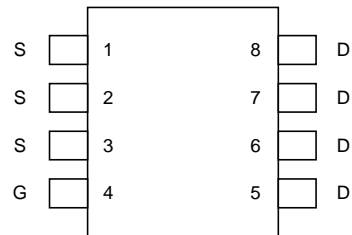


N-Channel Enhancement Mode MOSFET

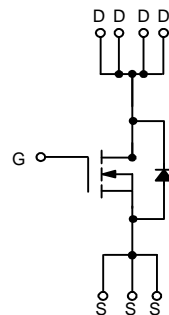
### Features

- 20V/10A,  $R_{DS(ON)} = 10m\Omega(\text{typ.}) @ V_{GS} = 4.5V$   
 $R_{DS(ON)} = 15m\Omega(\text{typ.}) @ V_{GS} = 2.5V$
- Super High Density Cell Design
- Reliable and Rugged
- SO-8 Package

### Pin Description



SO-8



N-Channel MOSFET

### Applications

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

### Ordering and Marking Information

<p>APM9424 □□-□□</p> <p>Handling Code Temp. Range Package Code</p>	<p>Package Code K : SO-8 Operation Junction Temp. Range C : -55 to 150°C Handling Code TU : Tube TR : Tape &amp; Reel</p>
<p>APM9424 K : <span style="border: 1px solid black; padding: 2px;">APM9424 XXXXX</span></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	20	V
$V_{GSS}$	Gate-Source Voltage	$\pm 16$	
$I_D^*$	Maximum Drain Current – Continuous	10	A
$I_{DM}$	Maximum Drain Current – Pulsed	30	

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

Symbol	Parameter	Rating	Unit
$P_D$	Maximum Power Dissipation	$T_A = 25^\circ\text{C}$	2.5
		$T_A = 100^\circ\text{C}$	1.0
$T_J$	Maximum Junction Temperature	150	$^\circ\text{C}$
$T_{\text{STG}}$	Storage Temperature Range	-55 to 150	
$R_{\theta\text{JA}}^*$	Thermal Resistance - Junction to Ambient	50	$^\circ\text{C/W}$

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

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

Symbol	Parameter	Test Condition	APM9424			Unit
			Min.	Typ.	Max.	
<b>Static</b>						
$BV_{\text{DSS}}$	Drain-Source Breakdown Voltage	$V_{\text{GS}}=0\text{V}$ , $I_{\text{DS}}=250\mu\text{A}$	20			V
$I_{\text{DSS}}$	Zero Gate Voltage Drain Current	$V_{\text{DS}}=16\text{V}$ , $V_{\text{GS}}=0\text{V}$			1	$\mu\text{A}$
$V_{\text{GS(th)}}$	Gate Threshold Voltage	$V_{\text{DS}}=V_{\text{GS}}$ , $I_{\text{DS}}=250\mu\text{A}$	0.7	0.9	1.5	V
$I_{\text{GSS}}$	Gate Leakage Current	$V_{\text{GS}}=\pm 16\text{V}$ , $V_{\text{DS}}=0\text{V}$			$\pm 100$	nA
$R_{\text{DS(ON)}}^a$	Drain-Source On-state Resistance	$V_{\text{GS}}=4.5\text{V}$ , $I_{\text{DS}}=10\text{A}$		10	13	m $\Omega$
		$V_{\text{GS}}=2.5\text{V}$ , $I_{\text{DS}}=8\text{A}$		15	20	
$V_{\text{SD}}^a$	Diode Forward Voltage	$I_{\text{SD}}=2.3\text{A}$ , $V_{\text{GS}}=0\text{V}$		0.8	1.3	V
<b>Dynamic<sup>b</sup></b>						
$Q_g$	Total Gate Charge	$V_{\text{DS}}=10\text{V}$ , $V_{\text{GS}}=4.5\text{V}$ , $I_{\text{DS}}=10\text{A}$		28.2	37	nC
$Q_{\text{gs}}$	Gate-Source Charge			5.2		
$Q_{\text{gd}}$	Gate-Drain Charge			7.6		
$t_{\text{d(ON)}}$	Turn-on Delay Time	$V_{\text{DD}}=15\text{V}$ , $I_{\text{DS}}=10\text{A}$ , $V_{\text{GEN}}=4.5\text{V}$ , $R_G=6\Omega$		35	70	ns
$T_r$	Turn-on Rise Time			80	160	
$t_{\text{d(OFF)}}$	Turn-off Delay Time			115	235	
$T_f$	Turn-off Fall Time			40	85	
$C_{\text{iss}}$	Input Capacitance	$V_{\text{GS}}=0\text{V}$ , $V_{\text{DS}}=15\text{V}$ Frequency=1.0MHz		2400		pF
$C_{\text{oss}}$	Output Capacitance			720		
$C_{\text{riss}}$	Reverse Transfer			480		

