

TDM3412-VB Datasheet

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

PRODUCT SUMMARY

	V _{DS} (V)	R _{DS(on)} (Ω)	I _D (A) ^a	Q _g (Typ.)
Channel-1	30	0.0200 at V _{GS} = 10 V	11	3.5 nC
		0.0265 at V _{GS} = 4.5 V	11	
Channel-2	30	0.0090 at V _{GS} = 10 V	28	6.8 nC
		0.0135 at V _{GS} = 4.5 V	28	

FEATURES

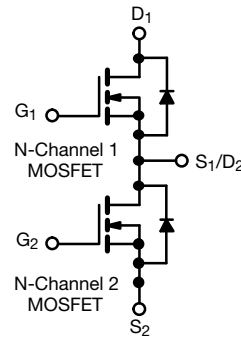
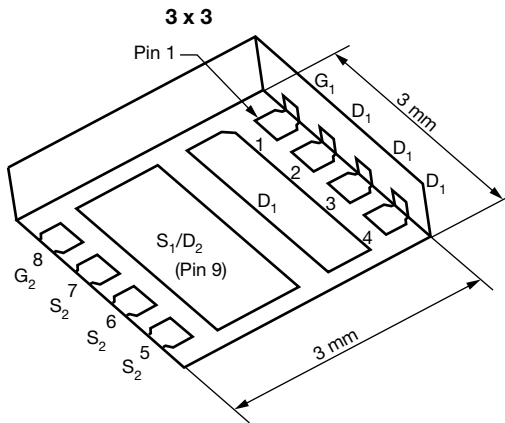
- DFN Optimizes High-Side and Low-Side MOSFETs for Synchronous Buck Converters
- Trench Power Mosfets
- 100 % R_g and UIS Tested
-

APPLICATIONS

- Computing System Power
- POL
- Synchronous Buck Converter



RoHS
COMPLIANT
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		V
Gate-Source Voltage		V _{GS}	± 20		
Continuous Drain Current (T _J = 150 °C)	T _C = 25 °C	I _D	11 ^a	28 ^a	A
	T _C = 70 °C		11 ^a	28 ^a	
	T _A = 25 °C		9.8 ^{b, c}	14.9 ^{b, c}	
	T _A = 70 °C		7.8 ^{b, c}	11.9 ^{b, c}	
Pulsed Drain Current (t = 300 μs)		I _{DM}	30	40	
Continuous Source Drain Diode Current	T _A = 25 °C	I _S	11 ^a	26	
	T _A = 25 °C		3.2 ^{b, c}	3.8 ^{b, c}	
Avalanche Current	L = 0.1 mH	I _{AS}	12	15	
Single Pulse Avalanche Energy		E _{AS}	7	11	mJ
Maximum Power Dissipation	T _C = 25 °C	P _D	16.7	31	W
	T _C = 70 °C		10.7	20	
	T _A = 25 °C		3.7 ^{b, c}	4.2 ^{b, c}	
	T _A = 70 °C		2.4 ^{b, c}	2.7 ^{b, c}	
Operating Junction and Storage Temperature Range		T _J , T _{stg}	- 55 to 150		°C
Soldering Recommendations (Peak Temperature) ^{d, e}			260		

Notes:

a. Package limited.

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

c. t = 10 s.

d. The PowerPAIR 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.

THERMAL RESISTANCE RATINGS

Parameter		Symbol	Channel-1		Channel-2		Unit
			Typ.	Max.	Typ.	Max.	
Maximum Junction-to-Ambient ^{a, b}	$t \leq 10$ s	R_{thJA}	27	34	24	30	°C/W
Maximum Junction-to-Case (Drain)	Steady State	R_{thJC}	6	7.5	3.2	4	

Notes:

a. Surface mounted on 1" x 1" FR4 board.

b. Maximum under steady state conditions is 69 °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, I _D = 250 μA	Ch-1	30			V	
		V _{GS} = 0 V, I _D = 250 μA	Ch-2	30				
V _{DS} Temperature Coefficient	ΔV _{DS} /T _J	I _D = 250 μA	Ch-1		24		mV/°C	
		I _D = 250 μA	Ch-2		30			
V _{GS(th)} Temperature Coefficient	ΔV _{GS(th)} /T _J	I _D = 250 μA	Ch-1		- 4.1			
		I _D = 250 μA	Ch-2		- 5			
Gate Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA	Ch-1	1		2.4	V	
		V _{DS} = V _{GS} , I _D = 250 μA	Ch-2	1		2.2		
Gate Source Leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 20 V	Ch-1 Ch-2			± 100 ± 100	nA	
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 30 V, V _{GS} = 0 V	Ch-1			1	μA	
		V _{DS} = 30 V, V _{GS} = 0 V	Ch-2			1		
		V _{DS} = 30 V, V _{GS} = 0 V, T _J = 55 °C	Ch-1			5		
		V _{DS} = 30 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 = 9.8 A	Ch-1		0.0200		Ω	
		V _{GS} = 10 V, I _D = 15 A	Ch-2		0.0090			
		V _{GS} = 4.5 V, I _D = 8.5 A	Ch-1		0.0265			
		V _{GS} = 4.5 V, I _D = 12 A	Ch-2		0.0135			
Forward Transconductance ^b	g _{fs}	V _{DS} = 15 V, I _D = 9.8 A	Ch-1		30		S	
		V _{DS} = 15 V, I _D = 15 A	Ch-2		30			
Dynamic ^a								
Input Capacitance	C _{iss}	Channel-1 V _{DS} = 15 V, V _{GS} = 0 V, f = 1 MHz	Ch-1 Ch-2		400 730		pF	
Output Capacitance	C _{oss}		Ch-1 Ch-2		125 155			
Reverse Transfer Capacitance	C _{rss}	Channel-2 V _{DS} = 15 V, V _{GS} = 0 V, f = 1 MHz	Ch-1 Ch-2		25 65			nC
			V _{DS} = 15 V, V _{GS} = 10 V, I _D = 9.8 A	Ch-1		7.4		
Total Gate Charge	Q _g	V _{DS} = 15 V, V _{GS} = 10 V, I _D = 15 A	Ch-2		14.2	22		
		Channel-1 V _{DS} = 15 V, V _{GS} = 4.5 V, I _D = 9.8 A	Ch-1 Ch-2		3.5 6.8	5.3 11		
Gate-Source Charge	Q _{gs}		Channel-2 V _{DS} = 15 V, V _{GS} = 4.5 V, I _D = 15 A	Ch-1 Ch-2		1.5 2.2		
		Ch-1 Ch-2			1.1 2.3			
Gate Resistance	R _g	f = 1 MHz	Ch-1 Ch-2	0.5 0.5	2.6 2.6	5.2 5.2	Ω	

