Si1401EDH

Vishay Siliconix

P-Channel 12 V (D-S) MOSFET

PRODUCT SUMMARY			
V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)[a]	Q_g (Typ.)
- 12	0.034 at V_{GS} = - 4.5 V	- 4	14.1 nC
	0.046 at V_{GS} = - 2.5 V	- 4	
	0.070 at V_{GS} = - 1.8 V	- 4	
	0.110 at V_{GS} = - 1.5 V	- 4	

FEATURES

- **Halogen-free According to IEC 61249-2-21 Definition**
- TrenchFET® Power MOSFET
- Typical ESD Performance 1500 V
- 100 % R_g Tested
- Compliant to RoHS Directive 2002/95/EC

Pb-free

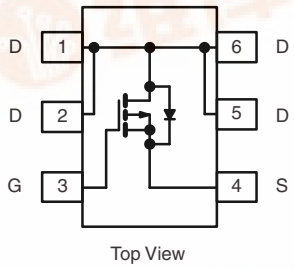
RoHS COMPLIANT

HALOGEN FREE

APPLICATIONS

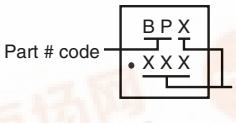
- Load Switch, PA Switch and Battery Switch for Portable Devices
  - Cellular Phone
  - DSC
  - Portable Game Console
  - MP3
  - GPS

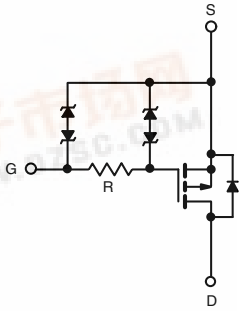
SOT-363
SC-70 (6-LEADS)



Top View

Marking Code





P-Channel MOSFET

Ordering Information: Si1401EDH-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}	- 12	V
Gate-Source Voltage		V_{GS}	± 10	
Continuous Drain Current (T_J = 150 °C)	T_C = 25 °C	I_D	- 4[a]	A
	T_C = 70 °C		- 4[a]	
	T_A = 25 °C		- 4[a, b, c]	
	T_A = 70 °C		- 4[a, b, c]	
Pulsed Drain Current		I_{DM}	- 25	
Continuous Source-Drain Diode Current	T_C = 25 °C	I_S	- 2.3	
	T_A = 25 °C		- 1.3[b, c]	
Maximum Power Dissipation	T_C = 25 °C	P_D	2.8	W
	T_C = 70 °C		1.8	
	T_A = 25 °C		1.6[b, c]	
	T_A = 70 °C		1.0[b, c]	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	- 55 to 150	°C
Soldering Recommendations (Peak Temperature)			260	

THERMAL RESISTANCE RATINGS					
Parameter		**Symbol**	**Typical**	**Maximum**	**Unit**
Maximum Junction-to-Ambient[b, d]	t ≤ 5 s	R_{thJA}	60	80	°C/W
Maximum Junction-to-Foot (Drain)	Steady State	R_{thJF}	34	45	

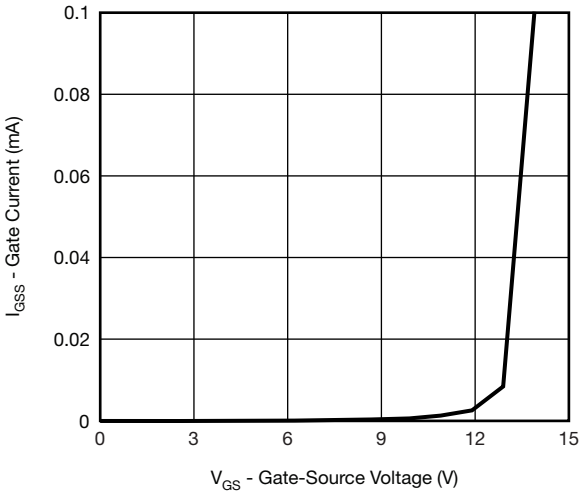
Notes:
a. Package limited.
b. Surface mounted on 1" x 1" FR4 board.
c. t = 5 s.
d. Maximum under steady state conditions is 125 °C/W.

