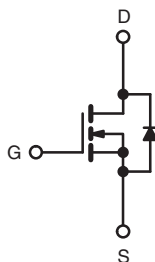
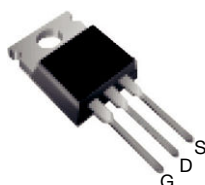


## D Series Power MOSFET

### PRODUCT SUMMARY

$V_{DS}$ (V) at $T_J$ max.	550	
$R_{DS(on)}$ max. at 25 °C ( $\Omega$ )	$V_{GS} = 10$ V	0.85
$Q_g$ (max.) (nC)	30	
$Q_{gs}$ (nC)	4	
$Q_{gd}$ (nC)	7	
Configuration	Single	

**TO-220AB**


N-Channel MOSFET

### FEATURES

- Optimal Design
  - Low Area Specific On-Resistance
  - Low Input Capacitance ( $C_{iss}$ )
  - Reduced Capacitive Switching Losses
  - High Body Diode Ruggedness
  - Avalanche Energy Rated (UIS)
- Optimal Efficiency and Operation
  - Low Cost
  - Simple Gate Drive Circuitry
  - Low Figure-of-Merit (FOM):  $R_{on} \times Q_g$
  - Fast Switching
- Material categorization: For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)

### APPLICATIONS

- Consumer Electronics
  - Displays (LCD or Plasma TV)
- Server and Telecom Power Supplies
  - SMPS
- Industrial
  - Welding
  - Induction Heating
  - Motor Drives
- Battery Chargers



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

### ORDERING INFORMATION

Package	TO-220AB
Lead (Pb)-free	SiHP8N50D-E3
Lead (Pb)-free and Halogen-free	SiHP8N50D-GE3

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

PARAMETER	SYMBOL	LIMIT	UNIT
Drain-Source Voltage	$V_{DS}$	500	V
Gate-Source Voltage	$V_{GS}$	$\pm 30$	
Gate-Source Voltage AC ( $f > 1$ Hz)		30	
Continuous Drain Current ( $T_J = 150$ °C)	$I_D$	8.7	A
$V_{GS}$ at 10 V		5.5	
Pulsed Drain Current <sup>a</sup>	$I_{DM}$	18	
Linear Derating Factor		1.25	W/°C
Single Pulse Avalanche Energy <sup>b</sup>	$E_{AS}$	29	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	$dV/dt$	24	V/ns
Reverse Diode $dV/dt$ <sup>d</sup>		0.37	
Soldering Recommendations (Peak Temperature) <sup>c</sup>		300	°C


#### Notes

- Repetitive rating; pulse width limited by maximum junction temperature.
- $V_{DD} = 50$  V, starting  $T_J = 25$  °C,  $L = 2.3$  mH,  $R_g = 25$   $\Omega$ ,  $I_{AS} = 5$  A.
- 1.6 mm from case.
- $I_{SD} \leq I_D$ , starting  $T_J = 25$  °C.

