

NPN RF Transistor

MMBT5179

Description

This device is designed for use in low noise UHF/VHF amplifiers with collector currents in the 100 μ 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	$^\circ\text{C}$

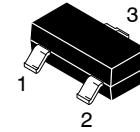
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

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°C	225 1.8	MW mW/ $^\circ\text{C}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	556	$^\circ\text{C}/\text{W}$

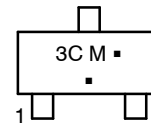
- These ratings are based on a maximum junction temperature of 150°C .
- These are steady-state limits. onsemi should be consulted on applications involving pulsed or low-duty cycle operations.
- Device mounted on FR-4 PCB $1.6'' \times 1.6'' \times 0.06''$.



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 [†]
MMBT5179	SOT-23 (Pb-Free)	3000 / Tape and Reel

[†]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](#).

MMBT5179

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	μA
		$V_{CB} = 15\text{ V}$, $T_A = 150^\circ\text{C}$		1.0	μA

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

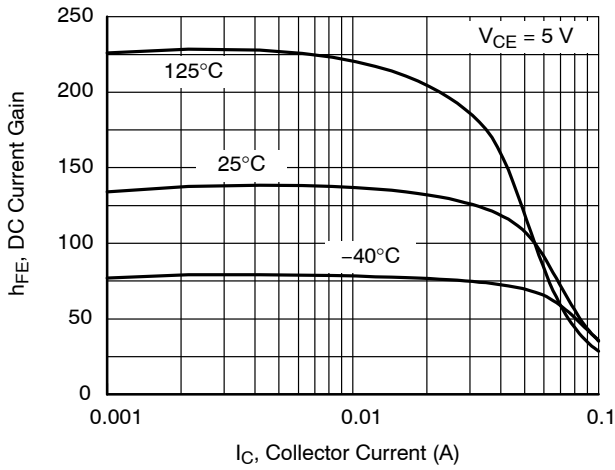


Figure 1. DC Current Gain vs. Collector Current

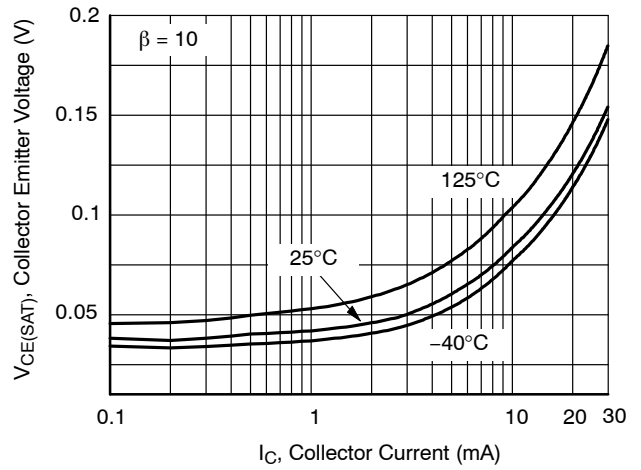


Figure 2. Collector-Emitter Saturation Voltage vs. Collector Current

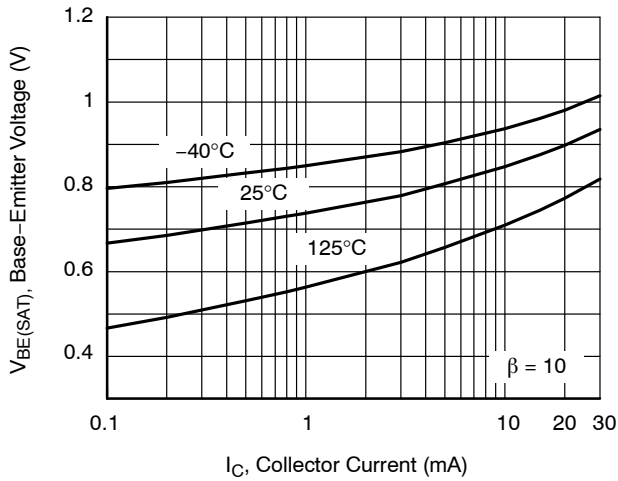


Figure 3. Base-Emitter Saturation Voltage vs. Collector Current

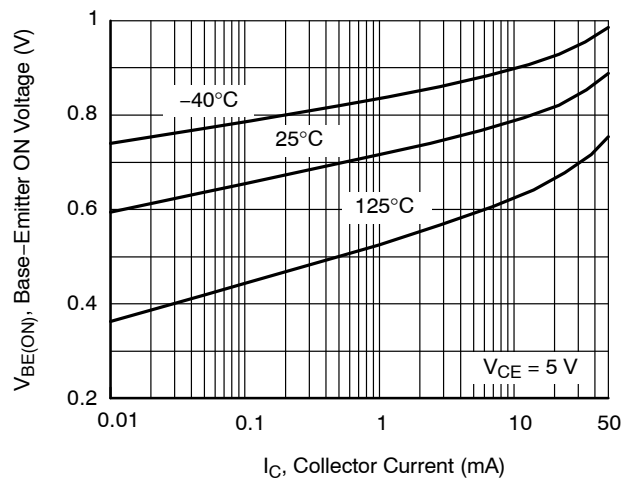


Figure 4. Base-Emitter ON Voltage vs. Collector Current

