



## Absolute Maximum Ratings

Symbol	Parameter	Rating	Unit
<b>Common Ratings</b> ( $T_A=25^\circ\text{C}$ Unless Otherwise Noted)			
$V_{DSS}$	Drain-Source Voltage	20	V
$V_{GSS}$	Gate-Source Voltage	$\pm 16$	
$T_J$	Maximum Junction Temperature	150	$^\circ\text{C}$
$T_{STG}$	Storage Temperature Range	-55 to 150	$^\circ\text{C}$
$I_S$	Diode Continuous Forward Current	$T_C=25^\circ\text{C}$ 16	A
<b>Mounted on Large Heat Sink</b>			
$I_{DP}$	300 $\mu\text{s}$ Pulse Drain Current Tested	$T_C=25^\circ\text{C}$ 100	A
		$T_C=100^\circ\text{C}$ 75	
$I_D$	Continuous Drain Current	$T_C=25^\circ\text{C}$ 40*	A
		$T_C=100^\circ\text{C}$ 25	
$P_D$	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	$^\circ\text{C}/\text{W}$
<b>Mounted on PCB of 1in<sup>2</sup> pad area</b>			
$I_{DP}$	300 $\mu\text{s}$ Pulse Drain Current Tested	$T_A=25^\circ\text{C}$ 100	A
		$T_A=100^\circ\text{C}$ 75	
$I_D$	Continuous Drain Current	$T_A=25^\circ\text{C}$ 10	A
		$T_A=100^\circ\text{C}$ 6	
$P_D$	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	$^\circ\text{C}/\text{W}$
<b>Mounted on PCB of Minimum Footprint</b>			
$I_{DP}$	300 $\mu\text{s}$ Pulse Drain Current Tested	$T_A=25^\circ\text{C}$ 100	A
		$T_A=100^\circ\text{C}$ 75	
$I_D$	Continuous Drain Current	$T_A=25^\circ\text{C}$ 9	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	$^\circ\text{C}/\text{W}$

Note:

\* Current limited by bond wire.