**THERMAL RESISTANCE RATINGS**

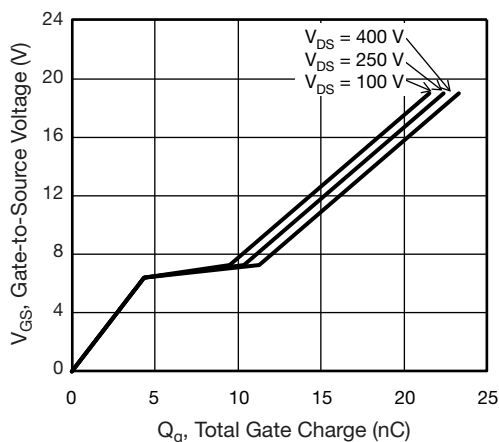
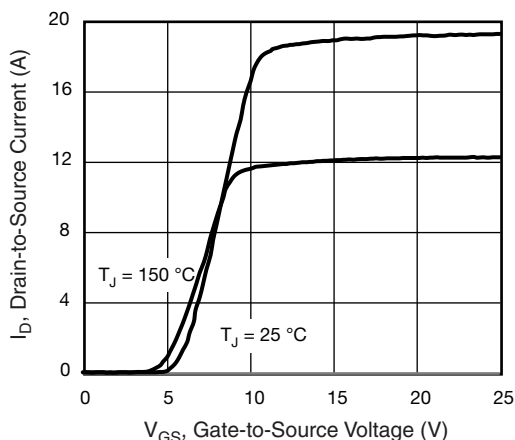
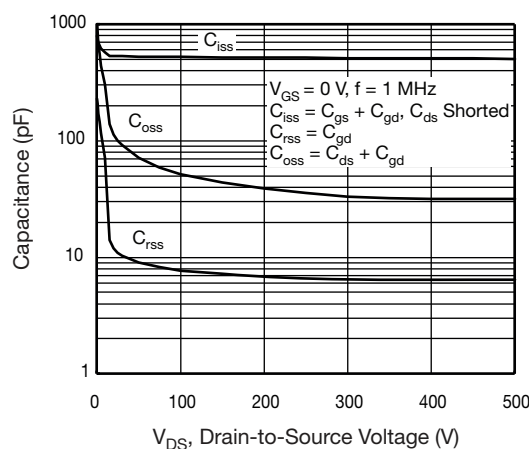
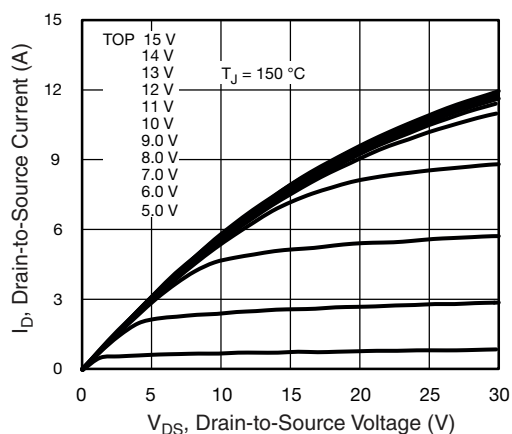
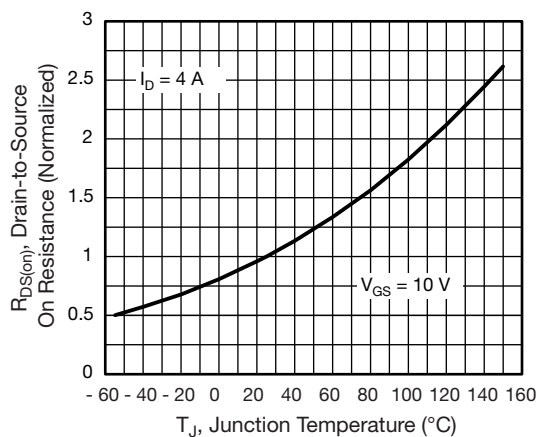
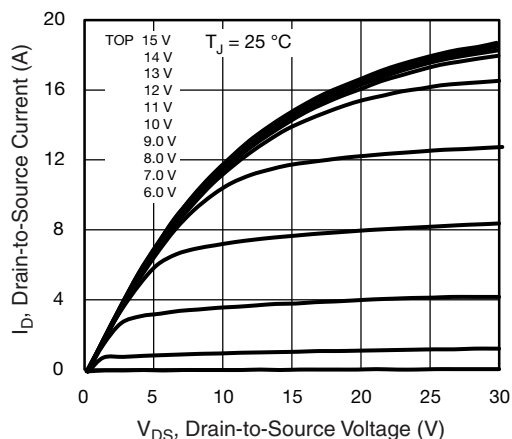
PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient	$R_{thJA}$	-	62	°C/W
Maximum Junction-to-Case (Drain)	$R_{thJC}$	-	0.8	

