

9416M-VB Datasheet

N-Channel 30-V (D-S) MOSFET

PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)
30	0.003 at $V_{GS} = 10$ V	25
	0.004 at $V_{GS} = 4.5$ V	22

FEATURES

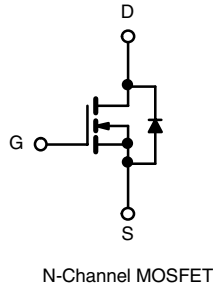
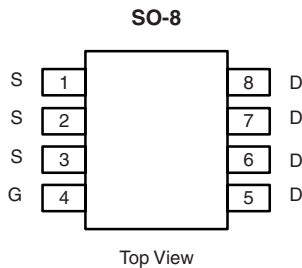
- Halogen-free According to IEC 61249-2-21 Available
- Ultra Low On-Resistance Using High Density Trench Power MOSFET Technology



RoHS
COMPLIANT
HALOGEN
FREE
Available

APPLICATIONS

- Synchronous Buck Low-Side
 - Notebook
 - Server
 - Workstation
- Synchronous Rectifier-POL



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

Parameter	Symbol	10 s	Steady State	Unit
Drain-Source Voltage	V_{DS}	30		V
Gate-Source Voltage	V_{GS}	± 20		
Continuous Drain Current ($T_J = 150^\circ\text{C}$) ^a	I_D	25	17	A
		20	13	
Pulsed Drain Current (10 μs Pulse Width)	I_{DM}	70		
Continuous Source Current (Diode Conduction) ^a	I_S	2.9	1.3	
Avalanche Current	I_{AS}	50		
Maximum Power Dissipation ^a	P_D	3.5	1.6	W
		2.2	1	
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 ^a	R_{thJA}	29	35	$^\circ\text{C/W}$
		67	80	
Maximum Junction-to-Foot (Drain)	R_{thJF}	13	16	

Notes:

a. Surface Mounted on 1" x 1" FR4 board.

SPECIFICATIONS $T_J = 25\text{ }^{\circ}\text{C}$, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	1.0		3.0	V
Gate-Body Leakage	I_{GSS}	$V_{DS} = 0\text{ V}$, $V_{GS} = \pm 20\text{ V}$			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 30\text{ V}$, $V_{GS} = 0\text{ V}$			1	μA
		$V_{DS} = 30\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 55\text{ }^{\circ}\text{C}$			5	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}$, $V_{GS} = 10\text{ V}$	30			A
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$, $I_D = 25\text{ A}$		0.003		Ω
		$V_{GS} = 4.5\text{ V}$, $I_D = 22\text{ A}$		0.004		
Forward Transconductance ^a	g_{fs}	$V_{DS} = 15\text{ V}$, $I_D = 25\text{ A}$		110		S
Diode Forward Voltage ^a	V_{SD}	$I_S = 2.9\text{ A}$, $V_{GS} = 0\text{ V}$		0.72	1.1	V
Dynamic^b						
Input Capacitance	C_{iss}	$V_{DS} = 15\text{ V}$, $V_{GS} = 4.5\text{ V}$, $I_D = 20\text{ A}$		6500		pF
Output Capacitance	C_{oss}			930		
Reverse Transfer Capacitance	C_{rss}			610		
Total Gate Charge	Q_g	$V_{DS} = 15\text{ V}$, $V_{GS} = 4.5\text{ V}$, $I_D = 20\text{ A}$		45	70	nC
Gate-Source Charge	Q_{gs}			20		
Gate-Drain Charge	Q_{gd}			16		
Gate Resistance	R_g	$f = 1.0\text{ MHz}$		1.1		Ω
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 15\text{ V}$, $R_L = 15\text{ }\Omega$ $I_D \cong 1\text{ A}$, $V_{GEN} = 10\text{ V}$, $R_g = 6\text{ }\Omega$		27	40	ns
Rise Time	t_r			21	35	
Turn-Off Delay Time	$t_{d(off)}$			107	160	
Fall Time	t_f			43	65	
Source-Drain Reverse Recovery Time	t_{rr}	$I_F = 2.9\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$		45	70	

