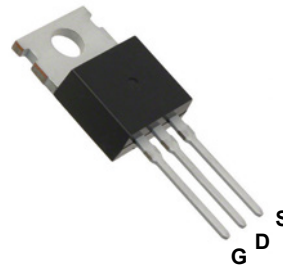
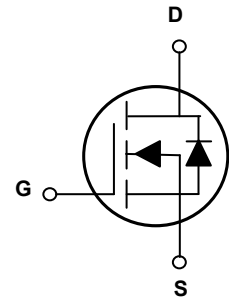


## Main Product Characteristics

$BV_{DSS}$	115V
$R_{DS(ON)}$	7.6m $\Omega$
$I_D$	95A



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 GSFH1196 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 supply 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	$V_{DS}$	115	V
Gate-Source Voltage	$V_{GS}$	+20/-12	V
Drain Current-Continuous ( $T_C=25^\circ\text{C}$ )	$I_D$	95	A
Drain Current-Continuous ( $T_C=100^\circ\text{C}$ )		60	
Drain Current-Pulsed <sup>1</sup>	$I_{DM}$	380	A
Single Pulse Avalanche Energy <sup>2</sup>	$E_{AS}$	266	mJ
Single Pulse Avalanche Current <sup>2</sup>	$I_{AS}$	73	A
Power Dissipation ( $T_C=25^\circ\text{C}$ )	$P_D$	180	W
Power Dissipation-Derate above $25^\circ\text{C}$		1.44	
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	62	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	0.68	$^\circ\text{C}/\text{W}$
Operating Junction Temperature Range	$T_J$	-55 To +150	$^\circ\text{C}$
Storage Temperature Range	$T_{STG}$	-55 To +150	$^\circ\text{C}$

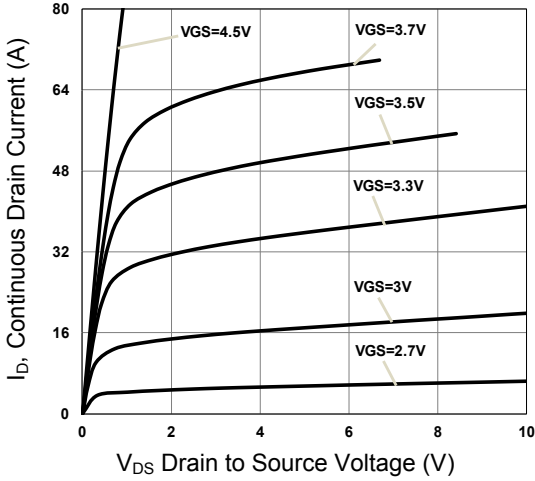
**Electrical Characteristics** ( $T_J=25^{\circ}\text{C}$  unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
<b>On/Off Characteristics</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	115	-	-	V
Drain-Source Leakage Current	$I_{DSS}$	$V_{DS}=115V, V_{GS}=0V, T_J=25^{\circ}\text{C}$	-	-	1	$\mu A$
		$V_{DS}=92V, V_{GS}=0V, T_J=125^{\circ}\text{C}$	-	-	10	$\mu A$
Gate-Source Leakage Current	$I_{GSS}$	$V_{GS}=20V, V_{DS}=0V$	-	-	100	nA
Static Drain-Source On-Resistance <sup>3</sup>	$R_{DS(ON)}$	$V_{GS}=10V, I_D=20A$	-	6.4	7.6	m $\Omega$
		$V_{GS}=4.5V, I_D=10A$	-	8.5	11	
Gate Threshold Voltage	$V_{GS(th)}$	$V_{GS}=V_{DS}, I_D=250\mu A$	1.2	1.8	2.5	V
Forward Transconductance	$g_{fs}$	$V_{DS}=10V, I_D=3A$	-	16	-	S
<b>Dynamic and Switching Characteristics</b>						
Total Gate Charge <sup>3,4</sup>	$Q_g$	$V_{DS}=60V, I_D=45A$ $V_{GS}=10V$	-	70	105	nC
Gate-Source Charge <sup>3,4</sup>	$Q_{gs}$		-	14	21	
Gate-Drain Charge <sup>3,4</sup>	$Q_{gd}$		-	16	24	
Turn-On Delay Time <sup>3,4</sup>	$t_{d(on)}$	$V_{DS}=60V, R_G=6\Omega$ $V_{GS}=10V, I_D=45A$	-	22	35	nS
Rise Time <sup>3,4</sup>	$t_r$		-	25	40	
Turn-Off Delay Time <sup>3,4</sup>	$t_{d(off)}$		-	35	55	
Fall Time <sup>3,4</sup>	$t_f$		-	18	30	
Input Capacitance	$C_{iss}$	$V_{DS}=60V, V_{GS}=0V,$ $F=1\text{MHz}$	-	4500	6700	pF
Output Capacitance	$C_{oss}$		-	350	520	
Reverse Transfer Capacitance	$C_{rss}$		-	10	20	
Gate Resistance	$R_g$	$V_{GS}=0V, V_{DS}=0V,$ $F=1\text{MHz}$	-	1.7	-	$\Omega$
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
Continuous Source Current	$I_S$	$V_G=V_D=0V,$ Force Current	-	-	-95	A
Pulsed Source Current	$I_{SM}$		-	-	-190	A
Diode Forward Voltage	$V_{SD}$	$V_{GS}=0V, I_S=1A,$ $T_J=25^{\circ}\text{C}$	-	-	-1	V
Reverse Recovery Time <sup>3</sup>	$t_{rr}$	$V_R=100V, I_S=10A$ $di/dt=100A/\mu s$ $T_J=25^{\circ}\text{C}$	-	66	-	nS
Reverse Recovery Charge <sup>3</sup>	$Q_{rr}$		-	130	-	nC

