



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

PRODUCT SUMMARY			
V _{DS} (V)	R _{DS(on)} (Ω)	I _D (A) ^a	Q _g (Typ.)
- 20	0.084 at V _{GS} = - 10 V	- 3.3	4 nC
	0.108 at V _{GS} = - 4.5 V	- 2.9	
	0.175 at V _{GS} = - 2.5 V	- 2.3	

SCHOTTKY PRODUCT SUMMARY		
V _{KA} (V)	V _f (V) Diode Forward Voltage	I _F (A) ^a
20	0.5 at 1 A	2

FEATURES

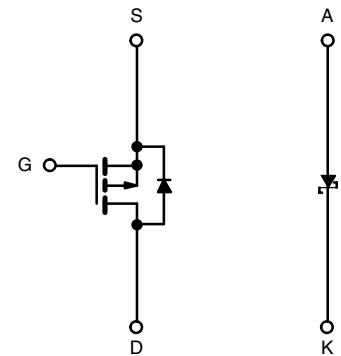
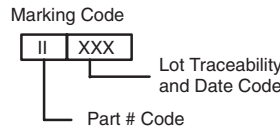
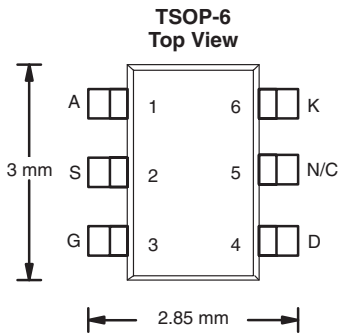
- Halogen-free According to IEC 61249-2-21 Definition
- LITTLE FOOT® Plus Schottky Power MOSFET
- Compliant to RoHS Directive 2002/95/EC



RoHS
COMPLIANT
HALOGEN
FREE
Available

APPLICATIONS

- HDD
- DC-DC Converter



P-Channel MOSFET

Ordering Information: Si3805DV-T1-E3 (Lead (Pb)-free)
Si3805DV-T1-GE3 (Lead (Pb)-free and Halogen-free)

ABSOLUTE MAXIMUM RATINGS T _A = 25 °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}	± 12		
Continuous Drain Current (T _J = 150 °C) (MOSFET)	I _D	T _C = 25 °C	- 3.3	
		T _C = 70 °C	- 2.7	
		T _A = 25 °C	- 3.0 ^{b, c}	
		T _A = 70 °C	- 2.4 ^{b, c}	
Pulsed Drain Current (MOSFET)	I _{DM}	- 15	A	
Continuous Source-Drain Diode Current (MOSFET Diode Conduction)	I _S	T _C = 25 °C		- 1.2
		T _A = 25 °C	- 0.9 ^{b, c}	
Average Forward Current (Schottky)	I _F	2 ^b	W	
Pulsed Forward Current (Schottky)	I _{FM}	5		
Maximum Power Dissipation (MOSFET)	P _D	T _C = 25 °C		1.4
		T _C = 70 °C		0.9
		T _A = 25 °C	1.1 ^{b, c}	
		T _A = 70 °C	0.7 ^{b, c}	
Maximum Power Dissipation (Schottky)	P _D	T _C = 25 °C	1.4	
		T _C = 70 °C	0.9	
		T _A = 25 °C	1.1 ^{b, c}	
		T _A = 70 °C	0.7 ^{b, c}	
Operating Junction and Storage Temperature Range	T _J , T _{stg}	- 55 to 150	°C	

THERMAL RESISTANCE RATINGS

Parameter		Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient (MOSFET) ^{b, d}	$t \leq 5$ s	R_{thJA}	93	110	°C/W
Maximum Junction-to-Foot (Drain) (MOSFET)	Steady State	R_{thJF}	75	90	
Maximum Junction-to-Ambient (Schottky) ^{b, e}	$t \leq 5$ s	R_{thJA}	97	115	
Maximum Junction-to-Foot (Drain) (Schottky)	Steady State	R_{thJF}	78	95	

Notes:

