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

MOSFET PRODUCT SUMMARY			
V_{DS} (V)	$r_{DS(on)}$ (Ω)	I_D (A)[a]	Q_g (Typ)
–20	0.210 @ V_{GS} = –4.5 V	– 2.7	2.9
	0.345 @ V_{GS} = –2.5 V	–2.1	

SCHOTTKY PRODUCT SUMMARY		
V_{KA} (V)	V_f (V) Diode Forward Voltage	I_F (A)[a]
20	0.50 V @ 1 A	2.4

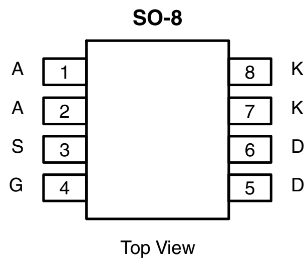
FEATURES

- LITTLE FOOT® *Plus* Power MOSFET

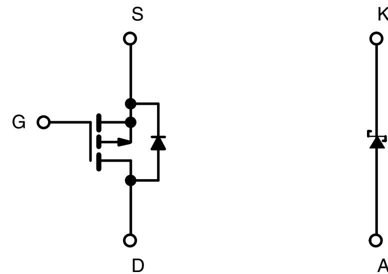
APPLICATIONS

- Asynchronous DC/DC Buck

RoHS
COMPLIANT



Ordering Information: Si4845DY-T1—E3 (Lead (Pb)–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}	–20	
Gate-Source Voltage (MOSFET)		V_{GS}	± 12	
Continuous Drain Current (T_J = 150°C) (MOSFET)	T_C = 25°C	I_D	– 2.7	A
	T_C = 70°C		–2.1	
	T_A = 25°C		–2.1[b, c]	
	T_A = 70°C		–1.7[b, c]	
Pulsed Drain Current (MOSFET)		I_{DM}	–7	
Continuous Source Current (MOSFET Diode Conduction)	T_C = 25°C	I_S	–2.4	
	T_A = 25°C		–1.9[b, c]	
Average Foward Current (Schottky)		I_F	– 1[b]	
Pulsed Foward Current (Schottky)		I_{FM}	–7	
Maximum Power Dissipation (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		1.1[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)	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 sec.
d. Maximum under Steady State conditions is 120 °C/W.

New Product

MOSFET SPECIFICATIONS (T_J = 25°C UNLESS OTHERWISE NOTED)

