

MC3231-VB Datasheet

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

PRODUCT SUMMARY

| V_{DS} (V) | $R_{DS(on)}$ (Ω) | I_D (A) ^a | Q_g (Typ.) |
|--------------|-----------------------------|------------------------|--------------|
| - 30 | 0.030 at $V_{GS} = - 10$ V | - 5.1 | 5.1 nC |
| | 0.042 at $V_{GS} = - 4.5$ V | - 4.1 | |

FEATURES

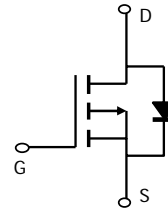
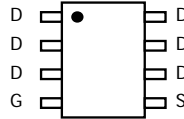
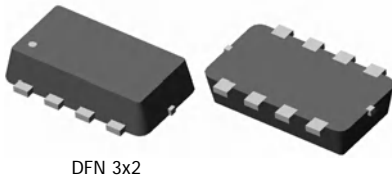
- Halogen-free According to IEC 61249-2-21 Available
- Trench Power MOSFET

APPLICATIONS

- Load Switch



RoHS
COMPLIANT
HALOGEN
FREE
Available



ABSOLUTE MAXIMUM RATINGS $T_A = 25$ °C, unless otherwise noted

| Parameter | Symbol | Limit | Unit |
|--|----------------|---------------|------------------------|
| Drain-Source Voltage | V_{DS} | - 30 | V |
| Gate-Source Voltage | V_{GS} | ± 20 | |
| Continuous Drain Current ($T_J = 150$ °C) | I_D | $T_C = 25$ °C | A |
| | | $T_C = 70$ °C | |
| | | $T_A = 25$ °C | |
| | | $T_A = 70$ °C | |
| Pulsed Drain Current | I_{DM} | - 20 | A |
| Continuous Source-Drain Diode Current | I_S | $T_C = 25$ °C | |
| | | $T_A = 25$ °C | - 1.67 ^{b, c} |
| Maximum Power Dissipation | P_D | $T_C = 25$ °C | W |
| | | $T_C = 70$ °C | |
| | | $T_A = 25$ °C | |
| | | $T_A = 70$ °C | |
| Operating Junction and Storage Temperature Range | T_J, T_{stg} | - 55 to 150 | °C |

THERMAL RESISTANCE RATINGS

| Parameter | Symbol | Typical | Maximum | Unit |
|---|------------|---------|---------|------|
| Maximum Junction-to-Ambient ^{b, d} | R_{thJA} | 55 | 62.5 | °C/W |
| Maximum Junction-to-Foot (Drain) | R_{thJF} | 34 | 41 | |

Notes:

- Based on $T_C = 25$ °C.
- Surface Mounted on 1" x 1" FR4 board.
- $t = 5$ s.
- Maximum under Steady State conditions is 110 °C/W.

