

Absolute Maximum Ratings

Symbol	Parameter	Rating	Unit	
Common Ratings ($T_A=25^\circ\text{C}$ Unless Otherwise Noted)				
V_{DSS}	Drain-Source Voltage	25	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	$T_C=25^\circ\text{C}$ 30	A	
Mounted on Large Heat Sink				
I_{DP}	300 μs Pulse Drain Current Tested	$T_C=25^\circ\text{C}$	100	A
		$T_C=100^\circ\text{C}$	65	
I_D	Continuous Drain Current	$T_C=25^\circ\text{C}$	50*	A
		$T_C=100^\circ\text{C}$	38	
P_D	Maximum Power Dissipation	$T_C=25^\circ\text{C}$	50	W
		$T_C=100^\circ\text{C}$	20	
$R_{\theta JC}$	Thermal Resistance-Junction to Case	2.5	$^\circ\text{C/W}$	
Mounted on PCB of 1in² Pad Area				
I_{DP}	300 μs Pulse Drain Current Tested	$T_A=25^\circ\text{C}$	100	A
		$T_A=100^\circ\text{C}$	65	
I_D	Continuous Drain Current	$T_A=25^\circ\text{C}$	13	A
		$T_A=100^\circ\text{C}$	8	
P_D	Maximum Power Dissipation	$T_A=25^\circ\text{C}$	2.5	W
		$T_A=100^\circ\text{C}$	1	
$R_{\theta JA}$	Thermal Resistance-Junction to Ambient	50	$^\circ\text{C/W}$	
Mounted on PCB of Minimum Footprint				
I_{DP}	300 μs Pulse Drain Current Tested	$T_A=25^\circ\text{C}$	100	A
		$T_A=100^\circ\text{C}$	65	
I_D	Continuous Drain Current	$T_A=25^\circ\text{C}$	10.5	A
		$T_A=100^\circ\text{C}$	6	
P_D	Maximum Power Dissipation	$T_A=25^\circ\text{C}$	1.6	W
		$T_A=100^\circ\text{C}$	0.6	
$R_{\theta JA}$	Thermal Resistance-Junction to Ambient	75	$^\circ\text{C/W}$	

Note:

* Current limited by bond wire.

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

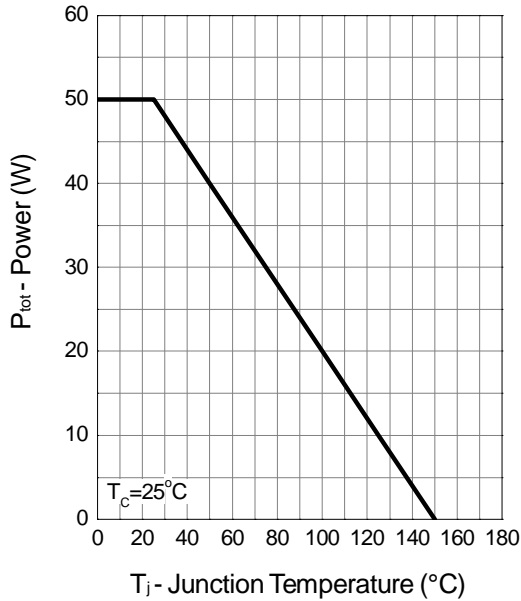
Symbol	Parameter	Test Condition	APM2509NU			Unit
			Min.	Typ.	Max.	
Drain-Source Avalanche Ratings						
E_{AS}	Avalanche Energy, Single Pulsed	$I_D=15A, L=0.5mH$			50	mJ
Static Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_{DS}=250\mu A$	25			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=20V, V_{GS}=0V$ $T_J=85^\circ\text{C}$			1 30	μA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_{DS}=250\mu A$	1.3	1.8	2.5	V
I_{GSS}	Gate Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$			± 100	nA
$R_{DS(ON)}^a$	Drain-Source On-state Resistance	$V_{GS}=10V, I_{DS}=30A$ $V_{GS}=4.5V, I_{DS}=15A$		7.5 13	9 18	$m\Omega$
Diode Characteristics						
V_{SD}^a	Diode Forward Voltage	$I_{SD}=10A, V_{GS}=0V$		0.9	1.1	V
t_{rr}^b	Reverse Recovery Time	$I_{SD}=10A, dI_{SD}/dt = 100A/\mu s$		17		ns
Q_{rr}^b	Reverse Recovery Charge			6		nC
Dynamic Characteristics^b						
R_G	Gate Resistance	$V_{GS}=0V, V_{DS}=0V, F=1MHz$		1.8		Ω
C_{iss}	Input Capacitance	$V_{GS}=0V,$ $V_{DS}=15V,$ Frequency=1.0MHz		1560		pF
C_{oss}	Output Capacitance			345		
C_{rss}	Reverse Transfer Capacitance			245		
$t_{d(ON)}$	Turn-on Delay Time		$V_{DD}=15V, R_L=15\Omega,$ $I_{DS}=1A, V_{GEN}=10V,$ $R_G=6\Omega$		17	
T_r	Turn-on Rise Time			18		
$t_{d(OFF)}$	Turn-off Delay Time			41		
T_f	Turn-off Fall Time			16		
Gate Charge Characteristics^b						
Q_g	Total Gate Charge	$V_{DS}=15V, V_{GS}=4.5V,$ $I_{DS}=30A$		17.5		nC
Q_{gs}	Gate-Source Charge			5		
Q_{gd}	Gate-Drain Charge			11		

