

P-Channel 20 V (D-S) MOSFET with Schottky Diode

PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A) ^d	Q_g (Typ.)
- 20	0.108 at $V_{GS} = -4.5$ V	- 4.1	4 nC
	0.175 at $V_{GS} = -2.5$ V	- 3.3	

SCHOTTKY PRODUCT SUMMARY

V_{KA} (V)	V_f (V) Diode Forward Voltage	I_F (A) ^a
30	0.5 at 1 A	2

FEATURES

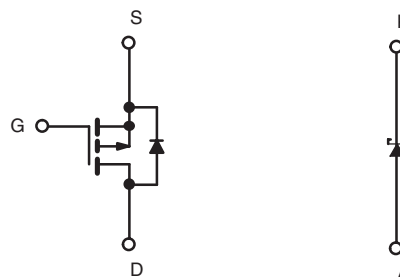
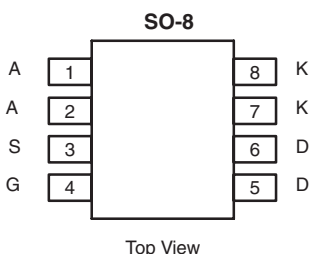
- Halogen-free According to IEC 61249-2-21 Definition
- LITTLE FOOT® Plus Schottky
- 100 % R_g Tested
- Compliant to RoHS Directive 2002/95/EC



RoHS
COMPLIANT
HALOGEN
FREE
Available

APPLICATIONS

- Portable Devices
- Ideal for Boost Circuits
- Ideal for Buck Circuits



Ordering Information: Si4823DY-T1-E3 (Lead (Pb)-free)
Si4823DY-T1-GE3 (Lead (Pb)-free and Halogen-free)

P-Channel MOSFET

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage (MOSFET)	V_{DS}	- 20	V
Reverse Voltage (Schottky)	V_{KA}	30	
Gate-Source Voltage (MOSFET)	V_{GS}	± 12	
Continuous Drain Current ($T_J = 150$ °C) (MOSFET)	I_D	$T_C = 25$ °C	A
		$T_C = 70$ °C	
		$T_A = 25$ °C	
		$T_A = 70$ °C	
Pulsed Drain Current (MOSFET)	I_{DM}	- 15	A
Continuous Source-Drain Diode Current (MOSFET Diode Conduction)	I_S	- 2.3	
		- 1.4 ^{b, c}	
Average Forward Current (Schottky)	I_F	- 2 ^b	A
Pulsed Forward Current (MOSFET)	I_{FM}	- 3	
Maximum Power Dissipation (MOSFET)	P_D	$T_C = 25$ °C	W
		$T_C = 70$ °C	
		$T_A = 25$ °C	
		$T_A = 70$ °C	
Maximum Power Dissipation (Schottky)	P_D	$T_C = 25$ °C	W
		$T_C = 70$ °C	
		$T_A = 25$ °C	
		$T_A = 70$ °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) ^{b, e}	R_{thJA}	60	71.5	°C/W
Maximum Junction-to-Foot (Drain) (MOSFET)	R_{thJF}	35	45	
Maximum Junction-to-Ambient (Schottky) ^{b, f}	R_{thJA}	63	78	
Maximum Junction-to-Foot (Drain) (Schottky)	R_{thJF}	39	47	

Notes:

- a. Package limited.
b. Surface mounted on 1" x 1" FR4 board.
c. $t = 10$ s.
d. Based on $T_C = 25$ °C.
e. Maximum under steady state conditions is 110 °C/W.
f. Maximum under steady state conditions 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}	$V_{GS} = 0\text{ V}$, $I_D = -250\text{ }\mu\text{A}$	- 20			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = -250\text{ }\mu\text{A}$		- 20		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			3		
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = -250\text{ }\mu\text{A}$	- 0.6		- 1.5	V
Gate-Source Leakage	I_{GSS}	$V_{DS} = 0\text{ V}$, $V_{GS} = \pm 12\text{ V}$			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = -20\text{ V}$, $V_{GS} = 0\text{ V}$			- 1	μA
		$V_{DS} = -20\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 55\text{ }^\circ\text{C}$			- 10	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \leq 5\text{ V}$, $V_{GS} = -4.5\text{ V}$	- 15			A
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = -4.5\text{ V}$, $I_D = -3.3\text{ A}$		0.090	0.108	Ω
		$V_{GS} = -2.5\text{ V}$, $I_D = -2.6\text{ A}$		0.140	0.175	
Forward Transconductance ^a	g_{fs}	$V_{DS} = -10\text{ V}$, $I_D = -3.3\text{ A}$		6		S
Dynamic ^b						
Input Capacitance	C_{iss}	$V_{DS} = -10\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1\text{ MHz}$		330	660	pF
Output Capacitance	C_{oss}			80	160	
Reverse Transfer Capacitance	C_{rss}			57	114	
Total Gate Charge	Q_g	$V_{DS} = -10\text{ V}$, $V_{GS} = -10\text{ V}$, $I_D = -3.3\text{ A}$		8	12	nC
		$V_{DS} = -10\text{ V}$, $V_{GS} = -4.5\text{ V}$, $I_D = -3.3\text{ A}$		4	6	
Q_{gs}			0.8			
Q_{gd}			1.4			
Gate Resistance	R_g	$f = 1\text{ MHz}$	1.2	6	12	Ω
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -10\text{ V}$, $R_L = 3.8\text{ }\Omega$ $I_D \cong -2.6\text{ A}$, $V_{GEN} = -10\text{ V}$, $R_g = 1\text{ }\Omega$		3	6	ns
Rise Time	t_r			10	20	
Turn-Off DelayTime	$t_{d(off)}$			16	24	
Fall Time	t_f			8	15	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -10\text{ V}$, $R_L = 3.8\text{ }\Omega$ $I_D \cong -2.6\text{ A}$, $V_{GEN} = -4.5\text{ V}$, $R_g = 1\text{ }\Omega$		18	27	
Rise Time	t_r			40	60	
Turn-Off DelayTime	$t_{d(off)}$			18	27	
Fall Time	t_f			10	15	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	$T_C = 25\text{ }^\circ\text{C}$			- 6.2	A
Pulse Diode Forward Current	I_{SM}				- 15	
Body Diode Voltage	V_{SD}	$I_S = -2.6\text{ A}$, $V_{GS} = 0\text{ V}$		- 0.8	- 1.2	V
Body Diode Reverse Recovery Time	t_{rr}	$I_F = -2.6\text{ A}$, $dI/dt = 100\text{ A}/\mu\text{s}$, $T_J = 25\text{ }^\circ\text{C}$		23	35	ns
Body Diode Reverse Recovery Charge	Q_{rr}			14	21	nC
Reverse Recovery Fall Time	t_a			11		ns
Reverse Recovery Rise Time	t_b			12		

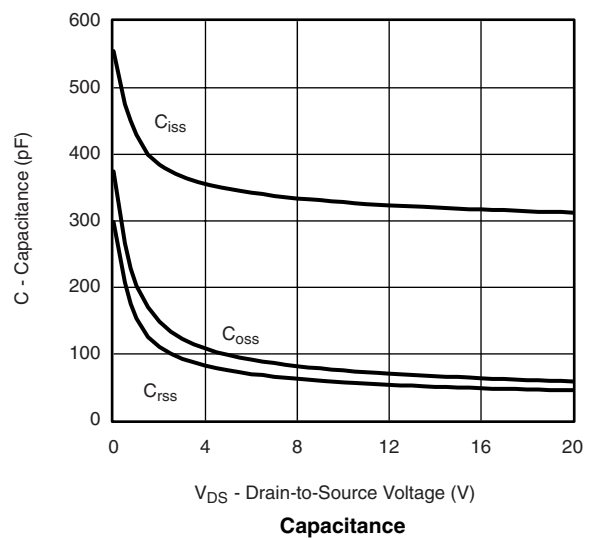
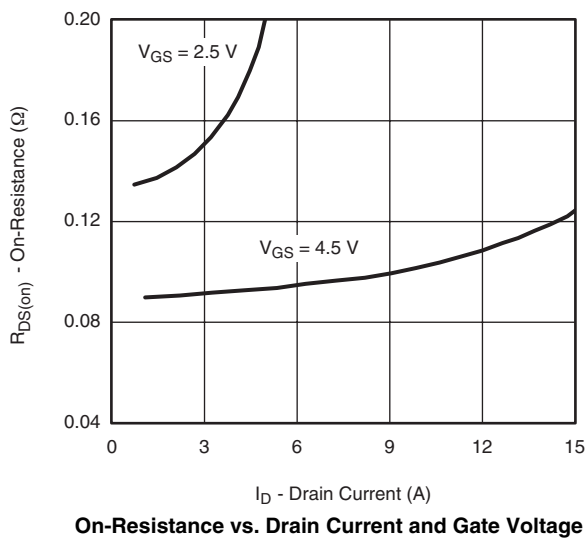
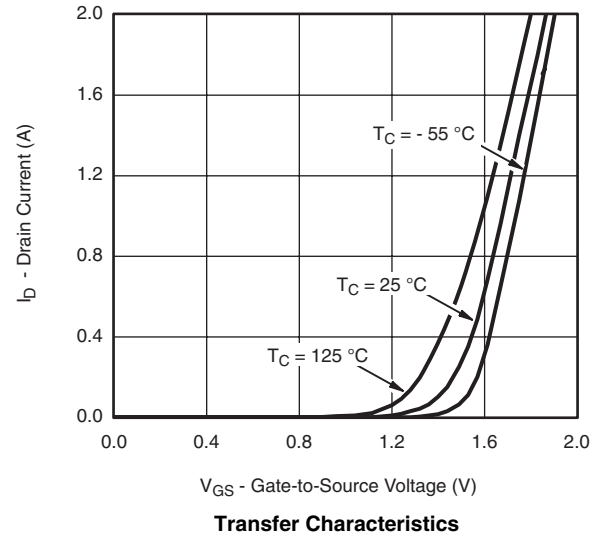
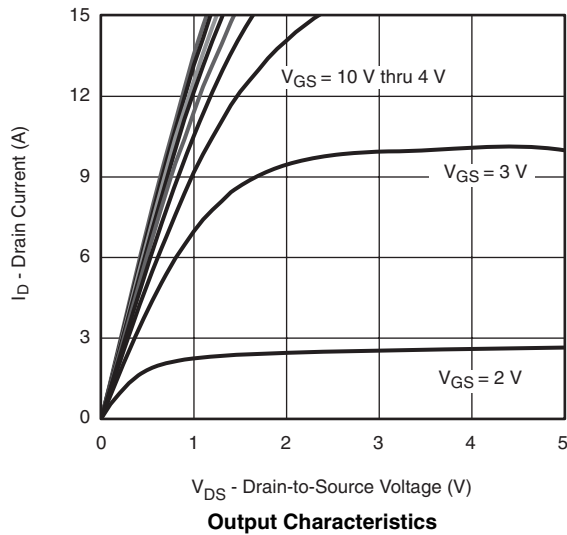
Notes:

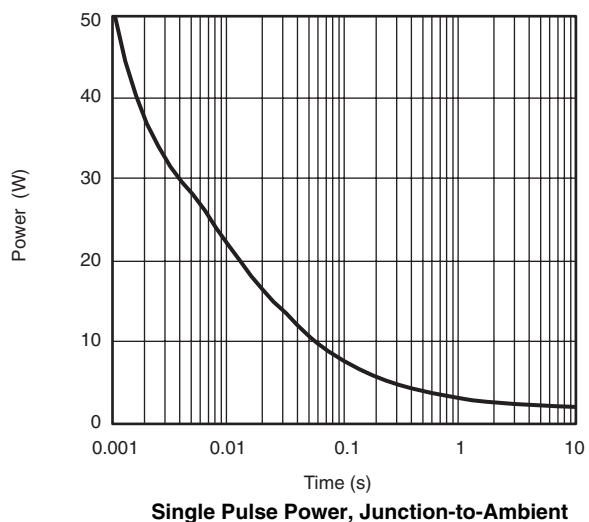
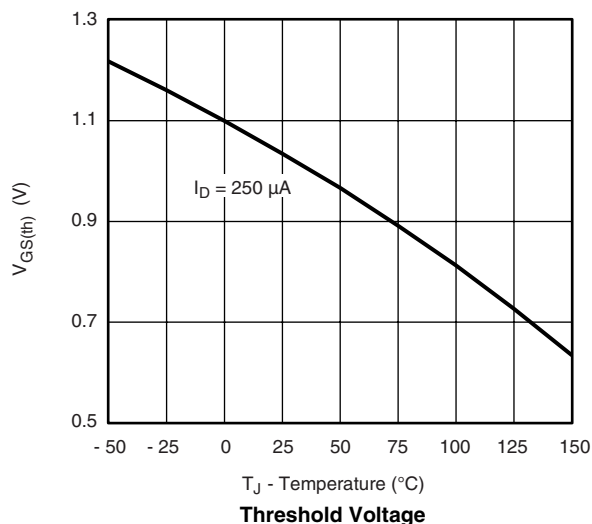
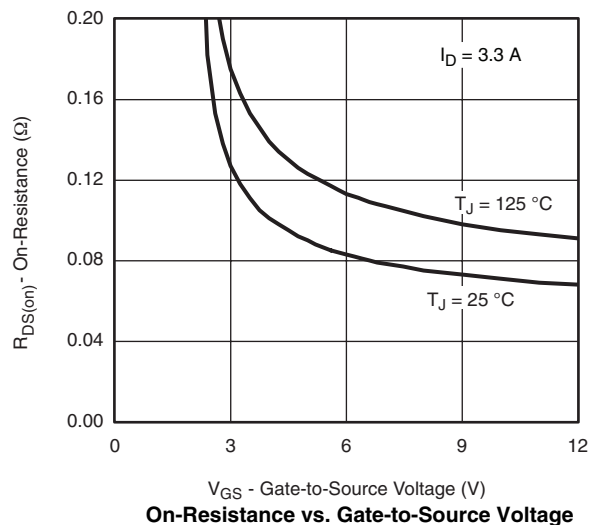
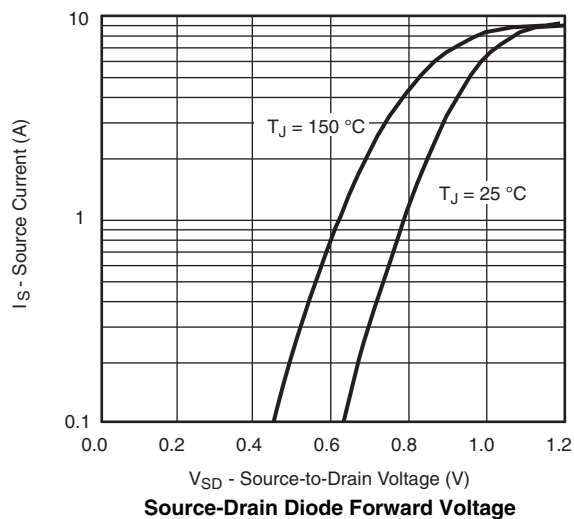
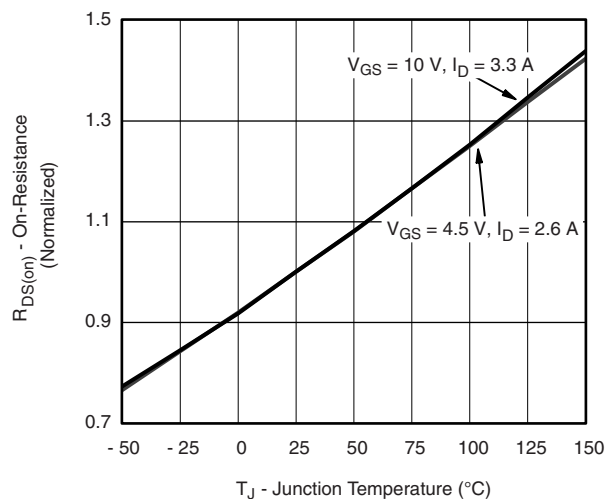
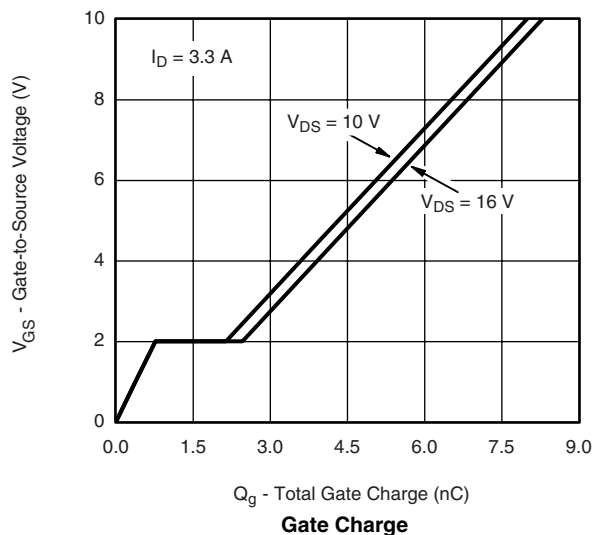
- a. Pulse test; pulse width ≤ 300 μ s, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.

