

APM1402S

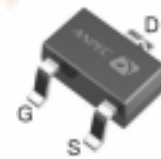


N-Channel Enhancement Mode MOSFET

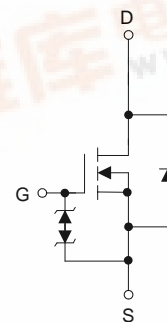
Features

- 20V/0.8A ,
 $R_{DS(ON)}=190m\Omega(\text{typ.}) @ V_{GS}=4.5V$
 $R_{DS(ON)}=310m\Omega(\text{typ.}) @ V_{GS}=2.5V$
- Super High Dense Cell Design
- Reliable and Rugged
- Lead Free Available (RoHS Compliant)

Pin Description



Top View of SC-70



N-Channel MOSFET

Applications

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

Ordering and Marking Information

<p>APM1402 □□-□□ □</p> <ul style="list-style-type: none"> □ □ : Lead Free Code □ □ : Handling Code □ : Temp. Range □ : Package Code 	<p>Package Code S : SC-70</p> <p>Operating Junction Temp. Range C : -55 to 150°C</p> <p>Handling Code TR : Tape & Reel</p> <p>Lead Free Code L : Lead Free Device Blank : Original Device</p>
APM1402 S :	02

Note: ANPEC lead-free products contain molding compounds/die attach materials and 100% matte in plate termination finish; which are fully compliant with RoHS and compatible with both SnPb and lead-free soldering 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 ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Rating	Unit	
V_{DSS}	Drain-Source Voltage	20	V	
V_{GSS}	Gate-Source Voltage	± 8		
I_D^*	Continuous Drain Current	0.8	A	
I_{DM}^*	Pulsed Drain Current			3
I_S^*	Diode Continuous Forward Current	0.3	A	
T_J	Maximum Junction Temperature	150	$^\circ\text{C}$	
T_{STG}	Storage Temperature Range	-55 to 150		
P_D^*	Maximum Power Dissipation	$T_A=25^\circ\text{C}$	0.34	W
		$T_A=100^\circ\text{C}$	0.13	
$R_{\theta JA}^*$	Thermal Resistance-Junction to Ambient	360	$^\circ\text{C}/\text{W}$	

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	APM1402S			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	$V_{DS}=16\text{V}, V_{GS}=0\text{V}$			1	μA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_{DS}=250\mu\text{A}$	0.5	0.75	1.2	V
I_{GSS}	Gate Leakage Current	$V_{GS}=\pm 8\text{V}, V_{DS}=0\text{V}$			± 10	μA
$R_{DS(ON)}^a$	Drain-Source On-state Resistance	$V_{GS}=4.5\text{V}, I_{DS}=1.2\text{A}$		190	250	m Ω
		$V_{GS}=2.5\text{V}, I_{DS}=0.6\text{A}$		310	410	
V_{SD}^a	Diode Forward Voltage	$I_{SD}=0.3\text{A}, V_{GS}=0\text{V}$		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		131		pF
C_{oss}	Output Capacitance			30		
C_{rss}	Reverse Transfer Capacitance			15		
$t_{d(ON)}$	Turn-on Delay Time	$V_{DD}=15\text{V}, R_L=15\Omega,$ $I_{DS}=1\text{A}, V_{GEN}=10\text{V},$ $R_G=6\Omega$		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	

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

Symbol	Parameter	Test Condition	APM1402S			Unit
			Min.	Typ.	Max.	
Gate Charge Characteristics^b						
Q _g	Total Gate Charge	V _{DS} =10V, V _{GS} =4.5V, I _{DS} =0.8A		5.5	7.2	nC
Q _{gs}	Gate-Source Charge			0.6		
Q _{gd}	Gate-Drain Charge			0.84		