Notes:

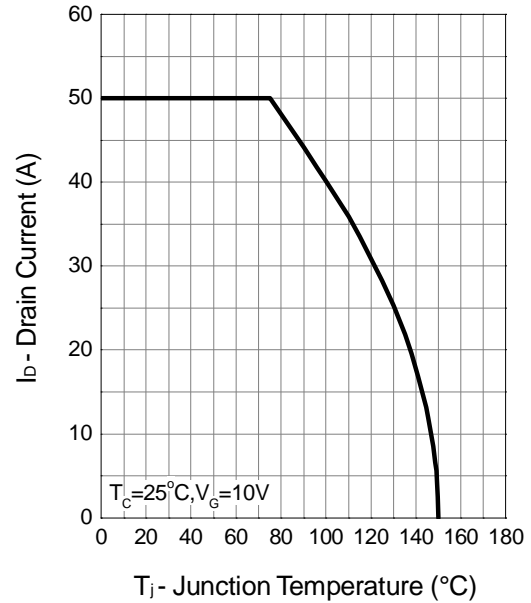
- a : Pulse test ; pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$.
b : Guaranteed by design, not subject to production testing.

Typical Characteristics

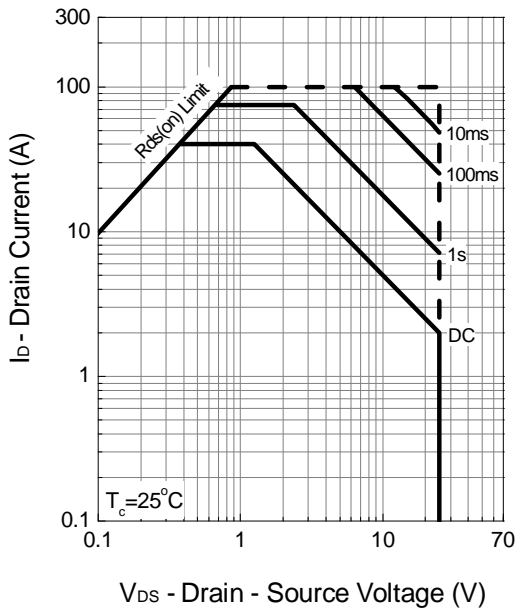
Power Dissipation



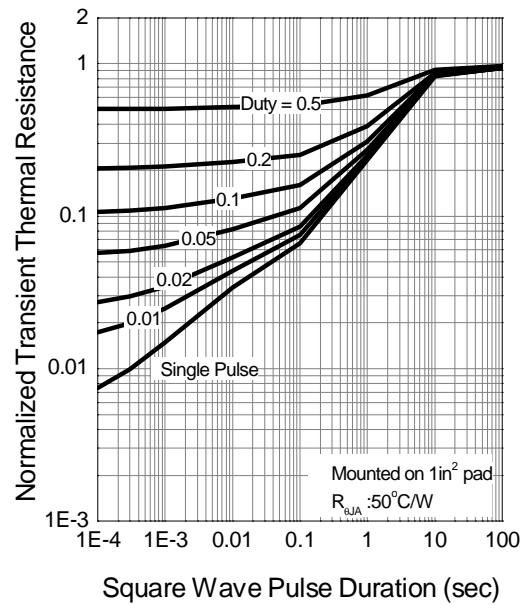
Drain Current



Safe Operation Area

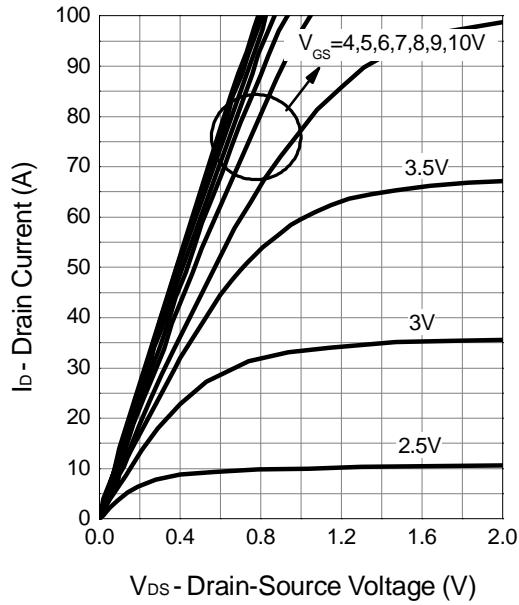


Thermal Transient Impedance

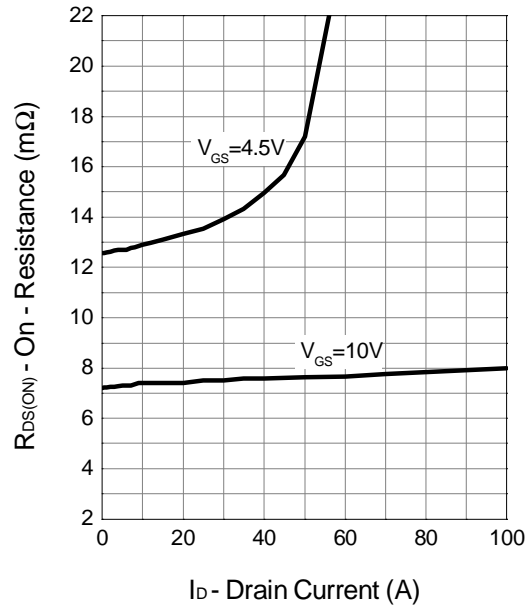


Typical Characteristics (Cont.)

