



DESCRIPTION

The MMBT4401L is available in SOT-23 package.

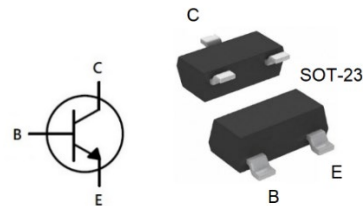
ORDERING INFORMATION

Package Type	Part Number
SOT-23	MMBT4401L
Note	SPQ: 3,000pcs/Reel
AiT provides all RoHS Compliant Products	

APPLICATION

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

PIN DESCRIPTION



PIN#	DESCRIPTION
B	BASE
E	EMITTER
C	COLLECTOR

ABSOLUTE MAXIMUM RATINGS

T_A = 25°C, unless otherwise noted.

V _{CEO} , Collector–Emitter Voltage		40V
V _{CBO} , Collector–Base Voltage		60V
V _{EBO} , Emitter–Base Voltage		6V
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	60	-	-	V
Emitter-Base Breakdown Voltage	V _{(BR)EBO}	I _E = 0.1mA, I _C = 0	6	-	-	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	20	-	-	-
		V _{CE} = 1V, I _C = 1mA	40	-	-	
		V _{CE} = 1V, I _C = 10mA	80	-	-	
		V _{CE} = 1V, I _C = 150mA	100	-	300	
		V _{CE} = 2V, I _C = 500mA	40	-	-	
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	-	-	1.20	
Parameter	Symbol	Conditions	Min	Typ.	Max	Unit
SMALL-SIGNAL CHARACTERISTICS						
Current-Gain Bandwidth Product	f _T	V _{CE} = 10V, I _C = 20mA, f=100MHz	250	-	-	MHz
Collector-Base Capacitance	C _{cb}	V _{CB} = 5V, I _E = 0, f=1MHz	-	-	6.5	pF
Emitter-Base Capacitance	C _{eb}	V _{EB} = 0.5V, I _C = 0, f=1MHz	-	-	30	pF
Input Impedance	h _{ie}	V _{CE} = 10V, I _C = 1mA, f=1kHz	1.0	-	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	40	-	500	-
Output Admittance	h _{oe}	V _{CE} = 10V, I _C = 1mA, f=1kHz	1.0	-	30	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	I _C = 150mA, I _{B1} = 15mA,	-	-	20	
Storage Time	t _s	V _{CC} = 30V, I _C = 150mA, I _{B1} = I _{B2} = 15mA	-	-	225	ns
Fall Time	t _f	I _{B1} = I _{B2} = 15mA	-	-	30	