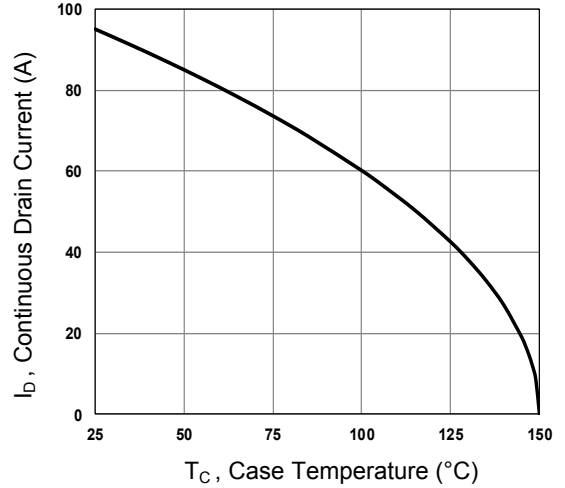
Note:

1. Repetitive rating: Pulsed width limited by maximum junction temperature.
2.  $V_{DD}=50V, V_{GS}=10V, L=0.1\text{mH}, I_{AS}=73A, R_G=25\Omega,$  starting  $T_J=25^{\circ}\text{C}$ .
3. Pulse test: pulse width  $\leq 300\mu s,$  duty cycle  $\leq 2\%$ .
4. Essentially independent of operating temperature.

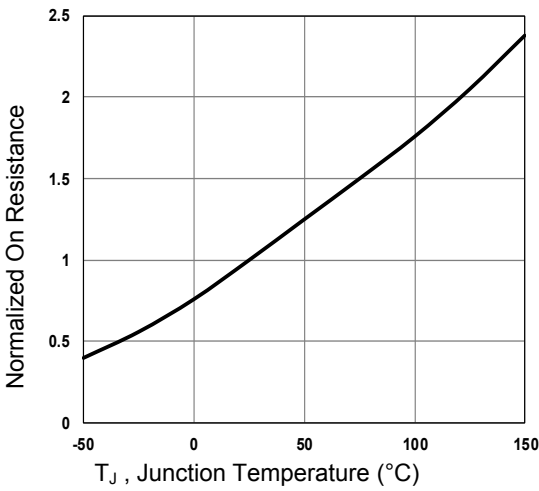
**Typical Electrical and Thermal Characteristic Curves**



