# N-Channel Super Junction Power MOSFET Ⅲ

## 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.

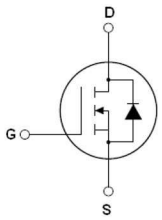
## Features

- ◆ 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

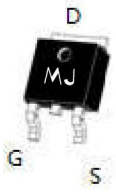
## Application

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

| | | |
|---|---|---|
| $V_{DS}$ | 650 | V |
| $R_{DS(ON)TYP}$ | 750 | mΩ |
| $I_D$ | 5 | A |




Schematic diagram




TO-252

## Package Marking And Ordering Information

| Device | Device Package | Marking |
|---|---|---|
| MJ65T900K | TO-252 | MJ65T900K |

## Table 1. Absolute Maximum Ratings ($T_C$=25℃)

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Drain-Source Voltage ($V_{GS}$=0V) | $V_{DS}$ | 650 | V |
| Gate-Source Voltage ($V_{DS}$=0V) AC (f>1 Hz) | $V_{GS}$ | ±30 | V |
| Continuous Drain Current at Tc=25°C | $I_D$ (DC) | 5 | A |
| Continuous Drain Current at Tc=100°C | $I_D$ (DC) | 3 | A |
| Pulsed drain current (Note 1) | $I_{DM}$ (pluse) | 20 | A |
| Maximum Power Dissipation (Tc=25℃) | $P_D$ | 46 | W |
| Derate above 25°C | $P_D$ | 0.37 | W/°C |
| Single pulse avalanche energy (Note 2) | $E_{AS}$ | 52 | mJ |
| Avalanche current (Note 1) | $I_{AR}$ | 0.9 | A |
| Repetitive Avalanche energy, $t_{AR}$ limited by $T_{jmax}$ (Note 1) | $E_{AR}$ | 0.14 | mJ |

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Drain Source voltage slope, $V_{DS}$ ≤480 V | dv/dt | 50 | V/ns |
| Reverse diode dv/dt, $V_{DS}$ ≤480 V,$I_{SD}$<$I_D$ | dv/dt | 15 | V/ns |
| Operating Junction and Storage Temperature Range | $T_J$,$T_{STG}$ | -55...+150 | °C |

* limited by maximum junction temperature

## Table 2. Thermal Characteristic

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Thermal Resistance，Junction-to-Case（Maximum） | $R_{thJC}$ | 2.72 | °C/W |
| Thermal Resistance，Junction-to-Ambient（Maximum） | $R_{thJA}$ | 75 | °C/W |

## Table 3. Electrical Characteristics ($T_A$=25℃ unless otherwise noted)

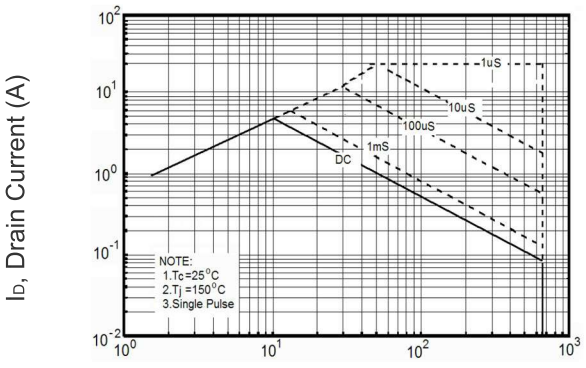
| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **On/off states** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $V_{GS}$=0V $I_D$=250μA | 650 | - | - | V |
| Zero Gate Voltage Drain Current (Tc=25℃) | $I_{DSS}$ | $V_{DS}$=650V,$V_{GS}$=0V | - | - | 1 | μA |
| Zero Gate Voltage Drain Current (Tc=125℃) | $I_{DSS}$ | $V_{DS}$=650V,$V_{GS}$=0V | - | - | 50 | μA |
| Gate-Body Leakage Current | $I_{GSS}$ | $V_{GS}$=±20V,$V_{DS}$=0V | - | - | ±100 | nA |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$,$I_D$=250μA | 3 | - | 4 | V |
| Drain-Source On-State Resistance | $R_{DS(ON)}$ | $V_{GS}$=10V,$I_D$=2.5A | - | 750 | 900 | mΩ |
| **Dynamic Characteristics** | | | | | | |
| Input Capacitance | $C_{ies}$ | $V_{DS}$=50V,$V_{GS}$=0V F=1.0MHz | - | 370 | - | PF |
| Output Capacitance | $C_{oss}$ | | - | 25 | - | PF |
| Reverse Transfer Capacitance | $C_{rss}$ | | - | 0.5 | - | PF |
| Total Gate Charge | $Q_g$ | $V_{DS}$=480V,$I_D$=5A $V_{GS}$=10V | - | 10.5 | 15 | nC |
| Gate-Source Charge | $Q_{gs}$ | | - | 2.6 | - | nC |
| Gate-Drain Charge | $Q_{gd}$ | | - | 5.3 | - | nC |
| **Switching times** | | | | | | |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD}$=380V,$I_D$=3A $R_G$=5Ω,$V_{GS}$=10V | - | 7 | - | nS |
| Turn-on Rise Time | $t_r$ | | - | 3 | - | nS |
| Turn-Off Delay Time | $t_{d(off)}$ | | - | 52 | 62 | nS |
| Turn-Off Fall Time | $t_f$ | | - | 10 | 16 | nS |
| **Source- Drain Diode Characteristics** | | | | | | |
| Source-drain current (Body Diode) | $I_{SD}$ | $T_C$=25°C | - | - | 5 | A |
| Pulsed Source-drain current (Body Diode) | $I_{SDM}$ | | - | - | 20 | A |
| Forward On Voltage | $V_{SD}$ | $T_j$=25°C,$I_{SD}$=5A,$V_{GS}$=0V | - | 0.9 | 1.2 | V |
| Reverse Recovery Time | $t_{rr}$ | $T_j$=25°C,$I_F$=2.5A di/dt=100A/μs | - | 210 | - | nS |
| Reverse Recovery Charge | $Q_{rr}$ | | - | 0.66 | - | uC |
| Peak reverse recovery Current | $I_{rrm}$ | | - | 6.5 | - | A |

