

N-Channel 12-V (D-S) MOSFET

PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A) ^a	Q_g (Typ.)
12	0.0053 at $V_{GS} = 4.5$ V	21.5	29.5 nC
	0.006 at $V_{GS} = 2.5$ V	20.2	
	0.0074 at $V_{GS} = 1.8$ V	18.2	

FEATURES

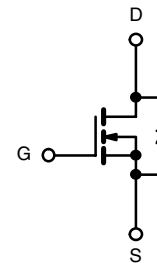
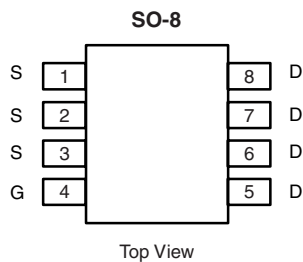
- Halogen-free According to IEC 61249-2-21 Available
- TrenchFET® Power MOSFET
- 100 % R_g and UIS Tested



RoHS
COMPLIANT
HALOGEN
FREE
Available

APPLICATIONS

- Synchronous Rectifier
- Point-of-Load Synchronous Buck Converter



N-Channel MOSFET

Ordering Information: Si4866BDY-T1-E3 (Lead (Pb)-free)
Si4866BDY-T1-GE3 (Lead (Pb)-free and Halogen-free)

ABSOLUTE MAXIMUM RATINGS $T_A = 25$ °C, unless otherwise noted

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	12	V
Gate-Source Voltage	V_{GS}	± 8	
Continuous Drain Current ($T_J = 150$ °C)	$T_C = 25$ °C	21.5	A
	$T_C = 70$ °C	17.2	
	$T_A = 25$ °C	16.1 ^{b,c}	
	$T_A = 70$ °C	12.9 ^{b,c}	
Pulsed Drain Current	I_{DM}	50	A
Continuous Source-Drain Diode Current	$T_C = 25$ °C	4.0	
	$T_A = 25$ °C	2.3 ^{b,c}	
Single Pulse Avalanche Current	I_{AS}	20	mJ
Avalanche Energy	E_{AS}	20	
Maximum Power Dissipation	$T_C = 25$ °C	4.45	W
	$T_C = 70$ °C	2.85	
	$T_A = 25$ °C	2.50 ^{b,c}	
	$T_A = 70$ °C	1.6 ^{b,c}	
Operating Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to 150	°C

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient ^{b,d}	R_{thJA}	40	50	°C/W
Maximum Junction-to-Foot (Drain)	R_{thJF}	23	28	

Notes:

- Based on $T_C = 25$ °C.
- Surface Mounted on 1" x 1" FR4 board.
- $t = 10$ s.
- Maximum under Steady State conditions is 90 °C/W.

