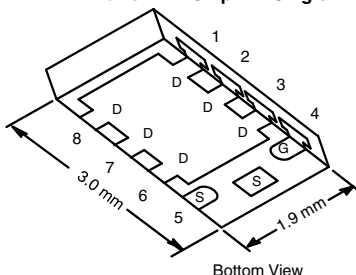


P-Channel 12 V (D-S) MOSFET

PRODUCT SUMMARY

V _{DS} (V)	R _{DS(on)} (Ω) (Max.)	I _D (A)	Q _g (Typ.)
- 12	0.0082 at V _{GS} = - 4.5 V	- 25 ^a	43 nC
	0.0094 at V _{GS} = - 3.7 V	- 25 ^a	
	0.0117 at V _{GS} = - 2.5 V	- 25 ^a	
	0.0206 at V _{GS} = - 1.8 V	- 15	

PowerPAK ChipFET Single



Ordering Information:

Si5411EDU-T1-GE3 (Lead (Pb)-free and Halogen-free)

FEATURES

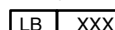
- TrenchFET® Power MOSFET
- Thermally Enhanced PowerPAK® ChipFET Package
 - Small Footprint Area
 - Low On-Resistance
- 100 % R_g and UIS Tested
- Typical ESD Protection: 5000 V (HBM)
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912


RoHS
COMPLIANT
HALOGEN
FREE

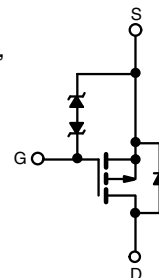
APPLICATIONS

- Portable Devices such as Smart Phones, Tablet PCs and Mobile Computing
 - Battery Switch
 - Load Switch
 - Power Management

Marking Code


Lot Traceability
and Date Code

Part # Code



P-Channel MOSFET

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V _{DS}	- 12	V
Gate-Source Voltage	V _{GS}	± 8	
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	- 16.5 ^{b, c}
		T _A = 70 °C	- 13 ^{b, c}
Pulsed Drain Current (t = 100 μs)	I _{DM}	- 140	A
Continuous Source-Drain Diode Current	I _S	T _C = 25 °C	- 25 ^a
		T _A = 25 °C	- 2.6 ^{b, c}
Single Avalanche Current	I _{AS}	- 15	
Single Avalanche Energy	E _{AS}	11	mJ
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}	- 50 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}	3	4	

Notes

- Package limited.
- Surface mounted on 1" x 1" FR4 board.
- t = 5 s.
- See solder profile (www.vishay.com/doc?73257). The PowerPAK ChipFET 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.

