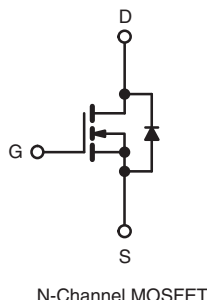


E Series Power MOSFET

PRODUCT SUMMARY

V_{DS} (V) at T_J max.	700	
$R_{DS(on)}$ max. at 25 °C (Ω)	$V_{GS} = 10$ V	0.145
Q_g max. (nC)	122	
Q_{gs} (nC)	21	
Q_{gd} (nC)	37	
Configuration	Single	



FEATURES

- Low Figure-of-Merit (FOM) $R_{on} \times Q_g$
- Low Input Capacitance (C_{iss})
- Reduced Switching and Conduction Losses
- Ultra Low Gate Charge (Q_g)
- Avalanche Energy Rated (UIS)
- Material categorization: For definitions please see www.vishay.com/doc?99912



RoHS
COMPLIANT
HALOGEN
FREE
Available

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
 - Renewable Energy
 - Solar (PV Inverters)

ORDERING INFORMATION

Package	TO-220AB
Lead (Pb)-free	SiHP24N65E-E3
Lead (Pb)-free and Halogen-free	SiHP24N65E-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}	± 20	
Gate-Source Voltage AC ($f > 1$ Hz)		30	
Continuous Drain Current ($T_J = 150$ °C)	V_{GS} at 10 V	$T_C = 25$ °C	A
		$T_C = 100$ °C	
Pulsed Drain Current ^a	I_{DM}	70	W/°C
Linear Derating Factor		2	
Single Pulse Avalanche Energy ^b	E_{AS}	508	mJ
Maximum Power Dissipation	P_D	250	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	V/ns
Reverse Diode dV/dt ^d			
Soldering Recommendations (Peak Temperature)		for 10 s	300° °C


Notes

- Repetitive rating; pulse width limited by maximum junction temperature.
- $V_{DD} = 50$ V, starting $T_J = 25$ °C, $L = 28.2$ mH, $R_g = 25$ Ω , $I_{AS} = 6$ A.
- 1.6 mm from case.
- $I_{SD} \leq I_D$, $dI/dt = 100$ A/ μ s, starting $T_J = 25$ °C.

