



DESCRIPTION

The MMBT4403L is available in SOT-23 package.

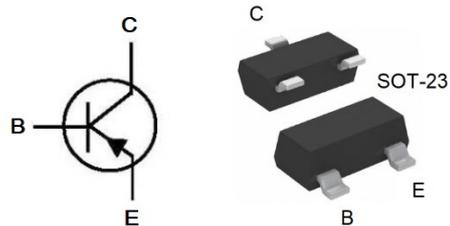
FEATURE

- Complementary NPN Type: MMBT4401L
- Epoxy Meets UL 94 V-0 Flammability Rating

APPLICATION

- High Stability and High Reliability
- General Purpose Application
- Switching Application.

PIN DESCRIPTION



ORDERING INFORMATION

| Package Type | Part Number |
|--|--------------------|
| SOT-23 | MMBT4403L |
| Note | SPQ: 3,000pcs/Reel |
| AiT provides all RoHS Compliant Products | |

| PIN# | DESCRIPTION | |
|------|-------------|-----------|
| 1 | B | BASE |
| 2 | E | EMITTER |
| 3 | C | COLLECTOR |

ABSOLUTE MAXIMUM RATINGS

T_A = 25°C, unless otherwise noted.

| | | |
|---|-----------------------|--------------|
| V _{CEO} , Collector–Emitter Voltage | | -40V |
| V _{CBO} , Collector–Base Voltage | | -40V |
| V _{EBO} , Emitter–Base Voltage | | -5V |
| I _C , Continuous Collector Current | | -600mA |
| P _D , Total Device Dissipation FR-5 Board ⁽¹⁾ | T _A = 25°C | 225mW |
| | Derate above 25°C | 1.8 mW/°C |
| R _{θJA} , Thermal Resistance, Junction-Ambient | | 556°C/W |
| P _D , Total Device Dissipation Alumina Substrate ⁽²⁾ | T _A = 25°C | 300mW |
| | Derate above 25°C | 2.4 mW/°C |
| R _{θJA} , Thermal Resistance, Junction-Ambient | | 417°C/W |
| T _J , Operation Junction Temperature | | -55°C~+150°C |
| T _{STG} , Storage Temperature | | -55°C~+150°C |

Stresses above may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated in the Electrical Characteristics are not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

(1) FR-5=1.0x0.75x0.062 in.

(2) Alumina=0.4x0.3x0.024 in. 99.5% alumina.



ELECTRICAL CHARACTERISTICS

T_A = 25°C, unless otherwise noted.