- a. Based on $T_C = 25$ °C.
 b. Surface Mounted on 1" x 1" FR4 board.
 c. $t = 5$ s
 d. Maximum under Steady State conditions is 150 °C/W.
 e. Maximum under Steady State conditions is 155 °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		-20		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$		3			
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = -250$ μ A	-0.6		-1.5	V
Gate-Source Leakage	I_{GSS}	$V_{DS} = 0$ V, $V_{GS} = \pm 12$ 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, $V_{GS} = -4.5$ V	-15			A
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = -10$ V, $I_D = -3.0$ A		0.070	0.084	Ω
		$V_{GS} = -4.5$ V, $I_D = -2.6$ A		0.090	0.108	
		$V_{GS} = -2.5$ V, $I_D = 2.1$ A		0.140	0.175	
Forward Transconductance ^a	g_{fs}	$V_{DS} = -10$ V, $I_D = -3.0$ A		6		S
Dynamic^b						
Input Capacitance	C_{iss}	$V_{DS} = -10$ V, $V_{GS} = 0$ V, $f = 1$ MHz		330		pF
Output Capacitance	C_{oss}		80			
Reverse Transfer Capacitance	C_{rss}		57			
Total Gate Charge	Q_g	$V_{DS} = -10$ V, $V_{GS} = -10$ V, $I_D = -3.0$ A		8	12	nC
Gate-Source Charge	Q_{gs}	$V_{DS} = -10$ V, $V_{GS} = -4.5$ V, $I_D = -3.0$ A		4	6	
Gate-Drain Charge	Q_{gd}		0.8			
Gate Resistance	R_g		1.4			
Gate Resistance	R_g	$f = 1$ MHz	1.2	6	12	Ω
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -10$ V, $R_L = 4.2$ Ω $I_D \cong -2.4$ A, $V_{GEN} = -10$ V, $R_g = 1$ Ω		3	6	ns
Rise Time	t_r		10	20		
Turn-Off Delay Time	$t_{d(off)}$		16	24		
Fall Time	t_f		8	15		
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -10$ V, $R_L = 4.2$ Ω $I_D \cong -2.4$ A, $V_{GEN} = -4.5$ V, $R_g = 1$ Ω		18	27	
Rise Time	t_r		40	60		
Turn-Off Delay Time	$t_{d(off)}$		18	27		
Fall Time	t_f		10	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	$T_C = 25\text{ }^\circ\text{C}$			- 1.2	A
Pulse Diode Forward Current	I_{SM}				- 15	
Body Diode Voltage	V_{SD}	$I_S = - 1.0\text{ A}, V_{GS} = 0\text{ V}$		- 0.75	- 1.2	V
Body Diode Reverse Recovery Time	t_{rr}	$I_F = - 2.4\text{ A}, dI/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$		23	35	ns
Body Diode Reverse Recovery Charge	Q_{rr}			14	21	nC
Reverse Recovery Fall Time	t_a			11		ns
Reverse Recovery Rise Time	t_b			12		

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	$I_F = 1\text{ A}$		0.42	0.50	V
		$I_F = 1\text{ A}, T_J = 125\text{ }^\circ\text{C}$		0.36	0.43	
Maximum Reverse Leakage Current	I_{rm}	$V_r = 5\text{ V}$		0.015	0.08	mA
		$V_r = 5\text{ V}, T_J = 85\text{ }^\circ\text{C}$		0.50	5.00	
		$V_r = 20\text{ V}$		0.02	0.10	
		$V_r = 20\text{ V}, T_J = 85\text{ }^\circ\text{C}$		0.7	7.00	
		$V_r = 20\text{ V}, T_J = 125\text{ }^\circ\text{C}$		5	50	
Junction Capacitance	C_T	$V_r = 10\text{ V}$		60		pF

