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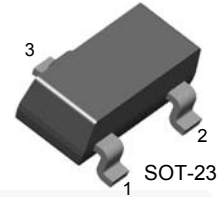
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# MMBT3646 NPN Switching Transistor

## Features

- NPN High Speed Switching Transistor
- Process 22



1. Base 2. Emitter 3. Collector

## Ordering Information

Part Number	Top Mark	Package	Packing Method
MMBT3646	23	SOT-23 3L	Tape and Reel

## Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only. Values are at  $T_C = 25^\circ\text{C}$  unless otherwise noted.

Symbol	Parameter	Value	Unit
$V_{CEO}$	Collector-Emitter Voltage	15	V
$V_{CES}$	Collector-Emitter Voltage	40	V
$V_{CBO}$	Collector-Base Voltage	40	V
$V_{EBO}$	Emitter-Base Voltage	5	V
$I_C$	Collector Current (DC) - Continuous	300	mA
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range	-55 to 150	$^\circ\text{C}$

## Thermal Characteristics<sup>(1)</sup>

Values are at  $T_C = 25^\circ\text{C}$  unless otherwise noted.

Symbol	Parameter	Value	Unit
$P_D$	Total Device Dissipation at $T_A = 25^\circ\text{C}$	625	mW
	Derate Above $25^\circ\text{C}$	5	mW/ $^\circ\text{C}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	200	$^\circ\text{C}/\text{W}$

### Note:

1. PCB size: FR-4 trace width is 50 mil / 25 mil / 15 mil, thickness: 2 OZ, minimum land pattern size.

## Electrical Characteristics

Values are at  $T_C = 25^\circ\text{C}$  unless otherwise noted.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage	$I_C = 100\ \mu\text{A}, V_{BE} = 0$	40			V
$V_{CEO(SUS)}$	Collector-Emitter Sustaining Voltage <sup>(2)</sup>	$I_C = 10\ \text{mA}, I_B = 0$	15			V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	$I_C = 100\ \mu\text{A}, I_E = 0$	40			V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	$I_E = 100\ \mu\text{A}, I_C = 0$	5			V
$I_{CES}$	Collector Cut-Off Current	$V_{CE} = 20\ \text{V}, V_{BE} = 0$			0.5	$\mu\text{A}$
		$V_{CE} = 20\ \text{V}, V_{BE} = 0,$ $T_A = 65^\circ\text{C}$			3.0	
$h_{FE}$	DC Current Gain <sup>(2)</sup>	$V_{CE} = 0.4\ \text{V}, I_C = 30\ \text{mA}$	30		120	
		$V_{CE} = 0.5\ \text{V}, I_C = 100\ \text{mA}$	25			
		$V_{CE} = 1.0\ \text{V}, I_C = 300\ \text{mA}$	15			
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage <sup>(2)</sup>	$I_C = 30\ \text{mA}, I_B = 3\ \text{mA}$			0.20	V
		$I_C = 100\ \text{mA}, I_B = 10\ \text{mA}$			0.28	
		$I_C = 300\ \text{mA}, I_B = 30\ \text{mA}$			0.50	
		$I_C = 30\ \text{mA}, I_B = 3\ \text{mA},$ $T_A = 65^\circ\text{C}$			0.30	
$V_{BE(sat)}$	Base-Emitter Saturation Voltage <sup>(2)</sup>	$I_C = 30\ \text{mA}, I_B = 3\ \text{mA}$	0.73		0.95	V
		$I_C = 100\ \text{mA}, I_B = 10\ \text{mA}$			1.20	
		$I_C = 300\ \text{mA}, I_B = 30\ \text{mA}$			1.70	
$C_{ob}$	Output Capacitance	$V_{CE} = 5\ \text{V}, I_E = 0,$ $f = 1\ \text{MHz}$			5	pF
$C_{ib}$	Input Capacitance	$V_{EB} = 0.5\ \text{V}, I_C = 0,$ $f = 1\ \text{MHz}$			8	pF
$t_{on}$	Turn-On Time	$V_{CC} = 10\ \text{V}, I_C = 300\ \text{mA},$ $I_{B1} = 30\ \text{mA},$ $V_{CE(off)} = 3\ \text{V}$			18	ns
$t_d$	Delay Time				10	ns
$t_r$	Rise Time				15	ns
$t_{off}$	Turn-Off Time				28	ns
$t_f$	Fall Time	$V_{CC} = 10\ \text{V}, I_C = 300\ \text{mA},$ $I_{B1} = I_{B2} = 30\ \text{mA}$			15	ns
$t_s$	Storage Time				20	ns

### Note:

2. Pulse test: pulse width  $\leq 300\ \mu\text{s}$ , duty cycle  $\leq 2.0\%$ .

Physical Dimensions

SOT-23



Figure 1. 3-LEAD, SOT-23, JEDEC TO-236, LOW PROFILE (ACTIVE)

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