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

MOSFET PRODUCT SUMMARY			
V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)	Q_g (Typ.)
30	0.035 at V_{GS} = 10 V	7.4	4.2 nC
	0.052 at V_{GS} = 4.5 V	6.1	

SCHOTTKY PRODUCT SUMMARY		
V_{KA} (V)	V_F (V) Diode Forward Voltage	I_F (A)[a]
30	0.470 at 3 A	3

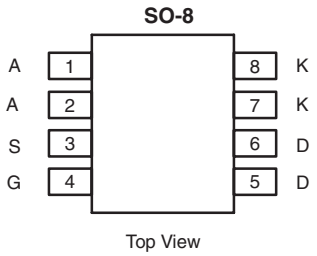
FEATURES

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

Pb-free
RoHS COMPLIANT
HALOGEN FREE Available

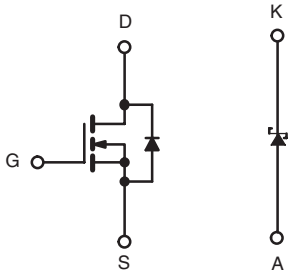
APPLICATIONS

- Load Switch for Portable Applications
  - Ideal for Boost Circuits
- HDD Driver



Top View

Ordering Information: Si4620DY-T1-E3 (Lead (Pb)-free)
Si4620DY-T1-GE3 (Lead (Pb)-free and Halogen-free)



N-Channel MOSFET

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	7.5	A
	T_C = 70 °C		6	
	T_A = 25 °C		6	
	T_A = 70 °C		4.8	
Pulsed Drain Current (MOSFET)		I_{DM}	40	
Continuous Source Current (MOSFET Diode Conduction)	T_C = 25 °C	I_S	2.6	
	T_A = 25 °C		1.7[a, b]	
Average Forward Current (Schottky)		I_F	3	
Pulsed Forward Current (Schottky)		I_{FM}	8	
Maximum Power Dissipation (MOSFET)	T_C = 25 °C	P_D	3.1	W
	T_C = 70 °C		2	
	T_A = 25 °C		2[a, b]	
	T_A = 70 °C		1.3[a, b]	
Maximum Power Dissipation (Schottky)	T_C = 25 °C		3	
	T_C = 70 °C		1.9	
	T_A = 25 °C		1.8	
	T_A = 70 °C		1.1	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	- 55 to 150	°C
Soldering Recommendations (Peak Temperature)			260	

THERMAL RESISTANCE RATINGS				
Parameter	**Symbol**	**Typical**	**Maximum**	**Unit**
Maximum Junction-to-Ambient (MOSFET)[a, c]	R_{thJA}	53	62.5	°C/W
Maximum Junction-to-Foot (Drain) (MOSFET)	R_{thJF}	30	40	
Maximum Junction-to-Ambient (Schottky)	R_{thJA}	55	65	
Maximum Junction-to-Foot (Drain) (Schottky)	R_{thJF}	32	42	

Notes:
a. Surface Mounted on FR4 board.
b. t ≤ 10 s.
c. Maximum under Steady State conditions for MOSFETS is 110 °C/W.
d. Maximum under Steady State conditions for Schottky is 115 °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	30			V
V_{DS} Temperature Coefficient	$\Delta V_{DS/TJ}$	I_D = 250 µA		32.5		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)/TJ}$			- 5.3		
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 µA	1.2		2.5	V
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			1	µA
		V_{DS} = 30 V, V_{GS} = 0 V, T_J = 55 °C			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 = 6 A		0.028	0.035	Ω
		V_{GS} = 4.5 V, I_D = 4.9 A		0.041	0.052	
Forward Transconductance[a]	g_{fs}	V_{DS} = 15 V, I_D = 6 A		12		S
Dynamic[b]						
Input Capacitance	C_{iss}	V_{DS} = 15 V, V_{GS} = 0 V, f = 1 MHz		520	1040	pF
Output Capacitance	C_{oss}			115	230	
Reverse Transfer Capacitance	C_{rss}			55	110	
Total Gate Charge	Q_g	V_{DS} = 15 V, V_{GS} = 10 V, I_D = 6 A		8.6	13	nC
		V_{DS} = 15 V, V_{GS} = 4.5 V, I_D = 6 A		4.2	6.5	
Gate-Source Charge	Q_{gs}			1.8		
Gate-Drain Charge	Q_{gd}			1.5		
Gate Resistance	R_g	f = 1 MHz		2.8		Ω
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 15 V, R_L = 3.1 Ω I_D ≅ 4.8 A, V_{GEN} = 4.5 V, R_g = 6 Ω		16	30	ns
Rise Time	t_r			36	54	
Turn-Off Delay Time	$t_{d(off)}$			21	40	
Fall Time	t_f			17	40	

