

# DDTC (R1≠R2 SERIES) E

## NPN PRE-BIASED SMALL SIGNAL SURFACE MOUNT TRANSISTOR

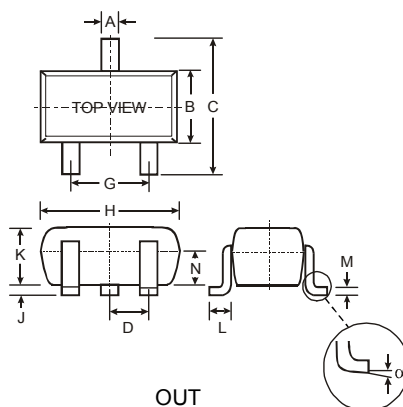
### Features

- Epitaxial Planar Die Construction
- Complementary PNP Types Available (DDTA)
- Built-In Biasing Resistors, R1≠R2
- **Lead Free/RoHS Compliant (Note 2)**
- **"Green" Device (Note 3 and 4)**

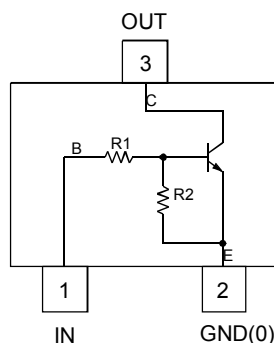
### Mechanical Data

- Case: SOT-523
- Case Material: Molded Plastic. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020C
- Terminals: Solderable per MIL-STD-202, Method 208
- Lead Free Plating (Matte Tin Finish annealed over Alloy 42 leadframe)
- Terminal Connections: See Diagram
- Marking & Date Code Information: See Table Below & Page 4
- Ordering Information: See Page 4
- Weight: 0.002 grams (approximate)

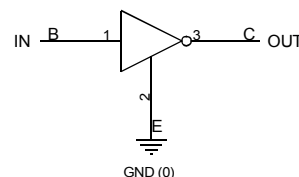
| P/N       | R1 (NOM) | R2 (NOM) | Marking |
|-----------|----------|----------|---------|
| DDTC113ZE | 1KΩ      | 10KΩ     | N02     |
| DDTC123YE | 2.2KΩ    | 10KΩ     | N05     |
| DDTC123JE | 2.2KΩ    | 47KΩ     | N06     |
| DDTC143XE | 4.7KΩ    | 10KΩ     | N09     |
| DDTC143FE | 4.7KΩ    | 22KΩ     | N10     |
| DDTC143ZE | 4.7KΩ    | 47KΩ     | N11     |
| DDTC114YE | 10KΩ     | 47KΩ     | N14     |
| DDTC114WE | 10KΩ     | 4.7KΩ    | N15     |
| DDTC124XE | 22KΩ     | 47KΩ     | N18     |
| DDTC144VE | 47KΩ     | 10KΩ     | N21     |
| DDTC144WE | 47KΩ     | 22KΩ     | N22     |



| SOT-523              |      |      |      |
|----------------------|------|------|------|
| Dim                  | Min  | Max  | Typ  |
| A                    | 0.15 | 0.30 | 0.22 |
| B                    | 0.75 | 0.85 | 0.80 |
| C                    | 1.45 | 1.75 | 1.60 |
| D                    | —    | —    | 0.50 |
| G                    | 0.90 | 1.10 | 1.00 |
| H                    | 1.50 | 1.70 | 1.60 |
| J                    | 0.00 | 0.10 | 0.05 |
| K                    | 0.60 | 0.80 | 0.75 |
| L                    | 0.10 | 0.30 | 0.22 |
| M                    | 0.10 | 0.20 | 0.12 |
| N                    | 0.45 | 0.65 | 0.50 |
| α                    | 0°   | 8°   | —    |
| All Dimensions in mm |      |      |      |



