

APM9968C

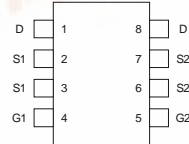


N-Channel Enhancement Mode MOSFET

Features

- 20V/6A, $R_{DS(ON)}=16m\Omega(\text{typ.}) @ V_{GS}=4.5V$
 $R_{DS(ON)}=20m\Omega(\text{typ.}) @ V_{GS}=2.5V$
- Super High Dense Cell Design for Extremely Low $R_{DS(ON)}$
- Reliable and Rugged
- TSSOP-8 Packages

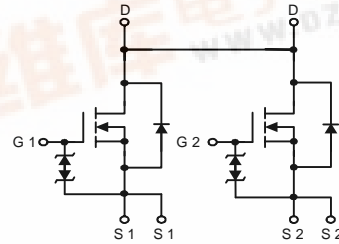
Pin Description



TSSOP-8

Applications

- Power Management in Notebook Computer, Portable Equipment and Battery Powered Systems.
- Zener Diode Protected Gate Provide Human Body Mode Electrostatic Discharge Protection to 2500 V.



N-Channel MOSFET

Ordering and Marking Information

<p>APM9968C □□-□□</p> <p>Handling Code</p> <p>Temp. Range</p> <p>Package Code</p>	<p>Package Code O : TSSOP-8</p> <p>Temp. Range C : -55 to 150°C</p> <p>Handling Code TR : Tape & Reel</p>
<p>APM9968C O : APM9968C 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	20	V	
V_{GSS}	Gate-Source Voltage	± 8		
I_D^*	Maximum Drain Current – Continuous	6	A	
I_{DM}	Maximum Drain Current – Pulsed	20		
P_D	Maximum Power Dissipation	$T_A=25^\circ\text{C}$	1	W
		$T_A=100^\circ\text{C}$	0.4	
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	80	$^\circ\text{C/W}$	

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

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

Symbol	Parameter	Test Condition	APM9968C			Unit
			Min.	Typ.	Max.	
Static						
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_{DS}=250\mu A$	20			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=16V, V_{GS}=0V$			1	μA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_{DS}=250\mu A$	0.6	0.7	1	V
I_{GSS}	Gate Leakage Current	$V_{GS}=\pm 8V, V_{DS}=0V$			± 10	μA
$R_{DS(ON)}^a$	Drain-Source On-state Resistance	$V_{GS}=4.5V, I_{DS}=6A$		16	20	m Ω
		$V_{GS}=2.5V, I_{DS}=5.2A$		20	25	
V_{SD}^a	Diode Forward Voltage	$I_{SD}=0.5A, V_{GS}=0V$		0.7	1.3	V
Dynamic^b						
Q_g	Total Gate Charge	$V_{DS}=10V, I_{DS}=6A$ $V_{GS}=4.5V,$		19	25	nC
Q_{gs}	Gate-Source Charge			2		
Q_{gd}	Gate-Drain Charge			5		
$t_{d(ON)}$	Turn-on Delay Time	$V_{DD}=10V, I_{DS}=6A,$ $V_{GEN}=4.5V, R_G=6\Omega$		37	68	ns
T_r	Turn-on Rise Time			33	62	
$t_{d(OFF)}$	Turn-off Delay Time			100	182	
T_f	Turn-off Fall Time			54	100	

