# 30V Half Bridge Dual N-Channel Enhancement Mode Power MOSFET

## Description

The MJB301Q is designed to provide a high efficiency synchronous buck power stage with optimal layout and board space utilization. It includes two specialized MOSFETs in a dual Power DFN3X3 package. The Q1 "High Side" MOSFET is desgined to minimze switching losses. The Q2"Low Side" MOSFET uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge.

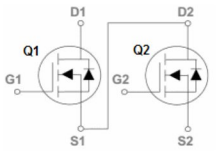
## General Features

| Q1 "High Side" MOSFET | Q2 "Low Side" MOSFET |
|---|---|
| $V_{DS}$=30V,$I_D$=15A | $V_{DS}$=30V,$I_D$=20A |
| $R_{DS(ON)}$<9mΩ @ $V_{GS}$=10V | $R_{DS(ON)}$<8.5mΩ @ $V_{GS}$=10V |
| $R_{DS(ON)}$<14mΩ @ $V_{GS}$=4.5V | $R_{DS(ON)}$<22mΩ @ $V_{GS}$=4.5V |

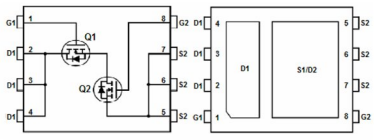
- Excellent gate charge x $R_{DS(on)}$ product(FOM)
- Very low on-resistance $R_{DS(on)}$
- 150 °C operating temperature
- Pb-free lead plating
- 100% UIS tested

## Application

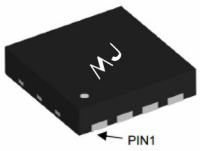
- Compact DC/DC converter applications



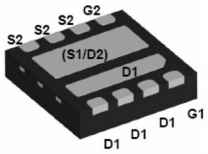
Schematic diagram



Pin Assignment



Top View



Bottom View

**100% UIS TESTED! 100% ΔVds TESTED!**

## Package Marking and Ordering Information

| Device Marking | Device | Device Package | Reel Size | Tape width | Quantity |
|---|---|---|---|---|---|
| MJB301Q | MJB301Q | DFN3X3-8L | - | - | - |

## Absolute Maximum Ratings ($T_C$ =25 ℃unless otherwise noted)

| Parameter | | Symbol | Q1 | Q2 | Unit |
|---|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DS}$ | 30 | 30 | V |
| Gate-Source Voltage | | $V_{GS}$ | ±20 | ±20 | V |
| Drain Current-Continuous (Note 2) | $T_A$=25°C | $I_D$ | 15 | 20 | A |
| | $T_A$=100°C | $I_D$ | 10.6 | 14.1 | A |
| Drain Current -Pulsed (Note 1) | | $I_{DM}$ | 60 | 80 | A |
| Power Dissipation | $T_A$=25°C | $P_D$ | 18 | 20 | W |
| Operating Junction and Storage Temperature Range | | $T_J$,$T_{STG}$ | -55 To 150 | -55 To 150 | ℃ |

## Thermal Characteristic

| Parameter | Symbol | Typ | Max | Unit |
|---|---|---|---|---|
| Thermal Resistance,Junction-to-Case (Note 2) (Q1) | $R_{\theta JC}$ | 6.5 | 7 | V |
| Thermal Resistance,Junction-to-Case (Note 2) (Q1) | $R_{\theta JC}$ | 6 | 6.3 | V |

