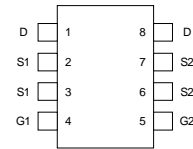


N-Channel Enhancement Mode MOSFET

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

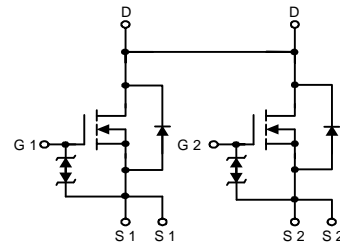
Pin Description



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> <div style="margin-left: 20px;"> <p>└─── Handling Code</p> <p>└─── Temp. Range</p> <p>└─── Package Code</p> </div>	<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>

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 ($T_A = 25^\circ\text{C}$ 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)

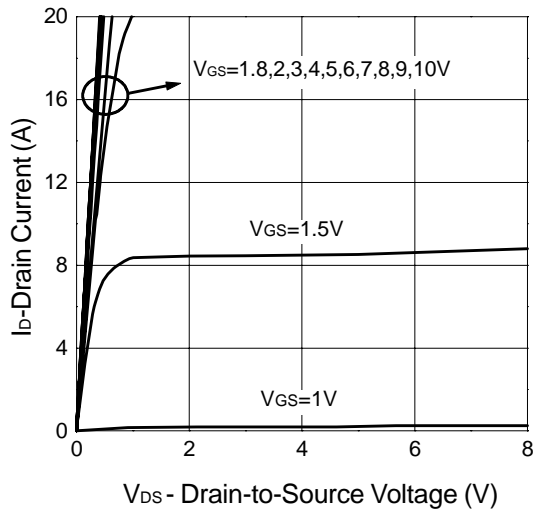
Symbol	Parameter	Test Condition	APM9968C			Unit
			Min.	Typ.	Max.	
C_{iss}	Input Capacitance	$V_{GS}=0V$ $V_{DS}=15V$ Frequency=1.0MHz		1253		pF
C_{oss}	Output Capacitance			340		
C_{rss}	Reverse Transfer Capacitance			260		

Notes

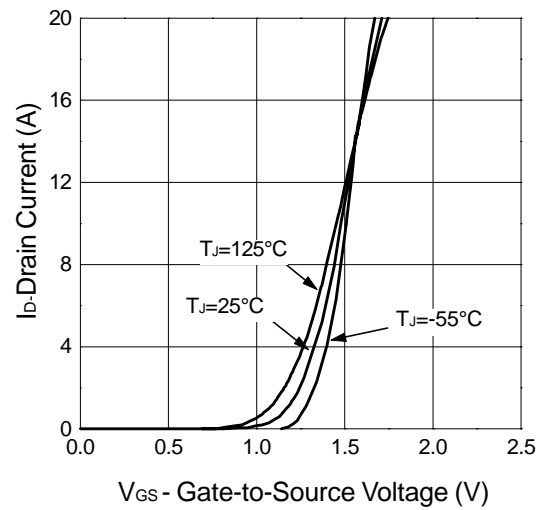
- ^a : Pulse test ; pulse width $\leq 300\mu\text{s}$, duty cycle $\leq 2\%$
^b : Guaranteed by design, not subject to production testing

