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

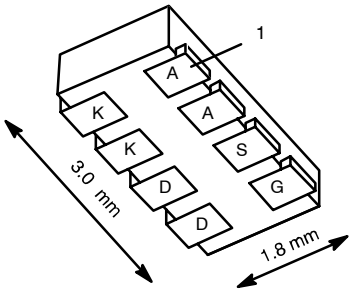
- TrenchFET® Power MOSFETS
- Ultra Low $r_{DS(on)}$
- Ultra Low V_F Schottky
- Si5853DC Pin Compatible

Pb-free Available

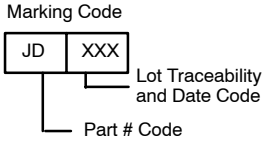
APPLICATIONS

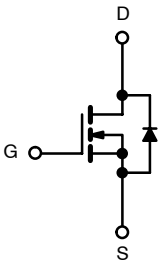
- Buck Rectifier Switch, Buck-Boost
- Synchronous Rectifier or Load
- Switch For Portable Devices

1206-8 ChipFET®



Bottom View





N-Channel MOSFET

Ordering Information: Si5856DC-T1
Si5856DC-T1—E3 (Lead (Pb)-Free)

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.

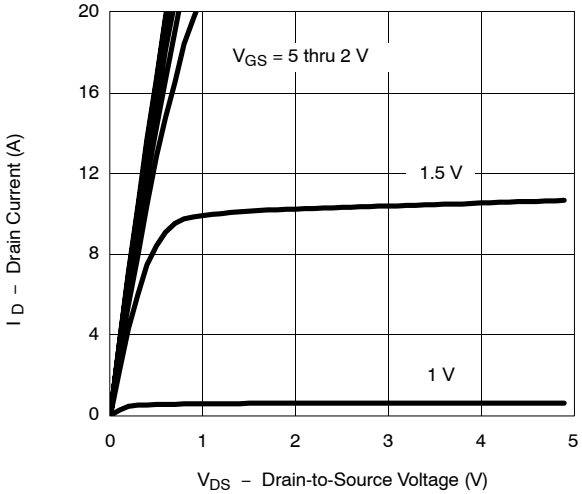
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

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

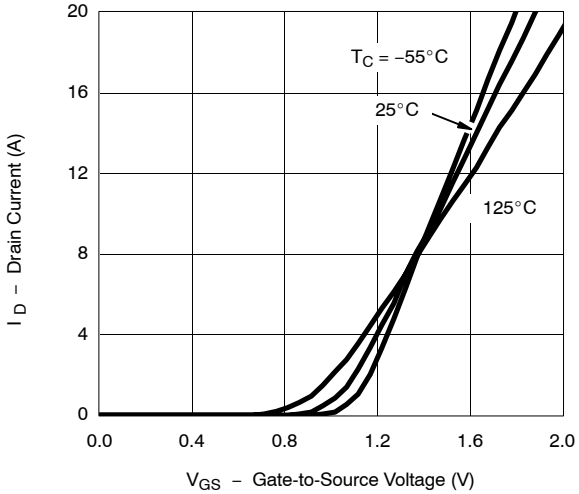
Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Forward Voltage Drop	V_F	I_F = 1.0		0.34	0.375	V
		I_F = 1.0, T_J = 125°C		0.255	0.290	
Maximum Reverse Leakage Current	I_{rm}	V_r = 20 V		0.05	0.500	mA
		V_r = 20 V, T_J = 85°C		2	20	
		V_r = 20 V, T_J = 125°C		10	100	
Junction Capacitance	C_T	V_r = 10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