## Q1 Electrical Characteristics ($T_A$=25℃unless otherwise noted)

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Off Characteristics** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $V_{GS}$=0V $I_D$=250μA | 30 | - | - | V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$=30V,$V_{GS}$=0V | - | - | 1 | μA |
| Gate-Body Leakage Current | $I_{GSS}$ | $V_{DS}$=±20V,$V_{DS}$=0V | - | - | ±100 | nA |
| **On Characteristics** (Note 3) | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$ ,$I_D$=250μA | 1.0 | 1.5 | 2.2 | V |
| Drain-Source On-State Resistance | $R_{DS(ON)}$ | $V_{GS}$=10V, $I_D$=10A | - | 7.5 | 9 | mΩ |
| | | $V_{GS}$=4.5V, $I_D$=10A | - | 10.2 | 14 | mΩ |
| Forward Transconductance | $g_{FS}$ | $V_{DS}$=5V,$I_D$=10A | - | 20 | - | S |
| **Dynamic Characteristics** (Note 4) | | | | | | |
| Input Capacitance | $C_{lss}$ | $V_{DS}$=15V,$V_{GS}$=0V, F=1.0MHz | - | 690 | - | PF |
| Output Capacitance | $C_{oss}$ | | - | 105 | - | PF |
| Reverse Transfer Capacitance | $C_{rss}$ | | - | 80 | - | PF |
| **Switching Characteristics** (Note 4) | | | | | | |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD}$=15V, $R_L$=0.75Ω $V_{GS}$=10V,$R_G$=3Ω | - | 5 | - | nS |
| Turn-on Rise Time | $t_r$ | | - | 3.5 | - | nS |
| Turn-Off Delay Time | $t_{d(off)}$ | | - | 19 | - | nS |
| Turn-Off Fall Time | $t_f$ | | - | 3.5 | - | nS |
| Total Gate Charge | $Q_g$ | $V_{DS}$=15V,$I_D$=10A, $V_{GS}$=10V | - | 15 | - | nC |
| Gate-Source Charge | $Q_{gs}$ | | - | 2.5 | - | nC |
| Gate-Drain Charge | $Q_{gd}$ | | - | 3 | - | nC |
| **Drain-Source Diode Characteristics** | | | | | | |
| Diode Forward Voltage (Note 3) | $V_{SD}$ | $V_{GS}$=0V,$I_S$=10A | - | | 1.2 | V |
| Diode Forward Current (Note 2) | $I_S$ | | - | - | 15 | A |
| Reverse Recovery Time | $t_{rr}$ | $T_J$=25°C, $I_F$=10A di/dt=100A/μs (Note3) | - | 19 | - | nS |
| Reverse Recovery Charge | $Q_{rr}$ | | - | 10 | - | nC |

**Notes:**

① Repetitive Rating: Pulse width limited by maximum junction temperature.
② Surface Mounted on FR4 Board, t ≤ 10 sec.
③ Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
④ Guaranteed by design, not subject to production
⑤ EAS condition : Tj=25℃,$V_{DD}$=15V,$V_G$=10V,L=0.5mH,Rg=25Ω

