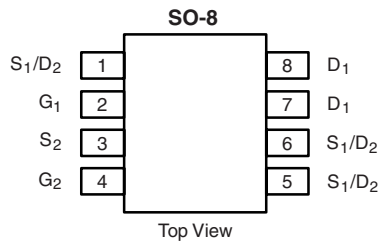


Dual N-Channel 30-V (D-S) MOSFET with Schottky Diode

PRODUCT SUMMARY				
	V _{DS} (V)	R _{DS(on)} (Ω)	I _D (A) ^{a, e}	Q _g (Typ.)
Channel-1	30	0.018 at V _{GS} = 10 V	8.0	10.5
		0.022 at V _{GS} = 4.5 V	8.0	
Channel-2	30	0.018 at V _{GS} = 10 V	8.0	10.5
		0.022 at V _{GS} = 4.5 V	8.0	

SCHOTTKY PRODUCT SUMMARY		
V _{DS} (V)	V _{SD} (V) Diode Forward Voltage	I _F (A) ^a
30	0.43 V at 1.0 A	2.8



Ordering Information: Si4650DY-T1-E3 (Lead (Pb)-free)
Si4650DY-T1-GE3 (Lead (Pb)-free and Halogen-free)

FEATURES

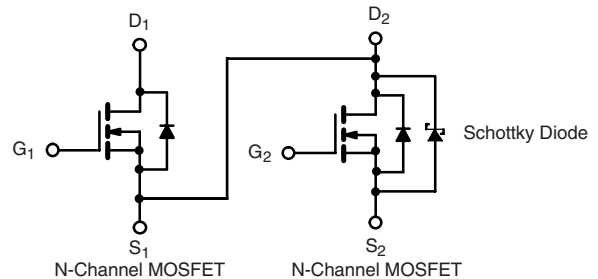
- Halogen-free According to IEC 61249-2-21 Definition
- TrenchFET[®] Power MOSFET
- 100 % R_g and UIS Tested
- Compliant to RoHS Directive 2002/95/EC



RoHS
COMPLIANT
HALOGEN
FREE
Available

APPLICATIONS

- Notebook Logic dc-to-dc
- Low Current dc-to-dc



ABSOLUTE MAXIMUM RATINGS T _A = 25 °C, unless otherwise noted				
Parameter	Symbol	Channel-1	Channel-2	Unit
Drain-Source Voltage	V _{DS}	30	30	V
Gate-Source Voltage	V _{GS}	± 20	± 20	V
Continuous Drain Current (T _J = 150 °C)	I _D	T _C = 25 °C	8.0 ^e	8.0 ^e
		T _C = 70 °C	7.8	7.8
		T _A = 25 °C	7.8 ^{b, c}	7.8 ^{b, c}
		T _A = 70 °C	6.2 ^{b, c}	6.2 ^{b, c}
Pulsed Drain Current (10 μs Pulse Width)	I _{DM}	30	30	A
Source-Drain Current Diode Current	I _S	T _C = 25 °C	2.8	2.8
		T _A = 25 °C	1.8 ^{b, c}	1.8 ^{b, c}
Pulsed Source-Drain Current	I _{SM}	30	30	A
Single Pulse Avalanche Current	I _{AS}	20	20	A
Single Pulse Avalanche Energy	E _{AS}	20	20	mJ
Maximum Power Dissipation	P _D	T _C = 25 °C	3.1	3.1
		T _C = 70 °C	2	2
		T _A = 25 °C	2 ^{b, c}	2 ^{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

THERMAL RESISTANCE RATINGS						
Parameter	Symbol	Channel-1		Channel-2		Unit
		Typ.	Max.	Typ.	Max.	
Maximum Junction-to-Ambient ^{b, d}	R _{thJA}	52	62.5	52	62.5	°C/W
Maximum Junction-to-Foot (Drain)	R _{thJF}	35	40	35	40	°C/W

Notes:

- Based on T_C = 25 °C.
- Surface mounted on 1" x 1" FR4 board.
- t = 10 s.
- Maximum under steady state conditions is 110 °C/W (Channel-1) and 110 °C/W (Channel-2).
- Package limited.

SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted								
Parameter	Symbol	Test Conditions	Min.	Typ. ^a	Max.	Unit		
Static								
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}, I_D = 1\text{ mA}$	Ch-1	30			V	
		$V_{GS} = 0\text{ V}, I_D = 1\text{ mA}$	Ch-2	30				
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = 250\text{ }\mu\text{A}$	Ch-1		35		mV/ $^\circ\text{C}$	
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$	$I_D = 250\text{ }\mu\text{A}$	Ch-1		-6			
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 1\text{ mA}$	Ch-1	1		3	V	
		$V_{DS} = V_{GS}, I_D = 1\text{ mA}$	Ch-2	1		3		
Gate-Body Leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$	Ch-1			100	μA	
		$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$	Ch-2			100		
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}$	Ch-1			0.001	mA	
		$V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}$	Ch-2		0.06	0.5		
		$V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}, T_J = 100\text{ }^\circ\text{C}$	Ch-1			0.025		
		$V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}, T_J = 100\text{ }^\circ\text{C}$	Ch-2		5	20		
On-State Drain Current ^b	$I_{D(on)}$	$V_{DS} = 5\text{ V}, V_{GS} = 10\text{ V}$	Ch-1	20			A	
		$V_{DS} = 5\text{ V}, V_{GS} = 10\text{ V}$	Ch-2	20				
Drain-Source On-State Resistance ^b	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 8\text{ A}$	Ch-1		0.014	0.018	Ω	
		$V_{GS} = 10\text{ V}, I_D = 8\text{ A}$	Ch-2		0.014	0.018		
		$V_{GS} = 4.5\text{ V}, I_D = 5\text{ A}$	Ch-1		0.017	0.022		
		$V_{GS} = 4.5\text{ V}, I_D = 5\text{ A}$	Ch-2		0.017	0.022		
Forward Transconductance ^b	g_{fs}	$V_{DS} = 15\text{ V}, I_D = 8\text{ A}$	Ch-1		40		S	
		$V_{DS} = 15\text{ V}, I_D = 8\text{ A}$	Ch-2		40			
Dynamic^a								
Input Capacitance	C_{iss}	Channel-1 $V_{DS} = 15\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	Ch-1		1550		pF	
			Ch-2		1550			
Output Capacitance	C_{oss}		Ch-1		220			
			Ch-2		275			
Reverse Transfer Capacitance	C_{rss}	Channel-2 $V_{DS} = 15\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	Ch-1		80			
			Ch-2		80			
Total Gate Charge	Q_g		$V_{DS} = 15\text{ V}, V_{GS} = 10\text{ V}, I_D = 8\text{ A}$	Ch-1		25.5	40	nC
				Ch-2		25.5	40	
		$V_{DS} = 15\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 8\text{ A}$	Ch-1		10.5	16		
			Ch-2		10.5	16		
Gate-Source Charge	Q_{gs}	Channel-2 $V_{DS} = 15\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 8\text{ A}$	Ch-1		5			
Gate-Drain Charge	Q_{gd}		Ch-2		5			
Gate Resistance	R_g	$f = 1\text{ MHz}$	Ch-1		1.8	3.0	Ω	
			Ch-2		1.8	3.0		