Schematic and Pin Configuration



Equivalent Inverter Circuit

### Maximum Ratings @T<sub>A</sub> = 25°C unless otherwise specified

| Characteristic            | Symbol               | Value                                                                                                                                                                                                                                                         | Unit |
|---------------------------|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| Supply Voltage (3) to (2) | V <sub>CC</sub>      | 50                                                                                                                                                                                                                                                            | V    |
| Input Voltage, (1) to (2) | V <sub>IN</sub>      | DDTC113ZE -5 to +10<br>DDTC123YE -5 to +12<br>DDTC123JE -5 to +12<br>DDTC143XE -7 to +20<br>DDTC143FE -6 to +30<br>DDTC143ZE -5 to +30<br>DDTC114YE -6 to +40<br>DDTC114WE -10 to +30<br>DDTC124XE -10 to +40<br>DDTC144VE -15 to +40<br>DDTC144WE -10 to +40 | V    |
| Output Current            | I <sub>O</sub>       | DDTC113ZE 100<br>DDTC123YE 100<br>DDTC123JE 100<br>DDTC143XE 100<br>DDTC143FE 100<br>DDTC143ZE 100<br>DDTC114YE 70<br>DDTC114WE 100<br>DDTC124XE 50<br>DDTC144VE 30<br>DDTC144WE 30                                                                           | mA   |
| Output Current            | I <sub>C</sub> (Max) | 100                                                                                                                                                                                                                                                           | mA   |

- Notes:
1. Mounted on FR4 PC Board with recommended pad layout at <http://www.diodes.com/datasheets/ap02001.pdf>.
  2. No purposefully added lead.
  3. 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).
  4. Product manufactured with Date Code UO (week 40, 2007) and newer are built with Green Molding Compound. Product manufactured prior to Date Code UO are built with Non-Green Molding Compound and may contain Halogens or Sb2O3 Fire Retardants.

