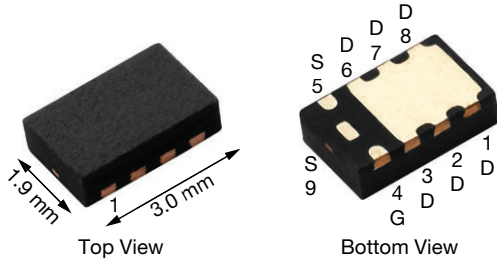


N-Channel 40 V (D-S) MOSFET

PowerPAK® ChipFET® Single

FEATURES

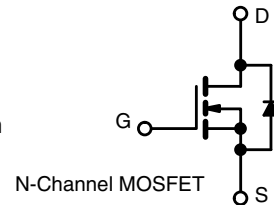
- TrenchFET® Gen IV power MOSFET
- 100 % R_g and UIS tested
- Thermally enhanced PowerPAK ChipFET package
 - Compact footprint area - less than 6.09 mm²
 - Thin 0.8 mm profile
- 56 % lower R_{DS(ON)} than the prior generation
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912


RoHS
 COMPLIANT
 HALOGEN
FREE
PRODUCT SUMMARY

V _{DS} (V)	40
R _{DS(on)} max. (Ω) at V _{GS} = 10 V	0.00775
R _{DS(on)} max. (Ω) at V _{GS} = 4.5 V	0.00947
Q _g typ. (nC)	12.6
I _D (A) ^{a, g}	25
Configuration	Single

APPLICATIONS

- DC/DC converters
- Motor drive control
- Synchronous rectification
- Battery management
- Load switch


ORDERING INFORMATION

Package	PowerPAK ChipFET
Lead (Pb)-free and halogen-free	Si5448DU-T1-GE3

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

PARAMETER	SYMBOL	LIMIT	UNIT
Drain-source voltage	V _{DS}	40	V
Gate-source voltage	V _{GS}	+20 / -16	
Continuous drain current (T _J = 150 °C)	I _D	T _C = 25 °C	25 ^a
		T _C = 70 °C	25 ^a
		T _A = 25 °C	15.9 ^{b, c}
		T _A = 70 °C	12.7 ^{b, c}
Pulsed drain current (t = 100 μs)	I _{DM}	100	A
Continuous source-drain diode current	I _S	T _C = 25 °C	
		T _A = 25 °C	2.6 ^{b, c}
Single pulse avalanche current	I _{AS}	15	mJ
Single pulse avalanche energy	E _{AS}	11.25	
Maximum power dissipation	P _D	T _C = 25 °C	31
		T _C = 70 °C	20
		T _A = 25 °C	3.1 ^{b, c}
		T _A = 70 °C	2 ^{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	TYPICAL	MAXIMUM	UNIT
Maximum junction-to-ambient ^{b, f}	R _{thJA}	34	40	°C/W
Maximum junction-to-case (drain)	R _{thJC}	4	4	

Notes

- Package limited.
- Surface mounted on 1" x 1" FR4 board.
- t = 10 s.
- See solder profile (www.vishay.com/doc?73257). The PowerPAK 1212-8 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.
- Rework conditions: manual soldering with a soldering iron is not recommended for leadless components.
- Maximum under steady state conditions is 90 °C/W.
- T_C = 25 °C.

