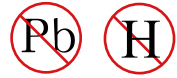




## High Voltage Transistor

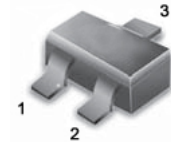


## FEATURE

- We declare that the material of product compliance with RoHS requirements.

## DEVICE MARKING AND ORDERING INFORMATION

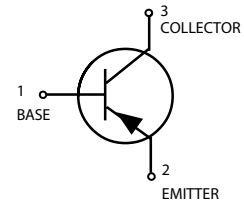
Device	Marking	Shipping
MMBT5401	2L	3000/Tape&Reel



## MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	$V_{CEO}$	- 150	Vdc
Collector-Base Voltage	$V_{CBO}$	- 160	Vdc
Emitter-Base Voltage	$V_{EBO}$	- 5.0	Vdc
Collector Current — Continuous	$I_C$	- 500	mAdc

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## THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Total Device Dissipation FR- 5 Board (1) $T_A = 25^\circ\text{C}$	$P_D$	225	mW
Derate above $25^\circ\text{C}$		1.8	mW/ $^\circ\text{C}$
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	556	$^\circ\text{C/W}$
Total Device Dissipation Alumina Substrate, (2) $T_A = 25^\circ\text{C}$	$P_D$	300	mW
Derate above $25^\circ\text{C}$		2.4	mW/ $^\circ\text{C}$
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	417	$^\circ\text{C/W}$
Junction and Storage Temperature	$T_J, T_{stg}$	-55 to +150	$^\circ\text{C}$

## DEVICE MARKING

MMBT5401 = 2L

ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$  unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
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## OFF CHARACTERISTICS

Collector-Emitter Breakdown Voltage ( $I_C = -1.0\text{ mAdc}$ , $I_E = 0$ )	$V_{(BR)CEO}$	- 150	—	Vdc
Collector-Base Breakdown Voltage ( $I_C = -100\text{ }\mu\text{Adc}$ , $I_E = 0$ )	$V_{(BR)CBO}$	- 160	—	Vdc
Emitter-Base Breakdown Voltage ( $I_E = -10\text{ }\mu\text{Adc}$ , $I_C = 0$ )	$V_{(BR)EBO}$	-5.0	—	Vdc
Collector Cutoff Current ( $V_{CB} = -120\text{ Vdc}$ , $I_E = 0$ )	$I_{CES}$	—	- 50	nAdc
( $V_{CB} = -120\text{ Vdc}$ , $I_E = 0$ , $T_A = 100^\circ\text{C}$ )		—	- 50	$\mu\text{Adc}$

1. FR-5 =  $1.0 \times 0.75 \times 0.062\text{ in.}$ 2. Alumina =  $0.4 \times 0.3 \times 0.024\text{ in.}$  99.5% alumina.