Notes:

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

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

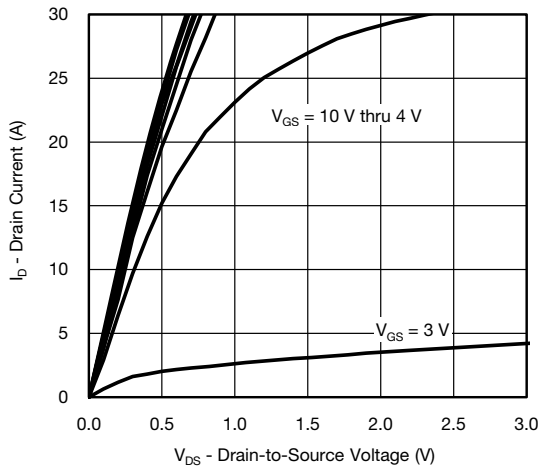
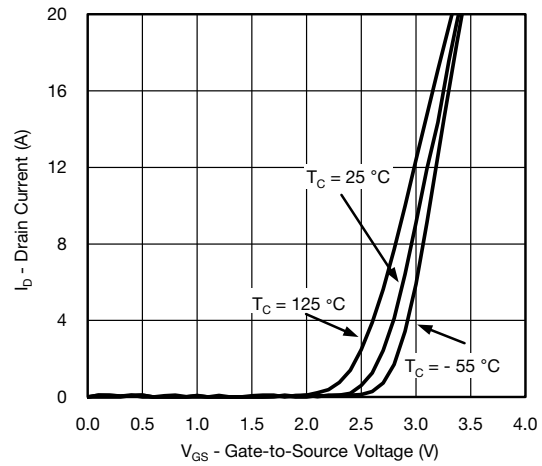
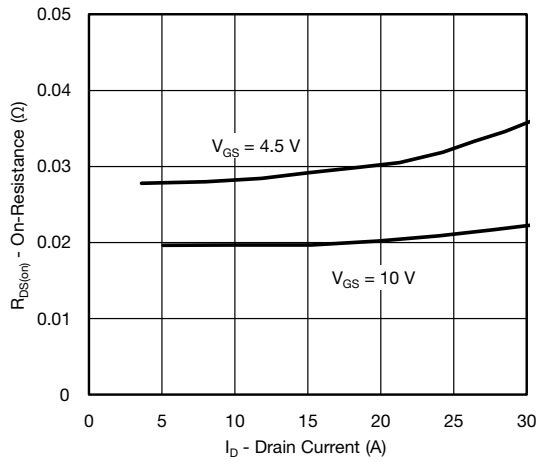
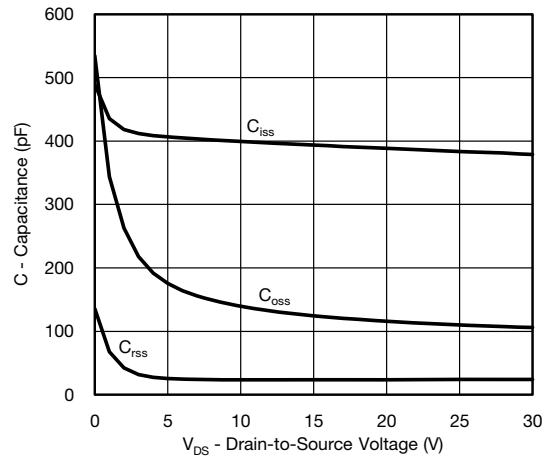
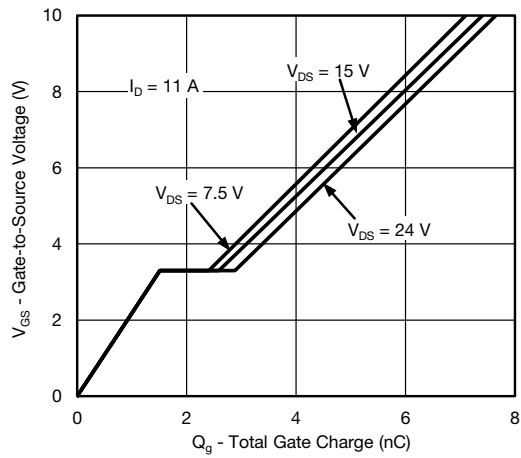
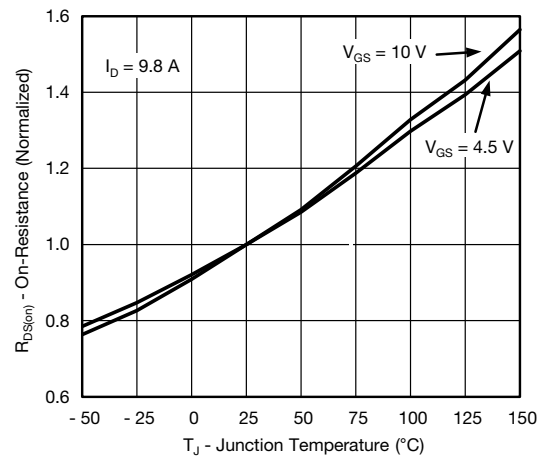
SPECIFICATIONS (T _J = 25 °C, unless otherwise noted)								
Parameter	Symbol	Test Conditions		Min.	Typ.	Max.	Unit	
Dynamic ^a								
Turn-On Delay Time	t _{d(on)}	Channel-1 V _{DD} = 15 V, R _L = 1.9 Ω I _D ≅ 8 A, V _{GEN} = 4.5 V, R _g = 1 Ω	Ch-1		25	50	ns	
			Ch-2		25	50		
Rise Time	t _r		Ch-1		45	90		
			Ch-2		80	160		
Turn-Off Delay Time	t _{d(off)}	Channel-2 V _{DD} = 15 V, R _L = 1.5 Ω I _D ≅ 10 A, V _{GEN} = 4.5 V, R _g = 1 Ω	Ch-1		10	20		
			Ch-2		20	40		
Fall Time	t _f		Ch-1		10	20		
			Ch-2		40	80		
Turn-On Delay Time	t _{d(on)}	Channel-1 V _{DD} = 15 V, R _L = 1.9 Ω I _D ≅ 8 A, V _{GEN} = 10 V, R _g = 1 Ω	Ch-1		5	10		
			Ch-2		5	10		
Rise Time	t _r		Ch-1		10	20		
			Ch-2		20	40		
Turn-Off Delay Time	t _{d(off)}	Channel-2 V _{DD} = 15 V, R _L = 1.5 Ω I _D ≅ 10 A, V _{GEN} = 10 V, R _g = 1 Ω	Ch-1		10	20		
			Ch-2		15	30		
Fall Time	t _f		Ch-1		7	15		
			Ch-2		10	20		
Drain-Source Body Diode Characteristics								
Continuous Source-Drain Diode Current	I _S	T _C = 25 °C	Ch-1			11	A	
			Ch-2			26		
Pulse Diode Forward Current ^a	I _{SM}		Ch-1			30		
			Ch-2			40		
Body Diode Voltage	V _{SD}	I _S = 8 A, V _{GS} = 0 V	Ch-1		0.84	1.2	V	
		I _S = 10 A, V _{GS} = 0 V	Ch-2		0.82	1.2		
Body Diode Reverse Recovery Time	t _{rr}	Channel-1 I _F = 8 A, dI/dt = 100 A/μs, T _J = 25 °C	Ch-1		17	35	ns	
			Ch-2		20	40		
Body Diode Reverse Recovery Charge	Q _{rr}		Channel-2 I _F = 10 A, dI/dt = 100 A/μs, T _J = 25 °C	Ch-1		9	20	nC
				Ch-2		14	30	
Reverse Recovery Fall Time	t _a			Ch-1		9.5		ns
				Ch-2		12.5		
Reverse Recovery Fall Time	t _a			Ch-1		7.5		
Reverse Recovery Rise Time	t _b				Ch-2		7.5	

