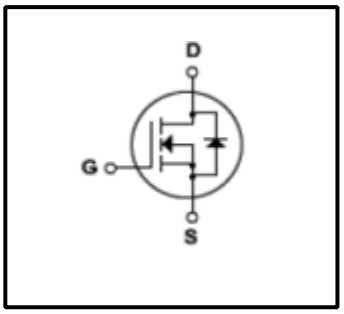
# WFF12N65S

## *650V Super-Junction Power MOSFET*

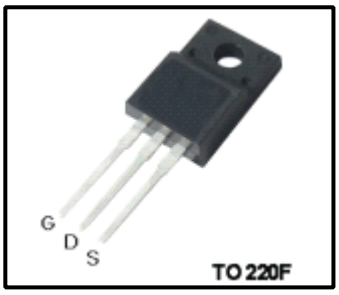
### Features

- Ultra low $R_{dson}$
- Ultra low gate charge (typ. $Q_g$ = 28nC)
- 100% UIS tested
- RoHS compliant
- Maximum Junction Temperature Range(150℃)




### General Description

Power MOSFET is fabricated using advanced super junction technology. The resulting device has extremely low on resistance, making it especially suitable for applications which require superior power density and outstanding efficiency.




### Absolute Maximum Ratings

| Symbol | Parameter | Value | Units |
|---|---|---|---|
| $V_{DSS}$ | Drain Source Voltage | 650 | V |
| $I_D$ | Continuous Drain Current(@Tc=25℃) | 12 | A |
| $I_{DM}$ | Drain Current Pulsed [1] | 30 | A |
| $V_{GS}$ | Gate to Source Voltage | ±30 | V |
| $E_{AS}$ | Single Pulse Avalanche Energy [2] | 350 | mJ |
| $I_{AR}$ | Single Pulse Avalanche Current [1] | 12 | A |
| $E_{AR}$ | Repetitive Avalanche Energy [1] | 12.5 | mJ |
| $P_D$ | Total Power Dissipation(@Tc=25℃)<br>-Derate above 25℃ | 33<br>0.26 | W |
| $T_J$ | Junction Temperature | 150 | ℃ |
| $T_{stg}$ | Storage Temperature | -55~150 | ℃ |
| Is | Continuous diode forward current | 12 | A |
| Is,pulse | Diode pulse current | 30 | A |

Notes:

1.Repetitive Rating:Pulse width limited by maximum Junction Temperature

2.$I_{AS}$=3.5,$V_{DD}$=60V,$R_G$=25Ω,Starting $T_J$=25℃

### Thermal Characteristics

| Symbol | Parameter | Value | | | Units |
|---|---|---|---|---|---|
| | | Min | Typ | Max | |
| $R_{\theta JC}$ | Thermal Resistance , Junction -to -Case | - | - | 3.8 | ℃/W |
| $R_{\theta JA}$ | Thermal Resistance , Junction -to -Ambient | - | - | 80 | ℃/W |

## Electrical Characteristics(Tc=25℃ unless otherwise noted)

| Characteristics | Symbol | Test Condition | Min | Type | Max | Unit |
|---|---|---|---|---|---|---|
| Gate leakage current | $I_{GSS}$ | $V_{GS}$=±30V,$V_{DS}$=0V | - | - | ±100 | nA |
| Drain cut -off current | $I_{DSS}$ | $V_{DS}$=650,$V_{GS}$=0V | - | - | 1 | μA |
| Drain -source breakdown voltage | $V_{(BR)DSS}$ | $I_D$=250μA,$V_{GS}$=0V | 650 | - | - | V |
| Gate threshold voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$,$I_D$=250uA | 2.5 | - | 4.5 | V |
| Drain -source ON resistance | $R_{DS(ON)}$ | $V_{GS}$=10V,$I_D$=6A<br>Tj=25℃<br>Tj=125℃ | -<br>- | 0.315<br>0.69 | 0.35<br>- | Ω |
| Gate resistance | $R_G$ | f=1MHz,open drain | - | 0.9 | - | Ω |
| Input capacitance | $C_{iss}$ | $V_{DS}$=25V, | - | 1040 | | pF |
| Reverse transfer capacitance | $C_{rss}$ | $V_{GS}$=0V, | - | 10 | | |
| Output capacitance | $C_{oss}$ | f=1MHz | - | 780 | | |
| Turn-on delay time | td(on) | $V_{DD}$ = 380V, $I_D$ = 6A $R_G$ = 4.7Ω, $V_{GS}$=10V | - | 16 | - | ns |
| Rise time | $t_r$ | | - | 14 | - | |
| Turn-off delay time | td(off) | | - | 40 | - | |
| Fall time | tf | | - | 5 | - | |
| Gate to source charge | Qgs | $V_{DD}$=480 V, $I_D$=6A, $V_{GS}$=0 to 10 V | - | 6 | - | nC |
| Gate to drain charge | Qgd | | - | 13 | - | |
| Gate charge total | Qg | | - | 28 | - | |
| Gate plateau voltage | Vplateau | | - | 5.5 | - | |