## Q1Typical Electrical and Thermal Characteristics (Curves)

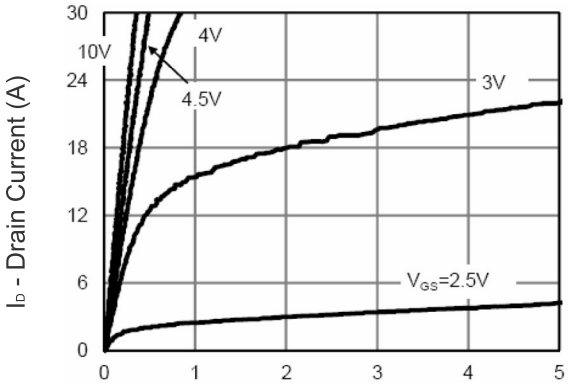



Figure 1 Output Characteristics

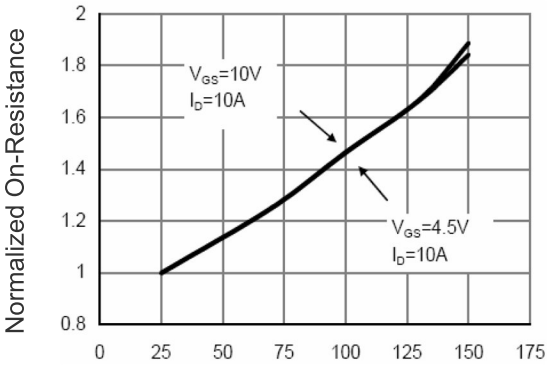



Figure 4 Rdson-Junction Temperature

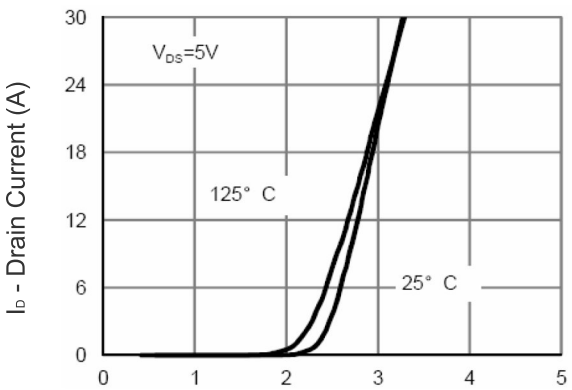



Figure 2 Transfer Characteristics

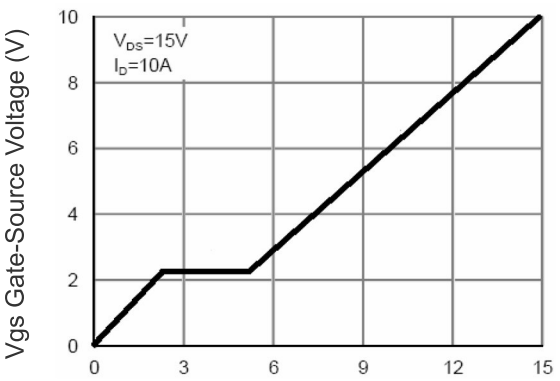



Figure 5 Gate Charge

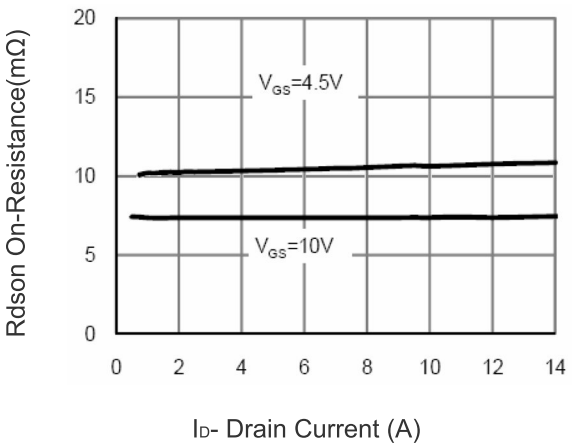



Figure 3 Rdson- Drain Current

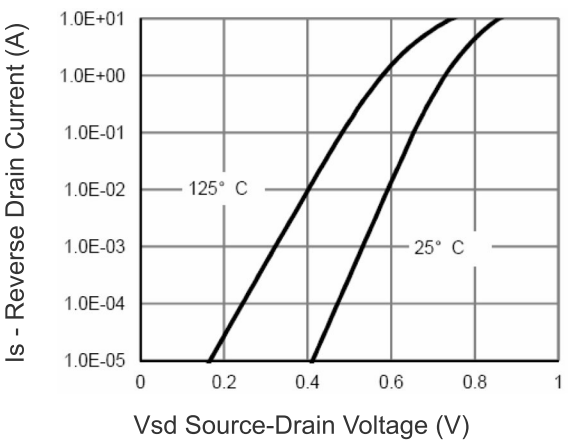



Figure 6 Source- Drain Diode Forward

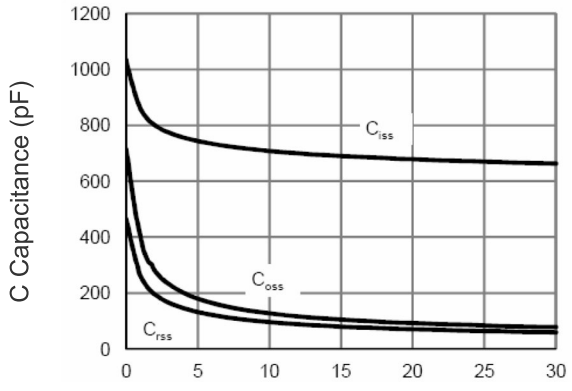



Figure 7 Capacitance vs Vds

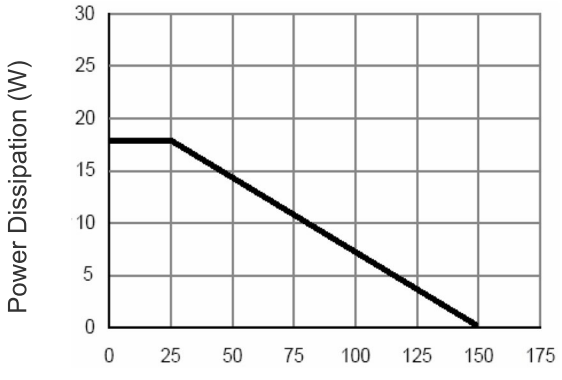



Figure 9 Power De-rating

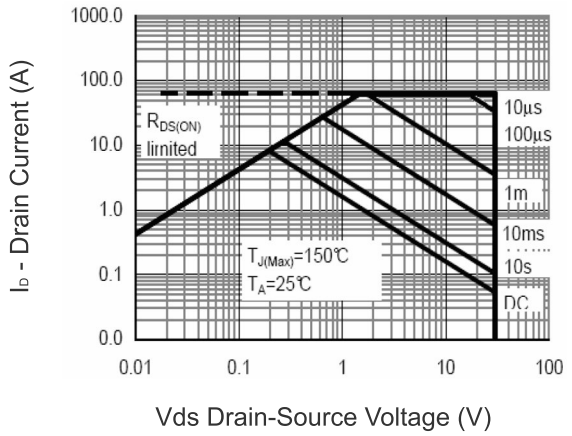



Figure 8 Safe Operation Area

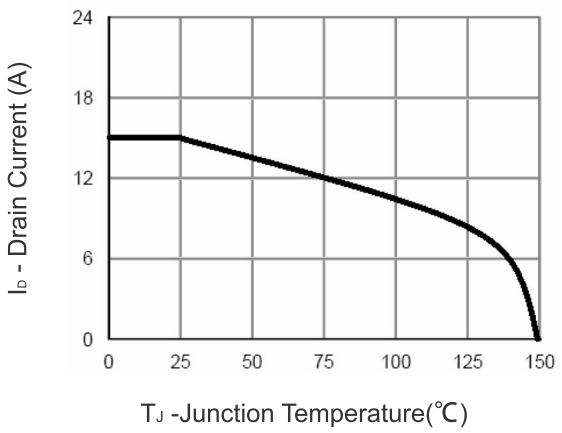



Figure 10 $I_D$ Current De-rating

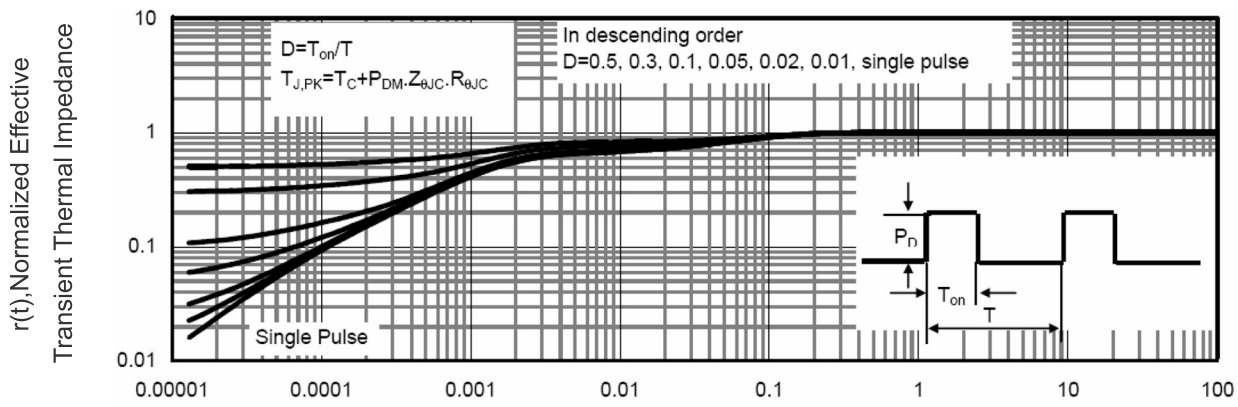



Figure 11 Normalized Maximum Transient Thermal Impedance

