

N-Channel Enhancement Mode MOSFET

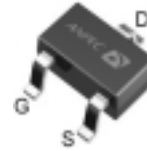
Features

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

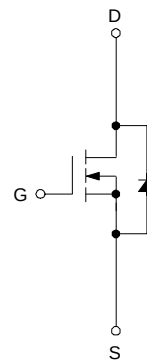
Applications

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

Pin Description

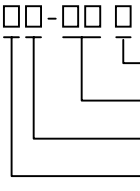


Top View of SC-70



N-Channel MOSFET

Ordering and Marking Information

APM1404 □□-□□ □  □□ : Package Code □ : Temp. Range □ : Handling Code □ : Lead Free 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.

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 ($T_A = 25^\circ\text{C}$ 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	$V_{GS}=4.5V$ 1.2	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	$T_A=25^\circ\text{C}$ 0.35	W
		$T_A=100^\circ\text{C}$ 0.14	
$R_{\theta JA}^*$	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.) ($T_A = 25^\circ\text{C}$ 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		

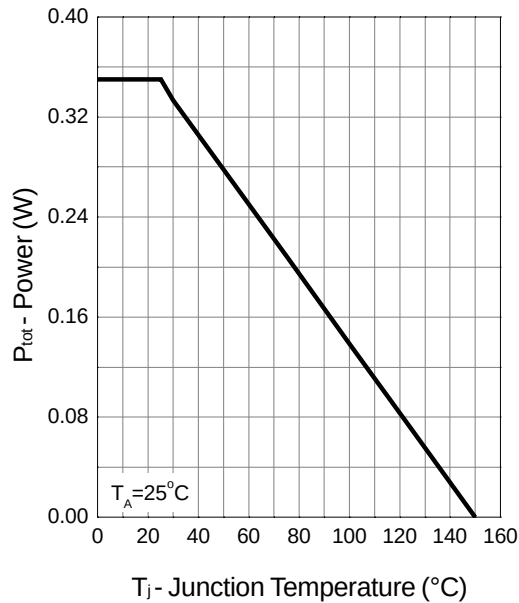
Notes:

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

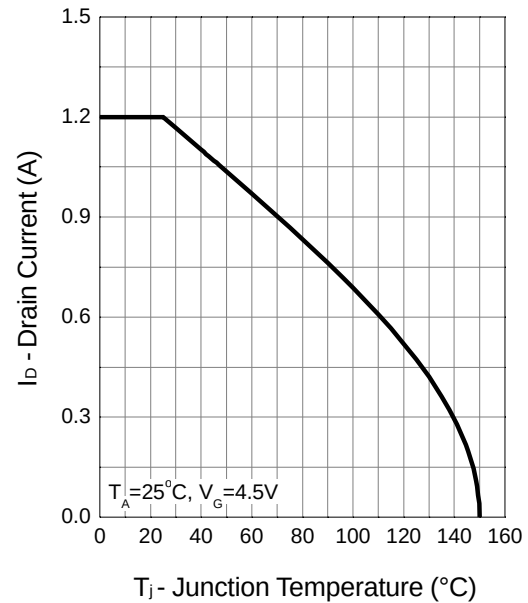
b : Guaranteed by design, not subject to production testing.