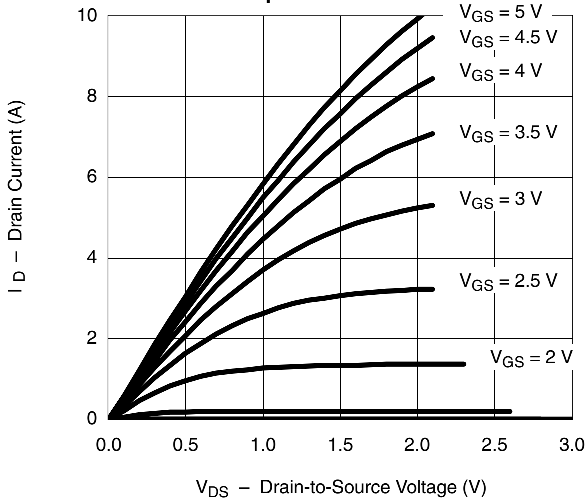
Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	V_{GS} = 0 V, I_D = –250 µA	–20			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	I_D = –250 µA		–25		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			2.6		
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, I_D = –250 µA	–0.5		–1.5	V
Gate-Body Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 12 V			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = –20 V, V_{GS} = 0 V			–1	µA
		V_{DS} = –20 V, V_{GS} = 0 V, T_J = 75°C			–10	
On-State Drain Current[a]	$I_{D(on)}$	V_{DS} ≥ –5 V, V_{GS} = –4.5 V	–5			A
Drain-Source On-State Resistance[a]	$r_{DS(on)}$	V_{GS} = –4.5 V, I_D = –2 A		0.175	0.210	Ω
		V_{GS} = –2.5 V, I_D = –1 A		0.285	0.345	
Forward Transconductance[a]	g_{fs}	V_{DS} = –15 V, I_D = –2 A		3.5		S
Dynamic[b]						
Input Capacitance	C_{iss}	V_{DS} = –10 V, V_{GS} = 0 V, f = 1 MHz		312		pF
Output Capacitance	C_{oss}			63		
Reverse Transfer Capacitance	C_{rss}			33		
Total Gate Charge	Q_g	V_{DS} = –10 V, V_{GS} = –4.5 V, I_D = –4 A		2.9	4.5	nC
Gate-Source Charge	Q_{gs}			0.72		
Gate-Drain Charge	Q_{gd}			0.65		
Gate Resistance	R_g	f = 1 MHz		5.5		Ω
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = –10 V, R_L = 2.5 Ω I_D ≅ –4 A, V_{GEN} = –4.5 V, R_g = 1 Ω		8	13	ns
Rise Time	t_r			40	60	
Turn-Off Delay Time	$t_{d(off)}$			17	26	
Fall Time	t_f			11	18	
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = –10 V, R_L = 2.5 Ω I_D ≅ –4 A, V_{GEN} = –10 V, R_g = 1 Ω		3	6	
Rise Time	t_r			10	16	
Turn-Off Delay Time	$t_{d(off)}$			12	20	
Fall Time	t_f			8	15	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	T_C = 25 °C			–2.7	A
Pulse Diode Forward Current[a]	I_{SM}				–7	
Body Diode Voltage	V_{SD}	I_S = –1.9 A, V_{GS} = 0 V		–0.85	–1.2	V
Body Diode Reverse Recovery Time	t_{rr}	I_F = –2 A, di/dt = 100 A/µs, T_J = 25 °C		24	40	ns
Body Diode Reverse Recovery Charge	Q_{rr}			14	20	nC
Reverse Recovery Fall Time	t_a			14		ns
Reverse Recovery Rise Time	t_b			10		

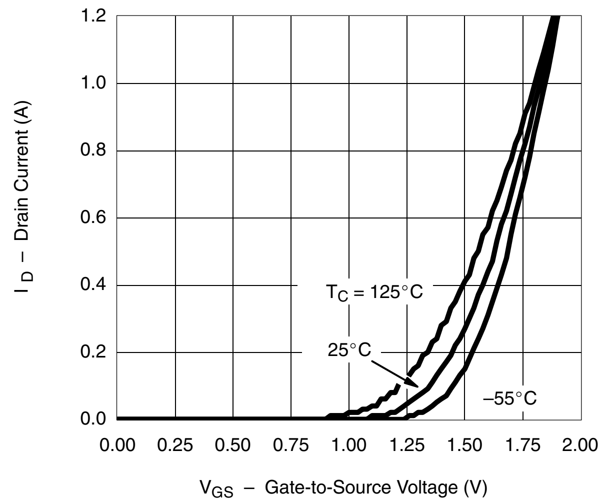
Notes
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2%.
b. Guaranteed by design, not subject to production testing.

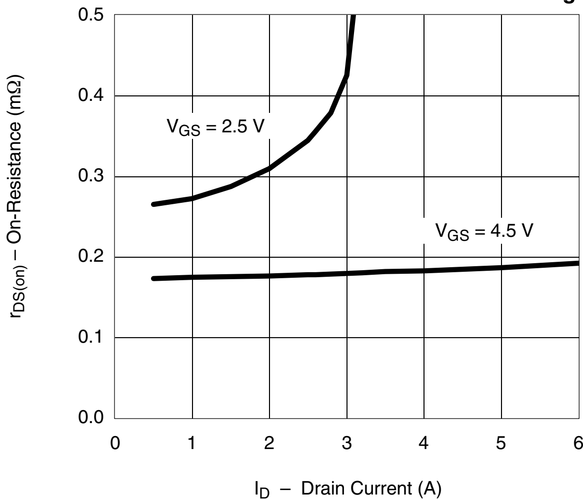
SCHOTTKY SPECIFICATIONS (T_J = 25°C UNLESS OTHERWISE NOTED)						
Parameter	**Symbol**	**Test Condition**	**Min**	**Typ**	**Max**	**Unit**
Forward Voltage Drop	V_F	I_F = 1 A		0.45	0.50	V
		I_F = 1 A, T_J = 125°C		0.36	0.42	
Maximum Reverse Leakage Current	I_{rm}	V_r = 30 V		0.04	0.1	mA
		V_r = 30 V, T_J = 75°C		0.1	2	
		V_r = 30 V, T_J = 125°C		2	10	
Junction Capacitance	C_T	V_r = 10 V		62		pF

