# 20V PNP MEDIUM POWER TRANSISTOR IN SOT89

## Features

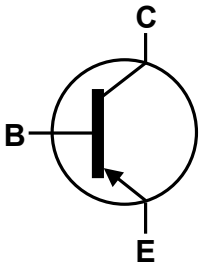
- $BV_{CEO}$ > -20V
- $I_C$ = -5A high Continuous Current
- Low saturation voltage $V_{CE(sat)}$ < -1V @ -4A
- Complementary NPN Type: 2DD2098
- **Totally Lead-Free & Fully RoHS compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**

## Mechanical Data

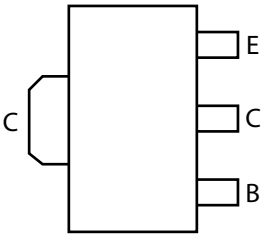
- Case: SOT89
- Case Material: Molded Plastic, "Green" Molding Compound.
- UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish - Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.052 grams (approximate)

SOT89

Top View




Device Symbol



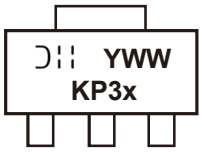

Pin Out – Top View

## Ordering Information (Note 4)

| Part Number | Marking | Reel size (inches) | Tape width (mm) | Quantity per reel |
|---|---|---|---|---|
| 2DB1386Q-13 | KP3Q | 13 | 12 | 2,500 |
| 2DB1386Q-13R | KP3Q | 13 | 12 | 4,000 |
| 2DB1386R-13 | KP3R | 13 | 12 | 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 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




KP3x = Product Type Marking Code,
where: KP3Q = 2DB1386Q
KP3R = 2DB1386R
YWW = Date Code Marking
Y = Last digit of year (ex: 7 = 2007)
WW = Week code (01 – 53)

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

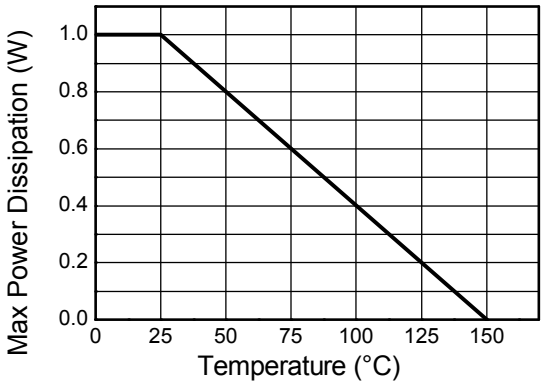
| Characteristic | Symbol | Value | Unit |
|---|---|---|---|
| Collector-Base Voltage | $V_{CBO}$ | -30 | V |
| Collector-Emitter Voltage | $V_{CEO}$ | -20 | V |
| Emitter-Base Voltage | $V_{EBO}$ | -6 | V |
| Continuous Collector Current | $I_C$ | -5 | A |
| Peak Pulse Current | $I_{CM}$ | -10 | A |
| Base Current | $I_B$ | -500 | mA |

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

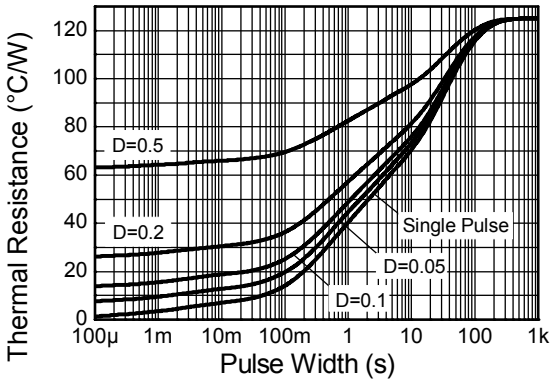
| Characteristic | Symbol | Value | Unit |
|---|---|---|---|
| Power Dissipation (Note 5) | $P_D$ | 1 | W |
| Thermal Resistance, Junction to Ambient Air (Note 5) | $R_{\theta JA}$ | 125 | °C/W |
| Thermal Resistance, Junction to Leads (Note 6) | $R_{\theta JL}$ | 19 | °C/W |
| Operating and Storage Temperature Range | $T_J$, $T_{STG}$ | -55 to +150 | °C |

Notes: 5. For a device surface mounted on 15mm x 15mm x 0.6mm FR4 PCB with high coverage of single sided 1 oz copper, in still air conditions; the device is measured when operating in steady state condition.
6. Thermal resistance from junction to solder-point (on the exposed collector pad).

