P-Channel 30-V (D-S) MOSFET with Schottky Diode

MOSFET PRODUCT SUMMARY		
V_{DS} (V)	$r_{DS(on)}$ (Ω)	I_D (A)
–30	0.020 @ V_{GS} = –10 V	8.3
	0.030 @ V_{GS} = –4.5 V	6.8

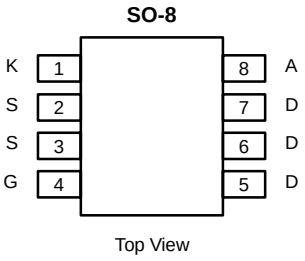
SCHOTTKY PRODUCT SUMMARY		
V_{KA} (V)	V_f (V) Diode Forward Voltage	I_F (A)
30	0.53 V @ 3 A	3

FEATURES

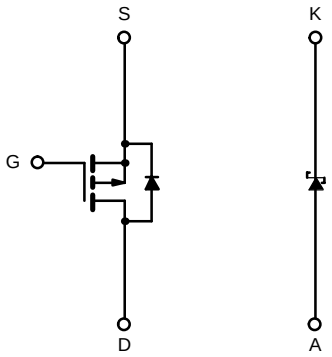
- TrenchFET® Power MOSFET
- LITTLE FOOT *Plus*™ Schottky

APPLICATIONS

- Battery Charging
- DC/DC Converters
  - Asynchronous Buck
  - Voltage Inverter



Top View



P-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C UNLESS OTHERWISE NOTED)					
Parameter		Symbol	10 Sec	Steady State	Unit
Drain-Source Voltage (MOSFET)		V_{DS}	–30		V
Reverse Voltage (Schottky)		V_{KA}	30		
Gate-Source Voltage (MOSFET)		V_{GS}	±20		
Continuous Drain Current (T_J = 150°C) (MOSFET)[a, b]	T_A = 25°C	I_D	–8.3	–6.1	A
	T_A = 70°C		–6.6	–4.9	
Pulsed Drain Current (MOSFET)		I_{DM}	–40		
Continuous Source Current (MOSFET Diode Conduction)[a, b]		I_S	–2.3	–1.25	
Average Foward Current (Schottky)		I_F	3		
Pulsed Foward Current (Schottky)		I_{FM}	20		
Maximum Power Dissipation (MOSFET)[a, b]	T_A = 25°C	P_D	2.5	1.38	W
	T_A = 70°C		1.6	0.88	
Maximum Power Dissipation (Schottky)[a, b]	T_A = 25°C		1.5	1.0	
	T_A = 70°C		0.98	0.64	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	–55 to 150		°C

Notes
a. Surface Mounted on FR4 Board.
b. t ≤ 10 sec.

THERMAL RESISTANCE RATINGS

Parameter	Device	Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient ($t \leq 10$ sec)[a]	MOSFET	R_{thJA}	37	50	°C/W
	Schottky		65	81	
Maximum Junction-to-Ambient (t = steady state)[a]	MOSFET		70	90	
	Schottky		100	125	
Maximum Junction-to-Foot (Drain)	MOSFET	R_{thJF}	20	25	
	Schottky		50	62.5	

Notes
a. Surface Mounted on FR4 Board.
b. $t \leq 10$ sec.

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	–1.0			V
Gate-Body Leakage	I_{GSS}	$V_{DS} = 0$ V, $V_{GS} = \pm 20$ V			±100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = -24$ V, $V_{GS} = 0$ V			–1	µA
		$V_{DS} = -24$ V, $V_{GS} = 0$ V, $T_J = 75$°C			–10	
On-State Drain Current[a]	$I_{D(on)}$	$V_{DS} \geq -5$ V, $V_{GS} = -10$ V	–20			A
Drain-Source On-State Resistance[a]	$r_{DS(on)}$	$V_{GS} = -10$ V, $I_D = -8.3$ A		0.0165	0.020	Ω
		$V_{GS} = -4.5$ V, $I_D = -6.8$ A		0.0245	0.030	
Forward Transconductance[a]	g_{fs}	$V_{DS} = -15$ V, $I_D = -8.3$ A		22		S
Diode Forward Voltage[a]	V_{SD}	$I_S = -2.3$ A, $V_{GS} = 0$ V		–0.75	–1.1	V
Dynamic[b]						
Total Gate Charge	Q_g	$V_{DS} = -15$ V, $V_{GS} = -5$ V, $I_D = -8.3$ A		22	33	nC
Gate-Source Charge	Q_{gs}			9		
Gate-Drain Charge	Q_{gd}			6.6		
Gate-Resistance	R_G			1.9		Ω
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -15$ V, $R_L = 15$ Ω $I_D \cong -1$ A, $V_{GEN} = -10$ V, $R_G = 6$ Ω		17	26	ns
Rise Time	t_r			15	23	
Turn-Off Delay Time	$t_{d(off)}$			56	85	
Fall Time	t_f			21	32	
Source-Drain Reverse Recovery Time	t_{rr}	$I_F = -2.3$ A, di/dt = 100 A/µs		45	70	