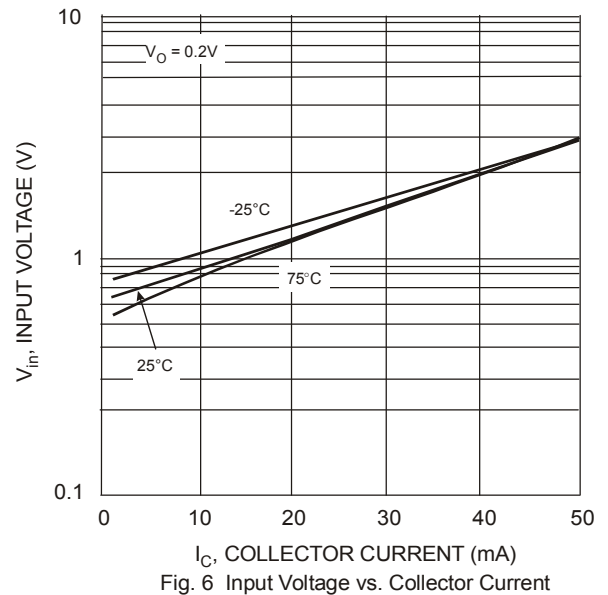
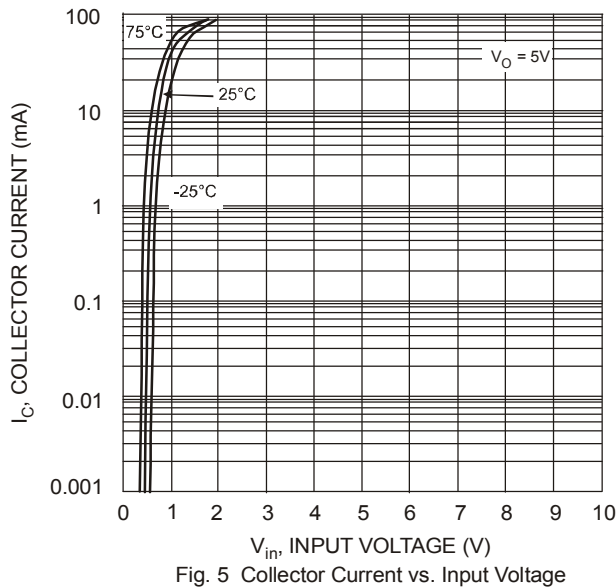
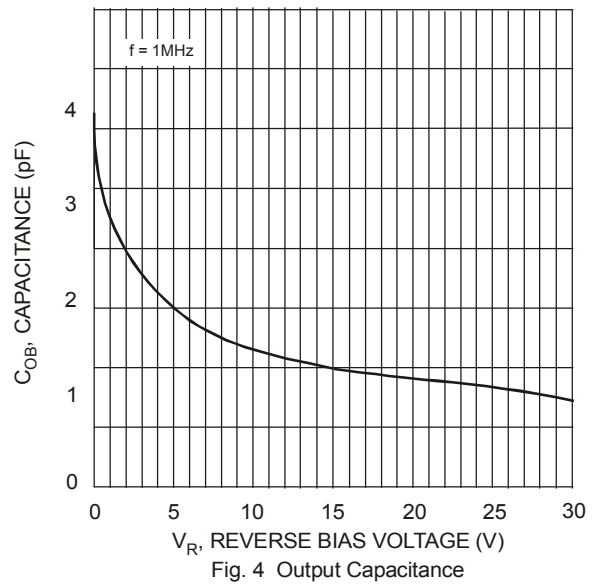
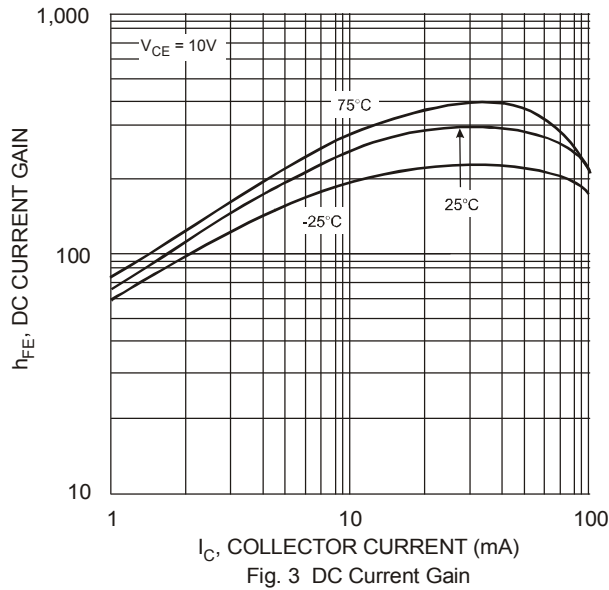
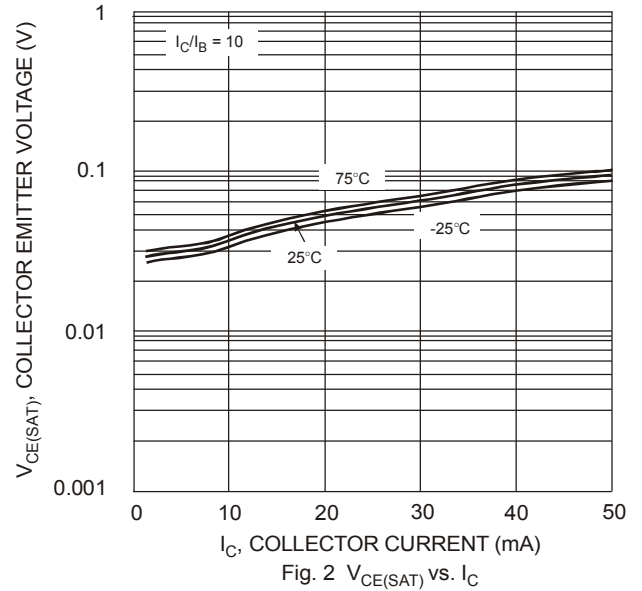
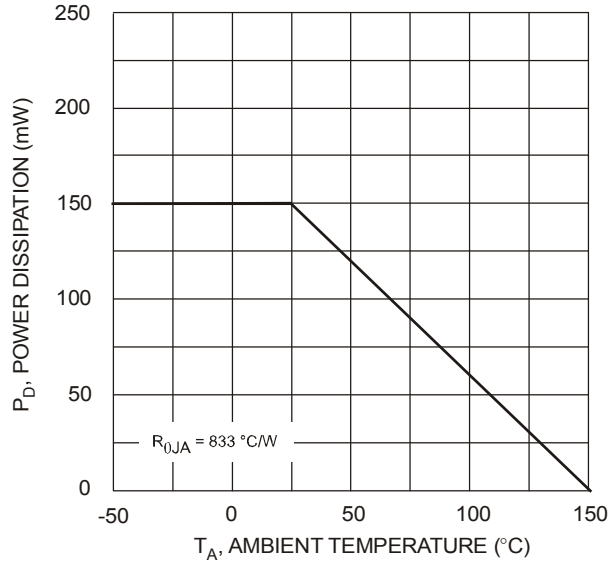
## Thermal Characteristics @T<sub>A</sub> = 25°C unless otherwise specified

