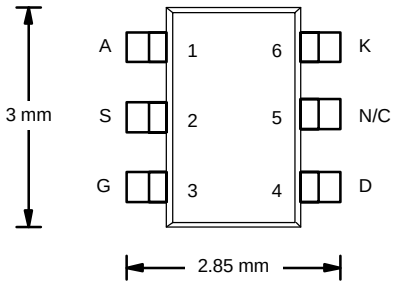
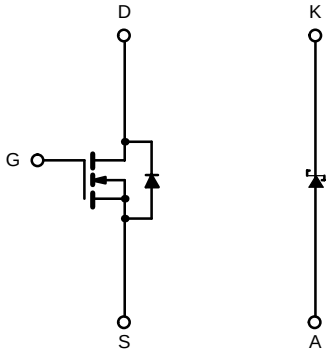
N-Channel 20-V (D-S) MOSFET With Schottky Diode

LITTLE FOOT Plus™

MOSFET PRODUCT SUMMARY		
V_{DS} (V)	$r_{DS(on)}$ (Ω)	I_D (A)
20	0.125 @ V_{GS} = 4.5 V	±2.4
	0.200 @ V_{GS} = 2.5 V	±1.8

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





N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS (T_A = 25°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}	±12	±12	
Continuous Drain Current (T_J = 150°C) (MOSFET)[a]	T_A = 25°C	I_D	±2.4	±2.0	A
	T_A = 85°C		±1.7	±1.4	
Pulsed Drain Current (MOSFET)		I_{DM}	±8		
Continuous Source Current (MOSFET Diode Conduction)[a]		I_S	1.05	0.75	
Average Foward Current (Schottky)		I_F	0.5	0.5	
Pulsed Foward Current (Schottky)		I_{FM}	8	8	
Maximum Power Dissipation (MOSFET)[a]	T_A = 25°C	P_D	1.15	0.83	W
	T_A = 85°C		0.59	0.53	
Maximum Power Dissipation (Schottky)[a]	T_A = 25°C		1.0	0.76	
	T_A = 85°C		0.52	0.48	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	–55 to 150		°C

Notes
a. Surface Mounted on 1" x 1" 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	
Junction-to-Ambient[a]	Steady State	MOSFET		130	150	
		Schottky		140	165	
Junction-to-Foot (MOSFET Drain, Schottky Kathode)	Steady State	MOSFET	R_{thJF}	75	90	
		Schottky		80	95	

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

MOSFET + SCHOTTKY 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	0.6			V
Gate-Body Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ±12 V			±100	nA
Zero Gate Voltage Drain Current (MOSFET + Schottky)	I_{DSS}	V_{DS} = 16 V, V_{GS} = 0 V			1	µA
		V_{DS} = 16 V, V_{GS} = 0 V, T_J = 85°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 = 2.4 A		0.100	0.125	Ω
		V_{GS} = 2.5 V, I_D = 1.0 A		0.160	0.200	
Forward Transconductance[a]	g_{fs}	V_{DS} = 5 V, I_D = 2.4 A		5		S
Schottky Diode Forward Voltage[a]	V_{SD}	I_S = 1.5 A, V_{GS} = 0 V		0.79	1.1	V
Dynamic[b]						
Total Gate Charge	Q_g	V_{DS} = 10 V, V_{GS} = 4.5 V, I_D = 2.4 A		2.1	4.0	nC
Gate-Source Charge	Q_{gs}			0.3		
Gate-Drain Charge	Q_{gd}			0.4		
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		10	17	ns
Rise Time	t_r			30	50	
Turn-Off Delay Time	$t_{d(off)}$			14	25	
Fall Time	t_f			6	12	
Source-Drain Reverse Recovery Time	t_{rr}	I_F = 3.0 A, di/dt = 100 A/µs		30	50	

