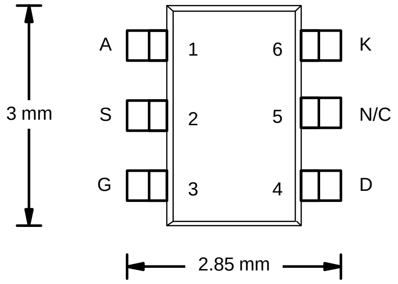
P-Channel 20-V (D-S) MOSFET With Schottky Diode

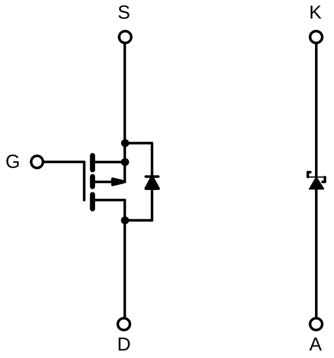
MOSFET PRODUCT SUMMARY		
V_{DS} (V)	$r_{DS(on)}$ (Ω)	I_D (A)
–20	0.200 @ V_{GS} = –4.5 V	±1.8
	0.340 @ V_{GS} = –2.5 V	±1.3

LITTLE FOOT Plus™

SCHOTTKY PRODUCT SUMMARY		
V_{KA} (V)	V_f (v) Diode Forward Voltage	I_F (A)
20	0.48 V @ 0.5 A	0.5

TSOP-6
Top View





P-Channel MOSFET

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}	±12	±12	
Continuous Drain Current (T_J = 150°C) (MOSFET)[a]	T_A = 25°C	I_D	±1.8	±1.6	A
	T_A = 70°C		±1.5	±1.2	
Pulsed Drain Current (MOSFET)		I_{DM}	±7		
Continuous Source Current (MOSFET Diode Conduction)[a]		I_S	–1.05	–0.75	
Average Foward Current (Schottky)		I_F	0.5		
Pulsed Foward Current (Schottky)		I_{FM}	7		
Maximum Power Dissipation (MOSFET)[a]	T_A = 25°C	P_D	1.15	0.83	W
	T_A = 70°C		0.73	0.53	
Maximum Power Dissipation (Schottky)[a]	T_A = 25°C		1.0	0.76	
	T_A = 70°C		0.64	0.48	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	–55 to 150		°C

Notes
a. Surface Mounted on 1" x1" FR4 Board.

THERMAL RESISTANCE RATINGS

Parameter		Device	Symbol	Typical	Maximum	Unit
Junction-to-Ambient[a]	t ≤ 5 sec	MOSFET	R_{thJA}	93	110	°C/W
		Schottky		103	125	
	Steady State	MOSFET		130	150	
		Schottky		140	165	
Junction-to-Foot	Steady State	MOSFET	R_{thJF}	75	90	
		Schottky		80	95	

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	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = -250\ \mu A$	–0.5			V
Gate-Body Leakage	I_{GSS}	$V_{DS} = 0$ V, $V_{GS} = \pm 12$ V			±100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = -16$ V, $V_{GS} = 0$ V			–1	µA
		$V_{DS} = -16$ V, $V_{GS} = 0$ V, $T_J = 75°C$			–10	
On-State Drain Current[a]	$I_{D(on)}$	$V_{DS} \geq -5$ V, $V_{GS} = -4.5$ V	–5			A
Drain-Source On-State Resistance[a]	$r_{DS(on)}$	$V_{GS} = -4.5$ V, $I_D = -1.8$ A		0.160	0.200	Ω
		$V_{GS} = -2.5$ V, $I_D = -1.0$ A		0.280	0.340	
Forward Transconductance[a]	g_{fs}	$V_{DS} = -5$ V, $I_D = -1.8$ A		3.6		S
Diode Forward Voltage[a]	V_{SD}	$I_S = -1.05$ A, $V_{GS} = 0$ V		–0.83	–1.10	V
Dynamic[b]						
Total Gate Charge	Q_g	$V_{DS} = -10$ V, $V_{GS} = -4.5$ V, $I_D = -1.8$ A		2.7	4.0	nC
Gate-Source Charge	Q_{gs}			0.4		
Gate-Drain Charge	Q_{gd}			0.6		
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -10$ V, $R_L = 10\ \Omega$ $I_D \cong -1$ A, $V_{GEN} = -4.5$ V, $R_G = 6\ \Omega$		11	17	ns
Rise Time	t_r			34	50	
Turn-Off Delay Time	$t_{d(off)}$			19	30	
Fall Time	t_f			24	36	
Source-Drain Reverse Recovery Time	t_{rr}	$I_F = -1.05$ A, di/dt = 100 A/µs		20	40	

