

**General Description**

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



Fig. 1: SOT-363

**Features**

- Built in Base Resistors
- Epitaxial Planar Die Construction
- Lead Free By Design/RoHS Compliant (Note 1)
- "Green" Device (Note 2)

**Mechanical Data**

- Case: SOT-363
- Case Material: Molded Plastic. "Green Molding" Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020C
- Terminal Connections: See Fig. 2
- Terminals: Finish - Matte Tin annealed over Alloy 42 leadframe. Solderable per MIL-STD-202, Method 208
- Marking & Type Code Information: See Page 5
- Ordering Information: See Page 5
- Weight: 0.015 grams (approximate)

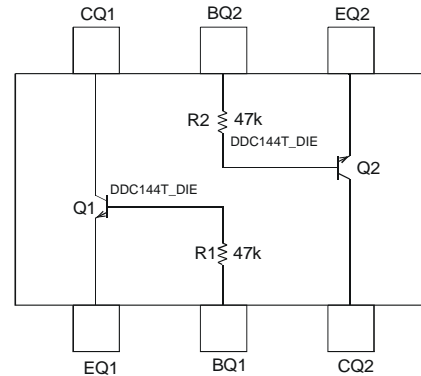


Fig. 2: Schematic and Pin Configuration

| Sub-Component P/N | Reference | Device Type | R1 (NOM) | R2 (NOM) | Figure |
|-------------------|-----------|-------------|----------|----------|--------|
| DDTC144T_DIE      | Q1        | NPN         | 47KΩ     | —        | 2      |
| DDTC144T_DIE      | Q2        | NPN         | —        | 47KΩ     | 2      |

**Maximum Ratings: Total Device** @T<sub>A</sub> = 25°C unless otherwise specified

| Characteristic            | Symbol           | Value | Unit    |
|---------------------------|------------------|-------|---------|
| Power Dissipation         | P <sub>d</sub>   | 200   | mW      |
| Power Deration above 25°C | P <sub>der</sub> | 1.6   | mW / °C |
| Output Current            | I <sub>out</sub> | 100   | mA      |

**Thermal Characteristics**

| Characteristic  | Symbol                            | Value       | Unit |
|---|-----------------------------------|-------------|------|
| Junction Operation and Storage Temperature Range  | T <sub>J</sub> , T <sub>STG</sub> | -55 to +150 | °C   |
| Thermal Resistance, junction to ambient (packaged device) (Ref: equivalent to only one heated junction) @ T <sub>A</sub> = 25°C | R <sub>θJA</sub>                  | 625         | °C/W |

- Notes:
1. No purposefully added lead.
  2. Diodes Inc.'s "Green" policy can be found on our website at [http://www.diodes.com/products/lead\\_free/index.php](http://www.diodes.com/products/lead_free/index.php).
  3. Device mounted on FR-4 PCB, 1" x 0.85" x 0.062"; pad layout as shown on Page 5 or see Diodes Inc. suggested pad layout document AP02001, which can be found on our website at <http://www.diodes.com/datasheets/ap02001.pdf>.

**Maximum Ratings:**
**Sub-Component Device: Discrete NPN Transistor (Q1, Q2) @ $T_A = 25^\circ\text{C}$  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 (dc)    | $I_{C(max)}$ | 50    | mA   |

