**THE 2DD1766P/Q ARE OBSOLETE.**
**PLEASE USE THE FCX491TA.**
**THE 2DD1766R IS OBSOLETE.**
**PLEASE USE THE FCX491ATA.**

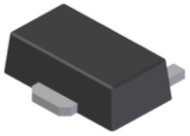
Lead-free Green

# 2DD1766P/Q/R

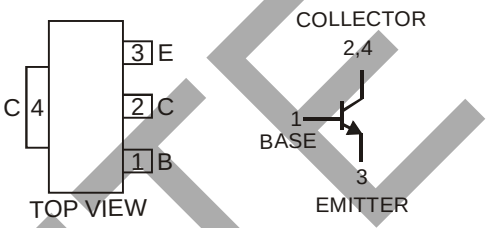
## NPN SURFACE MOUNT TRANSISTOR

## Features

- Epitaxial Planar Die Construction
- Complementary PNP Type Available (2DB1188)
- 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)**
- **The 2DD1766P/Q/R are suitable for automotive applications requiring specific change control; these parts are AEC-Q101 qualified, PPAP capable, and manufactured in IATF 16949 certified facilities.**
  **https://www.diodes.com/quality/product-definitions/**



SOT89-3L




Schematic and Pin Configuration

## Mechanical Data

- Package: SOT89-3L
- Package Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish — Matte Tin annealed over Copper leadframe (Lead Free Plating). Solderable per MIL-STD-202, Method 208 e3
- Marking & Type Code Information: See Page 3
- Ordering Information: See Page 3
- Weight: 0.072 grams (Approximate)

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

| Characteristic | Symbol | Value | Unit |
|---|---|---|---|
| Collector-Base Voltage | $V_{CBO}$ | 40 | V |
| Collector-Emitter Voltage | $V_{CEO}$ | 32 | V |
| Emitter-Base Voltage | $V_{EBO}$ | 5 | V |
| Peak Pulse Current | $I_{CM}$ | 2.5 | A |
| Continuous Collector Current | $I_C$ | 2 | A |

## Thermal Characteristics

| Characteristic | Symbol | Value | Unit |
|---|---|---|---|
| Power Dissipation (Note 4) @ $T_A$ = +25°C | $P_D$ | 1 | W |
| Thermal Resistance, Junction to Ambient Air (Note 4) @ $T_A$ = +25°C | $R_{\theta JA}$ | 125 | °C/W |
| 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 | Conditions |
|---|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS (Note 5)** | | | | | | | |
| Collector-Base Breakdown Voltage | | $V_{(BR)CBO}$ | 40 | — | — | V | $I_C$ = 50µA, $I_E$ = 0 |
| Collector-Emitter Breakdown Voltage | | $V_{(BR)CEO}$ | 32 | — | — | V | $I_C$ = 1mA, $I_B$ = 0 |
| Emitter-Base Breakdown Voltage | | $V_{(BR)EBO}$ | 5 | — | — | V | $I_E$ = 50µA, $I_C$ = 0 |
| Collector Cut-Off Current | | $I_{CBO}$ | — | — | 1 | µA | $V_{CB}$ = 20V, $I_E$ = 0 |
| Emitter Cut-Off Current | | $I_{EBO}$ | — | — | 1 | µA | $V_{EB}$ = 4V, $I_C$ = 0 |
| **ON CHARACTERISTICS (Note 5)** | | | | | | | |
| Collector-Emitter Saturation Voltage | | $V_{CE(SAT)}$ | — | 0.3 | 0.8 | V | $I_C$ = 2A, $I_B$ = 0.2A |
| DC Current Gain | 2DD1766P | $h_{FE}$ | 82 | — | 180 | — | $V_{CE}$ = 3V, $I_C$ = 0.5A |
| | 2DD1766Q | | 120 | — | 270 | — | |
| | 2DD1766R | | 180 | — | 390 | — | |
| **SMALL SIGNAL CHARACTERISTICS** | | | | | | | |
| Transition Frequency | | $f_T$ | — | 220 | — | MHz | $V_{CE}$ = 5V, $I_E$ = -50mA, f = 100MHz |
| Output Capacitance | | $C_{ob}$ | — | 13 | — | pF | $V_{CB}$ = 10V, $I_E$ = 0, f = 1MHz |

Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
2. See https://www.diodes.com/quality/lead-free/ 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. Device mounted on FR-4 PCB; pad layout as shown on page 4 or in Incorporated's suggested pad layout document, which can be found on our website at https://www.diodes.com/design/support/packaging/diodes-packaging/.
5. Measured under pulsed conditions. Pulse width = 300µs. Duty cycle ≤ 2%.

