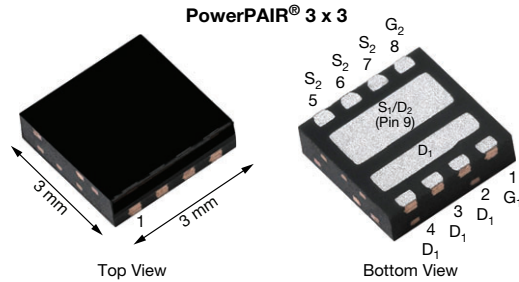


Dual N-Channel 25 V (D-S) MOSFETs



FEATURES

- TrenchFET® Gen IV power MOSFETs
- 100 % R_g and UIS tested
- Optimized Q_{gs}/Q_{gs} ratio improves switching characteristics
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



RoHS
COMPLIANT
HALOGEN
FREE

APPLICATIONS

- CPU core power
- Computer / server peripherals
- POL
- Synchronous buck converter
- Telecom DC/DC



PRODUCT SUMMARY		
	CHANNEL-1	CHANNEL-2
V _{DS} (V)	25	25
R _{DS(on)} max. (Ω) at V _{GS} = 10 V	0.0150	0.0100
R _{DS(on)} max. (Ω) at V _{GS} = 4.5 V	0.0250	0.0150
Q _g typ. (nC)	2.1	3.5
I _D (A) ^g	25.3	30 ^a
Configuration	Dual	

ORDERING INFORMATION	
Package	PowerPAIR 3 x 3
Lead (Pb)-free and halogen-free	SiZ328DT-T1-GE3

ABSOLUTE MAXIMUM RATINGS (T _A = 25 °C, unless otherwise noted)					
PARAMETER	SYMBOL	CHANNEL-1	CHANNEL-2	UNIT	
Drain-source voltage	V _{DS}	25	25	V	
Gate-source voltage	V _{GS}	+16, -12	+16, -12		
Continuous drain current (T _J = 150 °C)	I _D	T _C = 25 °C	25.3	30 ^a	A
		T _C = 70 °C	20.2	25.5	
		T _A = 25 °C	11.1 ^{b, c}	15 ^{b, c}	
		T _A = 70 °C	8.9 ^{b, c}	12 ^{b, c}	
Pulsed drain current (100 μs pulse width)	I _{DM}	40	50		
Continuous source drain diode current	I _S	T _C = 25 °C	12.6	13.5	
		T _A = 25 °C	2.4 ^{b, c}	3 ^{b, c}	
Single pulse avalanche current	I _{AS}	7	11		
Single pulse avalanche energy	E _{AS}	2.5	6.1	mJ	
Maximum power dissipation	P _D	T _C = 25 °C	15	16.2	W
		T _C = 70 °C	9.6	10.4	
		T _A = 25 °C	2.9 ^{b, c}	3.6 ^{b, c}	
		T _A = 70 °C	1.8 ^{b, c}	2.3 ^{b, c}	
Operating junction and storage temperature range	T _J , T _{stg}	-55 to +150		°C	
Soldering recommendations (peak temperature) ^d		260			

THERMAL RESISTANCE RATINGS						
PARAMETER	SYMBOL	CHANNEL-1		CHANNEL-2		UNIT
		TYP.	MAX.	TYP.	MAX.	
Maximum junction-to-ambient ^{b, f}	R _{thJA}	35	43	28	35	°C/W
Maximum junction-to-case (drain)	R _{thJC}	6.7	8.3	6.3	7.7	

Notes

- Package limited
- Surface mounted on 1" x 1" FR4 board
- t = 10 s
- See solder profile (www.vishay.com/doc?73257). The PowerPAIR 3 x 3 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
- Rework conditions: manual soldering with a soldering iron is not recommended for leadless components
- Maximum under steady state conditions is 80 °C/W for channel-1 and 69 °C/W for channel-2
- T_C = 25 °C



