

## AP9980M-VB Datasheet

### N-Channel 80 V (D-S) MOSFET

PRODUCT SUMMARY			
V <sub>DS</sub> (V)	R <sub>DS(on)</sub> (Ω)	I <sub>D</sub> (A) <sup>a</sup>	Q <sub>g</sub> (Typ.)
80	0.062 at V <sub>GS</sub> = 10 V	3.5	7.3 nC

**FEATURES**

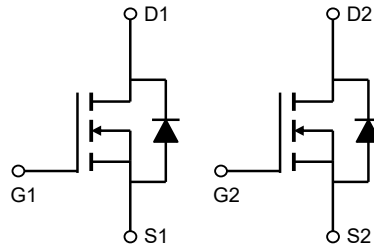
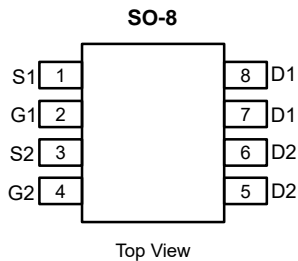
- Halogen-free According to IEC 61249-2-21 Definition
- TrenchFET<sup>®</sup> Power MOSFET
- 100 % R<sub>g</sub> and UIS Tested
- Compliant to RoHS Directive 2002/95/EC



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**  
Available

**APPLICATIONS**

- DC/DC Conversion  
- Notebook System Power



Absolute Maximum Ratings T <sub>A</sub> =25°C unless otherwise noted			
Parameter	Symbol	Maximum	Units
Drain-Source Voltage	V <sub>DS</sub>	80	V
Gate-Source Voltage	V <sub>GS</sub>	±30	V
Continuous Drain Current	I <sub>D</sub>	T <sub>A</sub> =25°C	3.5
		T <sub>A</sub> =70°C	2.9
Pulsed Drain Current <sup>C</sup>	I <sub>DM</sub>	18	A
Avalanche Current <sup>C</sup>	I <sub>AR</sub>	16	A
Repetitive avalanche energy L=0.1mH <sup>C</sup>	E <sub>AR</sub>	12.8	mJ
Power Dissipation <sup>B</sup>	P <sub>D</sub>	T <sub>A</sub> =25°C	2
		T <sub>A</sub> =70°C	1.3
Junction and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-55 to 150	°C

Thermal Characteristics					
Parameter	Symbol	Typ	Max	Units	
Maximum Junction-to-Ambient <sup>A</sup>	R <sub>θJA</sub>	t ≤ 10s	48	62.5	°C/W
Maximum Junction-to-Ambient <sup>A,D</sup>		Steady-State	74	90	°C/W
Maximum Junction-to-Lead	R <sub>θJL</sub>	32	40	°C/W	

