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	0.00375 at V_{GS} = 10 V	34	35.7 nC
	0.0047 at V_{GS} = 4.5 V	30	

FEATURES

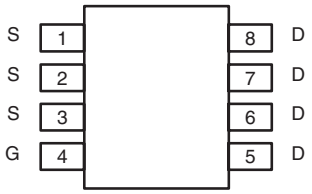
- **Halogen-free According to IEC 61249-2-21 Available**
- SkyFET® Monolithic TrenchFET® Power MOSFET and Schottky Diode
- 100 % R_g and UIS Tested

RoHS COMPLIANT
HALOGEN FREE Available

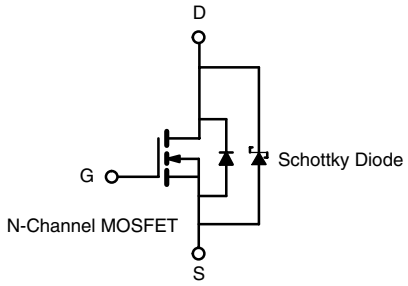
APPLICATIONS

- Notebook CPU Core
- Buck Converter
- Synchronous Rectifier Switch

SO-8



Top View



Ordering Information: Si4642DY-T1-E3 (Lead (Pb)-free)
Si4642DY-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	34	A
	T_C = 70 °C		27	
	T_A = 25 °C		22.7[b, c]	
	T_A = 70 °C		18[b, c]	
Pulsed Drain Current		I_{DM}	70	
Continuous Source-Drain Diode Current	T_C = 25 °C	I_S	7	
	T_A = 25 °C		3.1[b, c]	
Single Pulse Avalanche Current	L = 0.1 mH	I_{AS}	45	
Single Pulse Avalanche Energy		E_{AS}	101	mJ
Maximum Power Dissipation	T_C = 25 °C	P_D	7.8	W
	T_C = 70 °C		5	
	T_A = 25 °C		3.5[b, c]	
	T_A = 70 °C		2.2[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}	29	35	°C/W
Maximum Junction-to-Foot (Drain)	Steady State	R_{thJF}	13	16	

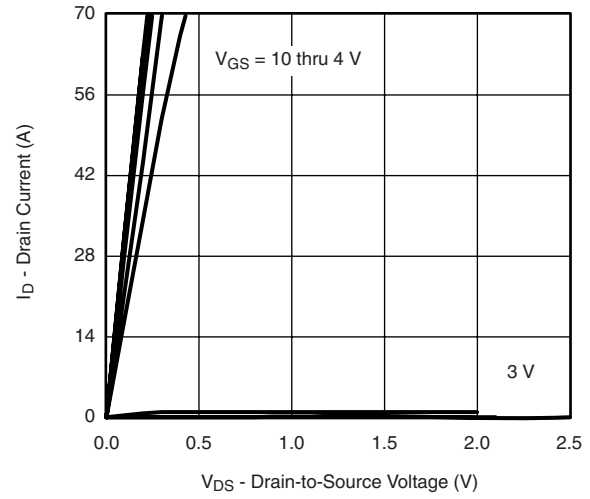
Notes:
a. Based on T_C = 25 °C.
b. Surface Mounted on 1" x 1" FR4 board.
c. t = 10 s.
d. Maximum under Steady State conditions is 80 °C/W.

