

APM1404S

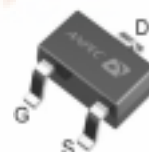


N-Channel Enhancement Mode MOSFET

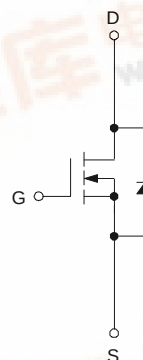
Features

- 20V/1.2A ,
 $R_{DS(ON)}=90m\Omega(\text{typ.}) @ V_{GS}=4.5V$
 $R_{DS(ON)}=120m\Omega(\text{typ.}) @ V_{GS}=2.5V$
- Super High Dense Cell Design
- Reliable and Rugged
- SC-70 Package
- 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

APM1404 □□-□□□ Lead Free Code Handling Code Temp. Range Package Code	Package Code S : SC-70 Operating Junction Temp. Range C : -55 to 150°C Handling Code TR : Tape & Reel Lead Free Code L : Lead Free Device Blank : Original Device
APM1404 S : 04	

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

Note:

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

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

Symbol	Parameter	Test Condition	APM1404S			Unit
			Min.	Typ.	Max.	
Static Characteristics						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _{DS} =250μA	20			V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =16V, V _{GS} =0V			1	μA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _{DS} =250μA	0.5	0.7	1	V
I _{GSS}	Gate Leakage Current	V _{GS} =±10V, V _{DS} =0V			±100	nA
R _{DS(ON)} ^a	Drain-Source On-state Resistance	V _{GS} =4.5V, I _{DS} =1.2A		90	120	mΩ
		V _{GS} =2.5V, I _{DS} =0.6A		120	160	
V _{SD} ^a	Diode Forward Voltage	I _{SD} =0.5A, V _{GS} =0V		0.8	1.3	V
Dynamic Characteristics ^b						
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =15V, Frequency=1.0MHz		255		pF
C _{oss}	Output Capacitance			70		
C _{rss}	Reverse Transfer Capacitance			50		
t _{d(ON)}	Turn-on Delay Time	V _{DD} =10V, I _{DS} =1A, V _{GEN} =4.5V, R _G =6Ω, R _L =10Ω		2	4	ns
T _r	Turn-on Rise Time			2	4	
t _{d(OFF)}	Turn-off Delay Time			7	10	
T _f	Turn-off Fall Time			3	5	

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

Symbol	Parameter	Test Condition	APM1404S			Unit
			Min.	Typ.	Max.	
Gate Charge Characteristics ^b						
Q _g	Total Gate Charge	V _{DS} =10V, V _{GS} =4.5V, I _{DS} =1.2A		5	7	nC
Q _{gs}	Gate-Source Charge			0.68		
Q _{gd}	Gate-Drain Charge			0.72		

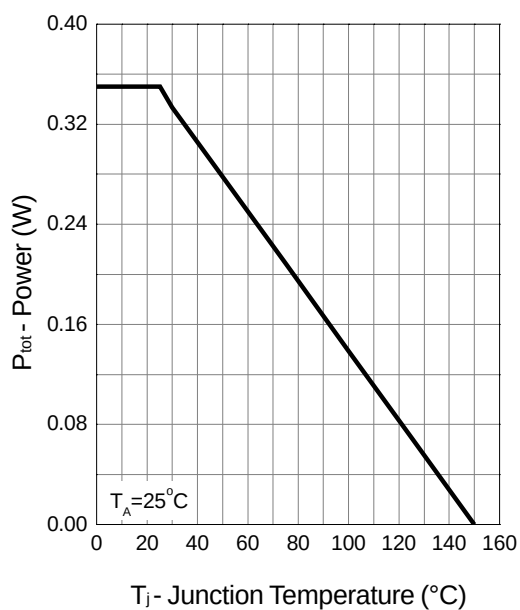
Notes:

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

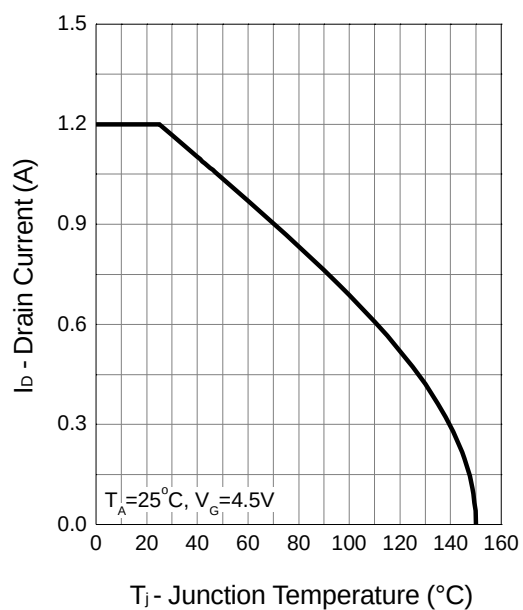
b : Guaranteed by design, not subject to production testing.

Typical Characteristics

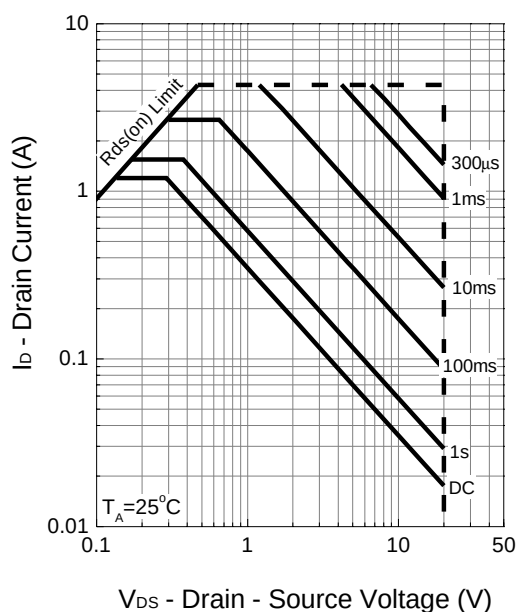
Power Dissipation



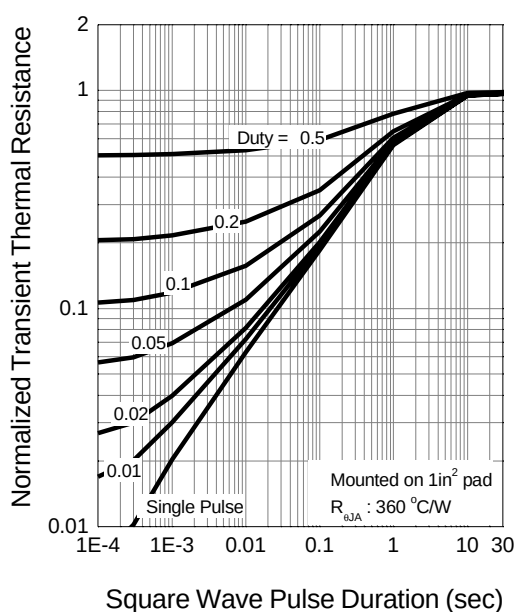
Drain Current



Safe Operation Area

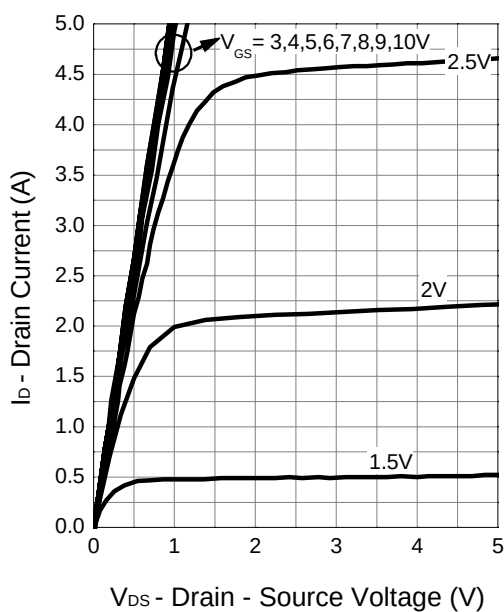


Thermal Transient Impedance

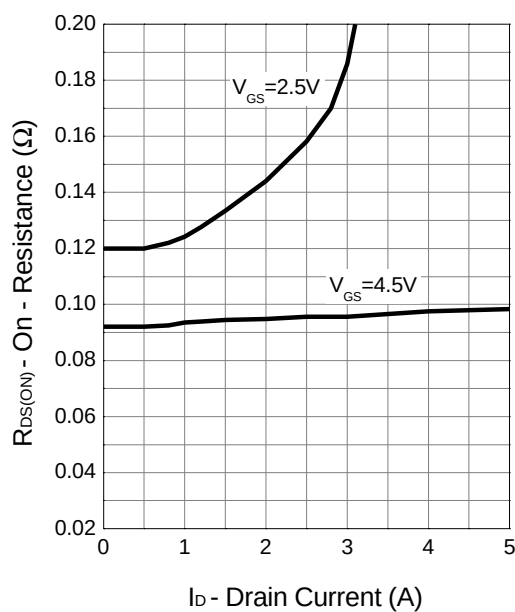


Typical Characteristics (Cont.)

