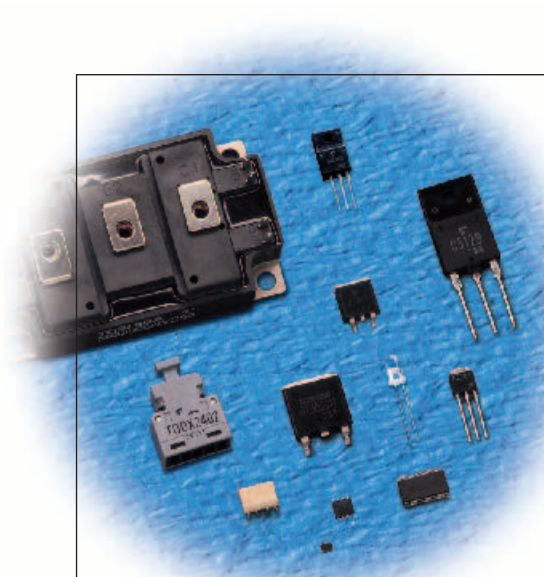
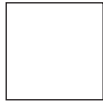


	Package Dimensions	2 – 7
	Small Signal Devices	8 – 17
	Switching Diodes Arrays	8
	Schottky Barrier Diodes	9
	Zener Diodes	11
	Diodes for Protection against ESD	12
	Varicap Diodes	13 – 14
	PIN Diodes	14
	Point Regulator	15 – 17
	Small Signal Transistors	18 – 34
	Tape Packing Specifications	18
	Bias Resistor Built-in Transistors (BRTs)	20 – 21
	Standard Family	22 – 23
	S-MOS	24 – 25
	Junction FETs (J-FETs)	26
	BC Series, BF Series, TBC Series	26
	Surface Mount Products	27 – 28
	RF-Transistor	29 – 30
	Microwave Transistor	30
	Op Amp Comparator ICs	31
	RF Cell Pack	32
	LINE UP for RF Power Devices	34
	Power Devices	35 – 69
	Small Surface-Mount Rectifiers	35
	FLAT(US/S/M-FLAT) Package Series	36
	S-MOS Series	37
	Power MOSFETs	38 – 58
	Deflection Transistor	59
	IGBT-Modules	61 – 63
	Discrete IGBTs	64 – 67
	Integrated Circuits	71 – 88
	CMOS Logic	72
	Voltage Family (TC74VCX/LCX/LVX-Series)	72 – 73
	VHS Family (TC74VHC/VHCT-Series)	74
	AC Family (TC74AC/ACT-Series)	75
	NHS Family (TC74HC/HCT-Series)	76 – 77
	Standard Logic (TC4000B/4500B-Series)	78
	Mini MOS Families	79
	Target Application & example	80
	L-MOS	81
	Selection Guide	82 – 83
	Product Guide	84
	Pin Assignments	85
	Bus-Switches	86
	Voltage Regulator	87 – 88
	Opto Products	89 – 115
	Phototransistor	89 – 94
	Photodiode	94
	Photodarlington Transistor	95
	Photothyristor	96
	Phototriac	97 – 98
	AC Power	99
	Photo-IC	100 – 101
	Photo-Voltaic	102
	Photorelay	103 – 106
	LED Lamps	107
	Surface Mount (SMD)	107 – 108
	High Brightness TOSBRIGHT®	109 – 112
	TOSLINK Fiber Optic Devices	113 – 115
	Product Liability Statement	116



Innovative Semiconductor Solutions

European Selection 2003



TOSHIBA

Reference Table of Package Name by Supplier

May '03

JEDEC No. (USA)	SOT No. (Europe)	EIAJ No. (Japan)	Number of Pins	Size Name (Type)	Toshiba	Matsushita	Rohm	NEC
	SOD-123		2		SMC LB101			
	SOD-323		2	2125	USC	S-Mini(2pin)	USM	2pin Super Mini Mold
			2	1608	SSC			
	SOD-523	SC-79	2	1608	ESC			
			2	1406	sESC			
TO-92		SC-43	3		TO-92	TO-92	TO-92	TO-92
(TO-92 Small)		SC-72	3		N-MINI	New S Type	SPT	SST
(TO-92 Large)		SC-51	3		LSTM(TO-92MOD)	TO-92L	TO-92L	-
TO-236MOD	SOT-23MOD	SC-59	3	3216	S-Mini	Mini(3pin)	SMT/SMD	3pin Mini Mold
	SOT-323	SC-70	3	2125	USM	S-Mini	UMT/UMD	3pin Super Mini Mold
	SOT-416	(SC-75)	3	1608	SSM	SS Mini	EMT3	3pin Ultra Super Mini Mold
	SOT-490	SC-81	3	1608	ESM			
	SOT-89	SC-62	3		Power Mini	Mini PW	MPT	3pin PW Mini Mold
		SC-63	3		PW Mold/DP	-	CPT	MP-3
	SOT-223		3		SP			
			3		TO-220SM			
			3		TO-3P(SM)			
	SOT-563	SC-89	3		BS6			
			3	1006	fSC			
			3	1006	fSM			
			3		TSM			
			3		VESM			
	SOT-143R	SC-61	4	3216	SMQ	Mini(4pin)	SM4	4pin Mini Mold
	SOT-343	-	4	2125	USQ			
			4	1212	TESQ			
	SOT-25	SC-74A	5	3216	SMV	Mini(5pin)	FMT	5pin Mini Mold
	SOT-353	SC-88A	5	2125	USV	S-Mini(5pin)	UM5	5pin Super Mini Mold
			5	1616	ESV			
	(SOT-353)		5	2120	UFV			
	SOT-26	SC-74	6	2828	SM6	Mini(6pin)	IMD	6pin Mini Mold
	SOT-363	SC-88	6	2125	US6	S-Mini(6pin)	UM6	6pin Super Mini Mold
			6	2120	TU6			
			6	1616	ES6			
			8	4029	SM8			
			8	3120	US8			

For further product information, brochures and datasheets please have a look at our internet sites:

Datasheets: http://www.semicon.toshiba.co.jp/eng/search/ft_datasheet.html

Brochures: <http://www.semicon.toshiba.co.jp/eng/index.html>

TEE homepage: <http://www.toshiba-components.com>

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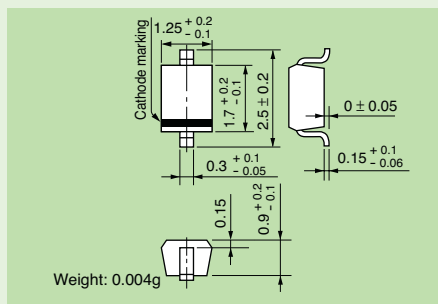
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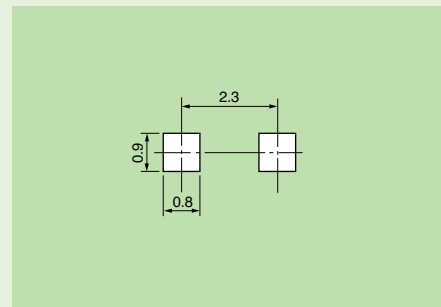
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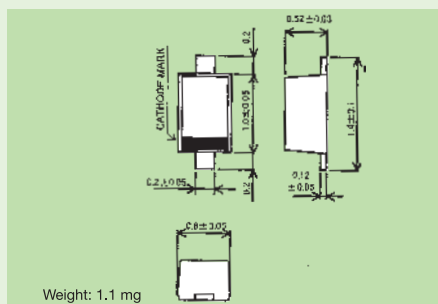
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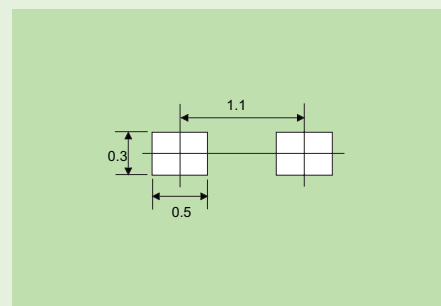
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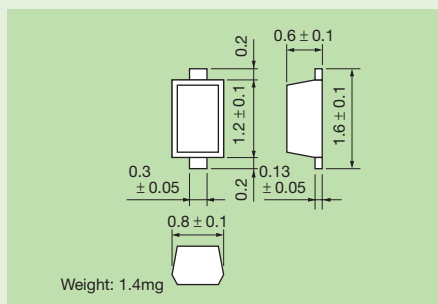
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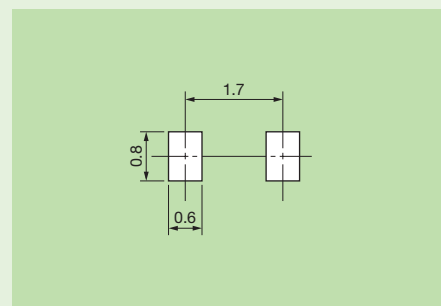
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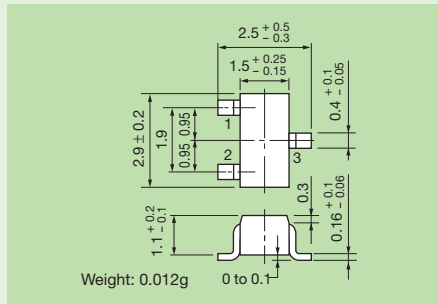
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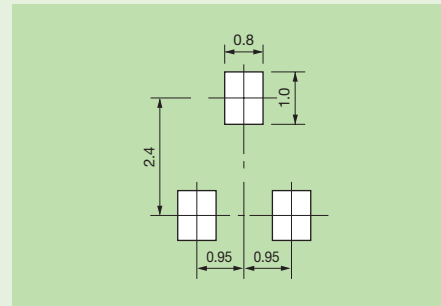
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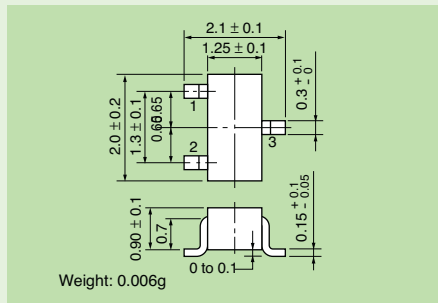
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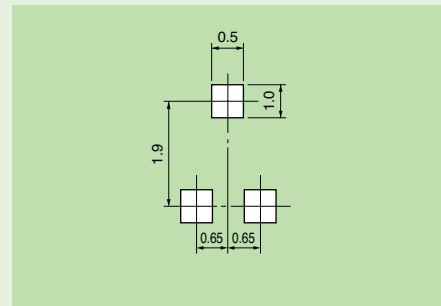
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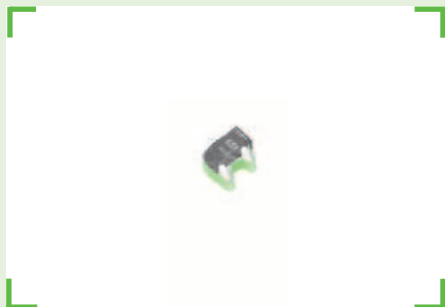


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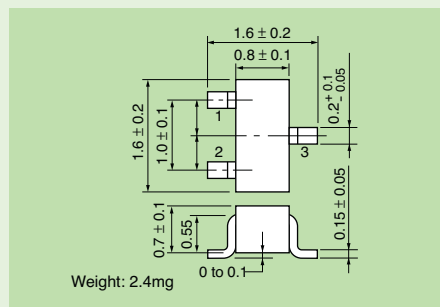


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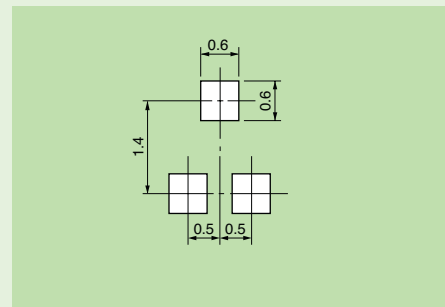
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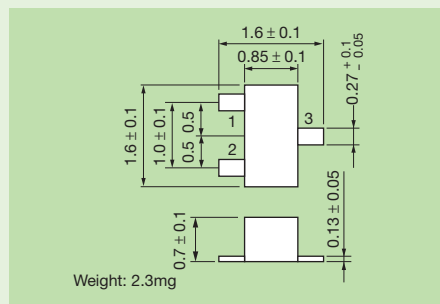
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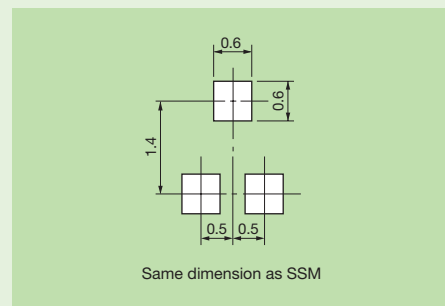
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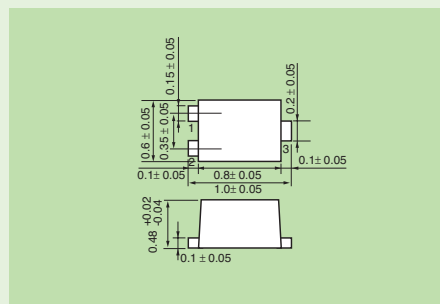
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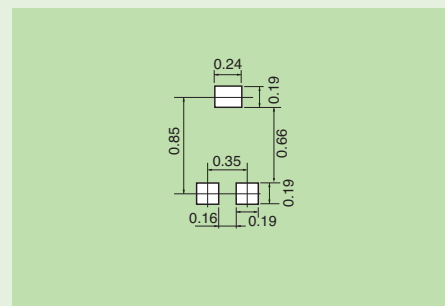
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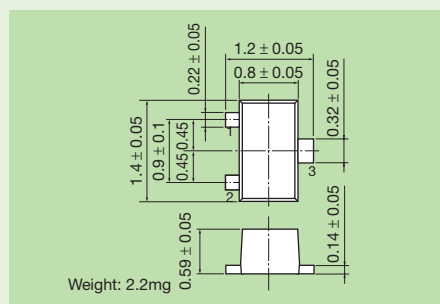
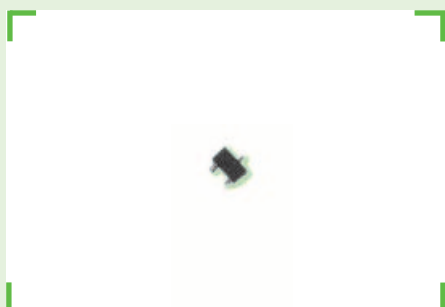
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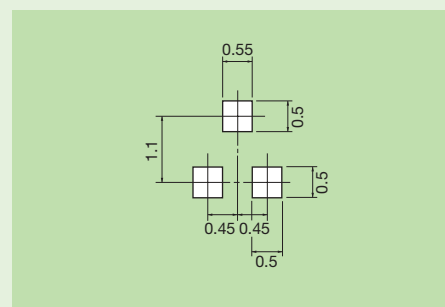
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TESM



Unit: mm



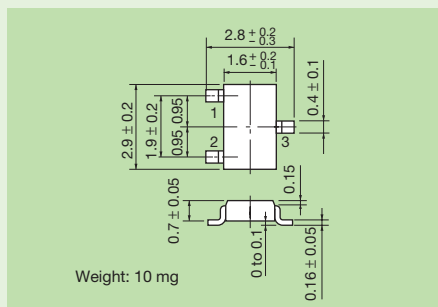
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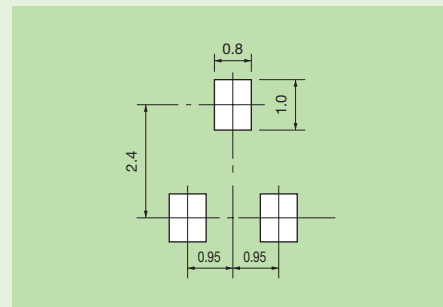
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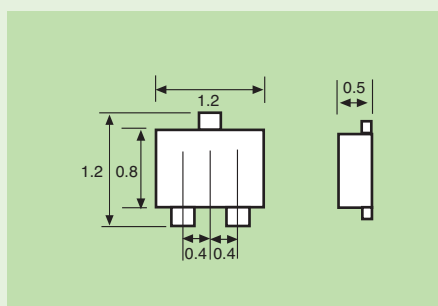
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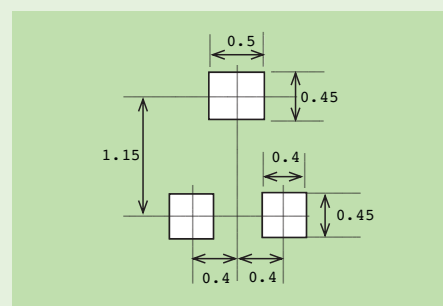
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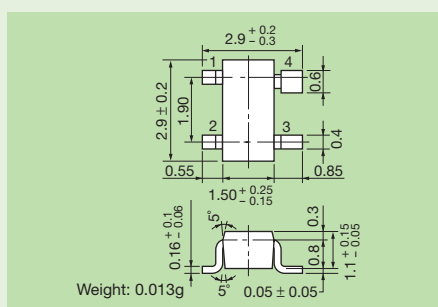
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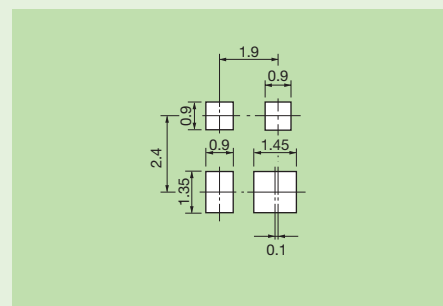
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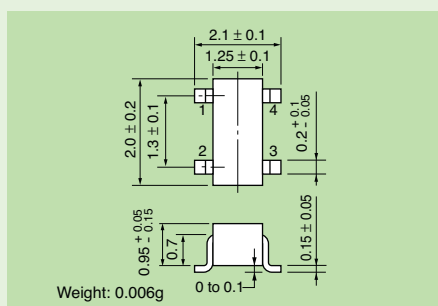
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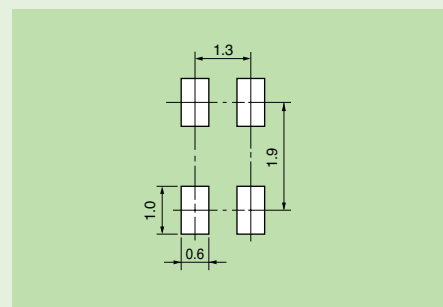
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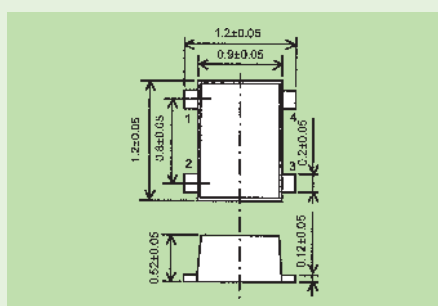
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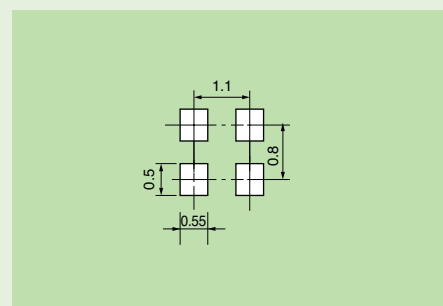
Unit: mm



TESQ



Unit: mm

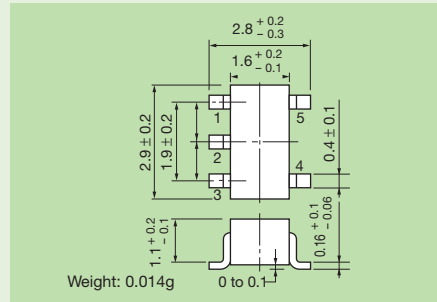


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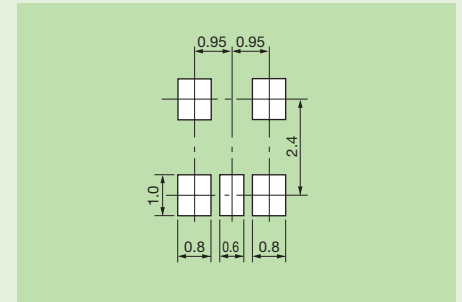
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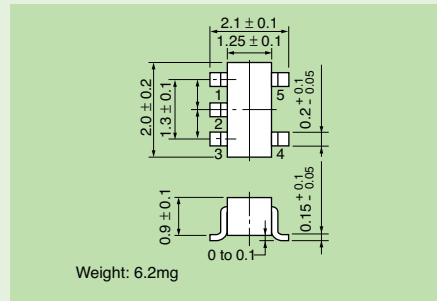
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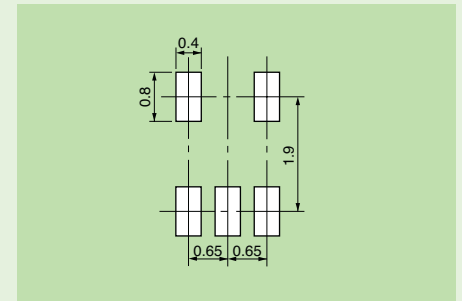
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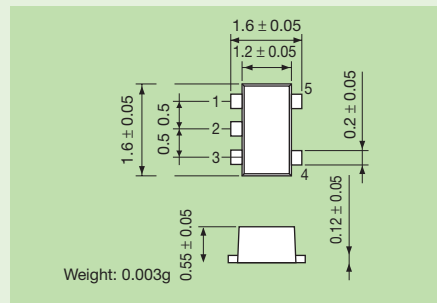
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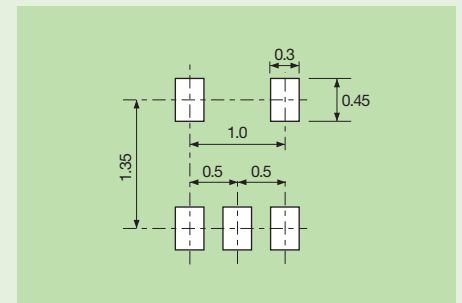
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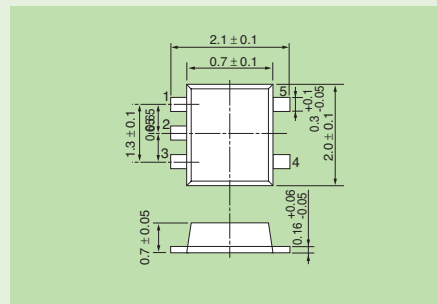
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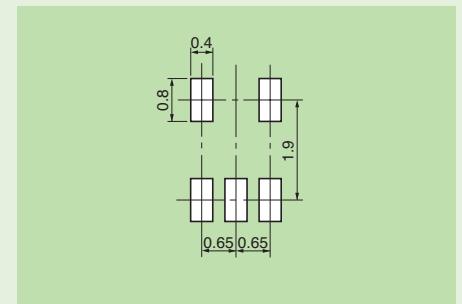
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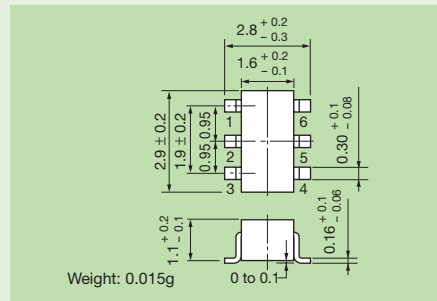
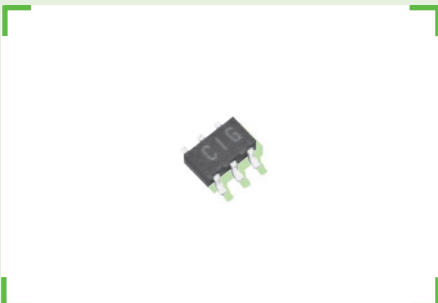
■ UFV



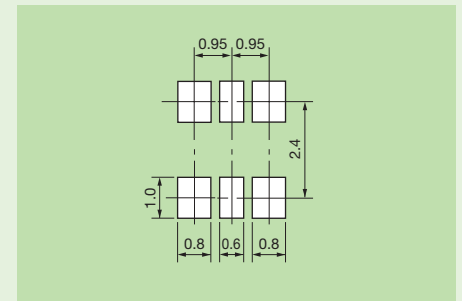
Unit:UFV



■ SM6 (SC-74)



Unit: mm



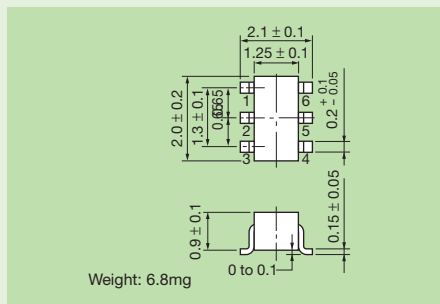
Package Dimensions

US6

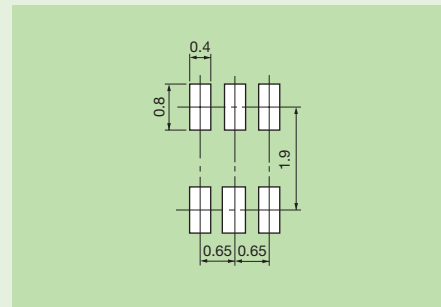
Appearance



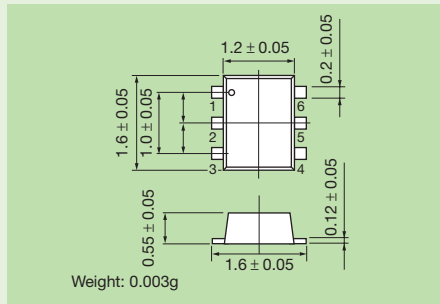
Package Dimensions



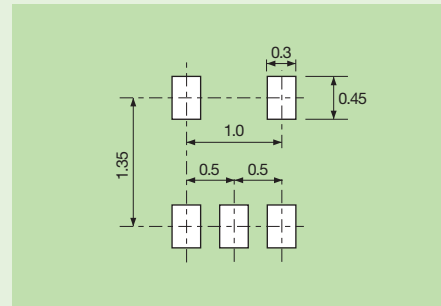
Pad Dimensions (reference) Unit: mm



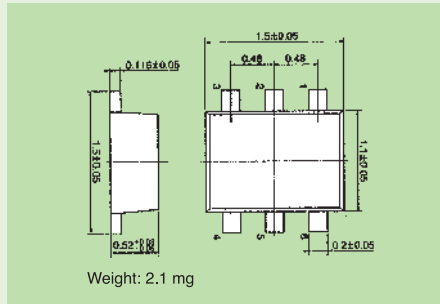
ES6



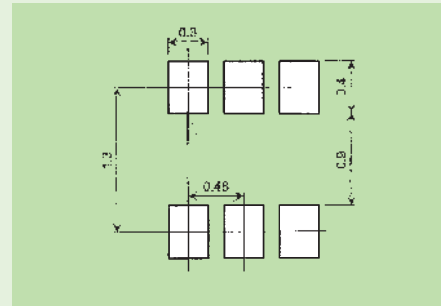
Unit: mm



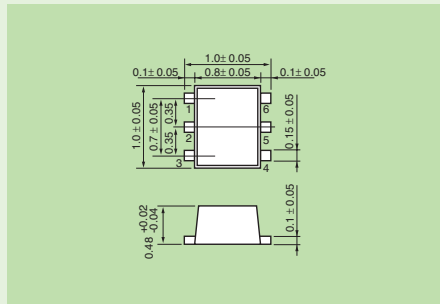
sES6



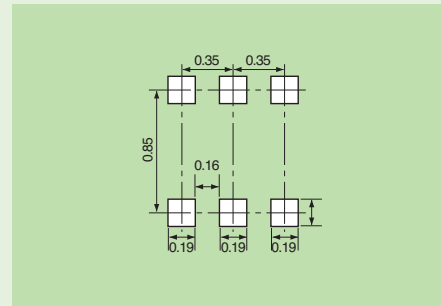
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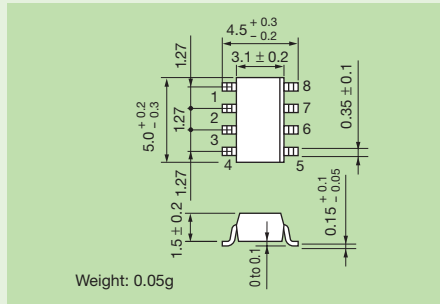
FS6



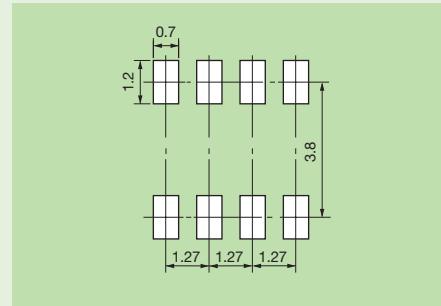
Unit: mm



FM8



Unit: mm

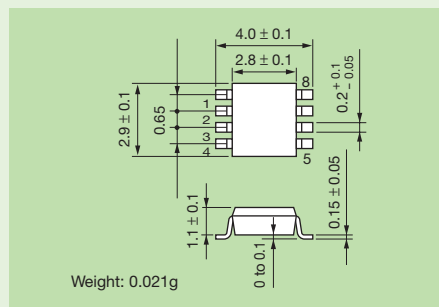


■ SM8

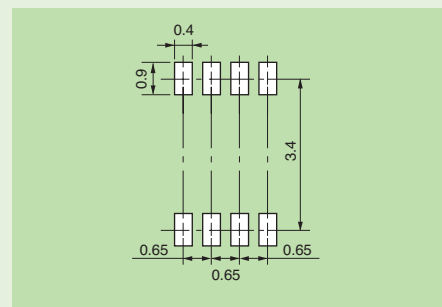
Appearance



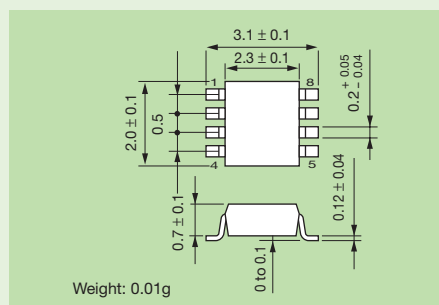
Package Dimensions



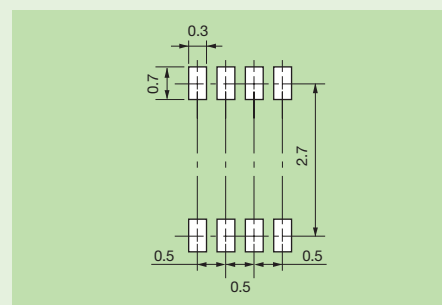
Pad Dimensions (reference) Unit: mm

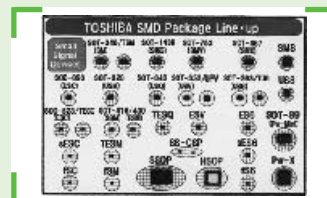


■ US8



Unit: mm





Switching Diodes – Arrays

Electrical Characteristics (Ta = 25 °C)																
V _R (V)	I _o (mA)	t _{rr} (ns)	ESC SOD-523	ESM SOT-490	SSM SOT-416	USC SOD323	USM SOT-323	S-MINI (SC-59)	SMQ (SC-61)	USQ SOT-343	ESV	USV SOT353	SMV (SC-74C)	SM6 (SC-74)	US6 SOT363	ES6
30	100	–						1SS307								
80	100	–						1SS412	1SS379							
80	100	1.6 TYP.		1SS360F	1SS360		1SS300	1SS181				HN4D01JU	1SS308	HN1D01F	HN1D01FU	HN1D01FE
80	100	1.6 TYP.		(A3)	(A3)		(A3)	(A3)					(A1)	(A2)	(A2)	
				1SS361F	1SS361		1SS301	1SS184				HN4D02JU	1SS309	HN1D02F	HN1D02FU	HN1D02FE
80	100	1.6 TYP.														
				(B3)	(B3)		(B3)	(B3)					(A3)	(A3)	(A3)	
80	100 (80)	1.6 TYP.			1SS362		1SS302	1SS226								
80	100 (80)	1.6 TYP.			(C3)		(C3)	(A3)								
			1SS387			1SS352		1SS193			HN2D01JE			(HN2D01F)	(HN2D01FU)	
80	100 (80)	1.6 TYP.														
			(C1)			(C1)		(F3)						(A1)	(A1)	
80	100 (80)	1.6 TYP.						1SS196	1SS272	1SS382						(HN2D02FU)
80	100	1.6 TYP.						(G3)	(A1)	(A1)						(A5)
														HN1D03F	HN1D03FU	
80	100	1.6 TYP.														
														(A4)	(A4)	
80	200	7.0 TYP.						1SS336								
80	200	6.0 TYP.						(I9)								
80	200	6.0 TYP.						(J9)								
200	100	30 TYP.				1SS403	1SS370	1SS250	1SS306							
400	100	500 TYP.						1SS397	1SS311	1SS399				HN2D03F		
400	100	500 TYP.						(B9)	(B9)	(A6)				(A4)		
400	100	500 TYP.						(X9)								

() Marking

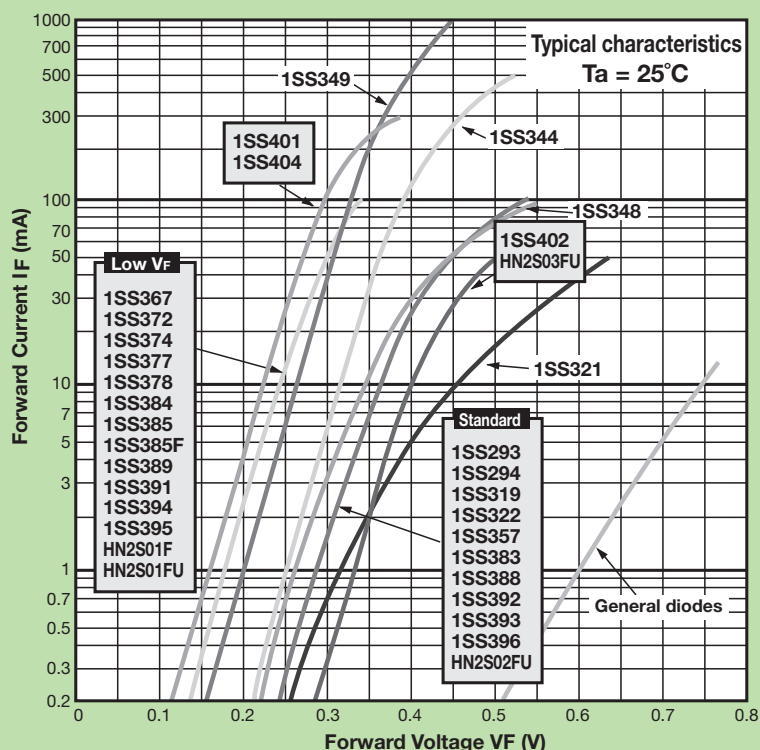
Schottky Barrier Diodes (General Purpose)

Features	Maximum Ratings		Electrical Characteristics (Ta = 25 °C)																		
	VR (V)	Io (mA)	VF(V)		fSC	ESC	ESM	SSC	SSM	USC	USM (SC-70)	USQ	TESQ	ESV	USV	ES6	US6	S-MINI (SC-59)	SMQ (SC-61)	SM6 (SC-74)	
			max	@If (mA)																	
Low-VF	10	100	0.3	5		1SS389		1SS373		1SS367	1SS395	1SS384					HN2S01FU	1SS394	1SS391	HN2S01F	
			0.5	100																	
						(S4)		(S4)		(S4)	(S9)	(A5)					(A6)	(S9)	(A5)	(A6)	
	10	100	0.3	5			1SS385F		1SS385		1SS378							1SS377			
			0.5	100																	
							(09)		(09)		(09)							(09)			
	10	100	0.3	5							1SS372								1SS374		
			0.5	100																	
											(N9)								(N9)		
Low-IR, High-speed	20	50	–	1	1SS413	1SS405				1SS406		1SS402	HN2S03T			HN2S03FE	HN2S03FU				
			–	5																	
			0.55	50								(N9)					(N9)				
Low-IR	10	50																1SS321			
			1.0	50																	
																		(F9)			
Standard	40	100				1SS388		1SS369		1SS357	1SS322	1SS383			HN2S02JE			1SS294	1SS319		
			0.6	100																	
						(S3)		(S3)		(S3)	(A9)	(A4)					(A9)	(A4)			
	40	100									1SS393							1SS392			
			0.6	100																	
												(R9)						(R9)			
40	100																	1SS396			
		0.6	100																		
																		(T9)			
High-VR	80	100																	1SS348		
			0.7	100																	
																		(K9)			
High-IO, Low-VF	20	300 (H9)	–	1						1SS404	1SS401				HN2S04JU	HN2S04FU	1SS344				
			–	10																	
			0.45	300							(S3)	(D9)									
High-ID	20	500																1SS344			
			0.55	500																	
																		(H9)			
	20	1000																1SS349			
0.55			1000																		
																		(L9)			

() Marking

Schottky Barrier Diodes

I_F - V_F Characteristics (typ.)

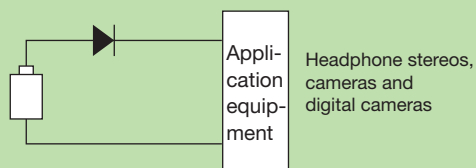


Functions and Applications

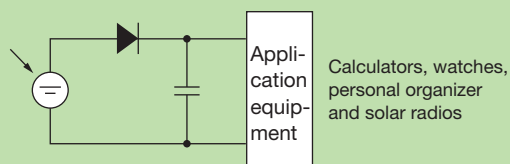
Functional Use	Applications
Battery reverse-connection prevention	Headphone stereos, cameras and digital cameras
Memory back-up circuits	Notebook computers, word processors, cellular phones and pagers
Speed-up circuits	Measuring instruments
Low-voltage operation circuits	Calculators and watches
Others	DC-DC converters

Application Examples of Schottky Barrier Diodes

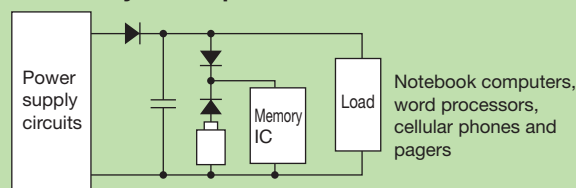
Battery reverse-connection prevention



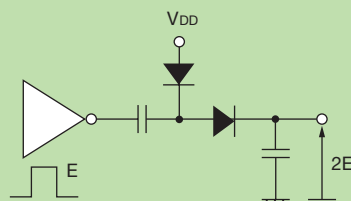
Solar cell battery



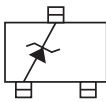
Memory back-up circuits



DC-DC converters



■ Zener Diodes

Zener Voltage V_z (V)	Package			
		S-MINI (SC-59)	USC	ESC
2.0		02CZ2.0	02DZ2.0	015AZ2.0
2.2		02CZ2.2	02DZ2.2	015AZ2.2
2.4		02CZ2.4	02DZ2.4	015AZ2.4
2.7		02CZ2.7	02DZ2.7	015AZ2.7
3.0		02CZ3.0	02DZ3.0	015AZ3.0
3.3		02CZ3.3	02DZ3.3	015AZ3.3
3.6		02CZ3.6	02DZ3.6	015AZ3.6
3.9		02CZ3.9	02DZ3.9	015AZ3.9
4.3		02CZ4.3	02DZ4.3	015AZ4.3
4.7		02CZ4.7	02DZ4.7	015AZ4.7
5.1		02CZ5.1	02DZ5.1	015AZ5.1
5.6		02CZ5.6	02DZ5.6	015AZ5.6
6.2		02CZ6.2	02DZ6.2	015AZ6.2
6.8		02CZ6.8	02DZ6.8	015AZ6.8
7.5		02CZ7.5	02DZ7.5	015AZ7.5
8.2		02CZ8.2	02DZ8.2	015AZ8.2
9.1		02CZ9.1	02DZ9.1	015AZ9.1
10		02CZ10	02DZ10	015AZ10
11		02CZ11	02DZ11	015AZ11
12		02CZ12	02DZ12	015AZ12
13		02CZ13	02DZ13	
15		02CZ15	02DZ15	
16		02CZ16	02DZ16	
18		02CZ18	02DZ18	
20		02CZ20	02DZ20	
22		02CZ22	02DZ22	
24		02CZ24	02DZ24	
27		02CZ27		
30		02CZ30		
33		02CZ33		
36		02CZ36		
39		02CZ39		
43		02CZ43		
47		02CZ47		
Pin assignent				
P (mW)		200	200	150

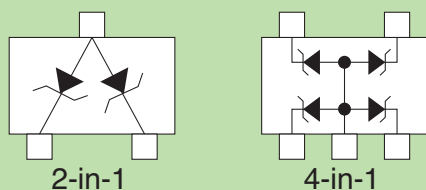
Small Signal Devices

Diodes for Protection against ESD

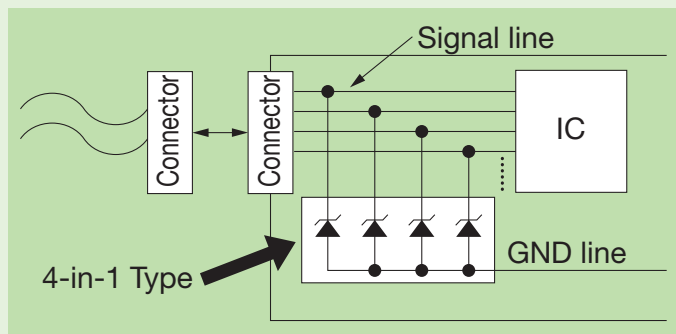
Small-signal zener diodes are suitable for protecting electronic circuits against ESD from external pins.

(Since multiple devices are incorporated into a single package, the product is ideal for interface protection.)

Internal Connections

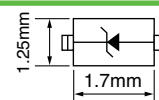


Protection circuit example



Single Type

Product No.	V _Z (V)			@I _Z (mA)	I _R (μA)	@V _R (V)	C _T pF	@V _R (V)	Package
	Min	Typ.	Max						
DF2S12FU	11.4	12.0	12.6	5	0.05	9	15	0	USC



New product

Standard Type

2-in-1			4-in-1			V _Z (V)	I _R (μA)			
VESM	ESM	USM	ESV	USV	SMV				US8	
Typ.	@I _Z (mA)	Max	@V _Z (V)							
	DF3A2.2FE	DF3A2.2FU	DF5A2.2JE	DF5A2.2FU	DF5A2.2F		2.2	5	120	1.0
	DF3A3.3FE	DF3A3.3FU	DF5A3.3JE	DF5A3.3FU	DF5A3.3F		3.3	5	20	1.0
	DF3A5.6FE	DF3A5.6FU	DF5A5.6JE	DF5A5.6FU	DF5A5.6F	DF8A5.6FK	3.6	5	10	1.0
	DF3A6.2FE	DF3A6.2FU	DF5A6.2JE	DF5A6.2FU	DF5A6.2F	DF8A6.2FK	6.2	5	1	3.0
	DF3A6.8FE	DF3A6.8FU	DF5A6.8JE	DF5A6.8FU	DF5A6.8F	DF8A6.8FK	6.8	5	0.5	5.0
DF3A8.2FV	DF3A8.2FE	DF3A8.2FU	DF5A8.2JE	DF5A8.2FU	DF5A8.2F		8.2	5	0.5	6.5

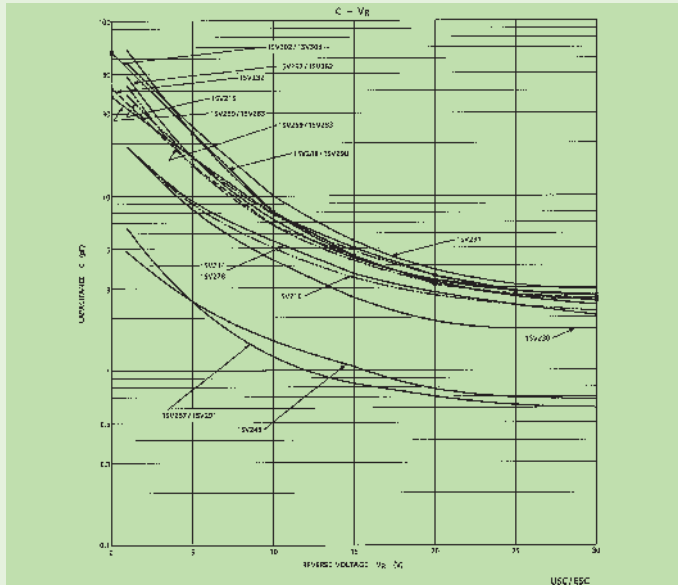
High-Speed Signal Type

2-in-1		4-in-1			V _Z (V)		C _T (pF)	
ESM	USM	ESV	USV	SMV				
					Typ.	@I _Z (mA)	Typ.	@V _Z (V)
DF3A6.2LFE	DF3A6.2LFU	DF5A6.2LJE	DF5A6.2LFU	DF5A6.2LF		6.2		5
DF3A6.8LFE	DF3A6.8LFU	DF5A6.8LJE	DF5A6.8LFU	DF5A6.8LF	6.8	5	6	0
DF3A8.2LFE	DF3A8.2LFU	DF5A8.2LJE	DF5A8.2LFU	DF5A8.2LF	8.2	5	6	0

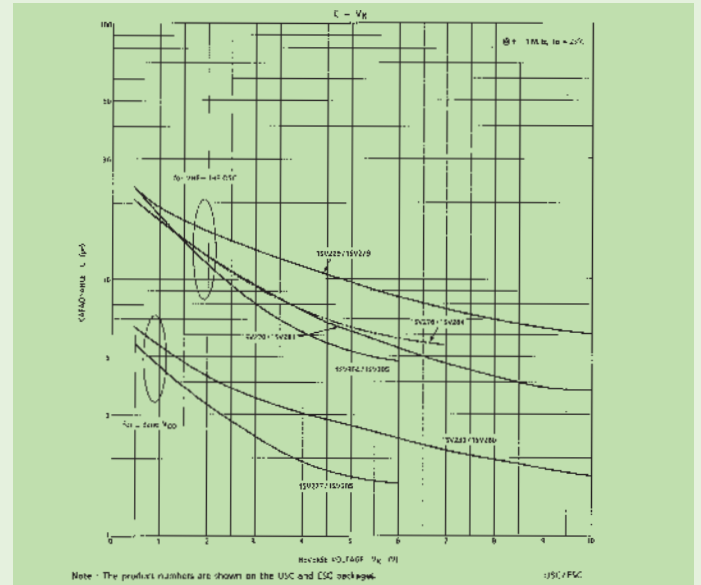
Under development

Varicap Diodes

Varicap C-V performance
(TV-tuner, BS-tuner, satellite-communication use)



Varicap Diodes for TV Tuners and BS Tuners,
C-V Characteristics



Varicap Diodes for TV Tuners and VHF to UHF Bands

Application	Product No.	V _R (V)	I _R		C _T (1)		C _T (2)		C _T (1)/C _T (2)	r _s (Typ.)			Package Type
			(nA)	V _R (V)	(pF)	V _R (V)	(pF)	V _R (V)		()	V _R (V)	f (MHz)	
AFC	1SV216	30	10	28	10.5 to 16	2	3.3 to 5.7	10	2.5 to 3.4	0.55	5	470	USC
VHF Tuning (CATV)	1SV215	30	10	28	26 to 32	2	2.5 to 3.2	25	5.9min	0.6	5	470	USC
	1SV217	30	10	28	33 to 39	2	2.6 to 3.2	25	11min	0.83	5	470	USC
	1SV231	30	10	28	41 to 49.5	2	2.7 to 3.4	25	14min	1.05	5	470	USC
	1SV232	30	10	28	28 to 32	2	2.75 to 3.1	25	10min	0.55	5	470	USC
	1SV242	30	10	28	36 to 42	1	2.43 to 3.0	28	13.4min	0.65	5	470	SM
	1SV262	34	10	32	33 to 38	2	2.6 to 3.0	25	12min	0.6	5	470	USC
	1SV282	34	10	32	33 to 38	2	2.6 to 3.0	25	12min	0.6	5	470	ESC
	1SV269	34	10	32	29 to 34	2	2.5 to 2.9	25	10.8min	0.55	5	470	USC
	1SV283	34	10	32	29 to 34	2	2.5 to 2.9	25	11min	0.55	5	470	ESC
V, UHF Tuning	1SV214	30	10	28	14.16 to 16.25	2	2.11 to 2.43	25	9.5 to 7.15	0.4	5	470	USC
	1SV278	30	10	28	14.16 to 16.25	2	2.11 to 2.43	25	5.9 to 7.15	0.4	5	470	ESC
UHF Tuning (BS 2ND C/V) (CATV)	1SV245	30	10	28	3.31 to 4.55	2	0.61 to 0.77	25	5.0min	1.2	1	470	USC
	1SV287	30	10	28	4.2 to 5.7	2	0.53 to 0.68	25	7.6typ	1.9	1	470	USC
	1SV291	30	10	28	4.2 to 5.7	2	0.53 to 0.68	25	7.6typ	1.9	1	470	ESC
	★1SV302	30	10	28	42 to 51	2	2.1 to 3.1	25	18typ	1.05	5	470	USC
	★1SV303	30	10	28	42 to 51	2	2.1 to 3.1	25	18typ	1.05	5	470	ESC
	JDV2S71U	30	10	28	6.5	1	0.56	25	11.5typ			470	USC
	JDV2S71E	30	10	28	6.5	1	0.56	25	11.5typ			470	ESC
UHF VCO	1SV229	15	3	15	14 to 16	2	5.5 to 6.5	10	2.0min	0.2	5	470	USC
	1SV279	15	3	15	14 to 16	2	5.5 to 6.5	10	2.0min	0.2	5	470	ESC
	1SV239	15	10	15	3.8 to 4.7	2	1.5 to 2.0	10	2.0min	0.45	1	470	USC
	1SV280	15	3	15	3.8 to 4.7	2	1.5 to 2.0	10	2.0min	0.45	1	470	ESC
	1SV270	10	3	10	15 to 17	1	7.3 to 8.7	4	1.8min	0.28	1	470	USC
	1SV281	10	3	10	15 to 17	1	7.3 to 8.7	4	1.8min	0.28	1	470	ESC
	1SV277	10	3	10	4.0 to 4.9	1	1.85 to 2.35	4	2.0min	0.42	1	470	USC
	1SV285	10	3	10	4.0 to 4.9	1	1.85 to 2.35	4	2.0min	0.42	1	470	ESC
	1SV276	10	3	10	15 to 17	1	7.0 to 8.5	4	1.8min	0.22	1	470	USC
	1SV284	10	3	10	15 to 17	1	7.0 to 8.5	4	1.8min	0.22	1	470	ESC
	*1SV293	10	3	10	18 to 20	1	10.1 to 11.1	4	1.55min	0.26	1	470	USC
	*1SV304	10	3	10	17.3 to 19.3	1	5.3 to 6.6	4	3typ	0.27	1	470	USC
	*1SV305	10	3	10	17.3 to 19.3	1	5.3 to 6.6	4	3typ	0.27	1	470	ESC
	★1SV306	15	3	15	14 to 16	2	5.5 to 6.5	10	2min	0.2	5	470	USQ
CATV Conv. OSC	1SV230	30	10	28	13.9 to 16.1	2	1.7 to 2.1	20	7.1min	0.73	5	470	USC
	1SV286	30	10	28	14.5 to 16.1	2	1.56 to 1.86	20	7.1min	0.75	5	470	ESC
Wide Band	1SV288	30	10	28	41 to 49.5	2	2.5 to 3.2	25	16typ	0.92	5	470	USC

* New ★ Under development

■ Varicap Diodes for TV Tuners and VHF to UHF Bands

Application	Product No.	V _R (V)	I _R		C _T (1)		C _T (2)		C _T (1)/C _T (2)	r _s (Typ.)			Package Type
			(nA)	V _R (V)	(pF)	V _R (V)	(pF)	V _R (V)		(Ω)	V _R (V)	f (MHz)	
Tuning (CATV)	1SV290	30	10	28	41 to 49.5	2	2.5 to 3.2	25	16typ	0.92	5	470	ESC
	1SV310	10	3	10	9.7 to 11	1	4.45 to 5.45	4	2.1typ	0.28	1	470	USC
	1SV311	10	3	10	9.7 to 11	1	4.45 to 5.45	4	2.1typ	0.28	1	470	ESC
	*1SV313	10	3	10	7.3 to 8.4	0.5	2.75 to 3.4	2.5	2.5typ	0.35	1	470	USC
	*1SV314	10	3	10	7.3 to 8.4	0.5	2.75 to 3.4	2.5	2.5typ	0.35	1	470	ESC
	★1SV317	10	3	10	23.5	0.5	9.4	2.5	2.5typ	0.26	1	470	USC
	★1SV318	10	3	10	23.5	0.5	9.4	4	2.5typ	0.26	1	470	ESC
	1SV322	10	3	10	26.5 to 29.5	1	6.0 to 9.1	4	4.3typ	0.4	4	100	USC
	1SV323	10	3	10	26.5 to 29.5	1	6.0 to 9.1	4	4.3typ	0.4	4	100	ESC
	1SV324	10	3	10	44 to 49.5	1	8.5 to 12.2	4	4.3typ	0.4	4	100	USC
	1SV325	10	3	10	44 to 49.5	1	8.5 to 12.2	4	4.3typ	0.4	4	100	ESC
	*1SV329	10	3	10	5.7 to 6.7	1	1.85 to 2.45	4	2.8typ	0.55	1	470	ESC
	*1SV330	10	3	10	18	1	5.1	4	3.5typ	0.45	1	470	USC
	*1SV331	10	3	10	18	1	5.1	4	3.5typ	0.45	1	470	ESC
	JDV2S01E	10	3	10	3	1	1.58	4	1.9typ	0.56	1	470	ESC
	JDV2S01S	10	3	10	3	1	1.58	4	1.9typ	0.56	1	470	ESC
	JDV2S01U	10	3	10	3	1	1.58	4	1.9typ	0.56	1	470	USC
	JDV2S01FS	10	3	10	3	1	1.58	4	1.9typ	0.56	1	470	fSC
	JDV2S02E	10	3	10	2	1	1.1	4	1.8typ	0.7	0.5	470	ESC
	JDV2S02S	10	3	10	1.8 to 2.3	1	0.83 to 1.23	4	2.0 typ	0.6	1	470	SESC
	JDV2S02T	10	3	10	2	1	1.1	4	1.8typ	0.7	0.5	470	TESC
	JDV2S02U	10	3	10	2	1	1.1	4	1.8typ	0.7	0.5	470	USC
	JDV2S03E	10	3	10	28	1	5.6	4	5.0 typ	0.8	4	100	ESC
	JDV2S03U	10	3	10	28	1	5.6	4	5.0 typ	0.8	4	100	USC
	JDV2S05E	10	3	10	3.85 to 4.55	1	1.94 to 2.48	4	1.9 typ	0.3	1	470	ESC
	JDV2S05S	10	3	10	4.5	1	9	4	2.0 typ				ESC
	JDV2S05FS	10	3	10	4.5	1	9	4	2.0 typ				fSC
	JDV2S06S	10	3	10	15 to 17	1	7 to 8.5	4	2.0 typ	0.27	1	470	SESC
	JDV2S06FS	10	3	10	15 to 17	1	7 to 8.5	4	2.0 typ	0.27	1	470	fSC
	JDV2S07S	10	3	10	4.0 to 4.9	1	1.85 to 2.35	4	2.3 typ	0.42	1	470	SESC
	JDV2S08S	10	3	10	17.3 to 19.3	1	5.3 to 6.6	4	3.0 typ	0.35	1	470	SESC
	JDV2S08FS	10	3	10	17.3 to 19.3	1	5.3 to 6.6	4	3.0 typ	0.35	1	470	fSC
	JDV2S09S	10	3	10	9.7 to 11.1	1	4.45 to 5.45	4	2.1 typ	0.33	1	470	SESC
	JDV2S10S	10	3	10	7.3 to 8.4	0.5	2.75 to 3.4	2.5	2.5 typ	0.35	1	470	SESC
	JDV2S10FS	10	3	10	7.3 to 8.4	0.5	2.75 to 3.4	2.5	2.5 typ	0.35	1	470	fSC
	JDV2S10T	10	3	10	7.8	0.5	2.95 to 3.4	2.5	2.5typ	0.35	1	470	TESC
	JDV2S13S	10	3	10	5.7 to 6.7	1	1.85 to 2.45	4	2.8 typ	0.55	1	470	SESC
	JDV2S13FS	10	3	10	5.7 to 6.7	1	1.85 to 2.45	4	2.8 typ	0.55	1	470	fSC
	JDV2S14E	10	3	10	56.3 to 64.7	0.5	19 to 26.5	2.5	2.15 typ	0.4	4	100	ESC
	JDV2S16E	10	3	10	3.6	0.5	7.2	2.5	2.0 typ				ESC
	JDV2S16S	10	3	10	3.6	0.5	7.2	2.5	2.0 typ				SESC
	JDV2S16FS	10	3	10	3.6	0.5	7.2	2.5	2.0 typ				fSC
	JDV2S17E	10	3	10	1.9	1	4.0	4	2.1 typ				ESC
	JDV2S17S	10	3	10	1.9	1	4.0	4	2.1 typ				SESC
	JDV2S18E	10	3	10	16	1	7.27	4	2.2 typ	0.27	1	470	ESC
	JDV2S18S	10	3	10	16	1	7.27	4	2.2 typ	0.27	1	470	SESC
	JDV2S18FS	10	3	10	16	1	7.27	4	2.2 typ	0.27	1	470	fSC
	JDV2S19E	10	3	10	2.67	1	2.02	4	1.82 typ				ESC
	JDV2S19S	10	3	10	2.67	1	2.02	4	1.82				SESC
	JDV2S19FS	10	3	10	2.67	1	2.02	4	1.82				fSC
	JDV2S20E	10	3	10	2.9	0.5	1.32	2.5	2.2				ESC
	JDV2S20S	10	3	10	2.9	0.5	1.32	2.5	2.2				SESC
	JDV2S20FS	10	3	10	2.9	0.5	1.32	2.5	2.2				fSC

* New ★ under development

■ PIN Diodes

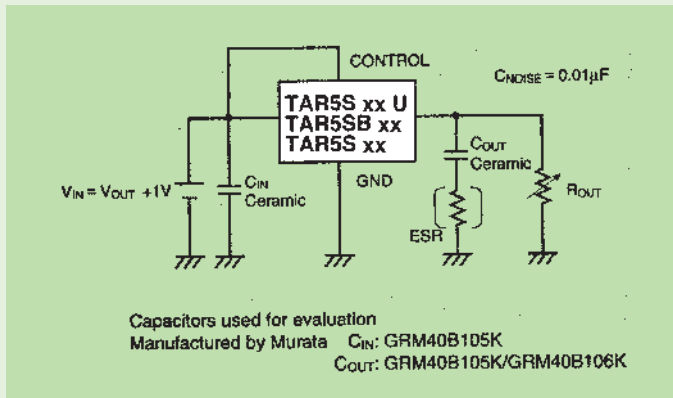
Product No.	V _R (V)	I _{FM} (mA)	C _T (pF)	r _s (Ω)	Package Type
1SV308	30	300	2.2	1.1	SMV
JDP2S01E	30	50	0.65	0.65	ESC
JDP2S01T	30	50	0.65	0.65	TESC
JDP2S01S	30	50	0.65	0.65	SESC
JDP2S01U	30	50	0.65	0.65	USC
JDP2S01AFS	30	50	0.65	0.65	fSC
JDP2S02T	30	300	0.65	1.1	TESC
JDP2S02S	30	300	0.65	1.1	SESC
JDP2S02AS	30	300	0.3	1.0	SESC
JDP2S02AFS	30	300	2.2	1.1	fSC
JDP4P02U	30	300	0.65	1.1	USQ
JDP2S03S	30	100	0.7	0.6	SESC

Point Regulators

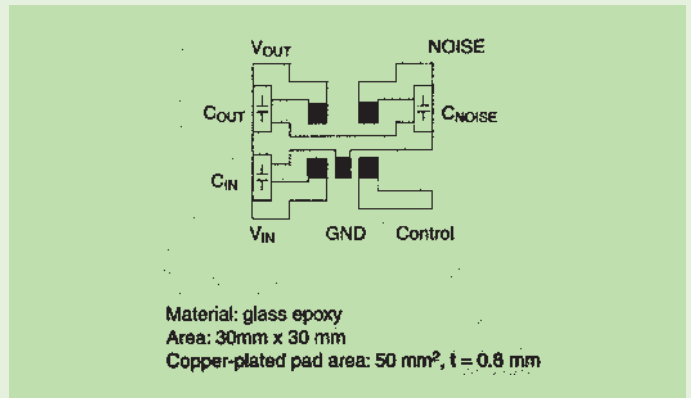
The point regulator series features one or two regulator ICs in a small package. The devices are suitable for use

as power supplies in battery-driven mobile phones and portable audio players.