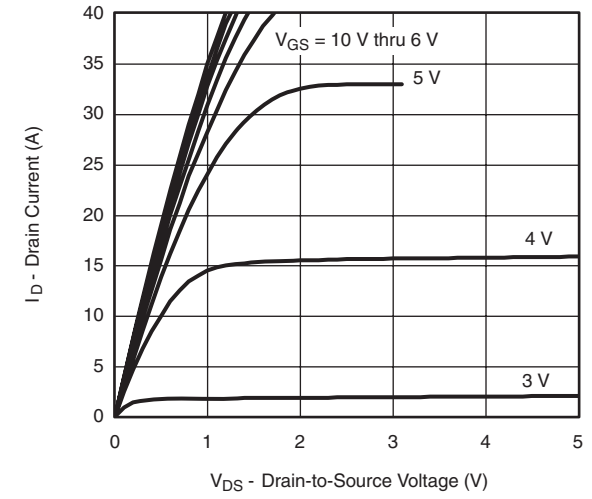
SPECIFICATIONS T_J = 25 °C, unless otherwise noted						
Parameter	**Symbol**	**Test Conditions**	**Min.**	**Typ.**	**Max.**	**Unit**
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	T_C = 25 °C			2.6	A
Pulse Diode Forward Current	I_{SM}				40	
Body Diode Voltage	V_{SD}	I_S = 1.7 A, V_{GS} = 0 V		0.8	1.2	V
Body Diode Reverse Recovery Time	t_{rr}	I_F = 1.7 A, dI/dt = 100 A/µs, T_J = 25 °C		20	40	ns
Body Diode Reverse Recovery Charge	Q_{rr}			14	30	nC
Reverse Recovery Fall Time	t_a			14		ns
Reverse Recovery Rise Time	t_b			6		

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

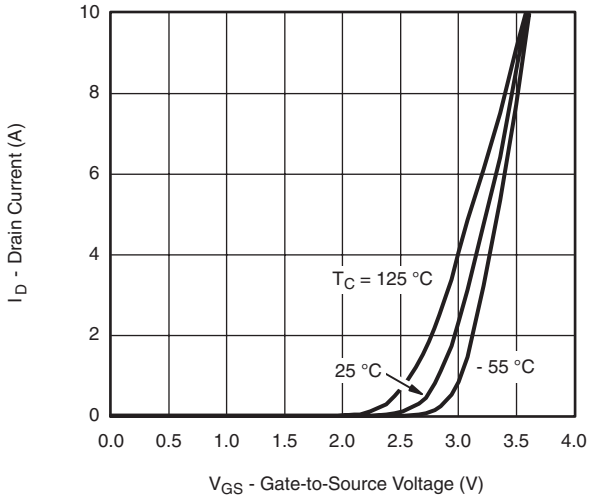
SCHOTTKY SPECIFICATIONS T_J = 25 °C, unless otherwise noted						
Parameter	**Symbol**	**Test Conditions**	**Min.**	**Typ.**	**Max.**	**Unit**
Forward Voltage Drop	V_F	I_F = 3 A		0.39	0.470	V
		I_F = 3 A, T_J = 125 °C		0.35	0.420	
Maximum Reverse Leakage Current	I_{rm}	V_r = 5 V		0.1	0.2	mA
		V_r = 5 V, T_J = 85 °C		3.5	17.5	
		V_r = 5 V, T_J = 106 °C		12	60	
		V_r = 30 V		0.22	0.5	
		V_r = 30 V, T_J = 85 °C		10	50	
		V_r = 30 V, T_J = 125 °C		40	200	
Junction Capacitance	C_T	V_r = 15 V		100		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.

