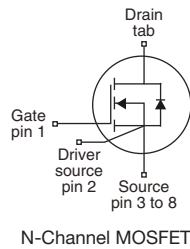
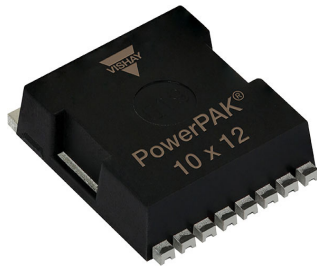


## EF Series Power MOSFET With Fast Body Diode



### 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)
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**

### 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.	650	
$R_{DS(on)}$ typ. ( $\Omega$ ) at 25 °C	$V_{GS} = 10$ V	0.137
$Q_g$ max. (nC)	38	
$Q_{gs}$ (nC)	10	
$Q_{gd}$ (nC)	6	
Configuration	Single	

### ORDERING INFORMATION

Package	PowerPAK 10 x 12
Lead (Pb)-free and halogen-free	SiHK155N60EF-T1GE3

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


PARAMETER	SYMBOL	LIMIT	UNIT	
Drain-source voltage	$V_{DS}$	600	V	
Gate-source voltage	$V_{GS}$	$\pm 30$		
Continuous drain current ( $T_J = 150$ °C)	$V_{GS}$ at 10 V	$T_C = 25$ °C	18	A
		$T_C = 100$ °C	12	
Pulsed drain current <sup>a</sup>	$I_{DM}$	43		
Linear derating factor		1.04	W/°C	
Single pulse avalanche energy <sup>b</sup>	$E_{AS}$	179	mJ	
Maximum power dissipation	$P_D$	156	W	
Operating junction and storage temperature range	$T_J, T_{stg}$	-55 to +150	°C	
Drain-source voltage slope	$dv/dt$	$T_J = 125$ °C	100	V/ns
Reverse diode $dv/dt$ <sup>d</sup>		50		

#### Notes

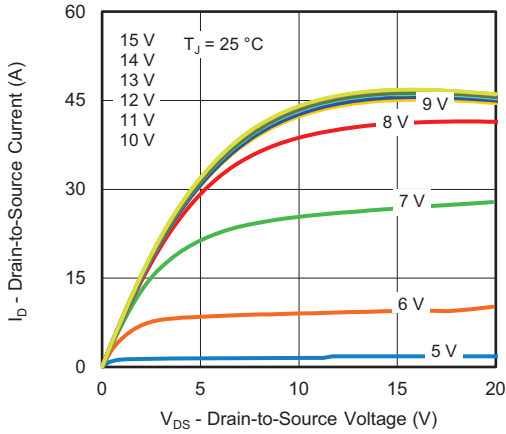
- a. Repetitive rating; pulse width limited by maximum junction temperature  
 b.  $V_{DD} = 120$  V, starting  $T_J = 25$  °C,  $L = 28.2$  mH,  $R_g = 25$   $\Omega$ ,  $I_{AS} = 2.8$  A  
 c.  $I_{SD} \leq I_D$ ,  $di/dt = 100$  A/ $\mu$ s, starting  $T_J = 25$  °C



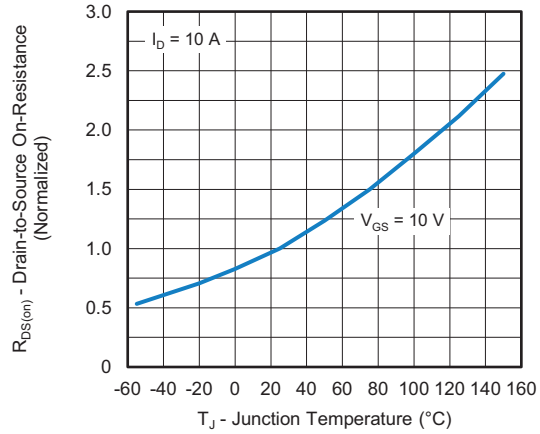
THERMAL RESISTANCE RATINGS				
PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum junction-to-ambient	$R_{thJA}$	-	50	°C/W
Maximum junction-to-case (drain)	$R_{thJC}$	-	0.96	

