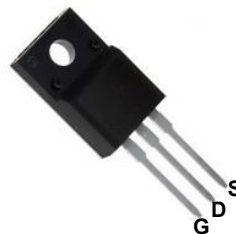
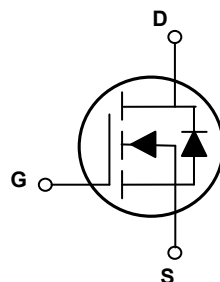


Main Product Characteristics

$V_{(BR)DSS}$	600V
$R_{DS(ON)}$	0.19Ω (max.)
I_D	20A



TO-220F



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 GSFU60R190 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 ($T_C=25^{\circ}\text{C}$ unless otherwise specified)

Parameter	Symbol	Max.	Unit
Drain-Source Voltage	V_{DS}	600	V
Gate-Source Voltage	V_{GS}	± 30	V
Drain Current-Continuous, at Steady-State, ($T_C=25^{\circ}\text{C}$)	I_D	20	A
Drain Current-Continuous, at Steady-State, ($T_C=100^{\circ}\text{C}$)		12	
Drain Current-Pulsed	I_{DM}	80	A
Single Pulse Avalanche Energy ¹	E_{AS}	967	mJ
Power Dissipation ($T_C=25^{\circ}\text{C}$)	P_D	45	W
Power Dissipation – Derate above 25°C		0.36	W/ $^{\circ}\text{C}$
Body Diode Reverse Voltage Slope ²	dv/dt	15	V/ns
MOS dv/dt Ruggedness ³	dv/dt	50	V/ns
Junction-to-Ambient (PCB Mounted, Steady-State)	$R_{\theta JA}$	62.5	$^{\circ}\text{C/W}$
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	2.78	$^{\circ}\text{C/W}$
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 ($T_C=25^{\circ}\text{C}$ unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
On / Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	600	-	-	V
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=600V, V_{GS}=0V$	-	-	200	nA
Gate-Source Forward Leakage	I_{GSS}	$V_{GS}=\pm 30V, V_{DS}=0V$	-	-	± 100	nA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=10A, T_J=25^{\circ}\text{C}$	-	0.16	0.19	Ω
		$V_{GS}=10V, I_D=10A, T_J=125^{\circ}\text{C}$	-	0.3	-	Ω
Gate Threshold Voltage	$V_{GS(th)}$	$V_{GS}=V_{DS}, I_D=250\mu A$	2.0	-	4.0	V
Dynamic and Switching Characteristics						
Total Gate Charge ^{4,5}	Q_g	$V_{DD}=480V, I_D=20A, V_{GS}=10V$	-	39	-	nC
Gate-Source Charge ^{4,5}	Q_{gs}		-	9.6	-	
Gate-Drain ("Miller") Charge ^{4,5}	Q_{gd}		-	20	-	
Turn-On Delay Time ^{4,5}	$t_{d(on)}$	$V_{DD}=300V, R_G=25\Omega, V_{GS}=10V, I_D=20A$	-	20	-	nS
Rise Time ^{4,5}	t_r		-	60	-	
Turn-Off Delay Time ^{4,5}	$t_{d(off)}$		-	105	-	
Fall Time ^{4,5}	t_f		-	42	-	
Input Capacitance	C_{iss}	$V_{DS}=100V, V_{GS}=0V, F=1\text{MHz}$	-	1174	-	pF
Output Capacitance	C_{oss}		-	67	-	
Reverse Transfer Capacitance	C_{rss}		-	4.0	-	
Gate Resistance	R_g	$F=1\text{MHz}$	-	2.6	-	Ω
Drain-Source Diode Characteristics and Maximum Ratings						
Continuous Source Current (Body Diode)	I_S	$T_C=25^{\circ}\text{C}$, MOSFET symbol showing the integral reverse p-n junction diode.	-	-	20	A
Source Pulse Current	I_{SM}		-	-	80	A
Diode Forward Voltage	V_{SD}	$V_{GS}=0V, I_S=20A$	-	-	1.2	V
Reverse Recovery Time ³	t_{rr}	$V_{DD}=50V, I_F=20A, di_F/dt=100A/\mu s$	-	426	-	nS
Reverse Recovery Charge ³	Q_{rr}		-	6.2	-	uC

Note:

1. $L=79\text{mH}$, $I_{AS}=4.6A$, $V_{DD}=100V$, starting temperature $T_J=25^{\circ}\text{C}$.
2. $V_{DS}=0 - 400V$, $I_{SD} \leq 20A$, $T_J=25^{\circ}\text{C}$.
3. $V_{DS}=0 - 480V$.
4. Pulse test: pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$.
5. Essentially independent of operating temperature.

