

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

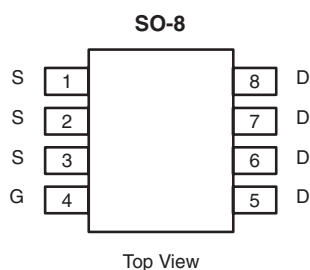
- Halogen-free According to IEC 61249-2-21 Definition
- SkyFET[®] Monolithic TrenchFET[®] Power MOSFET and Schottky Diode
- 100 % R_g Tested
- 100 % UIS Tested
- Compliant to RoHS Directive 2002/95/EC



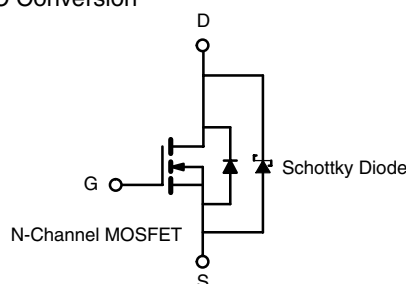
RoHS
COMPLIANT
HALOGEN
FREE
Available

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}	$t \leq 10$ s	R_{thJA}	33	42	°C/W
Maximum Junction-to-Foot (Drain)	Steady State	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 °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 = 1 mA	30			V	
Gate-Source Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 1 mA	1.3		2.7		
Gate-Source Leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 20 V			± 100	nA	
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 30 V, V _{GS} = 0 V		0.063	0.25	mA	
		V _{DS} = 30 V, V _{GS} = 0 V, T _J = 100 °C		6.4	65		
On -State Drain Current ^a	I _{D(on)}	V _{DS} ≥ 5 V, V _{GS} = 10 V	40			A	
Drain-Source On-State Resistance ^a	R _{DS(on)}	V _{GS} = 10 V, I _D = 15 A		0.0054	0.0065	Ω	
		V _{GS} = 4.5 V, I _D = 10 A		0.0065	0.008		
Forward Transconductance ^a	g _{fs}	V _{DS} = 15 V, I _D = 15 A		0.74		S	
Dynamic ^b							
Input Capacitance	C _{iss}	V _{DS} = 15 V, V _{GS} = 0 V, f = 1 MHz		4190		pF	
Output Capacitance	C _{oss}			620			
Reverse Transfer Capacitance	C _{rss}			225			
Total Gate Charge	Q _g	V _{DS} = 15 V, V _{GS} = 10 V, I _D = 10 A		66.5	100	nC	
Gate-Source Charge	Q _{gs}	V _{DS} = 15 V, V _{GS} = 4.5 V, I _D = 10 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 MHz	0.2	0.95	1.9	Ω	
Rise Time	t _r		V _{DD} = 15 V, R _L = 1.5 Ω I _D ≅ 10 A, V _{GEN} = 4.5 V, R _g = 1 Ω		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 V, R _L = 1.5 Ω I _D ≅ 10 A, V _{GEN} = 10 V, R _g = 1 Ω			9	18	
Turn-On Delay Time	t _{d(on)}			37	75		
Rise Time	t _r			19	35		
Turn-Off Delay Time	t _{d(off)}			44	85		
Fall Time	t _f			18	35		
Drain-Source Body Diode and Schottky Characteristics							
Continuous Source-Drain Diode Current	I _S	T _C = 25 °C			5.9	A	
Pulse Diode Forward Current ^a	I _{SM}				70		
Body Diode Voltage	V _{SD}	I _S = 2 A		0.42	0.55	V	
Body Diode Reverse Recovery Time	t _{rr}	I _F = 10 A, dI/dt = 100 A/μs, T _J = 25 °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			

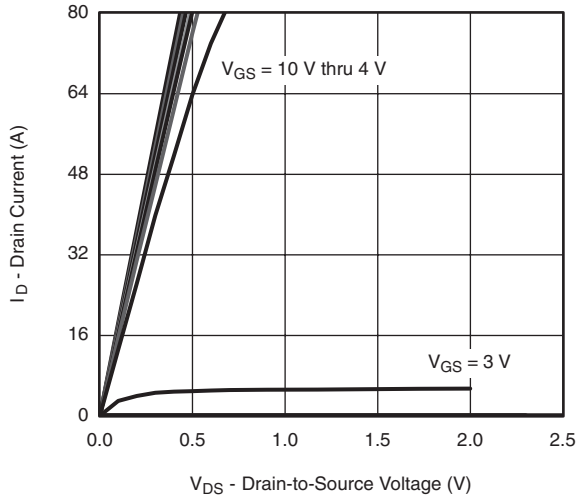
Notes:

a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.

