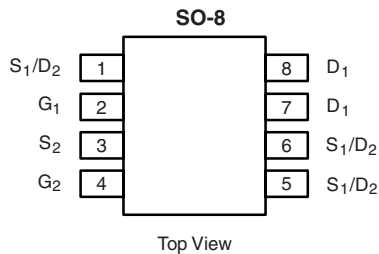


Dual N-Channel 30-V (D-S) MOSFET with Schottky Diode

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)

FEATURES

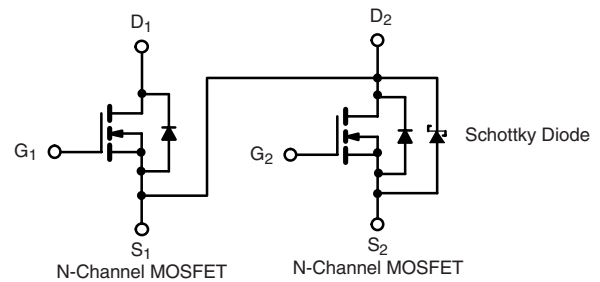
- TrenchFET[®] Power MOSFET
- 100 % R_g and UIS Tested

APPLICATIONS

- Notebook Logic DC-DC
- Low Current DC-DC



RoHS
COMPLIANT



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
				Ch-2		25.5	40
		Channel-1 $V_{DS} = 15\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 8\text{ A}$	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		
Ch-2			5				
Gate-Drain Charge	Q_{gd}	Channel-1 $V_{DS} = 15\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 8\text{ A}$	Ch-1		2.5		
			Ch-2		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		

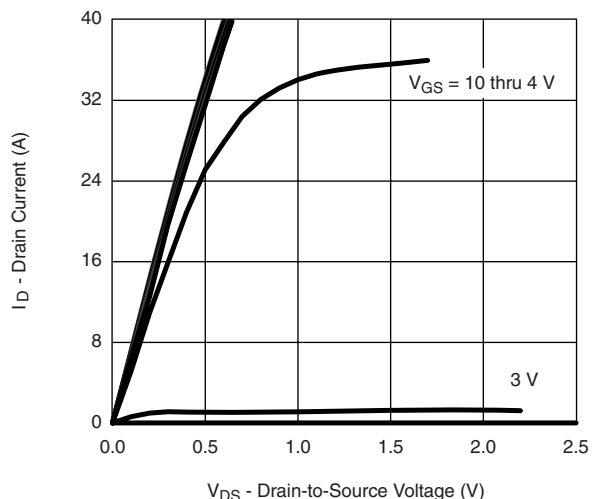
Notes:

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

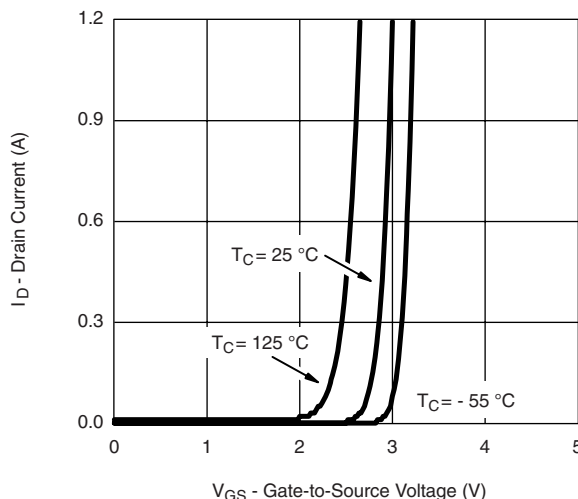
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



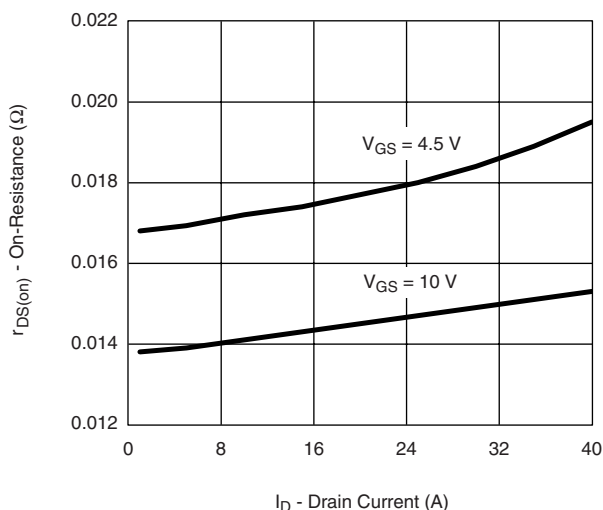
CHANNEL-1 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



