APM2014NU

N-Channel Enhancement Mode MOSFET

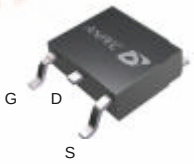
Features

- 20V/40A,
  $R_{DS(ON)}$=12mΩ (typ.) @ V_{GS}=4.5V
  $R_{DS(ON)}$=18mΩ (typ.) @ V_{GS}=2.5V
- Super High Dense Cell Design
- Reliable and Rugged
- Lead Free Available (RoHS Compliant)

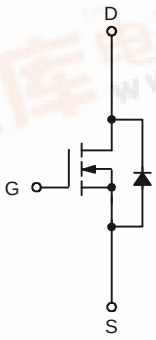
Applications

- Power Management in Desktop Computer or DC/DC Converters

Pin Description



Top View of TO-252



N-Channel MOSFET

Ordering and Marking Information

APM2014N □□-□□ □ Lead Free Code Handling Code Temp. Range Package Code	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
APM2014N U : 	XXXXX - Date Code

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 soldiering 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°C Unless Otherwise Noted)				
V_{DSS}	Drain-Source Voltage		20	V
V_{GSS}	Gate-Source Voltage		±16	
T_J	Maximum Junction Temperature		150	°C
T_{STG}	Storage Temperature Range		-55 to 150	°C
I_S	Diode Continuous Forward Current	T_C=25°C	16	A
Mounted on Large Heat Sink				
I_{DP}	300µs Pulse Drain Current Tested	T_C=25°C	100	A
		T_C=100°C	75	
I_D	Continuous Drain Current	T_C=25°C	40*	A
		T_C=100°C	25	
P_D	Maximum Power Dissipation	T_C=25°C	50	W
		T_C=100°C	20	
$R_{\theta JC}$	Thermal Resistance-Junction to Case		2.5	°C/W
Mounted on PCB of 1in^2 pad area				
I_{DP}	300µs Pulse Drain Current Tested	T_A=25°C	100	A
		T_A=100°C	75	
I_D	Continuous Drain Current	T_A=25°C	10	A
		T_A=100°C	6	
P_D	Maximum Power Dissipation	T_A=25°C	2.5	W
		T_A=100°C	1	
$R_{\theta JA}$	Thermal Resistance-Junction to Ambient		50	°C/W
Mounted on PCB of Minimum Footprint				
I_{DP}	300µs Pulse Drain Current Tested	T_A=25°C	100	A
		T_A=100°C	75	
I_D	Continuous Drain Current	T_A=25°C	9	A
		T_A=100°C	6	
P_D	Maximum Power Dissipation	T_A=25°C	1.6	W
		T_A=100°C	0.6	
$R_{\theta JA}$	Thermal Resistance-Junction to Ambient		75	°C/W

Note:

* Current limited by bond wire.

Electrical Characteristics (T_A = 25°C unless otherwise noted)

Symbol	Parameter	Test Condition	APM2014NU			Unit
			Min.	Typ.	Max.	
Static Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V, I_{DS}=250µA	20			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=16V, V_{GS}=0V			1	µA
		T_J=85°C			30	
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS}, I_{DS}=250µA	0.7	0.9	1.5	V
I_{GSS}	Gate Leakage Current	V_{GS}=±16V, V_{DS}=0V			±100	nA
$R_{DS(ON)}$ [a]	Drain-Source On-state Resistance	V_{GS}=4.5V, I_{DS}=10A		12	14	mΩ
		V_{GS}=2.5V, I_{DS}=5A		18	25	
Diode						
V_{SD} [a]	Diode Forward Voltage	I_{SD}=4A, V_{GS}=0V		0.8	1.3	V
Dynamic Characteristics [b]						
R_G	Gate Resistance	V_{GS}=0V,V_{DS}=0V,F=1MHz		1.7		Ω
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=15V, Frequency=1.0MHz		1290		pF
C_{oss}	Output Capacitance			300		
C_{rss}	Reverse Transfer Capacitance			210		
$t_{d(ON)}$	Turn-on Delay Time	V_{DD}=10V, R_L=10Ω, I_{DS}=1A, V_{GEN}=4.5V, R_G=6Ω		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/µs		20		ns
Q_{rr} [b]	Reverse Recovery Charge			9		nC
Gate Charge Characteristics [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		

