



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

PRODUCT SUMMARY

V_{DS} (V)	$r_{DS(on)}$ (Ω)	I_D (A)	Q_g (Typ)
- 20	0.054 at $V_{GS} = - 10$ V	6.2	4.5 nC
	0.094 at $V_{GS} = - 4.5$ V	4.7	

SCHOTTKY PRODUCT SUMMARY

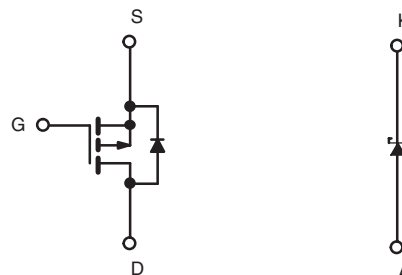
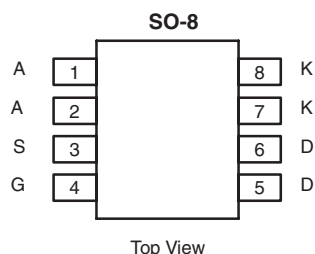
V_{KA} (V)	V_f (V) Diode Forward Voltage	I_F (A) ^a
20	0.45 at 1 A	2

FEATURES

- LITTLE FOOT[®] Plus Schottky

APPLICATIONS

- Portable Devices
 - Ideal for Boost Circuits
 - Ideal for Buck Circuits

RoHS
COMPLIANT

Ordering Information: Si4621DY-T1-E3 (Lead (Pb)-free)

P-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS $T_A = 25^\circ\text{C}$, unless otherwise noted

Parameter		Symbol	Limit	Unit
Drain-Source Voltage (MOSFET)		V _{DS}	- 20	V
Reverse Voltage (Schottky)		V _{KA}	20	
Gate-Source Voltage (MOSFET)		V _{GS}	± 20	
Continuous Drain Current (T _J = 150 °C) (MOSFET)	T _C = 25 °C	I _D	- 6.2	A
	T _C = 70 °C		- 5 ^a	
	T _A = 25 °C		- 5 ^{b, c}	
	T _A = 70 °C		- 4 ^{b, c}	
Pulsed Drain Current (MOSFET)		I _{DM}	- 25	
Continuous Source-Drain Diode Current (MOSFET Diode Conduction)	T _C = 25 °C	I _S	- 2.6	
	T _A = 25 °C		1.7 ^{b, c}	
Average Forward Current (Schottky)		I _F	2 ^b	
Pulsed Forward Current (MOSFET)		I _{FM}	5	
Maximum Power Dissipation (MOSFET)	T _C = 25 °C	P _D	3.1	W
	T _C = 70 °C		2	
	T _A = 25 °C		2 ^{b, c}	
	T _A = 70 °C		1.3 ^{b, c}	
Maximum Power Dissipation (Schottky)	T _C = 25 °C		2.7	
	T _C = 70 °C		1.7	
	T _A = 25 °C		1.6 ^{b, c}	
	T _A = 70 °C		1.0 ^{b, c}	
Operating Junction and Storage Temperature Range		T _J , T _{stg}	- 55 to 150	

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient (MOSFET) ^{b, f}	R_{thJA}	55	62.5	°C/W
Maximum Junction-to-Foot (Drain) (MOSFET)	R_{thJF}	33	40	
Maximum Junction-to-Ambient (Schottky) ^{b, g}	R_{thJA}	63	78	
Maximum Junction-to-Foot (Drain) (Schottky)	R_{thJF}	39	47	

Notes:

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

c. $t = 10$ sec.

f. Maximum under Steady State conditions is 110 °C/W.

g. Maximum under Steady State conditions is 115 °C/W.

