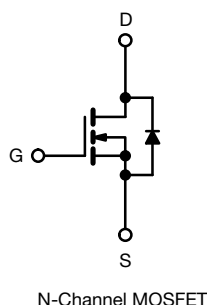
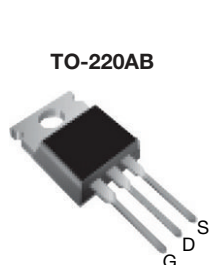


E Series Power MOSFET With Fast Body Diode and Low Gate Charge



N-Channel MOSFET

FEATURES

- Reduced figure-of-merit (FOM): $R_{on} \times Q_g$
- Fast body diode MOSFET using E series technology
- Reduced t_{rr} , Q_{rr} , and I_{RRM}
- Increased robustness due to low Q_{rr}
- Low input capacitance (C_{iss})
- Reduced switching and conduction losses
- Avalanche energy rated (UIS)
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



RoHS
COMPLIANT
HALOGEN
FREE
Available

PRODUCT SUMMARY

V_{DS} (V) at T_J max.	650	
$R_{DS(on)}$ typ. (Ω) at 25 °C	$V_{GS} = 10$ V	0.127
Q_g (Max.) (nC)	75	
Q_{gs} (nC)	17	
Q_{gd} (nC)	19	
Configuration	Single	

APPLICATIONS

- Telecommunications
 - Server and telecom power supplies
- Computing
 - ATX power supplies
- Industrial
 - Welding
 - Induction heating
 - Battery chargers
 - Uninterruptible power supplies (UPS)
- Renewable energy
 - String PV inverters

ORDERING INFORMATION

Package	TO-220AB
Lead (Pb)-free and halogen-free	SiHP25N60EFL-BE3 ^a SiHP25N60EFL-GE3

Note

a. "-BE3" denotes alternate manufacturing location

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}	± 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}	61	
Linear derating factor		2	W/°C
Single pulse avalanche energy ^b	E_{AS}	353	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) ^c	For 10 s	300	°C

Notes

- a. Repetitive rating; pulse width limited by maximum junction temperature
 b. $V_{DD} = 140$ V, starting $T_J = 25$ °C, $L = 28.2$ mH, $R_g = 25$ Ω , $I_{AS} = 5$ A
 c. 1.6 mm from case



d. $I_{SD} \leq I_D$, $dI/dt = 100 \text{ A}/\mu\text{s}$, starting $T_J = 25^\circ\text{C}$

