

N-Channel Super Junction Power MOSFET II

General Description

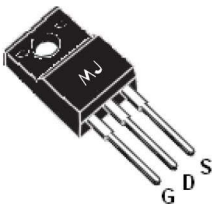
The series of devices use advanced super junction technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. This super junction MOSFET fits the industry's AC-DC SMPS requirements for PFC, AC/DC power conversion, and industrial power applications.

Features

- ◆ New technology for high voltage device
- ◆ Low on-resistance and low conduction losses
- ◆ Small package
- ◆ Ultra Low Gate Charge cause lower driving requirements
- ◆ 100% Avalanche Tested
- ◆ ROHS compliant



Schematic diagram



TO-220F

Application

- ◆ Power factor correction (PFC)
- ◆ Switched mode power supplies(SMPS)
- ◆ Uninterruptible Power Supply (UPS)

| | | |
|------------------|-----|----|
| V_{DS} | 650 | V |
| $R_{DS(ON) MAX}$ | 540 | mΩ |
| I_D | 8 | A |

Package Marking And Ordering Information

| Device | Device Package | Marking |
|-----------|----------------|-----------|
| MJ65R540F | TO-220F | MJ65R540F |

Table 1. Absolute Maximum Ratings (Tc=25℃)

| Parameter | Symbol | MJ65R540F | Unit |
|---|------------------|-----------|------|
| Drain-Source Voltage ($V_{GS}=0V$) | V_{DS} | 650 | V |
| Gate-Source Voltage ($V_{DS}=0V$) | V_{GS} | ±30 | V |
| Continuous Drain Current at Tc=25℃ | I_D (DC) | 8* | A |
| Continuous Drain Current at Tc=100℃ | I_D (DC) | 5.2* | A |
| Pulsed drain current ^(Note 1) | I_{DM} (pluse) | 24* | A |
| Maximum Power Dissipation (Tc=25℃) | P_D | 31.7 | W |
| Derate above 25℃ | P_D | 0.25 | W/℃ |
| Single pulse avalanche energy ^(Note 2) | E_{AS} | 185 | mJ |
| Avalanche current ^(Note 1) | I_{AR} | 4 | A |
| Repetitive Avalanche energy, t_{AR} limited by T_{jmax} ^(Note 1) | E_{AR} | 0.4 | mJ |

| Parameter | Symbol | MJ65R540F | Unit |
|---|----------------|------------|------|
| 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...+150 | ℃ |

* limited by maximum junction temperature

Table 2. Thermal Characteristic

| Parameter | Symbol | MJ65R540F | Unit |
|---|-------------------|-----------|------|
| Thermal Resistance, Junction-to-Case (Maximum) | R _{thJC} | 3.94 | °C/W |
| Thermal Resistance, Junction-to-Ambient (Maximum) | R _{thJA} | 80 | °C/W |

Table 3. Electrical Characteristics (T_A=25°C unless otherwise noted)

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|--|---------------------|--|-----|------|------|------|
| On/off states | | | | | | |
| Drain-Source Breakdown Voltage | BV _{DSS} | V _{GS} =0V I _D =250μA | 650 | - | - | V |
| Zero Gate Voltage Drain Current (Tc=25°C) | I _{DSS} | V _{DS} =650V,V _{GS} =0V | - | - | 1 | μA |
| Zero Gate Voltage Drain Current (Tc=125°C) | I _{DSS} | V _{DS} =650V,V _{GS} =0V | - | - | 100 | μA |
| Gate-Body Leakage Current | I _{GSS} | V _{GS} =±30V,V _{DS} =0V | - | - | ±100 | nA |
| Gate Threshold Voltage | V _{GS(th)} | V _{DS} =V _{GS} ,I _D =250μA | 2.5 | 3 | 3.5 | V |
| Drain-Source On-State Resistance | R _{DS(ON)} | V _{GS} =10V,I _D =4A | - | 480 | 540 | mΩ |
| Dynamic Characteristics | | | | | | |
| Forward Transconductance | g _{FS} | V _{DS} =20V,I _D =4A | - | 5.5 | - | S |
| Input Capacitance | C _{ies} | V _{DS} =50V,V _{GS} =0V F=1.0MHz | - | 680 | - | PF |
| Output Capacitance | C _{oss} | | - | 58 | - | PF |
| Reverse Transfer Capacitance | C _{rss} | | - | 4 | - | PF |
| Total Gate Charge | Q _g | V _{DS} =480V,I _D =8A V _{GS} =10V | - | 14.5 | 22 | nC |
| Gate-Source Charge | Q _{gs} | | - | 2.8 | - | nC |
| Gate-Drain Charge | Q _{gd} | | - | 5.5 | - | nC |
| Intrinsic gate resistance | R _G | f=1 MHz open drain | - | 2 | - | Ω |
| Switching times | | | | | | |
| Turn-on Delay Time | t _{d(on)} | V _{DD} =380V,I _D =4A R _G =12Ω,V _{GS} =10V | - | 5.5 | - | nS |
| Turn-on Rise Time | t _r | | - | 3.5 | - | nS |
| Turn-Off Delay Time | t _{d(off)} | | - | 55 | 75 | nS |
| Turn-Off Fall Time | t _f | | - | 6.5 | 10 | nS |
| Source- Drain Diode Characteristics | | | | | | |
| Source-drain current (Body Diode) | I _{SD} | T _C =25°C | - | - | 8 | A |
| Pulsed Source-drain current (Body Diode) | I _{SDM} | | - | - | 23.4 | A |
| Forward On Voltage | V _{SD} | T _J =25°C,I _{SD} =8A,V _{GS} =0V | - | 0.9 | 1.2 | V |
| Reverse Recovery Time | t _{rr} | T _J =25°C,I _F =8A di/dt=100A/μs | - | 220 | - | nS |
| Reverse Recovery Charge | Q _{rr} | | - | 2.2 | - | uC |
| Peak reverse recovery current | I _{rrm} | | - | 20 | - | A |

