

9406GM-VB Datasheet

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

| PRODUCT SUMMARY | | | | | | |
|---------------------|----------------------------------|---------------------------------|-----------------------|--|--|--|
| V _{DS} (V) | R _{DS(on)} (Ω) | I _D (A) ^a | Q _g (Typ.) | | | |
| 30 | 0.008 at V _{GS} = 10 V | 13 | 6.1 nC | | | |
| - 50 | 0.011 at V _{GS} = 4.5 V | 11 | 0.1110 | | | |

SO-8

Top View

8 D

D

6 D

5 D

S

S

S

G

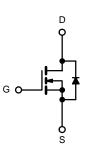
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FEATURES

- Halogen-free
- Trench Power MOSFET
- Optimized for High-Side Synchronous Rectifier Operation
- 100 % R_g Tested
- 100 % UIS Tested

APPLICATIONS

Notebook CPU Core
High-Side Switch



N-Channel MOSFET

| ABSOLUTE MAXIMUM RATING | S T _A = 25 °C, unles | s otherwise not | ed | | |
|--|--|-----------------|---------------------|------|------|
| Parameter | | Symbol | Limit | Unit | |
| Drain-Source Voltage | V _{DS} | 30 | V | | |
| Gate-Source Voltage | | V _{GS} | | | ± 20 |
| | T _C = 25 °C | | 13 | | |
| Continuous Drain Current (T _J = 150 °C) | T _C = 70 °C | | 10 | | |
| $Continuous Drain Current (1) = 150^{\circ} C)$ | T _A = 25 °C | I _D | 9 ^{b, c} | | |
| | T _A = 70 °C | | 7 ^{b, c} | • | |
| Pulsed Drain Current | | I _{DM} | 45 | — A | |
| Continuous Source-Drain Diode Current | T _C = 25 °C | | 3.7 | | |
| | T _A = 25 °C | I _S | 2.0 ^{b, c} | | |
| Single Pulse Avalanche Current | L = 0.1 mH | I _{AS} | 20 | | |
| Avalanche Energy | | E _{AS} | 21 | mJ | |
| | T _C = 25 °C | | 4.1 | | |
| Movimum Dower Dissinction | T _C = 70 °C | Pn | 2.5 | w | |
| Maximum Power Dissipation | T _A = 25 °C | | 2.2 ^{b, c} | vv | |
| | T _A = 70 °C | | 1.3 ^{b, c} | | |
| Operating Junction and Storage Temperature Ra | T _J , T _{stg} | - 55 to 150 | °C | | |

| THERMAL RESISTANCE RATINGS | | | | | | |
|---|--------------|-------------------|---------|---------|------|--|
| Parameter | | Symbol | Typical | Maximum | Unit | |
| Maximum Junction-to-Ambient ^{b, d} | t ≤ 10 s | R _{thJA} | 39 | 55 | °C/W | |
| Maximum Junction-to-Foot (Drain) | Steady State | R _{thJF} | 25 | 29 | 0/11 | |

Notes:

a. Base on T_C = 25 °C.

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

c. t = 10 s. d. Maximum under Steady State conditions is 85 °C/W.