## Source-Drain Ratings and Characteristics(Ta=25℃)

| Characteristics | Symbol | Test Condition | Min | Type | Max | Unit |
|---|---|---|---|---|---|---|
| Diode forward voltage | $V_{SD}$ | $V_{GS}$=0 V, $I_F$=6A | - | - | 1.4 | V |
| Reverse recovery time | $t_{rr}$ | $V_R$=50 V, $I_F$=12A, dI$_F$/dt=100 A/μs | - | 439 | - | ns |
| Reverse recovery charge | $Q_{rr}$ | | - | 3.6 | - | μc |
| Peak reverse recovery current | $I_{rrm}$ | | - | 15 | - | A |

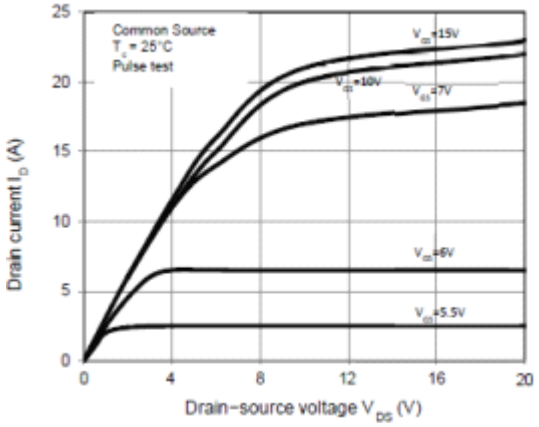



Fig.1 On-Region Characteristics

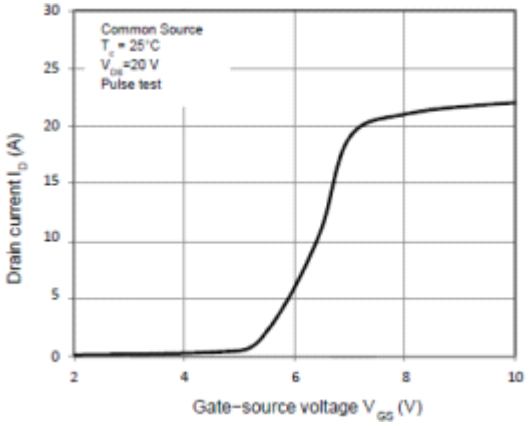



Fig.2 Transfer Characteristics

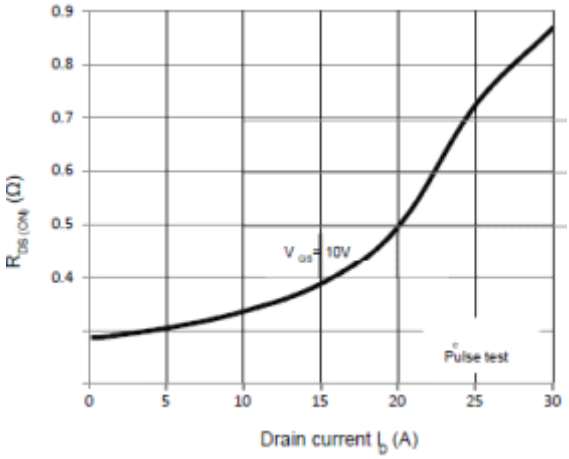



Fig.3 On-Resistance Variation vs. Drain Current

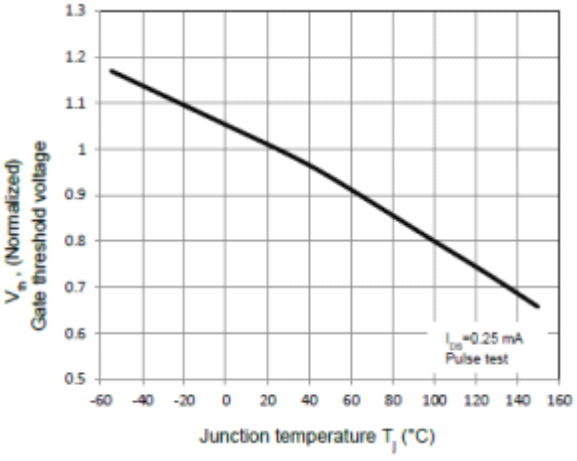



Fig.4 Threshold Voltage vs.Temperature

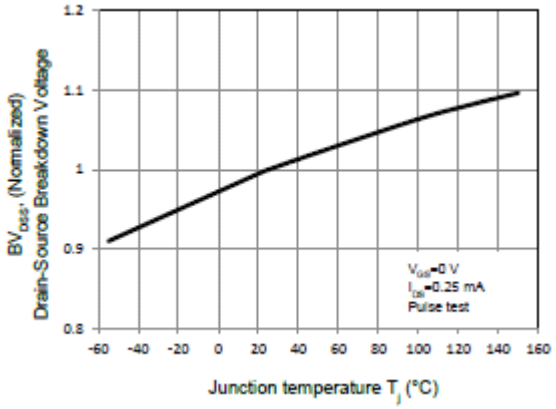



