

**SOT-23 BIPOLAR TRANSISTORS
TRANSISTOR(NPN)**

FEATURES

- * Power dissipation
P_{CM}: 0.3 W(T_{amb}=25°C)
- * Collector current
I_{CM}: 0.6 A
- * Collector-base voltage
V_{(BR)CBO}: 60 V
- * Operating and storage junction temperature range
T_J, T_{stg}: -55°C to +150°C

MECHANICAL DATA

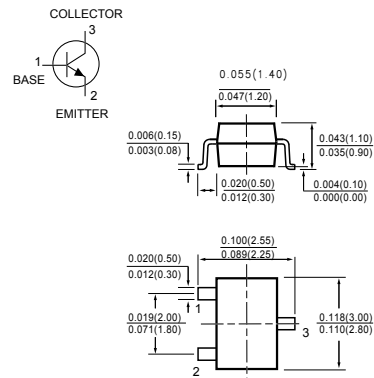
- * Case: Molded plastic
- * Epoxy: UL 94V-O rate flame retardant
- * Lead: MIL-STD-202E method 208C guaranteed
- * Mounting position: Any
- * Weight: 0.008 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25 °C ambient temperature unless otherwise specified.
Single phase, half wave, 60 Hz, resistive or inductive load.
For capacitive load, derate current by 20%.



SOT-23



MAXIMUM RATINGS (@ T_A = 25°C unless otherwise noted)

RATINGS	SYMBOL	VALUE	UNITS
Max. Steady State Power Dissipation ⁽¹⁾ @T _A =25°C Derate above 25°C	P _D	300	mW
Max. Operating Temperature Range	T _J	150	°C
Storage Temperature Range	T _{STG}	-55 to +150	°C

ELECTRICAL CHARACTERISTICS (@ T_A = 25°C unless otherwise noted)

CHARACTERISTICS	SYMBOL	MIN.	TYP.	MAX.	UNITS
Thermal Resistance Junction to Ambient	R _{θJA}	-	-	417	°C/W

Notes : 1. Alumina=0.4*0.3*0.024in.99.5% alumina
2. "Fully ROHS Compliant", "100% Sn plating (Pb-free)".

ELECTRICAL CHARACTERISTICS (@TA=25°C unless otherwise noted)

Chatacteristic	Symbol	Min	Max	Unit
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OFF CHARACTERISTICS

Collector-Emitter Breakdown Voltage(1) ($I_C = 1.0 \text{ mAdc}$, $I_B = 0$)	$V_{(BR)CEO}$	40	-	Vdc
Collector-Base Breakdown Voltage ($I_C = 0.1 \text{ uAdc}$, $I_E = 0$)	$V_{(BR)CBO}$	60	-	Vdc
Emitter-Base Breakdown Voltage ($I_E = 0.1 \text{ uAdc}$, $I_C = 0$)	$V_{(BR)EBO}$	6.0	-	Vdc
Base Cutoff Current ($V_{CE} = 35\text{Vdc}$, $V_{BE(off)} = 0.4\text{Vdc}$)	I_{BEV}	-	0.1	μAdc
Collector Cutoff Current ($V_{CE} = 35\text{Vdc}$, $V_{EB} = 0.4\text{Vdc}$)	I_{CEX}	-	0.1	μAdc

ON CHARACTERISTICS(1)

DC Current Gain ($I_C = 0.1 \text{ mAdc}$, $V_{CE} = 1.0\text{Vdc}$) ($I_C = 1.0 \text{ mAdc}$, $V_{CE} = 1.0\text{Vdc}$) ($I_C = 10 \text{ mAdc}$, $V_{CE} = 1.0\text{Vdc}$) ($I_C = 150 \text{ mAdc}$, $V_{CE} = 1.0\text{Vdc}$) ($I_C = 500 \text{ mAdc}$, $V_{CE} = 2.0\text{Vdc}$)	h_{FE}	20 40 80 100 40	- - - 300 -	-
Collector-Emitter Saturation Voltage (1) ($I_C = 150 \text{ mAdc}$, $I_B = 15 \text{ mAdc}$) ($I_C = 500 \text{ mAdc}$, $I_B = 50 \text{ mAdc}$)	$V_{CE(sat)}$	- -	0.4 0.75	Vdc
Base-Emitter Saturation Voltage (1) ($I_C = 150 \text{ mAdc}$, $I_B = 15 \text{ mAdc}$) ($I_C = 500 \text{ mAdc}$, $I_B = 50 \text{ mAdc}$)	$V_{BE(sat)}$	0.75 -	0.95 1.2	Vdc