SPECIFICATIONS T _J = 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	12			V
V _{DS} Temperature Coefficient	ΔV _{DS} /T _J	I _D = 250 μA		12		mV/°C
V _{GS(th)} Temperature Coefficient	ΔV _{GS(th)} /T _J			- 3.5		
Gate-Source Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA	0.4		1.0	V
Gate-Source Leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 8 V			± 100	nA
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 12 V, V _{GS} = 0 V			1	μA
		V _{DS} = 12 V, V _{GS} = 0 V, T _J = 55 °C			10	
On-State Drain Current ^a	I _{D(on)}	V _{DS} ≥ 5 V, V _{GS} = 4.5 V	20			A
Drain-Source On-State Resistance ^a	R _{DS(on)}	V _{GS} = 4.5 V, I _D = 12 A		0.0042	0.0053	Ω
		V _{GS} = 2.5 V, I _D = 10 A		0.0048	0.0060	
		V _{GS} = 1.8 V, I _D = 8 A		0.006	0.0074	
Forward Transconductance ^a	g _{fs}	V _{DS} = 15 V, I _D = 12 A		80		S
Dynamic ^b						
Input Capacitance	C _{iss}	V _{DS} = 6 V, V _{GS} = 0 V, f = 1 MHz		5020		pF
Output Capacitance	C _{oss}			1305		
Reverse Transfer Capacitance	C _{rss}			805		
Total Gate Charge	Q _g	V _{DS} = 6 V, V _{GS} = 4.5 V, I _D = 10 A		52	80	nC
		V _{DS} = 6 V, V _{GS} = 2.5 V, I _D = 10 A		29.5	45	
Gate-Source Charge	Q _{gs}			6.2		
Gate-Drain Charge	Q _{gd}			8.9		
Gate Resistance	R _g	f = 1 MHz		0.8	1.3	Ω
Turn-On Delay Time	t _{d(on)}	V _{DD} = 6 V, R _L = 1.2 Ω I _D ≅ 5 A, V _{GEN} = 4.5 V, R _g = 1 Ω		26	40	ns
Rise Time	t _r			18	30	
Turn-Off Delay Time	t _{d(off)}			85	130	
Fall Time	t _f			32	50	
Turn-On Delay Time	t _{d(on)}	V _{DD} = 6 V, R _L = 1.2 Ω I _D ≅ 5 A, V _{GEN} = 10 V, R _g = 1 Ω		13	25	
Rise Time	t _r			12	24	
Turn-Off Delay Time	t _{d(off)}			57	90	
Fall Time	t _f			9	18	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I _S	T _C = 25 °C			4	A
Pulse Diode Forward Current ^a	I _{SM}				50	
Body Diode Voltage	V _{SD}	I _S = 2.3 A		0.62	1.1	V
Body Diode Reverse Recovery Time	t _{rr}	I _F = 9.5 A, dI/dt = 100 A/μs, T _J = 25 °C		50	80	ns
Body Diode Reverse Recovery Charge	Q _{rr}			35	55	nC
Reverse Recovery Fall Time	t _a			19		ns
Reverse Recovery Rise Time	t _b			31		

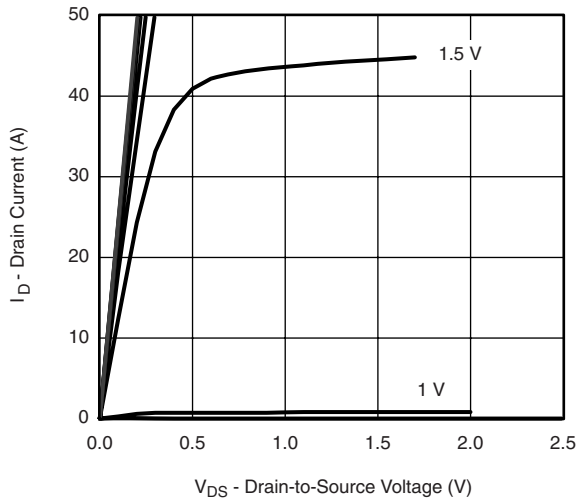
Notes:

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

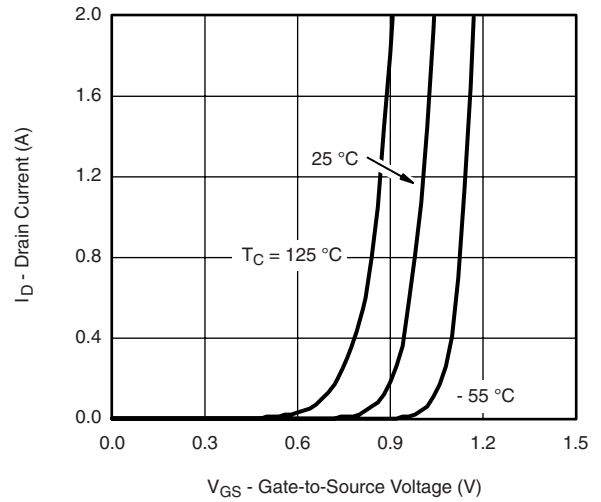
b. Guaranteed by design, not subject to production testing.

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.

