APM4010NU

N-Channel Enhancement Mode MOSFET

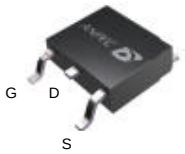
Features

- 40V/57A,
  $R_{DS(ON)}$=8.2mΩ (typ.) @ V_{GS}=10V
  $R_{DS(ON)}$=13mΩ (typ.) @ V_{GS}=5V
- Super High Dense Cell Design
- Reliable and Rugged
- Lead Free and Green Devices Available (RoHS Compliant)

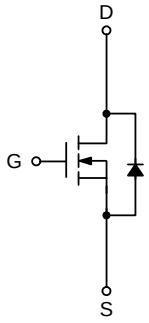
Applications

- Power Management in LCD monitor/TV inverter.

Pin Description



Top View of TO-252



N-Channel MOSFET

Ordering and Marking Information

APM4010N □□-□□□

- Assembly Material
- Handling Code
- Temp. Range
- Package Code

Package Code
U : TO-252
Operating Junction Temp. Range
C : -55 to 150°C
Handling Code
TR : Tape & Reel
Assembly Material
L : Lead Free Device
G : Halogen and Lead Free Device

APM4010N U :



XXXXX - Date Code

Note: ANPEC lead-free products contain molding compounds/die attach materials and 100% matte tin plate termination finish; which are fully compliant with RoHS. 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 defines "Green" to mean lead-free (RoHS compliant) and halogen free (Br or Cl does not exceed 900ppm by weight in homogeneous material and total of Br and Cl does not exceed 1500ppm by weight).

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.

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Absolute Maximum Ratings

Symbol	Parameter		Rating	Unit
Common Ratings (T_A=25°C Unless Otherwise Noted)				
V_{DSS}	Drain-Source Voltage		40	V
V_{GSS}	Gate-Source Voltage		±20	
T_J	Maximum Junction Temperature		150	°C
T_{STG}	Storage Temperature Range		-55 to 150	°C
I_S	Diode Continuous Forward Current		20	A
Mounted on Large Heat Sink				
I_{DP}	300µs Pulse Drain Current Tested	T_C=25°C	140	A
		T_C=100°C	100	
I_D	Continuous Drain Current	T_C=25°C	57	A
		T_C=100°C	35	
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_C=25°C	48	A
		T_C=100°C	32	
I_D	Continuous Drain Current	T_A=25°C	12	A
		T_A=100°C	8	
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_C=25°C	40	A
		T_C=100°C	24	
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	1.5	W
		T_A=100°C	0.5	
$R_{\theta JA}$	Thermal Resistance-Junction to Ambient		75	°C/W

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Electrical Characteristics (T_A=25°C Unless Otherwise Noted)

Symbol	Parameter	Test Condition	APM4010NU			Unit
			Min.	Typ.	Max.	
Static Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V, I_{DS}=250μA	40			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=32V, V_{GS}=0V			1	μA
		T_J=85°C			30	
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS}, I_{DS}=250μA	1.5	2	2.5	V
I_{GSS}	Gate Leakage Current	V_{GS}=±20V, V_{DS}=0V			±100	nA
$R_{DS(ON)}$ [a]	Drain-Source On-state Resistance	V_{GS}=10V, I_{DS}=15A		8.2	10	mΩ
		V_{GS}=5V, I_{DS}=8A		13	17	
Diode Characteristics						
V_{SD} [a]	Diode Forward Voltage	I_{SD}=15A, V_{GS}=0V		0.8	1.1	V
t_{rr}	Reverse Recovery Time	I_{DS}=15A, dI_{SD}/dt=100A/μs		28		ns
Q_{rr}	Reverse Recovery Charge			25		nC
Gate Charge Characteristics [b]						
Q_g	Total Gate Charge	V_{DS}=20V, V_{GS}=10V, I_{DS}=15A		29	41	nC
Q_{gs}	Gate-Source Charge			3.6		
Q_{gd}	Gate-Drain Charge			9.6		
Dynamic Characteristics [b]						
R_G	Gate Resistance	V_{GS}=0V,V_{DS}=0V,F=1MHz		1.5		Ω
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=20V, Frequency=1.0MHz		1400		pF
C_{oss}	Output Capacitance			215		
C_{rss}	Reverse Transfer Capacitance			150		
$t_{d(ON)}$	Turn-on Delay Time	V_{DD}=20V, R_L=20Ω, I_{DS}=1A, V_{GEN}=10V, R_G=6Ω		12	23	ns
t_r	Turn-on Rise Time			12	23	
$t_{d(OFF)}$	Turn-off Delay Time			37	68	
t_f	Turn-off Fall Time			12	23	