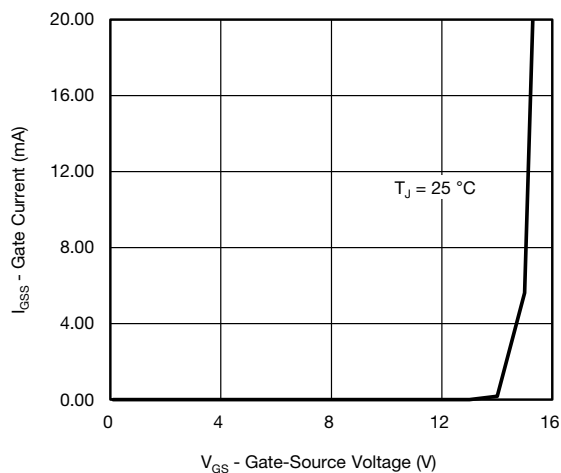
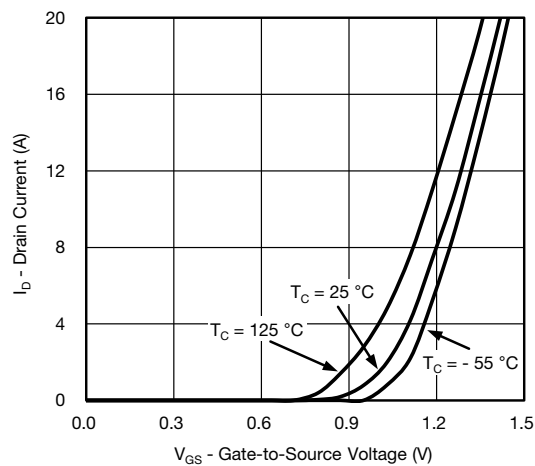
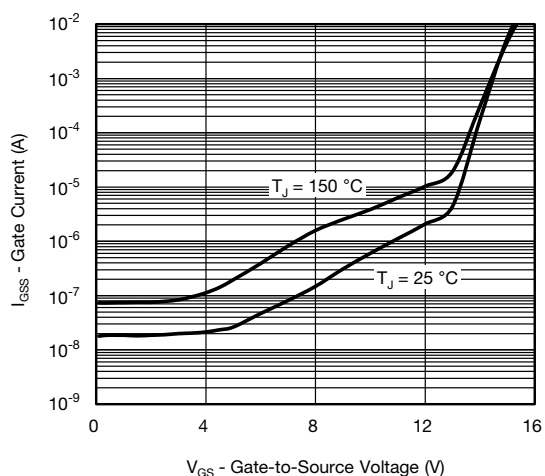
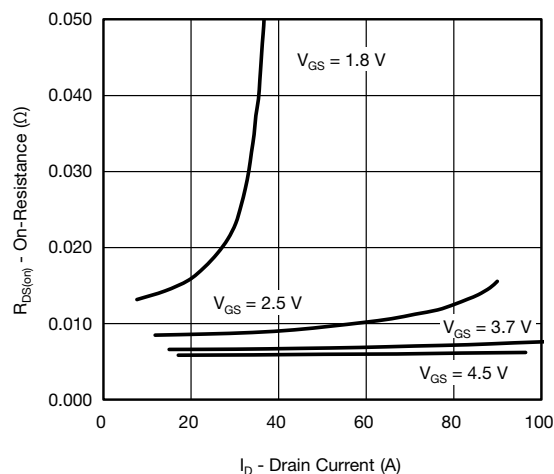
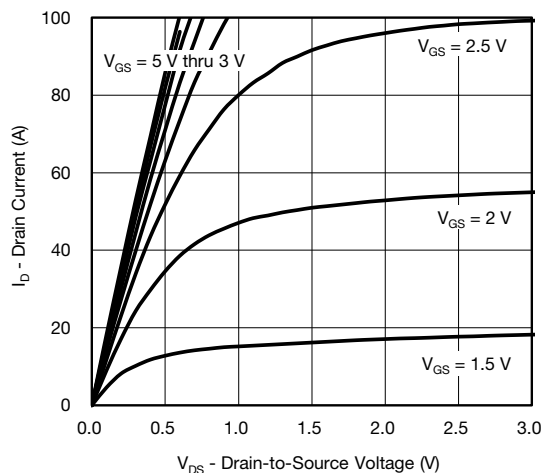
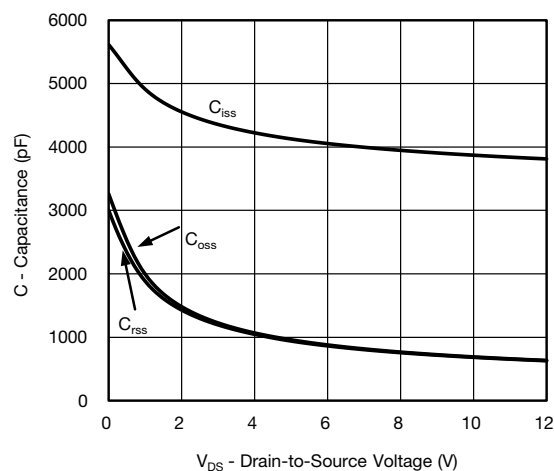
**SPECIFICATIONS** ($T_J = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)

