

# Dual P-Channel 20-V (D-S) MOSFET

## PRODUCT SUMMARY

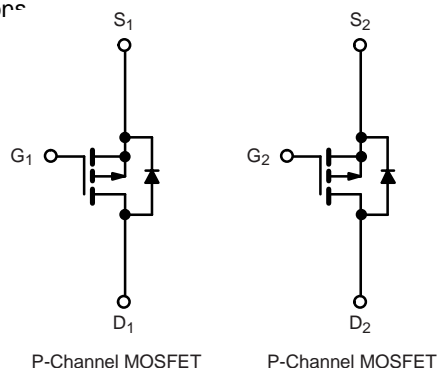
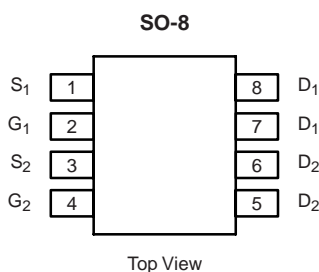
$V_{DS}$ (V)	$R_{DS(on)}$ ( $\Omega$ )	$I_D$ (A) <sup>d, e</sup>	$Q_g$ (Typ.)
- 20	0.048 at $V_{GS} = - 4.5$ V	- 5	7 nC
	0.065 at $V_{GS} = - 2.5$ V	- 3	

## FEATURES

- Halogen-free
- TrenchFET® Power MOSFET
- 100 % UIS Tested

## APPLICATIONS

- Load Switches
  - Notebook PCs
  - Desktop PCs
  - Game Station<sup>™</sup>


**RoHS**  
COMPLIANT


## ABSOLUTE MAXIMUM RATINGS $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise noted

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	- 20	V
Gate-Source Voltage	$V_{GS}$	$\pm 12$	
Continuous Drain Current ( $T_J = 150\text{ }^\circ\text{C}$ )	$T_C = 25\text{ }^\circ\text{C}$	- 5.0 <sup>e</sup>	A
	$T_C = 70\text{ }^\circ\text{C}$	- 4.0 <sup>e</sup>	
	$T_A = 25\text{ }^\circ\text{C}$	- 3.3 <sup>a, b</sup>	
	$T_A = 70\text{ }^\circ\text{C}$	- 2.5 <sup>a, b</sup>	
Pulsed Drain Current	$I_{DM}$	- 20 <sup>e</sup>	A
Continuous Source-Drain Diode Current	$T_C = 25\text{ }^\circ\text{C}$	- 4	
	$T_A = 25\text{ }^\circ\text{C}$	- 2.9 <sup>a, b</sup>	
Avalanche Current	$I_{AS}$	- 10	mJ
Single-Pulse Avalanche Energy	$E_{AS}$	15	
Maximum Power Dissipation	$T_C = 25\text{ }^\circ\text{C}$	5.0	W
	$T_C = 70\text{ }^\circ\text{C}$	2.2	
	$T_A = 25\text{ }^\circ\text{C}$	1.5 <sup>a, b</sup>	
	$T_A = 70\text{ }^\circ\text{C}$	0.8 <sup>a, b</sup>	
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	- 55 to 150	$^\circ\text{C}$

## THERMAL RESISTANCE RATINGS

Parameter	Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient <sup>a, c</sup>	$R_{thJA}$	30	40	$^\circ\text{C/W}$
Maximum Junction-to-Foot	$R_{thJF}$	15	20	

Notes:

- Surface mounted on 1" x 1" FR4 board.
- $t = 10$  s.
- Maximum under Steady State conditions is 85  $^\circ\text{C/W}$ .
- Based on  $T_C = 25\text{ }^\circ\text{C}$ .
- Limited by package.

