

MJ N-Channel Enhancement Mode Power MOSFET

Description

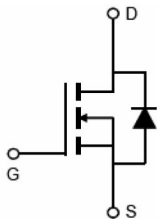
The MJ6004R uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 2.5V. This device is suitable for use as a Battery protection or in other Switching application.

General Features

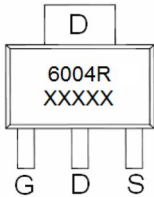
- ◆ $V_{DS} = 60V, I_D = 4.0A$
 $R_{DS(ON)} < 90m\Omega @ V_{GS} = 10V$
 $R_{DS(ON)} < 110m\Omega @ V_{GS} = 4.5V$
- ◆ High power and current handing capability
- ◆ Lead free product is acquired
- ◆ Surface Mount Package

Application

- ◆ Battery switch
- ◆ DC/DC converter



Schematic diagram



SOT-223-3L view

Package Marking and Ordering Information

| Device Marking | Device | Device Package | Reel Size | Tape width | Quantity |
|----------------|---------|----------------|-----------|------------|----------|
| MJ6004R | MJ6004R | SOT-223-3L | - | - | - |

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

| Parameter | Symbol | Limit | Unit |
|---|----------------|------------|------|
| Drain-Source Voltage | V_{DS} | 60 | V |
| Gate-Source Voltage | V_{GS} | ±20 | V |
| Drain Current-Continuous | I_D | 4 | A |
| Pulsed Drain Current ^(Note 1) | I_{DM} | 16 | A |
| Maximum Power Dissipation | P_D | 3 | W |
| Single pulse avalanche energy ^(Note 1) | E_{AS} | 22 | mJ |
| Operating Junction and Storage Temperature Range | T_J, T_{STG} | -55 To 150 | °C |

Thermal Characteristic

| | | | |
|--|-----------------|------|------|
| Thermal Resistance,Junction-to-Ambient ^(Note 3) | $R_{\theta JA}$ | 41.7 | °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 | 60 | - | - | V |
| Zero Gate Voltage Drain Current | I _{DSS} | V _{DS} =60V,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 | 1.3 | 2.0 | V |
| Drain-Source On-State Resistance | R _{DS(ON)} | V _{GS} =10V, I _D =4A | - | 64 | 90 | mΩ |
| | | V _{GS} =4.5V, I _D =4A | - | 75 | 110 | mΩ |
| Forward Transconductance | g _{FS} | V _{DS} =5V,I _D =4A | 4 | - | - | S |
| Dynamic Characteristics ^(Note 4) | | | | | | |
| Input Capacitance | C _{iss} | V _{DS} =30V,V _{GS} =0V, F=1.0MHz | - | 470 | - | PF |
| Output Capacitance | C _{oss} | | - | 29 | - | PF |
| Reverse Transfer Capacitance | C _{rss} | | - | 24 | - | PF |
| Switching Characteristics ^(Note 4) | | | | | | |
| Turn-on Delay Time | t _{d(on)} | V _{DD} =30V,I _D =4A V _{GS} =10V,R _{GEN} =1Ω | - | 6 | - | nS |
| Turn-on Rise Time | t _r | | - | 15 | - | nS |
| Turn-Off Delay Time | t _{d(off)} | | - | 15 | - | nS |
| Turn-Off Fall Time | t _f | | - | 10 | - | nS |
| Total Gate Charge | Q _g | V _{DS} =30V,I _D =4A, V _{GS} =10V | - | 14.6 | - | nC |
| Gate-Source Charge | Q _{gs} | | - | 1.6 | - | nC |
| Gate-Drain Charge | Q _{gd} | | - | 3 | - | nC |
| Drain-Source Diode Characteristics | | | | | | |
| Diode Forward Voltage ^(Note 3) | V _{SD} | V _{GS} =0V,I _S =4A | - | - | 1.2 | V |
| Diode Forward Current ^(Note 2) | I _S | | - | - | 4 | 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
- ⑤ EAS condition : T_j=25℃, V_{DD}=-30V,V_G=-10V,L=0.5mH,R_g=25Ω

