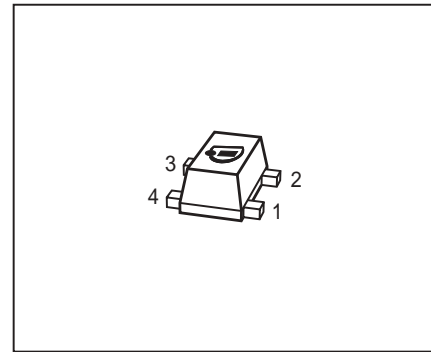
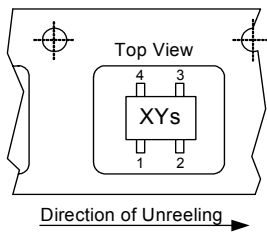


NPN Silicon Germanium RF Transistor*

- For medium power amplifiers and driver stages
- High OIP_3 and P_{-1dB}
- Ideal for low phase noise oscillators
- Maxim. available Gain $G_{ma} = 21.5$ dB at 1.8 GHz
Noise figure $F = 0.8$ dB at 1.8 GHz
- 70 GHz f_T - Silicon Germanium technology
- Pb-free (RoHS compliant) package¹⁾
- Qualified according AEC Q101

* Short term description



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

Type	Marking	Pin Configuration						Package
		1=B	2=E	3=C	4=E	-	-	
BFP650F	R5s	1=B	2=E	3=C	4=E	-	-	TSFP-4

¹Pb-containing package may be available upon special request

Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-emitter voltage $T_A > 0\text{ }^\circ\text{C}$ $T_A \leq 0\text{ }^\circ\text{C}$	V_{CEO}	4 3.7	V
Collector-emitter voltage	V_{CES}	13	
Collector-base voltage	V_{CBO}	13	
Emitter-base voltage	V_{EBO}	1.2	
Collector current	I_C	150	mA
Base current	I_B	10	
Total power dissipation ¹⁾ $T_S \leq 85\text{ }^\circ\text{C}$	P_{tot}	500	mW
Junction temperature	T_j	150	$^\circ\text{C}$
Ambient temperature	T_A	-65 ... 150	
Storage temperature	T_{stg}	-65 ... 150	

Thermal Resistance

Parameter	Symbol	Value	Unit
Junction - soldering point ²⁾	R_{thJS}	≤ 130	K/W

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC Characteristics					
Collector-emitter breakdown voltage $I_C = 3\text{ mA}, I_B = 0$	$V_{(BR)CEO}$	4	4.5	-	V
Collector-emitter cutoff current $V_{CE} = 13\text{ V}, V_{BE} = 0$	I_{CES}	-	-	100	μA
Collector-base cutoff current $V_{CB} = 5\text{ V}, I_E = 0$	I_{CBO}	-	-	100	nA
Emitter-base cutoff current $V_{EB} = 0.5\text{ V}, I_C = 0$	I_{EBO}	-	-	10	μA
DC current gain $I_C = 80\text{ mA}, V_{CE} = 3\text{ V}$, pulse measured	h_{FE}	110	180	270	-

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

²For calculation of R_{thJA} please refer to Application Note Thermal Resistance

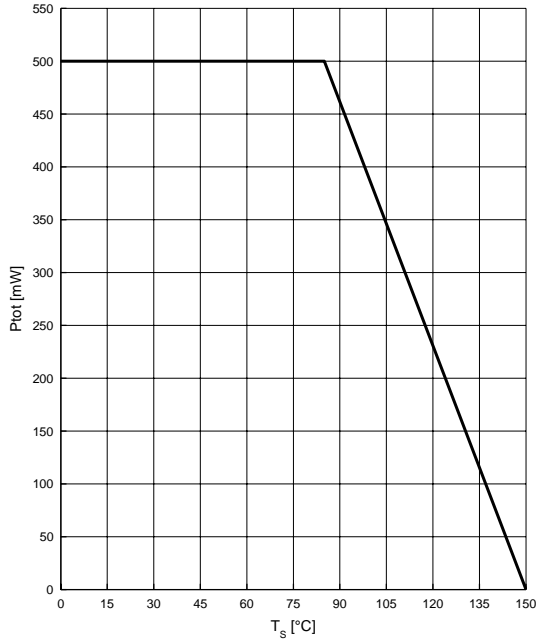
Electrical Characteristics at $T_A = 25^\circ\text{C}$, unless otherwise specified

