

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

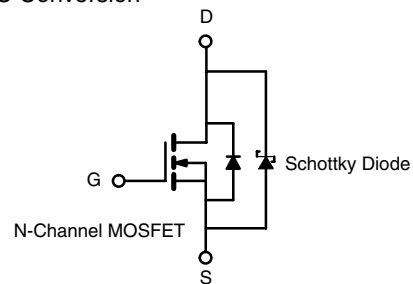
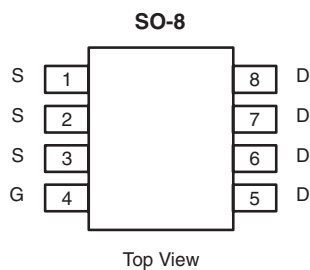
- Halogen-free According to IEC 61249-2-21 Definition
- SkyFET[®] Monolithic TrenchFET[®] Power MOSFET and Schottky Diode
- 100 % R_g Tested
- 100 % UIS Tested
- Compliant to RoHS Directive 2002/95/EC



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)	T _C = 25 °C	I _D	22.4	A
	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	
Continuous Source-Drain Diode Current	T _C = 25 °C	I _S	5.3	
	T _A = 25 °C		2.7 ^{b, c}	
Single Pulse Avalanche Current	L = 0.1 mH	I _{AS}	30	mJ
Single Pulse Avalanche Energy		E _{AS}	45	
Maximum Power Dissipation	T _C = 25 °C	P _D	5.9	W
	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 ≤ 10 s	R _{thJA}	33	42	°C/W
Maximum Junction-to-Foot (Drain)	Steady State	R _{thJF}	16	21	

Notes:

- Based on T_C = 25 °C.
- Surface Mounted on 1" x 1" FR4 board.
- t = 10 s.
- Maximum under Steady State conditions is 85 °C/W.

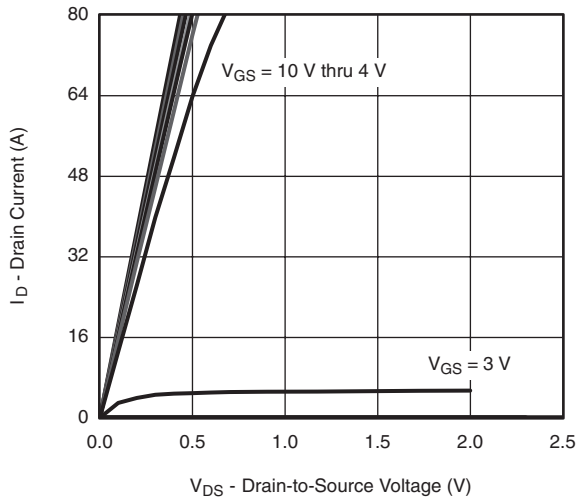
SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}, I_D = 1\text{ mA}$	30			V
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 1\text{ mA}$	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
				27.5	42	
Gate-Source Charge	Q_{gs}	$V_{DS} = 15\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 10\text{ A}$		11.5		
Gate-Drain Charge	Q_{gd}			7		
Gate Resistance	R_g	$f = 1\text{ MHz}$	0.2	0.95	1.9	Ω
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 15\text{ V}, R_L = 1.5\text{ }\Omega$ $I_D \cong 10\text{ A}, V_{GEN} = 4.5\text{ V}, R_g = 1\text{ }\Omega$		16	30	ns
Rise Time	t_r			10	20	
Turn-Off Delay Time	$t_{d(off)}$			39	75	
Fall Time	t_f			9	18	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 15\text{ V}, R_L = 1.5\text{ }\Omega$ $I_D \cong 10\text{ A}, V_{GEN} = 10\text{ V}, R_g = 1\text{ }\Omega$		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	$T_C = 25\text{ }^\circ\text{C}$			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:

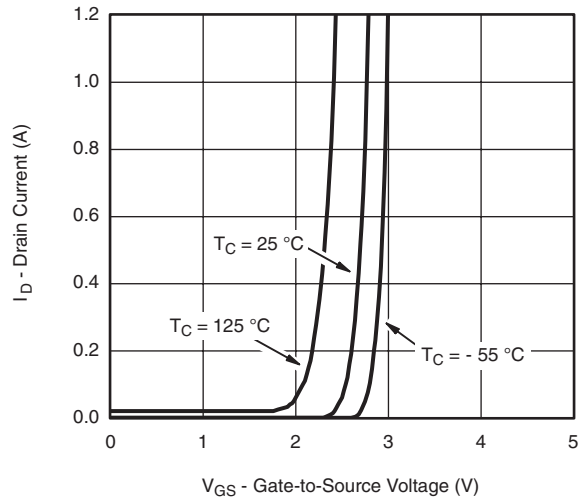
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
b. Guaranteed by design, not subject to production testing.

