Si4776DY

Vishay Siliconix

N-Channel 30 V (D-S) MOSFET with Schottky Diode

PRODUCT SUMMARY			
V_{DS} (V)	$R_{DS(on)}$ (Ω) Max.	I_D (A)[a]	Q_g (Typ.)
30	0.016 at V_{GS} = 10 V	11.9	5.5 nC
	0.020 at V_{GS} = 4.5 V	10.6	

FEATURES

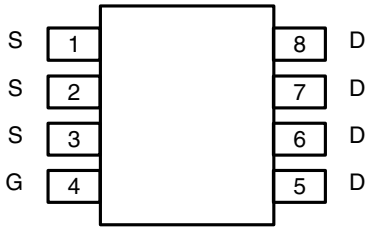
- **Halogen-free According to IEC 61249-2-21 Definition**
- SkyFET® Monolithic TrenchFET® Power MOSFET and Schottky Diode
- 100 % R_g and UIS Tested
- Compliant to RoHS Directive 2002/95/EC

Pb-free
RoHS COMPLIANT
HALOGEN FREE

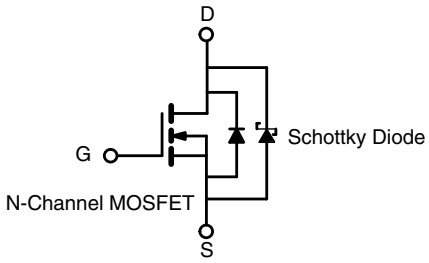
APPLICATIONS

- Notebook System Power and Memory - Low Side

SO-8



Top View



Ordering Information:
Si4776DY-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}	30	V
Gate-Source Voltage		V_{GS}	± 20	
Continuous Drain Current (T_J = 150 °C)	T_C = 25 °C	I_D	11.9	A
	T_C = 70 °C		9.5	
	T_A = 25 °C		9.3[b, c]	
	T_A = 70 °C		7.5[b, c]	
Pulsed Drain Current (t = 300 µs)		I_{DM}	50	
Continuous Source-Drain Diode Current	T_C = 25 °C	I_S	3.7	
	T_A = 25 °C		2.3[b, c]	
Single Pulse Avalanche Current	L = 0.1 mH	I_{AS}	10	
Single Pulse Avalanche Energy		E_{AS}	5	mJ
Maximum Power Dissipation	T_C = 25 °C	P_D	4.1	W
	T_C = 70 °C		2.6	
	T_A = 25 °C		2.5[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	Typ.	Max.	Unit
Maximum Junction-to-Ambient[b, d]	t ≤ 10 s	R_{thJA}	40	50	°C/W
Maximum Junction-to-Foot (Drain)	Steady State	R_{thJF}	24	30	

Notes:
a. Based on T_C = 25 °C.
b. Surface mounted on 1" x 1" FR4 board.
c. t = 10 s.
d. Maximum under steady state conditions is 95 °C/W.