Notes:

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

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



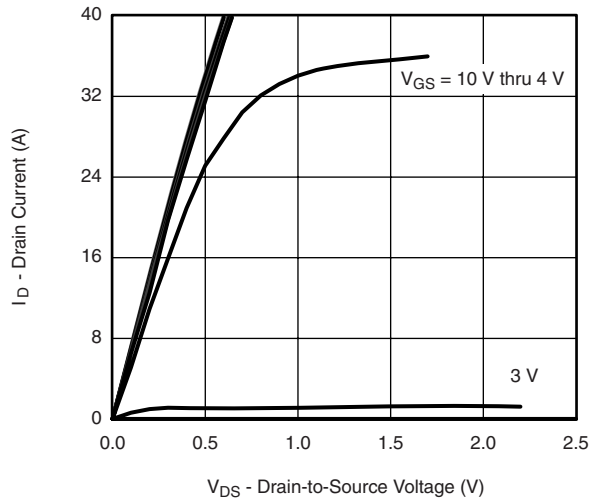
SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted							
Parameter	Symbol	Test Conditions	Min.	Typ. ^a	Max.	Unit	
Dynamic^a							
Turn-On Delay Time	$t_{d(on)}$	Channel-1 $V_{DD} = 15\text{ V}, R_L = 3\ \Omega$ $I_D \cong 5\text{ A}, V_{GEN} = 10\text{ V}, R_g = 1\ \Omega$	Ch-1		7	14	ns
			Ch-2		7	14	
Rise Time	t_r		Ch-1		29	45	
			Ch-2		29	45	
Turn-Off Delay Time	$t_{d(off)}$	Channel-2 $V_{DD} = 15\text{ V}, R_L = 3\ \Omega$ $I_D \cong 5\text{ A}, V_{GEN} = 10\text{ V}, R_g = 1\ \Omega$	Ch-1		19	30	
			Ch-2		19	30	
Fall Time	t_f		Ch-1		8	16	
			Ch-2		8	16	
Turn-On Delay Time	$t_{d(on)}$	Channel-1 $V_{DD} = 15\text{ V}, R_L = 3\ \Omega$ $I_D \cong 5\text{ A}, V_{GEN} = 4.5\text{ V}, R_g = 1\ \Omega$	Ch-1		32	50	
			Ch-2		32	50	
Rise Time	t_r		Ch-1		130	200	
			Ch-2		130	200	
Turn-Off Delay Time	$t_{d(off)}$	Channel-2 $V_{DD} = 15\text{ V}, R_L = 3\ \Omega$ $I_D \cong 5\text{ A}, V_{GEN} = 4.5\text{ V}, R_g = 1\ \Omega$	Ch-1		19	30	
			Ch-2		19	30	
Fall Time	t_f		Ch-1		34	55	
			Ch-2		34	55	
Drain-Source Body Diode Characteristics							
Continuous Source-Drain Diode Current	I_S	$T_C = 25\text{ }^\circ\text{C}$	Ch-1			2.8	A
			Ch-2			2.8	
Pulse Diode Forward Current ^a	I_{SM}		Ch-1			30	
			Ch-2			30	
Body Diode Voltage	V_{SD}	$I_S = 2\text{ A}$	Ch-1		0.77	1.1	V
		$I_S = 1\text{ A}$	Ch-2		0.37	0.43	
Body Diode Reverse Recovery Time	t_{rr}	Channel-1 $I_F = 4\text{ A}, dI/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$	Ch-1		25	40	ns
			Ch-2		23	40	
Body Diode Reverse Recovery Charge	Q_{rr}		Ch-1		18	30	nC
			Ch-2		13	20	
Reverse Recovery Fall Time	t_a	Channel-2 $I_F = 4\text{ A}, dI/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$	Ch-1		14		ns
			Ch-2		11		
Reverse Recovery Rise Time	t_b		Ch-1		11		
			Ch-2		12		

Notes:

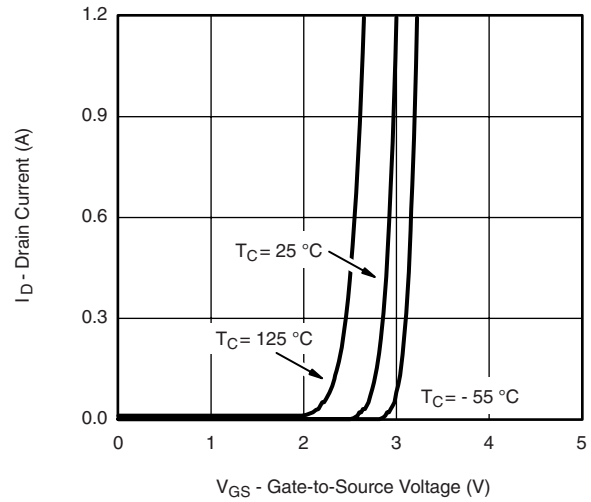
- a. Guaranteed by design, not subject to production testing.
- b. Pulse test; pulse width $\leq 300\ \mu\text{s}$, duty cycle $\leq 2\%$.