Typical Electrical and Thermal Characteristic Curves

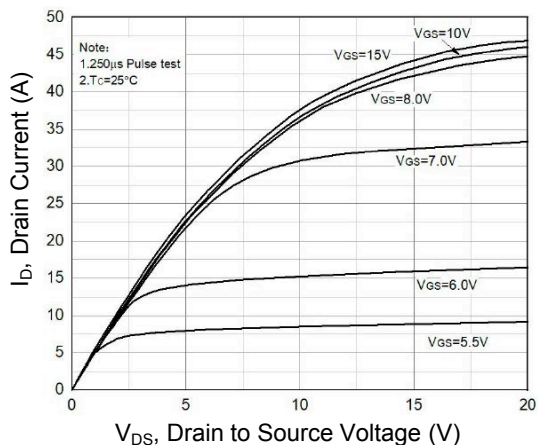


Figure 1. Typical Output Characteristics

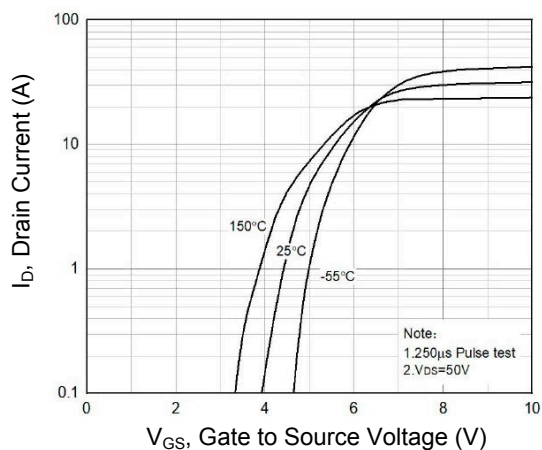


Figure 2. Typical Transfer Characteristics

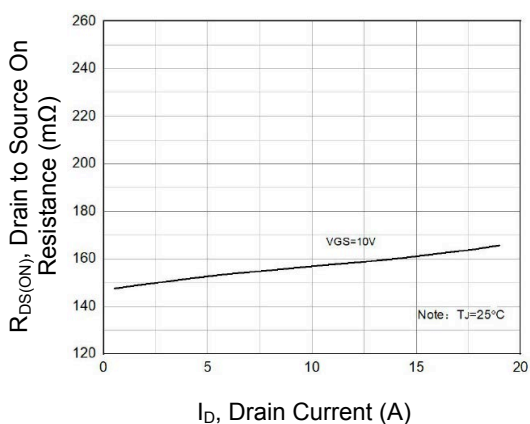


Figure 3. $R_{DS(ON)}$ vs. Drain Current

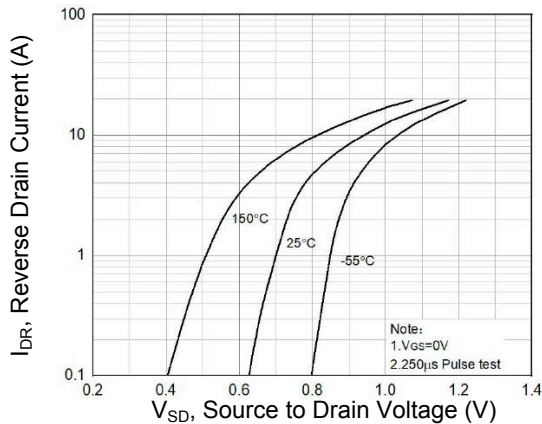


Figure 4. Body Diode Characteristics

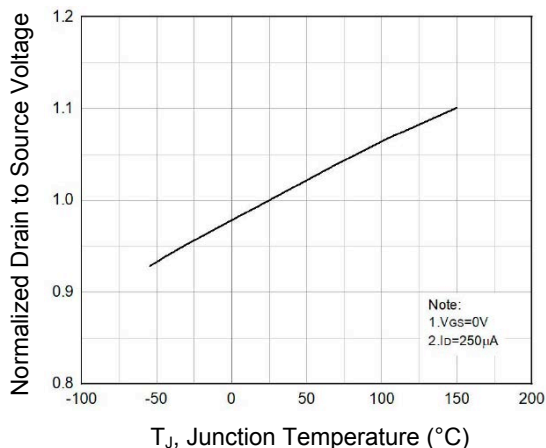


Figure 5. Normalized BV_{DSS} vs. Junction Temperature

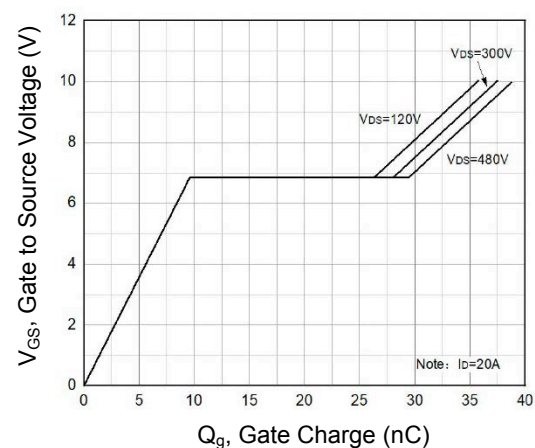


Figure 6. Gate Charge Characteristics

Typical Electrical and Thermal Characteristic Curves

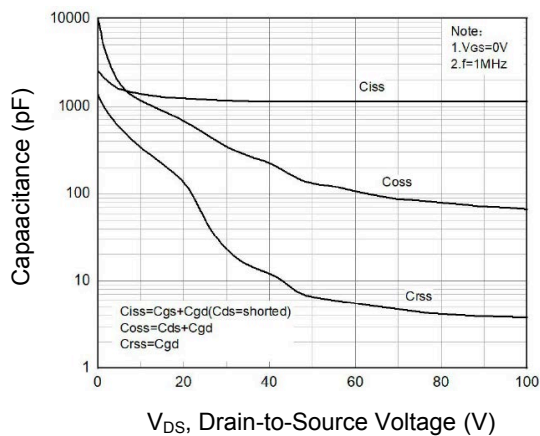


Figure 7. Capacitance Characteristics

