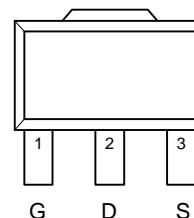


P-Channel Enhancement Mode MOSFET

Features

- 20V/-3A , $R_{DS(ON)}=50m\Omega(\text{typ.}) @ V_{GS}=-4.5V$
 $R_{DS(ON)}=70m\Omega(\text{typ.}) @ V_{GS}=-2.5V$
- Reliable and Rugged
- SOT-89 Package

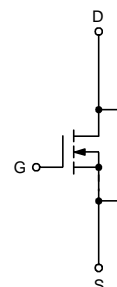
Pin Description



Top View of SOT-89

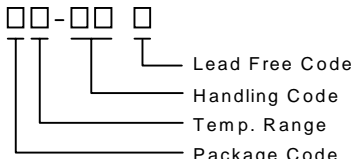
Applications

- Power Management in Notebook Computer ,
Portable Equipment and Battery Powered
Systems.



P-Channel MOSFET

Ordering and Marking Information

APM2070P □□-□□ □ 	Package Code D : SOT-89 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
APM2070P D : APM2070P XXXXX	XXXXX - Date Code

Absolute Maximum Ratings (T_A = 25°C unless otherwise noted)

Symbol	Parameter	Rating	Unit
V _{DSS}	Drain-Source Voltage	-20	V
V _{GSS}	Gate-Source Voltage	±12	
I _D	Maximum Drain Current – Continuous	-3	A
I _{DM}	Maximum Pulsed Drain Current (Pulse width ≤ 300 μs)	-12	

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

Symbol	Parameter	Rating	Unit
P_D	Maximum Power Dissipation	$T_A=25^\circ\text{C}$	1.4
		$T_A=100^\circ\text{C}$	0.5
T_J	Maximum Junction Temperature	150	$^\circ\text{C}$
T_{STG}	Storage Temperature Range	-55 to 150	$^\circ\text{C}$
$R_{\theta\text{JA}}$	Thermal Resistance – Junction to Ambient	85	$^\circ\text{C/W}$

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

Symbol	Parameter	Test Condition	APM2070P			Unit
			Min.	Typ.	Max.	
Static						
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{\text{GS}}=0\text{V}$, $I_{\text{DS}}=-250\mu\text{A}$	-20			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{\text{DS}}=-16\text{V}$, $V_{\text{GS}}=0\text{V}$			-1	μA
$V_{\text{GS(th)}}$	Gate Threshold Voltage	$V_{\text{DS}}=V_{\text{GS}}$, $I_{\text{DS}}=-250\mu\text{A}$	-0.6	-0.75	-1	V
I_{GSS}	Gate Leakage Current	$V_{\text{GS}}=\pm 12\text{V}$, $V_{\text{DS}}=0\text{V}$			± 100	nA
$R_{\text{DS(ON)}}^{\text{a}}$	Drain-Source On-state Resistance	$V_{\text{GS}}=-4.5\text{V}$, $I_{\text{DS}}=-3\text{A}$		50	70	m Ω
		$V_{\text{GS}}=-2.5\text{V}$, $I_{\text{DS}}=-1.5\text{A}$		70	100	
V_{SD}^{a}	Diode Forward Voltage	$I_{\text{S}}=-1\text{A}$, $V_{\text{GS}}=0\text{V}$		-0.7	-1.3	V
Dynamic^b						
Q_{g}	Total Gate Charge	$V_{\text{DS}}=-10\text{V}$, $I_{\text{DS}}=-3\text{A}$ $V_{\text{GS}}=-4.5\text{V}$		17.4	23	nC
Q_{gs}	Gate-Source Charge			2.7		
Q_{gd}	Gate-Drain Charge			3.8		
$t_{\text{d(ON)}}$	Turn-on Delay Time	$V_{\text{DD}}=-10\text{V}$, $I_{\text{DS}}=-3\text{A}$, $V_{\text{GEN}}=-4.5\text{V}$, $R_{\text{G}}=6\Omega$		12	21	ns
T_{r}	Turn-on Rise Time			25	42	
$t_{\text{d(OFF)}}$	Turn-off Delay Time			52	85	
T_{f}	Turn-off Fall Time			18	32	
C_{iSS}	Input Capacitance	$V_{\text{GS}}=0\text{V}$		1118		pF
C_{OSS}	Output Capacitance	$V_{\text{DS}}=-15\text{V}$		293		
C_{rSS}	Reverse Transfer Capacitance	Frequency=1.0MHz		231		