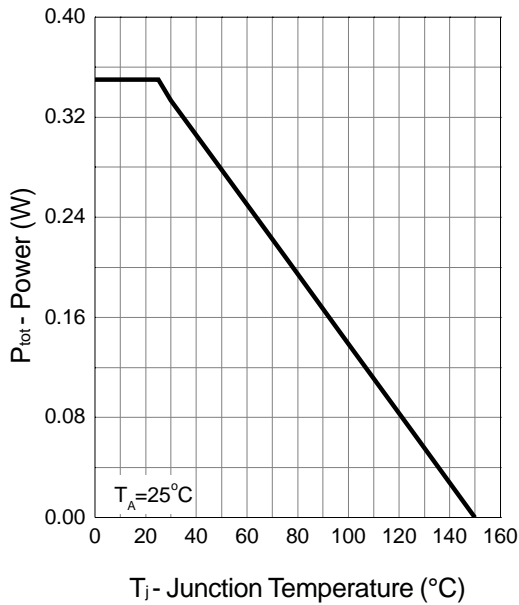
Notes:

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

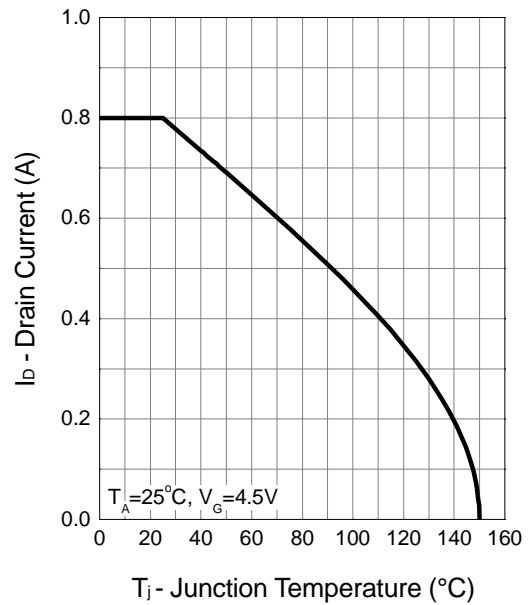
b : Guaranteed by design, not subject to production testing.

