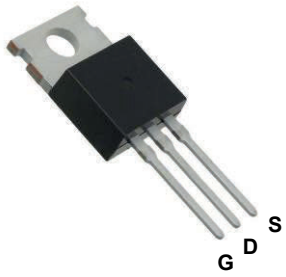
GOOD-ARK SEMICONDUCTOR

GSFH4R590

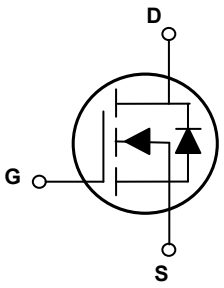
90V N-Channel MOSFET

Main Product Characteristics

$V_{(BR)DSS}$	90V
$R_{DS(ON)}$	4.5mΩ
I_D	130A



TO-220



Schematic Diagram

Features and Benefits

- Advanced MOSFET process technology
- Ideal for high efficiency switched mode power supplies
- Low on-resistance with low gate charge
- Fast switching and reverse body recovery

Description

The GSFH4R590 utilizes the latest techniques to achieve high cell density and low on-resistance. These features make this device extremely efficient and reliable for use in high efficiency switch mode power supplies and a wide variety of other applications.

Absolute Maximum Ratings (T_A=25°C unless otherwise specified)

Parameter	Symbol	Max.	Unit
Drain-Source Voltage	V_{DS}	90	V
Gate-Source Voltage	V_{GS}	±20	V
Drain Current-Continuous, at Steady-State, (Tc=25°C)[1]	I_D	130	A
Drain Current-Continuous, at Steady-State, (Tc=100°C)		94	
Drain Current-Pulsed[2]	I_{DM}	520	A
Single Pulse Avalanche Energy[3]	E_{AS}	400	mJ
Power Dissipation (T_A=25°C)	P_D	160	W
Linear Derating Factor (T_A=25°C)		1.28	W/°C
Junction-to-Ambient (PCB Mounted, Steady-State)[4]	$R_{\theta JA}$	62.5	°C/W
Junction-to-Case	$R_{\theta JC}$	0.78	°C/W
Operating Junction Temperature Range	T_J	-55 To +150	°C
Storage Temperature Range	T_{STG}	-55 To +150	°C

Electrical Characteristics (T_A=25°C unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
On / Off Characteristics						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS}=0V, I_D=250uA	90	92.5	-	V
Drain-Source Leakage Current	I_{DSS}	V_{DS}=85V, V_{GS}=0V	-	-	1	μA
		T_J=125°C	-	-	50	
Gate-Source Forward Leakage	I_{GSS}	V_{GS}=±20V	-	-	±100	nA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	V_{GS}=10V, I_D=50A	-	4.5	5.4	mΩ
Gate Threshold Voltage	$V_{GS(th)}$	V_{GS}=V_{DS}, I_D=250uA	2.2	3.0	3.9	V
Dynamic and Switching Characteristics						
Total Gate Charge	Q_g	V_{DS}=40V, I_D=50A, V_{GS}=10V	-	69	-	nC
Gate-Source Charge	Q_{gs}		-	30	-	
Gate-Drain ("Miller") Charge	Q_{gd}		-	16	-	
Turn-On Delay Time	$t_{d(on)}$	V_{DS}=40V, R_{GEN}=24Ω, V_{GS}=10V, I_D=13.2A	-	59	-	nS
Rise Time	t_r		-	82	-	
Turn-Off Delay Time	$t_{d(off)}$		-	126	-	
Fall Time	t_f		-	72	-	
Input Capacitance	C_{iss}	V_{DS}=40V, V_{GS}=0V, F=1MHz	-	4284	-	pF
Output Capacitance	C_{oss}		-	668	-	
Reverse Transfer Capacitance	C_{rss}		-	18	-	
Gate Resistance	R_g	F=1MHz	-	1.7	-	Ω
Drain-Source Diode Characteristics and Maximum Ratings						
Continuous Source Current (Body Diode)	I_S	MOSFET symbol showing the integral reverse p-n junction diode.	-	-	120	A
Pulsed Source Current (Body Diode)	I_{SM}		-	-	480	A
Diode Forward Voltage	V_{SD}	V_{GS}=0V, I_S=50A	-	1.0	1.2	V
Reverse Recovery Time	T_{rr}	I_F=20A, T_J=25℃ di/dt=100A/μs	-	53	-	nS
Reverse Recovery Charge	Q_{rr}		-	0.31	-	uC