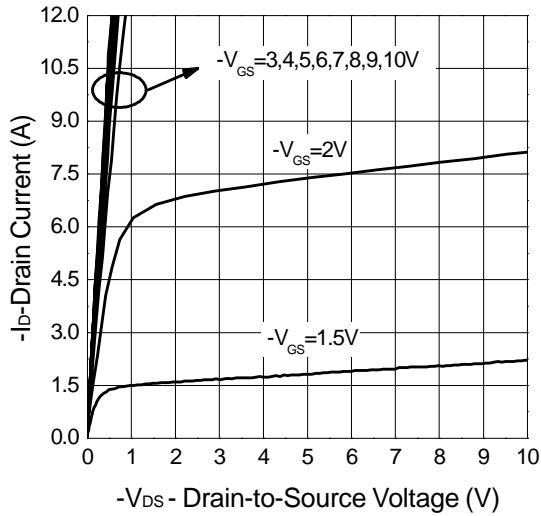
Notes

^a : Pulse test ; pulse width $\leq 300\mu\text{s}$, duty cycle $\leq 2\%$

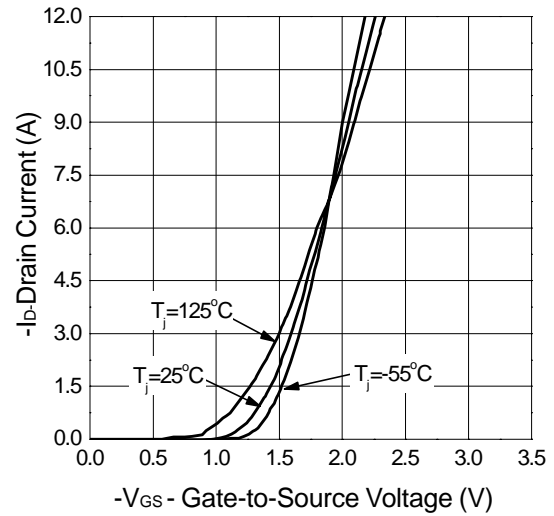
^b : Guaranteed by design, not subject to production testing