TYPICAL CHARACTERISTICS (25°C UNLESS NOTED) MOSFET

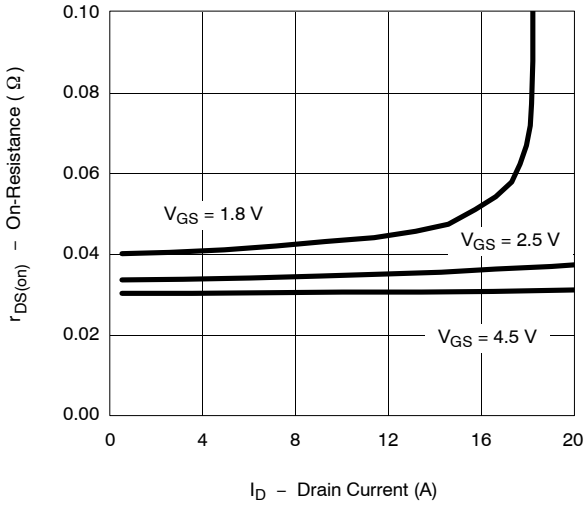
Output Characteristics



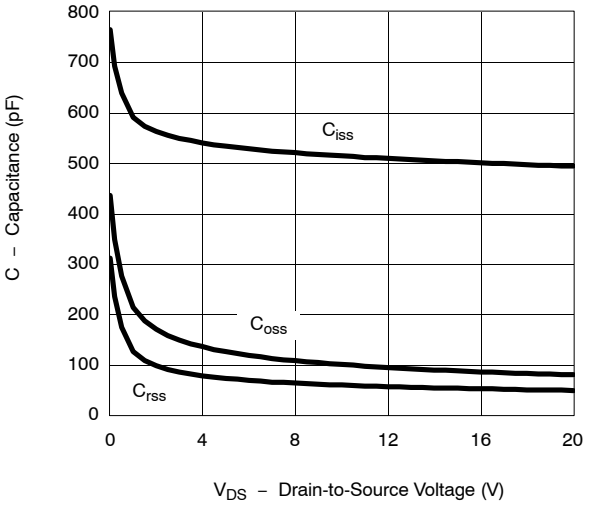
Transfer Characteristics



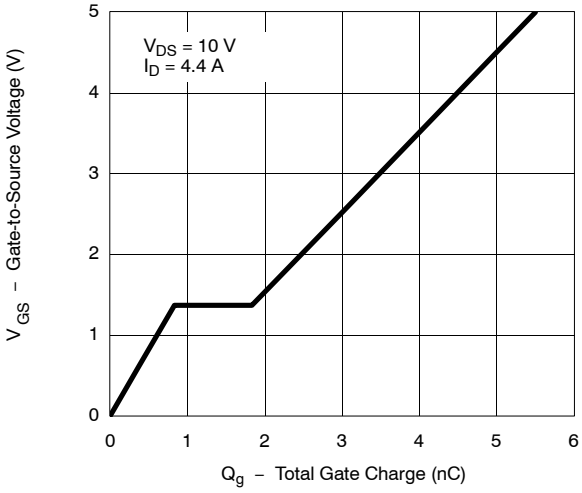
On-Resistance vs. Drain Current



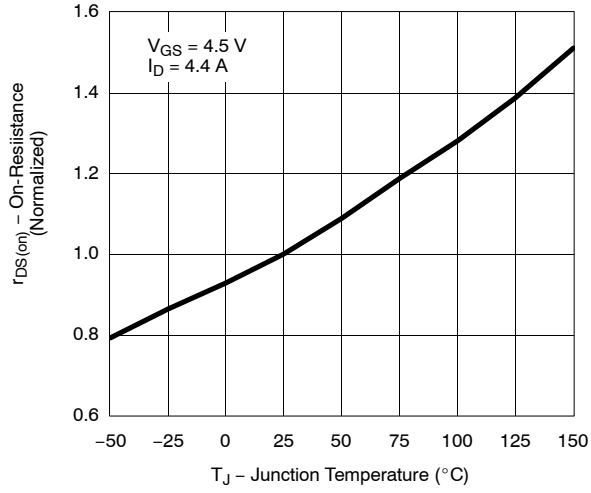
Capacitance



Gate Charge