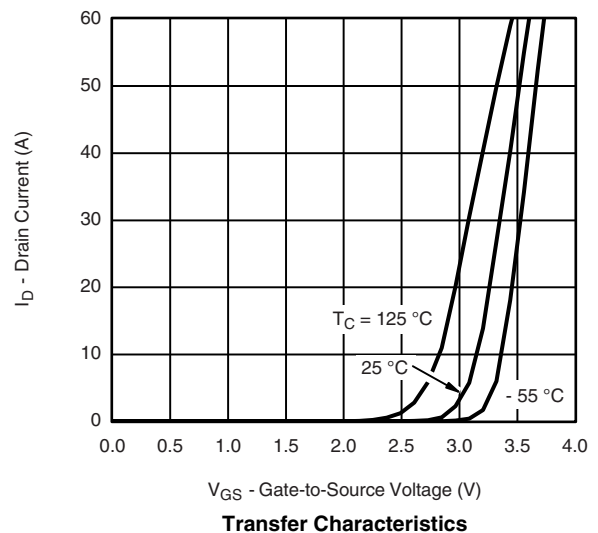
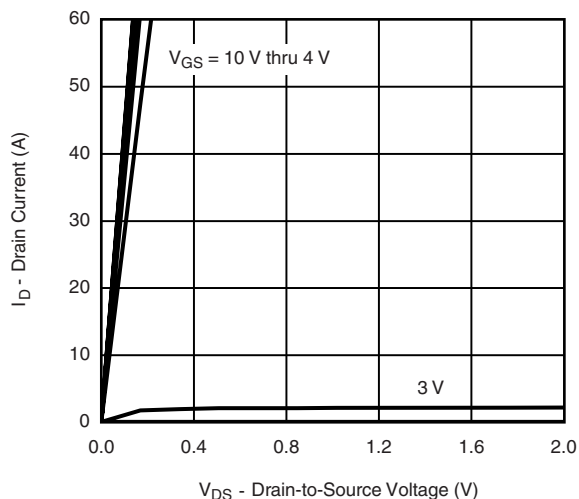
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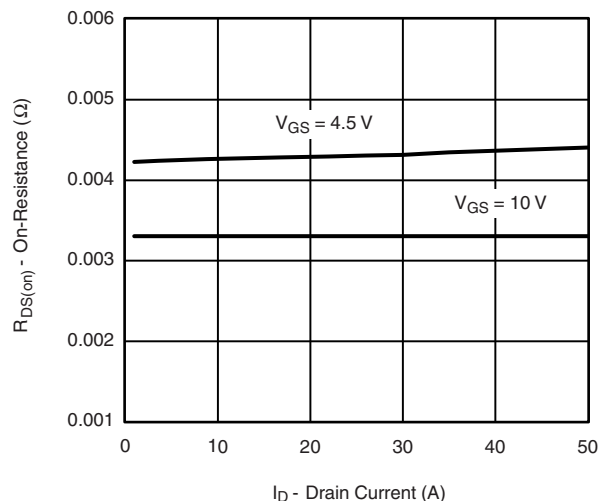
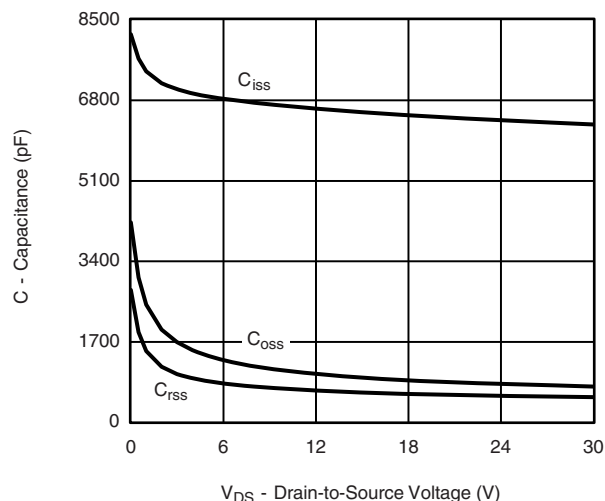
