

NDS9945-VB Datasheet

Dual-N+N 60V SOP8 Trench MOSFET

PRODUCT SUMMARY			
V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A) ^a	Q_g (Typ.)
60	0.095 at $V_{GS} = 10$ V	4.0	2.1 nC
	0.100 at $V_{GS} = 4.5$ V	3.8	

FEATURES

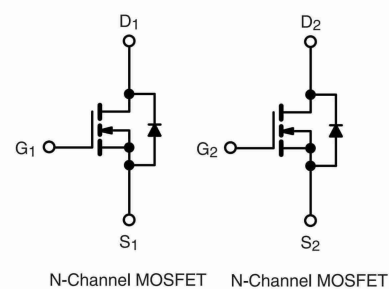
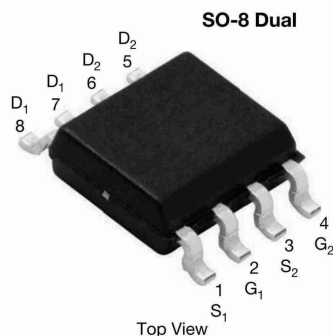
- Halogen-free According to IEC 61249-2-21 Available
- TrenchFET[®] Power MOSFET
- 100 % R_g Tested
- 100 % UIS Tested



RoHS
COMPLIANT
HALOGEN
FREE
Available

APPLICATIONS

- Battery Switch
- DC/DC Converter



ABSOLUTE MAXIMUM RATINGS $T_A = 25$ °C, unless otherwise noted				
Parameter		Symbol	Limit	Unit
Drain-Source Voltage		V_{DS}	60	V
Gate-Source Voltage		V_{GS}	± 20	
Continuous Drain Current ($T_J = 150$ °C)	$T_C = 25$ °C	I_D	4.0	A
	$T_C = 70$ °C		3.4	
	$T_A = 25$ °C		3.1 ^{b, c}	
	$T_A = 70$ °C		2.5 ^{b, c}	
Pulsed Drain Current		I_{DM}	12	
Continuous Source-Drain Diode Current	$T_C = 25$ °C	I_S	1.39	A
	$T_A = 25$ °C		0.91 ^{b, c}	
Avalanche Current		I_{AS}	6	mJ
Single-Pulse Avalanche Energy		E_{AS}	1.8	
Maximum Power Dissipation	$T_C = 25$ °C	P_D	1.66	W
	$T_C = 70$ °C		1.06	
	$T_A = 25$ °C		1.09 ^{b, c}	
	$T_A = 70$ °C		0.7 ^{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}	≤ 5 s	R_{thJA}	90	115	°C/W
Maximum Junction-to-Foot (Drain)	Steady State	R_{thJF}	60	75	

Notes:

a. Based on $T_C = 25$ °C.

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

c. $t = 5$ s.

