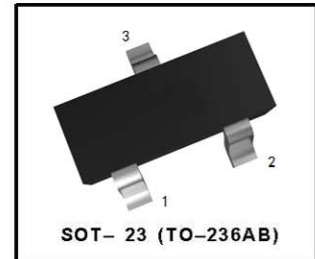
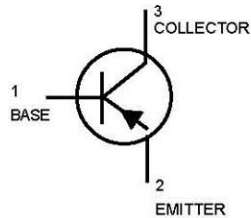


## PNP Silicon



### ● MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector–Emitter Voltage	$V_{CE0}$	– 150	Vdc
Collector–Base Voltage	$V_{CBO}$	– 160	Vdc
Emitter–Base Voltage	$V_{EBO}$	– 5.0	Vdc
Collector Current — Continuous	$I_C$	– 500	mAdc

### ● 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/°C
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	556	°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/°C
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	417	°C/W
Junction and Storage Temperature	$T_J, T_{stg}$	–55to+150	°C

### ● DEVICE MARKING

MMBT5401=2L

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

Characteristic	Symbol	Min	Max	Unit
<b>OFF CHARACTERISTICS</b>				
Collector–Emitter Breakdown Voltage ( $I_C = -1.0\text{ mAdc}, I_B = 0$ )	$V_{(BR)CE0}$	– 150	—	Vdc
Collector–Base Breakdown Voltage ( $I_C = -100\ \mu\text{Adc}, I_E = 0$ )	$V_{(BR)CBO}$	– 160	—	Vdc
Emitter–Base Breakdown Voltage ( $I_E = -10\ \mu\text{Adc}, I_C = 0$ )	$V_{(BR)EBO}$	– 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 x 0.75 x 0.062 in.

2. Alumina = 0.4 x 0.3 x 0.024 in. 99.5% alumina.

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

Characteristic	Symbol	Min	Max	Unit
<b>ON CHARACTERISTICS (2)</b>				
DC Current Gain ( $I_C = -1.0\text{mA dc}$ , $V_{CE} = -5.0\text{V dc}$ )	$h_{FE}$	50	—	—
( $I_C = -10\text{mA dc}$ , $V_{CE} = -5.0\text{V dc}$ )		60	240	
( $I_C = -50\text{mA dc}$ , $V_{CE} = -5.0\text{V dc}$ )		50	—	
Collector–Emitter Saturation Voltage ( $I_C = -10\text{mA dc}$ , $I_B = -1.0\text{mA dc}$ )	$V_{CE(sat)}$	—	- 0.2	Vdc
( $I_C = -50\text{mA dc}$ , $I_B = -5.0\text{mA dc}$ )		—	- 0.5	
Base–Emitter Saturation Voltage ( $I_C = -10\text{mA dc}$ , $I_B = -1.0\text{mA dc}$ )	$V_{BE(sat)}$	—	- 1.0	Vdc
( $I_C = -50\text{mA dc}$ , $I_B = -5.0\text{mA dc}$ )		—	- 1.0	

● **SMALL-SIGNAL CHARACTERISTICS**

Current–Gain — Bandwidth Product ( $I_C = -10\text{mA dc}$ , $V_{CE} = -10\text{V dc}$ , $f = 100\text{MHz}$ )	$f_T$	100	300	MHz
Output Capacitance ( $V_{CB} = -10\text{V dc}$ , $I_E = 0$ , $f = 1.0\text{MHz}$ )	$C_{obo}$	—	6.0	pF
Small–Signal Current Gain ( $I_C = -1.0\text{mA dc}$ , $V_{CE} = -10\text{V dc}$ , $f = 1.0\text{kHz}$ )	$h_{fe}$	40	200	—
Noise Figure ( $I_C = -200\text{μA dc}$ , $V_{CE} = -5.0\text{V dc}$ , $R_s = 10\Omega$ , $f = 1.0\text{kHz}$ )	NF	—	8.0	dB