Evaluation Circuit for Stable Operating Area



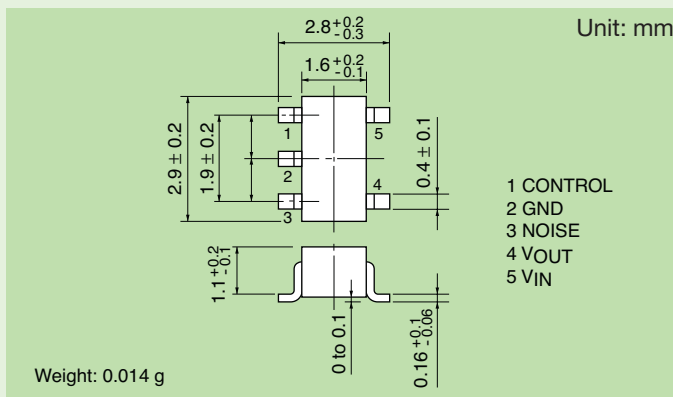
Recommended PCB Layout



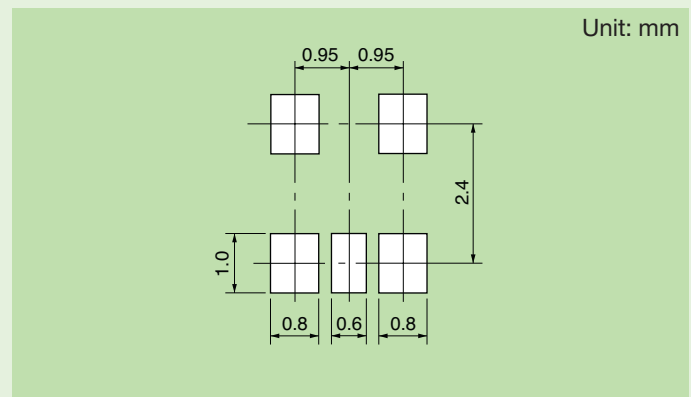
Features

- Small package (SMV: SOT-25 5-pin)
- Dropout voltage 130 mV (typ.), 200 mV (max) @50 mA
- Connection to a noise bypass capacitor realizes low noise of 30 μ Vrms (typ.).
- High performance with ripple rejection of 70 dB (typ. @f = 1 KHz)
- ON/OFF control function (ON at 1.5 V or higher; OFF at 0.4 V or lower)
- Standby current of 0.1 μ A or less (when control OFF)
- Built-in overtemperature and overcurrent protection circuits

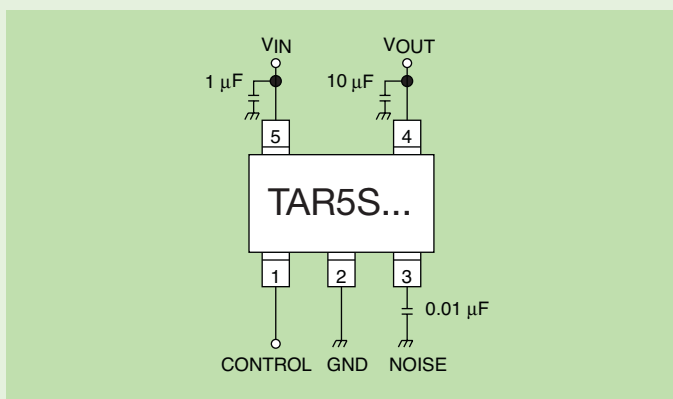
Package dimensions (pin connections)



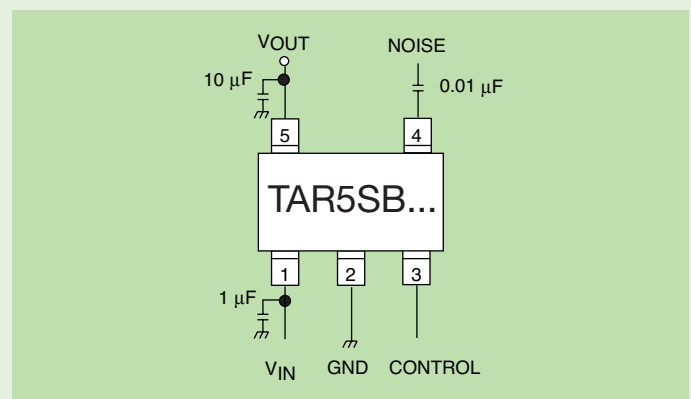
Recommended land dimensions



Pin Layout Typ "S"



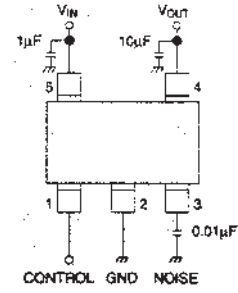
Pin Layout Typ "SB"



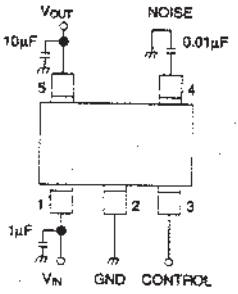
■ Point Regulator

Lineup on New Products

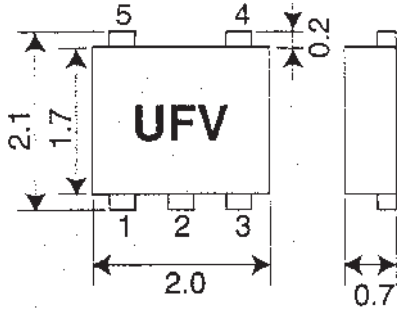
1) Single output: SMV (SOT23-5pin) package Toshiba Pin Out

Part No.	Output voltage	Electrical characteristics
TAR5S15	1.5V	Input Voltage 15 V Max. Output Current 200 mA Max. Output voltage tolerance: $\pm 2.5\%$ Max. (Except 1.5V and 1.8V items) Dropout Voltage 130 mV typ. Line Regulation 3 mV typ. Load Regulation 25 mV typ. 
TAR5S16	1.6V	
TAR5S17	1.7V	
TAR5S18	1.8V	
TAR5S19	1.9V	
TAR5S20	2.0V	
TAR5S21	2.1V	
TAR5S22	2.2V	
TAR5S25	2.5V	
TAR5S27	2.7V	
TAR5S28	2.8V	
TAR5S29	2.9V	
TAR5S30	3.0V	
TAR5S33	3.3V	
TAR5S35	3.5V	
TAR5S45	4.5V	
TAR5S50	5.0V	

2) Single output SMV package NSC Pin Out

Part No.	Output voltage	Package	Features
TAR5SB15 to TAR5SB25	1.5V to 2.5V (0.1V step)	SMV	Input Voltage 15 V Max. Output Current 150 mA Max. Output voltage accuracy: $\pm 2.5\%$ Max. or ± 60 mV Max. (1.5 to 2.3 V) Dropout Voltage 120 mV typ. Line Regulation 3 mV typ. Load Regulation 25 mV typ. Pin compatible to NS's products. 
TAR5SB26	2.6V		
TAR5SB27	2.7V		
TAR5SB28	2.8V		
TAR5SB29	2.9V		
TAR5SB30 to TAR5SB35	3.0V to 3.5V (0.1V step)		
TAR5SB36 to TAR5SB42	3.6V to 4.2V (0.1V step)		
TAR5SB43 to TAR5SB50	4.3V to 5.0V (0.1V step)		

3) Single output UFV package

Part No.	Output voltage	Package	Features
TAR5S15U	1.5V	UFV	Smaller package of UFV: mounting area is reduced to 51% against SMV. product height is 0.7 mm typ. Input Voltage: 15V Max. Output Current: 150 mA  Unit: mm
TAR5S16U	1.6V		
TAR5S17U	1.7V		
TAR5S18U	1.8V		
TAR5S19U to TAR5S24U	1.9V to 2.4V (0.1V step)		
TAR5S25U	2.5V		
TAR5S26U	2.6V		
TAR5S27U	2.7V		
TAR5S28U	2.8V		
TAR5S29U	2.9V		
TAR5S30U	3.0V		
TAR5S31U	3.1V		
TAR5S32U	3.2V		
TAR5S33U	3.3V		
TAR5S34U	3.4V		
TAR5S35U	3.5V		
TAR5S36U to TAR5S50U	3.6V to 5.0V (0.1V step)		

4) Dual Type (dual circuit)

Output voltage can be set, 0.1 V step for 1.5 V to 5.0 V (semi-custom products)

Two identical output voltage types

Product No.	Ch	Output Voltage (V)				Maximum Rating		Package
		Min	Typ.	Max	Measured current	Output current (mA)	Power dissipation (mW)*	
TAR8H01K	A	2.73	2.8	2.87	30 mA	100	400	US8
	B	2.92	3.0	3.08	60 mA	150		
TAR8H02K	A	2.73	2.8	2.87	30 mA	100		
	B	2.73	2.8	2.87	30 mA	150		

*: Evaluation result for 30 x 30 mm glass epoxy board

* Other Voltage combination on request 1.5–5.0 Volt range 0.1 Volt step

Different output voltage type

All combination of output voltage from 1.5 to 5.0V will be available.

Part No.	Output voltage	Package	Features
TAR8D01K	2.5+2.8V	US8	Independently controlled output type. Output Current: 100 mA Output voltage accuracy: $\pm 2.5\%$ Max.
TAR8D02K	2.0+2.8V		
TAR8D03K	2.8+3.0V		
TAR8D04K	1.5+1.5V		
TAR8D05K	2.8+2.8V		
TAR8D06K	2.9+2.9V		
TAR8D07K	3.0+3.0V	US8	One voltage-control terminal type. Output Current: 100 mA Output voltage accuracy: $\pm 2.5\%$ Max.
TAR8H01K	2.8+3.0V		
TAR8H02K	2.8+2.8V		
TAR8H03K	2.5+2.8V		
TAR8H04K	2.5+3.0V		
TAR8H05K	1.8+2.8V		
TAR8H06K	1.8+2.5V		

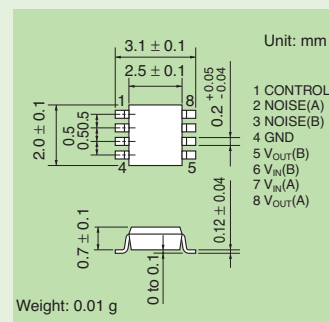
Features

- Incorporates two-output regulator IC in ultra-super-mini 8-pin package (US8), the smallest package type in the World.
- Output voltage can be set, 0.1 V step for 1.5 V to 5.0 V (semi-custom products).

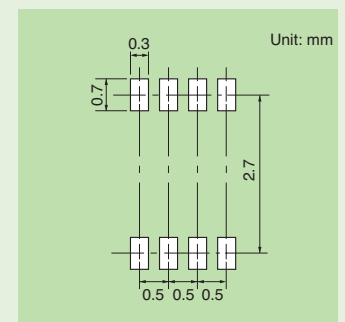
Typical Characteristics

- Dropout voltage (TAR8H01K)
Channel A: 130 mV (typ.), 200 mV (max) @30 mA
Channel B: 150 mV (typ.), 300 mV (max) @60 mA
- Connection to a noise bypass capacitor realizes low noise of 30 μ Vrms (typ.).
- High performance with ripple rejection of 65 dB (typ. @f = 200 Hz)
- Simultaneous ON/OFF control of both channels (ON at 2.2 V or higher; OFF at 0.4 V or lower)
- Standby current of 10 μ A or less (when control OFF)
- Built-in overtemperature and overcurrent protection circuits

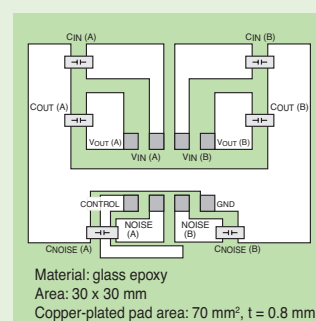
Package dimensions (pin connections)



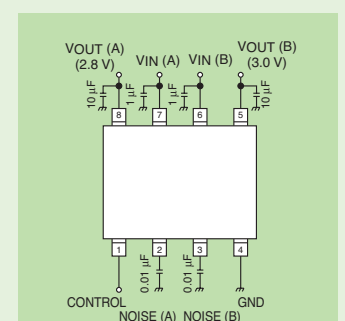
Recommended land dimensions



Power dissipation evaluation board

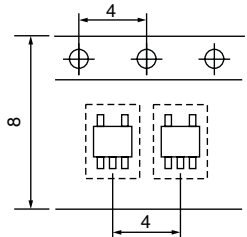


Recommended circuit



Small Signal Transistors

Tape Packing Specifications TAR5S and SB Series

Packing Type	Tape Type Suffix	Tape Dimensions (Unit: mm)	Reel Appearance	Packing Quantity
Embossed tape	TE85L			3000 per reel

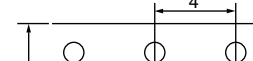
Small Signal Transistors

Classification	V _{CEO} (V)	I _C (mA)	TSM	TESM		VESM		ESM		SSM		USM (SC-70)		S-MINI (SC-59)		USV
				NPN	PNP	NPN	PNP	NPN	PNP	NPN	PNP	NPN	PNP	NPN	PNP	NPN
General-purpose	50	150	—	2SC4738FT	2SA1832FT	2SC4738FV	2SA1832FV	2SC4738F	2SA1832F	2SC4738	2SA1832	2SC4116	2SA1586	2SC2712	2SA1162	2SC4944
Low-noise	120	100	—	—	—	—	—	—	—	—	—	2SC4117	2SA1587	2SC2713	2SA1163	
			—	—	—	—	—	—	—	—	—	—	—	2SC3324	2SA1312	
General-purpose	30	500	—	—	—	—	—	—	—	—	—	2SC4118	2SA1588	2SC2859	2SA1182	
	50	500	—	—	—	—	—	—	—	—	—	—	—	2SC3325	2SA1313	
Low saturation	12	400	—	—	—	—	—	2SC5376F	—	2SC5376	2SA1955	—	—	—	—	
	12	500	—	—	—	—	—	—	—	—	—	2SC5233	2SA1954	2SC5232	2SA1953	
	15	800	—	—	—	—	—	—	—	—	—	—	—	—	2SA1362	
High current	25	800	—	—	—	—	—	—	—	—	—	—	—	2SC3265	2SA1298	
	30	800	—	—	—	—	—	—	—	—	—	—	—	2SC4210	2SA1621	
High withstand voltage capability	80	300	—	—	—	—	—	—	—	—	—	—	—	2SC4209	2SA1620	
High h _{FE}	50	150	—	—	—	—	—	—	—	—	—	2SC4666	—	2SC3295	—	
Muting	20	300	—	—	—	—	—	—	—	—	—	2SC4213	—	2SC3326	—	
High-speed switching	15	200	—	—	—	—	—	—	—	—	—	2SC4667	—	2SC3437	—	
High-speed switching	200	50	—	—	—	—	—	—	—	—	—	—	—	2SC3138	2SA1255	
High withstand voltage capability	300	100	—	—	—	—	—	—	—	—	—	—	—	2SC4497	2SA1721	
Low V _{CEsat}	12	400	—	—	—	—	—	2SC5376F	2SA1955F	—	—	—	—	—	—	
Electronic flash	10	5000	2SC5766	—	—	—	—	—	—	—	—	—	—	—	—	

 New products

Package Size	2.9 x 2.8 (3 pins)	1.4 x 0.8(3 pins) Flat lead	1.2 x 1.2 (3 pins) Flat lead	1.6 x 0.8(3 pins) Flat lead	1.6 x 0.8(3 pins)	2.0 x 1.25(3 pins)	2.9 x 1.5(3 pins)	2.0 x 1.25
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TAR8H Series

Packing Type	Tape Type Suffix	Tape Dimensions (Unit: mm)	Reel Appearance	Packing Quantity
Embossed tape	TE85L			3000 per reel

USV	SMV (SC-74A)		ES6			US6			SM6 (SC-74)			MINI		TO-92	
PNP	NPN	PNP	NPN	PNP	PNP + NPN	NPN	PNP	PNP + NPN	NPN	PNP	PNP+NPN	NPN	PNP	NPN	PNP
2SA1873	2SC4207	2SA1618	HN1C01FE*	HN1A01FE*		HN1C01FU	HN1A01FU	HN1B01FU	HN1C01F	HN1A01F	HN1B01F	2SC2458	2SA1048	2SC1815	2SA1015
			HN2C01FE*	HN2A01FE*	HN1B04FE**	HN2C01FU*	HN2A01FU*	HN1B04FU**	—	—	*** HN3B01F				
	—	—	—	—	—	—	—	—	—	—	—	2SC2459	2SA1049	2SC2240	2SA970
	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	—	—	—	—	—	2SC1959	2SA562TM
	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
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(5 pins)	2.9 x 1.5 (5 pins)	1.6 x 1.2(6 pins)	2.0 x 1.25(6 pins)	2.9 x 1.6(6 pins)
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*: Mirror-image connections ★: Point-symmetrical array
 **: NPN + PNP
 ***: Cascade connection

Small Signal Transistors

■ Bias Resistor Built-in Transistors (BRTs)

		General-Purpose Type																							
Ratings	V _{CE0} (V)		50																						
	I _c (mA)		100																						
	Package		VESM		fSM		TESM		ESM		SSM		USM (SC-70)		S-MINI (SC-59)		ESV		USV		SMV (SC-74A)		ES6		
Polarity		NPN	PNP	NPN	PNP	NPN	PNP	NPN	PNP	NPN	PNP	NPN	PNP	NPN	PNP	NPN	PNP	NPN	PNP	NPN	PNP	NPN	PNP	NPN x 2	PNP x 2
Internal resistors (KΩ)												 (Emitter-common)										 (Point-symmetrical array type)			
		R1	R2																						
4.7	4.7	RN1101FV	RN2101FV	RN1101FS	RN2101FS	RN1101FT	RN2101FT	RN1101F	RN2101F	RN1101	RN2101	RN1301	RN2301	RN1401	RN2401	RN1701JE	RN2701JE	RN1701	RN2701	RN1501	RN2501	RN1901FE	RN2901FE		
10	10	RN1102FV	RN2102FV	RN1102FS	RN2102FS	RN1102FT	RN2102FT	RN1102F	RN2102F	RN1102	RN2102	RN1302	RN2302	RN1402	RN2402	RN1702JE	RN2702JE	RN1702	RN2702	RN1502	RN2502	RN1902FE	RN2902FE		
22	22	RN1103FV	RN2103FV	RN1103FS	RN2103FS	RN1103FT	RN2103FT	RN1103F	RN2103F	RN1103	RN2103	RN1303	RN2303	RN1403	RN2403	RN1703JE	RN2703JE	RN1703	RN2703	RN1503	RN2503	RN1903FE	RN2903FE		
47	47	RN1104FV	RN2104FV	RN1104FS	RN2104FS	RN1104FT	RN2104FT	RN1104F	RN2104F	RN1104	RN2104	RN1304	RN2304	RN1404	RN2404	RN1704JE	RN2704JE	RN1704	RN2704	RN1504	RN2504	RN1904FE	RN2904FE		
2.2	47	RN1105FV	RN2105FV	RN1105FS	RN2105FS	RN1105FT	RN2105FT	RN1105F	RN2105F	RN1105	RN2105	RN1305	RN2305	RN1405	RN2405	RN1705JE	RN2705JE	RN1705	RN2705	RN1505	RN2505	RN1905FE	RN2905FE		
4.7	47	RN1106FV	RN2106FV	RN1106FS	RN2106FS	RN1106FT	RN2106FT	RN1106F	RN2106F	RN1106	RN2106	RN1306	RN2306	RN1406	RN2406	RN1706JE	RN2706JE	RN1706	RN2706	RN1506	RN2506	RN1906FE	RN2906FE		
10	47	RN1107FV	RN2107FV	RN1107FS	RN2107FS	RN1107FT	RN2107FT	RN1107F	RN2107F	RN1107	RN2107	RN1307	RN2307	RN1407	RN2407	RN1707JE	RN2707JE	RN1707	RN2707	RN1507	RN2507	RN1907FE	RN2907FE		
22	47	RN1108FV	RN2108FV	RN1108FS	RN2108FS	RN1108FT	RN2108FT	RN1108F	RN2108F	RN1108	RN2108	RN1308	RN2308	RN1408	RN2408	RN1708JE	RN2708JE	RN1708	RN2708	RN1508	RN2508	RN1908FE	RN2908FE		
47	22	RN1109FV	RN2109FV	RN1109FS	RN2109FS	RN1109FT	RN2109FT	RN1109F	RN2109F	RN1109	RN2109	RN1309	RN2309	RN1409	RN2409	RN1709JE	RN2709JE	RN1709	RN2709	RN1509	RN2509	RN1909FE	RN2909FE		
4.7	∞	RN1110FV	RN2110FV	RN1110FS	RN2110FS	RN1110FT	RN2110FT	RN1110F	RN2110F	RN1110	RN2110	RN1310	RN2310	RN1410	RN2410	RN1710JE	RN2710JE	RN1710	RN2710	RN1510	RN2510	RN1910FE	RN2910FE		
10	∞	RN1111FV	RN2111FV	RN1111FS	RN2111FS	RN1111FT	RN2111FT	RN1111F	RN2111F	RN1111	RN2111	RN1311	RN2311	RN1411	RN2411	RN1711JE	RN2711JE	RN1711	RN2711	RN1511	RN2511	RN1911FE	RN2911FE		
22	∞	RN1112FV	RN2112FV	RN1112FS	RN2112FS	RN1112FT	RN2112FT	RN1112F	RN2112F	RN1112	RN2112	RN1312	RN2312	RN1412	RN2412										
47	∞	RN1113FV	RN2113FV	RN1113FS	RN2113FS	RN1113FT	RN2113FT	RN1113F	RN2113F	RN1113	RN2113	RN1313	RN2313	RN1413	RN2413										
1	10					RN1114FT	RN2114FT			RN1114	RN2114	RN1314	RN2314	RN1414	RN2414				RN2714						
2.2	10	RN1115FV	RN2115FV			RN1115FT	RN2115FT			RN1115	RN2115	RN1315	RN2315	RN1415	RN2415										
4.7	10					RN1116FT	RN2116FT			RN1116	RN2116	RN1316	RN2316	RN1416	RN2416										
10	4.7					RN1117FT	RN2117FT			RN1117	RN2117	RN1317	RN2317	RN1417	RN2417										
47	10					RN1118FT	RN2118FT			RN1118	RN2118	RN1318	RN2318	RN1418	RN2418										
100	100					RN1130FT	RN2130FT																		
100	∞					RN1131FT	RN2131FT																		
200	∞					RN1132FT	RN2132FT																		

Under development

■ High current type

		High Current					
Ratings	V _{CE0} (V)	50				12	
	I _C (mA)	800				500	
	Package	MINI		S-MINI (SC-59)		USM	
Polarity		NPN	PNP	NPN	PNP	NPN	PNP
Internal resistors (K Ω)							
R1	R2						
1	1	RN1221	RN2221	RN1421	RN2421	RN1321A	RN2321A
2.2	2.2	RN1222	RN2222	RN1422	RN2422	RN1322A	RN2322A
4.7	4.7	RN1223	RN2223	RN1423	RN2423	RN1323A	RN2323A
10	10	RN1224	RN2224	RN1424	RN2424	RN1324A	RN2324A
0.47	10	RN1225	RN2225	RN1425	RN2425	RN1325A	RN2325A
1	10	RN1226	RN2226	RN1426	RN2426	RN1326A	RN2326A
2.2	10	RN1227	RN2227	RN1427	RN2427	RN1327A	RN2327A

■ High hFE Type

Ratings	V _{CE0} (V)	40 / 30		
	I _C (mA)	100 / -100		
	Package	ES6		
Polarity		NPNx2	PNPx2	NPN+PNP
Internal Resistors (Kohm)				
R1 (k Ω)	R2 (k Ω)	Parallel Point Symmetry		
2.2	∞	RN1970HFE	RN2970HFE	RN4990HFE
10	∞	RN1971HFE	RN2971HFE	RN4991HFE
22	∞	RN1972HFE	RN2972HFE	RN4992HFE

■ Multi-chip 5-pin packages

■ Multi-chip 6-pin packages

21

■ Small-Signal MOSFETs (S-MOS)

Standard Family 1-in-1 Type

Drive Voltage	Polarity	Package					Absolute Maximum Ratings			R _{DS(ON)} (Ω)		@V _{GS}	@I _D	V _{th} (V)		@V _{DS}	@I _D	t _{on} (ns)	t _{off} (ns)	@V _{GS}	@I _D
		ESM	TESM	SSM	USM	S-MINI	V _{DS} (V)	V _{GSS} (V)	I _D (mA)	Typ.	Max	(V)	(mA)	Min	Max	(V)	(mA)	Typ.	Typ.	(V)	(mA)
1.0V	Nch	—	—	2SK2825	2SK2824	2SK2823	20	10	100	10	40	1.5	10	0.5	1.0	1.5	0.1	350	200	1.5	10
2.5V	Nch	—	—	2SK1830	2SK1829	2SK1828	20	10	50	20	40	2.5	10	0.5	1.5	3	0.1	140	140	2.5	10
2.5V	Pch	—	—	2SJ347	2SJ346	2SJ345	-20	-7	-50	20	40	-2.5	-10	-0.5	-1.5	-3	-0.1	150	130	-2.5	-10
2.5V	Nch	SSM3K03FE	—	—	—	—	20	10	100	4	12	2.5	10	0.7	1.3	3	0.1	160	190	2.5	10
2.5V	Pch	SSM3J03FE*	—	—	—	—	-20	-7	-100	12	25	-2.5	-10	-0.7	-1.3	-3	-0.1	180	200	-2.5	-10
2.5V	Nch	—	—	2SK2035	2SK2034	2SK2033	20	10	100	8	12	2.5	10	0.5	1.5	3	0.1	160	150	2.5	10
2.5V	Nch	—	—	—	2SK2037	2SK2036	20	10	100	3.5	6	2.5	10	0.5	1.5	3	0.1	280	340	2.5	10
2.5V	Nch	—	—	—	SSM3K05FU	—	20	±12	400	0.85	1.2	2.5	200	0.6	1.1	3	0.1	60	70	2.5	100
2.5V	Pch	—	—	—	SSM3J05FU	—	-20	±12	-200	3.2	4	-2.5	-50	-0.6	-1.1	-3	-0.1	70	70	-2.5	-50
2.5V	Nch	—	—	—	—	2SK2009	30	±20	200	1.2	2	2.5	50	0.5	1.5	3	0.1	60	120	2.5	10
2.5V	Pch	—	—	—	—	2SJ305	-30	±20	-200	2.4	4	-2.5	-50	-0.5	-1.5	-3	-0.1	60	150	-2.5	-10
4V	Nch	—	—	—	2SK1827	2SK1826	50	10	50	20	50	4	10	0.8	2.5	5	0.1	110	150	4	10
4V	Pch	—	—	—	2SJ344	2SJ343	-50	-7	-50	20	50	-4	-10	-0.8	-2.5	-5	-0.1	150	130	-4	-10
10V	Nch	—	—	—	—	2SK1062	60	±20	200	0.6	1	10	50	2	3.5	10	1	14	75	10	100
10V	Pch	—	—	—	—	2SJ168	-60	±20	-200	1.3	2	-10	-50	-2	-3.5	-10	-1	14	100	-10	-
1.5V	Nch	—	SSM3K15TE	SSM3K15FS	SSM3K15FU	SSM3K15F	30		100	7		2.5		0.8	1.5						
1.0V	Nch	—	SSM3K16TE	SSM3K16FS	SSM3K16FU	—	20		100	5		2.5		0.6	1.1						
	Nch	—	—	—	SSM3K17FU	—	50		200	40		2.5									
	Nch	—	—	—	SSM3K7002FU	—	60		200	3.3											
1.5V	Pch	—	SSM3J15TE	SSM3J15FS	SSM3J15FU	—	-30		-100	32		-2.5		-1.1	-1.7						
1.0V	Pch	—	SSM3J16TE	SSM3J16FS	SSM3J16FU	—	-20		-100	45		-1.5		-0.6	-1.1						

*: under development

Standard Family 2-in-1 Type

Polarity	Maximum Rating			Packages				Internal Components (FET)	V_{th} (V)	R_{on} (Ω)	Typ. (Max) @ V_{GS} (V)
	V_{DSS} (V)	V_{GSS} (V)	I_D (mA)	ESV	USV	ES6	US6				
Nch x 2	20	10	50				HN1K02FU	2SK1829 x 2	0.5 ~ 1.5	20 (40)	2.5
Pch x 2	-20	-7	-50				HN1J02FU	2SJ346 x 2	-0.5 ~ -1.5	20 (40)	-2.5
Nch x 2	20	10	100		HN4K03JU		HN1K03FU	2SK2034 x 2	0.5 ~ 1.5	8 (12)	2.5
Nch + Pch	20	10	50				HN1L02FU	2SK1829 + 2SJ346	0.5 ~ 1.5	20 (40)	2.5
	-20	-7	-50						-0.5 ~ -1.5	20 (40)	-2.5
Nch + Pch	50	10	50				HN1L03FU	2SK1827 + 2SJ346	0.8 ~ 2.5	20 (50)	4
	-20	-7	-50						-0.5 ~ -1.5	20 (40)	-2.5
Nch x 2	50	10	50				HN1K04FU	2SK1827 x 2	0.8 ~ 2.5	20 (50)	4
Nch x 2	20	10	100				HN1K05FU	2SK2824 x 2	0.5 ~ 1.0	10 (40)	1.5
Nch x 2	20	10	100				HN1K06FU	2SK2037 x 2	0.5 ~ 1.5	3.5 (6)	2.5
Nch x 2	20	± 12	400		SSM5N05FU		SSM6N05FU	SSM3K05FU x 2	0.6 ~ 1.1	0.85 (1.2)	2.5
Pch x 2	-20	± 12	-200		SSM5P05FU		SSM6P05FU	SSM3J05FU x 2	-0.6 ~ -1.1	3.2 (4)	-2.5
Nch + Pch	20	± 12	400				SSM6L05FU	SSM3K05FU + SSM3J05FU	0.6 ~ 1.1	0.85 (1.2)	2.5
	-20	± 12	-200						-0.6 ~ -1.1	3.2 (4)	-2.5
* Nch x 2	20	10	100				SSM6N04FU	SSM3K04FU x 2	0.5 ~ 1.5	4 (12)	2.5
Nch x 2	30	± 20	400				SSM6N09FU	SSM3K09FU x 2	1.1 ~ 1.8	0.8 (1.2)	4
Pch x 2	-30	± 20	-200				SSM6P09FU	SSM3J09FU x 2	-1.1 ~ -1.8	3.3 (4.2)	-4
Nch + Pch	30	± 20	400				SSM6L09FU	SSM3K09FU + SSM3J09FU	1.1 ~ 1.8	0.8 (1.2)	4
	-30	± 20	-200						-1.1 ~ -1.8	3.3 (4.2)	-4
Nch	30		100	SSM5N15FE	SSM5N15FU	SSM6N15FE	SSM6N15FU	SSM3K15FUx2	0.8 ~ 1.5	7.0	2.5
	20	± 10	100	SSM5N16FE	SSM5N16FU	SSM6N16FE	SSM6N16FU	SSM3K16FUx2	0.6 ~ 1.1	15.0	1.5
Nch	50		100				SSM6N17FU	SSM3K17FUx2		40.0	2.5
	60		200				SSM6N7002FU	SSM3K17FUx3		3.3	4.5
Pch	-30		-100	SSM5P15FE	SSM5P15FU	SSM6P15FE	SSM6P15FU	SSM3J15FUx2		32.0	-2.5
	-20		-100	SSM5P16FE	SSM5P16FU	SSM6P16FE	SSM6P16FU	SSM3J16FUx2		45.0	-1.5
Nch+Pch	20/-20		100/-100			SSM6L16FE		SSM3K16FU+SSM3J16FU	0.8 ~ 1.5	15.0/45.0	± 1.5

 New products *Built-in pull-down resistor $R_{GS} = 1M\Omega$

Small Signal Transistors

S-MOS + SBD Combination

Suitable for under 3W class DC-DC Converter

Content	Part No.	Package	MOS FET				SBD		
			V_{ds} (V)	I_D (A)	RDS(ON)Max (Ohm)		V_R (V)	VF Max. (V)	
Pch MOS +SBD	SSM5G01TU	UFV	-30	-1	0.8	-4	20	0.45	0.3
	SSM5G02TU		-12	-1	0.48	-1.8	12	0.43	0.5
	SSM5G04TU		-12	-1	0.4	-2.5	12	0.43	0.5
	SSM5G06FE	ESV	-20	-0.1	45	-1.5	15	0.3	5m
Nch MOS + SBD	SSM5H01TU	UFV	30	1.4	0.45	4	20	0.45	0.3
	SSM5H03TU		12	1.4	0.3	4	12	0.43	0.5
	SSM5H06FE	ESV	20	0.1	15	1.5	15	0.3	5m

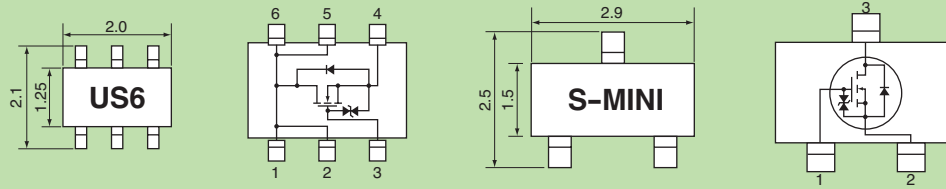
S-MOS

High-Current Family

Drive Voltage	Polarity	Packages				Maximum Ratings			R _{DS(ON)} (mΩ)			V _{th} (V)				ton (ns)	toff (ns)		
		US6	S-MINI	TSM	UF6	V _{DS} (V)	V _{GSS} (V)	I _D (A)			@V _{GS} (V)	Min	Max	@V _{DS} (V)	@I _D (mA)	Typ.	Typ.	@V _{GS} (V)	@I _D (A)
									Typ.	Max									
2.5 V	Nch	—	SSM3K01F	—	—	30	± 10	1.3	115	150	2.5	0.6	1.1	3	0.1	45	69	2.5	0.5
									85	120	4								
2.5 V	Nch	—	SSM3K02F	—	—	30	± 10	1	180	250	2.5	0.6	1.1	3	0.1	52	80	2.5	0.5
									140	200	4								
2.5 V	Nch	SSM6K06FU	—	—	—	20	± 12	1.1	160	210	2.5	0.6	1.1	3	0.1	42	100	2.5	0.5
									120	160	4								
2.5 V	Nch	SSM6K08FU	—	—	—	20	± 12	1.6	100	140	2.5	0.5	1.2	3	0.1	16	15	2.5	0.8
									77	105	4								
2.5 V	Pch	SSM6J08FU	—	—	—	−20	± 12	−1.3	200	260	−2.5	−0.5	−1.1	−3	−0.1	33	47	−2.5	−0.65
									140	180	−4								
2.5 V	Pch	—	SSM3J01F	—	—	−30	± 10	−0.7	400	600	−2.5	−0.6	−1.1	−3	−0.1	36	37	−2.5	−0.3
									300	400	−4								
2.5 V	Pch	—	SSM3J02F	—	—	−30	± 10	−0.6	550	700	−2.5	−0.6	−1.1	−3	−0.1	55	52	−2.5	−0.3
									400	500	−4								
2.5 V	Pch	SSM6J06FU	—	—	—	−20	± 12	−0.65	550	700	−2.5	−0.6	−1.1	−3	−0.1	27	43	−2.5	−0.3
									400	500	−4								
4 V	Nch	SSM6K07FU	—	—	—	30	± 20	1.5	170	220	4	1.1	1.8	5	0.1	46	65	4	0.75
									105	130	10								
4 V	Pch	SSM6J07FU	—	—	—	−30	± 20	−0.8	570	800	−4	−1.1	−1.8	−5	−0.1	28	38	−4	−0.4
									350	450	−10								
2.5 V	Nch	—	—	SSM3K12T SSM3K14T	—	30 30			3.0 4.0	145 60	4.5 4.5	1.1 1.0	1.8 2.5						
1.0 V	Nch	—	—	—	SSM6K18TU	20			4.4	54	2.5	0.5	1.1						
1.0 V	Pch	—	—	SSM3J13T SSM3J14T	—	−12 −30			−3.0 −2.6	70 145	−4 −4.5	−0.45 −0.45	−1.1 −1.1						

 New products

Package and internal connections

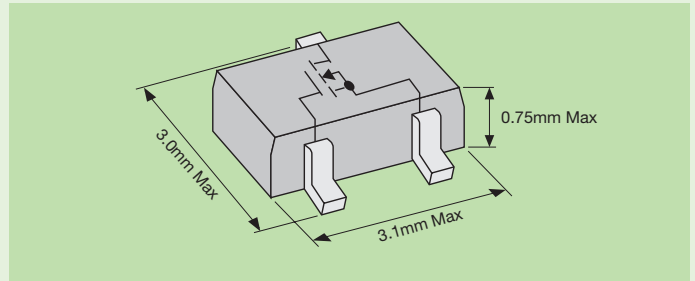


High-Current Family (TSM Package)

Packages	Polarity	V _{DSS} (V)	I _D (A)	V _{th} (V)	R _{DS(ON)} (Ω)	Max @V _{GS} (V)
SSM3K01T	Nch	30	3.2	0.6 ~ 1.1	0.15	2.5
SSM3J01T	Pch	-30	-1.7	-0.6 ~ -1.1	0.6	-2.5
SSM3K12T	Nch	30	3	1.1 ~ 1.8	0.145	4.5
SSM3J13T	Pch	-12	-3	-0.45 ~ -1.1	0.095	-2.5
SSM3K14T	Nch	30	4	1.0 ~ 2.5	0.057	4.5
SSM3J14T	Pch	-30	-2.7	-0.8 ~ -2.0	0.145	-4.5

■ New products

■ The electrical characteristics quoted for products which are underdevelopment are only intended as approximate target values. The actual specifications may change without notice.



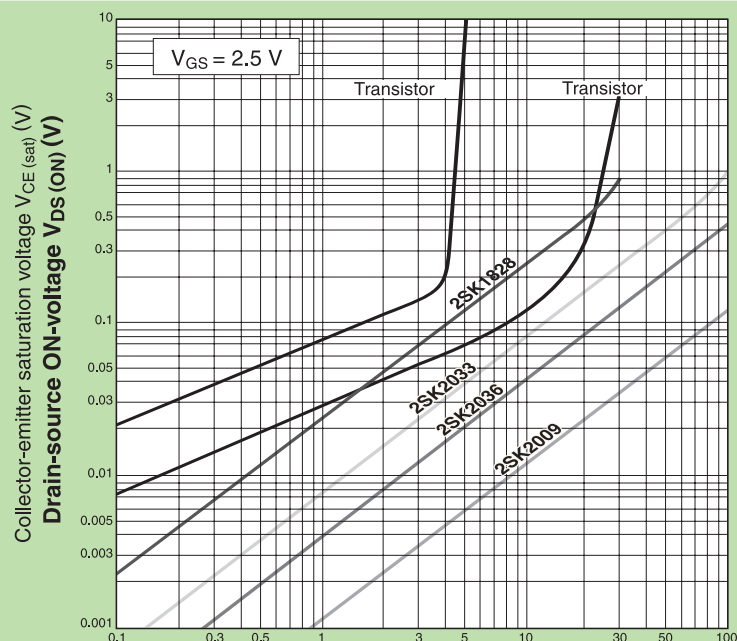
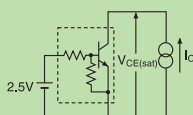
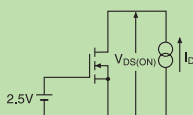
Product lines and list of characteristics for S-MOS with built-in pull-down resistor (Single Type)

Drive Voltage	Polar- ity	Package				Absolute Maximum Ratings			R _{DS(ON)} (Ω)		@V _{GS}		@I _D		V _{th} (V)		@V _{DS}		@I _D		t _{on} (ns)		t _{off} (ns)		@V _{GS}		@I _D		R _{GS} (MΩ)		
		ESM	SSM	USM	VSEM	V _{DS} (V)	V _{GSS} (V)	I _D (mA)	Typ.	Max	(V)	(mA)	Min	Max	(V)	(mA)	Typ.	Typ.	(V)	(mA)	Min	Typ.	Max								
2.5V	Nch	SSM3K04FE	SSM3K04FS	SSM3K04FU		20	10	100	4	12	2.5	10	0.7	1.3	3	0.1	160	190	2.5	10	0.7	1	1.3								
	Nch)				SSM3K15FV	30		100	2.4		2.5																				

Product lines and list of characteristics for S-MOS with built-in pull-down resistor (Dual Type)

Product No.	Internal FET		Polarity	Drive Voltage	Absolute Maximum Ratings		$R_{DS(ON)}$ (Ω)	@ V_{GS} (V)	Internal Connections
					V_{DS} (V)	I_D (mA)	Typ.		
SSM6N04FU	Q1	SSM3K04FU	Nch	2.5 V	20	100	4	2.5	Q1  Q2 
	Q2	SSM3K04FU	Nch						

Comparison with Built-in Resistor Bipolar Transistors



Small Signal Transistors

Junction FETs (J-FETs)

Polarity	S-MINI (SC-59)	USM (SC-70)	SMV (SC-74A)	USV	V _{GDS} (V)	I _G (mA)	P _D (mW)	I _{DSS} (mA)	V _{DS} (V)	V _{GS} (V)	Y _{fs} (mS)	V _{DS} (V)	V _{GS} (V)	C _{rss} (pF) (Typ.)	V _{DG} (V)	f (MHz)	Marking
Nch	2SK208	2SK879	—	—	− 50	10	100	0.3 ~ 6.5	10	0	1.2 (min)	10	0	2.6	10	1	J□
Pch	2SJ106	2SJ144	—	—	50	− 10	100	− 1.2 ~ − 14	− 10	0	1 (min)	− 10	0	3.6	− 10	1	V□
Nch	2SK209	2SK880	2SK2145	2SK3320	− 50	10	100	1.2 ~ 14	10	0	15 (typ.)	10	0	3	10	1	X□
Nch	2SK368	—	—	—	− 100	10	100	0.6 ~ 6.5	10	0	4.6 (typ.)	10	0	3	10	1	KA□

Alphabetic characters of marking prefix indicates I_{DSS} rank.

BC Series

Type No.		V _{CBO}	I _C	P _C	h _{FE}			V _{ce(sat)} MAX			f _T Typ	NF MAX		Package
NPN	PNP	(V)	(mA)	(mW)	V _{CE} (V)	I _C (mA)		(V)	I _C (mA)	I _B (mA)	(MIN) (MHz)	(dB)	f (Hz)	
BC337	BC327	45	500	625	100~400*	1	100	0.70	500	50	100	−	−	TO-92
BC338	BC328	25	500	625	100~400*	1	100	0.70	500	50	100	−	−	TO-92
BC546	−	65	100	500	110~800**	5	2	0.60	100	5	300	10	1K	TO-92
BC547	−	45	100	500	110~800**	5	2	0.60	100	5	300	10	1K	TO-92
BC548	−	30	100	500	110~800**	5	2	0.60	100	5	300	10	1K	TO-92
BC549	−	30	100	500	200~800**	5	2	0.60	100	5	300	4	1K	TO-92
BC550	−	45	100	500	200~800**	5	2	0.60	100	5	300	4	1K	TO-92
−	BC556	65	100	500	75~475***	5	2	0.65	100	5	300	10	1K	TO-92
−	BC557	45	100	500	75~475***	5	2	0.65	100	5	300	10	1K	TO-92
−	BC558	30	100	500	75~475***	5	2	0.65	100	5	300	10	1K	TO-92
−	BC559	30	100	500	125~475***	5	2	0.65	100	5	300	4	1K	TO-92
−	BC560	45	100	500	125~475***	5	2	0.65	100	5	300	4	1K	TO-92

* −16: 100~250; −25: 160~400; −40: 250~600

** A: 110~220; B: 200~450; C: 420~800

*** No Classification: 75~250; A: 125~250; B: 220~475

BF Series

BF420	BF421	300	50	830	40 min	20	25	−	−	−	(60)	−	−	TO-92
BF422	BF423	250	50	830	50 min	20	25	−	−	−	(60)	−	−	TO-92

Taping: TPE2; 3000 Pcs/AMMO PACK

TBC Series

Type No.		V _{CEO} (V _{CE} S)	I _C	P _C	h _{FE}			V _{ce(sat)} MAX			f _T Typ (Min.)			Package
NPN	PNP	(V)	(mA)	(mW)	V _{CE} (V)	I _C (mA)		(V)	I _C (mA)	I _B (mA)	(MHz)	V _{CE} (V)	I _C (mA)	
TBC846	−	65	100	150	110~800*	5	2	0.60	100	5	300	5	10	SOT23
TBC847	−	45	100	150	110~800*	5	2	0.60	100	5	300	5	10	SOT23
TBC848	−	30	100	150	110~800*	5	2	0.60	100	5	300	5	10	SOT23
TBC849	−	30	100	150	200~800*	5	2	0.60	100	5	300	5	10	SOT23
−	TBC856	65	100	150	75~475*	5	2	0.65	100	5	300	5	10	SOT23
−	TBC857	45	100	150	75~475*	5	2	0.65	100	5	300	5	10	SOT23
−	TBC858	30	100	150	75~475*	5	2	0.65	100	5	300	5	10	SOT23
−	TBC859	30	100	150	125~475*	5	2	0.65	100	5	300	5	10	SOT23
2SC2712	2SA1162	50	150	150	70~700/4**	6	2	0.25/0.3	100	10	80	10	1	SOT23

O: 70~140

Y: 120~240

GR: 200~400

BL: 350~700

*A: 110~220

B: 200~450

C: 420~800

Taping: TE85L 3000 pcs/reel

■ Surface Mount Products

Type No.		Ic	VCE0	Pc	Pc*	h _{FE}			VCE(sat)			f _T			Marking	Package
NPN	PNP					VCE	Ic		V	Ic	Ib	(MHz)	Vce	Ic		
(A)	(V)	(W)	(W)	(V)	(mA)	(V)	(mA)		(V)	(A)	(mA)		(V)	(mA)	NPN/PNP	
2SC2880	2SA1200	0.05	120	0.5	0.8	70~240	5	10	0.5	10m	1	120	30	10	B/A	SOT89
2SC3515	2SA1384	0.1	300	0.5	1	30~150 ¹	10	20	0.5	20m	2	60	10	20	J/I	SOT89
2SC2882	2SA1202	0.4	90	0.5	1	70~240 ²	2	50	0.4	0.2	20	100/120	10	10	F/E	SOT89
2SC2881	2SA1201	0.8	120	0.5	1	80~220 ³	5	100	1.0	0.5	50	120	5	100	D/C	SOT89
2SC2883	2SA1203	1.5	30	0.5	1	100~320 ⁴	2	500	2.0	1.5	30	120	2	500	G/H	SOT89

2SC3803	2SA1483	0.2	45	0.5	1	40~240 ⁵	1	10	0.3	0.1	10	200	10	10	V/W	SOT89
2SC2884	2SA1204	0.8	30	0.5	1	100~320 ⁴	1	100	0.5/0.7	0.5	20	120	5	10	P/R	SOT89
2SC4540	2SA1735	1.0	50	0.5	1	120~400	2	100	0.5	0.5	25	100	2	100	KC/LC	SOT89
2SC4539	2SA1734	1.2	30	0.5	1	120~400	2	100	0.5	0.7	35	100	2	100	KB/LB	SOT89
2SC2982	2SA1314	2.0	10	0.5	1	⁶ ⁷	1	500	0.5	2.0	50	150	12	500	S/T	SOT89
2SC4409	2SA1681	2.0	50	0.5	1	120~400	2	100	0.5	1.0	50	100	2	100	KA/LA	SOT89
2SC2873	2SA1213	2.0	50	0.5	1	70~240 ²	2	500	0.5	1.0	50	120	2	500	M/N	SOT89
2SC4541	2SA1736	3.0	50	0.5	1	120~400	2	100	0.5	1.5	75	100	2	100	KD/LD	SOT89

2SD1784		1-5	30	0.5	1	4000/MIN	2	150	1.5	10	1	–	–	–	XN	SOT89
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Type No.	VCE0	Ic	Pc	h _{FE}			f _T	Typ.		NF			Typ.	Marking	Package
				VCE	Ic			VCE	Ic	(dB)	Vce	Ic	f		
(V)	(mA)	(W)	(V)	(mA)	(MHz)	(V)	(mA)	(V)	(mA)		(V)	(mA)	(MHz)		
2SC3268	12	70	0.8	25 MIN.	10	20	5000	10	20	2.0	10	5	1000	ME	SOT89
2SC3607	12	80	0.8	30~250	10	20	7000	10	20	1.1	10	5	1000	MH	SOT89
2SC4318	10	65	0.8	30~200	8	20	9000	8	20	1.7	8	5	2000	MN	SOT89

hfe Note: ¹ R: 30~ 90 O: 50~150

² O: 70~140 Y: 120~140

³ O: 80~160 Y: 120~240

⁴ O: 100~200 Y: 160~320

⁵ R: 40~ 80 O: 70~140

⁶ A: 140~240 B: 200~330

⁷ A: 140~280 B: 200~400

Y: 120~240

C: 300~450

C: 300~600

D: 420~600

Taping: TE12L 1000 pcs/Reel

RF-Transistors

Appli- cation	Product No.	Maximum Ratings			Electrical Characteristics													Package Type
		V _{CE}	I _C	P _C	C _{ob}	C _{re}	f _T (Typ.)			S ₂₁ ² (Typ.)				NF (Typ.)				
		(V)	(mA)	(mW)	(pF)	(pF)	(GHz)	V _{CE} (V)	I _C (mA)	(dB)	V _{CE} (V)	I _C (mA)	f (GHz)	(dB)	V _{CE} (V)	I _C (mA)	f (GHz)	
VHF to UHF AMP	2SA1161	−8	−30	200	0.95	0.75	3.5	−5	−10	8.0	−5	−10	1	3.5	−5	−3	1	TO-92
	2SC2498	20	50	300	1.15	0.75	3.5	10	10	14.5	10	10	0.5	2.5	10	5	0.5	TO-92
	2SC2644	12	120	500	1.6	1.1	4	10	30	14.0	10	30	0.5	2.3	10	10	0.5	TO-92
	2SC2753	12	70	300	1.1	0.65	5	10	20	10.5	10	20	1	1.7	10	5	1	TO-92
	2SC3011	7	30	150	0.7	0.5	6.5	5	10	12	5	10	1	2.3	5	5	1	S-MINI
	2SC3098	20	50	150	1.15	0.75	3.5	10	10	14.5	10	10	0.5	2.5	10	5	0.5	S-MINI
	2SC3099	20	30	150	0.9	0.6	4	10	10	15.0	10	10	0.5	1.7	10	3	0.5	S-MINI
	2SC3268	12	70	☆800	1.05	0.7	5	10	20	9.5	10	20	1	2	10	5	1	PW-MINI
	2SC3429	12	70	150	0.85	0.57	5	10	20	10.5	10	20	1	1.7	5	1		S-MINI
	2SC3605	12	80	600	1.2	0.75	6.5	10	20	10	10	20	1	1.1	10	5	1	TO-92
	2SC3607	12	80	☆800	1.15	0.8	6.5	10	20	9.5	10	20	1	1.1	10	5	1	PW-MINI
	2SC4318	10	40	800	0.75	0.55	9	8	20	5.5	8	20	2	1.7	8	5	2	PW-MINI
	2SC4392	7	30	100	0.7	0.5	6.5	5	10	12	5	10	1	2.3	5	5	1	USM
	2SC4393	12	70	100	0.85	0.57	5	10	20	10.5	10	20	1	1.7	5	5	1	USM
	2SC5064	12	30	150	0.7	0.45	7	5	10	12	5	10	1	1.1	5	3	1	S-MINI
	2SC5065	12	30	100	0.7	0.45	7	5	10	12	5	10	1	1.1	5	3	1	USM
	2SC5066	12	30	100	0.7	0.45	7	5	10	12	5	10	1	1.1	5	3	1	SSM
	*2SC5066F	12	30	100	0.7	0.45	7	5	10	12	5	10	1	1.1	5	3	1	ESM
	2SC5084	12	80	150	1.0	0.65	7	10	20	11	10	20	1	1.1	10	5	1	SM
	2SC5085	12	80	100	1.0	0.65	7	10	20	11	10	20	1	1.1	10	5	1	USM
	2SC5086	12	80	100	1.0	0.65	7	10	20	11	10	20	1	1.1	10	5	1	SSM
	*2SC5086F	12	80	100	1.0	0.65	7	10	20	11	10	20	1	1.1	10	5	1	ESM
	2SC5087	12	80	150	1.1	0.65	7	10	20	13	10	20	1	1.1	10	5	1	SMQ
	2SC5088	12	80	100	1.1	0.65	7	10	20	13	10	20	1	1.1	10	5	1	USQ
	2SC5089	10	40	150	0.7	0.5	10	8	20	7	8	20	2	1.7	8	5	2	PW-MINI
	2SC5090	10	40	100	0.7	0.5	10	8	20	7	8	20	2	1.7	8	5	2	USM
	2SC5091	10	40	100	0.7	0.5	10	8	20	7	8	20	2	1.7	8	5	2	SSM
	*2SC5091F	10	40	100	0.7	0.5	10	8	20	7	8	20	2	1.7	8	5	2	ESM
	2SC5092	10	40	150	0.5	0.35	10	8	20	10	8	20	2	1.8	8	5	2	SMQ
	2SC5093	10	40	100	0.65	0.45	10	8	20	9.5	8	20	2	1.8	8	5	2	USQ
	2SC5094	10	15	150	0.5	0.4	10	6	7	7.5	6	7	2	1.8	6	3	2	S-MINI
	2SC5095	10	15	100	0.5	0.4	10	6	7	7.5	6	7	2	1.8	6	3	2	USM
	2SC5096	10	15	100	0.5	0.4	10	6	7	7.5	6	7	2	1.8	6	3	2	SSM
	*2SC5096F	10	15	100	0.5	0.4	10	6	7	7.5	6	7	2	1.8	6	3	2	ESM
	2SC5097	10	15	150	0.5	0.35	10	6	7	10	6	7	2	1.8	6	3	2	SMQ
	2SC5098	10	15	100	0.5	0.34	10	6	7	10	6	7	2	1.8	6	3	2	USQ
	*2SC5254	7	40	150	0.65	0.5	12	5	20	8.5	5	20	2	1.5	5	5	2	S-MINI
	*2SC5255	7	40	100	0.5	0.35	12	5	20	8.5	5	20	2	1.5	5	5	2	USM
	*2SC5256	7	40	100	0.65	0.5	12	5	20	8.5	5	20	2	1.5	5	5	2	SSM
	*2SC5256F	7	40	100	0.65	0.5	12	5	20	8.5	5	20	2	1.5	5	5	2	ESM
*2SC5257	7	40	150	0.65	0.45	12	5	20	10	5	20	2	1.5	5	5	2	SMQ	
*2SC5258	7	40	100	0.65	0.45	12	5	20	10	5	20	2	1.5	5	5	2	USQ	
*2SC5259	7	15	150	0.4	0.3	12	5	7	8.5	5	7	2	1.8	5	3	2	S-MINI	
*2SC5260	7	15	100	0.4	0.3	12	5	7	8.5	5	7	2	1.8	5	3	2	USM	
*2SC5261	7	15	100	0.4	0.3	12	5	7	8.5	5	7	2	1.8	5	3	2	SSM	
*2SC5261F	7	15	100	0.4	0.3	12	5	7	8.5	5	7	2	1.8	5	3	2	ESM	
*2SC5262	7	15	150	0.45	0.35	12	5	7	11	5	7	2	17	5	3	2	SMQ	
*2SC5263	7	15	100	0.45	0.35	12	5	7	11	5	7	2	1.7	5	3	2	USQ	
2SC5313	12	80	100	1.0	0.65	7	10	20	11	10	20	1	1.1	10	5	1	SSM	
*2SC5315	5	20	150	0.6	0.45	15	3	15	9	3	15	2	1.3	3	5	2	S-MINI	

* New

Small Signal Transistors

RF-Transistors

Appli- cation	Product No.	Maximum Ratings			Electrical Characteristics													Package Type
		V _{CE}	I _C	P _C	C _{ob}	C _{re}	f _r (Typ.)			S _{21e} ² (Typ.)				NF (Typ.)				
		(V)	(mA)	(mW)	(pF)	(pF)	(GHz)	V _{CE} (V)	I _C (mA)	(dB)	V _{CE} (V)	I _C (mA)	f (GHz)	(dB)	V _{CE} (V)	I _C (mA)	f (GHz)	
VHF to UHF OSC	2SC3547A	12	30	150	1.05	—	4	10	10	—	—	—	—	—	—	—	—	S-MINI
	2SC3547B	12	30	150	1.05	—	4	10	10	—	—	—	—	—	—	—	—	S-MINI
	2SC4247	12	30	100	1.05	—	4	10	10	—	—	—	—	—	—	—	—	USM
	2SC4248	12	30	100	1.05	—	4	10	10	—	—	—	—	—	—	—	—	USM
	2SC5106	10	30	150	0.7	0.5	6	5	5	11	5	5	1	—	—	—	—	S-MINI
	2SC5107	10	30	100	0.7	0.5	6	5	5	11	5	5	1	—	—	—	—	USM
	2SC5108	10	30	100	0.7	0.5	6	5	5	11	5	5	1	—	—	—	—	SSM
	*2SC5108F	10	30	100	0.7	0.5	6	5	5	11	5	5	1	—	—	—	—	ESM
	2SC5109	10	60	150	0.9	0.7	5	5	5	10	5	5	1	—	—	—	—	S-MINI
	2SC5110	10	60	100	0.9	0.7	5	5	5	10	5	5	1	—	—	—	—	USM
	2SC5111	10	60	100	0.9	0.7	5	5	5	10	5	5	1	—	—	—	—	SSM
	*2SC5111F	10	60	100	0.9	0.7	5	5	5	10	5	5	1	—	—	—	—	ESM
VHF to UHF AMP	2SC5316	5	20	100	0.6	0.45	15	3	15	9	3	15	2	1.3	3	5	2	USM
	*2SC5317	5	20	100	0.6	0.45	15	3	15	9	3	15	2	1.3	3	5	2	SSM
	*2SC5317F	5	20	100	0.6	0.45	15	3	15	9	3	15	2	1.3	3	5	2	ESM
	*2SC5318	5	20	150	0.6	0.4	15	3	15	11.5	3	15	2	1.3	3	5	2	SMQ
	*2SC5319	5	20	100	0.6	0.4	15	3	15	11.5	3	15	2	1.3	3	5	2	USQ
	2SC5320	5	10	150	0.4	0.3	15	3	7	9.5	3	7	2	1.4	3	3	2	S-MINI
	2SC5321	5	10	100	0.4	0.3	15	3	7	9.5	3	7	2	1.4	3	3	2	USM
	*2SC5322	5	10	100	0.4	0.3	15	3	7	9.5	3	7	2	1.4	3	3	2	SSM
	*2SC5322F	5	10	100	0.4	0.3	15	3	7	9.5	3	7	2	1.4	3	3	2	ESM
	2SC5323	5	10	150	0.4	0.25	15	3	7	12	3	7	2	1.4	3	3	2	SMQ
	*2SC5324	5	10	100	0.4	0.25	15	3	7	12	3	7	2	1.4	3	3	2	USQ

* New

Microwave Transistor Product Line up Single Type

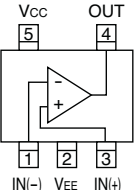
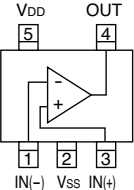
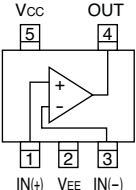
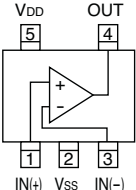
ft	Gain 8DB)	LF Noise(dB)	TESM	fSM	USM	SSM	SMQ	USQ	TESQ
5 GHz	11,5	1,4	MT3S05T						
	13,5	1,4	MT3S08T	MT3S08FS					
7 GHz	12,5	1,2	MT3S04AT	MT3S04FS	MT3S04AU	MT3S04AS	MT3S04A	MT3S04AU	
10 GHz	8	1,4	MT3S03AT	MT3S03FS		MT3S03AT	MT3S03A	MT3S03AU	
	9,5	1,6	MT3S06T		MT3S06U		MT4S06	MT4S06U	
12 GHz	9,5	1,5	MT3S07T	MT3S07FS	MT3S07U	MT3S07S			
13,0 GHz	9,1	1,2	MT3S41T	MT3S41FS					
	11	1,2	MT3S38T						
16 GHz	11,5	1,2	MT3S46T						
17 GHz	12	1,2	MT3S37T	MT3S37FS					
	12,5	1,3	MT3S36T	MT3S36FS					
	16,5	1,3	MT3S38T	MT3S38FS					
	9,9	1,2	MT3S40T	MT3S40FS					
18 GHz	12	1,1	MT3S45T	MT3S45FS					
	17,5	1,3	MT3S36T	MT3S36FS					
	17	1,2	MT3S37T	MT3S37FS					
20 GHz	12	1,4	MT3S35T	MT3S35FS					
22 GHz	16	0,72						MT4S100U	MT4S100T
23 GHz	17	0,8						MT4S101U	MT4S101T

Op Amp Comparator ICs

Single type 2125 size USV packages are added to the product line-up.