# ELECTRICAL CHARACTERISTICS

## MMBT5401

### ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ unless otherwise noted) (Continued)

Characteristic	Symbol	Min	Max	Unit
<b>DC CHARACTERISTICS (2)</b>				
DC Current Gain ( $I_C = -1.0\text{mA}$ , $V_{CE} = -5.0\text{Vdc}$ )	$h_{FE}$	50	—	—
( $I_C = -10\text{mA}$ , $V_{CE} = -5.0\text{Vdc}$ )		60	240	
( $I_C = -50\text{mA}$ , $V_{CE} = -5.0\text{Vdc}$ )		50	—	
Collector-Emitter Saturation Voltage ( $I_C = -10\text{mA}$ , $I_B = -1.0\text{mA}$ )	$V_{CE(sat)}$	—	- 0.2	Vdc
( $I_C = -50\text{mA}$ , $I_B = -5.0\text{mA}$ )		—	- 0.5	
Base-Emitter Saturation Voltage ( $I_C = -10\text{mA}$ , $I_B = -1.0\text{mA}$ )	$V_{BE(sat)}$	—	- 1.0	Vdc
( $I_C = -50\text{mA}$ , $I_B = -5.0\text{mA}$ )		—	- 1.0	
<b>SMALL-SIGNAL CHARACTERISTICS</b>				
Current-Gain — Bandwidth Product ( $I_C = -10\text{mA}$ , $V_{CE} = -10\text{Vdc}$ , $f = 100\text{MHz}$ )	$f_T$	100	300	MHz
Output Capacitance ( $V_{CB} = -10\text{Vdc}$ , $I_E = 0$ , $f = 1.0\text{MHz}$ )	$C_{obo}$	—	6.0	pF
Small-Signal Current Gain ( $I_C = -1.0\text{mA}$ , $V_{CE} = -10\text{Vdc}$ , $f = 1.0\text{kHz}$ )	$h_{fe}$	40	200	—
Noise Figure ( $I_C = -200\text{μA}$ , $V_{CE} = -5.0\text{Vdc}$ , $R_s = 10\Omega$ , $f = 1.0\text{kHz}$ )	NF	—	8.0	dB