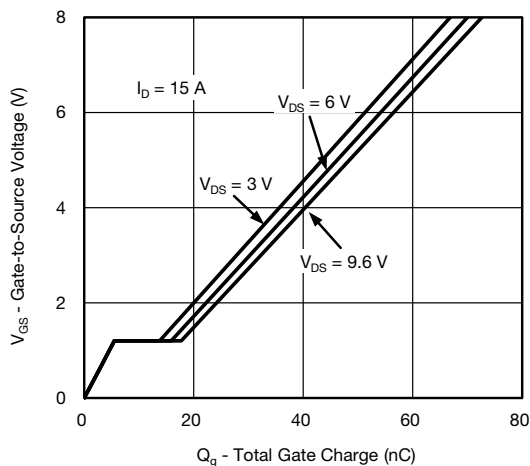
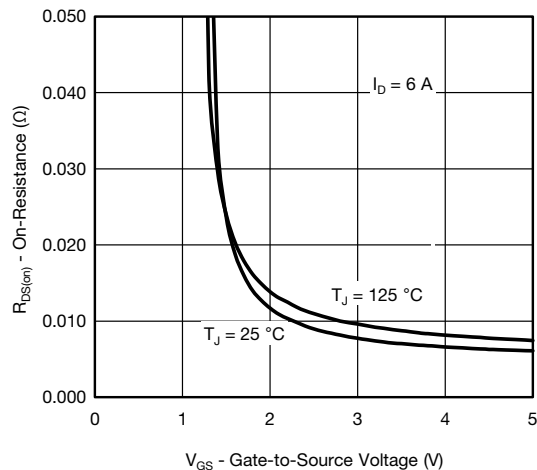
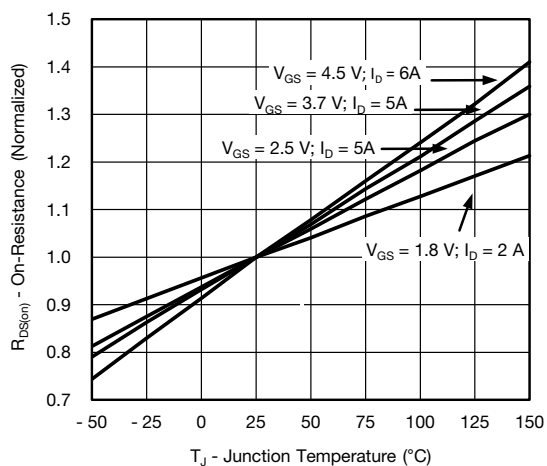
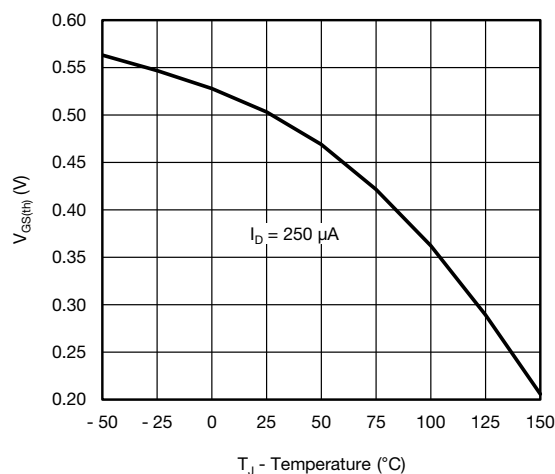
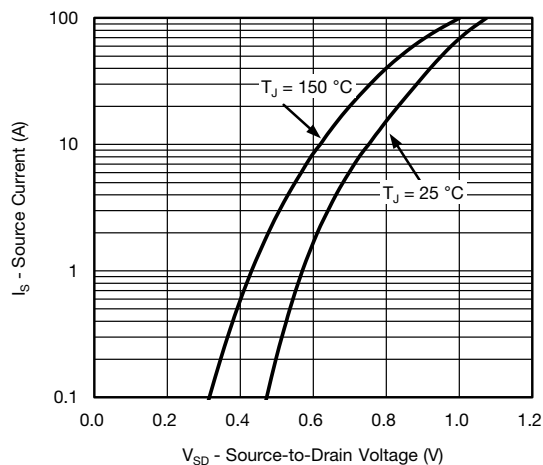
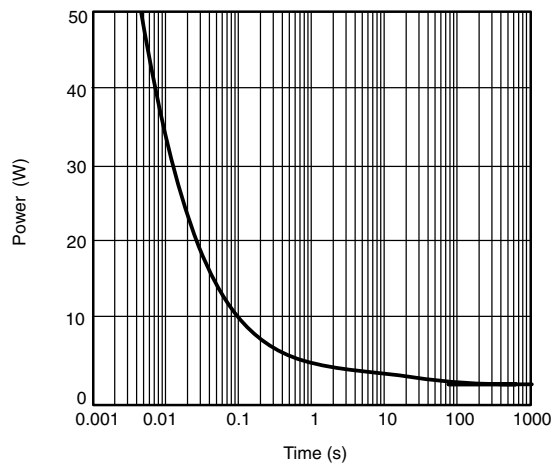
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V _{DS}	V _{GS} = 0 V, I _D = - 250 μA	- 12			V
V _{DS} Temperature Coefficient	ΔV _{DS} /T _J	I _D = - 250 μA		- 5		mV/°C
V _{GS(th)} Temperature Coefficient	ΔV _{GS(th)} /T _J			1.8		
Gate-Source Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = - 250 μA	- 0.4		- 0.9	V
Gate-Source Leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 8 V			± 2	μA
		V _{DS} = 0 V, V _{GS} = ± 4.5 V			± 0.2	
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = - 12 V, V _{GS} = 0 V			- 1	
		V _{DS} = - 12 V, V _{GS} = 0 V, T _J = 55 °C			- 10	
On-State Drain Current ^a	I _{D(on)}	V _{DS} ≤ - 5 V, V _{GS} = - 4.5 V	- 10			A
Drain-Source On-State Resistance ^a	R _{DS(on)}	V _{GS} = - 4.5 V, I _D = - 6 A		0.0066	0.0082	Ω
		V _{GS} = - 3.7 V, I _D = - 5 A		0.0073	0.0094	
		V _{GS} = - 2.5 V, I _D = - 5 A		0.0095	0.0117	
		V _{GS} = - 1.8 V, I _D = - 2 A		0.0155	0.0206	
Forward Transconductance ^a	g _{fs}	V _{GS} = - 6 V, I _D = - 6 A		45		S
