# 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.

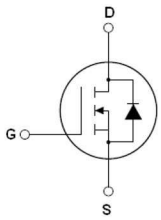
## Features

- ◆ 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

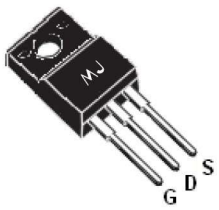
## Application

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

| | | |
|---|---|---|
| $V_{DS@Tjmax}$ | 750 | V |
| $R_{DS(ON)TYP.}$ | 260 | mΩ |
| $I_D$ | 15 | A |




Schematic diagram




TO-220F

## Package Marking And Ordering Information

| Device | Device Package | Marking |
|---|---|---|
| MJ70R260F | TO-220F | MJ70R260F |

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

| Parameter | Symbol | MJ70R260F | Unit |
|---|---|---|---|
| Drain-Source Voltage ($V_{GS}$=0V) | $V_{DS}$ | 700 | V |
| Gate-Source Voltage ($V_{DS}$=0V) | $V_{GS}$ | ±30 | V |
| Continuous Drain Current at Tc=25°C | $I_{D\ (DC)}$ | 15* | A |
| Continuous Drain Current at Tc=100°C | $I_{D\ (DC)}$ | 10* | A |
| Pulsed drain current (Note 1) | $I_{DM\ (pluse)}$ | 45* | A |
| Maximum Power Dissipation (Tc=25℃) | $P_D$ | 33.5 | W |
| Derate above 25°C | $P_D$ | 0.268 | W/°C |
| Single pulse avalanche energy (Note 2) | $E_{AS}$ | 370 | mJ |
| Avalanche current (Note 1) | $I_{AR}$ | 7.5 | A |
| Repetitive Avalanche energy, $t_{AR}$ limited by $T_{jmax}$ (Note 1) | $E_{AR}$ | 0.8 | mJ |

| Parameter | Symbol | MJ70R260F | 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 | MJ70R260F | Unit |
|---|---|---|---|
| Thermal Resistance，Junction-to-Case（Maximum） | $R_{thJC}$ | 3.73 | °C/W |
| Thermal Resistance，Junction-to-Ambient（Maximum） | $R_{thJA}$ | 80 | °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 | 700 | - | - | V |
| Zero Gate Voltage Drain Current (Tc=25℃) | $I_{DSS}$ | $V_{DS}$=700V,$V_{GS}$=0V | - | - | 1 | μA |
| Zero Gate Voltage Drain Current (Tc=125℃) | $I_{DSS}$ | $V_{DS}$=700V,$V_{GS}$=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,$I_D$=8A | - | 260 | 290 | mΩ |
| **Dynamic Characteristics** | | | | | | |
| Forward Transconductance | $g_{FS}$ | $V_{DS}$=20V,$I_D$=8A | - | 11 | - | S |
| Input Capacitance | $C_{ies}$ | $V_{DS}$=50V,$V_{GS}$=0V F=1.0MHz | - | 1360 | - | pF |
| Output Capacitance | $C_{oss}$ | | - | 115 | - | pF |
| Reverse Transfer Capacitance | $C_{rss}$ | | - | 4.8 | - | pF |
| Total Gate Charge | $Q_g$ | $V_{DS}$=480V,$I_D$=15A $V_{GS}$=10V | - | 29 | 45 | nC |
| Gate-Source Charge | $Q_{gs}$ | | - | 6.5 | - | nC |
| Gate-Drain Charge | $Q_{gd}$ | | - | 12 | - | nC |
| Intrinsic gate resistance | $R_G$ | f=1 MHz open drain | - | 10 | - | Ω |
| **Switching times** | | | | | | |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD}$=380V,$I_D$=8A $R_G$=5.5Ω,$V_{GS}$=10V | - | 10 | - | nS |
| Turn-on Rise Time | $t_r$ | | - | 5 | - | nS |
| Turn-Off Delay Time | $t_{d(off)}$ | | - | 55 | 75 | nS |
| Turn-Off Fall Time | $t_f$ | | - | 4.5 | 10 | nS |
| **Source- Drain Diode Characteristics** | | | | | | |
| Source-drain current (Body Diode) | $I_{SD}$ | $T_C$=25°C | - | - | 15 | A |
| Pulsed Source-drain current (Body Diode) | $I_{SDM}$ | | - | - | 45 | 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 | - | 270 | - | nS |
| Reverse Recovery Charge | $Q_{rr}$ | | - | 3.3 | - | uC |
| Peak reverse recovery Current | $I_{rrm}$ | | - | 24 | - | 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)