SPECIFICATIONS ( $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
<b>Static</b>							
Drain-source breakdown voltage	$V_{DS}$	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$		600	-	-	V
$V_{DS}$ temperature coefficient	$\Delta V_{DS}/T_J$	Reference to $25\text{ }^\circ\text{C}$ , $I_D = 1\text{ mA}$		-	0.62	-	V/°C
Gate-source threshold voltage (N)	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$		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	$I_{DSS}$	$V_{DS} = 480\text{ V}, V_{GS} = 0\text{ V}$		-	-	1	$\mu\text{A}$
		$V_{DS} = 480\text{ V}, V_{GS} = 0\text{ V}, T_J = 125\text{ }^\circ\text{C}$		-	-	2	mA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$	$I_D = 10\text{ A}$	-	0.137	0.159	$\Omega$
Forward transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 10\text{ V}, I_D = 10\text{ A}$		-	9.2	-	S
<b>Dynamic</b>							
Input capacitance	$C_{iss}$	$V_{GS} = 0\text{ V}, V_{DS} = 100\text{ V}, f = 100\text{ KHz}$		-	1465	-	pF
Output capacitance	$C_{oss}$			-	56	-	
Reverse transfer capacitance	$C_{rss}$			-	1	-	
Effective output capacitance, energy related	$C_{o(er)}$	$V_{DS} = 0\text{ V to } 400\text{ V}, V_{GS} = 0\text{ V}$		-	61	-	pF
Effective output capacitance, time related	$C_{o(tr)}$			-	356	-	
Total gate charge	$Q_g$	$V_{GS} = 10\text{ V}$	$I_D = 10\text{ A}, V_{DS} = 480\text{ V}$	-	25	38	nC
Gate-source charge	$Q_{gs}$			-	10	-	
Gate-drain charge	$Q_{gd}$			-	6	-	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 480\text{ V}, I_D = 10\text{ A}, V_{GS} = 10\text{ V}, R_g = 9.1\text{ }\Omega$		-	20	40	ns
Rise time	$t_r$			-	27	54	
Turn-off delay time	$t_{d(off)}$			-	28	56	
Fall time	$t_f$			-	17	34	
Gate input resistance	$R_g$	$f = 1\text{ MHz}$		0.4	0.9	1.8	$\Omega$
<b>Drain-Source Body Diode Characteristics</b>							
Continuous source-drain diode current	$I_S$	MOSFET symbol showing the integral reverse p - n junction diode 		-	-	18	A
Pulsed diode forward current	$I_{SM}$			-	-	43	
Diode forward voltage	$V_{SD}$	$T_J = 25\text{ }^\circ\text{C}, I_S = 10\text{ A}, V_{GS} = 0\text{ V}$		-	-	1.2	V
Reverse recovery time	$t_{rr}$	$T_J = 25\text{ }^\circ\text{C}, I_F = I_S = 10\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, V_R = 400\text{ V}$		-	95	190	ns
Reverse recovery charge	$Q_{rr}$			-	0.5	1.0	$\mu\text{C}$
Reverse recovery current	$I_{RRM}$			-	12	-	A

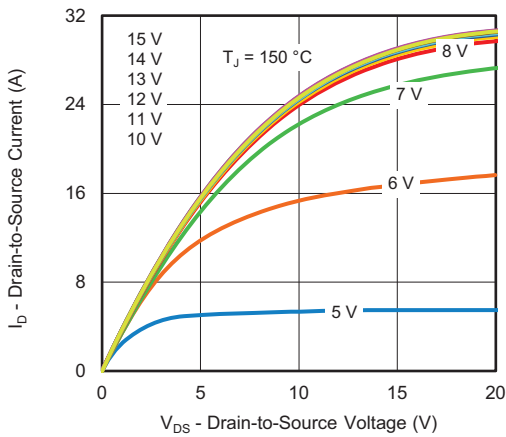
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



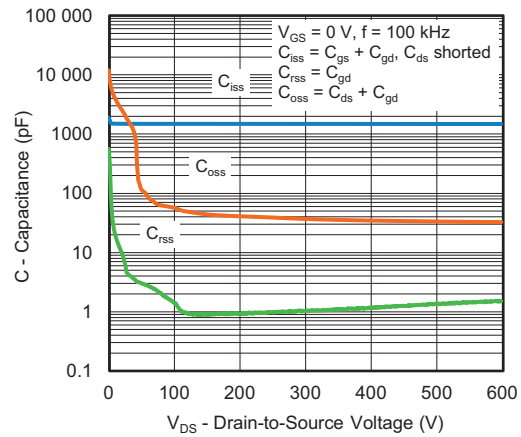
**Fig. 1 - Typical Output Characteristics**



