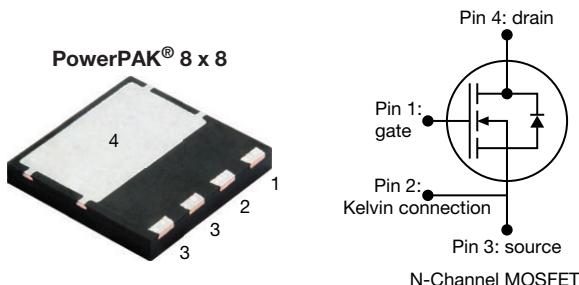


## E Series Power MOSFET



### FEATURES

- 4<sup>th</sup> generation E series technology
- Low figure-of-merit (FOM)  $R_{on} \times Q_g$
- Low effective capacitance ( $C_{o(er)}$ )
- Reduced switching and conduction losses
- Avalanche energy rated (UIS)
- Kelvin connection for reduced gate noise
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
**HALOGEN**  
**FREE**  
**GREEN**  
(S-2008)

### APPLICATIONS

- Server and telecom power supplies
- Switch mode power supplies (SMPS)
- Power factor correction power supplies (PFC)
- Lighting
  - High-intensity discharge (HID)
  - Fluorescent ballast lighting
- Industrial
  - Welding
  - Induction heating
  - Motor drives
  - Battery chargers
  - Solar (PV inverters)

PRODUCT SUMMARY	
$V_{DS}$ (V) at $T_J$ max.	700
$R_{DS(on)}$ typ. ( $\Omega$ ) at 25 °C	$V_{GS} = 10$ V 0.070
$Q_g$ max. (nC)	78
$Q_{gs}$ (nC)	21
$Q_{gd}$ (nC)	16
Configuration	Single

ORDERING INFORMATION	
Package	PowerPAK® 8 x 8
Lead (Pb)-free and halogen-free	SiHH075N65E-T1-GE3

ABSOLUTE MAXIMUM RATINGS ( $T_C = 25$ °C, unless otherwise noted)				
PARAMETER		SYMBOL	LIMIT	UNIT
Drain-source voltage		$V_{DS}$	650	V
Gate-source voltage		$V_{GS}$	$\pm 30$	
Continuous drain current ( $T_J = 150$ °C)	$V_{GS}$ at 10 V	$I_D$	29	A
			19	
Pulsed drain current <sup>a</sup>		$I_{DM}$	97	
Linear derating factor			1.6	W/°C
Single pulse avalanche energy <sup>b</sup>		$E_{AS}$	144	mJ
Maximum power dissipation		$P_D$	160	W
Operating junction and storage temperature range		$T_J, T_{stg}$	-55 to +150	°C
Drain-source voltage slope	$dv/dt$		100	V/ns
Reverse diode $dv/dt$ <sup>c</sup>			100	