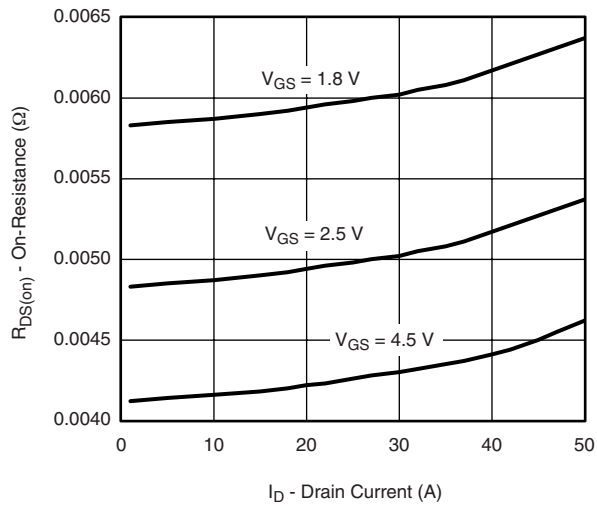
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



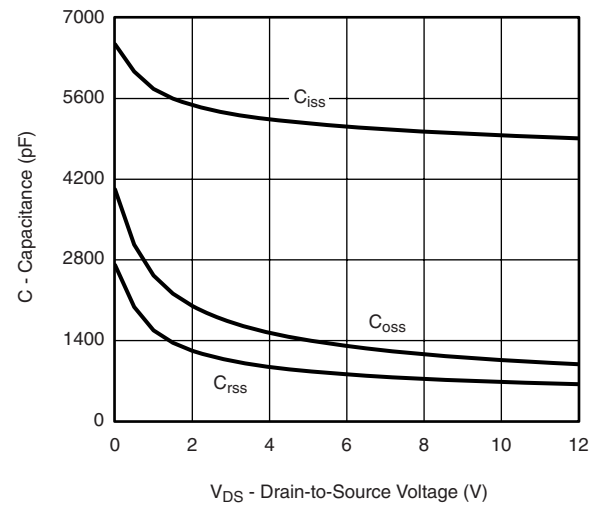
Output Characteristics



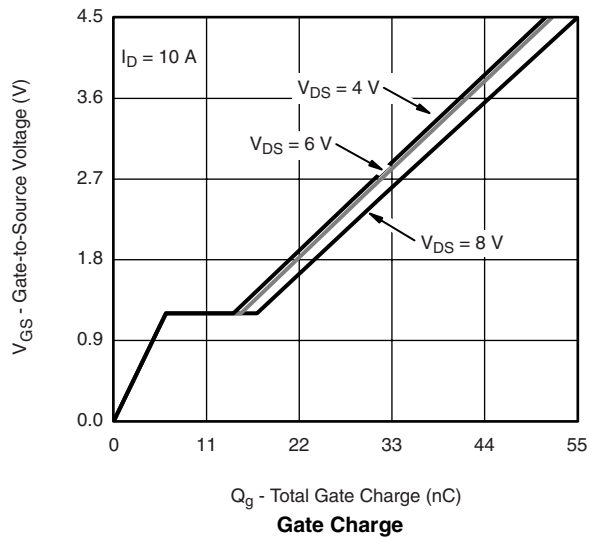
Transfer Characteristics



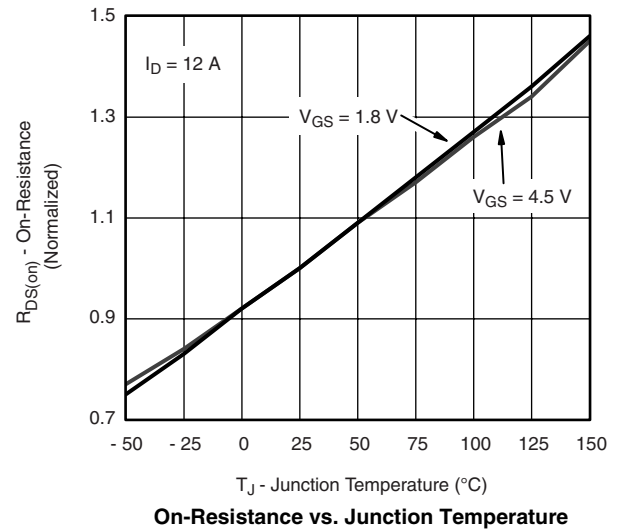
On-Resistance vs. Drain Current and Gate Voltage