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

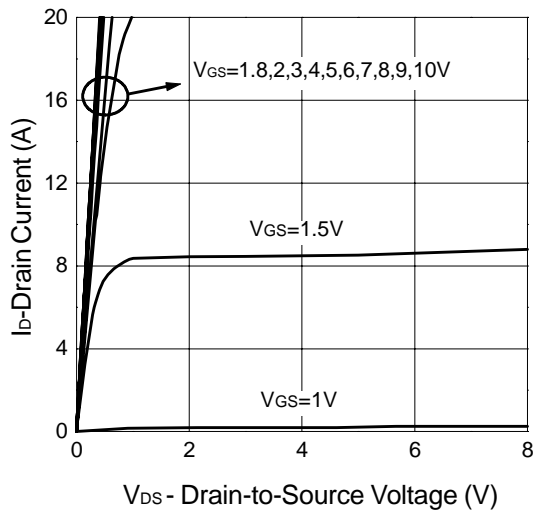
Symbol	Parameter	Test Condition	APM9968C			Unit
			Min.	Typ.	Max.	
C_{iss}	Input Capacitance	$V_{GS}=0V$		1253		pF
C_{oss}	Output Capacitance	$V_{DS}=15V$		340		
C_{rss}	Reverse Transfer Capacitance	Frequency=1.0MHz		260		

Notes

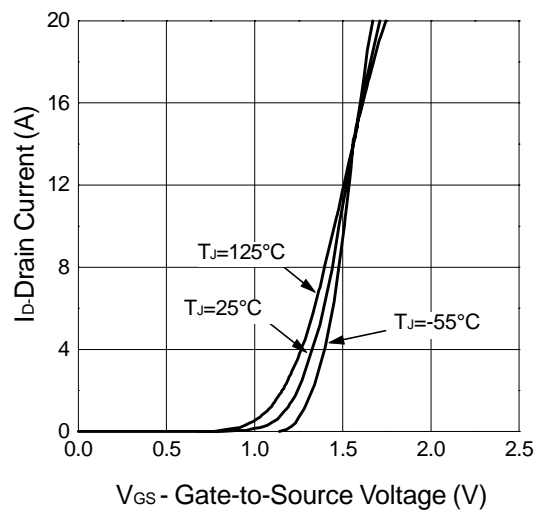
- ^a : Pulse test ; pulse width $\leq 300\mu\text{s}$, duty cycle $\leq 2\%$
^b : Guaranteed by design, not subject to production testing