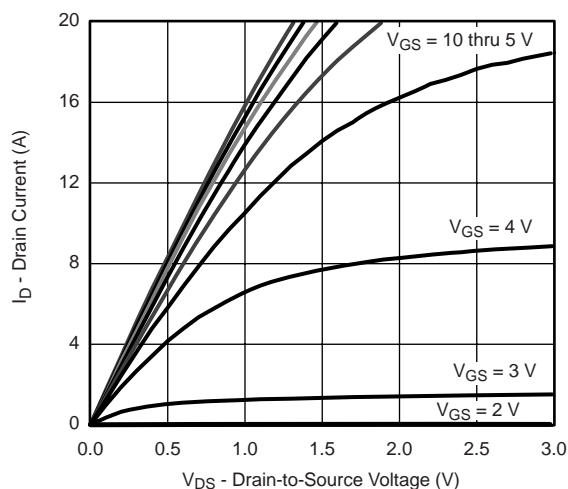
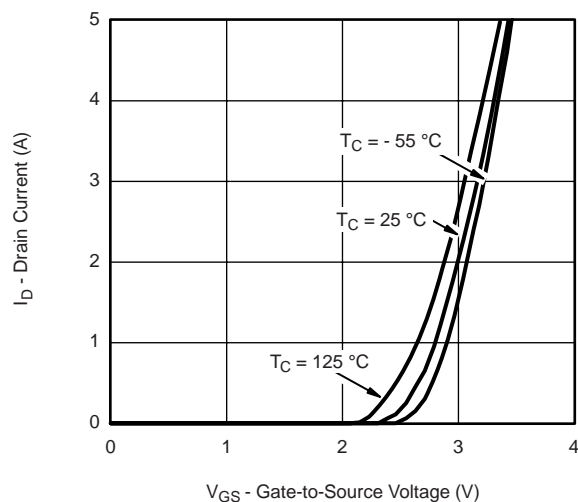
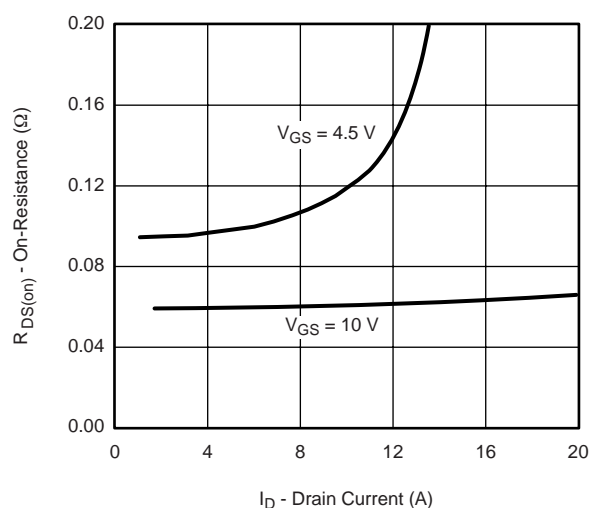
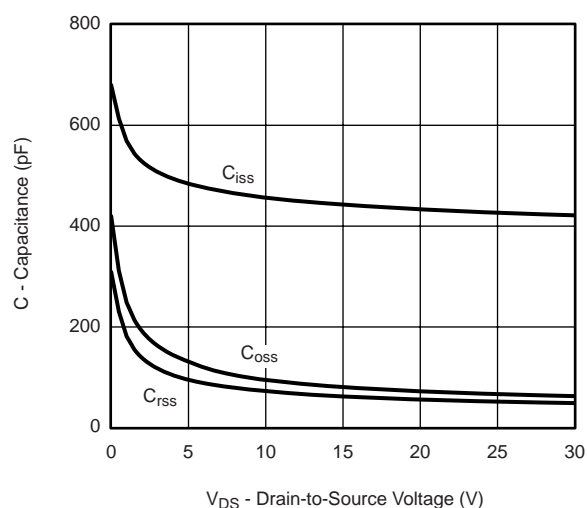
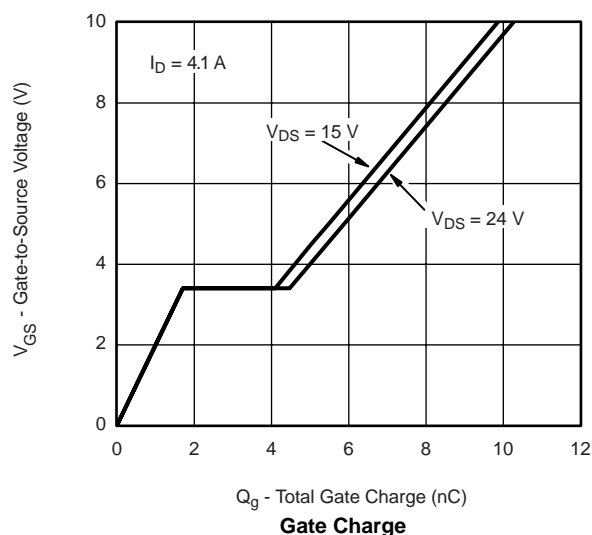
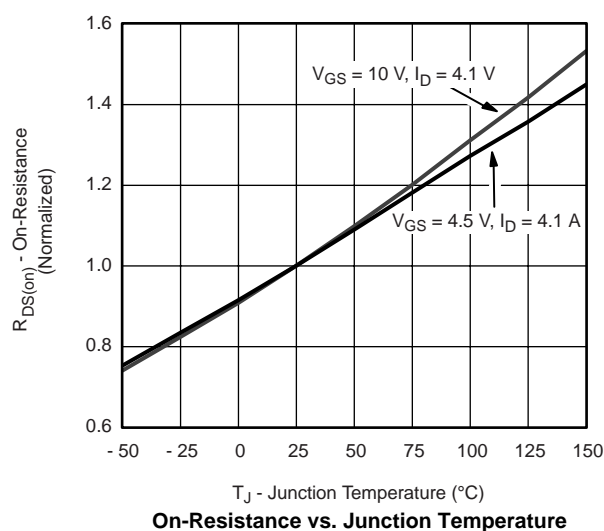
| SPECIFICATIONS T _J = 25 °C, unless otherwise noted | | | | | | |
|---|--------------------------------------|--|-------|-------|-------|-------|
| Parameter | Symbol | Test Conditions | Min. | Typ. | Max. | Unit |
| Static | | | | | | |
| Drain-Source Breakdown Voltage | V _{DS} | V _{GS} = 0 V, I _D = - 250 μA | - 30 | | | V |
| V _{DS} Temperature Coefficient | ΔV _{DS} /T _J | I _D = - 250 μA | | - 31 | | mV/°C |
| V _{GS(th)} Temperature Coefficient | ΔV _{GS(th)} /T _J | | | 4.5 | | |
| Gate-Source Threshold Voltage | V _{GS(th)} | V _{DS} = V _{GS} , I _D = - 250 μA | - 1.0 | | - 3.0 | V |
| Gate-Source Leakage | I _{GSS} | V _{DS} = 0 V, V _{GS} = ± 20 V | | | ± 100 | nA |
| Zero Gate Voltage Drain Current | I _{DSS} | V _{DS} = - 30 V, V _{GS} = 0 V | | | - 1 | μA |
| | | V _{DS} = - 30 V, V _{GS} = 0 V, T _J = 55 °C | | | - 10 | |
| On-State Drain Current ^a | I _{D(on)} | V _{DS} ≤ - 5 V, V _{GS} = - 10 V | - 20 | | | A |
| Drain-Source On-State Resistance ^a | R _{DS(on)} | V _{GS} = - 10 V, I _D = - 4.1 A | | 0.030 | | Ω |
| | | V _{GS} = - 4.5 V, I _D = - 1.0 A | | 0.042 | | |
| Forward Transconductance ^a | g _{fs} | V _{DS} = - 15 V, I _D = - 4.1 A | | 8 | | S |
| Dynamic ^b | | | | | | |
| Input Capacitance | C _{iss} | V _{DS} = - 15 V, V _{GS} = 0 V, f = 1 MHz | | 450 | | pF |