Typical Characteristics

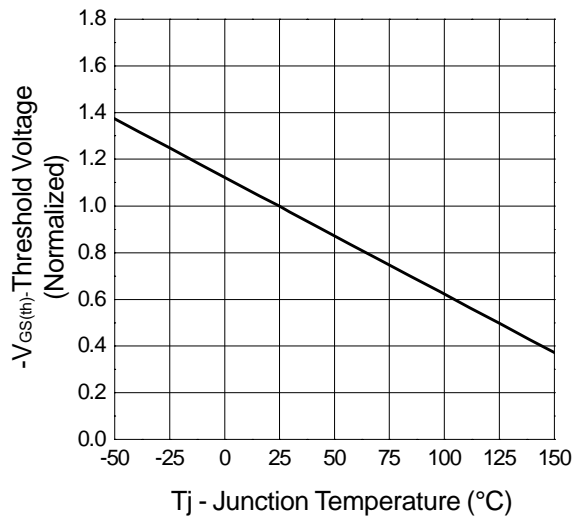
Output Characteristics



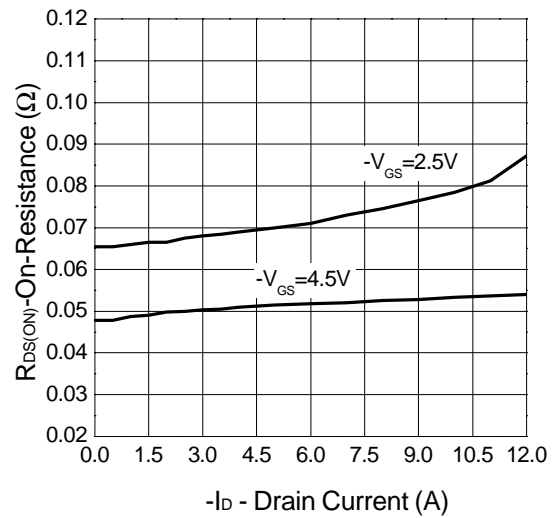
Transfer Characteristics



Threshold Voltage vs. Junction Temperature

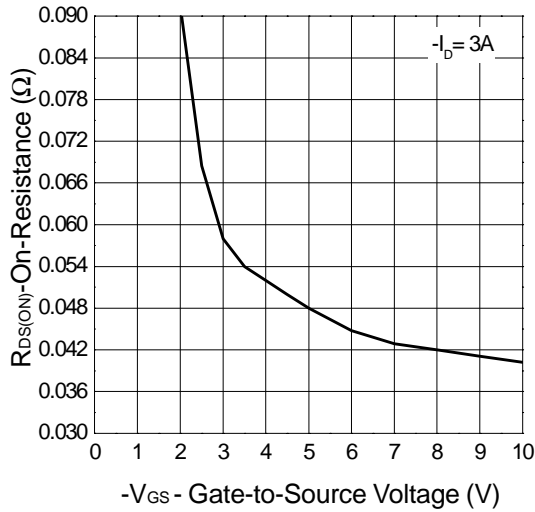


On-Resistance vs. Drain Current

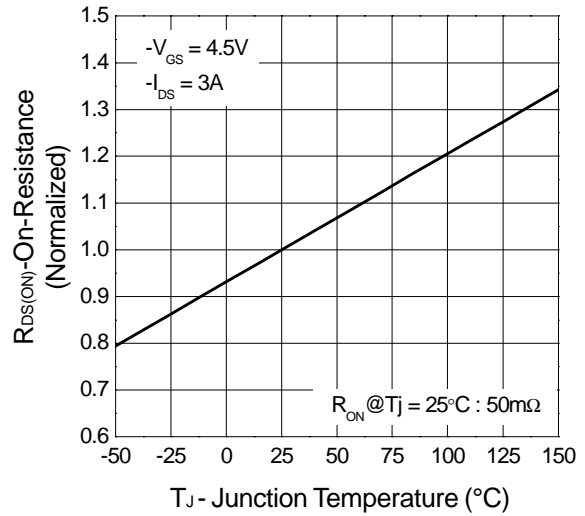


Typical Characteristics (Cont.)

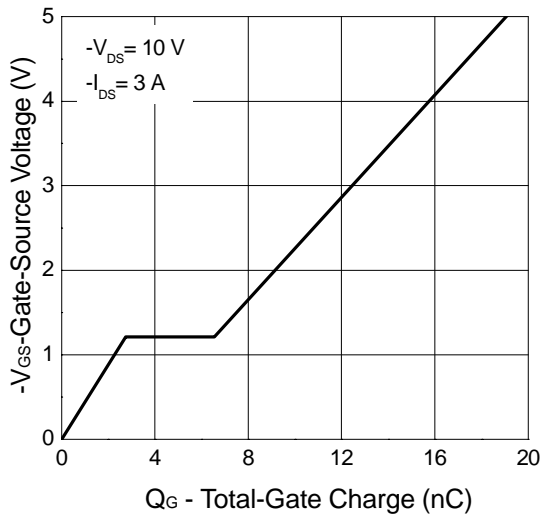
On-Resistance vs. Gate-to-Source Voltage



