



General Description

The QM3052M6 is the highest performance trench N-ch MOSFETs with extreme high cell density, which provide excellent R_{DS(on)} and gate charge for most of the synchronous buck converter applications.

The QM3052M6 meet the RoHS and Green Product requirement, 100% EAS guaranteed with full function reliability approved.

Features

- Advanced high cell density Trench technology
- Super Low Gate Charge
- Excellent CdV/dt effect decline
- 100% EAS Guaranteed
- Green Device Available

Product Summary

| BVDSS | R _{DS(on)} | I _D |
|-------|---------------------|----------------|
| 30V | 8.0 mΩ | 62A |

Applications

- High Frequency Point-of-Load Synchronous Buck Converter for MB/NB/UMPC/VGA
- Networking DC-DC Power System
- Load Switch

PRPAK5X6 Pin Configuration



Absolute Maximum Ratings

| Symbol | Parameter | Rating | Units |
|---------------------------------------|--|------------|-------|
| V _{DS} | Drain-Source Voltage | 30 | V |
| V _{GS} | Gate-Source Voltage | ±20 | V |
| I _D @T _C =25°C | Continuous Drain Current, V _{GS} @ 10V ^{1,7} | 62 | A |
| I _D @T _C =100°C | Continuous Drain Current, V _{GS} @ 10V ¹ | 40 | A |
| I _D @T _A =25°C | Continuous Drain Current, V _{GS} @ 10V ¹ | 13.1 | A |
| I _D @T _A =70°C | Continuous Drain Current, V _{GS} @ 10V ¹ | 10.5 | A |
| I _{DM} | Pulsed Drain Current ² | 150 | A |
| EAS | Single Pulse Avalanche Energy ³ | 69 | mJ |
| I _{AS} | Avalanche Current | 37 | A |
| P _D @T _C =25°C | Total Power Dissipation ⁴ | 46.3 | W |
| P _D @T _A =25°C | Total Power Dissipation ⁴ | 2 | W |
| T _{STG} | Storage Temperature Range | -55 to 150 | °C |
| T _J | Operating Junction Temperature Range | -55 to 150 | °C |

Thermal Data

| Symbol | Parameter | Typ. | Max. | Unit |
|------------------|--|------|------|------|
| R _{θJA} | Thermal Resistance Junction-Ambient ¹ | --- | 62 | °C/W |
| R _{θJC} | Thermal Resistance Junction-Case ¹ | --- | 2.7 | °C/W |

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

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|------------------------------|--|--|------|------|-----------|---------------------|
| BV_{DSS} | Drain-Source Breakdown Voltage | $V_{GS}=0V, I_D=250\mu A$ | 30 | --- | --- | V |
| $\Delta BV_{DSS}/\Delta T_J$ | BVDSS Temperature Coefficient | Reference to 25°C , $I_D=1\text{mA}$ | --- | 0.01 | --- | $V/^\circ\text{C}$ |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance ² | $V_{GS}=10V, I_D=30A$ | --- | 6.4 | 8.0 | $m\Omega$ |
| | | $V_{GS}=4.5V, I_D=15A$ | --- | 10 | 12.5 | |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{GS}=V_{DS}, I_D=250\mu A$ | 1.2 | 1.5 | 2.5 | V |
| $\Delta V_{GS(th)}$ | $V_{GS(th)}$ Temperature Coefficient | | --- | -3.1 | --- | $mV/^\circ\text{C}$ |
| I_{DSS} | Drain-Source Leakage Current | $V_{DS}=24V, V_{GS}=0V, T_J=25^\circ\text{C}$ | --- | --- | 1 | μA |
| | | $V_{DS}=24V, V_{GS}=0V, T_J=55^\circ\text{C}$ | --- | --- | 5 | |
| I_{GSS} | Gate-Source Leakage Current | $V_{GS}=\pm 20V, V_{DS}=0V$ | --- | --- | ± 100 | nA |
| gfs | Forward Transconductance | $V_{DS}=5V, I_D=30A$ | --- | 41 | --- | S |
| R_g | Gate Resistance | $V_{DS}=0V, V_{GS}=0V, f=1\text{MHz}$ | --- | 3.9 | 5.8 | Ω |
| Q_g | Total Gate Charge (4.5V) | $V_{DS}=15V, V_{GS}=4.5V, I_D=15A$ | --- | 7.4 | 10.4 | nC |
| Q_{gs} | Gate-Source Charge | | --- | 3.0 | 4.2 | |
| Q_{gd} | Gate-Drain Charge | | --- | 2.2 | 3.1 | |
| $T_{d(on)}$ | Turn-On Delay Time | $V_{DD}=15V, V_{GS}=10V, R_G=3.3\Omega, I_D=15A$ | --- | 4.5 | 9 | ns |
| T_r | Rise Time | | --- | 22 | 40 | |
| $T_{d(off)}$ | Turn-Off Delay Time | | --- | 26 | 52 | |
| T_f | Fall Time | | --- | 19 | 38 | |
| C_{iss} | Input Capacitance | $V_{DS}=15V, V_{GS}=0V, f=1\text{MHz}$ | --- | 710 | 994 | pF |
| C_{oss} | Output Capacitance | | --- | 210 | 294 | |
| C_{rss} | Reverse Transfer Capacitance | | --- | 98 | 137 | |