| Parameter | Symbol | Conditions | Min | Typ. | Max | Unit |
|---------------------------------------|----------------------|--|-------|------|-------|-------------------|
| OFF CHARACTERISTICS | | | | | | |
| Collector-Emitter * Breakdown Voltage | V _{(BR)CEO} | I _C = -1mA, I _B = 0 | -40 | - | - | V |
| Collector-Base Breakdown Voltage | V _{(BR)CBO} | I _C = -0.1mA, I _E = 0 | -40 | - | - | V |
| Emitter-Base Breakdown Voltage | V _{(BR)EBO} | I _E = -0.1mA, I _C = 0 | -5 | - | - | V |
| Base Cutoff Current | I _{BEV} | V _{CE} = -35V, V _{EB} = -0.4V | - | - | -0.1 | μA |
| Collector Cutoff Current | I _{CEX} | V _{CE} = -35V, V _{EB} = -0.4V | - | - | -0.1 | μA |
| ON CHARACTERISTICS | | | | | | |
| DC Current Gain | h _{FE} | V _{CE} = -1V, I _C = -0.1mA | 30 | - | - | - |
| | | V _{CE} = -1V, I _C = -1mA | 60 | - | - | |
| | | V _{CE} = -1V, I _C = -10mA | 100 | - | - | |
| | | V _{CE} = -2V, I _C = -150mA * | 100 | - | 300 | |
| | | V _{CE} = -2V, I _C = -500mA* | 20 | - | - | |
| Collector-Emitter Saturation Voltage* | V _{CE(sat)} | I _C = -150mA, I _B = -15mA | - | - | -0.40 | V |
| | | I _C = -500mA, I _B = -50mA | - | - | -0.75 | |
| Base-Emitter Saturation Voltage* | V _{BE(sat)} | I _C = -150mA, I _B = -15mA | -0.75 | - | -0.95 | V |
| | | I _C = -500mA, I _B = -50mA | - | - | -1.30 | |
| SMALL-SIGNAL CHARACTERISTICS | | | | | | |
| Current-Gain Bandwidth Product | f _T | V _{CE} = -10V, I _C = -20mA, f=100MHz | 200 | - | - | MHz |
| Collector-Base Capacitance | C _{cb} | V _{CB} = -10V, I _E = 0, f=1MHz | - | - | 8.5 | pF |
| Emitter-Base Capacitance | C _{eb} | V _{BE} = -0.5V, I _C = 0, f=1MHz | - | - | 30 | pF |
| Input Impedance | h _{ie} | V _{CE} = -10V, I _C = -1mA, f=1kHz | 1.5 | - | 15 | kΩ |
| Voltage Feedback Ratio | h _{re} | V _{CE} = -10V, I _C = -1mA, f=1kHz | 0.1 | - | 8.0 | X10 ⁻⁴ |
| Small-Signal Current Gain | h _{fe} | V _{CE} = -10V, I _C = -1mA, f=1kHz | 60 | - | 500 | - |
| Output Admittance | h _{oe} | V _{CE} = -10V, I _C = -1mA, f=1kHz | 1.0 | - | 100 | μmhos |
| SWITCHING CHARACTERISTICS | | | | | | |
| Delay Time | t _d | V _{CC} = -30V, V _{EB} = -2V, I _C = -150mA, I _{B1} = -15mA, | - | - | 15 | ns |
| Rise Time | t _r | | - | - | 20 | |
| Storage Time | t _s | V _{CC} = -30V, I _C = -150mA, I _{B1} = I _{B2} = -15mA | - | - | 225 | ns |
| Fall Time | t _f | | - | - | 30 | |

