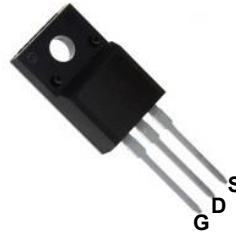
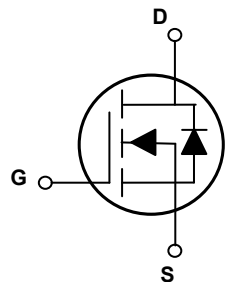


Main Product Characteristics

$V_{(BR)DSS}$	650V
$R_{DS(ON)}$	0.40Ω (max.)
I_D	11A



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 GSFU65R400 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 ($T_A=25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Max.	Unit
Drain-Source Voltage	V_{DS}	650	V
Gate-Source Voltage	V_{GS}	±30	V
Drain Current-Continuous, at Steady-State, ($T_C=25^\circ\text{C}$)	I_D	11	A
Drain Current-Continuous, at Steady-State, ($T_C=100^\circ\text{C}$)		7	
Drain Current-Pulsed	I_{DM}	44	A
Single Pulse Avalanche Energy ¹	E_{AS}	356	mJ
Single Pulse Avalanche Current	I_{AS}	2.8	A
Power Dissipation ($T_C=25^\circ\text{C}$)	P_D	31	W
		0.24	W/ $^\circ\text{C}$
Body Diode Reverse Voltage Slope ²	dv/dt	15	V/ns
MOS dv/dt Ruggedness ³	dv/dt	100	V/ns
Junction-to-Ambient (PCB Mounted, Steady-State)	$R_{\theta JA}$	62.5	$^\circ\text{C/W}$
Junction-to-Case	$R_{\theta JC}$	4.1	$^\circ\text{C/W}$
Operating Junction Temperature Range	T_J	-55 To +150	$^\circ\text{C}$
Storage Temperature Range	T_{STG}	-55 To +150	$^\circ\text{C}$
Soldering Temperature	T_{SOLD}	260	$^\circ\text{C}$

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 _{GS} =0V, I _D =250uA	650	-	-	V
Drain-Source Leakage Current	I _{DSS}	V _{DS} =650V, V _{GS} =0V T _J =25°C	-	-	1	μA
		V _{DS} =650V, V _{GS} =0V T _J =125°C	-	1.5	-	μA
Gate-Source Leakage Current	I _{GSS}	V _{GS} =±30V, V _{DS} =0V	-	-	±100	nA
Static Drain-Source On-Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =5.5A	-	0.33	0.40	Ω
Gate Threshold Voltage	V _{GS(th)}	V _{GS} =V _{DS} , I _D =250uA	2.0	-	4.0	V
Gate Resistance	R _g	F=1MHz	-	3.6	-	Ω
Dynamic and Switching Characteristics						
Total Gate Charge ^{4,5}	Q _g	V _{DD} =520V, I _D =11A, V _{GS} =10V	-	30	-	nC
Gate-Source Charge ^{4,5}	Q _{gs}		-	7.8	-	
Gate-Drain ("Miller") Charge ^{4,5}	Q _{gd}		-	15	-	
Gate Plateau ^{4,5}	V _{plateau}		-	6.9	-	V
Turn-On Delay Time ^{4,5}	t _{d(on)}	V _{DD} =325V, R _G =24Ω, V _{GS} =10V, I _D =11A	-	15	-	nS
Rise Time ^{4,5}	t _r		-	35	-	
Turn-Off Delay Time ^{4,5}	t _{d(off)}		-	65	-	
Fall Time ^{4,5}	t _f		-	30	-	
Input Capacitance	C _{iss}	V _{DS} =100V, V _{GS} =0V, F=1MHz	-	925	-	pF
Output Capacitance	C _{oss}		-	30	-	
Reverse Transfer Capacitance	C _{rss}		-	0.8	-	
Drain-Source Diode Characteristics and Maximum Ratings						
Continuous Source Current (Body Diode)	I _S	T _C =25°C, MOSFET symbol showing the integral reverse p-n junction diode.	-	-	11	A
Diode Pulse Current	I _{S,pulse}		-	-	44	A
Diode Forward Voltage	V _{SD}	V _{GS} =0V, I _S =11A	-	-	1.4	V
Reverse Recovery Time ⁴	t _{rr}	V _{GS} =0V, I _S =11A, dI _F /dt=100A/μs	-	254	-	nS
Reverse Recovery Charge ⁴	Q _{rr}		-	3.2	-	uC
Reverse Recovery Peak Current ⁴	I _{rm}		-	25	-	A