Typical Characteristics

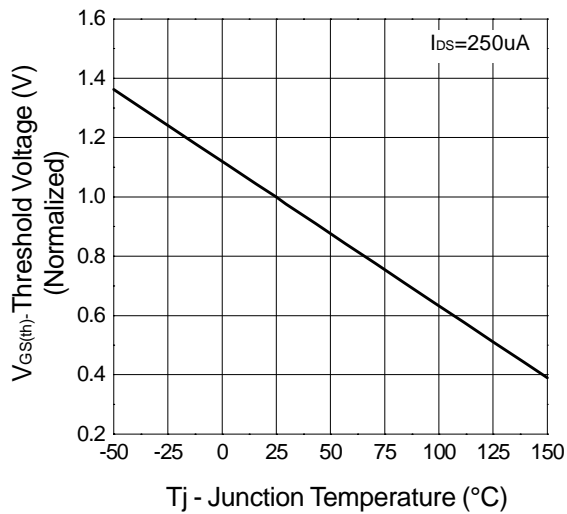
Output Characteristics



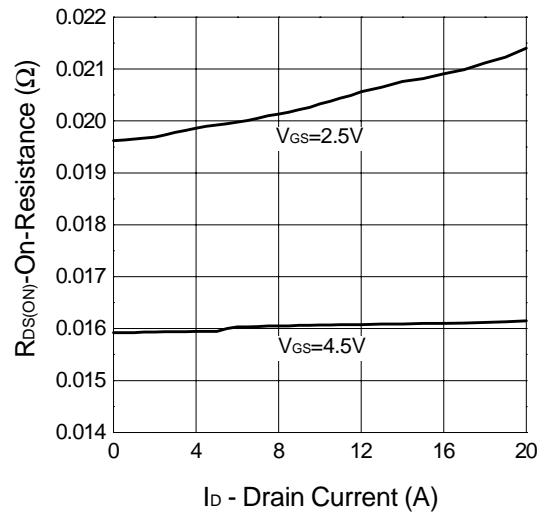
Transfer Characteristics



Threshold Voltage vs. Junction Temperature

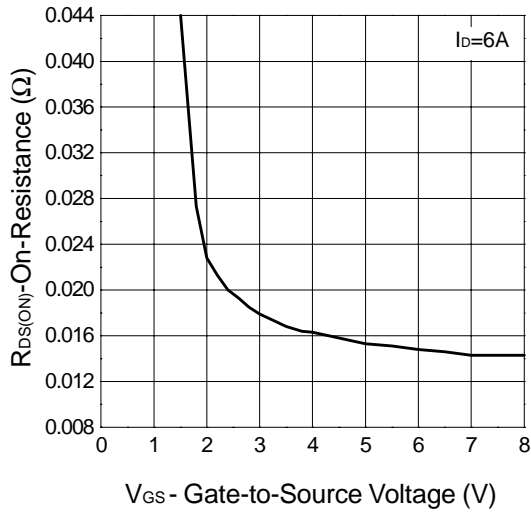


On-Resistance vs. Drain Current

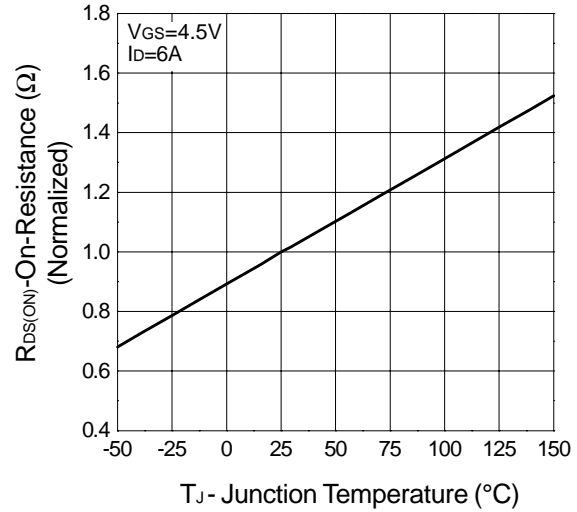


Typical Characteristics

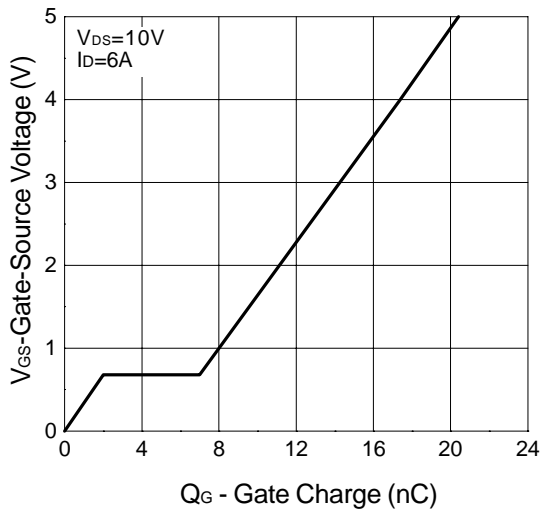
On-Resistance vs. Gate-to-Source Voltage