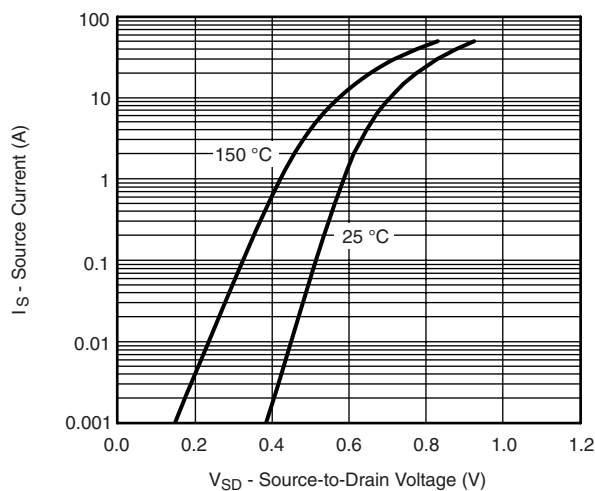
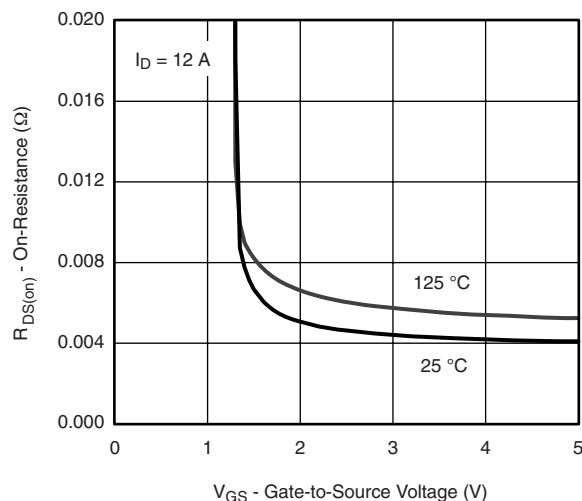
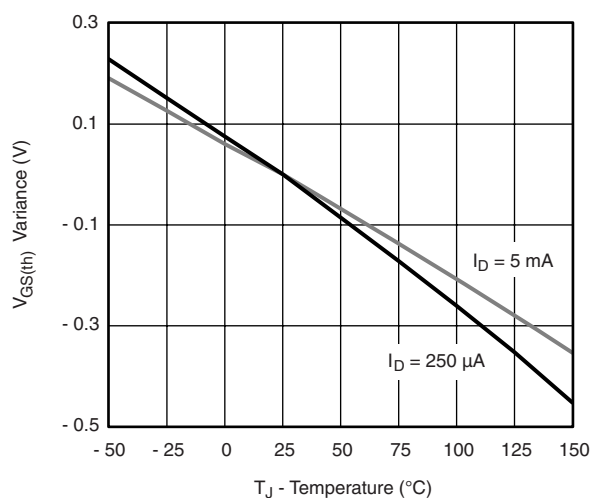
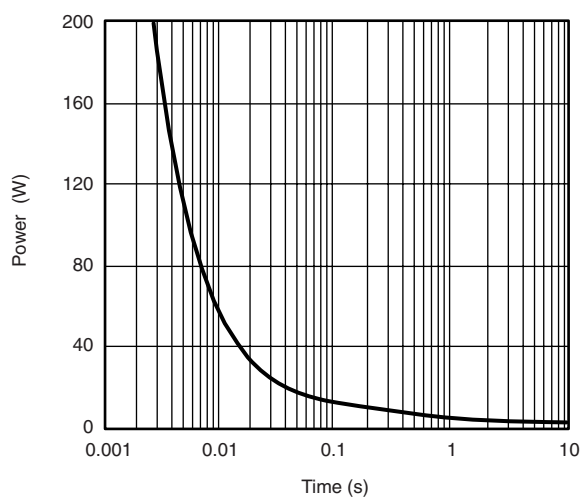
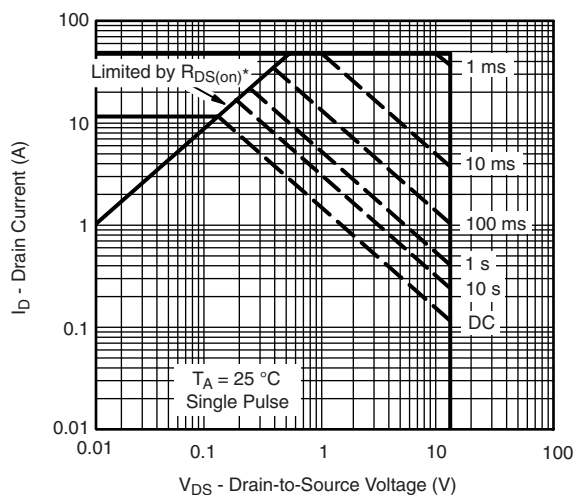
Capacitance



