

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

PRODUCT SUMMARY				
	V _{DS} (V)	R _{DS(on)} (Ω)	I _D (A) ^a	Q _g (Typ.)
Channel-1	30	0.0093 at V _{GS} = 10 V	25	8.2
		0.0124 at V _{GS} = 4.5 V	25	
Channel-2	30	0.0053 at V _{GS} = 10 V	30	15.3
		0.007 at V _{GS} = 4.5 V	30	

FEATURES

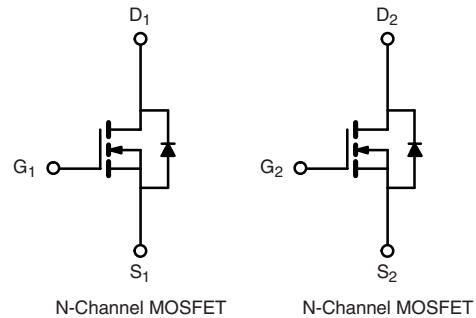
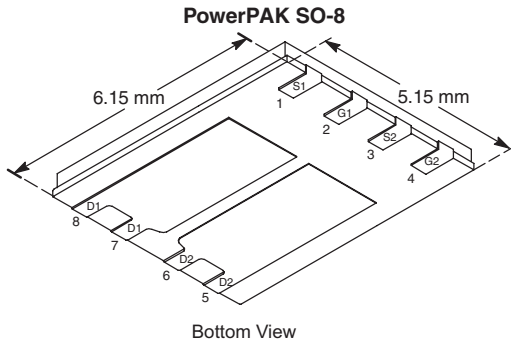
- Halogen-free According to IEC 61249-2-21
- TrenchFET[®] Power MOSFET
- PWM Optimized



RoHS
COMPLIANT
HALOGEN
FREE

APPLICATIONS

- System Power DC/DC



Ordering Information: Si7998DP-T1-GE3 (Lead (Pb)-free and Halogen-free)

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		
Continuous Drain Current (T _J = 150 °C)	I _D	T _C = 25 °C	25 ^a	30 ^a	A
		T _C = 70 °C	25 ^a	30 ^a	
		T _A = 25 °C	15 ^{b, c}	21 ^{b, c}	
		T _A = 70 °C	12 ^{b, c}	17 ^{b, c}	
Pulsed Drain Current	I _{DM}	60	80		
Source-Drain Current Diode Current	I _S	T _C = 25 °C	19	30 ^a	
		T _A = 25 °C	3.0 ^{b, c}	3.3 ^{b, c}	
Maximum Power Dissipation	P _D	T _C = 25 °C	22	40	W
		T _C = 70 °C	14	25	
		T _A = 25 °C	3.6 ^{b, c}	4.0 ^{b, c}	
		T _A = 70 °C	2.3 ^{b, c}	2.5 ^{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	Channel-1		Channel-2		Unit
		Typ.	Max.	Typ.	Max.	
Maximum Junction-to-Ambient ^{b, f}	R _{thJA}	26	35	22	31	°C/W
Maximum Junction-to-Case (Drain)	R _{thJC}	4	5.5	2.2	3.1	

Notes:

a. Package Limited.

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

c. t = 10 s.

d. See Solder Profile (www.vishay.com/ppg?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.

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 80 °C/W.

SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted							
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit	
Static							
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	Ch-1	30			V
		$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	Ch-2	30			
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = 250\text{ }\mu\text{A}$	Ch-1		28		mV/ $^\circ\text{C}$
		$I_D = 250\text{ }\mu\text{A}$	Ch-2		26		
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$	$I_D = 250\text{ }\mu\text{A}$	Ch-1		-5.6		
		$I_D = 250\text{ }\mu\text{A}$	Ch-2		-6		
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	Ch-1	1.2		2.5	V
		$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	Ch-2	1.2		2.5	
Gate-Body Leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$	Ch-1			100	nA
		$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$	Ch-2			100	
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}$	Ch-1			1	μA
		$V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}$	Ch-2			1	
		$V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}, T_J = 85\text{ }^\circ\text{C}$	Ch-1			10	
		$V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}, T_J = 85\text{ }^\circ\text{C}$	Ch-2			10	
On-State Drain Current ^b	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}, V_{GS} = 10\text{ V}$	Ch-1	30			A
		$V_{DS} \geq 5\text{ V}, V_{GS} = 10\text{ V}$	Ch-2	30			
Drain-Source On-State Resistance ^b	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 15\text{ A}$	Ch-1		0.0076	0.0093	Ω
		$V_{GS} = 10\text{ V}, I_D = 20\text{ A}$	Ch-2		0.0044	0.0053	
		$V_{GS} = 4.5\text{ V}, I_D = 13\text{ A}$	Ch-1		0.0103	0.0124	
		$V_{GS} = 4.5\text{ V}, I_D = 18\text{ A}$	Ch-2		0.0058	0.007	
Forward Transconductance ^b	g_{fs}	$V_{DS} = 10\text{ V}, I_D = 15\text{ A}$	Ch-1		45		S
		$V_{DS} = 10\text{ V}, I_D = 20\text{ A}$	Ch-2		71		
Dynamic^a							
Input Capacitance	C_{iss}	Channel-1 $V_{DS} = 15\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$ Channel-2 $V_{DS} = 15\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	Ch-1		1100		pF
			Ch-2		2000		
Output Capacitance	C_{oss}		Ch-1		200		
			Ch-2		390		
Reverse Transfer Capacitance	C_{rss}		Ch-1		90		
			Ch-2		160		
Total Gate Charge	Q_g	$V_{DS} = 15\text{ V}, V_{GS} = 10\text{ V}, I_D = 15\text{ A}$	Ch-1		17	26	nC
		$V_{DS} = 15\text{ V}, V_{GS} = 10\text{ V}, I_D = 20\text{ A}$	Ch-2		32	48	
		Channel-1 $V_{DS} = 15\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 15\text{ A}$	Ch-1		8.2	13	
			Ch-2		15.3	23	
Gate-Source Charge	Q_{gs}	Channel-2 $V_{DS} = 15\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 20\text{ A}$	Ch-1		3.2		
			Ch-2		6.3		
Gate-Drain Charge	Q_{gd}	Ch-1		2.7			
		Ch-2		4.7			
Gate Resistance	R_g	$f = 1\text{ MHz}$	Ch-1		3.5	7	Ω
			Ch-2		3.5	7	

