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

MOSFET PRODUCT SUMMARY		
V_{DS} (V)	$r_{DS(on)}$ (Ω)	I_D (A)
20	0.040 @ V_{GS} = 4.5 V	5.9
	0.045 @ V_{GS} = 2.5 V	5.6
	0.052 @ V_{GS} = 1.8 V	5.2

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

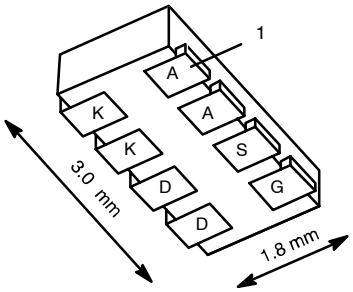
FEATURES

- TrenchFET® Power MOSFETS
- Ultra Low $r_{DS(on)}$
- Ultra Low V_F Schottky
- Si5853DC Pin Compatible

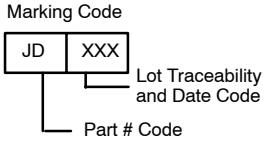
APPLICATIONS

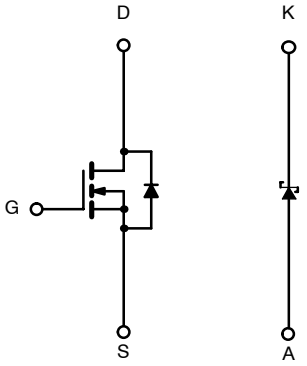
- Buck Rectifier Switch, Buck-Boost
- Synchronous Rectifier or Load
- Switch For Portable Devices

1206-8 ChipFET®



Bottom View





N-Channel MOSFET

Ordering Information: Si5856DC-T1

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C UNLESS OTHERWISE NOTED)					
Parameter		Symbol	5 sec	Steady State	Unit
Drain-Source Voltage (MOSFET and Schottky)		V_{DS}	20		V
Reverse Voltage (Schottky)		V_{KA}	20		
Gate-Source Voltage (MOSFET)		V_{GS}	±8		
Continuous Drain Current (T_J = 150°C) (MOSFET)[a]	T_A = 25°C	I_D	5.9	4.4	A
	T_A = 85°C		4.2	3.1	
Pulsed Drain Current (MOSFET)		I_{DM}	20		
Continuous Source Current (MOSFET Diode Conduction)[a]		I_S	1.8	0.9	
Average Foward Current (Schottky)		I_F	1.0		
Pulsed Foward Current (Schottky)		I_{FM}	7		
Maximum Power Dissipation (MOSFET)[a]	T_A = 25°C	P_D	2.1	1.1	W
	T_A = 85°C		1.1	0.6	
Maximum Power Dissipation (Schottky)[a]	T_A = 25°C		1.9	1.1	
	T_A = 85°C		1.0	0.56	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	−55 to 150		°C
Soldering Recommendations (Peak Temperature)[b, c]			260		

Notes
a. Surface Mounted on 1" x 1" FR4 Board.
b. 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.
c. 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[a]	t ≤ 5 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°C UNLESS OTHERWISE NOTED)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Static						
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 µA	0.4		1.0	V
Gate-Body Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ±8 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 = 85°C			5	
On-State Drain Current[a]	$I_{D(on)}$	V_{DS} ≥ 5 V, V_{GS} = 4.5 V	20			A
Drain-Source On-State Resistance[a]	$r_{DS(on)}$	V_{GS} = 4.5 V, I_D = 4.4 A		0.032	0.040	Ω
		V_{GS} = 2.5 V, I_D = 4.1 A		0.036	0.045	
		V_{GS} = 1.8 V, I_D = 1.9 A		0.042	0.052	
Forward Transconductance[a]	g_{fs}	V_{DS} = 10 V, I_D = 4.4 A		22		S
Diode Forward Voltage[a]	V_{SD}	I_S = 1.0 A, V_{GS} = 0 V		0.8	1.2	V
Dynamic[b]						
Total Gate Charge	Q_g	V_{DS} = 10 V, V_{GS} = 4.5 V, I_D = 4.4 A		5	7.5	nC
Gate-Source Charge	Q_{gs}			0.85		
Gate-Drain Charge	Q_{gd}			1		
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 10 V, R_L = 10 Ω I_D ≅ 1 A, V_{GEN} = 4.5 V, R_G = 6 Ω		20	30	ns
Rise Time	t_r			36	55	
Turn-Off Delay Time	$t_{d(off)}$			30	45	
Fall Time	t_f			12	20	
Source-Drain Reverse Recovery Time	t_{rr}	I_F = 0.9 A, di/dt = 100 A/µs		45	90	

