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	0.0055 at V_{GS} = 10 V	24	36 nC
	0.0066 at V_{GS} = 4.5 V	24	

SCHOTTKY PRODUCT SUMMARY		
V_{DS} (V)	V_{SD} (V) Diode Forward Voltage	I_F (A)
30	0.39 V at 1.0 A	2.0

FEATURES

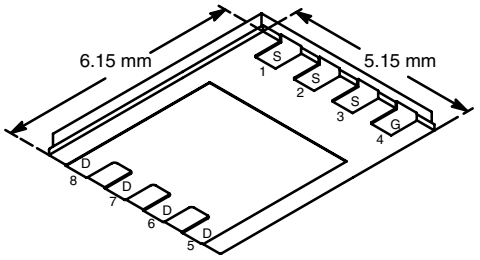
- TrenchFET® PowerMOSFET
- 100 % R_g Tested

APPLICATIONS

- DC/DC Conversion
  - CPU core low side
  - Secondary synchronous rectification

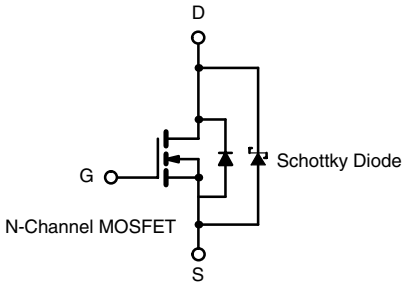
Pb-free
RoHS COMPLIANT

PowerPAK SO-8



Bottom View

Ordering Information: Si7374DP-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)	T_C = 25 °C	I_D	24[a]	A
	T_C = 70 °C		24[a]	
	T_A = 25 °C		23.8[b, c]	
	T_A = 70 °C		19[b, c]	
Pulsed Drain Current		I_{DM}	100	
Continuous Source-Drain Diode Current	T_C = 25 °C	I_S	24[a]	
	T_A = 25 °C		4.2[b, c]	
Maximum Power Dissipation	T_C = 25 °C	P_D	56	W
	T_C = 70 °C		36	
	T_A = 25 °C		5[b, c]	
	T_A = 70 °C		3.2[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]	t ≤ 10 sec	R_{thJA}	20	25	°C/W
Maximum Junction-to-Case (Drain)	Steady State	R_{thJC}	1.7	2.2	

Notes:
a. Based on T_C = 25 °C.
b. Surface mounted on 1" x 1" FR4 board.
c. t = 10 sec.
d. See Solder Profile (http://www.vishay.com/doc?73461). The PowerPAK SO-8 is a leadless package. The end of the lead terminal is exposed copper (not plated) as a result of the singulation process in manufacturing. A solder fillet at the exposed copper tip cannot be guaranteed and is not required to ensure adequate bottom side solder interconnection.
e. Rework Conditions: manual soldering with a soldering iron is not recommended for leadless components.
f. Maximum under steady state conditions is 68 °C/W.

SPECIFICATIONS (T_J = 25 °C UNLESS OTHERWISE NOTED)

