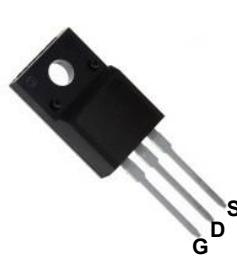
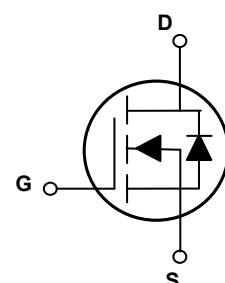


## Main Product Characteristics

$V_{(BR)DSS}$	650V
$R_{DS(ON)}$	0.64Ω (max.)
$I_D$	7A



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 GSFU65R640 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	Max.	Unit
Drain-Source Voltage	$V_{DS}$	650	V
Gate-Source Voltage	$V_{GS}$	$\pm 30$	V
Drain Current-Continuous, at Steady-State, ( $T_C=25^\circ\text{C}$ )	$I_D$	7	A
Drain Current-Continuous, at Steady-State, ( $T_C=100^\circ\text{C}$ )		4.4	
Drain Current-Pulsed	$I_{DM}$	28	A
Single Pulse Avalanche Energy <sup>1</sup>	$E_{AS}$	221	mJ
Power Dissipation ( $T_C=25^\circ\text{C}$ )	$P_D$	28	W
		0.22	W/ $^\circ\text{C}$
Body Diode Reverse Voltage Slope <sup>2</sup>	$dv/dt$	50	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	$^\circ\text{C}/\text{W}$
Junction-to-Case	$R_{\theta JC}$	4.4	$^\circ\text{C}/\text{W}$
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** ( $T_C=25^\circ\text{C}$  unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
<b>On / Off Characteristics</b>						
Drain-Source Breakdown Voltage	$\text{BV}_{\text{DSS}}$	$\text{V}_{\text{GS}}=0\text{V}, \text{I}_D=250\mu\text{A}$	650	-	-	V
Drain-Source Leakage Current	$\text{I}_{\text{DSS}}$	$\text{V}_{\text{DS}}=650\text{V}, \text{V}_{\text{GS}}=0\text{V}$	-	-	200	nA
Gate-Source Leakage Current	$\text{I}_{\text{GSS}}$	$\text{V}_{\text{GS}}=\pm 30\text{V}, \text{V}_{\text{DS}}=0\text{V}$	-	-	$\pm 100$	nA
Static Drain-Source On-Resistance	$\text{R}_{\text{DS(ON)}}$	$\text{V}_{\text{GS}}=10\text{V}, \text{I}_D=3.5\text{A}$ $\text{T}_J=25^\circ\text{C}$	-	0.54	0.64	$\Omega$
		$\text{V}_{\text{GS}}=10\text{V}, \text{I}_D=3.5\text{A}$ $\text{T}_J=125^\circ\text{C}$	-	1.09	-	$\Omega$
Gate Threshold Voltage	$\text{V}_{\text{GS(th)}}$	$\text{V}_{\text{GS}}=\text{V}_{\text{DS}}, \text{I}_D=250\mu\text{A}$	2.0	-	4.0	V
Gate Resistance	$\text{R}_g$	$\text{F}=1\text{MHz}$	-	4.7	-	$\Omega$
<b>Dynamic and Switching Characteristics</b>						
Total Gate Charge <sup>4,5</sup>	$\text{Q}_g$	$\text{V}_{\text{DD}}=520\text{V}, \text{I}_D=7\text{A},$ $\text{V}_{\text{GS}}=10\text{V}$	-	20	-	nC
Gate-Source Charge <sup>4,5</sup>	$\text{Q}_{\text{gs}}$		-	5.2	-	
Gate-Drain ("Miller") Charge <sup>4,5</sup>	$\text{Q}_{\text{gd}}$		-	8.8	-	
Turn-On Delay Time <sup>4,5</sup>	$t_{\text{d(on)}}$	$\text{V}_{\text{DD}}=325\text{V}, \text{R}_g=25\Omega,$ $\text{V}_{\text{GS}}=10\text{V}, \text{I}_D=7\text{A}$	-	21	-	nS
Rise Time <sup>4,5</sup>	$t_r$		-	39	-	
Turn-Off Delay Time <sup>4,5</sup>	$t_{\text{d(off)}}$		-	90	-	
Fall Time <sup>4,5</sup>	$t_f$		-	36	-	
Input Capacitance	$\text{C}_{\text{iss}}$	$\text{V}_{\text{DS}}=100\text{V}, \text{V}_{\text{GS}}=0\text{V},$ $\text{F}=1\text{MHz}$	-	605	-	pF
Output Capacitance	$\text{C}_{\text{oss}}$		-	25	-	
Reverse Transfer Capacitance	$\text{C}_{\text{rss}}$		-	0.8	-	
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
Continuous Source Current (Body Diode)	$\text{I}_S$	$\text{T}_C=25^\circ\text{C},$ MOSFET symbol showing the integral reverse p-n junction diode.	-	-	7	A
Source Pulse Current	$\text{I}_{\text{SM}}$		-	-	28	A
Diode Forward Voltage	$\text{V}_{\text{SD}}$	$\text{V}_{\text{GS}}=0\text{V}, \text{I}_S=7\text{A}$	-	-	1.4	V
Reverse Recovery Time <sup>3</sup>	$t_{\text{rr}}$	$\text{V}_{\text{GS}}=0\text{V}, \text{I}_F=7\text{A},$ $d\text{I}_F/dt=100\text{A}/\mu\text{s}$	-	239	-	nS
Reverse Recovery Charge <sup>3</sup>	$\text{Q}_{\text{rr}}$		-	2.5	-	uC

