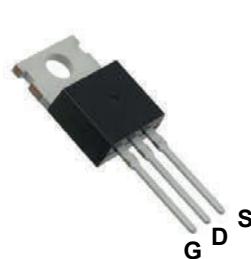
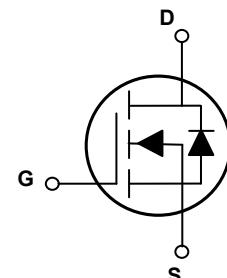


## Main Product Characteristics

$V_{(BR)DSS}$	650V
$R_{DS(ON)}$	0.22Ω (max.)
$I_D$	20A



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 GSJH65R220 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	Parameter	Unit
Drain-Source Voltage	$V_{DS}$	650	V
Gate-to-Source Voltage	$V_{GS}$	$\pm 30$	V
Continuous Drain Current, @ Steady-State ( $T_C=25^\circ\text{C}$ )	$I_D$	20	A
Continuous Drain Current, @ Steady-State ( $T_C=100^\circ\text{C}$ )		12	A
Pulsed Drain Current	$I_{DM}$	80	A
Power Dissipation ( $T_C=25^\circ\text{C}$ )	$P_D$	208	W
		1.66	W/°C
Single Pulse Avalanche Energy <sup>1</sup>	$E_{AS}$	657	mJ
Body Diode Reverse Voltage Slope <sup>2</sup>	$dv/dt$	15	V/ns
MOS $dv/dt$ Ruggedness <sup>3</sup>	$dv/dt$	100	V/ns
Junction-to-Ambient (PCB Mounted, Steady-State)	$R_{\theta JA}$	62.5	°C/W
Junction-to-Case	$R_{\theta JC}$	0.62	°C/W
Operating Junction and Storage Temperature Range	$T_J/T_{STG}$	-55 to + 150	°C

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

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
<b>On / Off Characteristics</b>						
Drain-to-Source Breakdown Voltage	$V_{(\text{BR})\text{DSS}}$	$V_{\text{GS}}=0\text{V}, I_D=250\mu\text{A}$	650	-	-	V
Drain-to-Source Leakage Current	$I_{\text{DS}(\text{SS})}$	$V_{\text{DS}}=650\text{V}, V_{\text{GS}}=0\text{V}$	-	-	1	$\mu\text{A}$
Gate-to-Source Forward Leakage	$I_{\text{GS}(\text{SS})}$	$V_{\text{DS}}=0\text{V}, V_{\text{GS}}=30\text{V}$	-	-	100	nA
		$V_{\text{DS}}=0\text{V}, V_{\text{GS}}=-30\text{V}$	-	-	-100	
Static Drain-to-Source On-Resistance	$R_{\text{DS}(\text{ON})}$	$V_{\text{GS}}=10\text{V}, I_D=10\text{A}$	-	0.19	0.22	$\Omega$
Gate Threshold Voltage	$V_{\text{GS}(\text{th})}$	$V_{\text{DS}}=V_{\text{GS}}, I_D=250\mu\text{A}$	2.0	-	4.0	V
<b>Dynamic and Switching Characteristics</b>						
Input Capacitance	$C_{\text{iss}}$	$V_{\text{GS}}=0\text{V}, V_{\text{DS}}=100\text{V}, f=1\text{MHz}$	-	1718	-	pF
Output Capacitance	$C_{\text{oss}}$		-	66	-	
Reverse Transfer Capacitance	$C_{\text{rss}}$		-	1.7	-	
Total Gate Charge <sup>4,5</sup>	$Q_g$	$I_D=20\text{A}, V_{\text{DD}}=520\text{V}, V_{\text{GS}}=10\text{V}$	-	48	-	nC
Gate-to-Source Charge <sup>4,5</sup>	$Q_{\text{gs}}$		-	20	-	
Gate-to-Drain ("Miller") Charge <sup>4,5</sup>	$Q_{\text{gd}}$		-	19	-	
Turn-On Delay Time <sup>4,5</sup>	$t_{\text{d}(\text{on})}$	$V_{\text{DD}}=325\text{V}, V_{\text{GS}}=10\text{V}, R_G=25\Omega, I_D=20\text{A}$	-	32	-	nS
Rise Time <sup>4,5</sup>	$t_r$		-	96	-	
Turn-Off Delay Time <sup>4,5</sup>	$t_{\text{d}(\text{off})}$		-	105	-	
Fall Time <sup>4,5</sup>	$t_f$		-	75	-	
Gate Resistance	$R_g$	$f=1\text{MHz}$	-	1.3	-	$\Omega$
<b>Source-Drain Ratings and Characteristics</b>						
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	$I_{\text{SM}}$		-	-	80	A
Diode Forward Voltage	$V_{\text{SD}}$	$I_S=20\text{A}, V_{\text{GS}}=0\text{V}$	-	1.1	1.4	V
Reverse Recovery Time <sup>2</sup>	$T_{\text{rr}}$	$I_F=20\text{A}, V_{\text{DD}}=50\text{V}, dI_F/dt=100\text{A/us}$	-	330	-	nS
Reverse Recovery Charge <sup>2</sup>	$Q_{\text{rr}}$		-	5.7	-	$\mu\text{C}$

