

Absolute Maximum Ratings ($T_A = 25^\circ\text{C}$ 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	$T_A=25^\circ\text{C}$	-3.9
		$T_A=70^\circ\text{C}$	-3.1
I_{DM}^*	300 μs Pulsed Drain Current	$T_A=25^\circ\text{C}$	-15.7
		$T_A=70^\circ\text{C}$	-12.6
I_{S}^*	Diode Continuous Forward Current	-1	A
T_{J}	Maximum Junction Temperature	150	
T_{STG}	Storage Temperature Range	-55 to 150	
P_{D}^*	Maximum Power Dissipation	$T_A=25^\circ\text{C}$	1.4
		$T_A=70^\circ\text{C}$	0.9
R_{JA}^*	Thermal Resistance-Junction to Ambient	$t \leq 10\text{s}$	90
		Steady state	125

Note: *Surface Mounted on 1in² pad area, $t \leq 10\text{sec}$.

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Static Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{\text{GS}}=0\text{V}$, $I_{\text{DS}}=-250\mu\text{A}$	-20	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{\text{DS}}=-16\text{V}$, $V_{\text{GS}}=0\text{V}$	-	-	-1	μA
		$T_{\text{J}}=85^\circ\text{C}$	-	-	-30	
$V_{\text{GS(th)}}$	Gate Threshold Voltage	$V_{\text{DS}}=V_{\text{GS}}$, $I_{\text{DS}}=-250\mu\text{A}$	-0.5	-0.7	-1	V
I_{GSS}	Gate Leakage Current	$V_{\text{GS}}=\pm 10\text{V}$, $V_{\text{DS}}=0\text{V}$	-	-	± 10	μA
$R_{\text{DS(ON)}}^a$	Drain-Source On-State Resistance	$V_{\text{GS}}=-4.5\text{V}$, $I_{\text{DS}}=-3.9\text{A}$	-	45	60	$\text{m}\Omega$
		$V_{\text{GS}}=-2.5\text{V}$, $I_{\text{DS}}=-2.5\text{A}$	-	62	90	
		$V_{\text{GS}}=-1.8\text{V}$, $I_{\text{DS}}=-1\text{A}$	-	95	150	
V_{SD}^a	Diode Forward Voltage	$I_{\text{SD}}=-1\text{A}$, $V_{\text{GS}}=0\text{V}$	-	-0.7	-1	V
Gate Charge Characteristics ^b						
Q_{g}	Total Gate Charge	$V_{\text{DS}}=-10\text{V}$, $V_{\text{GS}}=-4.5\text{V}$, $I_{\text{DS}}=-3.9\text{A}$	-	7	-	nC
Q_{gs}	Gate-Source Charge		-	0.6	-	
Q_{gd}	Gate-Drain Charge		-	2.5	-	

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

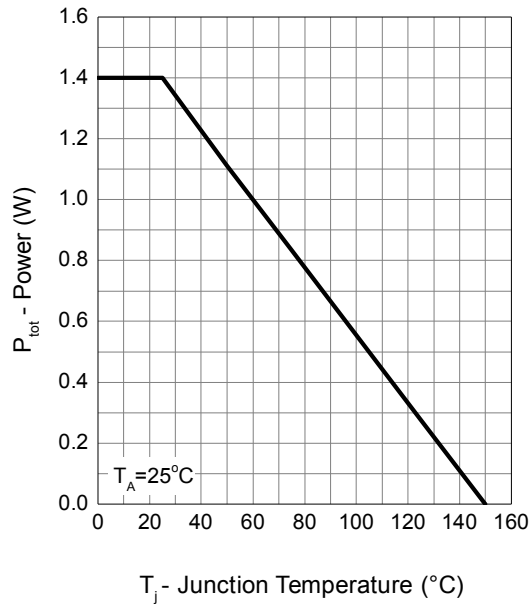
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Dynamic Characteristics^b						
R_G	Gate Resistance	$V_{GS}=0V, V_{DS}=0V, F=1\text{MHz}$	-	5.5	-	Ω
C_{iss}	Input Capacitance	$V_{GS}=0V,$ $V_{DS}=-10V,$ Frequency=1.0MHz	-	460	-	pF
C_{oss}	Output Capacitance		-	108	-	
C_{rss}	Reverse Transfer Capacitance		-	95	-	
$t_{d(ON)}$	Turn-on Delay Time	$V_{DD}=-10V, R_L=10\Omega,$ $I_{DS}=-1A, V_{GEN}=-4.5V,$ $R_G=6\Omega$	-	6.5	-	ns
t_r	Turn-on Rise Time		-	13.6	-	
$t_{d(OFF)}$	Turn-off Delay Time		-	27.4	-	
t_f	Turn-off Fall Time		-	17.8	-	
t_{rr}	Reverse Recovery Time	$I_{SD}=-3.9A, dI_{SD}/dt = 100A/\mu s$	-	26	-	nC
Q_{rr}	Reverse Recovery Charge		-	10	-	

