

Absolute Maximum Ratings

Symbol	Parameter	Rating	Unit
Common Ratings ($T_A=25^{\circ}\text{C}$ Unless Otherwise Noted)			
V_{DSS}	Drain-Source Voltage	30	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	30	A
I_{DP}	300 μs Pulse Drain Current Tested	$T_C=25^{\circ}\text{C}$	
		$T_C=100^{\circ}\text{C}$	
I_D	Continuous Drain Current	$T_C=25^{\circ}\text{C}$	
		$T_C=100^{\circ}\text{C}$	
P_D	Maximum Power Dissipation	$T_C=25^{\circ}\text{C}$	
		$T_C=100^{\circ}\text{C}$	
$R_{\theta\text{JC}}$	Thermal Resistance-Junction to Case	Steady State	2.5
$R_{\theta\text{JA}}$	Thermal Resistance-Junction to Ambient	$t \leq 10\text{s}$	15
		Steady State	50
I_{AS}^{a}	Avalanche Current, Single pulse ($L=0.5\text{mH}$)	20	A
E_{AS}^{a}	Avalanche Energy, Single pulse ($L=0.5\text{mH}$)	100	mJ

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

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	$V_{\text{GS}}=0\text{V}, I_{\text{DS}}=250\mu\text{A}$	30	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{\text{DS}}=24\text{V}, V_{\text{GS}}=0\text{V}$	-	-	1	μA
		$T_J=85^{\circ}\text{C}$	-	-	30	
$V_{\text{GS(th)}}$	Gate Threshold Voltage	$V_{\text{DS}}=V_{\text{GS}}, I_{\text{DS}}=250\mu\text{A}$	1.5	1.8	2.5	V
I_{GSS}	Gate Leakage Current	$V_{\text{GS}}=\pm 20\text{V}, V_{\text{DS}}=0\text{V}$	-	-	± 10	μA
$R_{\text{DS(on)}}^{\text{b}}$	Drain-Source On-state Resistance	$V_{\text{GS}}=10\text{V}, I_{\text{DS}}=30\text{A}$	-	4.1	5	m Ω
		$T_J=125^{\circ}\text{C}$	-	6.3	-	
		$V_{\text{GS}}=4.5\text{V}, I_{\text{DS}}=20\text{A}$	-	5.3	6.9	
Gfs	Forward Transconductance	$V_{\text{DS}}=5\text{V}, I_{\text{DS}}=20\text{A}$	-	40	-	S

