

S Series Power MOSFET

PRODUCT SUMMARY		
V_{DS} at T_J max. (V)	650	
$R_{DS(on)}$ max. at 25 °C (Ω)	$V_{GS} = 10$ V	0.190
Q_g max. (nC)	98	
Q_{gs} (nC)	17	
Q_{gd} (nC)	25	
Configuration	Single	

FEATURES

- Generation One
- High E_{AR} Capability
- Lower Figure-of-Merit $R_{on} \times Q_g$
- 100 % Avalanche Tested
- Ultra Low R_{on}
- dV/dt Ruggedness
- Ultra Low Gate Charge (Q_g)
- Compliant to RoHS Directive 2002/95/EC

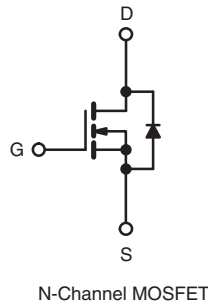
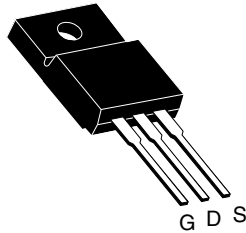

RoHS*
COMPLIANT

Note

* Pb containing terminations are not RoHS compliant, exemptions may apply

APPLICATIONS

- PFC Power Supply Stages
- Hard Switching Topologies
- Solar Inverters
- UPS
- Motor Control
- Lighting
- Server Telecom

TO-220 FULLPAK


ORDERING INFORMATION	
Package	TO-220 FULLPAK
Lead (Pb)-free	SiHF22N60S-E3


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}	± 20	
Gate-Source Voltage AC ($f > 1$ Hz)		30	
Continuous Drain Current ^a	V_{GS} at 10 V	$T_C = 25$ °C	A
		$T_C = 100$ °C	
Pulsed Drain Current ^b	I_{DM}	65	
Linear Derating Factor		2	W/°C
Single Pulse Avalanche Energy ^c	E_{AS}	690	mJ
Repetitive Avalanche Energy ^b	E_{AR}	25	
Maximum Power Dissipation	P_D	250	W
Drain-Source Voltage Slope	dV/dt	$T_J = 125$ °C	37
Reverse Diode dV/dt ^e		5.3	V/ns
Operating Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to + 150	°C
Soldering Recommendations (Peak Temperature) ^d	for 10 s	300	

Notes

- Limited by maximum junction temperature.
- 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 , $I_{AS} = 7$ 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}	-	65	°C/W
Maximum Junction-to-Case (Drain)	R_{thJC}	-	3.4	

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}	$V_{GS} = 0\text{ V}, I_D = 1\text{ mA}$		600	-	-	V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to $25\text{ }^\circ\text{C}, I_D = 1\text{ mA}$		-	0.70	-	V/°C
Gate-Source Threshold Voltage (N)	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$		2.0	-	4.0	V
Gate-Source Leakage	I_{GSS}	$V_{GS} = \pm 20\text{ V}$		-	-	± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 600\text{ V}, V_{GS} = 0\text{ V}$		-	-	5	μA
		$V_{DS} = 600\text{ V}, V_{GS} = 0\text{ V}, T_J = 150\text{ }^\circ\text{C}$		-	-	100	
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$	$I_D = 11\text{ A}$	-	0.160	0.190	Ω
Forward Transconductance ^a	g_{fs}	$V_{DS} = 50\text{ V}, I_D = 13\text{ A}$		-	9.4	-	S
Dynamic							
Input Capacitance	C_{iss}	$V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1.0\text{ MHz}$		-	2810	-	pF
Output Capacitance	C_{oss}			-	1480	-	
Reverse Transfer Capacitance	C_{rss}			-	33	-	
Effective Output Capacitance (Time Related)	$C_{oss\text{ eff.}}(TR)^a$	$V_{GS} = 0\text{ V}$	$V_{DS} = 0\text{ V to } 480\text{ V}$	-	155	-	
Total Gate Charge	Q_g	$V_{GS} = 10\text{ V}$	$I_D = 22\text{ A}, V_{DS} = 480\text{ V}$	-	75	110	nC
Gate-Source Charge	Q_{gs}			-	17	-	
Gate-Drain Charge	Q_{gd}			-	25	-	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 380\text{ V}, I_D = 22\text{ A}, R_g = 9.1\text{ }\Omega, V_{GS} = 10\text{ V}$		-	24	50	ns
Rise Time	t_r			-	68	100	
Turn-Off Delay Time	$t_{d(off)}$			-	77	115	
Fall Time	t_f			-	59	90	
Gate Input Resistance	R_g	$f = 1\text{ MHz}, \text{open drain}$		-	0.65	-	Ω
Drain-Source Body Diode Characteristics							
Continuous Source-Drain Diode Current	I_S	MOSFET symbol showing the integral reverse p - n junction diode 		-	-	22	A
Pulsed Diode Forward Current	I_{SM}			-	-	88	
Diode Forward Voltage	V_{SD}	$T_J = 25\text{ }^\circ\text{C}, I_S = 22\text{ A}, V_{GS} = 0\text{ V}$		-	-	1.2	V
Reverse Recovery Time	t_{rr}	$T_J = 25\text{ }^\circ\text{C}, I_F = I_S, di/dt = 100\text{ A}/\mu\text{s}, V_R = 25\text{ V}$		-	462	690	ns
Reverse Recovery Charge	Q_{rr}			-	8.3	16	μC
Reverse Recovery Current	I_{RRM}			-	30	60	A