Guaranteed Avalanche Characteristics

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|--------|--|--|------|------|------|------|
| EAS | Single Pulse Avalanche Energy ⁵ | $V_{DD}=25V, L=0.1\text{mH}, I_{AS}=30A$ | 45 | --- | --- | mJ |

Diode Characteristics

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|----------|--|---|------|------|------|------|
| I_S | Continuous Source Current ^{1,6} | $V_G=V_D=0V, \text{Force Current}$ | --- | --- | 62 | A |
| I_{SM} | Pulsed Source Current ^{2,6} | | --- | --- | 150 | A |
| V_{SD} | Diode Forward Voltage ² | $V_{GS}=0V, I_S=1A, T_J=25^\circ\text{C}$ | --- | --- | 1 | V |

Note :

- The data tested by surface mounted on a 1 inch² FR-4 board with 2OZ copper.
- The data tested by pulsed, pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$
- The EAS data shows Max. rating. The test condition is $V_{DD}=25V, V_{GS}=10V, L=0.1\text{mH}, I_{AS}=37A$
- The power dissipation is limited by 150°C junction temperature
- The Min. value is 100% EAS tested guarantee.
- The data is theoretically the same as I_D and I_{DM} , in real applications, should be limited by total power dissipation.
- Package limitation current is 85A.

