



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

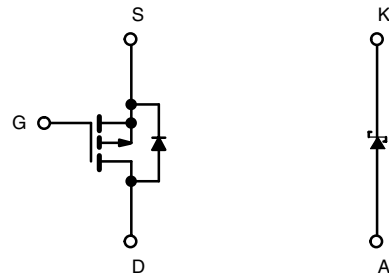
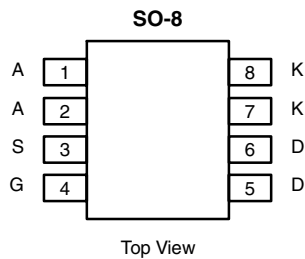
- LITTLE FOOT® Plus Power MOSFET

APPLICATIONS

- Asynchronous DC/DC Buck



RoHS
COMPLIANT



Ordering Information: Si4845DY-T1—E3 (Lead (Pb)—Free)

P-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$ 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 ($T_J = 150^\circ\text{C}$) (MOSFET)	I_D	$T_C = 25^\circ\text{C}$	-2.7	A
		$T_C = 70^\circ\text{C}$	-2.1	
		$T_A = 25^\circ\text{C}$	-2.1 ^{b, c}	
		$T_A = 70^\circ\text{C}$	-1.7 ^{b, c}	
Pulsed Drain Current (MOSFET)	I_{DM}	-7		
Continuous Source Current (MOSFET Diode Conduction)	I_S	$T_C = 25^\circ\text{C}$	-2.4	
		$T_A = 25^\circ\text{C}$	-1.9 ^{b, c}	
Average Forward Current (Schottky)	I_F	-1 ^b		
Pulsed Forward Current (Schottky)	I_{FM}	-7		
Maximum Power Dissipation (Schottky)	P_D	$T_C = 25^\circ\text{C}$	2.75	W
		$T_C = 70^\circ\text{C}$	1.75	
		$T_A = 25^\circ\text{C}$	1.75 ^{b, c}	
		$T_A = 70^\circ\text{C}$	1.1 ^{b, c}	
Operating Junction and Storage Temperature Range	T_J, T_{stg}	-55 to 150	$^\circ\text{C}$	

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient (MOSFET and Schottky)	R_{thJA}	60	71.5	$^\circ\text{C/W}$
Maximum Junction-to-Foot (Drain) (MOSFET and Schottky)	R_{thJF}	35	45	

Notes

- Based on $T_C = 25^\circ\text{C}$.
- Surface Mounted on FR4 Board.
- $t \leq 10$ sec.
- Maximum under Steady State conditions is 120°C/W .

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	ΔV _{DS} /T _J	I _D = -250 μA		-25		mV/°C
V _{GS(th)} Temperature Coefficient	ΔV _{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 ($T_J = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED)**

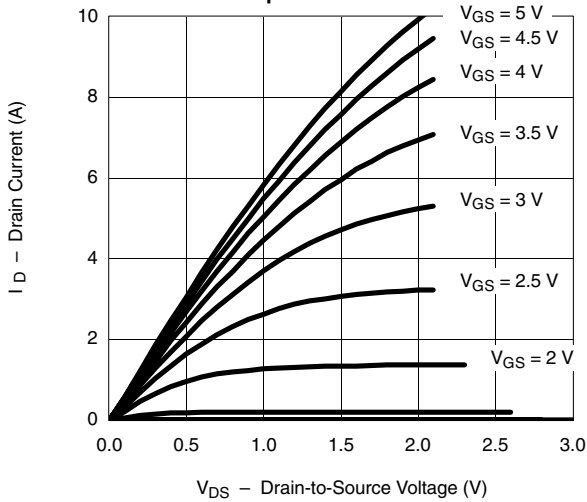
Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Forward Voltage Drop	V_F	$I_F = 1\text{ A}$		0.45	0.50	V
		$I_F = 1\text{ A}, T_J = 125^\circ\text{C}$		0.36	0.42	
Maximum Reverse Leakage Current	I_{rm}	$V_r = 30\text{ V}$		0.04	0.1	mA
		$V_r = 30\text{ V}, T_J = 75^\circ\text{C}$		0.1	2	
		$V_r = 30\text{ V}, T_J = 125^\circ\text{C}$		2	10	
Junction Capacitance	C_T	$V_r = 10\text{ V}$		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.

