

APM3023NU

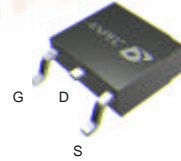


N-Channel Enhancement Mode MOSFET

Features

- 30V/30A,
 $R_{DS(ON)}=15m\Omega$ (typ.) @ $V_{GS}=10V$
 $R_{DS(ON)}=22m\Omega$ (typ.) @ $V_{GS}=4.5V$
- Super High Dense Cell Design
- Reliable and Rugged
- Lead Free Available (RoHS Compliant)

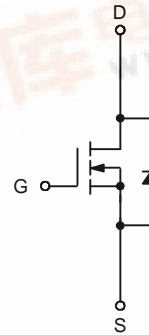
Pin Description



Top View of TO-252

Applications

- Power Management in Desktop Computer or DC/DC Converters



N-Channel MOSFET

Ordering and Marking Information

<p>APM3023N □□-□□ □</p> <p>Lead Free Code Handling Code Temp. Range Package Code</p>	<p>Package Code U : TO-252 Operating Junction Temp. Range C : -55 to 150° C Handling Code TU : Tube TR : Tape & Reel Lead Free Code L : Lead Free Device Blank : Original Device</p>
<p>APM3023N U : APM3023N XXXXX</p>	<p>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.

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	$T_C=25^{\circ}\text{C}$ 20	A	
Mounted on Large Heat Sink				
I_{DP}	300 μs Pulse Drain Current Tested	$T_C=25^{\circ}\text{C}$	100	A
		$T_C=100^{\circ}\text{C}$	60	
I_D	Continuous Drain Current	$T_C=25^{\circ}\text{C}$	30*	A
		$T_C=100^{\circ}\text{C}$	20	
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
		$T_A=100^{\circ}\text{C}$	60	
I_D	Continuous Drain Current	$T_A=25^{\circ}\text{C}$	10	A
		$T_A=100^{\circ}\text{C}$	4	
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
		$T_A=100^{\circ}\text{C}$	60	
I_D	Continuous Drain Current	$T_A=25^{\circ}\text{C}$	7	A
		$T_A=100^{\circ}\text{C}$	5	
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)

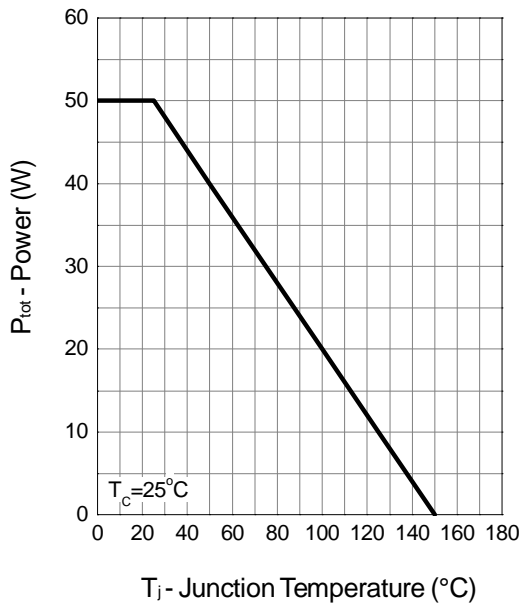
Symbol	Parameter	Test Condition	APM3023NU			Unit
			Min.	Typ.	Max.	
Static Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_{DS}=250\mu A$	30			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=24V, V_{GS}=0V$			1	μA
		$T_J=85^\circ C$			30	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_{DS}=250\mu A$	1	1.5	2	V
I_{GSS}	Gate Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$			± 100	nA
$R_{DS(ON)}^a$	Drain-Source On-state Resistance	$V_{GS}=10V, I_{DS}=20A$		15	20	m Ω
		$V_{GS}=4.5V, I_{DS}=10A$		22	28	
Diode Characteristics						
V_{SD}^a	Diode Forward Voltage	$I_{SD}=15A, V_{GS}=0V$		0.7	1.3	V
Dynamic Characteristics^b						
R_G	Gate Resistance	$V_{GS}=0V, V_{DS}=0V, F=1MHz$		2.5		Ω
C_{iss}	Input Capacitance	$V_{GS}=0V,$ $V_{DS}=25V,$ Frequency=1.0MHz		1040		pF
C_{oss}	Output Capacitance			200		
C_{riss}	Reverse Transfer Capacitance			85		
$t_{d(ON)}$	Turn-on Delay Time	$V_{DD}=15V, R_L=15\Omega,$ $I_{DS}=1A, V_{GEN}=10V,$ $R_G=6\Omega$		11	18	ns
T_r	Turn-on Rise Time			17	26	
$t_{d(OFF)}$	Turn-off Delay Time			37	54	
T_f	Turn-off Fall Time			20	30	
Q_{rr}	Body Diode Reverse Recovery Charge		$I_F=20A, di/dt=100A/\mu s$		12.1	
T_{rr}	Body Diode Reverse Recovery Time			22		
Gate Charge Characteristics^b						
Q_g	Total Gate Charge	$V_{DS}=15V, V_{GS}=10V,$ $I_{DS}=20A$		30	40	nC
Q_{gs}	Gate-Source Charge			5.8		
Q_{gd}	Gate-Drain Charge			3.8		