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.	Max.	Unit	
Dynamic^a							
Turn-On Delay Time	$t_{d(on)}$	Channel-1 $V_{DD} = 15\text{ V}$, $R_L = 1.5\ \Omega$ $I_D \cong 10\text{ A}$, $V_{GEN} = 4.5\text{ V}$, $R_g = 1\ \Omega$	Ch-1		20	30	ns
			Ch-2		26	40	
Rise Time	t_r		Ch-1		15	25	
			Ch-2		17	30	
Turn-Off Delay Time	$t_{d(off)}$	Channel-2 $V_{DD} = 15\text{ V}$, $R_L = 1.5\ \Omega$ $I_D \cong 10\text{ A}$, $V_{GEN} = 4.5\text{ V}$, $R_g = 1\ \Omega$	Ch-1		22	35	
			Ch-2		35	55	
Fall Time	t_f		Ch-1		10	15	
			Ch-2		13	20	
Turn-On Delay Time	$t_{d(on)}$	Channel-1 $V_{DD} = 15\text{ V}$, $R_L = 1.5\ \Omega$ $I_D \cong 10\text{ A}$, $V_{GEN} = 10\text{ V}$, $R_g = 1\ \Omega$	Ch-1		10	15	
			Ch-2		13	20	
Rise Time	t_r		Ch-1		10	15	
			Ch-2		10	15	
Turn-Off Delay Time	$t_{d(off)}$	Channel-2 $V_{DD} = 15\text{ V}$, $R_L = 1.5\ \Omega$ $I_D \cong 10\text{ A}$, $V_{GEN} = 10\text{ V}$, $R_g = 1\ \Omega$	Ch-1		22	35	
			Ch-2		32	50	
Fall Time	t_f		Ch-1		10	15	
			Ch-2		10	15	
Drain-Source Body Diode Characteristics							
Continuous Source-Drain Diode Current	I_S	$T_C = 25\text{ }^\circ\text{C}$	Ch-1			13	A
			Ch-2			30	
Pulse Diode Forward Current ^a	I_{SM}		Ch-1			30	A
			Ch-2			80	
Body Diode Voltage	V_{SD}	$I_S = 10\text{ A}$	Ch-1		0.8	1.2	V
		$I_S = 10\text{ A}$	Ch-2		0.8	1.2	
Body Diode Reverse Recovery Time	t_{rr}	Channel-1 $I_F = 10\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $T_J = 25\text{ }^\circ\text{C}$	Ch-1		20	30	ns
			Ch-2		27	40	
Body Diode Reverse Recovery Charge	Q_{rr}		Ch-1		15	25	nC
			Ch-2		22	35	
Reverse Recovery Fall Time	t_a	Channel-2 $I_F = 10\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $T_J = 25\text{ }^\circ\text{C}$	Ch-1		11		ns
			Ch-2		15		
Reverse Recovery Rise Time	t_b		Ch-1		9		ns
			Ch-2		12		

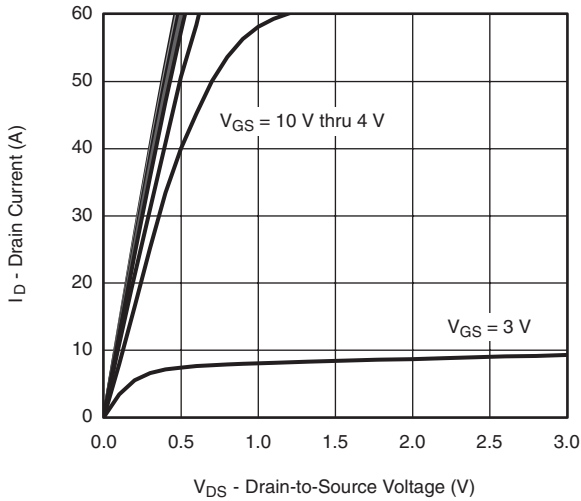
Notes:

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

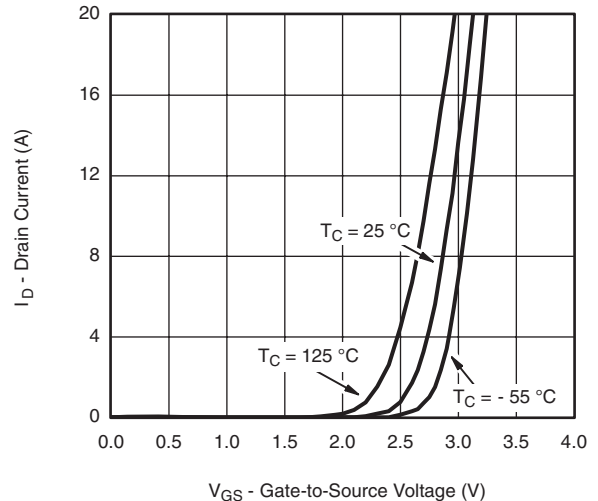
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