## Q2 Electrical Characteristics (TC=25℃unless otherwise noted)

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Off Characteristics** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $V_{GS}$=0V $I_D$=-250μA | 30 | - | - | V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$=30V,$V_{GS}$=0V | - | - | 1 | μA |
| Gate-Body Leakage Current | $I_{GSS}$ | $V_{DS}$=±20V,$V_{DS}$=0V | - | - | ±100 | nA |
| **On Characteristics** (Note 3) | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$ ,$I_D$=250μA | 1.0 | 1.5 | 2.2 | V |
| Drain-Source On-State Resistance | $R_{DS(ON)}$ | $V_{GS}$=10V, $I_D$=10A | - | 6.4 | 8.5 | mΩ |
| | | $V_{GS}$=4.5V, $I_D$=10A | - | 17 | 22 | mΩ |
| Forward Transconductance | $g_{FS}$ | $V_{DS}$=5V,$I_D$=10A | - | 26 | - | S |
| **Dynamic Characteristics** (Note 4) | | | | | | |
| Input Capacitance | $C_{lss}$ | $V_{DS}$=15V,$V_{GS}$=0V, F=1.0MHz | - | 1210 | - | PF |
| Output Capacitance | $C_{oss}$ | | - | 160 | - | PF |
| Reverse Transfer Capacitance | $C_{rss}$ | | - | 105 | - | PF |
| **Switching Characteristics** (Note 4) | | | | | | |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD}$=15V, $R_L$=0.75Ω $V_{GS}$=10V,$R_G$=3Ω | - | 5 | - | nS |
