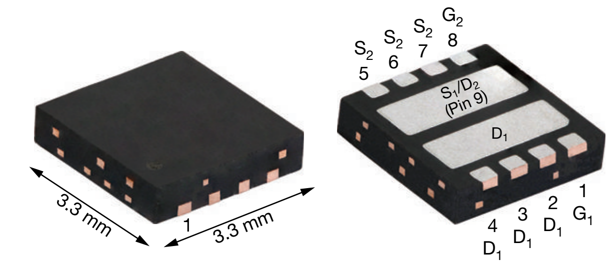
Dual N-Channel 100 V (D-S) MOSFETs

PowerPAIR® 3 x 3S



Top View   Bottom View

PRODUCT SUMMARY

	CHANNEL-1	CHANNEL-2
V_{DS} (V)	100	100
$R_{DS(on)}$ max. (Ω) at V_{GS} = 10 V	0.0377	0.0394
$R_{DS(on)}$ max. (Ω) at V_{GS} = 4.5 V	0.0517	0.0541
Q_g typ. (nC)	6.1	6.2
I_D (A) [a]	19.5	19.1
Configuration	Dual	

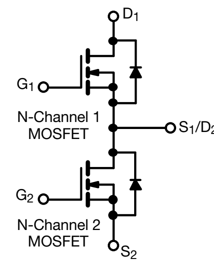
FEATURES

- TrenchFET® Gen IV power MOSFETs
- 100 % R_g and UIS tested
- Integrated MOSFET half bridge power stage
- 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

- POL
- Synchronous buck converter
- Telecom DC/DC
- Resonant converters
- Motor drive control



ORDERING INFORMATION

Package	PowerPAIR 3 x 3S
Lead (Pb)-free and halogen-free	SiZ270DT-T1-GE3

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

PARAMETER		SYMBOL	CHANNEL-1	CHANNEL-2	UNIT
Drain-source voltage		V_{DS}	100	100	V
Gate-source voltage		V_{GS}	± 20	± 20	
Continuous drain current (T_J = 150 °C)	T_C = 25 °C	I_D	19.5 [a]	19.1 [a]	A
	T_C = 70 °C		15.6	15.2	
	T_A = 25 °C		7.1 [b, c]	6.9 [b, c]	
	T_A = 70 °C		5.6 [b, c]	5.5 [b, c]	
Pulsed drain current (100 μs pulse width)		I_{DM}	40	40	
Continuous source drain diode current	T_C = 25 °C	I_S	27	27	
	T_A = 25 °C		3.6 [b, c]	3.6 [b, c]	
Single pulse avalanche current	L = 0.1 mH	I_{AS}	10	10	
Single pulse avalanche energy		E_{AS}	5	5	mJ
Maximum power dissipation	T_C = 25 °C	P_D	33	33	W
	T_C = 70 °C		21	21	
	T_A = 25 °C		4.3 [b, c]	4.3 [b, c]	
	T_A = 70 °C		2.8 [b, c]	2.8 [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]	t ≤ 10 s	R_{thJA}	23	29	23	29	°C/W
Maximum junction-to-case (drain)	Steady state	R_{thJC}	3	3.8	3	3.8	

Notes
a. T_C = 25 °C
b. Surface mounted on 1" x 1" FR4 board
c. t = 10 s
d. See solder profile (www.vishay.com/doc?73257). The PowerPAIR 3 x 3S 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 is 64 °C/W for channel-1 and 64 °C/W for channel-2