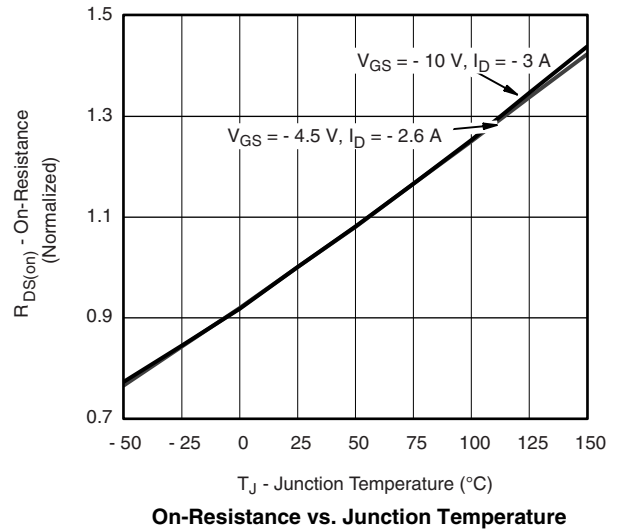
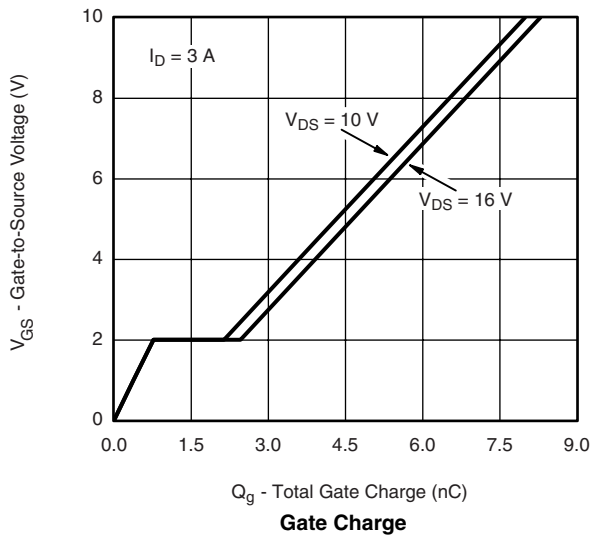
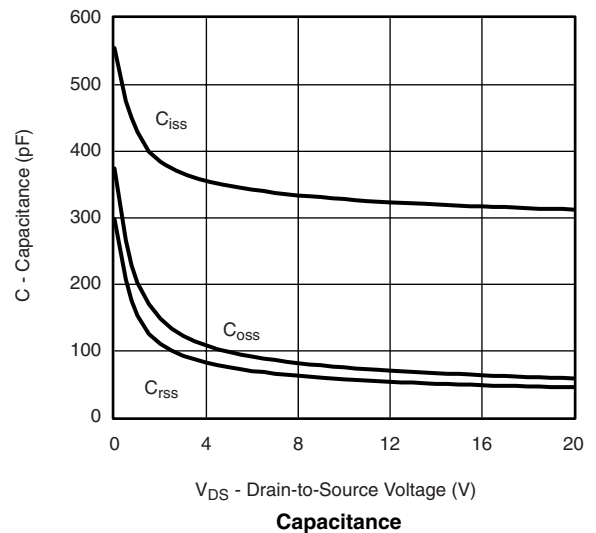
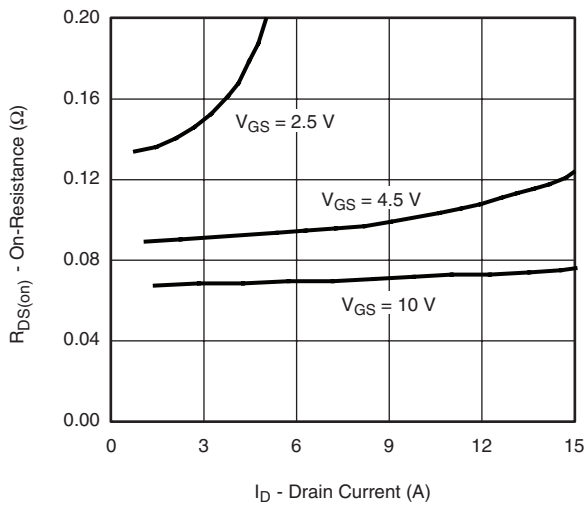
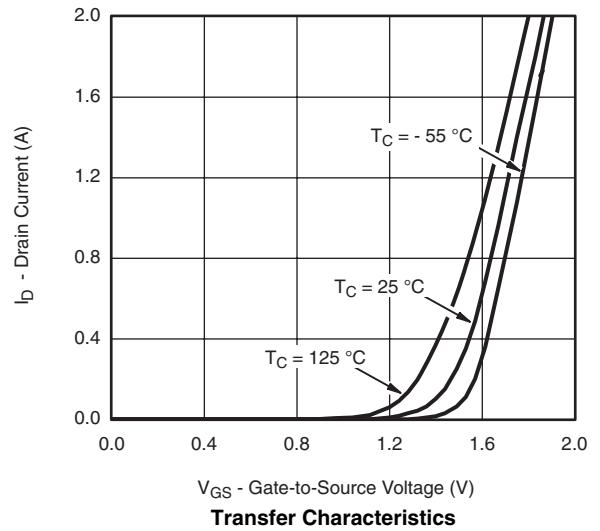
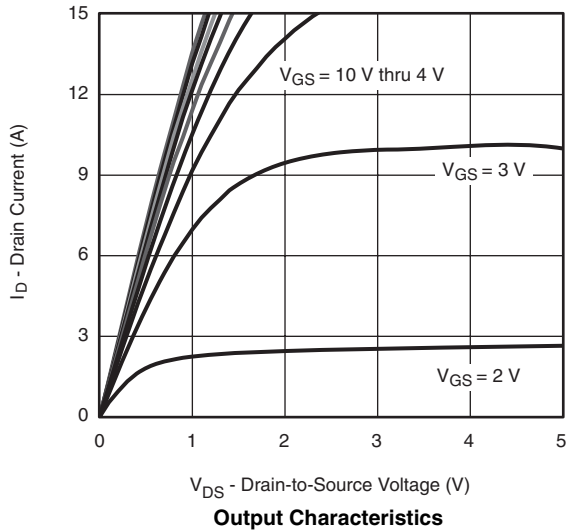
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