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



TYPICAL PERFORMANCE CHARACTERISTICS

Fig 1. Turn-On Time

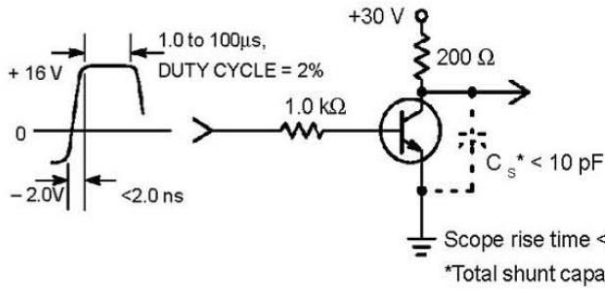


Fig 2. Turn-Off Time

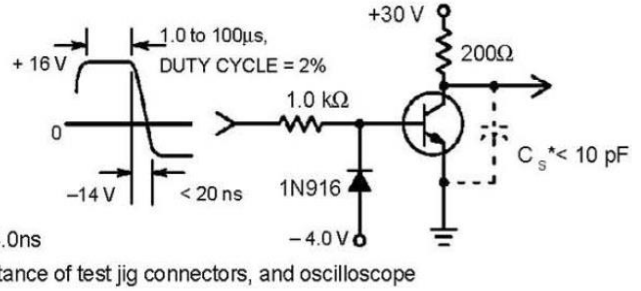


Fig 3. Capacitance

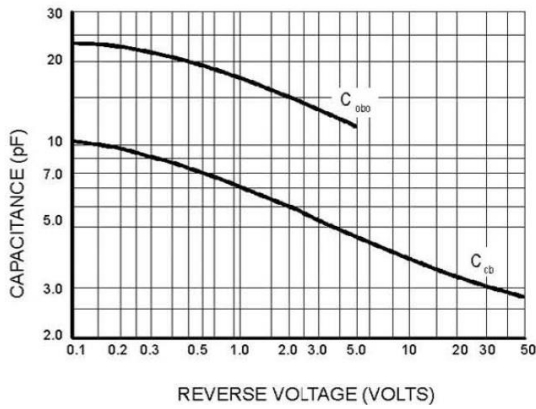


Fig 4. Charge Data

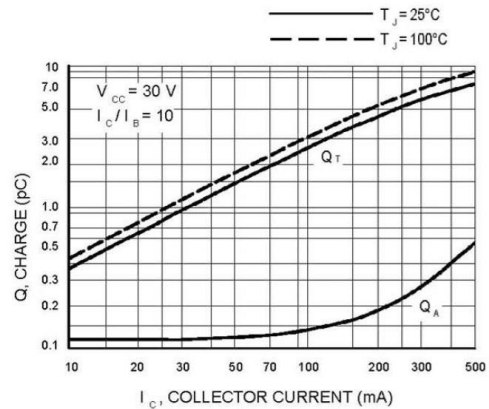


Fig 5. Turn-On Time