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	100	-	-	V
		V_{GS} = 0 V, I_D = 250 μA	Ch-2	100	-	-	
V_{DS} Temperature coefficient	$\Delta V_{DS}/T_J$	I_D = 250 μA	Ch-1	-	66	-	mV/°C
		I_D = 250 μA	Ch-2	-	75	-	
$V_{GS(th)}$ Temperature coefficient	$\Delta V_{GS(th)}/T_J$	I_D = 250 μA	Ch-1	-	-4.6	-	
		I_D = 250 μA	Ch-2	-	-4.4	-	
Gate threshold voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, I_D = 250 μA	Ch-1	1.1	-	2.4	V
		$V_{DS} = V_{GS}$, I_D = 250 μA	Ch-2	1.1	-	2.4	
Gate source leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 20 V	Ch-1	-	-	± 100	nA
		V_{DS} = 0 V, V_{GS} = ± 20 V	Ch-2	-	-	± 100	
Zero gate voltage drain current	I_{DSS}	V_{DS} = 100 V, V_{GS} = 0 V	Ch-1	-	-	1	μA
		V_{DS} = 100 V, V_{GS} = 0 V	Ch-2	-	-	1	
		V_{DS} = 100 V, V_{GS} = 0 V, T_J = 55 °C	Ch-1	-	-	5	
		V_{DS} = 100 V, V_{GS} = 0 V, T_J = 55 °C	Ch-2	-	-	5	
On-state drain current [b]	$I_{D(on)}$	$V_{DS} \geq$ 5 V, V_{GS} = 10 V	Ch-1	7	-	-	A
		$V_{DS} \geq$ 5 V, V_{GS} = 10 V	Ch-2	7	-	-	
Drain-source on-state resistance [b]	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 7 A	Ch-1	-	0.0302	0.0377	Ω
		V_{GS} = 10 V, I_D = 7 A	Ch-2	-	0.0315	0.0394	
		V_{GS} = 4.5 V, I_D = 5 A	Ch-1	-	0.0340	0.0517	
		V_{GS} = 4.5 V, I_D = 5 A	Ch-2	-	0.0350	0.0541	
Forward transconductance [b]	g_{fs}	V_{DS} = 10 V, I_D = 7 A	Ch-1	-	43	-	S
		V_{DS} = 10 V, I_D = 7 A	Ch-2	-	50	-	
Dynamic [a]							
Input capacitance	C_{iss}	Channel-1 V_{DS} = 50 V, V_{GS} = 0 V, f = 1 MHz Channel-2 V_{DS} = 50 V, V_{GS} = 0 V, f = 1 MHz	Ch-1	-	860	-	pF
			Ch-2	-	845	-	
Output capacitance	C_{oss}		Ch-1	-	70	-	
			Ch-2	-	65	-	
Reverse transfer capacitance	C_{rss}		Ch-1	-	8	-	
			Ch-2	-	7	-	
C_{rss}/C_{iss} ratio			Ch-1	-	-	0.018	
			Ch-2	-	-	0.017	
Total gate charge	Q_g	V_{DS} = 50 V, V_{GS} = 10 V, I_D = 7 A	Ch-1	-	13.3	27	nC
		V_{DS} = 50 V, V_{GS} = 10 V, I_D = 7 A	Ch-2	-	13.3	27	
		V_{DS} = 50 V, V_{GS} = 4.5 V, I_D = 7 A	Ch-1	-	6.14	13	
		V_{DS} = 50 V, V_{GS} = 4.5 V, I_D = 7 A	Ch-2	-	6.2	13	
Gate-source charge	Q_{gs}	Channel-1 V_{DS} = 50 V, V_{GS} = 4.5 V, I_D = 7 A Channel-2 V_{DS} = 50 V, V_{GS} = 4.5 V, I_D = 7 A	Ch-1	-	2.9	-	
			Ch-2	-	2.8	-	
Gate-drain charge	Q_{gd}		Ch-1	-	1.4	-	
			Ch-2	-	1.6	-	
Output charge	Q_{oss}	V_{DS} = 50 V, V_{GS} = 0 V	Ch-1	-	11	-	
			Ch-2	-	11	-	
Gate resistance	R_g	f = 1 MHz	Ch-1	0.26	1.3	2.6	Ω
			Ch-2	0.2	1	2	

SPECIFICATIONS (T_J = 25 °C, unless otherwise noted)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Dynamic [a]							
Turn-on delay time	$t_{d(on)}$	Channel-1 V_{DD} = 50 V, R_L = 3 Ω, $I_D \cong$ 5 A, V_{GEN} = 10 V, R_g = 1 Ω Channel-2 V_{DD} = 50 V, R_L = 3 Ω, $I_D \cong$ 5 A, V_{GEN} = 10 V, R_g = 1 Ω	Ch-1	-	12	24	ns
			Ch-2	-	12	24	
Rise time	t_r		Ch-1	-	6	12	
			Ch-2	-	6	12	
Turn-off delay time	$t_{d(off)}$		Ch-1	-	22	44	
			Ch-2	-	23	45	
Fall time	t_f		Ch-1	-	6	12	
			Ch-2	-	5	10	
Turn-on delay time	$t_{d(on)}$	Channel-1 V_{DD} = 40 V, R_L = 3 Ω, $I_D \cong$ 5 A, V_{GEN} = 4.5 V, R_g = 1 Ω Channel-2 V_{DD} = 40 V, R_L = 3 Ω, $I_D \cong$ 5 A, V_{GEN} = 4.5 V, R_g = 1 Ω	Ch-1	-	22	44	
			Ch-2	-	20	40	
Rise time	t_r		Ch-1	-	40	80	
			Ch-2	-	42	84	
Turn-off delay time	$t_{d(off)}$		Ch-1	-	24	48	
			Ch-2	-	25	50	
Fall time	t_f		Ch-1	-	12	24	
			Ch-2	-	10	20	
Drain-Source Body Diode Characteristics							
Continuous source-drain diode current	I_S	T_C = 25 °C	Ch-1	-	-	27	A
			Ch-2	-	-	27	
Pulse diode forward current (t = 100 μs)	I_{SM}		Ch-1	-	-	40	
			Ch-2	-	-	40	
Body diode voltage	V_{SD}	I_S = 5 A, V_{GS} = 0 V	Ch-1	-	0.8	1.2	V
		I_S = 5 A, V_{GS} = 0 V	Ch-2	-	0.8	1.2	
Body diode reverse recovery time	t_{rr}	Channel-1 I_F = 5 A, di/dt = 100 A/μs, T_J = 25 °C Channel-2 I_F = 5 A, di/dt = 100 A/μs, T_J = 25 °C	Ch-1	-	29	58	ns
			Ch-2	-	28	56	
Body diode reverse recovery charge	Q_{rr}		Ch-1	-	34	68	nC
			Ch-2	-	32	64	
Reverse recovery fall time	t_a		Ch-1	-	25	-	ns
			Ch-2	-	24	-	
Reverse recovery rise time	t_b		Ch-1	-	4	-	
			Ch-2	-	4	-	