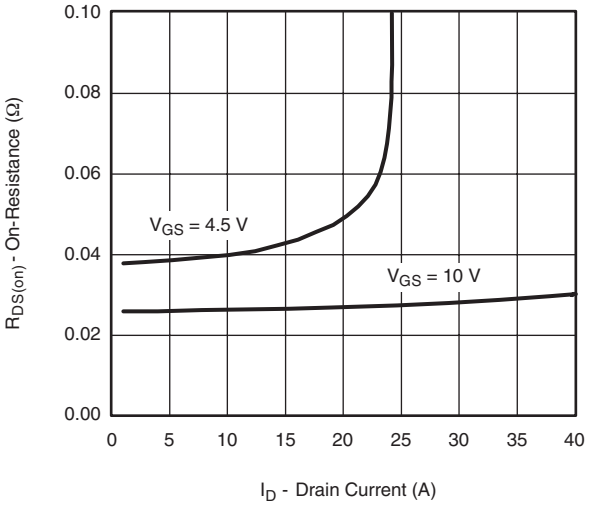
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



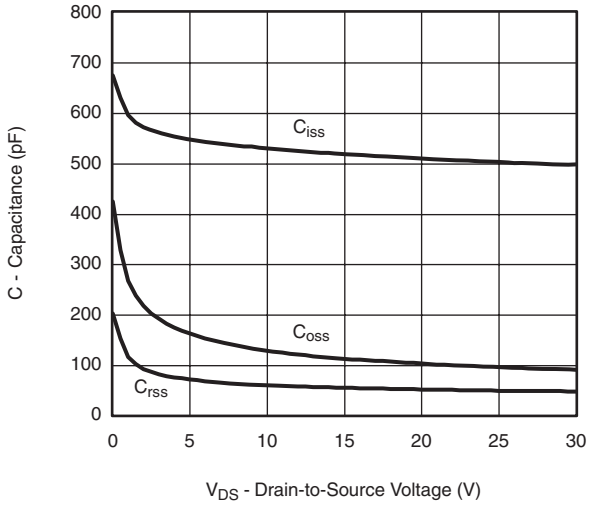
Output Characteristics



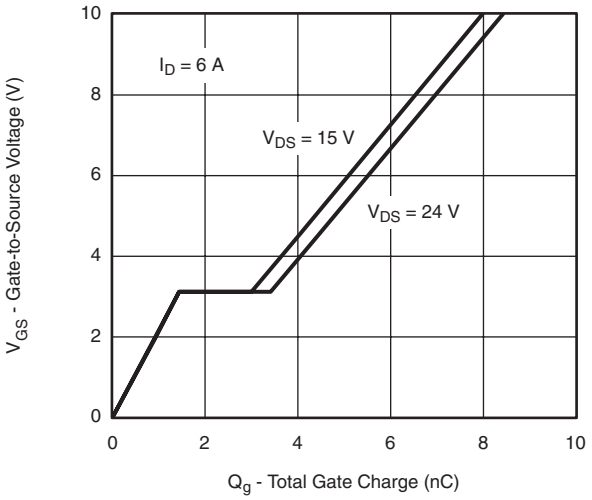
Transfer Characteristics



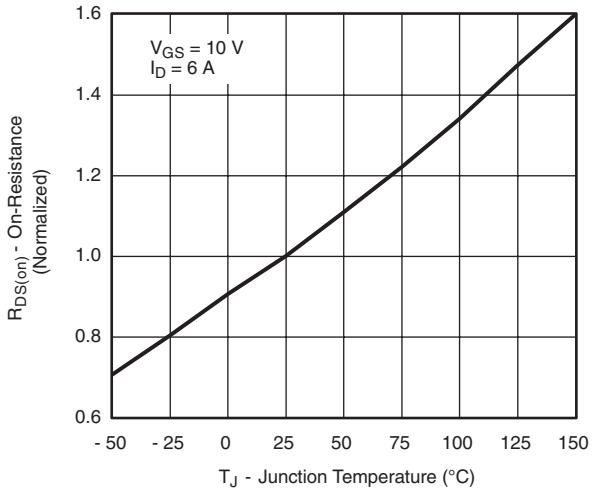
On-Resistance vs. Drain Current and Gate Voltage



