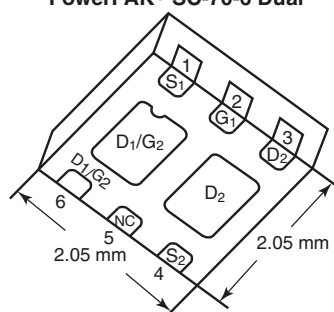


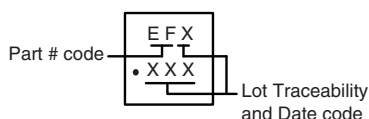
N- and P-Channel for Level Shift Load Switch

PRODUCT SUMMARY

	V _{DS} (V)	R _{DS(on)} (Ω)	I _D (A)	Q _g (Typ.)
N-Channel	20	0.225 at V _{GS} = 4.5 V	1.5 ^a	1.1 nC
		0.270 at V _{GS} = 2.5 V	1.5 ^a	
		0.345 at V _{GS} = 1.8 V	1.5 ^a	
		0.960 at V _{GS} = 1.5 V	0.5	
P-Channel	- 12	0.057 at V _{GS} = - 4.5 V	- 4.5 ^a	5 nC
		0.077 at V _{GS} = - 2.5 V	- 4.5 ^a	
		0.115 at V _{GS} = - 1.8 V	- 4.5 ^a	
		0.200 at V _{GS} = - 1.5 V	- 1.5	

PowerPAK® SC-70-6 Dual


Marking Code

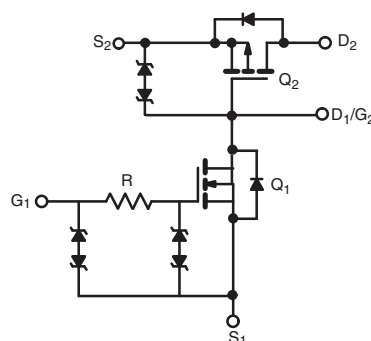

Ordering Information: SiA777EDJ-T1-GE3 (Lead (Pb)-free and Halogen-free)

FEATURES

- Halogen-free According to IEC 61249-2-21 Definition
- TrenchFET® Power MOSFETs
- Typical ESD Protection: N-Channel 2800 V P-Channel 1900 V
- 100 % R_g Tested
- Compliant to RoHS Directive 2002/95/EC

APPLICATIONS

- Load Switch with Level Shift for Portable Devices
 - N-Channel for Level Shift Drive
 - P-Channel for Main Switch


RoHS
COMPLIANT
HALOGEN
FREE


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

Parameter		Symbol	N-Channel	P-Channel	Unit
Drain-Source Voltage		V _{DS}	20	- 12	V
Gate-Source Voltage		V _{GS}	± 6	± 8	
Continuous Drain Current (T _J = 150 °C)	T _C = 25 °C	I _D	1.5 ^a	- 4.5 ^a	A
	T _C = 70 °C		1.5 ^a	- 4.5 ^a	
	T _A = 25 °C		1.5 ^{a, b, c}	- 4.5 ^{a, b, c}	
	T _A = 70 °C		1.5 ^{a, b, c}	- 3.9 ^{b, c}	
Pulsed Drain Current		I _{DM}	4	- 15	
Source Drain Current Diode Current	T _C = 25 °C	I _S	1.5 ^a	- 4.5 ^a	
	T _A = 25 °C		1.6 ^{b, c}	- 1.6 ^{b, c}	
Maximum Power Dissipation	T _C = 25 °C	P _D	5	7.8	W
	T _C = 70 °C		3.2	5	
	T _A = 25 °C		1.9 ^{b, c}	1.9 ^{b, c}	
	T _A = 70 °C		1.2 ^{b, c}	1.2 ^{b, c}	
Operating Junction and Storage Temperature Range		T _J , T _{stg}	- 55 to 150		°C
Soldering Recommendations (Peak Temperature) ^{d, e}			260		

THERMAL RESISTANCE RATINGS

Parameter	Symbol	N-Channel		P-Channel		Unit
		Typ.	Max.	Typ.	Max.	
Maximum Junction-to-Ambient ^{b, f}	R _{thJA}	52	65	52	65	°C/W
Maximum Junction-to-Case (Drain)	R _{thJC}	20	25	12.5	16	

Notes:

a. Package limited.

b. Surface mounted on 1" x 1" FR4 board.

c. t = 5 s.

