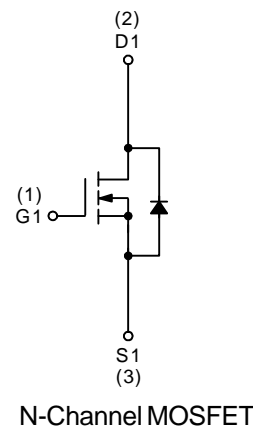


## N-Channel Enhancement Mode MOSFET

### Features

- 40V/20A,  
 $R_{DS(ON)} = 29m\Omega$  (typ.) @  $V_{GS} = 10V$   
 $R_{DS(ON)} = 45m\Omega$  (typ.) @  $V_{GS} = 5V$
- Super High Dense Cell Design
- Reliable and Rugged
- Lead Free Available (RoHS Compliant)

### Pin Description



### Applications

- Inverter Application in LCM and LCD TV

### Ordering and Marking Information

<p>APM4034N    □□-□□ □</p> <div style="margin-left: 20px;"> <p>└─── Lead Free Code</p> <p>└─── Handling Code</p> <p>└─── Temp. Range</p> <p>└─── Package Code</p> </div>	<p>Package Code                      U : TO-252                      Operating Junction Temp. Range                      C : -55 to 150°C                      Handling Code                      TU : Tube    TR : Tape &amp; Reel                      Lead Free Code                      L : Lead Free Device</p>
<p>APM4034N U : </p>	<p style="text-align: center;">XXXXX - Date Code</p>

Note: ANPEC lead-free products contain molding compounds and 100% matte tin plate termination finish; which are fully compliant with RoHS and compatible with both SnPb and lead-free soldering operations. ANPEC lead-free products meet or exceed the lead-free requirements of IPC/JEDEC J STD-020C for MSL classification at lead-free peak reflow temperature.

ANPEC reserves the right to make changes to improve reliability or manufacturability without notice, and advise customers to obtain the latest version of relevant information to verify before placing orders.

## 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	40	V	
$V_{GSS}$	Gate-Source Voltage	$\pm 20$		
$T_J$	Maximum Junction Temperature	150	$^\circ\text{C}$	
$T_{STG}$	Storage Temperature Range	-55 to 150	$^\circ\text{C}$	
$I_S$	Diode Continuous Forward Current	$T_C=25^\circ\text{C}$ 20*	A	
$I_{DP}$	300 $\mu\text{s}$ Pulse Drain Current Tested	$T_C=25^\circ\text{C}$	40	A
		$T_C=100^\circ\text{C}$	20	
$I_D$	Continuous Drain Current	$T_C=25^\circ\text{C}$	20*	A
		$T_C=100^\circ\text{C}$	10	
$P_D$	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	$^\circ\text{C/W}$	
$R_{\theta JA}$	Thermal Resistance-Junction to Ambient	50	$^\circ\text{C/W}$	

Notes :

\* Current limited by bond wire.

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

Symbol	Parameter	Test Condition	APM4034NU			Unit
			Min.	Typ.	Max.	
<b>Static Characteristics</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_{DS}=250\mu\text{A}$	40			V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=32V, V_{GS}=0V$ $T_J=85^\circ\text{C}$			1	$\mu\text{A}$
					30	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_{DS}=250\mu\text{A}$	1.5	2	3	V
$I_{GSS}$	Gate Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$			$\pm 100$	nA
$R_{DS(ON)}^a$	Drain-Source On-state Resistance	$V_{GS}=10V, I_{DS}=10A$		29	37	m $\Omega$
		$V_{GS}=5V, I_{DS}=5A$		45	62	
<b>Diode Characteristics</b>						
$V_{SD}^a$	Diode Forward Voltage	$I_{SD}=2A, V_{GS}=0V$		0.8	1.1	V
$t_{rr}$	Reverse Recovery Time	$I_{SD}=10A, dI_{SD}/dt = 100A/\mu\text{s}$		16		ns
$Q_{rr}$	Reverse Recovery Charge			8		nC