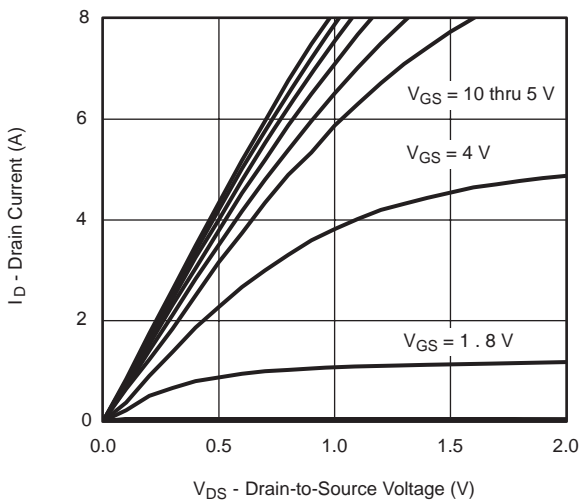
SPECIFICATIONS T <sub>J</sub> = 25 °C, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V <sub>DS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = - 250 μA	- 20			V
V <sub>DS</sub> Temperature Coefficient	ΔV <sub>DS</sub> /T <sub>J</sub>	I <sub>D</sub> = - 250 μA		- 25		mV/°C
V <sub>GS(th)</sub> Temperature Coefficient	ΔV <sub>GS(th)</sub> /T <sub>J</sub>			4.0		
Gate-Source Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = - 250 μA	- 0.5		- 1.5	V
Gate-Source Leakage	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ± 12 V			± 100	nA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = - 15 V, V <sub>GS</sub> = 0 V			- 1	μA
		V <sub>DS</sub> = - 15 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 55 °C			- 5	
On-State Drain Current <sup>a</sup>	I <sub>D(on)</sub>	V <sub>DS</sub> ≥ - 10 V, V <sub>GS</sub> = - 10 V	- 20			A
Drain-Source On-State Resistance <sup>a</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> = - 4.5 V, I <sub>D</sub> = - 4 A		0.048	0.055	Ω
		V <sub>GS</sub> = - 2.5 V, I <sub>D</sub> = - 2.4 A		0.065	0.073	
Forward Transconductance <sup>a</sup>	g <sub>fs</sub>	V <sub>DS</sub> = - 10 V, I <sub>D</sub> = - 4 A		23		S
Dynamic <sup>b</sup>						
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> = - 15 V, V <sub>GS</sub> = 0 V, f = 1 MHz		1296		pF
Output Capacitance	C <sub>oss</sub>			205		
Reverse Transfer Capacitance	C <sub>rss</sub>			118		
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> = - 15 V, V <sub>GS</sub> = - 4.5 V, I <sub>D</sub> = - 4 A		7		nC
		V <sub>DS</sub> = - 15 V, V <sub>GS</sub> = - 2.5 V, I <sub>D</sub> = - 2.4 A		5.5		
Q <sub>gs</sub>			2			
Q <sub>gd</sub>			1.5			
Gate Resistance	R <sub>g</sub>	f = 1 MHz		6.8		Ω
Turn-On Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> = - 15 V, R <sub>L</sub> = 15 Ω I <sub>D</sub> ≅ - 1 A, V <sub>GEN</sub> = - 4.5 V, R <sub>g</sub> = 1 Ω		7		ns
Rise Time	t <sub>r</sub>			6.3		
Turn-Off DelayTime	t <sub>d(off)</sub>			45		
Fall Time	t <sub>f</sub>			10		
Turn-On Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> = - 15 V, R <sub>L</sub> = 15 Ω I <sub>D</sub> ≅ - 1 A, V <sub>GEN</sub> = - 2.5 V, R <sub>g</sub> = 1 Ω		6		
Rise Time	t <sub>r</sub>			3.5		
Turn-Off DelayTime	t <sub>d(off)</sub>			40		
Fall Time	t <sub>f</sub>			6		
Drain-Source Body Diode Characteristics						
Continous Source-Drain Diode Current	I <sub>S</sub>	T <sub>C</sub> = 25 °C			- 4	A
Pulse Diode Forward Current	I <sub>SM</sub>				- 20	
Body Diode Voltage	V <sub>SD</sub>	I <sub>S</sub> = - 2 A, V <sub>GS</sub> = 0 V		- 0.7	- 1.0	V
Body Diode Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = - 2 A, dI/dt = 100 A/μs, T <sub>J</sub> = 25 °C		14		ns
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>			3.5		nC

Notes:

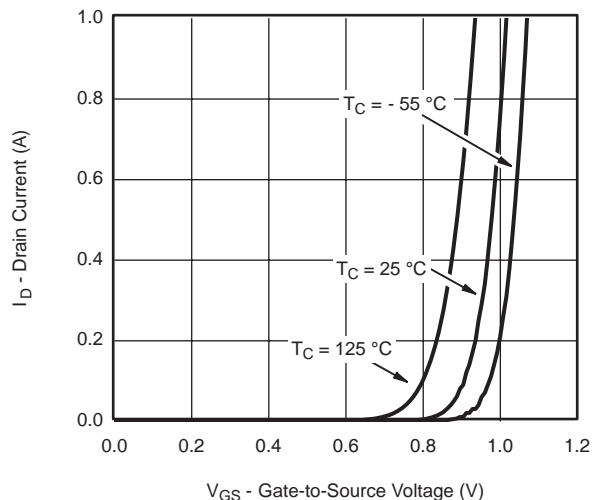
- a. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .  
 b. Guaranteed by design, not subject to production testing.

