

## P-Channel Enhancement Mode Power MOSFET

### Description

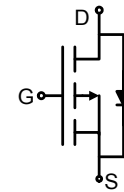
The HM20P02Q uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 2.5V. This device is suitable for use as a load switch or in PWM applications.

### General Features

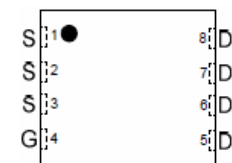
- $V_{DS} = -20V, I_D = -20A$   
 $R_{DS(ON)} < 28m\Omega @ V_{GS} = -4.5V$   
 $R_{DS(ON)} < 40m\Omega @ V_{GS} = -2.5V$
- High power and current handling capability
- Lead free product is acquired
- Surface Mount Package

### Application

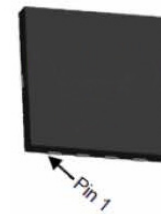
- Motor drive
- Load switch
- Power management



Schematic diagram



Pin Assignment



DFN 3.3x3.3 EP top view

### Package Marking And Ordering Information

| Device Marking | Device   | Device Package | Reel Size | Tape width | Quantity   |
|----------------|----------|----------------|-----------|------------|------------|
| HM20P02Q       | HM20P02Q | DFN3X3-8L      | Ø330mm    | 12mm       | 2500 units |

### Absolute Maximum Ratings ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

| Parameter                                        | Symbol         | Limit      | Unit             |
|--------------------------------------------------|----------------|------------|------------------|
| Drain-Source Voltage                             | $V_{DS}$       | -20        | V                |
| Gate-Source Voltage                              | $V_{GS}$       | $\pm 12$   | V                |
| Drain Current-Continuous                         | $I_D$          | -20        | A                |
| Drain Current-Pulsed (Note 1)                    | $I_{DM}$       | -60        | A                |
| Maximum Power Dissipation                        | $P_D$          | 3.1        | W                |
| Operating Junction and Storage Temperature Range | $T_J, T_{STG}$ | -55 To 150 | $^\circ\text{C}$ |

### Thermal Characteristic

|                                                  |                 |    |                    |
|--------------------------------------------------|-----------------|----|--------------------|
| Thermal Resistance, Junction-to-Ambient (Note 2) | $R_{\theta JA}$ | 42 | $^\circ\text{C/W}$ |
|--------------------------------------------------|-----------------|----|--------------------|

### Electrical Characteristics ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

| Parameter                      | Symbol     | Condition                      | Min | Typ | Max | Unit |
|--------------------------------|------------|--------------------------------|-----|-----|-----|------|
| <b>Off Characteristics</b>     |            |                                |     |     |     |      |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $V_{GS} = 0V, I_D = -250\mu A$ | -20 | -   | -   | V    |