| Parameter | Symbol | Test Conditions | Min. | Тур. | Max. | Unit |
|---|-------------------------|---|------|-------|----------|----------|
| Static | | | | | I | |
| Drain-Source Breakdown Voltage | V _{DS} | V _{GS} = 0 V, I _D = 250 μA | 30 | | | V |
| V _{DS} Temperature Coefficient | $\Delta V_{DS}/T_{J}$ | L 050 A | | 26 | | mV/°C |
| V _{GS(th)} Temperature Coefficient | $\Delta V_{GS(th)}/T_J$ | I _D = 250 μA | | - 6 | | |
| Gate-Source Threshold Voltage | V _{GS(th)} | $V_{DS} = V_{GS}, I_{D} = 250 \ \mu A$ | 1.0 | | 3.0 | V |
| Gate-Source Leakage | I _{GSS} | $V_{DS} = 0 V, V_{GS} = \pm 20 V$ | | | ± 100 | nA |
| | | V _{DS} = 30 V, V _{GS} = 0 V | | | 1 | μA |
| Zero Gate Voltage Drain Current | IDSS | V _{DS} = 30 V, V _{GS} = 0 V, T _J = 55 °C | | | 10 | |
| On-State Drain Current ^a | I _{D(on)} | $V_{DS} \ge 5 \text{ V}, V_{GS} = 10 \text{ V}$ | 20 | | | А |
| _ | | $V_{GS} = 10 \text{ V}, \text{ I}_{D} = 10 \text{ A}$ | | 0.008 | | <u> </u> |
| Drain-Source On-State Resistance ^a | R _{DS(on)} | V _{GS} = 4.5 V, I _D = 9 A | | 0.011 | | Ω |
| Forward Transconductance ^a | 9 _{fs} | V _{DS} = 15 V, I _D = 10 A | | 50 | | S |
| Dynamic ^b | <u> </u> | | | | | • |
| Input Capacitance | C _{iss} | | | 800 | | pF |
| Output Capacitance | C _{oss} | V _{DS} = 15 V, V _{GS} = 0 V, f = 1 MHz | | 165 | | |
| Reverse Transfer Capacitance | C _{rss} | 20 00 | | 73 | | |
| Total Gate Charge | | V _{DS} = 15 V, V _{GS} = 10 V, I _D = 10 A | | 15 | 23 | nC |
| | Q _g | | | 6.8 | 10.2 | |
| Gate-Source Charge | Q _{gs} | $V_{DS} = 15 \text{ V}, \text{ V}_{GS} = 5 \text{ V}, \text{ I}_{D} = 10 \text{ A}$ | | 2.5 | | |
| Gate-Drain Charge | Q _{gd} | | | 2.3 | | |
| Gate Resistance | Rg | f = 1 MHz | 0.36 | 1.8 | 3.6 | Ω |
| Turn-On Delay Time | t _{d(on)} | | | 16 | 23 | - |
| Rise Time | t _r | V_{DD} = 15 V, R_L = 1.4 Ω | | 12 | 16 | |
| Turn-Off Delay Time | t _{d(off)} | $I_D \cong$ 9 A, V_{GEN} = 4.5 V, R_g = 1 Ω | | 16 | 22 | |
| Fall Time | t _f | | | 10 | 18 | |
| Turn-On Delay Time | t _{d(on)} | | | 8 | 16 | ns |
| Rise Time | t _r | V_{DD} = 15 V, R_L = 1.4 Ω | | 10 | 20 | - |
| Turn-Off Delay Time | t _{d(off)} | $I_D \cong$ 9 A, V_{GEN} = 10 V, R_g = 1 Ω | | 16 | 22 | |
| Fall Time | t _f | | | 8 | 15 | |
| Drain-Source Body Diode Characterist | ics | | | | <u> </u> | <u> </u> |
| Continuous Source-Drain Diode Current | ۱ _S | T _C = 25 °C | | | 10 | |
| Pulse Diode Forward Current ^a | I _{SM} | | | | 50 | A |
| Body Diode Voltage | V _{SD} | I _S = 9 A | | 0.8 | 1.2 | V |
| Body Diode Reverse Recovery Time | t _{rr} | | | 15 | 30 | ns |
| Body Diode Reverse Recovery Charge | Q _{rr} | | | 6 | 12 | nC |
| Reverse Recovery Fall Time | t _a | I _F = 9 A, dl/dt = 100 A/μs, T _J = 25 °C | | 8 | | |
| Reverse Recovery Rise Time | t _b | | | 7 | | ns |

Notes:

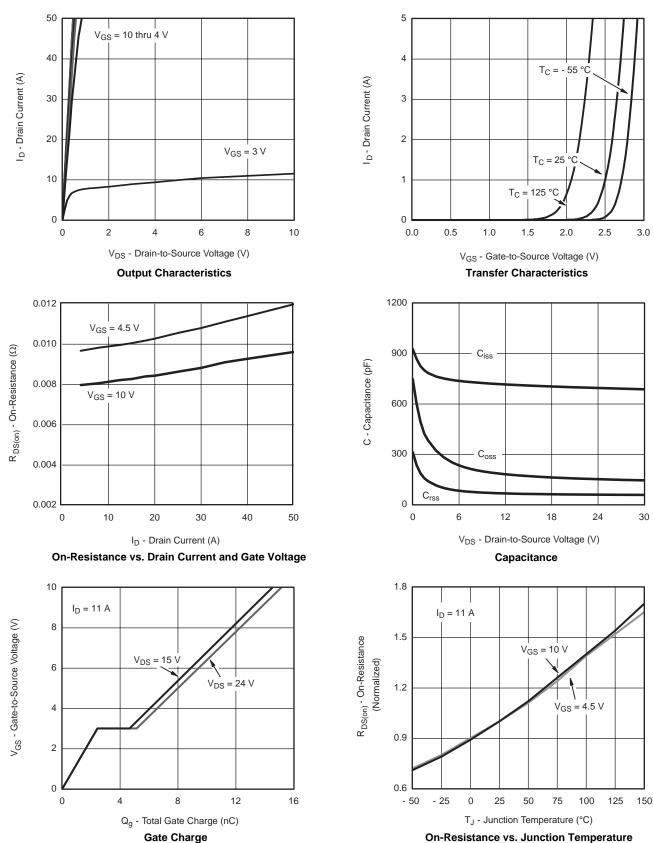
a. Pulse test; pulse width \leq 300 µs, duty cycle \leq 2 %.

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

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.