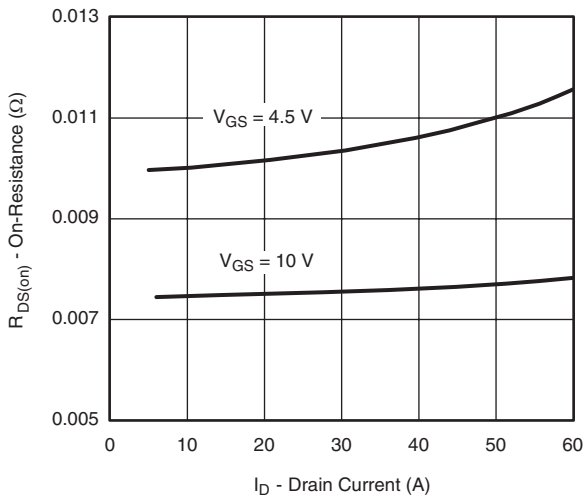
CHANNEL-1 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



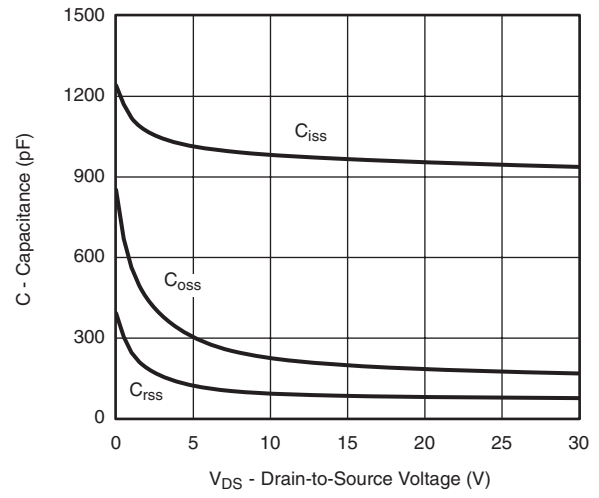
Output Characteristics



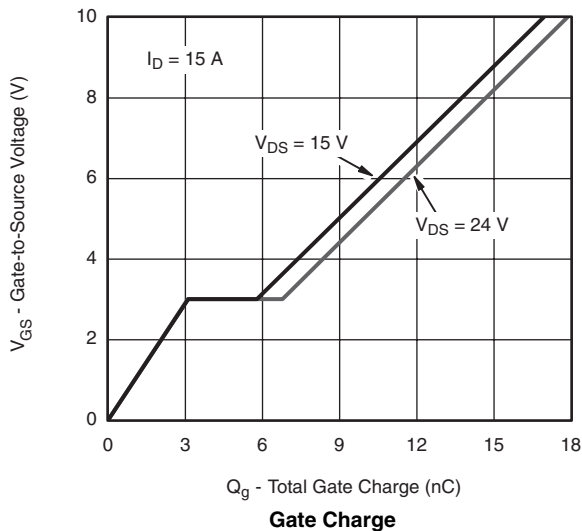
Transfer Characteristics



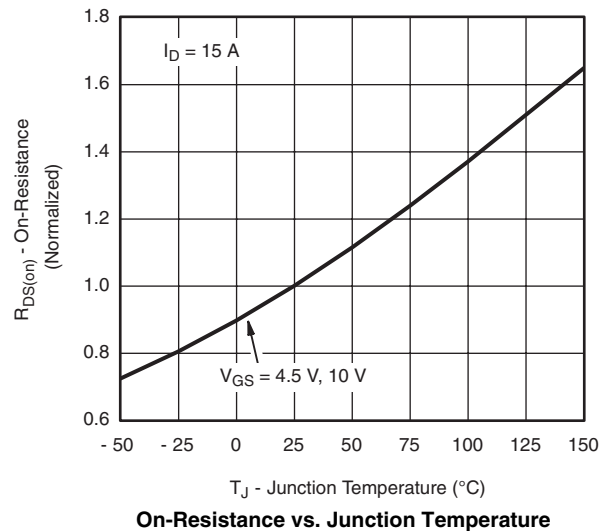
On-Resistance vs. Drain Current



Capacitance



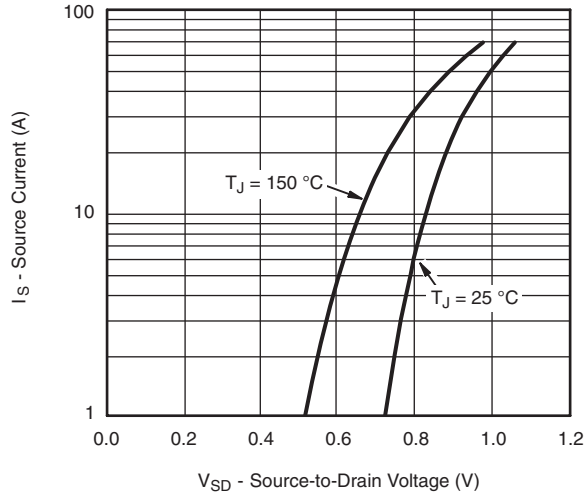
Gate Charge



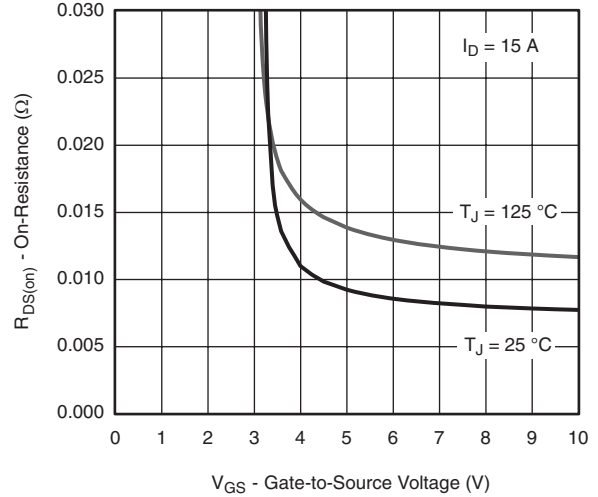