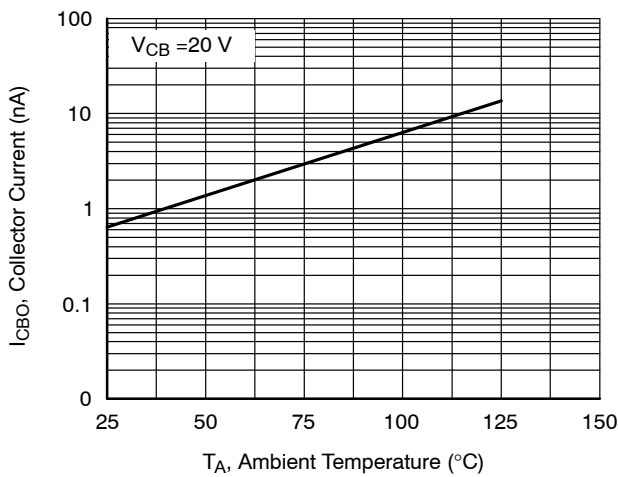


Figure 5. Collector Cut-Off Current vs. Ambient Temperature

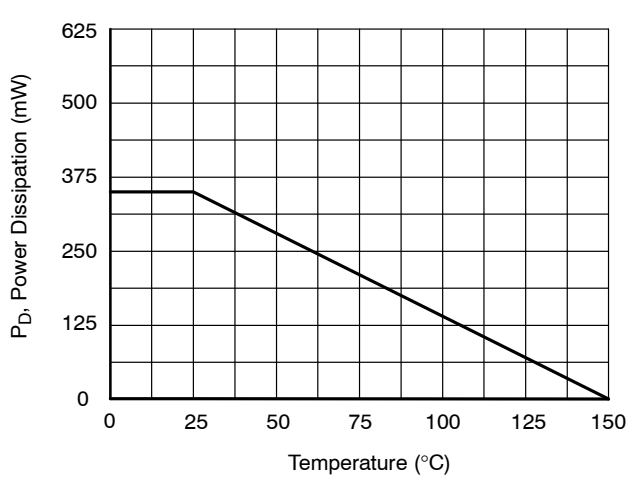


Figure 6. Power Dissipation vs. Ambient Temperature

MMBT5179

TEST CIRCUIT

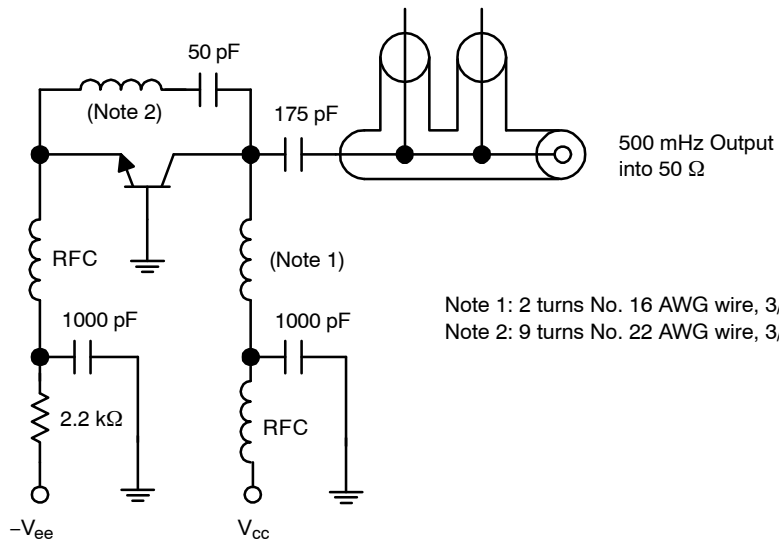


Figure 7. 500 MHz Oscillator Circuit

MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



SOT-23 (TO-236)
CASE 318
ISSUE AT

DATE 01 MAR 2023

SCALE 4:1



NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M,1994.
2. CONTROLLING DIMENSION: MILLIMETERS
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

DIM	MILLIMETERS			INCHES		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.89	1.00	1.11	0.035	0.039	0.044
A1	0.01	0.06	0.10	0.000	0.002	0.004
b	0.37	0.44	0.50	0.015	0.017	0.020
c	0.08	0.14	0.20	0.003	0.006	0.008
D	2.80	2.90	3.04	0.110	0.114	0.120
E	1.20	1.30	1.40	0.047	0.051	0.055
e	1.78	1.90	2.04	0.070	0.075	0.080
L	0.30	0.43	0.55	0.012	0.017	0.022
L1	0.35	0.54	0.69	0.014	0.021	0.027
H _E	2.10	2.40	2.64	0.083	0.094	0.104
T	0°	---	10°	0°	---	10°

GENERIC MARKING DIAGRAM*



- XXX = Specific Device Code
- M = Date Code
- = Pb-Free Package

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.



RECOMMENDED MOUNTING FOOTPRINT

* For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

STYLES ON PAGE 2

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MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS



SOT-23 (TO-236)
CASE 318
ISSUE AT

DATE 01 MAR 2023

- | | | | | | |
