

N-Channel Enhancement Mode MOSFET

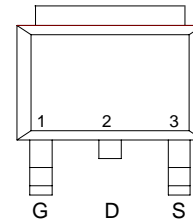
Features

- 25V/60A , $R_{DS(ON)}=8m\Omega(\text{typ.}) @ V_{GS}=10V$
 $R_{DS(ON)}=11m\Omega(\text{typ.}) @ V_{GS}=4.5V$
- Super High Dense Advanced Cell Design for
Extremely Low $R_{DS(ON)}$
- Reliable and Rugged
- TO-252 Package

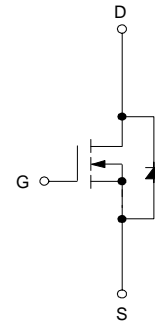
Applications

- Power Management in Desktop Computer or
DC/DC Converters.

Pin Description



Top View of TO-252



N-Channel MOSFET

Ordering and Marking Information

<p>APM2509N</p> <p>□□-□□□</p> <p>Lead Free Code</p> <p>Handling Code</p> <p>Temp. Range</p> <p>Package Code</p>	<p>Package Code</p> <p>U : TO-252</p> <p>Operating Junction Temp. Range</p> <p>C : -55 to 150°C</p> <p>Handling Code</p> <p>TU : Tube</p> <p>TR : Tape & Reel</p> <p>Lead Free Code</p> <p>L : Lead Free Device Blank : Original Device</p>
<p>APM2509N U :</p> <p>APM2509N XXXXX</p>	<p>XXXXX - Date Code</p>

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

Symbol	Parameter	Rating	Unit
V_{DSS}	Drain-Source Voltage	25	V
V_{GSS}	Gate-Source Voltage	± 20	
I_D^*	Maximum Drain Current – Continuous	60	A
I_{DM}	Maximum Drain Current – Pulsed	110	

* Surface Mounted on FR4 Board, $t \leq 10$ sec.

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°C unless otherwise noted)

Symbol	Parameter	Rating	Unit
P _D	Maximum Power Dissipation	T _C =25°C	50
		T _C =100°C	20
T _J , T _{STG}	Maximum Operating and Storage Junction Temperature	-55 to 150	°C
R _{θJA} ^a	Thermal Resistance – Junction to Ambient	50	°C/W
R _{θJC}	Thermal Resistance – Junction to Case	2.5	°C/W

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

Symbol	Parameter	Test Condition	APM2509N			Unit
			Min.	Typ.	Max.	
Static						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _{DS} =250μA	25			V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =20V , V _{GS} =0V			1	μA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _{DS} =250μA	1	1.5	2	V
I _{GSS}	Gate Leakage Current	V _{GS} =±20V, V _{DS} =0V			±100	nA
R _{DS(ON)} ^a	Drain-Source On-state Resistance	V _{GS} =10V, I _{DS} =35A		8	9	mΩ
		V _{GS} =4.5V, I _{DS} =20A		11	15	
V _{SD} ^a	Diode Forward Voltage	I _S =35A, V _{GS} =0V		0.85	1.3	V
Dynamic ^b						
Q _g	Total Gate Charge	V _{DS} =15V, I _{DS} =30A V _{GS} =4.5V,		20.2	28	nC
Q _{gs}	Gate-Source Charge			4.8		
Q _{gd}	Gate-Drain Charge			8.4		
t _{d(ON)}	Turn-on Delay Time	V _{DD} =15V, I _{DS} =1A, V _{GEN} =10V, R _G = 6Ω		10	15	ns
T _r	Turn-on Rise Time			7	13	
t _{d(OFF)}	Turn-off Delay Time			35	50	
T _f	Turn-off Fall Time			10	20	
C _{iss}	Input Capacitance	V _{GS} =0V		1785		pF
C _{oss}	Output Capacitance	V _{DS} =15V		605		
C _{rss}	Reverse Transfer Capacitance	Frequency =1.0MHz		490		