Note:

1.  $L=79\text{mH}, \text{I}_{AS}=2.2\text{A}, \text{V}_{DD}=100\text{V}$ , starting temperature  $\text{T}_J=25^\circ\text{C}$ .
2.  $\text{V}_{\text{DS}}=0-400\text{V}, \text{I}_{SD} \leq 20\text{A}, \text{T}_J=25^\circ\text{C}$ .
3.  $\text{V}_{\text{DS}}=0-480\text{V}$ .
4. Pulse test: pulse width  $\leq 300\text{us}$ , duty cycle  $\leq 2\%$ .
5. Essentially independent of operating temperature.

## Typical Electrical and Thermal Characteristic Curves

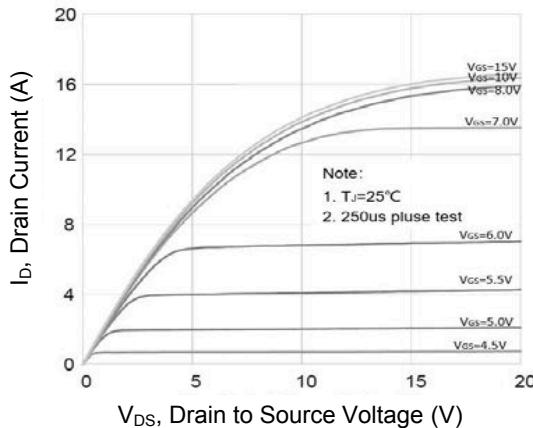


Figure 1. Typical Output Characteristics