|---------------------------------------------------------|-------------------------------------------------------|-------------------------------------------------------------|-------------------------------------------------------------|-------------------------------------------------------------|-------------------------------------------------------------|
| STYLE 1 THRU 5:
CANCELLED | STYLE 6:
PIN 1. BASE
2. EMITTER
3. COLLECTOR | STYLE 7:
PIN 1. EMITTER
2. BASE
3. COLLECTOR | STYLE 8:
PIN 1. ANODE
2. NO CONNECTION
3. CATHODE | | |
| STYLE 9:
PIN 1. ANODE
2. ANODE
3. CATHODE | STYLE 10:
PIN 1. DRAIN
2. SOURCE
3. GATE | STYLE 11:
PIN 1. ANODE
2. CATHODE
3. CATHODE-ANODE | STYLE 12:
PIN 1. CATHODE
2. CATHODE
3. ANODE | STYLE 13:
PIN 1. SOURCE
2. DRAIN
3. GATE | STYLE 14:
PIN 1. CATHODE
2. GATE
3. ANODE |
| STYLE 15:
PIN 1. GATE
2. CATHODE
3. ANODE | STYLE 16:
PIN 1. ANODE
2. CATHODE
3. CATHODE | STYLE 17:
PIN 1. NO CONNECTION
2. ANODE
3. CATHODE | STYLE 18:
PIN 1. NO CONNECTION
2. CATHODE
3. ANODE | STYLE 19:
PIN 1. CATHODE
2. ANODE
3. CATHODE-ANODE | STYLE 20:
PIN 1. CATHODE
2. ANODE
3. GATE |
| STYLE 21:
PIN 1. GATE
2. SOURCE
3. DRAIN | STYLE 22:
PIN 1. RETURN
2. OUTPUT
3. INPUT | STYLE 23:
PIN 1. ANODE
2. ANODE
3. CATHODE | STYLE 24:
PIN 1. GATE
2. DRAIN
3. SOURCE | STYLE 25:
PIN 1. ANODE
2. CATHODE
3. GATE | STYLE 26:
PIN 1. CATHODE
2. ANODE
3. NO CONNECTION |
| STYLE 27:
PIN 1. CATHODE
2. CATHODE
3. CATHODE | STYLE 28:
PIN 1. ANODE
2. ANODE
3. ANODE | | | | |

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