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.

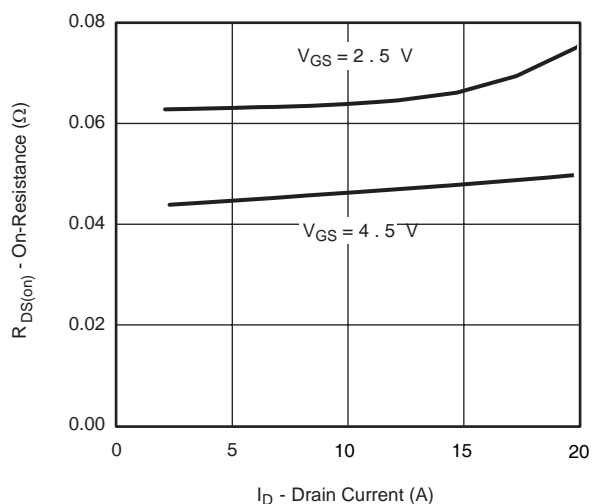
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



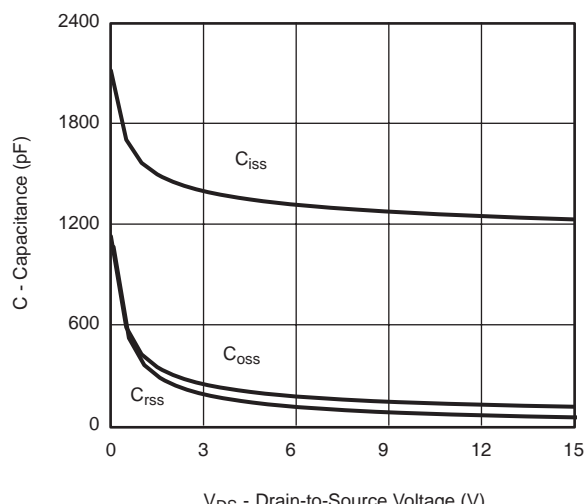
**Output Characteristics**



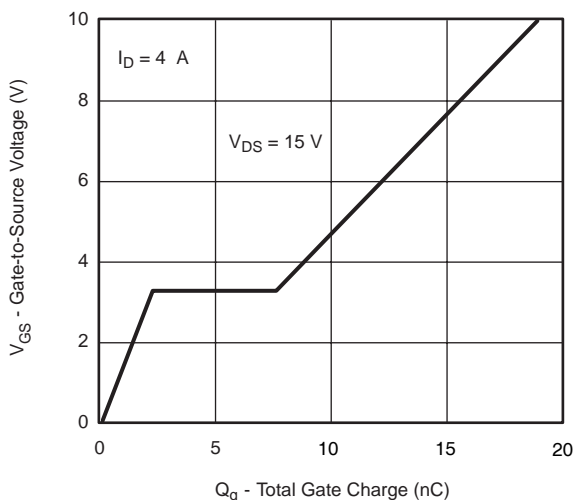
**Transfer Characteristics**



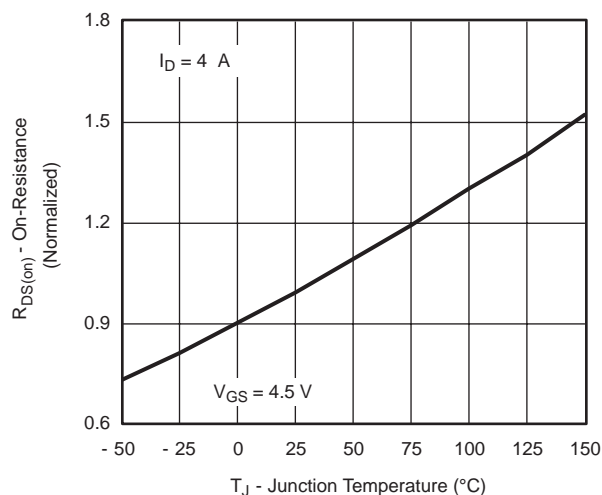
**On-Resistance vs. Drain Current**



**Capacitance**

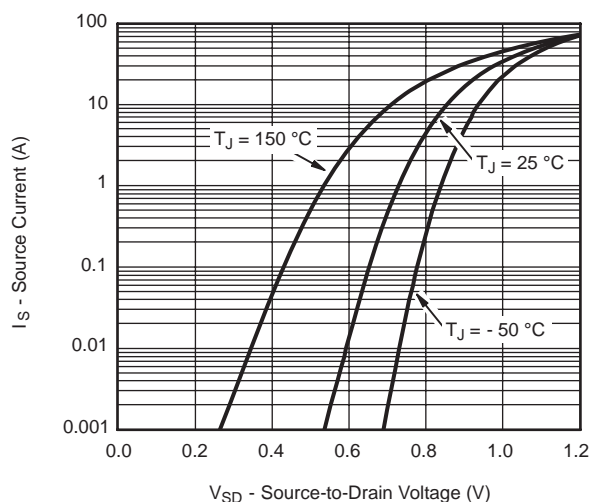