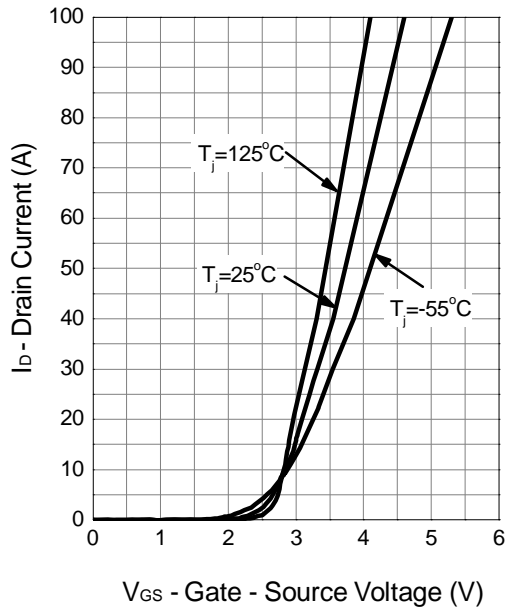
Output Characteristics



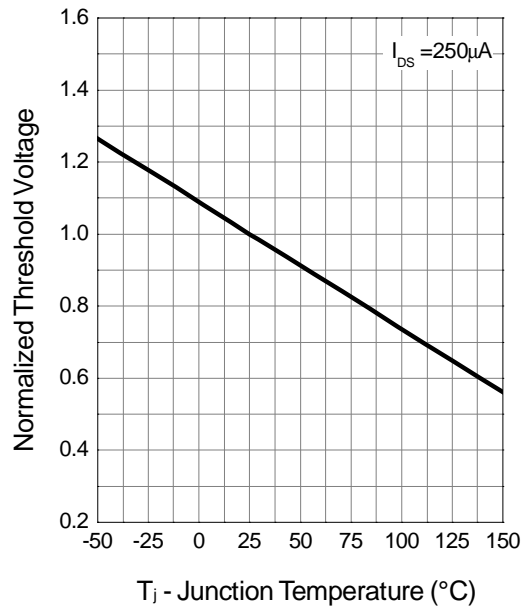
Drain-Source On Resistance



Transfer Characteristics

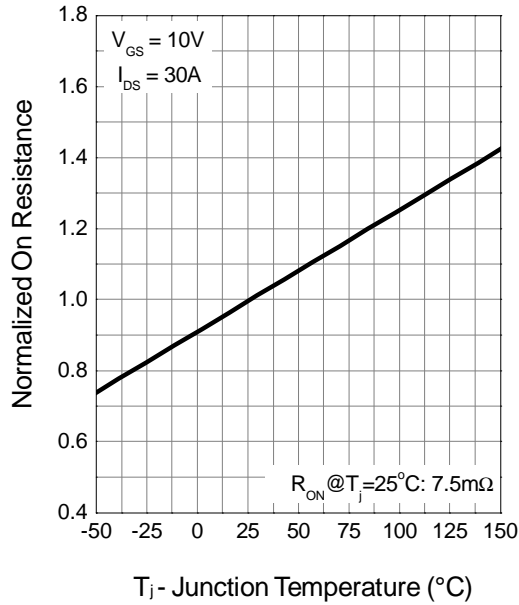


Gate Threshold Voltage

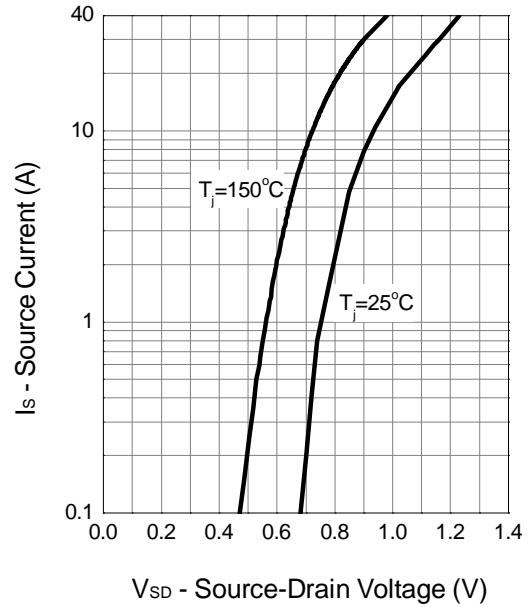


Typical Characteristics (Cont.)