Notes:

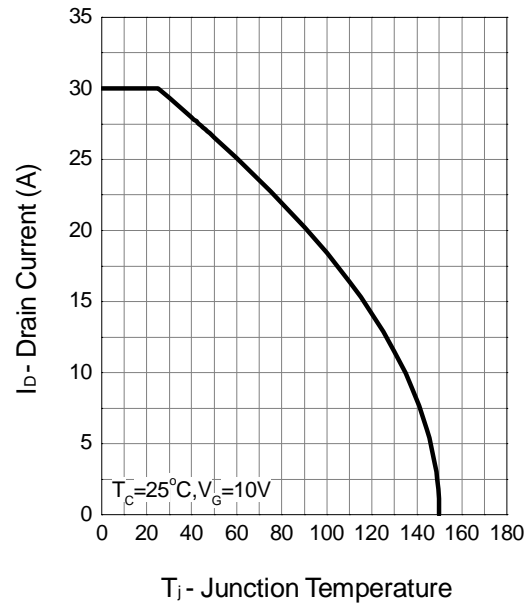
- a : Pulse test ; pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$.
- b : Guaranteed by design, not subject to production testing.

Typical Characteristics

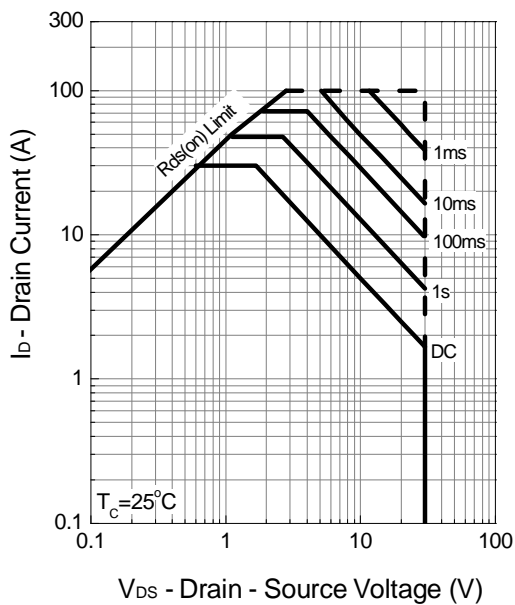
Power Dissipation



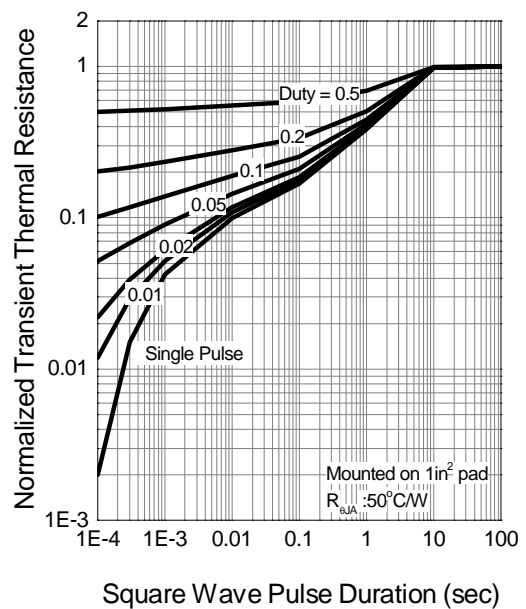
Drain Current



Safe Operation Area

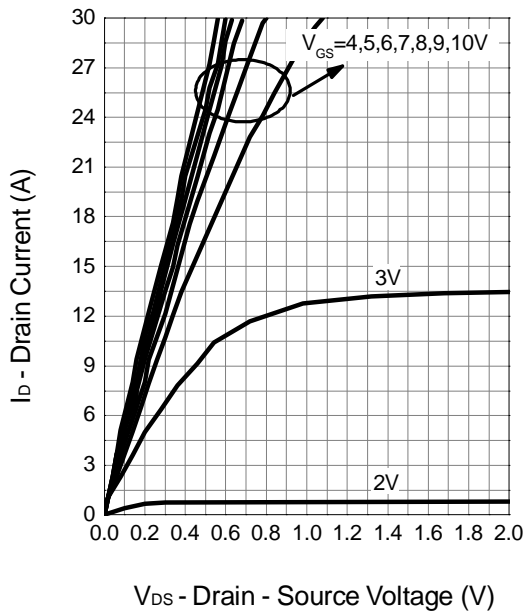


Thermal Transient Impedance

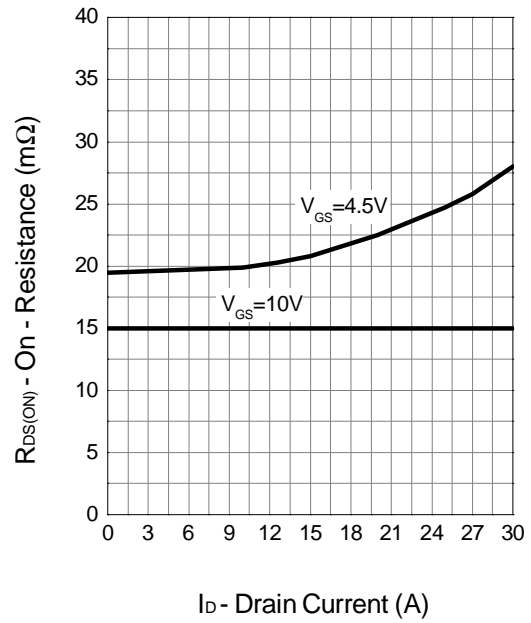


Typical Characteristics (Cont.)

