

**100V HIGH VOLTAGE NPN SURFACE MOUNT TRANSISTOR**
**Features**

- Epitaxial Planar Die Construction
- High Collector-Emitter Voltage  $BV_{CEO} > 100V$
- Ideally Suited for Automated Assembly Processes
- Ideal for Power Switching or Amplification Applications
- **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**
- **PPAP capable (Note 4)**

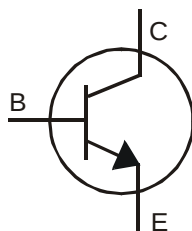
**Mechanical Data**

- Case: TO252 (DPAK)
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208 
- Weight: 0.34 grams (approximate)

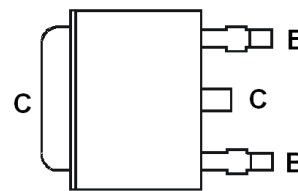
TO252 (DPAK)



Top View



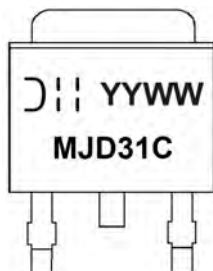
Device Schematic


 Pin Out Configuration  
 Top view

**Ordering Information (Notes 4 & 5)**

| Product    | Compliance | Marking | Reel size (inches) | Tape width (mm) | Quantity per reel |
|------------|------------|---------|--------------------|-----------------|-------------------|
| MJD31C-13  | AEC-Q101   | MJD31C  | 13                 | 16              | 2,500             |
| MJD31CQ-13 | Automotive | MJD31C  | 13                 | 16              | 2,500             |

- 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> 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. Automotive products are AEC-Q101 qualified and are PPAP capable. Automotive, AEC-Q101 and standard products are electrically and thermally the same, except where specified.
  5. For packaging details, go to our website at <http://www.diodes.com>

**Marking Information**


MJD31C = Product Type Marking Code  
 D = Manufacturers' code marking  
 YYWW = Date Code Marking  
 YY = Last Digit of Year (ex: 10 = 2010)  
 WW = Week Code (01 – 53)

## Maximum Ratings (@T<sub>A</sub> = +25°C, unless otherwise specified.)

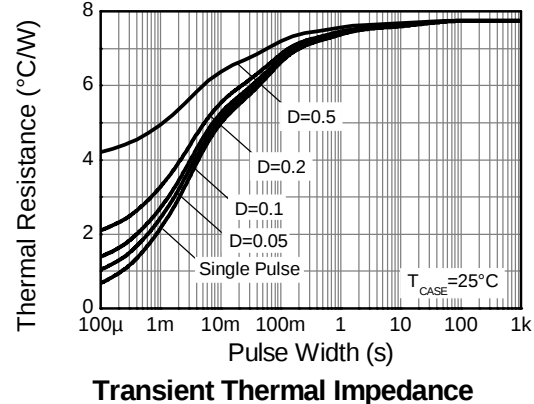
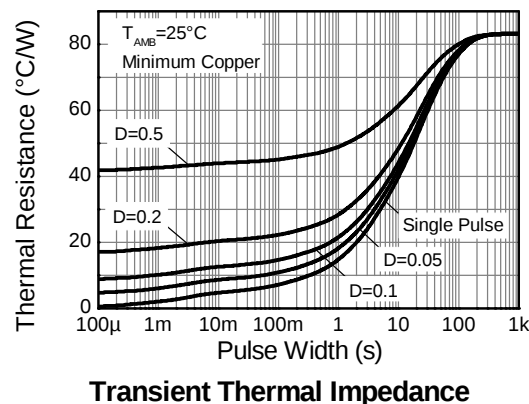
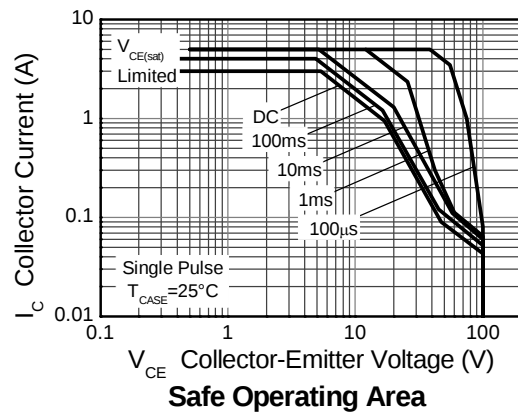
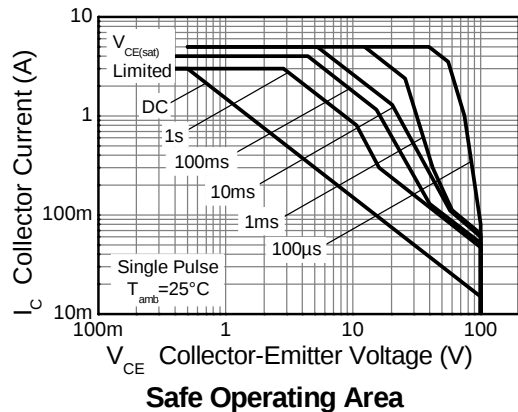
| Characteristic               | Symbol           | Value | Unit |
|------------------------------|------------------|-------|------|
| Collector-Base Voltage       | V <sub>CBO</sub> | 100   | V    |
| Collector-Emitter Voltage    | V <sub>CEO</sub> | 100   | V    |
| Emitter-Base Voltage         | V <sub>EBO</sub> | 6     | V    |
| Continuous Collector Current | I <sub>C</sub>   | 3     | A    |
| Peak Pulse Collector Current | I <sub>CM</sub>  | 5     | A    |
| Continuous Base Current      | I <sub>B</sub>   | 1     | A    |