Typical Characteristics

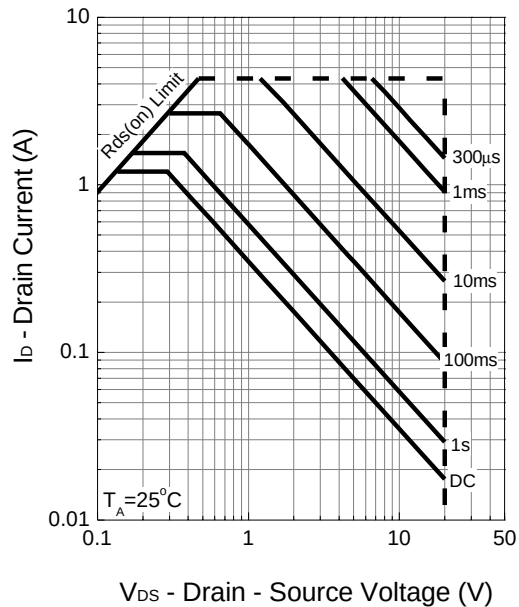
Power Dissipation



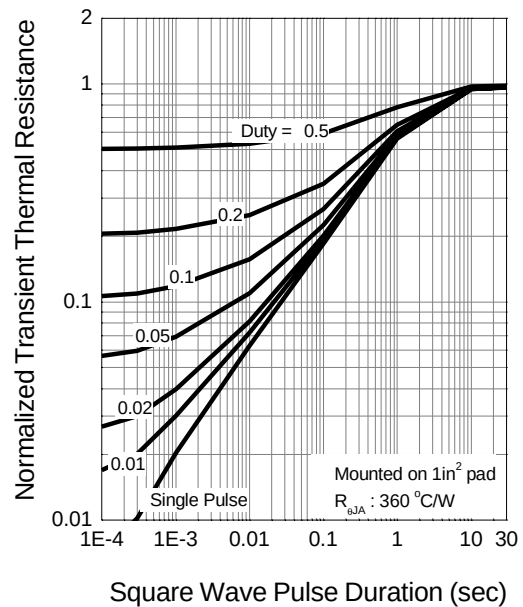
Drain Current



Safe Operation Area

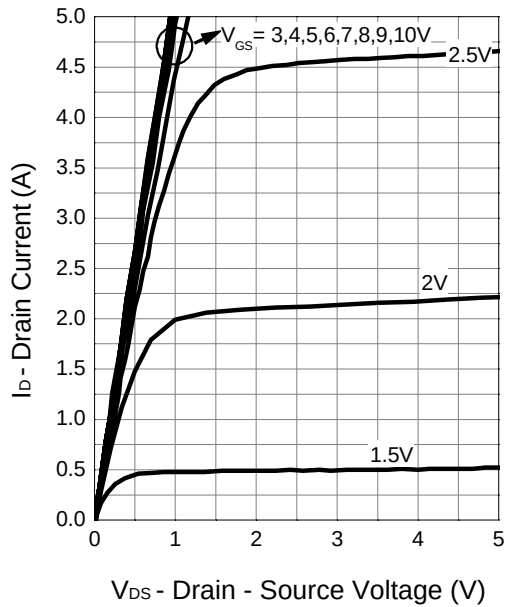


Thermal Transient Impedance

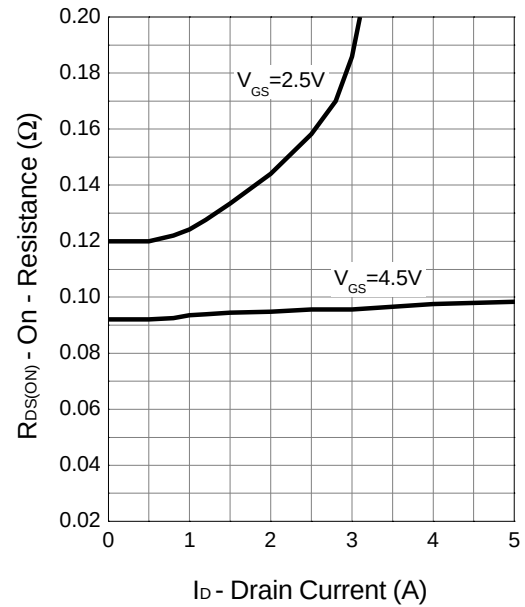


Typical Characteristics (Cont.)

