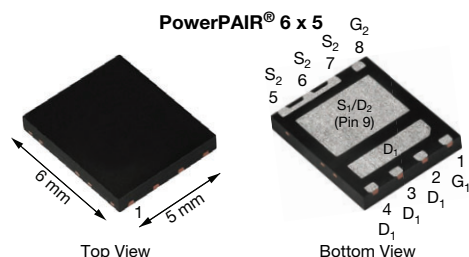


Dual N-Channel 30 V (D-S) MOSFETs



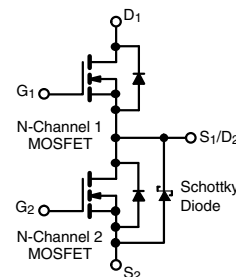
RoHS
COMPLIANT
HALOGEN
FREE

FEATURES

- TrenchFET® Gen IV power MOSFETs
- SkyFET® low side MOSFET with integrated Schottky
- 100 % R_g and UIS tested
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

APPLICATIONS

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



PRODUCT SUMMARY

	CHANNEL-1	CHANNEL-2
V_{DS} (V)	30	30
$R_{DS(on)}$ max. (Ω) at $V_{GS} = 10$ V	0.0067	0.0028
$R_{DS(on)}$ max. (Ω) at $V_{GS} = 4.5$ V	0.0100	0.0038
Q_g typ. (nC)	5.4	13.2
I_D (A) a, g	20	60
Configuration	Dual plus integrated Schottky (SkyFET)	

ORDERING INFORMATION

Package	PowerPAIR 6 x 5
Lead (Pb)-free and halogen-free	SiZ998DT-T1-GE3

ABSOLUTE MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$, unless otherwise noted)

PARAMETER		SYMBOL	CHANNEL-1	CHANNEL-2	UNIT
Drain-source voltage		V _{DS}	30		V
Gate-source voltage		V _{GS}	+20, -16		
Continuous drain current (T _J = 150 °C)	T _C = 25 °C	I _D	20 ^a	60 ^a	A
	T _C = 70 °C		20 ^a	60 ^a	
	T _A = 25 °C		18.8 ^{b, c}	32.8 ^{b, c}	
	T _A = 70 °C		15 ^c	26.2 ^{b, c}	
Pulsed drain current (t = 100 μs)		I _{DM}	90	130	
Continuous source drain diode current	T _C = 25 °C	I _S	16.8	27.4	
	T _A = 25 °C		3.2 ^{b, c}	4 ^{b, c}	
Single pulse avalanche current	L = 0.1 mH	I _{AS}	15	20	mJ
Single pulse avalanche energy		E _{AS}	11.25	20	
Maximum power dissipation	T _C = 25 °C	P _D	20.2	32.9	W
	T _C = 70 °C		12.9	21.1	
	T _A = 25 °C		3.8 ^{b, c}	4.8 ^{b, c}	
	T _A = 70 °C		2.4 ^{b, c}	3.1 ^{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	33	21	26	$^\circ\text{C/W}$
Maximum junction-to-case (drain)	R_{thJC}	4.7	6.2	3	3.8	

Notes

- Package limited
- Surface mounted on 1" x 1" FR4 board
- $t = 10$ s
- See solder profile (www.vishay.com/doc?73257). 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
- Rework conditions: manual soldering with a soldering iron is not recommended for leadless components
- Maximum under steady state conditions is 68 $^\circ\text{C/W}$ for channel-1 and 61 $^\circ\text{C/W}$ for channel-2
- $T_C = 25^\circ\text{C}$

**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 V, I _D = 250 μA	Ch-1	30	-	-	V	
		V _{GS} = 0 V, I _D = 250 μA	Ch-2	30	-	-		
Gate threshold voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA	Ch-1	1.1	-	2.2	V	
		V _{DS} = V _{GS} , I _D = 250 μA	Ch-2	1.1	-	2.2		
Gate source leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 20 V, -16 V	Ch-1	-	-	± 100	nA	
			Ch-2	-	-	± 100		
Zero gate voltage drain current	I _{DSS}	V _{DS} = 30 V, V _{GS} = 0 V	Ch-1	-	-	1	μA	
			Ch-2	-	-	150		
		V _{DS} = 30 V, V _{GS} = 0 V, T _J = 55 °C	Ch-1	-	-	5	mA	
			Ch-2	-	-	3		
On-state drain current ^b	I _{D(on)}	V _{DS} ≥ 5 V, V _{GS} = 10 V	Ch-1	20	-	-	A	
			Ch-2	20	-	-		
Drain-source on-state resistance ^b	R _{DS(on)}	V _{GS} = 10 V, I _D = 15 A	Ch-1	-	0.0047	0.0067	Ω	
		V _{GS} = 10 V, I _D = 19 A	Ch-2	-	0.0022	0.0028		
		V _{GS} = 4.5 V, I _D = 12 A	Ch-1	-	0.0065	0.0100		
		V _{GS} = 4.5 V, I _D = 15 A	Ch-2	-	0.0030	0.0038		
Forward transconductance ^b	g _{fs}	V _{DS} = 10 V, I _D = 15 A	Ch-1	-	80	-	S	
		V _{DS} = 10 V, I _D = 19 A	Ch-2	-	165	-		
Dynamic ^a								
Input capacitance	C _{iss}	Channel-1 V _{DS} = 15 V, V _{GS} = 0 V, f = 1 MHz Channel-2 V _{DS} = 15 V, V _{GS} = 0 V, f = 1 MHz	Ch-1	-	930	-	pF	
			Ch-2	-	2620	-		
Output capacitance	C _{oss}		Ch-1	-	325	-		
			Ch-2	-	902	-		
Reverse transfer capacitance	C _{rss}		Ch-1	-	21	-		
			Ch-2	-	55	-		
C _{rss} /C _{iss} ratio			Ch-1	-	0.023	0.046		
			Ch-2	-	0.021	0.042		
Total gate charge	Q _g	V _{DS} = 15 V, V _{GS} = 10 V, I _D = 20 A	Ch-1	-	12	18	nC	
			Ch-2	-	29.5	44.3		
Gate-source charge	Q _{gs}	Channel-1 V _{DS} = 15 V, V _{GS} = 4.5 V, I _D = 20 A	Ch-1	-	5.4	8.1		
			Ch-2	-	13.2	19.8		
Gate-drain charge	Q _{gd}	Channel-2 V _{DS} = 15 V, V _{GS} = 4.5 V, I _D = 20 A	Ch-1	-	3	-		
			Ch-2	-	7.1	-		
Output charge	Q _{oss}	V _{DS} = 15 V, V _{GS} = 0 V	Ch-1	-	0.75	-		
			Ch-2	-	1.3	-		
Gate resistance	R _g	f = 1 MHz	Ch-1	-	10	-	Ω	
			Ch-2	-	30	-		
			Ch-1	0.3	1.5	3		
			Ch-2	0.2	1.1	2.2		

