

Absolute Maximum Ratings ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Rating	Unit
V_{DSS}	Drain-Source Voltage	-20	V
V_{GSS}	Gate-Source Voltage	± 10	
I_D^*	Continuous Drain Current	$V_{GS} = -4.5\text{V}$	A
I_{DM}^*	300 μs Pulsed Drain Current		
I_S^*	Diode Continuous Forward Current	-2.1	A
T_J	Maximum Junction Temperature	-0.5	$^\circ\text{C}$
T_{STG}	Storage Temperature Range	150	
P_D^*	Maximum Power Dissipation	-55 to 150	W
$R_{\theta JA}^*$		Thermal Resistance-Junction to Ambient	
		$T_A = 25^\circ\text{C}$	
		$T_A = 100^\circ\text{C}$	
		360	$^\circ\text{C/W}$

Note:

*Surface Mounted on 1in² pad area, $t \leq 10\text{sec}$.

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

Symbol	Parameter	Test Condition	APM1401S			Unit
			Min.	Typ.	Max.	
Static Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{V}, I_{DS} = -250\mu\text{A}$	-20			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = -16\text{V}, V_{GS} = 0\text{V}$ $T_J = 85^\circ\text{C}$			-1	
					-30	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_{DS} = -250\mu\text{A}$	-0.5	-0.7	-1	V
I_{GSS}	Gate Leakage Current	$V_{GS} = \pm 10\text{V}, V_{DS} = 0\text{V}$			± 100	nA
$R_{DS(ON)}^a$	Drain-Source On-state Resistance	$V_{GS} = -4.5\text{V}, I_{DS} = -0.65\text{A}$		370	480	m Ω
		$V_{GS} = -2.5\text{V}, I_{DS} = -0.45\text{A}$		550	720	
g_{fs}	Forward Transconductance	$V_{DS} = -10\text{V}, I_{DS} = -0.65\text{A}$		6.5		S
V_{SD}^a	Diode Forward Voltage	$I_{SD} = -0.5\text{A}, V_{GS} = 0\text{V}$		-0.8	-1.3	V
Dynamic Characteristics^b						
C_{iss}	Input Capacitance	$V_{GS} = 0\text{V},$ $V_{DS} = -15\text{V},$ Frequency = 1.0MHz		136		pF
C_{oss}	Output Capacitance			38		
C_{rss}	Reverse Transfer Capacitance			26		

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

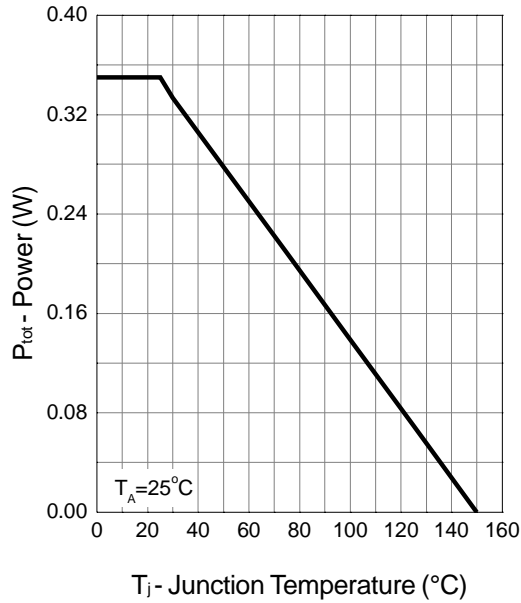
Symbol	Parameter	Test Condition	APM1401S			Unit
			Min.	Typ.	Max.	
t _{d(ON)}	Turn-on Delay Time	V _{DD} =-10V, R _L =10Ω, I _{DS} =-1A, V _{GEN} =-4.5V, R _G =6Ω		5	10	ns
T _r	Turn-on Rise Time			8	12	
t _{d(OFF)}	Turn-off Delay Time			9.6	15	
T _f	Turn-off Fall Time			5	15	
Gate Charge Characteristics^b						
Q _g	Total Gate Charge	V _{DS} =-10V, V _{GS} =-4.5V, I _{DS} =-0.65A		7.4	9.6	nC
Q _{gs}	Gate-Source Charge			1.1		
Q _{gd}	Gate-Drain Charge			1.2		

Notes:

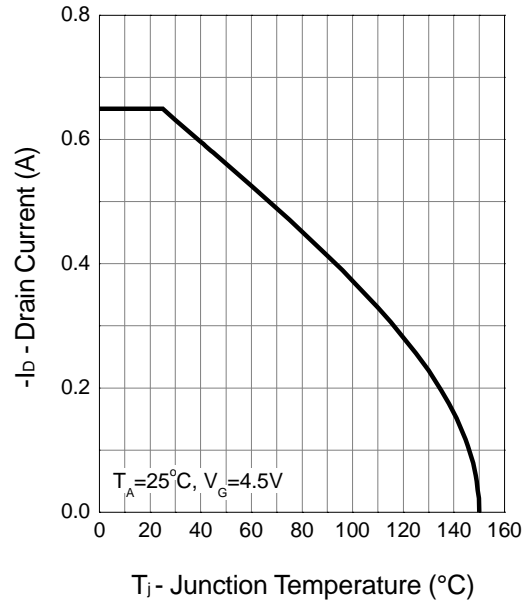
- a : Pulse test ; pulse width ≤300μs, duty cycle ≤ 2%.
- b : Guaranteed by design, not subject to production testing.

Typical Characteristics

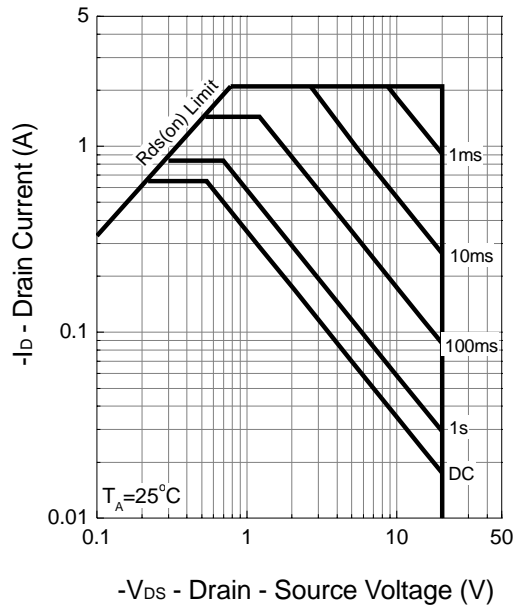
Power Dissipation



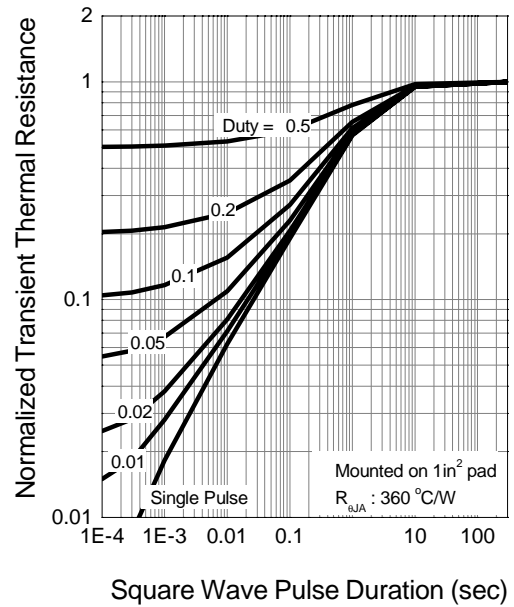
Drain Current



Safe Operation Area

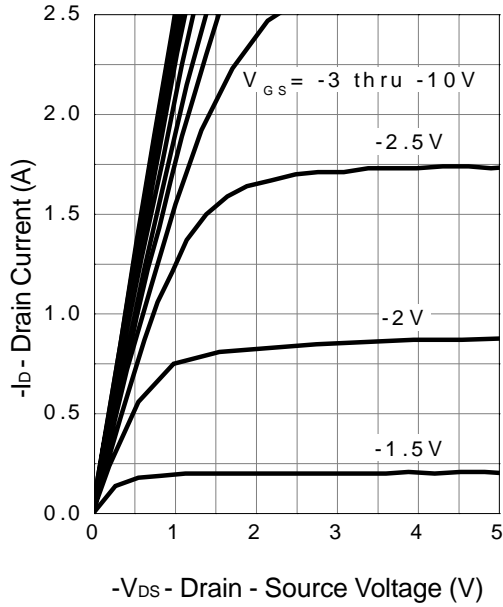


Thermal Transient Impedance

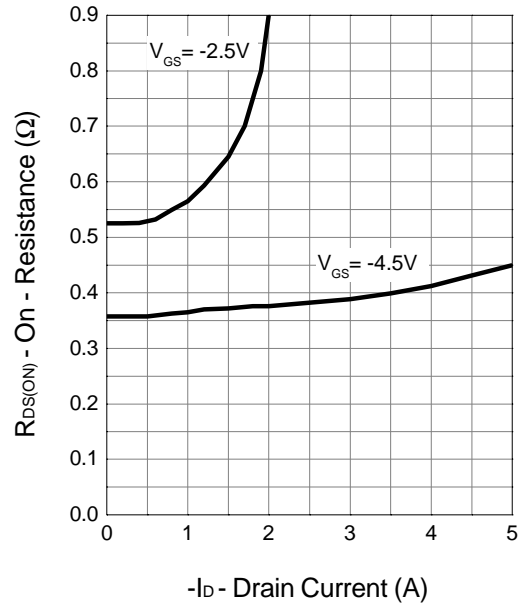


Typical Characteristics (Cont.)

