

BFR380L3

Low profile linear silicon NPN RF bipolar transistor



Product description

The BFR380L3 is a low noise device based on Si that is part of Infineon's established third generation RF bipolar transistor family. Its high transition frequency and low current and low noise characteristics make the device suitable for a broad range of applications as high as 3.5 GHz. It remains cost competitive without compromising on ease of use.



Feature list

- Minimum noise figure $NF_{min} = 1.1$ dB at 1.8 GHz, 3 V, 8 mA
- High gain $G_{ma} = 14$ dB at 1.8 GHz, 3 V, 40 mA
- $OIP_3 = 29.5$ dBm at 1.8 GHz, 3 V, 40 mA

Product validation

Qualified for industrial applications according to the relevant tests of JEDEC JESD47, JESD22, and J-STD-020. Qualified for industrial applications according to the relevant tests of AEC-Q 101.

Potential applications

- Low noise amplifiers (LNAs) for DVB-T/H
- LNAs for TV white space application
- Low noise, high linearity amplifiers for sub-1 GHz ISM band applications

Device information

Table 1 Part information

Product name / Ordering code	Package	Pin configuration			Marking	Pieces / Reel
BFR380L3 / BFR380L3E6327XTMA1	TSLP-3-1	1 = B	2 = E	3 = C	FC	15000

Attention: ESD (Electrostatic discharge) sensitive device, observe handling precautions

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Absolute maximum ratings

1 Absolute maximum ratings

Table 2 Absolute maximum ratings at $T_A = 25\text{ °C}$ (unless otherwise specified)

Parameter	Symbol	Values		Unit	Note or test condition
		Min.	Max.		
Collector emitter voltage	V_{CEO}	–	6	V	Open base
Collector emitter voltage	V_{CES}		15		E-B short circuited
Collector base voltage	V_{CBO}		15		Open emitter
Emitter base voltage	V_{EBO}		2		Open collector
Base current	I_B		14	mA	–
Collector current	I_C		80		
Total power dissipation ¹⁾	P_{tot}		380	mW	$T_S \leq 96\text{ °C}$
Junction temperature	T_J		150	°C	–
Storage temperature	T_{Stg}	-55			

Attention: Stresses above the max. values listed here may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect device reliability. Exceeding only one of these values may cause irreversible damage to the integrated circuit.

¹ T_S is the soldering point temperature. T_S is measured on the emitter lead at the soldering point of the PCB.

2 Thermal characteristics

Table 3 Thermal resistance

Parameter	Symbol	Values			Unit	Note or test condition
		Min.	Typ.	Max.		
Junction - soldering point	R_{thJS}	–	140	–	K/W	–