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

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0$ V, $I_D = -250$ μ A	- 20			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = -250$ μ A		- 16		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			3.6		
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = -250$ μ A	- 1		- 3	V
Gate-Source Leakage	I_{GSS}	$V_{DS} = 0$ V, $V_{GS} = \pm 20$ 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, $T_J = 55$ °C			- 10	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \leq 5$ V, $V_{GS} = -10$ V	- 25			A
Drain-Source On-State Resistance ^a	$r_{DS(on)}$	$V_{GS} = -10$ V, $I_D = -5$ A		0.042	0.054	Ω
		$V_{GS} = -4.5$ V, $I_D = -1.1$ A		0.073	0.094	
Forward Transconductance ^a	g_{fs}	$V_{DS} = -10$ V, $I_D = -5$ A		10		S
Dynamic^b						
Input Capacitance	C_{iss}	$V_{DS} = -10$ V, $V_{GS} = 0$ V, $f = 1$ MHz		450		pF
Output Capacitance	C_{oss}			160		
Reverse Transfer Capacitance	C_{rss}			105		
Total Gate Charge	Q_g	$V_{DS} = -10$ V, $V_{GS} = -10$ V, $I_D = -6.2$ A		8.7	13	nC
		$V_{DS} = -10$ V, $V_{GS} = -4.5$ V, $I_D = -6.2$ A		4.5	6.8	
Gate-Source Charge	Q_{gs}			1.7		
Gate-Drain Charge	Q_{gd}			1.8		
Gate Resistance	R_g	$f = 1$ MHz		9		Ω
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -10$ V, $R_L = 2.5$ Ω $I_D \cong -4$ A, $V_{GEN} = -4.5$ V, $R_g = 1$ Ω		15	25	ns
Rise Time	t_r			60	90	
Turn-Off Delay Time	$t_{d(off)}$			22	35	
Fall Time	t_f			15	25	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -10$ V, $R_L = 2.5$ Ω $I_D \cong -4$ A, $V_{GEN} = -10$ V, $R_g = 1$ Ω		5	10	
Rise Time	t_r			60	90	
Turn-Off Delay Time	$t_{d(off)}$			20	30	
Fall Time	t_f			7	15	



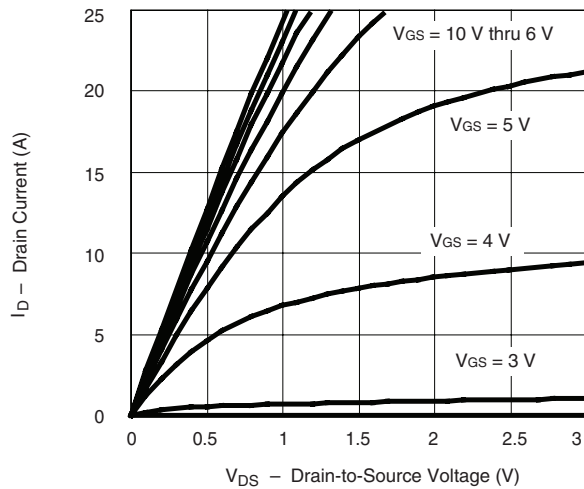
SPECIFICATIONS $T_J = 25\text{ }^{\circ}\text{C}$, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	$T_C = 25\text{ }^{\circ}\text{C}$			- 6.2	A
Pulse Diode Forward Current	I_{SM}				- 25	
Body Diode Voltage	V_{SD}	$I_S = -1.7\text{ A}$, $V_{GS} = 0\text{ V}$		- 0.8	- 1.2	V
Body Diode Reverse Recovery Time	t_{rr}	$I_F = -1.7\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $T_J = 25\text{ }^{\circ}\text{C}$		21	40	ns
Body Diode Reverse Recovery Charge	Q_{rr}			10	20	nC
Reverse Recovery Fall Time	t_a			7		ns
Reverse Recovery Rise Time	t_b			16		

Notes:

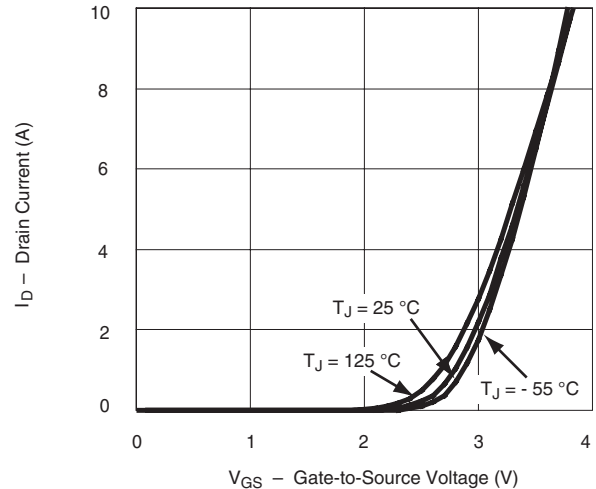
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
b. Guaranteed by design, not subject to production testing.