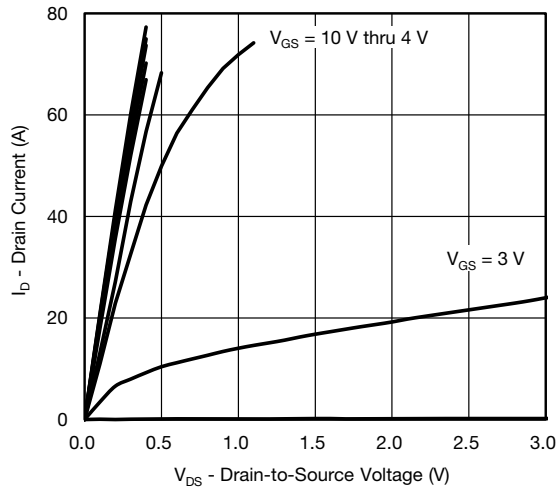
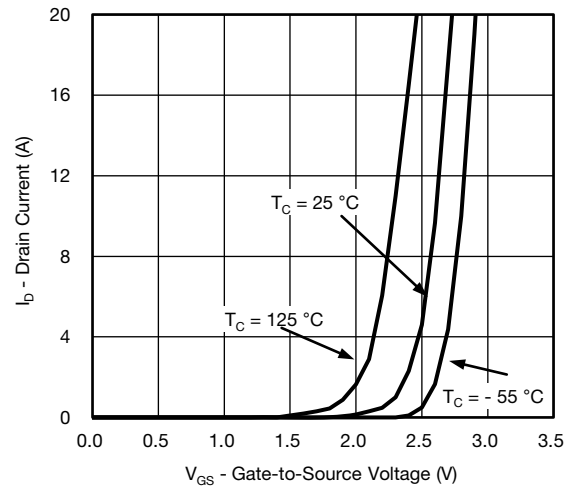
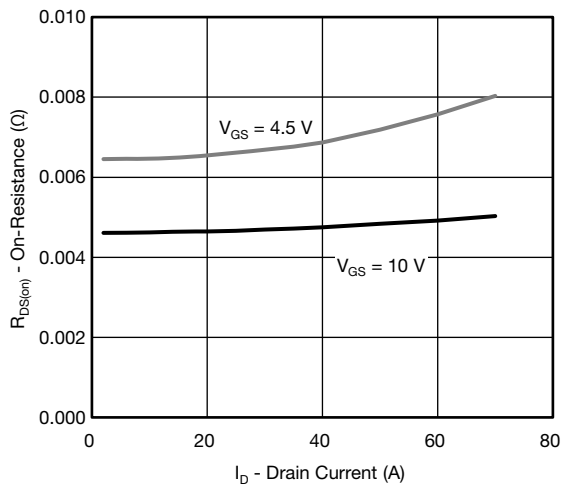
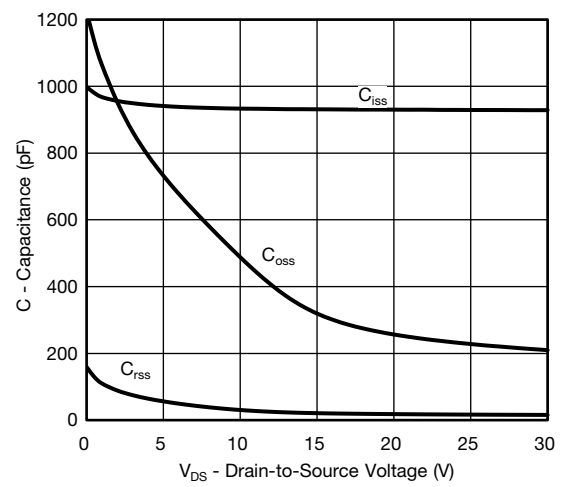
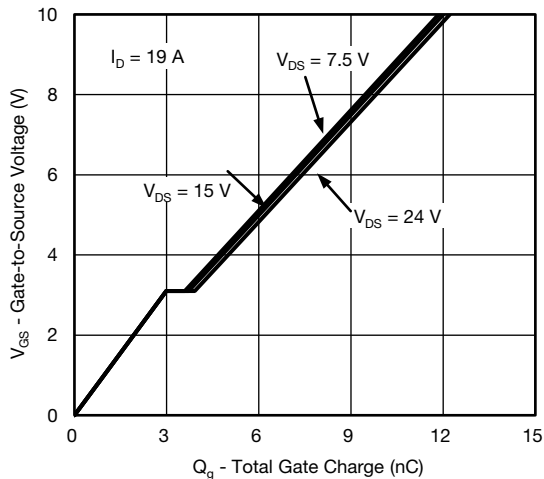
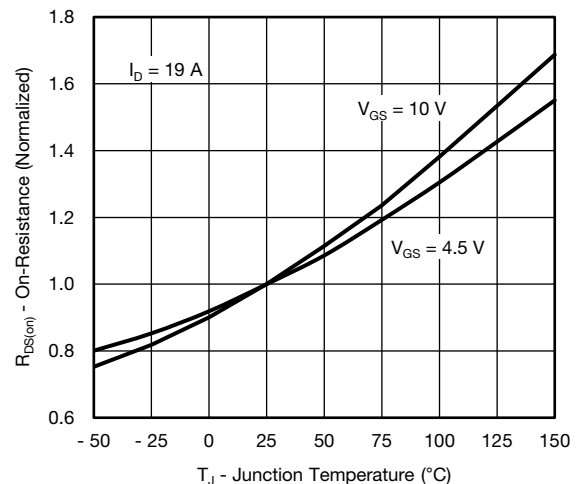
**SPECIFICATIONS** ($T_J = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)