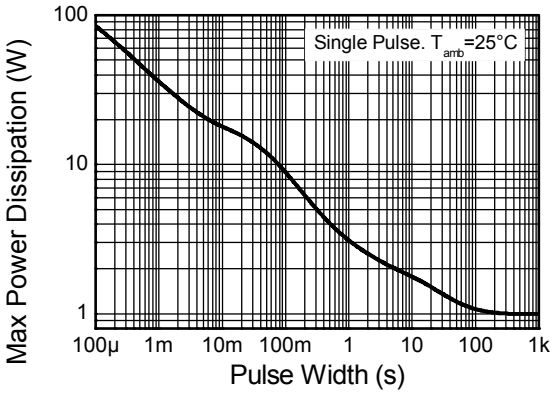
## Thermal Characteristics and Derating Information




**Derating Curve**




**Transient Thermal Impedance**




**Pulse Power Dissipation**

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

| Characteristic | | Symbol | Min | Typ | Max | Unit | Conditions |
|---|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS (Note 7)** | | | | | | | |
| Collector-Base Breakdown Voltage | | $BV_{CBO}$ | -30 | — | — | V | $I_C$ = -50μA, $I_E$ = 0 |
| Collector-Emitter Breakdown Voltage | | $BV_{CEO}$ | -20 | — | — | V | $I_C$ = -1mA, $I_B$ = 0 |
| Emitter-Base Breakdown Voltage | | $BV_{EBO}$ | -6 | — | — | V | $I_E$ = -50μA, $I_C$ = 0 |
| Collector Cut-Off Current | | $I_{CBO}$ | — | — | -0.5 | μA | $V_{CB}$ = -20V, $I_E$ = 0 |
| Emitter Cut-Off Current | | $I_{EBO}$ | — | — | -0.5 | μA | $V_{EB}$ = -5V, $I_C$ = 0 |
| **ON CHARACTERISTICS (Note 7)** | | | | | | | |
| Collector-Emitter Saturation Voltage | | $V_{CE(SAT)}$ | — | -0.25 | -1.0 | V | $I_C$ = -4A, $I_B$ = -0.1A |
| DC Current Gain | 2DB1386Q | $h_{FE}$ | 120 | — | 270 | — | $I_C$ = -0.5A, $V_{CE}$ = -2V |
| | 2DB1386R | | 180 | — | 390 | | |
| **SMALL SIGNAL CHARACTERISTICS** | | | | | | | |
| Output Capacitance | | $C_{obo}$ | — | 55 | — | pF | $V_{CB}$ = -20V, $I_E$ = 0, f = 1MHz |
| Current Gain-Bandwidth Product | | $f_T$ | — | 100 | — | MHz | $V_{CE}$ = -6V, $I_E$ = 50mA, f = 30MHz |

Notes: 7. Measured under pulsed conditions. Pulse width ≤ 300μs. Duty cycle ≤ 2%.

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

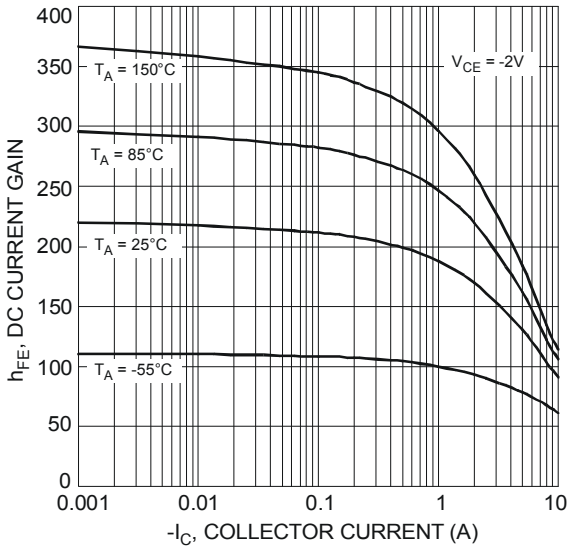



Figure 1 Typical DC Current Gain vs. Collector Current (2DB1386Q)