#### Notes

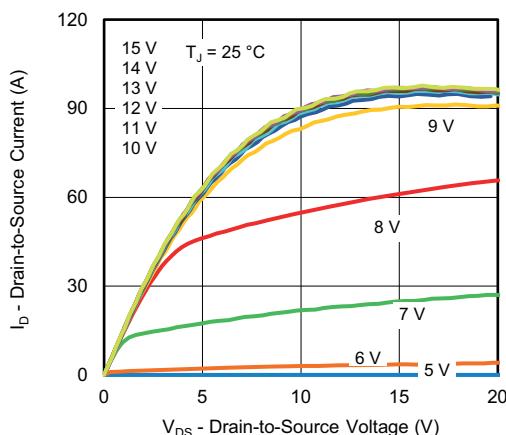
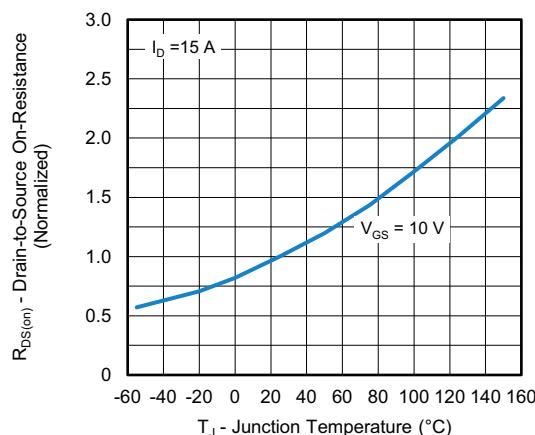
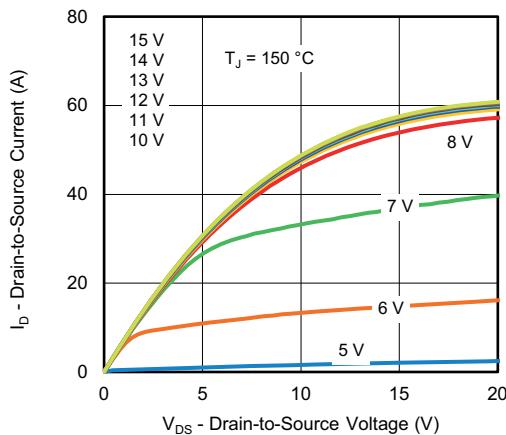
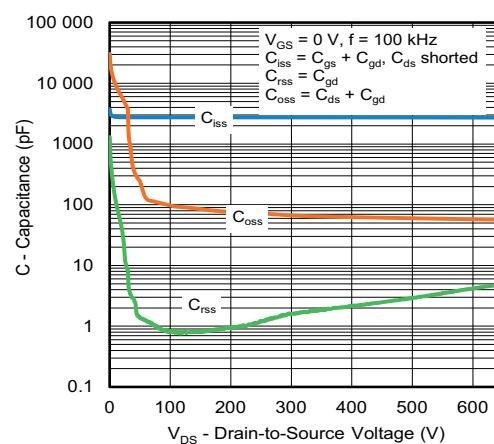
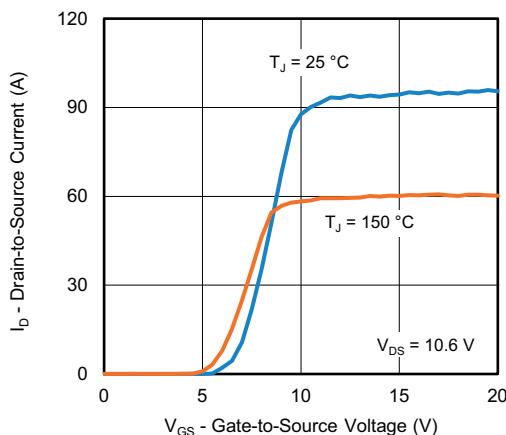
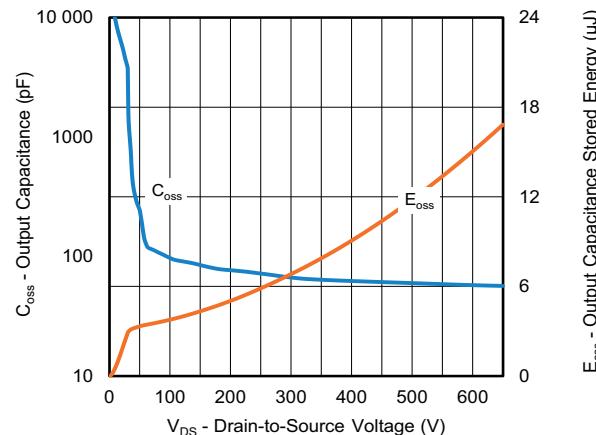
- Repetitive rating; pulse width limited by maximum junction temperature
- $V_{DD} = 140$  V, starting  $T_J = 25$  °C,  $L = 28.2$  mH,  $R_g = 25$  Ω,  $I_{AS} = 3.2$  A
- $I_{SD} \leq I_D$ ,  $di/dt = 170$  A/μs, starting  $T_J = 25$  °C

**THERMAL RESISTANCE RATINGS**

PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum junction-to-ambient	$R_{thJA}$	38	50	$^{\circ}\text{C}/\text{W}$
Maximum junction-to-case (drain)	$R_{thJC}$	0.48	0.62	