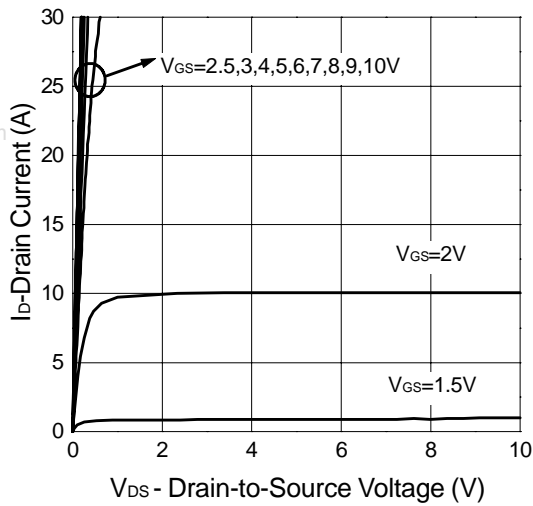
**Notes**

<sup>a</sup> : Guaranteed by design, not subject to production testing

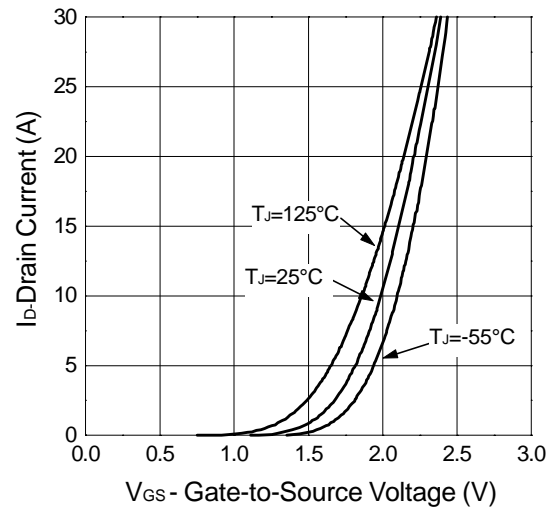
<sup>b</sup> : Pulse test ; pulse width  $\leq 500\mu\text{s}$ , duty cycle  $\leq 2\%$