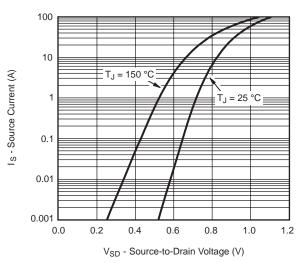




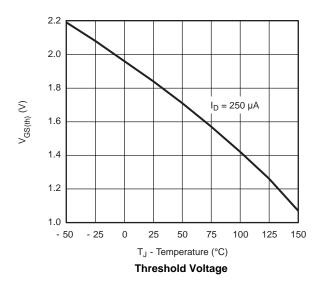


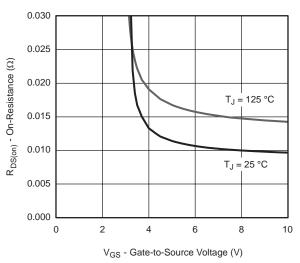












On-Resistance vs. Gate-to-Source Voltage

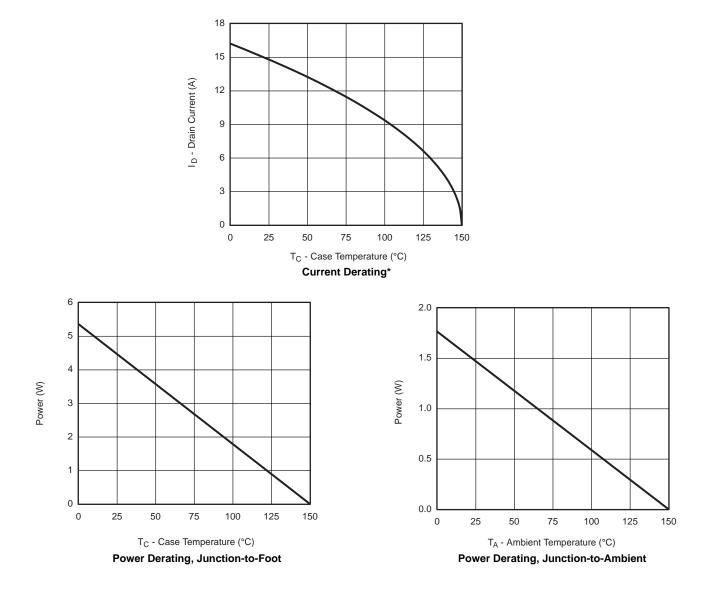






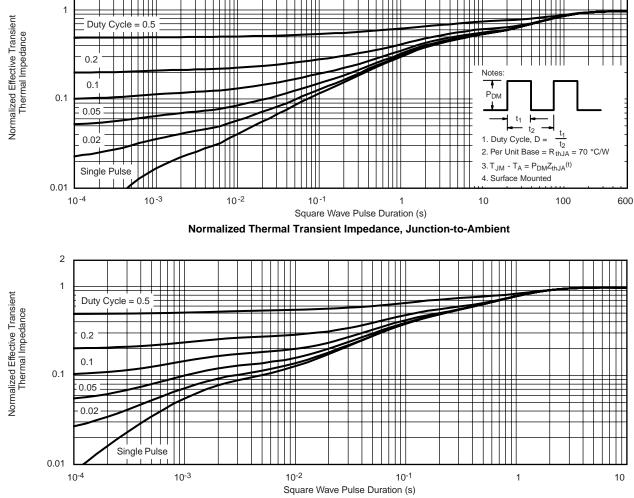


TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



* The power dissipation P_D is based on $T_{J(max)} = 150$ °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

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TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

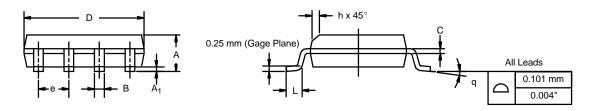
Normalized Thermal Transient Impedance, Junction-to-Foot

<u>VBsemi</u> www.VBsemi.com



SOIC (NARROW): 8-LEAD

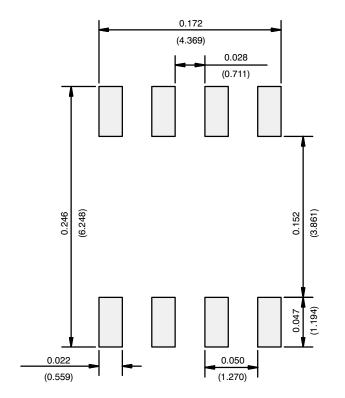




| MILLIMETERS | | | INCHES | | | |
|---|------|------|--------|-----------|--|--|
| DIM | Min | Мах | Min | Max | | |
| A | 1.35 | 1.75 | 0.053 | 0.069 | | |
| A ₁ | 0.10 | 0.20 | 0.004 | 0.008 | | |
| В | 0.35 | 0.51 | 0.014 | 0.020 | | |
| С | 0.19 | 0.25 | 0.0075 | 0.010 | | |
| D | 4.80 | 5.00 | 0.189 | 0.196 | | |
| E | 3.80 | 4.00 | 0.150 | 0.157 | | |
| е | 1.27 | BSC | 0.050 | 0.050 BSC | | |
| н | 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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