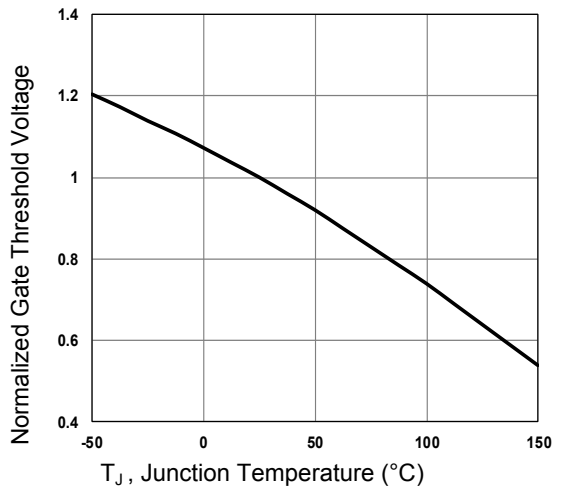
**Figure 1. Typical Output Characteristics**



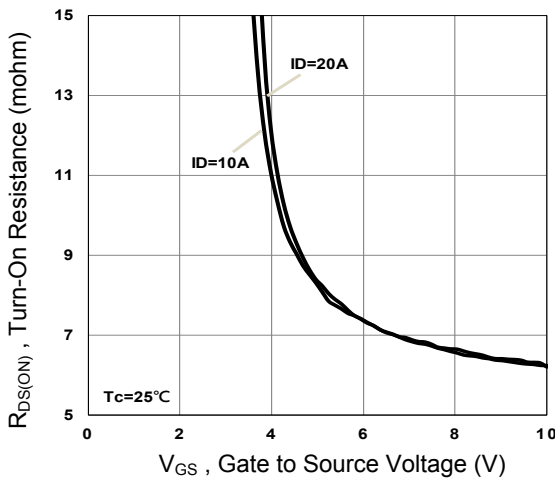
**Figure 2. Continuous Drain Current vs.  $T_C$**



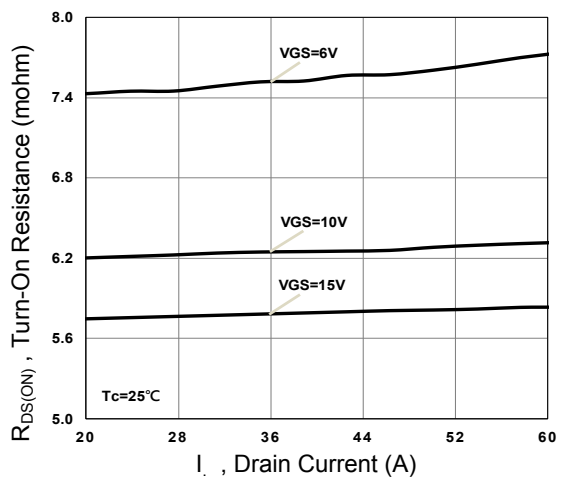
**Figure 3. Normalized  $R_{DS(ON)}$  vs.  $T_J$**