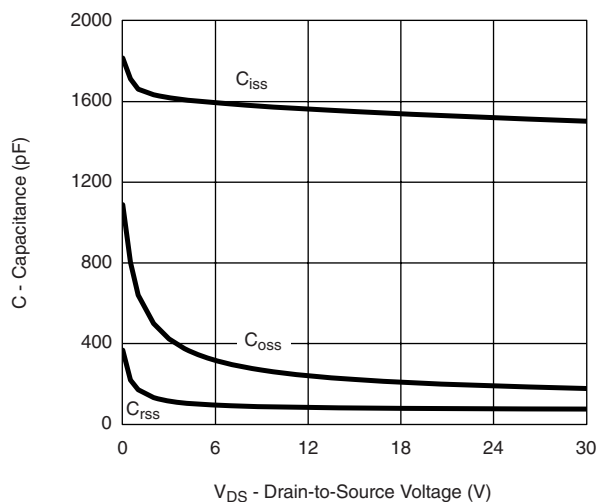
Output Characteristics



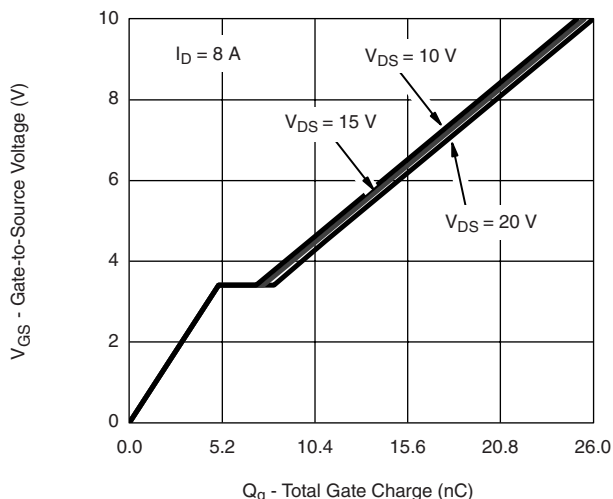
Transfer Characteristics



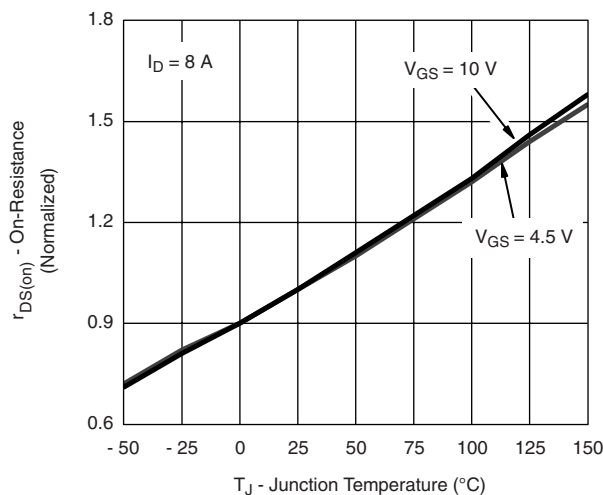
On-Resistance vs. Drain Current



Capacitance

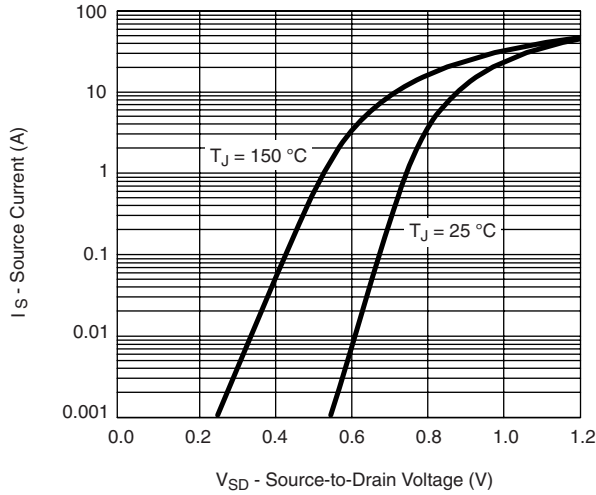


Gate Charge

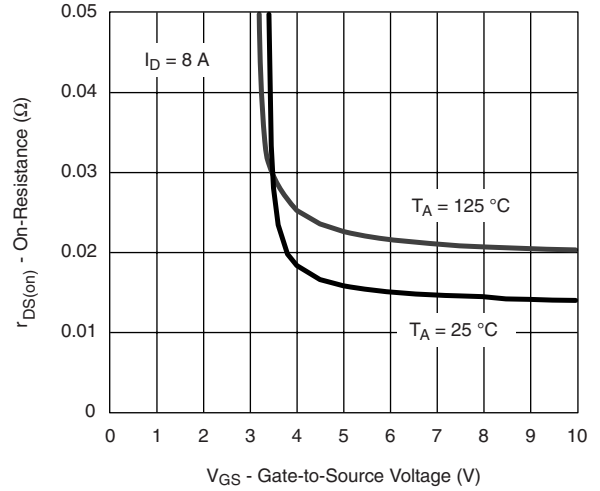


On-Resistance vs. Junction Temperature

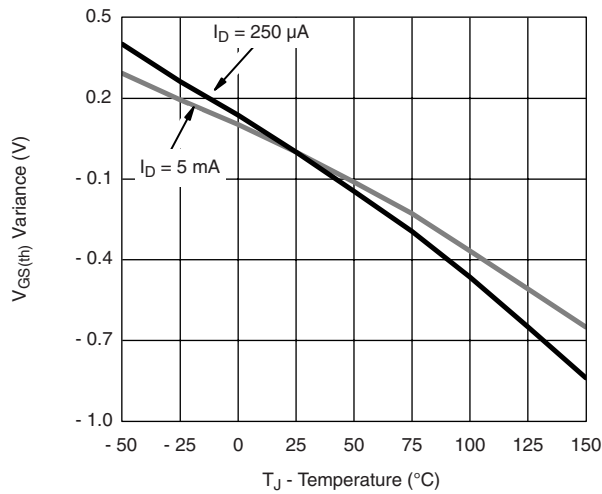
