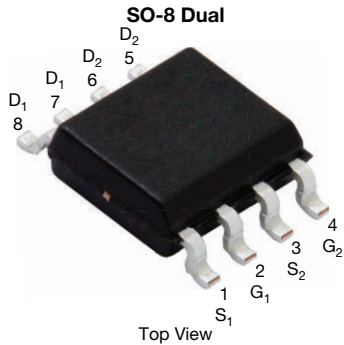


## Dual N-Channel 60 V (D-S) MOSFET



Marking code: G3

PRODUCT SUMMARY	
$V_{DS}$ (V)	60
$R_{DS(on)}$ max. ( $\Omega$ ) at $V_{GS} = 10$ V	0.0409
$R_{DS(on)}$ max. ( $\Omega$ ) at $V_{GS} = 4.5$ V	0.0516
$Q_g$ typ. (nC)	2.4
$I_D$ (A) <sup>d</sup>	6.1
Configuration	Dual

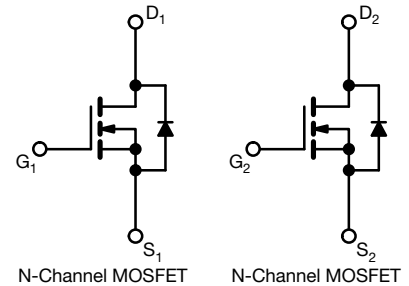
### FEATURES

- TrenchFET® power MOSFET
- 100 %  $R_g$  tested
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


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

### APPLICATIONS

- DC/DC converter
- Load switch
- Inverters
- Circuit protection



ORDERING INFORMATION	
Package	SO-8
Lead (Pb)-free and halogen-free	Si4946CDY-T1-GE3

ABSOLUTE MAXIMUM RATINGS ( $T_A = 25$ °C, unless otherwise noted)				
PARAMETER		SYMBOL	LIMIT	UNIT
Drain-source voltage		$V_{DS}$	60	V
Gate-source voltage		$V_{GS}$	$\pm 20$	
Continuous drain current ( $T_J = 150$ °C)	$T_C = 25$ °C	$I_D$	6.1	A
	$T_C = 70$ °C		4.9	
	$T_A = 25$ °C		5.2 <sup>a, b</sup>	
	$T_A = 70$ °C		4.2 <sup>a, b</sup>	
Pulsed drain current ( $t = 100$ $\mu$ s)		$I_{DM}$	25	
Continuous source-drain diode current	$T_C = 25$ °C	$I_S$	2.3	
	$T_A = 25$ °C		1.7 <sup>a, b</sup>	
Single pulse avalanche current	L = 0.1 mH	$I_{AS}$	8	
Single pulse avalanche energy		$E_{AS}$	3.2	mJ
Maximum power dissipation	$T_C = 25$ °C	$P_D$	2.8	W
	$T_C = 70$ °C		1.8	
	$T_A = 25$ °C		2 <sup>a, b</sup>	
	$T_A = 70$ °C		1.3 <sup>a, b</sup>	
Operating junction and storage temperature range		$T_J, T_{stg}$	-55 to +150	°C

THERMAL RESISTANCE RATINGS					
PARAMETER		SYMBOL	TYPICAL	MAXIMUM	UNIT
Maximum junction-to-ambient <sup>a, c</sup>	$t \leq 10$ s	$R_{thJA}$	58	62.5	°C/W
Maximum junction-to-foot (drain)	Steady state	$R_{thJF}$	38	45	

### Notes

- Surface mounted on 1" x 1" FR4 board
- $t = 10$  s
- Maximum under steady state conditions is 110 °C/W
- $T_C = 25$  °C



