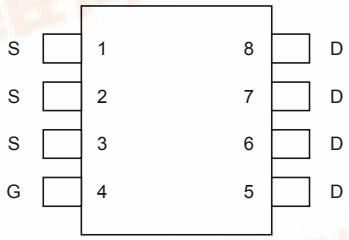
APM4461

P-Channel Enhancement Mode MOSFET

Features

- -20V/-7A, $R_{DS(ON)}$ = 25mΩ(typ.) @ V_{GS} = -10V
  $R_{DS(ON)}$ = 35mΩ(typ.) @ V_{GS} = -4.5V
  $R_{DS(ON)}$ = 55mΩ(typ.) @ V_{GS} = -2.5V
- Super High Density Cell Design
- Reliable and Rugged
- SOP-8 Package

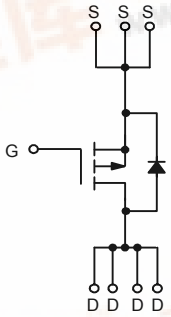
Pin Description



SO – 8

Applications

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



P-Channel MOSFET

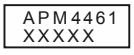
Ordering and Marking Information

APM4461 □□-□□

- Handling Code
- Temp. Range
- Package Code

Package Code
K : SO-8
Operation Junction Temp. Range
C : -55 to 150°C
Handling Code
TR : Tape & Reel

APM4461 K :



XXXXX - Date Code

Absolute Maximum Ratings (T$_A$ = 25°C unless otherwise noted)

Symbol	Parameter	Rating	Unit
V_{DSS}	Drain-Source Voltage	-20	V
V_{GSS}	Gate-Source Voltage	±20	
I_D*	Maximum Drain Current – Continuous	-7	A

* Surface Mounted on FR4 Board, t ≤ 10 sec.

Absolute Maximum Ratings (Cont.) (T_A = 25°C unless otherwise noted)

Symbol	Parameter		Rating	Unit
I_{DM}	Maximum Drain Current – Pulsed		-25	A
P_D	Maximum Power Dissipation	T_A=25 °C	2.5	W
		T_A=100 °C	1.0	
T_J	Maximum Junction Temperature		150	°C
T_{STG}	Storage Temperature Range		-55 to 150	°C
$R_{\theta JA}$	Thermal Resistance – Junction to Ambient		50	°C/W

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

Symbol	Parameter	Test Condition	APM4461			Unit
			Min.	Typ.	Max.	
Static						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V , I_{DS}=-250A	-20			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=-24V , V_{GS}=0V			-1	μA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} , I_{DS}=-250μA	-0.6		-1.5	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}=-7A		25	35	mΩ
		V_{GS}=-4.5V , I_{DS}=-4A		35	50	
		V_{GS}=-2.5V , I_{DS}=-2A		55	65	
V_{SD}[a]	Diode Forward Voltage	I_{SD}=-2A, V_{GS}=0V	-0.7		-1.3	V
Dynamic[b]						
Q_g	Total Gate Charge	V_{DS}=-10V , V_{GS}=-4.5V, I_{DS}=-2A		17.8	21	nC
Q_{gs}	Gate-Source Charge			4		
Q_{gd}	Gate-Drain Charge			5.2		
$t_{d(ON)}$	Turn-on Delay Time	V_{DD}=-10V , I_{DS}=-2A , V_{GEN}=-4.5 V , R_G=0.2Ω		10	15	ns
T_r	Turn-on Rise Time			15	20	
$t_{d(OFF)}$	Turn-off Delay Time			32	26	
T_f	Turn-off Fall Time			15	25	
C_{iss}	Input Capacitance	V_{GS}=0V V_{DS}=-15V Frequency=1.0MHz		1240		pF
C_{oss}	Output Capacitance			340		
C_{rss}	Reverse Transfer Capacitance			216		