Note a: Pulse test ; pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$.

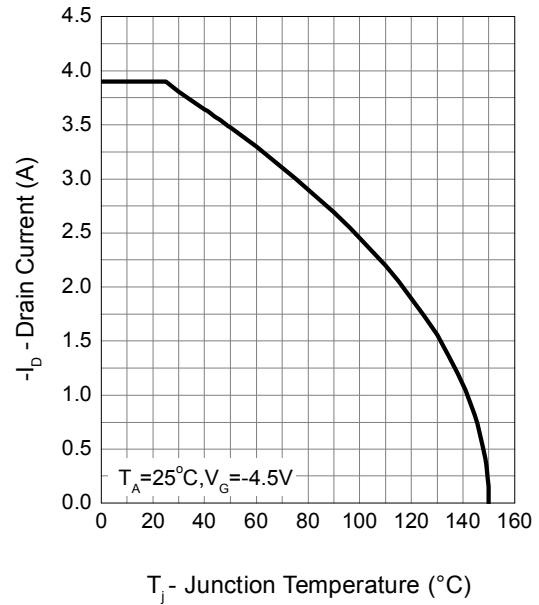
Note b: Guaranteed by design, not subject to production testing.

Typical Operating Characteristics

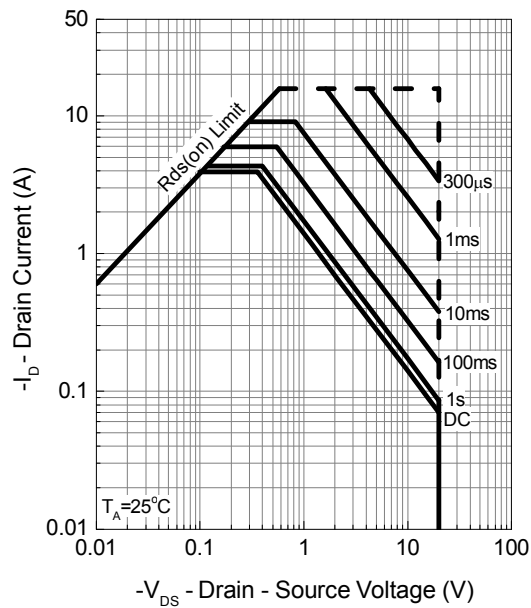