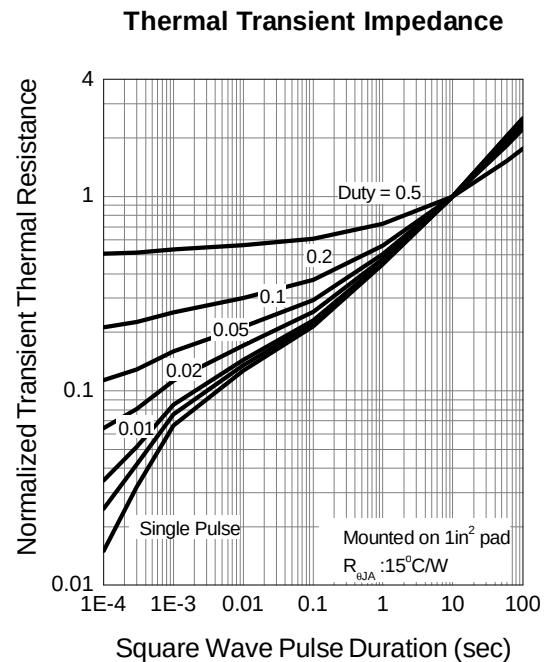
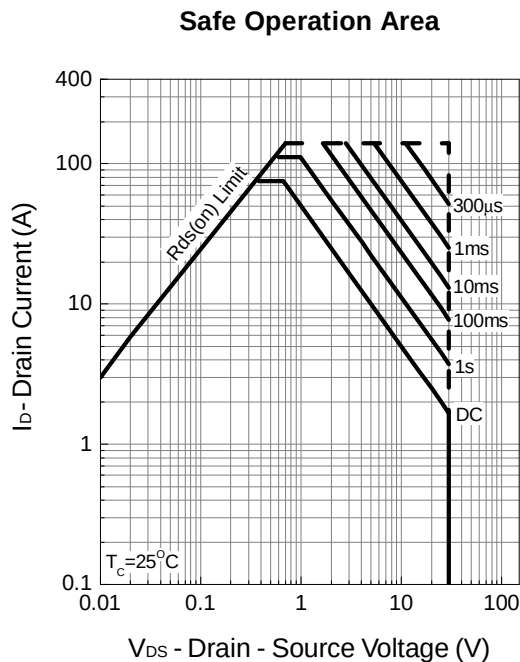
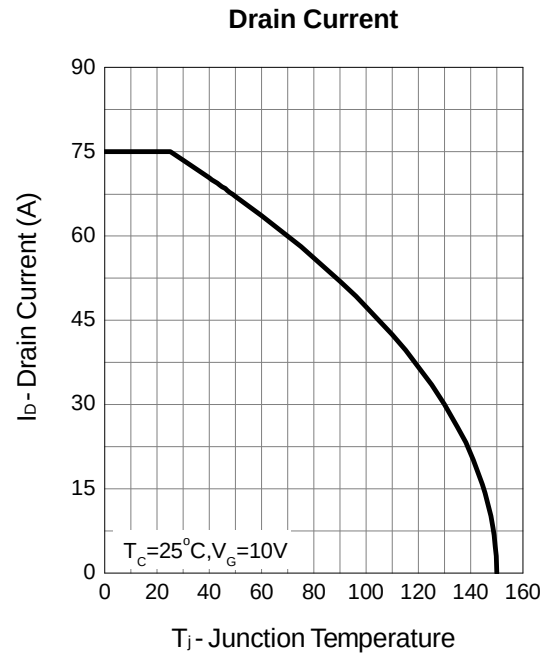
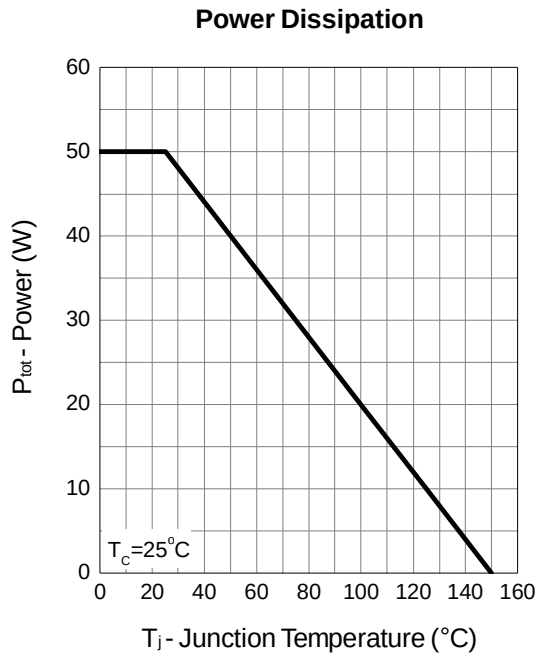
Electrical Characteristics (Cont.) ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Diode Characteristics						
V_{SD}^b	Diode Forward Voltage	$I_{SD}=20A, V_{GS}=0V$	-	0.8	1.1	V
t_{rr}	Reverse Recovery Time	$I_F=20A, dI_{SD}/dt=100A/\mu s$	-	14	-	ns
t_a	Charge Time		-	7.5	-	
t_b	Discharge Time		-	6.5	-	
Q_{rr}	Reverse Recovery Charge		-	6	-	nC
Dynamic Characteristics ^c						
R_G	Gate Resistance	$V_{GS}=0V, V_{DS}=0V, F=1MHz$	2.1	2.6	3.1	Ω
C_{iss}	Input Capacitance	$V_{GS}=0V,$ $V_{DS}=15V,$ Frequency=1.0MHz	1344	1680	2016	pF
C_{oss}	Output Capacitance		175	250	325	
C_{rss}	Reverse Transfer Capacitance		96	160	224	
$t_{d(ON)}$	Turn-on Delay Time	$V_{DD}=15V, R_L=15\Omega,$ $I_{DS}=1A, V_{GEN}=10V,$ $R_G=6\Omega$	-	14	21	ns
t_r	Turn-on Rise Time		-	11	16	
$t_{d(OFF)}$	Turn-off Delay Time		-	51	75	
t_f	Turn-off Fall Time		-	17	25	
Gate Charge Characteristics ^c						
Q_g	Total Gate Charge	$V_{DS}=15V, V_{GS}=4.5V,$ $I_{DS}=30A$	-	14	20	nC
Q_g	Total Gate Charge	$V_{DS}=15V, V_{GS}=10V,$ $I_{DS}=30A$	-	31	43	
Q_{gth}	Threshold Gate Charge		-	1.4	2	
Q_{gs}	Gate-Source Charge		-	2.8	3.9	
Q_{gd}	Gate-Drain Charge		-	8	11.2	