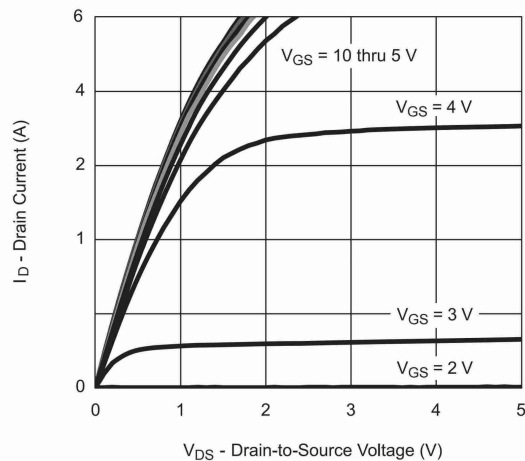
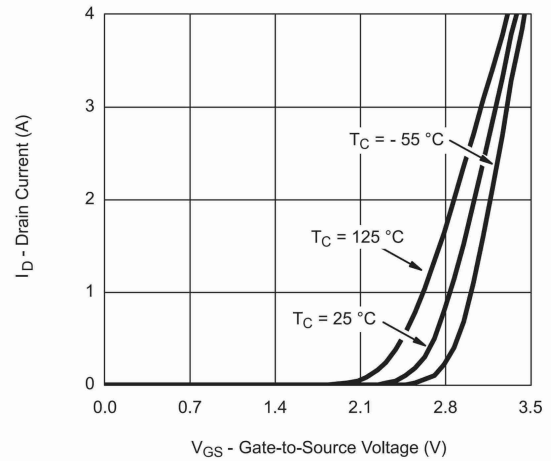
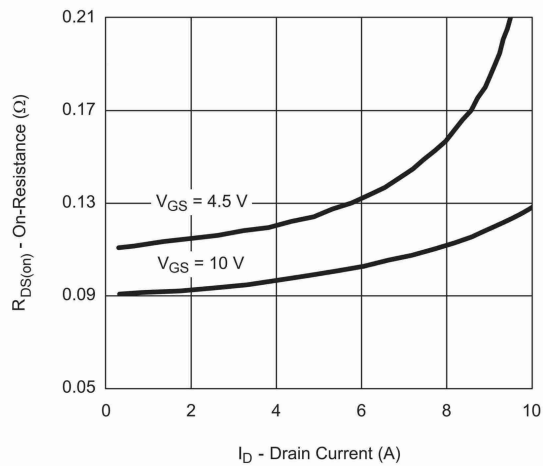
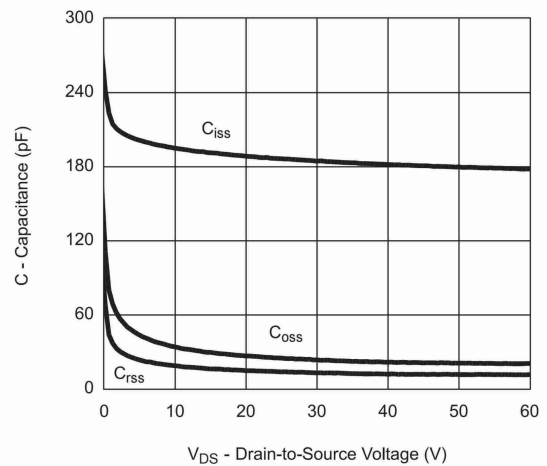
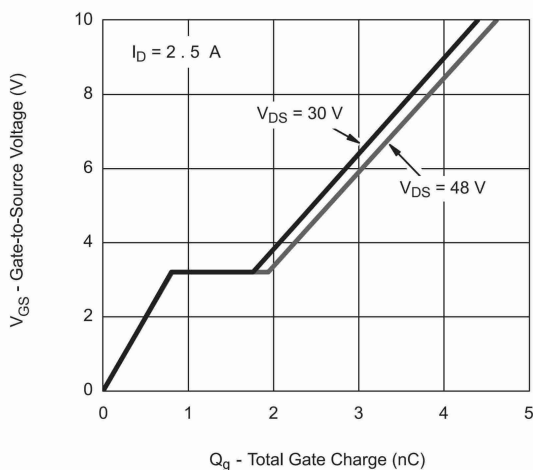
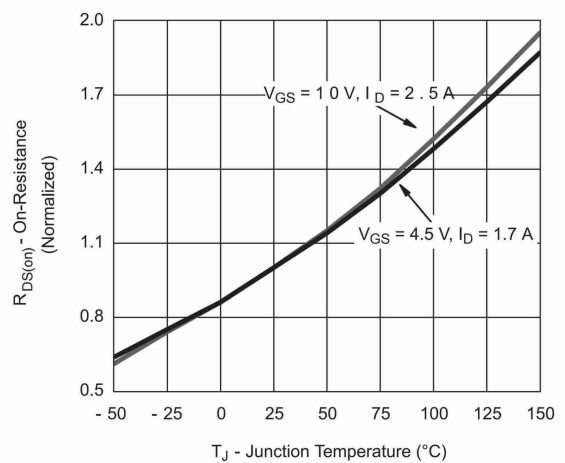
d. Maximum under Steady State conditions is 120 °C/W.