SPECIFICATIONS ( $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
<b>Static</b>						
Drain-source breakdown voltage	$V_{DS}$	$V_{GS} = 0\text{ V}$ , $I_D = 250\text{ }\mu\text{A}$	60	-	-	V
$V_{DS}$ temperature coefficient	$\Delta V_{DS}/T_J$	$I_D = 250\text{ }\mu\text{A}$	-	40	-	mV/ $^\circ\text{C}$
$V_{GS(th)}$ temperature coefficient	$\Delta V_{GS(th)}/T_J$		-	-4.8	-	
Gate-source threshold voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$ , $I_D = 250\text{ }\mu\text{A}$	1	-	3	V
Gate-source leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}$ , $V_{GS} = \pm 20\text{ V}$	-	-	$\pm 100$	nA
Zero gate voltage drain current	$I_{DSS}$	$V_{DS} = 60\text{ V}$ , $V_{GS} = 0\text{ V}$	-	-	1	$\mu\text{A}$
		$V_{DS} = 60\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_J = 70\text{ }^\circ\text{C}$	-	-	10	
On-state drain current <sup>a</sup>	$I_{D(on)}$	$V_{DS} \leq 10\text{ V}$ , $V_{GS} = 10\text{ V}$	8	-	-	A
Drain-source on-state resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$ , $I_D = 5.2\text{ A}$	-	0.0330	0.0409	$\Omega$
		$V_{GS} = 4.5\text{ V}$ , $I_D = 4.6\text{ A}$	-	0.0430	0.0516	
Forward transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 30\text{ V}$ , $I_D = 5.2\text{ A}$	-	17	-	S
<b>Dynamic <sup>b</sup></b>						
Input capacitance	$C_{ISS}$	$V_{DS} = 30\text{ V}$ , $V_{GS} = 0\text{ V}$ , $f = 1\text{ MHz}$	-	350	-	pF
Output capacitance	$C_{OSS}$		-	148	-	
Reverse transfer capacitance	$C_{RSS}$		-	9	-	
Total gate charge	$Q_g$	$V_{DS} = 30\text{ V}$ , $V_{GS} = 10\text{ V}$ , $I_D = 5.2\text{ A}$	-	5.1	10	nC
		$V_{DS} = 30\text{ V}$ , $V_{GS} = 4.5\text{ V}$ , $I_D = 5.2\text{ A}$	-	2.4	4.8	
Gate-source charge	$Q_{gs}$	$V_{DS} = 30\text{ V}$ , $V_{GS} = 4.5\text{ V}$ , $I_D = 5.2\text{ A}$	-	1.1	-	nC
Gate-drain charge	$Q_{gd}$		-	0.5	-	
Gate resistance	$R_g$		$f = 1\text{ MHz}$	0.26	1.3	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 30\text{ V}$ , $R_L = 7.2\text{ }\Omega$ , $I_D \cong 4.2\text{ A}$ , $V_{GEN} = 10\text{ V}$ , $R_g = 1\text{ }\Omega$	-	8	16	ns
Rise time	$t_r$		-	5	10	
Turn-off delay time	$t_{d(off)}$		-	16	30	
Fall time	$t_f$		-	3	6	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 30\text{ V}$ , $R_L = 7.2\text{ }\Omega$ , $I_D \cong 4.2\text{ A}$ , $V_{GEN} = 4.5\text{ V}$ , $R_g = 1\text{ }\Omega$	-	17	30	ns
Rise time	$t_r$		-	35	55	
Turn-off delay time	$t_{d(off)}$		-	14	28	
Fall time	$t_f$		-	20	33	
<b>Drain-Source Body Diode Characteristics</b>						
Continuous source-drain diode current	$I_S$	$T_C = 25\text{ }^\circ\text{C}$	-	-	2.3	A
Pulse diode forward current	$I_{SM}$		-	-	25	
Body diode voltage	$V_{SD}$	$I_S = 4.2\text{ A}$ , $V_{GS} = 0\text{ V}$	-	0.85	1.2	V
Body diode reverse recovery time	$t_{rr}$	$I_F = 4.2\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$ , $T_J = 25\text{ }^\circ\text{C}$	-	21	32	ns
Body diode reverse recovery charge	$Q_{rr}$		-	12	35	nC
Reverse recovery fall time	$t_a$		-	12	-	ns
Reverse recovery rise time	$t_b$		-	9	-	

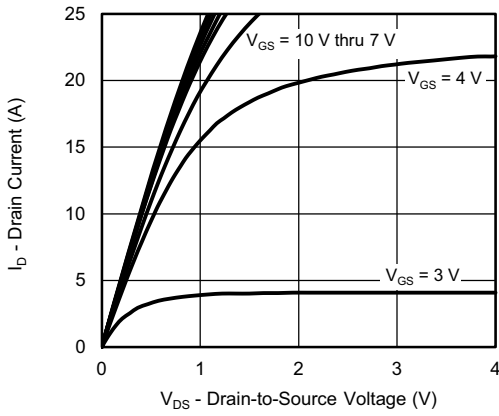
**Notes**

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

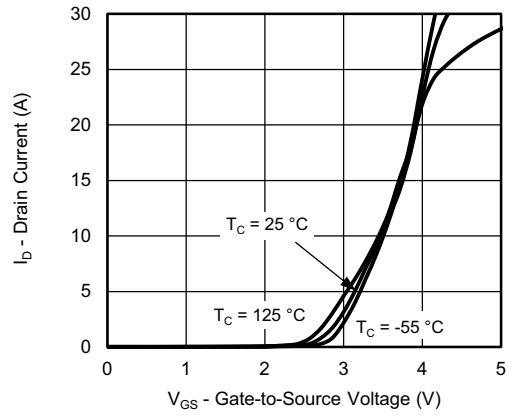
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.