Notes

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

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS (curves)

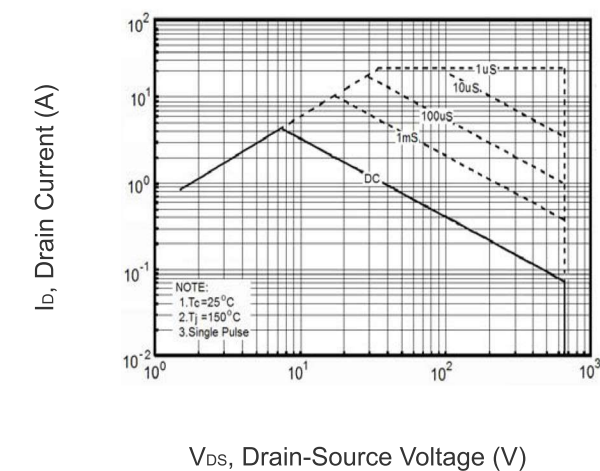


Figure 1 Safe operating area

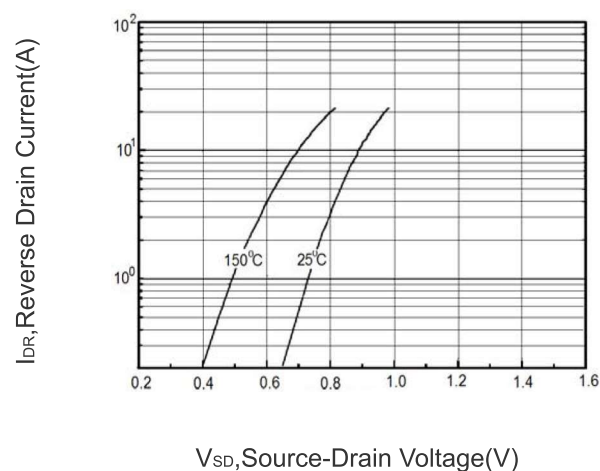


Figure 2 Source-Drain Diode Forward Voltage

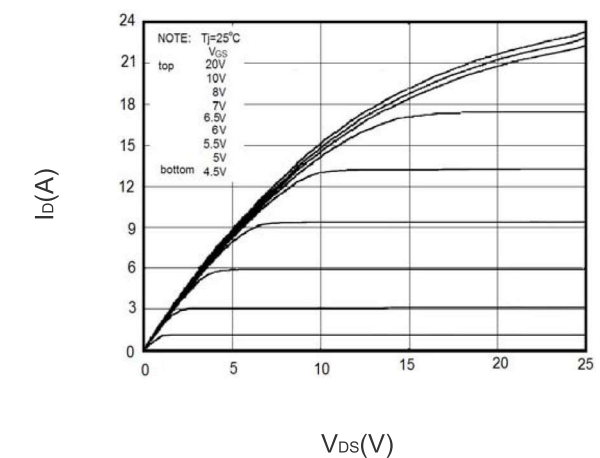


Figure 3 Output characteristics