Note

a. $C_{oss\text{ eff.}}(TR)$ is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 % to 80 % V_{DS} .

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

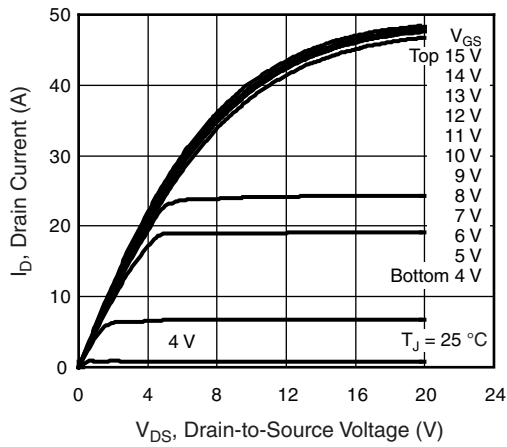


Fig. 1 - Typical Output Characteristics, $T_J = 25\text{ }^\circ\text{C}$

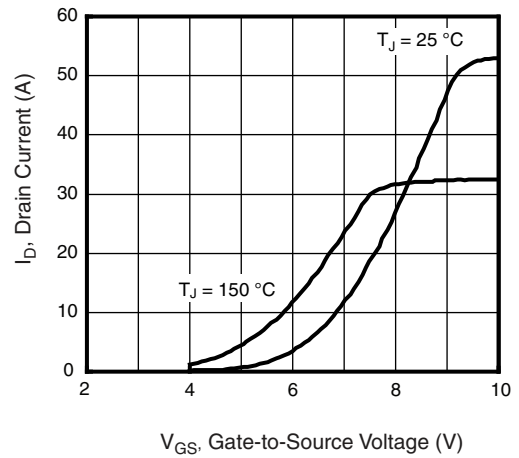


Fig. 3 - Typical Transfer Characteristics

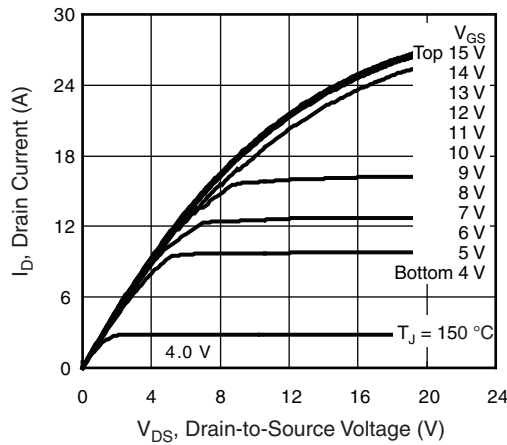


Fig. 2 - Typical Output Characteristics, $T_J = 150\text{ }^\circ\text{C}$