Power Dissipation



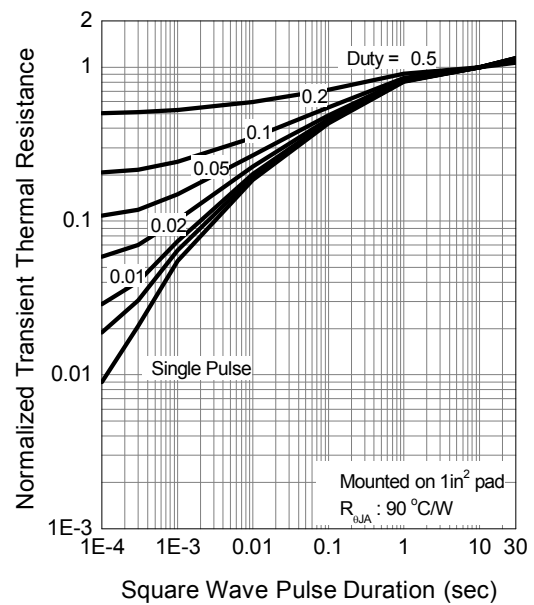
Drain Current



Safe Operation Area

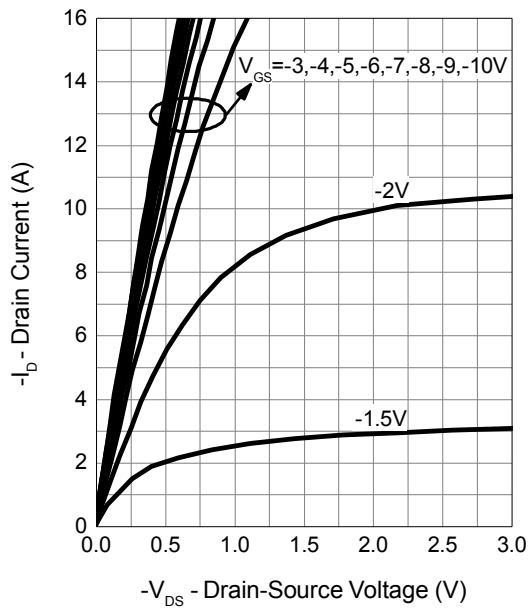


Thermal Transient Impedance

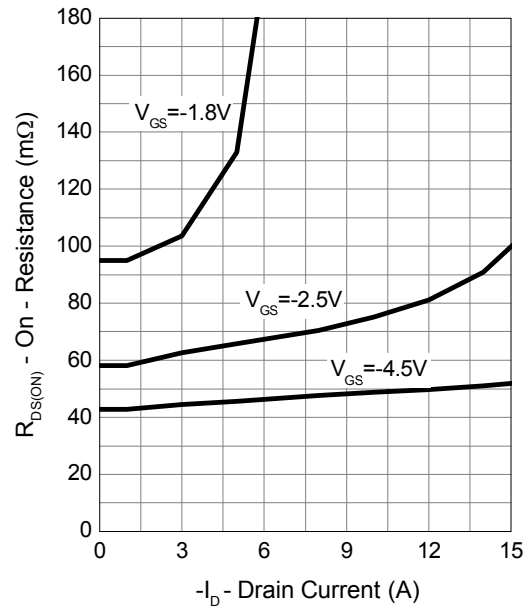


Typical Operating Characteristics (Cont.)

