# MJ P-Channel Enhancement Mode Power MOSFET

## Description

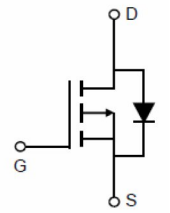
The MJ60P04Y uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge . This device is well suited for use as a load switch or in PWM applications.

## General Features

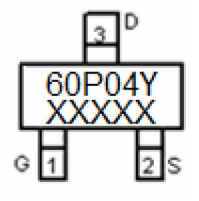
- $V_{DS}$ =-60V,$I_D$ =-4A
  $R_{DS(ON)}$ <120mΩ @ $V_{GS}$ =-10V
  $R_{DS(ON)}$ <170mΩ @ $V_{GS}$ =-4.5V
- High density cell design for ultra low Rdson
- Fully characterized avalanche voltage and current
- Excellent package for good heat dissipation

## Application

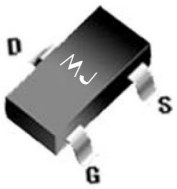
- Load switch
- PWM application




Schematic diagram




Marking and pin assignment




SOT-23-3L top view

## Package Marking and Ordering Information

| Device Marking | Device | Device Package | Reel Size | Tape width | Quantity |
|---|---|---|---|---|---|
| 60P04Y | MJ60P04Y | SOT-23-3L | Ø180mm | 8 mm | 3000 units |

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

| Parameter | Symbol | Limit | Unit |
|---|---|---|---|
| Drain-Source Voltage | $V_{DS}$ | -60 | V |
| Gate-Source Voltage | $V_{DS}$ | ±20 | V |
| Drain Current-Continuous | $I_D$ | -4 | A |
| Pulsed Drain Current (Note 1) | $I_{DM}$ | -16 | A |
| Maximum Power Dissipation | $P_D$ | 1.5 | W |
| Single pulse avalanche energy (Note 1) | $E_{AS}$ | 72 | mJ |
| Operating Junction and Storage Temperature Range | $T_J$ ,$T_{STG}$ | -55 To 150 | ℃ |

## Thermal Characteristic

| | | | |
|---|---|---|---|
| Thermal Resistance,Junction-to-Ambient (Note 2) | $R_{\theta JA}$ | 83.3 | ℃/W |

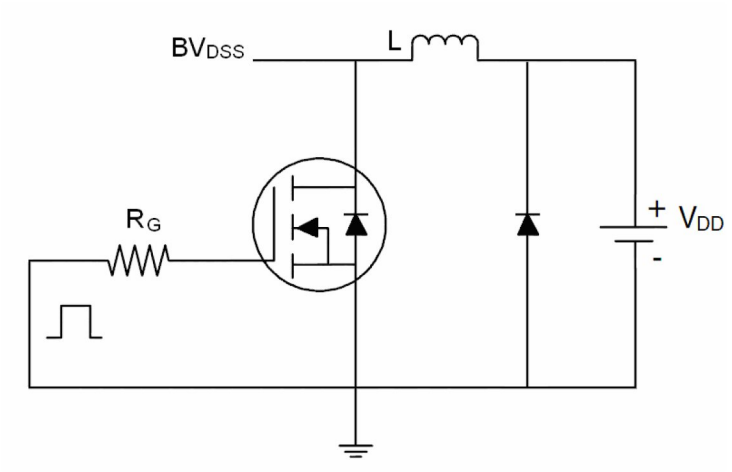
## Electrical Characteristics ($T_A$ =25℃unless otherwise noted)