Dual 2.0 mm x 2.3 mm size US8 packages are added to the product line-up.

Single Circuit: SMV (F type), USV (FU type), ESV (FE-type)

Function	Bipolar Comparators	CMOS Comparators				Bipolar Op Amps		CMOS Op Amps			
Product No.	TA75S393F	TC75S56F TC75S56FU TC75S56FE	TC75S57F TC75S57FU TC75S57FE	TC75S58F TC75S58FU TC75S58FE	TC75S59F TC75S59FU TC75S59FE	TA75S01F	TA75S558F	TC75S51F TC75S51FU TC75S51FE	TC75S54F TC75S54FU TC75S54FE	TC75S55F TC75S55FU TC75S55FE	TC75S60F TC75S60FU
Features	Single/dual power supply, open collector output	Single/dual power supply, push-pull output, super-low current consumption	Single/dual power supply, push-pull output, low current consumption	Single/dual power supply, open drain output, super-low current consumption	Single/dual power supply, open drain output, low current consumption	Single/dual power supply, unity gain capability	Dual power supply	Single/dual power supply, low-voltage operations, wide dynamic range	Single/dual power supply, low-voltage operations, super-low current consumption, wide dynamic range	Single/dual power supply, low-voltage operations, super-low current consumption, wide dynamic range	Single/dual power supply, high slew rate, high fT, low-voltage operation, low current consumption
Output Circuit	open collect	push-pull		open drain							
Operating voltage	2 to 36 V or ±1 to ±18 V	1.8 to 7 V or ±0.9 to ±3.5 V				3 to 12 V or ±1.5 to ±6 V	±4 to 18 V	1.5 to 7 V or ±0.75 to ±3.5 V	1.8 to 7 V or ±0.9 to ±3.5 V		
Equivalent products	TA75393 (LM393) (LM2903)	—	—	—	—	TA75358C (LM358) (LM2804)	TA75558 (4558)	—	—	—	—
Pin layout (TOP VIEW)											

Note : The layout of input pins for the SMV op amp and the comparator IC are different. The pin layout of the op amp and comparator IC are the same as that of the SM8 type.

Dual Circuit: SM8 (FU type), US8 (FK type), ESV (FE-type)

Function	Bipolar Comparators	CMOS Comparators				Bipolar Op Amps		CMOS Op Amps			
Product No.	TA75W393FU	TC75W56FU TC75W56FK	TC75W57FU TC75W57FK	TC75W58FU TC75W58FK	TC75W59FU TC75W59FK	TA75W01FU	TA75W558FU	TC75W51FU TC75W51FK	TC75W54FU TC75W54FK	TC75W55FU TC75W55FK	TC75W60FU TC75W60FK
Features	Single/dual power supply, open collector output	Single/dual power supply, push-pull output, super-low current consumption	Single/dual power supply, push-pull output, low current consumption	Single/dual power supply, open drain output, super-low current consumption	Single/dual power supply, open drain output, low current consumption	Single/dual power supply, unity gain capability	Dual power supply	Single/dual power supply, low-voltage operations, wide dynamic range	Single/dual power supply, low-voltage operations, super-low current consumption, wide dynamic range	Single/dual power supply, low-voltage operations, super-low current consumption, wide dynamic range	Single/dual power supply, high slew rate, high fT, low-voltage operation, low current consumption
Operating voltage	2 to 36 V or ±1 to ±18 V	1.8 to 7 V or ±0.9 to ±3.5 V				3 to 12 V or ±1.5 to ±6 V	±4 to 18 V	1.5 to 7 V or ±0.75 to ±3.5 V	1.8 to 7 V or ±0.9 to ±3.5 V		
Equivalent products	TA75393 (LM393) (LM2903)	—	—	—	—	TA75358C (LM358) (LM2904)	TA75558 (4558)	—	—	—	—
Pin layout (TOP VIEW)											

Small Signal Transistors

■ RF Cell Pack for X'tal OSC

TA4014FT/FE & TA4015FT/FE

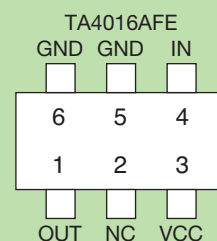
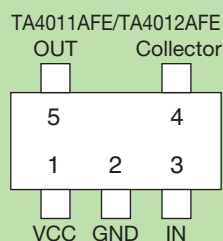
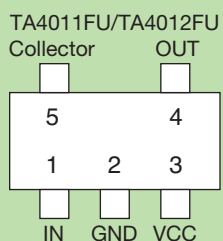
- Small Package
TU6, ES6 (Under Development)
- Use High fT Transistor (fT = 4.5GHz)
Quick start: Tstart = 1msec
Low Noise: CN 150dBc @ 10kHz
- Optimum Circuit
OSC Pushing (@Vcc Drift ± 5%): 0.1ppm
- Low Voltage Operation
Vcc = 2.5 ~ 3.5V

Part No.	Package	Application	Features
TA4014FT	TU6	X'tal OSC + Buffer (Cascode Amp)	Vout = 1.2Vpp, Tstart = 1msec Icc = 1.2mA (@3V)
TA4014FE	ES6		
TA4014FC	CS6		
TA4015FT	TU6		
TA4015FE	ES6		

■ RF Cellpack Amplifiers

Type	Part No.	Package	Application	Icc(mA)	Gain	LF Noise	Bandwidth
Silicon Cellpack	TA4011FE	ESV	UHF wide band amplifier	3.5	10 dB	6 dB	2.2 GHz
	TA4011FU	USV					
	TA4012F	SMV	UHF wide band amplifier	6.5	12 dB	5.5 dB	2.1 GHz
	TA4012FU	USV					
	TA4012AFE	USV	UHF wide band amplifier	10.5	14 dB	4.5 dB	1.7 GHz
	TA4013F	SMV					
	TA4013FU	USV	VHF LNA	19	12.5 dB	3 dB	1 GHz
	TA4017FT	CS6					
	TA4018F	SM8	VHF LNA with AGC	28	11 dB	11.5 dB	350 GHz
	TA4019F	SM8	UHF LNA	35	30 dB	8 dB	300 MHz
	TA4107F	SM8	UHF down converter	30		12 dB	1 GHz

■ Pin assignment (Top view)

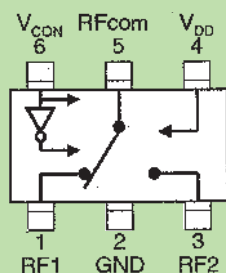


RF Switch

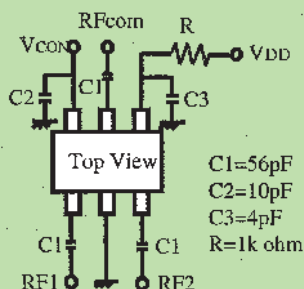
TG2211FT

Block Diagram

Inverter Type



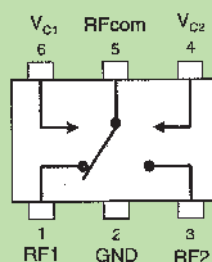
Test Circuit



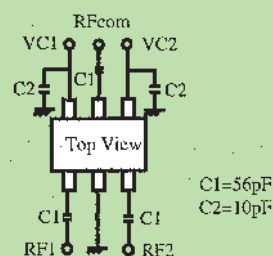
TG2216TU

Block Diagram

Dual control input type



Test Circuit



Cellpack for RF Switch

Type	Part No.	Package	Application	Features
GaAs Cellpack	TG2211FT	TU6	2.4GHz Antenna switch include inverter	Loss = 0.55dB, ISL=24dB, Pi1dB=22dBmW @2.5GHz
	TG2216TU	UF6	2.4GHz Antenna switch for medium power	Loss = 0.7dB, ISL=23dB, Pi1dB=28dBmW @2.5GHz

Bipolar RF Power Transistors

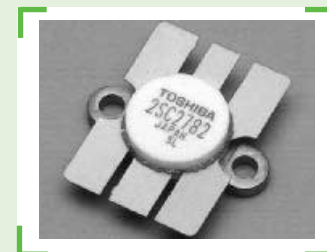
Product Number	Frequency [MHz]	Vcc [V]	Po [W]	Package Outline
2SC2290	28	12.5	60	2-13B1A
2SC2879	28	12.5	100	2-13B1A
2SC2510	28	28	150	2-13B1A
2SC2782	175	12.5	80	2-13C1A

Package Outline:

2-13B1A



2-13C1A



MOS FET RF Power Transistors

Product Number	Frequency [MHz]	Vdd [V]	Po [W]	Package Outline
2SK1310A	230	50	190	2-22C2A
2SK1739A	770	40	90	2-22C2A
2SK2854	849	6	0.2	PW-MINI
2SK2855	849	6	1.26	PW-MINI
2SK3074	520	9.6	0.63	PW-MINI
2SK3075	520	9.6	7	PW-X
2SK3475	520	7.2	0.63	PW-MINI
2SK3476	520	7.2	7	PW-X
2SK3077A	470	4.5	0.11	USQ
2SK3078A	470	4.5	0.63	PW-MINI
2SK3079A	470	4.5	2.2	PW-X

Package Outline:

2-22CA

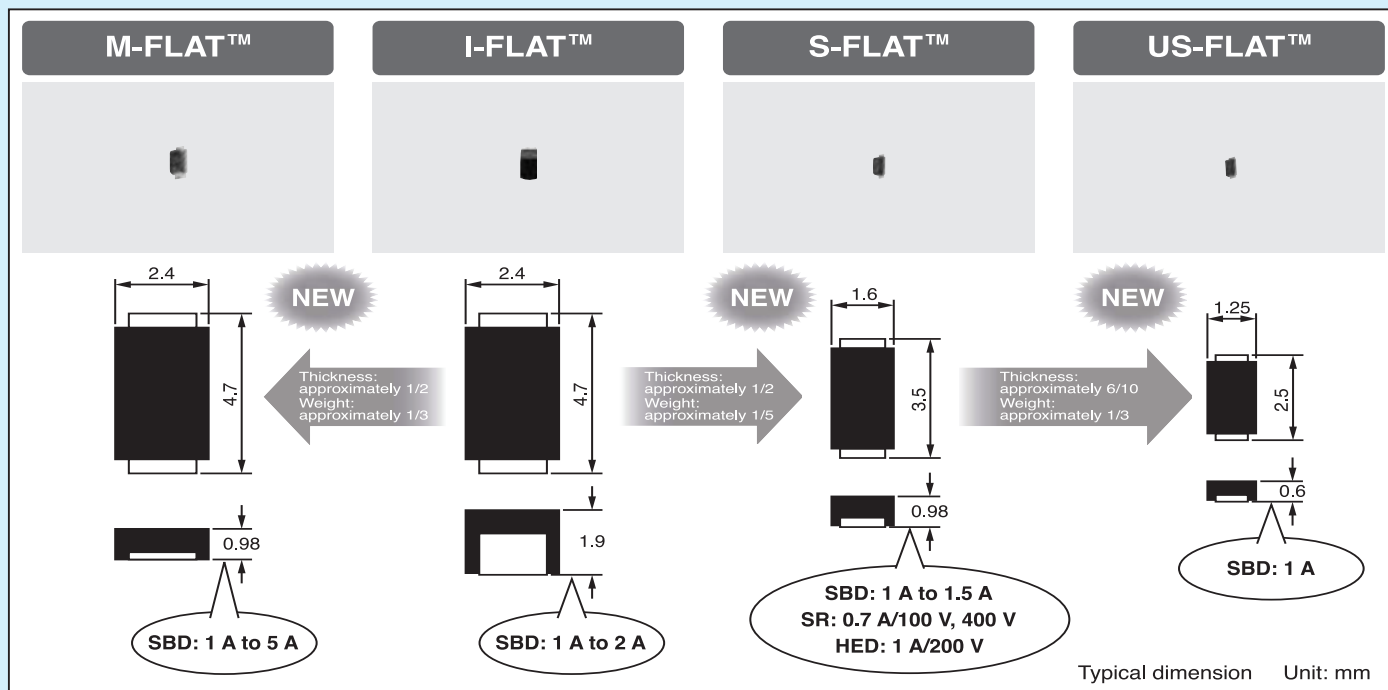




■ LINE UP for RF Power Modules

Product Number	Po [Wmin]	Eff(T) [%]	Frequency [MHz]	Vcc [V]	Pi [mW]	Package Outline
S-AV17	60	45	144 to 148	12.5	400	5-53L
S-AU27AL	32	35	400 to 430	12.5	200	5-53Q
S-AU27AM	32	35	450 to 490	12.5	200	5-53Q
S-AU27AH	32	35	490 to 512	12.5	200	5-53Q
S-AV6	28	45	154 to 162	12.5	200	5-53P
S-AV7	28	45	144 to 148	12.5	200	5-53P
S-AV10L	14	40	135 to 155	12.5	200	5-53P
S-AV10H	14	40	150 to 175	12.5	200	5-53P
S-AU57	7	40	430 to 450	9.6	20	5-23E
S-AU68L	7	35	400 to 420	9.6	20	5-23E
S-AU68M	7	40	450 to 470	9.6	20	5-23E
S-AU50L	12	40	400 to 430	9.6	50	5-23E
S-AU50M	12	40	430 to 480	9.6	50	5-23E
S-AU50H	6.5	40	470 to 520	9.6	50	5-23E
S-AV32	60		134 to 174	12.5		
S-AU82L	60		400 to 470	12.5		
S-AU82H	60		450 to 520	12.5		
S-AV33	32		134 to 174	12.5		
S-AU83L	32		400 to 470	12.5		
S-AU83H	32		450 to 520	12.5		
S-AV31	35		154 to 162	12.5		

Small Surface-Mount Rectifiers US-FLAT, S-FLAT and M-FLAT Series



Products being Developed for M-FLAT™ package

General-Purpose Diodes

Product Number	Maximum Ratings					Electrical Characteristics				Remarks
	I_F (AV) (A)	V_{RRM} (V)	I_{FSM} (A)	T_J (°C)	T_{stg} (°C)	V_{FM} (V)	I_{FM} (A)	I_{RRM} (μA)	V_{RRM} (V)	
CMC01	1	400	30	-40 to 150	-40 to 150	1	1	10	400	Strobe discharge circuit $I_{FRM} = 150$ A
CMG02	2	400	50	-40 to 150	-40 to 150	1.1	2	10	400	General-purpose rectifier

SBDs

Product Number	Maximum Ratings					Electrical Characteristics				Remarks
	I_F (AV) (A)	V_{RRM} (V)	I_{FSM} (A)	T_J (°C)	T_{stg} (°C)	V_{FM} (V)	I_{FM} (A)	I_{RRM} (μA)	V_{RRM} (V)	
CMS12	3	25	40	-40 to 150	-40 to 150	0.45	3	50	25	Low leakage current type

Zener Diodes

Product Number	Zener Voltage V_Z (V)				Reverse Current		Remarks
	Min	Typ.	Max	Current I_Z (mA)	I_{RRM} (μA) V_{RRM} (V)		
CMZM16	14.4	16	17.6	10	10	11	Bi-directional zener diode (P = 1 W)
CMZ12 Series	10.8	12	13.2	10	10	8	Line-up: Zener voltage 12 V to 53 V (P = 2 W)

HEDs

Product Number	Maximum Ratings					Electrical Characteristics					Test Conditions
	I_F (AV) (A)	V_{RRM} (V)	I_{FSM} (A)	T_J (°C)	T_{stg} (°C)	V_{FM} (V)	I_{FM} (A)	I_{RRM} (μA)	V_{RRM} (V)	t_{rr} (ns)	
CMH01	3	200	40	-40 to 150	-40 to 150	0.98	3	10	200	35	$I_F = 1$ A, $di/dt = -30$ A/μs
CMH02	3	400	40	-40 to 150	-40 to 150	1.3	3	10	400	50	$I_F = 1$ A, $di/dt = -30$ A/μs
CMH04	1	200	40	-40 to 150	-40 to 150	0.98	1	10	200	35	$I_F = 1$ A, $di/dt = -30$ A/μs
CMH05	1	400	40	-40 to 150	-40 to 150	1.3	1	10	400	50	$I_F = 1$ A, $di/dt = -30$ A/μs
CMH07	2	200	40	-40 to 150	-40 to 150	0.98	2	10	200	35	$I_F = 1$ A, $di/dt = -30$ A/μs
CMH08	2	400	40	-40 to 150	-40 to 150	1.3	2	10	400	50	$I_F = 1$ A, $di/dt = -30$ A/μs

Note: The products above are being developed. Thus, the values shown may subject to change without prior notice.
For details, please contact Toshiba sales office.

■ FLAT(US/S/M-FLAT) Package Series

US-FLAT™ SBDs Line-up

Product Number	Maximum Ratings					Electrical Characteristics			
	I _F (AV) (A)	V _{RRM} (V)	I _{FSM} (A)	T _j (°C)	T _{stg} (°C)	V _{FM} (V)	I _{FM} (A)	I _{RRM} (mA)	V _{RRM} (V)
CUS01	1.0	30	20	-40 to 125	-40 to 150	0.37	0.7	1.5	30
CUS02	1.0	30	20	-40 to 150	-40 to 150	0.45	0.7	0.1	30

S-FLAT™ Rectifiers Line-up

Type	Product Number	Maximum Ratings					Electrical Characteristics				
		I _F (AV) (A)	V _{RRM} (V)	I _{FSM} (A)	T _j (°C)	T _{stg} (°C)	V _{FM} (V)	I _{FM} (A)	I _{RRM} (mA)	V _{RRM} (V)	t _{rr} (ns)
SBDs	CRS01	1	30	20	-40 to 125	-40 to 150	0.37	0.7	1.5	30	-
	CRS02	1	30	20	-40 to 125	-40 to 150	0.4	0.7	0.05	30	-
	CRS03	1	30	20	-40 to 150	-40 to 150	0.45	0.7	0.1	30	-
	CRS04	1	40	20	-40 to 150	-40 to 150	0.49	0.7	0.1	40	-
	CRS05	1	30	20	-40 to 150	-40 to 150	0.45	1	0.005	5	-
	CRS06	1	20	20	-40 to 125	-40 to 150	0.36	1	1	20	-
	CRS08	1.5	30	30	-40 to 125	-40 to 150	0.36	1.5	1	30	-
	CRS09	1.5	30	30	-40 to 150	-40 to 150	0.46	1.5	0.05	30	-
	CRS11	1	30	20	-40 to 125	-40 to 150	0.36	1	1.5	30	-
HEDs	CRH01	1	200	15	-40 to 150	-40 to 150	0.98	1	0.01	200	35
General-purpose rectifiers	CRG01	0.7	100	15	-40 to 150	-40 to 150	1.1	0.7	0.01	100	-
	CRG02	0.7	400	15	-40 to 150	-40 to 150	1.1	0.7	0.01	400	-

S-FLAT™ Zener Diodes Line-up

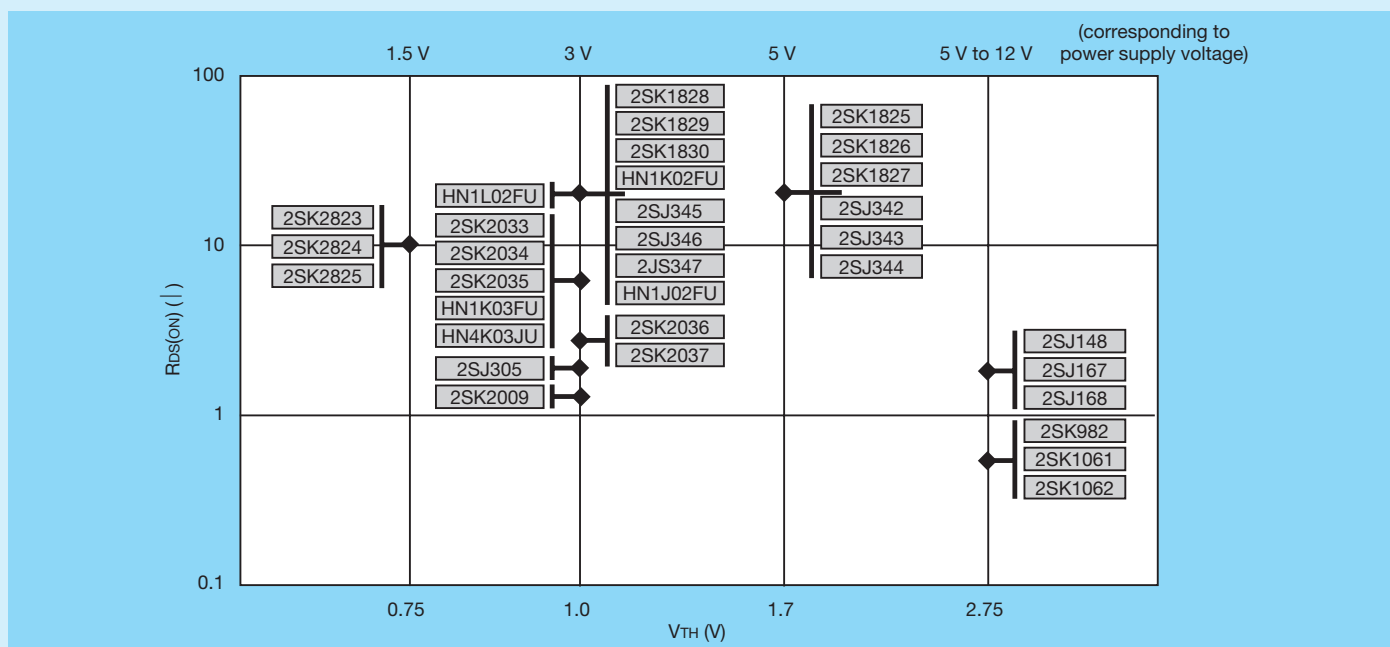
Product Number	Zener Voltage V _Z (V)				measuring current I _Z (mA)	Forward Voltage		Reverse Current	
	min	typ.	max			V _F (V) max	measuring current I _F (A)	I _R (μA) max	measuring voltage V _R (V)
CRY62	5.6	6.2	6.8		10	1.0	0.2	10	2
CRY68	6.2	6.8	7.4		10	1.0	0.2	10	3
CRY75	6.8	7.5	8.3		10	1.0	0.2	10	4.5
CRY82	7.4	8.2	9.1		10	1.0	0.2	10	4.9
CRY91	8.2	9.1	10.1		10	1.0	0.2	10	5.5
CRZ10	9.0	10	11.0		10	1.0	0.2	10	6
CRZ11	9.9	11	12.1		10	1.0	0.2	10	7
CRZ12	10.8	12	13.2		10	1.0	0.2	10	8
CRZ13	11.7	13	14.3		10	1.0	0.2	10	9
CRZ15	13.5	15	16.5		10	1.0	0.2	10	10
CRZ16	14.4	16	17.6		10	1.0	0.2	10	11
CRZ18	16.2	18	19.8		10	1.0	0.2	10	13
CRZ20	18.0	20	22.0		10	1.0	0.2	10	14
CRZ22	19.8	22	24.2		10	1.0	0.2	10	16
CRZ24	21.6	24	26.4		10	1.0	0.2	10	17
CRZ27	24.3	27	29.7		10	1.0	0.2	10	19
CRZ30	27.0	30	33.0		10	1.0	0.2	10	21
CRZ33	29.7	33	36.3		10	1.0	0.2	10	26.4
CRZ36	32.4	36	39.6	9	1.0	0.2	10	28.8	
CRZ39	35.1	39	42.9	8	1.0	0.2	10	31.2	
CRZ43	38.7	43	47.3	7	1.0	0.2	10	34.4	
CRZ47	42.3	47	51.7	6	1.0	0.2	10	37.6	

M-FLAT™ SBDs Line-up

Product Number	Maximum Ratings					Electrical Characteristics			
	I _F (AV) (A)	V _{RRM} (V)	I _{FSM} (A)	T _j (°C)	T _{stg} (°C)	V _{FM} (V)	I _{FM} (A)	I _{RRM} (mA)	V _{RRM} (V)
CMS01	3	30	40	-40 to 125	-40 to 150	0.37	3	5	30
CMS02	3	30	40	-40 to 125	-40 to 150	0.4	3	0.5	30
CMS03	3	30	40	-40 to 150	-40 to 150	0.45	3	0.5	30
CMS04	5	30	70	-40 to 125	-40 to 150	0.37	5	8	30
CMS05	5	30	70	-40 to 150	-40 to 150	0.45	5	0.8	30
CMS06	2	30	40	-40 to 125	-40 to 150	0.37	2	3	30
CMS07	2	30	40	-40 to 150	-40 to 150	0.45	2	0.5	30
CMS08	1	30	30	-40 to 125	-40 to 150	0.37	1	1.5	30
CMS09	1	30	30	-40 to 150	-40 to 150	0.45	1	0.5	30
CMS10	1	40	25	-40 to 150	-40 to 150	0.55	1	0.5	40
CMS11	2	40	30	-40 to 150	-40 to 150	0.55	2	0.5	40

■ S-MOS Series

Product No.	Polarity	V _{DDs}	R _{DS(on)}			V _{TH}	I _D	Package
				V _{GS}	I _D			
2SJ148	P	60	1.3	10.0	50	2.0 to 3.5	200	TO-92
2SJ167	P	60	1.3	10.0	50	2.0 to 3.5	200	TO-92 MINI
2SJ168	P	60	1.3	10.0	50	2.0 to 3.5	200	S-MINI
2SJ305	P	30	2.4	2.5	50	0.5 to 1.5	200	S-MINI
2SJ342	P	50	20.0	4.0	10	0.8 to 2.5	50	TO-92 MINI
2SJ343	P	50	20.0	4.0	10	0.8 to 2.5	50	S-MINI
2SJ344	P	50	20.0	4.0	10	0.8 to 2.5	50	USM
2SJ345	P	20	20.0	2.5	10	0.8 to 2.5	50	S-MINI
2SJ346	P	20	20.0	2.5	10	0.8 to 2.5	50	USM
2SJ347	P	20	20.0	2.5	10	0.8 to 2.5	50	SSM
2SK982	N	60	0.6	10.0	50	2.0 to 3.5	200	TO-92
2SK1061	N	60	0.6	10.0	50	2.0 to 3.5	200	TO-92 MINI
2SK1062	N	60	0.6	10.0	50	2.0 to 3.5	200	S-MINI
2SK1825	N	50	20.0	4.0	10	0.8 to 2.5	50	TO-92 MINI
2SK1826	N	50	20.0	4.0	10	0.8 to 1.5	50	S-MINI
2SK1827	N	50	20.0	4.0	10	0.8 to 2.5	50	USM
2SK1828	N	20	20.0	2.5	10	0.5 to 1.5	50	S-MINI
2SK1829	N	20	20.0	2.5	10	0.5 to 1.5	50	USM
2SK1830	N	20	20.0	2.5	10	0.5 to 1.5	50	SSM
2SK2009	N	30	1.2	2.5	50	0.5 to 1.5	200	S-MINI
2SK2033	N	20	8.0	2.5	10	0.5 to 1.5	100	S-MINI
2SK2034	N	20	8.0	2.5	10	0.5 to 1.5	100	USM
2SK2035	N	20	8.0	2.5	10	0.5 to 1.5	100	SSM
2SK2036	N	20	4.0	2.5	10	0.5 to 1.5	100	S-MINI
2SK2037	N	20	4.0	2.5	10	0.5 to 1.5	100	USM
2SK2823	N	20	10.0	1.5	10	0.5 to 1.5	100	S-MINI
2SK2824	N	20	10.0	1.5	10	0.5 to 1.5	100	USM
2SK2825	N	20	10.0	1.5	10	0.5 to 1.5	100	SSM
HN1J02FU	Px2	20	20.0	2.5	10	0.5 to 1.5	50	US6
HN1K02FU	Nx2	20	20.0	2.5	10	0.5 to 1.5	50	US6
HN1K03FU	Nx2	20	8.0	2.5	10	0.5 to 1.5	100	US6
HN1L02FU	N+P	20	20.0	2.5	10	0.5 to 1.5	50	US6
HN4K03JU	Nx2	20	8.0	2.5	10	0.5 to 1.5	100	USV

■ R_{DS(on)}-V_{TH}

Power MOSFETs Line-up:

I _B (A)	V _{DS} (V)	12	16	20	30	50	60	100	150	180	200	250
1							◆2SK1890(0.73) ▲2SJ507(0.7)	◆2SK2583(0.7) ▲2SK2582(0.7) ◆2SJ508(1.9) ▲2SJ338(5.0)		◆2SK2019(5.0) ▼2SK2162(5.0) ◆2SJ313(5.0) ▼2SJ338(5.0)	◆2SK2989(0.55) ⚡TPCS8004(0.9)1.3A ▼2SJ667(2.0) ★TPC80124(0.4)1.8A	
2	◆2SK2548(0.29) #◆2SJ465(0.7)1				◆2SJ511(0.45) ◆2SK2964(0.17)		◆2SK2615(0.3) ▲2SK2961(0.27) [O2SK24(0.3)]					▼2SJ610(2.55)
2.5					◆TPCS201(0.095)			▼2SK2201(0.35) ★2SK2400(0.25) ▲2SK2742(0.35)				▼2SK3462(1.7)
3												
4					P#TPCS5102(0.06) P#TPCS3303(0.035) CP#TPC8402(0.035) P#TPC8403(0.035) CP#TPC8403(0.035)						◆2SK2840(1.0) ▼2SK3342(1.0)	
4.5												
5	◆2SK2489(1.0) #◆2SJ439(0.2)			N#TPCS8208(0.05) N#TPCS8209(0.03) N#TPCS8205(0.045) N#TPCS8210(0.03) N#TPCS8209(0.03) P#TPCS8209(0.05) P#TPCS8212(0.024) N#TPCS8208(0.017)	CN#TPC8402(0.05) ★2SJ525(0.12) N#TPCS8004(0.05) P#TPCS104-H(0.065) N#TPCS209(0.05)	▲2SK2989(0.15) ▲2SJ537(0.15)	▼2SK2584(0.16) ▲2SK2230(0.16) ▲2SK2741(0.16) ▼2SJ377(0.19) ★2SJ376(0.19) ▲2SJ465(0.1) ▲2SJ482(0.19)	▼2SK2399(0.23) ★2SK2400(0.25)	[▼2SK3205(0.55)]	▼2SK2950(0.8) ★2SK2381(0.8) [O2SK3201(0.8)] ◆2SJ407(1.0)	◆2SJ512(1.25)	
5.5	P#TPCS6103(0.055)]											
6				N#TPCS802(0.03) N#TPCS802(0.024) N#TPCS8203(0.021) P#TPCS8101(0.025) CN#TPC8401(0.021) N#TPCS802(0.017) N#TPCS6005(0.028)]								
6.5					N#TPCS8001(0.02) N#TPCS8006-H(0.027) P#TPCS102-H(0.04)		N#TPCS206(0.05)				[▼2SJ515(0.44)]	◆2SJ516(0.2)
7												
7.5												◆2SK2417(0.5) [▼2SJ14(0.255)]
8					P#TPCS110(0.025)40V N#TPCS110(0.015)					◆2SK2467(0.63)		
8.5											◆2SK2380(0.4) ◆2SJ513(0.5)	◆2SK2914(0.5)
9												
9.5												
10					P#TPCS108(0.02) ▲2SK2839(0.04)					□2SK1529(0.63) ◆2SJ440(0.63) □2SJ200(0.65)		◆2SK2966(0.32)]
11					N#TPCS8011(0.014) N#TPCS8014(0.016) P#TPCS108(0.013)						◆2SK2965(0.26)	
12								◆2SJ389(0.21)			◆2SK1530(0.63) ◆2SJ201(0.63)	
13					N#TPCS8009-H(0.01) N#TPCS8030(0.007) N#TPCS8030(0.007) P#TPCS8030(0.007) P#TPCS8030(0.005)							◆2SK2508(0.25) O2SK2598(0.25)
15					N#TPCS13-H(0.0065) N#S3D18(0.0045)]						◆2SK2862(0.18) O2SK2401(0.18)	
16												
18												
20					▼2SK2614(0.046) ◆2SK2391(0.085)		◆2SJ349(0.045) O2SJ401(0.045) ▼2SK2782(0.055) [▼2SK3345(0.02)]	◆2SK2391(0.085) ◆2SJ519(0.21) ◆2SJ484(0.09) ◆2SJ339(0.025)	◆2SK2882(0.12) ◆2SK3397(0.12)			O2SK2993(0.105) ◆2SK3388(0.105) ◆2SK3445(0.105)
25					◆2SK2507(0.046)		◆2SK2232(0.046) O2SK2311(0.046)				◆2SK3444(0.082)	
27								■2SK2314(0.085) O2SK2784(0.085) ◆2SK2466(0.046)			□2SK3176(0.052)	□2SK2987(0.058) O2SK2986(0.058)
30							◆2SJ334(0.038) O2SJ402(0.038) [■2SJ570(0.038)]		◆2SK3443(0.055)			
35					■2SK2844(0.02)		[O2SK3375(0.02)]					
36							◆2SK2385(0.03)					
40					O2SK3069(0.03) O2SK3090(0.02) N#TPCS8011(0.01) S[O2SK2744(0.025) S[O2SK2966(0.02)]		□2SK2233(0.03) O2SK2545(0.03) S O2SK2398(0.03) S O2SK3051(0.03) S O2SK3051(0.03) O2SK376(0.017) [■2SK3208(0.017) [■2SK3208(0.017) [O2SK3345(0.03)]					
45												
50					◆2SK2551(0.011) □2SK2745(0.0095)		S ◆2SK3440(0.008) □2SK2173(0.017) S □2SK2445(0.018)	◆2SK3442(0.020)				
55												
60					□2SK3128(0.011) O2SK3125(0.007)		□2SK2313(0.011) O2SK2287(0.011)					
70							◆2SK2987(0.058) O2SK2986(0.058)					
75					S ◆2SK3388(0.005)		◆2SK3441(0.0058)					

Notes: () = $R_{DS(ON)}$ max
\$ = 10-V drive
= 2.5-V drive
¥ = High-speed diode
N = N-ch
P = P-ch
CN = Complementary N-ch
CP = Complementary P-ch
I = Under development

▽ DP (DPack) ▲ TO-92MOD

 SOP-8 Lead clamp PW-MOL
 TO-3P(S) TO-3P(N)

SSOP-3 common-drain ★ SOP

3 ♠ VS-6 ♠ TSSOP-8 ♣
220(S) ■ TC-220AB ♣

IC-220FL/SM (D:Pack)

Package code	TPS	PW-MINI
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
10	10	10
11	11	11
12	12	12
13	13	13
14	14	14
15	15	15
16	16	16
17	17	17
18	18	18
19	19	19
20	20	20
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22	22	22
23	23	23
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90	90	90
91	91	91
92	92	92
93	93	93
94	94	94
95	95	95
96	96	96
97	97	97
98	98	98
99	99	99
100	100	100

($V_{DS} = 400\text{ V to }1000\text{ V}$)

I_b (A)	$V_{DS}(V)$	400	450	500	600	700	800	900	1000
0.5				▲2SK2988(1.8) ★2SK3302(1.8) ○2SK3471(1.8)					
1			▼2SK3472(4.5)		▲2SK2836(9) ▼2SK3371(9)			■2SK2733(9.0) ▼2SK2845(9.0) ▼2SK3301(20)	
1.5			▼2SK3171(7)				▼2SK2997(8)		
2				★2SK2599(3.2) ▼2SK2862(3.2) [▼2SK3381(3.2)]	★2SK2846(5) ▼2SK2885(5) ▲2SK3007(5)				
2.5			▼2SK3643(2.45) [▲2SK3072(2.45)]					◆2SK2718(6.4)	
3							■2SK2603(3.6) O2SK2883(3.6)	◆2SK2700(4.3) ■2SK2608(4.3) O2SK2719(4.3) [O2SK3088(4.3)]	
3.5					◆2SK2750(2.2) ■2SK3005(2.2)				■2SK1119(3.8) O2SK1930(3.8)
4									
4.5									
5				◆2SK2662(1.5) O2SK3391(1.5) ■2SK2661(1.5) ▼2SK3316(1.8) ▲2SK3466(1.5) [VOS215(1.8)]			O2SK2604(2.2) ◆2SK2605(2.2) O2SK2884(2.2)	O2SK2610(2.5) ◆2SK2717(2.5)	O2SK1359(3.8)
5.5	◆2SK2679(1.2) O2SK2838(1.2)								
6					◆2SK2545(1.25) ■2SK2544(1.25) O2SK2777(1.25) O2SK2602(1.25) [O2SK3312(1.25)] ▼2SK3130(1.5)				
6.5									
7							O2SK2746(1.7)	O2SK2811(1.4) O2SK2868(1.25)	O2SK1385(1.8)
7.5									
8				▲2SK2543(0.85) ■2SK2542(0.85) O2SK2776(0.85) [▲2SK3538(0.85)] O2SK2600(0.85)				O2SK2847(1.4) [O2SK3473(1.6)]	O2SK2613(1.7)
8.5	◆2SK2932(0.55) [▲2SK3499(0.55)]						O2SK2606(1.2)	O2SK3017(1.25)	
9					◆2SK2986(1.0) ◆2SK2843(0.75) ■2SK2886(0.75) O2SK2889(0.75) ▲2SK3438(1.0) [O2SK3437(1.0)] O2SK3399(0.75)	◆2SK3265(1.0)	O2SK2607(1.2)		
10	O2SK3126(0.65) O2SK3399(0.65) ◆2SK3310(0.65) [▲2SK3544(0.65)]			O2SK2601(1.0) O2SK3399(0.65) ◆2SK3310(0.65)					
12				▼2SK3313(0.62) [▼2SK2784(0.62)] O2SK2608(0.62) ◆2SK2842(0.52) ▲2SK3398(0.52)	O2SK2699(0.65)			◆2SK1489(1.0)	
13			O2SK3403(0.4)						
14				O2SK2916(0.4) O2SK2688(0.4)					
15				O2SK2953(0.4) O2SK2915(0.4)					
16									
18				O2SK2917(0.27) O2SK2637(0.27) O2SK3171(0.27)					
20									
30									
50				▼2SK3131(0.11) ◆2SK3132(0.095)					

Notes: () = $F_{DS(on)}$ max N = N-ch
 ▲ = I_{AS} drive P = P-ch
 ▼ = I_{AS} drive CN = Complementary N-ch
 CP = Complementary P-ch
 Y = High-speed diode [] = Under development

Package code
 ◇ PW-MINI (SOT189) △ SP (SOT-223) ○ VS-4 ♥ VS-6 ✕ TSSOP-4
 ★ SOP-4 common-drain ☆ TSSOP-4
 ○ TO-20FL/SW (DPAK) ◆ TO-20(S) ■ TO-20AB
 ▲ DP (PAK) ▼ FPAK/D (DPAK) ▽ DP (PAK)
 ○ TO-3P(S) □ TO-3P(N) ● TO-3P(L)

Power MOSFET tapings

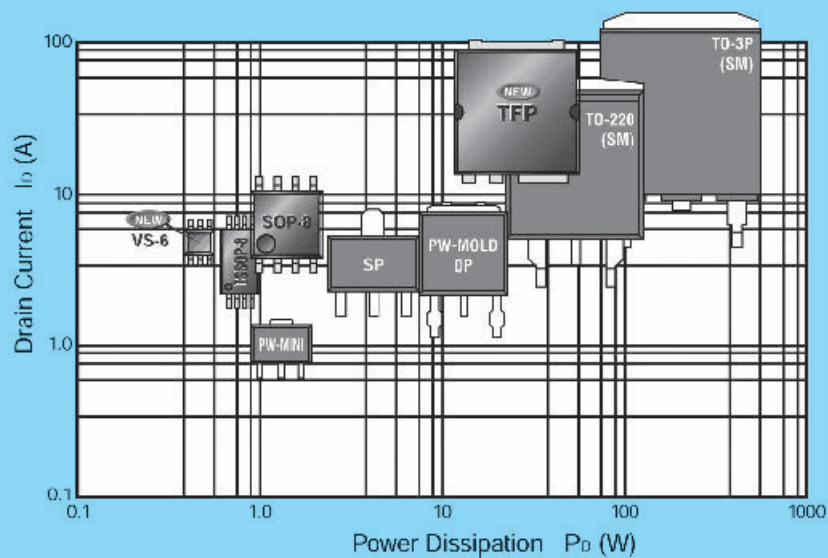
Compact packages

Meet the needs for equipment miniaturization and flatness

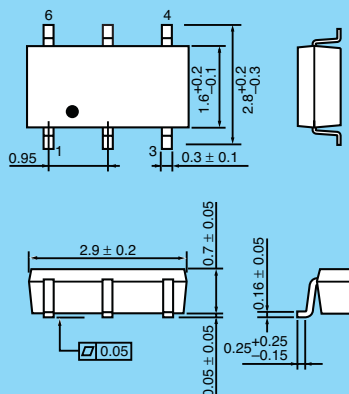
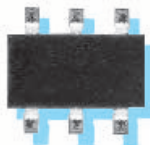
Extensive product line : $P_D = 1.0 \text{ W}$ to 150 W and $I_D = 1 \text{ A}$ to 50 A

■ TFP: high performance devices with a 4-pin structure for separating input and output

■ SOP-8 and TSSOP-8: ultra-low ON-resistance devices using trench structure

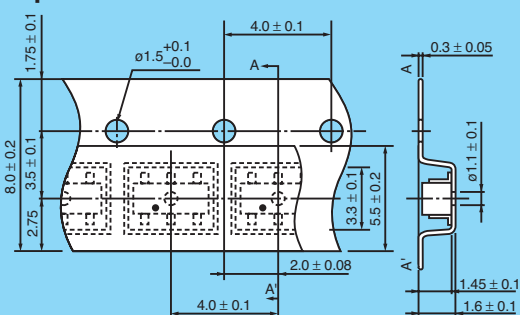


VS-6



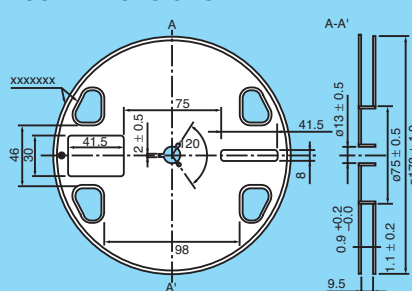
Tape Dimensions

Unit: mm



Reel Dimensions

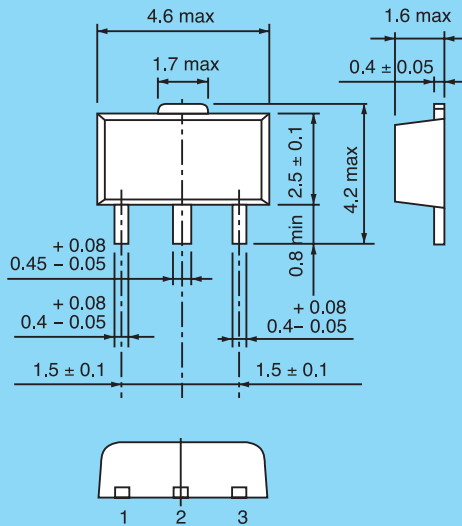
Unit: mm



Packing Quantity

3000/reel

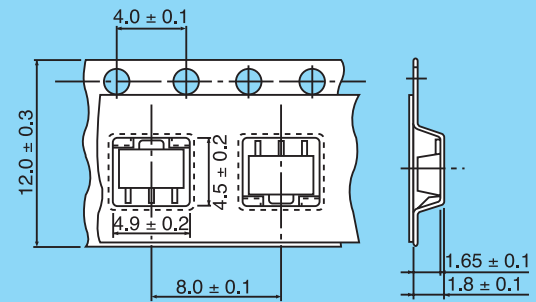
PW-MINI (SOT-89)



1. GATE
2. DRAIN (HEAT SINK)
3. SOURCE

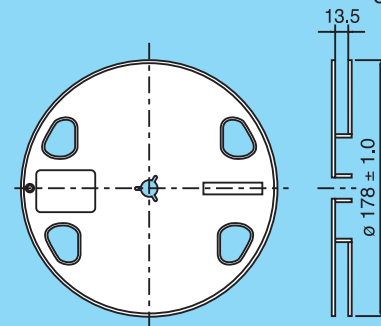
Tape Dimensions

Unit : mm



Reel Dimensions

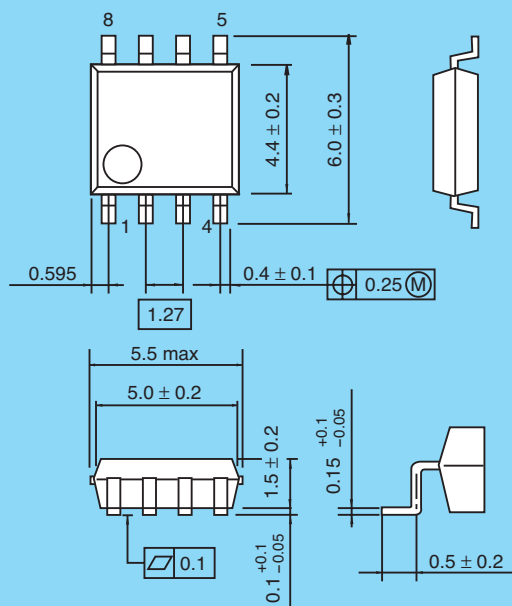
Unit : mm



Packing Quantity

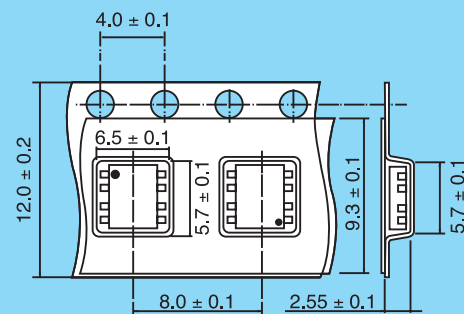
1000/reel

SOP-8



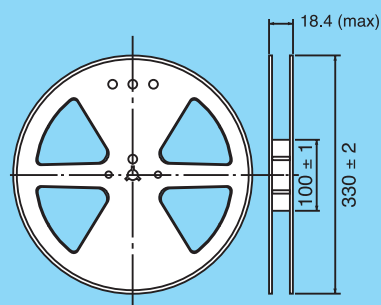
Tape Dimensions

Unit : mm



Reel Dimensions

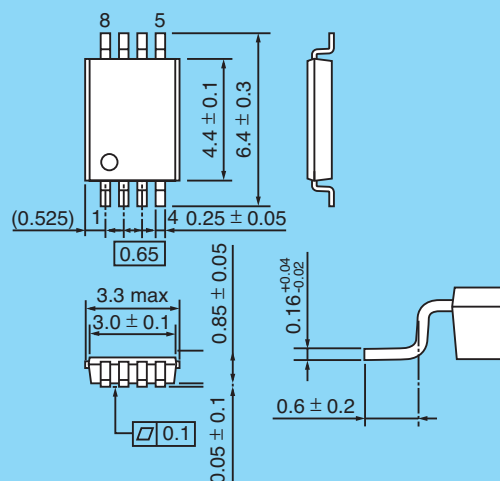
Unit : mm



Packing Quantity

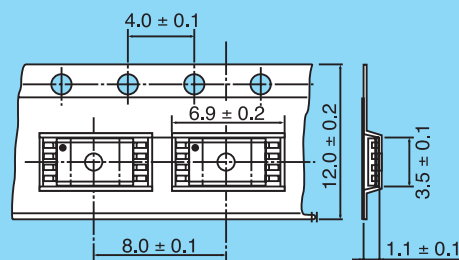
3000/reel

TSSOP-8



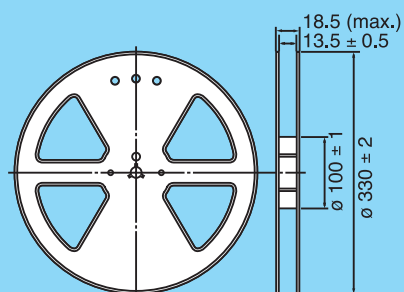
Tape Dimensions

Unit : mm



Reel Dimensions

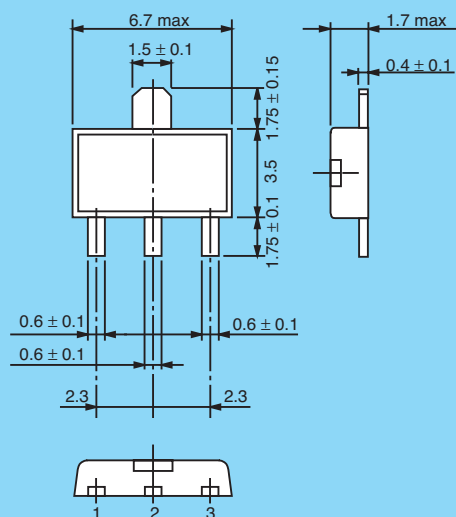
Unit : mm



Packing Quantity

3000/reel

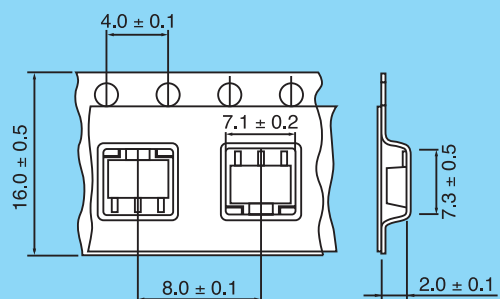
SP (SOT-223)



1. GATE
2. DRAIN(HEAT SINK)
3. SOURCE

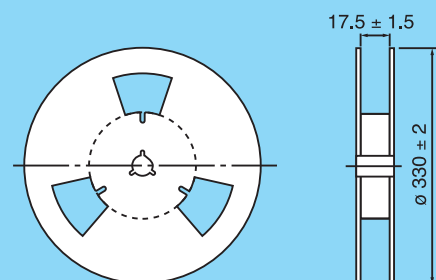
Tape Dimensions

Unit : mm



Reel Dimensions

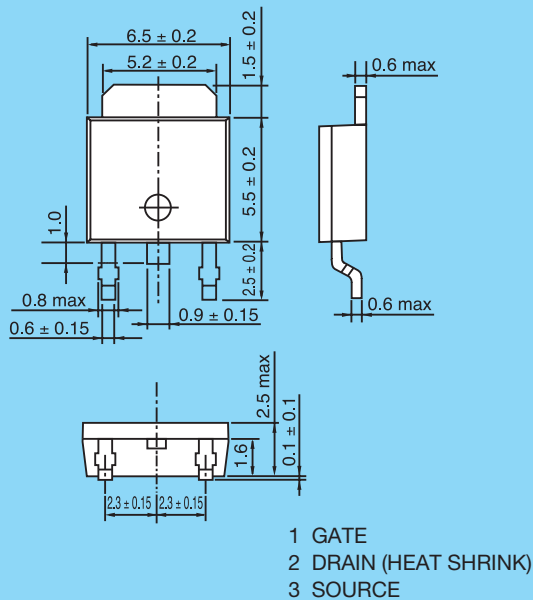
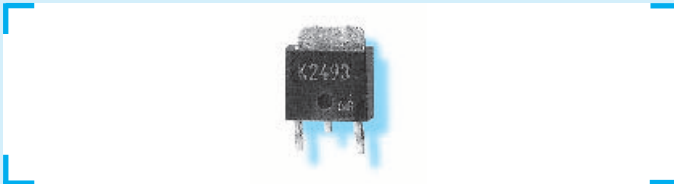
Unit : mm



Packing Quantity

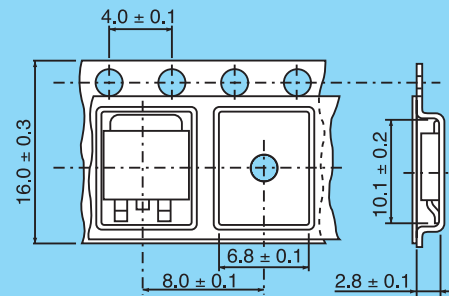
3000/reel

PW-MOLD (D PACK)



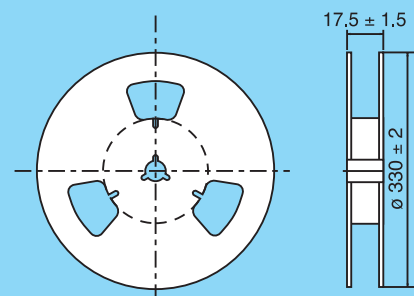
Tape Dimensions

Unit : mm



Reel Dimensions

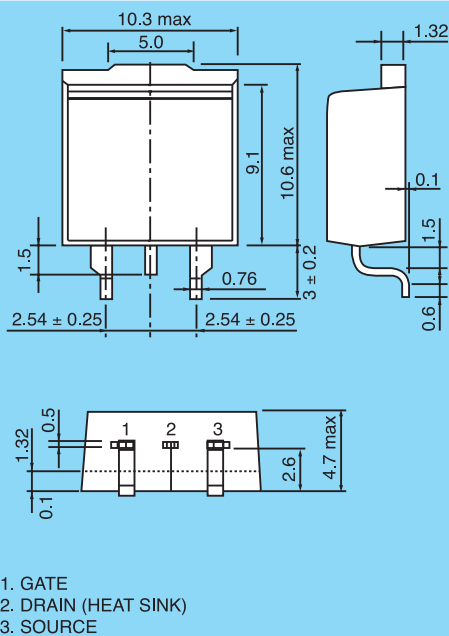
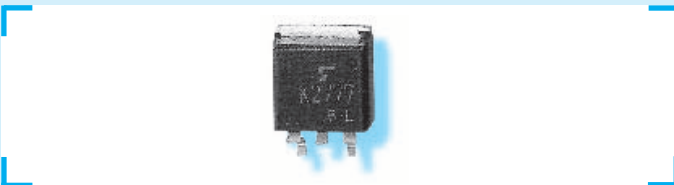
Unit : mm



Packing Quantity

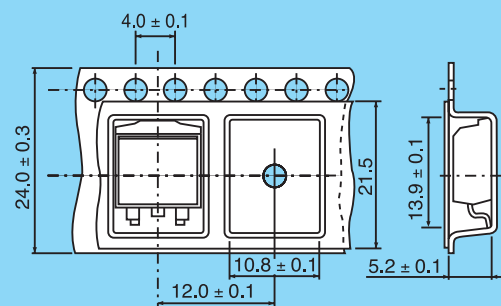
700/reel

TO-220SM (D² PACK)



