

Product Summary

| $V_{(BR)DSS}$ | $R_{DS(ON)}$ max | I_D max $T_A = +25^\circ\text{C}$ |
|---------------|--------------------------|--|
| 60V | $3\Omega @ V_{GS} = 10V$ | 300mA |

Description

This MOSFET has been designed to minimize the on-state resistance ($R_{DS(ON)}$) and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

Applications

- Motor Control
- Power Management Functions

Features and Benefits

- Low On-Resistance
- Low Gate Threshold Voltage
- Low Input Capacitance
- Fast Switching Speed
- Small Surface Mount Package
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**

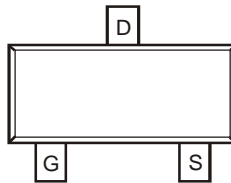
Mechanical Data

- Case: SOT23
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Matte Tin Finish annealed over Alloy 42 leadframe (Lead Free Plating). Solderable per MIL-STD-202, Method 208 ^{e3}
- Weight: 0.008 grams (approximate)

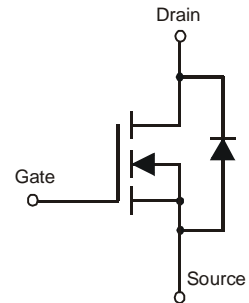
SOT23



Top View



Top View
Pin Out Configuration



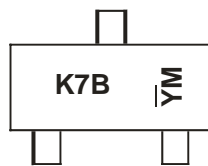
Equivalent Circuit

Ordering Information (Note 4)

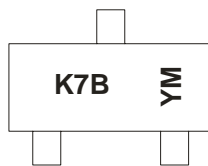
| Part Number | Case | Packaging |
|--------------|-------|--------------------|
| 2N7002E-7-F | SOT23 | 3,000/Tape & Reel |
| 2N7002E-13-F | SOT23 | 10,000/Tape & Reel |

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant
 2. See http://www.diodes.com/quality/lead_free.html for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
 3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
 4. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

Marking Information



Chengdu A/T Site



Shanghai A/T Site

K7B = Product Type Marking Code
 YM = Date Code Marking for SAT (Shanghai Assembly/ Test site)
 YM = Date Code Marking for CAT (Chengdu Assembly/ Test site)
 Y or Y= Year (ex: A = 2013)
 M = Month (ex: 9 = September)

Date Code Key

| Year | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Code | P | R | S | T | U | V | W | X | Y | Z | A | B | C | D | E |

| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Code | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | O | N | D |

Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

| Characteristic | | | Symbol | Value | Units |
|---|--------------|------------------------|------------------|-------|-------|
| Drain-Source Voltage | | | V _{DSS} | 60 | V |
| Drain-Gate Voltage R _{GS} ≤ 1.0MΩ | | | V _{DGR} | 60 | V |
| Gate-Source Voltage | | | V _{GSS} | ±20 | V |
| Continuous Pulsed | | | | ±40 | |
| Continuous Drain Current (Note 5) V _{GS} = 10V | Steady State | T _A = +25°C | I _D | 250 | mA |
| | | T _A = +70°C | | 200 | |
| Continuous Drain Current (Note 6) V _{GS} = 10V | Steady State | T _A = +25°C | I _D | 300 | mA |
| | | T _A = +70°C | | 240 | |
| Maximum Body Diode Forward Current (Note 6) | | | I _S | 500 | mA |
| Pulsed Drain Current (10μs pulse, duty cycle = 1%) | | | I _{DM} | 800 | mA |

Thermal Characteristics (@T_A = +25°C, unless otherwise specified.)

| Characteristic | | Symbol | Value | Units |
|---|----------|-----------------------------------|------------|-------|
| Total Power Dissipation | (Note 5) | P _D | 370 | mW |
| | (Note 6) | | 540 | |
| Thermal Resistance, Junction to Ambient | (Note 5) | R _{θJA} | 348 | °C/W |
| | (Note 6) | | 241 | |
| Thermal Resistance, Junction to Case | (Note 6) | R _{θJC} | 91 | |
| Operating and Storage Temperature Range | | T _J , T _{STG} | -55 to 150 | °C |

Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|--|---------------------|-----|-----|-----|------|--|
| OFF CHARACTERISTICS (Note 7) | | | | | | |
| Drain-Source Breakdown Voltage | BV _{DSS} | 60 | 70 | — | V | V _{GS} = 0V, I _D = 10μA |
| Zero Gate Voltage Drain Current | I _{DSS} | — | — | 1.0 | μA | V _{DS} = 60V, V _{GS} = 0V |
| @ T _C = +25°C | | | | 500 | | |
| Gate-Body Leakage | I _{GSS} | — | — | ±10 | nA | V _{GS} = ±15V, V _{DS} = 0V |
| ON CHARACTERISTICS (Note 7) | | | | | | |
| Gate Threshold Voltage | V _{GS(th)} | 1.0 | — | 2.5 | V | V _{DS} = V _{GS} , I _D = 250μA |
| Static Drain-Source On-Resistance | R _{DS(ON)} | — | 1.6 | 3 | Ω | V _{GS} = 10V, I _D = 250mA V _{GS} = 4.5V, I _D = 200mA |
| @ T _J = +25°C | | | 2.0 | 4 | | |
| On-State Drain Current | I _{D(ON)} | 0.8 | 1.0 | — | A | V _{GS} = 10V, V _{DS} = 7.5V |
| Forward Transconductance | g _{FS} | 80 | — | — | mS | V _{DS} = 10V, I _D = 0.2A |
| DYNAMIC CHARACTERISTICS (Note 8) | | | | | | |
| Input Capacitance | C _{iss} | — | 22 | 50 | pF | V _{DS} = 25V, V _{GS} = 0V, f = 1.0MHz |
| Output Capacitance | C _{oss} | — | 11 | 25 | pF | |
| Reverse Transfer Capacitance | C _{rss} | — | 2.0 | 5.0 | pF | |
| Gate resistance | R _g | — | 120 | — | Ω | V _{DS} = 0V, V _{GS} = 0V, f = 1.0MHz |
| Total Gate Charge (V _{GS} = 4.5V) | Q _g | — | 223 | — | pC | V _{DS} = 10V, I _D = 250mA |
| Gate-Source Charge | Q _{gs} | — | 82 | — | pC | |
| Gate-Drain Charge | Q _{gd} | — | 178 | — | pC | |
| SWITCHING CHARACTERISTICS (Note 8) | | | | | | |
| Turn-On Delay Time | t _{D(ON)} | — | 7.0 | 20 | ns | V _{DD} = 30V, I _D = 0.2A, R _L = 150Ω, V _{GEN} = 10V, R _{GEN} = 25Ω |
| Turn-Off Delay Time | t _{D(OFF)} | — | 11 | 20 | ns | |

- Notes:
- Device mounted on FR-4 PCB, with minimum recommended pad layout.
 - Device mounted on 1" x 1" FR-4 PCB with high coverage 2oz. Copper, single sided.
 - Short duration pulse test used to minimize self-heating effect.
 - Guaranteed by design. Not subject to product testing.

