

**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)

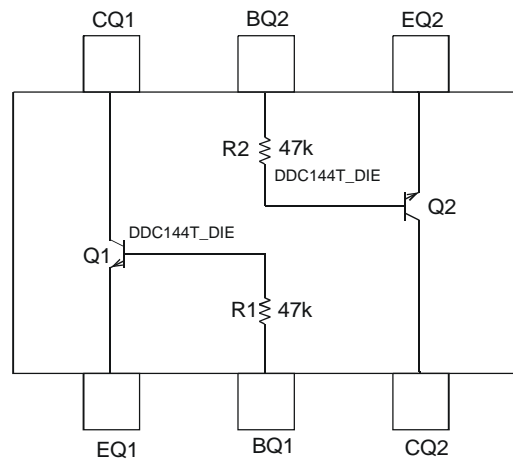


Fig. 2: Schematic and Pin Configuration

| 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)<br>(Ref: equivalent to only one heated junction) @ T <sub>A</sub> = 25°C | R <sub>0JA</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>.

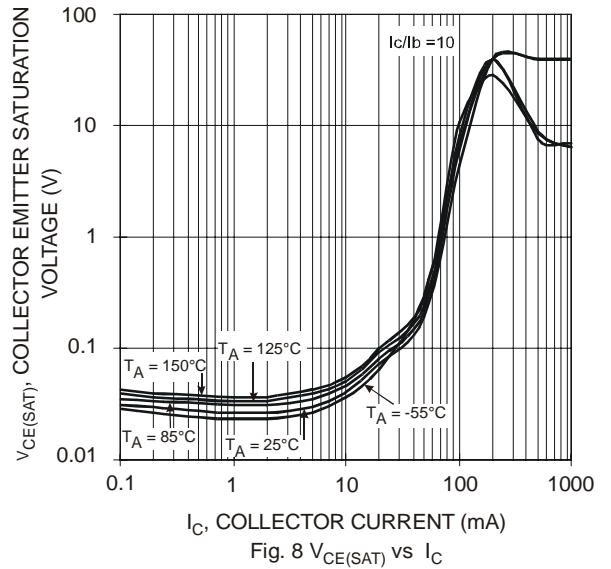
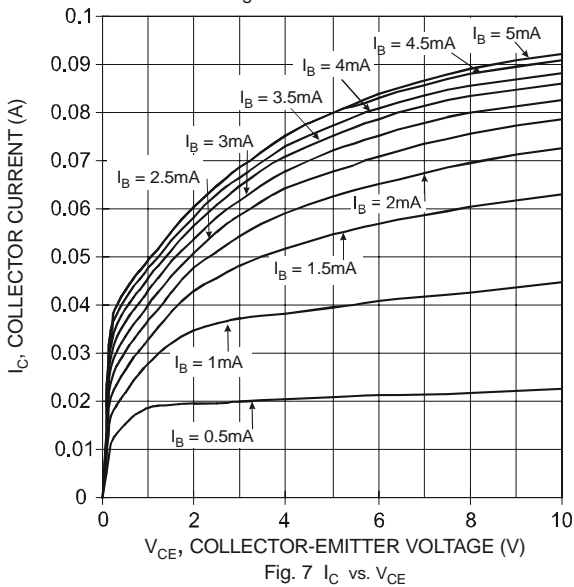
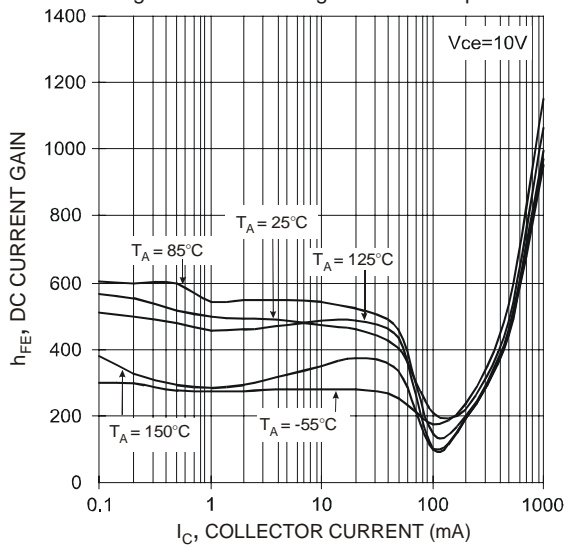
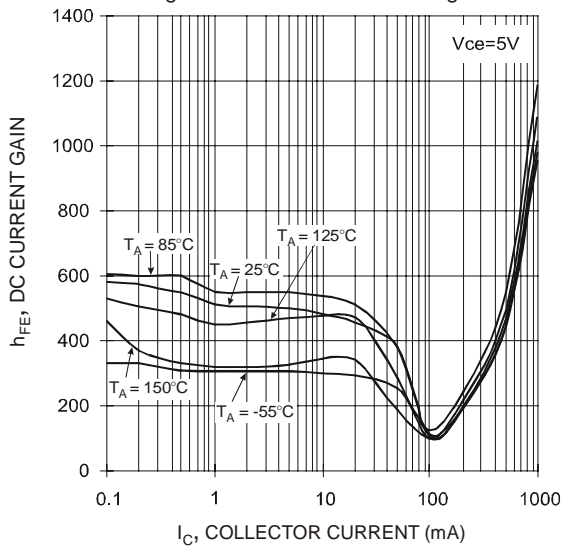
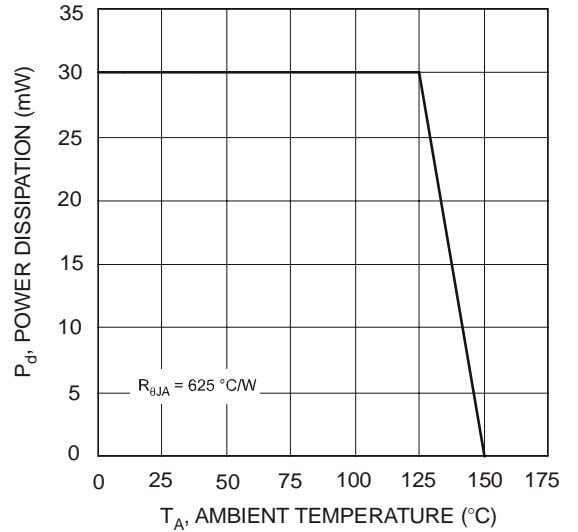
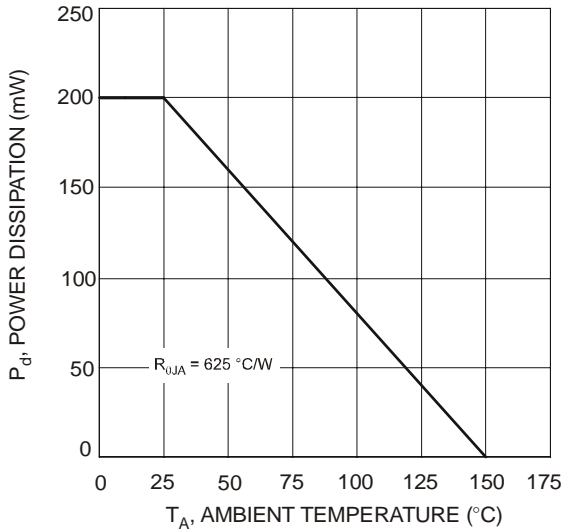
**Maximum Ratings:**
**Sub-Component Device: Discrete NPN Transistor (Q1, Q2) @ $T_A = 25^\circ\text{C}$  unless otherwise specified**