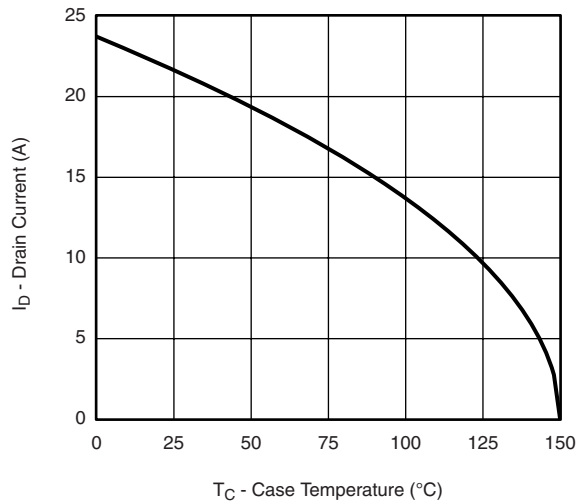
Gate Charge



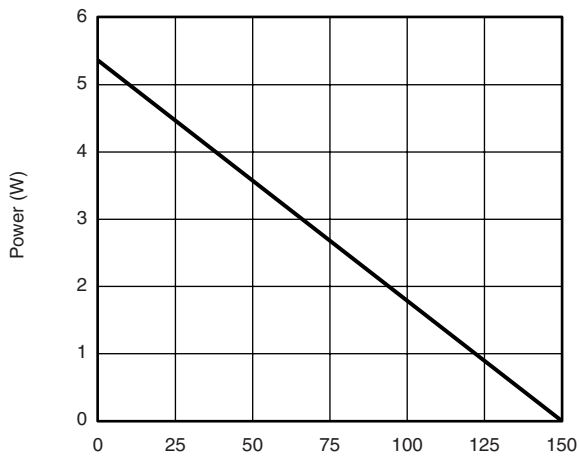
On-Resistance vs. Junction Temperature

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, Junction-to-Ambient**

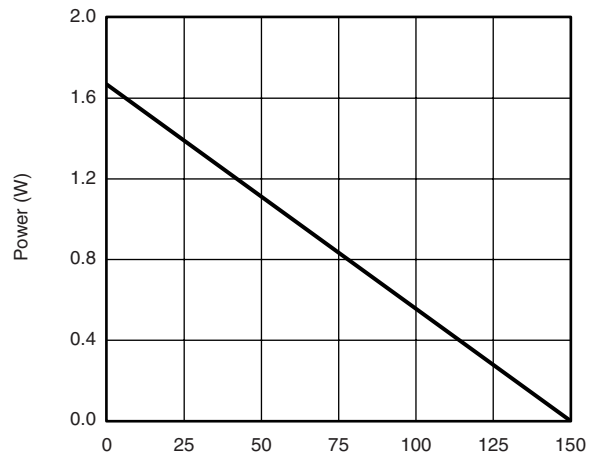
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