Note:

1. $L=79\text{mH}$, $V_{DD}=100V$, $R_G=25\Omega$, starting temperature $T_J=25^{\circ}\text{C}$.
2. $V_{DS}=0-400V$, $I_{SD} \leq I_S$, $T_J=25^{\circ}\text{C}$.
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

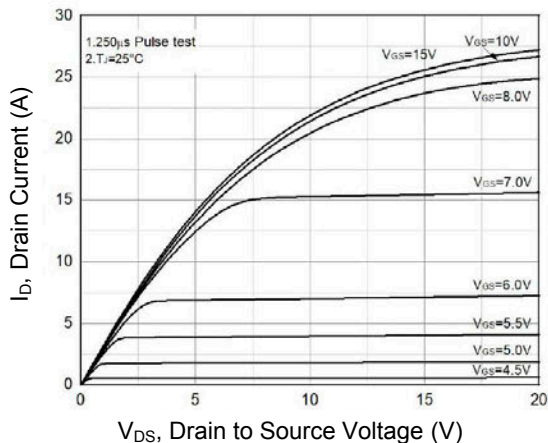


Figure 1. Typical Output Characteristics

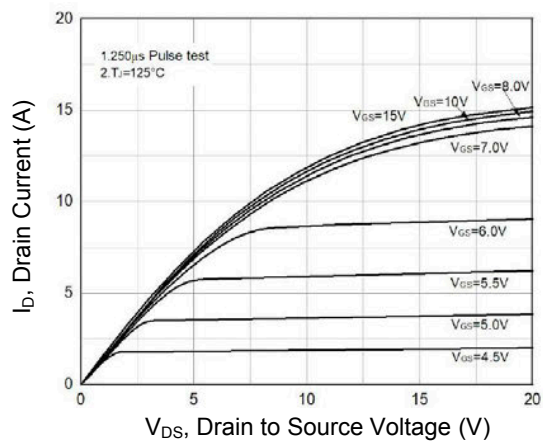


Figure 2. Typical Output Characteristics

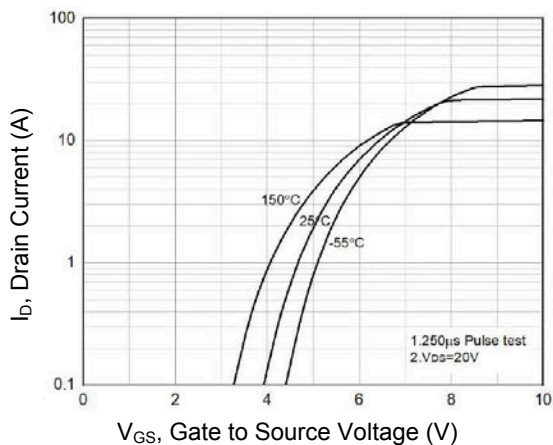


Figure 3. Transfer Characteristics

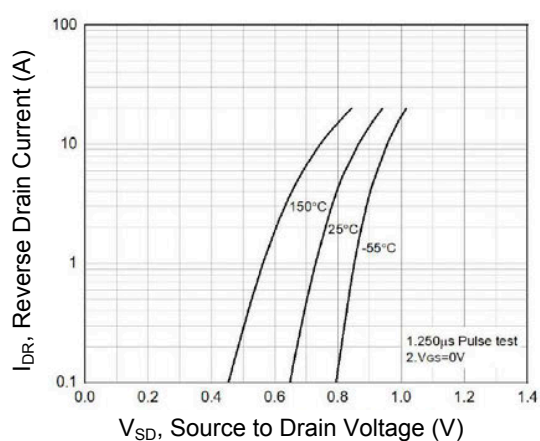


Figure 4. Body Diode Characteristics

