

P-Channel 150-V (D-S) MOSFET

PRODUCT SUMMARY			
V _{DS} (V)	R _{DS(on)} (Ω)	I _D (A) ^a	Q _g (Typ.)
- 150	1.2 at V _{GS} = - 10 V	- 1.3	4.8 nC
	1.3 at V _{GS} = - 6 V	- 1.2	

FEATURES

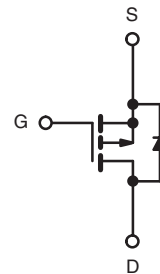
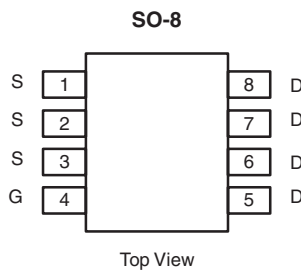
- Halogen-free According to IEC 61249-2-21 Definition
- TrenchFET[®] Power MOSFET
- 100 % UIS Tested



RoHS
COMPLIANT
HALOGEN
FREE
Available

APPLICATIONS

- Active Clamp Switch
- Isolated DC/DC Converters



Ordering Information: Si4409DY-T1-E3 (Lead (Pb)-free)
Si4409DY-T1-GE3 (Lead (Pb)-free and Halogen-free)

P-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS T _A = 25 °C, unless otherwise noted				
Parameter	Symbol	Limit	Unit	
Drain-Source Voltage	V _{DS}	- 150	V	
Gate-Source Voltage	V _{GS}	± 20		
Continuous Drain Current (T _J = 150 °C)	I _D	T _C = 25 °C	- 1.3	A
		T _C = 70 °C	- 1.0	
		T _A = 25 °C	- 0.9 ^{b, c}	
		T _A = 70 °C	- 0.7 ^{b, c}	
Pulsed Drain Current	I _{DM}	- 2		
Continuous Source-Drain Diode Current	I _S	T _C = 25 °C	- 1.3	A
		T _A = 25 °C	- 0.9 ^{b, c}	
Avalanche Current	I _{AS}	4		
Single-Pulse Avalanche Energy	E _{AS}	0.8	mJ	
Maximum Power Dissipation	P _D	T _C = 25 °C	4.6	W
		T _C = 70 °C	2.9	
		T _A = 25 °C	2.2 ^{b, c}	
		T _A = 70 °C	1.4 ^{b, c}	
Operating Junction and Storage Temperature Range	T _J , T _{stg}	- 55 to 150	°C	

THERMAL RESISTANCE RATINGS					
Parameter	Symbol	Typical	Maximum	Unit	
Maximum Junction-to-Ambient ^{b, d}	R _{thJA}	47	55	°C/W	
Maximum Junction-to-Foot	R _{thJF}	22	27		

Notes:

- T_C = 25 °C.
- Surface Mounted on 1" x 1" FR4 board.
- t = 5 s.
- Maximum under Steady State conditions is 95 °C/W.

