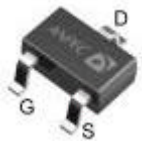
P-Channel Enhancement Mode MOSFET

Features

- -20V/-2.8A
  $R_{DS(ON)}$= 56mΩ (typ.) @ V_{GS}= -4.5V
  $R_{DS(ON)}$= 85mΩ (typ.) @ V_{GS}= -2.5V
  $R_{DS(ON)}$= 106mΩ (typ.) @ V_{GS}= -1.8V
- Super High Dense Cell Design
- Reliable and Rugged

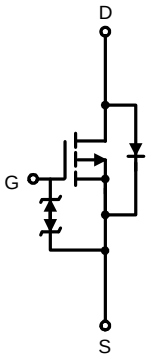
Pin Description



SOT-23

Applications

- Power Management in Notebook Computer, Portable Equipment and Battery Powered Systems.



P Channel MOSFET

Ordering and Marking Information

APM2301CA □□-□□□ Lead Free Code Handling Code Temp. Range Package Code	Package Code A : SOT-23 Operating Junction Temp. Range C : -55 to 150 °C Handling Code TR : Tape & Reel Lead Free Code L : Lead Free Device Blank : Original Device
APM2301CA: C01X	XXXXX - Date Code

Note: ANPEC lead-free products contain molding compounds/die attach materials and 100% matte tin plate termination finish; which are fully compliant with RoHS and compatible with both SnPb and lead-free soldiering operations. ANPEC lead-free products meet or exceed the lead-free requirements of IPC/JEDEC J STD-020C for MSL classification at lead-free peak reflow temperature.

Absolute Maximum Ratings (T$_A$ = 25°C Unless Otherwise Noted)

Symbol	Parameter		Rating	Unit
V_{DSS}	Drain-Source Voltage		-20	V
V_{GSS}	Gate-Source Voltage		±12	
I_D *	Continuous Drain Current	V_{GS}=-4.5V	-2.8	A
I_{DM} *	300µs Pulsed Drain Current		-12	
I_S *	Diode Continuous Forward Current		-1.3	A
T_J	Maximum Junction Temperature		150	°C
T_{STG}	Storage Temperature Range		-55 to 150	
P_D *	Maximum Power Dissipation	T_A=25°C	0.83	W
		T_A=100°C	0.3	
$R_{\theta JA}$ *	Thermal Resistance-Junction to Ambient		150	°C/W

Notes: *Surface Mounted on 1in^2 pad area, t ≤ 10sec.

Electrical Characteristics (T$_A$ = 25°C Unless Otherwise Noted)

Symbol	Parameter	Test Condition	APM2301CA			Unit
			Min.	Typ.	Max.	
Static Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V, I_{DS}=250µA	-20			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=-16V, V_{GS}=0V			-1	µA
		T_J=85°C			-30	
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}= V_{GS}, I_{DS}=-250µA	-0.5	-0.75	-1	V
I_{GSS}	Gate Leakage Current	V_{GS}=±12V, V_{DS}=0V			±10	µA
$R_{DS(ON)}$ [a]	Drain-Source On-State Resistance	V_{GS}=-4.5V, I_{DS}=-2.8A		56	70	mΩ
		V_{GS}=-2.5V, I_{DS}=-2A		85	115	
		V_{GS}=-1.8V, I_{DS}=-1A		106	165	
V_{SD} [a]	Diode Forward Voltage	I_{SD}=-1.3A, V_{GS}=0V		-0.75	-1.3	V
Gate Charge Characteristics [b]						
Q_g	Total Gate Charge	V_{DS}=-10V, V_{GS}=-4.5V, I_{DS}=-2.8A		7	10	nC
Q_{gs}	Gate-Source Charge			1.9		
Q_{gd}	Gate-Drain Charge			1.9		

Electrical Characteristics (Cont.) (T_A = 25°C Unless Otherwise Noted)