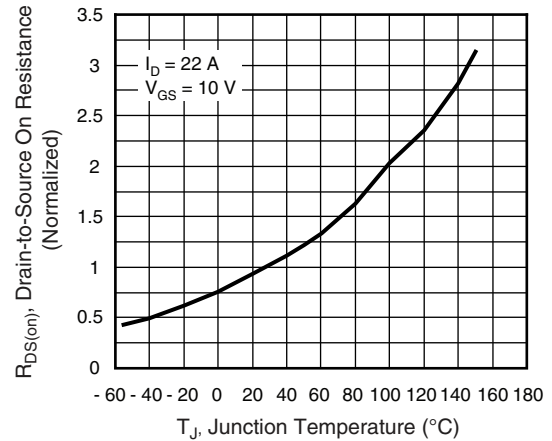


Fig. 4 - Normalized On-Resistance vs. Temperature

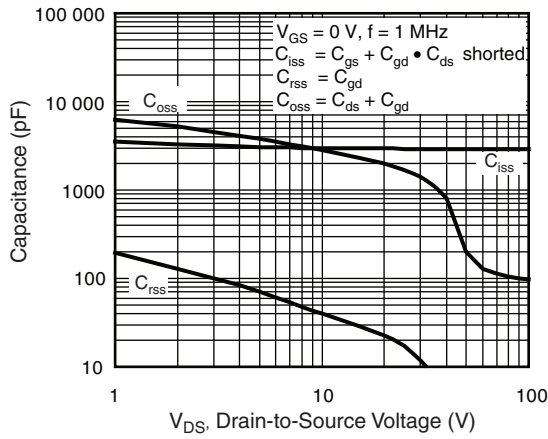


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

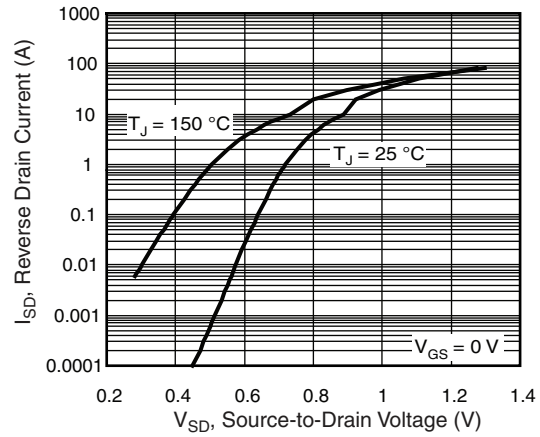


Fig. 7 - Typical Source-Drain Diode Forward Voltage

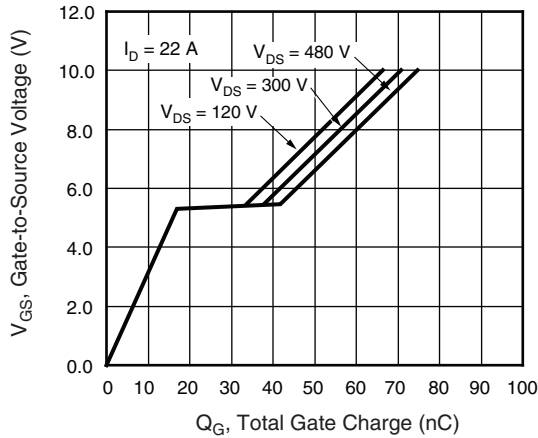


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

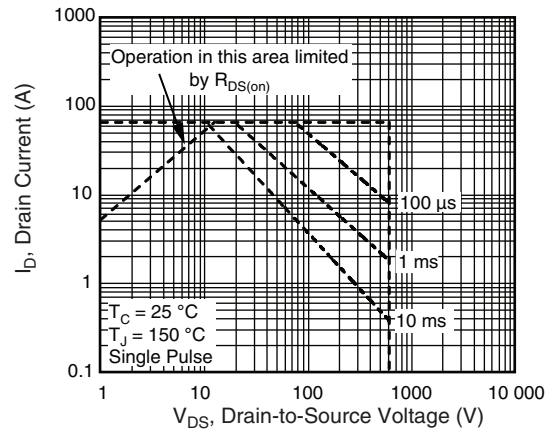


Fig. 8 - Maximum Safe Operating Area

