

## P-Channel 1.8-V (G-S) MOSFET With Schottky Diode

MOSFET PRODUCT SUMMARY		
$V_{DS}$ (V)	$r_{DS(on)}$ ( $\Omega$ )	$I_D$ (A)
-20	0.110 @ $V_{GS} = -4.5$ V	-3.6
	0.160 @ $V_{GS} = -2.5$ V	-3.0
	0.240 @ $V_{GS} = -1.8$ V	-2.4

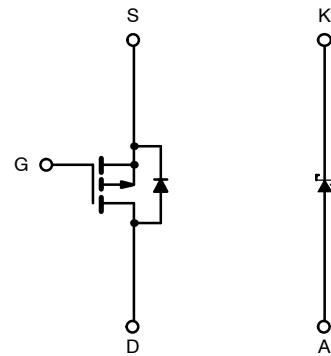
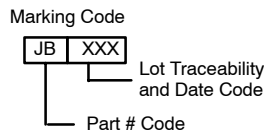
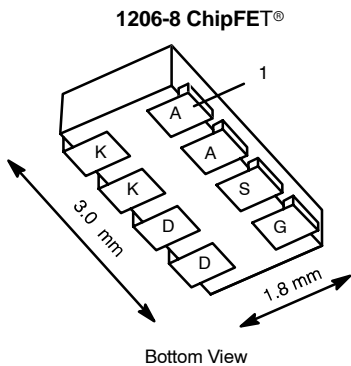
SCHOTTKY PRODUCT SUMMARY		
$V_{KA}$ (V)	$V_f$ (V) Diode Forward Voltage	$I_F$ (A)
20	0.375 V @ 1 A	1.0

### FEATURES

- TrenchFET® Power MOSFETS
- Ultra Low  $V_f$  Schottky
- Si5853DC Pin Compatible

### APPLICATIONS

- Charging Circuit in Portable Devices



**Ordering Information:** Si5855DC-T1  
Si5855DC-T1—E3 (Lead Free)

ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED)					
Parameter	Symbol	5 sec	Steady State	Unit	
Drain-Source Voltage (MOSFET)	$V_{DS}$	-20		V	
Reverse Voltage (Schottky)	$V_{KA}$	20			
Gate-Source Voltage (MOSFET)	$V_{GS}$	$\pm 8$			
Continuous Drain Current ( $T_J = 150^\circ\text{C}$ ) (MOSFET) <sup>a</sup>	$I_D$	$T_A = 25^\circ\text{C}$	-3.6	-2.7	A
		$T_A = 85^\circ\text{C}$	-2.6	-1.9	
Pulsed Drain Current (MOSFET)	$I_{DM}$	-10			
Continuous Source Current (MOSFET Diode Conduction) <sup>a</sup>	$I_S$	-1.8	-0.9		
Average Forward Current (Schottky)	$I_F$	1.0			
Pulsed Forward Current (Schottky)	$I_{FM}$	7			
Maximum Power Dissipation (MOSFET) <sup>a</sup>	$P_D$	$T_A = 25^\circ\text{C}$	2.1	1.1	
		$T_A = 85^\circ\text{C}$	1.1	0.6	
Maximum Power Dissipation (Schottky) <sup>a</sup>	$P_D$	$T_A = 25^\circ\text{C}$	1.9	1.1	
		$T_A = 85^\circ\text{C}$	1.0	0.56	
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	-55 to 150		$^\circ\text{C}$	
Soldering Recommendations (Peak Temperature) <sup>b, c</sup>		260			

**Notes**

- Surface Mounted on 1" x 1" FR4 Board.
- See Reliability Manual for profile. The ChipFET is a leadless package. The end of the lead terminal is exposed copper (not plated) as a result of the singulation process in manufacturing. A solder fillet at the exposed copper tip cannot be guaranteed and is not required to ensure adequate bottom side solder interconnection.
- Rework Conditions: manual soldering with a soldering iron is not recommended for leadless components.