Notes：

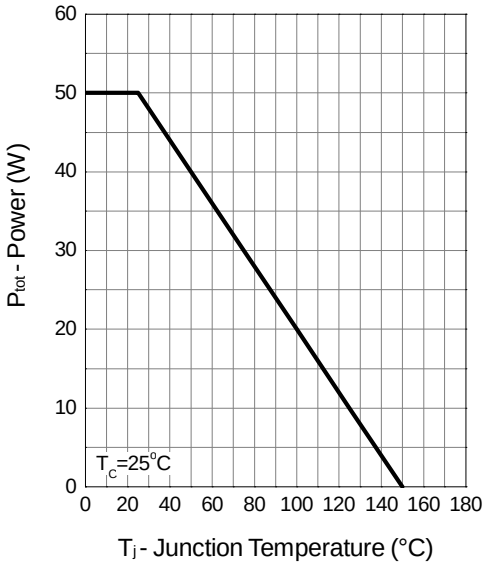
a : Pulse test ; pulse width≤300μs, duty cycle≤2%.

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

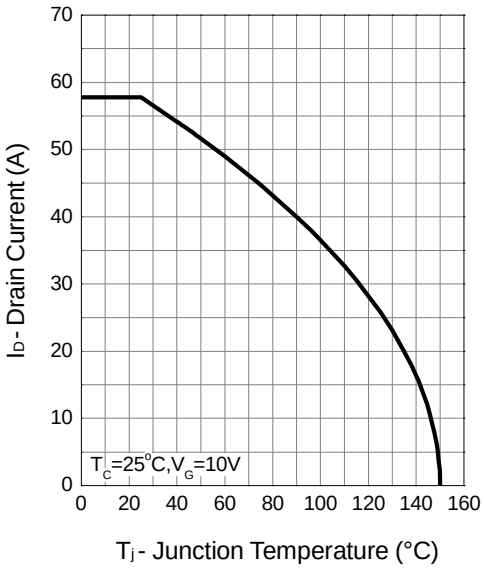
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Typical Characteristics