Dynamic ^b						
Input Capacitance	C _{iss}	V _{DS} = - 6 V, V _{GS} = 0 V, f = 1 MHz		4100		pF
Output Capacitance	C _{oss}			860		
Reverse Transfer Capacitance	C _{rss}			870		
Total Gate Charge	Q _g	V _{DS} = - 6 V, V _{GS} = - 8 V, I _D = - 15 A		70	105	nC
		V _{DS} = - 6 V, V _{GS} = - 4.5 V, I _D = - 15 A		43	65	
Q _{gs}			5.5			
Q _{gd}			10.5			
Gate Resistance	R _g	f = 1 MHz	0.7	3.6	7.2	Ω
Turn-On Delay Time	t _{d(on)}	V _{DD} = - 6 V, R _L = 0.6 Ω I _D ≅ - 10 A, V _{GEN} = - 4.5 V, R _g = 1 Ω		30	60	ns
Rise Time	t _r			30	60	
Turn-Off Delay Time	t _{d(off)}			70	140	
Fall Time	t _f			35	70	
Turn-On Delay Time	t _{d(on)}	V _{DD} = - 6 V, R _L = 0.6 Ω I _D ≅ - 10 A, V _{GEN} = - 8 V, R _g = 1 Ω		12	25	
Rise Time	t _r			5	10	
Turn-Off Delay Time	t _{d(off)}			80	160	
Fall Time	t _f			25	50	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I _S	T _C = 25 °C			- 25	A
Pulse Diode Forward Current (100 μs)	I _{SM}				- 140	
Body Diode Voltage	V _{SD}	I _S = - 10 A, V _{GS} = 0 V		- 0.8	- 1.2	V
Body Diode Reverse Recovery Time	t _{rr}	I _F = - 10 A, dI/dt = 100 A/μs, T _J = 25 °C		45	90	ns
Body Diode Reverse Recovery Charge	Q _{rr}			35	70	nC
Reverse Recovery Fall Time	t _a			17		ns
Reverse Recovery Rise Time	t _b			28		

