

## 9976GM-VB Datasheet

### Dual N-Channel 60 V (D-S) 175 °C MOSFET

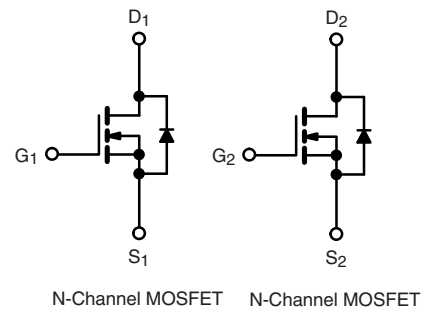
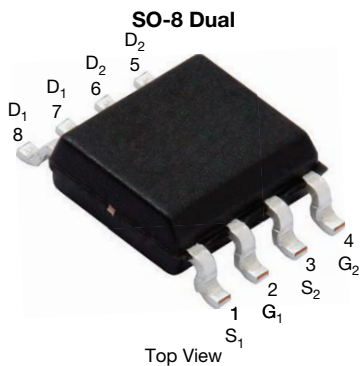
PRODUCT SUMMARY	
V <sub>DS</sub> (V)	60
R <sub>DS(on)</sub> (Ω) at V <sub>GS</sub> = 10 V	0.028
R <sub>DS(on)</sub> (Ω) at V <sub>GS</sub> = 4.5 V	0.030
I <sub>D</sub> (A) per leg	7
Configuration	Dual

#### FEATURES

- TrenchFET® power MOSFET
- 100 % R<sub>g</sub> and UIS tested



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



ABSOLUTE MAXIMUM RATINGS (T <sub>C</sub> = 25 °C, unless otherwise noted)			
PARAMETER	SYMBOL	LIMIT	UNIT
Drain-Source Voltage	V <sub>DS</sub>	60	V
Gate-Source Voltage	V <sub>GS</sub>	± 20	
Continuous Drain Current	I <sub>D</sub>	T <sub>C</sub> = 25 °C	7
		T <sub>C</sub> = 125 °C	4
Continuous Source Current (Diode Conduction) <sup>a</sup>	I <sub>S</sub>	3.6	A
Pulsed Drain Current <sup>b</sup>	I <sub>DM</sub>	28	
Single Pulse Avalanche Current	I <sub>AS</sub>	18	
Single Pulse Avalanche Energy	E <sub>AS</sub>	16.2	mJ
Maximum Power Dissipation <sup>b</sup>	P <sub>D</sub>	T <sub>C</sub> = 25 °C	4
		T <sub>C</sub> = 125 °C	1.3
Operating Junction and Storage Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	-55 to +175	°C

THERMAL RESISTANCE RATINGS			
PARAMETER	SYMBOL	LIMIT	UNIT
Junction-to-Ambient	R <sub>thJA</sub>	110	°C/W
Junction-to-Foot (Drain)	R <sub>thJF</sub>	34	

#### Notes

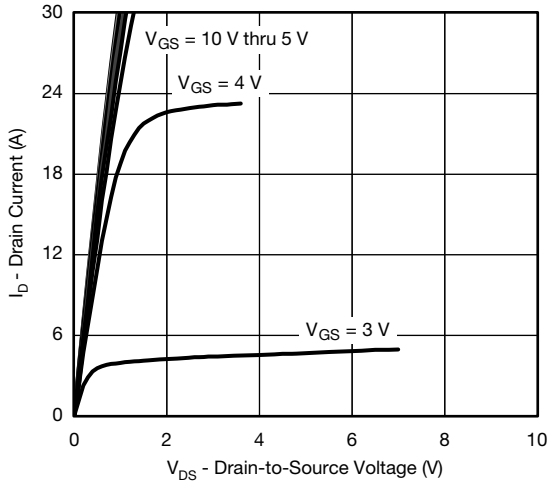
- Package limited.
- Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2 %.
- When mounted on 1" square PCB (FR4 material).

