

MJ P-Channel Enhancement Mode Power MOSFET

Description

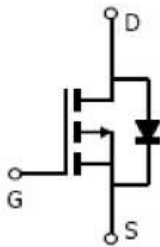
The MJ60P20K uses advanced trench technology and design to provide excellent RDS(ON) with low gate charge. It can be used in a wide variety of applications.

General Features

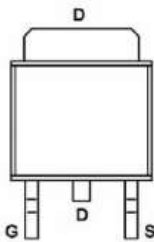
- ◆ $V_{DS} = -60V, I_D = -20A$
 $R_{DS(ON)} < 42m\Omega @ V_{GS} = -10V$
- ◆ High density cell design for ultra low Rdson
- ◆ Fully characterized avalanche voltage and current
- ◆ Good stability and uniformity with high EAS
- ◆ Excellent package for good heat dissipation

Application

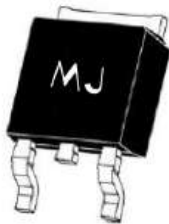
- ◆ Power switching application
- ◆ Hard switched and high frequency circuits
- ◆ Uninterruptible power supply



Schematic diagram



Marking and pin assignment



TO-252-2L top view

100% UIS TESTED!

Package Marking and Ordering Information

| Device Marking | Device | Device Package | Reel Size | Tape width | Quantity |
|----------------|----------|----------------|-----------|------------|----------|
| MJ60P20K | MJ60P20K | TO-252-2L | - | - | - |

Absolute Maximum Ratings (Tc =25 °C unless 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 | -20 | A |
| Drain Current-Continuous($T_C = 100^{\circ}C$) | $I_{D(100^{\circ}C)}$ | -14.1 | A |
| Pulsed Drain Current | I_{DM} | 80 | A |
| Maximum Power Dissipation | P_D | 60 | W |
| Derating factor | | 0.4 | W/°C |
| Single pulse avalanche energy ^(Note 5) | E_{AS} | 100 | mJ |
| Operating Junction and Storage Temperature Range | T_J, T_{STG} | -55 To 175 | °C |

Thermal Characteristic

| | | | |
|--|-----------------|-----|------|
| Thermal Resistance, Junction-to-Case ^(Note 2) | $R_{\theta JC}$ | 2.5 | °C/W |
|--|-----------------|-----|------|

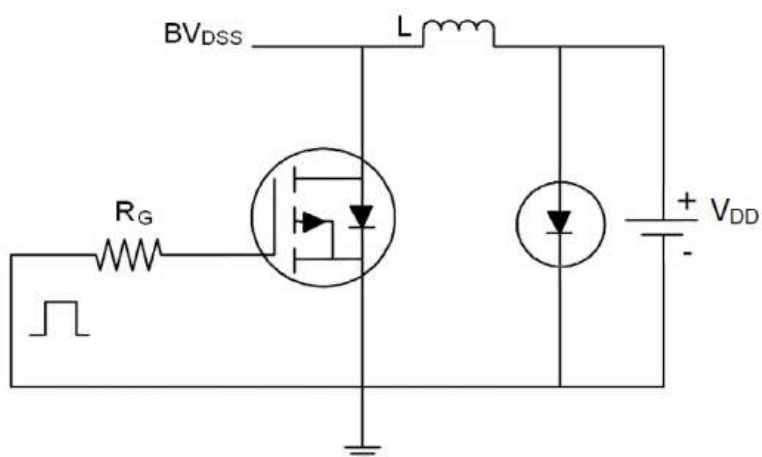
Electrical Characteristics (T_c =25°C unless otherwise noted)

| 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 | -2 | -2.8 | -3.5 | V |
| Drain-Source On-State Resistance | R _{DS(ON)} | V _{GS} =-10V, I _D =-20A | - | 35 | 42 | mΩ |
| Forward Transconductance | g _{FS} | V _{DS} =-5V,I _D =-20A | - | 20 | - | S |
| Dynamic Characteristics ^(Note 4) | | | | | | |
| Input Capacitance | C _{iss} | V _{DS} =-30V,V _{GS} =0V F=1.0MHz | - | 2485 | - | PF |
| Output Capacitance | C _{oss} | | - | 114 | - | PF |
| Reverse Transfer Capacitance | C _{rss} | | - | 104 | - | PF |
| Switching Characteristics ^(Note 4) | | | | | | |
| Turn-on Delay Time | t _{d(on)} | V _{DD} =-30V,I _D =-20A V _{GS} =-10V,R _{GEN} =3Ω | - | 12 | - | nS |
| Turn-on Rise Time | t _r | | - | 14 | - | nS |
| Turn-Off Delay Time | t _{d(off)} | | - | 38 | - | nS |
| Turn-Off Fall Time | t _f | | - | 15 | - | nS |
| Total Gate Charge | Q _g | V _{DS} =-30V,I _D =-20A V _{GS} =-10V | - | 46.1 | - | nC |
| Gate-Source Charge | Q _{gs} | | - | 9.9 | - | nC |
| Gate-Drain Charge | Q _{gd} | | - | 11.7 | - | nC |
| Drain-Source Diode Characteristics | | | | | | |
| Diode Forward Voltage ^(Note 3) | V _{SD} | V _{GS} =0V,I _S =-20A | - | - | 1.2 | V |
| Diode Forward Current ^(Note 2) | I _S | | - | - | -20 | A |
| Reverse Recovery Time | t _{rr} | T _J =25°C, I _F =-20A di/dt=-100A/μs ^(Note 3) | - | - | 40 | nS |
| Reverse Recovery Charge | Q _{rr} | | - | - | 120 | nC |