Si3805DV

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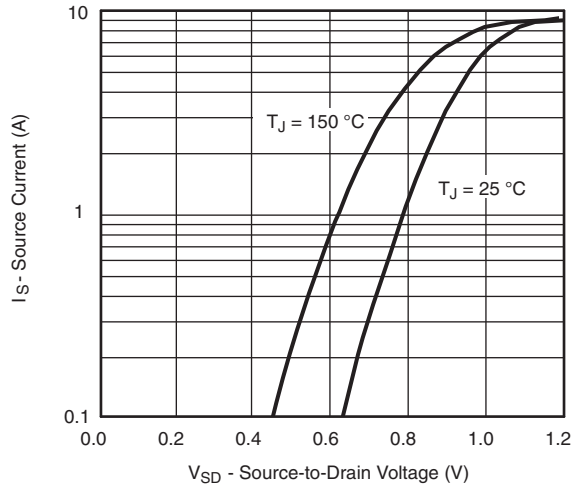


MOSFET TYPICAL CHARACTERISTICS $T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted

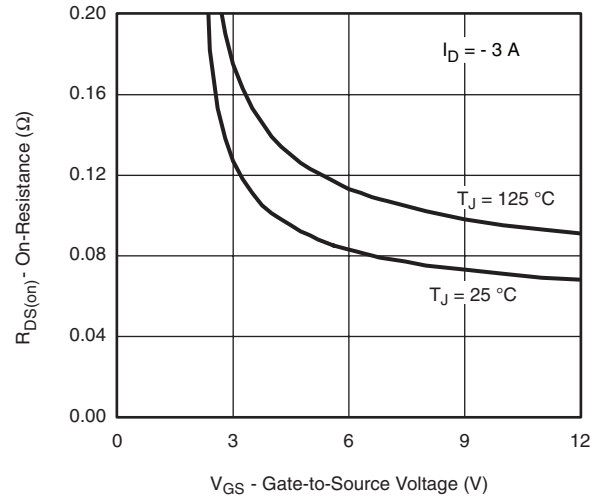




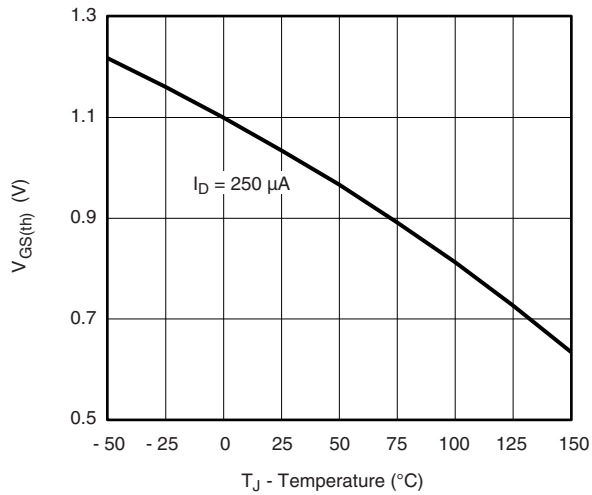
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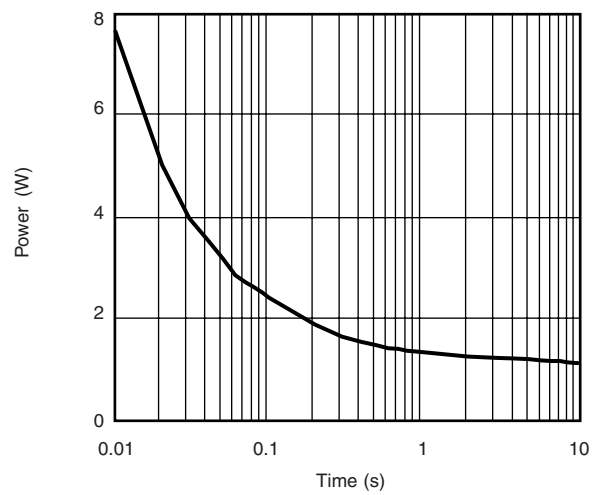
Source-Drain Diode Forward Voltage