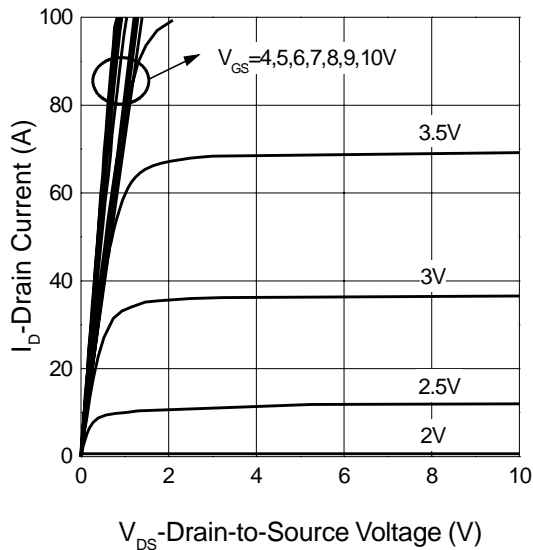
Notes

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

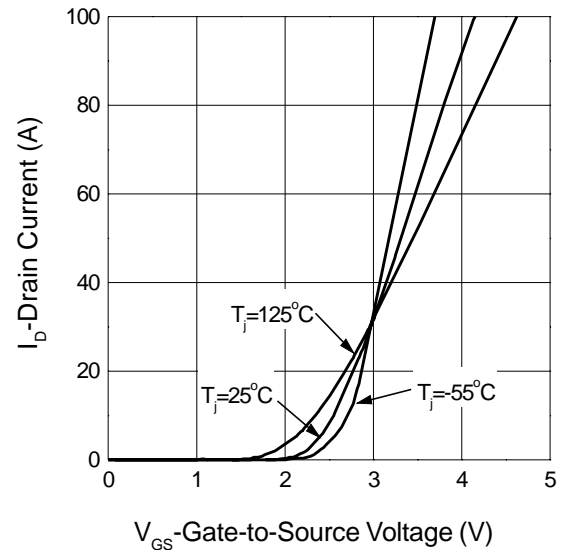
^b : Guaranteed by design, not subject to production testing