| Output Capacitance | C _{oss} | | | 80 | | |
| Reverse Transfer Capacitance | C _{rss} | | | 63 | | |
| Total Gate Charge | Q _g | V _{DS} = - 15 V, V _{GS} = - 10 V, I _D = - 4.1 A | | 10 | 15 | nC |
| | | | | 5.1 | 8 | |
| Gate-Source Charge | Q _{gs} | V _{DS} = - 15 V, V _{GS} = - 4.5 V, I _D = - 4.1 A | | 1.8 | | |
| Gate-Drain Charge | Q _{gd} | | | 2.5 | | |
| Gate Resistance | R _g | f = 1 MHz | | 7 | | Ω |
| Turn-On Delay Time | t _{d(on)} | V _{DD} = - 15 V, R _L = 4.6 Ω I _D ≅ - 3.3 A, V _{GEN} = - 4.5 V, R _g = 1 Ω | | 40 | 60 | ns |
| Rise Time | t _r | | | 80 | 120 | |
| Turn-Off Delay Time | t _{d(off)} | | | 20 | 30 | |
| Fall Time | t _f | | | 12 | 20 | |
| Turn-On Delay Time | t _{d(on)} | V _{DD} = - 15 V, R _L = 4.6 Ω I _D ≅ - 3.3 A, V _{GEN} = - 10 V, R _g = 1 Ω | | 5 | 10 | |
| Rise Time | t _r | | | 13 | 20 | |
| Turn-Off Delay Time | t _{d(off)} | | | 20 | 30 | |
| Fall Time | t _f | | | 10 | 15 | |
| Drain-Source Body Diode Characteristics | | | | | | |
| Continuous Source-Drain Diode Current | I _S | T _C = 25 °C | | | - 2.5 | A |
| Pulse Diode Forward Current ^a | I _{SM} | | | | - 20 | |
| Body Diode Voltage | V _{SD} | I _S = - 3.3 A | | - 0.8 | - 1.2 | V |
| Body Diode Reverse Recovery Time | t _{rr} | I _F = - 3.3 A, di/dt = 100 A/μs, T _J = 25 °C | | 20 | 30 | ns |
| Body Diode Reverse Recovery Charge | Q _{rr} | | | 20 | 30 | nC |
| Reverse Recovery Fall Time | t _a | | | 14 | | ns |
| Reverse Recovery Rise Time | t _b | | | 6 | | |