## Electrical Characteristics (Cont.) (T<sub>A</sub> = 25°C unless otherwise noted)

Symbol	Parameter	Test Condition	APM4034NU			Unit
			Min.	Typ.	Max.	
<b>Dynamic Characteristics<sup>b</sup></b>						
R <sub>G</sub>	Gate Resistance	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, F=1MHz		2		Ω
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =20V, Frequency=1.0MHz		500		pF
C <sub>oss</sub>	Output Capacitance			70		
C <sub>rss</sub>	Reverse Transfer Capacitance			50		
t <sub>d(ON)</sub>	Turn-on Delay Time	V <sub>DD</sub> =20V, R <sub>L</sub> =20Ω, I <sub>DS</sub> =1A, V <sub>GEN</sub> =10V, R <sub>G</sub> =6Ω		4	8	ns
T <sub>r</sub>	Turn-on Rise Time			11	21	
t <sub>d(OFF)</sub>	Turn-off Delay Time			17	32	
T <sub>f</sub>	Turn-off Fall Time			3	6	
<b>Gate Charge Characteristics<sup>b</sup></b>						
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> =20V, V <sub>GS</sub> =10V, I <sub>DS</sub> =10A		10	14	nC
Q <sub>gs</sub>	Gate-Source Charge			1.8		
Q <sub>gd</sub>	Gate-Drain Charge			2		

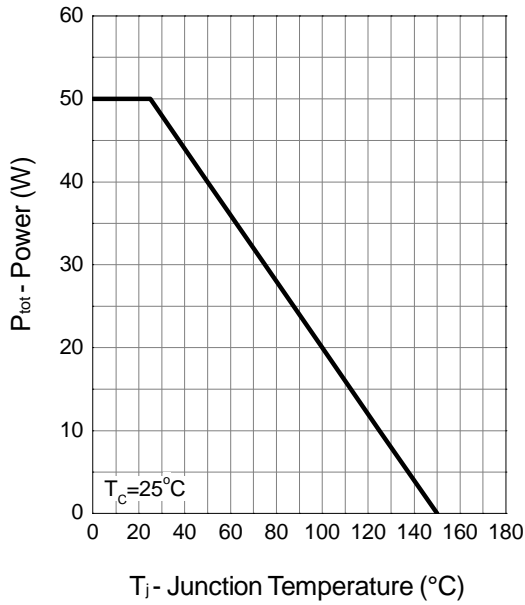
Notes :

a : Pulse test ; pulse width ≤ 300μs, duty cycle ≤ 2%.

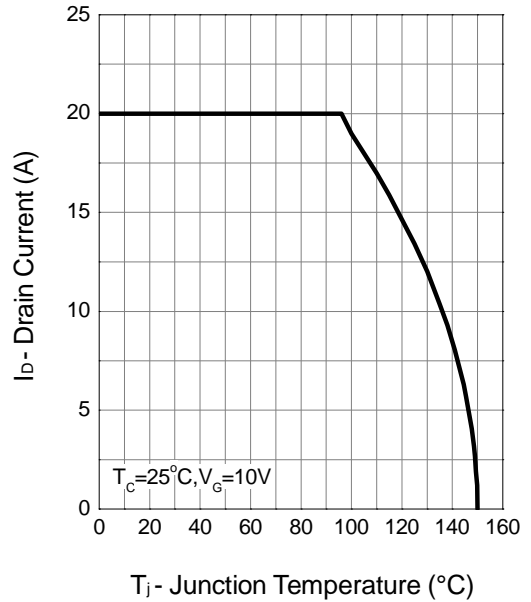
b : Guaranteed by design, not subject to production testing.