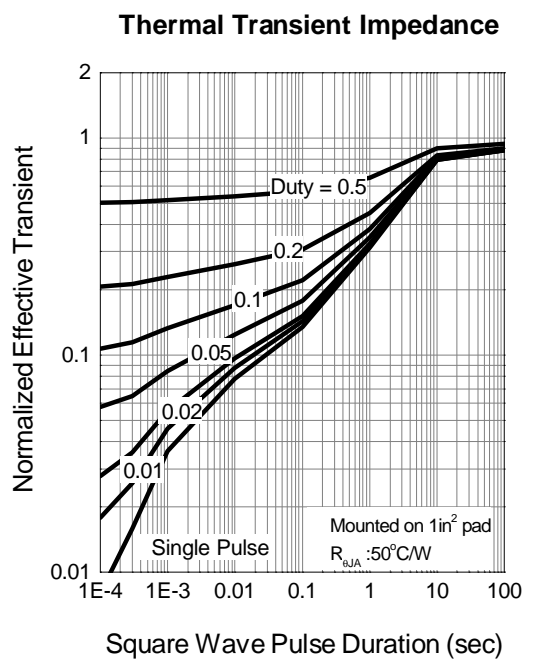
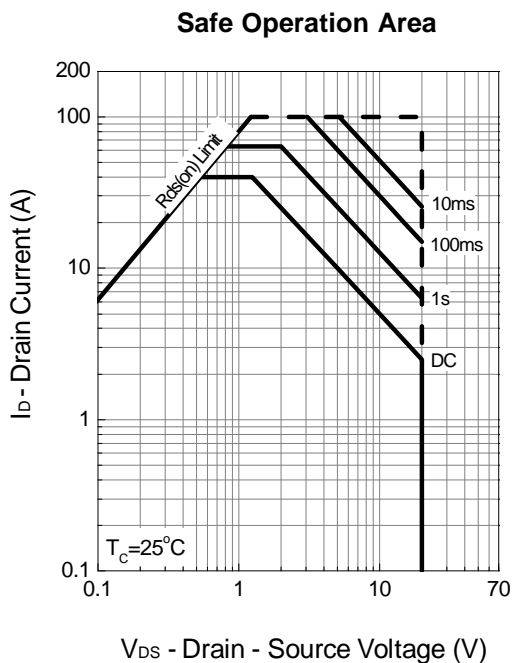
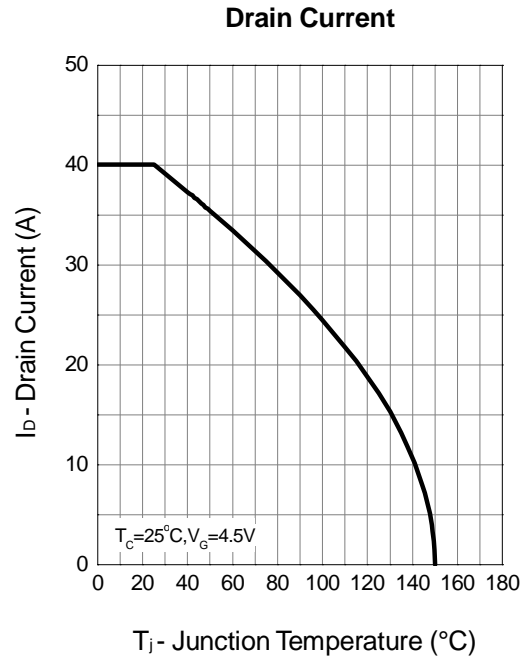
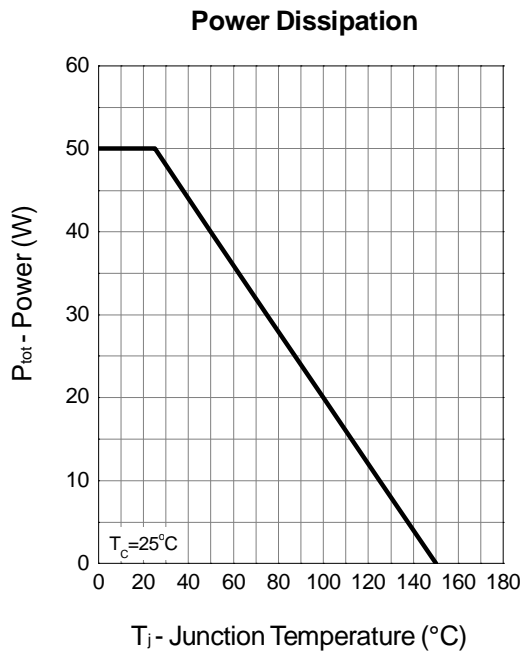
## Electrical Characteristics ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test Condition	APM2014NU			Unit
			Min.	Typ.	Max.	
<b>Static Characteristics</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_{DS}=250\mu A$	20			V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=16V, V_{GS}=0V$ $T_J=85^\circ\text{C}$			1 30	$\mu A$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_{DS}=250\mu A$	0.7	0.9	1.5	V
$I_{GSS}$	Gate Leakage Current	$V_{GS}=\pm 16V, V_{DS}=0V$			$\pm 100$	nA
$R_{DS(ON)}^a$	Drain-Source On-state Resistance	$V_{GS}=4.5V, I_{DS}=10A$ $V_{GS}=2.5V, I_{DS}=5A$		12 18	14 25	$m\Omega$
<b>Diode</b>						
$V_{SD}^a$	Diode Forward Voltage	$I_{SD}=4A, V_{GS}=0V$		0.8	1.3	V
<b>Dynamic Characteristics<sup>b</sup></b>						
$R_G$	Gate Resistance	$V_{GS}=0V, V_{DS}=0V, F=1\text{MHz}$		1.7		$\Omega$
$C_{iss}$	Input Capacitance	$V_{GS}=0V,$ $V_{DS}=15V,$ Frequency=1.0MHz		1290		pF
$C_{oss}$	Output Capacitance			300		
$C_{riss}$	Reverse Transfer Capacitance			210		
$t_{d(ON)}$	Turn-on Delay Time	$V_{DD}=10V, R_L=10\Omega,$ $I_{DS}=1A, V_{GEN}=4.5V,$ $R_G=6\Omega$		10	20	ns
$T_r$	Turn-on Rise Time			15	29	
$t_{d(OFF)}$	Turn-off Delay Time			28	52	
$T_f$	Turn-off Fall Time			17	33	
$t_{rr}^b$	Reverse Recovery Time	$I_{SD}=10A, di_{SD}/dt = 100A/\mu s$		20		ns
$Q_{rr}^b$	Reverse Recovery Charge			9		nC
<b>Gate Charge Characteristics<sup>b</sup></b>						
$Q_g$	Total Gate Charge	$V_{DS}=10V, V_{GS}=4.5V,$ $I_{DS}=5A$		18.2	24	nC
$Q_{gs}$	Gate-Source Charge			5.6		
$Q_{gd}$	Gate-Drain Charge			4.8		

