

Low Noise Silicon Bipolar 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
- Pb-free (RoHS compliant) package
- Qualification report according to AEC-Q101 available



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

Type	Marking	Pin Configuration			Package
BFR181	RFs	1=B	2=E	3=C	SOT23

Maximum Ratings at $T_A = 25$ °C, unless otherwise specified

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⁾	P_{tot}	175	mW
$T_S \leq 91$ °C			
Junction temperature	T_J	150	°C
Ambient temperature	T_A	-65 ... 150	
Storage temperature	T_{Stg}	-65 ... 150	

Thermal Resistance

Parameter	Symbol	Value	Unit
Junction - soldering point ²⁾	R_{thJS}	335	K/W

¹ T_S is measured on the collector lead at the soldering point of the pcb

²For the definition of R_{thJS} please refer to Application Note AN077 (Thermal Resistance Calculation)

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	

DC Characteristics

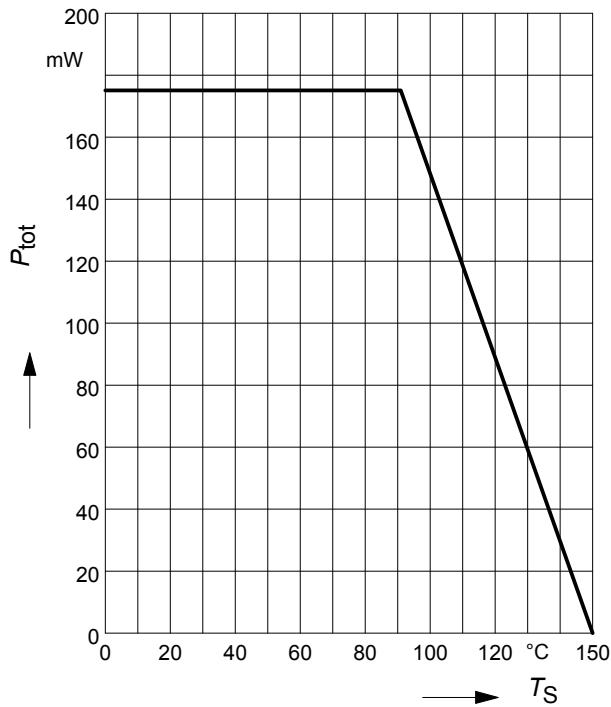
Collector-emitter breakdown voltage $I_C = 1 \text{ mA}, I_B = 0$	$V_{(\text{BR})\text{CEO}}$	12	-	-	V
Collector-emitter cutoff current $V_{\text{CE}} = 20 \text{ V}, V_{\text{BE}} = 0$	I_{CES}	-	-	100	μA
Collector-base cutoff current $V_{\text{CB}} = 10 \text{ V}, I_E = 0$	I_{CBO}	-	-	100	nA
Emitter-base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

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

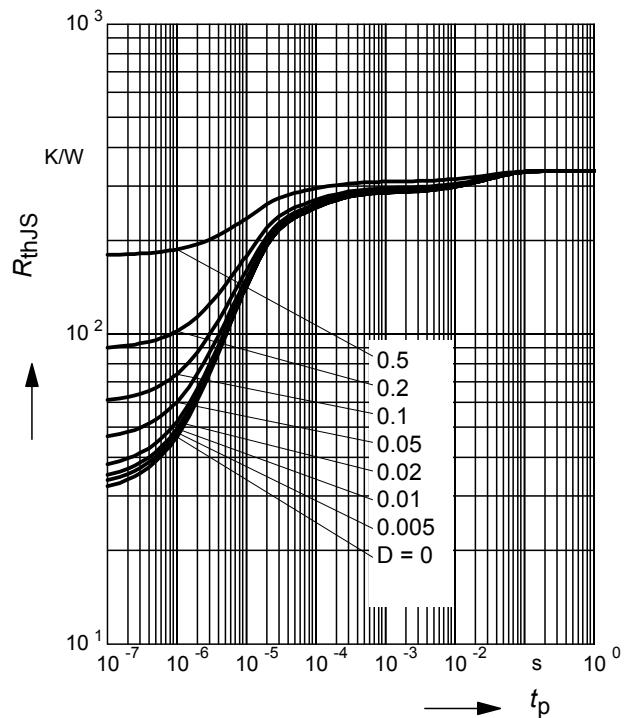
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC Characteristics (verified by random sampling)					
Transition frequency $I_C = 10 \text{ mA}, V_{CE} = 8 \text{ V}, f = 500 \text{ MHz}$	f_T	6	8	-	GHz
Collector-base capacitance $V_{CB} = 10 \text{ V}, f = 1 \text{ MHz}, V_{BE} = 0 \text{ V}$, emitter grounded	C_{cb}	-	0.27	0.45	pF
Collector emitter capacitance $V_{CE} = 10 \text{ V}, f = 1 \text{ MHz}, V_{BE} = 0 \text{ V}$, base grounded	C_{ce}	-	0.2	-	
Emitter-base capacitance $V_{EB} = 0.5 \text{ V}, f = 1 \text{ MHz}, V_{CB} = 0 \text{ V}$, collector grounded	C_{eb}	-	0.35	-	
Minimum noise figure $I_C = 2 \text{ mA}, V_{CE} = 8 \text{ V}, Z_S = Z_{\text{Sopt}}$, $f = 900 \text{ MHz}$ $I_C = 2 \text{ mA}, V_{CE} = 8 \text{ V}, Z_S = Z_{\text{Sopt}}$, $f = 1.8 \text{ GHz}$	NF_{\min}	-	0.9	-	dB
Power gain, maximum stable ¹⁾ $I_C = 10 \text{ mA}, V_{CE} = 8 \text{ V}, Z_S = Z_{\text{Sopt}}, Z_L = Z_{\text{Lopt}}$, $f = 900 \text{ MHz}$	G_{ms}	-	18.5	-	dB
Power gain, maximum available ²⁾ $I_C = 5 \text{ mA}, V_{CE} = 8 \text{ V}, Z_S = Z_{\text{Sopt}}, Z_L = Z_{\text{Lopt}}$, $f = 1.8 \text{ GHz}$	G_{ma}	-	12.5	-	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$	-	14.5	-	dB