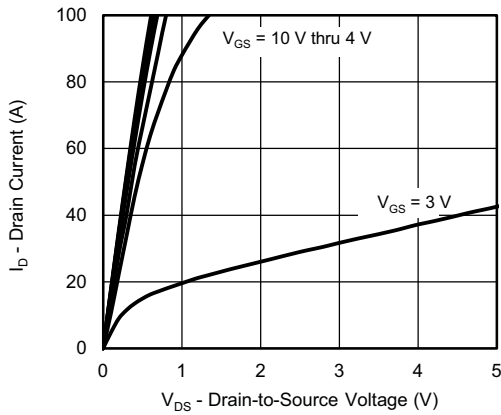
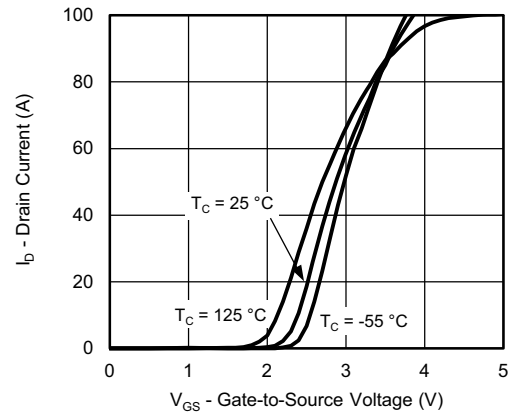
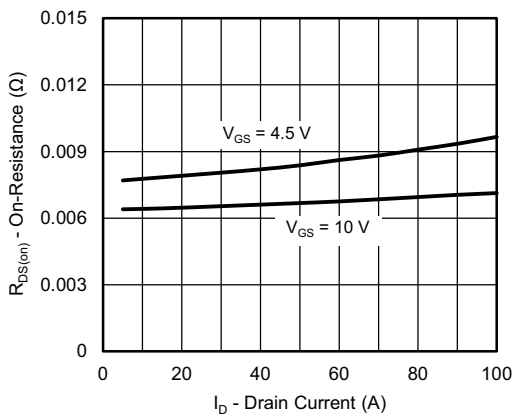
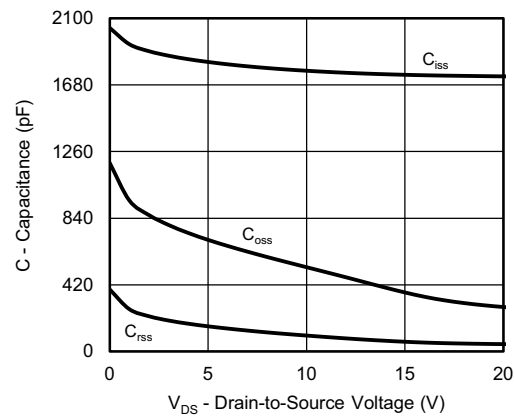
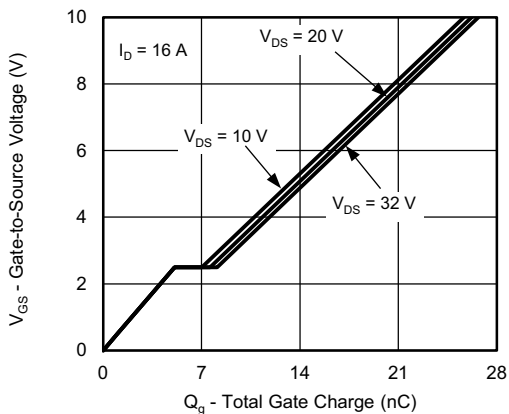
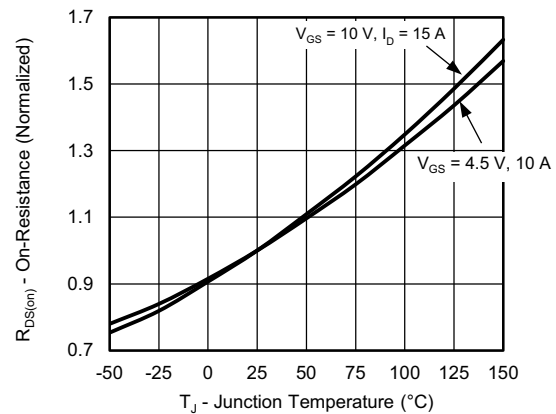


