

NPN Silicon RF Transistor

- For low noise, high-gain broadband amplifiers at collector currents from 0.5 mA to 12 mA
- $f_T = 8$ GHz, $NF_{min} = 0.9$ dB at 900 MHz



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

Type	Marking	Pin Configuration			Package
BFR181W	RFs	1=B	2=E	3=C	SOT323

Maximum Ratings at $T_A = 25$ °C

Parameter	Symbol	Value	Unit
Collector-emitter voltage	V_{CEO}	12	V
Collector-emitter voltage	V_{CES}	20	
Collector-base voltage	V_{CBO}	20	
Emitter-base voltage	V_{EBO}	2	
Collector current	I_C	20	mA
Base current	I_B	2	
Total power dissipation ¹⁾ $T_S \leq 90$ °C	P_{tot}	175	mW
Junction temperature	T_J	150	°C
Storage temperature	T_{Stg}	-65 ... 150	

Thermal Resistance

Parameter	Symbol	Value	Unit
Junction - soldering point ²⁾	R_{thJS}	≤ 345	K/W

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 AN077 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 $I_C = 1\text{ mA}, I_B = 0$	$V_{(BR)CEO}$	12	-	-	V
Collector-emitter cutoff current $V_{CE} = 20\text{ V}, V_{BE} = 0$	I_{CES}	-	-	100	μA
Collector-base cutoff current $V_{CB} = 10\text{ V}, I_E = 0$	I_{CBO}	-	-	100	nA
Emitter-base cutoff current $V_{EB} = 1\text{ V}, I_C = 0$	I_{EBO}	-	-	1	μA
DC current gain $I_C = 5\text{ mA}, V_{CE} = 8\text{ V}$, pulse measured	h_{FE}	70	100	140	-

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

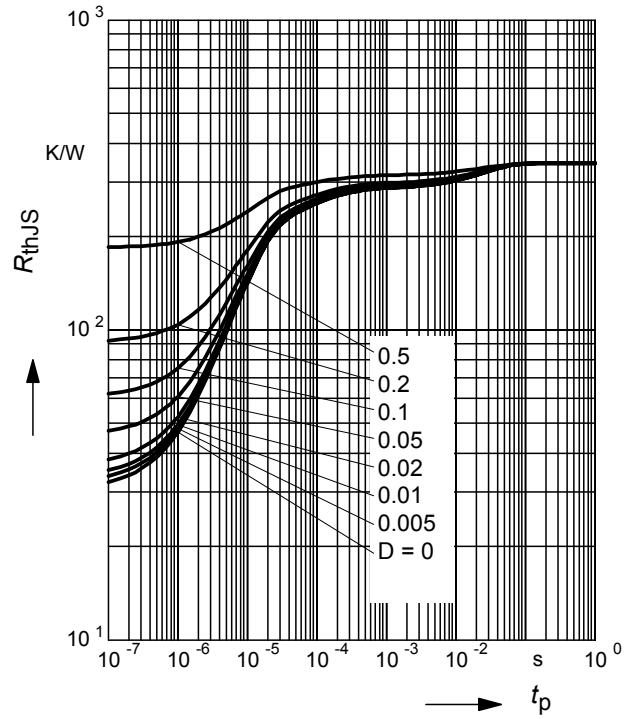
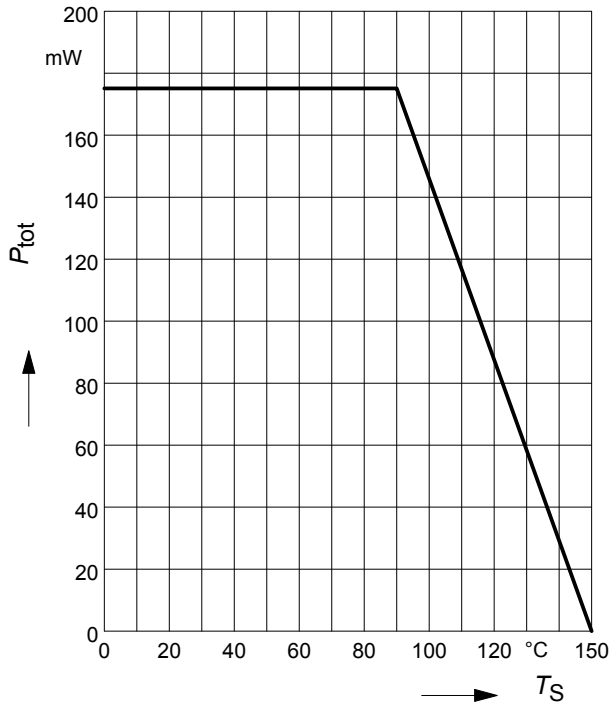
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC Characteristics (verified by random sampling)					
Transition frequency $I_C = 10\text{ mA}$, $V_{CE} = 8\text{ V}$, $f = 500\text{ MHz}$	f_T	6	8	-	GHz
Collector-base capacitance $V_{CB} = 10\text{ V}$, $f = 1\text{ MHz}$, $V_{BE} = 0$, emitter grounded	C_{cb}	-	0.29	0.45	pF
Collector emitter capacitance $V_{CE} = 10\text{ V}$, $f = 1\text{ MHz}$, $V_{BE} = 0$, base grounded	C_{ce}	-	0.22	-	
Emitter-base capacitance $V_{EB} = 0.5\text{ V}$, $f = 1\text{ MHz}$, $V_{CB} = 0$, collector grounded	C_{eb}	-	0.35	-	
Minimum noise figure $I_C = 2\text{ mA}$, $V_{CE} = 8\text{ V}$, $Z_S = Z_{Sopt}$, $f = 900\text{ MHz}$ $I_C = 2\text{ mA}$, $V_{CE} = 8\text{ V}$, $Z_S = Z_{Sopt}$, $f = 1.8\text{ GHz}$	NF_{min}	-	0.9	-	dB
Power gain, maximum stable ¹⁾ $I_C = 5\text{ mA}$, $V_{CE} = 8\text{ V}$, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$, $f = 900\text{ MHz}$	G_{ms}	-	19	-	dB
Power gain, maximum available ²⁾ $I_C = 5\text{ mA}$, $V_{CE} = 8\text{ V}$, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$, $f = 1.8\text{ GHz}$	G_{ma}	-	13.5	-	dB
Transducer gain $I_C = 5\text{ mA}$, $V_{CE} = 8\text{ V}$, $Z_S = Z_L = 50\ \Omega$, $f = 900\text{ MHz}$ $I_C = 5\text{ mA}$, $V_{CE} = 8\text{ V}$, $Z_S = Z_L = 50\ \Omega$, $f = 1.8\text{ MHz}$	$ S_{21e} ^2$	-	15.5	-	dB
		-	10	-	

