

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

PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A) ^a	Q_g (Typ.)
30	0.0065 at $V_{GS} = 10$ V	22.4	27.5 nC
	0.008 at $V_{GS} = 4.5$ V	20.2	

FEATURES

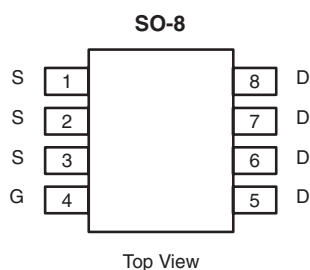
- Halogen-free According to IEC 61249-2-21 Definition
- SkyFET[®] Monolithic TrenchFET[®] Power MOSFET and Schottky Diode
- 100 % R_g Tested
- 100 % UIS Tested
- Compliant to RoHS Directive 2002/95/EC



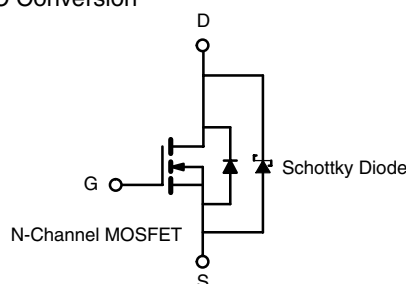
RoHS
COMPLIANT
HALOGEN
FREE
Available

APPLICATIONS

- Notebook System Power
- DC/DC Conversion



Ordering Information: Si4638DY-T1-E3 (Lead (Pb)-free)
Si4638DY-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	V_{DS}	30	V
Gate-Source Voltage	V_{GS}	± 20	
Continuous Drain Current ($T_J = 150$ °C)	I_D	$T_C = 25$ °C	22.4
		$T_C = 70$ °C	18
		$T_A = 25$ °C	16 ^{b, c}
		$T_A = 70$ °C	12.7 ^{b, c}
Pulsed Drain Current	I_{DM}	70	A
Continuous Source-Drain Diode Current	I_S	$T_C = 25$ °C	5.3
		$T_A = 25$ °C	2.7 ^{b, c}
Single Pulse Avalanche Current	I_{AS}	30	mJ
Single Pulse Avalanche Energy	E_{AS}	45	
Maximum Power Dissipation	P_D	$T_C = 25$ °C	5.9
		$T_C = 70$ °C	3.8
		$T_A = 25$ °C	3 ^{b, c}
		$T_A = 70$ °C	1.9 ^{b, c}
Operating Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to 150	°C

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Typ.	Max.	Unit
Maximum Junction-to-Ambient ^{b, d}	R_{thJA}	33	42	°C/W
Maximum Junction-to-Foot (Drain)	R_{thJF}	16	21	

Notes:

a. Based on $T_C = 25$ °C.

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

c. $t = 10$ s.

d. Maximum under Steady State conditions is 85 °C/W.