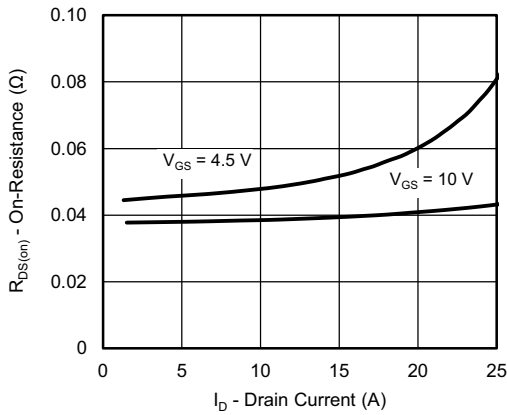
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



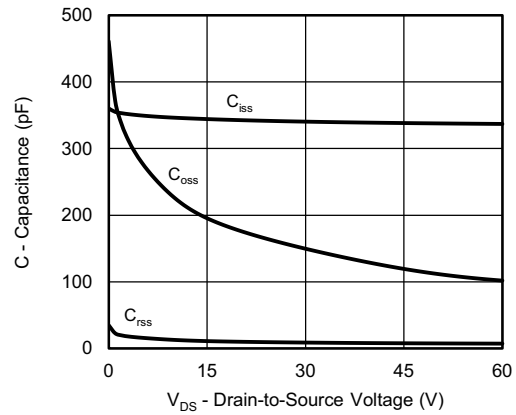
**Output Characteristics**



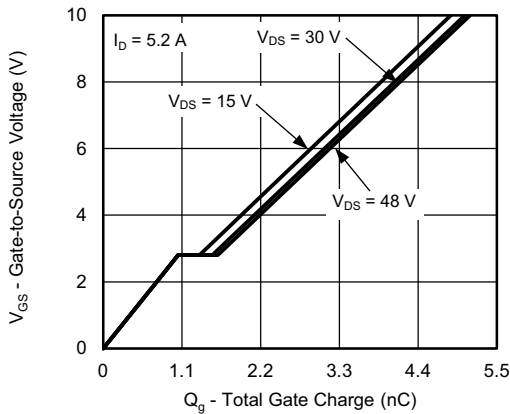
**Transfer Characteristics**



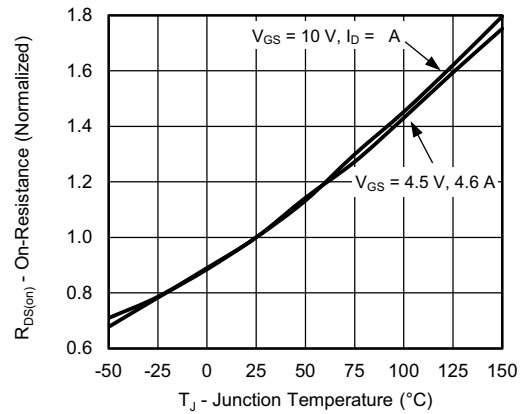
**On-Resistance vs. Drain Current and Gate Voltage**



**Capacitance**



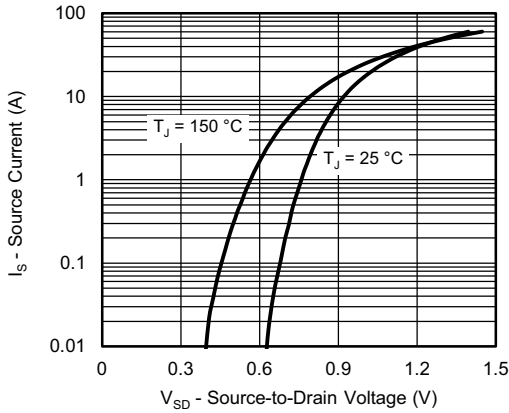
**Gate Charge**



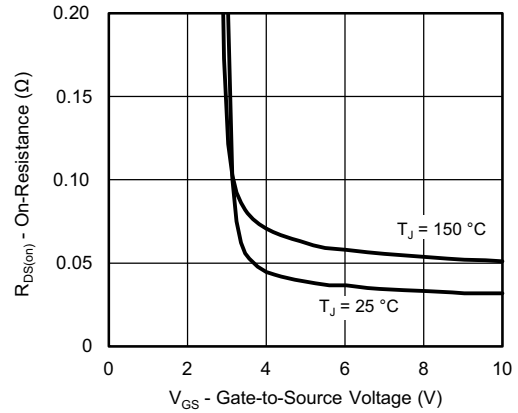
**On-Resistance vs. Junction Temperature**



