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Si4906DY

Vishay Siliconix

Dual N-Channel 40-V (D-S) MOSFET

PRODUCT SUMMARY

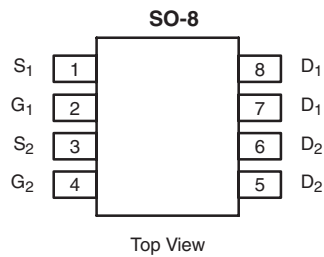|	V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)[a]	Q_g (Typ.)
N-Channel	40	0.039 at V_{GS} = 10 V	6.6	6.6
		0.050 at V_{GS} = 4.5 V	5.8	

FEATURES
- **Halogen-free According to IEC 61249-2-21 Definition**
- TrenchFET® Power MOSFET
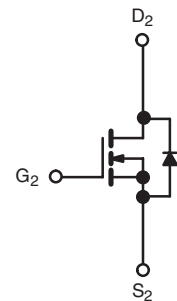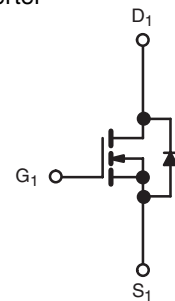- 100 % R_g and UIS Tested
- Compliant to RoHS Directive 2002/95/EC

APPLICATIONS
- CCFL Inverter

SO-8

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S1  [ 1        8 ]  D1
G1  [ 2        7 ]  D1
S2  [ 3        6 ]  D2
G2  [ 4        5 ]  D2
```

Top View

Ordering Information: Si4906DY-T1-E3 (Lead (Pb)-free)
Si4906DY-T1-GE3 (Lead (Pb)-free and Halogen-free)

N-Channel MOSFET   N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS T_A = 25 °C, unless otherwise noted

Parameter		Symbol	Limit	Unit
Drain-Source Voltage		V_{DS}	40	V
Gate-Source Voltage		V_{GS}	± 16	
Continuous Drain Current (T_J = 150 °C)	T_C = 25 °C	I_D	6.6	A
	T_C = 70 °C		5.3	
	T_A = 25 °C		5.3[b, c]	
	T_A = 70 °C		4.2[b, c]	
Pulsed Drain Current (10 µs Pulse Width)		I_{DM}	30	
Source-Drain Current Diode Current	T_C = 25 °C	I_S	2.5	
	T_A = 25 °C		1.7[b, c]	
Pulsed Sorce-Drain Current		I_{SM}	30	
Single Pulse Avalanche Current	L = 0.1 mH	I_{AS}	13	
Single-Pulse Avalanche Energy		E_{AS}	8.5	mJ
Maximum Power Dissipation	T_C = 25 °C	P_D	3.1	W
	T_C = 70 °C		2	
	T_A = 25 °C		2[b, c]	
	T_A = 70 °C		1.28[b, c]	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	- 55 to 150	°C

THERMAL RESISTANCE RATINGS

Parameter		Symbol	Limit		Unit
			Typical	Maximum	
Maximum Junction-to-Ambient[b, d]	t ≤ 10 s	R_{thJA}	52	62.5	°C/W
Maximum Junction-to-Foot (Drain)	Steady State	R_{thJF}	32	40	

Notes:
a. Based on T_C = 25 °C.
b. Surface Mounted on 1" x 1" FR4 board.
c. t = 10 s.
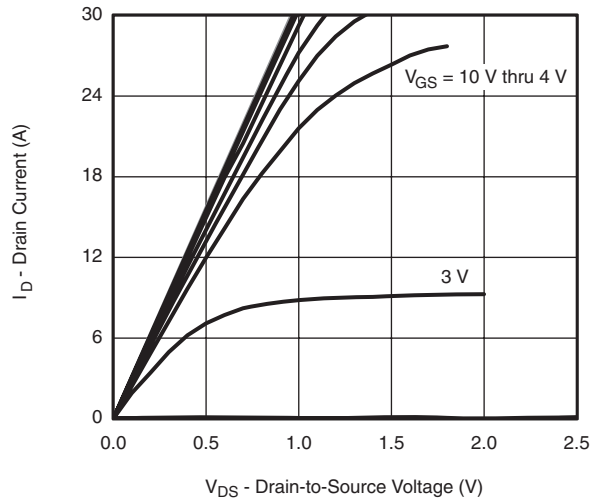d. Maximum under Steady State conditions is 110 °C/W.