Capacitance

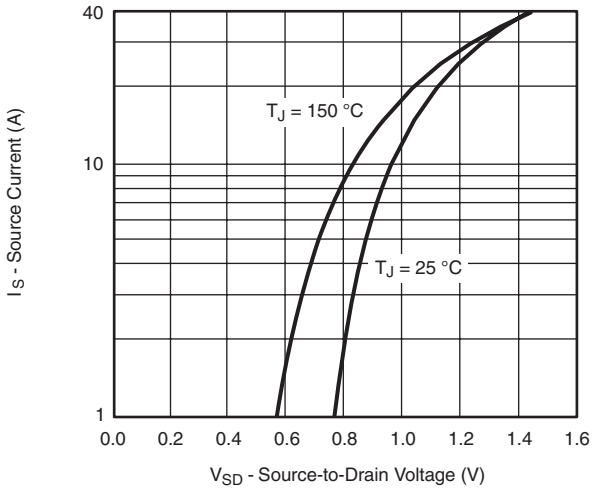


Gate Charge

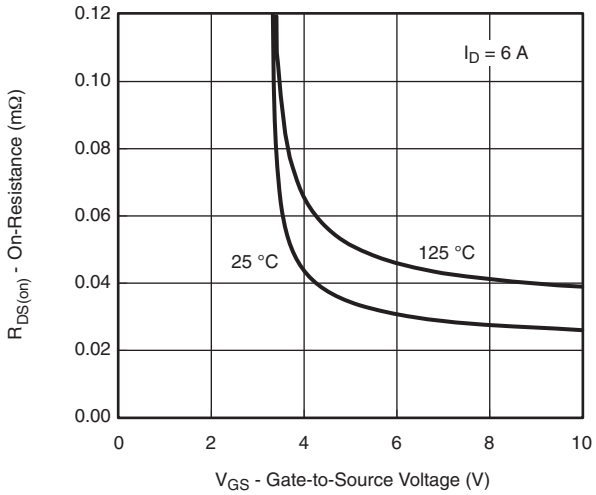


On-Resistance vs. Junction Temperature

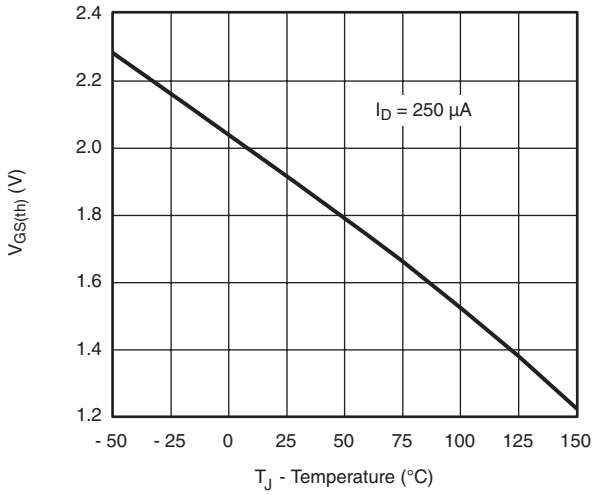
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



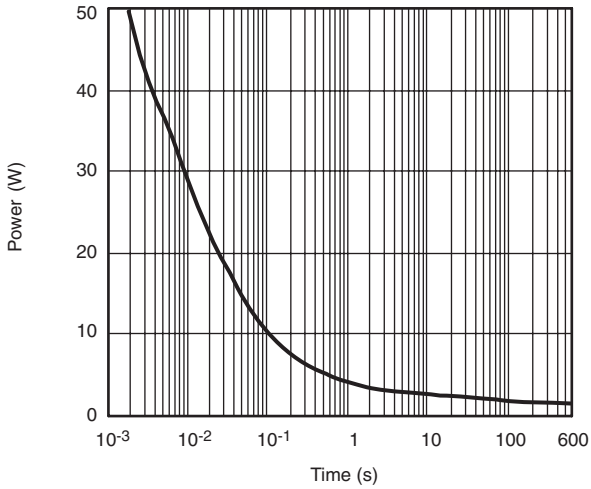
Source-Drain Diode Forward Voltage



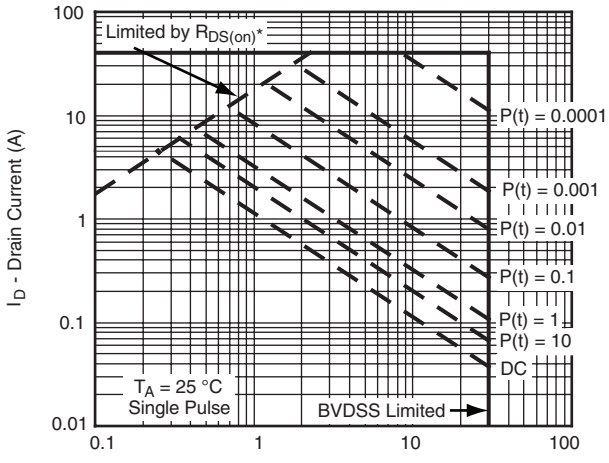
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