THERMAL RESISTANCE RATINGS						
Parameter		Device	Symbol	Typical	Maximum	Unit
Junction-to-Ambient <sup>a</sup>	$t \leq 5 \text{ sec}$	MOSFET	$R_{thJA}$	50	60	°C/W
		Schottky		54	65	
	Steady State	MOSFET		90	110	
		Schottky		95	115	
Junction-to-Foot	Steady State	MOSFET	$R_{thJF}$	30	40	
		Schottky	30	40		

## Notes

a. Surface Mounted on 1" x 1" FR4 Board.

MOSFET SPECIFICATIONS ( $T_J = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED)						
Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
<b>Static</b>						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250 \mu\text{A}$	-0.45		-1.0	V
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0 \text{ V}, V_{GS} = \pm 8 \text{ V}$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = -20 \text{ V}, V_{GS} = 0 \text{ V}$			-1	$\mu\text{A}$
		$V_{DS} = -20 \text{ V}, V_{GS} = 0 \text{ V}, T_J = 85^\circ\text{C}$			-5	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{DS} \leq -5 \text{ V}, V_{GS} = -4.5 \text{ V}$	-10			A
Drain-Source On-State Resistance <sup>a</sup>	$r_{DS(on)}$	$V_{GS} = -4.5 \text{ V}, I_D = -2.7 \text{ A}$		0.095	0.110	$\Omega$
		$V_{GS} = -2.5 \text{ V}, I_D = -2.2 \text{ A}$		0.137	0.160	
		$V_{GS} = -1.8 \text{ V}, I_D = -1 \text{ A}$		0.205	0.240	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = -10 \text{ V}, I_D = -2.7 \text{ A}$		7		S
Diode Forward Voltage <sup>a</sup>	$V_{SD}$	$I_S = -0.9 \text{ A}, V_{GS} = 0 \text{ V}$		-0.8	-1.2	V
<b>Dynamic<sup>b</sup></b>						
Total Gate Charge	$Q_g$	$V_{DS} = -10 \text{ V}, V_{GS} = -4.5 \text{ V}, I_D = -2.7 \text{ A}$		5.1	7.7	nC
Gate-Source Charge	$Q_{gs}$		1.2			
Gate-Drain Charge	$Q_{gd}$		1.0			
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -10 \text{ V}, R_L = 10 \Omega$ $I_D \cong -1 \text{ A}, V_{GEN} = -4.5 \text{ V}, R_g = 6 \Omega$		16	25	ns
Rise Time	$t_r$		30	45		
Turn-Off Delay Time	$t_{d(off)}$		30	45		
Fall Time	$t_f$		27	40		
Source-Drain Reverse Recovery Time	$t_{rr}$	$I_F = -0.9 \text{ A}, di/dt = 100 \text{ A}/\mu\text{s}$		20	40	

## Notes

a. Pulse test; pulse width  $\leq 300 \mu\text{s}$ , duty cycle  $\leq 2\%$ .

b. Guaranteed by design, not subject to production testing.