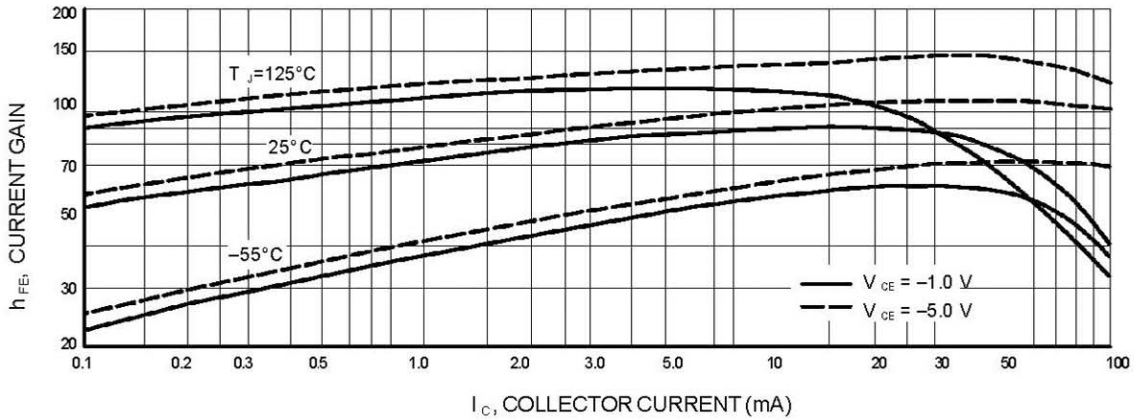


Figure 1. DC Current Gain

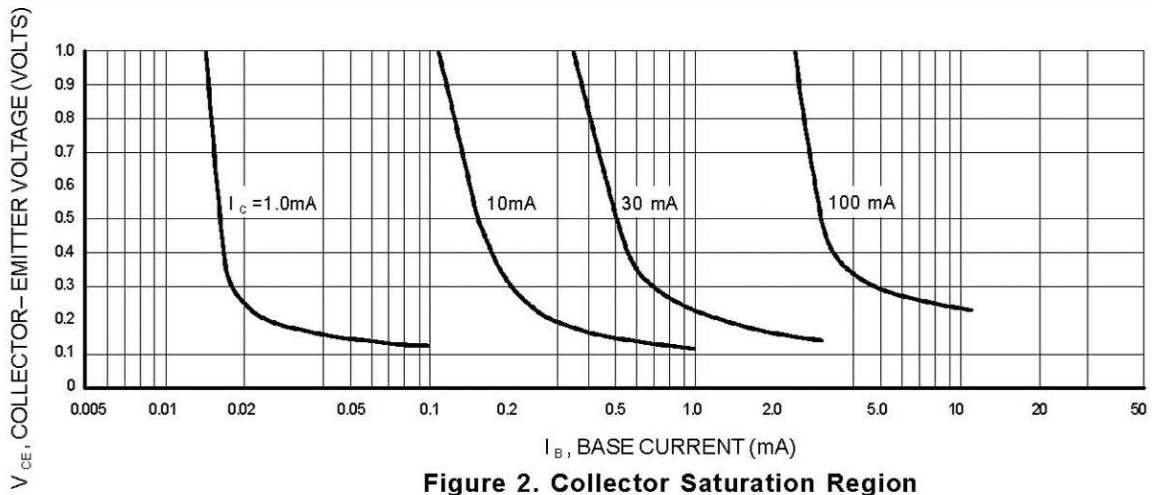


Figure 2. Collector Saturation Region

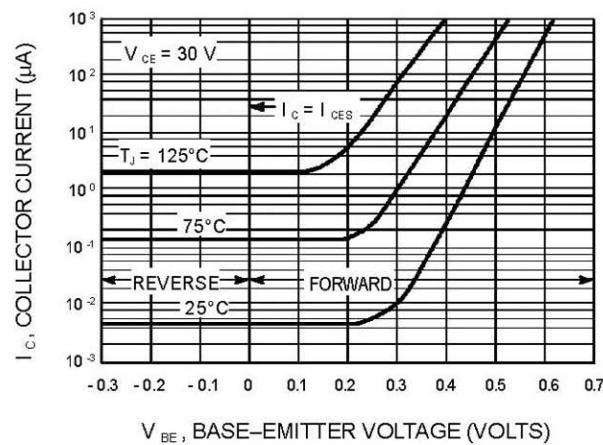


Figure 3. Collector Cut-Off Region

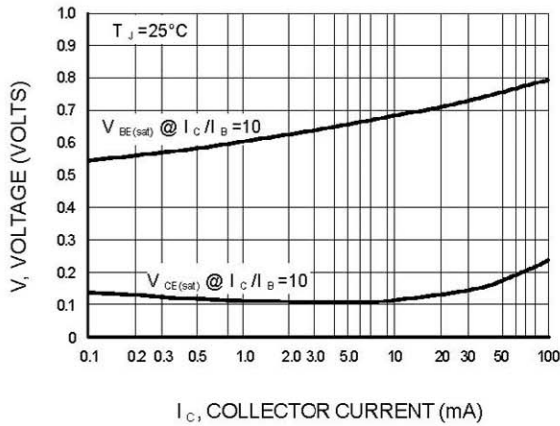


Figure 4. "On" Voltages

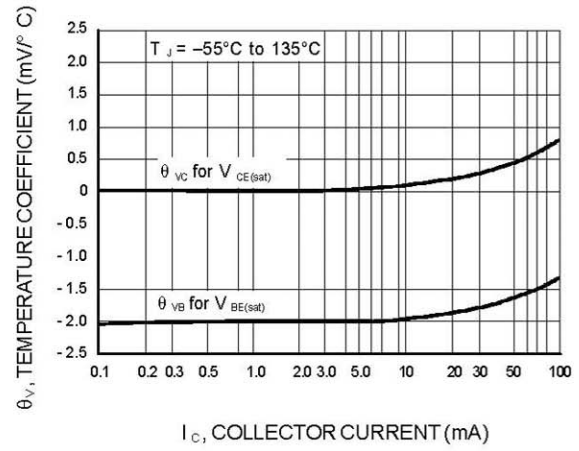