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 = - 250 µA	- 12			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	I_D = - 250 µA		- 5.2		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			2.5		
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = - 250 µA	- 0.4		- 1	V
Gate-Source Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 8 V			± 5	µA
		V_{DS} = 0 V, V_{GS} = ± 4.5 V			± 1	
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = - 12 V, V_{GS} = 0 V			- 1	
		V_{DS} = - 12 V, V_{GS} = 0 V, T_J = 55 °C			- 10	
On-State Drain Current[a]	$I_{D(on)}$	$V_{DS} \leq$ - 5 V, V_{GS} = - 10 V	- 15			A
Drain-Source On-State Resistance[a]	$R_{DS(on)}$	V_{GS} = - 4.5 V, I_D = - 5.5 A		0.028	0.034	Ω
		V_{GS} = - 2.5 V, I_D = - 4.8 A		0.038	0.046	
		V_{GS} = - 1.8 V, I_D = - 1.4 A		0.053	0.070	
		V_{GS} = - 1.5 V, I_D = - 0.9 A		0.072	0.110	
Forward Transconductance[a]	g_{fs}	V_{DS} = - 6 V, I_D = - 5.5 A		16		S
Dynamic[b]						
Total Gate Charge	Q_g	V_{DS} = - 6 V, V_{GS} = - 8 V, I_D = - 5.5 A		24	36	nC
Gate-Source Charge		V_{DS} = - 6 V, V_{GS} = - 4.5 V, I_D = - 5.5 A		14.1	22	
	Q_{gs}			1.9		
Gate-Drain Charge	Q_{gd}			4		
Gate Resistance	R_g	f = 1 MHz	0.08	0.42	0.84	kΩ
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = - 6 V, R_L = 1.4 Ω $I_D \cong$ - 4.4 A, V_{GEN} = - 4.5 V, R_g = 1 Ω		160	240	ns
Rise Time	t_r			420	630	
Turn-Off Delay Time	$t_{d(off)}$			1325	1990	
Fall Time	t_f			985	1480	
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = - 6 V, R_L = 1.4 Ω $I_D \cong$ - 4.4 A, V_{GEN} = - 8 V, R_g = 1 Ω		72	110	
Rise Time	t_r			210	320	
Turn-Off Delay Time	$t_{d(off)}$			2100	3150	
Fall Time	t_f			1015	1525	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	T_C = 25 °C			- 2.3	A
Pulse Diode Forward Current	I_{SM}				- 25	
Body Diode Voltage	V_{SD}	I_S = - 5.5 A, V_{GS} = 0 V		- 0.85	- 1.2	V
Body Diode Reverse Recovery Time	t_{rr}	I_F = - 5.5 A, dI/dt = 100 A/µs, T_J = 25 °C		27	50	ns
Body Diode Reverse Recovery Charge	Q_{rr}			12	25	nC
Reverse Recovery Fall Time	t_a			10		ns
Reverse Recovery Rise Time	t_b			17		

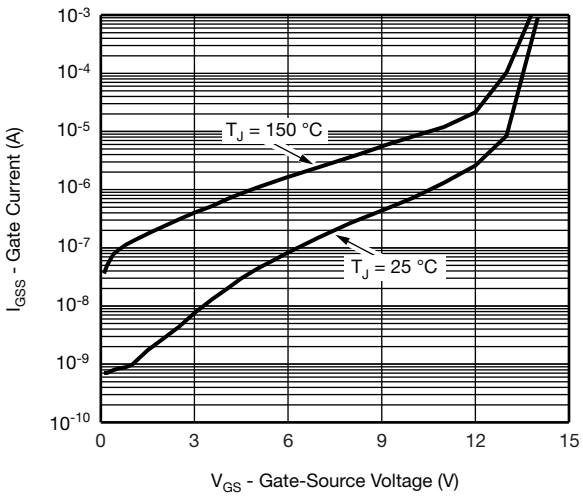
Notes:
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.

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.