Typical Characteristics

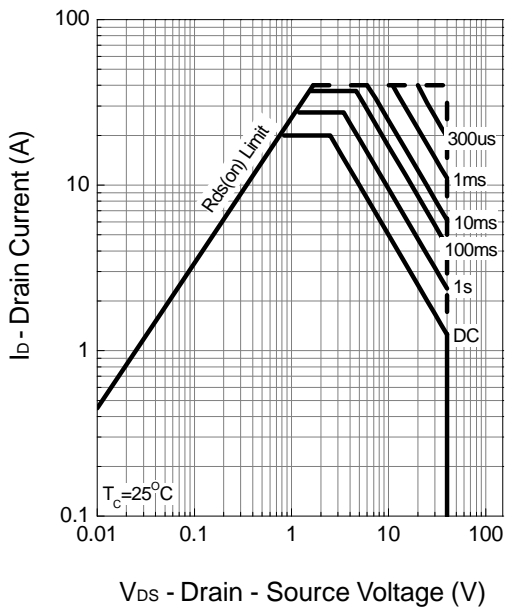
Power Dissipation



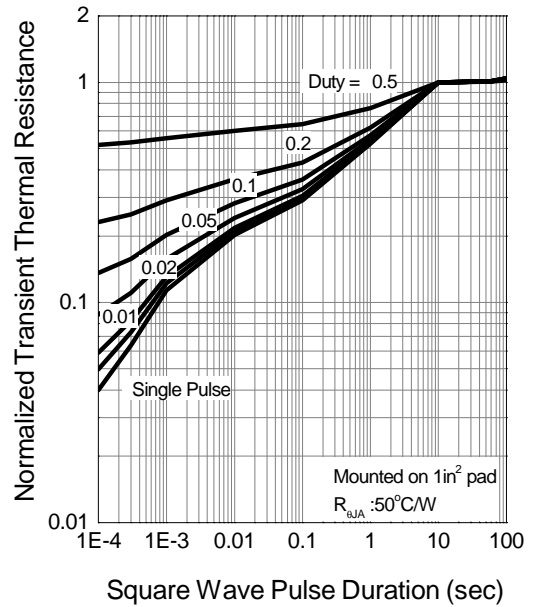
Drain Current



Safe Operation Area

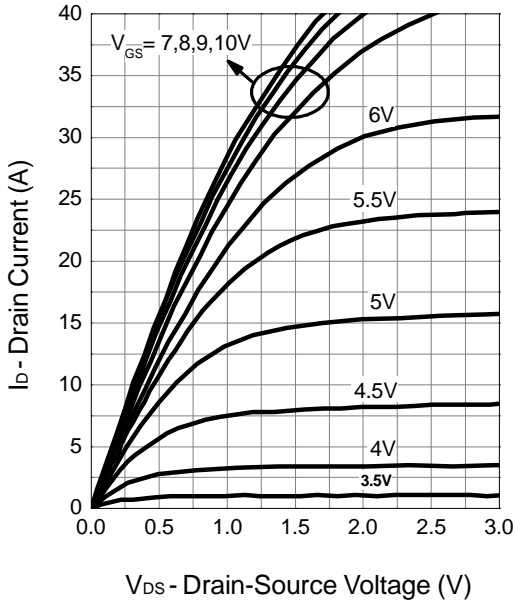


Thermal Transient Impedance

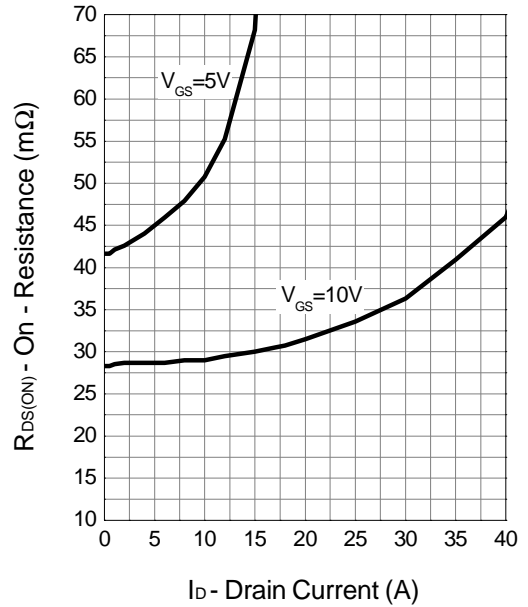


Typical Characteristics (Cont.)

