

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

PRODUCT SUMMARY			
$V_{DS}$ (V)	$R_{DS(on)}$ ( $\Omega$ )	$I_D$ (A) <sup>d</sup>	$Q_g$ (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) <sup>a</sup>
30	0.5 at 1 A	2

### FEATURES

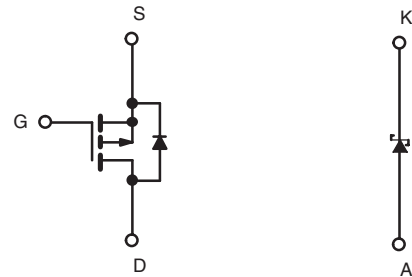
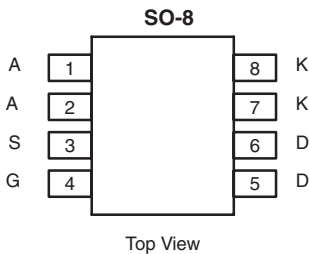
- Halogen-free According to IEC 61249-2-21 Definition
- LITTLE FOOT® Plus Schottky
- 100 %  $R_g$  Tested
- Compliant to RoHS Directive 2002/95/EC



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**  
Available

### APPLICATIONS

- Portable Devices
- Ideal for Boost Circuits
- Ideal for Book 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)	$V_{GS}$	$\pm 12$		
Continuous Drain Current ( $T_J = 150$ °C) (MOSFET)	$I_D$	$T_C = 25$ °C	- 4.1	
		$T_C = 70$ °C	- 3.3	
		$T_A = 25$ °C	- 3.3 <sup>b, c</sup>	
		$T_A = 70$ °C	- 2.6 <sup>b, c</sup>	
Pulsed Drain Current (MOSFET)	$I_{DM}$	- 15	A	
Continuous Source-Drain Diode Current (MOSFET Diode Conduction)	$I_S$	$T_C = 25$ °C		- 2.3
		$T_A = 25$ °C		- 1.4 <sup>b, c</sup>
Average Forward Current (Schottky)	$I_F$	- 2 <sup>b</sup>	A	
Pulsed Forward Current (MOSFET)	$I_{FM}$	- 3		
Maximum Power Dissipation (MOSFET)	$P_D$	$T_C = 25$ °C	2.8	
		$T_C = 70$ °C	1.8	
		$T_A = 25$ °C	1.7 <sup>b, c</sup>	
		$T_A = 70$ °C	1.1 <sup>b, c</sup>	
Maximum Power Dissipation (Schottky)	$P_D$	$T_C = 25$ °C	2.7	
		$T_C = 70$ °C	1.7	
		$T_A = 25$ °C	1.6 <sup>b, c</sup>	
		$T_A = 70$ °C	1.0 <sup>b, c</sup>	
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) <sup>b, e</sup>	$R_{thJA}$	60	71.5	°C/W
Maximum Junction-to-Foot (Drain) (MOSFET)	$R_{thJF}$	35	45	
Maximum Junction-to-Ambient (Schottky) <sup>b, f</sup>	$R_{thJA}$	63	78	
Maximum Junction-to-Foot (Drain) (Schottky)	$R_{thJF}$	39	47	