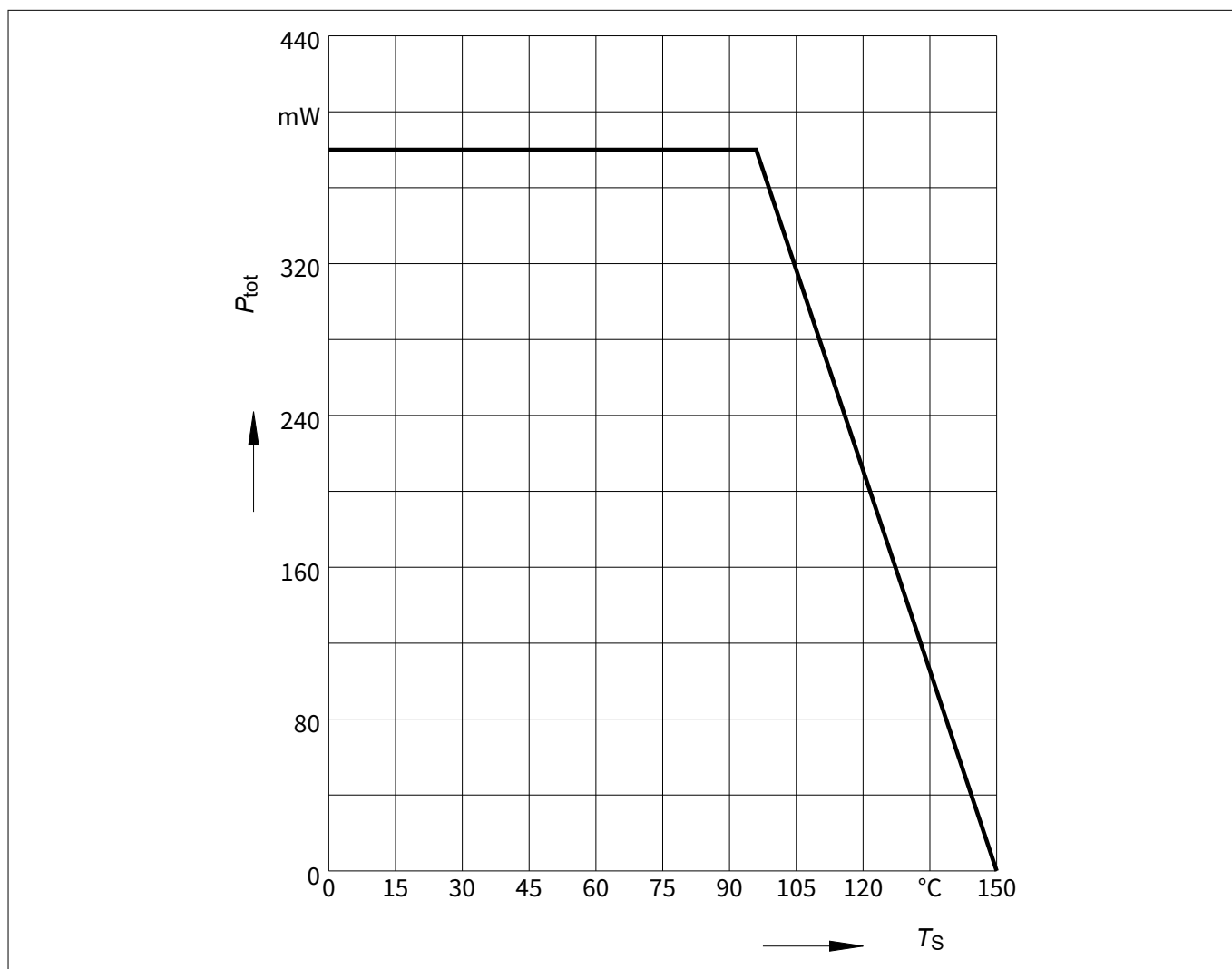


Figure 1 Total power dissipation $P_{tot} = f(T_s)$

Electrical characteristics

3 Electrical characteristics

3.1 DC characteristics

Table 4 DC characteristics at $T_A = 25\text{ °C}$ (unless otherwise specified)

Parameter	Symbol	Values			Unit	Note or test condition
		Min.	Typ.	Max.		
Collector emitter breakdown voltage	$V_{(BR)CEO}$	6	9	–	V	$I_C = 1\text{ mA}$, $I_B = 0$, open base
Collector emitter leakage current	I_{CES}	–	1	30 ²⁾	nA	$V_{CE} = 5\text{ V}$, $V_{BE} = 0$, E-B short circuited
			–	1000 ²⁾		$V_{CE} = 15\text{ V}$, $V_{BE} = 0$, E-B short circuited
			–	30 ²⁾		$V_{CB} = 5\text{ V}$, $I_E = 0$, open emitter
Collector base leakage current	I_{CBO}					
Emitter base leakage current	I_{EBO}		10	500 ²⁾		$V_{EB} = 1\text{ V}$, $I_C = 0$, open collector
DC current gain	h_{FE}	90	120	160		$V_{CE} = 3\text{ V}$, $I_C = 40\text{ mA}$, pulse measured

3.2 General AC characteristics

Table 5 General AC characteristics at $T_A = 25\text{ °C}$

Parameter	Symbol	Values			Unit	Note or test condition
		Min.	Typ.	Max.		
Transition frequency	f_T	11	14	–	GHz	$V_{CE} = 3\text{ V}$, $I_C = 40\text{ mA}$, $f = 1\text{ GHz}$
Collector base capacitance	C_{CB}	–	0.45	0.8	pF	$V_{CB} = 5\text{ V}$, $V_{BE} = 0$, $f = 1\text{ MHz}$, emitter grounded
Collector emitter capacitance	C_{CE}		0.18	–		$V_{CE} = 5\text{ V}$, $V_{BE} = 0$, $f = 1\text{ MHz}$, base grounded
Emitter base capacitance	C_{EB}		1	–		$V_{EB} = 0.5\text{ V}$, $V_{CB} = 0$, $f = 1\text{ MHz}$, collector grounded

²⁾ Maximum values not limited by the device but by the short cycle time of the 100% test.