**SPECIFICATIONS (T<sub>J</sub> = 25 °C, unless otherwise noted)**

PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
<b>Static</b>							
Drain-source breakdown voltage	$V_{DS}$	$V_{GS} = 0 \text{ V}$ , $I_D = 250 \mu\text{A}$		650	-	-	V
$V_{DS}$ temperature coefficient	$\Delta V_{DS}/T_J$	Reference to 25 °C, $I_D = 1 \text{ mA}$		-	0.67	-	$^{\circ}\text{C}/\text{C}$
Gate-source threshold voltage (N)	$V_{GS(th)}$	$V_{DS} = V_{GS}$ , $I_D = 250 \mu\text{A}$		3.0	-	5.0	V
Gate-source leakage	$I_{GSS}$	$V_{GS} = \pm 20 \text{ V}$		-	-	$\pm 100$	nA
		$V_{GS} = \pm 30 \text{ V}$		-	-	$\pm 1$	$\mu\text{A}$
Zero gate voltage drain current	$I_{DSS}$	$V_{DS} = 650 \text{ V}$ , $V_{GS} = 0 \text{ V}$		-	-	1	$\mu\text{A}$
		$V_{DS} = 520 \text{ V}$ , $V_{GS} = 0 \text{ V}$ , $T_J = 125 \text{ }^{\circ}\text{C}$		-	-	10	
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS} = 10 \text{ V}$	$I_D = 15 \text{ A}$	-	0.070	0.080	$\Omega$
Forward transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 10 \text{ V}$ , $I_D = 15 \text{ A}$		-	15	-	S
<b>Dynamic</b>							
Input capacitance	$C_{iss}$	$V_{GS} = 0 \text{ V}$ , $V_{DS} = 100 \text{ V}$ , $f = 100 \text{ kHz}$		-	2832	-	pF
Output capacitance	$C_{oss}$			-	102	-	
Reverse transfer capacitance	$C_{rss}$			-	2	-	
Effective output capacitance, energy related <sup>a</sup>	$C_{o(er)}$	$V_{DS} = 0 \text{ V to } 400 \text{ V}$ , $V_{GS} = 0 \text{ V}$		-	113	-	
Effective output capacitance, time related <sup>b</sup>	$C_{o(tr)}$			-	768	-	
Total gate charge	$Q_g$			-	52	78	nC
Gate-source charge	$Q_{gs}$	$V_{GS} = 10 \text{ V}$	$I_D = 15 \text{ A}$ , $V_{DS} = 520 \text{ V}$	-	21	-	
Gate-drain charge	$Q_{gd}$			-	16	-	
Turn-on delay time	$t_{d(on)}$			-	30	60	ns
Rise time	$t_r$	$V_{DD} = 520 \text{ V}$ , $I_D = 17.3 \text{ A}$ , $V_{GS} = 10 \text{ V}$ , $R_g = 10 \Omega$		-	31	62	
Turn-off delay time	$t_{d(off)}$		-	57	86		
Fall time	$t_f$		-	8	16		
Gate input resistance	$R_g$	$f = 1 \text{ MHz}$		0.5	1	2.0	$\Omega$
<b>Drain-Source Body Diode Characteristics</b>							
Continuous source-drain diode current	$I_S$	MOSFET symbol showing the integral reverse p - n junction diode		-	-	29	A
Pulsed diode forward current	$I_{SM}$			-	-	97	
Diode forward voltage	$V_{SD}$	$T_J = 25 \text{ }^{\circ}\text{C}$ , $I_S = 15 \text{ A}$ , $V_{GS} = 0 \text{ V}$		-	-	1.2	V
Reverse recovery time	$t_{rr}$	$T_J = 25 \text{ }^{\circ}\text{C}$ , $I_F = I_S = 15 \text{ A}$ , $di/dt = 100 \text{ A}/\mu\text{s}$ , $V_R = 400 \text{ V}$		-	380	760	ns
Reverse recovery charge	$Q_{rr}$			-	5	10	$\mu\text{C}$
Reverse recovery current	$I_{RRM}$			-	17	-	A