Typical Characteristics

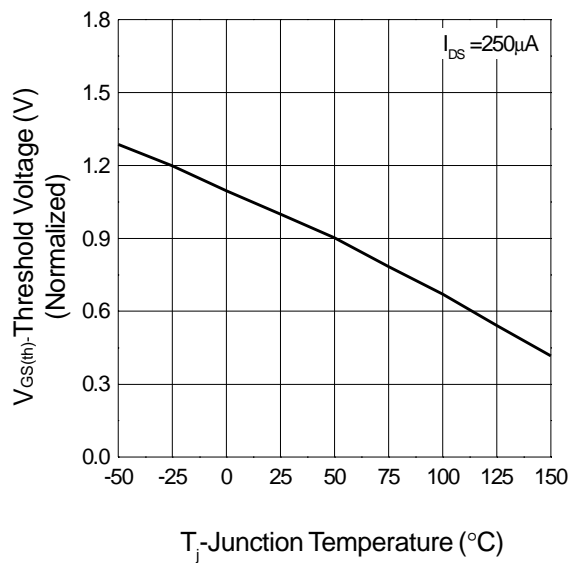
Output Characteristics



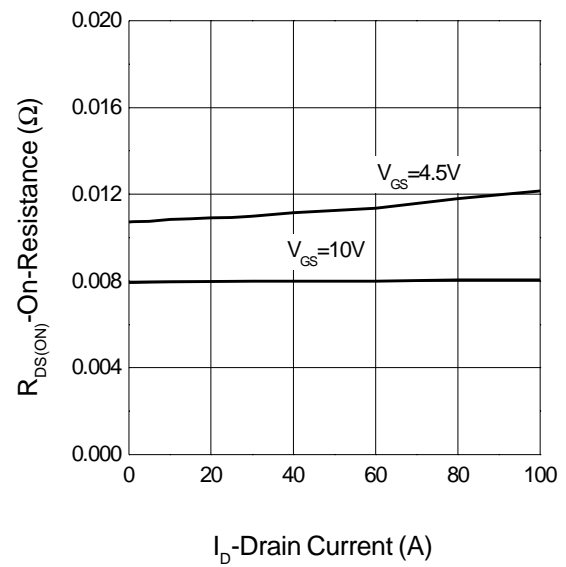
Transfer Characteristics



Threshold Voltage vs. Junction Temperature

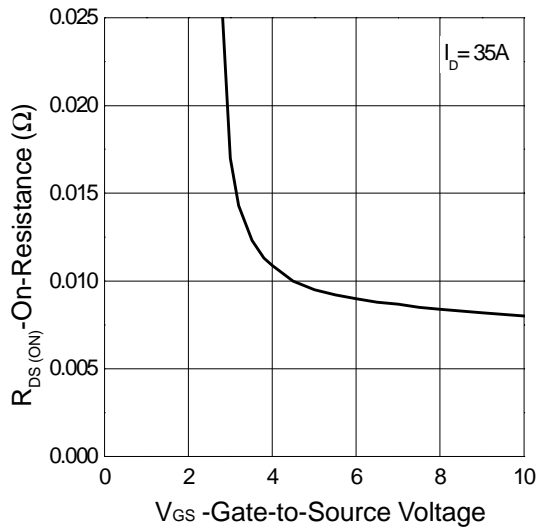


On-Resistance vs. Drain Current

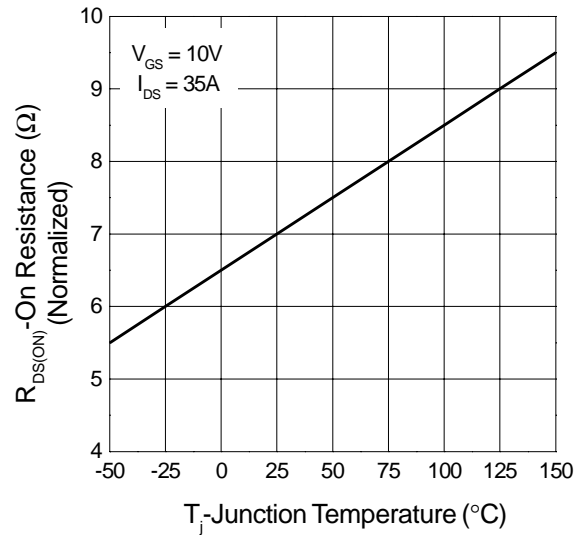


Typical Characteristics (Cont.)

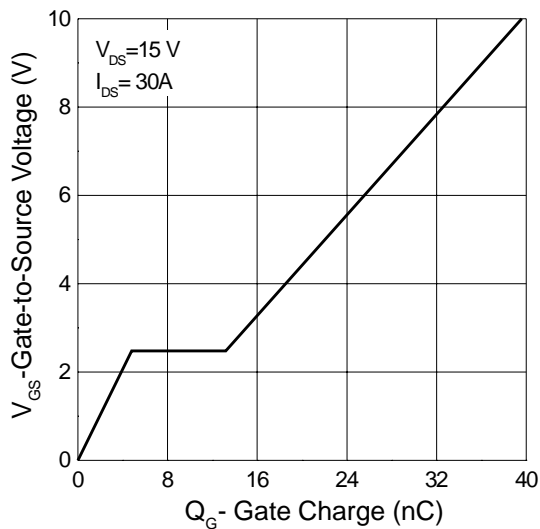
On-Resistance vs. Gate-to-Source Voltage