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

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

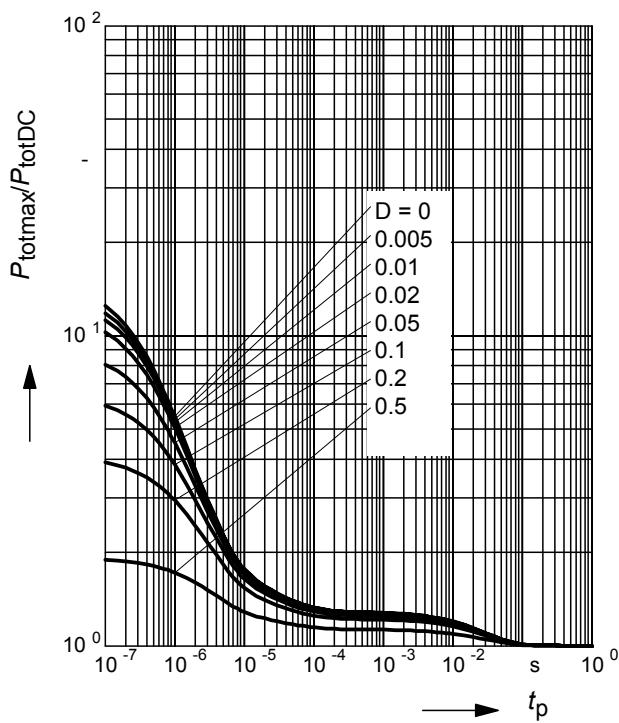


Permissible Pulse Load $R_{\text{thJS}} = f(t_p)$

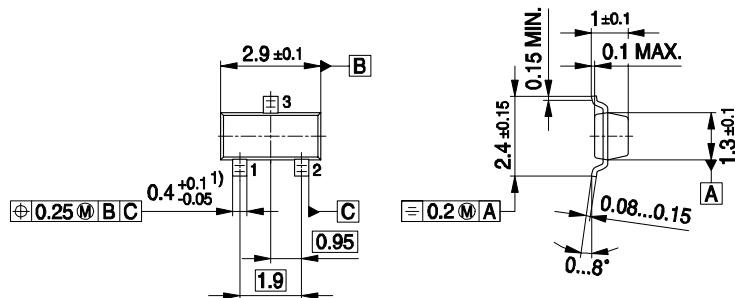


Permissible Pulse Load

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



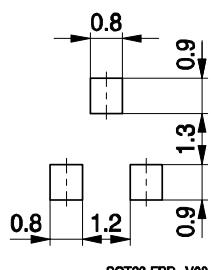
Package Outline



1) Lead width can be 0.6 max. in dambar area

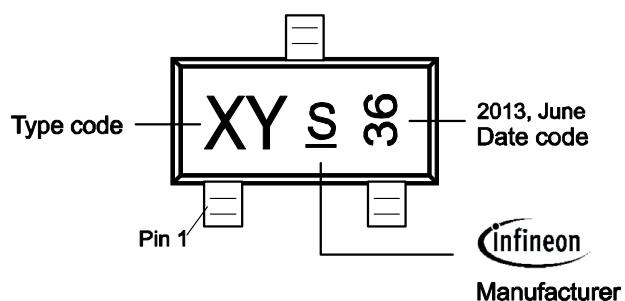
SOT23-PO V08

Foot Print



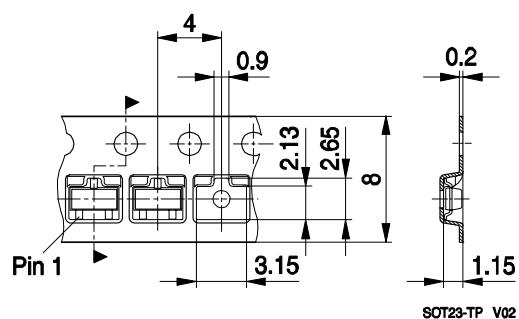
SOT23-FPR V08

Marking Layout



Standard Packing

Reel ø 180 mm: 3.000 Pieces / Reel
 Reel ø 330 mm = 10.000 Pieces / Reel



SOT23-TP V02

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