Note:

1. Pulse test: Pulse width ≤300us, duty cycle ≤2%.
2. Repetitive rating: Pulsed width limited by maximum junction temperature.
3. L=0.5mH, I_{AS}=40A, V_{DD}=72V, T_J=25°C.
4. Device mounted on FR-4 PCB, 1 inch x 0.85 inch x 0.062 inch.

Typical Electrical and Thermal Characteristic Curves

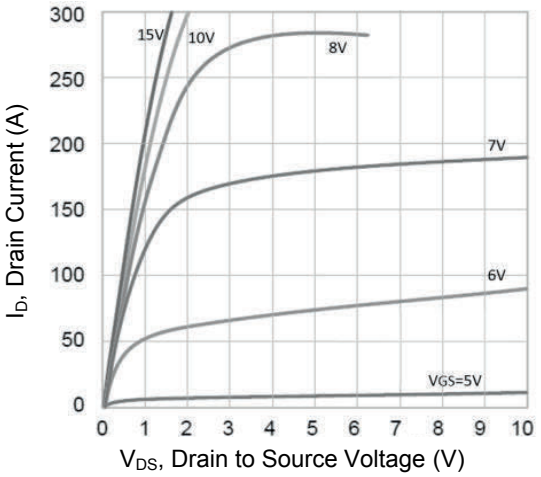


Figure 1. Typical Output Characteristics

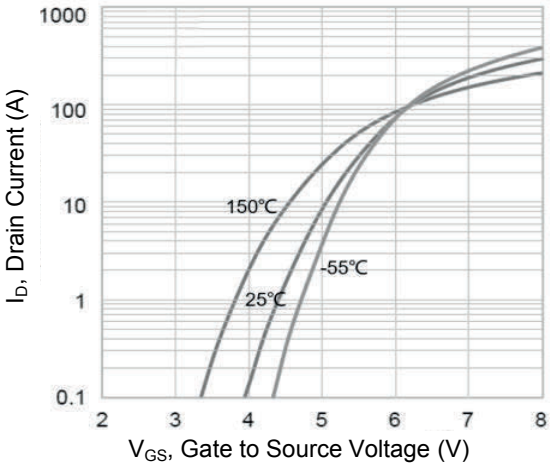


Figure 2. Transfer Characteristics

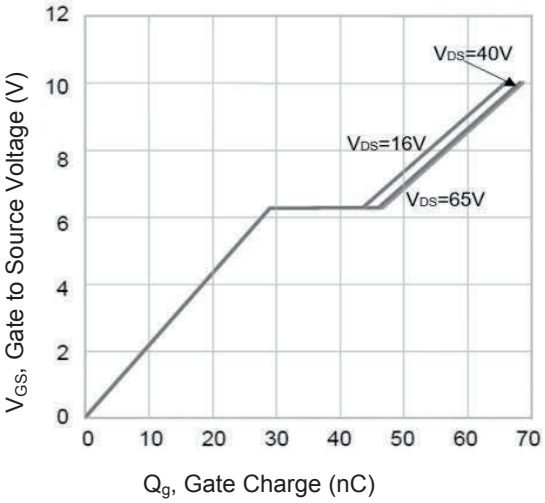


Figure 3. Gate Charge

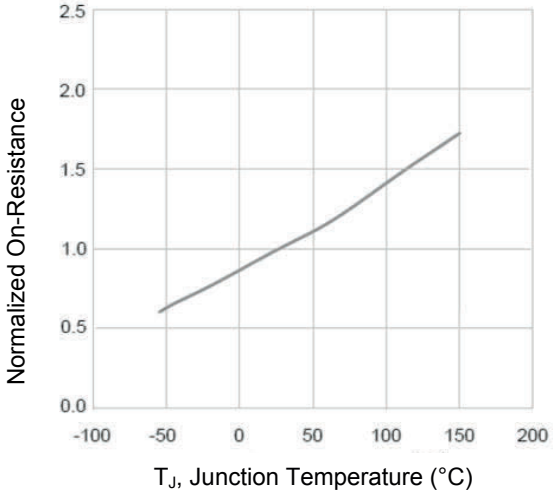