THERMAL RESISTANCE RATINGS

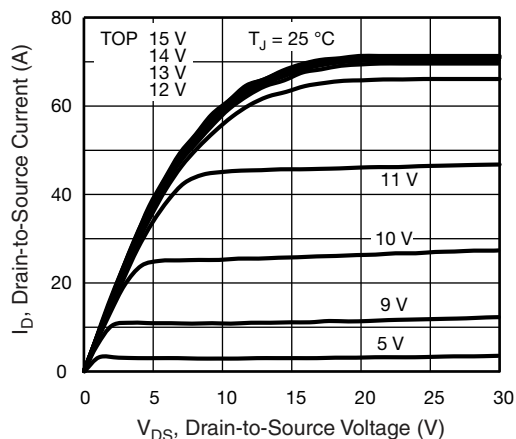
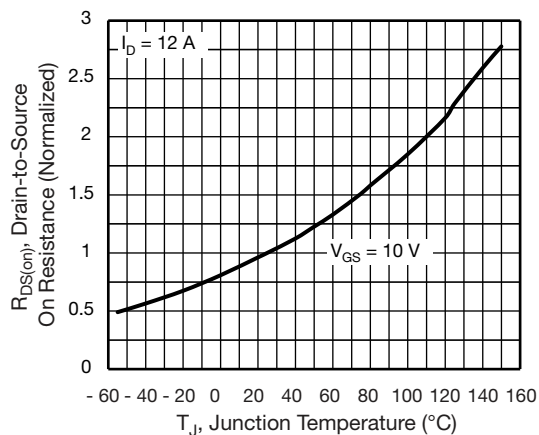
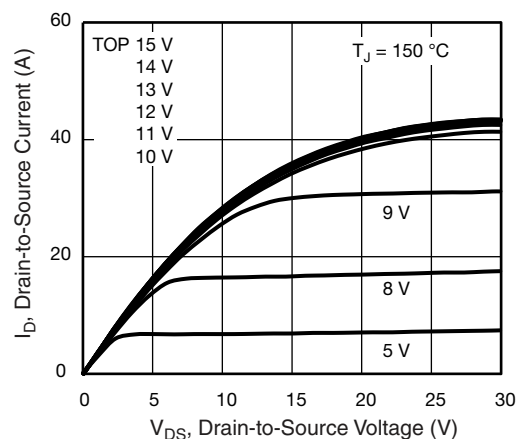
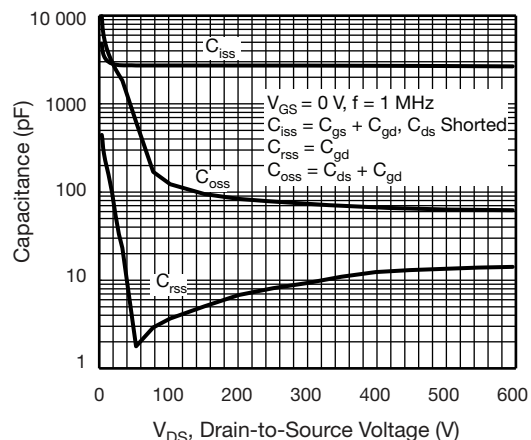
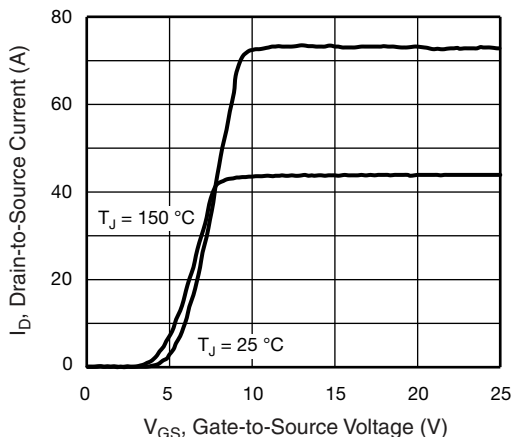
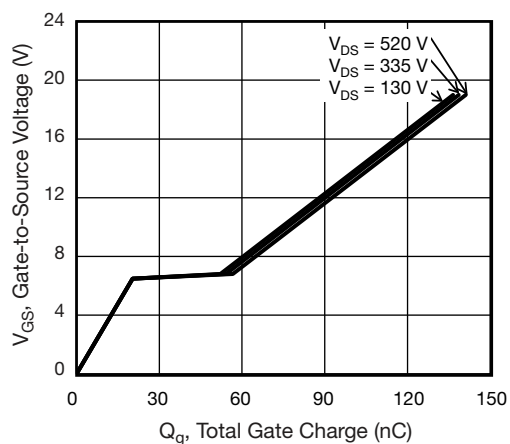
PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient	R_{thJA}	-	62	°C/W
Maximum Junction-to-Case (Drain)	R_{thJC}	-	0.5	