On-Resistance vs. Junction Temperature



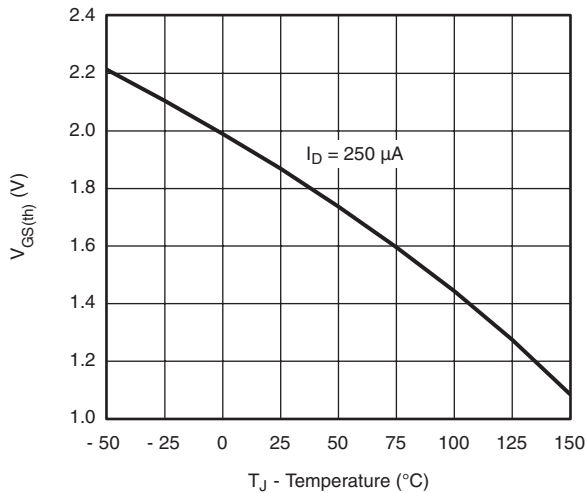
CHANNEL-1 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



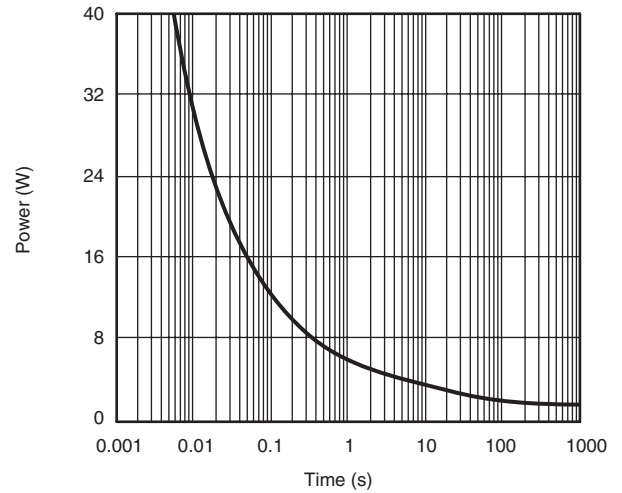
Source-Drain Diode Forward Voltage



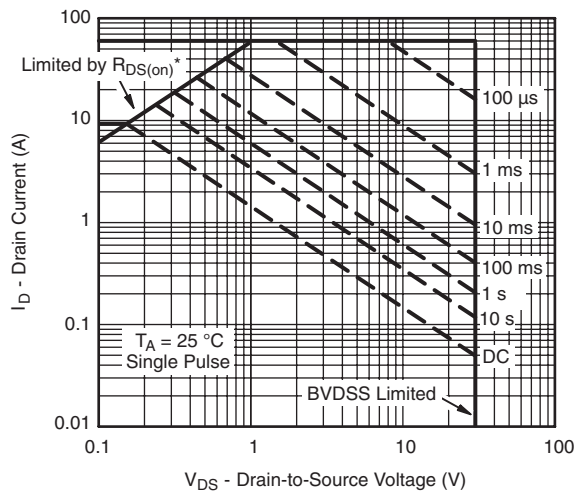
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



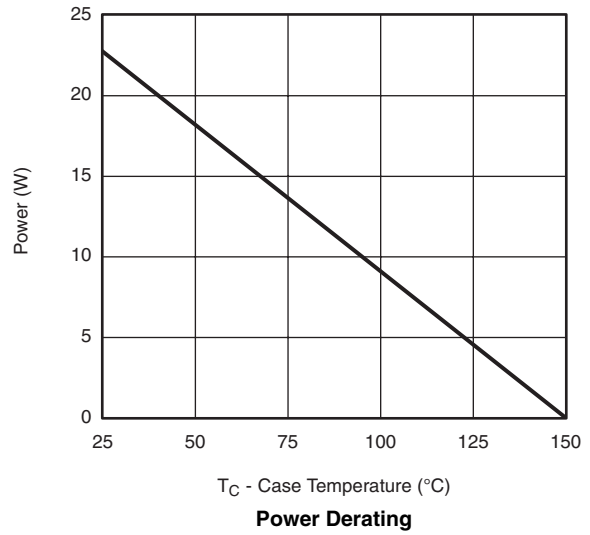
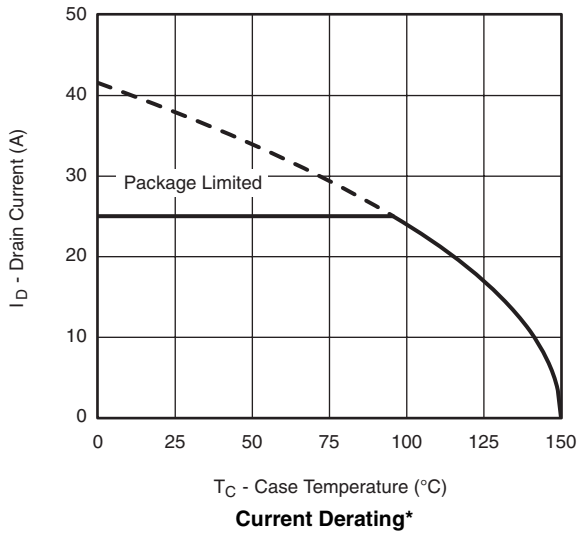
Single Pulse Power



