



# THE DATASHEET OF DDTC123YCA-7-F

**NPN PRE-BIASED SMALL SIGNAL SURFACE MOUNT TRANSISTOR**
**Features**

- Epitaxial Planar Die Construction
- Complementary PNP Types Available (DDTA)
- Built-In Biasing Resistors, R1≠R2
- **Totally Lead-Free & Fully RoHS compliant (Notes 1 & 2)**
- **Halogen and Antimony Free "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**
- **PPAP Capable (Note 4)**

**Mechanical Data**

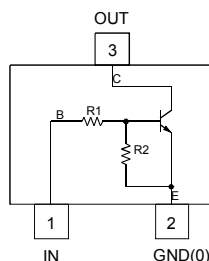
- Case: SOT23
- Case Material: Molded Plastic, "Green" Molding Compound
- UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208 
- Weight: 0.008 grams (approximate)

| Part Number | R1 (NOM) | R2 (NOM) |
|-------------|----------|----------|
| DDTC113ZCA  | 1KΩ      | 10KΩ     |
| DDTC123YCA  | 2.2KΩ    | 10KΩ     |
| DDTC123JCA  | 2.2KΩ    | 47KΩ     |
| DDTC143XCA  | 4.7KΩ    | 10KΩ     |
| DDTC143FCA  | 4.7KΩ    | 22KΩ     |
| DDTC143ZCA  | 4.7KΩ    | 47KΩ     |
| DDTC114YCA  | 10KΩ     | 47KΩ     |
| DDTC114WCA  | 10KΩ     | 4.7KΩ    |
| DDTC124XCA  | 22KΩ     | 47KΩ     |
| DDTC144VCA  | 47KΩ     | 10KΩ     |
| DDTC144WCA  | 47KΩ     | 22KΩ     |

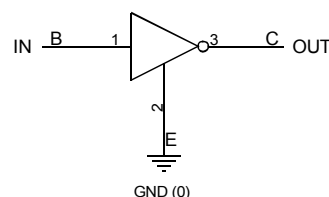
SOT23



Top View



Device Schematic



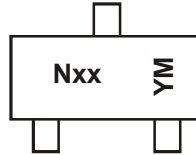
Equivalent Inverter Circuit

**Ordering Information** (Notes 3 & 4)

| Product          | Compliance | Marking | Reel size (inches) | Tape width (mm) | Quantity per reel |
|------------------|------------|---------|--------------------|-----------------|-------------------|
| DDTC113ZCA-7-F   | AEC-Q101   | N02     | 7                  | 8               | 3,000             |
| DDTC123YCA-7-F   | AEC-Q101   | N05     | 7                  | 8               | 3,000             |
| DDTC123JCA-7-F   | AEC-Q101   | N06     | 7                  | 8               | 3,000             |
| DDTC143XCA-7-F   | AEC-Q101   | N09     | 7                  | 8               | 3,000             |
| DDTC143FCA-7-F   | AEC-Q101   | N10     | 7                  | 8               | 3,000             |
| DDTC143ZCA-7-F   | AEC-Q101   | N11     | 7                  | 8               | 3,000             |
| DDTC143ZCAQ-7-F  | Automotive | N11     | 7                  | 8               | 3,000             |
| DDTC143ZCAQ-13-F | Automotive | N11     | 13                 | 8               | 10,000            |
| DDTC114YCA-7-F   | AEC-Q101   | N14     | 7                  | 8               | 3,000             |
| DDTC114YCAQ-7-F  | Automotive | N14     | 7                  | 8               | 3,000             |
| DDTC114YCAQ-13-F | Automotive | N14     | 13                 | 8               | 10,000            |
| DDTC114WCA-7-F   | AEC-Q101   | N15     | 7                  | 8               | 3,000             |
| DDTC124XCA-7-F   | AEC-Q101   | N18     | 7                  | 8               | 3,000             |
| DDTC144VCA-7-F   | AEC-Q101   | N21     | 7                  | 8               | 3,000             |
| DDTC144WCA-7-F   | AEC-Q101   | N22     | 7                  | 8               | 3,000             |

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
  2. See [http://www.diodes.com/quality/lead\\_free.html](http://www.diodes.com/quality/lead_free.html) 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. Automotive products are AEC-Q101 qualified and are PPAP capable. Automotive, AEC-Q101 and standard products are electrically and thermally the same, except where specified. For more information, please refer to [http://www.diodes.com/quality/product\\_compliance\\_definitions/](http://www.diodes.com/quality/product_compliance_definitions/).
  5. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

