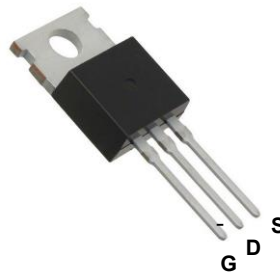
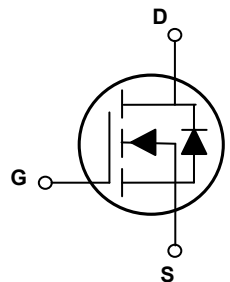


Main Product Characteristics

$V_{(BR)DSS}$	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 ($T_A=25^\circ\text{C}$ 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, ($T_c=25^\circ\text{C}$) ¹	I_D	130	A
Drain Current-Continuous, at Steady-State, ($T_c=100^\circ\text{C}$)		94	
Drain Current-Pulsed ²	I_{DM}	520	A
Single Pulse Avalanche Energy ³	E_{AS}	400	mJ
Power Dissipation ($T_A=25^\circ\text{C}$)	P_D	160	W
Linear Derating Factor ($T_A=25^\circ\text{C}$)		1.28	W/ $^\circ\text{C}$
Junction-to-Ambient (PCB Mounted, Steady-State) ⁴	$R_{\theta JA}$	62.5	$^\circ\text{C/W}$
Junction-to-Case	$R_{\theta JC}$	0.78	$^\circ\text{C/W}$
Operating Junction Temperature Range	T_J	-55 To +150	$^\circ\text{C}$
Storage Temperature Range	T_{STG}	-55 To +150	$^\circ\text{C}$

Electrical Characteristics ($T_A=25^{\circ}\text{C}$ unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
On / Off Characteristics						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS}=0V, I_D=250\mu A$	90	92.5	-	V
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=85V, V_{GS}=0V$	-	-	1	μA
		$T_J=125^{\circ}\text{C}$	-	-	50	
Gate-Source Forward Leakage	I_{GSS}	$V_{GS}=\pm 20V$	-	-	± 100	nA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=50A$	-	4.5	5.4	m Ω
Gate Threshold Voltage	$V_{GS(th)}$	$V_{GS}=V_{DS}, I_D=250\mu A$	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	$t_{d(on)}$	$V_{DS}=40V, R_{GEN}=24\Omega, V_{GS}=10V, I_D=13.2A$	-	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 Threshold Voltage	R_g	$F=1MHz$	-	1.7	-	Ω
Drain-Source Diode Characteristics and Maximum Ratings						
Continuous Source Current (Body Diode) ¹	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}	$I_F=20A, T_J=25^{\circ}\text{C}$ $di/dt=100A/\mu s$	-	53	-	ns
Reverse Recovery Charge	Q_{rr}		-	0.31	-	μC

Note:

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

Typical Electrical and Thermal Characteristic Curves

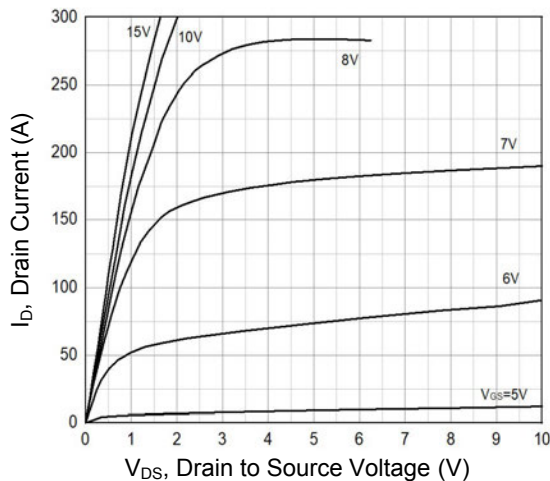


Figure 1. Typical Output Characteristics

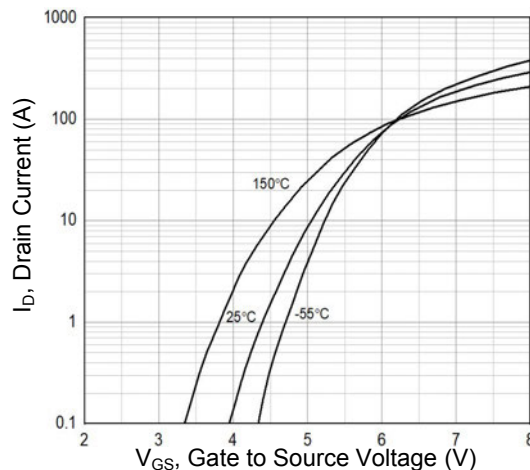


Figure 2. Transfer Characteristics

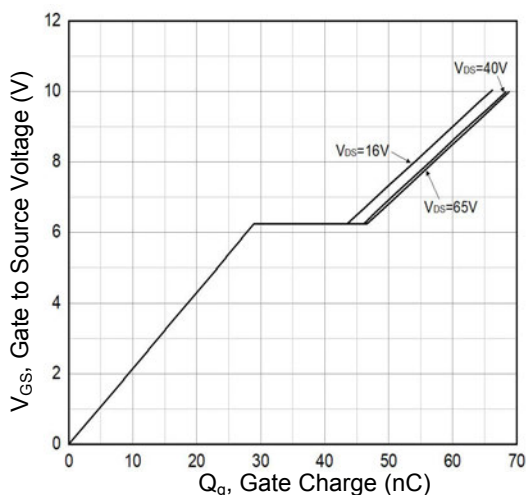


Figure 3. Gate Charge Characteristics

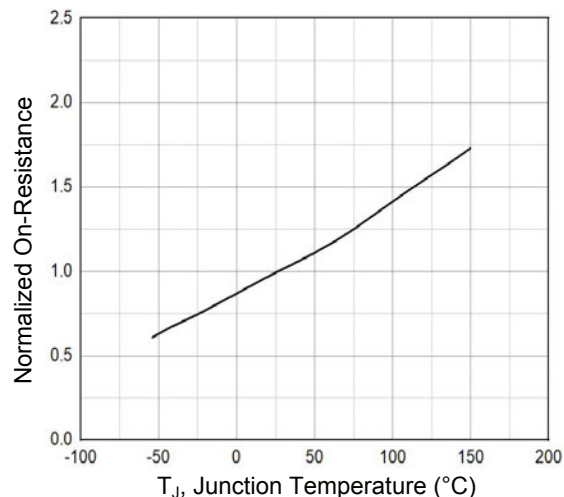


Figure 4. Normalized $R_{DS(ON)}$ vs. Junction Temperature

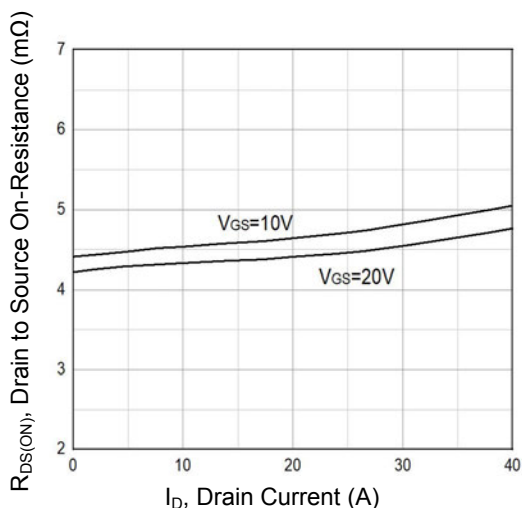


Figure 5. Drain-Source On-Resistance

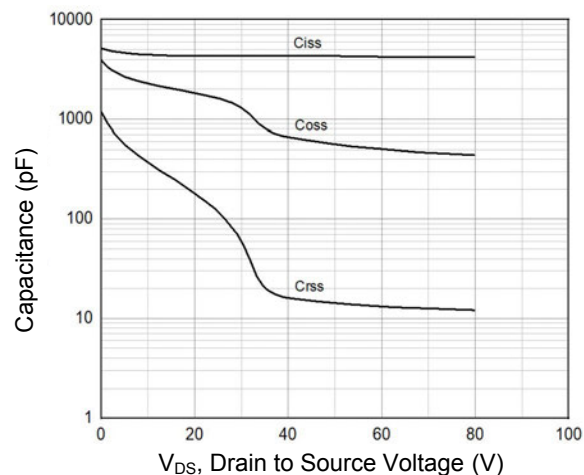


Figure 6. Typical Capacitance vs. Drain-to-Source Voltage

Typical Electrical and Thermal Characteristic Curves

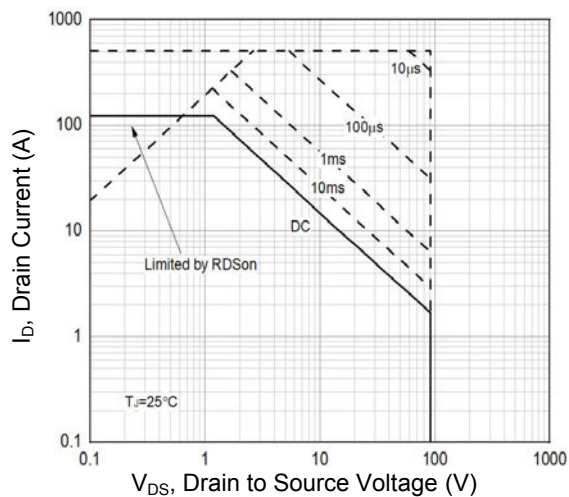