SCHOTTKY SPECIFICATIONS $T_J = 25\text{ }^{\circ}\text{C}$, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Forward Voltage Drop	V_F	$I_F = 1\text{ A}$		0.41	0.45	V
		$I_F = 1\text{ A}$, $T_J = 125\text{ }^{\circ}\text{C}$		0.36	0.41	
Maximum Reverse Leakage Current	I_{rm}	$V_r = 20\text{ V}$		0.02	0.20	mA
		$V_r = 20\text{ V}$, $T_J = 85\text{ }^{\circ}\text{C}$		0.7	7	
		$V_r = 20\text{ V}$, $T_J = 125\text{ }^{\circ}\text{C}$		5	50	
Junction Capacitance	C_T	$V_r = 10\text{ V}$		60		pF

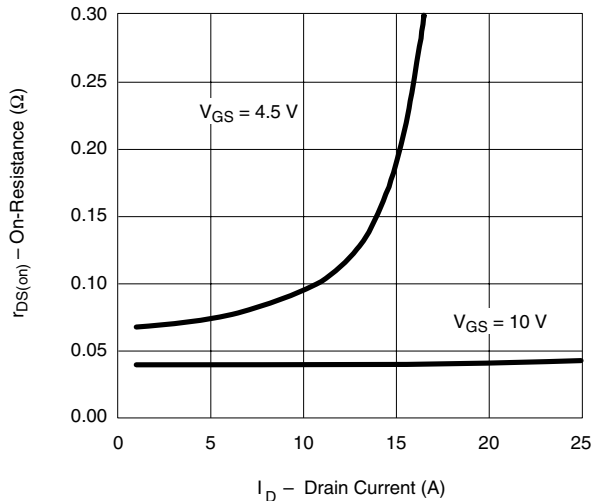
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