Notes:

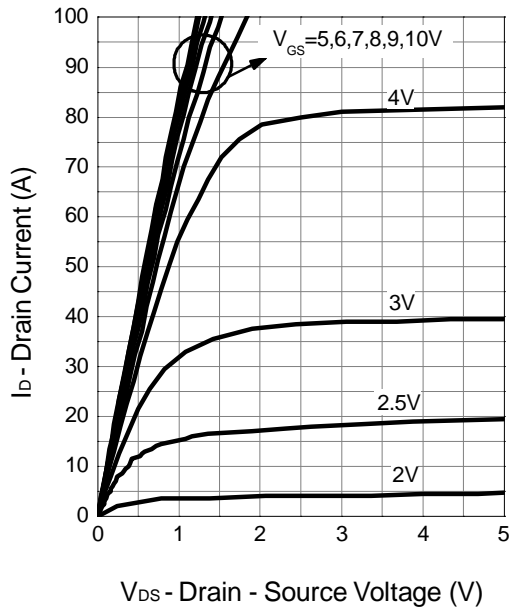
- a : Pulse test ; pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$ .
- b : Guaranteed by design, not subject to production testing.

## Typical Characteristics

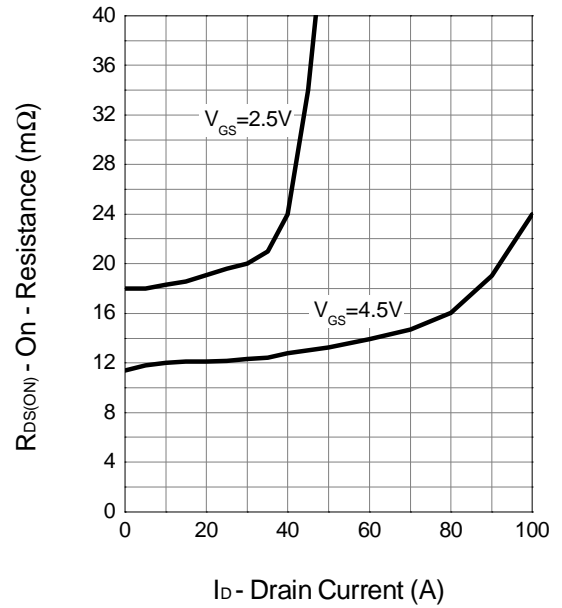


Typical Characteristics (Cont.)