<b>SPECIFICATIONS</b> ( $T_C = 25\text{ }^\circ\text{C}$ , 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
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$		1.5	2.0	2.5	
Gate-Source Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$		-	-	$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{GS} = 0\text{ V}$	$V_{DS} = 60\text{ V}$	-	-	1	$\mu\text{A}$
		$V_{GS} = 0\text{ V}$	$V_{DS} = 60\text{ V}, T_J = 125\text{ }^\circ\text{C}$	-	-	50	
		$V_{GS} = 0\text{ V}$	$V_{DS} = 60\text{ V}, T_J = 175\text{ }^\circ\text{C}$	-	-	150	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{GS} = 10\text{ V}$	$V_{DS} \geq 5\text{ V}$	20	-	-	A
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$	$I_D = 4.5\text{ A}$	-	0.028	-	$\Omega$
		$V_{GS} = 10\text{ V}$	$I_D = 4.5\text{ A}, T_J = 125\text{ }^\circ\text{C}$	-	0.066	-	
		$V_{GS} = 10\text{ V}$	$I_D = 4.5\text{ A}, T_J = 175\text{ }^\circ\text{C}$	-	0.081	-	
		$V_{GS} = 4.5\text{ V}$	$I_D = 4\text{ A}$	-	0.030	-	
Forward Transconductance <sup>f</sup>	$g_{fs}$	$V_{DS} = 15\text{ V}, I_D = 4.5\text{ A}$		-	15	-	S
<b>Dynamic <sup>b</sup></b>							
Input Capacitance	$C_{iss}$	$V_{GS} = 0\text{ V}$	$V_{DS} = 25\text{ V}, f = 1\text{ MHz}$	-	600	750	$\mu\text{F}$
Output Capacitance	$C_{oss}$			-	110	140	
Reverse Transfer Capacitance	$C_{rss}$			-	50	62	
Total Gate Charge <sup>c</sup>	$Q_g$	$V_{GS} = 10\text{ V}$	$V_{DS} = 30\text{ V}, I_D = 5.3\text{ A}$	-	11.7	18	nC
Gate-Source Charge <sup>c</sup>	$Q_{gs}$			-	1.8	2.7	
Gate-Drain Charge <sup>c</sup>	$Q_{gd}$			-	2.8	4.2	
Gate Resistance	$R_g$	$f = 1\text{ MHz}$		1.3	-	6	$\Omega$
Turn-On Delay Time <sup>c</sup>	$t_{d(on)}$	$V_{DD} = 30\text{ V}, R_L = 6.8\text{ }\Omega$ $I_D \cong 4.4\text{ A}, V_{GEN} = 10\text{ V}, R_g = 1\text{ }\Omega$		-	7	11	ns
Rise Time <sup>c</sup>	$t_r$			-	3.3	5	
Turn-Off Delay Time <sup>c</sup>	$t_{d(off)}$			-	22.4	33.5	
Fall Time <sup>c</sup>	$t_f$			-	2.1	3.2	
<b>Source-Drain Diode Ratings and Characteristics <sup>b</sup></b>							
Pulsed Current <sup>a</sup>	$I_{SM}$			-	-	28	A
Forward Voltage	$V_{SD}$	$I_F = 2\text{ A}, V_{GS} = 0\text{ V}$		-	0.75	1.1	V

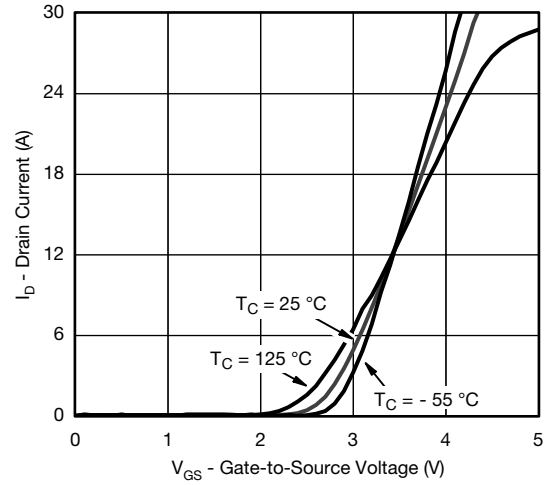
**Notes**

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

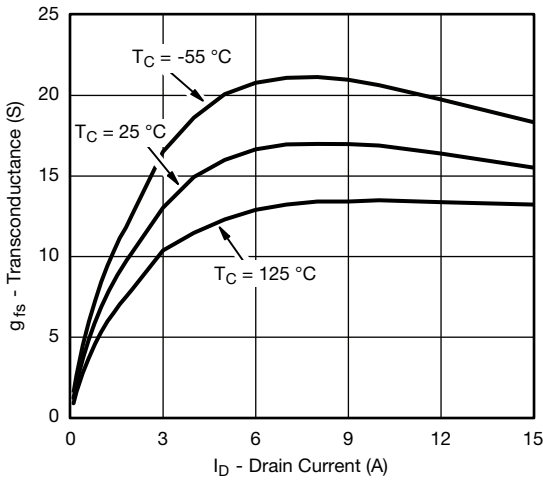
**TYPICAL CHARACTERISTICS** ( $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise noted)