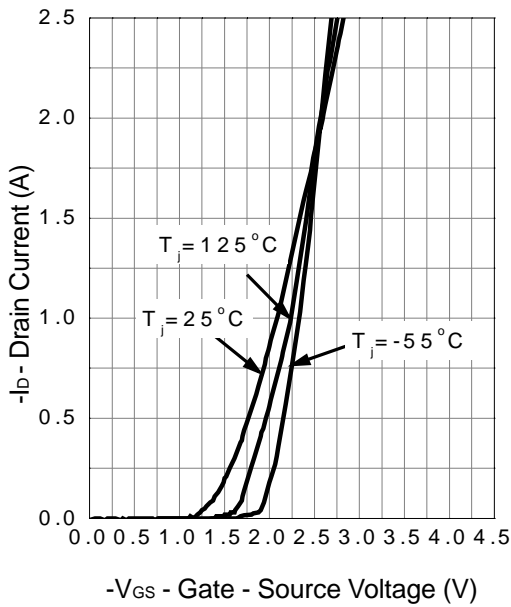
Output Characteristics



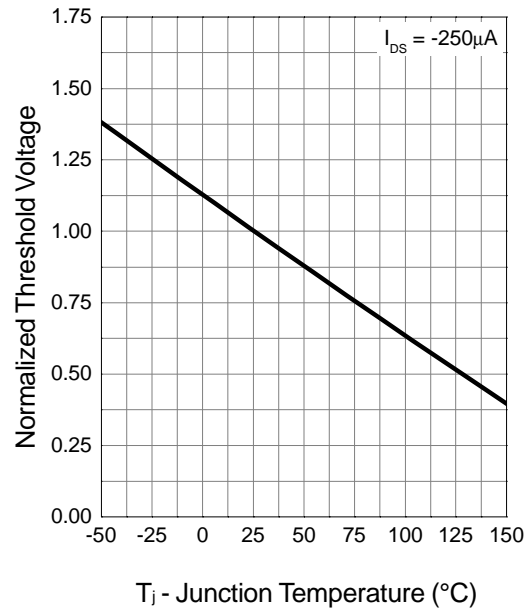
Drain-Source On Resistance



Transfer Characteristics

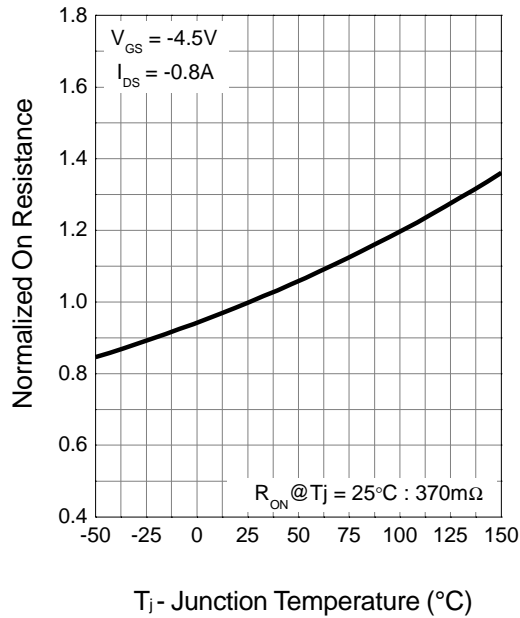


Gate Threshold Voltage

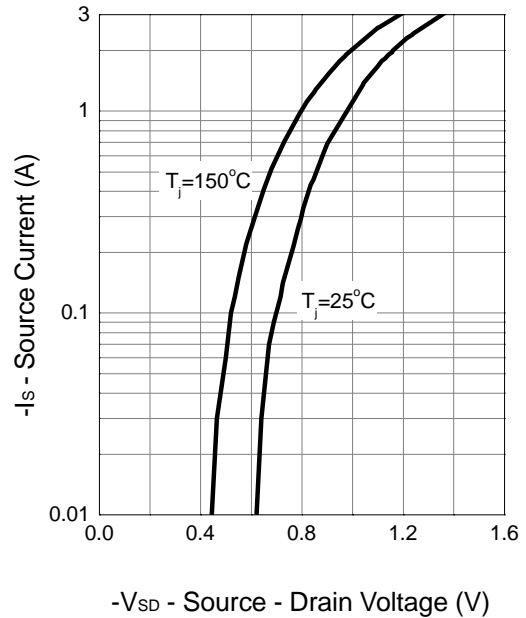


Typical Characteristics (Cont.)