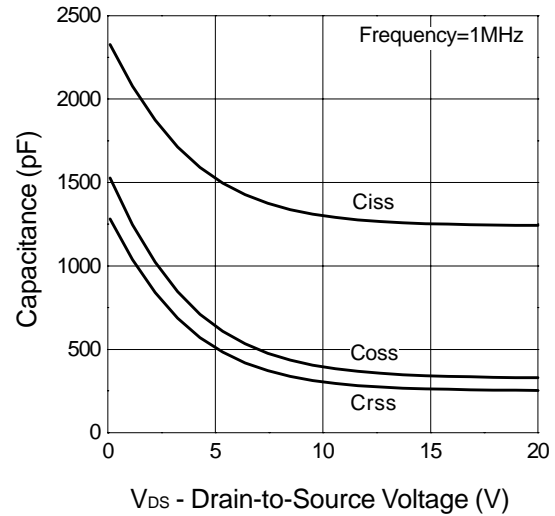
On-Resistance vs. Junction Temperature



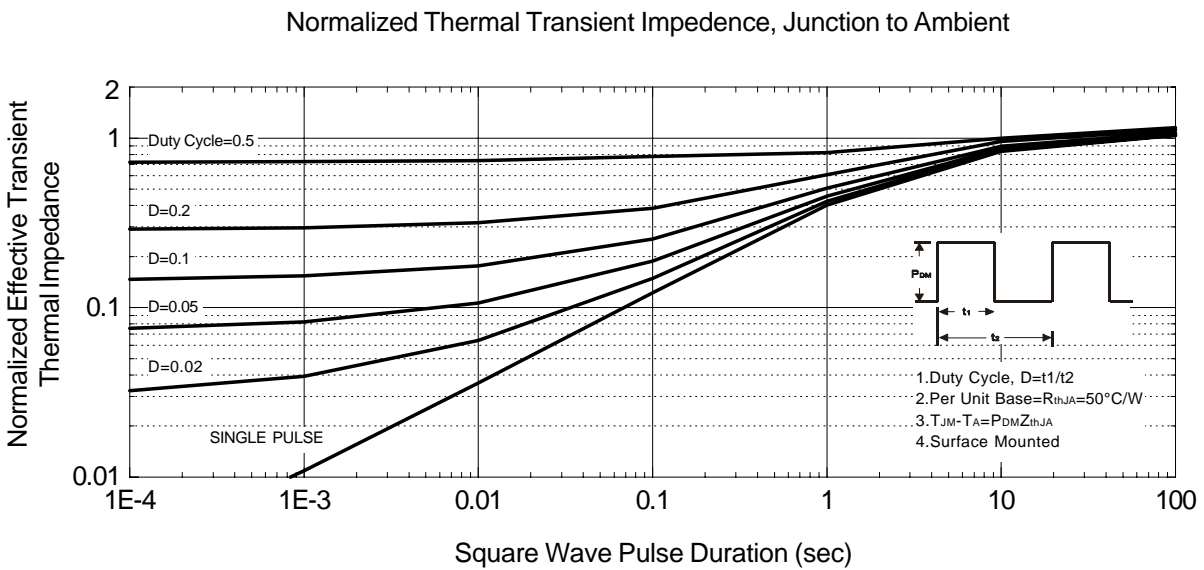
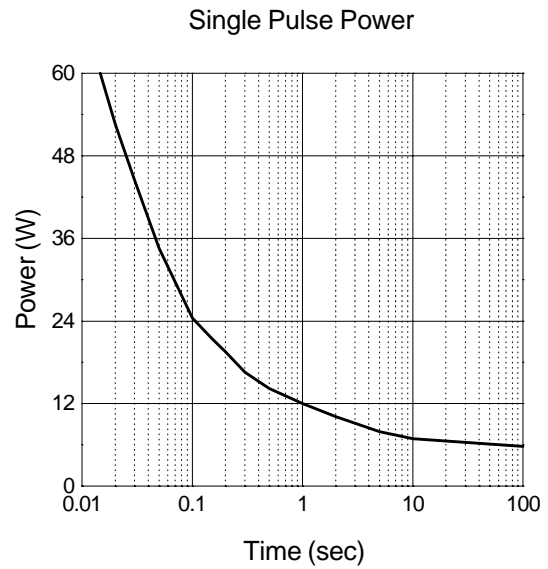
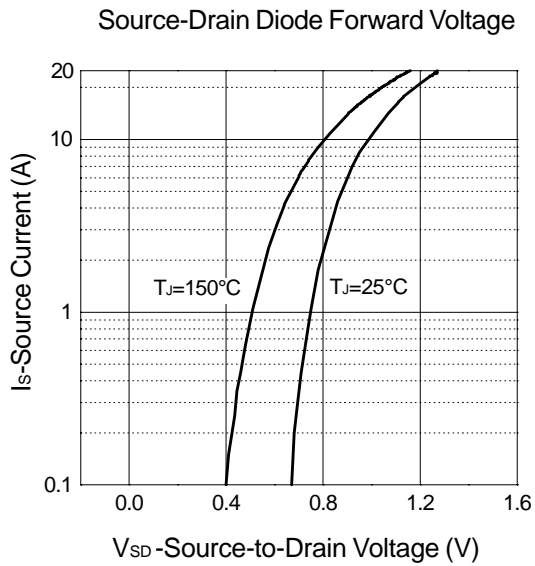
Gate Charge