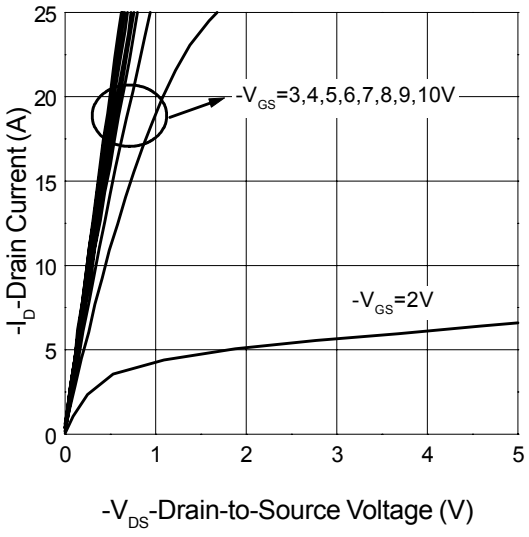
Notes

[a] : Guaranteed by design, not subject to production testing

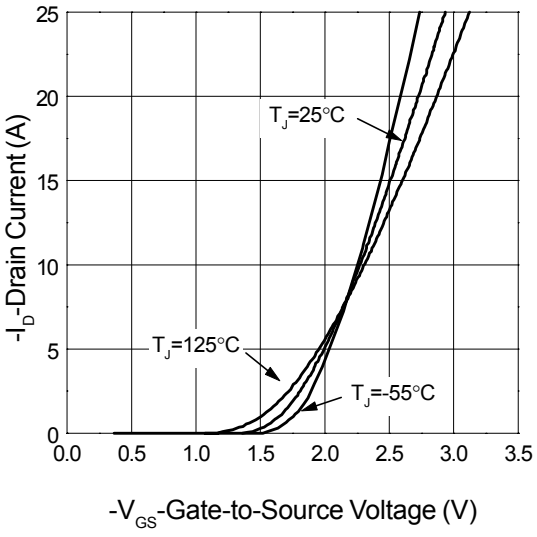
[b] : Pulse test ; pulse width ≤ 500μs, duty cycle ≤ 2%

