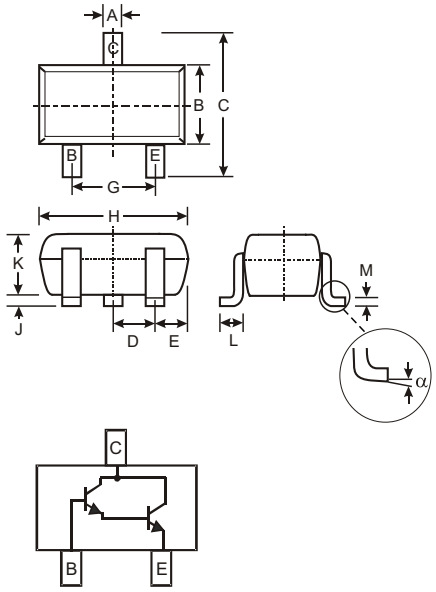
# MMSTA13/MMSTA14

## NPN SURFACE MOUNT DARLINGTON TRANSISTOR

SPICE MODEL: MMSTA13 MMSTA14

## Features

- Epitaxial Planar Die Construction
- Complementary PNP Type Available (MMSTA63/MMSTA64)
- Ideal for Medium Power Amplification and Switching
- High Current Gain
- Ultra-Small Surface Mount Package
- **Available in Lead Free/RoHS Compliant Version (Note 2)**




| SOT-323 | | |
|---|---|---|
| **Dim** | **Min** | **Max** |
| **A** | 0.25 | 0.40 |
| **B** | 1.15 | 1.35 |
| **C** | 2.00 | 2.20 |
| **D** | 0.65 Nominal | |
| **E** | 0.30 | 0.40 |
| **G** | 1.20 | 1.40 |
| **H** | 1.80 | 2.20 |
| **J** | 0.0 | 0.10 |
| **K** | 0.90 | 1.00 |
| **L** | 0.25 | 0.40 |
| **M** | 0.10 | 0.18 |
| α | 0° | 8° |
| **All Dimensions in mm** | | |

## Mechanical Data

- Case: SOT-323
- Case Material: Molded Plastic. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020C
- Terminal Connections: See Diagram
- Terminals: Solderable per MIL-STD-202, Method 208
- Also Available in Lead Free Plating (Matte Tin Finish annealed over Alloy 42 leadframe). Please see Ordering Information, Note 5, on Page 2
- MMSTA13 Marking K2D, K3D (See Page 2)
- MMSTA14 Marking K3D (See Page 2)
- Ordering & Date Code Information: See Page 2
- Weight: 0.006 grams (approximate)




## Maximum Ratings

@ $T_A$ = 25°C unless otherwise specified

| Characteristic | Symbol | MMSTA13 | MMSTA14 | Unit |
|---|---|---|---|---|
| Collector-Base Voltage | $V_{CBO}$ | 30 | | V |
| Collector-Emitter Voltage | $V_{CEO}$ | 30 | | V |
| Emitter-Base Voltage | $V_{EBO}$ | 10 | | V |
| Collector Current - Continuous (Note 1) | $I_C$ | 300 | | mA |
| Power Dissipation (Note 1) | $P_d$ | 200 | | mW |
| Thermal Resistance, Junction to Ambient (Note 1) | $R_{\theta JA}$ | 625 | | K/W |
| Operating and Storage and Temperature Range | $T_j$, $T_{STG}$ | -55 to +150 | | °C |

Note: 1. Device mounted on FR-4 PCB, 1 inch x 0.85 inch x 0.062 inch; pad layout as shown on Diodes Inc. suggested pad layout document AP02001, which can be found on our website at http://www.diodes.com/datasheets/ap02001.pdf.
2. No purposefully added lead.