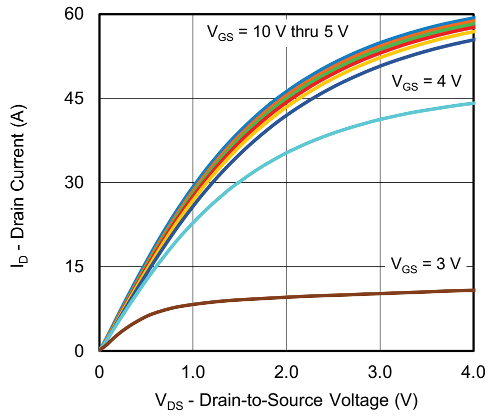
Notes

a. Guaranteed by design, not subject to production testing

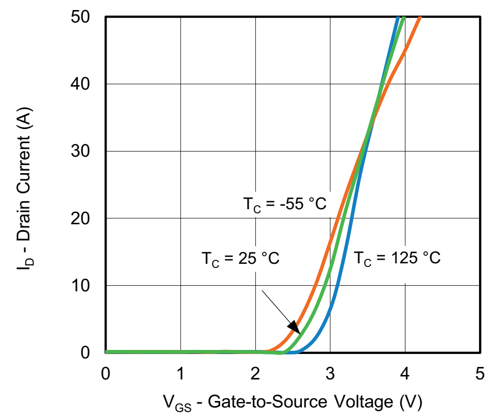
b. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2 %

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.

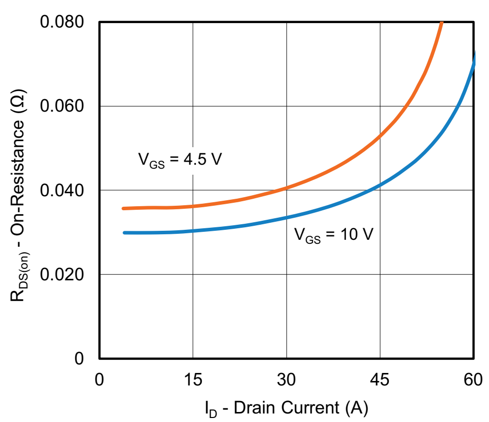
CHANNEL-1 TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



