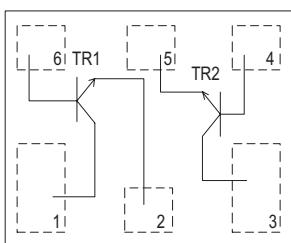
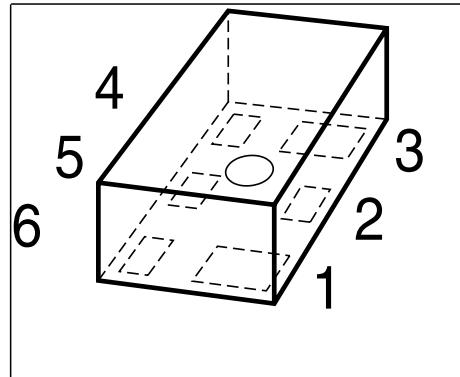


### NPN Silicon RF Transistor

#### 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 TR1	$V_{CEO}$	6	V
TR2		6	
Collector-emitter voltage TR1	$V_{CES}$	15	
TR2		15	
Collector-base voltage TR1	$V_{CBO}$	15	
TR2		15	
Emitter-base voltage TR1	$V_{EBO}$	2	
TR2		2	
Collector current TR1	$I_C$	35	mA
TR2		80	

**Maximum Ratings**

<b>Parameter</b>	<b>Symbol</b>	<b>Value</b>	<b>Unit</b>
Base current TR1	$I_B$	4	mA
TR2		14	
Total power dissipation <sup>1)</sup> $T_S \leq 101^\circ\text{C}$ , TR1	$P_{\text{tot}}$	210	mW
$T_S \leq 96^\circ\text{C}$ , TR2		380	
Junction temperature TR1	$T_j$	150	°C
TR2		150	
Ambient temperature TR1	$T_A$	-65 ... 150	
TR2		-65 ... 150	
Storage temperature TR1	$T_{\text{stg}}$	-65 ... 150	
TR2		-65 ... 150	

**Thermal Resistance**

<b>Parameter</b>	<b>Symbol</b>	<b>Value</b>	<b>Unit</b>
Junction - soldering point <sup>2)</sup> TR1	$R_{\text{thJS}}$	$\leq 230$	K/W
TR2		$\leq 140$	

<sup>1</sup> $T_S$  is measured on the collector lead at the soldering point to the pcb

<sup>2</sup>For calculation of  $R_{\text{thJA}}$  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.	
<b>DC Characteristics</b>					
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, $V_{CE} = 15 \text{ V}$ , $V_{BE} = 0$ TR2, $V_{CE} = 15 \text{ V}$ , $V_{BE} = 0$	$I_{CES}$	- -	- -	10 10	$\mu\text{A}$
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, $V_{EB} = 1 \text{ V}$ , $I_C = 0$ TR2, $V_{EB} = 1 \text{ V}$ , $I_C = 0$	$I_{EBO}$	- -	- -	1 1	$\mu\text{A}$
DC current gain- TR1, $I_C = 15 \text{ mA}$ , $V_{CE} = 3 \text{ V}$ TR2, $I_C = 40 \text{ mA}$ , $V_{CE} = 3 \text{ V}$	$h_{FE}$	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.	
<b>AC Characteristics (verified by random sampling)</b>					
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.	
<b>AC Characteristics (verified by random sampling)</b>					
Noise figure TR1, $I_C = 3 \text{ mA}$ , $V_{CE} = 3 \text{ V}$ , $Z_S = Z_{Sopt}$ , $f = 1.8 \text{ GHz}$	$F$	-	1	-	dB
TR1, $I_C = 3 \text{ mA}$ , $V_{CE} = 3 \text{ V}$ , $Z_S = Z_{Sopt}$ , $f = 3 \text{ GHz}$		-	1.6	-	
TR2, $I_C = 8 \text{ mA}$ , $V_{CE} = 3 \text{ V}$ , $Z_S = Z_{Sopt}$ , $f = 1.8 \text{ GHz}$		-	1.3	-	
TR2, $I_C = 8 \text{ mA}$ , $V_{CE} = 3 \text{ V}$ , $Z_S = Z_{Sopt}$ , $f = 3 \text{ GHz}$		-	1.9	-	
Power gain, maximum available <sup>1)</sup> 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	-	
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	-	
Third order intercept point at output <sup>2)</sup> 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
1dB Compression point TR1, $I_C = 15 \text{ mA}$ , $V_{CE} = 3 \text{ V}$ , $f = 1.8 \text{ GHz}$ TR2, $I_C = 40 \text{ mA}$ , $V_{CE} = 3 \text{ V}$ , $f = 1.8 \text{ GHz}$	$P_{-1dB}$	-	9	-	

<sup>1</sup> $G_{ma} = |S_{21e}| / S_{12e} | (k - (k^2 - 1)^{1/2})$ 
<sup>2</sup>IP3 value depends on termination of all intermodulation frequency components.  
Termination used for this measurement is  $50\Omega$  from 0.1 MHz to 6 GHz