Figure 4. Normalized $R_{DS(ON)}$ vs. Junction Temperature

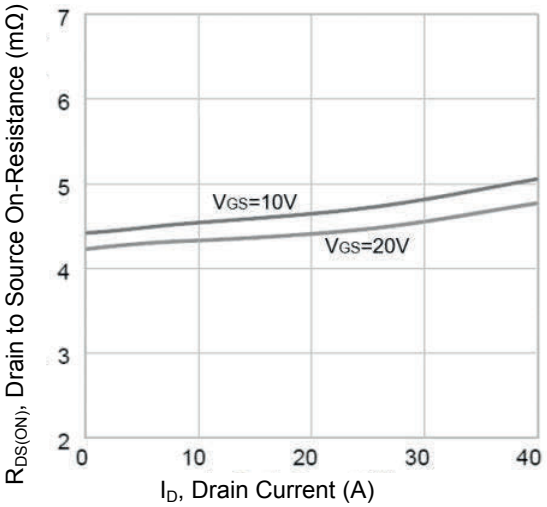


Figure 5. Drain-Source On-Resistance

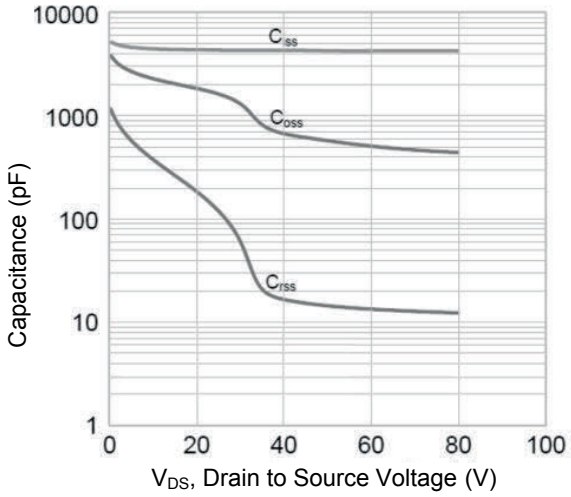


Figure 6. Typical Capacitance vs. Drain-to-Source Voltage

Typical Electrical and Thermal Characteristic Curves

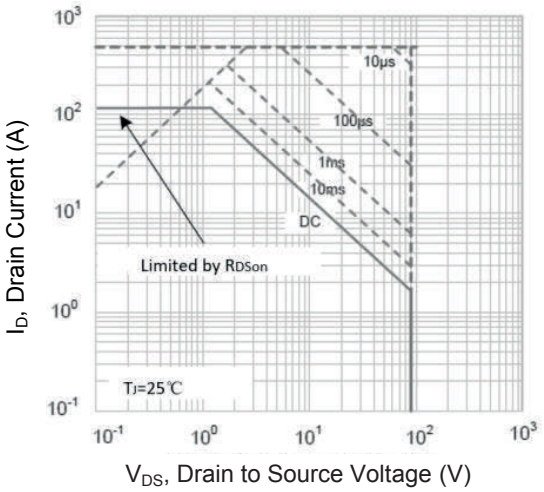


Figure 7. Safe Operation Area

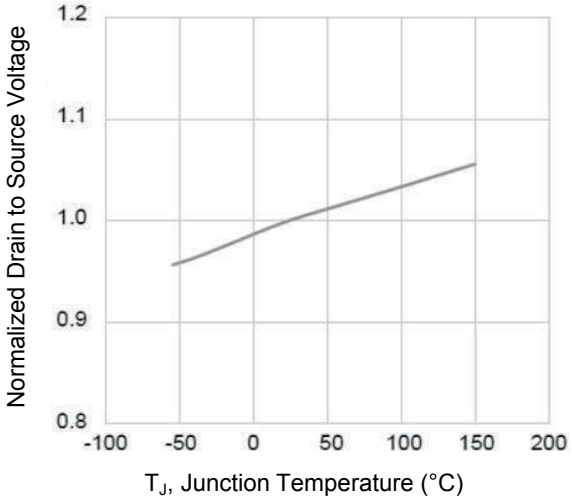
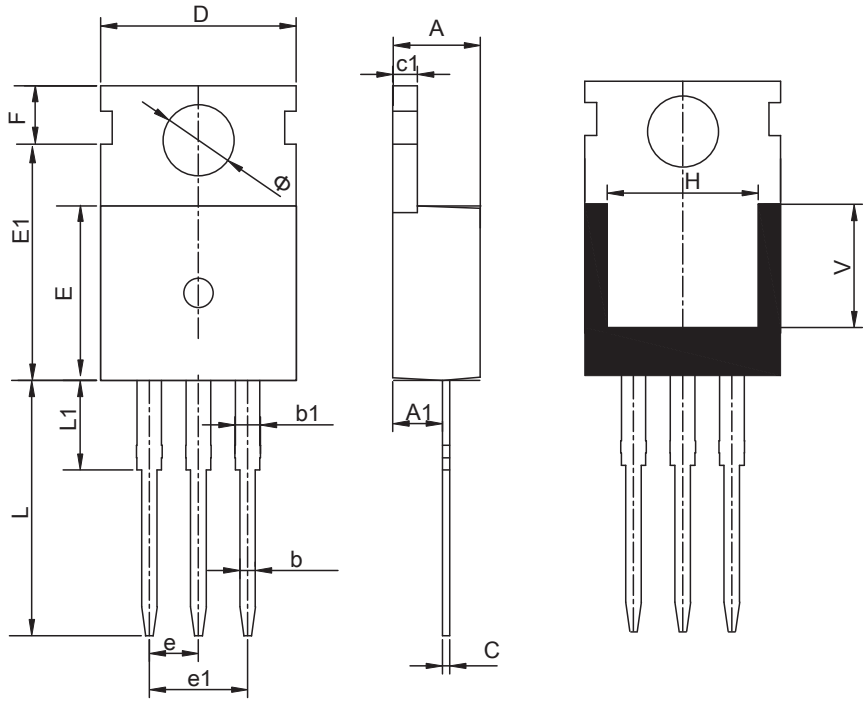


Figure 8. Normalized BV_{DS} vs. Junction Temperature

Package Outline Dimensions (TO-220)



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.40	4.60	0.173	0.181
A1	2.25	2.70	0.089	0.106
b	0.71	0.91	0.028	0.036
b1	1.17	1.37	0.046	0.054
C	0.33	0.65	0.013	0.026
c1	1.20	1.40	0.047	0.055
D	9.91	10.25	0.390	0.404
E	8.95	9.75	0.352	0.384
E1	12.65	13.00	0.498	0.512
e	2.54 TYP		0.100 TYP	
e1	4.98	5.18	0.196	0.204
F	2.65	2.95	0.104	0.116
H	7.90	8.10	0.311	0.319
L	12.90	13.40	0.508	0.528
L1	2.68	3.25	0.106	0.128
V	6.90 REF		0.272 REF	
Φ	3.40	3.80	0.134	0.150

Order Information

Device	Package	Marking	Carrier	Quantity
GSFH4R590	TO-220	H4R590	Tube	50pcs / Tube