THERMAL RESISTANCE RATINGS

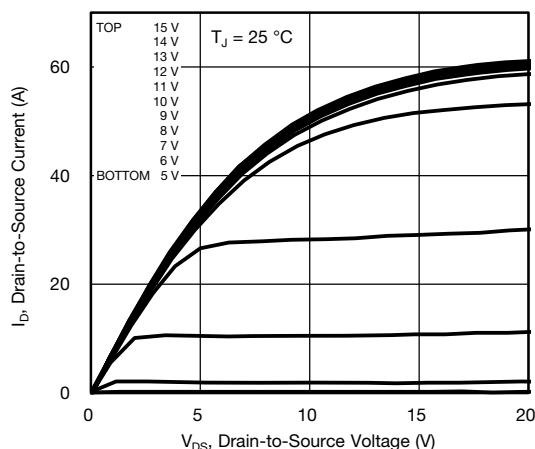
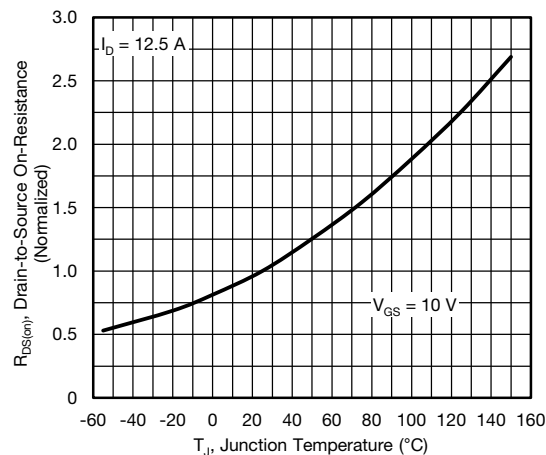
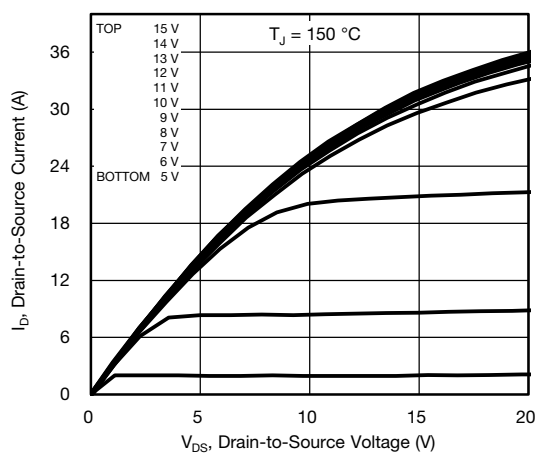
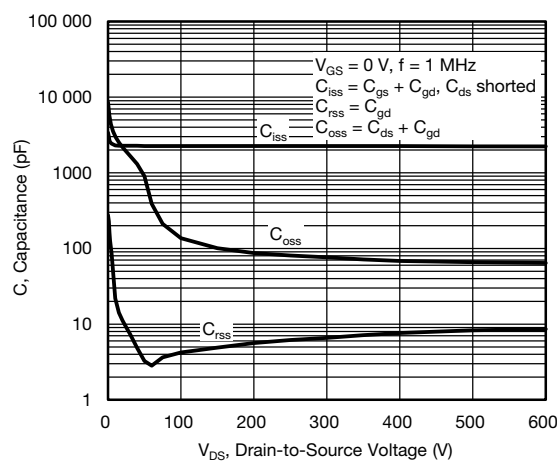
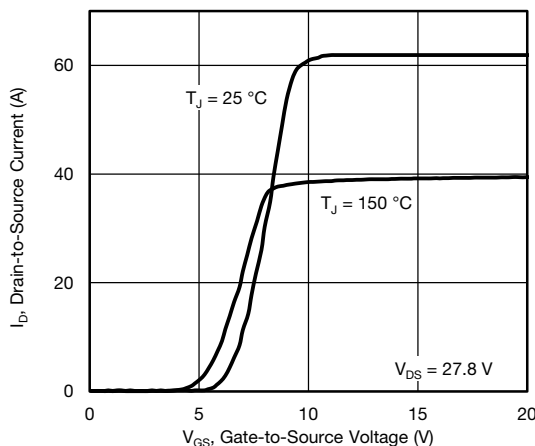
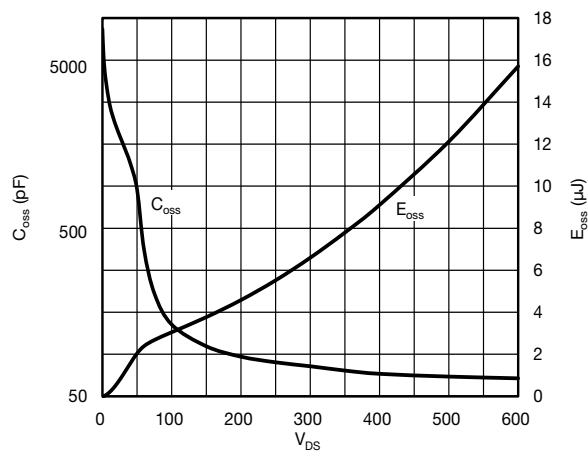
PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum junction-to-ambient	R_{thJA}	-	62	$^\circ\text{C}/\text{W}$
Maximum junction-to-case (drain)	R_{thJC}	-	0.5	