SCHOTTKY SPECIFICATIONS $T_J = 25\text{ }^{\circ}\text{C}$, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Forward Voltage Drop	V_F	$I_F = 1\text{ A}$		0.46	0.50	V
		$I_F = 1\text{ A}, T_J = 125\text{ }^{\circ}\text{C}$		0.41	0.50	
Maximum Reverse Leakage Current	I_{rm}	$V_R = 30\text{ V}$		0.025	0.1	mA
		$V_R = 30\text{ V}, T_J = 85\text{ }^{\circ}\text{C}$		0.6	6	
		$V_R = 30\text{ V}, T_J = 125\text{ }^{\circ}\text{C}$		5	25	
Junction Capacitance	C_T	$V_R = 15\text{ V}$		35		pF

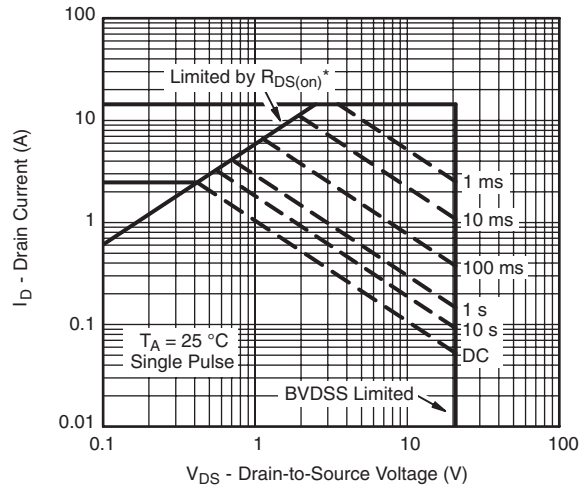
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