Note b : Pulse test ; pulse width $\leq 300\mu\text{s}$, duty cycle $\leq 2\%$.

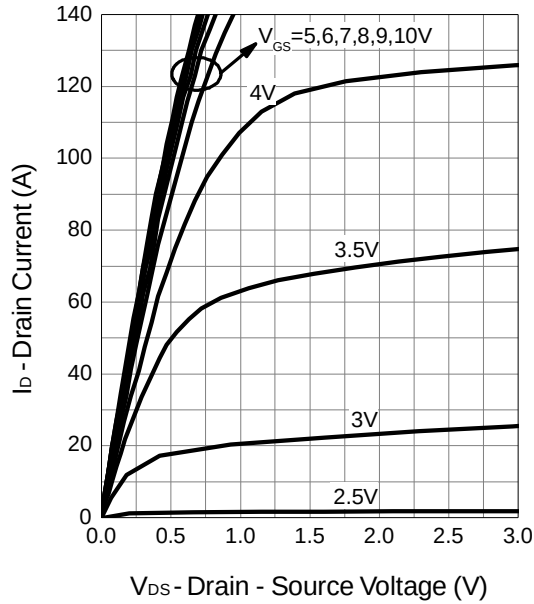
Note c : Guaranteed by design, not subject to production testing.

Typical Operating Characteristics

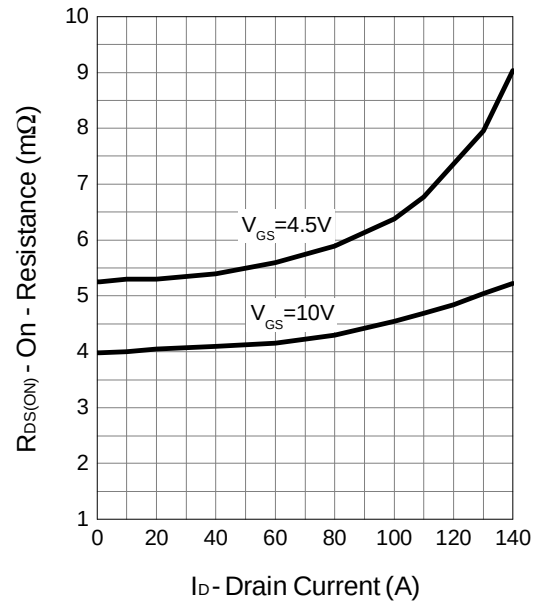


Typical Operating Characteristics (Cont.)

