

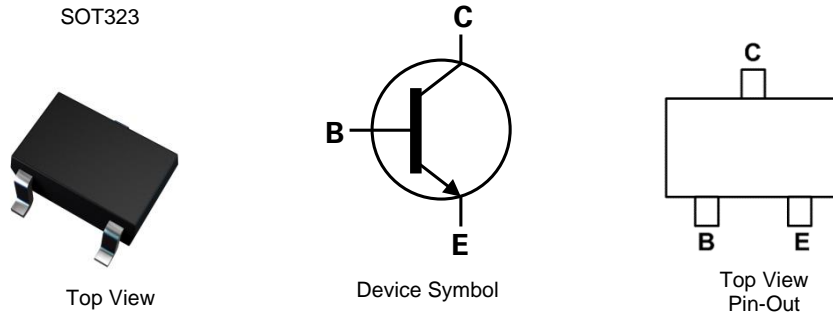
40V NPN SMALL SIGNAL TRANSISTOR IN SOT323

Features

- Ultra-Small Surface-Mount Package
- Epitaxial Planar Die Construction
- Ideal for Low-Power Amplification and Switching
- Complementary PNP Type: MMST4403
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **For automotive applications requiring specific change control (i.e. parts qualified to AEC-Q100/101/104/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please [contact us](mailto:contact@diodes.com) or your local Diodes representative. <https://www.diodes.com/quality/product-definitions/>**

Mechanical Data

- Package: SOT323
- Package 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 Lead, Solderable per MIL-STD-202, Method 208
- Weight: 0.006 grams (Approximate)

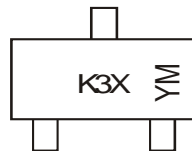


Ordering Information (Note 4)

| Part Number | Package | Marking | Reel Size (inches) | Tape Width (mm) | Packing | |
|---------------|---------|---------|--------------------|-----------------|---------|---------|
| | | | | | Qty. | Carrier |
| MMST4401-7-F | SOT323 | K3X | 7 | 8 | 3,000 | Reel |
| MMST4401-13-F | SOT323 | K3X | 13 | 8 | 10,000 | Reel |

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
 2. See <https://www.diodes.com/quality/lead-free/> 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. For packaging details, go to our website at <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

Marking Information



K3X = Product Type Marking Code
 YM = Date Code Marking
 Y or \bar{Y} = Year (ex: L = 2024)
 M or \bar{M} = Month (ex: 9 = September)

Date Code Key

| Year | 2010 | - | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 |
|-------|------|-----|------|------|------|------|------|------|------|------|------|------|
| Code | X | - | K | L | M | N | P | R | S | T | U | V |
| 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_A = +25°C, unless otherwise specified.)

| Characteristic | Symbol | Value | Unit |
|---------------------------|------------------|-------|------|
| Collector-Base Voltage | V _{CB0} | 60 | V |
| Collector-Emitter Voltage | V _{CEO} | 40 | V |
| Emitter-Base Voltage | V _{EBO} | 6 | V |
| Collector Current | I _C | 600 | mA |

Thermal Characteristics (@T_A = +25°C, unless otherwise specified.)

| Characteristic | Symbol | Value | Unit |
|--|-----------------------------------|-------------|------|
| Power Dissipation (Note 5) | P _D | 200 | mW |
| Thermal Resistance, Junction to Ambient Air (Note 5) | R _{θJA} | 625 | °C/W |
| Operating and Storage Temperature Range | T _J , T _{STG} | -55 to +150 | °C |

ESD Ratings (Note 6)

| Characteristic | Symbol | Value | Unit | JEDEC Class |
|--|---------|-------|------|-------------|
| Electrostatic Discharge - Human Body Model | ESD HBM | 4,000 | V | 3A |
| Electrostatic Discharge - Charged Device Model | ESD CDM | 1,000 | V | C3 |

Notes: 5. Device mounted on FR-4 PCB, 1 inch x 0.85 inch x 0.062 inch.
 6. Refer to JEDEC specification JS-001-2017 and JS-002-2022.