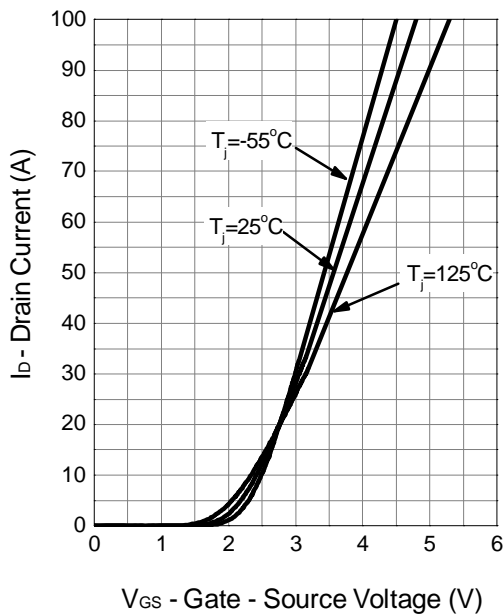
Output Characteristics



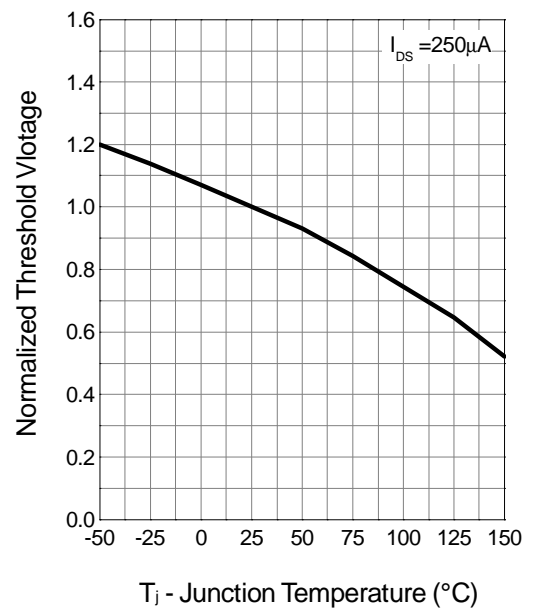
Drain-Source On Resistance



Transfer Characteristics

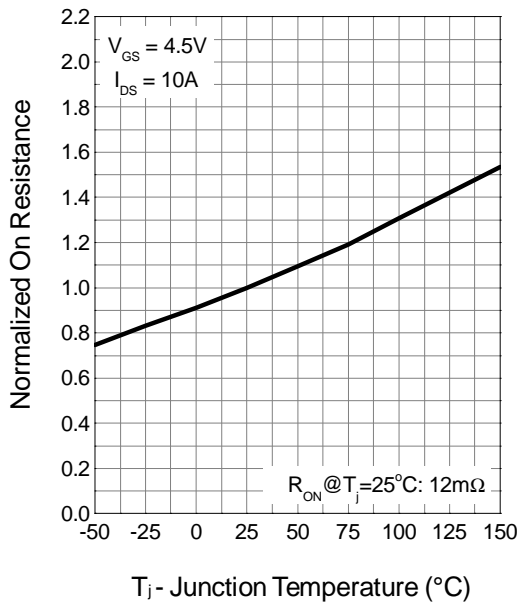


Gate Threshold Voltage

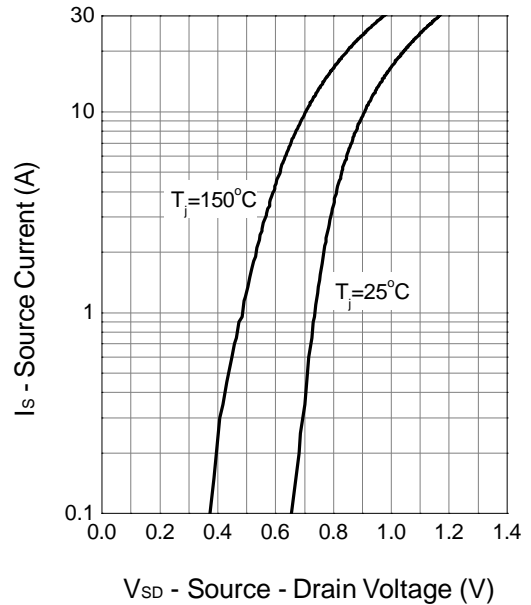


Typical Characteristics (Cont.)