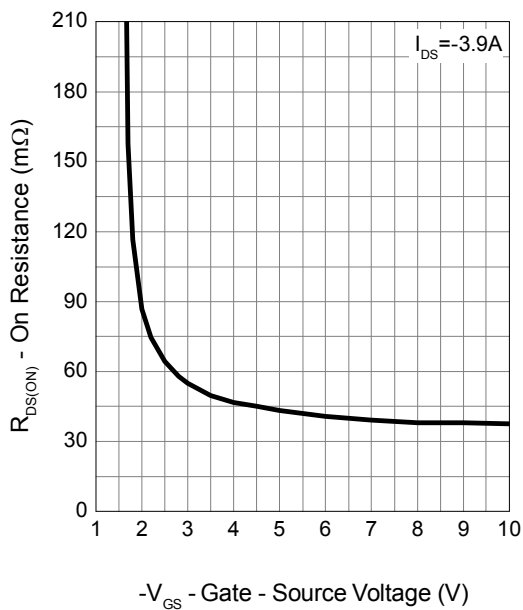
Output Characteristics



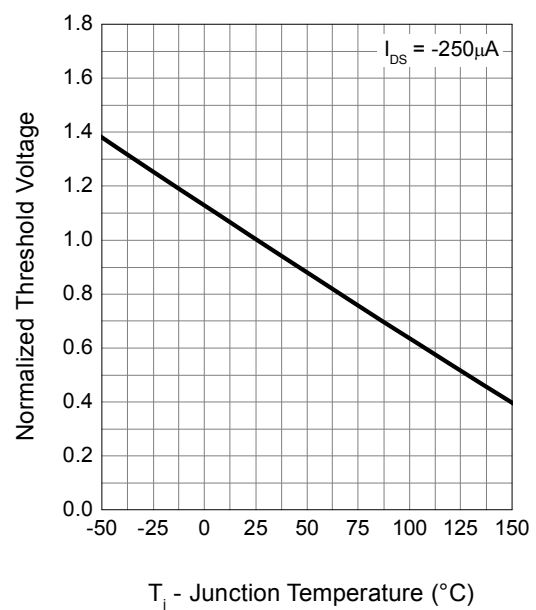
Drain-Source On Resistance



Gate-Source On Resistance

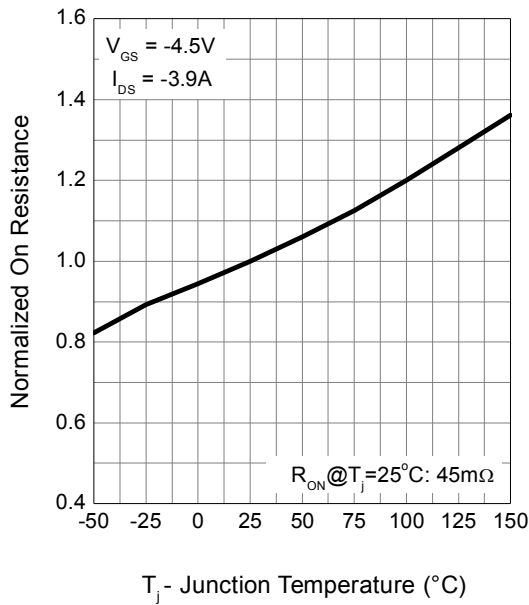


Gate Threshold Voltage

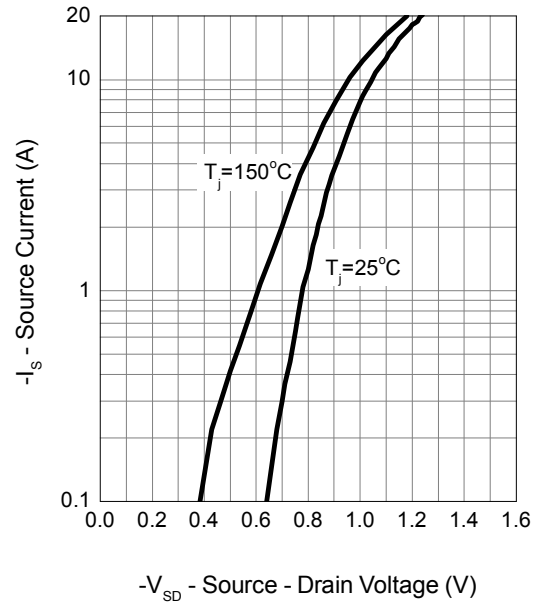


Typical Operating Characteristics (Cont.)