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	Ch-1	25	-	-	V	
		V _{GS} = 0 V, I _D = 250 μA	Ch-2	25	-	-		
V _{DS} Temperature coefficient	ΔV _{DS} /T _J	I _D = 250 μA	Ch-1	-	19	-	mV/°C	
		I _D = 250 μA	Ch-2	-	18	-		
V _{GS(th)} Temperature coefficient	ΔV _{GS(th)} /T _J	I _D = 250 μA	Ch-1	-	-4.1	-	mV/°C	
		I _D = 250 μA	Ch-2	-	-4.3	-		
Gate threshold voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA	Ch-1	1.1	-	2.5	V	
		V _{DS} = V _{GS} , I _D = 250 μA	Ch-2	1.1	-	2.5		
Gate source leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = +16 V, -12 V	Ch-1	-	-	± 100	nA	
		V _{DS} = 0 V, V _{GS} = +16 V, -12 V	Ch-2	-	-	± 100		
Zero gate voltage drain current	I _{DSS}	V _{DS} = 25 V, V _{GS} = 0 V	Ch-1	-	-	1	μA	
		V _{DS} = 25 V, V _{GS} = 0 V	Ch-2	-	-	1		
		V _{DS} = 25 V, V _{GS} = 0 V, T _J = 55 °C	Ch-1	-	-	5		
		V _{DS} = 25 V, V _{GS} = 0 V, T _J = 55 °C	Ch-2	-	-	5		
On-state drain current ^b	I _{D(on)}	V _{DS} ≥ 5 V, V _{GS} = 10 V	Ch-1	10	-	-	A	
		V _{DS} ≥ 5 V, V _{GS} = 10 V	Ch-2	10	-	-		
Drain-source on-state resistance ^b	R _{DS(on)}	V _{GS} = 10 V, I _D = 5 A	Ch-1	-	0.0120	0.0150	Ω	
		V _{GS} = 10 V, I _D = 5 A	Ch-2	-	0.0080	0.0100		
		V _{GS} = 4.5 V, I _D = 5 A	Ch-1	-	0.0175	0.0250		
		V _{GS} = 4.5 V, I _D = 5 A	Ch-2	-	0.0120	0.0150		
Forward transconductance ^b	g _{fs}	V _{DS} = 10 V, I _D = 10 A	Ch-1	-	25	-	S	
		V _{DS} = 10 V, I _D = 10 A	Ch-2	-	42	-		
Dynamic ^a								
Input capacitance	C _{iss}	Channel-1 V _{DS} = 10 V, V _{GS} = 0 V, f = 1 MHz Channel-2 V _{DS} = 10 V, V _{GS} = 0 V, f = 1 MHz	Ch-1	-	325	-	pF	
			Ch-2	-	600	-		
Output capacitance	C _{oss}		Ch-1	-	115	-	pF	
			Ch-2	-	230	-		
Reverse transfer capacitance	C _{rss}		Ch-1	-	20	-	pF	
			Ch-2	-	31	-		
C _{rss} /C _{iss} ratio			Ch-1	-	0.060	0.120		
			Ch-2	-	0.052	0.110		
Total gate charge	Q _g		V _{DS} = 10 V, V _{GS} = 10 V, I _D = 5 A	Ch-1	-	4.6	6.9	nC
			V _{DS} = 10 V, V _{GS} = 10 V, I _D = 5 A	Ch-2	-	7.5	11.3	
		V _{DS} = 10 V, V _{GS} = 4.5 V, I _D = 5 A	Ch-1	-	2.1	3.2		
		V _{DS} = 10 V, V _{GS} = 4.5 V, I _D = 5 A	Ch-2	-	3.5	5.3		
Gate-source charge	Q _{gs}	Channel-1 V _{DS} = 10 V, V _{GS} = 4.5 V, I _D = 5 A	Ch-1	-	0.95	-	nC	
			Ch-2	-	1.63	-		
Gate-drain charge	Q _{gd}	Channel-2 V _{DS} = 10 V, V _{GS} = 4.5 V, I _D = 5 A	Ch-1	-	0.37	-	nC	
			Ch-2	-	0.54	-		
Output charge	Q _{oss}	V _{DS} = 10 V, V _{GS} = 0 V	Ch-1	-	1.7	-	nC	
			Ch-2	-	3.4	-		
Gate resistance	R _g	f = 1 MHz	Ch-1	0.28	1.4	2.8	Ω	
			Ch-2	0.18	0.9	1.8		