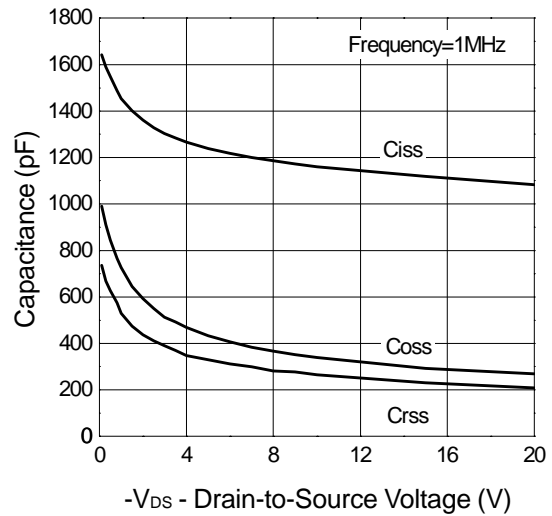
On-Resistance vs. Junction Temperature



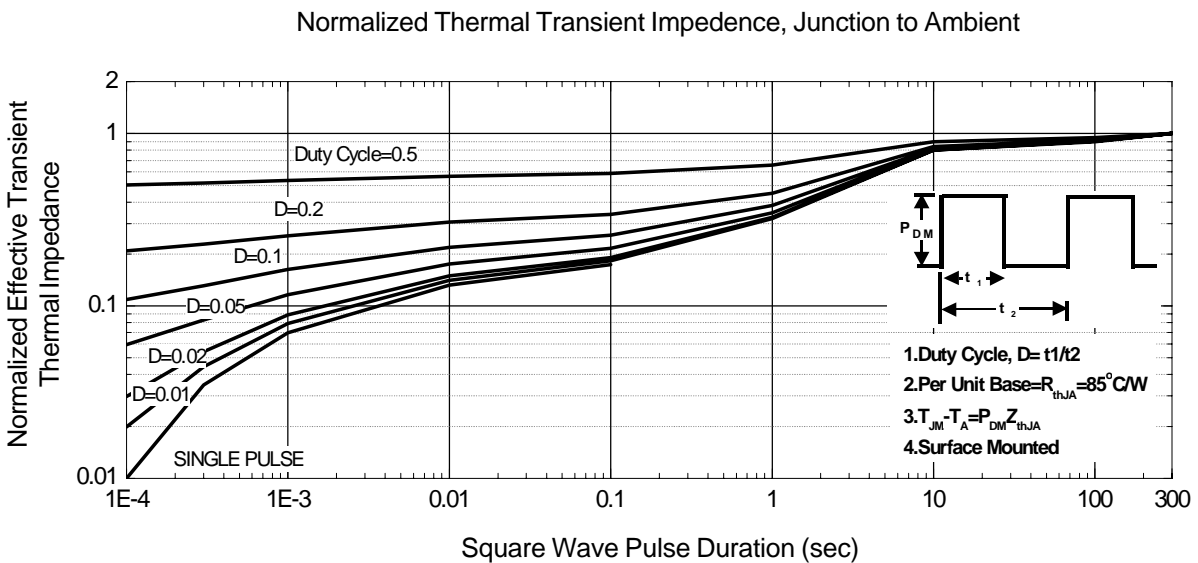
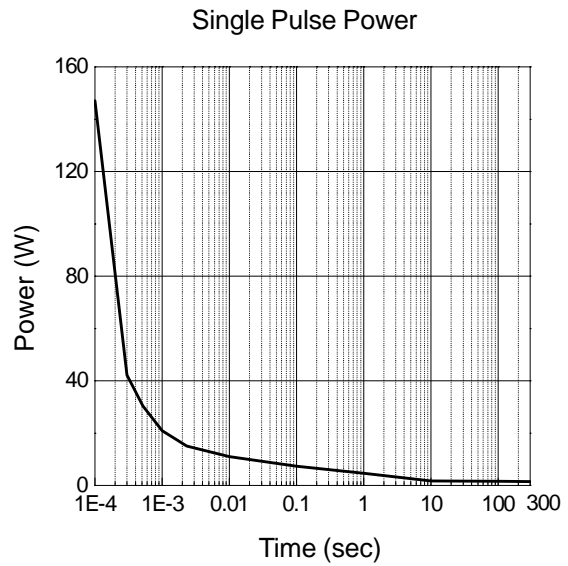
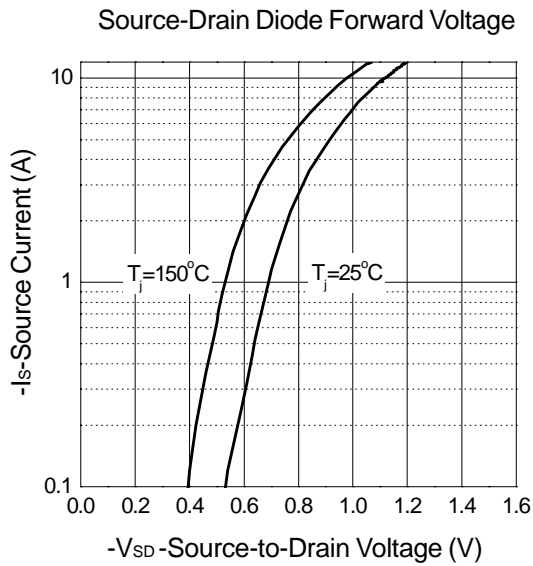
Gate Charge