SPECIFICATIONS $T_J = 25\text{ }^{\circ}\text{C}$, unless otherwise noted

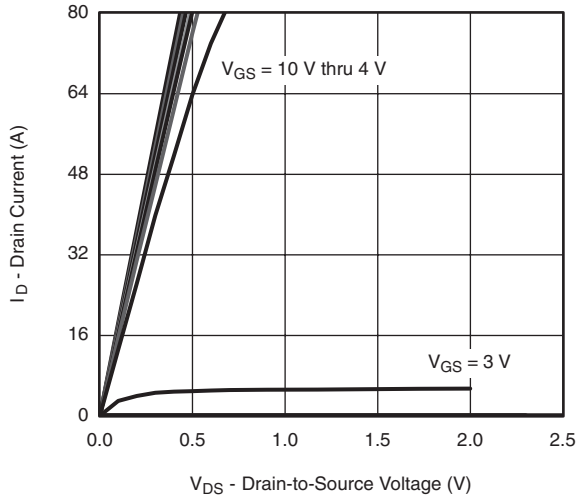
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit		
Static								
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}, I_D = 1\text{ mA}$	30			V		
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 1\text{ mA}$	1.3		2.7			
Gate-Source Leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			± 100	nA		
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}$		0.063	0.25	mA		
		$V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}, T_J = 100\text{ }^{\circ}\text{C}$		6.4	65			
On -State Drain Current ^a	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}, V_{GS} = 10\text{ V}$	40			A		
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 15\text{ A}$		0.0054	0.0065	Ω		
		$V_{GS} = 4.5\text{ V}, I_D = 10\text{ A}$		0.0065	0.008			
Forward Transconductance ^a	g_{fs}	$V_{DS} = 15\text{ V}, I_D = 15\text{ A}$		0.74		S		
Dynamic ^b								
Input Capacitance	C_{iss}	$V_{DS} = 15\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		4190		pF		
Output Capacitance	C_{oss}			620				
Reverse Transfer Capacitance	C_{rss}			225				
Total Gate Charge	Q_g	$V_{DS} = 15\text{ V}, V_{GS} = 10\text{ V}, I_D = 10\text{ A}$		66.5	100	nC		
Gate-Source Charge	Q_{gs}	$V_{DS} = 15\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 10\text{ A}$		27.5	42			
Gate-Drain Charge	Q_{gd}			11.5				
Gate Resistance	R_g			7				
Turn-On Delay Time	$t_{d(on)}$	$f = 1\text{ MHz}$	0.2	0.95	1.9	Ω		
Rise Time	t_r		$V_{DD} = 15\text{ V}, R_L = 1.5\text{ }\Omega$ $I_D \cong 10\text{ A}, V_{GEN} = 4.5\text{ V}, R_g = 1\text{ }\Omega$		16		30	ns
Turn-Off Delay Time	$t_{d(off)}$				10		20	
Fall Time	t_f				39		75	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 15\text{ V}, R_L = 1.5\text{ }\Omega$ $I_D \cong 10\text{ A}, V_{GEN} = 10\text{ V}, R_g = 1\text{ }\Omega$			9	18		
Rise Time	t_r			37	75			
Turn-Off Delay Time	$t_{d(off)}$			19	35			
Fall Time	t_f			44	85			
Drain-Source Body Diode and Schottky Characteristics								
Continuous Source-Drain Diode Current	I_S	$T_C = 25\text{ }^{\circ}\text{C}$			5.9	A		
Pulse Diode Forward Current ^a	I_{SM}				70			
Body Diode Voltage	V_{SD}	$I_S = 2\text{ A}$		0.42	0.55	V		
Body Diode Reverse Recovery Time	t_{rr}	$I_F = 10\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^{\circ}\text{C}$		32	60	ns		
Body Diode Reverse Recovery Charge	Q_{rr}			23	45	nC		
Reverse Recovery Fall Time	t_a			16		ns		
Reverse Recovery Rise Time	t_b			16				

Notes:

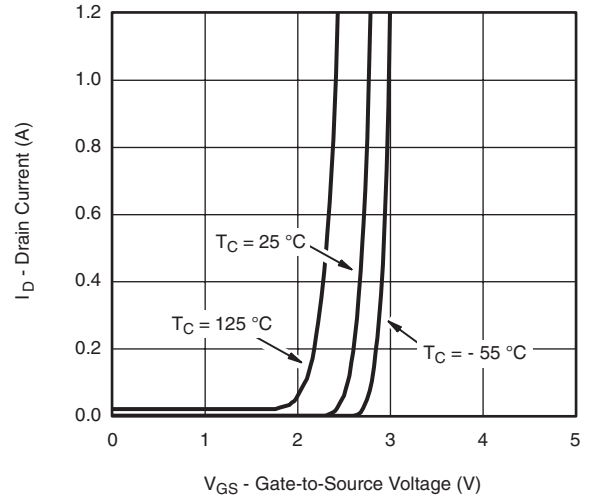
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
b. Guaranteed by design, not subject to production testing.

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.