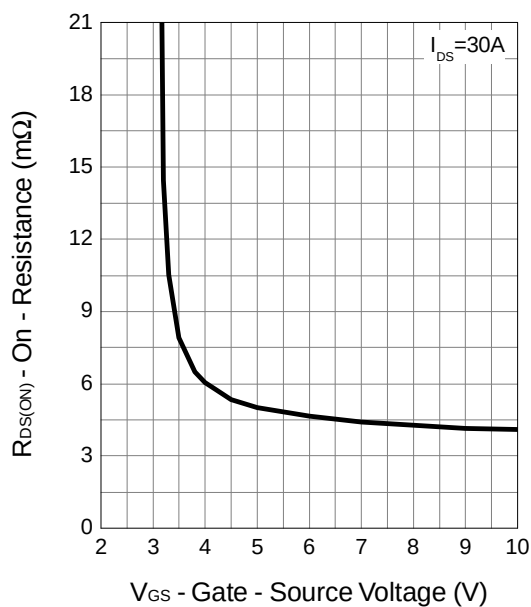
Output Characteristics



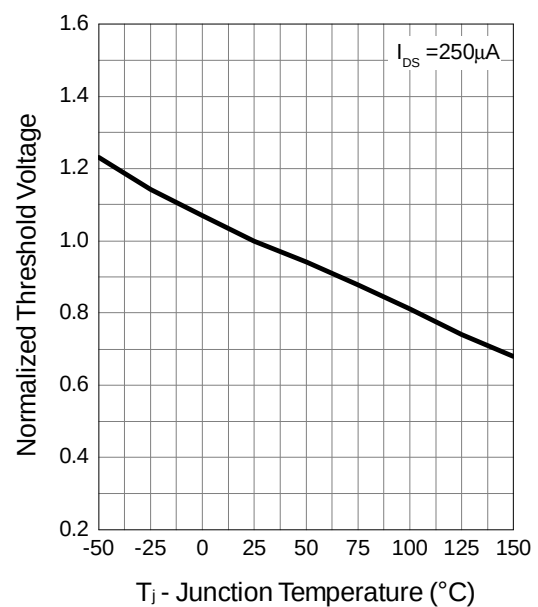
Drain-Source On Resistance



Gate-Source On Resistance

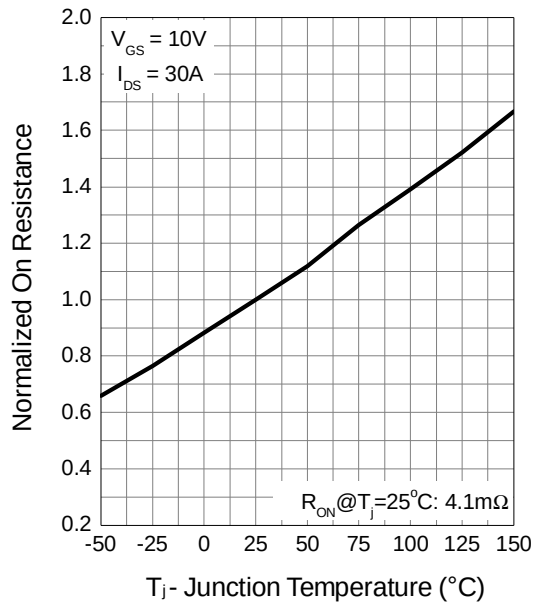


Gate Threshold Voltage

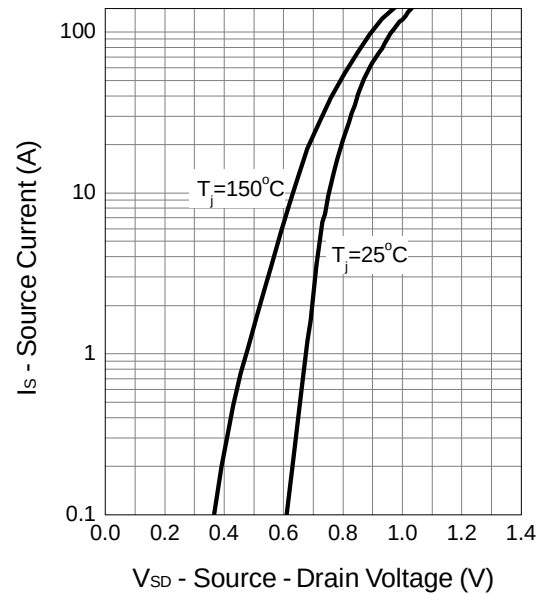


Typical Operating Characteristics (Cont.)