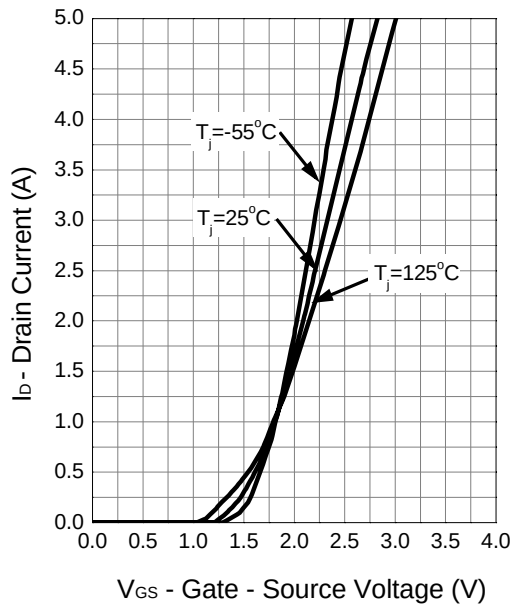
Output Characteristics



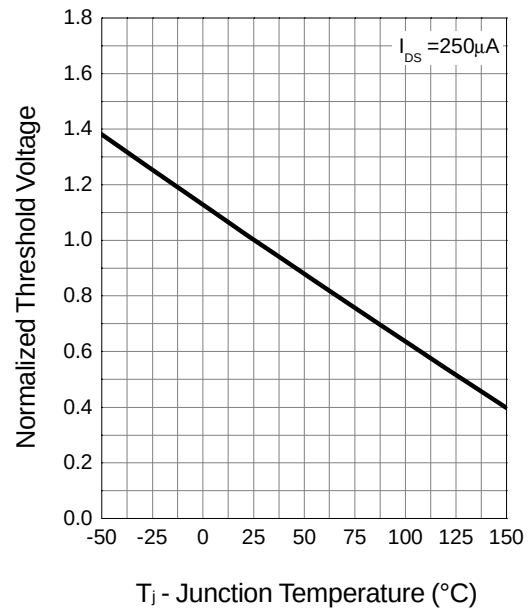
Drain-Source On Resistance



Transfer Characteristics

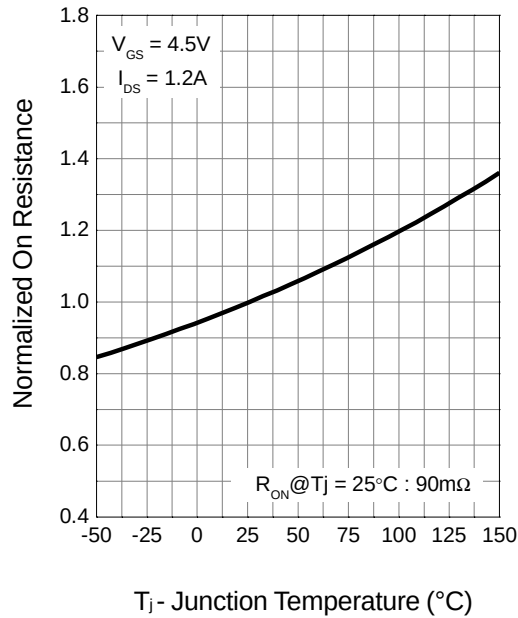


Gate Threshold Voltage

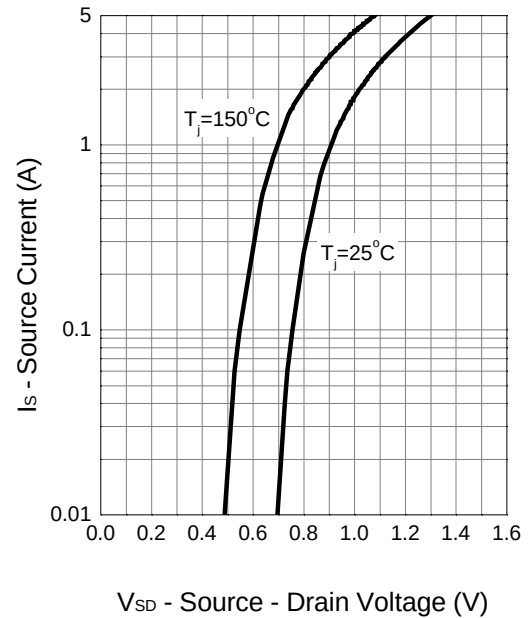


Typical Characteristics (Cont.)

