

# APM2312

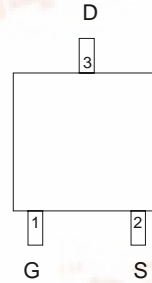


N-Channel Enhancement Mode MOSFET

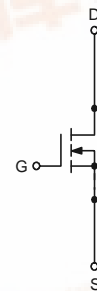
## Features

- 16V/5A,  $R_{DS(ON)}=35m\Omega(\text{typ.}) @ V_{GS}=4.5V$   
 $R_{DS(ON)}=45m\Omega(\text{typ.}) @ V_{GS}=2.5V$   
 $R_{DS(ON)}=60m\Omega(\text{typ.}) @ V_{GS}=1.8V$
- Super High Dense Cell Design for Extremely Low  $R_{DS(ON)}$
- Reliable and Rugged
- SOT-23 Package

## Pin Description



Top View of SOT-23



N-Channel MOSFET

## Applications

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

## Ordering and Marking Information

APM2312 <span style="border: 1px solid black; padding: 2px;">□□-□□</span> 	Package Code A : SOT-23 Operation Junction Temp. Range C : -55 to 150°C Handling Code TR : Tape & Reel
APM2312 A : <span style="border: 1px solid black; padding: 2px;">M12X</span>	X - Date Code

## Absolute Maximum Ratings ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Rating	Unit
$V_{DSS}$	Drain-Source Voltage	16	V
$V_{GSS}$	Gate-Source Voltage	$\pm 8$	
$I_D^*$	Maximum Drain Current – Continuous	5	A
$I_{DM}$	Maximum Drain Current – Pulsed	15	

\* Surface Mounted on FR4 Board,  $t \leq 10$  sec.

ANPEC reserves the right to make changes to improve reliability or manufacturability without notice, and advise customers to obtain the latest version of relevant information to verify before placing orders.



**Absolute Maximum Ratings (Cont.)** ( $T_A = 25^\circ\text{C}$  unless otherwise noted)

Symbol	Parameter	Rating	Unit
$P_D$	Maximum Power Dissipation	$T_A=25^\circ\text{C}$	1.25
		$T_A=100^\circ\text{C}$	0.5
$T_J$	Maximum Junction Temperature	150	$^\circ\text{C}$
$T_{STG}$	Storage Temperature Range	-55 to 150	$^\circ\text{C}$
$R_{\theta JA}$	Thermal Resistance – Junction to Ambient	100	$^\circ\text{C/W}$

**Electrical Characteristics** ( $T_A = 25^\circ\text{C}$  unless otherwise noted)

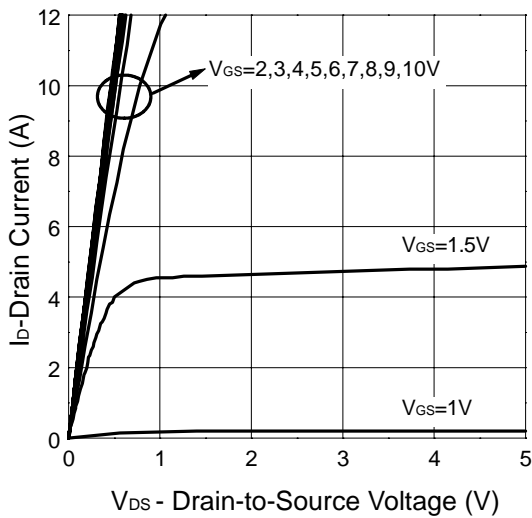
Symbol	Parameter	Test Condition	APM2312			Unit
			Min.	Typ.	Max.	
<b>Static</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_{DS}=250\mu\text{A}$	16			V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=16V, V_{GS}=0V$			1	$\mu\text{A}$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_{DS}=250\mu\text{A}$	0.5	0.7	1	V
$I_{GSS}$	Gate Leakage Current	$V_{GS}=\pm 8V, V_{DS}=0V$			$\pm 100$	nA
$R_{DS(ON)}^a$	Drain-Source On-state Resistance	$V_{GS}=4.5V, I_{DS}=5A$		35	45	m $\Omega$
		$V_{GS}=2.5V, I_{DS}=4.5A$		45	55	
		$V_{GS}=1.8V, I_{DS}=4A$		60	70	
$V_{SD}^a$	Diode Forward Voltage	$I_{SD}=1.7A, V_{GS}=0V$		0.7	1.3	V
<b>Dynamic<sup>b</sup></b>						
$Q_g$	Total Gate Charge	$V_{DS}=10V, I_{DS}=1A$ $V_{GS}=4.5V,$		10	12	nC
$Q_{gs}$	Gate-Source Charge			1.9		
$Q_{gd}$	Gate-Drain Charge			1.8		
$t_{d(ON)}$	Turn-on Delay Time	$V_{DD}=10V, I_{DS}=1A,$ $V_{GEN}=4.5V, R_G=0.2\Omega$		17	33	ns
$T_r$	Turn-on Rise Time			40	70	
$t_{d(OFF)}$	Turn-off Delay Time			45	80	
$T_f$	Turn-off Fall Time			25	45	
$C_{iss}$	Input Capacitance	$V_{GS}=0V$		580		pF
$C_{oss}$	Output Capacitance	$V_{DS}=15V$		170		
$C_{rss}$	Reverse Transfer Capacitance	Frequency=1.0MHz		100		