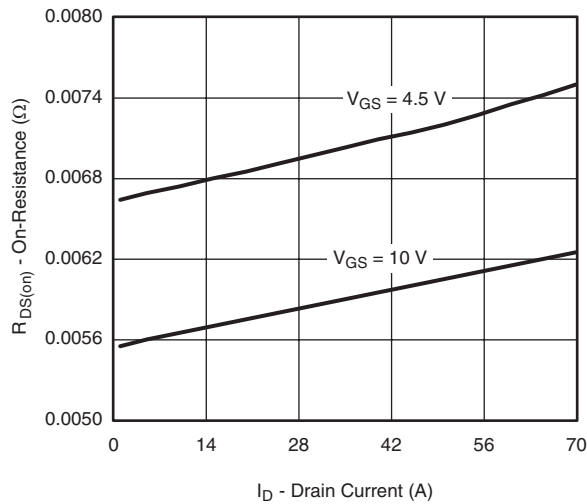
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



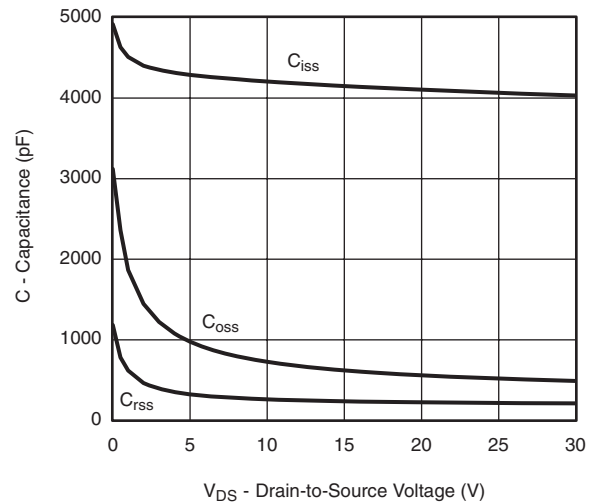
Output Characteristics



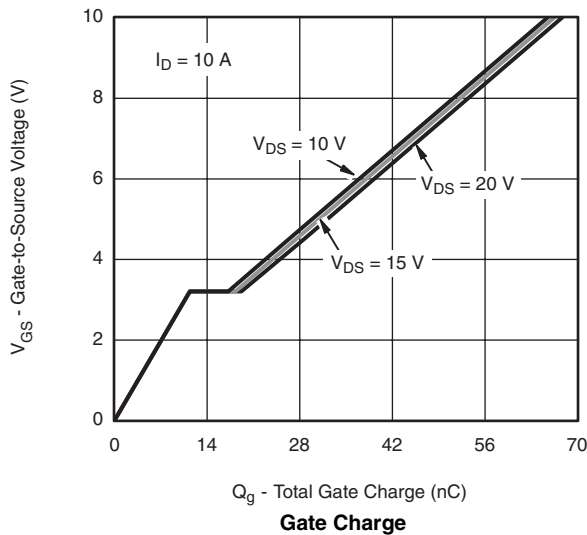
Transfer Characteristics



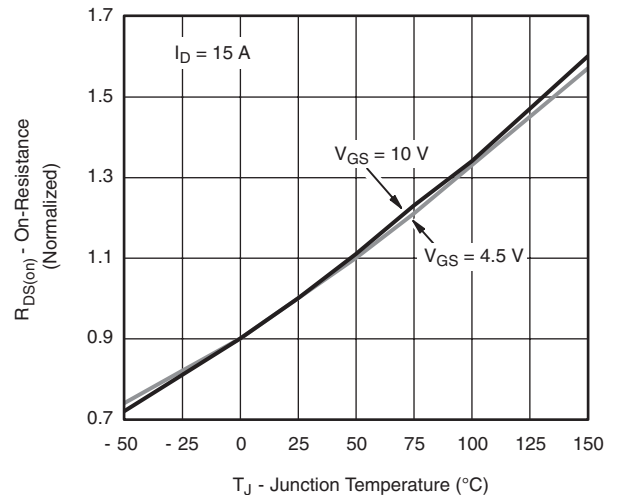
On-Resistance vs. Drain Current