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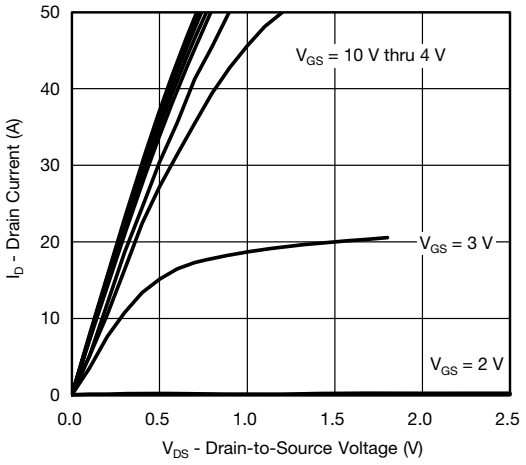
SPECIFICATIONS (T_J = 25 °C, unless otherwise noted)						
Parameter	**Symbol**	**Test Conditions**	**Min.**	**Typ.**	**Max.**	**Unit**
Static						
Drain-Source Breakdown Voltage	V_{DS}	V_{GS} = 0, I_D = 1 mA	30			V
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D= 1 mA	1		2.3	
Gate-Source Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 20 V			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 30 V, V_{GS} = 0 V		0.013	0.150	mA
		V_{DS} = 30 V, V_{GS} = 0 V, T_J = 100 °C		1	10	
On -State Drain Current[a]	$I_{D(on)}$	V_{DS} ≥ 5 V, V_{GS} = 10 V	30			A
Drain-Source On-State Resistance[a]	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 10 A		0.013	0.016	Ω
		V_{GS} = 4.5 V, I_D = 7 A		0.016	0.020	
Forward Transconductance[a]	g_{fs}	V_{DS} = 15 V, I_D = 10 A		30		S
Dynamic[b]						
Input Capacitance	C_{iss}	V_{DS} = 15 V, V_{GS} = 0 V, f = 1 MHz		521		pF
Output Capacitance	C_{oss}			141		
Reverse Transfer Capacitance	C_{rss}			57		
Total Gate Charge	Q_g	V_{DS} = 15 V, V_{GS} = 10 V, I_D = 10 A		11.6	17.5	nC
		V_{DS} = 15 V, V_{GS} = 4.5 V, I_D = 10 A		5.5	8.5	
Gate-Source Charge	Q_{gs}			1.5		
Gate-Drain Charge	Q_{gd}			1.9		
Gate Resistance	R_g	f = 1 MHz	0.2	0.8	1.6	Ω
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 15 V, R_L = 1.5 Ω I_D ≅ 10 A, V_{GEN} = 4.5 V, R_g = 1 Ω		12	24	ns
Rise Time	t_r			12	24	
Turn-Off Delay Time	$t_{d(off)}$			14	28	
Fall Time	t_f			8	16	
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 15 V, R_L = 1.5 Ω I_D ≅ 10 A, V_{GEN} = 10 V, R_g = 1 Ω		10	20	
Rise Time	t_r			11	22	
Turn-Off Delay Time	$t_{d(off)}$			11	22	
Fall Time	t_f			6	12	
Drain-Source Body Diode and Schottky Characteristics						
Continuous Source-Drain Diode Current	I_S	T_C = 25 °C			3.7	A
Pulse Diode Forward Current[a]	I_{SM}				50	
Body Diode Voltage	V_{SD}	I_S = 1 A		0.44	0.55	V
Body Diode Reverse Recovery Time	t_{rr}	I_F = 5 A, dI/dt = 100 A/µs, T_J = 25 °C		12	24	ns
Body Diode Reverse Recovery Charge	Q_{rr}			4.5	9	nC
Reverse Recovery Fall Time	t_a			6.5		ns
Reverse Recovery Rise Time	t_b			5.5		

Notes:
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.

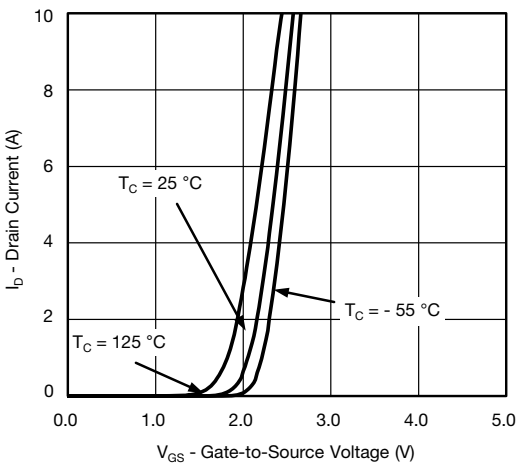
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

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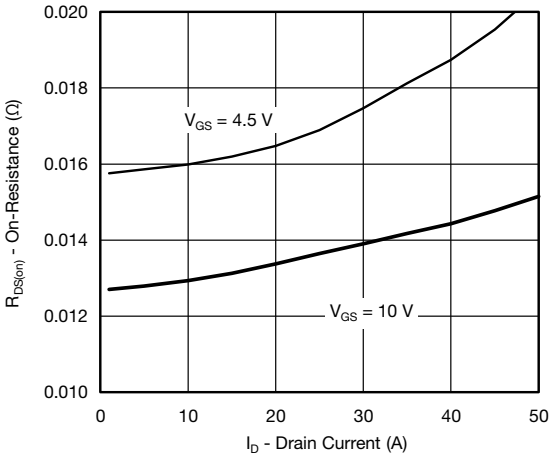
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



