

N-Channel 30-V (D-S) MOSFET

PRODUCT SUMMARY			
V_{DS} (V)	$r_{DS(on)}$ (Ω)	I_D (A) ^a	Q_g (Typ)
30	0.0095 @ $V_{GS} = 10$ V	35	9.2 nC
	0.014 @ $V_{GS} = 4.5$ V	35	

FEATURES

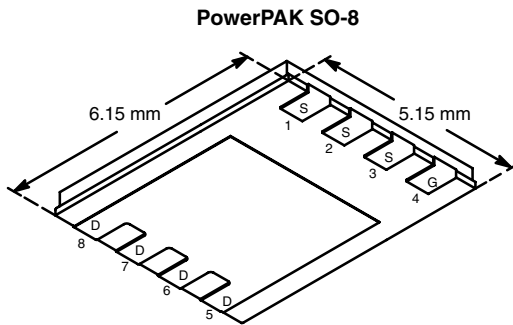
- TrenchFET® Power MOSFET
- New Low Thermal Resistance PowerPAK® Package with Low 1.07mm Profile
- Optimized for High-Side Synchronous Rectifier Operation
- 100% R_g Tested



RoHS
COMPLIANT

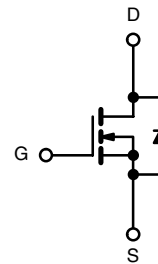
APPLICATIONS

- DC/DC Converters



Bottom View

Ordering Information: Si7686DP-T1—E3 (Lead (Pb)-Free)



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED)			
Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	30	V
Gate-Source Voltage	V_{GS}	± 20	
Continuous Drain Current ($T_J = 150^\circ\text{C}$)	I_D	$T_C = 25^\circ\text{C}$	35 ^a
		$T_C = 70^\circ\text{C}$	35 ^a
		$T_A = 25^\circ\text{C}$	17.9 ^{b, c}
		$T_A = 70^\circ\text{C}$	14.3 ^{b, c}
Pulsed Drain Current	I_{DM}	50	A
Continuous Source-Drain Diode Current	I_S	$T_C = 25^\circ\text{C}$	
		$T_A = 25^\circ\text{C}$	4.2 ^{b, c}
Maximum Power Dissipation	P_D	$T_C = 25^\circ\text{C}$	37.9
		$T_C = 70^\circ\text{C}$	24.2
		$T_A = 25^\circ\text{C}$	5 ^{b, c}
		$T_A = 70^\circ\text{C}$	3.2 ^{b, c}
Operating Junction and Storage Temperature Range	T_J, T_{stg}	-55 to 150	$^\circ\text{C}$
Soldering Recommendations (Peak Temperature) ^{d, e}		260	

THERMAL RESISTANCE RATINGS					
Parameter	Symbol	Typical	Maximum	Unit	
Maximum Junction-to-Ambient ^{b, f}	R_{thJA}	21	25	$^\circ\text{C/W}$	
Maximum Junction-to-Case (Drain)	R_{thJC}	2.8	3.3		

Notes:

- Package Limited.
- Surface mounted on 1" x 1" FR4 board.
- $t = 10$ sec
- See Solder Profile (<http://www.vishay.com/doc?73257>). 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.
- Rework Conditions: manual soldering with a soldering iron is not recommended for leadless components.
- Maximum under steady state conditions is 70°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 = 250 μA	30			V
V _{DS} Temperature Coefficient	ΔV _{DS} /T _J	I _D = 250 μA		31.3		mV/°C
V _{GS(th)} Temperature Coefficient	ΔV _{GS(th)} /T _J			-6		
Gate-Source Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA	1		3	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			1	μA
		V _{DS} = 30 V, V _{GS} = 0 V, T _J = 55 °C			10	
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 = 13.8 A		0.0078	0.0095	Ω
		V _{GS} = 4.5 V, I _D = 11.4 A		0.011	0.014	
Forward Transconductance ^a	g _{fs}	V _{DS} = 15 V, I _D = 13.8 A		56		S
Dynamic^b						
Input Capacitance	C _{iss}	V _{DS} = 15 V, V _{GS} = 0 V, f = 1 MHz		1220		pF
Output Capacitance	C _{oss}			230		
Reverse Transfer Capacitance	C _{rss}			98		
Total Gate Charge	Q _g	V _{DS} = 15 V, V _{GS} = 10 V, I _D = 13.8 A		17	26	nC
		V _{DS} = 15 V, V _{GS} = 5 V, I _D = 13.8 A		9.2	14	
Gate-Source Charge	Q _{gs}			4.1		
Gate-Drain Charge	Q _{gd}		2.8			
Gate Resistance	R _g	f = 1 MHz		0.8	1.2	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		20	30	ns
Rise Time	t _r			20	30	
Turn-Off Delay Time	t _{d(off)}			20	30	
Fall Time	t _f			8	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		13	20	
Rise Time	t _r			16	25	
Turn-Off Delay Time	t _{d(off)}			23	35	
Fall Time	t _f			8	15	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I _S	T _C = 25 °C			31.5	A
Pulse Diode Forward Current ^a	I _{SM}				50	
Body Diode Voltage	V _{SD}	I _S = 2.6 A		0.8	1.2	V
Body Diode Reverse Recovery Time	t _{rr}	I _F = 2.6 A, di/dt = 100 A/μs, T _J = 25 °C		25	50	ns
Body Diode Reverse Recovery Charge	Q _{rr}			15	30	nC
Reverse Recovery Fall Time	t _a			12.5		ns
Reverse Recovery Rise Time	t _b			12.5		

Notes

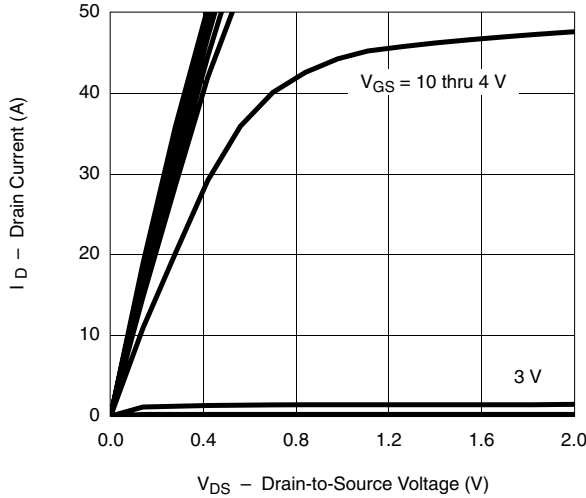
- a. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2%.
b. Guaranteed by design, not subject to production testing.

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.

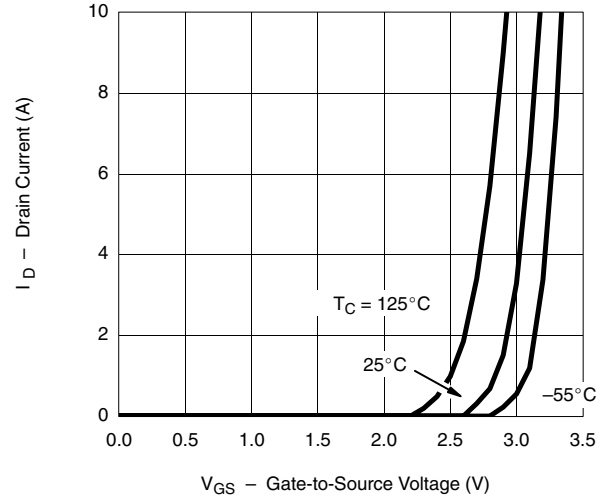


TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)