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC Characteristics (verified by random sampling)					
Transition frequency $I_C = 80\text{ mA}$, $V_{CE} = 3\text{ V}$, $f = 1\text{ GHz}$	f_T	-	42	-	GHz
Collector-base capacitance $V_{CB} = 3\text{ V}$, $f = 1\text{ MHz}$, $V_{BE} = 0$, emitter grounded	C_{cb}	-	0.26	-	pF
Collector emitter capacitance $V_{CE} = 3\text{ V}$, $f = 1\text{ MHz}$, $V_{BE} = 0$, base grounded	C_{ce}	-	0.45	-	
Emitter-base capacitance $V_{EB} = 0.5\text{ V}$, $f = 1\text{ MHz}$, $V_{CB} = 0$, collector grounded	C_{eb}	-	1.3	-	
Noise figure $I_C = 10\text{ mA}$, $V_{CE} = 3\text{ V}$, $f = 1.8\text{ GHz}$, $Z_S = Z_{Sopt}$ $I_C = 10\text{ mA}$, $V_{CE} = 3\text{ V}$, $f = 6\text{ GHz}$, $Z_S = Z_{Sopt}$	F	-	0.8 1.9	-	dB
Power gain, maximum available ¹⁾ $I_C = 80\text{ mA}$, $V_{CE} = 3\text{ V}$, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$, $f = 1.8\text{ GHz}$ $f = 6\text{ GHz}$	G_{ma}	-	21.5 11	-	
Transducer gain $I_C = 80\text{ mA}$, $V_{CE} = 3\text{ V}$, $Z_S = Z_L = 50\ \Omega$, $f = 1.8\text{ GHz}$ $f = 6\text{ GHz}$	$ S_{21e} ^2$	15 -	17.5 7.5	-	dB
Third order intercept point at output ²⁾ $V_{CE} = 3\text{ V}$, $I_C = 80\text{ mA}$, $f = 1.8\text{ GHz}$, $Z_S = Z_L = 50\ \Omega$	IP_3	-	31	-	dBm
1dB Compression point at output $I_C = 80\text{ mA}$, $V_{CE} = 3\text{ V}$, $Z_S = Z_L = 50\ \Omega$, $f = 1.8\text{ GHz}$	P_{-1dB}	-	17.5	-	

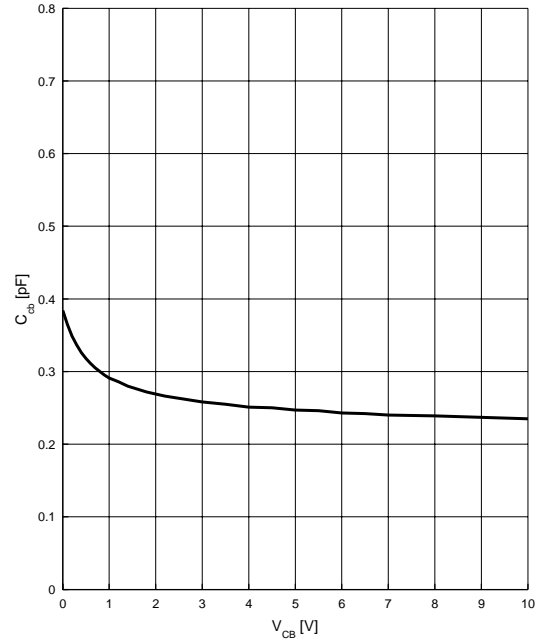
$$^1G_{ma} = |S_{21e}| / |S_{12e}| (k - (k^2 - 1)^{1/2})$$

²⁾ IP_3 value depends on termination of all intermodulation frequency components.
Termination used for this measurement is $50\ \Omega$ from 0.1 MHz to 6 GHz

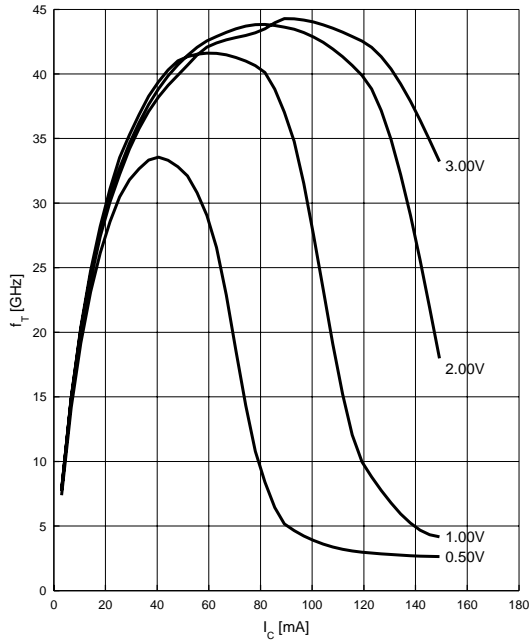
Total power dissipation $P_{tot} = f(T_S)$



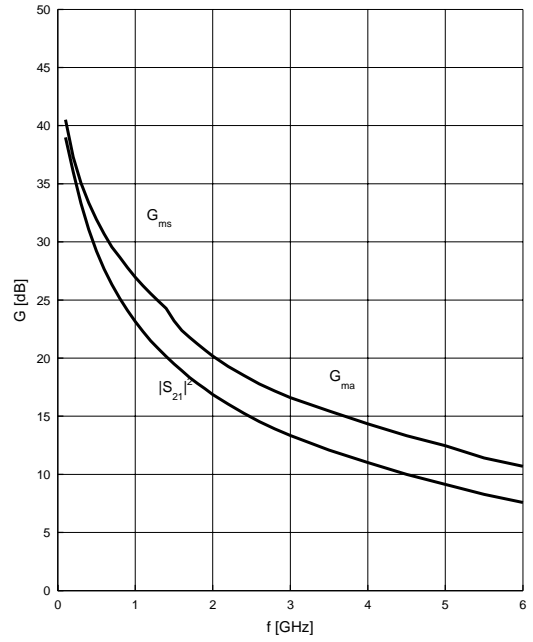
Collector-base capacitance $C_{cb} = f(V_{CB})$
 $f = 1$ MHz