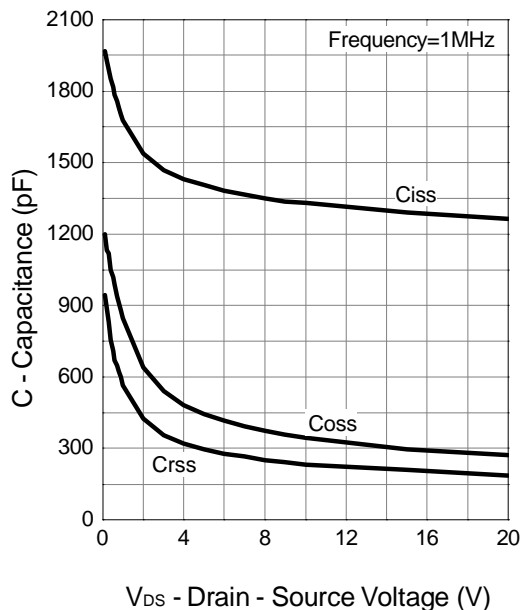
Drain-Source On Resistance



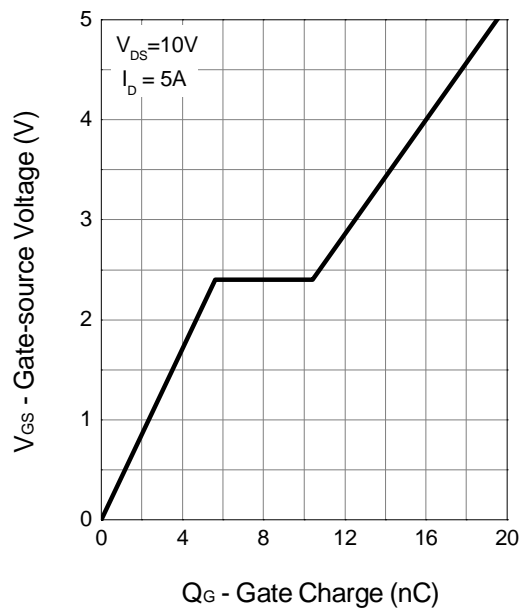
Source-Drain Diode Forward



Capacitance

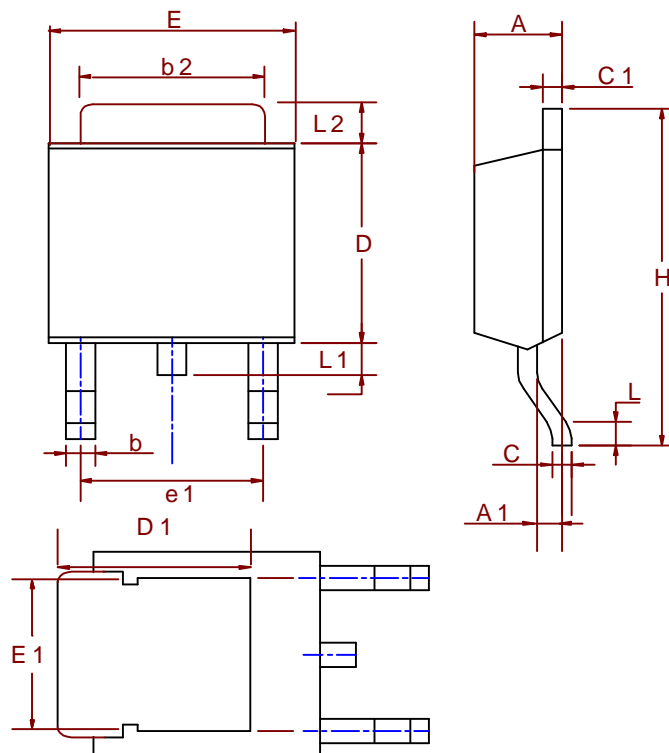


Gate Charge



## Package Information

TO-252 (Reference JEDEC Registration TO-252)

