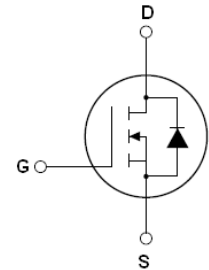


Main Product Characteristics

V_{DS}	650V
$R_{DS(ON)}$	950m Ω (Typ) @ $V_{GS}=10$ V
I_D	4A



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 SSFU65N04 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 ($T_C=25^{\circ}\text{C}$ unless otherwise specified)

Parameter	Symbol	Value	Unit
Drain-Source Voltage ($V_{GS}=0\text{V}$)	V_{DS}	650	V
Gate-Source Voltage ($V_{DS}=0\text{V}$), AC ($f>1$ Hz)	V_{GS}	± 30	V
Continuous Drain Current at $T_C=25^{\circ}\text{C}$	I_D (DC)	4*	A
Continuous Drain Current at $T_C=100^{\circ}\text{C}$	I_D (DC)	2.5*	A
Pulsed Drain Current ¹	I_{DM} (pulse)	16*	A
Maximum Power Dissipation ($T_C=25^{\circ}\text{C}$)	P_D	28.4	W
Power Dissipation-Derate Above 25°C		0.227	W/ $^{\circ}\text{C}$
Single Pulse Avalanche Energy ²	E_{AS}	27	mJ
Avalanche Current ¹	I_{AR}	0.7	A
Repetitive Avalanche Energy t_{AR} Limited by T_{jmax} ¹	E_{AR}	0.1	mJ
Drain Source Voltage Slope, $V_{DS} \leq 480$ V	dv/dt	50	V/nS
Reverse Diode dv/dt , $V_{DS} \leq 480$ V, $I_{SD} < I_D$	dv/dt	15	V/nS
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 to +150	$^{\circ}\text{C}$

* Limited by maximum junction temperature

Thermal Characteristics

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case (Maximum)	$R_{\theta JC}$	4.4	$^{\circ}C/W$
Thermal Resistance, Junction-to-Ambient (Maximum)	$R_{\theta JA}$	80	$^{\circ}C/W$

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

Parameter	Symbol	Condition	Min	Typ	Max	Unit
On/off States						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	650	-	-	V
Zero Gate Voltage Drain Current($T_C=25^{\circ}C$)	I_{DSS}	$V_{DS}=650V, V_{GS}=0V$	-	-	1	μA
Zero Gate Voltage Drain Current($T_C=125^{\circ}C$)	I_{DSS}	$V_{DS}=650V, V_{GS}=0V$	-	-	50	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	± 100	nA
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	3	-	4	V
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=2A$		950	1100	m Ω
Dynamic Characteristics						
Input Capacitance	C_{iss}	$V_{DS}=50V, V_{GS}=0V,$ $F=1.0MHz$	-	304	-	pF
Output Capacitance	C_{oss}		-	18	-	pF
Reverse Transfer Capacitance	C_{rss}		-	0.6	-	pF
Total Gate Charge	Q_g	$V_{DS}=480V, I_D=4A,$ $V_{GS}=10V$	-	8.8	12	nC
Gate-Source Charge	Q_{gs}		-	2.3	-	nC
Gate-Drain Charge	Q_{gd}		-	4	-	nC
Switching Times						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=380V, I_D=2.5A,$ $R_G=5\Omega, V_{GS}=10V$	-	8	-	nS
Turn-on Rise Time	t_r		-	4	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	52	70	nS
Turn-Off Fall Time	t_f		-	9	18	nS
Source- Drain Diode Characteristics						
Source-Drain Current(Body Diode)	I_{SD}	$T_C=25^{\circ}C$	-	-	4	A
Pulsed Source-Drain Current(Body Diode)	I_{SDM}		-	-	16	A
Forward On Voltage	V_{SD}	$T_J=25^{\circ}C, I_{SD}=4A, V_{GS}=0V$	-	0.9	1.2	V
Reverse Recovery Time	t_{rr}	$T_J=25^{\circ}C, I_F=2A, di/dt=100A/\mu S$	-	200	-	nS
Reverse Recovery Charge	Q_{rr}		-	0.6	-	μC
Peak Reverse Recovery Current	I_{rrm}		-	6	-	A