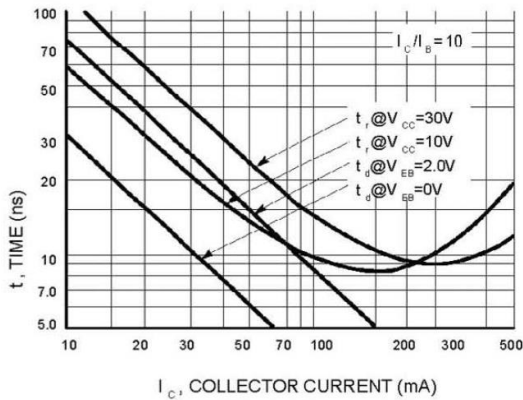


Fig 6. Rise and Fall Time

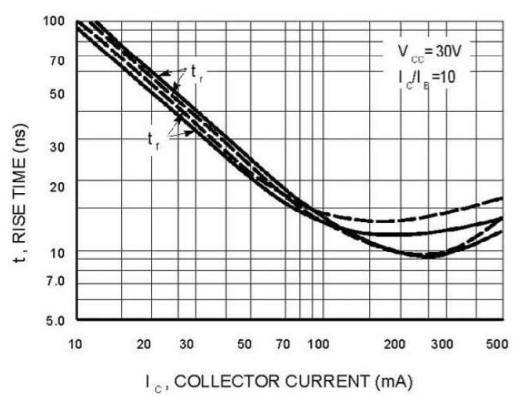




Fig 7. Storage Time

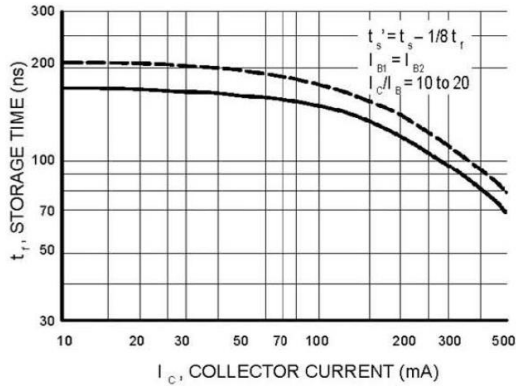


Fig 8. Fall Time

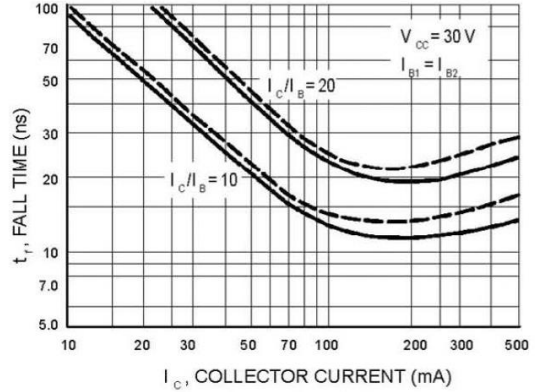


Fig 9. Frequency Effects

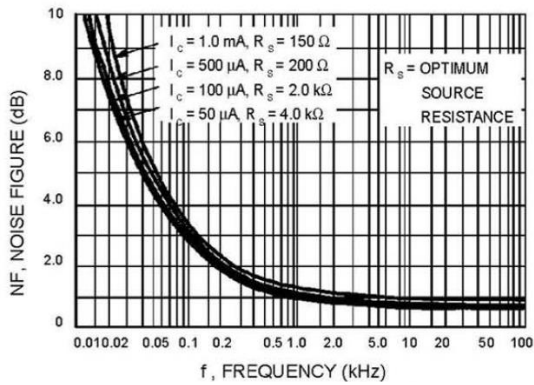


Fig 10. Source Resistance Effects

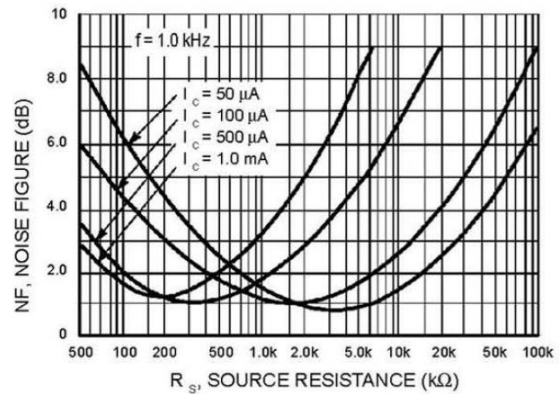