d. See solder profile (www.vishay.com/doc?73257). The PowerPAK SC-70 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 for channel 1 and channel 2 is 110 °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	N-Ch	20			V
		V _{GS} = 0 V, I _D = - 250 μA	P-Ch	- 12			
V _{DS} Temperature Coefficient	ΔV _{DS} /T _J	I _D = 250 μA	N-Ch		21		mV/°C
		I _D = - 250 μA	P-Ch		- 3		
V _{GS(th)} Temperature Coefficient	ΔV _{GS(th)} /T _J	I _D = 250 μA	N-Ch		- 2.3		
		I _D = - 250 μA	P-Ch		2.3		
Gate Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA	N-Ch	0.4		1.0	V
		V _{DS} = V _{GS} , I _D = - 250 μA	P-Ch	- 0.4		- 1	
Gate-Body Leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 3 V	N-Ch			± 1	μA
		V _{DS} = 0 V, V _{GS} = ± 4.5 V	P-Ch			± 0.5	
		V _{DS} = 0 V, V _{GS} = ± 6 V	N-Ch			± 1	mA
		V _{DS} = 0 V, V _{GS} = ± 8 V	P-Ch			± 3	
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 20 V, V _{GS} = 0 V	N-Ch			1	μA
		V _{DS} = - 12 V, V _{GS} = 0 V	P-Ch			- 1	
		V _{DS} = 20 V, V _{GS} = 0 V, T _J = 55 °C	N-Ch			10	
		V _{DS} = - 12 V, V _{GS} = 0 V, T _J = 55 °C	P-Ch			- 10	
On-State Drain Current ^b	I _{D(on)}	V _{DS} ≥ 5 V, V _{GS} = 4.5 V	N-Ch	4			A
		V _{DS} ≤ - 5 V, V _{GS} = - 4.5 V	P-Ch	- 10			
Drain-Source On-State Resistance ^b	R _{DS(on)}	V _{GS} = 4.5 V, I _D = 1.6 A	N-Ch		0.183	0.225	Ω
		V _{GS} = - 4.5 V, I _D = - 3.8 A	P-Ch		0.047	0.057	
		V _{GS} = 2.5 V, I _D = 1.5 A	N-Ch		0.220	0.270	
		V _{GS} = - 2.5 V, I _D = - 3.3 A	P-Ch		0.063	0.077	
		V _{GS} = 1.8 V, I _D = 1.3 A	N-Ch		0.275	0.345	
		V _{GS} = - 1.8 V, I _D = 2.6 A	P-Ch		0.095	0.115	
		V _{GS} = 1.5 V, I _D = 0.3 A	N-Ch		0.320	0.960	
		V _{GS} = - 1.5 V, I _D = 1 A	P-Ch		0.125	0.200	
Forward Transconductance ^b	g _{fs}	V _{DS} = 10 V, I _D = 1.6 A	N-Ch		3.5		S
		V _{DS} = - 10 V, I _D = - 3.8 A	P-Ch		11		
Dynamic ^a							
Total Gate Charge	Q _g	V _{DS} = 10 V, V _{GS} = 5 V, I _D = 1.7 A	N-Ch		1.3	2.2	nC
		V _{DS} = - 6 V, V _{GS} = - 8 V, I _D = - 4.9 A	P-Ch		7.5	12	
		N-Channel V _{DS} = 10 V, V _{GS} = 4.5 V, I _D = 1.7 A	N-Ch		1.1	1.7	
P-Ch			5	8			
Gate-Source Charge	Q _{gs}	P-Channel V _{DS} = - 6 V, V _{GS} = - 4.5 V, I _D = - 4.9 A	N-Ch		0.2		
Gate-Drain Charge	Q _{gd}		P-Ch		0.6		
			N-Ch		0.1		
Gate Resistance	R _g	f = 1 MHz	P-Ch		1.8		
			N-Ch	40	200	400	Ω
			P-Ch	2	10	20	

Notes:

a. Guaranteed by design, not subject to production testing.

b. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.



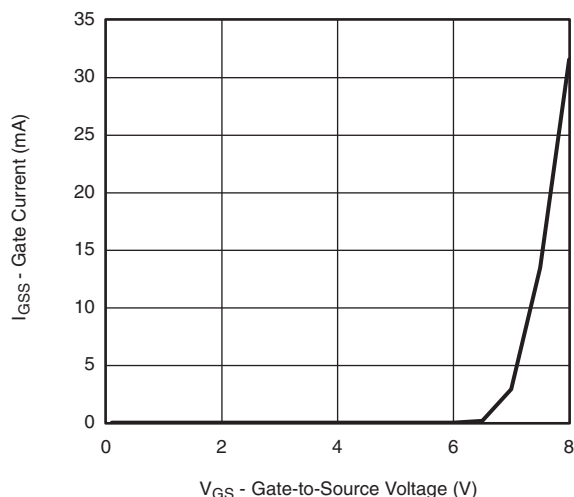
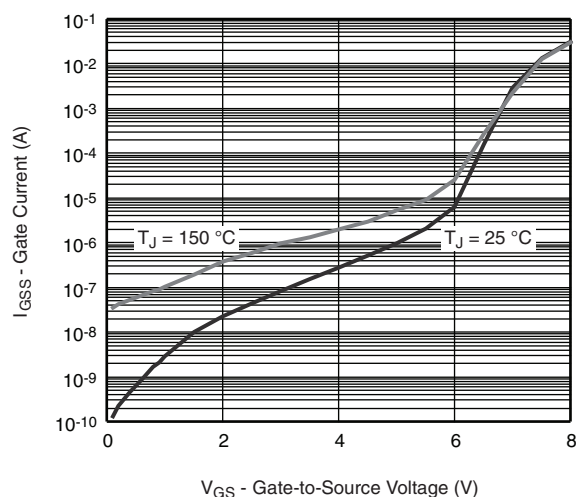
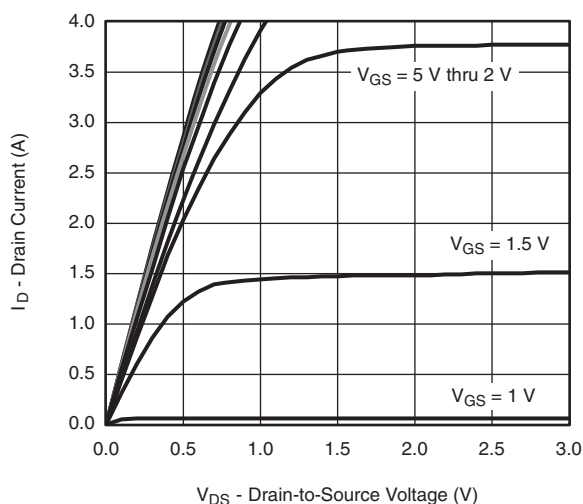
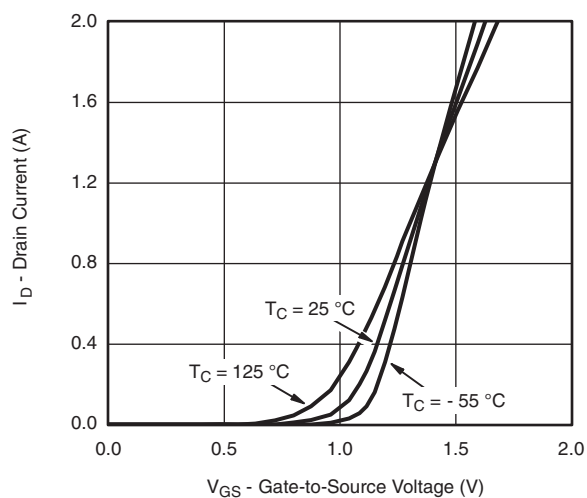
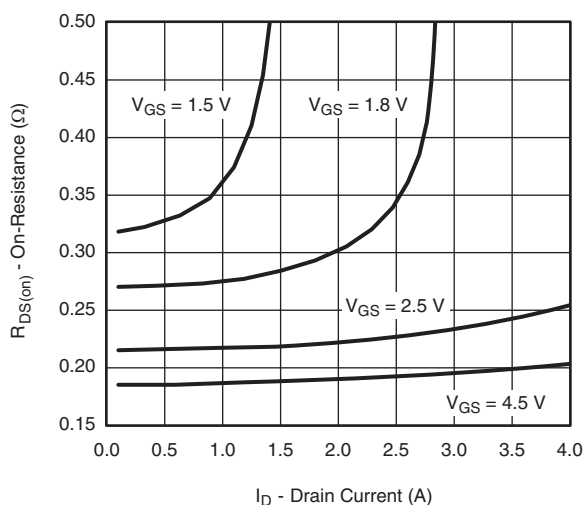
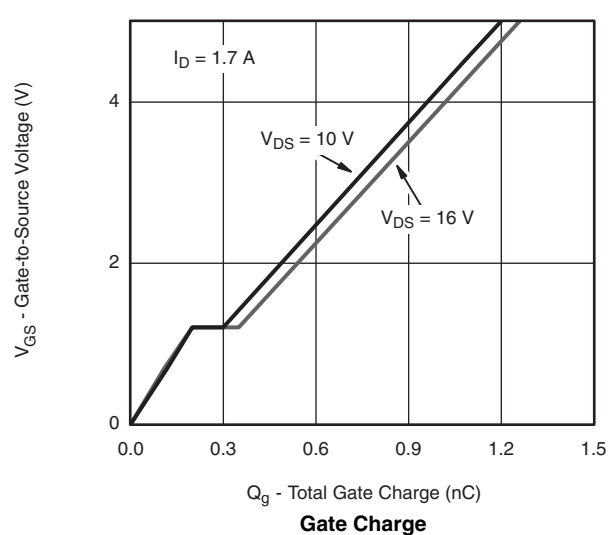
SPECIFICATIONS T _J = 25 °C, unless otherwise noted							
Parameter	Symbol	Test Conditions		Min.	Typ.	Max.	Unit
Dynamic ^a							
Turn-On Delay Time	t _{d(on)}	N-Channel V _{DD} = 10 V, R _L = 7.7 Ω I _D ≡ 1.3 A, V _{GEN} = 4.5 V, R _g = 1 Ω P-Channel V _{DD} = - 6 V, R _L = 1.5 Ω I _D ≡ - 3.9 A, V _{GEN} = - 4.5 V, R _g = 1 Ω	N-Ch		20	30	ns
			P-Ch		20	30	
Rise Time	t _r		N-Ch		12	20	
			P-Ch		20	30	
Turn-Off Delay Time	t _{d(off)}		N-Ch		70	105	
			P-Ch		32	50	
Fall Time	t _f		N-Ch		20	30	
			P-Ch		16	25	
Drain-Source Body Diode Characteristics							
Continuous Source-Drain Diode Current	I _S	T _C = 25 °C	N-Ch			1.5	A
			P-Ch			- 4.5	
Pulse Diode Forward Current ^a	I _{SM}		N-Ch			4	
			P-Ch			- 15	
Body Diode Voltage	V _{SD}	I _S = 1.3 A, V _{GS} = 0 V	N-Ch		0.9	1.2	V
		I _S = - 3.9 A, V _{GS} = 0 V	P-Ch		- 0.8	- 1.2	
Body Diode Reverse Recovery Time	t _{rr}	N-Channel I _F = 1.3 A, di/dt = 100 A/μs, T _J = 25 °C P-Channel I _F = - 3.9 A, di/dt = - 100 A/μs, T _J = 25 °C	N-Ch		50	75	ns
			P-Ch		45	70	
Body Diode Reverse Recovery Charge	Q _{rr}		N-Ch		30	45	nC
			P-Ch		25	40	
Reverse Recovery Fall Time	t _a		N-Ch		15		ns
			P-Ch		15		
Reverse Recovery Rise Time	t _b		N-Ch		35		
			P-Ch		30		