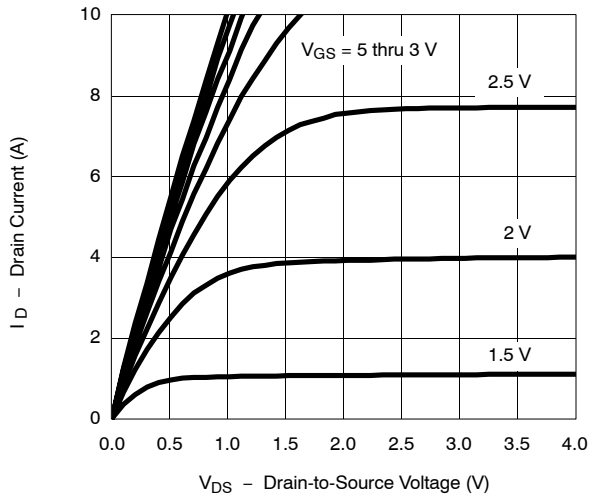
SCHOTTKY SPECIFICATIONS ( $T_J = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED)						
Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Forward Voltage Drop	$V_F$	$I_F = 1 \text{ A}$		0.34	0.375	V
		$I_F = 1 \text{ A}, T_J = 125^\circ\text{C}$		0.255	0.290	
Maximum Reverse Leakage Current	$I_{rm}$	$V_r = 20 \text{ V}$		0.05	0.500	mA
		$V_r = 20 \text{ V}, T_J = 85^\circ\text{C}$		2	20	
		$V_r = 20 \text{ V}, T_J = 125^\circ\text{C}$		10	100	
Junction Capacitance	$C_T$	$V_r = 10 \text{ V}$		90		pF



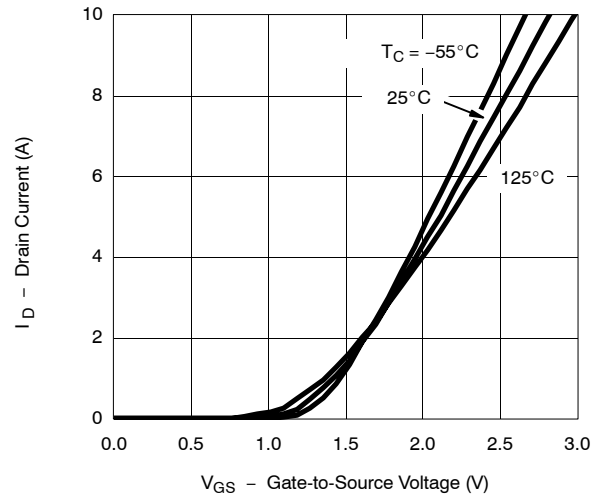
**TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED)**

