



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

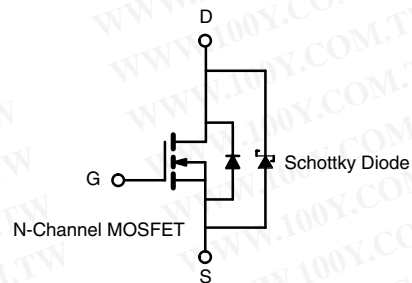
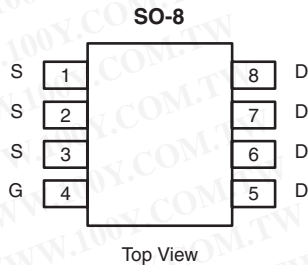
- Halogen-free According to IEC 61249-2-21 Available
- TrenchFET[®] Power MOSFET
- 100 % R_g and UIS Tested

APPLICATIONS

- Notebook Logic DC/DC
- Low Side



RoHS
 COMPLIANT
 HALOGEN
FREE
 Available



Ordering Information: Si4396DY-T1-E3 (Lead (Pb)-free)
 Si4396DY-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	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	
		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}	R _{thJA}	34	40	°C/W
Maximum Junction-to-Foot (Drain)	R _{thJF}	17	23	

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}	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	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	$t_{d(on)}$	$V_{DD} = 15\text{ V}, R_L = 3\text{ }\Omega$ $I_D \equiv 5\text{ A}, V_{GEN} = 4.5\text{ V}, R_g = 1\text{ }\Omega$		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	$t_{d(on)}$		$V_{DD} = 15\text{ V}, R_L = 3\text{ }\Omega$ $I_D \equiv 5\text{ A}, V_{GEN} = 10\text{ V}, R_g = 1\text{ }\Omega$		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			