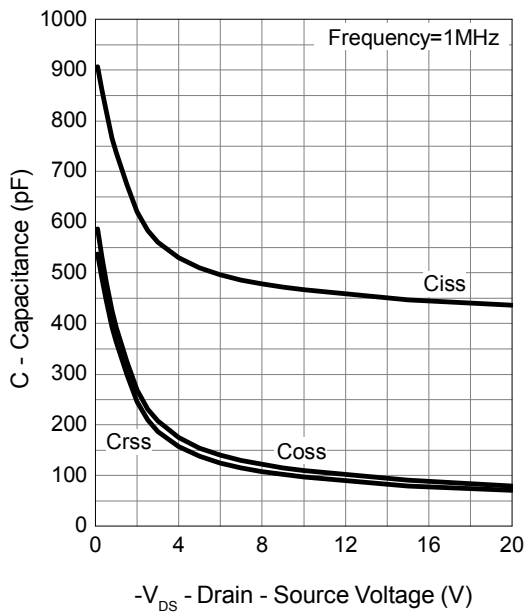
Drain-Source On Resistance



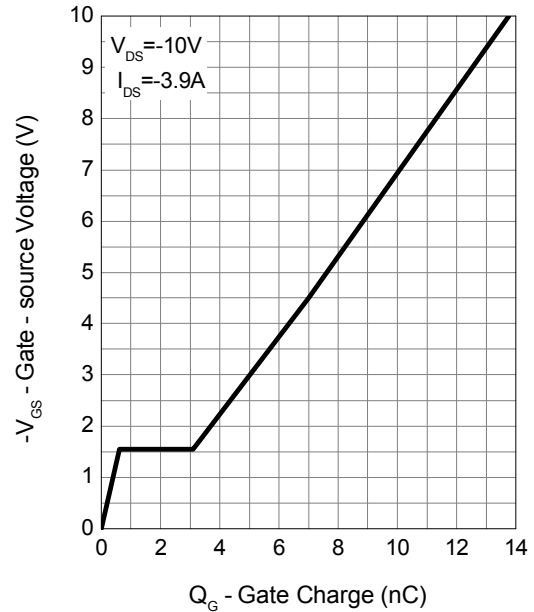
Source-Drain Diode Forward



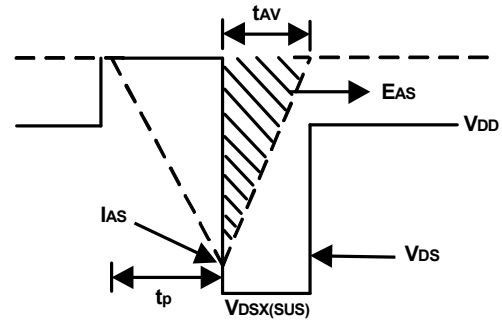
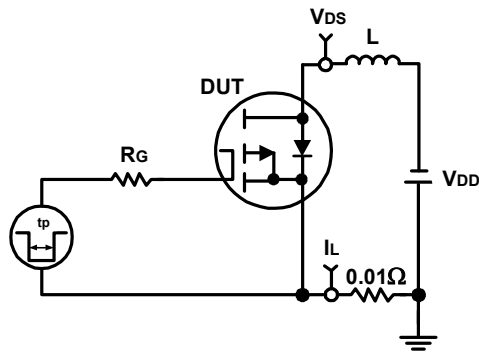
Capacitance



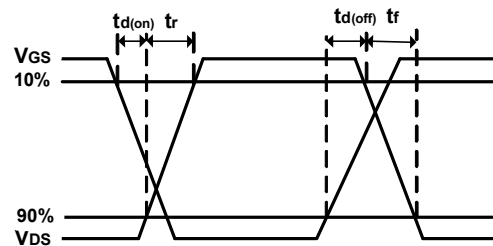
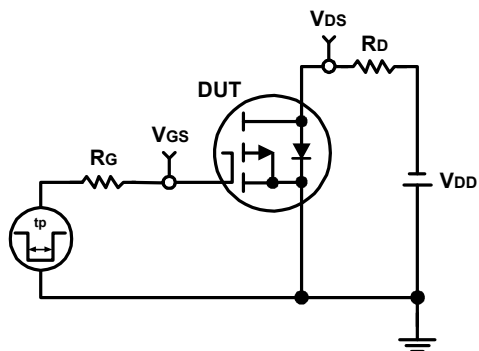
Gate Charge