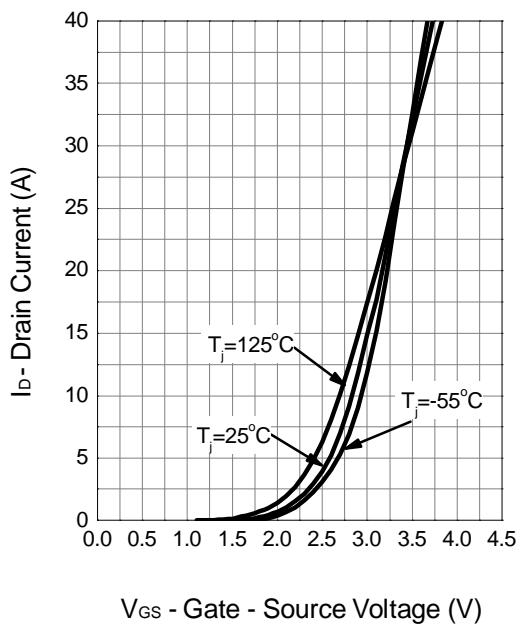
Output Characteristics



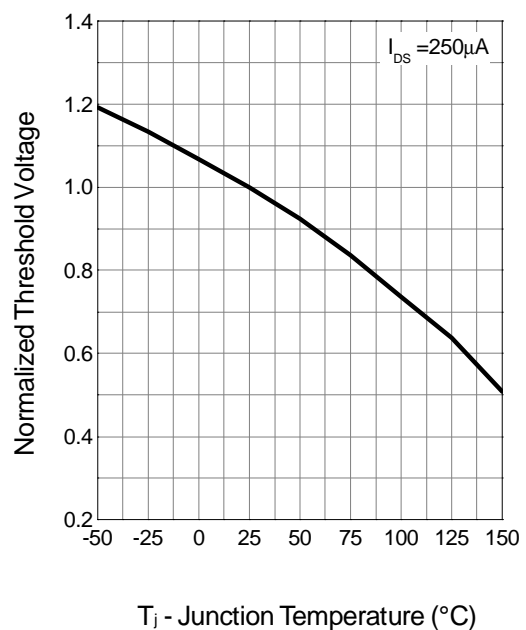
Drain-Source On Resistance



Transfer Characteristics

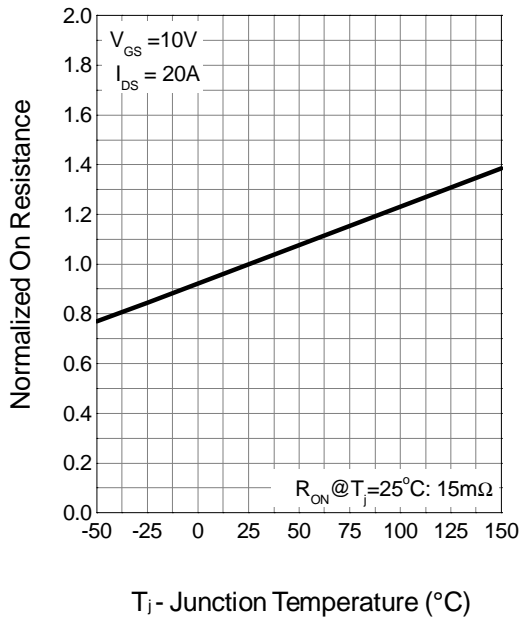


Gate Threshold Voltage

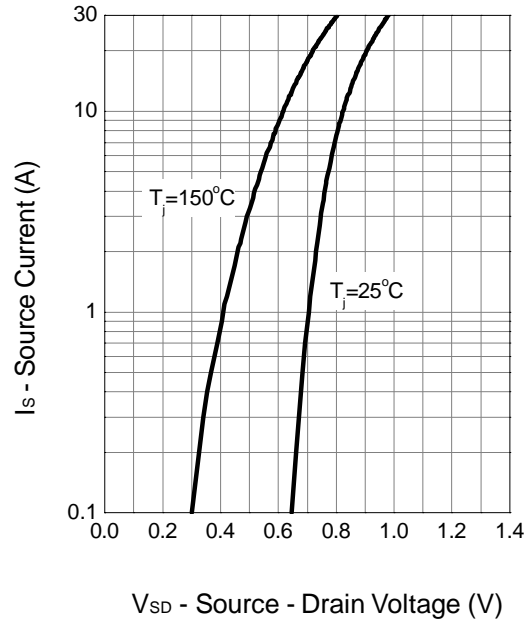


Typical Characteristics (Cont.)