Fig 11. Current Gain

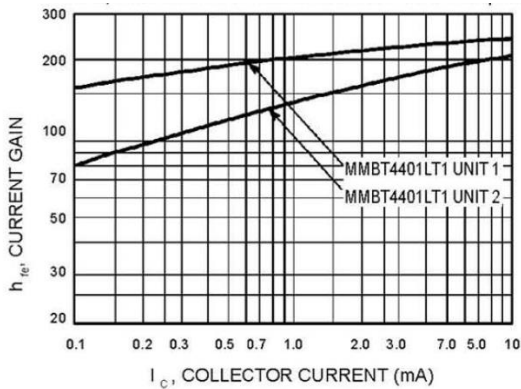


Fig 12. Impedance

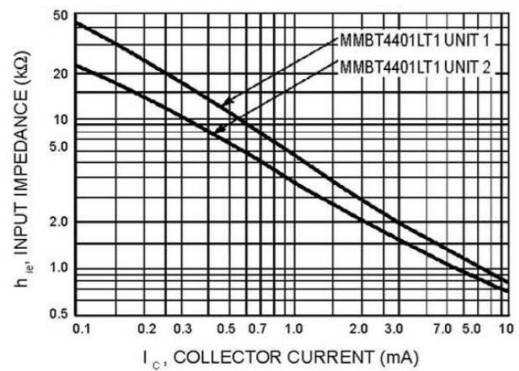




Fig 13. Voltage Feedback Ratio

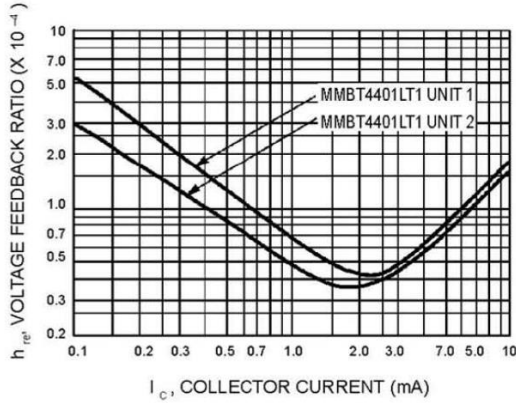


Fig 14. Output Admittance

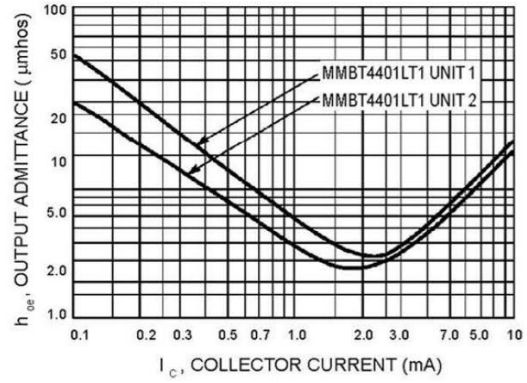


Fig 15. DC Current Gain

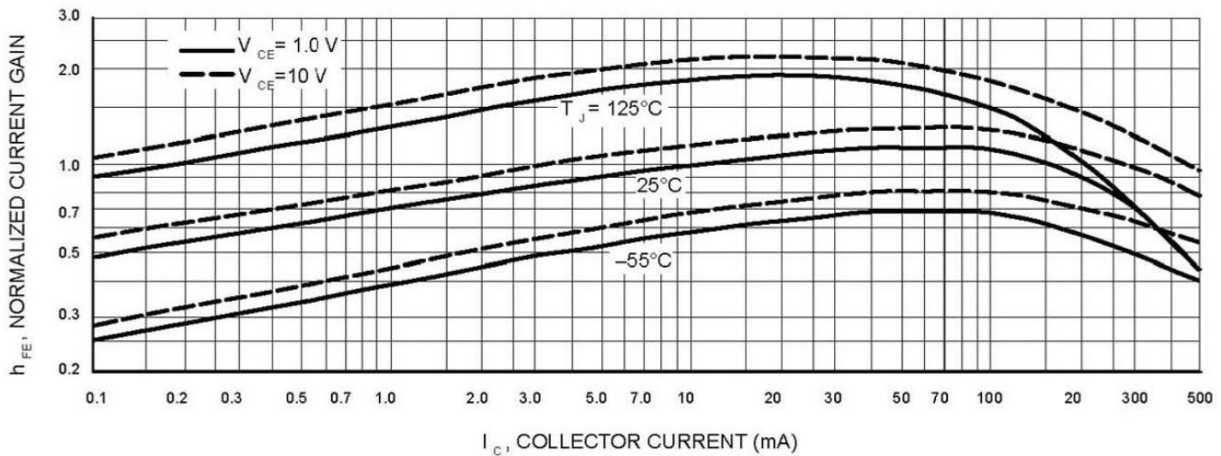