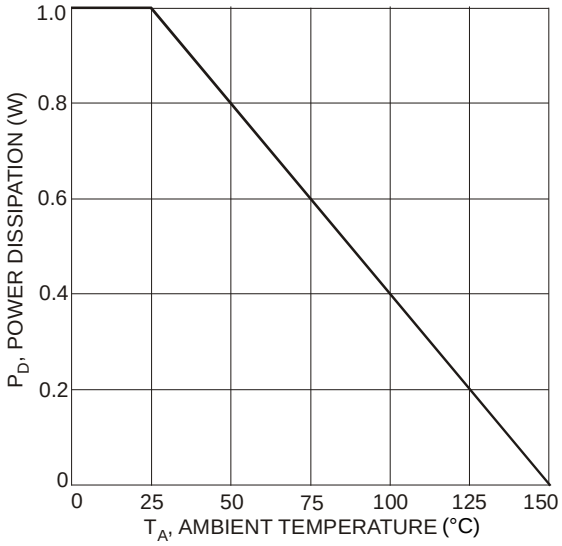



Fig. 1 Power Dissipation vs. Ambient Temperature (Note 4)

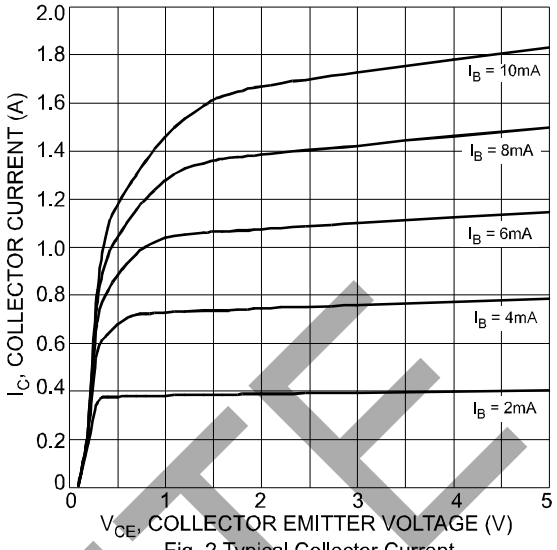



Fig. 2 Typical Collector Current vs. Collector-Emitter Voltage

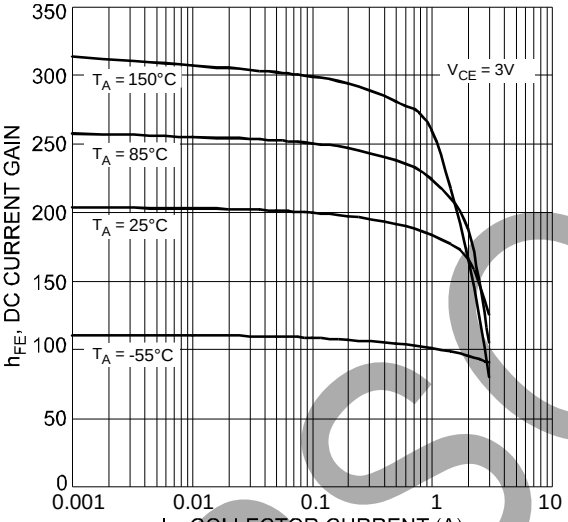



Fig. 3 Typical DC Current Gain vs. Collector Current (2DD1766Q)