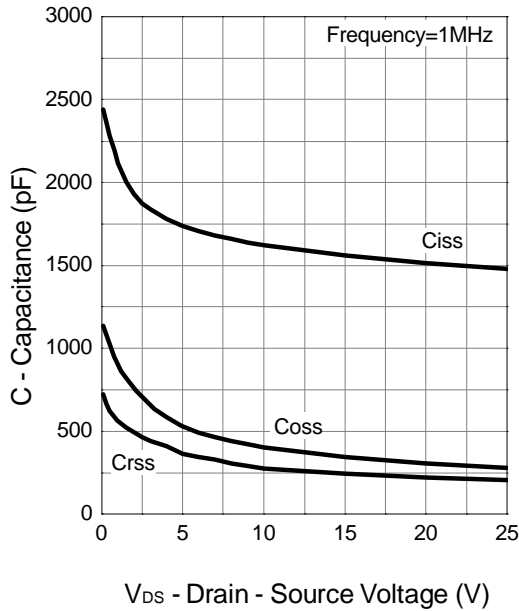
Drain-Source On Resistance



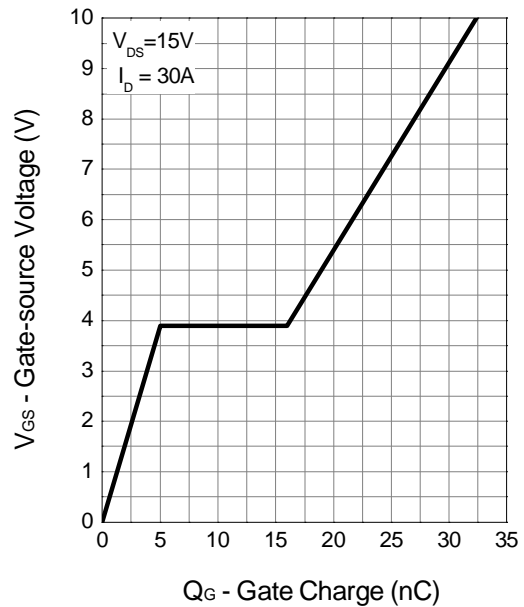
Source-Drain Diode Forward



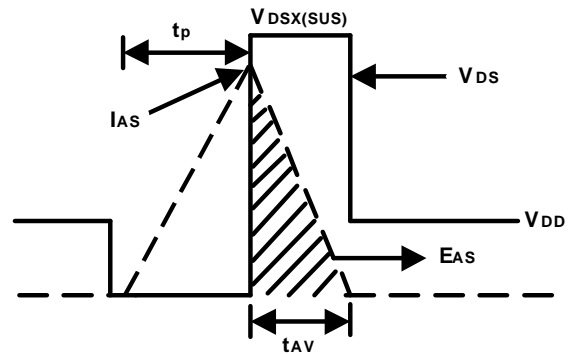
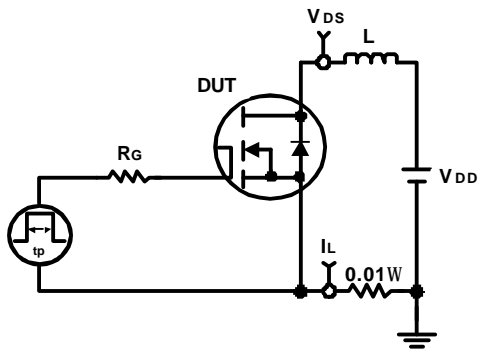
Capacitance



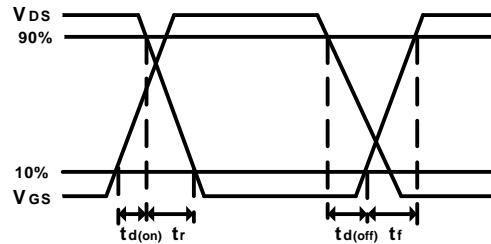