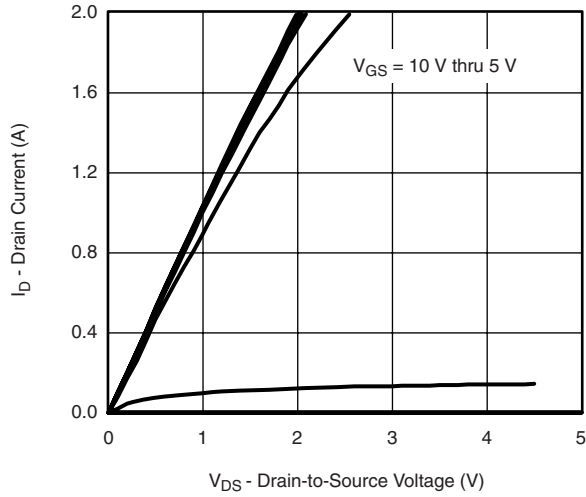
SPECIFICATIONS $T_J = 25^\circ\text{C}$, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}, I_D = -250\ \mu\text{A}$	- 150			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = -250\ \mu\text{A}$		- 160		mV/ $^\circ\text{C}$
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			5.5		
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\ \mu\text{A}$	- 2		- 4	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}	$V_{DS} = -150\text{ V}, V_{GS} = 0\text{ V}$			- 1	μA
		$V_{DS} = -150\text{ V}, V_{GS} = 0\text{ V}, T_J = 55^\circ\text{C}$			- 10	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \geq -10\text{ V}, V_{GS} = -10\text{ V}$	- 2			A
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = -10\text{ V}, I_D = -0.5\text{ A}$		0.95	1.2	Ω
		$V_{GS} = -6\text{ V}, I_D = -0.5\text{ A}$		1.0	1.3	
Forward Transconductance ^a	g_{fs}	$V_{DS} = -10\text{ V}, I_D = -0.5\text{ A}$		2.2		S
Dynamic^b						
Input Capacitance	C_{iss}	$V_{DS} = -50\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		332		pF
Output Capacitance	C_{oss}			25		
Reverse Transfer Capacitance	C_{rss}			13		
Total Gate Charge	Q_g	$V_{DS} = -75\text{ V}, V_{GS} = -10\text{ V}, I_D = -0.5\text{ A}$		7.7	12	nC
Gate-Source Charge	Q_{gs}	$V_{DS} = -75\text{ V}, V_{GS} = -6\text{ V}, I_D = -0.5\text{ A}$		4.8	7.5	
Gate-Drain Charge	Q_{gd}			1.5		
Gate Resistance	R_g		$f = 1\text{ MHz}$		2.5	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -75\text{ V}, R_L = 75\ \Omega$ $I_D \cong -1\text{ A}, V_{GEN} = -10\text{ V}, R_g = 6\ \Omega$		9		ns
Rise Time	t_r			7	14	
Turn-Off Delay Time	$t_{d(off)}$			10	20	
Fall Time	t_f			16	30	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -75\text{ V}, R_L = 75\ \Omega$ $I_D \cong -1\text{ A}, V_{GEN} = -6\text{ V}, R_g = 1\ \Omega$		9	18	
Rise Time	t_r			7	14	
Turn-Off Delay Time	$t_{d(off)}$			10	20	
Fall Time	t_f			13	25	
				10	20	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	$T_C = 25^\circ\text{C}$			- 1.3	A
Pulse Diode Forward Current	I_{SM}				- 2.0	
Body Diode Voltage	V_{SD}	$I_S = -1\text{ A}, V_{GS} = 0\text{ V}$		- 0.7	- 1.2	V
Body Diode Reverse Recovery Time	t_{rr}	$I_F = -1.2\text{ A}, dI/dt = 100\text{ A}/\mu\text{s}, T_J = 25^\circ\text{C}$		43	70	ns
Body Diode Reverse Recovery Charge	Q_{rr}			95	150	nC
Reverse Recovery Fall Time	t_a			40		ns
Reverse Recovery Rise Time	t_b			3		

Notes:

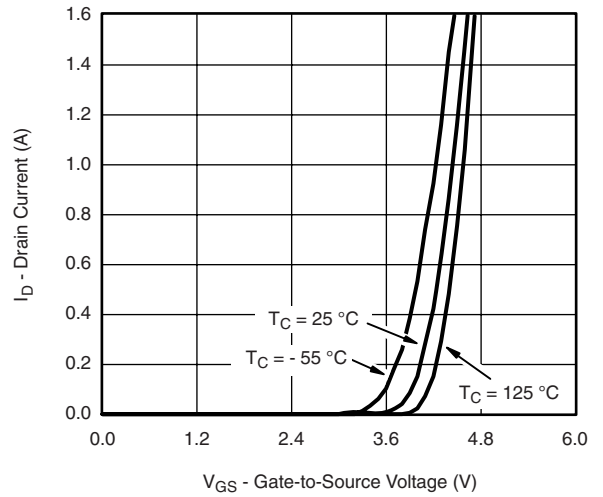
- a. Pulse test; pulse width $\leq 300\ \mu\text{s}$, duty cycle $\leq 2\%$.
b. Guaranteed by design, not subject to production testing.

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.