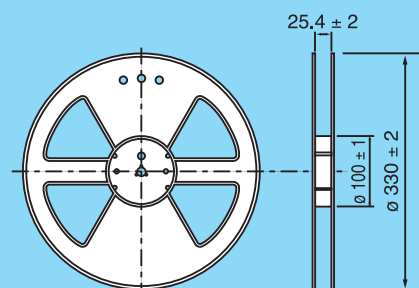
Tape Dimensions

Unit : mm



Reel Dimensions

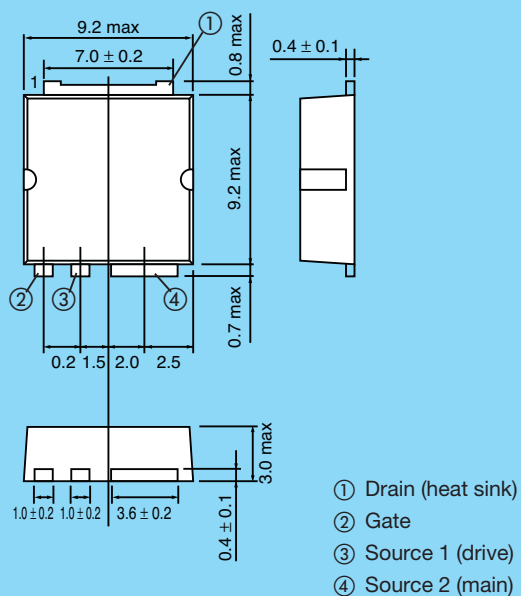
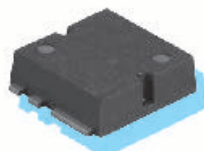
Unit : mm



Packing Quantity

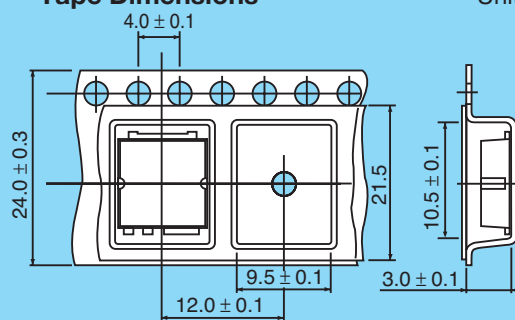
1000/reel

TFP



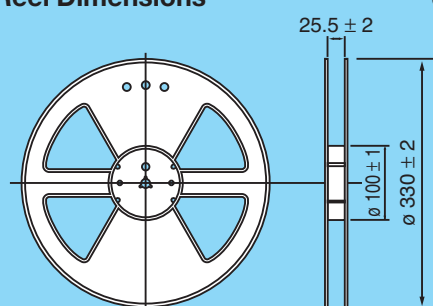
Tape Dimensions

Unit: mm



Reel Dimensions

Unit: mm

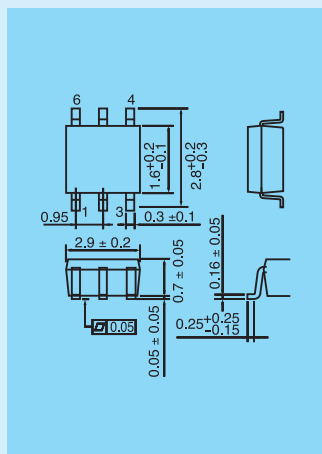
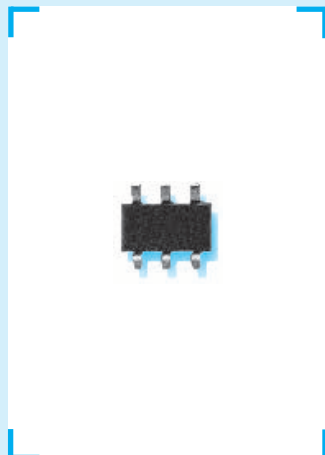


Packing Quantity

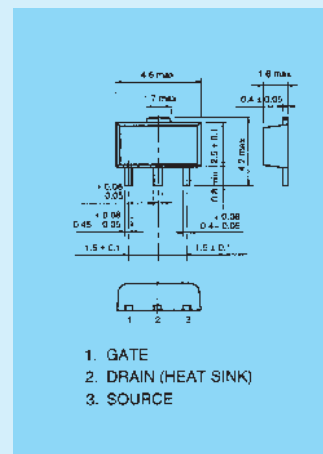
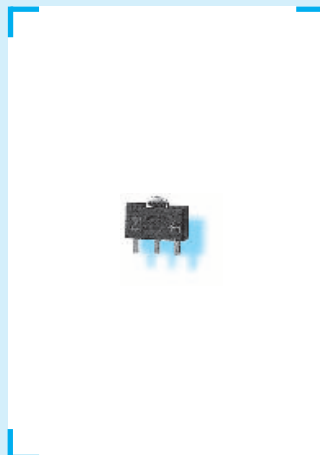
1500/reel

Power MOSFETs

VS-6

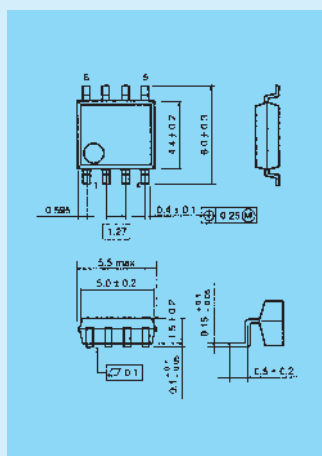


PW-MINI (SOT-89)

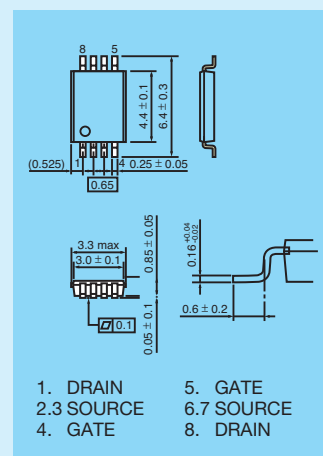
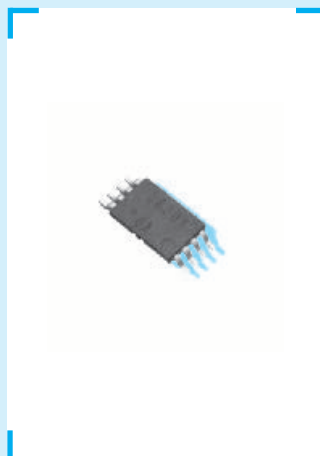


1. GATE
2. DRAIN (HEAT SINK)
3. SOURCE

SOP-8

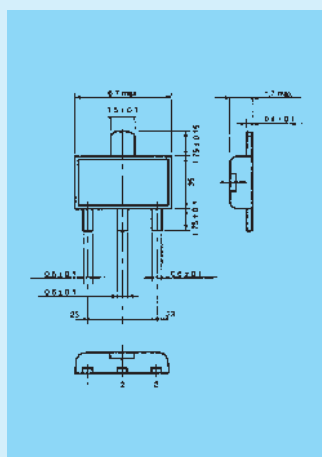
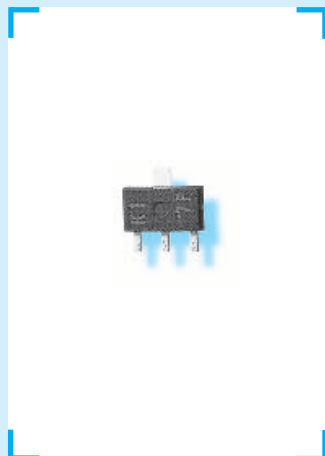


TSSOP-8

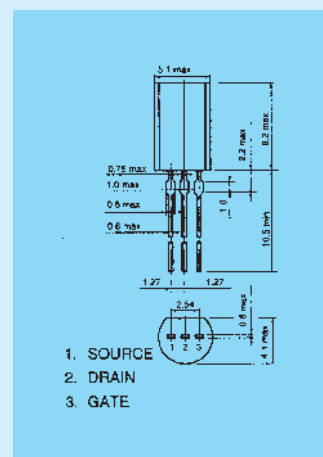


1. DRAIN
- 2.3 SOURCE
4. GATE
5. GATE
- 6.7 SOURCE
8. DRAIN

SP (SOT-223)



TO92-MOD

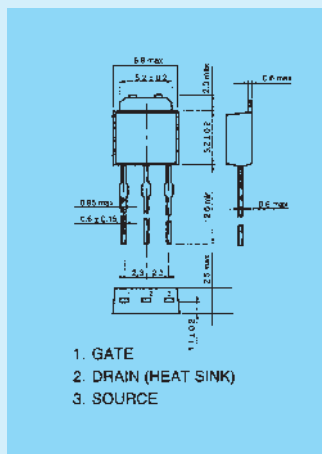


1. SOURCE
2. DRAIN
3. GATE

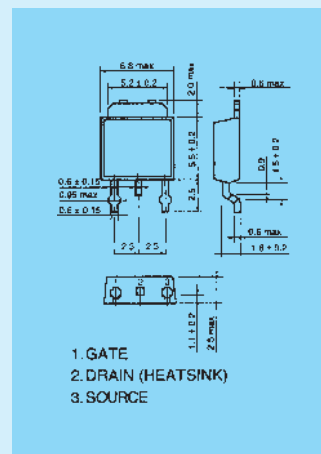
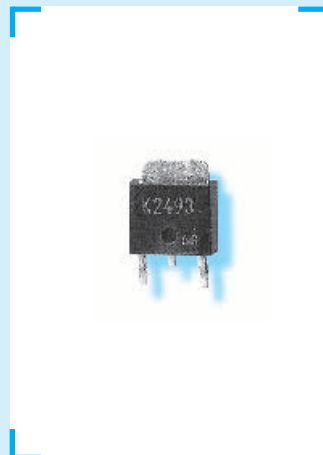
Package List

Power MOSFETs

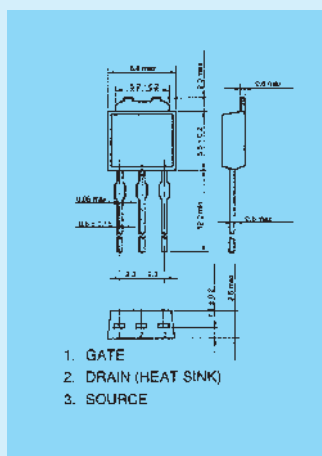
PW-MOLD (straight leads) (D Pack)



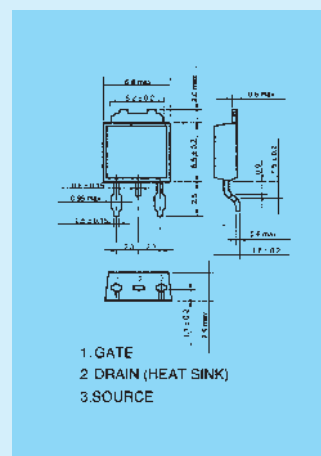
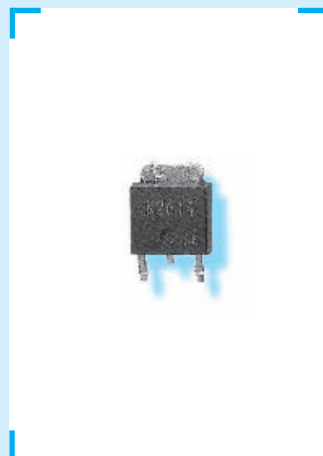
PW-MOLD (formed leads) (D Pack)



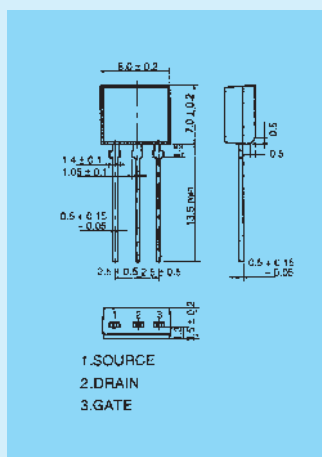
DP (straight leads) (D Pack)



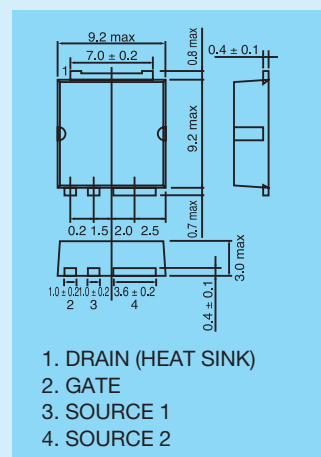
DP (formed leads) (D Pack)



TPS

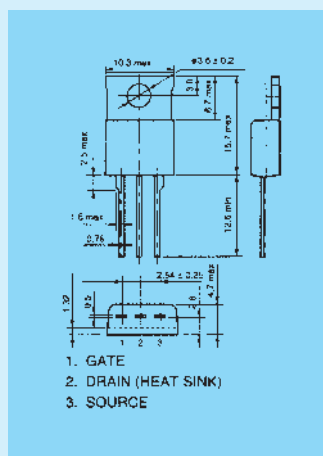


TFP

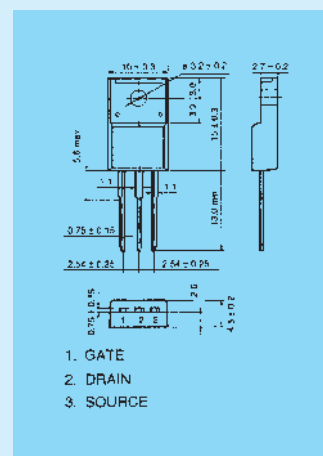
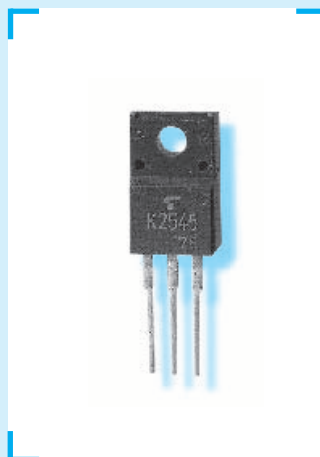


Power MOSFETs

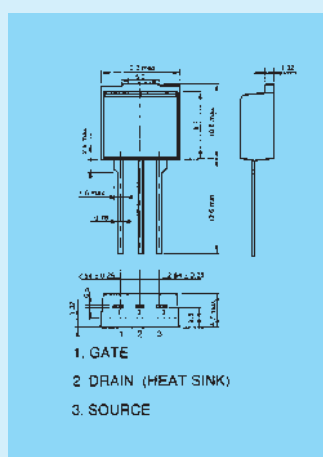
TO-220AB



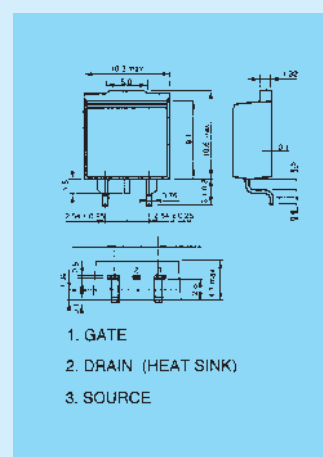
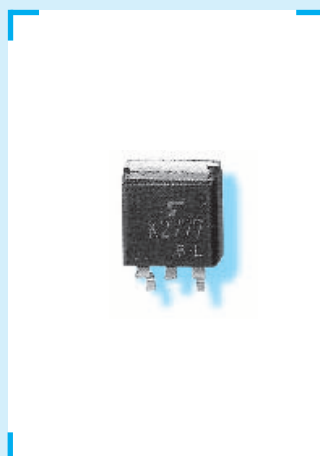
TO-220 (IS)



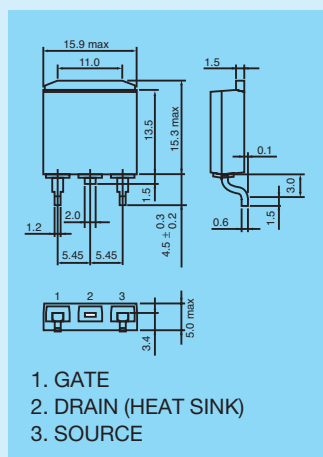
TO-220FL



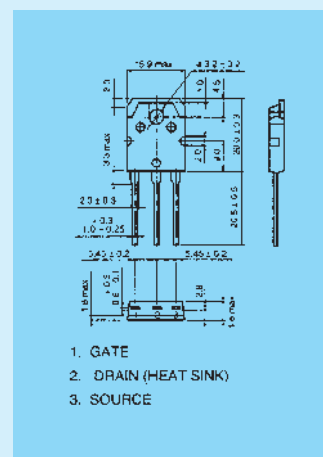
TO-220SM (D² Pack)



TO-3P(SM) (D³ Pack)



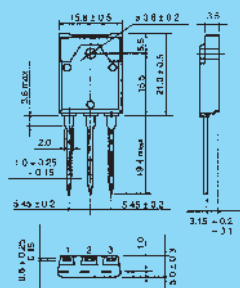
TO-3P(N)



Package List

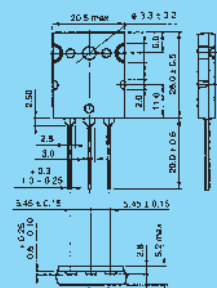
■ Power MOSFETs

TO-3PN(IS)



1. GATE
2. DRAIN
3. SOURCE

TO-3P(L)



1. GATE
2. DRAIN (HEAT SINK)
3. SOURCE

Product Number	Series	Package	Main Characteristics		
			V _{DS} (V)	I _D (A)	R _{DS(ON)} max. (Ω)
2SJ147	≠-MOS II	TO-220IS	-60	-12.0	0.2
2SJ183	L ² -≠-MOS III	PW-MOLD	-60	-5.0	0.35
2SJ200	≠-MOS II	TO-3P(N)	-180	-10.0	0.83
2SJ201	≠-MOS II	TO-3P(N)	-200	-12.0	0.63
2SJ224	≠-MOS II	TO-220FL/SM	-60	-12.0	0.2
2SJ238	L ² -≠-MOS IV	PW-MINI	-60	-1.0	0.85
2SJ239	L ² -≠-MOS IV	PW-MOLD	-60	-5.0	0.25
2SJ240	L ² -≠-MOS IV	TO-220(IS)	-60	-20.0	0.045
2SJ241	L ² -≠-MOS IV	TO-220FL/SM	-60	-20.0	0.045
2SJ304	L ² -≠-MOS IV	TO-220(IS)	-60	-14.0	0.13
2SJ312	L ² -≠-MOS IV	TO-220FL/SM	-60	-14.0	0.13
2SJ313	≠-MOS II	TO-220(IS)	-180	-1.0	5.0
2SJ315	L ² -≠-MOS IV	PW-MOLD	-60	-5.0	0.25
2SJ334	L ² -≠-MOS V	TO-220(IS)	-60	-30.0	0.038
2SJ338	≠-MOS II	PW-MOLD	-180	-1.0	5.0
2SJ349	L ² -≠-MOS V	TO-220(IS)	-60	-20.0	0.045
2SJ359	L ² -≠-MOS IV	TPS	-60	-5.0	0.25
2SJ360	L ² -≠-MOS V	PW-MINI	-60	-1.0	0.73
2SJ377	L ² -≠-MOS V	PW-MOLD	-60	-5.0	0.19
2SJ378	L ² -≠-MOS V	TPS	-60	-5.0	0.19
2SJ380	L ² -≠-MOS V	TO-220(IS)	-100	-12.0	0.21
2SJ401	L ² -≠-MOS V	TO-220FL/SM	-60	-20.0	0.045
2SJ402	L ² -≠-MOS V	TO-220FL/SM	-60	-30.0	0.038
2SJ407	≠-MOS V	TO-220(IS)	-200	-6.0	1.0
2SJ412	L ² -≠-MOS V	TO-220FL/SM	-100	-16.0	0.21
2SJ438	L ² -≠-MOS V	TO-220(IS)	-60	-5.0	0.19
2SJ439	≠-MOS V	PW-MOLD	-16	-5.0	0.2
2SJ440	≠-MOS II	TO-3P(N)IS	-180	-9.0	0.8
2SJ464	L ² -≠-MOS V	TO-220(IS)	-100	-18.0	0.09
2SJ465	≠-MOS V	PW-MINI	-16	-2.0	0.71
2SJ482	L ² -≠-MOS V	SP	-60	-5.0	0.19
2SJ507	L ² -≠-MOS V	TO-92MOD	-60	-1.0	0.7
2SJ508	L ² -≠-MOS V	PW-MINI	-100	-1.0	1.9
2SJ509	L ² -≠-MOS V	TO-92MOD	-100	-1.0	1.9
2SJ511	L ² -≠-MOS V	PW-MINI	-30	-2.0	0.45
2SJ512	≠-MOS V	TO-220(IS)	-250	-5.0	1.25
2SJ516	≠-MOS V	TO-220(IS)	-250	-6.5	0.8
2SJ525	L ² -≠-MOS V	TPS	-30	-5.0	0.12
2SJ537	L ² -≠-MOS V	TO-92MOD	-50	-5.0	0.19
2SJ567	≠-MOS V	PW-MOLD	-200	-2.5	2.0
2SJ610	≠-MOS V	PW-MOLD	-250	-2	2.55

Product Number	Series	Package	Main Characteristics		
			V _{DS} (V)	I _D (A)	R _{DS(ON)} max. (Ω)
*2SJ611	≠-MOS V	PW-MOLD	-450	-1.5	7.0
2SJ619	TFP	TFP	-100	-20	0.21
2SJ620	L ² -≠-MOS V	TFP	-100	-18	0.12
2SK357	≠-MOS	TO-220AB	150	5.0	0.9
2SK358	≠-MOS	TO-220AB	250	5.0	1.0
2SK385	≠-MOS	TO-3P(L)	400	10.0	0.6
2SK386	≠-MOS	TO-3P(L)	450	10.0	0.7
2SK387	≠-MOS	TO-3P(L)	150	12.0	0.18
2SK388	≠-MOS	TO-3P(L)	250	12.0	0.25
2SK447	≠-MOS	TO-3P(L)	250	15.0	0.24
2SK525	≠-MOS	TO-220IS	150	10.0	0.28
2SK526	≠-MOS	TO-220IS	250	10.0	0.6
2SK528	≠-MOS	TO-220IS	400	2.0	2.2
2SK529	≠-MOS	TO-220IS	450	2.0	2.6
2SK530	≠-MOS	TO-220IS	400	5.0	1.4
2SK531	≠-MOS	TO-220IS	450	5.0	1.6
2SK532	≠-MOS	TO-220IS	60	12.0	0.085
2SK537	≠-MOS	TO-220AB	900	1.0	9.0
2SK538	≠-MOS	TO-3P(N)	900	3.0	4.5
2SK539	≠-MOS	TO-3P(L)	900	5.0	2.5
2SK572	≠-MOS	TO-3P(N)	150	15.0	0.18
2SK573	≠-MOS	TO-3P(N)	250	15.0	0.32
2SK578	≠-MOS	TO-3P(L)	150	15.0	0.22
2SK643	≠-MOS II	TO-3P(N)	450	10.0	0.85
2SK644	≠-MOS II	TO-3P(N)	500	10.0	1.0
2SK672	≠-MOS II	TO-220AB	60	10.0	0.2
2SK673	≠-MOS II	TO-220AB	60	15.0	0.11
2SK674	≠-MOS II	TO-220AB	60	25.0	0.06
2SK678	≠-MOS II	TO-3P(L)	500	13.0	0.4
2SK693	≠-MOS II	TO-3P(L)	450	13.0	0.4
2SK694	≠-MOS II	TO-3P(L)	500	12.0	0.5
2SK788	≠-MOS II	TO-3P(N)	500	13.0	0.5
2SK789	≠-MOS II	TO-3P(N)	450	15.0	0.4
2SK790	≠-MOS II	TO-3P(N)	500	15.0	0.4
2SK791	≠-MOS	TO-220AB	850	3.0	4.5
2SK792	≠-MOS	TO-220AB	900	3.0	4.5
2SK793	≠-MOS	TO-3P(N)	850	5.0	2.5
2SK794	≠-MOS	TO-3P(N)	900	5.0	2.5
2SK849	≠-MOS II	TO-3P(N)	60	40.0	0.038
2SK850	≠-MOS II	TO-3P(N)	100	40.0	0.06
2SK851	≠-MOS II	TO-3P(N)	200	30.0	0.085

* = Under development

Power MOSFET Product List

Product Number	Series	Package	Main Characteristics		
			V _{DS}	I _D	R _{DS(ON)} max.
(V)	(A)	(Ω)			
2SK856	$\pm$ -MOS II	TO-220AB	60	45.0	0.03
2SK858	$\pm$ -MOS II	TO-220AB	600	2.0	4.0
2SK888	$\pm$ -MOS II	TO-220AB	100	15.0	0.18
2SK889	$\pm$ -MOS II	TO-220AB	100	27.0	0.085
2SK890	$\pm$ -MOS II	TO-220AB	200	10.0	0.4
2SK891	$\pm$ -MOS II	TO-220AB	200	20.0	0.18
2SK892	$\pm$ -MOS II	TO-220AB	500	2.5	3.0
2SK893	$\pm$ -MOS II	TO-220AB	500	5.0	1.5
2SK894	$\pm$ -MOS II	TO-220AB	500	8.0	0.85
2SK895	$\pm$ -MOS II	TO-3P(N)	450	12.0	0.6
2SK896	$\pm$ -MOS II	TO-3P(N)	500	12.0	0.5
2SK940	L ² - $\pm$ -MOS III	TO-92MOD	60	0.8	0.55
2SK941	L ² - $\pm$ -MOS III	TO-92MOD	100	0.6	1.3
2SK942	L ² - $\pm$ -MOS III	TO-220AB	60	25.0	0.046
2SK943	L ² - $\pm$ -MOS III	TO-220(IS)	60	25.0	0.046
2SK944	$\pm$ -MOS II	TO-3P(N)	250	22.0	0.15
2SK945	$\pm$ -MOS II	PW-MOLD	400	1.0	5.0
2SK1029	$\pm$ -MOS II	TO-3P(L)	500	10.0	0.5
2SK1078	L ² - $\pm$ -MOS III	PW-MINI	60	0.8	0.55
2SK1079	L ² - $\pm$ -MOS III	PW-MINI	100	0.6	1.3
2SK1112	L ² - $\pm$ -MOS III	PW-MOLD	60	5.0	0.16
2SK1113	L ² - $\pm$ -MOS III	PW-MOLD	120	3.0	0.42
2SK1114	L ² - $\pm$ -MOS III	TO-220AB	60	12.0	0.07
2SK1115	L ² - $\pm$ -MOS III	TO-220AB	60	20.0	0.055
2SK1116	L ² - $\pm$ -MOS III	TO-220AB	100	25.0	0.058
2SK1117	$\pm$ -MOS II	TO-220AB	600	6.0	1.25
2SK1118	$\pm$ -MOS II	TO-220(IS)	600	6.0	1.25
2SK1119	$\pm$ -MOS II.5	TO-220AB	1000	4.0	3.8
2SK1120	$\pm$ -MOS II.5	TO-3P(N)	1000	8.0	1.8
2SK1124	$\pm$ -MOS III	TO-3P(N)	60	45.0	0.03
2SK1213	$\pm$ -MOS II	TO-3P(N)	600	6.0	1.25
2SK1333	$\pm$ -MOS II	TO-3P(L)	500	15.0	0.4
2SK1344	L ² - $\pm$ -MOS III	TO-220(IS)	60	12.0	0.07
2SK1345	L ² - $\pm$ -MOS III	TO-220(IS)	60	20.0	0.055
2SK1346	$\pm$ -MOS II	TO-220(IS)	60	25.0	0.06
2SK1347	L ² - $\pm$ -MOS III	TO-220AB	100	20.0	0.085
2SK1348	L ² - $\pm$ -MOS III	TO-220(IS)	100	20.0	0.085
2SK1349	L ² - $\pm$ -MOS III	TO-220(IS)	100	25.0	0.058
2SK1350	$\pm$ -MOS II	TO-220(IS)	200	15.0	0.18
2SK1351	$\pm$ -MOS II	TO-220(IS)	500	5.0	1.5
2SK1352	$\pm$ -MOS II	TO-220(IS)	500	7.0	0.85

Product Number	Series	Package	Main Characteristics		
			V _{DS}	I _D	R _{DS(ON)} max.
(V)	(A)	(Ω)			
2SK1356	$\pm$ -MOS II	TO-220(IS)	900	3.0	4.3
2SK1357	$\pm$ -MOS II.5	TO-3P(N)	900	5.0	2.8
2SK1358	$\pm$ -MOS II.5	TO-3P(N)	900	9.0	1.4
2SK1359	$\pm$ -MOS II.5	TO-3P(N)	1000	5.0	3.8
2SK1360	$\pm$ -MOS	TO-3(N)IS	900	5.0	2.5
2SK1362	$\pm$ -MOS	TO-3P(N)IS	900	5.0	2.5
2SK1363	$\pm$ -MOS II.5	TO-3P(N)IS	900	8.0	1.4
2SK1365	$\pm$ -MOS II.5	TO-3P(N)IS	1000	7.0	1.8
2SK1377	$\pm$ -MOS	TO-220(IS)	400	5.5	1.2
2SK1378	$\pm$ -MOS	TO-220AB	400	10.0	0.55
2SK1379	L ² - $\pm$ -MOS III	TO-3P(N)	60	50.0	0.017
2SK1380	L ² - $\pm$ -MOS III	TO-3P(L)	60	60.0	0.011
2SK1381	L ² - $\pm$ -MOS III	TO-3P(N)	100	50.0	0.032
2SK1382	L ² - $\pm$ -MOS III	TO-3P(L)	100	60.0	0.02
2SK1486	$\pm$ -MOS III.5	TO-3P(L)	300	32.0	0.095
2SK1487	$\pm$ -MOS III.5	TO-3P(N)	450	10.0	1.0
2SK1488	$\pm$ -MOS III.5	TO-3P(N)	500	10.0	1.0
2SK1489	$\pm$ -MOS III.5	TO-3P(L)	1000	12.0	1.0
2SK1513	$\pm$ -MOS II	TO-3P(L)	500	8.0	0.75
2SK1529	$\pm$ -MOS II	TO-3P(N)	180	10.0	0.83
2SK1530	$\pm$ -MOS II	TO-3P(N)	200	12.0	0.63
2SK1531	$\pm$ -MOS III.5	TO-3P(N)	500	15.0	0.45
2SK1542	L ² - $\pm$ -MOS IV	TO-220AB	60	45.0	0.022
2SK1544	$\pm$ -MOS III.5	TO-3P(L)	500	25.0	0.2
2SK1574	$\pm$ -MOS III.5	TO-220AB	500	8.0	0.85
2SK1600	$\pm$ -MOS II.5	TO-220AB	800	3.0	5.0
2SK1601	$\pm$ -MOS II.5	TO-220AB	900	3.0	6.4
2SK1602	$\pm$ -MOS II.5	TO-220(IS)	800	2.8	5.0
2SK1603	$\pm$ -MOS II.5	TO-220(IS)	900	2.5	6.4
2SK1641	$\pm$ -MOS II	TO-3P(N)	250	20.0	0.23
2SK1642	$\pm$ -MOS II	TO-220(IS)	400	9.0	0.55
2SK1643	$\pm$ -MOS II.5	TO-220AB	900	5.0	2.8
2SK1649	$\pm$ -MOS	TO-3P(N)	900	6.0	2.5
2SK1650	$\pm$ -MOS II	TO-3P(N)	900	4.0	4.3
2SK1651	$\pm$ -MOS III.5	TO-3P(N)IS	500	8.0	1.0
2SK1652	$\pm$ -MOS III.5	TO-3P(N)IS	500	13.0	0.45
2SK1653	L ² - $\pm$ -MOS IV	TO-220(IS)	60	45.0	0.02
2SK1692	$\pm$ -MOS II.5	TO-3P(N)	900	7.0	2.0
2SK1717	L ² - $\pm$ -MOS IV	PW-MINI	60	2.0	0.37
2SK1719	L ² - $\pm$ -MOS IV	PW-MOLD	60	5.0	0.11
2SK1720	$\pm$ -MOS III	TO-220FL/SM	60	45.0	0.03

Product Number	Series	Package	Main Characteristics		
			V _{DS} (V)	I _D (A)	R _{DS(ON)} max. (Ω)
2SK1721	≠-MOS II	TO-220FL/SM	500	3.0	3.0
2SK1722	≠-MOS II	TO-220FL/SM	500	5.0	1.5
2SK1723	≠-MOS II	TO-3P(N)	600	12.0	0.65
2SK1745	≠-MOS III.5	TO-3P(N)	500	18.0	0.36
2SK1746	≠-MOS II	TO-220FL/SM	600	2.0	4.0
2SK1766	≠-MOS III.5	TO-220(IS)	250	10.0	0.6
2SK1767	≠-MOS III.5	TO-220(IS)	600	3.5	2.5
2SK1768	L ² -≠-MOS III	NPM	60	12.0	0.07
2SK1769	≠-MOS II	NPM	600	2.0	4.0
2SK1792	L ² -≠-MOS IV	TO-220FL/SM	60	45.0	0.02
2SK1805	≠-MOS III.5	TO-220(IS)	500	7.0	0.85
2SK1854	≠-MOS III.5	TO-220(IS)	400	6.0	1.0
2SK1855	≠-MOS III.5	TO-3P(N)	500	12.0	0.7
2SK1858	≠-MOS II.5	TO-220FL/SM	800	3.0	5.0
2SK1864	≠-MOS III.5	TO-220FL/SM	500	8.0	0.85
2SK1865	≠-MOS III.5	TO-220FL/SM	500	12.0	0.7
2SK1879	L ² -≠-MOS IV	TO-3P(N)	60	45.0	0.03
2SK1882	L ² -≠-MOS IV	TO-220(IS)	60	25.0	0.05
2SK1913	≠-MOS III.5	TO-220(IS)	600	4.0	1.8
2SK1915	≠-MOS II	TO-220FL/SM	600	6.0	1.25
2SK1927	≠-MOS II	TO-220FL/SM	100	15.0	0.18
2SK1928	≠-MOS II	TO-220FL/SM	100	27.0	0.085
2SK1929	≠-MOS II.5	TO-220FL/SM	900	5.0	2.8
2SK1930	≠-MOS II.5	TO-220FL/SM	1000	4.0	3.8
2SK1997	L ² -≠-MOS IV	TO-220(IS)	60	36.0	0.03
2SK1998	L ² -≠-MOS IV	TO-3P(N)	60	45.0	0.03
2SK2013	≠-MOS II	TO-220(IS)	180	1.0	5.0
2SK2030	L ² -≠-MOS IV	PW-MOLD	60	5.0	0.14
2SK2038	≠-MOS II.5	TO-3P(N)	800	5.0	2.2
2SK2039	≠-MOS II.5	TO-3P(N)	900	5.0	2.5
2SK2056	≠-MOS II.5	TO-220(IS)	800	4.0	2.4
2SK2057	≠-MOS IV	TO-3P(N)	500	20.0	0.34
2SK2077	≠-MOS II.5	TO-3P(N)	800	7.0	1.7
2SK2078	≠-MOS II.5	TO-3P(N)	800	9.0	1.2
2SK2088	≠-MOS II	TO-220FL/SM	200	10.0	0.4
2SK2089	≠-MOS II.5	TO-220FL/SM	800	5.0	2.4
2SK2107	≠-MOS II	TO-220FL/SM	200	18.0	0.18
2SK2146	≠-MOS III.5	TO-220(IS)	250	2.0	2.0
2SK2149	≠-MOS IV	TO-3P(N)	500	10.0	0.8
2SK2150	≠-MOS IV	TO-3P(N)	500	15.0	0.4
2SK2162	≠-MOS II	PW-MOLD	180	1.0	5.0

Product Number	Series	Package	Main Characteristics		
			V _{DS} (V)	I _D (A)	R _{DS(ON)} max. (Ω)
2SK2173	L ² -≠-MOS V	TO-3P(N)	60	50.0	0.017
2SK2200	L ² -≠-MOS V	TPS	100	3.0	0.35
2SK2201	L ² -≠-MOS V	PW-MOLD	100	3.0	0.35
2SK2222	≠-MOS II.5	TO-3P(N)IS	800	5.0	2.2
2SK2228	L ² -≠-MOS IV	TPS	60	5.0	0.11
2SK2229	L ² -≠-MOS V	TPS	60	5.0	0.16
2SK2230	≠-MOS III.5	TPS	250	2.0	2.0
2SK2231	L ² -≠-MOS V	PW-MOLD	60	5.0	0.16
2SK2232	L ² -≠-MOS V	TO-220(IS)	60	25.0	0.046
2SK2233	L ² -≠-MOS V	TO-3P(N)	60	45.0	0.03
2SK2235	≠-MOS III.5	PW-MOLD	250	2.0	2.0
2SK2236	≠-MOS IV	TO-220(IS)	500	5.0	1.6
2SK2237	≠-MOS IV	TO-220(IS)	500	8.0	0.8
2SK2266	L ² -≠-MOS V	TO-220FL/SM	60	45.0	0.03
2SK2267	L ² -≠-MOS V	TO-3P(L)	60	60.0	0.011
2SK2274	≠-MOS II.5	TO-220(IS)	700	5.0	1.7
2SK2311	L ² -≠-MOS V	TO-220FL/SM	60	25.0	0.046
2SK2312	L ² -≠-MOS V	TO-220(IS)	60	45.0	0.017
2SK2313	L ² -≠-MOS V	TO-3P(N)	60	60.0	0.011
2SK2314	L ² -≠-MOS V	TO-220AB	100	27.0	0.085
2SK2319	≠-MOS II.5	TO-3P(N)IS	800	7.0	1.7
2SK2320	≠-MOS II.5	TO-3P(N)IS	800	8.5	1.2
2SK2350	≠-MOS V	TO-220(IS)	200	8.5	0.4
2SK2351	≠-MOS IV	TO-220AB	600	6.0	1.25
2SK2352	≠-MOS- IV	TO-220(IS)	600	6.0	1.25
2SK2376	L ² -≠-MOS V	TO-220FL/SM	60	45.0	0.017
2SK2381	≠-MOS V	TO-220(IS)	200	5.0	0.8
2SK2382	≠-MOS V	TO-220(IS)	200	15.0	0.18
2SK2385	L ² -≠-MOS V	TO-220(IS)	60	36.0	0.03
2SK2386	≠-MOS IV	TO-220AB	500	5.0	1.6
2SK2387	≠-MOS IV	TO-220AB	500	8.0	0.8
2SK2388	≠-MOS IV	TO-220(IS)	600	3.5	2.2
2SK2391	L ² -≠-MOS V	TO-220(IS)	100	20.0	0.085
2SK2398	≠-MOS V	TO-3P(N)	60	45.0	0.03
2SK2399	L ² -≠-MOS V	PW-MOLD	100	5.0	0.23
2SK2400	L ² -≠-MOS V	TPS	100	5.0	0.23
2SK2401	≠-MOS V	TO-220FL/SM	200	15.0	0.18
2SK2402	≠-MOS IV	TO-220AB	600	3.5	2.2
2SK2417	≠-MOS V	TO-220(IS)	250	7.5	0.5
2SK2445	≠-MOS V	TO-3P(N)	60	50.0	0.018
2SK2466	U-MOS	TO-220(IS)	100	30.0	0.046

Power MOSFET Product List

Product Number	Series	Package	Main Characteristics		
			V _{DS} (V)	I _D (A)	R _{DS(ON)} max. (Ω)
2SK2467	≠-MOS II	TO-3P(N)IS	180	9.0	0.8
2SK2493	≠-MOS V	PW-MOLD	16	5.0	0.1
2SK2507	L ² -≠-MOS V	TO-220(IS)	50	25.0	0.046
2SK2508	≠-MOS V	TO-220(IS)	250	13.0	0.25
2SK2542	≠-MOS V	TO-220AB	500	8.0	0.85
2SK2543	≠-MOS V	TO-220(IS)	500	8.0	0.85
2SK2544	≠-MOS V	TO-220AB	600	6.0	1.25
2SK2545	≠-MOS V	TO-220(IS)	600	6.0	1.25
2SK2549	≠-MOS V	PW-MINI	16	2.0	0.29
2SK2550	L ² -≠-MOS V	TO-3P(N)	50	45.0	0.03
2SK2551	L ² -≠-MOS V	TO-3P(N)	50	50.0	0.011
2SK2598	≠-MOS V	TO-220FL/SM	250	13.0	0.25
2SK2599	≠-MOS V	TPS	500	2.0	3.2
2SK2601	≠-MOS V	TO-3P(N)	500	10.0	1.0
2SK2602	≠-MOS V	TO-3P(N)	600	6.0	1.25
2SK2603	≠-MOS III	TO-220AB	800	3.0	3.6
2SK2604	≠-MOS III	TO-3P(N)	800	5.0	2.2
2SK2605	≠-MOS III	TO-220(IS)	800	5.0	2.2
2SK2606	≠-MOS III	TO-3P(N)IS	800	8.5	1.2
2SK2607	≠-MOS III	TO-3P(N)	800	9.0	1.2
2SK2608	≠-MOS III	TO-220AB	900	3.0	4.3
2SK2610	≠-MOS III	TO-3P(N)	900	5.0	2.5
2SK2611	≠-MOS III	TO-3P(N)	900	9.0	1.4
2SK2613	≠-MOS III	TO-3P(N)	1000	8.0	1.7
2SK2614	L ² -≠-MOS V	DP	50	20.0	0.046
2SK2615	L ² -≠-MOS V	PW-MINI	60	2.0	0.3
2SK2661	≠-MOS V	TO-220AB	500	5.0	1.5
2SK2662	≠-MOS V	TO-220(IS)	500	5.0	1.5
2SK2679	≠-MOS V	TO-220(IS)	400	5.5	1.2
2SK2698	≠-MOS V	TO-3P(N)	500	15.0	0.4
2SK2699	≠-MOS V	TO-3P(N)	600	12.0	0.65
2SK2700	≠-MOS III	TO-220(IS)	900	3.0	4.3
2SK2717	≠-MOS III	TO-220(IS)	900	5.0	2.5
2SK2718	≠-MOS III	TO-220(IS)	900	2.5	6.4
2SK2719	≠-MOS III	TO-3P(N)	900	3.0	4.3
2SK2733	≠-MOS III	TO-220AB	900	1.0	9.0
2SK2741	L ² -≠-MOS V	SP	60	5.0	0.16
2SK2742	L ² -≠-MOS V	SP	100	3.0	0.35
2SK2744	≠-MOS V	TO-3P(N)	50	45.0	0.02
2SK2745	L ² -≠-MOS V	TO-3P(N)	50	50.0	0.0095
2SK2746	≠-MOS III	TO-3P(N)	800	7.0	1.7

Product Number	Series	Package	Main Characteristics		
			V _{DS} (V)	I _D (A)	R _{DS(ON)} max. (Ω)
2SK2749	≠-MOS III	TO-3P(N)	900	7.0	2.0
2SK2750	≠-MOS V	TO-220(IS)	600	3.5	2.2
2SK2776	≠-MOS V	TO-220FL/SM	500	8.0	0.85
2SK2777	≠-MOS V	TO-220FL/SM	600	6.0	1.25
2SK2782	L ² -≠-MOS V	DP	60	20.0	0.055
2SK2789	L ² -≠-MOS V	TO-220FL/SM	100	27.0	0.085
2SK2835	≠-MOS V	TPS	200	5.0	0.8
2SK2836	≠-MOS V	SP	600	1.0	9.0
2SK2837	≠-MOS V	TO-3P(N)	500	20.0	0.27
2SK2838	≠-MOS V	TO-220FL/SM	400	5.5	1.2
2SK2839	L ² -≠-MOS V	SP	30	10.0	0.04
2SK2841	≠-MOS V	TO-220AB	400	10.0	0.55
2SK2842	≠-MOS V	TO-220(IS)	500	12.0	0.52
2SK2843	≠-MOS V	TO-220(IS)	600	10.0	0.75
2SK2844	L ² -≠-MOS V	TO-220AB	30	35.0	0.02
2SK2845	≠-MOS III	DP	900	1.0	9.0
2SK2846	≠-MOS V	TPS	600	2.0	5.0
2SK2847	≠-MOS III	TO-3P(N)IS	900	8.0	1.4
2SK2862	≠-MOS V	TO-220(IS)	500	2.0	3.0
2SK2865	≠-MOS V	PW-MOLD	600	2.0	5.0
2SK2866	≠-MOS V	TO-220(AB)	600	10.0	0.75
2SK2883	≠-MOS III	TO-220FL/SM	800	3.0	3.6
2SK2884	≠-MOS III	TO-220FL/SM	800	5.0	2.2
2SK2886	L ² -≠-MOS V	TO-220(IS)	50	45.0	0.02
2SK2889	≠-MOS V	TO-220FL/SM	600	10.0	0.75
2SK2914	≠-MOS V	TO-220AB	250	7.5	0.5
2SK2915	≠-MOS V	TO-3P(N)	600	16.0	0.4
2SK2916	≠-MOS V	TO-3P(N)IS	500	14.0	0.4
2SK2917	≠-MOS V	TO-3P(N)IS	500	18.0	0.27
2SK2920	≠-MOS V	PW-MOLD	200	5.0	0.8
2SK2949	≠-MOS V	TO-220FL/SM	400	10.0	0.55
2SK2952	≠-MOS V	TO-220(IS)	400	8.5	0.55
2SK2953	≠-MOS V	TO-3P(N)IS	600	15.0	0.4
2SK2961	L ² -≠-MOS V	TO-92MOD	60	2.0	0.27
2SK2962	L ² -≠-MOS V	TO-92MOD	100	1.0	0.7
2SK2963	L ² -≠-MOS V	PW-MINI	100	1.0	0.7
2SK2964	L ² -≠-MOS V	PW-MINI	30	2.0	0.18
2SK2965	≠-MOS V	TO-220(IS)	200	11.0	0.26
2SK2967	≠-MOS V	TO-3P(N)	250	30.0	0.068
2SK2968	≠-MOS III	TO-3P(N)	900	10.0	1.25
2SK2985	U-MOS	TO-220(IS)	60	45.0	5.8

Product Number	Series	Package	Main Characteristics		
			V _{DS}	I _D	R _{DS(ON)} max.
(V)	(A)	(Ω)			
2SK2986	U-MOS	TO-220FL/SM	60	55.0	5.8
2SK2987	U-MOS	TO-3P(N)	60	70.0	5.8
2SK2989	L ² - μ -MOS V	TO-92MOD	50	5.0	0.15
2SK2991	μ -MOS V	TO-220FL/SM	500	5.0	1.5
2SK2992	μ -MOS V	PW-MINI	200	1.0	3.5
2SK2993	μ -MOS V	TO-220FL/SM	250	20.0	0.105
2SK2995	μ -MOS V	TO-3P(N)IS	250	30.0	0.068
2SK2996	μ -MOS V	TO-220(IS)	600	10.0	1.0
*2SK2997	μ -MOS III	DP	800	1.5	8.0
2SK2998	μ -MOS V	TO-92MOD	500	0.5	18.0
2SK3017	μ -MOS III	TO-3P(N)IS	900	8.5	1.25
2SK3051	L ² - μ -MOS V	TO-220FL/SM	50	45.0	0.03
2SK3067	μ -MOS V	TO-220(IS)	600	2.0	5.0
2SK3068	μ -MOS V	TO-220FL/SM	500	12.0	0.52
2SK3085	μ -MOS V	TO-220AB	600	3.5	2.2
2SK3089	L ² - μ -MOS V	TO-220FL/SM	30	40.0	0.03
2SK3090	L ² - μ -MOS V	TO-220FL/SM	30	45.0	0.02
2SK3117	μ -MOS V	TO-3P(SM)	500	20.0	0.27
2SK3125	L ² - μ -MOS V	TO-3P(SM)	30	60.0	0.007
2SK3126	μ -MOS V	TO-220(IS)	450	10.0	0.65
2SK3127	L ² - μ -MOS V	TO-220FL/SM	30	45.0	0.011
2SK3128	L ² - μ -MOS V	TO-3P(N)	30	60.0	0.011
2SK3130	μ -MOS V	TO-220(IS)	600	6.0	1.5
2SK3131	μ -MOS V	TO-3P(L)	500	50.0	0.11
2SK3132	μ -MOS V	TO-3P(L)	500	50.0	0.095
2SK3176	μ -MOS V	TO-3P(N)	200	30.0	0.052
2SK3236	U-MOS	TO-220(IS)	60	45.0	0.02
2SK3265	μ -MOS V	TO-220(IS)	700	10.0	1.0
2SK3301	μ -MOS III	PW-MOLD	900	1.0	20.0
2SK3302	μ -MOS V	TPS	500	0.5	18.0
2SK3309	μ -MOS V	TO-220FL/SM	450	10.0	0.65
2SK3310	μ -MOS V	TO-220(IS)	450	10.0	0.65
*2SK3312	μ -MOS V	TO-220FL/SM	600	6.0	1.25
2SK3313	μ -MOS V	TO-220(IS)	500	12.0	0.62
2SK3314	μ -MOS V	TO-3P(N)	500	15.0	0.44
2SK3316	μ -MOS V	TO-220(IS)	500	5.0	1.8
2SK3342	μ -MOS V	PW-MOLD	250	4.5	1.0
*2SK3343	U-MOS II	DP	60	20.0	0.02
2SK3371	μ -MOS V	PW-MOLD	600	1.0	9.0
2SK3387	TFP	TFP	150	18.0	0.08
2SK3388	TFP	TFP	250	20.0	0.105

Product Number	Series	Package	Main Characteristics		
			V _{DS}	I _D	R _{DS(ON)} max.
(V)	(A)	(Ω)			
2SK3389	TFP	TFP	30	75.0	0.005
2SK3397	U-MOS II	TFP	60	70.0	0.006
2SK3398	TFP	TFP	500	12.0	0.52
2SK3399	μ -MOS V	TO-220FL/SM	600	10.0	0.75
2SK3403	μ -MOS V	TO-220FL/SM	450	13.0	0.4
2SK3437	μ -MOS V	TO-220FL/SM	600	10.0	1.0
2SK3438	TFP	TFP	600	10.0	0.1
2SK3439	TFP	TFP	30	75.0	0.005
2SK3440	TFP	TFP	60	75.0	0.008
2SK3441	TFP	TFP	60	75.0	0.0058
2SK3442	TFP	TFP	100	75.0	0.015
2SK3443	TFP	TFP	150	30.0	0.028
2SK3444	TFP	TFP	200	25.0	0.055
2SK3445	TFP	TFP	250	20.0	0.105
2SK3462	μ -MOS V	PW-MOLD	250	3.0	1.7
2SK3466	TFP	TFP	500	5.0	1.5
2SK3471	μ -MOS V	PW-MINI	500	0.5	18.0
2SK3472	μ -MOS V	PW-MOLD	450	1.0	4.6
*2SK3498	μ -MOS V	PW-MOLD	400	1.0	5.5
2SK3499	TFP	TFP	400	8.5	0.55
*2SK3538	μ -MOS V	TFP	500	8.0	0.85
*2SK3643	μ -MOS V	PW-MOLD	450	2.5	2.45
*S2Y65	U-MOS III	SOP-8	30	13.0	0.008
*S3C06	U-MOS III	SOP-8	-30	-13.0	0.005
*S3C69	μ -MOS V	PW-MOLD	500	2.0	3.2
*S3D18	U-MOS III	SOP-8	30	15.0	0.0045
*S3D19	U-MOS III	SOP-8	30	11.0	0.014
*S3D72	μ -MOS V	TO-220(IS)	450	2.5	2.45
*S3E33	U-MOS III	SOP-8	-30	-11.0	0.011
*S3E67	U-MOS III	SOP-8	30	11.0	0.016
*S3E71	U-MOS III	SOP-8	-20	-3.5	0.12
*S3E72	U-MOS III	SOP-8	-30	-3.5	0.12
*S3E73	U-MOS III	SOP-8	30	5.0	0.05
TPC6001	U-MOS II	VS-6	20	6.0	0.03
TPC6002	U-MOS II	VS-6	30	6.0	0.03
TPC6003	U-MOS III	VS-6	30	6.0	0.024
TPC6004	U-MOS III	VS-6	20	6.0	0.024
TPC6005	U-MOS III	VS-6	30	6.0	0.028
TPC6101	U-MOS II	VS-6	-20	-4.5	0.06
TPC6102	U-MOS II	VS-6	-30	-4.5	0.06
TPC6103	U-MOS III	VS-6	-12	-4.5	0.035

* = Under development

Power MOSFET Product List

Product Number	Series	Package	Main Characteristics		
			V _{DS}	I _D	R _{DS(ON)} max.
			(V)	(A)	(Ω)
TPC6104	U-MOS III	VS-6	−20	−4.5	0.04
TPC6201	U-MOS II	VS-6	30	2.5	0.095
TPC8001	L ² - μ -MOS VI	SOP-8	30	7.0	0.02
TPC8002	L ² - μ -MOS VI	SOP-8	30	11.0	0.014
TPC8003	U-MOS II	SOP-8	30	13.0	0.007
TPC8004	L ² - μ -MOS VI	SOP-8	30	5.0	0.05
TPC8005-H	U-MOS II	SOP-8	30	11.0	0.016
TPC8006-H	U-MOS II	SOP-8	30	7.0	0.027
TPC8007-H	U-MOS II	SOP-8	30	13.0	0.01
TPC8009-H	U-MOS III	SOP-8	30	13.0	0.01
TPC8012-H	μ -MOS V	SOP-8	200	1.8	0.4
TPC8013-H	U-MOS III	SOP-8	30	15.0	0.0065
TPC8102	L ² - μ -MOS VI	SOP-8	−30	−6.0	0.04
TPC8103	U-MOS II	SOP-8	−30	−11.0	0.013
TPC8104-H	U-MOS II	SOP-8	−30	−5.0	0.065
TPC8105-H	U-MOS II	SOP-8	−30	−7.0	0.04
TPC8106-H	U-MOS II	SOP-8	−30	−10.0	0.02
TPC8107	U-MOS III	SOP-8	−30	−13.0	0.007
TPC8108	U-MOS III	SOP-8	−30	−11.0	0.013
TPC8109	U-MOS III	SOP-8	−30	−10.0	0.02
TPC8110	U-MOS III	SOP-8	−40	−8.0	0.25
TPC8201	L ² - μ -MOS VI	SOP-8	30	5.0	0.05
TPC8202	μ -MOS VI	SOP-8	20	5.0	0.05
TPC8203	U-MOS II	SOP-8	30	6.0	0.021
TPC8204	U-MOS II	SOP-8	20	6.0	0.02
TPC8206	U-MOS II	SOP-8	60	7.0	0.05
TPC8207	U-MOS II	SOP-8	20	6.0	0.02
TPC8208	U-MOS II	SOP-8	20	5.0	0.05
TPC8301	L ² - μ -MOS	SOP-8	−30	−3.5	0.12
TPC8302	μ -MOS VI	SOP-8	−20	−3.5	0.12
TPC8303	U-MOS II	SOP-8	−30	−4.5	0.035
TPC8305	U-MOS II	SOP-8	−20	−5.0	0.03
TPC8401	U-MOS II	SOP-8	30 −30	6.0 −4.5	0.021 0.035
TPC8402	U-MOS II	SOP-8	30 −30	5.0 −4.5	0.05 0.035
TPC8403	U-MOS II	SOP-8	30 −30	6.0 −4.5	0.033 0.055
TPCS8004	μ -MOS VI	TSSOP-8	200	1.3	0.8
TPCS8101	U-MOS II	TSSOP-8	−20	−6.0	0.02
TPCS8102	U-MOS II	TSSOP-8	−30	−6.0	0.025
TPCS8201	U-MOS II	TSSOP-8	20	5.0	0.03
TPCS8203	U-MOS II	TSSOP-8	20	6.0	0.024
TPCS8204	U-MOS III	TSSOP-8	20	6.0	0.017

Product Number	Series	Package	Main Characteristics		
			V _{DS}	I _D	R _{DS(ON)} max.
			(V)	(A)	(Ω)
TPCS8205	U-MOS II	TSSOP-8	20	5.0	0.045
TPCS8206	U-MOS II	TSSOP-8	20	5.0	0.03
TPCS8207	U-MOS II	TSSOP-8	20	6.0	0.024
TPCS8208	U-MOS III	TSSOP-8	20	6.0	0.017
TPCS8209	U-MOS III	TSSOP-8	20	5.0	0.03
TPCS8210	U-MOS III	TSSOP-8	20	5.0	0.03
TPCS8211	U-MOS III	TSSOP-8	20	6.0	0.024
TPCS8212	U-MOS III	TSSOP-8	20	6.0	0.024
TPCS8302	U-MOS III	TSSOP-8	−20	−5.0	0.035

* = Under development

Power MOSFET Superseded Products

The product number in the left-hand column below are soon to be superseded. When ordering, please choose

from among the recommended products in the right-hand column.