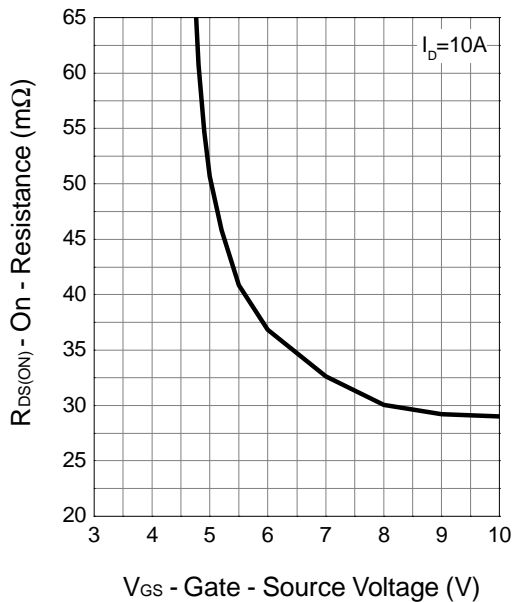
Output Characteristics



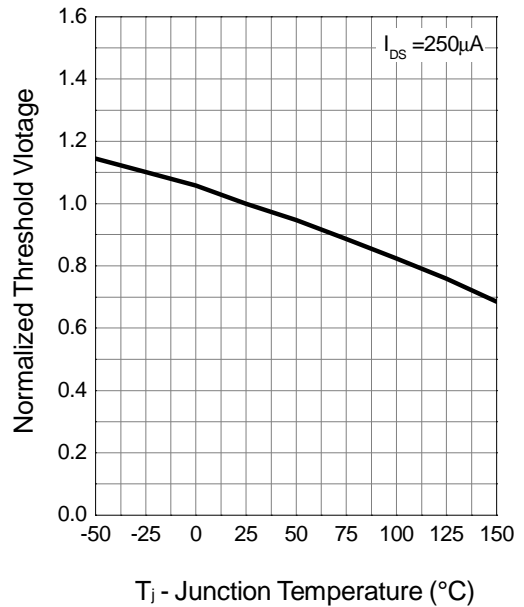
Drain-Source On Resistance



Drain-Source On Resistance

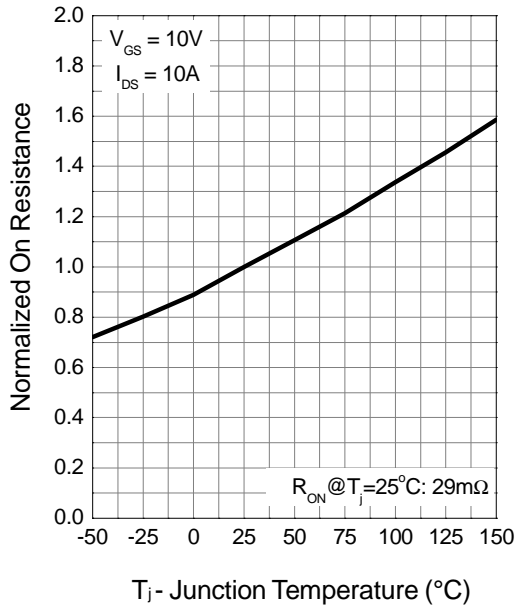


Gate Threshold Voltage

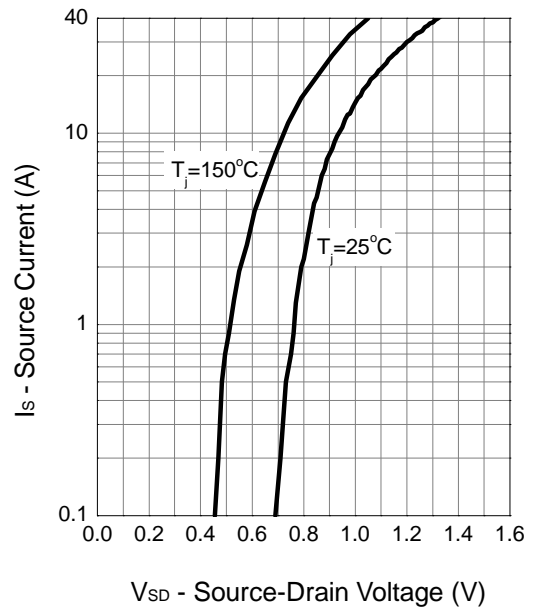


Typical Characteristics (Cont.)