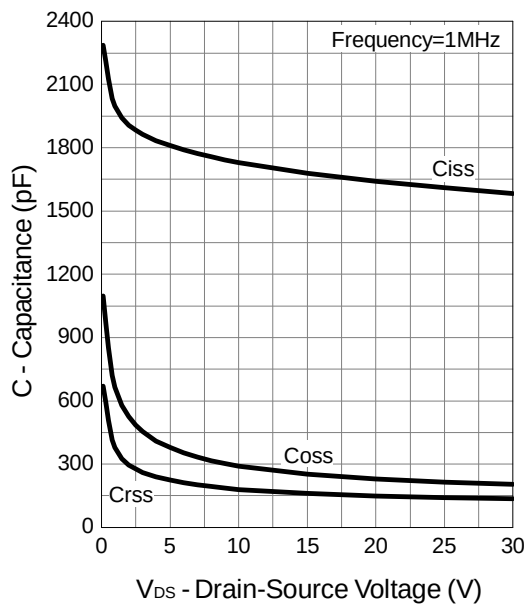
Drain-Source On Resistance



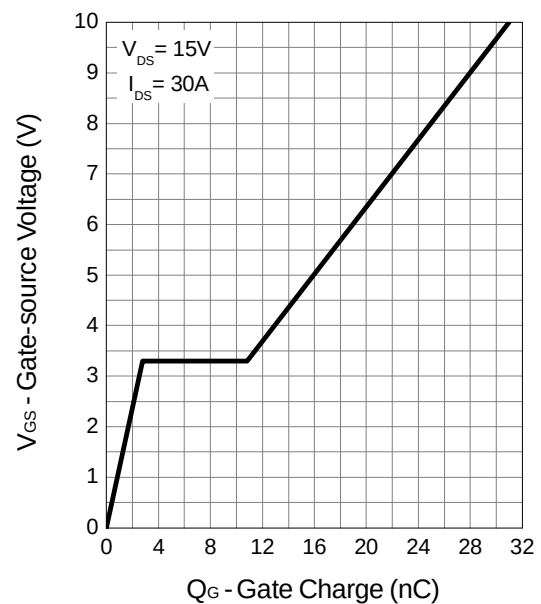
Source-Drain Diode Forward



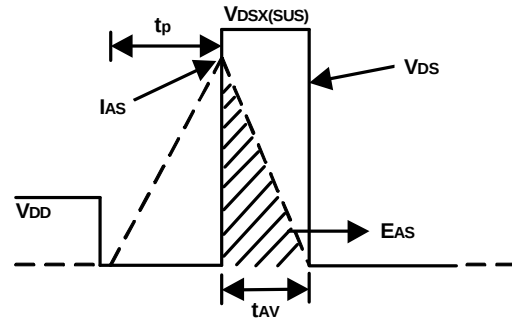
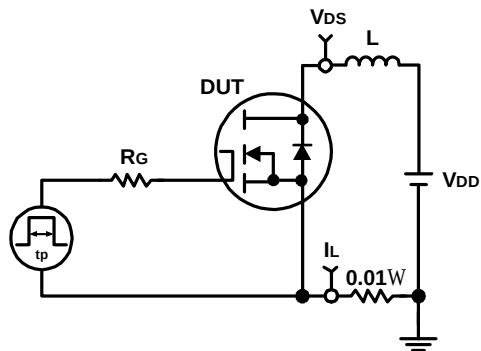
Capacitance



