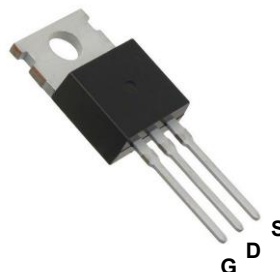
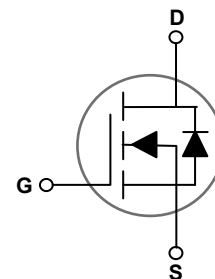


Main Product Characteristics

V_{DS}	40V
$R_{DS(ON)}$	3.2m Ω
I_D	210A



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 GSFH04210 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 ($T_A=25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Max.	Unit
Drain-Source Voltage	V_{DS}	40	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous	I_D	210	A
Drain Current-Continuous($T_C=100^\circ\text{C}$)		148	A
Pulsed Drain Current	I_{DM}	840	A
Maximum Power Dissipation	P_D	310	W
Derating Factor		2.07	W/ $^\circ\text{C}$
Single Pulse Avalanche Energy ⁵	E_{AS}	2500	mJ
Thermal Resistance, Junction-to-Case ²	$R_{\theta JC}$	0.48	$^\circ\text{C}/\text{W}$
Operating Junction Temperature Range	T_J	-55 To +175	$^\circ\text{C}$
Storage Temperature Range	T_{STG}	-55 To +175	$^\circ\text{C}$

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

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	40	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=40V, V_{GS}=0V$	-	-	1	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	± 100	nA
On Characteristics³						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	1.3	1.8	2.5	V
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=20A$	-	2.3	3.2	m Ω
Forward Transconductance	g_{FS}	$V_{DS}=5V, I_D=20A$	-	100	-	S
Dynamic Characteristics⁴						
Input Capacitance	C_{iss}	$V_{DS}=25V, V_{GS}=0V,$ $F=1.0MHz$	-	10331	-	PF
Output Capacitance	C_{oss}		-	1160	-	
Reverse Transfer Capacitance	C_{rss}		-	1045	-	
Switching Characteristics⁴						
Turn-On Delay Time	$t_{d(on)}$	$V_{DD}=30V, R_L=15\Omega$ $V_{GS}=10V, R_G=2.5\Omega$	-	41	-	nS
Turn-On Rise Time	t_r		-	40	-	
Turn-Off Delay Time	$t_{d(off)}$		-	145	-	
Turn-Off Fall Time	t_f		-	65	-	
Total Gate Charge	Q_g	$V_{DD}=20V, I_D=20A,$ $V_{GS}=10V$	-	239	-	nC
Gate-Source Charge	Q_{gs}		-	23.5	-	
Gate-Drain Charge	Q_{gd}		-	49.6	-	
Source-Drain Diode Characteristics						
Diode Forward Voltage ³	V_{SD}	$V_{GS}=0V, I_S=20A$	-	0.85	1.2	V
Diode Forward Current ²	I_S		-	-	210	A
Reverse Recovery Time	t_{rr}	$T_J=25^\circ\text{C}, I_F=20A$ $di/dt=-100A/\mu s^3$	-	55	-	nS
Reverse Recovery Charge	Q_{rr}		-	90	-	nC
Forward Turn-On Time	t_{on}	Intrinsic turn-on is negligible(turn-on is dominated by LS+LD)				

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, $t \leq 10$ sec.
3. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.
4. Guaranteed by design, not subject to production
5. EAS condition: $T_J=25^\circ\text{C}, V_{DD}=20V, V_G=10V, L=0.5mH, R_G=25\Omega$