**Gate Charge**

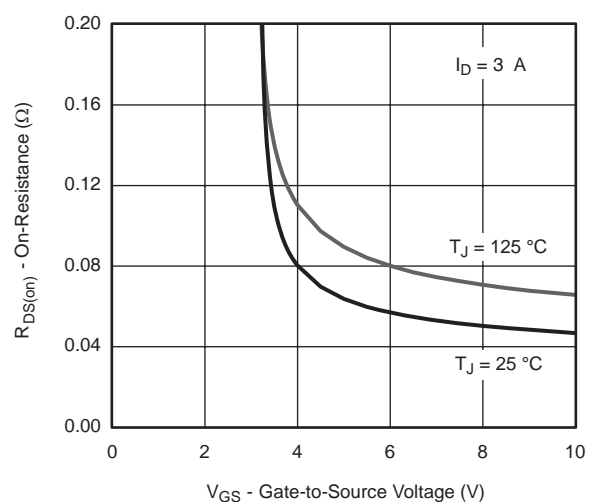


**On-Resistance vs. Junction Temperature**

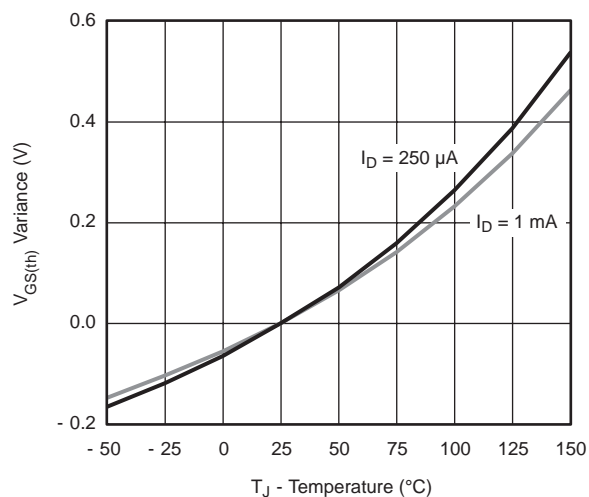
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



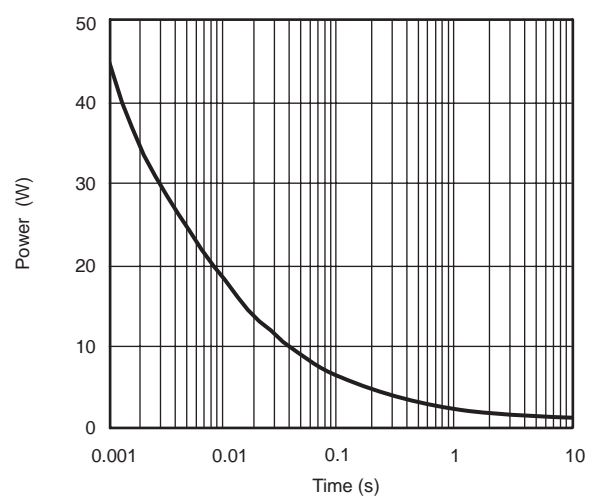
Source-Drain Diode Forward Voltage



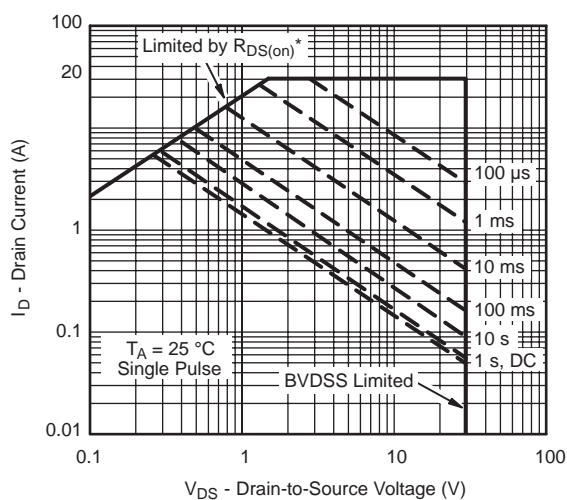
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