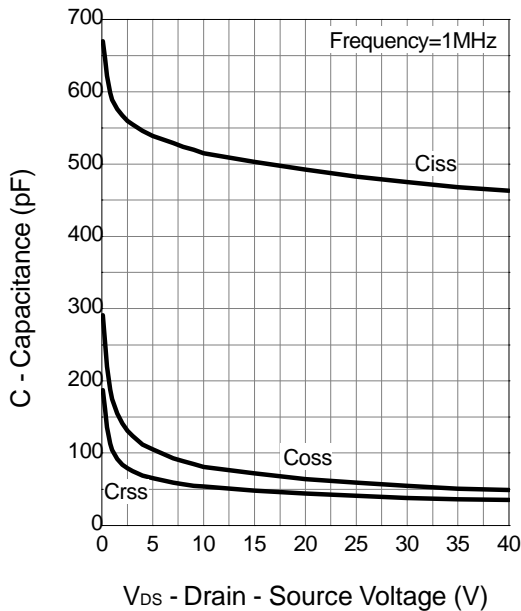
Drain-Source On Resistance



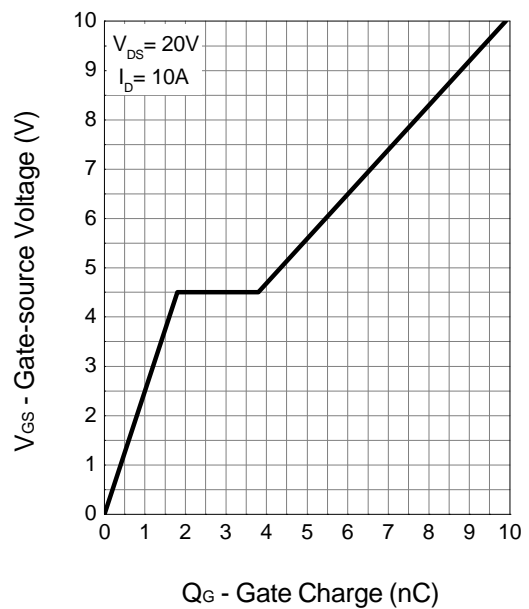
Source-Drain Diode Forward



Capacitance

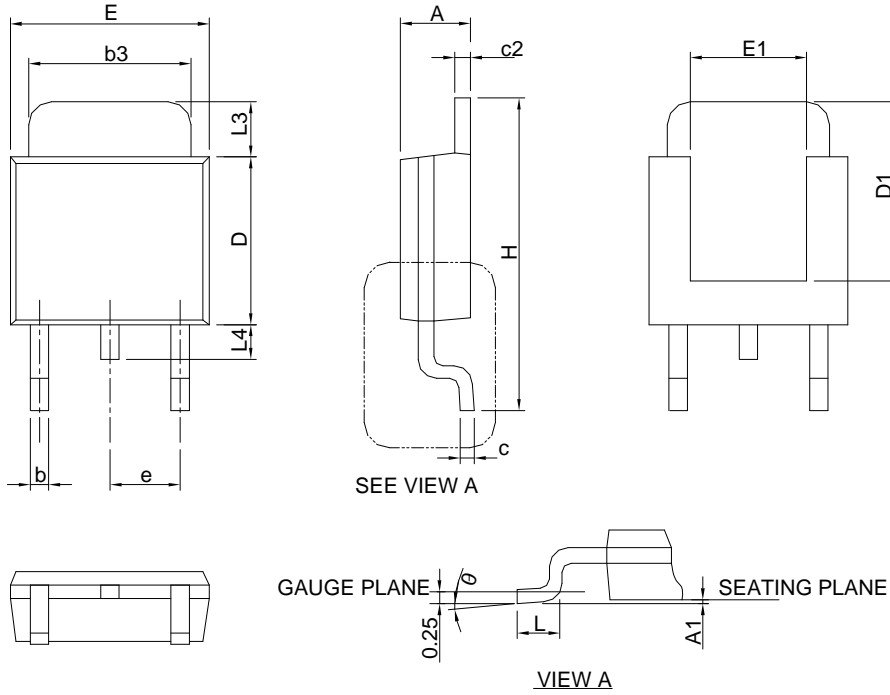


Gate Charge



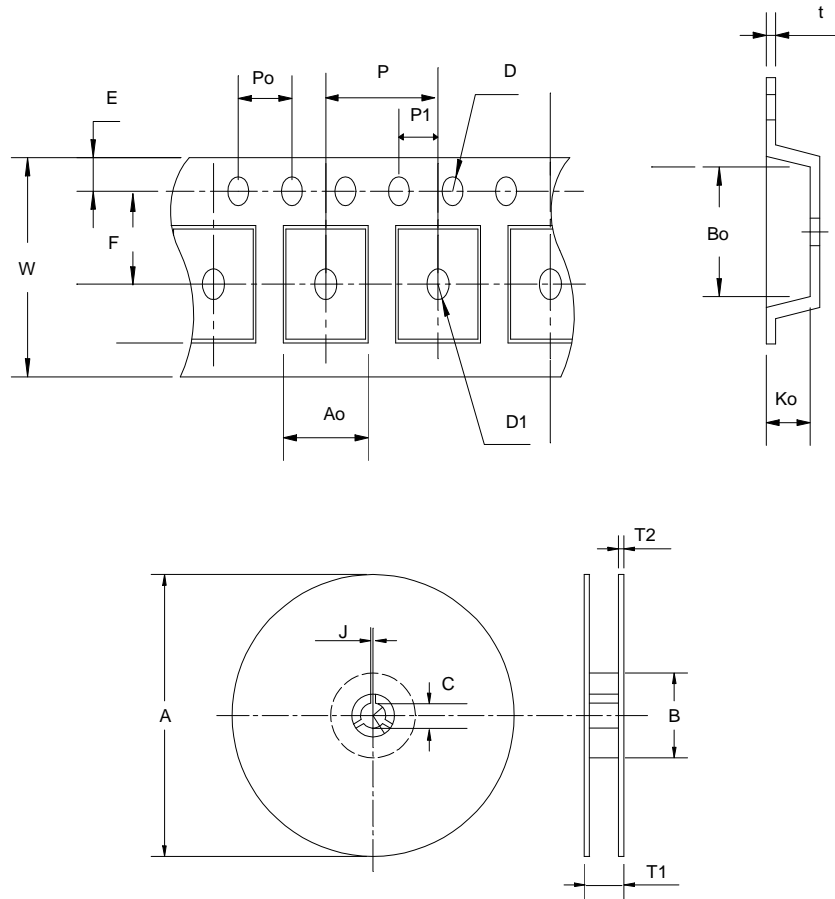
Package Information

T0252-3



SYMBOL	T0252			
	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		0.180	
E	6.35	6.73	0.250	0.265
