

Absolute Maximum Ratings

Symbol	Parameter	Rating	Unit
Common Ratings ($T_A = 25^\circ\text{C}$ Unless Otherwise Noted)			
V_{DSS}	Drain-Source Voltage	-40	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
I_{DP}^*	300 μs Pulse Drain Current Tested	$T_C = 25^\circ\text{C}$ -90	A
		$T_C = 100^\circ\text{C}$ -60	
I_D^*	Continuous Drain Current	$T_C = 25^\circ\text{C}$ -45	A
		$T_C = 100^\circ\text{C}$ -30	
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:

* Surface Mounted on 1in^2 pad area, $t \leq 10$ sec.

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

Symbol	Parameter	Test Condition	APM4015PU			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	-1.3	-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} =-20A		13	16	mΩ
		V _{GS} =-4.5V, I _{DS} =-10A		19	25	
Diode Characteristics						
V _{SD} ^a	Diode Forward Voltage	I _{SD} =-20A, V _{GS} =0V		-0.75	-1.1	V
t _{rr}	Reverse Recovery Time	I _{SD} =-20A, dI _{SD} /dt=100A/μs		28		ns
Q _{rr}	Reverse Recovery Charge			26		nC

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

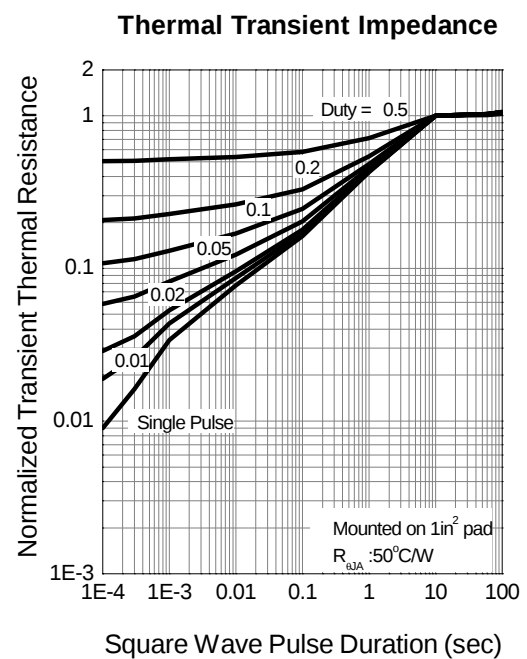
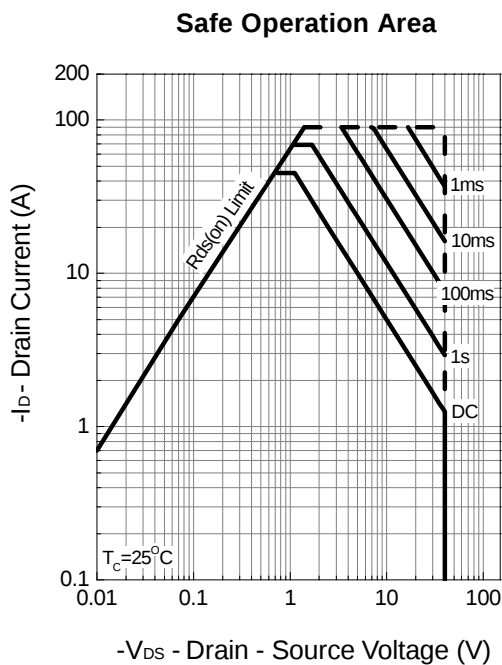
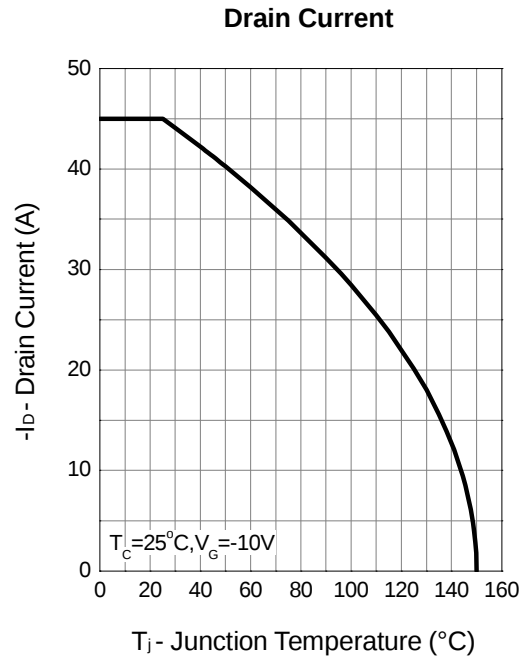
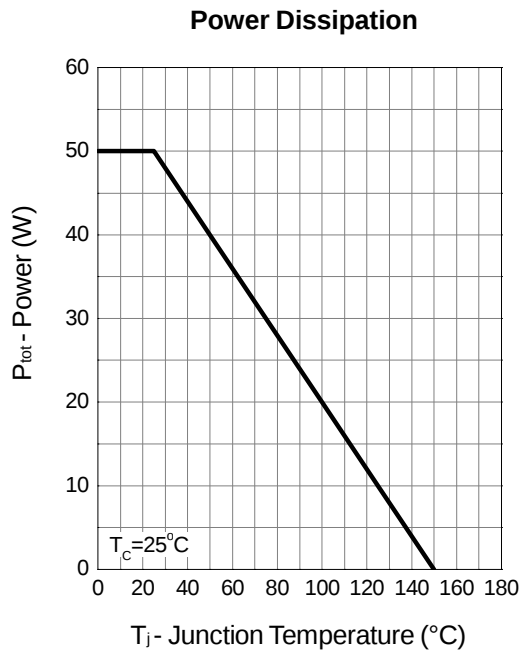
Symbol	Parameter	Test Condition	APM4015PU			Unit
			Min.	Typ.	Max.	
Dynamic Characteristics ^b						
R _G	Gate Resistance	V _{GS} =0V,V _{DS} =0V,F=1MHz		4		Ω
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =-20V, Frequency=1.0MHz		2800		pF
C _{oss}	Output Capacitance			320		
C _{rss}	Reverse Transfer Capacitance			220		
t _{d(ON)}	Turn-on Delay Time	V _{DD} =-20V, R _L =20Ω, I _{DS} =-1A, V _{GEN} =-10V, R _G =6Ω		11	21	ns
t _r	Turn-on Rise Time			75	135	
t _{d(OFF)}	Turn-off Delay Time			89	161	
t _f	Turn-off Fall Time			35	64	
Gate Charge Characteristics ^b						
Q _g	Total Gate Charge	V _{DS} =-20V, V _{GS} =-10V, I _{DS} =-20A		40	56	nC
Q _{gs}	Gate-Source Charge			6		
Q _{gd}	Gate-Drain Charge			12		

Notes:

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

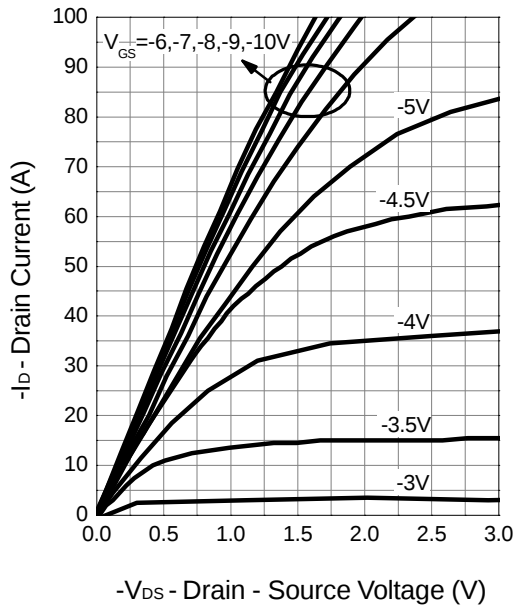
b : Guaranteed by design, not subject to production testing.