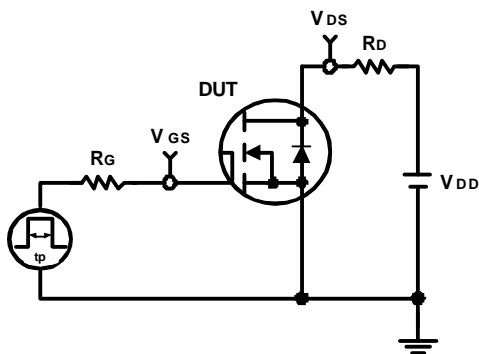
Gate Charge



Avalanche Test Circuit and Waveforms

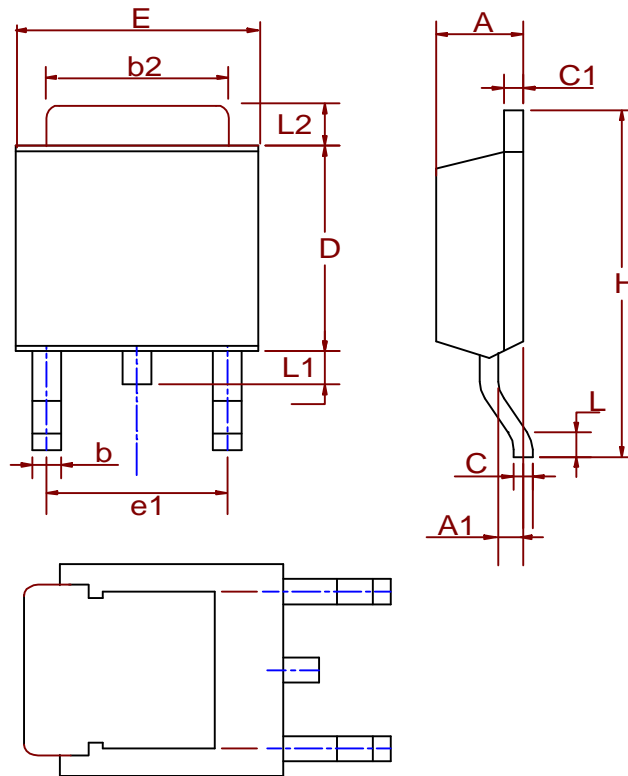


Switching Time Test Circuit and Waveforms



Packaging Information

TO-252(Reference JEDEC Registration TO-252)

