

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

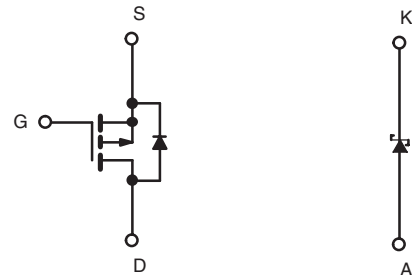
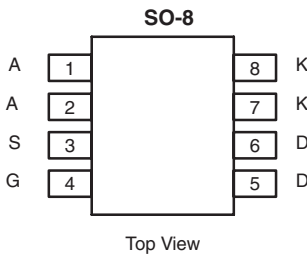
- Halogen-free According to IEC 61249-2-21 Definition
- LITTLE FOOT® Plus Schottky
- 100 % R_g Tested
- Compliant to RoHS Directive 2002/95/EC



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	- 4.1	
		$T_C = 70$ °C	- 3.3	
		$T_A = 25$ °C	- 3.3 ^{b, c}	
		$T_A = 70$ °C	- 2.6 ^{b, c}	
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 ^{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	2.8	
		$T_C = 70$ °C	1.8	
		$T_A = 25$ °C	1.7 ^{b, c}	
		$T_A = 70$ °C	1.1 ^{b, c}	
Maximum Power Dissipation (Schottky)	P_D	$T_C = 25$ °C	2.7	
		$T_C = 70$ °C	1.7	
		$T_A = 25$ °C	1.6 ^{b, c}	
		$T_A = 70$ °C	1.0 ^{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) ^{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:

- 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
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0$ V, $I_D = -250$ μ A	-20			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = -250$ μ A		-20		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$		3			
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = -250$ μ A	-0.6		-1.5	V
Gate-Source Leakage	I_{GSS}	$V_{DS} = 0$ V, $V_{GS} = \pm 12$ V			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = -20$ V, $V_{GS} = 0$ V			-1	μ A
		$V_{DS} = -20$ V, $V_{GS} = 0$ V, $T_J = 55$ °C			-10	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \leq 5$ V, $V_{GS} = -4.5$ V	-15			A
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = -4.5$ V, $I_D = -3.3$ A		0.090	0.108	Ω
		$V_{GS} = -2.5$ V, $I_D = -2.6$ A		0.140	0.175	
Forward Transconductance ^a	g_{fs}	$V_{DS} = -10$ V, $I_D = -3.3$ A		6		S
Dynamic^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, $R_L = 3.8$ Ω $I_D \cong -2.6$ A, $V_{GEN} = -10$ V, $R_g = 1$ Ω		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, $R_L = 3.8$ Ω $I_D \cong -2.6$ A, $V_{GEN} = -4.5$ V, $R_g = 1$ Ω		18	27	ns
Rise Time	t_r		40	60		
Turn-Off Delay Time	$t_{d(off)}$		18	27		
Fall Time	t_f		10	15		
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	$T_C = 25$ °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/ μ 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			