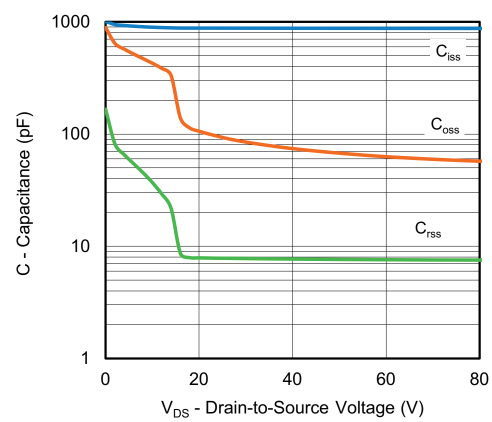
Output Characteristics



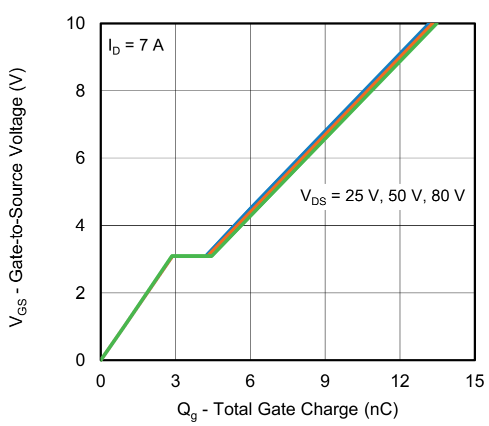
Transfer Characteristics



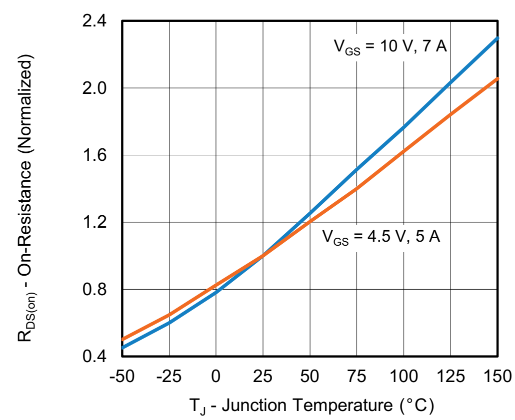
On-Resistance vs. Drain Current



Capacitance

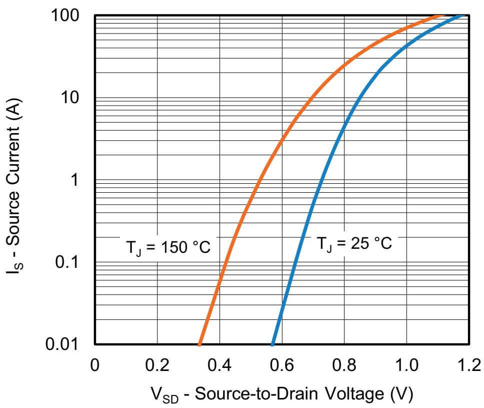


Gate Charge

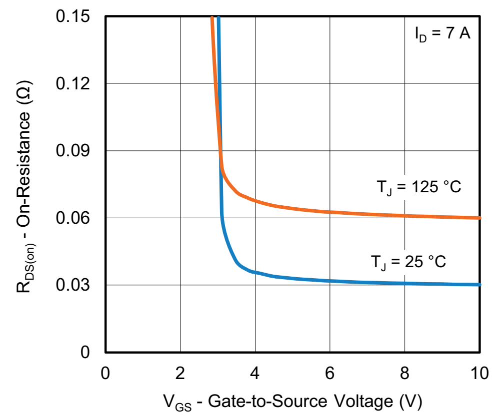


On-Resistance vs. Junction Temperature

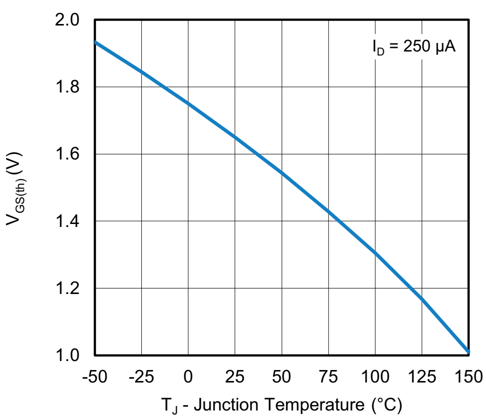
CHANNEL-1 TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



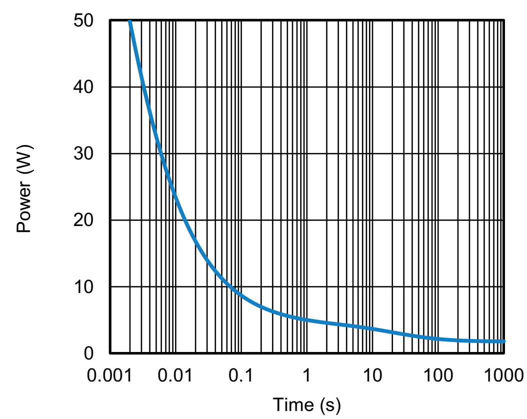
Source-Drain Diode Forward Voltage



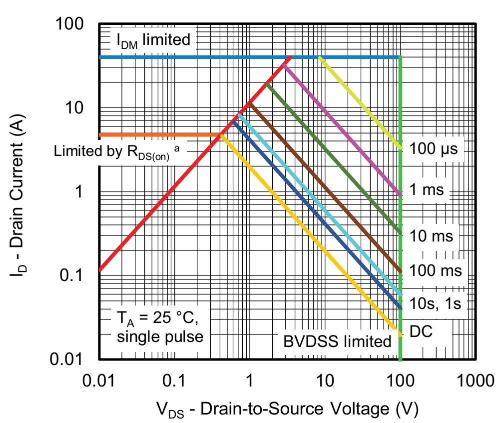
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



Single Pulse Power, Junction-to-Ambient

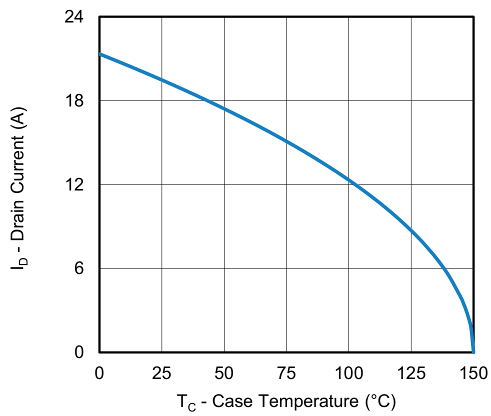


Safe Operating Area, Junction-to-Ambient

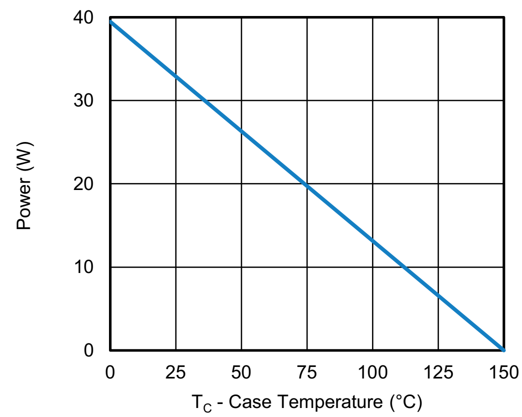
Note

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

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



Current Derating [a]