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	1.5		3	
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		0.05	0.2	mA
		V_{DS} = 30 V, V_{GS} = 0 V, T_J = 100 °C		5.5	50	
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 = 20 A		0.0031	0.00375	Ω
		V_{GS} = 4.5 V, I_D = 15 A		0.0039	0.0047	
Forward Transconductance[a]	g_{fs}	V_{DS} = 15 V, I_D = 20 A		108		S
Dynamic[b]						
Input Capacitance	C_{iss}	V_{DS} = 15 V, V_{GS} = 0 V, f = 1 MHz		5540		pF
Output Capacitance	C_{oss}			790		
Reverse Transfer Capacitance	C_{rss}			346		
Total Gate Charge	Q_g	V_{DS} = 15 V, V_{GS} = 10 V, I_D = 20 A		74	110	nC
		V_{DS} = 15 V, V_{GS} = 4.5 V, I_D = 20 A		35.7	54	
Gate-Source Charge	Q_{gs}			16.8		
Gate-Drain Charge	Q_{gd}			10.7		
Gate Resistance	R_g	f = 1 MHz		1.5	2.3	Ω
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 15 V, R_L = 3 Ω I_D ≅ 5 A, V_{GEN} = 4.5 V, R_G = 1 Ω		76	115	ns
Rise Time	t_r			180	270	
Turn-Off Delay Time	$t_{d(off)}$			53	80	
Fall Time	t_f			50	75	
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 15 V, R_L = 3 Ω I_D ≅ 5 A, V_{GEN} = 10 V, R_G = 1 Ω		17	26	
Rise Time	t_r			24	36	
Turn-Off Delay Time	$t_{d(off)}$			46	70	
Fall Time	t_f			9	15	
Drain-Source Body Diode and Schottky Characteristics						
Continuous Source-Drain Diode Current	I_S	T_C = 25 °C			7	A
Pulse Diode Forward Current[a]	I_{SM}				70	
Body Diode Voltage	V_{SD}	I_S = 2 A		0.44	0.53	V
Body Diode Reverse Recovery Time	t_{rr}	I_F = 13 A, dI/dt = 100 A/µs, T_J = 25 °C		36	55	ns
Body Diode Reverse Recovery Charge	Q_{rr}			34	52	nC
Reverse Recovery Fall Time	t_a			19		ns
Reverse Recovery Rise Time	t_b			17		

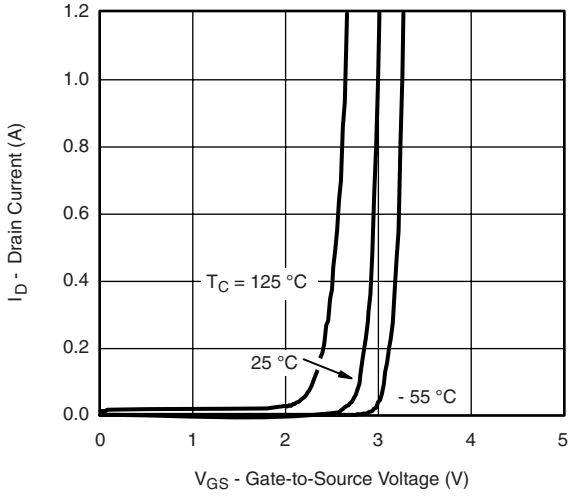
Notes:
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.

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.

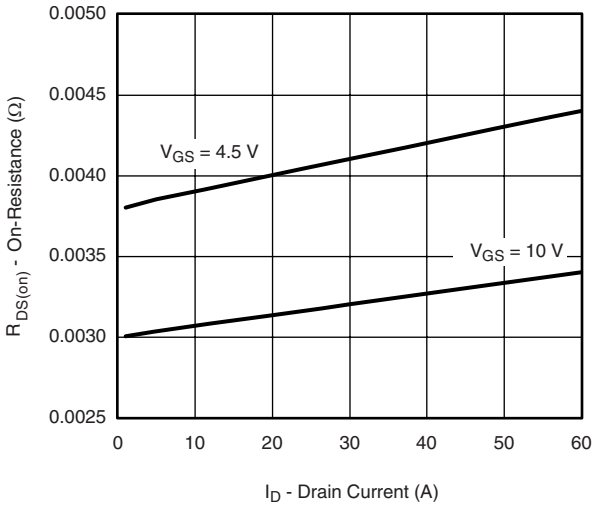
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