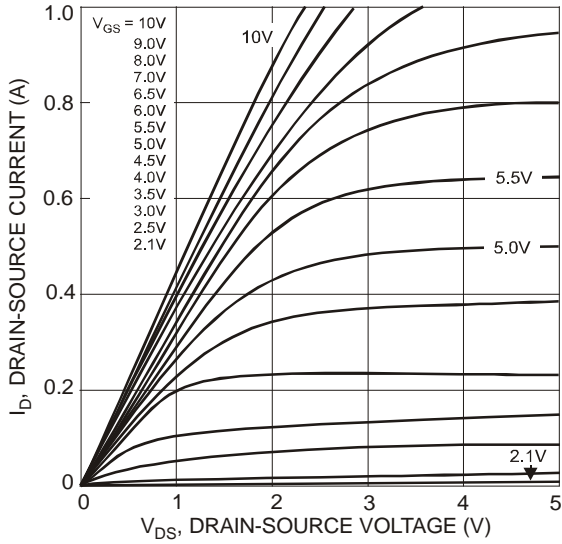


Fig. 1 On-Region Characteristics

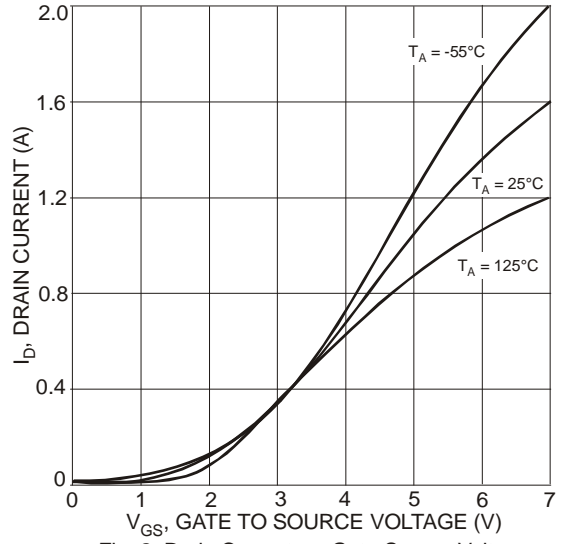


Fig. 2 Drain Current vs. Gate-Source Voltage

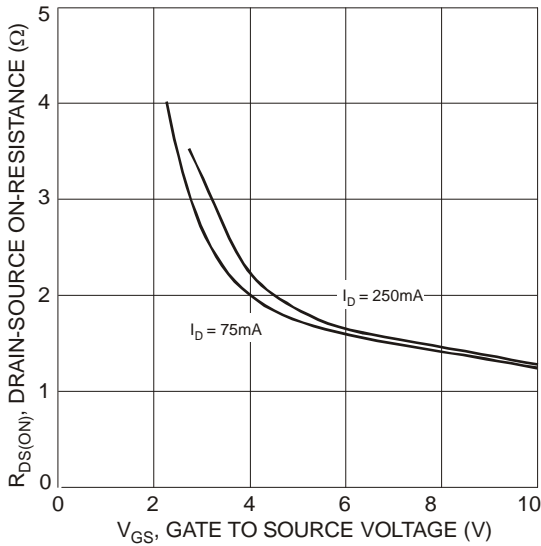


Fig. 3 On Resistance vs. Gate-Source Voltage

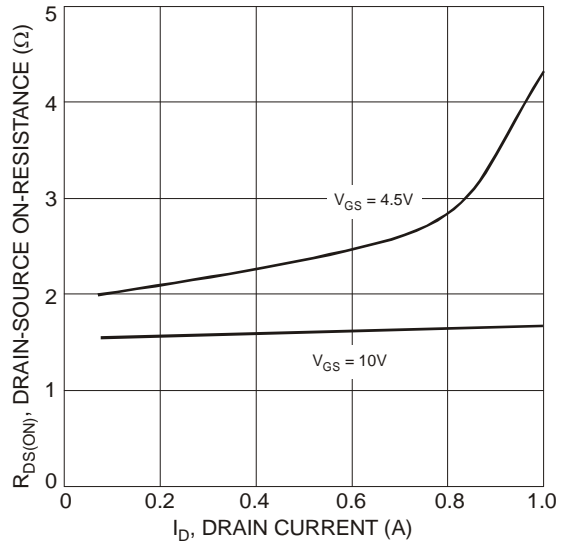


Fig. 4 On Resistance vs. Drain Current

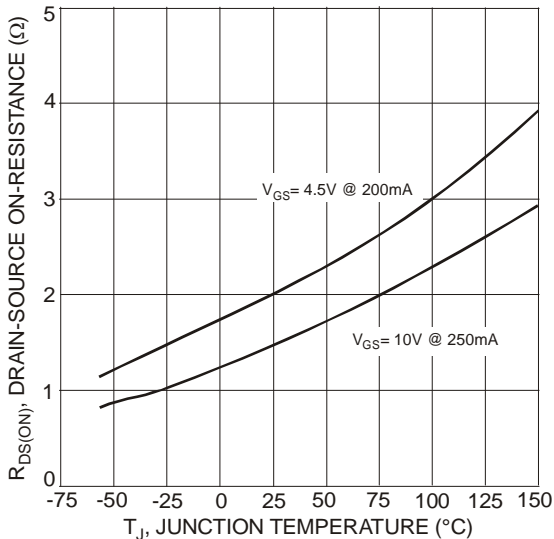


Fig. 5 On-Resistance vs. Junction Temperature

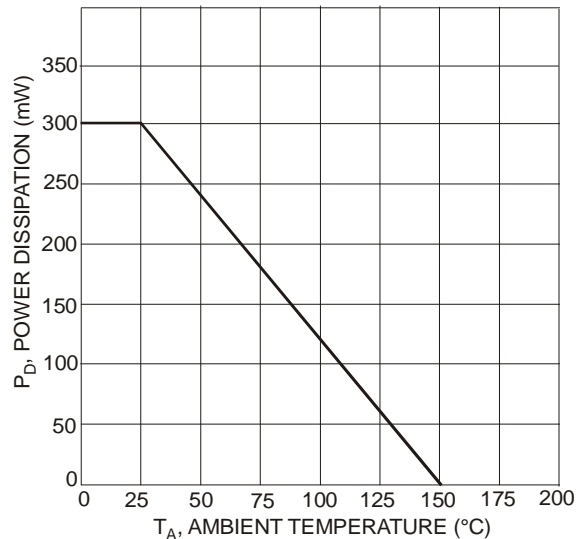
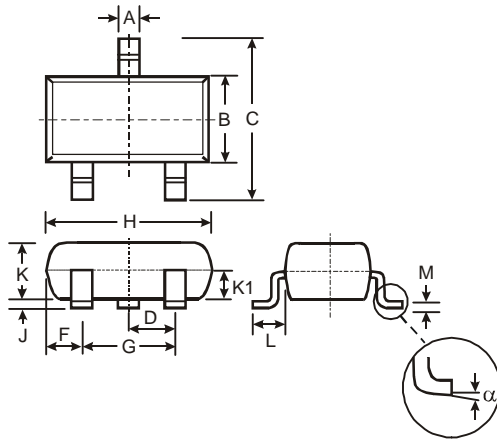


Fig. 6 Max Power Dissipation vs. Ambient Temperature

Package Outline Dimensions

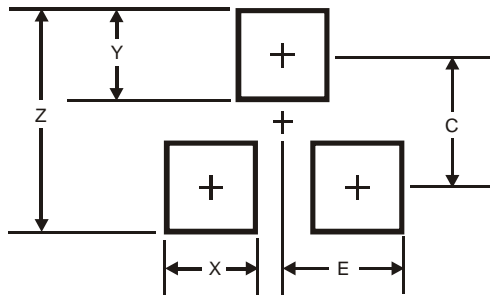
Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.



| SOT23 | | | |
|----------------------|-------|------|-------|
| Dim | Min | Max | Typ |
| A | 0.37 | 0.51 | 0.40 |
| B | 1.20 | 1.40 | 1.30 |
| C | 2.30 | 2.50 | 2.40 |
| D | 0.89 | 1.03 | 0.915 |
| F | 0.45 | 0.60 | 0.535 |
| G | 1.78 | 2.05 | 1.83 |
| H | 2.80 | 3.00 | 2.90 |
| J | 0.013 | 0.10 | 0.05 |
| K | 0.903 | 1.10 | 1.00 |
| K1 | - | - | 0.400 |
| L | 0.45 | 0.61 | 0.55 |
| M | 0.085 | 0.18 | 0.11 |
| α | 0° | 8° | - |
| All Dimensions in mm | | | |

Suggested Pad Layout

Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.



| Dimensions | Value (in mm) |
|------------|---------------|
| Z | 2.9 |
| X | 0.8 |
| Y | 0.9 |
| C | 2.0 |
| E | 1.35 |

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