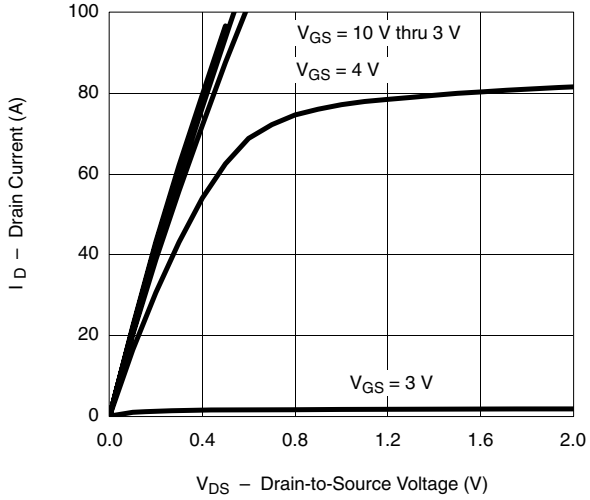
Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	V_{GS} = 0 V, I_D = 1 mA	30			V
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 μA	1.5		2.8	V
Gate-Source Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ±20 V			±100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 30 V, V_{GS} = 0 V			500	μA
		V_{DS} = 30 V, V_{GS} = 0 V, T_J = 55 °C			10	mA
On-State Drain Current[a]	$I_{D(on)}$	V_{DS} ≥ 5 V, V_{GS} = 10 V	50			A
Drain-Source On-State Resistance[a]	$r_{DS(on)}$	V_{GS} = 10 V, I_D = 23.8 A		0.0046	0.0055	Ω
		V_{GS} = 4.5 V, I_D = 21.8 A		0.0055	0.0066	
Forward Transconductance[a]	g_{fs}	V_{DS} = 15 V, I_D = 23.8 A		95		S
Dynamic[b]						
Input Capacitance	C_{iss}	V_{DS} = 15 V, V_{GS} = 0 V, f = 1 MHz		5500		pF
Output Capacitance	C_{oss}			870		
Reverse Transfer Capacitance	C_{rss}			360		
Total Gate Charge	Q_g	V_{DS} = 15 V, V_{GS} = 10 V, I_D = 20 A		81	122	nC
		V_{DS} = 15 V, V_{GS} = 4.5 V, I_D= 20 A		38	57	
Gate-Source Charge	Q_{gs}			18		
Gate-Drain Charge	Q_{gd}			11		
Gate Resistance	R_g	f = 1 MHz		0.95	1.4	Ω
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 15 V, R_L = 1.5 Ω I_D ≅ 10 A, V_{GEN} = 4.5 V, R_g = 1 Ω		40	60	ns
Rise Time	t_r			160	240	
Turn-Off Delay Time	$t_{d(off)}$			30	45	
Fall Time	t_f			10	15	
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 15 V, R_L = 1.5 Ω I_D ≅ 10 A, V_{GEN} = 10 V, R_g = 1 Ω		15	25	
Rise Time	t_r			15	25	
Turn-Off Delay Time	$t_{d(off)}$			42	65	
Fall Time	t_f			10	15	
Drain-Source Body Diode Characteristics						
Continuous Source–Drain Current	I_S	T_C = 25 °C			24	A
Pulse Forward Diode Current	I_{SM}				100	
Forward Voltage Drop (Schottky Diode)	V_F	I_F =1 A		0.35	0.39	V
		I_F = 1 A, T_J = 150 °C		0.27	0.31	
Maximal Reverse Leakage Current (Schottky Diode)	I_{rm}	V_r =30 V		0.07	0.5	mA
		V_r = 30 V, T_J = 100 °C		3.5	10	
		V_r = 30 V, T_J = 125 °C		10	100	
Junction Capacitance (Schottky Diode)	C_T	V_r = 10 V		58		pF
Body Diode Reverse Recovery Time	t_{rr}	I_F = 10 A, di/dt = 100 A/μs, T_J = 25 °C		45	70	ns
Body Diode Reverse Recovery Charge	Q_{rr}			39	60	nC
Reverse Recovery Fall Time	t_a			20		ns
Reverse Recovery Rise Time	t_b			25		

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

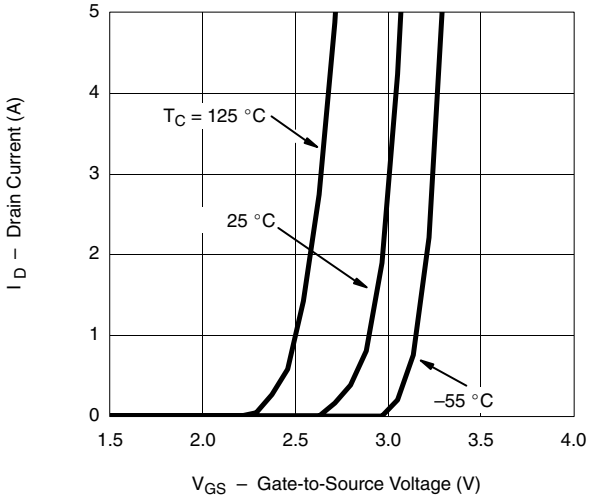
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED)