SPECIFICATIONS (T _J = 25 °C, unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Static						
Drain-source breakdown voltage	V _{DS}	V _{GS} = 0 V, I _D = 250 μA	40	-	-	V
V _{DS} temperature coefficient	ΔV _{DS} /T _J	I _D = 250 μA	-	21.2	-	mV/°C
V _{GS(th)} temperature coefficient	ΔV _{GS(th)} /T _J		-	-5.1	-	
Gate-source threshold voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA	1	-	2.5	V
Gate-source leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = +20 V / -16 V	-	-	± 100	nA
Zero gate voltage drain current	I _{DSS}	V _{DS} = 40 V, V _{GS} = 0 V	-	-	1	μA
		V _{DS} = 40 V, V _{GS} = 0 V, T _J = 70 °C	-	-	10	
On-state drain current ^a	I _{D(on)}	V _{DS} ≤ 10 V, V _{GS} = 10 V	20	-	-	A
Drain-source on-state resistance ^a	R _{DS(on)}	V _{GS} = 10 V, I _D = 15 A	-	0.00646	0.00775	Ω
		V _{GS} = 4.5 V, I _D = 10 A	-	0.00790	0.00947	
Forward transconductance ^a	g _{fs}	V _{DS} = 10 V, I _D = 15 A	-	80	-	S
Dynamic ^b						
Input capacitance	C _{ISS}	V _{DS} = 20 V, V _{GS} = 0 V, f = 1 MHz	-	1765	-	pF
Output capacitance	C _{OSS}		-	278	-	
Reverse transfer capacitance	C _{RSS}		-	45	-	
Total gate charge	Q _g	V _{DS} = 20 V, V _{GS} = 10 V, I _D = 15 A	-	26.2	40	nC
		V _{DS} = 20 V, V _{GS} = 4.5 V, I _D = 15 A	-	12.6	20	
Gate-source charge	Q _{gs}	V _{DS} = 20 V, V _{GS} = 4.5 V, I _D = 15 A	-	5.1	-	nC
Gate-drain charge	Q _{gd}		-	2.5	-	
Gate resistance	R _g		f = 1 MHz	0.3	1.5	
Turn-on delay time	t _{d(on)}	V _{DD} = 20 V, R _L = 1.7 Ω, I _D ≅ 12 A, V _{GEN} = 10 V, R _g = 1 Ω	-	10	20	ns
Rise time	t _r		-	35	53	
Turn-off delay time	t _{d(off)}		-	15	30	
Fall time	t _f		-	10	20	
Turn-on delay time	t _{d(on)}	V _{DD} = 20 V, R _L = 1.7 Ω, I _D ≅ 12 A, V _{GEN} = 4.5 V, R _g = 1 Ω	-	15	30	ns
Rise time	t _r		-	60	90	
Turn-off delay time	t _{d(off)}		-	18	36	
Fall time	t _f		-	33	50	
Drain-Source Body Diode Characteristics						
Continuous source-drain diode current	I _S	T _C = 25 °C	-	-	25	A
Pulse diode forward current	I _{SM}		-	-	100	
Body diode voltage	V _{SD}	I _S = 13 A, V _{GS} = 0 V	-	0.8	1.2	V
Body diode reverse recovery time	t _{rr}	I _F = 13 A, di/dt = 100 A/μs, T _J = 25 °C	-	33	50	ns
Body diode reverse recovery charge	Q _{rr}		-	30	45	nC
Reverse recovery fall time	t _a		-	18	-	ns
Reverse recovery rise time	t _b		-	15	-	

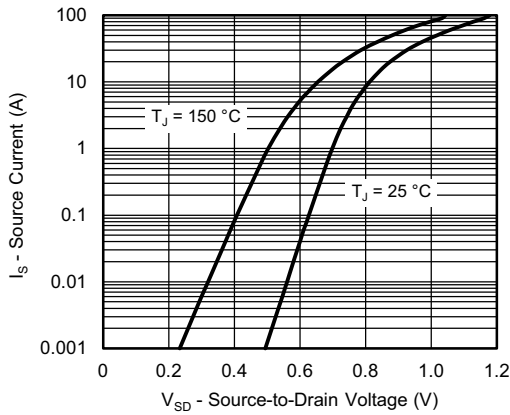
Notes

- a. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2 %.
- b. Guaranteed by design, not subject to production testing.