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


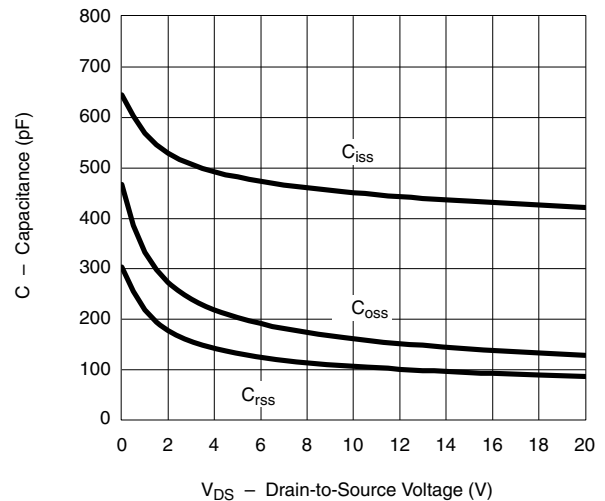
Output Characteristics



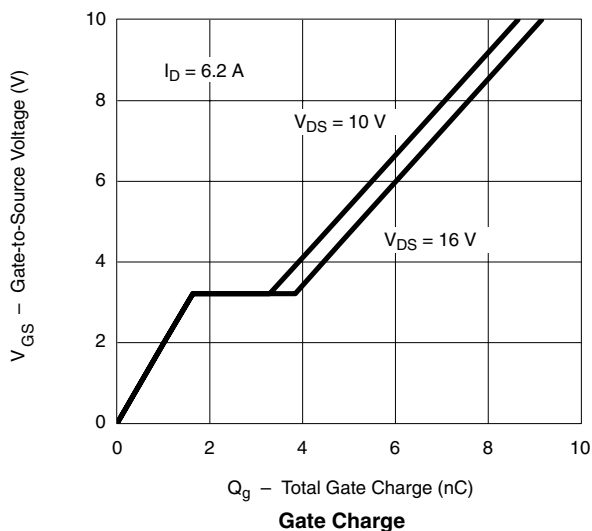
Transfer Characteristics



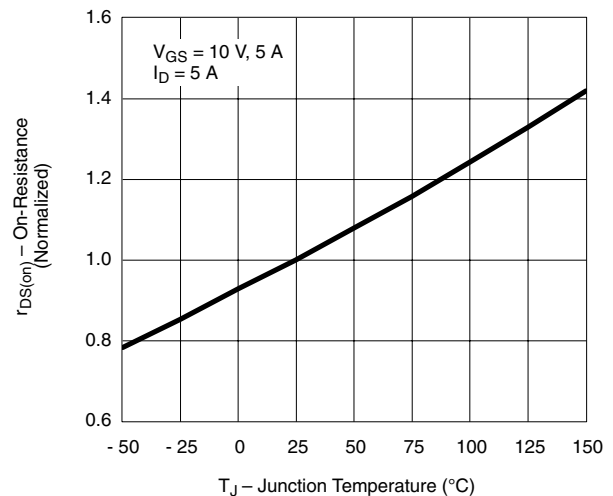
On-Resistance vs. Drain Current and Gate Voltage



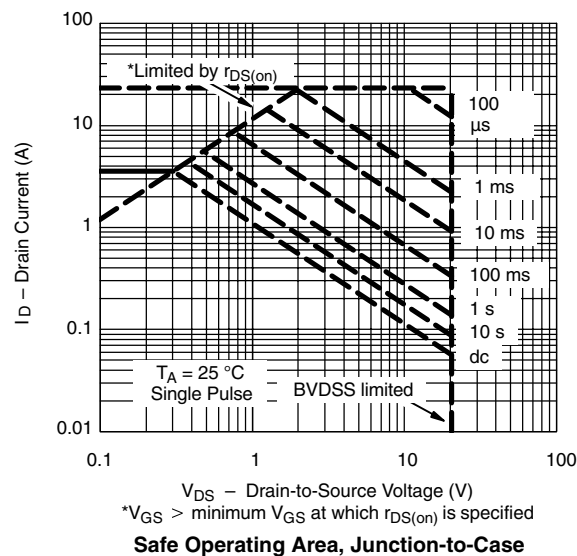
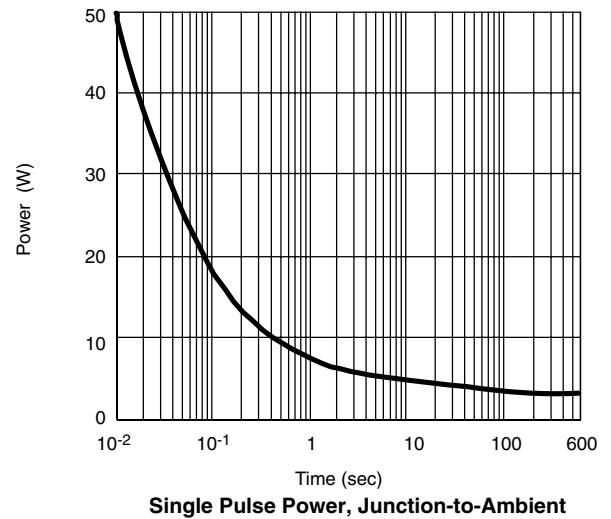
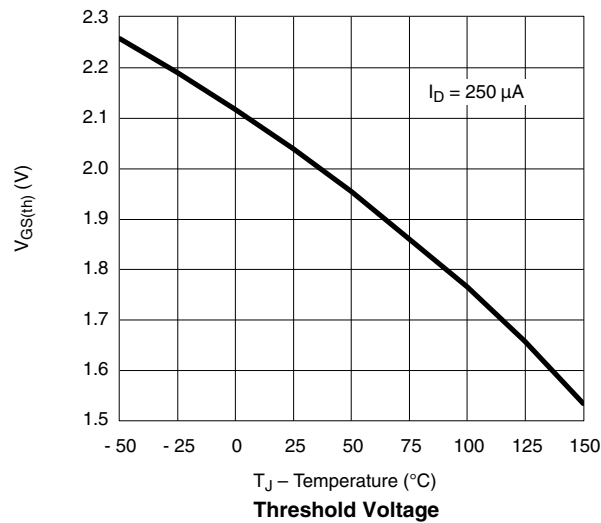
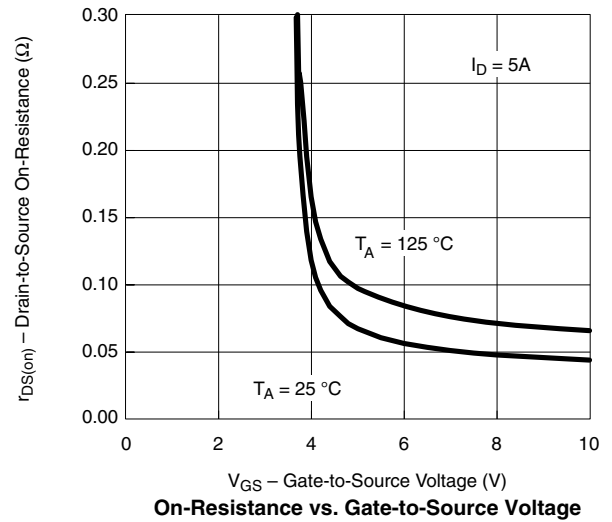
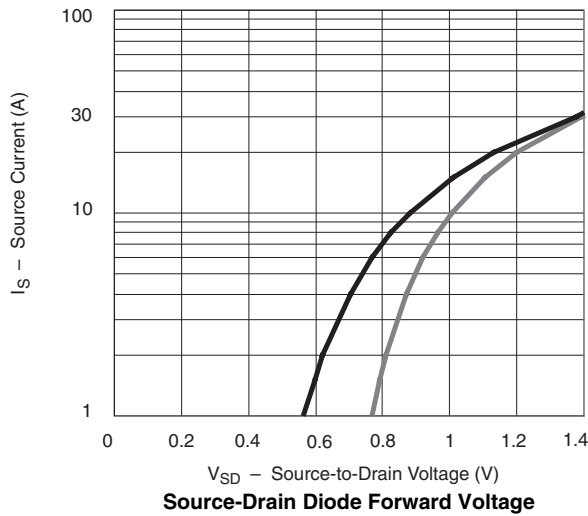
Capacitance