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.

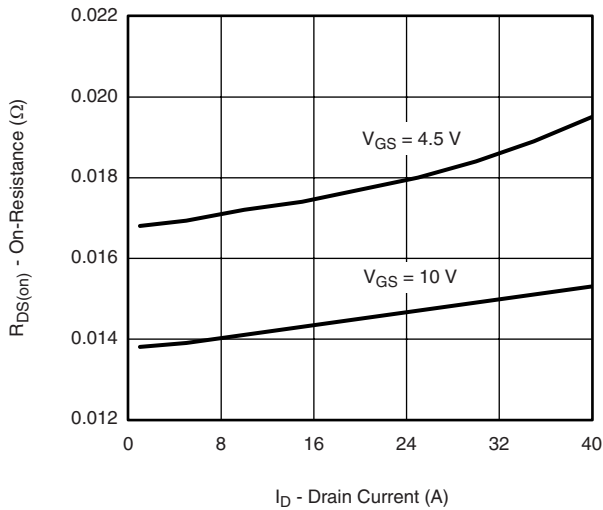
CHANNEL-1 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



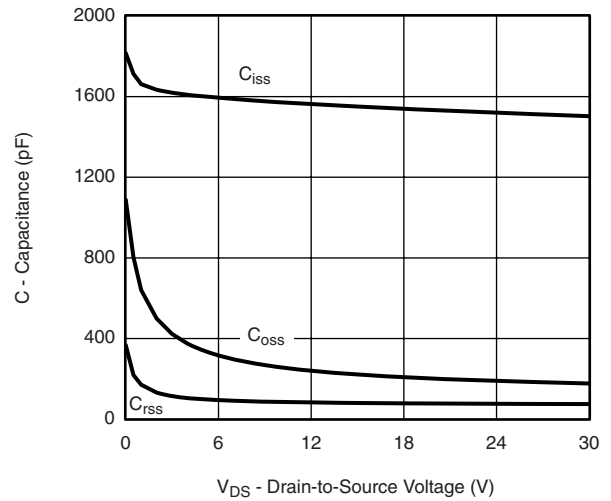
Output Characteristics



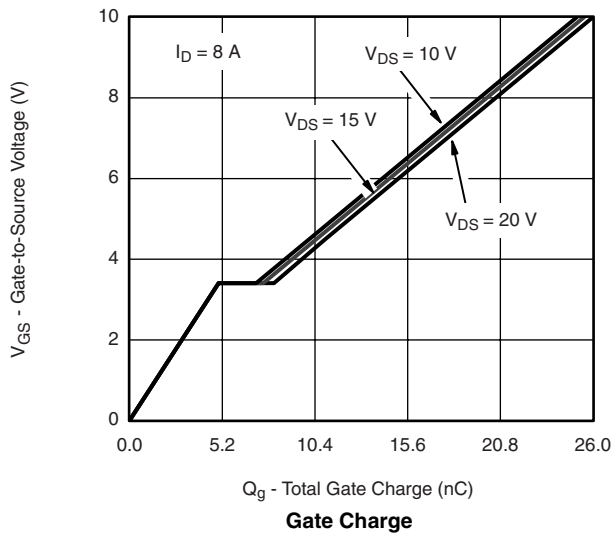
Transfer Characteristics



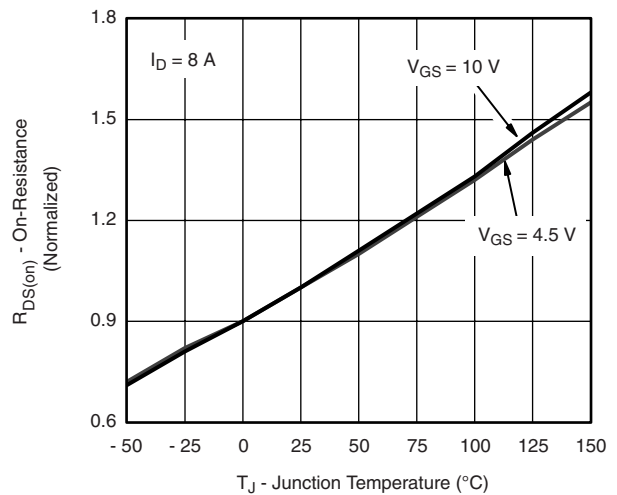
On-Resistance vs. Drain Current



Capacitance

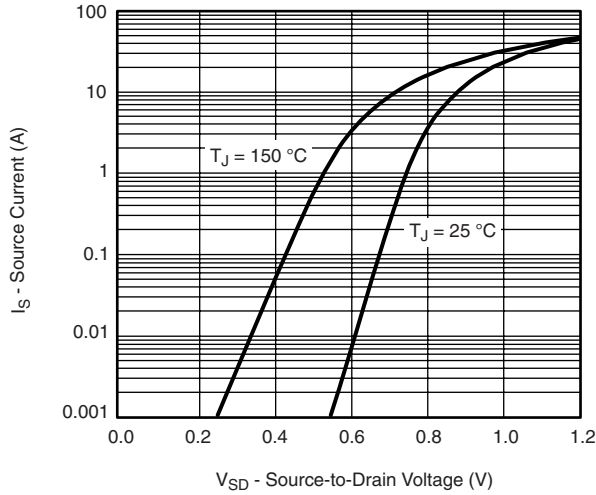


Gate Charge

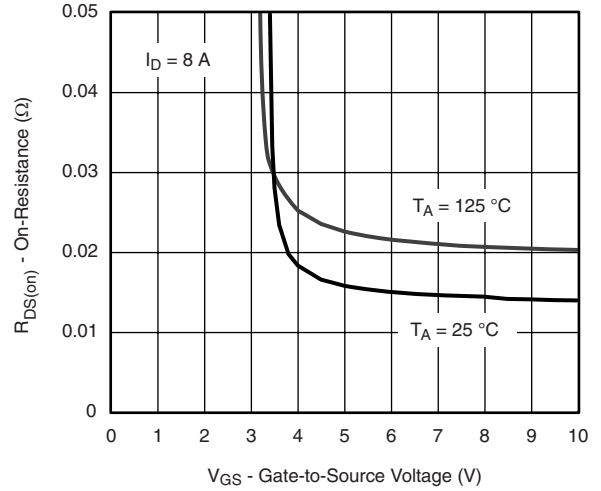