Typical Characteristics

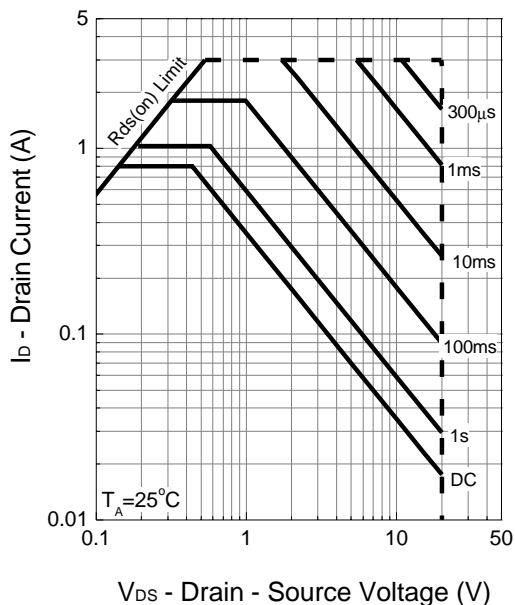
Power Dissipation



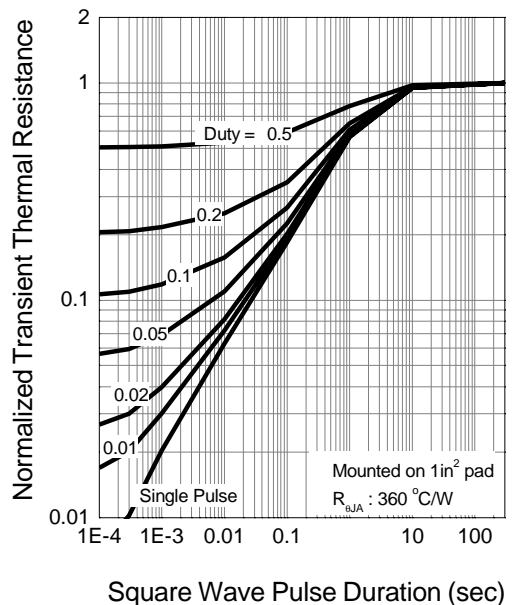
Drain Current



Safe Operation Area

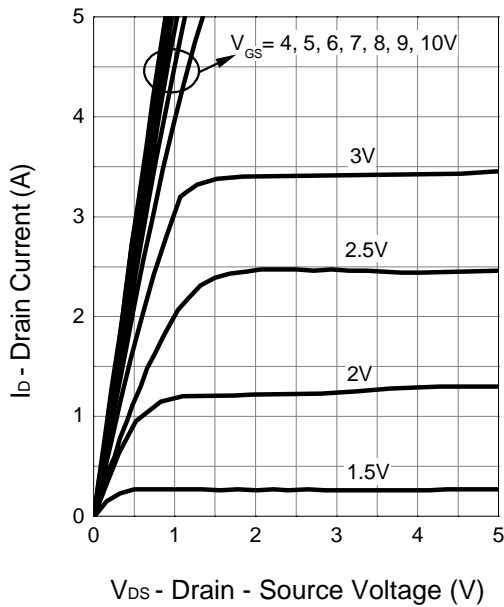


Thermal Transient Impedance

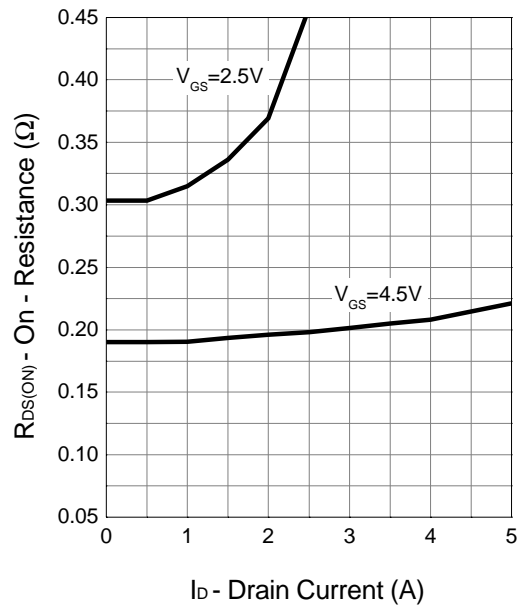


Typical Characteristics (Cont.)