## Notes

1.Repetitive Rating: Pulse width limited by maximum junction temperature

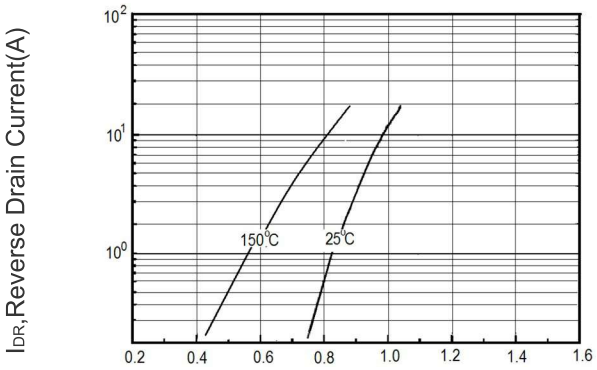
2.$T_j$=25℃,$V_{DD}$=50V,$V_G$=10V, $R_G$=25Ω

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS (curves)



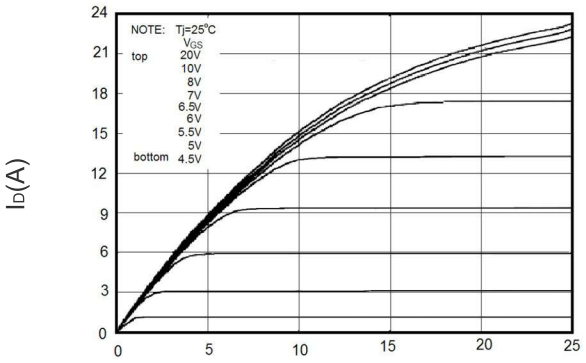

$V_{DS}$, Drain-Source Voltage (V)

Figure 1 Safe operating area



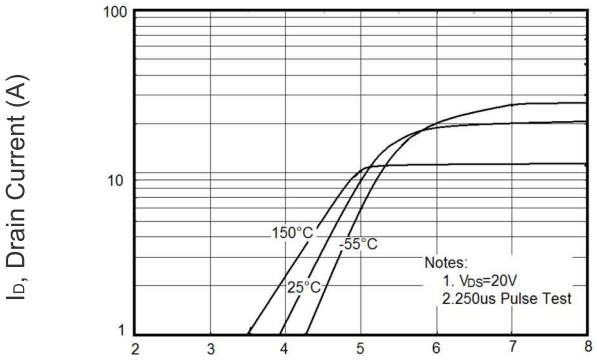

$V_{SD}$,Source-Drain Voltage(V)