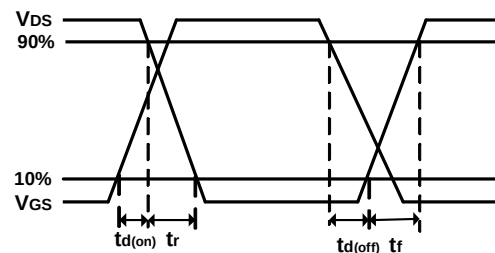
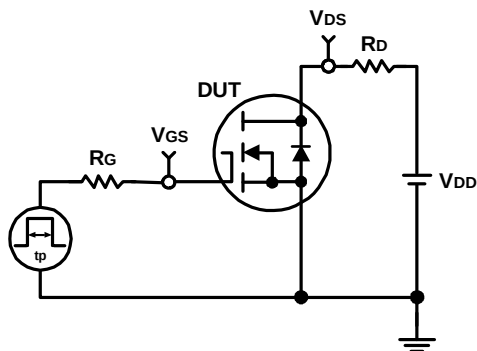
Gate Charge



Avalanche Test Circuit and Waveforms

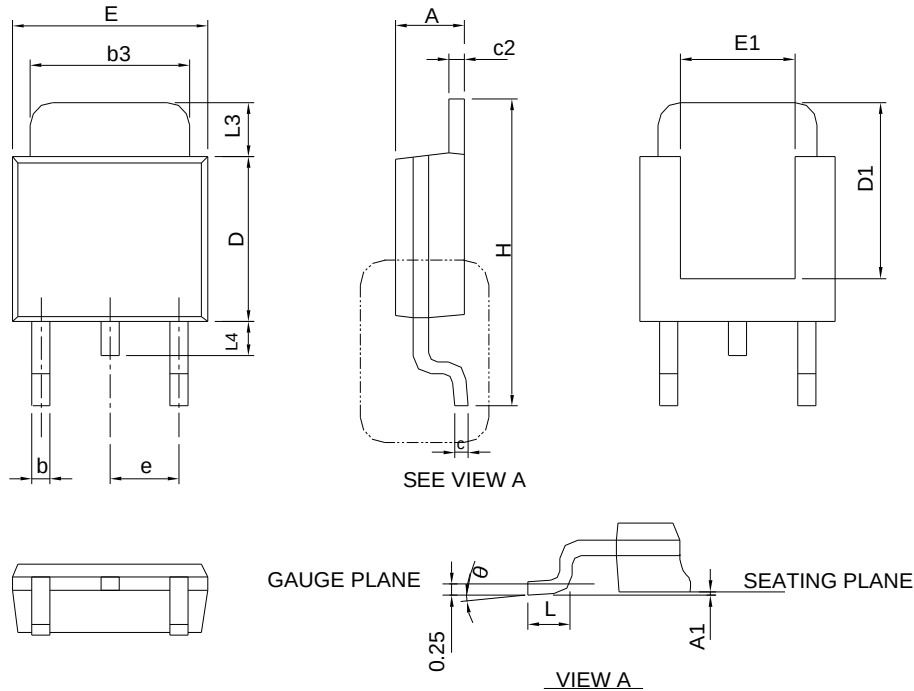


Switching Time Test Circuit and Waveforms



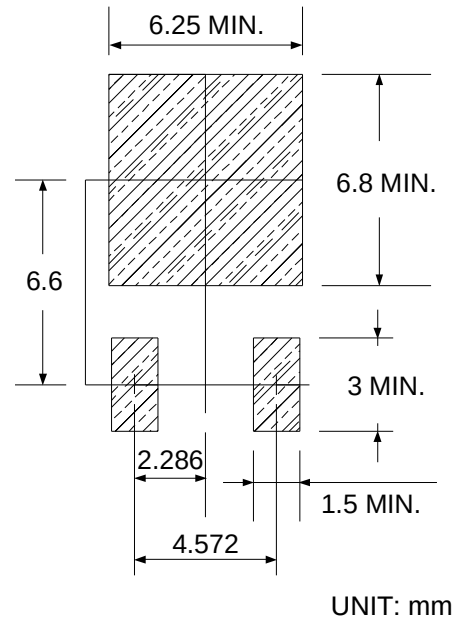
Package Information

TO-252-3



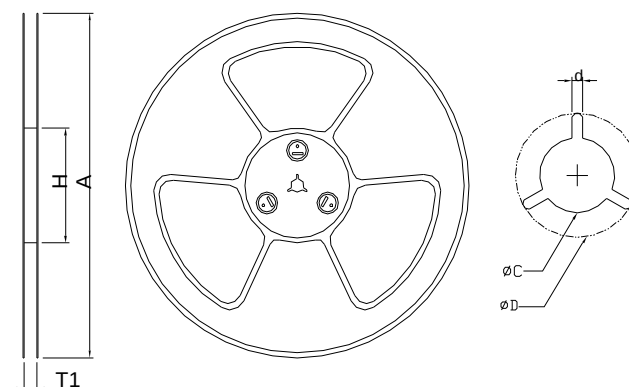
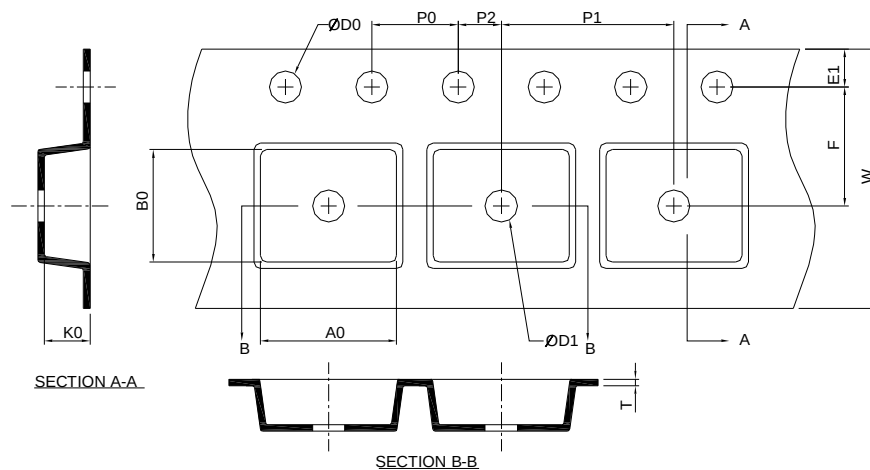
SYMBOL	TO-252-3			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	2.18	2.39	0.086	0.094
A1	-	0.13	-	0.005
b	0.50	0.89	0.020	0.035
b3	4.95	5.46	0.195	0.215
c	0.46	0.61	0.018	0.024
c2	0.46	0.89	0.018	0.035
D	5.33	6.22	0.210	0.245
D1	4.57	6.00	0.180	0.236
E	6.35	6.73	0.250	0.265
E1	3.81	6.00	0.150	0.236
e	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

