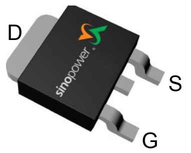
N-Channel Enhancement Mode MOSFET

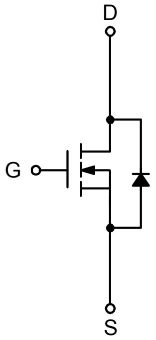
Features

- 30V/60A,
  $R_{DS(ON)}$=5.7mΩ (Max.) @ V_{GS}=10V
  $R_{DS(ON)}$=9mΩ (Max.) @ V_{GS}=4.5V
- Reliable and Rugged
- Lead Free and Green Devices Available (RoHS Compliant)

Pin Description



Top View of TO-252-3



N-Channel MOSFET

Applications

- Power Management in Desktop Computer or DC/DC Converters.

Ordering and Marking Information

SM3116NB □□-□□ □ Assembly Material Handling Code Temperature Range Package Code		Package Code U : TO-252-3 Operating Junction Temperature Range C : -55 to 150 °C Handling Code TR : Tape & Reel (2500ea/reel) Assembly Material G : Halogen and Lead Free Device
SM3116NB U :	SM3116NB XXXXX	XXXXX - Lot Code

Note : SINOPOWER lead-free products contain molding compounds/die attach materials and 100% matte tin plate termination finish; which are fully compliant with RoHS. SINOPOWER lead-free products meet or exceed the lead-free requirements of IPC/JEDEC J-STD-020D for MSL classification at lead-free peak reflow temperature. SINOPOWER defines "Green" to mean lead-free (RoHS compliant) and halogen free (Br or Cl does not exceed 900ppm by weight in homogeneous material and total of Br and Cl does not exceed 1500ppm by weight).

Absolute Maximum Ratings

Symbol	Parameter		Rating	Unit
Common Ratings (T_A=25°C Unless Otherwise Noted)				
V_{DSS}	Drain-Source Voltage		30	V
V_{GSS}	Gate-Source Voltage		±20	
T_J	Maximum Junction Temperature		150	°C
T_{STG}	Storage Temperature Range		-55 to 150	°C
I_S	Diode Continuous Forward Current		20	A
I_{DP}	Pulse Drain Current Tested	T_C=25°C	140	A
		T_C=100°C	90	
I_D [a]	Continuous Drain Current	T_C=25°C	60*	A
		T_C=100°C	48	
P_D	Maximum Power Dissipation	T_C=25°C	50	W
		T_C=100°C	20	
$R_{\theta JC}$	Thermal Resistance-Junction to Case	Steady State	2.5	°C/W
$R_{\theta JA}$	Thermal Resistance-Junction to Ambient	$t \leq$ 10s	15	°C/W
		Steady State	45	
I_{AS} [b]	Avalanche Current, Single pulse	L=0.5mH	20	A
E_{AS} [b]	Avalanche Energy, Single pulse	L=0.5mH	100	mJ

Note a : * Current limited by bond wire.

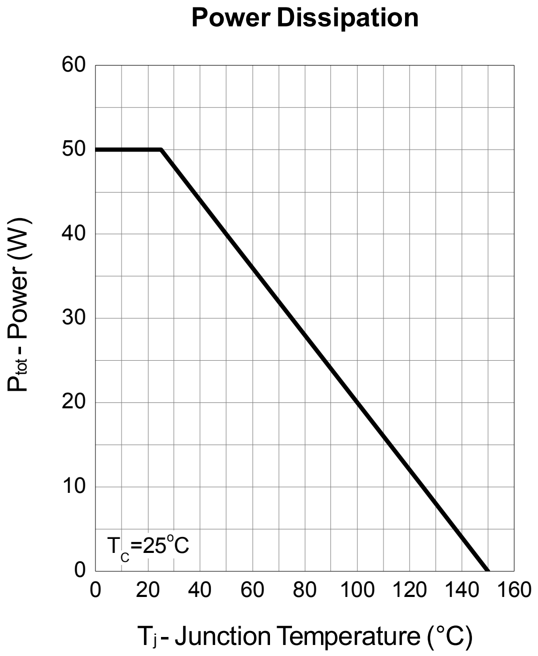
Note b : UIS tested and pulse width limited by maximum junction temperature 150°C (initial temperature T_j=25°C).