Superseded Products					Recommended Replacement Products				
Product No.	Electrical Characteristics			Package	Recommended Replacement Products	Electrical Characteristics			Package
	V _{DSS} (V)	I _D (A)	R _{DS(ON)} max (Ω)			V _{DSS} (V)	I _D (A)	R _{DS(ON)} max (Ω)	
2SJ238	−60	−1	0.85	PW-MINI	2SJ360	−60	−1	0.73	PW-MINI
2SJ239	−60	−5	0.25	PW-MOLD	2SJ377	−60	−5	0.19	PW-MOLD
2SJ240	−60	−20	0.045	TO-220(IS)	2SJ349	−60	−20	0.045	TO-220(IS)
2SJ241	−60	−20	0.045	TO-220FL/SM	2SJ401	−60	−20	0.045	TO-220FL/SM
2SK386	450	10	0.7	TO-3PL	2SK2698	500	15	0.4	TO-3P(N)
2SK447	250	15	0.24	TO-3P(L)	2SK2508	250	13	0.25	TO-220(IS)
2SK537	900	1	9	TO-220AB	2SK2733	900	1	9	TO-220AB
2SK538	900	3	4.5	TO-3P(N)	2SK2719	900	3	4.5	TO-3P(N)
2SK791	850	3	4.5	TO-220AB	2SK2608	900	3	4.3	TO-220AB
2SK792	900	3	4.5	TO-220AB	2SK2608	900	3	4.3	TO-220AB
2SK850	100	35	0.06	TO-3P(N)	2SK2466	100	30	0.046	TO-220(IS)
2SK851	200	30	0.085	TO-3P(N)	2SK2967	250	30	0.07	TO-3P(N)
2SK889	100	27	0.085	TO-220AB	2SK2314	100	27	0.085	TO-220AB
2SK942	60	25	0.046	TO-220AB	2SK2232	60	25	0.046	TO-220(IS)
2SK943	60	25	0.046	TO-220(IS)	2SK2232	60	25	0.046	TO-220(IS)
2SK945	400	1	5	PW-MOLD	2SK2599	500	2	3	TPS
2SK1078	60	0.8	0.55	PW-MINI	2SK2615	60	2	0.37	PW-MINI
2SK1117	600	6	1.25	TO-220AB	2SK2544	600	6	1.25	TO-220AB
2SK1118	600	6	1.25	TO-220(IS)	2SK2545	600	6	1.25	TO-220(IS)
2SK1349	100	25	0.058	TO-220(IS)	2SK2391	100	20	0.085	TO-220(IS)
2SK1356	900	3	4.3	TO-220(IS)	2SK2700	900	3	4.3	TO-220(IS)
2SK1357	900	5	2.8	TO-3P(N)	2SK2610	900	5	2.5	TO-3P(N)
2SK1358	900	9	1.4	TO-3P(N)	2SK2611	900	9	1.4	TO-3P(N)
2SK1363	900	8	1.4	TO-3P(N) IS	2SK2847	900	8	1.4	TO-3P(N) IS
2SK1377	400	5.5	1.2	TO-220(IS)	2SK2679	400	5.5	1.2	TO-220(IS)
2SK1542	60	45	0.020	TO-220AB	2SK2376	60	45	0.017	TO-220FL/SM
2SK1603	900	2.5	6.4	TO-220(IS)	2SK2718	900	2.5	6.4	TO-220(IS)
2SK1641	250	20	0.23	TO-3P(N)	2SK2993	250	20	0.11	TO-220FL/SM
2SK1642	400	9	0.55	TO-220(IS)	2SK2952	400	8.5	0.55	TO-220(IS)
2SK1643	900	5	2.8	TO-220AB	2SK2717	900	5	2.5	TO-220(IS)
2SK1651	500	8	1	TO-3P(N) IS	*2SK2600	500	8	0.85	TO-3P(N) IS
2SK1653	60	45	0.020	TO-220(IS)	2SK2312	60	45	0.017	TO-220(IS)
2SK1692	900	7	2.0	TO-3P(N)	2SK2749	900	7	2.0	TO-3P(N)
2SK1717	60	2	0.37	PW-MINI	2SK2615	60	2	0.37	PW-MINI
2SK1722	500	5	1.5	TO-220FL/SM	2SK2991	500	5	1.5	TO-220FL/SM
2SK1723	600	12	0.65	TO-3P(N)	2SK2699	600	12	0.65	TO-3P(N)
2SK1745	500	18	0.36	TO-3P(N)	2SK2837	500	20	0.27	TO-3P(N)
2SK1766	250	10	0.6	TO-220(IS)	2SK2417	250	7.5	0.5	TO-220(IS)
2SK1792	60	45	0.02	TO-220FL/SM	2SK2376	60	45	0.017	TO-220FL/SM
2SK1858	800	3	5.0	TO-220FL/SM	2SK2883	800	3	3.6	TO-220FL/SM
2SK1927	100	15	0.1	TO-220FL/SM	2SK2789	100	27	0.85	TO-220FL/SM
2SK1928	100	27	0.085	TO-220FL/SM	2SK2789	100	27	0.85	TO-220FL/SM
2SK2039	900	5	2.5	TO-3P(N)	2SK2610	900	5	2.5	TO-3P(N)
2SK2056	900	4	2.4	TO-220(IS)	2SK2605	800	5	2.2	TO-220(IS)
2SK2057	500	20	0.34	TO-3P(N)	2SK2837	500	20	0.27	TO-3P(N)
2SK2077	800	7	1.7	TO-3P(N)	2SK2746	800	7	1.7	TO-3P(N)
2SK2078	800	9	1.2	TO-3P(N)	2SK2607	800	9	1.2	TO-3P(N)
2SK2150	500	15	0.4	TO-3P(N)	2SK2698	500	15	0.4	TO-3P(N)

* : Under development

Power MOSFETs Superseded Products

The product number in the left-hand column below are soon to be superseded. When ordering, please choose

from among the recommended products in the right-hand column.

Superseded Products					Recommended Replacement Products				
Product No.	Electrical Characteristics			Package	Recommended Replacement Products	Electrical Characteristics			Package
	V _{DSS} (V)	I _D (A)	R _{DS(ON)} max (Ω)			V _{DSS} (V)	I _D (A)	R _{DS(ON)} max (Ω)	
2SK2236	500	5	1.6	TO-220(IS)	2SK2662	500	5	1.5	TO-220(IS)
2SK2237	500	7	0.8	TO-220(IS)	2SK2543	500	8	0.85	TO-220(IS)
2SK2320	800	8.5	1.2	TO-3P(N) IS	2SK2607	800	9	1.2	TO-3P(N)
2SK2351	600	6	1.25	TO-220AB	2SK2544	600	6	1.25	TO-220AB
2SK2352	600	6	1.25	TO-220(IS)	2SK2545	600	6	1.25	TO-220(IS)
TPC8002	30	11	0.014	SOP-8	*S3D19	30	11	0.014	SOP-8
TPC8005-H	30	11	0.016	SOP-8	*TPC8010-H	30	11	0.016	SOP-8
TPC8007-H	30	13	0.01	SOP-8	TPC8009-H	30	13	0.01	SOP-8
TPC8102	– 30	– 6	0.04	SOP-8	TPC8105-H	– 30	– 7	0.04	SOP-8
TPC8103	– 30	– 11	0.013	SOP-8	TPC8108	– 30	– 11	0.013	SOP-8
TPC8106-H	– 30	– 10	0.02	SOP-8	TPC8109	– 30	– 10	0.02	SOP-8
TPC8201	30	5	0.05	SOP-8	*TPC8209	30	5	0.05	SOP-8
TPC8202	20	5	0.05	SOP-8	TPC8208	20	5	0.05	SOP-8
TPC8204	20	6	0.02	SOP-8	TPC8207	20	6	0.02	SOP-8
TPC8301	– 30	– 3.5	0.12	SOP-8	*TPC8303	– 30	–	0.027	SOP-8
TPC8302	– 20	– 3.5	0.12	SOP-8	*TPC8305	– 20	–	0.03	SOP-8
TPCS8201	20	5	0.03	TSSOP-8	TPCS8209	20	5	0.03	TSSOP-8
TPCS8203	20	6	0.024	TSSOP-8	TPCS8211	20	6	0.024	TSSOP-8
TPCS8206	20	5	0.03	TSSOP-8	TPCS8210	20	5	0.03	TSSOP-8
TPCS8207	20	6	0.024	TSSOP-8	TPCS8212	20	6	0.024	TSSOP-8

※: Under development

■ (1) Final-Phase Production

Product No.	Recommended Replacement Products
2SJ147	2SJ304
2SK385	2SK2698
2SK387	2SK2882
2SK388	2SK2508
2SK525	2SK2382
2SK526	2SK2417
2SK528	2SK2662
2SK529	2SK2662
2SK530	2SK2662
2SK531	2SK2662
2SK532	2SK2232
2SK539	2SK2610
2SK578	2SK2882
2SK891	2SK2382
2SK893	2SK2661
2SK944	2SK2967
2SK1116	2SK2232
2SK1213	2SK2602
2SK1347	2SK2314
2SK1362	2SK2610

Product No.	Recommended Replacement Products
2SK1378	2SK2841
2SK1600	2SK2603
2SK1601	2SK2608
2SK1652	2SK2698
2SK1720	2SK2266
2SK1721	2SK2991
2SK1746	2SK2865
2SK1768	2SK2614
2SK1769	2SK2599
2SK1854	2SK2952
2SK1864	2SK2776
2SK1865	2SK2776
2SK1882	2SK2232
2SK1915	2SK2777
2SK1929	2SK2884
2SK1997	2SK2385
2SK1998	2SK2233
2SK2038	2SK2604
2SK2088	2SK2401
2SK2089	2SK2884

Product No.	Recommended Replacement Products
2SK2107	2SK2401
2SK2149	2SK2601
2SK2222	2SK2604
2SK2319	2SK2746
2SK2386	2SK2661
2SK2387	2SK2542
2SK2388	2SK2750
2SK2402	2SK2750

Power MOSFET Final-Phase and Discontinued Products

(2) Discontinued Products

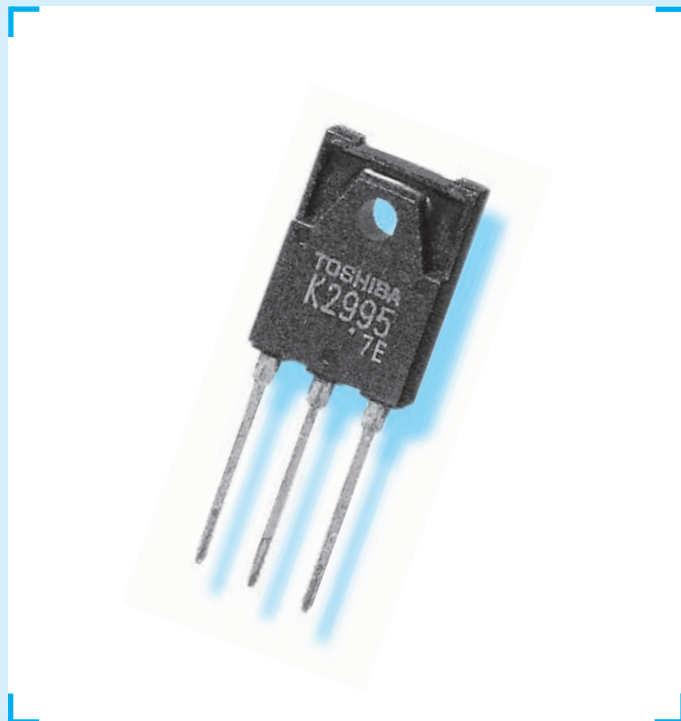
Product No.	Recommended Replacement Products
2SJ91	2SJ200
2SJ92	2SJ200
2SJ123	2SJ304
2SJ124	2SJ304
2SJ126	2SJ304
2SJ183	2SJ377
2SJ224	2SJ312
2SK271	2SK1529
2SK272	2SK1529
2SK324	2SK2698
2SK325	2SK2698
2SK355	2SK387
2SK356	2SK388
2SK357	2SK2381
2SK358	2SK2417
2SK405	2SK1529
2SK417	2SK2232
2SK418	2SK2662
2SK419	2SK2662
2SK420	2SK2662
2SK421	2SK2662
2SK422	2SK2961
2SK423	2SK941
2SK442	2SK2232
2SK527	2SK2232
2SK568	—
2SK572	—
2SK573	2SK1641
2SK643	2SK2601
2SK644	2SK2601
2SK672	2SK2232
2SK673	2SK2232
2SK674	2SK2232
2SK678	2SK2698
2SK693	2SK2698
2SK694	2SK2698
2SK708	2SK2698
2SK788	2SK2698
2SK789	2SK2698
2SK790	2SK2698
2SK793	2SK2610
2SK794	2SK2610
2SK849	2SK2233
2SK856	2SK2385
2SK857	2SK2233
2SK858	2SK2750
2SK888	2SK2350
2SK890	2SK2350
2SK892	2SK2662
2SK894	2SK2542
2SK895	2SK2601
2SK896	2SK2695
2SK1029	2SK2698

Product No.	Recommended Replacement Products
2SK1112	2SK2231
2SK1113	2SK2201
2SK1114	2SK2232
2SK1115	2SK2232
2SK1124	2SK2233
2SK1251	2SK2231
2SK1252	2SK2201
2SK1333	2SK2698
2SK1344	2SK2232
2SK1346	2SK2232
2SK1348	2SK2391
2SK1350	2SK2382
2SK1351	2SK2662
2SK1352	2SK2543
2SK1379	2SK2173
2SK1380	2SK2267
2SK1487	2SK2601
2SK1488	2SK2601
2SK1513	2SK2601
2SK1531	2SK2698
2SK1574	2SK2542
2SK1602	2SK2603
2SK1649	2SK2610
2SK1650	2SK2719
2SK1767	2SK2750
2SK1805	2SK2543
2SK1855	2SK2698
2SK1879	2SK2398
2SK1913	2SK2750
YTF150	2SK850
YTF151	2SK2466
YTF152	2SK2466
YTF153	2SK2466
YTF250	* 2SK2967
YTF251	* 2SK2967
YTF252	* 2SK2967
YTF253	* 2SK2967
YTF440	2SK2601
YTF441	2SK2601
YTF442	2SK2601
YTF443	2SK2601
YTF450	2SK2698
YTF451	2SK2698
YTF452	2SK2698
YTF453	2SK2698
YTF520	2SK2399
YTF521	2SK2350
YTF522	2SK2350
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YTF530	2SK2350
YTF531	2SK2350
YTF532	2SK2350
YTF533	2SK2350

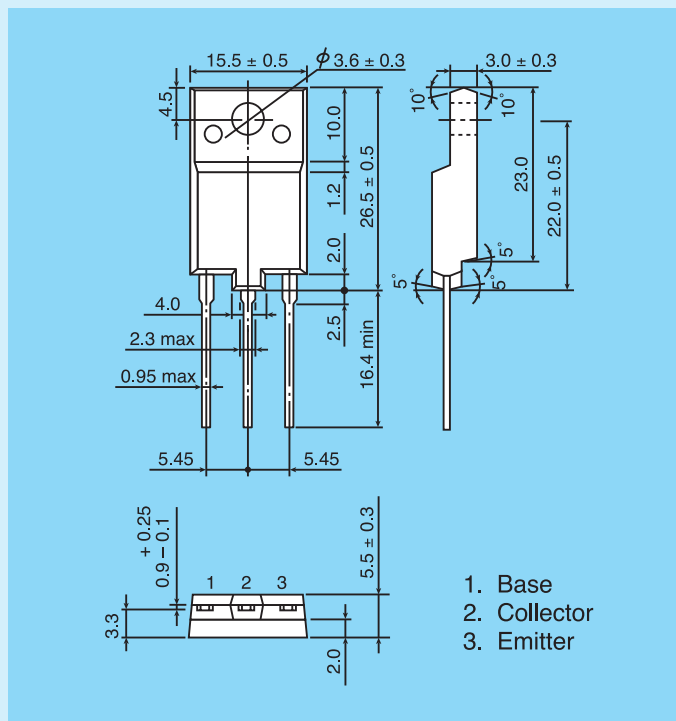
Product No.	Recommended Replacement Products
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YTF541	2SK2391
YTF542	2SK2391
YTF543	2SK2391
YTF610	2SK2381
YTF611	2SK2381
YTF612	2SK2381
YTF613	2SK2381
YTF620	2SK2381
YTF621	2SK2381
YTF622	2SK2381
YTF623	2SK2381
YTF630	2SK2350
YTF631	2SK2350
YTF632	2SK2350
YTF633	2SK2350
YTF640	2SK2382
YTF641	2SK2382
YTF642	2SK2382
YTF643	2SK2382
YTF820	2SK2661
YTF821	2SK2661
YTF822	2SK2661
YTF823	2SK2661
YTF830	2SK2661
YTF831	2SK2661
YTF832	2SK2661
YTF833	2SK2661
YTF840	2SK2542
YTF841	2SK2544
YTF842	2SK2544
YTF843	2SK2544

■ Appearance

TO-3P(H)IS

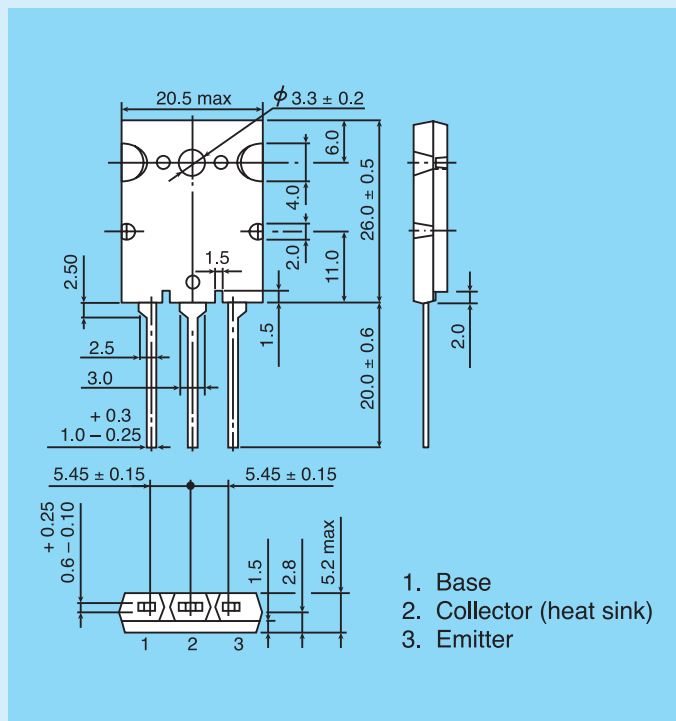
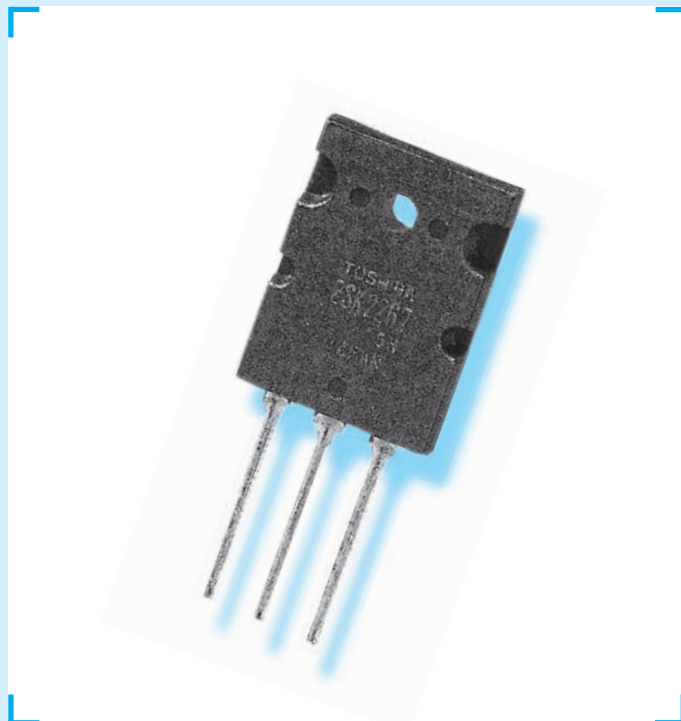


■ Package dimensions



(Unit: mm)

TO-3P(LH)



(Unit: mm)

Deflection Transistor – Characteristics List

2SC Series

Product No.	Maximum Ratings			Built-in damper diode	h _{FE}			V _{CE(sat)} Max			Switching Time (Max)				Genera- tion
	V _{CBO} (V)	I _C (A)	P _C (W)		Min (–)	Max (–)	@5V/I _C (A)	(V)	@ I _C (A)	@ I _B (A)	t _{stg} (μs)	t _f (μs)	@ f _H (kHz)	@ I _{cp} (A)	
2SC5280	1500	8	50	✓	4.0	8.5	6	5	6	1.5	6.0	0.50	32	6.0	4th
2SC5339	1500	7	50	✓	4.0	8.0	5	5	5	1.25	6.0	0.50	32	5.0	4th
2SC5386	1500	8	50		4.3	7.5	6	3	6	1.5	3.5	0.30	64	5.0	4th
2SC5387	1500	10	50		4.3	7.8	8	3	8	2	3.5	0.30	64	6.0	4th
2SC5404	1500	9	50		4.0	8.0	7	3	7	1.75	3.5	0.30	64	5.5	4th
2SC5411	1500	14	60		4.0	8.0	11	3	11	2.75	3.5	0.30	64	8.5	4th
2SC5421	1500	15	180		4.0	8.0	11	3	11	2.75	3.5	0.30	64	8.5	4th
2SC5422	1700	15	200		4.5	8.5	11	3	11	2.75	3.5	0.30	64	8.0	4th
2SC5445	1500	20	200		4.5	8.5	15	3	15	3.75	2.2	0.15	100	8.0	4th
2SC5446	1700	18	200		4.0	8.0	14	3	14	3.5	2.3	0.15	100	7.0	4th
2SC5570	1700	28	200		4.5	7.5	22	3	22	5.5	1.6	0.15	130	8.0	4th
2SC5587	1500	17	75		5.0	8.0	14	3	14	3.5	2.0	0.15	100	7.5	4th
2SC5588	1700	15	75		4.8	8.0	12	3	12	3	2.0	0.15	100	6.5	4th
2SC5589	1500	18	200		5.0	8.0	14	3	14	3.5	2.0	0.15	100	7.5	4th
2SC5590	1700	16	200		4.8	8.0	12	3	12	3	2.0	0.15	100	6.5	4th
2SC5612	2000	22	220		4.8	9.0	17	3	17	4.25	5.0	0.35	32	8.0	4th
2SC5695	1500	22	200		4.5	8.5	17	3	17	3.75	2.1	0.15	100	8.0	5th
2SC5716	1700	8	55	✓	3.8	9.0	6	5	6	1.5	5.0	0.35	32	5.5	4th
2SC5717	1500	21	75		4.5	8.5	17	3	17	3.75	2.1	0.15	100	8.0	5th
*(2SC5748)	2000	16	210		4.8	7.5	12	3	12	3	5.0	0.35	32	8.0	5th
*(2SC5749)	2000	16	210	✓	4.8	9.0	12	3	12	3	5.0	0.35	32	8.0	5th
*(S3D20)	1500	14	55		4.0	8.0	11	3	11	2.75	3.5	0.30	90	6.5	5th
*(S3D21)	1700	28	210		4.5	7.5	22	3	22	5.5	1.6	0.15	130	8.0	5th

2SD Series

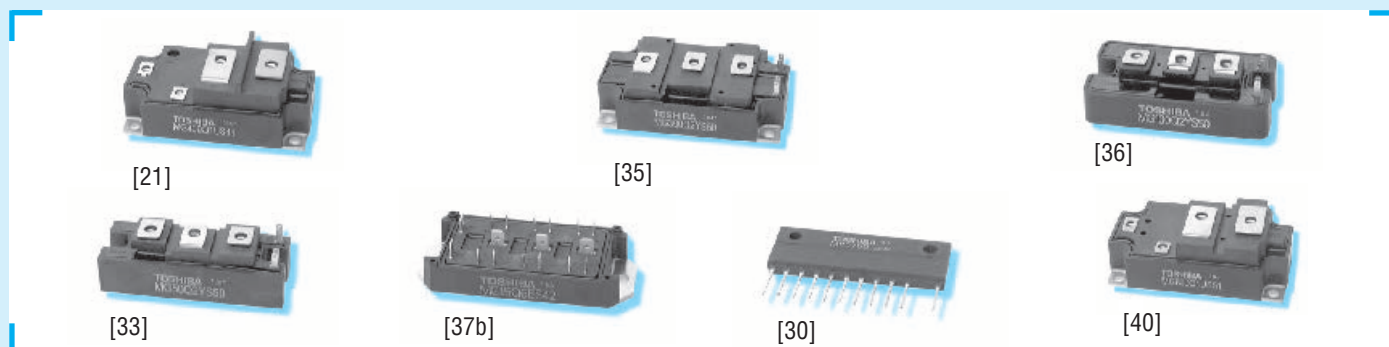
Product No.	Maximum Ratings			Built-in damper diode	h _{FE}			V _{CE(sat)} Max			Switching Time (Max)				Genera- tion
	V _{CBO} (V)	I _C (A)	P _C (W)		Min (–)	Max (–)	@5V/I _C (A)	(V)	@ I _C (A)	@ I _B (A)	t _{stg} (μs)	t _f (μs)	@ f _H (kHz)	@ I _{cp} (A)	
2SD2498	1500	6	50		5	9	4	5	4	0.8	10	0.7	15.75	4	3rd
2SD2499	1500	6	50	✓	5	9	4	5	4	0.8	11	0.6	15.75	4	3rd
2SD2500	1500	10	50		4	8	6	3	6	1.5	11	0.7	15.75	6	3rd
2SD2539	1500	7	50	✓	5	9	5	5	5	1	9	0.6	15.75	5	3rd
2SD2550	1700	4	50	✓	8	22	1	8	3	0.8	10	0.6	15.75	3	3rd
2SD2551	1700	5	50	✓	5	10	4	5	4	0.8	10	1.0	15.75	4	3rd
2SD2553	1700	8	50	✓	5	9	6	5	6	1.2	12	0.7	15.75	6	3rd
2SD2559	1500	8	50	✓	5	9	6	5	6	1.2	12	1.0	15.75	6	4th
2SD2586	1500	5	50	✓	4.4	8.5	3.5	5	3.5	0.8	10	0.6	15.75	3.5	4th
2SD2599	1500	3.5	40	✓	8	25	0.5	8	3	0.8	10	1.0	15.75	3	4th
2SD2638	1700	7	50	✓	4.5	7.5	5.5	5	5.5	1.2	9	0.8	15.75	5.5	4th

S2000 / S2055 Series Series

Product No.	Maximum Ratings			Built-in damper diode	h _{FE}			V _{CE(sat)} Max			Switching Time (Max)				Genera- tion
	V _{CBO} (V)	I _C (A)	P _C (W)		Min (–)	Max (–)	@5V/I _C (A)	(V)	@ I _C (A)	@ I _B (A)	t _{stg} (μs)	t _f (μs)	@ f _H (kHz)	@ I _{cp} (A)	
S2000N	1500	8	50		4.5	9	4.5	5	4.5	1	12	0.7	15.75	4.5	3rd
S2055N	1500	8	50	✓	4.5	9	4.5	5	4.5	1	11	0.6	15.75	4.5	3rd

: 3rd generation (old design)
 : 4th generation (new design)
 : 5th generation (new design)
 (*): 5th generation (new design under development)

IGBT Modules



Adv. 2nd Generation and 3rd Generation												
Connection			Maximum Rating									
Circuit	Type	V _{CES} (V)	I _C (A)									
			5–10	15–20	25–30	50	60–90	100–150	200–240	300	400	500–600
	Third Gen.	600								MG300J1US51 [21]	MG400J1US51 [21]	
	Adv. 2nd Gen.	1200							MG200Q1US41 [21]	MG300Q1US41 [21]	MG400Q1US41 [21]	MG500Q1US1 [21]
	PLUS	1200							MG200Q1US51 [40] BARRIERLESS	MG300Q1US51 [40] BARRIERLESS	MG400Q1US51 [40] BARRIERLESS	MG600Q1US51 [40] BARRIERLESS
	Adv. 2nd Gen.	1700							MG240V1US41 (240A) [21]			
	Third Gen.	600				MG50J2YS50 [33]	MG75J2YS50 [33]	MG100J2YS50 [33] MG150J2YS50 [36]	MG200J2YS50 [36]	MG300J2YS50 [35]		
	Adv. 2nd Gen.	1200			MG250Q2YS40 [33]	MG500Q2YS40 [33]	MG750Q2YS40 [33]	MG100Q2YS42 [35] MG150Q2YS40 [35]	MG200Q2YS40 [35]			
	PLUS	1200				MG500Q2YS50 [33]	MG750Q2YS50 [33]	MG100Q2YS50 MG150Q2YS50 [36] MG100Q2YS51 MG150Q2YS51 [35]	MG200Q2YS50 [35]	MG300Q2YS50 [35]		
	Adv. 2nd Gen.	1700			MG30V2YS40 (30A) [33]		MG90V2YS40 (90A) [35]	MG120V2YS40 (120A) [35]				
	Adv. 2nd Gen.	600		MP6750 (15A) [30] MP6752(20A) [30]								
	Third Gen.	600				MG50J6ES50 [14]	MG75J6ES50 [14]	MG100J6ES50 [14]				
	Adv. 2nd Gen.	1200	MG806ES42 [37b]	MG1506ES42 [37b]	MG2506ES42 [37b]	MG5006ES40 [23]						

[Number]: Indicates package. Please refer to package drawing on following pages.

IGBT Modules

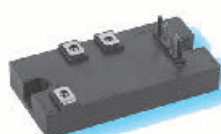
Compact IPM



[A]



[B]



[C]



[D]

Compact Intelligent Power Modules Line Up

Extremely Low R_{th} Version

Item	Ratings		Circuit	Package Type	Type No.	Function							
	Voltage	Current				OC	SC	UV	OT	Tc-M	H-Fo	L-Fo	
IPM	600V	50A	6in1	A	MIG50J6CSB1W	Y	Y	Y	Y	-	Y	Y	
			7in1		MIG50J7CSB1W	Y	Y	Y	Y	-	Y	Y	
		75A	6in1		MIG75J6CSB1W	Y	Y	Y	Y	-	Y	Y	
			7in1		MIG75J7CSB1W	Y	Y	Y	Y	-	Y	Y	
		100A	6in1		MIG100J6CSB1W	Y	Y	Y	Y	-	Y	Y	
			7in1		MIG100J7CSB1W	Y	Y	Y	Y	-	Y	Y	
		150A	6in1		MIG150J6CSB1W	Y	Y	Y	Y	-	Y	Y	
			7in1		MIG150J7CSB1W	Y	Y	Y	Y	-	Y	Y	
		200A	6in1	B	MIG200J6CMB1W	Y	Y	Y	Y	-	Y	Y	
		300A	2in1	C	MIG300J2CSB1W	Y	Y	Y	Y	-	Y	Y	
		MIG400J2CSB1W			Y	Y	Y	Y	-	Y	Y		
		600A		D	MIG600J2CMB1W	Y	Y	Y	Y	-	Y	Y	
	1200V	50A	6in1	A	MIG50Q6CSB1X	Y	Y	Y	Y	-	Y	Y	
			7in1		MIG50Q7CSB1X	Y	Y	Y	Y	-	Y	Y	
		75A	6in1		MIG75Q6CSB1X	Y	Y	Y	Y	-	Y	Y	
			7in1		MIG75Q7CSB1X	Y	Y	Y	Y	-	Y	Y	
		100A	6in1	B	MIG100Q6CMB1X	Y	Y	Y	Y	-	Y	Y	
		150A			MIG150Q6CMB1X	Y	Y	Y	Y	-	Y	Y	
		200A	2in1	C	MIG200Q2CSB1X	Y	Y	Y	Y	-	Y	Y	
		300A		D	MIG300Q2CMB1X	Y	Y	Y	Y	-	Y	Y	
		400A			MIG400Q2CMB1X	Y	Y	Y	Y	-	Y	Y	
					MIG400Q2CMB1X	Y	Y	Y	Y	-	Y	Y	

OC : Over-current protection
Tc-M : Case temperature monitoring

SC : Short-circuit protection
(#) : L-Fo output without protection

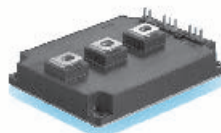
UV : Low supply voltage protection
H-Fo : High-side fault output

OT : Over-heat protection
L-Fo : Low-side fault output

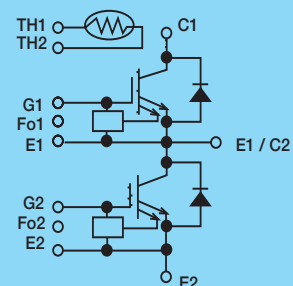
IGBT Module

Compact Standard Module

V _{CES} (V)	Compact STD		
	Maximum Ratings		
	IC (A)		
	400	600	800
600			MG800J2YS50A [E]
1200		MG600Q2YS60 [E]	
1700	MG400V2YS60 [E]		



[E]



■ IGBT-7 Standard Line up

Very Low Loss (UTPT Trench IEGT chips),

High Short Circuit Ruggedness

Ultra Low Thermal Resistance (SiN substrate),

Very Low Stray Inductance Package Design.



[33]



[36]



[35A, 35B]



[40A]



Circuit Type	Ratings							
	I _C (A)							
	50	75	100	150	200	300	400	600
							MG400Q1US71 [40A]	MG600Q1US71 [40A]
	MG50Q2YS71 [33]	MG75Q2YS71 [33]	MG100Q2YS71 [36]	MG150Q2YS71 [36] MG150Q2YS72 [35B] MG150Q2YS72(M5) [35A]	MG200Q2YS71 [35B] MG200Q2YS71(M5) [35A]	MG300Q2YS71 [35B] MG300Q2YS71(M5) [35A]		

NOTE: product under development. For schedule please contact your local sales office.

■ IGBT++ Standard Line Up

Extremely Low Switching loss IGBT Modules

Diode Type	Voltage	Ratings					
		I _C (A)					
		100	150	200	300	400	600
Soft recovery	1200	MG100Q2YS65H [36]	MG150Q2YS65H [36]	MG200Q2YS65H [35]	MG300Q2YS65H [35]	MG400Q1US65H [40]	MG600Q1US65H [40]
Fast recovery	1200	MG100Q2YS65H(EP) [36]	MG150Q2YS65H(EP) [36]	MG200Q2YS65H(EP) [35]		MG400Q1US65H(EP) [40]	



■ High-rugged products with 600 V and 1200 V voltage ratings (third generation)

With built-in diode

Package	Product No.	V _{CES} (V) max	I _C (A) DC max	P _C (W) max	V _{CE(sat)} (V) typ.	t _r (μs) typ.	t _f (μs) typ.	V _F (V) max	t _{rr} (ns) max
TO-220NIS	GT5J301	600	5	28	2.1	0.12	0.15	2.0	200
	GT10J303		10	30	2.1	0.12	0.15	2.0	200
	GT15J301		15	35	2.1	0.12	0.15	2.0	200
TO-220SM	GT5J311	600	5	45	2.1	0.12	0.15	2.0	200
	GT10J312		10	60	2.1	0.12	0.15	2.0	200
	GT15J311		15	70	2.1	0.12	0.15	2.0	200
TO-3P(N)	GT10J301	600	10	90	2.1	0.12	0.15	2.0	200
	GT20J301		20	130	2.1	0.12	0.15	2.0	200
	GT30J301		30	155	2.1	0.12	0.15	2.0	200
	GT10Q301	1200	10	140	2.1	0.07	0.16	3.0	350
	GT15Q301		15	170	2.1	0.05	0.16	3.0	350
TO-3P(SM)	GT10J311	600	10	80	2.1	0.12	0.15	2.0	200
	GT20J311		20	120	2.1	0.12	0.15	2.0	200
	GT30J311		30	145	2.1	0.12	0.15	2.0	200
	GT15Q311	1200	15	160	2.1	0.05	0.16	3.0	350
TO-3P(LH)	GT50J301	600	50	200	2.1	0.12	0.15	3.5	200
	GT25Q301	1200	25	200	2.1	0.10	0.16	3.0	350

Without built-in diode

Package	Product No.	V _{CES} (V) max	I _C (A) DC max	P _C (W) max	V _{CE(sat)} (V) typ.	t _r (μs) typ.	t _f (μs) typ.
TO-3P(N)	GT20J101	600	20	130	2.1	0.12	0.15
	GT30J101		30	155	2.1	0.12	0.15
	GT10Q101	1200	10	140	2.1	0.07	0.16
	GT15Q102		15	170	2.1	0.05	0.16
TO-3P(LH)	GT50J102	600	50	200	2.1	0.12	0.15
	GT25Q102	1200	25	200	2.1	0.10	0.16

■ Fast switching (FS) series with 600 V voltage rating (fourth generation)

With built-in diode

Package	Product No.	V _{CES} (V) max	I _C (A) DC max	P _C (W) max	V _{CE(sat)} (V) typ.	t _r (μs) typ.	t _f (μs) typ.	V _F (V) max	t _{rr} (ns) typ.
TO-220NIS	GT10J321	600	10	29	2.0	0.04	0.04	2.0	200(max)
	GT15J321		15	30	1.9	0.04	0.03	2.0	200(max)
	GT20J321		20	45	2.0	0.04	0.04	2.1	100
TO-3P(N)	GT30J324		30	170	2.0	0.07	0.05	3.8	60
TO-3P(LH)	GT50J325		50	240	2.0	0.07	0.05	4.2	65

Without built-in diode

Package	Product No.	V _{CES} (V) max	I _C (A) DC max	P _C (W) max	V _{CE(sat)} (V) typ.	t _r (μs) typ.	t _f (μs) typ.
TO-3P(N)	GT30J121	600	30	170	2.0	0.07	0.05
TO-3P(LH)	GT50J121		50	240	2.0	0.07	0.05

■ IGBTs and Diodes for Voltage Resonance Circuits (with soft switching)

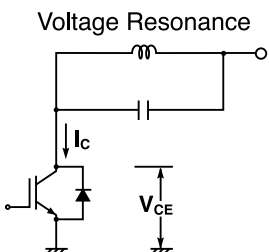
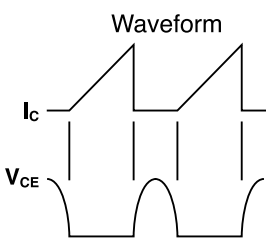
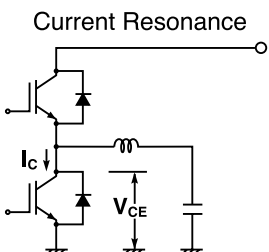
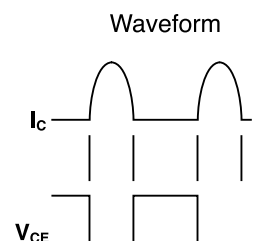
IGBT

AC Input Voltage	Product No.	V_{CES} / I_C	FRD	$t_f (\mu s)$ max	$V_{CE(sat)}$ (V)		Package	Remarks
					max	V_{GE} / I_C		
100 V to 120 V	GT15M321	900 V / 15 A	✓	0.4	2.5	15 V / 15 A	TO-3P (N)IS	For low power
	GT60M302	900 V / 60 A	✓	0.37	3.3	15 V / 60 A	TO-3P (LH)	
	GT60M303	900 V / 60 A	✓	0.4	2.7	15 V / 60 A	TO-3P (LH)	
	GT60M323	900 V / 60 A	✓	—	—	15 V / 60 A	TO-3P (LH)	Under development
	GT60N321	1000 V / 60 A	✓	0.4	2.8	15 V / 60 A	TO-3P (LH)	1000 V rating voltage
200 V to 240 V	GT40Q321	1200 V / 40 A	✓	0.72(typ.)	3.6	15 V / 40 A	TO-3P (N)	New product
	GT40T101	1500 V / 40 A		0.4	5.0	15 V / 40 A	TO-3P (LH)	1500 V rating voltage
	GT40T301	1500 V / 40 A	✓	0.4	5.0	15 V / 40 A	TO-3P (LH)	1500 V rating voltage

■ IGBTs for Current Resonance Circuits (with soft switching)

IGBT

AC Input Voltage	Product No.	V_{CES} / I_C	FRD	$t_f (\mu s)$ max	$V_{CE(sat)}$ (V)		Package	Remarks
					max	V_{GE} / I_C		
100 V to 240 V	GT40G121	400 V / 40 A		0.4	2.5	15 V / 60 A	TO-220AB	Compact package
	GT50G321	400 V / 50 A	✓	0.4	2.5	15 V / 60 A	TO-3P (LH)	400 V rating voltage
	GT30J322	600 V / 30 A	✓	0.4	2.8	15 V / 50 A	TO-3P (N)IS	Isolated package
	GT50J301	600 V / 50 A	✓	0.3	2.7	15 V / 50 A	TO-3P (LH)	High rugged product
	GT50J322	600 V / 50 A	✓	0.4	2.8	15 V / 50 A	TO-3P (LH)	
	GT50J325	600 V / 50 A	✓	0.05(typ.)	2.45	15 V / 50 A	TO-3P (LH)	Fast switching
	GT80J101A	600 V / 80 A		0.4	3.0	15 V / 80 A	TO-3P (LH)	

AC Input Voltage	Circuit	IGBT Rating
100 V to 120 V	Voltage Resonance  Waveform 	$V_{CES} = 900 \text{ V}, 1000 \text{ V}$ $I_C = 15 \text{ A}, 60 \text{ A}$
200 V to 240 V		$V_{CES} = 1200 \text{ V}, 1500 \text{ V}$ $I_C = 40 \text{ A}$
100 V to 240 V	Current Resonance  Waveform 	$V_{CES} = 400 \text{ V}$ $I_C = 40 \text{ A}, 50 \text{ A}$
		$V_{CES} = 600 \text{ V}$ $I_C = 30 \text{ A to } 80 \text{ A}$

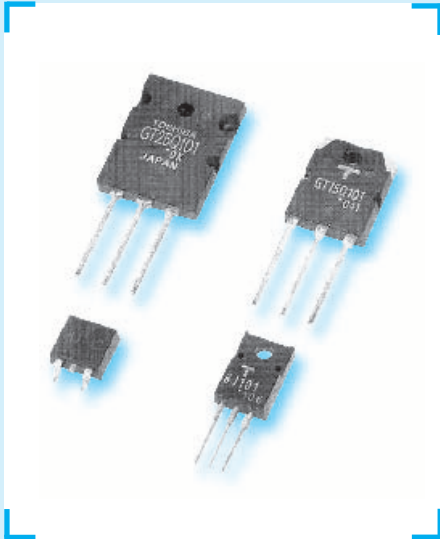
Final-phase and Discontinued Products

The following products are in stock but are being phased out of production. Recommended equivalent products which can be used in their place are shown. However, the characteristics of a recommended equivalent product

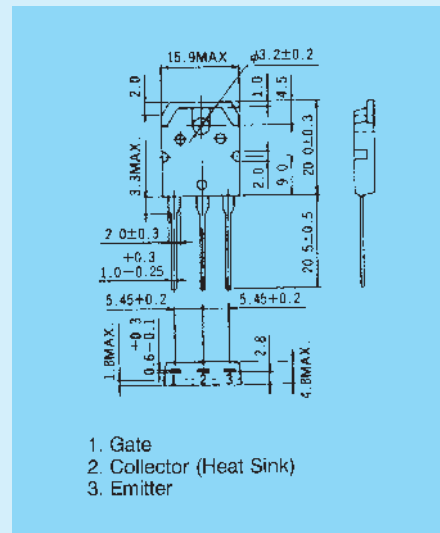
may not be exactly the same as those of the final-phase production or discontinued product. Before using a recommended equivalent product, please check it is suitable for use under the intended operating conditions.

Application	Final-Phase-Production or Discontinued Product	Maximum Ratings		Package	Recommended Equivalent Product	Maximum Ratings		Package
		V _{CES} (V)	I _C (A) DC			V _{CES} (V)	I _C (A) DC	
Soft switching Applications	MG60M1AL1	900	60	IH	GT60M303	900	60	TO-3P(LH)
	MG30T1AL1	1500	30	IH	GT40T301	1500	40	TO-3P(LH)
	GT40M101	900	40	TO-3P(N)IS	—	—	—	—
	GT40M301	900	40	TO-3P(LH)	GT60M303	900	60	TO-3P(LH)
	GT50M101	900	50	TO-3P(L)	GT60M303	900	60	TO-3P(LH)
	GT50L101	800	50	TO-3P(L)	GT60M303	900	60	TO-3P(LH)
	GT50Q101	1200	50	IH	GT40T301	1500	40	TO-3P(LH)
					GT40T101	1500	40	TO-3P(LH)
	GT50S101	1400	50	IH	GT40T301	1500	40	TO-3P(LH)
					GT40T101	1500	40	TO-3P(LH)
	GT50T101	1500	50	IH	GT40T301	1500	40	TO-3P(LH)
					GT40T101	1500	40	TO-3P(LH)
	GT60M101	900	60	TO-3P(L)	GT60M303	900	60	TO-3P(LH)
	GT60M102	900	60	TO-3P(L)	GT60M303	900	60	TO-3P(LH)
	GT60M103	900	60	TO-3P(L)	GT60M303	900	60	TO-3P(LH)
	GT60M104	900	60	TO-3P(L)	GT60M303	900	60	TO-3P(LH)
	GT60M105	900	60	TO-3P(L)	GT60M303	900	60	TO-3P(LH)
	GT60M305	900	60	TO-3P(LH)	GT60M303	900	60	TO-3P(LH)
	GT60J101	600	60	TO-3P(L)	GT50J102	600	50	TO-3P(LH)
	GT80J101	600	80	TO-3P(L)	GT80J101A	600	80	TO-3P(LH)
					GT60J321	600	60	TO-3P(LH)
Hard switching Applications	GT8J101	600	8	TO-220IS	GT10J303	600	10	TO-220IS
	GT8J102	600	8	TO-220SM	GT10J312	600	10	TO-220SM
	GT8N101	1000	8	TO-3P(N)	GT10Q101	1200	10	TO-3P(N)
	GT8Q101	1200	8	TO-3P(N)	GT10Q101	1200	10	TO-3P(N)
	GT8Q102	1200	8	TO-220SM	GT15Q311	1200	15	TO-3P(SM)
	GT15J101	600	15	TO-3P(N)	GT20J101	600	20	TO-3P(N)
	GT15J102	600	15	TO-220IS	GT15J301	600	15	TO-220IS
	GT15J103	600	15	TO-220SM	GT15J311	600	15	TO-220SM
	GT15N101	1000	15	TO-3P(N)	GT15Q102	1200	15	TO-3P(N)
	GT15Q101	1200	15	TO-3P(N)	GT15Q102	1200	15	TO-3P(N)
	GT25H101	500	25	TO-3P(N)	GT30J101	600	30	TO-3P(N)
	GT25J101	600	25	TO-3P(N)	GT30J121	600	30	TO-3P(N)
	GT25J102	600	25	TO-3P(IS)	GT30J121	600	30	TO-3P(N)
	GT25Q101	1200	25	TO-3P(LH)	GT25Q102	1200	25	TO-3P(LH)
	GT50J101	600	50	TO-3P(L)	GT50J121	600	50	TO-3P(LH)
Strobe Applications	GT5G101	400	130(pulse)	NPM	GT5G103	400	130(pulse)	DP
	GT8G101	400	130(pulse)	NPM	GT5G103	400	130(pulse)	DP
	GT8G102	400	150(pulse)	NPM	GT8G103	400	150(pulse)	DP
					GT8G121	400	150(pulse)	DP
	GT10G101	400	130(pulse)	TO-220IS	GT25G101	400	170(pulse)	TO-220FL
	GT10G102	400	130(pulse)	TO-220IS	GT25G102	400	150(pulse)	TO-220FL
	GT15G101	400	170(pulse)	TO-220IS	GT25G101	400	170(pulse)	TO-220FL
	GT20G101	400	130(pulse)	TO-220FL	GT25G101	400	170(pulse)	TO-220FL
	GT20G102	400	130(pulse)	TO-220FL	GT25G102	400	150(pulse)	TO-220FL
	GT50G101	400	100(pulse)	TO-3P(N)	GT25G101	400	170(pulse)	TO-220FL
	GT50G102	400	100(pulse)	TO-3P(N)	GT25G102	400	150(pulse)	TO-220FL
	GT75G101	400	150(pulse)	TO-3P(N)	GT25G101	400	170(pulse)	TO-220FL
					GT25G101	400	170(pulse)	TO-220FL

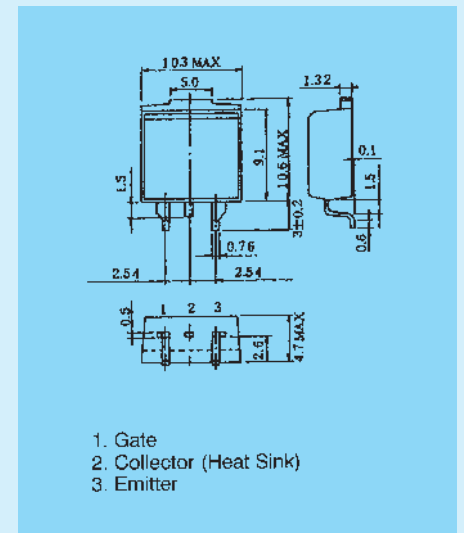
Discrete IGBTs incl. Co-PACKS^① Packages



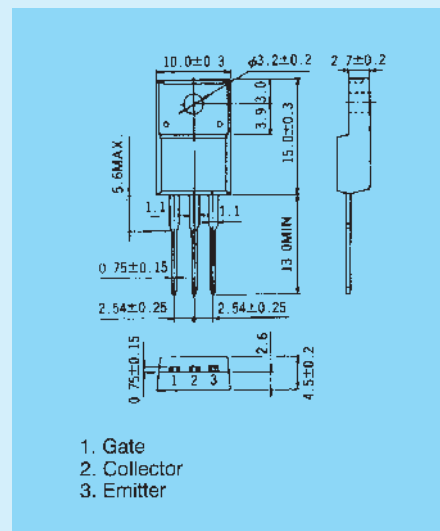
TO-3P(N)



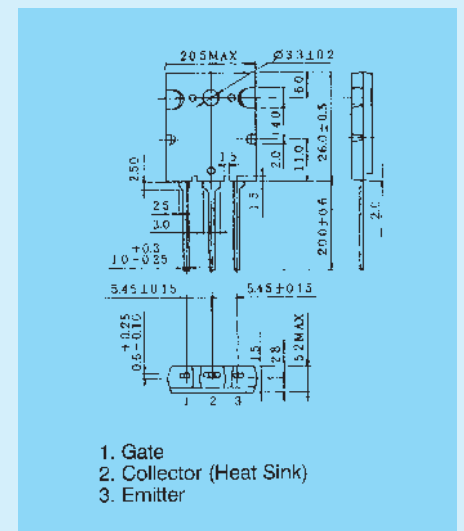
TO-220SM



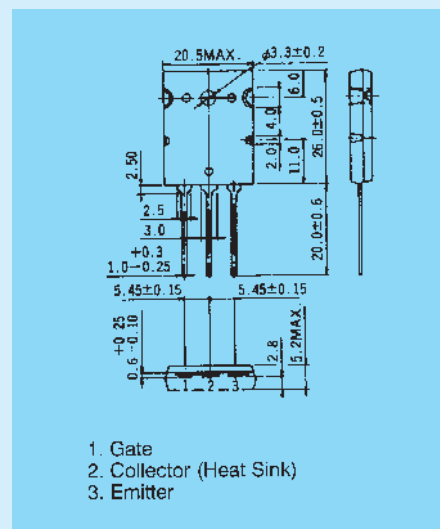
TO-220(IS)



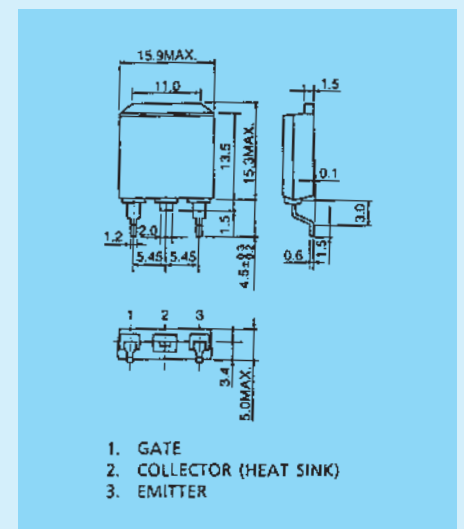
TO-3P(LH)



TO-3P(L)



TO-3P(SM)



■ IGBT Modules

Packages

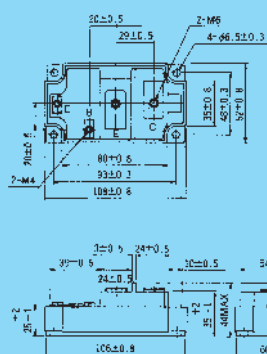
■ **1-packs**

2-109A4A

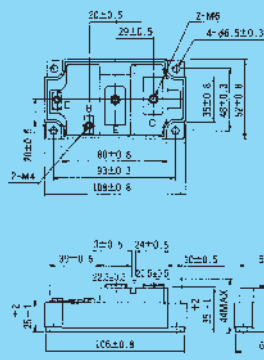
21

Technical drawing of the 2-109A4A valve assembly, showing a top view and a side view. The top view includes dimensions for the main body (100±0.5, 93±0.3, 109±0.8), the central valve (80±0.5), and the handle (291±0.5, 26±0.5). It also shows the handle pin (7-M6) and the handle nut (4-M6, 52.0.3). The side view shows the handle height (54±0.8) and the handle pin diameter (16±0.5). The drawing is labeled '2-109A4A' and '21'.

21



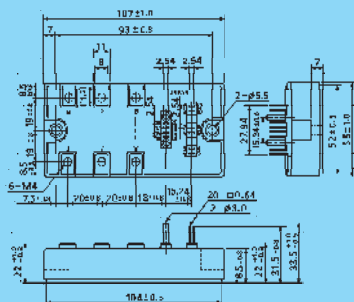
40



■ **2-packs**

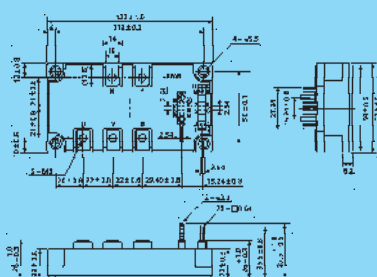
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33

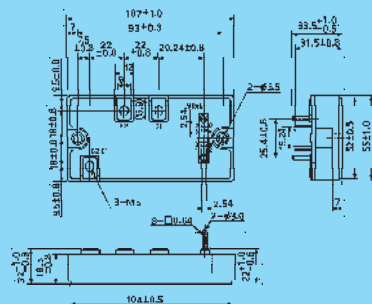


Technical drawing of the 2-109C1A pump assembly, showing a top view and a side view. The top view includes dimensions for the pump body, motor, and mounting flange. The side view shows the pump's profile and mounting details. A circular logo with the number 35 is in the top right corner.