SMALL-SIGNAL CHARACTERISTICS

Current-Gain-Bandwidth Product ($I_C = 20 \text{ mAdc}$, $V_{CE} = 10\text{Vdc}$, $f = 100\text{MHz}$)	f_T	250	-	MHz
Output Capacitance ($V_{CB} = 5.0\text{Vdc}$, $I_E = 0$, $f = 1.0\text{MHz}$)	C_{cb}	-	6.5	pF
Input Capacitance ($V_{EB} = 0.5\text{Vdc}$, $I_C = 0$, $f = 1.0\text{MHz}$)	C_{eb}	-	30	pF
Input Impedance ($V_{CE} = 10\text{Vdc}$, $I_C = 1.0 \text{ mAdc}$, $f = 1.0\text{kHz}$)	h_{ie}	1.0	15	kohms
Voltage Feedback Ratio ($V_{CE} = 10\text{Vdc}$, $I_C = 1.0 \text{ mAdc}$, $f = 1.0\text{kHz}$)	h_{re}	0.1	8.0	$\times 10^{-4}$
Small-Signal Current Gain ($V_{CE} = 10\text{Vdc}$, $I_C = 1.0 \text{ mAdc}$, $f = 1.0\text{kHz}$)	h_{fe}	40	500	-
Output Admittance ($V_{CE} = 10\text{Vdc}$, $I_C = 1.0 \text{ mAdc}$, $f = 1.0\text{kHz}$)	h_{oe}	1.0	30	μmos

SWITCHING CHARACTERISTICS

Delay Time	$(V_{CC} = 30\text{Vdc}$, $V_{EB} = 2.0\text{Vdc}$, $I_C = 150 \text{ mAdc}$, $I_{B1} = 15 \text{ mAdc}$)	t_d	-	15	ns
Rise Time		t_r	-	20	
Storage Time	$(V_{CC} = 30\text{Vdc}$, $I_C = 150 \text{ mAdc}$, $I_{B1} = I_{B2} = 15 \text{ mAdc}$)	t_s	-	225	ns
Fall Time		t_f	-	30	

Note : Pulse Test: Pulse Width \leq 300ms,Duty Cycle \leq 2.0%

RATING AND CHARACTERISTICS CURVES (MMBT4401)