Notes: 1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. $T_J=25^{\circ}C, V_{DD}=50V, V_G=10V, R_G=25\Omega$

Typical Electrical and Thermal Characteristic Curves

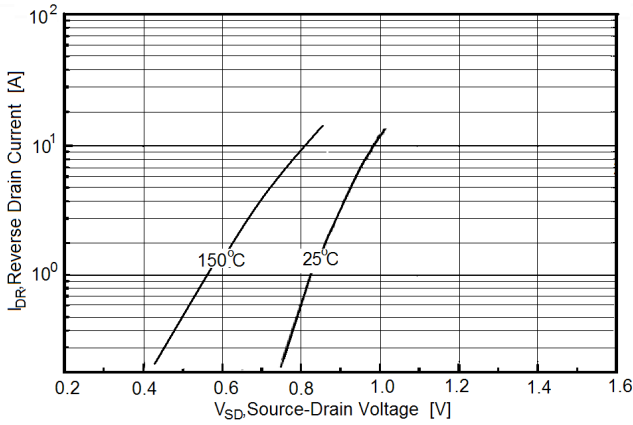


Fig.1 Source-Drain Diode Forward Voltage

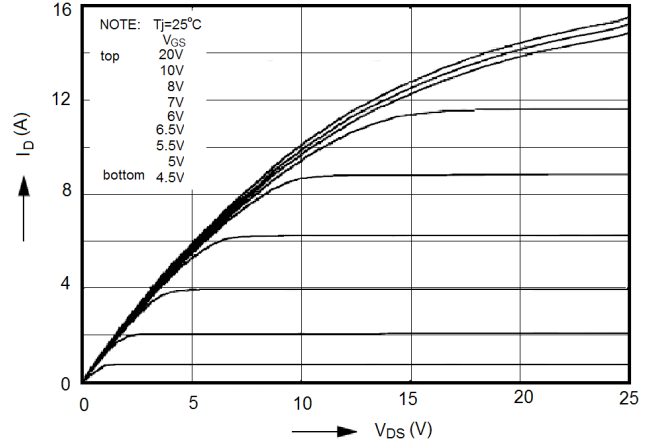


Fig.2. Output Characteristics