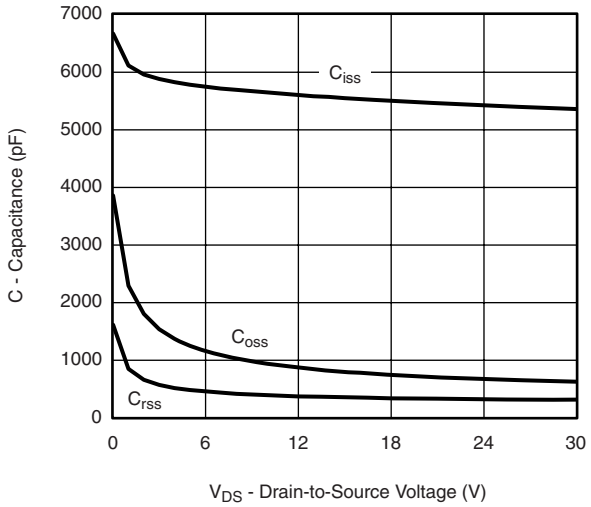
Output Characteristics



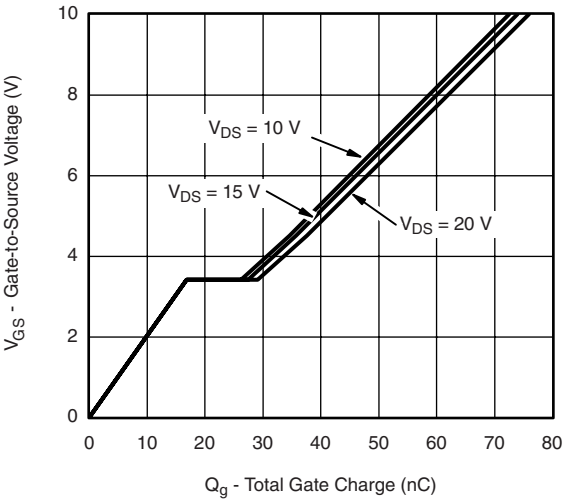
Transfer Characteristics



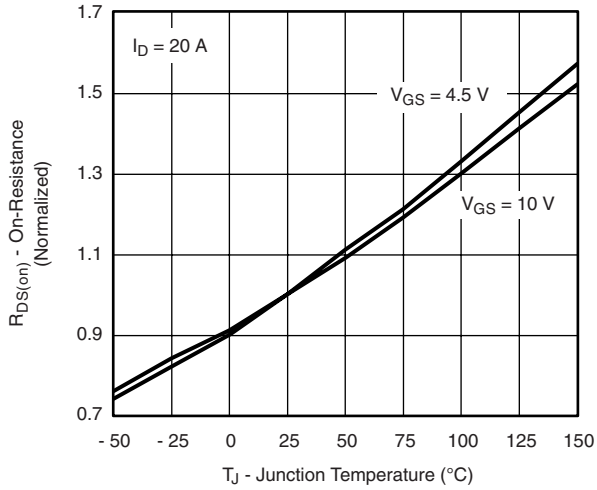
On-Resistance vs. Drain Current



Capacitance

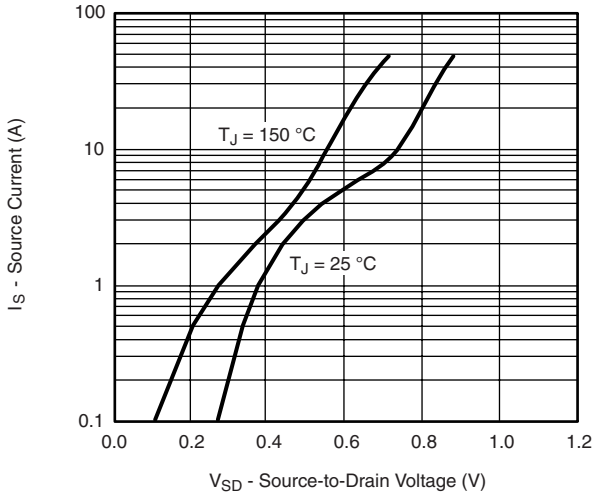


Gate Charge

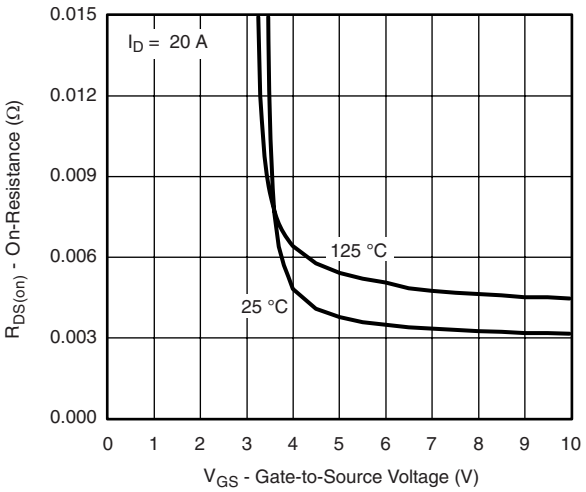