CHANNEL-1 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



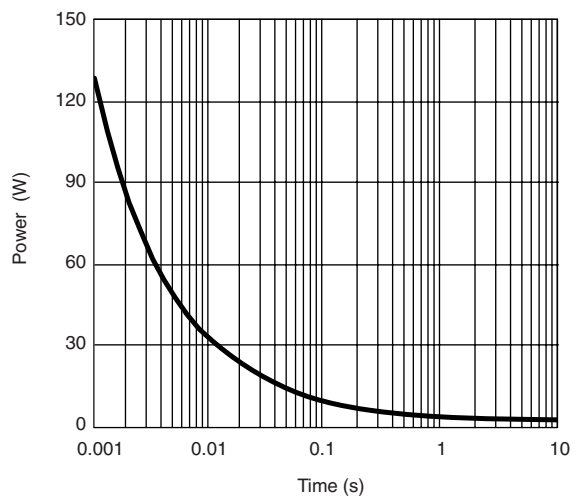
Source-Drain Diode Forward Voltage



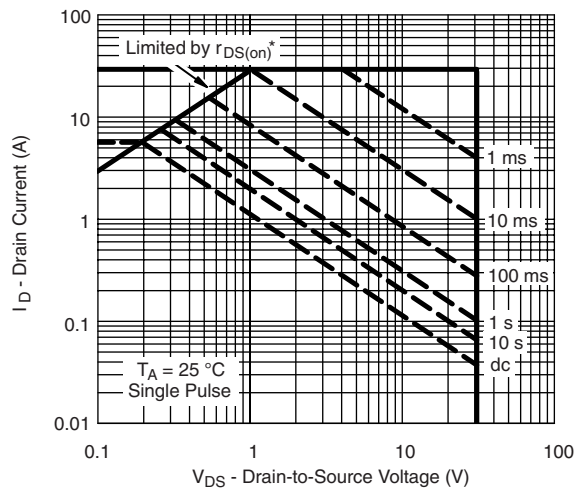
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



Single Pulse Power, Junction-to-Ambient

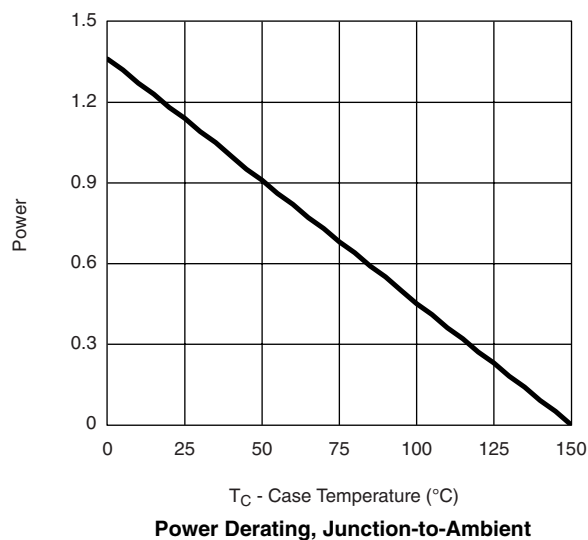
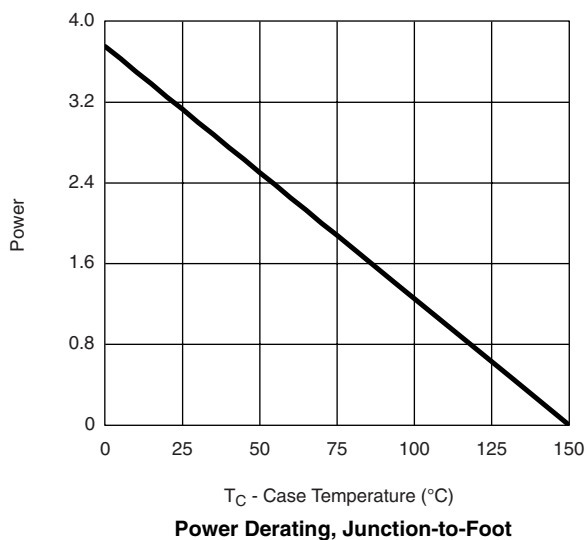
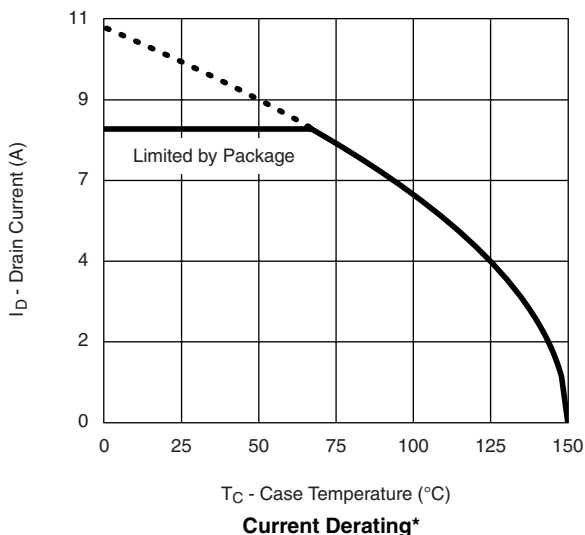