Typical Characteristics

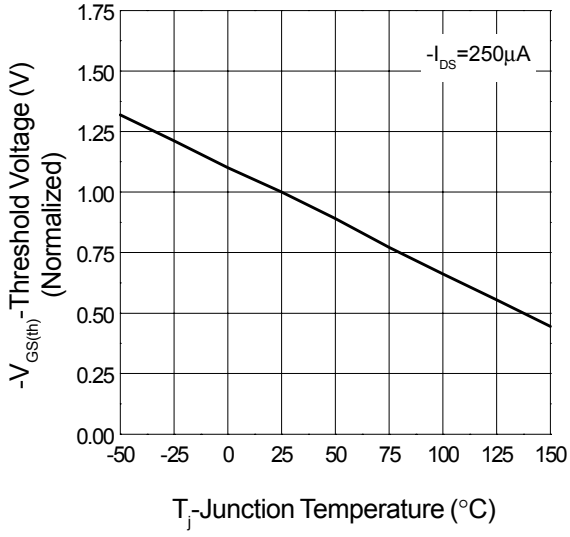
Output Characteristics



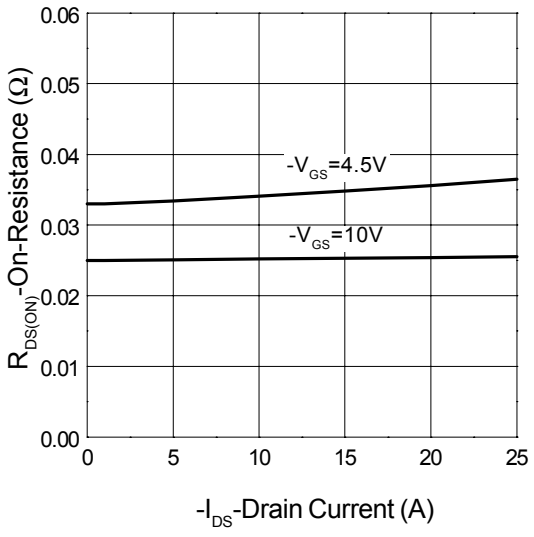
Transfer Characteristics



Threshold Voltage vs. Junction Temperature

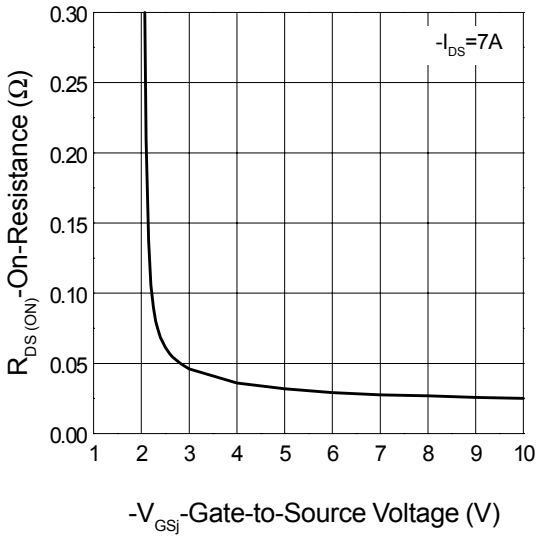


On-Resistance vs. Drain Current

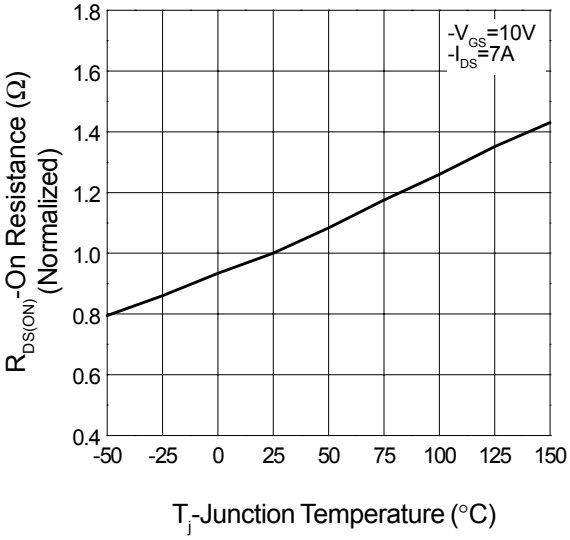


Typical Characteristics (Cont.)

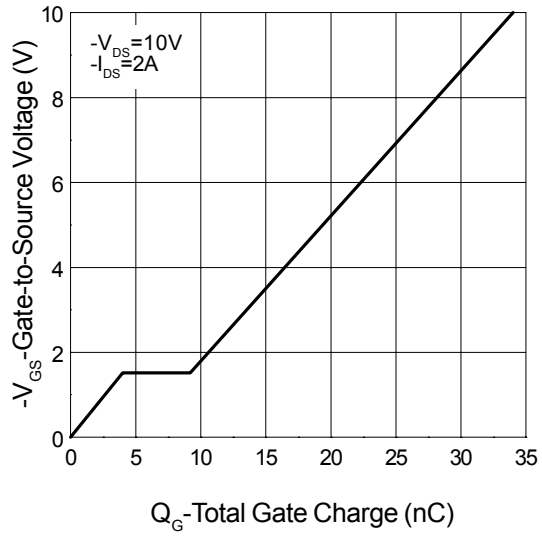
On-Resistance vs. Gate-to-Source Voltage