3.3 Frequency dependent AC characteristics

Measurement setup is a test fixture with Bias-T's in a 50 Ω system, $T_A = 25^\circ\text{C}$.

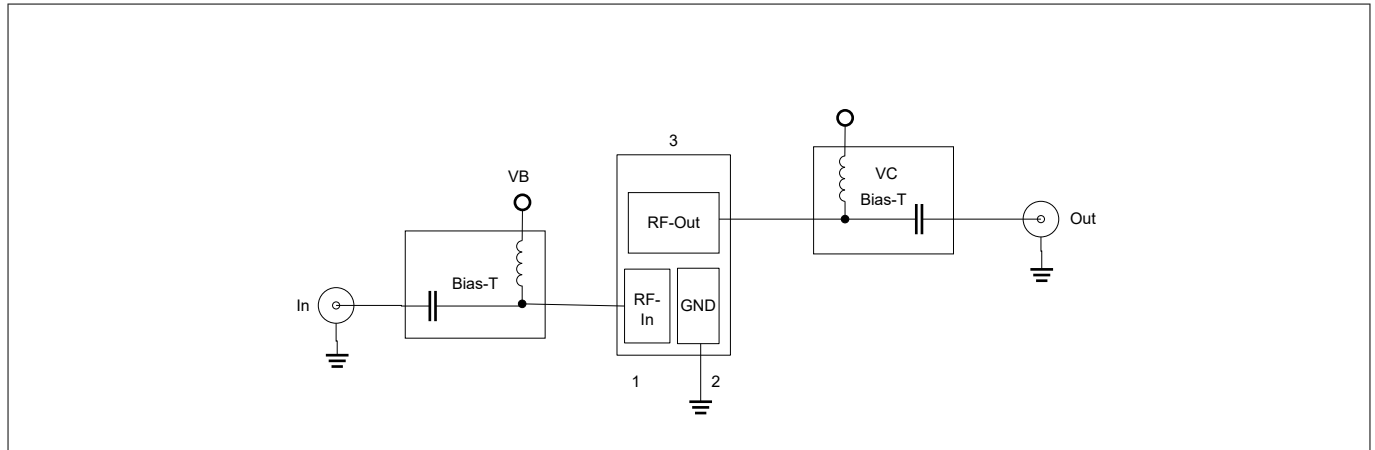


Figure 2 Testing circuit

Table 6 AC characteristics, $V_{CE} = 3\text{ V}$, $f = 1.8\text{ GHz}$

Parameter	Symbol	Values			Unit	Note or test condition
		Min.	Typ.	Max.		
Power gain					dB	$I_C = 40\text{ mA}$
• Maximum power gain	G_{ma}	11.5	14	16.5		
• Transducer gain	$ S_{21} ^2$	9.5	11.5	13.5		
Noise figure					dB	$I_C = 8\text{ mA}$
• Minimum noise figure	NF_{min}	0.5	1.1	2.1		
Linearity					dBm	$I_C = 40\text{ mA}$, $Z_S = Z_L = 50\ \Omega$, $Z_S = Z_{S,opt}$, $Z_L = Z_{L,opt}$
• 3rd order intercept point at output	OIP_3	–	29.5	–		
• 1 dB gain compression point at output	OP_{1dB}		16			
	OP_{1dB}		19.5			

Table 7 AC characteristics, $V_{CE} = 3\text{ V}$, $f = 3\text{ GHz}$

Parameter	Symbol	Values			Unit	Note or test condition
		Min.	Typ.	Max.		
Power gain					dB	$I_C = 40\text{ mA}$
• Maximum power gain	G_{ma}	7.5	10	12.5		
• Transducer gain	$ S_{21} ^2$	5.5	7.5	9.5		

Note: $G_{ms} = |S_{21}| / |S_{12}|$ for $k < 1$; $G_{ma} = |S_{21}| / |S_{12}| I(k - (k^2 - 1)^{1/2})$ for $k > 1$. In order to get the NF_{min} values stated in this chapter, the test fixture losses have been subtracted from all measured results. OIP_3 value depends on termination of all intermodulation frequency components. Termination used for this measurement is 50 Ω from 0.1 MHz to 6 GHz.