On-Resistance vs. Junction Temperature

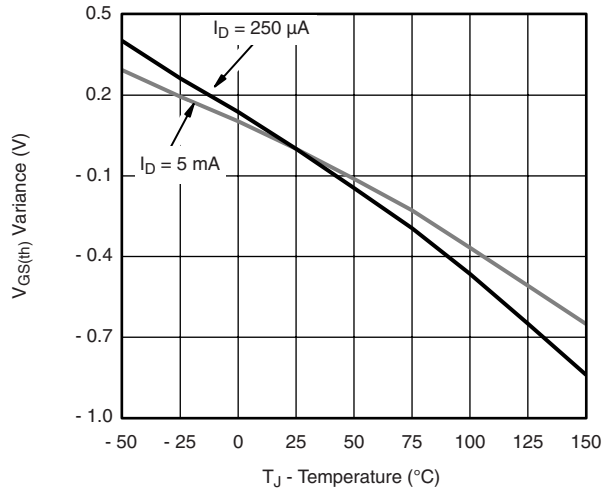
CHANNEL-1 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



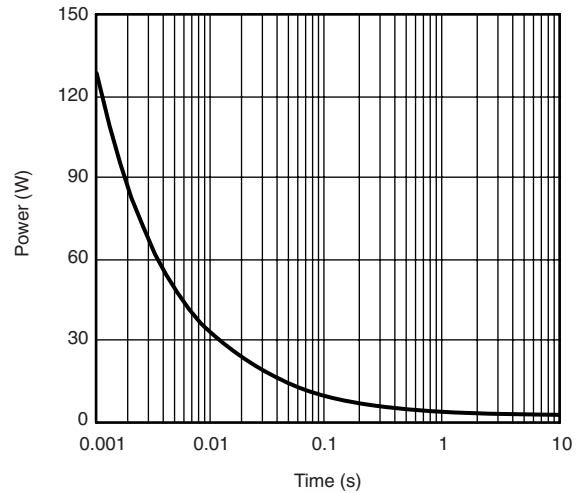
Source-Drain Diode Forward Voltage



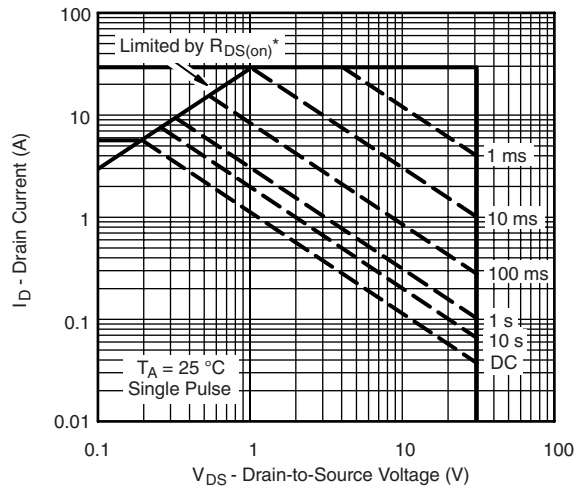
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



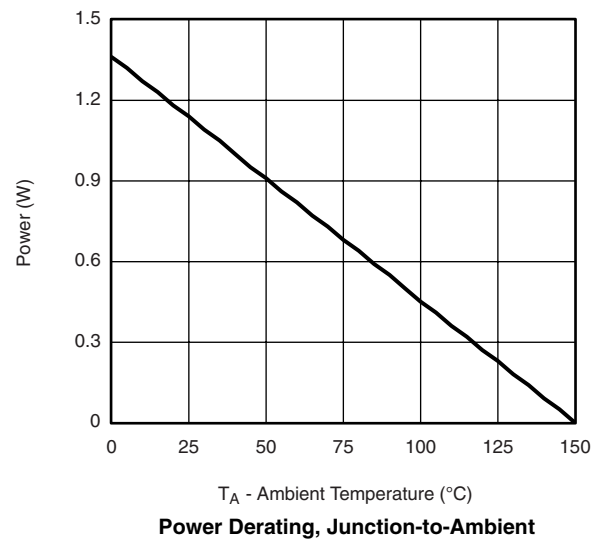
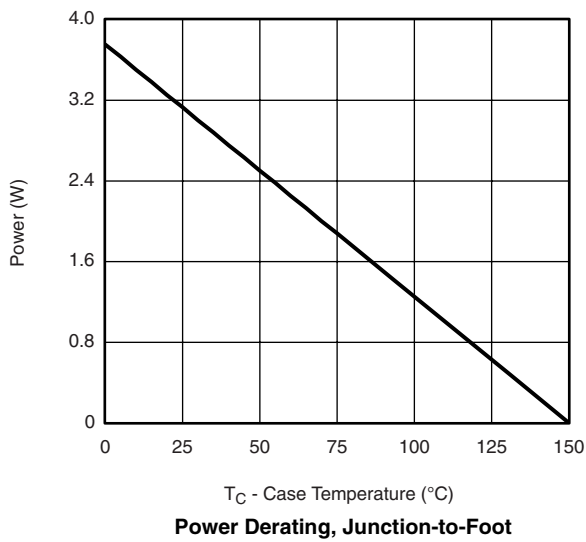
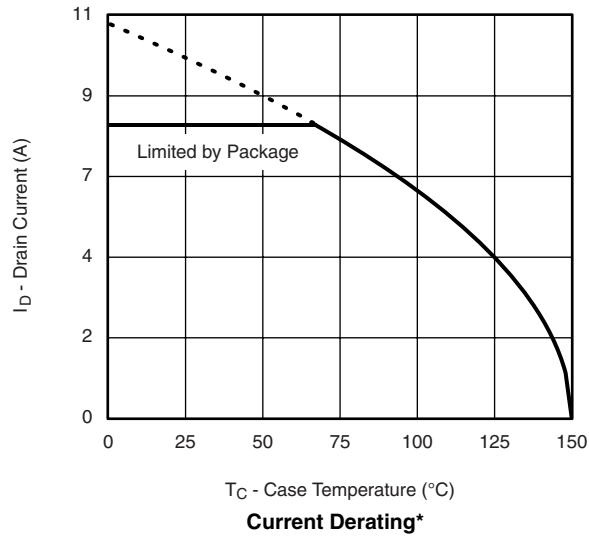
Single Pulse Power, Junction-to-Ambient



