



# 16.5 GHz Wideband NPN Chip – BFR391

Silicon NPN Planar RF Transistor in bare die form

Rev 1.3

15/02/19

## Description

NPN transistor in unencapsulated chip form. It is primarily intended for use in RF wideband amplifiers, such as in aerial amplifiers, radar systems, oscilloscopes, spectrum analyzers, etc. The transistor features low intermodulation distortion and high power gain; due to its very high transition frequency, it also has excellent wideband properties and low noise up to high frequencies.

## Ordering Information

The following part suffixes apply:

- No suffix - MIL-STD-750 /2072 Visual Inspection
- “H” - MIL-STD-750 /2072 Visual Inspection  
+ MIL-PRF-38534 Class H LAT
- “K” - MIL-STD-750 /2072 Visual Inspection  
+ MIL-PRF-38534 Class K LAT

LAT = Lot Acceptance Test.

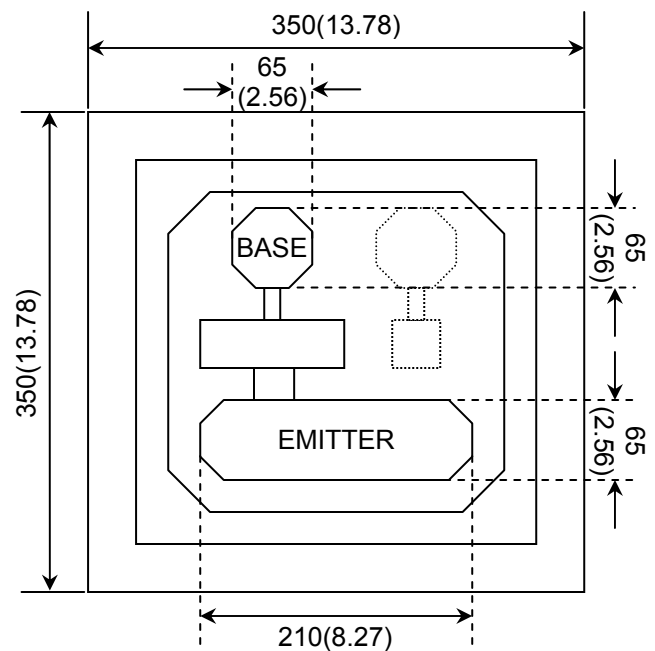
For further information on LAT process flows see below.

[www.siliconsupplies.com/quality/bare-die-lot-qualification](http://www.siliconsupplies.com/quality/bare-die-lot-qualification)

## Features:

- High Power Gain
- Low Noise
- Wide Transition Frequency

## Die Dimensions in $\mu\text{m}$ (mils)



CHIP BACKSIDE IS COLLECTOR

## Supply Formats:

- Default – Die in Waffle Pack (400 per tray capacity)
- Sawn Wafer on Tape – By specific request
- Unsawn Wafer – By specific request
- With additional electrical selection – Specific request
- Sawn as pairs – Specific request
- Adjacent pair pick – Specific request

## Mechanical Specification

Die Size (Unsawn)	350 x 350 13.78 x 13.78	$\mu\text{m}$ mils
Base Pad Size	65 x 65 2.65 x 2.65	$\mu\text{m}$ mils
Emitter Pad Size	210 x 65 8.27 x 65	$\mu\text{m}$ mils
Die Thickness	150 ( $\pm 20$ ) 5.90 ( $\pm 0.78$ )	$\mu\text{m}$ mils
Top Metal Composition	Al 0.6 $\mu\text{m}$	
Back Metal Composition	Au 0.6 $\mu\text{m}$	





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## Absolute Maximum Ratings $T_A = 25^\circ\text{C}$ unless otherwise stated

SYMBOL	PARAMETER	CONDITIONS	MIN	MAX	UNIT
$V_{CBO}$	collector-base voltage	open emitter	-	15	V
$V_{CEO}$	collector-emitter voltage	open base	-	8	V
$V_{EBO}$	emitter-base voltage	open collector	-	2	V
$I_C$	DC collector current	-	-	150	mA
$P_{tot}$	total power dissipation	-	-	400	mW
$T_{stg}, T_J$	storage & junction temperature	-	-65	150	$^\circ\text{C}$

