MMBT4401

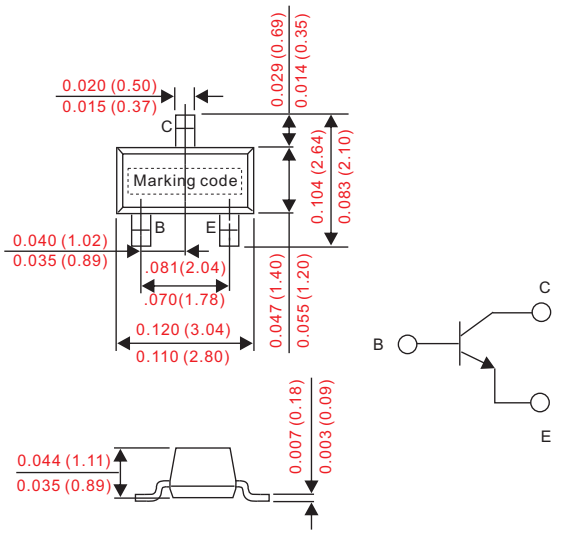
600mA General Purpose NPN Epitaxial Planar Transistor

■ Features

- Epitaxial plana chip construction.
- As complementary type, the NPN transistor MMBT4403 is recommended.
- Suffix "G" indicates Halogen-free part, ex.MMBT4401G.
- Lead-free parts for green partner, exceeds environmental standards of MIL-STD-19500 /228

■ Outline

SOT-23



Dimensions in inches and (millimeters)

■ Mechanical data

- Epoxy:UL94-V0 rated flame retardant
- Case : Molded plastic, SOT-23
- Terminals : Solder plated, solderable per MIL-STD-750, Method 2026
- Mounting Position : Any
- Weight : Approximated 0.008 gram

■ Maximum ratings

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

PARAMETER	CONDITIONS	Symbol	MMBT4401	UNIT
Marking code			2X	
Collector-Base voltage		V_{CBO}	60	V
Collector-Emitter voltage		V_{CEO}	40	V
Emitter-Base voltage		V_{EBO}	6.0	V
Collector current		I_C	600	mA
Total device dissipation FR-5 board(1)	T_A = 25°C	P_D	225	mW
	Derate above 25°C	P_D	1.8	mW/°C
Thermal resistance	Junction to ambient	$R_{\theta JA}$	556	°C/W
Total device dissipation alumina substrate(2)	T_A = 25°C	P_D	300	mW
	Derate above 25°C	P_D	2.4	mW/°C
Thermal resistance	Junction to ambient	$R_{\theta JA}$	417	°C/W
Operating temperature		T_J	-55 ~ +150	°C
Storage temperature		T_{STG}	-55 ~ +150	

1.FR-5 = 1.0 X 0.75 X0.062 in.
2.Alumina = 0.4 X 0.3 X 0.024 in. 99.5% alumina.

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■ Electrical characteristics

Off characteristivs

PARAMETER	CONDITIONS	Symbol	MIN.	TYP.	MAX.	UNIT
Collector-Base breakdown voltage	I_C = 0.1mA, I_E = 0	$V_{(BR)CBO}$	60			V
Collector-Emitter breakdown voltage(3)	I_C = 1.0mA, I_B = 0	$V_{(BR)CEO}$	40			V
Emitter-Base breakdown voltage	I_E = 0.1mA, I_C = 0	$V_{(BR)EBO}$	6.0			V
Base cutoff current	V_{CE} = 35Vdc, V_{EB} = 0.4 Vdc	I_{BL}			0.1	μA
Collector cutoff current	V_{CE} = 35Vdc, V_{EB} = 0.4Vdc	I_{CEX}			0.1	

On characteristivs(3)

