

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

### PRODUCT SUMMARY

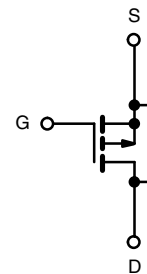
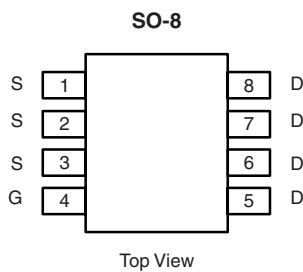
$V_{DS}$ (V)	$R_{DS(on)}$ ( $\Omega$ )	$I_D$ (A)
- 20	0.040 at $V_{GS} = - 4.5$ V	- 6.2
	0.060 at $V_{GS} = - 2.7$ V	- 5.0

### FEATURES

- Halogen-free According to IEC 61249-2-21 Definition
- Compliant to RoHS Directive 2002/95/EC



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



P-Channel MOSFET

**Ordering Information:** Si9433BDY-T1-E3 (Lead (Pb)-free)  
Si9433BDY-T1-GE3 (Lead (Pb)-free and Halogen-free)

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

Parameter	Symbol	10 s	Steady State	Unit
Drain-Source Voltage	$V_{DS}$	- 20		V
Gate-Source Voltage	$V_{GS}$	$\pm 12$		
Continuous Drain Current ( $T_J = 150^\circ\text{C}$ ) <sup>a</sup>	$I_D$	- 6.2	- 4.5	A
		- 5.0	- 3.5	
Pulsed Drain Current	$I_{DM}$	- 20		
Continuous Source Current (Diode Conduction) <sup>a</sup>	$I_S$	- 2.3	- 1.2	
Maximum Power Dissipation <sup>a</sup>	$P_D$	2.5	1.3	W
		1.6	0.8	
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</sup>	$R_{thJA}$	45	50	$^\circ\text{C/W}$
		80	95	
Maximum Junction-to-Foot (Drain)	$R_{thJF}$	20	24	

Notes:

a. Surface Mounted on FR4 board,  $t \leq 10$  s.

<b>SPECIFICATIONS</b> $T_J = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ. <sup>a</sup>	Max.	Unit
<b>Static</b>						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$ , $I_D = -250\text{ }\mu\text{A}$	-0.6		-1.5	V
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}$ , $V_{GS} = \pm 12\text{ V}$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = -20\text{ V}$ , $V_{GS} = 0\text{ V}$			-1	$\mu\text{A}$
		$V_{DS} = -20\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_J = 70\text{ }^{\circ}\text{C}$			-10	
On-State Drain Current <sup>b</sup>	$I_{D(on)}$	$V_{DS} \leq -5\text{ V}$ , $V_{GS} = -4.5\text{ V}$	-20			A
		$V_{DS} \leq -5\text{ V}$ , $V_{GS} = -2.7\text{ V}$	-5			
Drain-Source On-State Resistance <sup>b</sup>	$R_{DS(on)}$	$V_{GS} = -4.5\text{ V}$ , $I_D = -6.2\text{ A}$		0.030	0.040	$\Omega$
		$V_{GS} = -2.7\text{ V}$ , $I_D = -5.0\text{ A}$		0.050	0.060	
Forward Transconductance <sup>b</sup>	$g_{fs}$	$V_{DS} = -9\text{ V}$ , $I_D = -6.2\text{ A}$		15		S
Diode Forward Voltage <sup>b</sup>	$V_{SD}$	$I_S = -2.6\text{ A}$ , $V_{GS} = 0\text{ V}$		-0.76	-1.1	V
<b>Dynamic<sup>a</sup></b>						
Total Gate Charge	$Q_g$	$V_{DS} = -6\text{ V}$ , $V_{GS} = -4.5\text{ V}$ , $I_D = -6.2\text{ A}$		8.8	14	nC
Gate-Source Charge	$Q_{gs}$			1.8		
Gate-Drain Charge	$Q_{gd}$			2.4		
Gate Resistance	$R_g$			8.5		$\Omega$
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -6\text{ V}$ , $R_L = 6\text{ }\Omega$ $I_D \equiv -1\text{ A}$ , $V_{GEN} = -4.5\text{ V}$ , $R_g = 6\text{ }\Omega$		40	60	ns
Rise Time	$t_r$			55	85	
Turn-Off Delay Time	$t_{d(off)}$			65	100	
Fall Time	$t_f$			30	45	
Source-Drain Reverse Recovery Time	$t_{rr}$	$I_F = -2.3\text{ A}$ , $dI/dt = 100\text{ A}/\mu\text{s}$		35	55	