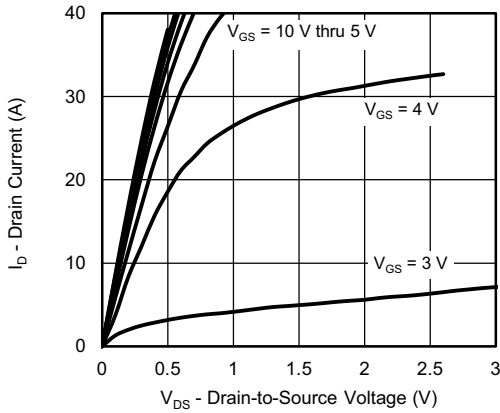
SPECIFICATIONS ($T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted)							
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT	
Dynamic ^a							
Turn-on delay time	$t_{d(on)}$	Channel-1 $V_{DD} = 10\text{ V}$, $R_L = 2\ \Omega$ $I_D \cong 5\text{ A}$, $V_{GEN} = 10\text{ V}$, $R_g = 1\ \Omega$	Ch-1	-	7	15	ns
			Ch-2	-	8	16	
Rise time	t_r	Channel-1 $V_{DD} = 10\text{ V}$, $R_L = 2\ \Omega$ $I_D \cong 5\text{ A}$, $V_{GEN} = 10\text{ V}$, $R_g = 1\ \Omega$	Ch-1	-	11	25	
			Ch-2	-	5	10	
Turn-off delay time	$t_{d(off)}$	Channel-2 $V_{DD} = 10\text{ V}$, $R_L = 2\ \Omega$ $I_D \cong 5\text{ A}$, $V_{GEN} = 10\text{ V}$, $R_g = 1\ \Omega$	Ch-1	-	12	25	
			Ch-2	-	15	30	
Fall time	t_f	Channel-2 $V_{DD} = 10\text{ V}$, $R_L = 2\ \Omega$ $I_D \cong 5\text{ A}$, $V_{GEN} = 10\text{ V}$, $R_g = 1\ \Omega$	Ch-1	-	5	10	
			Ch-2	-	5	10	
Turn-on delay time	$t_{d(on)}$	Channel-1 $V_{DD} = 10\text{ V}$, $R_L = 2\ \Omega$ $I_D \cong 5\text{ A}$, $V_{GEN} = 4.5\text{ V}$, $R_g = 1\ \Omega$	Ch-1	-	13	30	
			Ch-2	-	15	30	
Rise time	t_r	Channel-1 $V_{DD} = 10\text{ V}$, $R_L = 2\ \Omega$ $I_D \cong 5\text{ A}$, $V_{GEN} = 4.5\text{ V}$, $R_g = 1\ \Omega$	Ch-1	-	66	75	
			Ch-2	-	61	120	
Turn-off delay time	$t_{d(off)}$	Channel-2 $V_{DD} = 10\text{ V}$, $R_L = 2\ \Omega$ $I_D \cong 5\text{ A}$, $V_{GEN} = 4.5\text{ V}$, $R_g = 1\ \Omega$	Ch-1	-	8	20	
			Ch-2	-	10	20	
Fall time	t_f	Channel-2 $V_{DD} = 10\text{ V}$, $R_L = 2\ \Omega$ $I_D \cong 5\text{ A}$, $V_{GEN} = 4.5\text{ V}$, $R_g = 1\ \Omega$	Ch-1	-	5	10	
			Ch-2	-	5	10	
Drain-Source Body Diode Characteristics							
Continuous source-drain diode current	I_S	$T_C = 25\text{ }^\circ\text{C}$	Ch-1	-	-	12.6	A
			Ch-2	-	-	13.5	
Pulse diode forward current ($t = 100\ \mu\text{s}$)	I_{SM}		Ch-1	-	-	40	
			Ch-2	-	-	50	
Body diode voltage	V_{SD}	$I_S = 5\text{ A}$, $V_{GS} = 0\text{ V}$	Ch-1	-	0.82	1.2	V
			Ch-2	-	0.83	1.2	
Body diode reverse recovery time	t_{rr}		Ch-1	-	16	35	ns
			Ch-2	-	21	40	
Body diode reverse recovery charge	Q_{rr}	Channel-1 $I_F = 5\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $T_J = 25\text{ }^\circ\text{C}$	Ch-1	-	10	20	nC
			Ch-2	-	11	20	
Reverse recovery fall time	t_a	Channel-2 $I_F = 5\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $T_J = 25\text{ }^\circ\text{C}$	Ch-1	-	10	-	ns
			Ch-2	-	11	-	
Reverse recovery rise time	t_b		Ch-1	-	6	-	
			Ch-2	-	10	-	

Notes

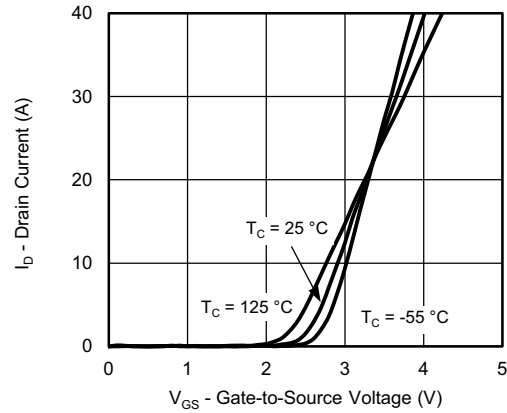
- a. Guaranteed by design, not subject to production testing
- b. Pulse test; pulse width $\leq 300\ \mu\text{s}$, duty cycle $\leq 2\%$

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.

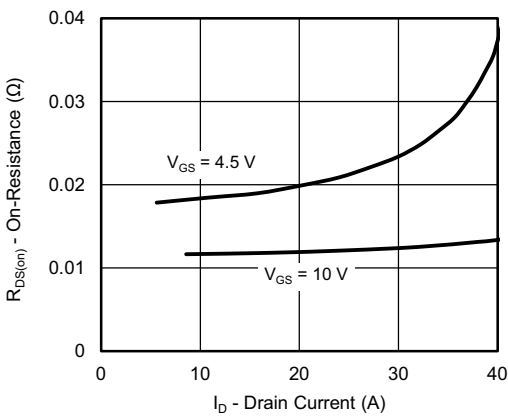
CHANNEL-1 TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