## Notes:

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

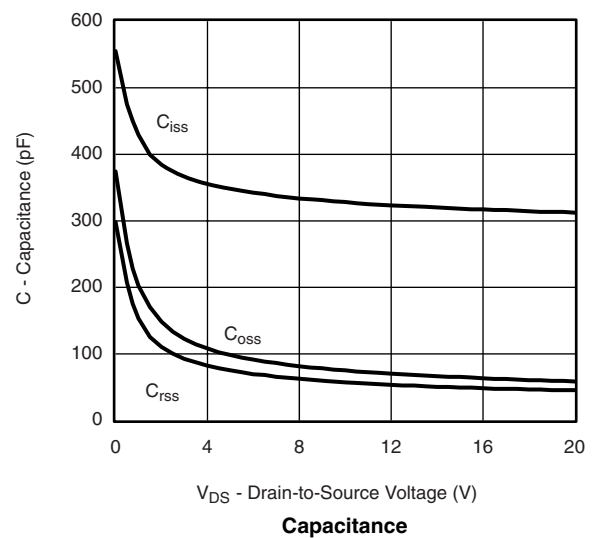
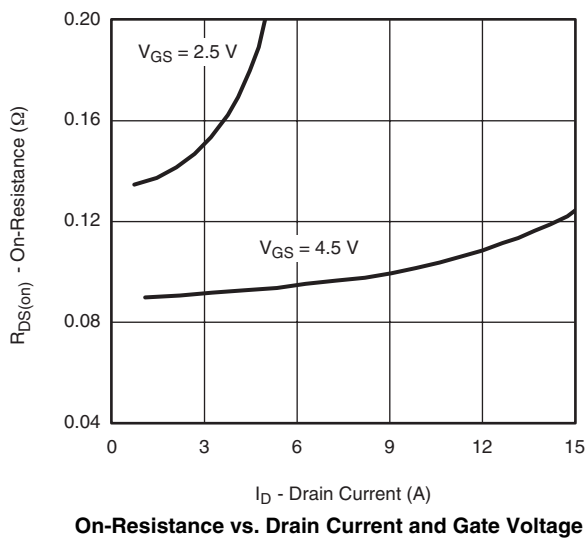
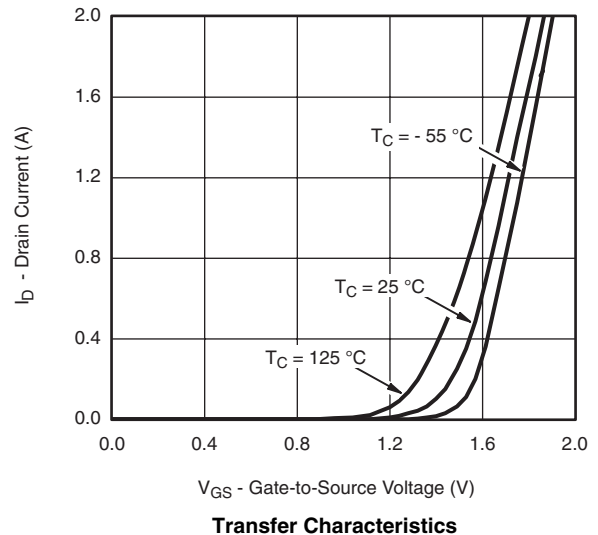
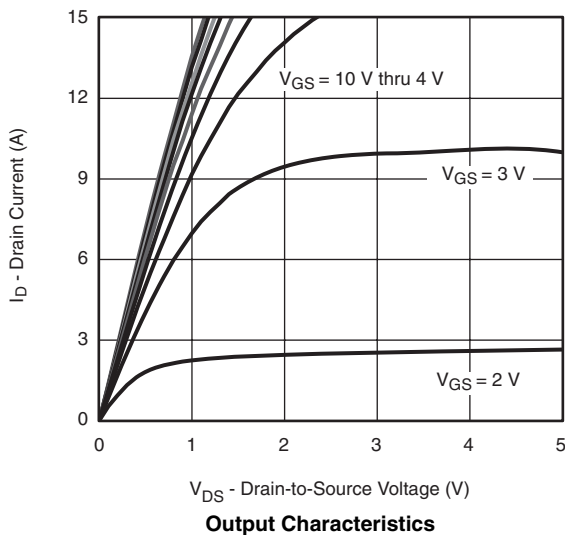
## Notes:

- Pulse test; pulse width  $\leq 300$   $\mu$ s, duty cycle  $\leq 2$  %.
- Guaranteed by design, not subject to production testing.