— 25°C - - - 100°C

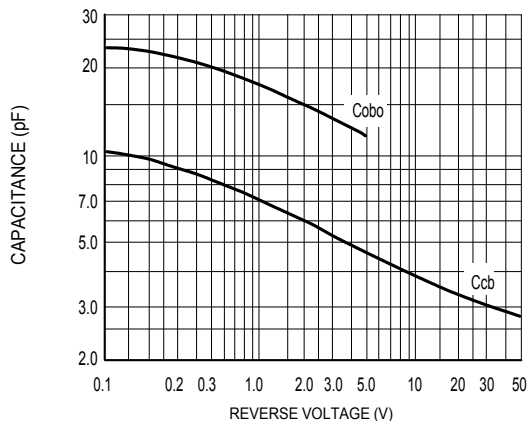


Figure 1. Capacitances

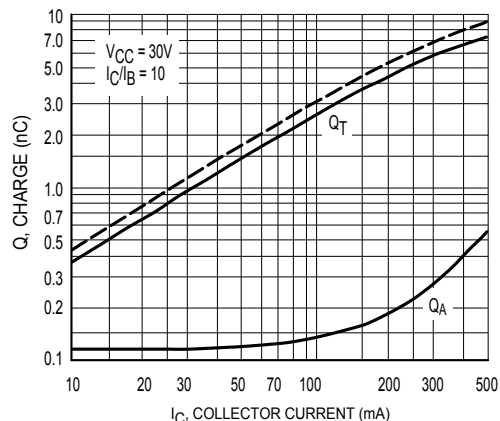


Figure 2. Charge Data

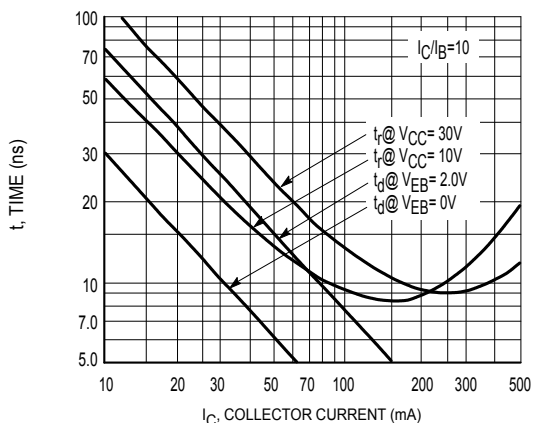


Figure 3. Turn-On Time

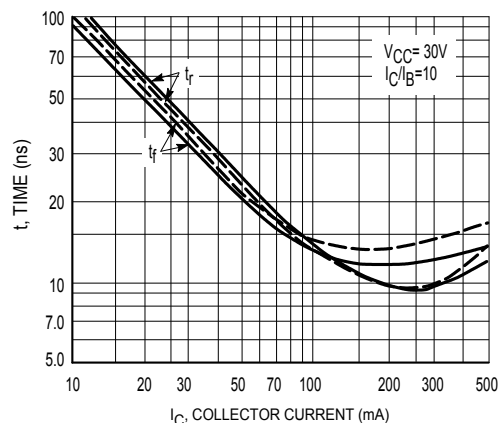


Figure 4. Rise and Fall Times

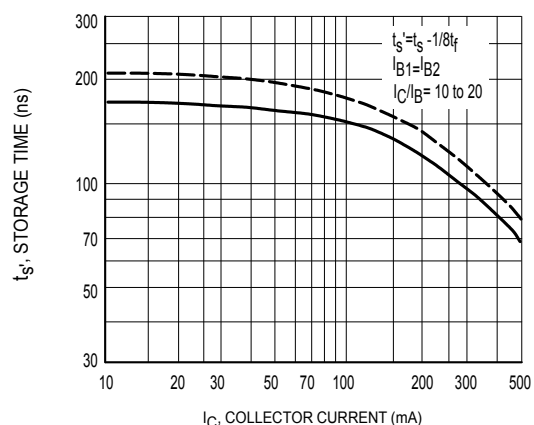


Figure 5. Storage Time