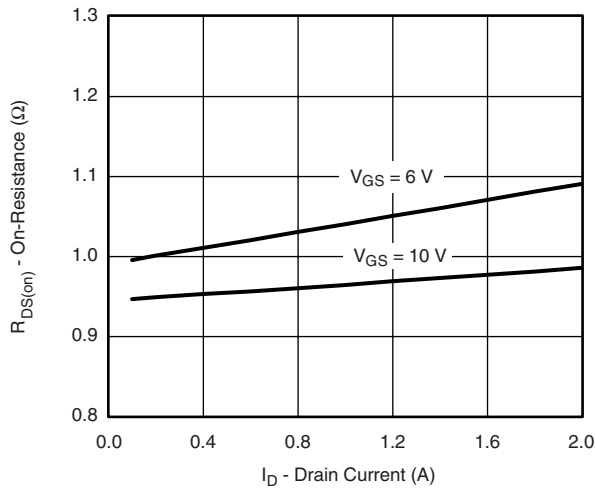
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



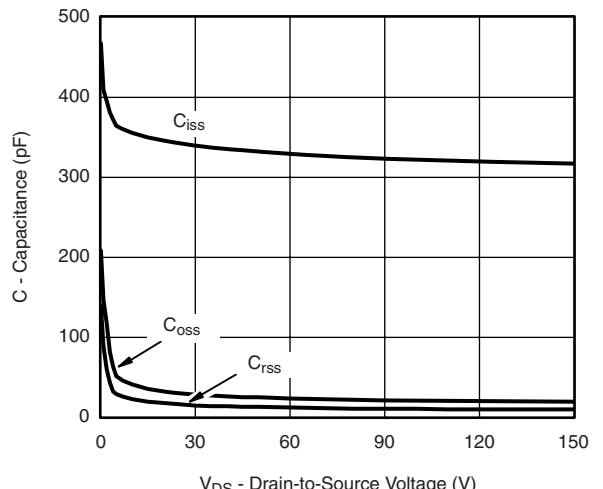
Output Characteristics



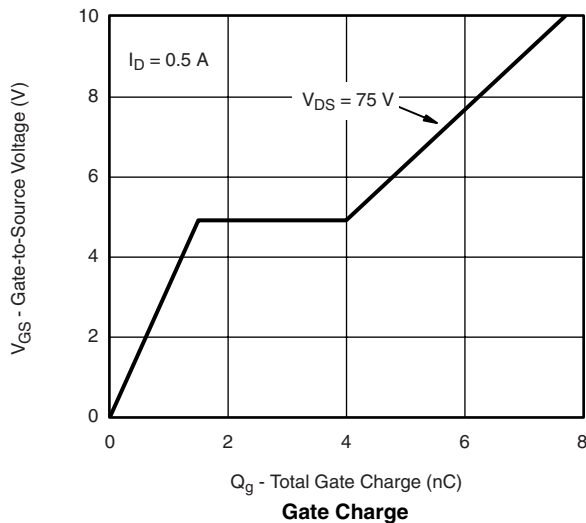
Transfer Characteristics



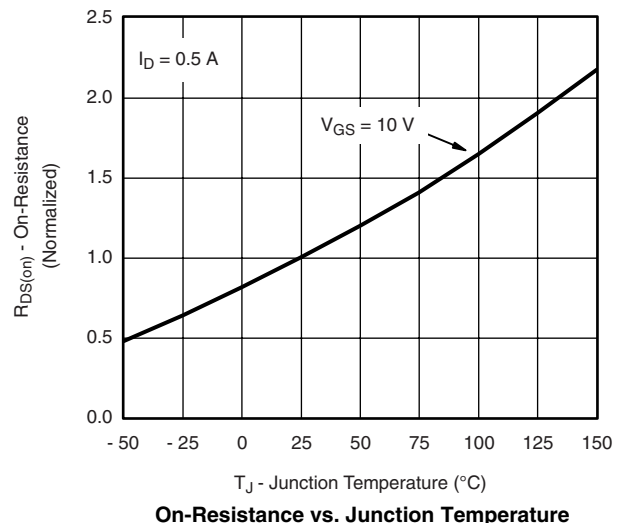
On-Resistance vs. Drain Current and Gate Voltage



