

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	0.0115 at $V_{GS} = 10$ V	16	13.3 nC
	0.016 at $V_{GS} = 4.5$ V	12.7	

SCHOTTKY AND BODY DIODE PRODUCT SUMMARY		
V_{DS} (V)	V_{SD} (V) Diode Forward Voltage	I_S (A)
30	0.4 at 2 A	5 ^a

FEATURES

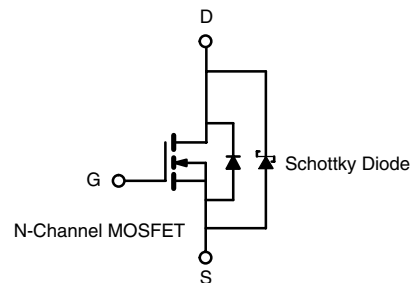
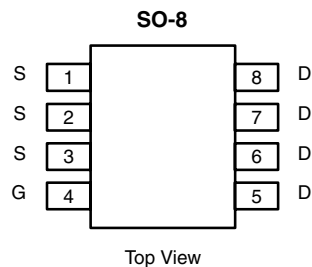
- TrenchFET[®] Power MOSFET
- 100 % R_g and UIS Tested

APPLICATIONS

- Notebook Logic DC/DC
- Low Side



RoHS
COMPLIANT



Ordering Information : Si4396DY-T1-E3 (Lead (Pb)-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	16	
		$T_C = 70$ °C	12.7	
		$T_A = 25$ °C	12.3 ^{b, c}	
		$T_A = 70$ °C	9.7 ^{b, c}	
Pulsed Drain Current	I_{DM}	40	A	
Continuous Source-Drain Diode Current	I_S	$T_C = 25$ °C		5
		$T_A = 25$ °C		2.8 ^{b, c}
Single Pulse Avalanche Current	I_{AS}	20		mJ
Single Pulse Avalanche Energy	E_{AS}	20		
Maximum Power Dissipation	P_D	$T_C = 25$ °C	5.4	
		$T_C = 70$ °C	3.4	
		$T_A = 25$ °C	3.1 ^{b, c}	
		$T_A = 70$ °C	2.0 ^{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}	$t \leq 10$ sec	R_{thJA}	34	40	°C/W
Maximum Junction-to-Foot (Drain)	Steady State	R_{thJF}	17	23	

Notes:

- a. Based on $T_C = 25$ °C.
- b. Surface Mounted on 1" x 1" FR4 Board.
- c. $t = 10$ sec.
- d. Maximum under Steady State conditions is 85 °C/W.