Safe Operating Area, Junction-to-Ambient



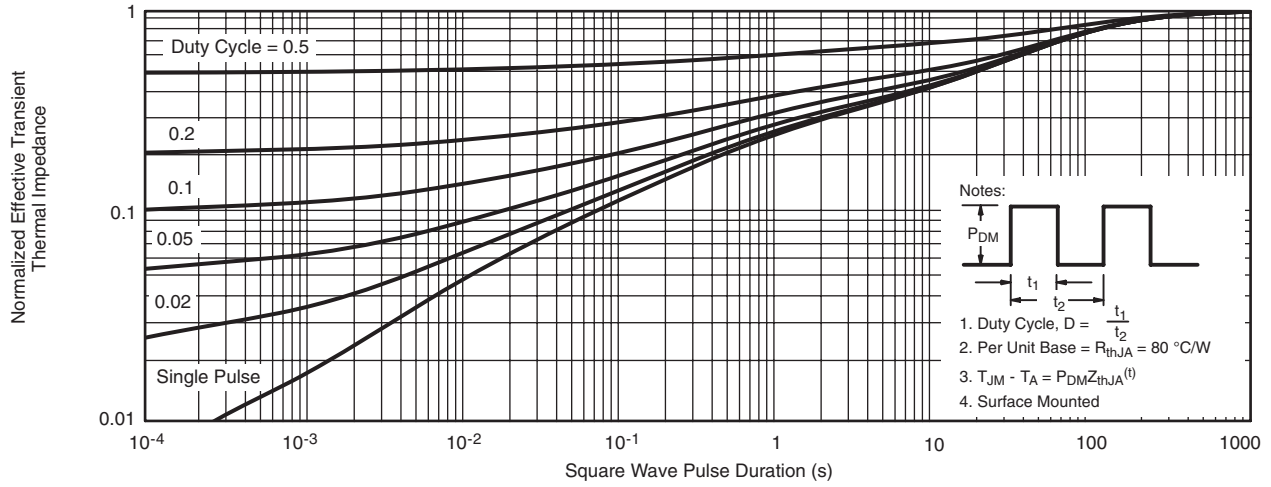
CHANNEL-1 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



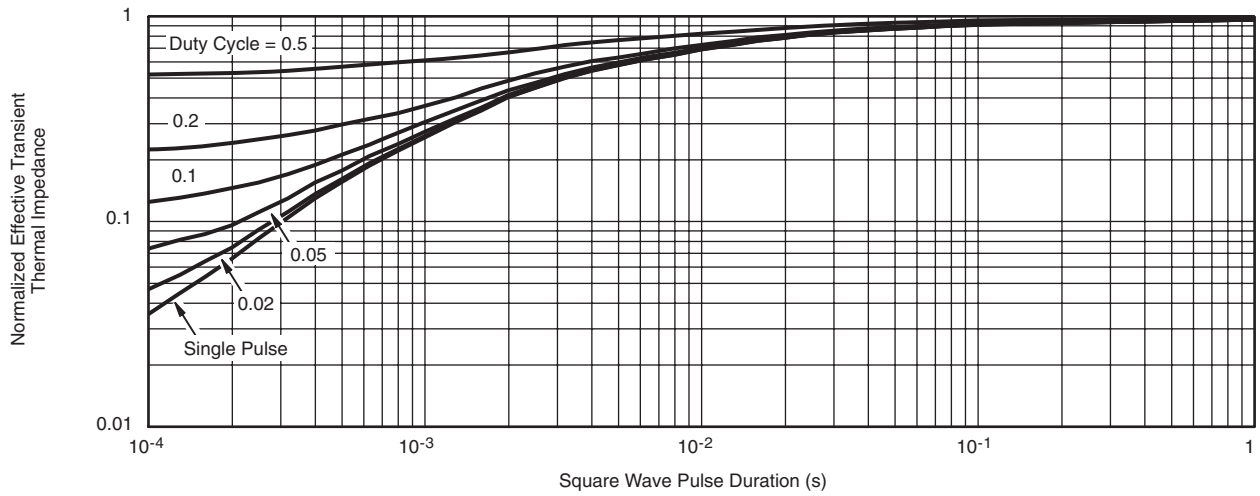
* The power dissipation P_D is based on $T_{J(max)} = 150$ °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.



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



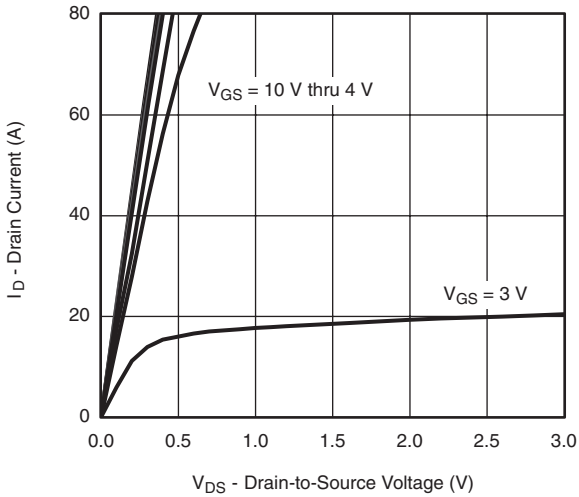
Normalized Thermal Transient Impedance, Junction-to-Ambient