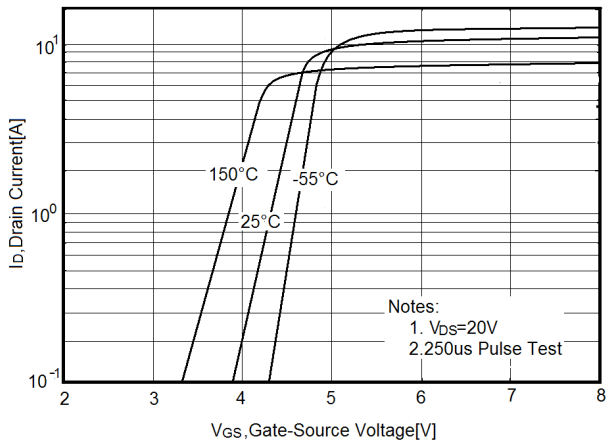


Fig.3 Transfer Characteristics

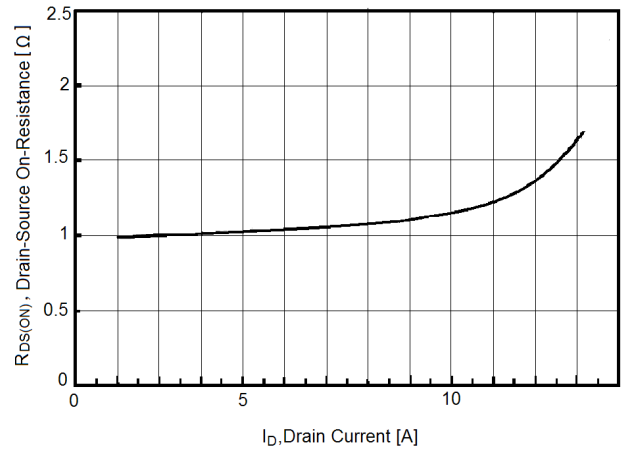


Fig.4 Static Drain-Source On Resistance

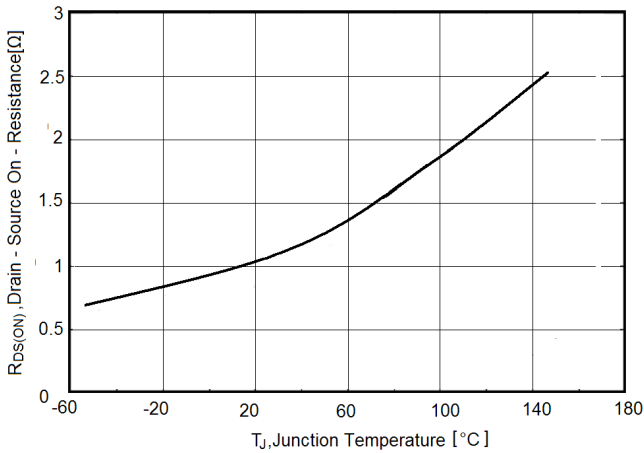


Fig.5 $R_{DS(ON)}$ vs Junction Temperature

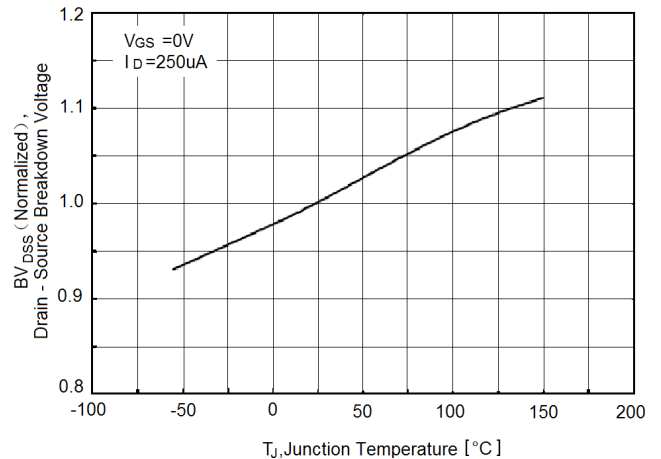


Fig.6 BV_{DSS} vs Junction Temperature