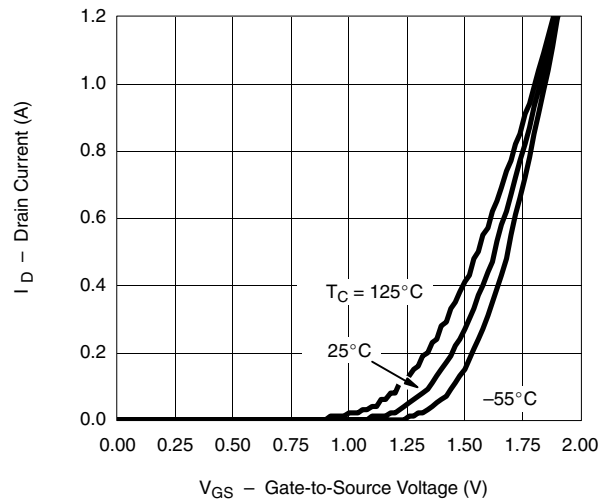


TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED) MOSFET

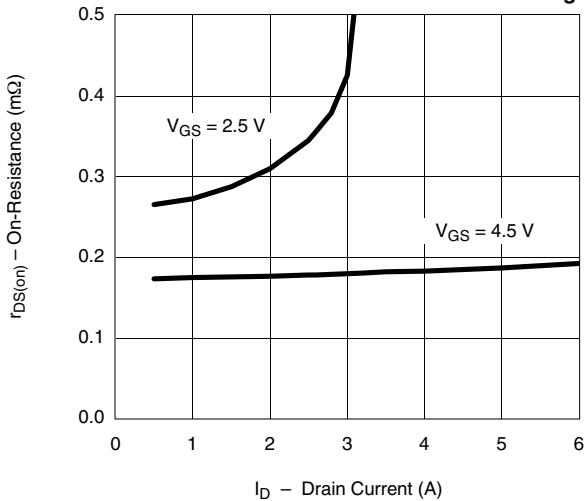
Output Characteristics



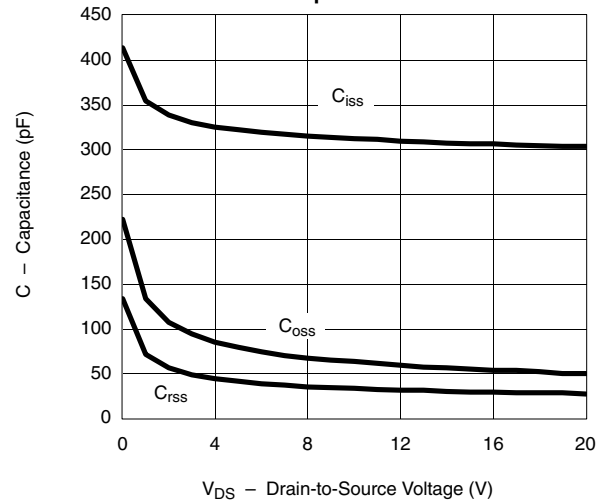
Transfer Characteristics



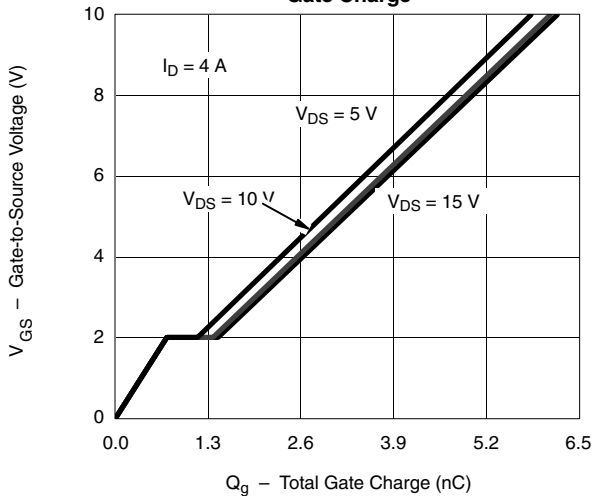
On-Resistance vs. Drain Current and Gate Voltage