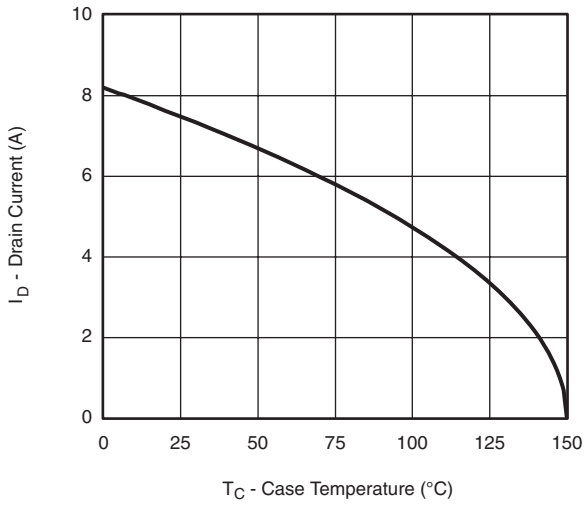
Single Pulse Power



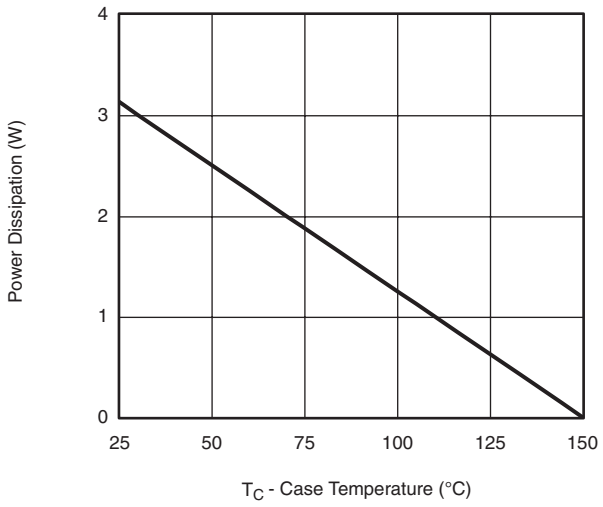
* V_{GS} > minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Ambient