Notes:

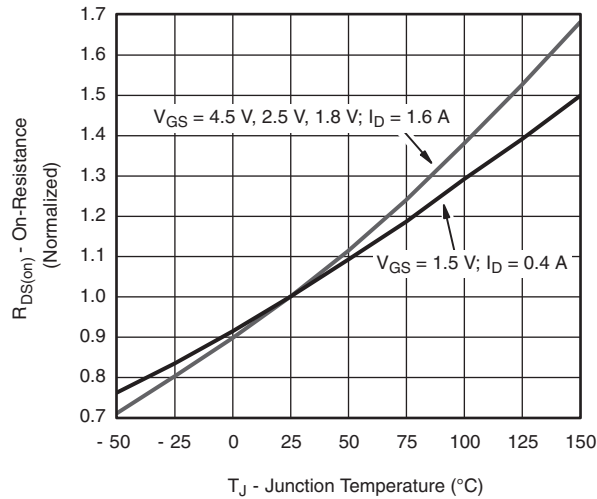
a. Guaranteed by design, not subject to production testing.

b. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.

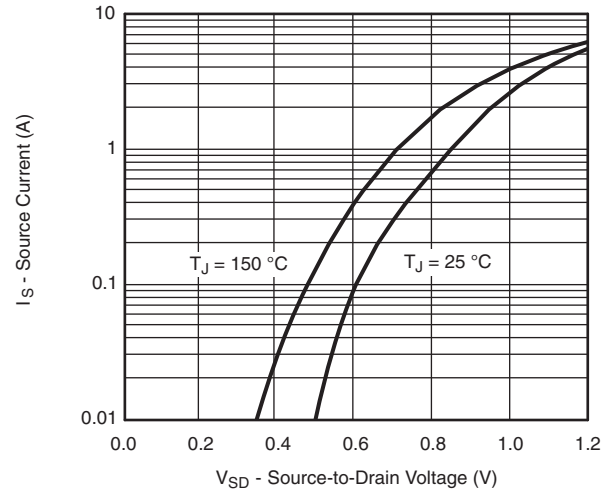
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

N-CHANNEL TYPICAL CHARACTERISTICS $T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise noted

