



# TSM2N7002E

## 50V N-Channel Enhancement Mode MOSFET

**SOT-23****SOT-323**

Pin assignment:

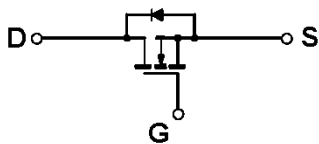
1. Gate
2. Source
3. Drain

 **$V_{DS} = 50V$**  **$R_{DS(on)}, V_{GS} @ 10V, I_{DS} @ 250mA = 3\Omega$**  **$R_{DS(on)}, V_{GS} @ 5V, I_{DS} @ 50mA = 4\Omega$** 

### Features

- ◇ Advanced trench process technology
- ◇ High density cell design for ultra low on-resistance
- ◇ High input impedance
- ◇ High speed switching
- ◇ No minority carrier storage time
- ◇ CMOS logic compatible input
- ◇ No secondary breakdown
- ◇ Compact and low profile SOT-363 package

### Block Diagram



### Ordering Information

Part No.	Packing	Package
TSM2N7002ECX	T & R	SOT-23
TSM2N7002ECU	(3kpcs/Reel)	SOT-323

### Absolute Maximum Rating ( $T_a = 25^\circ C$ unless otherwise noted)

Parameter	Symbol	Limit	Unit	
Drain-Source Voltage	$V_{DS}$	50	V	
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V	
Continuous Drain Current	$I_D$	250	mA	
Pulsed Drain Current	$I_{DM}$	1.0	A	
Maximum Power Dissipation		$T_a = 25^\circ C$	200	mW
		$T_a = 75^\circ C$	150	
Operating Junction Temperature	$T_J$	+150	$^\circ C$	
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	- 55 to +150	$^\circ C$	

### Thermal Performance

Parameter	Symbol	Limit	Unit
Lead Temperature (1/8" from case)	$T_L$	5	S
Junction to Ambient Thermal Resistance (PCB mounted)	$R_{\theta ja}$	625	$^\circ C/W$

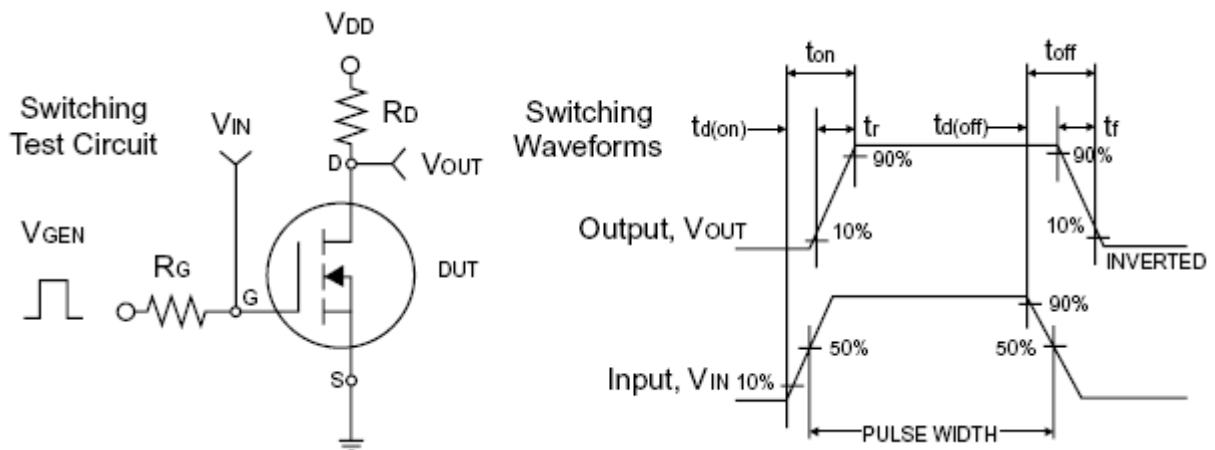
Note: Surface mounted on FR4 board  $t \leq 5$ sec.