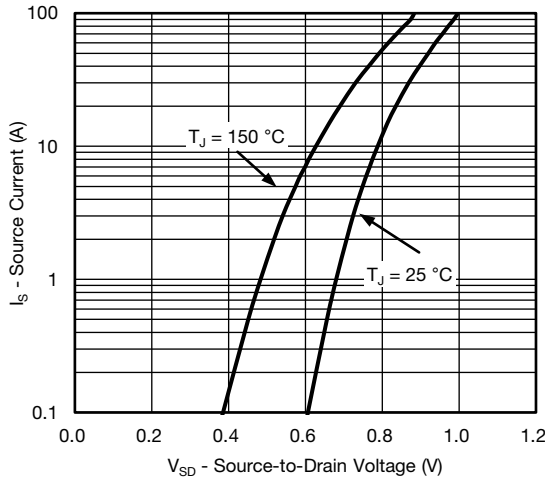
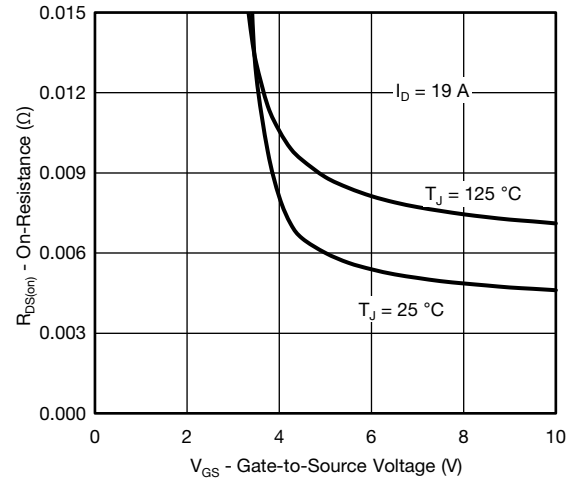
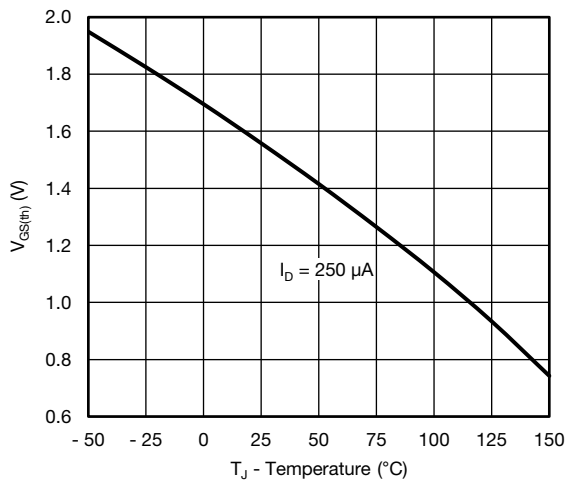
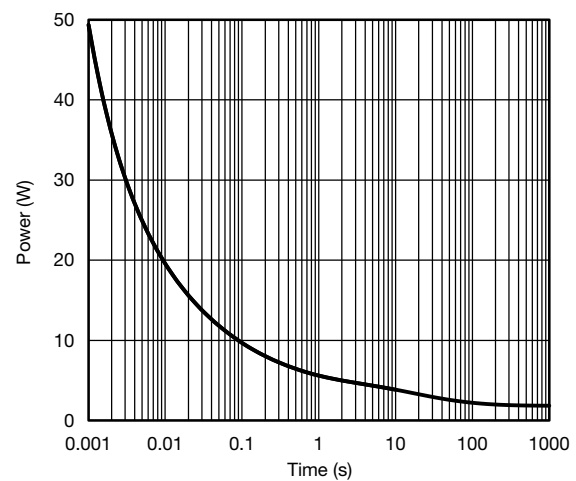
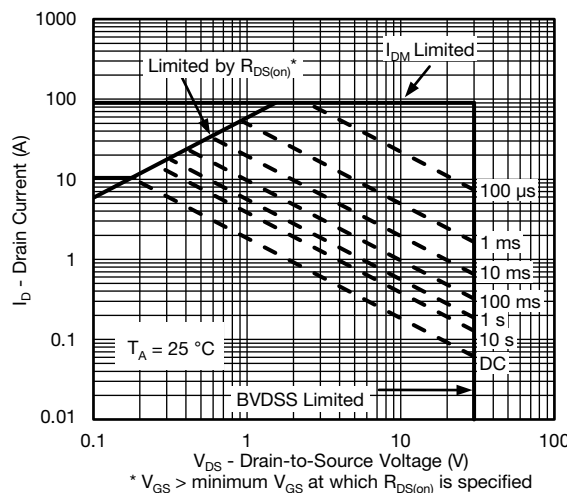
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT	
Dynamic ^a								
Turn-on delay time	t _{d(on)}	Channel-1 V _{DD} = 15 V, R _L = 1.5 Ω I _D ≅ 10 A, V _{GEN} = 4.5 V, R _g = 1 Ω	Ch-1	-	15	30	ns	
			Ch-2	-	25	50		
Rise time	t _r		Ch-1	-	65	130		
			Ch-2	-	65	130		
Turn-off delay time	t _{d(off)}	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	-	17	34		
Fall time	t _f		Ch-1	-	10	20		
			Ch-2	-	10	20		
Turn-on delay time	t _{d(on)}	Channel-1 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		
Rise time	t _r		Ch-1	-	25	50		
			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	-	15	30		
			Ch-2	-	22	44		
Fall time	t _f		Ch-1	-	10	20		
			Ch-2	-	10	20		
Drain-Source Body Diode Characteristics								
Continuous source-drain diode current	I _S	T _C = 25 °C	Ch-1	-	-	20	A	
			Ch-2	-	-	60		
Pulse diode forward current (t = 100 μs)	I _{SM}		Ch-1	-	-	90		
			Ch-2	-	-	130		
Body diode voltage	V _{SD}	I _S = 10 A, V _{GS} = 0 V	Ch-1	-	0.8	1.2	V	
		I _S = 2 A, V _{GS} = 0 V	Ch-2	-	0.41	0.53		
Body diode reverse recovery time	t _{rr}	Channel-1 I _F = 10 A, di/dt = 100 A/μs, T _J = 25 °C	Ch-1	-	30	60	ns	
			Ch-2	-	47	94		
Body diode reverse recovery charge	Q _{rr}		Channel-2 I _F = 10 A, di/dt = 100 A/μs, T _J = 25 °C	Ch-1	-	11	22	nC
				Ch-2	-	55	110	
Reverse recovery fall time	t _a			Ch-1	-	18	-	ns
				Ch-2	-	27	-	
Reverse recovery rise time	t _b			Ch-1	-	12	-	
				Ch-2	-	20	-	

