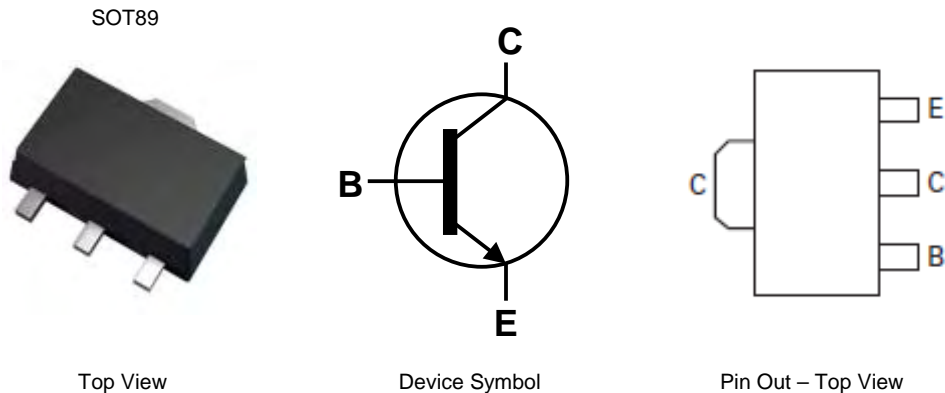


## Features

- $BV_{CEO} > 32V$
- Max Continuous Current  $I_C = 1A$
- Epitaxial Planar Die Construction
- Complementary PNP Type Available (2DB1132)
- Ideally Suited for Automated Assembly Processes
- Ideal for Medium 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**

## Mechanical Data

- Case: SOT89
- Case Material: Molded Plastic. "Green" Molding Compound.
- UL Flammability Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Matte Tin Finish (E3)
- Weight: 0.055 grams (Approximate)



## Ordering Information (Note 4)

| Product     | Marking | Reel size (inches) | Tape width (mm) | Quantity per reel |
|-------------|---------|--------------------|-----------------|-------------------|
| 2DD1664P-13 | N13P    | 13                 | 12              | 2,500             |
| 2DD1664Q-13 | N13Q    | 13                 | 12              | 2,500             |
| 2DD1664R-13 | N13R    | 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> 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>

## Marking Information



N13x = Product Type Marking Code:  
 Where N13P = 2DD1664P  
 N13Q = 2DD1664Q  
 N13R = 2DD1664R

YWW = Date Code Marking  
 Y = Last digit of year ex: 1 = 2011  
 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>CB0</sub> | 40    | V    |
| Collector-Emitter Voltage    | V <sub>CEO</sub> | 32    | V    |
| Emitter-Base Voltage         | V <sub>EBO</sub> | 6     | V    |
| Continuous Collector Current | I <sub>C</sub>   | 1     | A    |
| Peak Pulse Current (Note 6)  | I <sub>CM</sub>  | 2     | A    |

### Thermal Characteristics

| Characteristic                                   | Symbol                            | Value       | Unit |
|--|-----------------------------------|-------------|------|
| Power Dissipation (Note 5)                       | P <sub>D</sub>                    | 1           | W    |
| Thermal Resistance, Junction to Ambient (Note 5) | R <sub>θJA</sub>                  | 125         | °C/W |
| Thermal Resistance, Junction to Leads (Note 7)   | R <sub>θJL</sub>                  | 22          | °C/W |
| Operating and Storage Temperature Range          | T <sub>J</sub> , T <sub>STG</sub> | -55 to +150 | °C   |

- Notes:
- 5. For a device surface mounted on FR-4 PCB with minimum suggested pad layout; high coverage of single sided 1 oz copper, in still air conditions
  - 6. Measured under pulsed conditions. Pulse width = 300μs. Duty cycle ≤ 2%.
  - 7. Thermal resistance from junction to solder-point (at the end of the collector lead).