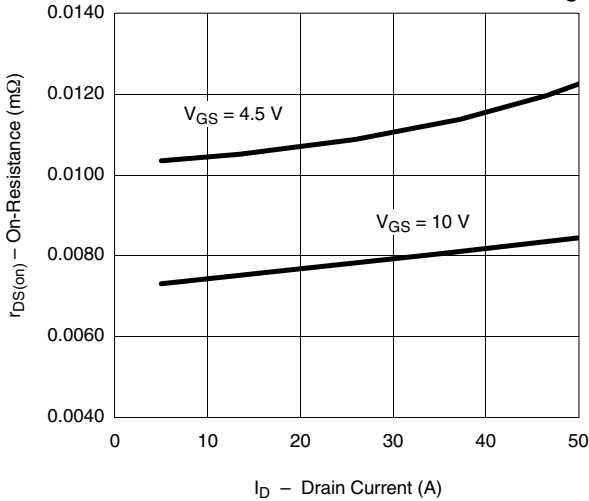
Output Characteristics



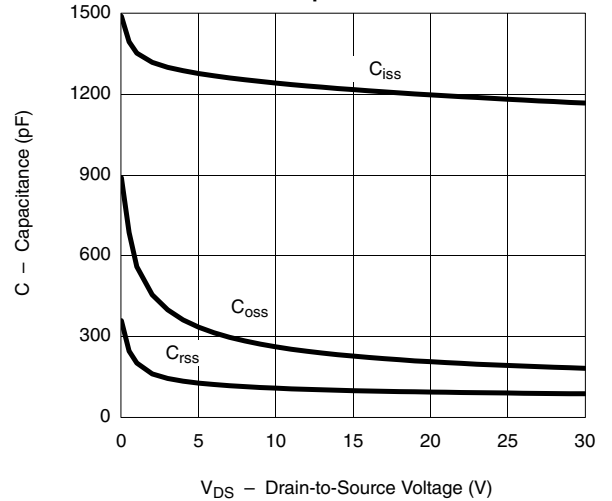
Transfer Characteristics



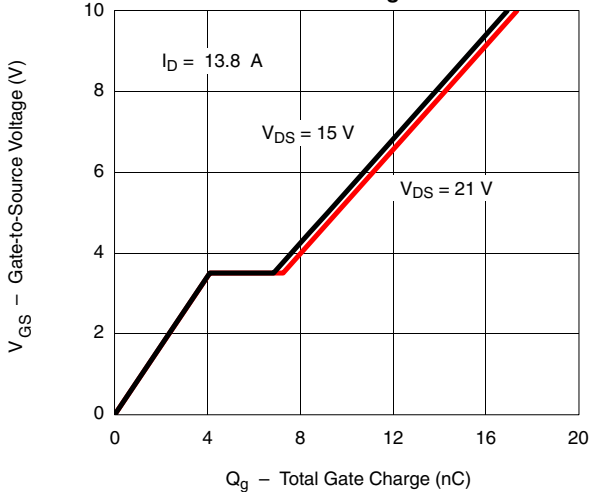
On-Resistance vs. Drain Current and Gate Voltage