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



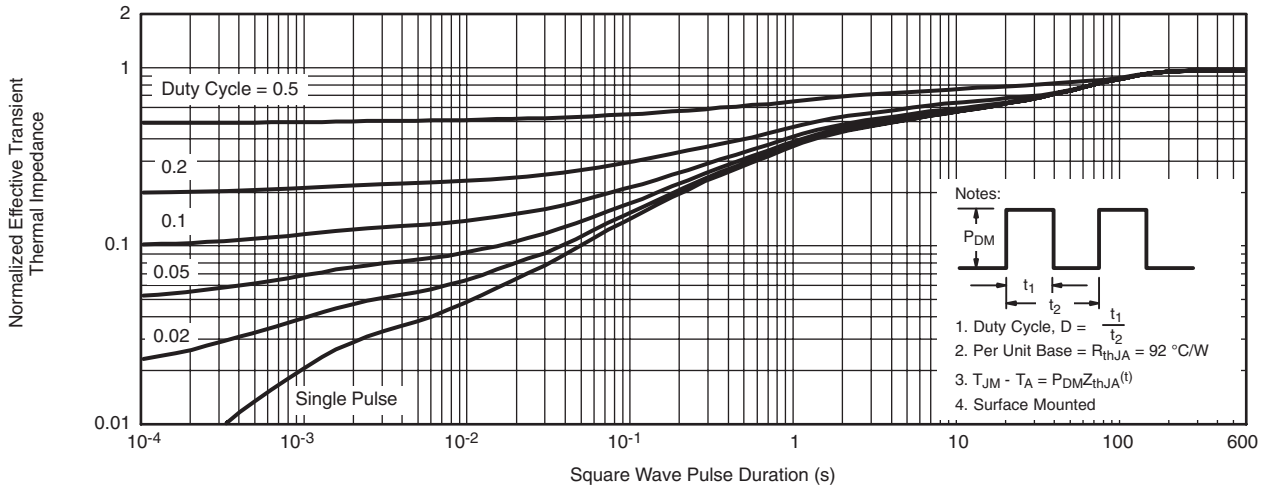
Current Derating*



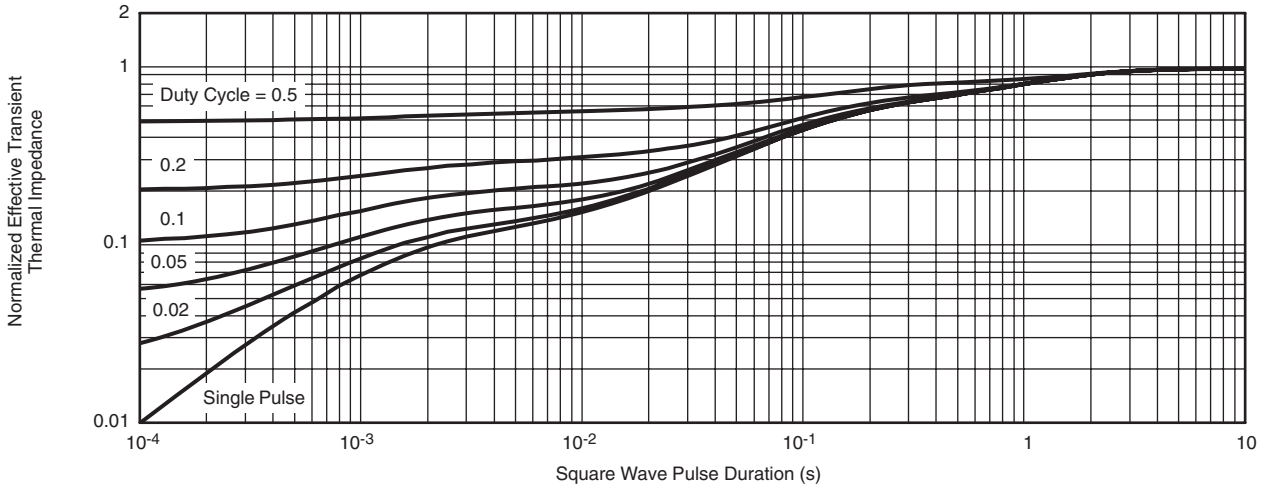
Power Derating

* 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

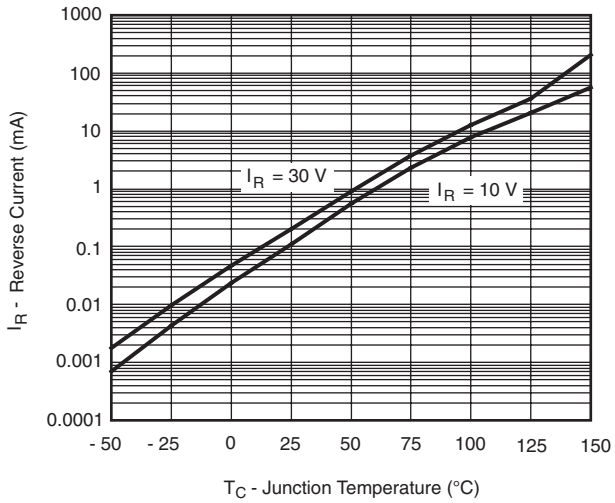


Normalized Thermal Transient Impedance, Junction-to-Ambient

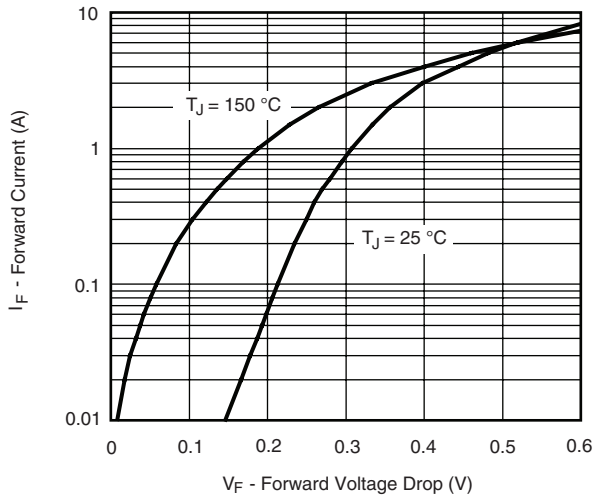


Normalized Thermal Transient Impedance, Junction-to-Foot

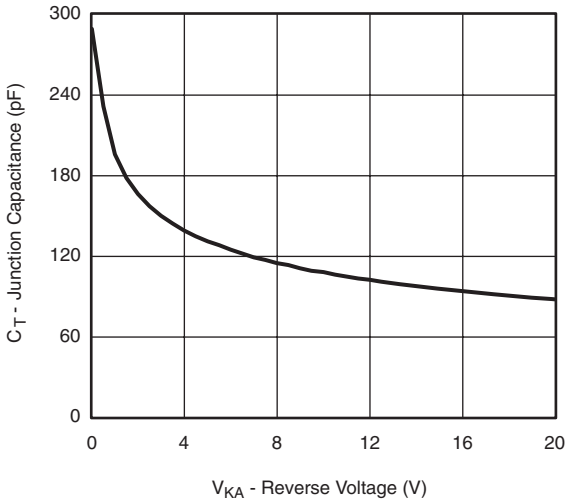
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