Electrical Characteristics						
T <sub>j</sub> = 25 °C unless otherwise noted						
Parameter	Conditions	Symbol	Min	Typ	Max	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	V <sub>GS</sub> = 0V, I <sub>D</sub> = 10uA	BV <sub>DSS</sub>	50	--	--	V
Drain-Source On-State Resistance	V <sub>GS</sub> = 10V, I <sub>D</sub> = 250mA	R <sub>DS(ON)</sub>	--	--	3	Ω
Drain-Source On-State Resistance	V <sub>GS</sub> = 5V, I <sub>D</sub> = 50mA	R <sub>DS(ON)</sub>	--	--	4	
Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250uA	V <sub>GS(TH)</sub>	1.0	2.0	2.5	V
Zero Gate Voltage Drain Current	V <sub>DS</sub> = 50V, V <sub>GS</sub> = 0V	I <sub>DSS</sub>	--	--	1.0	uA
Gate Body Leakage	V <sub>GS</sub> = ± 20V, V <sub>DS</sub> = 0V	I <sub>GSS</sub>	--	--	± 100	nA
On-State Drain Current	V <sub>DS</sub> ≥ 7V, V <sub>GS</sub> = 10V	I <sub>D(ON)</sub>	500	--	--	mA
Forward Transconductance	V <sub>DS</sub> = 7V, I <sub>D</sub> = 200mA	g <sub>fs</sub>	80	--	--	mS
<b>Dynamic *</b>						
Turn-On Delay Time	V <sub>DD</sub> = 30V, I <sub>D</sub> = 100mA, V <sub>GEN</sub> = 10V, R <sub>G</sub> = 10Ω	T <sub>D(ON)</sub>	--	7.5	20	nS
Turn-On Rise Time		t <sub>r</sub>	--	6	--	
Turn-Off Delay Time		T <sub>D(OFF)</sub>	--	7.5	20	
Turn-Off Fall Time		t <sub>f</sub>	--	3	--	
Input Capacitance	V <sub>DS</sub> = 25V, V <sub>GS</sub> = 0V, f = 1.0MHz	C <sub>iss</sub>	--	19	50	pF
Output Capacitance		C <sub>oss</sub>	--	10	25	
Reverse Transfer Capacitance		C <sub>rss</sub>	--	3	5	
<b>Source-Drain Diode</b>						
Max. Diode Forward Current		I <sub>S</sub>	--	--	115	mA
Diode Forward Voltage	I <sub>S</sub> = 115mA, V <sub>GS</sub> = 0V	V <sub>SD</sub>	--	0.76	1.5	V

Note : pulse test: pulse width <=300uS, duty cycle <=2%

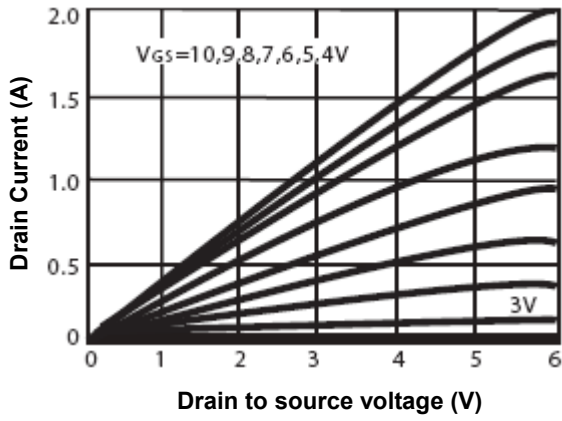
\* Guaranteed by design, not subject to production testing.