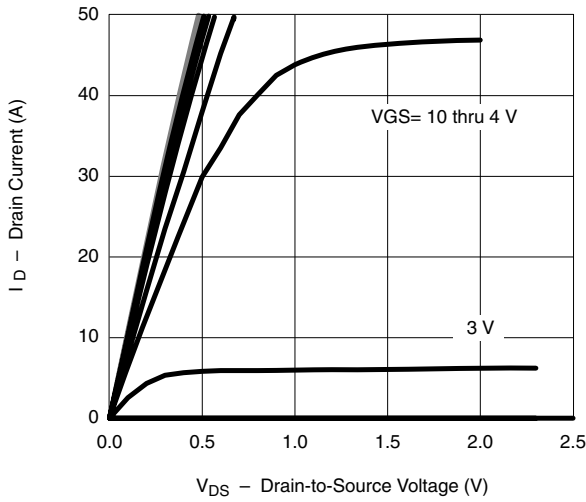
SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	30			V
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	1.2		2.6	V
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}	$V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}$		0.18	1	mA
		$V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}, T_J = 100\text{ }^\circ\text{C}$		22	100	
On -State Drain Current ^a	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}, V_{GS} = 10\text{ V}$	20			A
Drain-Source On-State Resistance ^a	$r_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 10\text{ A}$		0.0095	0.0115	Ω
		$V_{GS} = 4.5\text{ V}, I_D = 8\text{ A}$		0.0132	0.0160	
Forward Transconductance ^a	g_{fs}	$V_{DS} = 15\text{ V}, I_D = 10\text{ A}$		40		S
Dynamic^b						
Input Capacitance	C_{iss}	$V_{DS} = 15\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		1675		pF
Output Capacitance	C_{oss}			410		
Reverse Transfer Capacitance	C_{rss}			150		
Total Gate Charge	Q_g	$V_{DS} = 15\text{ V}, V_{GS} = 10\text{ V}, I_D = 10\text{ A}$		29.6	45	nC
				13.3	20	
Gate-Source Charge	Q_{gs}	$V_{DS} = 15\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 10\text{ A}$		4.5		
Gate-Drain Charge	Q_{gd}			4.3		
Gate Resistance	R_g	$f = 1\text{ MHz}$		1.55	2.4	Ω
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 15\text{ V}, R_L = 3\text{ }\Omega$ $I_D \cong 5\text{ A}, V_{GEN} = 4.5\text{ V}, R_G = 1\text{ }\Omega$		22	33	ns
Rise Time	t_r			71	110	
Turn-Off Delay Time	$t_{d(off)}$			22	33	
Fall Time	t_f			7	14	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 15\text{ V}, R_L = 3\text{ }\Omega$ $I_D \cong 5\text{ A}, V_{GEN} = 10\text{ V}, R_G = 1\text{ }\Omega$		11	18	
Rise Time	t_r			29	45	
Turn-Off Delay Time	$t_{d(off)}$			24	36	
Fall Time	t_f			8	15	
Drain-Source Body Diode and Schottky Characteristics						
Continuous Source-Drain Diode Current	I_S	$T_C = 25\text{ }^\circ\text{C}$			5	A
Pulse Diode Forward Current ^a	I_{SM}				40	
Body Diode Voltage	V_{SD}	$I_S = 2\text{ A}$		0.35	0.4	V
Body Diode Reverse Recovery Time	t_{rr}	$I_F = 4\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$		29	45	ns
Body Diode Reverse Recovery Charge	Q_{rr}			18	27	nC
Reverse Recovery Fall Time	t_a			14		ns
Reverse Recovery Rise Time	t_b			15		

Notes:

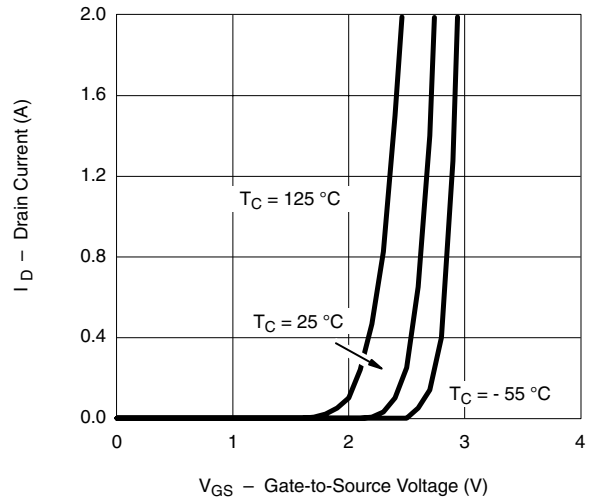
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$
b. Guaranteed by design, not subject to production testing.

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.

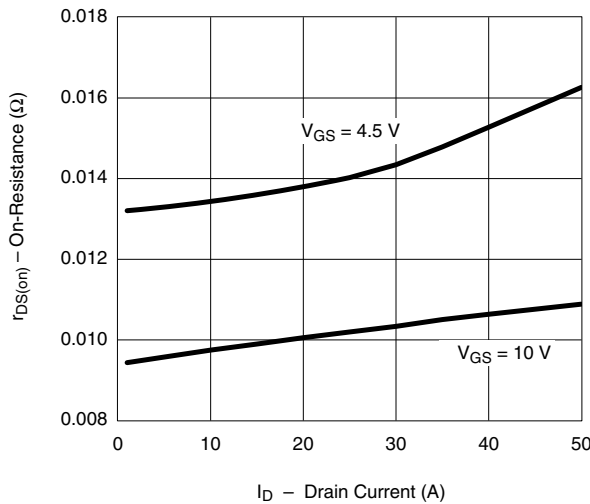
TYPICAL CHARACTERISTICS 25 °C, unless noted