SPECIFICATIONS T_J = 25 °C, unless otherwise noted

Parameter	Symbol	Test Conditions	Min.	Typ.[a]	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	V_{GS} = 0 V, I_D = 250 µA	40			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	I_D = 250 µA		40		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			- 4.6		
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 µA	0.8		2.2	V
Gate-Body Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 16 V			100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 40 V, V_{GS} = 0 V			1	µA
		V_{DS} = 40 V, V_{GS} = 0 V, T_J = 55 °C			10	
On-State Drain Current[b]	$I_{D(on)}$	V_{DS} = 5 V, V_{GS} = 10 V	20			A
Drain-Source On-State Resistance[b]	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 5 A		0.032	0.039	Ω
		V_{GS} = 4.5 V, I_D = 4 A		0.041	0.050	
Forward Transconductance[b]	g_{fs}	V_{DS} = 15 V, I_D = 5 A		15		S
Dynamic[a]						
Input Capacitance	C_{iss}	V_{DS} = 20 V, V_{GS} = 0 V, f = 1 MHz		625		pF
Output Capacitance	C_{oss}			88		
Reverse Transfer Capacitance	C_{rss}			50		
Total Gate Charge	Q_g	V_{DS} = 20 V, V_{GS} = 10 V, I_D = 5 A		14.4	22	nC
		V_{DS} = 20 V, V_{GS} = 4.5 V, I_D = 5 A		6.6	10	
Gate-Source Charge	Q_{gs}			1.6		
Gate-Drain Charge	Q_{gd}			2.3		
Gate Resistance	R_g	f = 1 MHz		2.3	3.5	Ω
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 20 V, R_L = 4 Ω $I_D \cong$ 5 A, V_{GEN} = 10 V, R_g = 1 Ω		9	15	ns
Rise Time	t_r			51	77	
Turn-Off Delay Time	$t_{d(off)}$			21	32	
Fall Time	t_f			6	10	
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 20 V, R_L = 4 Ω $I_D \cong$ 5 A, V_{GEN} = 4.5 V, R_g = 1 Ω		13	20	
Rise Time	t_r			85	128	
Turn-Off Delay Time	$t_{d(off)}$			17	26	
Fall Time	t_f			7	11	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	T_C = 25 °C			2.5	A
Pulse Diode Forward Current[a]	I_{SM}				30	