## Electrical Characteristics @ $T_A$ = 25°C unless otherwise specified

| Characteristic | | Symbol | Min | Max | Unit | Test Condition |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS (Note 3)** | | | | | | |
| Collector-Emitter Breakdown Voltage | | $V_{(BR)CEO}$ | 30 | — | V | $I_C$ = 100μA $V_{BE}$ = 0V |
| Collector Cutoff Current | | $I_{CBO}$ | — | 100 | nA | $V_{CB}$ = 30V, $I_E$ = 0 |
| Emitter Cutoff Current | | $I_{EBO}$ | — | 100 | nA | $V_{EB}$ = 10V, $I_C$ = 0 |
| **ON CHARACTERISTICS (Note 3)** | | | | | | |
| DC Current Gain | MMSTA13<br>MMSTA14<br>MMSTA13<br>MMSTA14 | $h_{FE}$ | 5,000<br>10,000<br>10,000<br>20,000 | — | — | $I_C$ = 10mA, $V_{CE}$ = 5.0V<br>$I_C$ = 10mA, $V_{CE}$ = 5.0V<br>$I_C$ = 100mA, $V_{CE}$ = 5.0V<br>$I_C$ = 100mA, $V_{CE}$ = 5.0V |
| Collector-Emitter Saturation Voltage | | $V_{CE(SAT)}$ | — | 1.5 | V | $I_C$ = 100mA, $I_B$ = 100μA |
| Base-Emitter Saturation Voltage | | $V_{BE(SAT)}$ | — | 2.0 | V | $I_C$ = 100mA, $V_{CE}$ = 5.0V |
| **SMALL SIGNAL CHARACTERISTICS** | | | | | | |
| Output Capacitance | | $C_{obo}$ | 8.0 Typical | | pF | $V_{CB}$ = 10V, f = 1.0MHz, $I_E$ = 0 |
| Input Capacitance | | $C_{ibo}$ | 15 Typical | | pF | $V_{EB}$ = 0.5V, f = 1.0MHz, $I_C$ = 0 |
| Current Gain-Bandwidth Product | | $f_T$ | 125 | — | MHz | $V_{CE}$ = 5.0V, $I_C$ = 10mA, f = 100MHz |

## Ordering Information (Note 4)

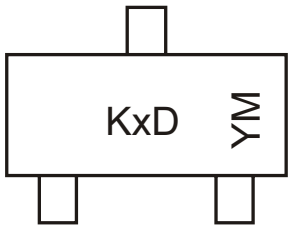
| Device | Packaging | Shipping |
|---|---|---|
| MMSTA13-7<br>MMSTA14-7 | SOT-323 | 3000/Tape & Reel |

Notes: 3. Short duration test pulse used to minimize self-heating effect.

4. For Packaging Details, go to our website at http://www.diodes.com/datasheets/ap02007.pdf.

5. For Lead Free/RoHS Compliant version part numbers, please add "-F" suffix to the part numbers above. Example: MMSTA14-7-F.

## Marking Information




KxD = Product Type Marking Code, e.g., K2D = MMSTA13
YM = Date Code Marking
Y = Year ex: N = 2002
M = Month ex: 9 = September

Date Code Key

| Year | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Code | J | K | L | M | N | P | R | S | T | U | V | W |