Typical Characteristics

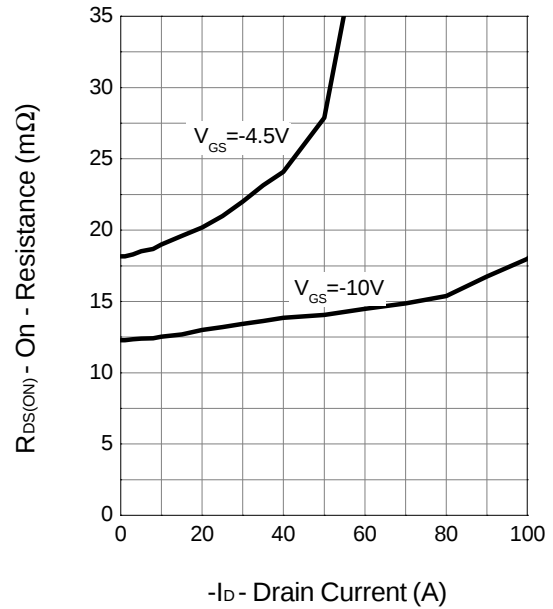


Typical Characteristics (Cont.)

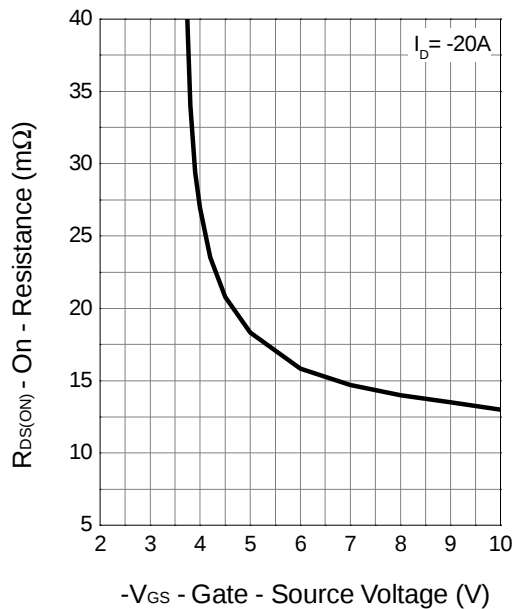
Output Characteristics



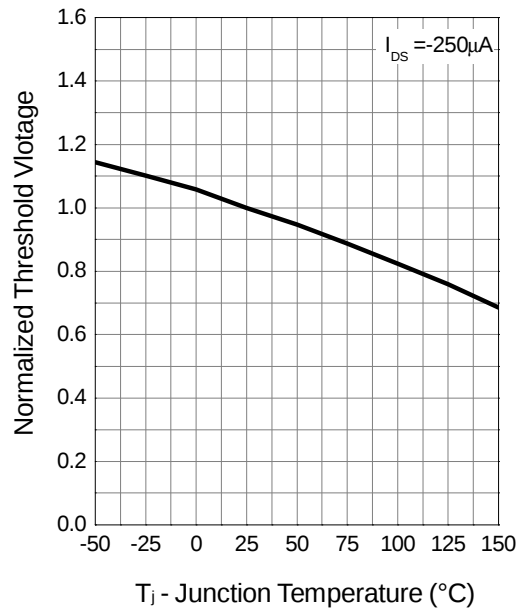
Drain-Source On Resistance



Drain-Source On Resistance

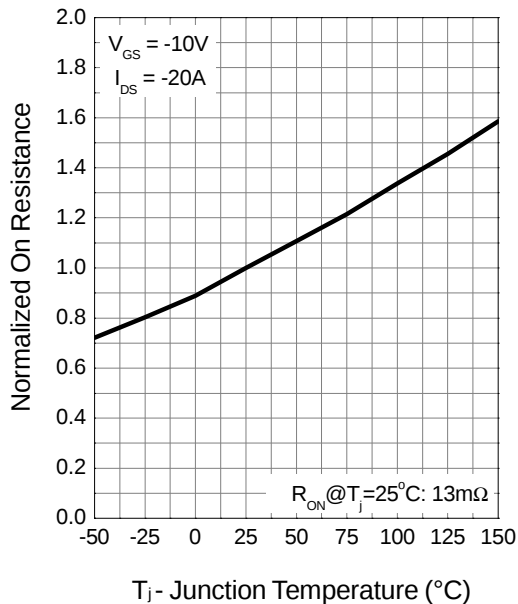


Gate Threshold Voltage

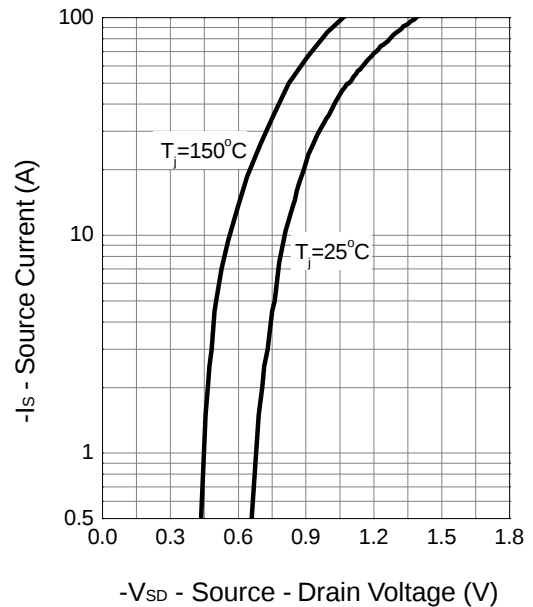


Typical Characteristics (Cont.)