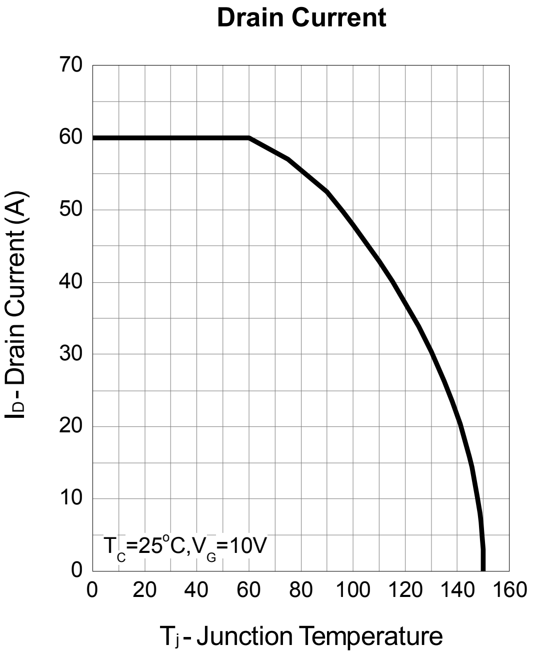
Electrical Characteristics (T$_A$ = 25°C unless otherwise noted)

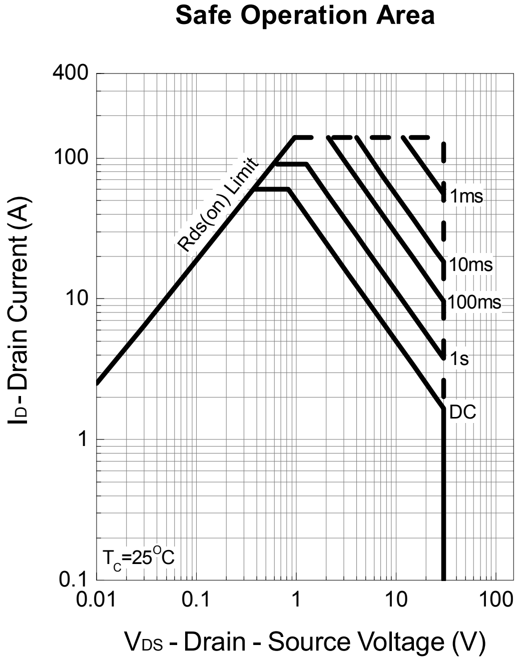
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Static Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V, I_{DS}=250μA	30	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=24V, V_{GS}=0V	-	-	1	μA
		T_J=85°C	-	-	30	
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS}, I_{DS}=250μA	1.5	1.8	2.5	V
I_{GSS}	Gate Leakage Current	V_{GS}=±20V, V_{DS}=0V	-	-	±100	nA
$R_{DS(ON)}$ [c]	Drain-Source On-state Resistance	V_{GS}=10V, I_{DS}=40A	-	4.7	5.7	mΩ
		T_J=125°C	-	6.9	-	
		V_{GS}=4.5V, I_{DS}=20A	-	7	9	
Gfs	Forward Transconductance	V_{DS}=5V, I_{DS}=40A	-	95	-	S
Diode Characteristics						
V_{SD} [c]	Diode Forward Voltage	I_{SD}=20A, V_{GS}=0V	-	0.8	1.1	V
t_{rr}	Reverse Recovery Time	I_{DS}=40A, dI_{SD}/dt=100A/μs	-	21	-	ns
t_a	Charge Time		-	13.2	-	
t_b	Discharge Time		-	7.8	-	
Q_{rr}	Reverse Recovery Charge		-	17	-	nC
Dynamic Characteristics [d]						
R_G	Gate Resistance	V_{GS}=0V,V_{DS}=0V,F=1MHz	1.5	2	2.5	Ω
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=15V, Frequency=1.0MHz	1200	1500	1820	pF
C_{oss}	Output Capacitance		210	260	310	
C_{rss}	Reverse Transfer Capacitance		100	130	175	
$t_{d(ON)}$	Turn-on Delay Time	V_{DD}=15V, R_L=15Ω, I_{DS}=1A, V_{GEN}=10V, R_G=6Ω	-	15	28	ns
t_r	Turn-on Rise Time		-	13	24	
$t_{d(OFF)}$	Turn-off Delay Time		-	32	57	
t_f	Turn-off Fall Time		-	9	17	
Gate Charge Characteristics [d]						
Q_g	Total Gate Charge	V_{DS}=15V, V_{GS}=4.5V, I_{DS}=40A	-	12	17	nC
Q_g	Total Gate Charge	V_{DS}=15V, V_{GS}=10V, I_{DS}=40A	-	25	37	
Q_{gth}	Threshold Gate Charge		-	1.5	2.0	
Q_{gs}	Gate-Source Charge		-	3	4.5	
Q_{gd}	Gate-Drain Charge		-	7.5	8.5	