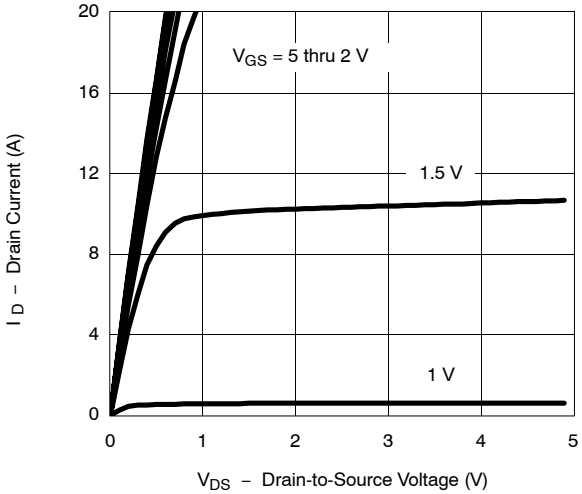
Notes
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2%,
b. Guaranteed by design, not subject to production testing.

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

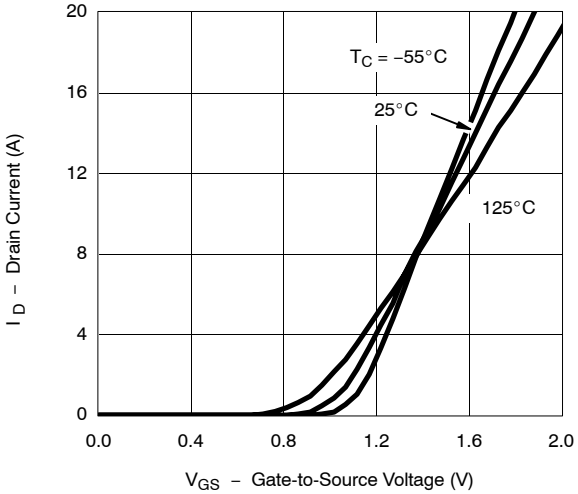
Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Forward Voltage Drop	V_F	I_F = 1.0		0.34	0.375	V
		I_F = 1.0, T_J = 125°C		0.255	0.290	
Maximum Reverse Leakage Current	I_{rm}	V_r = 20 V		0.05	0.500	mA
		V_r = 20 V, T_J = 85°C		2	20	
		V_r = 20 V, T_J = 125°C		10	100	
Junction Capacitance	C_T	V_r = 10 V		90		pF