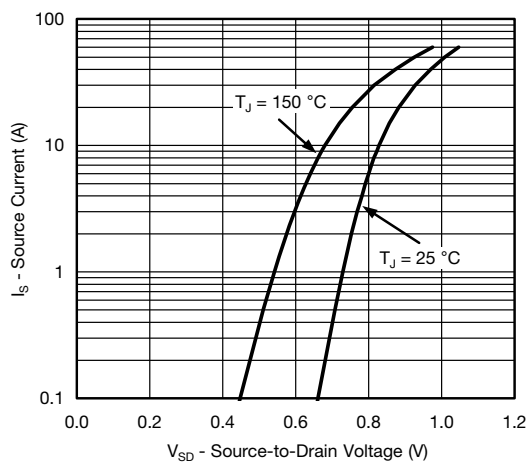
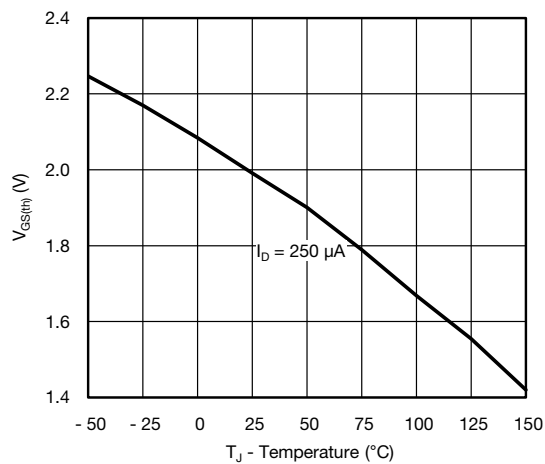
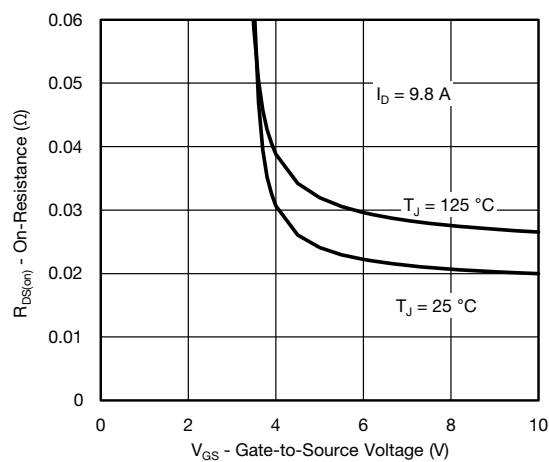
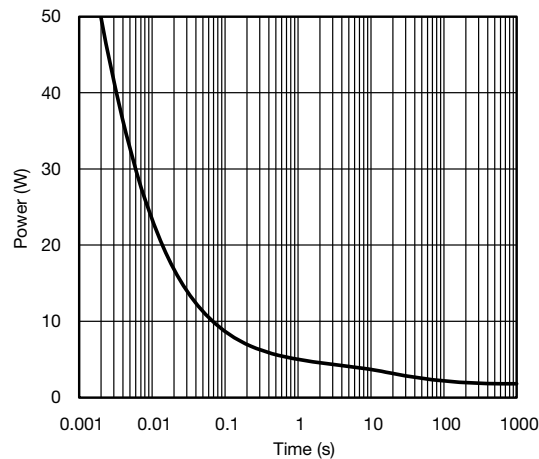
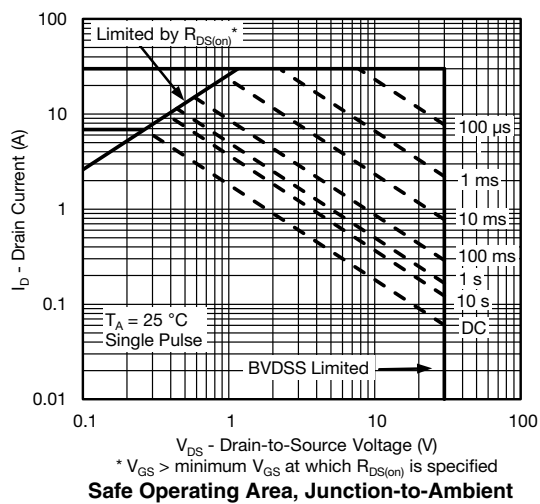
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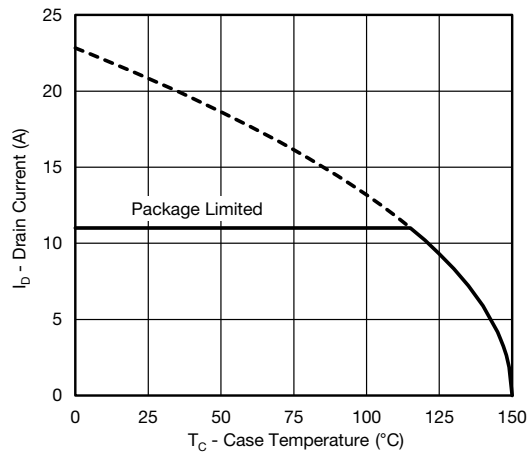
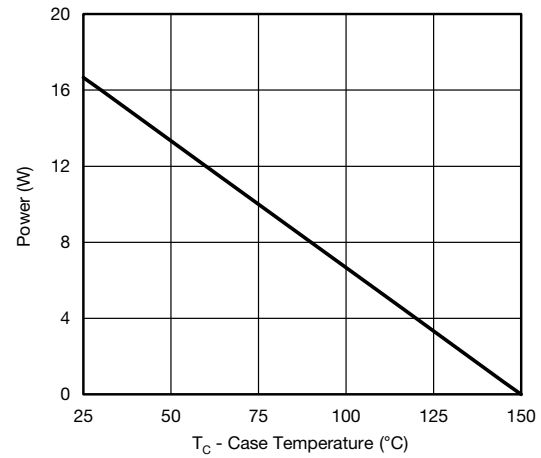
a. Guaranteed by design, not subject to production testing.