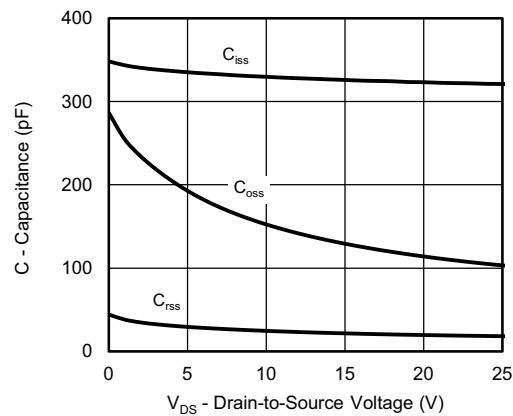
Output Characteristics



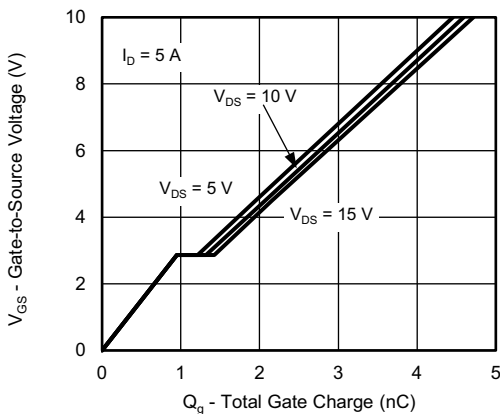
Transfer Characteristics



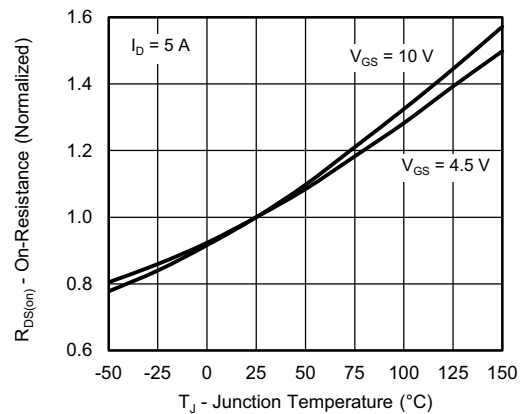
On-Resistance vs. Drain Current



Capacitance

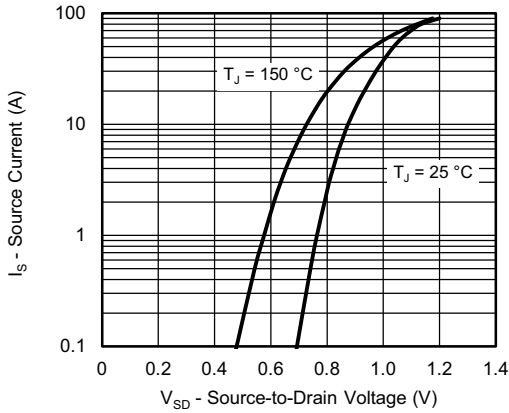


Gate Charge

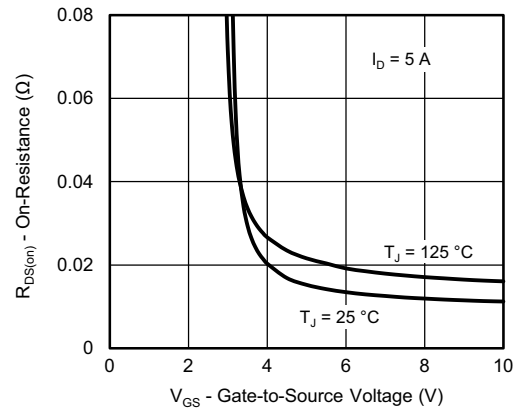


On-Resistance vs. Junction Temperature

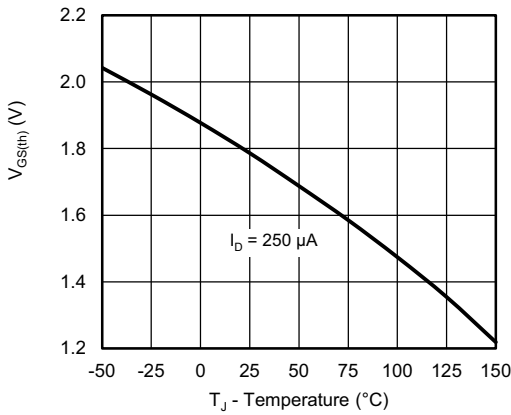
CHANNEL-1 TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



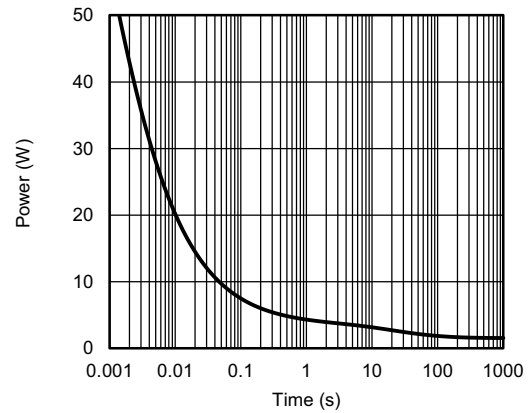
Source-Drain Diode Forward Voltage



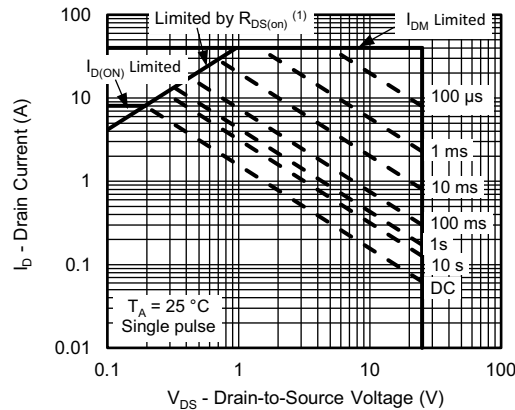
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