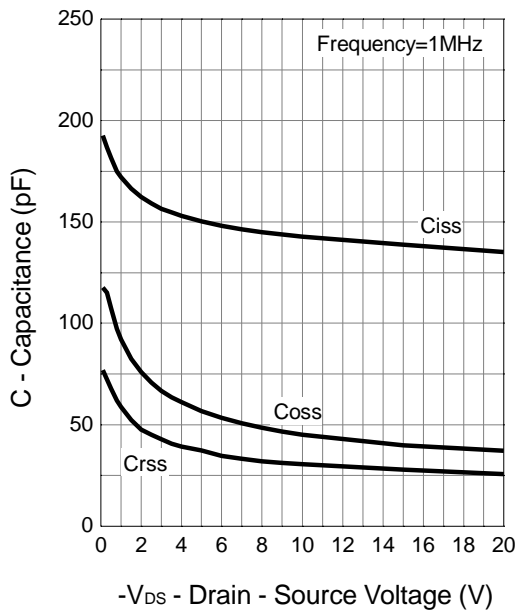
Drain-Source On Resistance



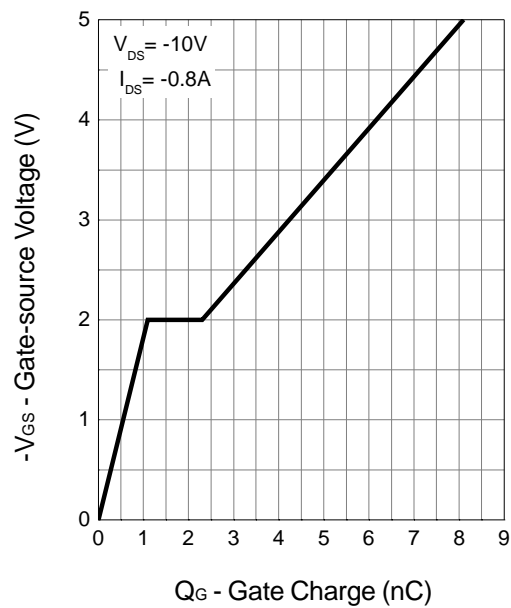
Source-Drain Diode Forward



Capacitance

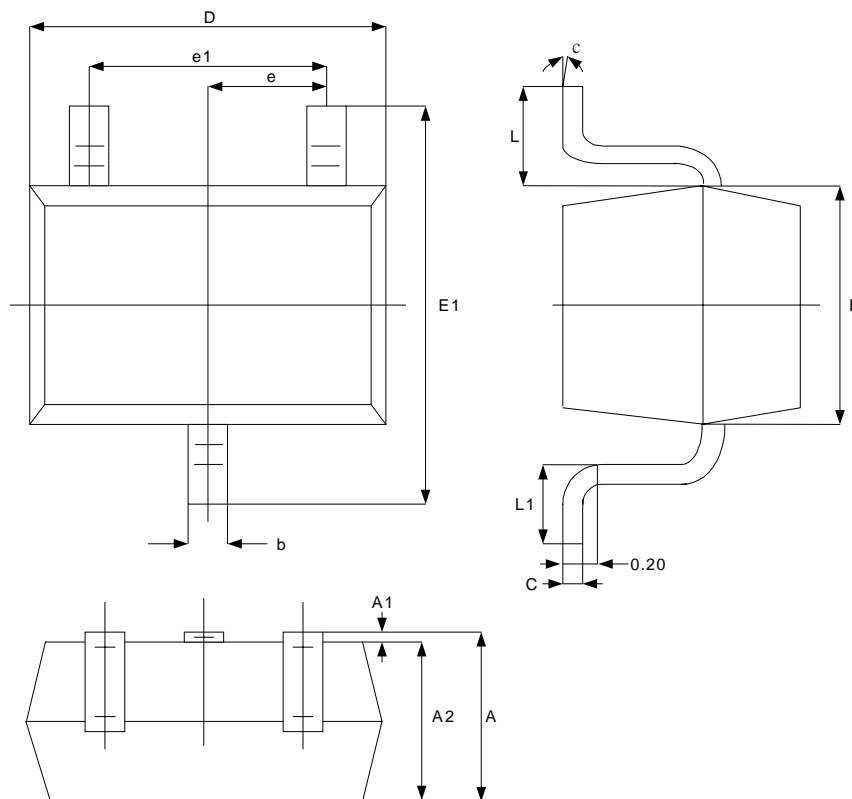


Gate Charge



Packaging Information

SC-70

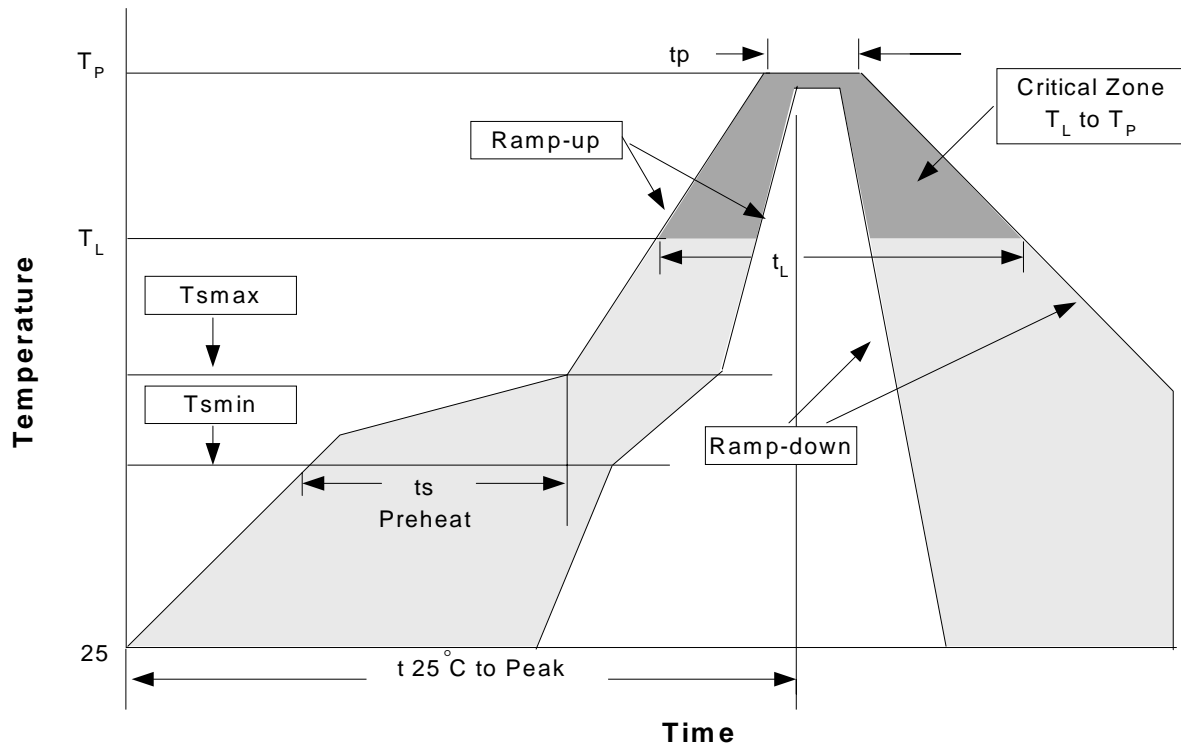


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.900	1.100	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.900	1.000	0.035	0.039
b	0.200	0.400	0.008	0.016
c	0.080	0.150	0.003	0.006
D	2.000	2.200	0.079	0.087
E	1.150	1.350	0.045	0.053
E1	2.150	2.450	0.085	0.096
e	0.650TYP		0.026TYP	
e1	1.200	1.400	0.047	0.055
L	0.525REF		0.021PEF	