**Figure 4. Normalized  $V_{th}$  vs.  $T_J$**

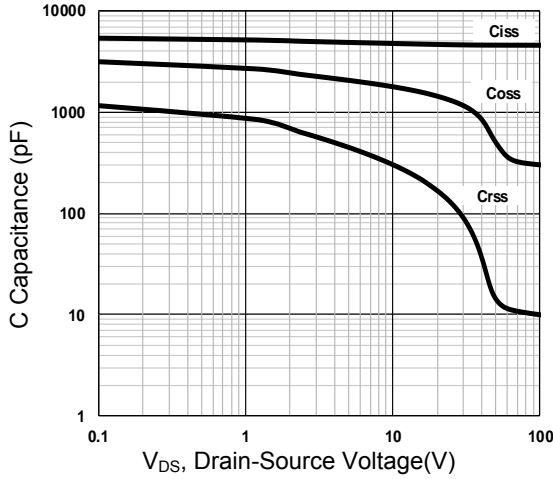


**Figure 5. Turn-On Resistance vs.  $V_{GS}$**

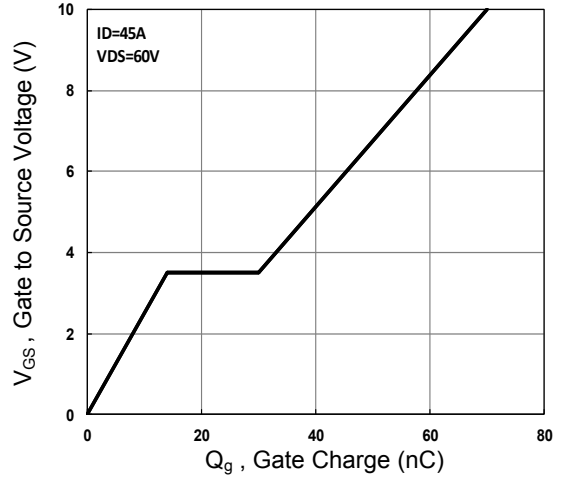


**Figure 6. Turn-On Resistance vs.  $I_D$**

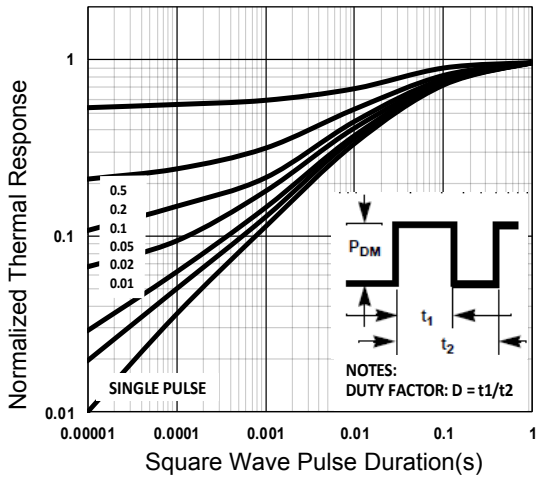
**Typical Electrical and Thermal Characteristic Curves**



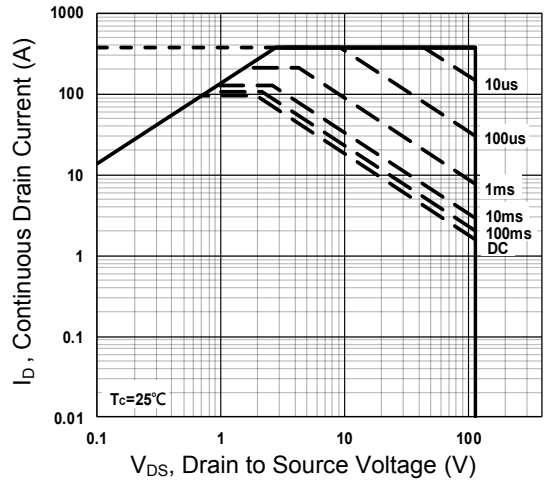
**Figure 7. Capacitance vs. V<sub>DS</sub>**



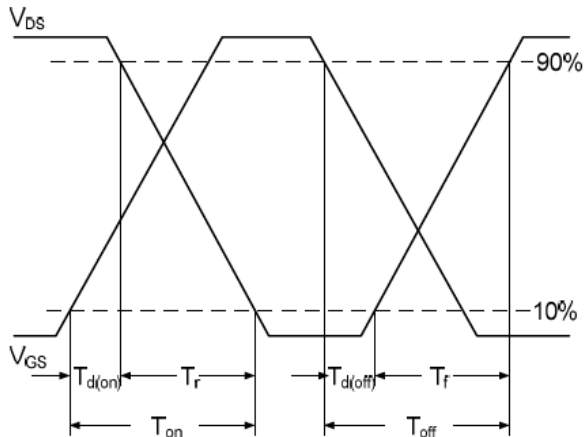
**Figure 8. Gate Charge Characteristics**