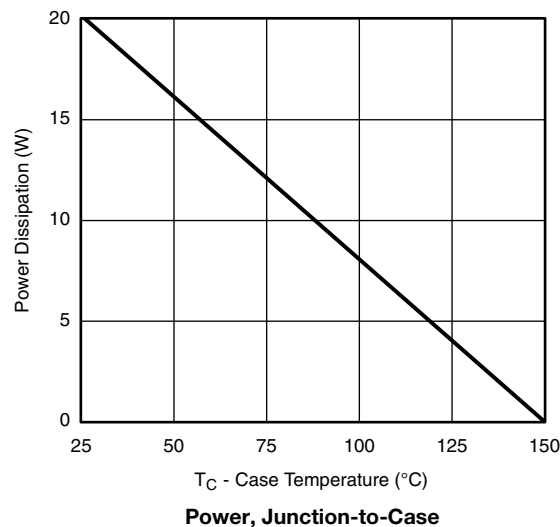
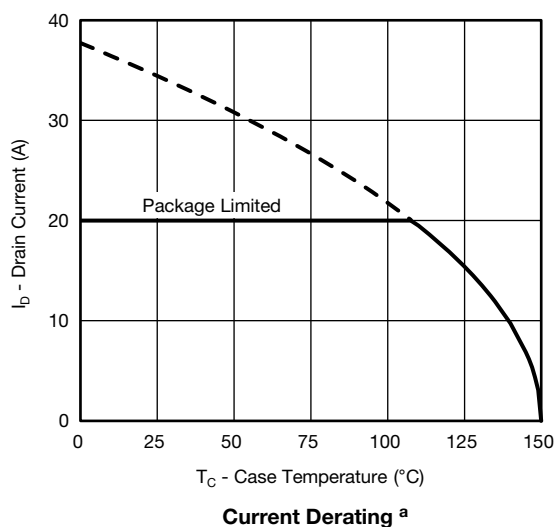
Notes

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

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

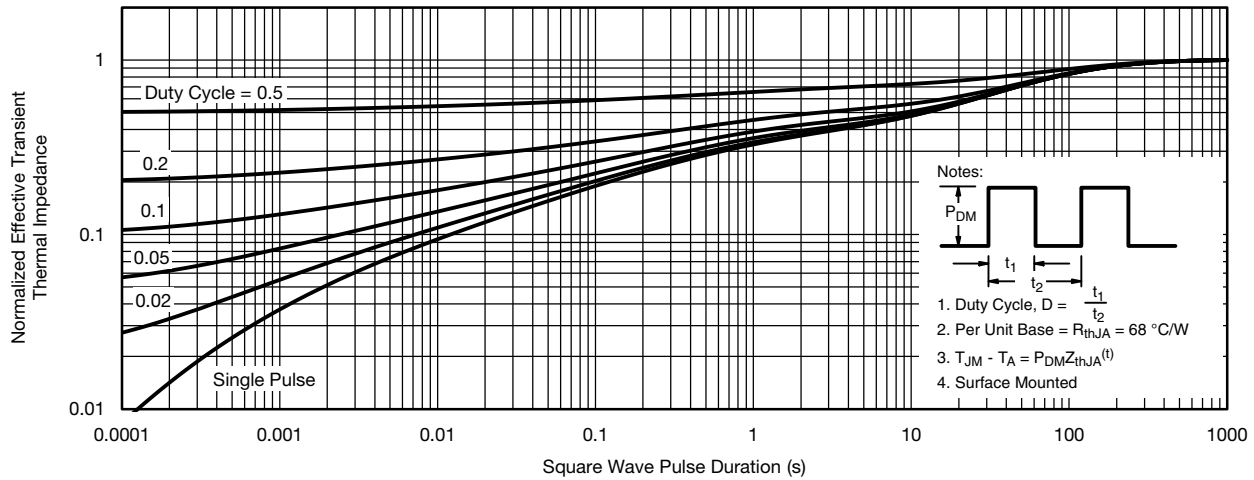
CHANNEL-1 TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

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)