| Characteristic            | Symbol       | Value | Unit |
|---------------------------|--------------|-------|------|
| Collector-Base Voltage    | $V_{CB0}$    | 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                                | $I_{CB0}$     | —   | —     | 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                              | $V_{(BR)CB0}$ | 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 <sub>cb0</sub> -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,  $d < 0.02$



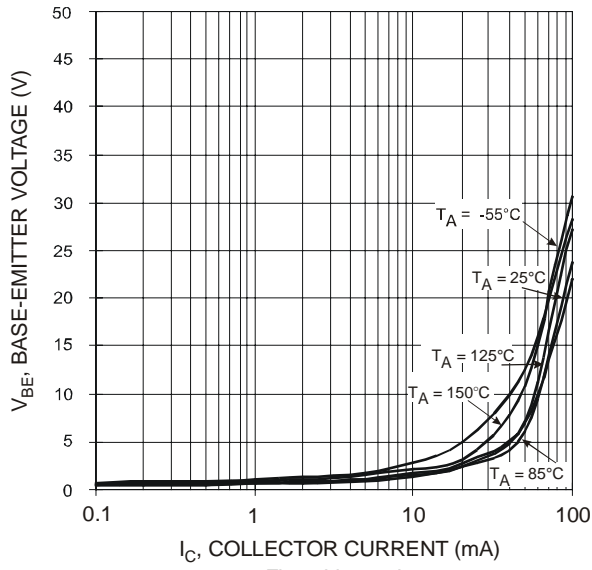


Fig. 9  $V_{BE}$  vs  $I_C$

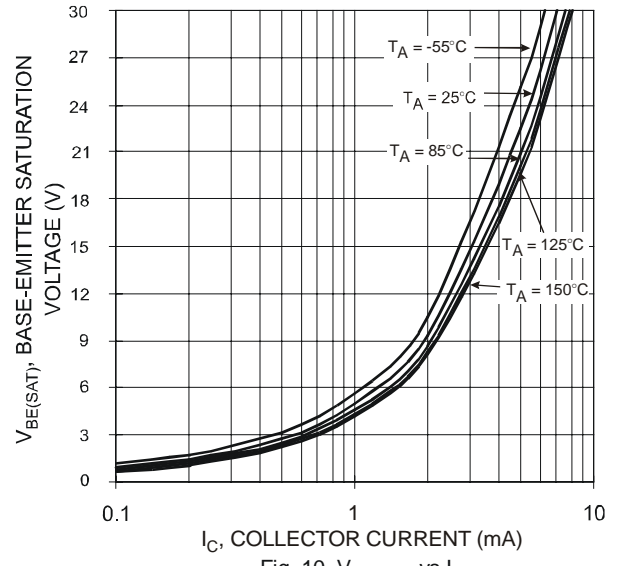


Fig. 10  $V_{BE(SAT)}$  vs  $I_C$

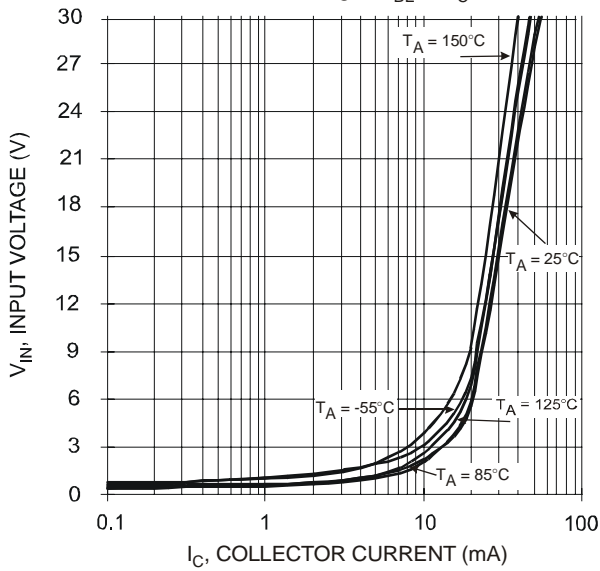


Fig. 11 Input Voltage vs Output Current

## 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

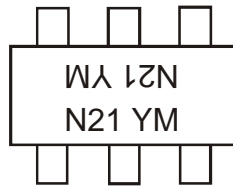


Fig. 12

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

### 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

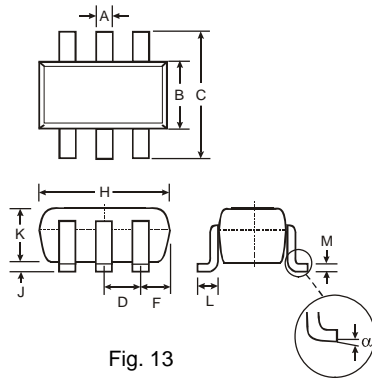


Fig. 13

| 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)

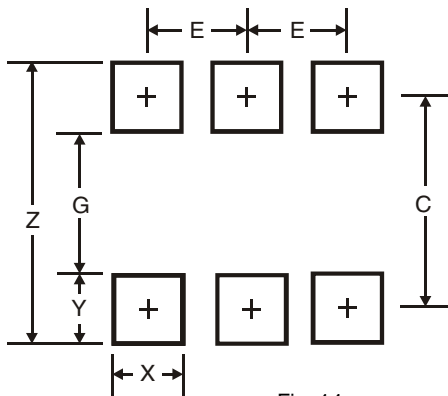


Fig. 14

| 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 |         |



#### IMPORTANT NOTICE

Diodes Incorporated and its subsidiaries reserve the right to make modifications, enhancements, improvements, corrections or other changes without further notice to any product herein. Diodes Incorporated does not assume any liability arising out of the application or use of any product described herein; neither does it convey any license under its patent rights, nor the rights of others. The user of products in such applications shall assume all risks of such use and will agree to hold Diodes Incorporated and all the companies whose products are represented on our website, harmless against all damages.

#### LIFE SUPPORT

Diodes Incorporated products are not authorized for use as critical components in life support devices or systems without the expressed written approval of the President of Diodes Incorporated.