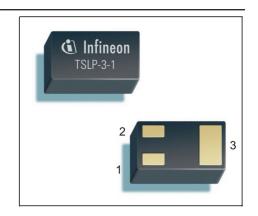


Low Noise Silicon Bipolar RF Transistor

- For low voltage / low current applications
- Ideal for VCO modules and low noise amplifiers
- Low noise figure: 1.1 dB at 1.8 GHz
- Excellent ESD performance typical value 1500V (HBM)
- High f_T of 22 GHz
- Pb-free (RoHS compliant) and halogen-free thin small leadless package
- Qualification report according to AEC-Q101 available







ESD (Electrostatic discharge) sensitive device, observe handling precaution!

Туре	Marking	Pin Configuration			Package
BFR460L3	AB	1 = B	2 = E	3 = C	TSLP-3-1

Maximum Ratings at T_A = 25 °C, unless otherwise specified

Parameter	Symbol	Value	Unit
Collector-emitter voltage	$V_{\sf CEO}$		V
<i>T</i> _A = 25 °C		4.5	
<i>T</i> _A = -55 °C		4.2	
Collector-emitter voltage	V_{CES}	15	
Collector-base voltage	V_{CBO}	15	
Emitter-base voltage	V_{EBO}	1.5	
Collector current	I _C	50	mA
Base current	I_{B}	5	
Total power dissipation ¹⁾	P _{tot}	200	mW
<i>T</i> _S ≤ 108°C			
Junction temperature	$ T_{J} $	150	°C
Storage temperature	T_{Stg}	-55 150	

 $^{{}^{1}}T_{\rm S}$ is measured on the collector lead at the soldering point to the pcb



Thermal Resistance

Parameter	Symbol	Value	Unit
Junction - soldering point ¹⁾	R_{thJS}	210	K/W

Electrical Characteristics at T_A = 25 °C, unless otherwise specified

Parameter	Symbol	Values		Unit	
		min.	typ.	max.	
DC Characteristics			•	•	•
Collector-emitter breakdown voltage	V _{(BR)CEO}	4.5	5.8	-	V
$I_{\rm C}$ = 1 mA, $I_{\rm B}$ = 0	, ,				
Collector-emitter cutoff current	I _{CES}	-	_	10	μΑ
$V_{CE} = 15 \text{ V}, V_{BE} = 0$					
Collector-base cutoff current	I _{CBO}	ı	-	100	nA
$V_{\rm CB} = 5 \text{ V}, I_{\rm E} = 0$					
Emitter-base cutoff current	I _{EBO}	-	-	1	μΑ
$V_{\text{EB}} = 0.5 \text{ V}, I_{\text{C}} = 0$					
DC current gain	h _{FE}	90	120	160	_
$I_{\rm C}$ = 20 mA, $V_{\rm CE}$ = 3 V, pulse measured					

 $^{^{1}\}mathrm{For}$ the definition of R_{thJS} please refer to Application Note AN077 (Thermal Resistance Calculation)

2 2013-09-13



Electrical Characteristics at T_A = 25 °C, unless otherwise specified

Parameter	Symbol		Values		
		min.	typ.	max.	
AC Characteristics (verified by random sam	pling)				
Transition frequency	f _T	16	22	-	GHz
$I_{\rm C}$ = 30 mA, $V_{\rm CE}$ = 3 V, f = 1 GHz					
Collector-base capacitance	C _{cb}	-	0.28	0.45	pF
$V_{\text{CB}} = 3 \text{ V}, f = 1 \text{ MHz}, V_{\text{BE}} = 0 ,$					
emitter grounded					
Collector emitter capacitance	C _{ce}	-	0.14	-	
$V_{CE} = 3 \text{ V}, f = 1 \text{ MHz}, V_{BE} = 0$,					
base grounded					
Emitter-base capacitance	C _{eb}	-	0.55	-	
$V_{\text{EB}} = 0.5 \text{ V}, f = 1 \text{ MHz}, V_{\text{CB}} = 0$,					
collector grounded					
Minimum noise figure	NF _{min}				dB
$I_{\rm C}$ = 5 mA, $V_{\rm CE}$ = 3 V, $Z_{\rm S}$ = $Z_{\rm Sopt}$,					
f = 1.8 GHz		-	1.1	-	
f = 3 GHz		-	1.35	-	
Power gain, maximum stable ¹⁾	G _{ms}	-	16.0	-	dB
$I_{\rm C}$ = 20 mA, $V_{\rm CE}$ = 3 V, $Z_{\rm S}$ = $Z_{\rm Sopt}$,					
$Z_{L} = Z_{Lopt}$, $f = 1.8 \text{ GHz}$					
Power gain, maximum available ¹⁾	G _{ma}	-	11	-	dB
$I_{\rm C}$ = 20 mA, $V_{\rm CE}$ = 3 V, $Z_{\rm S}$ = $Z_{\rm Sopt}$,					
$Z_{L} = Z_{Lopt}$, $f = 3$ GHz					
Transducer gain	$ S_{21e} ^2$				dB
$I_{\rm C}$ = 20 mA, $V_{\rm CE}$ = 3 V, $Z_{\rm S}$ = $Z_{\rm L}$ = 50 Ω ,					
f = 1,8 GHz		_	14	-	
f = 3 GHz		-	10	-	
Third order intercept point at output ²⁾	IP3	-	27	-	dBm
$V_{CE} = 3 \text{ V}, I_{C} = 20 \text{ mA}, f = 1.8 \text{ GHz}$					
1dB compression point at output	P _{-1dB}	-	11.5	-	
$I_{\rm C}$ = 20 mA, $V_{\rm CE}$ = 3 V, f = 1.8 GHz					

 $^{{}^{1}}G_{\text{ma}}$ = $|S_{21} / S_{12}|$ (k-(k²-1) $^{1/2}$), G_{ms} = $|S_{21} / S_{12}|$

²IP3 value depends on termination of all intermodulation frequency components.