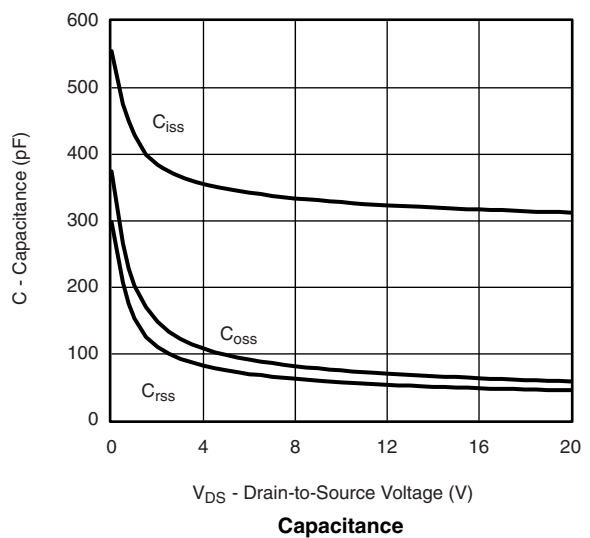
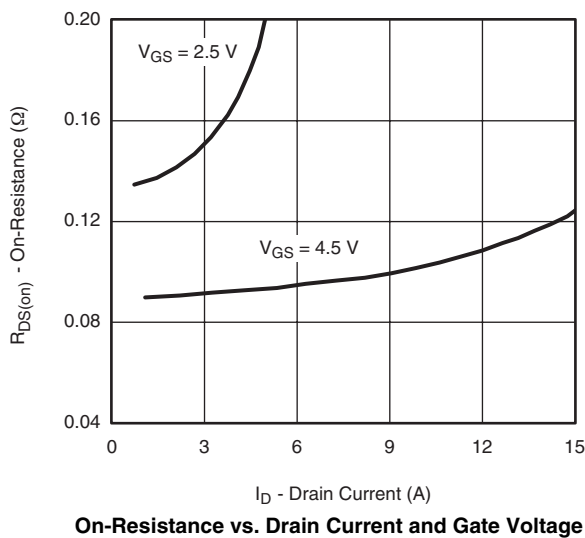
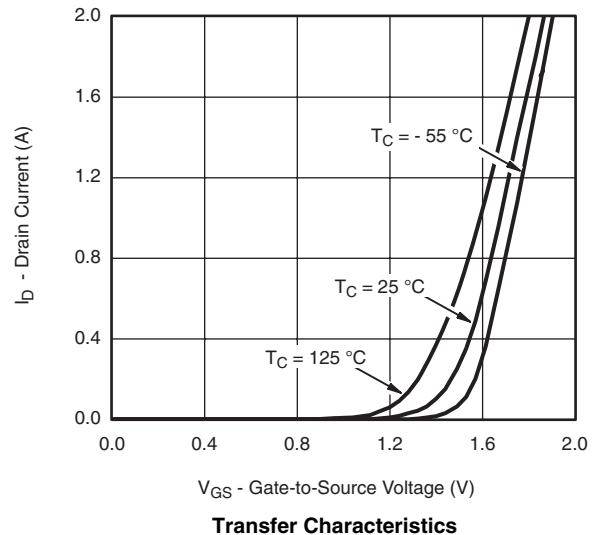
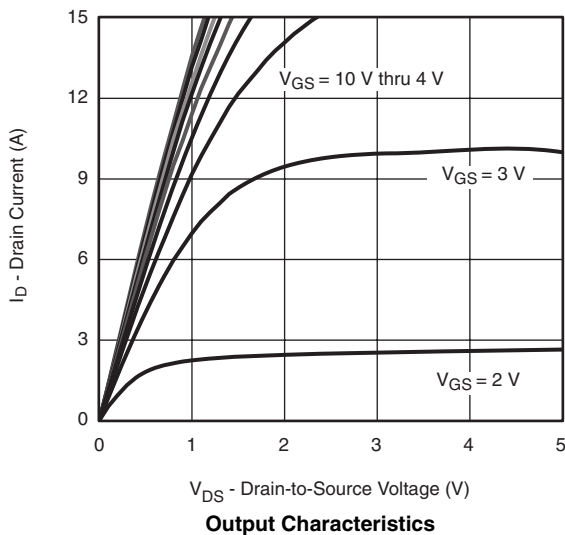
Notes:

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

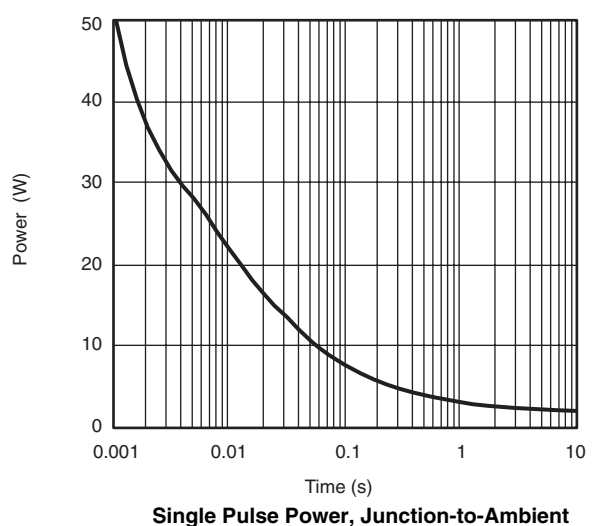
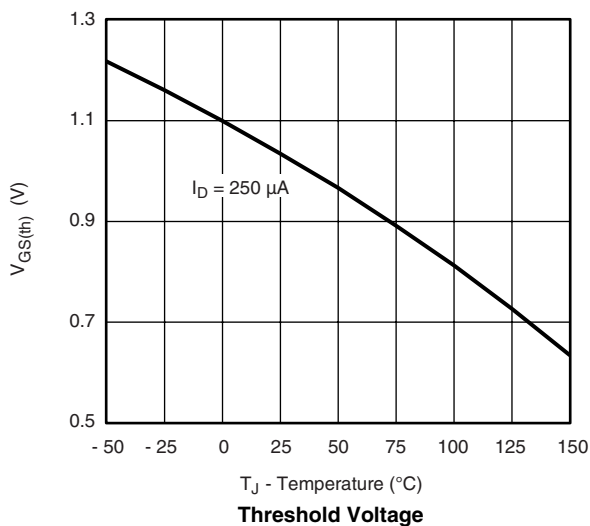
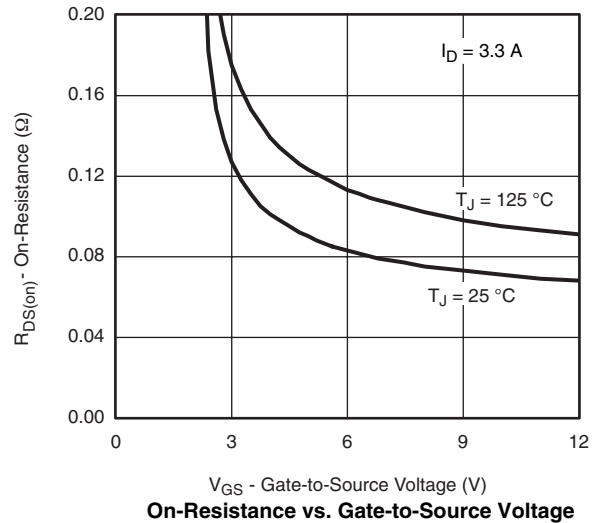
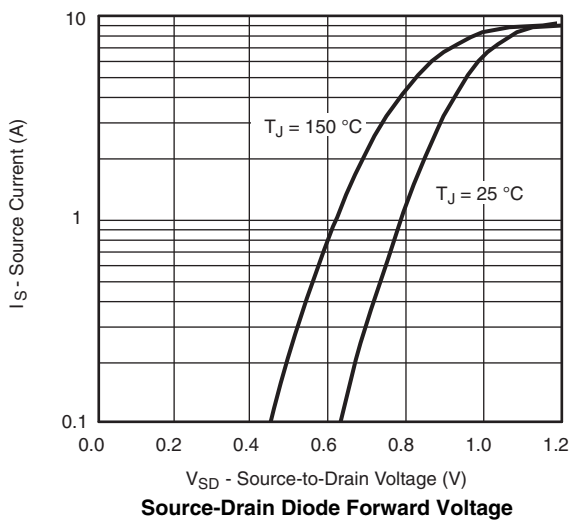
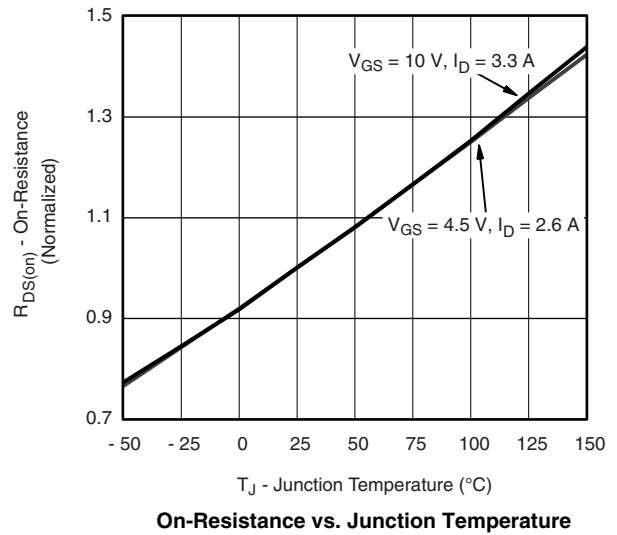
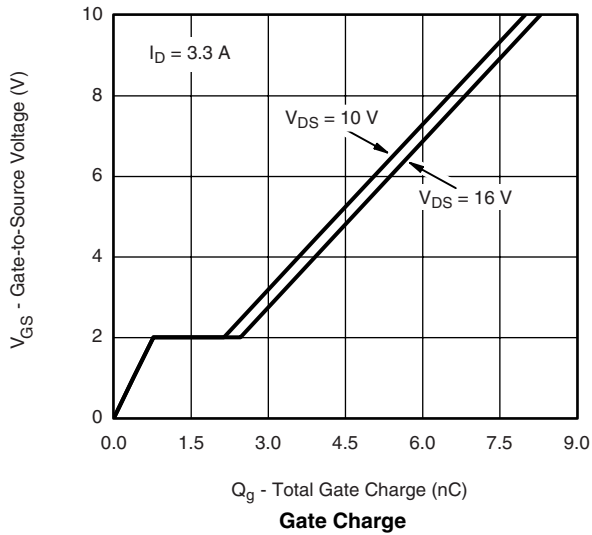
SCHOTTKY SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Forward Voltage Drop	V_F	$I_F = 1\text{ A}$		0.46	0.50	V
		$I_F = 1\text{ A}, T_J = 125\text{ }^\circ\text{C}$		0.41	0.50	
Maximum Reverse Leakage Current	I_{rm}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