**MOSFET**

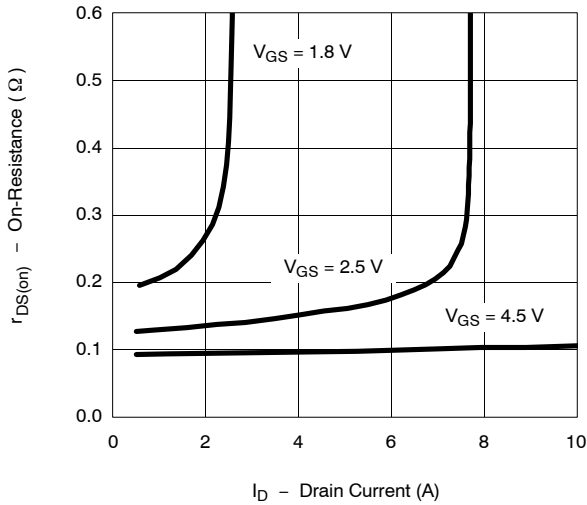
**Output Characteristics**



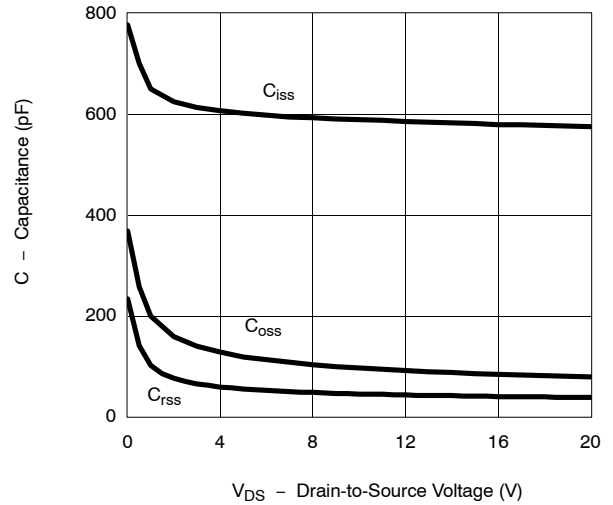
**Transfer Characteristics**



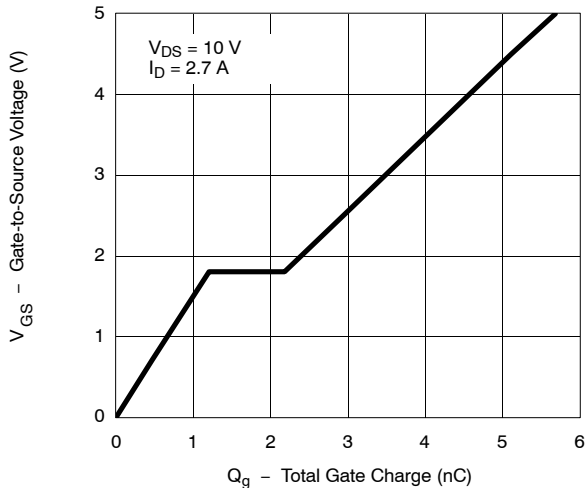
**On-Resistance vs. Drain Current**



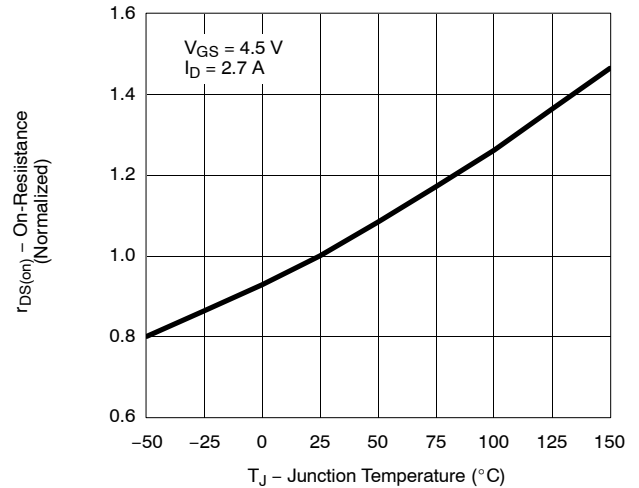
**Capacitance**



**Gate Charge**



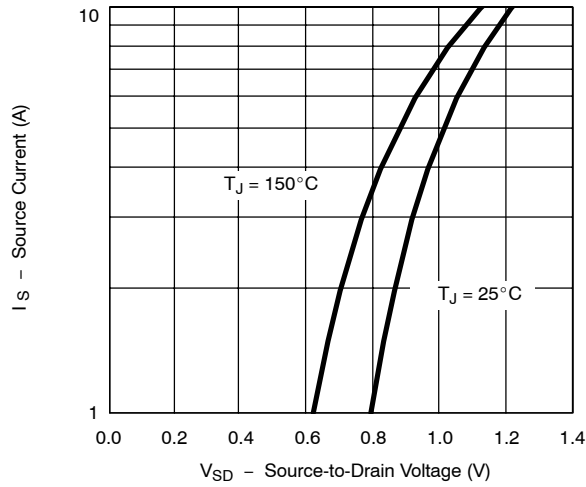
**On-Resistance vs. Junction Temperature**



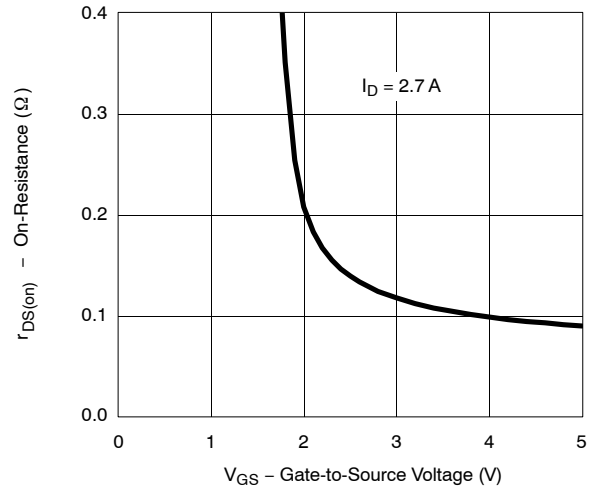
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**MOSFET**