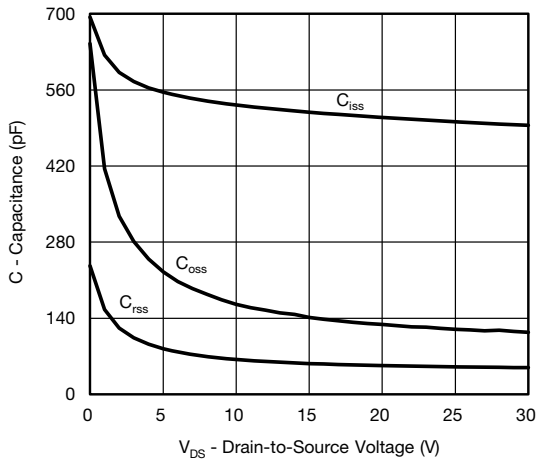
Output Characteristics



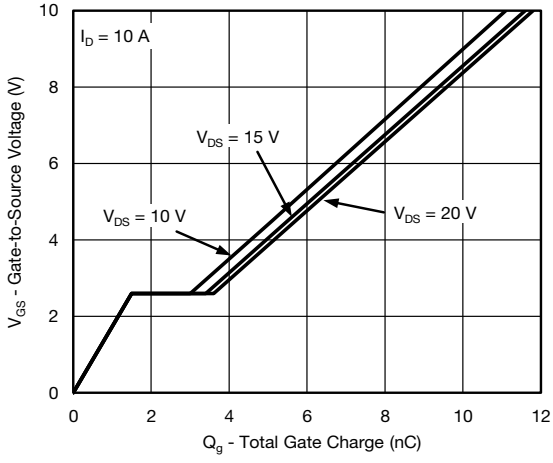
Transfer Characteristics



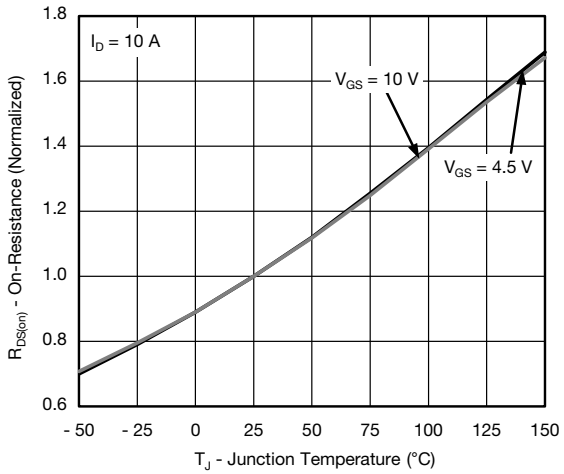
On-Resistance vs. Drain Current



Capacitance



Gate Charge



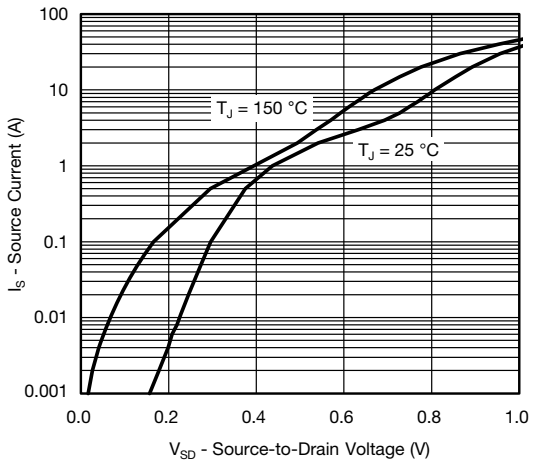
On-Resistance vs. Junction Temperature

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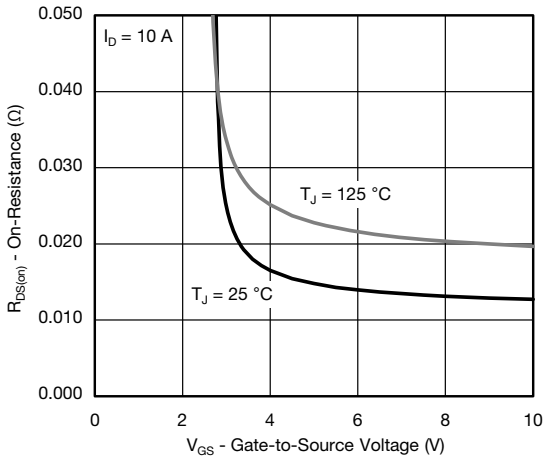
Si4776DY