**Electrical Characteristics @ $T_A = 25^\circ\text{C}$  unless otherwise specified**

| Characteristic   | Symbol        | Min | Typ   | Max  | Unit             | Test Condition  |
|--|---------------|-----|-------|------|------------------|---|
| <b>Off Characteristics</b>                                   |               |     |       |      |                  |   |
| Collector-Base Cut Off Current                               | $I_{CBO}$     | —   | —     | 100  | nA               | $V_{CB} = 50\text{V}, I_E = 0$                                  |
| Collector-Emitter Cut Off Current, $I_{O(OFF)}$              | $I_{CEO}$     | —   | —     | 500  | nA               | $V_{CE} = 50\text{V}, I_B = 0$                                  |
| Emitter-Base Cut Off Current                                 | $I_{EBO}$     | —   | —     | 500  | nA               | $V_{EB} = 5\text{V}, I_C = 0$                                   |
| Collector-Base Breakdown Voltage                             | $V_{(BR)CBO}$ | 50  | —     | —    | V                | $I_C = 50\mu\text{A}, I_E = 0$                                  |
| Collector-Emitter Breakdown Voltage                          | $V_{(BR)CEO}$ | 50  | —     | —    | V                | $I_C = 1\text{mA}, I_B = 0$                                     |
| Emitter-Base Breakdown Voltage                               | $V_{(BR)EBO}$ | 6   | —     | —    | V                | $I_E = 50\mu\text{A}, I_C = 0$                                  |
| Output Voltage (Transistor is off)                           | $V_{OH}$      | 4.6 | 4.45  | —    | V                | $V_{CC} = 5\text{V}, V_B = 0.05\text{V}, R_L = 1\text{K}\Omega$ |
| Input Voltage (load is off)                                  | $V_{I(OFF)}$  | —   | 0.6   | 0.4  | —                | $V_{CE} = 5\text{V}, I_C = 100\mu\text{A}$                      |
| Output Current (leakage same as $I_{CEO}$ )                  | $I_{O(OFF)}$  | —   | —     | 850  | nA               | $V_{CC} = 50\text{V}, V_I = 0\text{V}$                          |
| <b>On Characteristics*</b>                                   |               |     |       |      |                  |   |
| Collector-Emitter Saturation Voltage                         | $V_{CE(SAT)}$ | —   | 0.03  | 0.1  | V                | $I_C = 2.5\text{mA}, I_B = 0.25\text{mA}$                       |
|  |               | —   | 0.075 | 0.1  | V                | $I_C = 10\text{mA}, I_B = 0.5\text{mA}$                         |
|  |               | —   | 0.05  | 0.1  | V                | $I_C = 10\text{mA}, I_B = 1\text{mA}$                           |
|  |               | —   | 0.2   | 0.3  | V                | $I_C = 50\text{mA}, I_B = 5\text{mA}$                           |
| DC Current Gain  | $h_{FE}$      | 150 | 400   | —    | —                | $V_{CE} = 5\text{V}, I_C = 1\text{mA}$                          |
|  |               | 150 | 400   | —    | —                | $V_{CE} = 5\text{V}, I_C = 10\text{mA}$                         |
|  |               | 150 | 350   | —    | —                | $V_{CE} = 5\text{V}, I_C = 25\text{mA}$                         |
|  |               | 150 | 300   | —    | —                | $V_{CE} = 5\text{V}, I_C = 50\text{mA}$                         |
|  |               | 50  | 110   | —    | —                | $V_{CE} = 5\text{V}, I_C = 100\text{mA}$                        |
| Output Voltage (equivalent to $V_{CE(SAT)}$ or $V_{O(on)}$ ) | $V_{OL}$      | —   | 0.2   | 0.25 | Vdc              | $V_{CC} = 5\text{V}, V_B = 2.5\text{V}, R_L = 10\text{K}\Omega$ |
| Input Voltage  | $V_{I(ON)}$   | 1.5 | 0.95  | —    | Vdc              | $V_O = 0.3\text{V}, I_C = 2\text{mA}$                           |
| Input Current  | $I_i$         | —   | 19.2  | 28   | mA               | $V_I = 5\text{V}$   |
| Base-Emitter Turn-on Voltage                                 | $V_{BE(ON)}$  | —   | —     | 1.2  | V                | $V_{CE} = 5\text{V}, I_C = 2\text{mA}$                          |
| Base-Emitter Saturation Voltage                              | $V_{BE(SAT)}$ | —   | —     | 1.6  | V                | $I_C = 200\mu\text{A}, I_B = 20\mu\text{A}$                     |
| Input Resistor +/- 30% (Base)                                | R1            | —   | 47    | —    | $\text{K}\Omega$ | —   |
| <b>Small Signal Characteristics</b>                          |               |     |       |      |                  |   |
| Transition Frequency (gain-bandwidth product)                | $f_T$         | —   | 250   | —    | MHz              | $V_{CE} = 10\text{V}, I_E = 5\text{mA}, f = 100\text{MHz}$      |
| Collector Capacitance, ( $C_{cbo}$ -Output Capacitance)      | $C_C$         | —   | —     | 5    | pF               | $V_{CB} = 10\text{V}, I_E = 0, f = 1\text{MHz}$                 |

 \*Pulse Test: Pulse width,  $t_p < 300\ \mu\text{s}$ , Duty Cycle,  $d \leq 0.02$