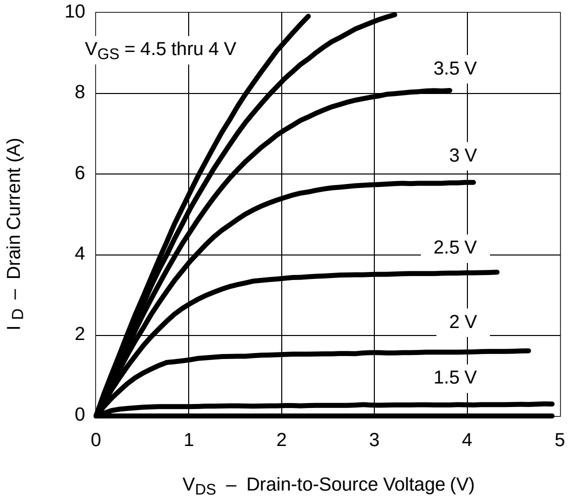
Notes
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2%.
b. Guaranteed by design, not subject to production testing.

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

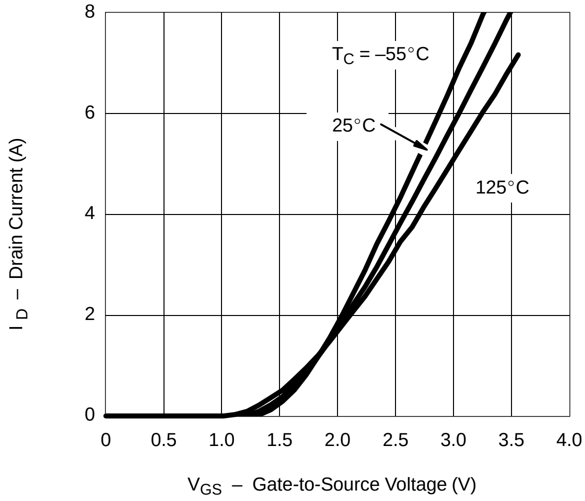
Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Forward Voltage Drop	V_F	$I_F = 0.5$ A		0.42	0.48	V
		$I_F = 0.5$ A, $T_J = 125°C$		0.33	0.4	
Maximum Reverse Leakage Current	I_{rm}	$V_r = 20$ V		0.002	0.100	mA
		$V_r = 20$ V, $T_J = 75°C$		0.06	1	
		$V_r = 20$ V, $T_J = 125°C$		1.5	10	
Junction Capacitance	C_T	$V_r = 10$ V		31		pF