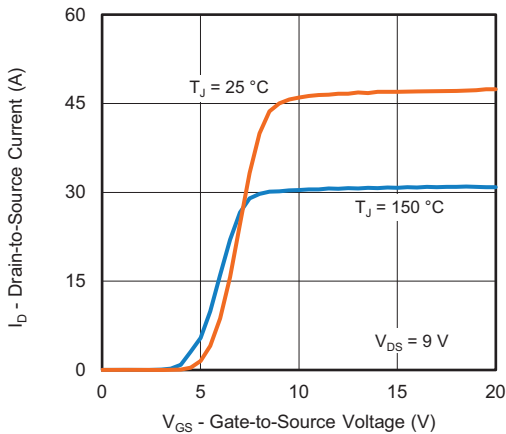
**Fig. 4 - Normalized On-Resistance vs. Temperature**



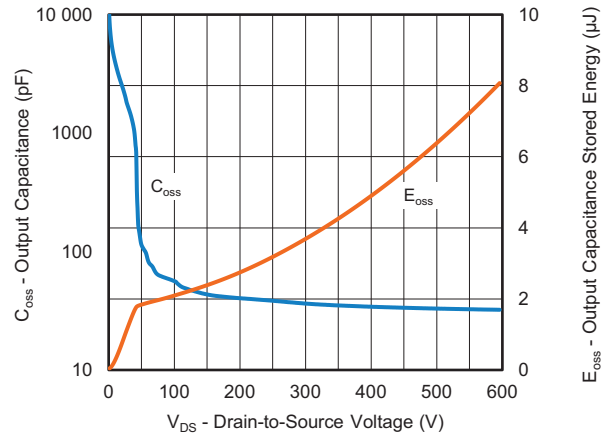
**Fig. 2 - Typical Output Characteristics**



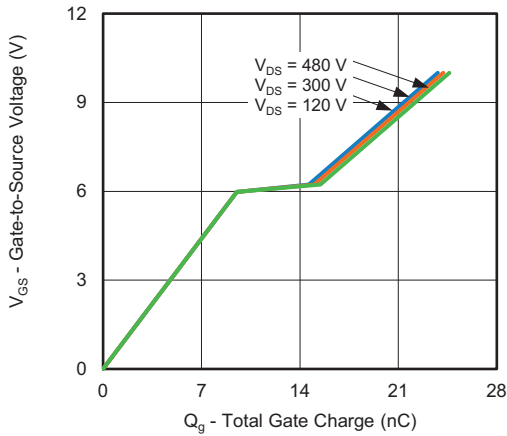
**Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage**



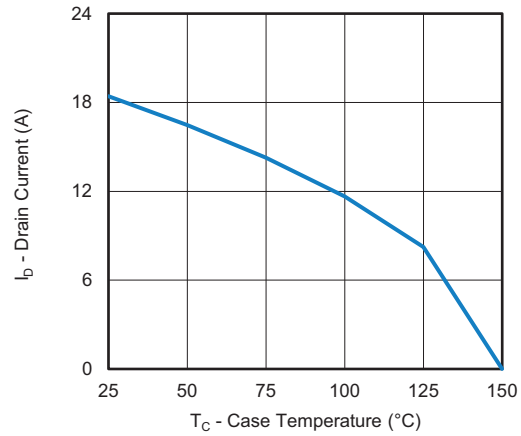
**Fig. 3 - Typical Transfer Characteristics**



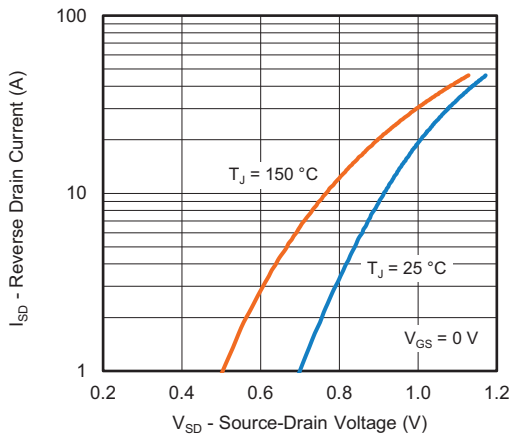
**Fig. 6 -  $C_{oss}$  and  $E_{oss}$  vs.  $V_{DS}$**