Vishay Siliconix

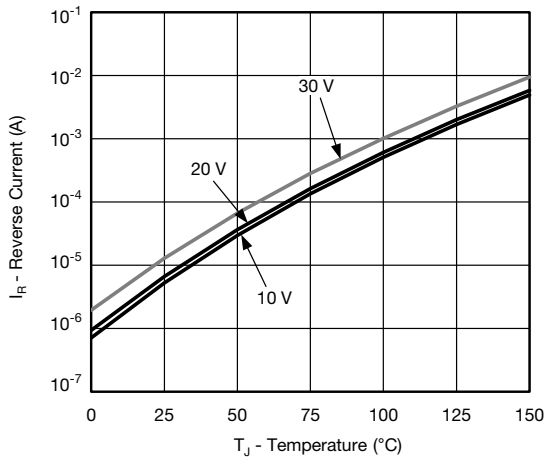
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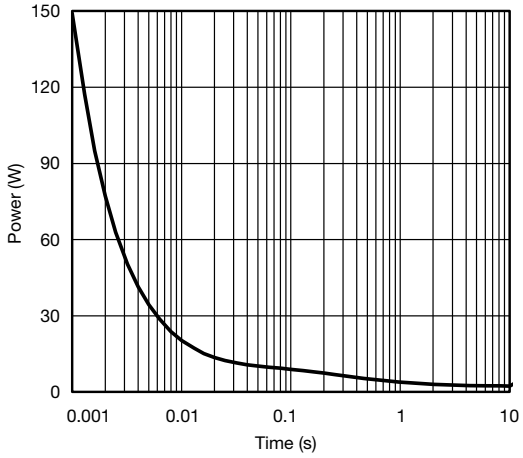
Source-Drain Diode Forward Voltage



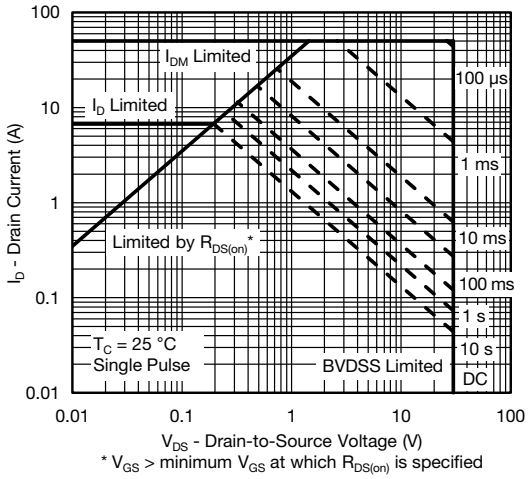
On-Resistance vs. Gate-to-Source Voltage



Reverse Current (Schottky)



Single Pulse Power, Junction-to-Ambient

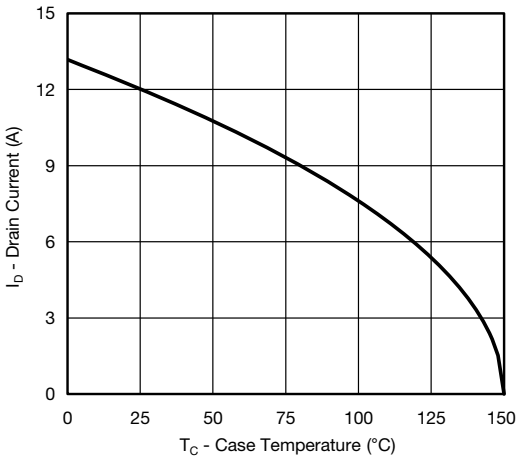


Safe Operating Area

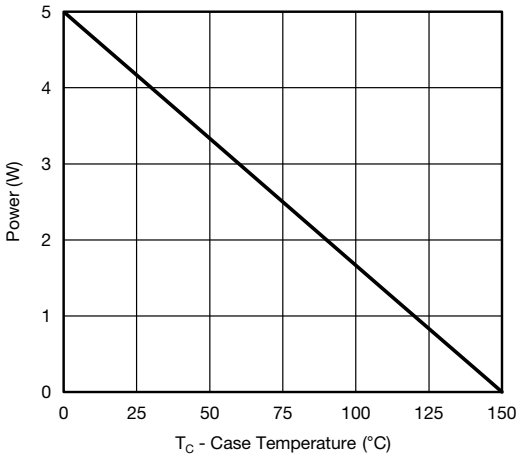
Document Number: 63316
S11-1658-Rev. A, 15-Aug-11