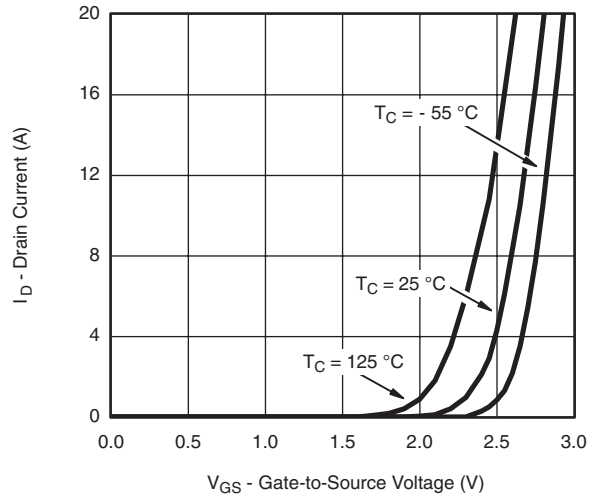
Normalized Thermal Transient Impedance, Junction-to-Case



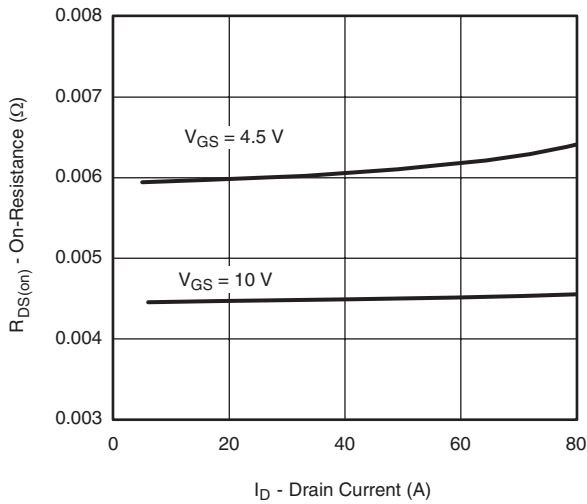
CHANNEL-2 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



