

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

MOSFET PRODUCT SUMMARY		
V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)
- 20	0.048 at $V_{GS} = -4.5$ V	- 6.3
	0.068 at $V_{GS} = -2.5$ V	- 5.3
	0.090 at $V_{GS} = -1.8$ V	- 4.6

SCHOTTKY PRODUCT SUMMARY		
V_{KA} (V)	V_f (V) Diode Forward Voltage	I_F (A)
20	0.48 V at 0.5 A	1.0

FEATURES

- Halogen-free Option Available
- TrenchFET® Power MOSFETS: 1.8 V Rated
- Ultra-Low Thermal Resistance, PowerPAK® Package with Low 1.07 mm Profile

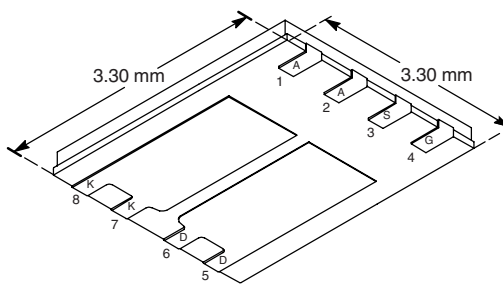


RoHS
COMPLIANT

APPLICATIONS

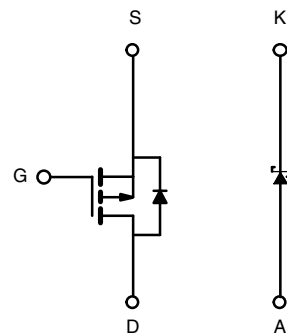
- Charger Switching

PowerPAK 1212-8



Bottom View

Ordering Information: Si7705DN-T1-E3 (Lead (Pb)-free)
Si7705DN-T1-GE3 (Lead (Pb)-free and Halogen-free)



P-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS T _A = 25 °C, unless otherwise noted					
Parameter		Symbol	10 s	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	- 6.3	- 4.3	A
	T _A = 85 °C		- 4.5	- 3.1	
Pulsed Drain Current (MOSFET)		I _{DM}	- 20		
Continuous Source Current (MOSFET Diode Conduction) ^a		I _S	- 2.3	- 1.1	
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	2.8	1.3	W
	T _A = 85 °C		1.5	0.7	
Maximum Power Dissipation (Schottky) ^a	T _A = 25 °C		2.0	1.1	
	T _A = 85 °C		1.0	0.6	
Operating Junction and Storage Temperature Range		T _J , T _{stg}	- 55 to 150		°C
Soldering Recommendations ^{b,c}			260		

Notes:

a. Surface Mounted on 1" x 1" FR4 board.

b. See Solder Profile (<http://www.vishay.com/ppg?73257>). The PowerPAK 1212-8 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	$t \leq 10$ s	MOSFET	R_{thJA}	35	44	°C/W
		Schottky		51	64	
	Steady State	MOSFET		75	94	
		Schottky		91	115	
Junction-to-Case (Drain)	Steady State	MOSFET	R_{thJC}	4	5	
		Schottky		10	12	

Notes:

a. Surface Mounted on 1" x 1" FR4 board.

