

Absolute Maximum Ratings ($T_A = 25^\circ\text{C}$ Unless Otherwise Noted)

Symbol	Parameter	Rating	Unit	
Common Ratings				
V_{DSS}	Drain-Source Voltage	-60	V	
V_{GSS}	Gate-Source Voltage	± 20		
T_J	Maximum Junction Temperature	150	$^\circ\text{C}$	
T_{STG}	Storage Temperature Range	-55 to 150	$^\circ\text{C}$	
I_S	Diode Continuous Forward Current	-13	A	
I_{AS}^a	Avalanche Current, Single pulse	L=0.5mH	A	
E_{AS}^a	Avalanche Energy, Single pulse	L=0.5mH	mJ	
I_{DP}^b	Pulse Drain Current Tested	$T_C=25^\circ\text{C}$	-80^c	
I_D	Continuous Drain Current	$T_C=25^\circ\text{C}$	-26	A
		$T_C=100^\circ\text{C}$	-16	
P_D	Maximum Power Dissipation	$T_C=25^\circ\text{C}$	54	W
		$T_C=100^\circ\text{C}$	21	
$R_{\theta JC}$	Thermal Resistance-Junction to Case	2.3	$^\circ\text{C/W}$	
I_D	Continuous Drain Current	$T_A=25^\circ\text{C}$	-5.3	A
		$T_A=70^\circ\text{C}$	-4.2	
P_D	Maximum Power Dissipation	$T_A=25^\circ\text{C}$	2.2	W
		$T_A=70^\circ\text{C}$	1.4	
$R_{\theta JA}^d$	Thermal Resistance-Junction to Ambient	Steady State	55	$^\circ\text{C/W}$

Note a : UIS tested and pulse width limited by maximum junction temperature 150°C (initial temperature $T_J=25^\circ\text{C}$).

Note b : Pulse width limited by max. junction temperature.

Note c : Wire limited.

Note d : $R_{\theta JA}$ steady state $t=999s$. $R_{\theta JA}$ is measured with the device mounted on 1in^2 , FR-4 board with 2oz. Copper.

Electrical Characteristics ($T_A = 25^\circ\text{C}$ Unless Otherwise Noted)

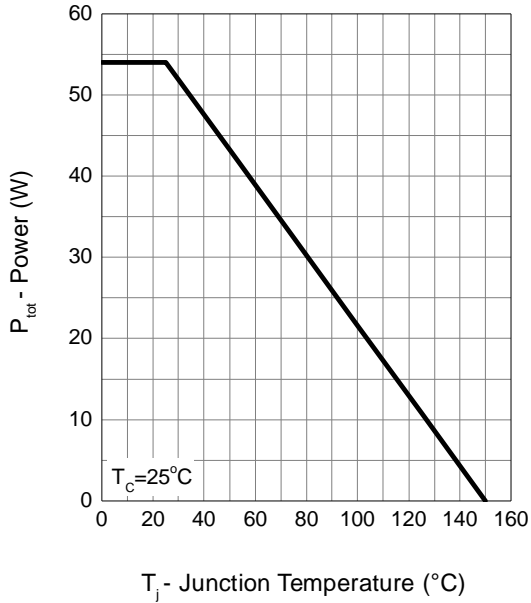
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Static Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_{DS}=-250\mu A$	-60	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=-48V, V_{GS}=0V$	-	-	1	μA
		$T_J=85^\circ C$	-	-	-30	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_{DS}=-250\mu A$	-1.3	-1.8	-2.3	V
I_{GSS}	Gate Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	± 100	nA
$R_{DS(ON)}^e$	Drain-Source On-state Resistance	$V_{GS}=-10V, I_{DS}=-20A$	-	32	40	$m\Omega$
		$V_{GS}=-4.5V, I_{DS}=-20A$	-	40	54	$m\Omega$
Diode Characteristics						
V_{SD}^e	Diode Forward Voltage	$I_{SD}=-1A, V_{GS}=0V$	-	-0.7	-1	V
t_{rr}	Reverse Recovery Time	$I_{SD}=-20A, di_{SD}/dt=100A/\mu s$	-	23	-	ns
Q_{rr}	Reverse Recovery Charge		-	22	-	nC
Dynamic Characteristics^f						
R_G	Gate Resistance	$V_{GS}=0V, V_{DS}=0V, f=1MHz$	-	8	16	Ω
C_{iss}	Input Capacitance	$V_{GS}=0V, V_{DS}=-30V, \text{Frequency}=1.0MHz$	-	1416	1840	μF
C_{oss}	Output Capacitance		-	142	-	
C_{rss}	Reverse Transfer Capacitance		-	85	-	
$t_{d(ON)}$	Turn-on Delay Time	$V_{DD}=-30V, R_L=30\Omega, I_{DS}=-1A, V_{GEN}=-10V, R_G=6\Omega$	-	10	18	ns
t_r	Turn-on Rise Time		-	9	16	
$t_{d(OFF)}$	Turn-off Delay Time		-	88	158	
t_f	Turn-off Fall Time		-	42	76	
Gate Charge Characteristics^f						
Q_g	Total Gate Charge	$V_{DS}=-30V, V_{GS}=-10V, I_{DS}=-20A$	-	32	45	nC
Q_{gs}	Gate-Source Charge		-	3.6	-	
Q_{gd}	Gate-Drain Charge		-	8.3	-	