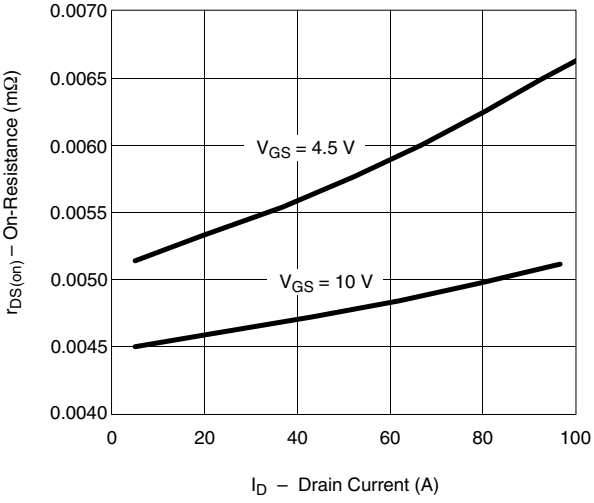
Output Characteristics



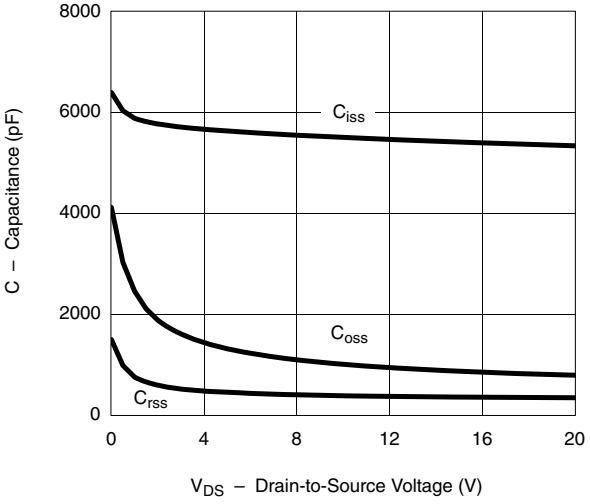
Transfer Characteristics



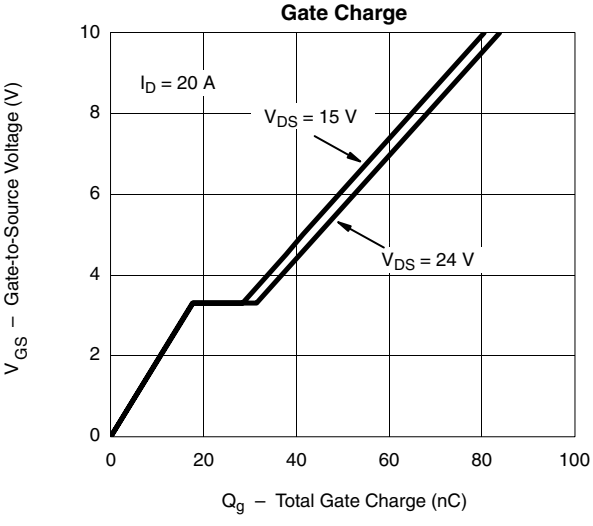
On-Resistance vs. Drain Current and Gate Voltage



