

Automotive N-Channel 40 V (D-S) 175 °C MOSFET

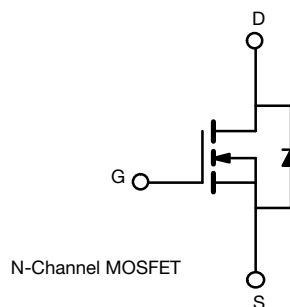
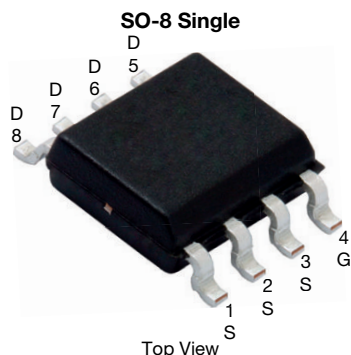
PRODUCT SUMMARY

V_{DS} (V)	40
$R_{DS(on)}$ (Ω) at $V_{GS} = 10$ V	0.0046
$R_{DS(on)}$ (Ω) at $V_{GS} = 4.5$ V	0.0056
I_D (A)	29
Configuration	Single
Package	SO-8

FEATURES

- TrenchFET® power MOSFET
- AEC-Q101 qualified
- 100 % R_g and UIS tested
- Material categorization:
for definitions of compliance please see
www.vishay.com/doc?99912

AUTOMOTIVE
GRADE

RoHS
COMPLIANT
HALOGEN
FREE


ABSOLUTE MAXIMUM RATINGS ($T_C = 25$ °C, unless otherwise noted)

PARAMETER	SYMBOL	LIMIT	UNIT
Drain-Source Voltage	V_{DS}	40	V
Gate-Source Voltage	V_{GS}	± 20	
Continuous Drain Current	I_D	$T_C = 25$ °C	29
		$T_C = 125$ °C	16.9
Continuous Source Current (Diode Conduction)	I_S	6.4	A
Pulsed Drain Current ^a	I_{DM}	84	
Single Pulse Avalanche Current	I_{AS}	50	
Single Pulse Avalanche Energy	E_{AS}	125	mJ
Maximum Power Dissipation ^a	P_D	$T_C = 25$ °C	7.1
		$T_C = 125$ °C	2.3
Operating Junction and Storage Temperature Range	T_J, T_{stg}	-55 to +175	°C

THERMAL RESISTANCE RATINGS

PARAMETER	SYMBOL	LIMIT	UNIT
Junction-to-Ambient	R_{thJA}	80	°C/W
Junction-to-Foot (Drain)	R_{thJF}	21	

Notes

- a. Pulse test; pulse width ≤ 300 μ s, duty cycle ≤ 2 %.
b. When mounted on 1" square PCB (FR4 material).



SPECIFICATIONS (T _C = 25 °C, unless otherwise noted)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Static							
Drain-Source Breakdown Voltage	V _{DS}	V _{GS} = 0 V, I _D = 250 μA		40	-	-	V
Gate-Source Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA		1.5	2.0	2.5	
Gate-Source Leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 20 V		-	-	± 100	nA
Zero Gate Voltage Drain Current	I _{DSS}	V _{GS} = 0 V	V _{DS} = 40 V	-	-	1	μA
		V _{GS} = 0 V	V _{DS} = 40 V, T _J = 125 °C	-	-	50	
		V _{GS} = 0 V	V _{DS} = 40 V, T _J = 175 °C	-	-	250	
On-State Drain Current ^a	I _{D(on)}	V _{GS} = 10 V	V _{DS} ≥ 5 V	30	-	-	A
Drain-Source On-State Resistance ^a	R _{DS(on)}	V _{GS} = 10 V	I _D = 14 A	-	0.0036	0.0046	Ω
		V _{GS} = 10 V	I _D = 14 A, T _J = 125 °C	-	-	0.0070	
		V _{GS} = 10 V	I _D = 14 A, T _J = 175 °C	-	-	0.0083	
		V _{GS} = 4.5 V	I _D = 12 A	-	0.0046	0.0056	
Forward Transconductance ^b	g _{fs}	V _{DS} = 15 V, I _D = 14 A		-	78	-	S
Dynamic ^b							
Input Capacitance	C _{iss}	V _{GS} = 0 V	V _{DS} = 20 V, f = 1 MHz	-	4319	5400	pF
Output Capacitance	C _{oss}			-	512	640	
Reverse Transfer Capacitance	C _{rss}			-	240	300	
Total Gate Charge ^c	Q _g	V _{GS} = 10 V	V _{DS} = 20 V, I _D = 5 A	-	72	110	nC
Gate-Source Charge ^c	Q _{gs}			-	13	-	
Gate-Drain Charge ^c	Q _{gd}			-	11	-	
Gate Resistance	R _g	f = 1 MHz		0.8	1.6	3.9	Ω
Turn-On Delay Time ^c	t _{d(on)}	V _{DD} = 20 V, R _L = 4 Ω I _D ≅ 5 A, V _{GEN} = 10 V, R _g = 1 Ω		-	15	25	ns
Rise Time ^c	t _r			-	30	45	
Turn-Off Delay Time ^c	t _{d(off)}			-	43	66	
Fall Time ^c	t _f			-	15	25	
Source-Drain Diode Ratings and Characteristics ^b							
Pulsed Current ^a	I _{SM}			-	-	84	A
Forward Voltage	V _{SD}	I _F = 6 A, V _{GS} = 0 V		-	0.75	1.2	V

