



THE DATASHEET OF MMBT200



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ON Semiconductor®

PN200A / MMBT200 PNP General-Purpose Amplifier

Description

This device is designed for general-purpose amplifier applications at collector currents to 300 mA. Sourced from Process 68.

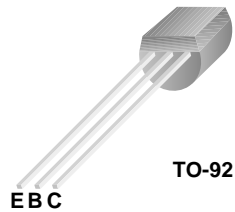


Figure 1. PN200A Device Package

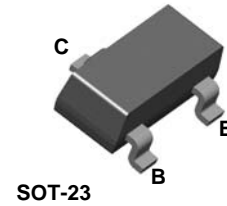


Figure 2. MMBT200 Device Package

Ordering Information

Part Number	Marking	Package	Packing Method
PN200A	PN200A	TO-92 3L	Bulk
MMBT200	N2	SOT-23 3L	Tape and Reel

Absolute Maximum Ratings^{(1),(2)}

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 $T_A = 25^\circ\text{C}$ unless otherwise noted.

Symbol	Parameter	Value	Unit
V_{CEO}	Collector-Emitter Voltage	-45	V
V_{CBO}	Collector-Base Voltage	-60	V
V_{EBO}	Emitter-Base Voltage	-6	V
I_C	Collector Current - Continuous	-500	mA
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to +150	$^\circ\text{C}$

Notes:

1. These ratings are based on a maximum junction temperature of 150°C .
2. These are steady-state limits. ON Semiconductor should be consulted on applications involving pulsed or low-duty cycle operations.

Thermal Characteristics

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

Symbol	Parameter	Max.		Unit
		PN200A ⁽³⁾	MMBT200 ⁽⁴⁾	
P_D	Total Device Dissipation	625	350	mW
	Derate Above 25°C	5.0	2.8	mW/ $^\circ\text{C}$
$R_{\theta JC}$	Thermal Resistance, Junction to Case	83.3		$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	200	357	$^\circ\text{C}/\text{W}$

Notes:

- PCB size: FR-4 76 x 114 x 1.57 mm³ (3.0 inch x 4.5 inch x 0.062 inch) with minimum land pattern size.
- Device mounted on FR-4 PCB 1.6 inch X 1.6 inch X 0.06 inch.

Electrical Characteristics

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

Symbol	Parameter	Conditions	Min.	Max.	Unit
Off Characteristics					
BV_{CBO}	Collector-Base Breakdown Voltage	$I_C = -10 \mu\text{A}$, $I_B = 0$	-60		V
BV_{CEO}	Collector-Emitter Breakdown Voltage ⁽⁵⁾	$I_C = -1.0 \text{ mA}$, $I_E = 0$	-45		V
BV_{EBO}	Emitter-Base Breakdown Voltage	$I_E = -10 \mu\text{A}$, $I_C = 0$	-6.0		V
I_{CBO}	Collector Cut-Off Current	$V_{CB} = -50 \text{ V}$, $I_E = 0$		-50	nA
I_{CES}	Collector Cut-Off Current	$V_{CE} = -40 \text{ V}$, $I_E = 0$		-50	nA
I_{EBO}	Emitter Cut-Off Current	$V_{EB} = -4.0 \text{ V}$, $I_C = 0$		-50	nA
On Characteristics					
h_{FE}	DC Current Gain	$I_C = -100 \mu\text{A}$, $V_{CE} = -1.0 \text{ V}$	MMBT200	80	
			PN200A	240	
		$I_C = -10 \text{ mA}$, $V_{CE} = -1.0 \text{ V}$	MMBT200	100	450
			PN200A	300	600
		$I_C = -100 \text{ mA}$, $V_{CE} = -1.0 \text{ V}^{(5)}$	PN200A	100	
$I_C = -150 \text{ mA}$, $V_{CE} = -5.0 \text{ V}^{(5)}$	MMBT200	100	350		
	PN200A	100			
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C = -10 \text{ mA}$, $I_B = -1.0 \text{ mA}$		-0.2	V
		$I_C = -200 \text{ mA}$, $I_B = -20 \text{ mA}^{(5)}$		-0.4	
$V_{BE(sat)}$	Base-Emitter Saturation Voltage	$I_C = -10 \text{ mA}$, $I_B = -1.0 \text{ mA}$		-0.85	V
		$I_C = -200 \text{ mA}$, $I_B = -20 \text{ mA}^{(5)}$		-1.00	
Small Signal Characteristics					
f_T	Current Gain - Bandwidth Product	$V_{CE} = -20 \text{ V}$, $I_C = -20 \text{ mA}$,	250		MHz
C_{ob}	Output Capacitance	$V_{CB} = -10 \text{ V}$, $f = -1.0 \text{ MHz}$		6.0	pF
NF	Noise Figure	$I_C = -100 \mu\text{A}$, $V_{CE} = -5.0 \text{ V}$, $R_G = 2.0 \text{ k}\Omega$, $f = 1.0 \text{ kHz}$		4.0	dB