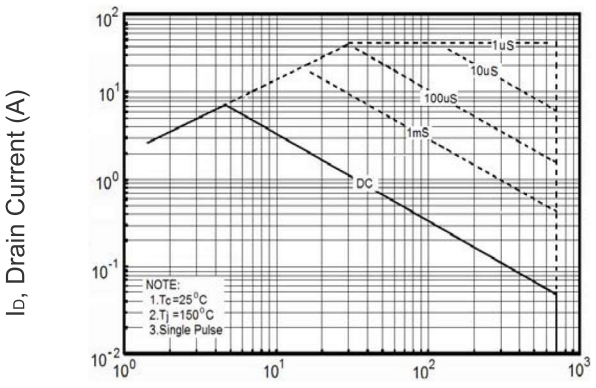



Figure 1 Safe operating area

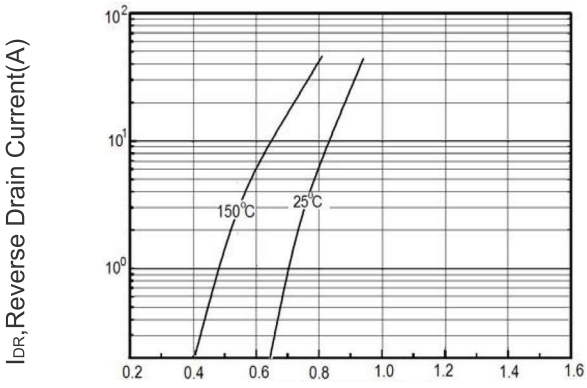



Figure 2 Source-Drain Diode Forward Voltage

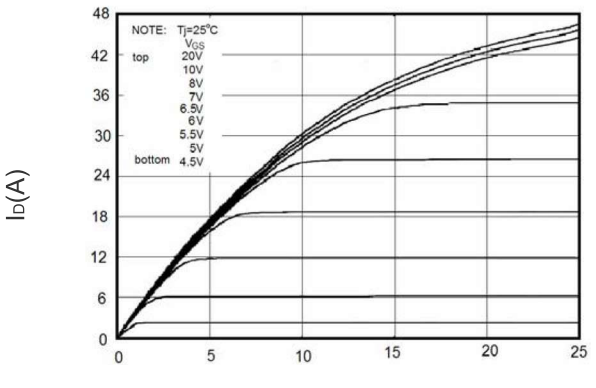



Figure 3 Output characteristics

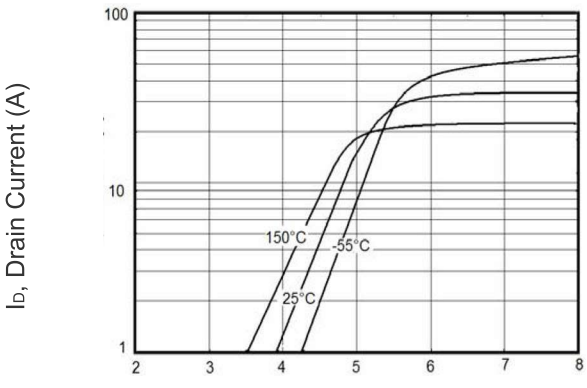



Figure 4 Transfer characteristics

