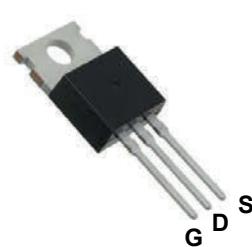
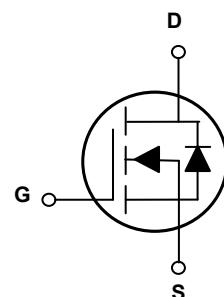


Main Product Characteristics

BV _{DSS}	40V
R _{DS(ON)}	7.1mΩ (Typ.)
I _D	60A



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 GSFH4010 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°C unless otherwise specified)

Parameter	Symbol	Max.	Unit
Drain-Source Voltage	V _{DS}	40	V
Gate-Source Voltage	V _{GS}	±20	V
Drain Current-Continuous (T _C =25°C)	I _D	60	A
Drain Current-Continuous (T _C =100°C)		38	
Drain Current-Pulsed ¹	I _{DM}	240	A
Single Pulse Avalanche Energy ²	E _{AS}	76	mJ
Single Pulse Avalanche Current ²	I _{AS}	39	A
Power Dissipation (T _C =25°C)	P _D	70	W
Power Dissipation-Derate above 25°C		0.56	W/°C
Thermal Resistance, Junction-to-Ambient	R _{θJA}	62	°C/W
Thermal Resistance, Junction-to-Case	R _{θJC}	1.79	°C/W
Operating Junction and Storage Temperature Range	T _{J/T_{STG}}	-55 to +150	°C

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

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
On / Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{\text{GS}}=0\text{V}, I_{\text{D}}=250\mu\text{A}$	40	-	-	V
BV_{DSS} Temperature Coefficient	$\Delta \text{BV}_{\text{DSS}}/\Delta T_J$	Reference to 25°C , $I_{\text{D}}=1\text{mA}$	-	0.03	-	$\text{V}/^\circ\text{C}$
Drain-Source Leakage Current	I_{DSS}	$V_{\text{DS}}=40\text{V}, V_{\text{GS}}=0\text{V}, T_J=25^\circ\text{C}$	-	-	1	μA
		$V_{\text{DS}}=32\text{V}, V_{\text{GS}}=0\text{V}, T_J=125^\circ\text{C}$	-	-	10	μA
Gate-Source Leakage Current	I_{GSS}	$V_{\text{GS}}=\pm 20\text{V}, V_{\text{DS}}=0\text{V}$	-	-	± 100	nA
Static Drain-Source On-Resistance ³	$R_{\text{DS}(\text{ON})}$	$V_{\text{GS}}=10\text{V}, I_{\text{D}}=10\text{A}$	-	7.1	10	$\text{m}\Omega$
		$V_{\text{GS}}=4.5\text{V}, I_{\text{D}}=5\text{A}$	-	10	14	
Gate Threshold Voltage	$V_{\text{GS}(\text{th})}$	$V_{\text{GS}}=V_{\text{DS}}, I_{\text{D}}=250\mu\text{A}$	1.2	1.6	2.5	V
$V_{\text{GS}(\text{th})}$ Temperature Coefficient	$\Delta V_{\text{GS}(\text{th})}$		-	-5	-	$\text{mV}/^\circ\text{C}$
Forward Transconductance	g_{fs}	$V_{\text{DS}}=10\text{V}, I_{\text{D}}=3\text{A}$	-	16	-	S
Dynamic and Switching Characteristics						
Total Gate Charge ^{3,4}	Q_g	$V_{\text{DS}}=20\text{V}, I_{\text{D}}=10\text{A}, V_{\text{GS}}=4.5\text{V}$	-	16.2	32	nC
Gate-Source Charge ^{3,4}	Q_{gs}		-	3.85	7	
Gate-Drain Charge ^{3,4}	Q_{gd}		-	6.05	12	
Turn-On Delay Time ^{3,4}	$t_{\text{d}(\text{on})}$	$V_{\text{DD}}=15\text{V}, R_{\text{G}}=6\Omega, V_{\text{GS}}=10\text{V}, I_{\text{D}}=1\text{A}$	-	13.6	25	nS
Rise Time ^{3,4}	t_r		-	2.5	5	
Turn-Off Delay Time ^{3,4}	$t_{\text{d}(\text{off})}$		-	68	120	
Fall Time ^{3,4}	t_f		-	5	10	
Input Capacitance	C_{iss}	$V_{\text{DS}}=25\text{V}, V_{\text{GS}}=0\text{V}, F=1\text{MHz}$	-	1540	2500	pF
Output Capacitance	C_{oss}		-	171	330	
Reverse Transfer Capacitance	C_{rss}		-	115	220	
Gate Resistance	R_g	$V_{\text{GS}}=0\text{V}, V_{\text{DS}}=0\text{V}, F=1\text{MHz}$	-	1.2	2.2	Ω
Source-Drain Ratings and Characteristics						
Continuous Source Current	I_s	$V_G=V_D=0\text{V}$, Force Current	-	-	60	A
Pulsed Source Current ³	I_{SM}		-	-	120	A
Diode Forward Voltage ³	V_{SD}	$V_{\text{GS}}=0\text{V}, I_{\text{S}}=1\text{A}, T_J=25^\circ\text{C}$	-	-	1	V