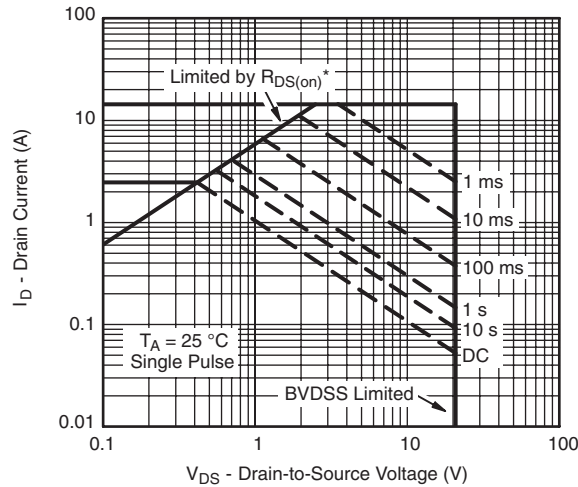
MOSFET TYPICAL CHARACTERISTICS $T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted



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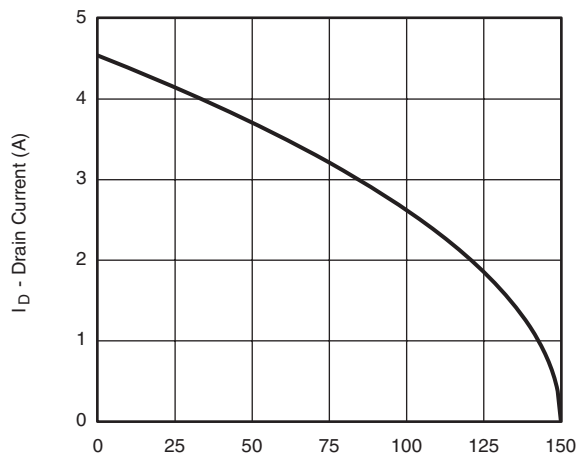


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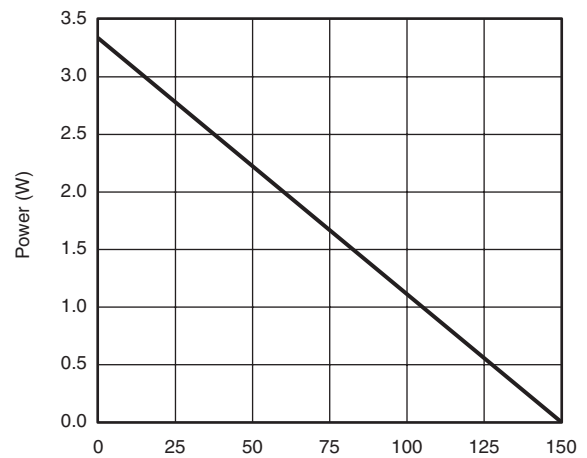
* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Ambient