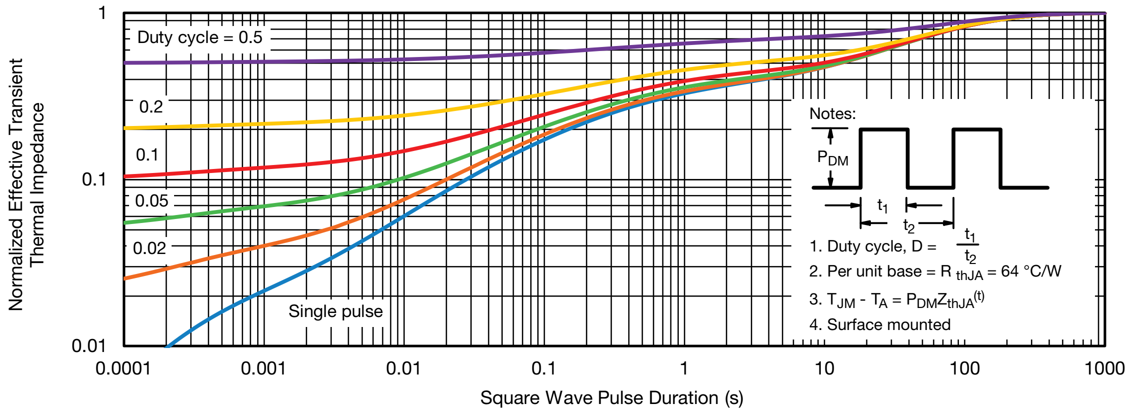


Power, Junction-to-Case

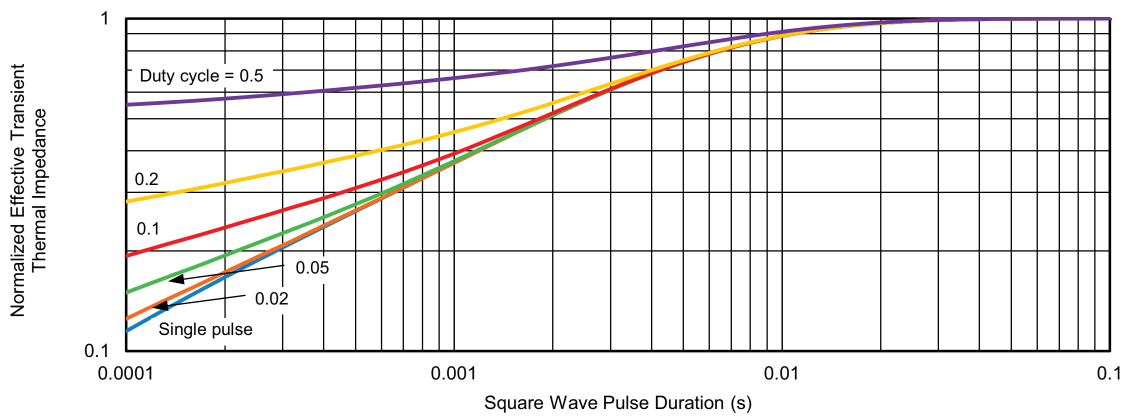
Note

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)

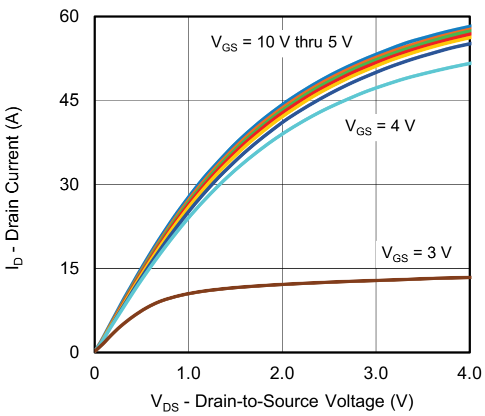


Normalized Thermal Transient Impedance, Junction-to-Ambient

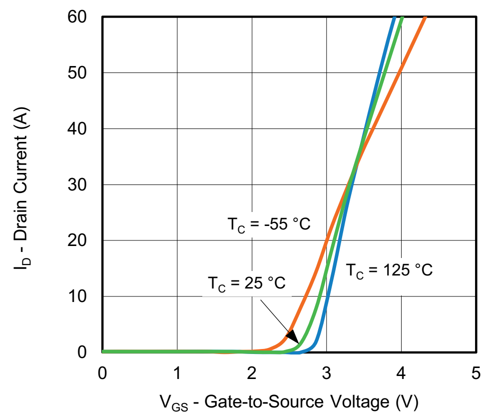


Normalized Thermal Transient Impedance, Junction-to-Case

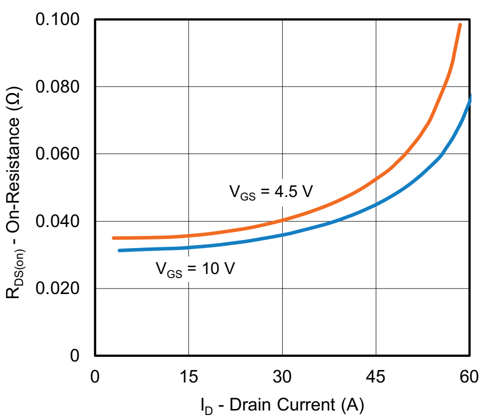
CHANNEL-2 TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