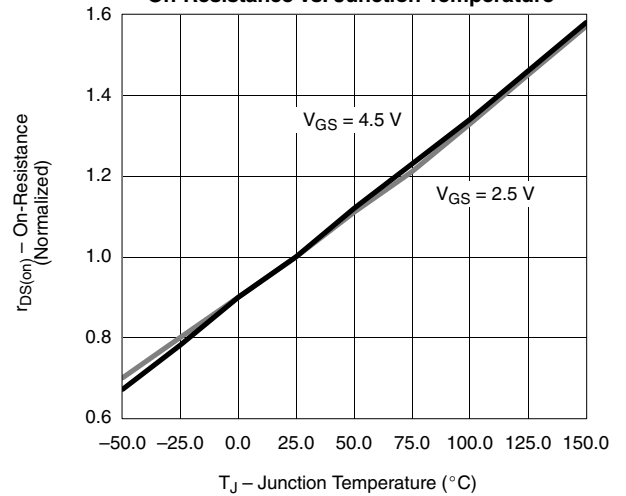
Capacitance



Gate Charge



On-Resistance vs. Junction Temperature

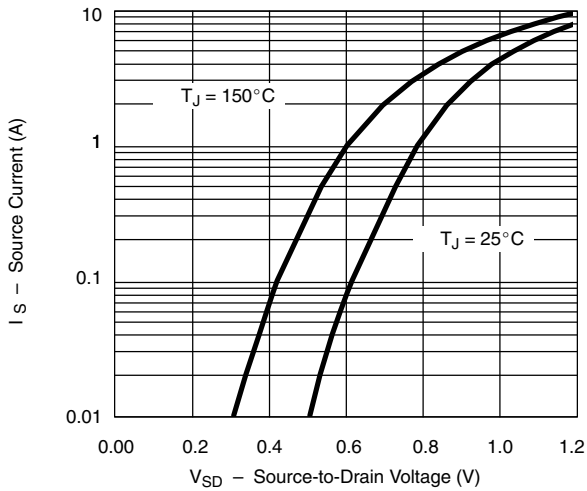




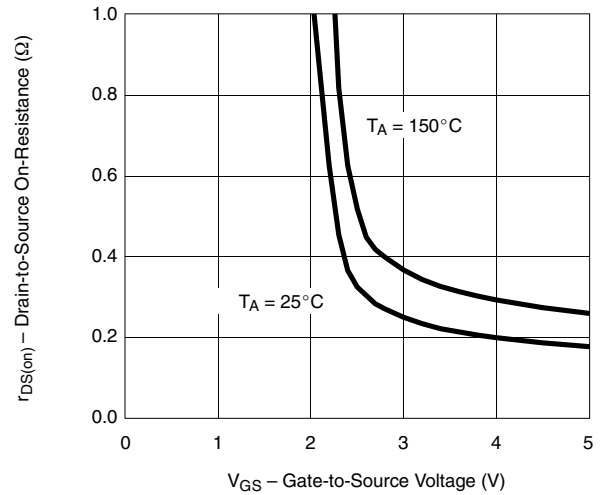
TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)