Symbol	Parameter	Test Condition	APM2301CA			Unit
			Min.	Typ.	Max.	
Dynamic Characteristics[b]						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=-10V, Frequency=1.0MHz		580		pF
C_{oss}	Output Capacitance			100		
C_{rss}	Reverse Transfer Capacitance			75		
$t_{d(ON)}$	Turn-on Delay Time	V_{DD}=-10V, R_L=10Ω, I_{DS}=1A, V_{GEN}=-4.5V, R_G=6Ω		4	7	ns
t_r	Turn-on Rise Time			13	23	
$t_{d(OFF)}$	Turn-off Delay Time			35	63	
t_f	Turn-off Fall Time			20	36	
t_{rr}	Reverse Recovery Time	I_{SD}=-2.8A, dI_{SD}/dt =100A/μs		20		ns
Q_{rr}	Reverse Recovery Charge			7		nC

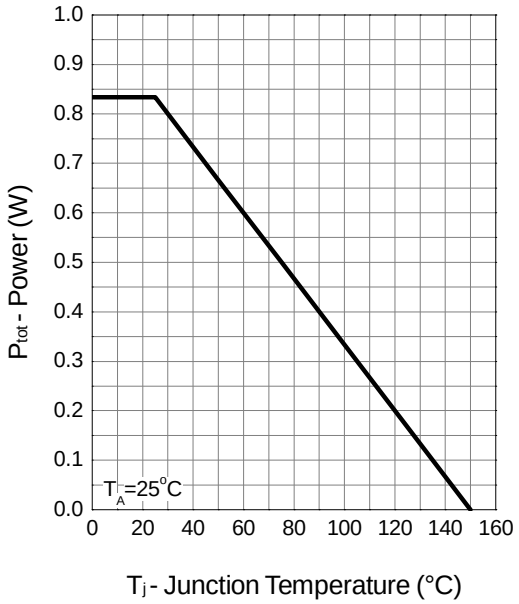
Notes:

a : Pulse test ; pulse width≤300μs, duty cycle≤2%.

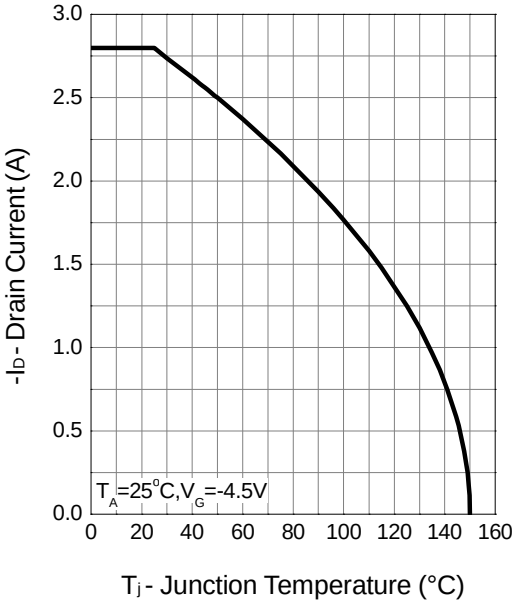
b : Guaranteed by design, not subject to production testing.