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

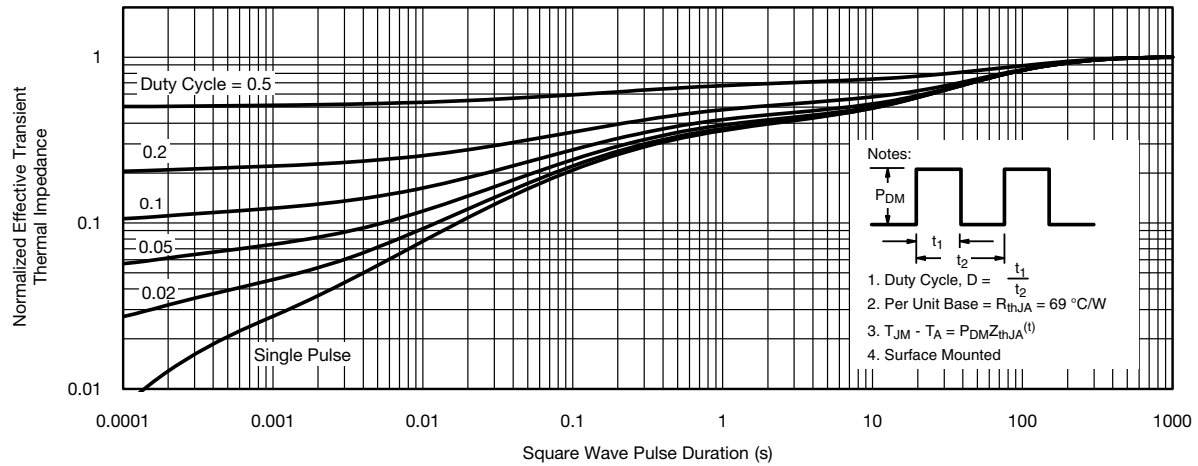
CHANNEL-1 TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