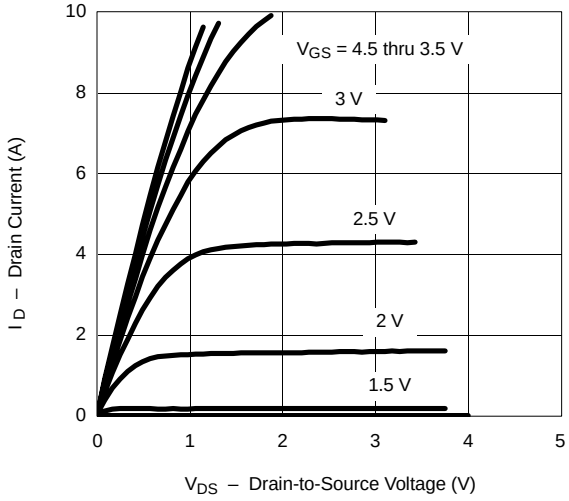
Notes
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2%.
b. Guaranteed by design, not subject to production testing.

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

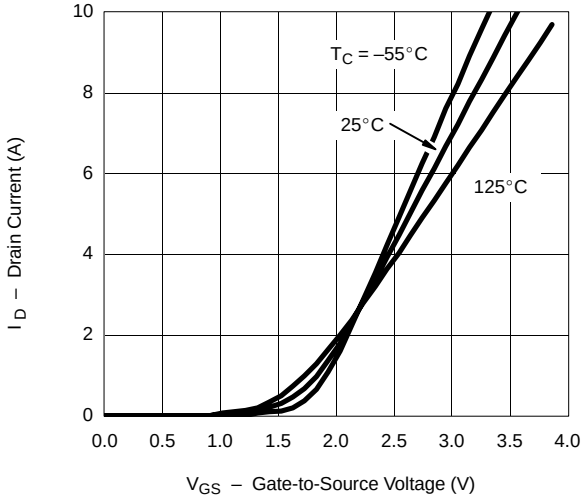
Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Forward Voltage Drop	V_F	I_F = 0.5		0.42	0.48	V
		I_F = 0.5, T_J = 125°C		0.33	0.4	
Maximum Reverse Leakage Current	I_{rm}	V_r = 20		0.002	0.100	mA
		V_r = 20, T_J = 75°C		0.06	1	
		V_r = 20, T_J = 125°C		1.5	10	
Junction Capacitance	C_T	V_r = 10 V		31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