## Typical Characteristics

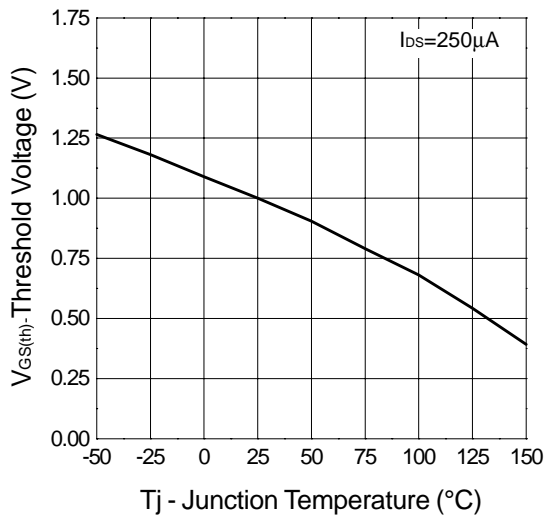
Output Characteristics



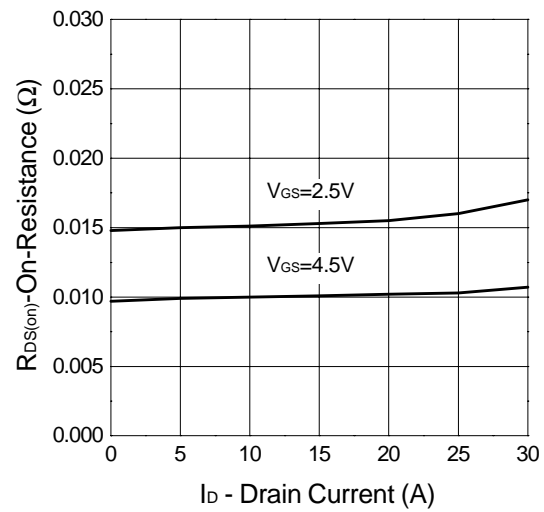
Transfer Characteristics



Threshold Voltage vs. Junction Temperature

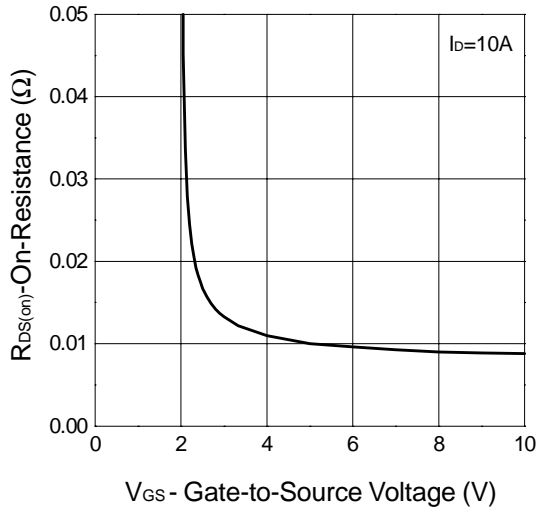


On-Resistance vs. Drain Current

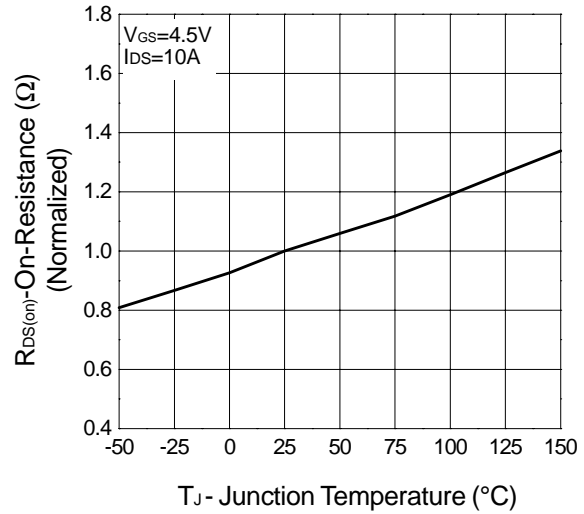


## Typical Characteristics

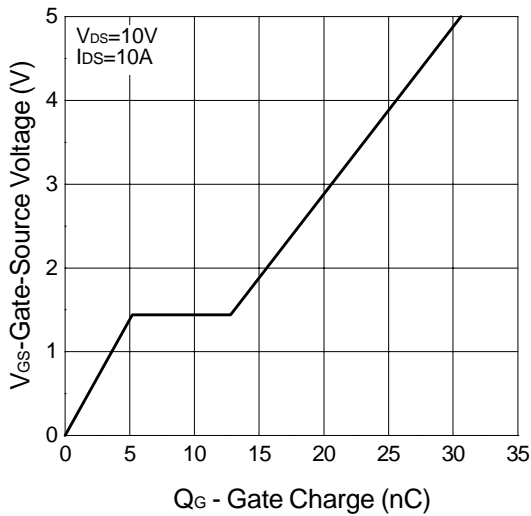
On-Resistance vs. Gate-to-Source Voltage