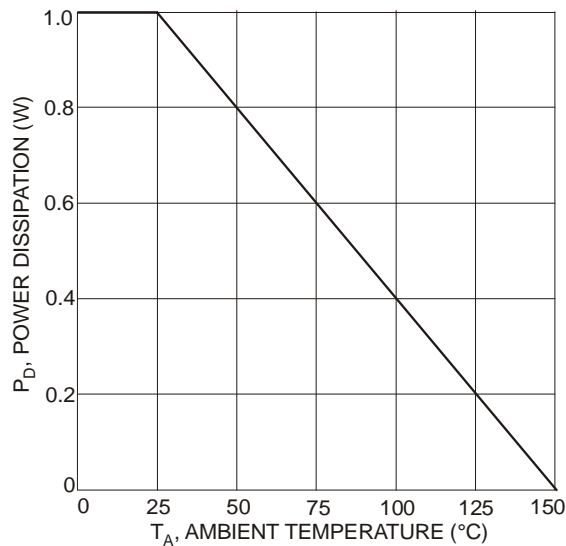


Figure 1. Power Dissipation vs. Ambient Temperature

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

| Characteristic                                 | Symbol        | Min      | Typ | Max | Unit | Test Condition  |
|--|---------------|----------|-----|-----|------|---|
| Collector-Base Breakdown Voltage               | $BV_{CBO}$    | 40       | -   | -   | V    | $I_C = 100\mu\text{A}$                                    |
| Collector-Emitter Breakdown Voltage (Note 8)   | $BV_{CEO}$    | 32       | -   | -   | V    | $I_C = 10\text{mA}$                                       |
| Emitter-Base Breakdown Voltage                 | $BV_{EBO}$    | 6        | -   | -   | V    | $I_E = 100\mu\text{A}$                                    |
| Collector-Emitter Cut-off Current              | $I_{CES}$     | -        | -   | 100 | nA   | $V_{CE} = 32\text{V}$                                     |
| Collector-Base Cut-off Current                 | $I_{CBO}$     | -        | -   | 100 | nA   | $V_{CB} = 36\text{V}$                                     |
| Base-Emitter Cut-off Current                   | $I_{EBO}$     | -        | -   | 100 | nA   | $V_{EB} = 6\text{V}$                                      |
| Static Forward Current Transfer Ratio (Note 8) | $h_{FE}$      | 2DD1664P | 82  | 180 | -    | $I_C = 100\text{mA}, V_{CE} = 3\text{V}$                  |
|  |               | 2DD1664Q | 120 | 270 |      |   |
|  |               | 2DD1664R | 180 | 390 |      |   |
| Collector-Emitter saturation Voltage (Note 8)  | $V_{CE(sat)}$ | -        | 120 | 400 | mV   | $I_C = 500\text{mA}, I_B = 50\text{mA}$                   |
| Transition frequency                           | $f_T$         | -        | 280 | -   | MHz  | $I_E = 50\text{mA}, V_{CE} = 5\text{V}, f = 30\text{MHz}$ |
| Output Capacitance                             | $C_{ob}$      | -        | 10  | -   | pF   | $I_E = 0\text{A}, V_{CB} = 10\text{V}, f = 1\text{MHz}$   |

Notes: 8. Measured under pulsed conditions. Pulse width = 300 $\mu\text{s}$ . Duty cycle  $\leq 2\%$

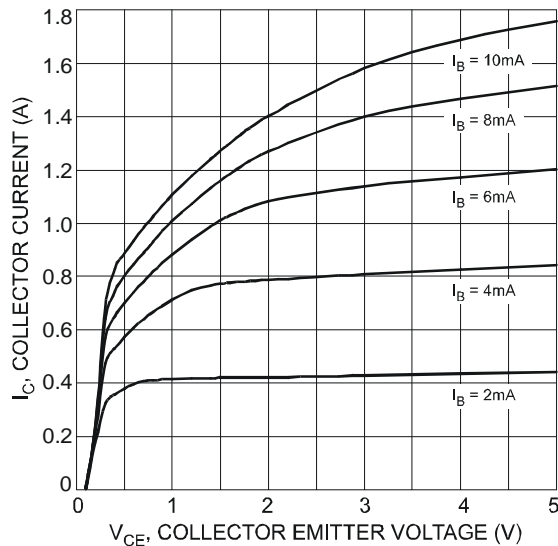
**Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)