Figure 5. Temperature Coefficients

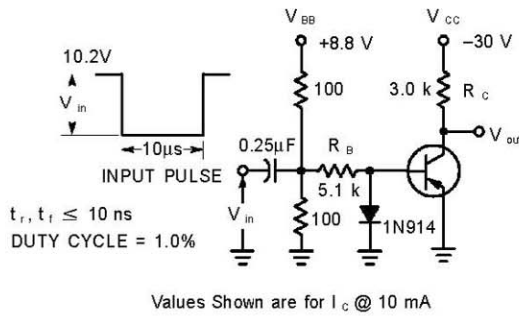


Figure 6. Switching Time Test Circuit

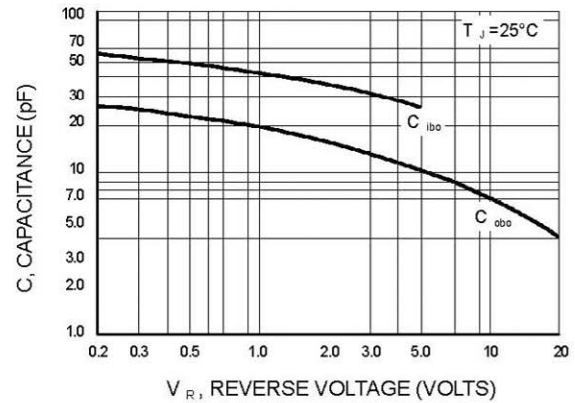


Figure 7. Capacitances

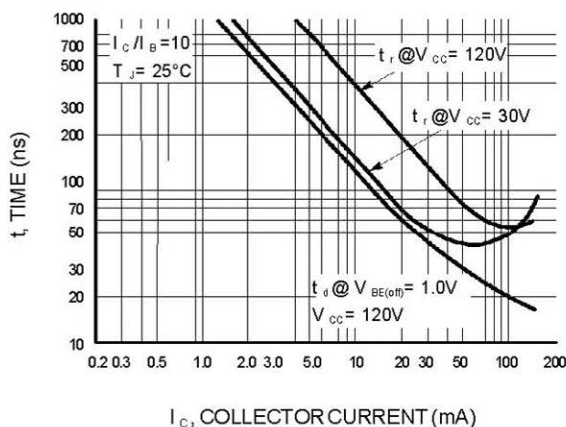


Figure 8. Turn-On Time

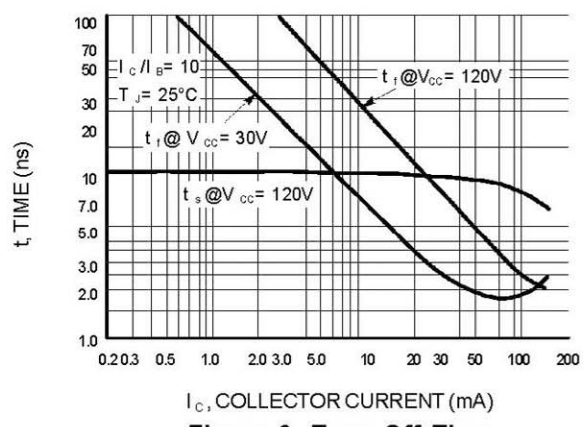


Figure 9. Turn-Off Time