MOSFET SPECIFICATIONS $T_J = 25$ °C, unless otherwise noted

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = -250$ μ A	- 0.45		- 1.0	V
Gate-Body Leakage	I_{GSS}	$V_{DS} = 0$ V, $V_{GS} = \pm 8$ V			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = -20$ V, $V_{GS} = 0$ V			- 1	μ A
		$V_{DS} = -20$ V, $V_{GS} = 0$ V, $T_J = 85$ °C			- 5	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \leq -5$ V, $V_{GS} = -4.5$ V	- 20			A
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = -4.5$ V, $I_D = -6.3$ A		0.040	0.048	Ω
		$V_{GS} = -2.5$ V, $I_D = -5.3$ A		0.054	0.068	
		$V_{GS} = -1.8$ V, $I_D = -1$ A		0.070	0.090	
Forward Transconductance ^a	g_{fs}	$V_{DS} = -10$ V, $I_D = -6.3$ A		14		S
Diode Forward Voltage ^a	V_{SD}	$I_S = -2.3$ 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, $I_D = -6.3$ A		11	17	nC
Gate-Source Charge	Q_{gs}			2.7		
Gate-Drain Charge	Q_{gd}			1.9		
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -10$ V, $R_L = 10$ Ω $I_D \cong -1$ A, $V_{GEN} = -4.5$ V, $R_G = 6$ Ω		70	105	ns
Rise Time	t_r			75	110	
Turn-Off Delay Time	$t_{d(off)}$			20	30	
Fall Time	t_f			45	70	

Notes:

a. Pulse test; pulse width ≤ 300 μ s, duty cycle ≤ 2 %.

b. Guaranteed by design, not subject to production testing.

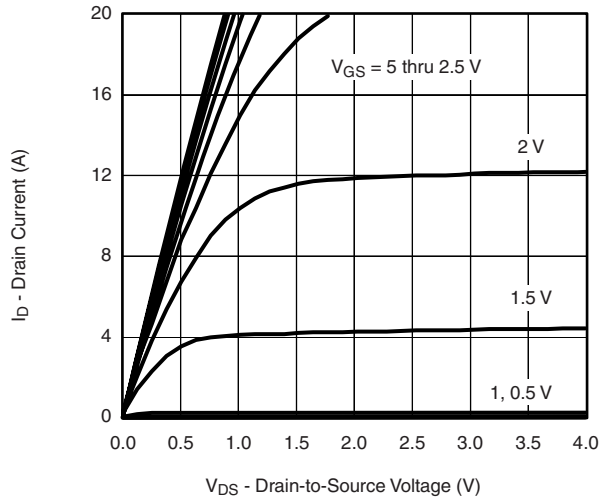
SCHOTTKY SPECIFICATIONS $T_J = 25$ °C, unless otherwise noted

Parameter	Symbol	Test Conditions	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, $T_J = 85$ °C		0.10	1	
		$V_r = 20$ V, $T_J = 125$ °C		1.5	10	
Junction Capacitance	C_T	$V_r = 10$ V		31		pF

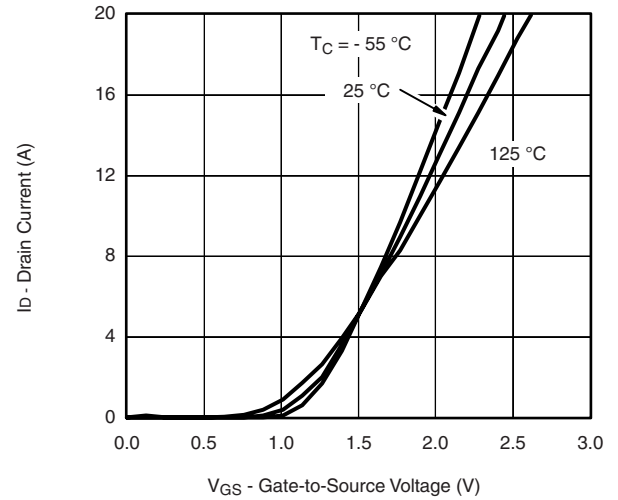
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



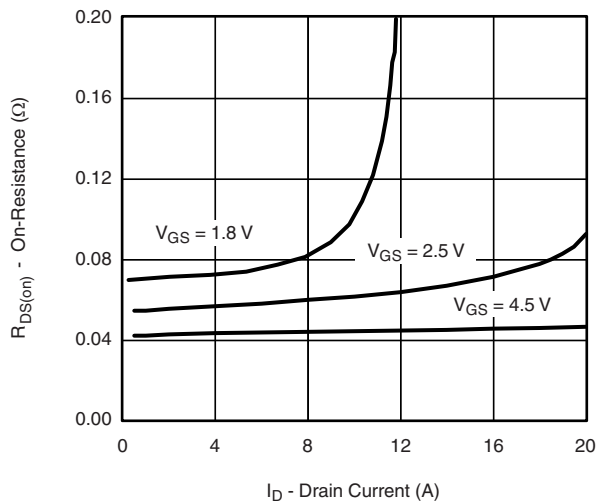
MOSFET TYPICAL CHARACTERISTICS $T_A = 25^\circ\text{C}$, unless otherwise noted



