

QM3009S-VB Datasheet

P-Channel 30-V (D-S) MOSFET

PRODUCT SUMMARY

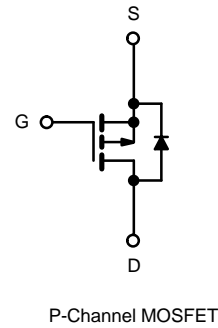
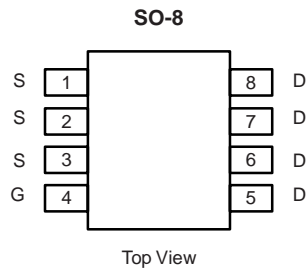
| V_{DS} (V) | $R_{DS(on)}$ (Ω) | I_D (A) |
|--------------|-----------------------------|-----------|
| - 30 | 0.033 at $V_{GS} = - 10$ V | - 5.8 |
| | 0.043 at $V_{GS} = - 6$ V | - 5.0 |
| | 0.056 at $V_{GS} = - 4.5$ V | - 4.4 |

FEATURES

- Halogen-free According to IEC 61249-2-21 Definition
- Trench Power MOSFET
- Compliant to RoHS Directive 2002/95/EC



RoHS
COMPLIANT
HALOGEN
FREE
Available



ABSOLUTE MAXIMUM RATINGS $T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise noted

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|--|------------------------------------|----------------|-------------|--------------|--------------------|
| Parameter | | Symbol | 10 s | Steady State | Unit |
| Drain-Source Voltage | | V_{DS} | - 30 | | V |
| Gate-Source Voltage | | V_{GS} | ± 20 | | |
| Continuous Drain Current ($T_J = 150\text{ }^{\circ}\text{C}$) ^a | $T_A = 25\text{ }^{\circ}\text{C}$ | I_D | - 5.8 | - 4.1 | A |
| | $T_A = 70\text{ }^{\circ}\text{C}$ | | - 4.6 | - 3.2 | |
| Pulsed Drain Current | | I_{DM} | - 30 | | |
| Continuous Source Current (Diode Conduction) ^a | | I_S | - 2.3 | - 1.1 | |
| Maximum Power Dissipation ^a | $T_A = 25\text{ }^{\circ}\text{C}$ | P_D | 2.5 | 1.3 | W |
| | $T_A = 70\text{ }^{\circ}\text{C}$ | | 1.6 | 0.8 | |
| Operating Junction and Storage Temperature Range | | T_J, T_{stg} | - 55 to 150 | | $^{\circ}\text{C}$ |

THERMAL RESISTANCE RATINGS

| Parameter | | Symbol | Typical | Maximum | Unit |
|--|---------------|------------|---------|---------|-----------------------------|
| Maximum Junction-to-Ambient ^a | $t \leq 10$ s | R_{thJA} | 40 | 50 | $^{\circ}\text{C}/\text{W}$ |
| | Steady State | | 70 | 95 | |
| Maximum Junction-to-Foot (Drain) | Steady State | R_{thJF} | 24 | 30 | |

Notes:

a. Surface Mounted on 1" x 1" FR4 board.