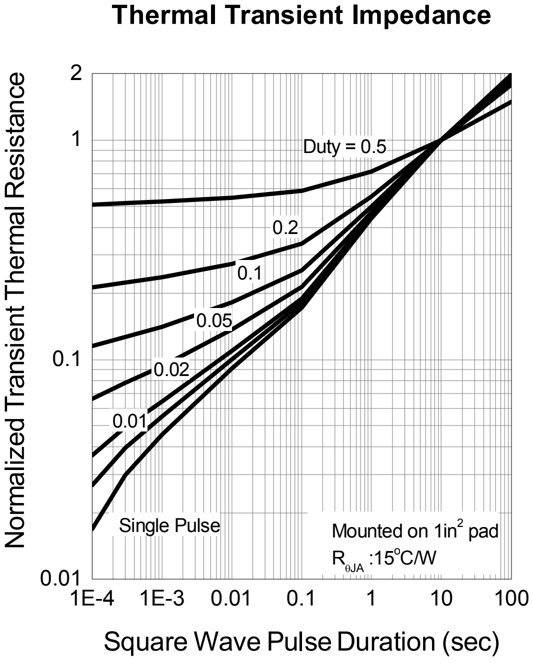
Note c : Pulse test ; pulse width≤300μs, duty cycle≤2%.
Note d : Guaranteed by design, not subject to production testing.