Typical Characteristics

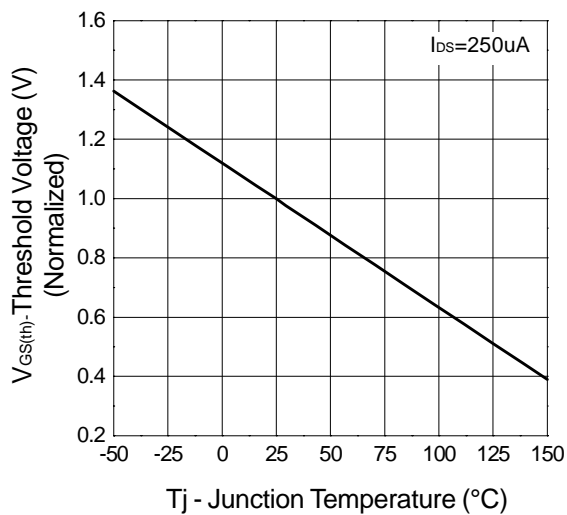
Output Characteristics



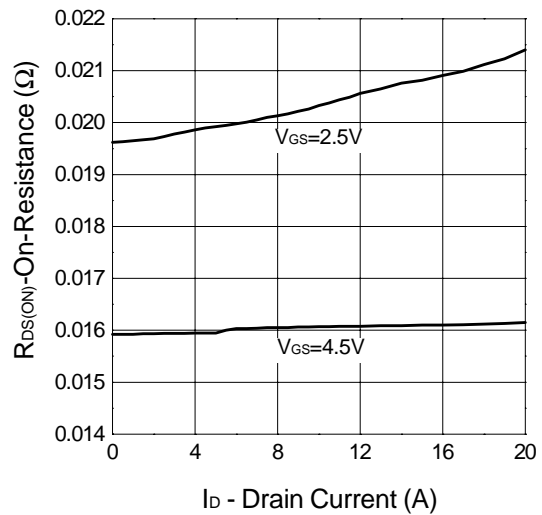
Transfer Characteristics



Threshold Voltage vs. Junction Temperature

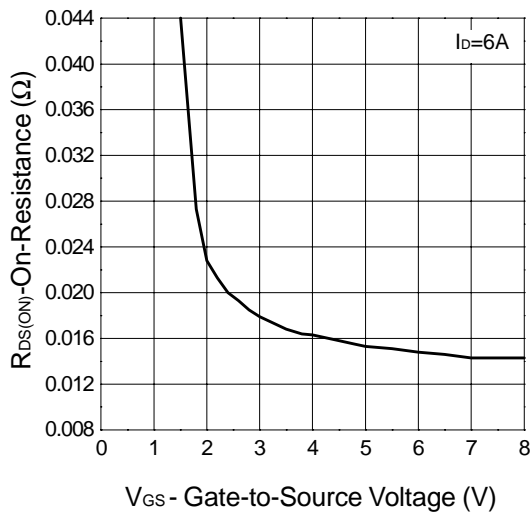


On-Resistance vs. Drain Current

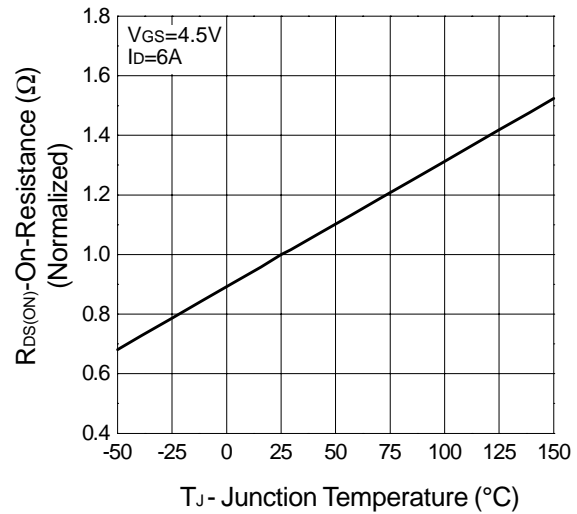


Typical Characteristics

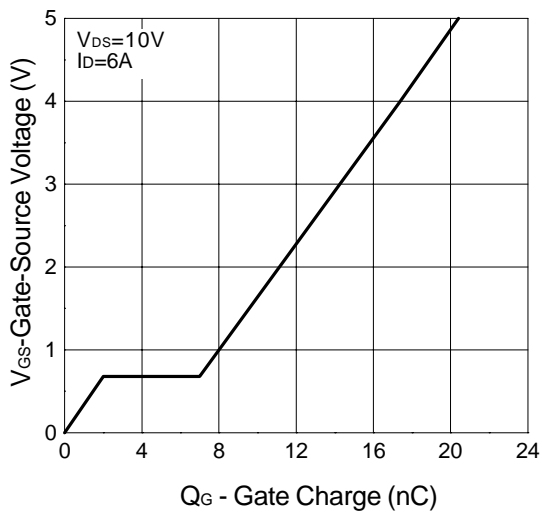
On-Resistance vs. Gate-to-Source Voltage