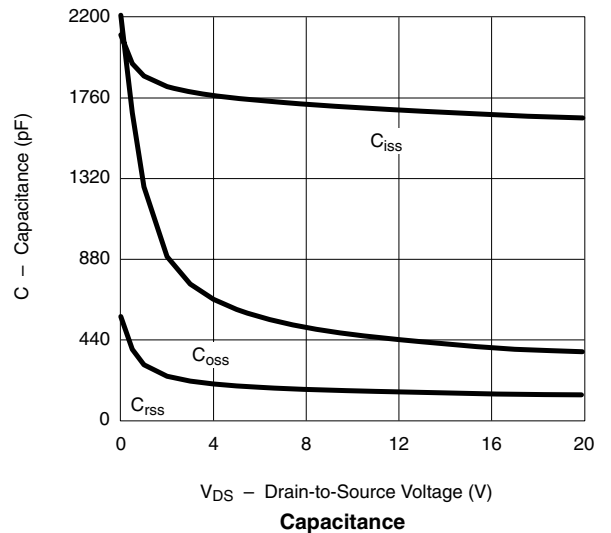
Output Characteristics



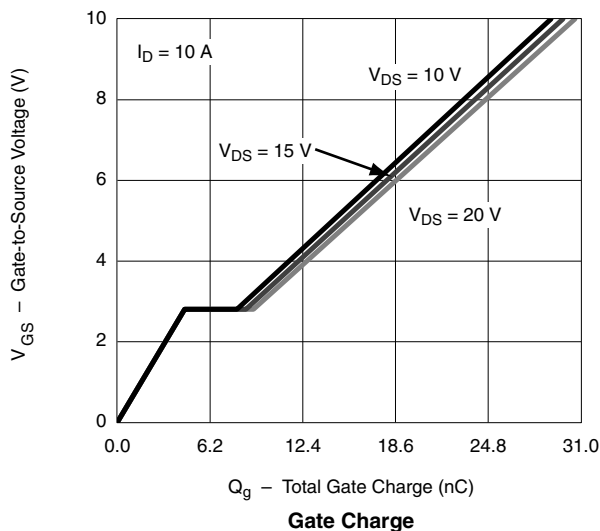
Transfer Characteristics



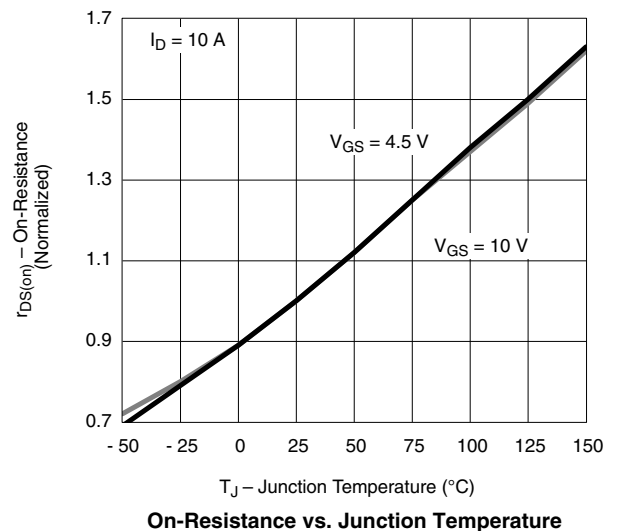
On-Resistance vs. Drain Current



Capacitance

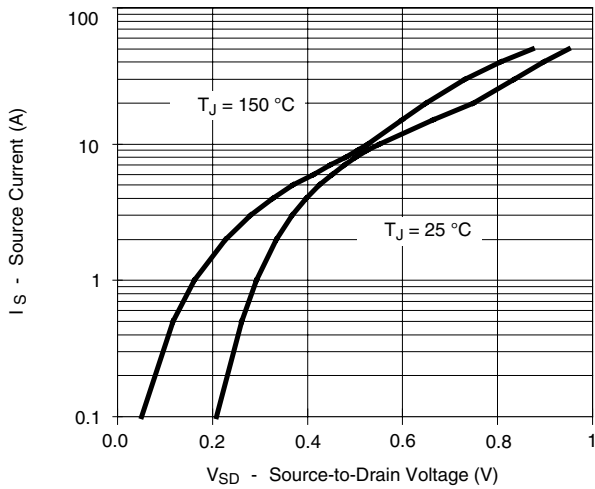


Gate Charge

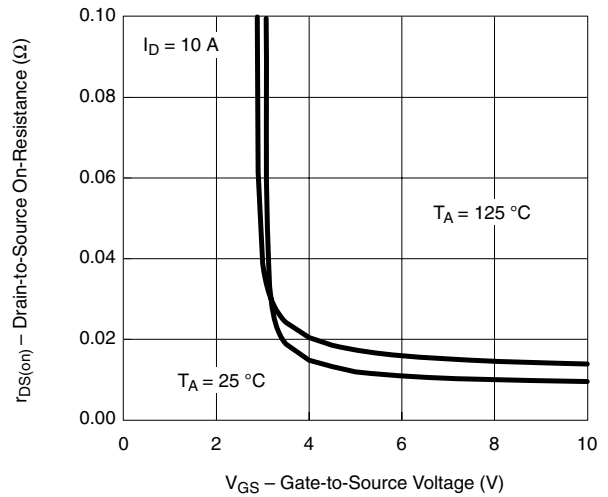