## Marking Information



Nxx = Product Type Marking Code (See Table Above)  
 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 | 2013 | 2014 | 2015 | 2016 | 2017 |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Code | N    | P    | R    | S    | T    | U    | V    | W    | X    | Y    | Z    | A    | B    | C    | D    | E    |

| 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   |

## Absolute Maximum Ratings (@T<sub>A</sub> = +25°C, unless otherwise specified.)

| Characteristic                    | Symbol              | Value                                                                                                                                                                                                                                                                    | Unit |
|-----------------------------------|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| Supply Voltage, <Pin: (3) to (2)> | V <sub>CC</sub>     | 50                                                                                                                                                                                                                                                                       | V    |
| Input Voltage, <Pin: (1) to (2)>  | V <sub>IN</sub>     | DDTC113ZCA -5 to +10<br>DDTC123YCA -5 to +12<br>DDTC123JCA -5 to +12<br>DDTC143XCA -7 to +20<br>DDTC143FCA -6 to +30<br>DDTC143ZCA -5 to +30<br>DDTC114YCA -6 to +40<br>DDTC114WCA -10 to +30<br>DDTC124XCA -10 to +40<br>DDTC144VCA -15 to +40<br>DDTC144WCA -10 to +40 | V    |
| Output Current                    | I <sub>O</sub>      | DDTC113ZCA 100<br>DDTC123YCA 100<br>DDTC123JCA 100<br>DDTC143XCA 100<br>DDTC143FCA 100<br>DDTC143ZCA 100<br>DDTC114YCA 70<br>DDTC114WCA 100<br>DDTC124XCA 50<br>DDTC144VCA 30<br>DDTC144WCA 30                                                                           | mA   |
| Output Current                    | I <sub>C(MAX)</sub> | 100                                                                                                                                                                                                                                                                      | mA   |

## Thermal Characteristics (@T<sub>A</sub> = +25°C, unless otherwise specified.)

| Characteristic                                       | Symbol                            | Value       | Unit |
|------------------------------------------------------|-----------------------------------|-------------|------|
| Power Dissipation (Note 6)                           | P <sub>D</sub>                    | 200         | mW   |
| Thermal Resistance, Junction to Ambient Air (Note 6) | R <sub>θJA</sub>                  | 625         | °C/W |
| Operating and Storage Temperature Range              | T <sub>J</sub> , T <sub>STG</sub> | -55 to +150 | °C   |

Notes: 6. Mounted on FR4 PC Board with minimum recommended pad layout

**Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

| Characteristic                 |                                                                                                                                                                       | Symbol                          | Min                                                                       | Typ | Max                                                                            | Unit | Test Condition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|---------------------------------------------------------------------------|-----|--------------------------------------------------------------------------------|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Input Voltage                  | DDTC113ZCA<br>DDTC123YCA<br>DDTC123JCA<br>DDTC143XCA<br>DDTC143FCA<br>DDTC143ZCA<br>DDTC114YCA<br>DDTC114WCA<br>DDTC124XCA<br>DDTC144VCA<br>DDTC144WCA                | V <sub>I(OFF)</sub>             | 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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                                | DDTC113ZCA<br>DDTC123YCA<br>DDTC123JCA<br>DDTC143XCA<br>DDTC143FCA<br>DDTC143ZCA<br>DDTC114YCA<br>DDTC114WCA<br>DDTC124XCA<br>DDTC144VCA<br>DDTC144WCA                | V <sub>I(ON)</sub>              | —                                                                         | —   | 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 DDTC123JCA<br>I <sub>O</sub> /I <sub>I</sub> = 5mA/0.25mA DDTC143ZCA<br>I <sub>O</sub> /I <sub>I</sub> = 5mA/0.25mA DDTC114YCA<br>I <sub>O</sub> /I <sub>I</sub> = 10mA/0.5mA All Others                                                                                                                                                                                                                                                                                                                                                                         |
| Input Current                  | DDTC113ZCA<br>DDTC123YCA<br>DDTC123JCA<br>DDTC143XCA<br>DDTC143FCA<br>DDTC143ZCA<br>DDTC114YCA<br>DDTC114WCA<br>DDTC124XCA<br>DDTC144VCA<br>DDTC144WCA                | 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                | DDTC113ZCA<br>DDTC123YCA<br>DDTC123JCA<br>DDTC143XCA<br>DDTC143FCA<br>DDTC143ZCA<br>DDTC114YCA<br>DDTC114YCAQ<br>DDTC114WCA<br>DDTC124XCA<br>DDTC144VCA<br>DDTC144WCA | G <sub>I</sub>                  | 33<br>33<br>80<br>30<br>68<br>80<br>68<br>80<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> = 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> = 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 Produc (Note 7) |                                                                                                                                                                       | f <sub>T</sub>                  | —                                                                         | 250 | —                                                                              | MHz  | V <sub>CE</sub> = 10V, I <sub>E</sub> = 5mA,<br>f = 100MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