Typical Operating Characteristics

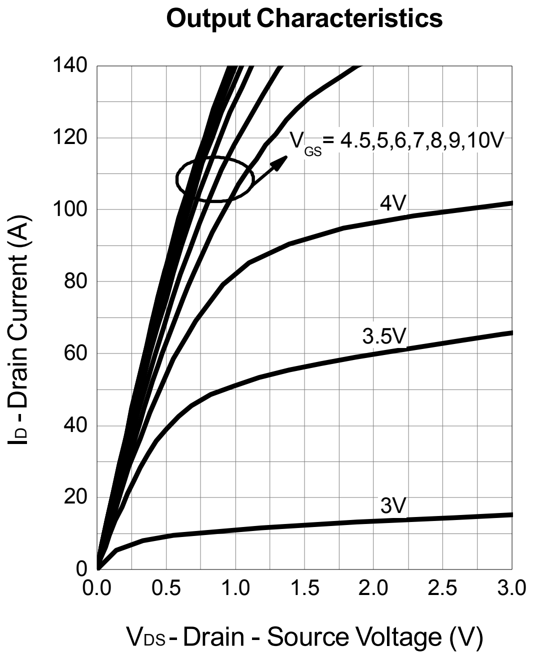


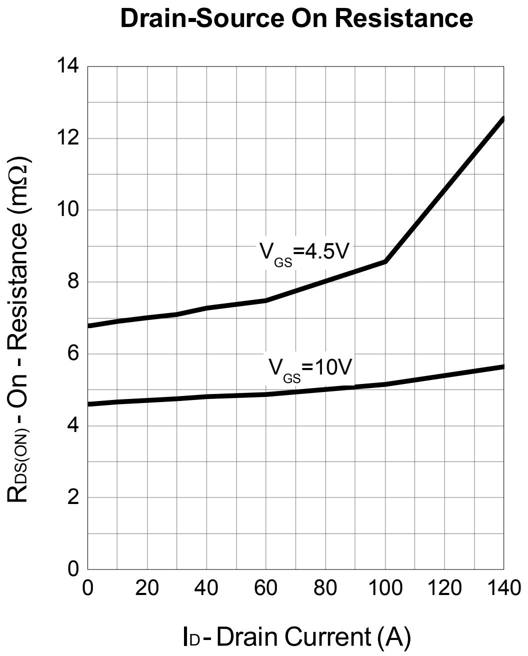


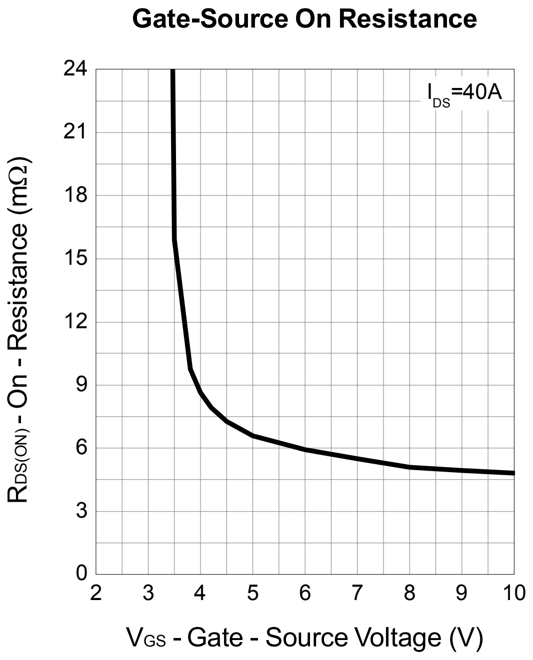


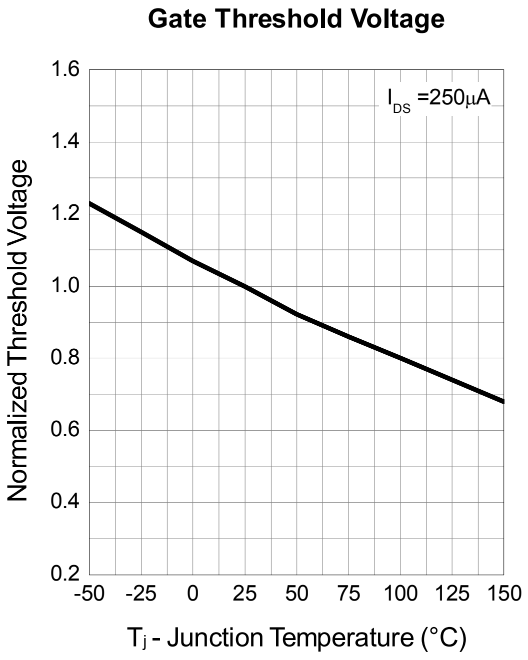


Typical Operating Characteristics (Cont.)

