# DUAL NPN TRANSISTORS WITH 47kΩ BASE RESISTOR

## Product Summary

| $BV_{CEO}$ | Base Resistors R1 & R2 | Package | $I_{C(Max)}$ |
|---|---|---|---|
| 50V | 47kΩ | SOT363 | 100mA |

## Features

- Built-in Base Resistors
- Epitaxial Planar Die Construction
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **For automotive applications requiring specific change control (i.e. parts qualified to AEC-Q100/101/104/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please contact us or your local Diodes representative. https://www.diodes.com/quality/product-definitions/**

## Description

DDC144TU is best-suited for logic-switching applications using control circuits like microcontrollers, comparators, etc. It features two discrete NPN transistors which can support maximum continuous current of 100mA. NPN transistors can be used as a control and can also be biased using higher supply voltages due to the built-in current limiting base resistor of 47kΩ. The component devices can be used as a part of a circuit or as a standalone discrete device.

## Mechanical Data

- Package: SOT363
- Package Material: Molded Plastic. "Green Molding" Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: See Fig. 2
- Terminals: Finish - Matte Tin Annealed over Alloy 42 Leadframe. Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.015 grams (Approximate)

Top View

Fig. 1 SOT363

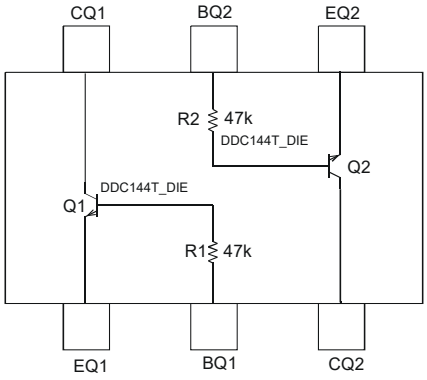


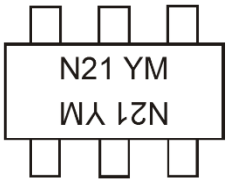

Fig. 2 Schematic and Pin Configuration

## Ordering Information (Note 4)

| Orderable Part Number | Marking Code | Package | Packing | |
|---|---|---|---|---|
| | | | Qty. | Carrier |
| DDC144TU-7 | N21 | SOT363 | 3000 | Tape & Reel |

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

## Marking Information




N21 = Product Type Marking Code
YM = Date Code Marking
Y = Year (ex: M = 2025)
M = Month (ex: 9 = September)

Date Code Key

| Year | 2006 | - | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Code | T | - | M | N | P | R | S | T | U | V | W | X |

| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Code | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | O | N | D |

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

| Characteristic | Symbol | Value | Unit |
|---|---|---|---|
| Power Dissipation | $P_d$ | 200 | mW |
| Power Deration above +25°C | $P_{der}$ | 1.6 | mW/°C |
| Output Current | $I_{out}$ | 100 | mA |

## Thermal Characteristics

| Characteristic | Symbol | Value | Unit |
|---|---|---|---|
| Junction Operation and Storage Temperature Range | $T_J$, $T_{STG}$ | -55 to +150 | °C |
| Thermal Resistance, Junction to Ambient (Packaged Device) (Ref: Equivalent to Only One Heated Junction) @$T_A$ = +25°C | $R_{\theta JA}$ | 625 | °C/W |

Note: 5. Device mounted on FR-4 PCB, 1" x 0.85" x 0.062" with recommended pad layout as shown on page 6. See Diodes Incorporated's package outlines and pad layouts on our website at http://www.diodes.com/package-outlines.html.

## Maximum Ratings: Sub-Component Device
## Discrete NPN Transistor (Q1, Q2) (@$T_A$ = +25°C, unless otherwise specified.)

| Characteristic | Symbol | Value | Unit |
|---|---|---|---|
| Collector-Base Voltage | $V_{CBO}$ | 50 | V |
| Collector-Emitter Voltage | $V_{CEO}$ | 50 | V |
| Emitter-Base Voltage | $V_{EBO}$ | 6 | V |
| Collector Current | $I_{C(max)}$ | 100 | mA |