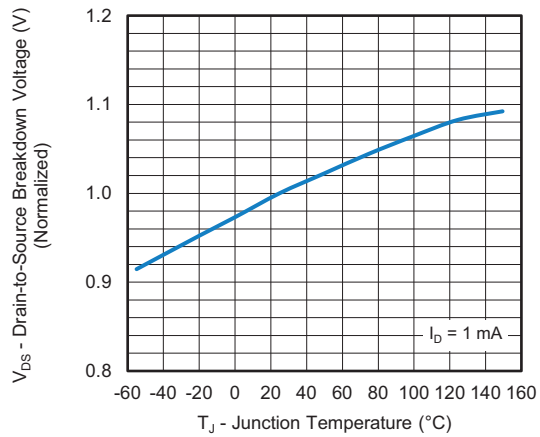
**Fig. 7 - Typical Gate Charge vs. Gate-to-Source Voltage**



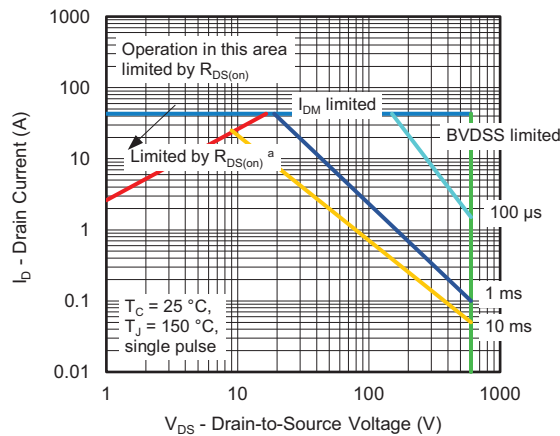
**Fig. 9 - Maximum Drain Current vs. Case Temperature**