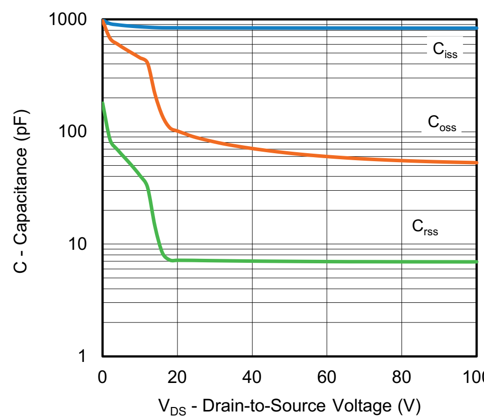
Output Characteristics



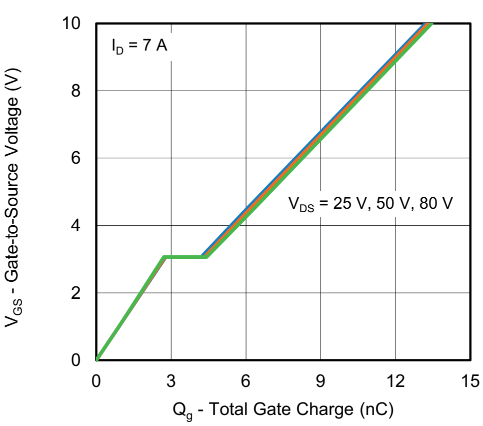
Transfer Characteristics



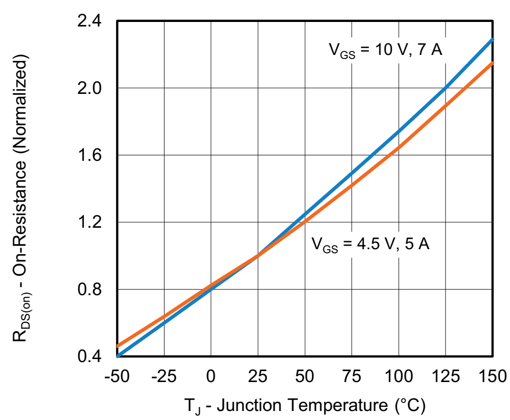
On-Resistance vs. Drain Current



Capacitance

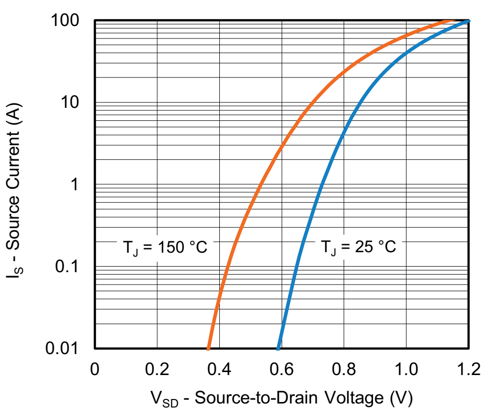


Gate Charge

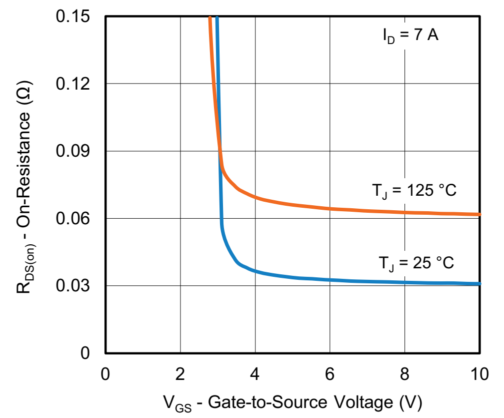


On-Resistance vs. Junction Temperature

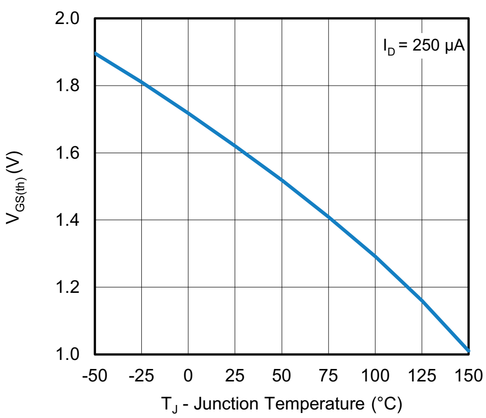
CHANNEL-2 TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



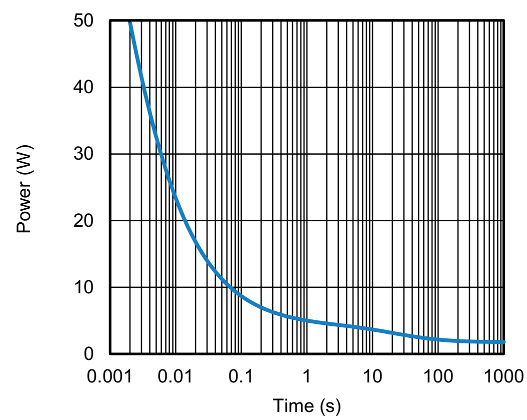
Source-Drain Diode Forward Voltage



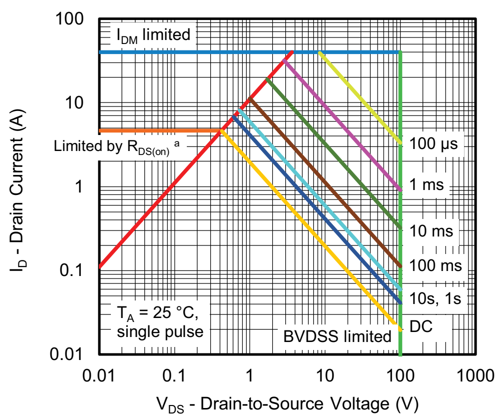
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



Single Pulse Power, Junction-to-Ambient

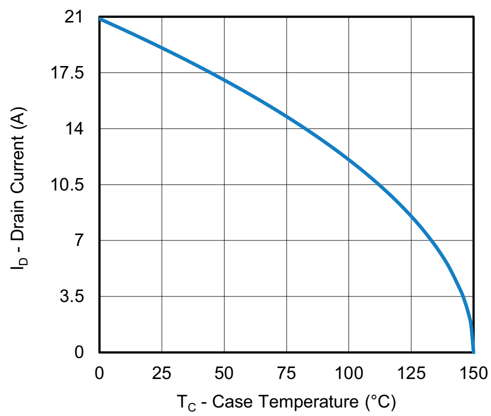


Safe Operating Area, Junction-to-Ambient

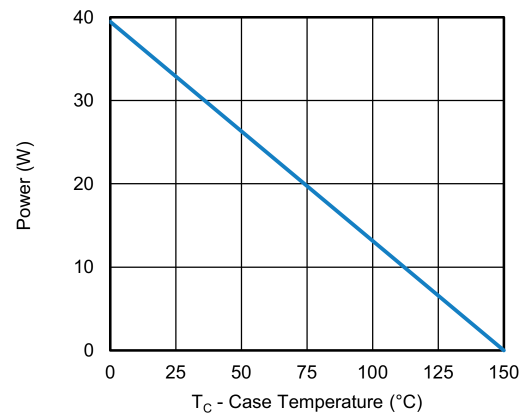
Note

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

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



Current Derating [a]