| 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,$V_{GS}$ =0V | - | - | ±100 | nA |
| **On Characteristics** (Note 3) | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$ =$V_{GS}$ ,$I_D$ =250μA | -1.0 | -1.5 | -2.5 | V |
| Drain-Source On-State Resistance | $R_{DS(ON)}$ | $V_{GS}$ =-10V, $I_D$ =-4A | - | 106 | 120 | mΩ |
| | | $V_{GS}$ =-4.5V, $I_D$ =-3A | - | 135 | 170 | mΩ |
| Forward Transconductance | $g_{FS}$ | $V_{DS}$ =-5V,$I_D$ =-4A | - | 10 | - | S |
| **Dynamic Characteristics** (Note 4) | | | | | | |
| Input Capacitance | $C_{lss}$ | $V_{DS}$ =-30V,$V_{GS}$ =0V, F=1.0MHz | - | 930 | - | PF |
| Output Capacitance | $C_{oss}$ | | - | 85 | - | PF |
| Reverse Transfer Capacitance | $C_{rss}$ | | - | 35 | - | PF |
| **Switching Characteristics** (Note 4) | | | | | | |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD}$ =-30V, ,$R_L$ =7.5Ω $V_{GS}$ =-10V,$R_{GEN}$ =3Ω | - | 8 | - | nS |
| Turn-on Rise Time | $t_r$ | | - | 4 | - | nS |
| Turn-Off Delay Time | $t_{d(off)}$ | | - | 32 | - | nS |
| Turn-Off Fall Time | $t_f$ | | - | 7 | - | nS |
| Total Gate Charge | $Q_g$ | $V_{DS}$ =-30V,$I_D$ =-4A, $V_{GS}$ =-10V | - | 25 | - | nC |
| Gate-Source Charge | $Q_{gs}$ | | - | 3 | - | nC |
| Gate-Drain Charge | $Q_{gd}$ | | - | 7 | - | 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 |
| Reverse Recovery Time | $t_{rr}$ | $T_J$ = 25°C, $I_F$ =- 4A di/dt = -100A/μs (Note3) | - | 25 | | nS |
| Reverse Recovery Charge | $Q_{rr}$ | | - | 31 | | nC |