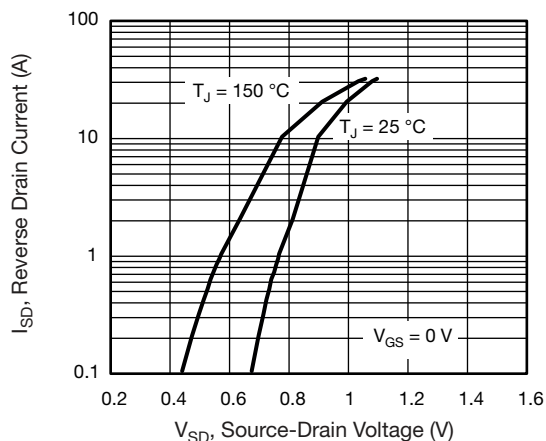
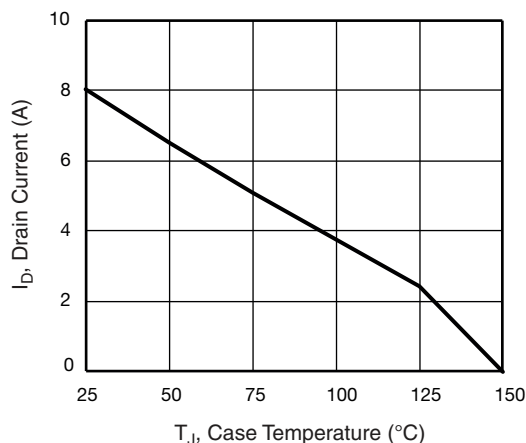
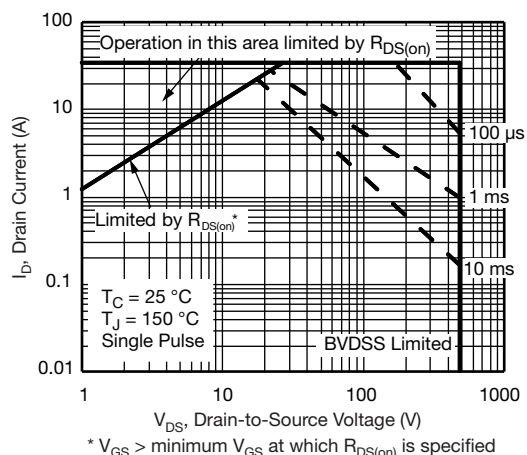
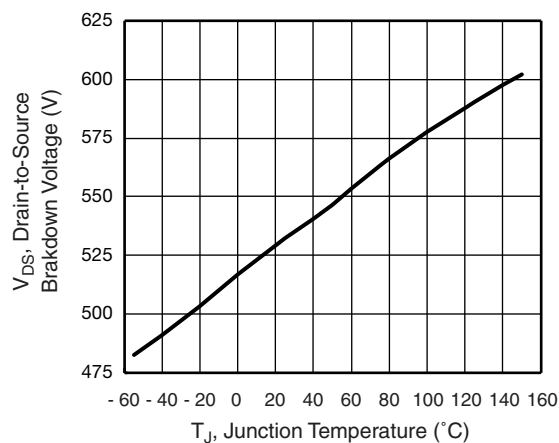
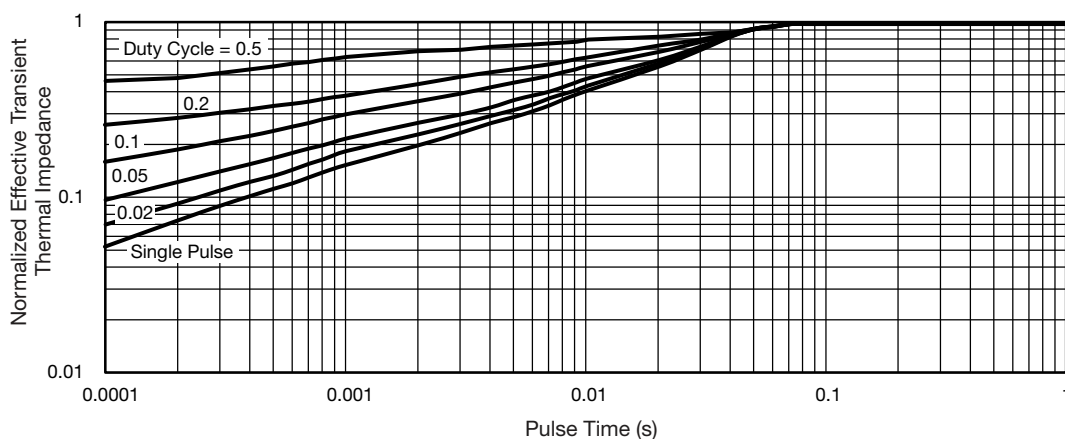
**SPECIFICATIONS** ( $T_J = 25^\circ\text{C}$ , unless otherwise noted)