E1	3.81		0.150	
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°

Carrier Tape



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

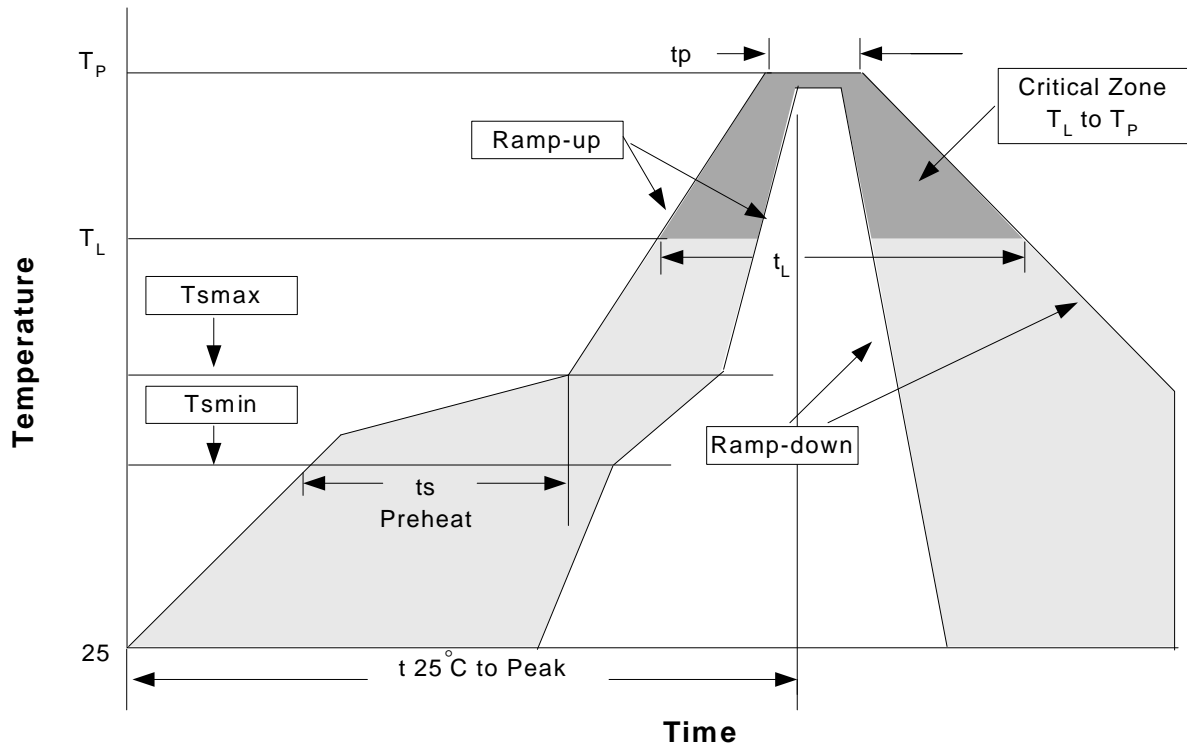
Application	Carrier Width	Cover Tape Width	Devices Per Reel
TO-252	16	13.3	2500



### 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

## Customer Service

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