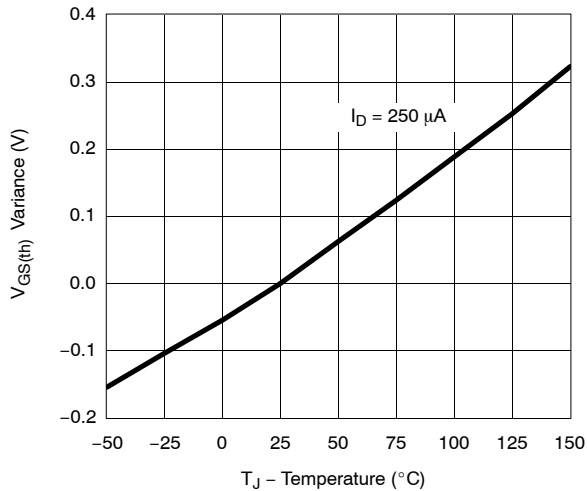
**Source-Drain Diode Forward Voltage**



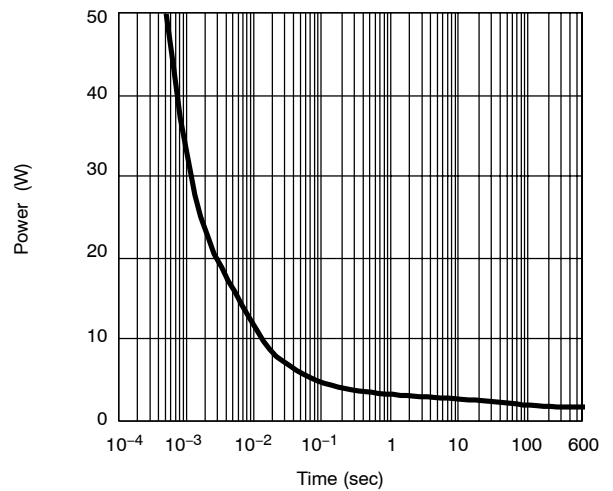
**On-Resistance vs. Gate-to-Source Voltage**