TYPICAL CHARACTERISTICS (25°C UNLESS NOTED) MOSFET

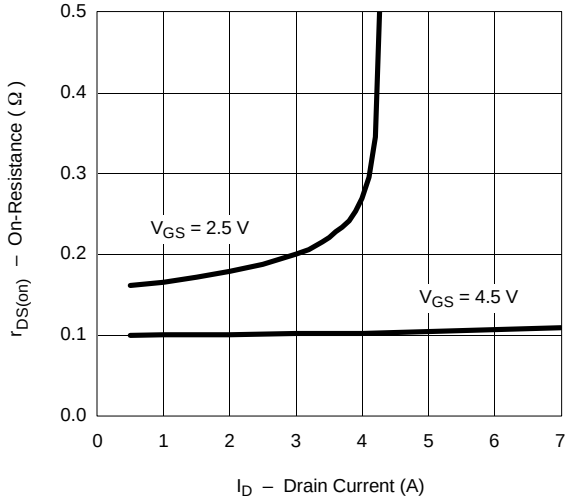
Output Characteristics



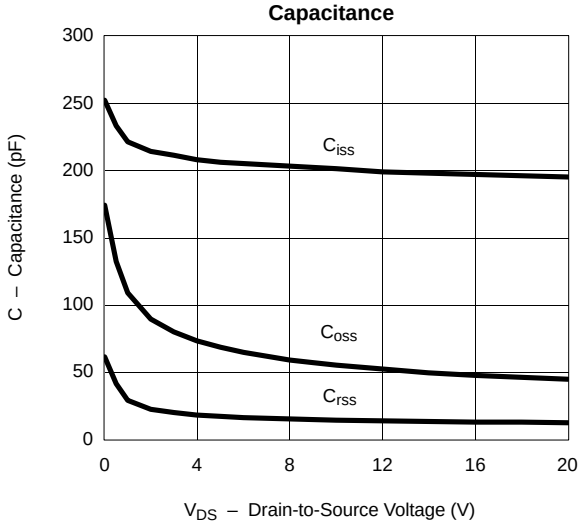
Transfer Characteristics



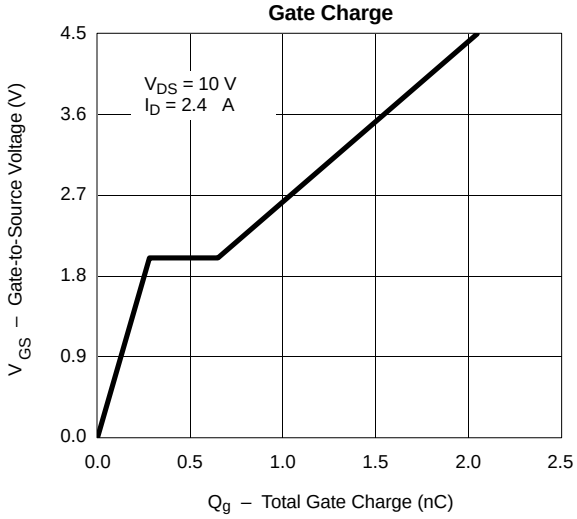
On-Resistance vs. Drain Current



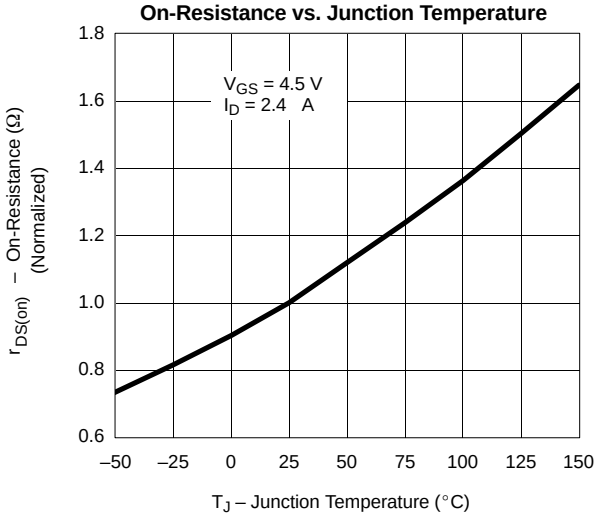
Capacitance



Gate Charge