Body Diode Voltage	V_{SD}	I_S = 1.7 A		0.79	1.2	V
Body Diode Reverse Recovery Time	t_{rr}	I_F = 1.7 A, dI/dt = 100 A/µs, T_J = 25 °C		30	45	ns
Body Diode Reverse Recovery Charge	Q_{rr}			30	45	nC
Reverse Recovery Fall Time	t_a			17		ns
Reverse Recovery Rise Time	t_b			13		

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

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.
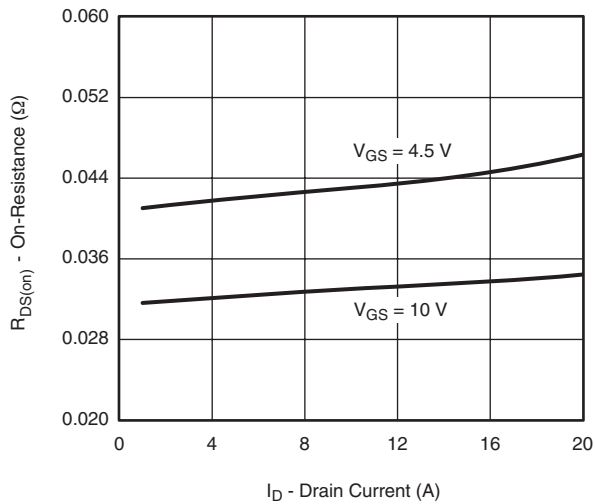
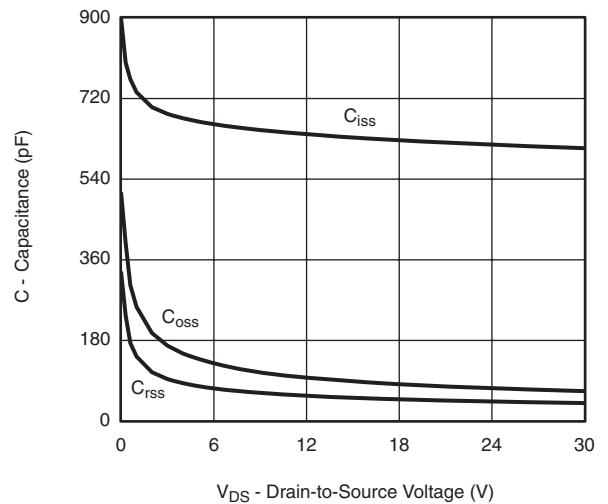## TYPICAL CHARACTERISTICS   25 °C, unless otherwise noted
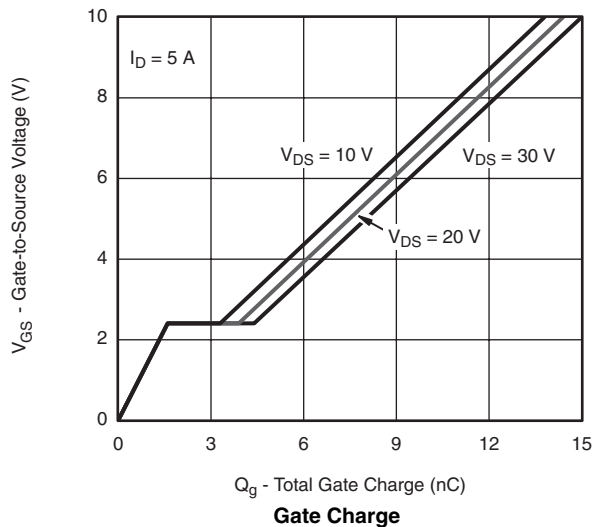
Output Characteristics

V_{GS} = 10 V thru 4 V

3 V

I_D - Drain Current (A)

V_{DS} - Drain-to-Source Voltage (V)
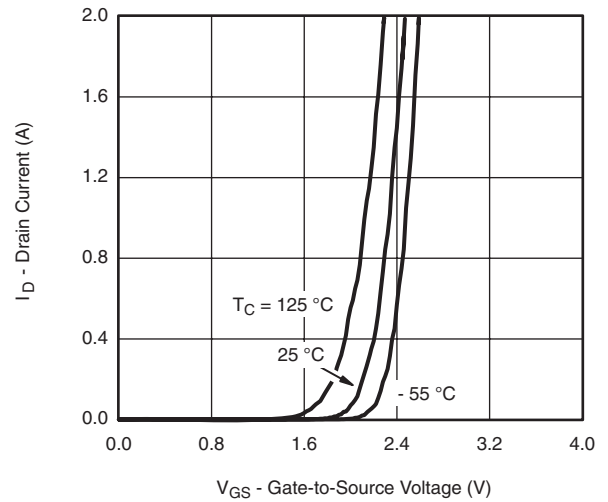
Transfer Characteristics

T_C = 125 °C

25 °C

- 55 °C

I_D - Drain Current (A)

V_{GS} - Gate-to-Source Voltage (V)

On-Resistance vs. Drain Current and Gate Voltage