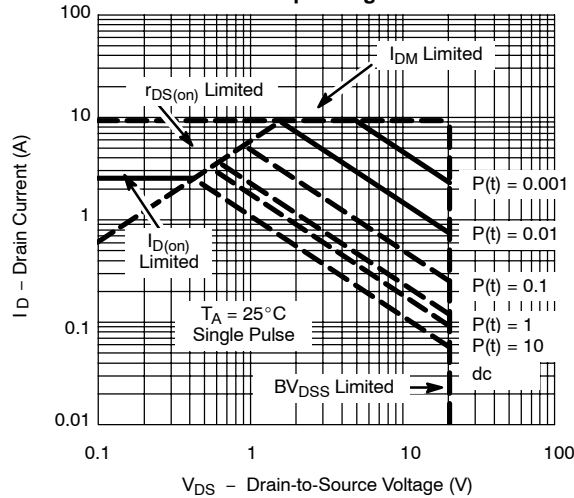
**Threshold Voltage**



**Single Pulse Power**

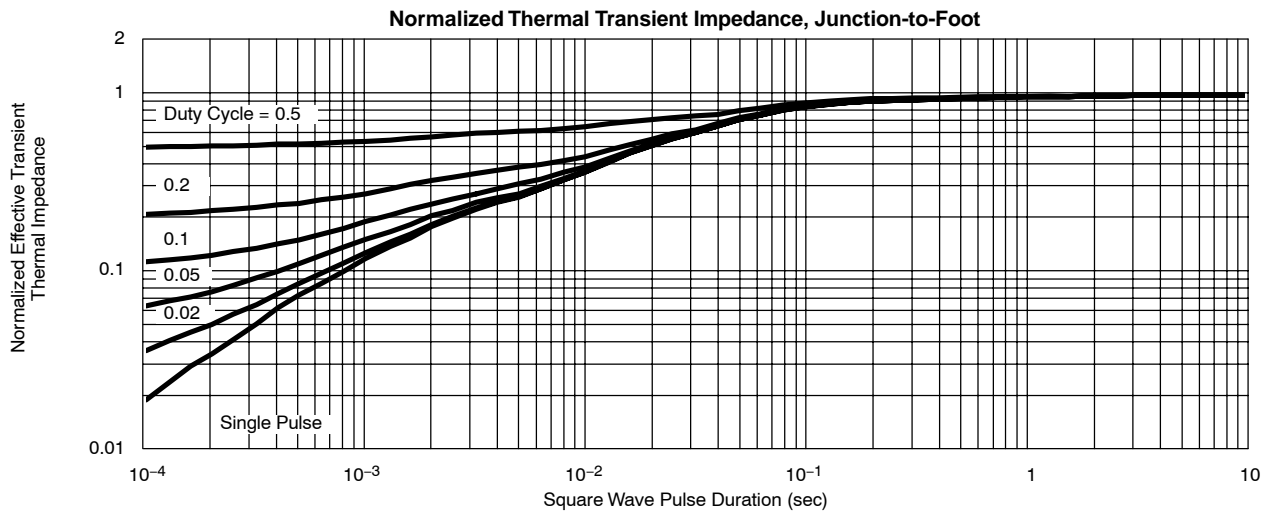
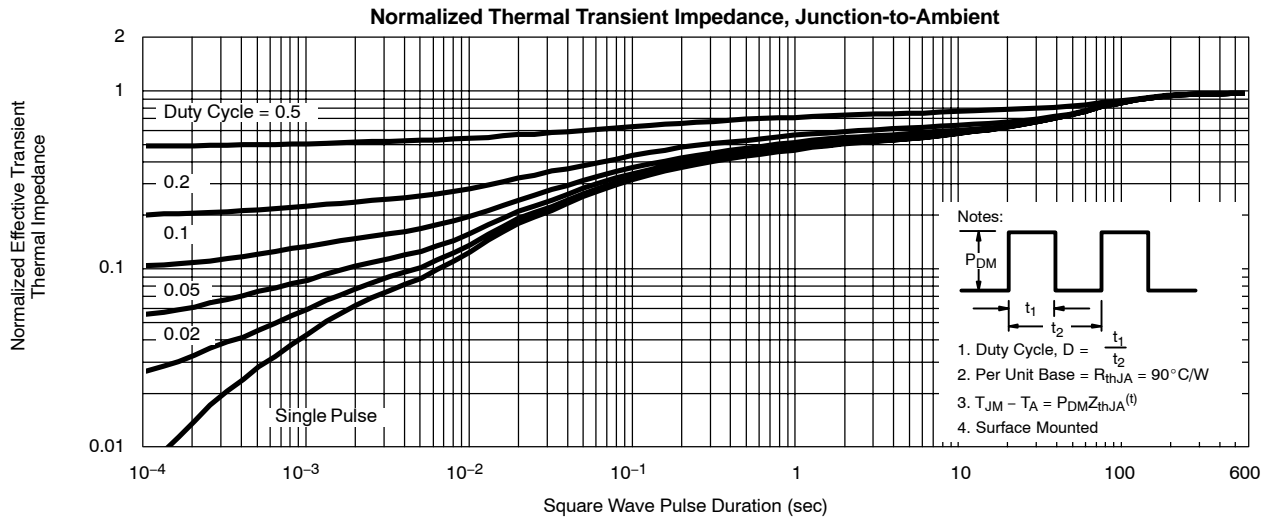