Gate Current vs. Gate-to-Source Voltage

Gate Current vs. Gate-to-Source Voltage

Output Characteristics

Transfer Characteristics

On-Resistance vs. Drain Current

Gate Charge

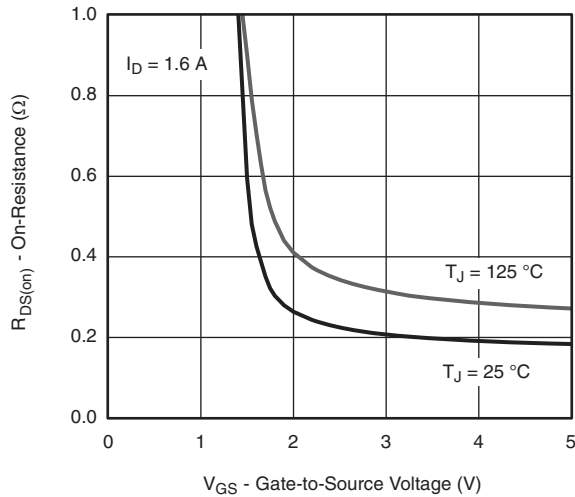
N-CHANNEL TYPICAL CHARACTERISTICS $T_A = 25^\circ\text{C}$, unless otherwise noted



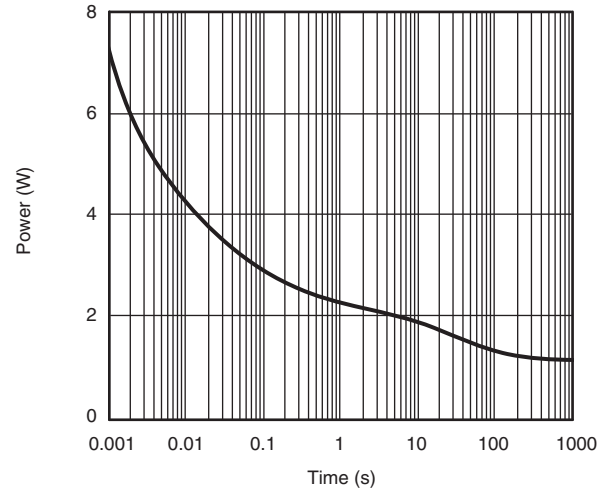
Normalized On-Resistance vs. Junction Temperature



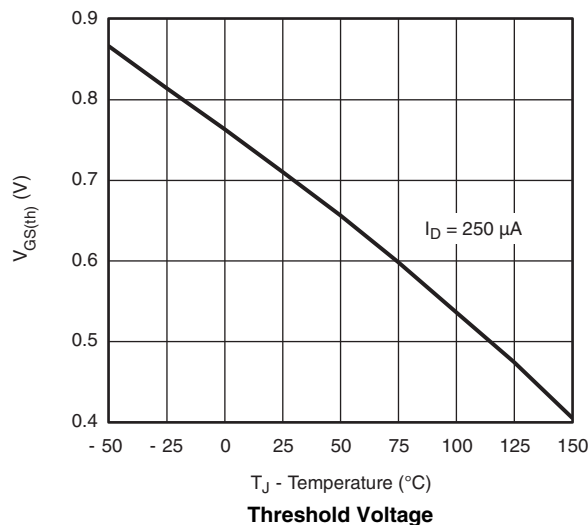
Source-Drain Diode Forward Voltage



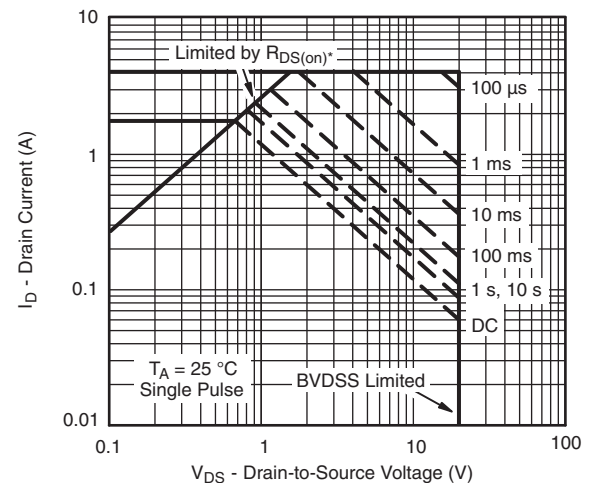
On-Resistance vs. Gate-to-Source Voltage



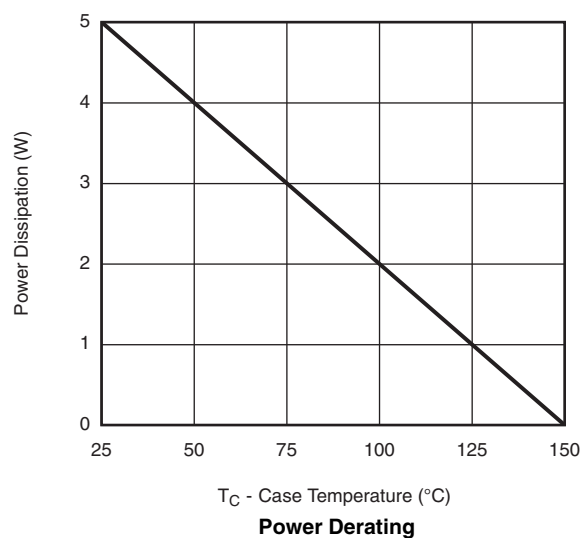
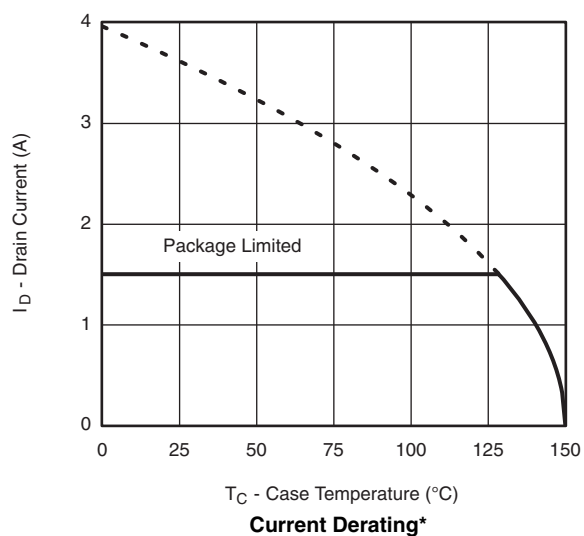
Single Pulse Power, Junction-to-Ambient