TYPICAL CHARACTERISTICS (25°C UNLESS NOTED) MOSFET

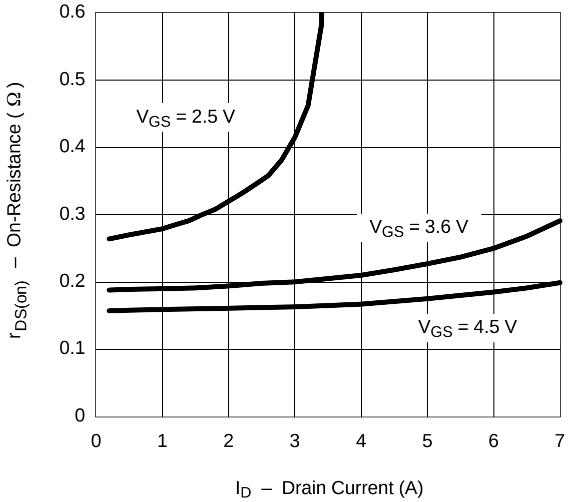
Output Characteristics



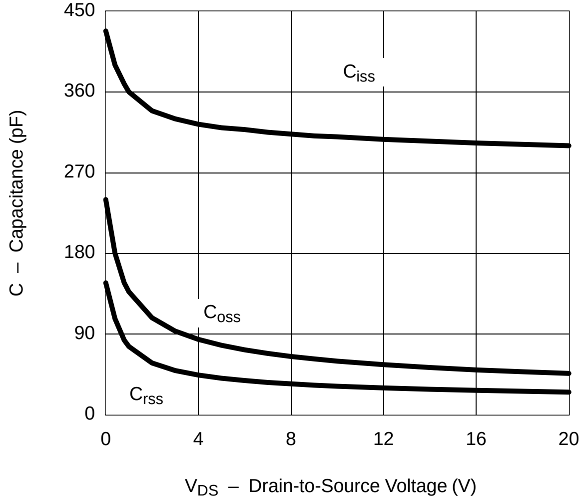
Transfer Characteristics



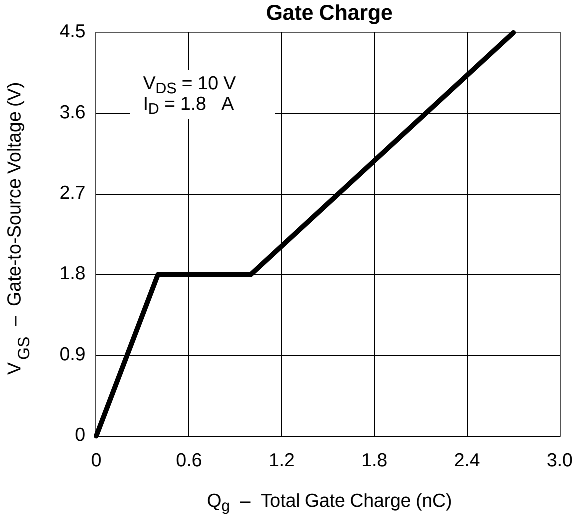
On-Resistance vs. Drain Current



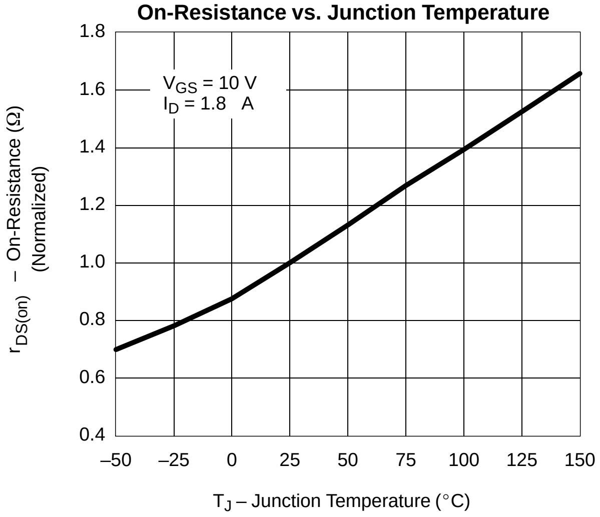
Capacitance



Gate Charge