Electrical Characteristics (T<sub>J</sub>=25°C unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>STATIC PARAMETERS</b>						
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	I <sub>D</sub> =250μA, V <sub>GS</sub> =0V	80			V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =80V, V <sub>GS</sub> =0V T <sub>J</sub> =55°C			1 5	μA
I <sub>GSS</sub>	Gate-Body leakage current	V <sub>DS</sub> =0V, V <sub>GS</sub> = ±30V			100	nA
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> I <sub>D</sub> =250μA	3.5	4.2	5	V
I <sub>D(ON)</sub>	On state drain current	V <sub>GS</sub> =10V, V <sub>DS</sub> =5V	18			A
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> =10V, I <sub>D</sub> =3.5A T <sub>J</sub> =125°C		62 113.0		mΩ
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =5V, I <sub>D</sub> =3.5A		15		S
V <sub>SD</sub>	Diode Forward Voltage	I <sub>S</sub> =1A, V <sub>GS</sub> =0V		0.77	1	V
I <sub>S</sub>	Maximum Body-Diode Continuous Current				2.5	A
I <sub>SM</sub>	Pulsed Body-diode Current <sup>C</sup>				18	A
<b>DYNAMIC PARAMETERS</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =40V, f=1MHz	510	640	770	pF
C <sub>oss</sub>	Output Capacitance		28	40	52	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		12	20	30	pF
R <sub>g</sub>	Gate resistance	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz	0.9	1.8	2.7	Ω
<b>SWITCHING PARAMETERS</b>						
Q <sub>g(10V)</sub>	Total Gate Charge	V <sub>GS</sub> =10V, V <sub>DS</sub> =40V, I <sub>D</sub> =3.5A	8	11	13	nC
Q <sub>g(4.5V)</sub>	Total Gate Charge		4	5.5	7	
Q <sub>gs</sub>	Gate Source Charge		4	5	6	nC
Q <sub>gd</sub>	Gate Drain Charge		0.7	1.2	1.7	nC
t <sub>D(on)</sub>	Turn-On DelayTime	V <sub>GS</sub> =10V, V <sub>DS</sub> =40V, R <sub>L</sub> =8Ω, R <sub>GEN</sub> =3Ω		7.2		ns
t <sub>r</sub>	Turn-On Rise Time			2.2		ns
t <sub>D(off)</sub>	Turn-Off DelayTime			17		ns
t <sub>f</sub>	Turn-Off Fall Time			2		ns
t <sub>rr</sub>	Body Diode Reverse Recovery Time		I <sub>F</sub> =3.5A, dI/dt=300A/μs	14	20	26
Q <sub>rr</sub>	Body Diode Reverse Recovery Charge	I <sub>F</sub> =3.5A, dI/dt=300A/μs	35	50	65	nC

A. The value of R<sub>θJA</sub> is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with T<sub>A</sub> =25°C. The value in any given application depends on the user's specific board design.

B. The power dissipation P<sub>D</sub> is based on T<sub>J(MAX)</sub>=150°C, using ≤ 10s junction-to-ambient thermal resistance.

C. Repetitive rating, pulse width limited by junction temperature T<sub>J(MAX)</sub>=150°C. Ratings are based on low frequency and duty cycles to keep initial T<sub>J</sub>=25°C.

D. The R<sub>θJA</sub> is the sum of the thermal impedance from junction to lead R<sub>θJL</sub> and lead to ambient.

E. The static characteristics in Figures 1 to 6 are obtained using <300μs pulses, duty cycle 0.5% max.

F. These curves are based on the junction-to-ambient thermal impedance which is measured with the device mounted on 1in<sup>2</sup> FR-4 board with

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

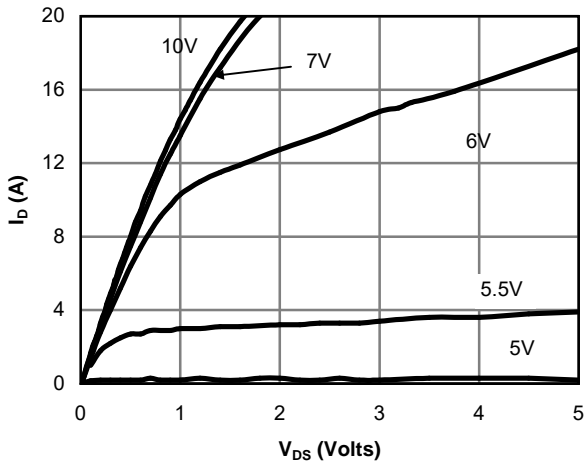


Fig 1: On-Region Characteristics (Note E)

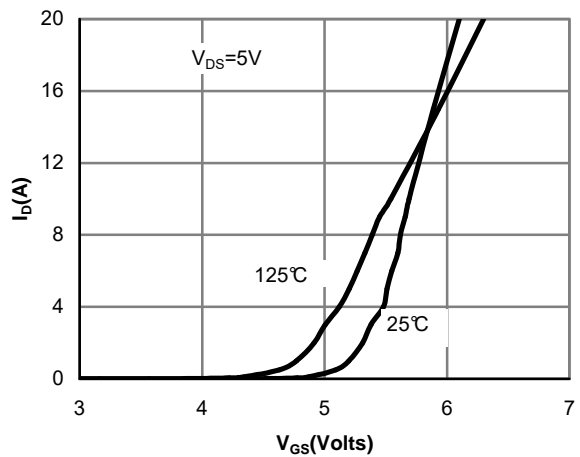


Figure 2: Transfer Characteristics (Note E)