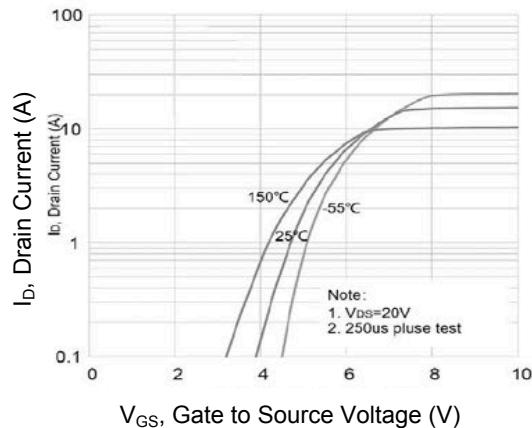


Figure 2. Transfer Characteristics

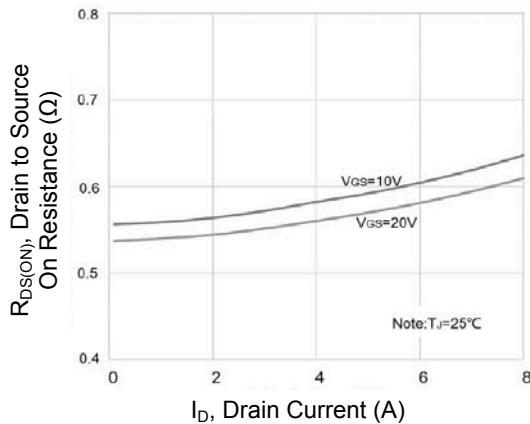


Figure 3.  $R_{DS(ON)}$  vs. Drain Current

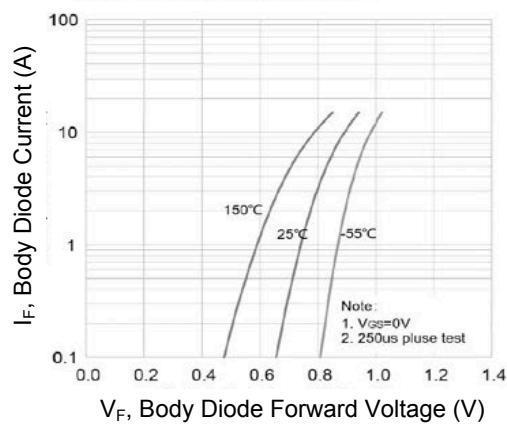


Figure 4. Body Diode Characteristics

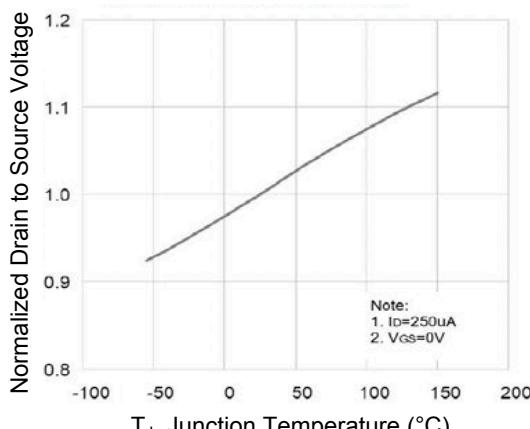


Figure 5. Normalized  $BV_{DSS}$  vs.  $T_J$

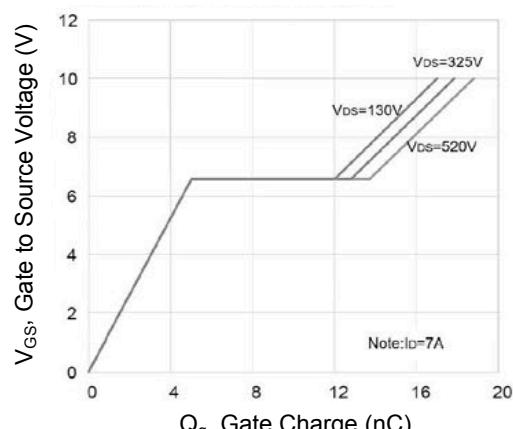


Figure 6. Gate Charge Characteristics

### Typical Electrical and Thermal Characteristic Curves

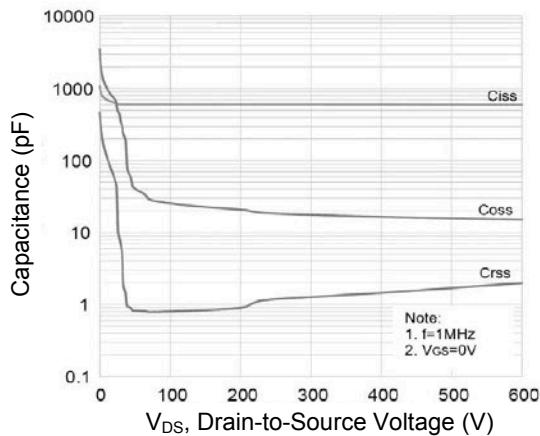


Figure 7. Capacitance Characteristics