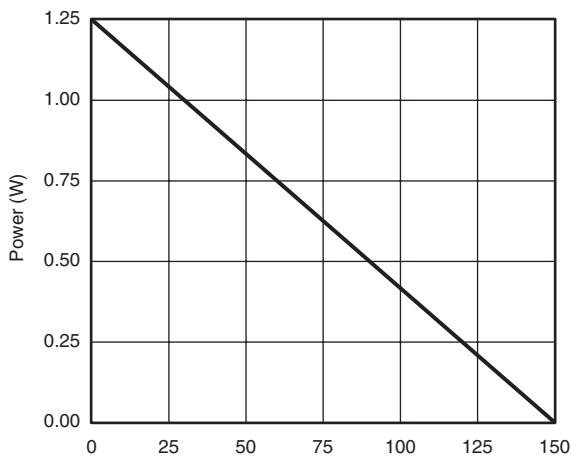
T_C - Case Temperature ($^\circ\text{C}$)

Current Derating*



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

Power Derating, Junction-to-Case

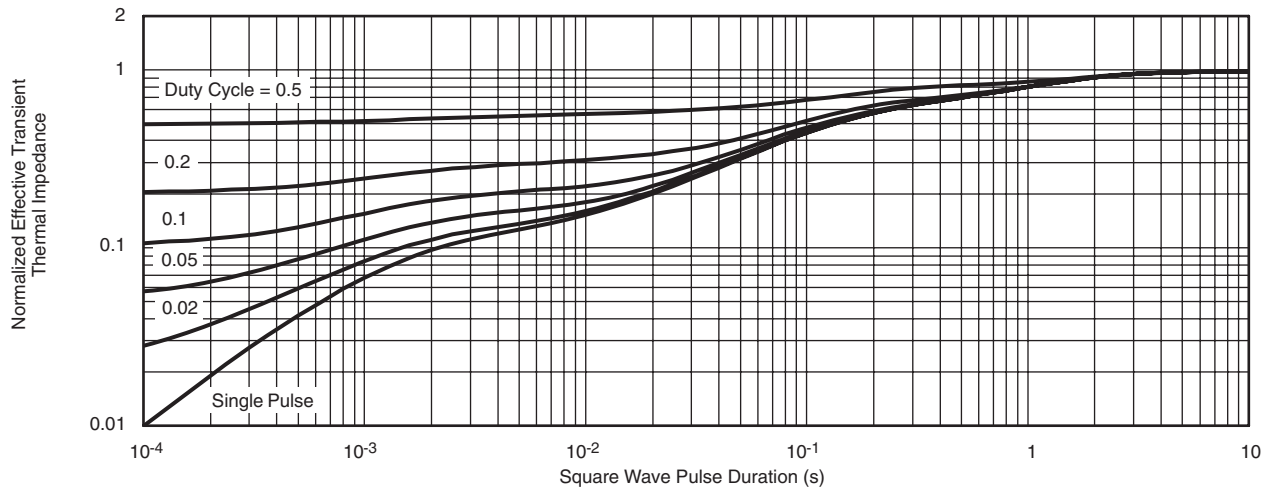
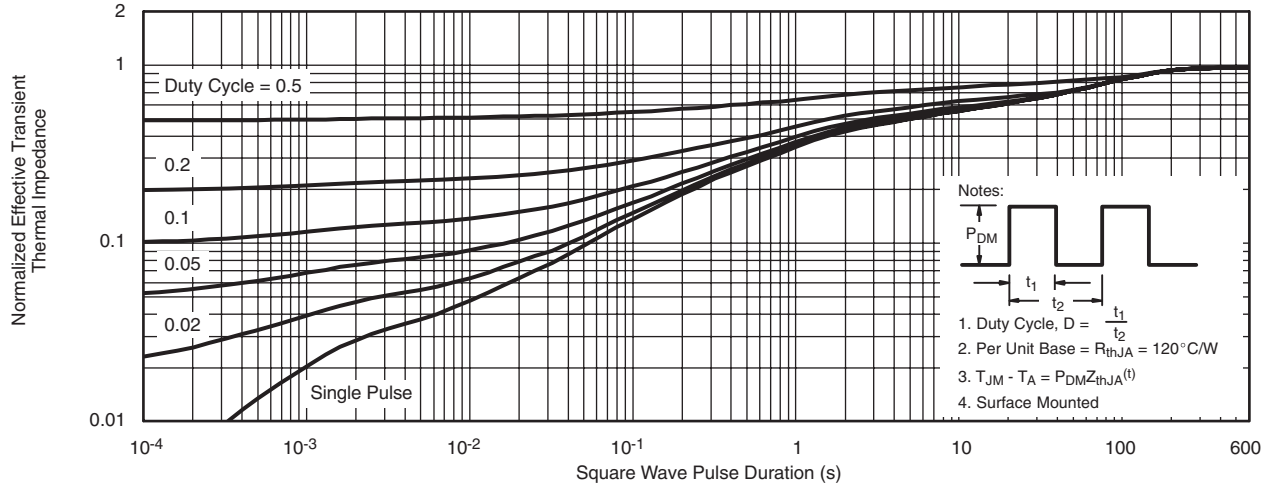