* $V_{GS} >$ minimum V_{GS} at which $r_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Ambient



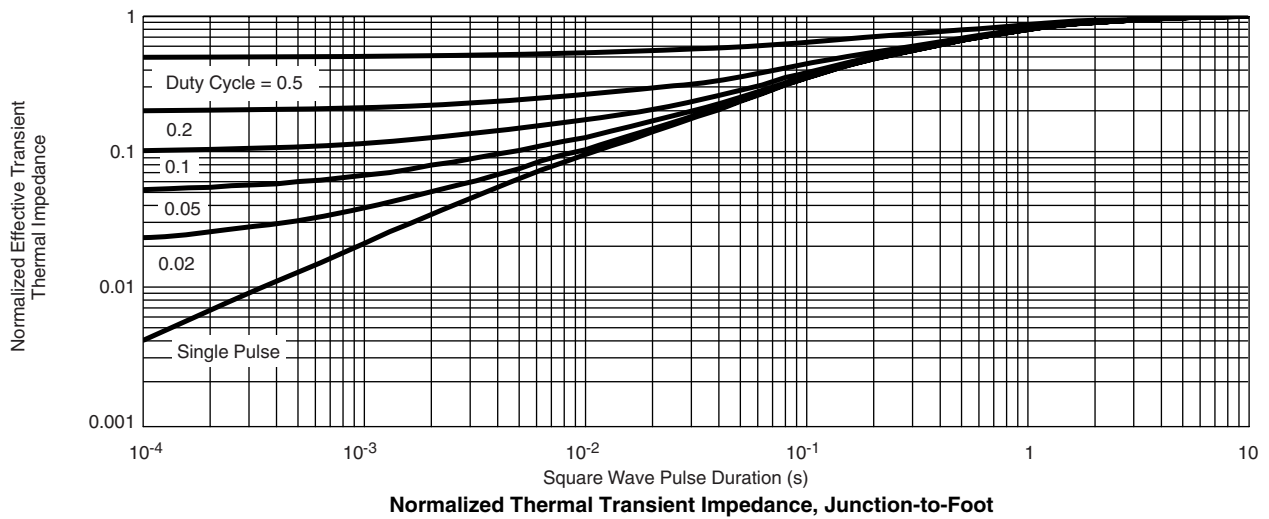
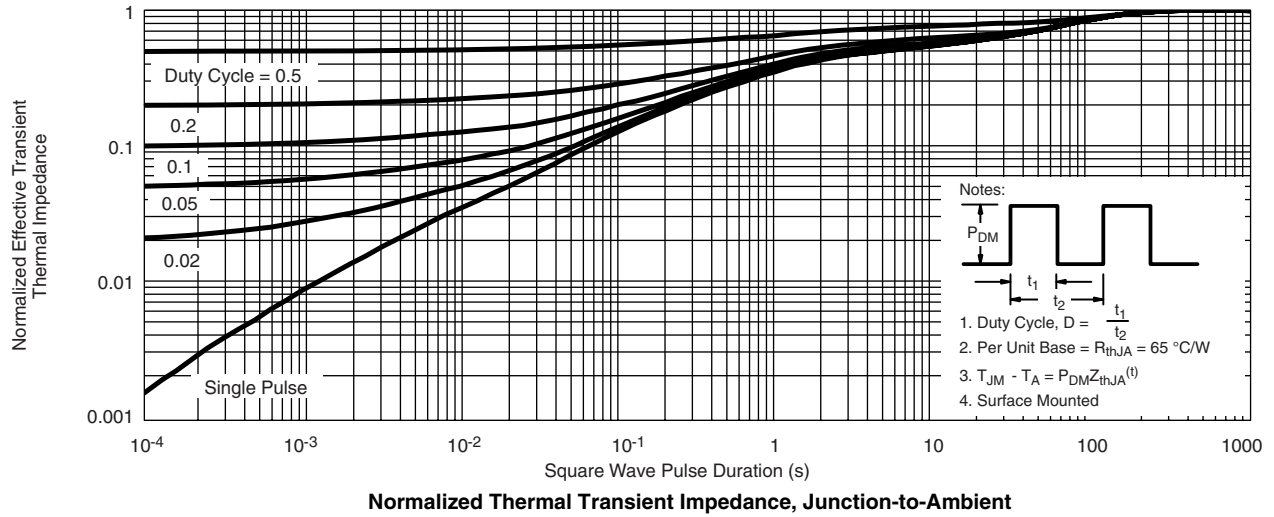
CHANNEL-1 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