Notes

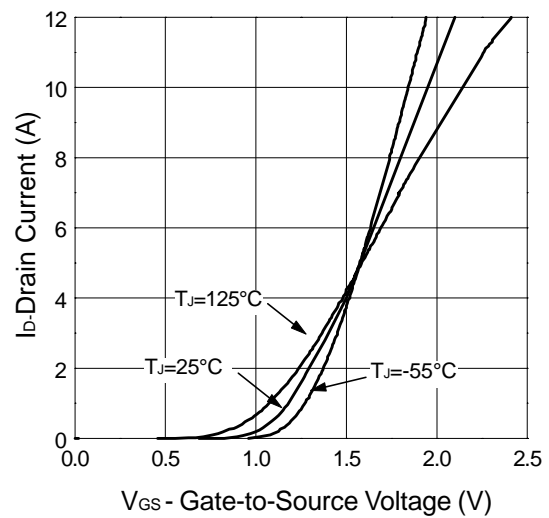
- <sup>a</sup> : Pulse test ; pulse width  $\leq 300\mu\text{s}$ , duty cycle  $\leq 2\%$
- <sup>b</sup> : Guaranteed by design, not subject to production testing

## Typical Characteristics

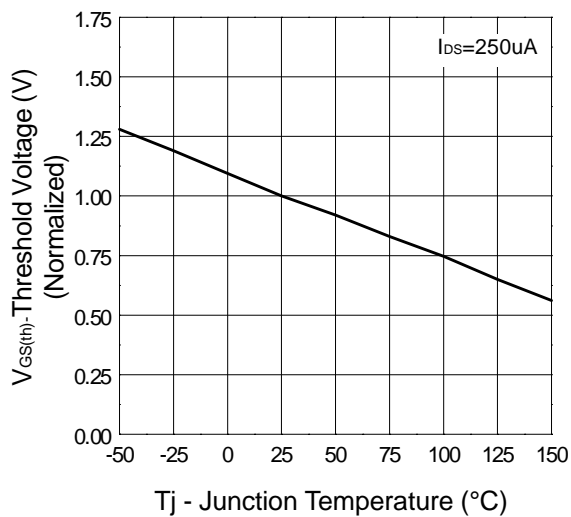