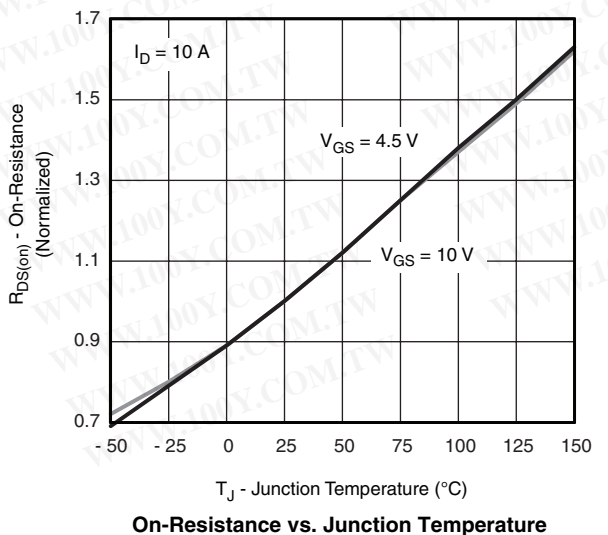
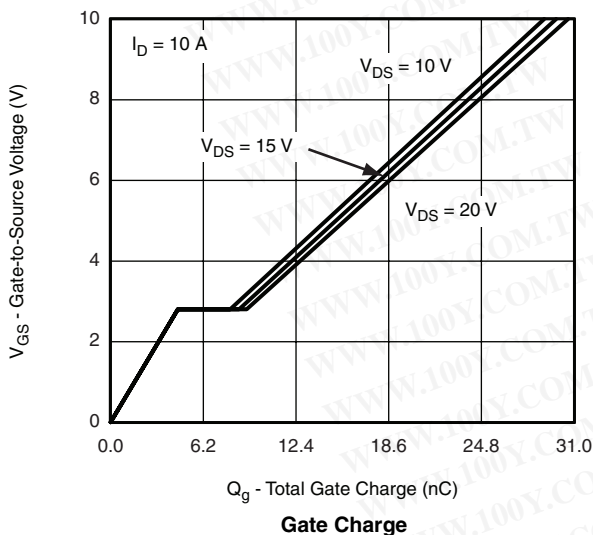
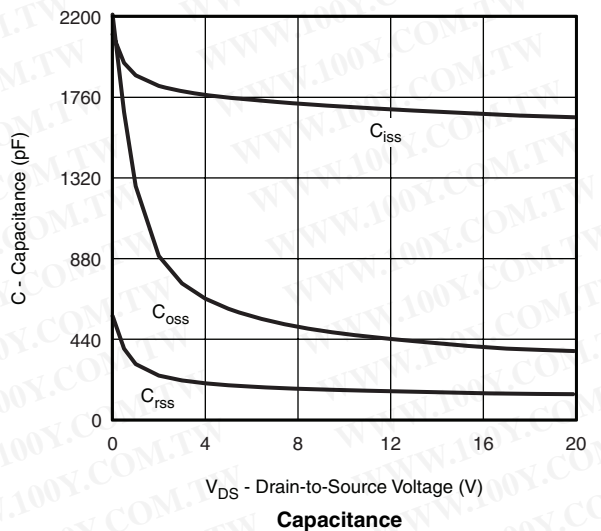
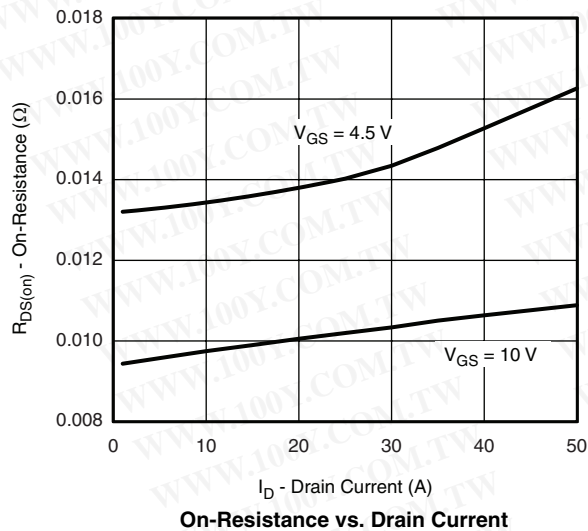
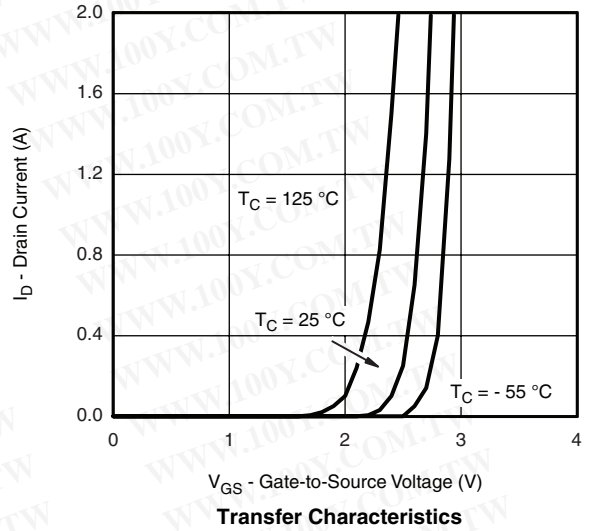
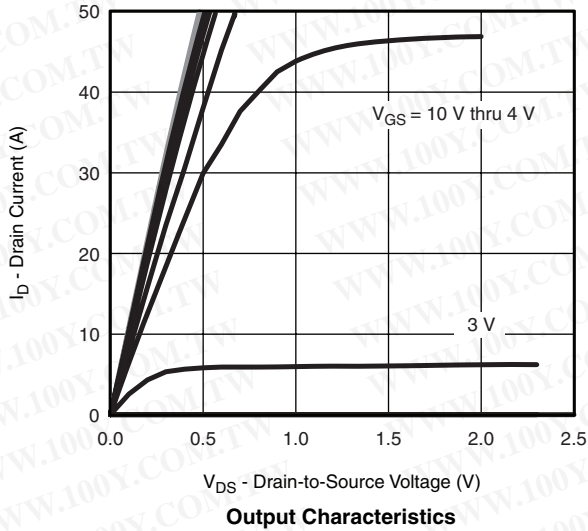
Notes:

- 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 otherwise noted



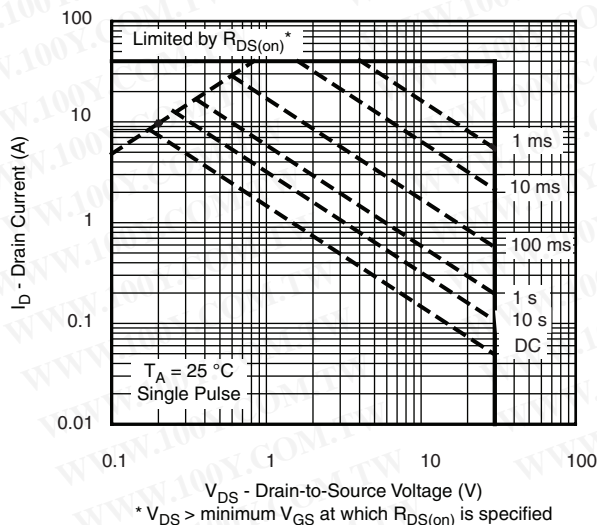
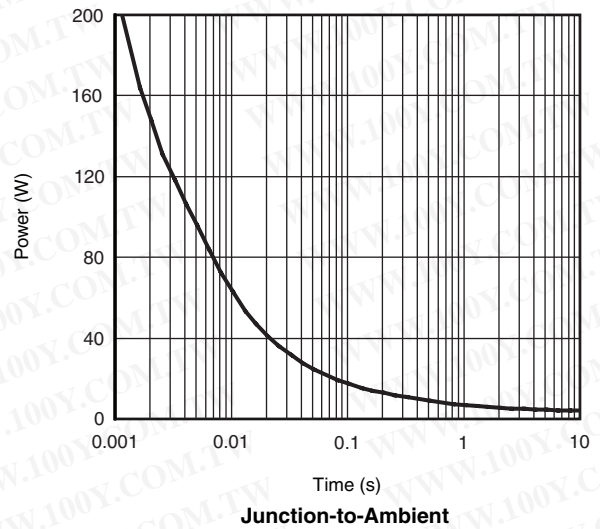
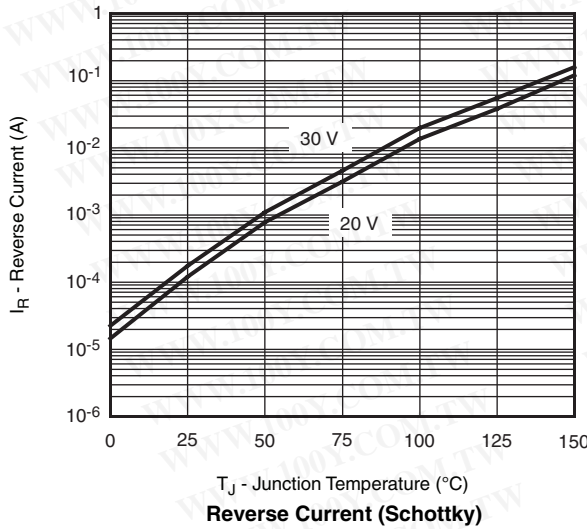
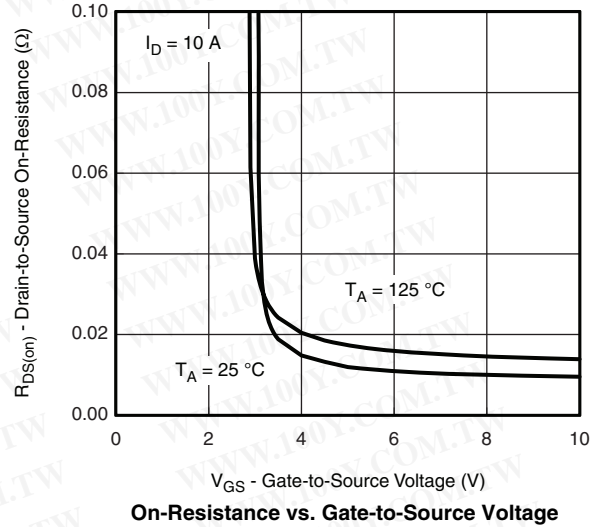
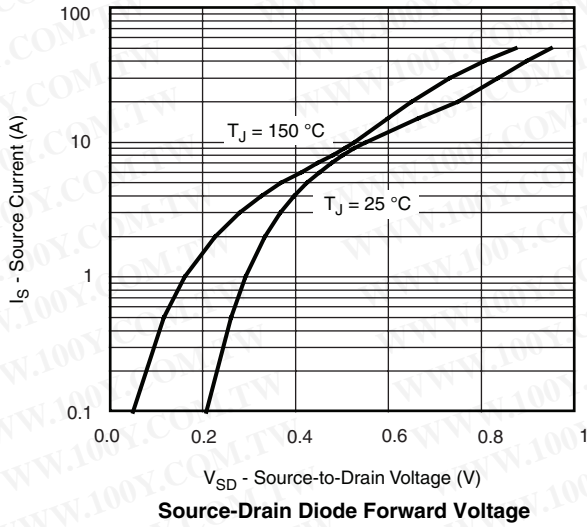
Si4396DY