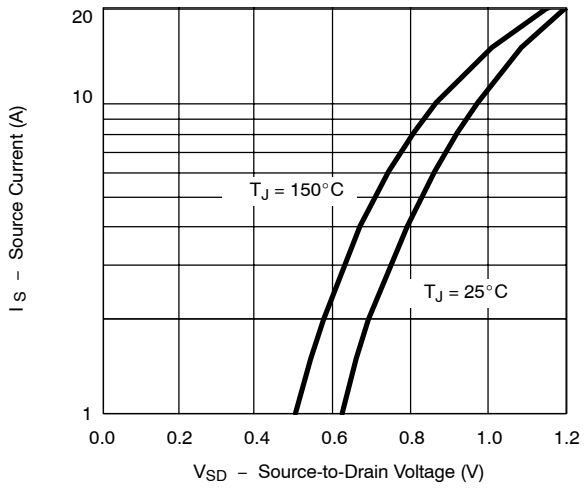


On-Resistance vs. Junction Temperature

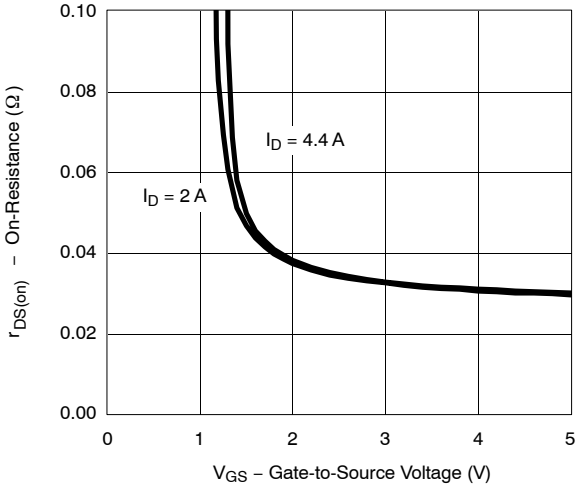


TYPICAL CHARACTERISTICS (25°C UNLESS NOTED) MOSFET

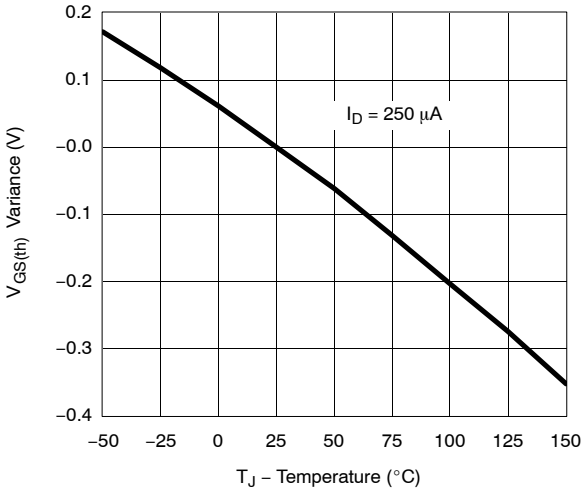
Source-Drain Diode Forward Voltage



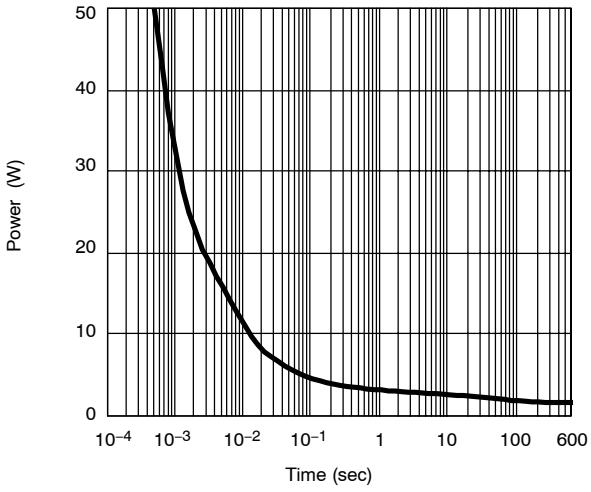
On-Resistance vs. Gate-to-Source Voltage