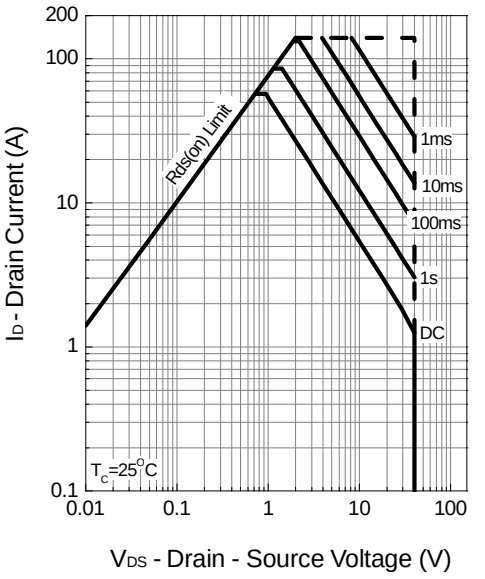
Power Dissipation



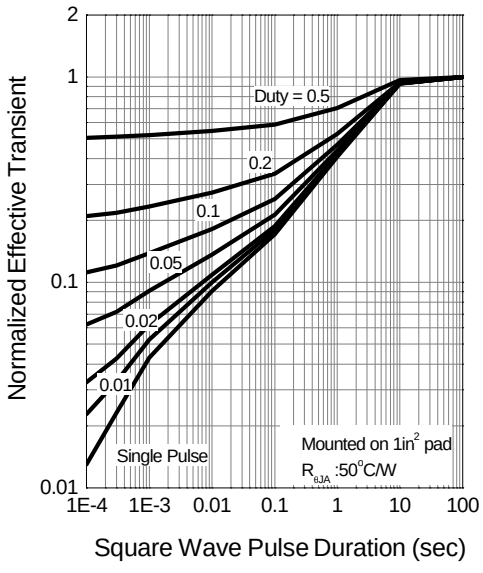
Drain Current



Safe Operation Area



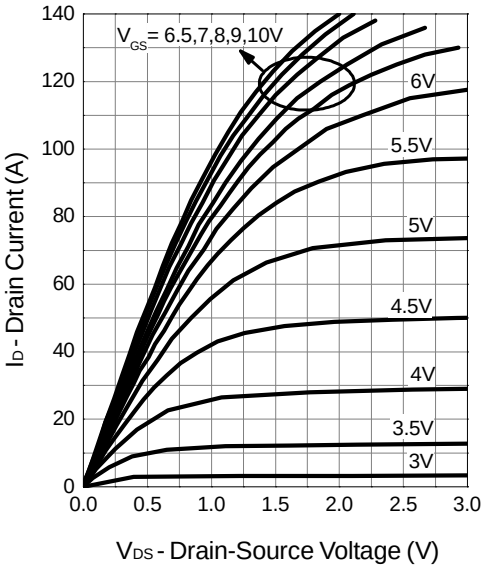
Thermal Transient Impedance



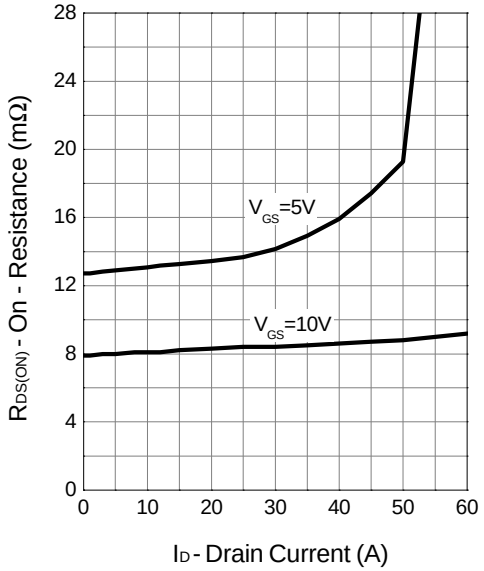
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Typical Characteristics (Cont.)