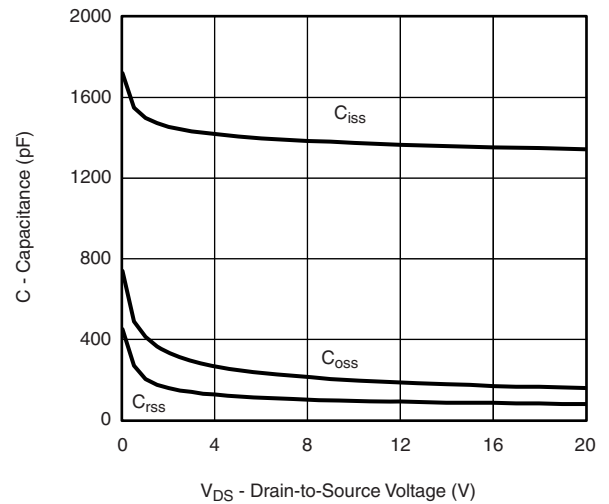
Output Characteristics



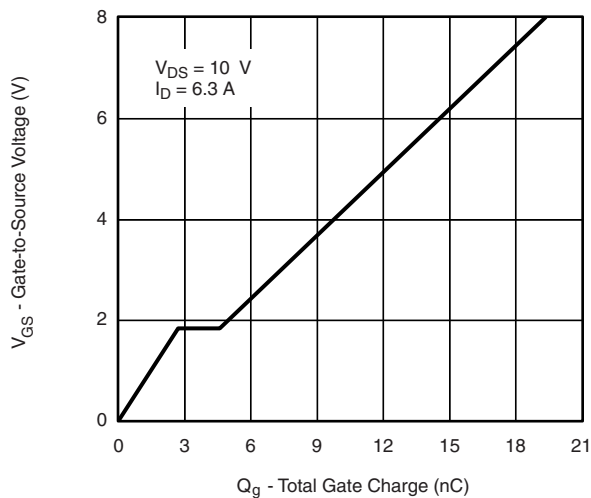
Transfer Characteristics