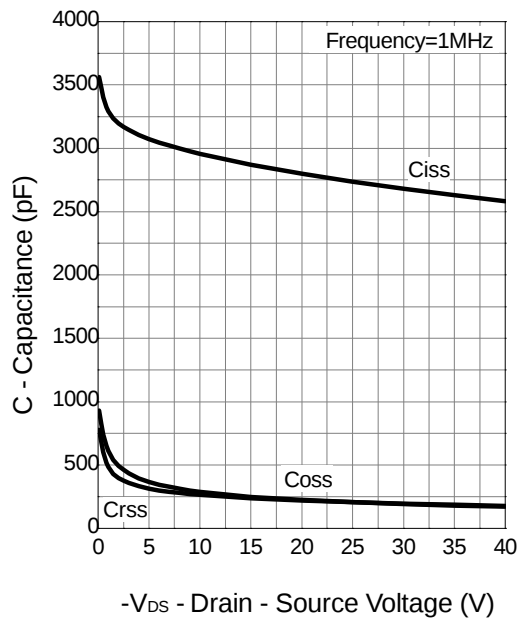
Drain-Source On Resistance



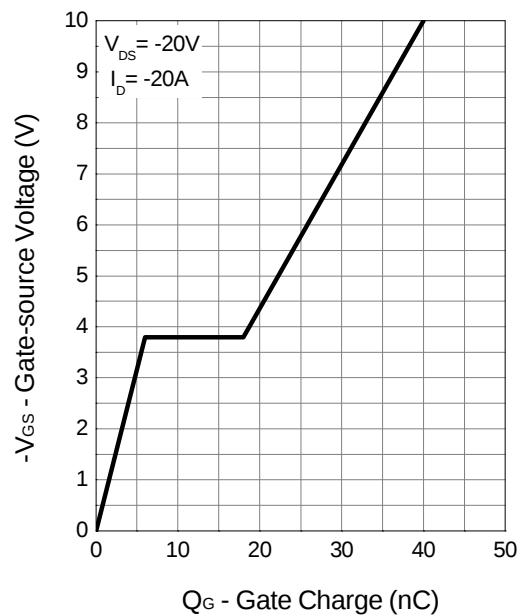
Source-Drain Diode Forward



Capacitance

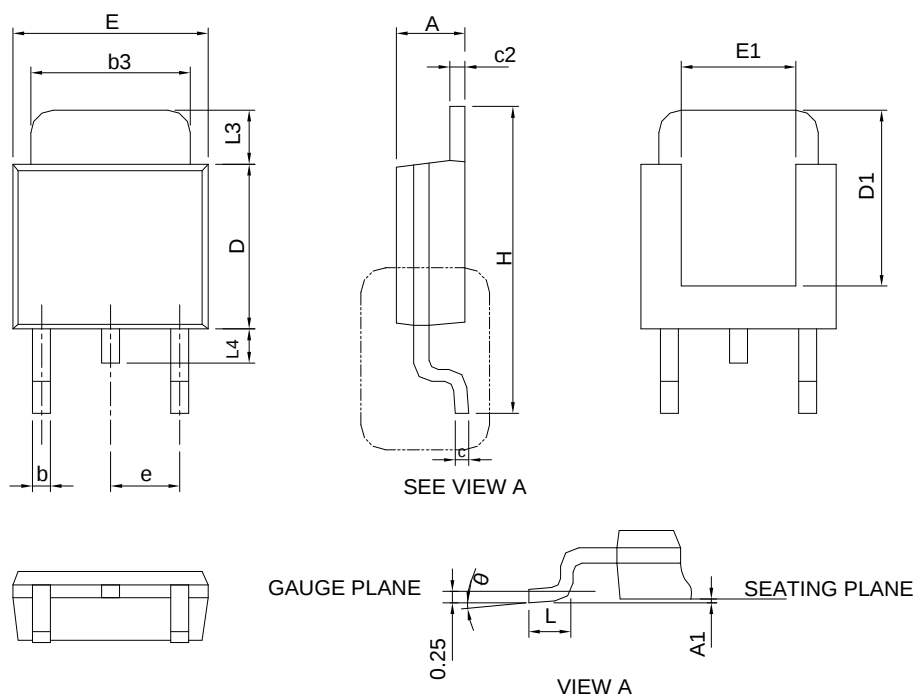