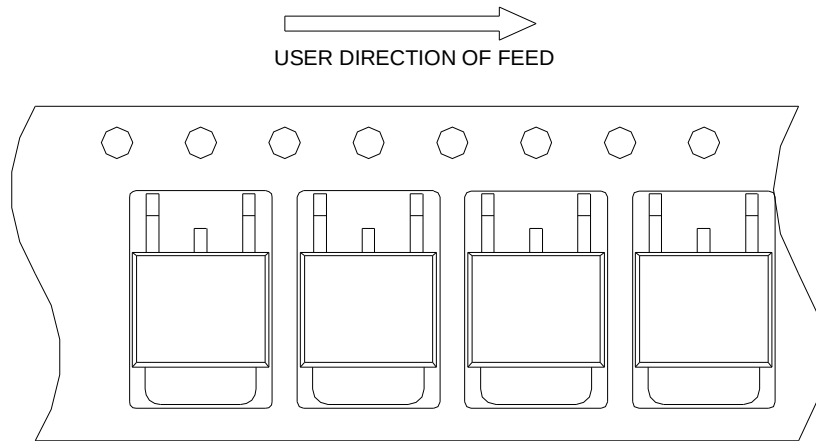


Application	A	H	T1	C	d	D	W	E1	F
TO-252-3	330.0 ± 2.00	50 MIN.	16.4 ± 2.00 -0.00	13.0 ± 0.50 -0.20	1.5 MIN.	20.2 MIN.	16.0 ± 0.30	1.75 ± 0.10	7.50 ± 0.05
	P0	P1	P2	D0	D1	T	A0	B0	K0
	4.0 ± 0.10	8.0 ± 0.10	2.0 ± 0.05	1.5 ± 0.10 -0.00	1.5 MIN.	0.6 ± 0.00 -0.40	6.80 ± 0.20	10.40 ± 0.20	2.50 ± 0.20

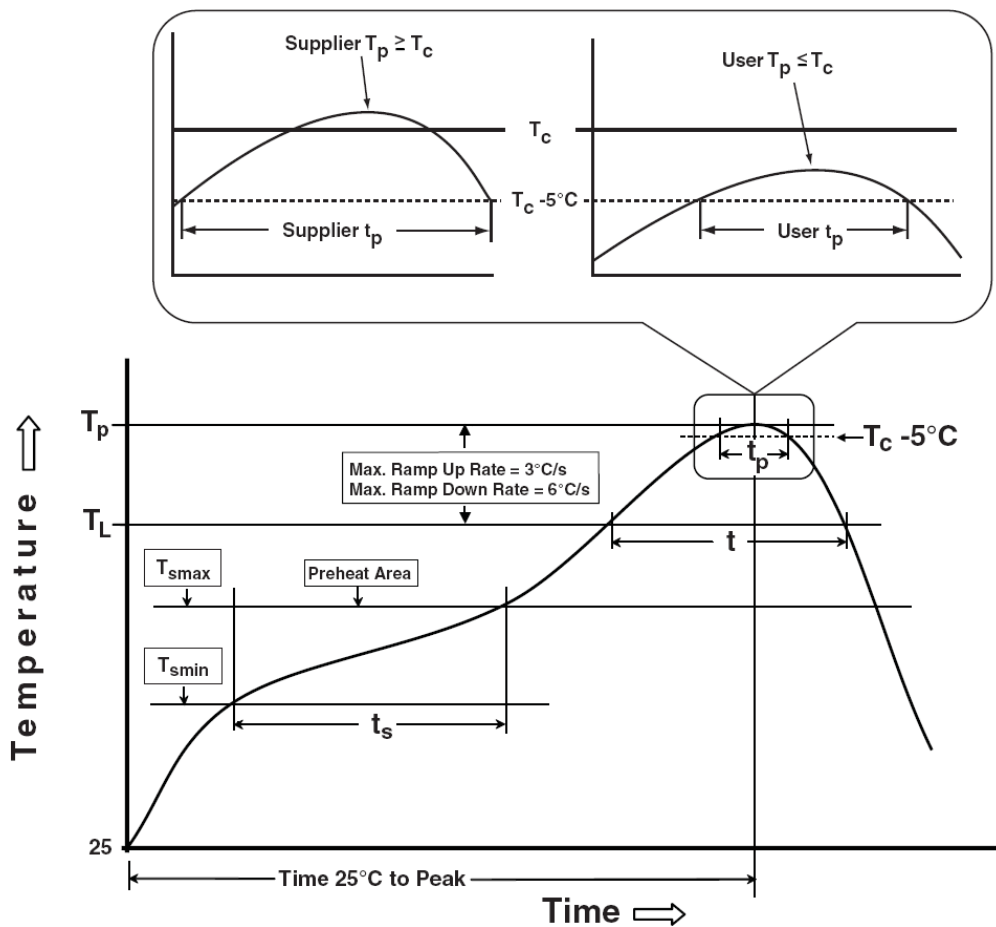
(mm)

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}) 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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