Typical Electrical and Thermal Characteristic Curves

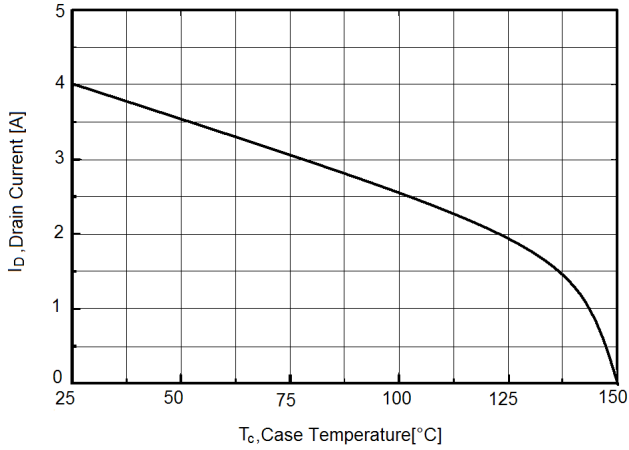


Fig.7 Maximum I_D vs Junction Temperature

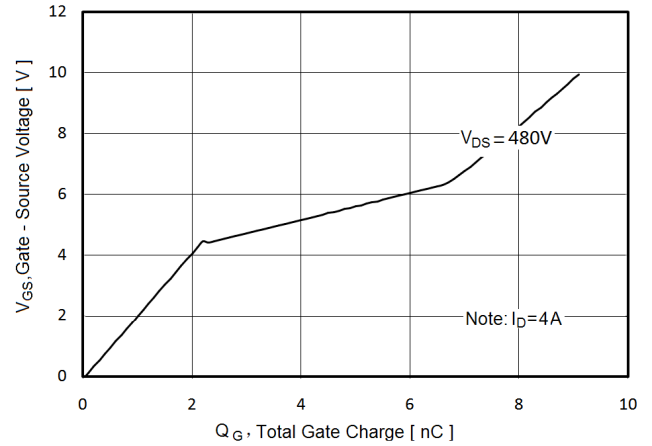


Fig.8 Gate Charge Waveforms

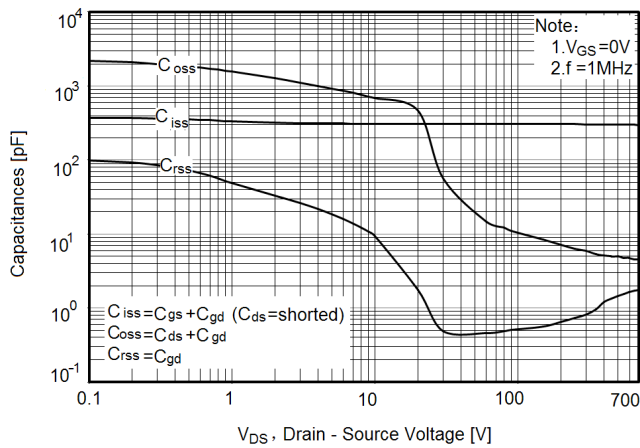


Fig.9 Capacitance

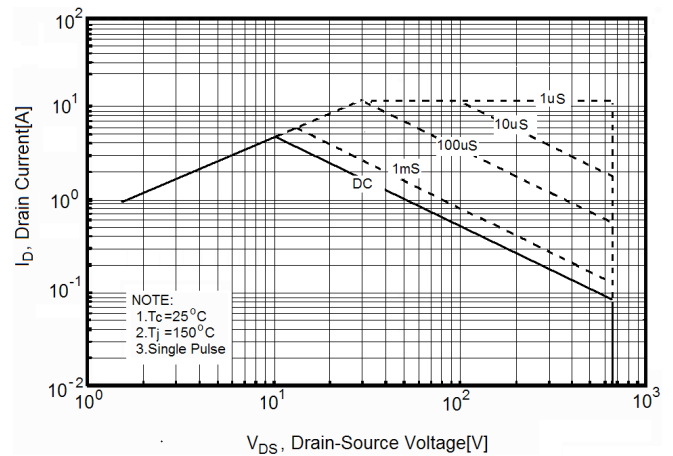


Fig.10 Safe Operating Area