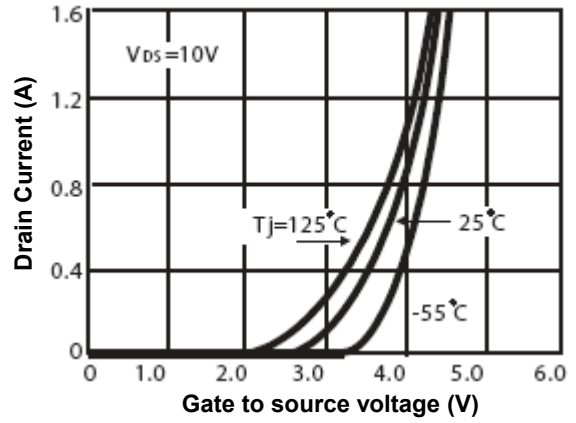


**Typical Characteristics Curve** ( $T_a = 25^\circ\text{C}$  unless otherwise noted)

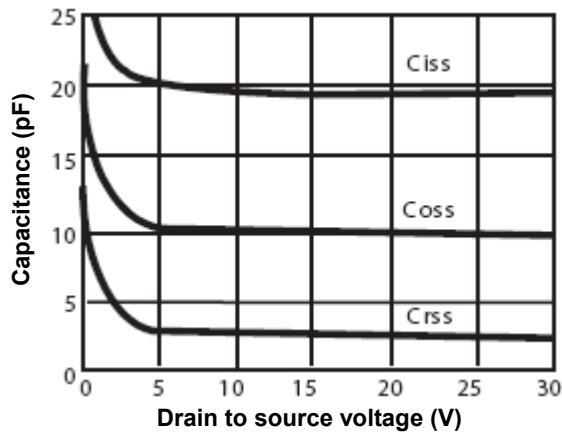
**Output Characteristic**



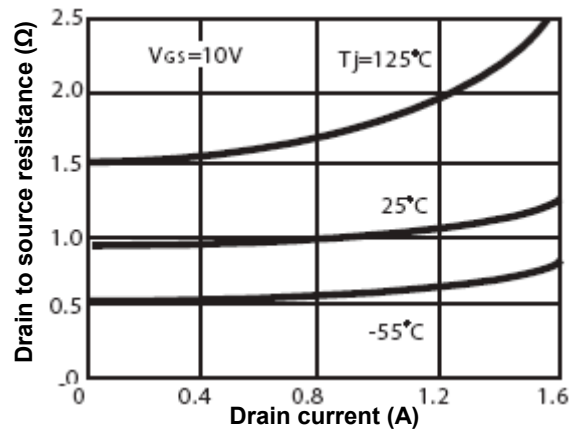
**Transfer Characteristics**



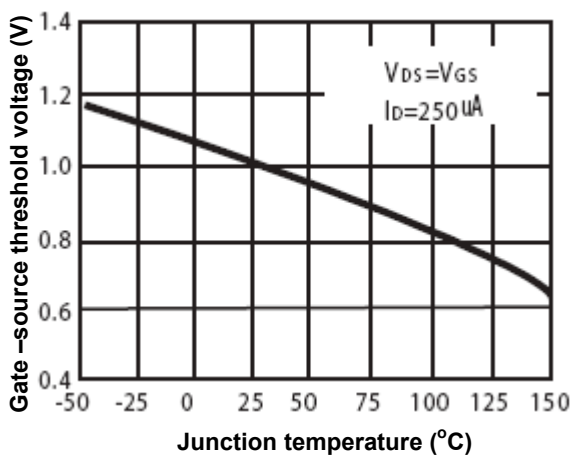
**Capacitance**



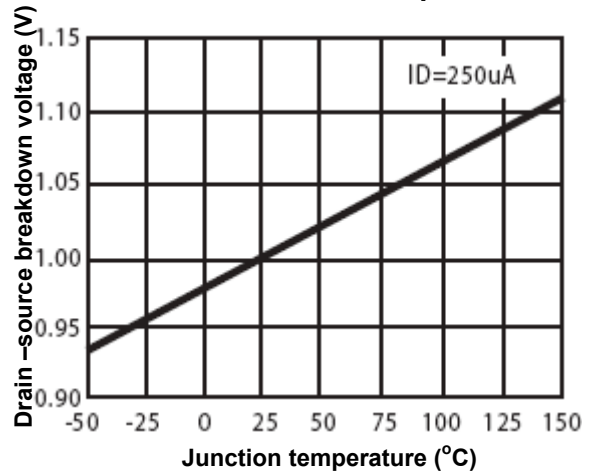
**$R_{ds(on)}$  Variation with Drain Current**



**$V_{GS(th)}$  with Temperature**



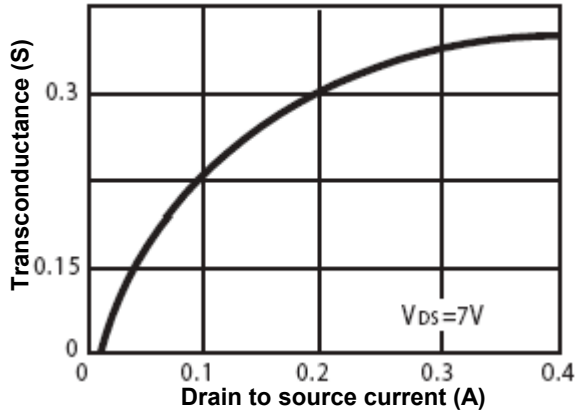
**$V_{DS}$  breakdown with Temperature**