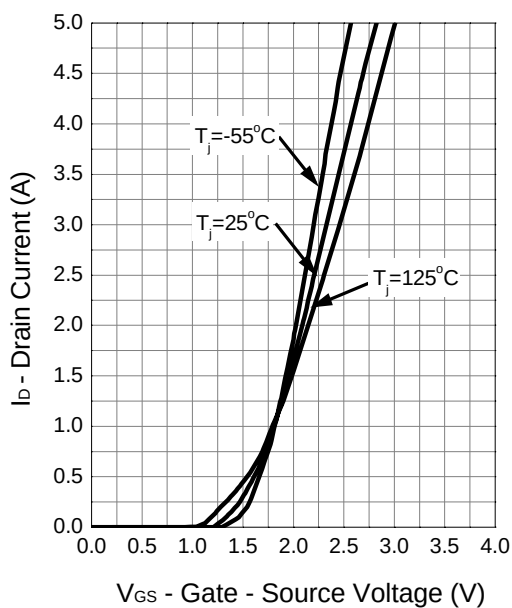
Output Characteristics



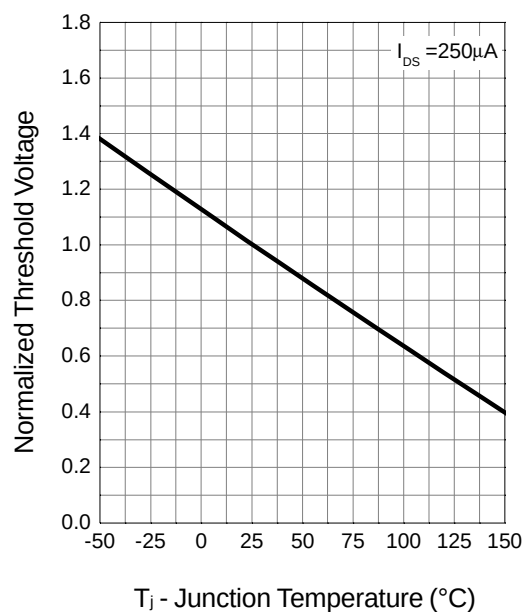
Drain-Source On Resistance



Transfer Characteristics

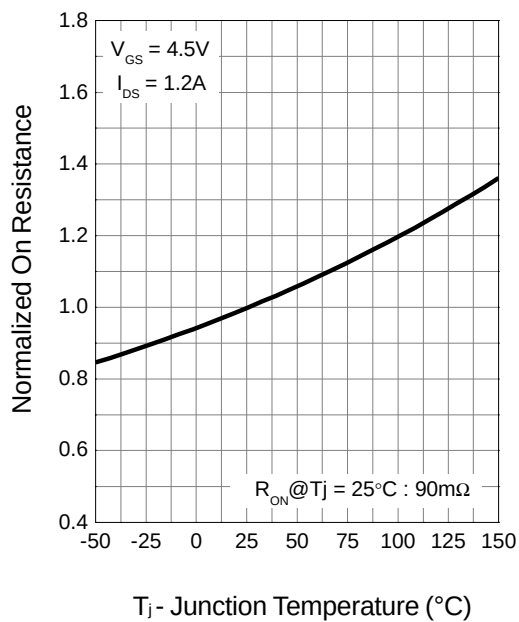


Gate Threshold Voltage

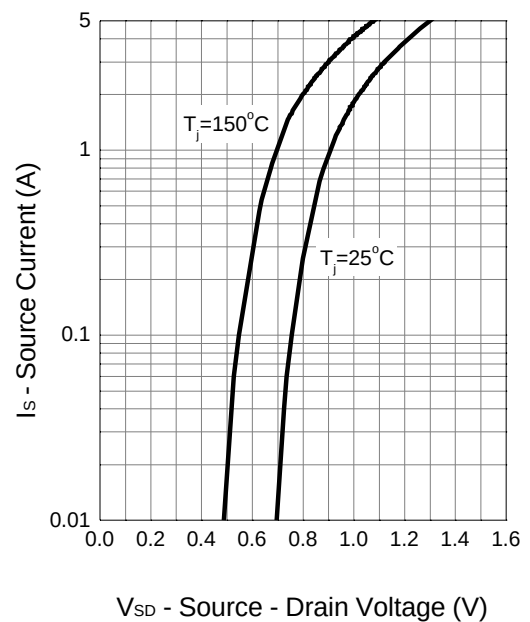


Typical Characteristics (Cont.)