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.

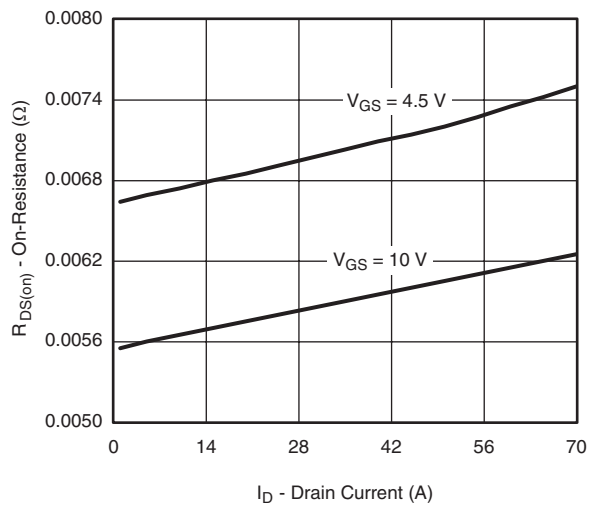
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



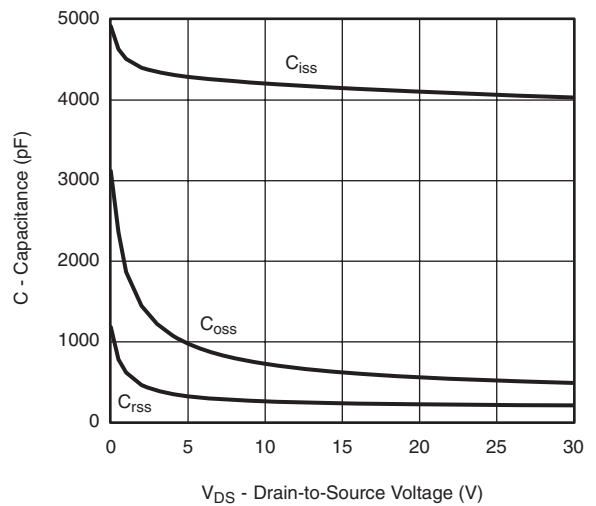
Output Characteristics



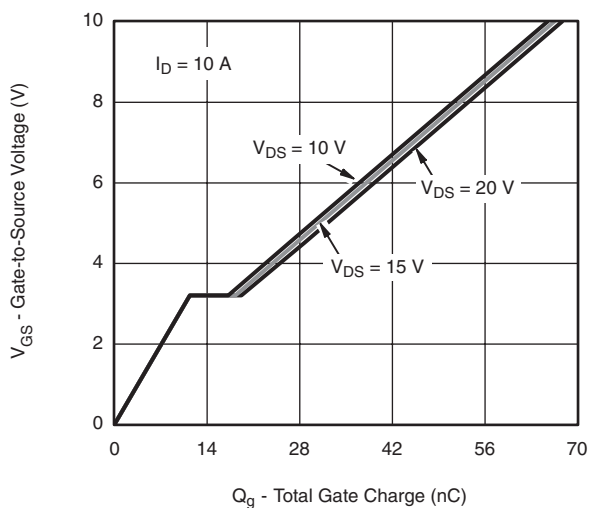
Transfer Characteristics