Typical Electrical and Thermal Characteristics

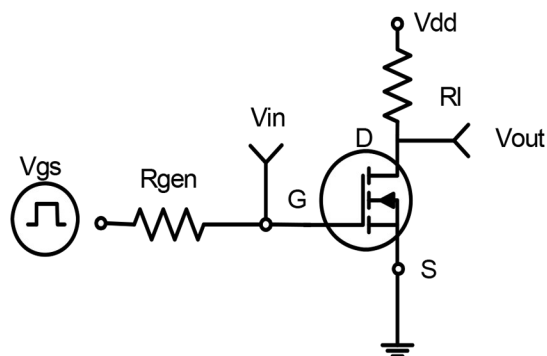


Figure 1 Switching Test Circuit

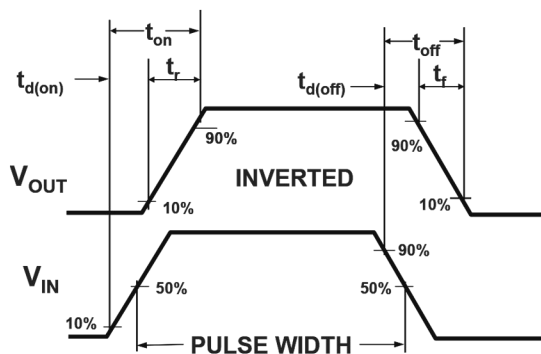
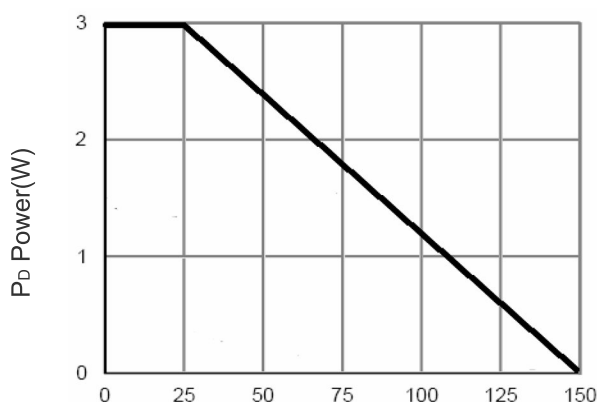
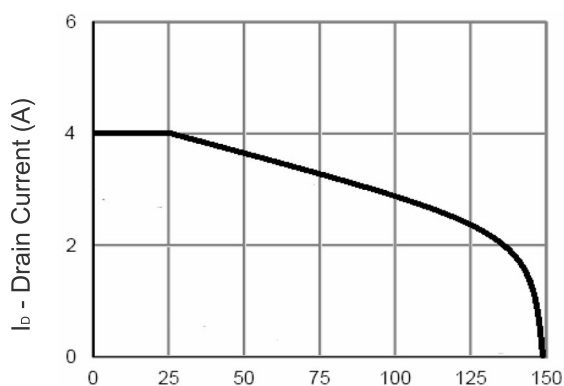


Figure 2 Switching Waveforms



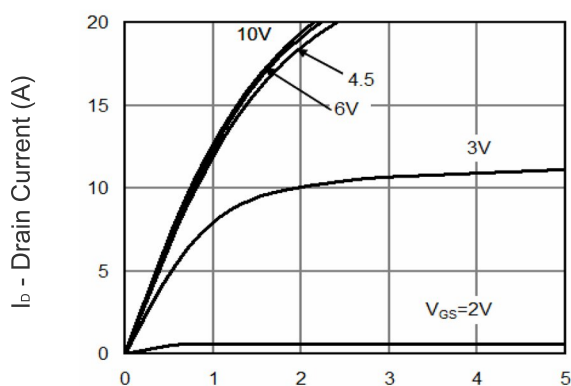
TJ - Junction Temperature(°C)