PARAMETER	CONDITIONS	Symbol	MIN.	TYP.	MAX.	UNIT
DC current gain	I_C = 0.1mA, V_{CE} = 1.0V	H_{FE}	20			-
	I_C = 1.0mA, V_{CE} = 1.0V		40			
	I_C = 10mA, V_{CE} = 1.0V		80		300	
	I_C = 150mA, V_{CE} = 1.0V		100			
	I_C = 500mA, V_{CE} = 2.0V		40			
Collector-Emitter saturation voltage(3)	I_C = 150mA, I_B = 15mA	$V_{CE(sat)}$			0.4	Vdc
	I_C = 500mA, I_B = 50mA				0.75	
Base-Emitter saturation voltage(3)	I_C = 150mA, I_B = 15mA	$V_{BE(sat)}$	0.75		0.95	Vdc
	I_C = 500mA, I_B = 50mA				1.20	

3.Pulse test : pukse width < 300uS, duty cycle < 2.0%.

Small-signal characteristivs

PARAMETER	CONDITIONS	Symbol	MIN.	TYP.	MAX.	UNIT
Current-gain-bandwidth product(4)	I_C = 20mA, V_{CE} = 10V, f = 100MHz	f_T	250			MHz
Output capacitance	V_{CB} = 5.0V, I_E = 0, f = 1.0MHz	C_{obo}			6.5	pF
Input capacitance	V_{EB} = 0.5V, I_C = 0, f = 1.0MHz	C_{ibo}			30	pF
Input impedance	V_{CE} = 10V, I_C = 1.0mA, f = 1.0KHz	h_{ie}	1.0		15	KΩ
Voltage feeback radio	V_{CE} = 10V, I_C = 1.0mA, f = 1.0KHz	h_{re}	0.1		8.0	X 10^{-4}
Small-signal current gain	V_{CE} = 10V, I_C = 1.0mA, f = 1.0KHz	h_{fe}	40		500	-
Output admittance	V_{CE} = 10V, I_C = 1.0mA, f = 1.0KHz	h_{oe}	1.0		30	μmhos

4.f_T is defined as the frequency at which h_{fe} extrapolates to unity.

Switching characteristivs

PARAMETER	CONDITIONS	Symbol	MIN.	TYP.	MAX.	UNIT
Delay time	V_{CC} = 30V, V_{BE} = 2.0V_{dc}, I_C = 150mA, I_{B1} = 15mA	td			15	nS
Rise time		tr			20	
Storage time	V_{CC} = 30V, I_C =150mA, I_{B1} = I_{B2} = 15mA	ts			225	
Fall time		tf			30	

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■ Switching time equivalent test circuits