# DEVICE CHARACTERISTICS

## MMBT5401

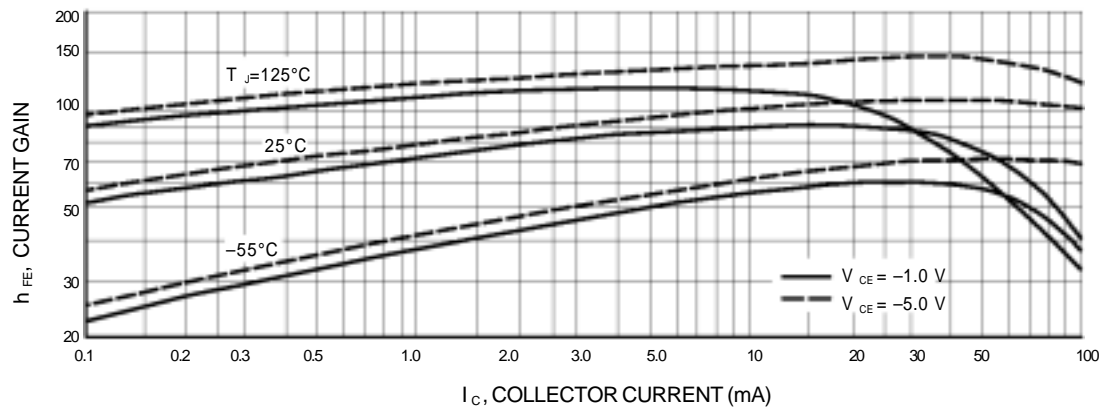


Figure 1. DC Current Gain

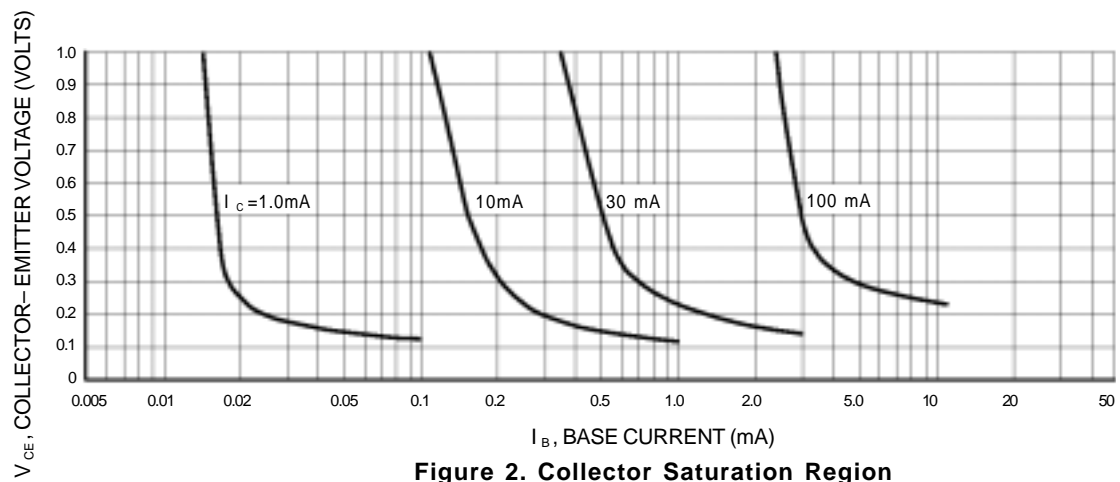


Figure 2. Collector Saturation Region

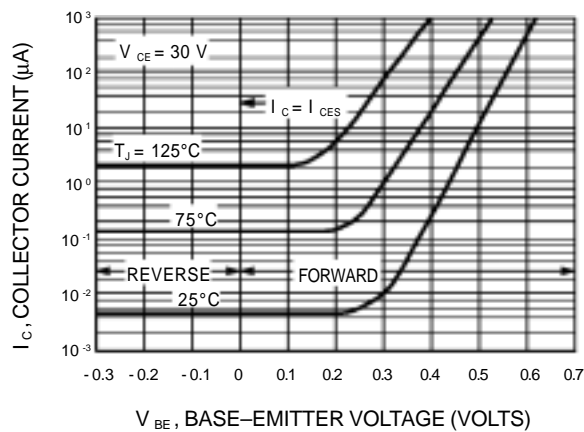
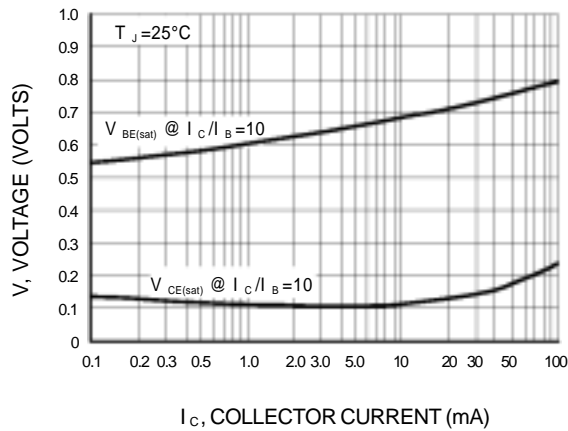