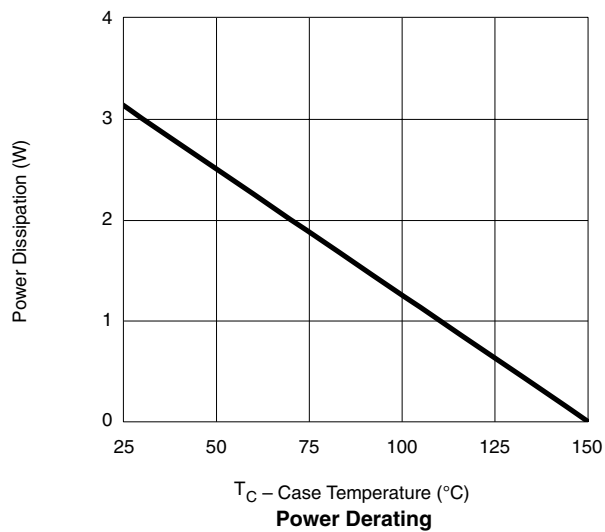
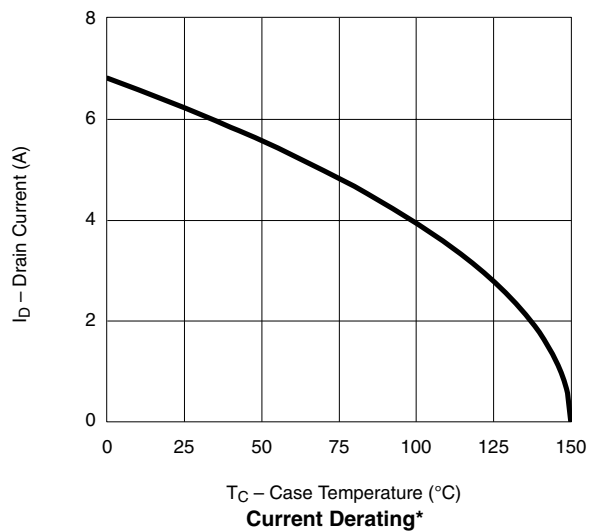