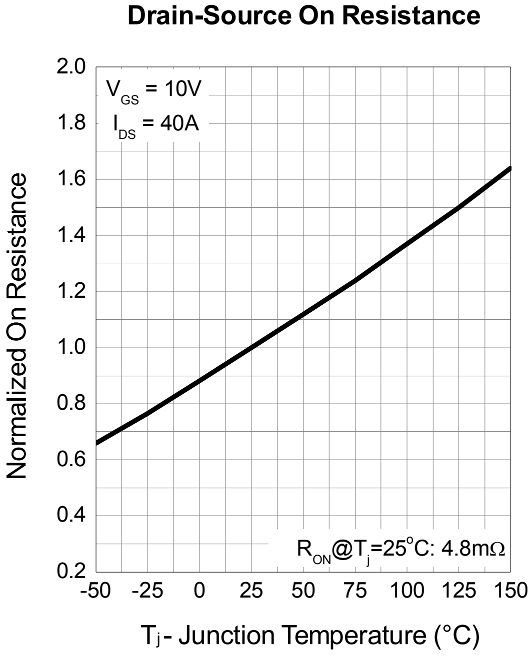


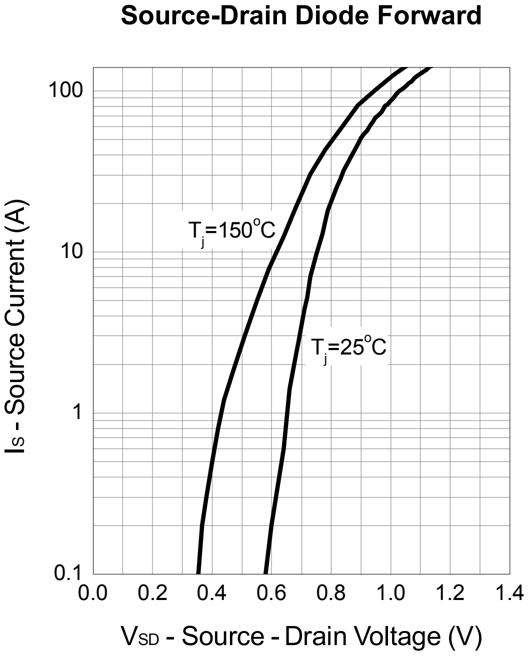


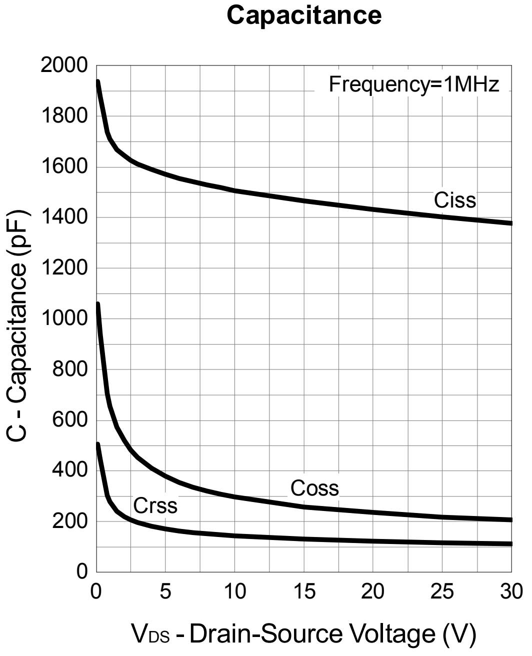


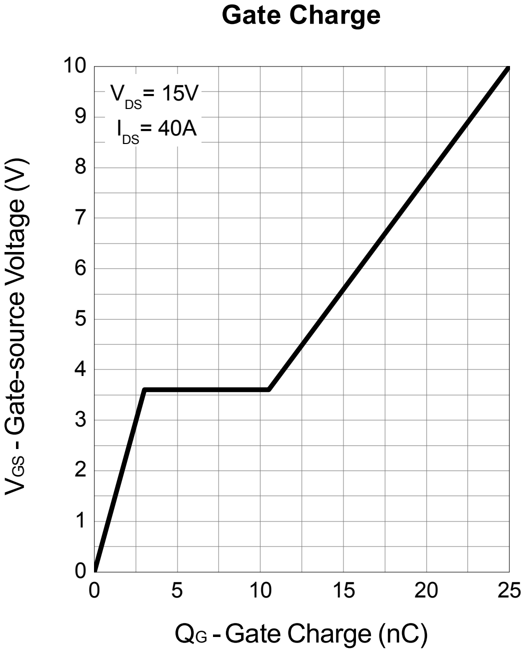


Typical Operating Characteristics (Cont.)