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

Threshold Voltage

On-Resistance vs. Gate-to-Source Voltage

Single Pulse Power


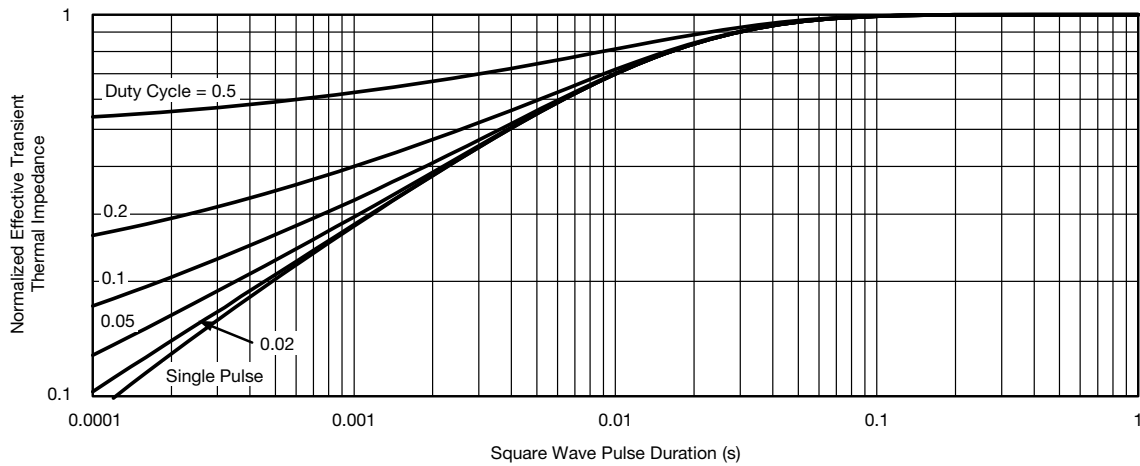
CHANNEL-1 TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

Current Derating*

Power, Junction-to-Case

* 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.

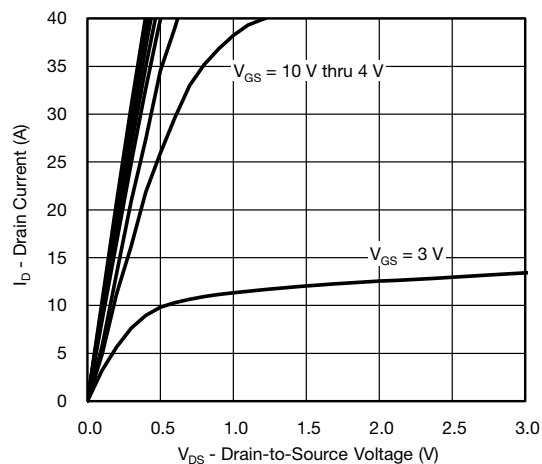
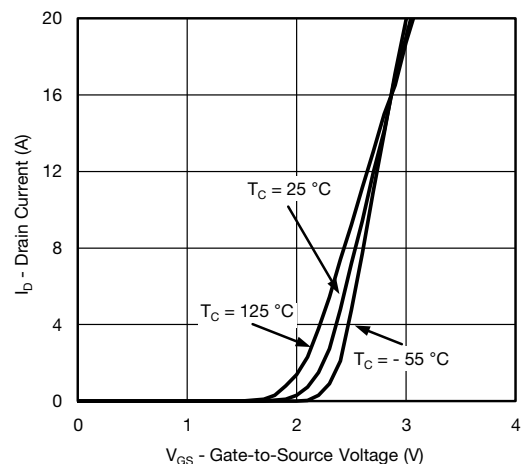
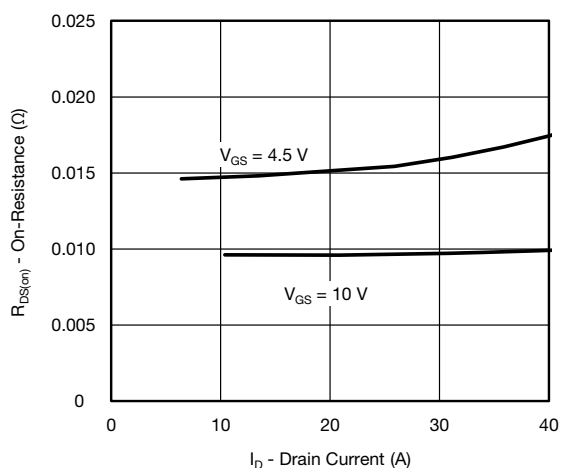
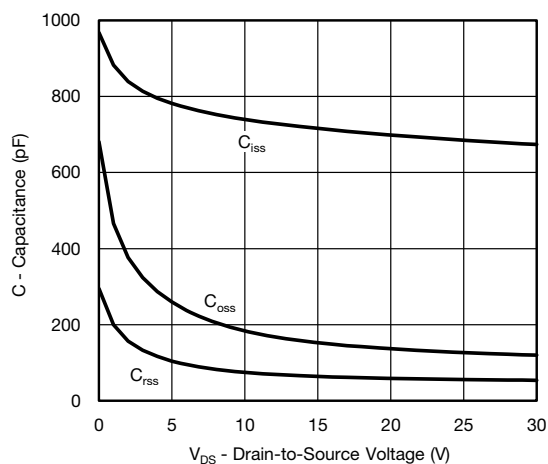
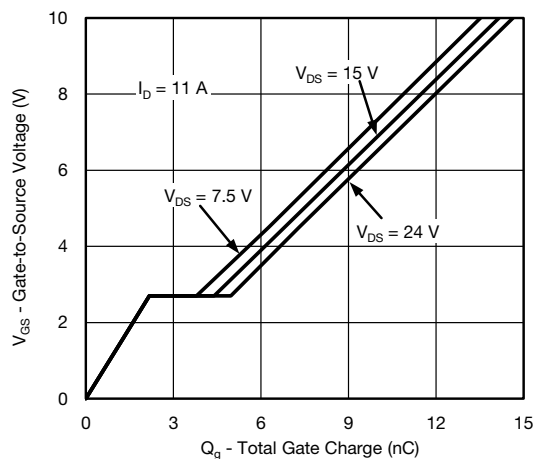
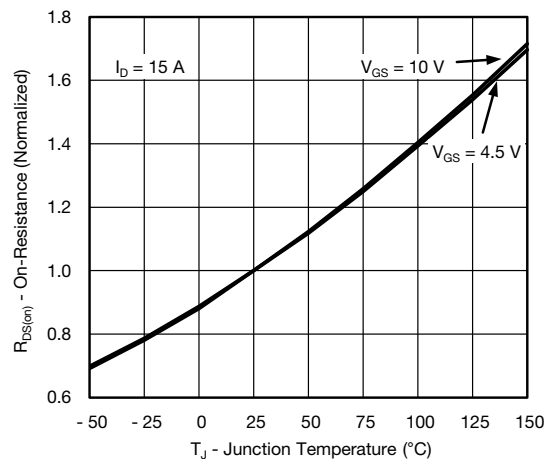
CHANNEL-1 TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