$$^1G_{ms} = |S_{21} / S_{12}|$$

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

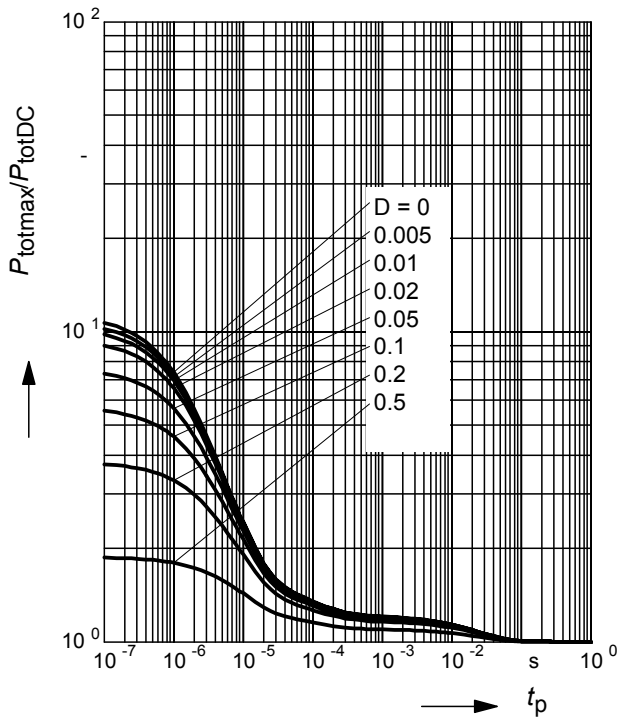
Total power dissipation $P_{tot} = f(T_S)$

Permissible Pulse Load $R_{thJS} = f(t_p)$



Permissible Pulse Load

$P_{totmax}/P_{totDC} = f(t_p)$



Package Outline



Foot Print



Marking Layout (Example)



Standard Packing

Reel \varnothing 180 mm = 3.000 Pieces/Reel
 Reel \varnothing 330 mm = 10.000 Pieces/Reel



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