Vishay Siliconix

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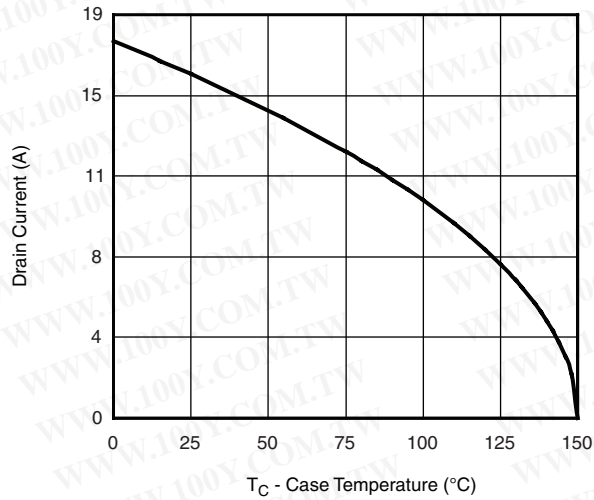
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



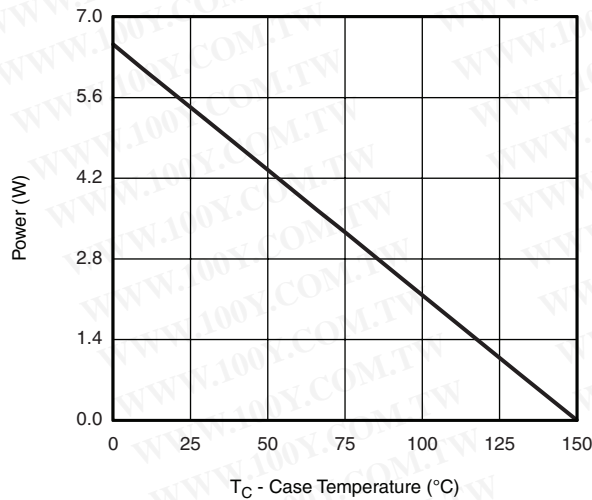
* $V_{DS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area

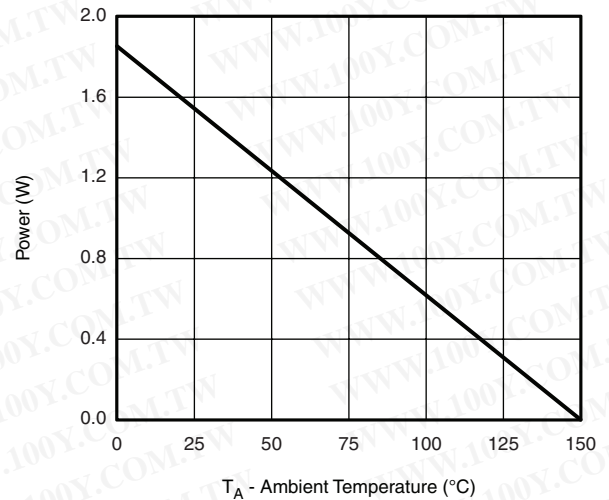
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Current Derating*