|                                    |                     |                                                                                             |      |      |      |    |
|------------------------------------|---------------------|---------------------------------------------------------------------------------------------|------|------|------|----|
| Zero Gate Voltage Drain Current    | I <sub>DSS</sub>    | V <sub>DS</sub> =-20V, V <sub>GS</sub> =0V                                                  | -    | -    | -1   | μA |
| Gate-Body Leakage Current          | I <sub>GSS</sub>    | V <sub>GS</sub> =±12V, V <sub>DS</sub> =0V                                                  | -    | -    | ±100 | nA |
| On Characteristics (Note 3)        |                     |                                                                                             |      |      |      |    |
| Gate Threshold Voltage             | V <sub>GS(th)</sub> | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250μA                                   | -0.5 | -0.7 | -1.4 | V  |
| Drain-Source On-State Resistance   | R <sub>DS(ON)</sub> | V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-6A                                                 | -    | 22   | 28   | mΩ |
|                                    |                     | V <sub>GS</sub> =-2.5V, I <sub>D</sub> =-5A                                                 |      | 32   | 40   | mΩ |
| Forward Transconductance           | g <sub>FS</sub>     | V <sub>DS</sub> =-15V, I <sub>D</sub> =-6A                                                  | -    | 17   | -    | S  |
| Dynamic Characteristics (Note4)    |                     |                                                                                             |      |      |      |    |
| Input Capacitance                  | C <sub>iss</sub>    | V <sub>DS</sub> =-10V, V <sub>GS</sub> =0V,<br>F=1.0MHz                                     | -    | 2100 | -    | PF |
| Output Capacitance                 | C <sub>oss</sub>    |                                                                                             | -    | 498  | -    | PF |
| Reverse Transfer Capacitance       | C <sub>rss</sub>    |                                                                                             | -    | 300  | -    | PF |
| Switching Characteristics (Note 4) |                     |                                                                                             |      |      |      |    |
| Turn-on Delay Time                 | t <sub>d(on)</sub>  | V <sub>DD</sub> =-10V, R <sub>L</sub> =10Ω,<br>V <sub>GS</sub> =-4.5V, R <sub>GEN</sub> =6Ω | -    | 25   | -    | nS |
| Turn-on Rise Time                  | t <sub>r</sub>      |                                                                                             | -    | 30   | -    | nS |
| Turn-Off Delay Time                | t <sub>d(off)</sub> |                                                                                             | -    | 70   | -    | nS |
| Turn-Off Fall Time                 | t <sub>f</sub>      |                                                                                             | -    | 50   | -    | nS |
| Total Gate Charge                  | Q <sub>g</sub>      | V <sub>DS</sub> =-10V, I <sub>D</sub> =-6A, V <sub>GS</sub> =-4.5V                          | -    | 17   | -    | nC |
| Gate-Source Charge                 | Q <sub>gs</sub>     |                                                                                             | -    | 4.1  | -    | nC |
| Gate-Drain Charge                  | Q <sub>gd</sub>     |                                                                                             | -    | 4.3  | -    | nC |
| Drain-Source Diode Characteristics |                     |                                                                                             |      |      |      |    |
| Diode Forward Voltage (Note 3)     | V <sub>SD</sub>     | V <sub>GS</sub> =0V, I <sub>S</sub> =-20A                                                   | -    | -    | -1.2 | V  |

## Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board,  $t \leq 10$  sec.
3. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .
4. Guaranteed by design, not subject to production