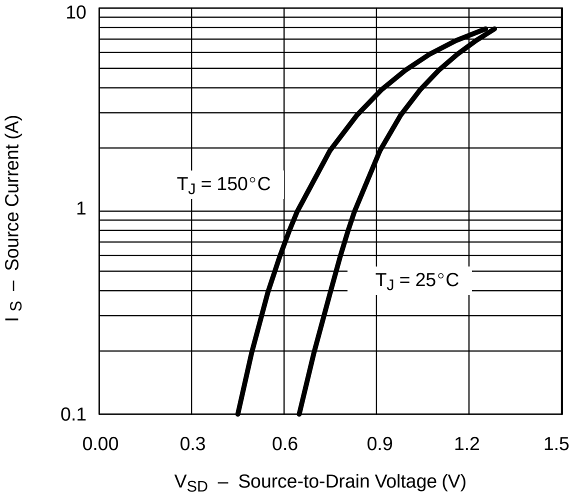


On-Resistance vs. Junction Temperature

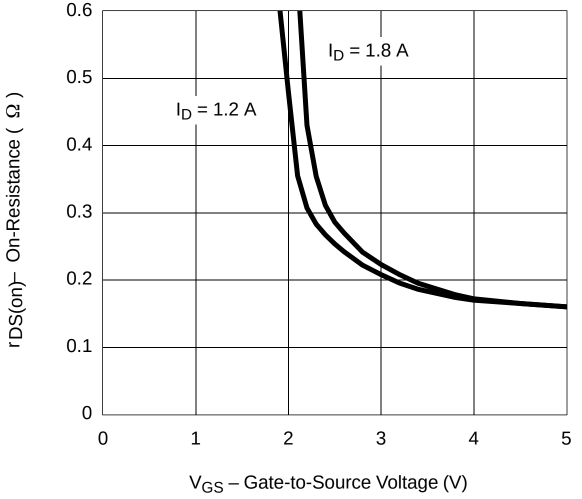


TYPICAL CHARACTERISTICS (25°C UNLESS NOTED) MOSFET

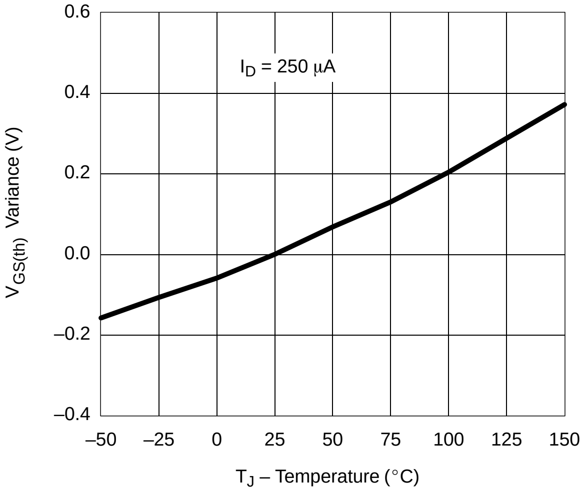
Source-Drain Diode Forward Voltage



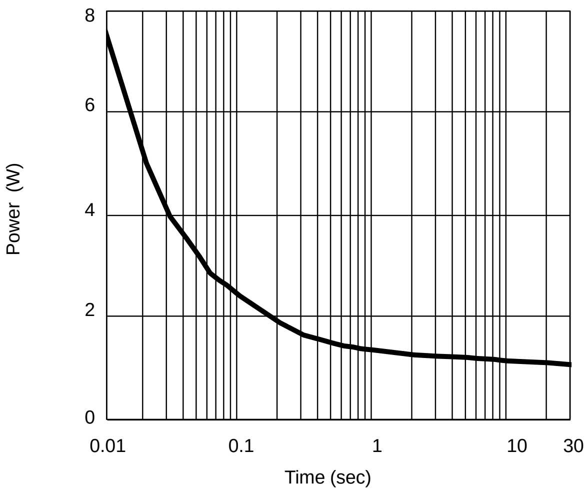
On-Resistance vs. Gate-to-Source Voltage