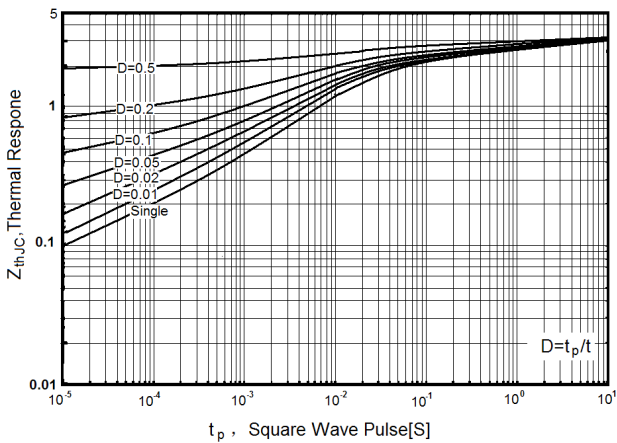


Fig.11 Transient Thermal Impedance

Test Circuits & Waveforms

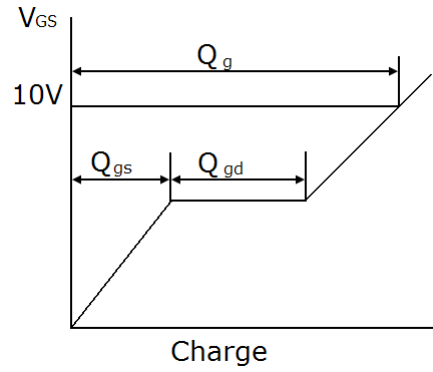
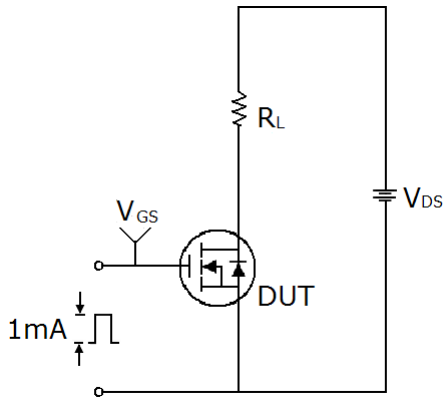


Fig.12 Gate Charge Test Circuit & Waveform

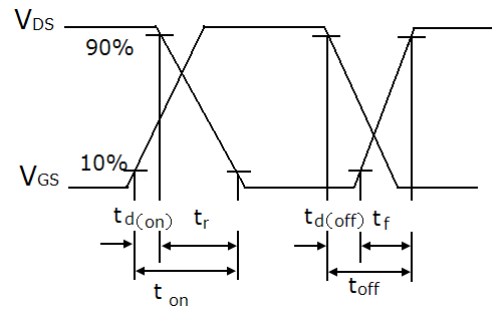
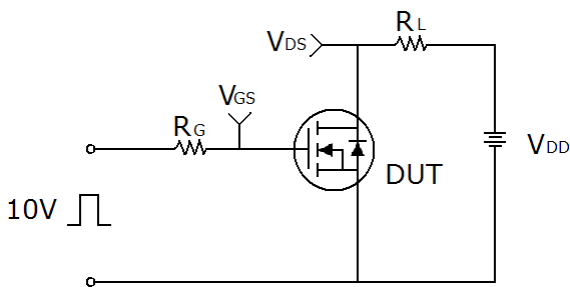