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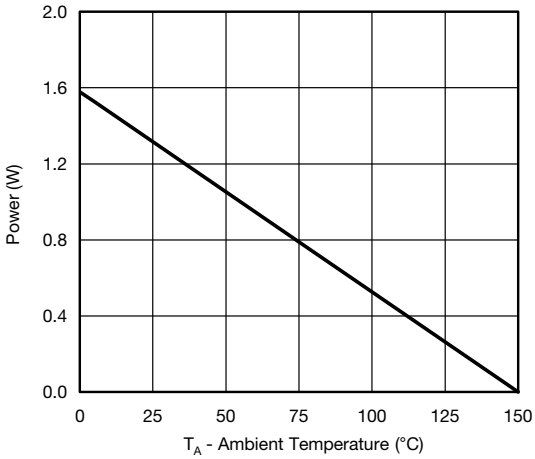
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Current Derating*



Power Derating, Junction-to-Foot

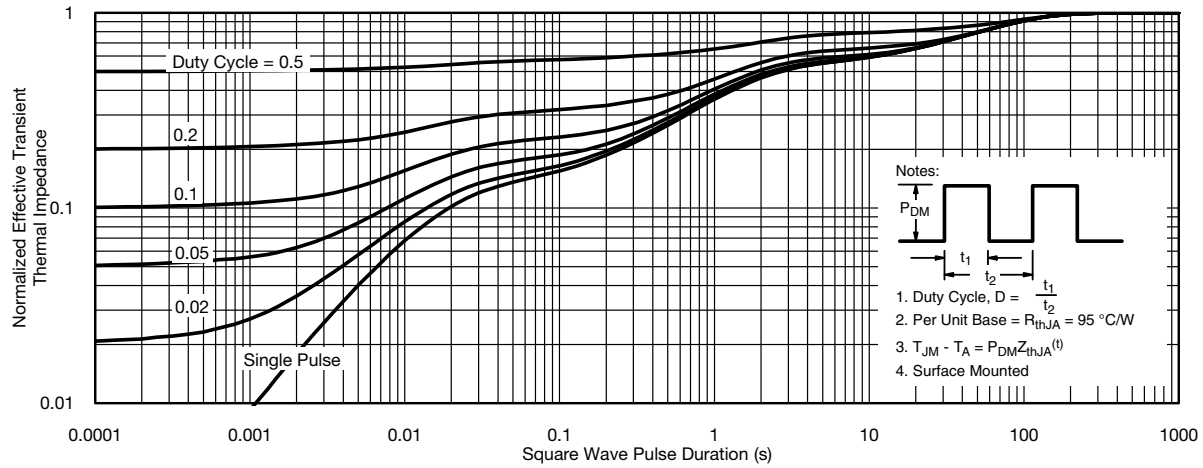


Power Derating, Junction-to-Ambient

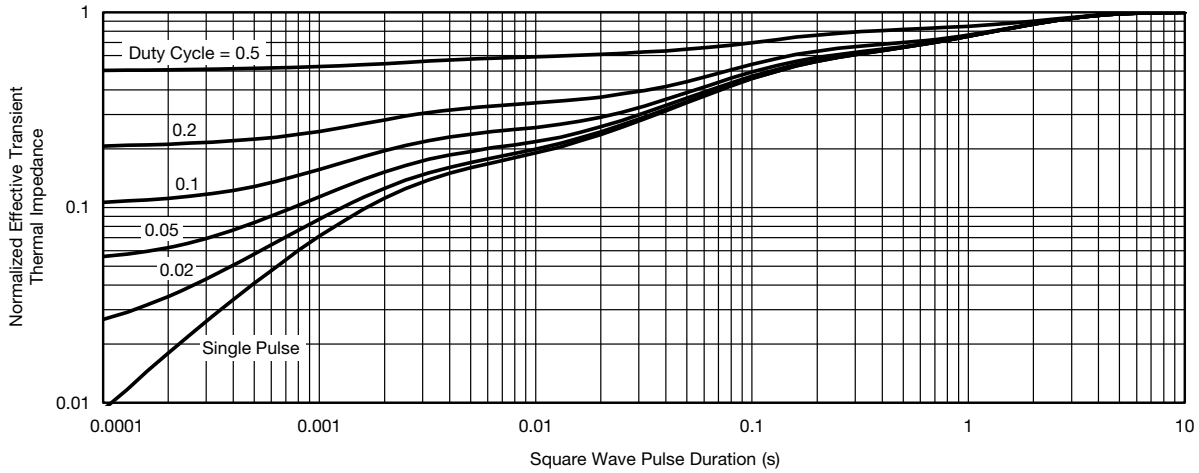
* The power dissipation P_D is based on $T_{J(max)}$ = 150 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