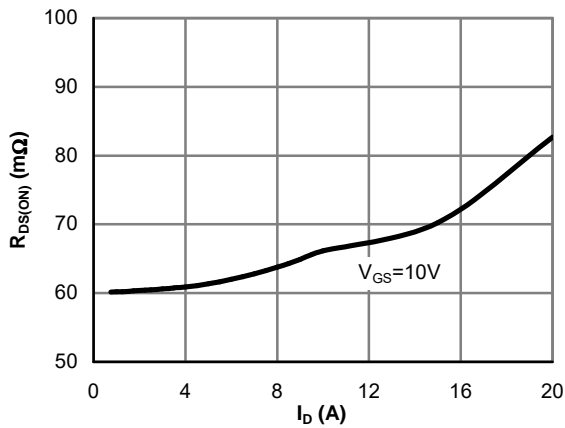


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

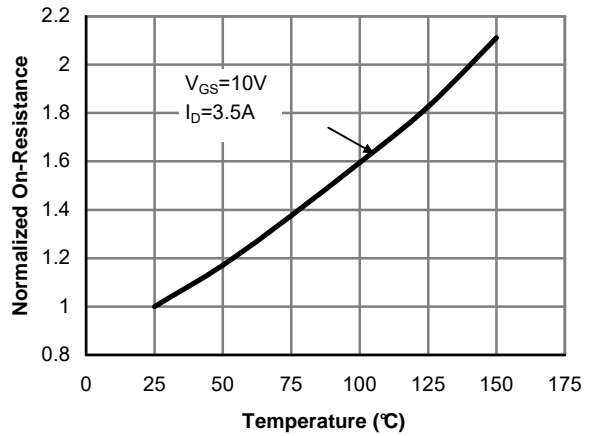


Figure 4: On-Resistance vs. Junction Temperature (Note E)