**Fig. 8 - Typical Source-Drain Diode Forward Voltage**



**Fig. 10 - Temperature vs. Drain-to-Source Voltage**



**Fig. 11 - Maximum Safe Operating Area**

**Note**

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

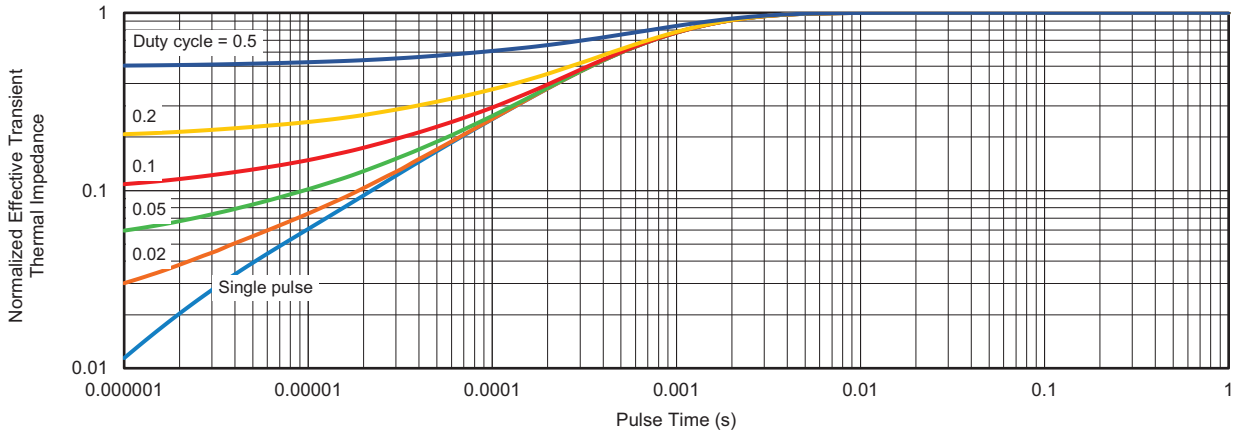


Fig. 12 - Normalized Transient Thermal Impedance, Junction-to-Case

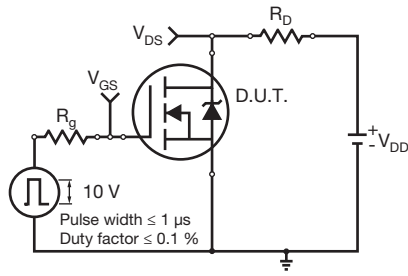


Fig. 13 - Switching Time Test Circuit

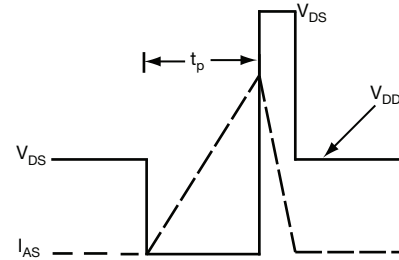


Fig. 16 - Unclamped Inductive Waveforms

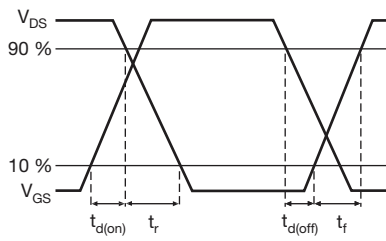


Fig. 14 - Switching Time Waveforms

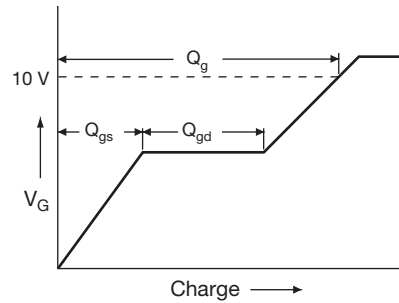


Fig. 17 - Basic Gate Charge Waveform

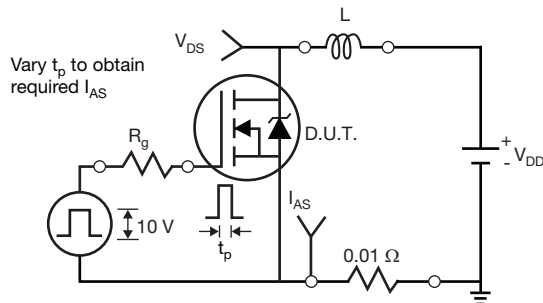


Fig. 15 - Unclamped Inductive Test Circuit

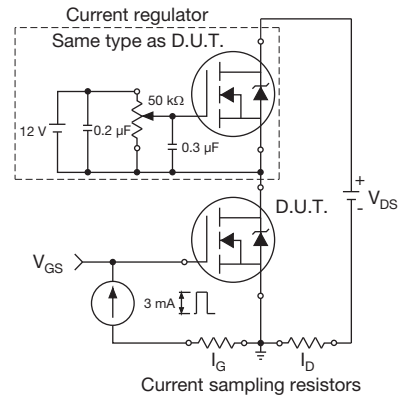
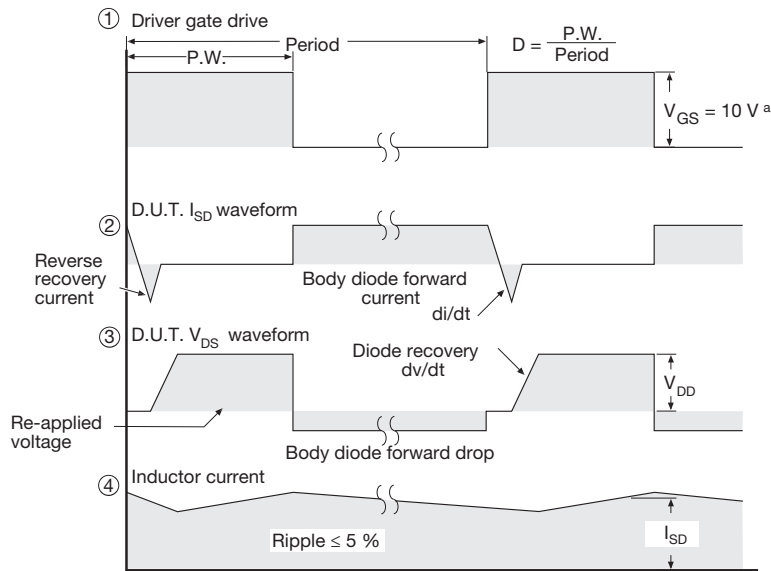
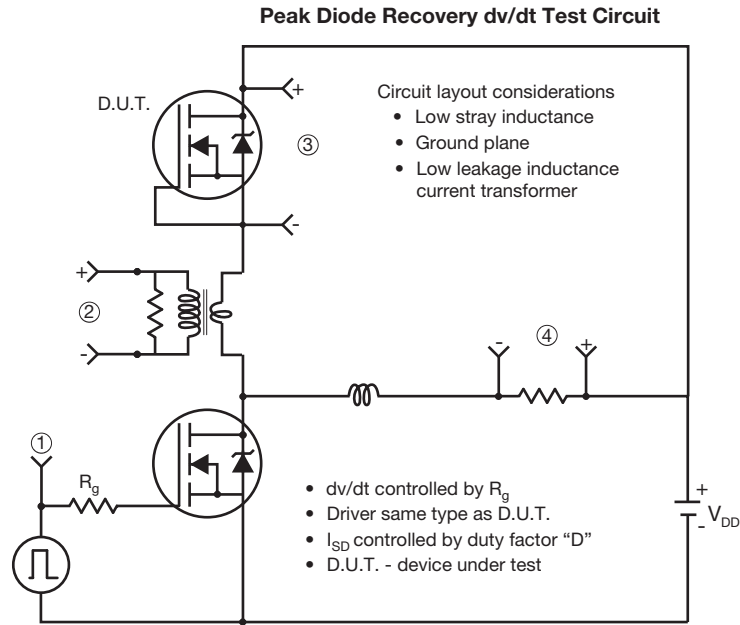