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

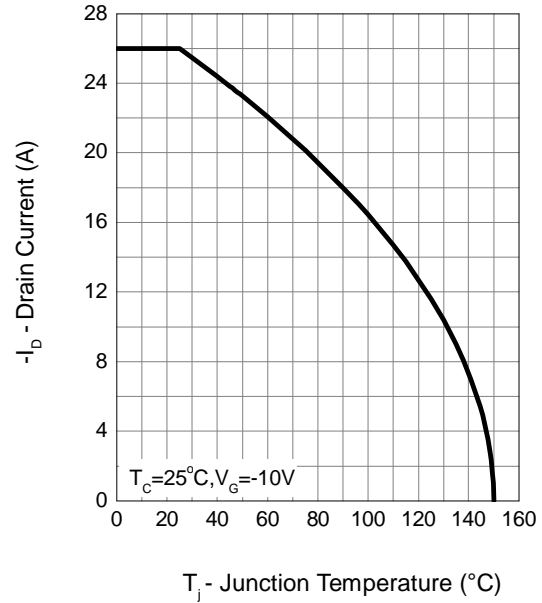
Note f : Guaranteed by design, not subject to production testing.

Typical Operating Characteristics

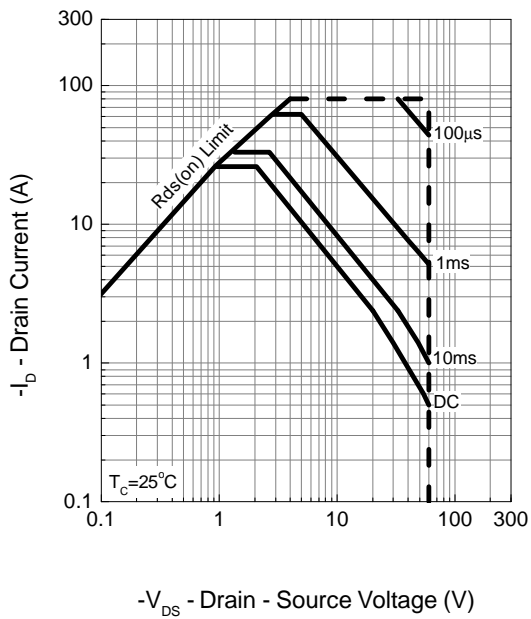