Notes:

a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, 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.

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

Output Characteristics

Transfer Characteristics

On-Resistance vs. Drain Current and Gate Voltage

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

Safe Operating Area

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

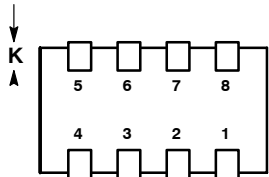


* The power dissipation P_D is based on $T_{J(max)} = 150$ °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted


PACKAGE DIMENSIONS

ChipFET
CASE 1206A-03
ISSUE D



- STYLE 2:
- 2. GATE 1
 - 4. GATE 2
 - 5. DRAIN 2
 - 6. DRAIN 2
 - 7. DRAIN 1
 - 8. DRAIN 1

- 1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
- 2. CONTROLLING DIMENSION: MILLIMETER.
- 3. MOLD GATE BURRS SHALL NOT EXCEED 0.13 MM PER SIDE.
- 4. LEADFRAME TO MOLDED BODY OFFSET IN HORIZONTAL AND VERTICAL SHALL NOT EXCEED 0.08 MM.
- 5. DIMENSIONS A AND B EXCLUSIVE OF MOLD GATE BURRS.
- 6. NO MOLD FLASH ALLOWED ON THE TOP AND BOTTOM LEAD SURFACE.
- 7. 1206A-01 AND 1206A-02 OBSOLETE. NEW STANDARD IS 1206A-03.

| DIM | MILLIMETERS | | INCHES | |
|-----|-------------|------|-----------|-------|
| | MIN | MAX | MIN | MAX |
| A | 2.95 | 3.10 | 0.116 | 0.122 |
| B | 1.55 | 1.70 | 0.061 | 0.067 |
| C | 1.00 | 1.10 | 0.039 | 0.043 |
| D | 0.25 | 0.35 | 0.010 | 0.014 |
| G | 0.65 BSC | | 0.025 BSC | |
| J | 0.10 | 0.20 | 0.004 | 0.008 |
| K | 0.28 | 0.42 | 0.011 | 0.017 |
| L | 0.55 BSC | | 0.022 BSC | |
| M | 5 ° NOM | | 5 ° NOM | |
| S | 1.80 | 2.00 | 0.072 | 0.080 |

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