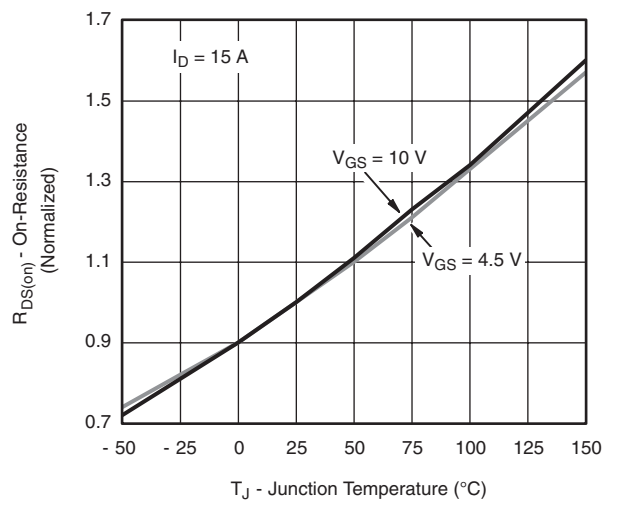
On-Resistance vs. Drain Current



Capacitance

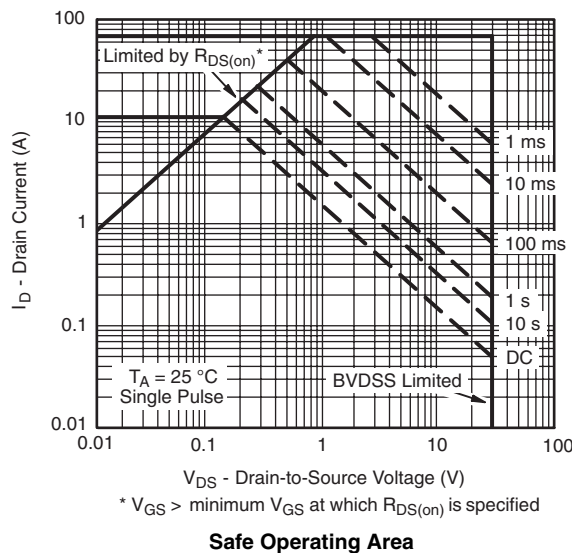
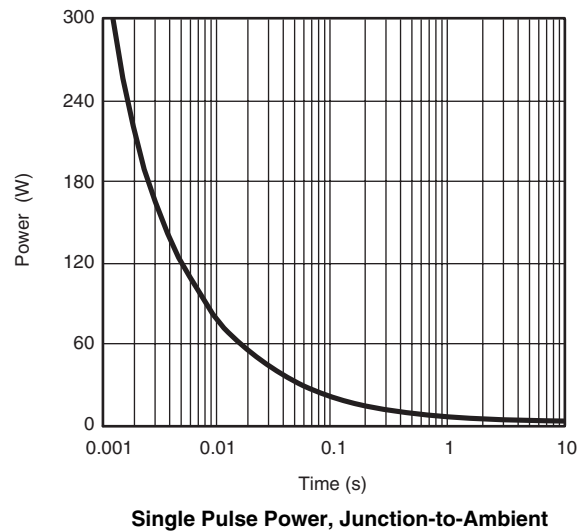
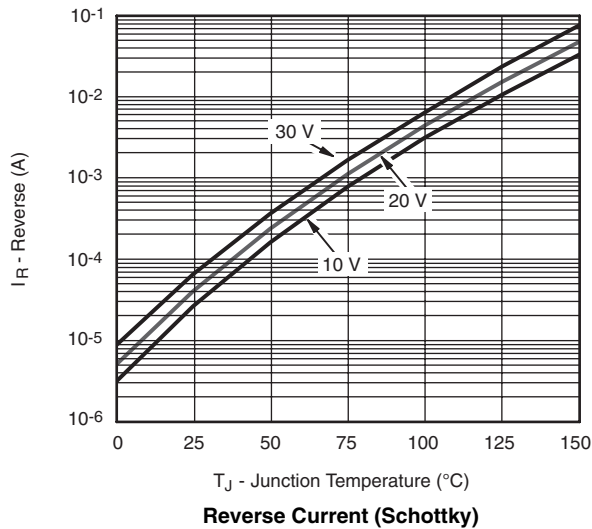
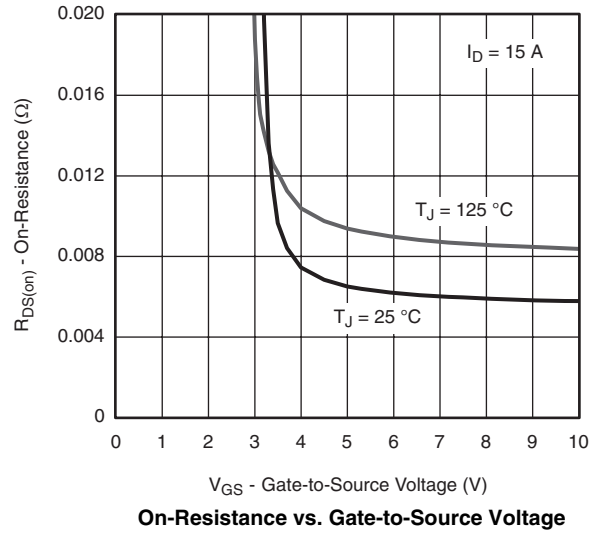
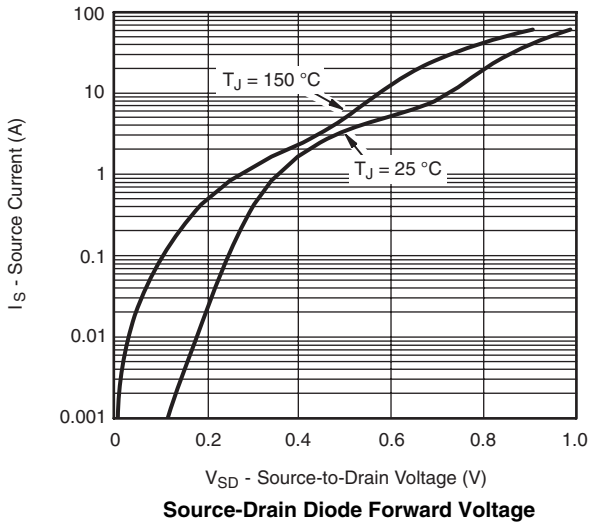