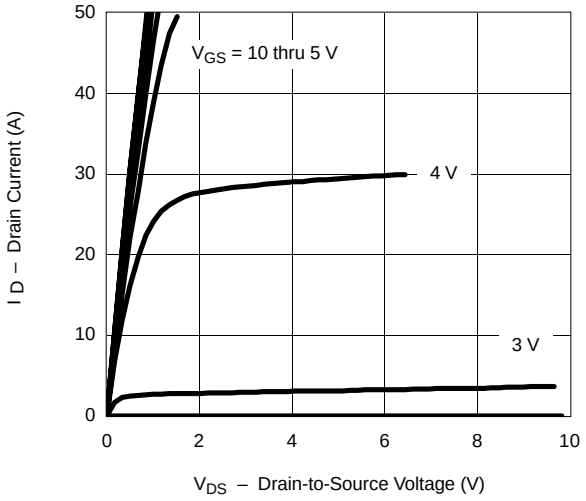
Notes
a. Pulse test; pulse width ≤ 300 µs, duty cycle $\leq 2\%$.
b. Guaranteed by design, not subject to production testing.

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

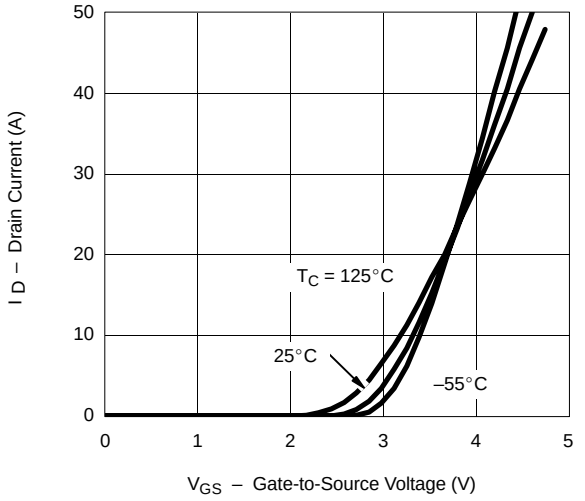
Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Forward Voltage Drop	V_F	$I_F = 3$ A		0.485	0.53	V
		$I_F = 3$ A, $T_J = 125$°C		0.42	0.47	
Maximum Reverse Leakage Current	I_{rm}	$V_r = 30$ V		0.008	0.1	mA
		$V_r = 30$ V, $T_J = 75$°C		0.4	5	
		$V_r = 30$ V, $T_J = 125$°C		6.5	20	
Junction Capacitance	C_T	$V_r = 15$ V		102		pF