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

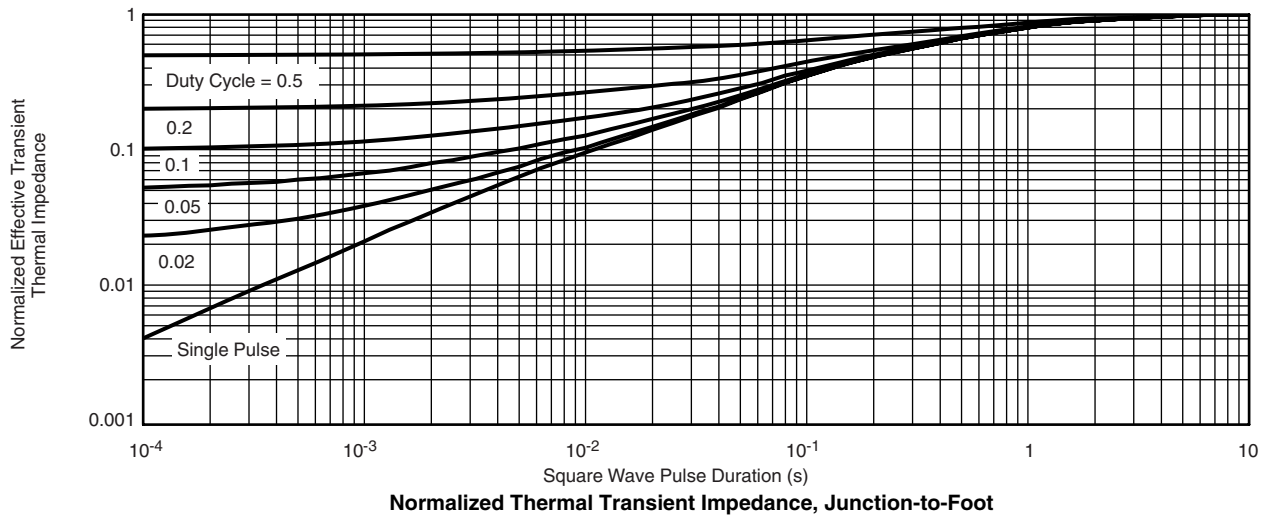
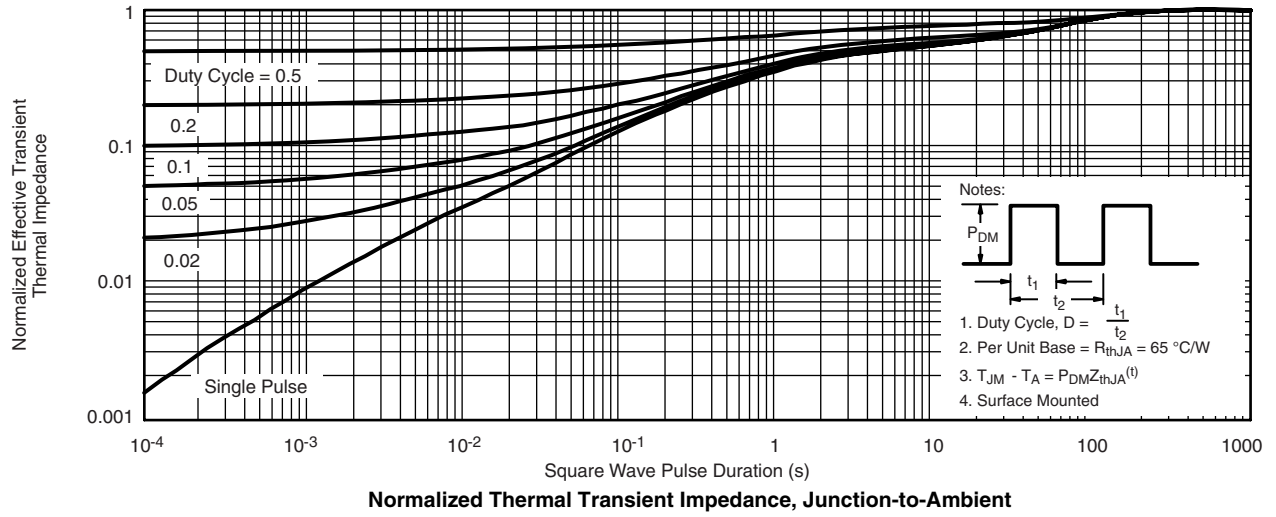
Safe Operating Area, Junction-to-Ambient

CHANNEL-1 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

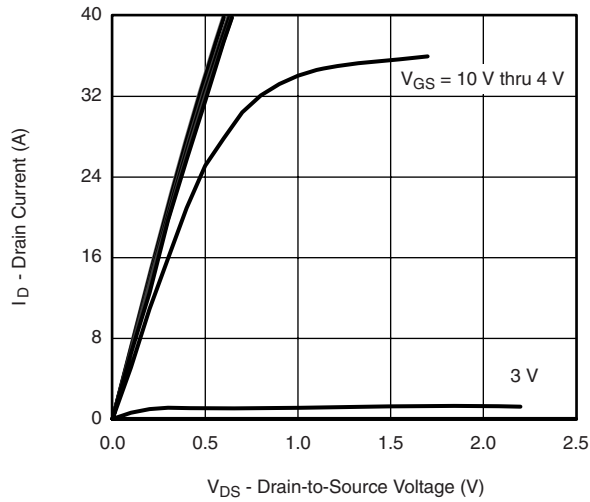


* The power dissipation P_D is based on $T_{J(max)} = 150$ °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