## Typical Electrical and Thermal Characteristics

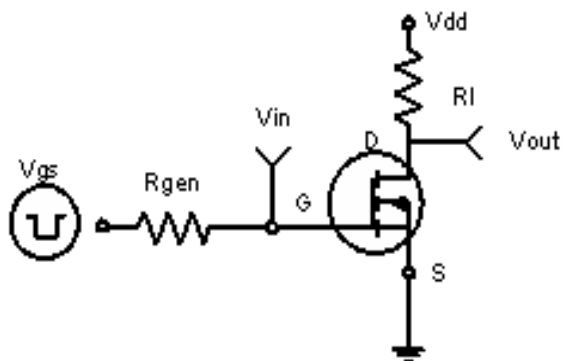


Figure 1 Switching Test Circuit

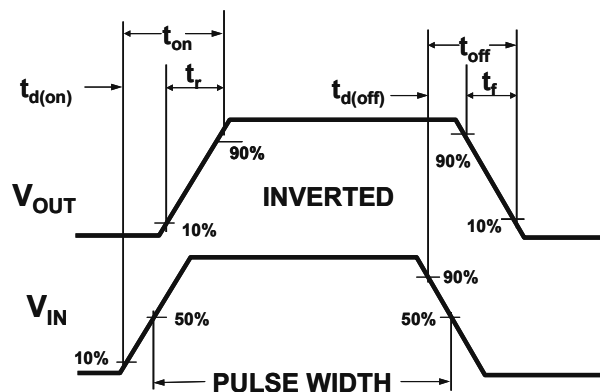


Figure 2 Switching Waveforms

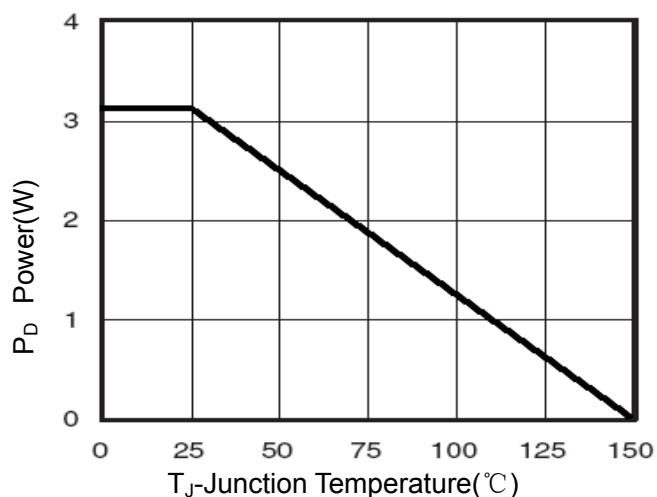


Figure 3 Power Dissipation

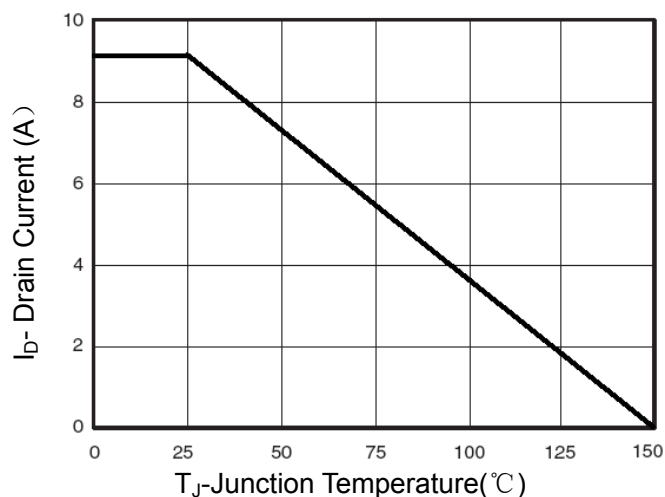


Figure 4 Drain Current

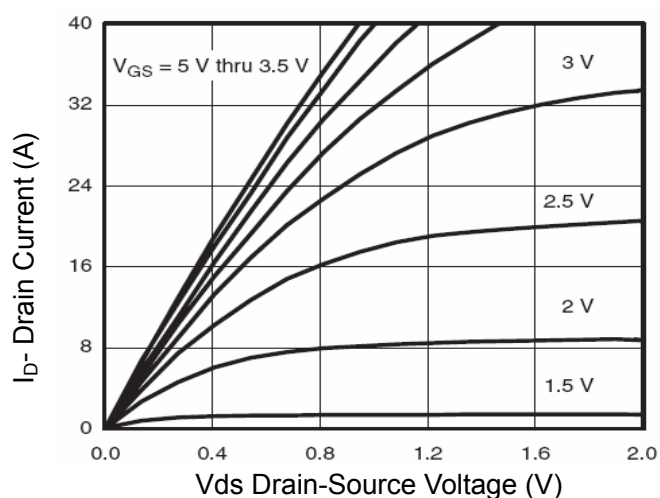


Figure 5 Output Characteristics

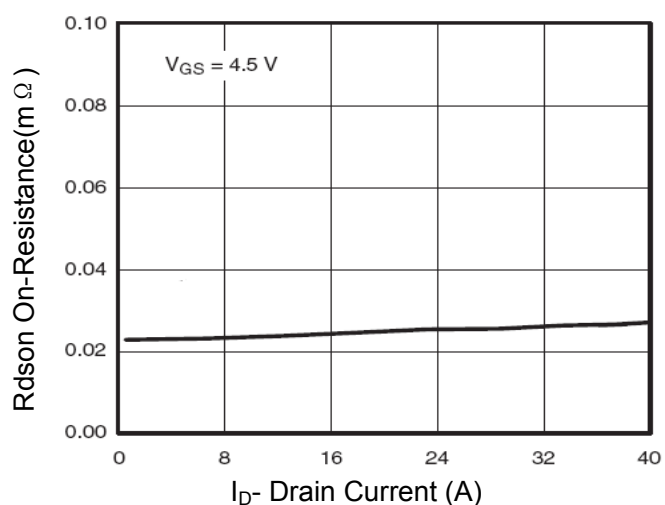


Figure 6 Drain-Source On-Resistance

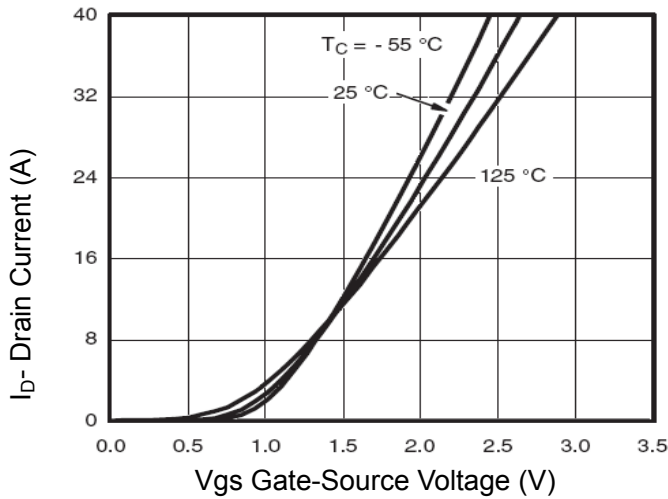


Figure 7 Transfer Characteristics

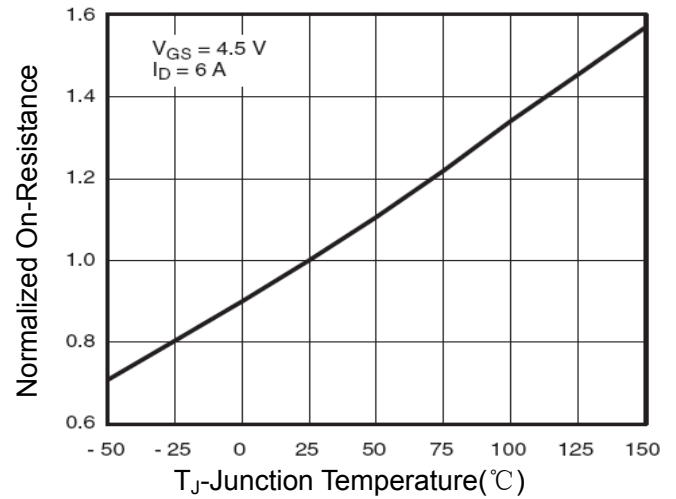