Typical Characteristics

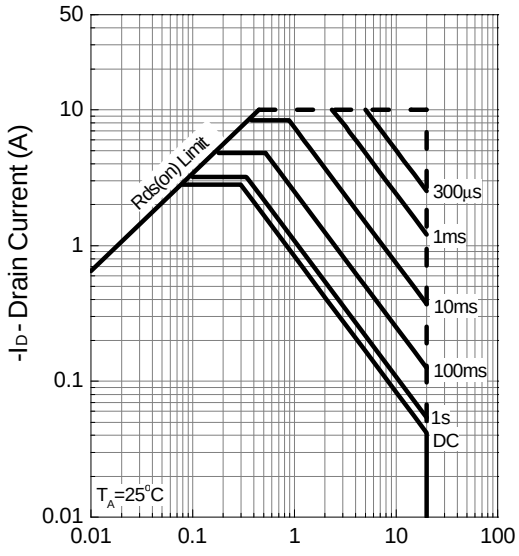
Power Dissipation



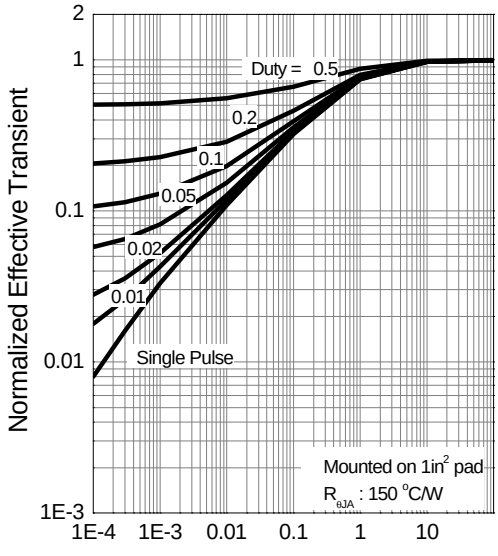
Drain Current



Safe Operation Area

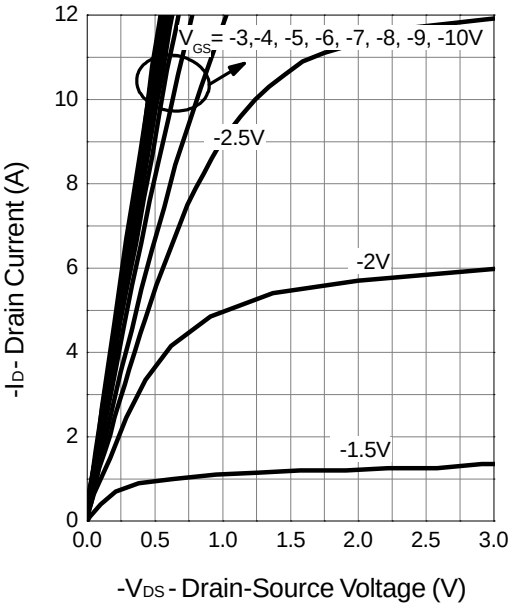


Thermal Transient Impedance

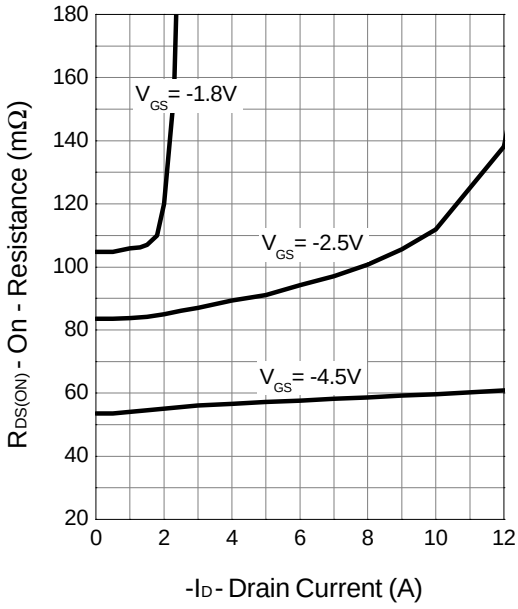


Typical Characteristics (Cont.)

