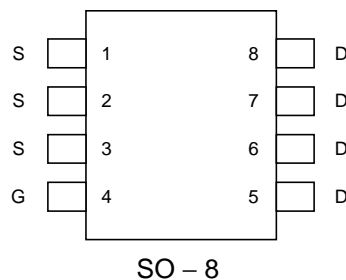


## N-Channel Enhancement Mode MOSFET

### Features

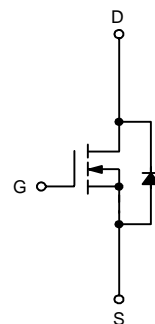
- 25V/16A ,  $R_{DS(ON)} = 7m\Omega(\text{typ.}) @ V_{GS} = 4.5V$
- Super High Dense Advanced Cell Design for Extremely Low  $R_{DS(ON)}$
- Reliable and Rugged
- SOP-8 Package

### Pin Description



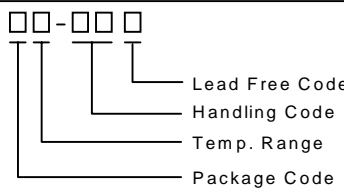
### Applications

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



N-Channel MOSFET

### Ordering and Marking Information

APM4230		Package Code K : SO - 8 Operating Junction Temp. Range C : -55 to 150 °C Handling Code TU : Tube      TR : Tape & Reel Lead Free Code L : Lead Free Device      Blank : Original Device
APM4230K :	<div style="border: 1px solid black; padding: 2px; display: inline-block;">                     APM4230                      XXXXX                 </div>	XXXXX - Date Code

### 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	$\pm 20$	
$I_D^*$	Maximum Drain Current – Continuous	16	A
$I_{DM}$	Maximum Drain Current – Pulsed	60	

\* 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	$^\circ\text{C}$
$T_{STG}$	Storage Temperature Range	-55 to 150	$^\circ\text{C}$
$R_{\theta JA}^*$	Thermal Resistance – Junction to Ambient	50	$^\circ\text{C/W}$

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

Symbol	Parameter	Test Condition	APM4230			Unit
			Min.	Typ.	Max.	
<b>Static</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_{DS}=250\mu\text{A}$	25			V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=20V, V_{GS}=0V$			1	$\mu\text{A}$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_{DS}=250\mu\text{A}$	1	1.5	2	V
$I_{GSS}$	Gate Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$			$\pm 100$	nA
$R_{DS(ON)}^a$	Drain-Source On-state Resistance	$V_{GS}=4.5V, I_{DS}=16A$		7	8	m $\Omega$
		$V_{GS}=4.5V, I_{DS}=16A$ $T_J=125^\circ\text{C}$		10.5	12	
$V_{SD}^a$	Diode Forward Voltage	$I_S=16A, V_{GS}=0V$		0.7	1.2	V
<b>Dynamic<sup>b</sup></b>						
$Q_g$	Total Gate Charge	$V_{DS}=15V, I_{DS}=16A$ $V_{GS}=4.5V,$		30	40	nC
$Q_{gs}$	Gate-Source Charge			13		
$Q_{gd}$	Gate-Drain Charge			10		
$t_{d(ON)}$	Turn-on Delay Time	$V_{DD}=15V, I_{DS}=1A,$ $V_{GEN}=10V, R_G=6\Omega$		13	20	ns
$T_r$	Turn-on Rise Time			9	15	
$t_{d(OFF)}$	Turn-off Delay Time			43	66	
$T_f$	Turn-off Fall Time			14	28	
$C_{iss}$	Input Capacitance	$V_{GS}=0V$		3000		pF
$C_{oss}$	Output Capacitance	$V_{DS}=15V$		660		
$C_{rss}$	Reverse Transfer Capacitance	Frequency=1.0MHz		330		