Figure 8 Drain-Source On-Resistance

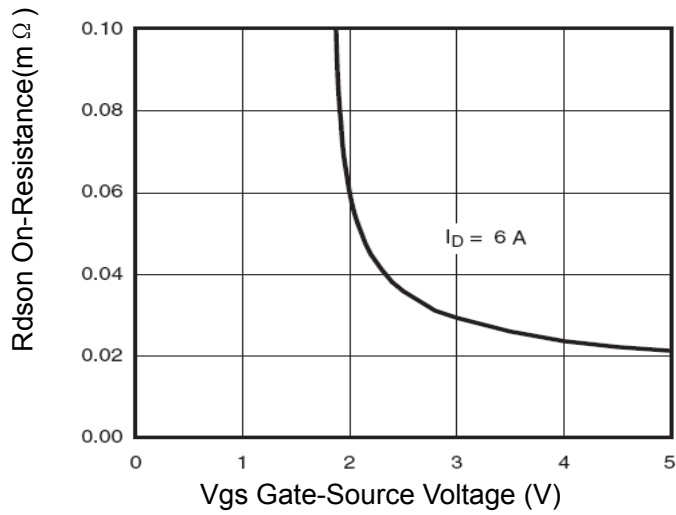


Figure 9  $R_{DS(on)}$  vs  $V_{GS}$

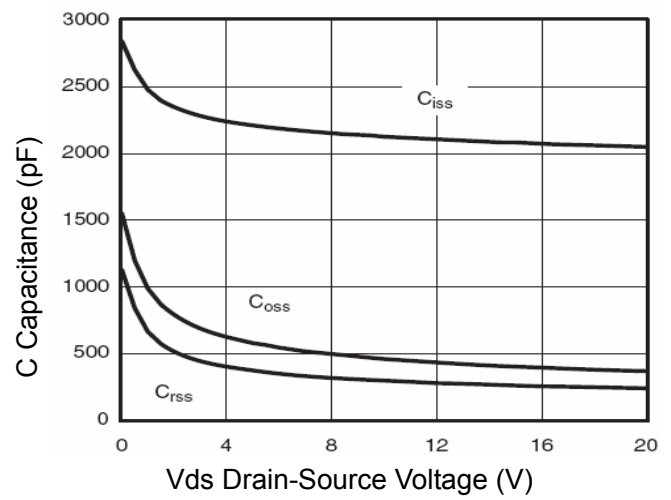


Figure 10 Capacitance vs  $V_{DS}$

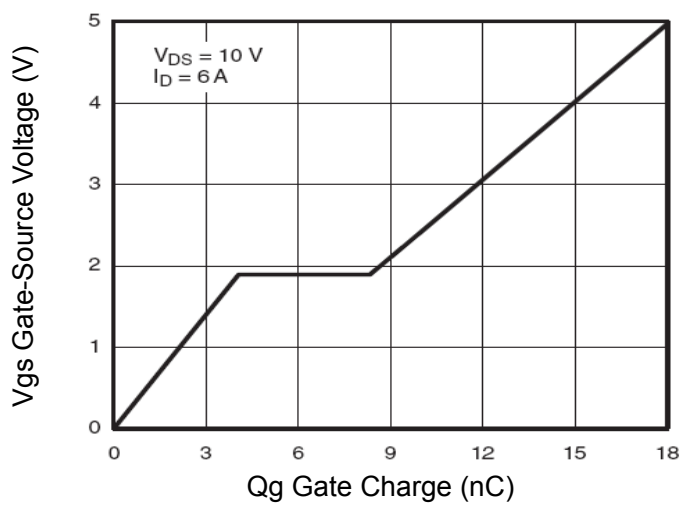


Figure 11 Gate Charge

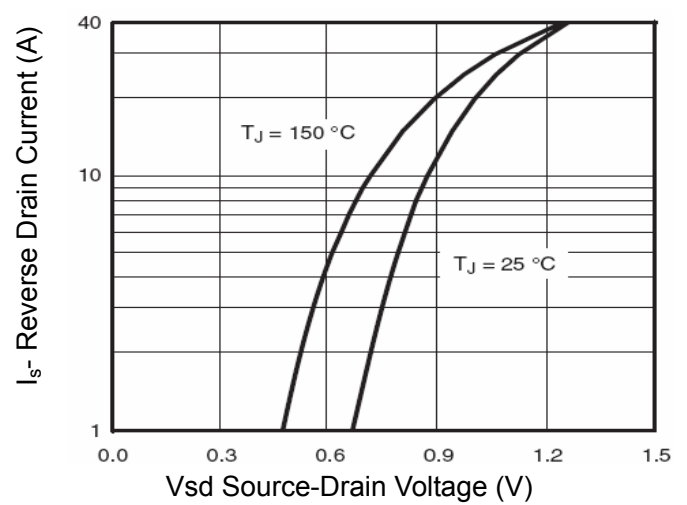


Figure 12 Source- Drain Diode Forward

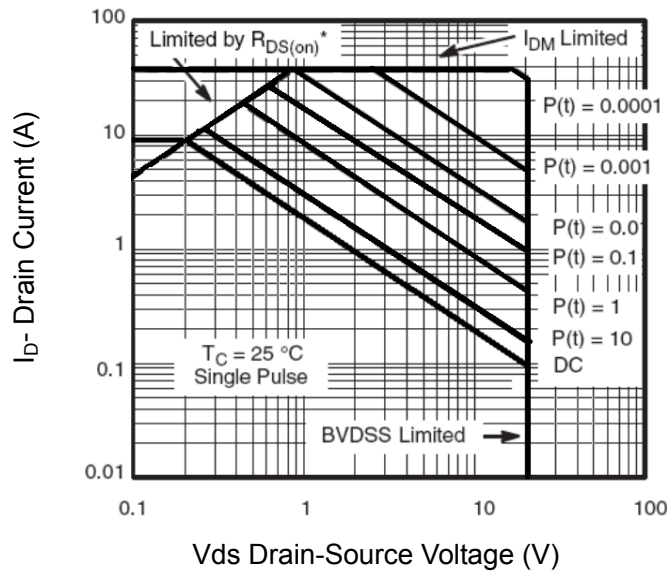


Figure 13 Safe Operation Area

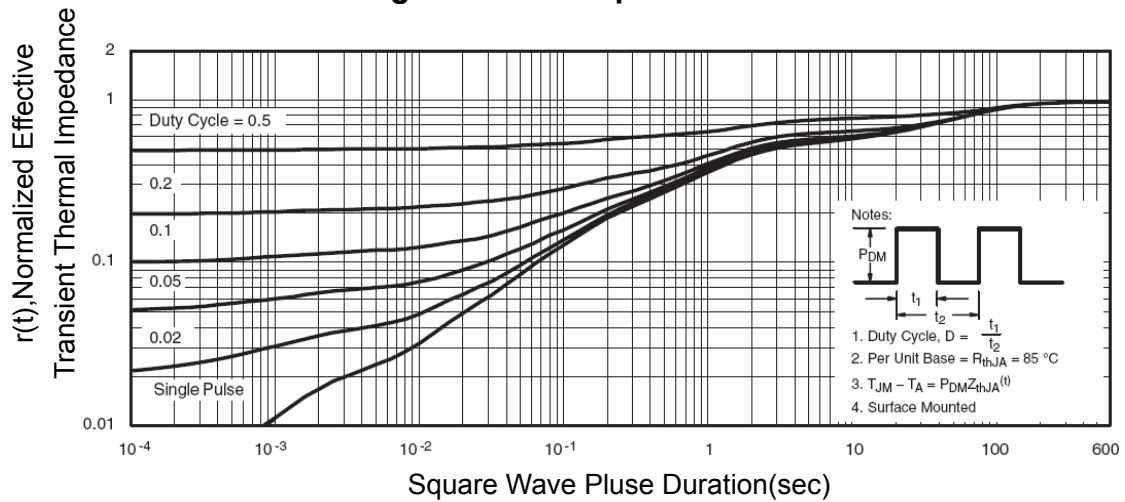


Figure 14 Normalized Maximum Transient Thermal Impedance

DFN3.3X3.3 EP Package Information

封装外形尺寸图