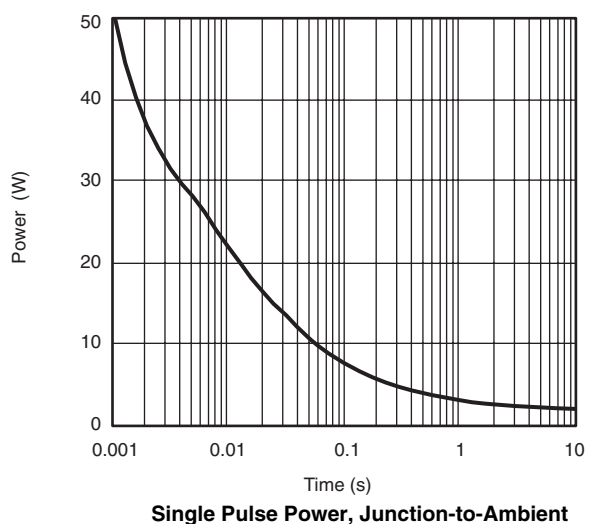
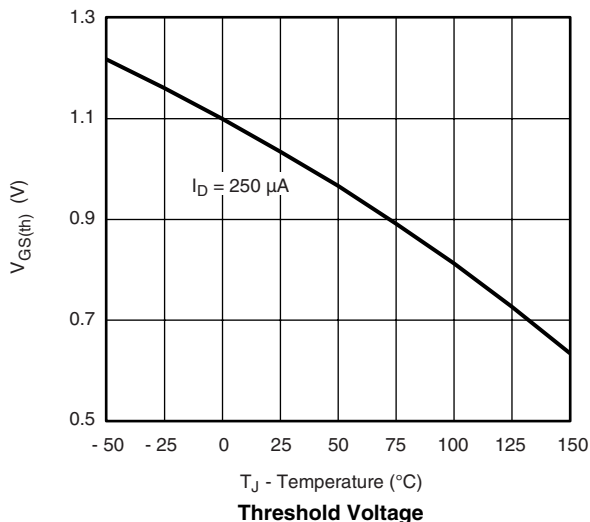
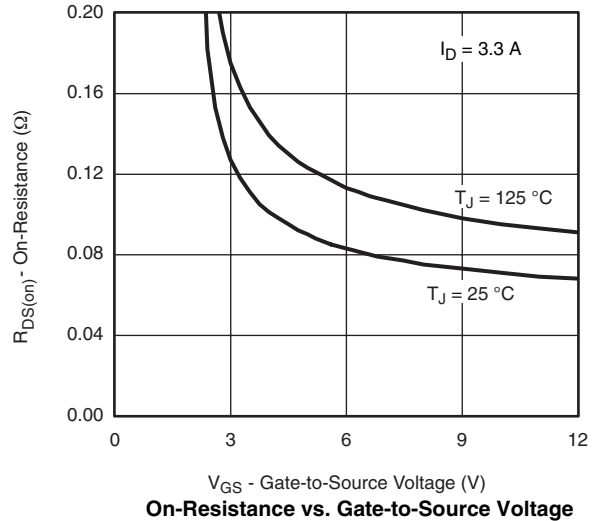
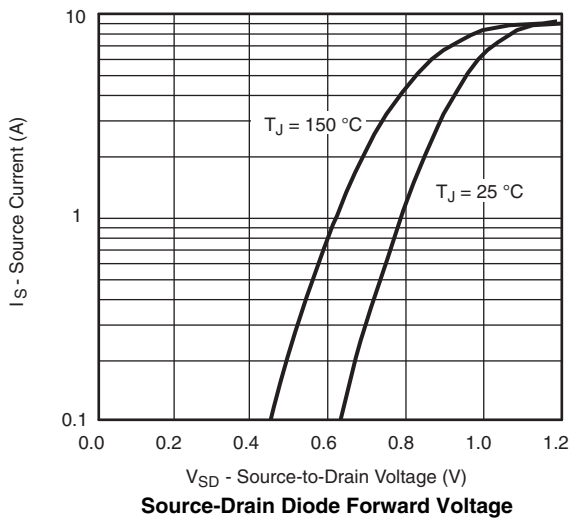
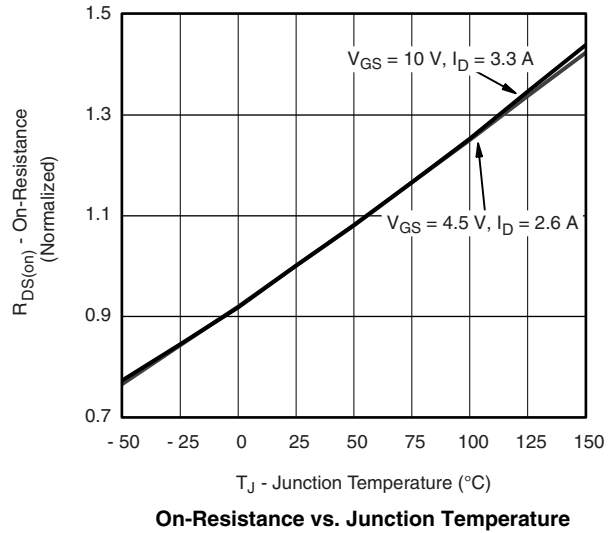
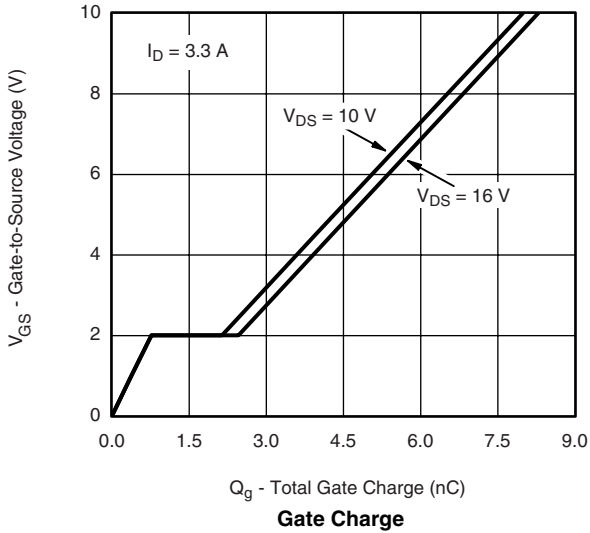
SCHOTTKY SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Forward Voltage Drop	$V_F$	$I_F = 1\text{ A}$		0.46	0.50	V
		$I_F = 1\text{ A}, T_J = 125\text{ }^\circ\text{C}$		0.41	0.50	
Maximum Reverse Leakage Current	$I_{rm}$	$V_R = 30\text{ V}$		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.