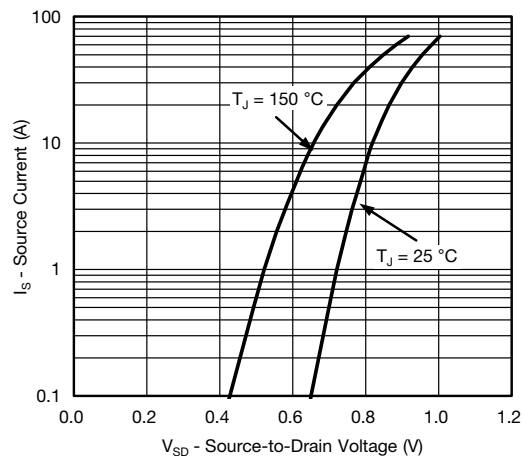
Normalized Thermal Transient Impedance, Junction-to-Ambient



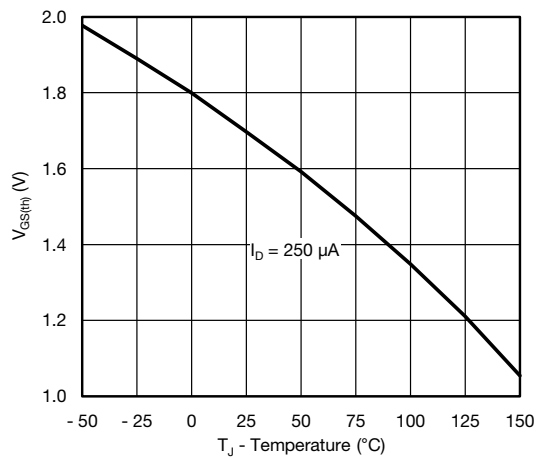
Normalized Thermal Transient Impedance, Junction-to-Case

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

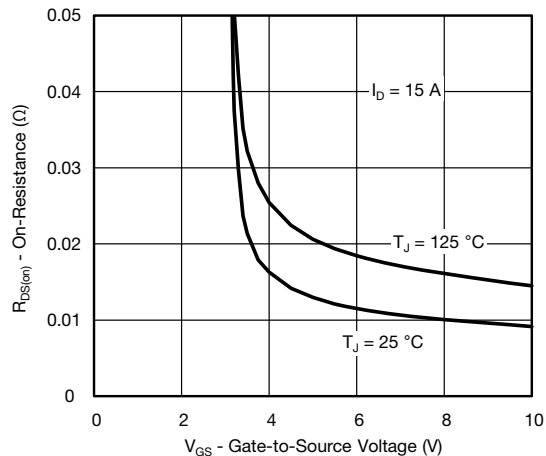
CHANNEL-2 TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