*Pulse test: pulse width ≤ 300μs, duty cycle ≤ 2.0%



TYPICAL PERFORMANCE CHARACTERISTICS

Fig 1. Turn-On Time

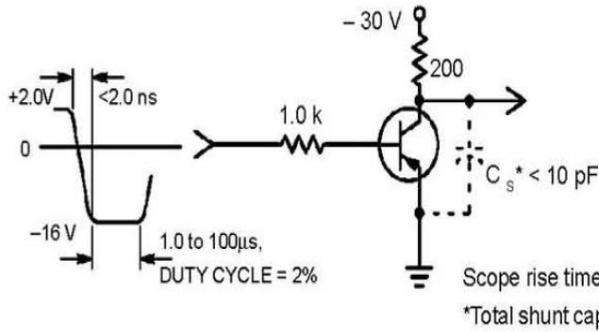


Fig 2. Turn-Off Time

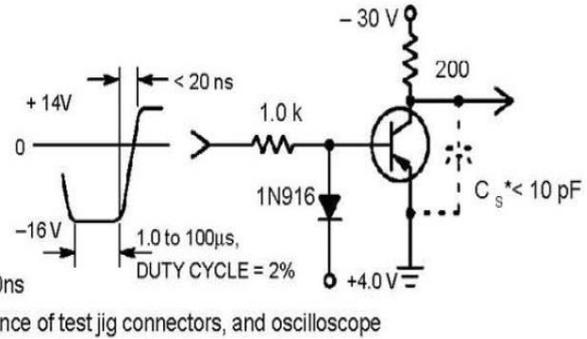


Fig 3. Capacitance

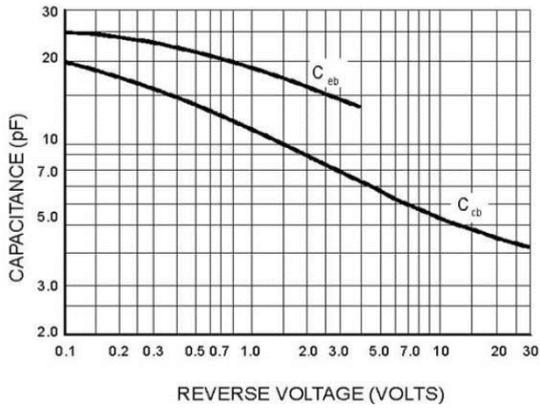


Fig 4. Charge Data

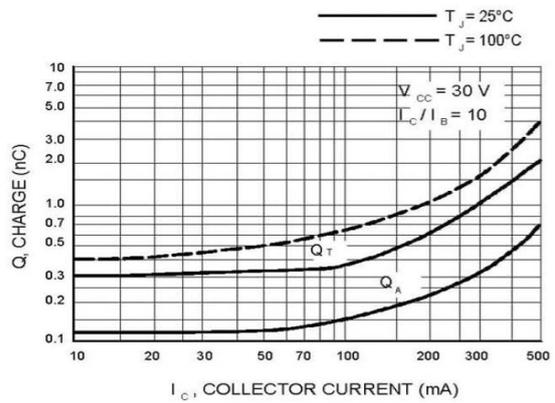


Fig 5. Turn-On Time

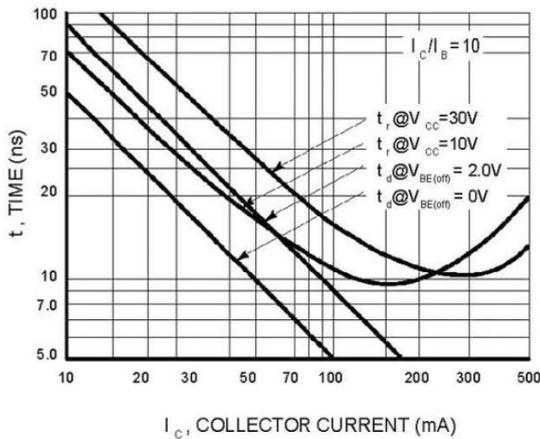


Fig 6. Rise Time