Typical Electrical and Thermal Characteristic Curves

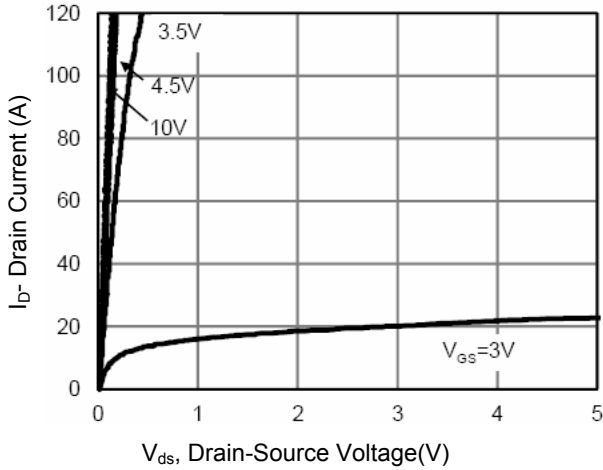


Figure 1. Output Characteristics

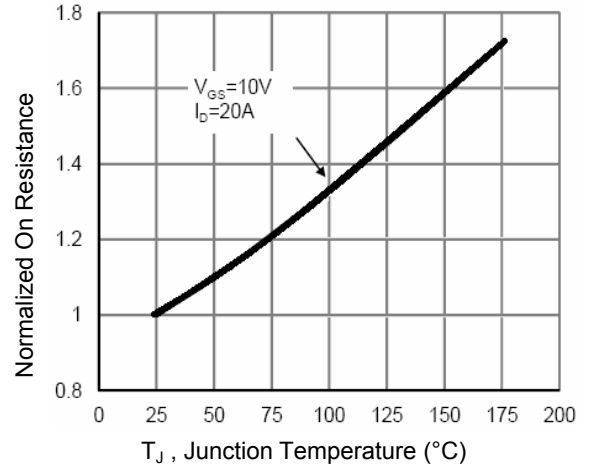


Figure 2. $R_{DS(on)}$ -Junction Temperature

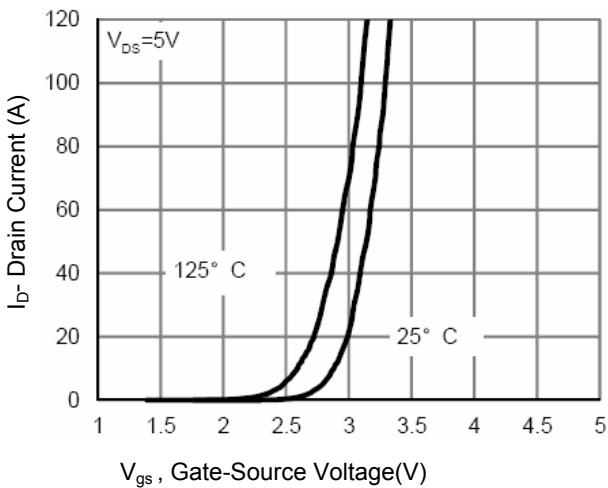


Figure 3. Transfer Characteristics

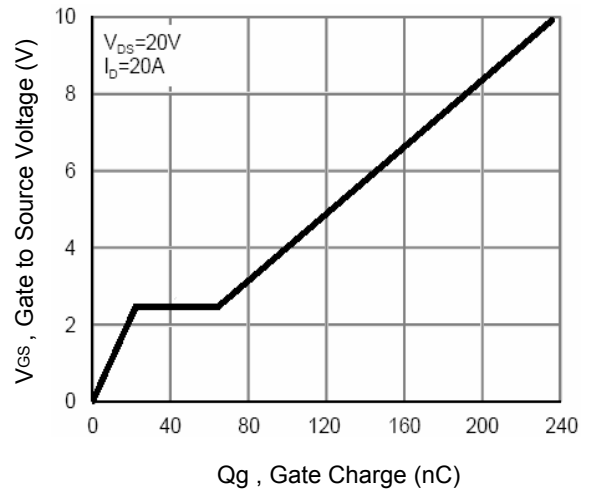