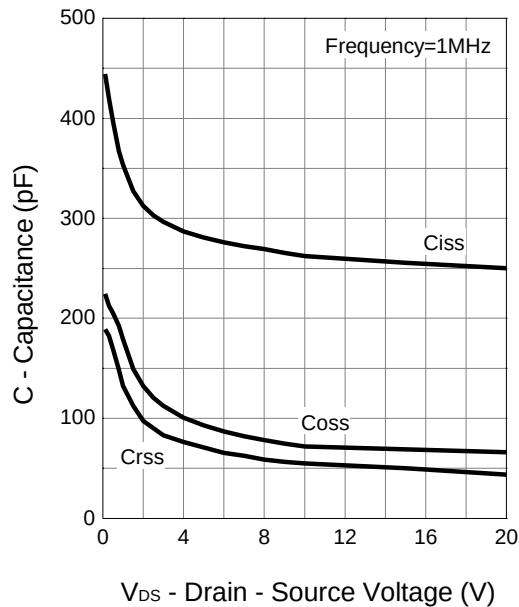
Drain-Source On Resistance



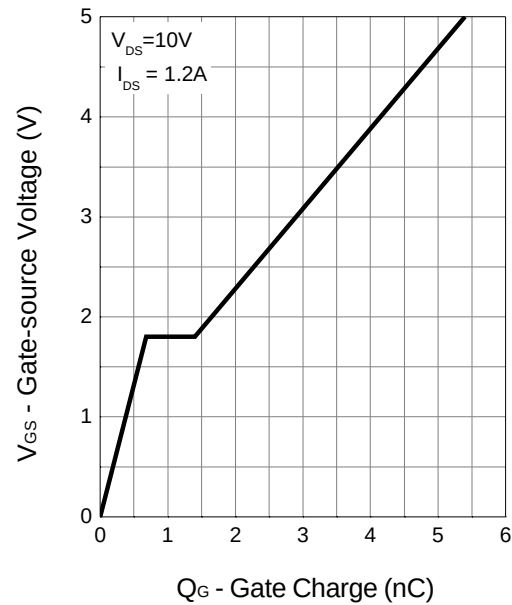
Source-Drain Diode Forward



Capacitance

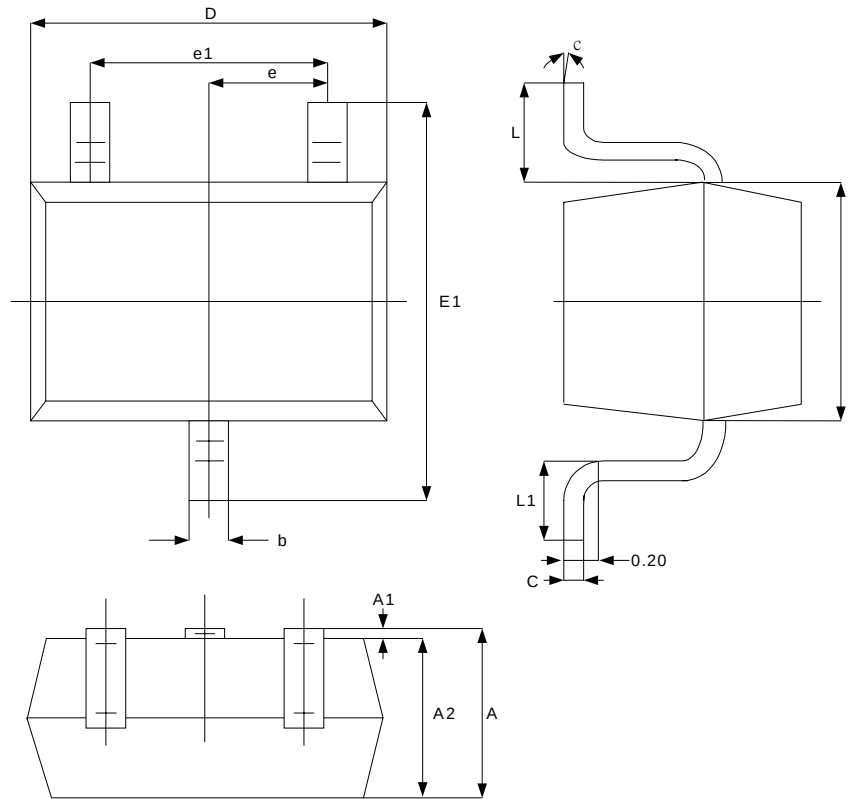


Gate Charge



Packaging Information

SC-70

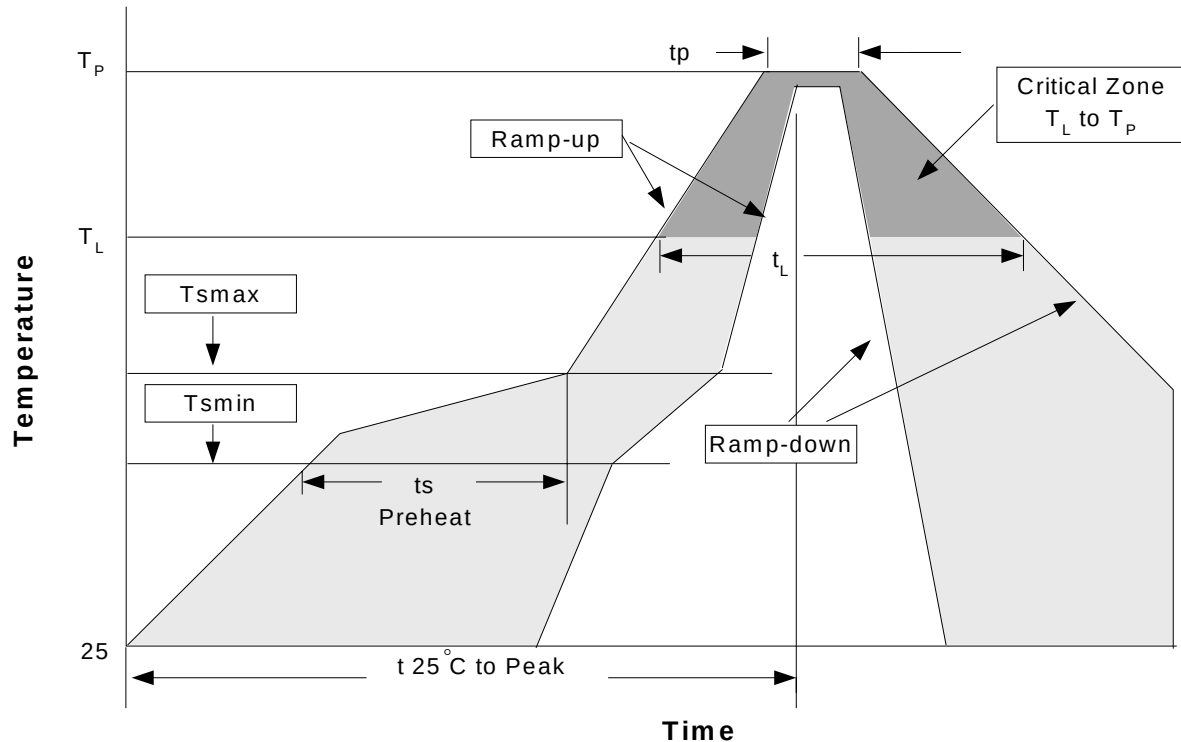


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.900	1.100	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.900	1.000	0.035	0.039
b	0.200	0.400	0.008	0.016
c	0.080	0.150	0.003	0.006
D	2.000	2.200	0.079	0.087
E	1.150	1.350	0.045	0.053
E1	2.150	2.450	0.085	0.096