TYPICAL CHARACTERISTICS (25°C UNLESS NOTED) MOSFET

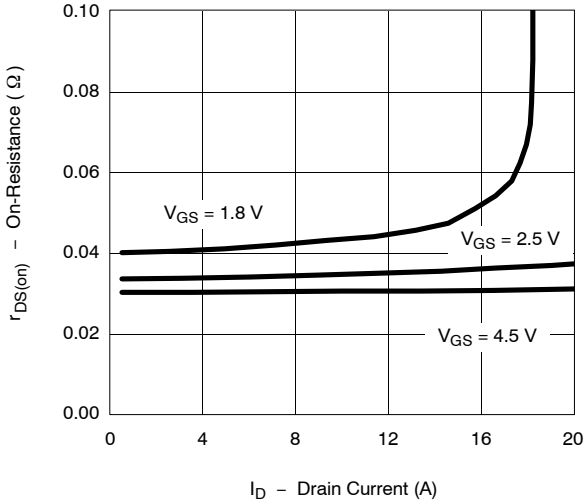
Output Characteristics



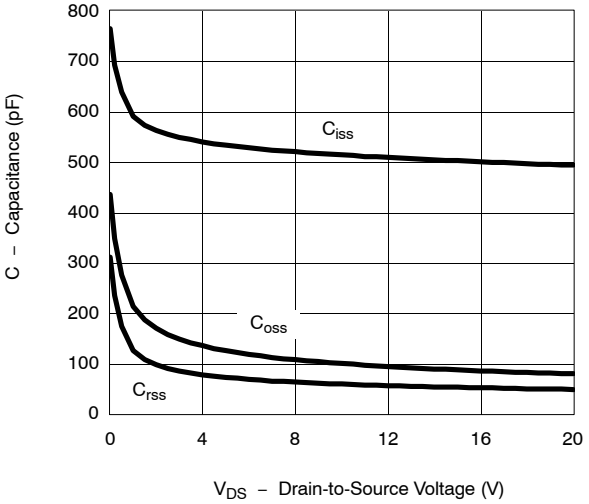
Transfer Characteristics



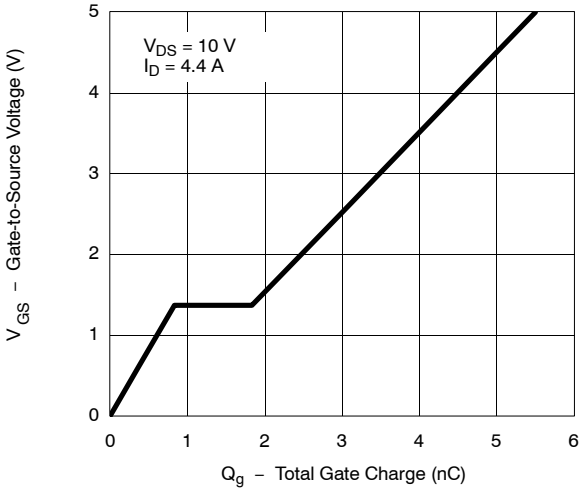
On-Resistance vs. Drain Current



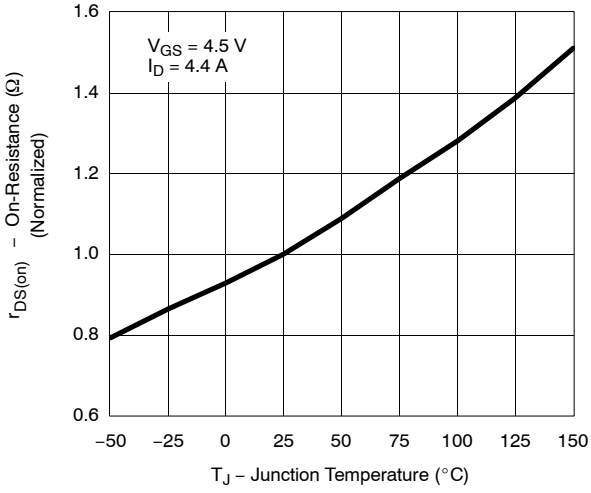
Capacitance



Gate Charge