**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)

**Fig. 1 - Typical Output Characteristics**

**Fig. 4 - Normalized On-Resistance vs. Temperature**

**Fig. 2 - Typical Output Characteristics**

**Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage**

**Fig. 3 - Typical Transfer Characteristics**

**Fig. 6 -  $C_{oss}$  and  $E_{oss}$  vs.  $V_{DS}$**

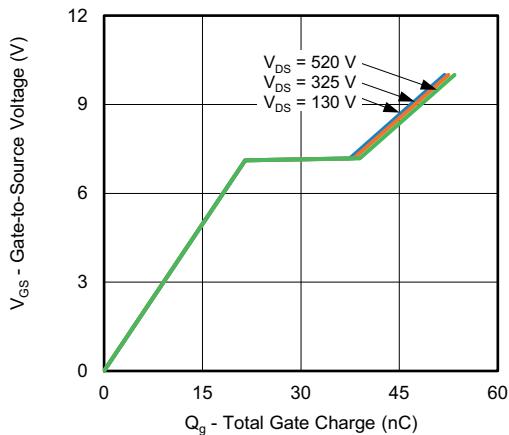


Fig. 7 - Typical Gate Charge vs. Gate-to-Source Voltage

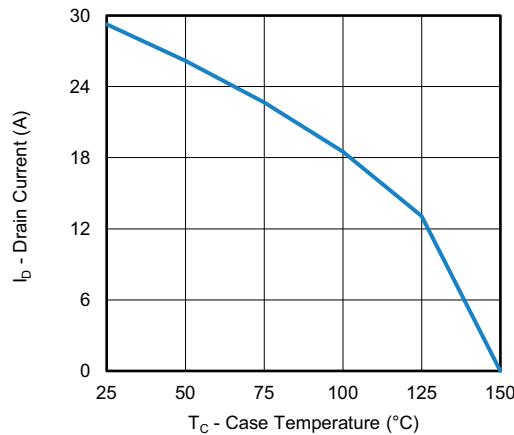


Fig. 10 - Maximum Drain Current vs. Case Temperature

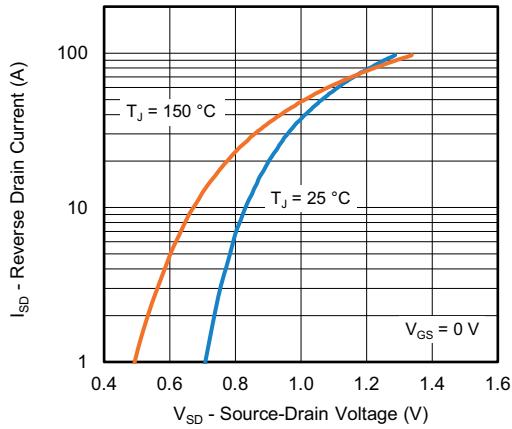


Fig. 8 - Typical Source-Drain Diode Forward Voltage

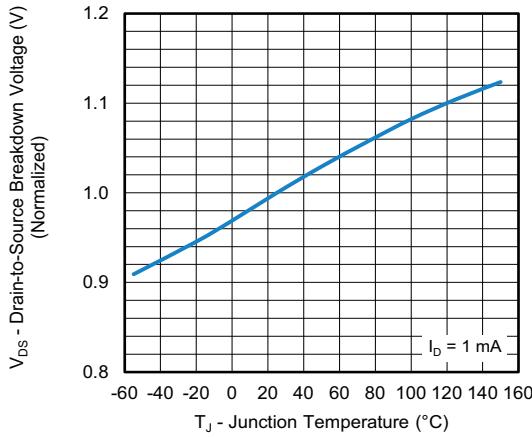


Fig. 11 - Temperature vs. Drain-to-Source Voltage

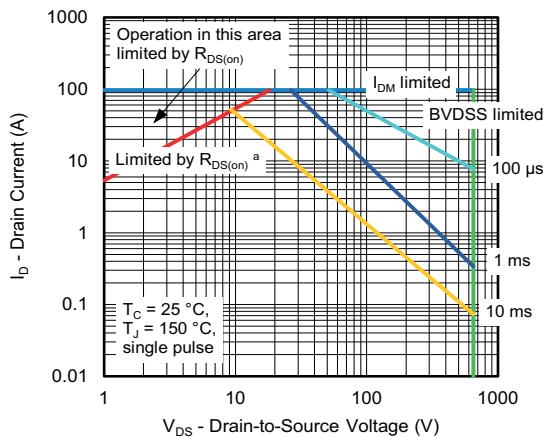
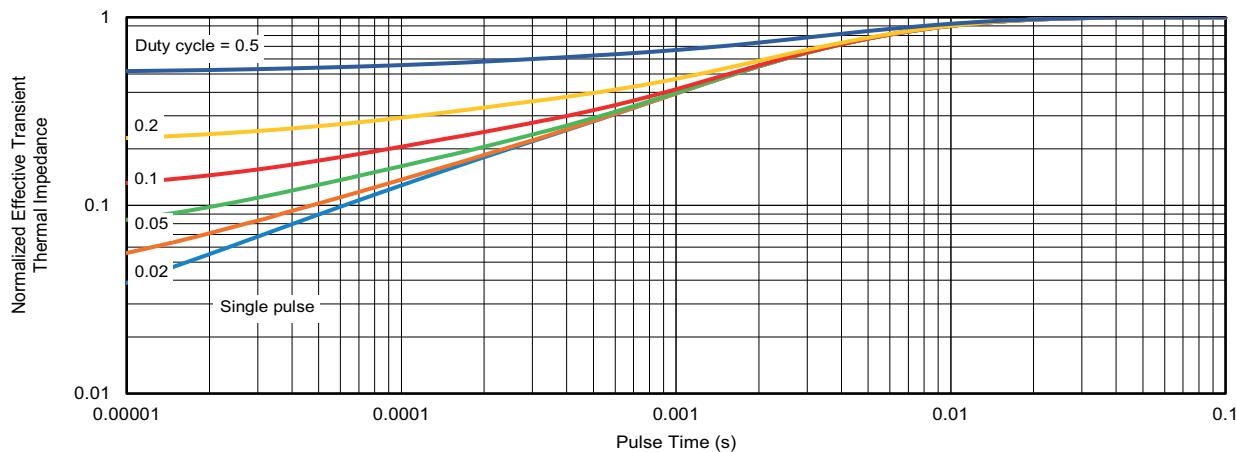