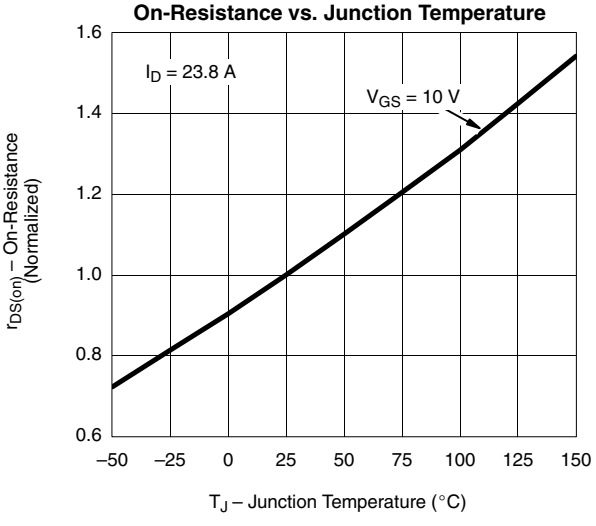
Capacitance



Gate Charge

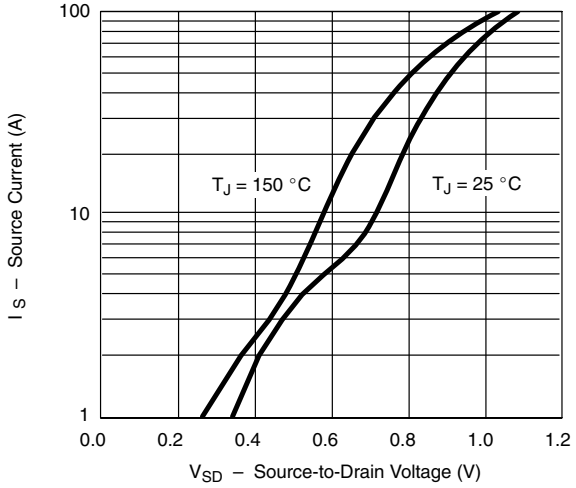


On-Resistance vs. Junction Temperature

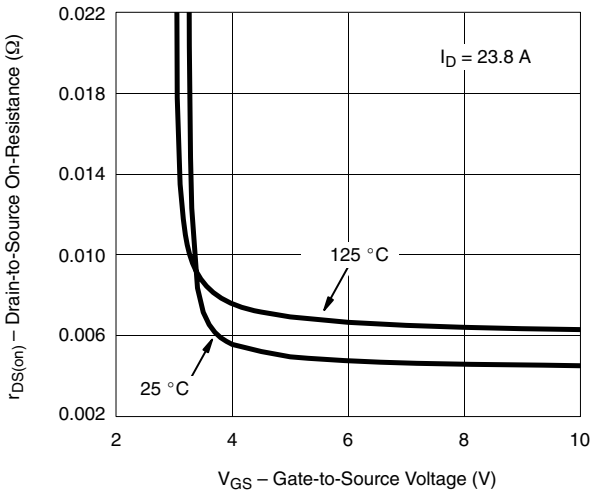


TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED)

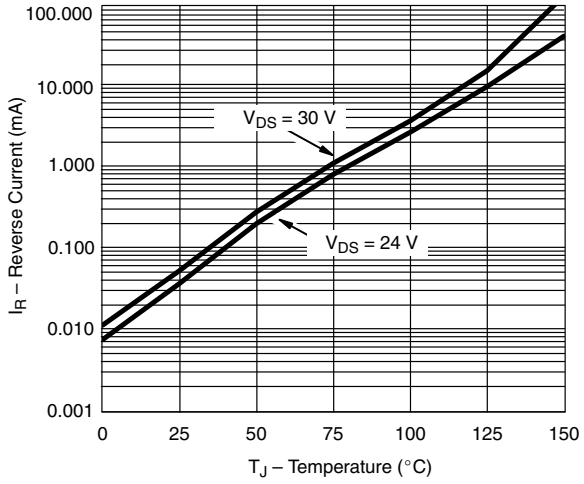
Source-Drain Diode Forward Voltage



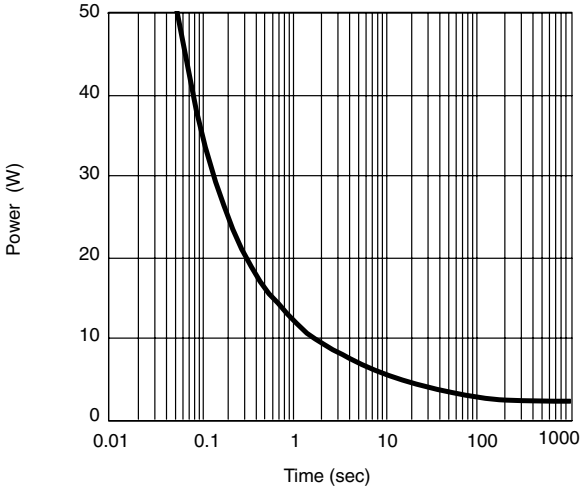
On-Resistance vs. Gate-to-Source Voltage