Fig.5 Breakdown Voltage vs. Temperature

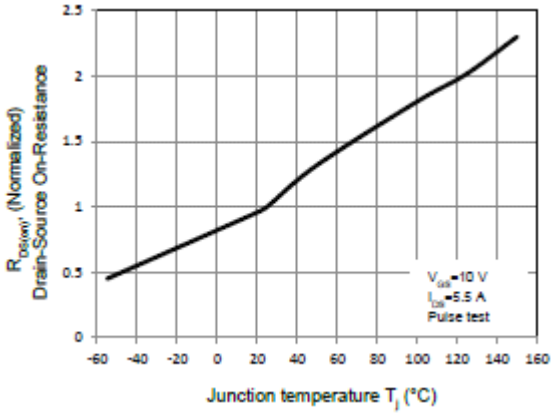



Fig.6 On-Resistance vs. Temperature

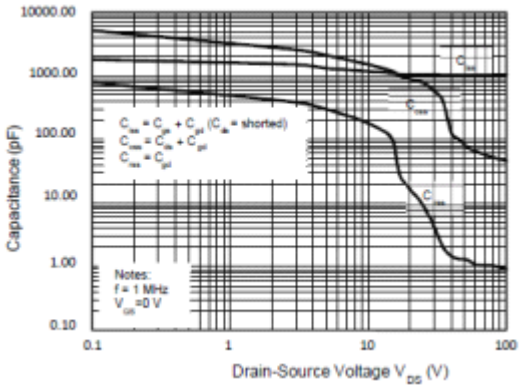



Fig.7 Capacitance Characteristics

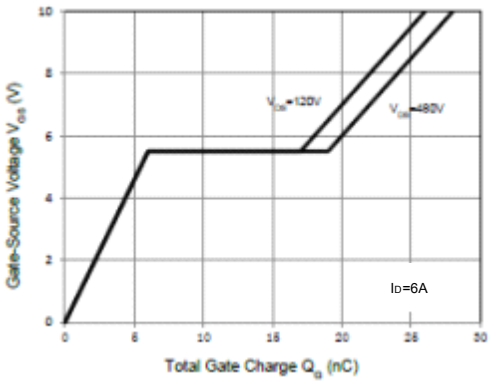



Fig.8 Gate Charge Characteristics

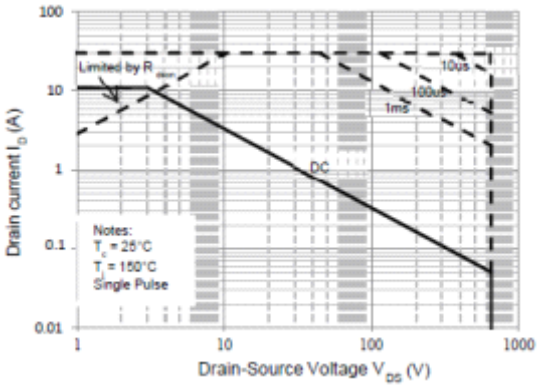



Fig.9 Maximum Safe Operating Area

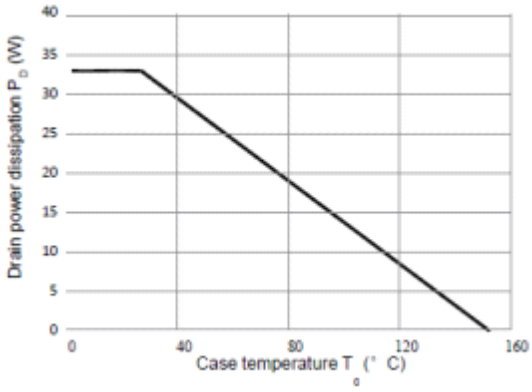



Fig.10 Power Dissipation vs. Temperature