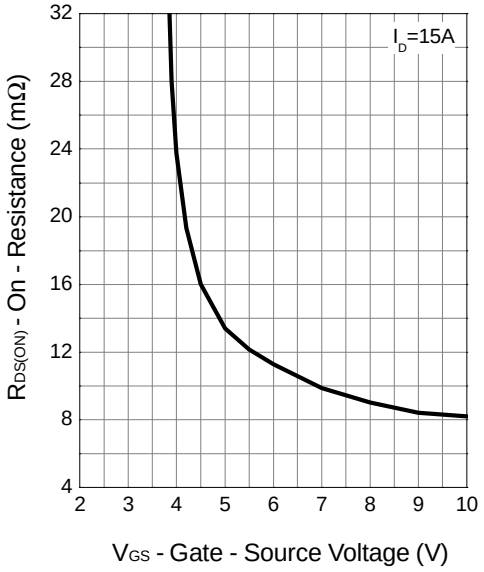
Output Characteristics



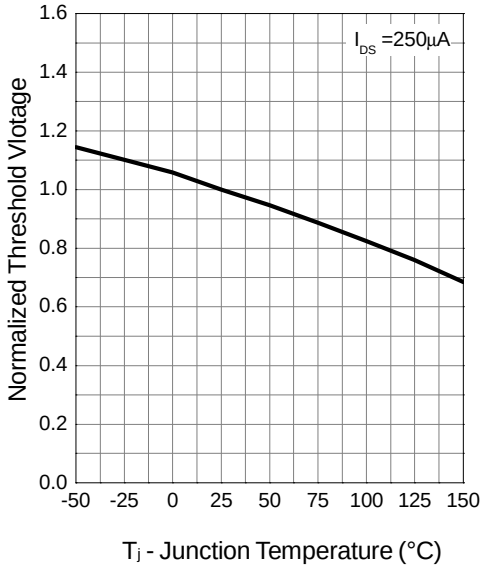
Drain-Source On Resistance



Drain-Source On Resistance



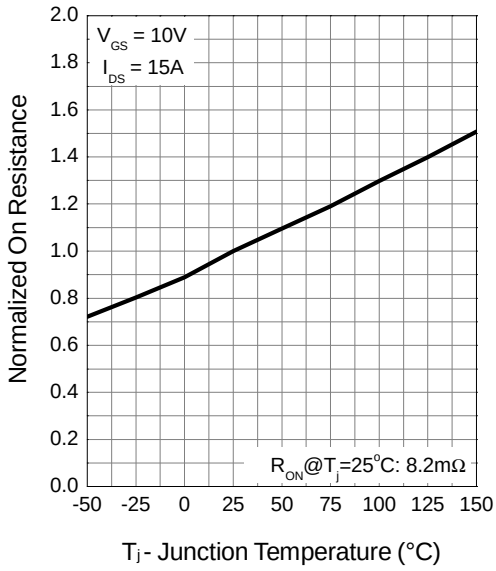
Gate Threshold Voltage



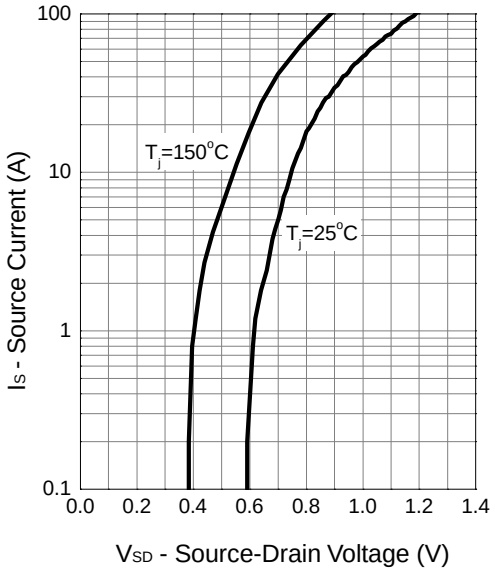
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Typical Characteristics (Cont.)

