

## Description

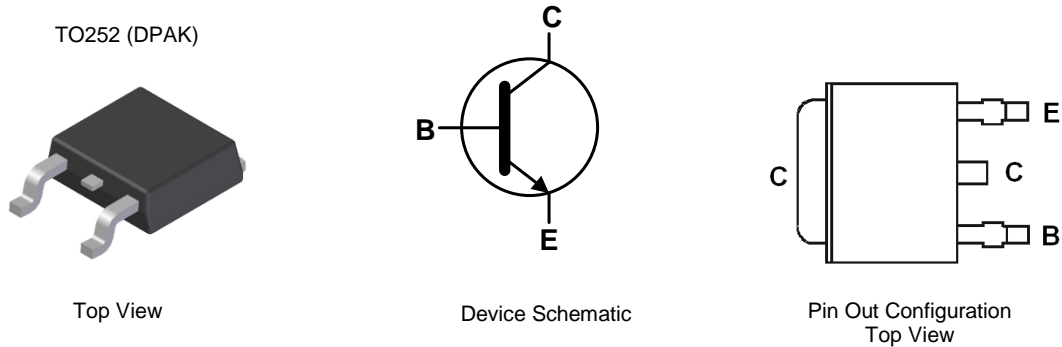
This Bipolar Junction Transistor (BJT) is designed to meet the stringent requirements of Automotive Applications.

## Features

- $BV_{CEO} > 100V$
- $I_C = 3A$  high Continuous Collector Current
- $I_{CM} = 5A$  Peak Pulse Current
- Ideal for Power Switching or Amplification Applications
- Complementary PNP Type: MJD32CUQ
- **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 <sup>(E3)</sup>
- Weight: 0.34 grams (Approximate)

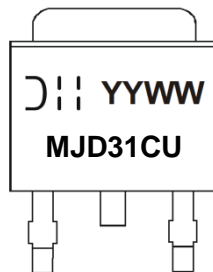


## Ordering Information (Notes 4 & 5)

Part number	Compliance	Marking	Reel size (inches)	Tape width (mm)	Quantity per reel
MJD31CUQ-13	Automotive	MJD31CU	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/quality/lead\\_free.html](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. Automotive products are AEC-Q101 qualified and are PPAP capable. Refer to [http://www.diodes.com/product\\_compliance\\_definitions.html](http://www.diodes.com/product_compliance_definitions.html).
  5. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

## Marking Information



MJD31CU = Product Type Marking Code  
 DII = Manufacturers' Code Marking  
 YYWW = Date Code Marking  
 YY = Last Two Digits of Year (ex: 17 = 2017)  
 WW = Week Code (01 to 53)

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

Characteristic	Symbol	Value	Unit
Collector-Base Voltage	V <sub>CB0</sub>	120	V
Collector-Emitter Voltage	V <sub>CEO</sub>	100	V
Emitter-Base Voltage	V <sub>EBO</sub>	7	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
Power Dissipation	P <sub>D</sub>	15	W