35

[illegible]

36

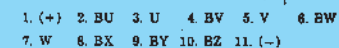


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■ CMOS Logic

C²MOS Standard Logic IC

Low Voltage Family	TC74VCX Series The 74VCX is a very high-speed, low-voltage logic device which can operate at 1.8 V ~ 3.3 V.
	TC74LCX Series The 74LCX is a high-speed, high-capacity drive, low-voltage logic device which can be used in mixed 3.3-V and 5-V systems.
	TC74LVX Series Low voltage series. The speed of the 74LVX at 3 V is double that of the 74HC series at 5 V.
VHS Family	TC74VHC/VHCT Series A next generation series with speeds comparable to those of the 74AC series and noise characteristics comparable to those of the 74HC series. An input power shutdown circuit facilitates application of the devices as an interface between two power supply units.
ACLFamily	TC74AC/ACT Series Highest-level CMOS series. Wide-ranging compatibility, complies with JEDEC STD20. Has a high-capacity drive capability of ± 24 mA and the lowest noise level in the industry.
NHS Family	TC74HC/HCT Series High-speed CMOS series. Speeds are comparable to LS-TTL.
Standard Family	TC4000B/4500B Series CMOS standard series. Operation guaranteed from 3 V to 18 V.
Mini MOS Families	Standard Logic IC in new ultra-small Packages
Bus Switches	TC7MB/WC/SB Highspeed Switching Devices
L-MOS	Single Gate Logic

CMOS Logic

Comparison of Logic Family Characteristics

Parameter	Symbol	CMOS (2.5-V Logic)	CMOS (3.3-V Logic)			CMOS (5.0-V Logic)			Unit
		74VCX	74VCX	74LCX	74LVX	74AC	74VHC	74HC	
Propagation Delay Time	t_{pd} (max)	3.2	2.5	6.5	12.0	8.0	8.5	23.0	ns
Output Current	I_{OH}/I_{OL} (min)	±18	±24	±24	±4	±24	± 8	±4 (±6)	mA
Simultaneous Switching Noise	V_{OLP} (typ.)	0.6	0.8	0.8	0.5	1.2	0.7	0.5	V
Input Voltage	V_{IH}/V_{IL}	1.6/0.7	2.0/0.8	2.0/0.8	2.0/0.8	3.15/1.35	3.15/1.35	3.15/1.35	V
Input Leakage Current	I_{IH}/I_{IL} (max)	±5.0	±5.0	±1.0	±1.0	±1.0	±1.0	±1.0	µA
Quiescent Power Dissipation	I_{cc} (max)	20.0	20.0	10.0	10.0	10.0	10.0	10.0	µA
Input Power-Down Protection	–	Yes	Yes	Yes	Yes	No	Yes	No	–
Output Power-Down Protection	–	Yes	Yes	Yes	No	No	No	No	–
Test Conditions	–	(A)(D)(F)(G)	(B)(D)(F)(G)	(B)(E)(F)(H)	(B)(E)(F)(H)	(C)(E)(F)(H)	(C)(E)(F)(H)	(C)(E)(F)(H)	

Test Conditions: (A) $V_{CC} = 2.5$ V, (B) $V_{CC} = 3.3$ V, (C) $V_{CC} = 4.5$ V
 (D) $C_L = 30$ pF, (E) $C_L = 50$ pF
 (F) $T_a = -40$ to 85 °C
 (G) 16244 type, (H) 244 type

Product Overview of the TC74VCX/LCX/LVX Series

Function		Device		
		TC74VCX Series	TC74LCX Series	TC74LVX Series
GATE	NAND	VCX00	LCX00	LVX00
	NOR	VCX02	LCX02	LVX02
	AND	VCX08	LCX08	LVX08
	OR	VCX32	LCX32	LVX32
	INVERTER, BUFFER	VCX04	LCX04	LVX04
	EXCLUSIVE OR	VCX86	LCX86	LVX86
	SCHMITT TRIGGER	VCX14	LCX14	LVX14
BUFFER	BUS BUFFER	VCX125, VCX240, VCX244, VCX367, VCX540, VCX541, VCX2125, VCX2244, VCX2367, VCX2541, VCX16240, VCX16244, VCX16827, VCX16834, VCX16835, VCX162244, VCX162827, VCX162835	LCX125, LCX240, LCX244, LCX540, LCX541, LCX16240A, LCX16244A,	LVX125, LVX240, LVX244
	BUS TRANSCEIVER	VCX245, VCX646, VCX652, VCX4245, VCX16245, VCX16500, VCX16501, VCX16543, VCX16600, VCX16601, VCX16646, VCX16652, VCXC3245, VCXR2245, VCX162243, VCXR162245, VCXR162500, VCXR162501, VCXR162543, VCXR162600, VCXR162601, VCXR162646, VCXR162652	LCX245, LCX646, LCX652, LCX16245A, LCX16646A, LCX16652A, LCX163245, LCXR163245	LVX245, LVX4245, LVXC3245
FLIP-FLOP	D-TYPE FLIP-FLOP	VCX74, VCX174, VCX273, VCX2374, VCX2574, VCX162721, VCX162821, VCX162823	LCX74	LVX74, LVX174, LVX273
	Three-STATE	VCX16374, VCX16721, VCX16821, VCX16823, VCX162374	LCX374, LCX574, LCX16374A,	LVX374
LATCH	Three-STATE	VCX373, VCX374, VCX573, VCX574, VCX2373, VCX2573, VCX16373, VCX16841, VCX16843, VCX162373, VCX162841, VCX162843	LCX373, LCX573, LCX16373A	LVX373, LVX573
DECODER		VCX138	LCX138	LVX138
MULTIPLEXER (DIGITAL)		VCX157, VCX257	LCX157, LCX257	LVX157

CMOS Logic

TC74 VCX/LCX/LVX Series Product Guide

TC74VCX Series

Device	Function	Pin
TC74VCX	00 FT QUAD 2-INPUT NAND GATE	14
	02 FT QUAD 2-INPUT NOR GATE	14
	04 FT HEX INVERTER	14
	08 FT QUAD 2-INPUT AND GATE	14
	14 FT HEX SCHMITT INVERTER	14
	32 FT QUAD 2-INPUT OR GATE	14
	74 FT DUAL D-TYPE FLIP-FLOP WITH PRESET AND CLEAR	14
	86 FT QUAD EXCLUSIVE OR GATE	14
TC74VCX	125 FT QUAD BUS BUFFER (Three-STATE)	14
	138 FT 3-TO-8 LINE DECODER	16
	157 FT QUAD 2-CHANNEL MULTIPLEXER	16
	174 FT HEX D-TYPE FLIP-FLOP WITH CLEAR	16
	240 FT OCTAL BUS BUFFER (3-STATE/INVERTING)	20
	244 FT OCTAL BUS BUFFER (Three-STATE)	20
	245 FT OCTAL BUS TRANSCEIVER (Three-STATE)	20
	257 FT QUAD 2-CHANNEL MULTIPLEXER (3-STATE)	16
	273 FT OCTAL D-TYPE FLIP-FLOP WITH CLEAR	20
	367 FT HEX BUS BUFFER (3-STATE)	16
	373 FT OCTAL D-TYPE LATCH (Three-STATE)	20
	374 FT OCTAL D-TYPE FLIP-FLOP (Three-STATE)	20
	540 FT OCTAL BUS BUFFER (3-STATE-INVERTING)	20
	541 FT OCTAL BUS BUFFER (Three-STATE)	20
	573 FT OCTAL D-TYPE LATCH (Three-STATE)	20
	574 FT OCTAL D-TYPE FLIP-FLOP (Three-STATE)	20
	646 FT OCTAL BUS TRANSCEIVER/REGISTER (3-STATE)	24
	652 FT OCTAL BUS TRANSCEIVER/REGISTER (3-STATE)	24
TC74VCX	2125 FT QUAD BUS BUFFER WITH SERIES RESISTOR (3-STATE)	14
	2244 FT OCTAL BUS BUFFER (Three-STATE)	20
	2367 FT HEX BUS BUFFER WITH SERIES RESISTOR (3-STATE)	16
	2373 FT OCTAL D-TYPE LATCH (Three-STATE)	20
	2374 FT OCTAL D-TYPE FLIP-FLOP (Three-STATE)	20
	2541 FT OCTAL BUS BUFFER (Three-STATE)	20
	2573 FT OCTAL D-TYPE LATCH (Three-STATE)	20
	2574 FT OCTAL D-TYPE FLIP-FLOP (Three-STATE)	20
	4245 FT DUAL SUPPLY OCTAL BUS TRANSCEIVER (3-STATE)	24
TC74VCX	16240 FT 16-BIT BUS BUFFER (3-STATE/INVERTING)	48
	16244 FT 16-BIT BUS BUFFER (Three-STATE)	48
	16245 FT 16-BIT BUS TRANSCEIVER (Three-STATE)	48
	16373 FT 16-BIT D-TYPE LATCH (Three-STATE)	48
	16374 FT 16-BIT D-TYPE FLIP-FLOP (Three-STATE)	48
	16500 FT 18-BIT UNIVERSAL BUS TRANSCEIVER (Three-STATE)	56
TC74VCX	16501 FT 18-BIT UNIVERSAL BUS TRANSCEIVER (Three-STATE)	56
	16543 FT 16-BIT REGISTERED TRANSCEIVER (Three-STATE)	56
	16600 FT 18-BIT UNIVERSAL BUS TRANSCEIVER (Three-STATE)	56

TC74LCX Series

Device	Function	Pin
TC74LCX	00 F/FN/FT QUAD 2-INPUT NAND GATE	14
	02 F/FN/FT QUAD 2-INPUT NOR GATE	14
	04 F/FN/FT HEX INVERTER	14
	08 F/FN/FT QUAD 2-INPUT AND GATE	14
TC74LCX	14 F/FN/FT HEX SCHMITT INVERTER	14
	32 F/FN/FT QUAD 2-INPUT OR GATE	14
	74 F/FN/FT DUAL D-TYPE FLIP-FLOP WITH PRESET AND CLEAR	14
	86 F/FN/FT QUAD EXCLUSIVE OR GATE	14
	125 F/FN/FT QUAD BUS BUFFER (Three-STATE)	14
	138 F/FN/FT 3-TO-8 LINE DECODER	16
TC74LCX	157 F/FN/FT QUAD 2-CHANNEL MULTIPLEXER	16
	240 F/FW/FT OCTAL BUS BUFFER (Three-STATE/INV.)	20
	244 F/FW/FT OCTAL BUS BUFFER (Three-STATE)	20
	245 F/FW/FT OCTAL BUS TRANSCEIVER (Three-STATE)	20
	257 F/FN/FT QUAD 2-CHANNEL MULTIPLEXER (Three-STATE)	16
TC74LCX	373 F/FW/FT OCTAL D-TYPE LATCH (Three-STATE)	20
	374 F/FW/FT OCTAL D-TYPE FLIP-FLOP (Three-STATE)	20

TC74LVX Series

Device	Function	Pin
TC74LVX	00 F/FN/FT QUAD 2-INPUT NAND GATE	14
	02 F/FN/FT QUAD 2-INPUT NOR GATE	14
	04 F/FN/FT HEX INVERTER	14
	08 F/FN/FT QUAD 2-INPUT AND GATE	14
	14 F/FN/FT HEX SCHMITT INVERTER	14
TC74LVX	32 F/FN/FT QUAD 2-INPUT OR GATE	14
	74 F/FN/FT DUAL D-TYPE FLIP-FLOP WITH PRESET AND CLEAR	14
	86 F/FN/FT QUAD EXCLUSIVE OR GATE	14
	125 F/FN/FT QUAD BUS BUFFER (Three-STATE)	14
	138 F/FN/FT 3-TO-8 LINE DECODER	16
	157 F/FN/FT QUAD 2-CHANNEL MULTIPLEXER	16
	174 F/FN/FT HEX D-TYPE FLIP-FLOP WITH CLEAR	16

Device	Function	Pin
TC74VCX	16601 FT 18-BIT UNIVERSAL BUS TRANSCEIVER (Three-STATE)	56
	16646 FT 16-BIT TRANSCEIVER / RECEIVER (Three-STATE)	56
TC74VCX	16652 FT 16-BIT TRANSCEIVER/RECEIVER (Three-STATE)	56
	16721 FT 20-BIT D-TYPE FLIP-FLOP (Three-STATE)	56
	16821 FT 20-BIT BUS INTERFACE FLIP-FLOP (Three-STATE)	56
	16823 FT 18-BIT BUS INTERFACE FLIP-FLOP (Three-STATE)	56
	16827 FT 20-BIT BUFFER/DRIVER (Three-STATE)	56
	16834 FT 18-BIT BUS DRIVER	56
	16835 FT 18-BIT UNIVERSAL BUS DRIVER (3-STATE)	56
	16841 FT 20-BIT BUS INTERFACE D-TYPE LATCH (Three-STATE)	56
	16843 FT 18-BIT BUS INTERFACE D-TYPE LATCH (Three-STATE)	56
TC74VCX	162244 FT 16-BIT BUS BUFFER WITH SERIES RESISTORS (Three-STATE)	48
	162373 FT 16-BIT D-TYPE LATCH WITH SERIES RESISTORS (Three-STATE)	48
TC74VCX	162374 FT 16-BIT D-TYPE FLIP-FLOP WITH SERIES RESISTORS (Three-STATE)	48
	162721 FT 20-BIT D-TYPE FLIP-FLOP WITH SERIES RESISTOR (3-STATE)	56
	162821 FT 20-BIT D-TYPE FLIP-FLOP WITH SERIES RESISTOR (3-STATE)	56
	162823 FT 18-BIT D-TYPE FLIP FLOP WITH SERIES RESISTOR (3-STATE)	56
	162827 FT 20-BIT BUFFER/DRIVER (Three-STATE)	48
	162835 FT 18-BIT UNIVERSAL BUS DRIVER WITH SERIES RESISTOR (3-STATE)	56
	162841 FT 20-BIT D-TYPE LATCH WITH SERIES RESISTOR (3-STATE)	56
	162843 FT 18-BIT D-TYPE LATCH WITH SERIES RESISTOR (3-STATE)	56
	163245FT 16-BIT DUAL SUPPLY VOLTAGE BUS TRANSCEIVER	48
	164245FT 16-BIT DUAL SUPPLY VOLTAGE BUS TRANSCEIVER	48
TC74VCX	C3245 FT DUAL SUPPLY OCTAL BUS TRANSCEIVER (3-STATE)	24
TC74VCX	R162245 FT OCTAL BUS TRANSCEIVER (Three-STATE)	48
	R162500 FT 18-BIT UNIVERSAL BUS TRANSCEIVER WITH SERIES RESISTOR (3-STATE)	56
	R162501 FT 18-BIT UNIVERSAL BUS TRANSCEIVER WITH SERIES RESISTOR (3-STATE)	56
	R162543 FT 16-BIT REGISTERED TRANSCEIVER WITH SERIES RESISTOR (3-STATE)	56
	R162600 FT 18-BIT UNIVERSAL BUS TRANSCEIVER WITH SERIES RESISTOR (3-STATE)	56
	R162601 FT 18-BIT UNIVERSAL BUS TRANSCEIVER WITH SERIES RESISTOR (3-STATE)	56
	R162646 FT 16-BIT BUS TRANSCEIVER/REGISTER	56
	R162652 FT 16-BIT BUS TRANSCEIVER/REGISTER	56
	R2245 FT OCTAL BUS TRANSCEIVER	20

* Several Function with Bushold/Live Insertion under development

Device	Function	Pin
TC74LCX	540 F/FW/FT OCTAL BUS BUFFER (Three-STATE/INV.)	20
	541 F/FW/FT OCTAL BUS BUFFER (Three-STATE)	20
	573 F/FW/FT OCTAL D-TYPE LATCH (Three-STATE)	20
TC74LCX	574 F/FW/FT OCTAL D-TYPE FLIP-FLOP (Three-STATE)	20
	646 FS OCTAL BUS TRANSCEIVER/REGISTER (Three-STATE)	24
	652 FS OCTAL BUS TRANSCEIVER/REGISTER (Three-STATE)	24
	16240 AFT 16-BIT BUS BUFFER (Three-STATE/INV.)	48
	16244 AFT 16-BIT BUS BUFFER (Three-STATE)	48
TC74LCX	16245 AFT 16-BIT BUS TRANSCEIVER (Three-STATE)	48
	16373 AFT 16-BIT D-TYPE LATCH (Three-STATE)	48
	16374 AFT 16-BIT D-TYPE FLIP-FLOP (Three-STATE)	48
	16646 AFT 16-BIT BUS TRANSCEIVER/REGISTER (Three-STATE)	56
	16652 AFT 16-BIT BUS TRANSCEIVER/REGISTER (Three-STATE)	56
	163245 FT 16-BIT DUAL SUPPLY VOLTAGE BUS TRANSCEIVER	48
	R163245 FT 16-BIT DUAL SUPPLY VOLTAGE BUS TRANSCEIVER WITH SERIES RESISTOR	48

* Several Function with Bushold under development

Device	Function	Pin
TC74LVX	240 F/FW/FT OCTAL BUS BUFFER (Three-STATE/INV.)	20
	244 F/FW/FT OCTAL BUS BUFFER (Three-STATE)	20
	245 F/FW/FT OCTAL BUS TRANSCEIVER (Three-STATE)	20
TC74LVX	273 F/FW/FT OCTAL D-TYPE FLIP-FLOP WITH CLEAR	20
	373 F/FW/FT OCTAL D-TYPE LATCH (Three-STATE)	20
	374 F/FW/FT OCTAL D-TYPE FLIP-FLOP (Three-STATE)	20
	573 F/FW/FT OCTAL D-TYPE LATCH (Three-STATE)	20
	4051 FT/FK ANALOG MULTIPLEXER	24
	4052 FT/FK ANALOG MULTIPLEXER	24
	4053 FT/FK ANALOG MULTIPLEXER	24
	4245 FS DUAL-SUPPLY OCTAL BUS TRANSCEIVER	24
	C3245 FS DUAL-SUPPLY OCTAL BUS TRANSCEIVER	24

* Several Function with Bushold under development

CMOS Logic

TC74VHC/VHCT Series Selection Guide

Function		TC74VHC/VHCT Series
Gate	NAND	00, T00A, 03, 10, 20
	NOR	02, 27
	AND	08, T08A, 11, 21
	OR	32, T32A
	Inverter	04, T04A, U04, 05
	Exclusive OR	86, T86A
	Schmitt Trigger	14, 132
Buffer	Bus Buffer	125, T125A, 126, T126A, 240, T240A, 244, T244A, T244, 367, T367A, 368, 540, T540A, 541, T541A
	BusTransceiver	245, T245A, T245
Flip-Flop	D Flip-Flop	74, T74A, T74, 174, 175, 273
	3-state	374, T374A, 574, T574A
Latch	3-state	373, T373A, 573, T573A
Decoder		T14A, 138, T138A, 139, T139A, 238,
Shift Register		164, 165, 299, 595
Binary Counter		161, 163, 393, 4040
Multiplexer Digital		153, 157, 257
Multivibrator		123A, 221A

TC74VHC/VHCT Series Product Guide

Device	Function	Pin	Device	Function	Pin
TC74VHC 00 F/FN/FT	QUAD 2-INPUT NAND GATE	14	TC74VHC 163 F/FN/FT	SYNC. BINARY COUNTER WITH SYNC.CLER	16
T00A F/FN/FT	QUAD 2-INPUT NAND GATE	14	TC74VHC 164 F/FN/FT	8-BIT SIPO SHIFT REGISTER	14
02 F/FN/FT	QUAD 2-INPUT NOR GATE	14	TC74VHC 165 F/FN/FT	8-BIT PISO SHIFT REGISTER	16
03 F/FN/FT	QUAD 2-INPUT NAND GATE (OPEN DRAIN)	14	174 F/FN/FT	HEX D FLIP-FLOP WITH CLEAR	16
04 F/FN/FT	HEX INVERTER	14	175 F/FN/FT	QUAD D FLIP-FLOP WITH CLEAR	16
TC74VHC T04A F/FN/FT	HEX INVERTER	14	221A F/FN/FT	DUAL MONOSTABLE MULTIVIBRATOR (tw out = 1.0Cx · Rx)	16
U04 F/FN/FT	HEX INVERTER	14	TC74VHC 238 F/FN/FT	3-TO-8 LINE DECODER	16
05 F/FN/FT	HEX INVERTER (OPEN DRAIN)	14	240 F/FW/FT	OCTAL BUS BUFFER (3-STATE/INV.)	20
08 F/FN/FT	QUAD 2-INPUT AND GATE	14	T240A F/FW/FT	OCTAL BUS BUFFER (3-STATE/INV.)	20
T08A F/FN/FT	QUAD 2-INPUT AND GATE	14	244 F/FW/FT	OCTAL BUS BUFFER (3-STATE)	20
TC74VHC 10 F/FN/FT	TRIPLE 3-INPUT NAND GATE	14	T244A F/FW/FT	OCTAL BUS BUFFER (3-STATE)	20
11 F/FN/FT	TRIPLE 3-INPUT AND GATE	14	TC74VHC 245 F/FW/FT	OCTAL BUS TRANSCEIVER (3-STATE)	20
14 F/FN/FT	HEX SCHMITT INVERTER	14	T245A F/FW/FT	OCTAL BUS TRANSCEIVER (3-STATE)	20
T14A F/FN/FT	DUAL 2-TO-4 LINE DECODE	14	257 F/FN/FT	QUAD 2-CHANNEL MULTIPLEXER (3-STATE)	16
20 F/FN/FT	DUAL 4-INPUT NAND GATE	14	273 F/FW/FT	OCTAL D FLIP-FLOP WITH CLEAR	20
21 F/FN/FT	DUAL 4-INPUT AND GATE	14	299 F/FW/FT	8-BIT PIPO SHIFT REGISTER	20
TC74VHC 27 F/FN/FT	TRIPLE 3-INPUT NOR GATE	14	TC74VHC 367 F/FN/FT	HEX BUS BUFFER (3-STATE)	16
32 F/FN/FT	QUAD 2-INPUT OR GATE	14	T367A F/FN/FT	HEX BUS BUFFER (3-STATE)	16
T32A F/FN/FT	QUAD 2-INPUT OR GATE	14	368 F/FN/FT	HEX BUS BUFFER (3-STATE)	16
74 F/FN/FT	DUAL D FLIP-FLOP WITH PRESET AND CLEAR	14	373 F/FW/FT	OCTAL D-TYPE LATCH (3-STATE)	20
T74A F/FN/FT	DUAL D FLIP-FLOP WITH PRESET AND CLEAR	14	T373A F/FW/FT	OCTAL D-TYPE LATCH (3-STATE)	20
86 F/FN/FT	QUAD EXCLUSIVE OR GATE	14	374 F/FW/FT	OCTAL D-TYPE FLIP-FLOP (3-STATE)	20
T86A F/FN/FT	QUAD EXCLUSIVE OR GATE	14	TC74VHC T374A F/FW/FT	OCTAL D-TYPE FLIP-FLOP (3-STATE)	20
TC74VHC 123A F/FN/FT	DUAL MONOSTABLE MULTIVIBRATOR (tw out = 1.0Cx · Rx)	16	393 F/FN/FT	DUAL BINARY COUNTER	14
125 F/FN/FT	QUAD BUS BUFFER (3-STATE)	14	540 F/FW/FT	OCTAL BUS BUFFER (3-STATE/INV.)	20
T125A F/FN/FT	QUAD BUS BUFFER (3-STATE)	14	T540A F/FW/FT	OCTAL BUS BUFFER (3-STATE/INV.)	20
126 F/FN/FT	QUAD BUS BUFFER (3-STATE)	14	541 F/FW/FT	OCTAL BUS BUFFER (3-STATE)	20
T126A F/FN/FT	QUAD BUS BUFFER (3-STATE)	14	T541A F/FW/FT	OCTAL BUS BUFFER (3-STATE)	20
132 F/FN/FT	QUAD 2-INPUT SCHMITT NAND	14	TC74VHC 573 F/FW/FT	OCTAL D-TYPE LATCH (3-STATE)	20
138 F/FN/FT	3-TO-8 LINE DECODER	16	T573A F/FW/FT	OCTAL D-TYPE LATCH (3-STATE)	20
TC74VHC T138A F/FN/FT	3-TO-8 LINE DECODER	16	574 F/FW/FT	OCTAL D-TYPE FLIP-FLOP (3-STATE)	20
139 F/FN/FT	DUAL 2-TO-4 LINE DECODER	16	T574A F/FW/FT	OCTAL D-TYPE FLIP-FLOP (3-STATE)	20
T139A F/FN/FT	DUAL 2-TO-4 LINE DECODE	16	595 F/FN/FT	8-BIT SHIFT REGISTER/LATCH (3-STATE)	16
153 F/FN/FT	DUAL 4-CHANNEL MULTIPLEXER	16	TC74VHC 4040 F/FN/FT	12-STAGE BINARY COUNTER	16
157 F/FN/FT	DUAL 2-CHANNEL MULTIPLEXER	16			
161 F/FN/FT	SYNC. BINARY COUNTER WITH ASYNC.CLER	16			

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TC74AC/ACT Series Selection Guide

Function		TC74AC/ACT Series
GATE	NAND	00, T00, 10, 20,
	NOR	02, T02
	AND	08, T08, 11
	OR	32, T32
	INVERTER, BUFFER	04, T04, 05
	EXCLUSIVE OR SCHMITT TRIGGER	86, T86 14, T14
BUFFER	BUS BUFFER	125, 126, 240, T240, 244, T244, 367, 540, T540, 541, T541
	BUS TRANSCEIVER	245, T245, 640, T640
FLIP-FLOP	J-K FLIP-FLOP	109, 112, T112
	D-TYPE FLIP-FLOP	74, T74, 174, T174, 175 T175, 273, T273, 377
		374, T374, 534, 574, T574
LATCH	3-STATE	373, T373, 573, T573
DECODER		138, T138, 139, T139
REGISTER		164, T164, 166, 299, T299
COUNTER	BINARY	161, T161, 163, T163, 393
	DECADE	390
MULTIPLEXER (DIGITAL)		151, T151, 153, T153, 157 T157, 257, T257, 258
COMPARATOR		521, T521
ADDER		283
PARITY TREE		280, T280

TC74AC/ACT Series Product Guide

Device	Function	Pin	Device	Function	Pin
TC74AC 00 P/F/FN/FS	QUAD 2-INPUT NAND GATE	14	TC74AC 174 P/F/FN/FS	HEX D FLIP-FLOP WITH CLEAR	16
T00 P/F/FN/FS	QUAD 2-INPUT NAND GATE	14	T174 P/F/FN	HEX D FLIP-FLOP WITH CLEAR	16
02 P/F/FN/FS	QUAD 2-INPUT NOR GATE	14	175 P/F/FN/FS	QUAD D FLIP-FLOP WITH CLEAR	16
T02 P/F/FN/FS	QUAD 2-INPUT NOR GATE	14	T175 P/F/FN	QUAD D FLIP-FLOP WITH CLEAR	16
04 P/F/FN/FS	HEX INVERTER	14	240 P/F/FW/FS	OCTAL BUS BUFFER (3-STATE/INV.)	20
TC74AC T04 P/F/FN/FS	HEX INVERTER	14	TC74ACT240 P/F/FW/FS	OCTAL BUS BUFFER (3-STATE/INV.)	20
05 P/F/FN	HEX INVERTER (OPEN DRAIN)	14	244 P/F/FW/FS	OCTAL BUS BUFFER (3-STATE)	20
08 P/F/FN/FS	QUAD 2-INPUT AND GATE	14	T244 P/F/FW/FS	OCTAL BUS BUFFER (3-STATE)	20
T08 P/F/FN/FS	QUAD 2-INPUT AND GATE	14	245 P/F/FW/FS	OCTAL BUS TRANSCEIVER (3-STATE)	20
10 P/F/FN	TRIPLE 3-INPUT NAND GATE	14	T245 P/F/FW/FS	OCTAL BUS TRANSCEIVER (3-STATE)	20
TC74AC 11 P/F/FN	TRIPLE 3-INPUT AND GATE	14	TC74AC 257 P/F/FN	QUAD 2-CHANNEL MULTIPLEXER (3-STATE)	16
14 P/F/FN/FS	HEX SCHMITT INVERTER	14	T257 P/F/FN	QUAD 2-CHANNEL MULTIPLEXER (3-STATE)	16
T14 P/F/FN/FS	HEX SCHMITT INVERTER	14	258 P/F/FN	QUAD 2-CHANNEL MULTIPLEXER (3-STATE/INV.)	16
20 P/F/FN	DUAL 4-INPUT NAND GATE	14	273 P/F/FW/FS	OCTAL D FLIP-FLOP WITH CLEAR	20
32 P/F/FN/FS	QUAD 2-INPUT OR GATE	14	T273 P/F/FW	OCTAL D FLIP-FLOP WITH CLEAR	20
TC74AC T32 P/F/FN/FS	QUAD 2-INPUT OR GATE	14	TC74AC 280 P/F/FN	9-BIT PARITY GENERATOR/CHECKER	14
74 P/F/FN/FS	DUAL D-FLIP-FLOP WITH PRESET AND CLEAR	14	T280 P/F/FN	9-BIT PARITY GENERATOR/CHECKER	14
T74 P/F/FN/FS	DUAL D-FLIP-FLOP WITH PRESET AND CLEAR	14	283 P/F/FN	4-BIT FULL ADDER	16
86 P/F/FN/FS	QUAD EXCLUSIVE OR GATE	14	299 P/F/FW	8-BIT PIPO SHIFT REGISTER	20
T86 P/F/FN	QUAD EXCLUSIVE OR GATE	14	T299 P/F/FW	8-BIT PIPO SHIFT REGISTER	20
TC74AC 109 P/F/FN	DUAL J-K FLIP-FLOP WITH PRESET AND CLEAR	16	TC74AC 367 P/F/FN/FS	HEX BUS BUFFER (3-STATE)	16
112 P/F/FN	DUAL J-K FLIP-FLOP WITH PRESET AND CLEAR	16	373 P/F/FW/FS	OCTAL D-TYPE LATCH (3-STATE)	20
T112 P/F/FN	DUAL J-K FLIP-FLOP WITH PRESET AND CLEAR	16	T373 P/F/FW/FS	OCTAL D-TYPE LATCH (3-STATE)	20
125 P/F/FN/FS	QUAD BUS BUFFER (3-STATE)	14	374 P/F/FW/FS	OCTAL D-TYPE FLIP-FLOP (3-STATE)	20
126 P/F/FN	QUAD BUS BUFFER (3-STATE)	14	T374 P/F/FW/FS	OCTAL D-TYPE FLIP-FLOP (3-STATE)	20
TC74AC 138 P/F/FW/FS	3-TO-8 LINE DECODER	16	TC74AC 377 P/F/FW	OCTAL D-TYPE FLIP-FLOP	20
T138 P/F/FN/FS	3-TO-8 LINE DECODER	16	390 P/F/FN	DUAL DECADE COUNTER	16
139 P/F/FN/FS	DUAL 2-TO-4 LINE DECODER	16	393 P/F/FN/FS	DUAL BINARY COUNTER	14
T139 P/F/FN/FS	DUAL 2-TO-4 LINE DECODER	16	521 P/F/FW	8-BIT COMPARATOR	20
151 P/F/FN	8-CHANNEL MULTIPLEXER	16	T521 P/F/FW	8-BIT COMPARATOR	20
TC74ACT151 P/F/FN	8-CHANNEL MULTIPLEXER	16	TC74AC 534 P/F/FW	OCTAL D-TYPE FLIP-FLOP (3-STATE/INV.)	20
153 P/F/FN	DUAL 4-CHANNEL MULTIPLEXER	16	540 P/F/FW/FS	OCTAL BUS BUFFER (3-STATE/INV.)	20
T153 P/F/FN	DUAL 4-CHANNEL MULTIPLEXER	16	T540 P/F/FW/FS	OCTAL BUS BUFFER (3-STATE/INV.)	20
157 P/F/FN/FS	QUAD 2-CHANNEL MULTIPLEXER	16	541 P/F/FW/FS	OCTAL BUS BUFFER (3-STATE)	20
T157 P/F/FN/FS	QUAD 2-CHANNEL MULTIPLEXER	16	T541 P/F/FW/FS	OCTAL BUS BUFFER (3-STATE)	20
TC74AC 161 P/F/FN/FS	SYNC. BINARY COUNTER WITH ASYNC. CLEAR	16	TC74AC 573 P/F/FW/FS	OCTAL D-TYPE LATCH (3-STATE)	20
T161 P/F/FN	SYNC. BINARY COUNTER WITH ASYNC. CLEAR	16	T573 P/F/FW/FS	OCTAL D-TYPE LATCH (3-STATE)	20
163 P/F/FN/FS	SYNC. BINARY COUNTER WITH SYNC. CLEAR	16	574 P/F/FW/FS	OCTAL D-TYPE FLIP-FLOP (3-STATE)	20
T163 P/F/FN	SYNC. BINARY COUNTER WITH SYNC. CLEAR	16	T574 P/F/FW/FS	OCTAL D-TYPE FLIP-FLOP (3-STATE)	20
164 P/F/FN/FS	8-BIT SIPO SHIFT REGISTER	14	640 P/F/FW/FS	OCTAL BUS TRANSCEIVER (3-STATE/INV.)	20
TC74ACT164 P/F/FN	8-BIT SIPO SHIFT REGISTER	14	TC74ACT640 P/F/FW/FS	OCTAL BUS TRANSCEIVER (3-STATE/INV.)	20
166 P/F/FN	8-BIT PISO SHIFT REGISTER	16			

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TC74HC/HCT Series Selection Guide

Function		TC74HC/HCT Series
GATE	NAND NOR AND OR INVERTER BUFFER EXCLUSIVE OR/NOR SCHMITT TRIGGER LEVEL SHIFTER BU, BUFFER	00A, T00A, 03A, 10A, 20A, 30A, 132A, 133A 02A, T02A, 27A, 4002A, 4078A 08A, T08A, 11A, 21A 32A, T32A, 4072A, 4075A, 4078A 04A, T04A, U04A, 05A, 14A, 4049A 07A, 4050A, T7007A 86A, T86A, 7266A 14A, 132A 4049A, 4050A 125A, 126A, 240A, T240A, 241A, 244A, T244A 365A, 366A, 367A, 368A, 540A, T540A, 541A T541A, 7240A, 7244A 245A, T245A, 640A, 646A, T646A, 652A, T652A
	BUS, TRANSCEIVER	
FLIP-FLOP	J-K FLIP-FLOP D FLIP-FLOP	107A, 109A, 112A 74A, T74A, 174A, T174A, 175A, 273A, T273A 377A
	3-STATE	374A, T374A, 564A, 574A, T574A, 646A T646A, 652A, T652A
LATCH		259A, 279A, 375A
	3-STATE	373A, T373A, 573A, T573A
MULTIVIBRATOR		4538A, 123A, 221A, 423A
DECODER		42A, 138A, T138A, 139A, T139A, 154A, 155A 237A, 238A, 4028A, 4514A
	7-SEGM, ENT	4511A
ENCODER		148A
REGISTER		164A, 165A, 166A, 173A, 299A, 595A, 597A 670A, 4094A, 40105A
COUNTER	BINARY	161A, 163A, 191A, 193A, 393A, 590A, 592A 697A, 4520A
	DECADE	390A
	DIVIDER	4017A, 4020A, 4024A, 4040A, 4060A, 40102A 40103A, 7292A
MULTIPLEXER	ANALOG	4051A, 4052A, 4053A
	DIGITAL	151A, 153A, 157A, T157A, 158A, 251A, 253A 257A
ANALOG SWITCH		4066A
COMPARATOR		85A, 688A, T688A
ADDER		283A
PARITY TREE		280A

TC74HC/HCT Series Product Guide

Device	Function	Pin	Device	Function	Pin
TC74HC 00 AP/AF/AFN	QUAD 2-INPUT NAND GATE	14	TC74HC T32 AP/AF/AFN	QUAD 2-INPUT OR GATE	14
T00 AP/AF/AFN	QUAD 2-INPUT NAND GATE	14	42 AP/AF/AFN	BCD TO DECIMAL DECODER	16
02 AP/AF/AFN	QUAD 2-INPUT NOR GATE	14	74 AP/AF/AFN	DUAL D-TYPE FLIP-FLOP WITH PRESET AND CLEAR	14
T02 AP/AF/AFN	QUAD 2-INPUT NOR GATE	14			
TC74HC 03 AP/AF/AFN	QUAD 2-INPUT NAND GATE(OPEN DRAIN)	14	TC74HC T74 AP/AF/AFN	DUAL D-TYPE FLIP-FLOP WITH PRESET AND CLEAR	14
04 AP/AF/AFN	HEX INVERTER	14	85 AP/AF/AFN	4-BIT MAGNITUDE COMPARATOR	16
T04 AP/AF/AFN	HEX INVERTER	14	86 AP/AF/AFN	QUAD EXCLUSIVE OR GATE	14
U04 AP/AF/AFN	HEX INVERTER	14	T86 AP/AF	QUAD EXCLUSIVE OR GATE	14
05 AP/AF	HEX INVERTER (OPEN DRAIN)	14			
TC74HC 07 AP/AF	HEX BUFFER(OPEN DRAIN)	14	TC74HC 107 AP/AF/AFN	DUAL J-K FLIP-FLOP WITH CLEAR	14
08 AP/AF/AFN	QUAD 2-INPUT AND GATE	14	109 AP/AF/AFN	DUAL J-K FLIP-FLOP WITH PRESET AND CLEAR	16
T08 AP/AF/AFN	QUAD 2-INPUT AND GATE	14	112 AP/AF/AFN	DUAL J-K FLIP-FLOP WITH PRESET AND CLEAR	16
10 AP/AF/AFN	TRIPLE 3-INPUT NAND GATE	14			
11 AP/AF/AFN	TRIPLE 3-INPUT AND GATE	14			
TC74HC 14 AP/AF/AFN	HEX SCHMITT INVERTER	14	TC74HC 123 AP/AF/AFN	DUAL MONOSTABLE MULTIVIBRATOR (tw out = 1.0 · Cx · Rx)	16
20 AP/AF/AFN	DUAL 4-INPUT NAND GATE	14	125 AP/AF/AFN	QUAD BUS BUFFER (3-STATE)	14
21 AP/AF/AFN	DUAL 4-INPUT AND GATE	14	126 AP/AF	QUAD BUS BUFFER(3-STATE)	14
27 AP/AF/AFN	TRIPLE 3-INPUT NOR GATE	14	132 AP/AF/AFN	QUAD 2-INPUT SCHMITT NAND GATE	14
30 AP/AF/AFN	8-INPUT NAND GATE	14			
32 AP/AF/AFN	QUAD 2-INPUT OR GATE	14	133 AP/AF	13-INPUT NAND GATE	16

TC74HC/HCT Series Product Guide

Device	Function	Pin	Device	Function	Pin
TC74HC 138 AP/AF/AFN	3-TO-8 LINE DECODER	16	TC74HC T540 AP/AF/AFW	OCTAL BUS BUFFER(3-STATE/INVERTED)	20
T138 AP/AF/AFN	3-TO-8 LINE DECODER	16	541 AP/AF/AFW	OCTAL BUS BUFFER (3-STATE)	20
139 AP/AF/AFN	DUAL 2-TO-4 LINE DECODER	16	T541 AP/AF/AFW	OCTAL BUS BUFFER(3-STATE)	20
T139 AP/AF/AFN	DUAL 2-TO-4 LINE DECODER	16	564 AP/AF	OCTAL D-TYPE FLIP-FLOP (3-STATE/INVERTED)	20
148 AP/AF	8-TO-3 LINE PRIORITY ENCODER	16			
TC74HC 151 AP/AF/AFN	8-CHANNEL MULTIPLEXER	16	TC74HC 573 AP/AF/AFW	OCTAL D-TYPE LATCH(3-STATE)	20
153 AP/AF/AFN	DUAL 4-CHANNEL MULTIPLEXER	16	T573 AP/AF/AFW	OCTAL D-TYPE LATCH(3-STATE)	20
154 AP	4-TO-16 LINE DECODER	24	574 AP/AF/AFW	OCTAL D-TYPE FLIP-FLOP (3-STATE)	20
155 AP/AF/AFN	DUAL 2-TO-4 LINE DECODER	16	T574 AP/AF/AFW	OCTAL D-TYPE FLIP-FLOP(3-STATE)	20
157 AP/AF/AFN	QUAD 2-CHANNEL MULTIPLEXER	16	590 AP/AF	8-BIT BINARY COUNTER/REGISTER (3-STATE)	16
T157 AP/AF/AFN	QUAD 2-CHANNEL MULTIPLEXER	16			
TC74HC 158 AP/AF/AFN	QUAD 2-CHANNEL MULTIPLEXER (INVERTED)	16	TC74HC 592 AP/AF	8-BIT REGISTER, BINARY COUNTER	16
161 AP/AF/AFN	SYNCHRONOUS BINARY COUNTER WITH ASYNC.CLEAR	16	595 AP/AF/AFN	8-BIT SHIFT REGISTER/LATCH (3-STATE)	16
163 AP/AF/AFN	SYNCHRONOUS BINARYCOUNTER WITH SYNC.CLEAR	16	597 AP/AF	8-BIT LATCH/SHIFT REGISTER	16
164 AP/AF/AFN	8-BIT SIPO SHIFT REGISTER	14	640 AP/AF	OCTAL BUS TRANSCEIVER (3-STATE/INVERTED)	20
			646 AP	OCTAL BUS TRANSCEIVER/REGISTER (3-STATE)	24
TC74HC 165 AP/AF/AFN	8-BIT PISO SHIFT REGISTER	16	TC74HC T646 AP	OCTAL BUS TRANSCEIVER/REGISTER (3-STATE)	24
166 AP/AF/AFN	8-BIT PISO SHIFT REGISTER	16	652 AP	OCTAL BUS TRANSCEIVER/REGISTER (3-STATE)	24
173 AP/AF	QUAD D-TYPE REGISTER (3-STATE)	16	T652 AP	OCTAL BUS TRANSCEIVER/REGISTER (3-STATE)	24
174 AP/AF/AFN	HEX D-TYPE FLIP-FLOP WITH CLEAR	16			
T174 AP/AF/AFN	HEX D-TYPE FLIP-FLOP WITH CLEAR	16			
175 AP/AF/AFN	QUAD D-TYPE FLIP-FLOP WITH CLEAR	16			
TC74HC 191 AP/AF	4-BIT BINARY UP/DOWN COUNTER	16	TC74HC 670 AP/AF	4-WORDx4-BIT REGISTER FILE(3-STATE)	16
193 AP/AF/AFN	SYNCHRONOUS UP/DOWN BINARY COUNTER	16	688 AP/AF	8-BIT EQUALITY COMPARATOR	20
221 AP/AF/AFN	DUAL MONOSTABLE MULTIVIBRATOR (tw out = 1.0 · Cx · Rx)	16	T688 AP/AF	8-BIT EQUALITY COMPARATOR	20
237 AP/AF	3-TO-8 LINE DECODER/LATCH	16	697 AP/AF	UP/DOWN 4-BIT BINARY COUNTER/REGISTER (3-STATE)	20
			4002 AP/AF	DUAL 4-INPUT NOR GATE	14
TC74HC 238 AP/AF	3-TO-8 LINE DECODER	16	TC74HC 4017 AP/AF	DECADE COUNTER/DIVIDER	16
240 AP/AF/AFW	OCTAL BUS BUFFER (3-STATE/INVERTED)	20	4020 AP/AF/AFN	14-STAGE BINARY COUNTER	16
T240 AP/AF/AFW	OCTAL BUS BUFFER (3-STATE/INVERTED)	20	4024 AP/AF	7-STAGE BINARY COUNTER	14
241 AP/AF	OCTAL BUS BUFFER (3-STATE)	20	4028 AP/AF	BCD TO DECIMAL DECODER	16
244 AP/AF/AFW	OCTAL BUS BUFFER (3-STATE)	20	4040 AP/AF/AFN	12-STAGE BINARY COUNTER	16
TC74HC T244 AP/AF/AFW	OCTAL BUS BUFFER (3-STATE)	20	TC74HC 4049 AP/AF/AFN/AFS	HEX BUFFER (INVERTED)	16
245 AP/AF/AFW	OCTAL BUS TRANSCEIVER (3-STATE)	20	4050 AP/AF/AFN/AFS	HEX BUFFER	16
T245 AP/AF/AFW	OCTAL BUS TRANSCEIVER (3-STATE)	20	4051 AP/AF/AFS	8-CHANNEL ANALOG MULTIPLEXER	16
251 AP/AF	8-CHANNEL MULTIPLEXER (3-STATE)	16	4052 AP/AF/AFS	DUAL 4-CHANNEL ANALOG MULTIPLEXER	16
253 AP/AF/AFN	DUAL 4-CHANNEL MULTIPLEXER (3-STATE)	16	4053 AP/AF/AFN/AFS	TRIPLE 2-CHANNEL ANALOG MULTIPLEXER	16
TC74HC 257 AP/AF/AFN	QUAD 2-CHANNEL MULTIPLEXER (3-STATE)	16	TC74HC 4060 AP/AF	14-STAGE BINARY COUNTER/OSCILLATOR	16
259 AP/AF/AFN	8-BIT ADDRESSABLE LATCH	16	4066 AP/AF/AFN/AFS	QUAD BI LATERAL SWITCH	14
273 AP/AF/AFW	OCTAL D-TYPE FLIP-FLOP WITH CLEAR	20	4072 AP/AF	DUAL 4-INPUT OR GATE	14
T273 AP/AF/AFW	OCTAL D-TYPE FLIP-FLOP WITH CLEAR	20	4075 AP/AF	TRIPLE 3-INPUT OR GATE	14
279 AP/AF	QUAD S-R LATCH	16	4078 AP/AF	8-INPUT OR/NOR GATE	14
TC74HC 280 AP/AF	9-BIT PARITY GENERATOR/CHECKER	14	TC74HC 4094 AP/AF/AFN	8-BIT SIPO SHIFT REGISTER/LATCH (3-STATE)	16
283 AP/AF/AFN	4-BIT BINARY FULL ADDER	16	40102 AP/AF	DUAL BCD PROGRAMMABLE DOWN COUNTER	16
299 AP/AF	8-BIT PIPO SHIFT REGISTER	20	40103 AP/AF	8-BIT BINARY PROGRAMMABLE DOWN COUNTER	16
365 AP/AF	HEX BUS BUFFER (3-STATE)	16			
366 AP/AF	HEX BUS BUFFER(3-STATE/INVERTED)	16			
367 AP/AF/AFN	HEX BUS BUFFER (3-STATE)	16			
TC74HC 368 AP/AF/AFN	HEX BUS BUFFER(3-STATE/INVERTED)	16	TC74HC 40105 AP/AF	4-BITx16-WORD FIFO REGISTER	16
373 AP/AF/AFW	OCTAL D-TYPE LATCH (3-STATE)	20	4511 AP/AF	BCD TO 7 SEGMENT LATCH/DECODER/DRIVER	16
T373 AP/AF/AFW	OCTAL D-TYPE LATCH(3-STATE)	20	4514 AP	4-TO-16 LINE DECODER/LATCH	24
374 AP/AF/AFW	OCTAL D-TYPE FLIP-FLOP (3-STATE)	20	4520 AP/AF	DUAL 4-BIT BINARY COUNTER	16
T374 AP/AF/AFW	OCTAL D-TYPE FLIP-FLOP (3-STATE)	20			
TC74HC 375 AP/AF/AFN	QUAD D-TYPE LATCH	16	TC74HC 4538 AP/AF/AFN/AFS	DUAL MONOSTABLE MULTIVIBRATOR	16
377 AP/AF/AFW	OCTAL D-TYPE FLIP-FLOP	20	T7007 AP/AF	HEX BUFFER	14
390 AP/AF/AFN	DUAL DECADE COUNTER	16	7240 AP/AF	OCTAL BUS BUFFER(3-STATE/INVERTED)	20
393 AP/AF/AFN	DUAL BINARY COUNTER	14	7244 AP/AF	OCTAL BUS BUFFER(3-STATE)	20
TC74HC 423 AP/AF	DUAL MONOSTABLE MULTIVIBRATOR (tw out = 1.0 · Cx Rx)	16	TC74HC 7266 AP/AF	QUAL EXCLUSIVE NOR GATE	14
540 AP/AF/AFW	OCTAL BUS BUFFER(3-STATE/INVERTED)	20	7292 AP/AF	PROGRAMMABLE DIVIDER/TIMER	16

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TC4000B/4500B Series Selection Guide

Function		TC4000B/4500B Series	
GATE	NAND	TC4011 BP / BF / BFN / BFT	
	NOR	TC4001 BP / BF / BFN / BFT	
	AND	TC4081 BP / BF / BFN	
	OR	TC4071BP/BF/BFN	
	INVERTER	TC4069UBP / BF / BFN / BFT	
	BUFFER	TC4049BP / BF / BFN,	TC4050BP / BF / BFN
	SCHMITT	TC4093BP / BF / BFN,	TC4584BP / BF / BFN
	EXCLUSIVE OR	TC4030BP/BF/BFN	
FLIP-FLOP		TC401 3BP / BF / BFN,	TC4027BP / BF / BFN
LATCH		TC4044BP / BF / BFN	
MULTIVIBRATOR		TC4538BP / BF	
SHIFT REGISTER		TC4015BP/BF/BFN,	TC4021BP/BF/BFN, TC4094BP/BF/BFN
DECODER		TC4028BP / BF / BFN	
COUNTER		TC401 7BP / BF, TC4040BP/BF/BFN,	TC4020BP / BF / BFN, TC4520BP/BF/BFN/BFT, TC4024BP / BF / BFN, TC4521BP
ANALOG MULTIPLEXER		TC4051 BP / BF / BFN / BFT, TC4052BP / BF / BFN / BFT,	
		TC4053BP / BF / BFN / BFT	
ANALOG SWITCH		TC4066BP / BF / BFN / BFT	
OTHER		TC4511 BP / BF,	TC4512BP / BF / BFN

TC4000B/4500B Series Product Guide

Device	Function
TC 4001 BP/BF/BFN/BFT	QUAD 2-INPUT NOR GATE
4011 BP/BF/BFN/BFT	QUAD 2-INPUT NAND GATE
4013 BP/BF/BFN	DUAL D-TYPE FLIP-FLOP
4015 BP/BF/BFN	DUAL 4-STAGE STATIC SHIFT REGISTER
TC 4017 BP/BF	DECADE COUNTER/DIVIDER
4020 BP/BF/BFN	14-STAGE RIPPLE-CARRY BINARY COUNTER/DIVIDER
4021 BP/BF/BFN	8-STAGE STATIC SHIFT REGISTER
4024 BP/BF/BFN	7-STAGE RIPPLE-CARRY BINARY COUNTER/DIVIDER
TC 4027 BP/BF/BFN	DUAL J-K MASTER-SLAVE FLIP-FLOP
4028 BP/BF/BFN	BCD-TO-DECIMAL DECODER
4030 BP/BF/BFN	QUAD EXCLUSIVE-OR GATE
4040 BP/BF/BFN	1 2-STAGE RIPPLE-CARRY BINARY COUNTER/DIVIDER
TC 4044 BP/BF/BFN	QUAD 3-STATE NAND R/S LATCH
4049 BP/BF/BFN	HEX BUFFER/CONVERTER(Inverting Type)
4050 BP/BF/BFN	HEX BUFFER/CONVERTER(Non-Inverting Type)

Device	Function
TC 4051 BP/BF/BFN/BFT	SINGLE 8-CHANNEL MULTIPLEXER/DEMULTIPLEXER
4052 BP/BF/BFN/BFT	DIFFERENTIAL 4-CHANNEL MULTIPLEXER/DEMULTIPLEXER
TC 4053 BP/BF/BFN/BFT	TRIPLE 2-CHANNEL MULTIPLEXER/DEMULTIPLEXER
4066 BP/BF/BFN/BFT	QUAD BILATERAL SWITCH
4069U BP/BF/BFN/BFT	HEX INVERTER
4071 BP/BF/BFN	QUAD 2-INPUT OR GATE
4081 BP/BF/BFN	QUAD 2-INPUT AND GATE
TC 4093 BP/BF/BFN	QUAD 2-INPUT NAND SCHMITT TRIGGER
4094 BP/BF/BFN	8-BIT SHIFT-AND-STORE BUS REGISTER
4511 BP/BF	BCD-TO-7-SEGMENT LATCH/DECODER/DRIVER
4512 BP/BF/BFN	8-CHANNEL DATA SELECTOR 173
4520 BP/BF/BFN	DUAL BINARY UP-COUNTER
TC 4521 BP	24-STAGE FREQUENCY DIVIDER
4538 BP/BF	DUAL PRECISION MONOSTABLE MULTIVIBRATOR
4584 BP/BF/BFN	HEX SCHMITT TRIGGER

Mini MOS Families

In recent years communications equipment has become much smaller and more compact.

As a result demand has increased for semiconductor device packages which are smaller, thinner and easier to assemble. To respond to these market requirements, Toshiba have been offering 5-pin and 8-pin ultra-small flat packages (the USV and the US8 respectively).

Now, by increasing the number of pins on those products, Toshiba have developed the smallest and thinnest 16-pin and 20-pin packages (the US16 and the US20 respectively).

Products in these packages will gradually be introduced into the C2MOS logic and bus switch product line-ups.

Features

World's smallest 16-pin and 20-pin packages

Mounting area: 16 mm² for 16-pin package

20 mm² for 20-pin package

World's thinnest 16-pin and 20-pin packages

Overall height: 1.0 mm (max)

Easy to mount on PCBs

0.5-mm pitch facilitates mounting on PCB.

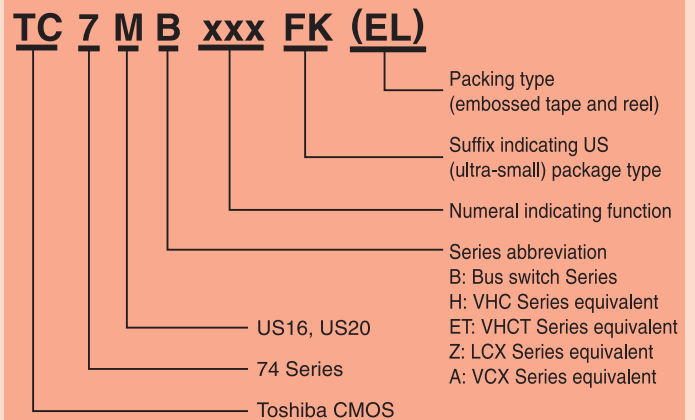
High quality, high reliability

IR reflow can be used. Humidity-proof packing is unnecessary.

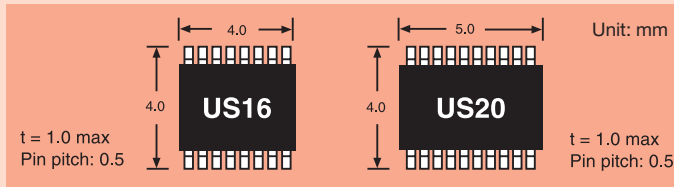
Extensive line-up

70 products scheduled for release

Product naming



External dimensions



Line-up

16-pin type

Function	TC7MB	TC7MH	TC7MET	TC7MZ	TC7MA
123A	–	O	–	–	–
138	–	O	O	O	O
139	–	–	O	–	–
153	–	O	–	–	–
157	–	O	–	O	O
161	–	O	–	–	–
163	–	O	–	–	–
165	–	O	–	–	–
175	–	O	–	–	–
221A	–	O	–	–	–
238	–	O	–	–	–
251	O	–	–	–	–
253	O	–	–	–	–
257	O	O	–	–	O
367	–	O	–	–	Plan
368	–	O	–	–	–
595	–	O	–	–	–
4040	–	O	–	–	–
4051	–	–	–	O	–
4052	–	–	–	O	–
4053	–	–	–	O	–

20-pin type

Function	TC7MB	TC7MH	TC7MET	TC7MZ	TC7MA
240	–	O	O	O	–
244	O*	O	O	O	O
2244	–	–	–	–	O
245	O*	O	Plan	O	O
R2245	–	–	–	–	O
273	–	O	–	–	–
373	–	O	O	O	O
2373	–	–	–	–	O
374	–	O	O	O	O
2374	–	–	–	–	O
540	–	O	O	O	–
541	–	O	O	O	O
2541	–	–	–	–	O
573	–	O	O	O	O
2573	–	–	–	–	O
574	–	O	O	O	O
2574	–	–	–	–	O

* : Line-up includes TC7MBD3244 and TC7MBD3245 which allow shifting of voltage level from 5 V to 3.3 V.

■ Target Application & example TC7MB/ WB/ SB Series

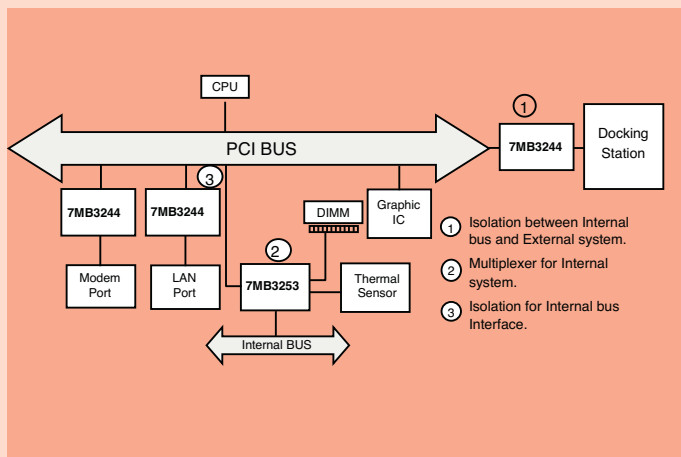
■ Target Application

- PC, PC peripheral
- Network/ Telecom
- High End PC, PC, Server
- Cellular / GSM
- TFT Monitor
- PDA
- POS Terminal / Elec. Wallet Reader
- Industrial

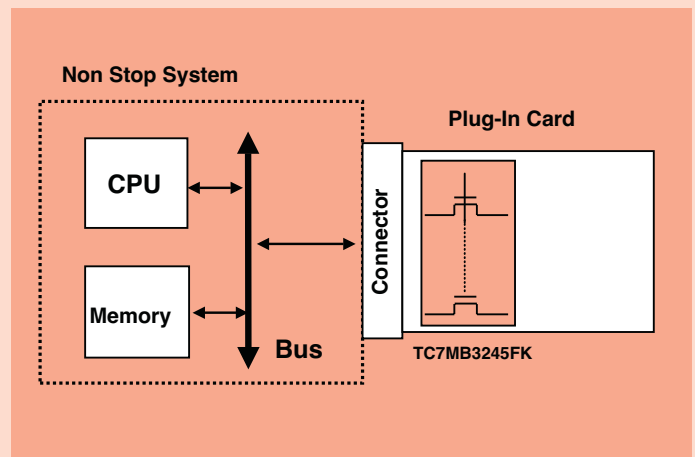
■ Application Example

- Live Bus Interface
- Isolation between Devices (Memory Interface etc.)
- Noise Filter
- Clock Distributor
- High Speed Level Shifter (5V -> 3V)

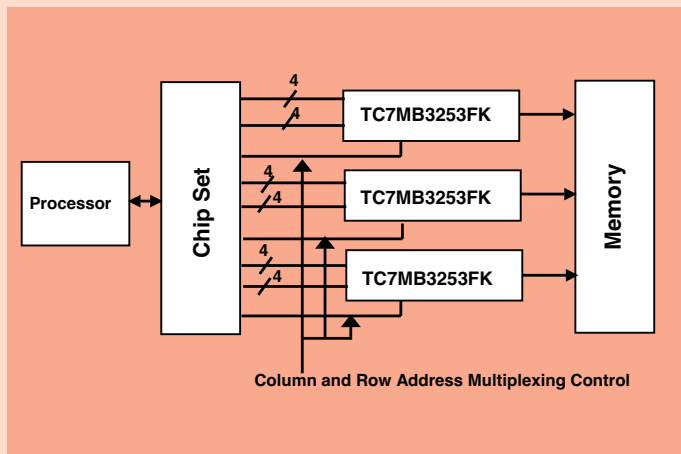
■ Application Example 1 High Speed Switching / Bus Isolation



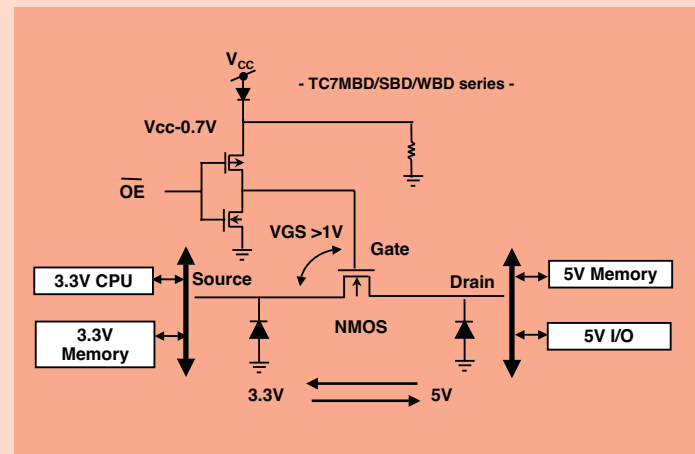
■ Application Example 2 Hot Plug Application



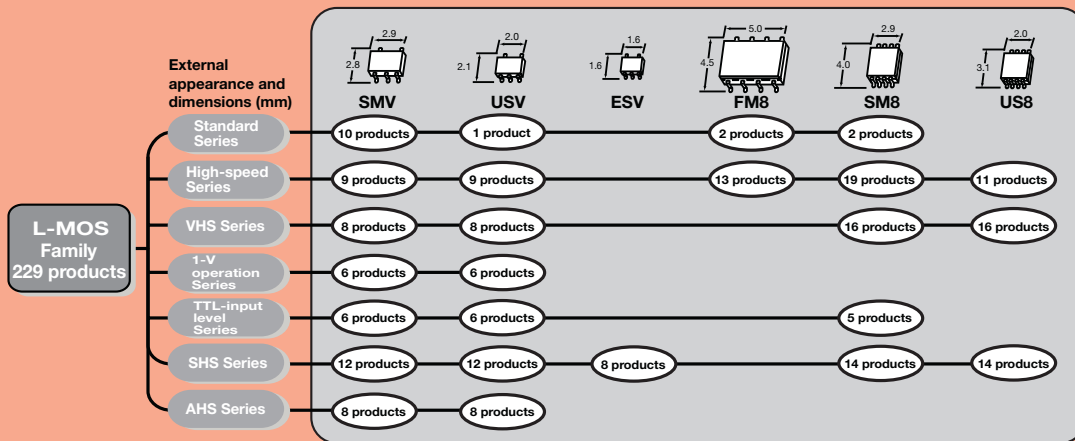
■ Application Example 3 Memory Address Multiplexing



■ Application Example 4 Voltage Translation 5V to 3.3V



L-MOS



Including products under development

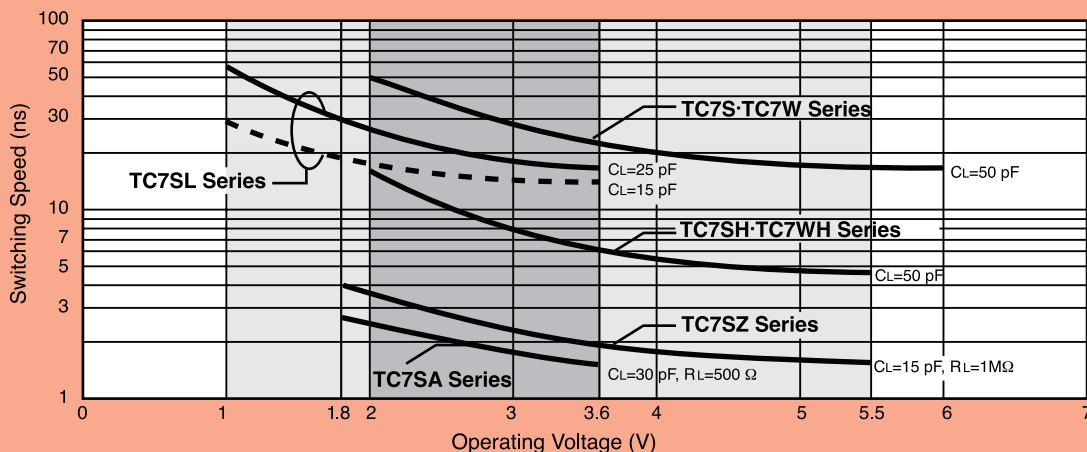
L-MOS Performance Summary

Parameter	Standard Series	High-Speed Series *1		Very-High-Speed Series	1-V Operation Series *1	TTL-Level Input Series		Super-High-Speed Series *2	AHS Series
	TC4SxxF TC4WxxF/FU	TC7SxxF/FU	TC7WxxF/FU/FK TC3WxxF/FU	TC7SHxxF/FU TC7WHxxF/FU/FK	TC7SLxxF/FU	TC7SETxxF/FU	TC7WTxxF/FU	*TC7SZxxF/FU *TC7SZxxAFE *TC7WZxxF/FU/FK	*TC7SAxxF/FU
Propagation delay time (NAND gate)	65 ns typ. @V _{CC} = 5 V CL = 15pF Ta=25°C	7 ns typ. @V _{CC} = 5 V CL = 15pF Ta=25°C	6 ns typ. @V _{CC} = 5 V CL = 15pF Ta=25°C	3.7 ns typ. @V _{CC} = 5 V CL = 15pF Ta=25°C	7.5 ns typ. @V _{CC} = 3 V CL = 15pF Ta=25°C	4.2 ns typ. @V _{CC} = 5 V CL = 15pF Ta=25°C	10 ns typ. (3state Bu) @V _{CC} = 5.5 V CL = 15pF Ta=25°C	2.4 ns typ. @V _{CC} = 3.3 V CL = 15pF RL = 1MΩ Ta=25°C	2.8 ns max @V _{CC} = 3.3 V CL = 30pF RL = 500Ω Ta=-40 ~ 85°C
Operating voltage range	3 ~ 18 V	2 ~ 6 V	2 ~ 6 V	2 ~ 5.5 V	1 ~ 3.6 V	4.5 ~ 5.5 V	4.5 ~ 5.5 V	1.8 ~ 5.5 V	1.8 ~ 3.6 V
Operating temperature range	-40 ~ 85°C	-40 ~ 85°C	-40 ~ 85°C	-40 ~ 85°C	-40 ~ 85°C	-40 ~ 85°C	-40 ~ 85°C	-40 ~ 85°C	-40 ~ 85°C
Output current	I _{OH}	0.42mA min (@V _{CC} = 5V)	2mA min (@V _{CC} = 4.5V)	4mA min (@V _{CC} = 4.5V)	8mA min (@V _{CC} = 4.5V)	1mA min (@V _{CC} = 1.5V)	8mA min (@V _{CC} = 4.5V)	4mA min (@V _{CC} = 4.5V)	24mA min (@V _{CC} = 3V)
	I _{OL}	0.42mA min (@V _{CC} = 5V)	2mA min (@V _{CC} = 4.5V)	4mA min (@V _{CC} = 4.5V)	8mA min (@V _{CC} = 4.5V)	1mA min (@V _{CC} = 1.5V)	8mA min (@V _{CC} = 4.5V)	4mA min (@V _{CC} = 4.5V)	24mA min (@V _{CC} = 3V)
Electrical characteristics (except for permissible power dissipation rating)	Same as those of the TC4xxxB series	Output current is 1/2 that of the TC74HCxxA series	Same as those of the TC74HCxxA series	Same as those of the TC74VHCxxx series	—	Input voltage specification is TTL level. V _{IL} = 0.8 V (max) V _{IH} = 2.0 V (min) The output voltage level is subject to full swings.		Same as those of the TC74LCxxx series when operating V _{CC} = 3.3V	Same as those of the TC74VCxxx series

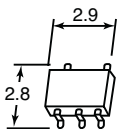
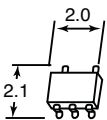
*: Some products are in under development stage.