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

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|---|---|---|---|---|---|---|
| **Off Characteristics** | | | | | | |
| Collector-Base Cutoff Current | $I_{CBO}$ | — | — | 100 | nA | $V_{CB}$ = 50V, $I_E$ = 0 |
| Collector-Emitter Cutoff Current, $I_{O(off)}$ | $I_{CEO}$ | — | — | 500 | nA | $V_{CE}$ = 50V, $I_B$ = 0 |
| Emitter-Base Cutoff Current | $I_{EBO}$ | — | — | 500 | nA | $V_{EB}$ = 5V, $I_C$ = 0 |
| Collector-Base Breakdown Voltage | $BV_{CBO}$ | 50 | — | — | V | $I_C$ = 50µA, $I_E$ = 0 |
| Collector-Emitter Breakdown Voltage | $BV_{CEO}$ | 50 | — | — | V | $I_C$ = 1mA, $I_B$ = 0 |
| Emitter-Base Breakdown Voltage | $BV_{EBO}$ | 6 | — | — | V | $I_E$ = 50µA, $I_C$ = 0 |
| Output Voltage (Transistor is off) | $V_{OH}$ | — | 4.45 | — | V | $V_{CC}$ = 5V, $V_B$ = 0.05V, $R_L$ = 1kΩ |
| Input Voltage (Load is off) (Note 6) | $V_{I(off)}$ | 0.4 | 0.6 | — | V | $V_{CE}$ = 5V, $I_C$ = 100µA |
| Output Current (Leakage Same as $I_{CEO}$) | $I_{O(off)}$ | — | — | 850 | nA | $V_{CC}$ = 50V, $V_I$ = 0 |
| **On Characteristics** | | | | | | |
| Collector-Emitter Saturation Voltage (Note 7) | $V_{CE(sat)}$ | — | 30 | 100 | mV | $I_C$ = 2.5mA, $I_B$ = 0.25mA |
| | | — | 75 | 100 | | $I_C$ = 10mA, $I_B$ = 0.5mA |
| | | — | 50 | 100 | | $I_C$ = 10mA, $I_B$ = 1mA |
| | | — | 200 | 300 | | $I_C$ = 50mA, $I_B$ = 5mA |
| DC Current Gain (Note 7) | $h_{FE}$ | 150 | 400 | — | — | $V_{CE}$ = 5V, $I_C$ = 1mA |
| | | 150 | 400 | — | | $V_{CE}$ = 5V, $I_C$ = 10mA |
| | | 150 | 350 | — | | $V_{CE}$ = 5V, $I_C$ = 25mA |
| | | 150 | 300 | — | | $V_{CE}$ = 5V, $I_C$ = 50mA |
| | | 50 | 110 | — | | $V_{CE}$ = 5V, $I_C$ = 100mA |
| Output Voltage (Equivalent to $V_{CE(sat)}$ or $V_{O(on)}$) | $V_{OL}$ | — | 200 | 250 | mV | $V_{CC}$ = 5V, $V_B$ = 2.5V, $R_L$ = 10kΩ |
| Input Voltage (Load is on) (Note 8) | $V_{I(on)}$ | — | 0.95 | 1.5 | V | $V_O$ = 0.3V, $I_C$ = 2mA |
| Input Current (Note 7) | $I_i$ | — | 19.2 | 28 | mA | $V_I$ = 5V |
| Base-Emitter Turn-on Voltage | $V_{BE(on)}$ | — | — | 1.2 | V | $V_{CE}$ = 5V, $I_C$ = 2mA |
| Base-Emitter Saturation Voltage | $V_{BE(sat)}$ | — | — | 1.6 | V | $I_C$ = 200µA, $I_B$ = 20µA |
| Input Resistor ±30% | R1 | 32.9 | 47 | 61.1 | kΩ | — |
| **Small-Signal Characteristics** | | | | | | |
| Transition Frequency (Gain-Bandwidth Product) | $f_T$ | — | 250 | — | MHz | $V_{CE}$ = 10V, $I_E$ = 5mA, f = 100MHz |
| Collector Capacitance (Ccbo-Output Capacitance) | $C_C$ | — | — | 5 | pF | $V_{CB}$ = 10V, $I_E$ = 0, f = 1MHz |

Notes: 6. Guarantees that the device will be switched off if the input voltage is lower than 0.4V.
7. Pulse test: Pulse width, tp < 300µs, duty cycle, d ≤ 0.02.
8. Guarantees that the device will be switched on if the input voltage is higher than 1.5V.