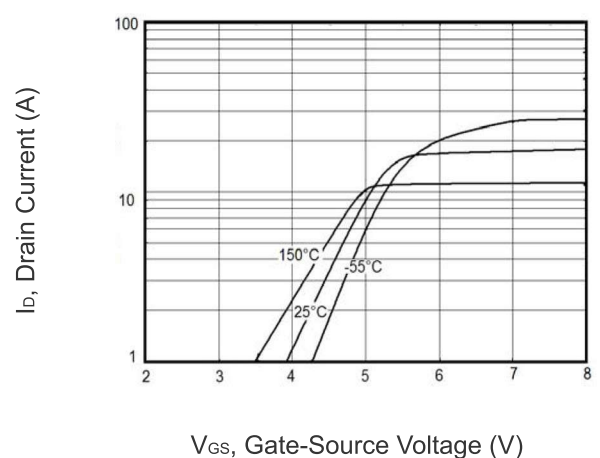


Figure 4 Transfer characteristics

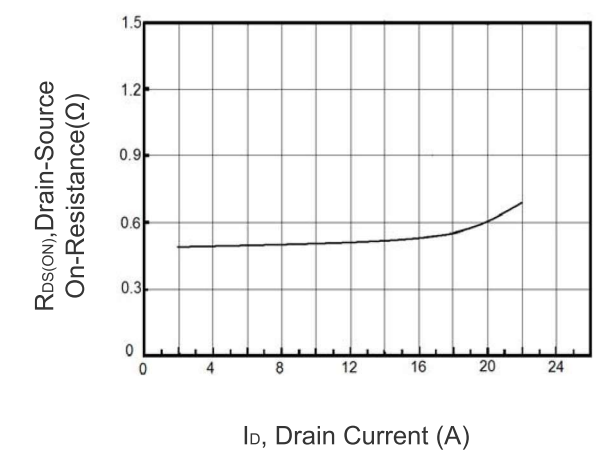


Figure 5 Static drain-source on resistance

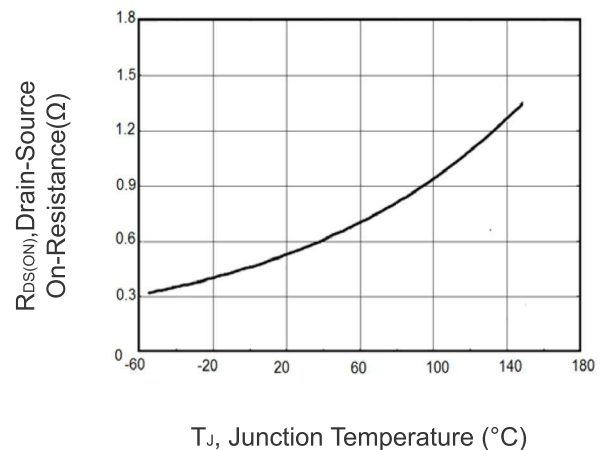


Figure 6 $R_{DS(ON)}$ vs Junction Temperature

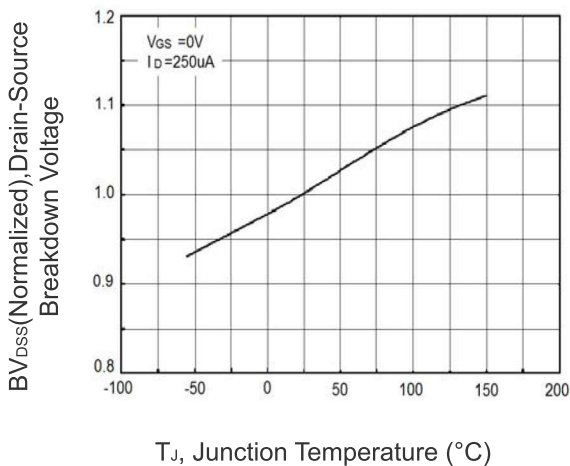


Figure 7 BV_{DSS} vs Junction Temperature

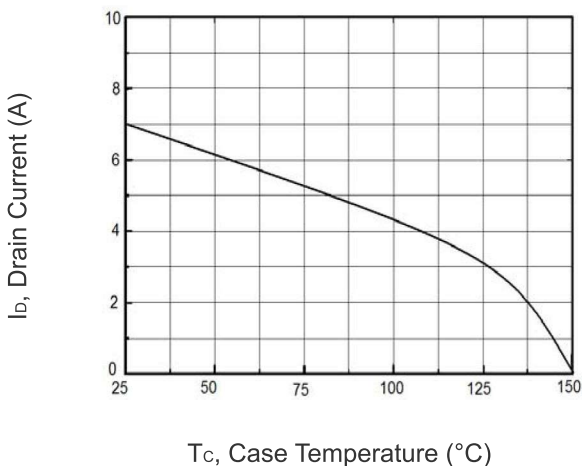