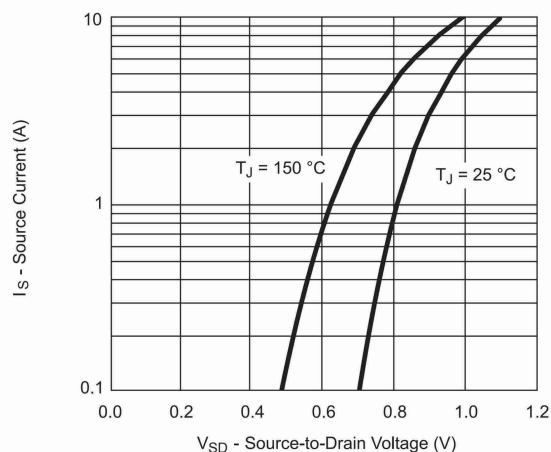
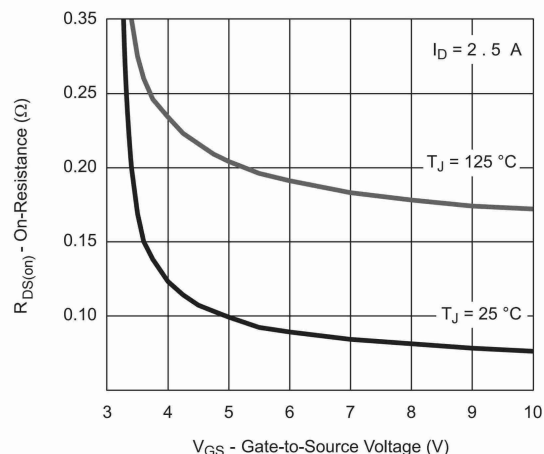
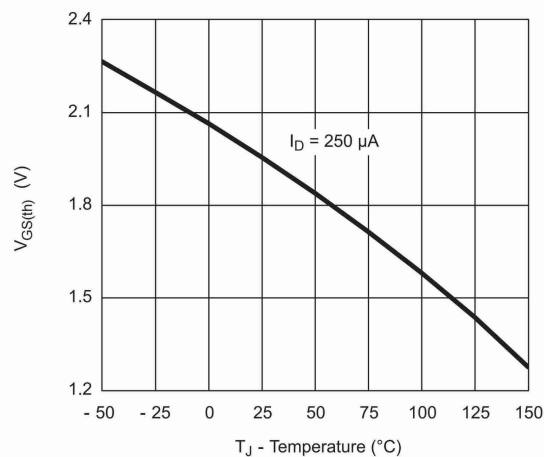
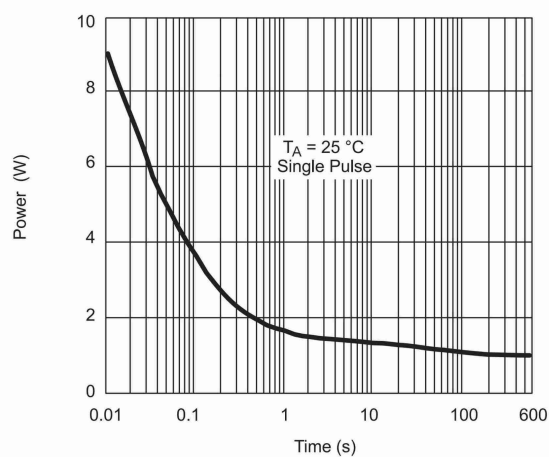
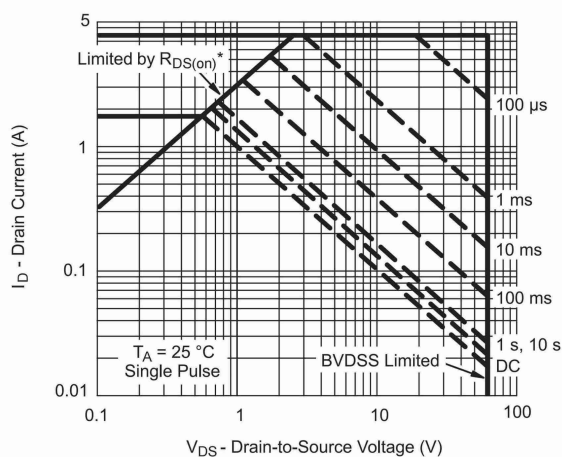
MOSFET SPECIFICATIONS $T_J = 25\text{ }^{\circ}\text{C}$, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{DS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	60			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = 250\text{ }\mu\text{A}$		55		mV/ $^{\circ}\text{C}$
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			- 5		
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	1		3	V
Gate-Source Leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}$			1	μA
		$V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}, T_J = 55\text{ }^{\circ}\text{C}$			10	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}, V_{GS} = 10\text{ V}$	8			A
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 1.9\text{ A}$		0.095		Ω
		$V_{GS} = 4.5\text{ V}, I_D = 1.7\text{ A}$		0.100		
Forward Transconductance ^a	g_{fs}	$V_{DS} = 15\text{V}, I_D = 1.9\text{ A}$		5		S
Dynamic ^b						
Input Capacitance	C_{iss}	$V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		180		pF
Output Capacitance	C_{oss}			22		
Reverse Transfer Capacitance	C_{rss}			13		
Total Gate Charge	Q_g	$V_{DS} = 30\text{ V}, V_{GS} = 10\text{ V}, I_D = 1.9\text{ A}$		4.2	6.1	nC
Gate-Source Charge	Q_{gs}	$V_{DS} = 30\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 1.9\text{ A}$		2.1	3.2	
Gate-Drain Charge	Q_{gd}			0.7		
				1		
Gate Resistance	R_g	$f = 1\text{ MHz}$	0.6	2.2	5.1	Ω
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 30\text{ V}, R_L = 20\text{ }\Omega$ $I_D \cong 1.5\text{ A}, V_{GEN} = 10\text{ V}, R_G = 1\text{ }\Omega$		4	6	ns
Rise Time	t_r			10	15	
Turn-Off Delay Time	$t_{d(off)}$			10	15	
Fall Time	t_f			7	10.5	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 30\text{ V}, R_L = 20\text{ }\Omega$ $I_D = 1.5\text{ A}, V_{GEN} = 4.5\text{ V}, R_G = 1\text{ }\Omega$		15	23	ns
Rise Time	t_r			16	24	
Turn-Off Delay Time	$t_{d(off)}$			11	17	
Fall Time	t_f			11	17	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	$T_C = 25\text{ }^{\circ}\text{C}$			2.19	A
Pulse Diode Forward Current ^a	I_{SM}				7	
Body Diode Voltage	V_{SD}	$I_S = 1.5\text{ A}$		0.8	1.2	V
Body Diode Reverse Recovery Time	t_{rr}	$I_F = 1.5\text{ A}, dI/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^{\circ}\text{C}$		15	23	ns
Body Diode Reverse Recovery Charge	Q_{rr}			10	15	nC
Reverse Recovery Fall Time	t_a			12		ns
Reverse Recovery Rise Time	t_b			3		