Note:

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

Typical Performance Characteristics

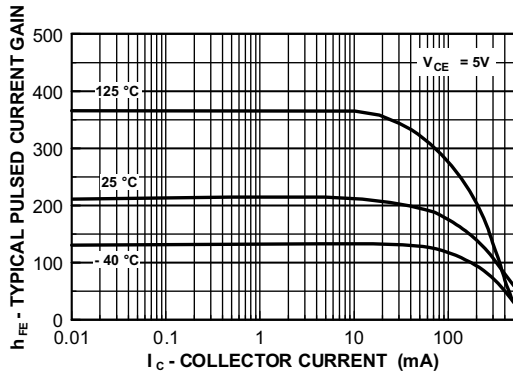


Figure 3. Typical Pulsed Current Gain vs. Collector Current

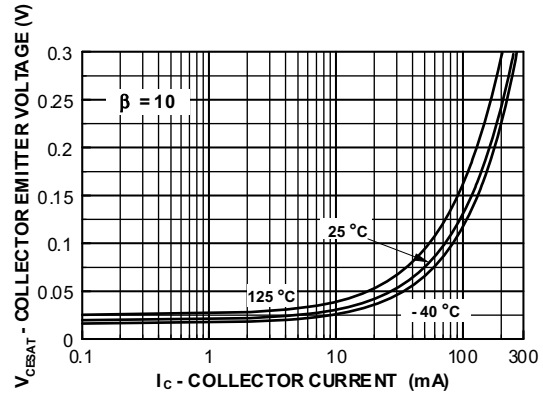


Figure 4. Collector-Emitter Saturation Voltage vs. Collector Current

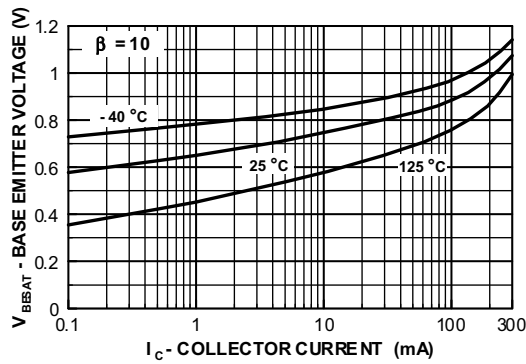


Figure 5. Base-Emitter Saturation Voltage vs. Collector Current

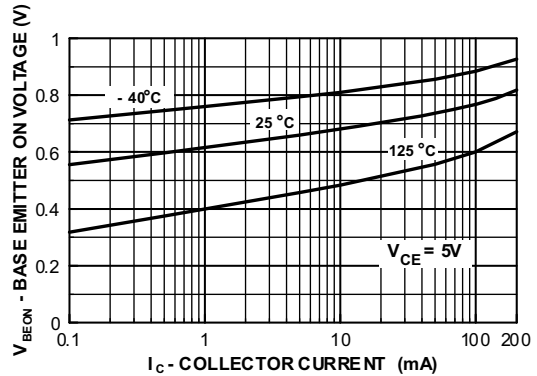


Figure 6. Base-Emitter On Voltage vs. Collector Current

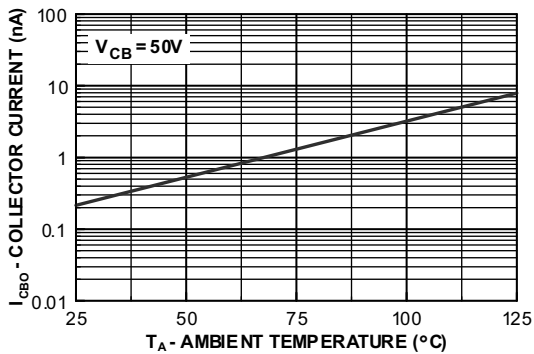


Figure 7. Collector Cut-Off Current vs. Ambient Temperature

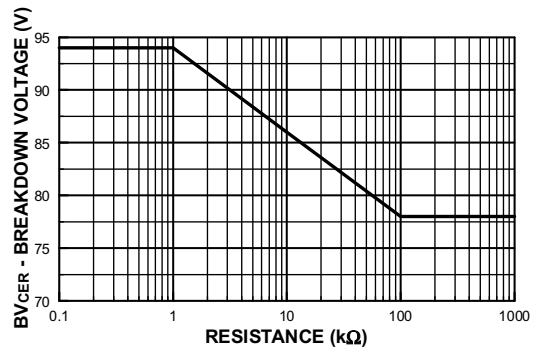


Figure 8. Collector-Emitter Breakdown Voltage with Resistance Between Emitter-Base

Typical Performance Characteristics (Continued)