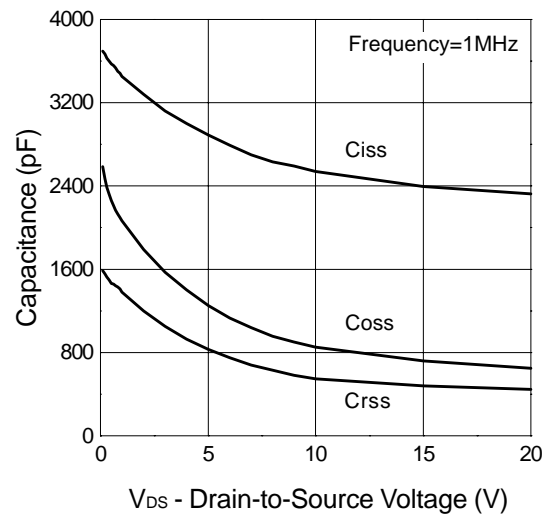
On-Resistance vs. Junction Temperature



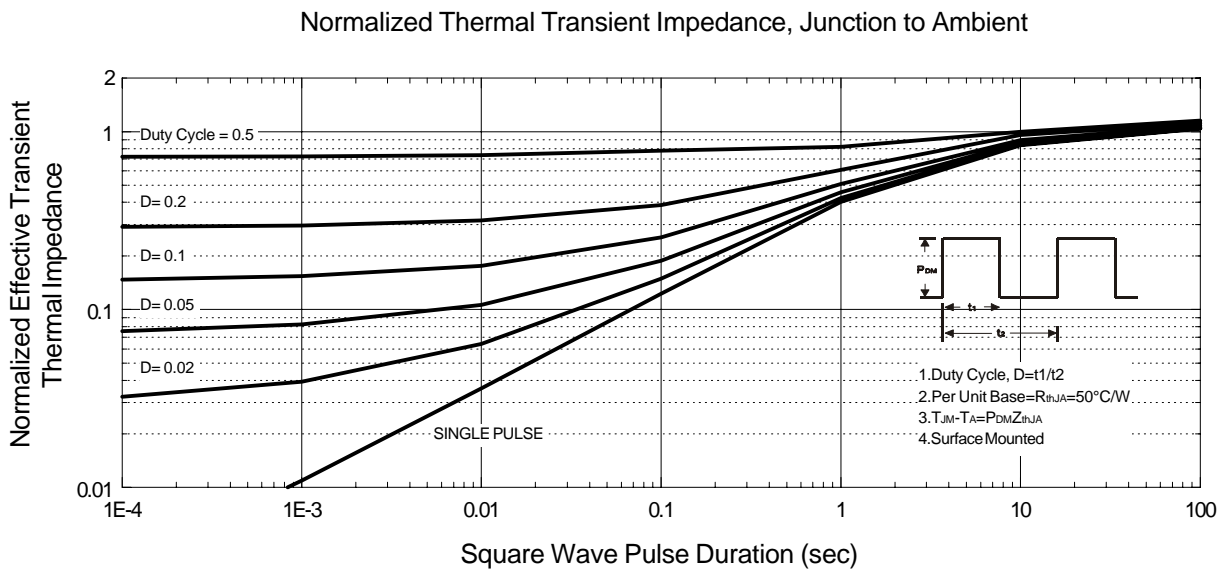
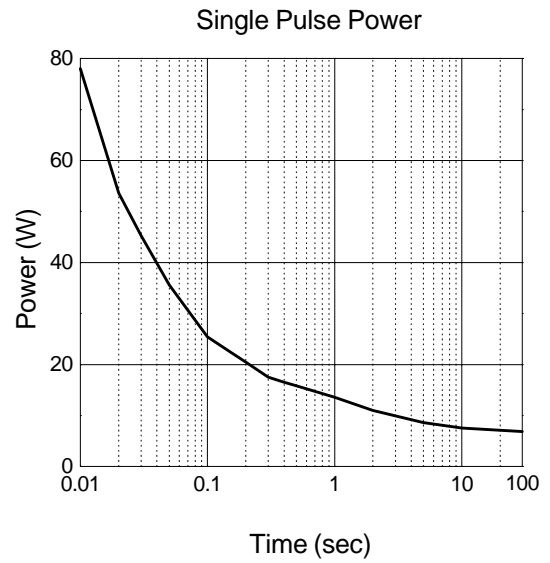
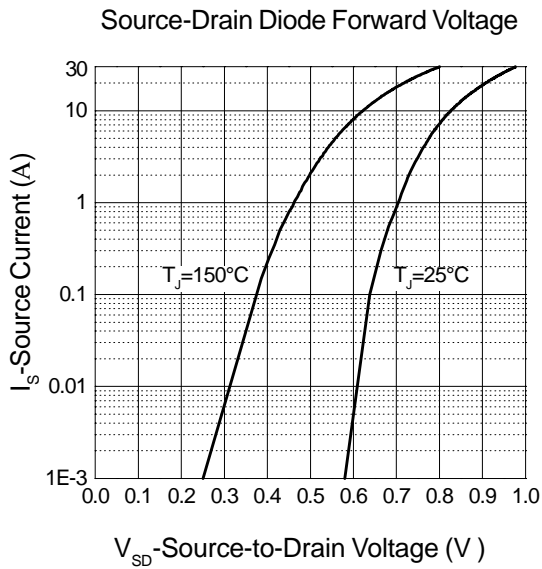
Gate Charge