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.

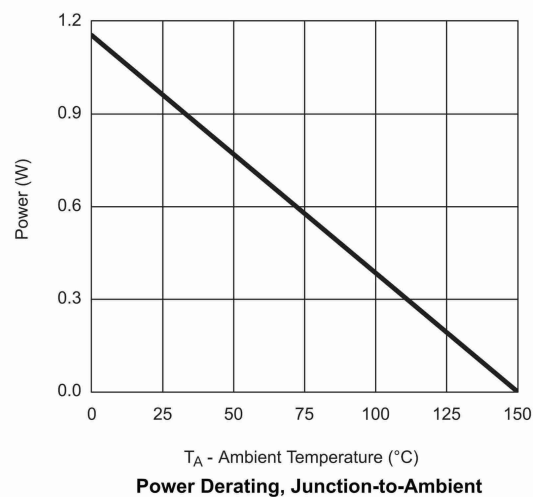
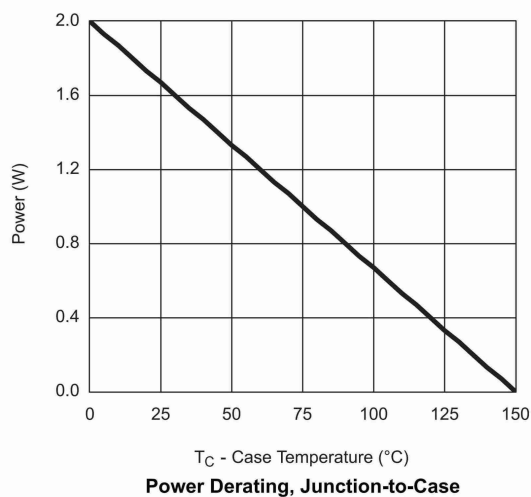
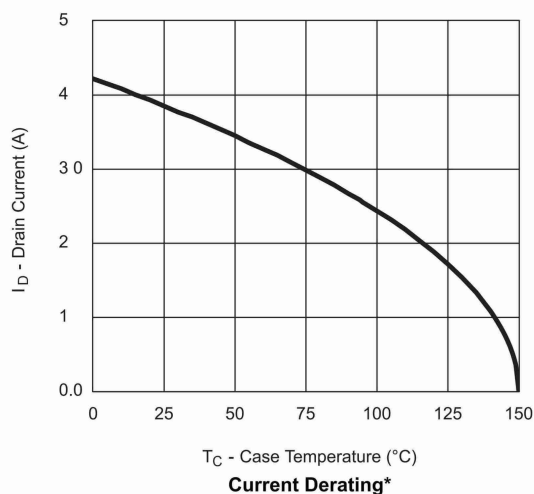
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