Gate Charge



Package Information

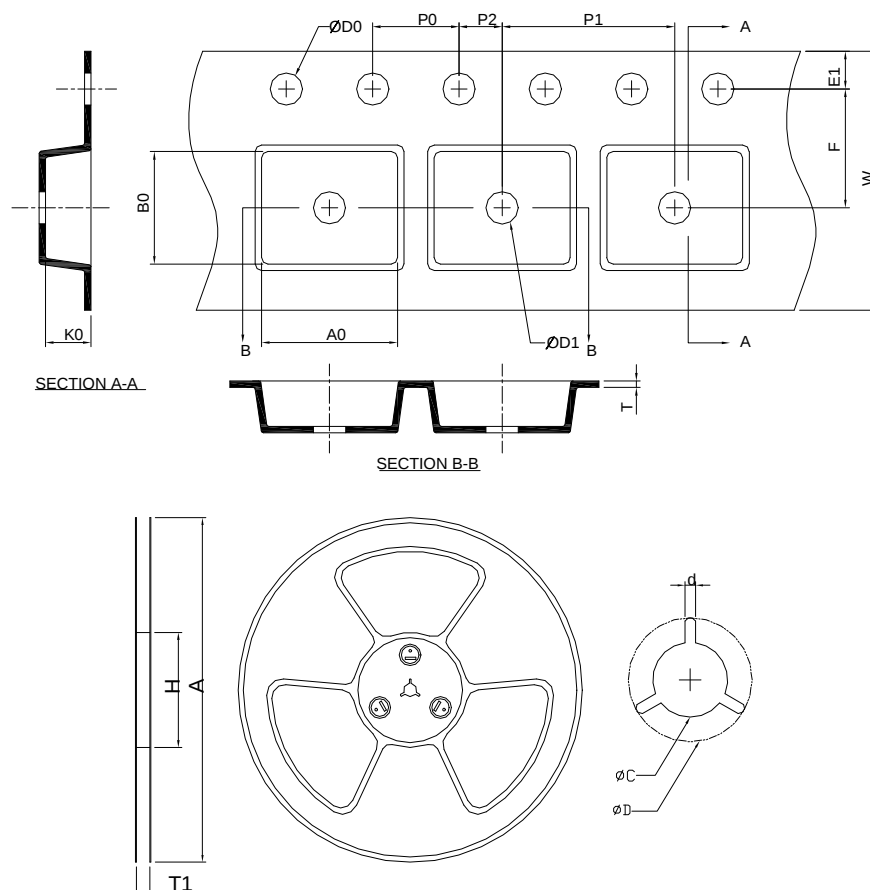
TO252-3



L O O M - S	TO252-3			
	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 : 1. Followed from JEDEC TO-252 .