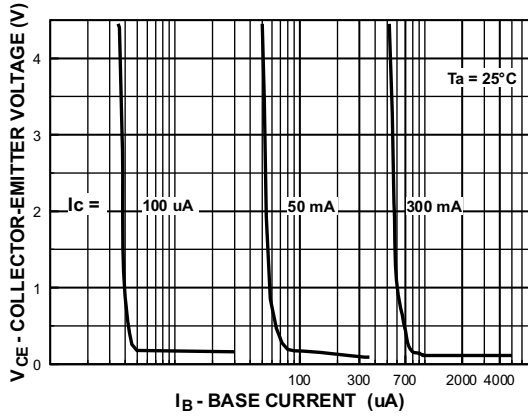


Figure 9. Collector Saturation Region

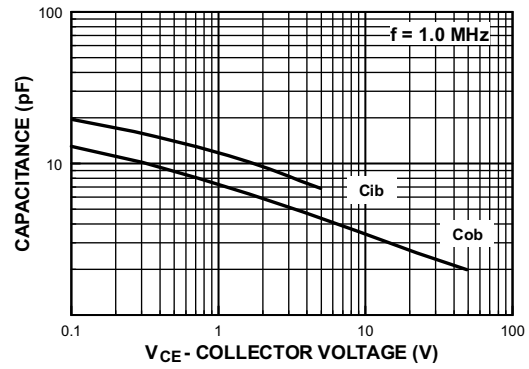


Figure 10. Input and Output Capacitance vs. Reverse Voltage

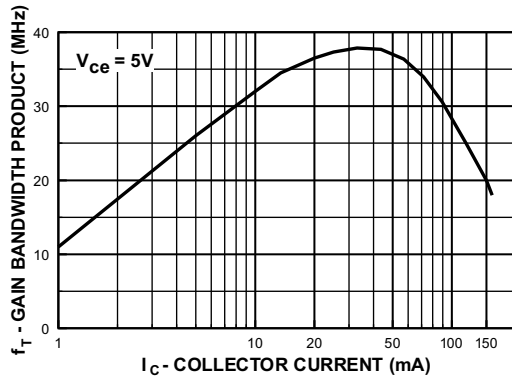


Figure 11. Gain Bandwidth Product vs. Collector Current

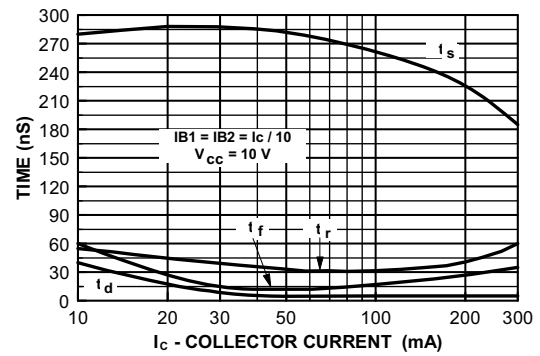


Figure 12. Switching Times vs. Collector Current