Capacitance

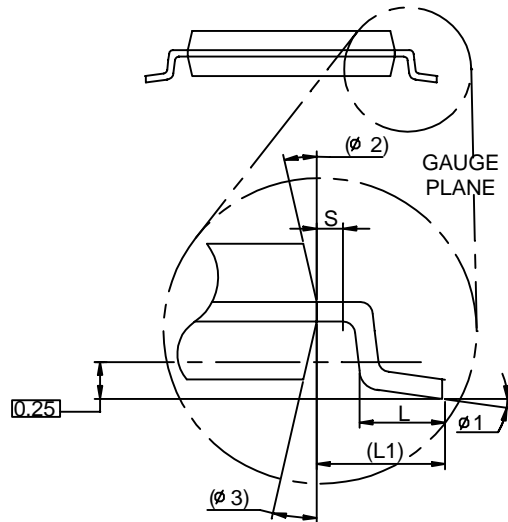
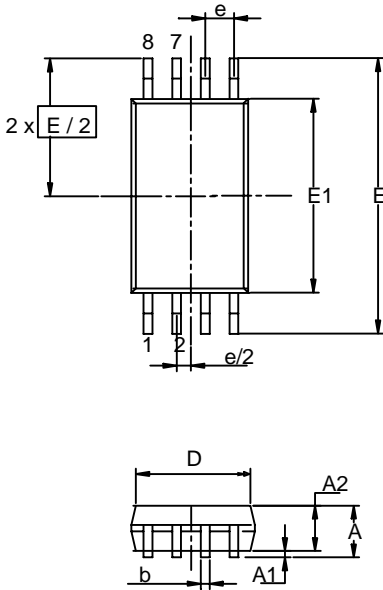