Note

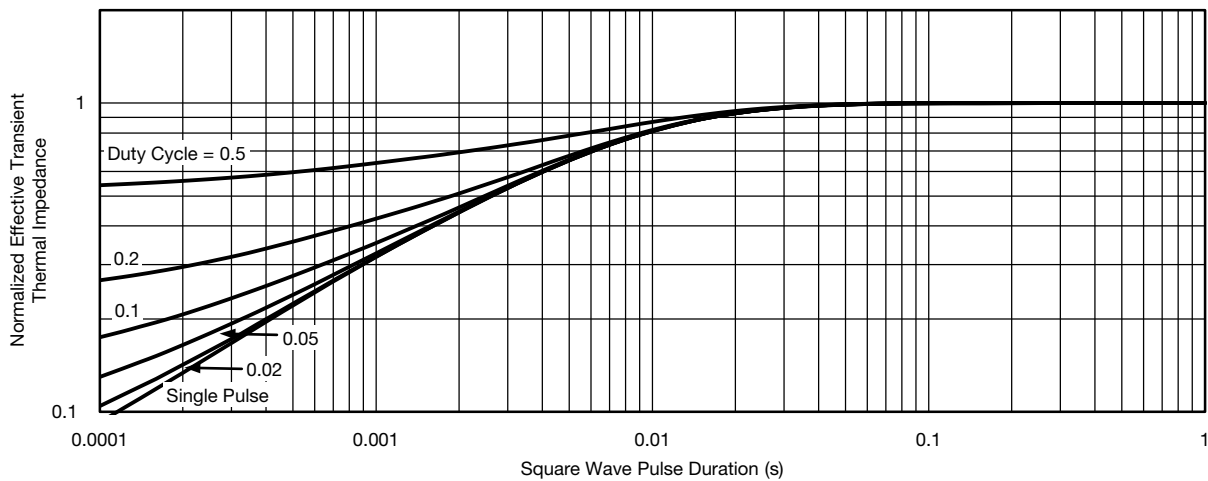
- a. The power dissipation P_D is based on T_J max. = 150 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit



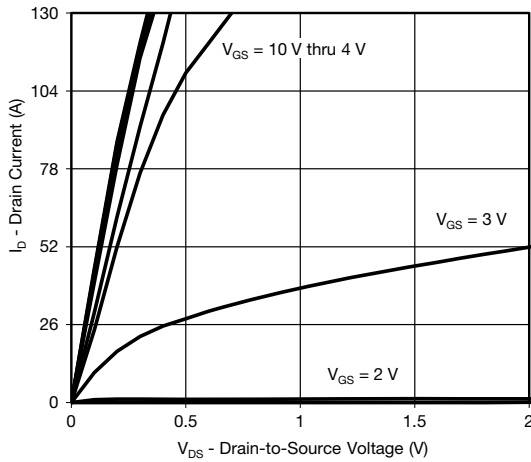
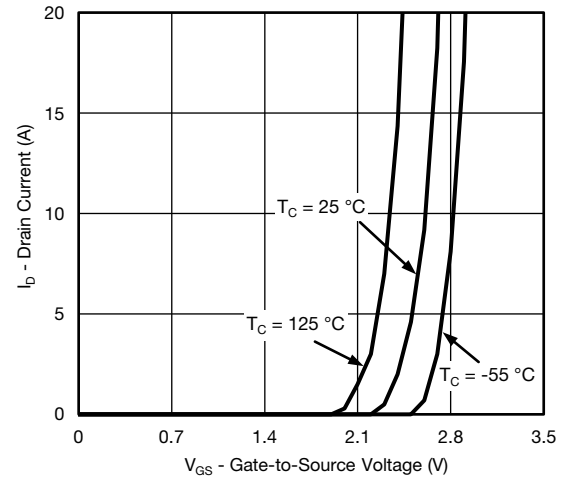
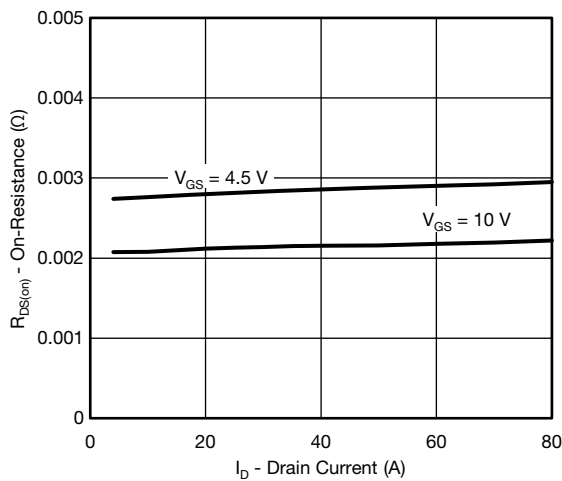
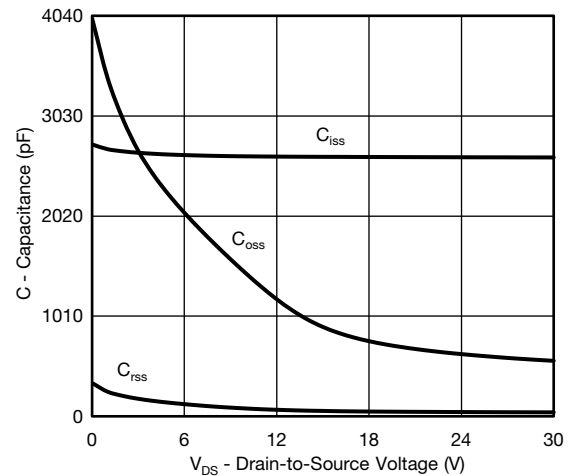
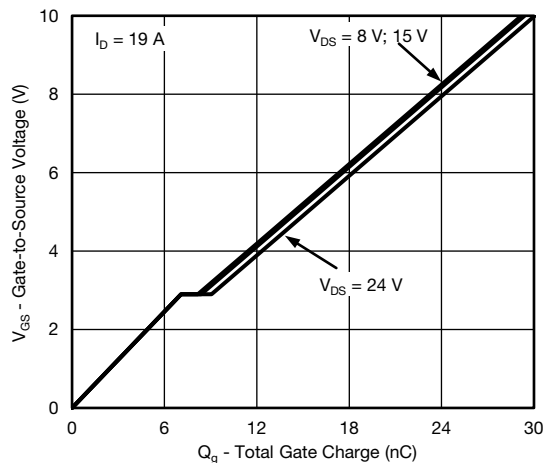
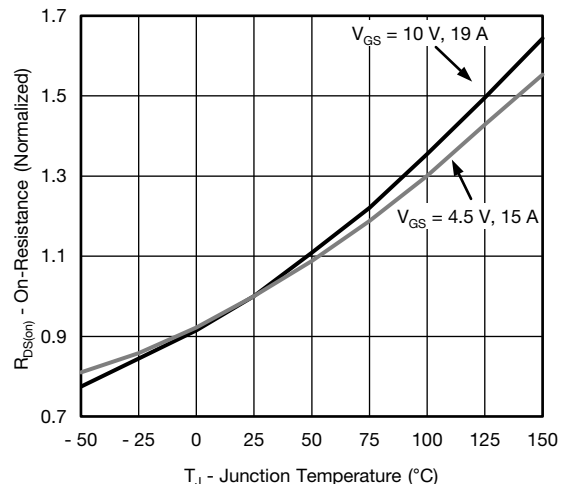
CHANNEL-1 TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