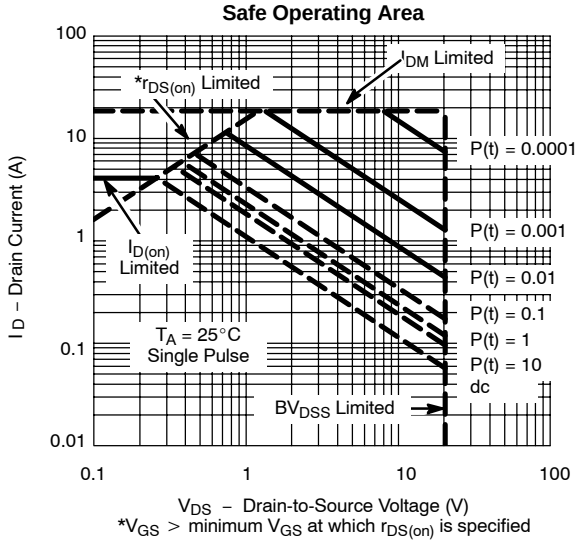
Threshold Voltage



Single Pulse Power

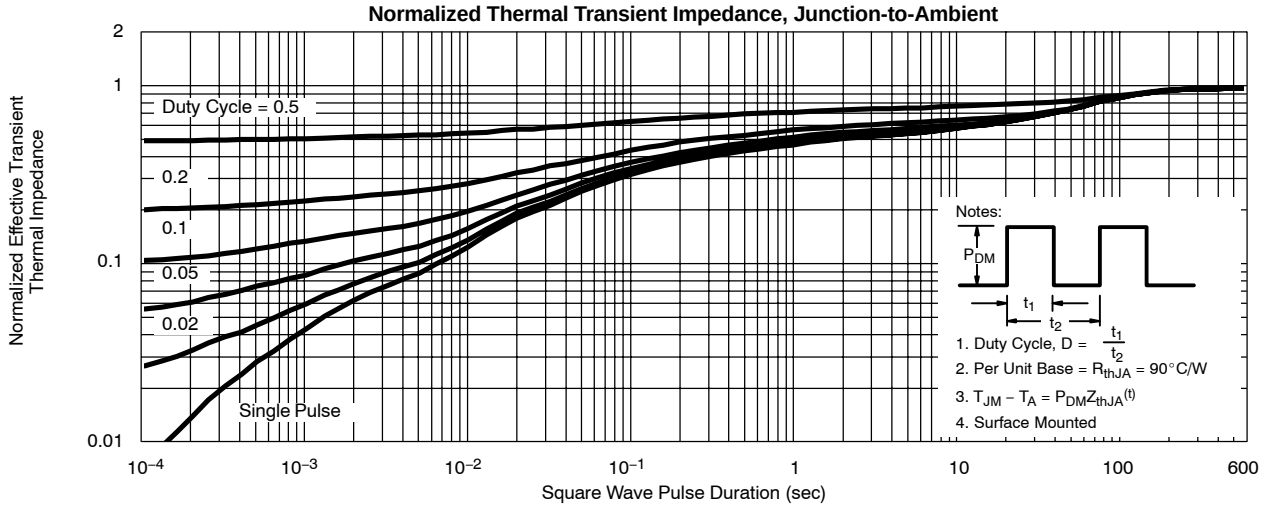


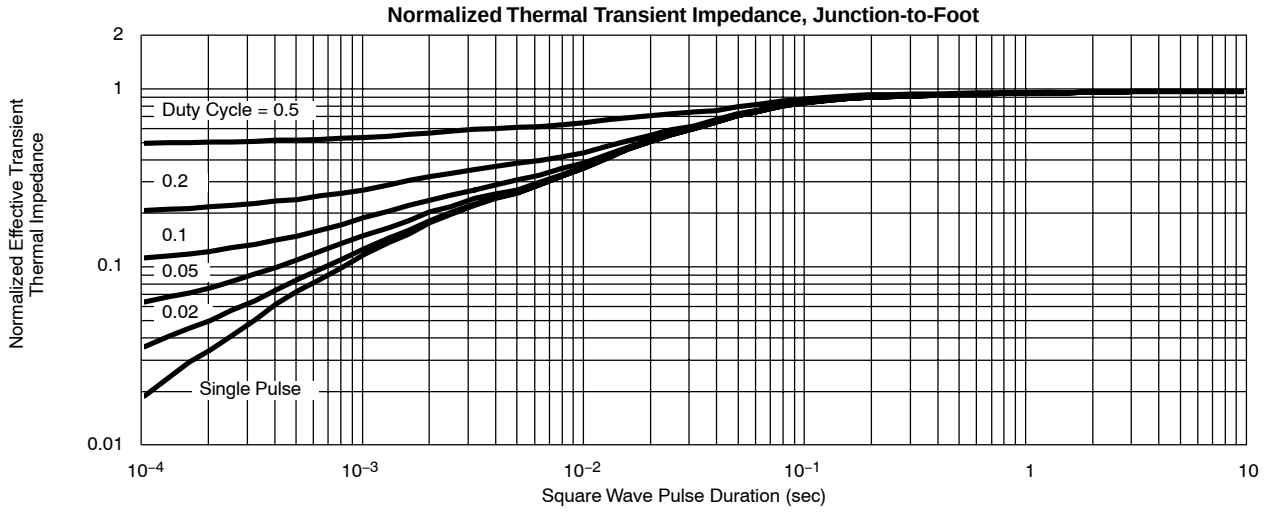
Safe Operating Area



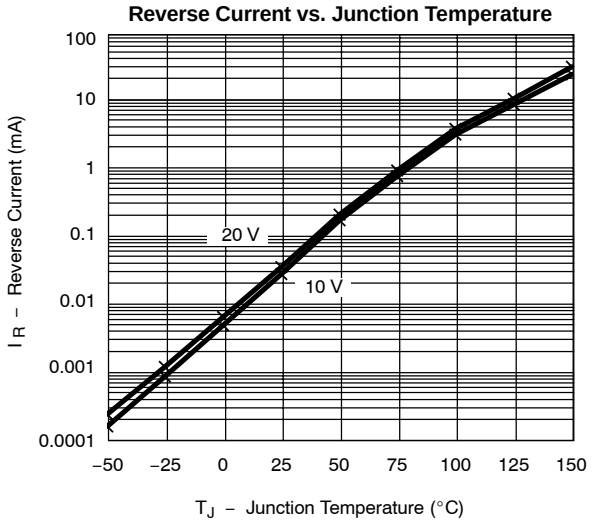