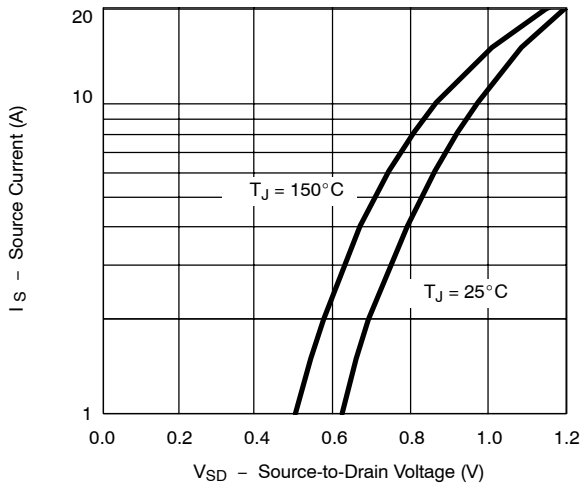


On-Resistance vs. Junction Temperature

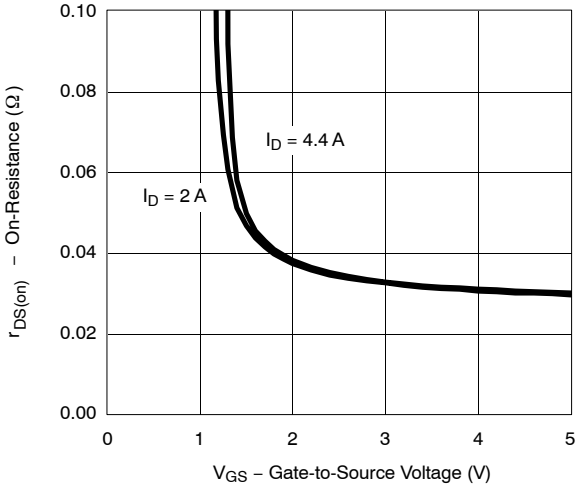


TYPICAL CHARACTERISTICS (25°C UNLESS NOTED) MOSFET

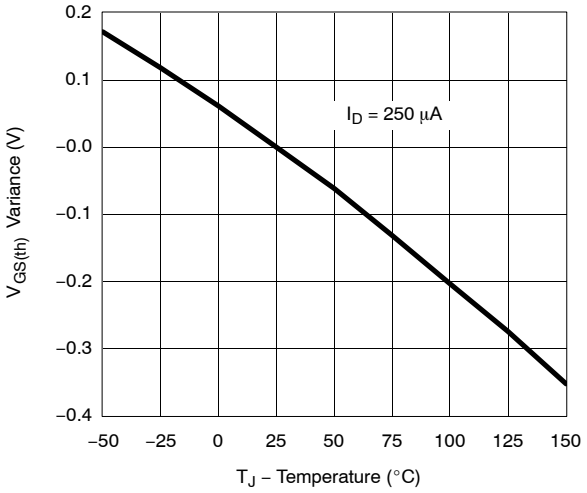
Source-Drain Diode Forward Voltage



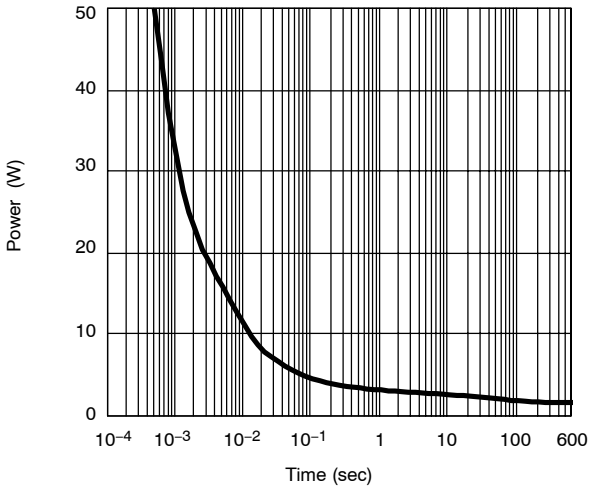
On-Resistance vs. Gate-to-Source Voltage