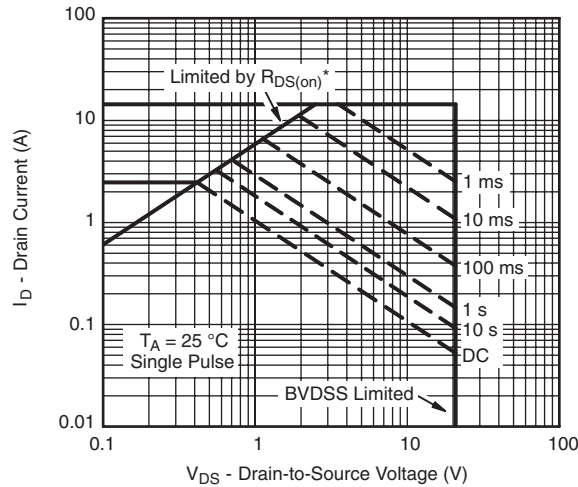
## MOSFET TYPICAL CHARACTERISTICS $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise noted



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

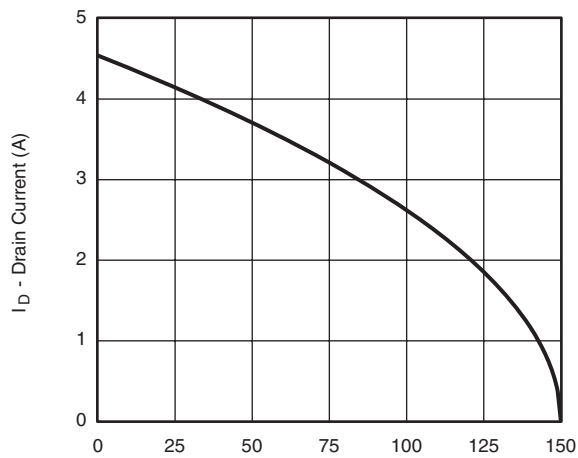


**MOSFET TYPICAL CHARACTERISTICS**  $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise noted



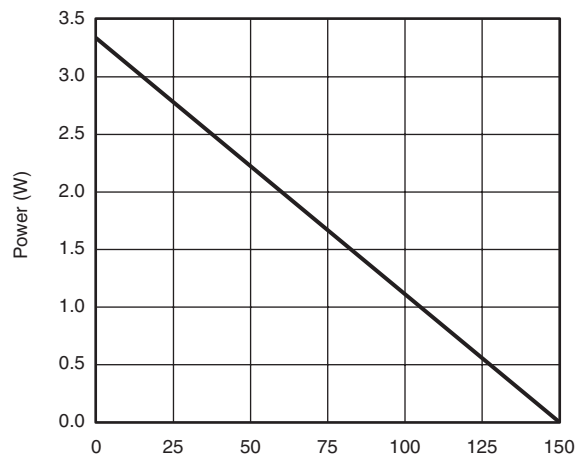