| SPECIFICATIONS $T_J = 25\text{ }^{\circ}\text{C}$, unless otherwise noted | | | | | | |
|---|--------------|--|-------|-------------------|-----------|---------------|
| Parameter | Symbol | Test Conditions | Min. | Typ. ^a | Max. | Unit |
| Static | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS} = V_{GS}$, $I_D = -250\text{ }\mu\text{A}$ | - 0.7 | | - 2.0 | V |
| Gate-Body Leakage | I_{GSS} | $V_{DS} = 0\text{ V}$, $V_{GS} = \pm 20\text{ V}$ | | | ± 100 | nA |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{DS} = -30\text{ V}$, $V_{GS} = 0\text{ V}$ | | | - 1 | μA |
| | | $V_{DS} = -30\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 70\text{ }^{\circ}\text{C}$ | | | - 5 | |
| On-State Drain Current ^b | $I_{D(on)}$ | $V_{DS} \leq -10\text{ V}$, $V_{GS} = -10\text{ V}$ | - 20 | | | A |
| | | $V_{DS} \leq -5\text{ V}$, $V_{GS} = -4.5\text{ V}$ | - 5 | | | |
| Drain-Source On-State Resistance ^b | $R_{DS(on)}$ | $V_{GS} = -10\text{ V}$, $I_D = -5.8\text{ A}$ | | 0.033 | | Ω |
| | | $V_{GS} = -6\text{ V}$, $I_D = -5\text{ A}$ | | 0.043 | | |
| | | $V_{GS} = -4.5\text{ V}$, $I_D = -4.4\text{ A}$ | | 0.056 | | |
| Forward Transconductance ^b | g_{fs} | $V_{DS} = -15\text{ V}$, $I_D = -5.8\text{ A}$ | | 13 | | S |
| Diode Forward Voltage ^b | V_{SD} | $I_S = -2.3\text{ A}$, $V_{GS} = 0\text{ V}$ | | - 0.8 | - 1.1 | V |
| Dynamic^a | | | | | | |
| Total Gate Charge | Q_g | $V_{DS} = -15\text{ V}$, $V_{GS} = -10\text{ V}$, $I_D = -3.5\text{ A}$ | | 16 | 24 | nC |
| Gate-Source Charge | Q_{gs} | | | 2.3 | | |
| Gate-Drain Charge | Q_{gd} | | | 4.5 | | |
| Gate Resistance | R_g | | | 8.8 | | Ω |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{DD} = -15\text{ V}$, $R_L = 15\text{ }\Omega$ $I_D \cong -1\text{ A}$, $V_{GEN} = -10\text{ V}$, $R_g = 6\text{ }\Omega$ | | 14 | 25 | ns |
| Rise Time | t_r | | | 14 | 25 | |
| Turn-Off Delay Time | $t_{d(off)}$ | | | 42 | 70 | |
| Fall Time | t_f | | | 30 | 50 | |
| Source-Drain Reverse Recovery Time | t_{rr} | $I_F = -1.2\text{ A}$, $dI/dt = 100\text{ A}/\mu\text{s}$ | | 30 | 60 | |

Notes:

a. Guaranteed by design, not subject to production testing.

b. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



Output Characteristics



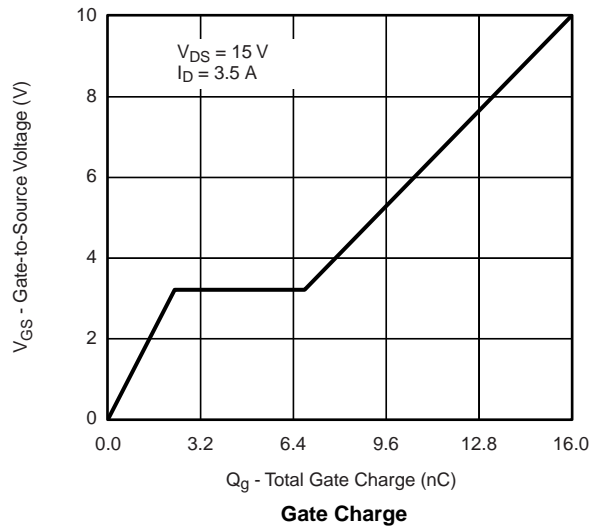
Transfer Characteristics



On-Resistance vs. Drain Current



Capacitance

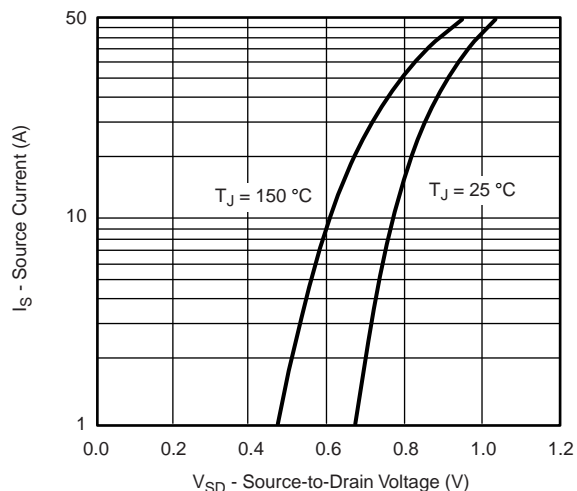


Gate Charge

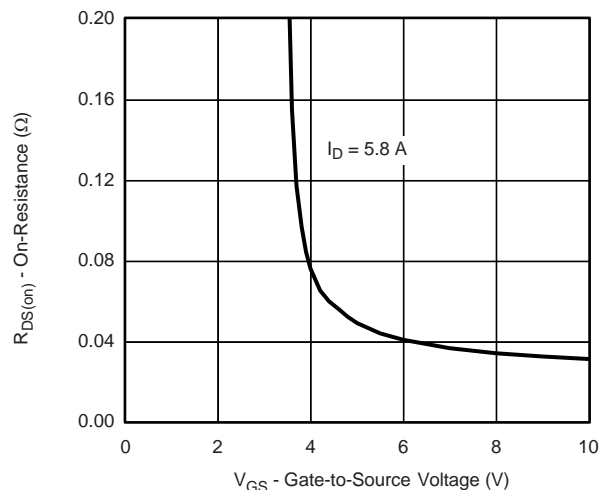


On-Resistance vs. Junction Temperature

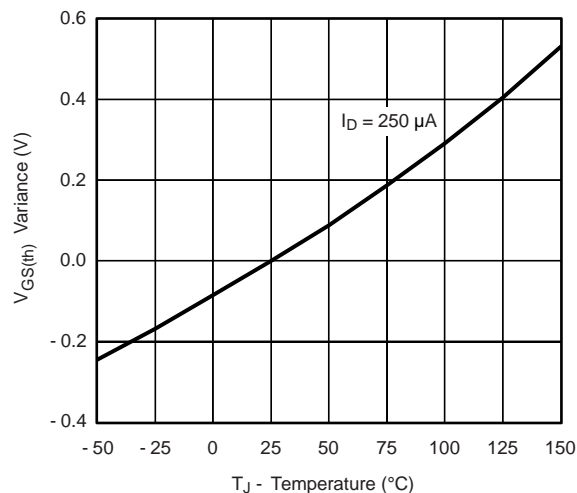
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



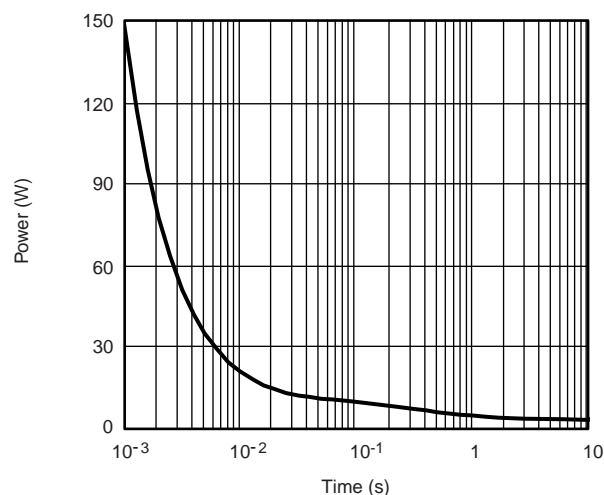
Source-Drain Diode Forward Voltage



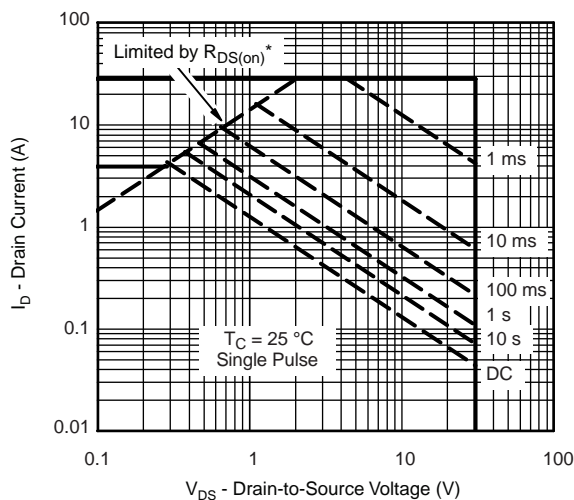
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