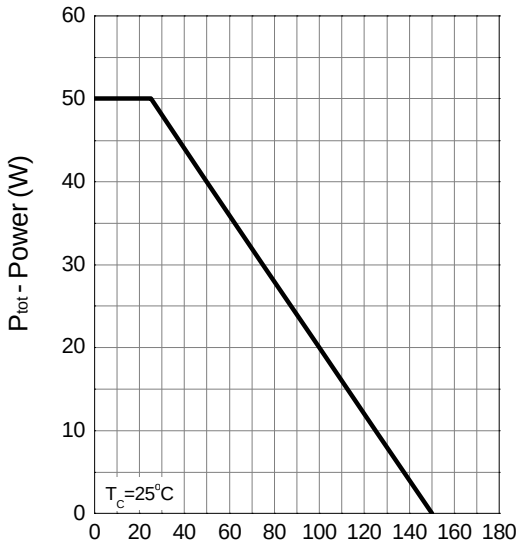
Notes:

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

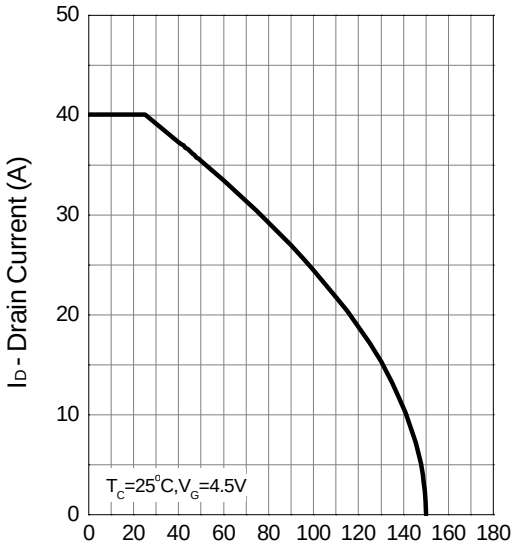
b : Guaranteed by design, not subject to production testing.