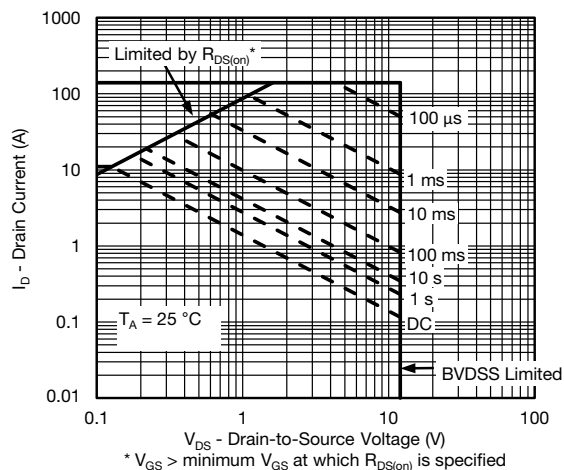
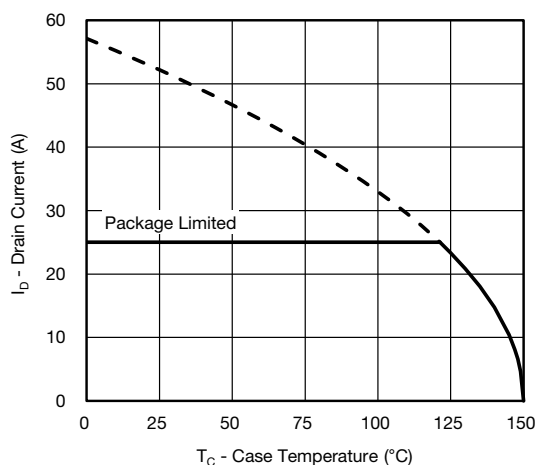
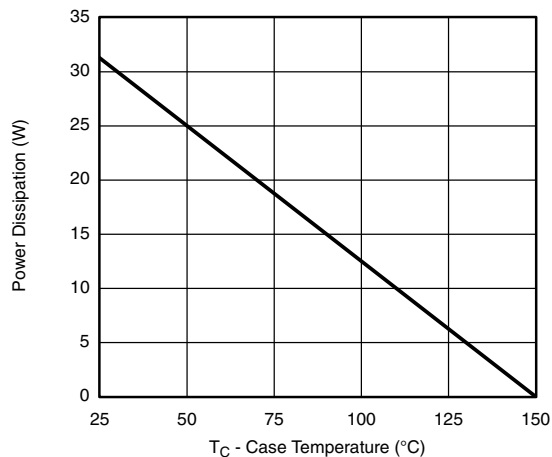
Notes