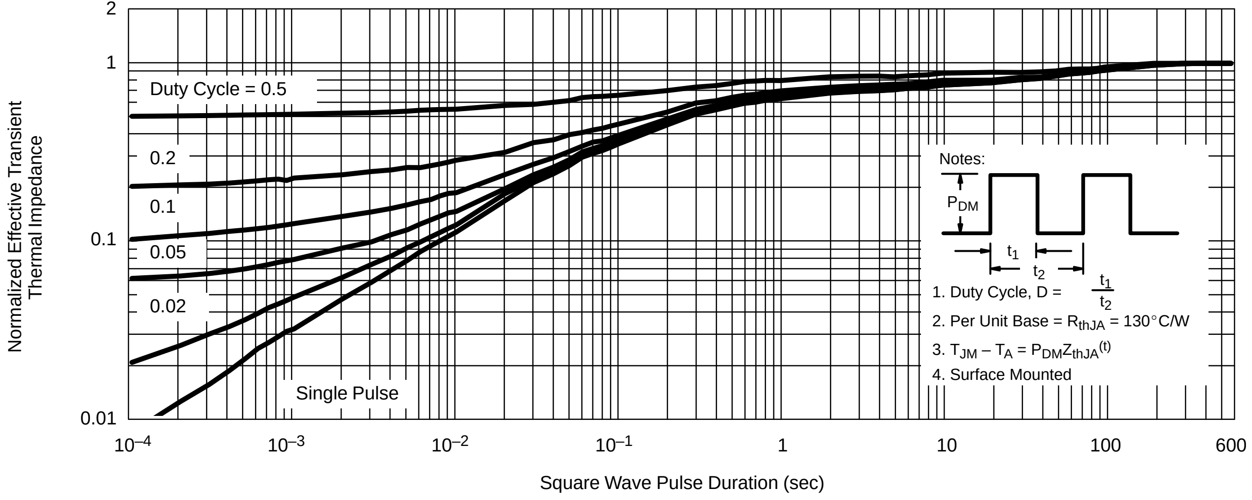
Threshold Voltage



Single Pulse Power, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Ambient

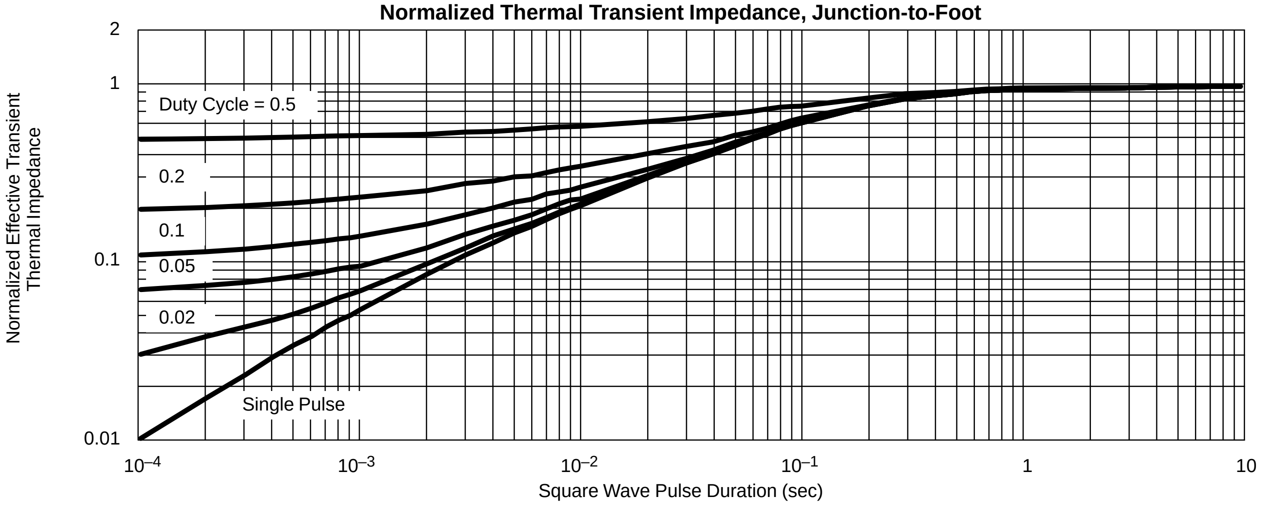


Notes:

1. Duty Cycle, D = $\frac{t_1}{t_2}$
2. Per Unit Base = R_{thJA} = 130°C/W
3. $T_{JM} - T_A = P_{DM}Z_{thJA}{}^{(t)}$
4. Surface Mounted

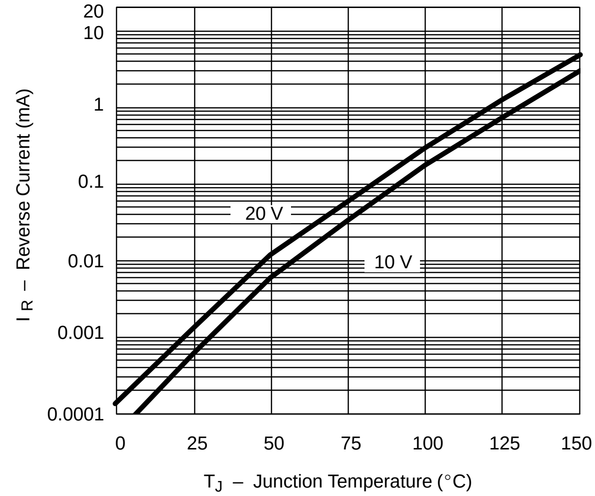
TYPICAL CHARACTERISTICS (25°C UNLESS NOTED) MOSFET