Reverse Current vs. Junction Temperature

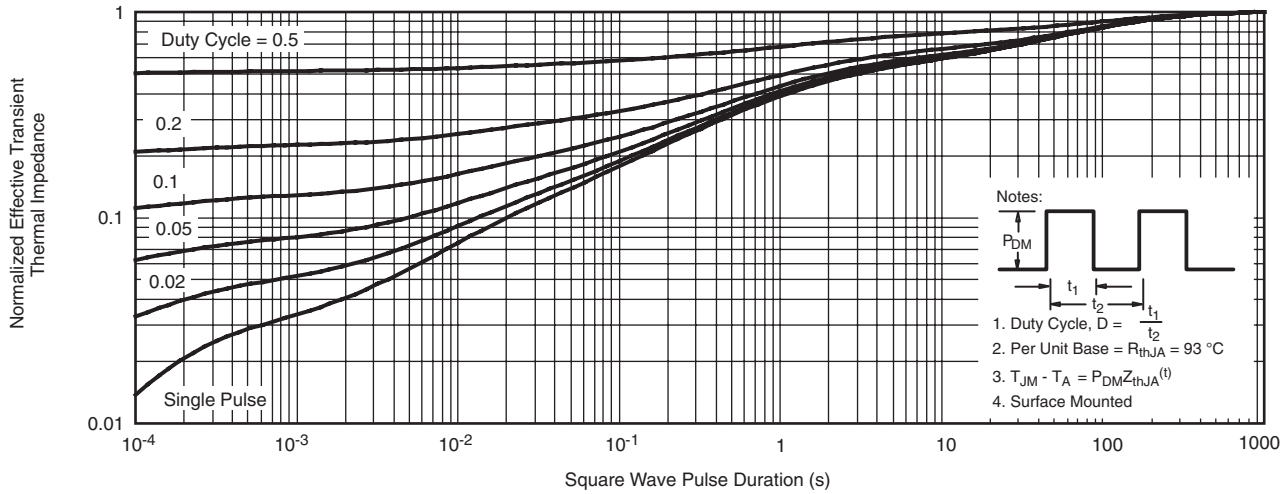


Forward Voltage Drop

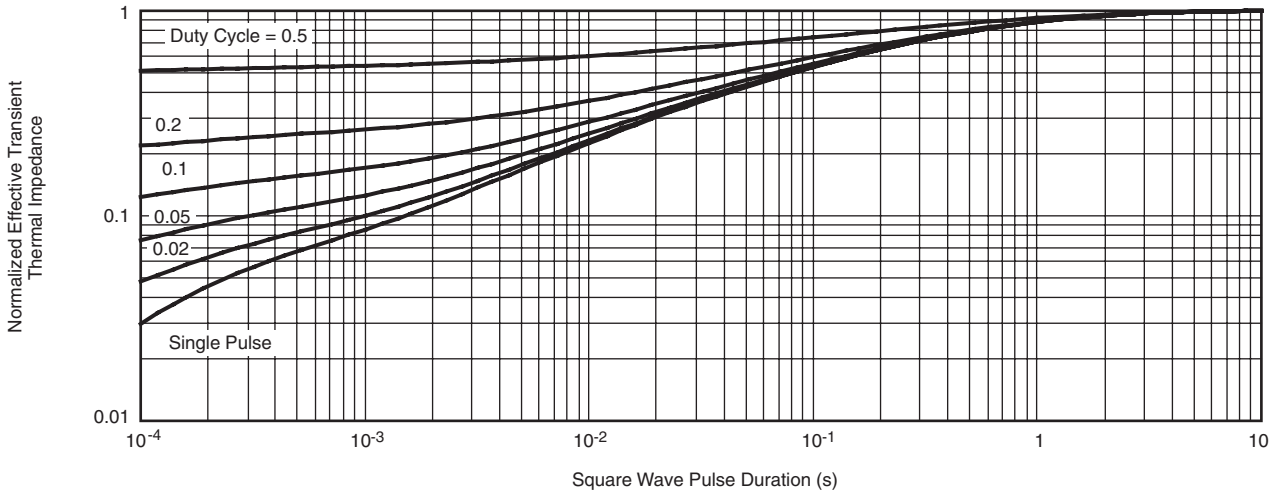


Capacitance

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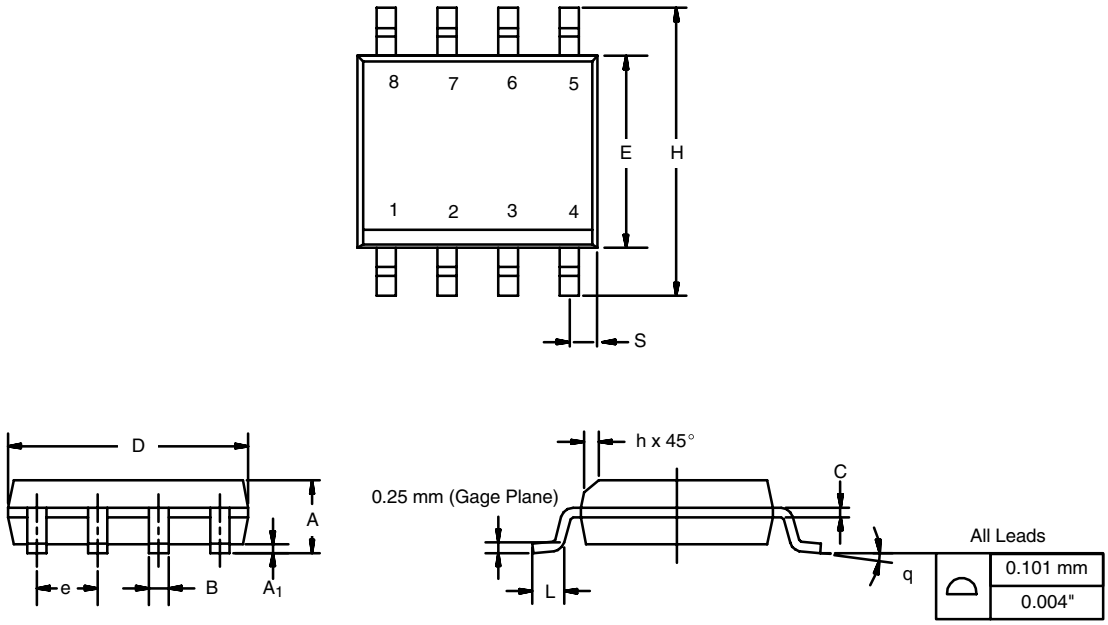