Gate Charge



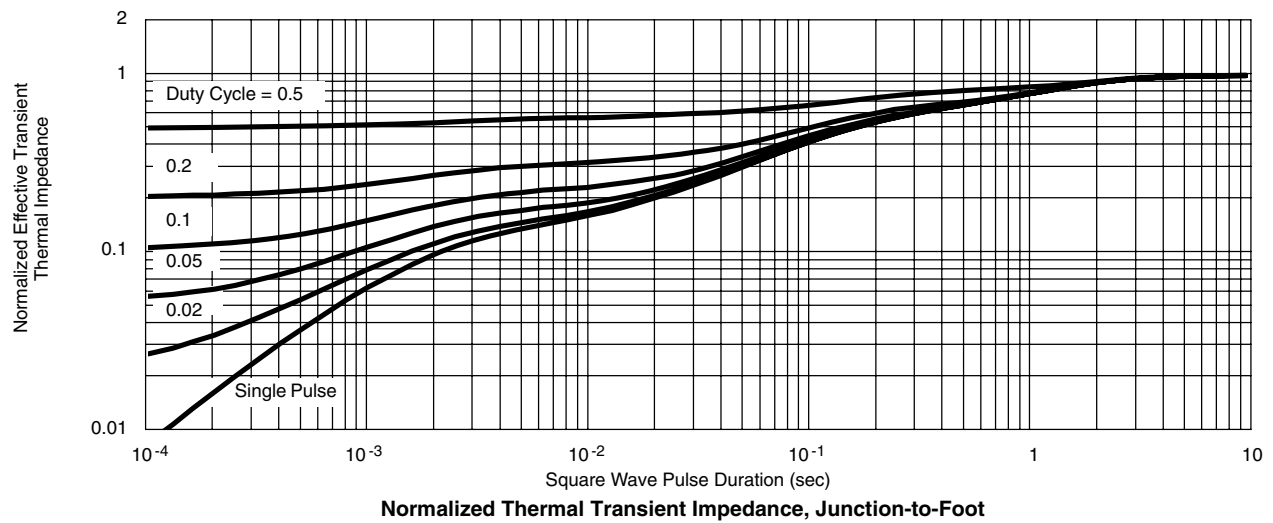
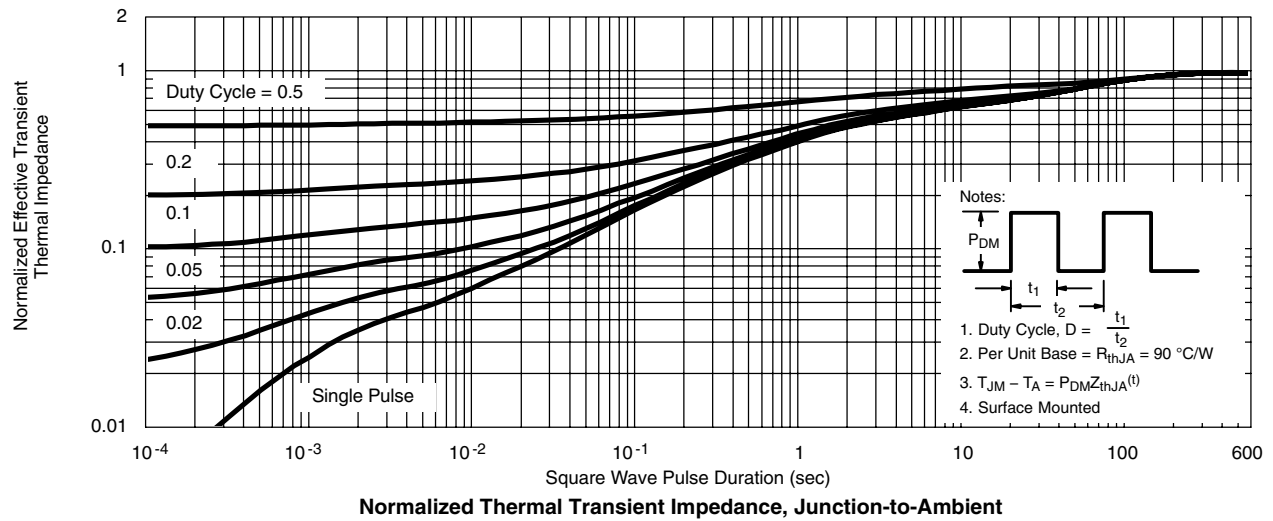
On-Resistance vs. Junction Temperature