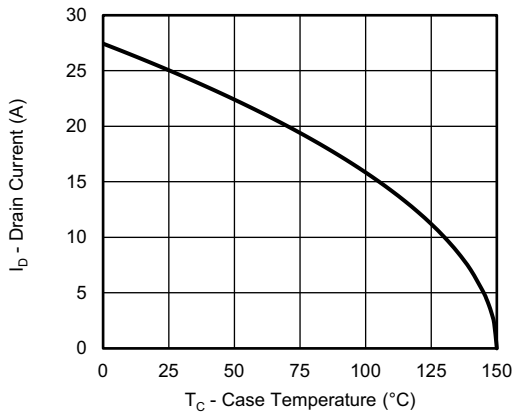
Single Pulse Power, Junction-to-Ambient



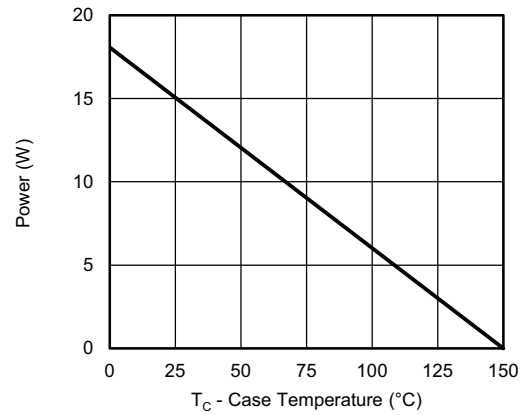
Safe Operating Area, Junction-to-Ambient



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



Current Derating ^a



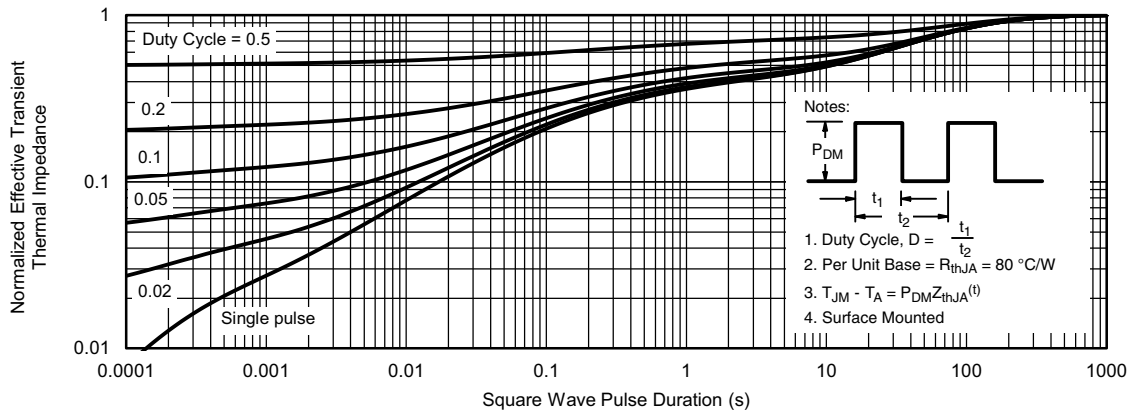
Power, Junction-to-Case

Note

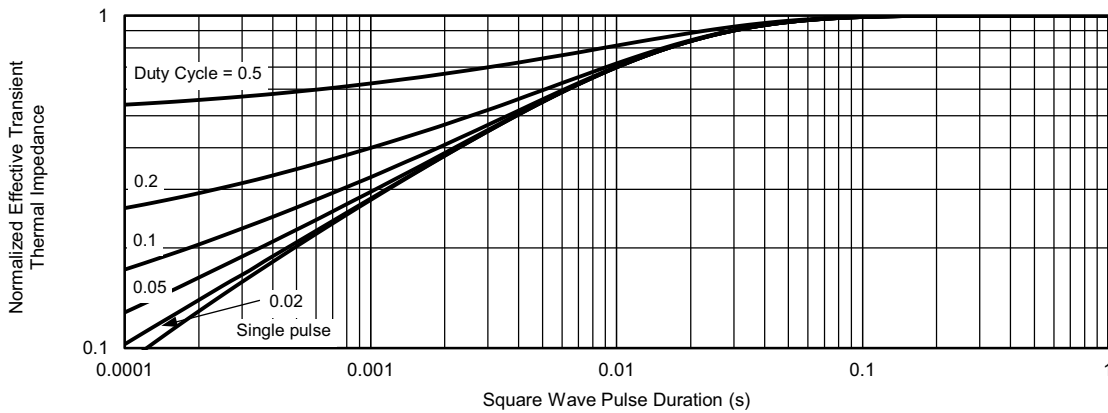
- a. The power dissipation P_D is based on T_J max. = 25 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit



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

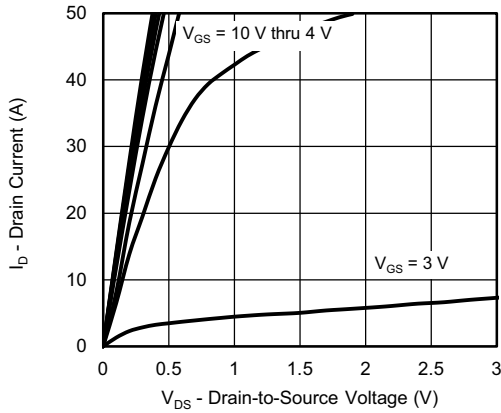


Normalized Thermal Transient Impedance, Junction-to-Ambient

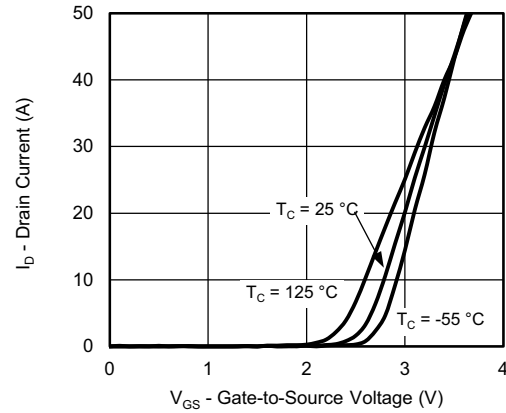


Normalized Thermal Transient Impedance, Junction-to-Case

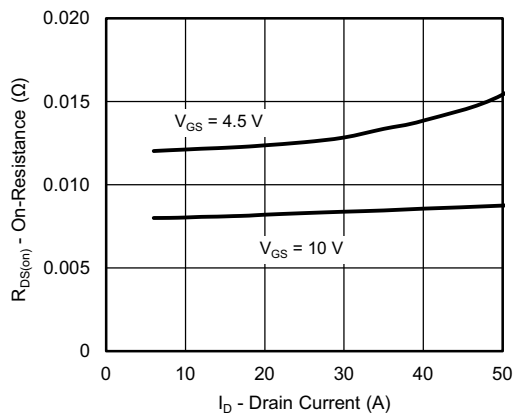
CHANNEL-2 TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