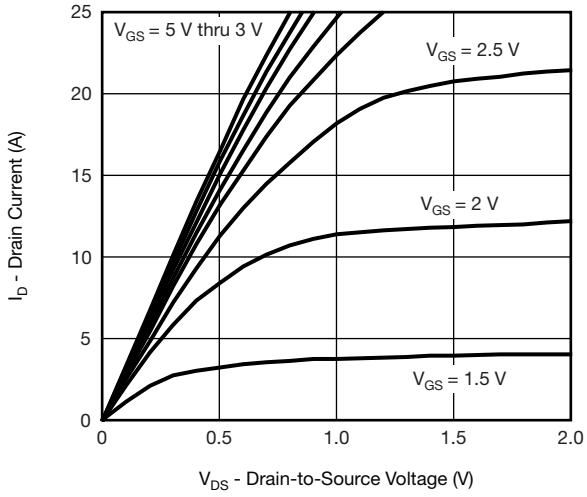
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



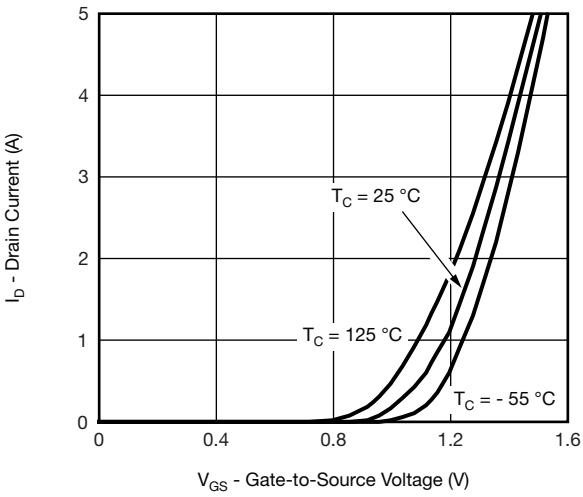
Gate Current vs. Gate-Source Voltage



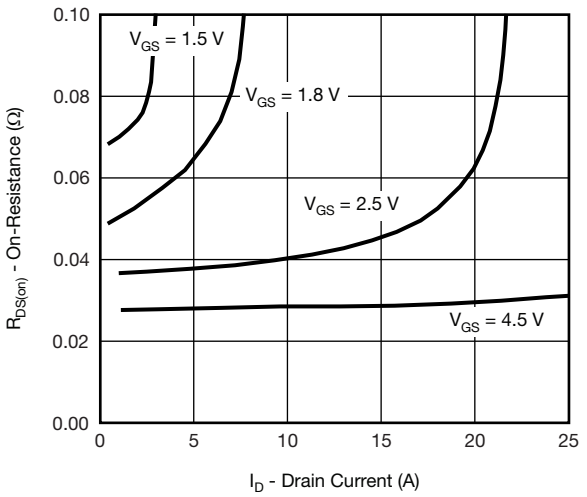
Gate Current vs. Gate-Source Voltage



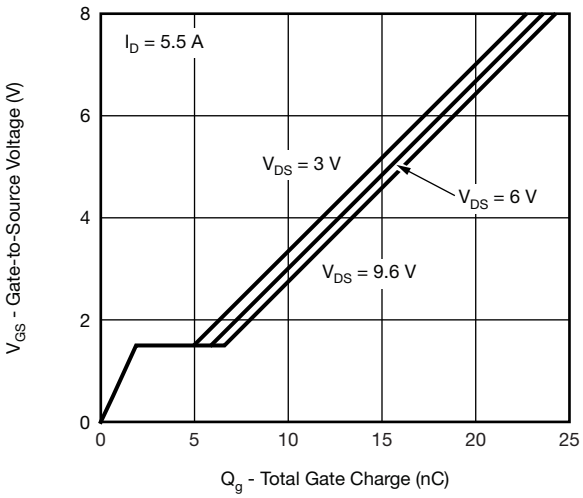