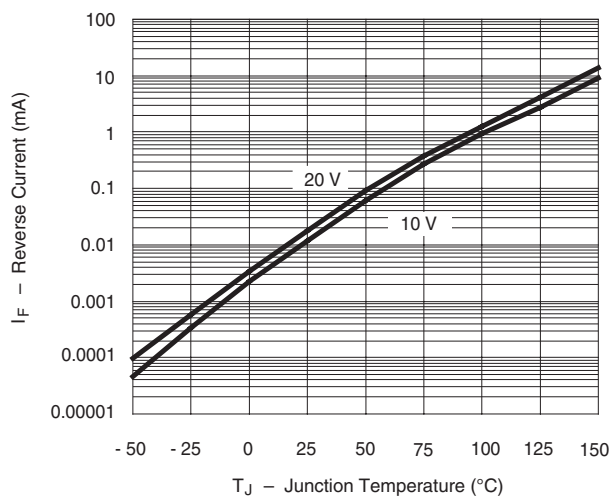
**MOSFET TYPICAL CHARACTERISTICS** $T_A = 25^\circ\text{C}$, unless otherwise noted

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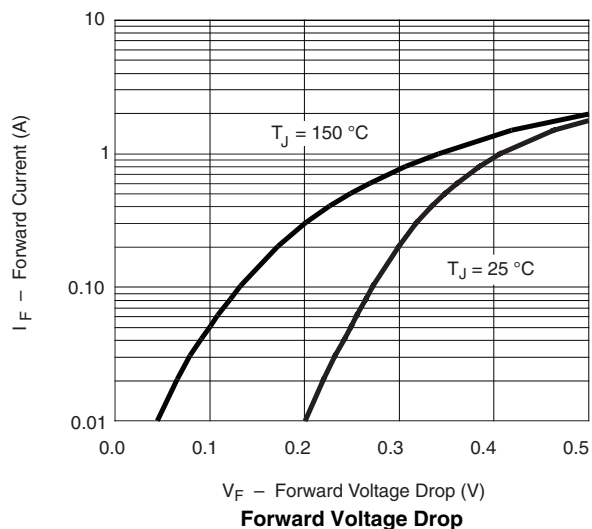
* The power dissipation P_D is based on $T_{J(\max)} = 150\text{ }^{\circ}\text{C}$, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

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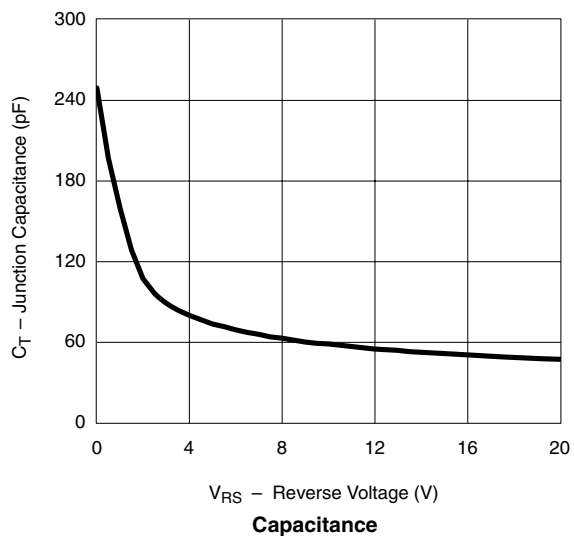


SCHOTTKY TYPICAL CHARACTERISTICS $T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise noted