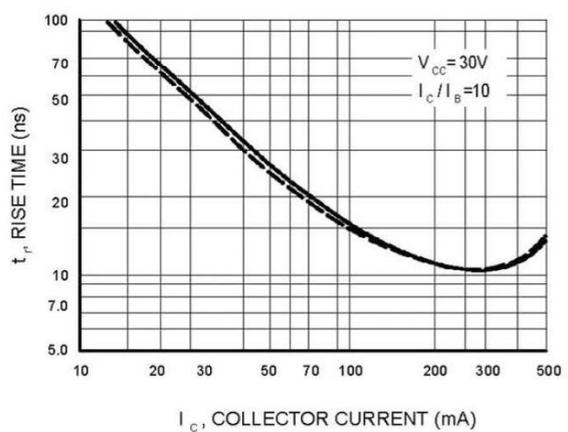




Fig 7. Storage Time

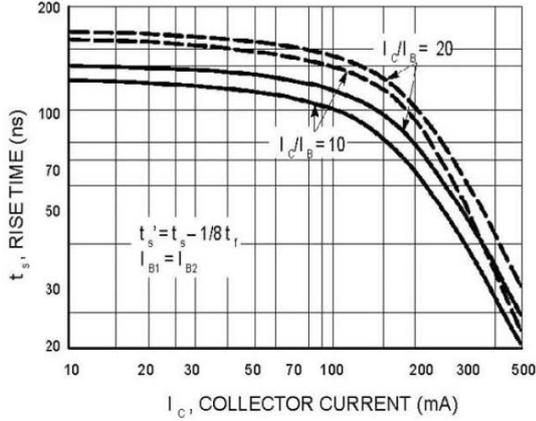


Fig 8. Frequency Effects

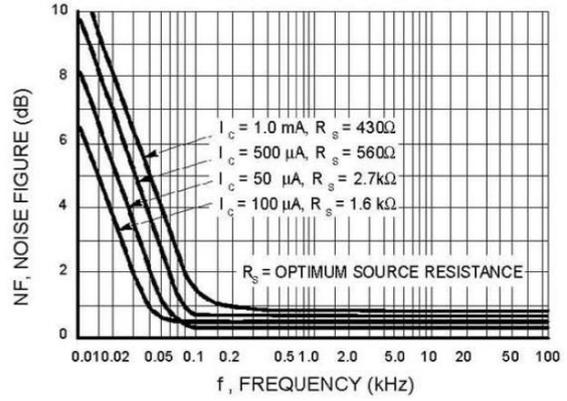


Fig 9. Source Resistance Effects

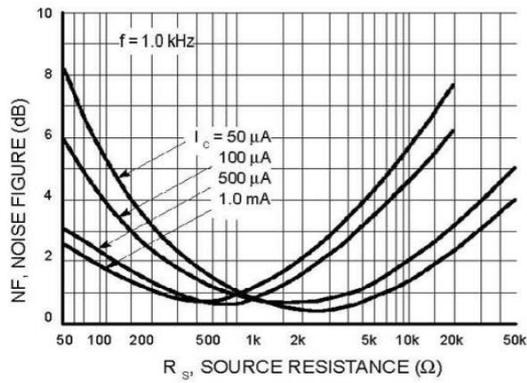


Fig 10. Current Gain

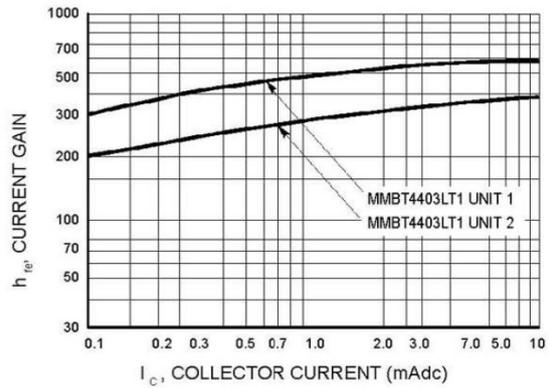


Fig 11. Input Impedance

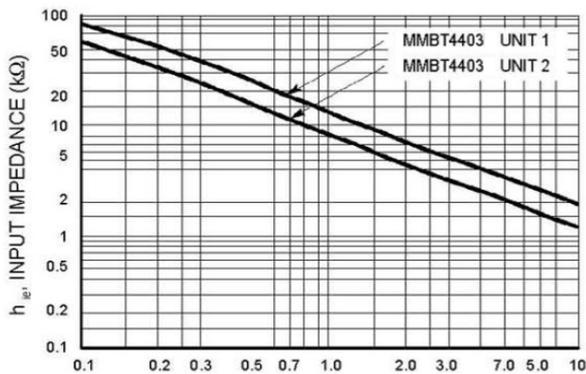


Fig 12. Voltage Feedback Ratio