Current Derating*

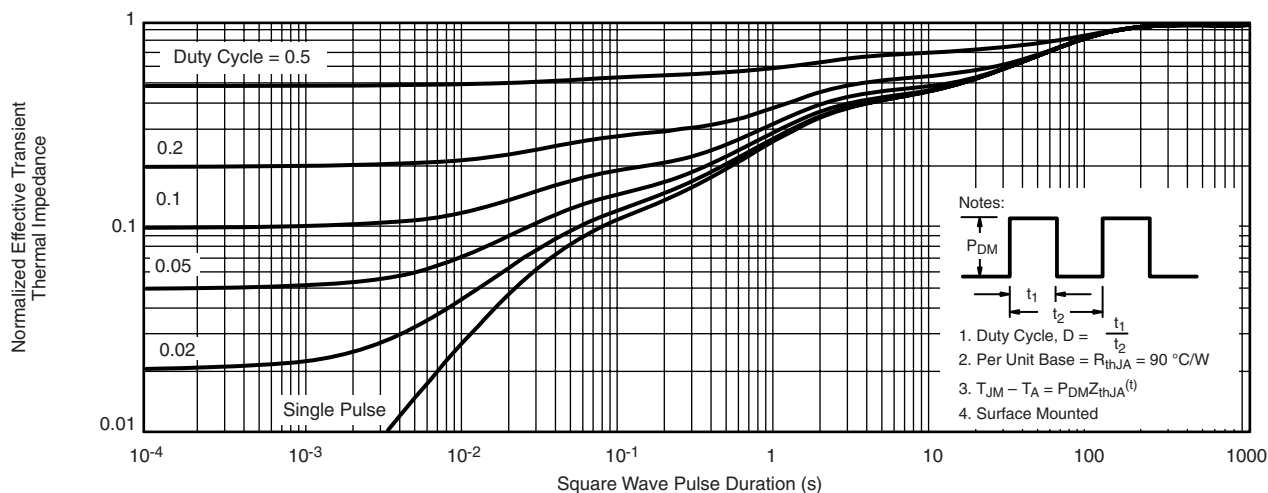
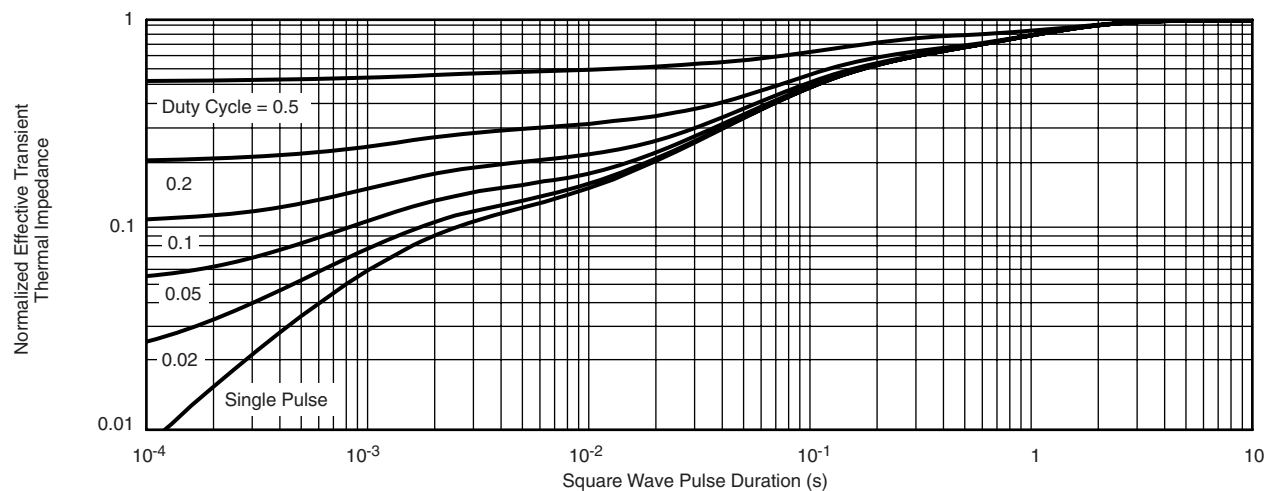