Typical Characteristics

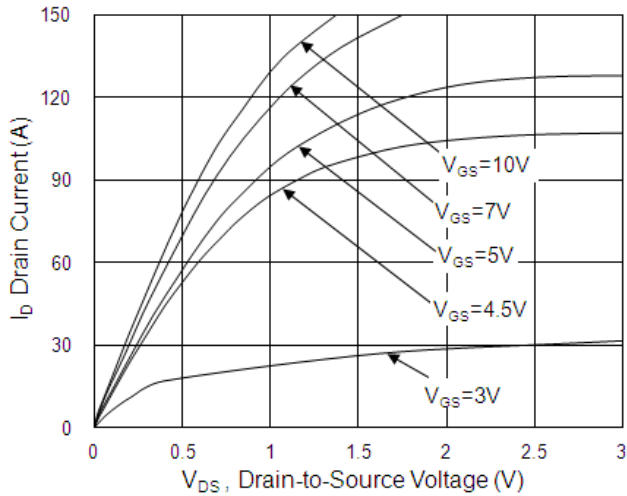


Fig.1 Typical Output Characteristics

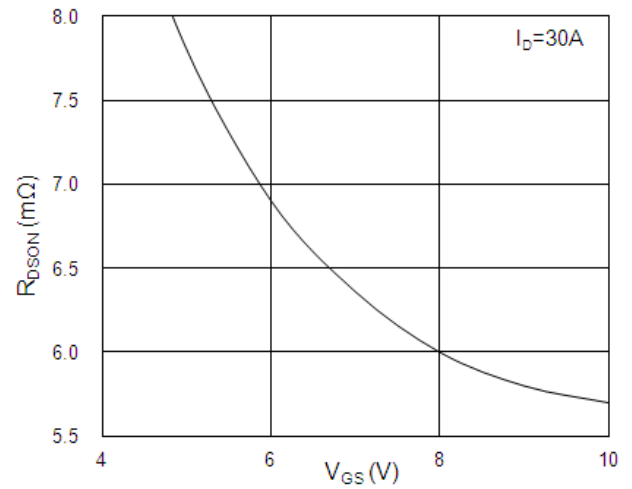


Fig.2 On-Resistance vs. Gate-Source

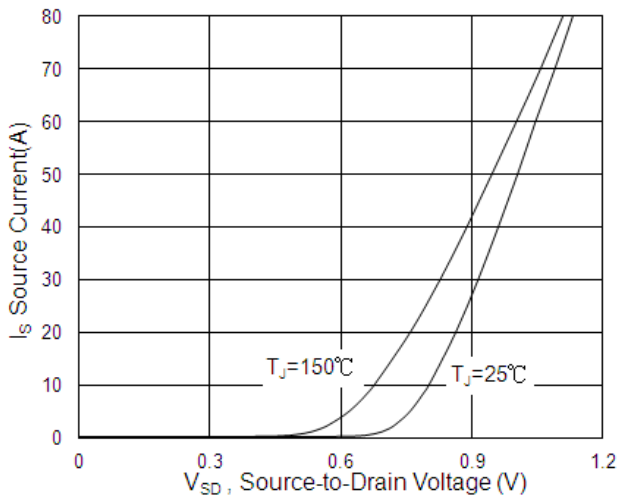


Fig.3 Forward Characteristics of Reverse

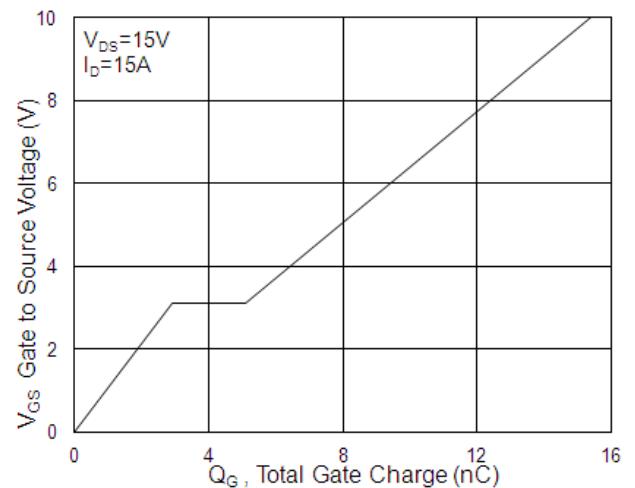


Fig.4 Gate-Charge Characteristics

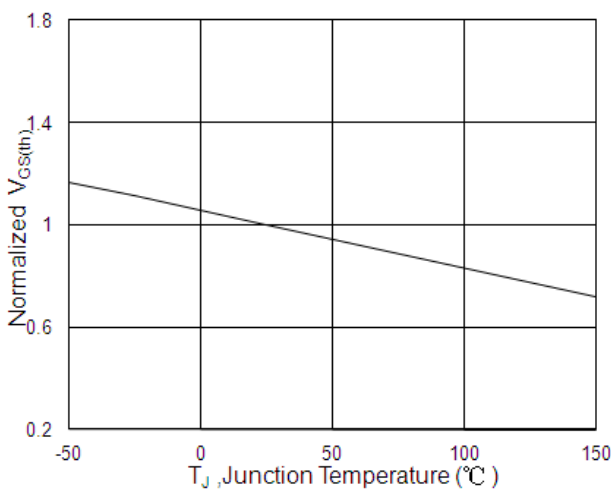