Figure 8 Maximum I_D vs Junction Temperature

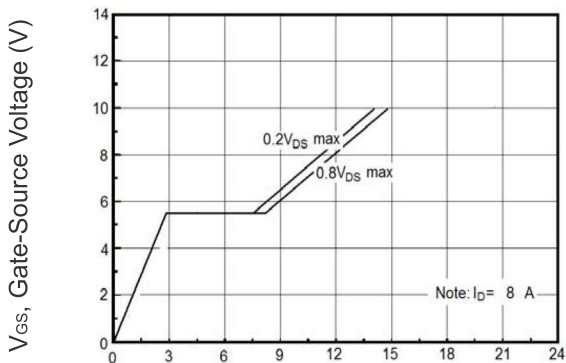


Figure 9 Gate charge waveforms

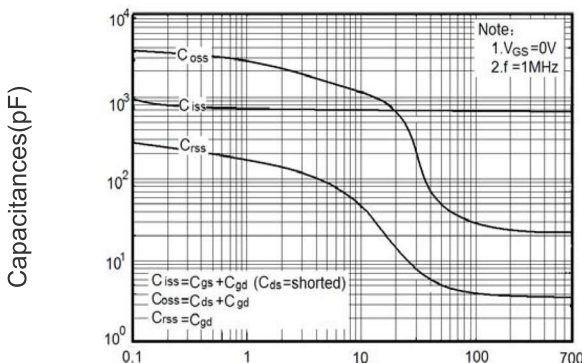


Figure 10 Capacitance

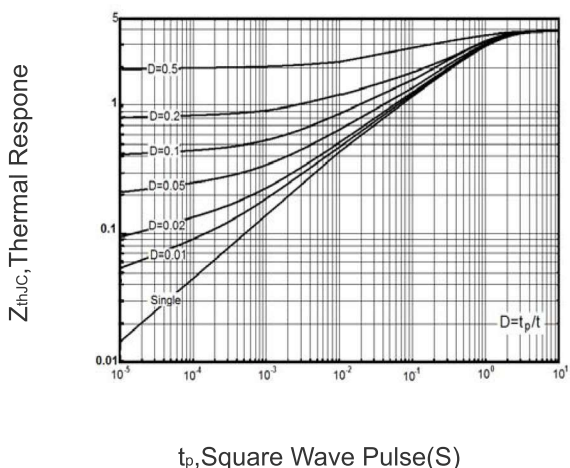
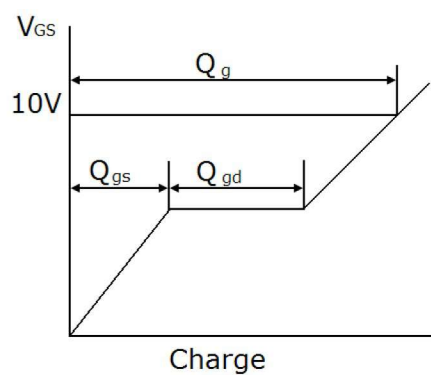


Figure 11 Transient Thermal Impedance

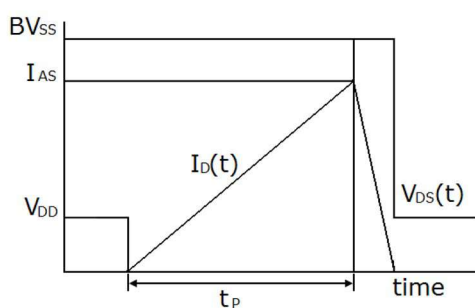
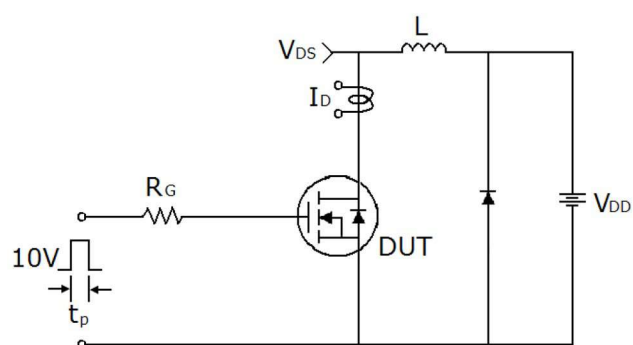
Test circuit