Figure 7. Safe Operation Area

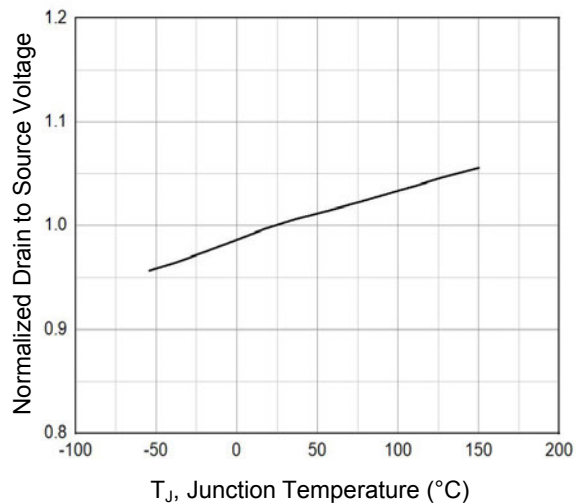
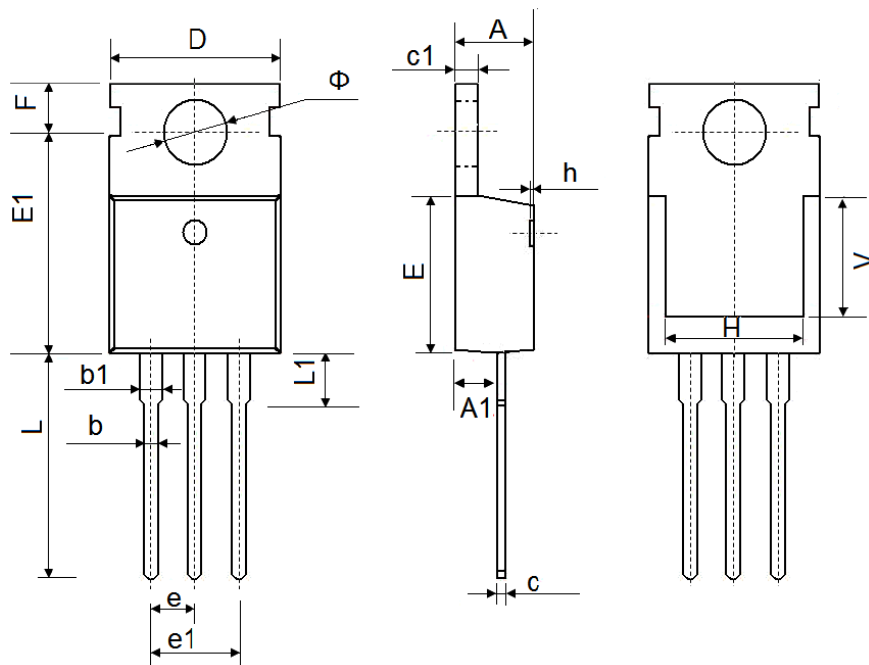


Figure 8. Normalized BV_{DS} vs. Junction Temperature

Package Outline Dimensions (TO-220)



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	4.400	4.600	0.173	0.181
A1	2.250	2.550	0.089	0.100
b	0.710	0.910	0.028	0.036
b1	1.170	1.370	0.046	0.054
c	0.330	0.650	0.013	0.026
c1	1.200	1.400	0.047	0.055
D	9.910	10.250	0.390	0.404
E	8.950	9.750	0.352	0.384
E1	12.650	12.950	0.498	0.510
e	2.540 TYP.		0.100 TYP.	
e1	4.980	5.180	0.196	0.204
F	2.650	2.950	0.104	0.116
H	7.900	8.100	0.311	0.319
h	0.000	0.300	0.000	0.012
L	12.900	13.400	0.508	0.528
L1	2.850	3.250	0.112	0.128
V	6.900 REF.		0.276 REF.	
Φ	3.400	3.800	0.134	0.150