Note: 7. Transistor - For Reference Only

**Typical Curves – DDTC123JCA** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

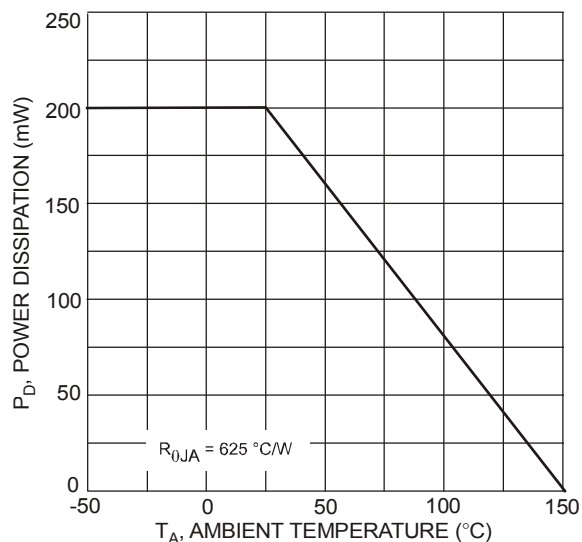


Fig. 1 Power Dissipation vs. Ambient Temperature

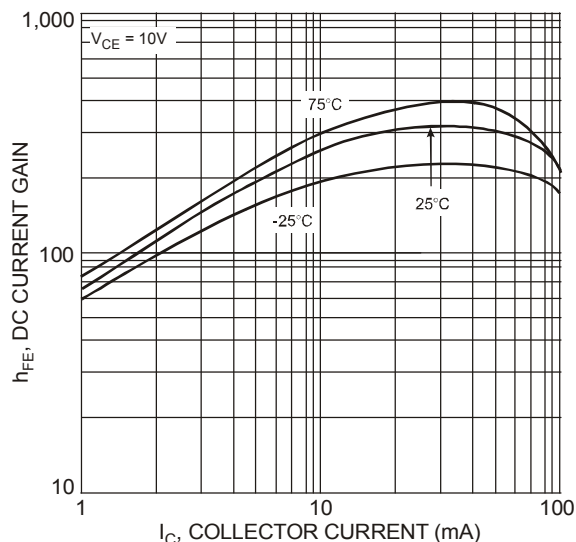


Fig. 2 Typical DC Current Gain vs. Collector Current

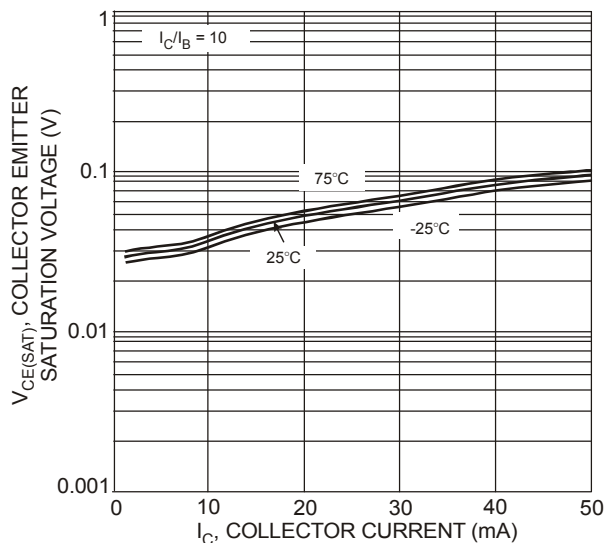


Fig. 3 Typical Collector Emitter Saturation Voltage vs. Collector Current

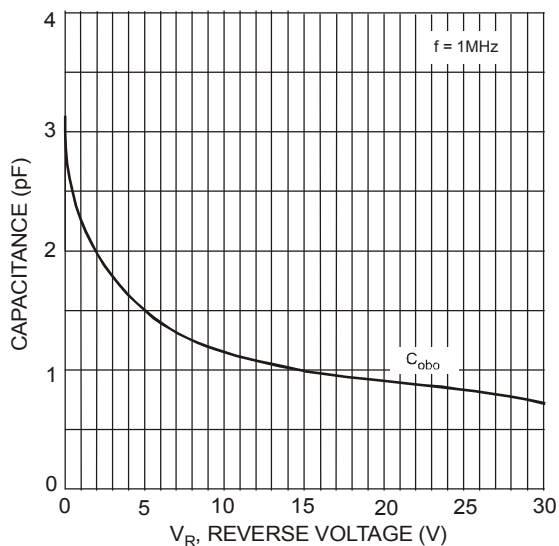


Fig. 4 Typical Capacitance Characteristics

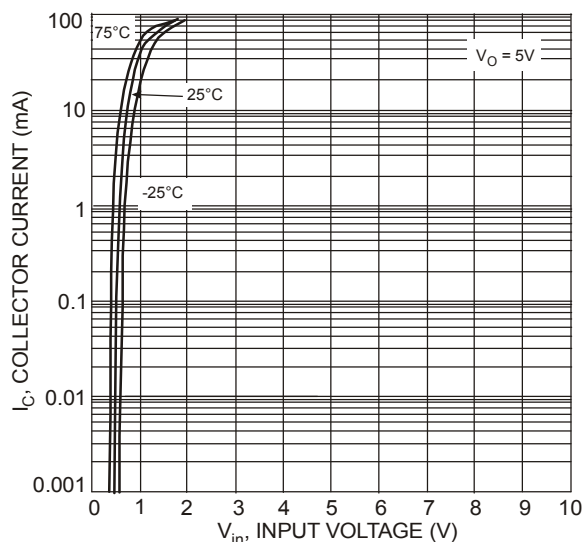


Fig. 5 Collector Current vs. Input Voltage

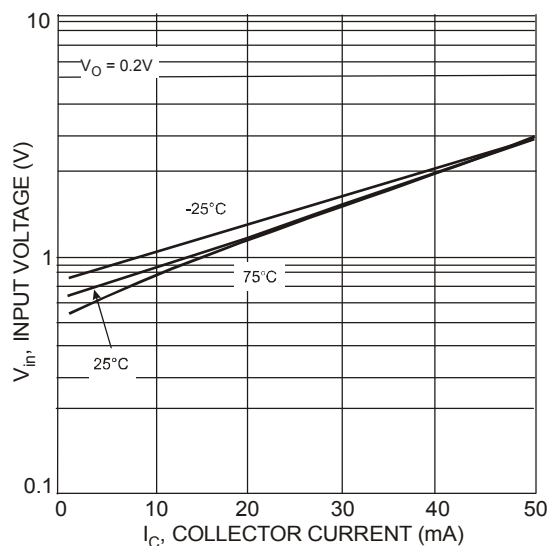
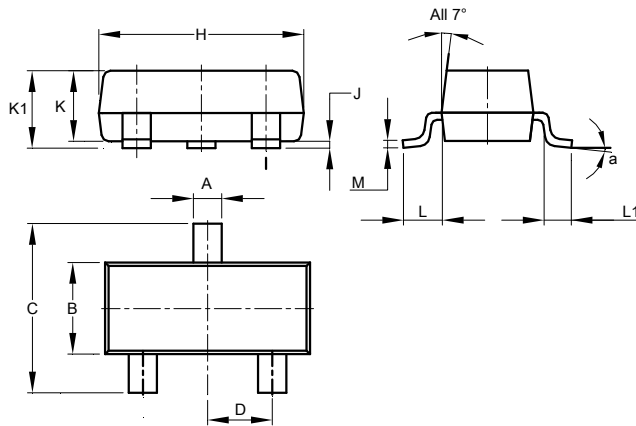


Fig. 6 Input Voltage vs. Collector Current

## Package Outline Dimensions

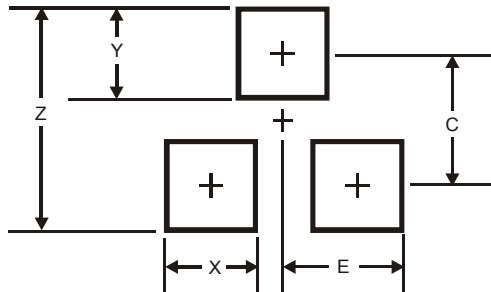
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



| SOT23                |       |       |       |
|----------------------|-------|-------|-------|
| Dim                  | Min   | Max   | Typ   |
| A                    | 0.37  | 0.51  | 0.40  |
| B                    | 1.20  | 1.40  | 1.30  |
| C                    | 2.30  | 2.50  | 2.40  |
| D                    | 0.89  | 1.03  | 0.915 |
| F                    | 0.45  | 0.60  | 0.535 |
| G                    | 1.78  | 2.05  | 1.83  |
| H                    | 2.80  | 3.00  | 2.90  |
| J                    | 0.013 | 0.10  | 0.05  |
| K                    | 0.890 | 1.00  | 0.975 |
| K1                   | 0.903 | 1.10  | 1.025 |
| L                    | 0.45  | 0.61  | 0.55  |
| L1                   | 0.25  | 0.55  | 0.40  |
| M                    | 0.085 | 0.150 | 0.110 |
| a                    | 8°    |       |       |
| All Dimensions in mm |       |       |       |

## Suggested Pad Layout

Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.



| Dimensions | Value (in mm) |
|------------|---------------|
| Z          | 2.9           |
| X          | 0.8           |
| Y          | 0.9           |
| C          | 2.0           |
| E          | 1.35          |

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