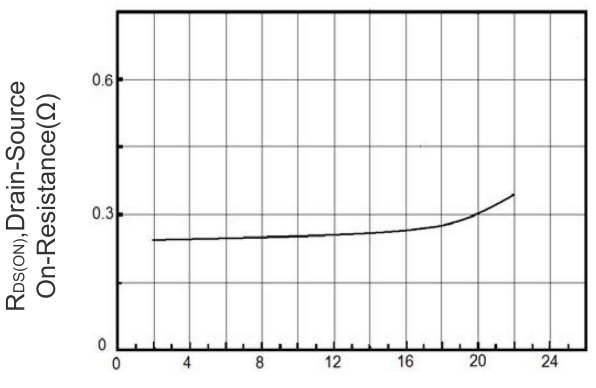



Figure 5 Static drain-source on resistance

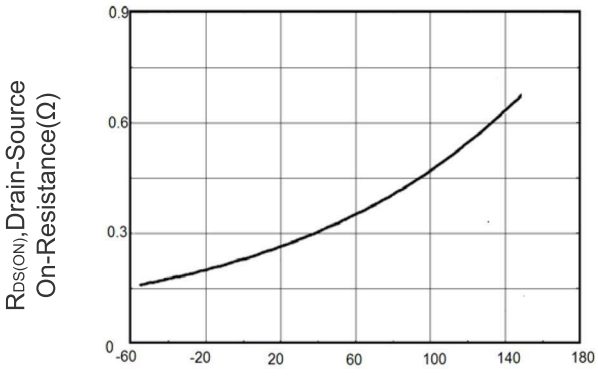



Figure 6 $R_{DS(ON)}$ vs Junction Temperature

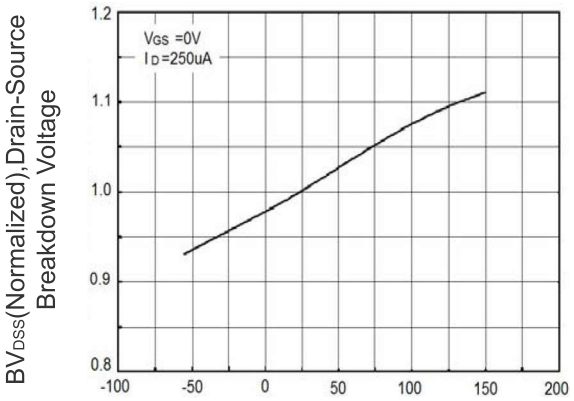



Figure 7 $BV_{DSS}$ vs Junction Temperature

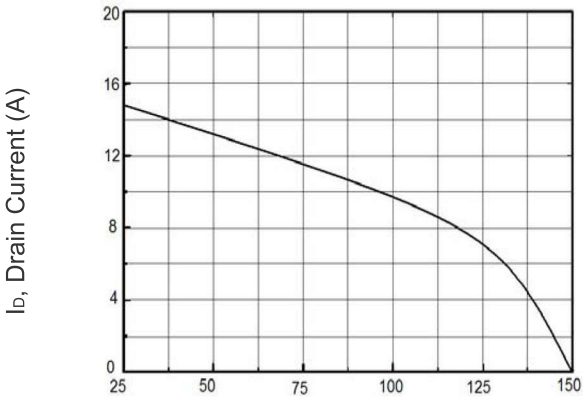