Output Characteristics



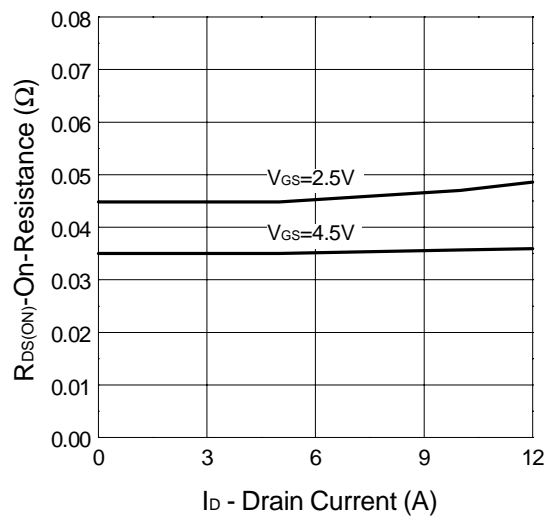
Transfer Characteristics



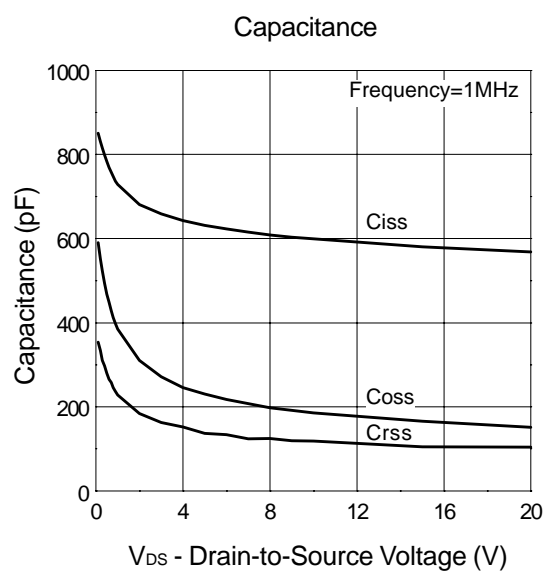
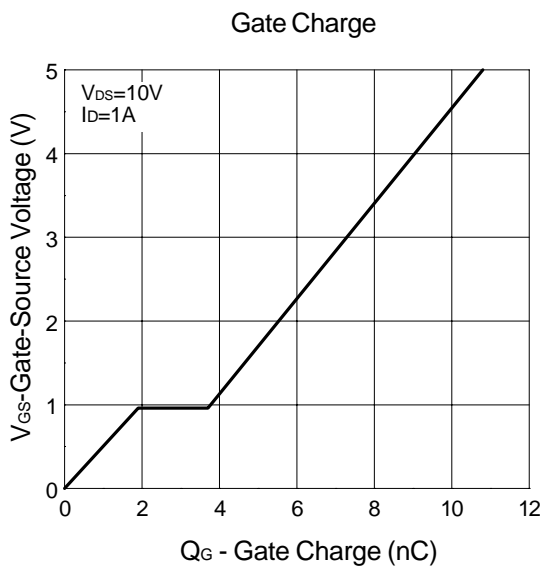
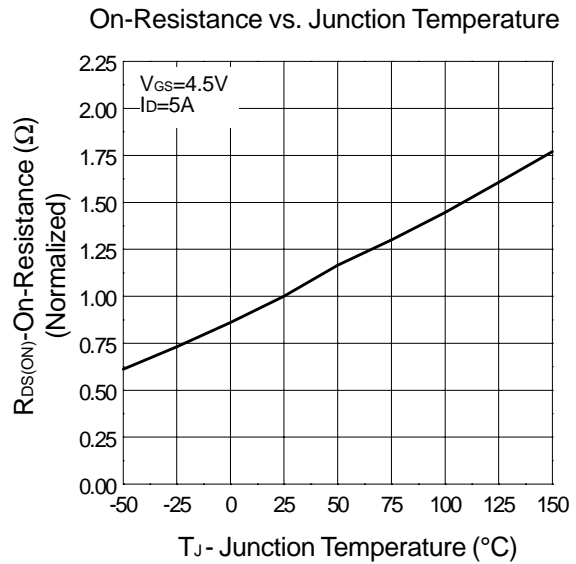
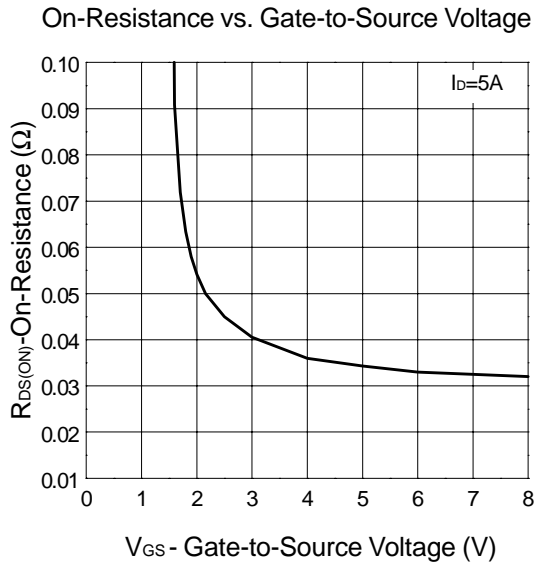
Threshold Voltage vs. Junction Temperature