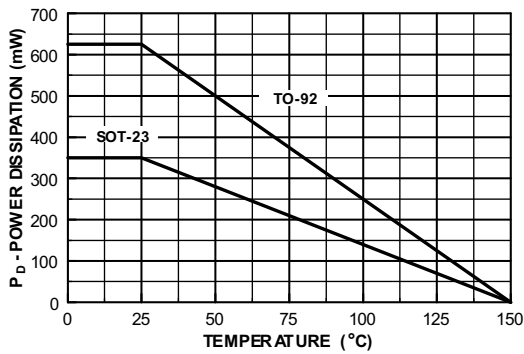
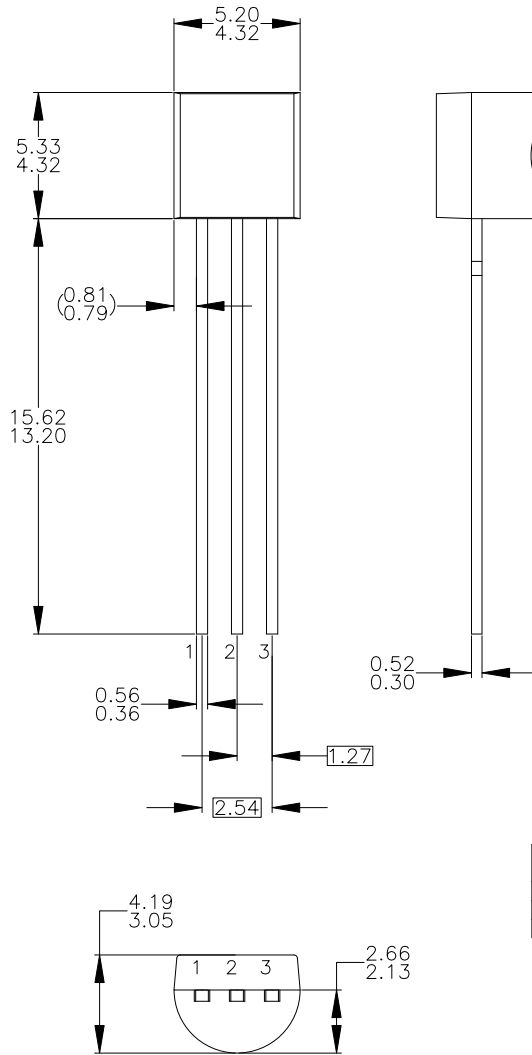


Figure 13. Power Dissipation vs. Ambient Temperature

Physical Dimensions

TO-92



NOTES: UNLESS OTHERWISE SPECIFIED

- A) DRAWING WITH REFERENCE TO JEDEC TO-92 RECOMMENDATIONS.
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DRAWING CONFORMS TO ASME Y14.5M-1994.
- D) TO-92 (92,94,96,97,98) PIN CONFIGURATION:

PIN	92			94			96			97			98		
	P	F	M	P	F	M	B	F	M	P	F	M	P	F	M
1	E	S	S	E	S	S	B	D	G	C	G	D	C	G	D
2	B	D	G	C	G	D	E	S	S	B	D	G	E	S	S
3	C	G	D	B	D	G	C	G	D	E	S	S	B	D	G

LEGEND:

- P - BIPOLAR
- F - JFET
- M - DMOS
- E - EMITTER
- B - BASE
- C - COLLECTOR
- D - DRAIN
- S - SOURCE
- G - GATE

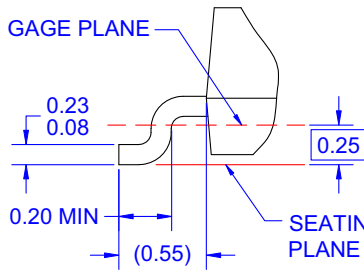
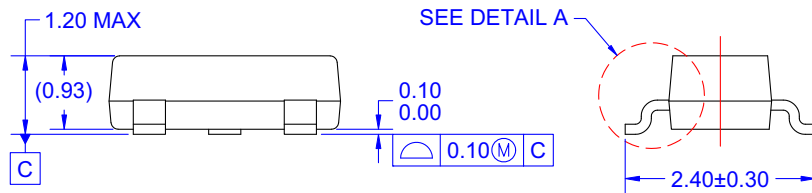
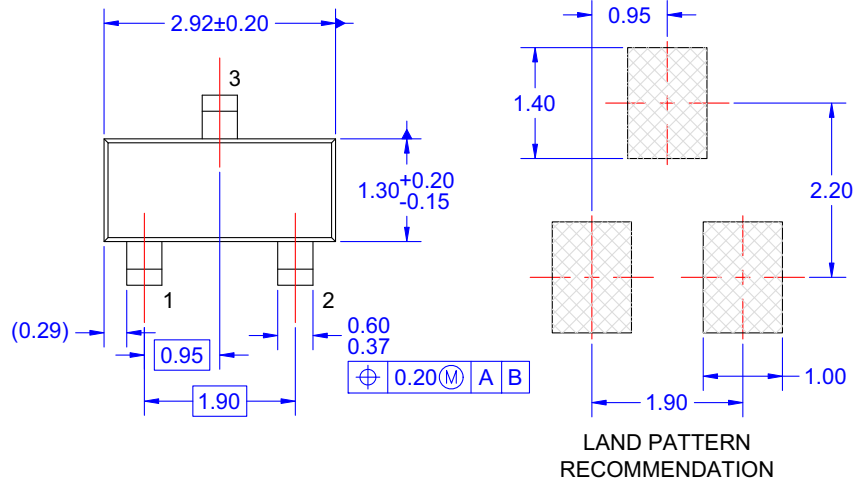
- E) FOR PACKAGE 92, 94, 96, 97 AND 98: PIN CONFIGURATION DRAIN "D" AND SOURCE "S" ARE INTERCHANGEABLE AT JFET "F" OPTION.
- F) DRAWING FILENAME: MKT-ZA03DREV3.

Figure 14. 3-LEAD, TO-92, MOLDED, STD STRAGHIT LEAD (NO EOL CODE) (ACTIVE)

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Physical Dimensions (Continued)

SOT-23



NOTES: UNLESS OTHERWISE SPECIFIED

- A) REFERENCE JEDEC REGISTRATION TO-236, VARIATION AB, ISSUE H.
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSIONS ARE INCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR EXTRUSIONS.
- D) DIMENSIONING AND TOLERANCING PER ASME Y14.5M - 1994.
- E) DRAWING FILE NAME: MA03DREV10

DETAIL A
SCALE: 2X

Figure 15. 3-LEAD, SOT23, JEDEC TO-236, LOW PROFILE (ACTIVE)

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