

MJ N-Channel Enhancement Mode Power MOSFET

Description

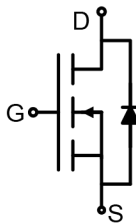
The MJ2304 uses advanced trench technology to provide excellent $R_{DS(ON)}$ and low gate charge .This device is suitable for use as a load switch or in PWM applications.

General Features

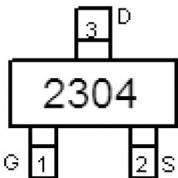
- ◆ $V_{DS}=30V, I_D=3.6A$
 $R_{DS(ON)} < 73m\Omega @ V_{GS}=4.5V$
 $R_{DS(ON)} < 58m\Omega @ V_{GS}=10V$
- ◆ High power and current handing capability
- ◆ Lead free product is acquired
- ◆ Surface Mount Package

Application

- ◆ Battery protection
- ◆ Load switch
- ◆ Power management



Schematic diagram



Marking and pin Assignment



SOT-23 top view

Package Marking and Ordering Information

| Device Marking | Device | Device Package | Reel Size | Tape width | Quantity |
|----------------|--------|----------------|-----------|------------|------------|
| 2304 | MJ2304 | SOT-23 | Ø180mm | 8 mm | 3000 units |

Absolute Maximum Ratings (Tc =25 °Cunless otherwise noted)

| Parameter | Symbol | Limit | Unit |
|--|----------------|------------|------|
| Drain-Source Voltage | V_{DS} | 30 | V |
| Gate-Source Voltage | V_{GS} | ±20 | V |
| Drain Current-Continuous | I_D | 3.6 | A |
| Pulsed Drain Current ^(Note 1) | I_{DM} | 15 | A |
| Maximum Power Dissipation | P_D | 1.7 | W |
| Operating Junction and Storage Temperature Range | T_J, T_{STG} | -55 To 150 | °C |

Thermal Characteristic

| | | | |
|--|-----------------|------|------|
| Thermal Resistance,Junction-to-Ambient ^(Note 2) | $R_{\theta JA}$ | 73.5 | °C/W |
|--|-----------------|------|------|

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 | 33 | - | 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 | 1.2 | 1.5 | 2.2 | V |
| Drain-Source On-State Resistance | R _{DS(ON)} | V _{GS} =4.5V, I _D =3.1A | - | 58 | 73 | mΩ |
| | | V _{GS} =10V, I _D =3.6A | - | 40 | 58 | mΩ |
| Forward Transconductance | g _{FS} | V _{DS} =5V,I _D =3.6A | - | 11 | - | S |
| Dynamic Characteristics ^(Note 4) | | | | | | |
| Input Capacitance | C _{iss} | V _{DS} =15V,V _{GS} =0V, F=1.0MHz | - | 230 | - | PF |
| Output Capacitance | C _{oss} | | - | 40 | - | PF |
| Reverse Transfer Capacitance | C _{rss} | | - | 17 | - | PF |
| Switching Characteristics ^(Note 4) | | | | | | |
| Turn-on Delay Time | t _{d(on)} | V _{DD} =10V,I _D =3.6A V _{GS} =4.5V,R _{GEN} =6Ω | - | 10 | - | nS |
| Turn-on Rise Time | t _r | | - | 50 | - | nS |
| Turn-Off Delay Time | t _{d(off)} | | - | 10 | - | nS |
| Turn-Off Fall Time | t _f | | - | 20 | - | nS |
| Total Gate Charge | Q _g | V _{DS} =15V,I _D =3.6A, V _{GS} =10V | - | 4.0 | - | nC |
| Gate-Source Charge | Q _{gs} | | - | 0.75 | - | nC |
| Gate-Drain Charge | Q _{gd} | | - | 0.65 | - | nC |
| Drain-Source Diode Characteristics | | | | | | |
| Diode Forward Voltage ^(Note 3) | V _{SD} | V _{GS} =0V,I _S =2.7A | - | 0.8 | 1.2 | V |
| Diode Forward Current ^(Note 2) | I _S | | - | - | 1.6 | A |