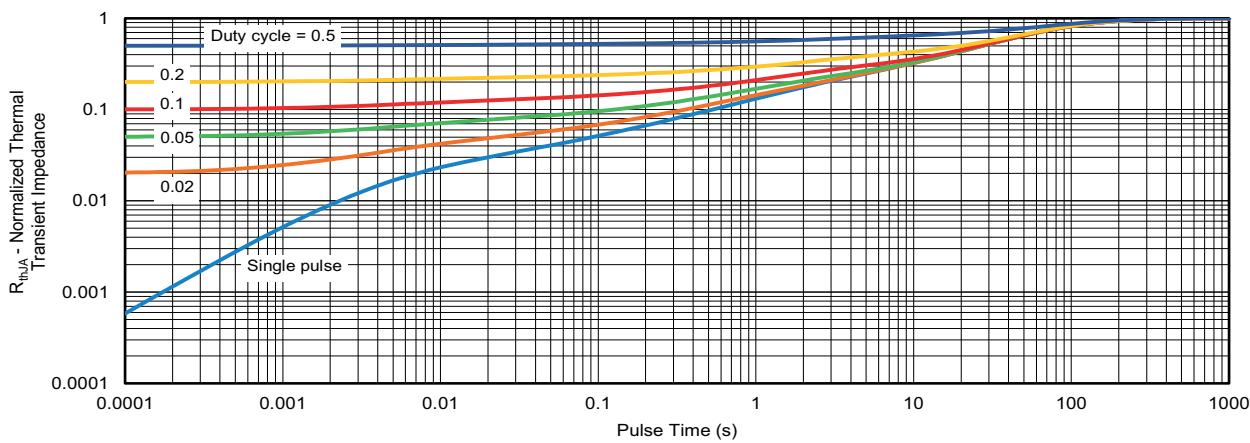
Fig. 9 - Maximum Safe Operating Area

#### Note

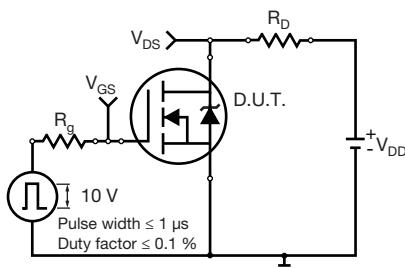
a.  $V_{GS} >$  minimum  $V_{GS}$  at which  $R_{DS(on)}$  is specified



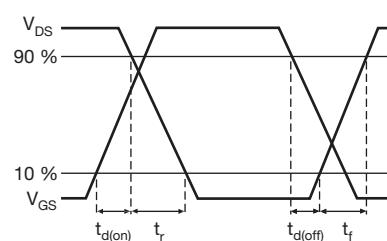
**Fig. 12 - Normalized Transient Thermal Impedance, Junction-to-Case**