Single Pulse Power, Junction-to-Ambient



* $V_{DS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

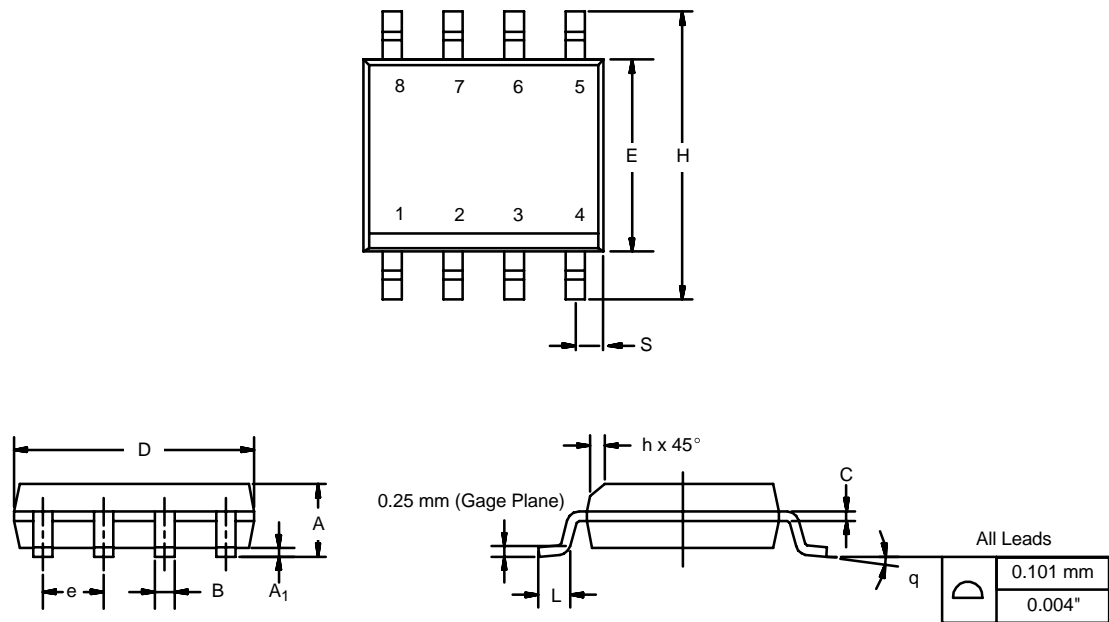
Safe Operating Area, Junction-to-Foot

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

Normalized Thermal Transient Impedance, Junction-to-Ambient

Normalized Thermal Transient Impedance, Junction-to-Foot

SOIC (NARROW): 8-LEAD
JEDEC Part Number: MS-012



| DIM | MILLIMETERS | | INCHES | |
|--------------------------------|-------------|------|-----------|-------|
| | Min | Max | Min | Max |
| A | 1.35 | 1.75 | 0.053 | 0.069 |
| A ₁ | 0.10 | 0.20 | 0.004 | 0.008 |
| B | 0.35 | 0.51 | 0.014 | 0.020 |
| C | 0.19 | 0.25 | 0.0075 | 0.010 |
| D | 4.80 | 5.00 | 0.189 | 0.196 |
| E | 3.80 | 4.00 | 0.150 | 0.157 |
| e | 1.27 BSC | | 0.050 BSC | |
| H | 5.80 | 6.20 | 0.228 | 0.244 |
| h | 0.25 | 0.50 | 0.010 | 0.020 |
| L | 0.50 | 0.93 | 0.020 | 0.037 |
| q | 0° | 8° | 0° | 8° |
| S | 0.44 | 0.64 | 0.018 | 0.026 |
| ECN: C-06527-Rev. I, 11-Sep-06 | | | | |
| DWG: 5498 | | | | |

RECOMMENDED MINIMUM PADS FOR SO-8



Recommended Minimum Pads
Dimensions in Inches/(mm)

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