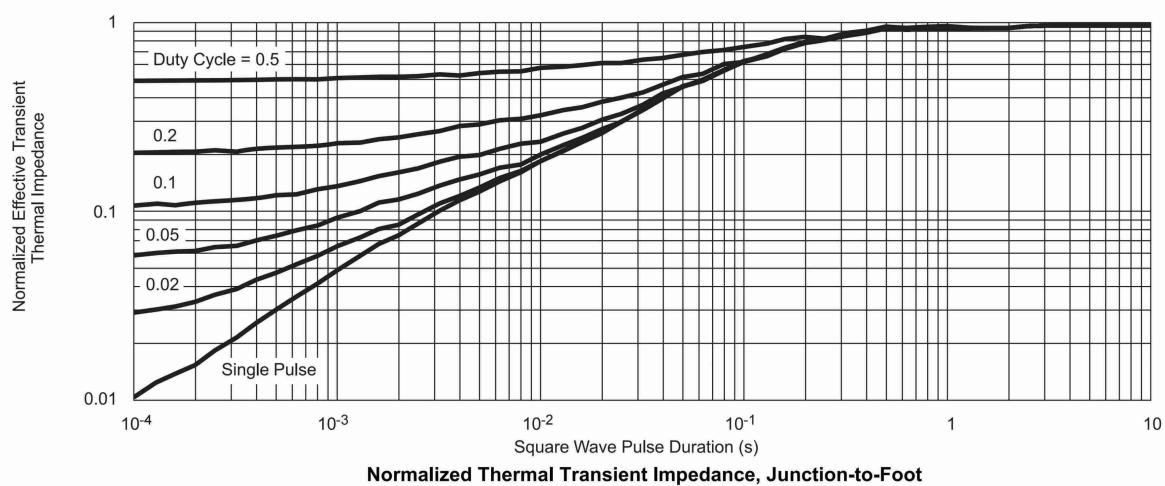
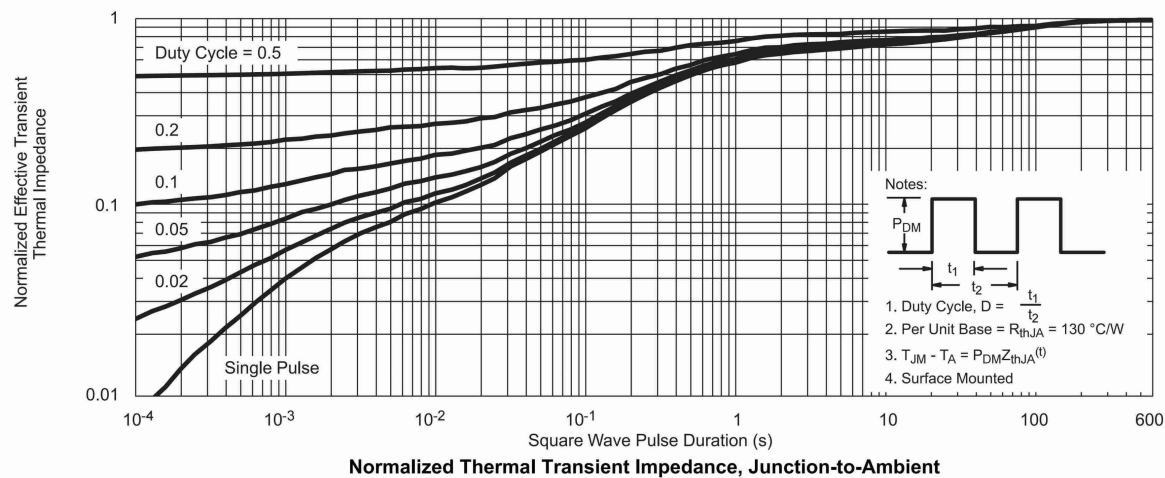
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