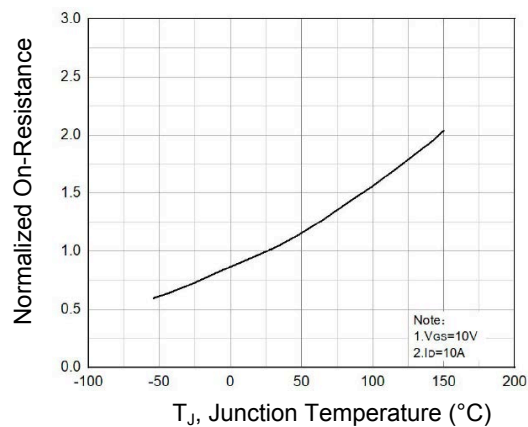


Figure 8. Normalized $R_{DS(ON)}$ vs. T_J

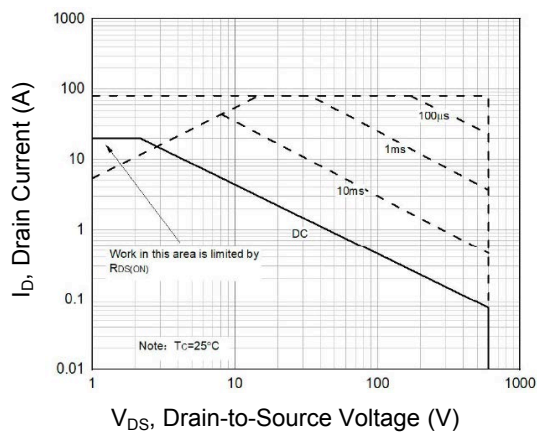
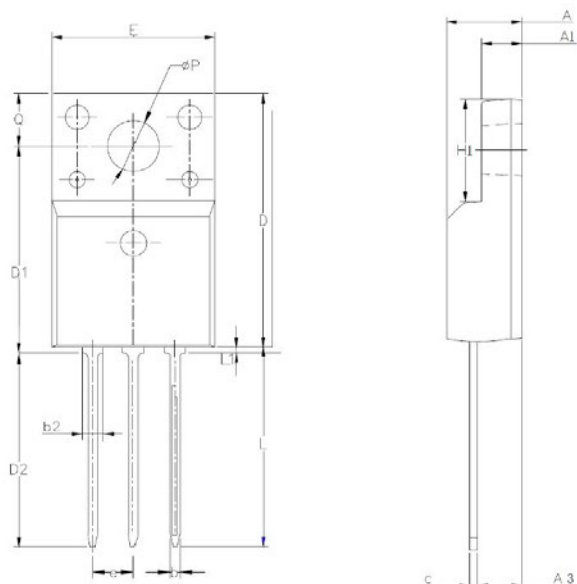


Figure 9. Safe Operation Area

Package Outline Dimensions (TO-220F)



Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	4.420	5.020	0.174	0.198
A1	2.300	2.800	0.091	0.110
A3	2.500	3.100	0.098	0.122
b	0.550	0.800	0.022	0.031
b2	-	1.290	-	0.051
c	0.350	0.650	0.014	0.026
D	15.250	16.250	0.600	0.640
D1	12.870	13.270	0.507	0.522
D2	12.280	12.680	0.483	0.500
E	9.730	10.360	0.383	0.408
e	2.540 BSC		0.100 BSC	
H1	6.400	7.000	0.252	0.276
L	12.480	13.480	0.491	0.530
L1	-	0.850	-	0.033
ØP	3.000	3.400	0.118	0.134
Q	3.050	3.550	0.120	0.140