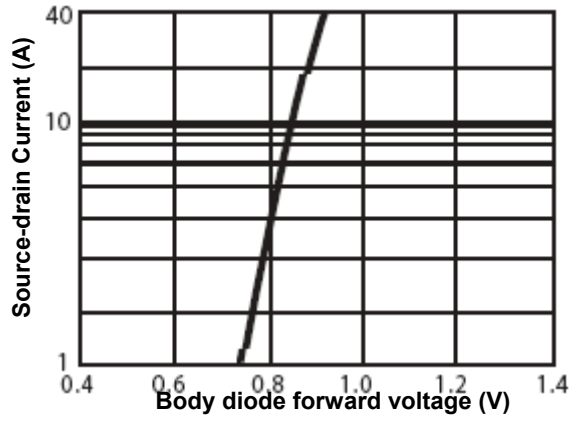


**Typical Characteristics Curve** ( $T_a = 25^\circ\text{C}$  unless otherwise noted)

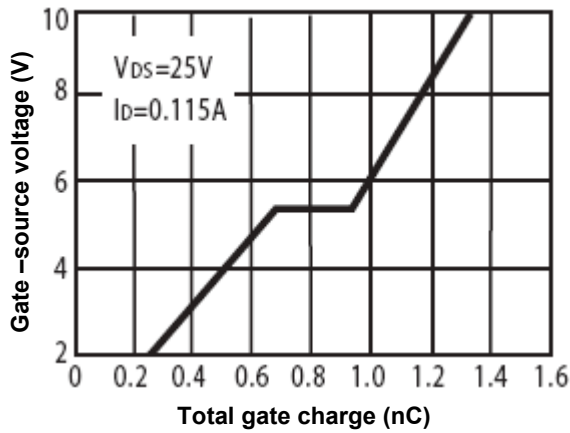
**Transconductance Variation**



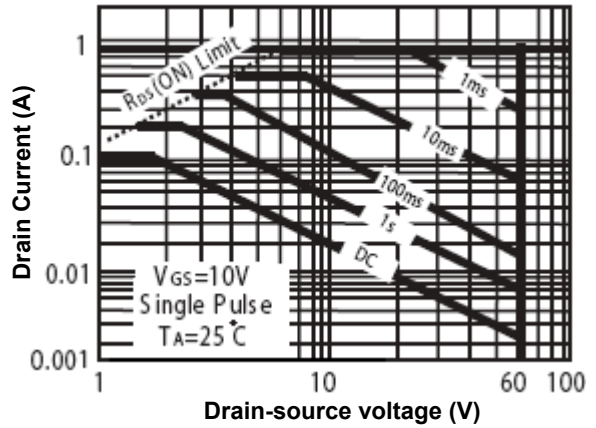
**Body Diode Forward Voltage**



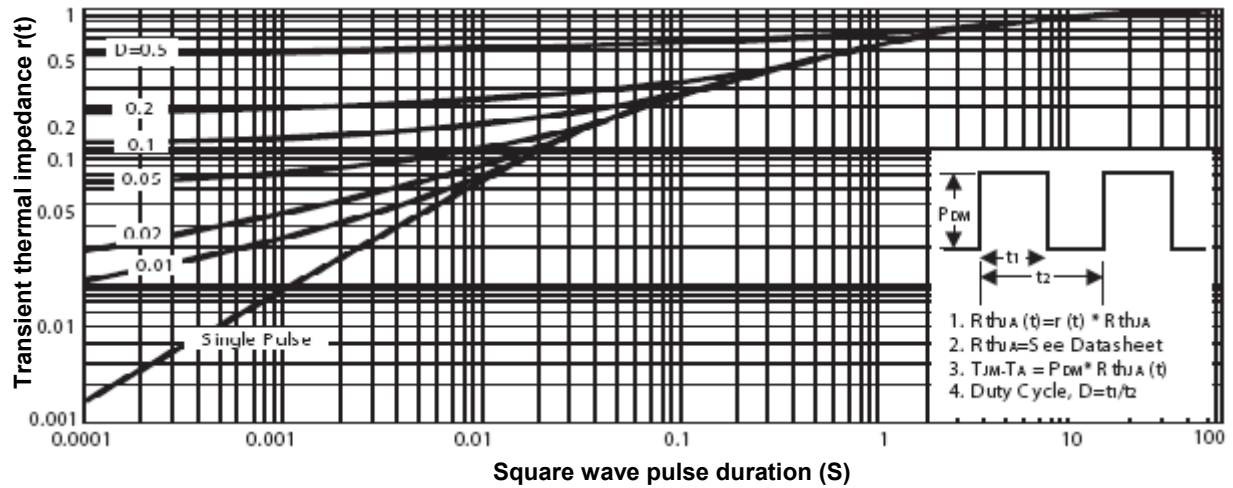
**Gate Charge**



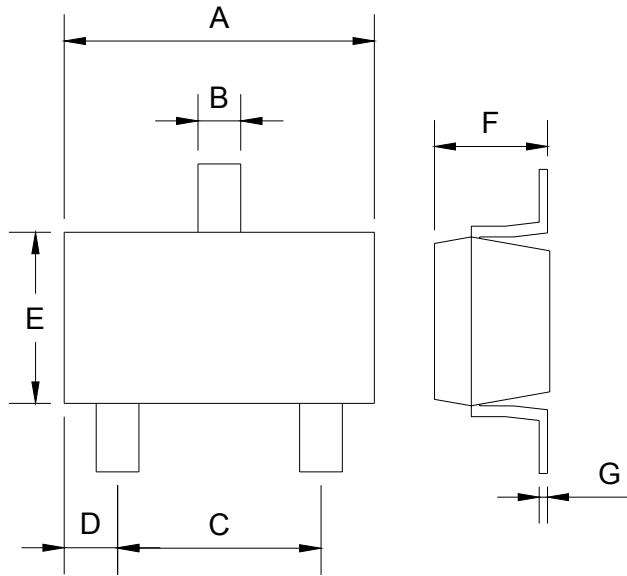
**Maximum Safe Operating Area**



**Normalized Thermal Transient Impedance Curve**

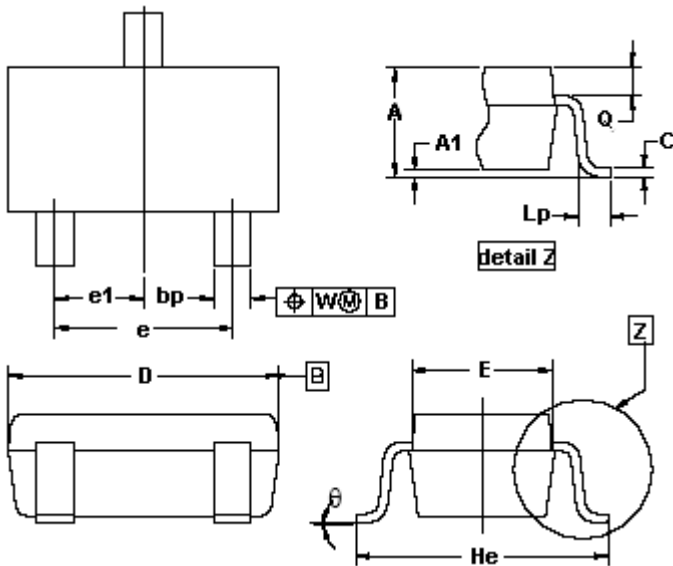


## SOT-23 Mechanical Drawing



SOT-23 DIMENSION				
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.88	2.91	0.113	0.115
B	0.39	0.42	0.015	0.017
C	1.78	2.03	0.070	0.080
D	0.51	0.61	0.020	0.024
E	1.59	1.66	0.063	0.065
F	1.04	1.08	0.041	0.043
G	0.07	0.09	0.003	0.004

## SOT-323 Mechanical Drawing



SOT-323 DIMENSION				
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	0.80	1.10	0.0315	0.0433
A1	--	0.10	--	0.0039
bp	0.30	0.40	0.0118	0.0157
C	0.10	0.25	0.0039	0.0098
D	1.80	2.20	0.0709	0.0866
E	1.15	1.35	0.0453	0.0531
e	1.30	--	0.0512	--
e1	0.65	--	0.0256	--
He	2.00	2.20	0.0787	0.0866
Lp	0.15	0.45	0.0059	0.0177
Q	0.13	0.23	0.0051	0.0091
W	0.20	--	0.0079	--
θ	10°	--	10°	--