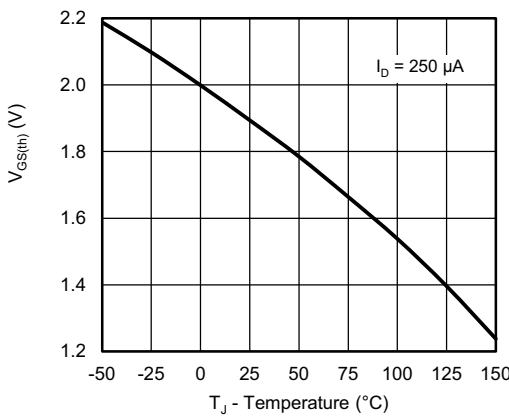
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



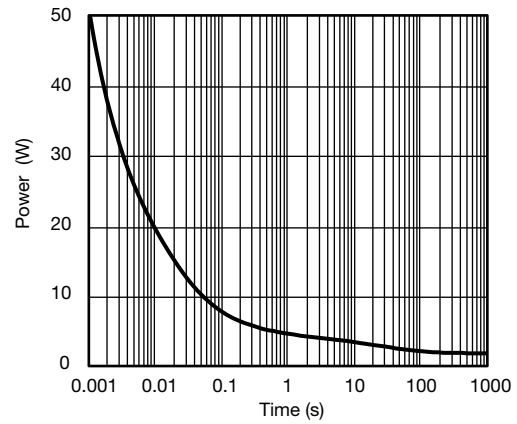
Source-Drain Diode Forward Voltage



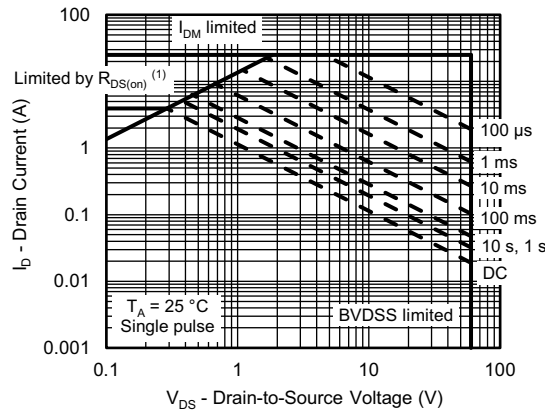
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage

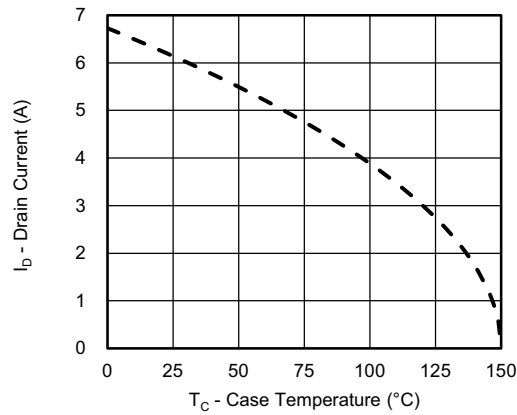


Single Pulse Power, Junction-to-Ambient

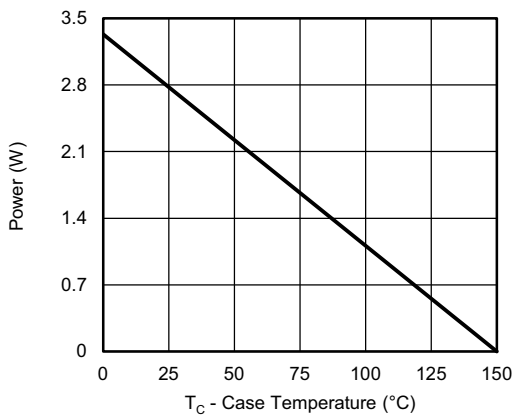


Safe Operating Area, Junction-to-Ambient

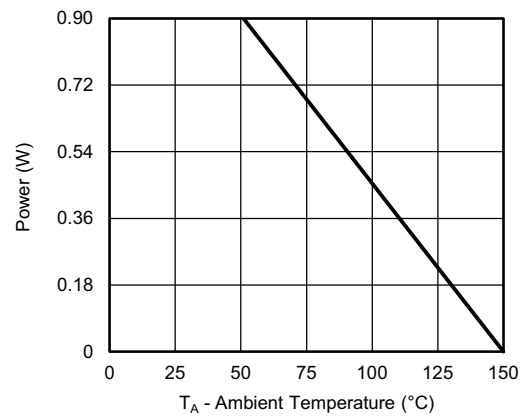
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