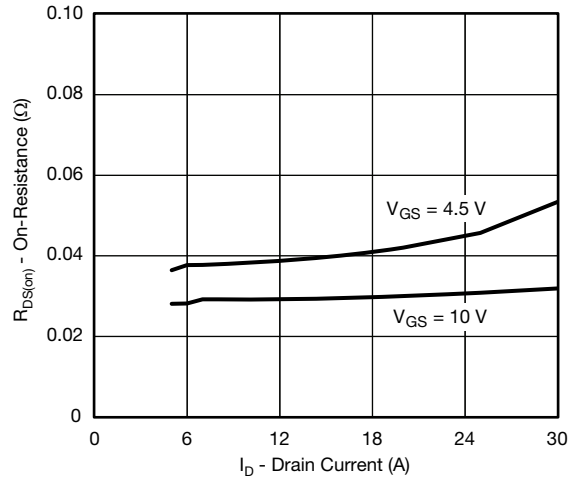
**Output Characteristics**



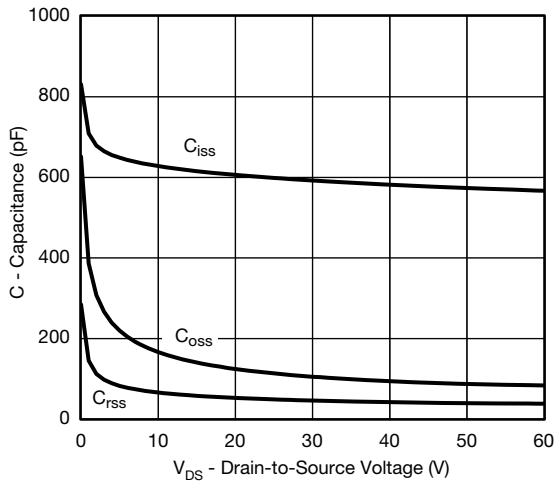
**Transfer Characteristics**



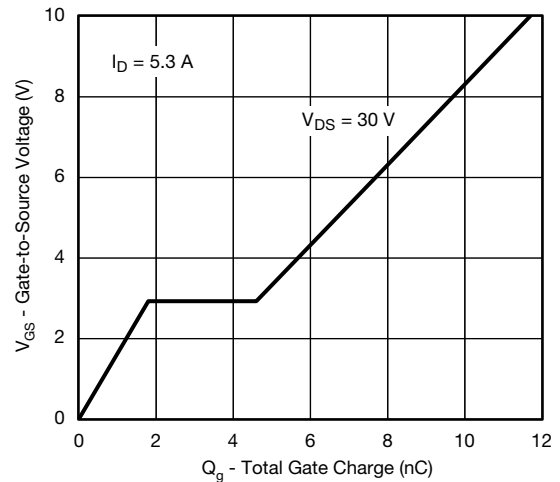
**Transconductance**



**On-Resistance vs. Drain Current**

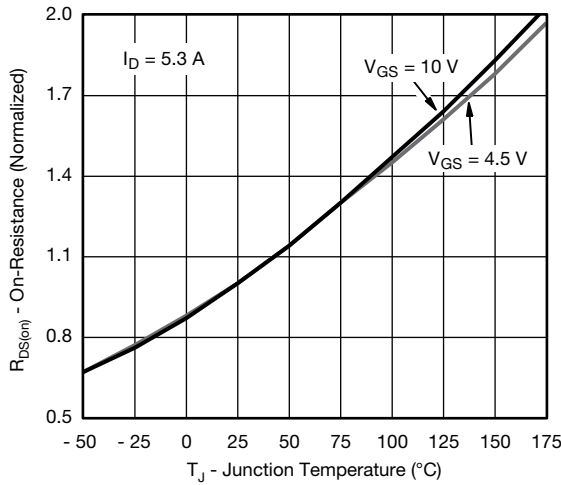


**Capacitance**

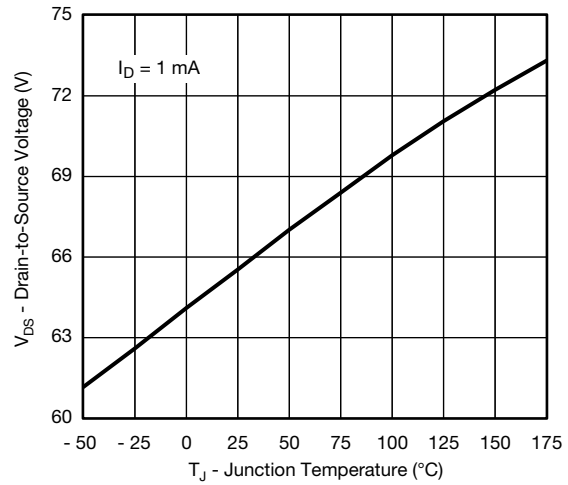