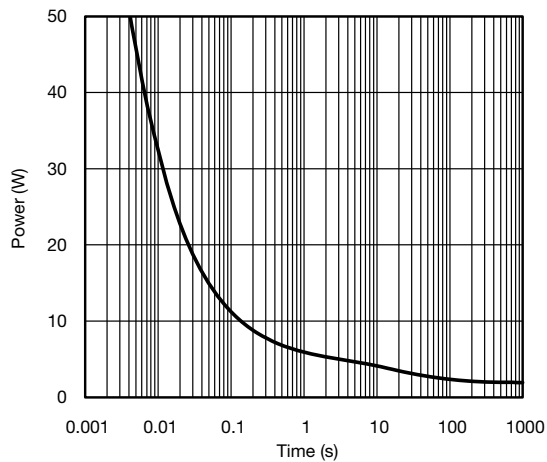
Source-Drain Diode Forward Voltage



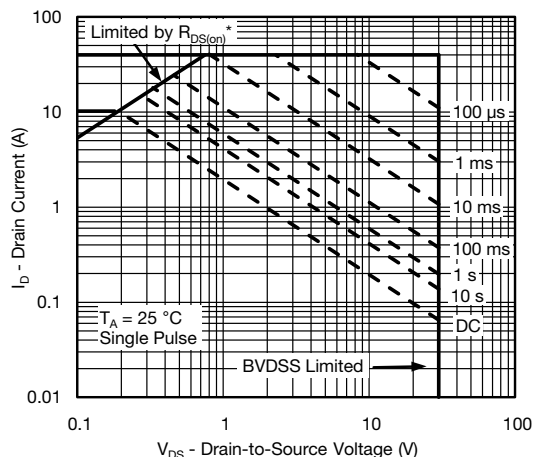
Threshold Voltage



On-Resistance vs. Gate-to-Source Voltage

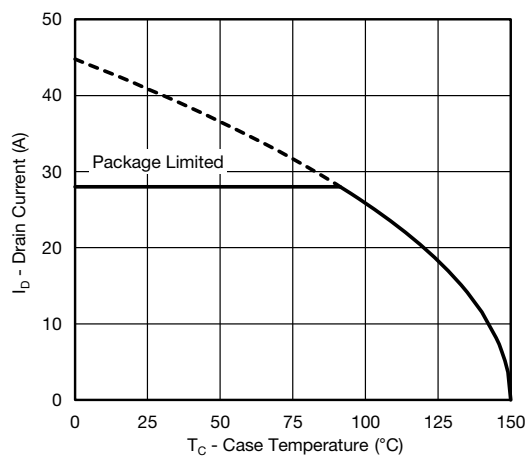
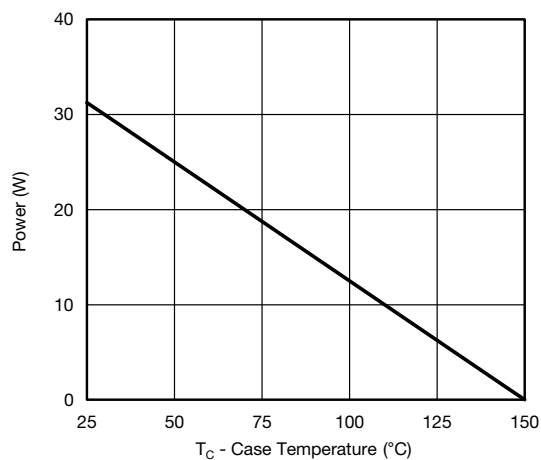


Single Pulse Power



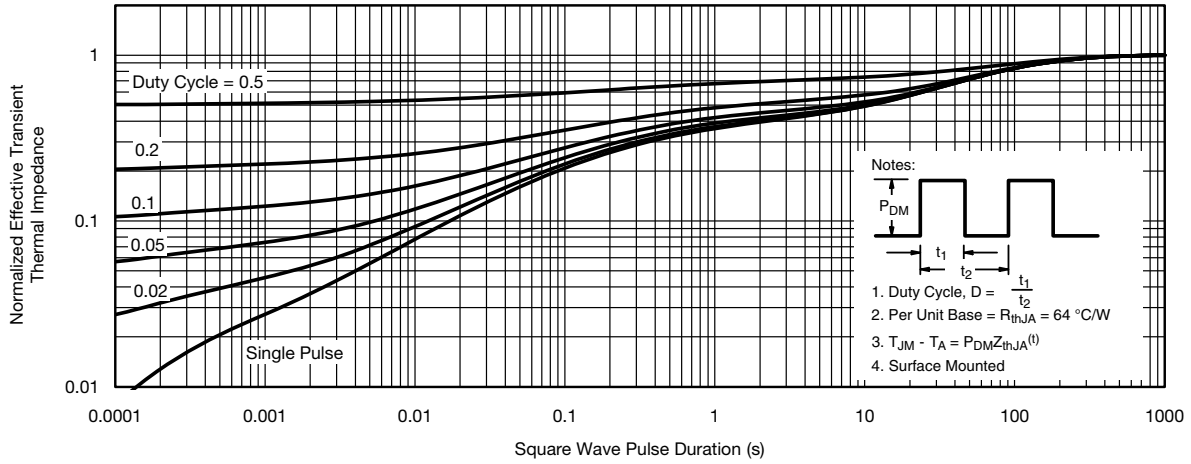
* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Ambient

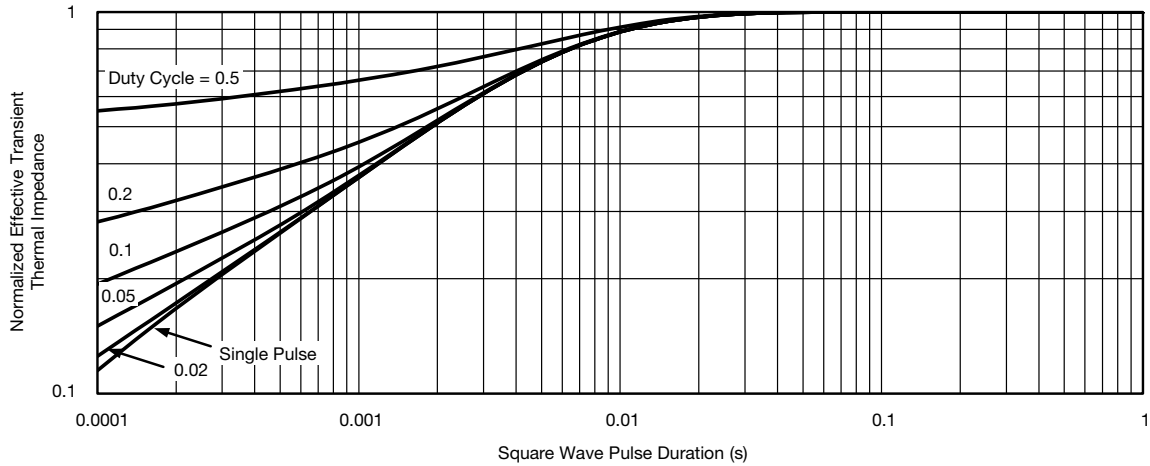
CHANNEL-2 TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