e	0.650TYP		0.026TYP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

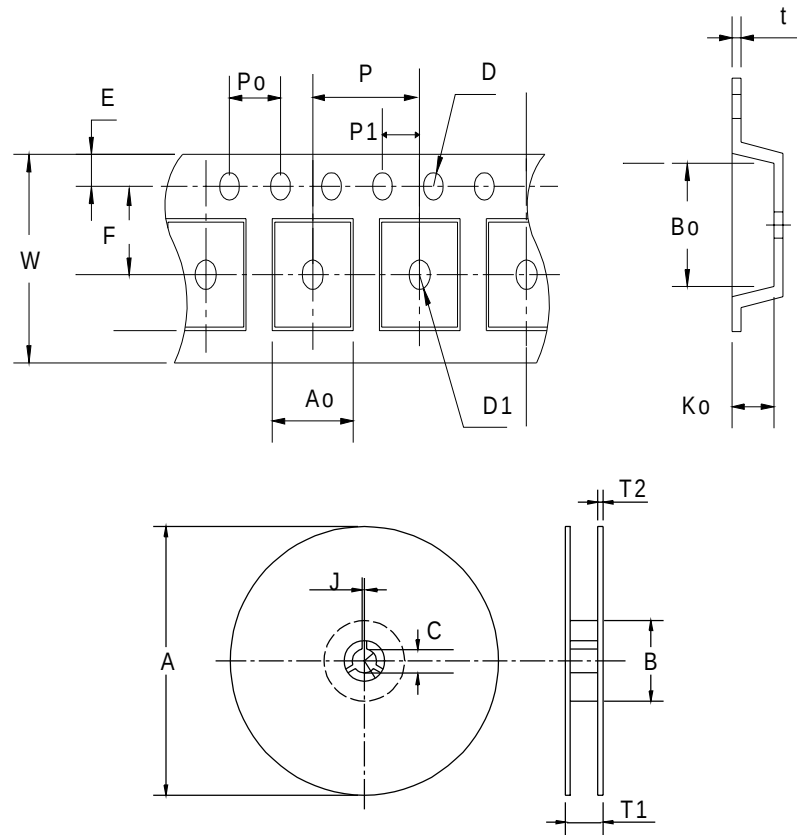
Profile Feature	Sn-Pb Eutectic Assembly		Pb-Free Assembly	
	Large Body	Small Body	Large Body	Small Body
Average ramp-up rate (T _L to T _P)	3°C/second max.		3°C/second max.	
Preheat				
- Temperature Min (T _{min})	100°C		150°C	
- Temperature Mix (T _{max})	150°C		200°C	
- Time (min to max)(t _s)	60-120 seconds		60-180 seconds	
T _{max} to T _L			3°C/second max	
- Ramp-up Rate				
T _{max} 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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