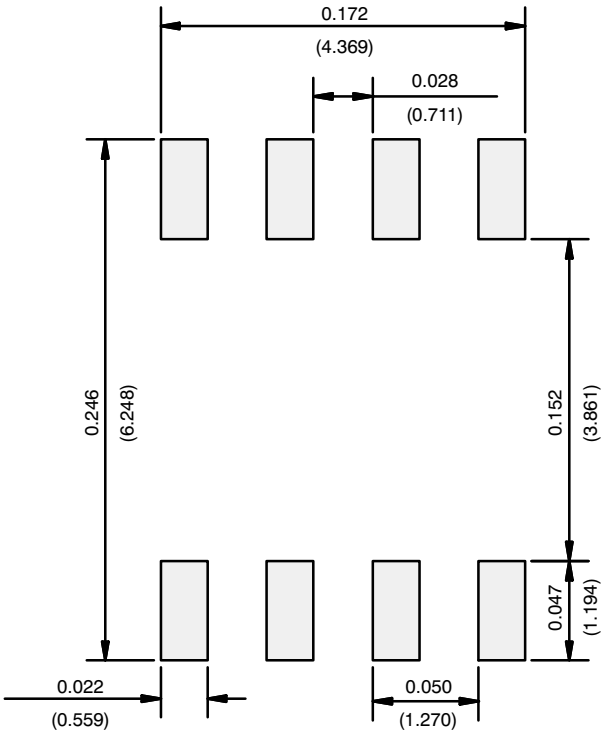
SOIC (NARROW): 8-LEAD
JEDEC Part Number: MS-012



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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