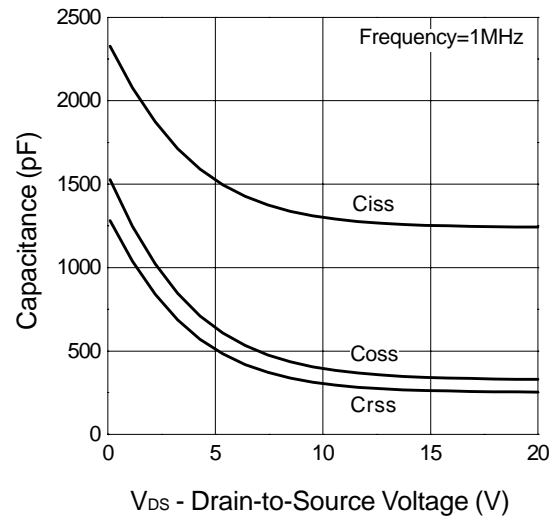
On-Resistance vs. Junction Temperature



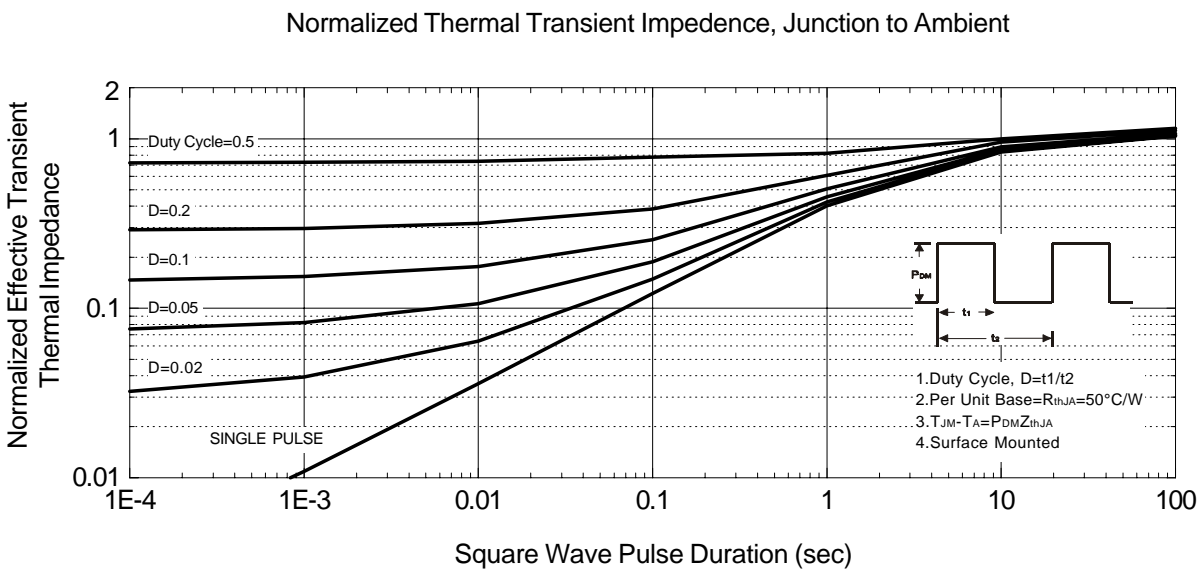
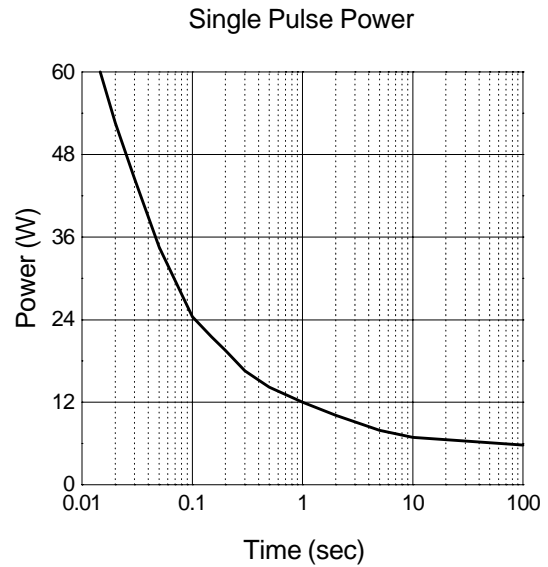
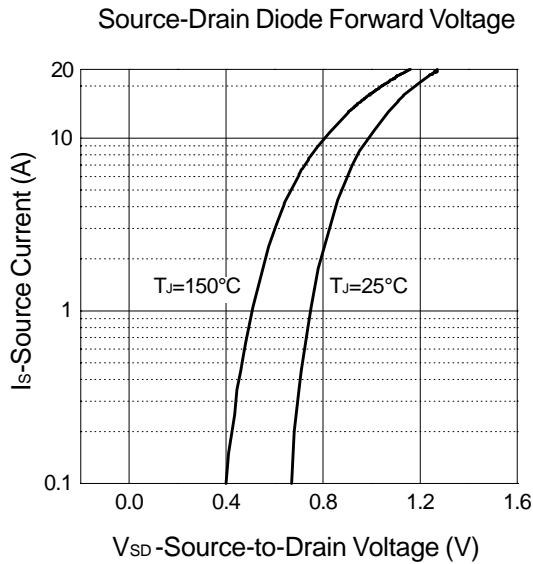
Gate Charge