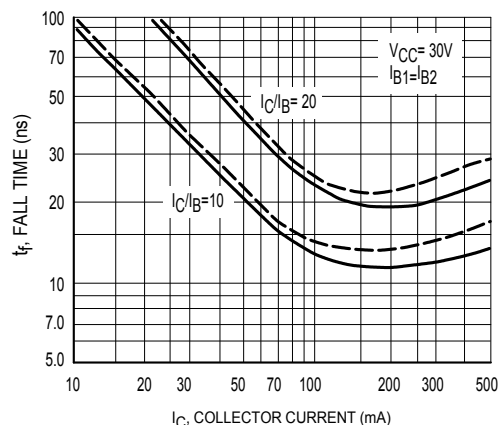
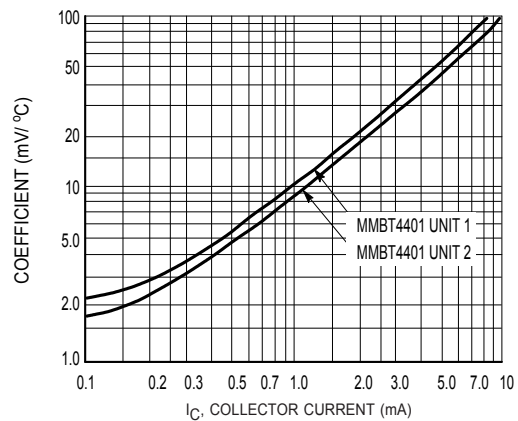
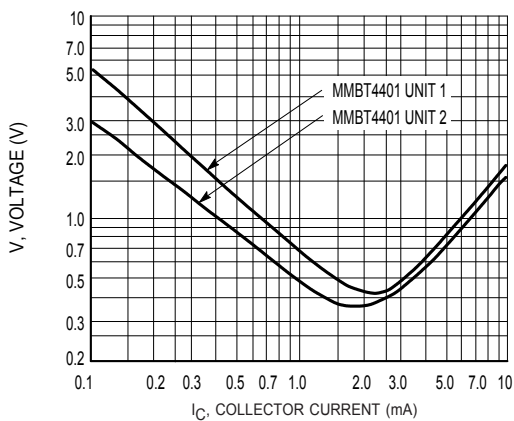
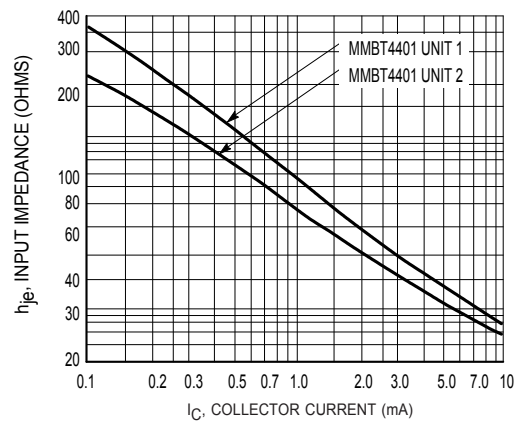
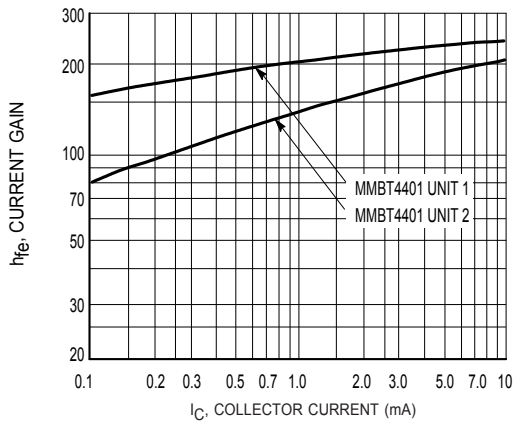
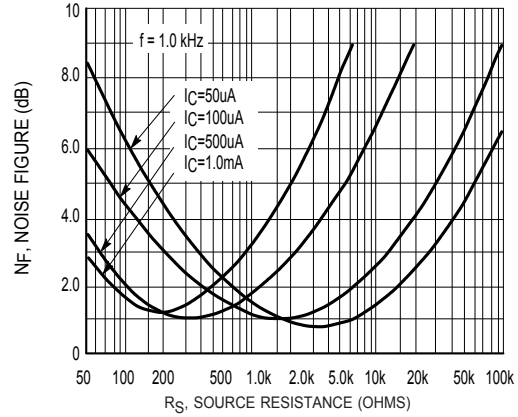
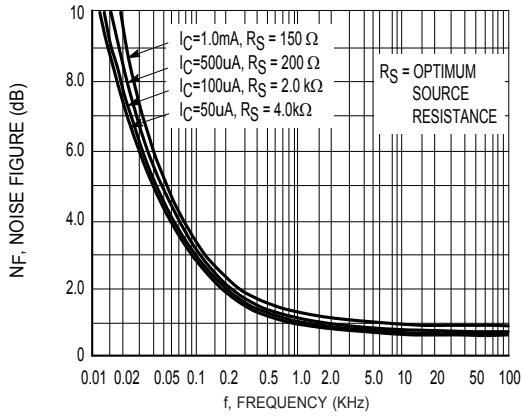


Figure 6. Fall Time

RATING AND CHARACTERISTICS CURVES (MMBT4401)