Fig 16. Collector Saturation Region

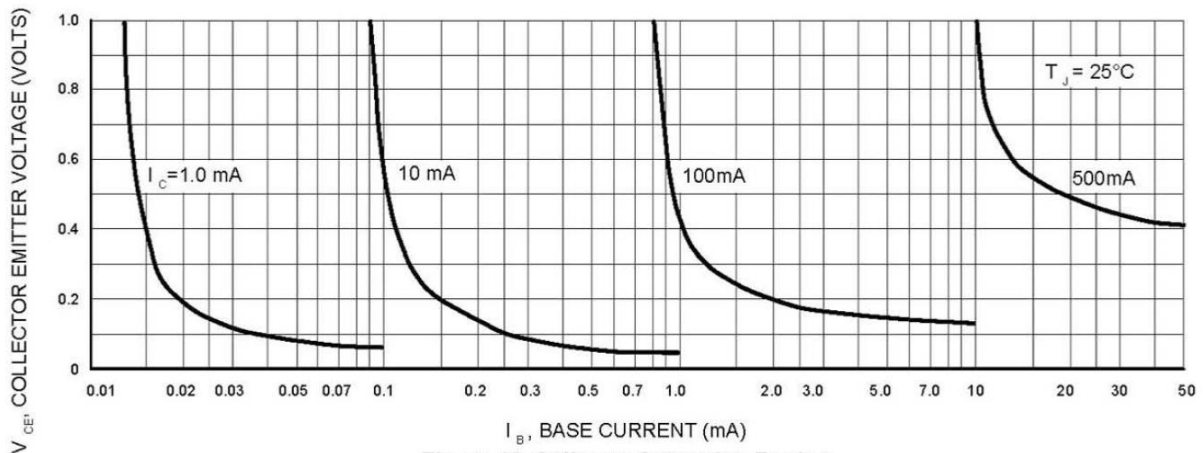




Fig 17. "On" Voltages

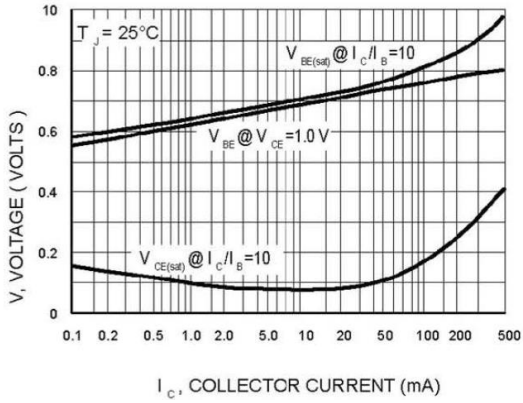
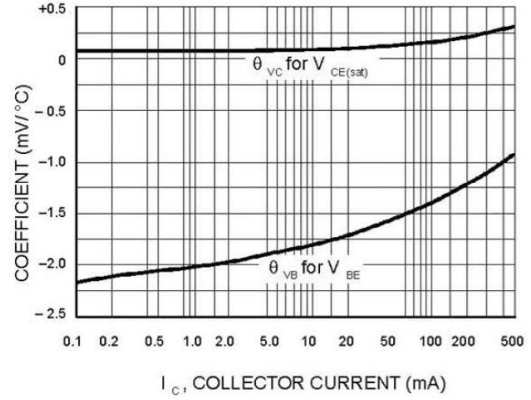


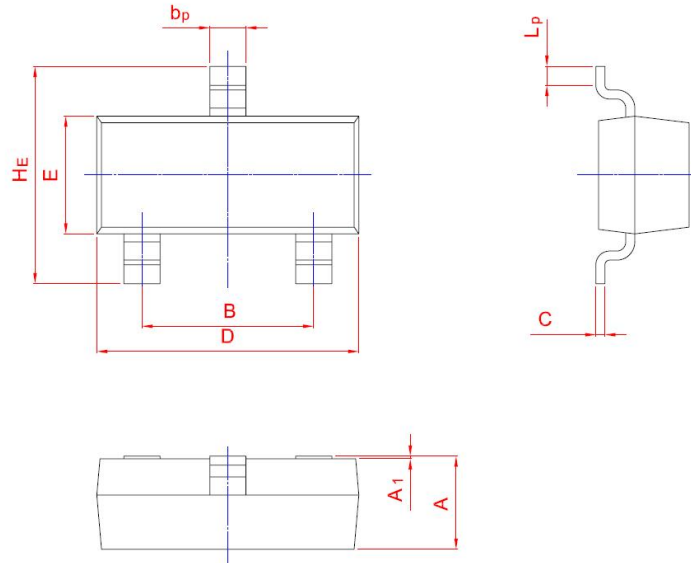
Fig 18. Temperature Coefficients





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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