4 Package information TSLP-3-1

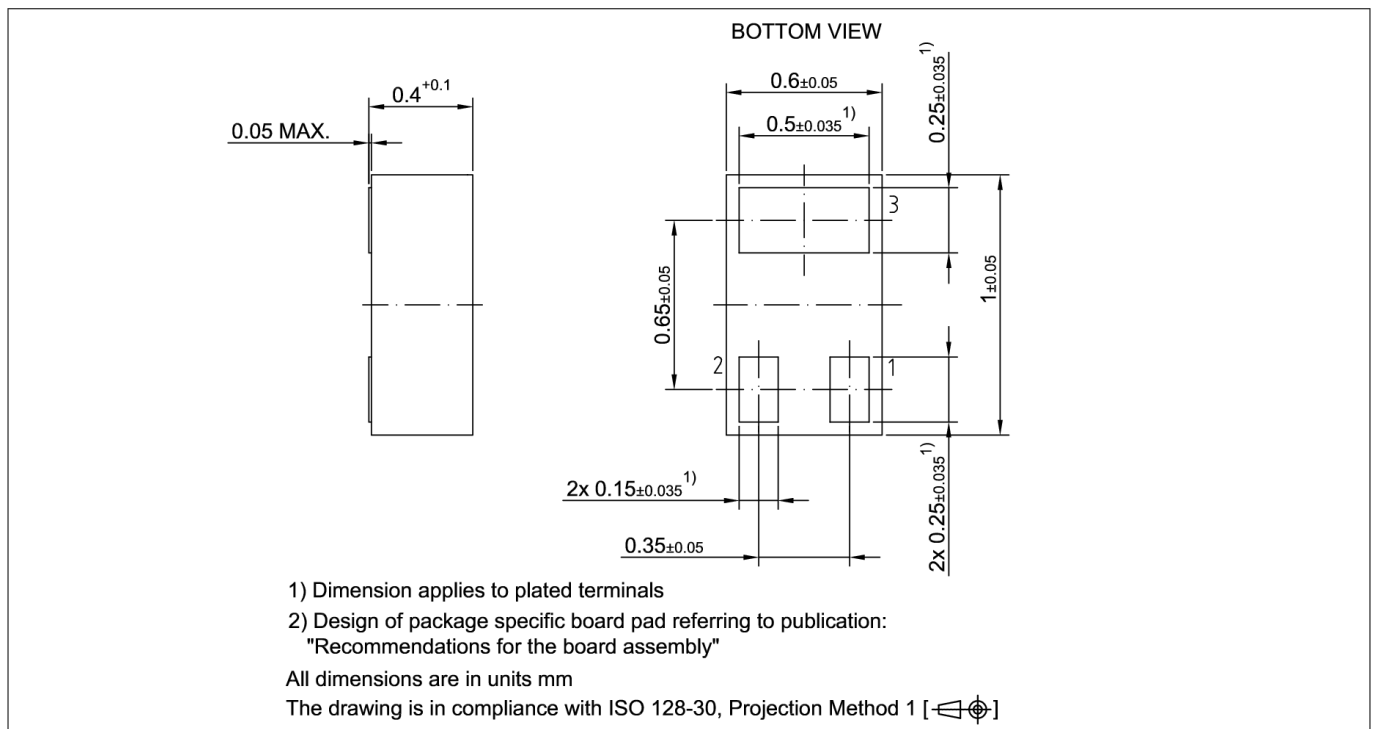


Figure 3 TSLP-3-1 package

Note: For package information including footprint, packing and assembly recommendation refer to:

<https://www.infineon.com/packages/TSLP-3-1/>

Revision history

Revision history

Document version	Date of release	Description of changes
Revision 2.0	2019-01-25	New datasheet layout.
Revision 3.0	2024-07-01	Updated product validation

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