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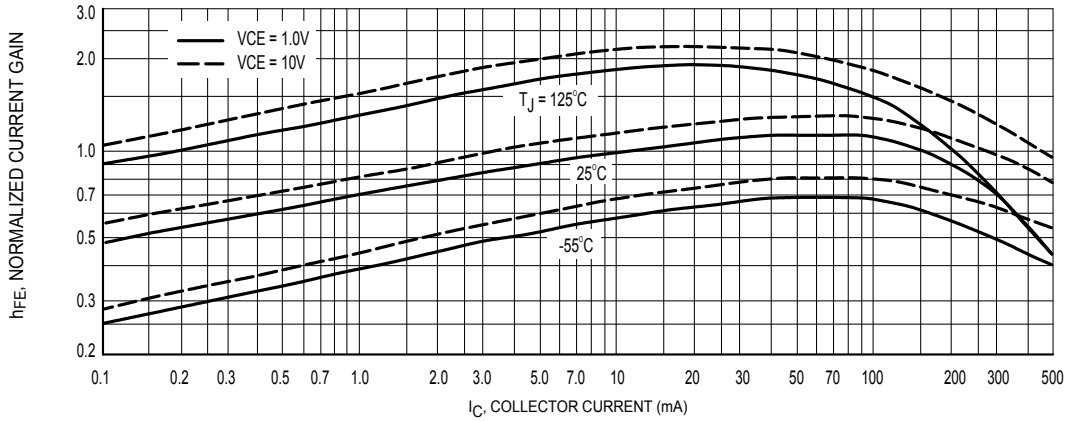


Figure 13. DC Current Gain

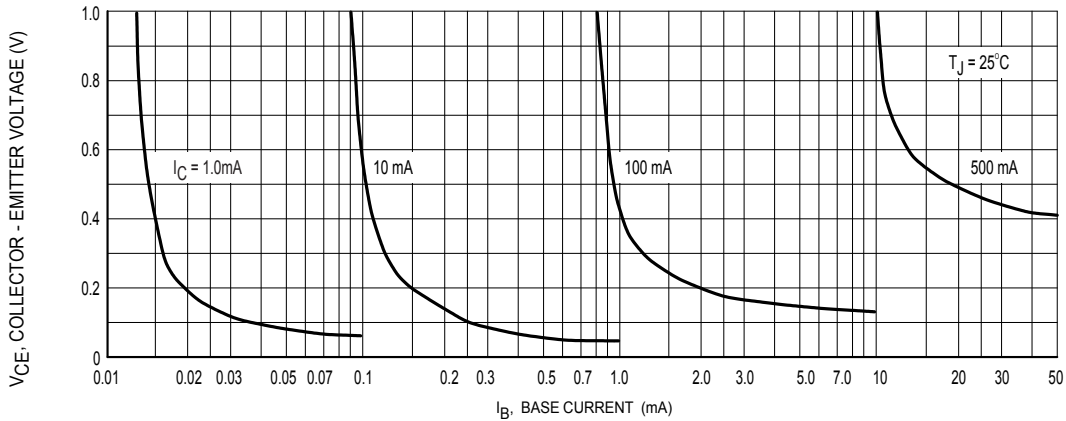


Figure 14. Collector Saturation Region

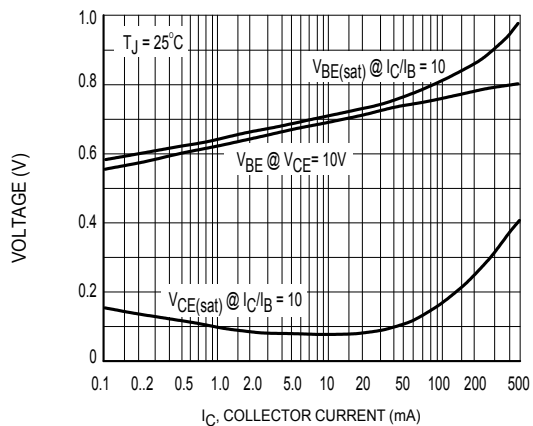


Figure 15. "ON" Voltages

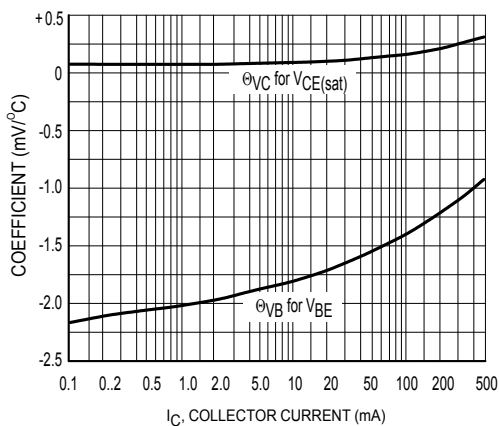


Figure 16. Temperature Coefficients

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