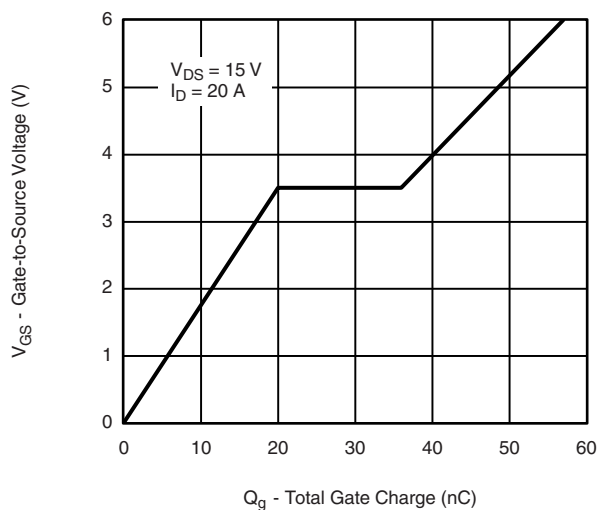
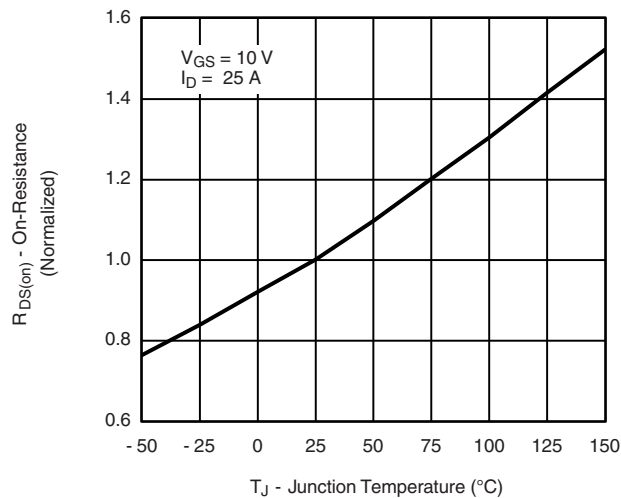
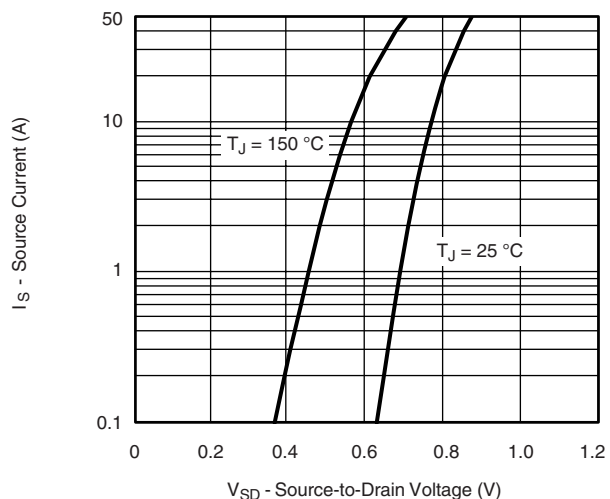
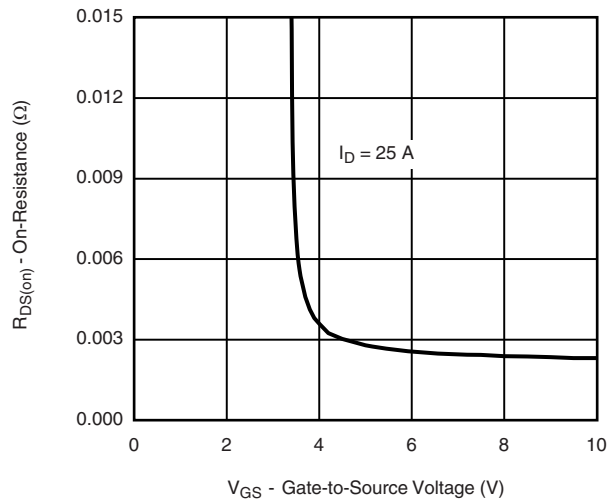
a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.