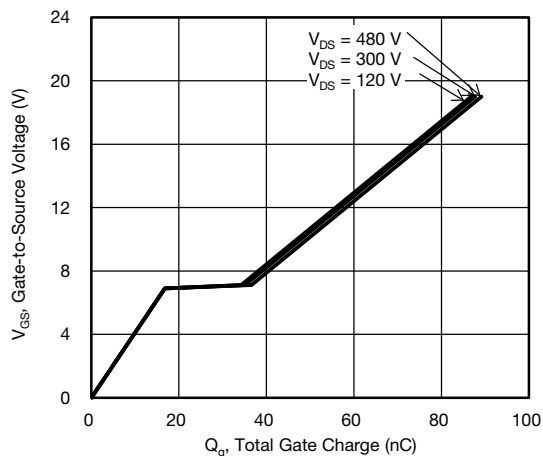
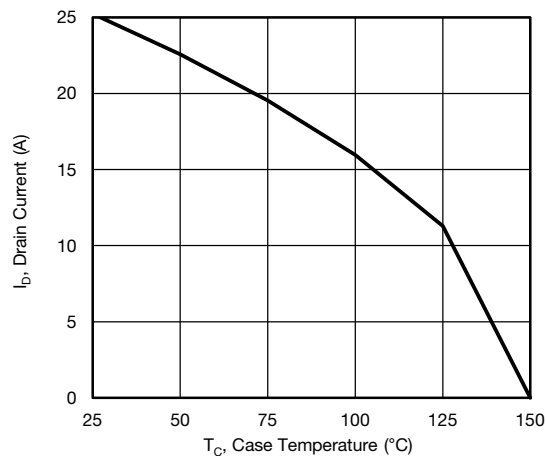
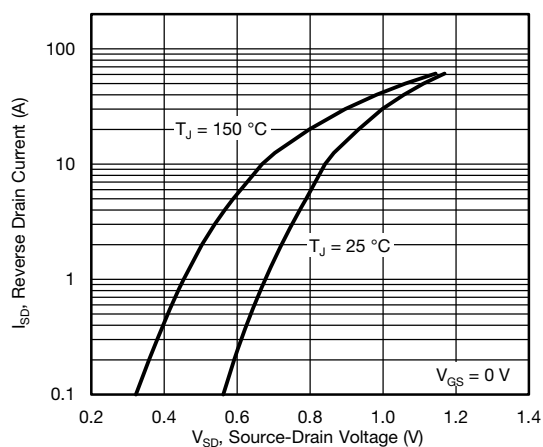
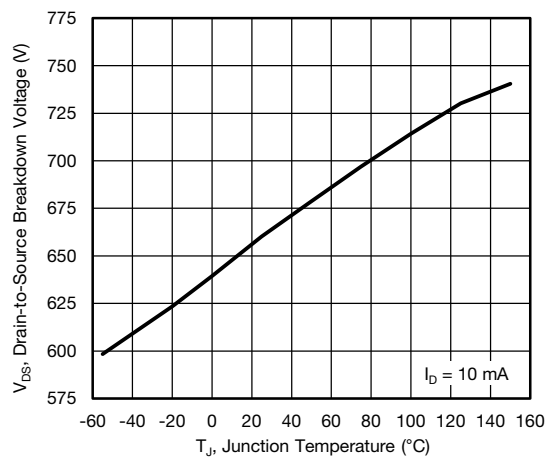
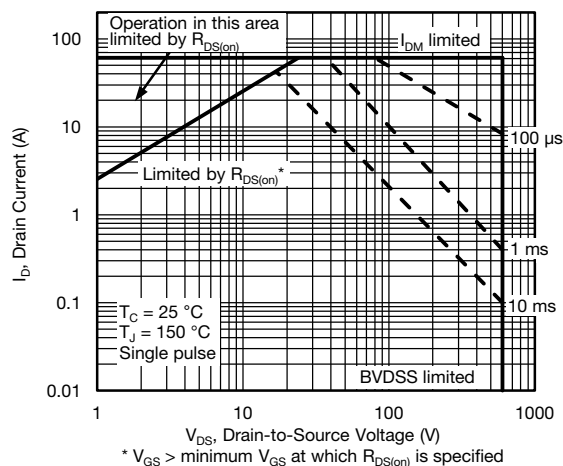
SPECIFICATIONS ($T_J = 25^\circ\text{C}$, unless otherwise noted)