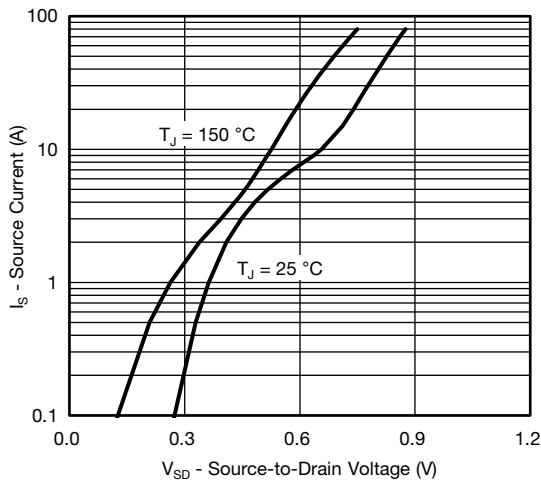
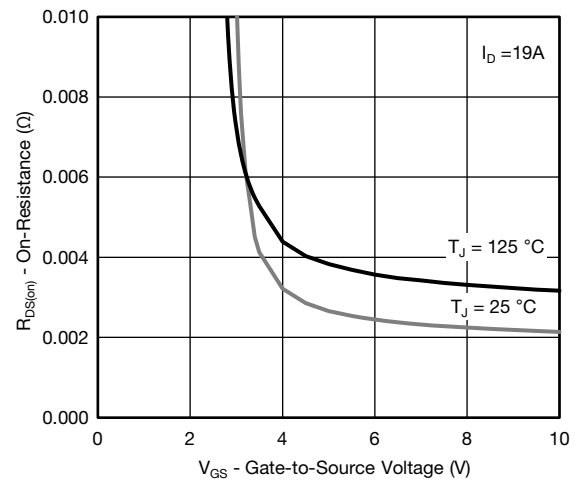
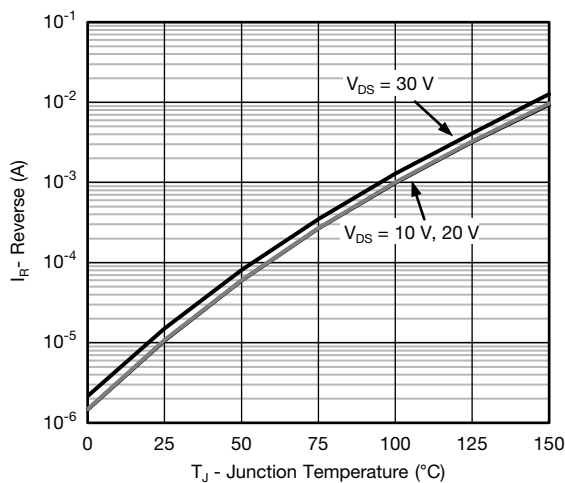
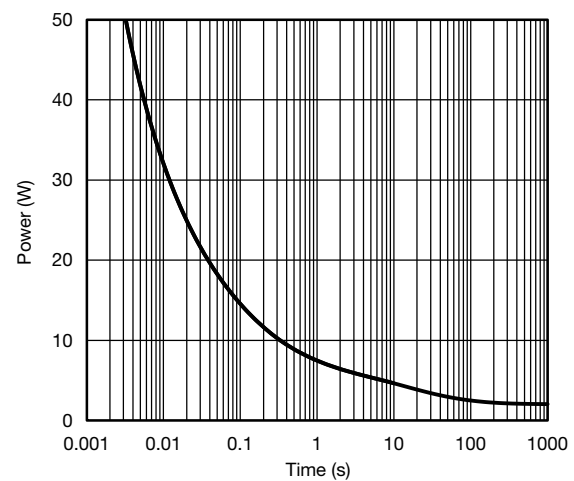
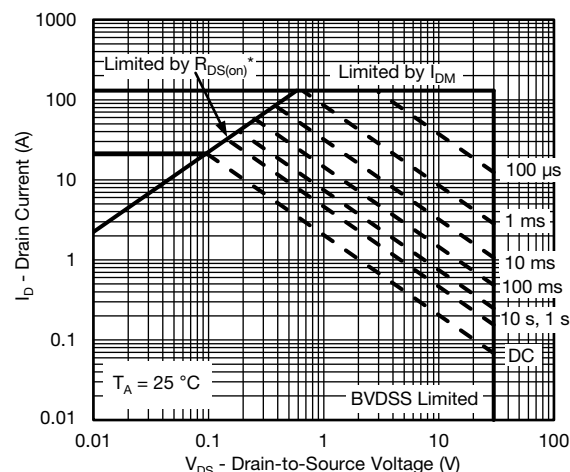