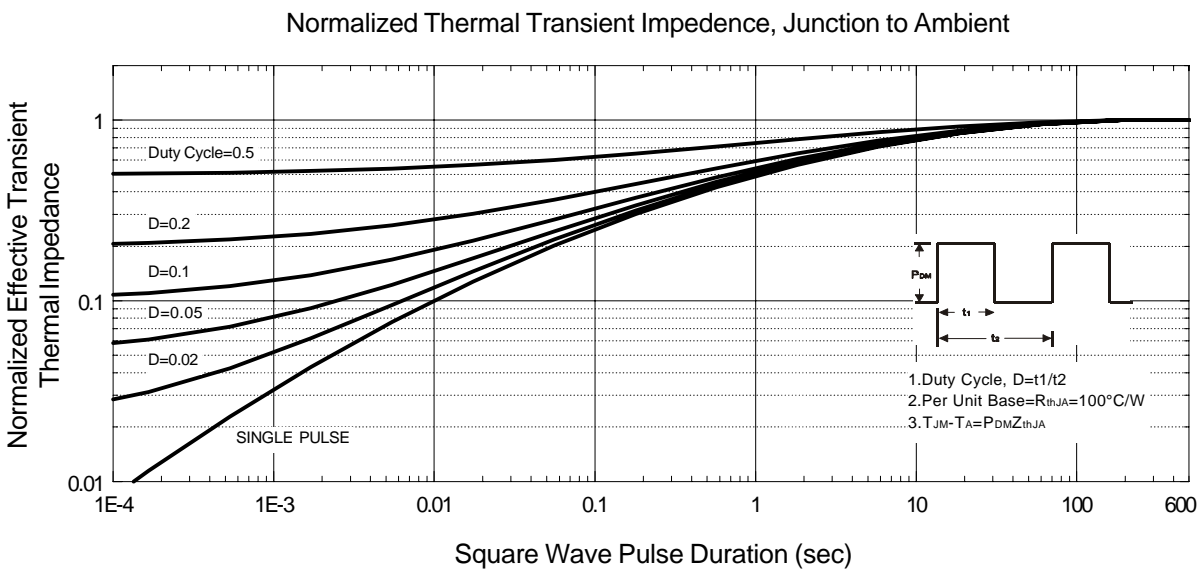
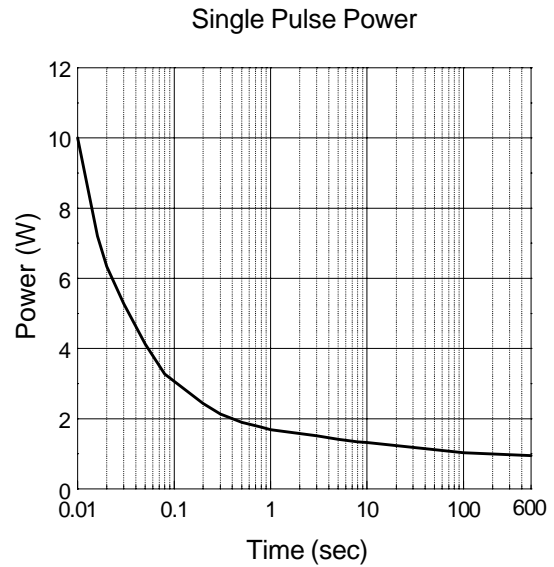
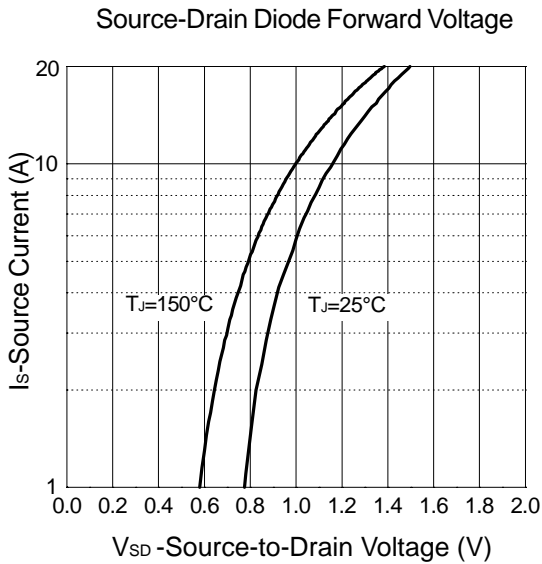
On-Resistance vs. Drain Current