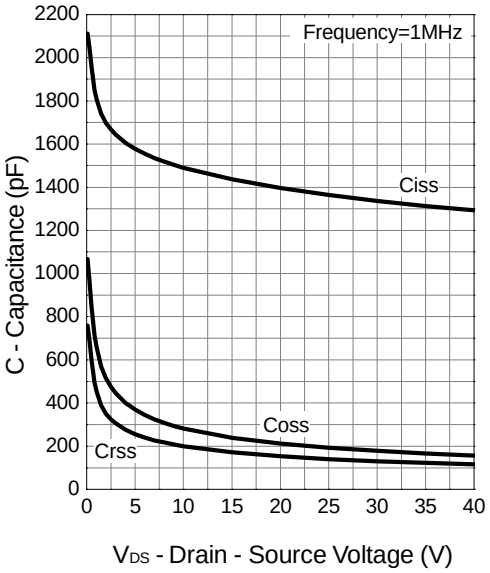
Drain-Source On Resistance



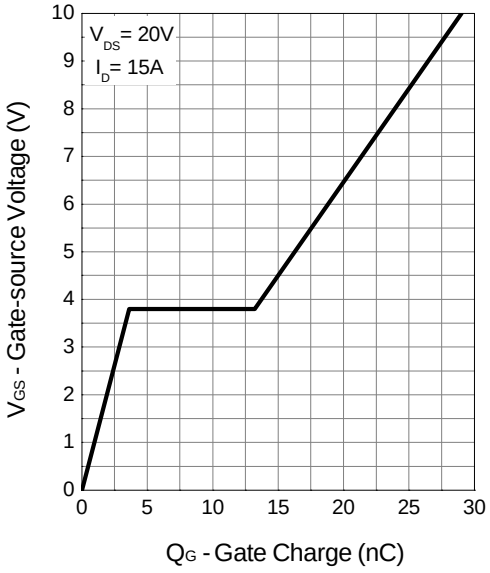
Source-Drain Diode Forward



Capacitance



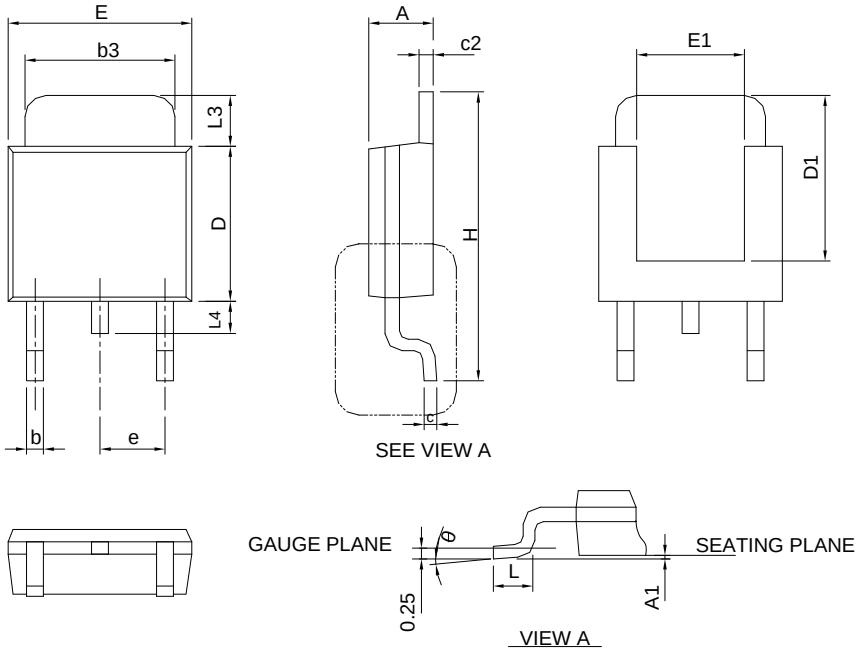
Gate Charge



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Package Information

TO-252

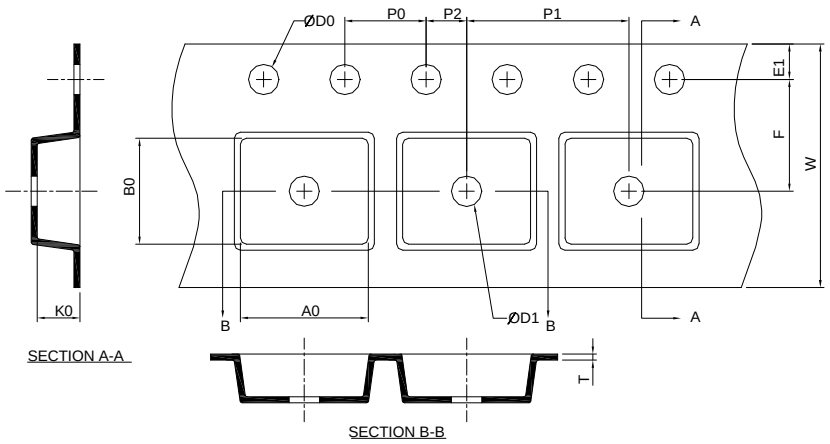


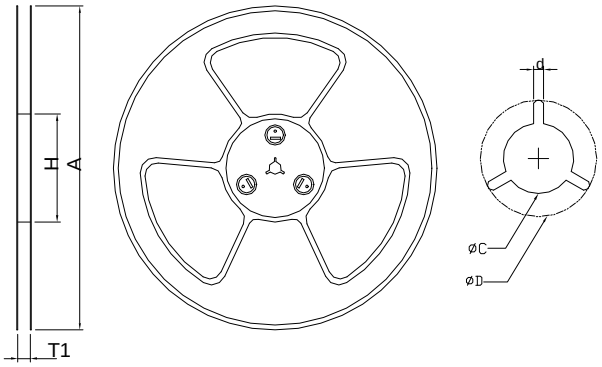
SYMBOL	TO-252			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	2.18	2.39	0.086	0.094
A1		0.13		0.005
b	0.50	0.89	0.020	0.035
b3	4.95	5.46	0.195	0.215
c	0.46	0.61	0.018	0.024
c2	0.46	0.89	0.018	0.035
D	5.33	6.22	0.210	0.245
D1	4.57	6.00	0.180	0.235
E	6.35	6.73	0.250	0.265
E1	3.81	6.00	0.150	0.235
e	2.29 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°

Note : Follow JEDEC TO-252 .

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Carrier Tape & Reel Dimensions





Application	A	H	T1	C	d	D	W	E1	F