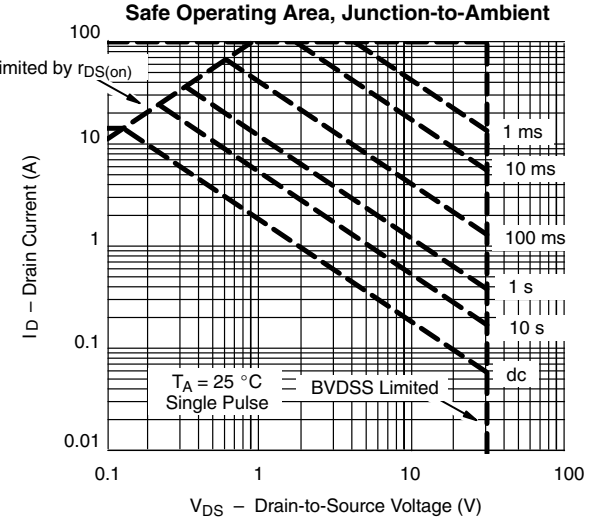
Threshold Voltage



Single Pulse Power



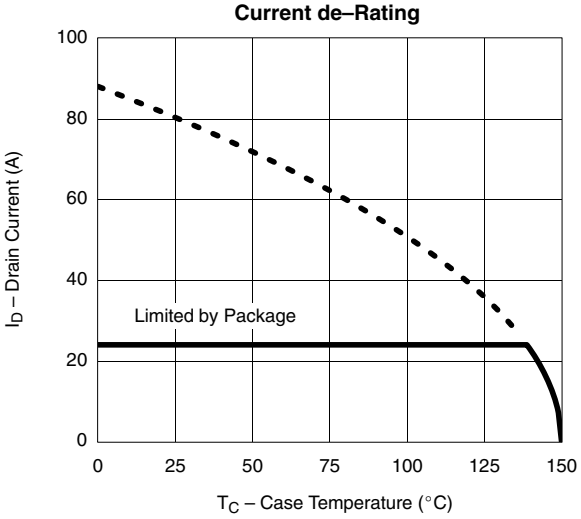
Safe Operating Area, Junction-to-Ambient



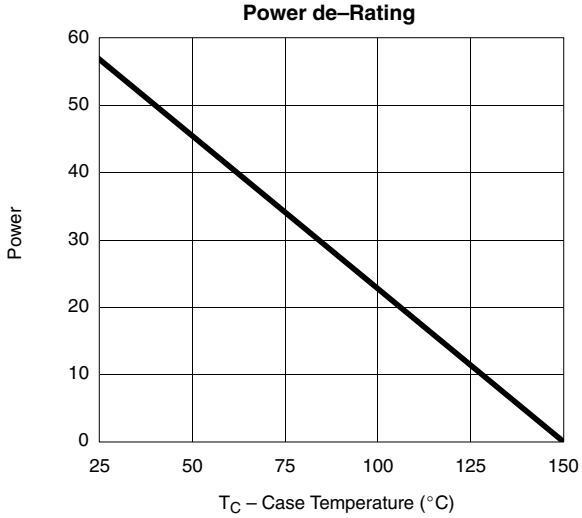
*V_{GS} > minimum V_{GS} at which $r_{DS(on)}$ is specified

TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED)