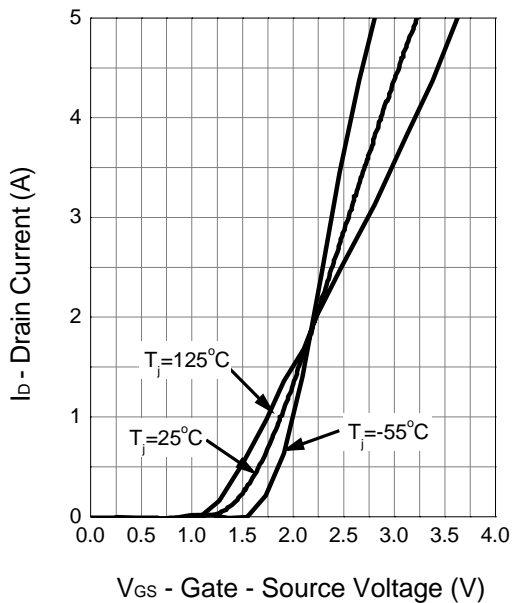
Output Characteristics



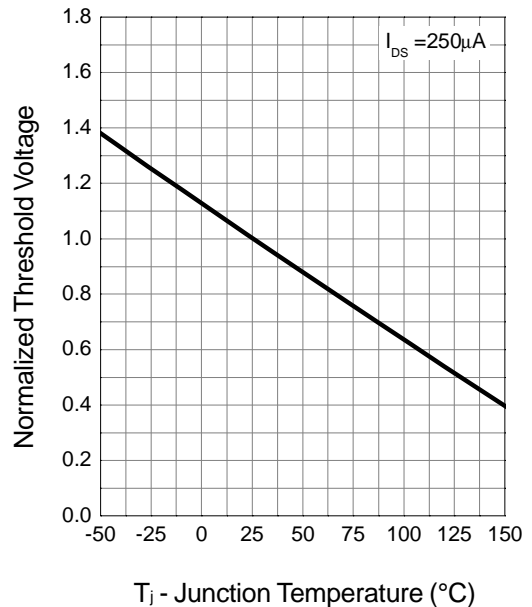
Drain-Source On Resistance



Transfer Characteristics

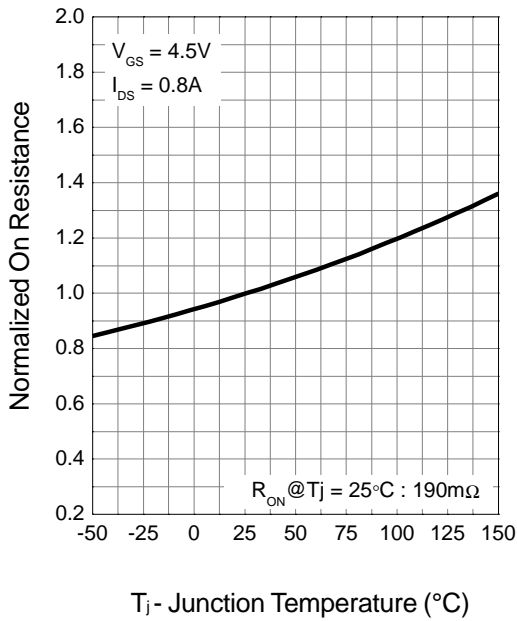


Gate Threshold Voltage

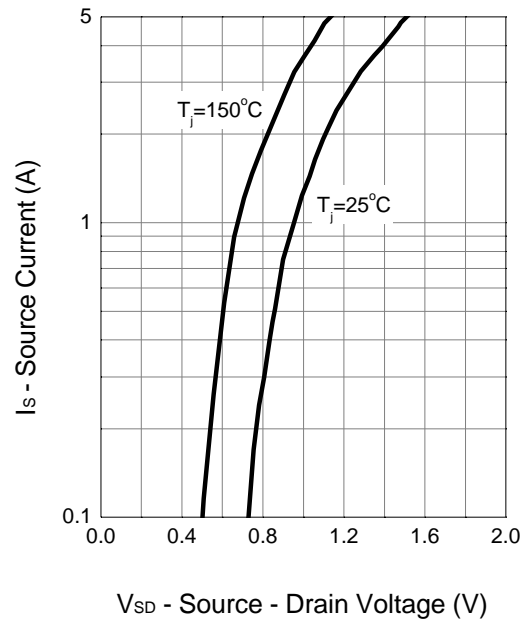


Typical Characteristics (Cont.)