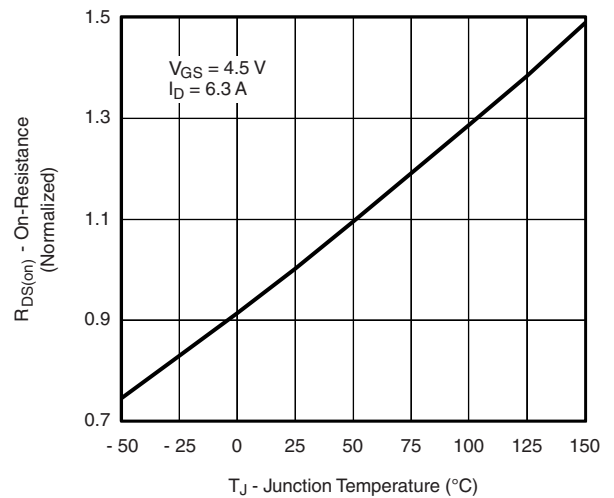
On-Resistance vs. Drain Current



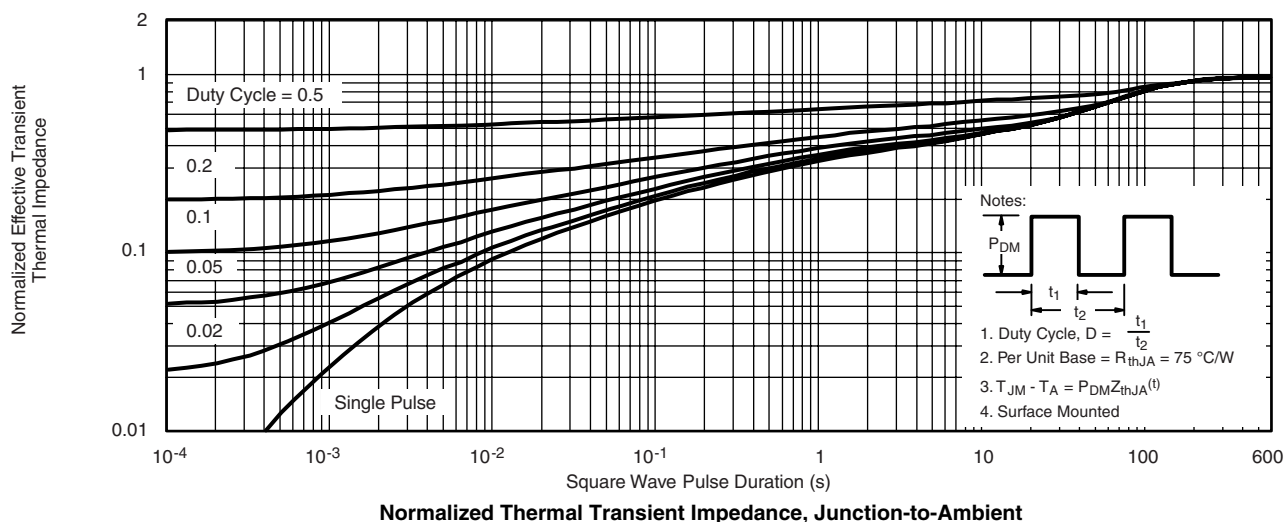
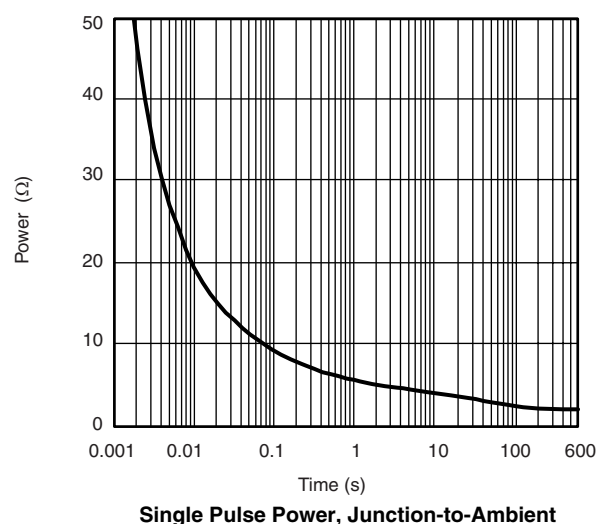