Capacitance

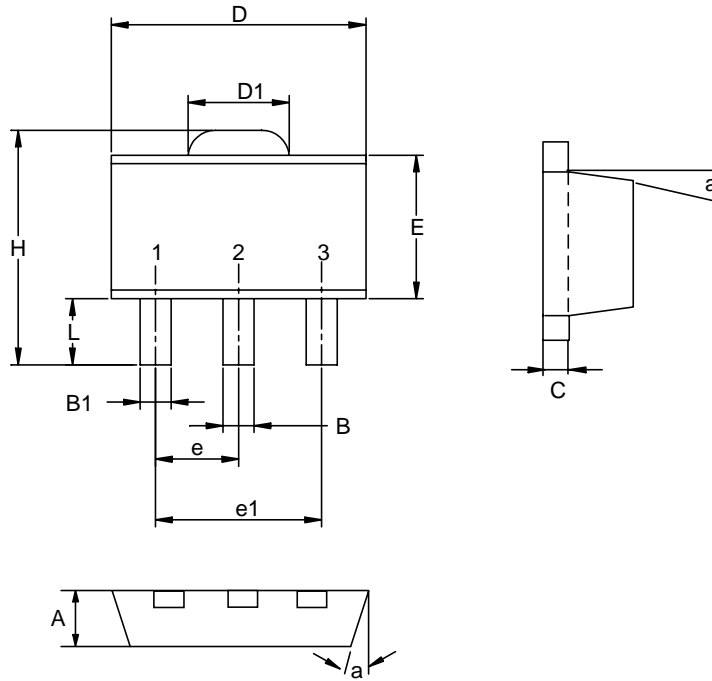


Typical Characteristics (Cont.)



Packaging Information

SOT-89 (Reference EIAJ ED-7500A Registration SC-62)



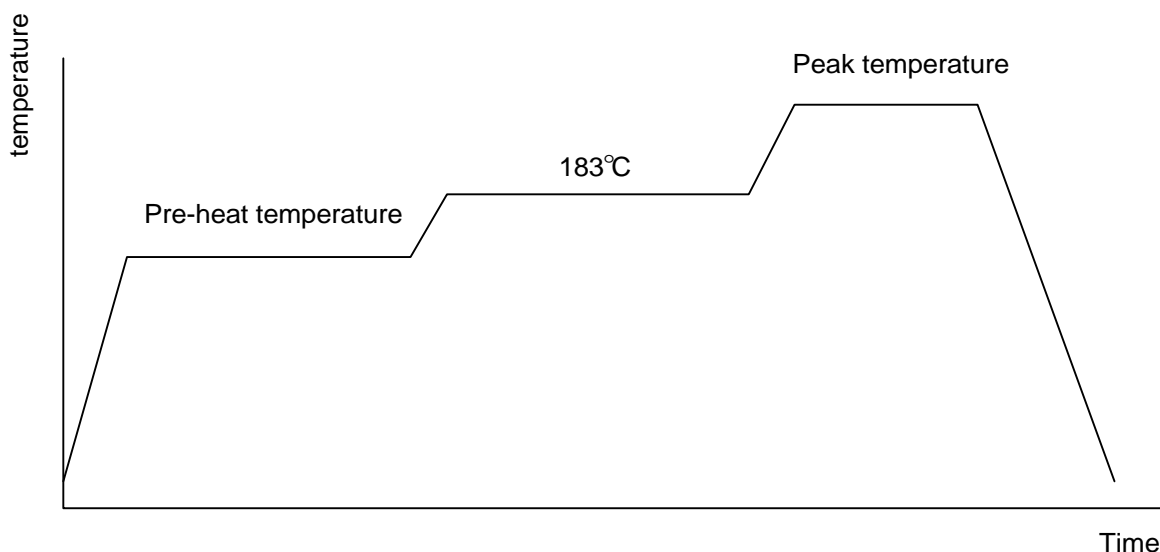
Dim	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	1.40	1.60	0.055	0.063
B	0.40	0.56	0.016	0.022
B1	0.35	0.48	0.014	0.019
C	0.35	0.44	0.014	0.017
D	4.40	4.60	0.173	0.181
D1	1.35	1.83	0.053	0.072
e	1.50 BSC		0.059 BSC	
e1	3.00 BSC		0.118 BSC	
E	2.29	2.60	0.090	0.102
H	3.75	4.25	0.148	0.167
L	0.80	1.20	0.031	0.047
α		10°		10°