MOSFET TYPICAL CHARACTERISTICS $T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise noted



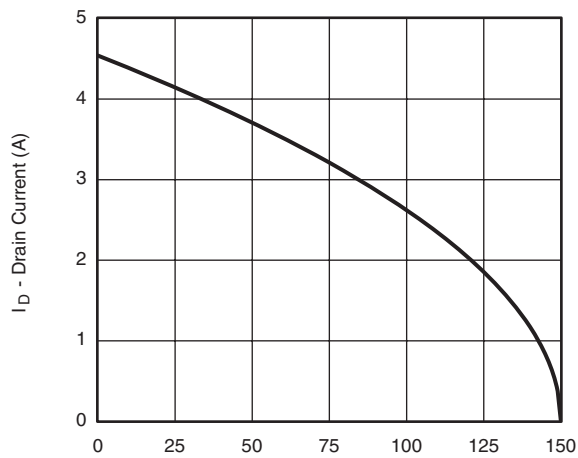
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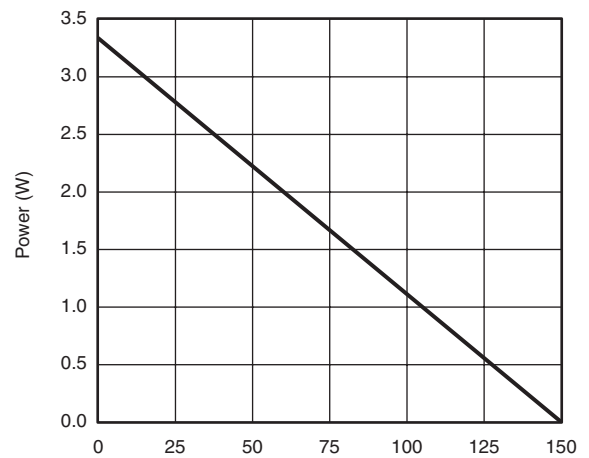


* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

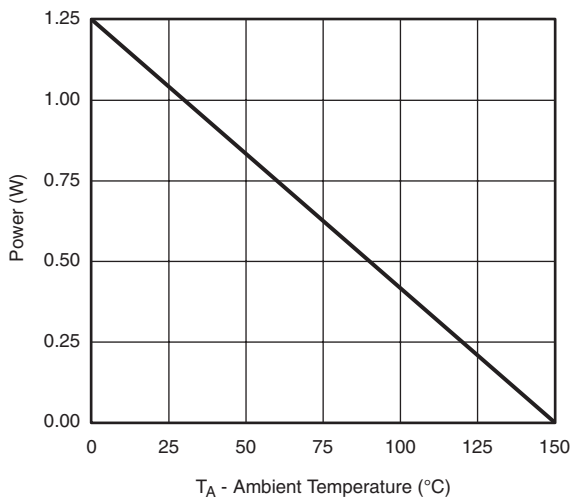
Safe Operating Area, Junction-to-Ambient