Reverse Current vs. Junction Temperature

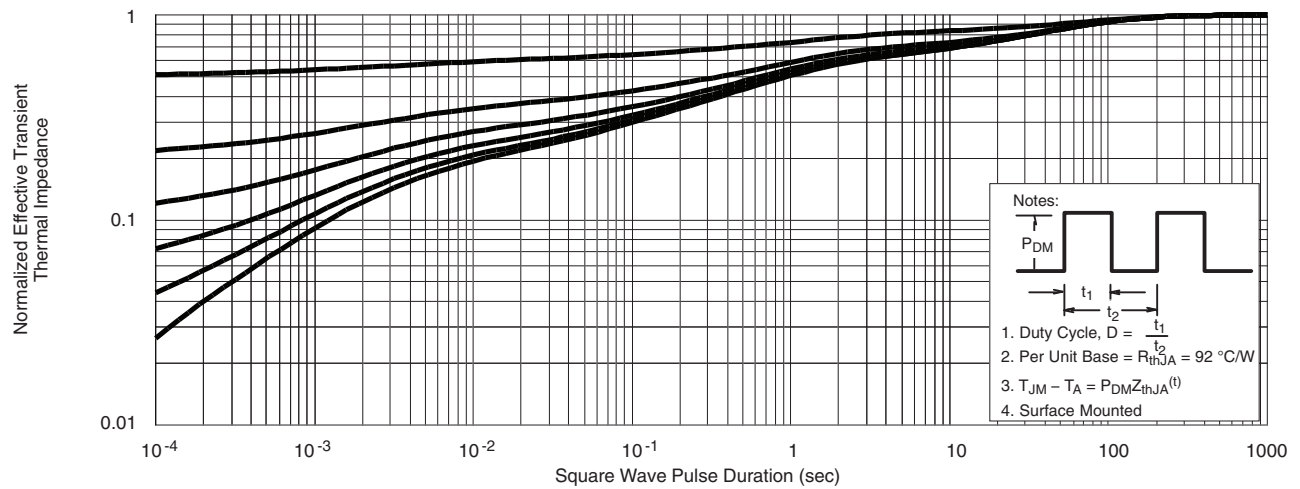


Forward Voltage Drop

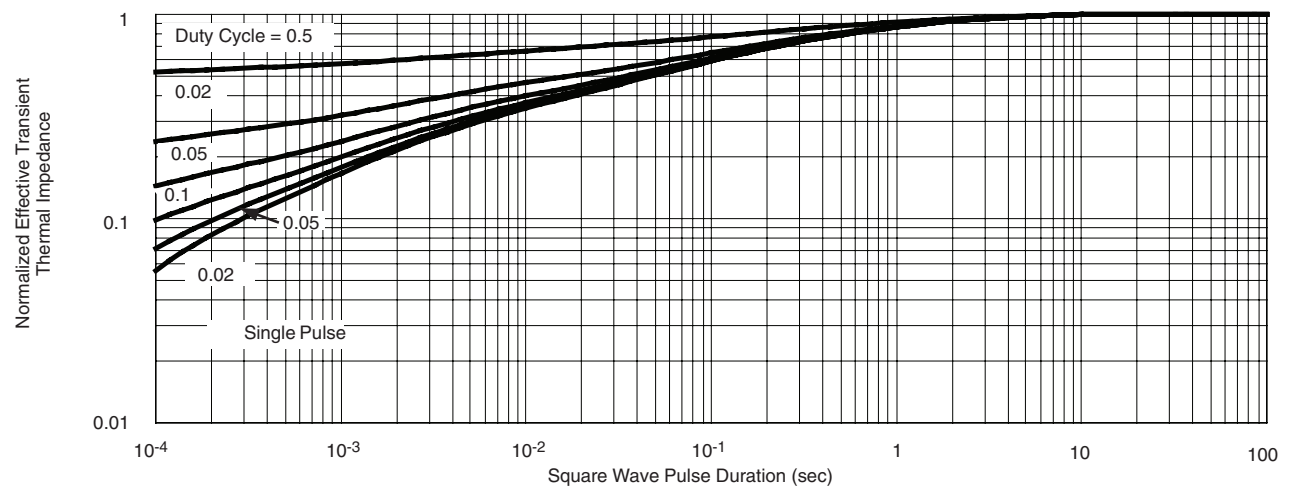


Capacitance

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



Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Foot

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