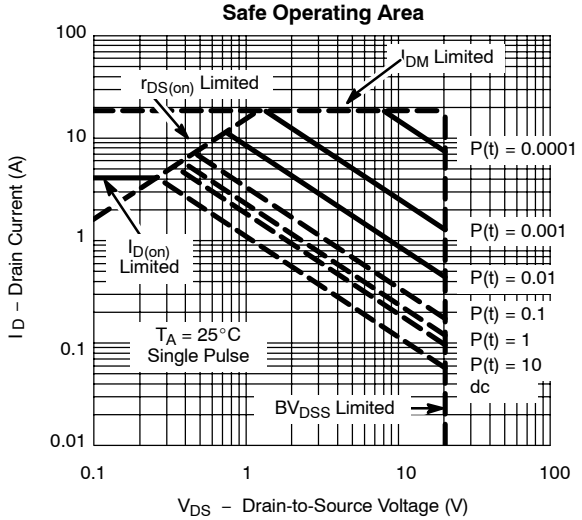
Threshold Voltage



Single Pulse Power



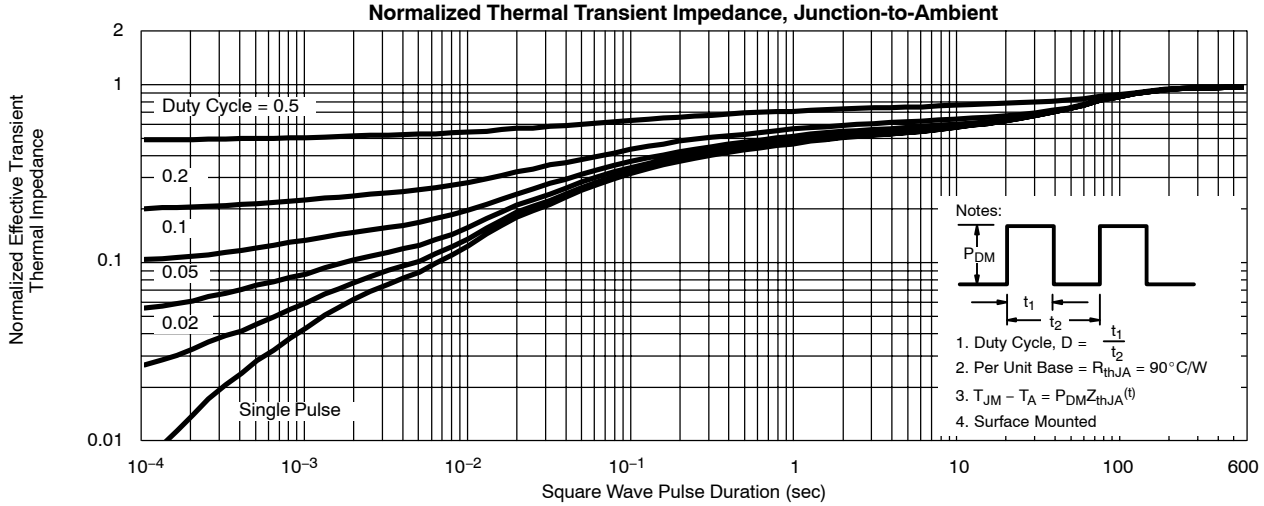
Safe Operating Area



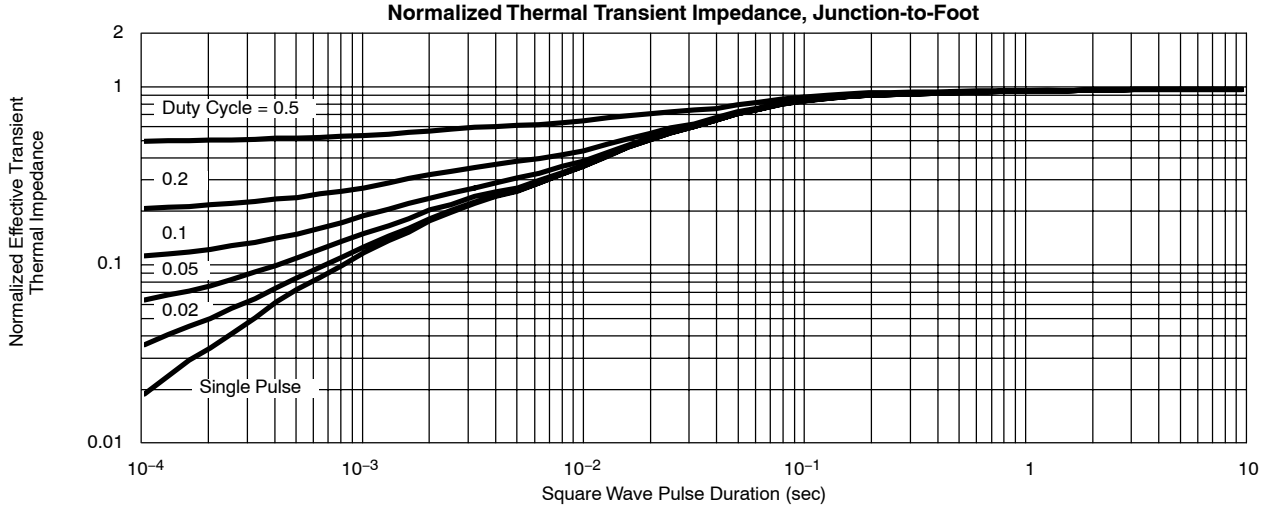
1000

TYPICAL CHARACTERISTICS (25°C UNLESS NOTED) MOSFET

Normalized Thermal Transient Impedance, Junction-to-Ambient

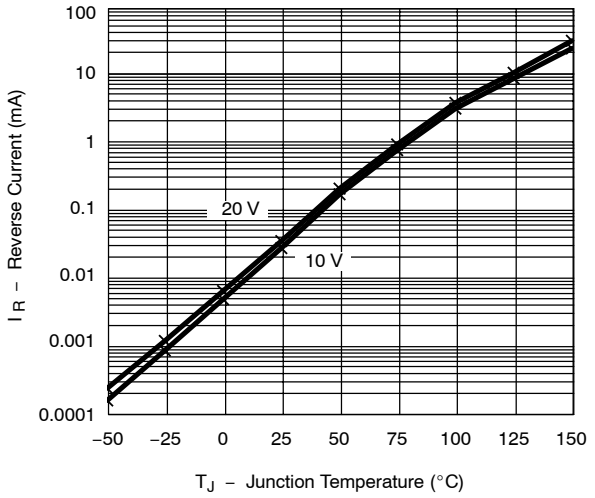


Normalized Thermal Transient Impedance, Junction-to-Foot