Figure 8 Maximum $I_D$ vs Junction Temperature

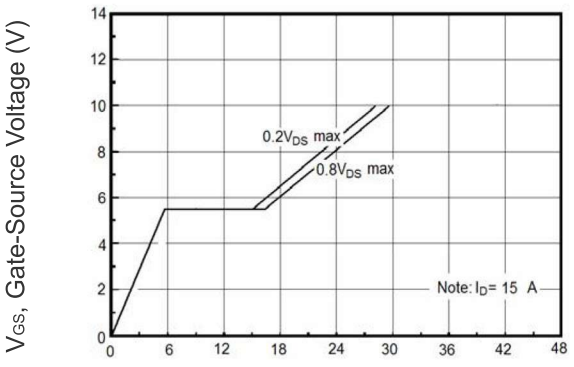



Figure 9 Gate charge waveforms

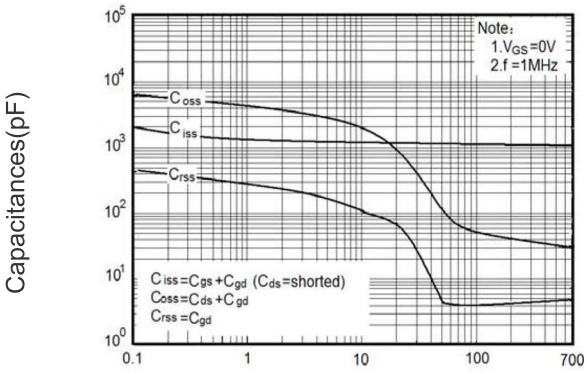



Figure 10 Capacitance

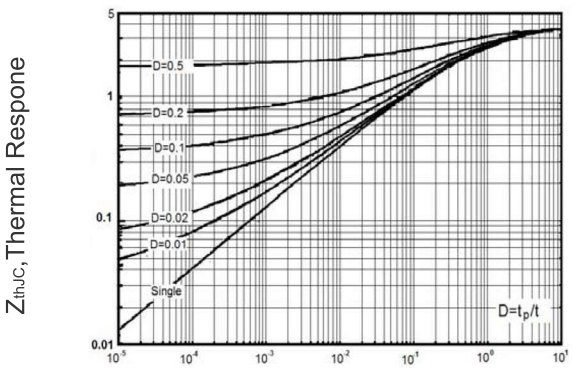
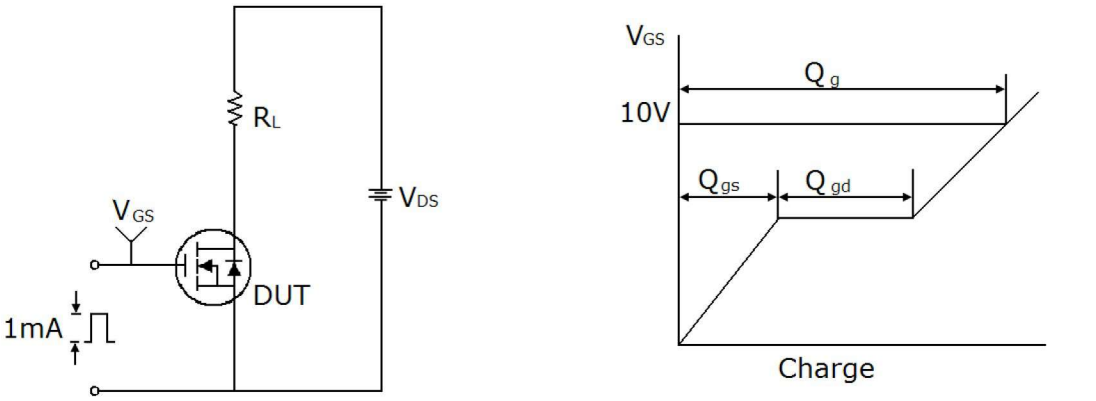
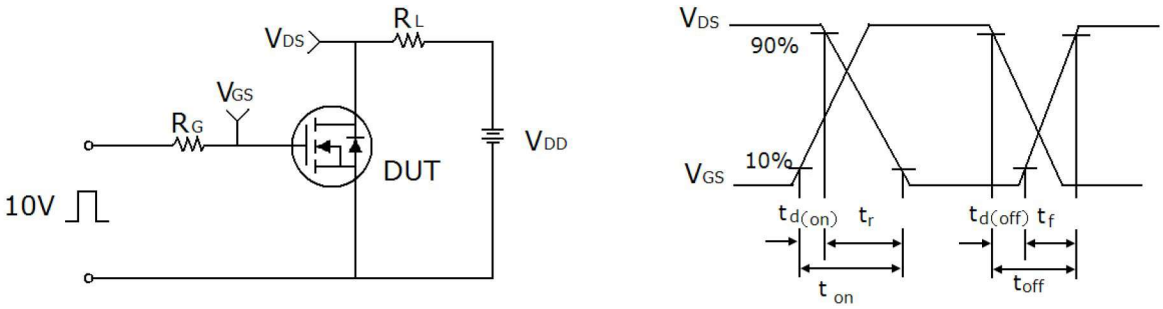