**Gate Charge**

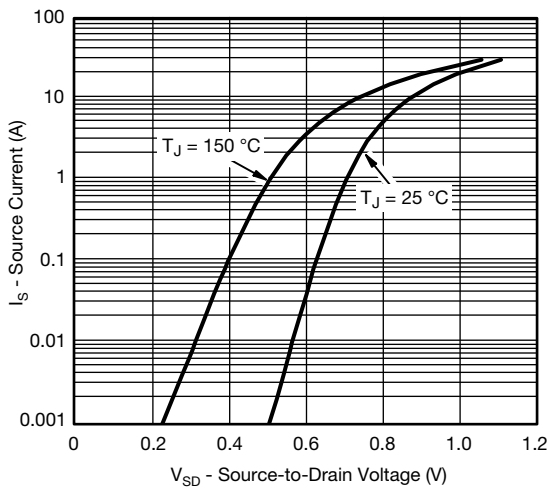
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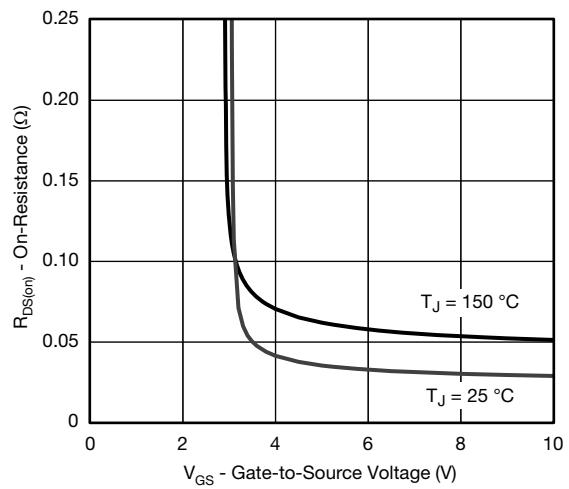
**On-Resistance vs. Junction Temperature**



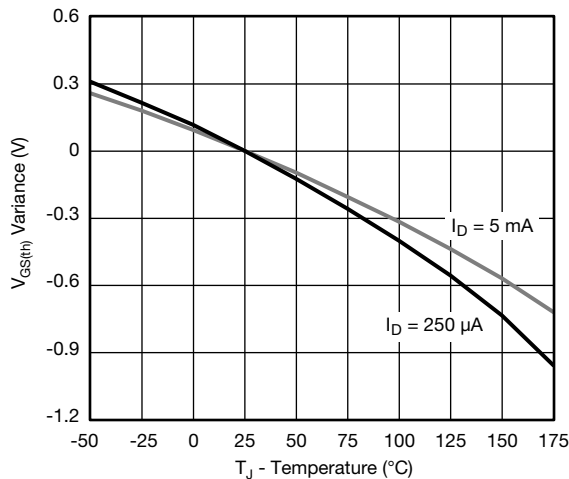
**Drain Source Breakdown vs. Junction Temperature**