Note:

1.  $L=79\text{mH}, I_{AS}=3.8\text{A}, V_{DD}=100\text{V}, R_g=25\Omega$ , starting temperature  $T_J=25^\circ\text{C}$ .
2.  $V_{\text{DS}}=0-400\text{V}, I_{SD} \leq I_S, T_J=25^\circ\text{C}$ .
3.  $V_{\text{DS}}=0-480\text{V}$ .
4. Pulse test: pulse width  $\leq 300\mu\text{s}$ , duty cycle  $\leq 2\%$ .
5. Essentially independent of operating temperature.

## Typical Electrical and Thermal Characteristic Curves

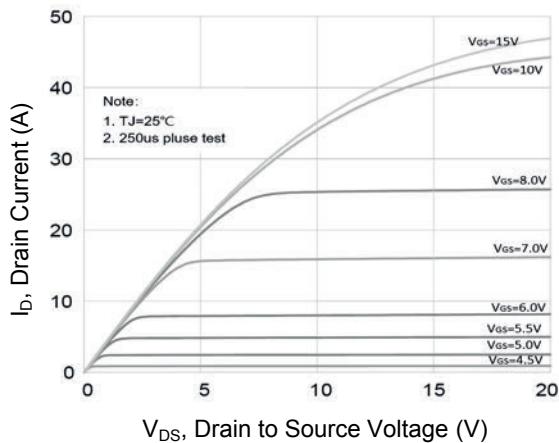