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

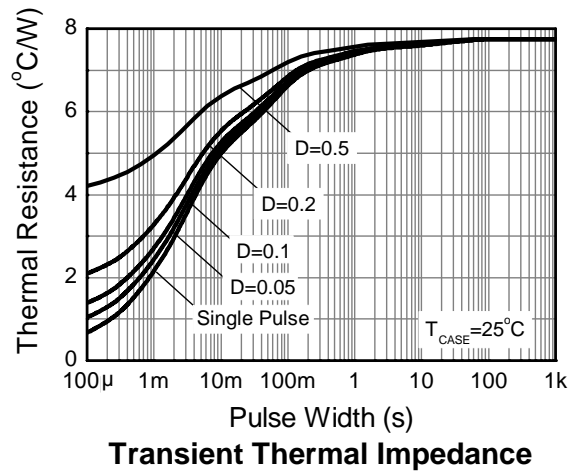
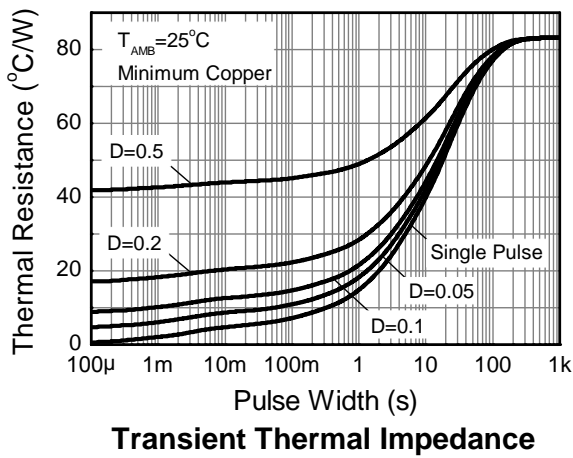
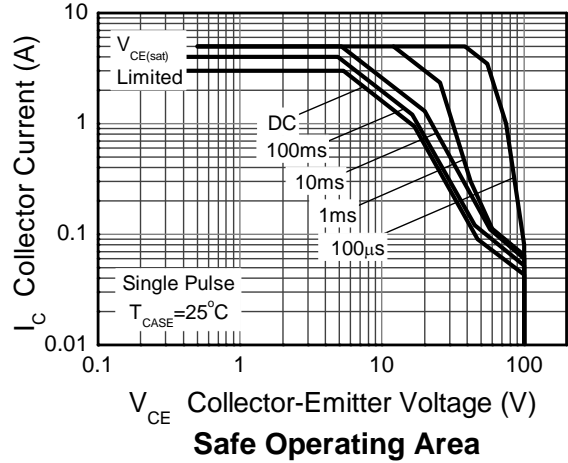
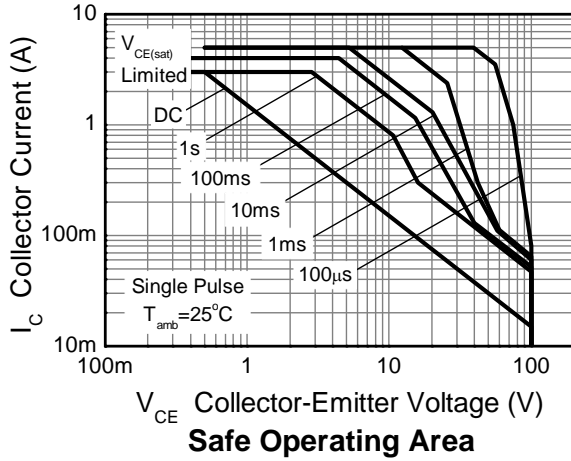
Characteristic	Symbol	Value	Unit
Power Dissipation	P <sub>D</sub>	(Note 6)	3.9
		(Note 7)	2.1
		(Note 8)	1.6
Thermal Resistance, Junction to Ambient Air	R <sub>θJA</sub>	(Note 6)	32
		(Note 7)	59
		(Note 8)	80
Thermal Resistance, Junction to Leads	R <sub>θJL</sub>	3.6	°C/W
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-55 to +150	

**ESD Ratings** (Note 10)

Characteristic	Symbol	Value	Unit	JEDEC Class
Electrostatic Discharge - Human Body Model	ESD HBM	4,000	V	3A
Electrostatic Discharge - Machine Model	ESD MM	400	V	C

- Notes:
6. For a device mounted with the exposed collector pad on 50mm x 50mm 2oz copper that is on a single-sided 1.6mm FR-4 PCB; device is measured under still air conditions whilst operating in a steady-state.
  7. Same as note (6), except mounted on 25mm x 25mm 1oz copper.
  8. Same as note (6), except mounted on minimum recommended pad (MRP) layout.
  9. Thermal resistance from junction to solder-point (on the exposed collector pad).
  10. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