Power Dissipation



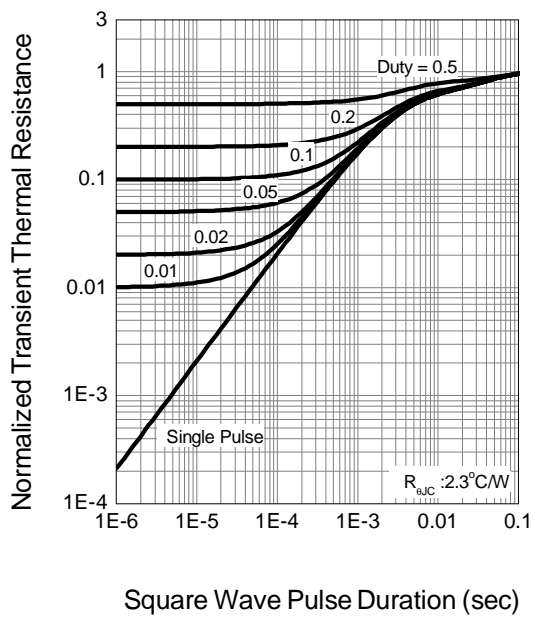
Drain Current



Safe Operation Area

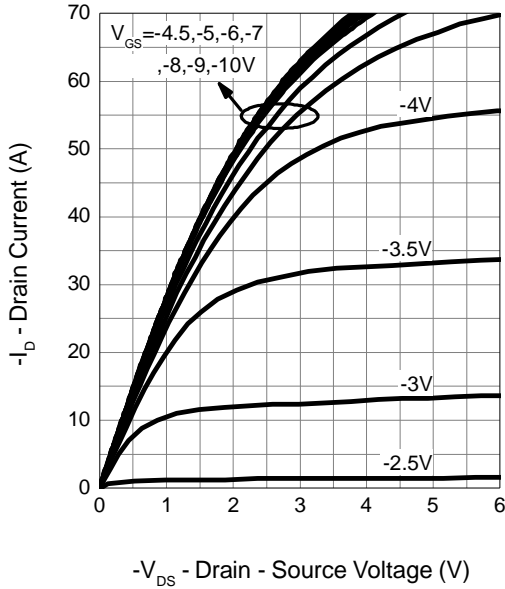


Thermal Transient Impedance

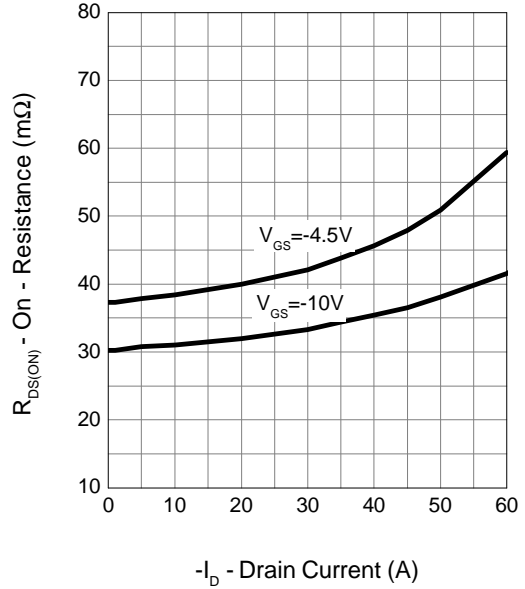


Typical Operating Characteristics (Cont.)