Physical Specifications

Terminal Material	Solder-Plated Copper (Solder Material : 90/10 or 63/37 SnPb)
Lead Solderability	Meets EIA Specification RSI86-91, ANSI/J-STD-002 Category 3.

Reflow Condition (IR/Convection or VPR Reflow)

Reference JEDEC Standard J-STD-020A APRIL 1999



Classification Reflow Profiles

	Convection or IR/ Convection	VPR
Average ramp-up rate(183°C to Peak)	3°C/second max.	10 °C /second max.
Preheat temperature 125 ± 25°C)	120 seconds max.	
Temperature maintained above 183°C	60 ~ 150 seconds	
Time within 5°C of actual peak temperature	10 ~ 20 seconds	60 seconds
Peak temperature range	220 +5/-0°C or 235 +5/-0°C	215~ 219°C or 235 +5/-0°C
Ramp-down rate	6 °C /second max.	10 °C /second max.
Time 25°C to peak temperature	6 minutes max.	

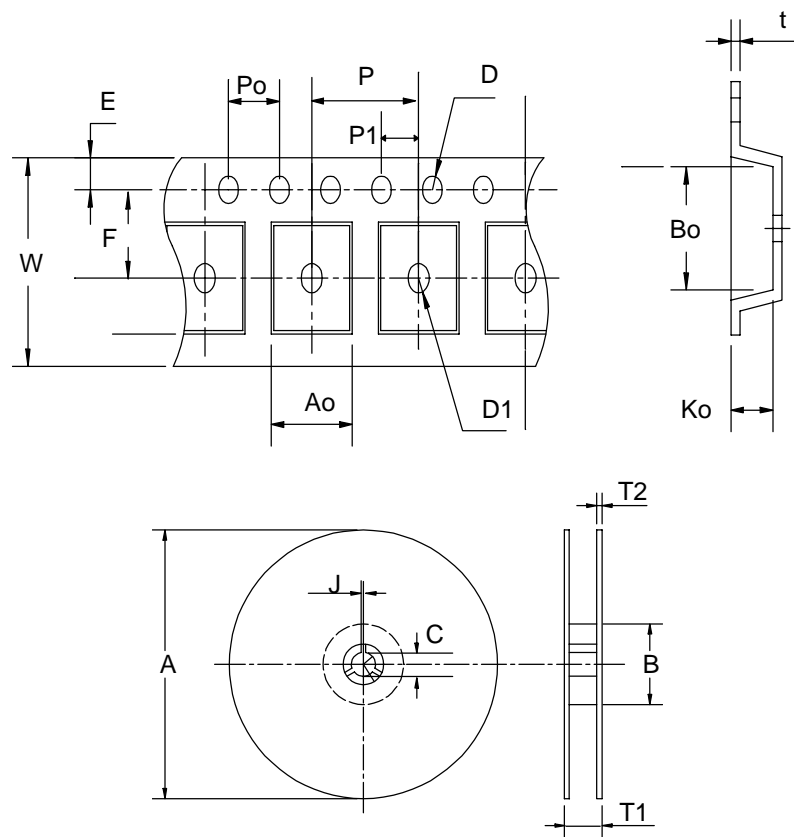
Package Reflow Conditions

pkg. thickness ≥ 2.5mm and all bags	pkg. thickness < 2.5mm and pkg. volume ≥ 350 mm ³	pkg. thickness < 2.5mm and pkg. volume < 350mm ³
Convection 220 +5/-0 °C		Convection 235 +5/-0 °C
VPR 215-219 °C		VPR 235 +5/-0 °C
IR/Convection 220 +5/-0 °C		IR/Convection 235 +5/-0 °C

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



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

Cover Tape Dimensions

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

Customer Service

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