Capacitance

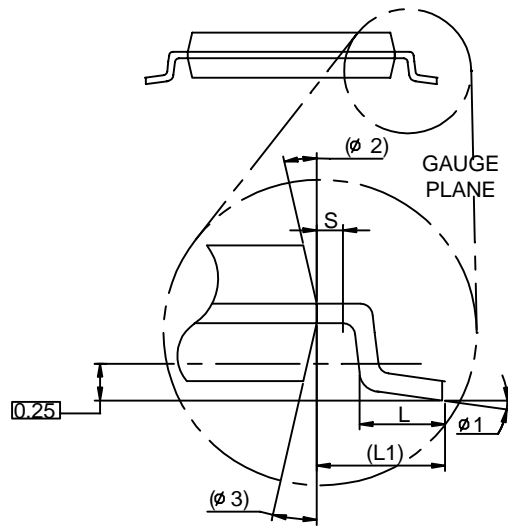
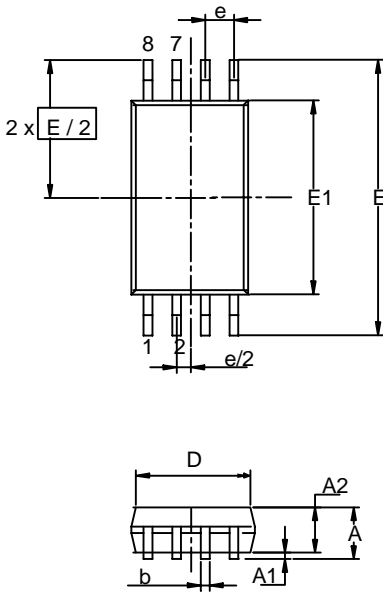