Typical Characteristics

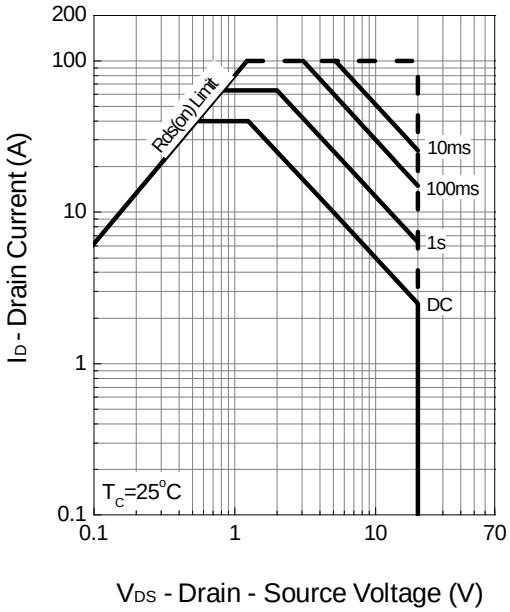
Power Dissipation



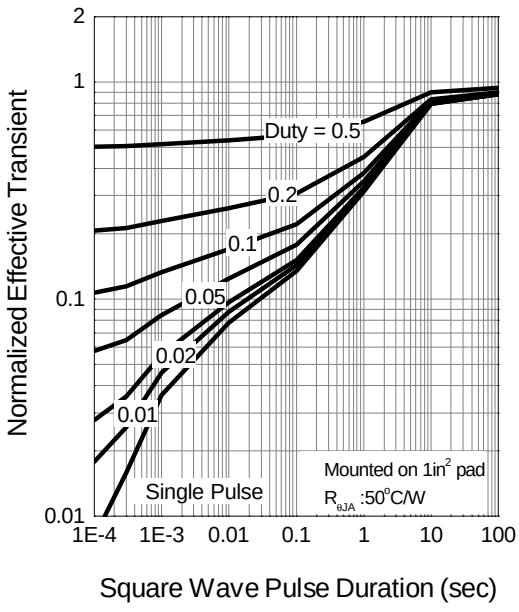
Drain Current



Safe Operation Area

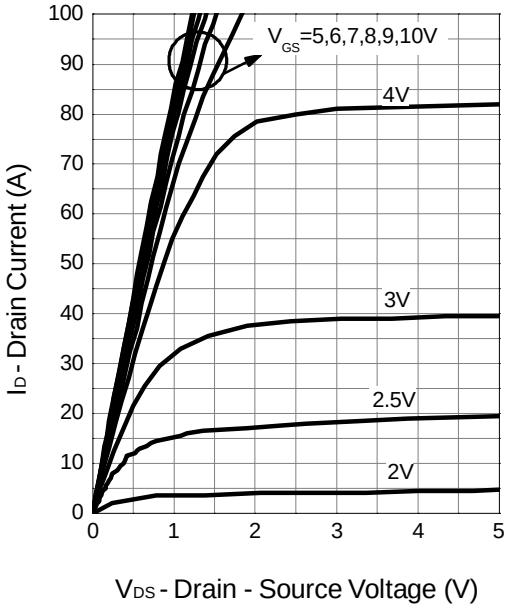


Thermal Transient Impedance

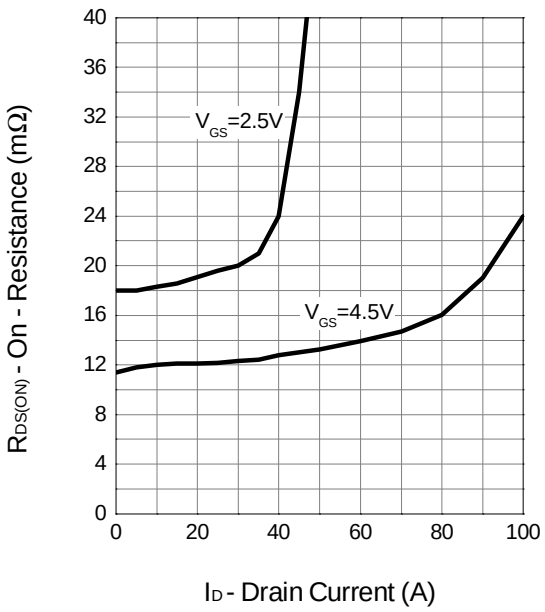


Typical Characteristics (Cont.)

