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

MOSFET PRODUCT SUMMARY			
V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)[a]	Q_g (Typ.)
- 30	0.068 at V_{GS} = - 10 V	- 4.6	4.6
	0.110 at V_{GS} = - 4.5 V	- 3.4	

SCHOTTKY PRODUCT SUMMARY		
V_{KA} (V)	V_F (V) Diode Forward Voltage	I_D (A)[a]
30	0.44 V at 1 A	2

FEATURES

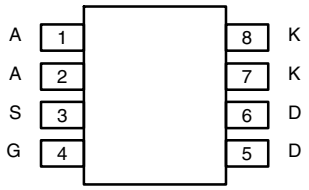
- **Halogen-free According to IEC 61249-2-21 Definition**
- LITTLE FOOT® *Plus* Power MOSFET
- 100 % R_g Tested
- Compliant to RoHS Directive 2002/95/EC

Pb-free
RoHS COMPLIANT
HALOGEN FREE

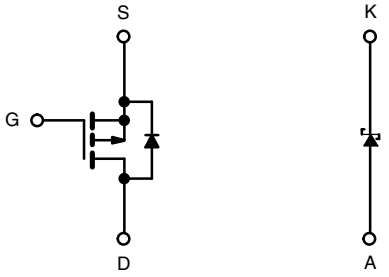
APPLICATIONS

- Battery Management in Notebook PC
- Non-synchronous Buck Converter in HDD

SO-8



Top View



P-Channel MOSFET

Ordering Information: Si4833BDY-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 (MOSFET)		V_{DS}	- 30	V
Reverse Voltage (Schottky)		V_{KA}	- 30	
Gate-Source Voltage (MOSFET)		V_{GS}	± 20	
Continuous Drain Current (T_J = 150 °C) (MOSFET)	T_C = 25 °C	I_D	- 4.6	A
	T_C = 70 °C		- 3.6	
	T_A = 25 °C		- 3.8[b, c]	
	T_A = 70 °C		- 3[b, c]	
Pulsed Drain Current (MOSFET) (t = 300 µs)		I_{DM}	- 20	
Continuous Source Current (MOSFET Diode Conduction)	T_C = 25 °C	I_S	- 2	
	T_A = 25 °C		- 1.4[b, c]	
Average Forward Current (Schottky)		I_F	- 1.4[b]	
Pulsed Forward Current (Schottky)		I_{FM}	- 2	
Maximum Power Dissipation (MOSFET and Schottky)	T_C = 25 °C	P_D	2.75	W
	T_C = 70 °C		1.75	
	T_A = 25 °C		1.75[b, c]	
	T_A = 70 °C		1.10[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 (MOSFET and Schottky)[b, c, d]	R_{thJA}	60	71.5	°C/W
Maximum Junction-to-Foot (Drain) (MOSFET and Schottky)	R_{thJF}	35	45	

Notes:
a. Based on T_C = 25 °C.
b. Surface mounted on FR4 board.
c. t ≤ 10 s.
d. Maximum under steady state conditions is 120 °C/W.