Figure 11 Transient Thermal Impedance

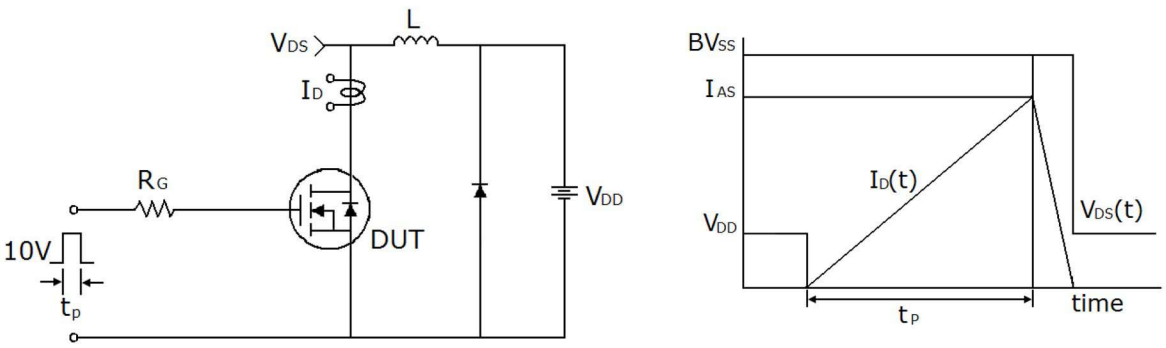
Test circuit




Gate charge test circuit & Waveform

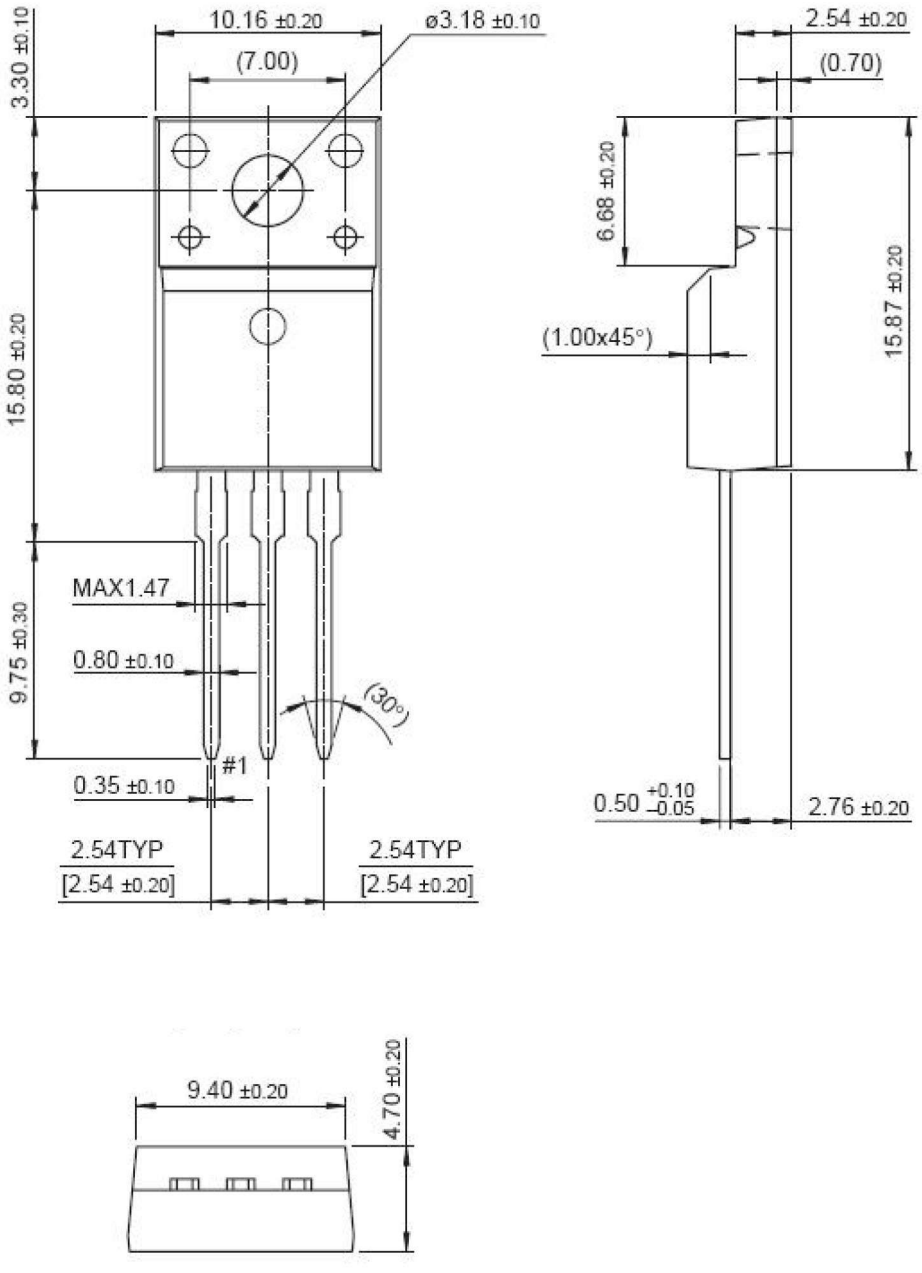



Switch Time Test Circuit




Unclamped Inductive Switching Test Circuit & Waveforms

## TO-220F Package Information




Dimensions in Millimeters

## Attention:

Any and all MJ power products described or contained herein do not have specifications that can handle applications that require extremely high levels of reliability, such as life-support systems, aircraft's control systems, or other applications whose failure can be reasonably expected to result in serious physical and/or material damage. Consult with your MJ power representative nearest you before using any MJ power products described or contained herein in such applications.

MJ power assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all MJ power products described or contained herein.

Specifications of any and all MJ power products described or contained herein stipulate the erformance, characteristics,and functions of the described products in the independent state, and are not guarantees of the performance, characteristics, and functions of the described products as mounted in the customer’s products or equipment. To verify symptoms and states that cannot be evaluated in an independent device, the customer should always evaluate and test devices mounted in the customer’s products or equipment.

MJ power Semiconductor CO.,LTD. strives to supply high-quality high-reliability products. However, any and all semiconductor products fail with some probability. It is possible that these probabilistic failures could give rise to accidents or events that could endanger human lives, that could give rise to smoke or fire, or that could cause damage to other property. When designing equipment, adopt safety measures so that these kinds of accidents or events cannot occur. Such measures include but are not limited to protective circuits and error prevention circuits for safe design, redundant design, and structural design.

In the event that any or all MJ power products(including technical data, services) described or contained herein are controlled under any of applicable local export control laws and regulations, such products must not be exported without obtaining the export license from the authorities concerned in accordance with the above law.



Information (including circuit diagrams and circuit parameters) herein is for example only ; it is not guaranteed for volume production. MJ power believes information herein is accurate and reliable, but no guarantees are made or implied regarding its use or any infringements of intellectual property rights or other rights of third parties.

Any and all information described or contained herein are subject to change without notice due to product/technology improvement, etc. When designing equipment, refer to the "Delivery Specification" for the MJ power product that you intend to use.

This catalog provides information as of Sep.2010. Specifications and information herein are subject to change without notice.