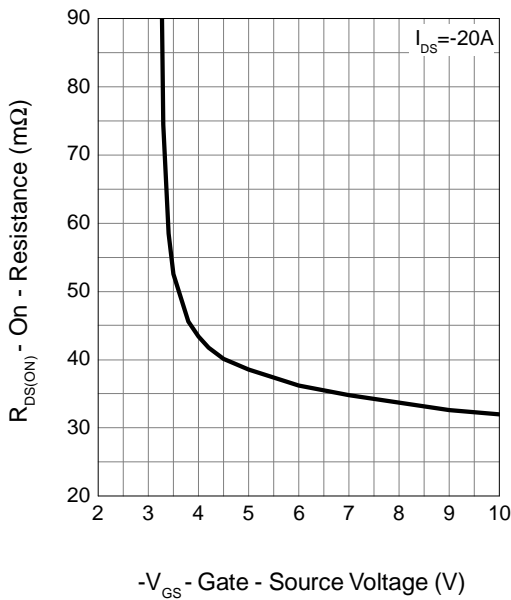
Output Characteristics



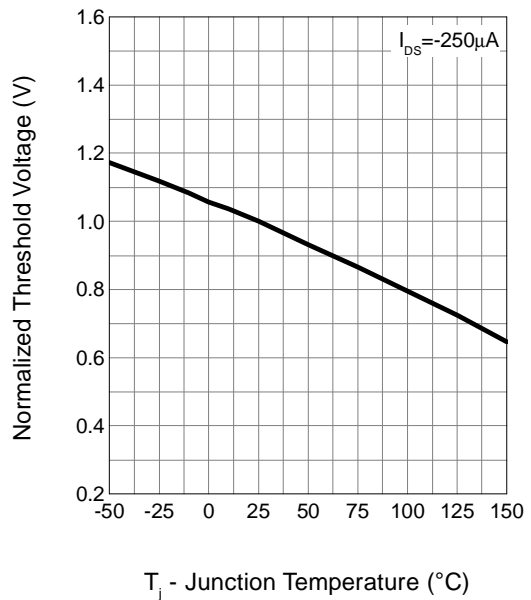
Drain-Source On Resistance



Gate-Source On Resistance

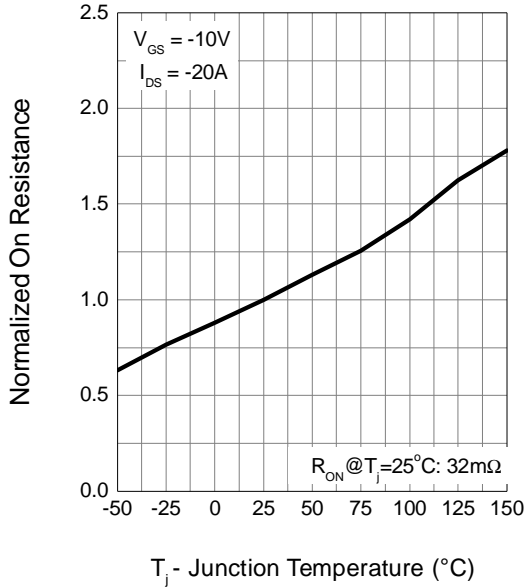


Gate Threshold Voltage

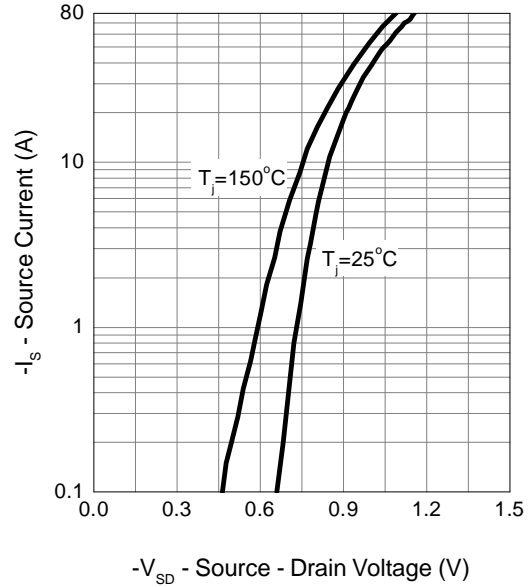


Typical Operating Characteristics (Cont.)