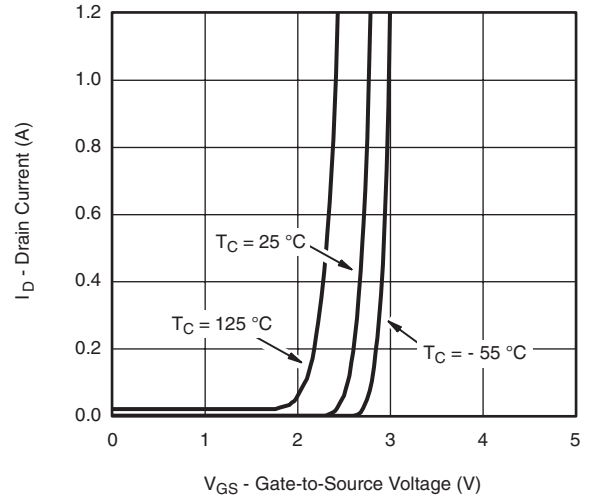
b. Guaranteed by design, not subject to production testing.

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.

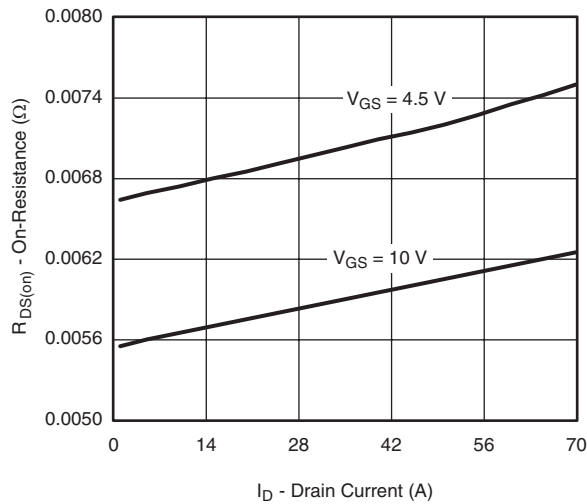
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