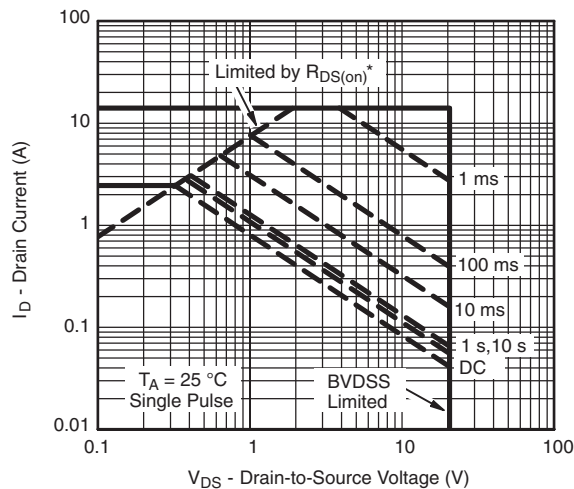
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



Single Pulse Power, Junction-to-Ambient

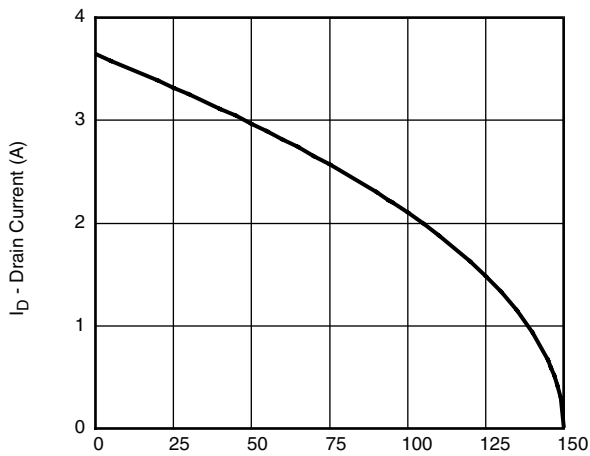


* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Case

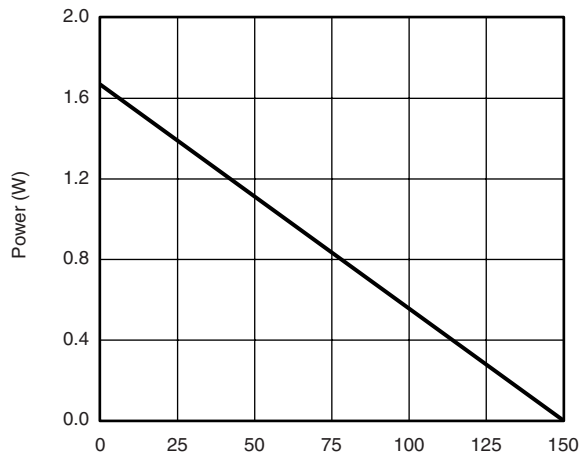


MOSFET TYPICAL CHARACTERISTICS $T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted



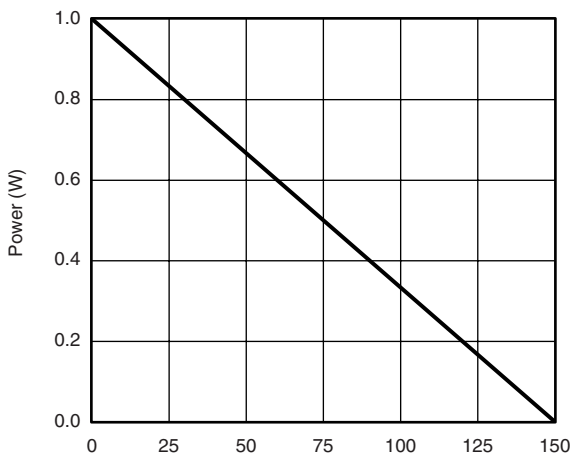
T_C - Case Temperature ($^\circ\text{C}$)