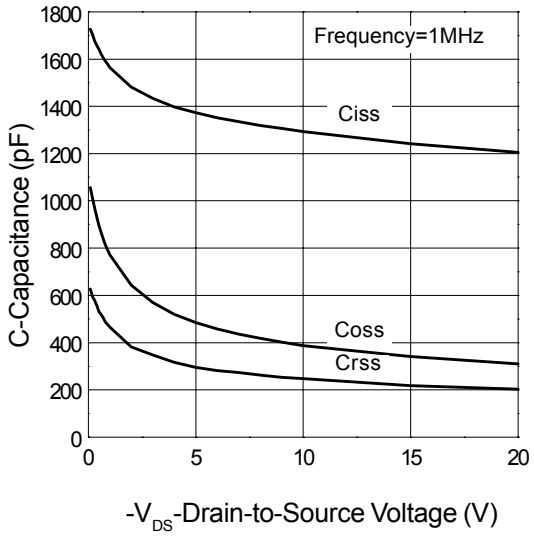
On-Resistaence vs. Junction Temperature



Gate Charge

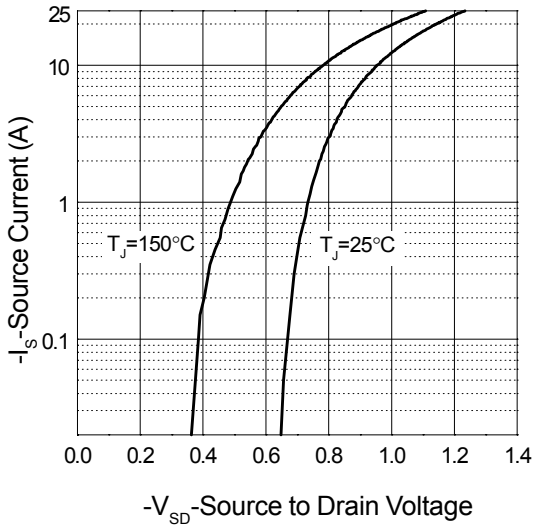


Capacitance Characteristics

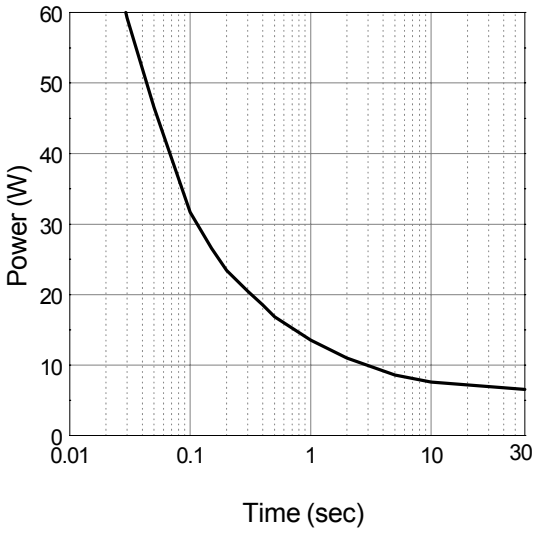


Typical Characteristics (Cont.)