Note:

1. Repetitive rating: Pulsed width limited by maximum junction temperature.
2. $V_{\text{DD}}=25\text{V}, V_{\text{GS}}=10\text{V}, L=0.1\text{mH}, I_{\text{AS}}=39\text{A}$, starting $T_J=25^\circ\text{C}$.
3. Pulse test: pulse width $\leq 300\text{us}$, duty cycle $\leq 2\%$.
4. Essentially independent of operation temperature.

Typical Electrical and Thermal Characteristic Curves

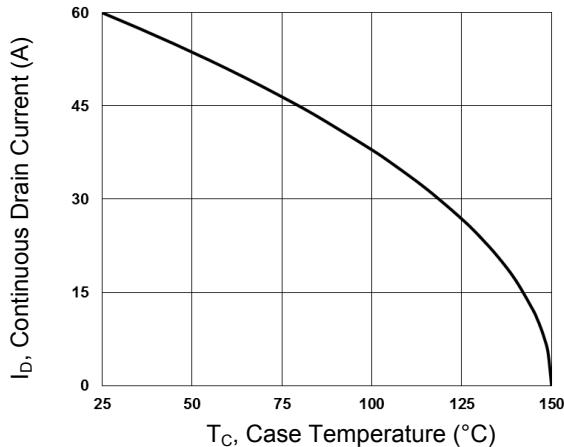


Figure 1. Continuous Drain Current vs. T_c

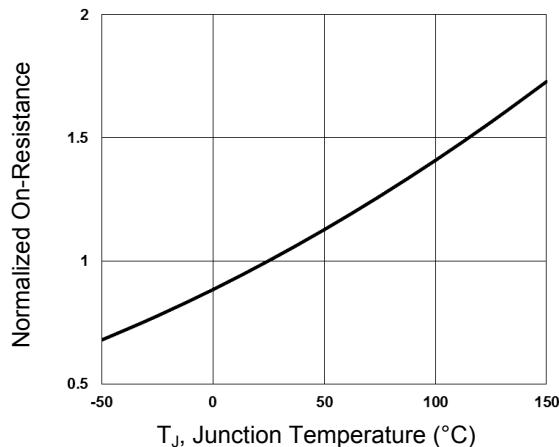