\*  $V_{GS} >$  minimum  $V_{GS}$  at which  $R_{DS(on)}$  is specified

**Safe Operating Area, Junction-to-Ambient**



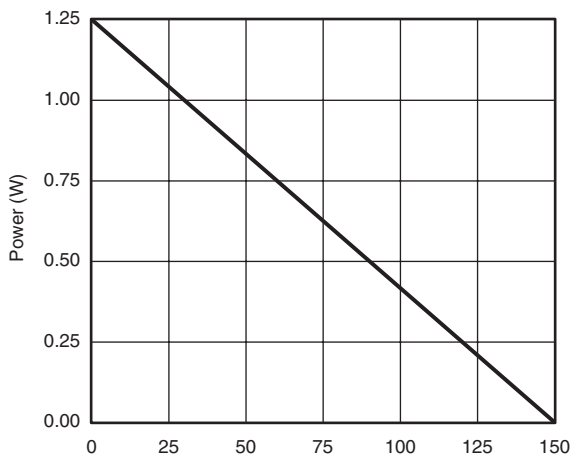
$T_C$  - Case Temperature ( $^\circ\text{C}$ )

**Current Derating\***



$T_C$  - Case Temperature ( $^\circ\text{C}$ )

**Power Derating, Junction-to-Case**

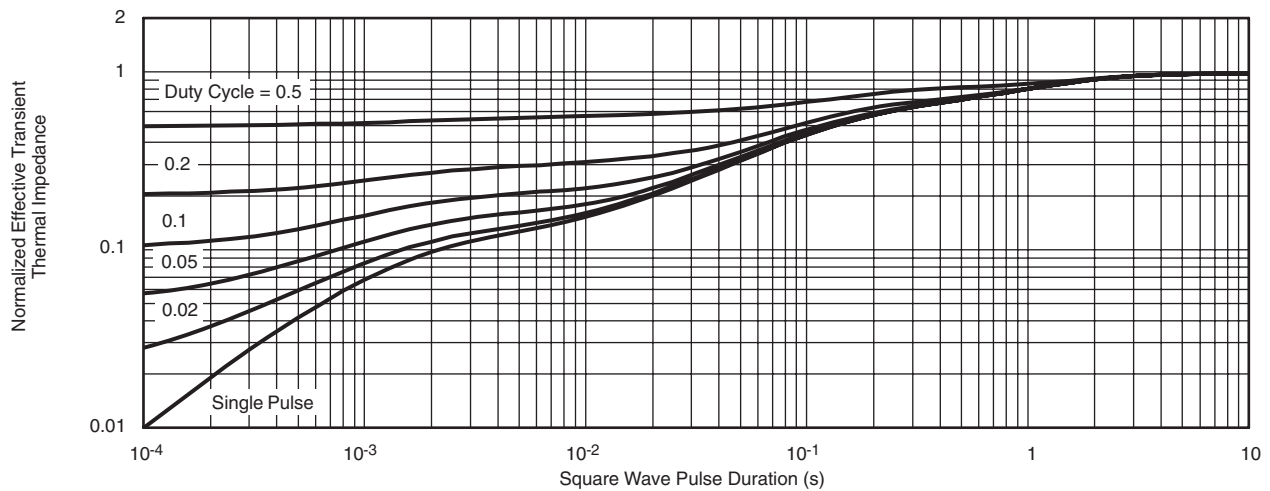
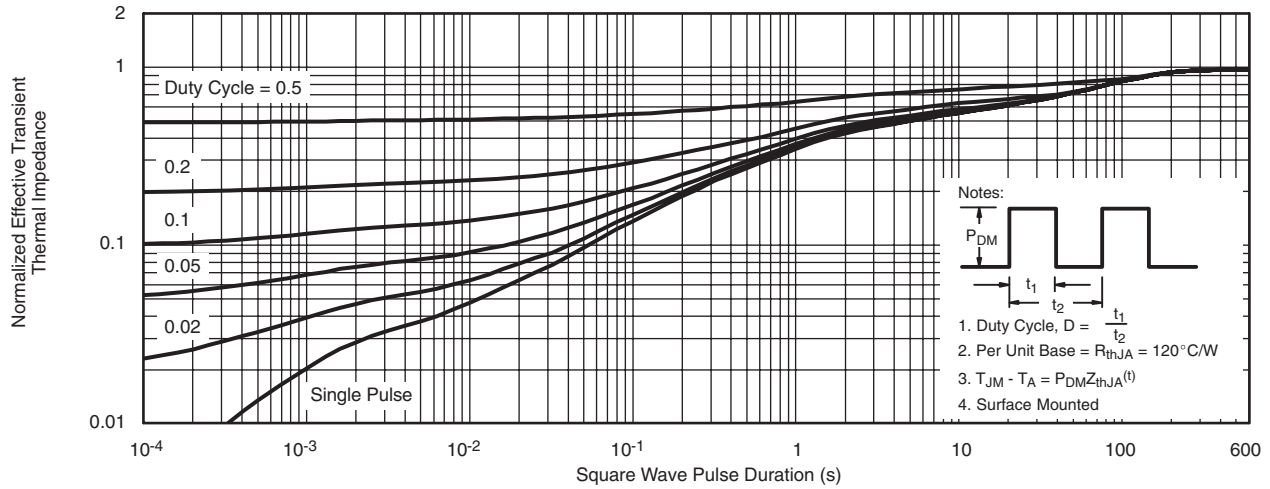