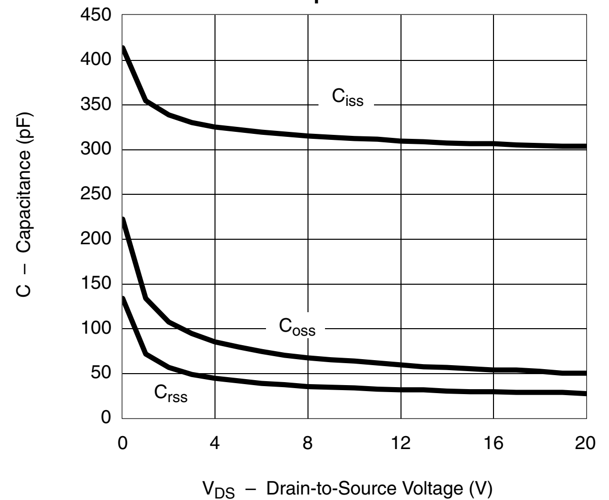
Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

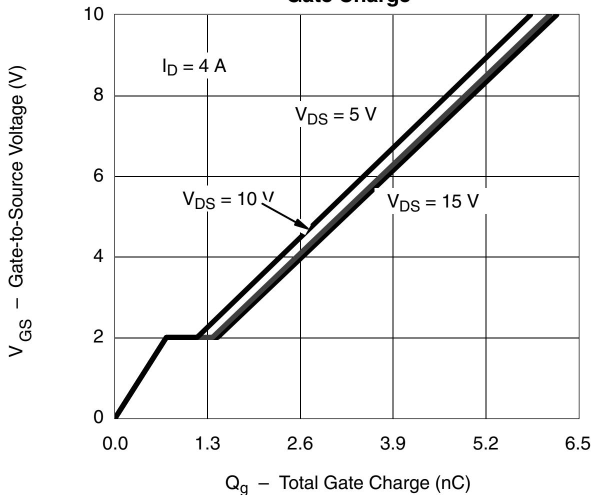
TYPICAL CHARACTERISTICS (25°C UNLESS NOTED) MOSFET