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

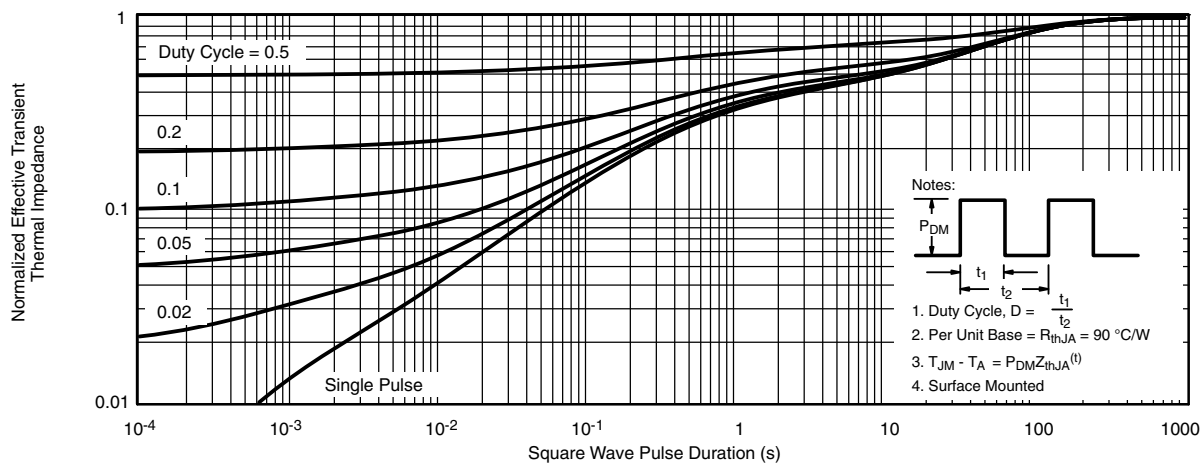
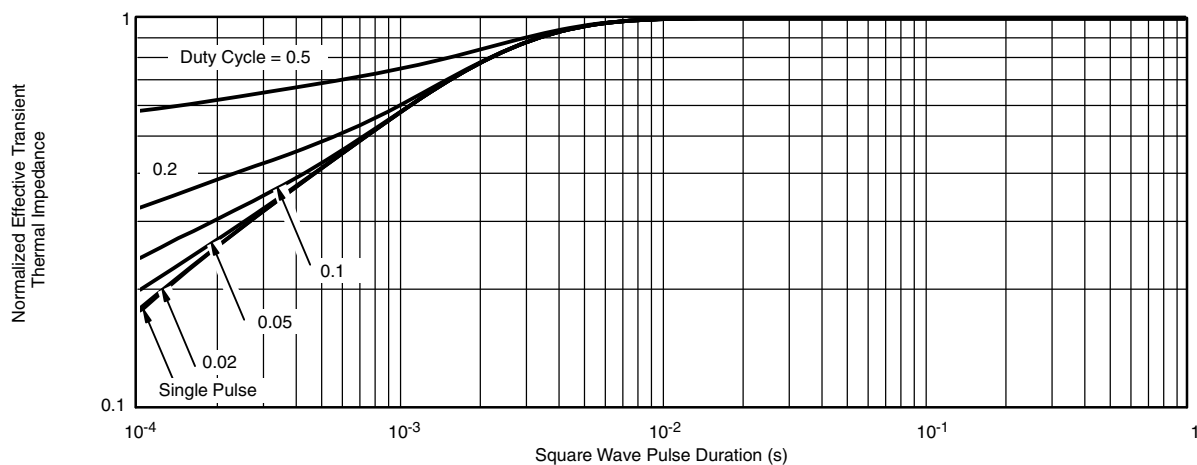
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

Gate Current vs. Gate-Source Voltage

Transfer Characteristics

Gate Current vs. Gate-Source Voltage

On-Resistance vs. Drain Current and Gate Voltage

Output Characteristics

Capacitance

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

Gate Charge

On-Resistance vs. Gate-to-Source Voltage

On-Resistance vs. Junction Temperature

Threshold Voltage

Source-Drain Diode Forward Voltage

Single Pulse Power, Junction-to-Ambient

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

Safe Operating Area, Junction-to-Ambient

Current Derating*

Power Derating

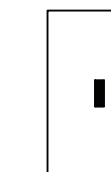
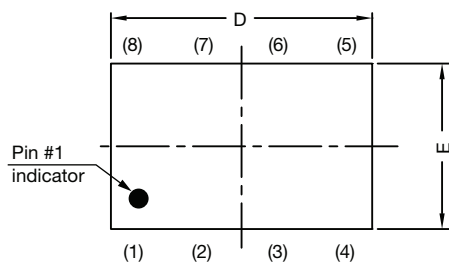
* The power dissipation P_D is based on $T_{J(max)} = 150^\circ\text{C}$, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the 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?62879.