Normalized Thermal Transient Impedance, Junction-to-Foot

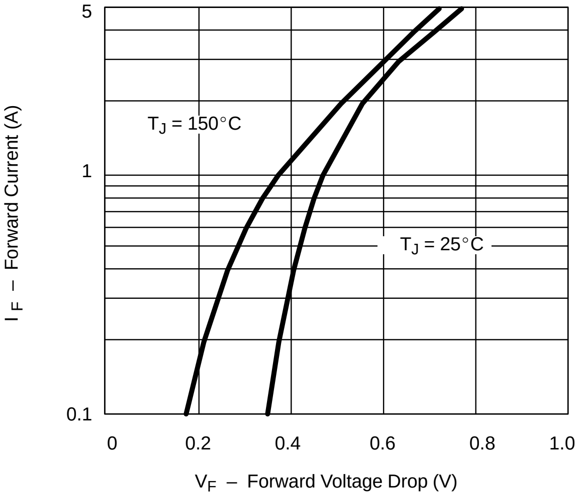


TYPICAL CHARACTERISTICS (25°C UNLESS NOTED) SCHOTTKY

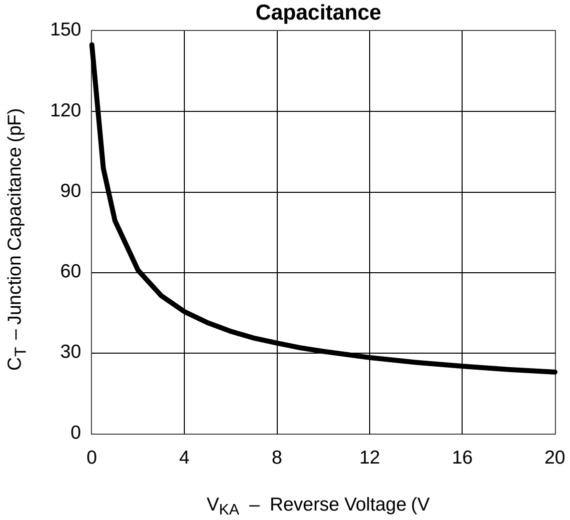
Reverse Current vs. Junction Temperature



Forward Voltage Drop

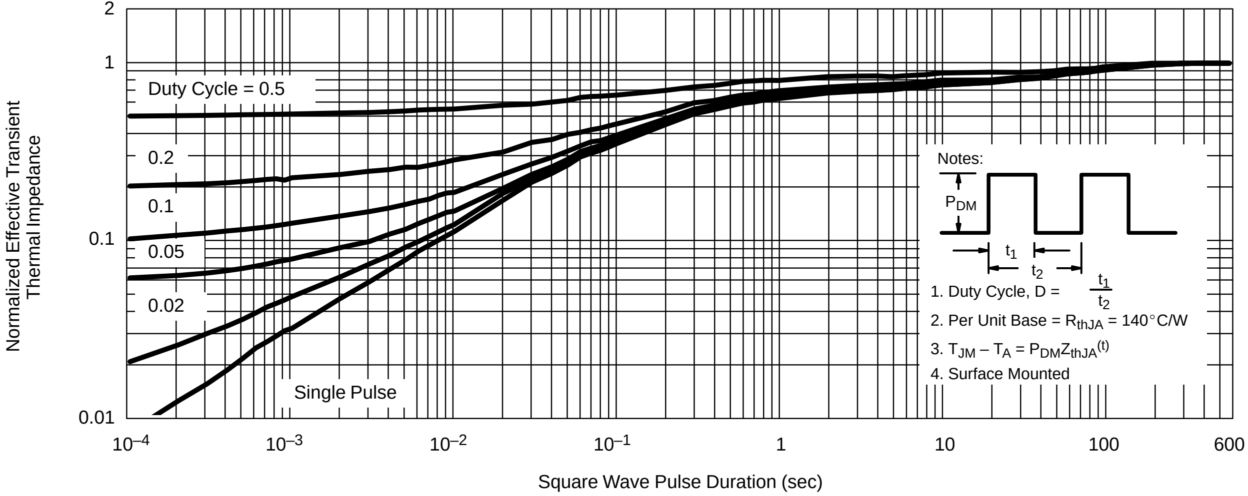


Capacitance



TYPICAL CHARACTERISTICS (25°C UNLESS NOTED) SCHOTTKY

Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Foot