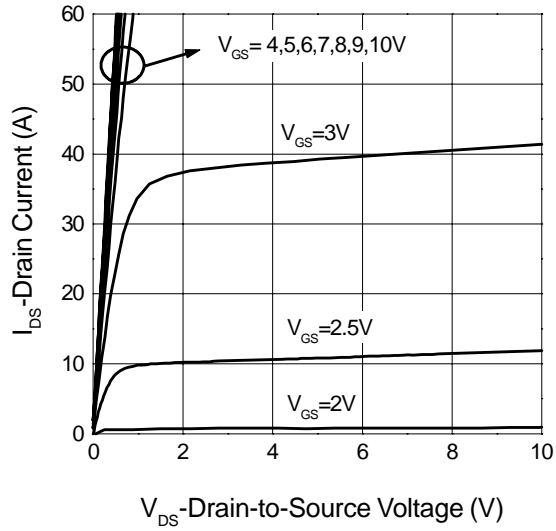
Notes

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

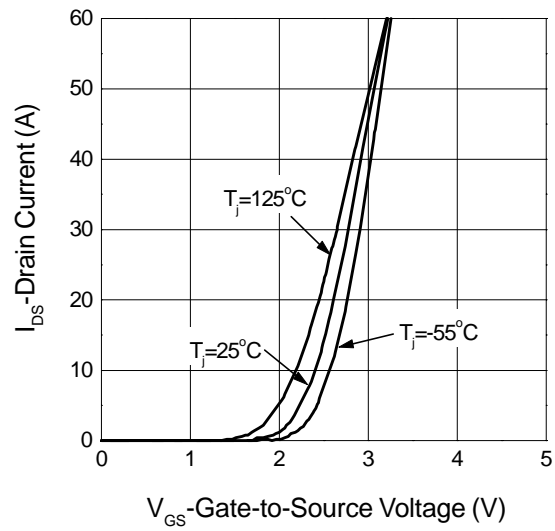
<sup>b</sup> : Guaranteed by design, not subject to production testing