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

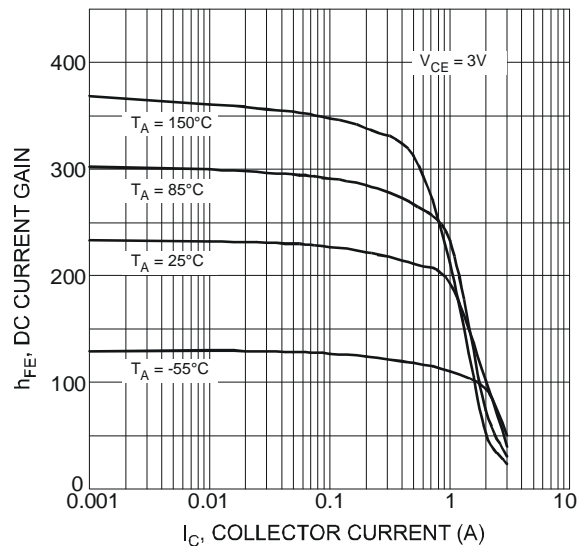


Figure 3. Typical DC Current Gain vs. Collector Current (2DD1664R)

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

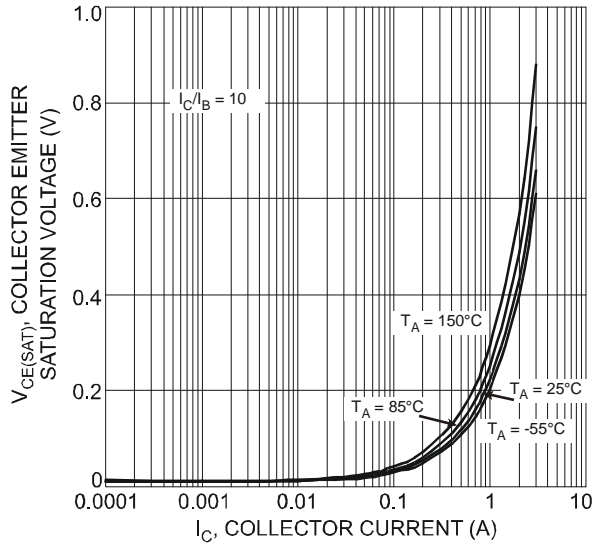


Figure 4. Typical Collector-Emitter Saturation Voltage vs. Collector Current

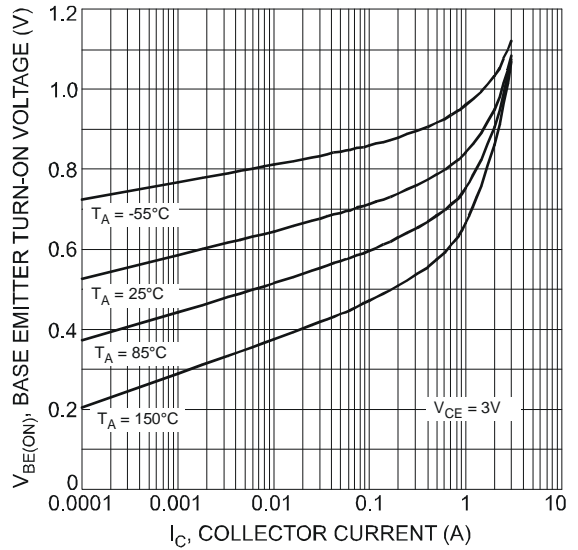


Figure 5. Typical Base-Emitter Turn-On Voltage vs. Collector Current

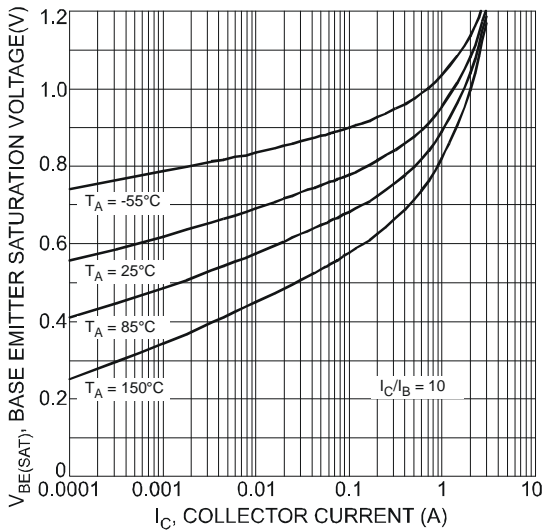