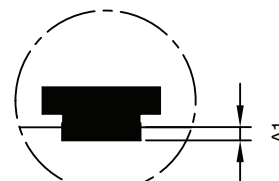
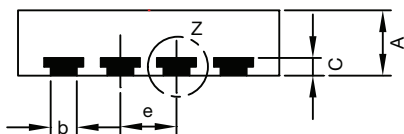
PowerPAK® ChipFET® Case Outline



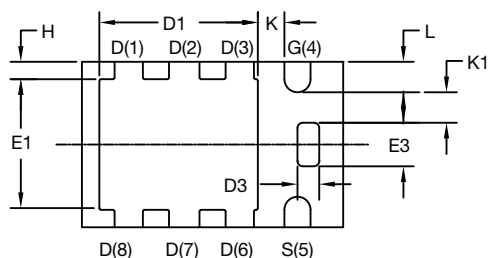
Side view of single



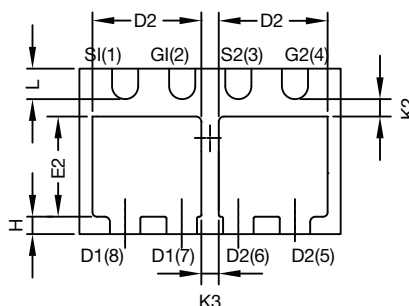
Side view of dual



Detail Z



Backside view of single pad



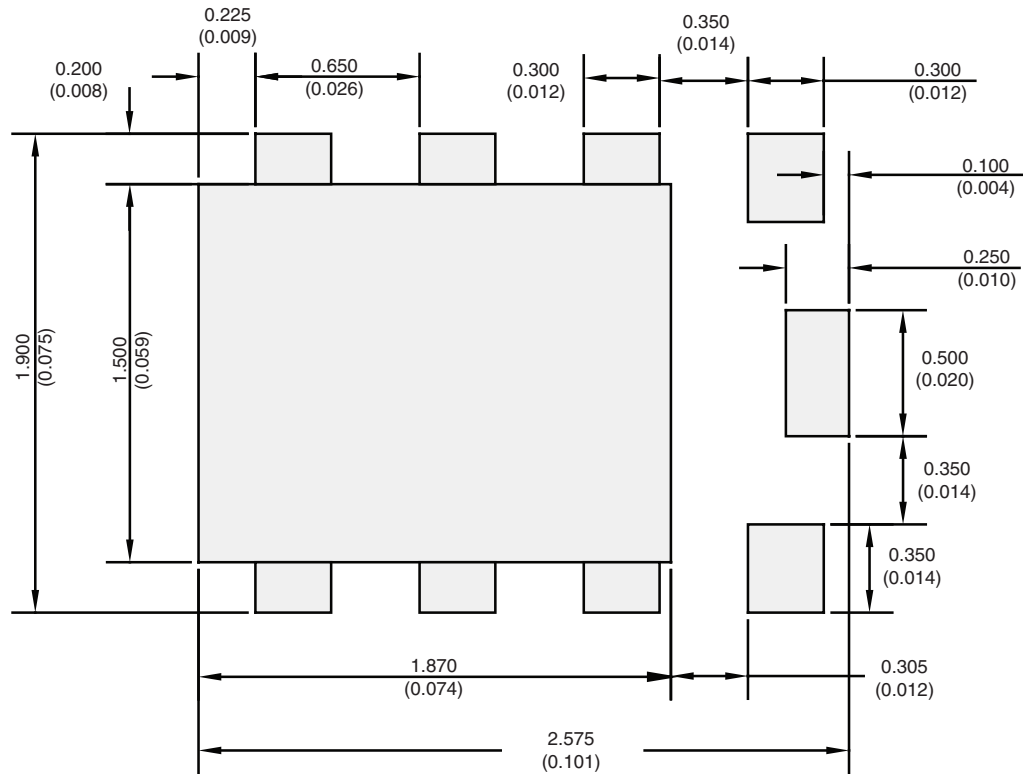
Backside view of dual pad

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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