Current Derating*

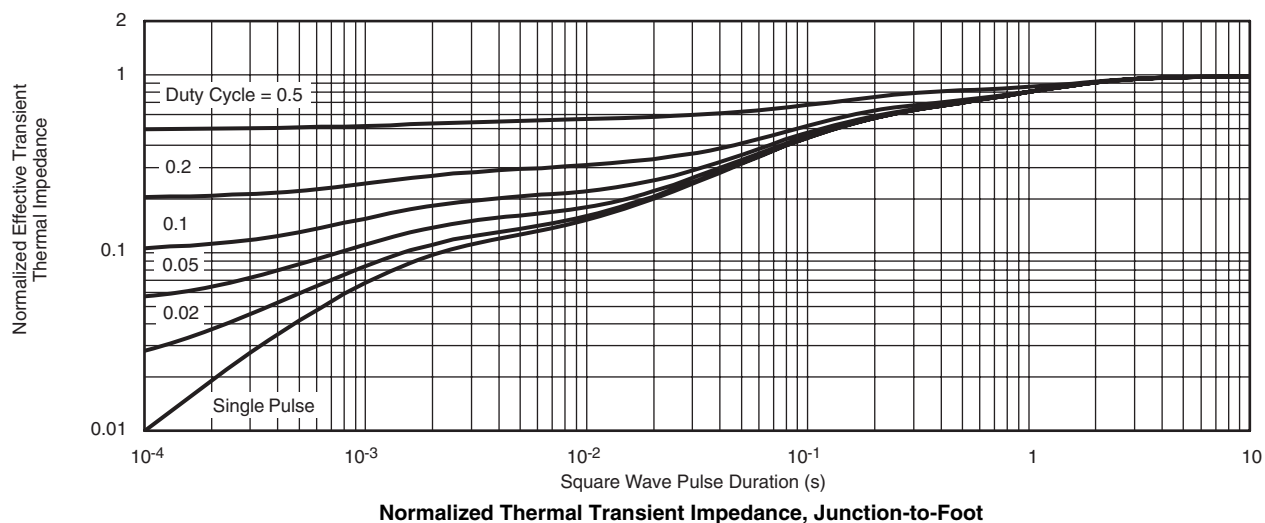
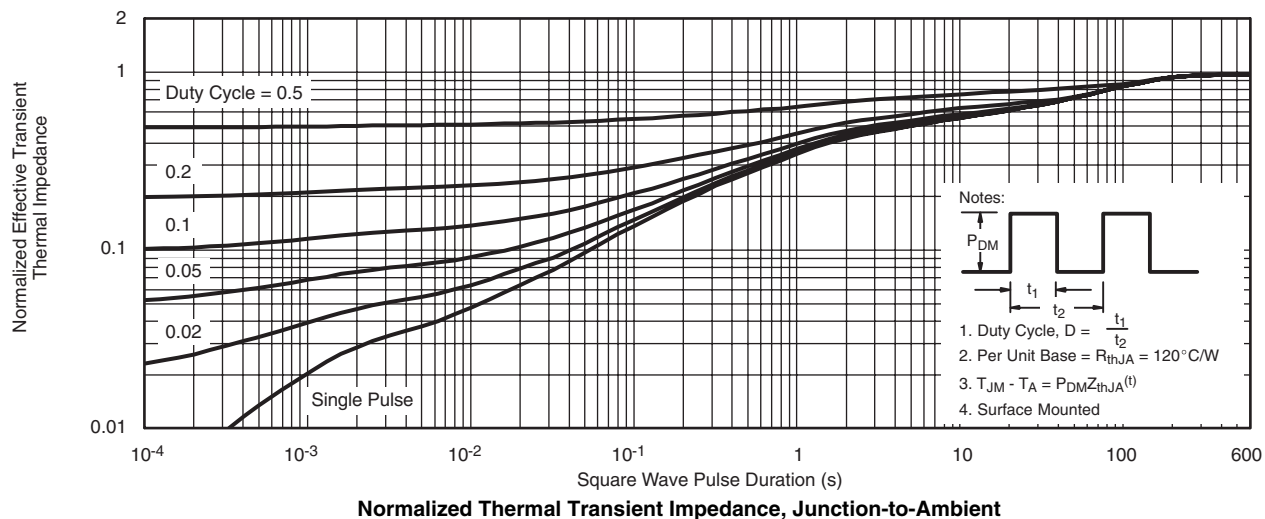


Power Derating, Junction-to-Case

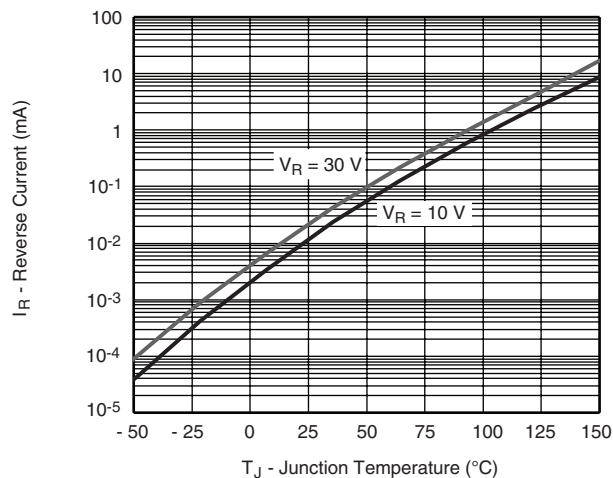


Power Derating, Junction-to-Ambient

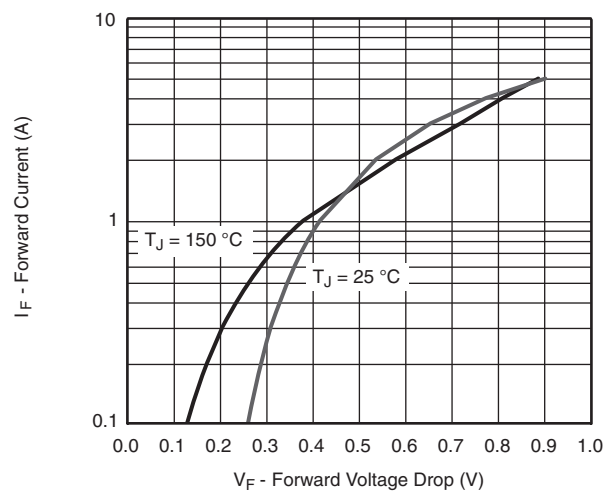
* The power dissipation P_D is based on $T_{J(max)} = 150^\circ\text{C}$, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the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