**Source Drain Diode Forward Voltage**

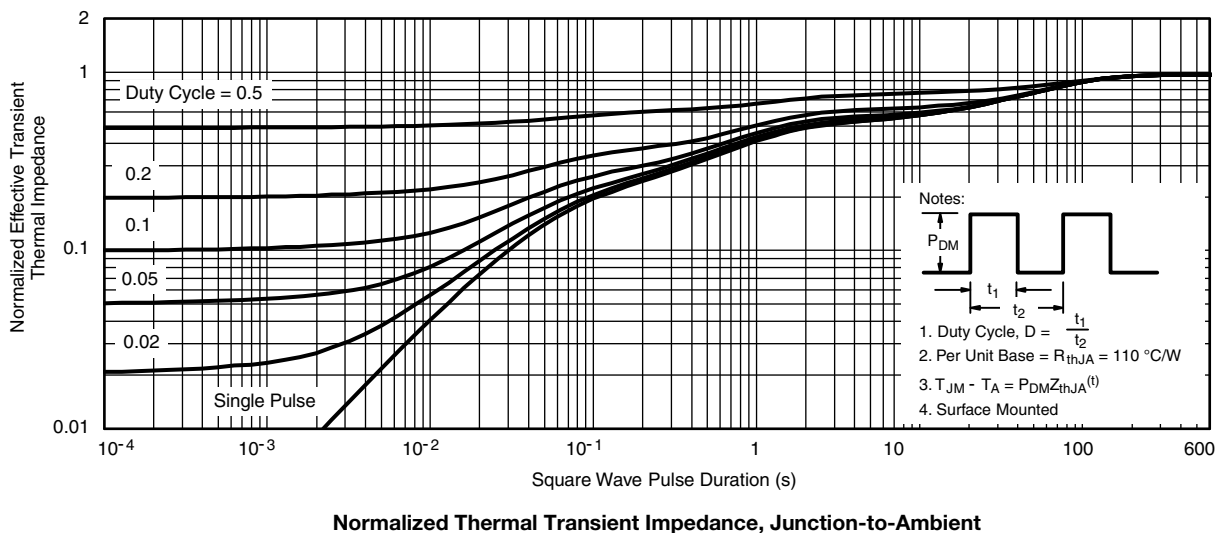
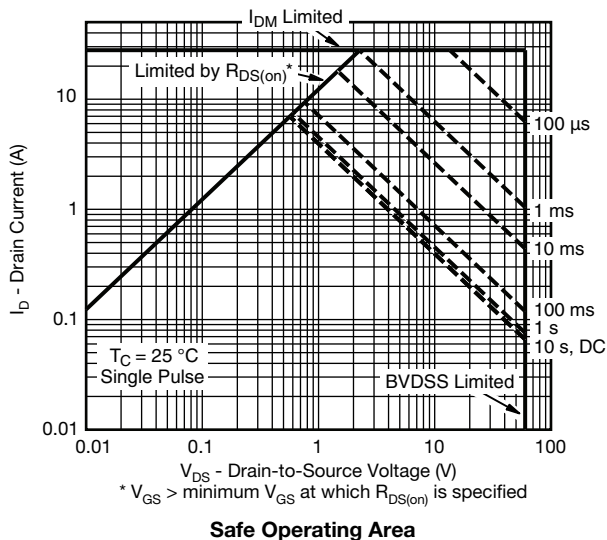