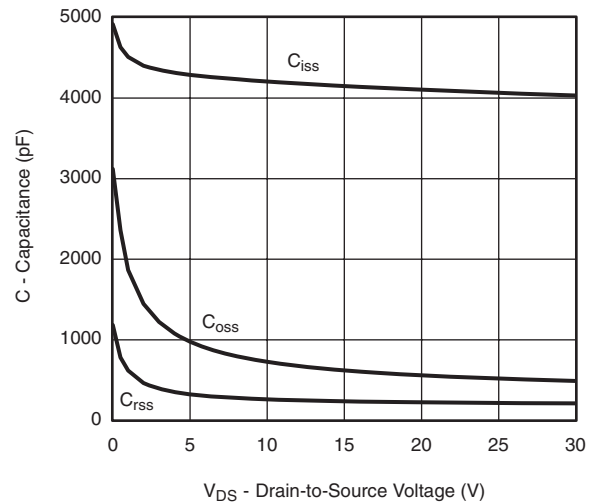
Output Characteristics



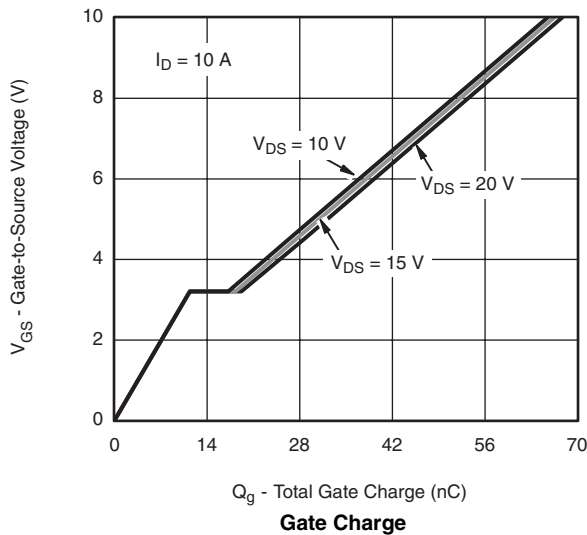
Transfer Characteristics



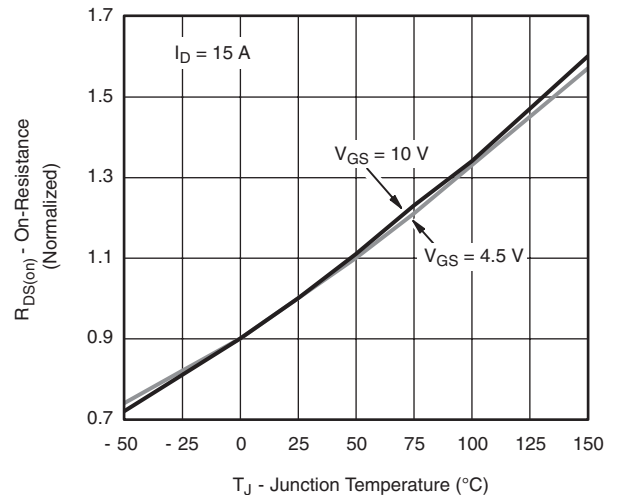
On-Resistance vs. Drain Current



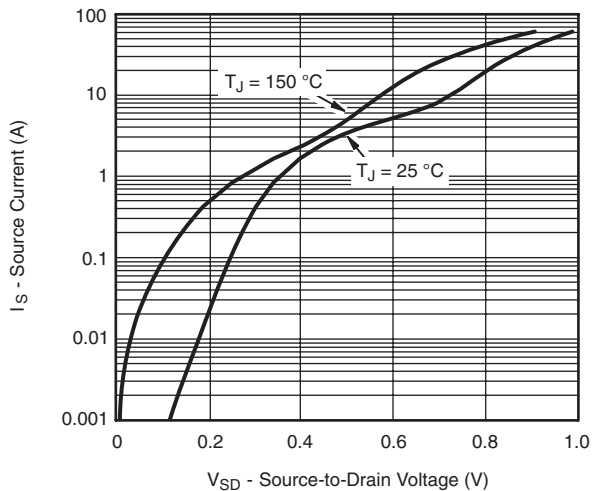
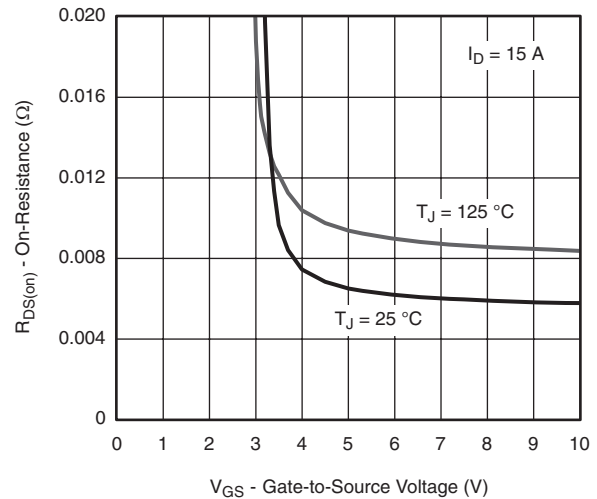
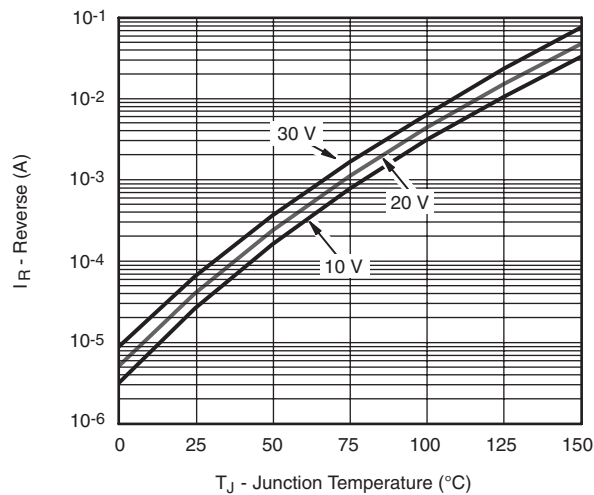
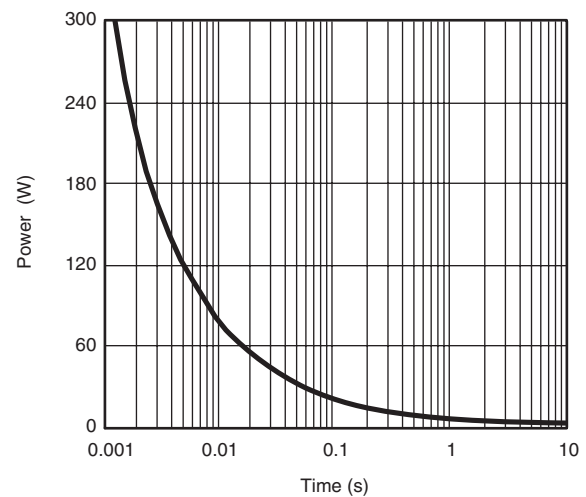
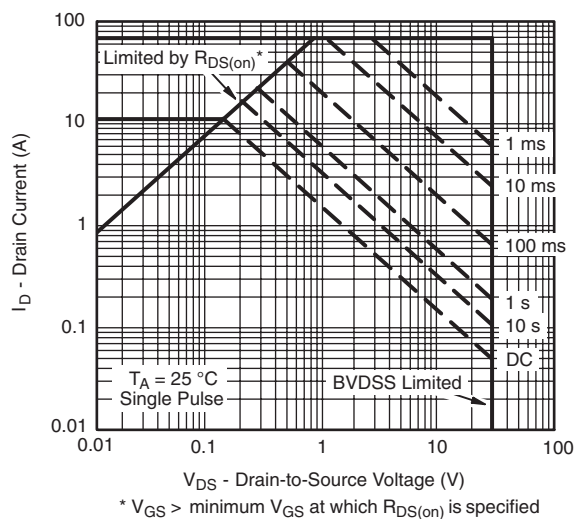
Capacitance