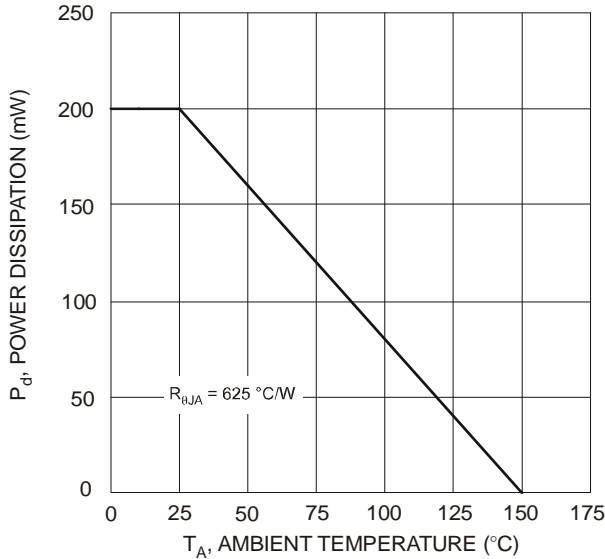


Fig. 3 Maximum Power Derating Curve

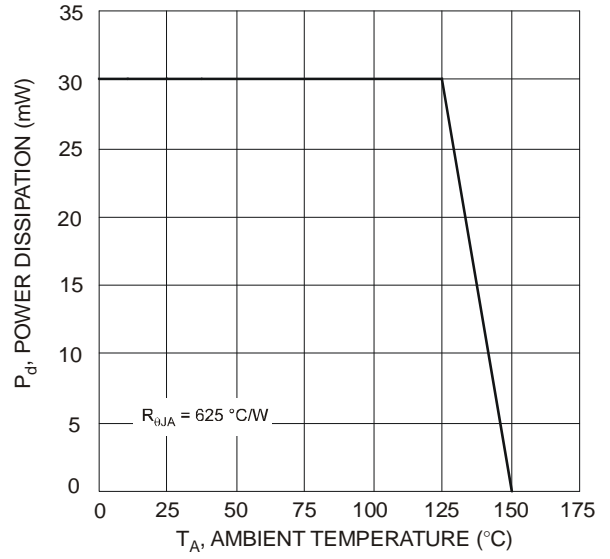


Fig. 4 Power Derating for Nominal Operation

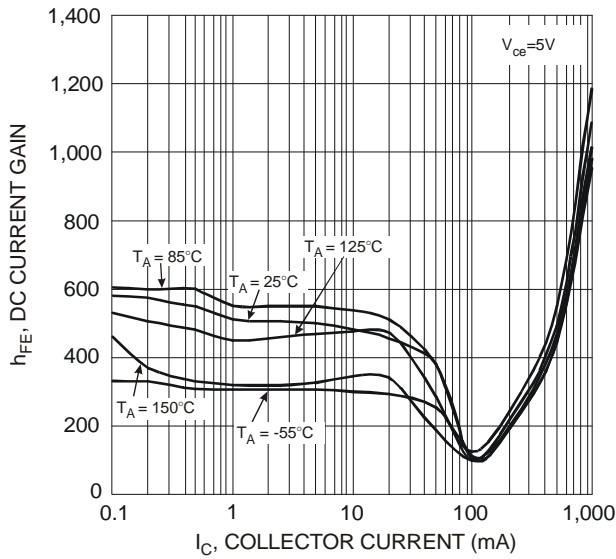


Fig. 5 DC Current Gain

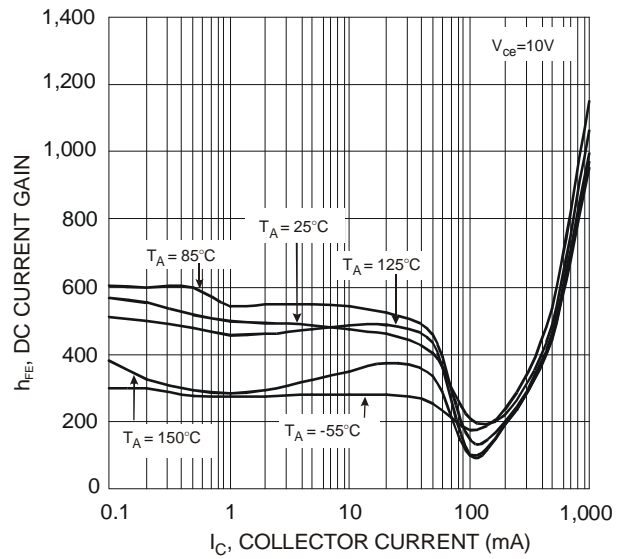


Fig. 6 DC Current Gain

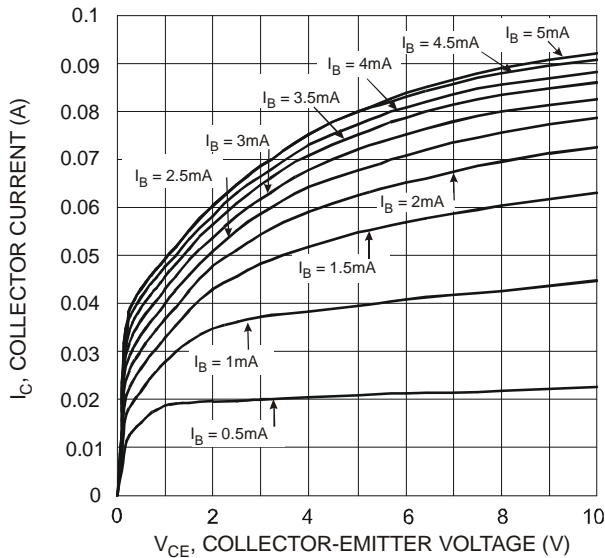


Fig. 7  $I_C$  vs.  $V_{CE}$

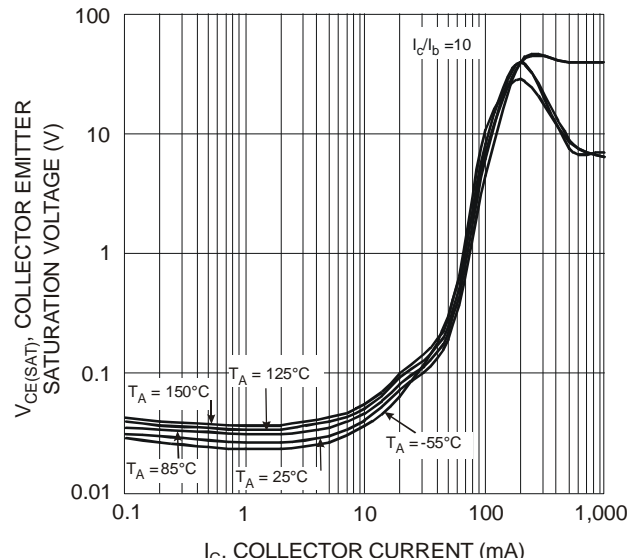


Fig. 8  $V_{CE(SAT)}$  vs  $I_C$

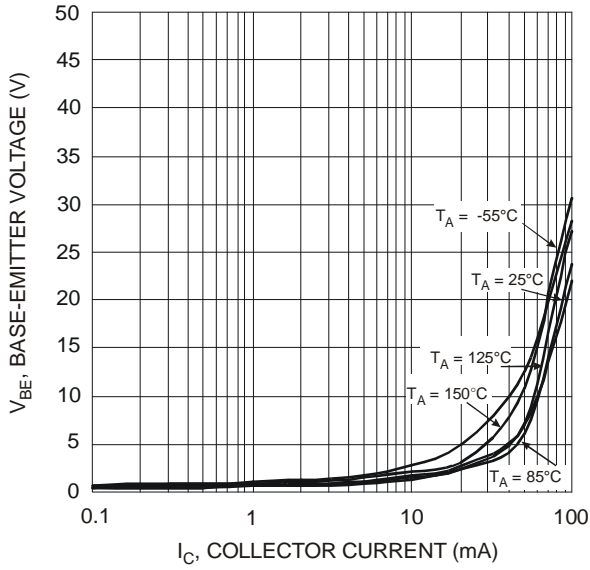


Fig. 9  $V_{BE}$  vs  $I_C$

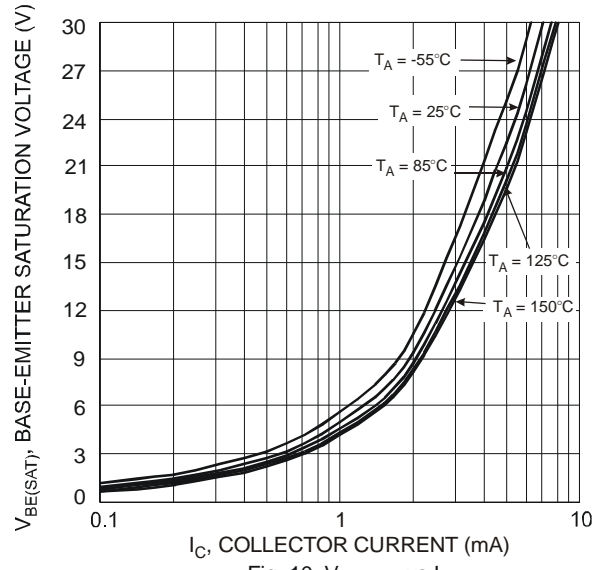


Fig. 10  $V_{BE(SAT)}$  vs  $I_C$

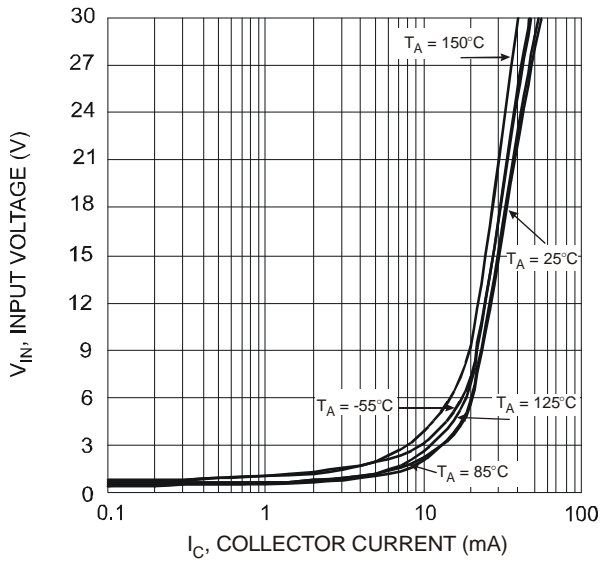


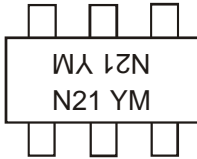
Fig. 11 Input Voltage vs Output Current

## Ordering Information (Note 4)

| Device     | Marking Code | Packaging | Shipping         |
|------------|--------------|-----------|------------------|
