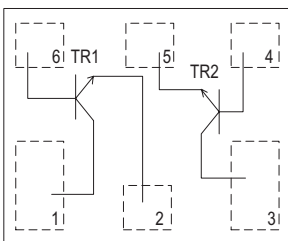
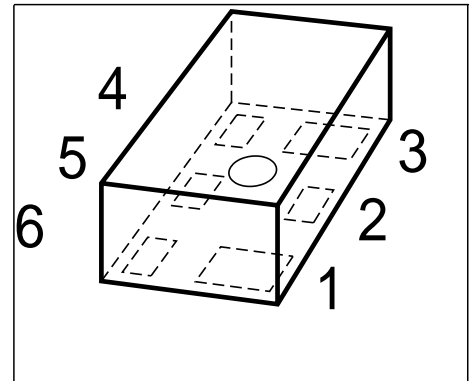


NPN Silicon RF TWIN Transistor

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: 1.0 dB at 1.8 GHz
- World's smallest SMD 6-pin leadless package
- Built in 2 transistors (TR1: die as BFR460L3,
TR2: die as BFR360L3)


ESD: Electrostatic discharge sensitive device, observe handling precaution!

Type	Marking	Pin Configuration						Package
BFS466L6	AC	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		6	
Collector-emitter voltage	V_{CES}		
TR1		15	
TR2		15	
Collector-base voltage	V_{CBO}		
TR1		15	
TR2		15	
Emitter-base voltage	V_{EBO}		
TR1		1.5	
TR2		2	
Collector current	I_C		mA
TR1		50	
TR2		35	

Maximum Ratings

Parameter	Symbol	Value	Unit
Base current	I_B		mA
TR1		5	
TR2		4	
Total power dissipation ¹⁾	P_{tot}		mW
TR1, $T_S \leq 104^\circ\text{C}$		200	
TR2, $T_S \leq 102^\circ\text{C}$		210	
Junction temperature	T_j		$^\circ\text{C}$
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		≤ 230	

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 $T_A = 25^\circ\text{C}$, unless otherwise specified

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC Characteristics					
Collector-emitter breakdown voltage TR1, $I_C = 1\text{ mA}$, $I_B = 0$ TR2, $I_C = 1\text{ mA}$, $I_B = 0$	$V_{(BR)CEO}$	4.5 6	5 9	- -	V
Collector-emitter cutoff current TR1, $V_{CE} = 15\text{ V}$, $V_{BE} = 0$ TR2, $V_{CE} = 15\text{ V}$, $V_{BE} = 0$	I_{CES}	- -	- -	10 10	μA
Collector-base cutoff current TR1, $V_{CB} = 5\text{ V}$, $I_E = 0$ TR2, $V_{CB} = 5\text{ V}$, $I_E = 0$	I_{CBO}	- -	- -	100 100	nA
Emitter-base cutoff current TR1, $V_{EB} = 0,5\text{ V}$, $I_C = 0$ TR2, $V_{EB} = 1\text{ V}$, $I_C = 0$	I_{EBO}	- -	- -	1 1	μA
DC current gain TR1, $I_C = 20\text{ mA}$, $V_{CE} = 3\text{ V}$ TR2, $I_C = 20\text{ mA}$, $V_{CE} = 3\text{ V}$	h_{FE}	- 90	130 130	- 160	-

Electrical Characteristics at $T_A = 25^\circ\text{C}$, unless otherwise specified

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC Characteristics (verified by random sampling)					
Transition frequency TR1, $I_C = 30\text{ mA}$, $V_{CE} = 3\text{ V}$, $f = 1\text{ GHz}$ TR2, $I_C = 15\text{ mA}$, $V_{CE} = 3\text{ V}$, $f = 1\text{ GHz}$	f_T	16 11	22 14	- -	GHz
Collector-base capacitance TR1, $V_{CB} = 3\text{ V}$, $f = 1\text{ MHz}$, emitter grounded TR2, $V_{CB} = 5\text{ V}$, $f = 1\text{ MHz}$, emitter grounded	C_{cb}	- -	0.33 0.3	0.5 0.45	pF
Collector emitter capacitance TR1, $V_{CE} = 3\text{ V}$, $f = 1\text{ MHz}$, base grounded TR1, $V_{CE} = 3\text{ V}$, $f = 1\text{ MHz}$, base grounded	C_{ce}	- -	0.17 0.17	- -	
Emitter-base capacitance TR1, $V_{EB} = 0,5\text{ V}$, $f = 1\text{ MHz}$, collector grounded TR2, $V_{EB} = 0,5\text{ V}$, $f = 1\text{ MHz}$, collector grounded	C_{eb}	- -	0.57 0.48	- -	