## Typical Characteristics

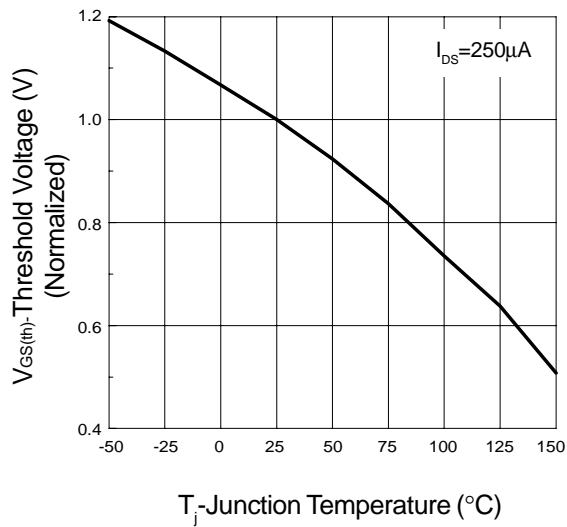
Output Characteristics



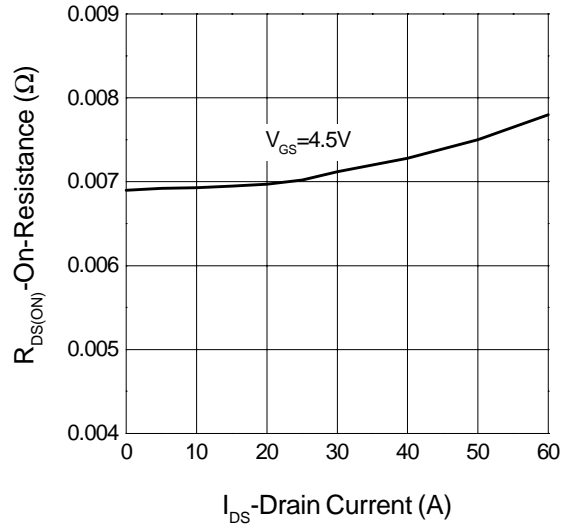
Transfer Characteristics



Threshold Voltage vs. Junction Temperature

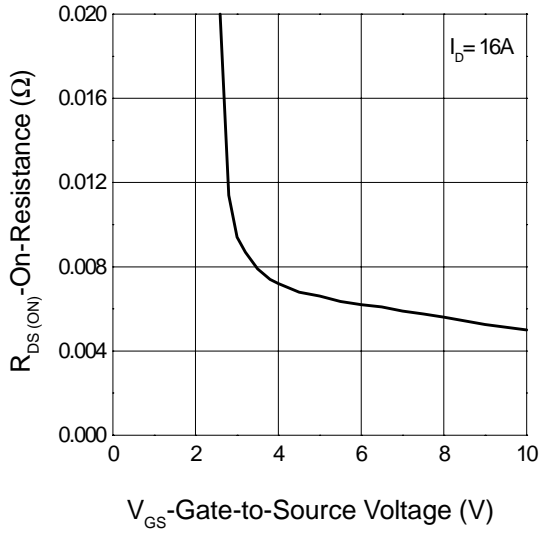


On-Resistance vs. Drain Current

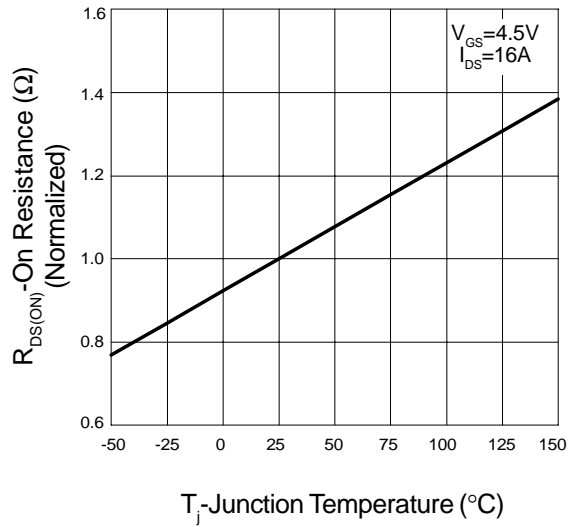


Typical Characteristics (Cont.)

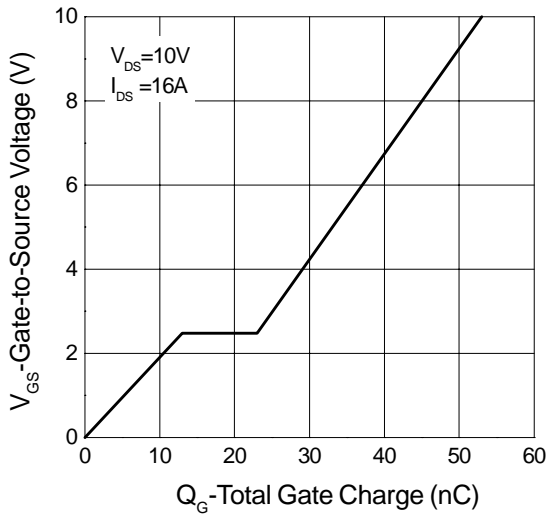
On-Resistance vs. Gate-to-Source Voltage