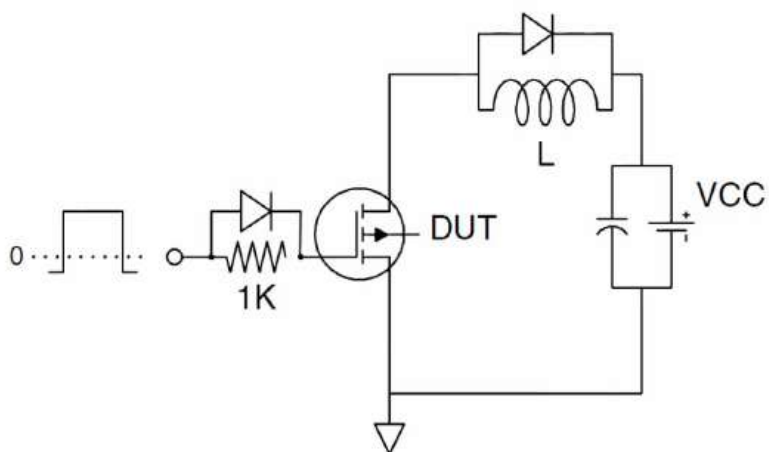
Notes:

- 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: T_J=25°C, V_{DD}=-30V, V_G=-10V, L=0.5mH, R_g=25Ω