On-Resistance vs. Junction Temperature

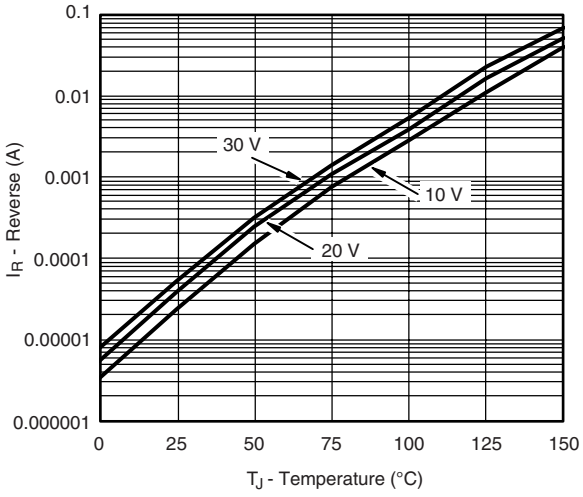
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



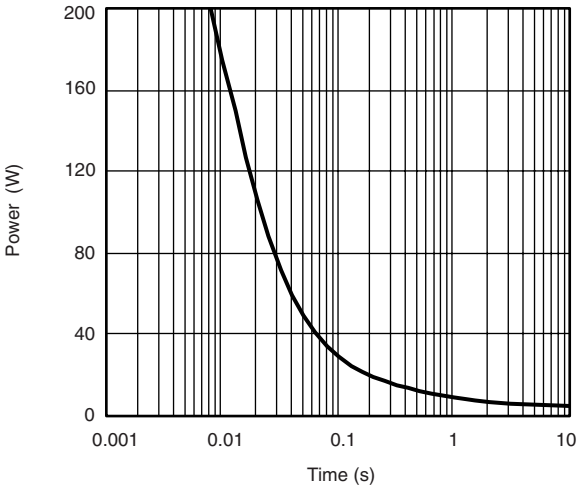
Source-Drain Diode Forward Voltage



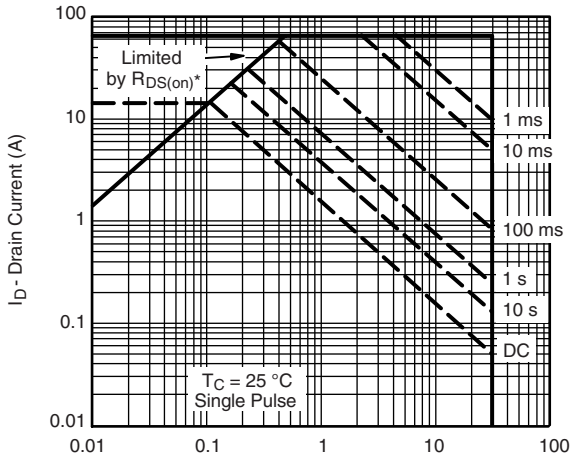
On-Resistance vs. Gate-to-Source Voltage