**Fig. 13 - Normalized Thermal Transient Impedance, Junction-to-Ambient**



**Fig. 14 - Switching Time Test Circuit**



**Fig. 15 - Switching Time Waveforms**

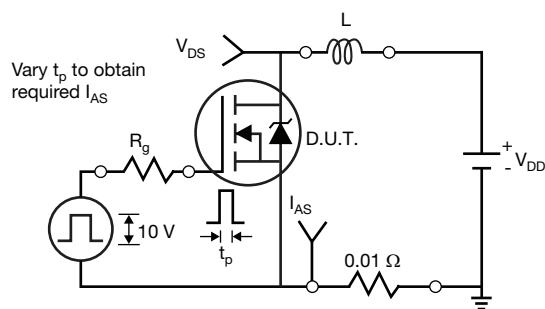


Fig. 16 - Unclamped Inductive Test Circuit

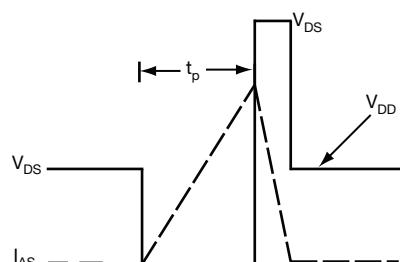


Fig. 17 - Unclamped Inductive Waveforms