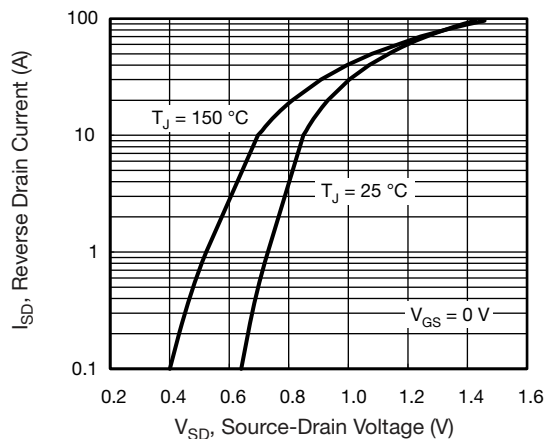
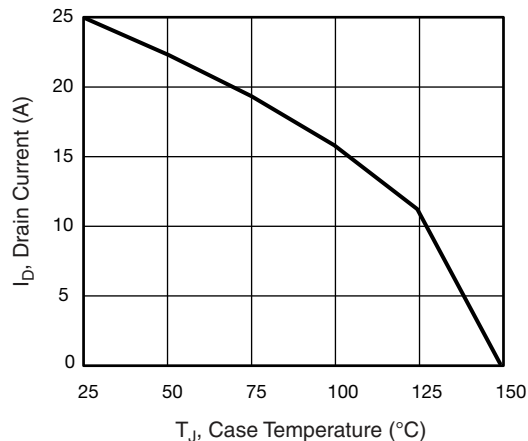
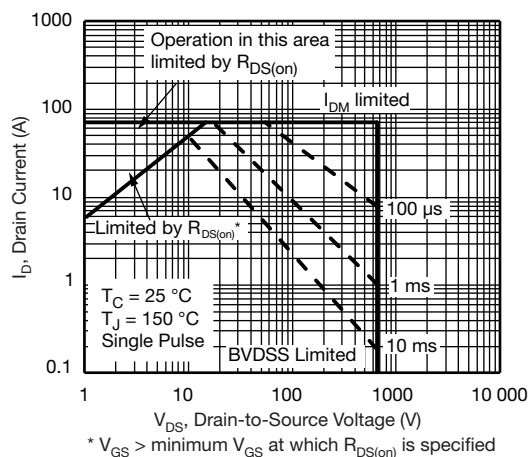
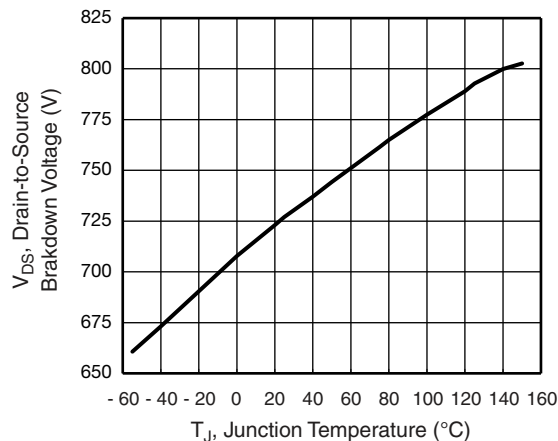
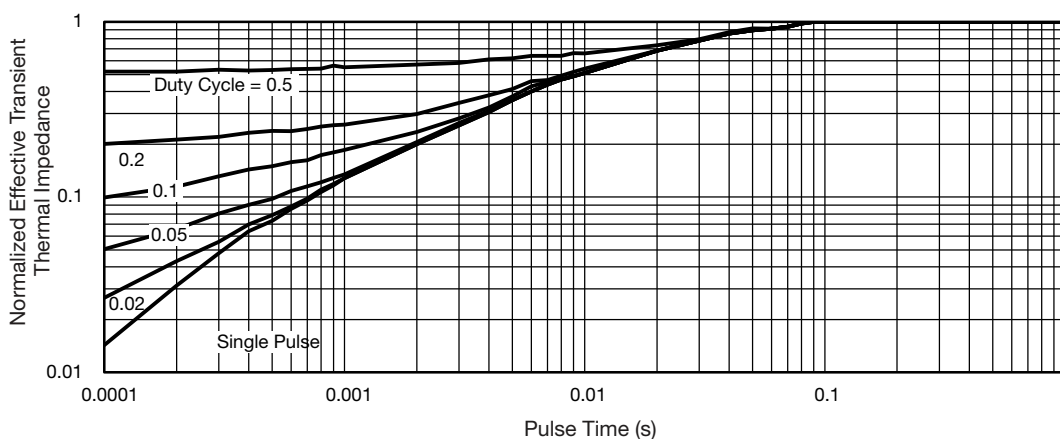
SPECIFICATIONS ($T_J = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)