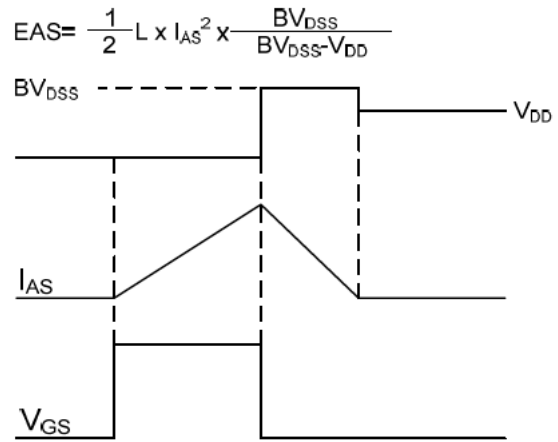
**Figure 9. Normalized Transient Impedance**



**Figure 10. Maximum Safe Operation Area**

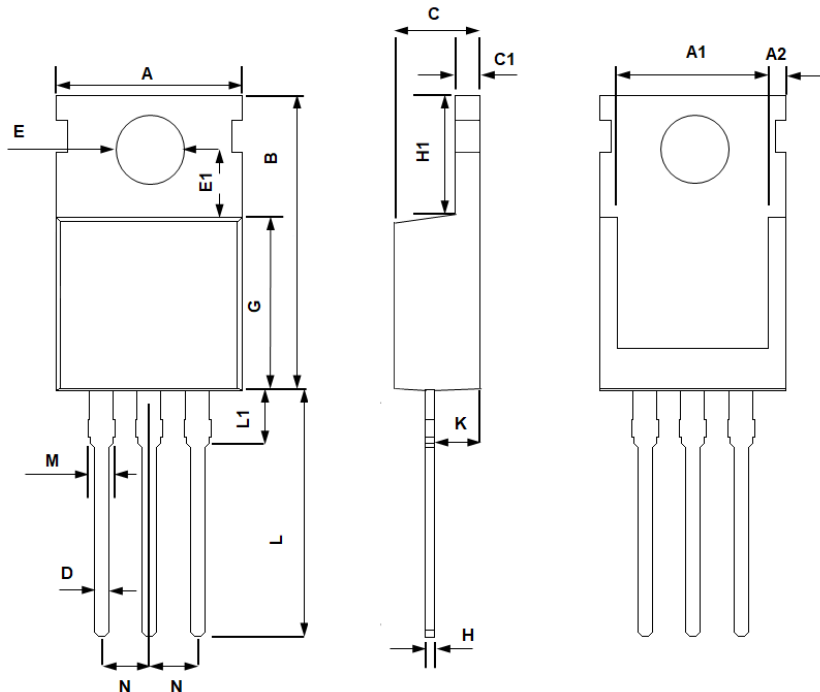


**Figure 11. Switching Time Waveform**



**Figure 12. EAS Waveform**

**Package Outline Dimensions (TO-220)**



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MAX	MIN	MAX	MIN
A	10.300	9.700	0.406	0.382
A1	8.600	7.600	0.338	0.299
A2	1.250	0.800	0.049	0.031
B	16.20	14.50	0.638	0.570
C	4.750	4.280	0.187	0.169
C1	1.500	1.100	0.059	0.043
D	1.000	0.600	0.039	0.024
E	4.000	3.300	0.157	0.129
E1	3.800	3.400	0.149	0.133
G	9.300	8.400	0.366	0.343
H	0.600	0.200	0.024	0.016
H1	6.850	6.200	0.024	0.016
K	2.850	2.100	0.106	0.083
L	14.000	12.500	0.551	0.492
L1	3.850	3.000	0.152	0.118
M	1.500	1.100	0.059	0.043
N	2.600	2.450	0.102	0.096