| Turn-on Rise Time | $t_r$ | | - | 12 | - | nS |
| Turn-Off Delay Time | $t_{d(off)}$ | | - | 19 | - | nS |
| Turn-Off Fall Time | $t_f$ | | - | 6 | - | nS |
| Total Gate Charge | $Q_g$ | $V_{DS}$=15V,$I_D$=10A, $V_{GS}$=10V | - | 17.5 | | nC |
| Gate-Source Charge | $Q_{gs}$ | | - | 3 | | nC |
| Gate-Drain Charge | $Q_{gd}$ | | - | 4.1 | | nC |
| **Drain-Source Diode Characteristics** | | | | | | |
| Diode Forward Voltage (Note 3) | $V_{SD}$ | $V_{GS}$=0V,$I_S$=10A | - | | 1.2 | V |
| Diode Forward Current (Note 2) | $I_S$ | | - | - | 20 | A |
| Reverse Recovery Time | $t_{rr}$ | $T_J$=25°C, $I_F$=10A di/dt=100A/μs (Note3) | - | 19 | - | nS |
| Reverse Recovery Charge | $Q_{rr}$ | | - | 10 | - | nC |

**Notes:**

① Repetitive Rating: Pulse width limited by maximum junction temperature.
② Surface Mounted on FR4 Board, t ≤ 10 sec.
③ Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
④ Guaranteed by design, not subject to production
⑤ EAS condition : Tj=25℃,$V_{DD}$=15V,$V_G$=10V,L=0.5mH,Rg=25Ω