Thermal Characteristics and Derating Information

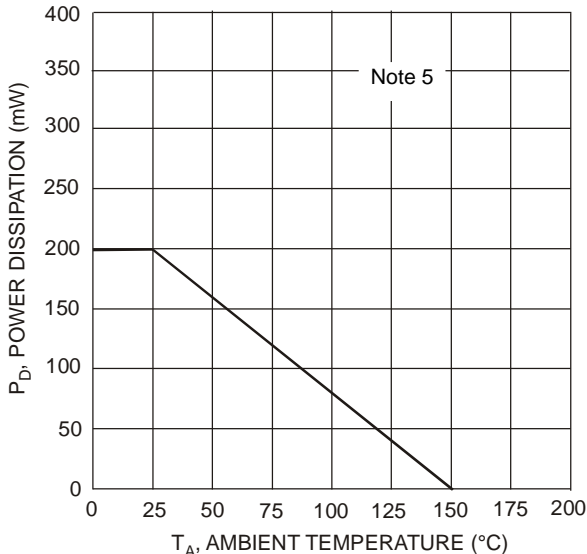


Fig. 1, Max Power Dissipation vs Ambient Temperature

Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|--|----------------------|-----------|-----|-------------|--------------------|--|
| OFF CHARACTERISTICS | | | | | | |
| Collector-Base Breakdown Voltage | BV _{CB0} | 60 | — | — | V | I _C = 100μA, I _B = 0 |
| Collector-Emitter Breakdown Voltage (Note 7) | BV _{CEO} | 40 | — | — | V | I _C = 1.0mA, I _B = 0 |
| Emitter-Base Breakdown Voltage | BV _{EBO} | 6 | — | — | V | I _E = 100μA, I _C = 0 |
| Collector Cutoff Current | I _{CEX} | — | — | 100 | nA | V _{CE} = 35V, V _{EB(off)} = 0.4V |
| Base Cutoff Current | I _{BL} | — | — | 100 | nA | V _{CE} = 35V, V _{EB(off)} = 0.4V |
| ON CHARACTERISTICS (Note 7) | | | | | | |
| DC Current Gain | h _{FE} | 20 | — | — | — | I _C = 100μA, V _{CE} = 1.0V |
| | | 40 | — | — | | I _C = 1.0mA, V _{CE} = 1.0V |
| | | 80 | — | — | | I _C = 10mA, V _{CE} = 1.0V |
| | | 100 | — | 300 | | I _C = 150mA, V _{CE} = 1.0V |
| | | 40 | — | — | | I _C = 500mA, V _{CE} = 2.0V |
| Collector-Emitter Saturation Voltage | V _{CE(sat)} | — | — | 0.4 0.75 | V | I _C = 150mA, I _B = 15mA I _C = 500mA, I _B = 50mA |
| Base-Emitter Saturation Voltage | V _{BE(sat)} | 0.75 — | — | 0.95 1.2 | V | I _C = 150mA, I _B = 15mA I _C = 500mA, I _B = 50mA |
| SMALL SIGNAL CHARACTERISTICS | | | | | | |
| Output Capacitance | C _{obo} | — | — | 8.5 | pF | V _{CB} = 5V, f = 1MHz, I _E = 0 |
| Input Capacitance | C _{ibo} | — | — | 30 | pF | V _{EB} = 0.5V, f = 1MHz, I _C = 0 |
| Input Impedance | h _{ie} | 1.0 | — | 15 | kΩ | V _{CE} = 10V, I _C = 1.0mA f = 1kHz |
| Voltage Feedback Ratio | h _{re} | 0.1 | — | 8.0 | x 10 ⁻⁴ | |
| Small Signal Current Gain | h _{fe} | 40 | — | 500 | — | |
| Output Admittance | h _{oe} | 1.0 | — | 30 | μS | |
| Current Gain Bandwidth Product | f _T | 250 | — | — | MHz | |
| SMALL SIGNAL CHARACTERISTICS | | | | | | |
| Delay Time | t _d | — | — | 15 | ns | V _{CC} = 30V, I _C = 150mA |
| Rise Time | t _r | — | — | 20 | ns | V _{BE(off)} = 2.0V, I _{B1} = 15mA |
| Storage Time | t _s | — | — | 225 | ns | V _{CC} = 30V, I _C = 150mA |
| Fall Time | t _f | — | — | 30 | ns | I _{B1} = -I _{B2} = 15mA |

Note: 7. Short duration pulse test used to minimize self-heating effect.

Typical Electrical Characteristics (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