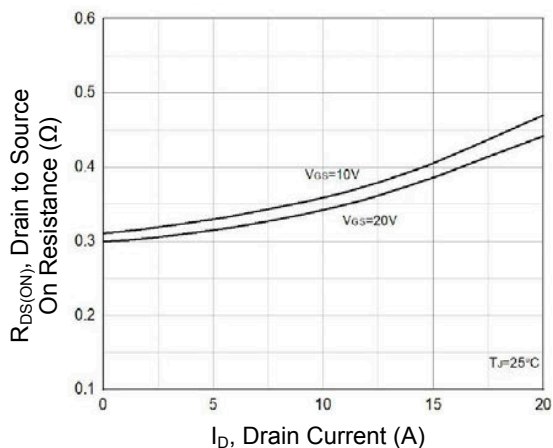


Figure 5. $R_{DS(ON)}$ vs. Drain Current

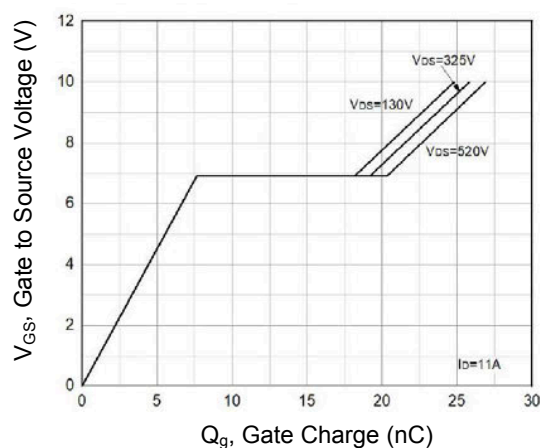


Figure 6. Gate Charge Characteristics

Typical Electrical and Thermal Characteristic Curves

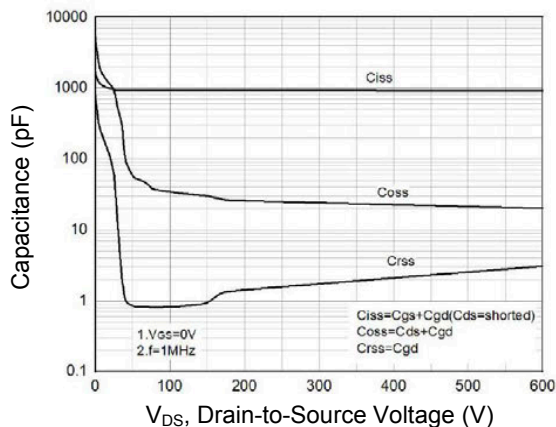


Figure 7. Capacitance Characteristics

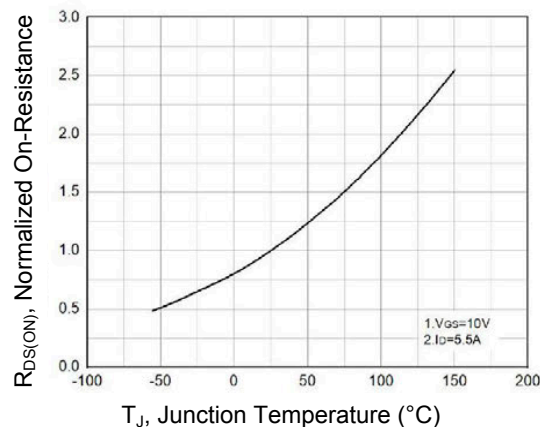


Figure 8. Normalized $R_{DS(on)}$ vs. T_J

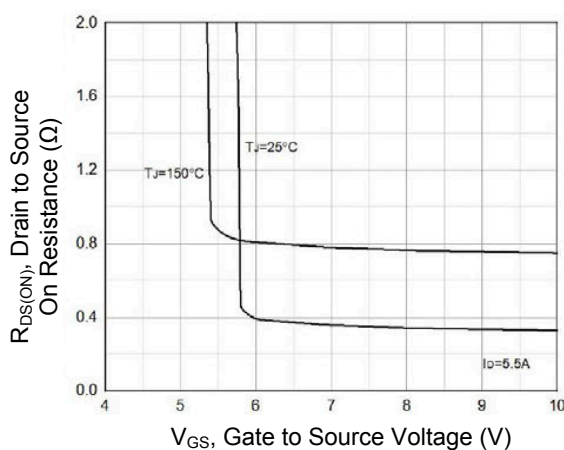


Figure 9. Normalized $R_{DS(on)}$ vs. V_{GS}

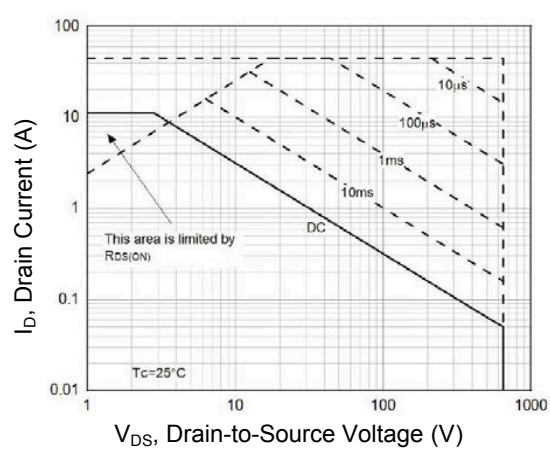


Figure 10. Safe Operation Area