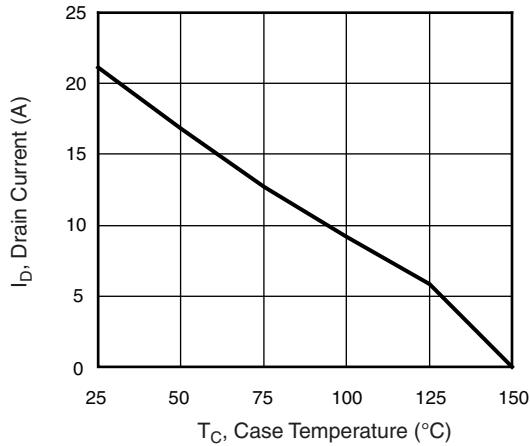


Fig. 9 - Maximum Drain Current vs. Case Temperature

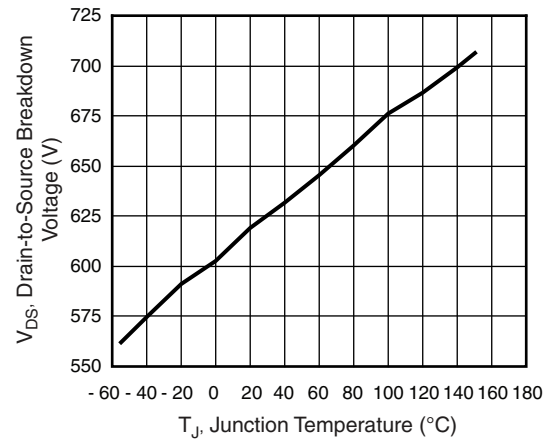


Fig. 10 - Drain-to-Source Breakdown Voltage

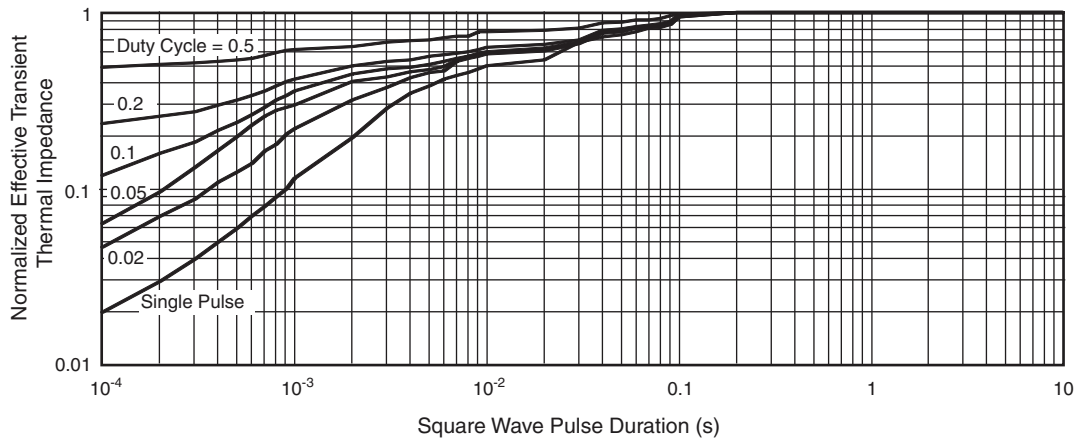


Fig. 11 - Normalized Thermal Transient Impedance, Junction-to-Case

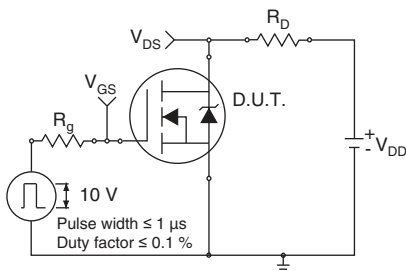


Fig. 11a - Switching Time Test Circuit

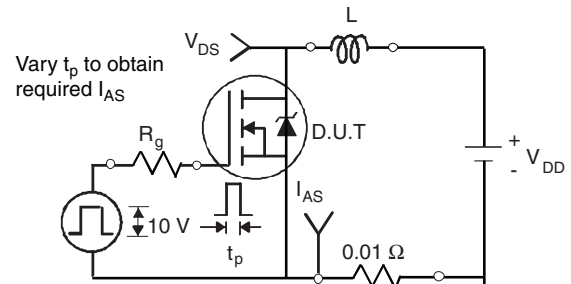


Fig. 12a - Unclamped Inductive Test Circuit