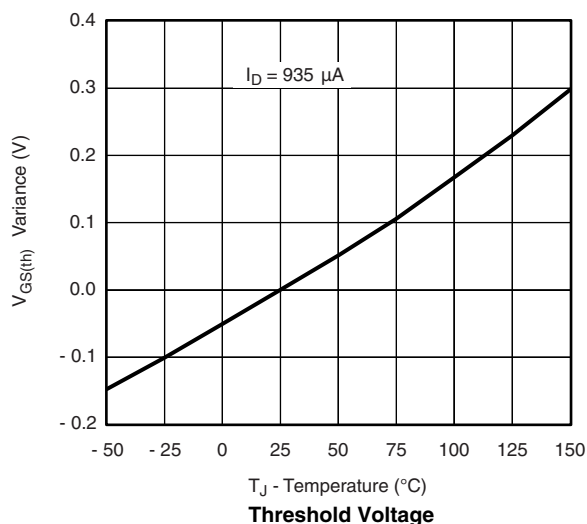
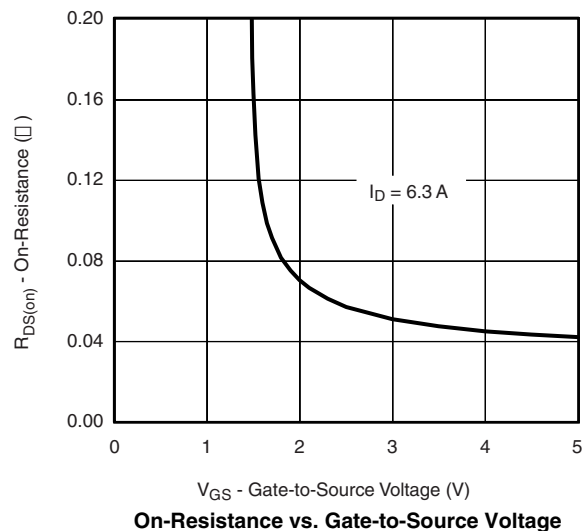
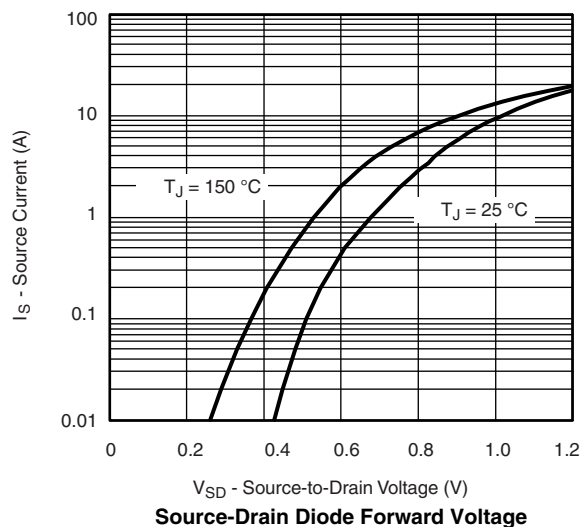
Capacitance