Figure 2. Normalized R_{DS(ON)} vs. T_j

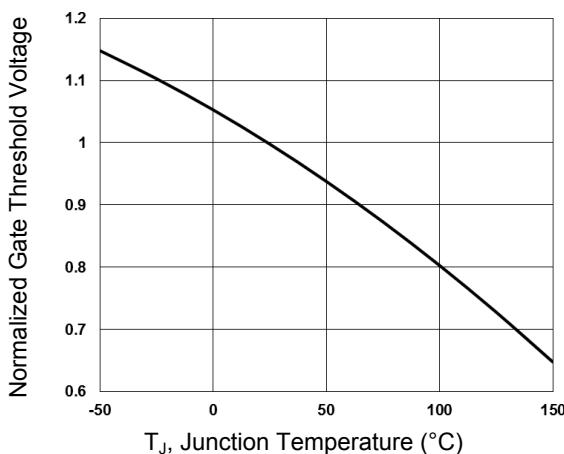


Figure 3. Normalized V_{th} vs. T_j

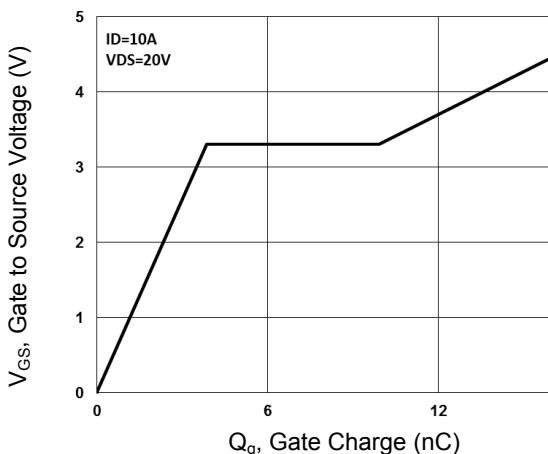


Figure 4. Gate Charge Waveform

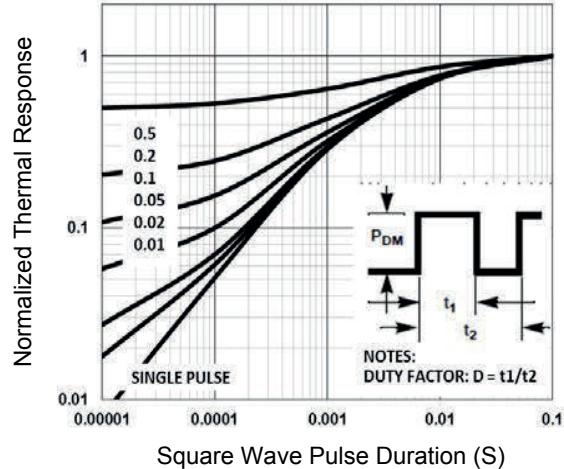


Figure 5. Normalized Transient Impedance

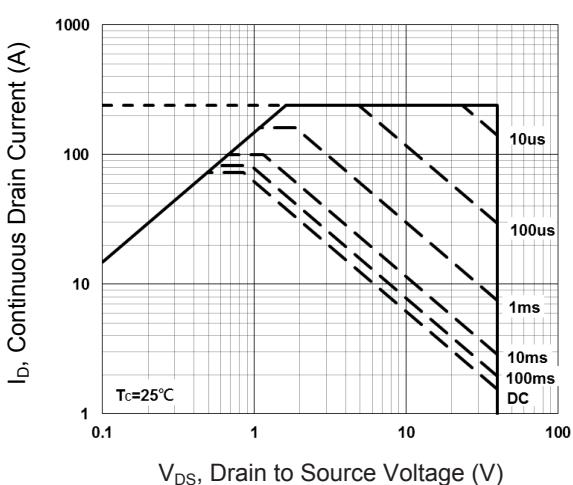
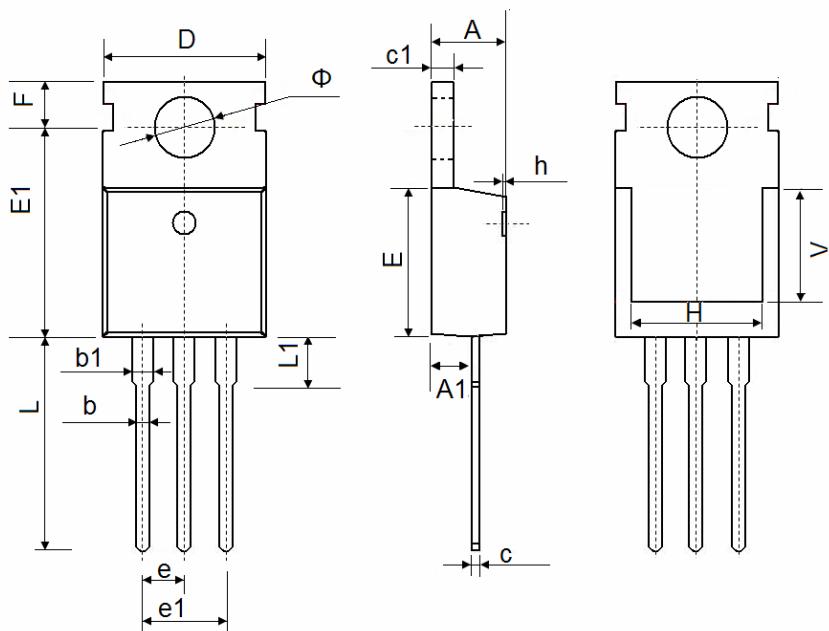


Figure 6. Maximum Safe Operation Area

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	8.9500	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