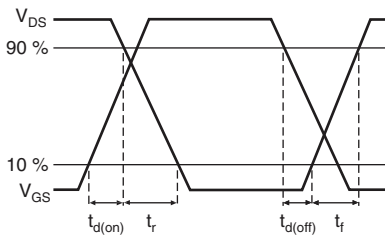


Fig. 11b - Switching Time Waveforms

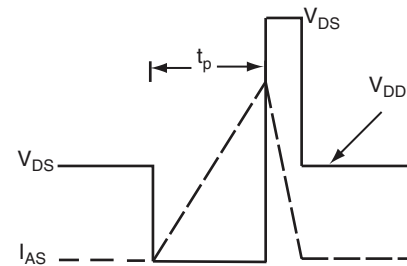


Fig. 12b - Unclamped Inductive Waveforms

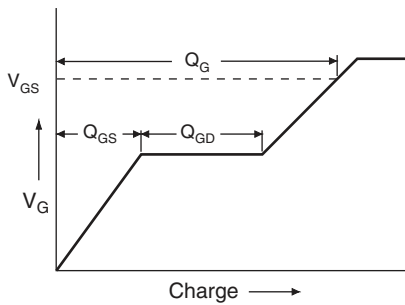


Fig. 13a - Basic Gate Charge Waveform

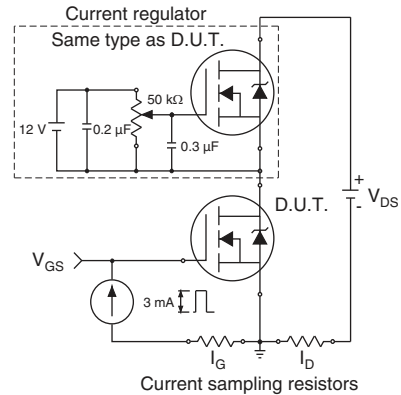


Fig. 13b - Gate Charge Test Circuit

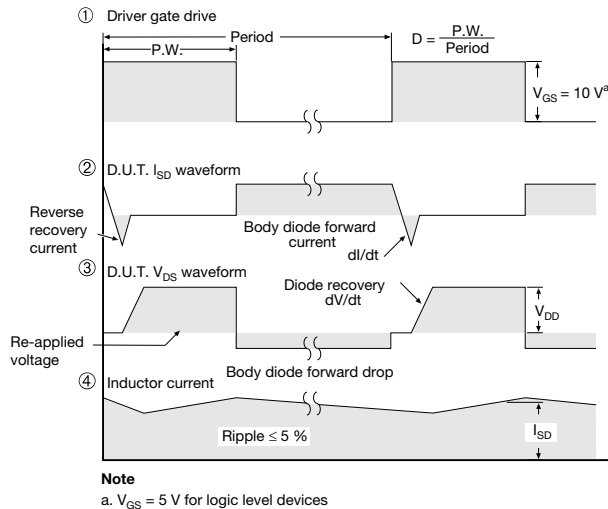
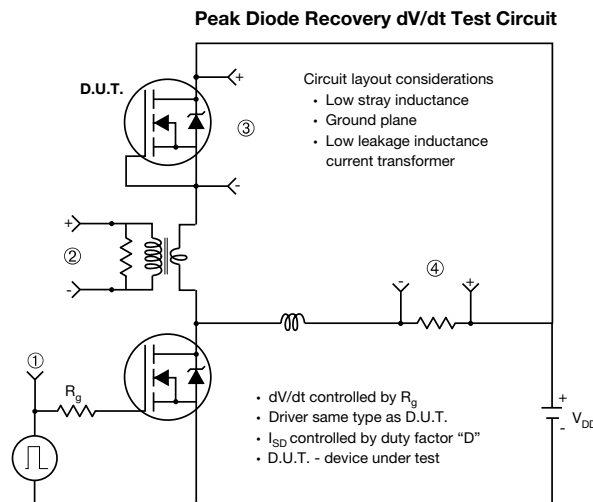


Fig. 14 - For N-Channel

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