Figure 2 Source-Drain Diode Forward Voltage



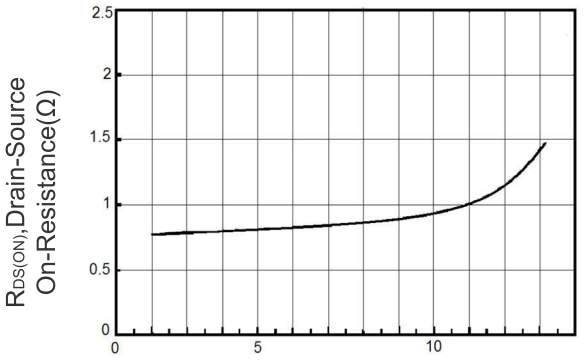

$V_{DS}$(V)

Figure 3 Output characteristics



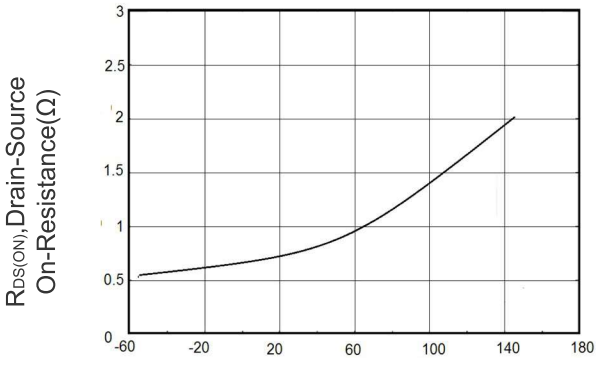

$V_{GS}$, Gate-Source Voltage (V)

Figure 4 Transfer characteristics




$I_D$, Drain Current (A)

Figure 5 Static drain-source on resistance




$T_J$, Junction Temperature (°C)