On-Resistance vs. Junction Temperature

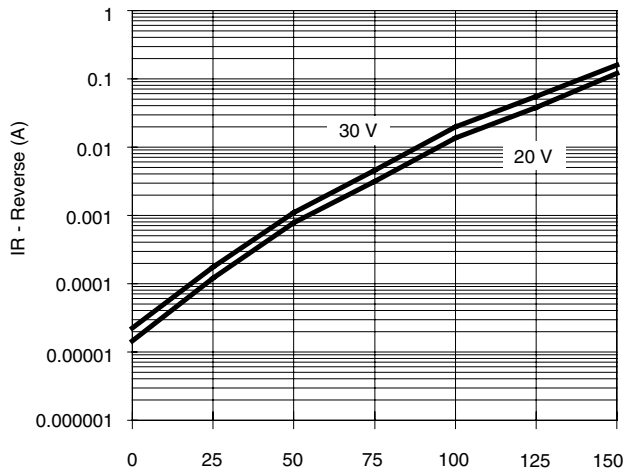
TYPICAL CHARACTERISTICS 25 °C, unless noted



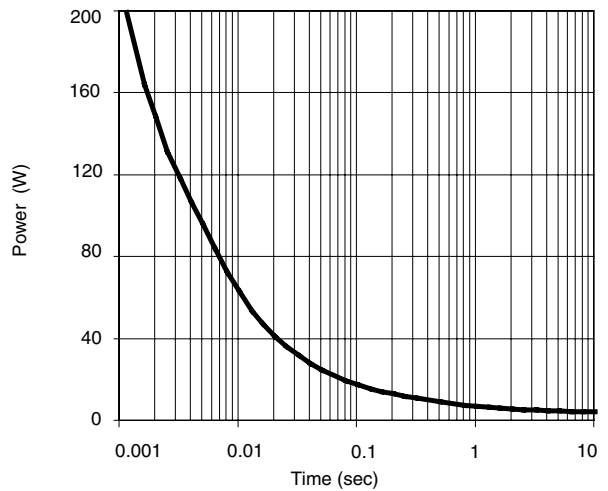
Source-Drain Diode Forward Voltage



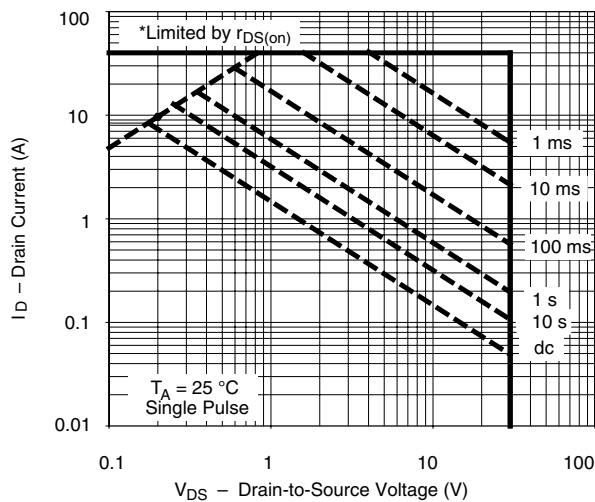
On-Resistance vs. Gate-to-Source Voltage