Transition frequency $f_T = f(I_C)$
 $V_{CE} =$ parameter in V, $f = 1$ GHz



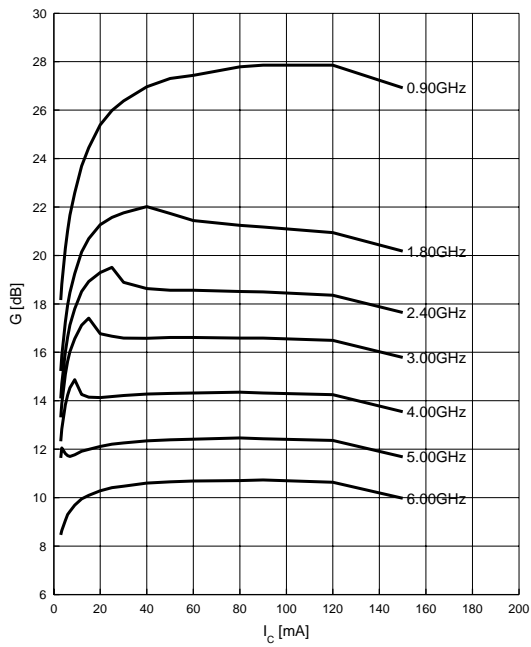
Power gain $G_{ma}, G_{ms} = f(f)$
 $V_{CE} = 3$ V, $I_C = 80$ mA



Power gain G_{ma} , $G_{ms} = f(I_C)$

$V_{CE} = 3\text{ V}$

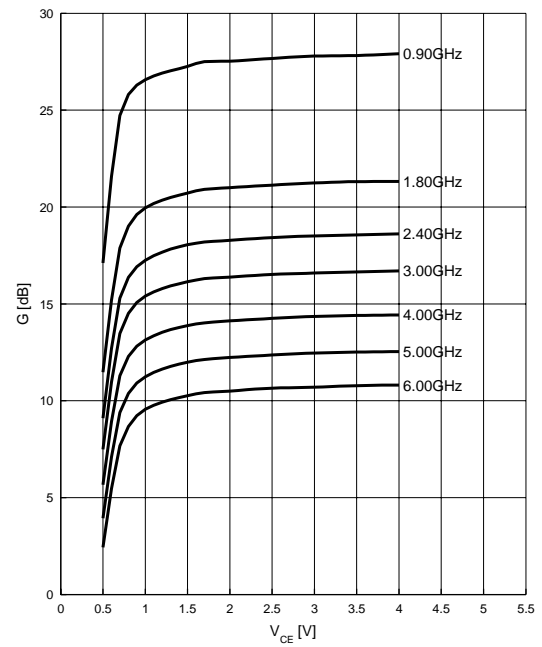
$f = \text{parameter in GHz}$



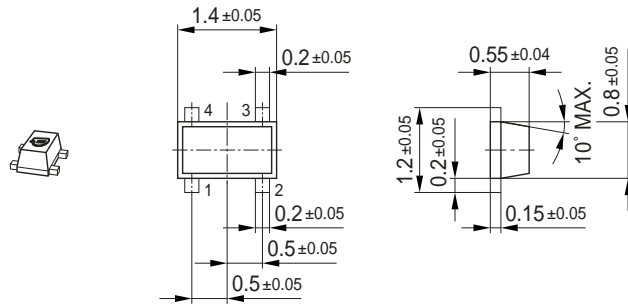
Power gain G_{ma} , $G_{ms} = f(V_{CE})$

$I_C = 80\text{ mA}$

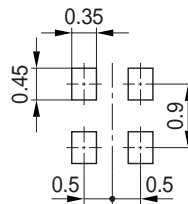
$f = \text{parameter in GHz}$



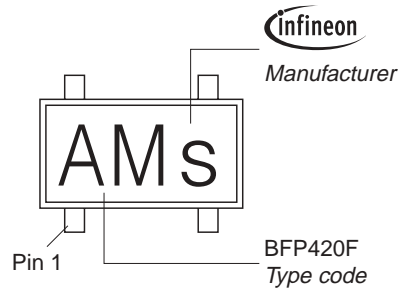
Package Outline



Foot Print

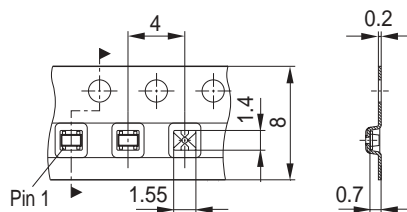


Marking Layout (Example)



Standard Packing

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



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