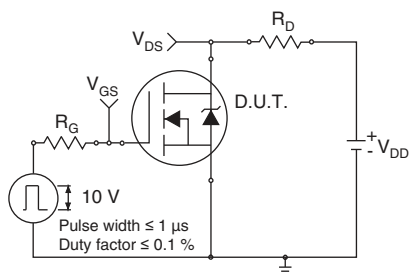
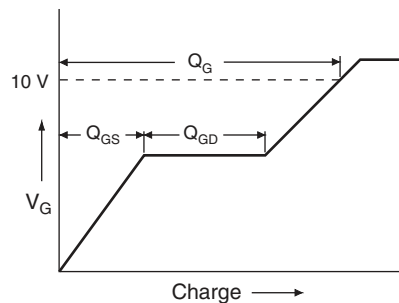
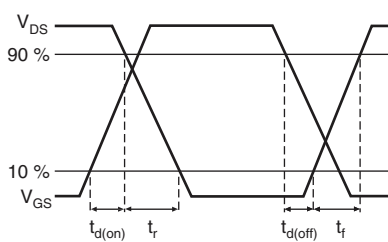
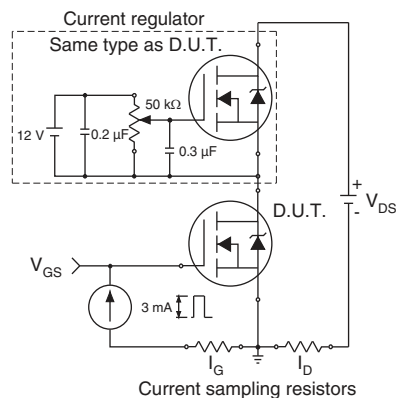
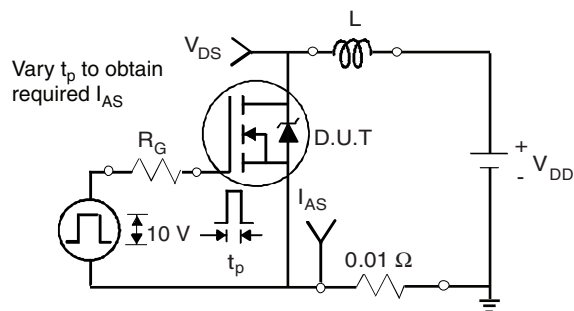
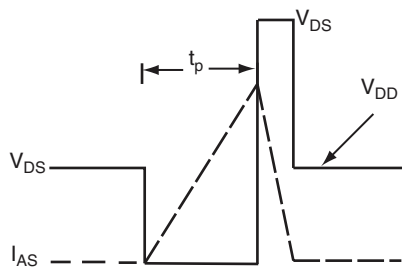
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0\text{ V}$ , $I_D = 250\text{ }\mu\text{A}$	500	-	-	V
$V_{DS}$ Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to $25^\circ\text{C}$ , $I_D = 250\text{ }\mu\text{A}$	-	0.58	-	V/°C
Gate-Source Threshold Voltage (N)	$V_{GS(th)}$	$V_{DS} = V_{GS}$ , $I_D = 250\text{ }\mu\text{A}$	3	-	5	V
Gate-Source Leakage	$I_{GSS}$	$V_{GS} = \pm 30\text{ V}$	-	-	$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 500\text{ V}$ , $V_{GS} = 0\text{ V}$	-	-	1	$\mu\text{A}$
		$V_{DS} = 400\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_J = 125^\circ\text{C}$	-	-	10	
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$ , $I_D = 4\text{ A}$	-	0.70	0.85	$\Omega$
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 20\text{ V}$ , $I_D = 4\text{ A}$	-	3	-	S
<b>Dynamic</b>						
Input Capacitance	$C_{iss}$	$V_{GS} = 0\text{ V}$ , $V_{DS} = 100\text{ V}$ , $f = 1\text{ MHz}$	-	527	-	pF
Output Capacitance	$C_{oss}$		-	52	-	
Reverse Transfer Capacitance	$C_{rss}$		-	8	-	
Effective Output Capacitance, Energy Related <sup>b</sup>	$C_{o(er)}$	$V_{DS} = 0\text{ V to } 400\text{ V}$ , $V_{GS} = 0\text{ V}$	-	46	-	
Effective Output Capacitance, Time Related <sup>c</sup>	$C_{o(tr)}$		-	64	-	
Total Gate Charge	$Q_g$	$V_{GS} = 10\text{ V}$ , $I_D = 4\text{ A}$ , $V_{DS} = 400\text{ V}$	-	15	30	nC
Gate-Source Charge	$Q_{gs}$		-	4	-	
Gate-Drain Charge	$Q_{gd}$		-	7	-	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 400\text{ V}$ , $I_D = 4\text{ A}$ , $R_g = 9.1\text{ }\Omega$ , $V_{GS} = 10\text{ V}$	-	13	26	ns
Rise Time	$t_r$		-	16	32	
Turn-Off Delay Time	$t_{d(off)}$		-	17	34	
Fall Time	$t_f$		-	11	22	
Gate Input Resistance	$R_g$	$f = 1\text{ MHz}$ , open drain	-	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 	-	-	8	A
Pulsed Diode Forward Current	$I_{SM}$		-	-	32	
Diode Forward Voltage	$V_{SD}$	$T_J = 25^\circ\text{C}$ , $I_S = 4\text{ A}$ , $V_{GS} = 0\text{ V}$	-	-	1.2	V
Reverse Recovery Time	$t_{rr}$	$T_J = 25^\circ\text{C}$ , $I_F = I_S = 4\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$ , $V_R = 20\text{ V}$	-	308	-	ns
Reverse Recovery Charge	$Q_{rr}$		-	1.8	-	$\mu\text{C}$
Reverse Recovery Current	$I_{RRM}$		-	11	-	A