Current Derating*



T_C - Case Temperature ($^\circ\text{C}$)

Power Derating, Junction-to-Foot



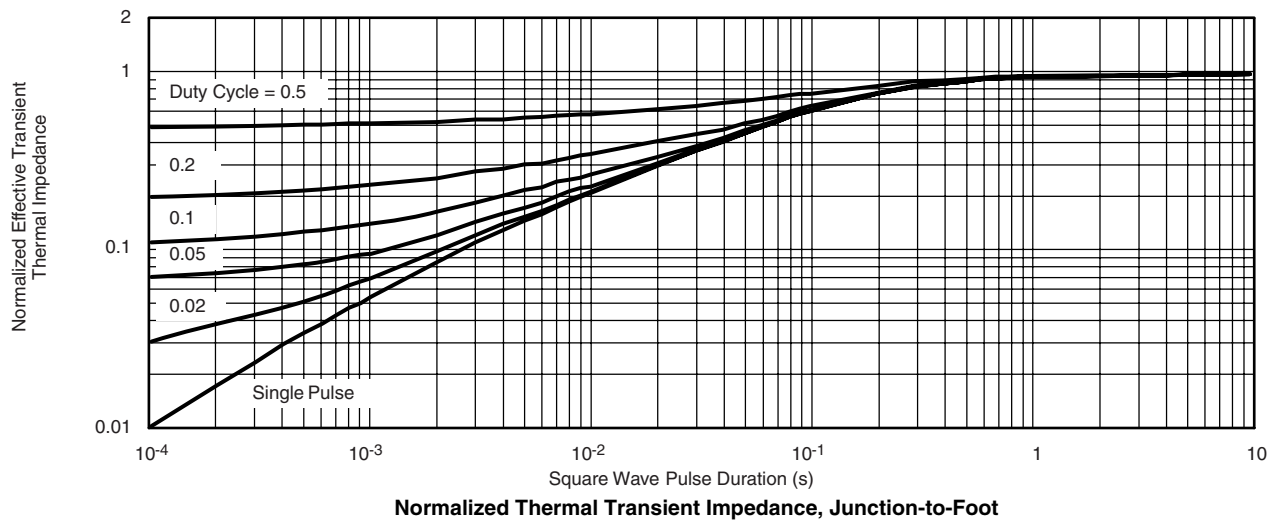
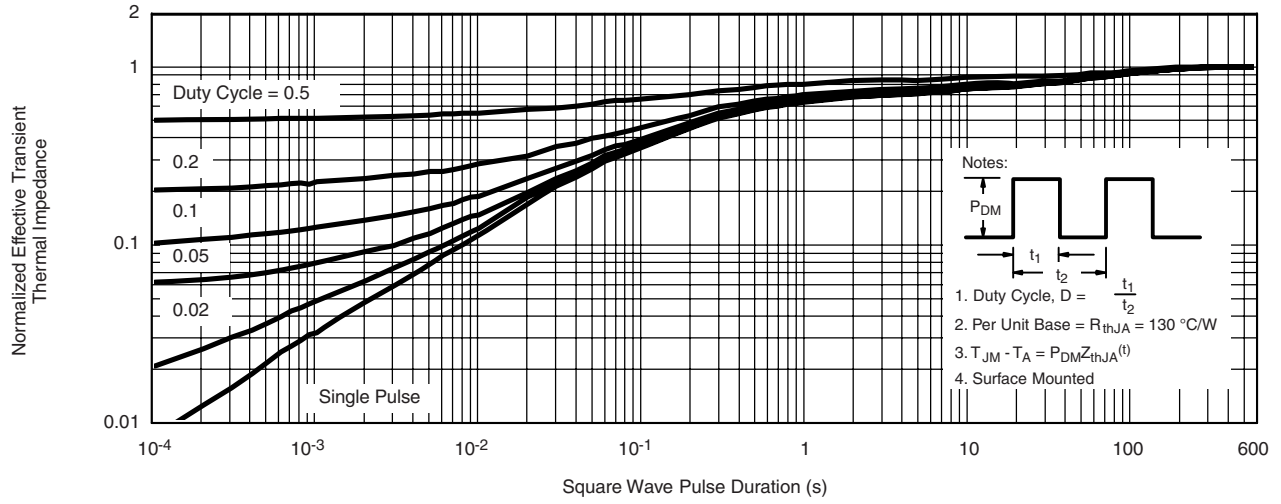
T_A - Ambient Temperature ($^\circ\text{C}$)