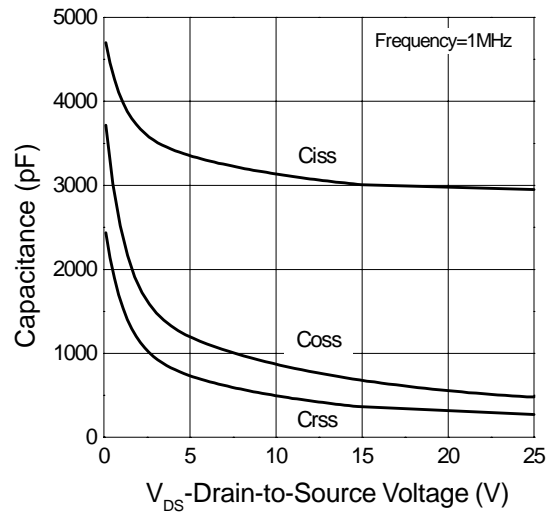
On-Resistance vs. Junction Temperature



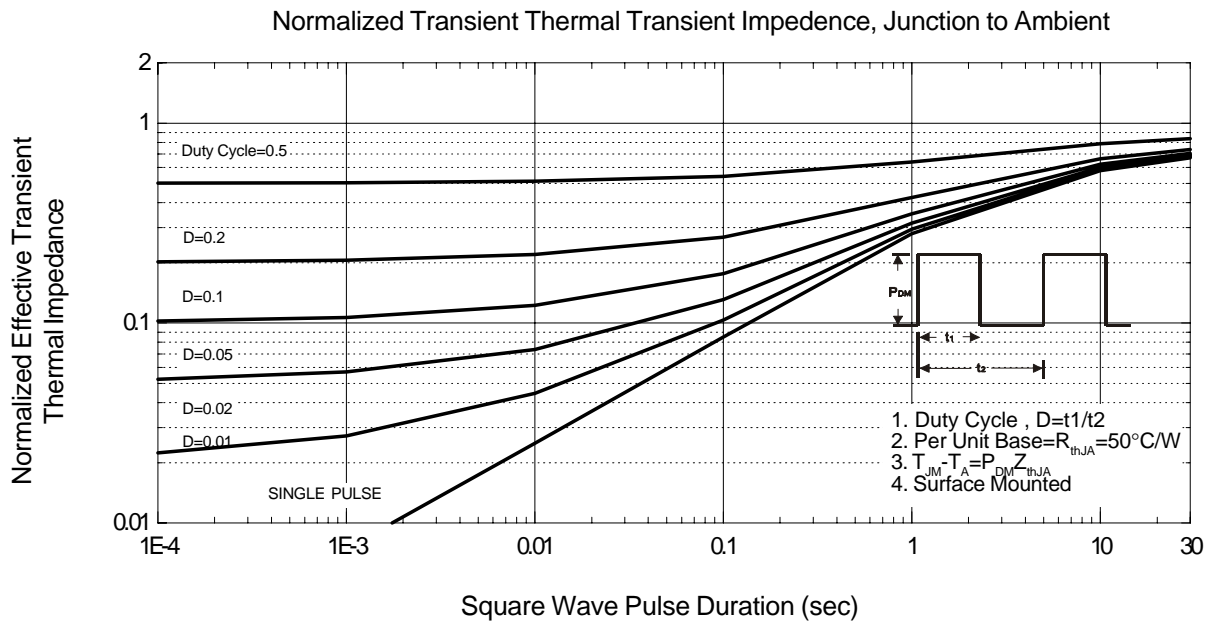
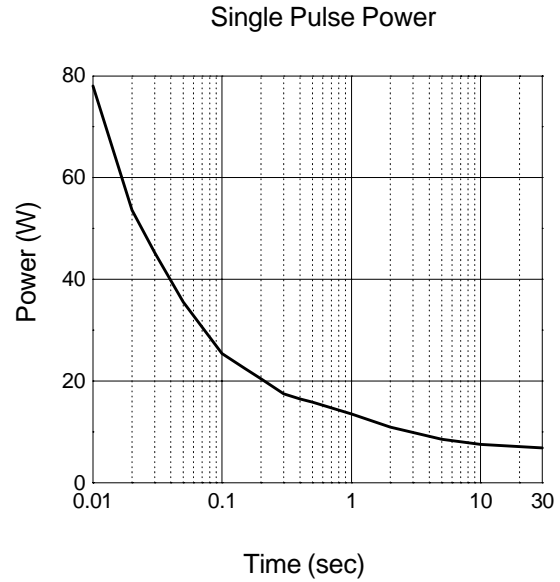
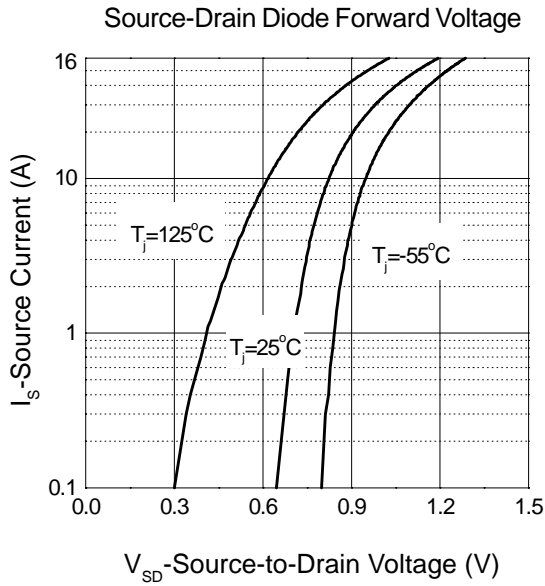
Gate Charge