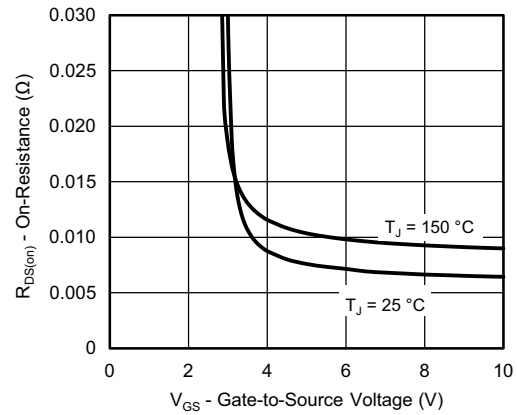
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

Output Characteristics

Transfer Characteristics

On-Resistance vs. Drain Current and Gate Voltage

Capacitance

Gate Charge

On-Resistance vs. Junction Temperature

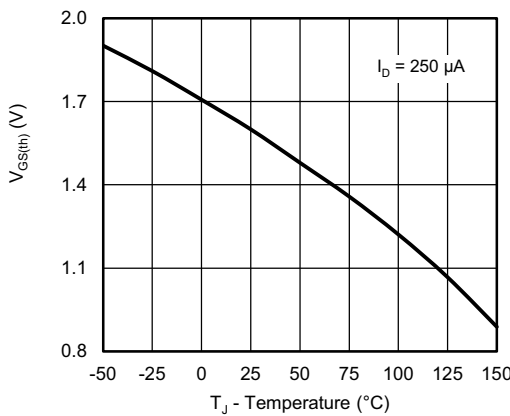
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



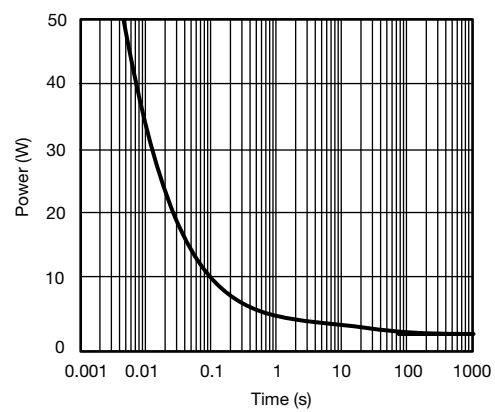
Source-Drain Diode Forward Voltage



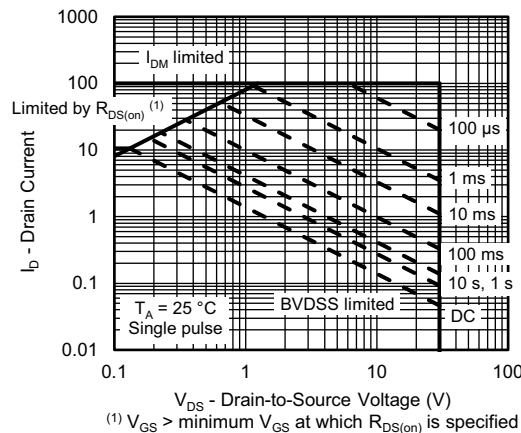
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



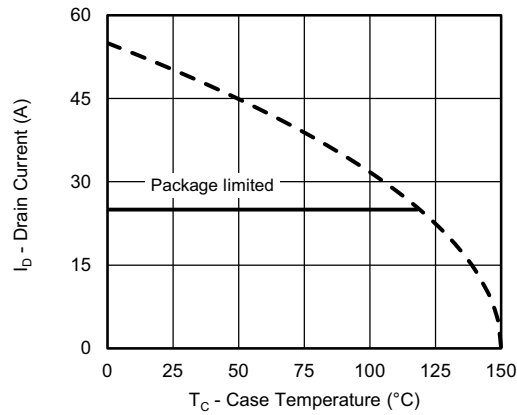
Single Pulse Power, Junction-to-Ambient



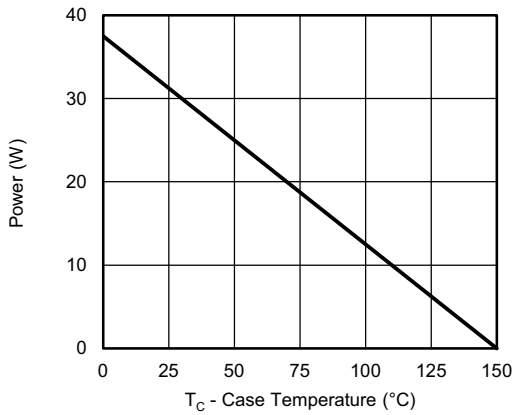
Safe Operating Area, Junction-to-Ambient