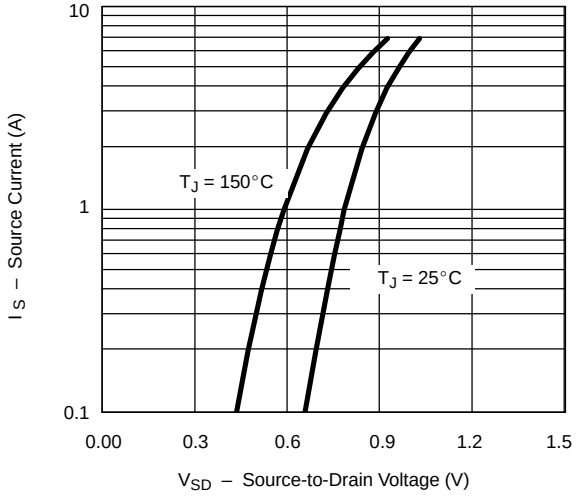


On-Resistance vs. Junction Temperature

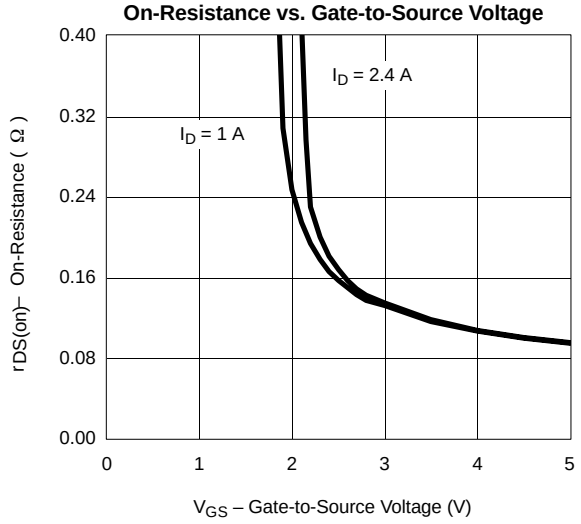


TYPICAL CHARACTERISTICS (25°C UNLESS NOTED) MOSFET

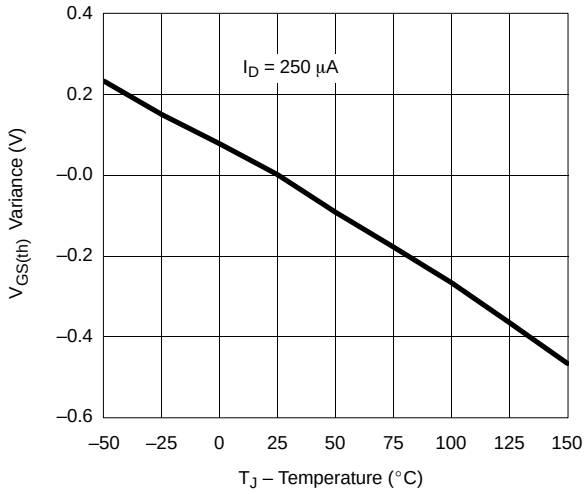
Source-Drain Diode Forward Voltage



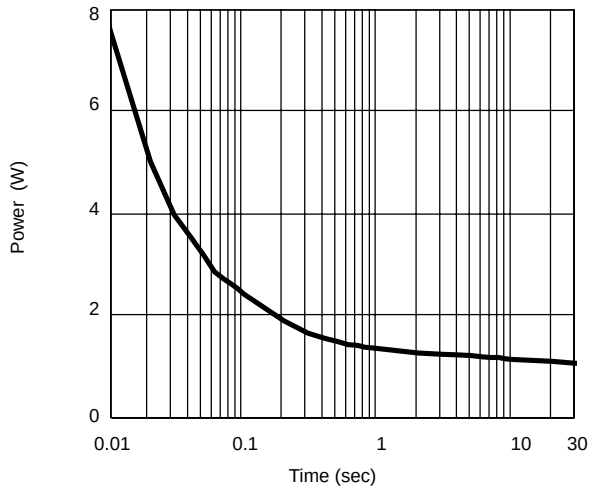
On-Resistance vs. Gate-to-Source Voltage



