

# NPN RF Transistor

## MMBT5179

### Description

This device is designed for use in low noise UHF/VHF amplifiers with collector currents in the 100  $\mu$ A to 30 mA range in common emitter or common base mode of operation, and in low frequency drift, high output UHF oscillators. Sourced from Process 40.

### Features

- This Device is Pb-Free, Halogen Free/BFR Free and is RoHS Compliant

### ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Value	Unit
$V_{CEO}$	Collector-Emitter Voltage	12	V
$V_{CBO}$	Collector-Base Voltage	20	V
$V_{EBO}$	Emitter-Base Voltage	2.5	V
$I_C$	Collector Current - Continuous	50	mA
$T_J, T_{stg}$	Operating and Storage Junction Temperature Range (Note 1)	-55 to +150	$^\circ\text{C}$

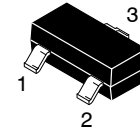
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

### THERMAL CHARACTERISTICS

( $T_A = 25^\circ\text{C}$  unless otherwise noted) (Note 3)

Symbol	Characteristic	Max	Unit
$P_D$	Total Device Dissipation Derate above $25^\circ\text{C}$	225 1.8	MW mW/ $^\circ\text{C}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	556	$^\circ\text{C}/\text{W}$

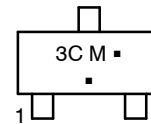
- These ratings are based on a maximum junction temperature of  $150^\circ\text{C}$ .
- These are steady-state limits. onsemi should be consulted on applications involving pulsed or low-duty cycle operations.
- Device mounted on FR-4 PCB  $1.6'' \times 1.6'' \times 0.06''$ .



1. Base 2. Emitter 3. Collector

SOT-23  
CASE 318-08

### MARKING DIAGRAM



3C = Specific Device Code  
M = Date Code\*  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

\*Date Code orientation and/or overbar may vary depending upon manufacturing location.

### ORDERING INFORMATION

Device	Package	Shipping <sup>†</sup>
MMBT5179	SOT-23 (Pb-Free)	3000 / Tape and Reel

<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, [BRD8011/D](#).

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

Symbol	Parameter	Test Conditions	Min	Max	Unit
$V_{CE(sus)}$	Collector–Emitter Sustaining Voltage (Note 4)	$I_C = 3.0\text{ mA}$ , $I_B = 0$	12		V
$V_{(BR)CBO}$	Collector–Base Breakdown Voltage	$I_C = 1.0\ \mu\text{A}$ , $I_E = 0$	20		V
$V_{(BR)EBO}$	Emitter–Base Breakdown Voltage	$I_E = 10\ \mu\text{A}$ , $I_C = 0$	2.5		V
$I_{CBO}$	Collector Cut–Off Current	$V_{CB} = 15\text{ V}$ , $I_E = 0$		0.02	$\mu\text{A}$
		$V_{CB} = 15\text{ V}$ , $T_A = 150^\circ\text{C}$		1.0	$\mu\text{A}$

## ON CHARACTERISTICS

$h_{FE}$	DC Current Gain	$I_C = 3.0\text{ mA}$ , $V_{CE} = 1.0\text{ V}$	25	250	
$V_{CE(sat)}$	Collector–Emitter Saturation Voltage	$I_C = 10\text{ mA}$ , $I_B = 1.0\text{ mA}$		0.4	V
$V_{BE(sat)}$	Base–Emitter Saturation Voltage	$I_C = 10\text{ mA}$ , $I_B = 1.0\text{ mA}$		1.0	V

## SMALL SIGNAL CHARACTERISTICS

$f_T$	Current Gain – Bandwidth Product	$I_C = 5.0\text{ mA}$ , $V_{CE} = 6.0\text{ V}$ , $f = 100\text{ MHz}$	900	2000	MHz
$C_{cb}$	Collector–Base Capacitance	$V_{CB} = 10\text{ V}$ , $I_E = 0$ , $f = 0.1\text{ to }1.0\text{ MHz}$		1.0	pF
$h_{fe}$	Small–Signal Current Gain	$I_C = 2.0\text{ mA}$ , $V_{CE} = 6\text{ V}$ , $f = 1.0\text{ kHz}$	25	300	
$rb'C_c$	Collector Base Time Constant	$I_C = 2.0\text{ mA}$ , $V_{CB} = 6.0\text{ V}$ , $f = 31.9\text{ MHz}$	3.0	14	ps
NF	Noise Figure	$I_C = 1.5\text{ mA}$ , $V_{CE} = 6.0\text{ V}$ , $R_S = 50\ \Omega$ , $f = 200\text{ MHz}$		5.0	dB

## FUNCTIONAL TEST

$G_{pe}$	Amplifier Power Gain	$V_{CE} = 6.0\text{ V}$ , $I_C = 5.0\text{ mA}$ , $f = 200\text{ MHz}$	15		dB
$P_O$	Power Output	$V_{CB} = 10\text{ V}$ , $I_E = 12\text{ mA}$ , $f \geq 500\text{ MHz}$	20		mW