T_A - Ambient Temperature ($^\circ\text{C}$)

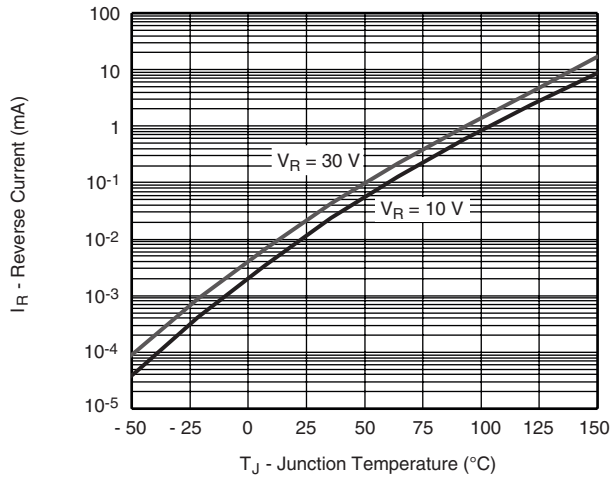
Power Derating, Junction-to-Ambient

* 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.

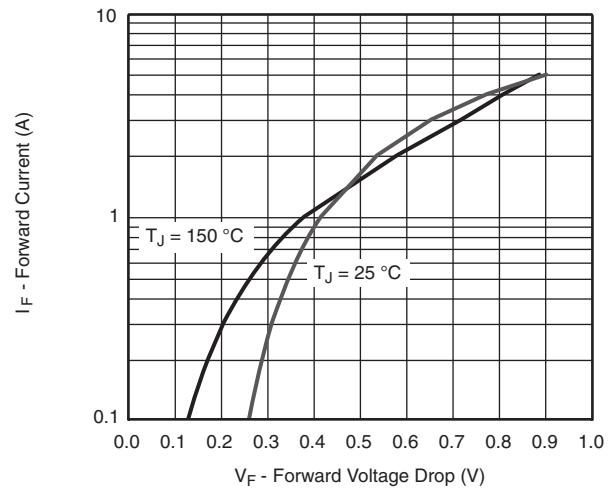
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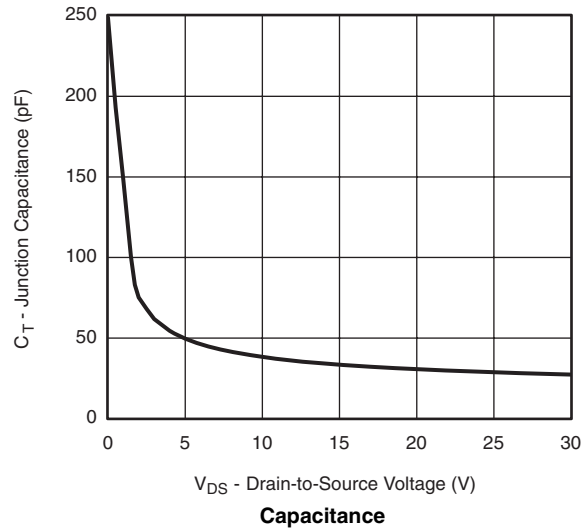
SCHOTTKY TYPICAL CHARACTERISTICS $T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted



Reverse Current vs. Junction Temperature

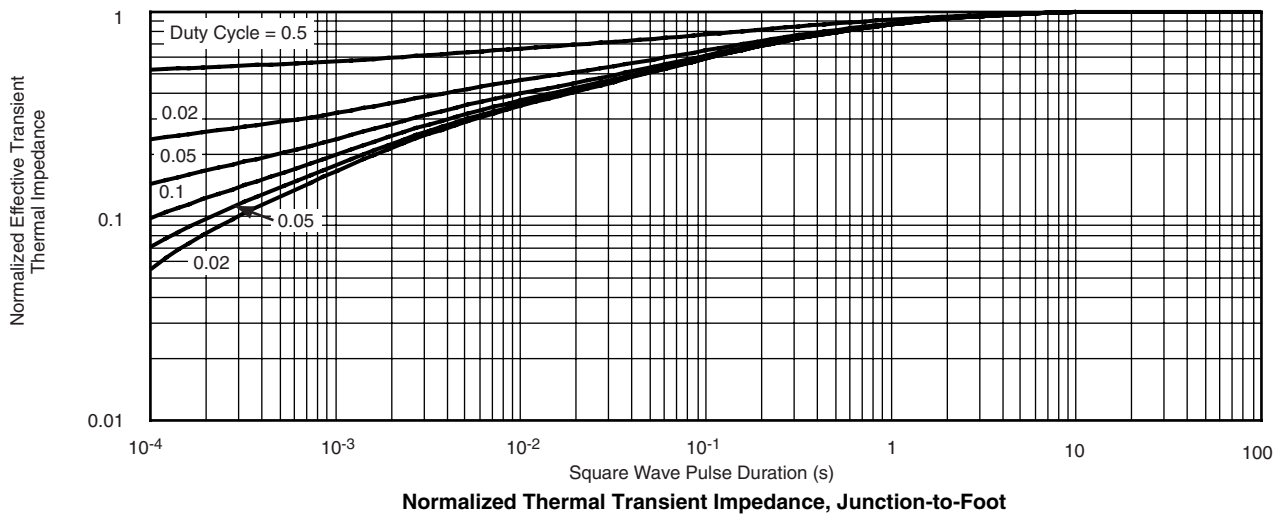
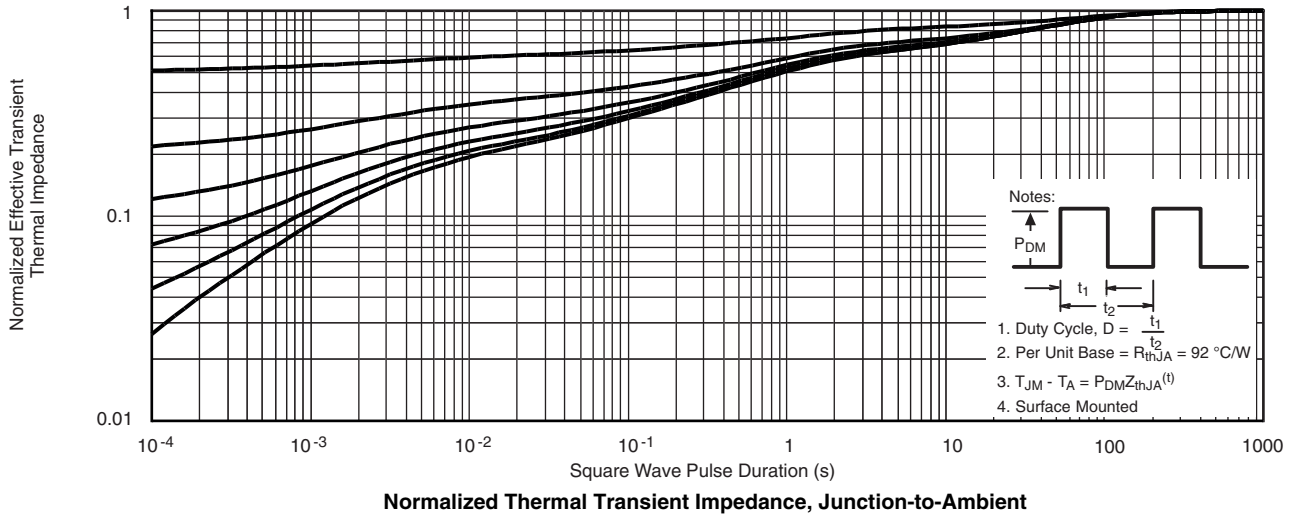