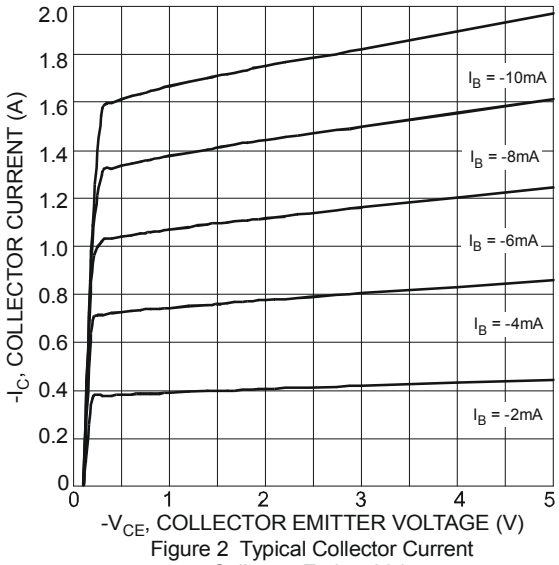



Figure 2 Typical Collector Current vs. Collector-Emitter Voltage

## Typical Electrical Characteristics (cont.)

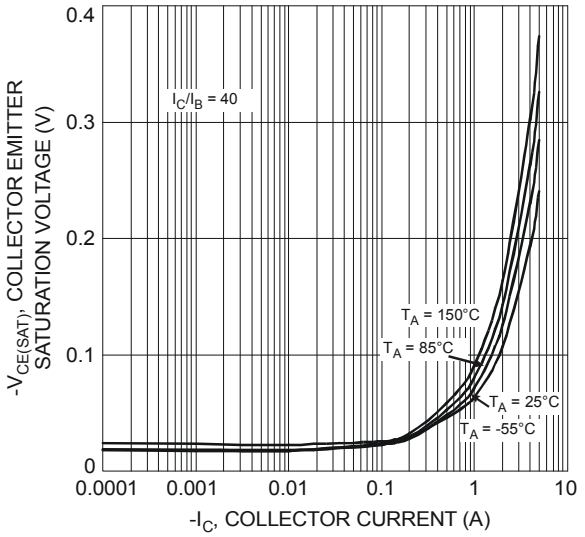



Figure 3 Typical Collector-Emitter Saturation Voltage vs. Collector Current

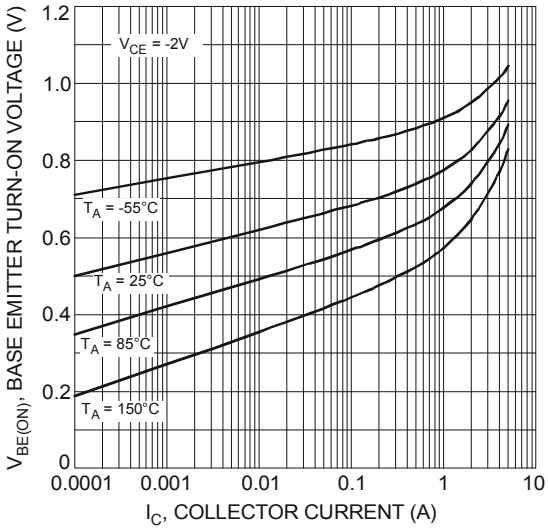



Figure 4 Typical Base-Emitter Turn-On Voltage vs. Collector Current

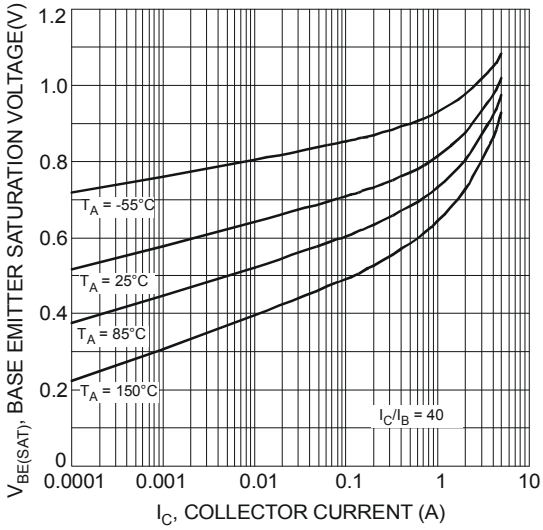



Figure 5 Typical Base-Emitter Saturation Voltage vs. Collector Current

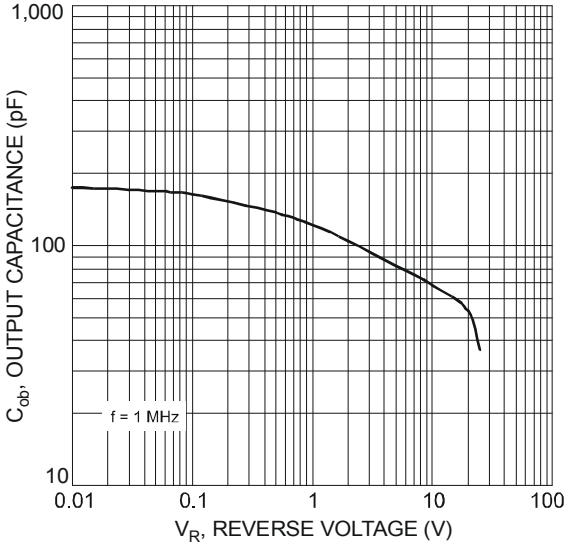



Figure 6 Typical Output Capacitance Characteristics

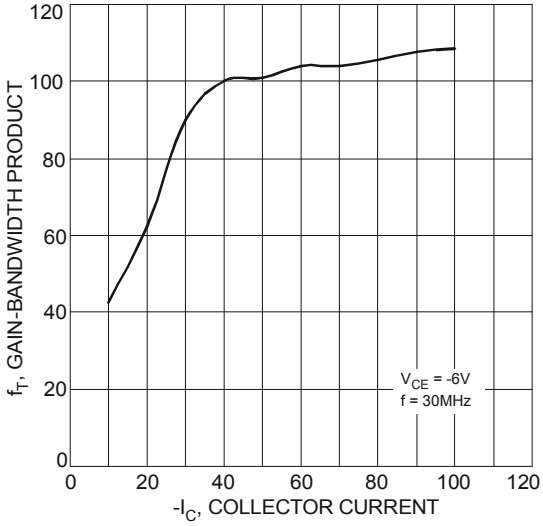
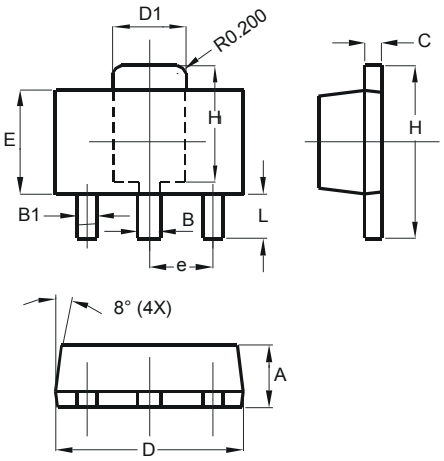



Figure 7 Typical Gain-Bandwidth Product vs. Collector Current