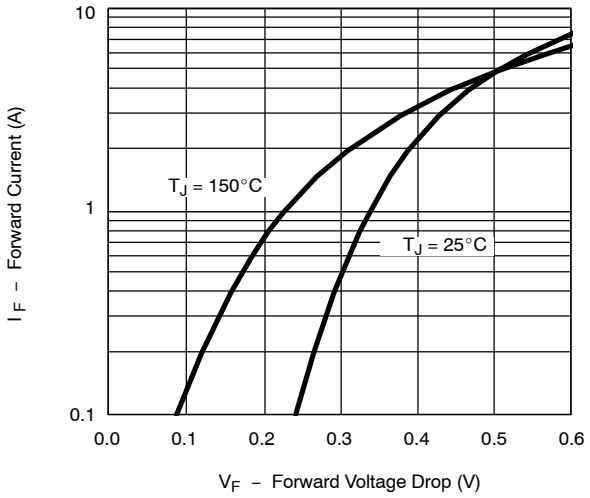


TYPICAL CHARACTERISTICS (25°C UNLESS NOTED) SCHOTTKY

Reverse Current vs. Junction Temperature

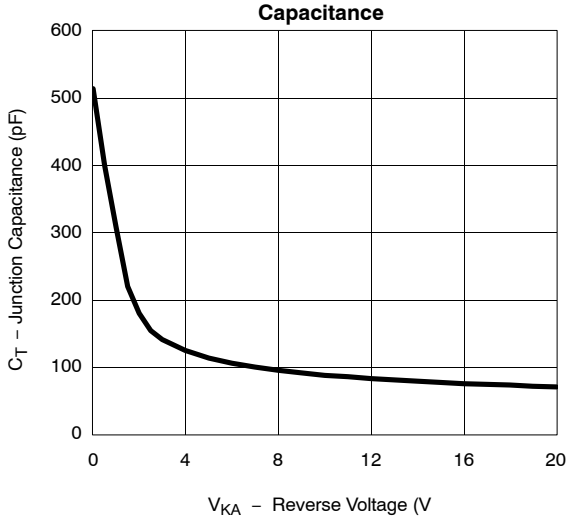


Forward Voltage Drop

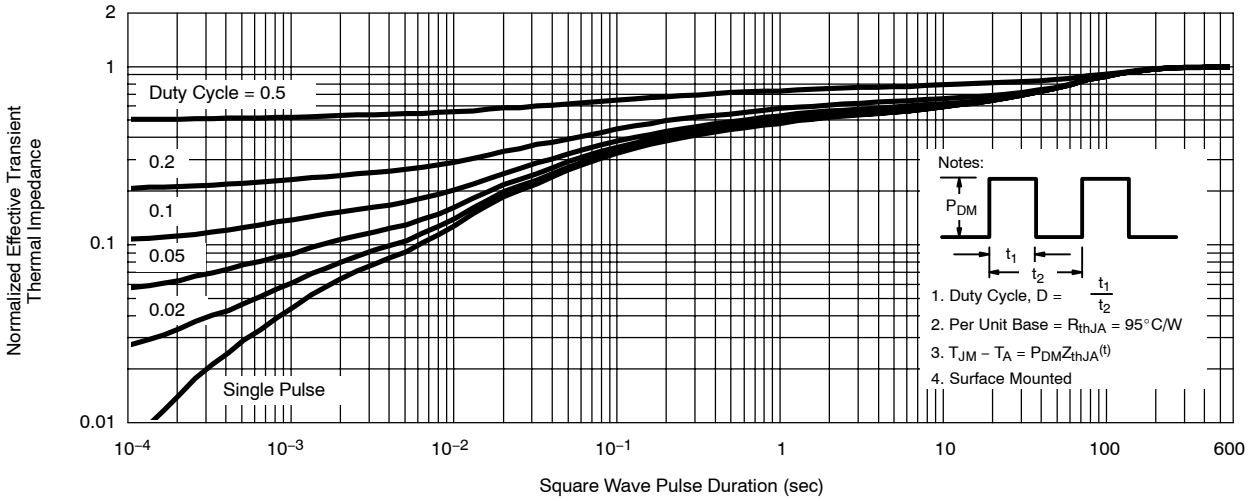


TYPICAL CHARACTERISTICS (25°C UNLESS NOTED) SCHOTTKY

Capacitance



Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Foot