Current de–Rating



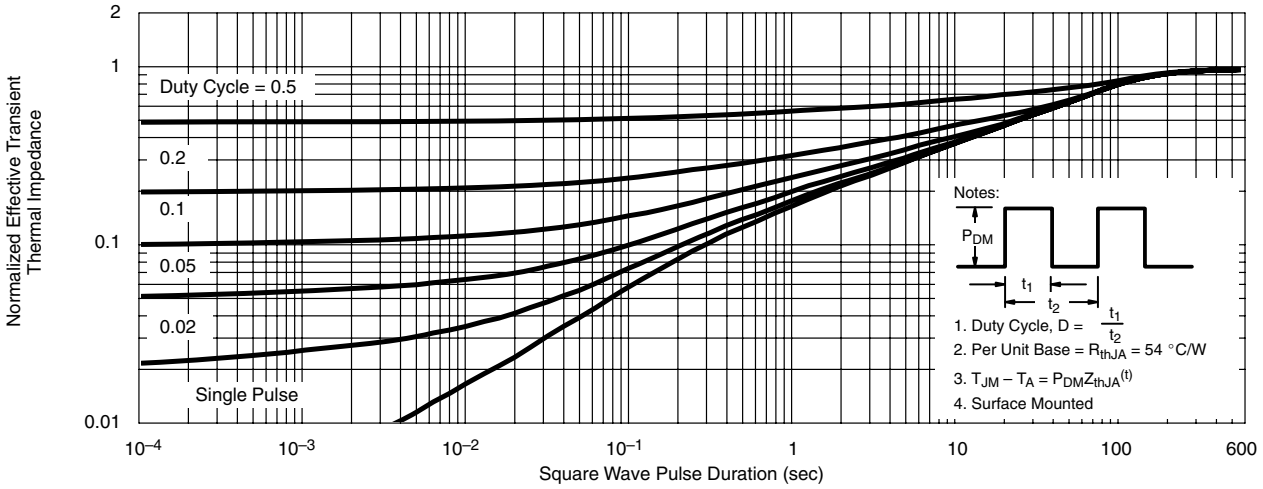
Power de–Rating



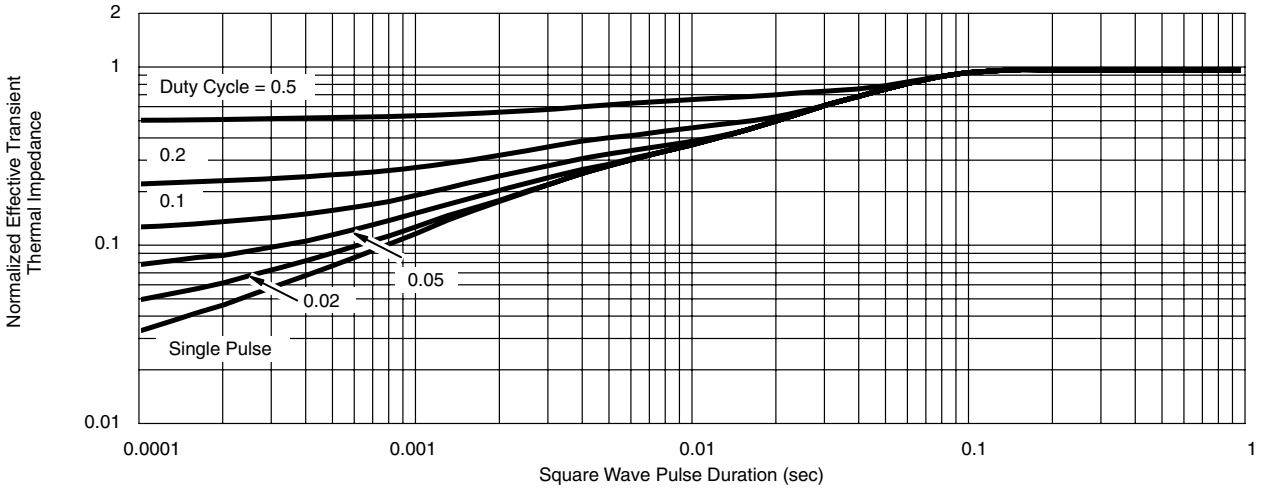
*The power dissipation P_D is based on $T_{J(max)}$ = 150 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED)

Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Case



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