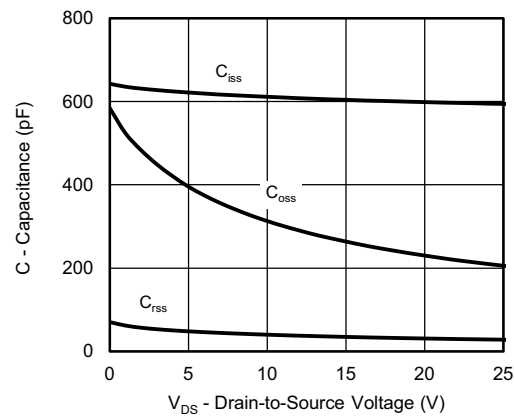
Output Characteristics



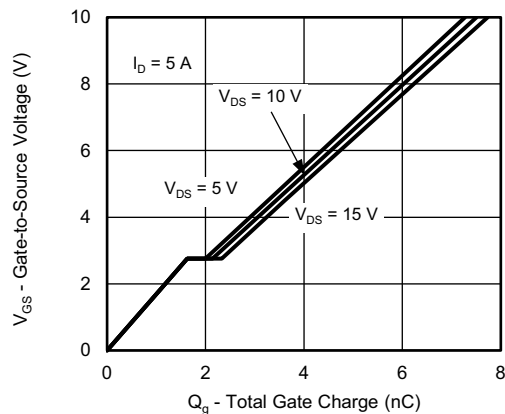
Transfer Characteristics



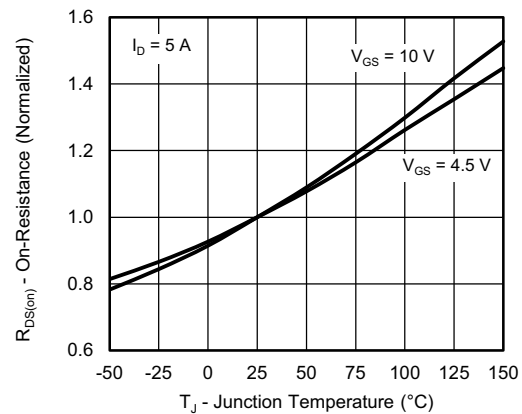
On-Resistance vs. Drain Current



Capacitance



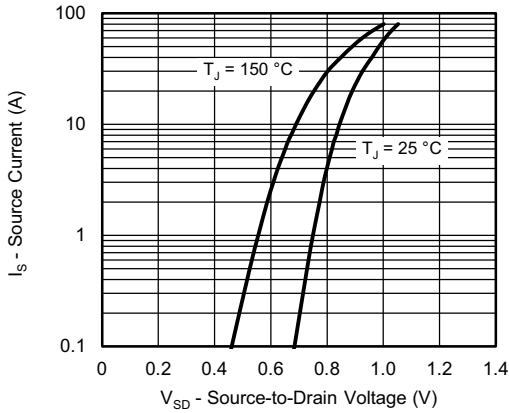
Gate Charge



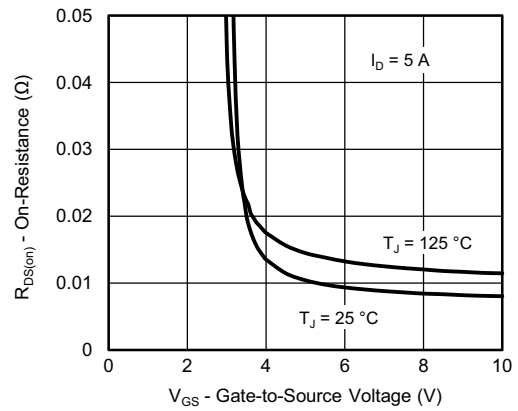
On-Resistance vs. Junction Temperature



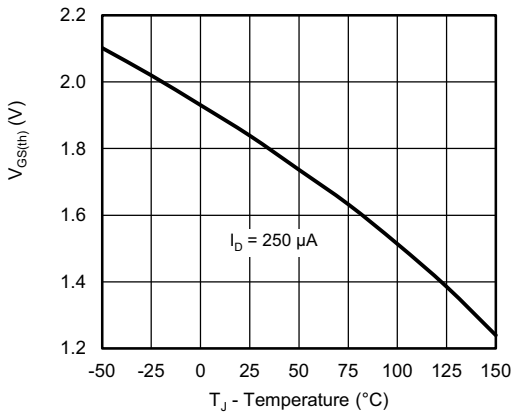
CHANNEL-2 TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



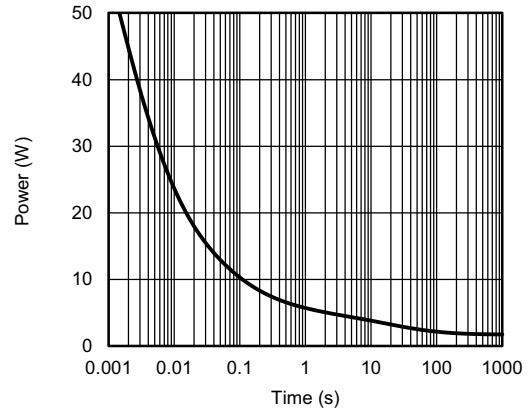
Source-Drain Diode Forward Voltage



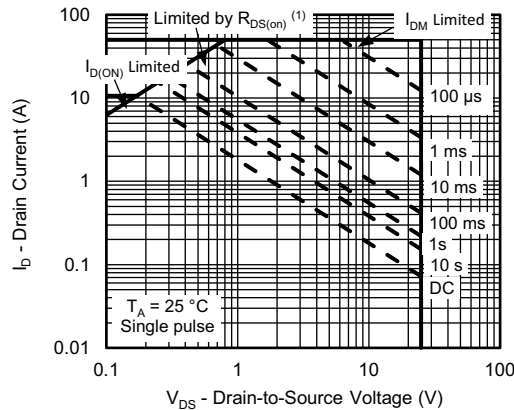
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



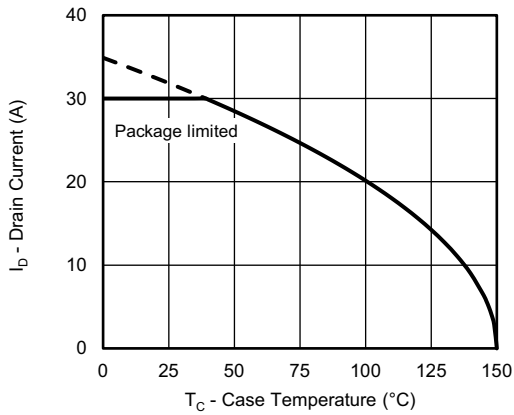
Single Pulse Power, Junction-to-Ambient



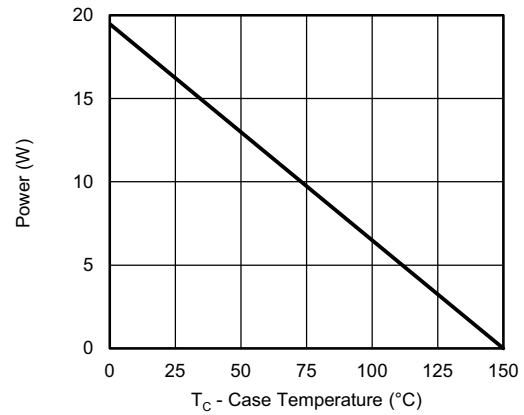
Safe Operating Area, Junction-to-Ambient