## Thermal Characteristics (@T<sub>A</sub> = +25°C, unless otherwise specified.)

| Characteristic                                   | Symbol                            | Value       | Unit |
|--------------------------------------------------|-----------------------------------|-------------|------|
| Power Dissipation (Note 6)                       | P <sub>D</sub>                    | 1.56        | W    |
| Power Dissipation (Note 7)                       | P <sub>D</sub>                    | 15          | W    |
| Thermal Resistance, Junction to Ambient (Note 6) | R <sub>θJA</sub>                  | 80          | °C/W |
| Thermal Resistance, Junction to Leads (Note 7)   | R <sub>θJL</sub>                  | 8.33        | °C/W |
| Operating and Storage Temperature Range          | T <sub>J</sub> , T <sub>STG</sub> | -55 to +150 | °C   |

Notes: 6. Device mounted on FR-4 PCB with minimum recommended pad layout.  
7. Thermal resistance from junction to solder-point (on the exposed collector pad).

## Thermal Characteristics



## Electrical Characteristics (@T<sub>A</sub> = +25°C, unless otherwise specified.)

| Characteristic                                | Symbol               | Min      | Typ | Max     | Unit | Test Condition                                                                         |
|-----------------------------------------------|----------------------|----------|-----|---------|------|----------------------------------------------------------------------------------------|
| Collector-Emitter Breakdown Voltage (Note 8)  | BV <sub>CEO</sub>    | 100      | —   | —       | V    | I <sub>C</sub> = 30mA, I <sub>B</sub> = 0                                              |
| Collector Cut-off Current                     | I <sub>CEO</sub>     | —        | —   | 1       | μA   | V <sub>CB</sub> = 60V, I <sub>B</sub> = 0                                              |
| Collector Cut-off Current                     | I <sub>CES</sub>     | —        | —   | 1       | μA   | V <sub>CE</sub> = 100V, V <sub>EB</sub> = 0                                            |
| Emitter Cut-off Current                       | I <sub>EBO</sub>     | —        | —   | 1       | μA   | V <sub>EB</sub> = 5V, I <sub>C</sub> = 0                                               |
| Collector-Emitter Saturation Voltage (Note 8) | V <sub>CE(sat)</sub> | —        | —   | 1.2     | V    | I <sub>C</sub> = 3.0A, I <sub>B</sub> = 375mA                                          |
| Base-Emitter Turn-On Voltage (Note 8)         | V <sub>BE(on)</sub>  | —        | —   | 1.8     | V    | I <sub>C</sub> = 3A, V <sub>CE</sub> = 4V                                              |
| DC Current Gain (Note 8)                      | h <sub>FE</sub>      | 25<br>10 | —   | —<br>50 | —    | V <sub>CE</sub> = 4V, I <sub>C</sub> = 1A<br>V <sub>CE</sub> = 4V, I <sub>C</sub> = 3A |
| Current Signal Current Gain                   | H <sub>fe</sub>      | 20       | —   | —       | —    | V <sub>CE</sub> = 10V, I <sub>C</sub> = 0.5A, f = 1KHz                                 |
| Current Gain-Bandwidth Product                | f <sub>T</sub>       | 3.0      | —   | —       | MHz  | I <sub>C</sub> = 500mA, V <sub>CE</sub> = 10V, f = 1MHz                                |

Notes: 8. Measured under pulsed conditions. Pulse width ≤ 300μs. Duty cycle ≤ 2%.