Power, Junction-to-Foot



Power, Junction-to-Ambient

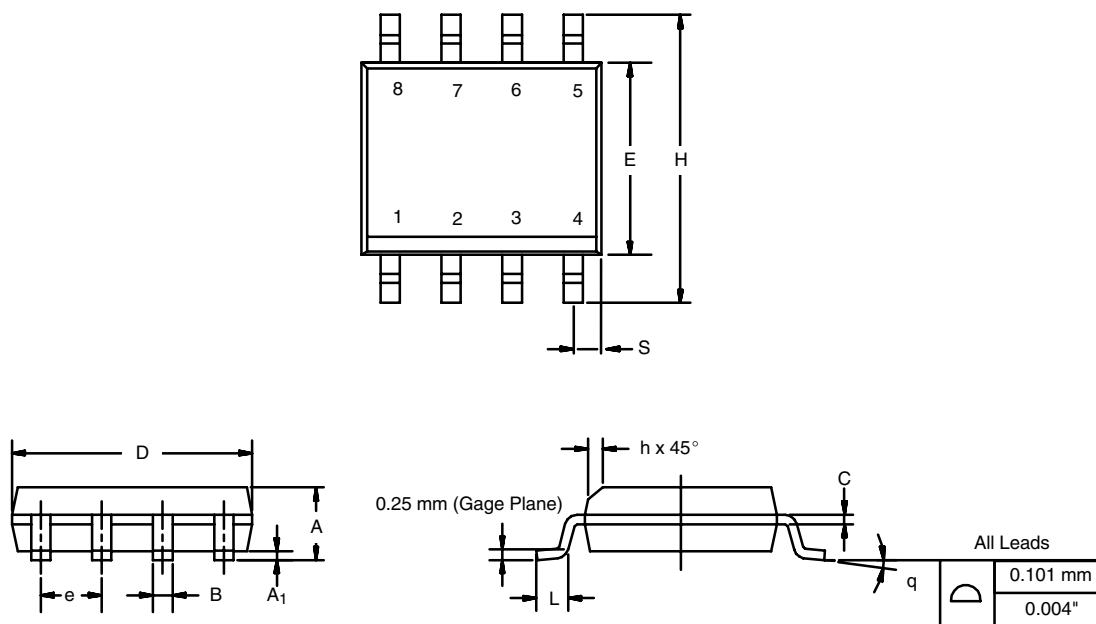
* The power dissipation P_D is based on $T_{J(max)} = 150$ °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted**Normalized Thermal Transient Impedance, Junction-to-Ambient****Normalized Thermal Transient Impedance, Junction-to-Foot**

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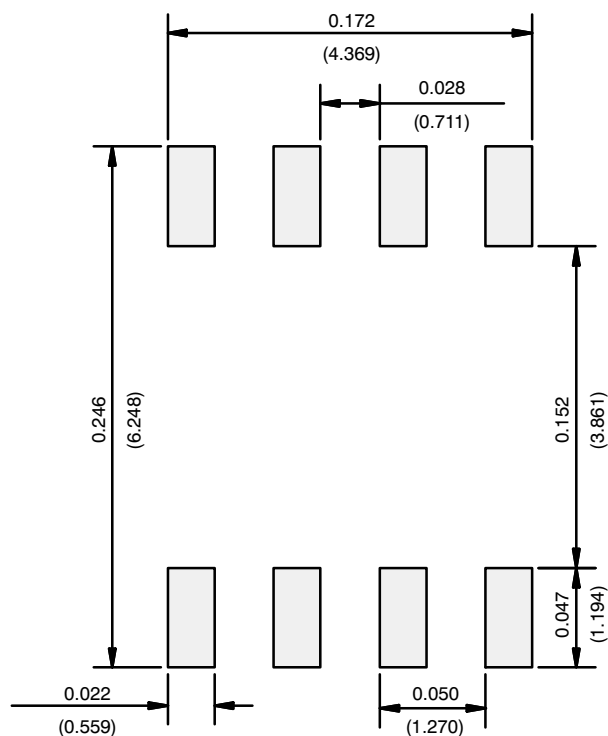
SOIC (NARROW): 8-LEAD

JEDEC Part Number: MS-012



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