**Current Derating <sup>a</sup>**



**Power, Junction-to-Case**



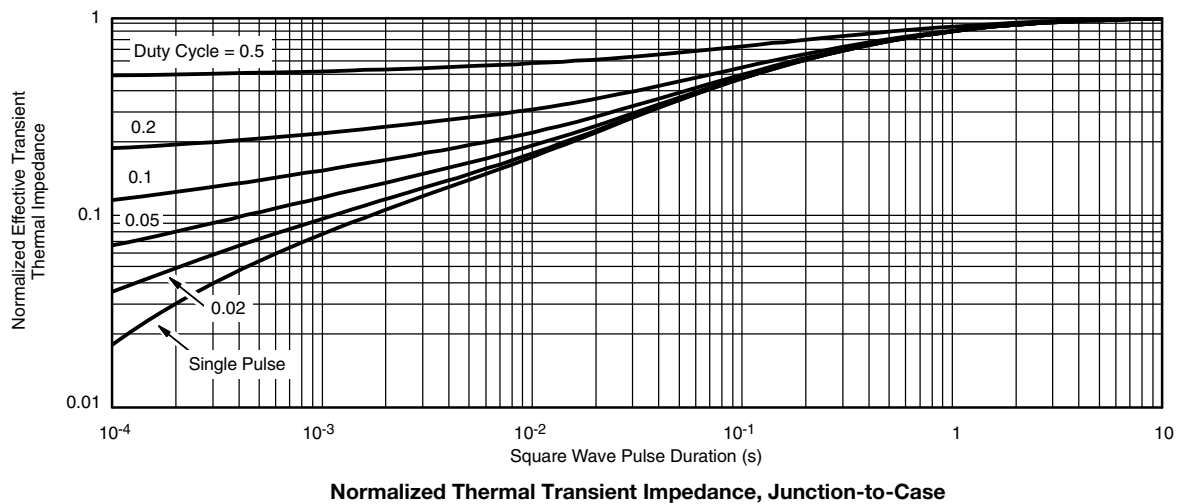
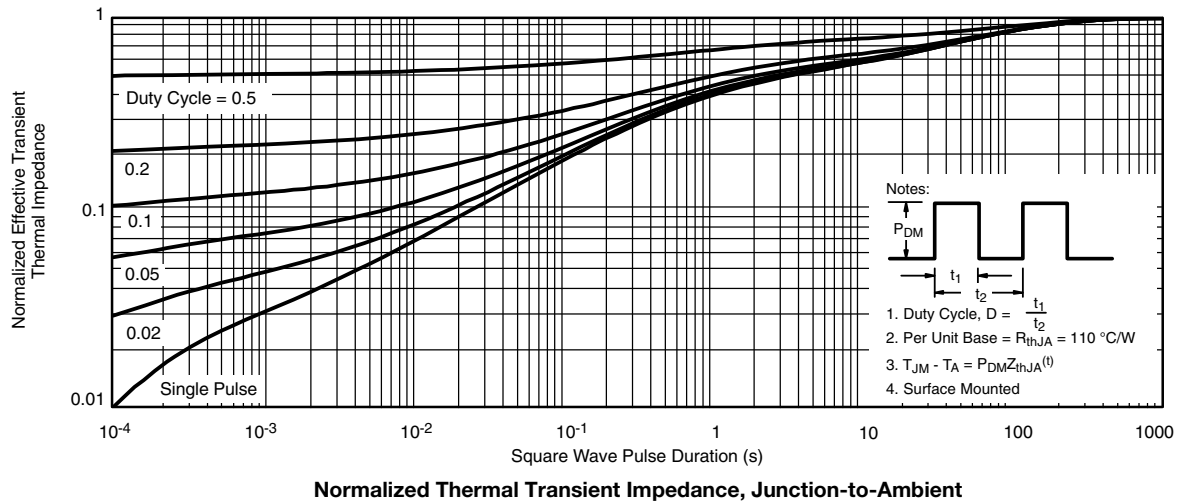
**Power, Junction-to-Ambient**

**Note**

- a. The power dissipation  $P_D$  is based on  $T_J$  max. = 150 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit



TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Vishay Siliconix maintains worldwide manufacturing capability. Products may be manufactured at one of several qualified locations. Reliability data for Silicon Technology and Package Reliability represent a composite of all qualified locations. For related documents such as package / tape drawings, part marking, and reliability data, see [www.vishay.com/ppg?75642](http://www.vishay.com/ppg?75642).

## 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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