**Thermal Characteristics**



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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Collector-Base Breakdown Voltage	BV <sub>CBO</sub>	120	–	–	V	I <sub>C</sub> = 20μA
Collector-Emitter Breakdown Voltage (Note 11)	BV <sub>CEO</sub>	100	–	–	V	I <sub>C</sub> = 30mA
Emitter-Base Breakdown Voltage	BV <sub>EBO</sub>	7	–	–	V	I <sub>E</sub> = 100μA
Collector-Base Cut-off Current	I <sub>CBO</sub>	–	–	1	μA	V <sub>CB</sub> = 100V
Collector Cut-off Current	I <sub>CEO</sub>	–	–	1	μA	V <sub>CE</sub> = 60V
Collector Cut-off Current	I <sub>CES</sub>	–	–	1	μA	V <sub>CE</sub> = 100V
Emitter Cut-off Current	I <sub>EBO</sub>	–	–	1	μA	V <sub>EB</sub> = 5V
Collector-Emitter Saturation Voltage (Note 11)	V <sub>CE(sat)</sub>	–	–	300	mV	I <sub>C</sub> = 1A, I <sub>B</sub> = 100mA
		–	–	500	mV	I <sub>C</sub> = 2A, I <sub>B</sub> = 200mA
		–	–	700	mV	I <sub>C</sub> = 3A, I <sub>B</sub> = 375mA
Base-Emitter Saturation Voltage (Note 11)	V <sub>BE(sat)</sub>	–	–	1.2	V	I <sub>C</sub> = 2A, I <sub>B</sub> = 200mA
Base-Emitter Turn-On Voltage (Note 11)	V <sub>BE(on)</sub>	–	–	950	mV	I <sub>C</sub> = 1A, V <sub>CE</sub> = 2V
		–	–	1.4	V	I <sub>C</sub> = 3A, V <sub>CE</sub> = 4V
DC Current Gain (Note 11)	h <sub>FE</sub>	25	–	–	–	V <sub>CE</sub> = 4V, I <sub>C</sub> = 1A
		10	–	50	–	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> = 0.5A, V <sub>CE</sub> = 10V, f = 1MHz

Note: 11. Measured under pulsed conditions. Pulse width ≤ 300μs. Duty cycle ≤ 2%.