Figure 3 Power Dissipation



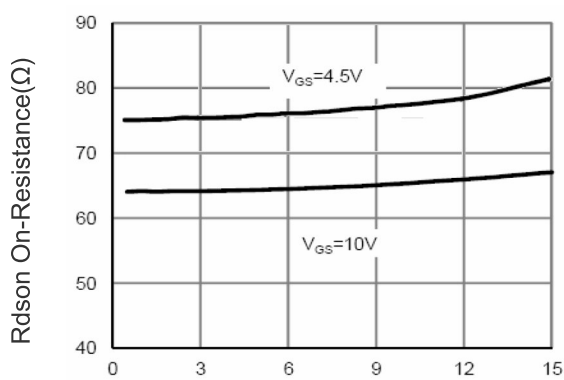
TJ - Junction Temperature(°C)

Figure 4 Drain Current



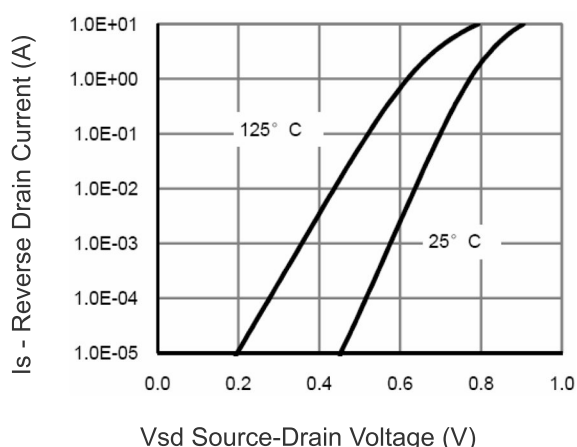
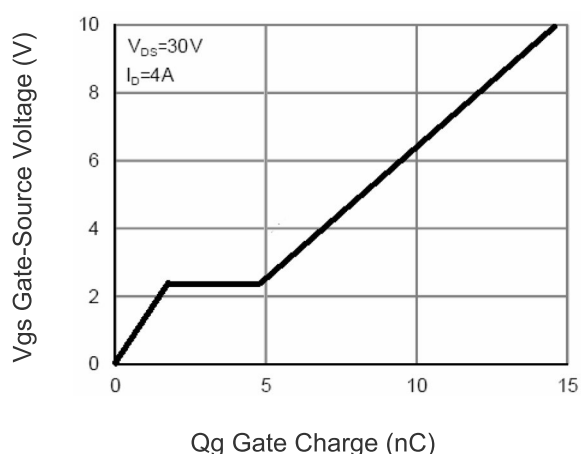
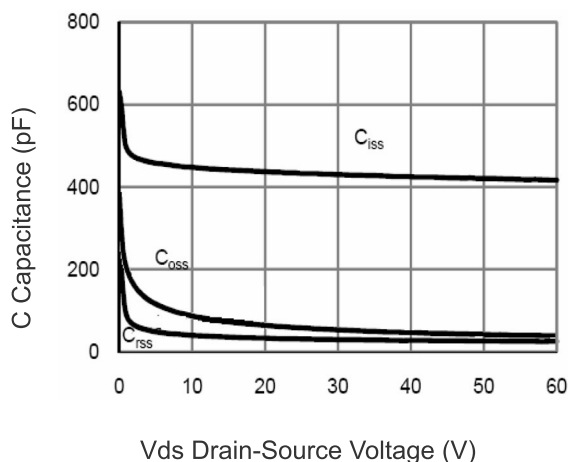
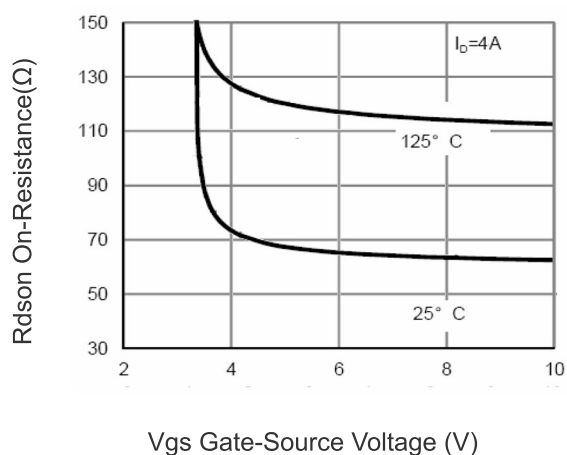
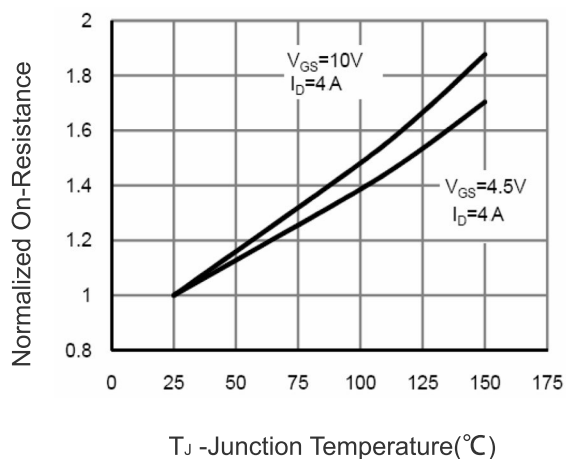
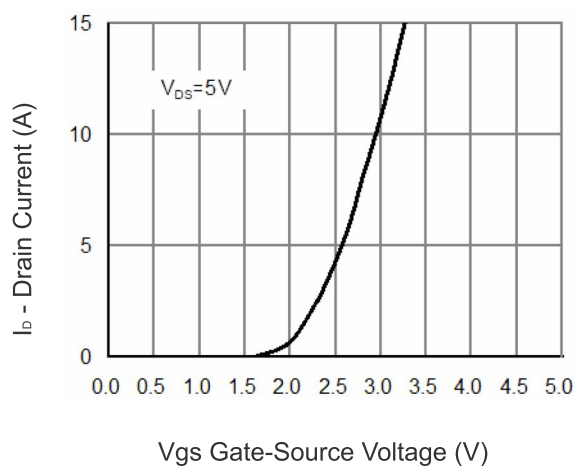
Vds Drain-Source Voltage (V)