*V_{GS} > minimum V_{GS} at which $r_{DS(on)}$ is specified

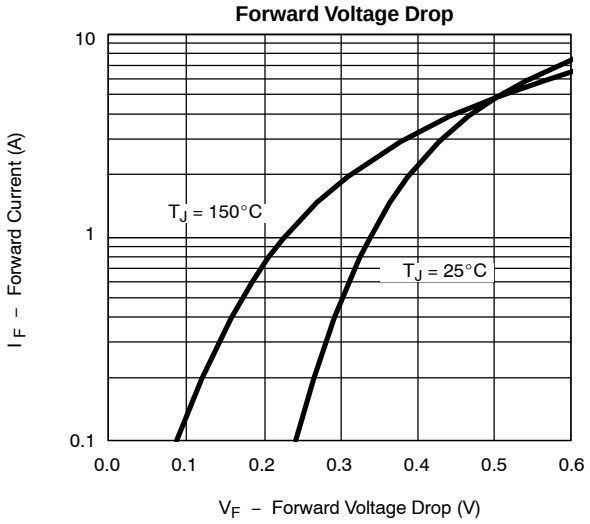
TYPICAL CHARACTERISTICS (25°C UNLESS NOTED) MOSFET





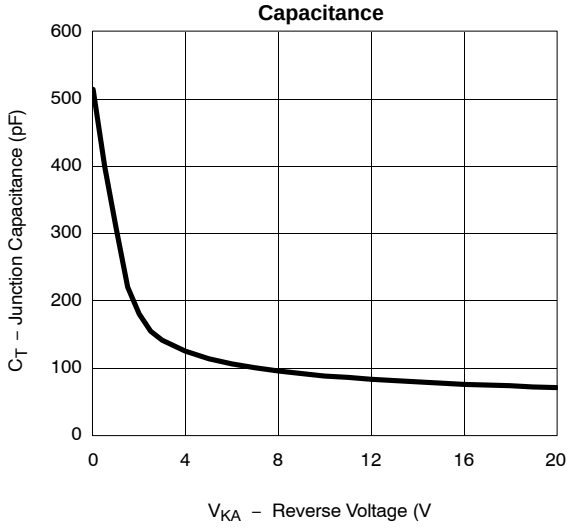
TYPICAL CHARACTERISTICS (25°C UNLESS NOTED) SCHOTTKY