TYPICAL CHARACTERISTICS (25°C UNLESS NOTED) MOSFET

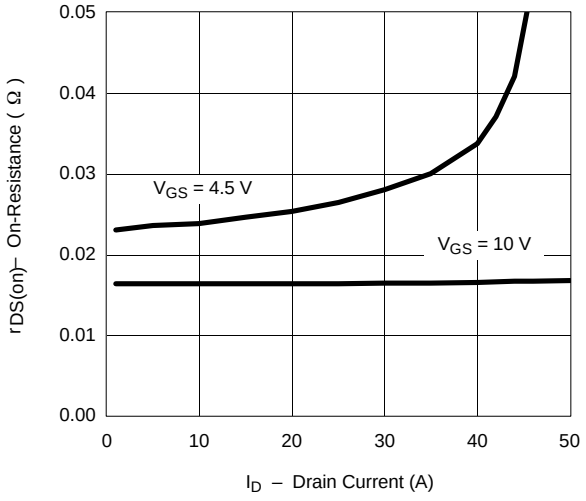
Output Characteristics



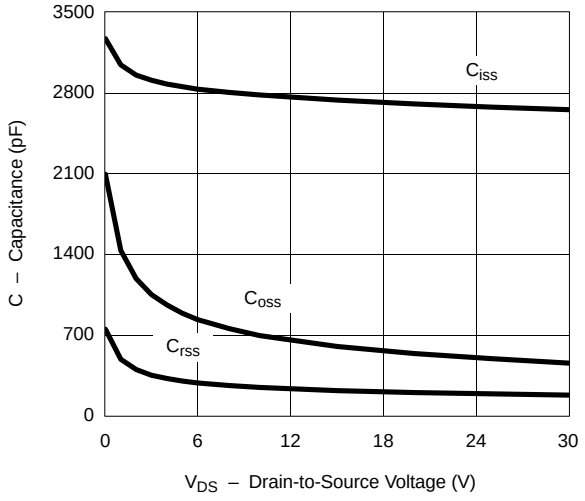
Transfer Characteristics



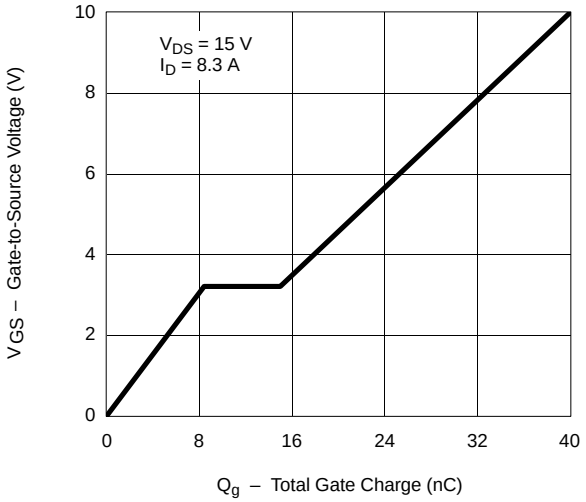
On-Resistance vs. Drain Current



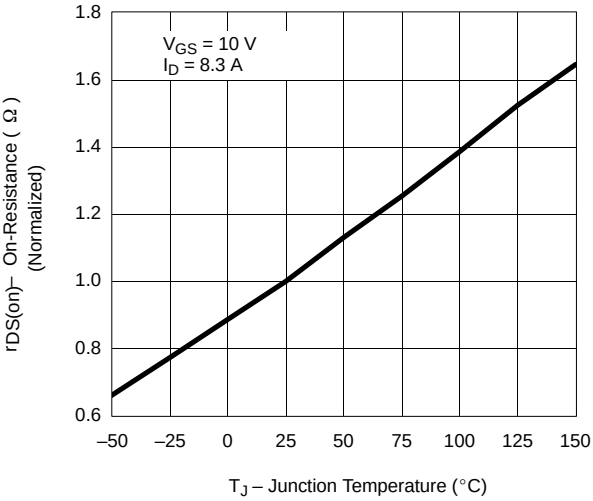
Capacitance



Gate Charge