$T_A$  - Ambient Temperature ( $^\circ\text{C}$ )

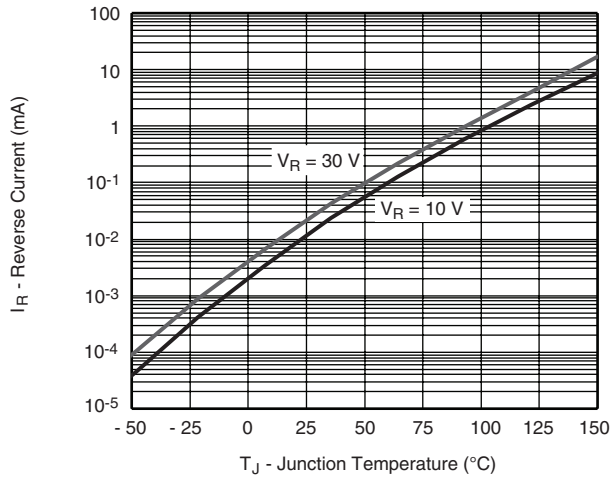
**Power Derating, Junction-to-Ambient**

\* The power dissipation  $P_D$  is based on  $T_{J(max)} = 150\text{ }^\circ\text{C}$ , 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.

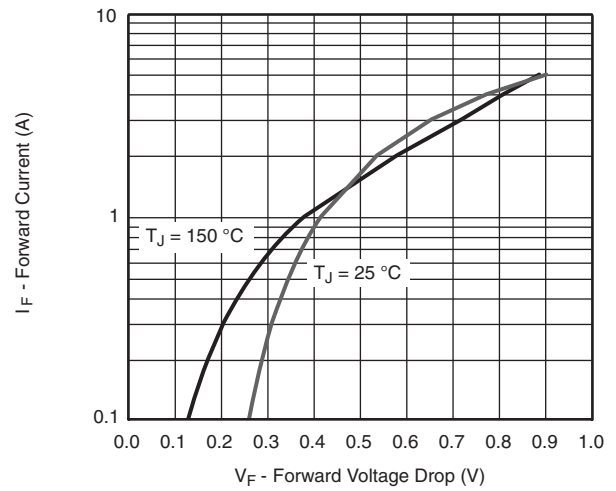
**MOSFET TYPICAL CHARACTERISTICS**  $T_A = 25^\circ\text{C}$ , unless otherwise noted