Carrier Tape & Reel Dimensions



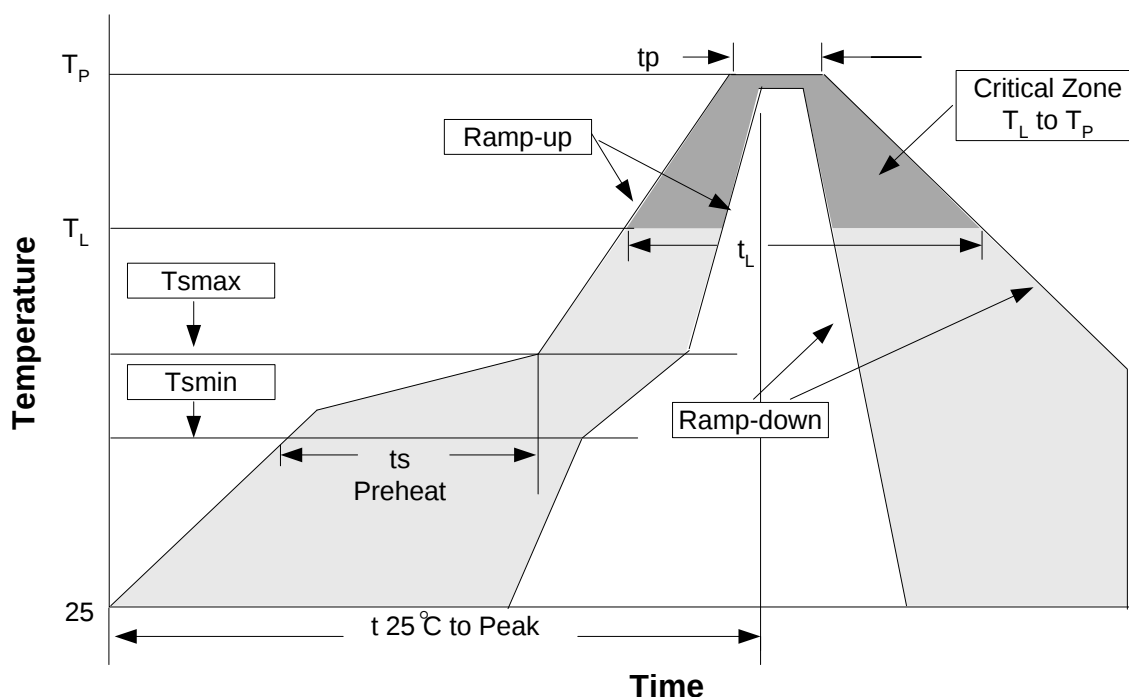
Application	A	H	T1	C	d	D	W	E1	F
TO-252	330.0 ±2.00	50 MIN.	16.4+2.00 0	13.0+0.50 -0.2	1.5 MIN.	20.2 MIN.	16.0 ±0.30	1.75 ±0.10	7.5 ±0.10
	P0	P1	P2	D0	D1	T	A0	B0	K0
	4.0 ±0.10	8.0 ±0.10	2.0 ±0.10	1.5 +0.10	1.5 MIN.	0.6 +0.00	6.8 ±0.20	10.4 ±0.20	2.5 ±0.20

(mm)

Devices Per Unit

Package Type	Unit	Quantity
TO- 252	Tape & Reel	2500

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 (T _{smin})	100°C	150°C
- Temperature Max (T _{smax})	150°C	200°C
- Time (min to max) (ts)	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 (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.

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.

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