Gate Charge

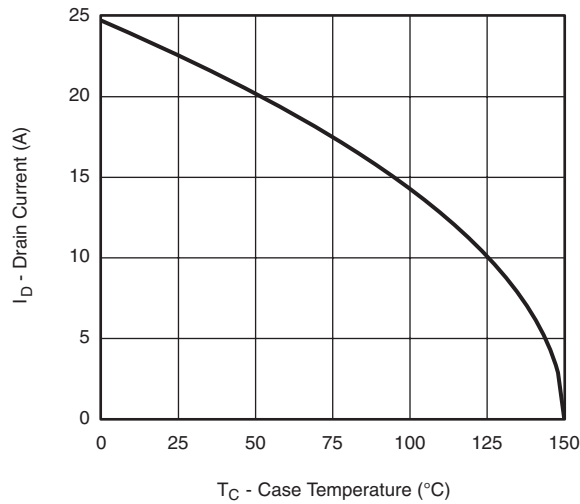


On-Resistance vs. Junction Temperature

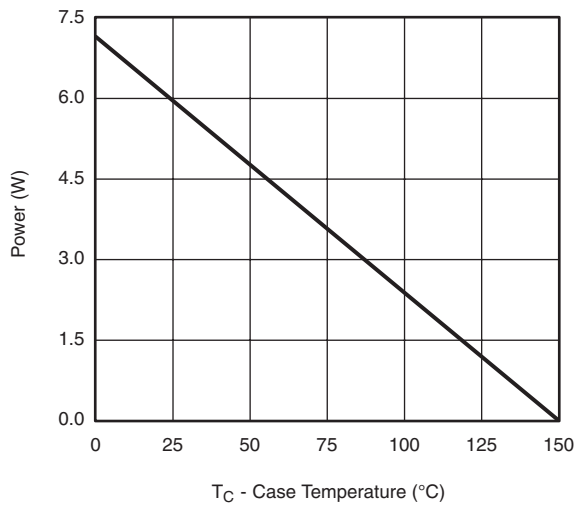
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



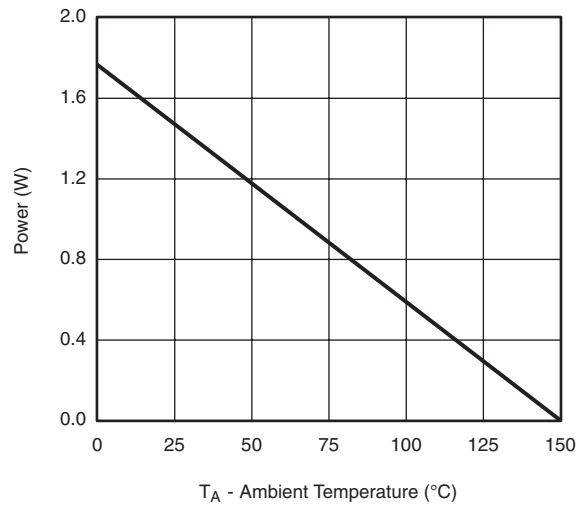
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