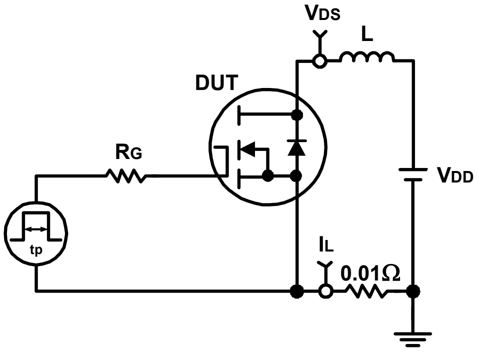


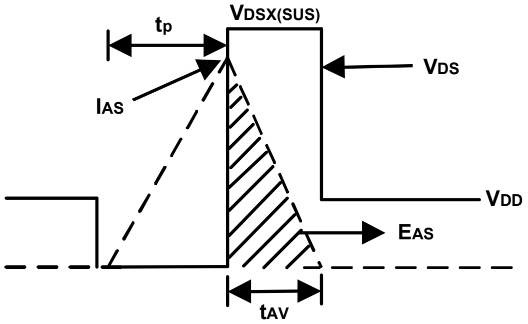




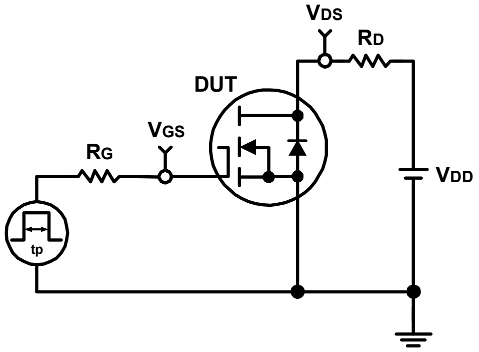


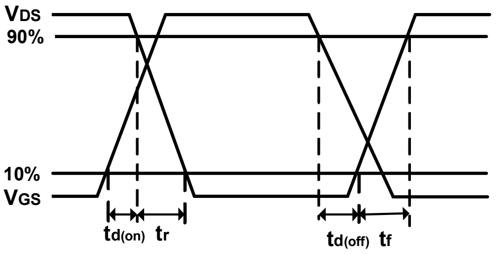
Avalanche Test Circuit and Waveforms





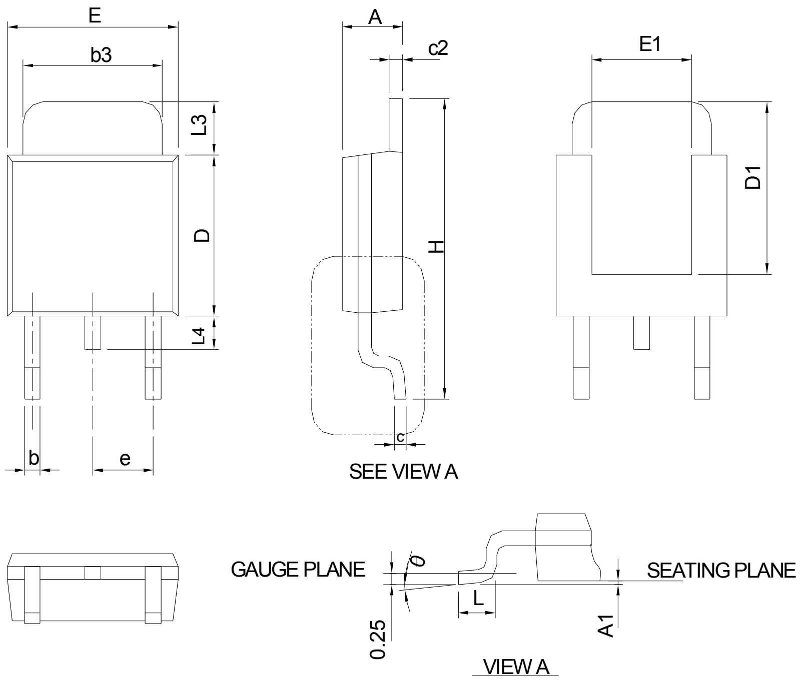
Switching Time Test Circuit and Waveforms