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

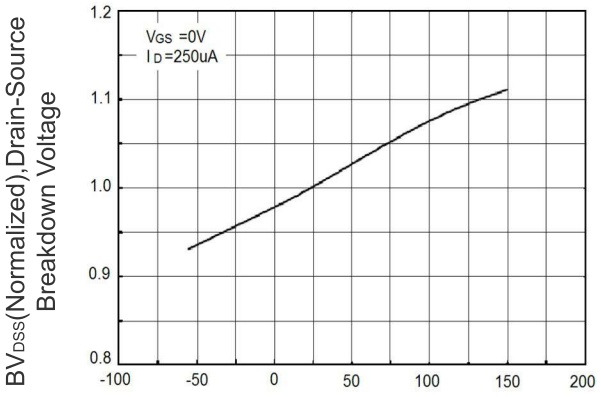



Figure 7 $BV_{DSS}$ vs Junction Temperature

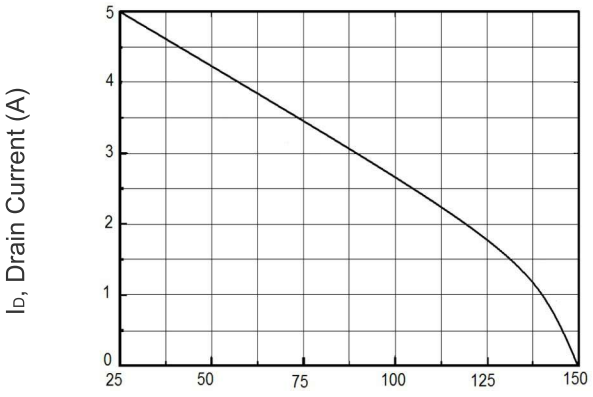



Figure 8 Maximum $I_D$ vs Junction Temperature

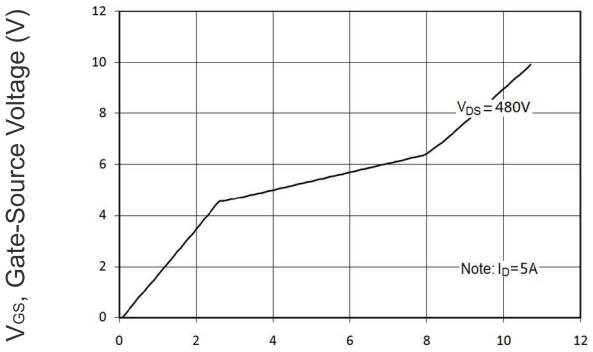



Figure 9 Gate charge waveforms

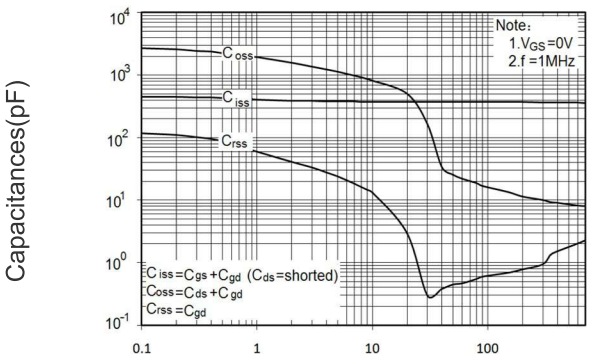



Figure 10 Capacitance

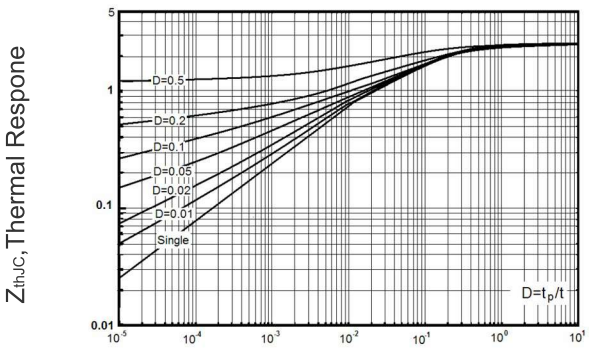
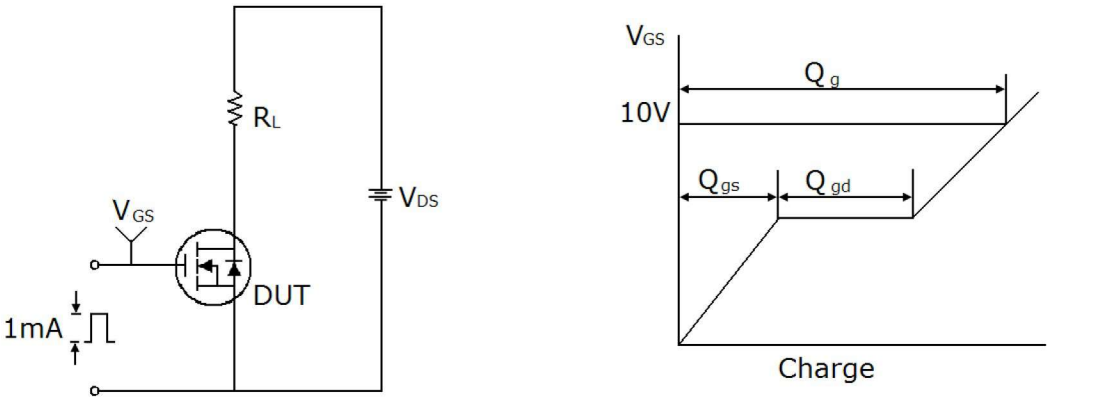
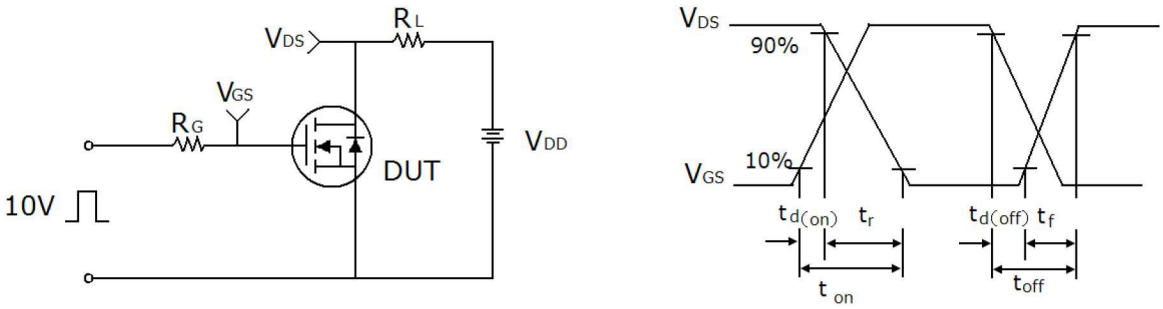