Normalized Thermal Transient Impedance, Junction-to-Ambient



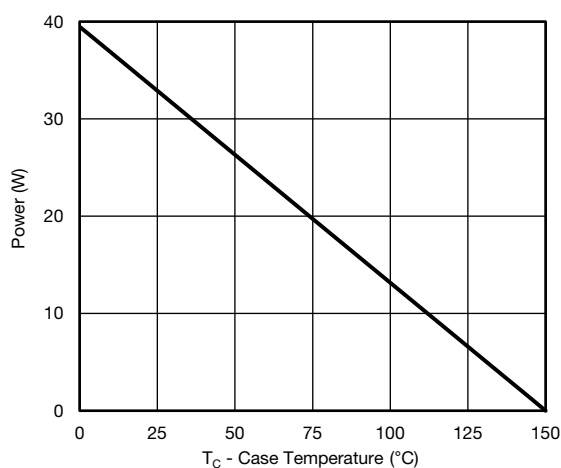
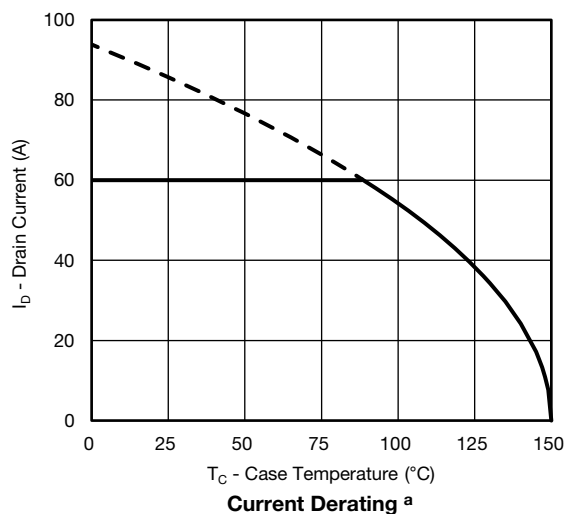
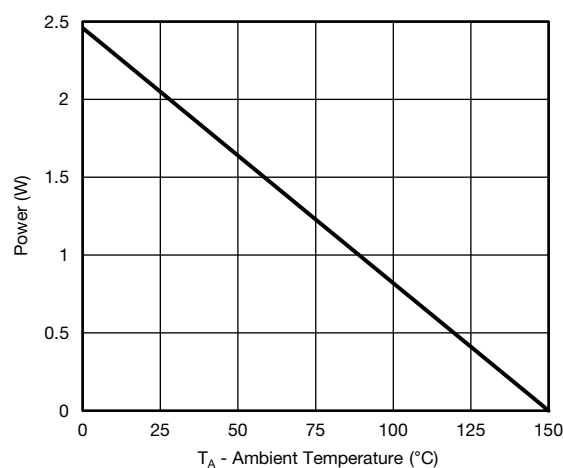
Normalized Thermal Transient Impedance, Junction-to-Case

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 (Schottky)

Single Pulse Power, Junction-to-Ambient


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

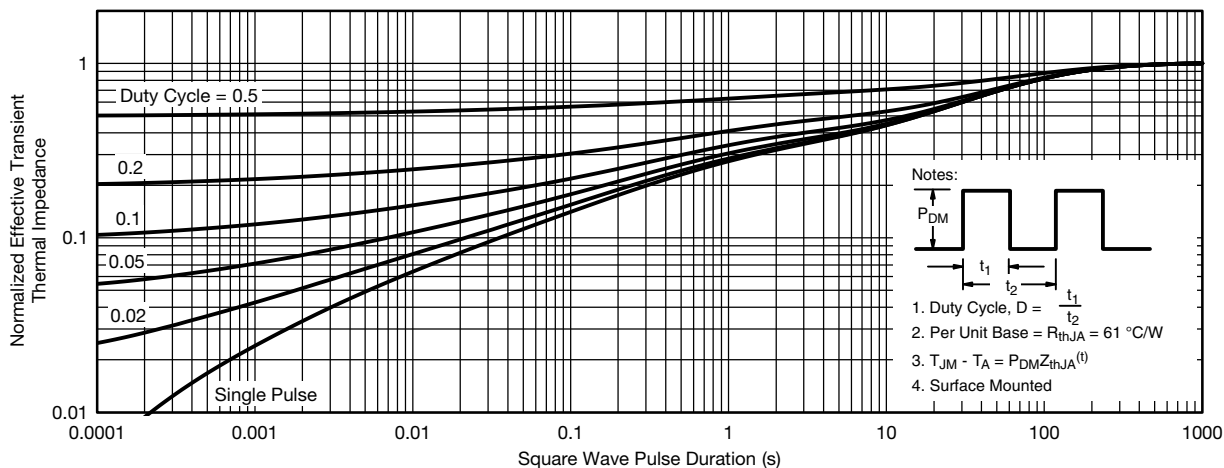
Safe Operating Area, Junction-to-Ambient