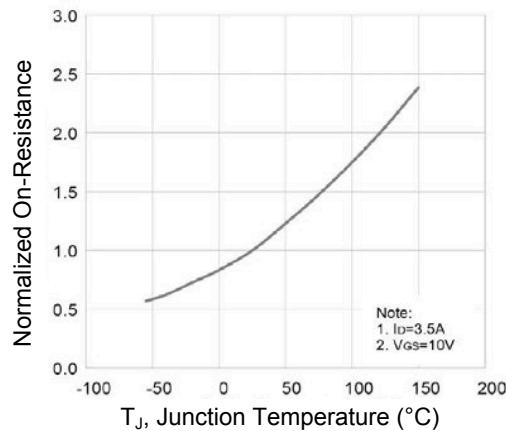


Figure 8. Normalized  $R_{DS(ON)}$  vs.  $T_J$

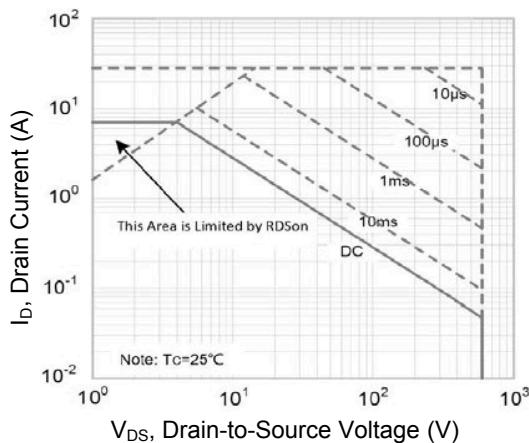
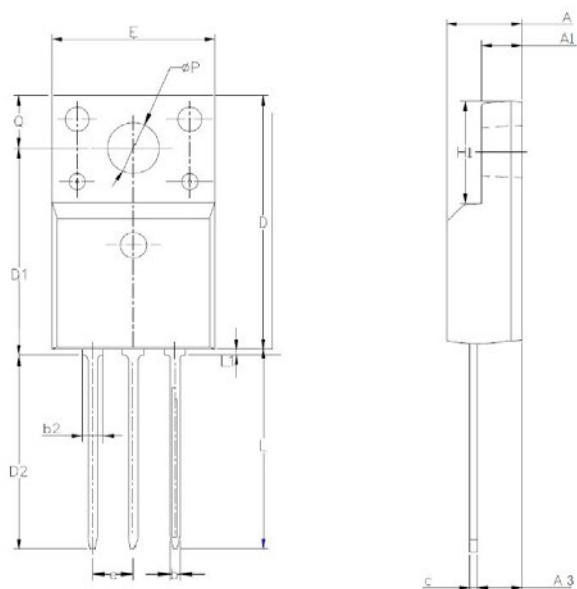


Figure 9. Safe Operation Area

**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	0.800	0.022	0.031
b2	-	1.290	-	0.051
c	0.350	0.650	0.014	0.026
D	15.250	16.250	0.600	0.640
D1	12.870	13.270	0.507	0.522
D2	12.280	12.680	0.483	0.500
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	0.530
L1	-	0.850	-	0.033
ØP	3.000	3.400	0.118	0.134
Q	3.050	3.550	0.120	0.140