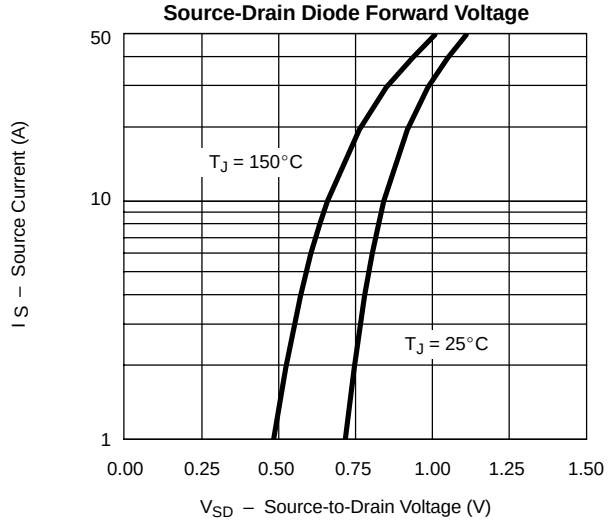


On-Resistance vs. Junction Temperature

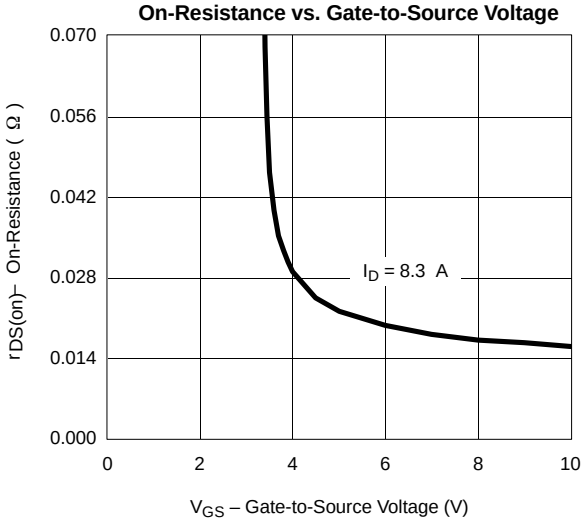


TYPICAL CHARACTERISTICS (25°C UNLESS NOTED) MOSFET

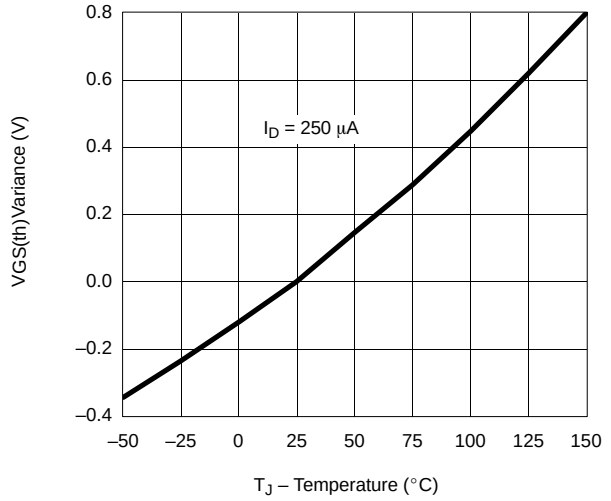
Source-Drain Diode Forward Voltage



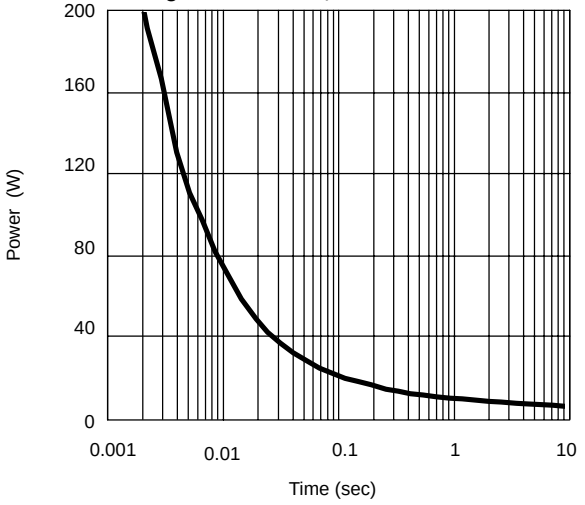
On-Resistance vs. Gate-to-Source Voltage