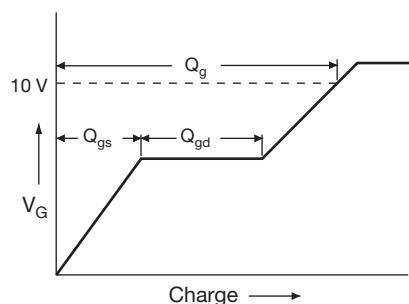


Fig. 18 - Basic Gate Charge Waveform

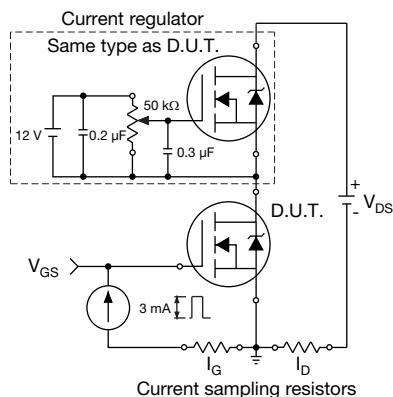
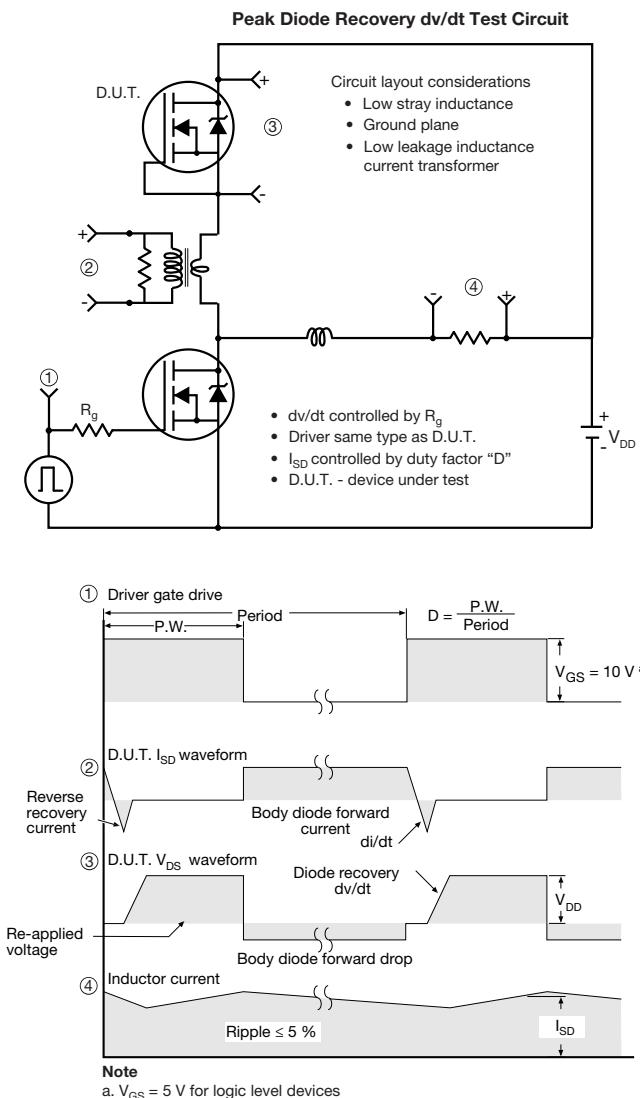


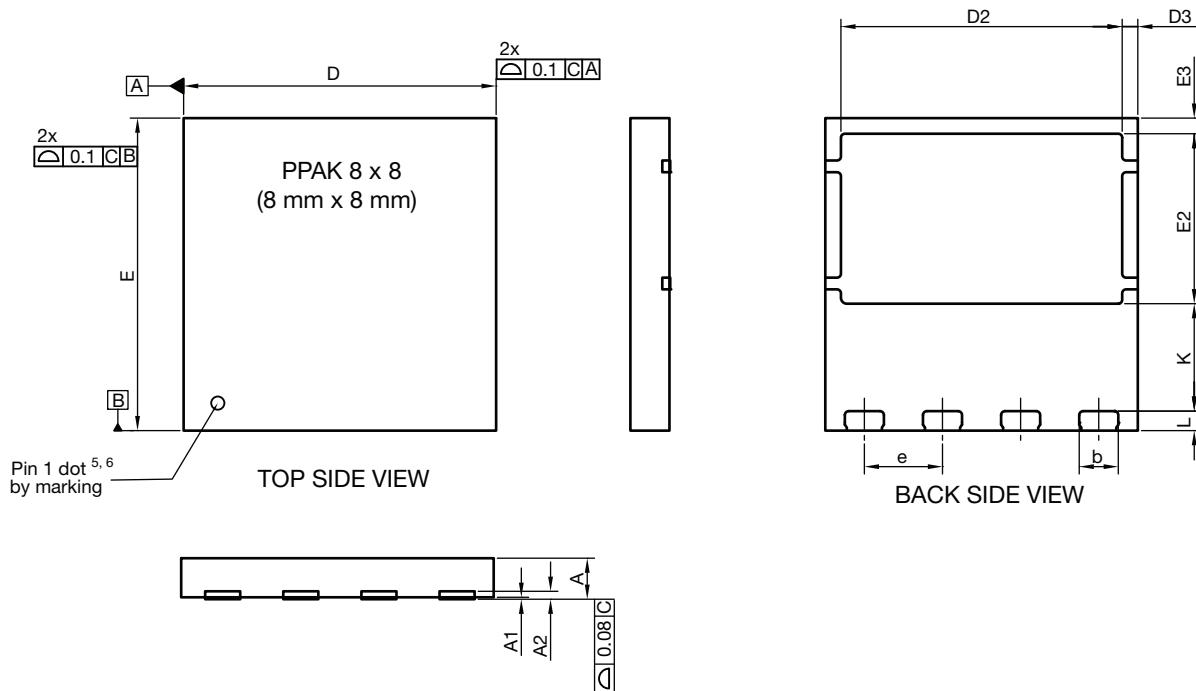
Fig. 19 - Gate Charge Test Circuit



**Fig. 20 - For N-Channel**

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## PowerPAK® 8 x 8 Case Outline