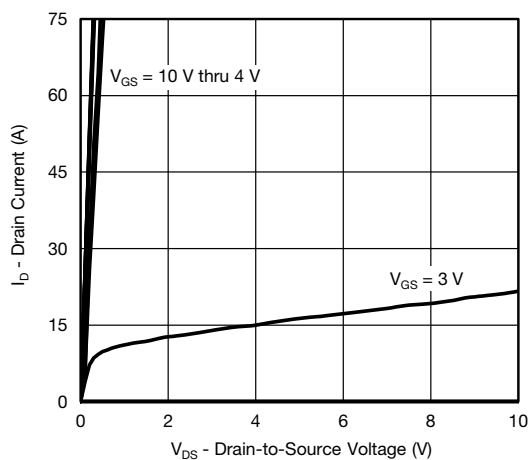
Notes

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

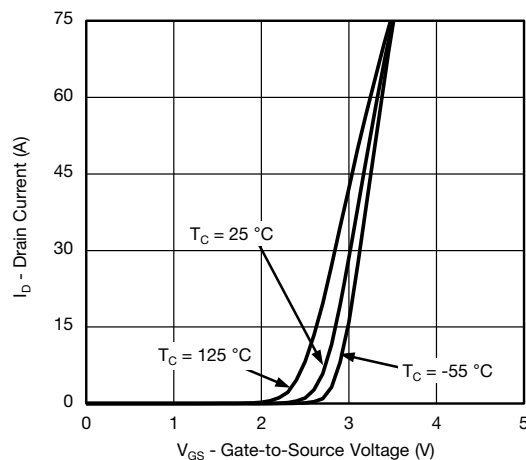
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



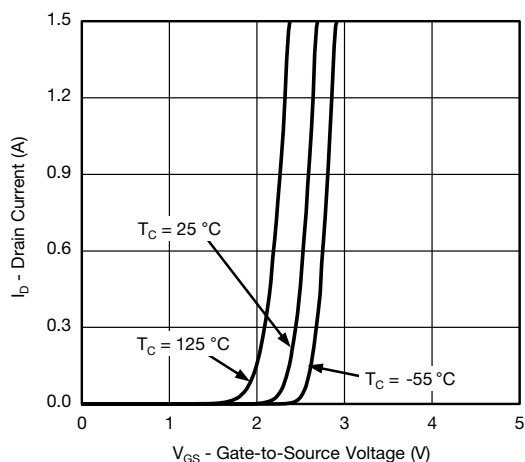
TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)