Avalanche Test Circuit and Waveforms

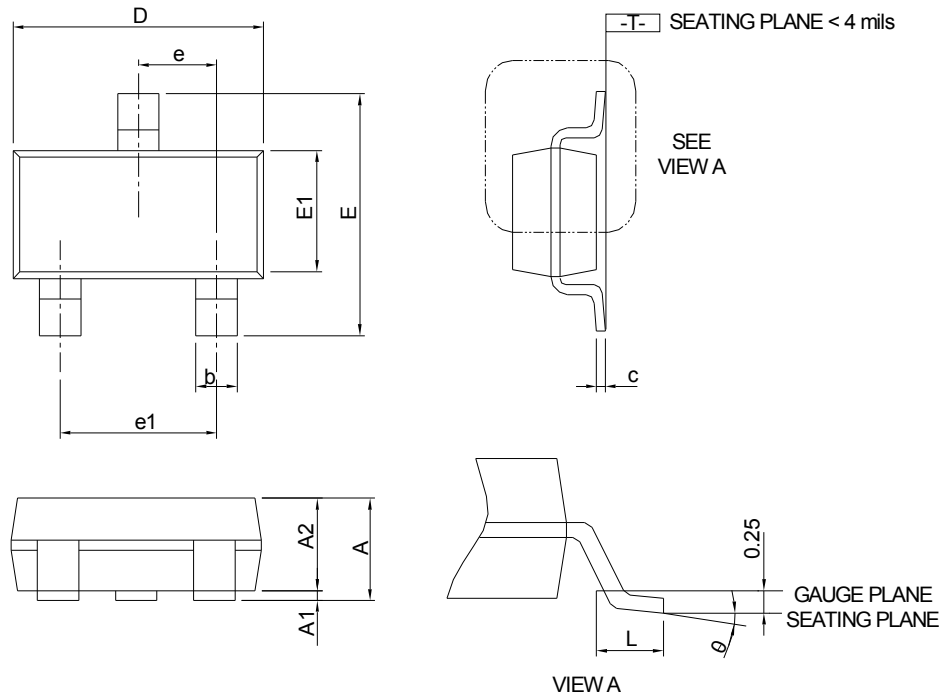


Switching Time Test Circuit and Waveforms



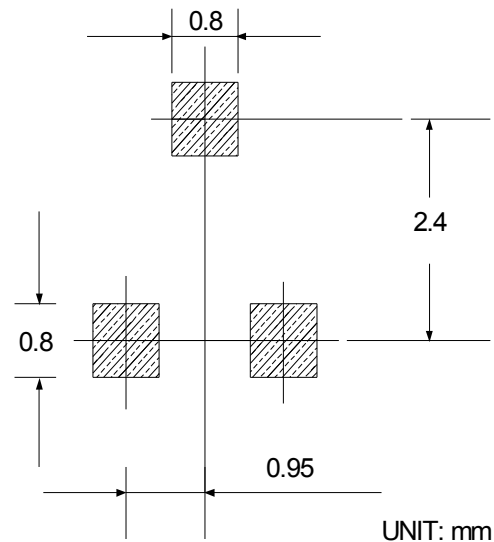
Package Information

SOT-23-3



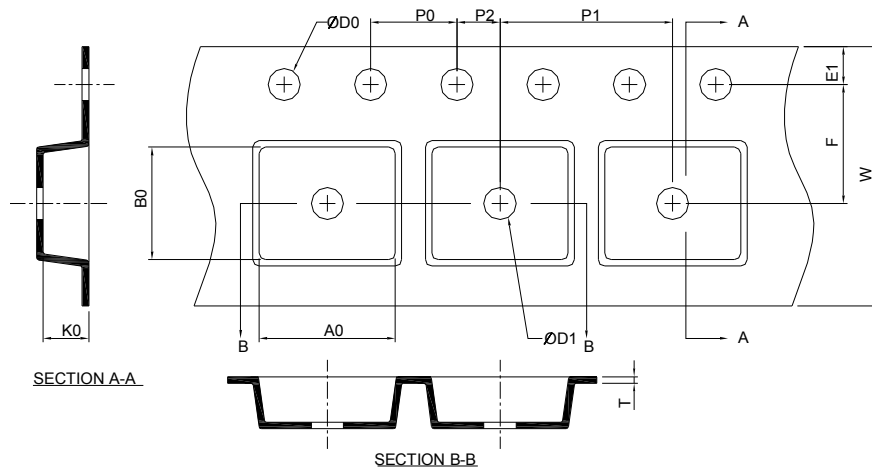
SYMBOL	SOT-23-3			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	-	1.20	-	0.047
A1	0.00	0.08	0.000	0.003
A2	0.90	1.12	0.035	0.044
b	0.30	0.50	0.012	0.020
c	0.08	0.22	0.003	0.009
D	2.70	3.10	0.106	0.122
E	2.60	3.00	0.102	0.118
E1	1.40	1.80	0.055	0.071
e	0.95 BSC		0.037 BSC	
e1	1.90 BSC		0.075 BSC	
L	0.30	0.60	0.012	0.024
θ	0°	8°	0°	8°