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, $I_C=5\text{mA}$, $V_{CE} = 3\text{ V}$, $f = 1.8\text{ GHz}$, $Z_S = Z_{\text{Sopt}}$		-	1.1	-	
TR1, $I_C=5\text{mA}$, $V_{CE} = 3\text{ V}$, $f = 3\text{ GHz}$, $Z_S = Z_{\text{Sopt}}$		-	1.4	-	
TR2, $I_C=3\text{mA}$, $V_{CE} = 3\text{ V}$, $f = 1.8\text{ GHz}$, $Z_S = Z_{\text{Sopt}}$		-	1	-	
TR2, $I_C=3\text{mA}$, $V_{CE} = 3\text{ V}$, $f = 3\text{ GHz}$, $Z_S = Z_{\text{Sopt}}$		-	1.4	-	
Power gain, maximum available ¹⁾	G_{ma}				
TR1, $I_C = 20\text{ mA}$, $V_{CE} = 3\text{ V}$, $Z_S=Z_{\text{Sopt}}$, $Z_L=Z_{\text{Lopt}}$, $f = 1.8\text{ GHz}$		-	14.5	-	
TR1, $I_C = 20\text{ mA}$, $V_{CE} = 3\text{ V}$, $Z_S=Z_{\text{Sopt}}$, $Z_L=Z_{\text{Lopt}}$, $f = 3\text{ GHz}$		-	10	-	
TR2, $I_C = 15\text{ mA}$, $V_{CE} = 3\text{ V}$, $Z_S=Z_{\text{Sopt}}$, $Z_L=Z_{\text{Lopt}}$, $f = 1.8\text{ GHz}$		-	14.5	-	
TR2, $I_C = 15\text{ mA}$, $V_{CE} = 3\text{ V}$, $Z_S=Z_{\text{Sopt}}$, $Z_L=Z_{\text{Lopt}}$, $f = 3\text{ GHz}$		-	10	-	
Transducer gain	$ S_{21e} ^2$				
TR1, $I_C = 20\text{ mA}$, $V_{CE} = 3\text{ V}$, $Z_S = Z_L = 50\Omega$, $f = 1.8\text{GHz}$		-	12.5	-	
TR1, $I_C = 20\text{ mA}$, $V_{CE} = 3\text{ V}$, $Z_S = Z_L = 50\Omega$, $f = 3\text{GHz}$		-	9	-	
TR2, $I_C = 15\text{ mA}$, $V_{CE} = 3\text{ V}$, $Z_S = Z_L = 50\Omega$, $f = 1.8\text{GHz}$		-	12.5	-	
TR2, $I_C = 15\text{ mA}$, $V_{CE} = 3\text{ V}$, $Z_S = Z_L = 50\Omega$, $f = 3\text{GHz}$		-	8.5	-	
Third order intercept point at output ²⁾	IP_3				dBm
TR1, $V_{CE}=3\text{V}$, $I_C=20\text{mA}$, $Z_S=Z_L=50\Omega$, $f=1.8\text{GHz}$		-	28	-	
TR2, $V_{CE}=3\text{V}$, $I_C=15\text{mA}$, $Z_S=Z_L=50\Omega$, $f=1.8\text{GHz}$		-	24.5	-	
1dB Compression point, at output	$P_{-1\text{dB}}$				
TR1, $I_C=20\text{mA}$, $V_{CE}=3\text{V}$, $Z_S=Z_L=50\Omega$, $f=1.8\text{GHz}$		-	12	-	
TR1, $I_C=15\text{mA}$, $V_{CE}=3\text{V}$, $Z_S=Z_L=50\Omega$, $f=1.8\text{GHz}$		-	9	-	

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

²IP3 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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