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

4. Pulse Test: Pulse Width  $\leq 300\ \mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ .

## SPICE MODEL

NPN ( $I_s=69.28\text{E-}18$   $X_{ti}=3$   $E_g=1.11$   $V_{af}=100$   $B_f=282.1$   $N_e=1.177$   $I_{se}=69.28\text{E-}18$   $I_{kf}=22.03\text{m}$   $X_{tb}=1.5$   $B_r=1.176$   $N_c=2$   $I_{sc}=0$   $I_{kr}=0$   $R_c=4$   $C_{jc}=1.042\text{p}$   $M_{jc}=.2468$   $V_{jc}=.75$   $F_c=.5$   $C_{je}=1.52\text{p}$   $M_{je}=.3223$   $V_{je}=.75$   $T_r=1.588\text{n}$   $T_f=135.6\text{p}$   $I_{tf}=.27$   $V_{tf}=10$   $X_{tf}=30$   $R_b=10$ )

TYPICAL CHARACTERISTICS

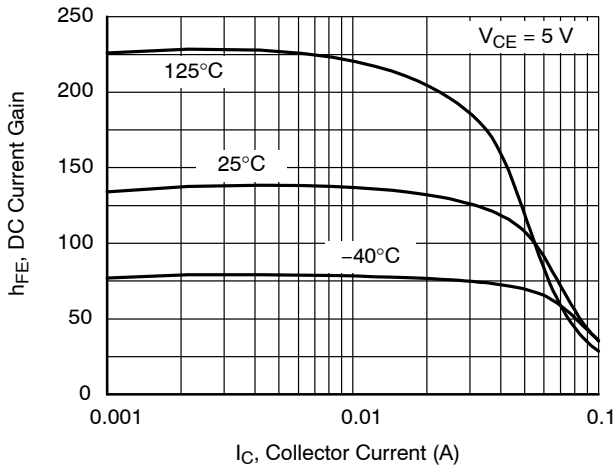


Figure 1. DC Current Gain vs. Collector Current