## Package Outline Dimensions

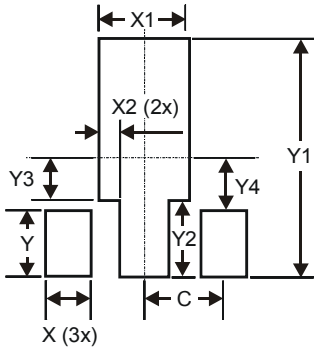
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for latest version.




| SOT89 | | |
|---|---|---|
| **Dim** | **Min** | **Max** |
| **A** | 1.40 | 1.60 |
| **B** | 0.44 | 0.62 |
| **B1** | 0.35 | 0.54 |
| **C** | 0.35 | 0.44 |
| **D** | 4.40 | 4.60 |
| **D1** | 1.62 | 1.83 |
| **E** | 2.29 | 2.60 |
| **e** | 1.50 Typ | |
| **H** | 3.94 | 4.25 |
| **H1** | 2.63 | 2.93 |
| **L** | 0.89 | 1.20 |
| **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) |
|---|---|
| **X** | 0.900 |
| **X1** | 1.733 |
| **X2** | 0.416 |
| **Y** | 1.300 |
| **Y1** | 4.600 |
| **Y2** | 1.475 |
| **Y3** | 0.950 |
| **Y4** | 1.125 |
| **C** | 1.500 |

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