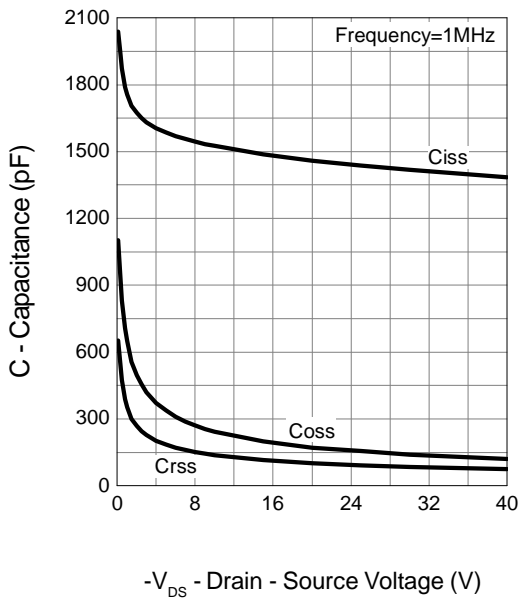
Drain-Source On Resistance



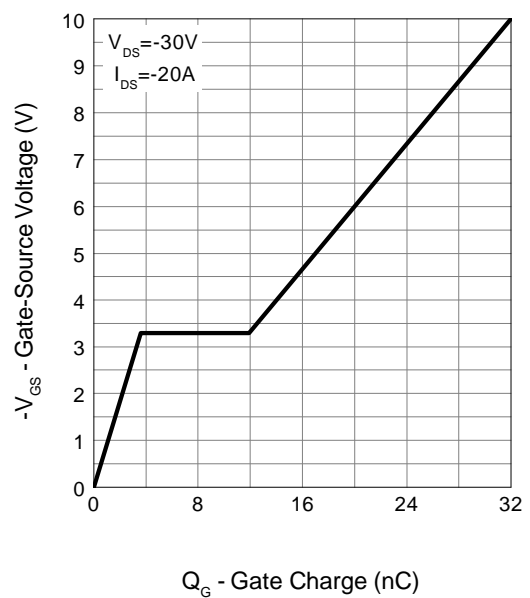
Source-Drain Diode Forward



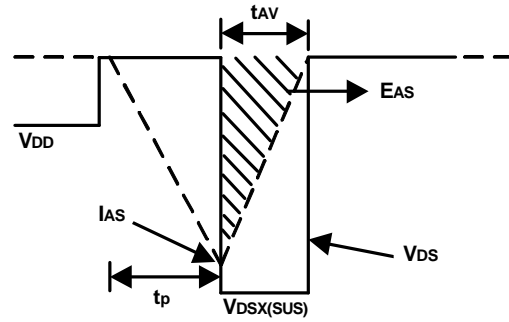
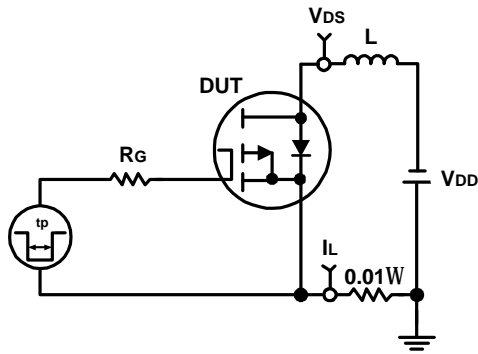
Capacitance



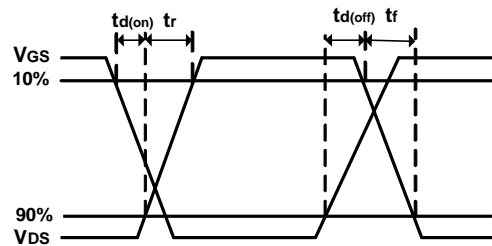
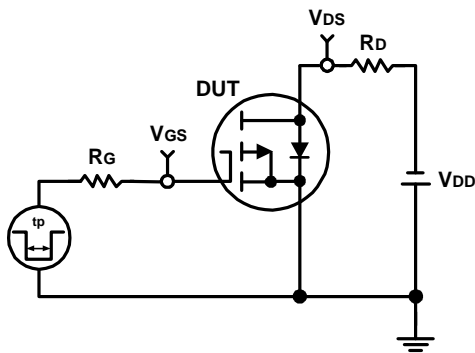
Gate Charge