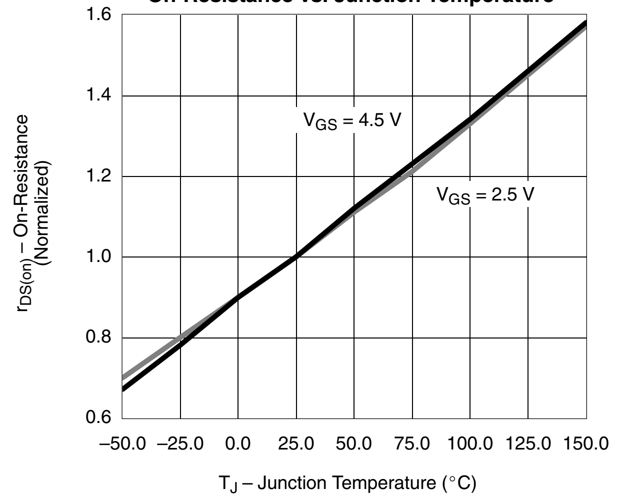




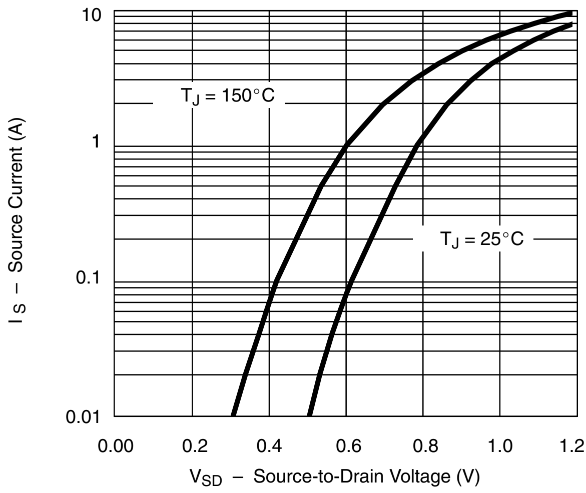


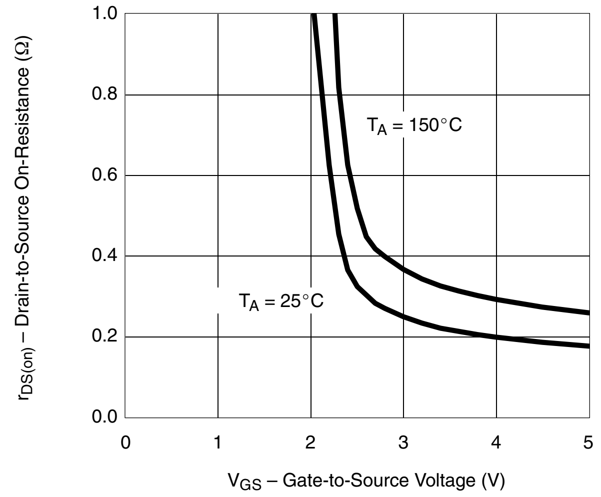


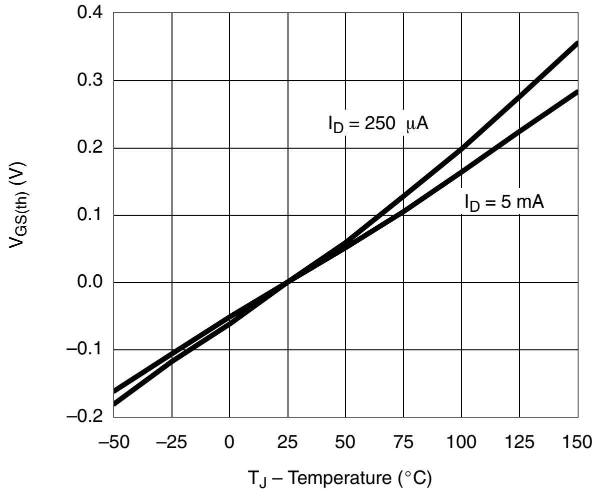


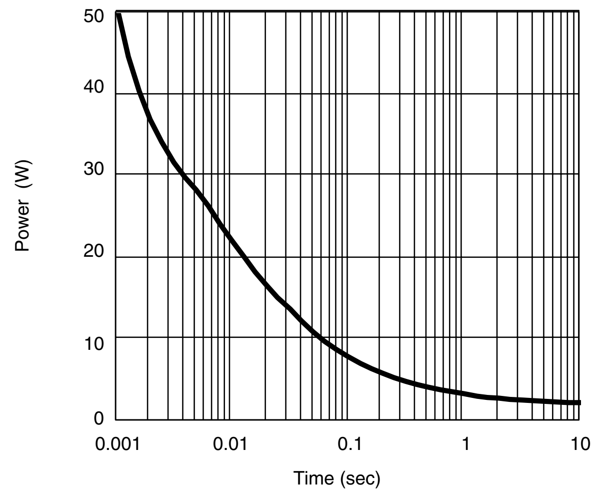


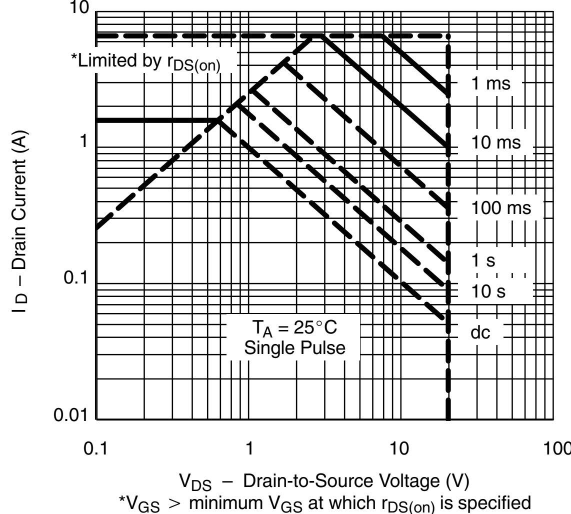
TYPICAL CHARACTERISTICS (25°C UNLESS NOTED) MOSFET