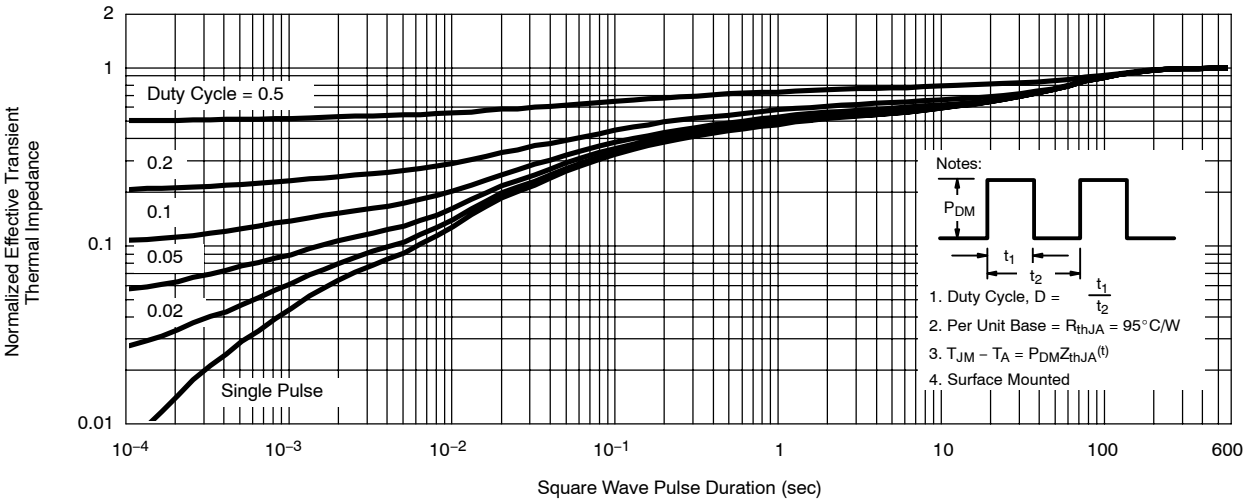


TYPICAL CHARACTERISTICS (25°C UNLESS NOTED) SCHOTTKY

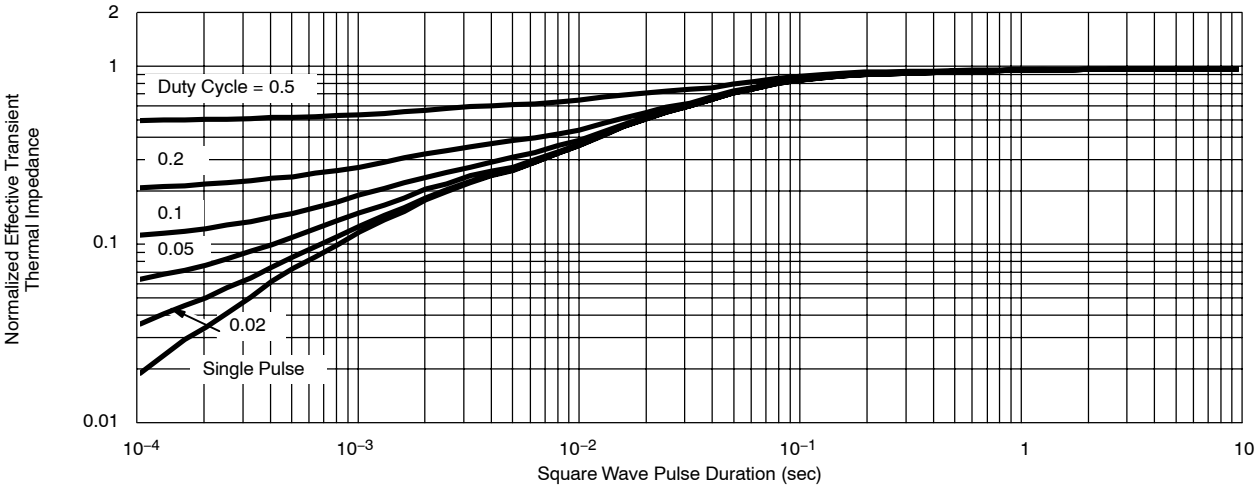
Capacitance



Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Foot



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