L1	0.260	0.460	0.010	0.018
θ	0°	8°	0°	8°

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

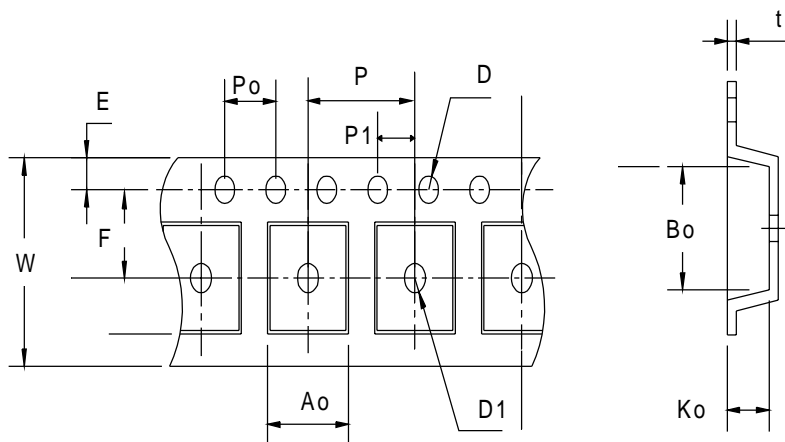
Package Thickness	Volume mm ³ <350	Volume mm ³ 350-2000	Volume mm ³ >2000
<1.6 mm	260 +0°C*	260 +0°C*	260 +0°C*
1.6 mm – 2.5 mm	260 +0°C*	250 +0°C*	245 +0°C*
≥2.5 mm	250 +0°C*	245 +0°C*	245 +0°C*

*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.

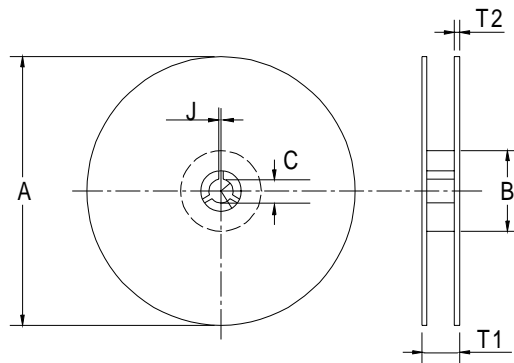
Reliability Test Program

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 & Reel Dimensions



Carrier Tape & Reel Dimensions(Cont.)



Application	A	B	C	J	T1	T2	W	P	E
SC-70	178±1	14.4 ± 0.4	13.0 + 0.2	1.15 ± 0.1	12. ±0.2	2.8± 0.2	8.0+ 0.3 - 0.1	4 ± 0.1	1.75± 0.1
	F	D	D1	Po	P1	Ao	Bo	Ko	t
	3.5 ± 0.05	1.55± 0.05	1.00 +0.25	4.0 ± 0.1	2.0 ± 0.05	2.4 ± 0.1	2.4± 0.1	1.19± 0.1	0.25±0.013

Cover Tape Dimensions

Application	Carrier Width	Cover Tape Width	Devices Per Reel
SC- 70	8	5.3	3000

Customer Service

Anpec Electronics Corp.

Head Office :

5F, No. 2 Li-Hsin Road, SBIP,

Hsin-Chu, Taiwan, R.O.C.

Tel : 886-3-5642000

Fax : 886-3-5642050

Taipei Branch :

7F, No. 137, Lane 235, Pac Chiao Rd.,

Hsin Tien City, Taipei Hsien, Taiwan, R. O. C.

Tel : 886-2-89191368

Fax : 886-2-89191369