Gate charge test circuit & Waveform

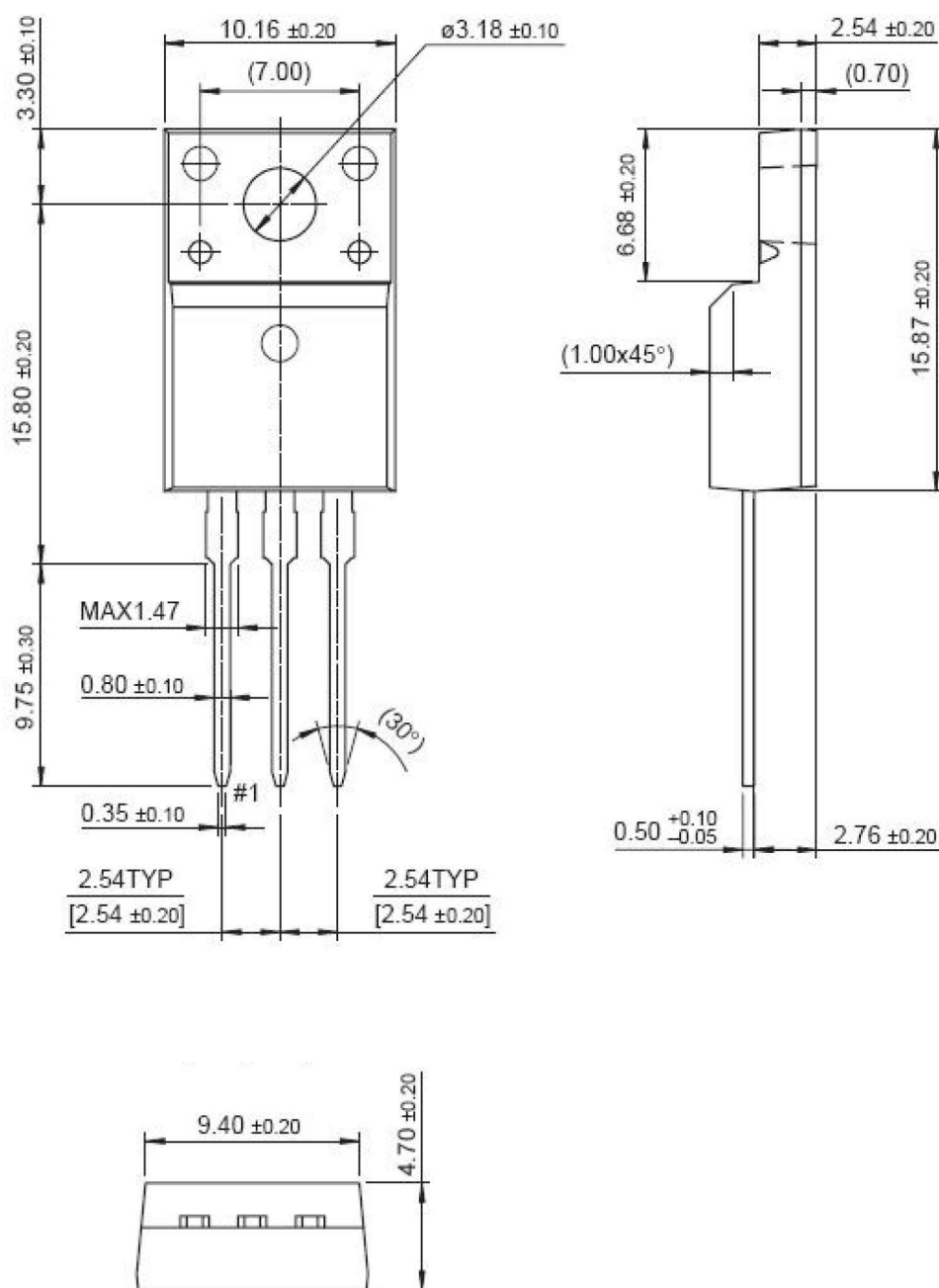


Switch Time Test Circuit



Unclamped Inductive Switching Test Circuit & Waveforms

TO-220F Package Information



Dimensions in Millimeters

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