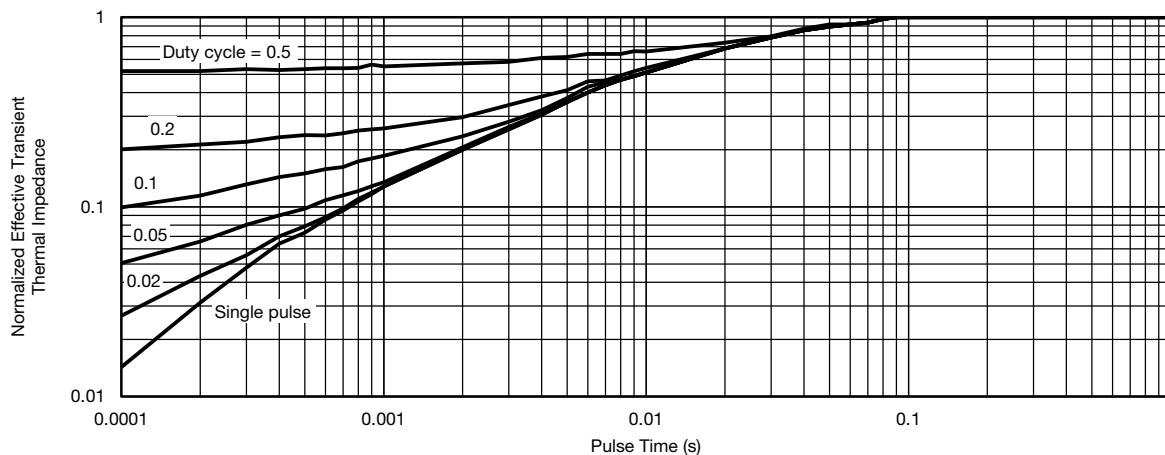
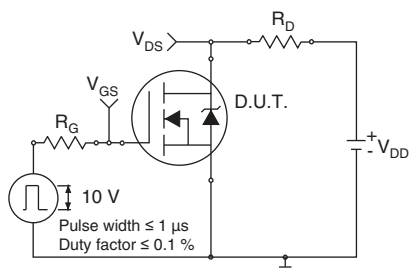
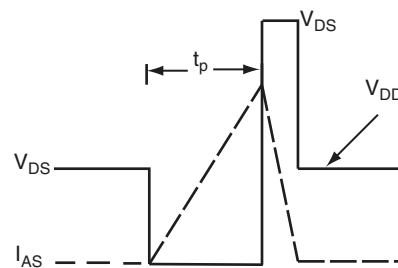
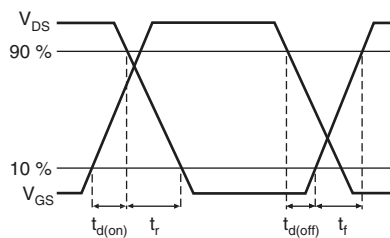
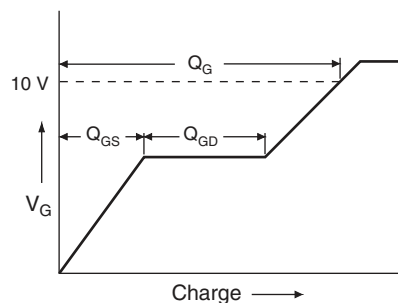
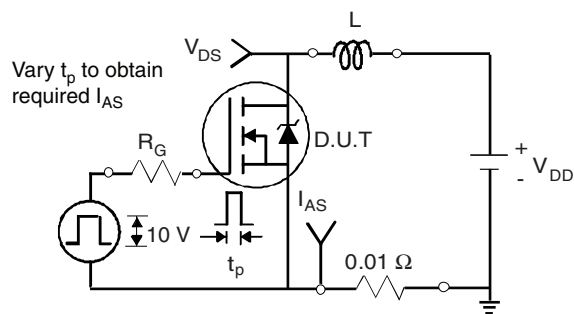
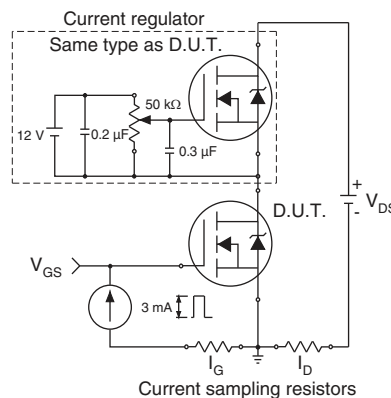
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Static							
Drain-source breakdown voltage	V _{DS}	V _{GS} = 0 V, I _D = 250 μA		600	-	-	V
V _{DS} temperature coefficient	ΔV _{DS} /T _J	Reference to 25 °C, I _D = 10 mA		-	0.69	-	V/°C
Gate-source threshold Voltage (N)	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA		3.0	-	5.0	V
Gate-source leakage	I _{GSS}	V _{GS} = ± 20 V		-	-	± 100	nA
		V _{GS} = ± 30 V		-	-	± 1	μA
Zero gate voltage drain current	I _{DSS}	V _{DS} = 480 V, V _{GS} = 0 V		-	-	1	μA
		V _{DS} = 480 V, V _{GS} = 0 V, T _J = 125 °C		-	-	500	
Drain-source on-state resistance	R _{DS(on)}	V _{GS} = 10 V	I _D = 12.5 A	-	0.127	0.146	Ω
Forward transconductance	g _{fs}	V _{DS} = 30 V, I _D = 12.5 A		-	11.3	-	S
Dynamic							
Input capacitance	C _{iss}	V _{GS} = 0 V, V _{DS} = 100 V, f = 1 MHz		-	2274	-	pF
Output capacitance	C _{oss}			-	137	-	
Reverse transfer capacitance	C _{rss}			-	4	-	
Effective output capacitance, energy related ^a	C _{o(er)}	V _{DS} = 0 V to 480 V, V _{GS} = 0 V		-	79	-	pF
Effective output capacitance, time related ^b	C _{o(tr)}			-	330	-	
Total gate charge	Q _g	V _{GS} = 10 V	I _D = 12.5 A, V _{DS} = 480 V	-	50	75	nC
Gate-source charge	Q _{gs}			-	17	-	
Gate-drain charge	Q _{gd}			-	19	-	
Turn-on delay time	t _{d(on)}	V _{DD} = 480 V, I _D = 12.5 A, R _g = 9.1 Ω, V _{GS} = 10 V		-	25	50	ns
Rise time	t _r			-	39	68	
Turn-off delay time	t _{d(off)}			-	47	94	
Fall time	t _f			-	21	42	
Gate input resistance	R _g	f = 1 MHz, open drain		0.4	0.7	1.4	Ω
Drain-Source Body Diode Characteristics							
Continuous source-drain diode current	I _S	MOSFET symbol showing the integral reverse p - n junction diode 		-	-	25	A
Pulsed diode forward current	I _{SM}			-	-	61	
Diode forward voltage	V _{SD}	T _J = 25 °C, I _S = 12.5 A, V _{GS} = 0 V		-	0.9	1.2	V
Reverse recovery time	t _{rr}	T _J = 25 °C, I _F = I _S =12.5 A, dI/dt = 100 A/μs, V _R = 25 V		-	138	276	ns
Reverse recovery charge	Q _{rr}			-	0.8	1.6	μC
Reverse recovery current	I _{RRM}			-	11	-	A