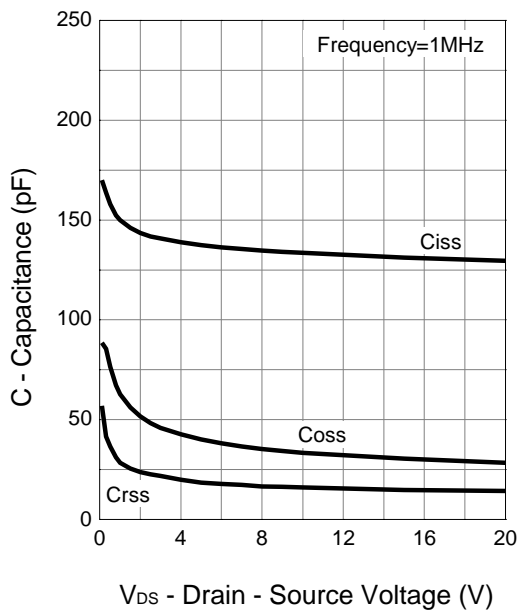
Drain-Source On Resistance



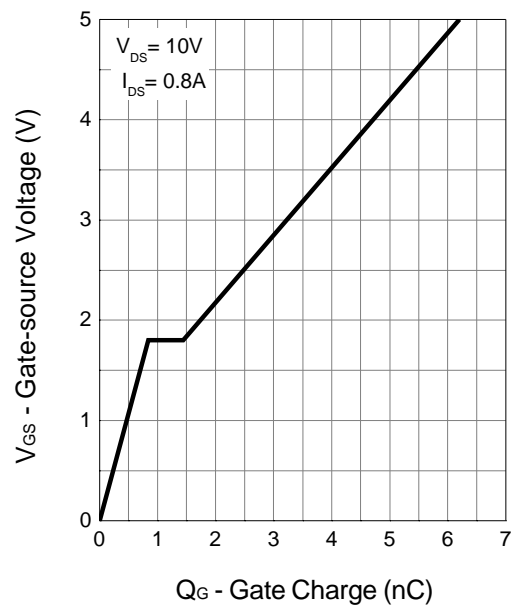
Source-Drain Diode Forward



Capacitance

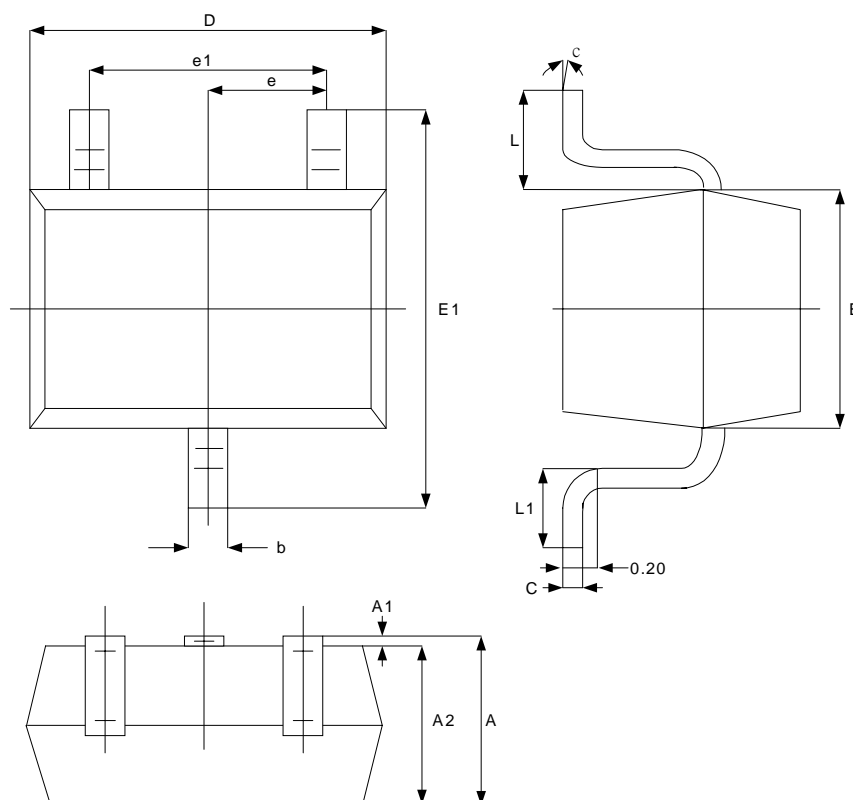


Gate Charge



Packaging Information

SC-70

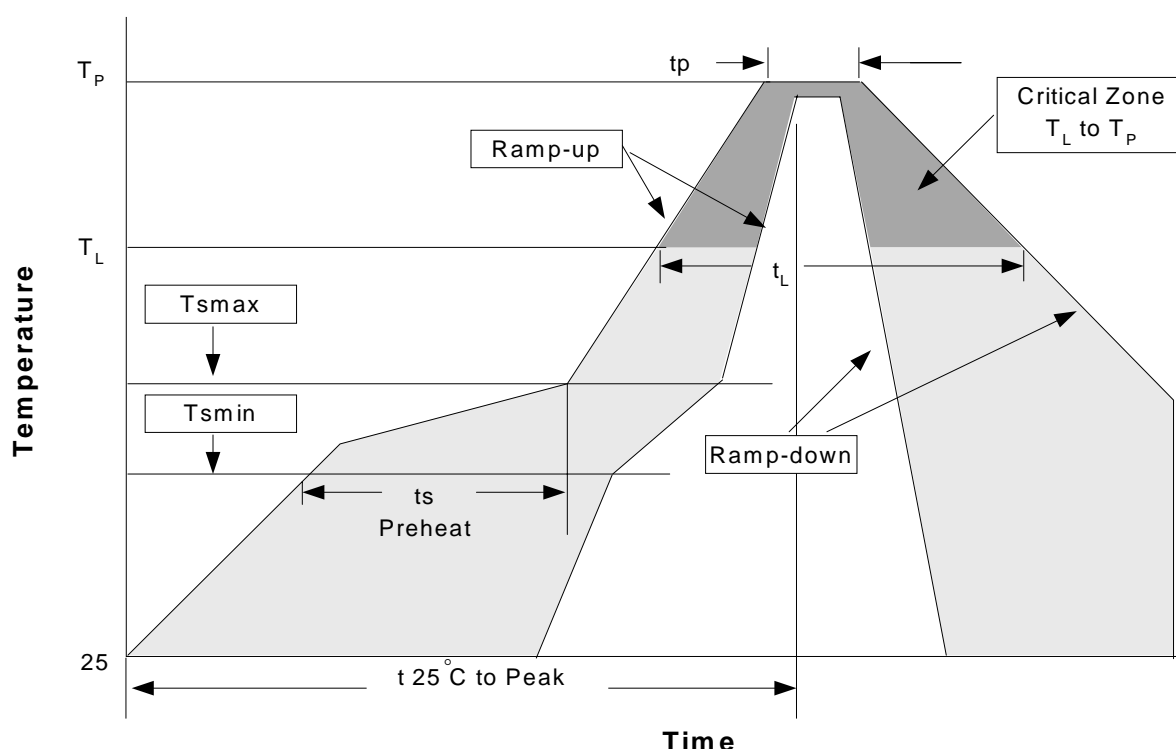


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.900	1.100	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.900	1.000	0.035	0.039
b	0.200	0.400	0.008	0.016
c	0.080	0.150	0.003	0.006
D	2.000	2.200	0.079	0.087
E	1.150	1.350	0.045	0.053
E1	2.150	2.450	0.085	0.096
e	0.650TYP		0.026TYP	
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

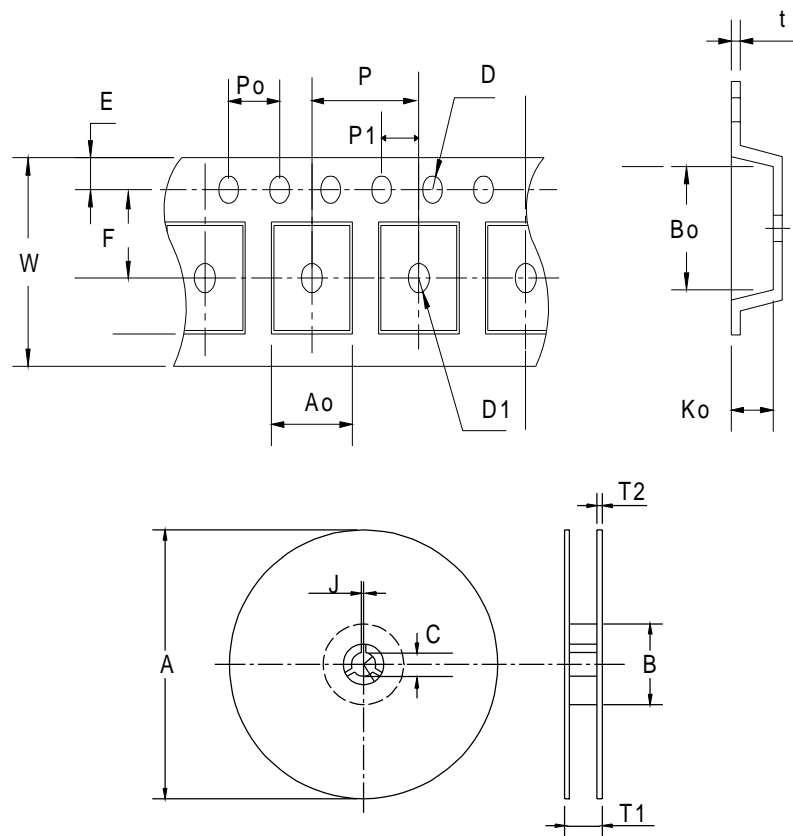
Profile Feature	Sn-Pb Eutectic Assembly		Pb-Free Assembly	
	Large Body	Small Body	Large Body	Small Body
Average ramp-up rate (T_L to T_P)	3°C/second max.		3°C/second max.	
Preheat				
- Temperature Min (T_{smin})	100°C		150°C	
- Temperature Mix (T_{smax})	150°C		200°C	
- Time (min to max)(t_s)	60-120 seconds		60-180 seconds	
T_{smax} to T_L				
- Ramp-up Rate			3°C/second max	
T_{smax} to T_L				
- Temperature(T_L)	183°C		217°C	
- Time (t_L)	60-150 seconds		60-150 seconds	
Peak Temperature(T_p)	225 +0/-5°C	240 +0/-5°C	245 +0/-5°C	250 +0/-5°C
Time within 5°C of actual Peak Temperature(t_p)	10-30 seconds	10-30 seconds	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.

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
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

APM1402S



Cover Tape Dimensions

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

Customer Service

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