Capacitance



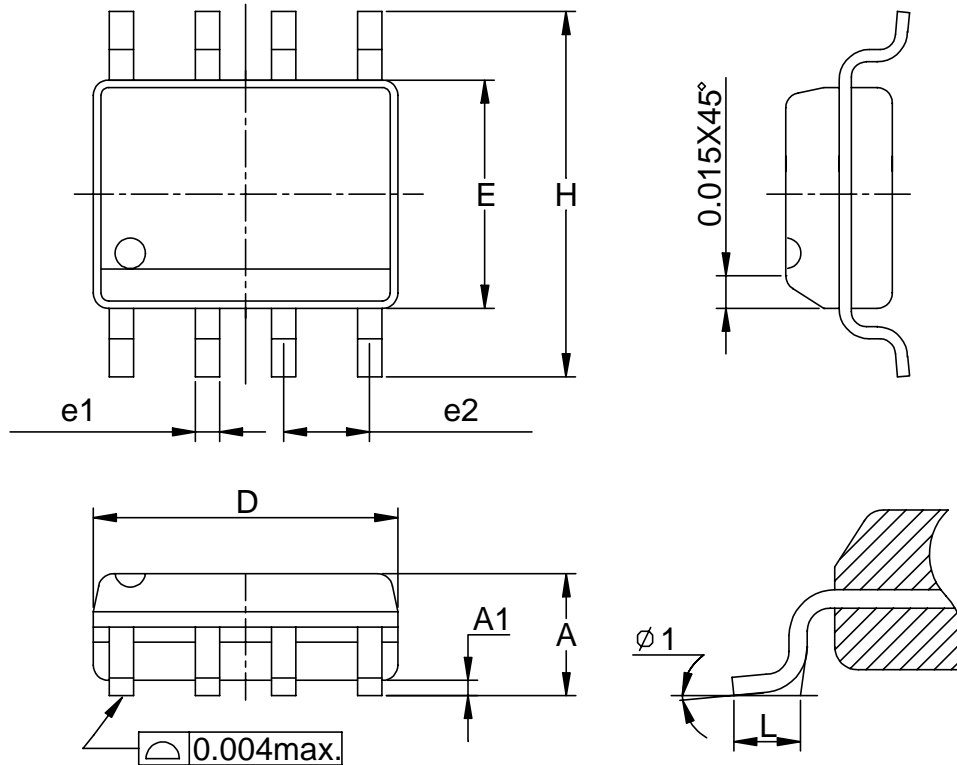
## Typical Characteristics



## Packaging Information

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

www.DataSheet4U.com



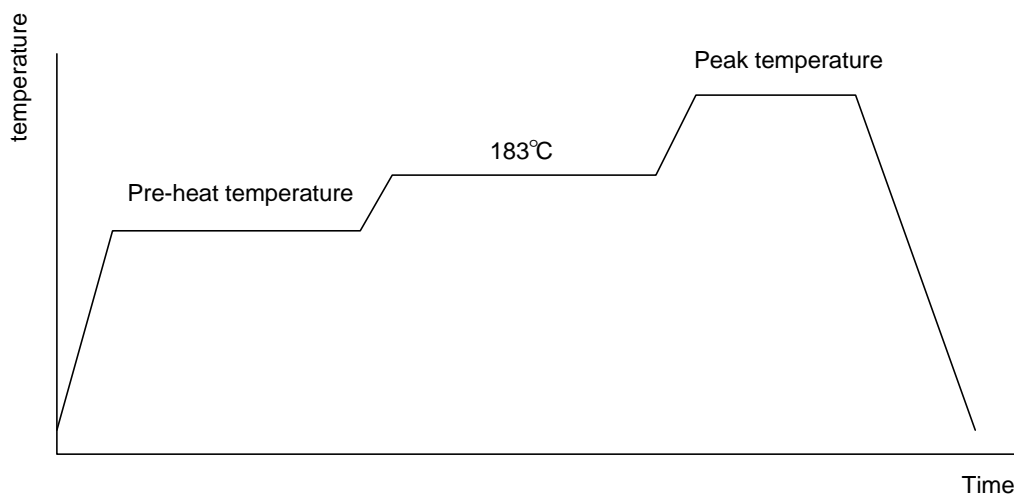
Dim	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	1.35	1.75	0.053	0.069
A1	0.10	0.25	0.004	0.010
D	4.80	5.00	0.189	0.197
E	3.80	4.00	0.150	0.157
H	5.80	6.20	0.228	0.244
L	0.40	1.27	0.016	0.050
e1	0.33	0.51	0.013	0.020
e2	1.27BSC		0.50BSC	
φ 1	8°		8°	

## 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)

www.DataSheet4U.com



## 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.	

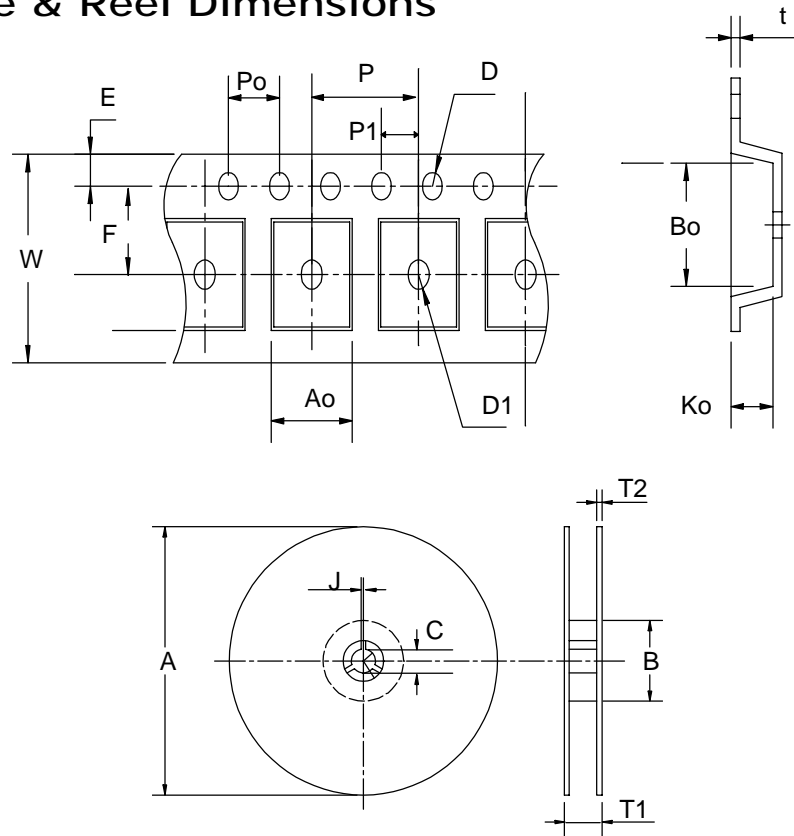
## Package Reflow Conditions

pkg. thickness ≥ 2.5mm and all bgas	pkg. thickness < 2.5mm and pkg. volume ≥ 350 mm <sup>3</sup>	pkg. thickness < 2.5mm and pkg. volume < 350mm <sup>3</sup>
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 & Reel Dimensions



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

### Anpec Electronics Corp.

#### Head Office :

5F, No. 2 Li-Hsin Road, SBIP,

Hsin-Chu, Taiwan, R.O.C.

Tel : 886-3-5642000

Fax : 886-3-5642050

#### Taipei Branch :

7F, No. 137, Lane 235, Pac Chiao Rd.,

Hsin Tien City, Taipei Hsien, Taiwan, R. O. C.

Tel : 886-2-89191368

Fax : 886-2-89191369