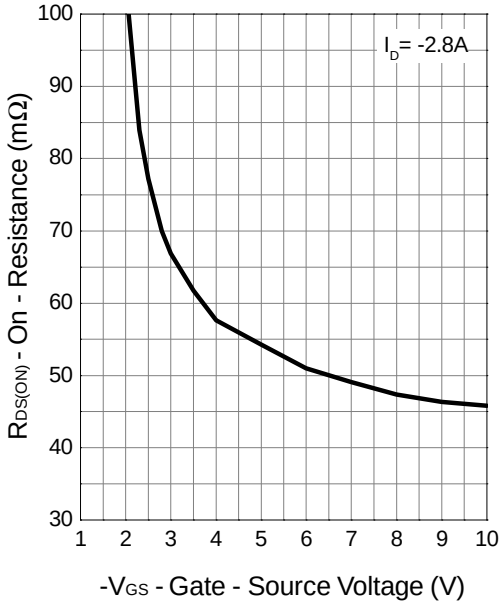
Output Characteristics



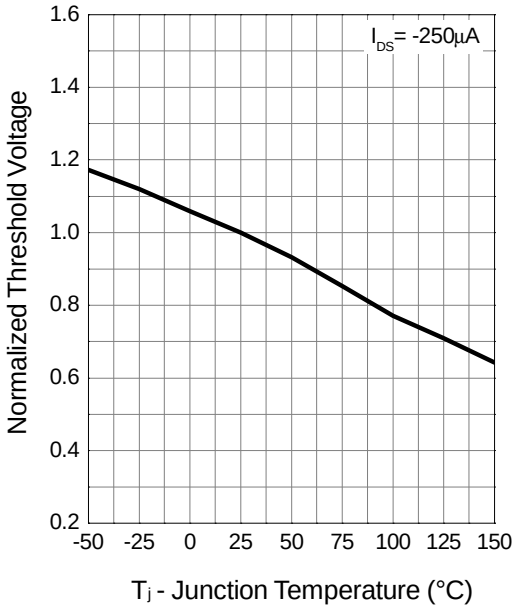
Drain-Source On Resistance



Drain-Source On Resistance

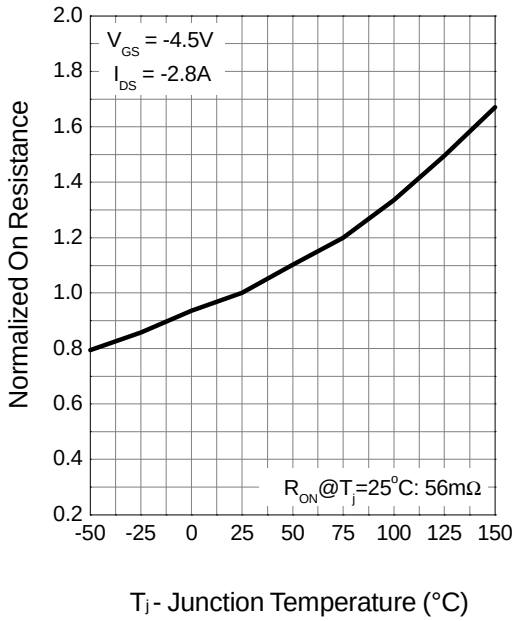


Gate Threshold Voltage

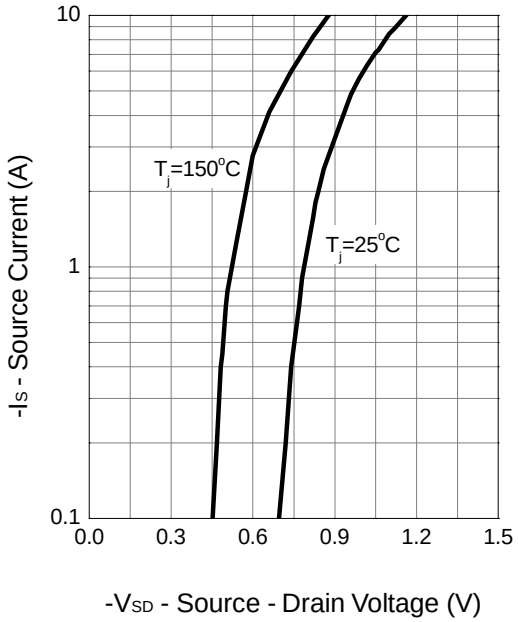


Typical Characteristics (Cont.)