Power Derating, Junction-to-Foot

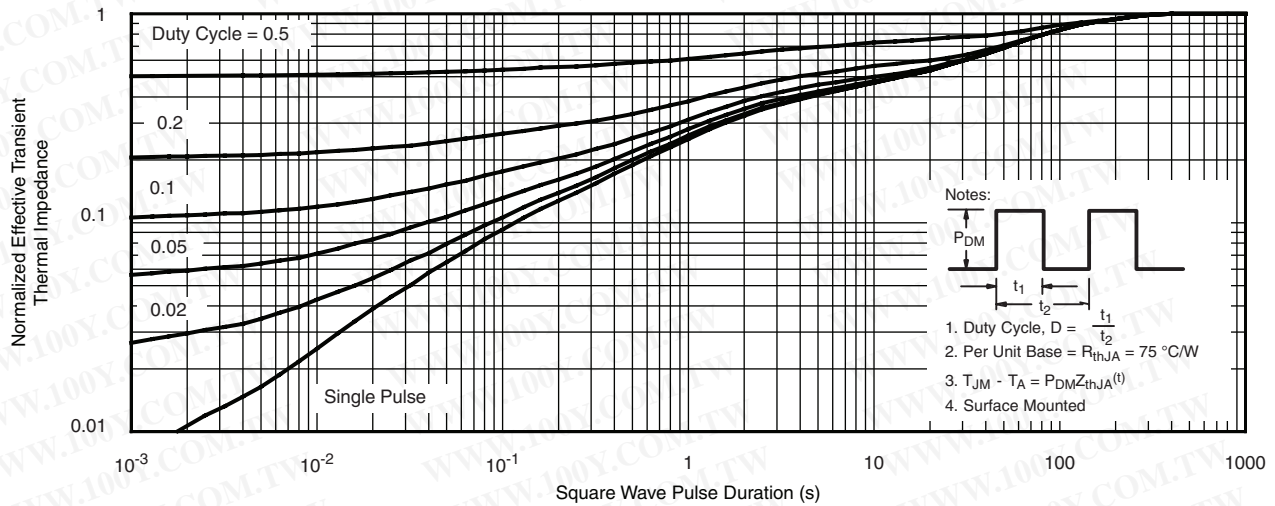


Power Derating, Junction-to-Ambient

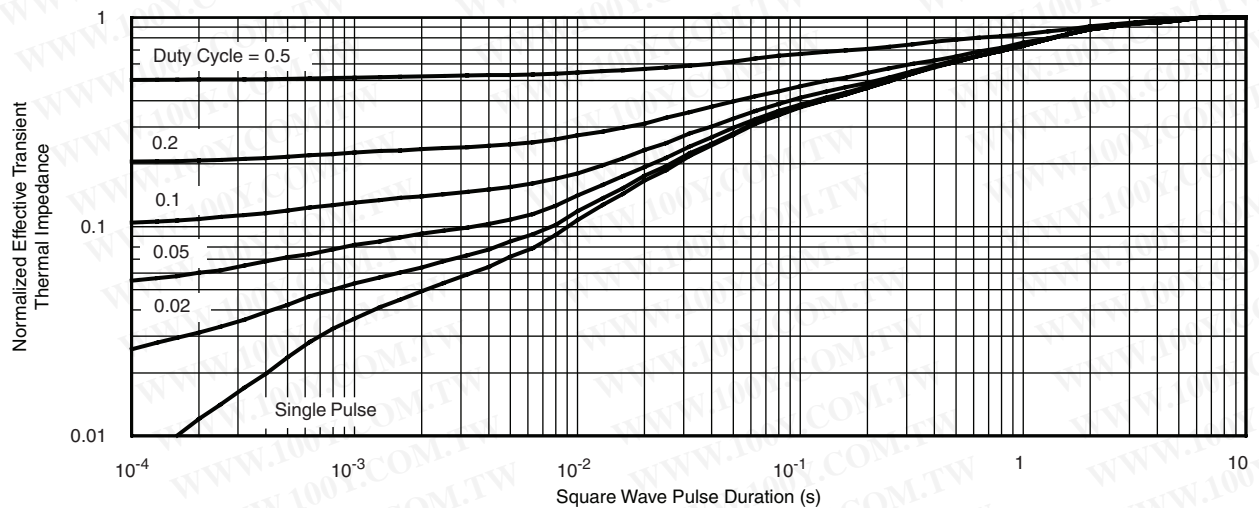
* The power dissipation P_D is based on $T_{J(max)} = 150\text{ °C}$, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package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

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TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Case

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