* 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.

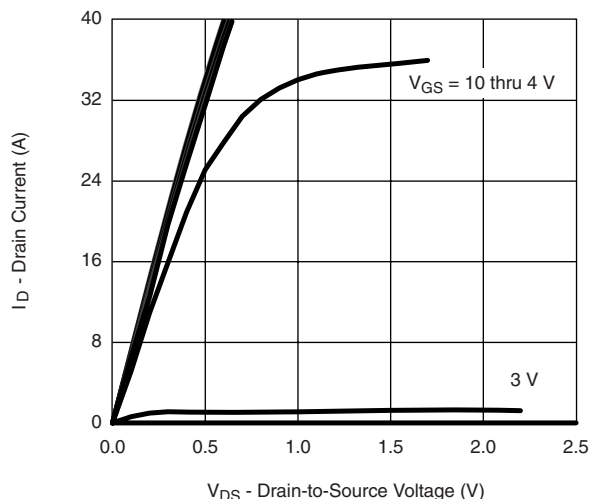


CHANNEL-1 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

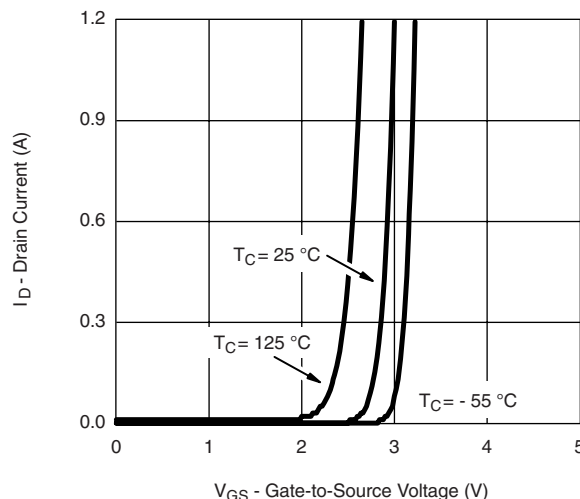




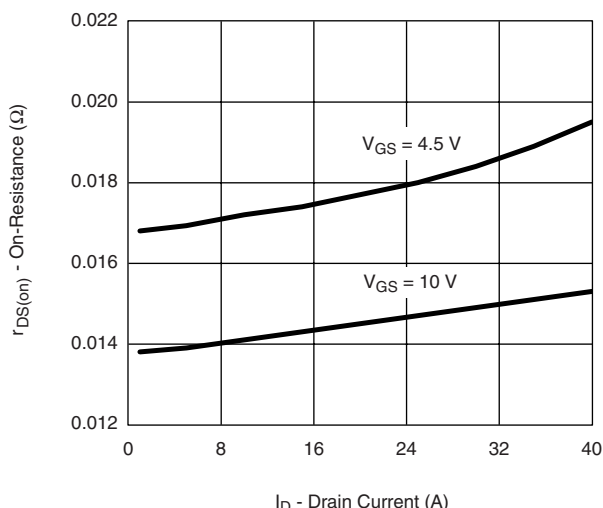
CHANNEL-2 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