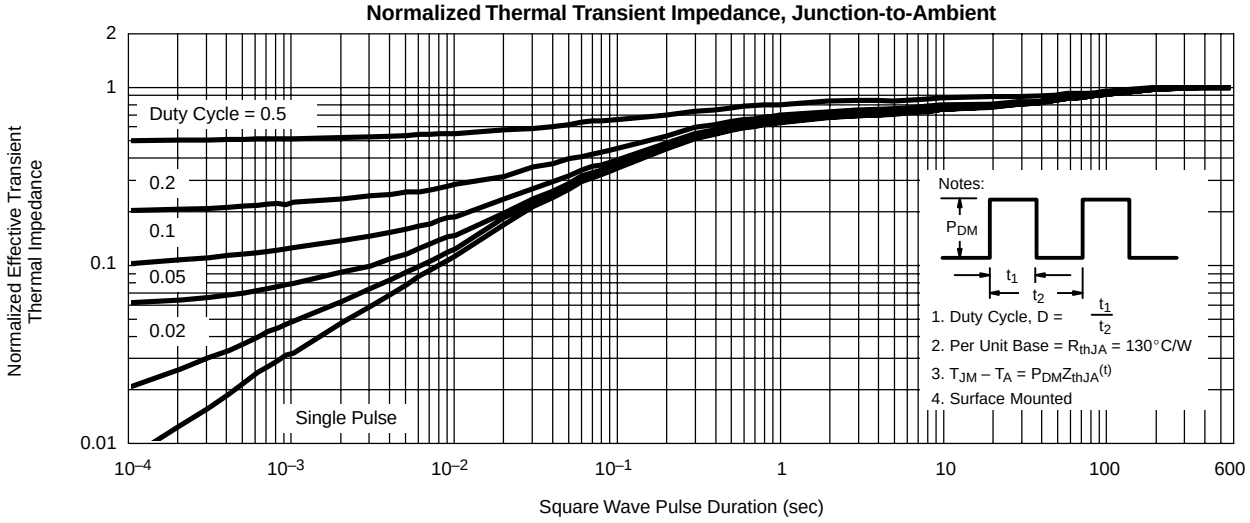
Threshold Voltage



Single Pulse Power, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Ambient



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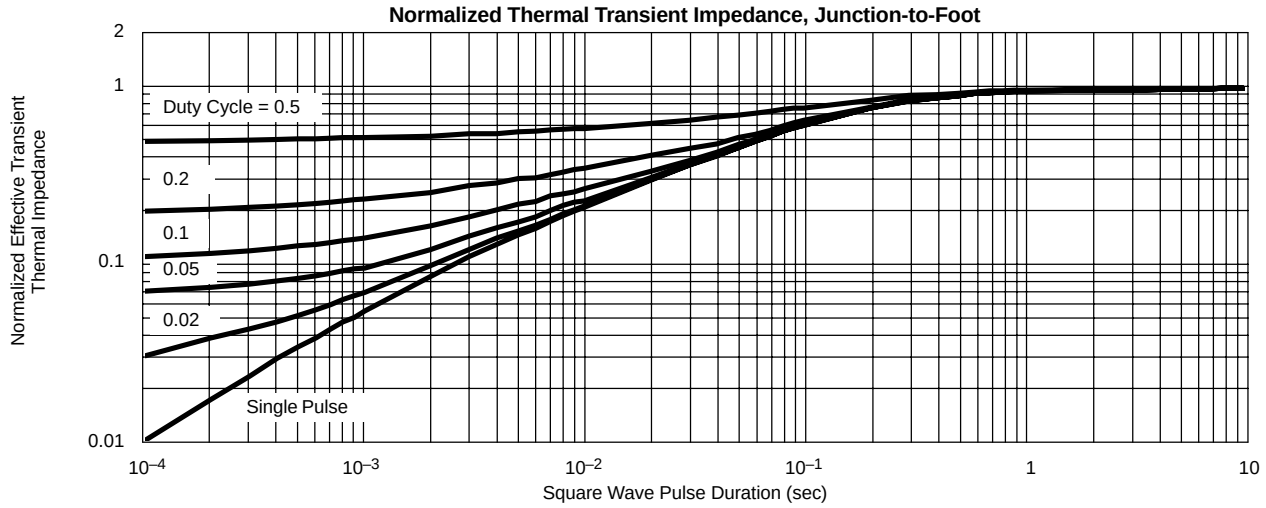
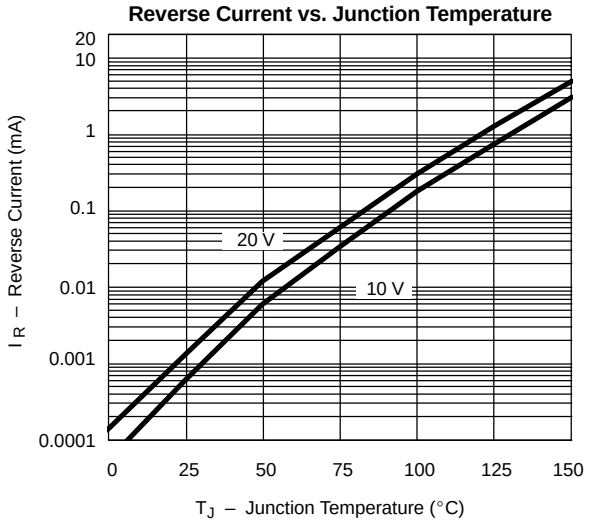
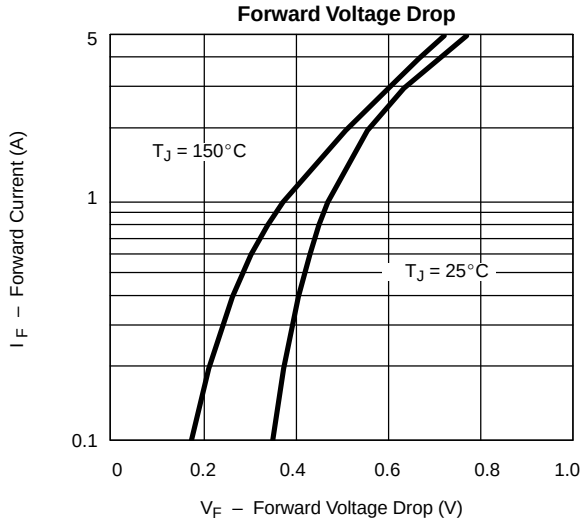
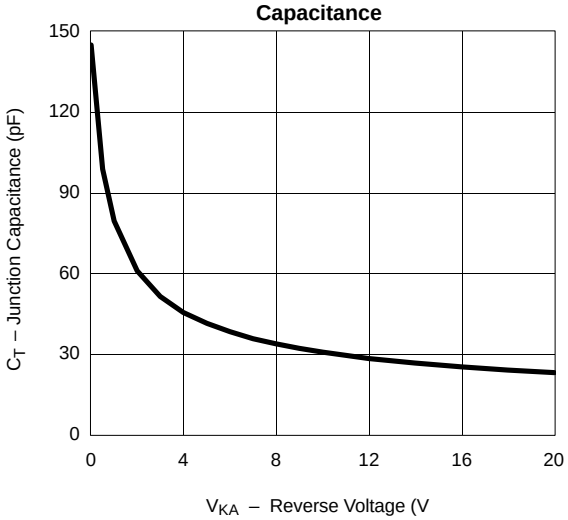
TYPICAL CHARACTERISTICS (25°C UNLESS NOTED) MOSFET