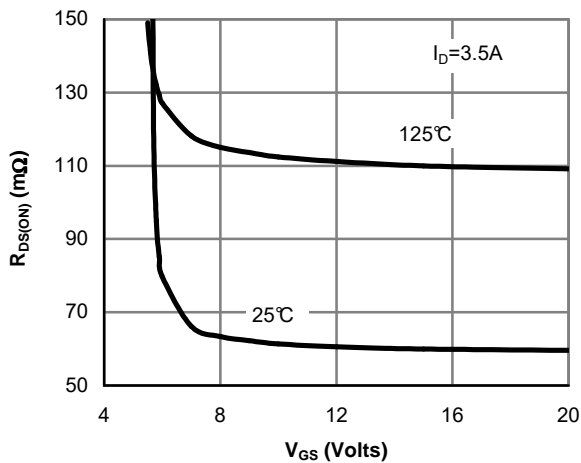


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

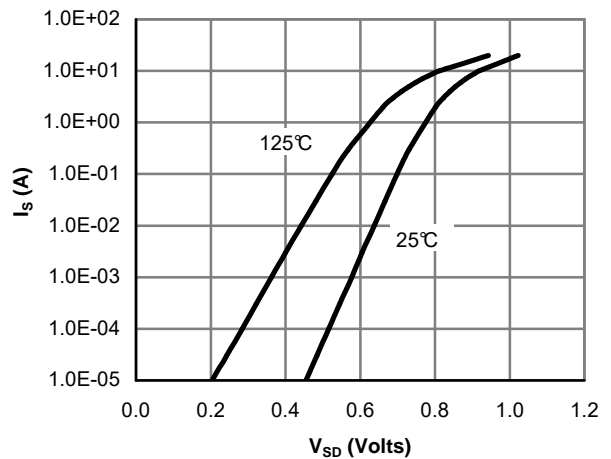


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

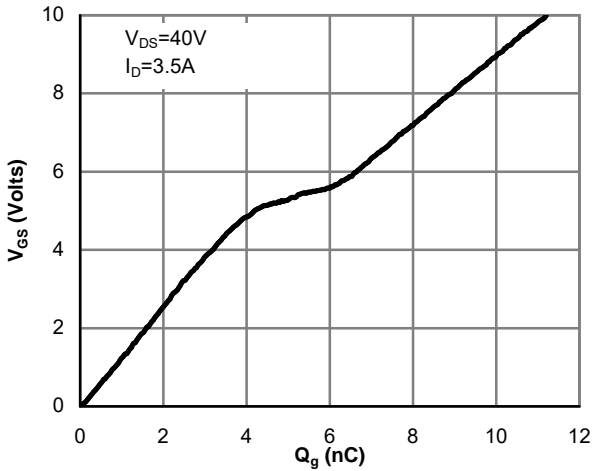


Figure 7: Gate-Charge Characteristics

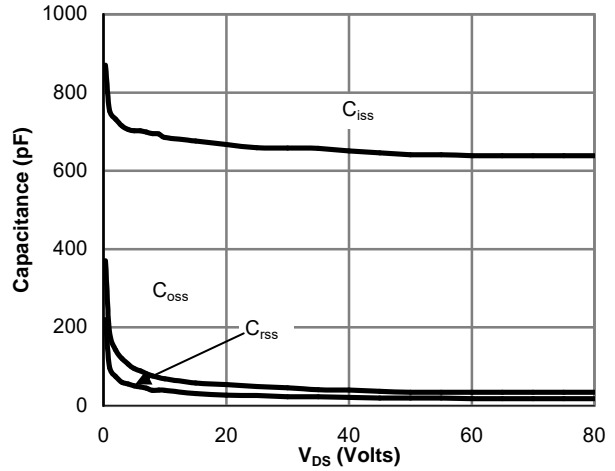


Figure 8: Capacitance Characteristics