**Safe Operating Area**



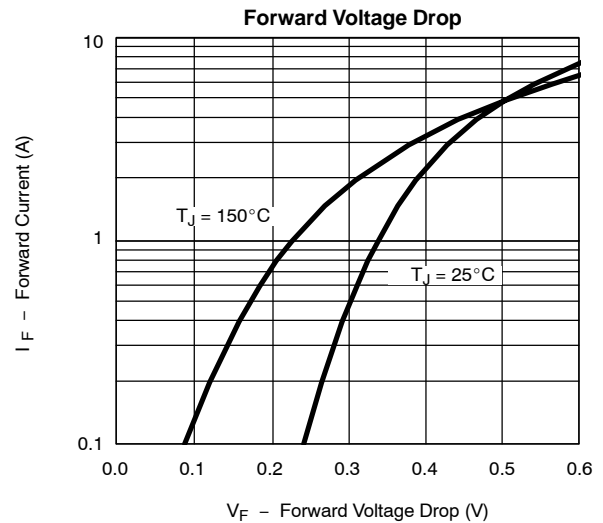
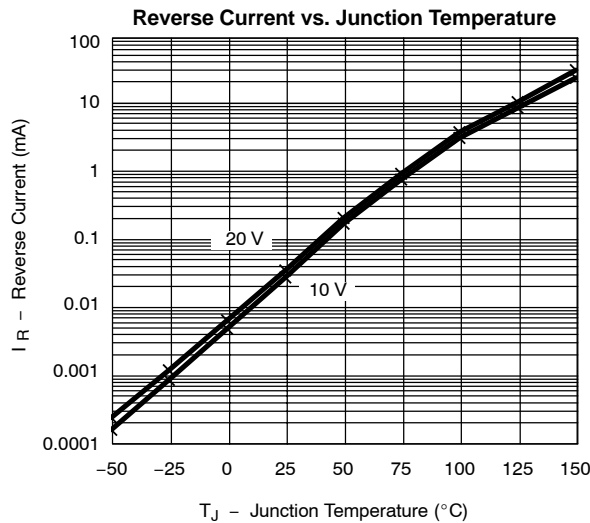
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**MOSFET**