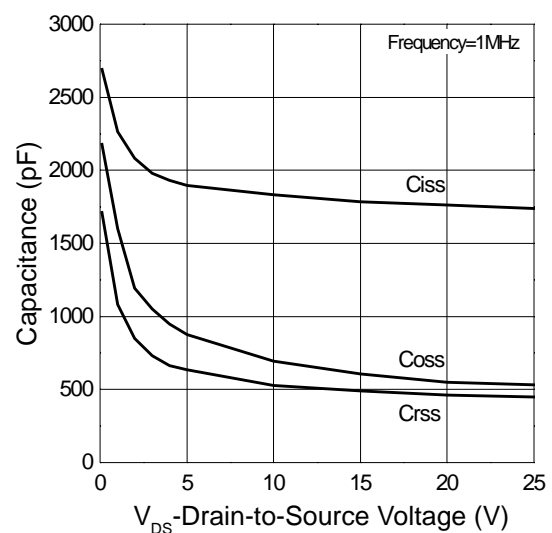
On-Resistance vs. Junction Temperature



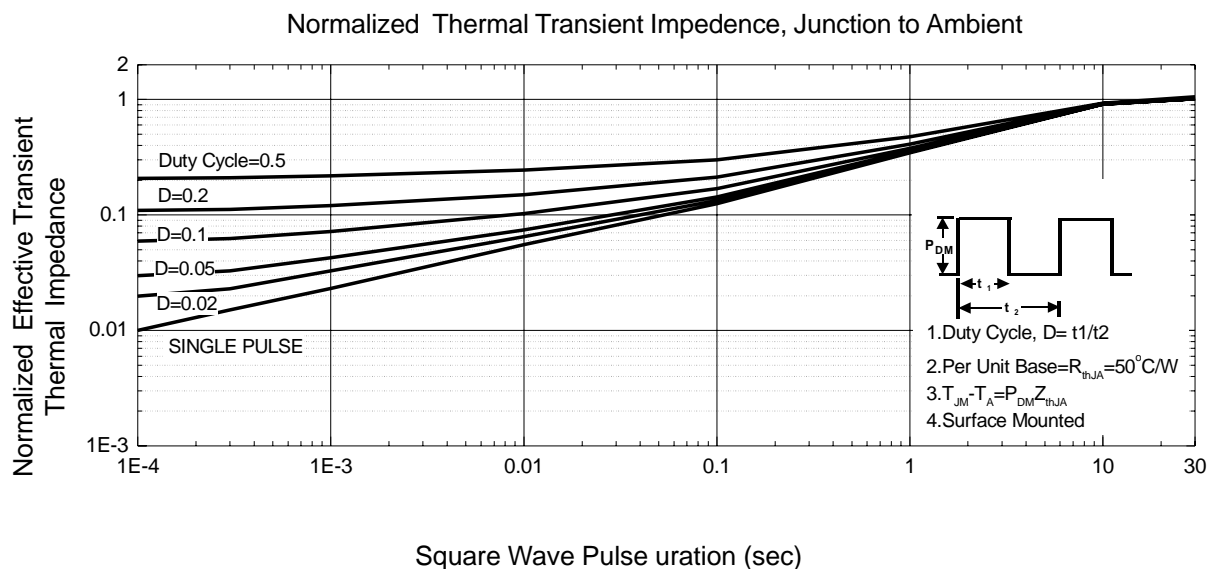
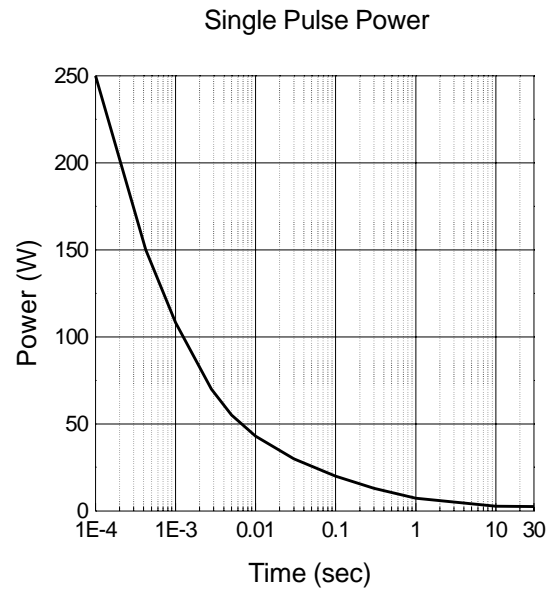
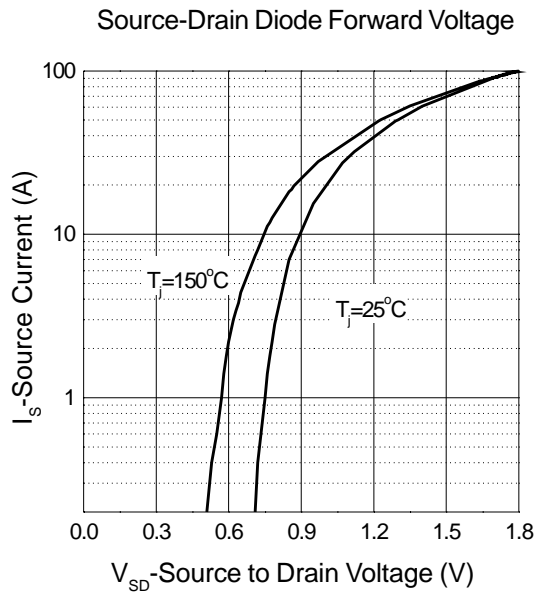
Gate Charge