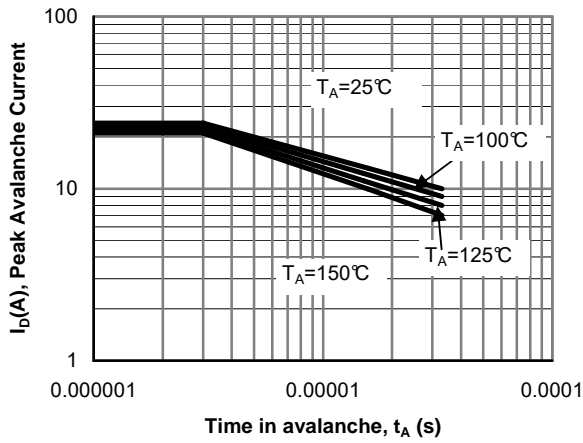


Figure 12: Single Pulse Avalanche capability

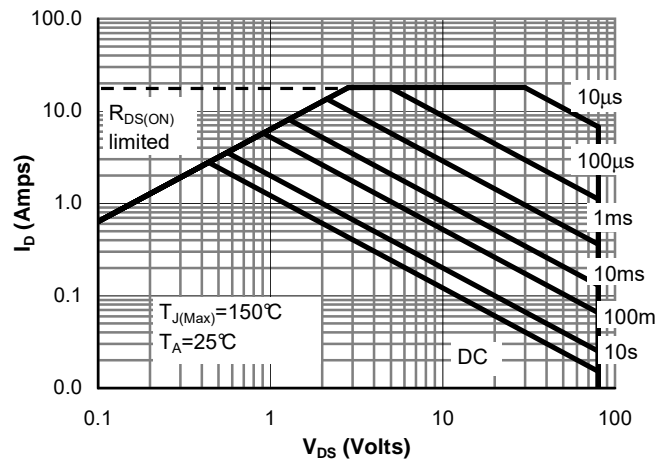


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

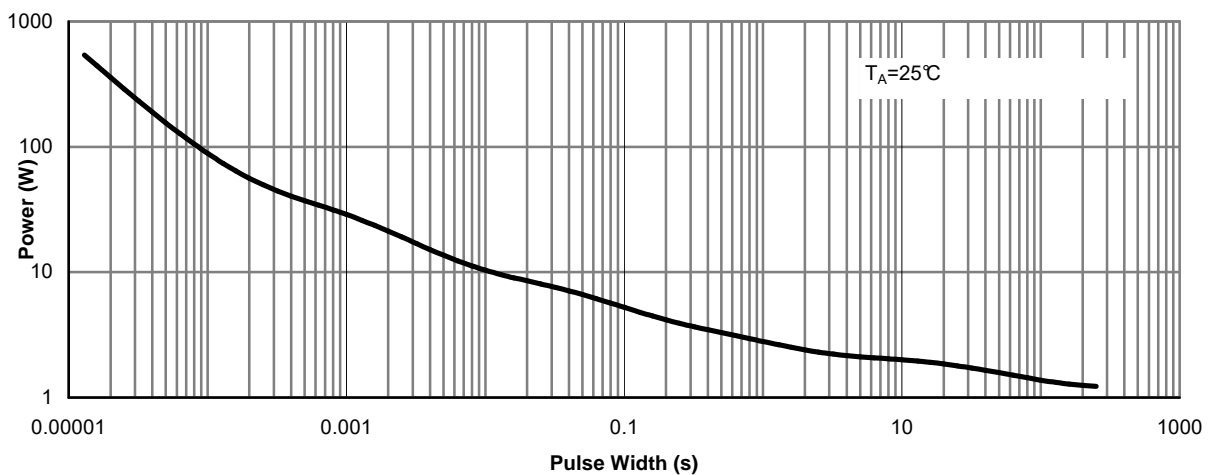


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

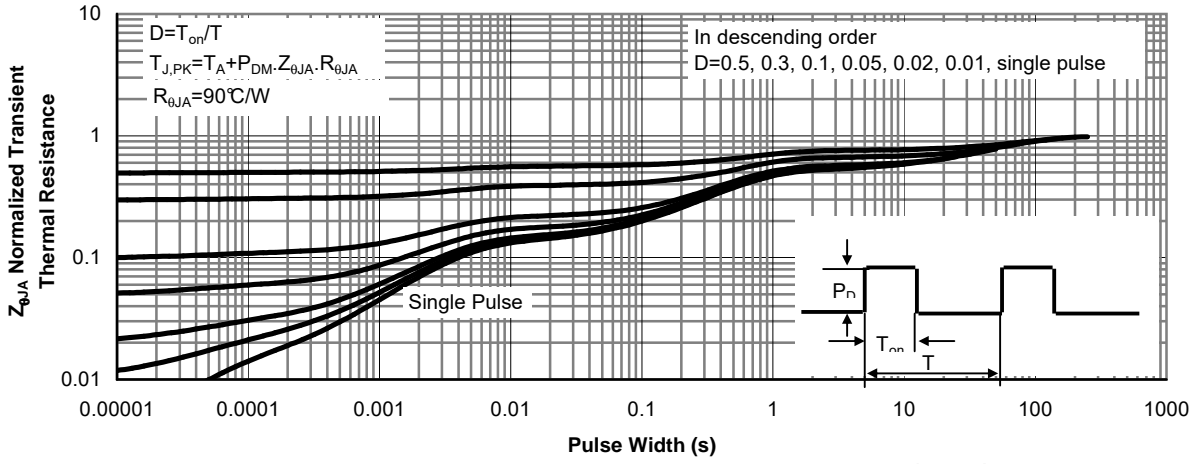
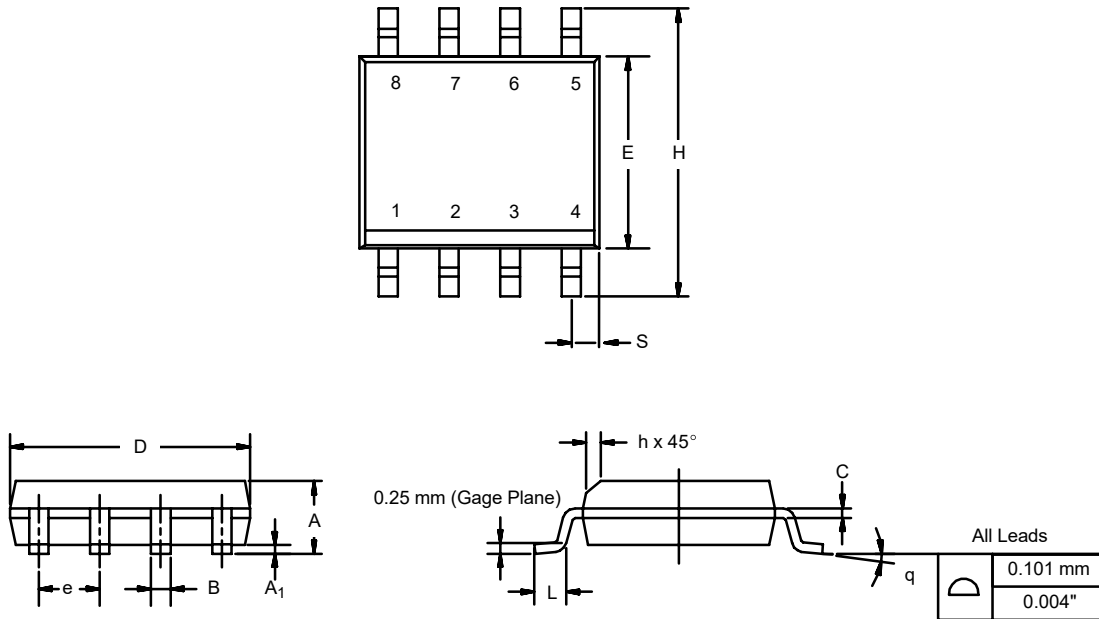