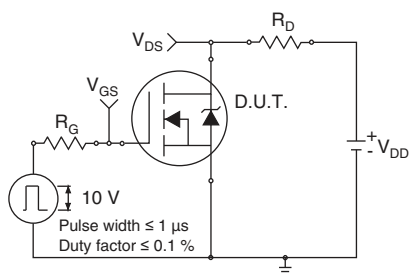
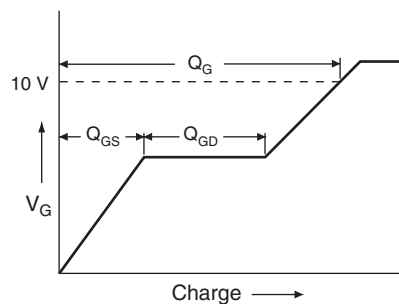
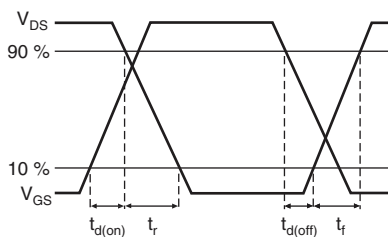
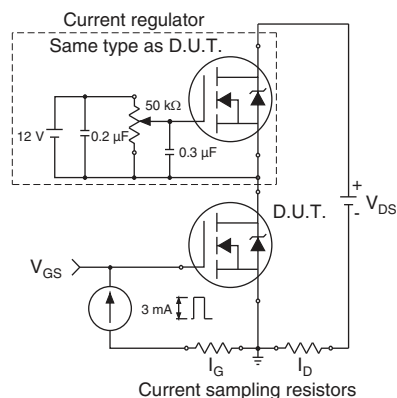
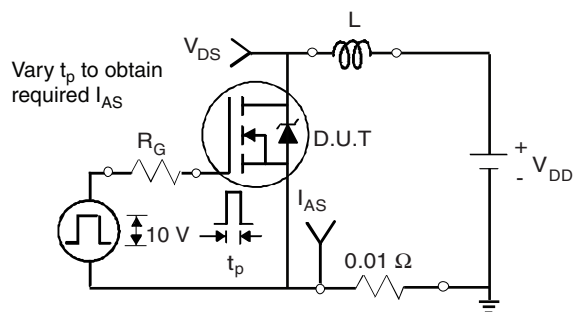
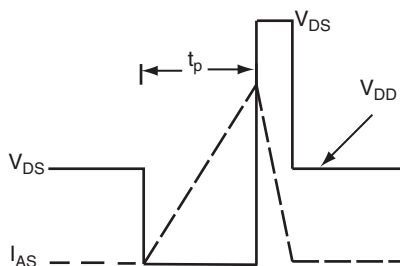
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}$, $I_D = 250\text{ }\mu\text{A}$	650	-	-	V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to $25\text{ }^{\circ}\text{C}$, $I_D = 250\text{ }\mu\text{A}$	-	0.72	-	V/°C
Gate-Source Threshold Voltage (N)	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	2	-	4	V
Gate-Source Leakage	I_{GSS}	$V_{GS} = \pm 20\text{ V}$	-	-	± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 650\text{ V}$, $V_{GS} = 0\text{ V}$	-	-	1	μA
		$V_{DS} = 520\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 125\text{ }^{\circ}\text{C}$	-	-	10	
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$, $I_D = 12\text{ A}$	-	0.120	0.145	Ω
Forward Transconductance	g_{fs}	$V_{DS} = 8\text{ V}$, $I_D = 5\text{ A}$	-	7.1	-	S
Dynamic						
Input Capacitance	C_{iss}	$V_{GS} = 0\text{ V}$, $V_{DS} = 100\text{ V}$, $f = 1\text{ MHz}$	-	2740	-	pF
Output Capacitance	C_{oss}		-	122	-	
Reverse Transfer Capacitance	C_{rss}		-	4	-	
Effective Output Capacitance, Energy Related ^a	$C_{o(er)}$	$V_{DS} = 0\text{ V to } 520\text{ V}$, $V_{GS} = 0\text{ V}$	-	93	-	
Effective Output Capacitance, Time Related ^b	$C_{o(tr)}$		-	352	-	
Total Gate Charge	Q_g	$V_{GS} = 10\text{ V}$, $I_D = 12\text{ A}$, $V_{DS} = 520\text{ V}$	-	81	122	nC
Gate-Source Charge	Q_{gs}		-	21	-	
Gate-Drain Charge	Q_{gd}		-	37	-	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 520\text{ V}$, $I_D = 12\text{ A}$, $V_{GS} = 10\text{ V}$, $R_g = 9.1\text{ }\Omega$	-	24	48	ns
Rise Time	t_r		-	84	126	
Turn-Off Delay Time	$t_{d(off)}$		-	70	105	
Fall Time	t_f		-	69	104	
Gate Input Resistance	R_g	$f = 1\text{ MHz}$, open drain	-	0.68	-	Ω
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	MOSFET symbol showing the integral reverse p - n junction diode 	-	-	24	A
Pulsed Diode Forward Current	I_{SM}		-	-	70	
Diode Forward Voltage	V_{SD}	$T_J = 25\text{ }^{\circ}\text{C}$, $I_S = 12\text{ A}$, $V_{GS} = 0\text{ V}$	-	-	1.2	V
Reverse Recovery Time	t_{rr}	$T_J = 25\text{ }^{\circ}\text{C}$, $I_F = I_S = 12\text{ A}$, $dI/dt = 100\text{ A}/\mu\text{s}$, $V_R = 25\text{ V}$	-	433	-	ns
Reverse Recovery Charge	Q_{rr}		-	7.3	-	μC
Reverse Recovery Current	I_{RRM}		-	28	-	A