Figure 4. Gate Charge Characteristics

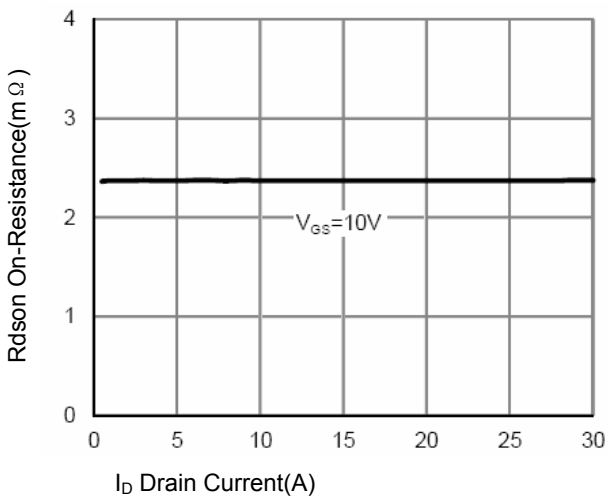


Figure 5. $R_{DS(on)}$ -Drain Current

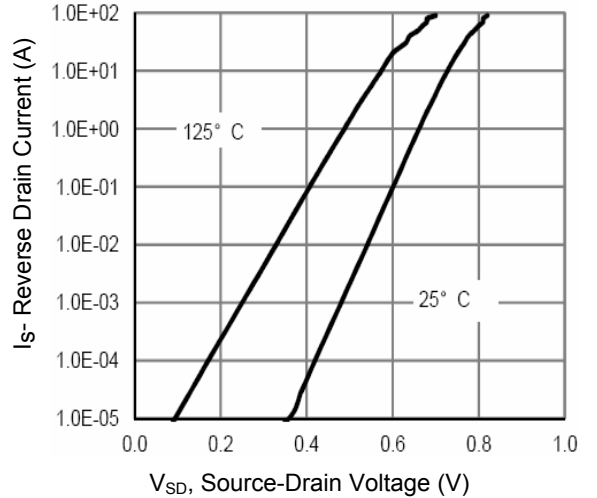


Figure 6. Source-Drain Diode Forward

Typical Electrical and Thermal Characteristic Curves

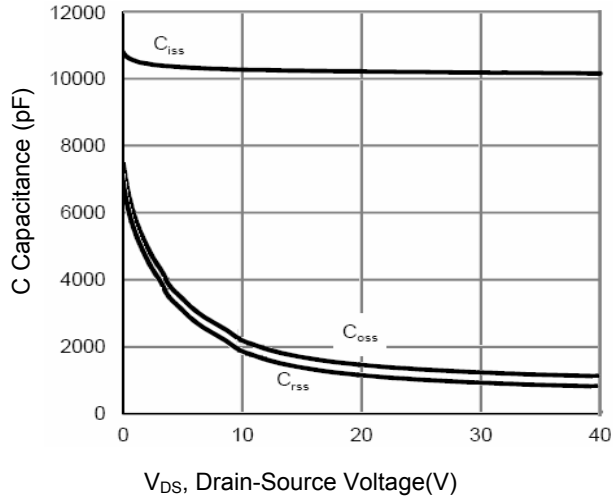


Figure 7. Capacitance vs. V_{DS}

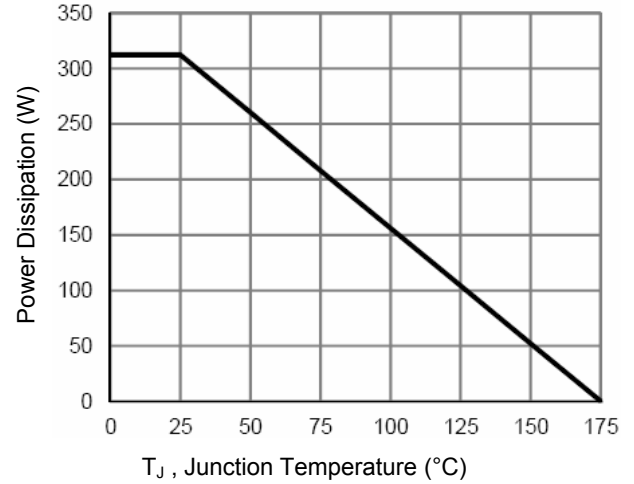