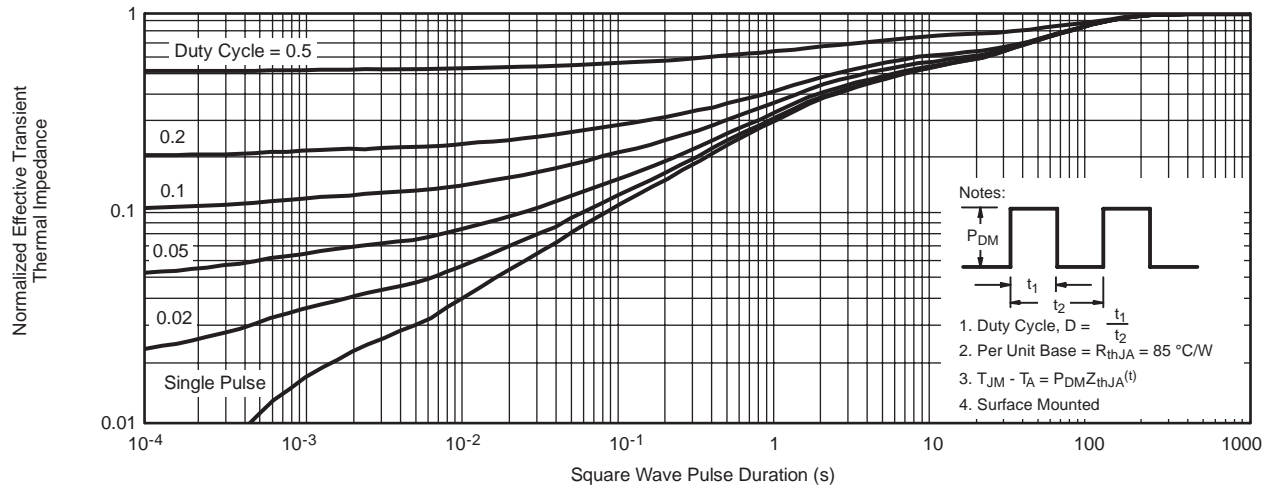
Single Pulse Power, Junction-to-Ambient



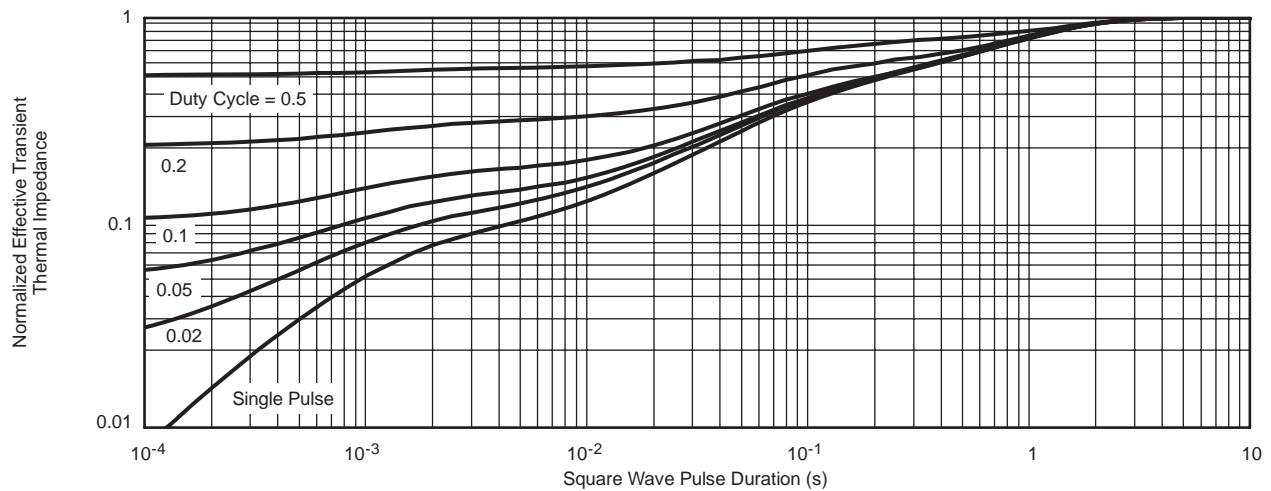
\*  $V_{GS} >$  minimum  $V_{GS}$  at which  $R_{DS(on)}$  is specified