Figure 11 Transient Thermal Impedance

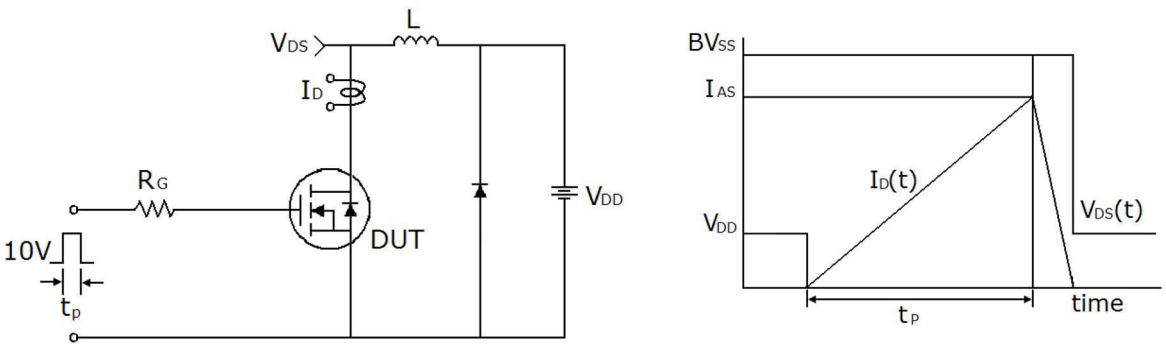
Test circuit




Gate charge test circuit & Waveform

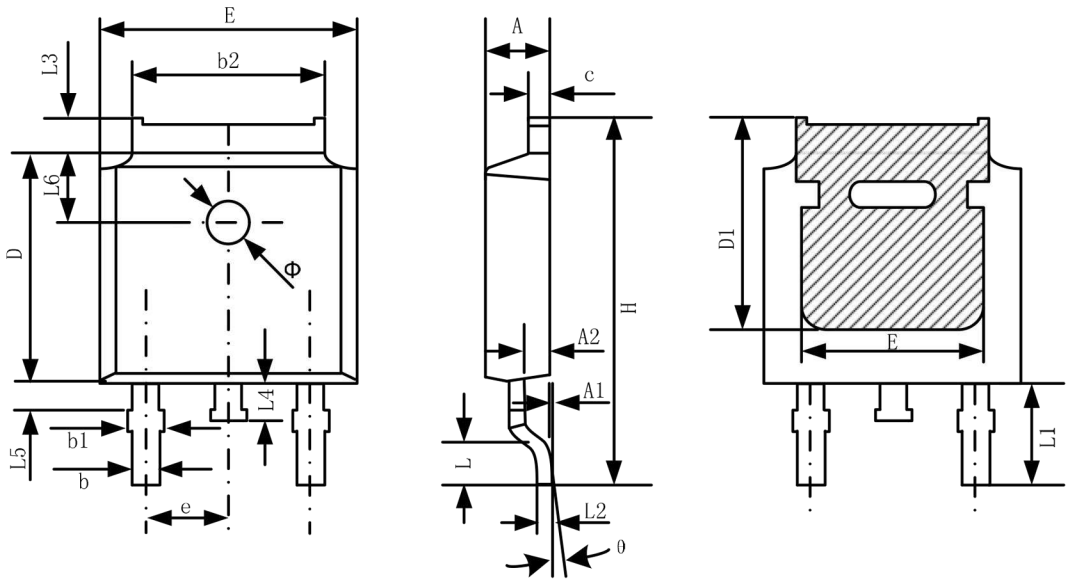



Switch Time Test Circuit




Unclamped Inductive Switching Test Circuit & Waveforms

## TO-252-2 Package Information




| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min. | Max. | Min. | Max. |
| A | 2.20 | 2.38 | 0.087 | 0.094 |
| A1 | 0.00 | 0.10 | 0.000 | 0.004 |
| A2 | 0.90 | 1.10 | 0.035 | 0.043 |
| b | 0.72 | 0.85 | 0.028 | 0.033 |
| b1 | 0.72 | 0.90 | 0.028 | 0.035 |
| b2 | 5.13 | 5.46 | 0.202 | 0.215 |
| c | 0.47 | 0.60 | 0.019 | 0.024 |
| D | 6.00 | 6.20 | 0.236 | 0.244 |
| D1 | 5.25 | -- | 0.207 | -- |
| E | 6.50 | 6.70 | 0.256 | 0.264 |
| E1 | 4.70 | -- | 0.185 | -- |
| e | 2.19 | 2.39 | 0.086 | 0.094 |
| H | 9.80 | 10.40 | 0.386 | 0.409 |
| L | 1.40 | 1.70 | 0.055 | 0.067 |
| L1 | 2.90 REF | | 0.114 REF | |
| L2 | 0.508 BSC | | 0.020 BSC | |
| L3 | 0.90 | 1.25 | 0.035 | 0.049 |
| L4 | 0.60 | 1.00 | 0.024 | 0.039 |
| L5 | 0.15 | 0.75 | 0.006 | 0.030 |
| L6 | 1.80 REF | | 0.071 REF | |
| Φ | 1.20 | 1.40 | 0.047 | 0.055 |
| θ | 0° | 8° | 0° | 8° |

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