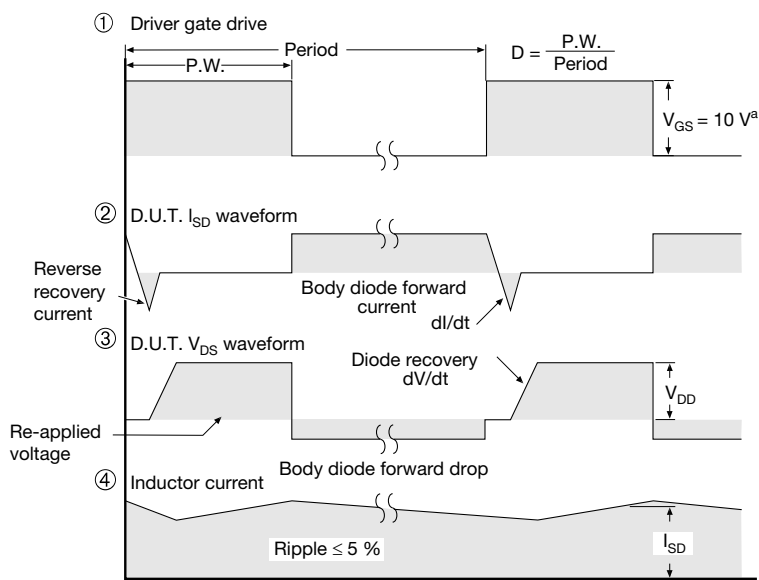
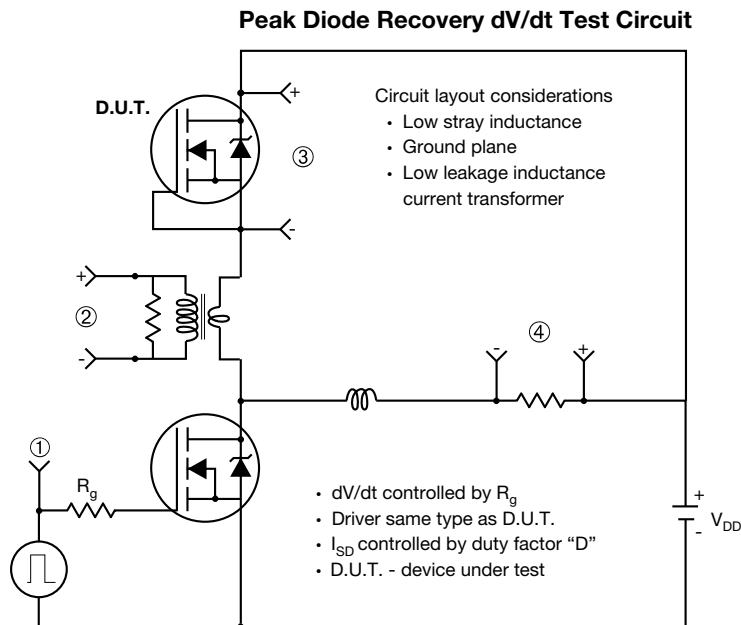
**Notes**

- a. Repetitive rating; pulse width limited by maximum junction temperature.  
b.  $C_{oss(er)}$  is a fixed capacitance that gives the same energy as  $C_{oss}$  while  $V_{DS}$  is rising from 0 % to 80 %  $V_{DSS}$ .  
c.  $C_{oss(tr)}$  is a fixed capacitance that gives the same charging time as  $C_{oss}$  while  $V_{DS}$  is rising from 0 % to 80 %  $V_{DSS}$ .

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



**Fig. 7 - Typical Source-Drain Diode Forward Voltage**

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

**Fig. 8 - Maximum Safe Operating Area**

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

**Fig. 11 - Normalized Thermal Transient Impedance, Junction-to-Case**


**Fig. 12 - Switching Time Test Circuit**

**Fig. 16 - Basic Gate Charge Waveform**

**Fig. 13 - Switching Time Waveforms**

**Fig. 17 - Gate Charge Test Circuit**

**Fig. 14 - Unclamped Inductive Test Circuit**

**Fig. 15 - Unclamped Inductive Waveforms**



**Fig. 18 - For N-Channel**

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