Safe Operating Area

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

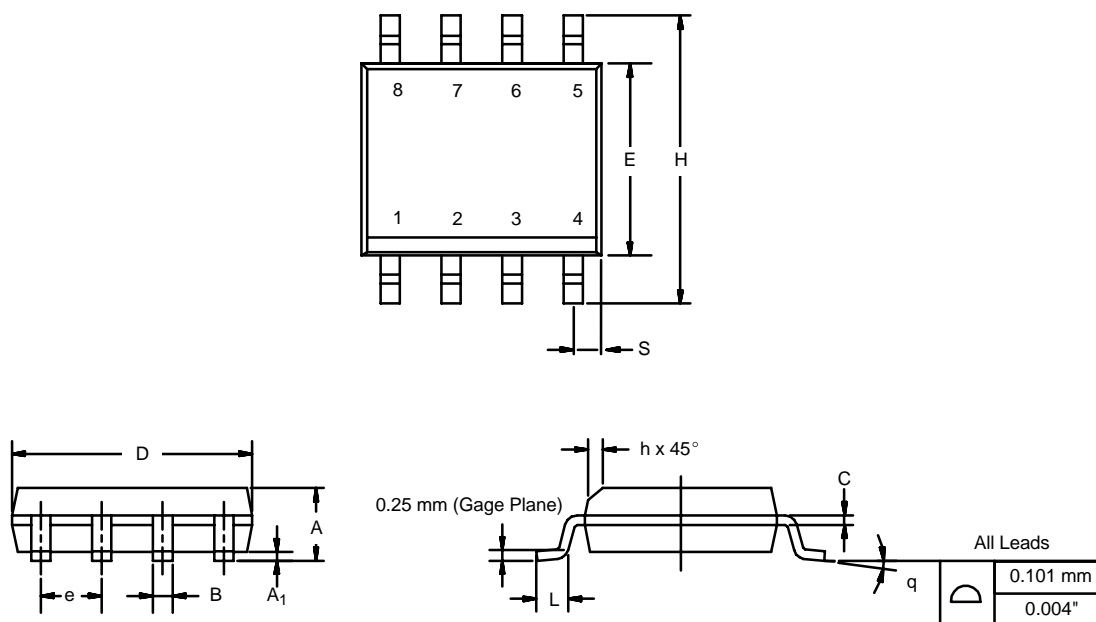


**Normalized Thermal Transient Impedance, Junction-to-Ambient**



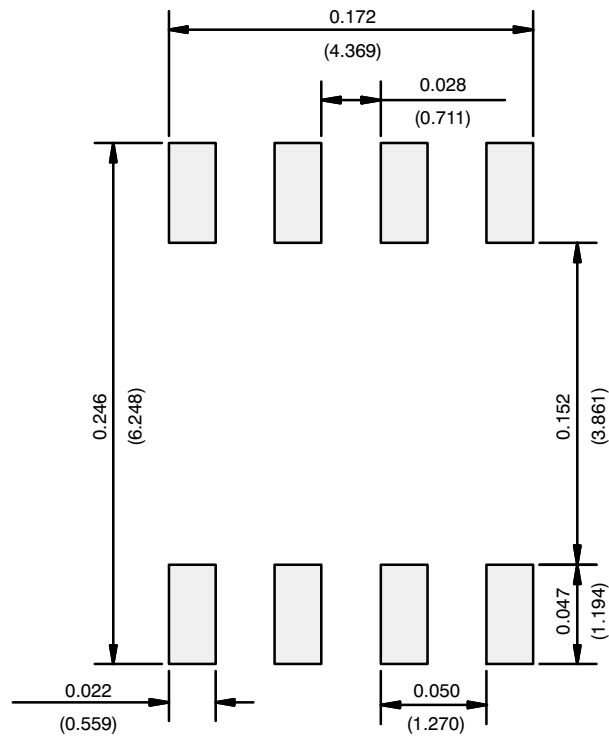
**Normalized Thermal Transient Impedance, Junction-to-Foot**

**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)

[Return to Index](#)

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