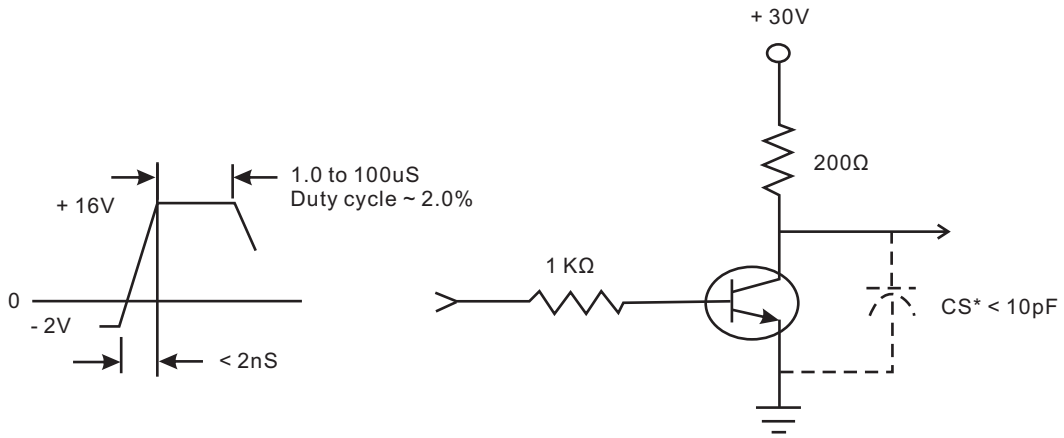

Fig.1 Turn-on time

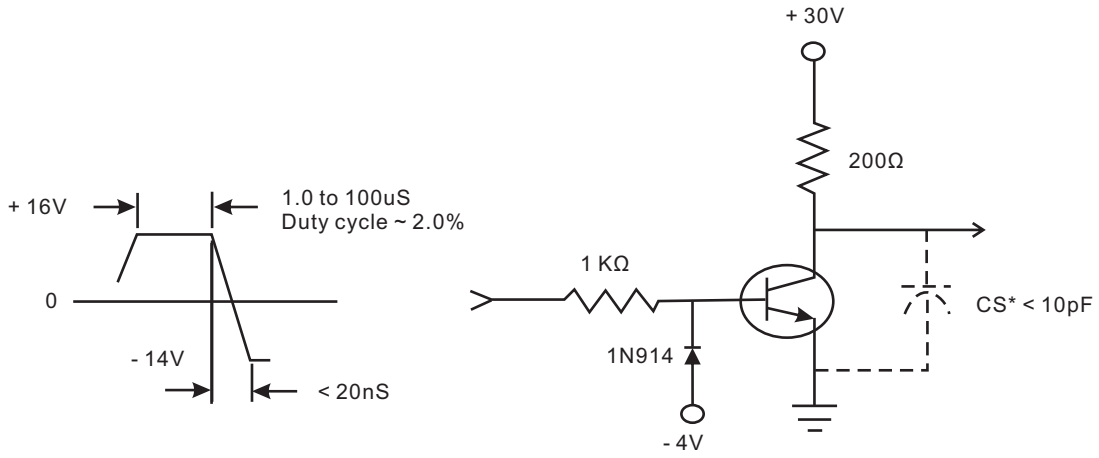

Fig.2 Turn-off time

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■ Rating and characteristic curves