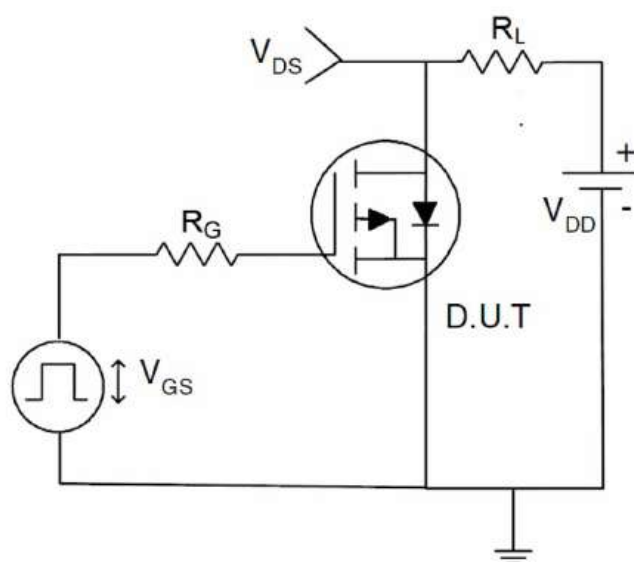
Test circuit



EAS test Circuit

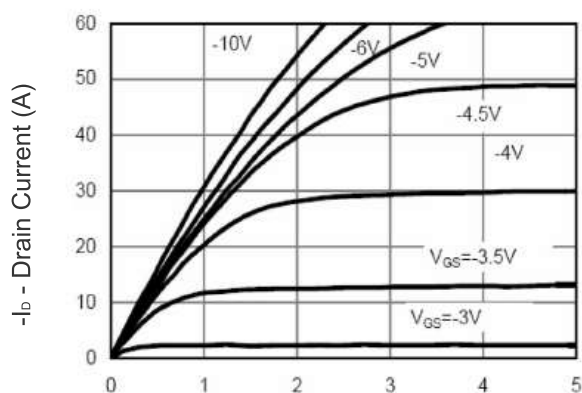


Gate charge test Circuit



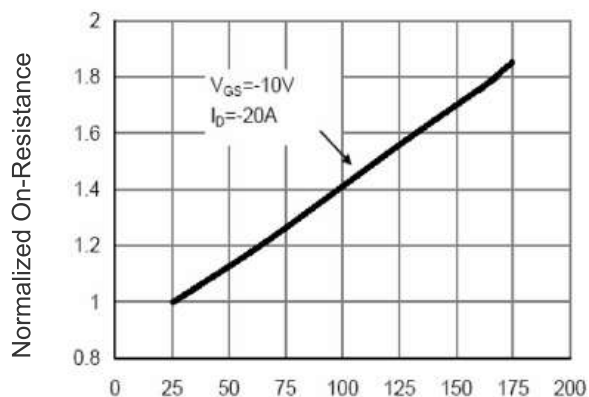
Switch Time Test Circuit

Typical Electrical and Thermal Characteristics (Curves)



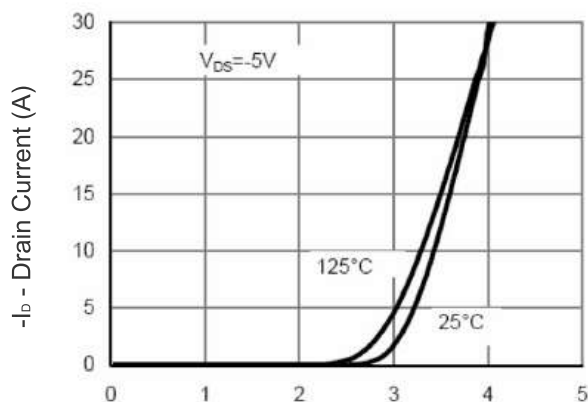
-V_{DS} Drain-Source Voltage (V)

Figure 1 Output Characteristics



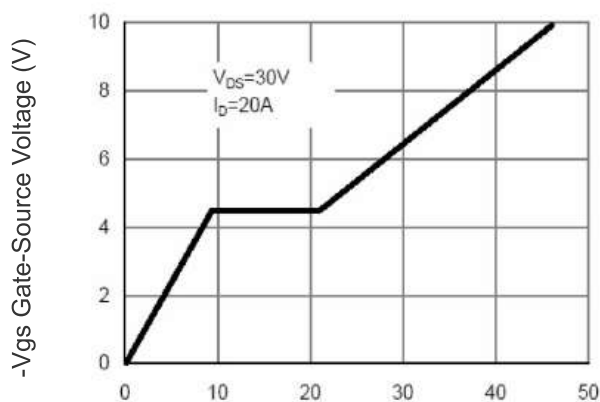
T_J -Junction Temperature(°C)

Figure 4 R_{DS(on)}-Junction Temperature



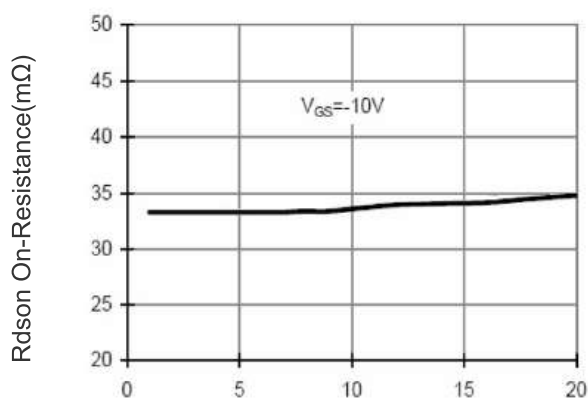
-V_{GS} Gate-Source Voltage (V)

Figure 2 Transfer Characteristics



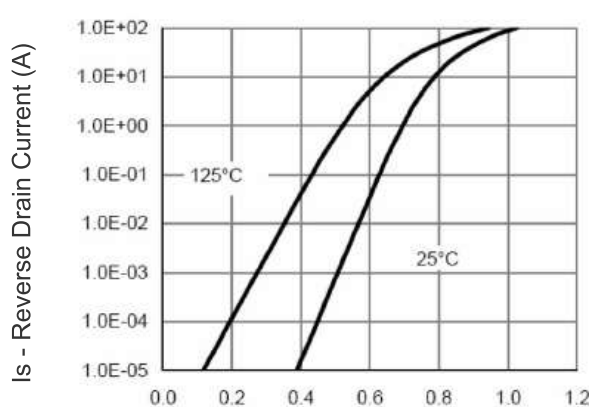
Q_g Gate Charge (nC)