MOSFET

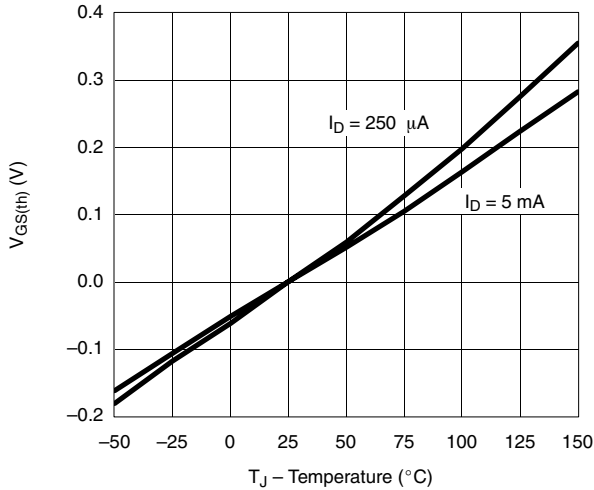
Source-Drain Diode Forward Voltage



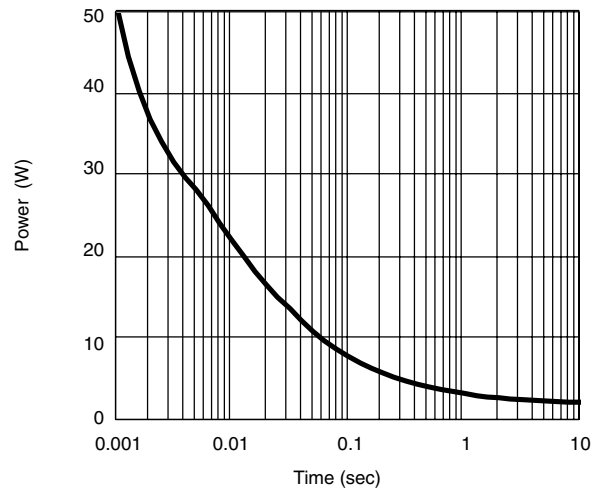
On-Resistance vs. Gate-to-Source Voltage



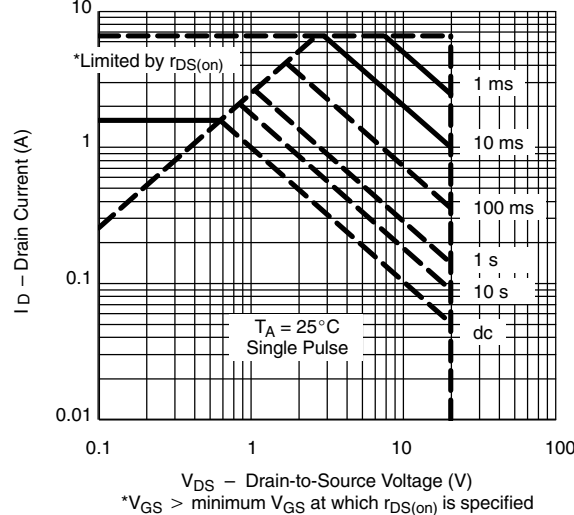
Threshold Voltage



Single Pulse Power, Junction-to-Ambient



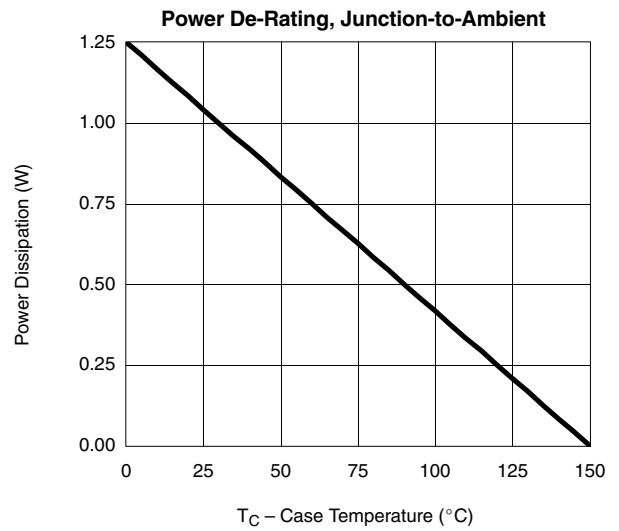
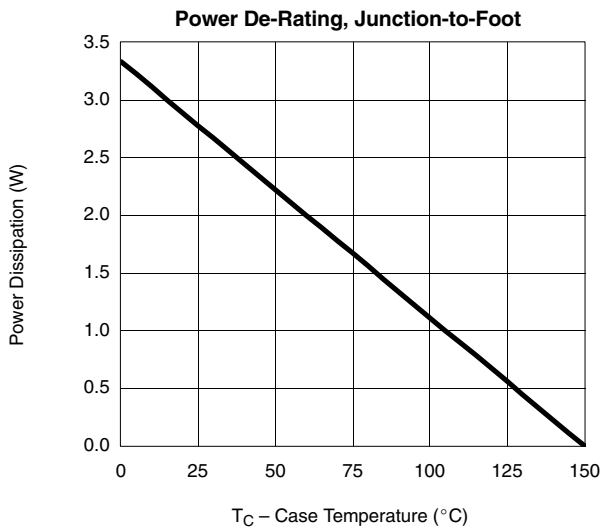
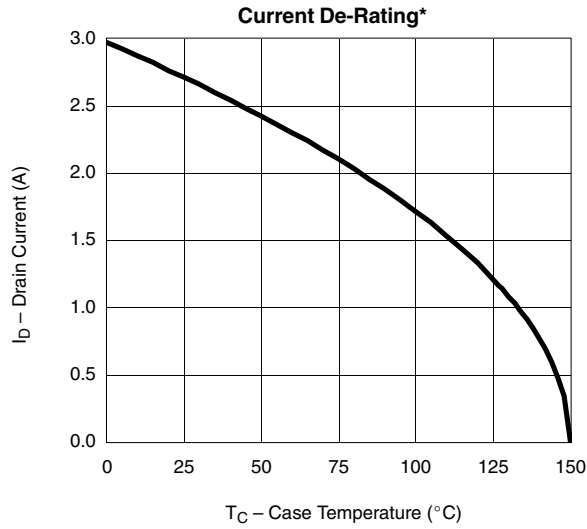
Safe Operating Area, Junction-to-Ambient





TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED)

MOSFET

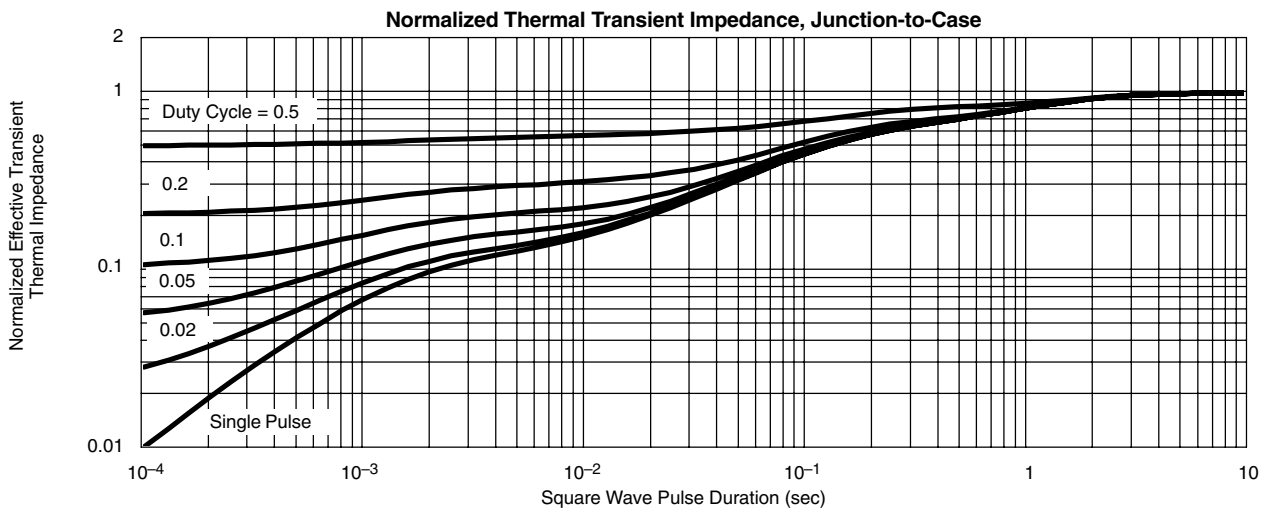
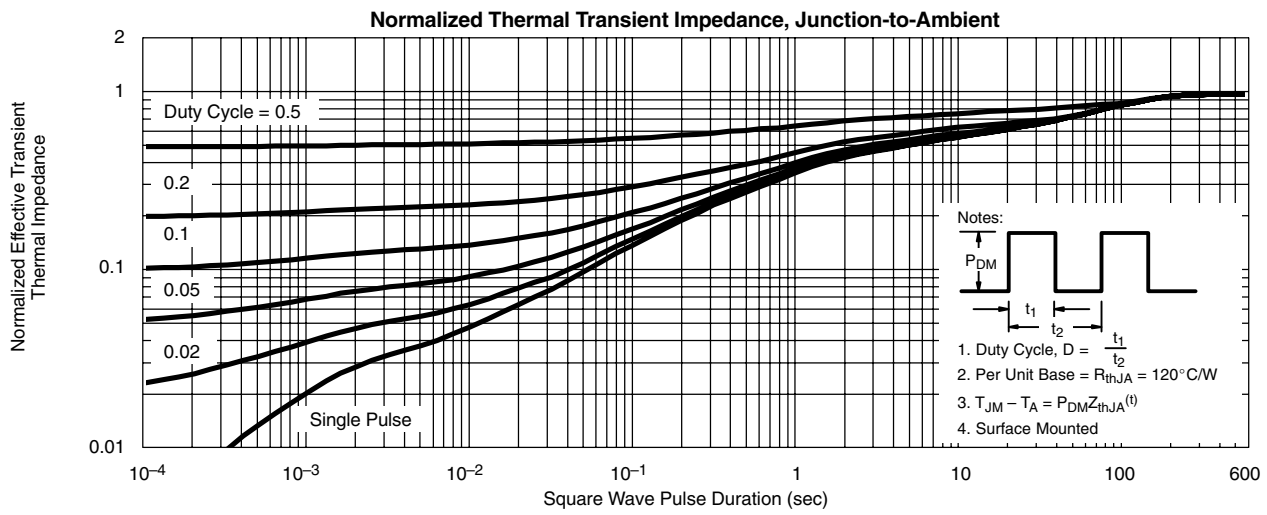