Capacitance

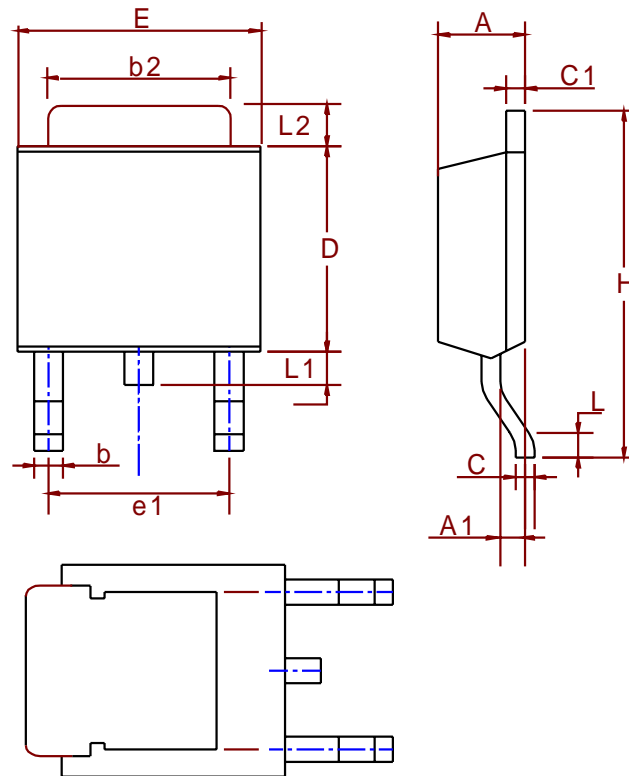


Typical Characteristics (Cont.)



Package Informaion

TO-252(Reference JEDEC Registration TO-252)