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TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Normalized Thermal Transient Impedance, Junction-to-Ambient

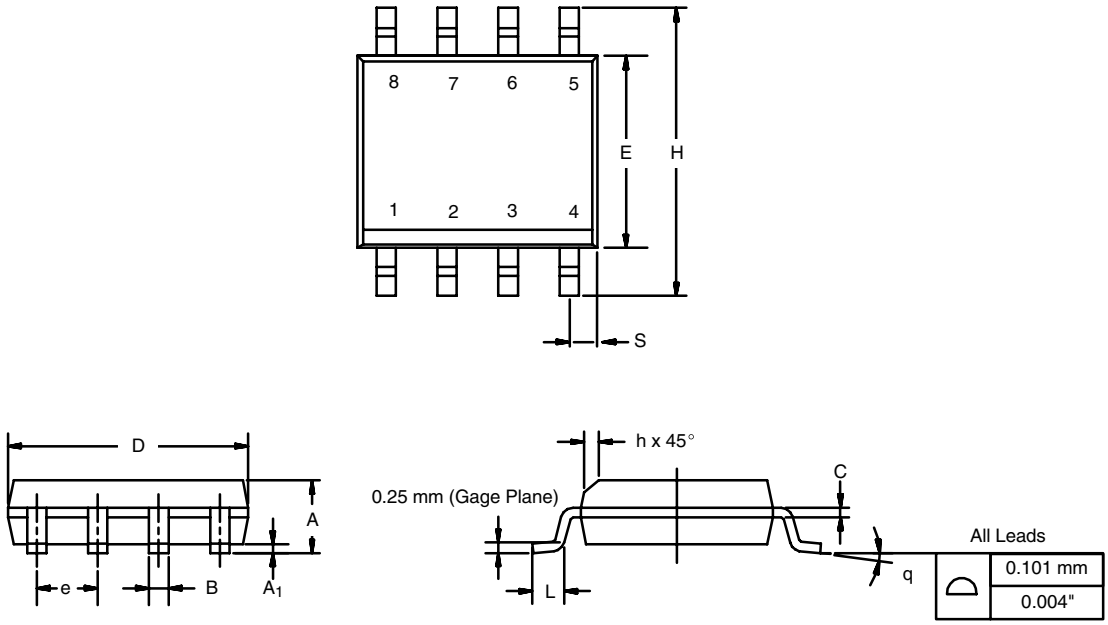


Normalized Thermal Transient Impedance, Junction-to-Foot

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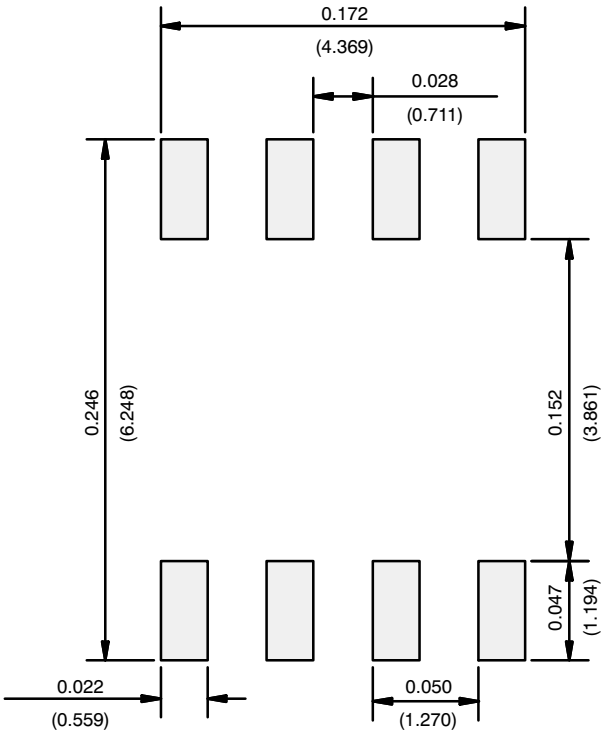
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SOIC (NARROW): 8-LEAD
JEDEC Part Number: MS-012



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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