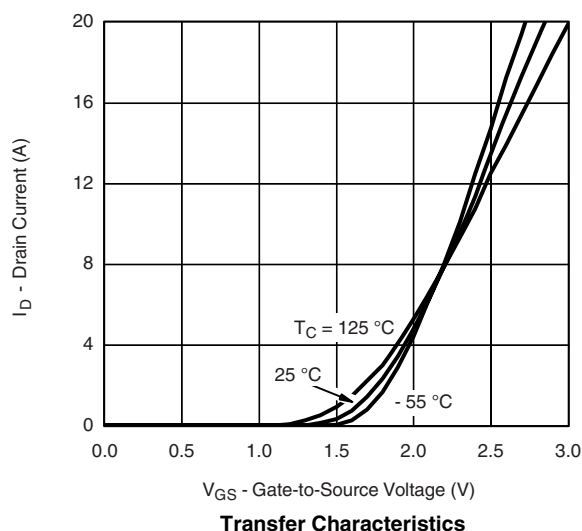
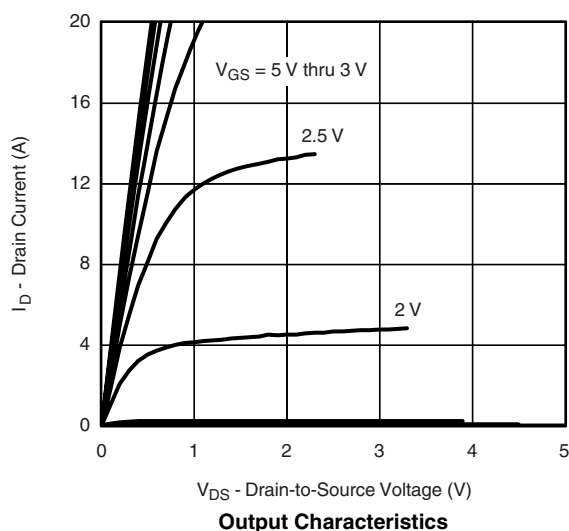
Notes:

a. For design aid only; not subject to production testing.

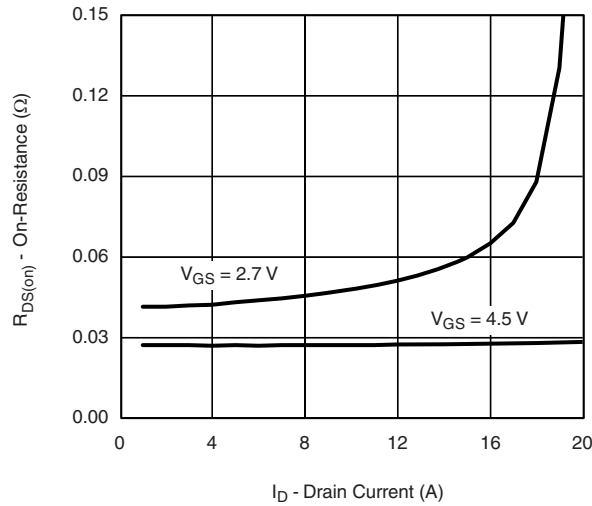
b. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .

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.