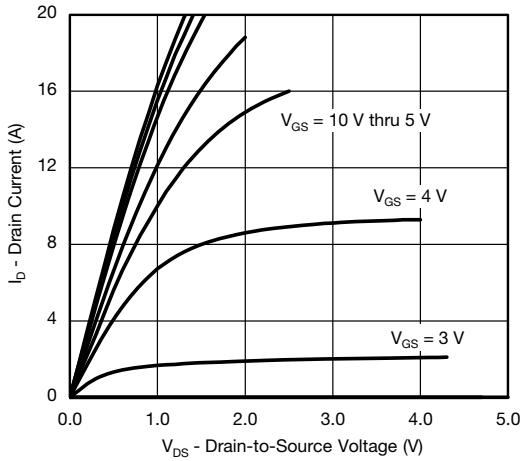
MOSFET SPECIFICATIONS (T_J = 25 °C, unless otherwise noted)						
Parameter	**Symbol**	**Test Conditions**	**Min.**	**Typ.**	**Max.**	**Unit**
Static						
Drain-Source Breakdown Voltage	V_{DS}	V_{DS} = 0 V, I_D = - 250 µA	- 30			V
V_{DS} Temperature Coefficient	$\Delta V_{DS/TJ}$	I_D = - 250 µA		- 20		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)/TJ}$			3.9		
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = - 250 µA	- 1	- 1.8	- 2.5	V
Gate-Body 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			- 1	µA
		V_{DS} = - 30 V, V_{GS} = 0 V, T_J = 75 °C			- 10	
On-State Drain Current[a]	$I_{D(on)}$	$V_{DS} \geq$ - 5 V, V_{GS} = - 10 V	- 5			A
Drain-Source On-State Resistance[a]	$R_{DS(on)}$	V_{GS} = - 10 V, I_D = - 3.6 A		0.055	0.068	Ω
		V_{GS} = - 4.5 V, I_D = - 2.8 A		0.092	0.110	
Forward Transconductance[a]	g_{fs}	V_{DS} = - 15 V, I_D = - 3.6 A		6.5		S
Dynamic[b]						
Input Capacitance	C_{iss}	V_{DS} = - 15 V, V_{GS} = 0 V, f = 1 MHz		350		pF
Output Capacitance	C_{oss}			75		
Reverse Transfer Capacitance	C_{rss}			63		
Total Gate Charge	Q_g	V_{DS} = - 15 V, V_{GS} = - 10 V, I_D = - 5 A		9	14	nC
		V_{DS} = - 15 V, V_{GS} = - 4.5 V, I_D = - 5 A		4.6	7	
Gate-Source Charge	Q_{gs}			1.3		
Gate-Drain Charge	Q_{gd}			2.1		
Gate Resistance	R_g	f = 1 MHz	1.5	7.3	14.5	Ω
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = - 15 V, R_L = 3 Ω $I_D \cong$ - 5 A, V_{GEN} = - 4.5 V, R_g = 1 Ω		28	50	ns
Rise Time	t_r			73	140	
Turn-Off Delay Time	$t_{d(off)}$			12	24	
Fall Time	t_f			8	16	
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = - 15 V, R_L = 3 Ω $I_D \cong$ - 5 A, V_{GEN} = - 10 V, R_g = 1 Ω		6	12	
Rise Time	t_r			9	18	
Turn-Off Delay Time	$t_{d(off)}$			12	24	
Fall Time	t_f			6	12	
Drain-Source Body Diode Characteristics						
Continous Source-Drain Diode Current	I_S	T_C = 25 °C			- 4.6	A
Pulse Diode Forward Current[a]	I_{SM}				- 20	
Body Diode Voltage	V_{SD}	I_S = - 2 A, V_{GS} = 0 V		- 0.83	- 1.2	V
Body Diode Reverse Recovery Time	t_{rr}	I_F = - 2 A, dI/dt = 100 A/µs, T_J = 25 °C		12	24	ns
Body Diode Reverse Recovery Charge	Q_{rr}			6	12	nC
Reverse Recovery Fall Time	t_a			8		ns
Reverse Recovery Rise Time	t_b			4		

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

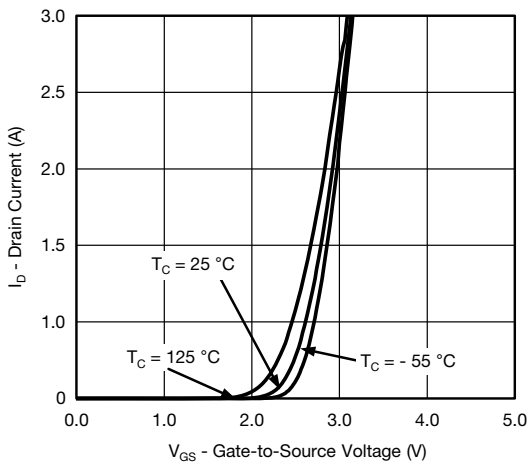
SCHOTTKY SPECIFICATIONS (T_J = 25 °C, unless otherwise noted)						
Parameter	**Symbol**	**Test Conditions**	**Min.**	**Typ.**	**Max.**	**Unit**
Forward Voltage Drop	V_F	I_F = 1 A		0.36	0.44	V
		I_F = 1 A, T_J = 125 °C		0.29	0.35	
Maximum Reverse Leakage Current	I_{rm}	V_R = 30 V		0.03	0.2	mA
		V_R = 30 V, T_J = 75 °C		0.6	5	
		V_R = 30 V, T_J = 125 °C		7.5	60	
Junction Capacitance	C_T	V_R = 15 V		5.3		pF

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.