Package Information

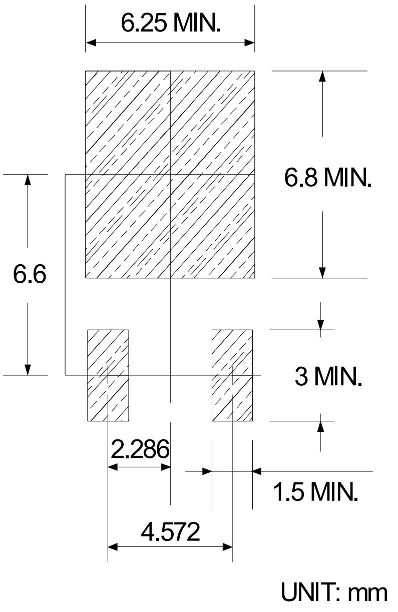
TO-252-3



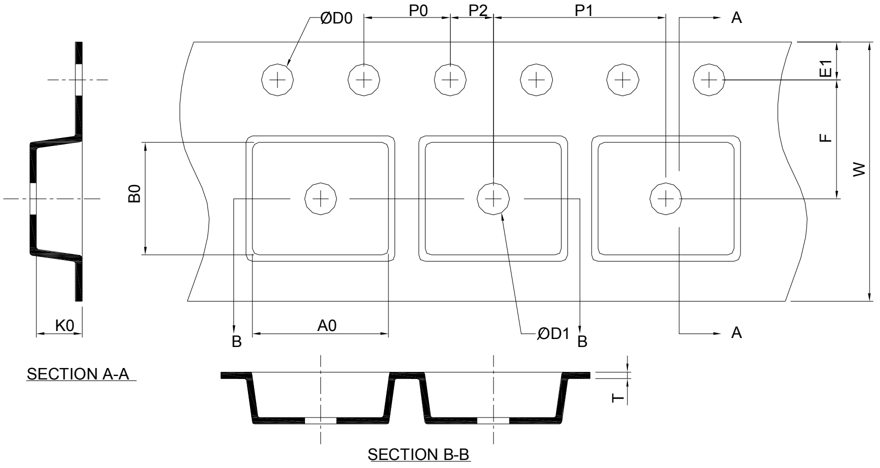
SYMBOL	TO-252-3			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	2.18	2.39	0.086	0.094
A1	-	0.13	-	0.005
b	0.50	0.89	0.020	0.035
b3	4.95	5.46	0.195	0.215
c	0.46	0.61	0.018	0.024
c2	0.46	0.89	0.018	0.035
D	5.33	6.22	0.210	0.245
D1	4.57	6.00	0.180	0.236
E	6.35	6.73	0.250	0.265
E1	3.81	6.00	0.150	0.236
e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

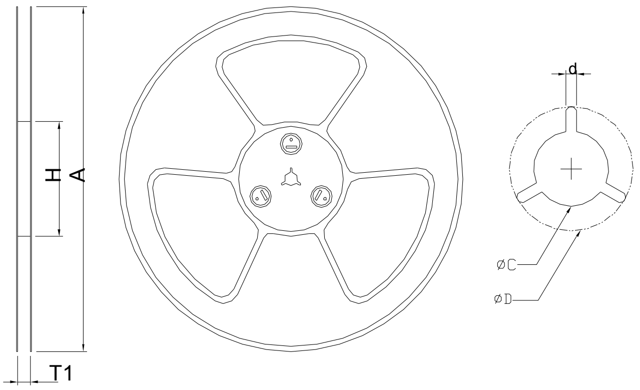
Note : Follow JEDEC TO-252 .