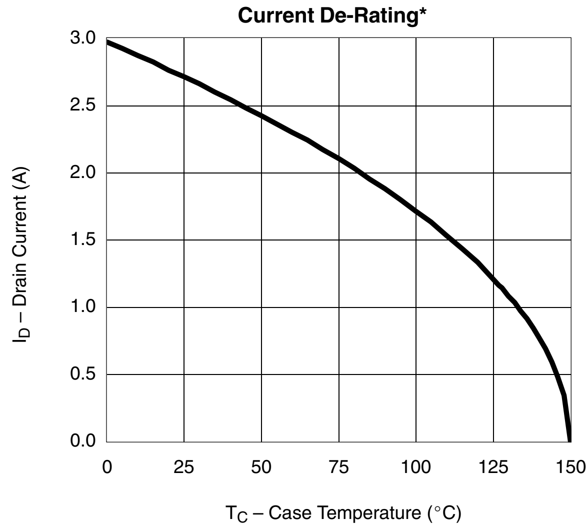


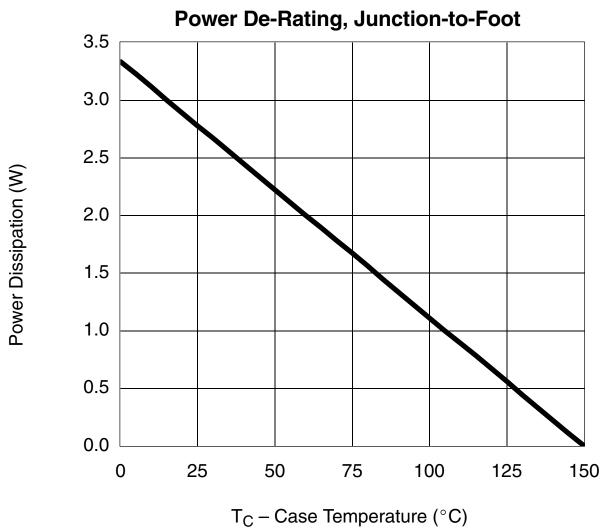


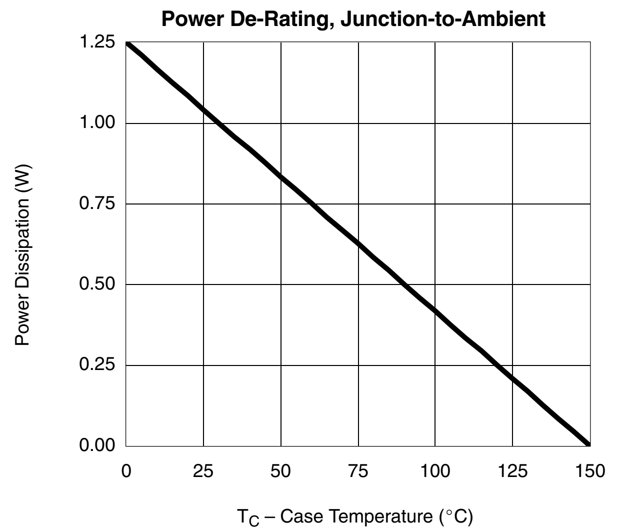




TYPICAL CHARACTERISTICS (25°C UNLESS NOTED) MOSFET

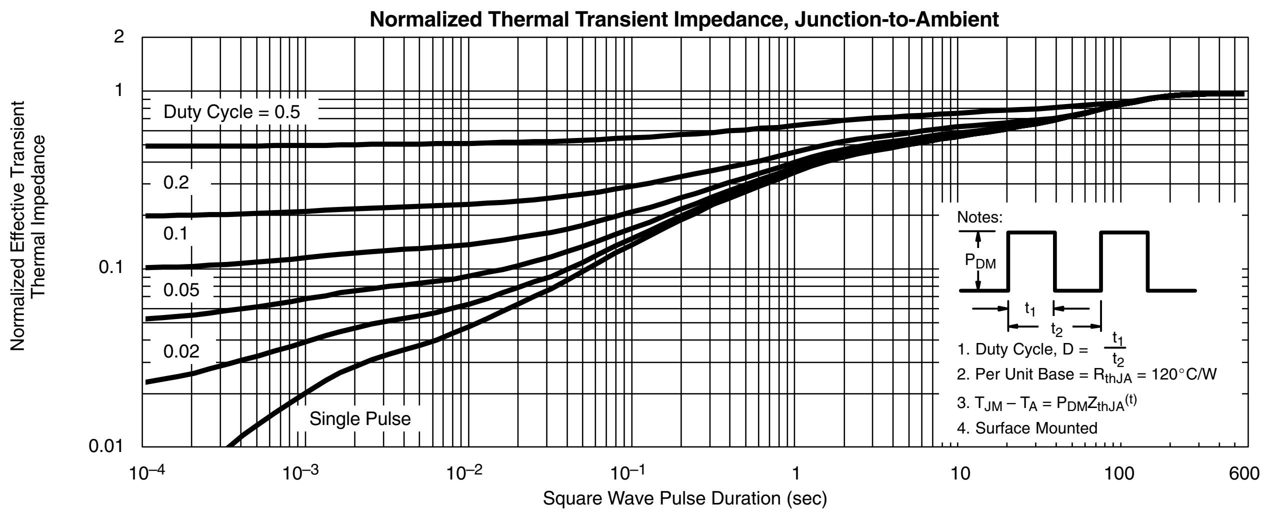