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



Current Derating ^a



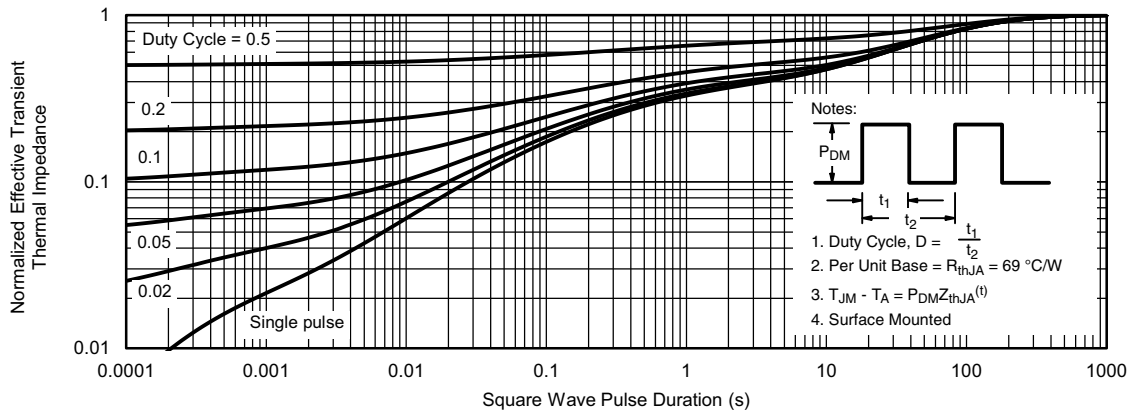
Power, Junction-to-Case

Note

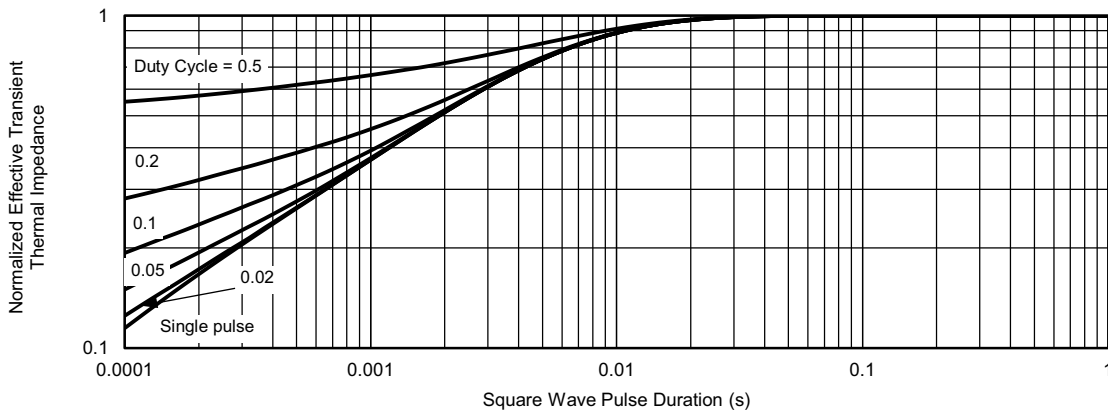
- a. The power dissipation P_D is based on T_J max. = 25 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit



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



Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Case

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 www.vishay.com/ppg?76059.



PowerPAIR® 3 x 3 Case Outline



Note
* Indicates pin #1 orientation (optional)

DIM.	MILLIMETERS			INCHES		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.70	0.75	0.80	0.028	0.030	0.031
A1	0.00		0.05	0.000		0.002
b	0.35	0.40	0.45	0.014	0.016	0.018
b1	0.20	0.25	0.38	0.008	0.010	0.015
C	0.18	0.20	0.23	0.007	0.008	0.009
D	2.90	3.00	3.10	0.114	0.118	0.122
D2	2.35	2.40	2.45	0.093	0.094	0.096
E	2.90	3.00	3.10	0.114	0.118	0.122
E1	0.94	0.99	1.04	0.037	0.039	0.041
E2	0.47	0.52	0.57	0.019	0.020	0.022
e	0.65 BSC			0.026 BSC		
K	0.25 typ.			0.010 typ.		
K1	0.35 typ.			0.014 typ.		
K2	0.30 typ.			0.012 typ.		
L	0.27	0.32	0.37	0.011	0.013	0.015

ECN: T12-0347-Rev. C, 18-Jun-12
DWG: 5998

RECOMMENDED MINIMUM PAD FOR PowerPAIR® 3 x 3



Recommended PAD for PowerPAIR 3 x 3

Dimensions in millimeters (inches)

Keep-Out 3.5 mm x 3.5 mm for non terminating traces



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