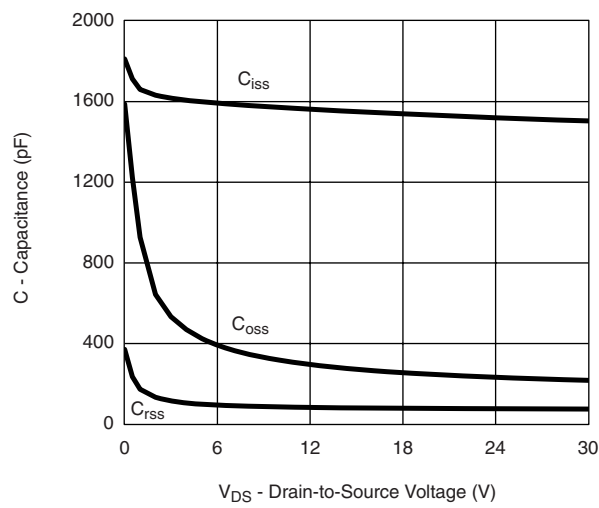
Output Characteristics



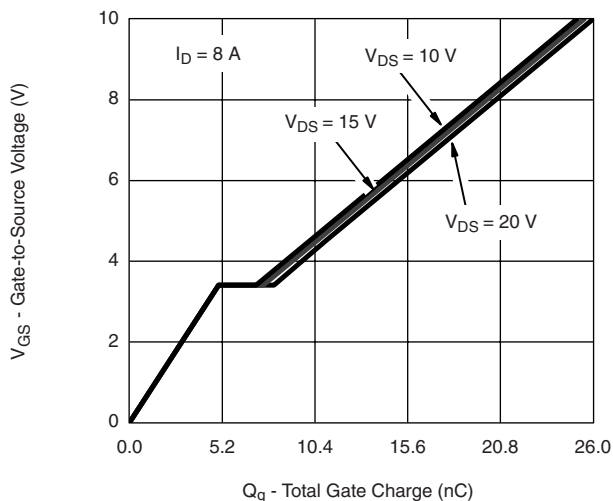
Transfer Characteristics



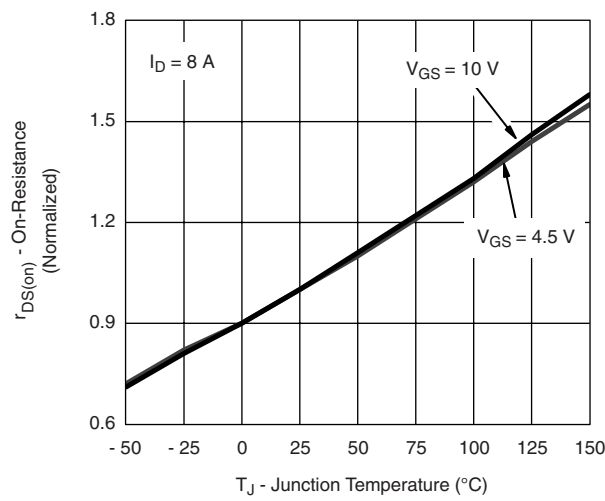
On-Resistance vs. Drain Current



Capacitance

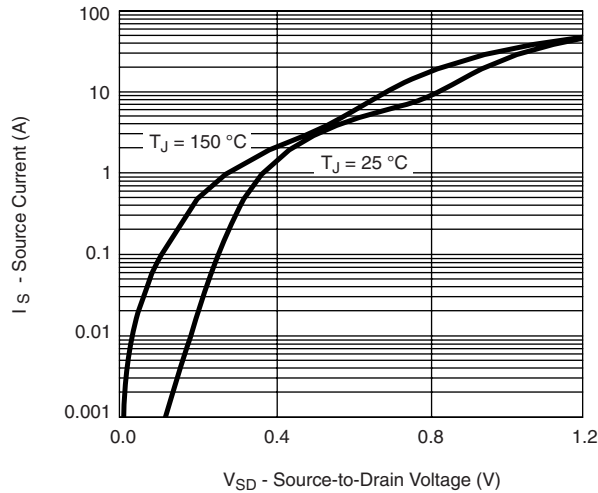


Gate Charge

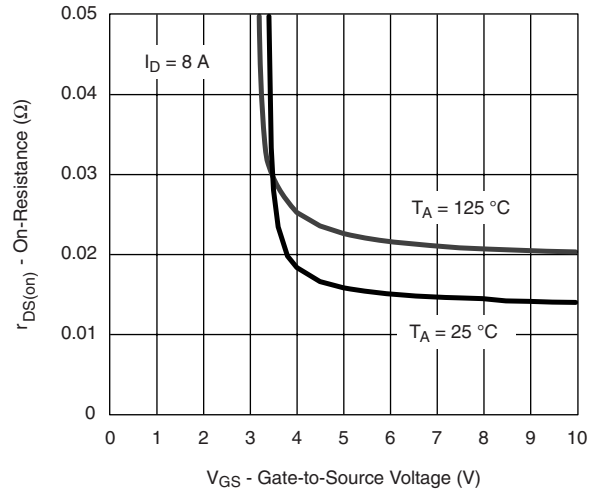


On-Resistance vs. Junction Temperature

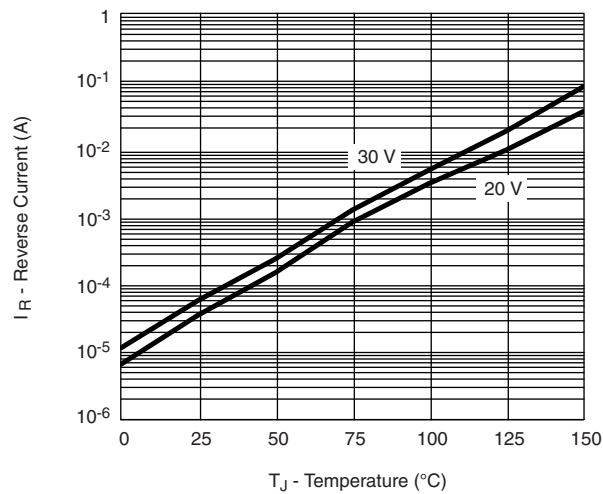
CHANNEL-2 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