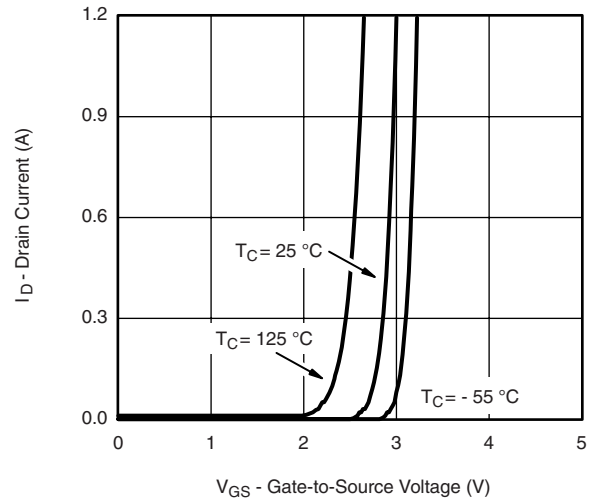
CHANNEL-1 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



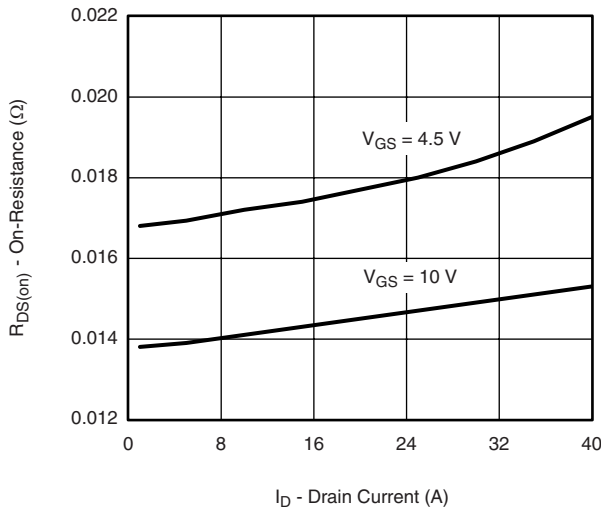
CHANNEL-2 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