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

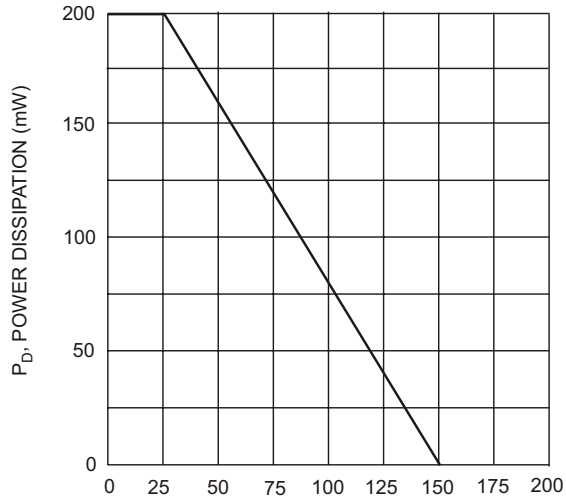



Fig. 1, Max Power Dissipation vs Ambient Temperature

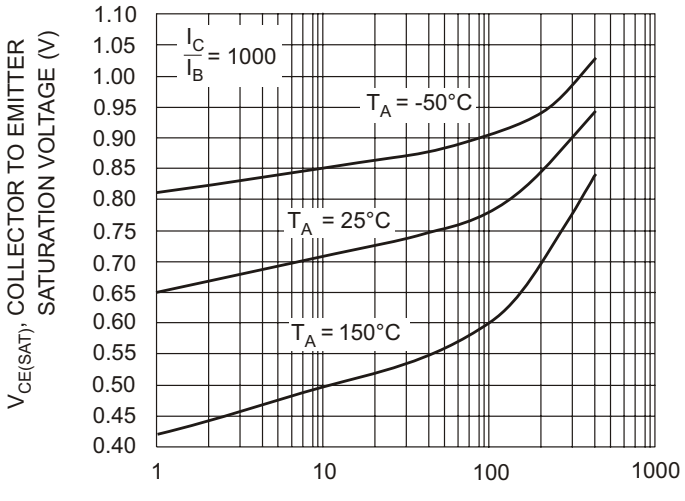



Fig. 2, Collector Emitter Saturation Voltage vs. Collector Current

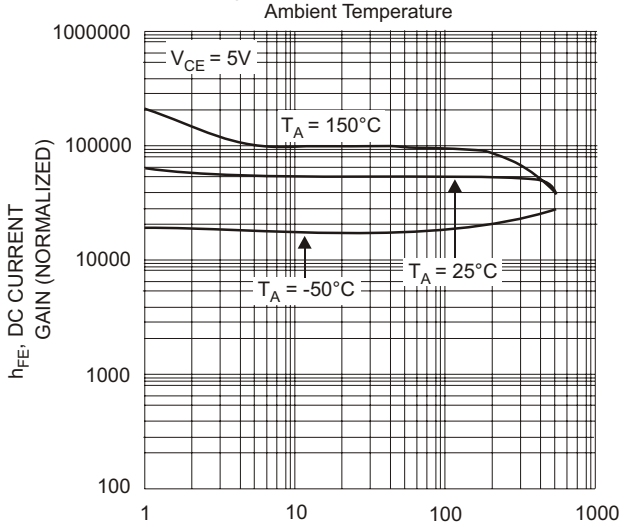



Fig. 3, DC Current Gain vs Collector Current

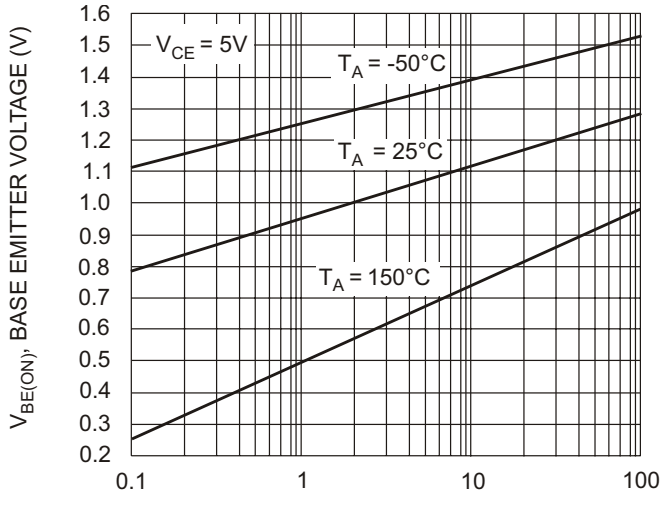



Fig. 4, Base Emitter Voltage vs. Collector Current

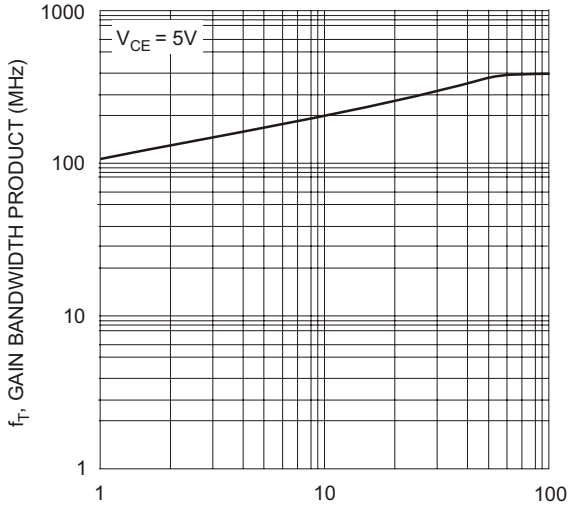



Fig. 5, Gain Bandwidth Product vs Collector Current