Figure 5 Gate Charge



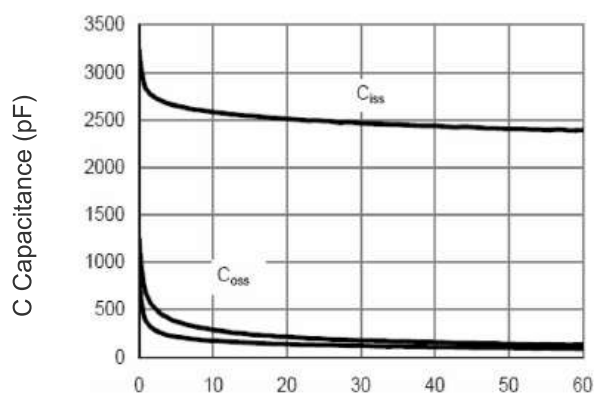
-I_D - Drain Current (A)

Figure 3 R_{DS(on)}- Drain Current



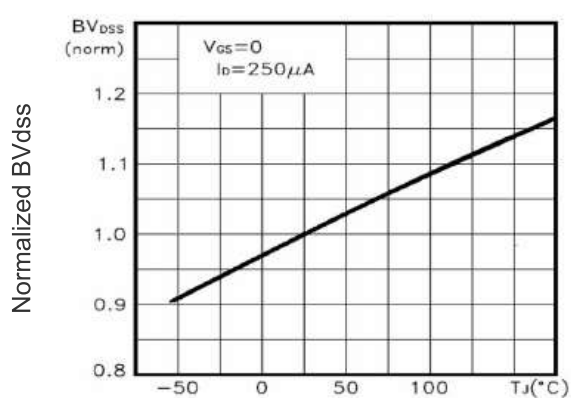
-V_{SD} Source-Drain Voltage (V)

Figure 6 Source- Drain Diode Forward



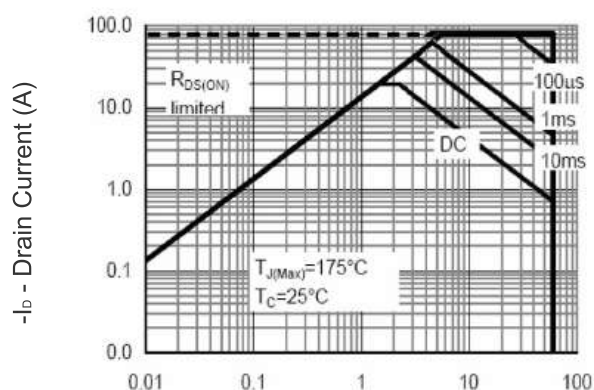
-Vds Drain-Source Voltage (V)

Figure 7 Capacitance vs Vds



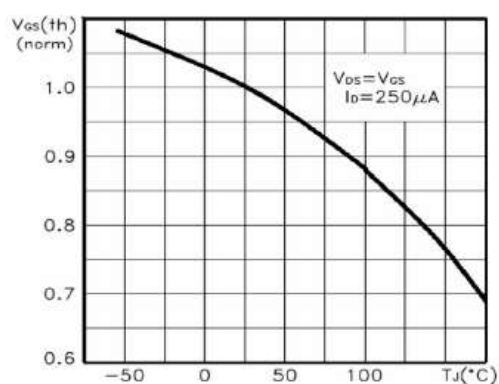
TJ -Junction Temperature(°C)

Figure 9 BVdss vs Junction Temperature



-Vds Drain-Source Voltage (V)

Figure 8 Safe Operation Area



TJ -Junction Temperature(°C)