Fig.1- Capacitances

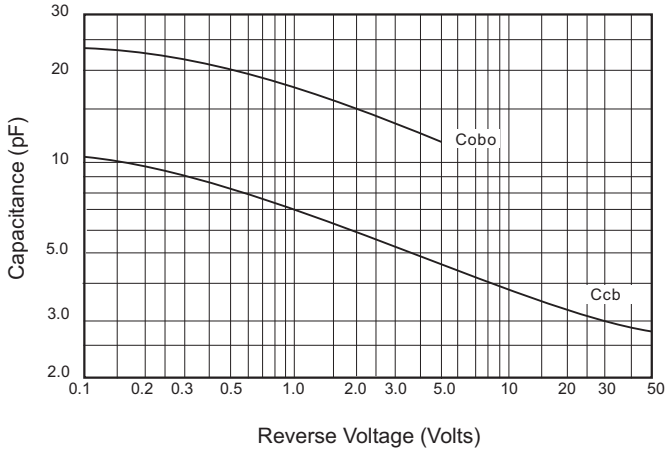


Fig. 2-Charge Data

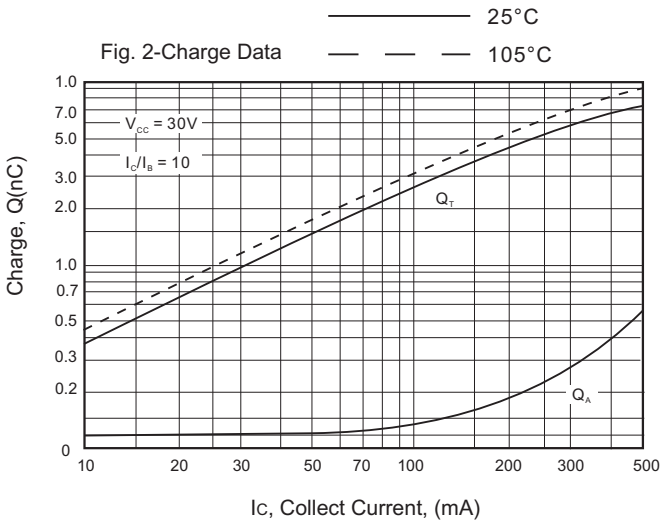


FIG.3- Turn-On Time

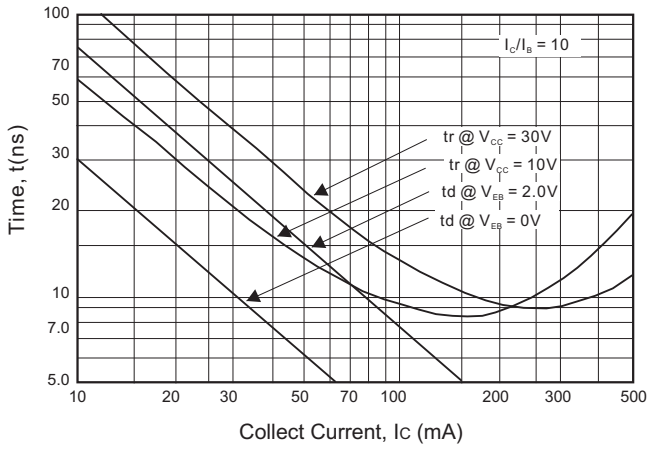


Fig. 4-Rise and Fall Time

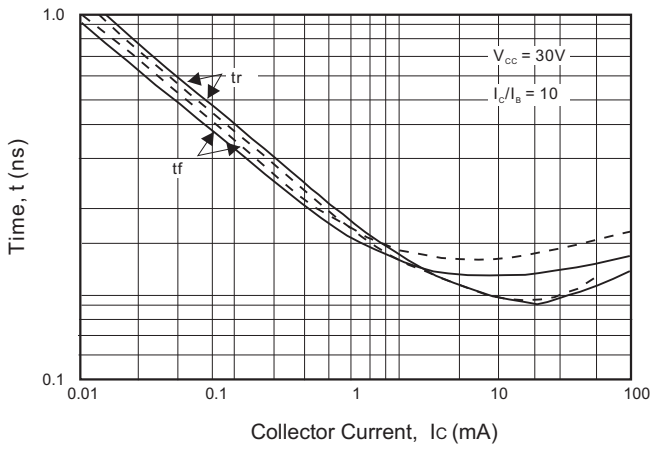


Fig. 5.-Storage T time

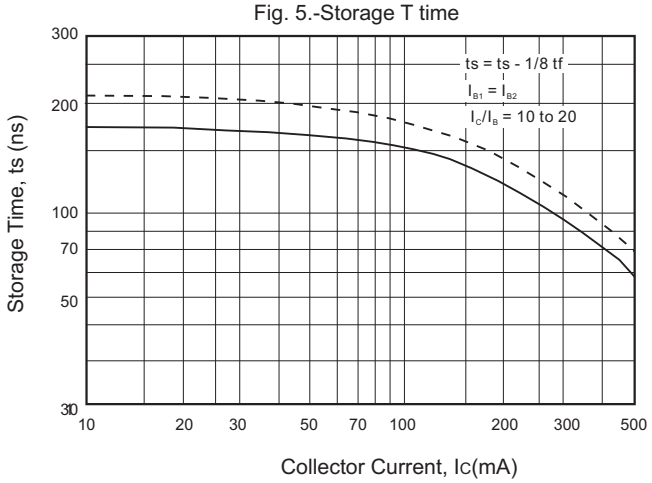
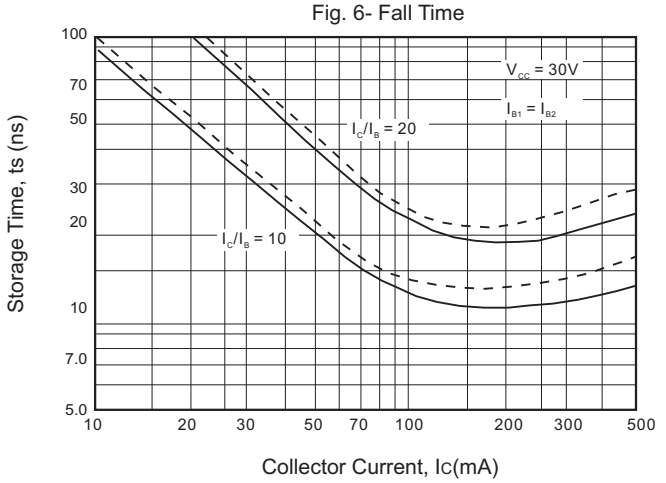