## Q2Typical Electrical and Thermal Characteristics (Curves)

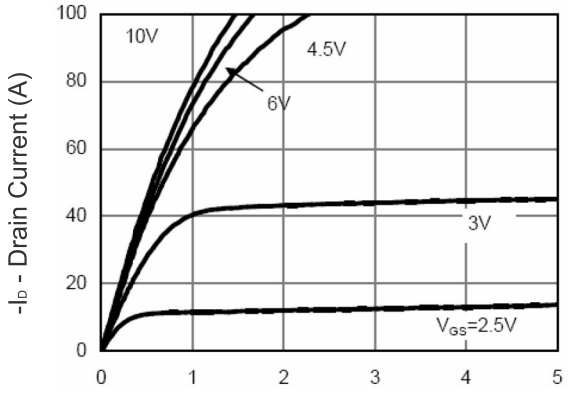



Figure 1 Output Characteristics

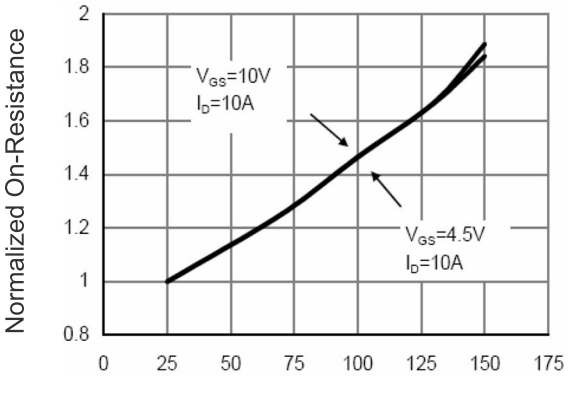



Figure 4 Rdson-Junction Temperature

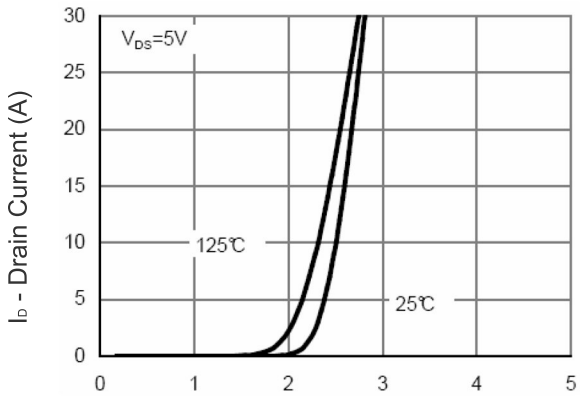



Figure 2 Transfer Characteristics

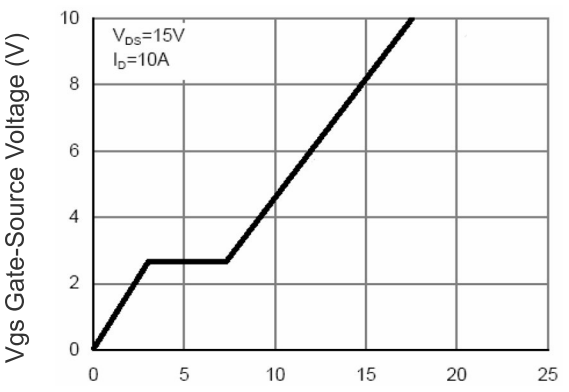



Figure 5 Gate Charge

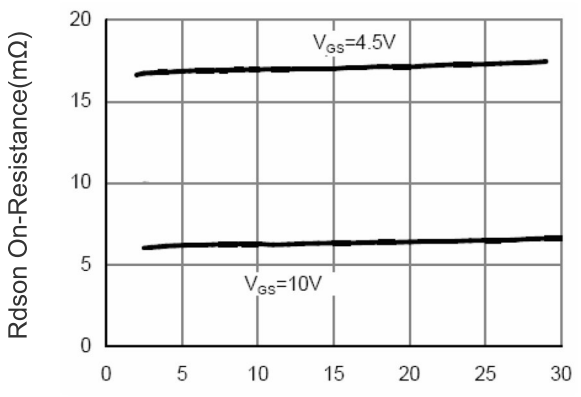



Figure 3 Rdson- Drain Current

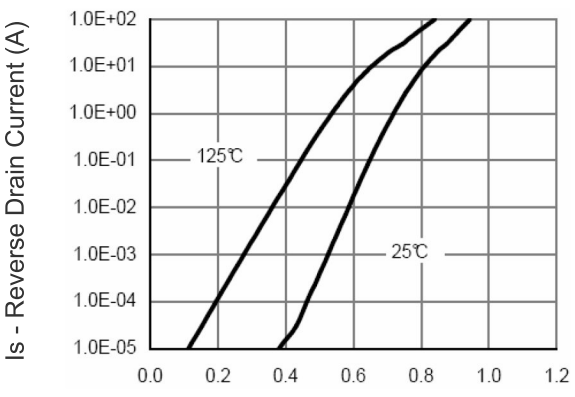



Figure 6 Source- Drain Diode Forward

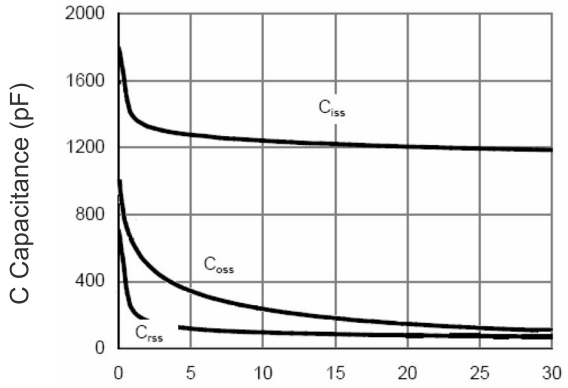



Figure 7 Capacitance vs Vds