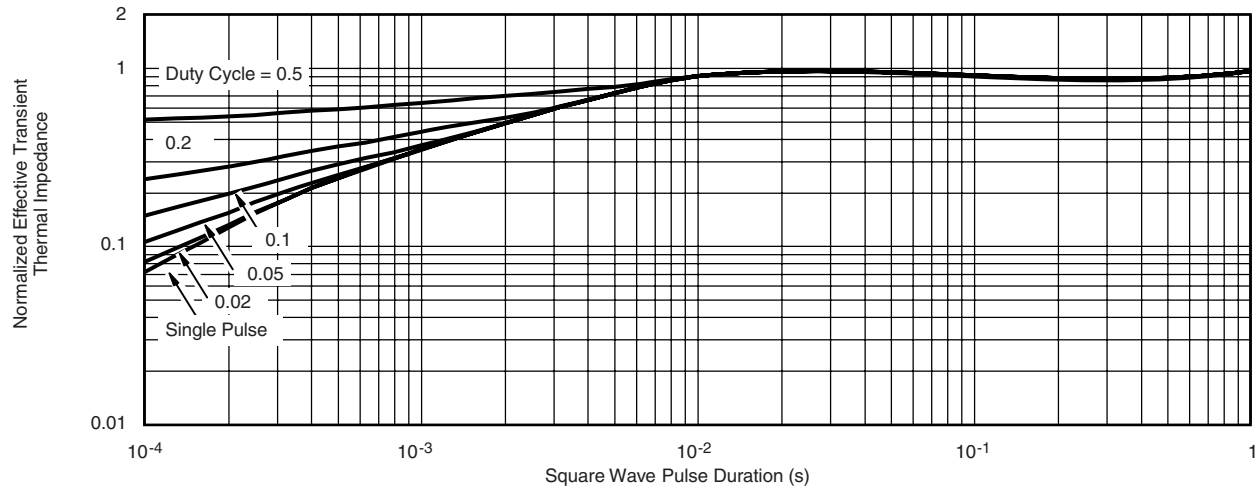
Gate Charge



On-Resistance vs. Junction Temperature

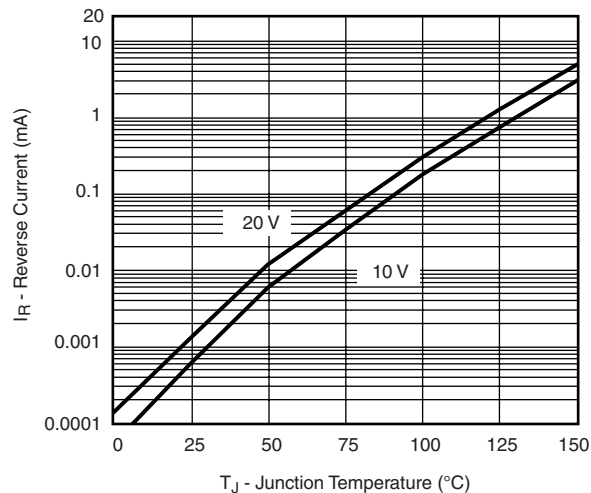
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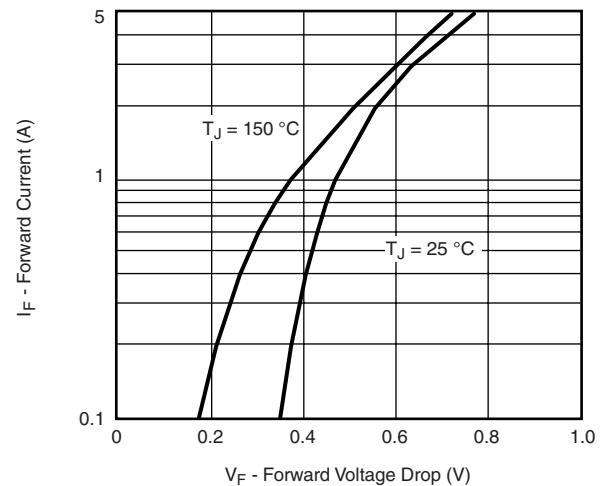


Normalized Thermal Transient Impedance, Junction-to-Case

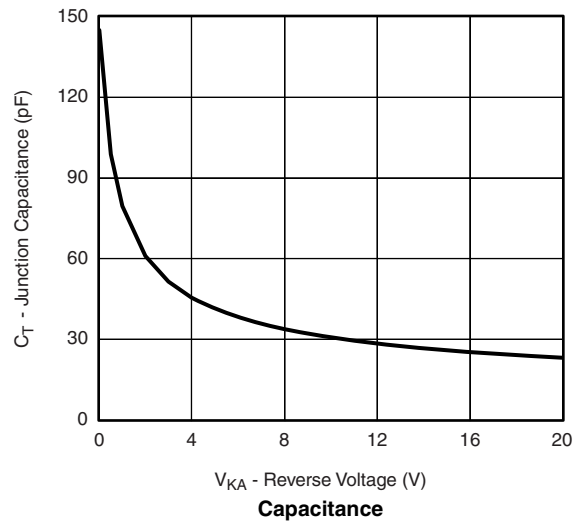
SCHOTTKY TYPICAL CHARACTERISTICS $T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise noted