Capacitance

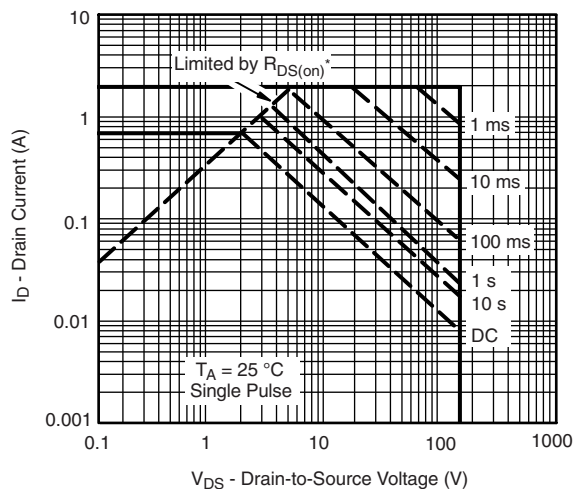
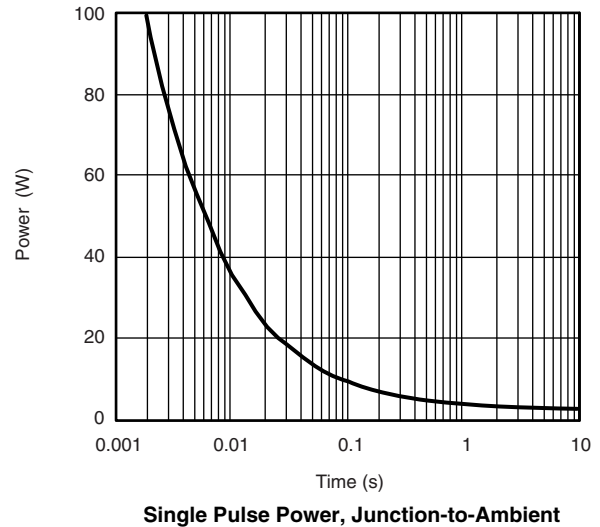
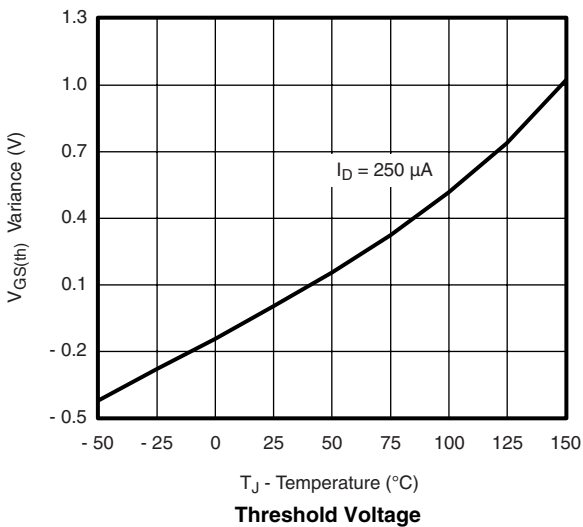
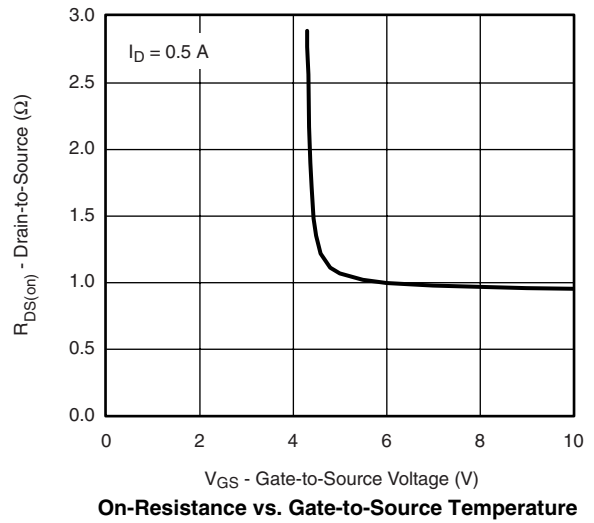
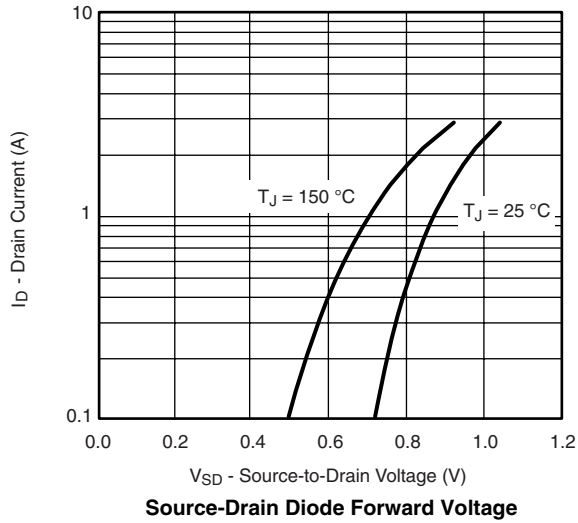