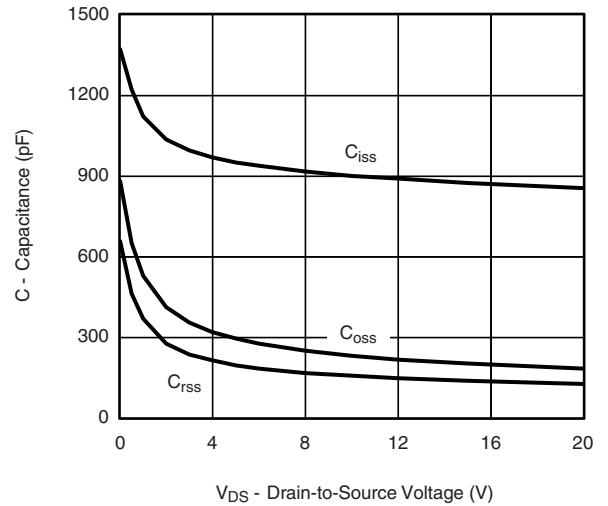
## TYPICAL CHARACTERISTICS $25\text{ }^{\circ}\text{C}$ , unless otherwise noted



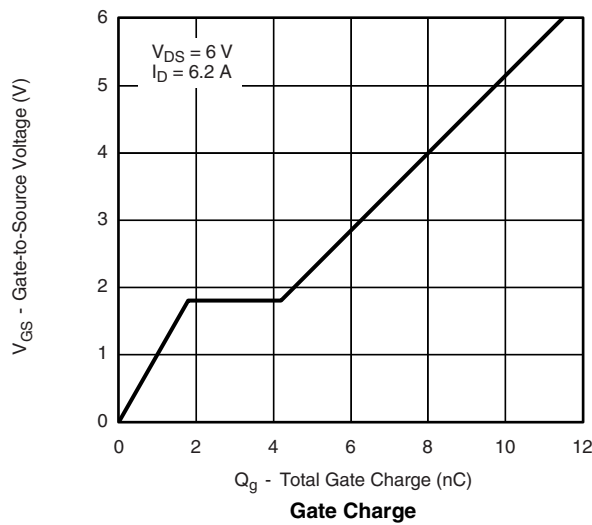
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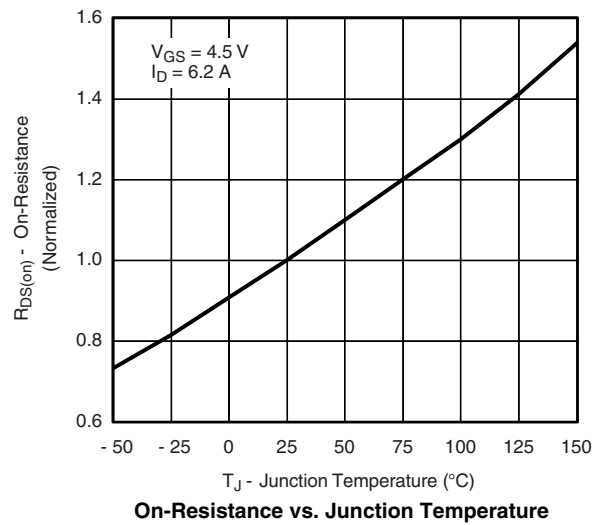
On-Resistance vs. Drain Current