| Characteristic                                       | Symbol                            | Value       | Unit |
|------------------------------------------------------|-----------------------------------|-------------|------|
| Power Dissipation                                    | P <sub>d</sub>                    | 150         | mW   |
| Thermal Resistance, Junction to Ambient Air (Note 1) | R <sub>θJA</sub>                  | 833         | °C/W |
| Operating and Storage Temperature Range              | T <sub>j</sub> , T <sub>STG</sub> | -55 to +150 | °C   |

## Electrical Characteristics @T<sub>A</sub> = 25°C unless otherwise specified

| Characteristic             | Symbol                                                                                                                                      | Min                                                                       | Typ | Max                                                                            | Unit | Test Condition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|-----|--------------------------------------------------------------------------------|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Input Voltage              | DDTC113ZE<br>DDTC123YE<br>DDTC123JE<br>DDTC143XE<br>DDTC143FE<br>DDTC143ZE<br>DDTC114YE<br>DDTC114WE<br>DDTC124XE<br>DDTC144VE<br>DDTC144WE | 0.3<br>0.3<br>0.5<br>0.3<br>0.3<br>0.5<br>0.3<br>0.8<br>0.4<br>1.0<br>0.8 | —   | —                                                                              | V    | V <sub>CC</sub> = 5V, I <sub>O</sub> = 100μA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                            | DDTC113ZE<br>DDTC123YE<br>DDTC123JE<br>DDTC143XE<br>DDTC143FE<br>DDTC143ZE<br>DDTC114YE<br>DDTC114WE<br>DDTC124XE<br>DDTC144VE<br>DDTC144WE | —                                                                         | —   | 3.0<br>3.0<br>1.1<br>2.5<br>1.3<br>1.3<br>1.4<br>3.0<br>2.5<br>5.0<br>4.0      |      | V <sub>O</sub> = 0.3V, I <sub>O</sub> = 20mA<br>V <sub>O</sub> = 0.3V, I <sub>O</sub> = 20mA<br>V <sub>O</sub> = 0.3V, I <sub>O</sub> = 5mA<br>V <sub>O</sub> = 0.3V, I <sub>O</sub> = 20mA<br>V <sub>O</sub> = 0.3V, I <sub>O</sub> = 3mA<br>V <sub>O</sub> = 0.3V, I <sub>O</sub> = 5mA<br>V <sub>O</sub> = 0.3V, I <sub>O</sub> = 1mA<br>V <sub>O</sub> = 0.3V, I <sub>O</sub> = 2mA<br>V <sub>O</sub> = 0.3V, I <sub>O</sub> = 2mA<br>V <sub>O</sub> = 0.3V, I <sub>O</sub> = 2mA<br>V <sub>O</sub> = 0.3V, I <sub>O</sub> = 2mA |
| Output Voltage             | V <sub>O(on)</sub>                                                                                                                          | —                                                                         | 0.1 | 0.3                                                                            | V    | I <sub>O</sub> /I <sub>I</sub> = 5mA/0.25mA DDTC123JE<br>I <sub>O</sub> /I <sub>I</sub> = 5mA/0.25mA DDTC143ZE<br>I <sub>O</sub> /I <sub>I</sub> = 5mA/0.25mA DDTC114YE<br>I <sub>O</sub> /I <sub>I</sub> = 10mA/0.5mA All Others                                                                                                                                                                                                                                                                                                    |
| Input Current              | I <sub>I</sub>                                                                                                                              | —                                                                         | —   | 7.2<br>3.8<br>3.6<br>1.8<br>1.8<br>1.8<br>0.88<br>0.88<br>0.36<br>0.16<br>0.16 | mA   | V <sub>I</sub> = 5V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Output Current             | I <sub>O(off)</sub>                                                                                                                         | —                                                                         | —   | 0.5                                                                            | μA   | V <sub>CC</sub> = 50V, V <sub>I</sub> = 0V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| DC Current Gain            | G <sub>I</sub>                                                                                                                              | 33<br>33<br>80<br>30<br>68<br>80<br>68<br>24<br>68<br>33<br>56            | —   | —                                                                              | —    | V <sub>O</sub> = 5V, I <sub>O</sub> = 5mA<br>V <sub>O</sub> = 5V, I <sub>O</sub> = 10mA<br>V <sub>O</sub> = 5V, I <sub>O</sub> = 10mA<br>V <sub>O</sub> = 5V, I <sub>O</sub> = 10mA<br>V <sub>O</sub> = 5V, I <sub>O</sub> = 10mA<br>V <sub>O</sub> = 5V, I <sub>O</sub> = 10mA<br>V <sub>O</sub> = 5V, I <sub>O</sub> = 5mA<br>V <sub>O</sub> = 5V, I <sub>O</sub> = 10mA<br>V <sub>O</sub> = 5V, I <sub>O</sub> = 5mA<br>V <sub>O</sub> = 5V, I <sub>O</sub> = 5mA<br>V <sub>O</sub> = 5V, I <sub>O</sub> = 5mA                    |
| Input Resistor Tolerance   | ΔR <sub>1</sub>                                                                                                                             | -30                                                                       | —   | +30                                                                            | %    | —                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Resistance Ratio Tolerance | ΔR <sub>2</sub> /R <sub>1</sub>                                                                                                             | -20                                                                       | —   | +20                                                                            | %    | —                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Gain-Bandwidth Product*    | f <sub>T</sub>                                                                                                                              | —                                                                         | 250 | —                                                                              | MHz  | V <sub>CE</sub> = 10V, I <sub>E</sub> = 5mA, f = 100MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