Threshold Voltage

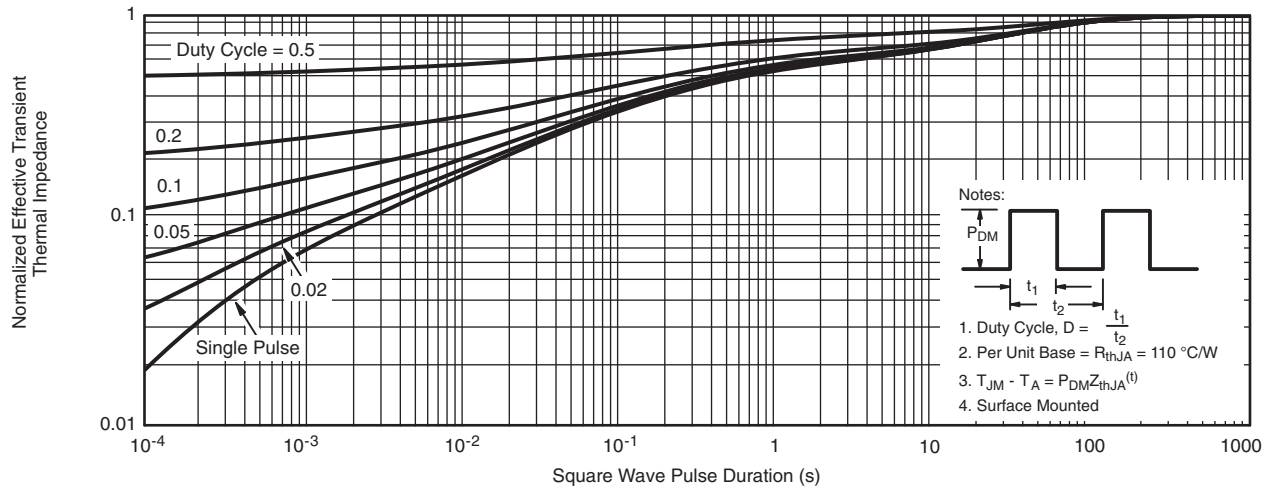


* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified
Safe Operating Area, Junction-to-Ambient

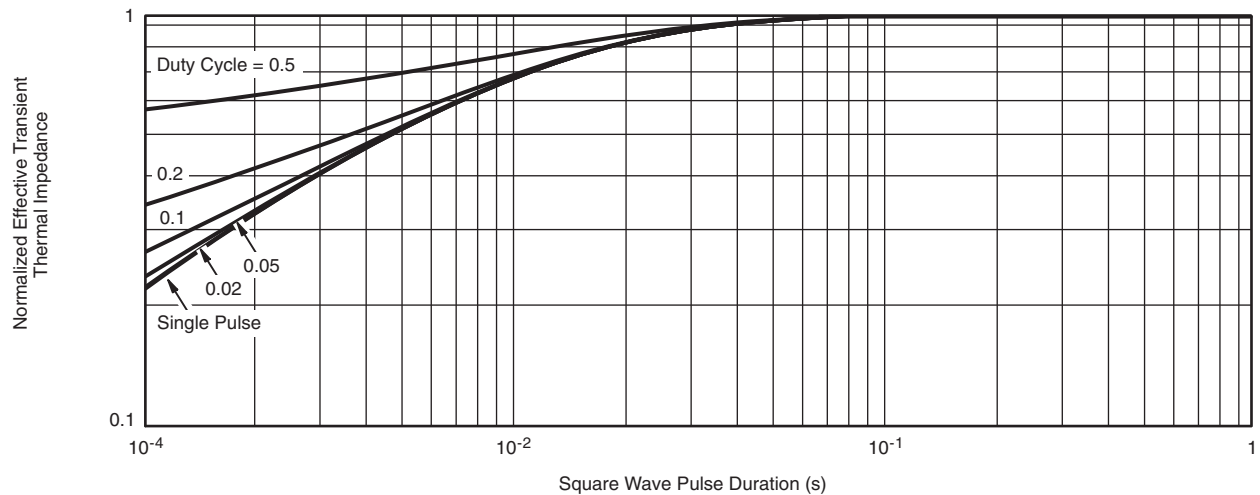
N-CHANNEL TYPICAL CHARACTERISTICS $T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise noted


* The power dissipation P_D is based on $T_{J(\max)} = 150\text{ }^{\circ}\text{C}$, 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.