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

Power, Junction-to-Case

Power, Junction-to-Ambient
Note

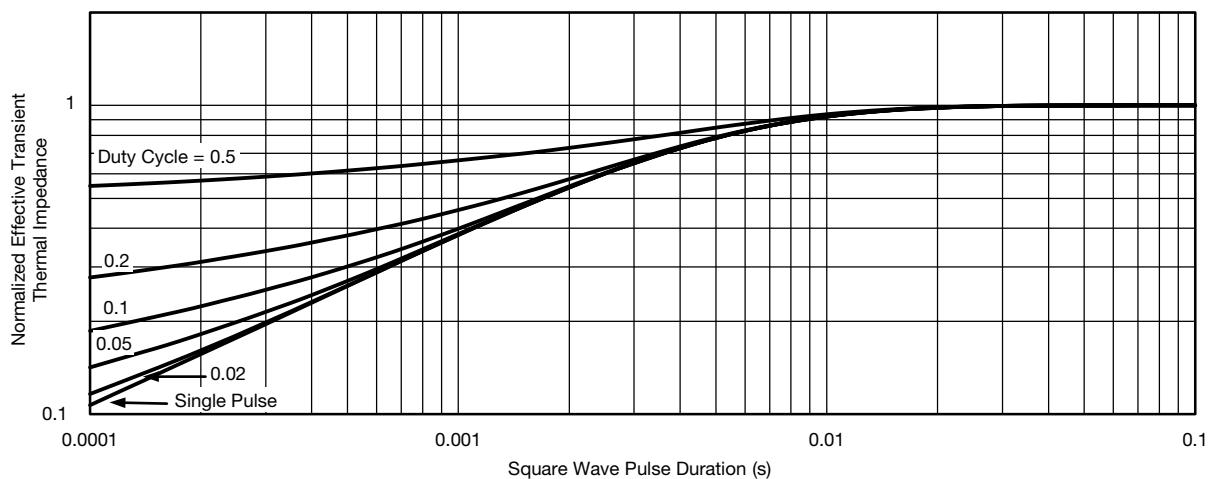
- a. The power dissipation P_D is based on T_J max. = 150 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit



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



Normalized Thermal Transient Impedance, Junction-to-Ambient

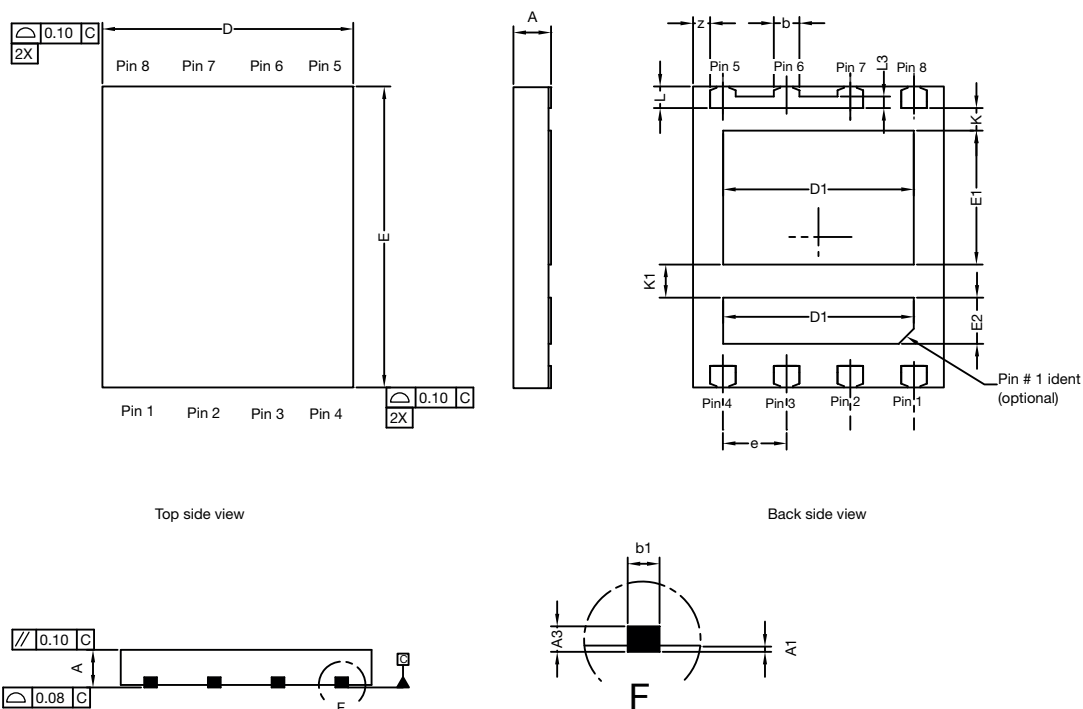


Normalized Thermal Transient Impedance, Junction-to-Case

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?62979.



PowerPAIR® 6 x 5 Case Outline



DIM.	MILLIMETERS			INCHES		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.70	0.75	0.80	0.028	0.030	0.032
A1	0.00	-	0.10	0.000	-	0.004
A3	0.15	0.20	0.25	0.006	0.007	0.009
b	0.43	0.51	0.61	0.017	0.020	0.024
b1	0.25 BSC			0.010 BSC		
D	4.90	5.00	5.10	0.192	0.196	0.200
D1	3.75	3.80	3.85	0.148	0.150	0.152
E	5.90	6.00	6.10	0.232	0.236	0.240
E1 Option AA (for W/B)	2.62	2.67	2.72	0.103	0.105	0.107
E1 Option AB (for BWL)	2.42	2.47	2.52	0.095	0.097	0.099
E2	0.87	0.92	0.97	0.034	0.036	0.038
e	1.27 BSC			0.050 BSC		
K Option AA (for W/B)	0.45 typ.			0.018 typ.		
K Option AB (for BWL)	0.65 typ.			0.025 typ.		
K1	0.66 typ.			0.025 typ.		
L	0.33	0.43	0.53	0.013	0.017	0.020
L3	0.23 BSC			0.009 BSC		
z	0.34 BSC			0.013 BSC		
ECN: T14-0782-Rev. C, 22-Dec-14						
DWG: 6005						

Recommended Minimum PAD for PowerPAIR® 6 x 5



Dimensions in millimeters (inch)

Note

- Linear dimensions are in black, the same information is provided in ordinate dimensions which are in blue.



Disclaimer

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