Termination used for this measurement is 50Ω from 0.1 MHz to 6 GHz



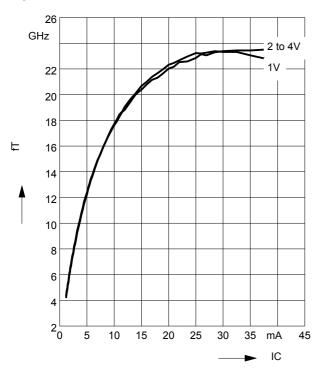
Total power dissipation $P_{tot} = f(T_S)$

240 mW 160 120 80 40 0 15 30 45 60 75 90 105 120 °C 150 — 7s

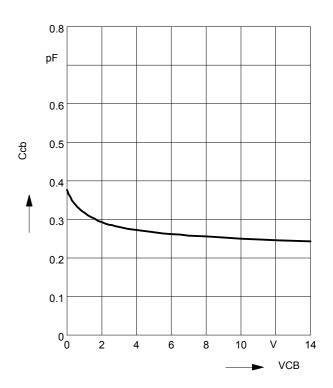
Transition frequency $f_T = f(I_C)$

f = 1 GHz

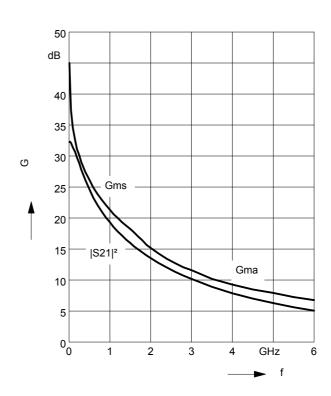
 V_{CE} = parameter in V



Collector-base capacitance C_{cb} = $f(V_{CB})$ f = 1MHz



Power gain G_{ma} , G_{ms} , $|S_{21}|^2 = f(f)$ $V_{CE} = 3 \text{ V}$, $I_{C} = 20 \text{ mA}$

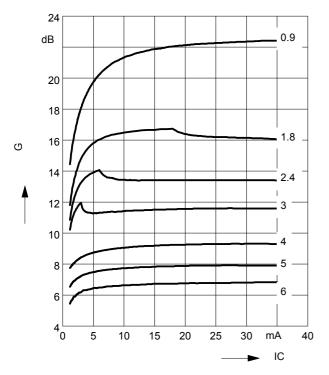




Power gain G_{ma} , $G_{ms} = f(I_C)$

 $V_{CE} = 3V$

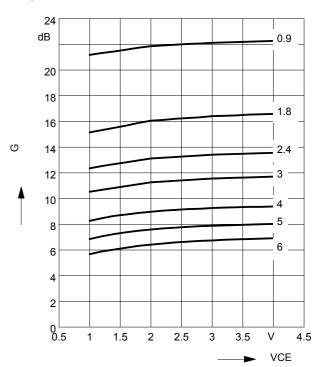
f = parameter in GHz



Power gain G_{ma} , $G_{ms} = f(V_{CE})$

 $I_{\rm C}$ = 20 mA

f = parameter in GHz





SPICE GP Model

For the SPICE Gummel Poon (GP) model as well as for the S-parameters (including noise parameters) please refer to our internet website www.infineon.com/rf.models.

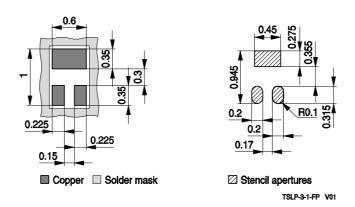
Please consult our website and download the latest versions before actually starting your design. You find the BFR460L3 SPICE GP model in the internet in MWO- and ADS-format, which you can import into these circuit simulation tools very quickly and conveniently. The model already contains the package parasitics and is ready to use for DC and high frequency simulations. The terminals of the model circuit correspond to the pin configuration of the device. The model parameters have been extracted and verified up to 6 GHz using typical devices. The BFR460L3 SPICE GP model reflects the typical DC- and RF-performance within the limitations which are given by the SPICE GP model itself. Besides the DC characteristics all S-parameters in magnitude and phase, as well as noise figure (including optimum source impedance, equivalent noise resistance and flicker noise) and intermodulation have been extracted.

TSLP-3-1-PO V03



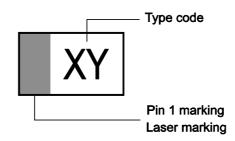
Pin 1 marking Top view Bottom view 0.05 MAX. 0.05±0.035 1) 0.05±0.035 1) 0.05±0.035 1) 0.05±0.035 1) 0.05±0.035 1) 0.05±0.035 1) 0.05±0.035 1) 0.05±0.035 1) 0.05±0.035 1) 0.05±0.035 1) 0.05±0.035 1) 0.05±0.035 1) 0.05±0.035 1) 0.05±0.035 1) 0.05±0.035 1) 0.05±0.035 1)

Foot Print



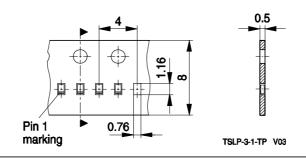
1) Dimension applies to plated terminal

Marking Layout (Example)



Standard Packing

Reel Ø 330 mm: 15.000 Pieces/ Reel





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