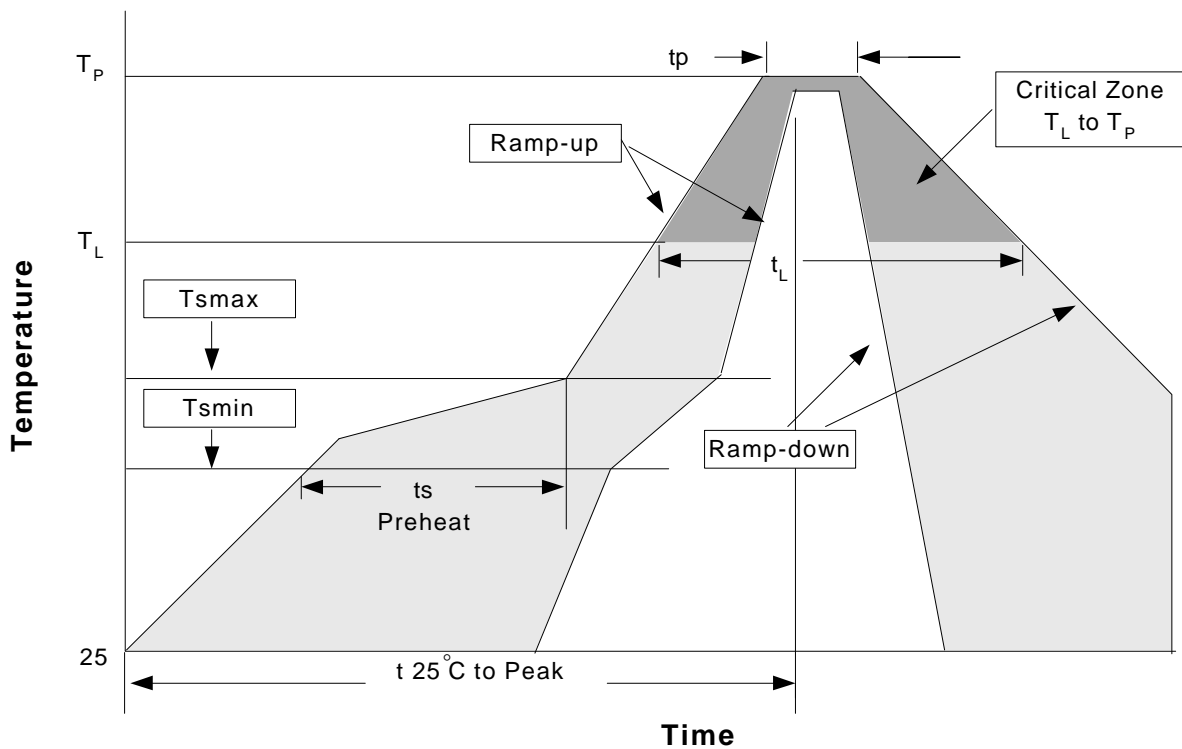


Dim	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	2.18	2.39	0.086	0.094
A1	0.89	1.27	0.035	0.050
b	0.508	0.89	0.020	0.035
b2	5.207	5.461	0.205	0.215
C	0.46	0.58	0.018	0.023
C1	0.46	0.58	0.018	0.023
D	5.334	6.22	0.210	0.245
D1	5.2 REF		0.205 REF	
E	6.35	6.73	0.250	0.265
E1	5.3 REF		0.209 REF	
e1	3.96	5.18	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 <sub>L</sub> to T <sub>P</sub> )	3°C/second max.	3°C/second max.
Preheat		
- Temperature Min (T <sub>smin</sub> )	100°C	150°C
- Temperature Max (T <sub>smax</sub> )	150°C	200°C
- Time (min to max) (t <sub>s</sub> )	60-120 seconds	60-180 seconds
Time maintained above:		
- Temperature (T <sub>L</sub> )	183°C	217°C
- Time (t <sub>L</sub> )	60-150 seconds	60-150 seconds
Peak/Classification Temperature (T <sub>P</sub> )	See table 1	See table 2
Time within 5°C of actual Peak Temperature (t <sub>p</sub> )	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 <sup>3</sup> <350	Volume mm <sup>3</sup> ≥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

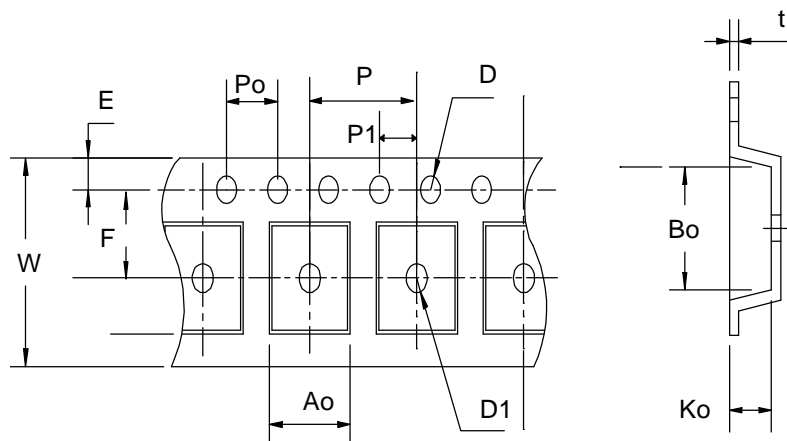
Package Thickness	Volume mm <sup>3</sup> <350	Volume mm <sup>3</sup> 350-2000	Volume mm <sup>3</sup> >2000
<1.6 mm	260 +0°C*	260 +0°C*	260 +0°C*
1.6 mm – 2.5 mm	260 +0°C*	250 +0°C*	245 +0°C*
≥2.5 mm	250 +0°C*	245 +0°C*	245 +0°C*

\*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.

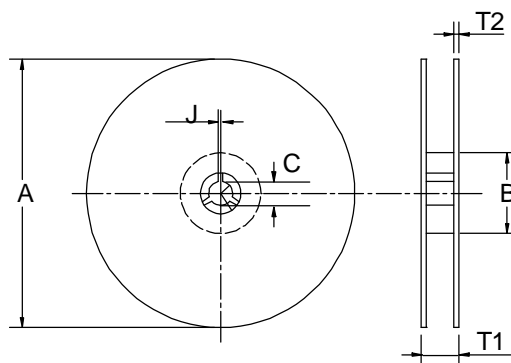
## Reliability Test Program

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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