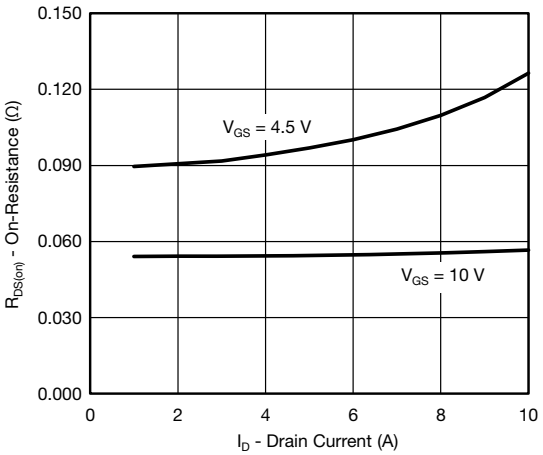
MOSFET TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



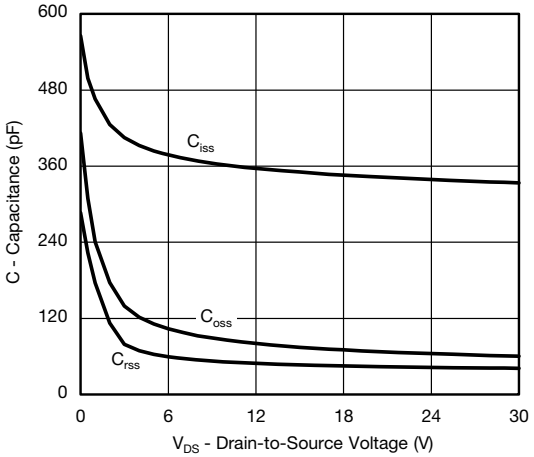
Output Characteristics



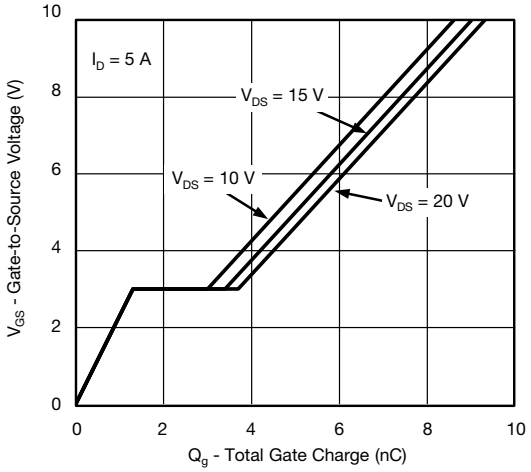
Transfer Characteristics



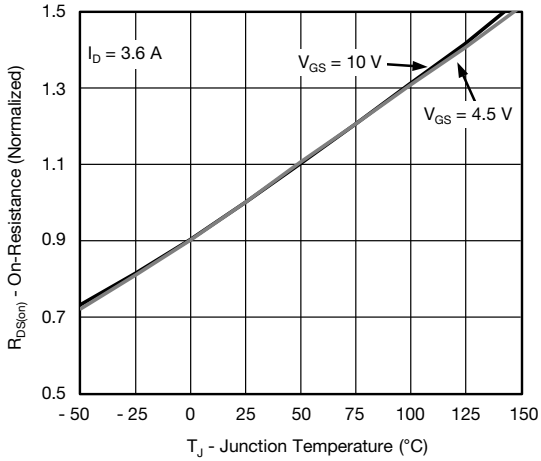
On-Resistance vs. Drain Current and Gate Voltage