RECOMMENDED LAND PATTERN



Carrier Tape & Reel Dimensions



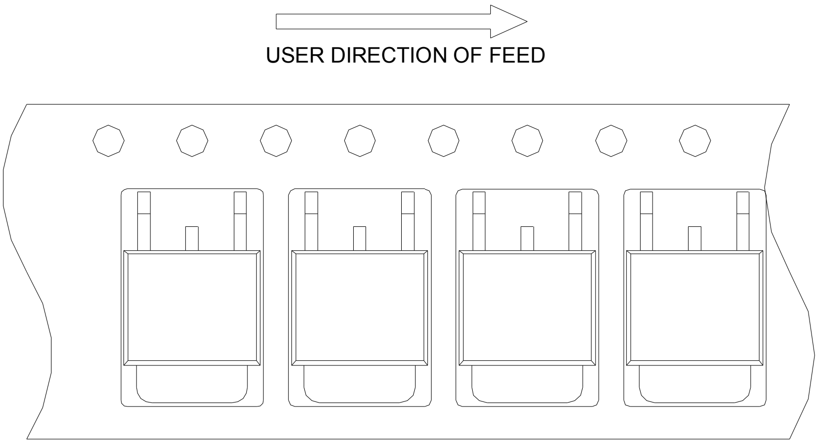


Application	A	H	T1	C	d	D	W	E1	F
TO-252-3	330.0± 2.00	50 MIN.	16.4+2.00 -0.00	13.0+0.50 -0.20	1.5 MIN.	20.2 MIN.	16.0±0.30	1.75±0.10	7.50±0.05
	P0	**P1**	**P2**	**D0**	**D1**	**T**	**A0**	**B0**	**K0**
	4.0±0.10	8.0±0.10	2.0±0.05	1.5+0.10 -0.00	1.5 MIN.	0.6+0.00 -0.40	6.80±0.20	10.40± 0.20	2.50±0.20

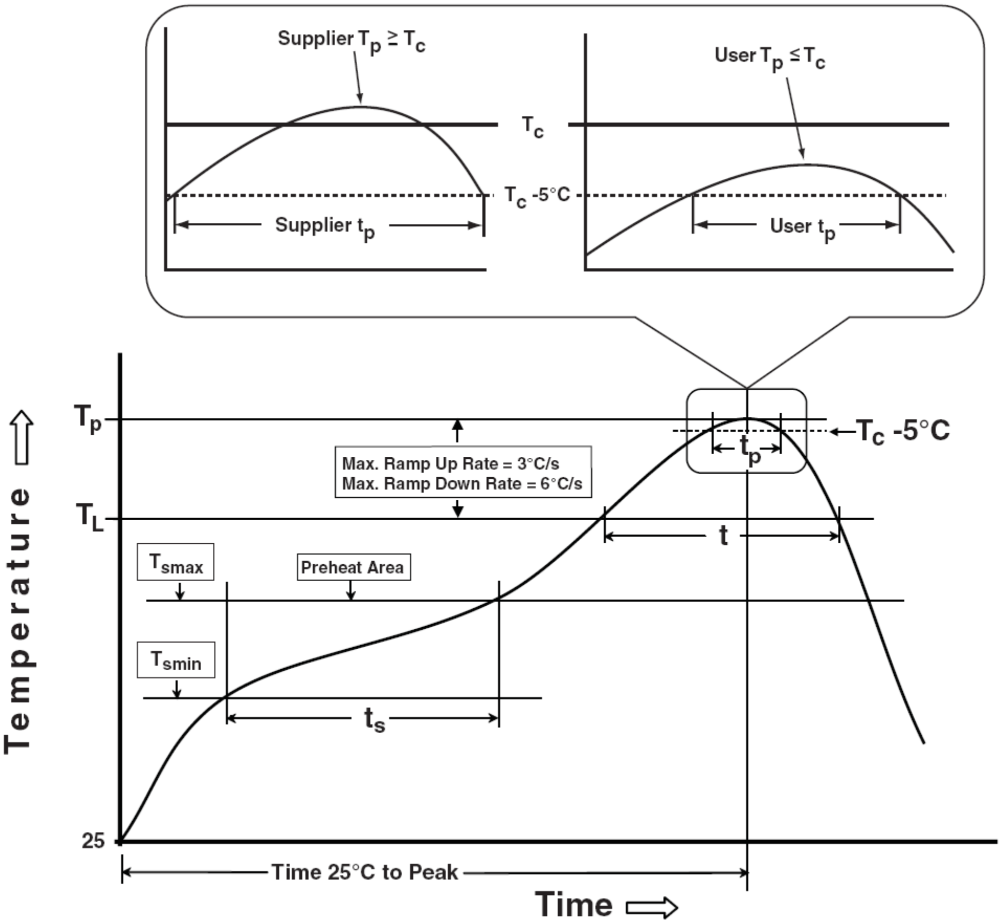
(mm)

Taping Direction Information

TO-252-3



Classification Profile



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 (Tc)

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 (Tc)

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 @ Tjmax
HTGB	JESD-22, A108	1000 Hrs, 100% of VGS max @ Tjmax
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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