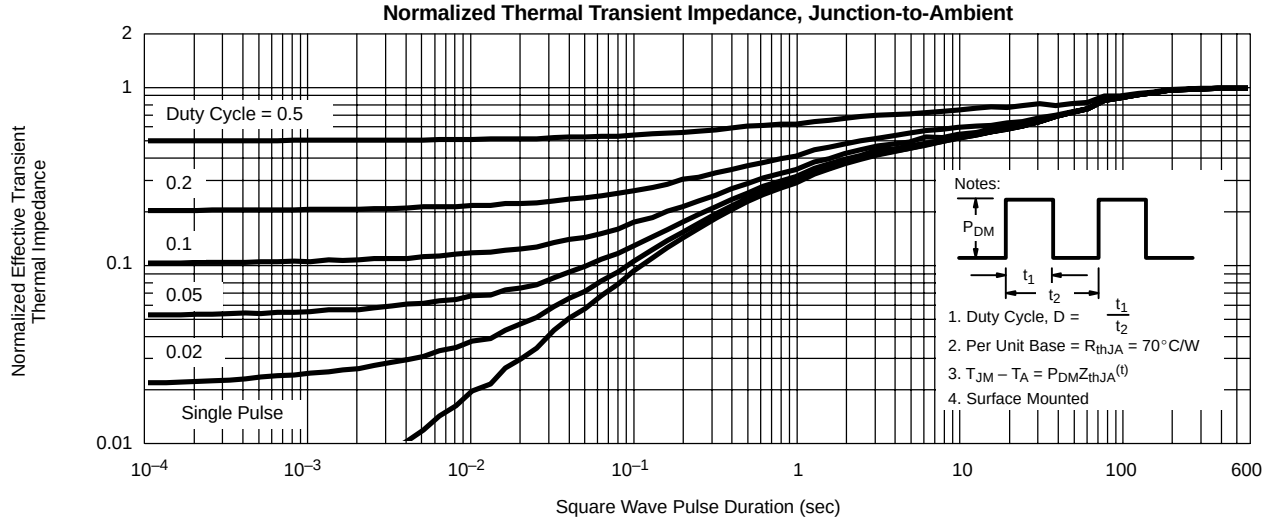
Threshold Voltage



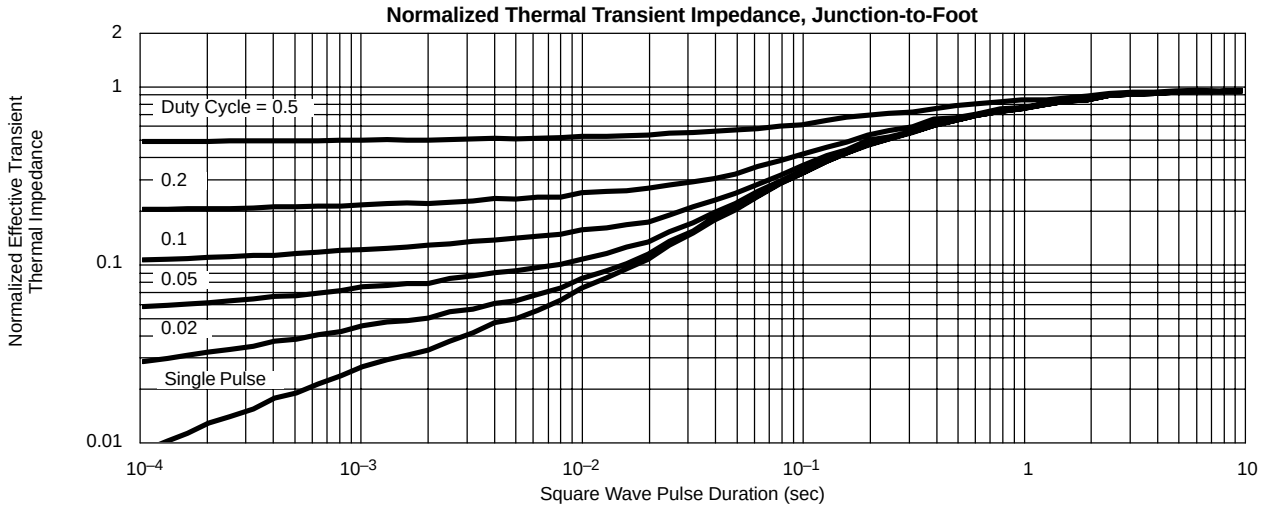
Single Pulse Power, Junction-to-Ambient



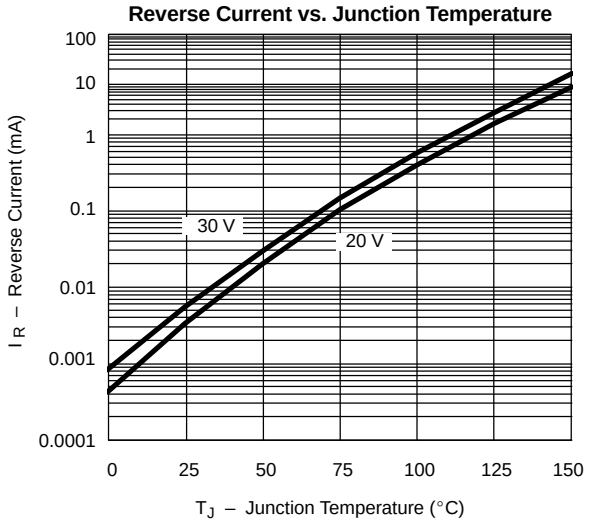
Normalized Thermal Transient Impedance, Junction-to-Ambient