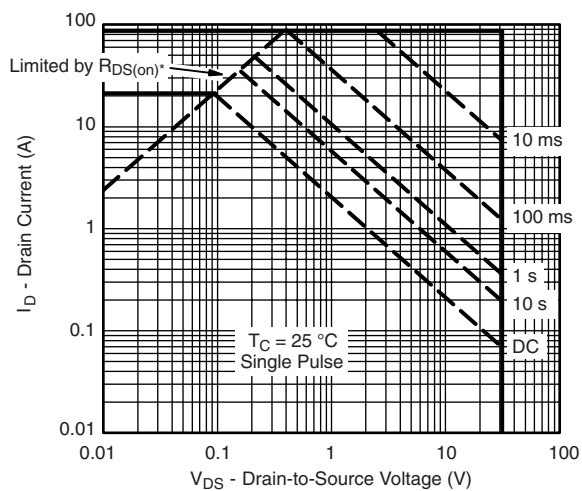
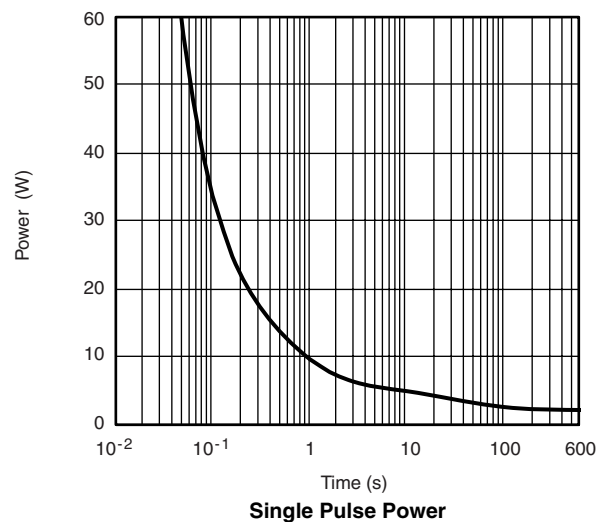
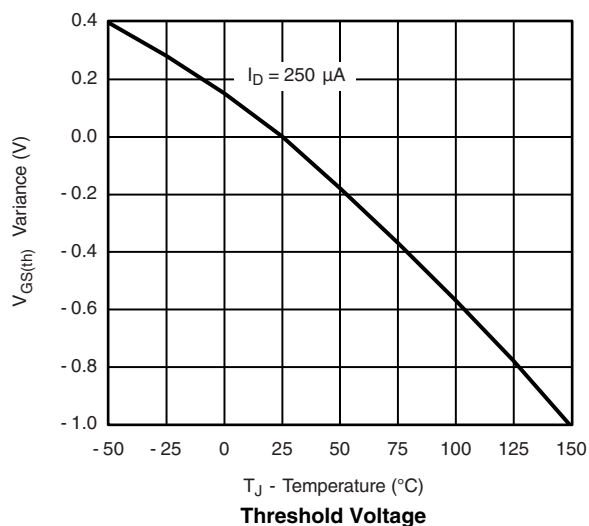
b. Guaranteed by design, not subject to production testing.