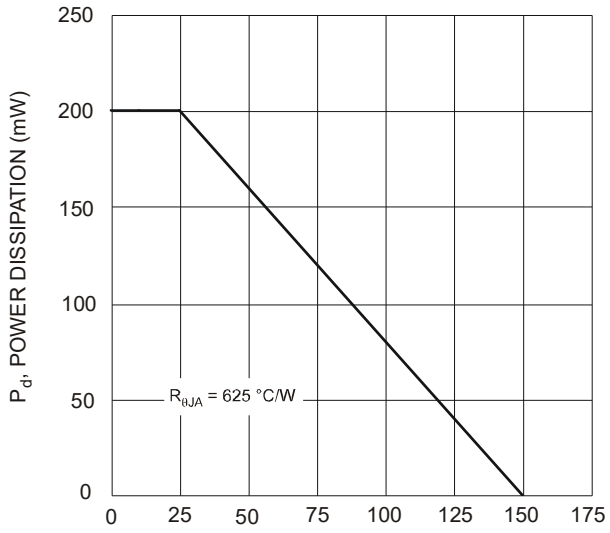



Fig. 3 Maximum Power Derating Curve

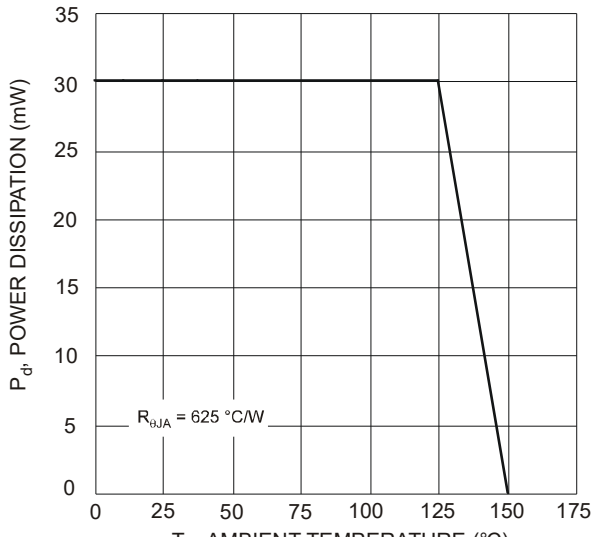



Fig. 4 Power Derating for Nominal Operation

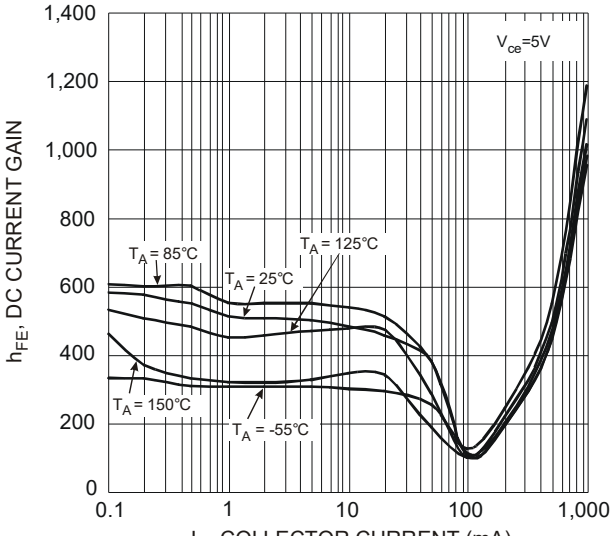



Fig. 5 DC Current Gain

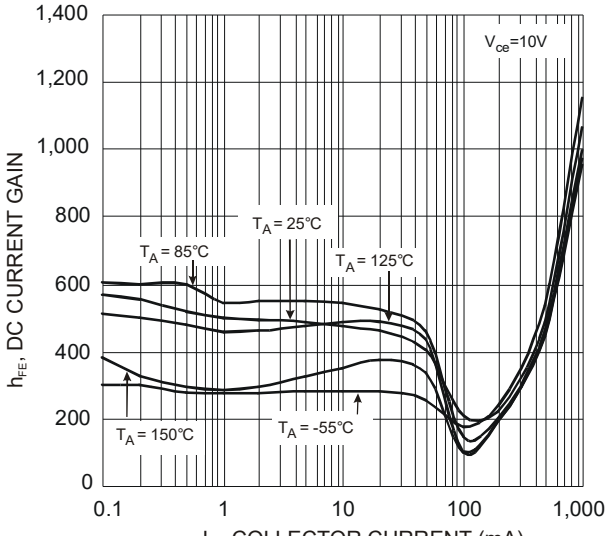



Fig. 6 DC Current Gain

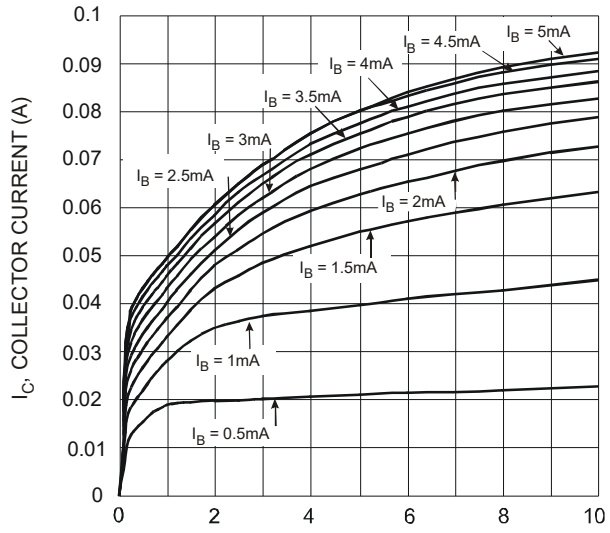



Fig. 7 $I_C$ vs. $V_{CE}$

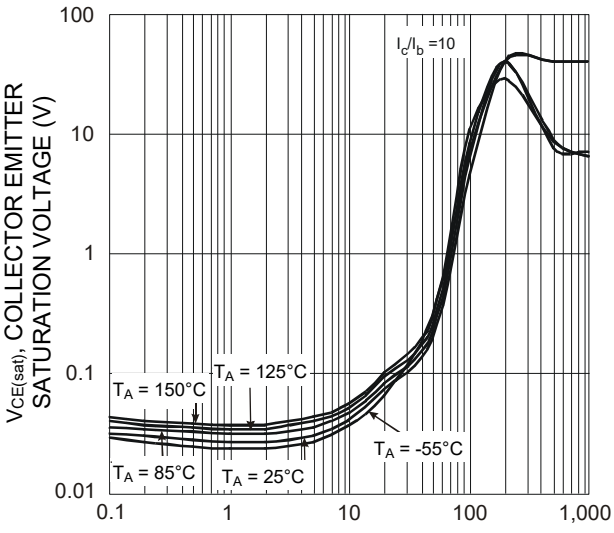



Fig. 8 $V_{CE(sat)}$ vs. $I_C$

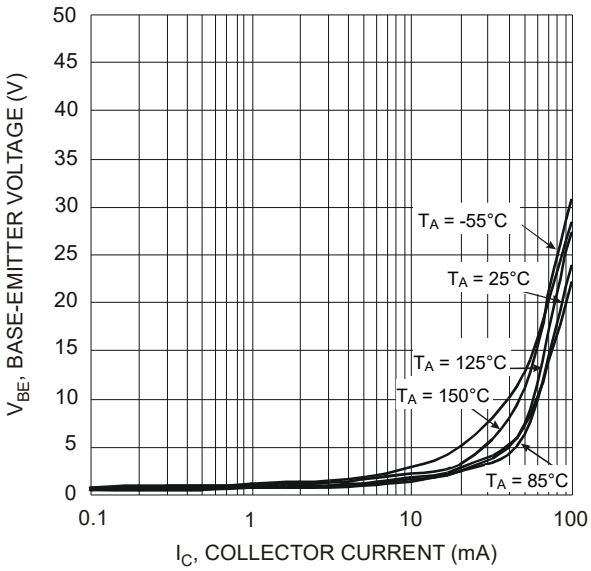



Fig. 9 $V_{BE}$ vs $I_C$