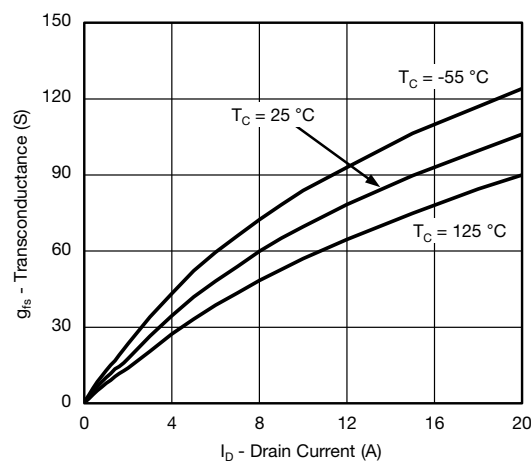
Output Characteristics



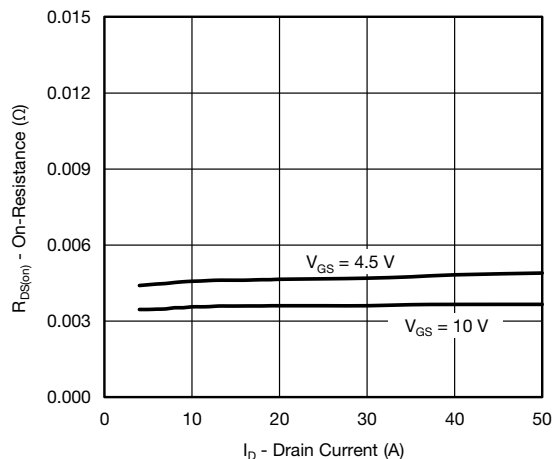
Transfer Characteristics



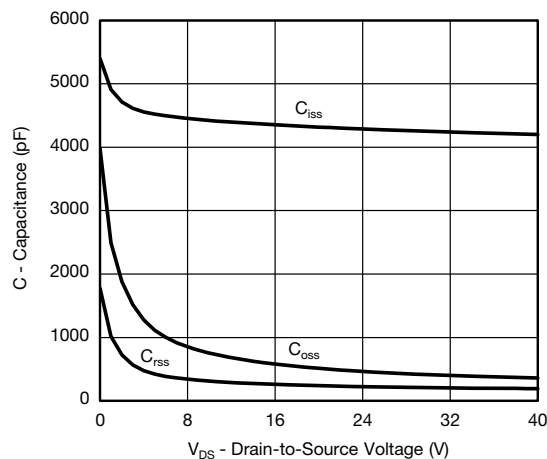
Transfer Characteristics



Transconductance



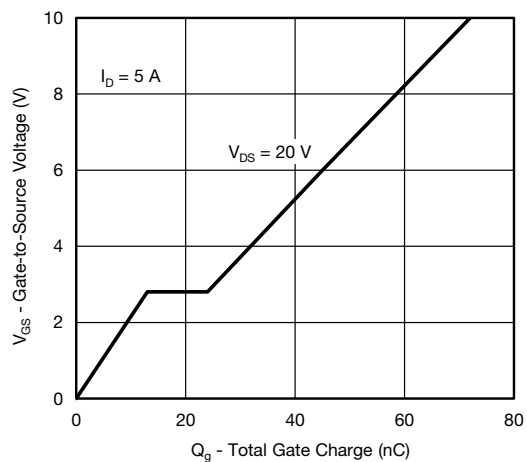
On-Resistance vs. Drain Current



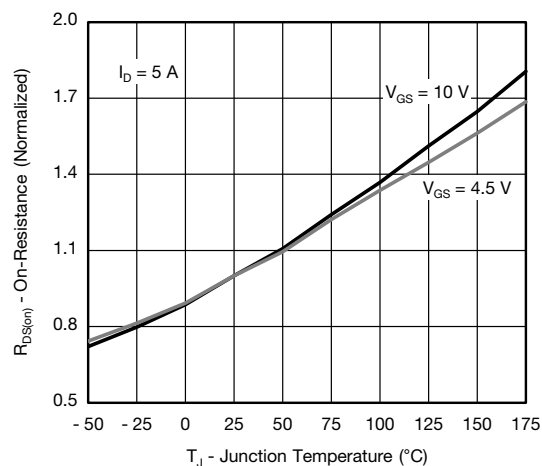
Capacitance



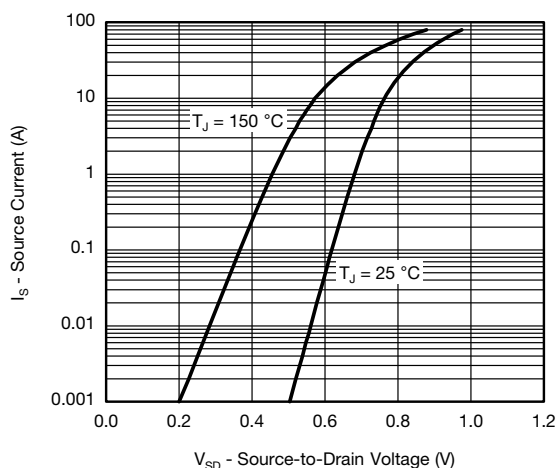
TYPICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$, unless otherwise noted)