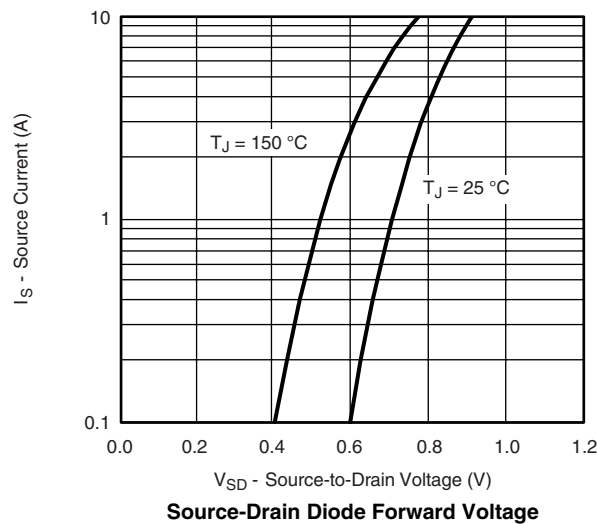
Capacitance



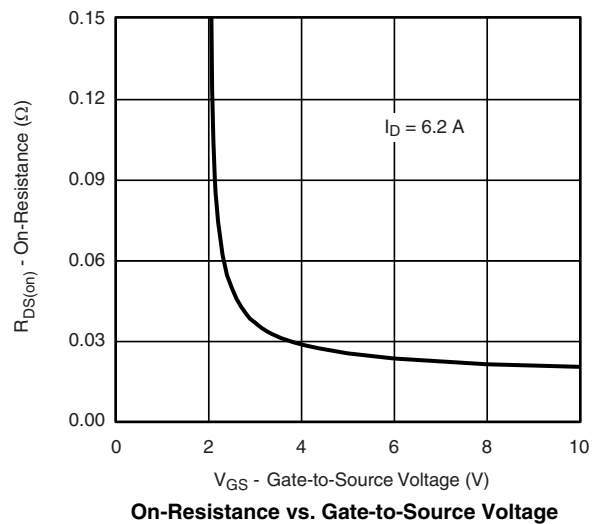
Gate Charge



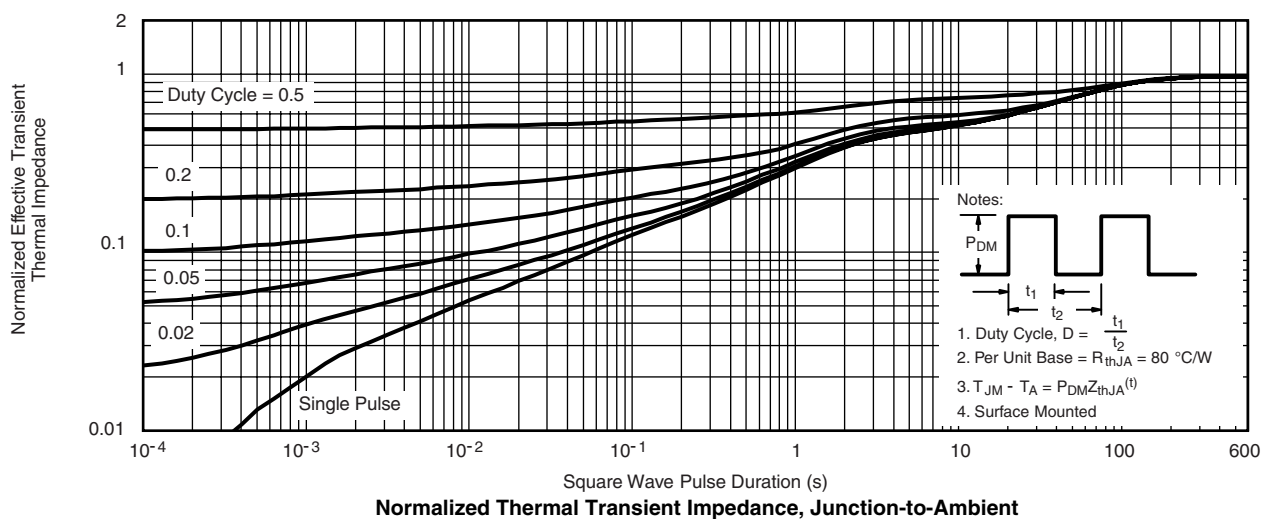