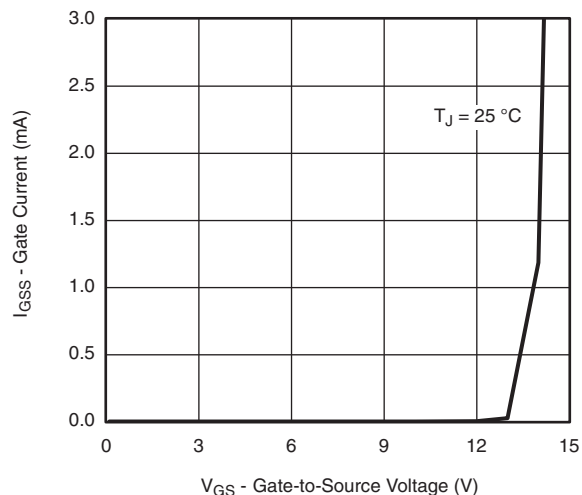
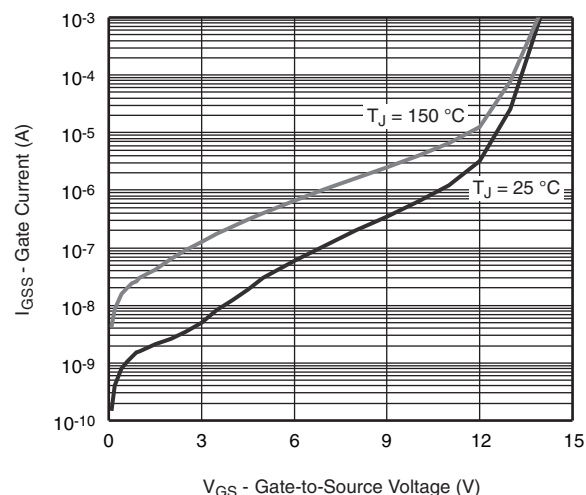
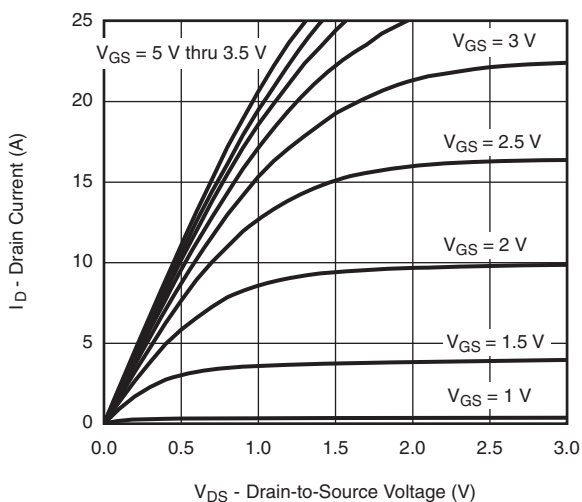
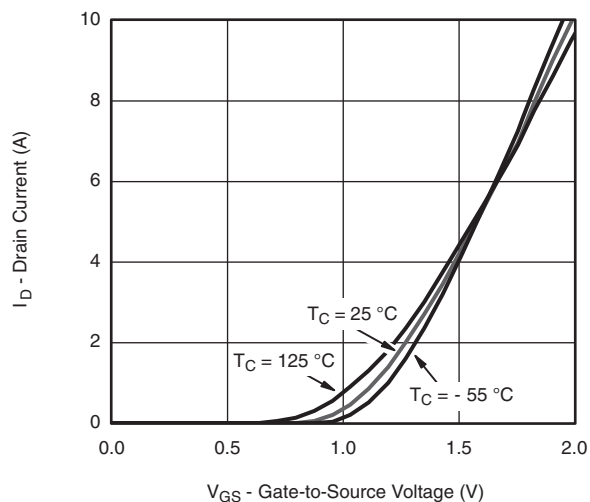
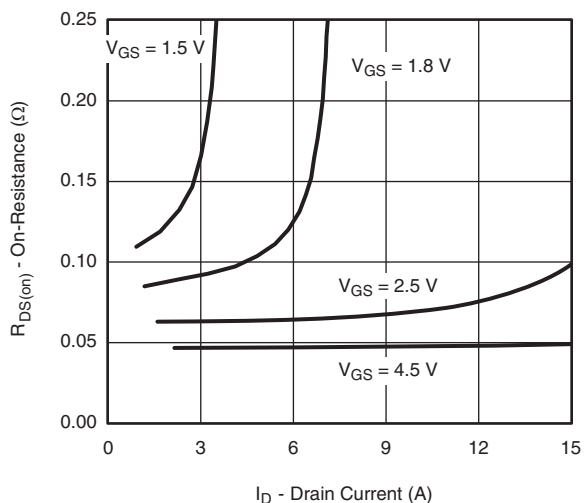
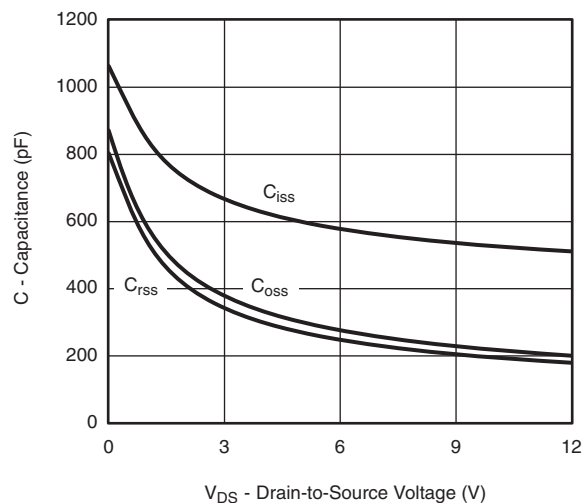
N-CHANNEL TYPICAL CHARACTERISTICS $T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise noted