Reverse Current (Schottky)



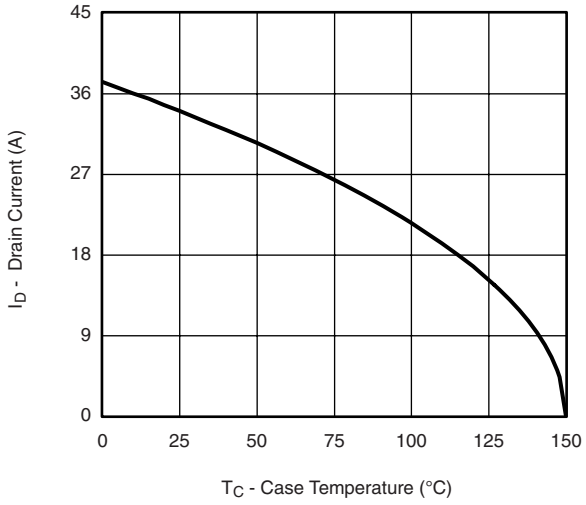
Single Pulse Power, Junction-to-Ambient



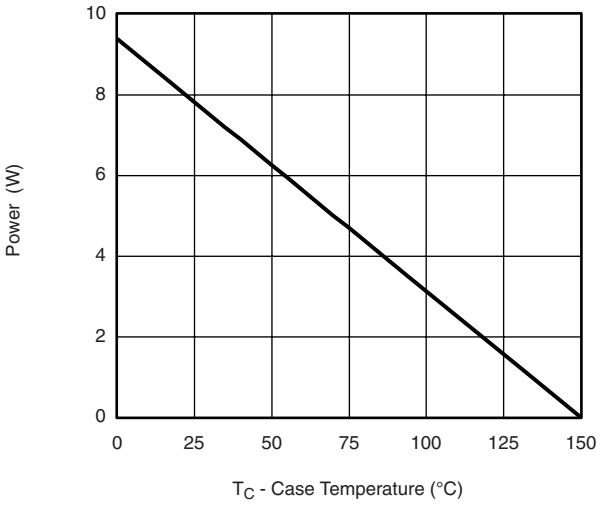
* V_{GS} > minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area

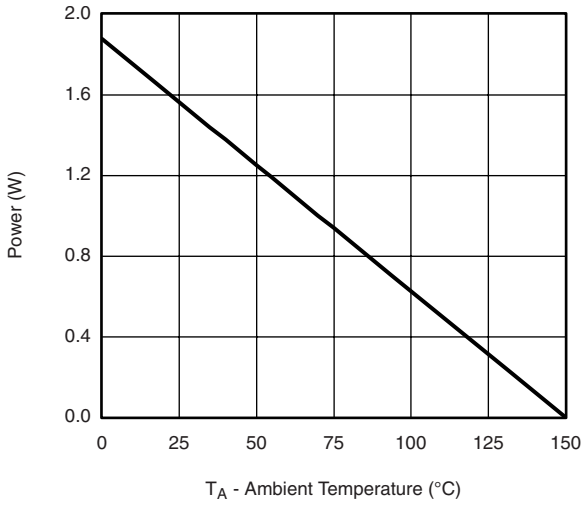
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