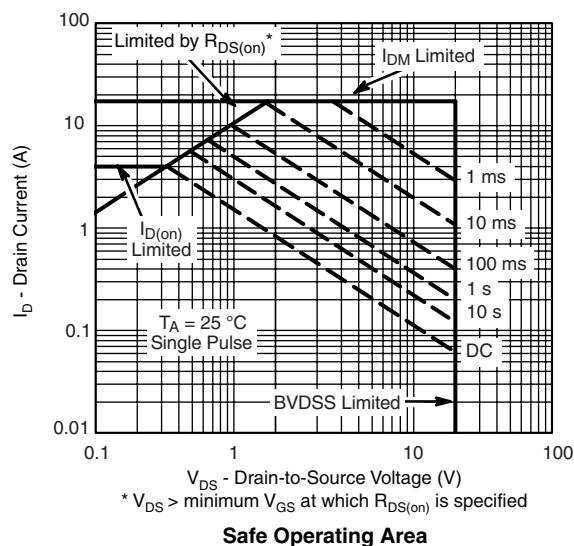
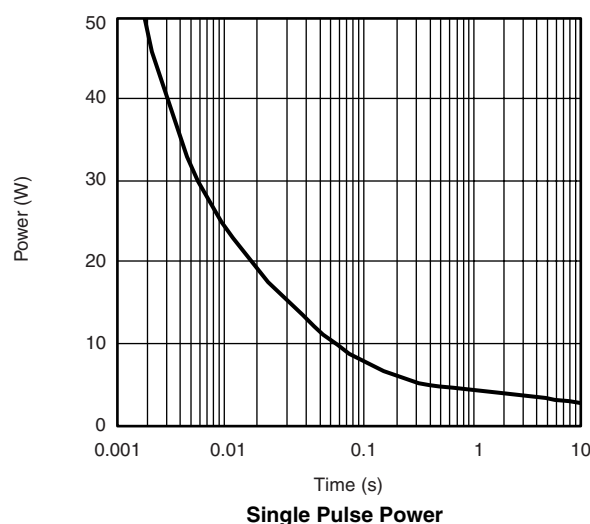
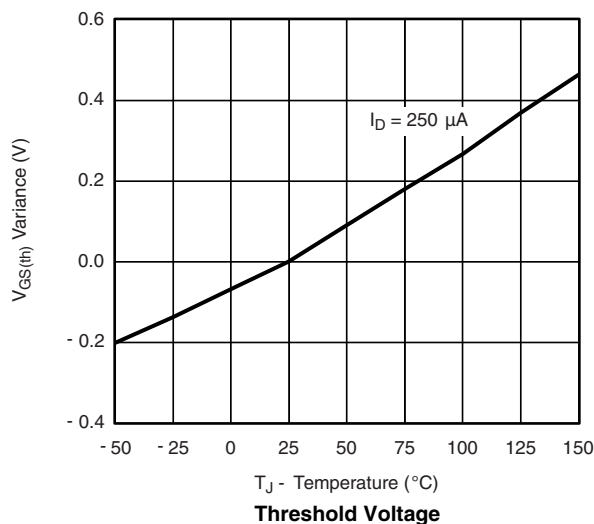
On-Resistance vs. Junction Temperature