Gate Charge



On-Resistance vs. Junction Temperature

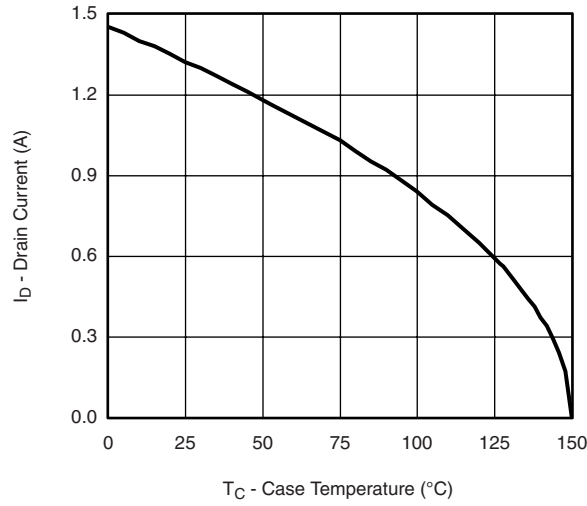
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



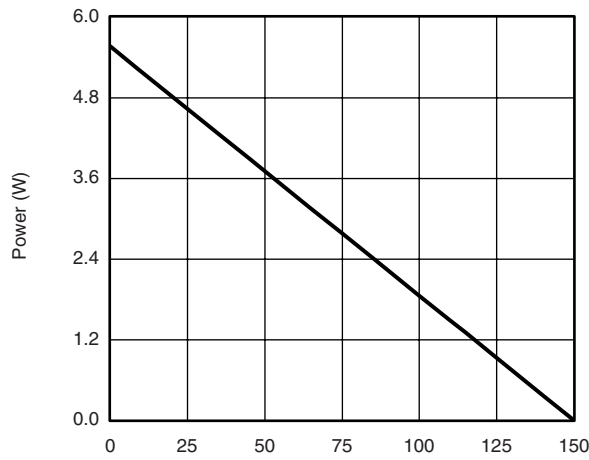
* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Ambient

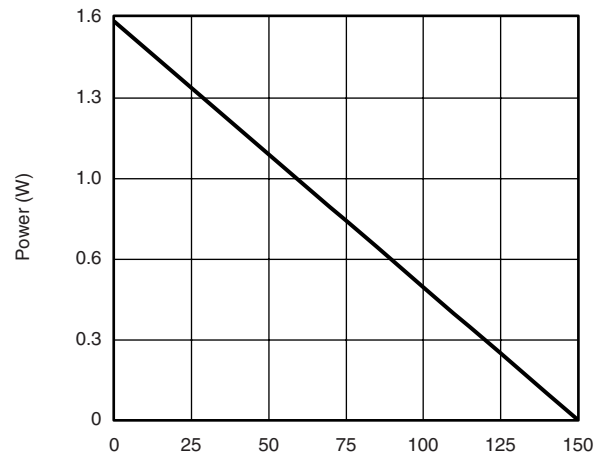
MOSFET TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