Fig. 6- Fall Time



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■ Rating and characteristic curves

Fig.7- DC Current Gain

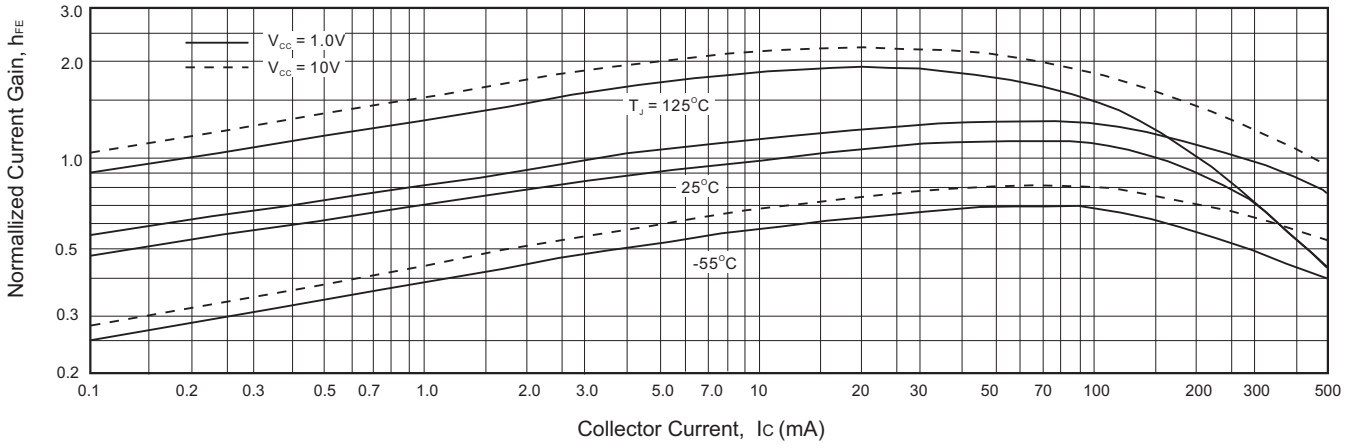


FIG.8- Collector Saturation Region

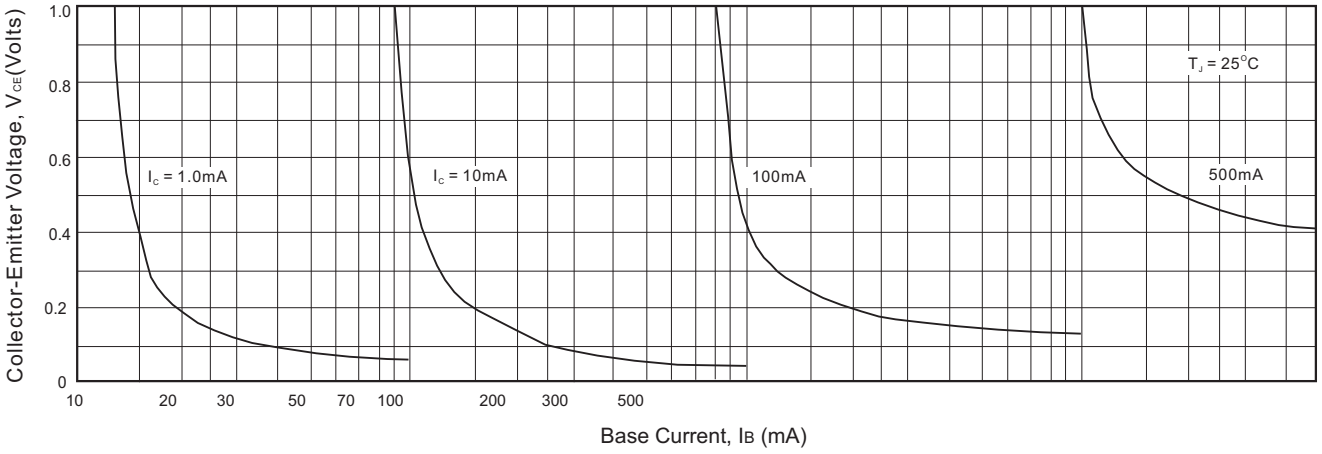


Fig. 9.-"On" Voltage

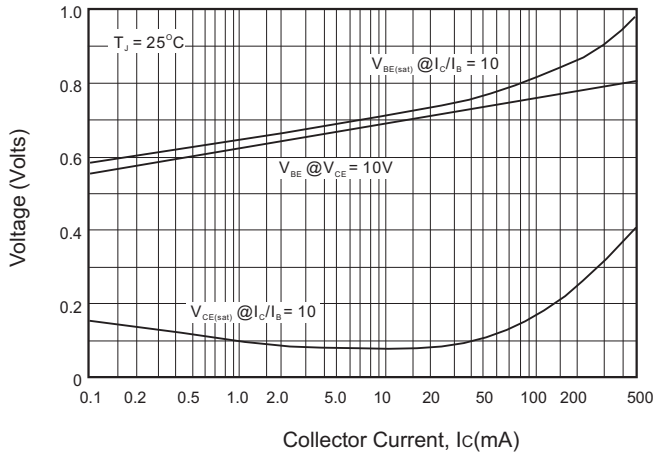
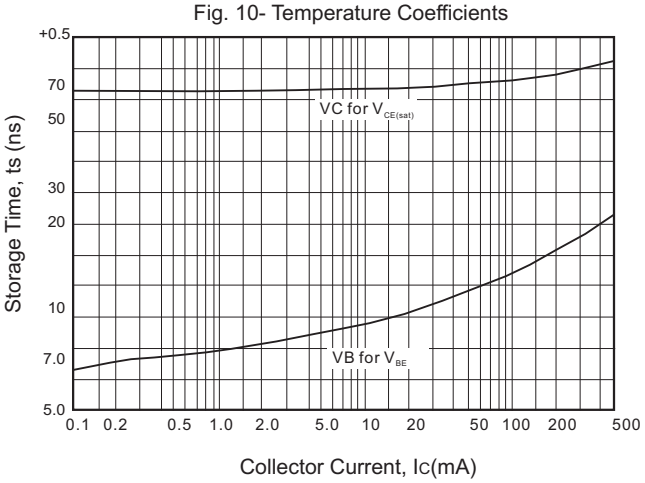


Fig. 10- Temperature Coefficients



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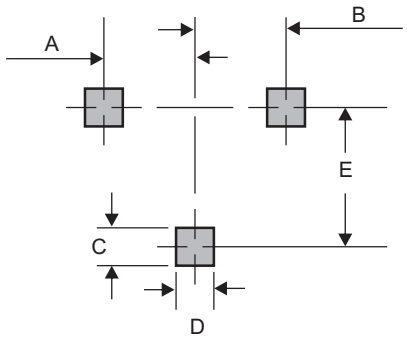
■ SOT-23 foot print



A	B	C	D	E
0.037 (0.95)	0.037 (0.95)	0.035 (0.90)	0.031 (0.80)	0.079 (2.00)

Dimensions in inches and (millimeters)

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