Reverse Current (Schottky)



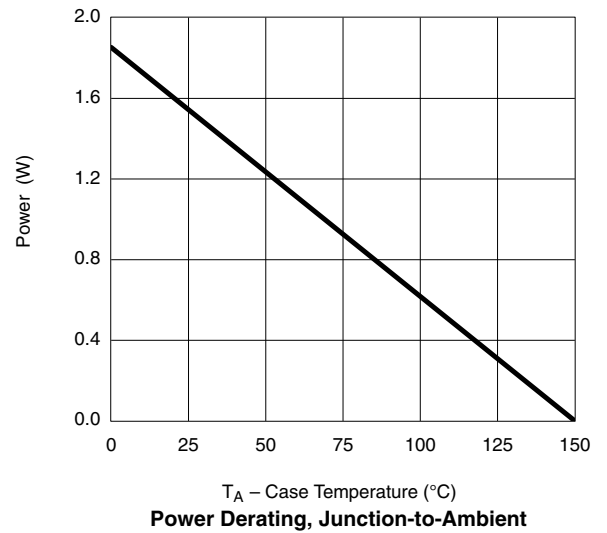
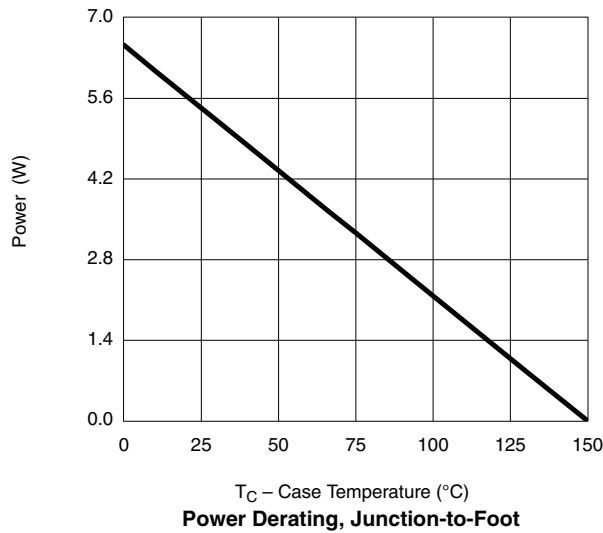
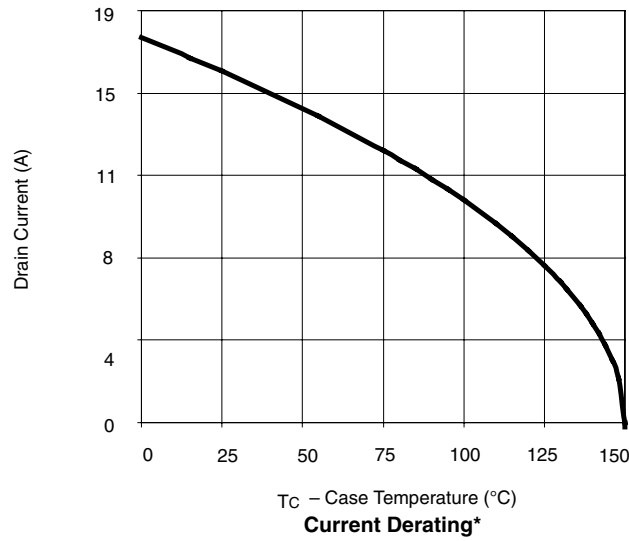
Junction-to-Ambient