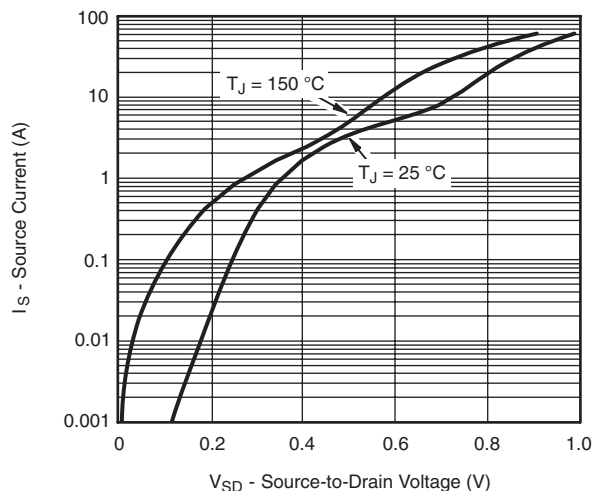
Capacitance



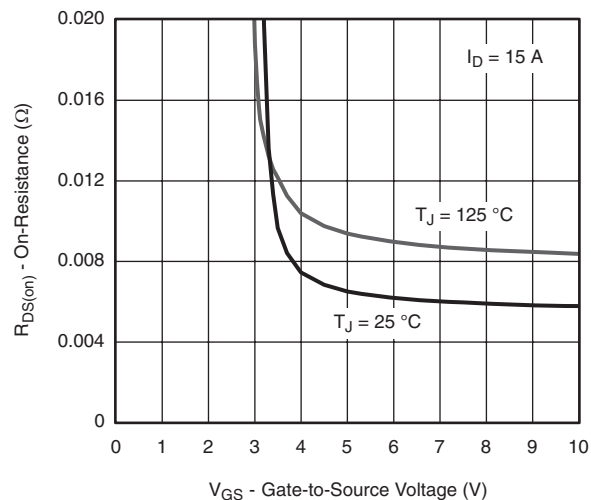
Gate Charge



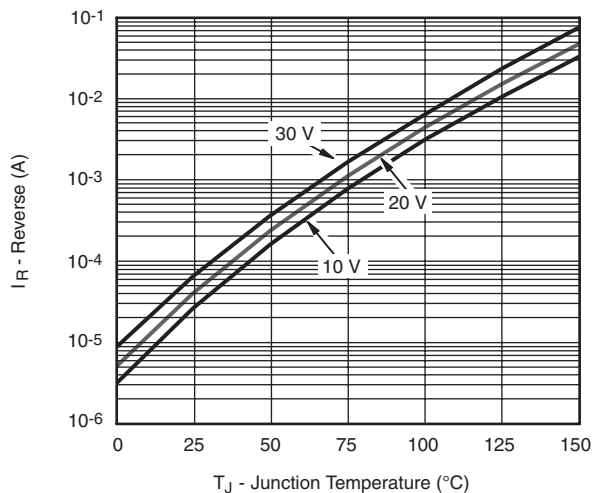
On-Resistance vs. Junction Temperature

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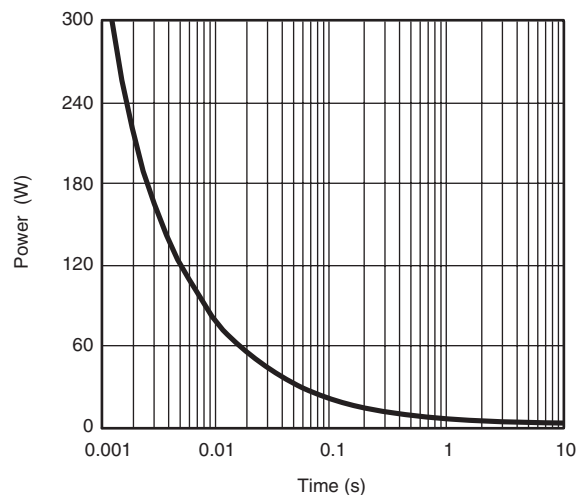
Source-Drain Diode Forward Voltage