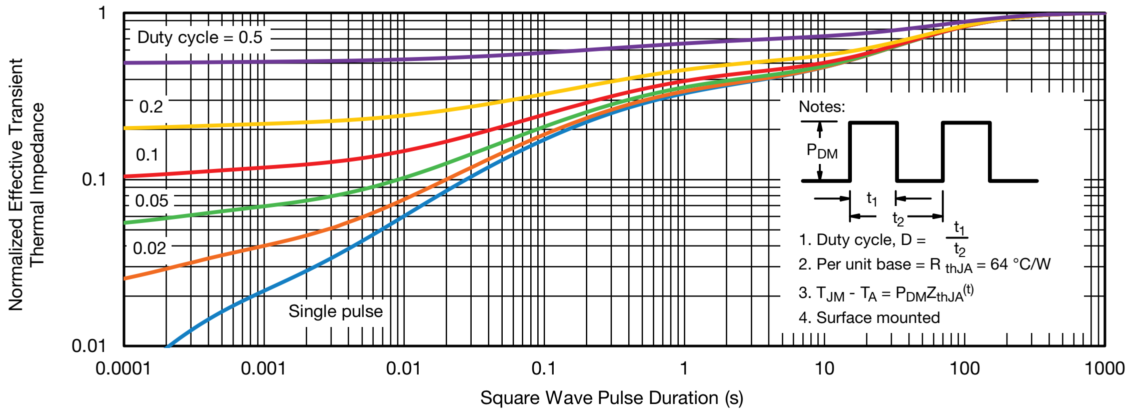


Power, Junction-to-Case

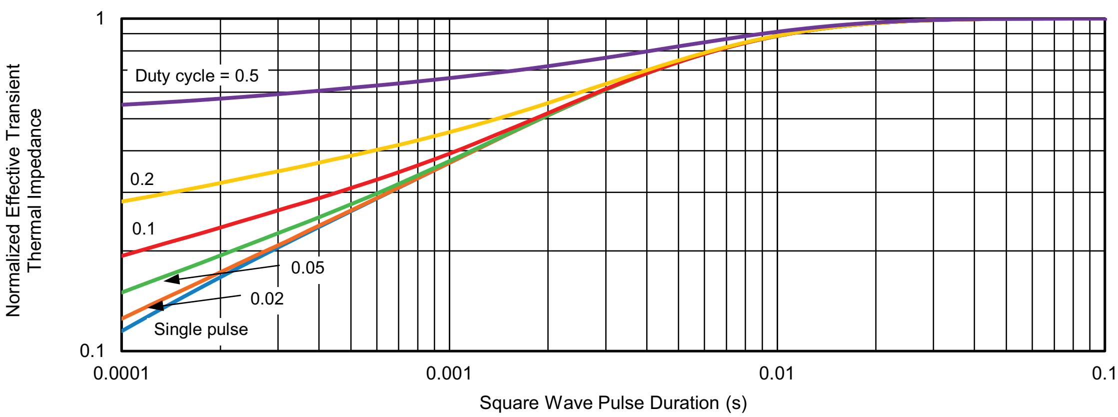
Note

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)