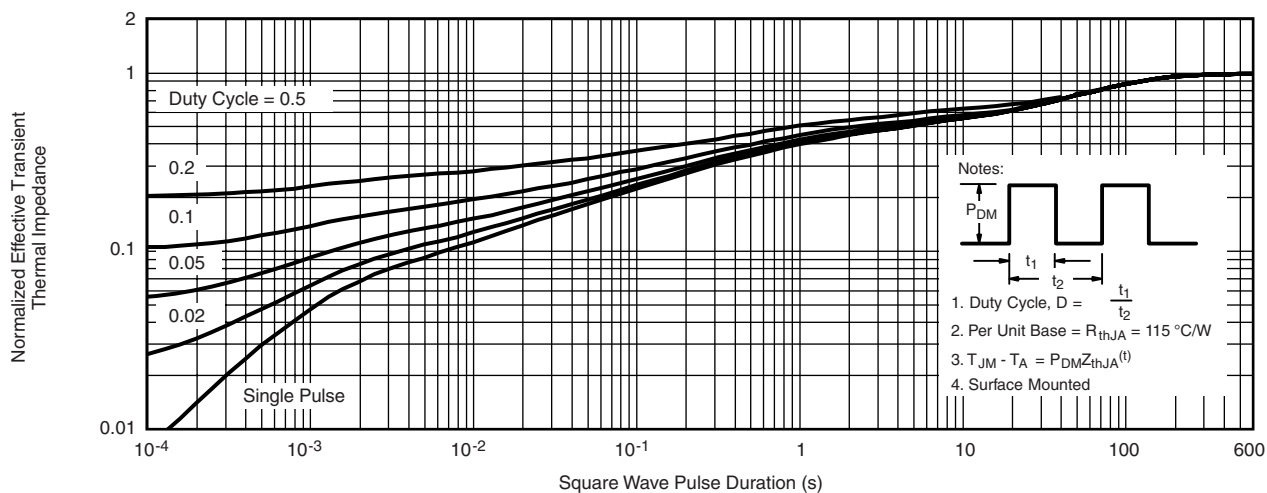
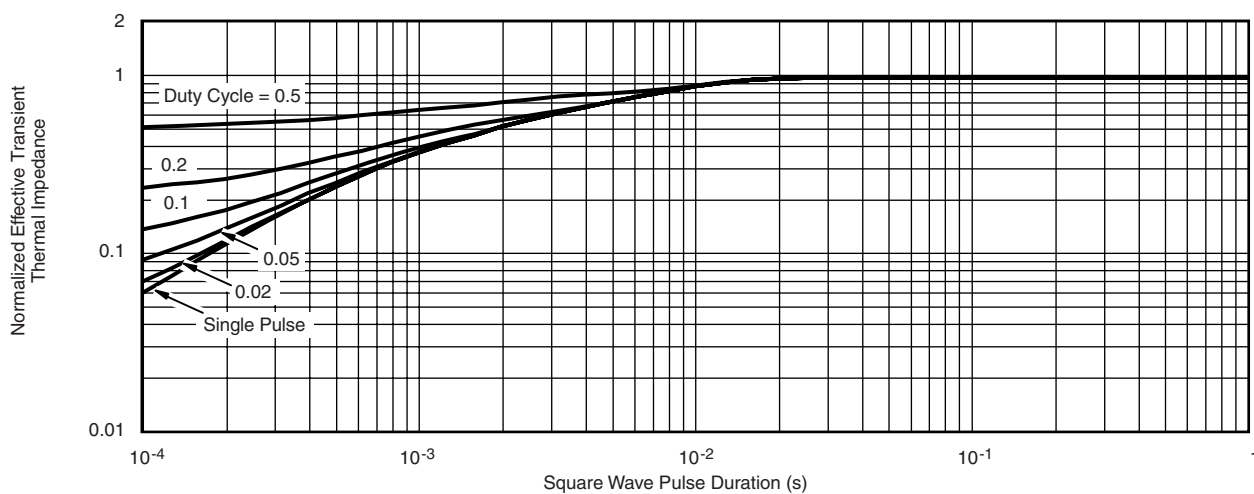
Reverse Current vs. Junction Temperature



Forward Voltage Drop



Capacitance

SCHOTTKY TYPICAL CHARACTERISTICS $T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise noted

Normalized Thermal Transient Impedance, Junction-to-Ambient

Normalized Thermal Transient Impedance, Junction-to-Case

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