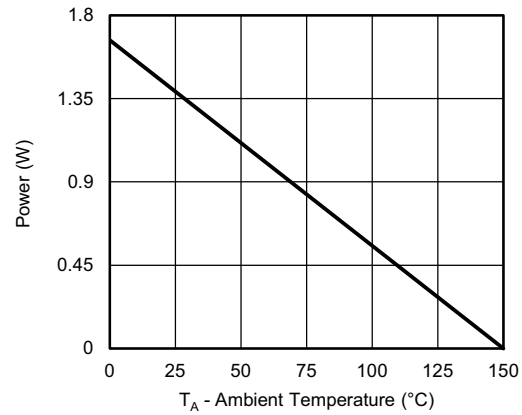
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Current Derating ^a



Power, Junction-to-Case



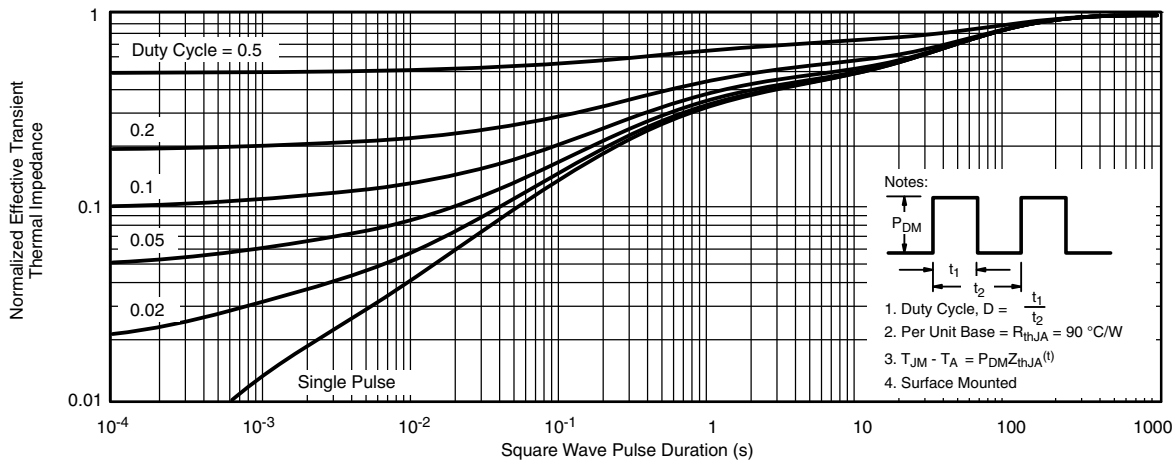
Power, Junction-to-Ambient

Note

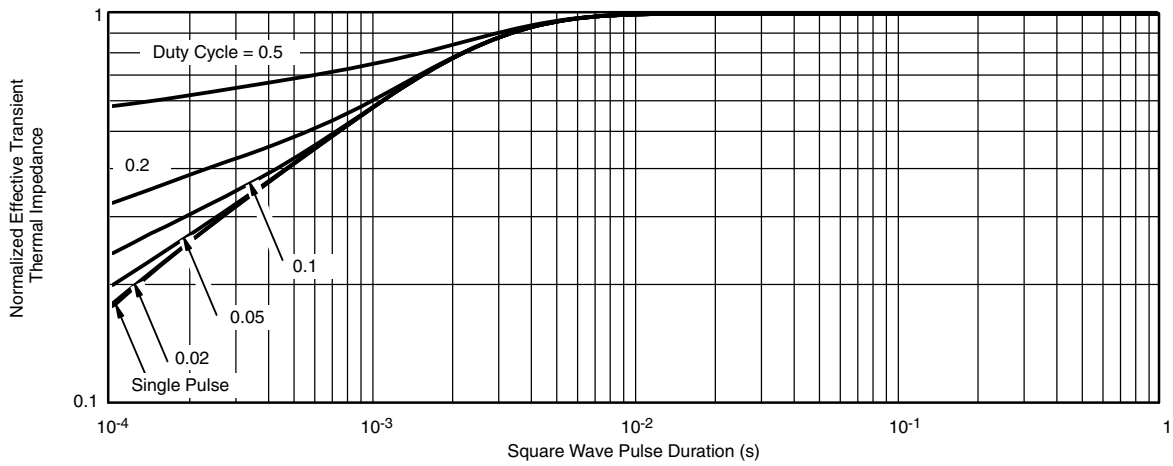
- a. The power dissipation P_D is based on T_J max. = 150 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.



TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



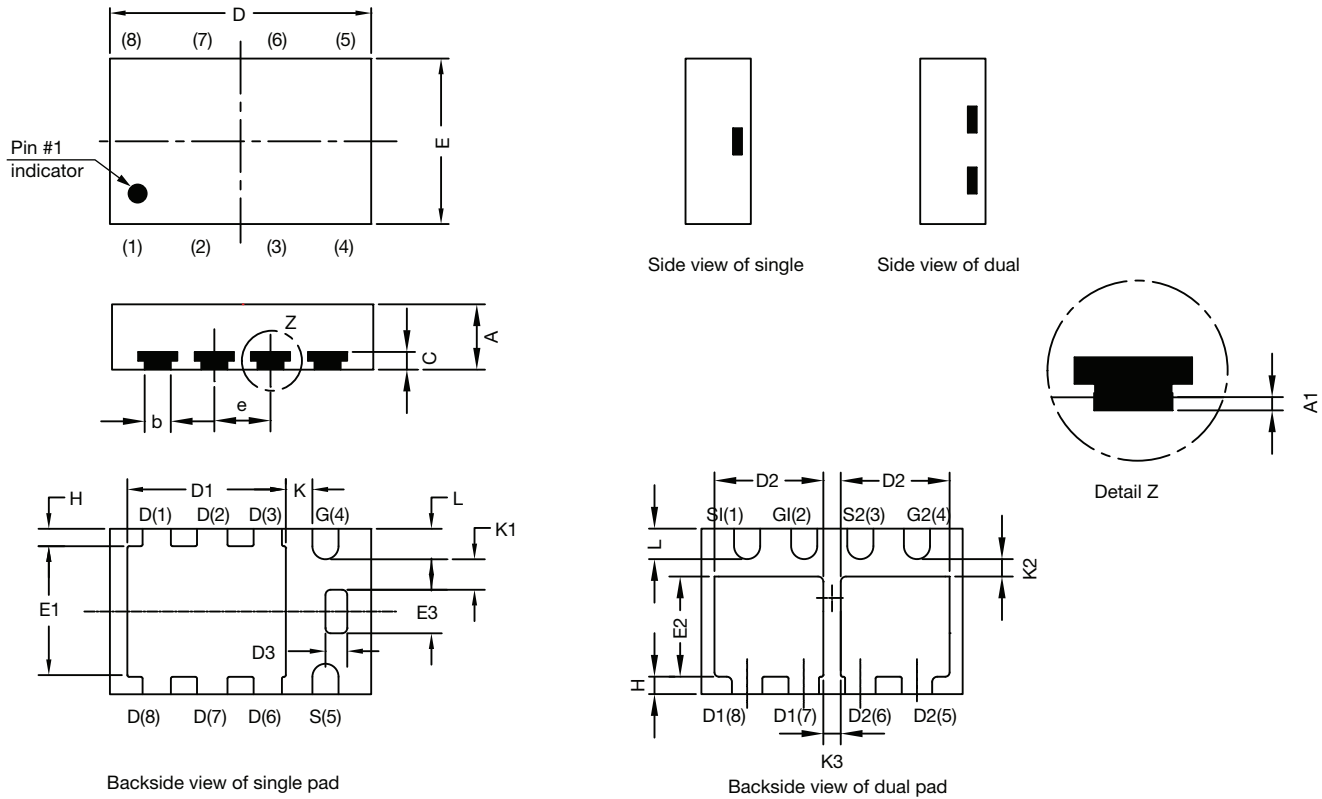
Normalized Thermal Transient Impedance, Junction-to-Ambient



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?76149.