*The power dissipation P_b is based on $T_{J(max)} = 175^\circ\text{C}$, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package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



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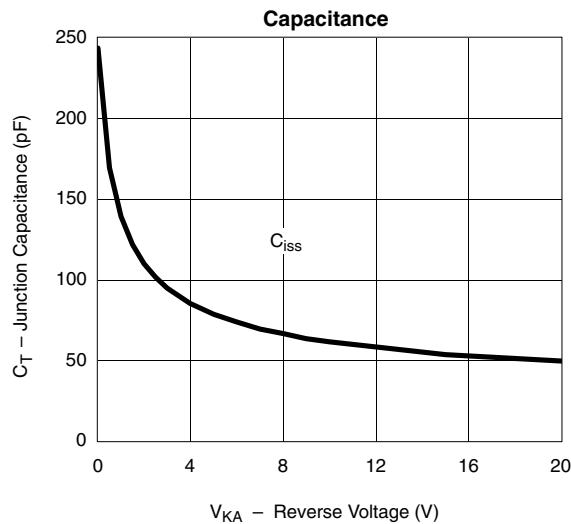
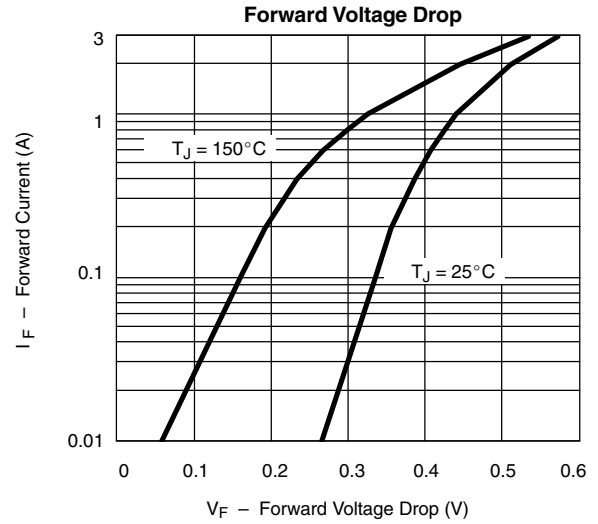
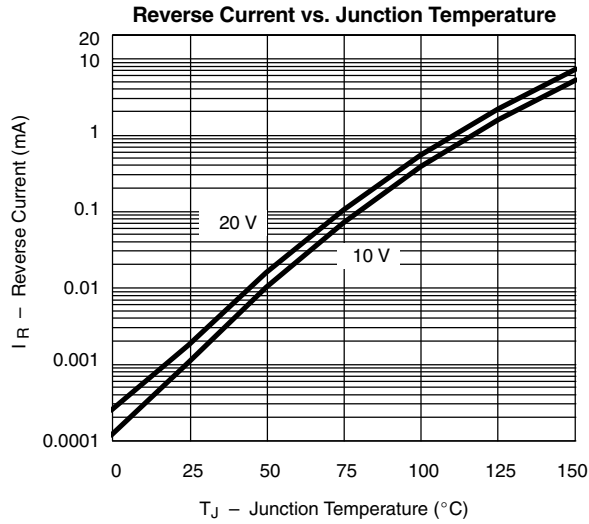
MOSFET





TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED)

SCHOTTKY



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