Power Derating, Junction-to-Ambient

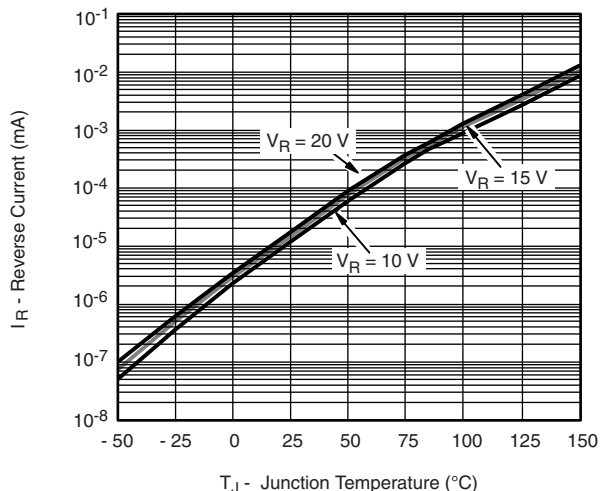
* The power dissipation P_D is based on $T_{J(\text{max})} = 150\text{ }^\circ\text{C}$, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls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



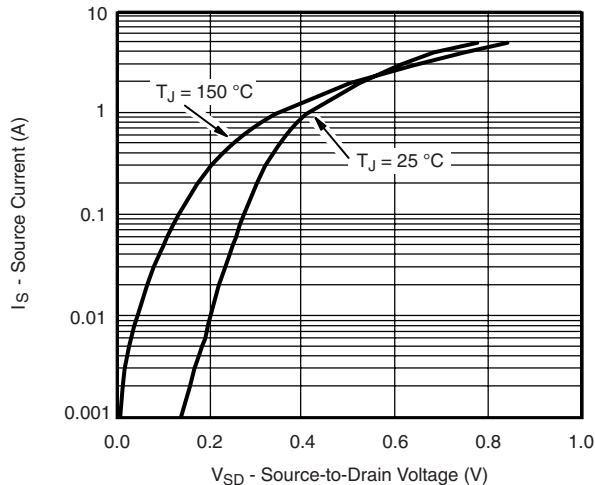
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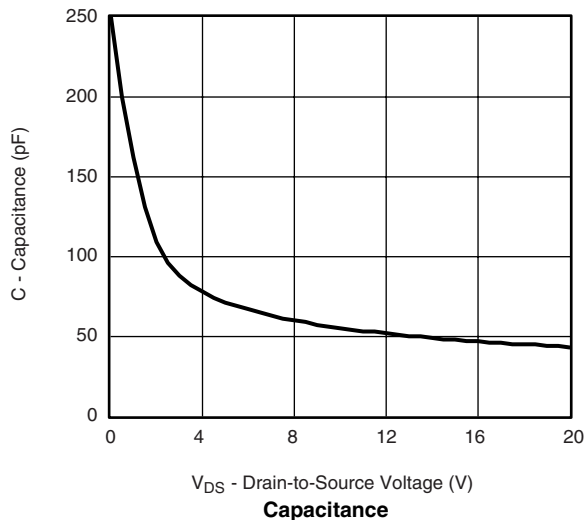
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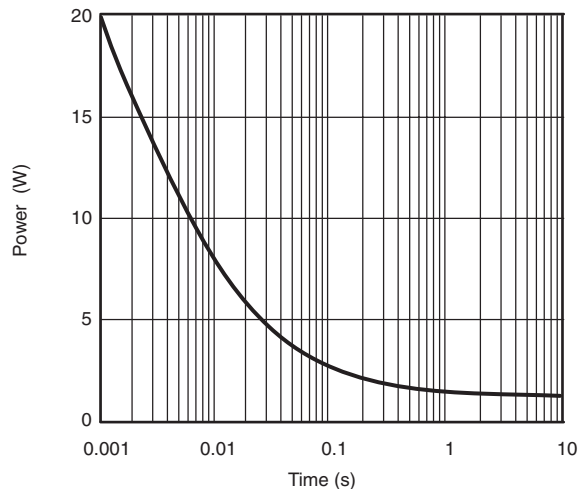
Reverse Current vs. Junction Temperature