Typical Characteristics (Cont.)

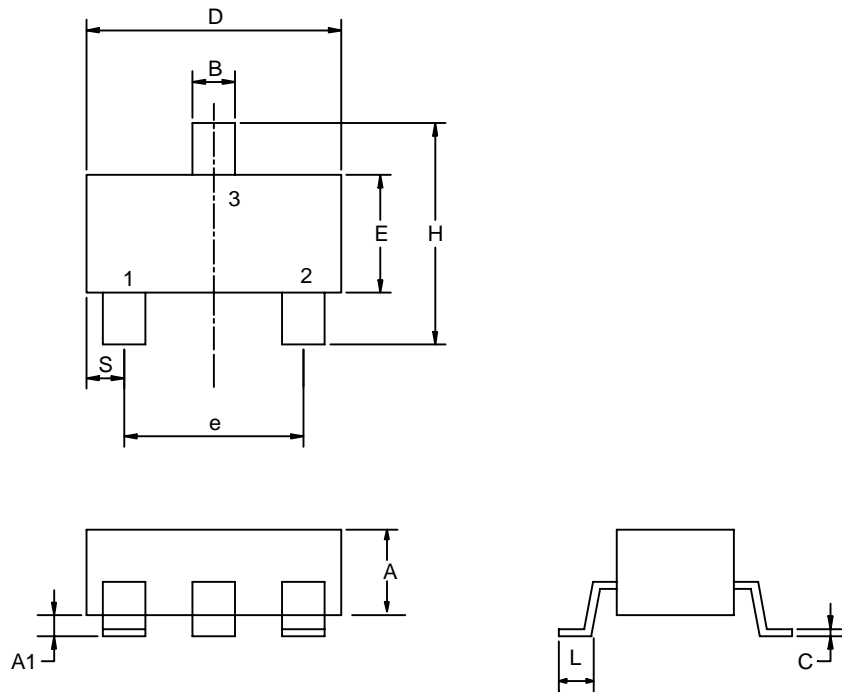


Typical Characteristics (Cont.)



## Packaging Information

SOT-23

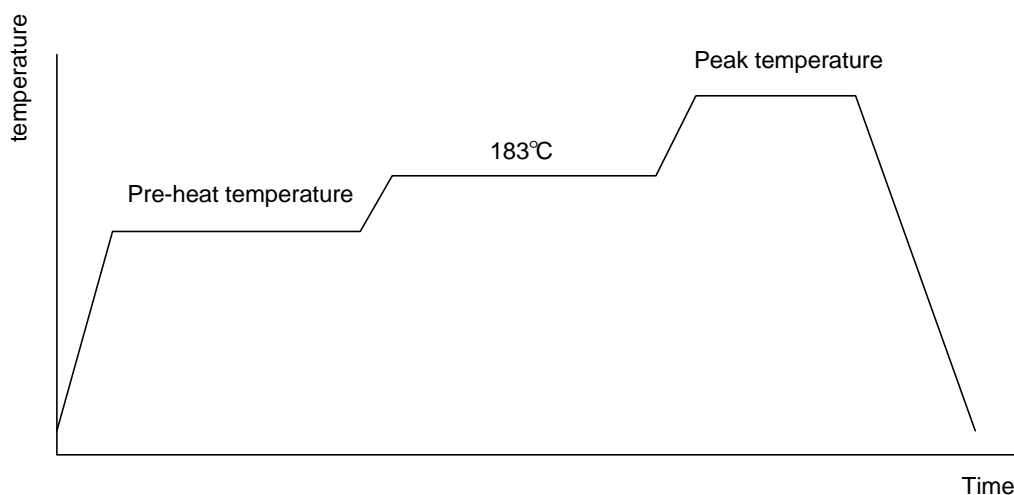


Dim	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	1.00	1.30	0.039	0.051
A1	0.00	0.10	0.000	0.004
B	0.35	0.51	0.014	0.020
C	0.10	0.25	0.004	0.010
D	2.70	3.10	0.106	0.122
E	1.40	1.80	0.055	0.071
e	1.90 BSC		0.075 BSC	
H	2.40	3.00	0.094	0.118
L	0.37		0.0015	

