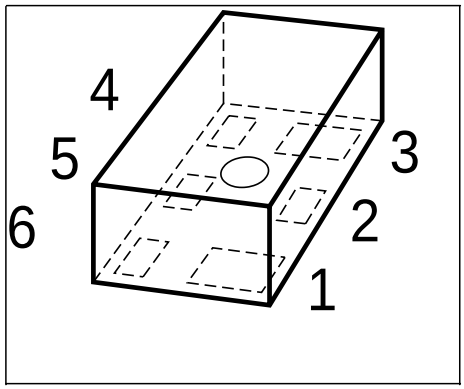
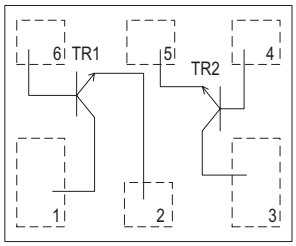
NPN Silicon RF TWIN Transistor

Preliminary data

- Low voltage/ low current applications
- Ideal for VCO modules and low noise amplifiers
- Low noise figure: TR1: 1.1dB at 1.8 GHz
  TR2: 1.5 dB at 1.8 GHz
- World's smallest SMD 6-pin leadless package
- Built in 2 transitors (TR1: die as BFR460L3,
  TR2: die as BFR949L3)





ESD: **E**lectro**s**tatic **d**ischarge sensitive device, observe handling precaution!

Type	Marking	Pin Configuration						Package
BFS469L6	AD	1=C1	2=E1	3=C2	4=B2	5=E2	6=B1	TSLP-6-1

Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-emitter voltage	V_{CEO}		V
TR1		4.5	
TR2		10	
Collector-emitter voltage	V_{CES}		
TR1		15	
TR2		20	
Collector-base voltage	V_{CBO}		
TR1		15	
TR2		20	
Emitter-base voltage	V_{EBO}		
TR1		1.5	
TR2		1.5	
Collector current	I_C		mA
TR1		50	
TR2		70	

Maximum Ratings

Parameter	Symbol	Value	Unit
Base current	I_B		mA
TR1		5	
TR2		7	
Total power dissipation[1)]	P_{tot}		mW
TR1, $T_S \leq 104°C$		200	
TR2, $T_S \leq 100°C$		250	
Junction temperature	T_j		°C
TR1		150	
TR2		150	
Ambient temperature	T_A		
TR1		-65 ... 150	
TR2		-65 ... 150	
Storage temperature	T_{stg}		
TR1		-65 ... 150	
TR2		-65 ... 150	

Thermal Resistance

Parameter	Symbol	Value	Unit
Junction - soldering point[2)]	R_{thJS}		K/W
TR1		≤ 230	
TR2		≤ 200	

[1] T_S is measured on the collector lead at the soldering point to the pcb

[2] For calculation of R_{thJA} please refer to Application Note Thermal Resistance

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC Characteristics					
Collector-emitter breakdown voltage	$V_{(BR)CEO}$				V
TR1, I_C = 1 mA, I_B = 0		4.5	5	-	
TR2, I_C = 1 mA, I_B = 0		10	-	-	
Collector-emitter cutoff current	I_{CES}				µA
TR1, V_{CE} = 15 V , V_{BE} = 0		-	-	10	
TR1, V_{CE} = 20 V, V_{BE} = 0		-	-	10	
Collector-base cutoff current	I_{CBO}				nA
TR1, V_{CB} = 5 V, I_E = 0		-	-	100	
TR2, V_{CB} = 10 V, I_E = 0		-	-	100	
Emitter-base cutoff current	I_{EBO}				µA
TR1, V_{EB} = 0,5 V, I_C = 0		-	-	1	
TR2, V_{EB} = 1 V, I_C = 0		-	-	0.1	
DC current gain-	h_{FE}				-
TR1, I_C = 20 mA, V_{CE} = 3 V		-	130	-	
TR2, I_C = 5 mA, V_{CE} = 3 V		100	140	200	