## Typical Electrical Characteristics (@T<sub>A</sub> = +25°C, unless otherwise specified.)

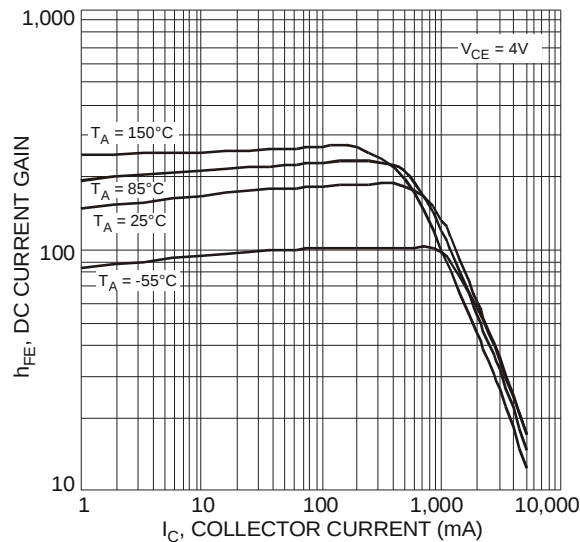


Figure 1 Typical DC Current Gain vs. Collector Current

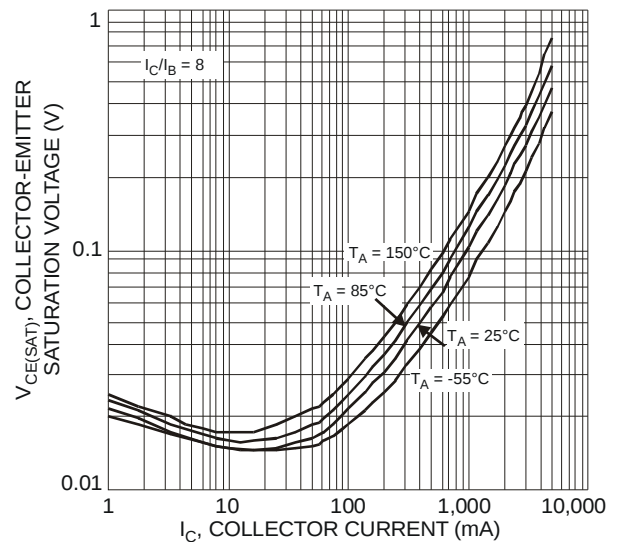


Figure 2 Typical Collector-Emitter Saturation Voltage vs. Collector Current

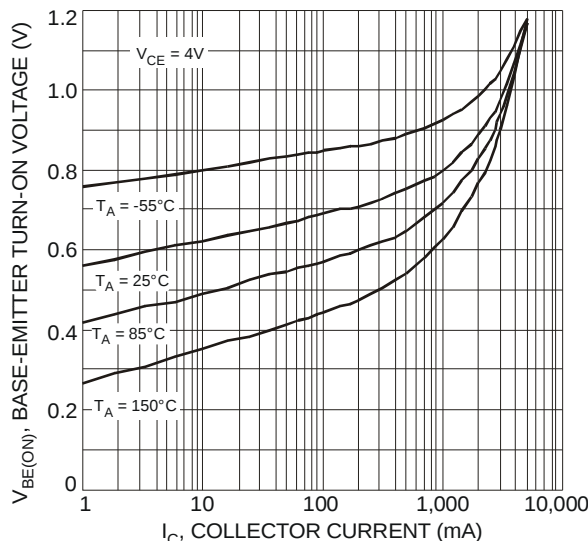


Figure 3 Typical Base-Emitter Turn-On Voltage vs. Collector Current

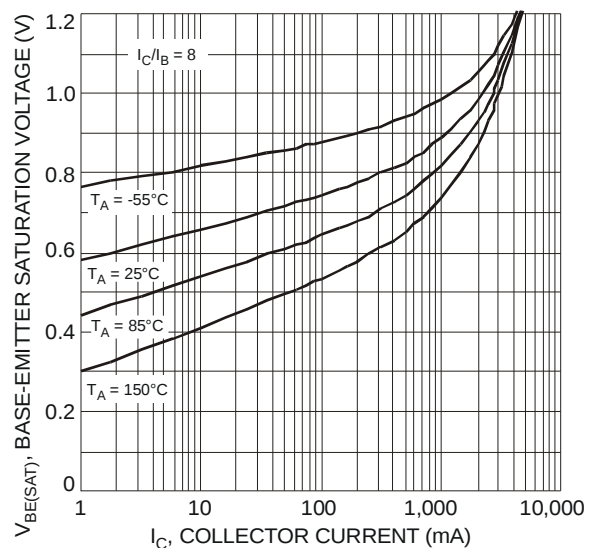
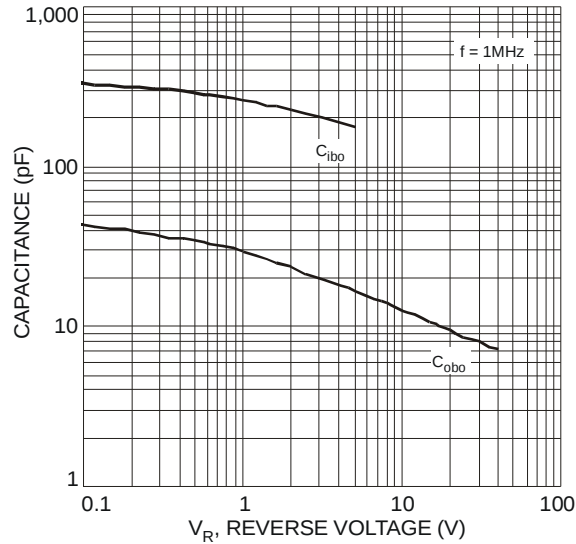
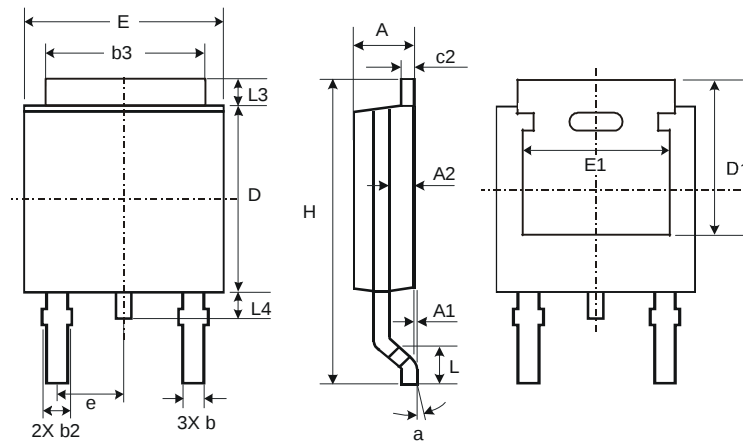


Figure 4 Typical Base-Emitter Saturation Voltage vs. Collector Current



## Package Outline Dimensions

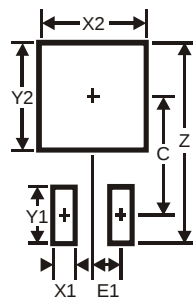
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



| TO252                |      |       |       |
|----------------------|------|-------|-------|
| Dim                  | Min  | Max   | Typ   |
| A                    | 2.19 | 2.39  | 2.29  |
| A1                   | 0.00 | 0.13  | 0.08  |
| A2                   | 0.97 | 1.17  | 1.07  |
| b                    | 0.64 | 0.88  | 0.783 |
| b2                   | 0.76 | 1.14  | 0.95  |
| b3                   | 5.21 | 5.46  | 5.33  |
| c2                   | 0.45 | 0.58  | 0.531 |
| D                    | 6.00 | 6.20  | 6.10  |
| D1                   | 5.21 | —     | —     |
| e                    | —    | —     | 2.286 |
| E                    | 6.45 | 6.70  | 6.58  |
| E1                   | 4.32 | —     | —     |
| H                    | 9.40 | 10.41 | 9.91  |
| L                    | 1.40 | 1.78  | 1.59  |
| L3                   | 0.88 | 1.27  | 1.08  |
| L4                   | 0.64 | 1.02  | 0.83  |
| a                    | 0°   | 10°   | —     |
| 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          | 11.6          |
| X1         | 1.5           |
| X2         | 7.0           |
| Y1         | 2.5           |
| Y2         | 7.0           |
| C          | 6.9           |
| E1         | 2.3           |

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