\* Transistor – For Reference Only

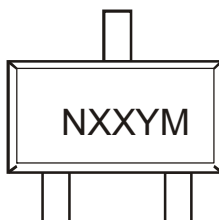


## Ordering Information (Note 5)

| Device        | Packaging | Shipping         |
|---------------|-----------|------------------|
| DDTC113ZE-7-F | SOT-523   | 3000/Tape & Reel |
| DDTC123YE-7-F | SOT-523   | 3000/Tape & Reel |
| DDTC123JE-7-F | SOT-523   | 3000/Tape & Reel |
| DDTC143XE-7-F | SOT-523   | 3000/Tape & Reel |
| DDTC143FE-7-F | SOT-523   | 3000/Tape & Reel |
| DDTC143ZE-7-F | SOT-523   | 3000/Tape & Reel |
| DDTC114YE-7-F | SOT-523   | 3000/Tape & Reel |
| DDTC114WE-7-F | SOT-523   | 3000/Tape & Reel |
| DDTC124XE-7-F | SOT-523   | 3000/Tape & Reel |
| DDTC144VE-7-F | SOT-523   | 3000/Tape & Reel |
| DDTC144WE-7-F | SOT-523   | 3000/Tape & Reel |

Notes: 5. For packaging details, go to our website at <http://www.diodes.com/datasheets/ap02007.pdf>.

## Marking Information



Nxx = Product Type Marking Code (See Page 1, e.g. N02 = DDTC113ZE)  
 YM = Date Code Marking  
 Y = Year ex: T = 2006  
 M = Month ex: 9 = September

### Date Code Key

| Year | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|------|------|------|------|------|------|------|------|------|------|------|------|
| Code | N    | P    | R    | S    | 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   |

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