Forward Diode Voltage



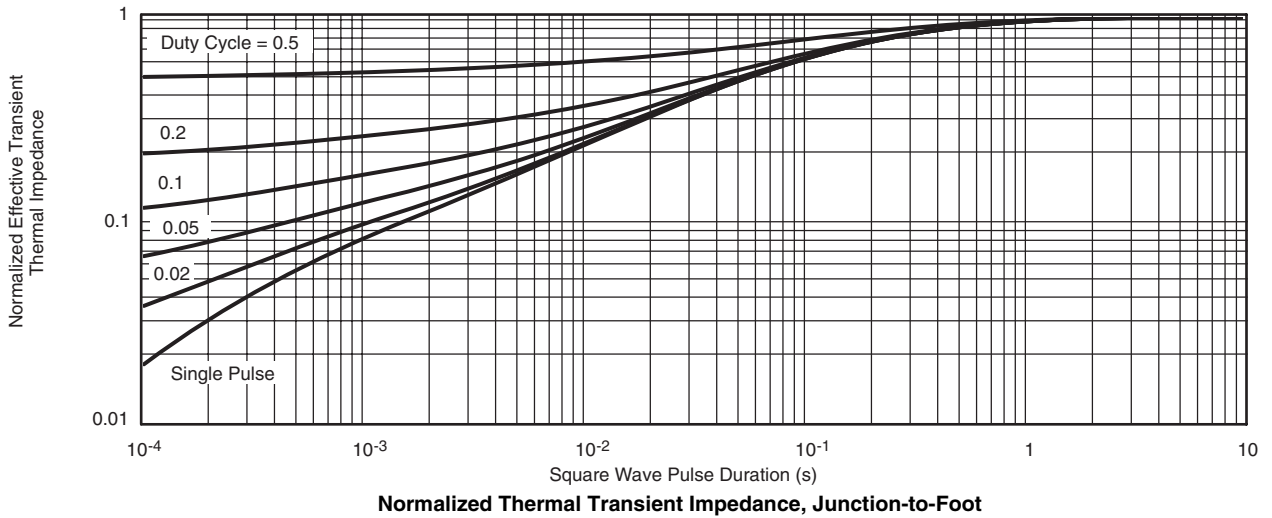
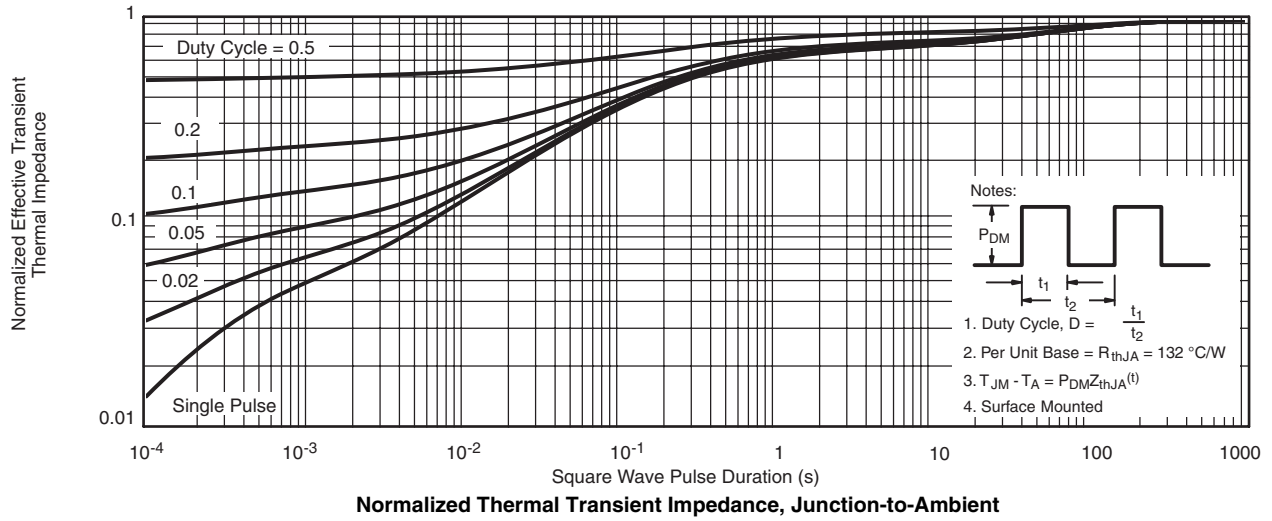
Capacitance



Single Pulse Power, Junction-to-Ambient



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