Figure 10 VGS(th) vs Junction Temperature

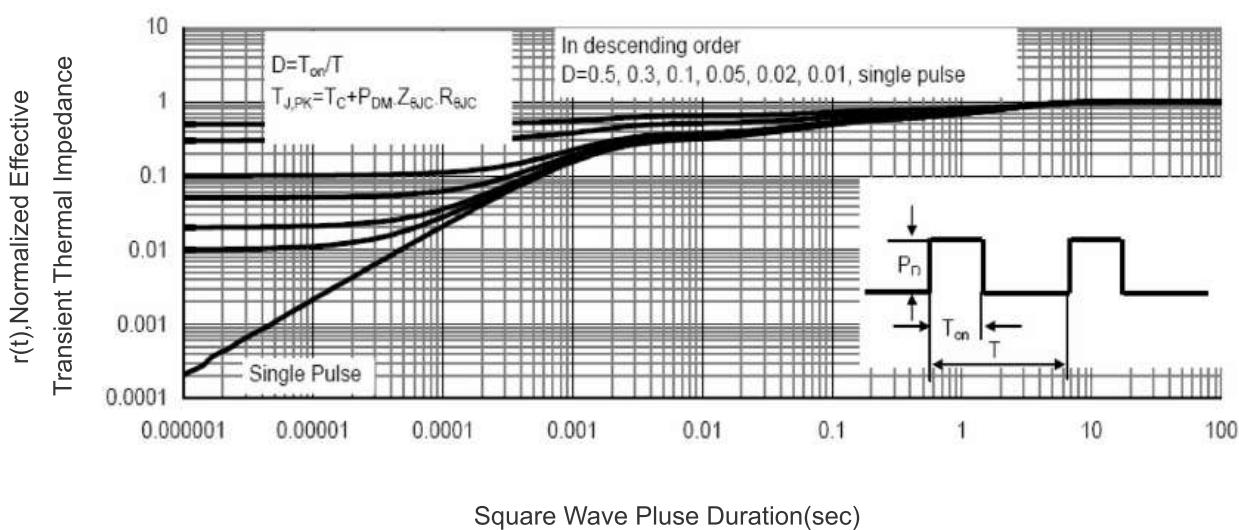
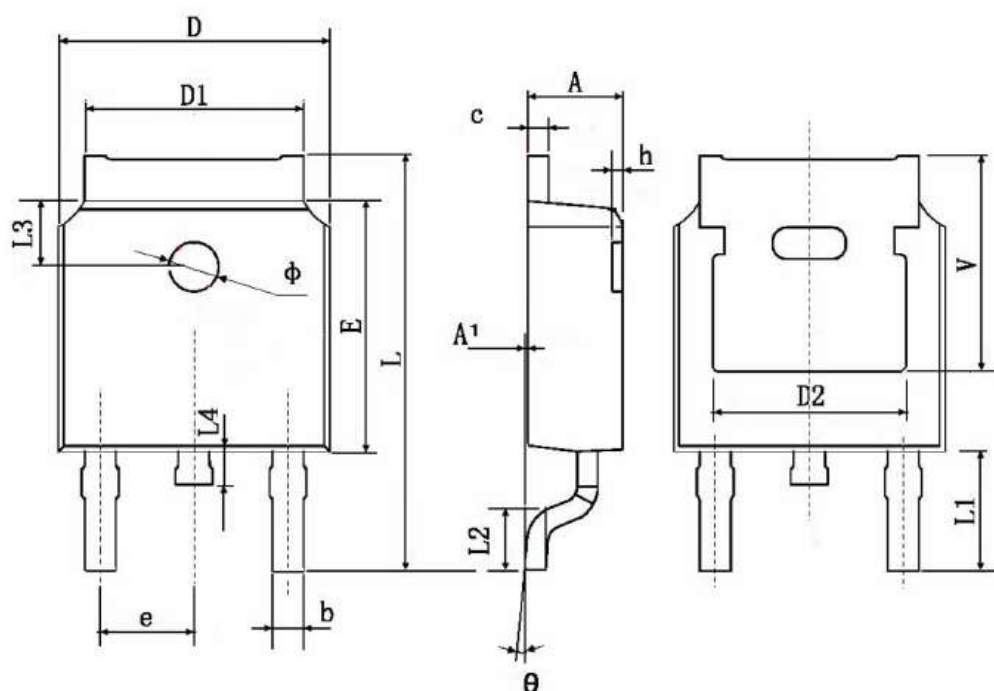


Figure 11 Normalized Maximum Transient Thermal Impedance

TO-252 Package Information



| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|--------|----------------------|-------|
| | Min. | Max. | Min. | Max. |
| A | 2.200 | 2.400 | 0.087 | 0.094 |
| A1 | 0.000 | 0.127 | 0.000 | 0.005 |
| b | 0.660 | 0.860 | 0.026 | 0.034 |
| c | 0.460 | 0.580 | 0.018 | 0.023 |
| D | 6.500 | 6.700 | 0.256 | 0.264 |
| D1 | 5.100 | 5.460 | 0.201 | 0.215 |
| D2 | 4.830 TYP. | | 0.190 TYP. | |
| E | 6.000 | 6.200 | 0.236 | 0.244 |
| e | 2.186 | 2.386 | 0.086 | 0.094 |
| L | 9.800 | 10.400 | 0.386 | 0.409 |
| L1 | 2.900 TYP. | | 0.114 TYP. | |
| L2 | 1.400 | 1.700 | 0.055 | 0.067 |
| L3 | 1.600 TYP. | | 0.063 TYP. | |
| L4 | 0.600 | 1.000 | 0.024 | 0.039 |
| Φ | 1.100 | 1.300 | 0.043 | 0.051 |
| θ | 0° | 8° | 0° | 8° |
| h | 0.000 | 0.300 | 0.000 | 0.012 |
| V | 5.350 TYP. | | 0.211 TYP. | |

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