**Typical Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

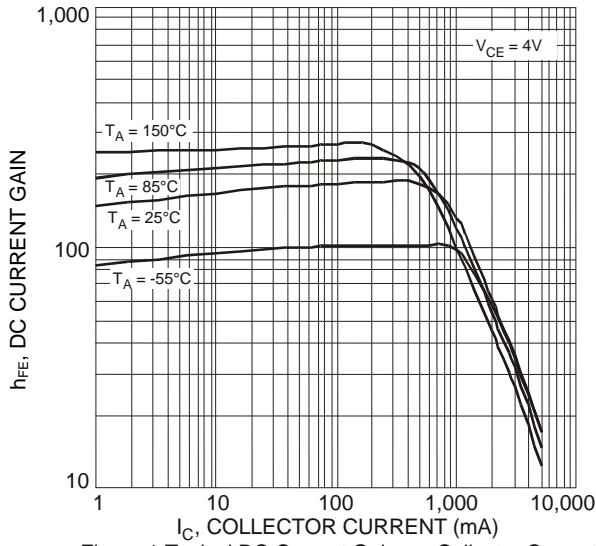


Figure 1 Typical DC Current Gain vs. Collector Current

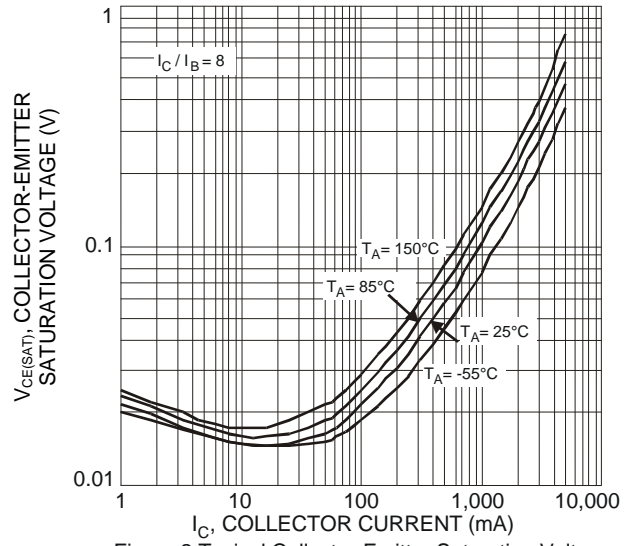


Figure 2 Typical Collector-Emitter Saturation Voltage vs. Collector Current

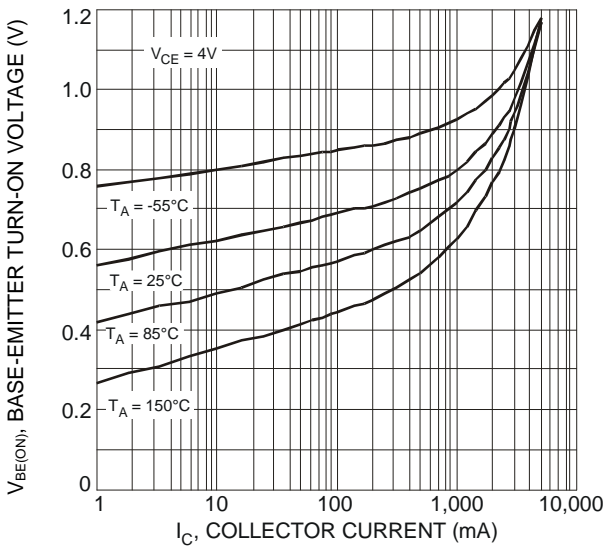


Figure 3 Typical Base-Emitter Turn-On Voltage vs. Collector Current

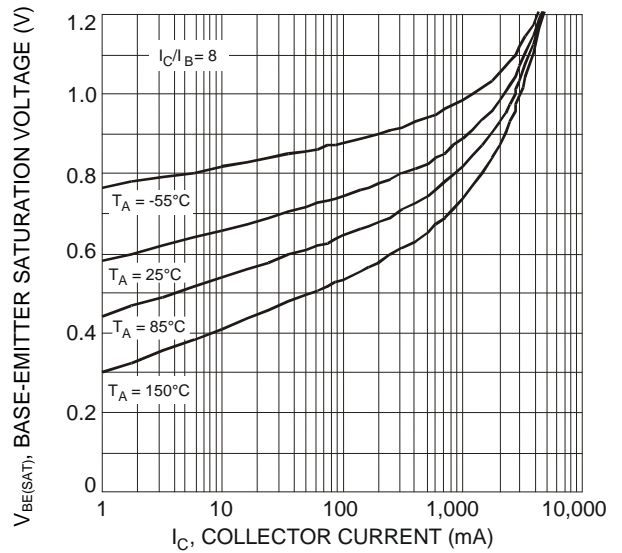


Figure 4 Typical Base-Emitter Saturation Voltage vs. Collector Current

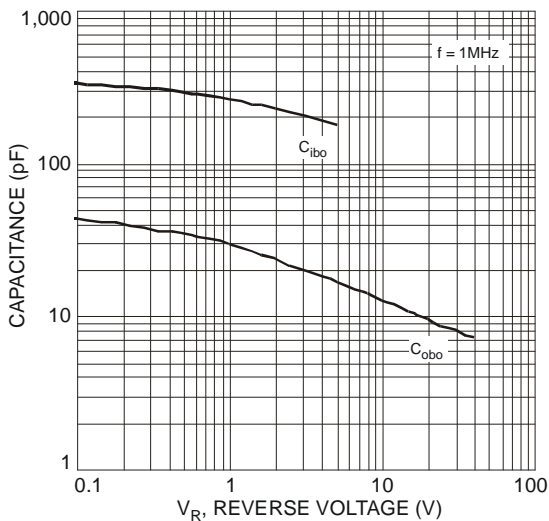
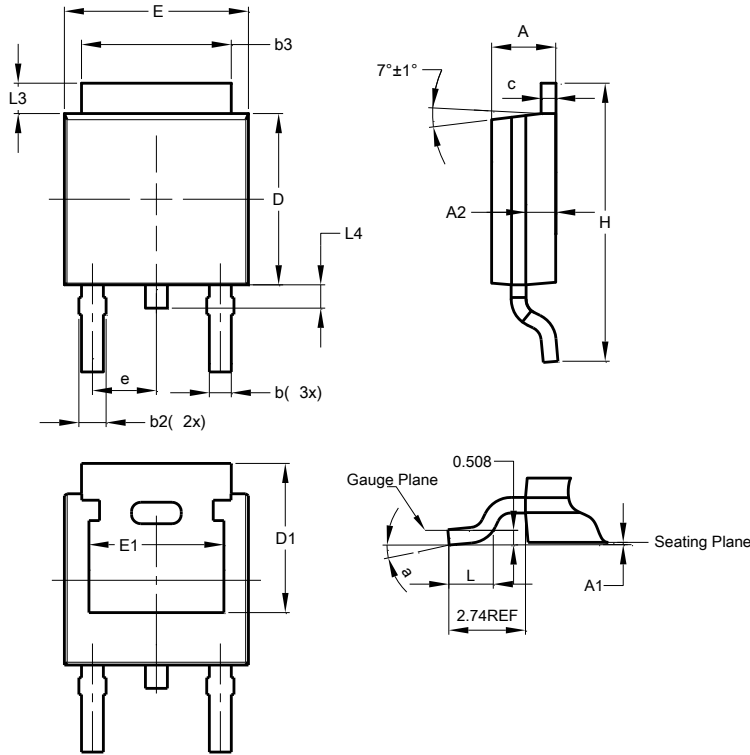


Figure 5 Typical Capacitance Characteristics

**Package Outline Dimensions**

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

**TO252 (DPAK)**

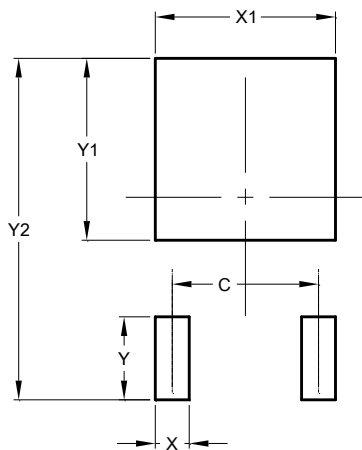


TO252 (DPAK)			
Dim	Min	Max	Typ
A	2.19	2.39	2.29
A1	0.00	0.13	0.08
A2	0.97	1.17	1.07
b	0.64	0.88	0.783
b2	0.76	1.14	0.95
b3	5.21	5.46	5.33
c	0.45	0.58	0.531
D	6.00	6.20	6.10
D1	5.21	-	-
e	-	-	2.286
E	6.45	6.70	6.58
E1	4.32	-	-
H	9.40	10.41	9.91
L	1.40	1.78	1.59
L3	0.88	1.27	1.08
L4	0.64	1.02	0.83
a	0°	10°	-
<b>All Dimensions in mm</b>			

**Suggested Pad Layout**

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

**TO252 (DPAK)**



Dimensions	Value (in mm)
C	4.572
X	1.060
X1	5.632
Y	2.600
Y1	5.700
Y2	10.700

Note: For high voltage applications, the appropriate industry sector guidelines should be considered with regards to creepage and clearance distances between device Terminals and PCB tracking.

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