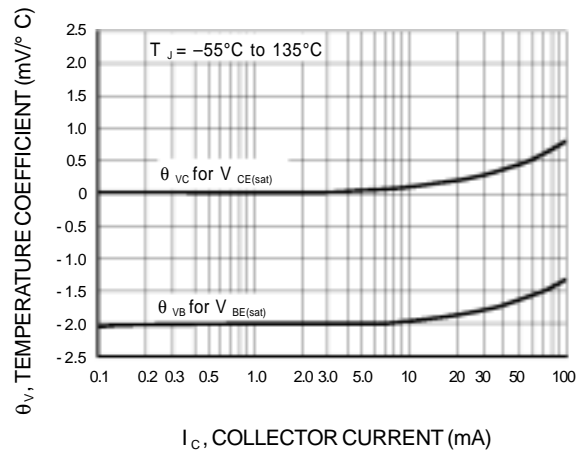
Figure 3. Collector Cut-Off Region

# DEVICE CHARACTERISTICS

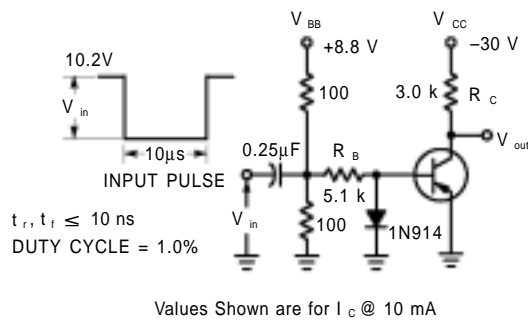
## MMBT5401



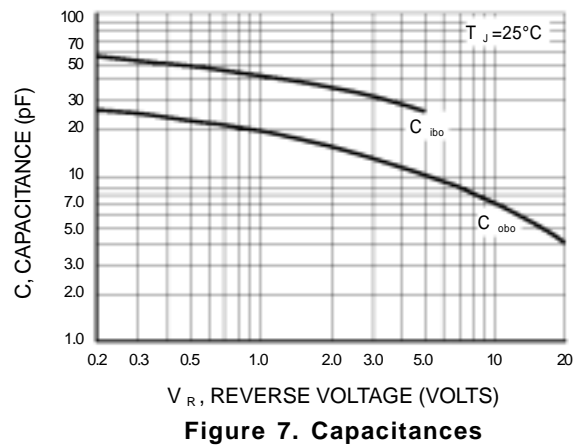
**Figure 4. "On" Voltages**



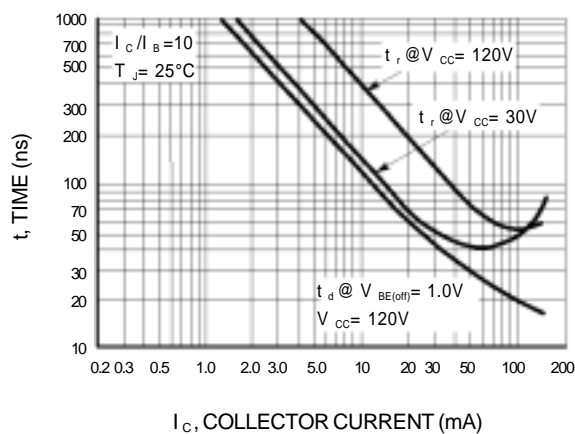
**Figure 5. Temperature Coefficients**



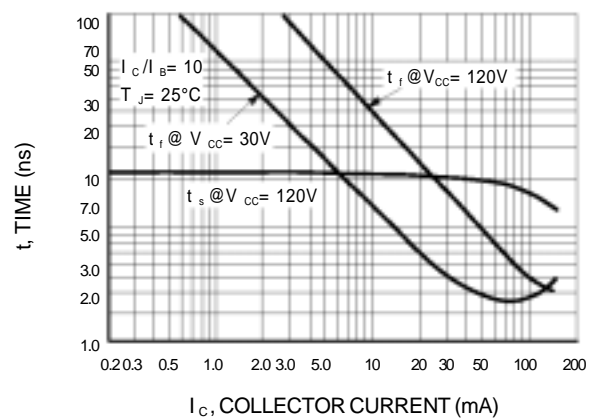
**Figure 6. Switching Time Test Circuit**



**Figure 7. Capacitances**



**Figure 8. Turn-On Time**

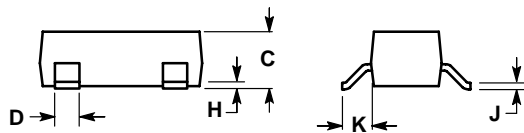
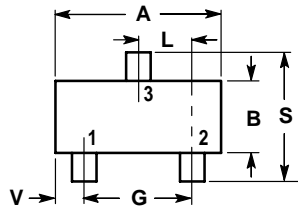


**Figure 9. Turn-Off Time**

# PACKAGE OUTLINE & DIMENSIONS

## MMBT5401

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#### NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.1102	0.1197	2.80	3.04
B	0.0472	0.0551	1.20	1.40
C	0.0350	0.0440	0.89	1.11
D	0.0150	0.0200	0.37	0.50
E	0.0701	0.0807	1.78	2.04
F	0.0005	0.0040	0.013	0.100
G	0.0034	0.0070	0.085	0.177
H	0.0140	0.0285	0.35	0.69
I	0.0350	0.0401	0.89	1.02
J	0.0830	0.1039	2.10	2.64
K	0.0177	0.0236	0.45	0.60

- PIN 1. BASE  
2. EMITTER  
3. COLLECTOR