Figure 8. Power De-Rating

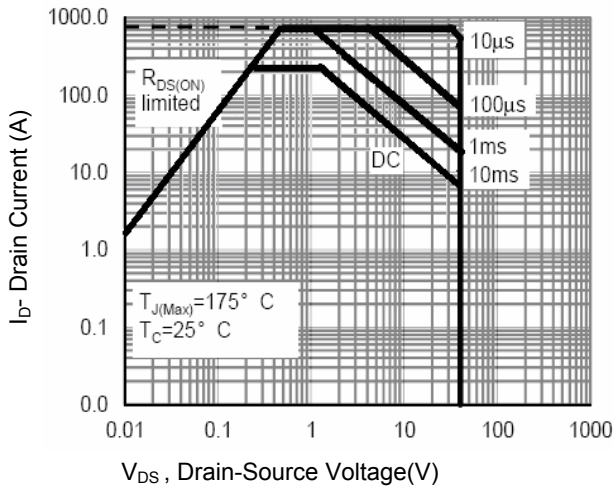


Figure 9. Safe Operation Area

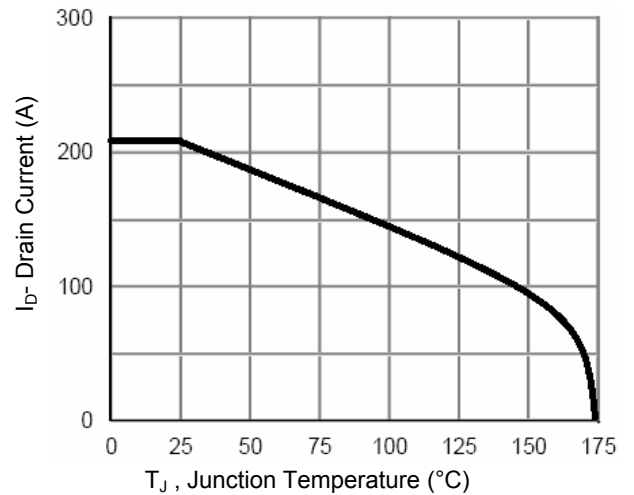


Figure 10. Current De-Rating

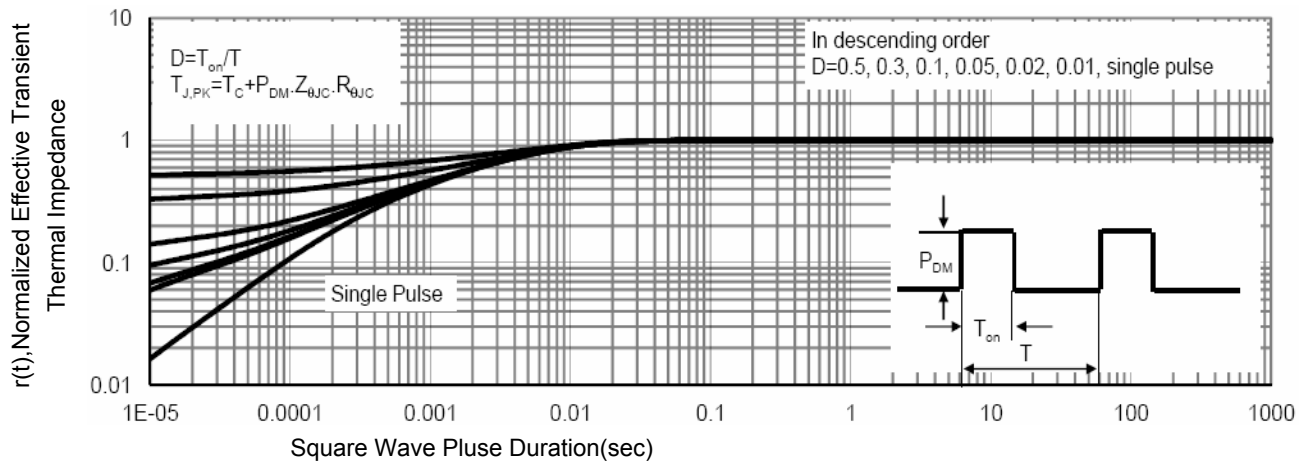


Figure 11. Normalized Maximum Transient Thermal Impedance

Typical Electrical and Thermal Characteristic Curves

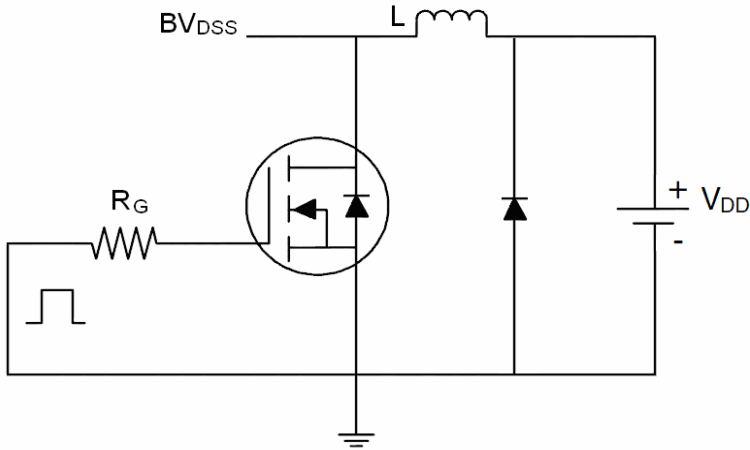