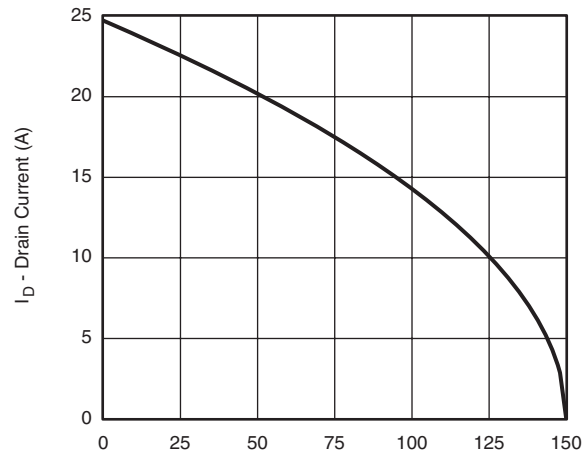
Gate Charge



On-Resistance vs. Junction Temperature

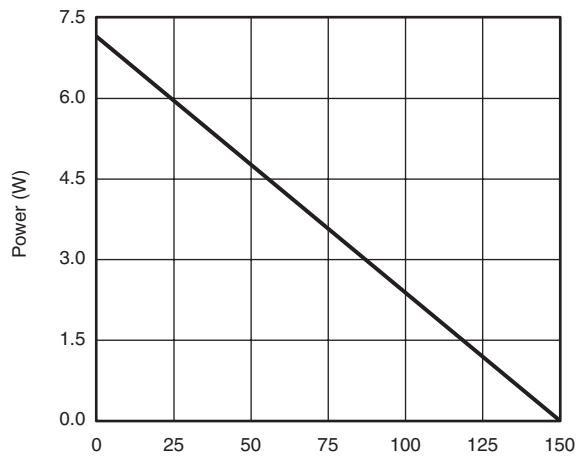
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted**Source-Drain Diode Forward Voltage****On-Resistance vs. Gate-to-Source Voltage****Reverse Current (Schottky)****Single Pulse Power, Junction-to-Ambient****Safe Operating Area**

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



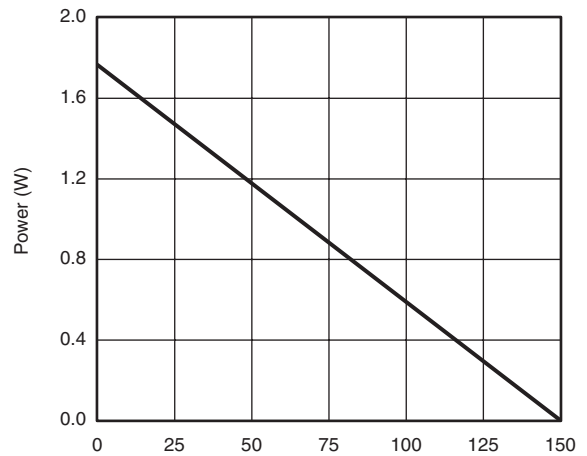
T_C - Case Temperature (°C)

Current Derating*



T_C - Case Temperature (°C)