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

Typical Electrical and Thermal Characteristics

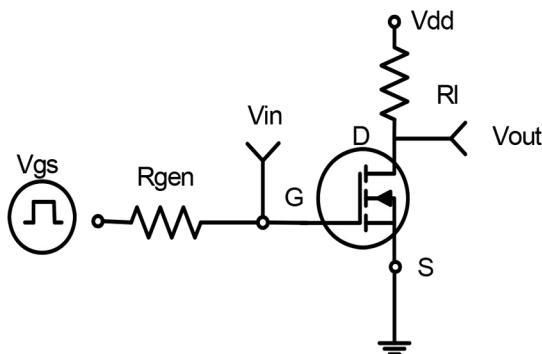


Figure 1 Switching Test Circuit

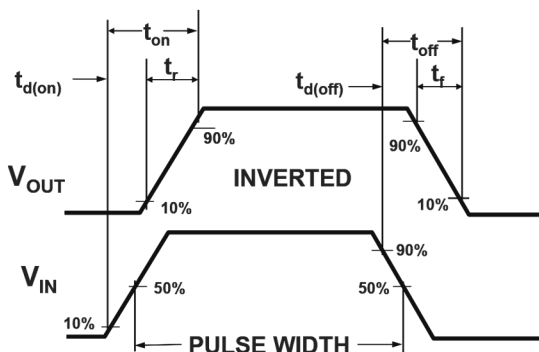


Figure 2 Switching Waveforms

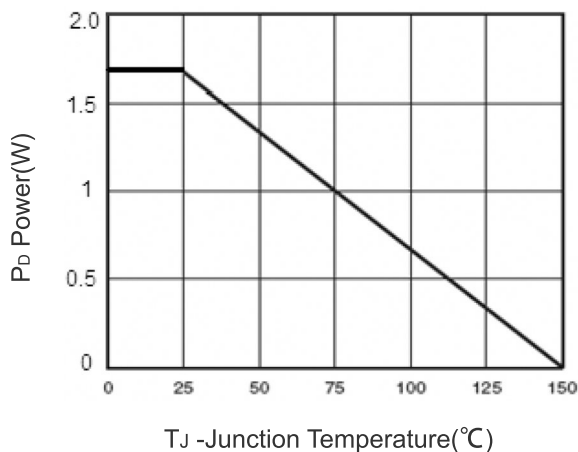


Figure 3 Power Dissipation

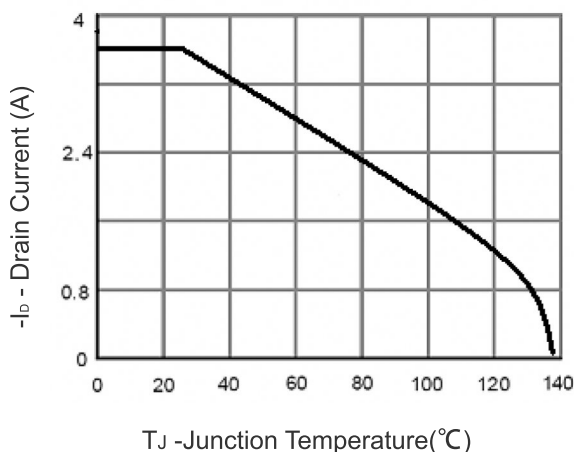


Figure 4 Drain Current

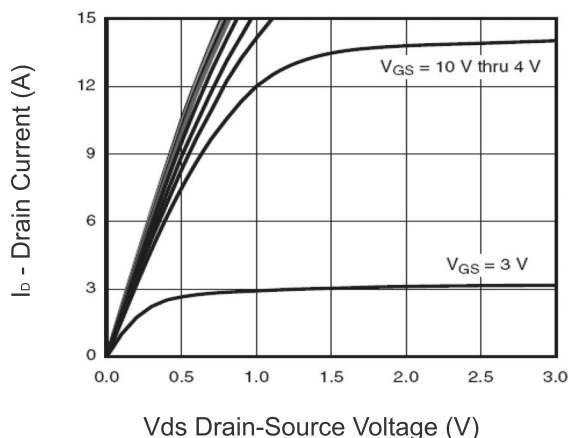