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

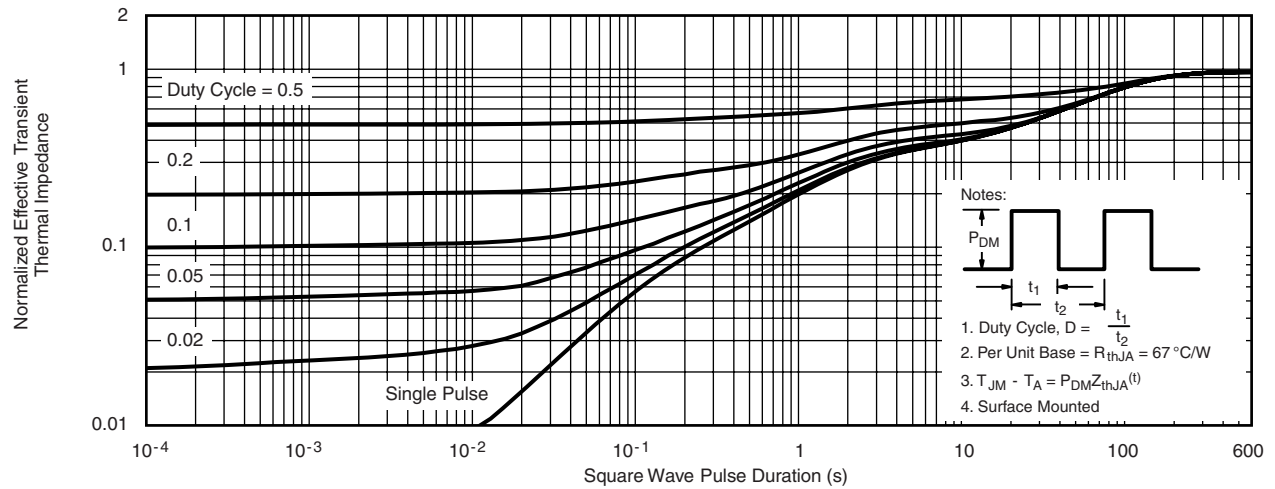
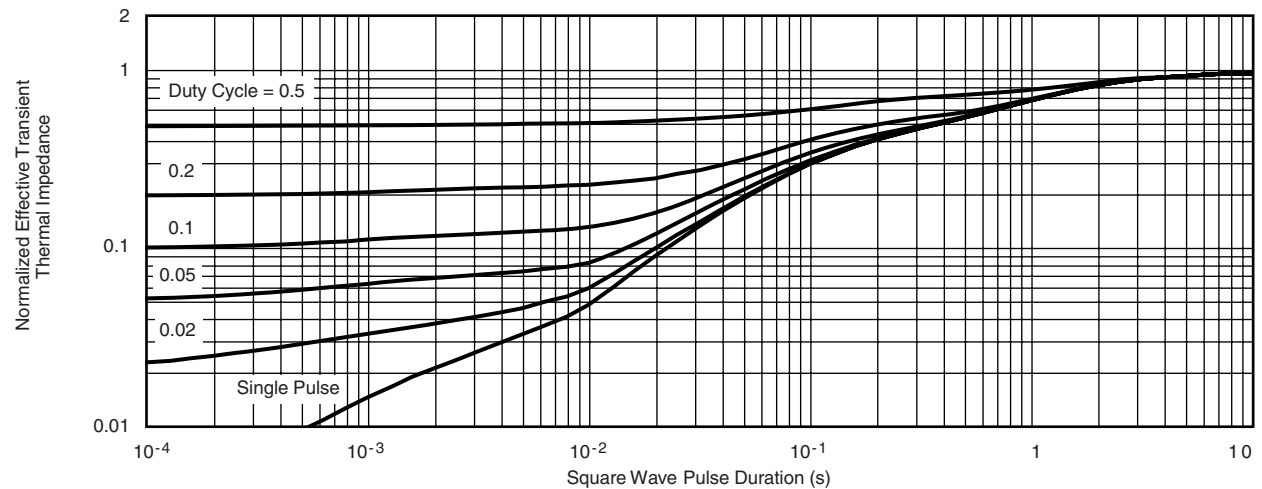


TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

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

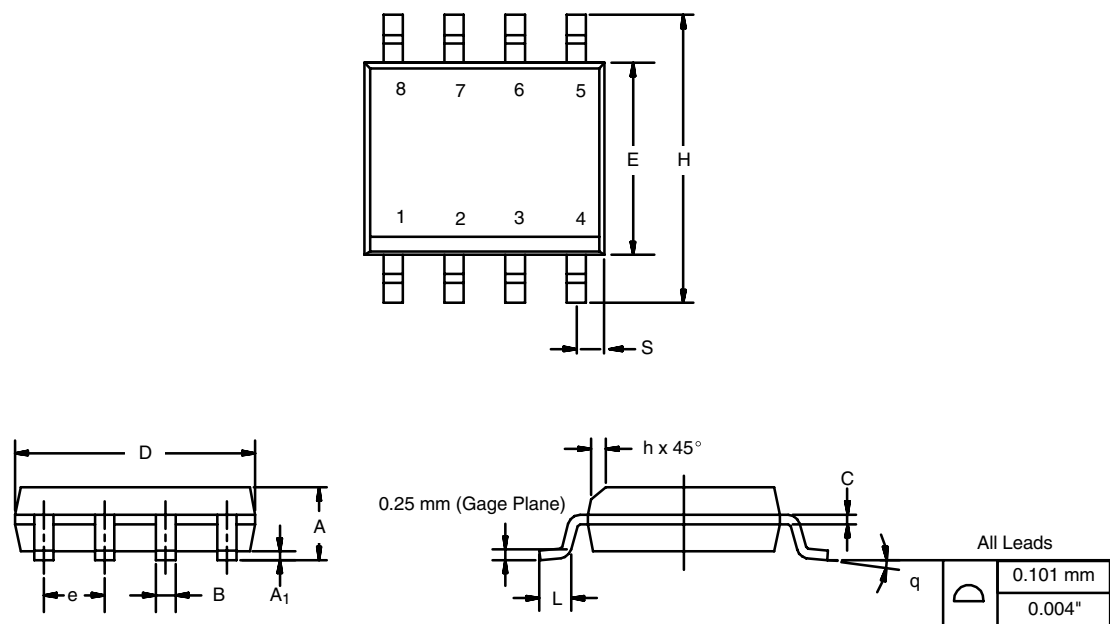
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted


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

Safe Operating Area, Junction-to-Case

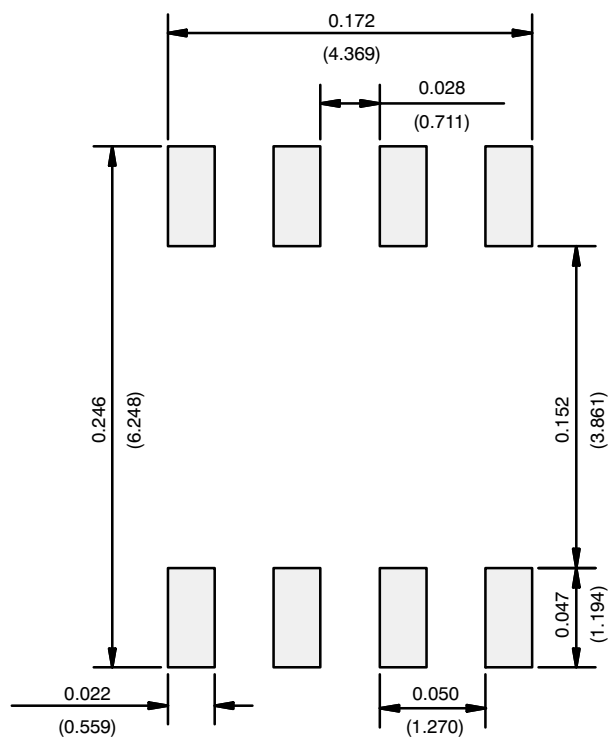
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

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 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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