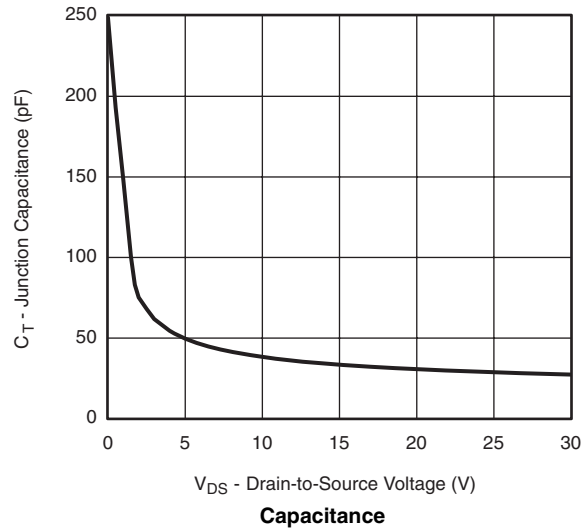
**SCHOTTKY TYPICAL CHARACTERISTICS**  $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise noted



**Reverse Current vs. Junction Temperature**

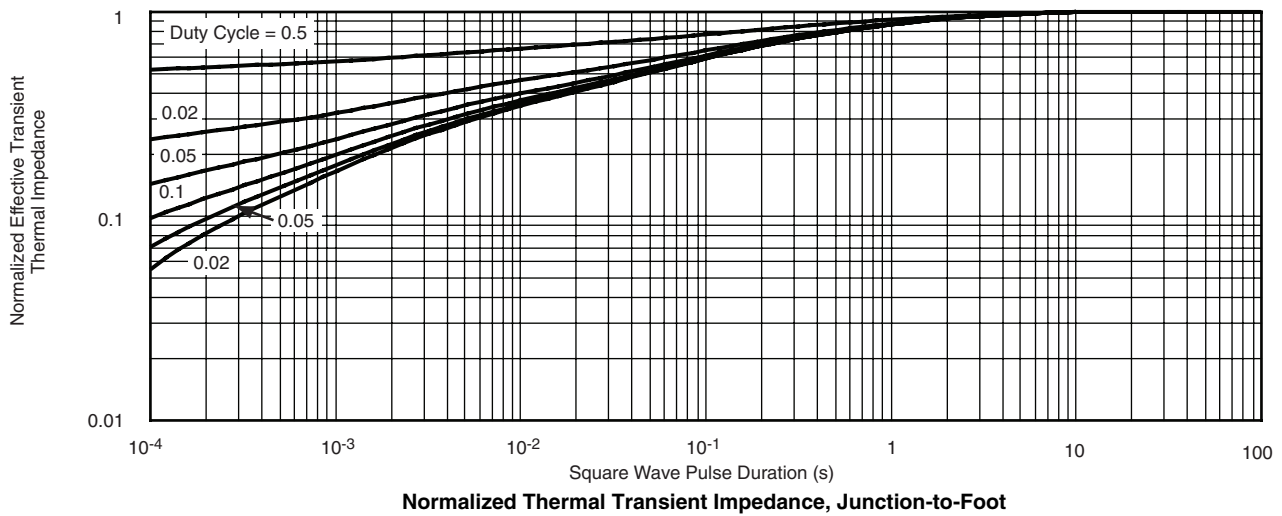
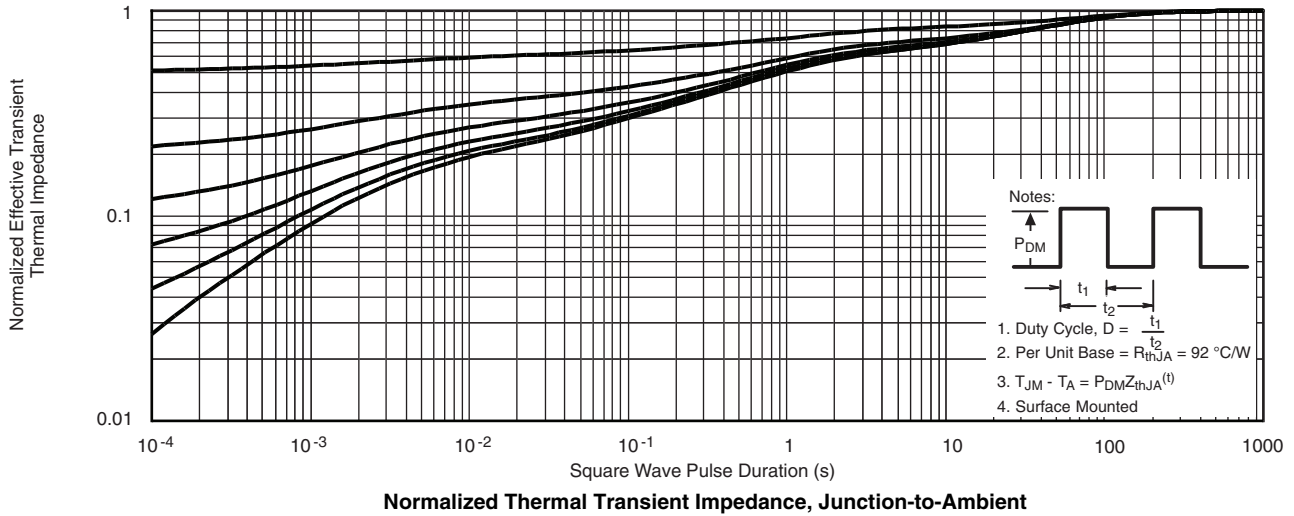