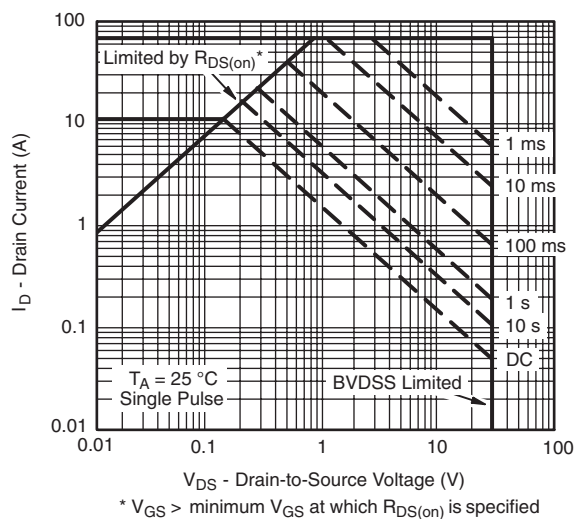
On-Resistance vs. Gate-to-Source Voltage



Reverse Current (Schottky)



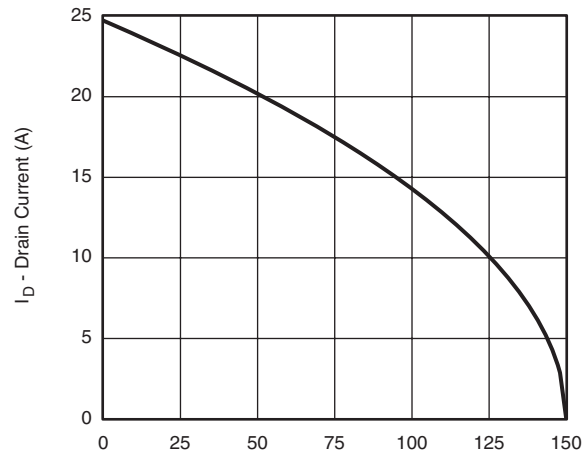
Single Pulse Power, Junction-to-Ambient



Safe Operating Area

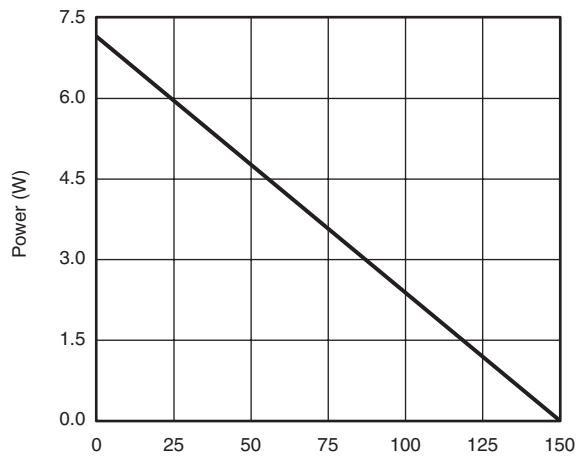


TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



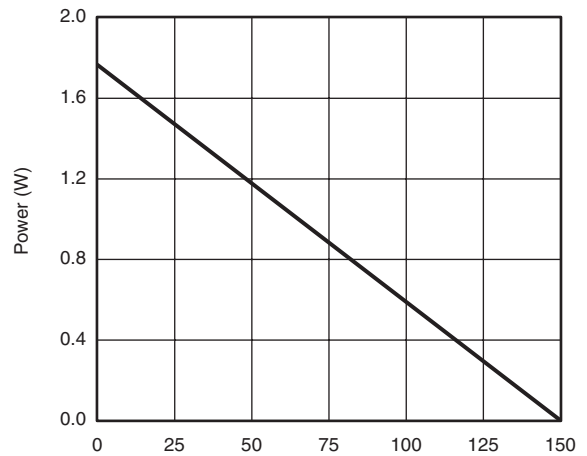
T_C - Case Temperature (°C)

Current Derating*



T_C - Case Temperature (°C)