| DDC144TU-7 | N21          | SOT-363   | 3000/Tape & Reel |

Notes: 4. For packaging details, please see below or go to our website at <http://www.diodes.com/datasheets/ap02007.pdf>.

## Marking Information



N21 = Product Type Marking Code  
 YM = Date Code Marking  
 Y = Year e.g., U = 2007  
 M = Month e.g., 9 = September

Fig. 12

### Date Code Key

| Year | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|------|------|------|------|------|------|------|------|
| Code | T    | U    | V    | W    | X    | Y    | Z    |

| 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   |

## Mechanical Details

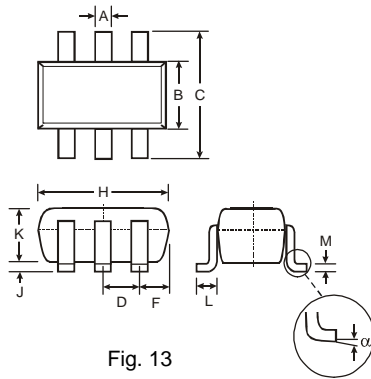


Fig. 13

| SOT-363              |              |      |
|----------------------|--------------|------|
| Dim                  | Min          | Max  |
| A                    | 0.10         | 0.30 |
| B                    | 1.15         | 1.35 |
| C                    | 2.00         | 2.20 |
| D                    | 0.65 Nominal |      |
| F                    | 0.30         | 0.40 |
| H                    | 1.80         | 2.20 |
| J                    | -            | 0.10 |
| K                    | 0.90         | 1.00 |
| L                    | 0.25         | 0.40 |
| M                    | 0.10         | 0.25 |
| $\alpha$             | 0°           | 8°   |
| All Dimensions in mm |              |      |

## Suggested Pad Layout: (Based on IPC-SM-782)

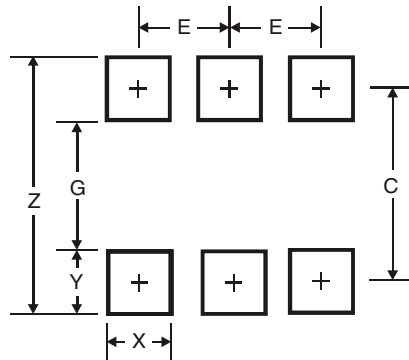


Fig. 14

| Figure 14 Dimensions | SOT-363 |
|----------------------|---------|
| Z                    | 2.5     |
| G                    | 1.3     |
| X                    | 0.42    |
| Y                    | 0.6     |
| C                    | 1.9     |
| E                    | 0.65    |
| All Dimensions in mm |         |

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