V_{GS} = 4.5 V

V_{GS} = 10 V

$R_{DS(on)}$ - On-Resistance (Ω)

I_D - Drain Current (A)

Capacitance

C_{iss}

C_{oss}

C_{rss}

C - Capacitance (pF)

V_{DS} - Drain-to-Source Voltage (V)

Gate Charge

I_D = 5 A

V_{DS} = 10 V

V_{DS} = 30 V

V_{DS} = 20 V

V_{GS} - Gate-to-Source Voltage (V)

Q_g - Total Gate Charge (nC)
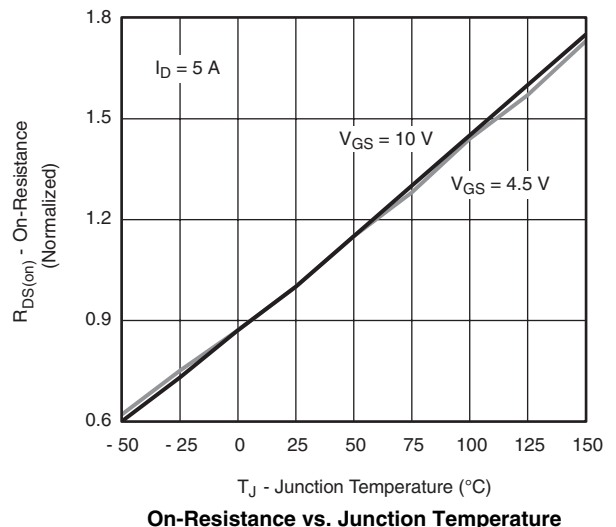
On-Resistance vs. Junction Temperature

I_D = 5 A

V_{GS} = 10 V
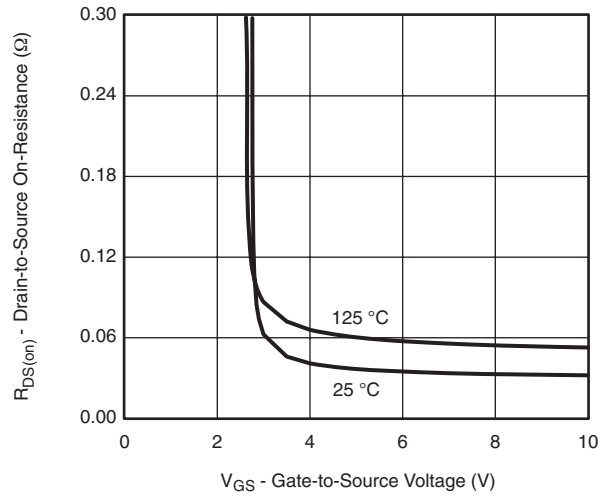
V_{GS} = 4.5 V

$R_{DS(on)}$ - On-Resistance (Normalized)
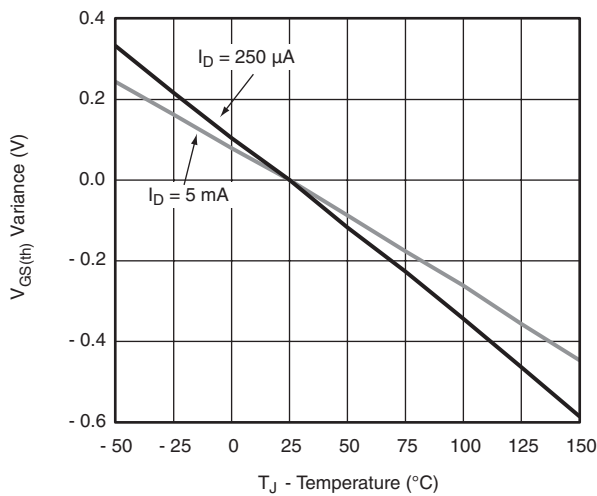
T_J - Junction Temperature (°C)

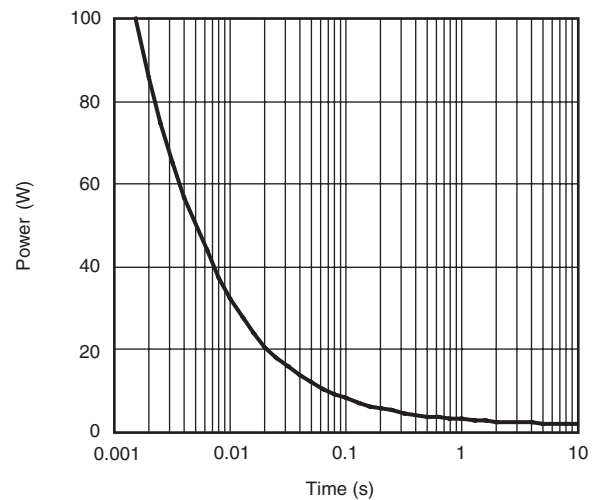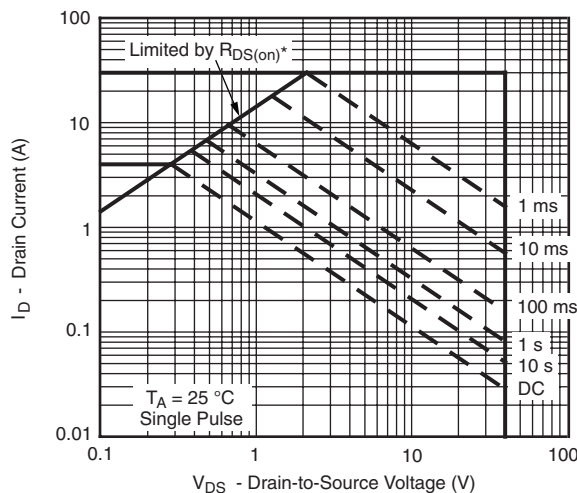## TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted
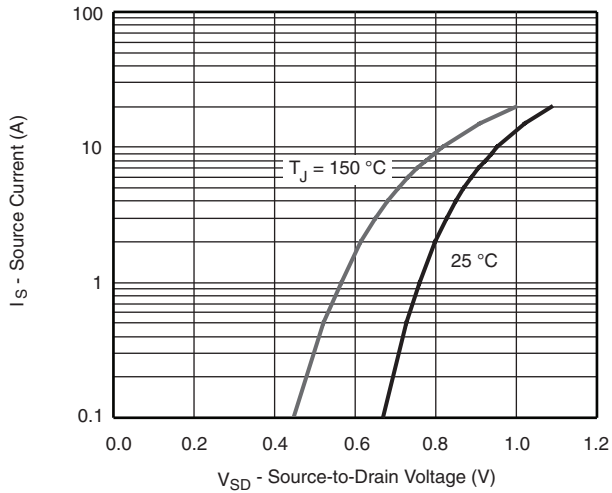
Source-Drain Diode Forward Voltage

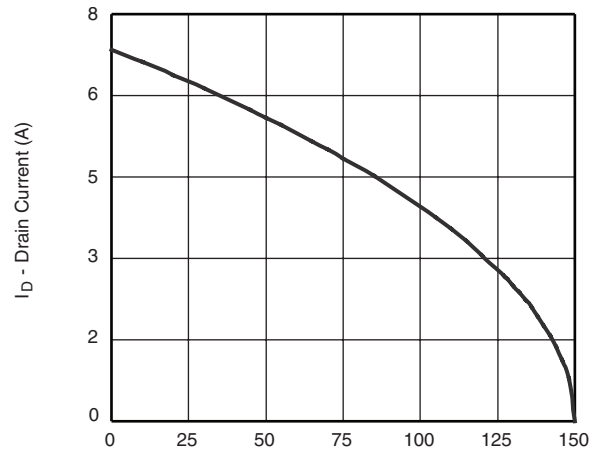**On-Resistance vs. Gate-to-Source Voltage**