Figure 1. Typical Output Characteristics

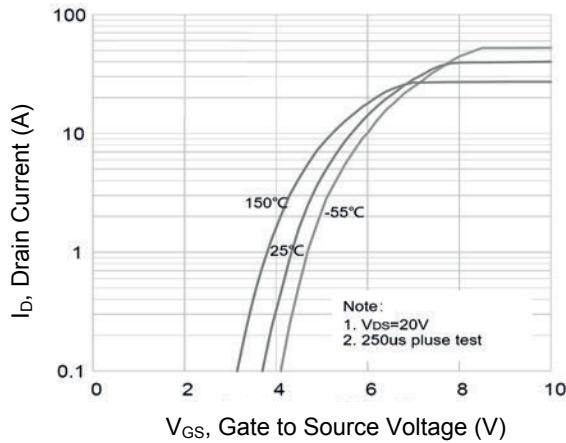


Figure 2. Transfer Characteristics

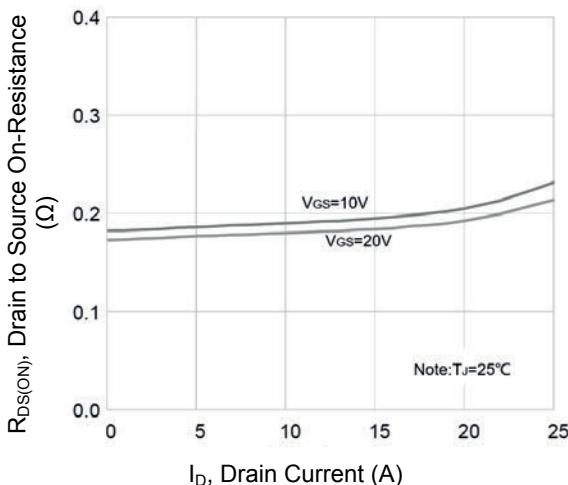


Figure 3.  $R_{DS(ON)}$  Vs. Drain Current

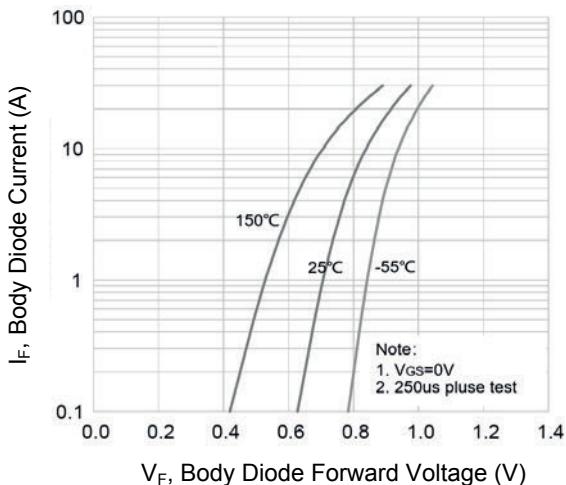


Figure 4. Body Diode Characteristics

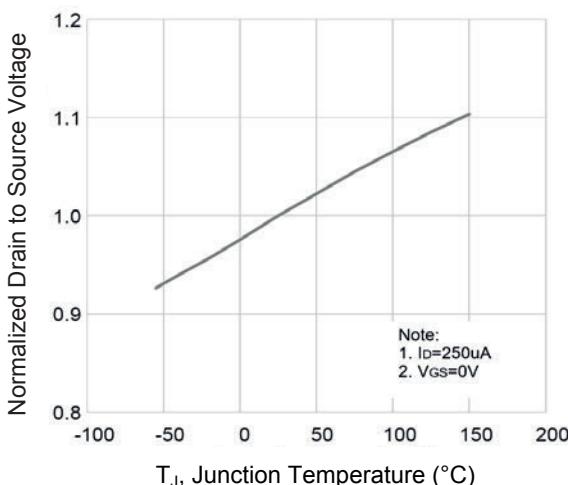


Figure 5. Normalized  $BV_{DSS}$  Vs.  $T_J$

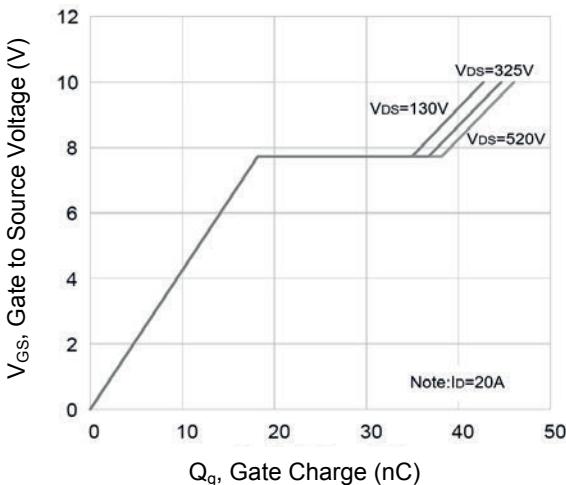
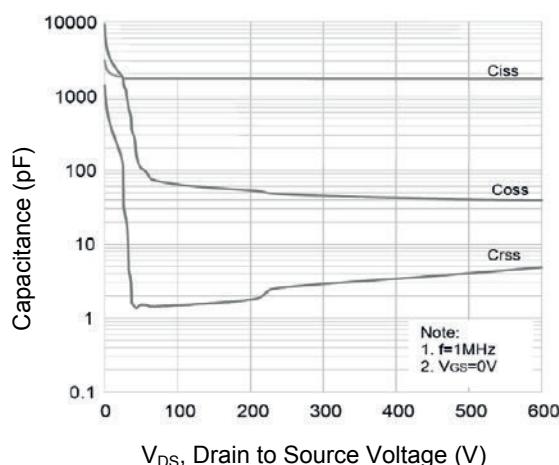