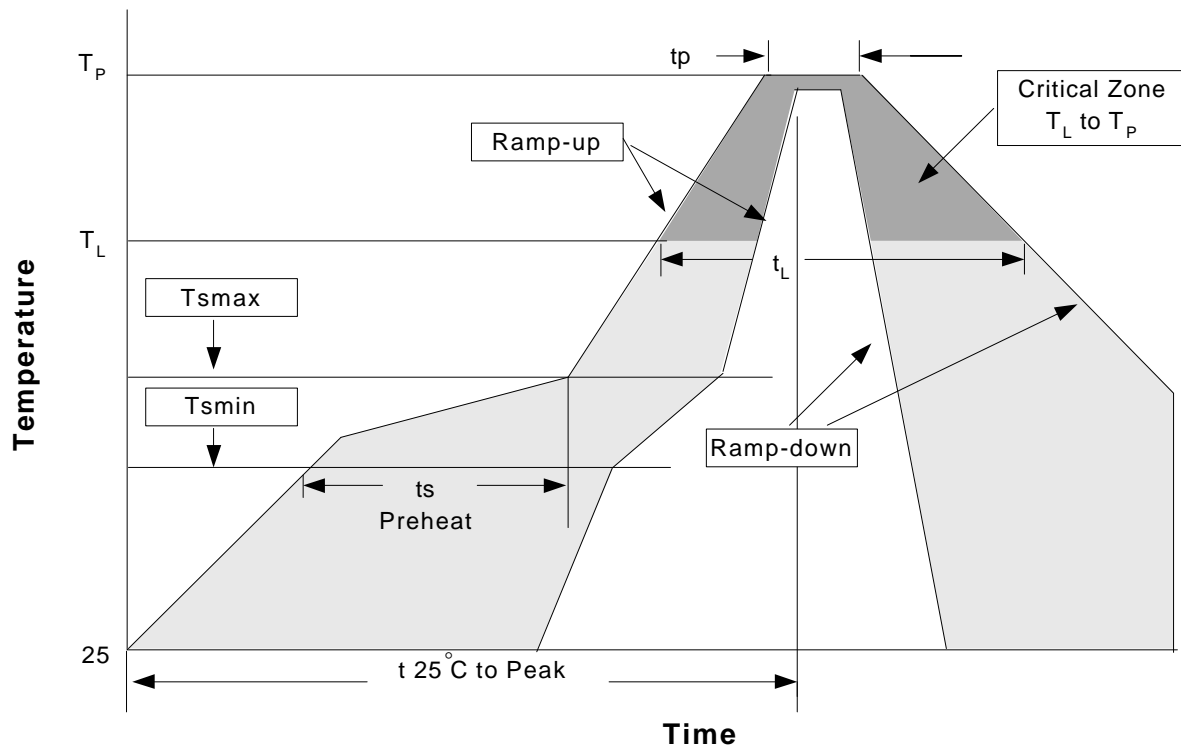


Dim	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	2.18	2.39	0.086	0.094
A1	0.89	1.27	0.035	0.050
b	0.508	0.89	0.020	0.035
b2	5.207	5.461	0.205	0.215
C	0.46	0.58	0.018	0.023
C1	0.46	0.58	0.018	0.023
D	5.334	6.22	0.210	0.245
E	6.35	6.73	0.250	0.265
e1	3.96	5.18	0.156	0.204
H	9.398	10.41	0.370	0.410
L	0.51		0.020	
L1	0.64	1.02	0.025	0.040
L2	0.89	2.032	0.035	0.080

Physical Specifications

Terminal Material	Solder-Plated Copper (Solder Material : 90/10 or 63/37 SnPb), 100%Sn
Lead Solderability	Meets EIA Specification RSI86-91, ANSI/J-STD-002 Category 3.