Typical Characteristics



Packaging Information

TSSOP-8

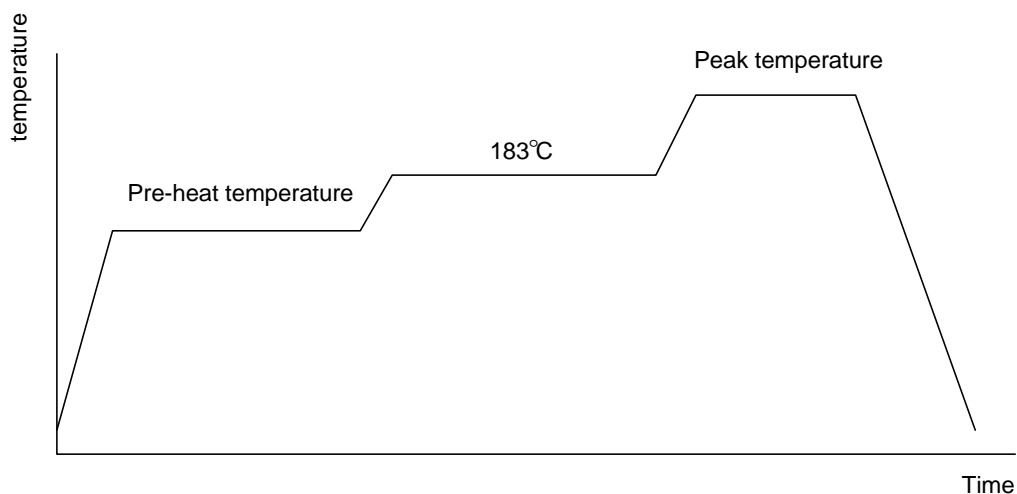


Dim	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A		1.2		0.047
A1	0.00	0.15	0.000	0.006
A2	0.80	1.05	0.031	0.041
b	0.19	0.30	0.007	0.012
D	2.9	3.1	0.114	0.122
e	0.65 BSC		0.026 BSC	
E	6.40 BSC		0.252 BSC	
E1	4.30	4.50	0.169	0.177
L	0.45	0.75	0.018	0.030
L1	1.0 REF		0.039 REF	
R	0.09		0.004	
R1	0.09		0.004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

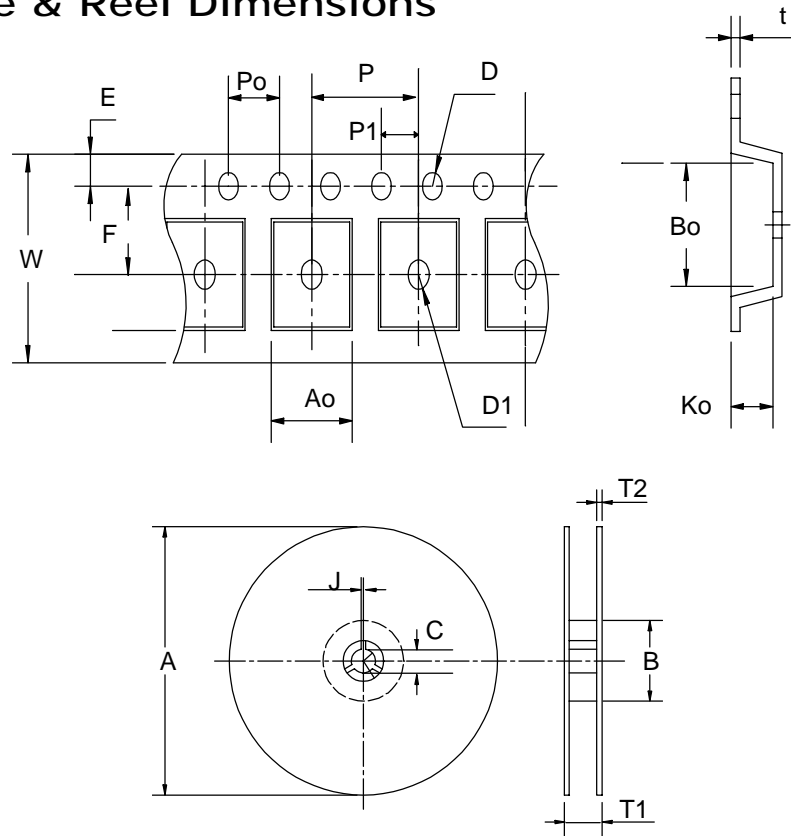
Package Reflow Conditions

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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