Fig.5 Normalized $V_{GS(th)}$ vs. T_J

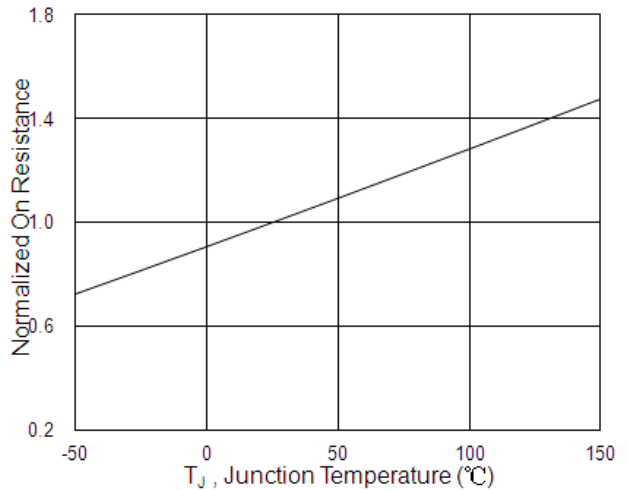


Fig.6 Normalized $R_{DS(on)}$ vs. T_J

N-Ch 30V Fast Switching MOSFETs

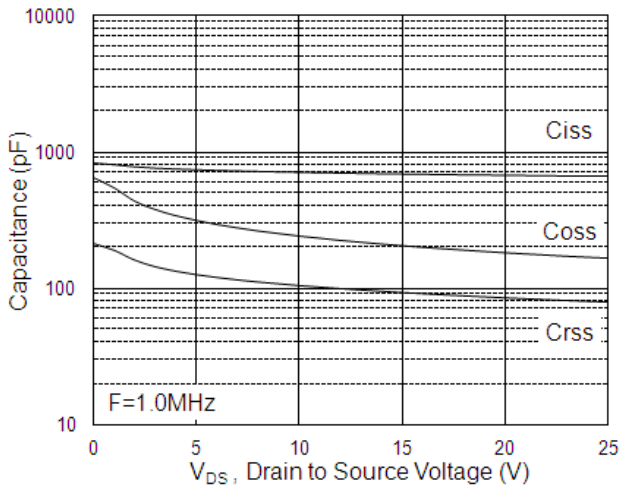


Fig.7 Capacitance

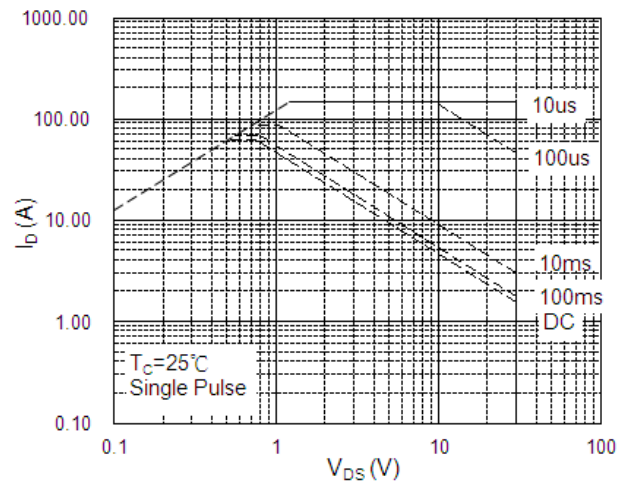


Fig.8 Safe Operating Area

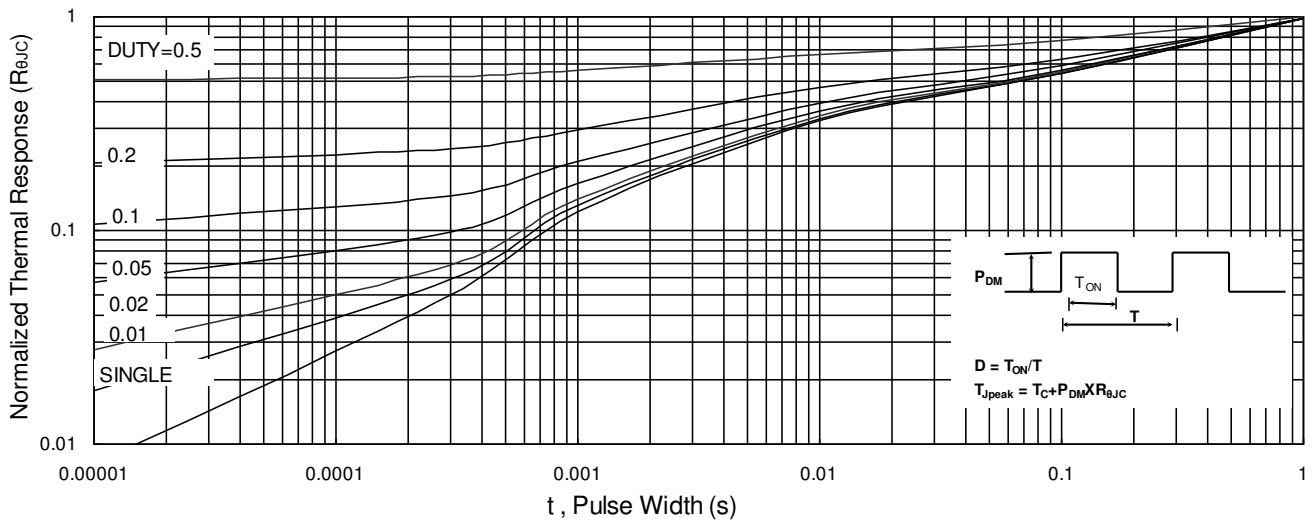


Fig.9 Normalized Maximum Transient Thermal Impedance