MOSFET TYPICAL CHARACTERISTICS $T_A = 25^\circ\text{C}$, unless otherwise noted


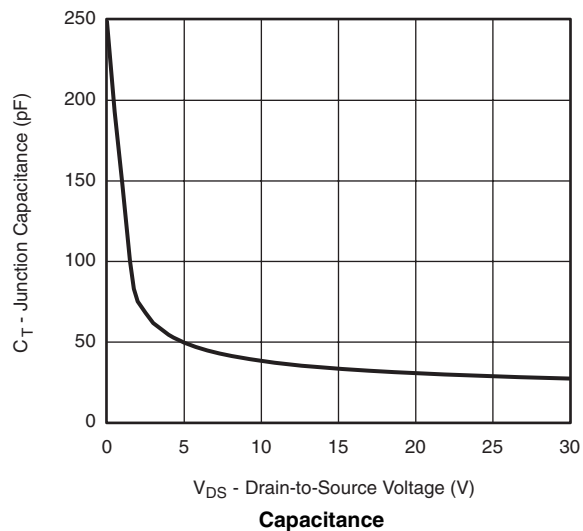
SCHOTTKY TYPICAL CHARACTERISTICS $T_A = 25^\circ\text{C}$, unless otherwise noted



Reverse Current vs. Junction Temperature

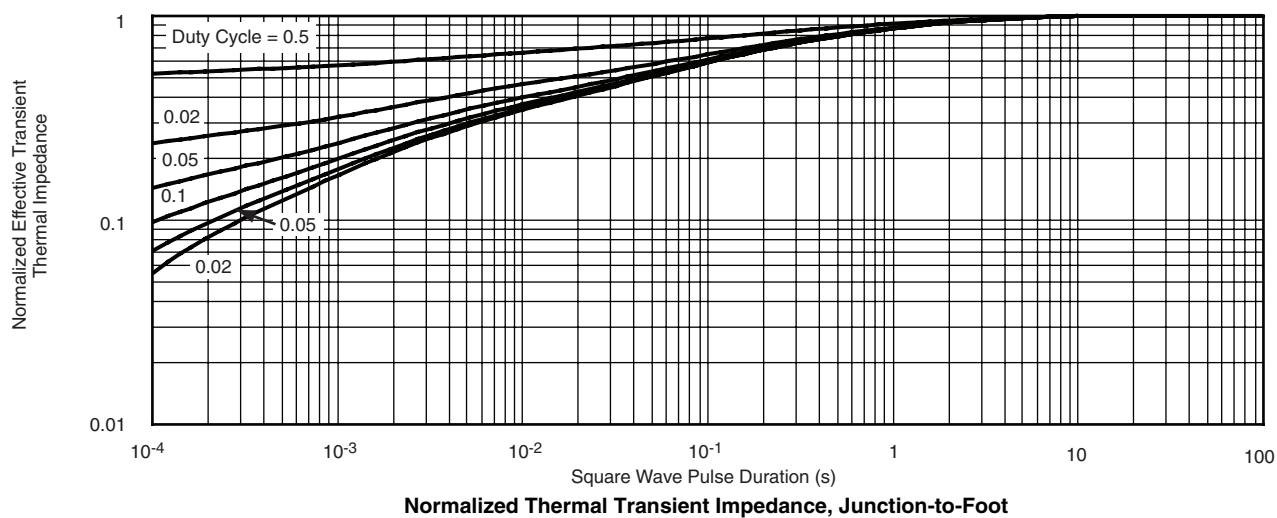
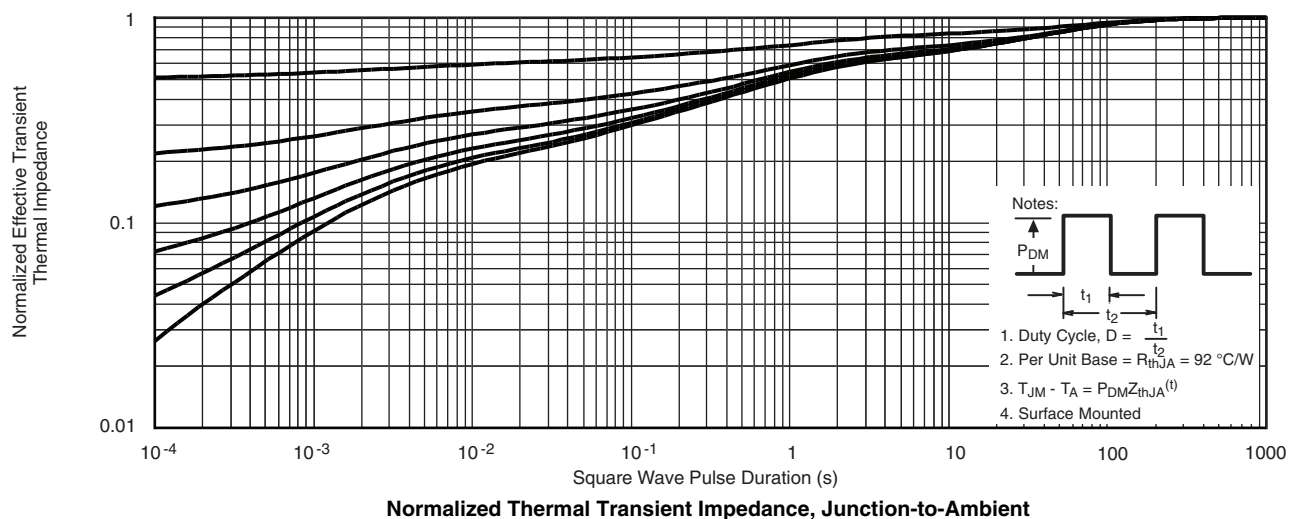