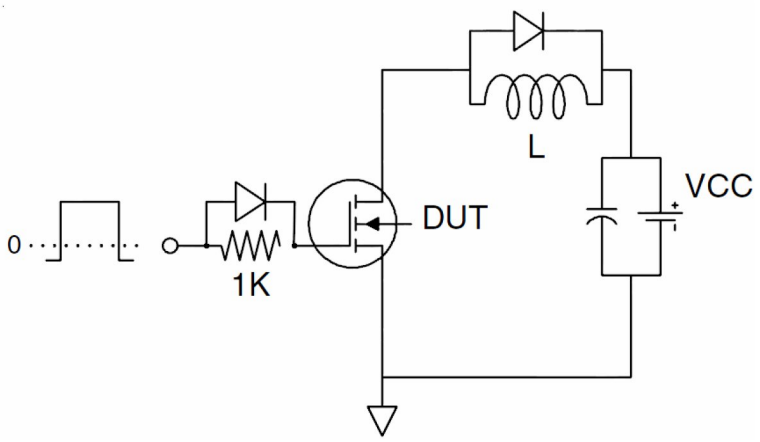
**Notes:**

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

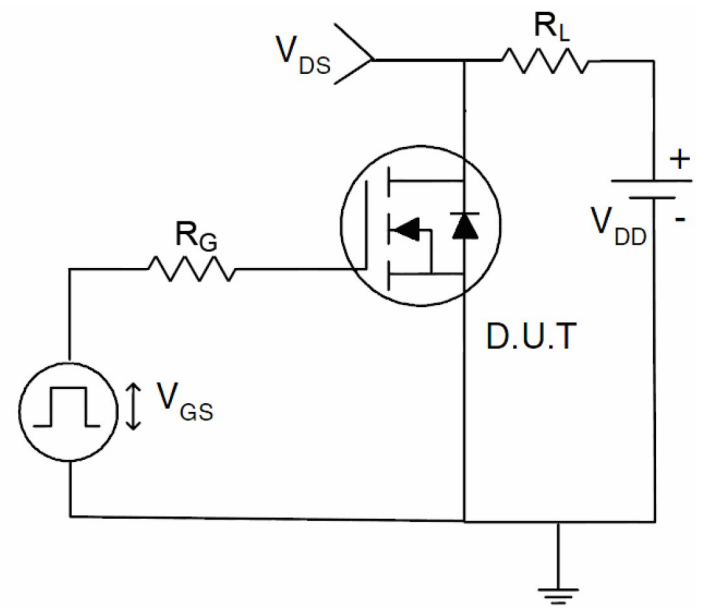
## Test Circuit




EAS test Circuit




Gate charge test Circuit




Switch Time Test Circuit

## Typical Electrical and Thermal Characteristics (Curves)

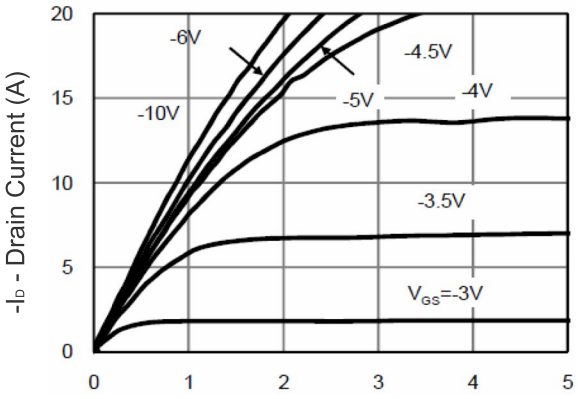



Figure 1 Output Characteristics

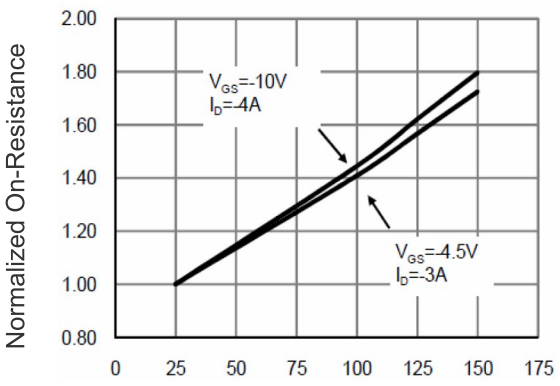



Figure 4 Rdson-Junction Temperature

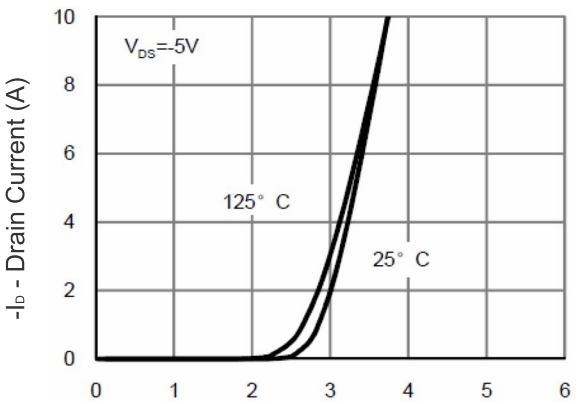



Figure 2 Transfer Characteristics

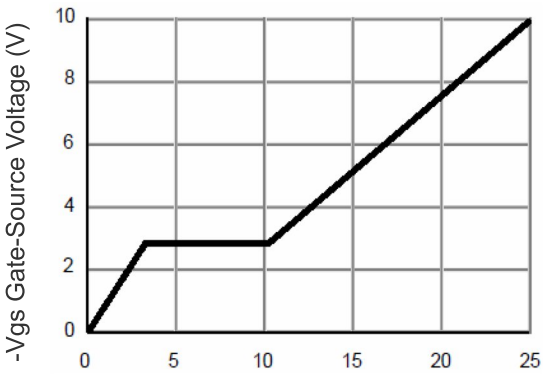



Figure 5 Gate Charge

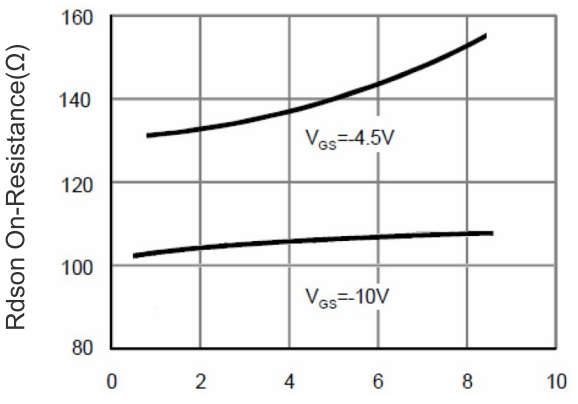