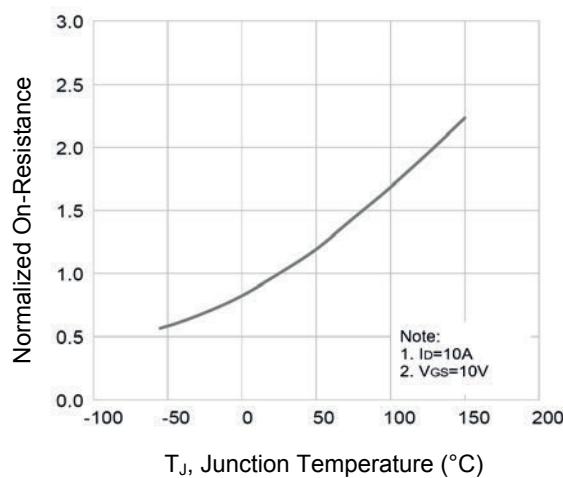
Figure 6. Gate Charge

## Typical Electrical and Thermal Characteristic Curves



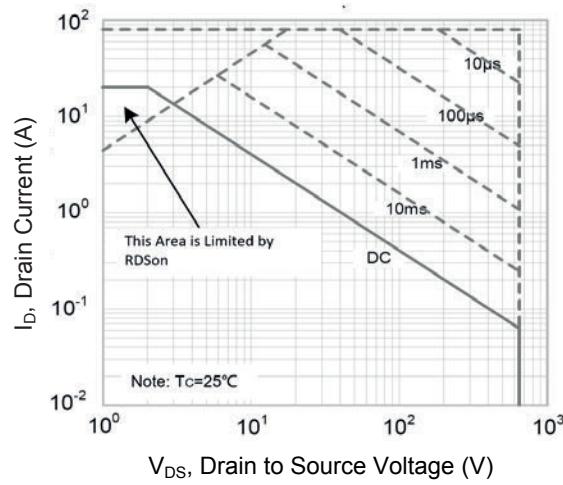
$V_{DS}$ , Drain to Source Voltage (V)

Figure 7. Capacitance Characteristics



$T_J$ , Junction Temperature (°C)

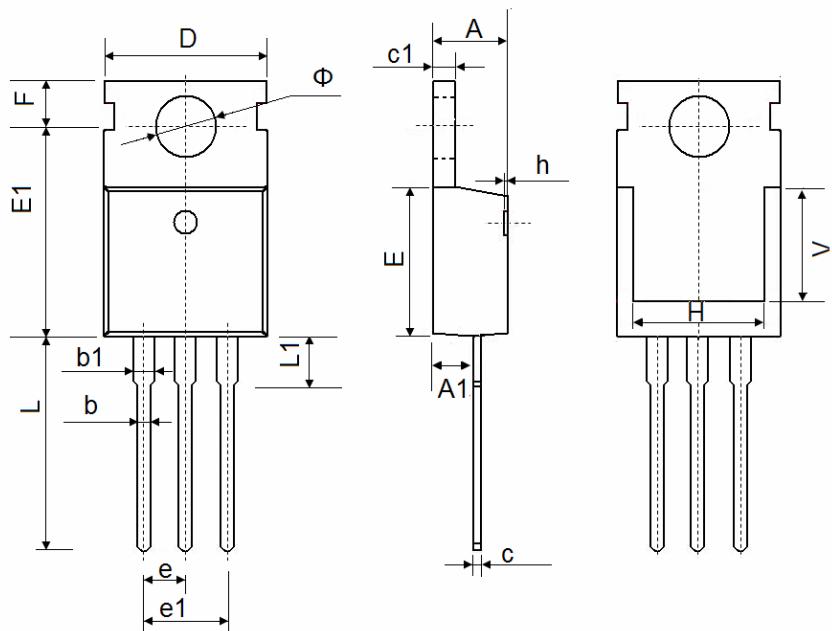
Figure 8. Normalized  $R_{DS(on)}$  Vs.  $T_J$



$V_{DS}$ , Drain to Source Voltage (V)

Figure 9. 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	8.950	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