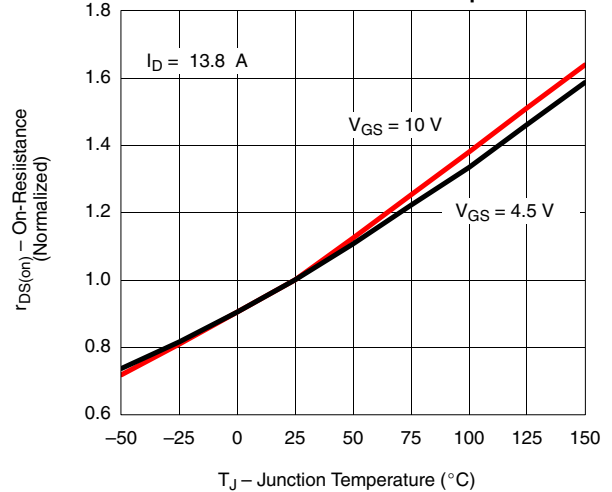
Capacitance



Gate Charge

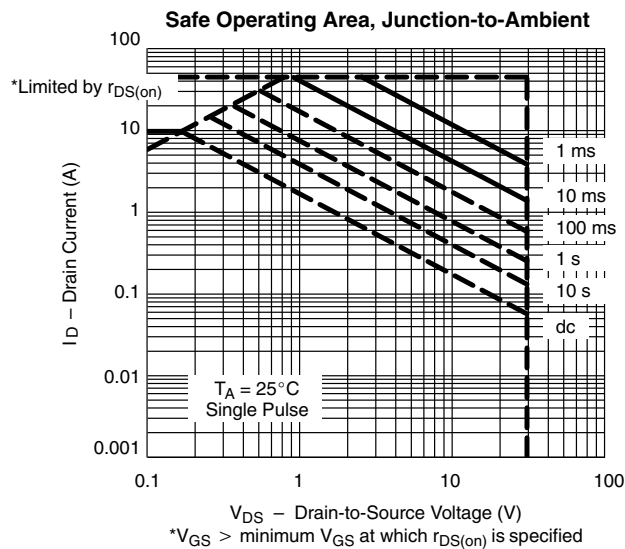
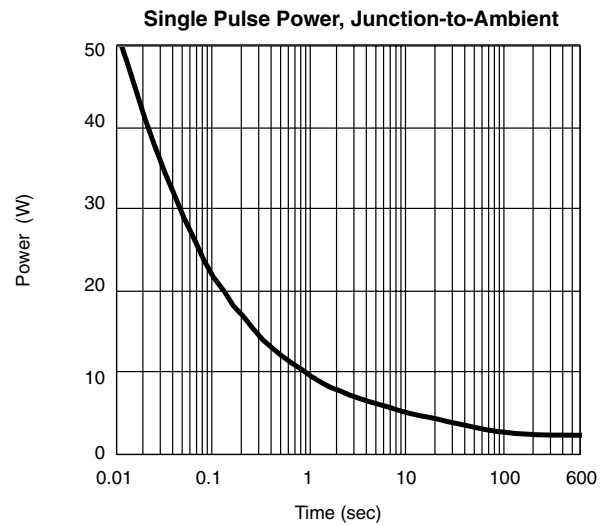
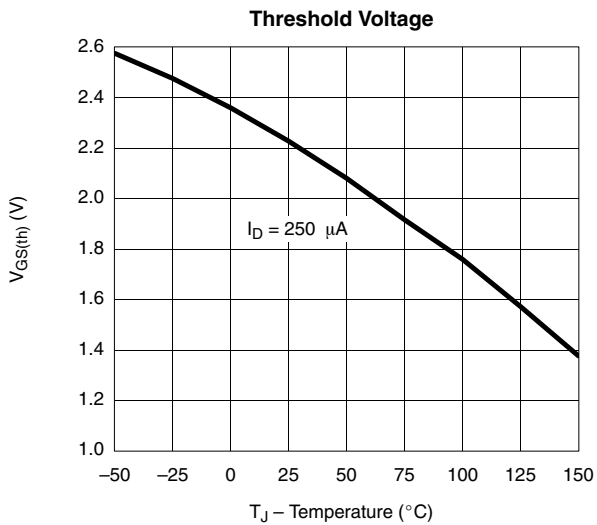
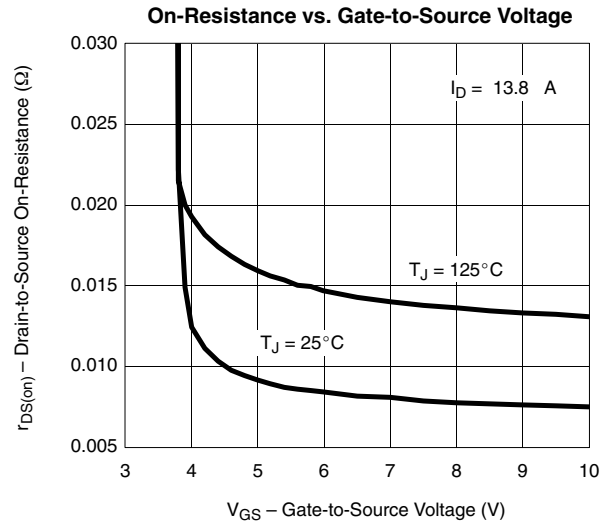
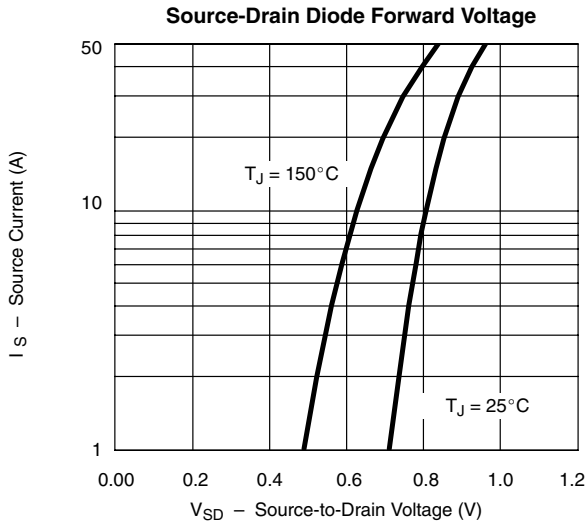