PowerPAK® ChipFET® Case Outline

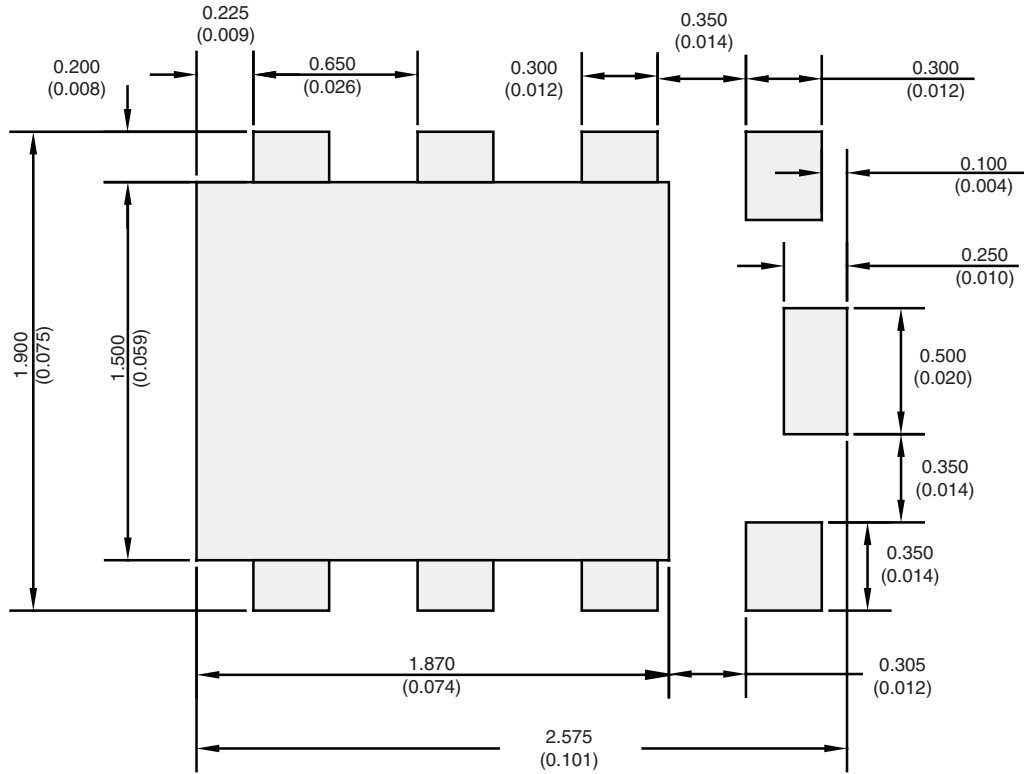


DIM.	MILLIMETERS			INCHES		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.70	0.75	0.85	0.028	0.030	0.033
A1	0	-	0.05	0	-	0.002
b	0.25	0.30	0.35	0.010	0.012	0.014
C	0.15	0.20	0.25	0.006	0.008	0.010
D	2.92	3.00	3.08	0.115	0.118	0.121
D1	1.75	1.87	2.00	0.069	0.074	0.079
D2	1.07	1.20	1.32	0.042	0.047	0.052
D3	0.20	0.25	0.30	0.008	0.010	0.012
E	1.82	1.90	1.98	0.072	0.075	0.078
E1	1.38	1.50	1.63	0.054	0.059	0.064
E2	0.92	1.05	1.17	0.036	0.041	0.046
E3	0.45	0.50	0.55	0.018	0.020	0.022
e	0.65 BSC			0.026 BSC		
H	0.15	0.20	0.25	0.006	0.008	0.010
K	0.25	-	-	0.010	-	-
K1	0.30	-	-	0.012	-	-
K2	0.20	-	-	0.008	-	-
K3	0.20	-	-	0.008	-	-
L	0.30	0.35	0.40	0.012	0.014	0.016
C14-0630-Rev. E, 21-Jul-14						
DWG: 5940						

Note

- Millimeters will govern

RECOMMENDED MINIMUM PADS FOR PowerPAK® ChipFET® Single



Recommended Minimum Pads
Dimensions in mm/(Inches)

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