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC Characteristics (verified by random sampling)					
Transition frequency	f_T				GHz
TR1, I_C = 30 mA, V_{CE} = 3 V, f = 1 GHz		16	22	-	
TR2, I_C = 15 mA, V_{CE} = 6 V, f = 1 GHz		tbd	9	-	
Collector-base capacitance	C_{cb}				pF
TR1, V_{CB} = 3 V, f = 1 MHz, emitter grounded		-	0.33	0.5	
TR2, V_{CB} = 10 V, f = 1 MHz, emitter grounded		-	0.3	0.45	
Collector emitter capacitance	C_{ce}				
TR1, V_{CE} = 3 V, f = 1 MHz, base grounded		-	0.17	-	
TR1, V_{CE} = 10 V, f = 1 MHz, base grounded		-	0.17	-	
Emitter-base capacitance	C_{eb}				
TR1, V_{EB} = 0,5 V, f = 1 MHz, collector grounded		-	0.57	-	
TR2, V_{EB} = 0,5 V, f = 1 MHz, collector grounded		-	0.75	-	

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC Characteristics (verified by random sampling)					
Noise figure	F				dB
TR1, I_C=5mA, V_{CE} = 3 V, f = 1.8 GHz, $Z_S = Z_{Sopt}$		-	1.1	-	
TR1, I_C=5mA, V_{CE} = 3 V, f = 3 GHz, $Z_S = Z_{Sopt}$		-	1.4	-	
TR2, I_C=3mA, V_{CE} = 6 V, f = 1 GHz, $Z_S = Z_{Sopt}$		-	1	-	
TR2, I_C=3mA, V_{CE} = 8 V, f = 1.8 GHz, $Z_S = Z_{Sopt}$		-	1.3	-	
Power gain, maximum stable[1)]	G_{ms}				
TR1, I_C = 20 mA, V_{CE} = 3 V, Z_S=Z_{Sopt}, Z_L=Z_{Lopt}, f = 1.8 GHz		-	14.5	-	
TR2, I_C = 10 mA, V_{CE} = 8 V, Z_S=Z_{Sopt}, Z_L=Z_{Lopt}, f = 0.9 GHz		-	20	-	
TR2, I_C = 10 mA, V_{CE} = 8 V, Z_S=Z_{Sopt}, Z_L=Z_{Lopt}, f = 1.8 GHz		-	14	-	
Power gain, maximum available[1)]	G_{ma}	-	10	-	
TR1, I_C = 20mA, V_{CE} = 3 V, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$, f = 1,8 GHz					
Transducer gain	$\lvert S_{21e}\rvert^2$				
TR1, I_C=20mA, V_{CE} = 3 V, Z_S=Z_L=50Ω, f=1.8GHz		-	12.5	-	
TR1, I_C=20mA, V_{CE} = 3 V, Z_S=Z_L=50Ω, f=3GHz		-	9	-	
TR2, I_C=15mA, V_{CE} = 6 V, Z_S=Z_L=50Ω, f=1GHz		-	15,5	-	
TR2, I_C=10mA, V_{CE} = 8 V, Z_S=Z_L=50Ω, f=1.8GHz		-	11	-	
Third order intercept point at output[2)]	IP_3				dBm
TR1, V_{CE}=3V, I_C=20mA, Z_S=Z_L=50Ω, f=1.8GHz		-	28	-	
TR2, V_{CE}=8V, I_C=10mA, Z_S=Z_L=50Ω, f=1.8GHz		-	24.5	-	
1dB Compression point at output	P_{-1dB}				
TR1, I_C=20mA, V_{CE}=3V, Z_S=Z_L=50Ω, f=1.8GHz		-	12	-	
TR1, I_C=10mA, V_{CE}=8V, Z_S=Z_L=50Ω, f=1.8GHz		-	6	-	

[1] $G_{ma} = |S_{21e} / S_{12e}| (k-(k^2-1)^{1/2})$, $G_{ms} = |S_{21e} / S_{12e}|$

[2] IP3 value depends on termination of all intermodulation frequency components.
Termination used for this measurement is 50Ω from 0.1 MHz to 6 GHz

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