Output Characteristics



Transfer Characteristics

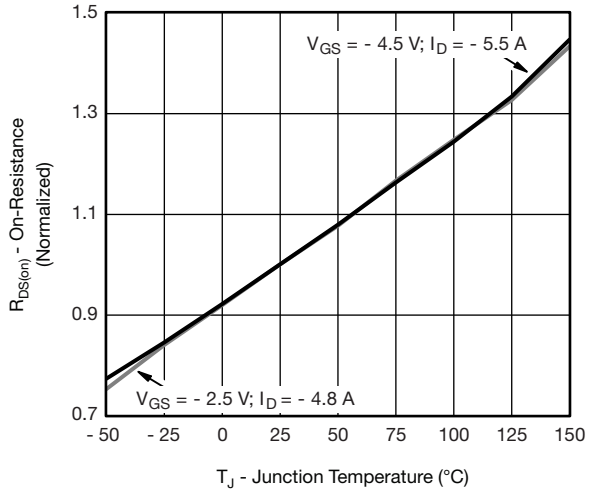


On-Resistance vs. Drain Current

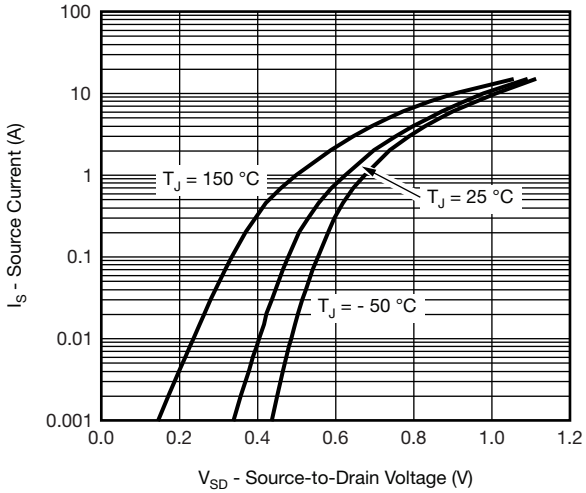


Gate Charge

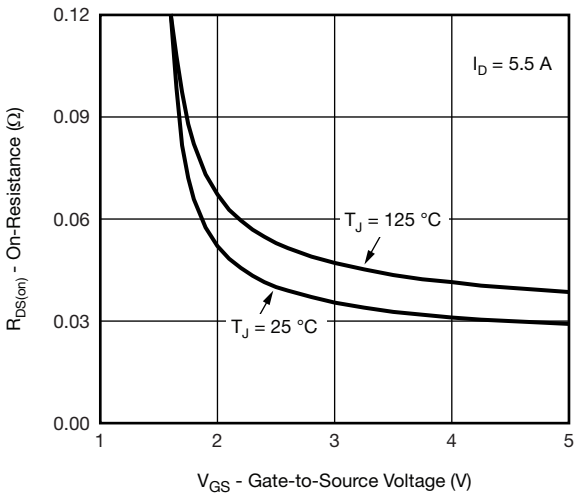
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