Source-Drain Diode Forward Voltage

On-Resistance vs. Gate-to-Source Voltage

Threshold Voltage

Single Pulse Power


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

Safe Operating Area

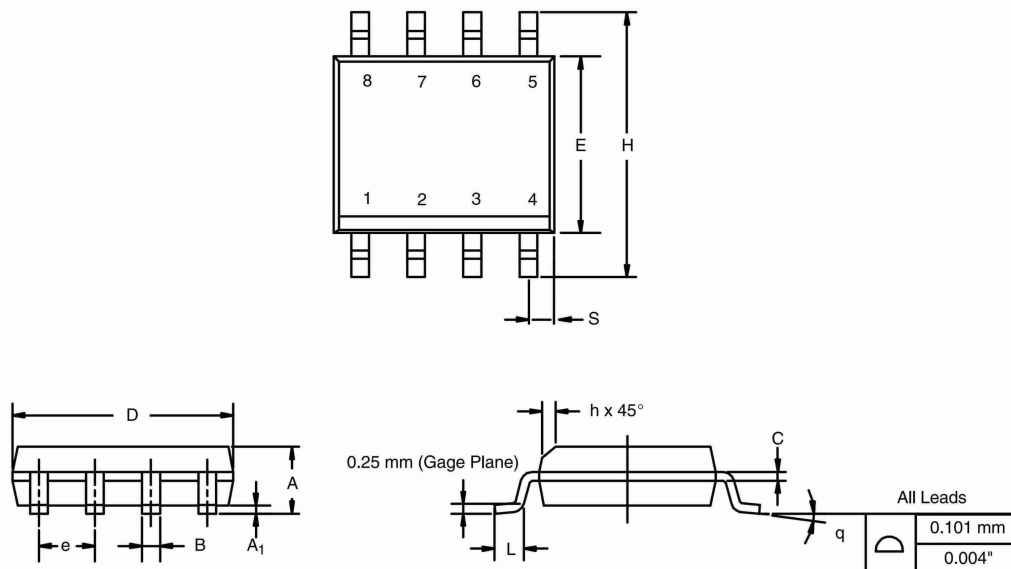
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted


* 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.

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


SOIC (NARROW): 8-LEAD

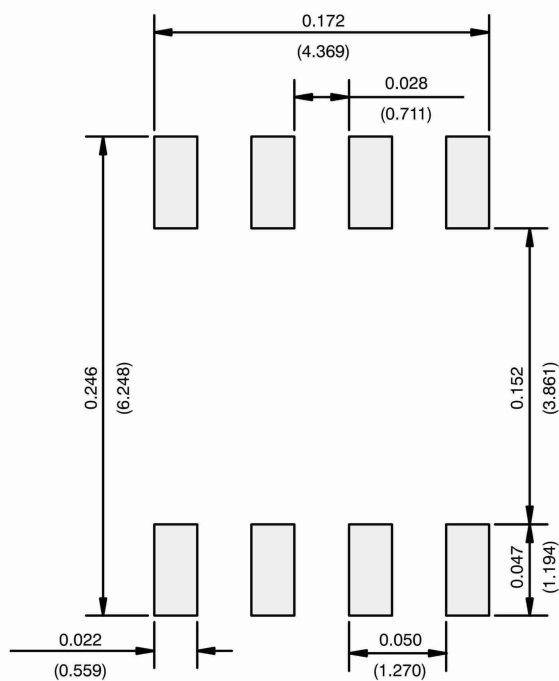
JEDEC Part Number: MS-012



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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