Source-Drain Diode Forward Voltage

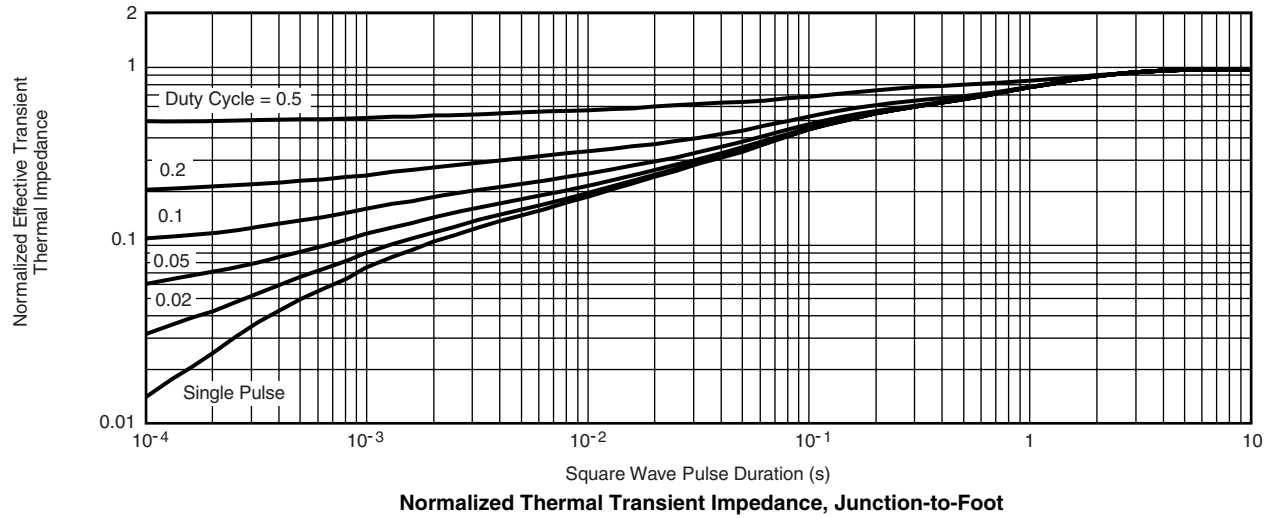


On-Resistance vs. Gate-to-Source Voltage

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



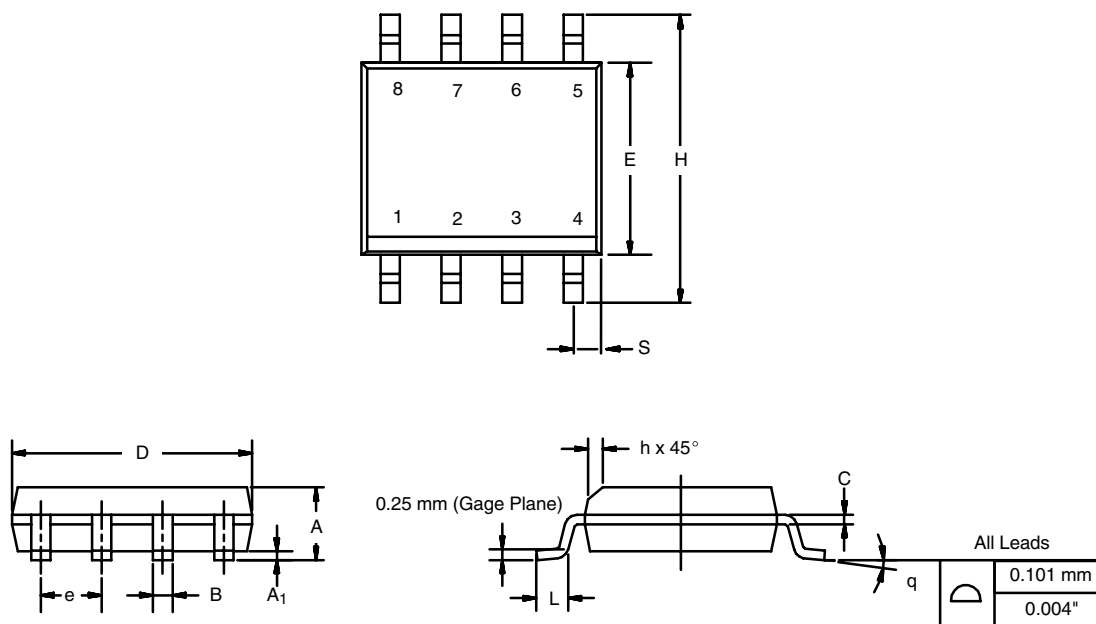
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



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## SOIC (NARROW): 8-LEAD

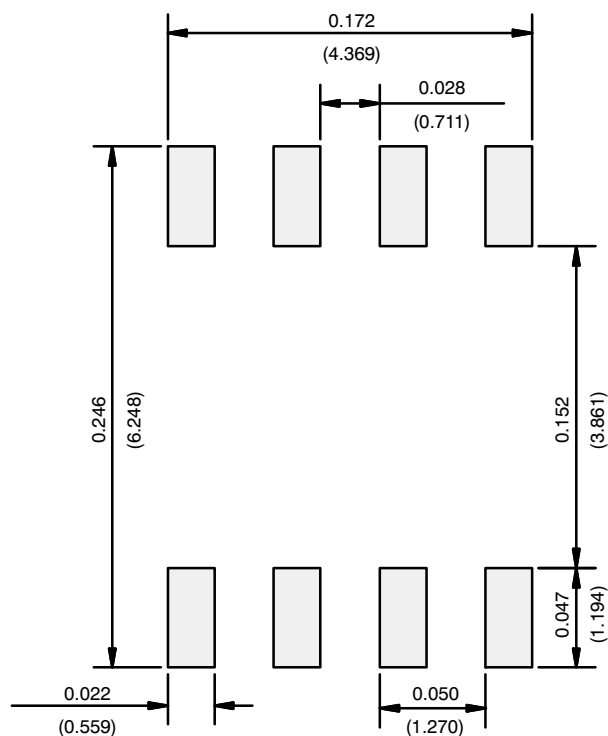
JEDEC Part Number: MS-012



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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