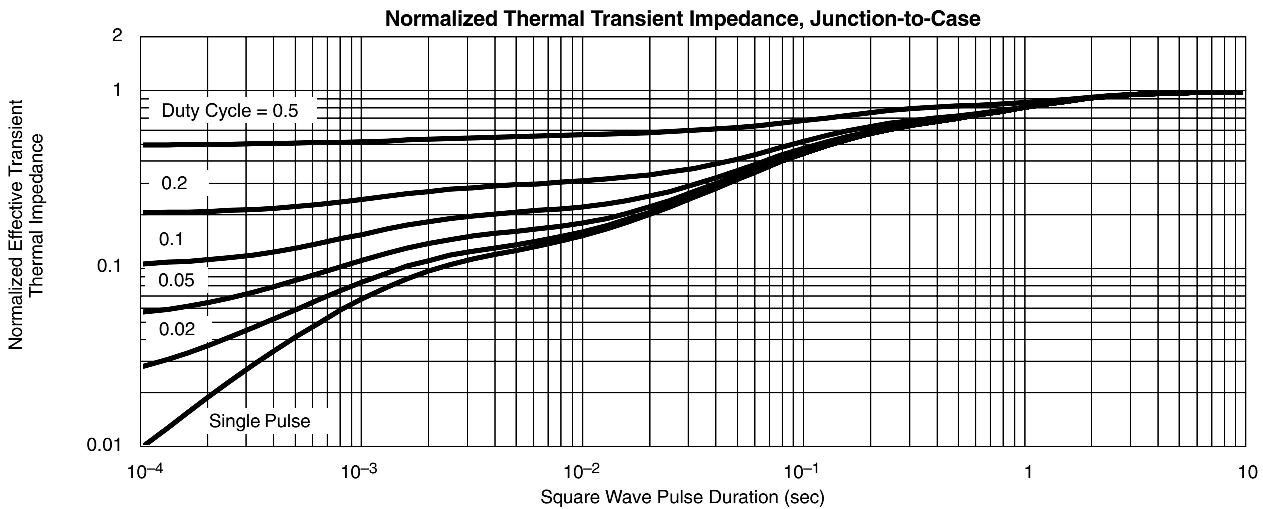




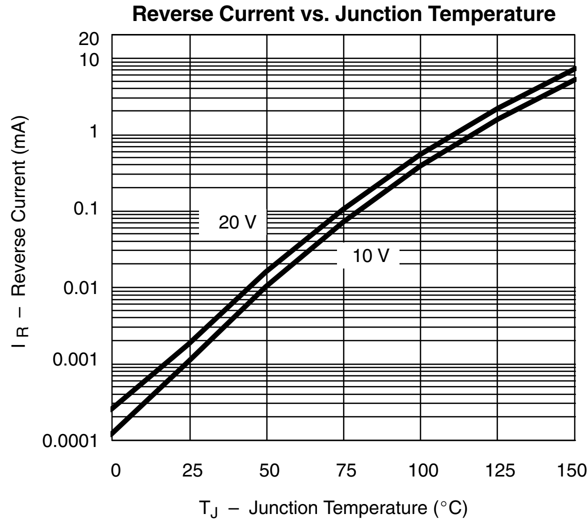
*The power dissipation P_b is based on $T_{J(max)}$ = 175°C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

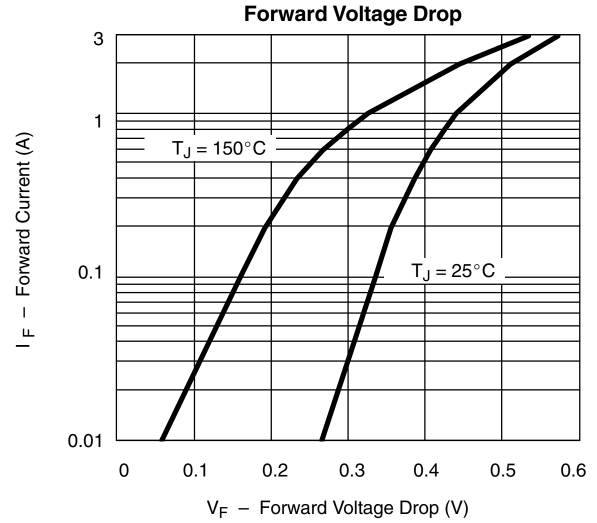
TYPICAL CHARACTERISTICS (25°C UNLESS NOTED) MOSFET

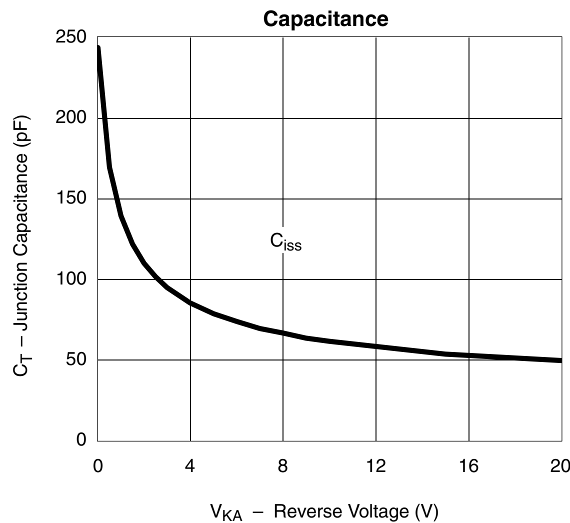




TYPICAL CHARACTERISTICS (25°C UNLESS NOTED) **SCHOTTKY**







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