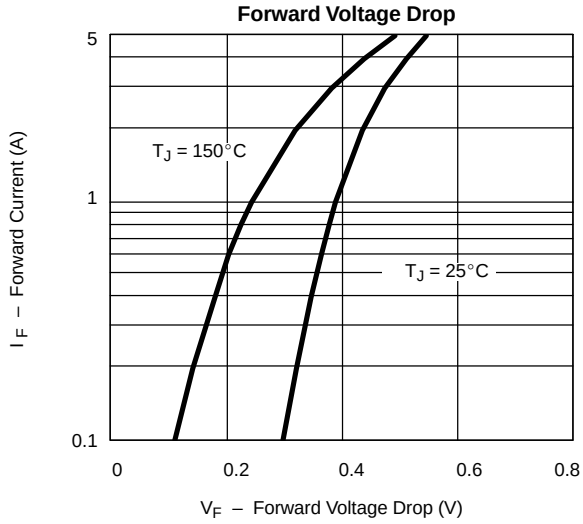


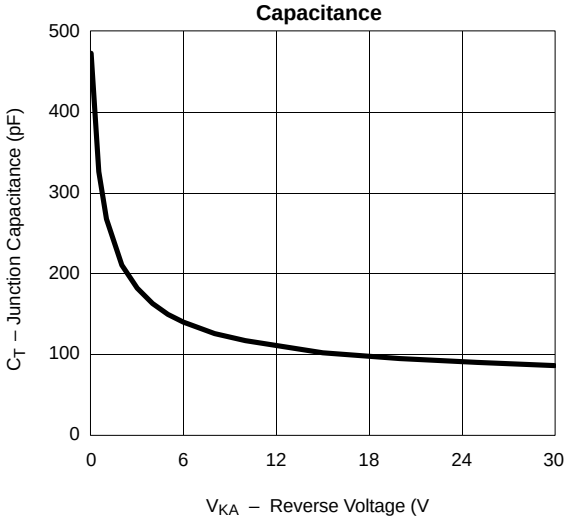
TYPICAL CHARACTERISTICS (25°C UNLESS NOTED) MOSFET



TYPICAL CHARACTERISTICS (25°C UNLESS NOTED) SCHOTTKY

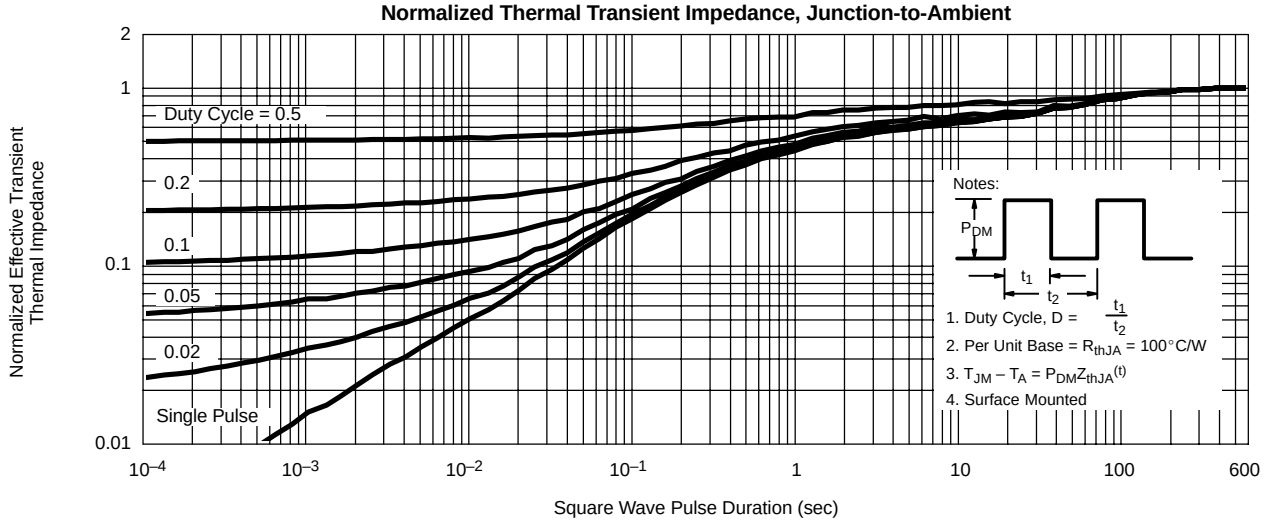






TYPICAL CHARACTERISTICS (25°C UNLESS NOTED) SCHOTTKY

Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Foot