*1: TC3WxxF/FU and TC7SLxxF/FU are original L-MOS devices and it is not a CMOS logic IC.

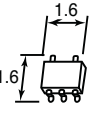
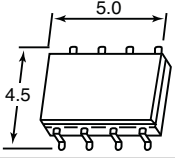
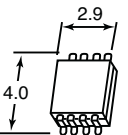
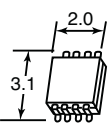
*2: TC7SZxxF/FU Series have 5-V tolerant function for input and output same as those of the TC74LCxxx Series. TC7SZxxAFE Series only have 5-V tolerant function for input.



■ Selection Guide

Package	SMV							USV				
Appearance (mm)												
Function	Standard Series	High-Speed Series	1-V Operation Series	VHS Series		SHS Series	AHS Series	High-Speed Series	1-V Operation Series	VHS Series		SHS Series
					TTL input level						TTL input level	
NAND	TC4S11F	TC7S00F	TC7SL00F	TC7SH00F	TC7SET00F	TC7SZ00F	TC7SA00F	TC7S00FU	TC7SL00FU	TC7SH00FU	TC7SET00FU	TC7SZ00FU
NAND (unbuffer)	TC4SU11F											
NAND (open drain)						*TC7SZ38F						*TC7SZ38FU
AND	TC4S81F	TC7S08F	TC7SL08F	TC7SH08F	TC7SET08F	TC7SZ08F	TC7SA08F	TC7S08FU	TC7SL08FU	TC7SH08FU	TC7SET08FU	TC7SZ08FU
NOR	TC4S01F	TC7S02F	TC7SL02F	TC7SH02F	TC7SET02F	TC7SZ02F	*TC7SA02F	TC7S02FU	TC7SL02FU	TC7SH02FU	TC7SET02FU	TC7SZ02FU
OR	TC4S71F	TC7S32F	TC7SL32F	TC7SH32F	TC7SET32F	TC7SZ32F	*TC7SA32F	TC7S32FU	TC7SL32FU	TC7SH32FU	TC7SET32FU	TC7SZ32FU
Exclusive-OR	TC4S30F	TC7S86F		TC7SH86F	TC7SET86F	*TC7SZ86F		TC7S86FU		TC7SH86FU	TC7SET86FU	*TC7SZ86FU
Inverter	TC4S69F	TC7S04F	TC7SL04F	TC7SH04F	TC7SET04F	TC7SZ04F	*TC7SA04F	TC7S04FU	TC7SL04FU	TC7SH04FU	TC7SET04FU	TC7SZ04FU
Inverter (unbuffer)	TC4SU69F	TC7SU04F	TC7SLU04F	TC7SHU04F		TC7SZU04F		TC7SU04FU	TC7SLU04FU	TC7SHU04FU		TC7SZU04FU
Inverter (open drain)						TC7SZ05F						TC7SZ05FU
Schmitt inverter	TC4S584F	TC7S14F		TC7SH14F		*TC7SZ14F	*TC7SA14F	TC7S14FU		TC7SH14FU		*TC7SZ14FU
Buffer												
Analog switch	TC4S66F TC4S66FU(USV)	TC7S66F						TC7S66FU				
Analog multiplexer												
D-type flip-flop												
3-state buffer						TC7SZ125F	*TC7SA125F					TC7SZ125FU
3-state buffer						TC7SZ126F	*TC7SA126F					TC7SZ126FU
3-state inverting buffer												
3-state buffer												
Bus transceiver												
Monostable multivibrator												
Digital multiplexer												
2-to-4 decoder												
2-to-3 decoder with Enable												
2-to-3 decoder with Enable												
Oscillator & divider												

• The suffix "F" denotes a SMV or FM8 package. • The suffix "FU" denotes a USV or SM8 package. • The suffix "FE" denotes a ESV package. The suffix "FK" denotes a US8 package.

ESV		FM8		SM8				US8				Package
												Appearance (mm)
AHS Series	SHS Series	Standard Series	High-Speed Series	Standard Series	High-Speed Series		VHS Series	SHS Series	High-Speed Series	VHS Series	SHS Series	Function
					TTL input level							
TC7SA00FU	TC7SZ00AFE		TC7W00F		TC7W00FU		TC7WH00FU	TC7WZ00FU	TC7W00FK	TC7WH00FK	TC7WZ00FK	NAND
												NAND (unbuffer)
								TC7WZ38FU			TC7WZ38FK	NAND (open drain)
TC7SA08FU	TC7SZ08AFE		TC7W08F		TC7W08FU		TC7WH08FU	TC7WZ08FU	TC7W08FK	TC7WH08FK	TC7WZ08FK	AND
*TC7SA02FU	TC7SZ02AFE		TC7W02F		TC7W02FU		TC7WH02FU	*TC7WZ02FU	TC7W02FK	TC7WH02FK	*TC7WZ02FK	NOR
*TC7SA32FU	TC7SZ32AFE		TC7W32F		TC7W32FU		TC7WH32FU	TC7WZ32FU	TC7W32FK	TC7WH32FK	TC7WZ32FK	OR
								*TC7WZ86FU			*TC7WZ86FK	Exclusive-OR
*TC7SA04FU	TC7SZ04AFE		TC7W04F		TC7W04FU		TC7WH04FU	*TC7WZ04FU	TC7W04FK	TC7WH04FK	*TC7WZ04FK	Inverter
	TC7SZU04AFE		TC7WU04F		TC7WU04FU		TC7WHU04FU	*TC7WZU04FU	TC7WU04FK	TC7WHU04FK	*TC7WZU04FK	Inverter (unbuffer)
								*TC7WZ05FU			*TC7WZ05FK	Inverter (open drain)
*TC7SA14FU			TC7W14F		TC7W14FU		TC7WH14FU	*TC7WZ14FU	TC7W14FK	TC7WH14FK	*TC7WZ14FK	Schmitt inverter
					TC7W34FU		TC7WH34FU	*TC7WZ34FU	TC7W34FK	TC7WH34FK	*TC7WZ34FK	Buffer
		TC4W66F	TC7W66F	TC4W66FU	TC7W66FU				TC7W66FK			Analog switch
		TC4W53F	TC7W53F	TC4W53FU	TC7W53FU				TC7W53FK			Analog multiplexer
			TC7W74F		TC7W74FU	TC7WT74FU	TC7WH74FU	*TC7WZ74FU		TC7WH74FK	*TC7WZ74FK	D-type flip-flop
*TC7SA125FU	*TC7SZ125AFE				TC7W125FU	TC7WT125FU	TC7WH125FU	*TC7WZ125FU		TC7WH125FK	*TC7WZ125FK	3-state buffer
*TC7SA126FU	*TC7SZ126AFE				TC7W126FU	TC7WT126FU	TC7WH126FU	*TC7WZ126FU		TC7WH126FK	*TC7WZ126FK	3-state buffer
					TC7W240FU	TC7WT240FU	TC7WH240FU			TC7WH240FK		3-state inverting buffer
					TC7W241FU	TC7WT241FU	TC7WH241FU			TC7WH241FK		3-state buffer
							TC7WH245FU			TC7WH245FK	TC7WZ245FK	Bus transceiver
							TC7WH123FU			TC7WH123FK		Monostable multivibrator
							TC7WH157FU			TC7WH157FK		Digital multiplexer
			TC7W139F		TC7W139FU							2-to-4 decoder
			TC3W01F		TC3W01FU							2-to-3 decoder with Enable
			TC3W02F		TC3W02FU							2-to-3 decoder with Enable
					TC3W03FU							Oscillator & divider

*: Under development

Product Guide

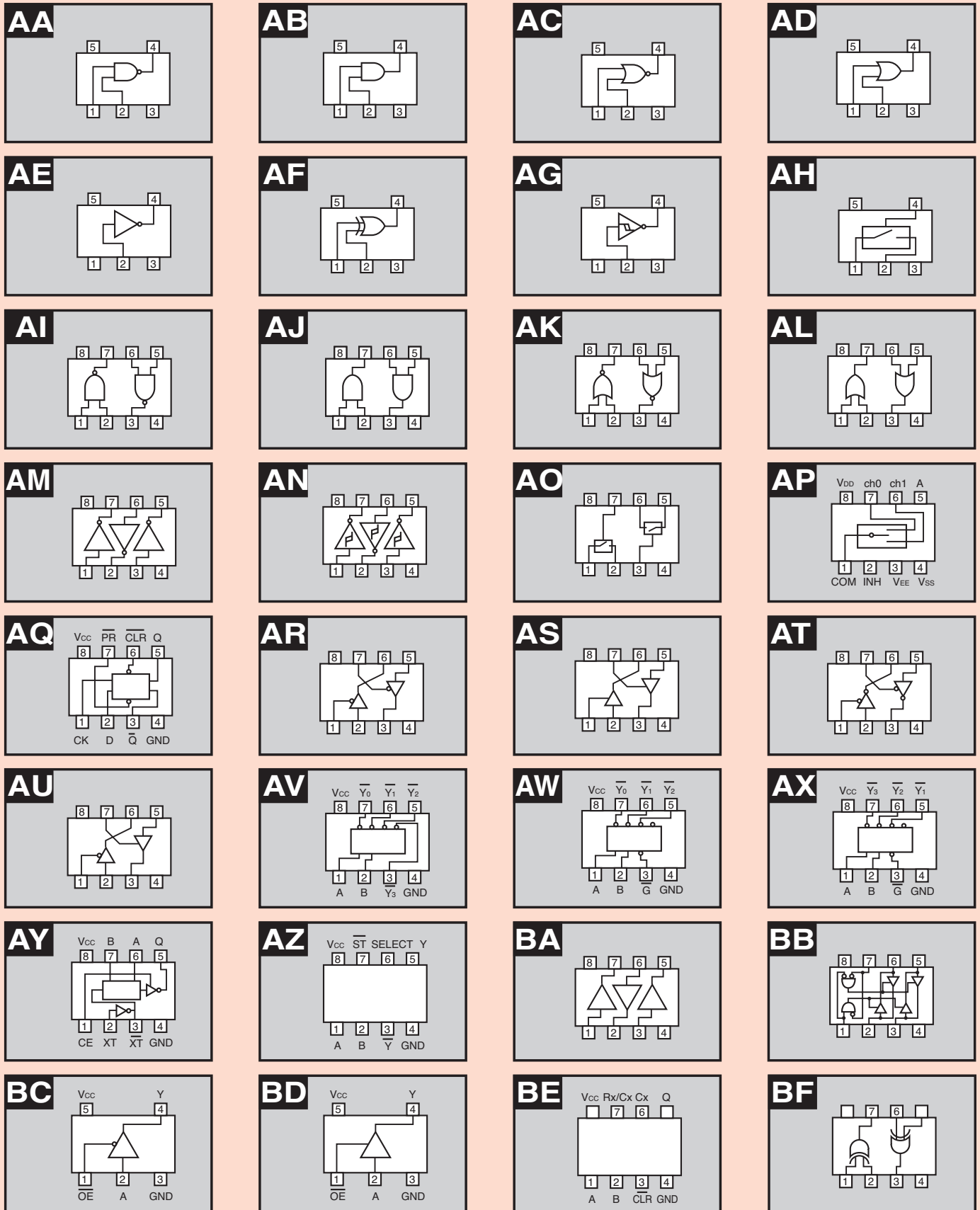
Product		Function	Marking	Pin Configuration
TC4S	01F	2-input NOR	C3	AC
	11F	2-input NAND	C1	AA
	U11F	2-input NAND (unbuffer)	C7	AA
	30F	Exclusive-OR	C8	AF
	66F/FU	Analog switch	C9	AH
	69F	Inverter	C5	AE
	U69F	Inverter (unbuffer)	C6	AE
	71F	2-input OR	C4	AD
	81F	2-input AND	C2	AB
	584F	Schmitt trigger inverter	CA	AG
TC7S	00F/FU	2-input NAND	E1	AA
	02F/FU	2-input NOR	E3	AC
	04F/FU	Inverter	E5	AE
	U04F/FU	Inverter (unbuffer)	E6	AE
	08F/FU	2-input AND	E2	AB
	14F/FU	Schmitt trigger inverter	EA	AG
	32F/FU	2-input OR	E4	AD
	66F/FU	Analog switch	E9	AH
	86F/FU	Exclusive-OR	E8	AF
	00F/FU	2-input NAND	G1	AA
	02F/FU	2-input NOR	G3	AC
	04F/FU	Inverter	G5	AE
	08F/FU	2-input AND	G2	AB
	32F/FU	2-input OR	G4	AD
	86F/FU	Exclusive-OR	G8	AF
TC7SET (TTL input level)	00F/FU	2-input NAND	H1	AA
	02F/FU	2-input NOR	H3	AC
	04F/FU	Inverter	H5	AE
	U04F/FU	Inverter (unbuffer)	H6	AE
	08F/FU	2-input AND	H2	AB
	14F/FU	Schmitt trigger inverter	HA	AG
	32F/FU	2-input OR	H4	AD
	86F/FU	Exclusive-OR	H8	AF
TC7SH	00F/FU	2-input NAND	L1	AA
	02F/FU	2-input NOR	L3	AC
	04F/FU	Inverter	L5	AE
	U04F/FU	Inverter (unbuffer)	L6	AE
	08F/FU	2-input AND	L2	AB
	32F/FU	2-input OR	L4	AD
TC7SZ	00F/FU/00AFE	2-input NAND	J1/R1	AA
	02F/FU/02AFE	2-input NOR	J3/R3	AC
	04F/FU/04AFE	Inverter	J5/R5	AE
	U04F/FU/U04AFE	Inverter (unbuffer)	J6/R6	AE
	05F/FU	Inverter (Open Drain)	JE	AE
	08F/FU/08AFE	2-input AND	J2/R2	AB
	* 14F/FU	Schmitt trigger inverter	JA	AG
	32F/FU/32AFE	2-input OR	J4/R4	AD
	* 38F/FU	2-input NAND (open drain)	JD	AA
	* 86F/FU	Exclusive-OR	J8	AF
	125F/FU/ * 125AFE	3-state buffer	JB	BC
	126F/FU/ * 126AFE	3-state buffer	JC	BD
TS7SA	00F/FU	2-input NAND	V1	AA
	* 02F/FU	2-input NOR	V3	AC
	* 04F/FU	Inverter	V5	AE
	08F/FU	2-input AND	V2	AB
	* 14F/FU	Schmitt trigger inverter	VA	AG
	* 32F/FU	2-input OR	V4	AD
	* 125F/FU	3-state buffer	VB	BC
	* 126F/FU	3-state buffer	VC	BD
TC4W	53F/FU	2-channel multiplexer	4W53F/4W53	AP
	66F/FU	Dual analog switch	4W66F/4W66	AQ
TC7W	00F/FU/FK	Dual 2-input NAND	7W00F/7W00/W00	AI
	02F/FU/FK	Dual 2-input NOR	7W02F/7W02/W02	AK
	04F/FU/FK	Triple inverter	7W04F/7W04/W04	AM
	U04F/FU/FK	Triple inverter (unbuffer)	7WU04F/7WU04/WU04	AM
	08F/FU/FK	Dual 2-input AND	7W08F/7W08/W08	AJ
	14F/FU/FK	Triple schmitt trigger inverter	7W14F/7W14/W14	AN
	32F/FU/FK	Dual 2-input OR	7W32F/7W32/W32	AL
	34F/FK	Triple non-inverting buffer	7W34/W34	BA
	53F/FU/FK	2-channel multiplexer	7W53F/7W53/W53	AP
	66F/FU/FK	Dual analog switch	7W66F/7W66/W66	AO
	74F/FK	D-type flip-flop	7W74F/7W74/W74	AQ
	125FU	Dual 3-state buffer	7W125	AR
	126FU	Dual 3-state buffer	7W126	AS
	139F/FU	2-to-4 decoder	7W139F/7W139	AV
	240FU	3-state buffer	7W240	AT
	241FU	3-state buffer	7W241	AU
TC7WH	00FU/FK	2-input NAND	H00/WH00	AI
	02FU/FK	2-input NOR	H02/WH02	AK
	04FU/FK	Triple inverter	H04/WH04	AM
	U04FU/FK	Triple inverter (buffer)	HU04/WHU04	AM
	08FU/FK	Dual 2-input AND	H08/WH08	AJ
	14FU/FK	Triple schmitt trigger inverter	H14/WH14	AN
	32FU/FK	Dual 2-input OR	H32/WH32	AL
	34FU/FK	Triple non-inverting buffer	H34/WH34	BA
	74FU/FK	D-type flip-flop	H74/WH74	AQ
	123FU/FK	Monostable multivibrator	H123/WH123	BE
	125FU/FK	Dual 3-state buffer	H125/WH125	AR
	126FU/FK	Dual 3-state buffer	H126/WH126	AS
	157FU/FK	2-channel multiplexer	H157/WH157	AZ
	240FU/FK	Dual 3-state buffer	H240/WH240	AT
	241FU/FK	Dual 3-state buffer	H241/WH241	AU
	245FU/FK	Bus transceiver	H245/WH245	BB
TC7WZ	00FU/FK	Dual 2-input NAND	Z00/WZ00	AI
	*02FU/FK	Dual 2-input NOR	Z02/WZ02	AK
	*04FU/FK	Triple inverter	Z04/WZ04	AM
	*U04FU/FK	Triple inverter (unbuffer)	ZU04/WZU04	AM
	*05FU/FK	Triple inverter (open drain)	Z05/WZ05	AM
	08FU/FK	Dual 2-input AND	Z08/WZ08	AJ
	*14FU/FK	Triple schmitt trigger inverter	Z14/WZ14	AN
	32FU/FK	Dual 2-input OR	Z32/WZ32	AL
	*34FU/FK	Triple non-inverting buffer	Z34/WZ34	BA
	38FU/FK	Dual 2-input NAND(open drain)	Z38/WZ38	AI
	*74FU/FK	D-type flip-flop	Z74/WZ74	AQ
	*86FU/FK	Dual Exclusive-OR	Z86/WZ86	BF
	*125FU/FK	Dual 3-state buffer	Z125/WZ125	AR
	*126FU/FK	Dual 3-state buffer	Z126/WZ126	AS
TC7WT (TTL input level)	74FU	D-type flip-flop	WT74	AQ
	125FU	Dual 3-state buffer	WT125	AR
	126FU	Dual 3-state buffer	WT126	AS
	240FU	Dual 3-state buffer	WT240	AT
	241FU	Dual 3-state buffer	WT241	AU
TC3W	01F/FU	2-to-3 decoder with Enable	3W01F/3W01	AW
	02F/FU	2-to-3 decoder with Enable	3W02F/3W02	AX
	03FU	Oscillator and divider	3W03	AY

• The suffix "F" denotes a SMV or FM8 package.
• The suffix "FU" denotes a USV or SM8 package.

• The suffix "FE" denotes a ESV package.
• The suffix "FK" denotes a US8 package.

* : Under development

Pin Assignments

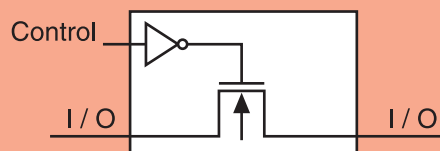


Top View

■ Bus Switches

Systems are becoming higher performance and more advanced due to the improved characteristics of their constituent devices, such as super-high speed, interface performance and low current dissipation. The Toshiba Bus Switch TC7MB / WB / SB Series facilitate the design of such systems. With their ultra-small packages (US packages), these series allow the construction of compact and light-weight equipment.

Basic equivalent circuit



Features

■ High-speed operation with propagation delay time of 250 ps (max)

Makes for higher bus speed.

■ Partial power-down

Makes for lower system power dissipation.

■ 5-V to 3-V interface (TC7MBD/WBD/SBD Series only)

Facilitates configuration of a system with various different power supplies.

■ Low ON-resistance of 5 Ω (typ.)

Can be used as high-speed analog switches.

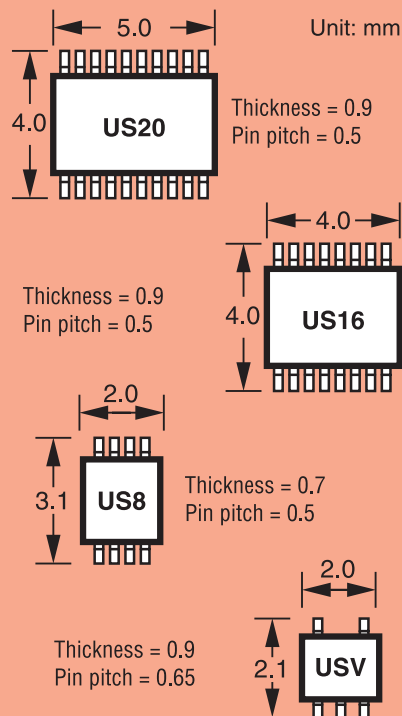
■ Save mounting area with ultra-small package

Enables construction of compact and thin systems.

Line-up and packages

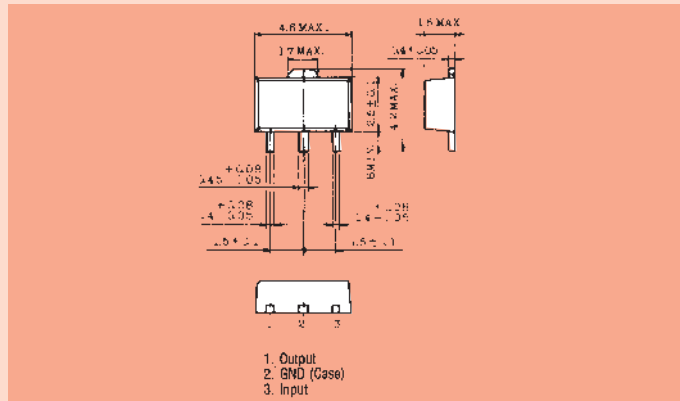
Product number	Function	Package
TC7MB3244FK	Octal bus switch	US20
TC7MBD3244FK	Octal bus switch with level shifting	US20
TC7MB3245FK	Octal bus switch	US20
TC7MBD3245FK	Octal bus switch with level shifting	US20
TC7MB3251FK	1-of-8 multiplexer / demultiplexer	US16
TC7MB3253FK	Dual 1-of-4 multiplexer / demultiplexer	US16
TC7MB3257FK	Quad 1-of-2 multiplexer / demultiplexer	US16
TC7WB125FK	Dual bus switch	US8
TC7WBD125FK	Dual bus switch with level shifting	US8
TC7WB126FK	Dual bus switch	US8
TC7WBD126FK	Dual bus switch with level shifting	US8
TC7SB384FU	Single bus switch	USV
TC7SBD384FU	Single bus switch with level shifting	USV
TC7SB385FU	Single bus switch	USV
TC7SBD385FU	Single bus switch with level shifting	USV
TC7SB66FU	Single bus switch	USV

Product line-up is subject to change without notice. For details of products, including development schedules, please contact your local Toshiba sales office.

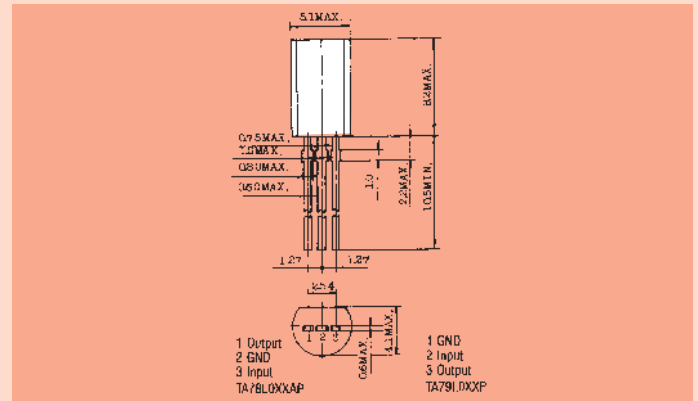


All values are indicated as the typical.

■ Voltage Regulator
SOT-89



TO-92 MOD



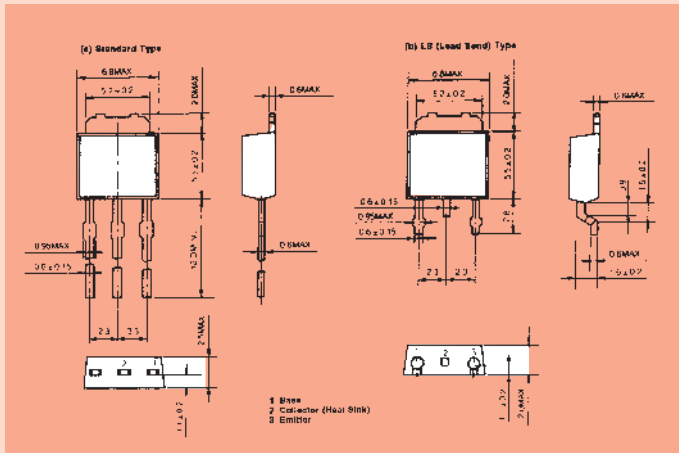
■ Series Regulators (Low Dropout)

Product No.	Output Current Max (mA)	Output Voltage Typ. (V)	Input Voltage Max (V)	Drop-out Voltage Typ. (V)	Bias Current Typ. (mA)	Output Voltage Accuracy (%)	Built-in Protection Circuits	Allowable Power Dissipation (W)	Package	External Appearance
TA78DL05F/AF TA78DL06F/AF TA78DL08F/AF TA78DL09F/AF TA78DL10F/AF TA78DL12F/AF TA78DL15F/AF	250	5 6 8 9 10 12 15	29 Load dump 60	0.4 (I _o =200mA)	0.5 0.55 0.6 0.65 0.7 0.8 0.9 (I _o =0A)	F : ±10 AF : ±5 (T _a =-40 to 85°C)	Thermal shutdown Over current Over voltage Reverse battery	1.0 (T _a =25°C) 10 (T _c =25°C)	PW-MOLD (DPAK)	
TA78DL05S/AS TA78DL06S/AS TA78DL08S/AS TA78DL09S/AS TA78DL10S/AS TA78DL12S/AS TA78DL15S/AS	250	5 6 8 9 10 12 15	29 Load dump 60	0.4 (I _o =200mA)	0.5 0.55 0.6 0.65 0.7 0.8 0.9 (I _o =0A)	S : ±10 AS : ±5 (T _a =-40 to 85°C)	Thermal shutdown Over current Over voltage Reverse battery	2.0 (T _a =25°C) 20 (T _c =25°C)	TO-220 (IS)	
TA78DL05BS TA78DL06BS TA78DL08BS TA78DL09BS TA78DL10BS TA78DL12BS TA78DL15BS	250	5 6 8 9 10 12 15	29 Load dump 60	0.4 (I _o =200mA)	0.5 0.55 0.6 0.65 0.7 0.8 0.9 (I _o =0A)	±10 (T _a =-40 to 85°C)	Thermal shutdown Over current Over voltage Reverse battery	2.0 (T _a =25°C) 20 (T _c =25°C)	TO-220 (IS)	
TA48L018F TA48L02F TA48L025F TA48L03F TA48L033F TA48L05F	150	1.8 2 2.5 3 3.3 5	16	0.5 (I _o =100mA)	0.4 (I _o =0A)	±5 (T _j =0 to 125°C)	Thermal shutdown Over current	0.5 (T _a =25°C)	PW-MINI (SOT-89)	
TA48L018S (*) TA48L02S (*) TA48L025S (*) TA48L03S (*) TA48L033S (*) TA48L05S (*)	150	1.8 2 2.5 3 3.3 5	16	0.5 (I _o =100mA)	0.4 (I _o =0A)	±5 (T _j =0 to 125°C)	Thermal shutdown Over current	0.8 (T _a =25°C)	TO-92MOD	
TA78DS05BP TA78DS05CP TA78DS06BP TA78DS08BP TA78DS09BP TA78DS10BP TA78DS12BP TA78DS15BP	30	5 5 6 8 9 10 12 15	29 Load dump 60	0.2 (I _o =10mA)	0.6 0.6 0.6 0.7 0.7 0.7 0.8 1.0 (I _o =0A)	BP : ±10 CP : ±5 (T _a =-40 to 85°C)	Thermal shutdown Over current Over voltage Reverse battery	0.8 (T _a =25°C)	TO-92MOD	
TA78DS05F TA78DS05AF TA78DS06F TA78DS08F TA78DS09F TA78DS10F TA78DS12F TA78DS15F	30	5 5 6 8 9 10 12 15	29 Load dump 60	0.2 (I _o =10mA)	0.6 0.6 0.6 0.7 0.7 0.7 0.8 1.0 (I _o =0A)	F : ±10 AF : ±5 (T _a =-40 to 85°C)	Thermal shutdown Over current Over voltage Reverse battery	0.5 (T _a =25°C)	PW-MINI (SOT-89)	

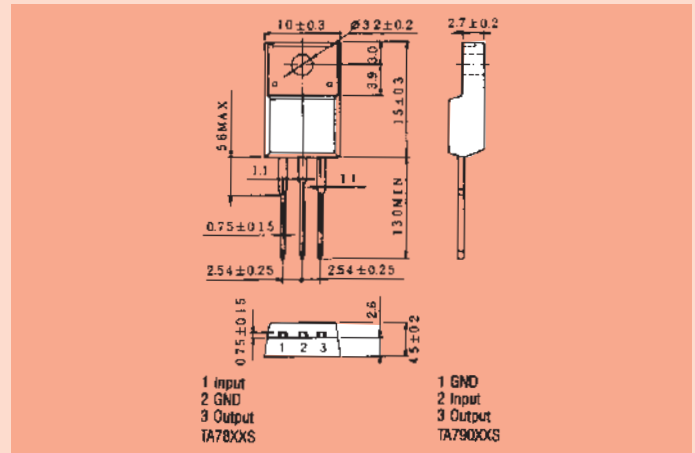
(*) Under Development

Integrated Circuits

Voltage Regulator DPAK (leadless) DPAK SMD



TO-220(IS)



Series Regulators (Multi-Function)

Product No.	Output Current Max (mA)	Output Voltage Typ. (V)	Input Voltage Max (V)	Drop-out Voltage Typ. (V)	Bias Current Typ. (mA)	Output Voltage Accuracy (%)	Built-in Protection Circuits	Allowable Power Dissipation (W)	Package	External Appearance
TA48S018F TA48S02F TA48S025F TA48S03F TA48S033F TA48S05F	1000	1.8 2 2.5 3 3.3 5	16	0.5 (I _o =500mA)	0.8 (I _o =0A)	±4.5 (T _a =0 to 125°C)	Thermal shutdown Over current	1.0 (T _a =25°C) 10 (T _c =25°C)	PW-MOLD 5 pin (DPAK-5)	
TA8004SA	400	5	29 Load dump 60	0.6 (I _o =400mA)	3.0 (I _o =0A)	±5 (T _a =-40 to 85°C)	Thermal shutdown Over current Over voltage Reverse battery	2.0 (T _a =25°C) 20 (T _c =25°C)	TO-220IS 5 pin	

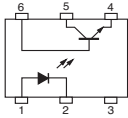
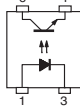
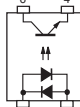
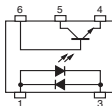
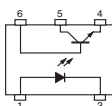
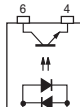
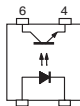
Shunt Regulators

Product No.	Cathode Current Max (mA)	Reference Voltage Typ. (V)	Cathode Voltage Max (V)	Minimum Cathode Current Max (mA)	Reference Voltage Accuracy (%)	Allowable Power Dissipation (W)	Package	External Appearance
TA76431F/FR	sink 150	2.495	37	1.0	±2.2 (T _a =25°C)	0.5 (T _a =25°C)	PW-MINI (SOT-89)	
TA76431S	sink 150	2.495	37	1.0	±2.2 (T _a =25°C)	0.8 (T _a =25°C)	TO-92MOD	
TA76432FT	sink 20	1.26	20	0.5	±1.4 (T _a =25°C)	0.45 (T _a =25°C) When mounted on a glass-epoxy board	UFV	
TA76432FC	sink 20	1.26	20	0.5	±1.4 (T _a =25°C)	0.38 (T _a =25°C) When mounted on a glass-epoxy board	SMV	
TA76432F/FR	sink 20	1.26	20	0.5	±1.4 (T _a =25°C)	0.5 (T _a =25°C)	PW-MINI (SOT-89)	
TA76432S	sink 20	1.26	20	0.5	±1.4 (T _a =25°C)	0.8 (T _a =25°C)	TO-92MOD	
TA76433FC	sink 20	1.26	15	0.5	±1.4 (T _a =25°C)	0.38 (T _a =25°C) When mounted on a glass-epoxy board	SMV	

Toshibas's photocouplers incorporate into a white mold package, a combination of either GaAs infrared LEDs or GaAlAs infrared LEDs and silicon photo-detectors. GaAlAs LEDs are adapted in the high-speed photo-IC types by

utilizing their features of high speed and high light power. Also, Toshiba's innovative white mold packaging results in high sensitivity, excellent efficiency, and superb reliability.

■ Phototransistor Output Devices

Product No.	Pin Configuration	Features	CTR (%)			@ I _F (mA), V _{CE} (V)	V _{CEO} (V)	BV _s (V _{rms})	Safety Standards ⁽¹⁾							
			Rank	Min	Max				UL	TÜV	VDE	BSI	SEMKO			
4N25 (SHORT)		JEDEC type 4N25 (short) can be used in place of products 25A to 28.	—	20	—	10, 10	30	2500	o							
4N25A (SHORT)																
4N26 (SHORT)																
4N27 (SHORT)		JEDEC type 4N35 (short) can be used in place of products 36 and 37.	—	100	—	10, 10	80	2500	o							
4N28 (SHORT)																
4N35 (SHORT)																
4N36 (SHORT)																
4N37 (SHORT)																
4N38 (SHORT)	JEDEC type 4N38 (short) can be used in place of 4N38A (short).	—	10	—	10, 10	80	2500	o								
4N38A (SHORT)																
TLP124		Mini-flat Low input current	—	100	1200	1, 0.5	80	3750	o							
			BV	200												
TLP126		Mini-flat AC input Low input current	—	100	1200	±1, 0.5			o							
TLP130		Mini-flat AC input Internal base connection	—	50	600	±5, 5			o							
			GB	100												
TLP131		Mini-flat Internal base connection	—	50	600	5, 5			o							
TLP137		Mini-flat Low input current Internal base connection	GB	100											1200	1, 0.5
			BV	200												
TLP180		Mini-flat AC input	—	50	600	±5, 5			o	o ⁽⁶⁾	Δ ⁽⁶⁾	o				
			GB	100												
TLP181 ⁽²⁾		Mini-flat Standard	—	50	600	5, 5			o	Δ ⁽⁶⁾	o ⁽⁶⁾	o				
			GB	100												
			GR	100											300	

Note 1: In the safety standard column:

Symbol o : Approved

Symbol Δ : Design which meets safety standards

Note 2: TLP181 is manufactured in Thailand by Toshiba Semiconductor Thailand as well as in Japan.

Note 6: VDE0884-approved with option (V4)

Phototransistor Output Devices (continued)

Product No.	Pin Configuration	Features	CTR (%)			@ I _F (mA), V _{CE} (V)	V _{CEO} (V)	BV _s (V _{rms})	Safety Standards ⁽¹⁾				
			Rank	Min	Max				UL	TÜV	VDE	BSI	SEMKO
TLP280		Half-pitch mini-flat Lead pitch = 1.27 mm AC input	—	50	600	±5, 5	80	2500	O	Δ ⁽⁶⁾	O ⁽⁶⁾	O	
TLP280-4		Half-pitch mini-flat 4-ch type Lead pitch = 1.27 mm AC input	—	50		±5, 5			O	Δ ⁽⁶⁾	O ⁽⁶⁾	O	
TLP281		Half-pitch mini-flat Lead pitch = 1.27 mm	—	50		5, 5			O	Δ ⁽⁶⁾	O ⁽⁶⁾	O	
TLP281-4		Half-pitch mini-flat 4-ch type Lead pitch = 1.27 mm	—	50		5, 5			O	Δ ⁽⁶⁾	O ⁽⁶⁾	O	
* TLP283		Half-pitch mini-flat Low input current High speed	—	100	400	1, 5	100	2500	Δ				
* TLP283-4		Four TLP283 channels	—	100	400	1, 5	100	2500	Δ				
TLP320		4-pin small package AC input 150-mA I _F rating	—	20	80	±100, 1	55	5000	O				
TLP320-2		Two TLP320 channels	—	20									
TLP320-4		Four TLP320 channels	—	20									
TLP321		4-pin small package High V _{CEO}	—	50	600	5, 5	80						
TLP321-2		Two TLP321 channels	—	50									
TLP321-4		Four TLP321 channels	—	50									
TLP330		150-mA I _F rating AC input Internal base connection	—	20	80	±100, 1	55	5000	O				

Note 1: In the safety standard column:

*: New product

Symbol O : Approved
Symbol Δ : Design which meets safety standards

Note 6: VDE0884-approved with option (V4)

■ Phototransistor Output Devices (continued)

Product No.	Pin Configuration	Features	CTR (%)			@ I _F (mA), V _{CE} (V)	V _{CEO} (V)	BV _s (V _{rms})	Safety Standards ⁽¹⁾																																				
			Rank	Min	Max				UL	TÜV	VDE	BSI	SEMKO																																
TLP331		Low input current Internal base connection	—	100	1200	1, 0.5	55	5000	o																																				
			BV	200																																									
TLP332		Low input current No internal base connection	—	100	1200	1, 0.5	55	5000	o																																				
			BV	200																																									
TLP421 TLP421F		4-pin small package VDE0884 approved with option (D4) SEMKO-approved	—	50	600	5, 5	80	5000	o	o ⁽⁴⁾	Δ ⁽⁴⁾	o ⁽⁵⁾	o ⁽⁷⁾																																
			GB	100																																									
			GR	100	300																																								
TLP504A		Standard	—	50	600	5, 5	55	2500	o																																				
			GB	100																																									
TLP521-1 ⁽²⁾		4-pin small package Standard	A	50	600	5, 5	55	2500	o																																				
			GB	100																																									
			BL	200	300																																								
			YG	50																																									
			GR	100	200																																								
			GRL	100																																									
			GRH	150	300																																								
			Y	50	150																																								
TLP521-2 ⁽²⁾		Two TLP521-1 channels	A	50	600									5, 5	55	2500	o																												
			GB	100																																									
			GR	100	300																																								
			BL	200	600																																								
TLP521-4		Four TLP521-1 channels	A	50	600																	5, 5	55	2500	o																				
			GB	100																																									
TLP620 ⁽²⁾		AC input 4-pin small package VDE0884 approved with option (D4) SEMKO-approved	—	50	600	±5, 5	55	5000	o	Δ ⁽⁴⁾	o ⁽⁴⁾	o ⁽⁵⁾	o ⁽⁷⁾																																
			GB	100																																									
TLP620F ⁽²⁾			GR	100	300																																								
TLP620-2 ⁽²⁾		Two TLP620 channels SEMKO-approved	—	50	600																									±5, 5	55	5000	o	Δ ⁽⁴⁾	o ⁽⁴⁾	o ⁽⁵⁾	o ⁽⁷⁾								
			GB	100																																									
TLP620-4		Four TLP620 channels	—	50	600																																	±5, 5	55	5000	o	Δ ⁽⁴⁾	o ⁽⁴⁾	o ⁽⁵⁾	o ⁽⁷⁾
			GB	100																																									

Note 1: In the safety standard column:

Symbol o : Approved

Symbol Δ : Design which meets safety standards

Note 2: TLP521-1 and TLP620 are manufactured in Thailand by Toshiba Semiconductor Thailand, as well as in Japan.

Note 4: VDE0884-approved with option (D4)

Note 5: BS EN60065, BS EN60950

Note 7: SS EN60065, SS EN60950

■ Phototransistor Output Devices (continued)

Product No.	Pin Configuration	Features	CTR (%)			@ I _F (mA), V _{CE} (V)	V _{CEO} (V)	BV _s (V _{rms})	Safety Standards ⁽¹⁾																																					
			Rank	Min	Max				UL	TÜV	VDE	BSI	SEMKO																																	
TLP621 ⁽²⁾		4-pin small package VDE0884-approved with option (D4) SEMKO-approved	—	50	600	5, 5	55	5000	o	Δ ⁽⁴⁾	o ⁽⁴⁾	o ⁽⁵⁾	o ⁽⁷⁾																																	
TLP621F ⁽²⁾			GB	100																																										
			BL	200																																										
			YG	50	300																																									
			GR	100																																										
			GRL	100										200																																
			GRH	150	300																																									
Y	50	150																																												
TLP621-2		Two TLP621 channels VDE0884-approved with option (D4) SEMKO-approved	—	50	600								5, 5	55	5000	o	Δ ⁽⁴⁾	o ⁽⁴⁾	o ⁽⁵⁾	o ⁽⁷⁾																										
			GB	100																																										
			GR	100																	300																									
TLP621-4		Four TLP621 channels VDE0884-approved with option (D4)	—	50	600																5, 5	55	5000	o	Δ ⁽⁴⁾	o ⁽⁴⁾	o ⁽⁵⁾	o ⁽⁷⁾																		
			GB	100																																										
TLP624		4-pin small package Low input current	—	100	1200																								1, 0.5	55	5000	o	Δ ⁽³⁾	Δ ⁽³⁾	o ⁽⁵⁾	o ⁽⁷⁾										
			BV	200																																										
TLP624-2		Two TLP624 channels	—	100		1200	1, 0.5	55	5000	o	Δ ⁽³⁾	Δ ⁽³⁾																									o ⁽⁵⁾	o ⁽⁷⁾								
			BV	200																																										
TLP624-4		Four TLP624 channels	—	100		1200																																	1, 0.5	55	5000	o	Δ ⁽³⁾	Δ ⁽³⁾	o ⁽⁵⁾	o ⁽⁷⁾
			BV	200																																										

Note 1: In the safety standard column:

Symbol o : Approved

Symbol Δ : Design which meets safety standards

Note 2: TLP621 is manufactured in Thailand by Toshiba Semiconductor Thailand as well as in Japan.

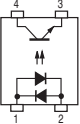
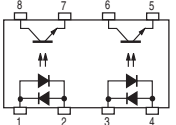
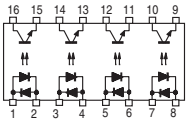
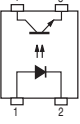
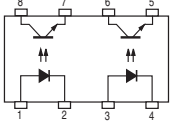
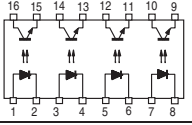
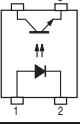
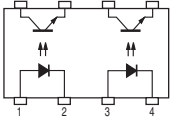
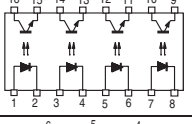
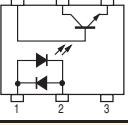
Note 3: VDE0884

Note 4: VDE0884-approved with option (D4)

Note 5: BS EN60065, BS EN60950

Note 7: SS EN60065, SS EN60950

■ Phototransistor Output Devices (continued)

Product No.	Pin Configuration	Features	CTR (%)			@ I _F (mA), V _{CE} (V)	V _{CEO} (V)	BV _s (V _{rms})	Safety Standards ⁽¹⁾				
			Rank	Min	Max				UL	TÜV	VDE	BSI	SEMKO
TLP626		4-pin small package AC input Low input current	—	100	1200	±1, 0.5	55	5000	o	Δ ⁽³⁾	Δ ⁽³⁾	o ⁽⁵⁾	
TLP626-2		Two TLP626 channels	—	100									
			BV	200									
TLP626-4		Four TLP626 channels	—	100	600	5, 5	350	5000	o	Δ ⁽³⁾	Δ ⁽³⁾		
			BV	200									
TLP628		4-pin small package High V _{CEO} (350 V)	—	50	600	5, 5	350	5000	o	Δ ⁽³⁾	Δ ⁽³⁾		
TLP628-2		Two TLP628 channels	—	50									
			GB	100									
TLP628-4		Four TLP628 channels	—	50	600	±5, 5	55	5000	o				
			GB	100									
TLP629		4-pin small package 150-mA I _F rating DC input	—	20	80	100, 1	55	5000	o	Δ ⁽³⁾	Δ ⁽³⁾		
TLP629-2		Two TLP629 channels											
TLP629-4		Four TLP629 channels											
TLP630		Standard AC input Internal base connection	—	50	600	±5, 5	55	5000	o				
			GB	100									

Note 1: In the safety standard column:

Symbol o : Approved

Symbol Δ : Design which meets safety standards

Note 3: VDE0884

Note 5: BS EN60065, BS EN60950

Phototransistor Output Devices (continued)

Product No.	Pin Configuration	Features	CTR (%)			@ I _F (mA), V _{CE} (V)	V _{CEO} (V)	BV _s (V _{rms})	Safety Standards ⁽¹⁾												
			Rank	Min	Max				UL	TÜV	VDE	BSI	SEMKO								
TLP631		Standard High isolation Internal base connection	—	50	600	5, 5	55	5000	o												
TLP632		Standard No internal base connection	GB	100																	
			BL	200																	
			YG	50	300																
			GR	100																	
			Y	50	150																
TLP731		VDE0884-approved with option (D4)	—	50	600	5, 5	55	4000	o	Δ ⁽⁴⁾	o ⁽⁴⁾	o ⁽⁵⁾	o ⁽⁷⁾								
			GB	100																	
			TLP732		VDE0884-approved with option (D4) No internal base connection									—	50	600					
														GB	100						
			TLP733 TLP733F		VDE0884-approved with option (D4) SEMKO-approved									—	50	600	5, 5	55	4000	o	Δ ⁽⁴⁾
GB	100																				
GR	100	300																			
TLP734 TLP734F		VDE0884-approved with option (D4) SEMKO-approved No internal base connection	—	50	600																
			GB	100																	
			GR	100	300																
CNY17-2		Direct replacement for CNY17 Series	—	63	125	10, 5	70	2500	Δ												
CNY17-3				100	200																
CNY17-4				160	320																

Note 1: In the safety standard column:

Symbol o : Approved

Symbol Δ : Design which meets safety standard

Note 4: VDE0884-approved with option (D4)

Note 5: BS EN60065, BS EN60950

Note 7: SS EN60065, SS EN60950

Diode Output Device

Product No.	Pin Configuration	Features	CTR (%)		I _{LEAK} (nA)		V _{KAO} (V)	Safety Standards ⁽¹⁾				
			Min	@ I _F (mA)	Max	@ V _{KAO} (V)		UL	TÜV	VDE	BSI	SEMKO
TLP722		4-pin small package High-speed SEMKO-approved	0.1	10	50	10	30	o	$o^{(4)}$	$\Delta^{(4)}$	o	$o^{(7)}$

Note 1: In the safety standard column:

Symbol o : Approved

Symbol Δ : Design which meets safety standard

Note 4: VDE0884-approved with option (D4)

Note 7: SS EN60065, SS EN60950

■ Photodarlington Transistor Output Devices

Product No.	Pin Configuration	Features	CTR (%)		V _{CE} (sat) (V)		V _{CEO} (V)	BV _s (V _{rms})	Safety Standards ⁽¹⁾																					
			Min	@ I _F (mA), V _{CE} (V)	Max	@ I _C (mA), I _F (mA)			UL	TÜV	VDE	BSI	SEMKO																	
4N29 (SHORT)		JEDEC type 4N29 (short) can be used in place of products 29A to 31.	100	10, 10	1.0	2, 8	30	2500	o																					
4N29A (SHORT)			50		1.2																									
4N30 (SHORT)					1.0																									
4N31 (SHORT)		JEDEC type 4N32 (short) can be used in place of products 32A and 33.	500																											
4N32 (SHORT)																														
4N32A (SHORT)																														
4N33 (SHORT)																														
TLP127		Mini-flat High V _{CEO}	1000	1, 1	1.2	100, 10	300	2500	o	o ⁽⁶⁾	Δ ⁽⁶⁾	o ⁽⁵⁾																		
TLP371		High V _{CEO}	1000	1, 1	1.2	100, 10	300	5000	o																					
TLP372		High V _{CEO} No internal base connection																												
TLP523		4-pin small package General-purpose	500	1, 1	1.0	50, 10	55	2500	o																					
TLP523-2		Two TLP523 channels																												
TLP523-4		Four TLP523 channels																												
TLP627 ⁽²⁾		High V _{CEO} 4-pin small package	1000	1, 1	1.2	100, 10	300	5000	o	Δ ⁽⁴⁾	o ⁽⁴⁾	o ⁽⁵⁾	o ⁽⁷⁾																	
TLP627-2 ⁽²⁾		Two TLP627 channels																												
TLP627-4		Four TLP627 channels																												
TLP627A		High V _{CEO} 4-pin small package	1500	1, 1.2	1.2	100, 10	350	5000	o	Δ	Δ	Δ	Δ																	

Note 1: In the safety standard column:

Symbol o: Approved

Symbol Δ: Design which meets safety standard

Note 2: TLP627 is manufactured in Thailand by Toshiba Semiconductor Thailand, as well as in Japan.