## Physical Specifications

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

## Reflow Condition (IR/Convection or VPR Reflow)



## Classification Reflow Profiles

	Convection or IR/ Convection	VPR
Average ramp-up rate(183°C to Peak)	3°C/second max.	10 °C /second max.
Preheat temperature 125 ± 25°C)	120 seconds max	
Temperature maintained above 183°C	60 – 150 seconds	
Time within 5°C of actual peak temperature	10 –20 seconds	60 seconds
Peak temperature range	220 +5/-0°C or 235 +5/-0°C	215-219°C or 235 +5/-0°C
Ramp-down rate	6 °C /second max.	10 °C /second max.
Time 25°C to peak temperature	6 minutes max.	

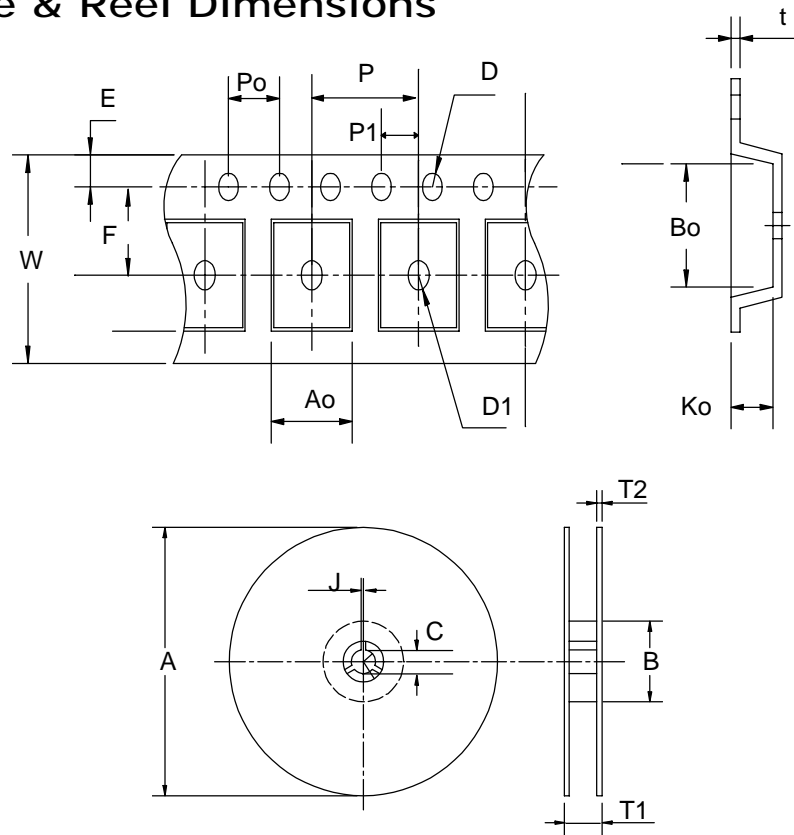
## Package Reflow Conditions

pkg. thickness ≥ 2.5mm and all bgas	pkg. thickness < 2.5mm and pkg. volume ≥ 350 mm <sup>3</sup>	pkg. thickness < 2.5mm and pkg. volume < 350mm <sup>3</sup>
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 235 +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



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 <sup>+0.3</sup> <sub>-0.3</sub>	4.0	1.75
	F	D	D1	Po	P1	Ao	Bo	Ko	t
	3.5 ± 0.05	1.5 +0.1	φ 0.1MIN	4.0	2.0 ± 0.05	3.1	3.0	1.3	0.2±0.03

(mm)



## Cover Tape Dimensions

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

## Customer Service

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