Capacitance

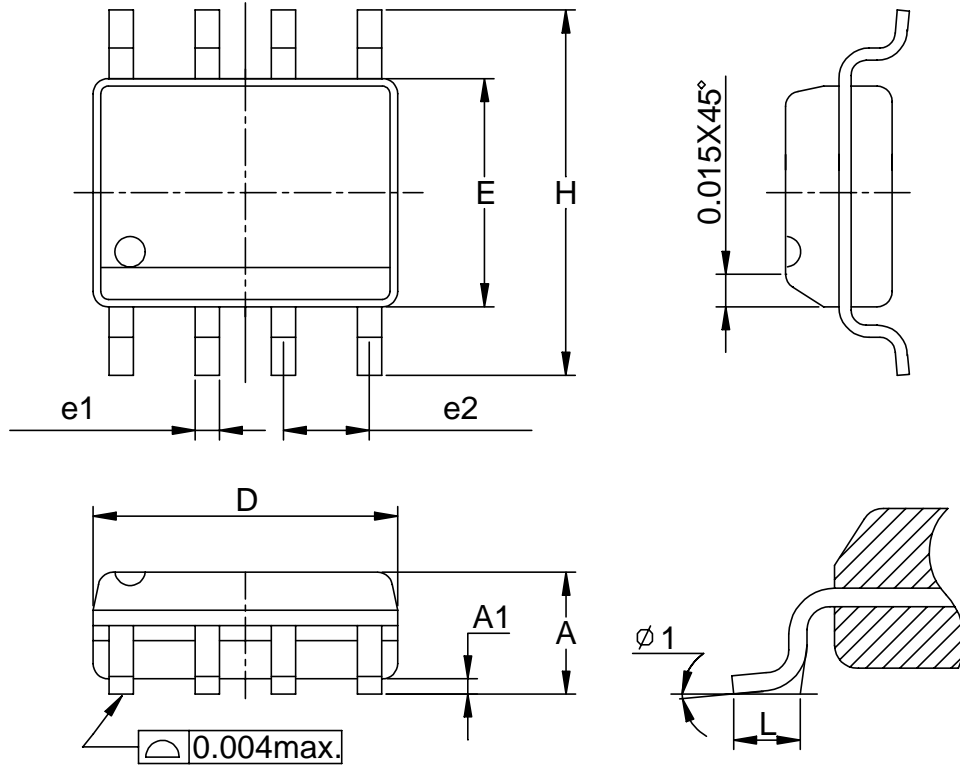


Typical Characteristics (Cont.)