Note 4: VDE0884-approved with option (D4)

Note 5: BS EN60065, BS EN60950

Note 6: VDE0884-approved with option (V4)

Note 7: SS EN60065, SS EN60950

Photothyristor Output Devices

Product No.	Pin Configuration	Features	I _{FT}	V _{TM}		V _{DRM} (V)	BV _s (V _{rms})	Safety Standards ⁽¹⁾				
			Max (mA)	Max (V)	@ I _{TM} (mA)			UL	TÜV	VDE	BSI	SEMCO
TLP141G		Mini-flat General-purpose	10	1.3	100	400	2500	o				
TLP541G		Standard	7	1.3	100	400	2500	o				
TLP741G		VDE0884-approved with option (D4)	10	1.3	100	400	4000	o	Δ ⁽⁴⁾	o ⁽⁴⁾	o ⁽⁵⁾	o ⁽⁷⁾
TLP741J						600						
TLP747G		VDE0884-approved with option (D4) SEMCO-approved	15	1.3	100	400	4000	o	Δ ⁽⁴⁾	o ⁽⁴⁾	o ⁽⁵⁾	o ⁽⁷⁾
TLP747J TLP747JF						600						

Note 1: In the safety standard column:

Symbol o: Approved

Symbol Δ: Design which meets safety standard

Note 4: VDE0884-approved with option (D4)

Note 5: BS EN60065, BS EN60950

Note 7: SS EN60065, SS EN60950

■ Phototriac Output Devices

Product No.	Pin Configuration	Features	IFT		V _{TM}		V _{DRM} (V)	BVs (Vrms)	Safety Standards ⁽¹⁾							
			Rank	Max (mA)	Max (V)	@ I _{TM} (mA)			UL	TÜV	VDE	BSI	SEMKO			
TLP160G		Mini-flat Non-zero-voltage turn-on	—	10	2.8	70	400	2500	o	Δ ⁽⁶⁾	o ⁽⁶⁾					
TLP160J/165J		Mini-flat High V _{DRM} VDE0884-registered with option (V4)	—	10					o	Δ ⁽⁶⁾	o ⁽⁶⁾					
			IFT7	7												
			IFT5	5												
TLP161G		Mini-flat Zero-voltage turn-on	—	10			400		600	3000	o	Δ ⁽⁶⁾	o ⁽⁶⁾			
TLP161J/166J		Mini-flat High V _{DRM} VDE0884-registered with option (V4)	—	10							o	Δ ⁽⁶⁾	o ⁽⁶⁾			
			IFT7	7												
			IFT5	5												
TLP168J		Mini-flat Zero-voltage turn-on Extra-low IFT	—	3			o									
TLP260J			Mini-flat High V _{DRM} VDE0884-registered with option (V4)	—			10						o	Δ ⁽⁶⁾	o ⁽⁶⁾	
TLP525G		4-pin small package	—	10			3.0		100	400	2500	o				
TLP525G-2		Two TLP525G channels														
TLP525G-4		Four TLP525G channels														
TLP560G		Non-zero-voltage turn-on Standard	—	10	3.0	100	400	2500	o							
TLP560J		Low IFT	IFT7	7												
			IFT5	5												
			IFT7	7												
TLP561G		Standard Low IFT	—	10	3.0	100	400		o							
TLP561J		Zero-voltage turn-on	IFT7	7												
			IFT5	5												
			IFT7	7												
TLP762J		Non-zero-voltage turn-on VDE0884-approved with option (D4)	—	10	3.0	100	600	4000	o	Δ ⁽⁴⁾	o ⁽⁴⁾	o ⁽⁵⁾	o ⁽⁷⁾			
TLP762JF		SEMKO-approved														
TLP763J		VDE0884-approved with option (D4)	—	10	3.0	100	600	4000	o	Δ ⁽⁴⁾	o ⁽⁴⁾	o ⁽⁵⁾	o ⁽⁷⁾			
TLP763JF		SEMKO-approved Zero-voltage turn-on														

Note 1: In the safety standard column:

Symbol o : Approved

Symbol Δ : Design which meets safety standard

Note 4: VDE0884-approved with option (D4)

Note 5: BS EN60065, BS EN60950

Note 6: VDE0884-approved with option (V4): TLP165J/TLP166J

Note 7: SS EN60065, SS EN60950

■ Phototriac Output Devices (continued)

Product No.	Pin Configuration	Features	IFT		V _{TM}		V _{DRM} (V)	BV _s (V _{rms})	Safety Standards ⁽¹⁾				
			Rank	Max (mA)	Max (V)	@ I _{TM} (mA)			UL	TÜV	VDE	BSI	SEMKO
TLP3022 (S)		Short package Direct replacement for XXX3020/3021/3022	—	10	3.0	100	400	5000	o	Δ ⁽⁴⁾	o ⁽⁴⁾	o ⁽⁵⁾	o ⁽⁷⁾
TLP3023 (S)		Short package Direct replacement for XXX3023	—	5									
TLP3042 (S)		Short package Direct replacement for XXX3040/3041/3042	—	10	3.0	100	400	5000	o	Δ ⁽⁴⁾	o ⁽⁴⁾	o ⁽⁵⁾	o ⁽⁷⁾
TLP3043 (S)		Short package Direct replacement for XXX3043	—	5									
TLP3051 (S)		Short package Direct replacement for XXX3050/3051	—	15	3.0	100	600	5000	o	Δ ⁽⁴⁾	o ⁽⁴⁾	o ⁽⁵⁾	o ⁽⁷⁾
TLP3052 (S)		Short package Direct replacement for XXX3052	—	10									
TLP3062 (S)		Short package Direct replacement for XXX3060/3061/3062	—	10	3.0	100	600	5000	o	Δ ⁽⁴⁾	o ⁽⁴⁾	o ⁽⁵⁾	o ⁽⁷⁾
TLP3063 (S)		Short package Direct replacement for XXX3063	—	5									
TLP3064 (S)		Short package Extra-low I _{FT}	—	3									

Note 1: In the safety standard column:

Symbol o : Approved

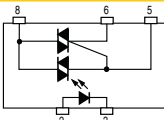
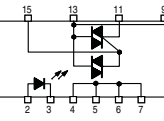
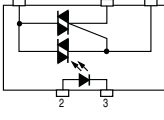
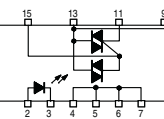
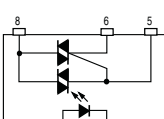
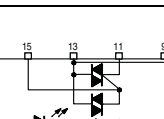
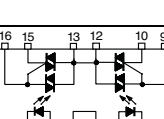
Symbol Δ : Design which meets safety standard

Note 4: VDE0884-approved with option (D4)

Note 5: BS EN60065, BS EN60950

Note 7: SS EN60065, SS EN60950

■ AC Power Output (photocoupled relay) Devices

Product No.	Pin Configuration	Features	IFT		ITM	V _{ORM} (V)	BV _s (V _{rms})	Safety Standards ⁽¹⁾					
			Rank	Max (mA)	@ Ta = 40°C (A _{rms})			UL	TÜV	VDE	BSI	SEMKO	
TLP3502		Direct control up to 0.5-A _{rms} load Zero-voltage turn-on (TLP3503)	—	10	0.5	400	2500	o					
TLP3503			IFT7	7									
			IFT5	5									
TLP3520		Direct control up to 1.0-A _{rms} load Zero-voltage turn-on (TLP3521)	—	10	1.0	600		o					
TLP3521			IFT7	7									
			IFT5	5									
TLP3506		Direct control up to 0.5-A _{rms} load Zero-voltage turn-on (TLP3507)	—	10	0.5	600		o					
TLP3507													
TLP3526		Direct control up to 1.0-A _{rms} load Zero-voltage turn-on (TLP3527)	—	10	1.0	600		o					
TLP3527													
TLP3502A		Direct control up to 0.6-A _{rms} load	—	10	0.6	400		o					
			IFT7	7									
			IFT5	5									
TLP3520A		Direct control up to 1.2-A _{rms} load	—	10	1.2	400		o					
			IFT7	7									
			IFT5	5									
TLP3530		Two-channel type 1.0 A _{rms} [for 1 ch] 1.4 A _{rms} [for 2 ch]	—	10	1.0 [for 1 channel]	400		o					
			IFT7	7	1.4 [for 2 channels]								

Note 1: In the safety standard column:

Symbol o: Approved

Symbol Δ: Design which meets safety standard

Z.C.: Zero-cross

Photo-IC Output Devices

Product No.	Pin Configuration	Features	Data Rate (NRZ) (typ.)	CTR	@ I _F (mA)	BV _s (V _{rms})	Safety Standards ⁽¹⁾				
							UL	TÜV	VDE	BSI	SEMKO
6N135		Standard	1 Mbit/s	7% min	16	2500	O				
6N136				19% min							
6N137		High speed	10 Mbits/s	700% typ.	5						
6N138		High CTR	300 Kbits/s	300% min	1.6						
6N139				400% min	0.5						
TLP112		Mini-flat High speed	1 Mbit/s	10% min	16						
TLP112A		Mini-flat High CTR		20% min							
TLP113		Mini-flat High speed	10 Mbits/s	Open-collector	10						
TLP114A		Mini-flat High CMR	1 Mbit/s	20% min	16	3750	O	O ⁽⁶⁾	Δ ⁽⁶⁾		
TLP114A (IGM)				25% min	10						
TLP115		Mini-flat High CMR	10 Mbits/s	Open-collector	10	2500	O				
TLP115A		Mini-flat Low input current High CMR			5						
TLP250		Medium-power IGBT/MOSFET Direct drive VDE0884-approved with option (D4)	0.2 μs	±0.5 Apeak (min)	5	2500	O	Δ ⁽⁴⁾	O ⁽⁴⁾		
TLP250F											
TLP251		Low-power IGBT/MOSFET Direct drive VDE0884-approved with option (D4)	0.3 μs	±0.1 Apeak (min)	5						
TLP251F											
* TLP351		Low-power IGBT/MOSFET Direct drive Low supply current	0.3 μs	±0.2 Apeak (min)	5	3750	Δ				
* TLP351F											
TLP550		Standard	1 Mbit/s	10% min (19% min for rank O)	16	2500	O				
TLP557		Giant transistor direct drive	1 μs	0.25-A constant current output	5						

Note 1: In the safety standard column:

*: New product

Symbol O : Approved

Symbol Δ : Design which meets safety standard

Note 4: VDE0884-approved with option (D4)

Note 6: VDE0884-approved with option (V4)

■ Photo-IC Output Devices (continued)

Product No.	Pin Configuration	Features	Data Rate (NRZ) (typ.)	CTR	@If (mA)	BV _s (V _{rms})	Safety Standards ⁽¹⁾				
							UL	TÜV	VDE	BSI	SEMKO
TLP558		3-state output Low input Inverter logic	5 Mbit/s	3-state output	1.6	2500	○				
TLP559		Internal shield High CMR	1 Mbit/s	20% min	16		○				
TLP559 (IGM)				25% min	10						
TLP750		IEC 950 satisfied VDE0884-approved with option (D4)	1 Mbit/s	10% min (19% min for rank O)	16	5000	○	Δ ⁽⁴⁾	○ ⁽⁴⁾	○ ⁽⁵⁾	○ ⁽⁷⁾
TLP751		Base connection IEC 65 satisfied VDE0884-approved with option (D4)	1 Mbit/s	4% min	16						
TLP759/759F		Internal shield IEC 950 satisfied VDE0884-approved with option (D4)	1 Mbit/s	20% min	16		○	Δ ⁽⁴⁾	○ ⁽⁴⁾	Δ ⁽⁵⁾	○ ⁽⁷⁾
TLP759 (IGM) 759F (IGM)				25% min	10						
TLP2200		3-state output Low input Buffer logic	5 Mbit/s	3-state output	1.6	2500	○				
TLP2530		Dual-channel version of 6N135	1 Mbit/s	7% min	16		○				
TLP2531		Dual-channel version of 6N136	1 Mbit/s	19% min	16		○				
TLP2601		High CMR High speed	10 Mbit/s	Open-collector	5		○				
TLP2630		Dual-channel version of 6N137	10 Mbit/s	Open-collector	5		○				
TLP2631		High CMR Dual-channel version of TLP2601	10 Mbit/s	Open-collector	5		○				

Note 1: In the safety standard column:

Symbol ○ : Approved

Symbol Δ : Design which meets safety standard

Note 4: VDE0884-approved with option (D4)

Note 5: BS EN60065, BS EN60950

Note 7: SS EN60065, SS EN60950

■ Photovoltaic Output Devices

Product No.	Pin Configuration	Features	Short Circuit Current (μA)			Open Voltage Voc (V)		BV _s (V _{rms})	Safety Standards ⁽¹⁾				
			Rank	Min	@ I _F (mA)	Min	@ I _F (mA)		UL	TÜV	VDE	BSI	SEMKO
TLP190B		Mini-flat High output current	—	12	10	7	10	2500	○				
TLP191B		Mini-flat High output current Internal shunt resistor	—	24	20	7	20		○				
TLP590B		High output current	—	12	10	7	10		○				
			C20	20									
TLP591B		High output current Internal shunt resistor	—	24	20	7	20	○					
			C40	40									

Note 1: In the safety standard column:

Symbol ○: Approved

Symbol △: Design which meets safety standard

■ MOSFET Output (photorelay) Devices

Product No.	Pin Configuration	Features	I _{FT}		R _{ON}			V _{OFF} (V)	BV _s (V _{rms})	Safety Standards ⁽¹⁾				
			Rank	Max (mA)	Max (Ω)	@ I _F (mA)	@ I _{ON} (A)			UL	TÜV	VDE	BSI	SEMKO
TLP172A		2.54 SOP4 Low cost Low trigger current High output current General-purpose	—	3	2	5	0.4 [AC]	60	1500	○				
TLP172G		2.54 SOP4 Low cost Low trigger current General-purpose For modems	—	3	50	5	0.11 [AC]	350		○				
TLP174G		2.54 SOP4 Low trigger current Current-limiting function For modems	—	3	35	5	0.12 [AC]	350		○				○ ⁽⁷⁾
TLP176A		2.54 SOP4 Low trigger current High output current	—	3	2	5	0.4 [AC]	60		○	Δ ⁽⁶⁾	○ ⁽⁶⁾		
TLP176D		2.54 SOP4 Low trigger current For PBXes	—	3	8	5	0.15 [AC]	200		○	Δ ⁽⁶⁾	○ ⁽⁶⁾		
TLP176G		2.54 SOP4 Low trigger current General-purpose For modems	—	3	35	5	0.12 [AC]	350		○	Δ ⁽⁶⁾	○ ⁽⁶⁾	○ ⁽⁵⁾	○ ⁽⁷⁾
TLP176GA		2.54 SOP4 Low trigger current General-purpose For modems	—	3	35	5	0.12 [AC]	400		Δ				
TLP192A		2.54 SOP6 Low cost Low trigger current High output current	—	3	2	5	0.4 [AC]	60		○				
TLP192G		2.54 SOP6 Low cost Low trigger current For modems	—	3	50	5	0.11 [AC]	350		○				
TLP197A		2.54 SOP6 Low trigger current High output current	—	3	2	5	0.4 [AC]	60		○				
TLP197D		2.54 SOP6 Low trigger current General-purpose	—	3	8	5	0.2 [AC]	200		○				
TLP197G		2.54 SOP6 Low trigger current For modems	—	3	35	5	0.12 [AC]	350		○	Δ ⁽⁶⁾	○ ⁽⁶⁾	○ ⁽⁵⁾	○ ⁽⁷⁾
TLP197GA		2.54 SOP6 Low trigger current For modems	—	3	35	5	0.12 [AC]	400		Δ				
TLP200D		2.54 SOP8 Tow TLP176D channels	—	3	8	5	0.15 [AC]	200		○				
TLP202A		2.54 SOP8 Tow TLP172A channels	—	3	2	5	0.4 [AC]	60		○				
TLP202G		2.54 SOP8 Tow TLP172G channels	—	3	50	5	0.11 [AC]	350		○				
TLP204G		2.54 SOP8 Tow TLP174G channels	—	3	35	5	0.12 [AC]	350		○				○ ⁽⁷⁾
TLP206A		2.54 SOP8 Tow TLP176A channels	—	3	2	5	0.4 [AC]	60		○				
TLP206G		2.54 SOP8 Tow TLP176G channels	—	3	35	5	0.12 [AC]	350		○	Δ ⁽⁶⁾	○ ⁽⁶⁾	○ ⁽⁵⁾	○ ⁽⁷⁾
TLP206GA		2.54 SOP8 Tow TLP176GA channels	—	3	35	5	0.12 [AC]	350		Δ				

Note 1: In the safety standard column:

Symbol ○ : Approved

Symbol Δ : Design which meets safety standard

Note 5: BS EN60065, BS EN60950

Note 6: VDE0884-approved with option (V4)

Note 7: SS EN60065, SS EN60950

MOSFET Output (photorelay) Devices (continued)

Product No.	Pin Configuration	Features	IFT		RON			V _{OFF} (V)	BV _S (V _{rms})	Safety Standards ⁽¹⁾				
			Rank	Max (mA)	Max (Ω)	@ I _F (mA)	@ I _{ON} (A)			UL	TÜV	VDE	BSI	SEMKO
TLP222A		DIP4 Low cost Low trigger current High output current	—	3	2	5	0.5 [DC]	60	2500	o				
TLP222G		DIP4 Low cost Low trigger current General-purpose For modems	—	3	50	5	0.12 [AC]	350		o				o ⁽⁷⁾
TLP222G-2		DIP8 Two TLP222G channels	—	3	50	5	0.12 [AC]	350		o				o ⁽⁷⁾
TLP225A		DIP4 For DC use only	—	5	1.1	10	0.5 [DC]	60		o				
TLP224G		DIP4 Low trigger current	—	3	35	5	0.12 [AC]	350		o			Δ ⁽⁵⁾	o ⁽⁷⁾
TLP224GA		Current-limiting function	—	3	35	5	0.12 [AC]	400		Δ				o ⁽⁷⁾
TLP224G-2		DIP8 Two TLP224G channels	—	3	35	5	0.12 [AC]	350		o			Δ ⁽⁵⁾	o ⁽⁷⁾
TLP227A		DIP4 Low trigger current	—	3	2	5	0.5 [AC]	60		o				o ⁽⁷⁾
TLP227A-2		Two TLP227A channels	—	3	2	5	0.5 [AC]	60		o				o ⁽⁷⁾
TLP227G		DIP4 Low trigger current General-purpose For modems	—	3	35	5	0.12 [AC]	350		o	Δ ⁽⁴⁾	o ⁽⁴⁾	o ⁽⁵⁾	o ⁽⁷⁾
TLP227G(N)														
TLP227G-2		DIP8 Two TLP227G channels	—	3	35	5	0.12 [AC]	350		o	Δ ⁽⁴⁾	o ⁽⁴⁾	o ⁽⁵⁾	o ⁽⁷⁾
TLP227G-2(N)														
TLP296G		DIP8 Two channels High V _{OFF}	—	5	30	10	0.12 [AC]	400		o				
TLP227GA		DIP4 Low trigger current	—	3	35	5	0.12 [AC]	400		Δ				o ⁽⁷⁾
TLP227GA-2		DIP8 Two TLP227GA channels	—	3	35	5	0.12 [AC]	400		Δ				o ⁽⁷⁾

Note 1: In the safety standard column:

Symbol o : Approved

Symbol Δ : Design which meets safety standard

Note 5: BS EN60065, BS EN60950

Note 6: VDE0884-approved with option (V4)

Note 7: SS EN60065, SS EN60950

■ MOSFET Output (photorelay) Devices (continued)

Product No.	Pin Configuration	Features	IFT		RON			V _{OFF} (V)	BV _s (V _{rms})	Safety Standards ⁽¹⁾				
			Rank	Max (mA)	Max (Ω)	@ I _F (mA)	@ I _{ON} (A)			UL	TÜV	VDE	BSI	SEMKO
TLP270D		SOP16 (14-pin) For DAA in modems	—	3	8	5	0.15 [AC]	200	1500	○			○ ⁽⁵⁾	
TLP270G		SOP16 (14-pin) For DAA in modems	—	3	35	5	0.12 [AC]	350		○			○ ⁽⁵⁾	
TLP3110		MFSOP6 (4-pin) Low CR C _{OFF} ≤ 150pF For testers	—	4	1.2	10	0.35 [AC]	60		○				
TLP3111		MFSOP6 (4-pin) Low CR C _{OFF} ≤ 15pF For testers	—	4	20	10	0.1 [AC]	80		○				
TLP3113		2.54SOP4 (4-pin) Lower CR C _{OFF} ≤ 1.4pF For testers	—	4	35	5	0.08 [AC]	40		Δ				
TLP3114		2.54SOP4 (4-pin) Lower CR C _{OFF} ≤ 7pF For testers	—	4	3	5	0.25 [AC]	40		Δ				
TLP3115		2.54SOP4 (4-pin) Lower CR C _{OFF} ≤ 14pF For testers	—	4	1.5	5	0.3 [AC]	40		Δ				
TLP3116		2.54SOP4 (4-pin) Lower CR C _{OFF} ≤ 2pF For testers	—	4	15	5	0.12 [AC]	40		Δ				
TLP3130		2.54SOP4 (4-pin) Lower CR C _{OFF} ≤ 2.5pF For testers	—	4	8	5	0.16 [AC]	20		Δ				
TLP3131		2.54SOP4 (4-pin) Lower CR C _{OFF} ≤ 12pF For testers	—	4	1.5	5	0.3 [AC]	20		Δ				
TLP3540		I _{OFF} ≤ 4nA DIP8 High output current For testers	—	5	0.12	10	2 [AC]	60	1500	○				
TLP4006G		DIP8 1a1b (N.C. + N.O.) General-purpose	—	3	25	5	0.12 [AC]	350	2500	Δ				
TLP4026G		2.54SOP8 1a1b (N.C. + N.O.) General-purpose	—	3	25	5	0.12 [AC]	350	1500	Δ				
TLP4176G		2.54SOP4 1b (Normally Close) General-purpose	—	3	25	5	0.12 [AC]	350	1500	Δ				
TLP4227G		DIP4 1b (Normally Close) General-purpose	—	3	25	5	0.15 [AC]	350	2500	○				○ ⁽⁷⁾

Note 1: In the safety standard column:

Symbol ○ : Approved

Symbol Δ : Design which meets safety standards

Note 4: VDE0884-approved with option (D4)

Note 5: BS EN60065, BS EN60950

Note 7: SS EN60065, SS EN60950

MOSFET Output (photorelay) Devices (continued)

Product No.	Pin Configuration	Features	IFT		RON			V _{OFF} (V)	BV _s (V _{rms})	Safety Standards ⁽¹⁾										
			Rank	Max (mA)	Max (Ω)	@ I _F (mA)	@ I _{ON} (A)			UL	TÜV	VDE	BSI	SEMKO						
TLP4197G		2.54SOP6 1b (Normally Close) General-purpose	—	3	25	5	0.12 [AC]	350	1500	Δ										
TLP4597G		DIP6 1b (Normally Close) General-purpose	—	3	25	5	0.15 [AC]	350	2500	o				o ⁽⁷⁾						
TLP4206G		2.54SOP8 Two TLP4176G channels	—	3	25	5	0.12 [AC]	350	1500	Δ										
TLP4227G-2		DIP8 Two TLP4176G channels	—	3	25	5	0.15 [AC]	350	2500	o				o ⁽⁷⁾						
TLP592A		DIP6 Low cost Low trigger current High output current	—	3	2	5	0.5 [AC]	60	2500	o										
TLP592G		DIP6 Low cost Low trigger current General-purpose	—	3	50	5	0.12 [AC]	350		o										
TLP598A		DIP6 Low trigger current available High output current	—	5	2	10	0.3 [AC]	60		o				o ⁽⁷⁾						
TLP599A			IFT2	2																
TLP597A			—	5																
TLP597A			IFT2	2																
TLP598B		DIP6 Low trigger current available	—	5	4	10	0.2 [AC]	100												
TLP599B			IFT2	2																
TLP598B			—	5																
TLP599B			IFT2	2																
TLP598G		DIP6 Low trigger current High V _{OFF}	—	5	12	10	0.15 [AC]	400												
TLP599G			IFT2	2																
TLP598G			—	5																
TLP599G			IFT2	2																
TLP597G		DIP6 Low trigger current	—	3	35	5	0.12 [AC]	350		o	Δ ⁽⁴⁾	o ⁽⁴⁾	o ⁽⁵⁾	o ⁽⁷⁾						
TLP597GA		DIP6 General-purpose	—	3	35	5	0.12 [AC]	400		o				o ⁽⁷⁾						
TLP594G		DIP6 Low trigger current General-purpose Current-limiting function	—	3	35	5	0.12 [AC]	350		o										
TLP797GA	DIP6 High isolation voltage	—	3	35	5	0.12 [AC]	400	5000	o	Δ	Δ	Δ	Δ							
TLP797GAF	DIP6 High isolation voltage	—	3	45	5	0.1 [AC]	600		o	Δ	Δ	Δ	Δ							
TLP797J	DIP6 High isolation voltage	—	3	45	5	0.1 [AC]	600		o	Δ	Δ	Δ	Δ							
TLP797JF	DIP6 High isolation voltage	—	3	45	5	0.1 [AC]	600		o	Δ	Δ	Δ	Δ							
TLP798G	DIP6 High isolation voltage IEC950 standard SEMKO-approved Low trigger current available	—	5	12	10	0.15 [AC]	400		o	o ⁽⁴⁾	Δ ⁽⁴⁾	o ⁽⁵⁾	o ⁽⁷⁾							
		IFT2	2						o	o ⁽⁴⁾	Δ ⁽⁴⁾	o ⁽⁵⁾	o ⁽⁷⁾							

Note 1: In the safety standard column:

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Note 4: VDE0884-approved with option (D4)

Note 5: BS EN60065, BS EN60950

Note 7: SS EN60065, SS EN60950

LED Lamps

Toshiba Visible LED Lamp Product Lines

■ Surface-Mount (SMD) LED Lamp Series

- different packages available - for all kind of automotive, telecom and industrial application
- InGaAIP - Technology for High Brightness and Low Power Consumption
- new E-Series has been introduced in all packages
- taping suffix: T02 3000 pcs / reel
T03 1000 pcs / reel
T04 4000 pcs / reel
T09 1000 pcs / reel
T10 500 pcs / reel
T11 2000 pcs / reel

■ High-Brightness Lead Type LEDs

- 4-element products are mainly available from the world's highest luminosity level "TL*H Series" to general purpose "TL*U Series"

- different packages available - for different applications like traffic lights, railway signals, all kind of signalisation, message sign boards, panels
- new E-Series has been introduced, brightness is about 1,3 x higher than of existing TLxE Series
- for new E-Series Toshiba introduced new part numbers with only 2 digits instead of 3 digits

■ General Information

- package suffix indicates straight or stopper type; Suffix "P" is straight lead type, LEDs without "P" have lead stoppers
- different taping options are available on request

1. InGaAIP Surface-Mount LED Lamps: 1.6 x 0.8 mm size

Package (mm)	Color of Emitted Light	Product No.	Luminous Intensity typ. (mcd) @20 mA	Viewing Angle typ. (°)	Packing Type (embossed taping)
1.6(L)x0.8(W)x0.6(H) (PCB type)	Red	TLRE1008A(T04)/(T05)	70	100~140	Taping No.: T04 4-mm pitch 4000pcs/reel Taping No.: T05 2-mm pitch 8000pcs/reel
	Red	TLSE1008A(T04)/(T05)	140		
	Orange	TLOE1008A(T04)/(T05)	180		
	Yellow	TLYE1008A(T04)/(T05)	105		
	Pure yellow	TLPYE1008A(T04)/(T05)	70		
	Green	TLGE1008A(T04)/(T05)	70		
	Green	TLFGE1008A(T04)/(T05)	40		
	Pure green	TLPGE1008A(T04)/(T05)	18		
	Red	TLSE1008A(T04)/(T05)	60		
	Orange	TLOU1008A(T04)/(T05)	78		
	Amber	TLAU1008A(T04)/(T05)	30		
	Yellow	TLYU1008A(T04)/(T05)	30		
	Green	TLGU1008A(T04)/(T05)	30		
	Pure green	TLPGU1008A(T04)/(T05)	6		

2. InGaAIP Surface-Mount LED Lamps: 1.6 x 0.8 mm size

Package (mm)	Color of Emitted Light	Product No.	Luminous Intensity typ. (mcd) @20 mA	Viewing Angle typ. (°)	Packing Type (embossed taping)
1.6(L)x0.8(W)x0.6(H) (ESC type)	Red	TLRMV1020(T14)/(T15)	Δ15 @ 5 mA	140~160	Taping No.: T14 4-mm pitch 4000pcs/reel Taping No.: T15 2-mm pitch 8000pcs/reel
	Red	TLSV1020(T14)/(T15)	Δ30 @ 5 mA		
	Orange	TLOV1020(T14)/(T15)	Δ38 @ 5 mA		
	Yellow	TLVY1020(T14)/(T15)	Δ25 @ 5 mA		
	Green	TLGV1020(T14)/(T15)	Δ14 @ 5 mA		
	Pure green	TLPV1020(T14)/(T15)	Δ3.5 @ 5 mA		
	Red	TLSE1020(T14)/(T15)	70		
	Orange	TLOU1020(T14)/(T15)	85		
	Yellow	TLYU1020(T14)/(T15)	60		
	Green	TLGU1020(T14)/(T15)	18		

3. InGaAIP Surface-Mount LED Lamps: 2.0 x 1.25 mm size

Package (mm)	Color of Emitted Light	Product No.	Luminous Intensity typ. (mcd) @20 mA	Viewing Angle typ. (°)	Packing Type (embossed taping)
2.0(L)x1.25(W)x1.1(H) (PCB type)	Red	TLRE1002A(T02)	70	120~140	Taping No.: T02 4-mm pitch 3000pcs/reel
	Red	TLSE1002A(T02)	140		
	Orange	TLOE1002A(T02)	180		
	Yellow	TLYE1002A(T02)	105		
	Pure yellow	TLPYE1002A(T02)	70		
	Green	TLGE1002A(T02)	70		
	Green	TLFGE1002A(T02)	40		
	Pure green	TLPGE1002A(T02)	18		
	Red	TLRU1002A(T02)	45		
	Red	TLSE1002A(T02)	60		
	Orange	TLOU1002A(T02)	78		
	Amber	TLAU1002A(T02)	30		
	Yellow	TLYU1002A(T02)	30		
	Green	TLGU1002A(T02)	30		
	Pure green	TLPGU1002A(T02)	6		

4. InGaAlP Surface-Mount LED Lamps: 3.2 x 2.4 mm size with Ø 2 lens

Package (mm)	Color of Emitted Light	Product No.	Luminous Intensity typ. (mcd) @ 20 mA	Viewing Angle typ. (°)	Packing Type (embossed taping)
3.2(L)x2.4(W)x2.4(H) with Ø2 lens	Red	TLRE1005B(T03)	450	30~40	Taping No.: T03 4-mm pitch 1000pcs/reel
	Red	TLSE1005B(T03)	1000		
	Orange	TL0E1005B(T03)	1500		
	Yellow	TLYE1005B(T03)	850		
	Pure yellow	TLPYE1005B(T03)	350		
	Green	TLGE1005B(T03)	350		
	Green	TLFGE1005B(T03)	250		
	Pure green	TLPGE1005B(T03)	130		

5. InGaAlP Surface-Mount LED Lamps: 3.2 x 2.8 mm size

Package (mm)	Color of Emitted Light	Product No.	Luminous Intensity typ. (mcd) @ 20 mA	Viewing Angle typ. (°)	Packing Type (embossed taping)
3.2(L)x2.8(W)x1.9(H)	Red	TLRMH1100A(T11)	150	120	Taping No.: T11 4-mm pitch 2000pcs/reel
	Red	TLSH1100A(T11)	260		
	Orange	TLOH1100A(T11)	270		
	Yellow	TLYH1100A(T11)	220		
	Red	TLRE1100(T11)	100		
	Red	TLSE1100(T11)	180		
	Orange	TLOE1100(T11)	180		
	Yellow	TLYE1100(T11)	150		
	Green	TLGE1100(T11)	100		
	Pure green	TLPGE1100(T11)	25		
	White	TLWA1100	100		
	Blue	TLBC1100	45		
	Green	TLEGC1100	180		

6. InGaAlP Surface-Mount LED Lamps: 3.2 x 2.8 mm size with Ø 2.8 lens

Package (mm)	Color of Emitted Light	Product No.	Luminous Intensity typ. (mcd) @ 20 mA	Viewing Angle typ. (°)	Packing Type (embossed taping)
3.2(L)x2.8(W)x3.4(H) with Ø2.8 lens	Red	TLRE1102(T10)	320	65	Taping No.: T10 8-mm pitch 500pcs/reel
	Red	TLSE1102(T10)	600		
	Orange	TLOE1102(T10)	650		
	Yellow	TLYE1102(T10)	480		
	Green	TLGE1102(T10)	300		
	Pure green	TLPGE1102(T10)	75		

7. InGaAlP High-Brightness (Package Size: Ø 5)

Color of Emitted Light	Intensity Iv (mcd) @ IF = 20 mA		Viewing Angle 2Θ1/2	Product Number		Typical Emitting Wavelength		Lens Type	Maximum DC Forward Current Rating IF (mA) @ Ta = 25°C	Typical Applications
	Min	Typ.		Open Rank	Rank Specified	λd (nm)	λp (nm)			
Red	1530	4500	6°	TLSU180P	TLSU180P(TU)	623	636	Transparent	30	Pilot lamps (narrow range)
	4760	14000	7°	TLRMJ20TP		626	636	Transparent	50	
	4760	11000		TLRH20TP		613	623	Transparent	50	
	2720	9000		TLRMH20TP		626	636	Transparent	50	
	2720	9000		TLSE20TP		613	623	Transparent	50	
	2720	8000		TLRME20TP		626	636	Transparent	50	
	2720	7000		TLRE20TP		630	644	Transparent	50	
	2720	10000	8°	TLRH180P	TLRH180P(UV)	630	644	Transparent	50	
	1530	8000		TLSE180P		613	623	Transparent	50	
	1530	5000		TLRE180AP	TLRE180AP(TU)	630	644	Transparent	50	
	850	3000		TLRH38TP		613	623	Transparent	50	
	2720	6500	12°	TLRMH38TP		626	636	Transparent	50	
	1530	4800		TLRMJ38TP		626	636	Transparent	50	
	2720	7000	15°	TLRMH151P		626	636	Transparent	50	
	1530	4200		TLRMJ17TP		626	636	Transparent	50	
	1530	4500	20°	TLRH17TP		613	623	Transparent	50	
	850	3200		TLRMH17TP		626	636	Transparent	50	
	850	3000		TLSE17TP		613	623	Transparent	50	
	850	2400		TLRME17TP		626	636	Transparent	50	
	476	1500		TLRE17TP		630	644	Transparent	50	
	272	900		TLSU156P	TLSU156P(QR)	623	636	Transparent	30	
	85	270		TLRE138P		630	644	Red, diffusing	50	
	850	2700	22°	TLRH157P	TLRH157P(ST)	613	623	Transparent	50	Message boards Back lighting
	850	2240		TLRMH157P		626	636	Transparent	50	
	476	1900		TLSE157P	TLSE157P(ST)	613	623	Transparent	50	
	476	1700		TLRH157P	TLRH157P(ST)	630	644	Transparent	50	
	272	1000		TLRE157AP	TLRE157AP(RS)	630	644	Transparent	50	
	850	1900	25°	TLRH16TP		613	623	Transparent	50	
	476	1500		TLRMH16TP		626	636	Transparent	50	
	476	1500		TLSE16TP		613	623	Transparent	50	
	476	1000		TLSE16CP		613	623	Red, transparent	50	
	476	900		TLRMH156P		626	636	Transparent	50	
	272	1200		TLRME16TP		626	636	Transparent	50	
	272	800		TLRE16TP		630	644	Transparent	50	
	153	600		TLRE16CP		630	644	Red, transparent	50	
	153	500		TLRME17DP		626	636	Red, diffusing	50	
	476	1400	30°	TLRH156P	TLRH156P(RS)	613	623	Transparent	50	
	850	2100		TLRMJ16TP		626	636	Transparent	50	
	272	900		TLSE156P	TLSE156P(RS)	613	623	Transparent	50	
	272	800		TLRH156P	TLRH156P(QR)	630	644	Transparent	50	
	153	550		TLSU113P		623	636	Red, transparent	30	
	153	450		TLRE156AP	TLRE156AP(PQ)	630	644	Transparent	50	
	272	650	35°	TLRMH265P		626	636	Milky-white, diffusing	50	
	47.6	250	40°	TLSU114P	TLSU114P(NP)	623	636	Red, diffusing	30	
	47.6	150	75°	TLRE25TP		613	644	Transparent	50	Back lighting (wide range)
	27.2	80	90°	TLRE263AP	TLRE263AP(MN)	630	644	Transparent	50	
	8.5	20	130°	TLRE11TP		613	644	Transparent	50	
	8.5	15	150°	TLRE261AP		630	644	Transparent	50	
Orange	2720	7000	6°	TLOU180P	TLOU180P(UV)	605	612	Transparent	30	Pilot lamps (narrow range)
	4760	15000	7°	TLOH20TP		605	612	Transparent	50	
	4760	10000		TLOE20TP		605	612	Transparent	50	
	2720	10000	8°	TLOH180P	TLOH180P(VW)	605	612	Transparent	50	
	1530	7000		TLOE180AP	TLOE180AP(UV)	605	612	Transparent	50	
	2720	7500	12°	TLOH38TP		605	612	Transparent	50	
	1530	5000	20°	TLOH17TP		605	612	Transparent	50	
	1530	4500		TLOE17TP		605	612	Transparent	50	
	476	900		TLOU156P	TLOU156P(RS)	605	612	Transparent	30	Message boards Back lighting
	476	800		TLOU172P		605	612	Orange, transparent	30	
	850	2800	22°	TLOH157P	TLOH157P(TU)	605	612	Transparent	50	
	476	2800		TLOE157AP	TLOE157AP(ST)	605	612	Transparent	50	
	850	2300	25°	TLOH16TP		605	612	Transparent	50	
	850	2000		TLOE16TP		605	612	Transparent	50	
	476	1600		TLOE16CP		605	612	Orange, transparent	50	

7. InGaAlP High-Brightness (Package Size: Ø 5) (continued)

Color of Emitted Light	Intensity Iv (mcd) @ IF = 20 mA		Viewing Angle 2Θ1/2	Product Number		Typical Emitting Wavelength		Lens Type	Maximum DC Forward Current Rating IF (mA) @ Ta = 25°C	Typical Applications
	Min	Typ.		Open Rank	Rank Specified	λd (nm)	λp (nm)			
Orange	476	1500	30°	TLOH156P	TLOH156P(ST)	605	612	Transparent	50	Message boards Back lighting
	272	1000		TLOE156AP	TLOE156AP(RS)	605	612	Transparent	50	
	272	900		TLOU113P	TLOU113P(RS)	605	612	Orange, transparent	30	
	272	900		TLOE266	TLOE266(RS)	605	612	Orange, transparent	50	
	47.6	250	40°	TLOU114P	TLOU114P(NP)	605	612	Orange, diffusing	30	Back lighting (wide range)
	153	350	75°	TLOE25TP		605	612	Transparent	50	
	47.6	260	90°	TLOE263AP	TLOE263AP(PQ)	605	612	Transparent	50	
	27.2	65	130°	TLOE11TP		605	612	Transparent	50	
	15.3	50	150°	TLOE261AP	TLOE261AP(LM)	605	612	Transparent	50	
Yellow	850	4300	6°	TLYU180P	TLYU180P(TU)	587	590	Transparent	30	Pilot lamps (narrow range)
	4760	13000	7°	TLYH20TP		587	590	Transparent	50	
	2720	9500		TLYE20TP		587	590	Transparent	50	
	2720	8000	8°	TLYH180P	TLYH180P(VW)	587	590	Transparent	50	
	1530	4700		TLYE180AP	TLYE180AP(UV)	587	590	Transparent	50	
	2720	7000	12°	TLYH38TP		587	590	Transparent	50	
	2200	4500	15°	TLYH151P		587	590	Transparent	50	
	1530	4800	20°	TLYH17TP		587	590	Transparent	50	
	850	3000		TLYE17TP		587	590	Transparent	50	
	153	500		TLYU156P	TLYU156P(QR)	587	590	Transparent	30	
	153	400		TLYU172P		587	590	Yellow, transparent	30	
	850	2500	22°	TLYH157P	TLYH157P(TU)	587	590	Transparent	50	Message boards Back lighting
	476	2200	25°	TLYE157AP	TLYE157AP(ST)	587	590	Transparent	50	
	850	2200		TLYH16TP		587	590	Transparent	50	
	476	1500		TLYE16TP		587	590	Transparent	50	
	476	1200		TLYE16CP		587	590	Yellow, transparent	50	
	476	1400	30°	TLYH156P	TLYH156P(RS)	587	590	Transparent	50	
	272	700		TLYE156AP	TLYE156AP(QR)	587	590	Transparent	50	
	153	500		TLYU113P		587	590	Yellow, transparent	30	
	47.6	130	40°	TLYU114P	TLYU114P(MN)	587	590	Yellow, diffusing	30	Back lighting (wide range)
	85	300	75°	TLYE25TP		587	590	Transparent	50	
	47.6	170	90°	TLYE263AP	TLYE263AP(NP)	587	590	Transparent	50	
	15.3	45	130°	TLYE11TP		587	590	Transparent	50	
	8.5	27	150°	TLYE261AP	TLYE261AP(JK)	587	590	Transparent	50	
Pure yellow	2720	8000	5°	TLPYE23TP		580	583	Transparent	50	Pilot lamps (narrow range)
	476	2000	18°	TLPYE19TP		580	583	Transparent	50	Message boards Back lighting
	272	750	30°	TLPYE18TP		580	583	Transparent	50	
Green	2720	7000	5°	TLGE23TP		571	574	Transparent	50	Pilot lamps (narrow range)
	1530	4000		TLGU23TP		571	574	Transparent	30	
	1530	5000	7°	TLGE183P		571	574	Transparent	50	
	476	1300	18°	TLGE19TP		571	574	Transparent	50	
	476	1700	20°	TLGE159P	TLGE159P(ST)	571	574	Transparent	50	
	476	1400		TLGE174P		571	574	Green, transparent	50	
	272	800	28°	TLGE158P	TLGE158P(QR)	571	574	Transparent	50	Message boards Back lighting
	272	700	30°	TLGE18TP		571	574	Transparent	50	
	153	500		TLGE18CP		571	574	Green, transparent	50	
	85	200		TLGU18TP		571	574	Transparent	30	
	47.6	180		TLGU18CP		571	574	Green, transparent	30	
	47.6	120	45°	TLGU13CP		571	574	Green, transparent	30	
	27.2	70	55°	TLGU13DP		571	574	Green, diffusing	30	Back lighting (wide range)
	27.2	90	75°	TLGE25TP		571	574	Transparent	50	
	8.5	20	130°	TLGE11TP		571	574	Transparent	50	
Green (New Color)	1530	5000	5°	TLFGE23TP		565	568	Transparent	50	Pilot lamps (narrow range)
	272	800	18°	TLFGE19TP		565	568	Transparent	50	Message boards Back lighting
	85	300	30°	TLFGE18TP		565	568	Transparent	50	
Pure green	850	3000	5°	TLPGE23TP		558	562	Transparent	50	Pilot lamps (narrow range)
	476	1600		TLPGU23TP		558	562	Transparent	30	
	476	2000	7°	TLPGE183P	TLPGE183P(ST)	558	562	Transparent	50	
	153	500	18°	TLPGE19TP		558	562	Transparent	50	
	153	430	20°	TLPGE159P		558	562	Transparent	50	
	85	150	28°	TLPGE158P		558	562	Transparent	50	Message boards Back lighting
	85	200	30°	TLPGE18TP		558	562	Transparent	50	
	27.2	90		TLPGU18TP		558	562	Transparent	30	
	27.2	80		TLPGU13CP		558	562	Green, transparent	30	
	15.3	35	55°	TLPGU13DP		558	562	Green, diffusing	30	
	2.72	8	130°	TLPGE11TP		558	562	Transparent	50	Back lighting (wide range)

7. InGaAlP High-Brightness (Package Size: Ø 3)

Color of Emitted Light	Intensity Iv (mcd) @ IF = 20 mA		Viewing Angle 2Θ1/2	Product Number		Typical Emitting Wavelength		Lens Type	Maximum DC Forward Current Rating IF (mA) @Ta = 25°C	Typical Applications
	Min	Typ.		Open Rank	Rank Specified	λd (nm)	λp (nm)			
Red	476	4000	9°	TLSU163		623	636	Pale red, transparent	30	Pilot lamps
	476	1600		TLSU160		623	636	Transparent	30	
	2720	4500	10°	TLSH160		613	623	Transparent	50	
	850	1800		TLRH160	TLRH160(ST)	630	644	Transparent	50	
	476	1200	16°	TLRE160A	TLRE160A(RS)	630	644	Transparent	50	
	1530	3500		TLSE50T		613	623	Transparent	50	
	850	2200		TLRME50T		626	636	Transparent	50	
	850	1800		TLRE50T		630	644	Transparent	50	
	153	450	18°	TLSU164		623	636	Pale red, diffusing	30	
	153	300	35°	TLSU125	TLSU125(PQ)	623	636	Transparent	30	
	85	270		TLSU123	TLSU123(PQ)	623	636	Red, transparent	30	
	272	800	40°	TLSH125		613	623	Transparent	50	
	85	180		TLSU126		623	636	Milky-white, diffusing	30	
	47.6	100	45°	TLSU124	TLSU124(MN)	623	636	Red, diffusing	30	
	272	800		TLSE53T		613	623	Transparent	50	
	272	600		TLRME53T		626	636	Transparent	50	
	153	400		TLRE53T		630	644	Transparent	50	
	47.6	170	60°	TLSU262	TLSU262(NP)	623	636	Transparent	30	Back lighting (wide range)
	85	330	80°	TLRME68TG		626	636	Transparent	50	
	85	220		TLRH262	TLRH262(NP)	630	644	Transparent	50	
	85	200		TLSE62T		613	623	Transparent	50	
	47.6	180		TLRME62T		626	636	Transparent	50	
	47.6	150		TLRE262A	TLRE262A(MN)	630	644	Transparent	50	
	47.6	130		TLSU268G		623	636	Transparent	30	
	47.6	120	120°	TLRE62T		630	644	Transparent	50	
	15.3	45		TLRE60T		630	644	Transparent	50	
	8.5	25		TLRE260A		630	644	Transparent	50	
	8.5	25	140°	TLRE260A		630	644	Transparent	50	
Orange	476	2500	9°	TLOU160		605	612	Transparent	30	Pilot lamps
	850	2300	10°	TLOH160	TLOH160(TU)	605	612	Transparent	50	
	476	1500		TLOE160A	TLOE160A(ST)	605	612	Transparent	50	
	1530	4500	16°	TLOE50T		605	612	Transparent	50	
	85	400	35°	TLOU123		605	612	Orange, transparent	30	
	47.6	180	40°	TLOU124		605	612	Orange, diffusing	30	
	272	1000	45°	TLOE53T		605	612	Transparent	50	Back lighting (wide range)
	47.6	300	60°	TLOU262	TLOU262(PQ)	605	612	Transparent	30	
	47.6	200		TLOU267		605	612	Orange, transparent	30	
	153	450	80°	TLOH262	TLOH262(PQ)	605	612	Transparent	50	
	153	350		TLOE62T		605	612	Transparent	50	
	85	300		TLOE262A	TLOE262A(PQ)	605	612	Transparent	50	
	27.2	100	120°	TLOE60T		605	612	Transparent	50	
	15.3	70	140°	TLOE260A	TLOE260A(LM)	605	612	Transparent	50	
Yellow	476	1500	9°	TLYU160	TLYU160(ST)	587	590	Transparent	30	Pilot lamps
	850	4300	10°	TLYH160	TLYH160(TU)	587	590	Transparent	50	
	476	2300		TLYE160A	TLYE160A(ST)	587	590	Transparent	50	
	1530	3500	16°	TLYE50T		587	590	Transparent	50	
	85	220	35°	TLYU123	TLYU123(NP)	587	590	Yellow, transparent	30	
	47.6	110	40°	TLYU124	TLYU124(MN)	587	590	Yellow, diffusing	30	
	272	800	45°	TLYE53T		587	590	Transparent	50	
	47.6	150	60°	TLYU262	TLYU262(MN)	587	590	Transparent	30	Back lighting (wide range)
	47.6	90		TLYU267		587	590	Yellow, transparent	30	
	85	340	80°	TLYE68TG		587	590	Transparent	50	
	85	280		TLYH262	TLYH262(PQ)	587	590	Transparent	50	
	85	250		TLYE62T		587	590	Transparent	50	
	85	240		TLYE262A	TLYE262A(NP)	587	590	Transparent	50	
	27.2	85	120°	TLYE60T		587	590	Transparent	50	
	15.3	40	140°	TLYE260A	TLYE260A(KL)	587	590	Transparent	50	
Pure yellow (New Color)	850	2500	16°	TLPE50T		580	583	Transparent	50	Pilot lamps
	153	450	45°	TLPE53T		580	583	Transparent	50	Back lighting (wide range)
	47.6	150	80°	TLPE62T		580	583	Transparent	50	

◆ : Mount flush with PCB

7. InGaAlP High-Brightness (Package Size: Ø 3) (continued)

Color of Emitted Light	Intensity Iv (mcd) @ IF = 20 mA		Viewing Angle 2Θ1/2	Product Number		Typical Emitting Wavelength		Lens Type	Maximum DC Forward Current Rating IF (mA) @ Ta = 25°C	Typical Applications
	Min	Typ.		Open Rank	Rank Specified	λd (nm)	λp (nm)			
Green	850	2400	9°	TLGE160	TLGE160(TU)	571	574	Transparent	50	Pilot lamps
	476	1200	10°	TLGU50T		571	574	Transparent	30	
	476	1500	16°	TLGE50T		571	574	Transparent	50	
	153	500	35°	TLGE125	TLGE125(QR)	571	574	Transparent	50	
	153	450		TLGE123	TLGE123(PQ)	571	574	Green, transparent	50	
	47.6	170	40°	TLGU53T		571	574	Transparent	30	
	47.6	150		TLGU53C		571	574	Green, transparent	30	
	153	400	45°	TLGE53T		571	574	Transparent	50	
	27.2	80	50°	TLGU53D		571	574	Green, diffusing	30	Back lighting (wide range)
	47.6	220	65°	TLGE262	TLGE262(NP)	571	574	Transparent	50	
	27.2	70	80°	TLGU62T		571	574	Transparent	30	
	47.6	155		TLGE68TG◆		571	574	Transparent	50	
	47.6	110		TLGE62T		571	574	Transparent	50	
	15.3	50	120°	TLGE60T		571	574	Transparent	50	
	8.5	45		TLGE260	TLGE260(KL)	571	574	Transparent	50	
Green (New Color)	272	1000	16°	TLFGE50T		565	568	Transparent	50	Pilot lamps
	85	200	45°	TLFGE53T		565	568	Transparent	50	
	27.2	70	80°	TLFGE62T		565	568	Transparent	50	Back lighting (wide range)
Pure green	272	450	9°	TLPG160		558	562	Transparent	50	Pilot lamps
	153	450	10°	TLPGU50T		558	562	Transparent	30	
	153	600	16°	TLPG150T		558	562	Transparent	50	
	47.6	150	35°	TLPG125		558	562	Transparent	50	
	27.2	80	40°	TLPGU53T		558	562	Transparent	30	
	27.2	70		TLPGU53C		558	562	Green, transparent	30	
	47.6	130	45°	TLPG153T		558	562	Transparent	50	
	15.3	40	50°	TLPGU53D		558	562	Green, diffusing	30	Back lighting (wide range)
	15.3	45	65°	TLPG1262		558	562	Transparent	50	
	15.3	45	80°	TLPG162T		558	562	Transparent	50	
	8.5	25		TLPGU62T		558	562	Transparent	30	

◆ : Mount flush with PCB

8. InGaAlP High-Brightness (Package Size: Ø 10, Elliptical)

Package size (mm)	Color of Emitted Light	Intensity Iv (mcd) @ IF = 20 mA		Viewing Angle 2Θ1/2	Product Number		Typical Emitting Wavelength		Lens Type	Maximum DC Forward Current Rating IF (mA) @ Ta = 25°C	Typical Applications
		Min	Typ.		Open Rank	Rank Specified	λd (nm)	λp (nm)			
Ø10	Red	4760	19000	4°	TLRH190P	TLRH190P(WX)	630	644	Transparent	50	Traffic light
	Orange	8500	33000		TLOH190P	TLOH190P(XY)	605	612	Transparent	50	
	Yellow	8500	30000		TLYH190P	TLYH190P(XY)	587	590	Transparent	50	
Elliptical 5 x 5.8	Red	476	1200	30°/50°	TLRMJ27T		626	636	Transparent	50	Message boards
		272	750		TLSE27C		613	623	Red, transparent	50	
		153	400		TLRME27C		626	636	Red, transparent	50	
		85	300	30°/60°	TLRE27C		630	644	Red, transparent	50	
		153	450		TLRH247	TLRH247(PQ)	630	644	Transparent	50	
		85	350		TLRE248		630	644	Red, transparent	50	
	Orange	85	450	30°/45°	TLOU248		605	612	Orange, transparent	30	
		272	800	30°/50°	TLOE27C		605	612	Orange, transparent	50	
		153	370	30°/60°	TLOE248		605	612	Orange, transparent	50	
	Yellow	272	650	30°/50°	TLYE27C		587	590	Yellow, transparent	50	
		153	700	30°/60°	TLYH247	TLYH247(QR)	587	590	Transparent	50	
	Green	85	250	30°/50°	TLGE27C		571	574	Green, transparent	50	
		47.6	180		TLGU27C		571	574	Green, transparent	30	
		153	400	30°/60°	TLGE247	TLGE247(PQ)	571	574	Transparent	50	
		153	360		TLGE248		571	574	Green, transparent	50	
	Pure green	27.2	90		TLPG1247	TLPG1247(LM)	558	562	Transparent	50	

■ TOSLINK – Fiber Optic Devices

Optical Modules for General-Purpose Use (simplex)

Transmitting Module	Receiving Module	Data Rate (Mb/s, NRZ)	Wavelength (nm)	Transmission Distance (m) ⁽¹⁾	Pulse Width Distortion (ns) ⁽¹⁾	Power Supply Voltage (V)	Operating Temperature (°C)	Appropriate Optical-Fiber Cable (μm)	Appropriate Optical-Fiber Cable with Fiber-Optic Connectors
		DC to 6	800	Up to 1000	± 55	5 ± 0.25	– 40 to 85	PCF (200/300)	TOCP100Q-□□B/TOCP100X-□□B
				Up to 800				H-PCF (200/230)	CF-1071 Series ⁽⁴⁾
		DC to 6	800	Up to 1000	± 55	5 ± 0.25	– 40 to 85	PCF (200/300)	TOCP100Q-□□B/TOCP100X-□□B
				Up to 800				H-PCF (200/230)	CF-1071 Series ⁽⁴⁾
		DC to 6	800	Up to 1000	± 55	5 ± 0.25	– 40 to 70	PCF (200/300)	TOCP100Q-□□B/TOCP100X-□□B
				Up to 800				H-PCF (200/230)	CF-1071 Series ⁽⁴⁾
		DC to 6	670	Up to 40	± 55	5 ± 0.25	– 40 to 85	APF (980/1000)	TOCP100-□□B/TOCP100P-□□B TOCP155-□□B/TOCP155P-□□B
		DC to 6	670	Up to 40	± 55	5 ± 0.25	– 40 to 85	APF (980/1000)	TOCP100-□□B/TOCP100P-□□B TOCP155-□□B/TOCP155P-□□B
		DC to 6	650	Up to 40	± 55	5 ± 0.25	– 40 to 70	APF (980/1000)	TOCP100-□□B/TOCP100P-□□B TOCP155-□□B/TOCP155P-□□B

Notes: (1) Value for operation at Ta = 25°C, V_{CC} = 5 V

(2) Optical receiving module with analog output pin used for optical flux monitoring

(3) It is necessary to change the external resistor value according to the transmission distance.

(4) CF-1071 Series is manufactured of Sumitomo Electronic Industries Ltd.

Optical Modules for General-Purpose Use (duplex)

Transceiving Module	Data Rate (Mb/s, NRZ)	Wavelength (nm)	Transmission Distance (m) ⁽¹⁾	Pulse Width Distortion (ns) ⁽¹⁾	Power Supply Voltage (V)	Operating Temperature (°C)	Appropriate Optical-Fiber Cable (μm)	Appropriate Optical-Fiber Cable with Fiber-Optic Connectors
	DC to 6	800	Up to 1000	± 55	5 ± 0.25	– 40 to 85	PCF (200/300)	TOCP200Q-□□B/TOCP200X-□□B
			Up to 800				H-PCF (200/230)	CF-2071 Series ⁽⁵⁾
	DC to 8	800	Up to 1000	± 42	5 ± 0.25	– 40 to 85	PCF (200/300)	TOCP200Q-□□B/TOCP200X-□□B
			Up to 700				H-PCF (200/230)	CF-2071 Series ⁽⁵⁾
	DC to 6	800	Up to 1000	± 55	5 ± 0.25	– 40 to 70	PCF (200/300)	TOCP200Q-□□B/TOCP200X-□□B
			Up to 800				H-PCF (200/230)	CF-2071 Series ⁽⁵⁾
	DC to 6	670	Up to 40	± 55	5 ± 0.25	– 40 to 85	APF (980/1000)	TOCP200-□□B/TOCP200P-□□B TOCP255-□□B/TOCP255P-□□B
	DC to 6	650	Up to 40	± 55	5 ± 0.25	– 40 to 70	APF (980/1000)	TOCP200-□□B/TOCP200P-□□B TOCP255-□□B/TOCP255P-□□B

Notes: (1) Value for operation at Ta = 25°C, V_{CC} = 5 V

(2) Optical receiving module with analog output pin used for optical flux monitoring

(3) It is necessary to change the external resistor value according to the transmission distance.

(5) CF-2071 Series is manufactured of Sumitomo Electronic Industries Ltd.

Optical Modules for Medium-Speed Data Transmission (simplex)

Transmitting Module	Receiving Module	Data Rate (Mb/s, NRZ)	Wavelength (nm)	Transmission Distance (m) ⁽¹⁾	Pulse Width Distortion (ns) ⁽¹⁾	Power Supply Voltage (V)	Operating Temperature (°C)	Appropriate Optical-Fiber Cable (μm)	Appropriate Optical-Fiber Cable with Fiber-Optic Connectors
TOTX194 ⁽³⁾ 	TORX194 	DC to 10	800	Up to 1000 Up to 700	± 30	5 ± 0.25	− 40 to 85	PCF (200/300) H-PCF (200/230)	TOCP100Q-□□B/TOCP100X-□□B CF-1071 Series ⁽⁴⁾
TOTX195 ⁽³⁾ 	TORX194 	DC to 10	670	Up to 50	± 30	5 ± 0.25	− 40 to 85	APF (980/1000)	TOCP100-□□B/TOCP100P-□□B TOCP155-□□B/TOCP155P-□□B

Notes: (1) Value for operation at Ta = 25°C, V_{CC} = 5 V

(3) It is necessary to change the external resistor value according to the transmission distance.

(4) CF-1071 Series is manufactured of Sumitomo Electronic Industries Ltd.

Optical Modules for Medium-Speed Data Transmission (duplex)

Transceiving Module	Data Rate (Mb/s, NRZ)	Wavelength (nm)	Transmission Distance (m) ⁽¹⁾	Pulse Width Distortion (ns) ⁽¹⁾	Power Supply Voltage (V)	Operating Temperature (°C)	Appropriate Optical-Fiber Cable (μm)	Appropriate Optical-Fiber Cable with Fiber-Optic Connectors
TODX294 ⁽³⁾ 	DC to 10	800	Up to 1000 Up to 700	± 30	5 ± 0.25	− 40 to 85	PCF (200/300) H-PCF (200/230)	TOCP200Q-□□B/TOCP200X-□□B CF-2071 Series ⁽⁵⁾
TODX295 ⁽³⁾ 	DC to 10	670	Up to 50	± 30	5 ± 0.25	− 40 to 85	APF (980/1000)	TOCP200-□□B/TOCP200P-□□B TOCP255-□□B/TOCP255P-□□B

Notes: (1) Value for operation at Ta = 25°C, V_{CC} = 5 V

(3) It is necessary to change the external resistor value according to the transmission distance.

(5) CF-2071 Series is manufactured of Sumitomo Electronic Industries Ltd.

Optical-Fiber Modules for High-Speed Data Transmission (duplex)

Transceiving Module	Data Rate (Mb/s, NRZ)	Wavelength (nm) ⁽⁶⁾	Transmission Distance (m) ⁽⁶⁾	Power Supply Voltage (V)	Operating Temperature (°C)	Appropriate Optical Fiber Cable (μm)	Appropriate Optical Fiber Cable with Fiber-Optic Connectors
TODX2402  New product	20 to 250M	650	Up to 20(250M) Up to 50(125M)	3.3 ± 0.3	0 to 60 −10 to 70	APF (980/1000)	SML fiber-optic cable connectors

Notes : (6) Value for operation at Ta = 25 °C, V_{CC} = 3.3 V.

Optical Modules for Digital Audio (simplex)

Transmitting Module	Receiving Module	Data Rate (Mb/s, NRZ)	Wavelength (nm)	Transmission Distance (m) ⁽¹⁰⁾	Pulse Width Distortion (ns) ⁽¹⁰⁾	Power Supply Voltage (V)	Operating Temperature (°C)	Appropriate Optical Fiber Cable (μm)	Appropriate Optical Fiber Cable with Fiber-Optic Connectors
TOTX178A 	TORX178B 	0.1 to 6M	660	Up to 5	± 30	5 ± 0.25	– 20 to 70	APF(970/1000) APF(980/1000)	TOCP172-□□B
TOTX178S 	TORX178S 	0.1 to 6M	660	Up to 5	± 30	5 ± 0.25	– 20 to 70		
TOTX179 	TORX179 	0.1 to 12.8M	650	Up to 5	± 25	5 ± 0.25	– 20 to 70		
TOTX179L  New product	TORX179L  New product	0.1 to 12.8M	650	Up to 5	± 25	5 ± 0.25	– 20 to 70		
TOTX179P 	TORX179P 	0.1 to 12.8M	650	Up to 5	± 25	5 ± 0.25	– 20 to 70		
TOTX179PL  New product	TORX179PL  New product	0.1 to 12.8M	650	Up to 5	± 25	5 ± 0.25	– 20 to 70		
TOTX179S 	TORX179S 	0.1 to 12.8M	650	Up to 10	± 25	5 ± 0.25	– 20 to 70		
TOTX141 	TORX141 	0.1 to 15M	650	Up to 10	± 20	2.7 to 3.6	– 20 to 70		
TOTX141L  New product	TORX141L  New product	0.1 to 15M	650	Up to 10	± 20	2.7 to 3.6	– 20 to 70		
TOTX141P 	TORX141P 	0.1 to 15M	650	Up to 10	± 20	2.7 to 3.6	– 20 to 70		
TOTX141PL  New product	TORX141PL  New product	0.1 to 15M	650	Up to 10	± 20	2.7 to 3.6	– 20 to 70		
TOTX193 	TORX193 	DC to 6M	660	Up to 10	± 25	5 ± 0.25	– 40 to 85	APF(980/1000)	Audio DNP Connector ⁽¹¹⁾
TOTX193K 	TORX193K 	DC to 6M	660	Up to 10	± 25	5 ± 0.25	– 40 to 85		

Notes : (10) Value for operation at Ta = 25 °C, V_{CC} = 5.0V or V_{CC} = 3.0V

(11) Audio DNP Connector is manufactured of Tyco Electronics AMP K. K.

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TOSHIBA

X30(EUROSEL2003)

Reference Table of Package Name by Supplier

May '03

JEDEC No. (USA)	SOT No. (Europe)	EIAJ No. (Japan)	Number of Pins	Size Name (Type)	Toshiba	Matsushita	Rohm	NEC
	SOD-123		2		SMC LB101			
	SOD-323		2	2125	USC	S-Mini(2pin)	USM	2pin Super Mini Mold
			2	1608	SSC			
	SOD-523	SC-79	2	1608	ESC			
			2	1406	sESC			
TO-92		SC-43	3		TO-92	TO-92	TO-92	TO-92
(TO-92 Small)		SC-72	3		N-MINI	New S Type	SPT	SST
(TO-92 Large)		SC-51	3		LSTM(TO-92MOD)	TO-92L	TO-92L	-
TO-236MOD	SOT-23MOD	SC-59	3	3216	S-Mini	Mini(3pin)	SMT/SMD	3pin Mini Mold
	SOT-323	SC-70	3	2125	USM	S-Mini	UMT/UMD	3pin Super Mini Mold
	SOT-416	(SC-75)	3	1608	SSM	SS Mini	EMT3	3pin Ultra Super Mini Mold
	SOT-490	SC-81	3	1608	ESM			
	SOT-89	SC-62	3		Power Mini	Mini PW	MPT	3pin PW Mini Mold
		SC-63	3		PW Mold/DP	-	CPT	MP-3
	SOT-223		3		SP			
			3		TO-220SM			
			3		TO-3P(SM)			
	SOT-563	SC-89	3		BS6			
			3	1006	fSC			
			3	1006	fSM			
			3		TSM			
			3		VESM			
	SOT-143R	SC-61	4	3216	SMQ	Mini(4pin)	SM4	4pin Mini Mold
	SOT-343	-	4	2125	USQ			
			4	1212	TESQ			
	SOT-25	SC-74A	5	3216	SMV	Mini(5pin)	FMT	5pin Mini Mold
	SOT-353	SC-88A	5	2125	USV	S-Mini(5pin)	UM5	5pin Super Mini Mold
			5	1616	ESV			
	(SOT-353)		5	2120	UFV			
	SOT-26	SC-74	6	2828	SM6	Mini(6pin)	IMD	6pin Mini Mold
	SOT-363	SC-88	6	2125	US6	S-Mini(6pin)	UM6	6pin Super Mini Mold
			6	2120	TU6			
			6	1616	ES6			
			8	4029	SM8			
			8	3120	US8			

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Datasheets: http://www.semicon.toshiba.co.jp/eng/search/ft_datasheet.html

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