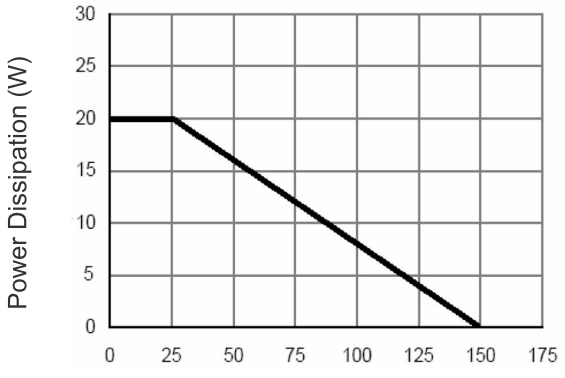



Figure 9 Power De-rating

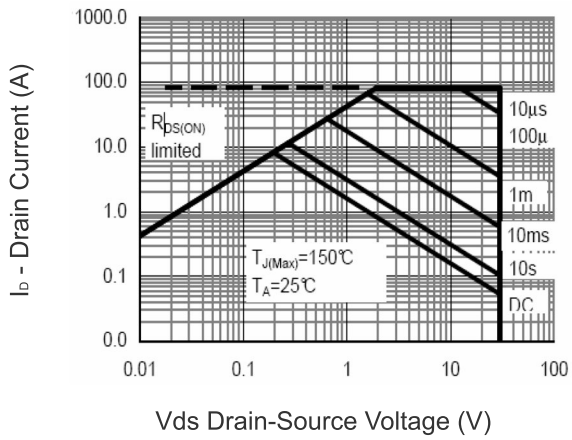



Figure 8 Safe Operation Area

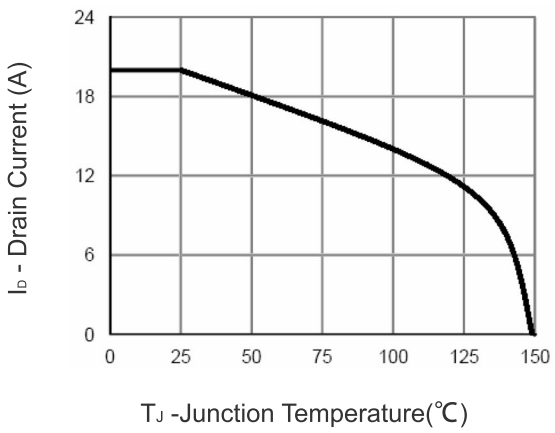



Figure 10 ID Current De-rating

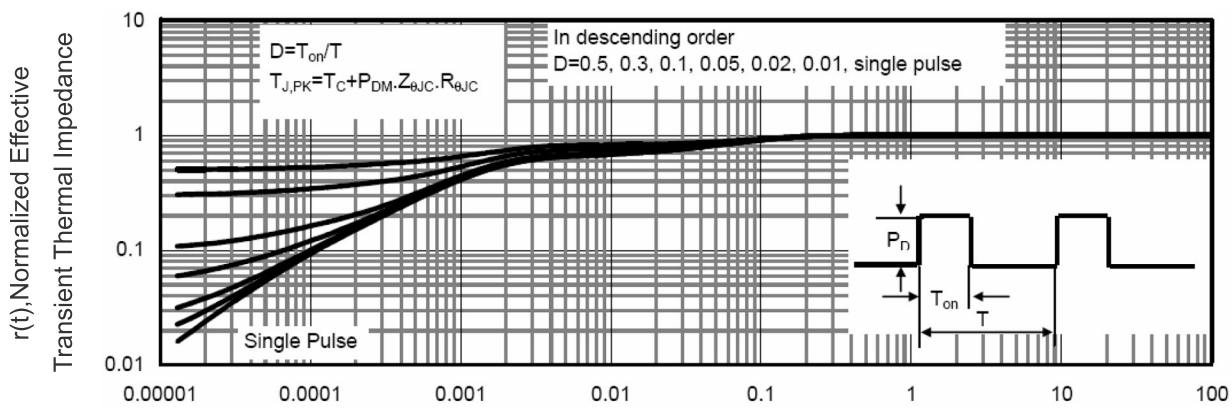
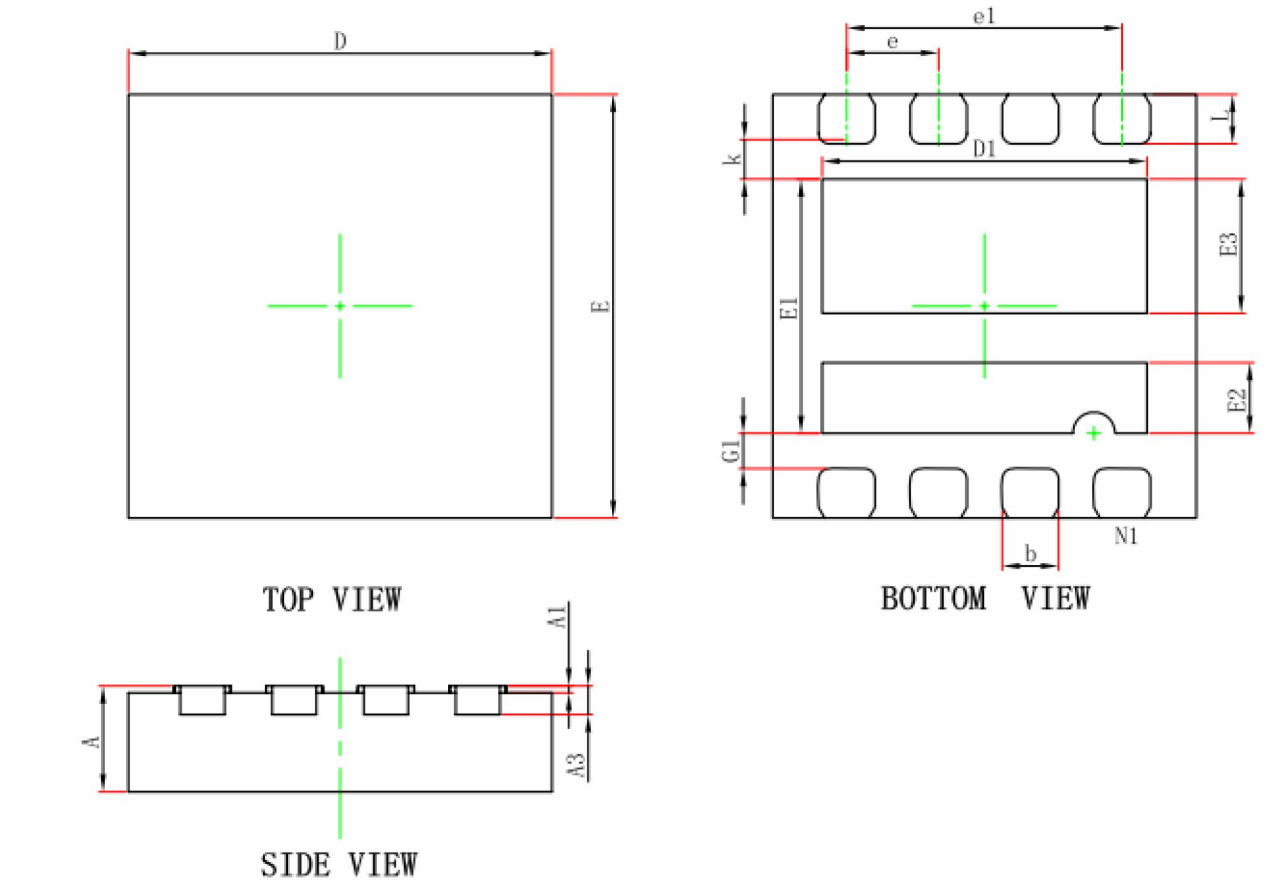



Figure 11 Normalized Maximum Transient Thermal Impedance

DFN3X3-8L Package Information




| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min. | Max. | Min. | Max. |
| A | 0.700 | 0.800 | 0.028 | 0.031 |
| A1 | 0.000 | 0.050 | 0.000 | 0.002 |
| A3 | 0.203REF. | | 0.008REF. | |
| D | 2.950 | 3.050 | 0.116 | 0.120 |
| E | 2.950 | 3.050 | 0.116 | 0.120 |
| D1 | 2.250 | 2.350 | 0.089 | 0.093 |
| E1 | 1.700 | 1.900 | 0.067 | 0.075 |
| E2 | 0.450 | 0.550 | 0.018 | 0.022 |
| E3 | 0.900 | 1.000 | 0.035 | 0.039 |
| k | 0.200 | 0.300 | 0.008 | 0.012 |
| G1 | 0.200 | 0.300 | 0.008 | 0.012 |
| b | 0.350 | 0.450 | 0.014 | 0.018 |
| e | 0.650BSC | | 0.026BSC | |
| e1 | 1.95BSC | | 0.077BSC | |
| L | 0.300 | 0.400 | 0.012 | 0.016 |

## 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.

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