On-Resistance vs. Junction Temperature

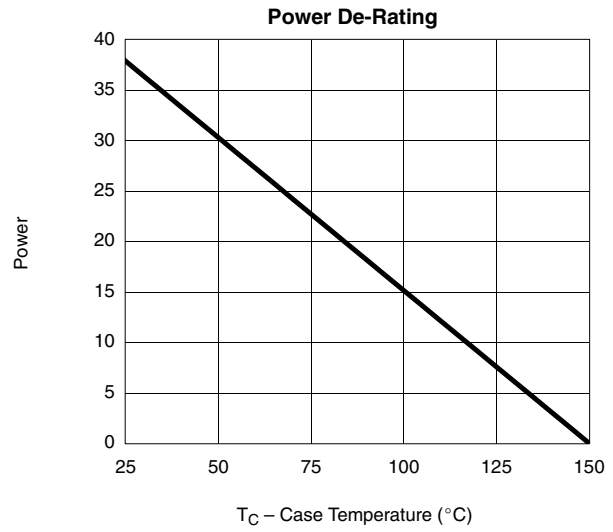
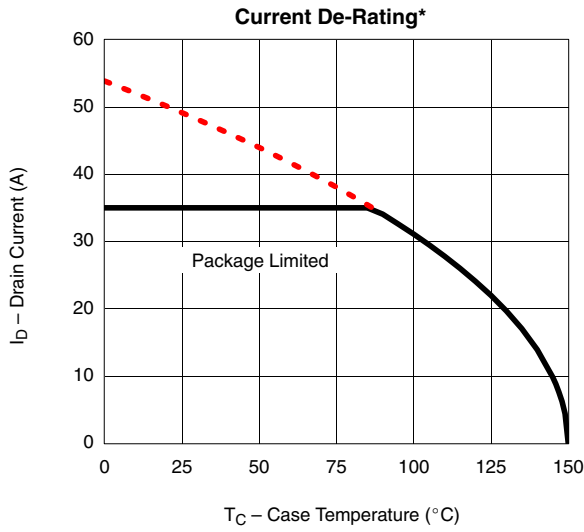




TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED)