Figure 5 Output Characteristics

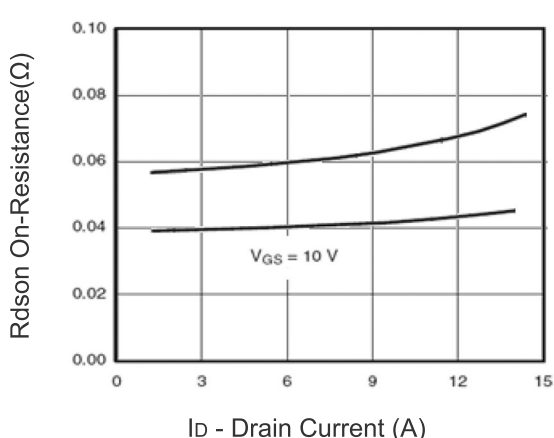


Figure 6 Drain-Source On-Resistance

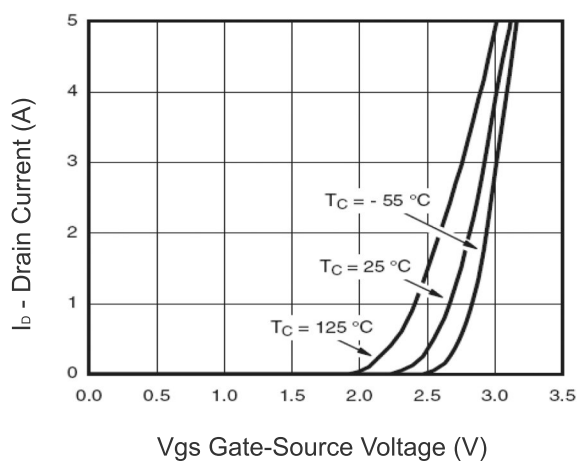


Figure 7 Transfer Characteristics

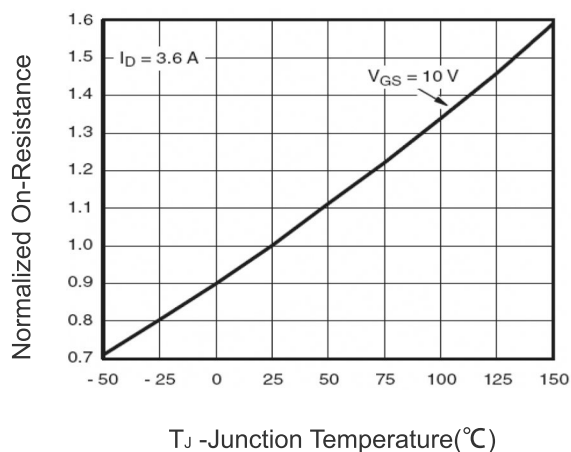


Figure 8 Drain-Source On-Resistance

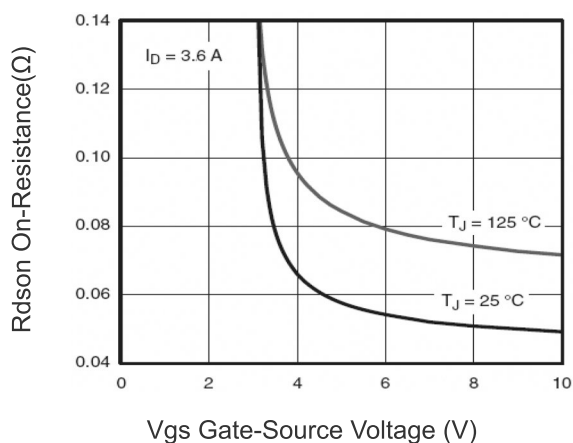
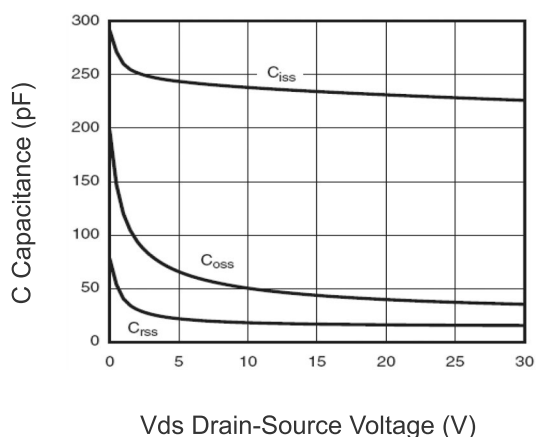
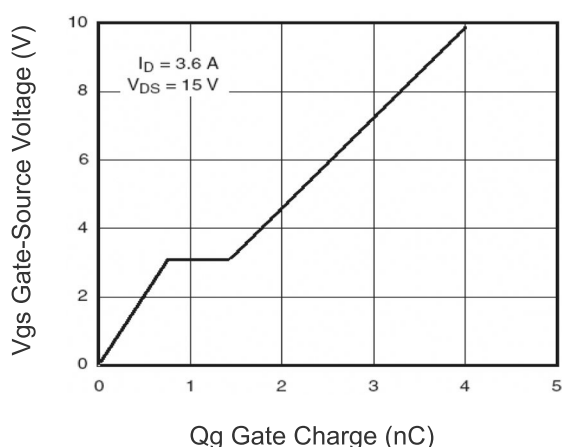