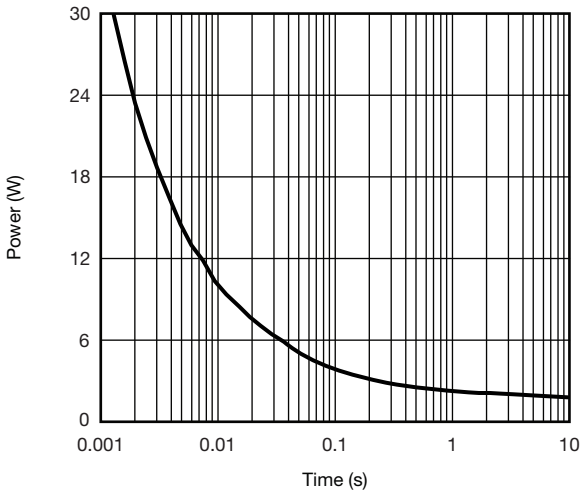
On-Resistance vs. Junction Temperature



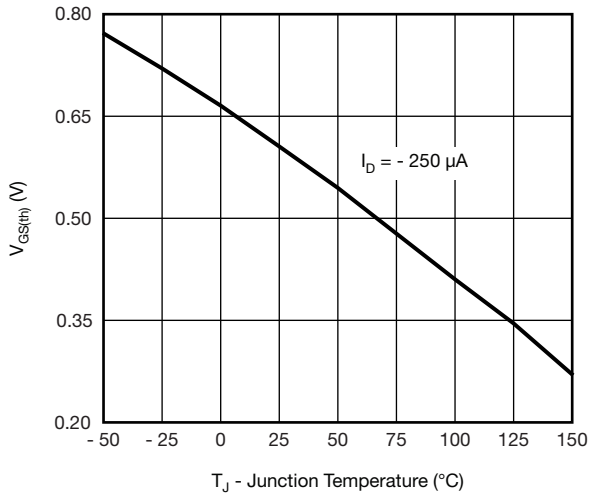
Source-Drain Diode Forward Voltage



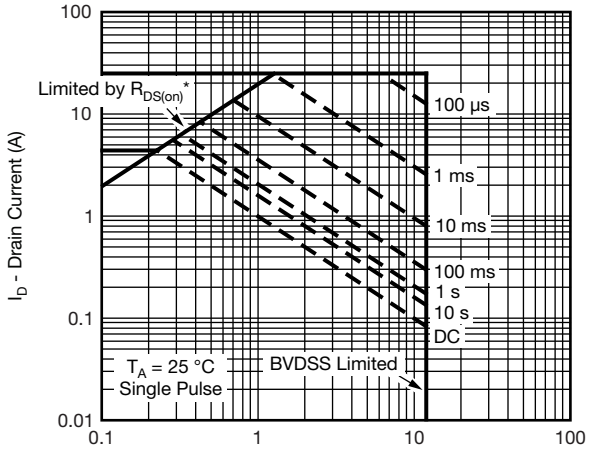
On-Resistance vs. Gate-to-Source Voltage



Single Pulse Power, Junction-to-Ambient



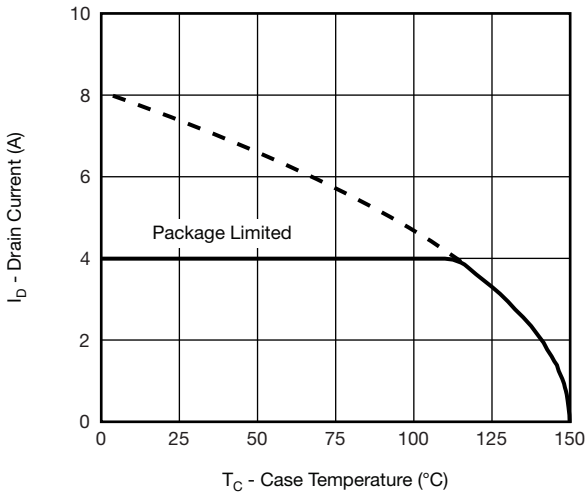
Threshold Voltage



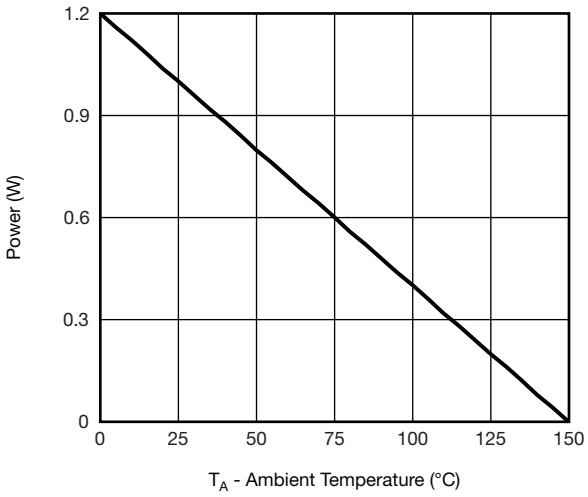
* V_{GS} > minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Ambient

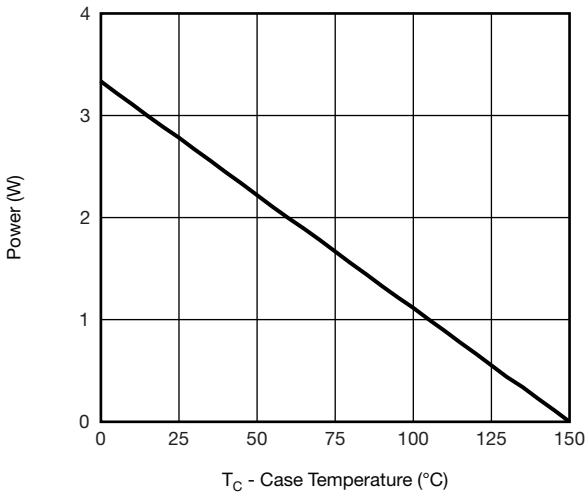
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