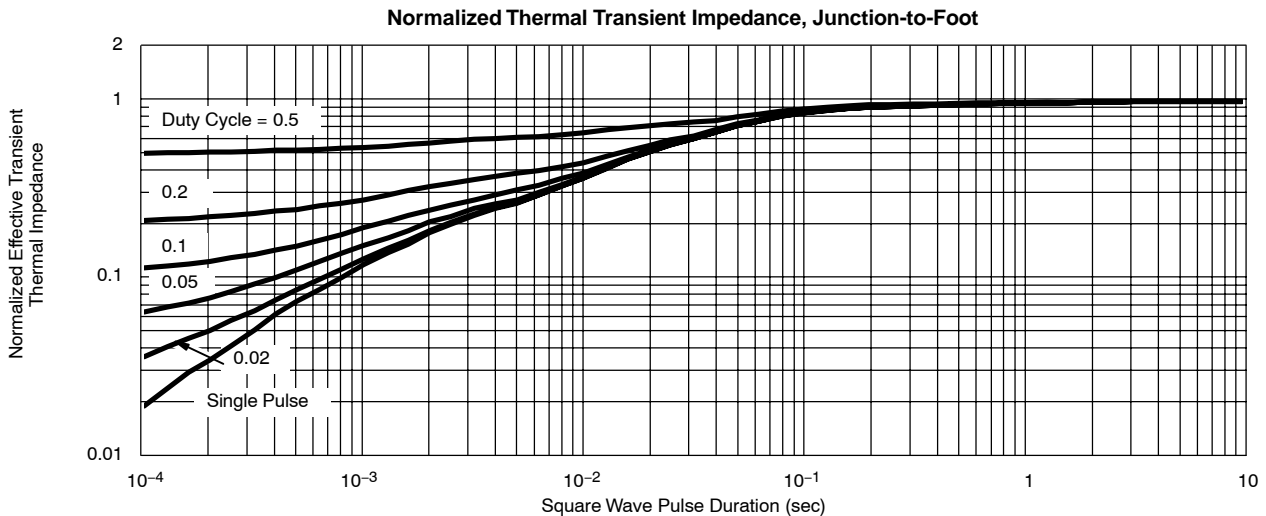
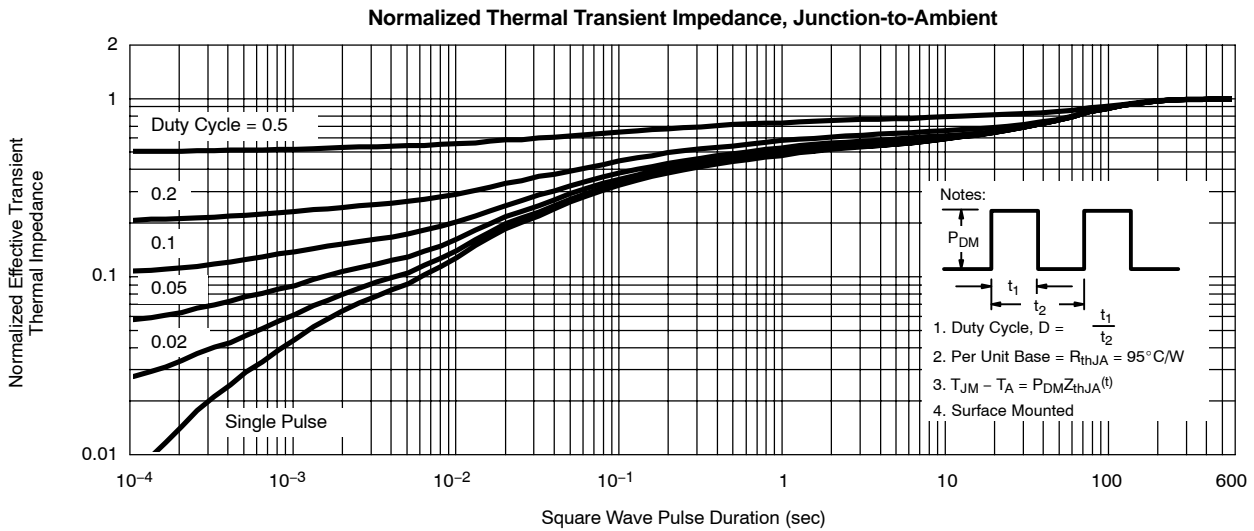
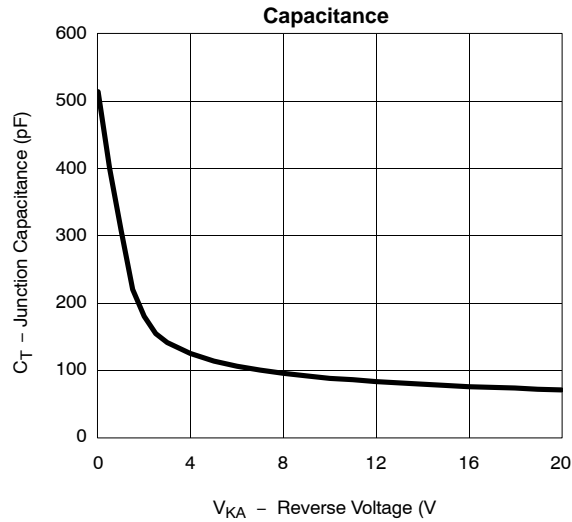
**TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)**

**SCHOTTKY**



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