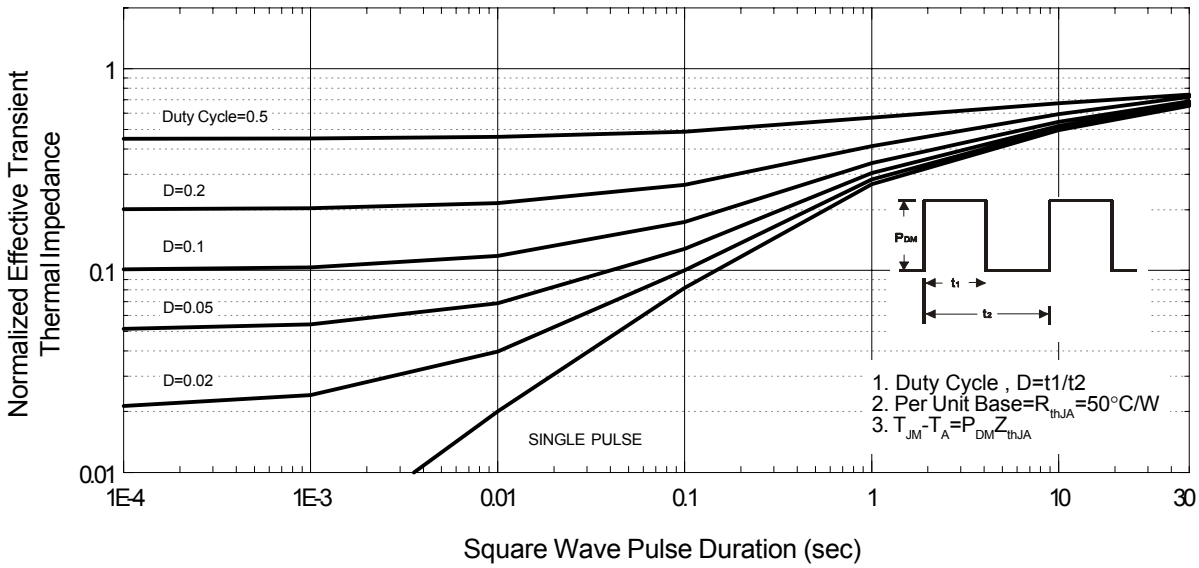
Source-Drain Diode Forward Voltage



Single Pulse Power

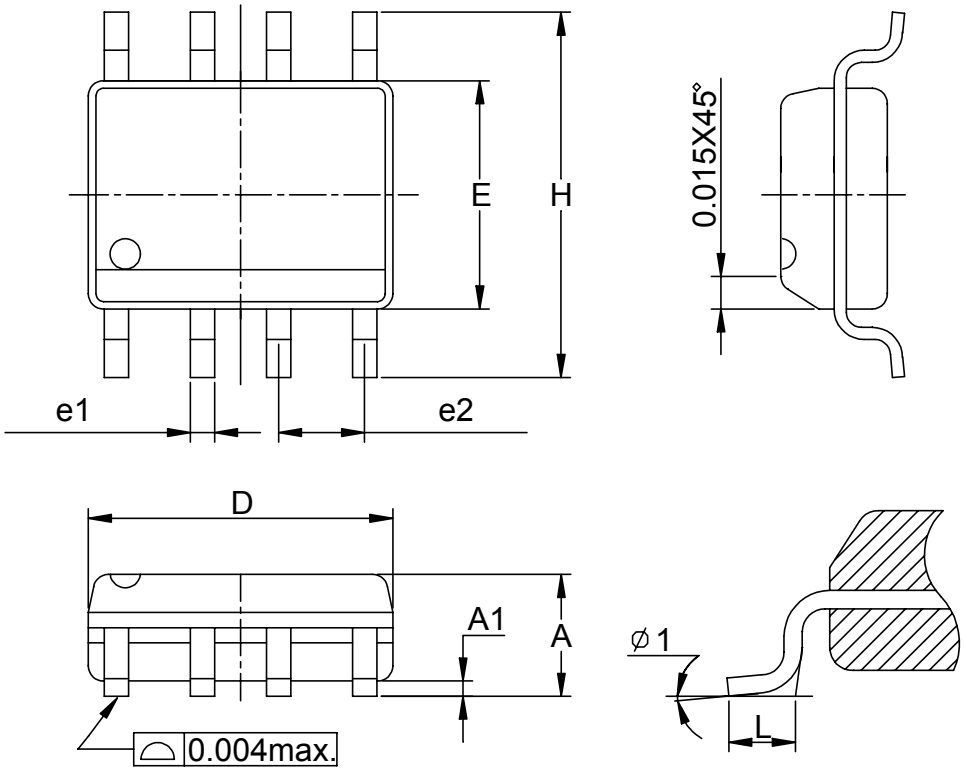


Normalized Transient Thermal Transient Impedence, Junction to Ambient



Packaging Information

SOP-8 pin (Reference JEDEC Registration MS-012)



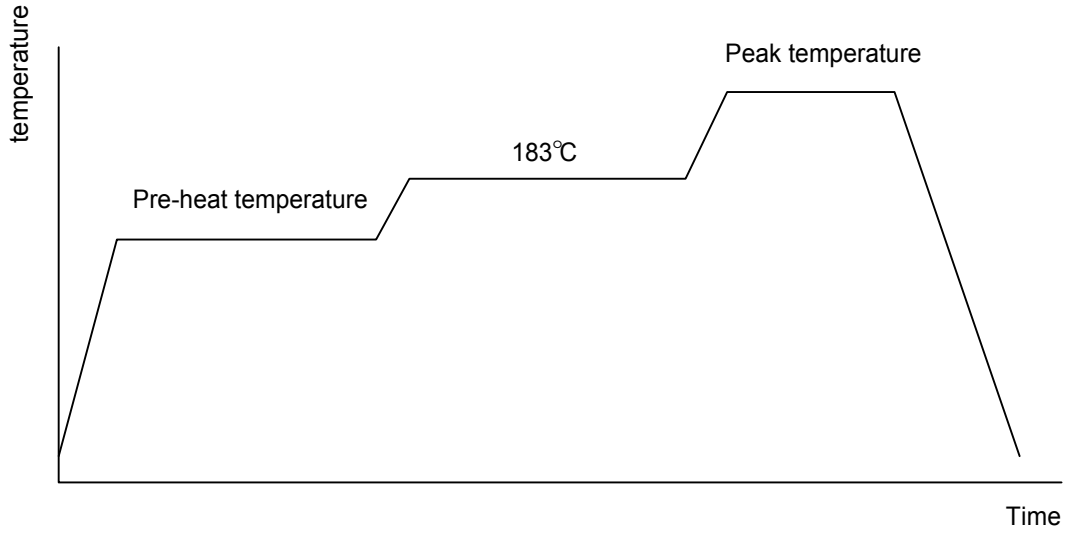
Dim	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	1.35	1.75	0.053	0.069
A1	0.10	0.25	0.004	0.010
D	4.80	5.00	0.189	0.197
E	3.80	4.00	0.150	0.157
H	5.80	6.20	0.228	0.244
L	0.40	1.27	0.016	0.050
e1	0.33	0.51	0.013	0.020
e2	1.27BSC		0.50BSC	
ϕ 1	8°		8°	

Physical Specifications

Terminal Material	Solder-Plated Copper (Solder Material : 90/10 or 63/37 SnPb)
Lead Solderability	Meets EIA Specification RSI86-91, ANSI/J-STD-002 Category 3.