## Electrical Characteristics $T_A = 25^\circ\text{C}$ unless otherwise stated

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	SYMBOL
$I_{CBO}$	collector cut-off current	$I_E = 0; V_{CB} = 5\text{V}$	-	-	100	nA
$I_{EBO}$	emitter cut-off current	$I_C = 0; V_{EB} = 5\text{V}$	-	-	100	nA
$h_{FE}$	DC current gain	$I_C = 50\text{mA}; V_{CE} = 5\text{V}$	60	-	150	
$f_T$	transition frequency	$I_C = 50\text{mA}; V_{CE} = 5\text{V}; f = 1\text{GHz}$	13	16.5	-	GHz
$G_P$	power gain	$I_C = 50\text{mA}; V_{CE} = 5\text{V}; f = 1\text{GHz}$	-	17.5	-	dB
NF	noise figure	$I_C = 10\text{mA}; V_{CE} = 1\text{V}; f = 1\text{GHz}$	-	1.2	1.8	dB

## Typical Characteristics $T_A = 25^\circ\text{C}$ unless otherwise stated

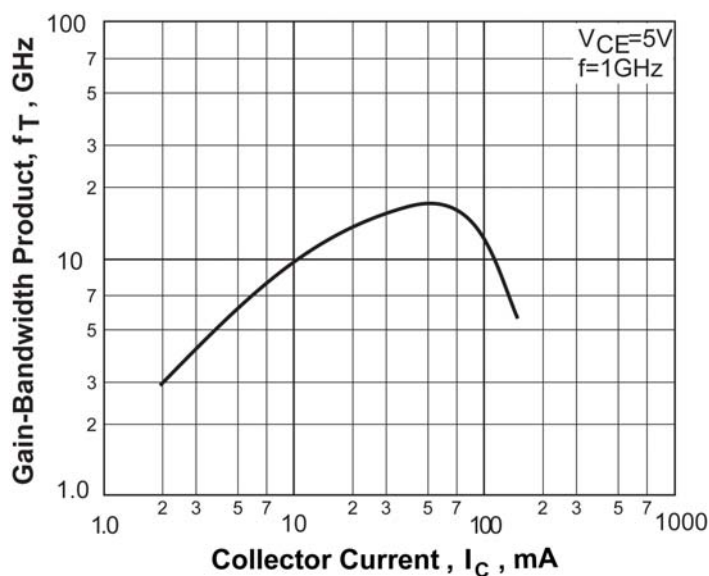


FIGURE 1. Transition Frequency versus Collector Current

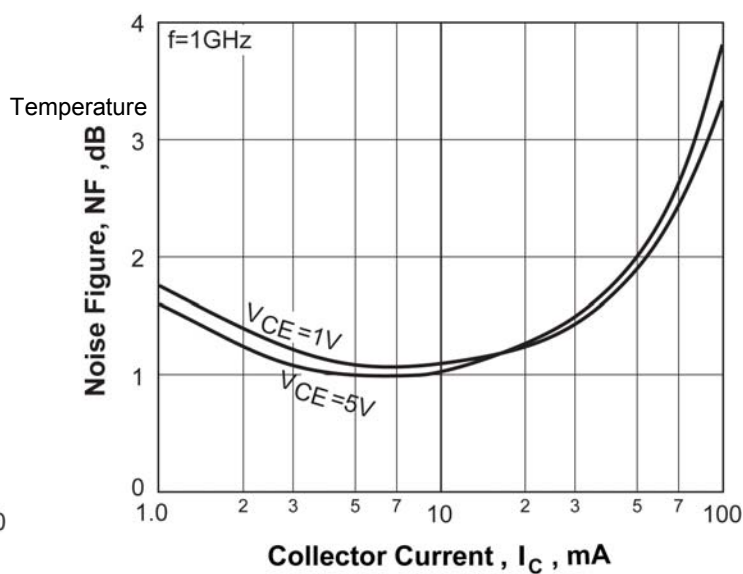


FIGURE 2. Noise Figure versus Collector Current





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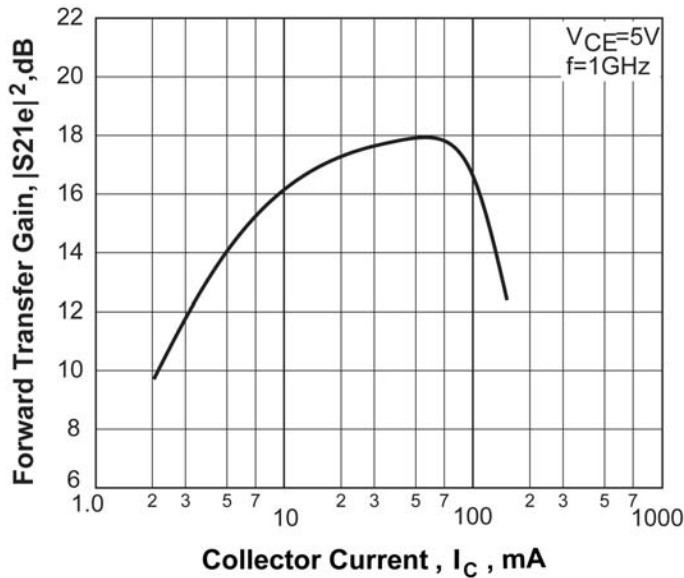