The image contains three technical drawings of a package, likely a microcontroller or similar component, showing various dimensions labeled A through O.

- Side View (Top):** Shows the profile of the package. Dimension A is the total height. Dimension B is the height of the central body. Dimension C is the height of the mounting pads.
- Top View (Middle):** Shows the top surface. Dimension D is the width of the package. Dimension E is the height of the package.
- Bottom View (Bottom):** Shows the bottom surface with mounting pads. Dimension F is the width of the central body. Dimension G is the width of the mounting pads. Dimension H is the height of the mounting pads. Dimension I is the height of the central body. Dimension J is the height of the mounting pads. Dimension K is the width of the mounting pads. Dimension L is the width of the central body. Dimension M is the width of the mounting pads. Dimension N is the width of the central body. Dimension O is the width of the mounting pads.

符号

单位: mm

MIN

MAX

TYP

A

0.75

0.85

0.8

B

0.25

0.35

0.3

C

0.18

0.22

0.2

D

3.2

3.3

3.25

E

3.2

3.3

3.25

F

2.2

2.5

2.35

G

1.8

2.0

1.9

H

0.3

0.4

0.35

I

0.15

0.25

0.2

J

0.4

0.5

0.45

K

0.6

0.7

0.65

L

1.38

1.58

1.48

M

1.8

2.1

1.95

N

0.15\*45°

O

0.4

0.5

0.45