Threshold Voltage

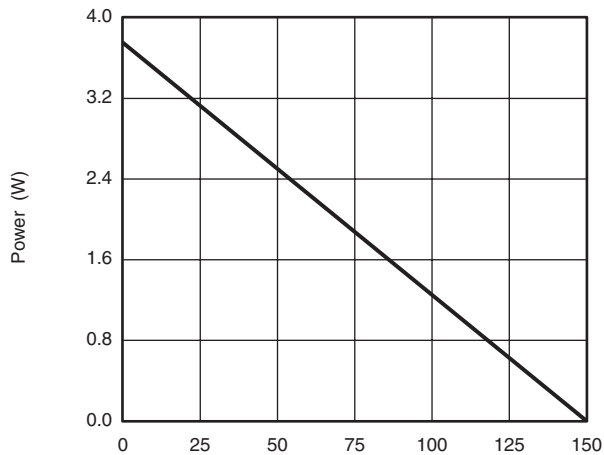**Single Pulse Power, Junction-to-Ambient**

Safe Operating Area, Junction-to-Ambient

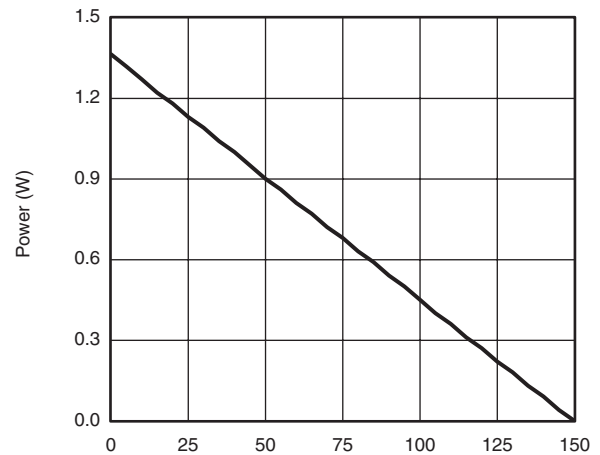* V_{GS} > minimum V_{GS} at which $R_{DS(on)}$ is specified

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

T_C - Case Temperature (°C)
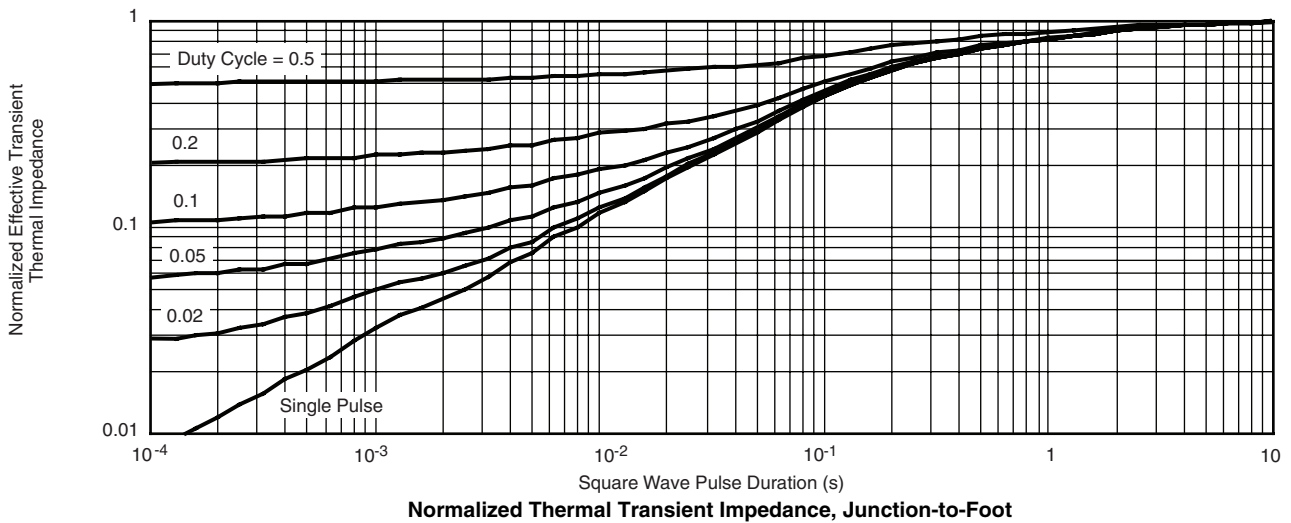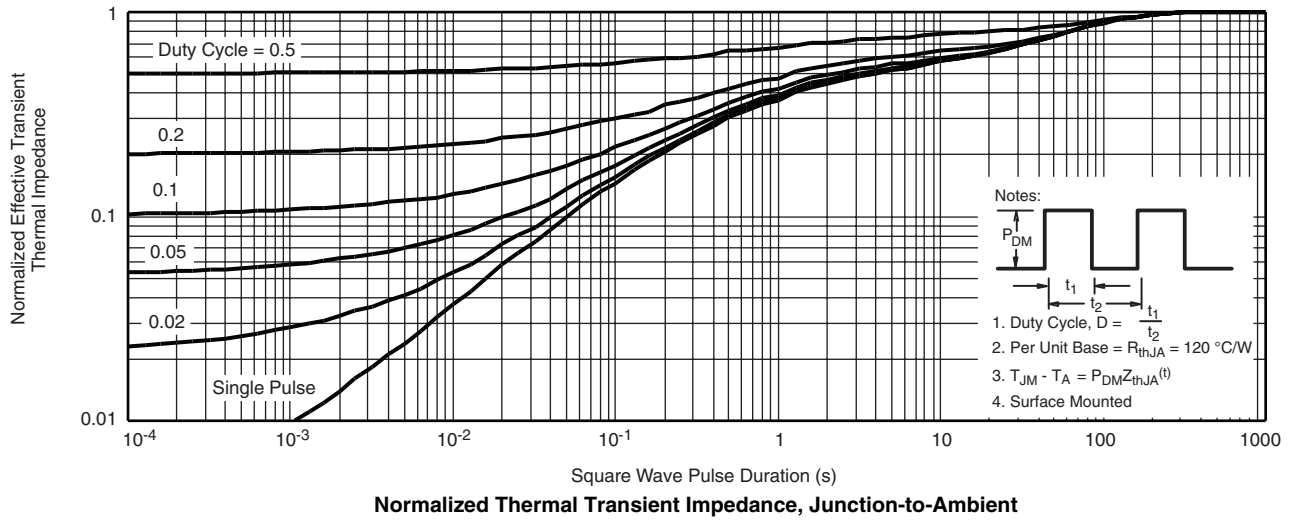**Current Derating***

T_C - Case Temperature (°C)
Power Derating, Junction-to-Foot

T_A - Ambient Temperature (°C)
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

Notes:

1. Duty Cycle, $D = \dfrac{t_1}{t_2}$
2. Per Unit Base = R_{thJA} = 120 °C/W
3. $T_{JM} - T_A = P_{DM}Z_{thJA}(t)$
4. Surface Mounted

Normalized Thermal Transient Impedance, Junction-to-Ambient

Normalized Thermal Transient Impedance, Junction-to-Foot

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