Current Derating*

Power, Junction-to-Case

* 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)

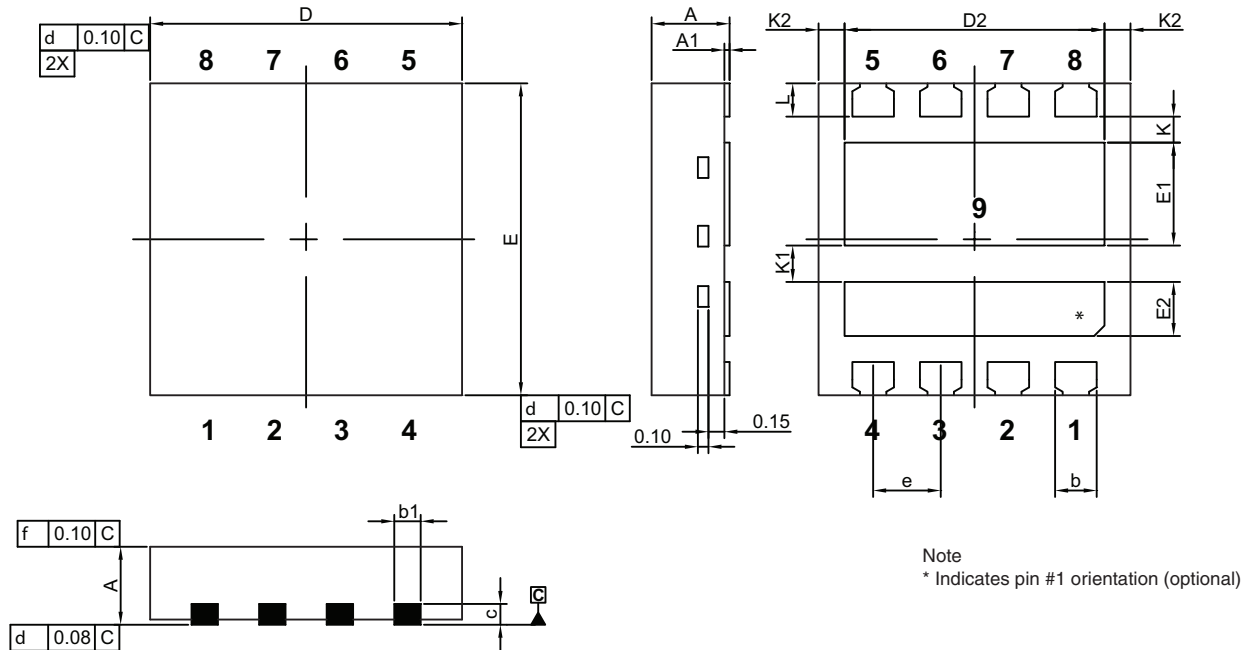


Normalized Thermal Transient Impedance, Junction-to-Ambient

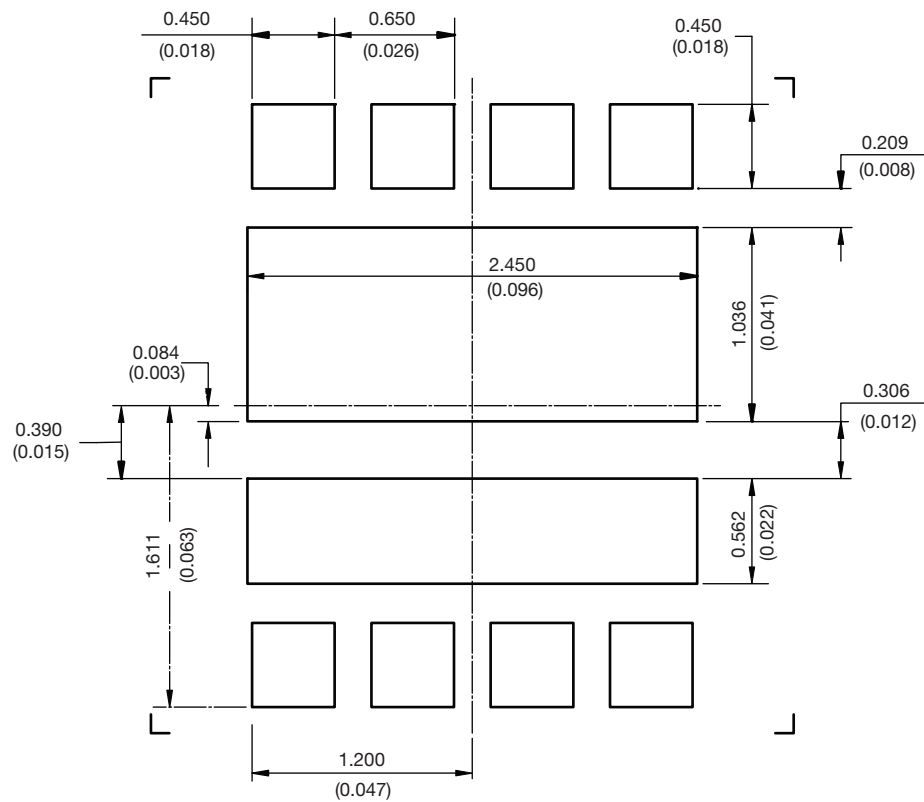


Normalized Thermal Transient Impedance, Junction-to-Case

PowerPAIR® 3 x 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	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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