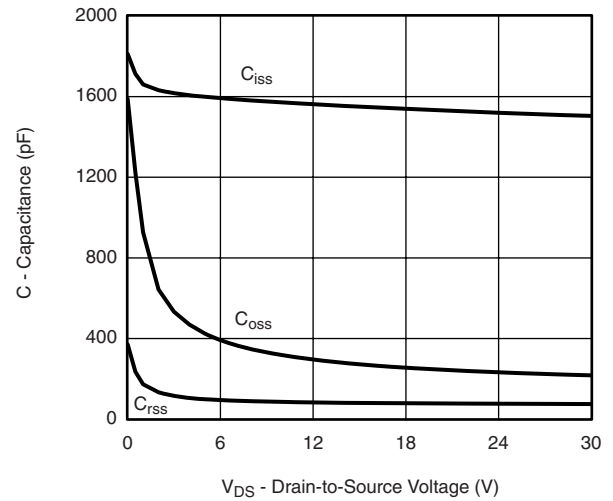
Output Characteristics



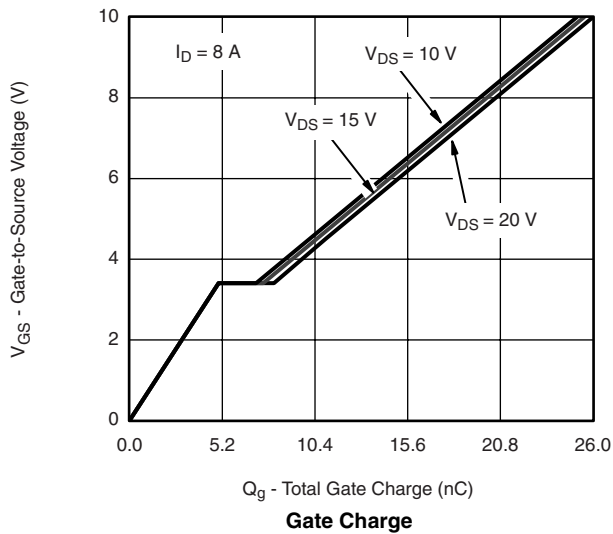
Transfer Characteristics



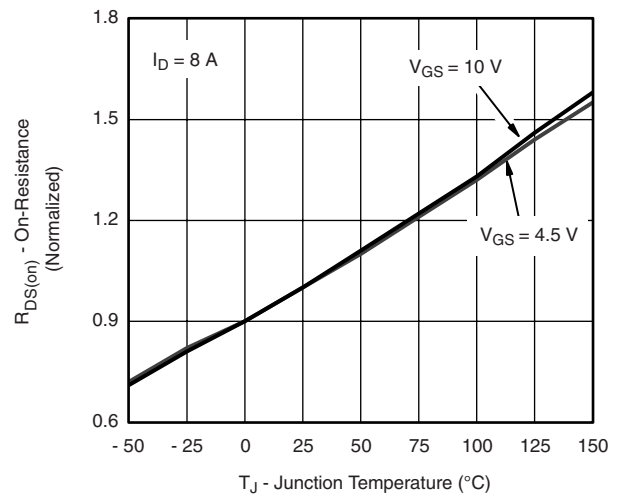
On-Resistance vs. Drain Current



Capacitance

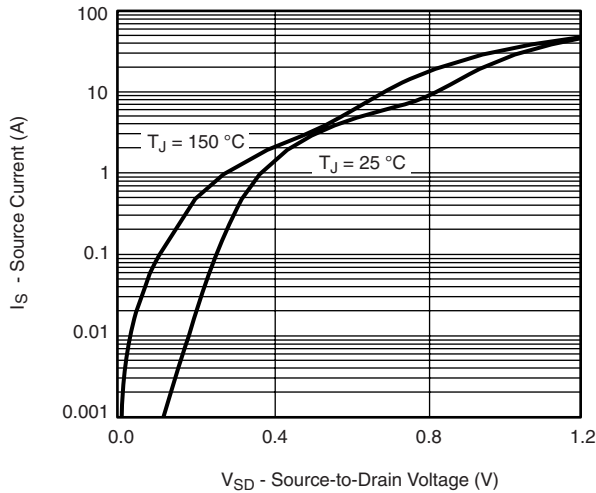


Gate Charge

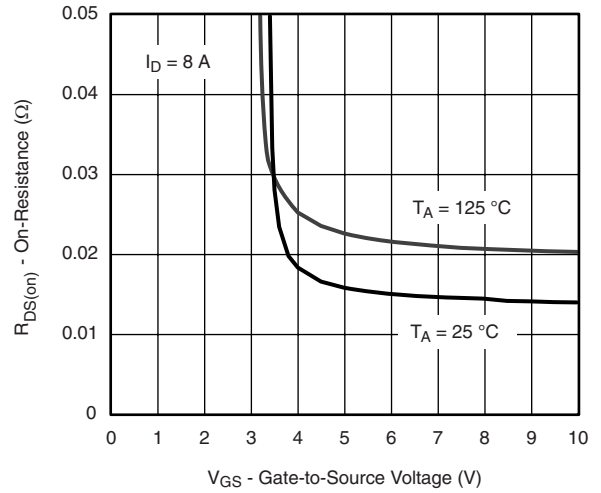


On-Resistance vs. Junction Temperature

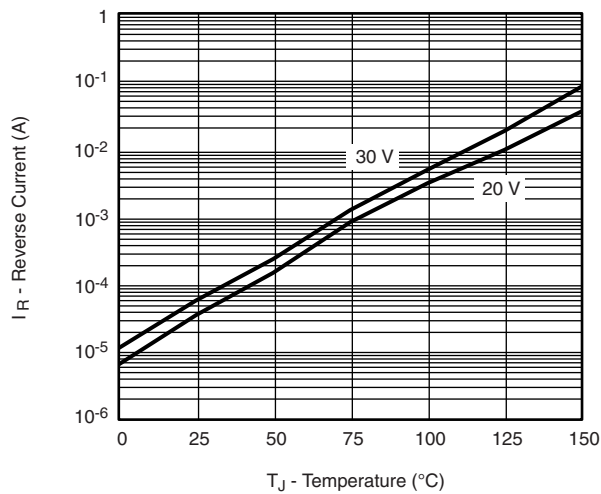
CHANNEL-2 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



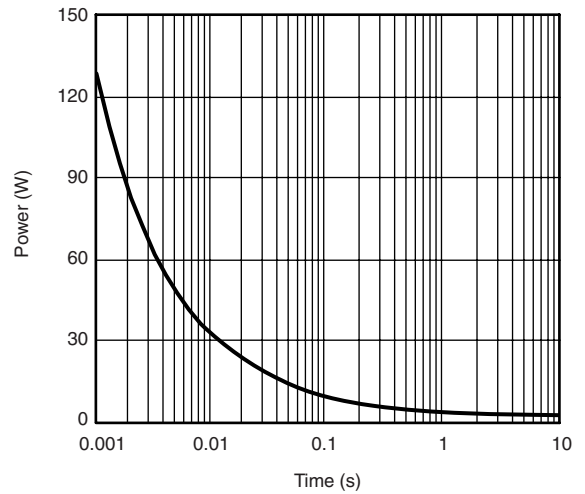
Source-Drain Diode Forward Voltage



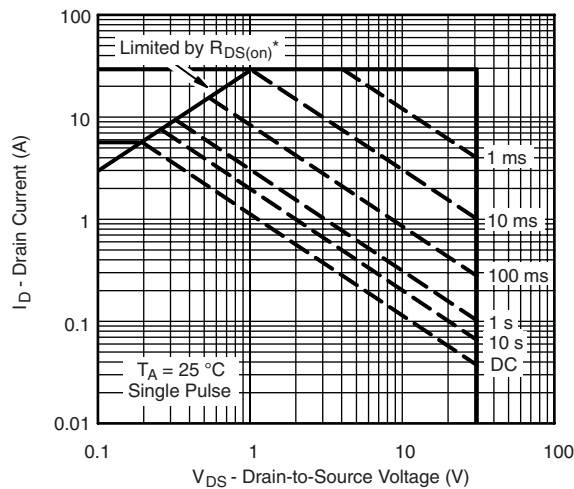
On-Resistance vs. Gate-to-Source Voltage