Capacitance

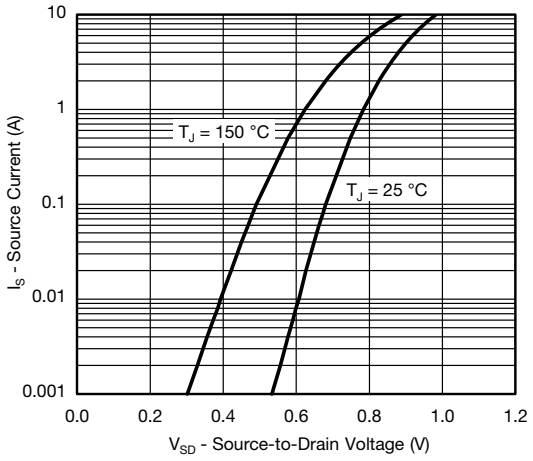


Gate Charge

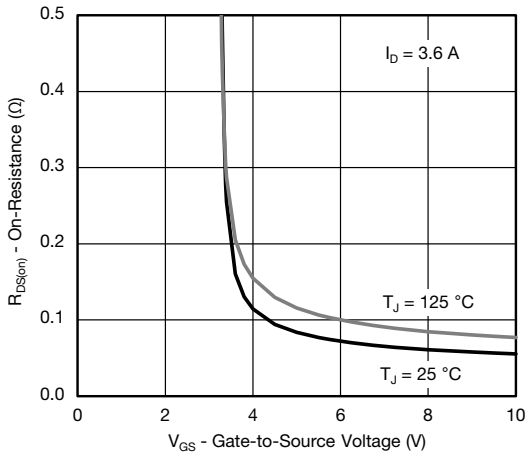


On-Resistance vs. Junction Temperature

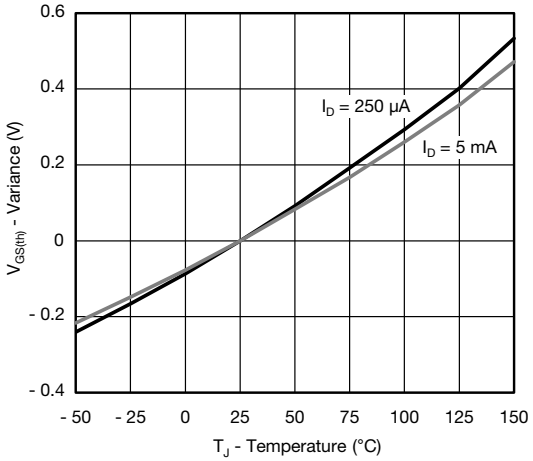
MOSFET TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



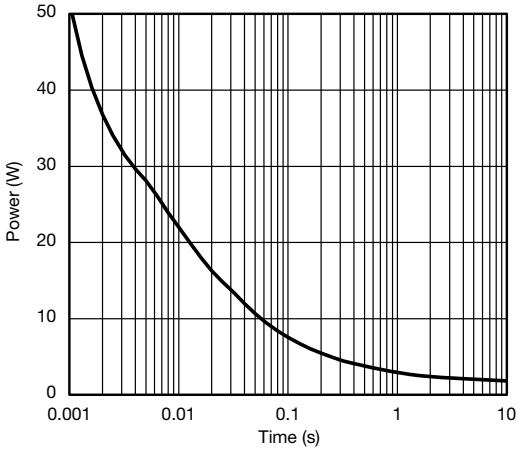
Source-Drain Diode Forward Voltage



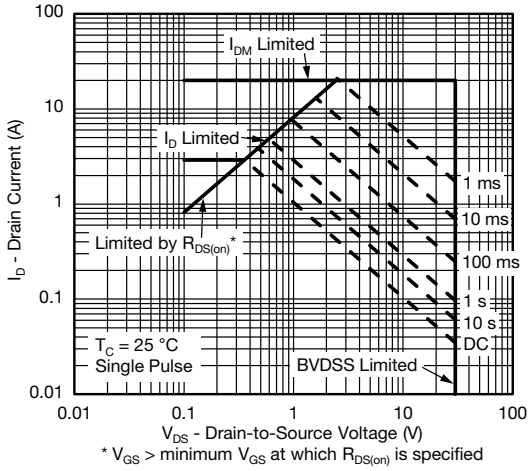
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage

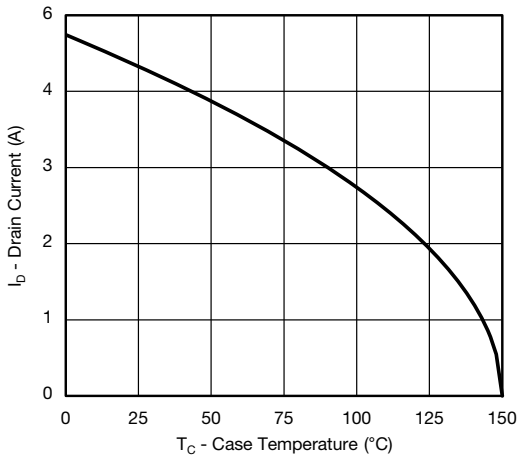


Single Pulse Power, Junction-to-Ambient

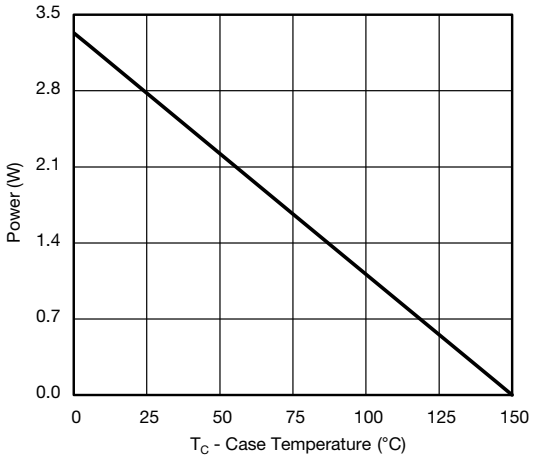


Safe Operating Area, Junction-to-Case

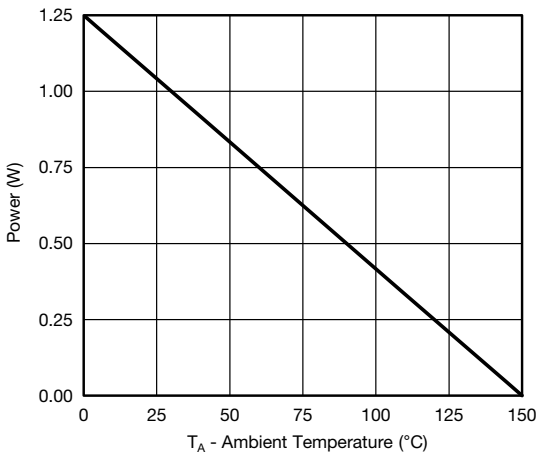
MOSFET TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Current Derating*