**On-Resistance vs. Gate-to-Source Voltage**

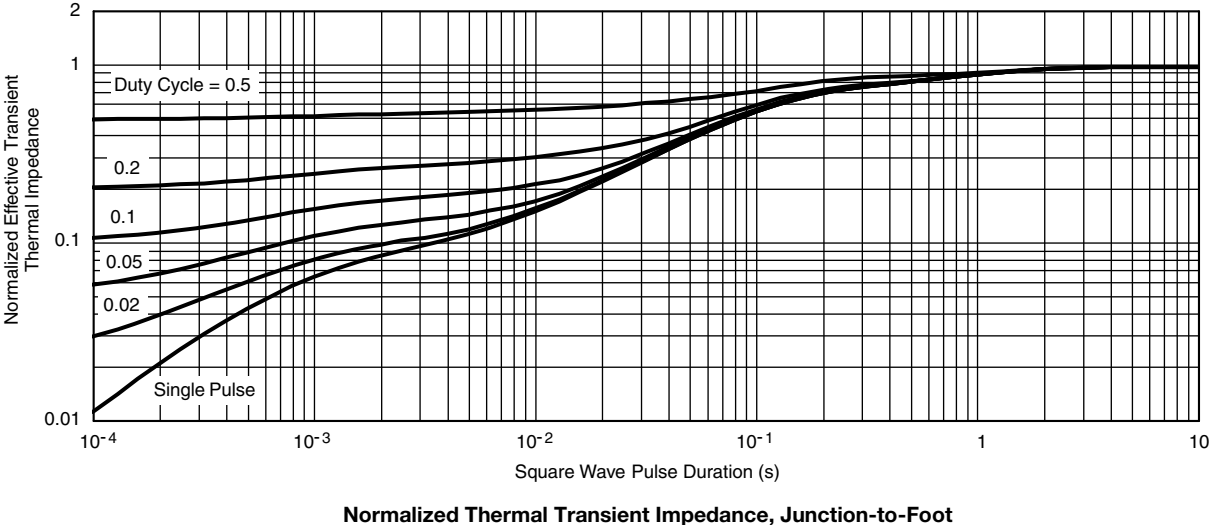


**Threshold Voltage**

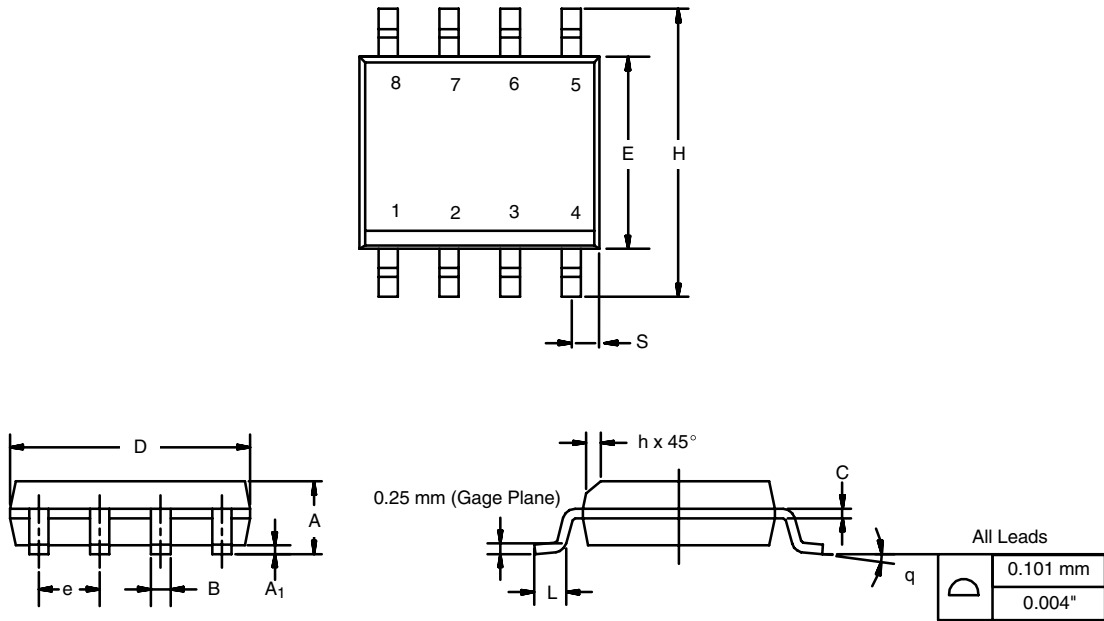
**THERMAL RATINGS** ( $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise noted)



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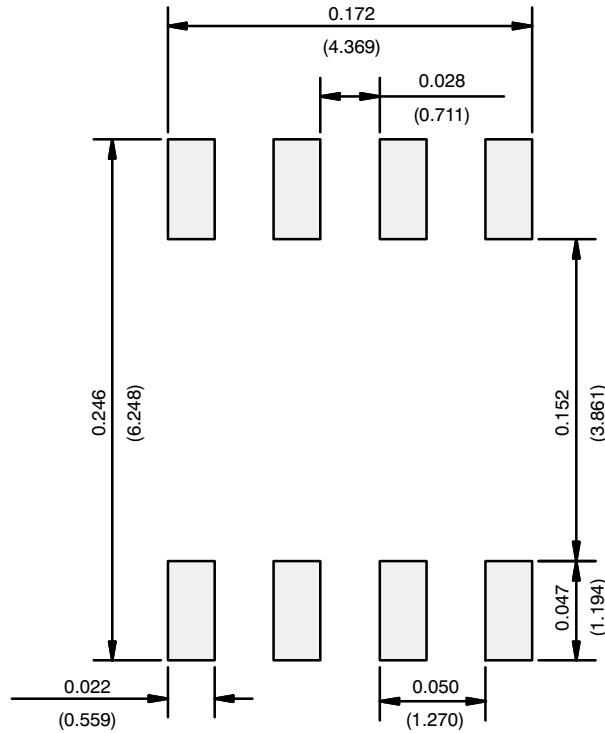


**SOIC (NARROW): 8-LEAD**  
JEDEC Part Number: MS-012



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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