RECOMMENDED LAND PATTERN



Note : Dimension D and E1 do not include mold flash, protrusions or gate burrs. Mold flash, protrusion or gate burrs shall not exceed 10 mil per side.

Carrier Tape & Reel Dimensions

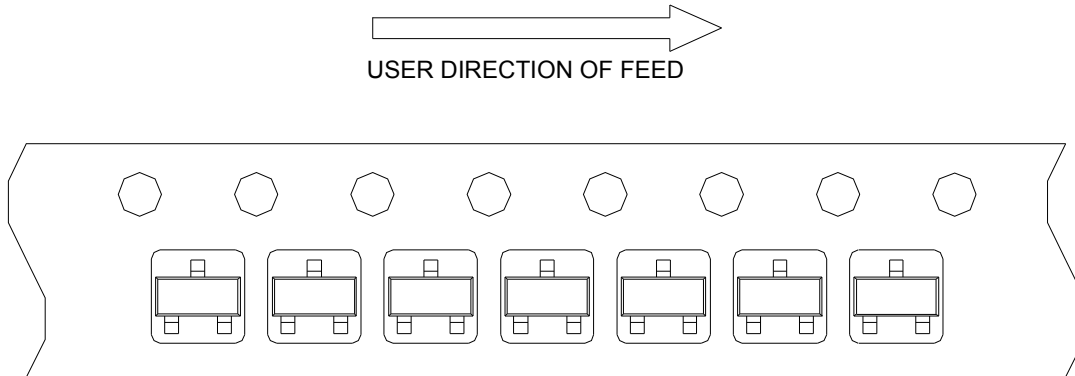


Application	A	H	T1	C	d	D	W	E1	F
SOT-23-3	178.0±2.00	50 MIN.	8.4+2.00 -0.00	13.0+0.50 -0.20	1.5 MIN.	20.2 MIN.	8.0±0.30	1.75±0.10	3.5±0.05
	P0	P1	P2	D0	D1	T	A0	B0	K0
	4.0±0.10	4.0±0.10	2.0±0.05	1.5+0.10 -0.00	1.0 MIN.	0.6+0.00 -0.40	3.20±0.20	3.10±0.20	1.50±0.20