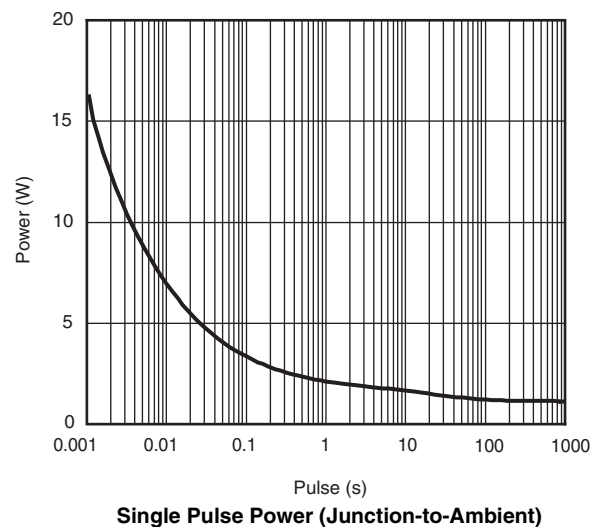
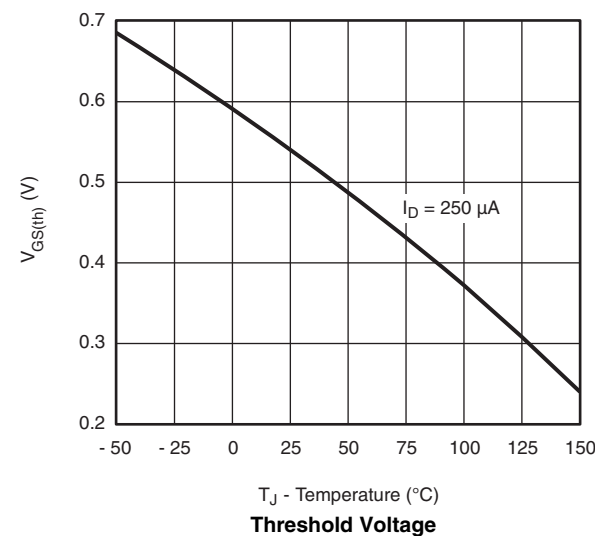
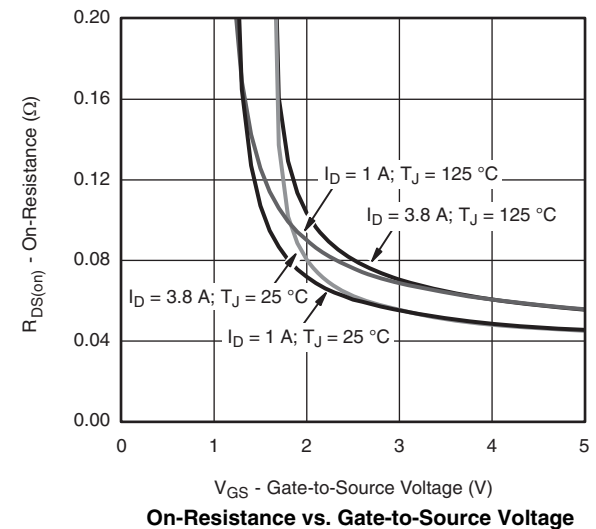
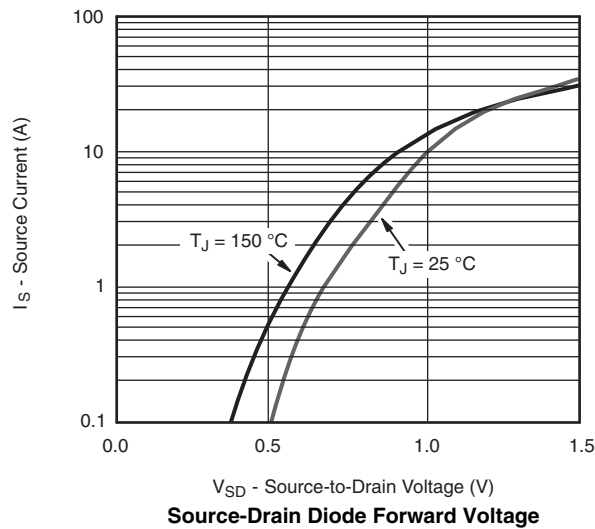
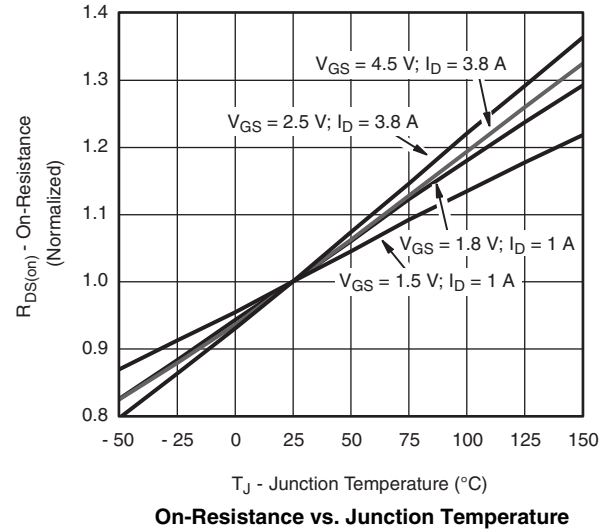
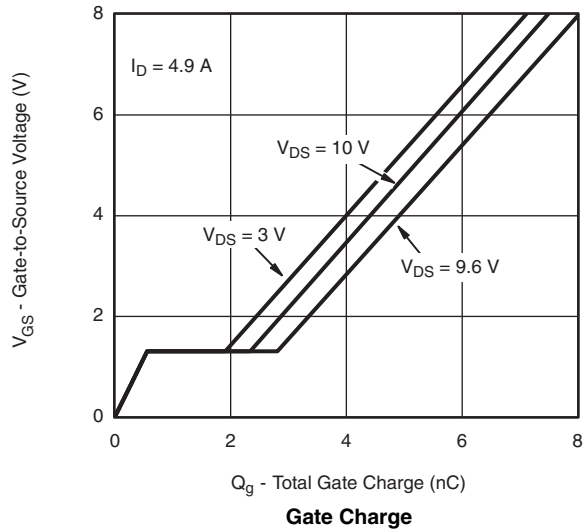
Normalized Thermal Transient Impedance, Junction-to-Ambient