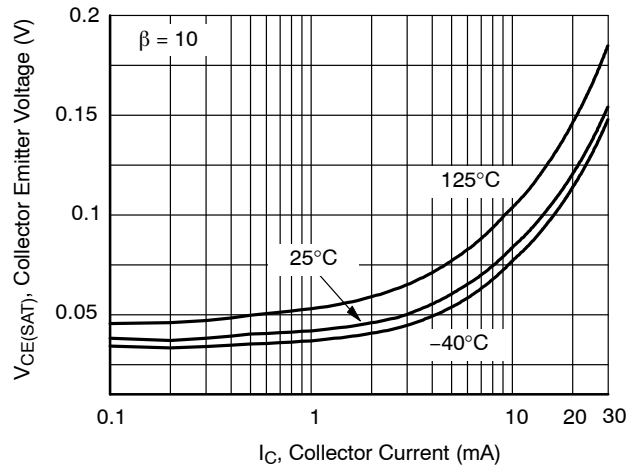


Figure 2. Collector-Emitter Saturation Voltage vs. Collector Current

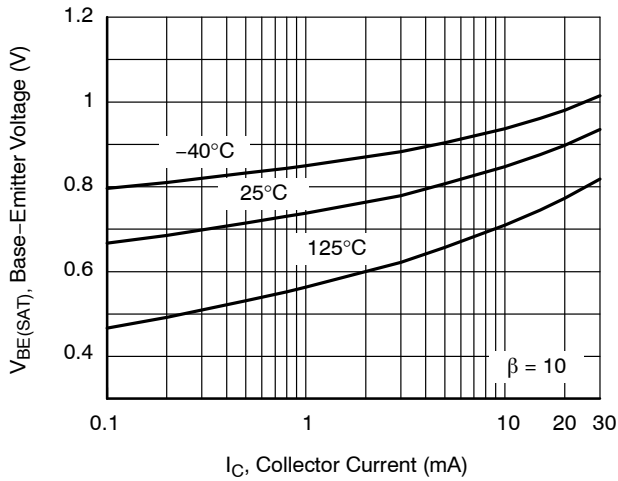


Figure 3. Base-Emitter Saturation Voltage vs. Collector Current

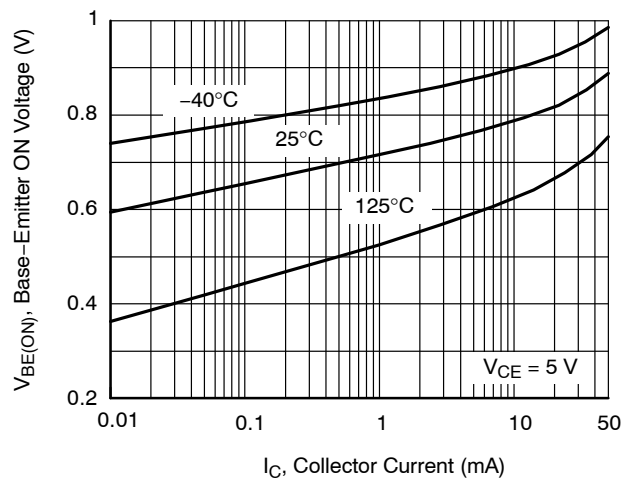


Figure 4. Base-Emitter ON Voltage vs. Collector Current

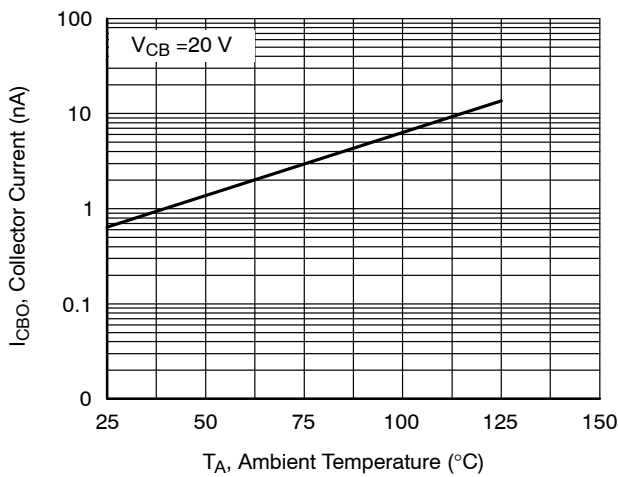


Figure 5. Collector Cut-Off Current vs. Ambient Temperature

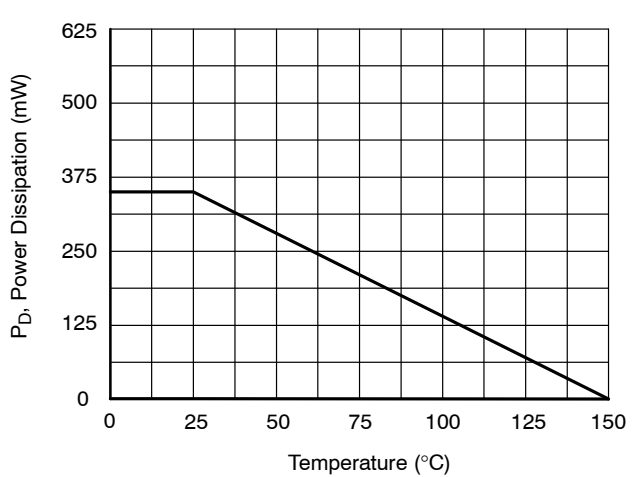


Figure 6. Power Dissipation vs. Ambient Temperature

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## TEST CIRCUIT

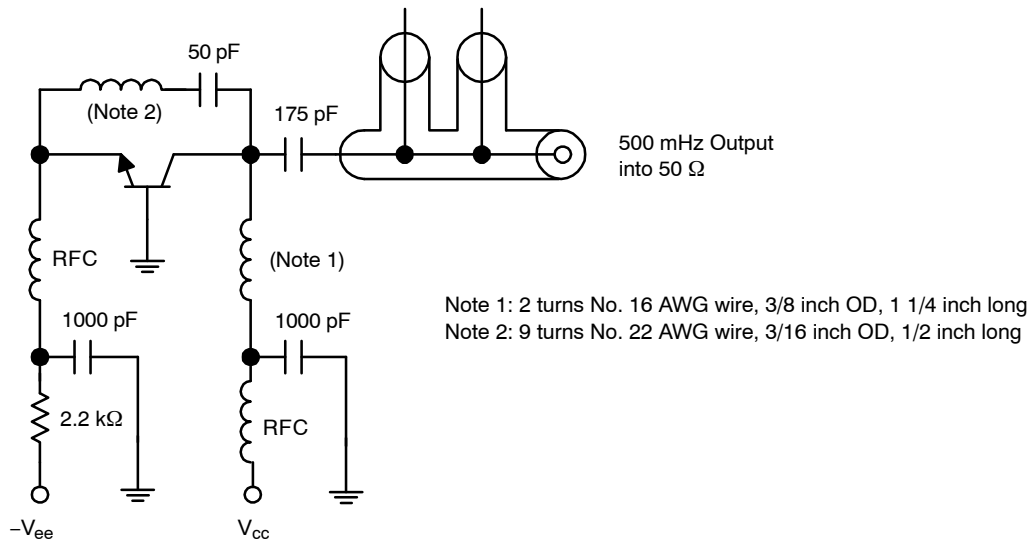


Figure 7. 500 MHz Oscillator Circuit

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