Forward Voltage Drop



Capacitance

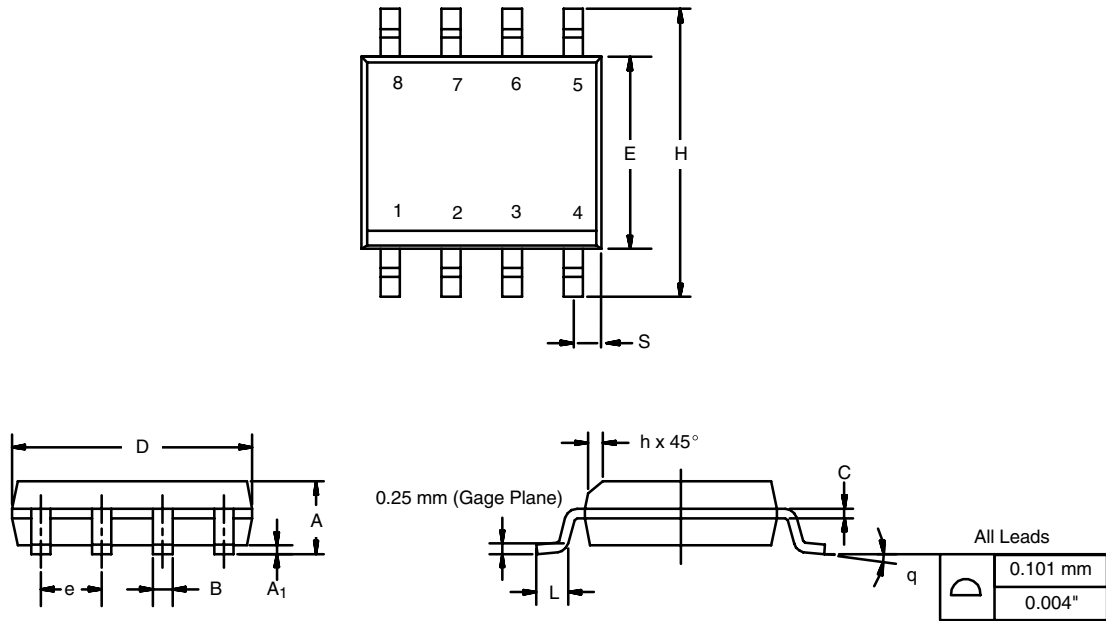
SCHOTTKY TYPICAL CHARACTERISTICS $T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted



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SOIC (NARROW): 8-LEAD

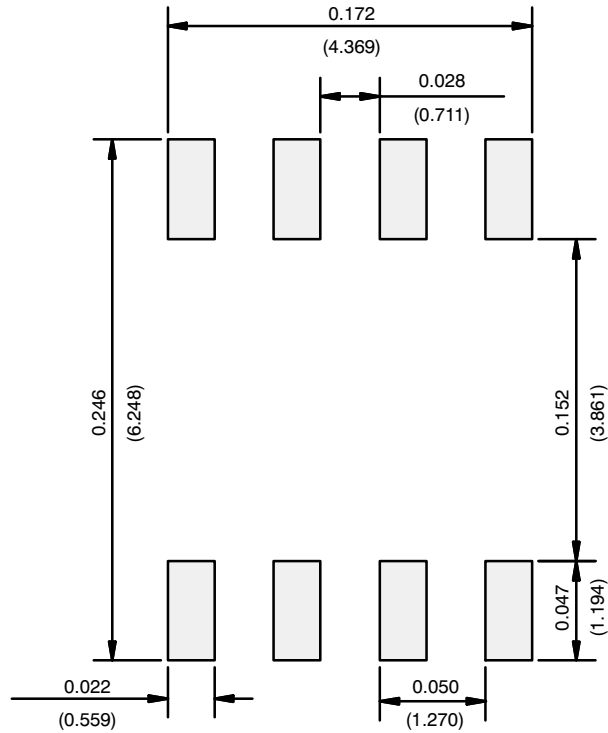
JEDEC Part Number: MS-012



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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