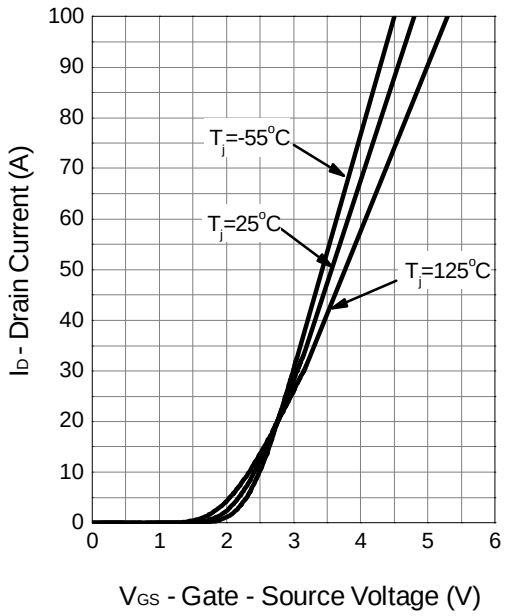
Output Characteristics



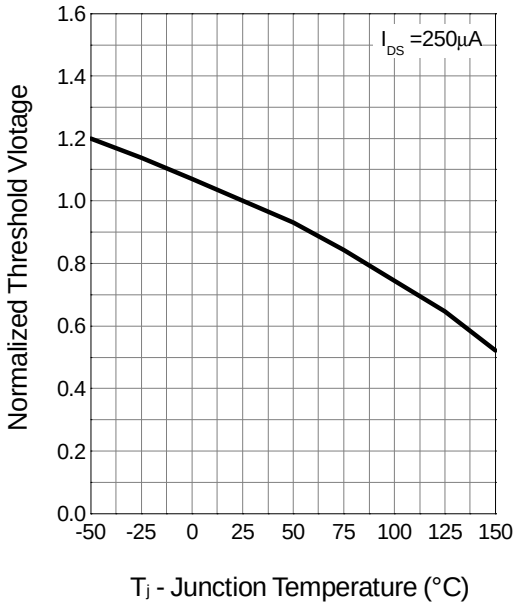
Drain-Source On Resistance



Transfer Characteristics

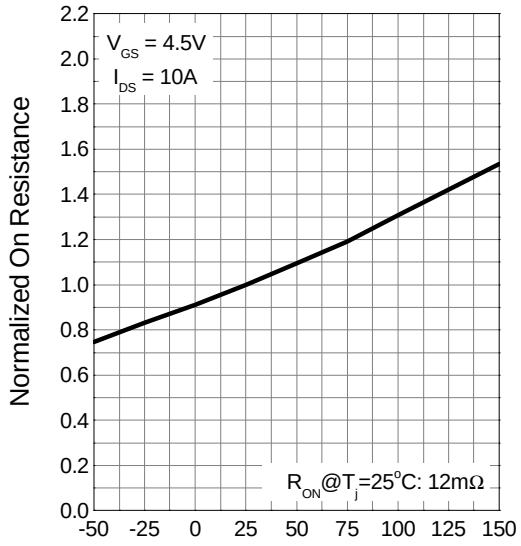


Gate Threshold Voltage

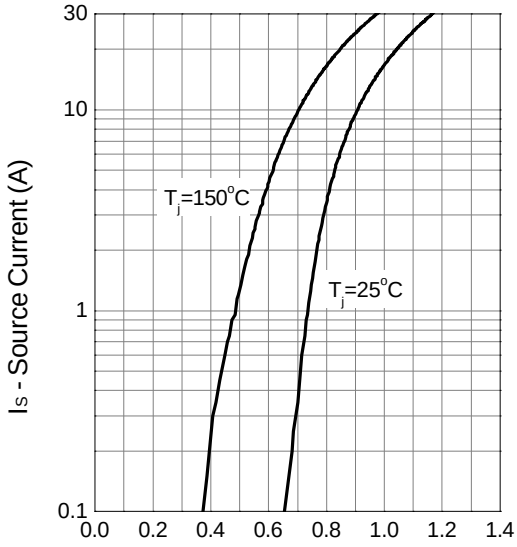


Typical Characteristics (Cont.)