Figure 5 Output Characteristics



ID - Drain Current (A)

Figure 6 Drain-Source On-Resistance



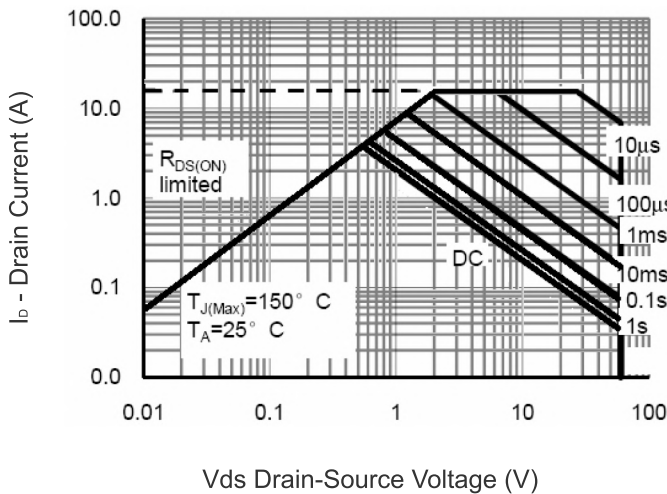


Figure 13 Safe Operation Area

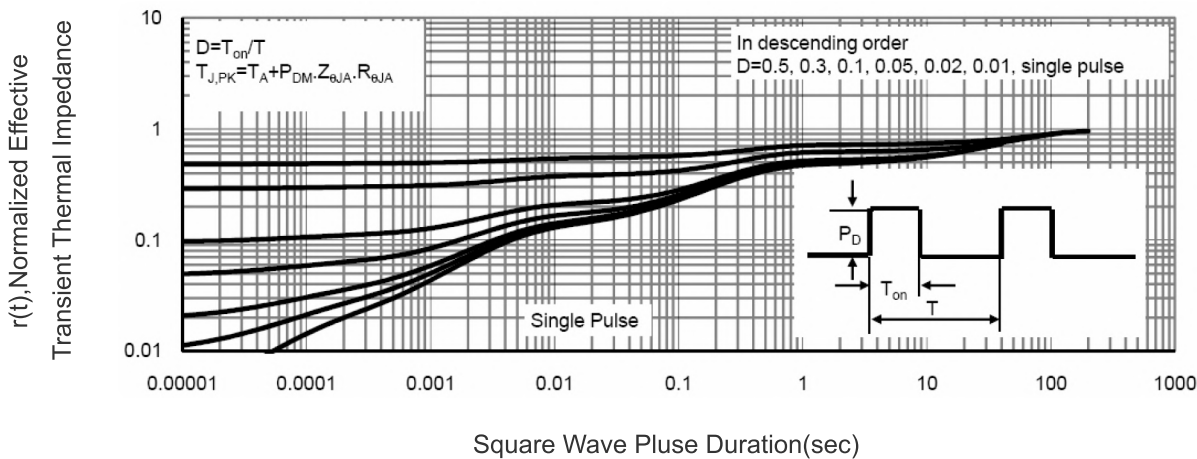
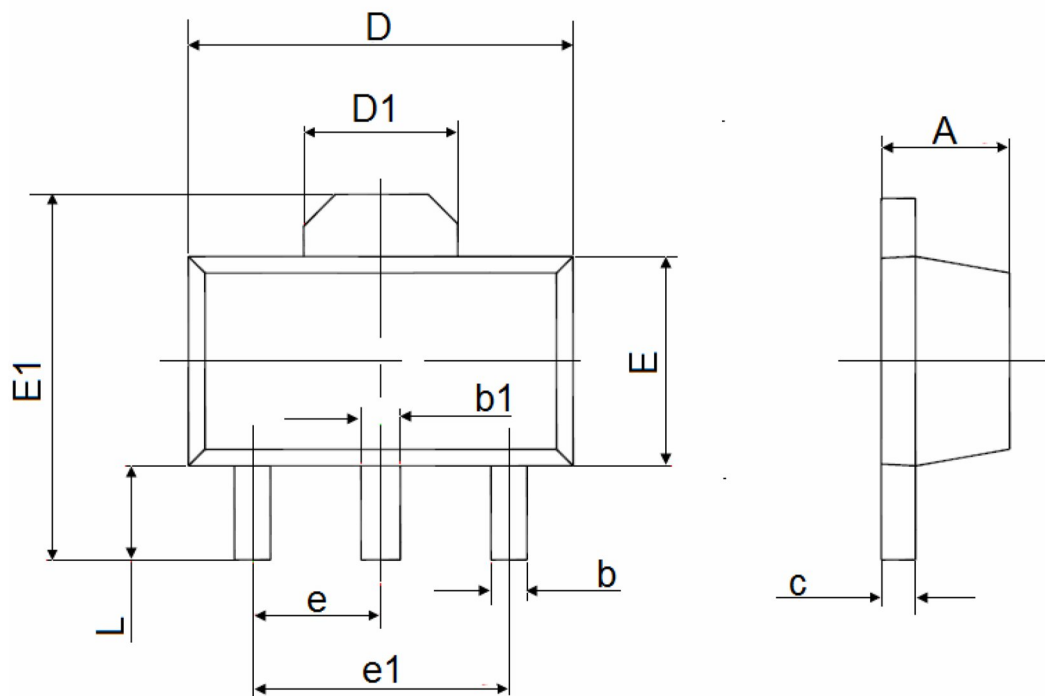


Figure 14 Normalized Maximum Transient Thermal Impedance

SOT-89-3L Package Information



| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|-------|----------------------|-------|
| | Min | Max | Min | Max |
| A | 1.400 | 1.600 | 0.055 | 0.063 |
| b | 0.320 | 0.520 | 0.013 | 0.020 |
| b1 | 0.400 | 0.580 | 0.016 | 0.023 |
| c | 0.350 | 0.440 | 0.014 | 0.017 |
| D | 4.400 | 4.600 | 0.173 | 0.181 |
| D1 | 1.550 REF. | | 0.061 REF. | |
| E | 2.300 | 2.600 | 0.091 | 0.102 |
| E1 | 3.940 | 4.250 | 0.155 | 0.167 |
| e | 1.500 TYP. | | 0.060 TYP. | |
| e1 | 3.000 TYP. | | 0.118 TYP. | |
| L | 0.900 | 1.200 | 0.035 | 0.047 |

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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