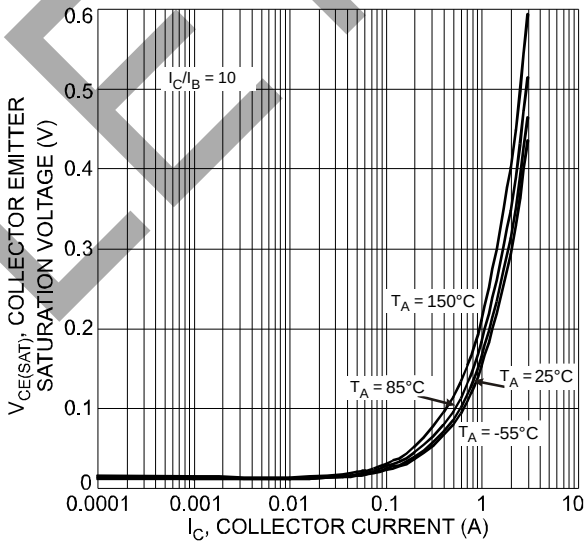



Fig. 4 Typical Collector-Emitter Saturation Voltage vs. Collector Current

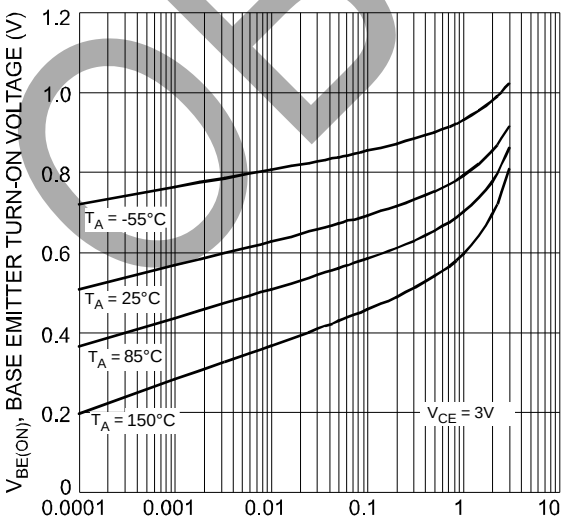



Fig. 5 Typical Base-Emitter Turn-On Voltage vs. Collector Current

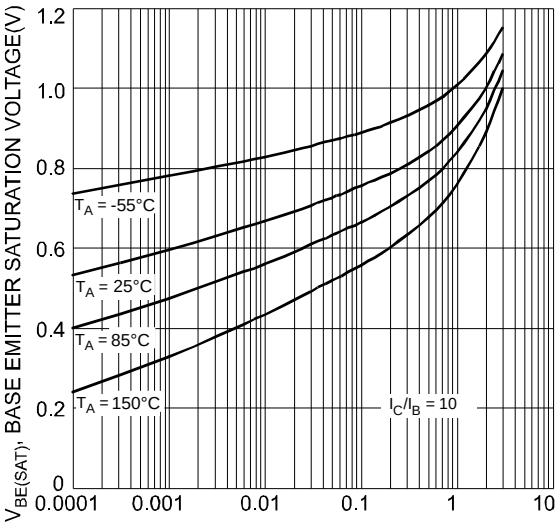



Fig. 6 Typical Base-Emitter Saturation Voltage vs. Collector Current

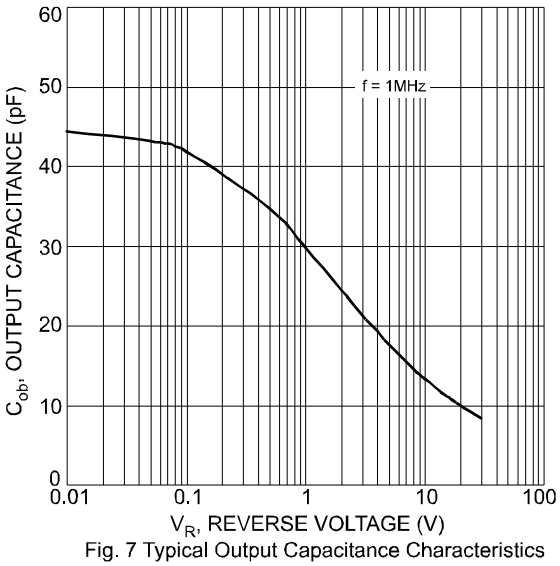


Fig. 7 Typical Output Capacitance Characteristics

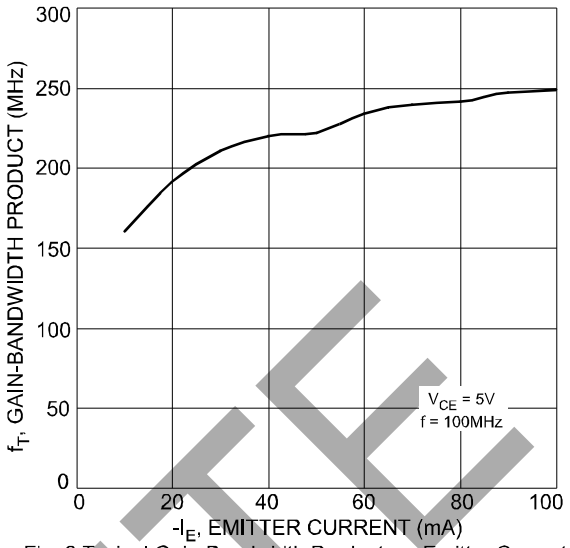


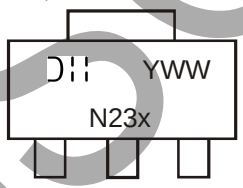
Fig. 8 Typical Gain-Bandwidth Product vs. Emitter Current

## Ordering Information (Note 6)

| Part Number | Package | Packing | |
|---|---|---|---|
| | | Qty. | Carrier |
| 2DD1766P-13 | SOT89-3L | 2500 | Tape & Reel |
| 2DD1766Q-13 | SOT89-3L | 2500 | Tape & Reel |
| 2DD1766R-13 | SOT89-3L | 2500 | Tape & Reel |

Note: 6. For packaging details, go to our website at https://www.diodes.com/design/support/packaging/diodes-packaging/.