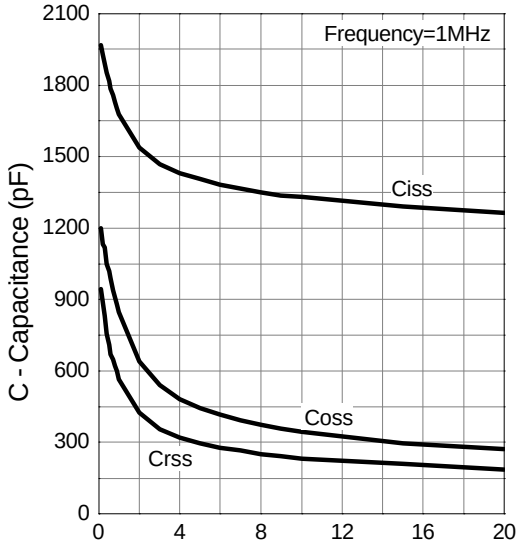
Drain-Source On Resistance



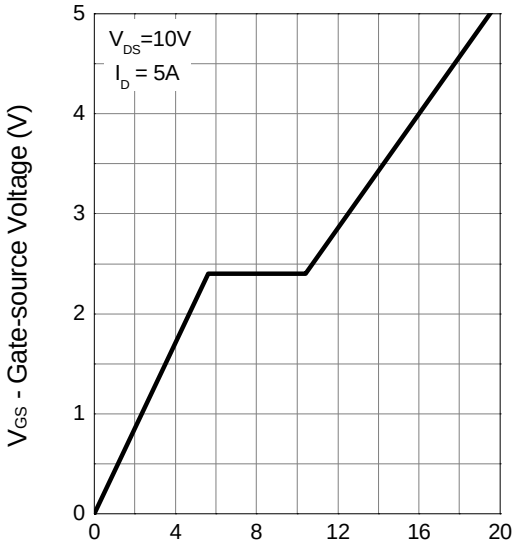
Source-Drain Diode Forward



Capacitance

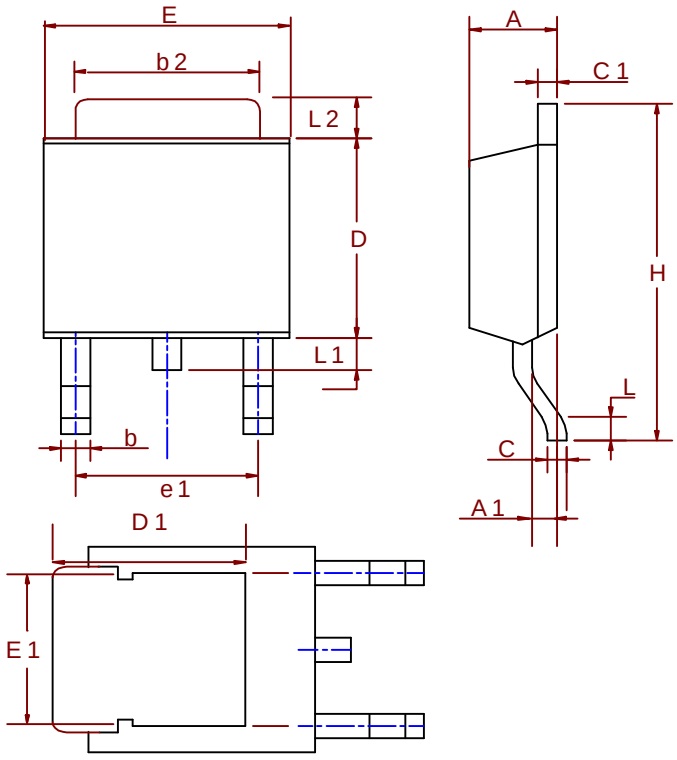


Gate Charge



Package Information

TO-252 (Reference JEDEC Registration TO-252)