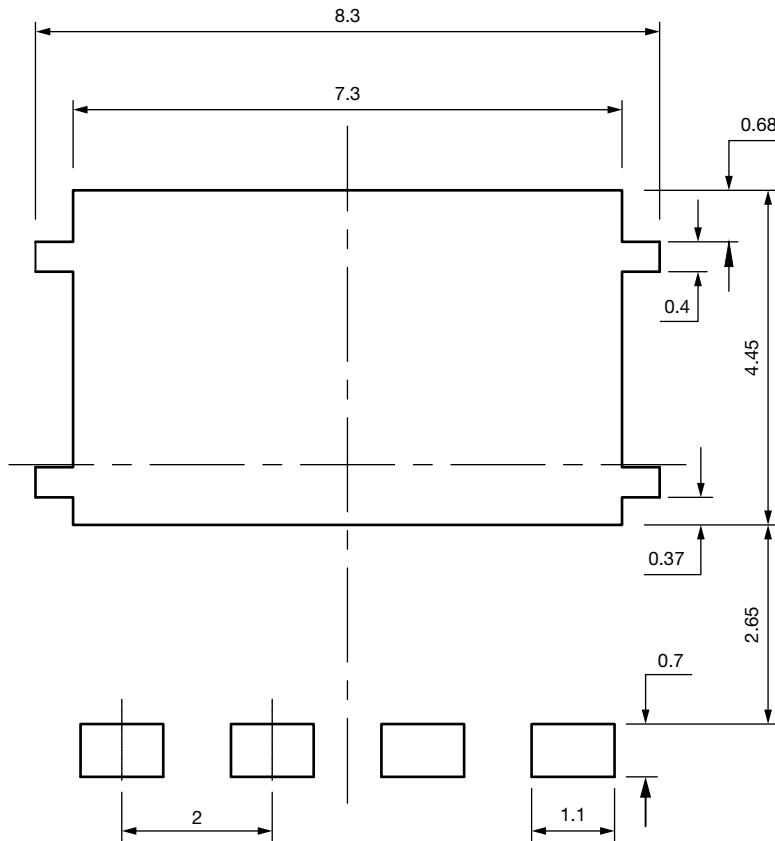


DIM.	MILLIMETERS			INCHES		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.95	1.00	1.05	0.037	0.039	0.041
A1	0.00	-	0.05	0.000	-	0.002
A2	020 ref.			0.008 ref.		
b	0.95	1.00	1.05	0.037	0.039	0.041
D	7.90	8.00	8.10	0.311	0.315	0.319
D2	7.10	7.20	7.30	0.280	0.283	0.287
D3	0.40 BSC			0.016 BSC		
e	2.00 BSC			0.079 BSC		
E	7.90	8.00	8.10	0.311	0.315	0.319
E2	4.30	4.35	4.40	0.169	0.171	0.173
E3	0.40 BSC			0.016 BSC		
K	2.75 BSC			0.108 BSC		
L	0.45	0.50	0.55	0.018	0.020	0.022
N <sup>(3)</sup>	8			8		

**Notes**

- (1) Use millimeters as the primary measurement
- (2) Dimensioning and tolerances conform to ASME Y14.5 M - 1994
- (3) N is the number of terminals
- (4) The pin 1 identifier must be existed on the top surface of the package by using indentation mark or other feature of package body
- (5) Exact shape and size of this feature is optional

ECN: E20-0518-Rev. B, 28-Sep-2020  
 DWG: 6041

**Recommended Minimum PADs for PowerPAK® 8 mm x 8 mm**

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