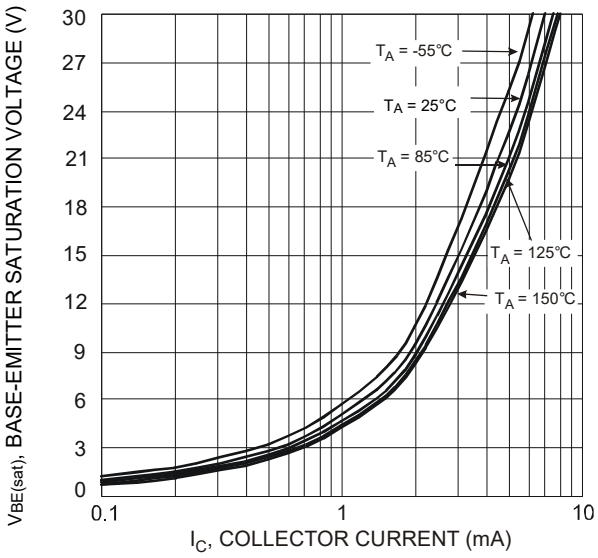



Fig. 10 $V_{BE(sat)}$ vs. $I_C$

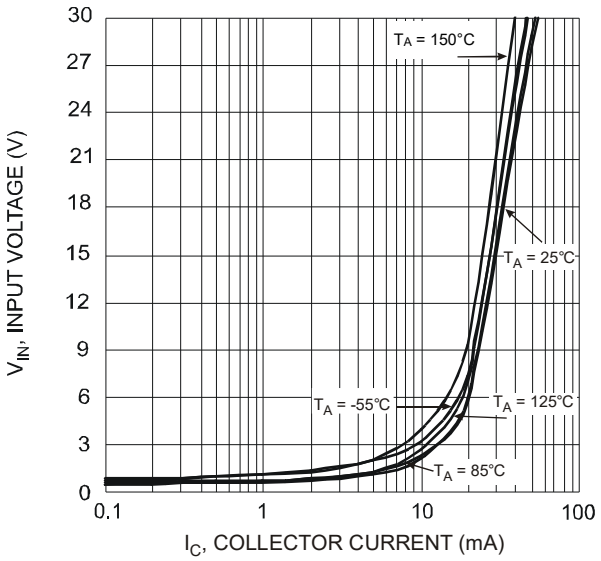
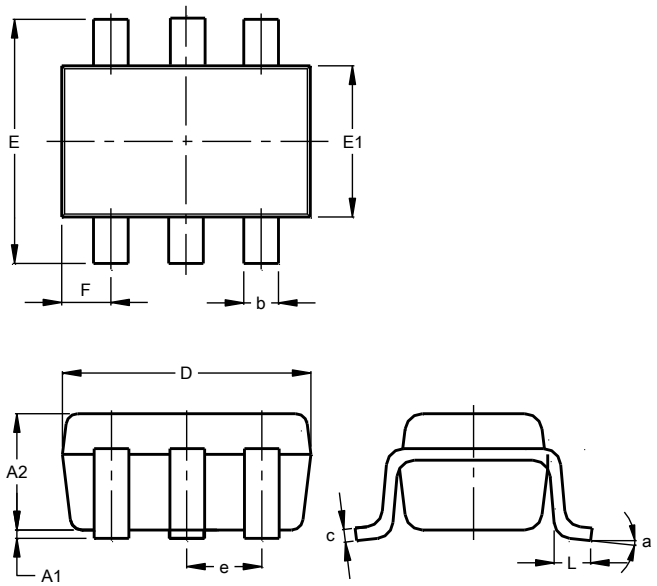



Fig. 11 Input Voltage vs. Collector Current

## Package Outline Dimensions

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

**SOT363**

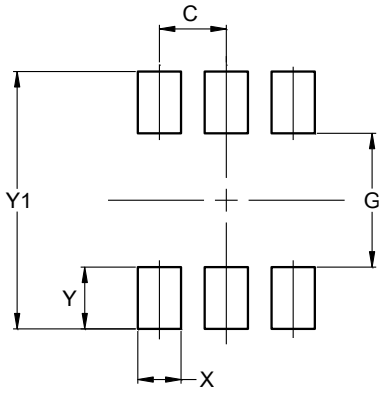



| SOT363 | | | |
|---|---|---|---|
| **Dim** | **Min** | **Max** | **Typ** |
| **A1** | 0.00 | 0.10 | 0.05 |
| **A2** | 0.90 | 1.00 | 0.95 |
| **b** | 0.10 | 0.30 | 0.25 |
| **c** | 0.10 | 0.22 | 0.11 |
| **D** | 1.80 | 2.20 | 2.15 |
| **E** | 2.00 | 2.20 | 2.10 |
| **E1** | 1.15 | 1.35 | 1.30 |
| **e** | 0.650 BSC | | |
| **F** | 0.40 | 0.45 | 0.425 |
| **L** | 0.25 | 0.40 | 0.30 |
| **a** | 0° | 8° | -- |
| **All Dimensions in mm** | | | |

## Suggested Pad Layout

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

**SOT363**




| Dimensions | Value (in mm) |
|---|---|
| **C** | 0.650 |
| **G** | 1.300 |
| **X** | 0.420 |
| **Y** | 0.600 |
| **Y1** | 2.500 |

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