Figure 6. Typical Base-Emitter Saturation Voltage vs. Collector Current

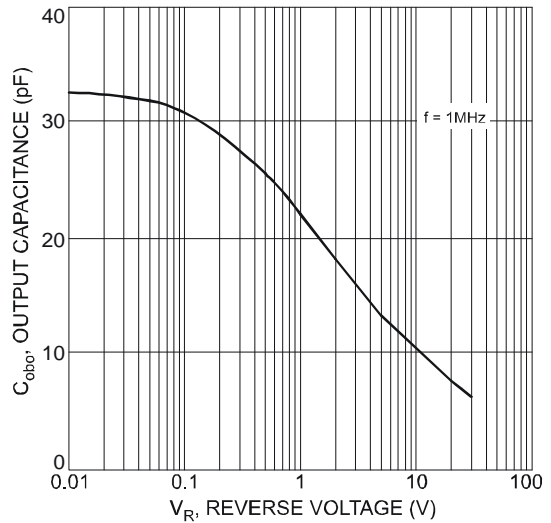


Figure 7. Typical Output Capacitance Characteristics

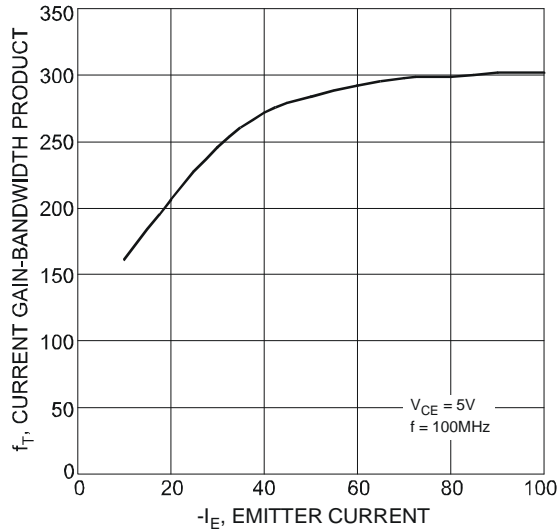
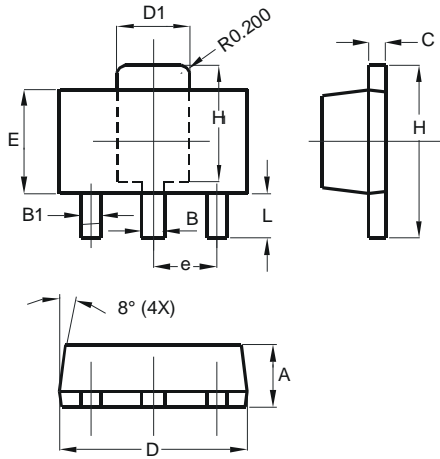


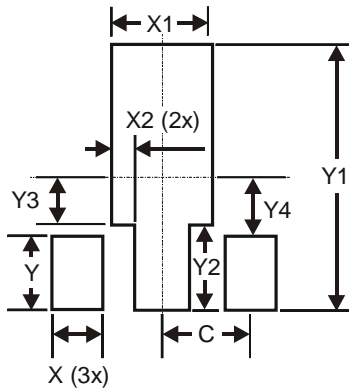
Figure 8. Typical Gain-Bandwidth Product vs. Emitter Current

**Package Outline Dimensions**



| 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**



| 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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