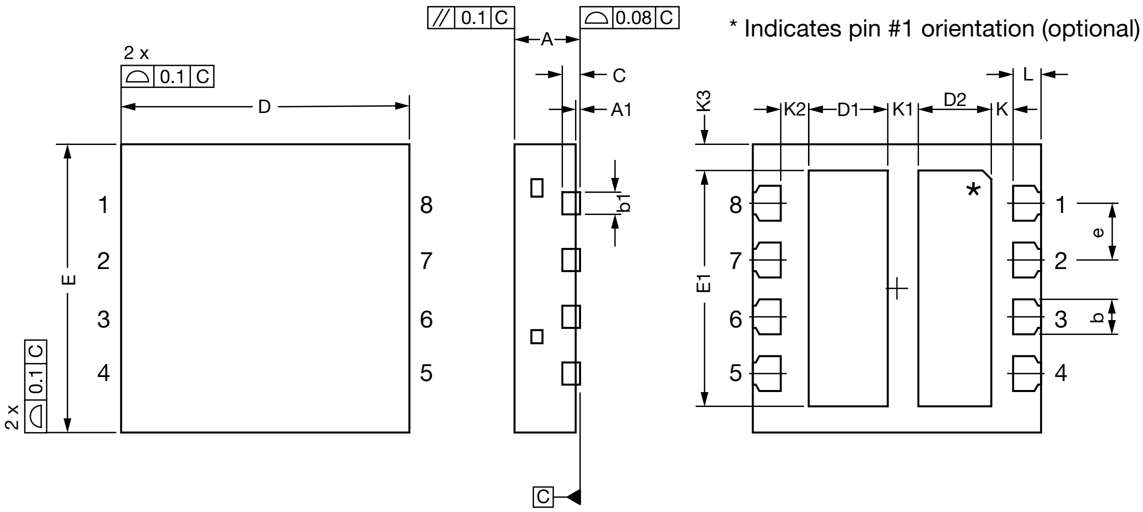


Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Case

PowerPAIR® 3.3 x 3.3 Case Outline

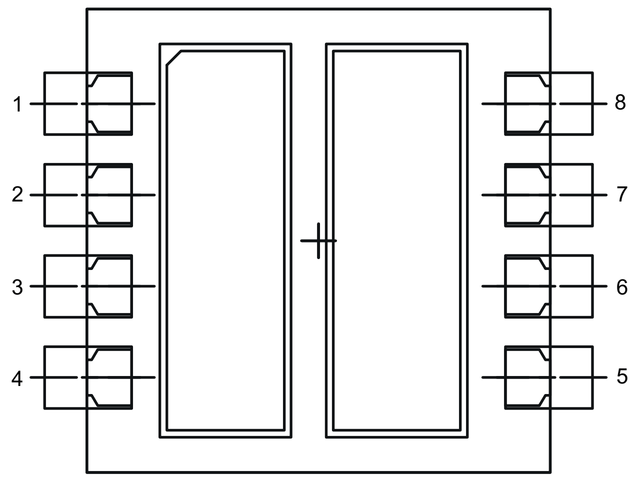


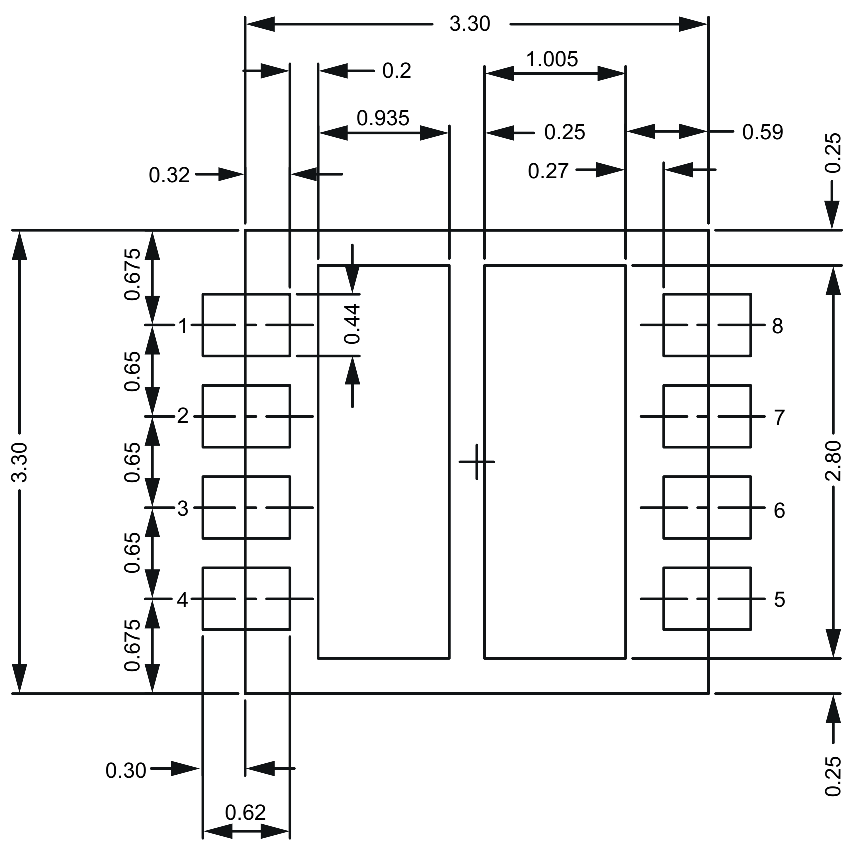
DIM.	MILLIMETERS			INCHES		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.70	0.75	0.80	0.028	0.030	0.031
A1	0.00	-	0.05	0.000	-	0.002
b	0.35	0.40	0.45	0.014	0.016	0.018
b1	0.20	0.25	0.38	0.008	0.010	0.015
C	0.18	0.20	0.23	0.007	0.008	0.009
D	3.20	3.30	3.40	0.126	0.130	0.134
D1	0.86	0.91	0.96	0.034	0.036	0.038
D2	0.79	0.84	0.89	0.031	0.033	0.035
E	3.20	3.30	3.40	0.126	0.130	0.134
E1	2.65	2.70	2.75	0.104	0.106	0.108
e	0.65 BSC			0.026 BSC		
K	0.25 ref.			0.010 ref.		
K1	0.35 ref.			0.014 ref.		
K2	0.32 ref.			0.013 ref.		
K3	0.30 ref.			0.012 ref.		
L	0.27	0.32	0.37	0.011	0.013	0.015
C18-0564-Rev. A, 14-May-2018 DWG: 6066						

Notes

(1) Use millimeters as the primary measurement
(2) Dimensioning and tolerances conform to ASME Y14.5M - 1994
(3) N is the number of terminals; Nd is the number of terminals in X-direction; Ne is the number of terminals in Y-direction
(4) Dimension b applies to plated terminal and is measured between 0.20 mm and 0.25 mm from terminal tip
(5) The pin # 1 identifier must be existed on the top surface of the package by using indentation mark or other feature of package body
(6) Exact shape and size of this features is optional
(7) Package warpage max. 0.08 mm
(8) Applied only for terminals

Recommended Land Pattern for PowerPAIR® 3 x 3S BWL





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