Typical Characteristics



Packaging Information

TSSOP-8

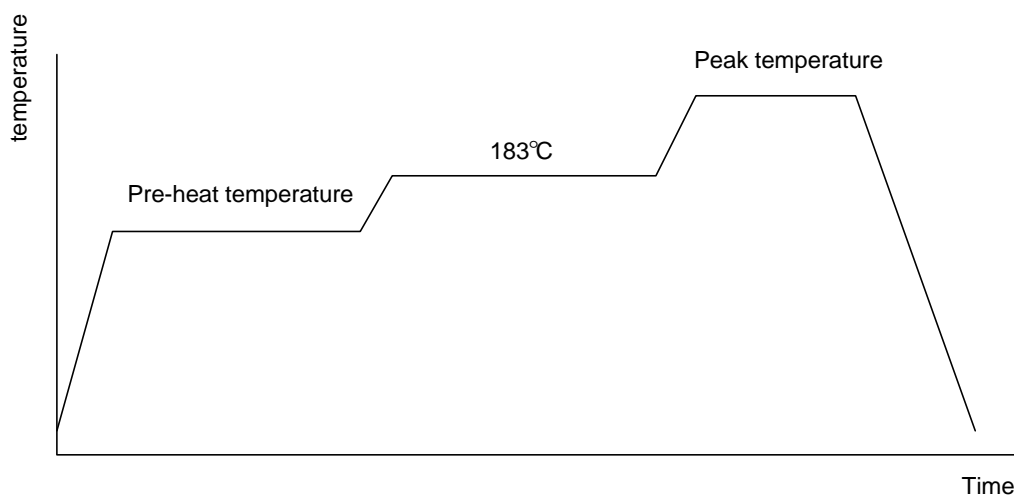


Dim	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A		1.2		0.047
A1	0.00	0.15	0.000	0.006
A2	0.80	1.05	0.031	0.041
b	0.19	0.30	0.007	0.012
D	2.9	3.1	0.114	0.122
e	0.65 BSC		0.026 BSC	
E	6.40 BSC		0.252 BSC	
E1	4.30	4.50	0.169	0.177
L	0.45	0.75	0.018	0.030
L1	1.0 REF		0.039REF	
R	0.09		0.004	
R1	0.09		0.004	
S	0.2		0.008	
$\phi 1$	0°	8°	0°	8°
$\phi 2$	12° REF		12° REF	
$\phi 3$	12° REF		12° REF	

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)



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.	

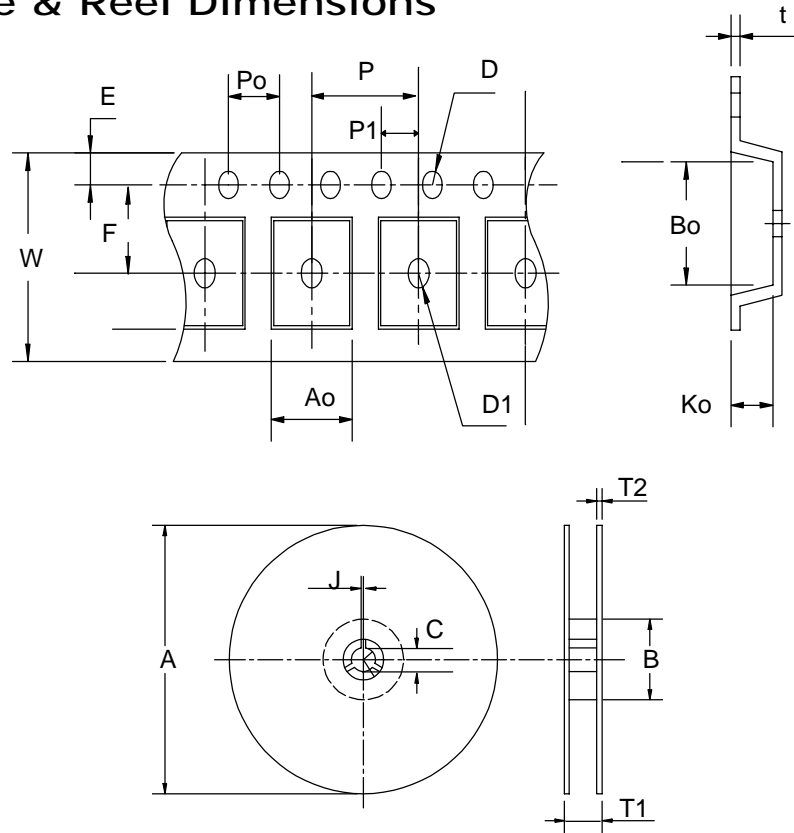
Package Reflow Conditions

pkg. thickness ≥ 2.5mm and all bgas	pkg. thickness < 2.5mm and pkg. volume ≥ 350 mm ³	pkg. thickness < 2.5mm and pkg. volume < 350mm ³
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
TSSOP-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 ± 0.1	1.5 + 0.1	1.5 + 0.1	4.0 ± 0.1	2.0 ± 0.1	7.0 ± 0.1	3.6 ± 0.3	1.6 ± 0.1	0.3 ± 0.013

Cover Tape Dimensions

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

Customer Service

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