TYPICAL CHARACTERISTICS (25°C UNLESS NOTED) SCHOTTKY

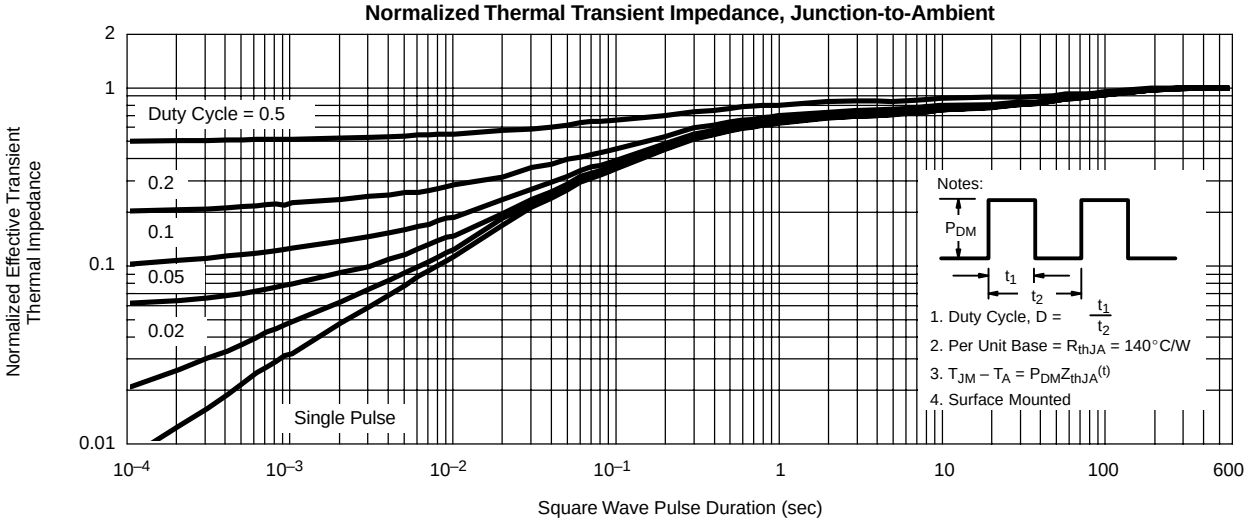






TYPICAL CHARACTERISTICS (25°C UNLESS NOTED) SCHOTTKY

Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Foot