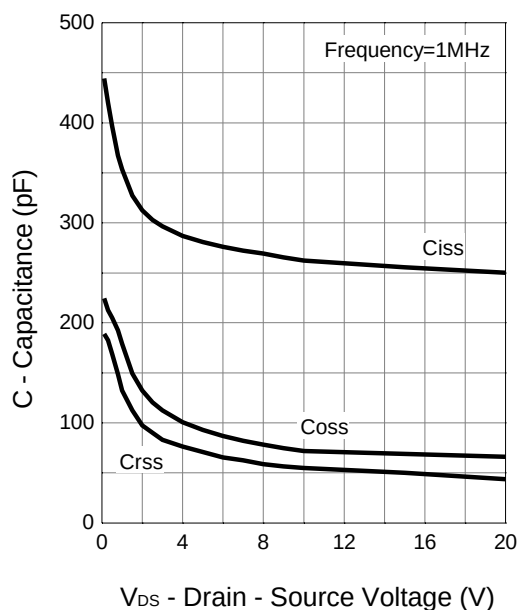
Drain-Source On Resistance



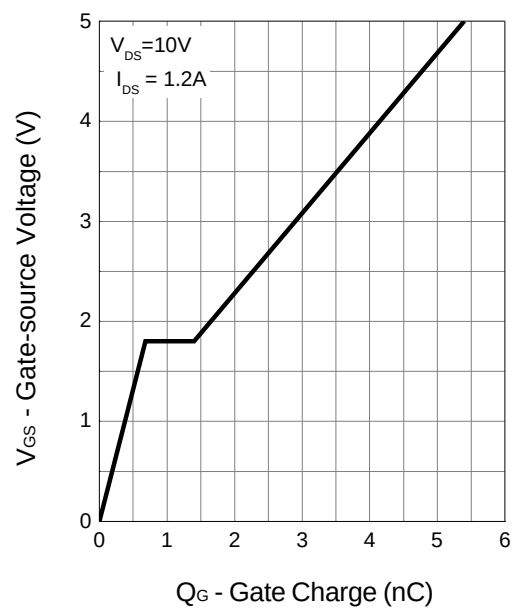
Source-Drain Diode Forward



Capacitance

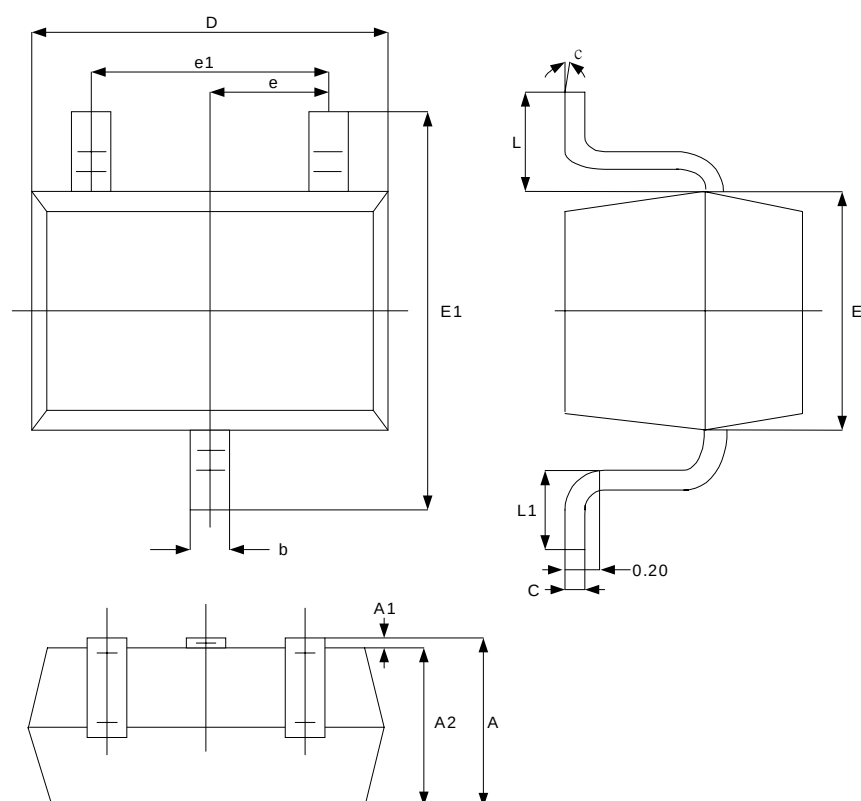


Gate Charge



Packaging Information

SC-70

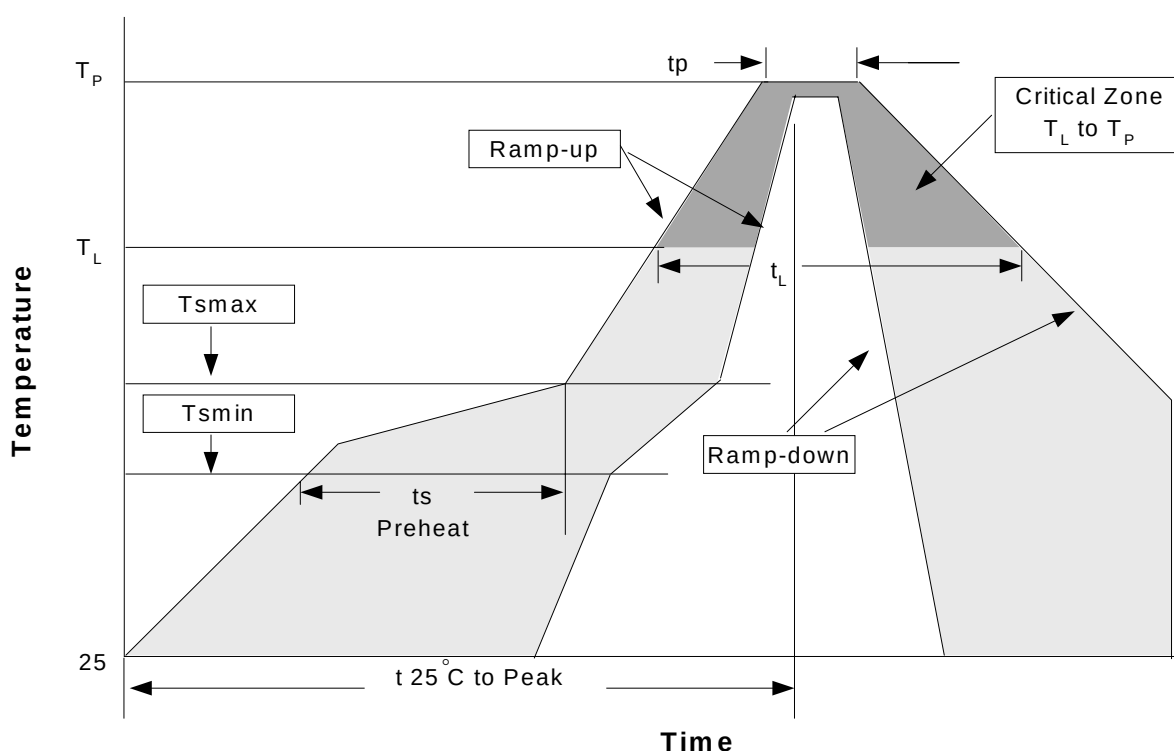


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.900	1.100	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.900	1.000	0.035	0.039
