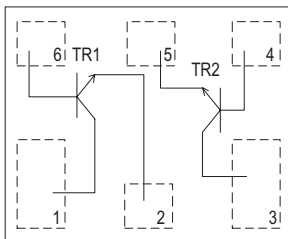
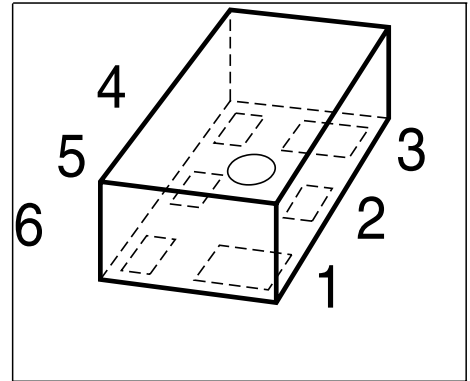


NPN Silicon RF Transistor

Preliminary data

- Low voltage/ low current operation
- For low noise amplifiers
- For oscillators up to 3.5 GHz and Pout > 10 dBm
- Low noise figure: TR1: 1.0dB at 1.8 GHz
TR2: 1.1 dB at 1.8 GHz
- Built in 2 Transistors (TR1: die as BFR360L3,
TR2: die as BFR380L3)



ESD: Electrostatic discharge sensitive device, observe handling precaution!

Type	Marking	Pin Configuration						Package
BFS386L6	FD	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}	6	V
TR1		6	
TR2		6	
Collector-emitter voltage	V_{CES}	15	
TR1		15	
TR2		15	
Collector-base voltage	V_{CBO}	15	
TR1		15	
TR2		15	
Emitter-base voltage	V_{EBO}	2	
TR1		2	
TR2		2	
Collector current	I_C	35	mA
TR1		35	
TR2		80	

Maximum Ratings

Parameter	Symbol	Value	Unit
Base current	I_B		mA
TR1		4	
TR2		14	
Total power dissipation ¹⁾	P_{tot}		mW
$T_S \leq 101^\circ\text{C}$, TR1		210	
$T_S \leq 96^\circ\text{C}$, TR2		380	
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		≤ 140	

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, $I_C = 1\text{mA}$, $I_B = 0$	$V_{(\text{BR})\text{CEO}}$	6 6	9 9	- -	V
Collector-emitter cutoff current TR1, $V_{\text{CE}} = 15\text{ V}$, $V_{\text{BE}} = 0$ TR2, $V_{\text{CE}} = 15\text{ V}$, $V_{\text{BE}} = 0$	I_{CES}	- -	- -	10 10	μA
Collector-base cutoff current TR1, $V_{\text{CB}} = 5\text{ V}$, $I_{\text{E}} = 0$ TR2, $V_{\text{CB}} = 5\text{ V}$, $I_{\text{E}} = 0$	I_{CBO}	- -	- -	100 100	nA
Emitter-base cutoff current TR1, $V_{\text{EB}} = 1\text{ V}$, $I_C = 0$ TR2, $V_{\text{EB}} = 1\text{ V}$, $I_C = 0$	I_{EBO}	- -	- -	1 1	μA
DC current gain- TR1, $I_C = 15\text{ mA}$, $V_{\text{CE}} = 3\text{ V}$ TR2, $I_C = 40\text{ mA}$, $V_{\text{CE}} = 3\text{ V}$	h_{FE}	60 60	130 130	200 200	-

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, $I_C = 15\text{ mA}$, $V_{CE} = 3\text{ V}$, $f = 1\text{ GHz}$ TR2, $I_C = 40\text{ mA}$, $V_{CE} = 3\text{ V}$, $f = 1\text{ GHz}$	f_T	- -	14 14	- -	GHz
Collector-base capacitance TR1, $V_{CB} = 5\text{ V}$, $f = 1\text{ MHz}$, emitter grounded TR2, $V_{CB} = 5\text{ V}$, $f = 1\text{ MHz}$, emitter grounded	C_{cb}	- -	0.3 0.5	- -	pF
Collector emitter capacitance TR1, $V_{CE} = 5\text{ V}$, $f = 1\text{ MHz}$, base grounded TR2, $V_{CE} = 5\text{ V}$, $f = 1\text{ MHz}$, base grounded	C_{ce}	- -	0.15 0.2	- -	
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}	- -	0.43 1.1	- -	

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC Characteristics (verified by random sampling)					
Noise figure TR1, $I_C = 3 \text{ mA}$, $V_{CE} = 3 \text{ V}$, $Z_S = Z_{\text{Sopt}}$, $f = 1.8 \text{ GHz}$ TR1, $I_C = 3 \text{ mA}$, $V_{CE} = 3 \text{ V}$, $Z_S = Z_{\text{Sopt}}$, $f = 3 \text{ GHz}$ TR2, $I_C = 8 \text{ mA}$, $V_{CE} = 3 \text{ V}$, $Z_S = Z_{\text{Sopt}}$, $f = 1.8 \text{ GHz}$ TR2, $I_C = 8 \text{ mA}$, $V_{CE} = 3 \text{ V}$, $Z_S = Z_{\text{Sopt}}$, $f = 3 \text{ GHz}$	F	-	1	-	dB
		-	1.6	-	
		-	1.3	-	
		-	1.9	-	
Power gain, maximum available ¹⁾ TR1, $I_C = 15 \text{ mA}$, $V_{CE} = 3 \text{ V}$, $f = 1.8 \text{ GHz}$ TR1, $I_C = 15 \text{ mA}$, $V_{CE} = 3 \text{ V}$, $f = 3 \text{ GHz}$ TR2, $I_C = 40 \text{ mA}$, $V_{CE} = 3 \text{ V}$, $f = 1.8 \text{ GHz}$ TR2, $I_C = 40 \text{ mA}$, $V_{CE} = 3 \text{ V}$, $f = 3 \text{ GHz}$	G_{ma}	-	14.5	-	
		-	10	-	
		-	12	-	
		-	8	-	
Transducer gain TR1, $I_C = 15 \text{ mA}$, $V_{CE} = 3 \text{ V}$, $f = 1.8 \text{ GHz}$ TR1, $I_C = 15 \text{ mA}$, $V_{CE} = 3 \text{ V}$, $f = 3 \text{ GHz}$ TR2, $I_C = 15 \text{ mA}$, $V_{CE} = 3 \text{ V}$, $f = 1.8 \text{ GHz}$ TR2, $I_C = 15 \text{ mA}$, $V_{CE} = 3 \text{ V}$, $f = 3 \text{ GHz}$	$ S_{21e} ^2$	-	12	-	
		-	8	-	
		-	10	-	
		-	6	-	
Third order intercept point at output ²⁾ TR1, $V_{CE} = 3 \text{ V}$, $I_C = 15 \text{ mA}$, $f = 1.8 \text{ GHz}$ TR2, $V_{CE} = 3 \text{ V}$, $I_C = 40 \text{ mA}$, $f = 1.8 \text{ GHz}$	IP_3	-	24	-	dBm
		-	27	-	
1dB Compression point TR1, $I_C = 15 \text{ mA}$, $V_{CE} = 3 \text{ V}$, $f = 1.8 \text{ GHz}$ TR2, $I_C = 40 \text{ mA}$, $V_{CE} = 3 \text{ V}$, $f = 1.8 \text{ GHz}$	$P_{-1\text{dB}}$	-	9	-	
		-	11.5	-	

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

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