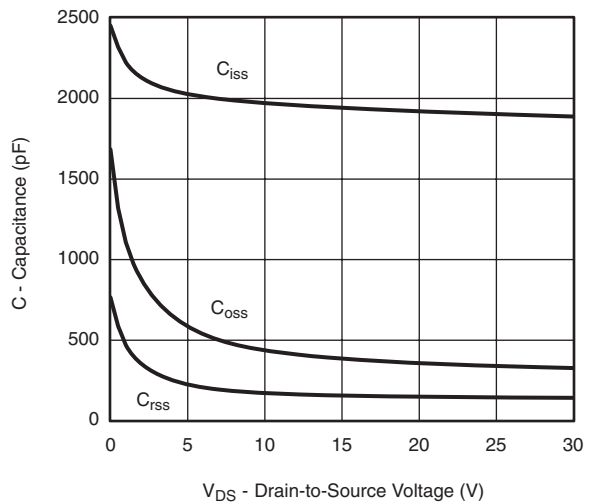
Output Characteristics



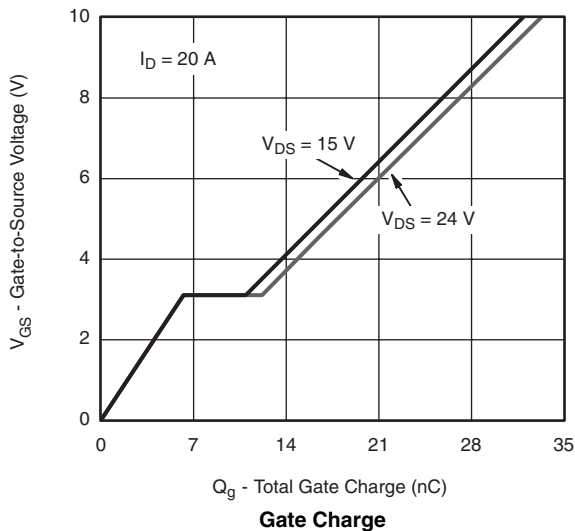
Transfer Characteristics



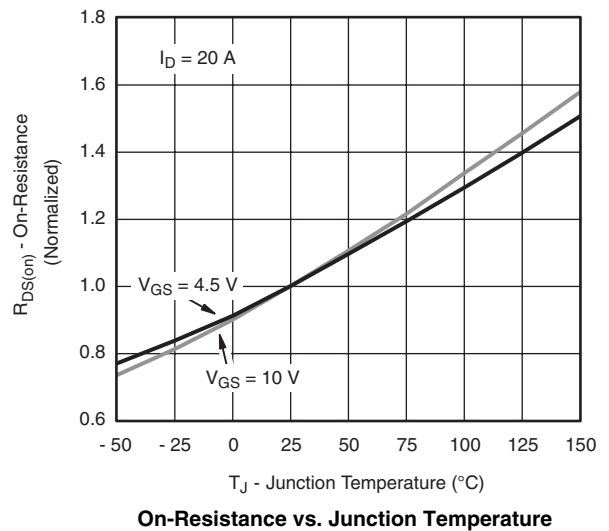
On-Resistance vs. Drain Current



Capacitance



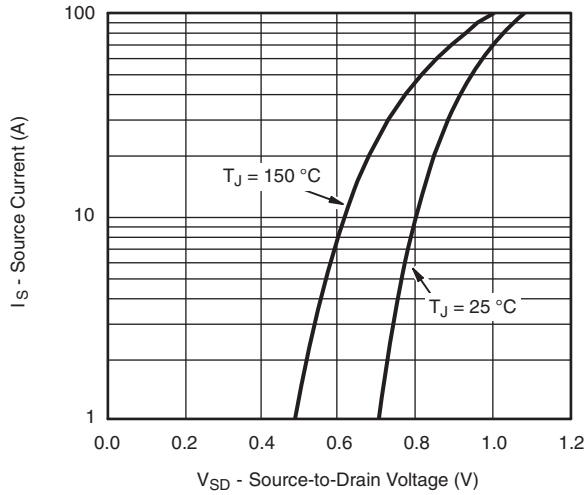
Gate Charge



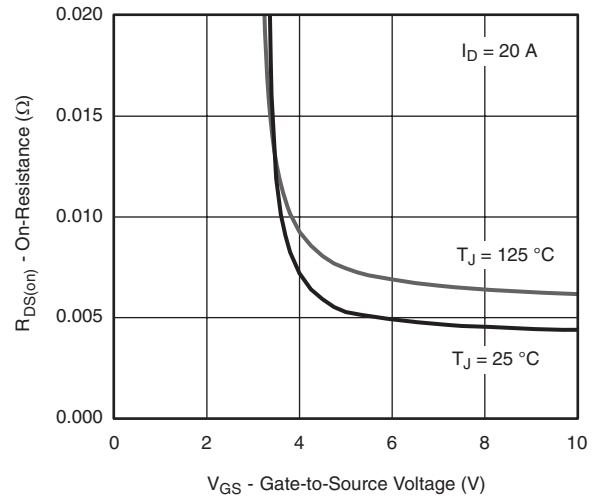
On-Resistance vs. Junction Temperature



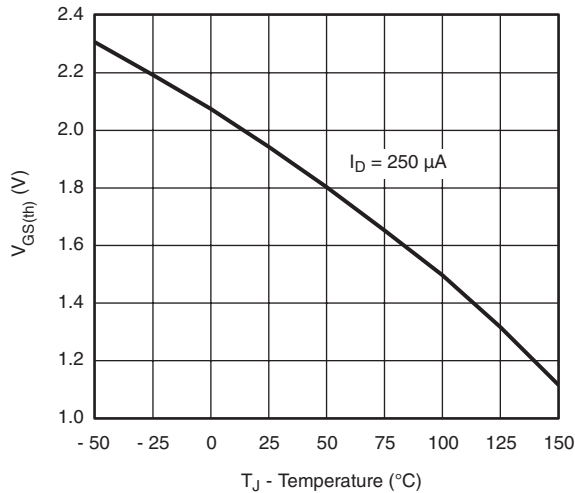
CHANNEL-2 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



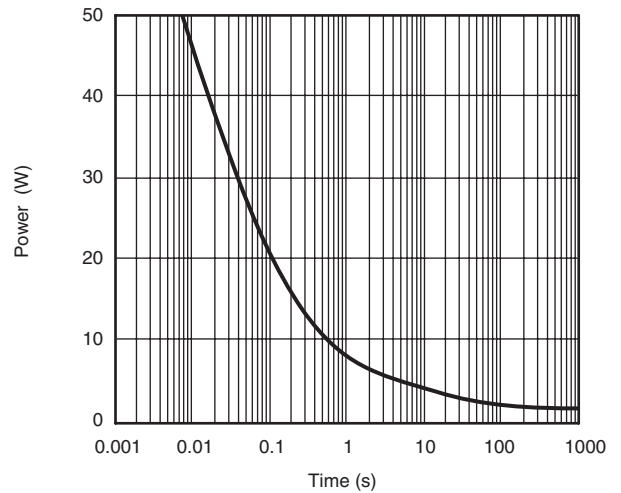
Source-Drain Diode Forward Voltage



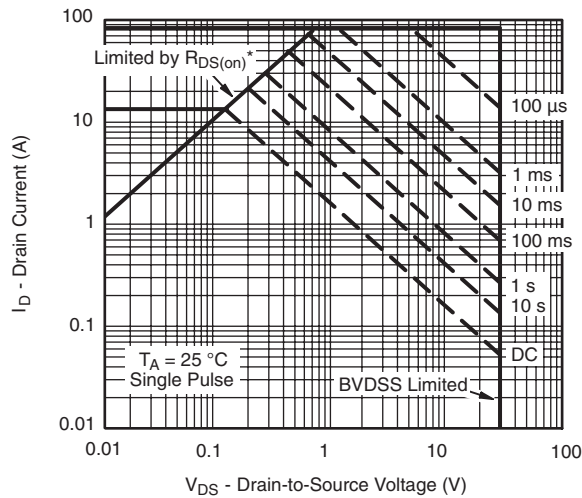
On-Resistance vs. Gate-to-Source Voltage