Avalanche Test Circuit and Waveforms

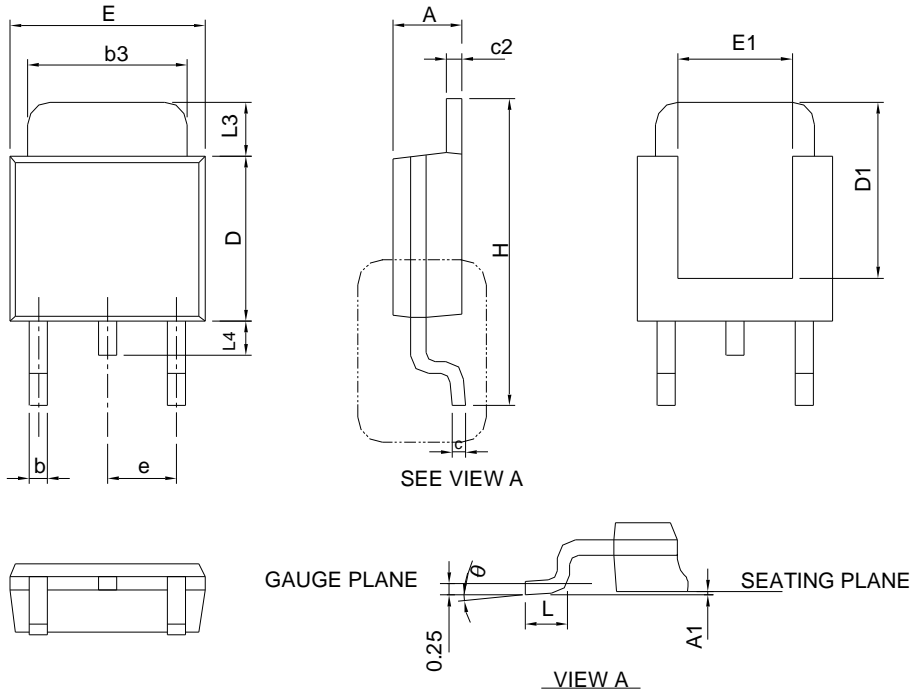


Switching Time Test Circuit and Waveforms



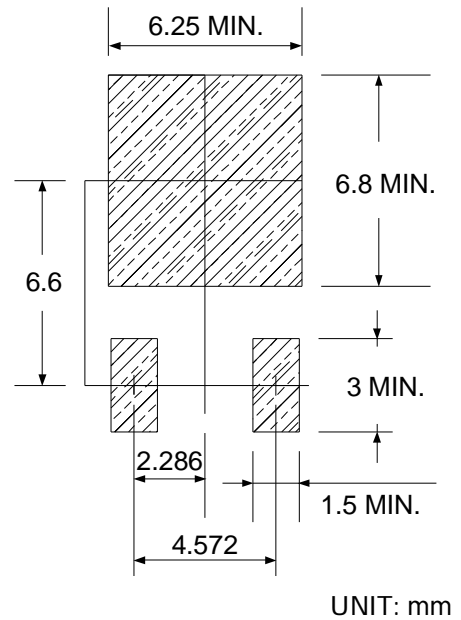
Package Information

TO-252-3



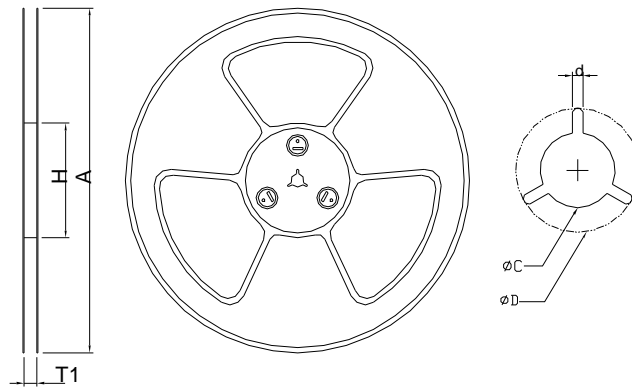
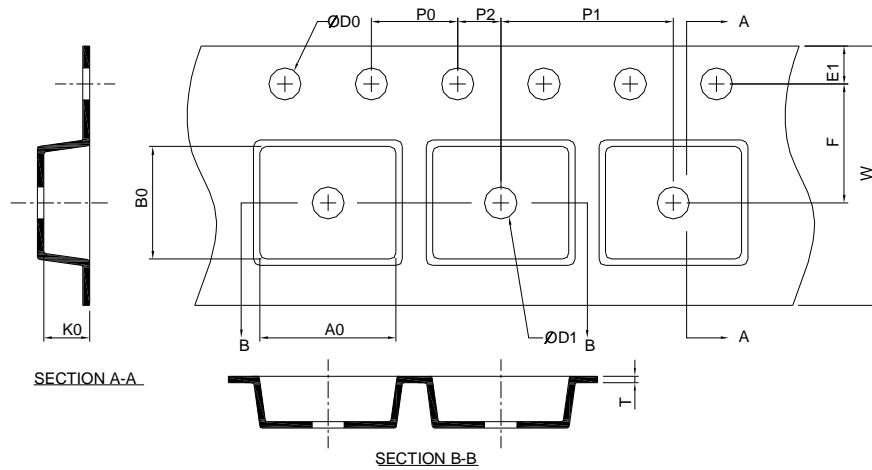
SYMBOL	TO-252-3			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	2.18	2.39	0.086	0.094
A1	-	0.13	-	0.005
b	0.50	0.89	0.020	0.035
b3	4.95	5.46	0.195	0.215
c	0.46	0.61	0.018	0.024
c2	0.46	0.89	0.018	0.035
D	5.33	6.22	0.210	0.245
D1	4.57	6.00	0.180	0.236
E	6.35	6.73	0.250	0.265