Reflow Condition (IR/Convection or VPR Reflow)

Reference JEDEC Standard J-STD-020A APRIL 1999



Classification Reflow Profiles

	Convection or IR/ Convection	VPR
Average ramp-up rate(183°C to Peak)	3°C/second max.	10 °C /second max.
Preheat temperature 125 ± 25°C)	120 seconds max	
Temperature maintained above 183°C	60 – 150 seconds	
Time within 5°C of actual peak temperature	10 –20 seconds	60 seconds
Peak temperature range	220 +5/-0°C or 235 +5/-0°C	215-219°C or 235 +5/-0°C
Ramp-down rate	6 °C /second max.	10 °C /second max.
Time 25°C to peak temperature	6 minutes max.	

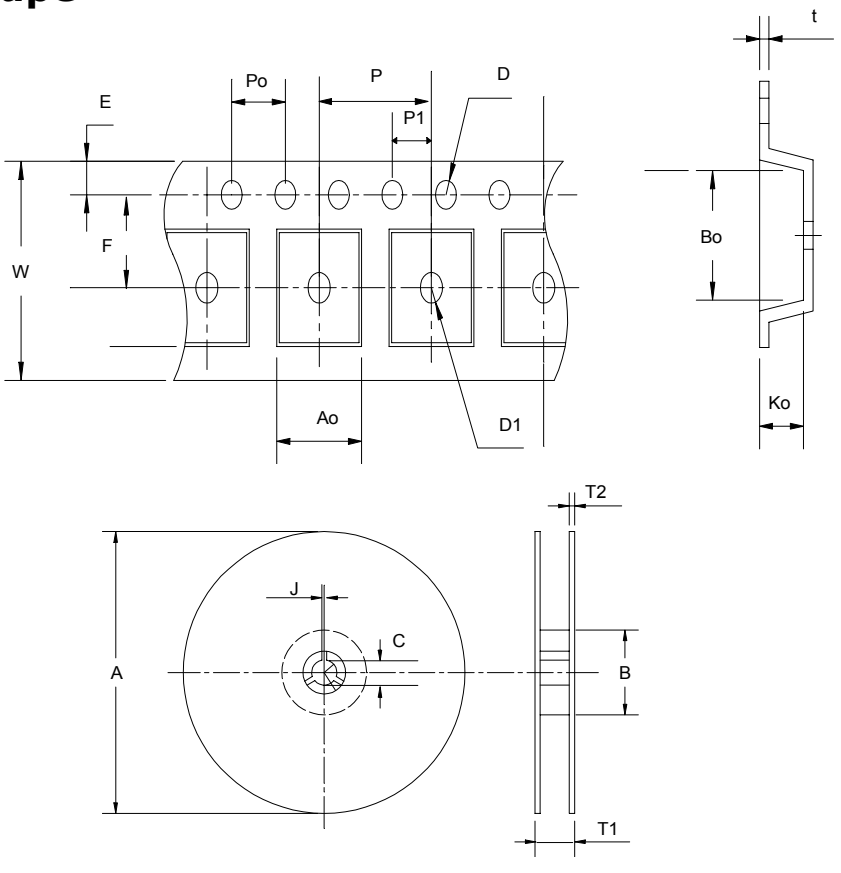
Package Reflow Conditions

pkg. thickness ≥ 2.5mm and all bgas	pkg. thickness < 2.5mm and pkg. volume ≥ 350 mm³	pkg. thickness < 2.5mm and pkg. volume < 350mm³
Convection 220 +5/-0 °C		Convection 235 +5/-0 °C
VPR 215-219 °C		VPR 235 +5/-0 °C
IR/Convection 220 +5/-0 °C		IR/Convection 235 +5/-0 °C

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



Application	A	B	C	J	T1	T2	W	P	E
SOP- 8	330 ± 1	62 +1.5	12.75+ 0.15	2 ± 0.5	12.4 ± 0.2	2 ± 0.2	12± 0. 3	8± 0.1	1.75±0.1
	F	D	D1	Po	P1	Ao	Bo	Ko	t
	5.5± 1	1.55 +0.1	1.55+ 0.25	4.0 ± 0.1	2.0 ± 0.1	6.4 ± 0.1	5.2± 0. 1	2.1± 0.1	0.3±0.013

Cover Tape Dimensions

Application	Carrier Width	Cover Tape Width	Devices Per Reel
SOP- 8	12	9.3	2500

Customer Service

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