Reverse Current vs. Junction Temperature



Single Pulse Power

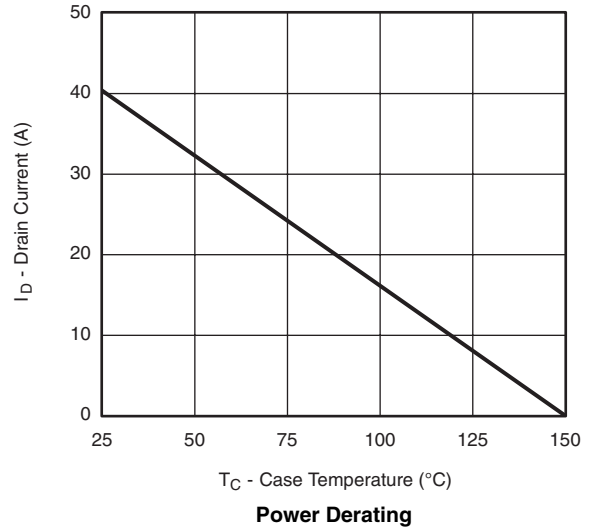
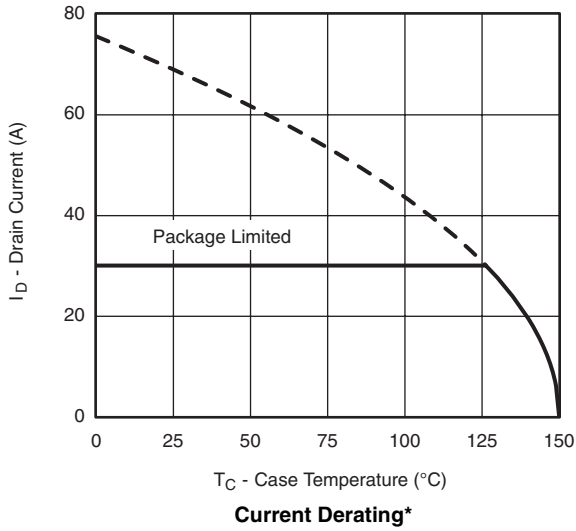


* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Ambient



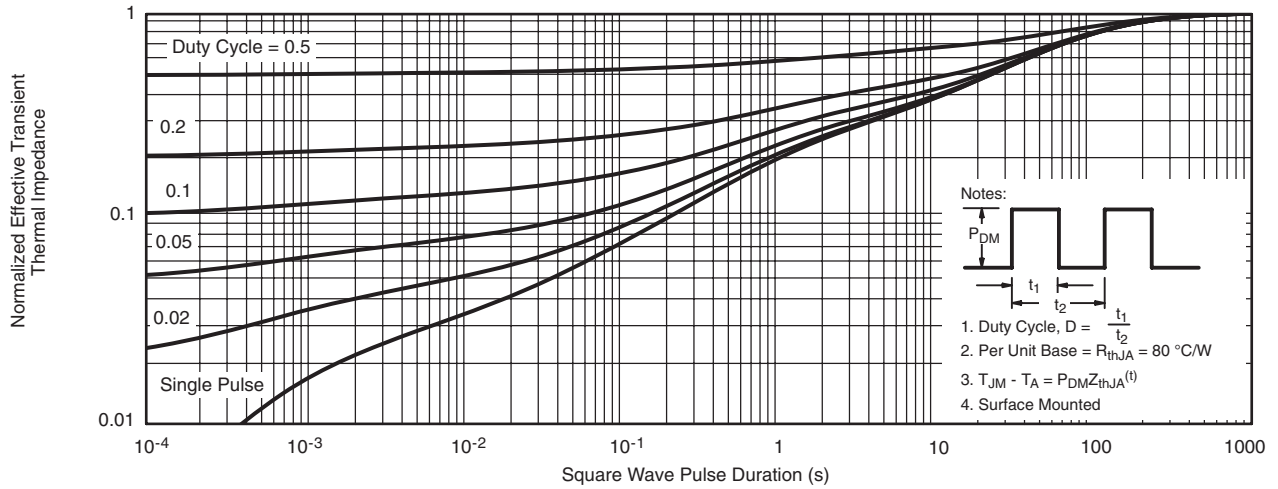
CHANNEL-2 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



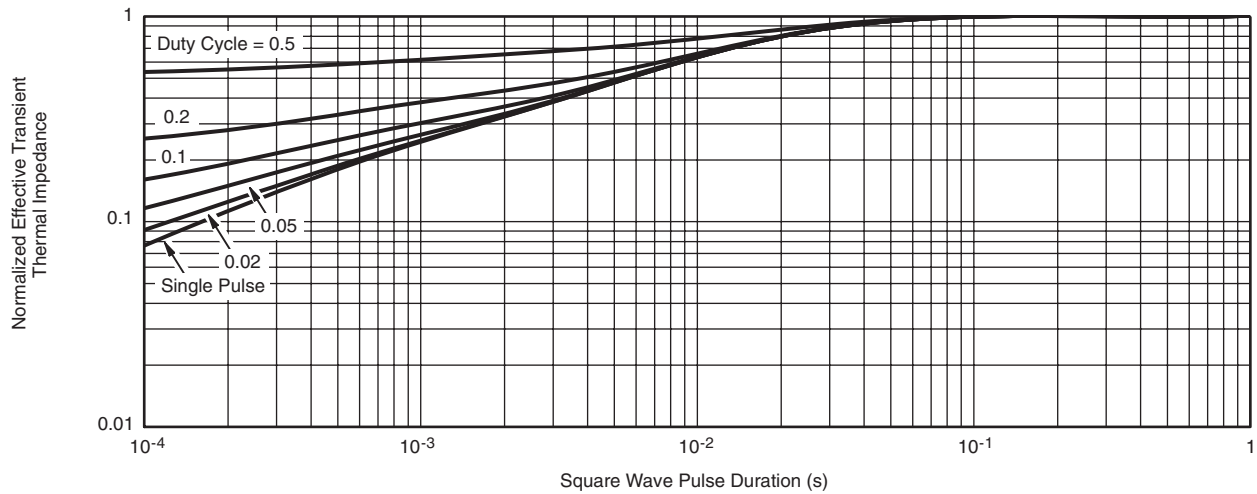
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CHANNEL-2 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Case

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