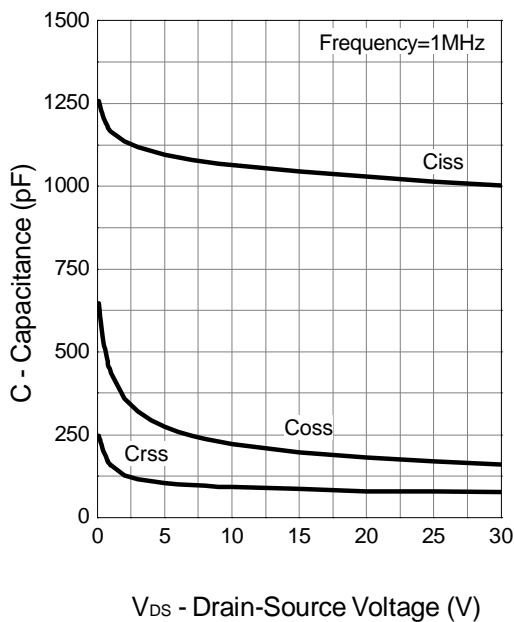
Drain-Source On Resistance



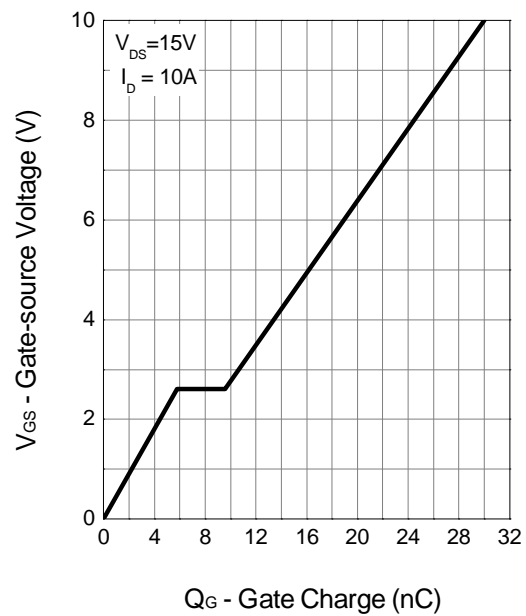
Source-Drain Diode Forward



Capacitance

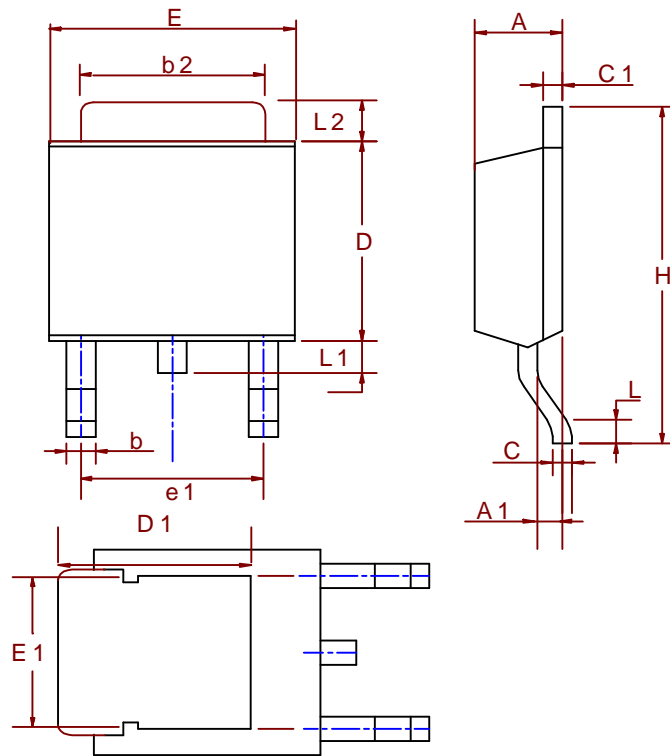


Gate Charge



Package Information

TO-252 (Reference JEDEC Registration TO-252)