Forward Voltage Drop



Capacitance

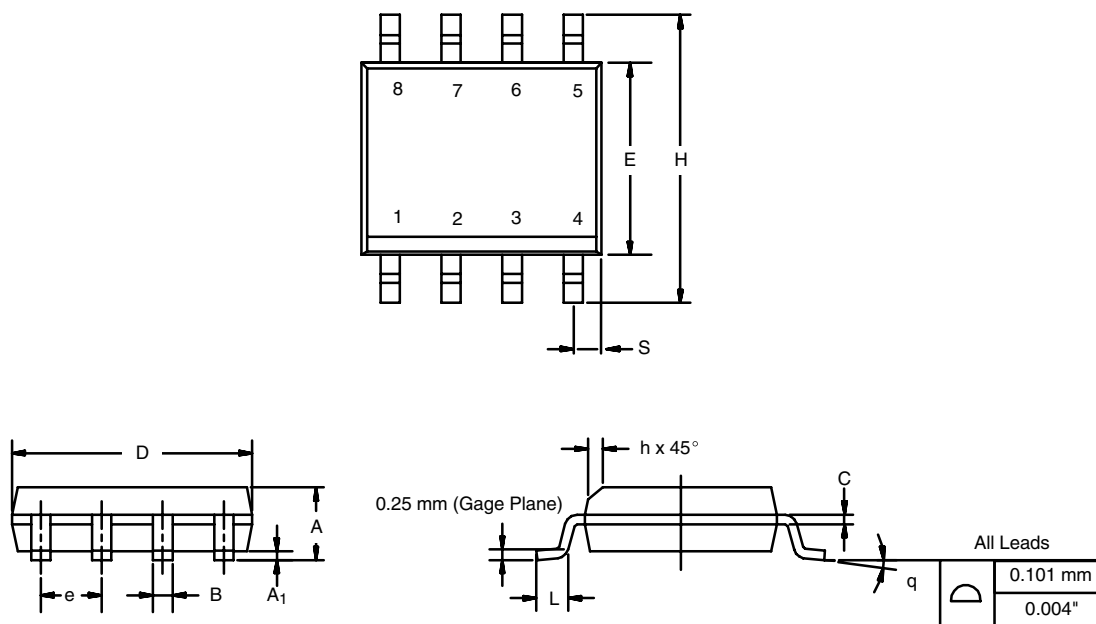
SCHOTTKY TYPICAL CHARACTERISTICS $T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise noted



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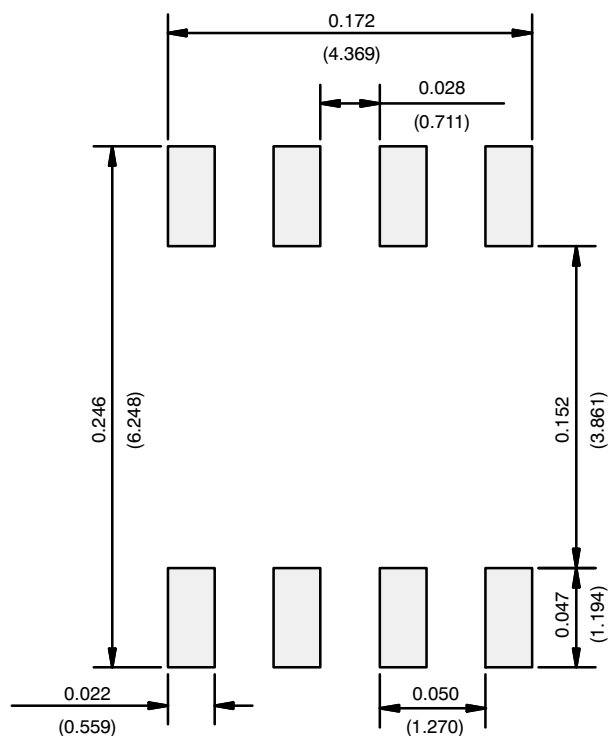
SOIC (NARROW): 8-LEAD

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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