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

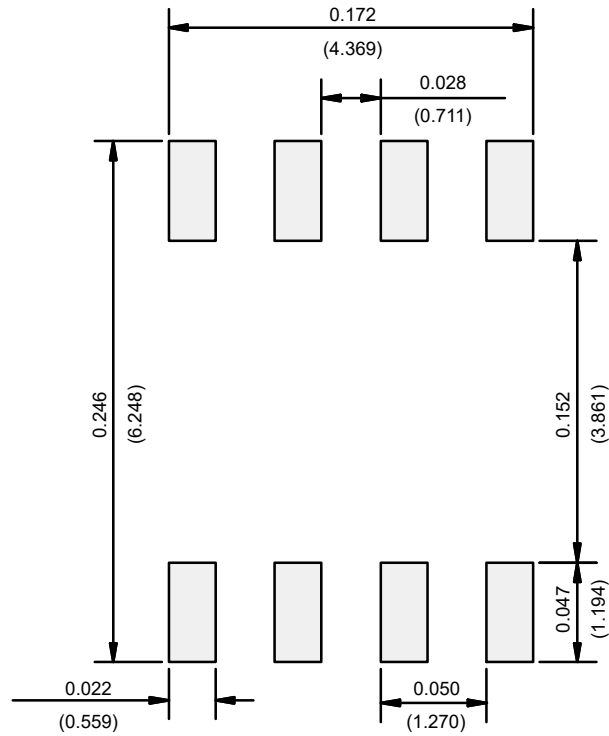
**SOIC (NARROW): 8-LEAD**

JEDEC Part Number: MS-012



DIM	MILLIMETERS		INCHES	
	Min	Max	Min	Max
A	1.35	1.75	0.053	0.069
A <sub>1</sub>	0.10	0.20	0.004	0.008
B	0.35	0.51	0.014	0.020
C	0.19	0.25	0.0075	0.010
D	4.80	5.00	0.189	0.196
E	3.80	4.00	0.150	0.157
e	1.27 BSC		0.050 BSC	
H	5.80	6.20	0.228	0.244
h	0.25	0.50	0.010	0.020
L	0.50	0.93	0.020	0.037
q	0°	8°	0°	8°
S	0.44	0.64	0.018	0.026
ECN: C-06527-Rev. I, 11-Sep-06				
DWG: 5498				

RECOMMENDED MINIMUM PADS FOR SO-8



Recommended Minimum Pads  
Dimensions in Inches/(mm)

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APPLICATION NOTE

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