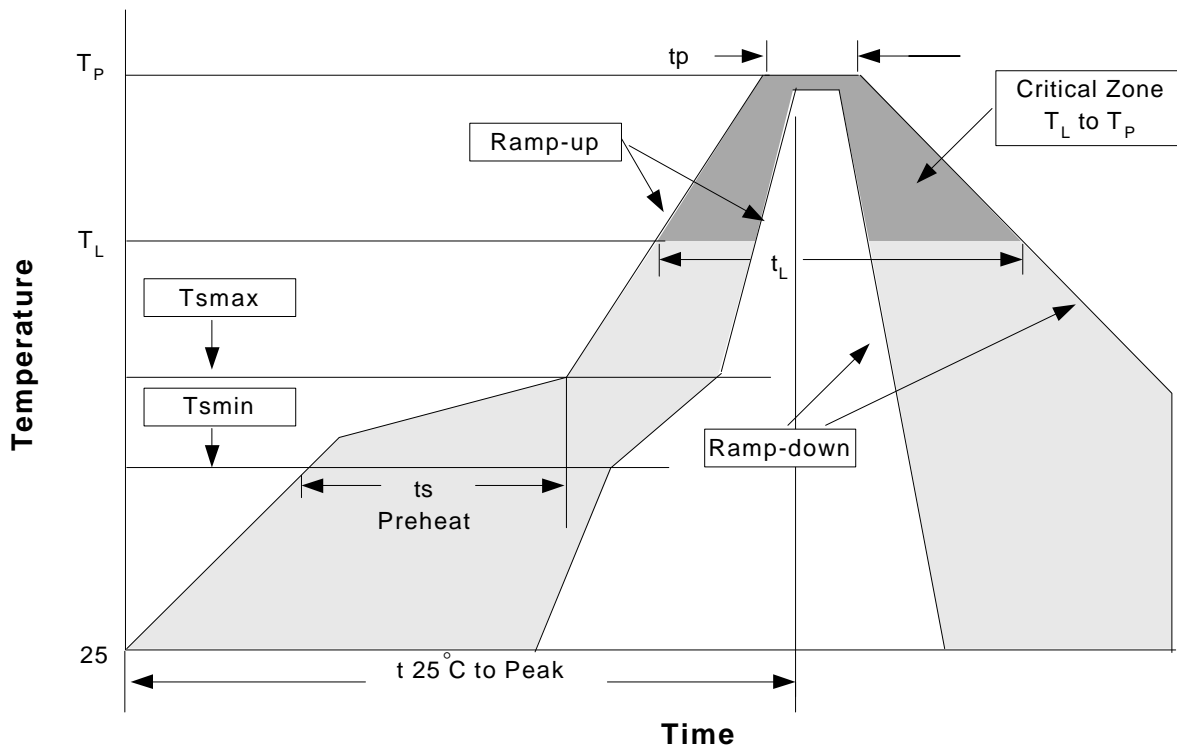


Dim	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	2.18	2.39	0.086	0.094
A1	0.89	1.27	0.035	0.050
b	0.508	0.89	0.020	0.035
b2	5.207	5.461	0.205	0.215
C	0.46	0.58	0.018	0.023
C1	0.46	0.58	0.018	0.023
D	5.334	6.22	0.210	0.245
D1	5.2 REF		0.205 REF	
E	6.35	6.73	0.250	0.265
E1	5.3 REF		0.209 REF	
e1	3.96	5.18	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 _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

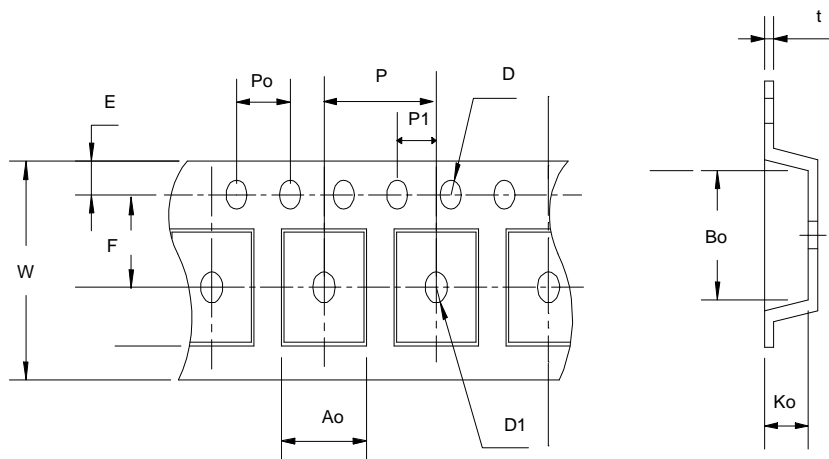
Package Thickness	Volume mm ³ <350	Volume mm ³ 350-2000	Volume mm ³ >2000
<1.6 mm	260 +0°C*	260 +0°C*	260 +0°C*
1.6 mm – 2.5 mm	260 +0°C*	250 +0°C*	245 +0°C*
≥2.5 mm	250 +0°C*	245 +0°C*	245 +0°C*

*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.

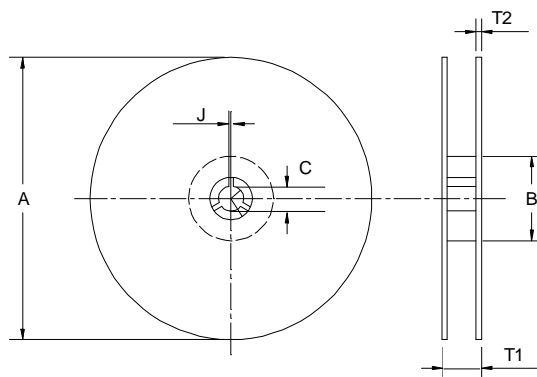
Reliability Test Program

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



Carrier Tape(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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