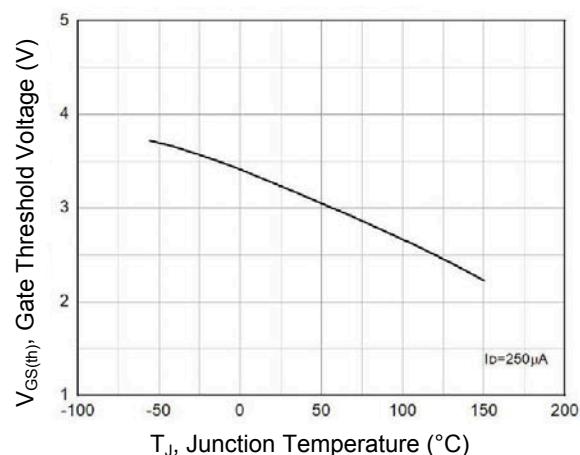


Figure 11. Gate Threshold Voltage vs. T_J

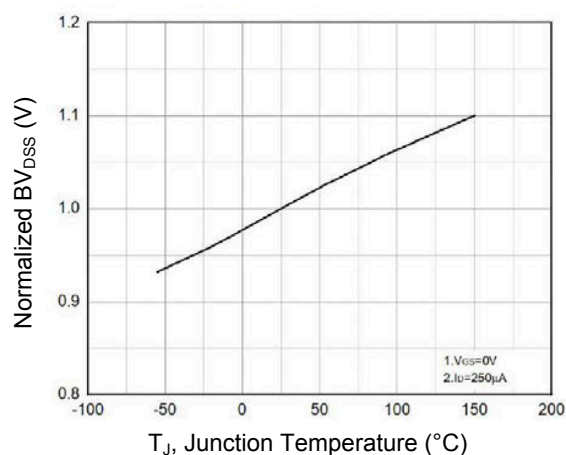
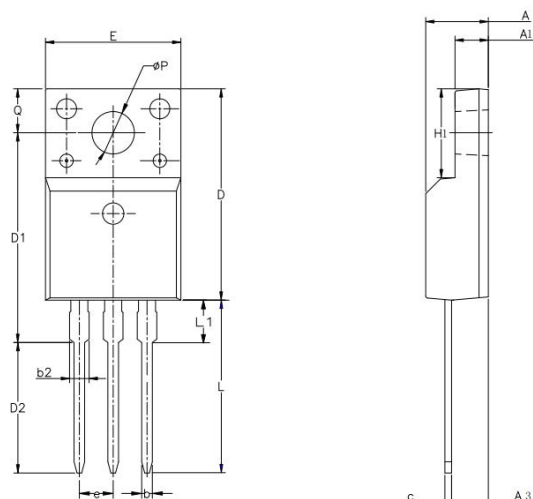


Figure 12. Normalized BV_{DSS} vs. T_J

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	0.850	0.022	0.033
b2	-	1.290	-	0.051
c	0.350	0.650	0.014	0.026
D	15.250	16.250	0.600	0.640
D1	13.970	14.970	0.550	0.589
D2	10.580	11.580	0.417	0.456
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	0.531
L1	-	2.000	-	0.079
θP	3.000	3.400	0.118	0.134
Q	3.050	3.550	0.120	0.140