E1	3.81	6.00	0.150	0.236
e	2.29 BSC		0.090 BSC	
H	9.40	10.41	0.370	0.410
L	0.90	1.78	0.035	0.070
L3	0.89	2.03	0.035	0.080
L4	-	1.02	-	0.040
θ	0°	8°	0°	8°

RECOMMENDED LAND PATTERN



Note : Follow JEDEC TO-252 .

Carrier Tape & Reel Dimensions

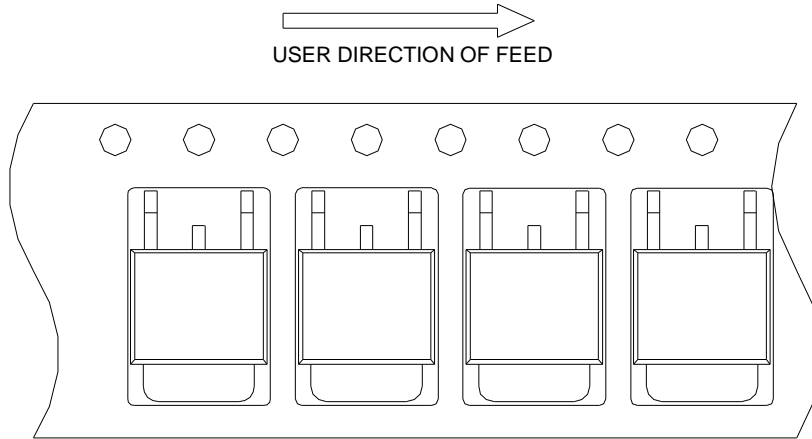


Application	A	H	T1	C	d	D	W	E1	F
TO-252-3	330.0±2.00	50 MIN.	16.4+2.00 -0.00	13.0+0.50 -0.20	1.5 MIN.	20.2 MIN.	16.0±0.30	1.75±0.10	7.50±0.05
	P0	P1	P2	D0	D1	T	A0	B0	K0
	4.0±0.10	8.0±0.10	2.0±0.05	1.5+0.10 -0.00	1.5 MIN.	0.6+0.00 -0.40	6.80±0.20	10.40±0.20	2.50±0.20