Fig. 18 - Gate Charge Test Circuit



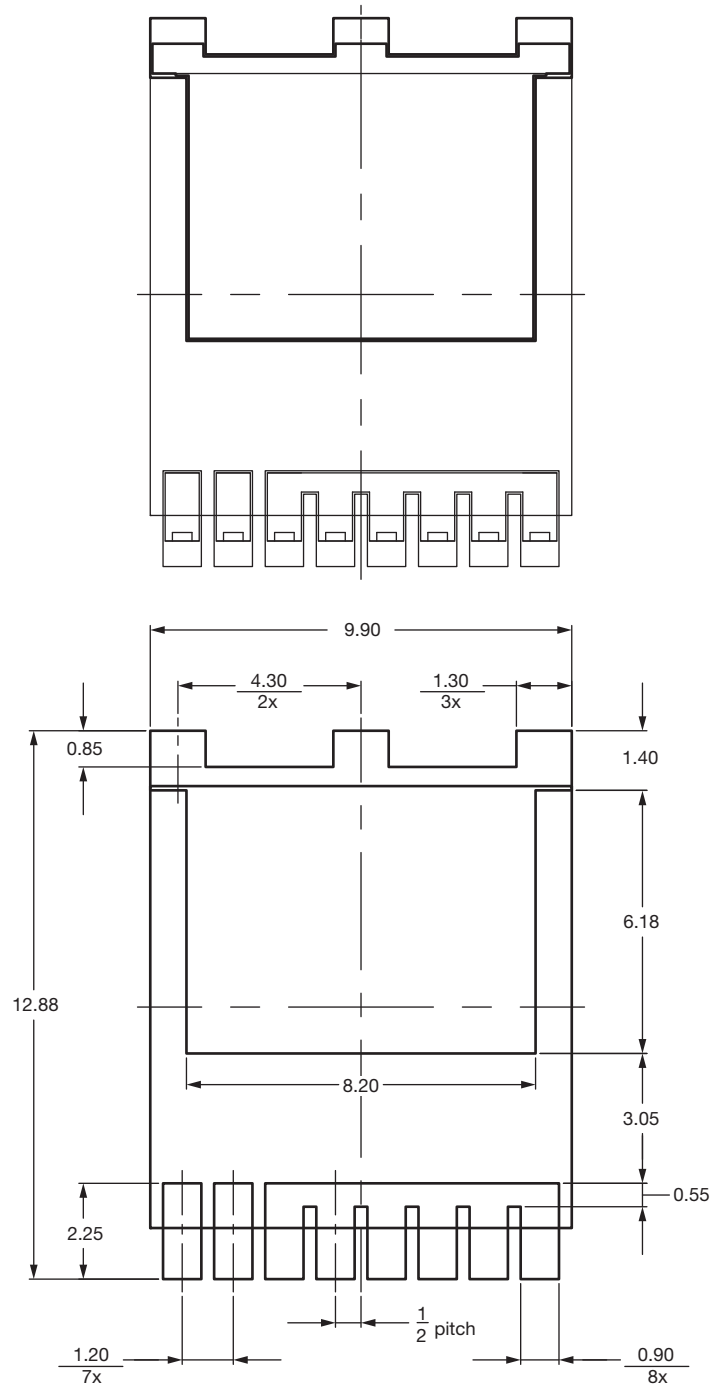
**Note**  
a.  $V_{GS} = 5\text{ V}$  for logic level devices

**Fig. 19 - For N-Channel**

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# Recommended Land Pattern PowerPAK® 10 x 12 (TOLL) (High Voltage)



**Note**

- Dimensions in mm

ECN: S22-1061-Rev. C, 26-Dec-2022  
DWG: 3013





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