Reverse Current



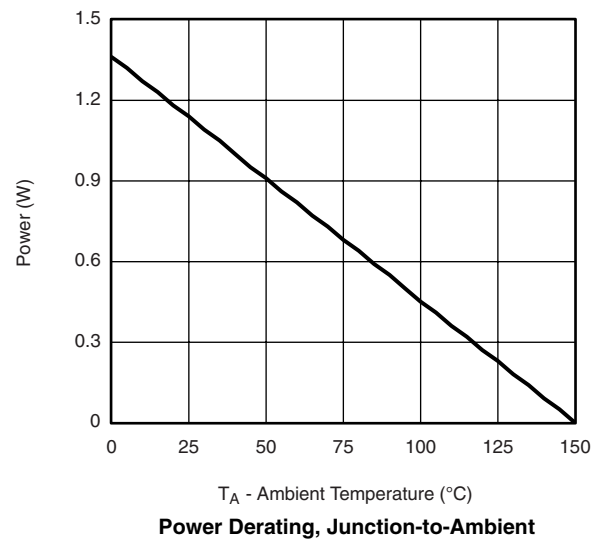
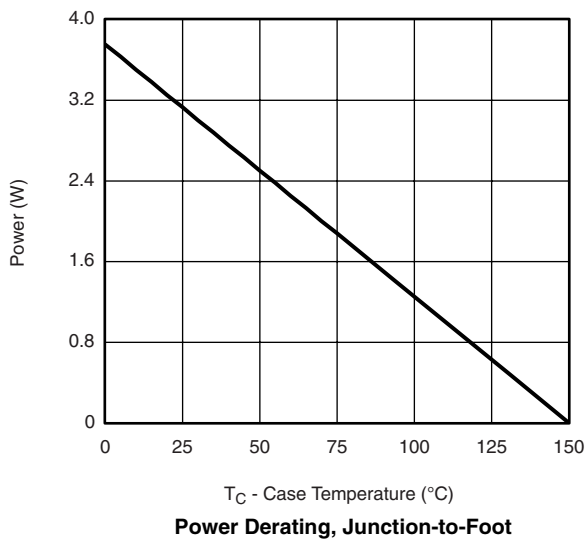
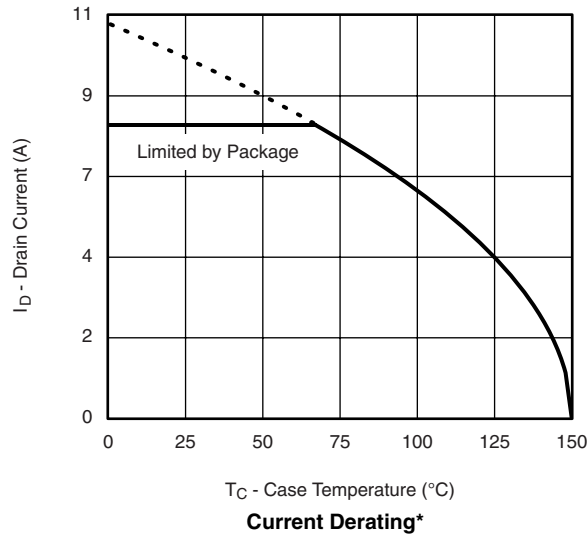
Single Pulse Power, Junction-to-Ambient



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

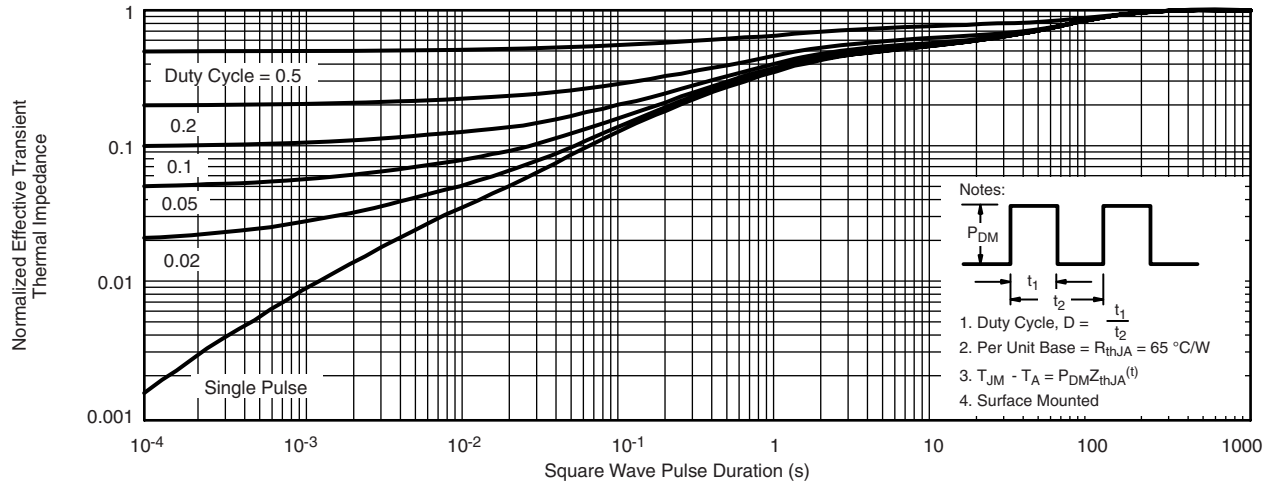
Safe Operating Area, Junction-to-Ambient

CHANNEL-2 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

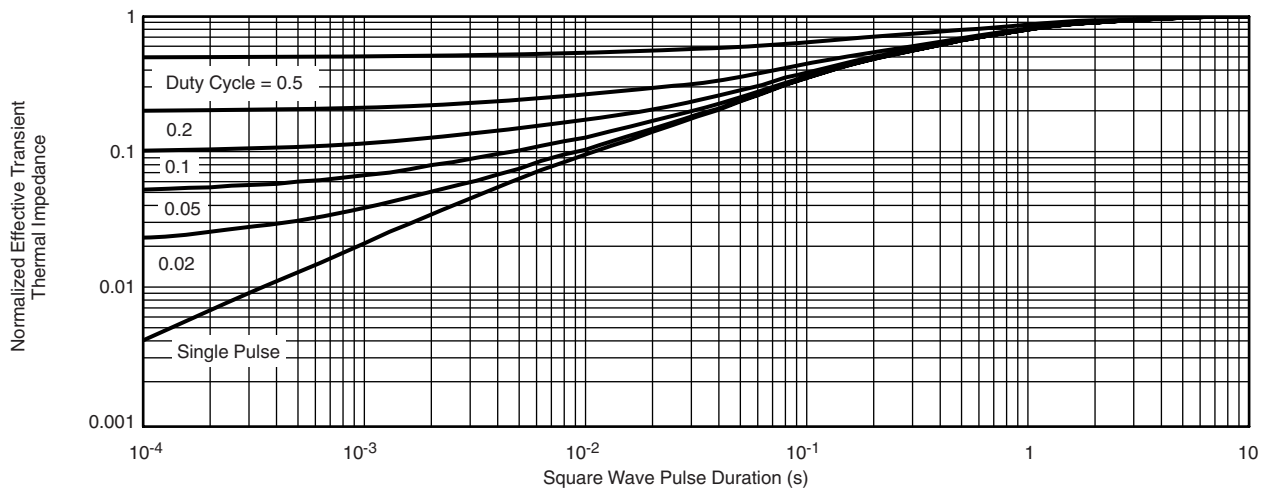


* The power dissipation P_D is based on $T_{J(max)} = 150$ °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

CHANNEL-2 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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