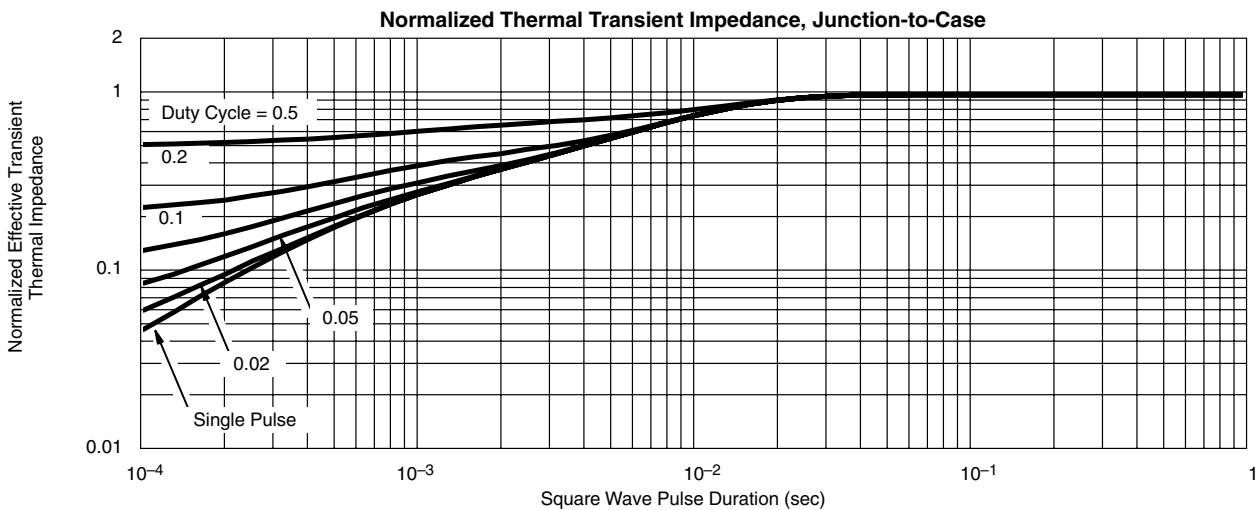
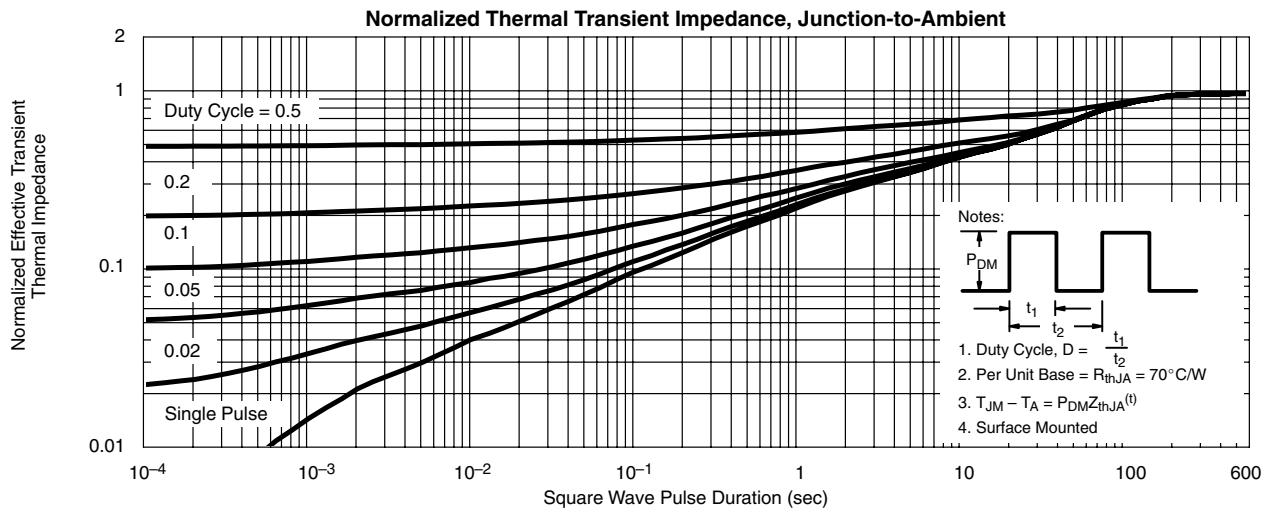
TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)



*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)



Vishay Siliconix maintains worldwide manufacturing capability. Products may be manufactured at one of several qualified locations. Reliability data for Silicon Technology and Package Reliability represent a composite of all qualified locations. For related documents such as package/tape drawings, part marking, and reliability data, see <http://www.vishay.com/ppg?73451>.



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