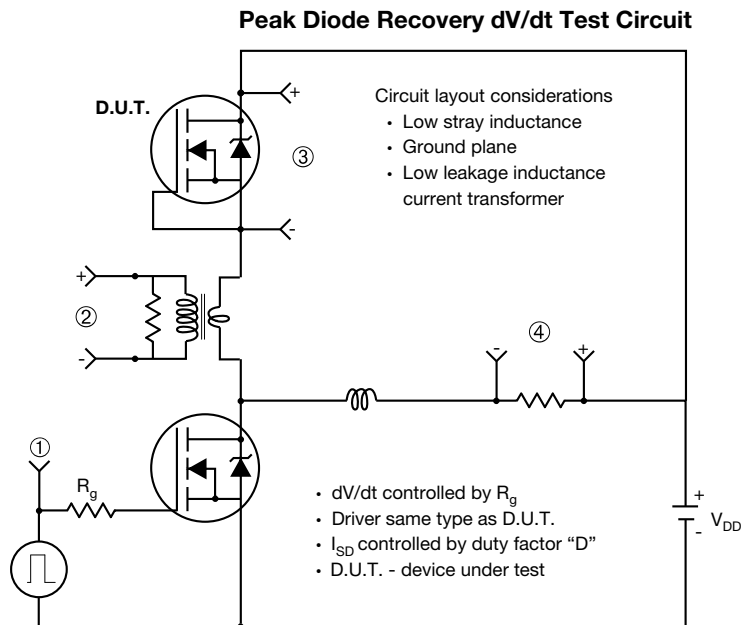
Notes

- 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 - 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 - Typical Drain-to-Source Voltage vs. Temperature

Fig. 9 - Maximum Safe Operating Area


Fig. 12 - Normalized Thermal Transient 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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