Figure 12. E_{AS} Test Circuit

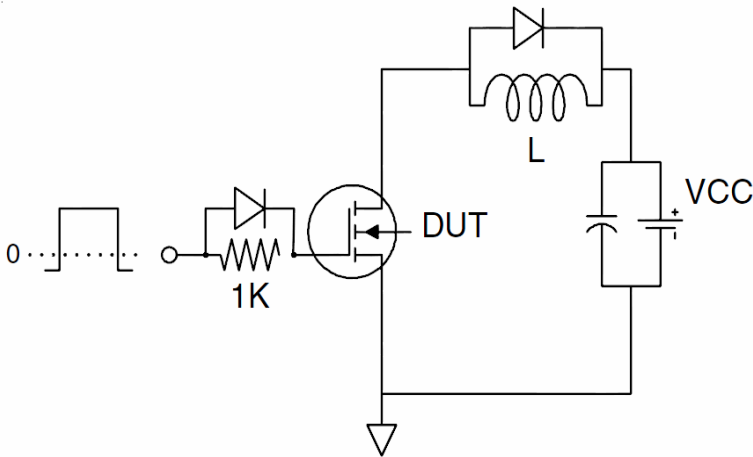


Figure 13. Gate Charge Test Circuit

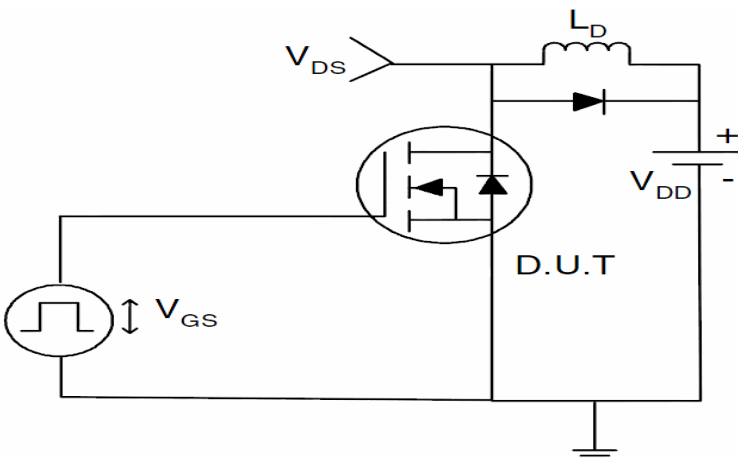
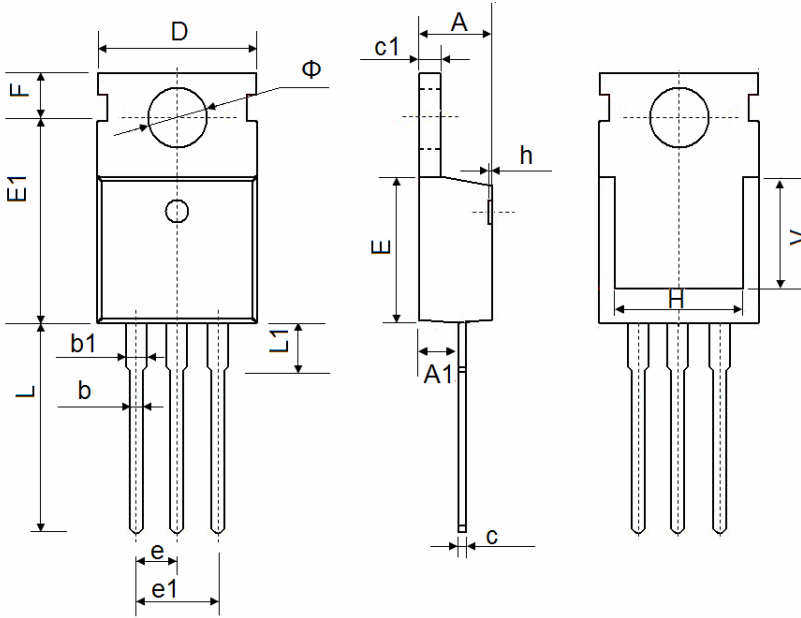


Figure 14. Switch Time Test Circuit

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	7.500 REF.		0.295 REF.	
Φ	3.400	3.800	0.134	0.150