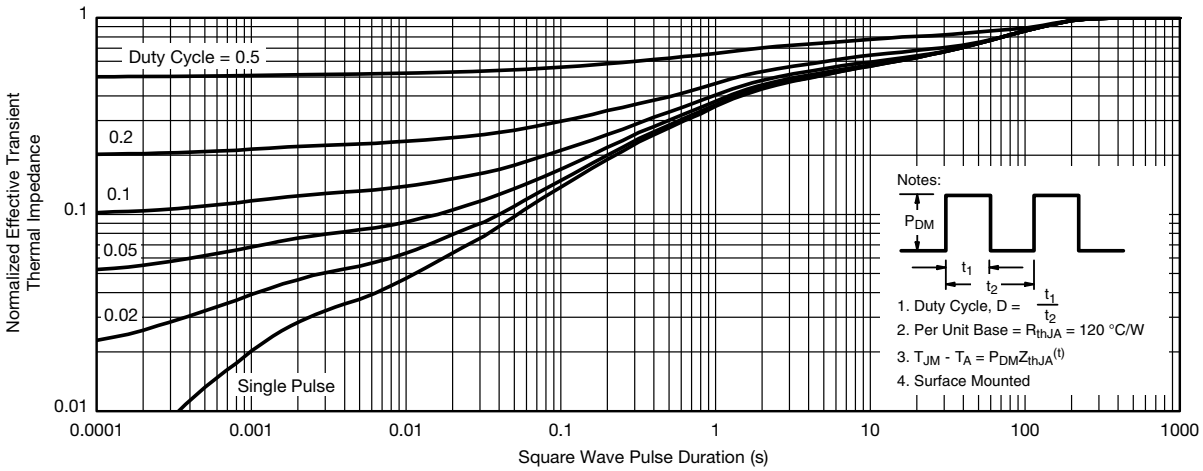
Power Derating, Junction-to-Foot



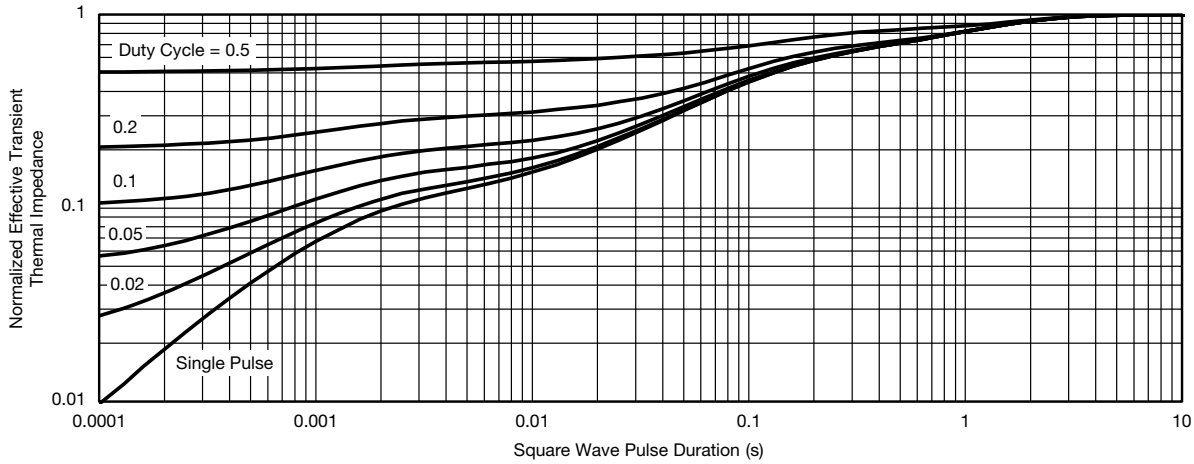
Power Derating, Junction-to-Ambient

* 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.

MOSFETS TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

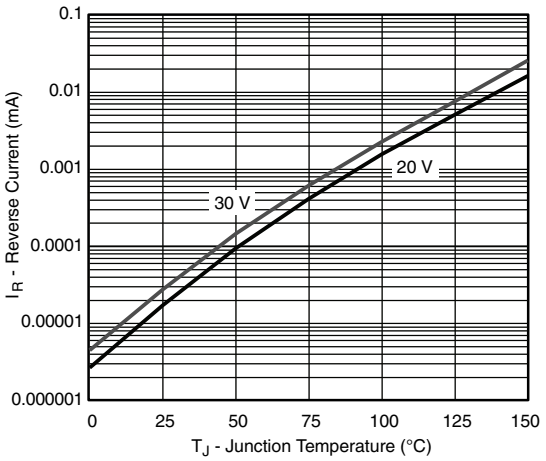


Normalized Thermal Transient Impedance, Junction-to-Ambient

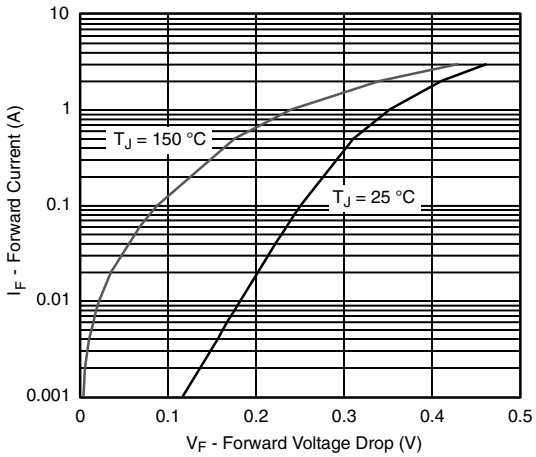


Normalized Thermal Transient Impedance, Junction-to-Foot

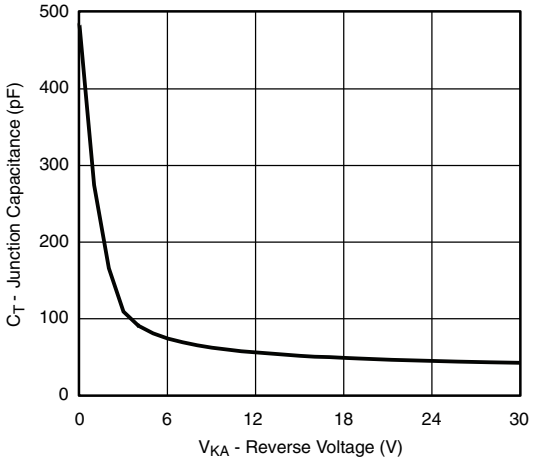
SCHOTTKY TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Reverse Current vs. Junction Temperature