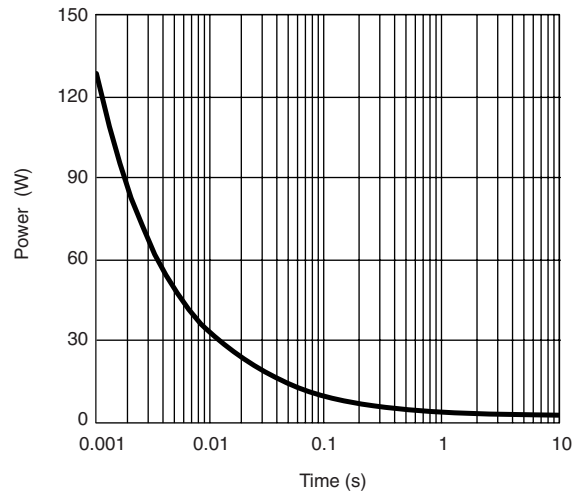
Source-Drain Diode Forward Voltage



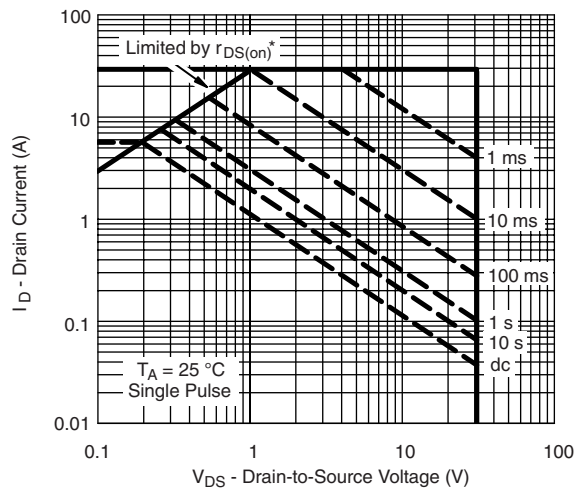
On-Resistance vs. Gate-to-Source Voltage



Reverse Current



Single Pulse Power, Junction-to-Ambient

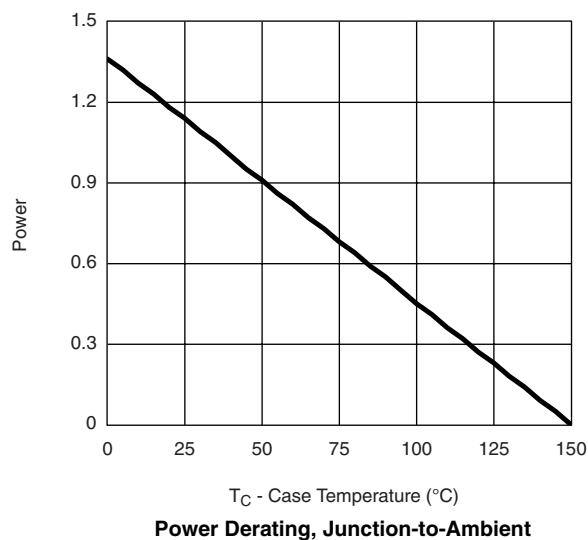
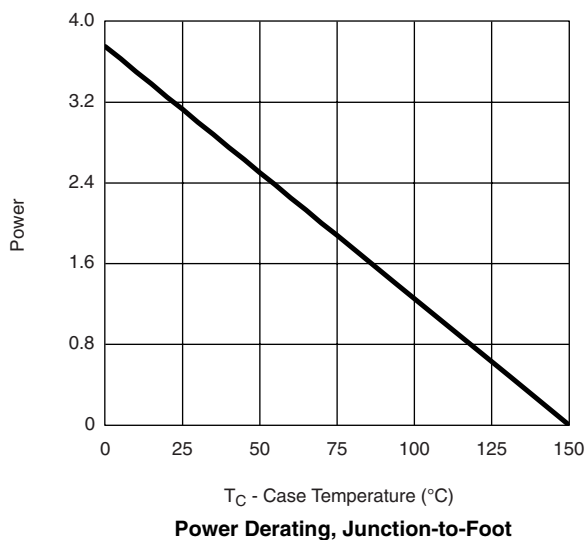
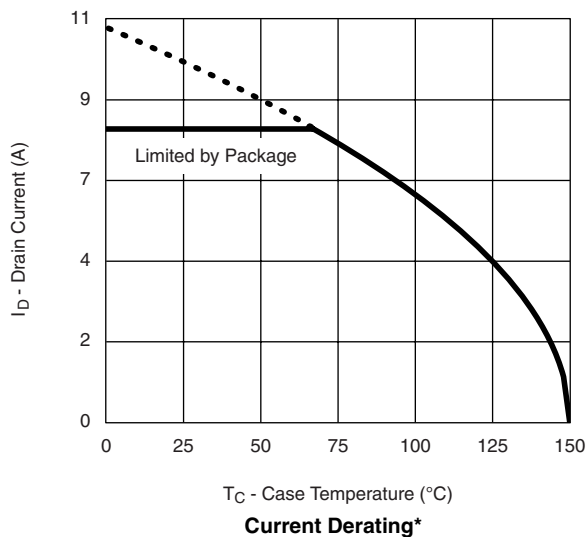