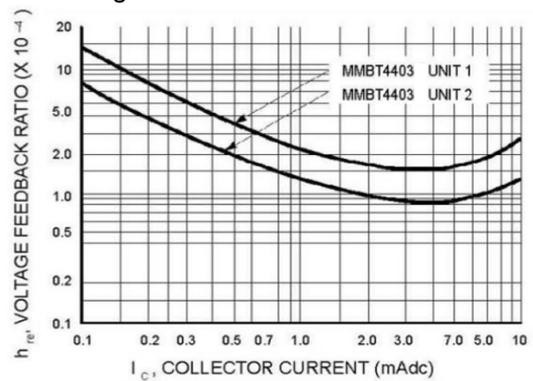




Fig 13. Output Admittance

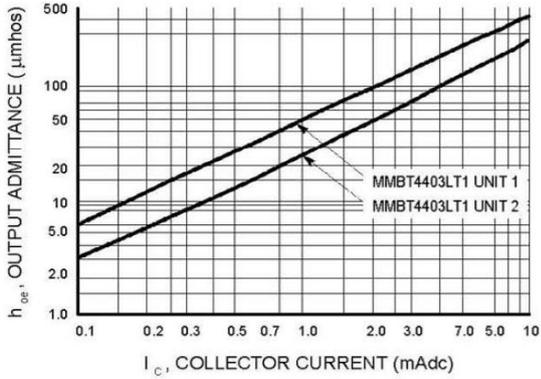


Fig 14. "On" Voltages

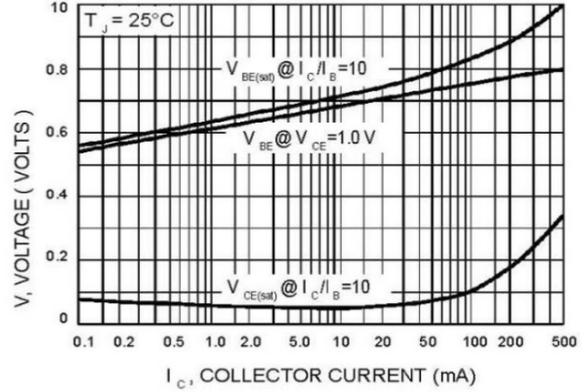


Fig 15. Temperature Coefficients

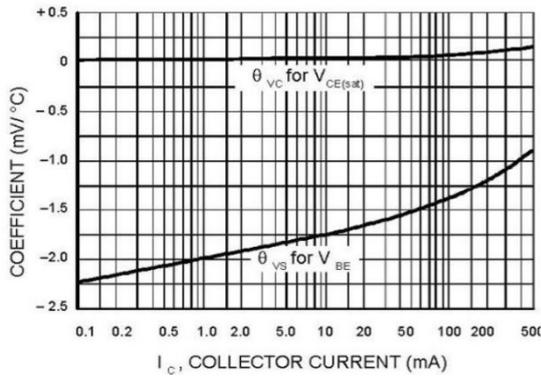


Fig 16. DC Current Gain

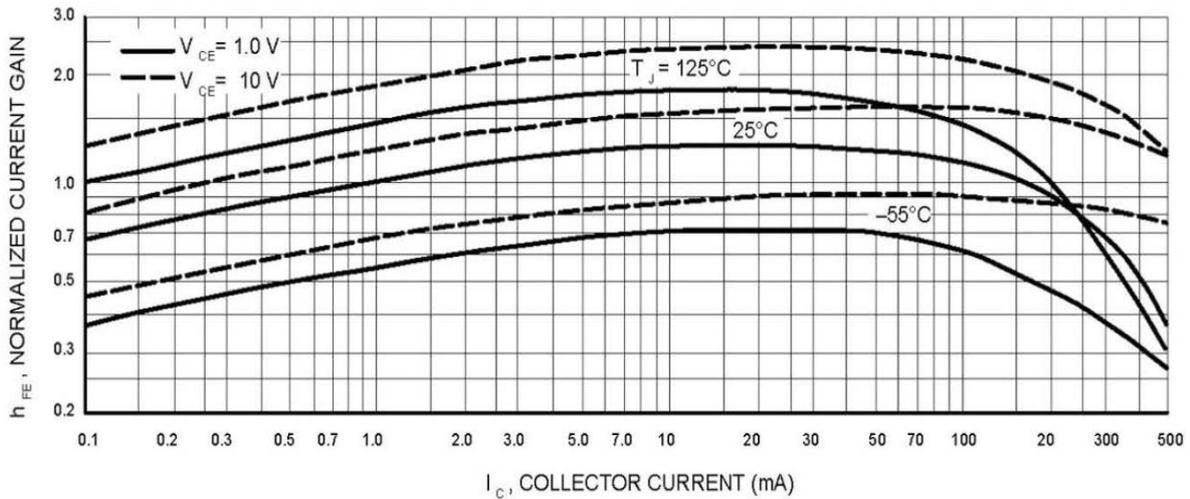
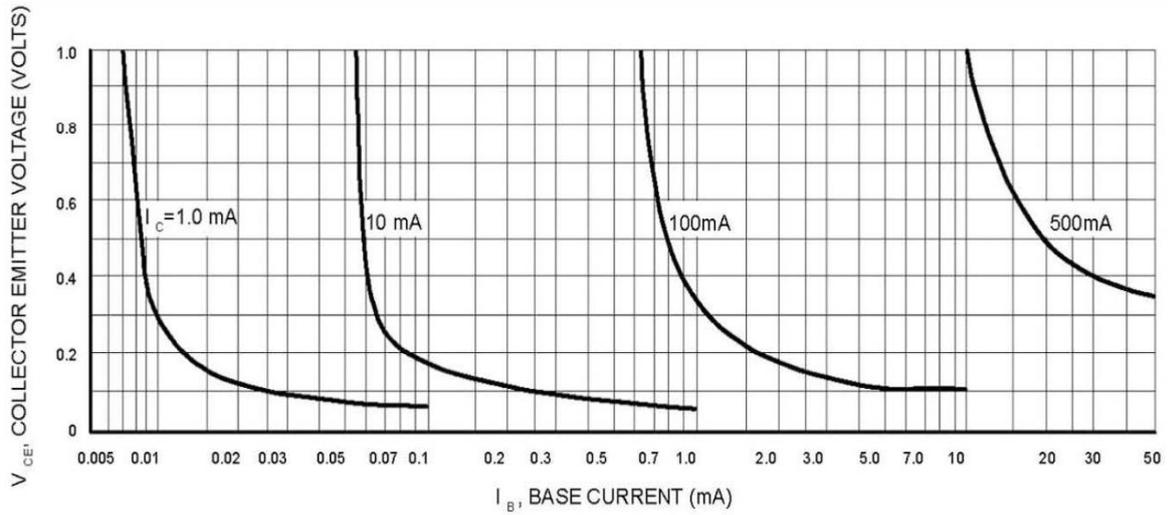




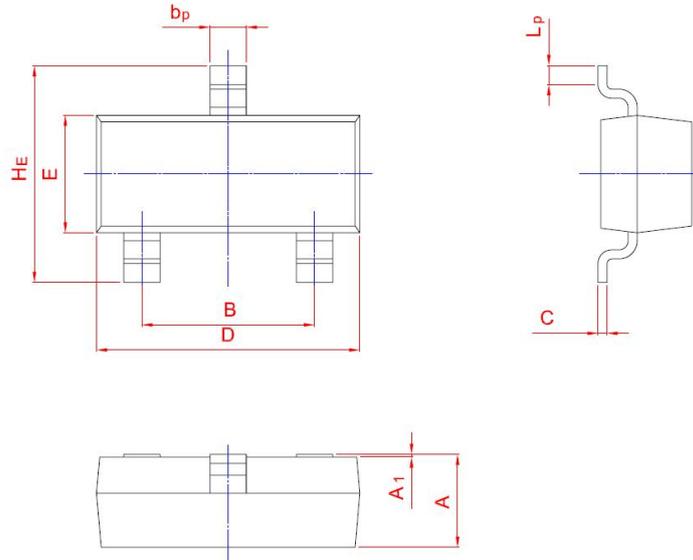
Fig 17. Collector Saturation Region





PACKAGE INFORMATION

Dimension in SOT-23 Package (Unit: mm)



| Symbol | Millimeters | |
|----------------|-------------|-------|
| | Min | Max |
| A | 0.900 | 1.400 |
| B | 1.780 | 2.050 |
| bp | 0.350 | 0.510 |
| C | 0.080 | 0.190 |
| D | 2.700 | 3.100 |
| E | 1.200 | 1.650 |
| HE | 2.100 | 3.000 |
| A ₁ | 0.013 | 0.100 |
| L _p | 0.200 | 0.500 |



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