Reflow Condition (IR/Convection or VPR Reflow)



Classification Reflow Profiles

Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Average ramp-up rate (T _L to T _P)	3°C/second max.	3°C/second max.
Preheat		
- Temperature Min (T _{smin})	100°C	150°C
- Temperature Max (T _{smax})	150°C	200°C
- Time (min to max) (t _s)	60-120 seconds	60-180 seconds
Time maintained above:		
- Temperature (T _L)	183°C	217°C
- Time (t _L)	60-150 seconds	60-150 seconds
Peak/Classification Temperature (T _P)	See table 1	See table 2
Time within 5°C of actual Peak Temperature (t _p)	10-30 seconds	20-40 seconds
Ramp-down Rate	6°C/second max.	6°C/second max.
Time 25°C to Peak Temperature	6 minutes max.	8 minutes max.

Notes: All temperatures refer to topside of the package .Measured on the body surface.

Classification Reflow Profiles(Cont.)

Table 1. SnPb Eutectic Process – Package Peak Reflow Temperatures

Package Thickness	Volume mm ³ <350	Volume mm ³ ≥350
<2.5 mm	240 +0/-5°C	225 +0/-5°C
≥2.5 mm	225 +0/-5°C	225 +0/-5°C

Table 2. Pb-free Process – Package Classification Reflow Temperatures

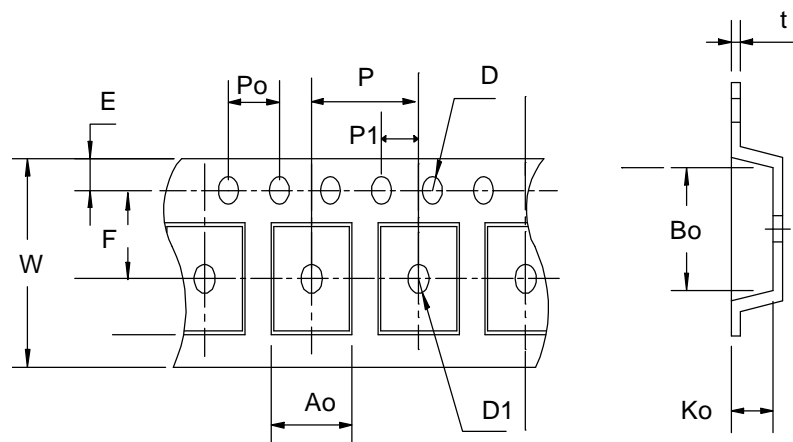
Package Thickness	Volume mm ³ <350	Volume mm ³ 350-2000	Volume mm ³ >2000
<1.6 mm	260 +0°C*	260 +0°C*	260 +0°C*
1.6 mm – 2.5 mm	260 +0°C*	250 +0°C*	245 +0°C*
≥2.5 mm	250 +0°C*	245 +0°C*	245 +0°C*

*Tolerance: The device manufacturer/supplier **shall** assure process compatibility up to and including the stated classification temperature (this means Peak reflow temperature +0°C. For example 260°C+0°C) at the rated MSL level.

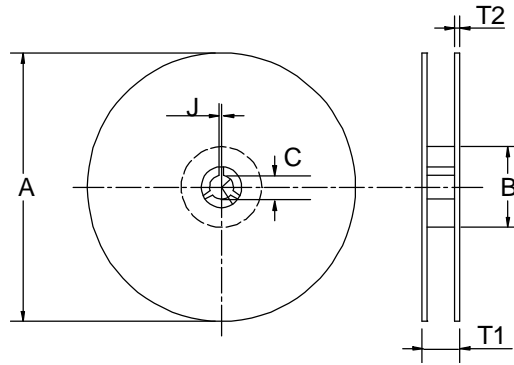
Reliability Test Program

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



Carrier Tape & Reel Dimensions(Cont.)



Application	A	B	C	J	T1	T2	W	P	E
TO-252	330 ±3	100 ±2	13 ±0.5	2 ±0.5	16.4 +0.3 -0.2	2.5 ±0.5	16+ 0.3 -0.1	8 ±0.1	1.75 ±0.1
	F	D	D1	Po	P1	Ao	Bo	Ko	t
	7.5 ±0.1	1.5 +0.1	1.5 ±0.25	4.0 ±0.1	2.0 ±0.1	6.8 ±0.1	10.4 ±0.1	2.5 ±0.1	0.3 ±0.05

(mm)

Cover Tape Dimensions

Application	Carrier Width	Cover Tape Width	Devices Per Reel
TO- 252	16	13.3	2500

Customer Service

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