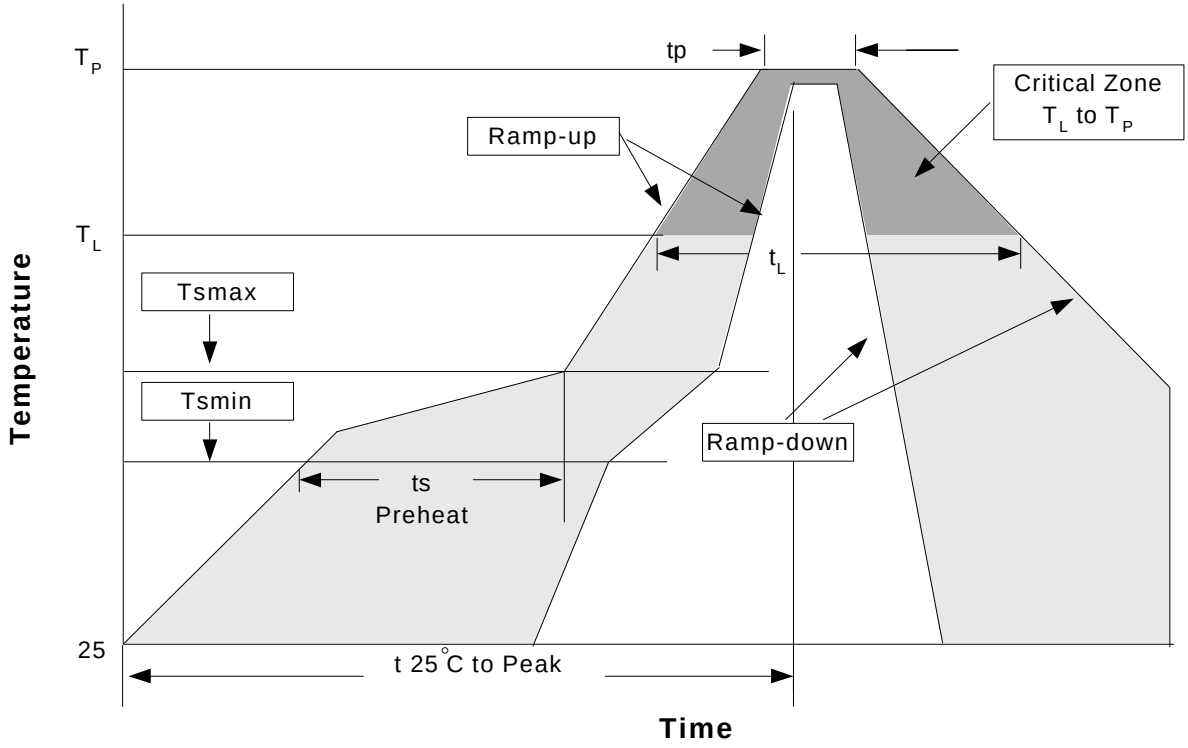


Dim	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	2.18	2.39	0.086	0.094
A1	0.89	1.27	0.035	0.050
b	0.508	0.89	0.020	0.035
b2	5.207	5.461	0.205	0.215
C	0.46	0.58	0.018	0.023
C1	0.46	0.58	0.018	0.023
D	5.334	6.22	0.210	0.245
D1	5.2 REF		0.205 REF	
E	6.35	6.73	0.250	0.265
E1	5.3 REF		0.209 REF	
e1	3.96	5.18	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 (Tsmin) - Temperature Max (Tsmax) - Time (min to max) (ts)	100°C 150°C 60-120 seconds	150°C 200°C 60-180 seconds
Time maintained above: - Temperature (T_L) - Time (t_L)	183°C 60-150 seconds	217°C 60-150 seconds
Peak/Classificatioon Temperature (Tp)	See table 1	See table 2
Time within 5°C of actual Peak Temperature (tp)	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 Entectic Process – Package Peak Reflow Temperatures

Package Thickness	Volume mm^3 <350	Volume mm^3 ³350
<2.5 mm	240 +0/-5°C	225 +0/-5°C
≥2.5 mm	225 +0/-5°C	225 +0/-5°C

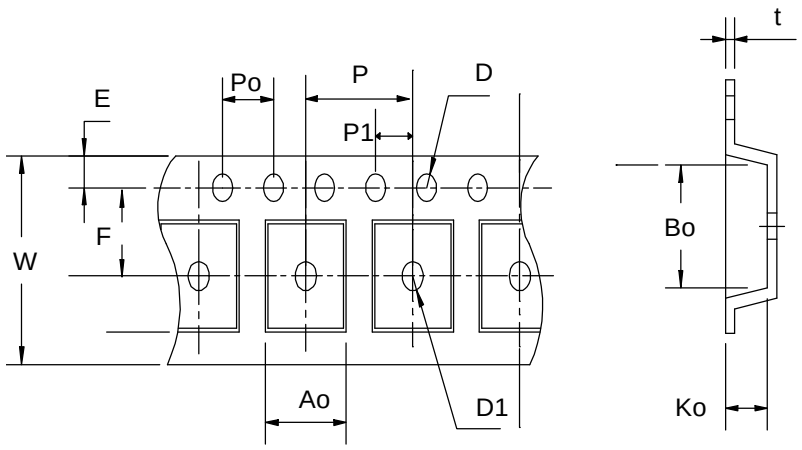
Table 2. Pb-free Process – Package Classification Reflow Temperatures

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.			

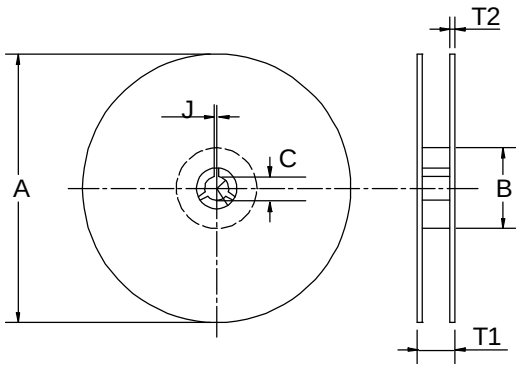
Reliability Test Program

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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