Figure 9 $R_{DS(on)}$ vs V_{GS}

Figure 10 Capacitance vs V_{DS}


Figure 11 Gate Charge

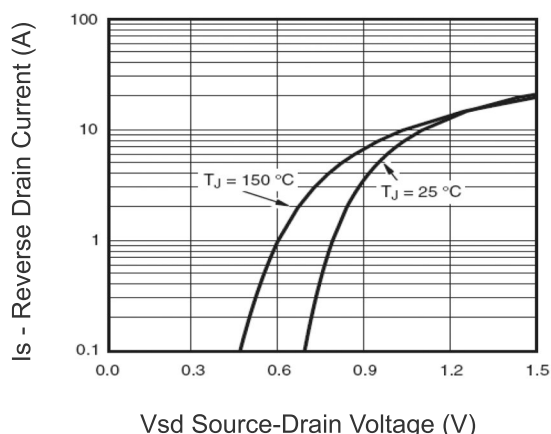


Figure 12 Source- Drain Diode Forward

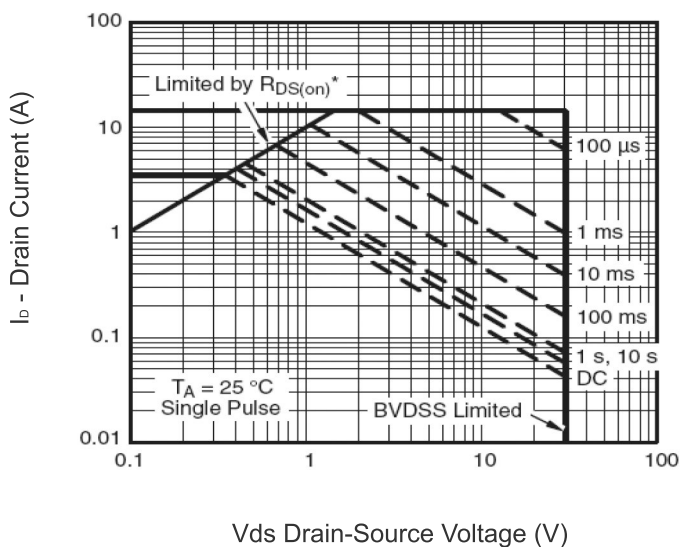


Figure 13 Safe Operation Area

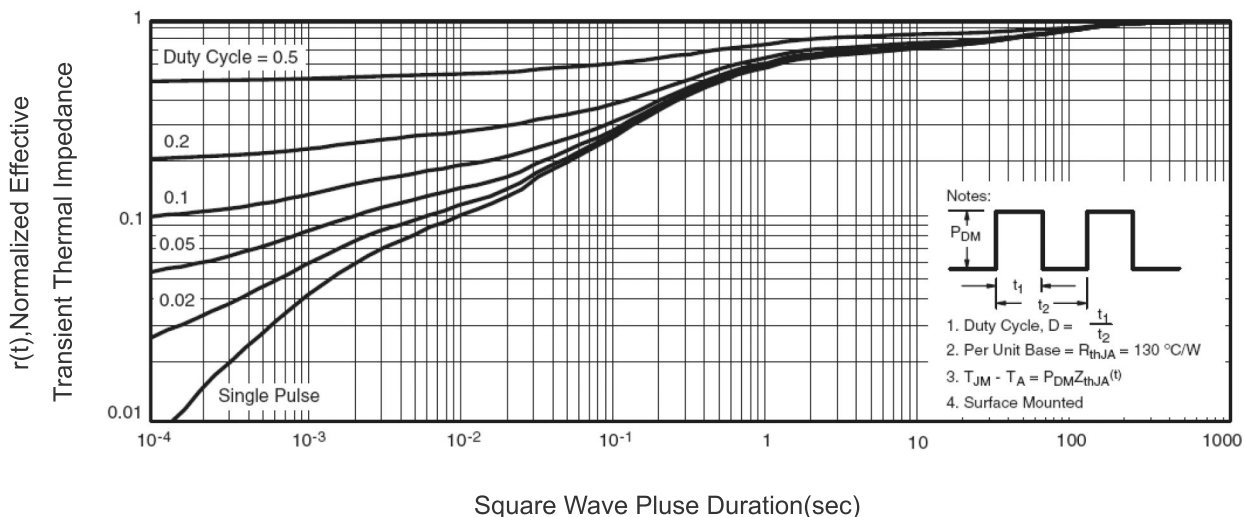
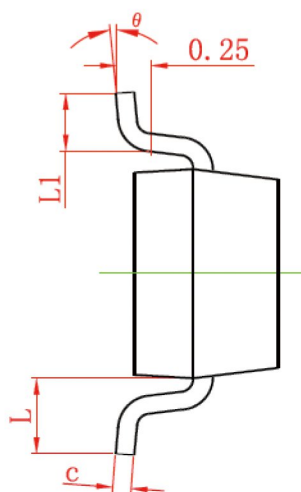
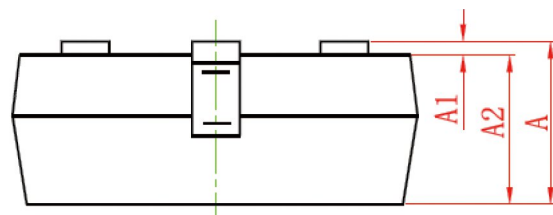
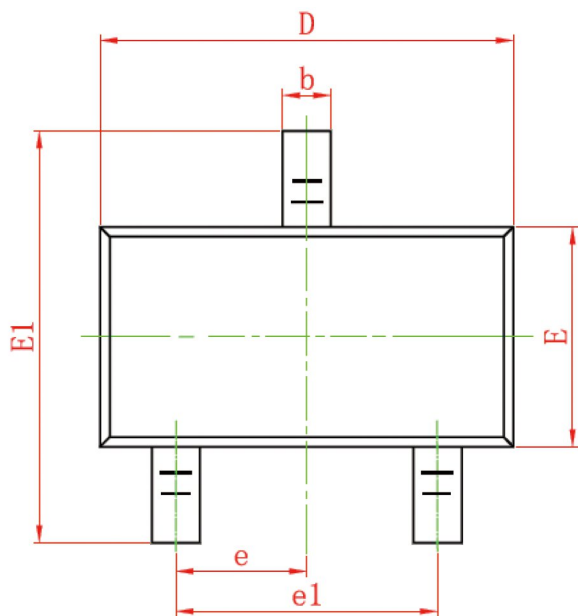


Figure 14 Normalized Maximum Transient Thermal Impedance

SOT-23 Package Information



| Symbol | Dimensions in Millimeters | |
|--------|---------------------------|-------|
| | MIN. | MAX. |
| A | 0.900 | 1.150 |
| A1 | 0.000 | 0.100 |
| A2 | 0.900 | 1.050 |
| b | 0.300 | 0.500 |
| c | 0.080 | 0.150 |
| D | 2.800 | 3.000 |
| E | 1.200 | 1.400 |
| E1 | 2.250 | 2.550 |
| e | 0.950TYP | |
| e1 | 1.800 | 2.000 |
| L | 0.550REF | |
| L1 | 0.300 | 0.500 |
| θ | 0° | 8° |

Notes:

- ① All dimensions are in millimeters.
- ② Tolerance $\pm 0.10\text{mm}$ (4 mil) unless otherwise specified
- ③ Package body sizes exclude mold flash and gate burrs. Mold flash at the non-lead sides should be less than 5 mils.
- ④ Dimension L is measured in gauge plane.
- ⑤ Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.

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