Current Derating*



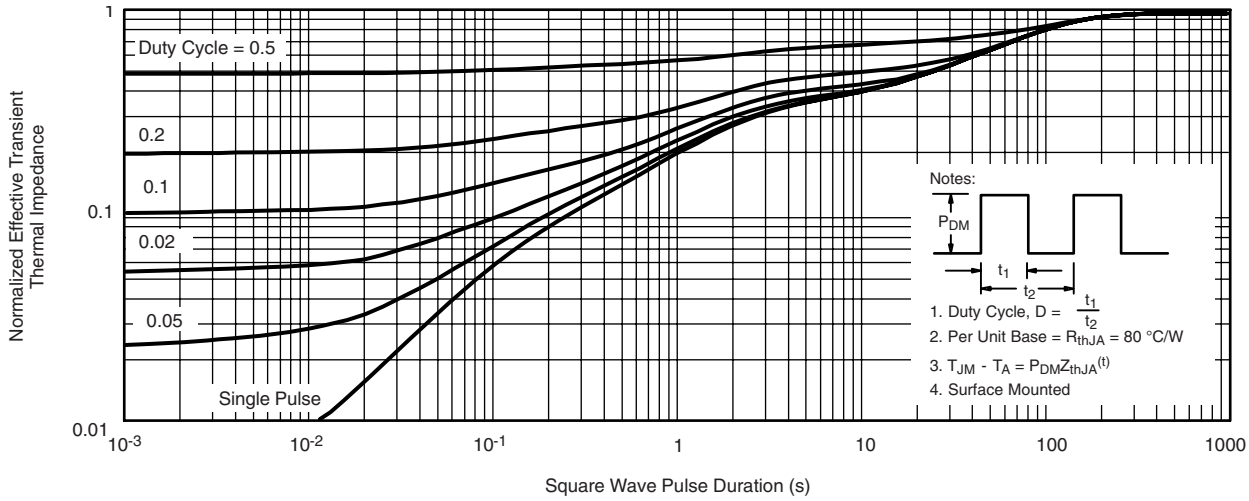
Power Derating, Junction-to-Foot



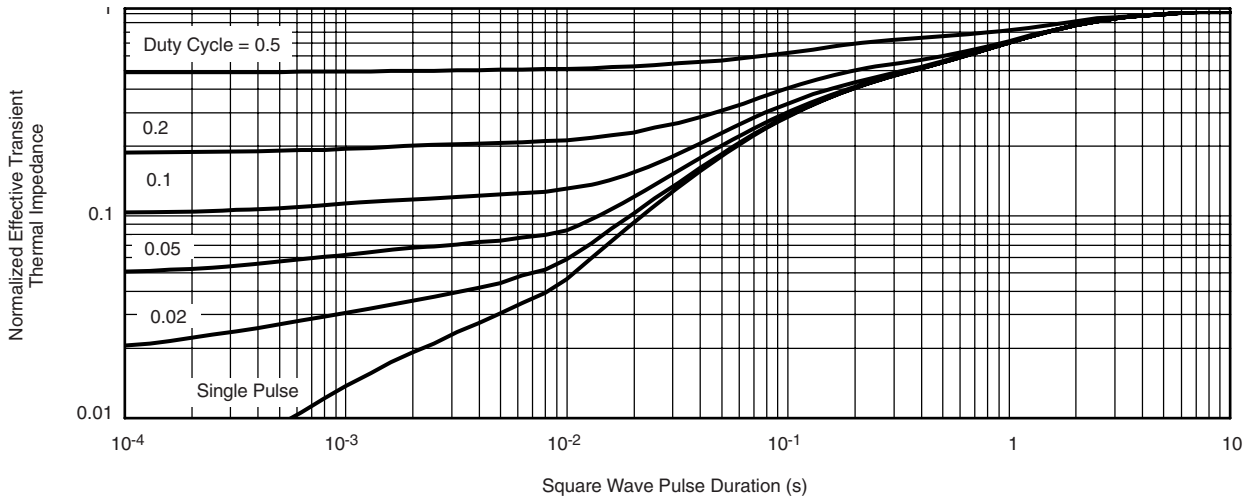
Power Derating, Junction-to-Ambient

* 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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