Current Derating*



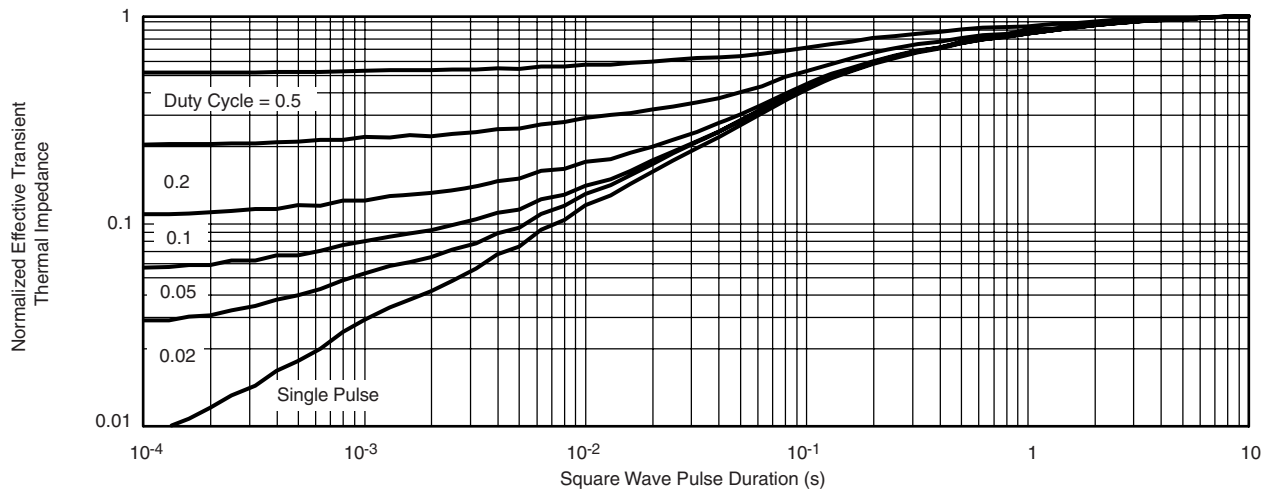
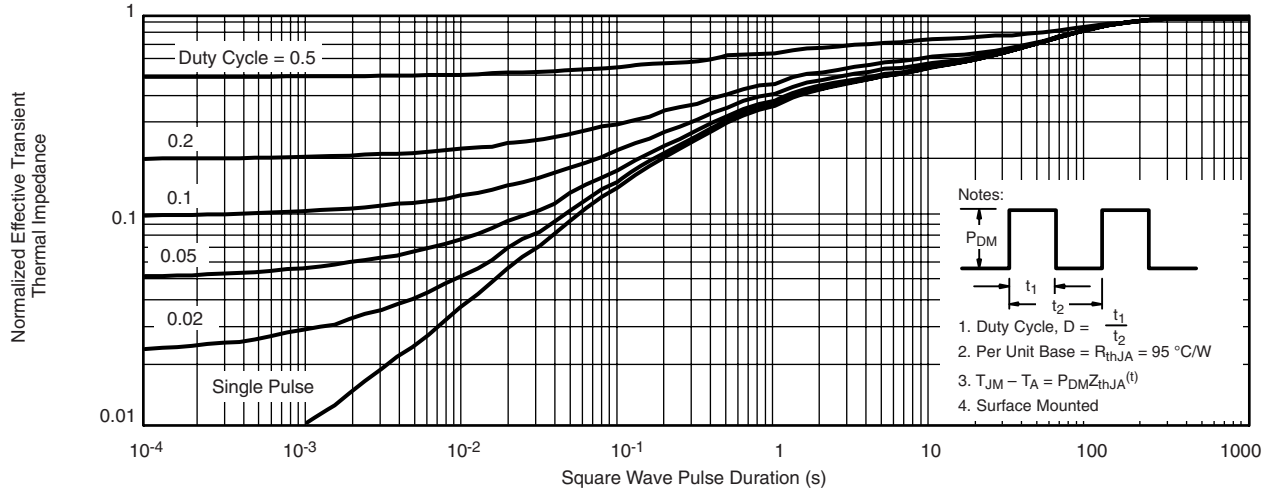
Power, Junction-to-Foot



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



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