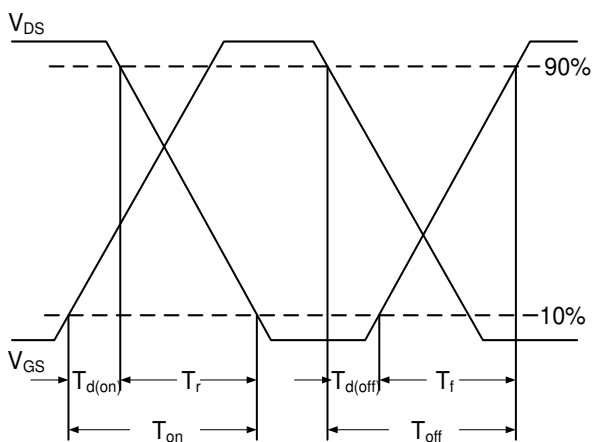


Fig.10 Switching Time Waveform

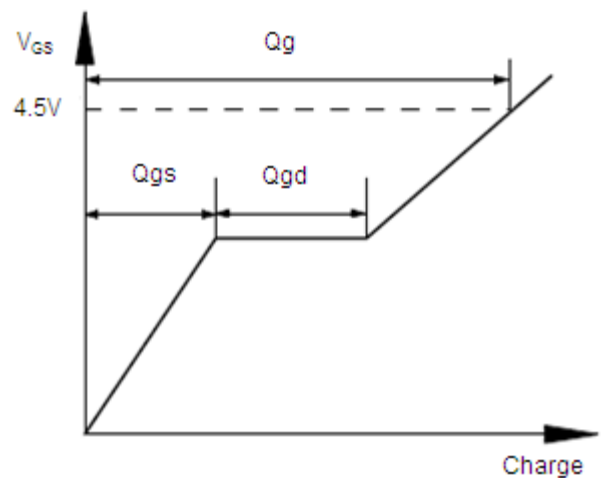
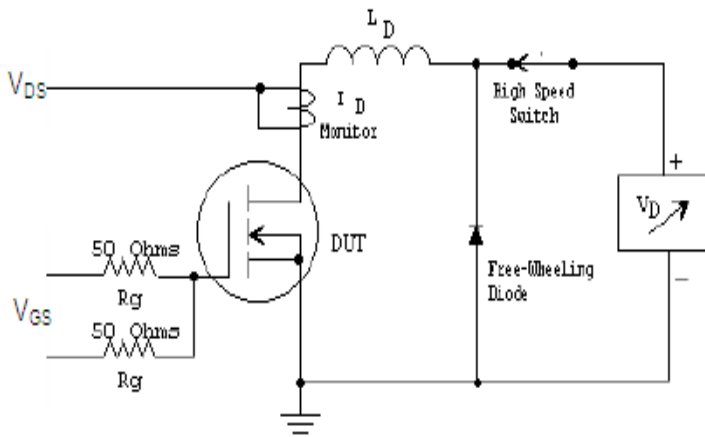


Fig.11 Gate Charge Waveform

N-Ch 30V Fast Switching MOSFETs



$$EAS = \frac{1}{2} L \times I_{AS}^2$$

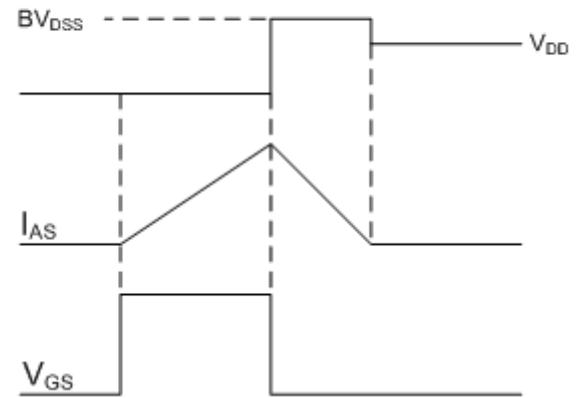


Fig.12 Unclamped Inductive Switching Test Circuit & Waveforms