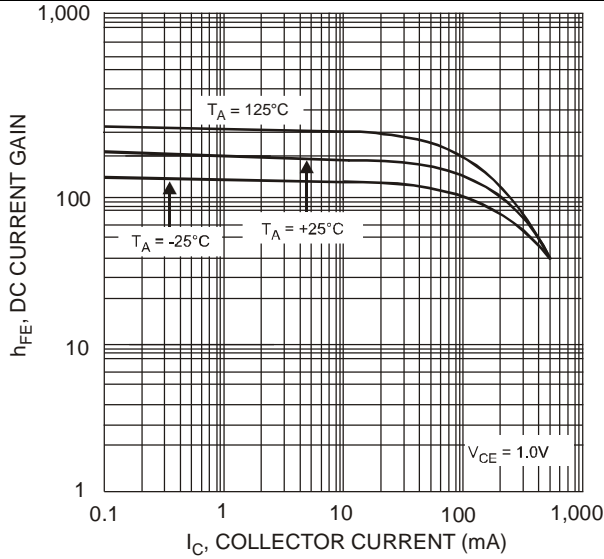


Fig. 2 Typical DC Current Gain vs Collector Current

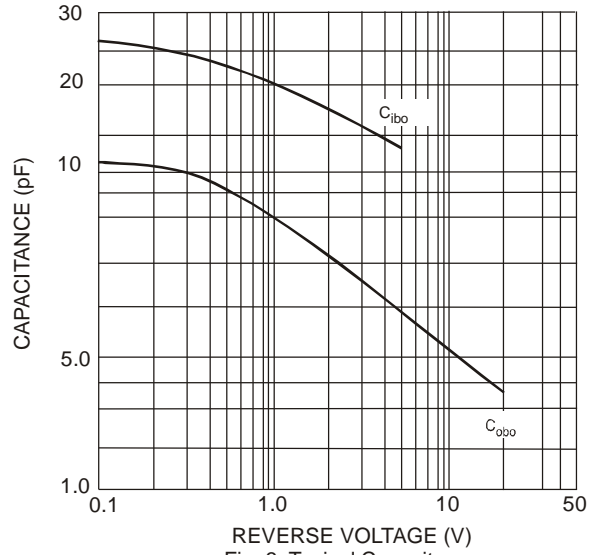


Fig. 3 Typical Capacitance

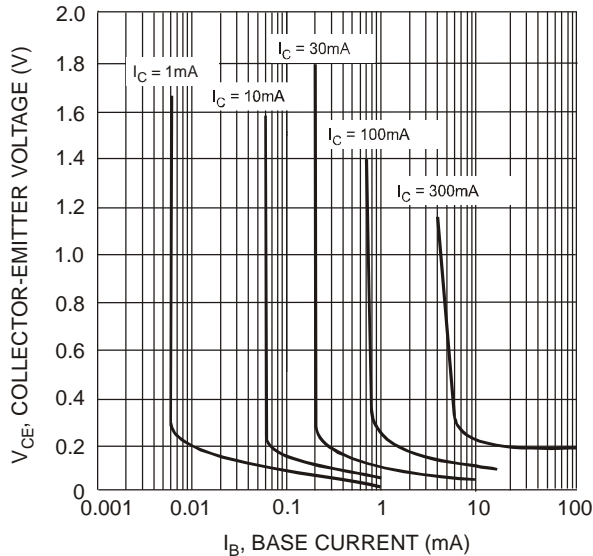


Fig. 4 Typical Collector Saturation Region

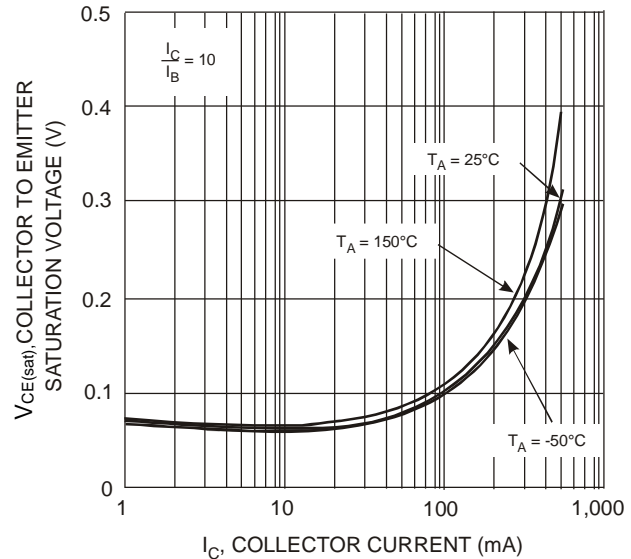


Fig. 5 Collector Emitter Saturation Voltage vs. Collector Current

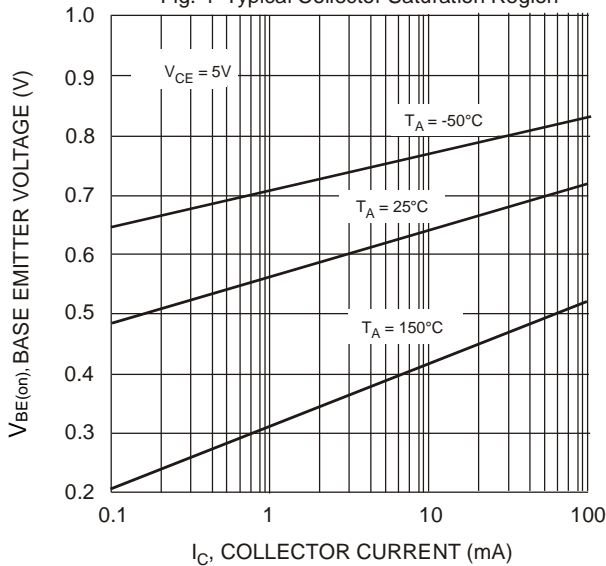


Fig. 6 Base Emitter Voltage vs. Collector Current

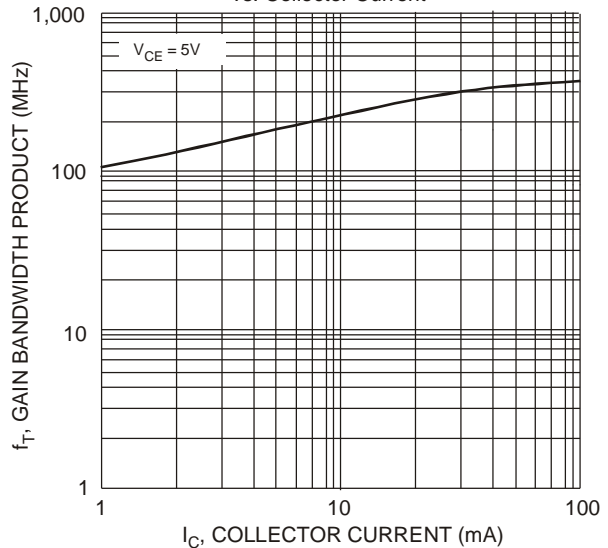
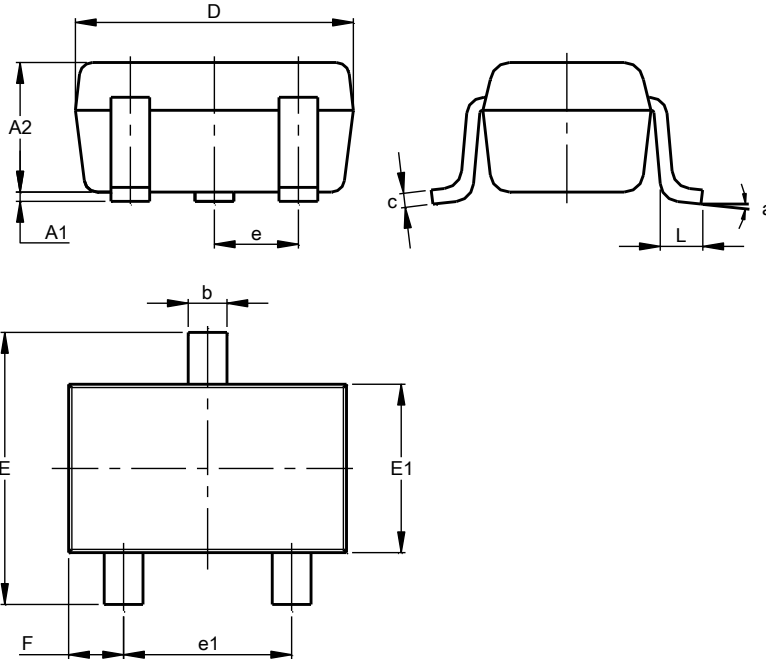


Fig. 7 Gain Bandwidth Product vs. Collector Current

Package Outline Dimensions

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

SOT323

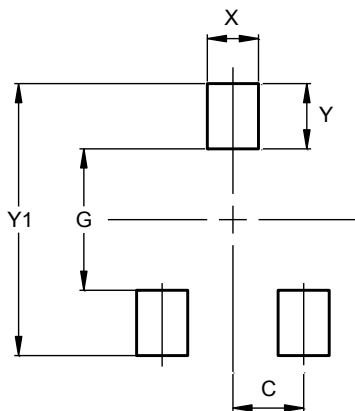


| SOT323 | | | |
|-----------------------------|-----------|-------|-------|
| Dim | Min | Max | Typ |
| A1 | 0.00 | 0.10 | 0.05 |
| A2 | 0.90 | 1.00 | 0.95 |
| b | 0.25 | 0.40 | 0.30 |
| c | 0.10 | 0.18 | 0.11 |
| D | 1.80 | 2.20 | 2.15 |
| E | 2.00 | 2.20 | 2.10 |
| E1 | 1.15 | 1.35 | 1.30 |
| e | 0.650 BSC | | |
| e1 | 1.20 | 1.40 | 1.30 |
| F | 0.375 | 0.475 | 0.425 |
| L | 0.25 | 0.40 | 0.30 |
| a | 0° | 8° | -- |
| All Dimensions in mm | | | |

Suggested Pad Layout

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

SOT323



| Dimensions | Value (in mm) |
|------------|---------------|
| C | 0.650 |
| G | 1.300 |
| X | 0.470 |
| Y | 0.600 |
| Y1 | 2.500 |

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