## Marking Information

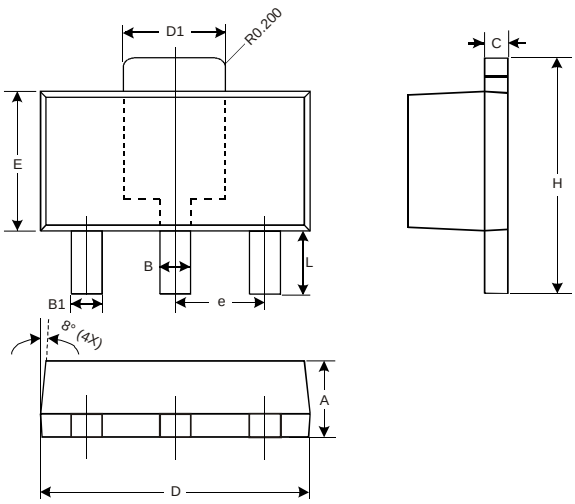



N23x = Product Type Marking Code:
Where N23P = 2DD1766P
N23Q = 2DD1766Q
N23R = 2DD1766R
YWW = Date Code Marking
Y = Last Digit of Year ex: 4 = 2024
WW = Week Code 01 - 52

## Package Outline Dimensions

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

**SOT89-3L**

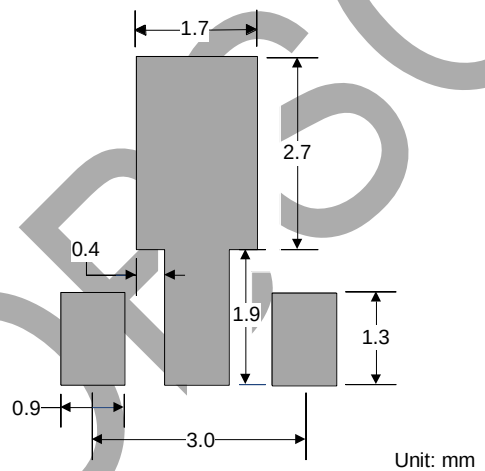



| SOT89-3L | | | |
|---|---|---|---|
| **Dim** | **Min** | **Max** | **Typ** |
| **A** | 1.40 | 1.60 | 1.50 |
| **B** | 0.45 | 0.55 | 0.50 |
| **B1** | 0.37 | 0.47 | 0.42 |
| **C** | 0.35 | 0.43 | 0.38 |
| **D** | 4.40 | 4.60 | 4.50 |
| **D1** | 1.50 | 1.70 | 1.60 |
| **E** | 2.40 | 2.60 | 2.50 |
| **e** | — | — | 1.50 |
| **H** | 3.95 | 4.25 | 4.10 |
| **L** | 0.90 | 1.20 | 1.05 |
| **All Dimensions in mm** | | | |

## Suggested Pad Layout

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

**SOT89-3L**




Unit: mm

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