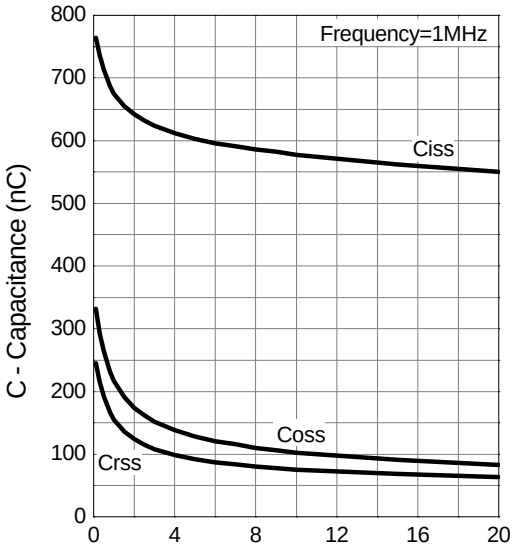
Drain-Source On Resistance



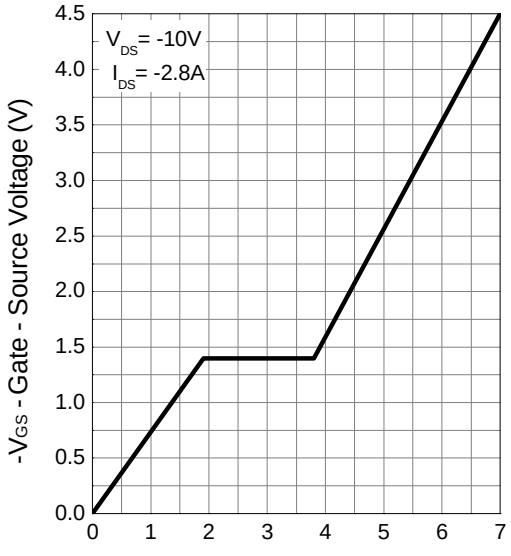
Source-Drain Diode Forward



Capacitance

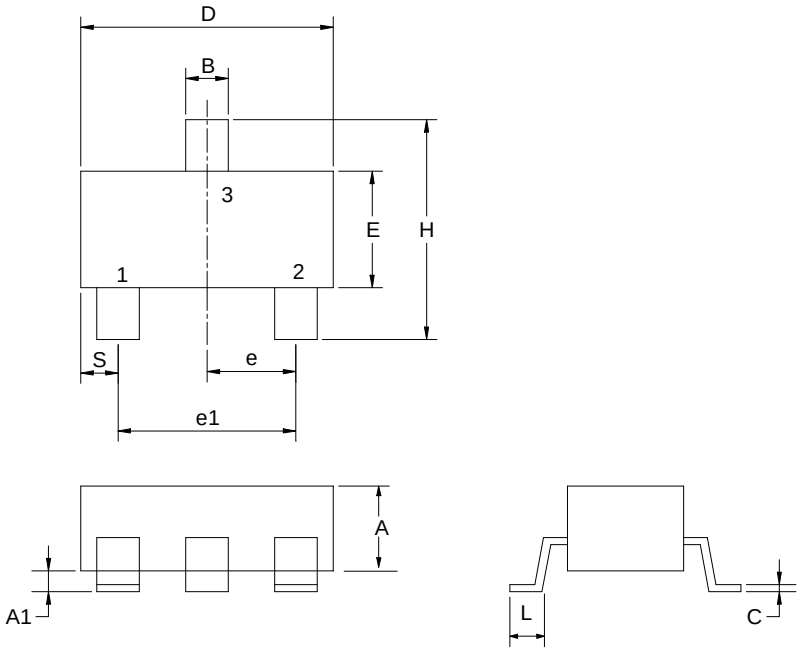


Gate Charge



Packaging Information

SOT-23



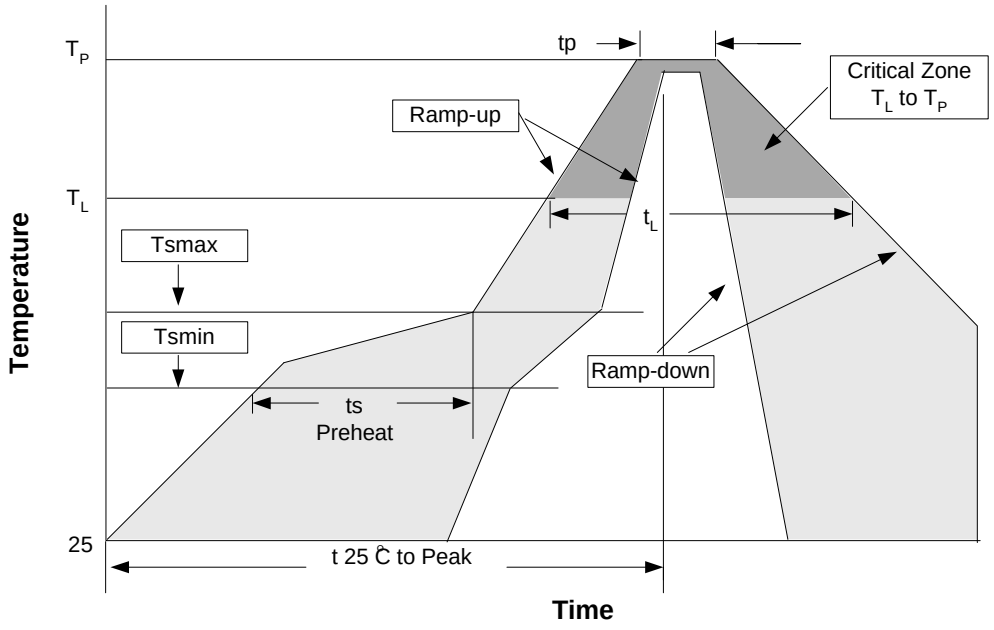
Dim	Parameter		Inches	
	Min.	Max.	Min.	Max.
A	1.00	1.30	0.039	0.051
A1	0.00	0.10	0.000	0.004
B	0.35	0.51	0.014	0.020
C	0.10	0.25	0.004	0.010
D	2.70	3.10	0.106	0.122
E	1.40	1.80	0.055	0.071
e1	1.90 TYP		0.075 TYP	
H	2.40	3.00	0.094	0.118
L	0.37		0.015	

Physical Specifications

Terminal Material	Solder-Plated Copper (Solder Material : 90/10 or 63/37 SnPb,100%Sn).
Lead Solderability	Meets EIA Specification RSI86-91, ANSI/J-STD-002 Category 3.

Reflow Condition

(IR/Convection or VPR Reflow)



Reflow Condition

Profile Feature	Sn-Pb Eutectic Assembly		Pb-Free Assembly	
	Large Body	Small Body	Large Body	Small Body
Average ramp-up rate(T_L to T_P)	3°C/second max.		3°C/second max.	
Preheat -Temperature Min (Tsmin) -Temperature Max (Tsmax) -Time (min to max) (ts)	100°C 150°C 60-120 seconds		150°C 200°C 60-180 seconds	
Tsmax to T_L -Ramp-up Rate			3°C/second max	
Time maintained above: -Temperature (T_L) -Time (t_L)	183°C 60-150 seconds		217°C 60-150 seconds	
Peak Temperature (Tp)	225 +0/-5°C	240 +0/-5°C	245 +0/-5°C	250 +0/-5°C
Time within 5°C of actual Peak Temperature (tp)	10-30 seconds	10-30 seconds	10-30 seconds	20-40 seconds
Ramp-down Rate	6°C/second max.		6°C/second max.	
Time 25°C to Peak Temperature	6 minutes max.		8 minutes max.	