b	0.200	0.400	0.008	0.016
c	0.080	0.150	0.003	0.006
D	2.000	2.200	0.079	0.087
E	1.150	1.350	0.045	0.053
E1	2.150	2.450	0.085	0.096
e	0.650TYP		0.026TYP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

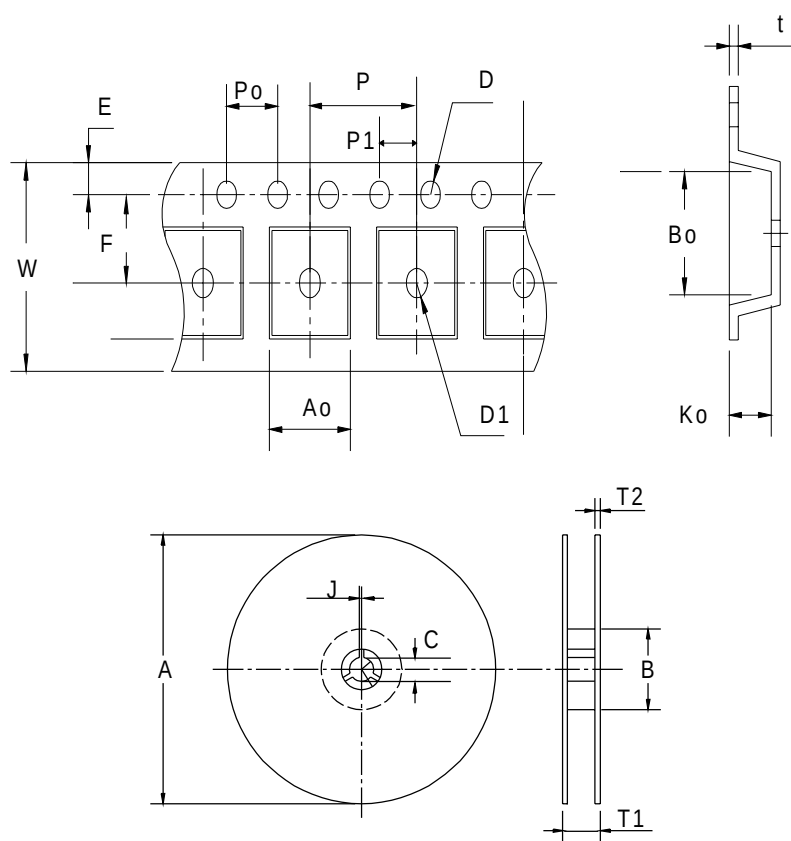
Profile Feature	Sn-Pb Eutectic Assembly		Pb-Free Assembly	
	Large Body	Small Body	Large Body	Small Body
Average ramp-up rate (T_L to T_P)	3°C/second max.		3°C/second max.	
Preheat				
- Temperature Min (T_{smin})	100°C		150°C	
- Temperature Mix (T_{smax})	150°C		200°C	
- Time (min to max)(t_s)	60-120 seconds		60-180 seconds	
T_{smax} to T_L			3°C/second max	
- Ramp-up Rate				
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	P0	P1	A0	B0	K0	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

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