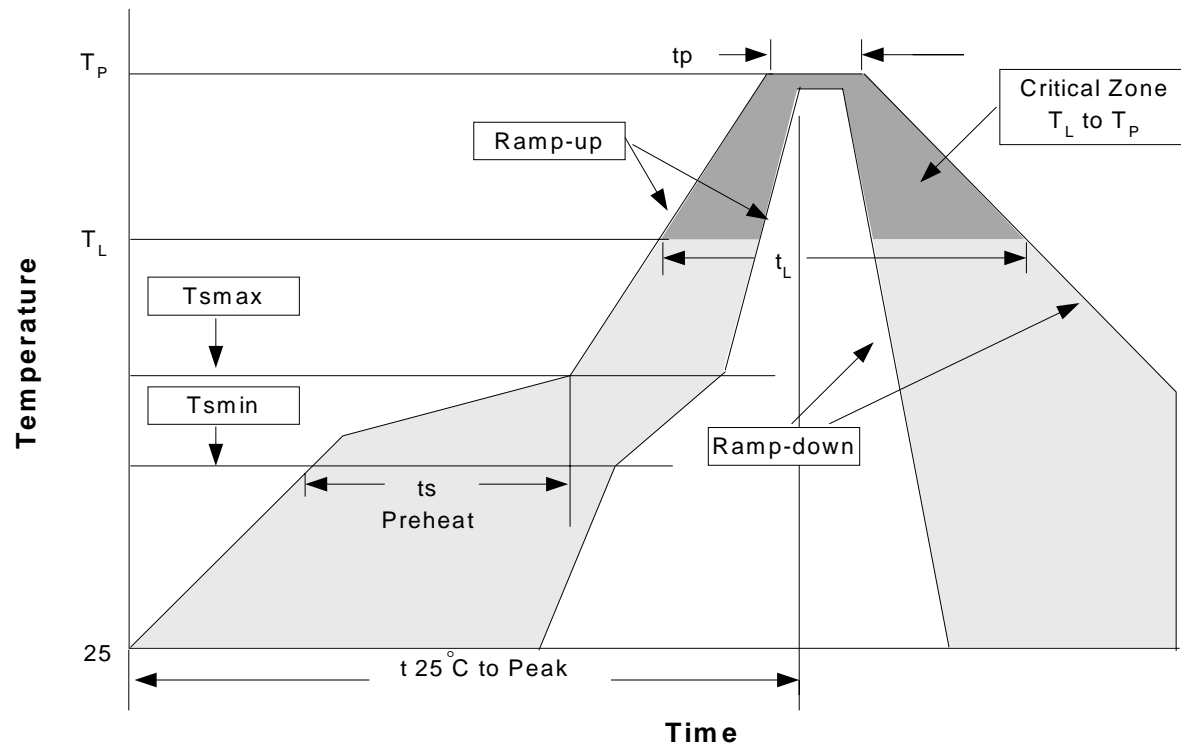


Dim	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	2.18	2.39	0.086	0.094
A1	0.89	1.27	0.035	0.050
b	0.508	0.89	0.020	0.035
b2	5.207	5.461	0.205	0.215
C	0.46	0.58	0.018	0.023
C1	0.46	0.58	0.018	0.023
D	5.334	6.22	0.210	0.245
E	6.35	6.73	0.250	0.265
e1	3.96	5.18	0.156	0.204
H	9.398	10.41	0.370	0.410
L	0.51		0.020	
L1	0.64	1.02	0.025	0.040
L2	0.89	2.032	0.035	0.080

Physical Specifications

Terminal Material	Solder-Plated Copper (Solder Material : 90/10 or 63/37 SnPb), 100%Sn
Lead Solderability	Meets EIA Specification RS186-91, ANSI/J-STD-002 Category 3.

Reflow Condition (IR/Convection or VPR Reflow)



Classification Reflow Profiles

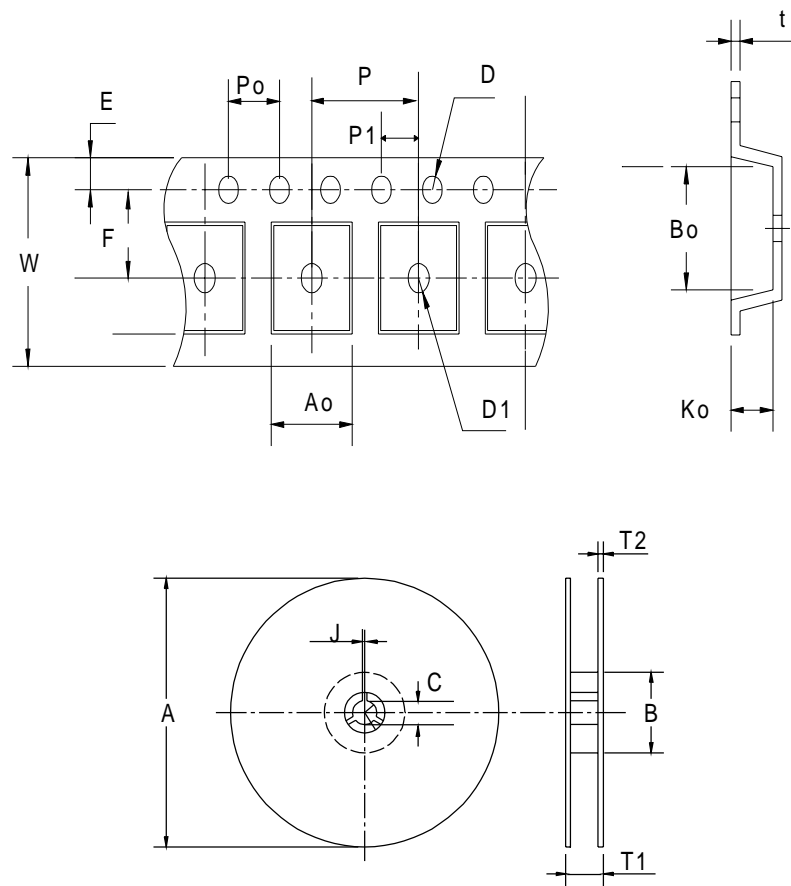
Profile Feature	Sn-Pb Eutectic Assembly		Pb-Free Assembly	
	Large Body	Small Body	Large Body	Small Body
Average ramp-up rate (T _L to T _P)	3°C/second max.		3°C/second max.	
Preheat				
- Temperature Min (T _{min})	100°C		150°C	
- Temperature Mix (T _{max})	150°C		200°C	
- Time (min to max)(t _s)	60-120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



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

(mm)

Cover Tape Dimensions

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

Customer Service

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