Package Informaion

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



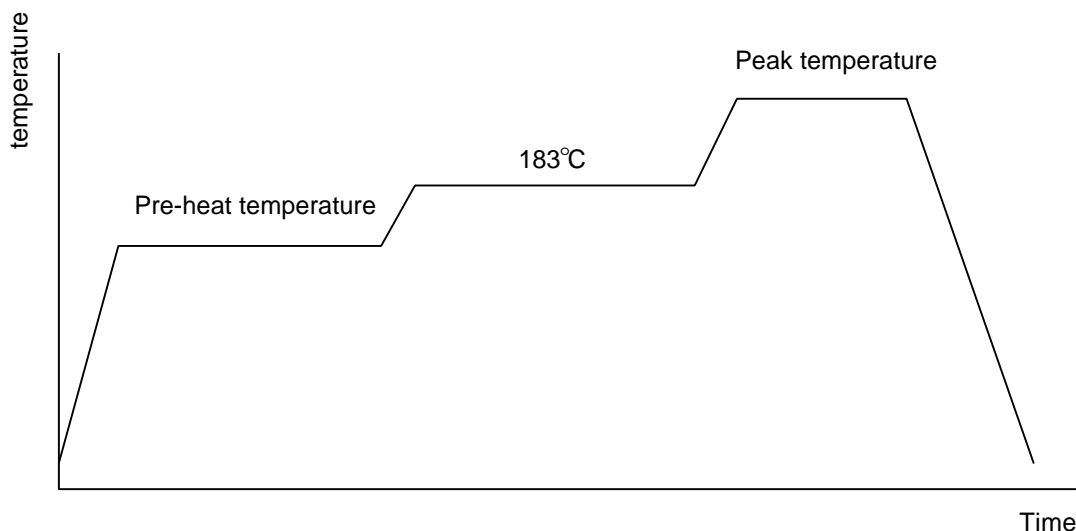
Dim	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	1.35	1.75	0.053	0.069
A1	0.10	0.25	0.004	0.010
D	4.80	5.00	0.189	0.197
E	3.80	4.00	0.150	0.157
H	5.80	6.20	0.228	0.244
L	0.40	1.27	0.016	0.050
e1	0.33	0.51	0.013	0.020
e2	1.27BSC		0.50BSC	
φ 1	8°		8°	

## 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.	

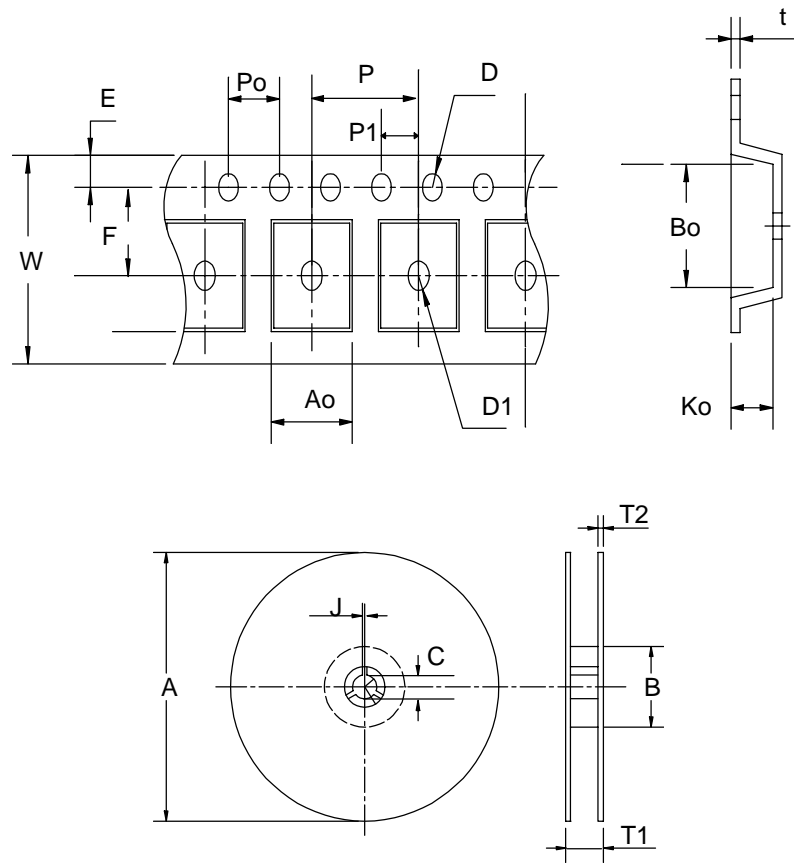
### Package Reflow Conditions

pkg. thickness ≥ 2.5mm and all bags	pkg. thickness < 2.5mm and pkg. volume ≥ 350 mm	pkg. thickness < 2.5mm and pkg. volume <
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 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 16 - 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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