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

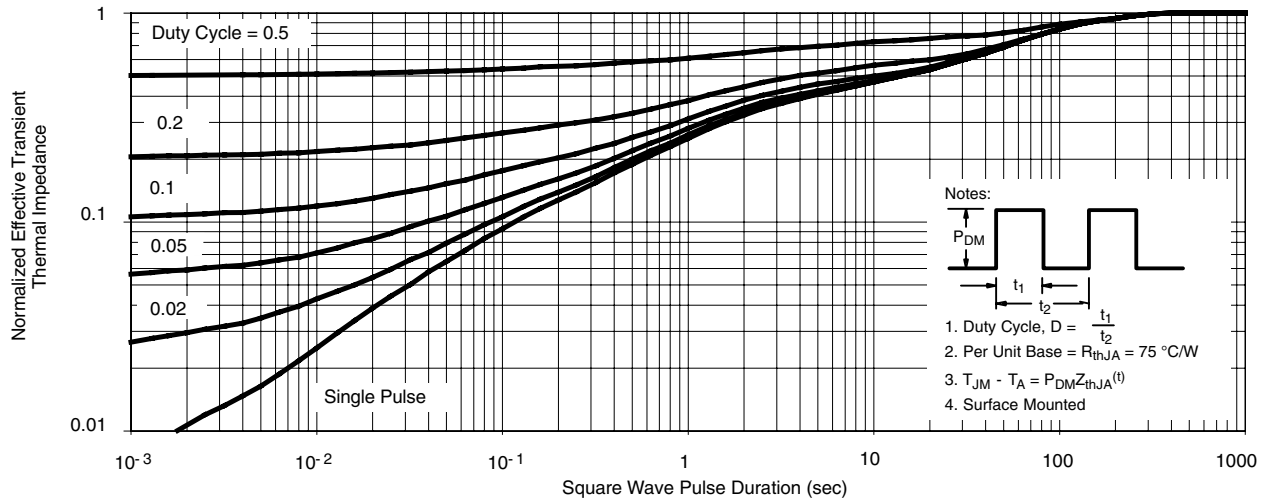
Safe Operating Area

TYPICAL CHARACTERISTICS 25 °C, unless noted

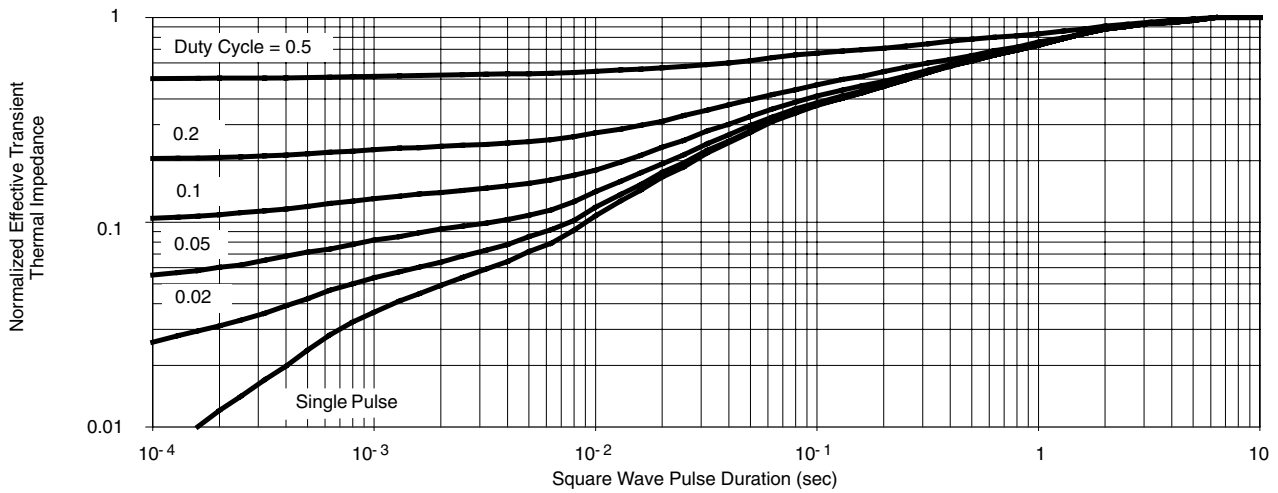


* The power dissipation P_D is based on $T_{J(max)} = 150$ °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

TYPICAL CHARACTERISTICS 25 °C, unless noted



Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Case

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