* $V_{GS} >$ minimum V_{GS} at which $r_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Ambient



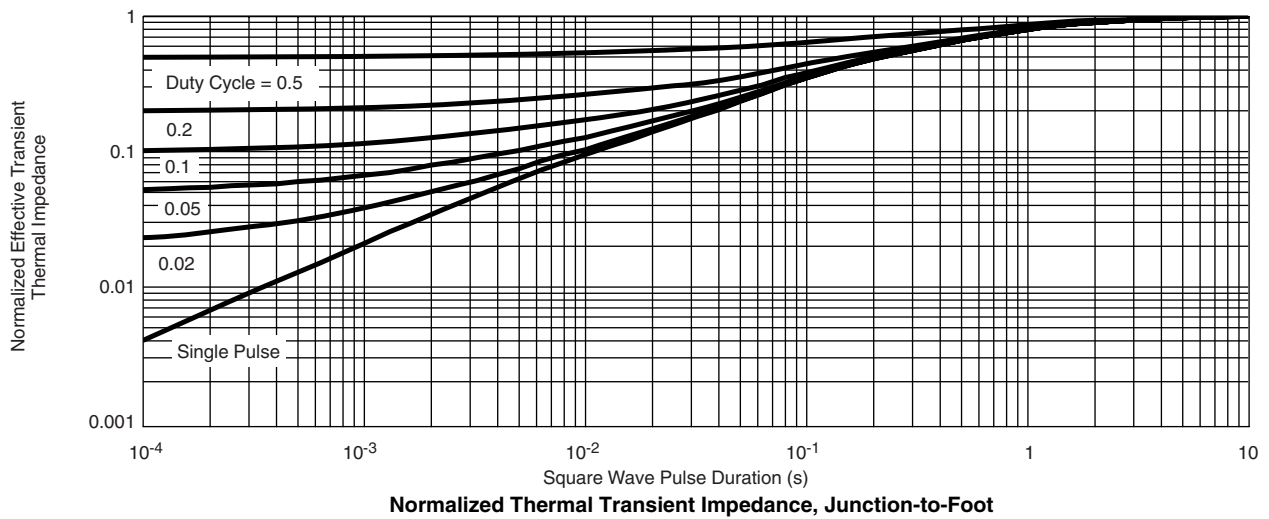
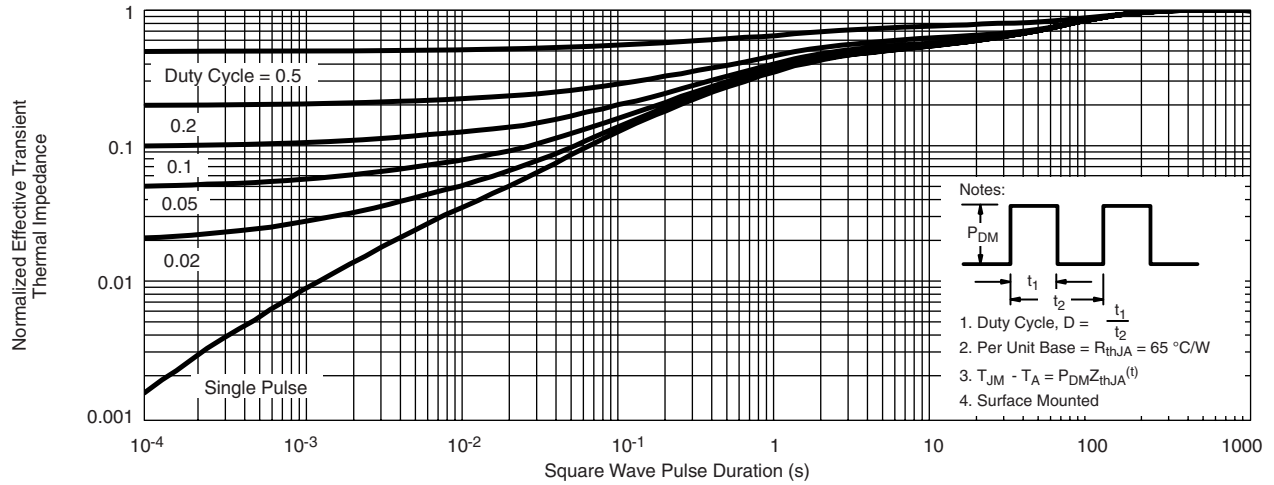
CHANNEL-2 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



* 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



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?70449>.



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