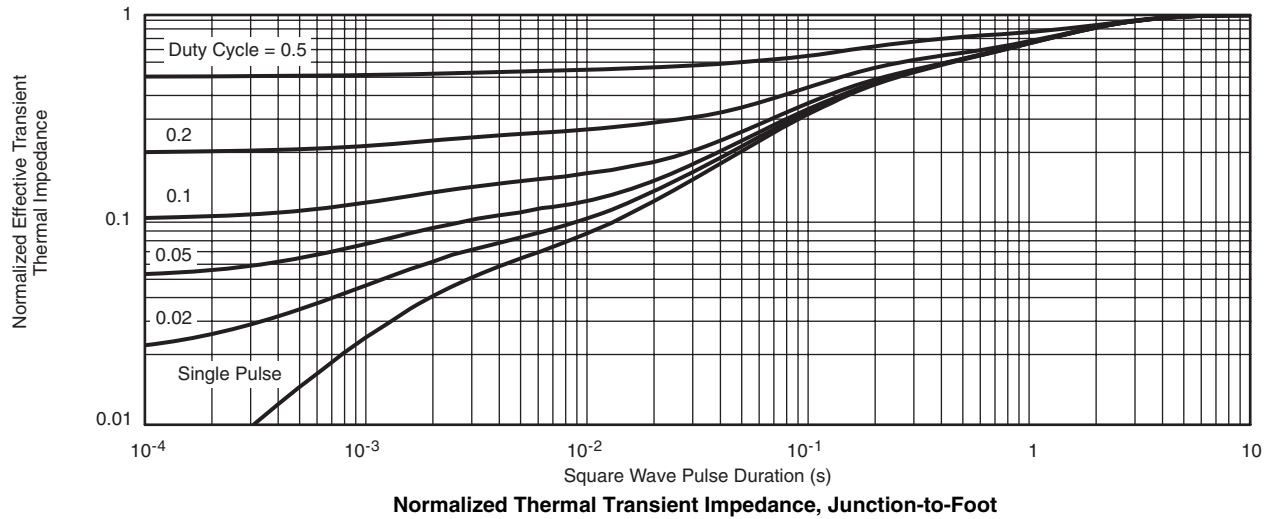
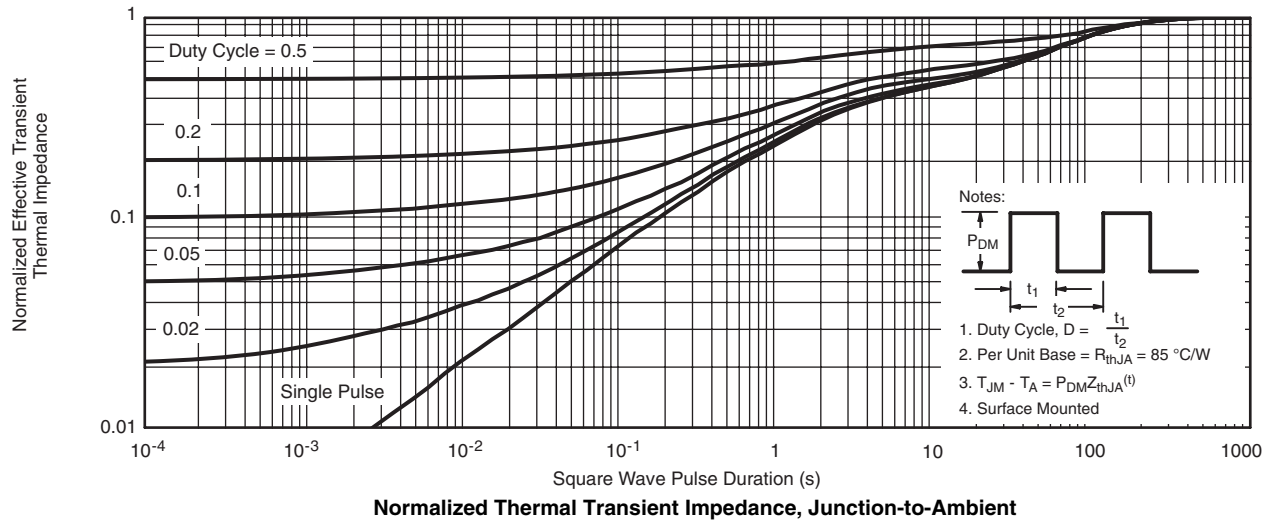
Power Derating, Junction-to-Foot



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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