Current Derating*



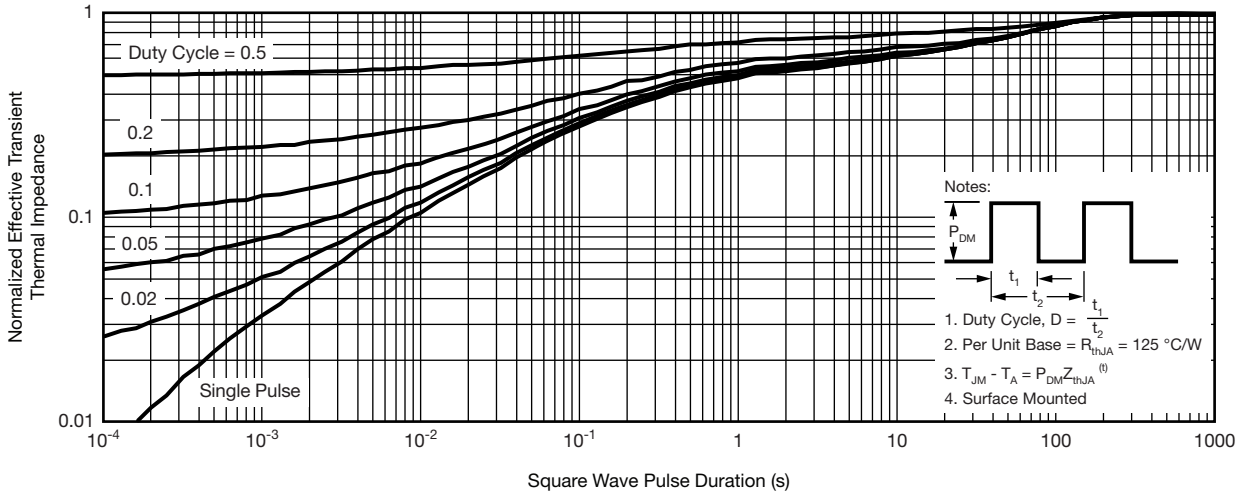
Power Derating, Junction-to-Ambient



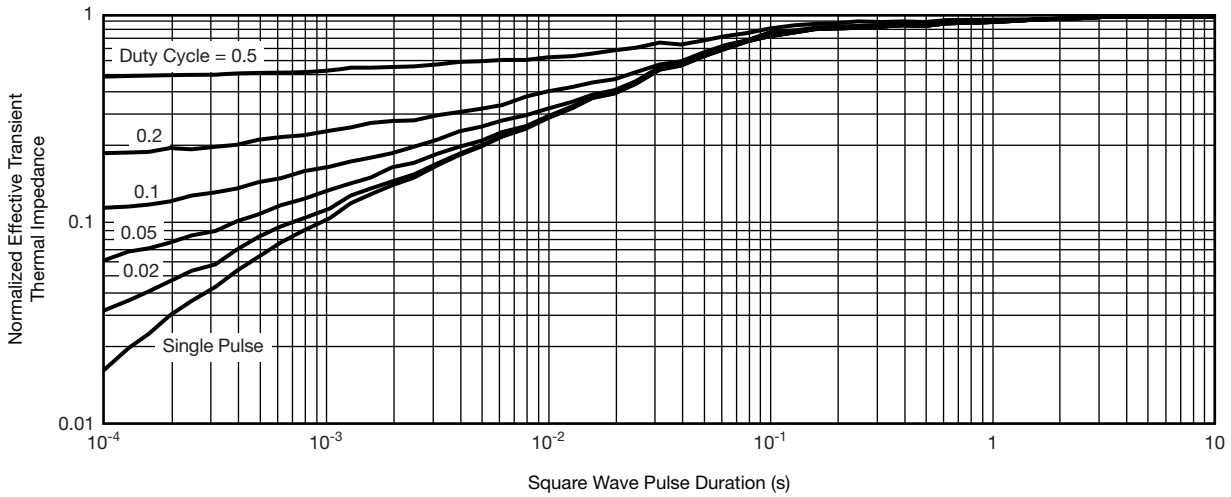
Power Derating, Junction-to-Foot

* 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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