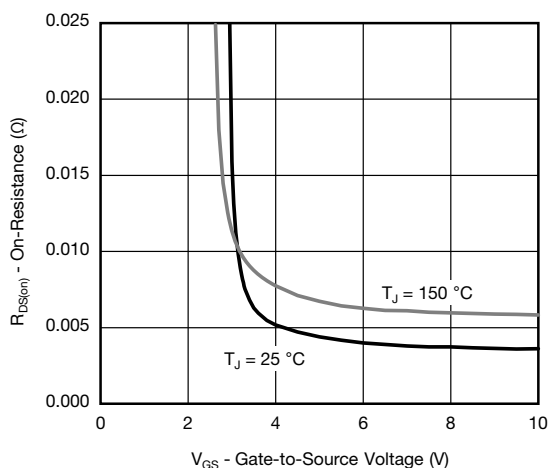
Gate Charge



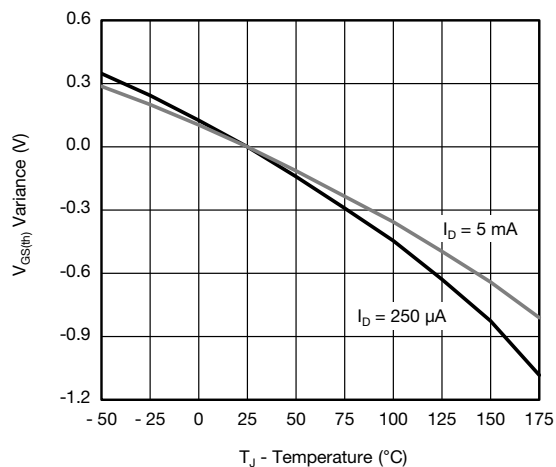
On-Resistance vs. Junction Temperature



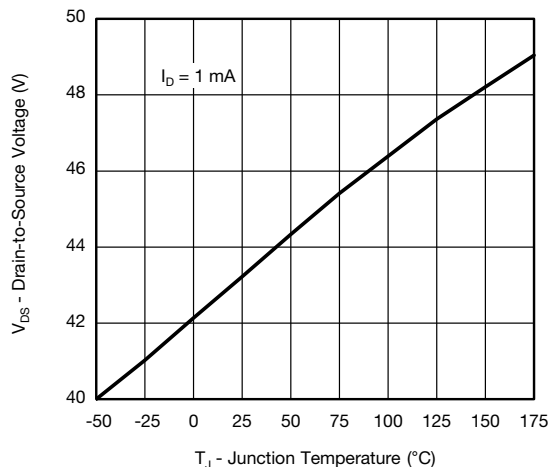
Source Drain Diode Forward Voltage



On-Resistance vs. Gate-to-Source Voltage



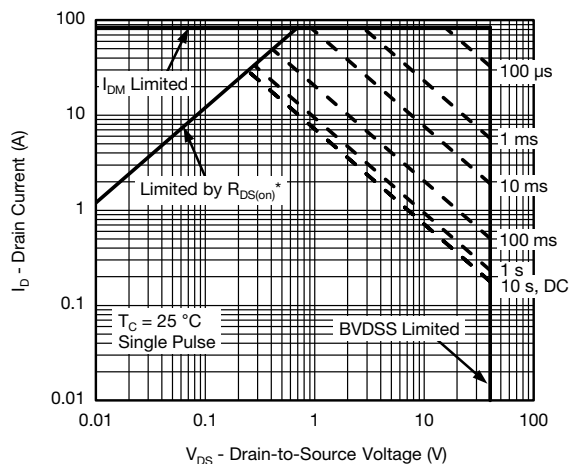
Threshold Voltage



Drain Source Breakdown vs. Junction Temperature

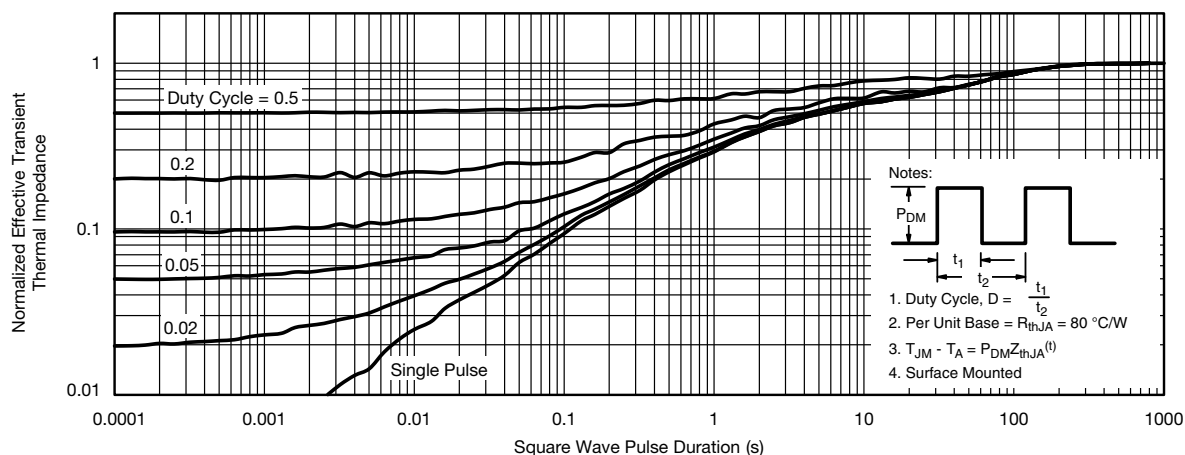


THERMAL RATINGS ($T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)



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

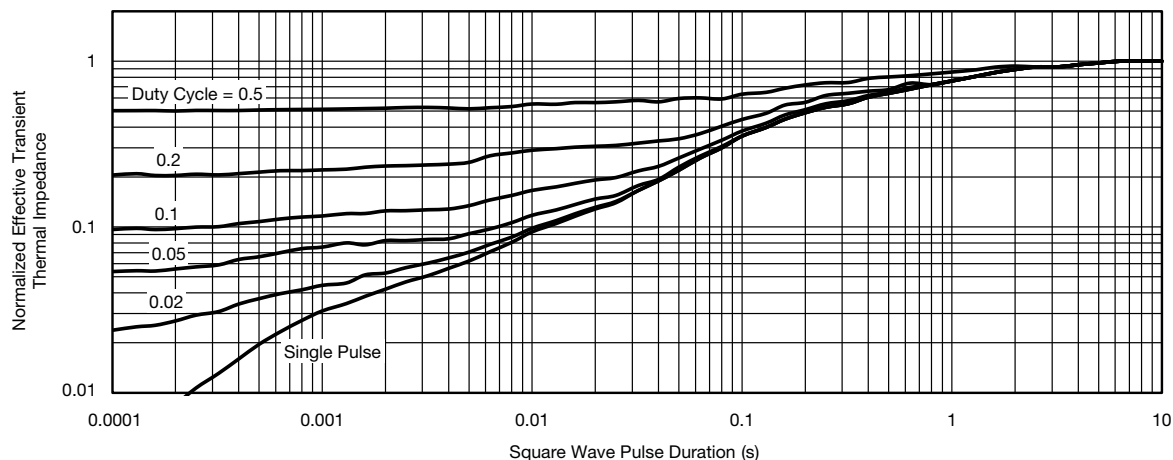
Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Ambient



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



Normalized Thermal Transient Impedance, Junction-to-Foot

Note

- The characteristics shown in the two graphs
 - Normalized Transient Thermal Impedance Junction-to-Ambient ($25\text{ }^{\circ}\text{C}$)
 - Normalized Transient Thermal Impedance Junction-to-Foot ($25\text{ }^{\circ}\text{C}$)are given for general guidelines only to enable the user to get a “ball park” indication of part capabilities. The data are extracted from single pulse transient thermal impedance characteristics which are developed from empirical measurements. The latter is valid for the part mounted on printed circuit board - FR4, size 1" x 1" x 0.062", double sided with 2 oz. copper, 100 % on both sides. The part capabilities can widely vary depending on actual application parameters and operating conditions.