Figure 3 Rdson- Drain Current

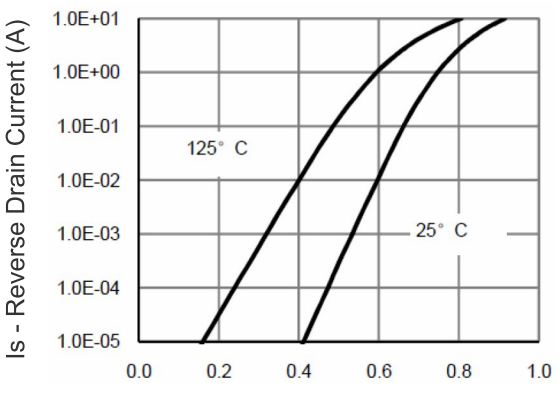



Figure 6 Source- Drain Diode Forward

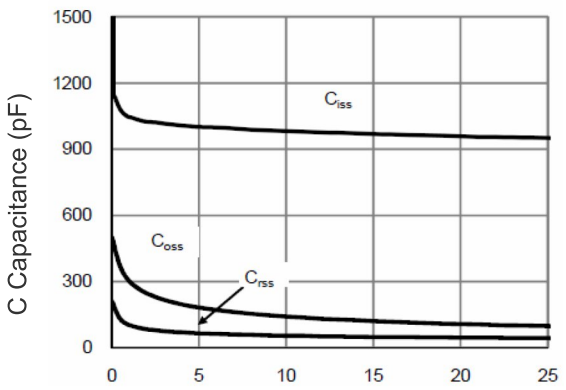



Figure 7 Capacitance vs Vds

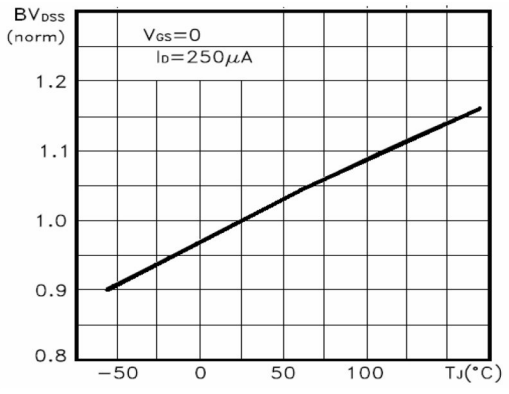



Figure 9 $BV_{DSS}$ vs Junction Temperature

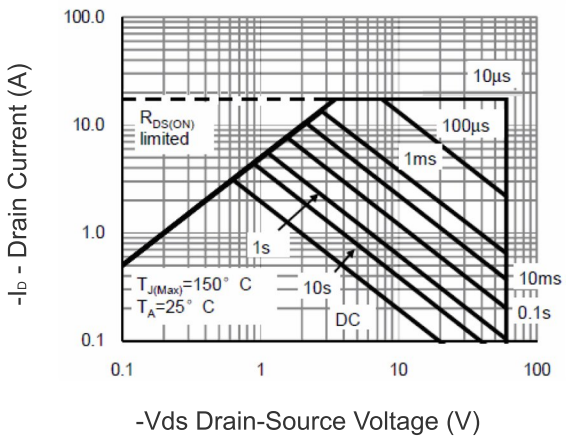



Figure 8 Safe Operation Area

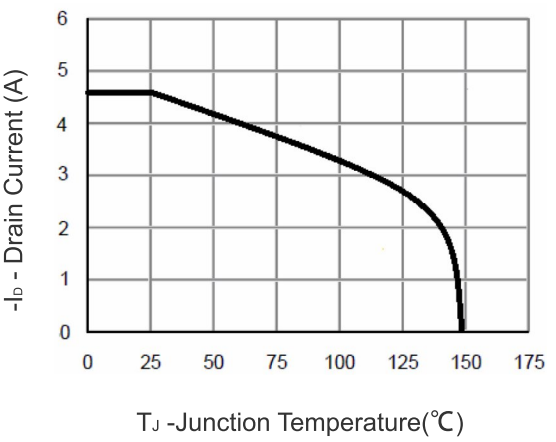



Figure 10 ID Current De-rating

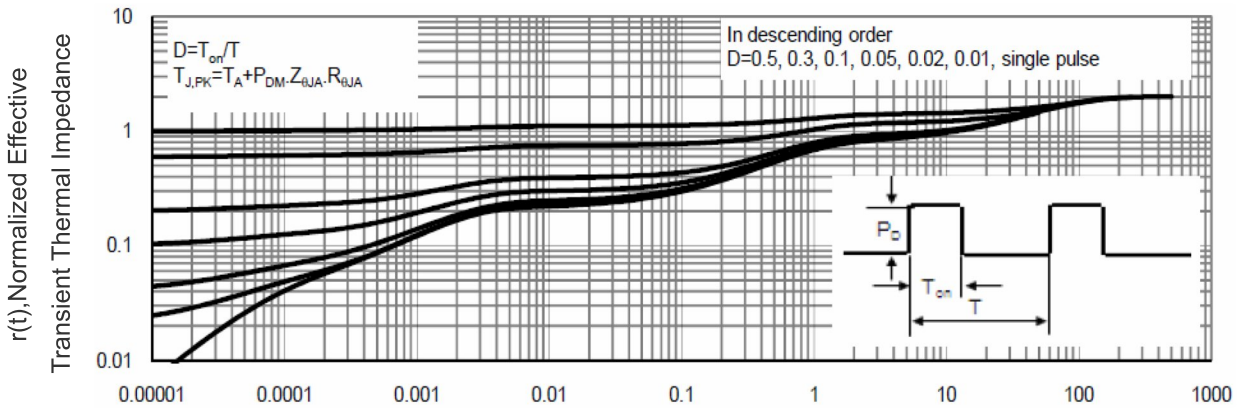
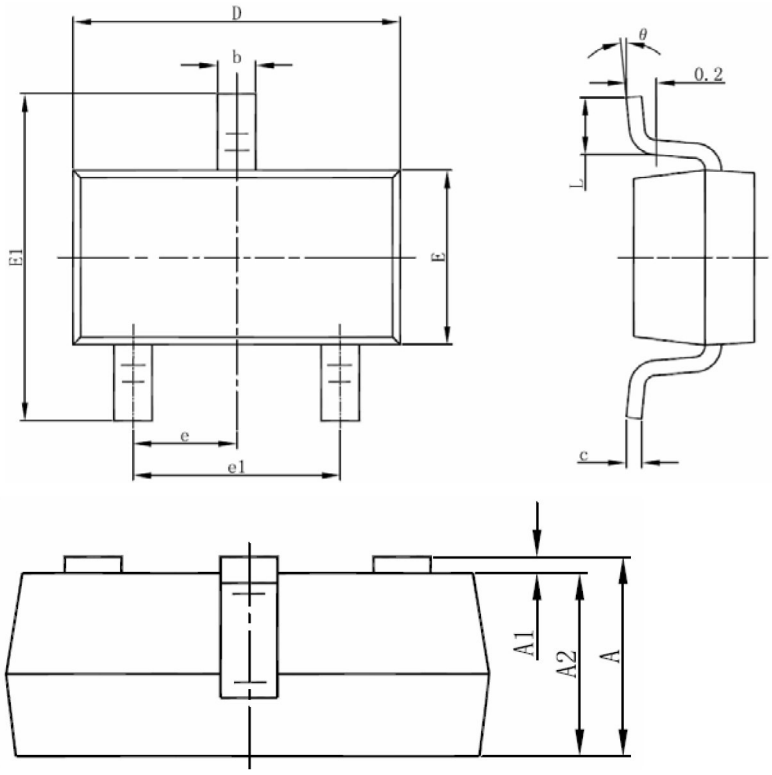



Figure 11 Normalized Maximum Transient Thermal Impedance

## SOT23-3L Package Information




| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min | Max | Min | Max |
| A | 1.050 | 1.250 | 0.041 | 0.049 |
| A1 | 0.000 | 0.100 | 0.000 | 0.004 |
| A2 | 1.050 | 1.150 | 0.041 | 0.045 |
| b | 0.300 | 0.500 | 0.012 | 0.020 |
| c | 0.100 | 0.200 | 0.004 | 0.008 |
| D | 2.820 | 3.020 | 0.111 | 0.119 |
| E | 1.500 | 1.700 | 0.059 | 0.067 |
| E1 | 2.650 | 2.950 | 0.104 | 0.116 |
| e | 0.950(BSC) | | 0.037(BSC) | |
| e1 | 1.800 | 2.000 | 0.071 | 0.079 |
| L | 0.300 | 0.600 | 0.012 | 0.024 |
| θ | 0° | 8° | 0° | 8° |

Notes:

① All dimensions are in millimeters.
② Tolerance ±0.10mm (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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