Forward Voltage Drop



Capacitance

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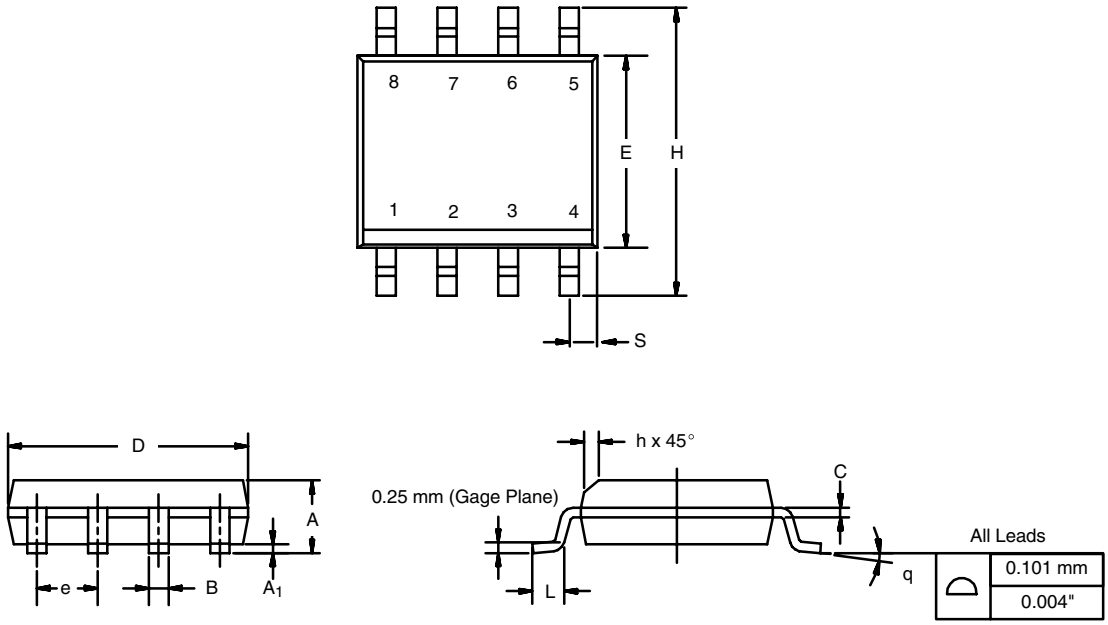
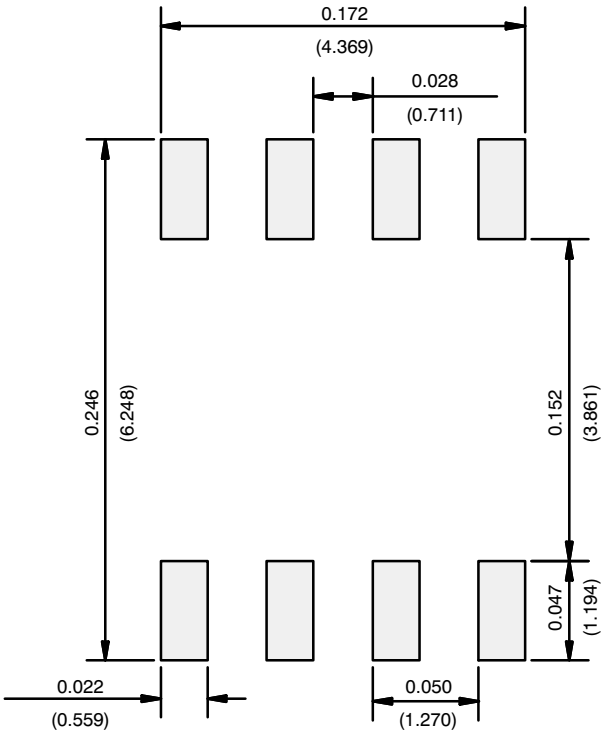
SOIC (NARROW): 8-LEAD
JEDEC Part Number: MS-012



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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