Notes: All temperatures refer to topside of the package .Measured on the body surface.

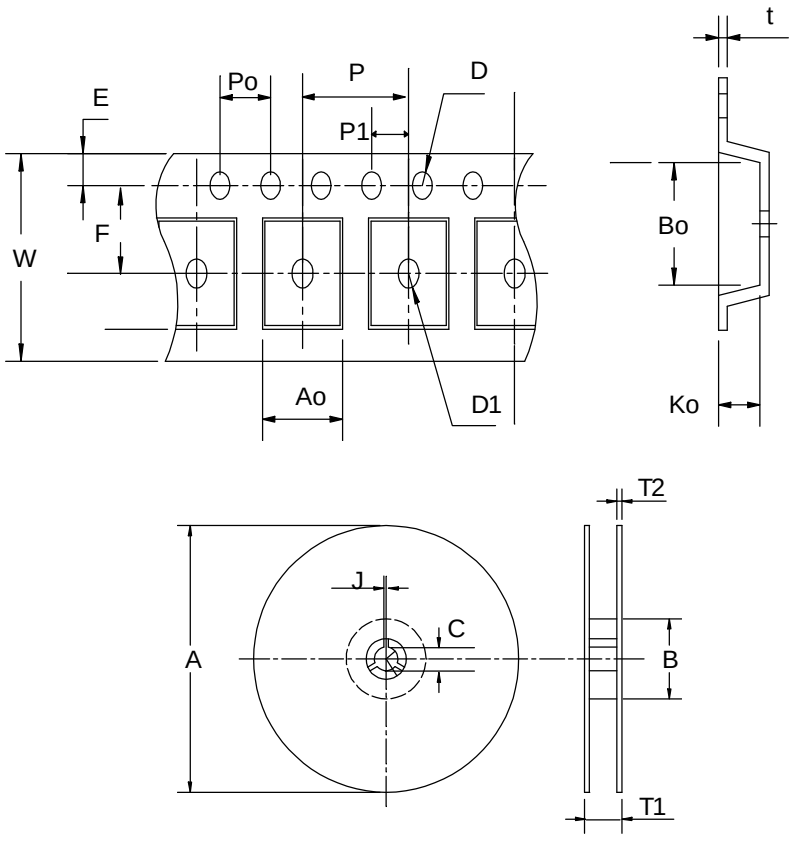
Reflow Condition

pkg. thickness ³ 2.5mm and all bags	pkg. thickness < 2.5mm and pkg. volume ³ 350mm³	pkg. thickness < 2.5mm and pkg. volume < 350mm³
Convection 220 +5/-0°C		Convection 235 +5/-0°C
VPR 215-219°C		VPR 235 +5/-0°C
IR/Convection 220 +5/-0°C		IR/Convection 220 +5/-0°C

Reliability test program

Test Item	Method	Description
SOLDERABILITY	MIL-STD-883D-2003	245°C,5 SEC
HOLT	MIL-STD 883D-1005.7	1000 Hrs Bias @125°C
PCT	JESD-22-B, A102	168 Hrs, 100% RH, 121°C
TST	MIL-STD 883D-1011.9	-65°C ~ 150°C, 200 Cycles

Carrier Tape & Reel Dimensions



Carrier Tape & Reel Dimensions (Cont.)

Application	A	B	C	J	T1	T2	W	P	E
SOT-23	178±1	60±1.0	12.0	2.5±0.15	9.0±0.5	1.4	8.0±0.3	4.0	1.75
	F	D	D1	Po	P1	Ao	Bo	Ko	t
	3.5±0.05	1.5±0.1	φ0.1MIN	4.0	2.0±0.05	3.1	3.0	1.3	0.2±0.03

Cover Tape Dimensions

Application	Carrier Width	Cover Tape Width	Devices Per Reel
SOT-23	8	5.3	3000

Customer Service

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