FIGURE 3. Insertion Power Gain versus Collector Current

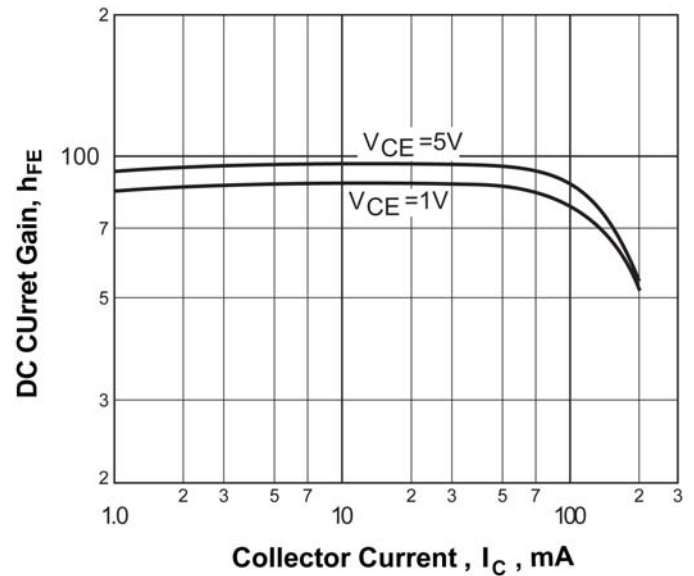


FIGURE 4.  $h_{FE}$  versus Collector Current

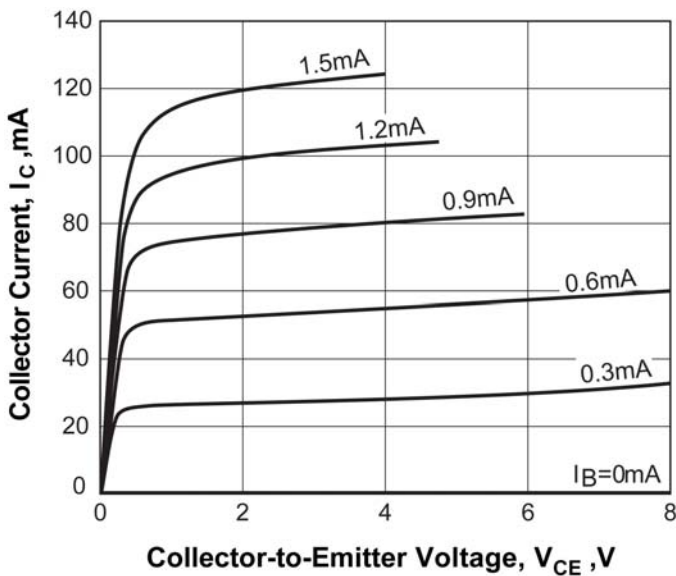


FIGURE 5. Collector Current versus Collector-to-Emitter Voltage

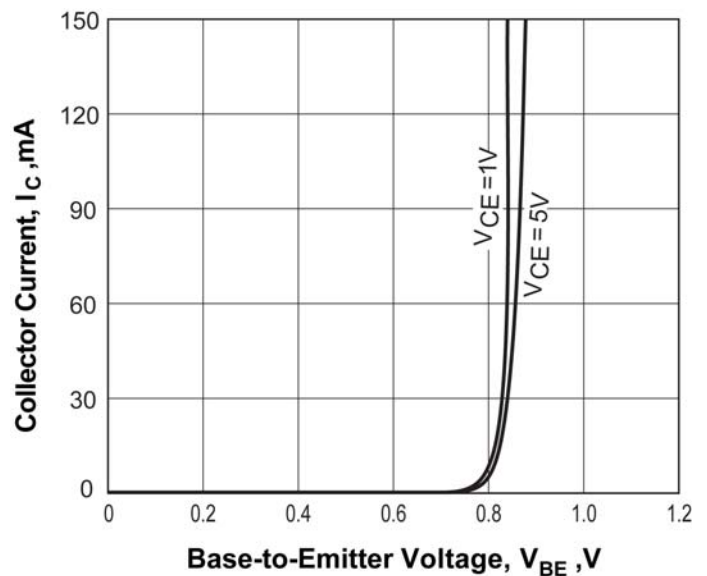


FIGURE 6. Collector Current versus Base-to-Emitter Voltage