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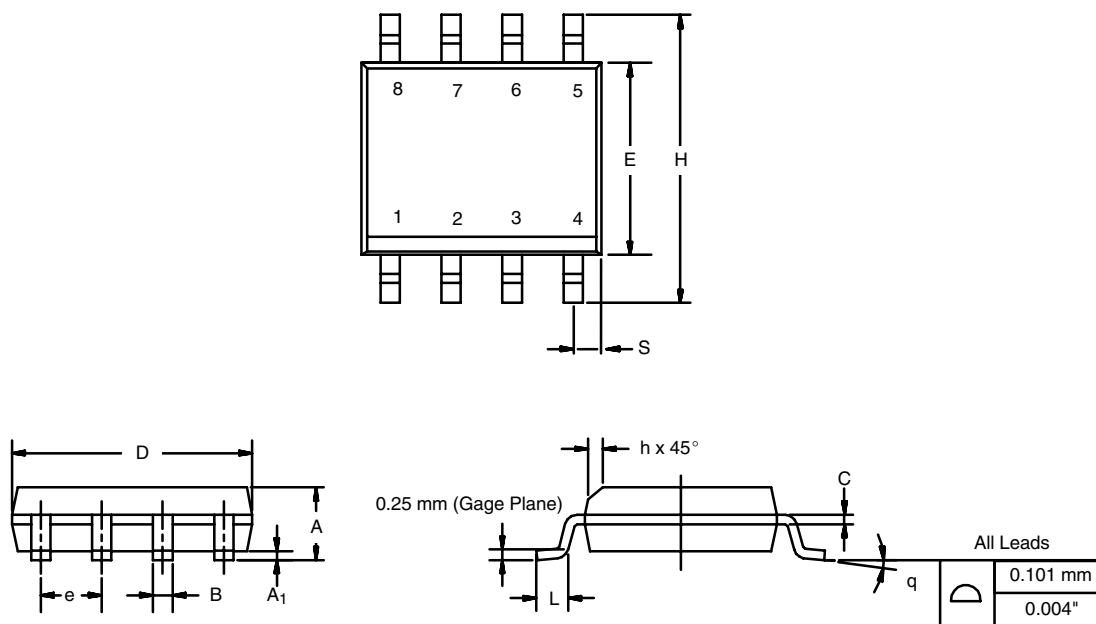
REVISION HISTORY ^a		
REVISION	DATE	DESCRIPTION OF CHANGE
C	21-Sep-15	• R _g and some timing changed

Note

a. As of April 2014

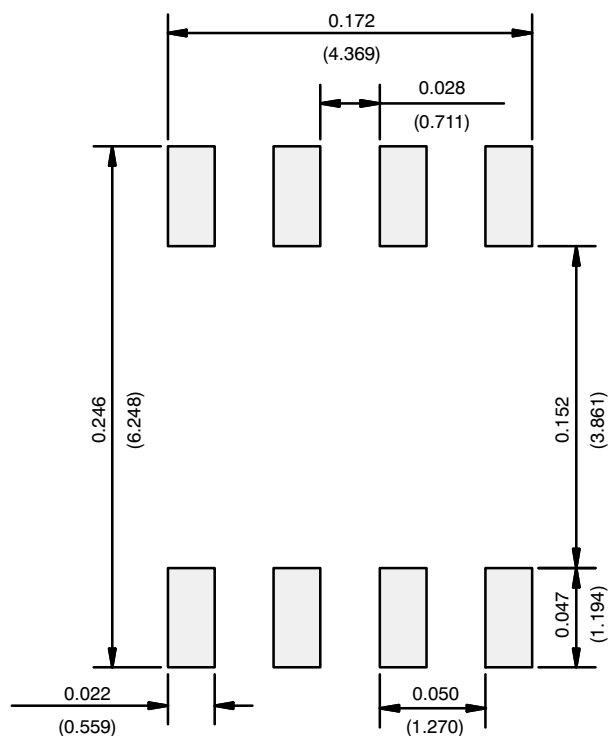
SOIC (NARROW): 8-LEAD

JEDEC Part Number: MS-012



DIM	MILLIMETERS		INCHES	
	Min	Max	Min	Max
A	1.35	1.75	0.053	0.069
A ₁	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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