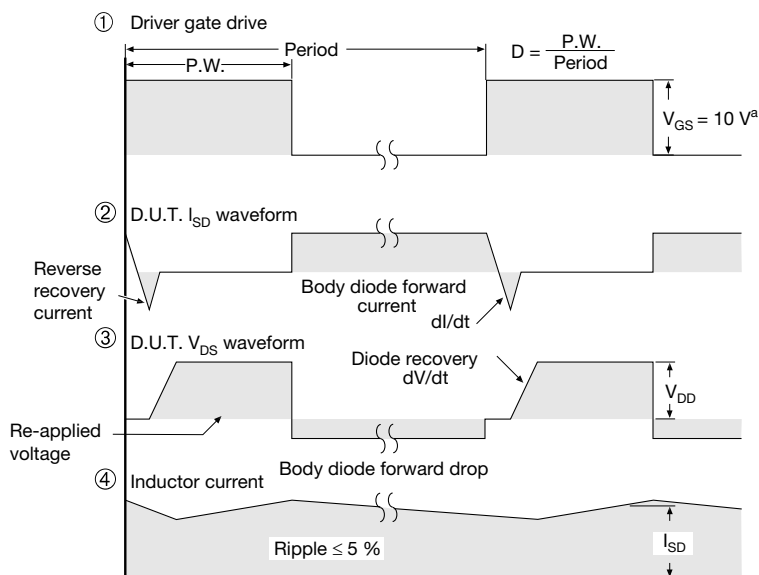
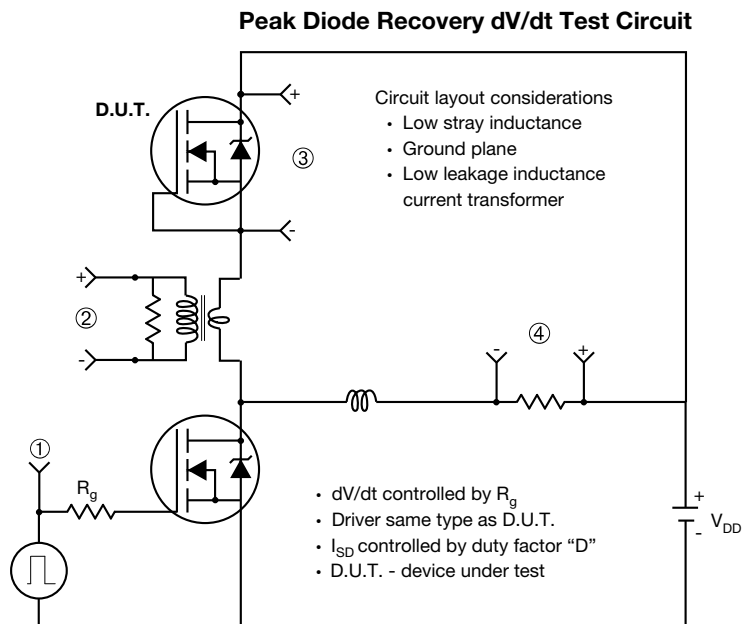
Notes

- a. $C_{oss(er)}$ is a fixed capacitance that gives the same energy as C_{oss} while V_{DS} is rising from 0 % to 80 % V_{DSS} .
b. $C_{oss(tr)}$ 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. 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 - Typical Gate Charge vs. Gate-to-Source Voltage


Fig. 7 - Typical Source-Drain Diode Forward Voltage

Fig. 9 - Maximum Drain Current vs. Case Temperature

Fig. 8 - Maximum Safe Operating Area

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

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


Note

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

Fig. 18 - For N-Channel

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Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.

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