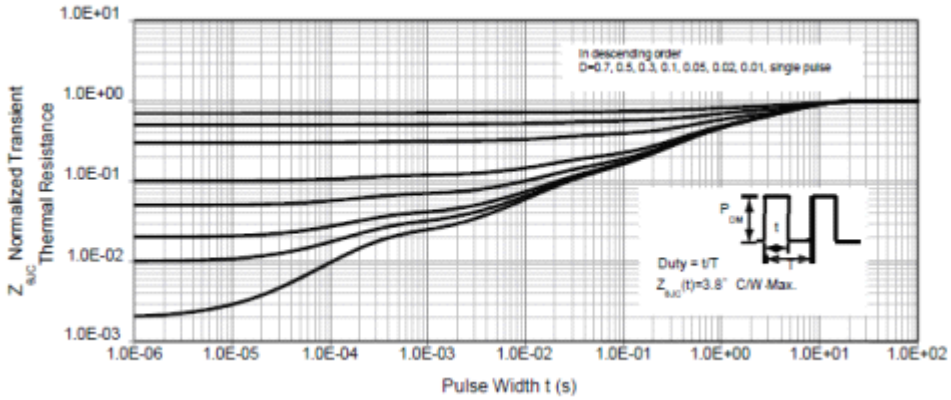



Fig.11 Transient Thermal Response Curve

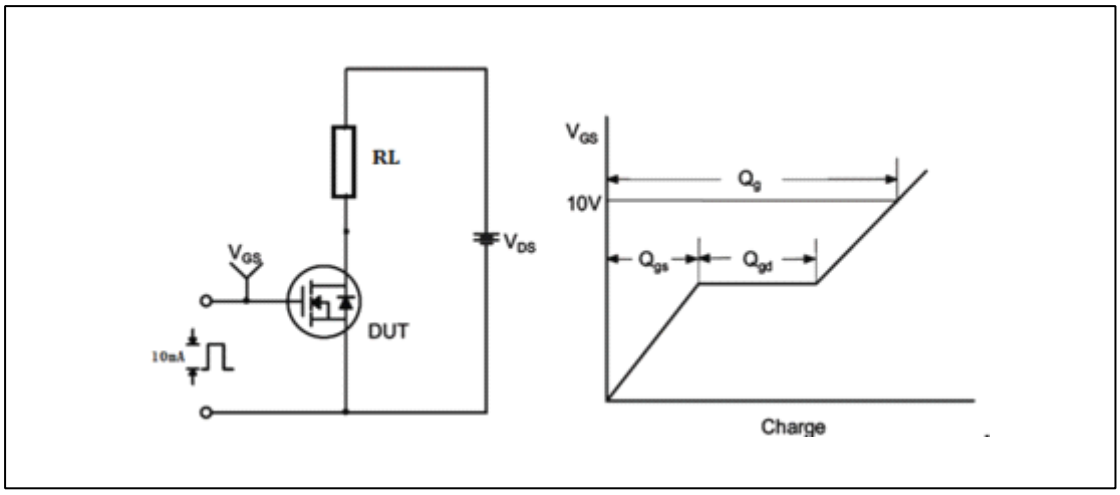



**Fig.12 Gate Charge Test Circuit & Waveform**

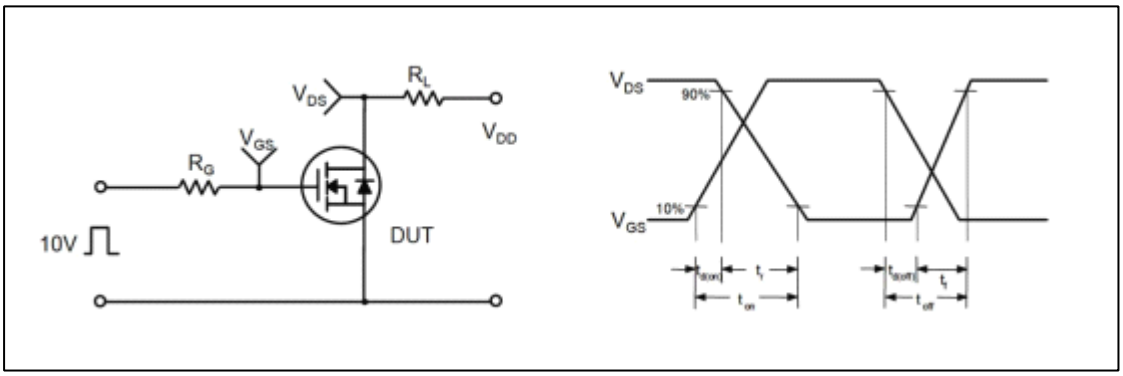



**Fig.13 Switching Test Circuit & Waveforms**

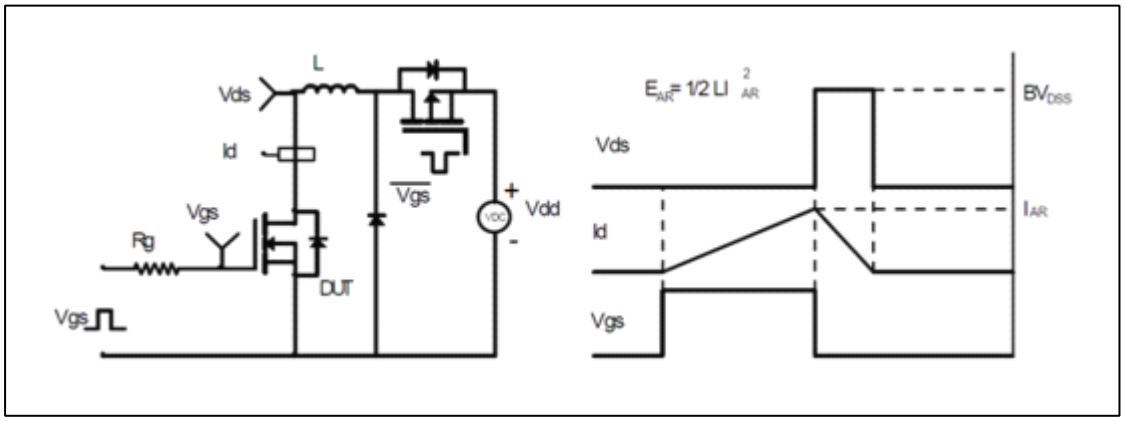



**Fig.14 Unclamped Inductive Switching Test Circuit & Waveform**

## TO-220F Package Dimension