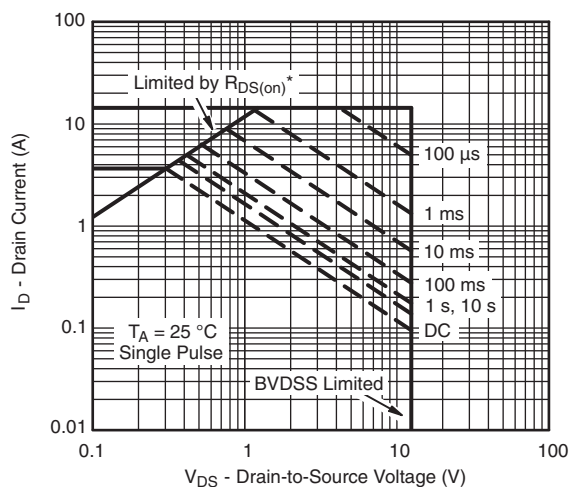


Normalized Thermal Transient Impedance, Junction-to-Case

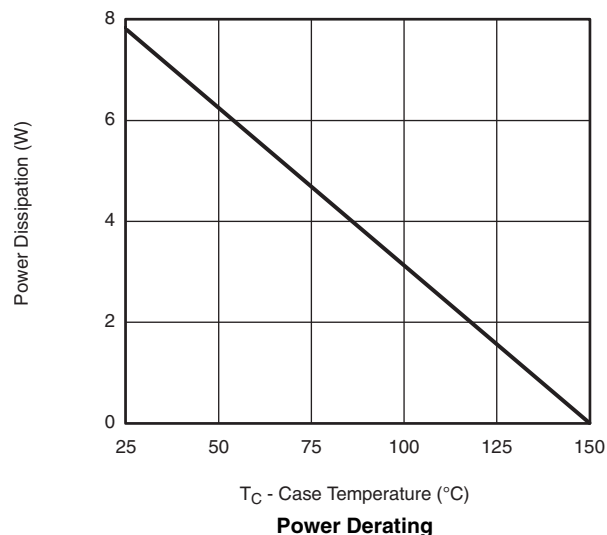
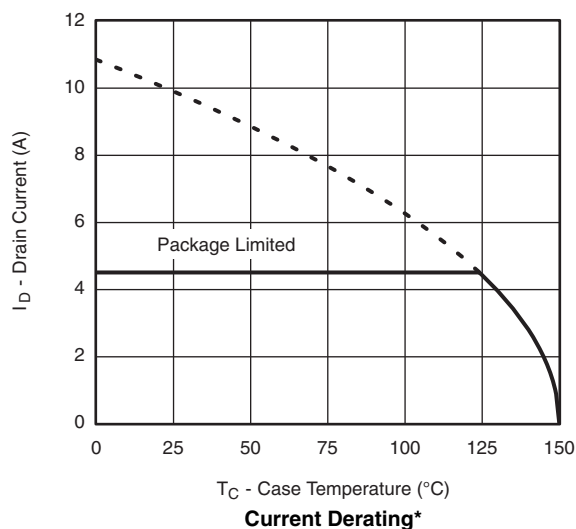
P-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted**Gate Current vs. Gate-Source Voltage****Gate Current vs. Gate-Source Voltage****Output Characteristics****Transfer Characteristics****On-Resistance vs. Drain Current and Gate Voltage****Capacitance**

P-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



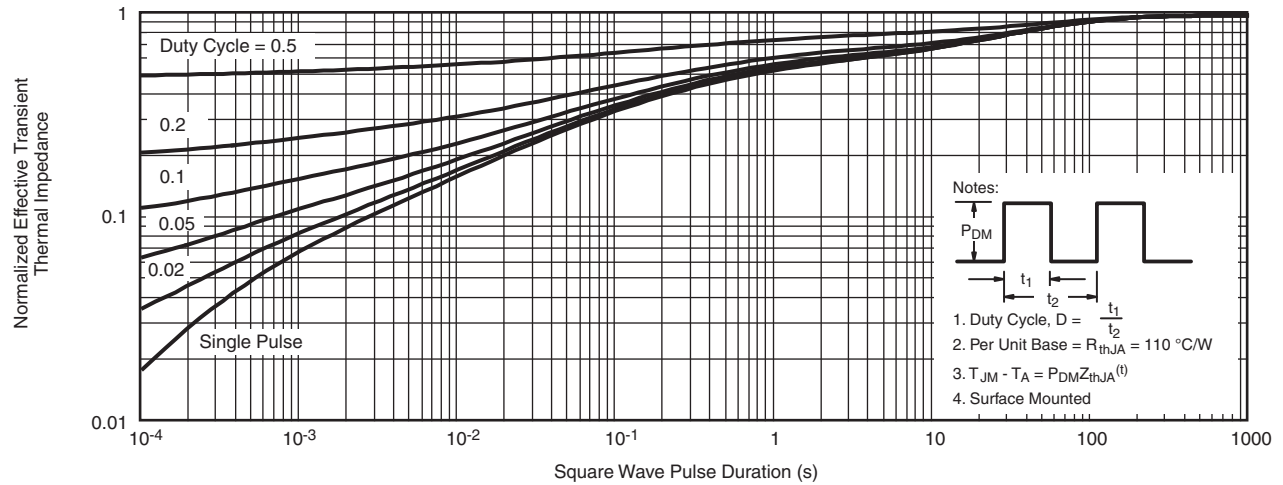
P-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted


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

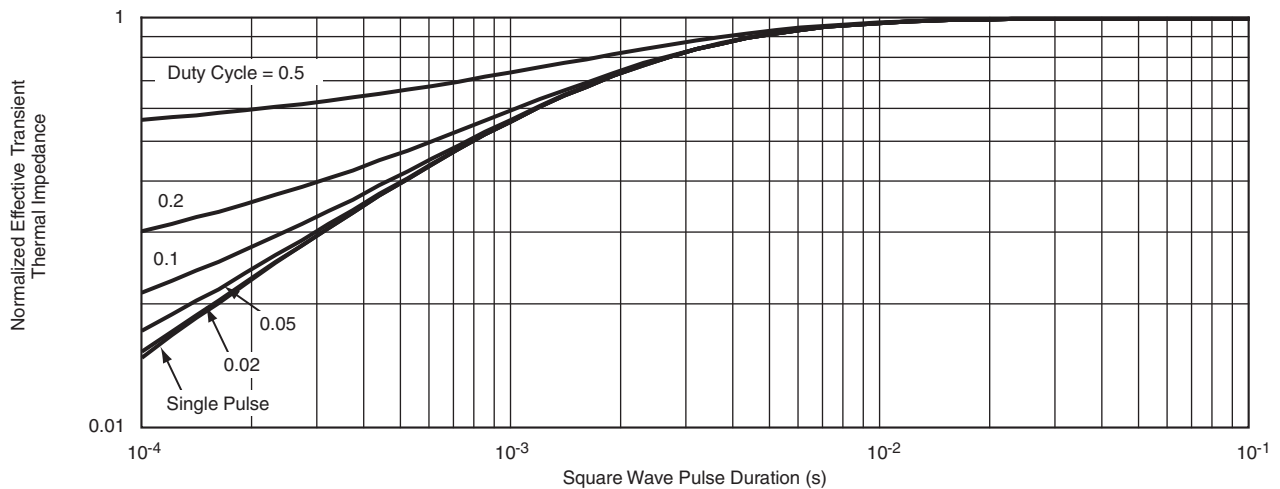
Safe Operating Area, Junction-to-Ambient


* The power dissipation P_D is based on $T_{J(max)} = 150\text{ }^\circ\text{C}$, 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.

P-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Case

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