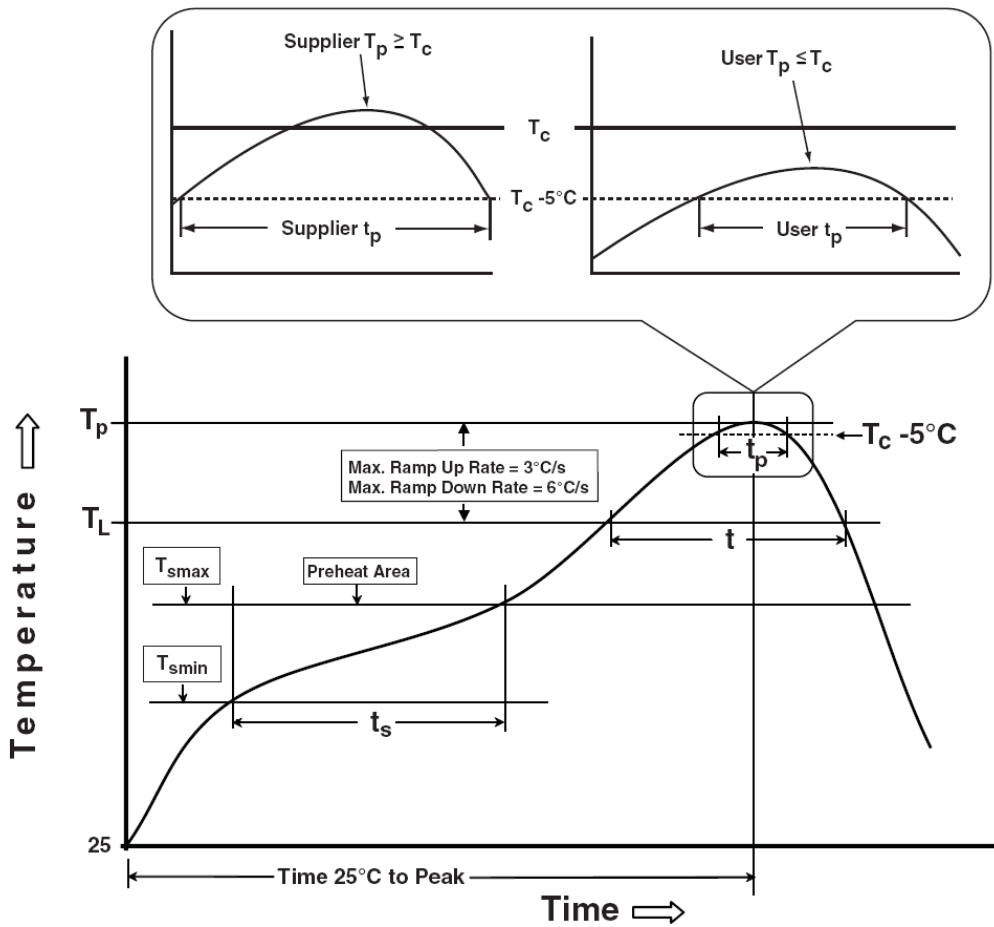
(mm)

Taping Direction Information

TO-252-3



Classification Profile



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Classification Reflow Profiles

Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Preheat & Soak		
Temperature min (T_{smin})	100 °C	150 °C
Temperature max (T_{smax})	150 °C	200 °C
Time (T_{smin} to T_{smax}) (t_s)	60-120 seconds	60-120 seconds
Average ramp-up rate (T_{smax} to T_p)	3 °C/second max.	3°C/second max.
Liquidous temperature (T_L)	183 °C	217 °C
Time at liquidous (t_L)	60-150 seconds	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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