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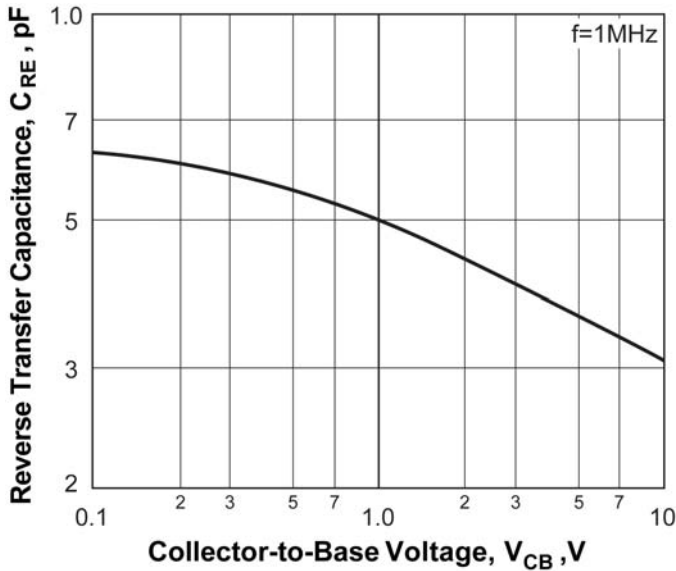


FIGURE 7. Reverse Transfer Capacitance

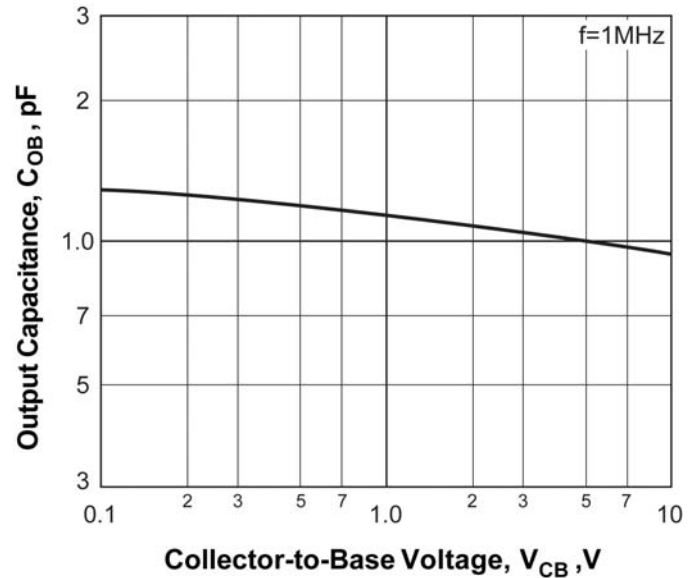


FIGURE 8. Output Capacitance

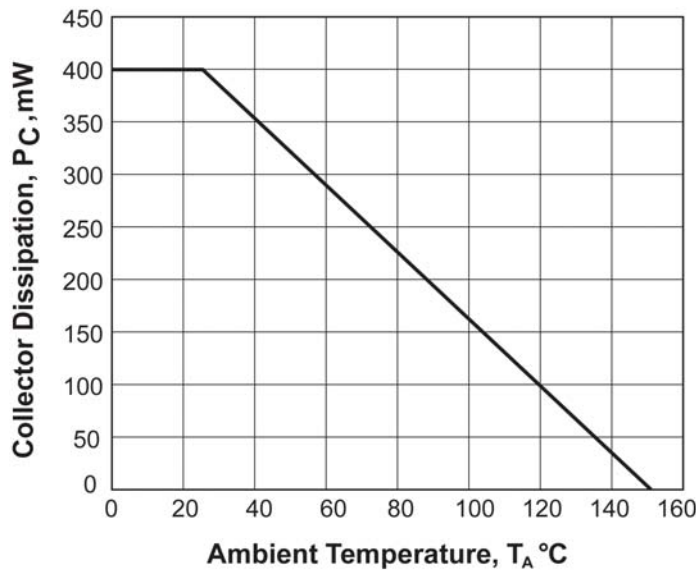


FIGURE 9. Power Dissipation versus Ambient Temperature

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