**Forward Voltage Drop**



**Capacitance**

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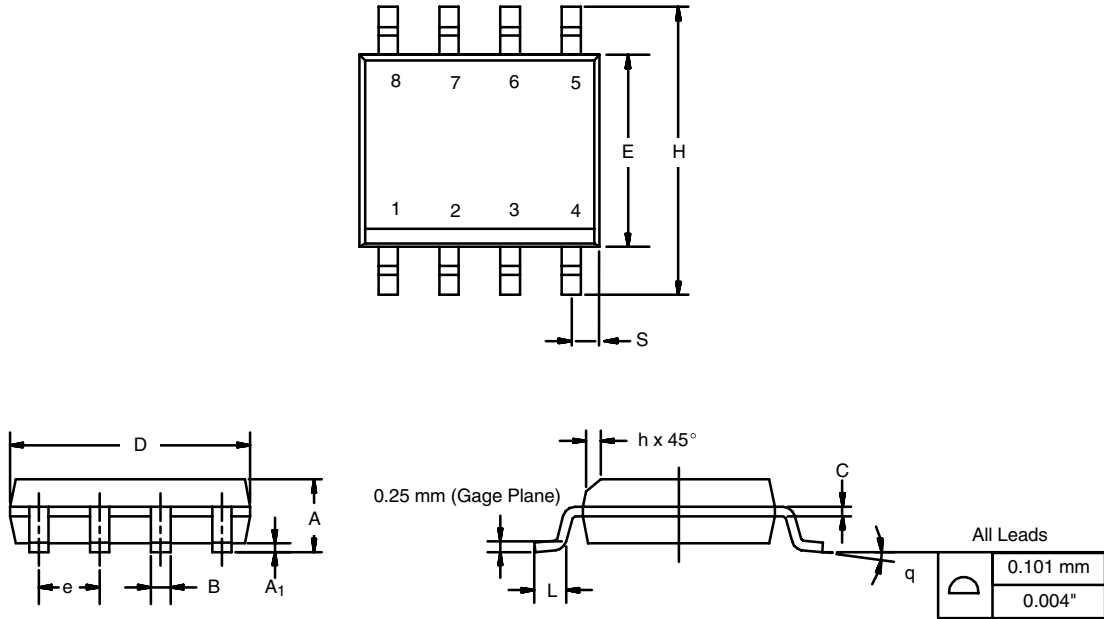
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**SOIC (NARROW): 8-LEAD**

JEDEC Part Number: MS-012



DIM	MILLIMETERS		INCHES	
	Min	Max	Min	Max
A	1.35	1.75	0.053	0.069
A <sub>1</sub>	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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