TO-252	330.0±2.00	50 MIN.	16.4+2.00 -0.00	13.0+0.50 -0.20	1.5 MIN.	20.2 MIN.	16.0±0.30	1.75±0.10	7.50±0.05
	P0	**P1**	**P2**	**D0**	**D1**	**T**	**A0**	**B0**	**K0**
	4.0±0.10	8.0±0.10	2.0±0.05	1.5+0.10 -0.00	1.5 MIN.	0.6+0.00 -0.40	6.80±0.20	10.40±0.20	2.50±0.20

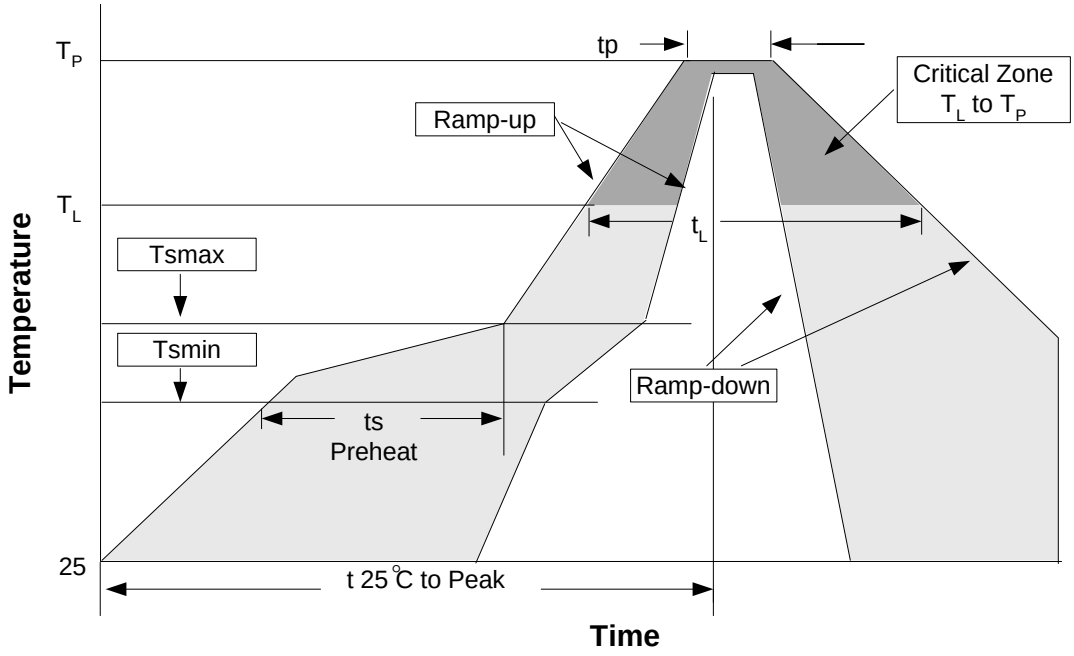
(mm)

Devices Per Unit

Package Type	Unit	Quantity
TO-252	Tape & Reel	2500

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Reflow Condition (IR/Convection or VPR Reflow)



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

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/Classification 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.

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

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Classification Reflow Profiles (Cont.)

Table 1. SnPb Eutectic 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.

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