Current Derating*



Power Derating, Junction-to-Foot

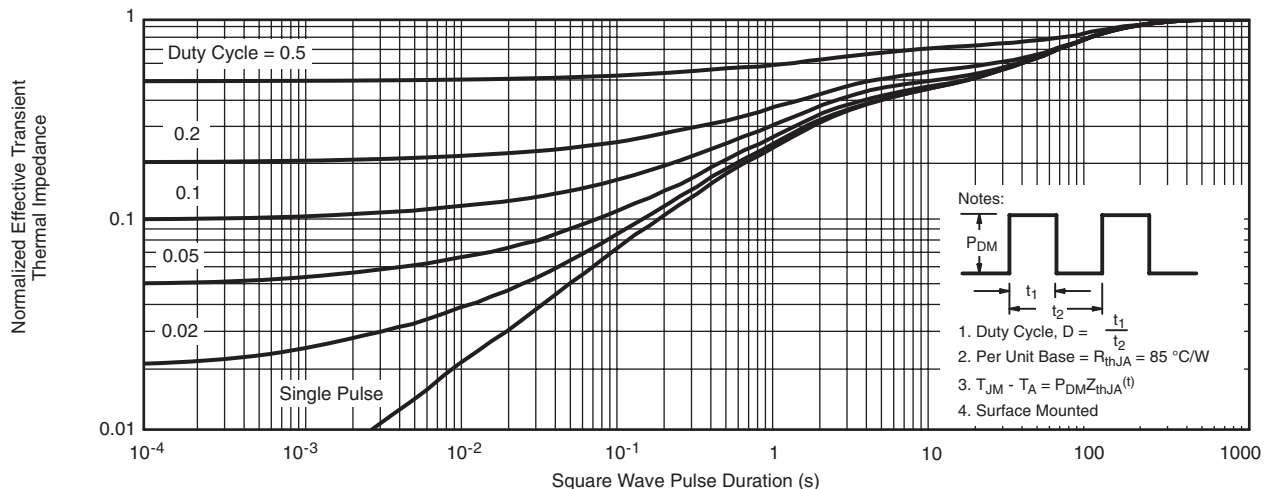


Power Derating, Junction-to-Ambient

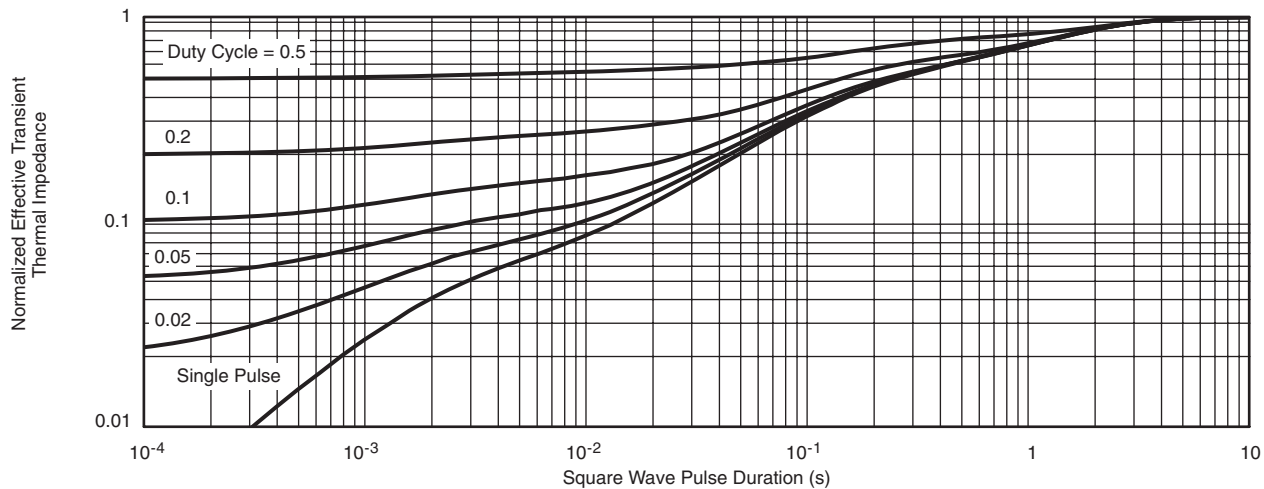
* The power dissipation P_D is based on $T_{J(max)} = 150$ °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.



TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Foot

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