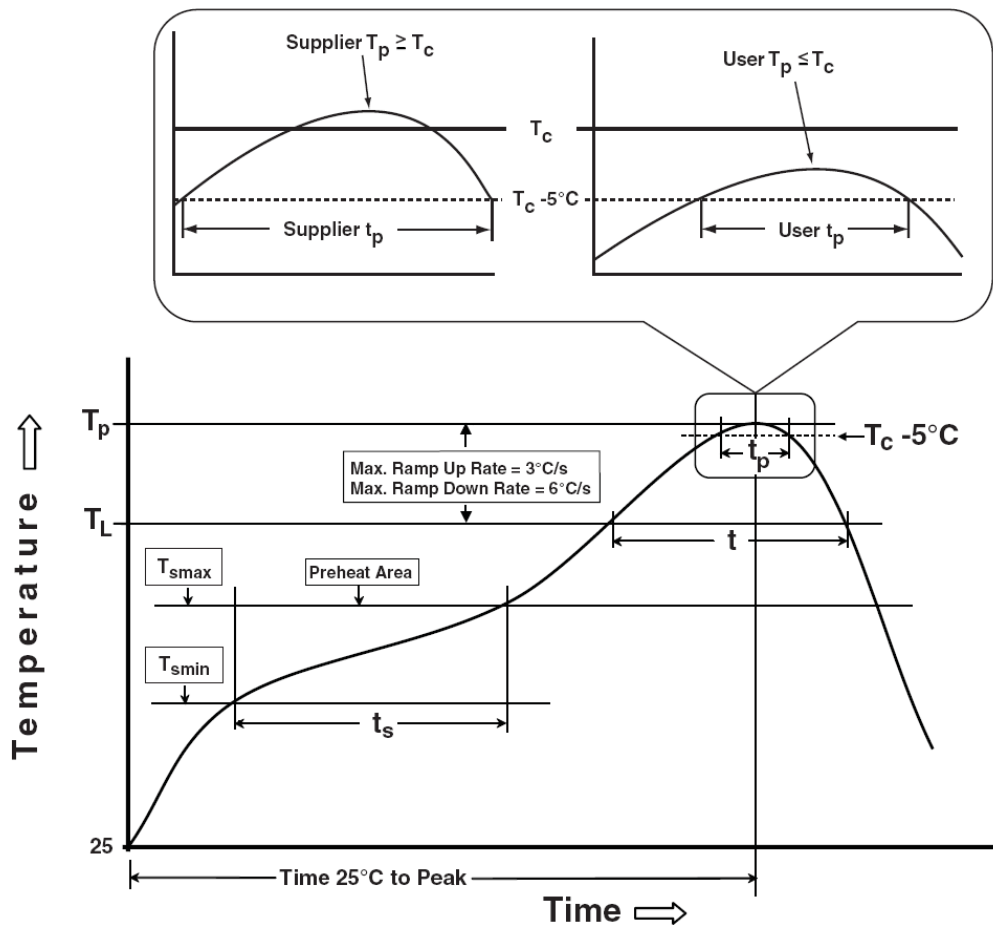
(mm)

Taping Direction Information

SOT-23-3



Classification Profile



Classification Reflow Profiles

Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Preheat & Soak Temperature min (T_{smin}) Temperature max (T_{smax}) Time (T_{smin} to T_{smax}) (t_s)	100 °C 150 °C 60-120 seconds	150 °C 200 °C 60-120 seconds
Average ramp-up rate (T_{smax} to T_p)	3 °C/second max.	3°C/second max.
Liquidous temperature (T_L) Time at liquidous (t_L)	183 °C 60-150 seconds	217 °C 60-150 seconds
Peak package body Temperature (T_p)*	See Classification Temp in table 1	See Classification Temp in table 2
Time (t_p)** within 5°C of the specified classification temperature (T_c)	20** seconds	30** seconds
Average ramp-down rate (T_p to T_{smax})	6 °C/second max.	6 °C/second max.
Time 25°C to peak temperature	6 minutes max.	8 minutes max.
* Tolerance for peak profile Temperature (T_p) is defined as a supplier minimum and a user maximum. ** Tolerance for time at peak profile temperature (t_p) is defined as a supplier minimum and a user maximum.		

Table 1. SnPb Eutectic Process – Classification Temperatures (T_c)

Package Thickness	Volume mm ³ <350	Volume mm ³ ≥350
<2.5 mm	235 °C	220 °C
≥2.5 mm	220 °C	220 °C

Table 2. Pb-free Process – Classification Temperatures (T_c)

Package Thickness	Volume mm ³ <350	Volume mm ³ 350-2000	Volume mm ³ >2000
<1.6 mm	260 °C	260 °C	260 °C
1.6 mm – 2.5 mm	260 °C	250 °C	245 °C
≥2.5 mm	250 °C	245 °C	245 °C

Reliability Test Program

Test item	Method	Description
SOLDERABILITY	JESD-22, B102	5 Sec, 245°C
HTRB	JESD-22, A108	1000 Hrs, 80% of VDS max @ T_{jmax}
HTGB	JESD-22, A108	1000 Hrs, 100% of VGS max @ T_{jmax}
PCT	JESD-22, A102	168 Hrs, 100%RH, 2atm, 121°C
TCT	JESD-22, A104	500 Cycles, -65°C~150°C

Customer Service

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