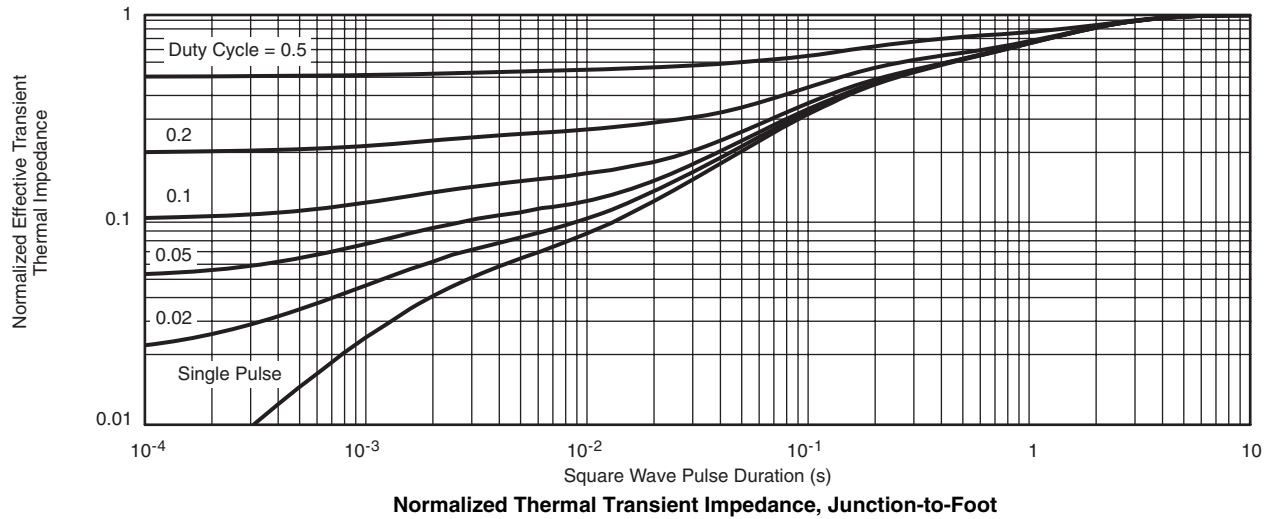
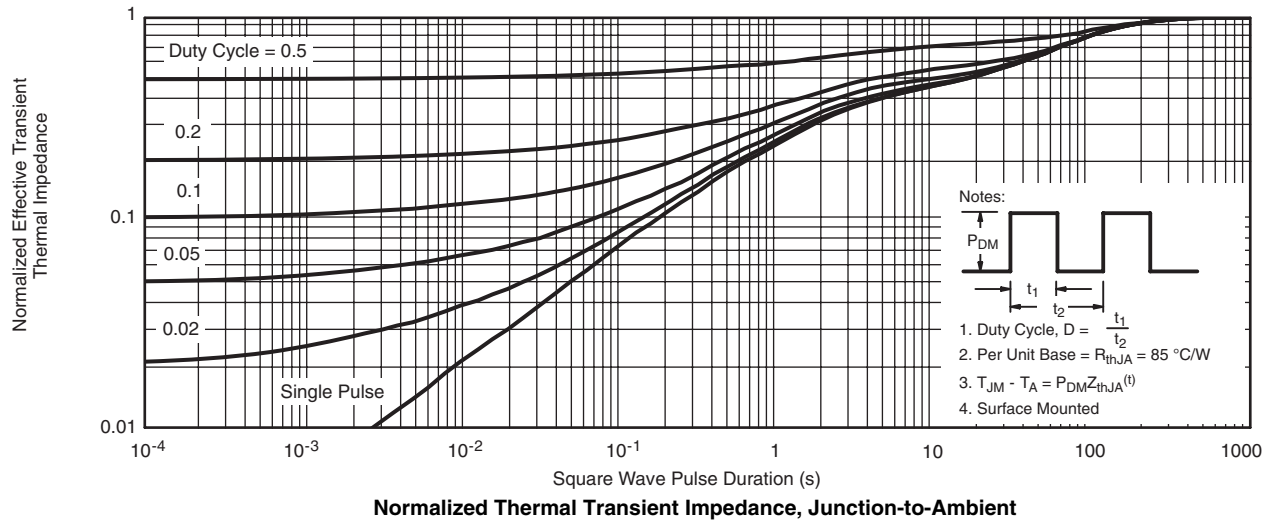
Power Derating, Junction-to-Foot



T_A - Ambient Temperature (°C)

Power Derating, Junction-to-Ambient

* The power dissipation P_D is based on $T_{J(max)} = 150$ °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.

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

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