Fig.13 Switch Time Test Circuit & Waveform

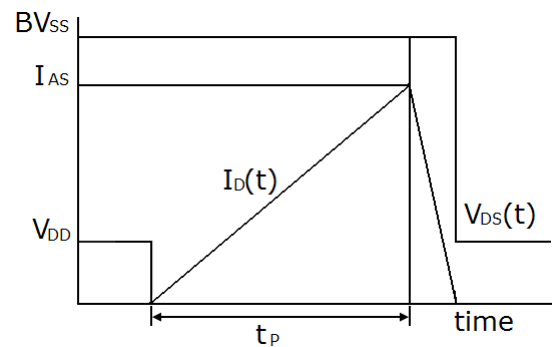
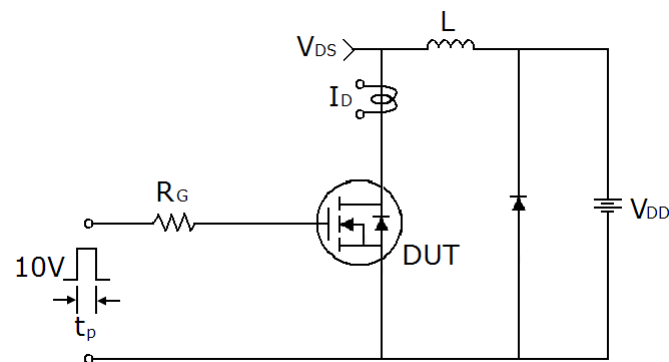
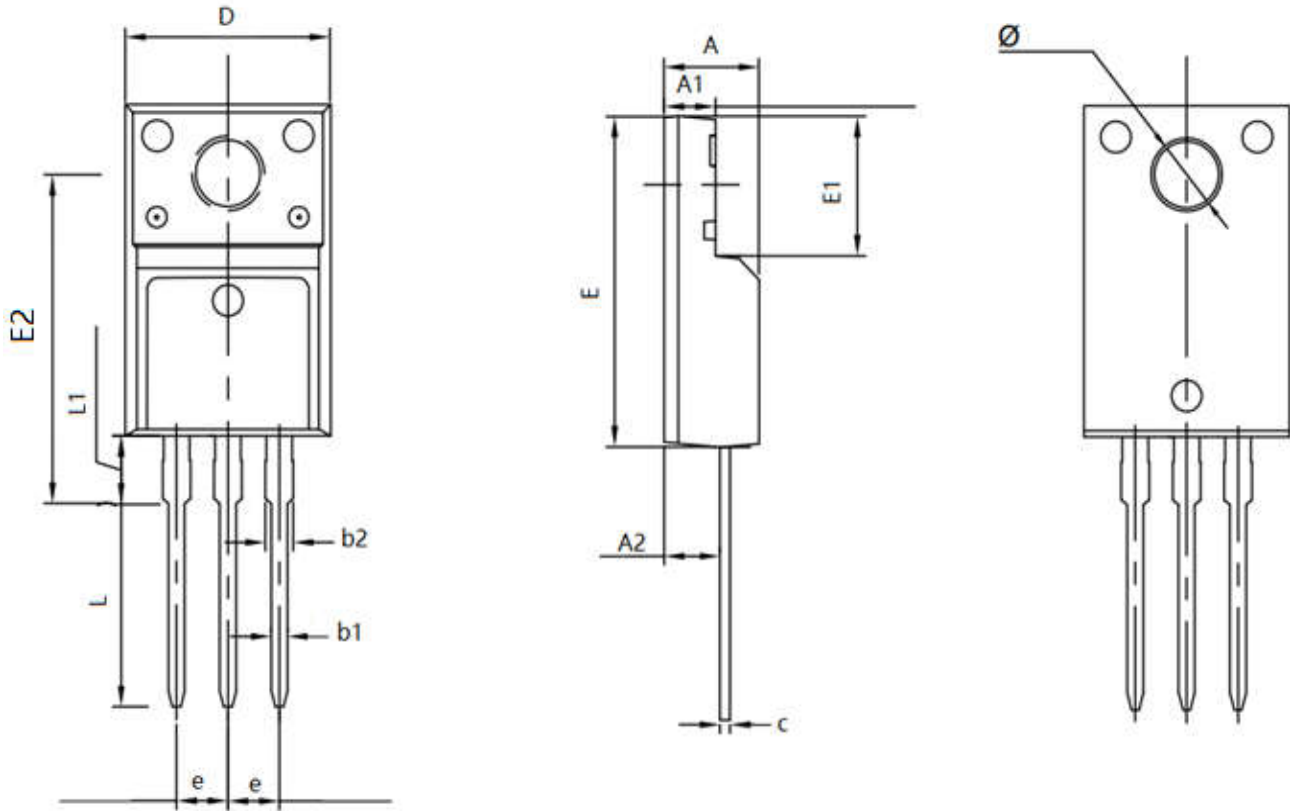


Fig.14 Unclamped Inductive Switching Test Circuit & Waveform

Package Outline Dimensions

TO-220F



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.500	4.900	0.177	0.193
A1	2.340	2.740	0.092	0.108
A2	2.560	2.960	0.101	0.117
b1	0.700	0.900	0.028	0.035
b2	1.180	1.580	0.046	0.062
c	0.400	0.600	0.016	0.024
D	9.960	10.360	0.392	0.408
E	15.670	15.970	0.617	0.629
E1	6.500	6.900	0.256	0.272
E2	15.500	16.100	0.610	0.634
e	2.540 TYP		0.100 TYP	
Φ	3.080	3.280	0.121	0.129
L	12.640	13.240	0.498	0.521
L1	3.030	3.430	0.119	0.135