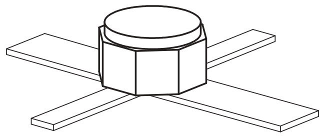
NPN Silicon Germanium RF Transistor

Preliminary data



- High gain low noise RF transistor
- Provides outstanding performance for a wide range of wireless applications
- Outstanding noise figure F = 0.8 dB at 1.8 GHz
  Outstanding noise figure F = 1 dB at 6 GHZ
- High maximum stable gain
  G_{ms} = 24 dB at 1.8 GHz
- Gold metallization for extra high reliability
- 70 GHz f_T-Silicon Germanium technology

ESD: **E**lectro**s**tatic **d**ischarge sensitive device, observe handling precaution!

Type	Marking	Pin Configuration						Package
BFY640	-	1=B	2=E	3=C	-	-	-	MICRO-X1

(ql) Testing level: P: Professional testing
H: High Rel quality
S: Space quality
ES: ESA qualified

Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-emitter voltage	V_{CEO}		V
T_A > 0 °C		4	
$T_A \geq$ 0 °C		3.7	
Collector-emitter voltage	V_{CES}	13	
Collector-base voltage	V_{CBO}	13	
Emitter-base voltage	V_{EBO}	1.2	
Collector current	I_C	50	mA
Base current	I_B	3	
Total power dissipation[1)] $T_S \leq$ 110 °C	P_{tot}	200	mW
Junction temperature	T_j	175	°C
Soldering temperature	T_{sol}	250	°C
Ambient temperature	T_A	-65 ... 175	°C
Storage temperature	T_{stg}	-65 ... 175	

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

Thermal Resistance

Parameter	Symbol	Value	Unit
Junction - soldering point[1)]	R_{thJS}	< 325	K/W

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC Characteristics					
Collector-emitter breakdown voltage I_C = 1 mA, I_B = 0	$V_{(BR)CEO}$	4	4.5	-	V
Collector-emitter cutoff current V_{CE} = 13 V, V_{BE} = 0	I_{CES}	-	-	500	nA
Collector -base cutoff current V_{CB} = 5 V, I_E = 0	I_{CBO}	-	-	100	
Emitter-base cutoff current V_{EB} = 2 V, I_C = 0	I_{EBO}	-	-	10	µA
DC current gain I_C = 30 mA, V_{CE} = 3 V	h_{FE}	135	180	250	-

[1]For calculation of R_{thJA} please refer to Application Note Thermal Resistance

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC Characteristics (verified by random sampling)					
Transition frequency I_C = 30 mA, V_{CE} = 3 V, f = 1 GHz	f_T	36	40	-	GHz
Collector-base capacitance V_{CB} = 2 V, f = 1 MHz, V_{BE} = 0 , emitter grounded	C_{cb}	-	0.09	0.12	pF
Collector emitter capacitance V_{CE} = 2 V, f = 1 MHz, V_{BE} = 0 , base grounded	C_{ce}	-	0.23	0.5	
Emitter-base capacitance V_{EB} = 0.5 V, f = 1 MHz, V_{CB} = 0 , collector grounded	C_{eb}	-	0.5	0.8	
Power gain, maximum stable[1)] I_C = 30 mA, V_{CE} = 3 V, f = 1.8 GHz, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$	G_{ms}	23	24	-	dB
Power gain, maximum available[1)] I_C = 30 mA, V_{CE} = 3 V, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$, f = 6 GHz	G_{ma}	12	12.5	-	dB
Transducer gain I_C = 30 mA, V_{CE} = 3 V, $Z_S = Z_L$ = 50 Ω, f = 1.8 GHz f = 6 GHz	$\|S_{21e}\|^2$	 - -	 21 10.5	 - -	dB
Third order intercept point[2)] I_C = 30 mA, V_{CE} = 3 V, $Z_S = Z_L$ = 50 Ω, f = 1.8 GHz	IP_3	-	26.5	-	dBm
1dB Compression point I_C = 30 mA, V_{CE} = 3 V, $Z_S = Z_L$ = 50 Ω, f = 1.8 GHz	P_{-1dB}	-	13	-	

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

[2]IP_3 values depends on termination of all intermodulation frequency components.
Termination used for this measurement is 50 Ω from 0.1 MHz for 6 GHz

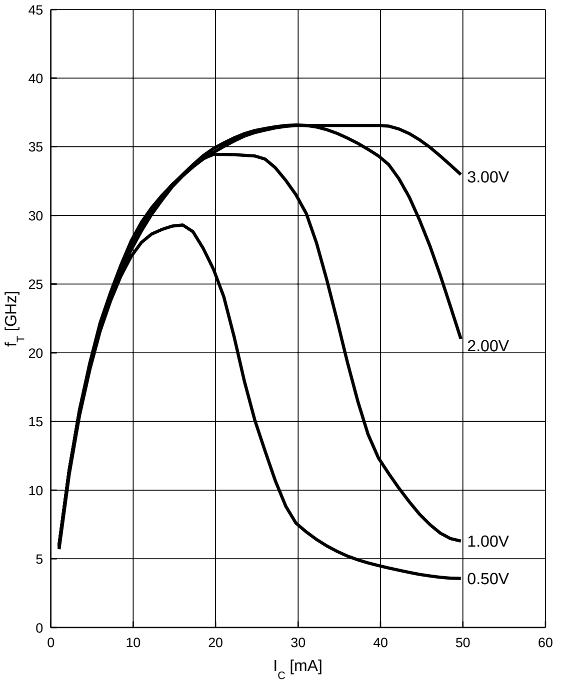
Electrical Characteristics

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Noise Characteristics					
Noise figure[1]	F				dB
$I_C = 5$ mA, $V_{CE} = 3$ V, $Z_S = Z_{Sopt}$, $f = 1.8$ GHz		-	-	1	
$I_C = 5$ mA, $V_{CE} = 3$ V, $Z_S = Z_{Sopt}$, $f = 1.8$ GHz, **BFY640-02**		-	-	1	
$I_C = 5$ mA, $V_{CE} = 3$ V, $Z_S = Z_{Sopt}$, $f = 1.8$ GHz, **BFY640-03**		-	-	1	
$I_C = 5$ mA, $V_{CE} = 3$ V, $Z_S = Z_{Sopt}$, $f = 6$ GHz, **BFY640-03**		-	-	1.2	
$I_C = 5$ mA, $V_{CE} = 3$ V, $Z_S = Z_{Sopt}$, $f = 1.8$ GHz, **BFY640-04**		-	-	0.8	
$I_C = 5$ mA, $V_{CE} = 3$ V, $Z_S = Z_{Sopt}$, $f = 6$ GHz, **BFY640-04**		-	-	1	
1/F Noise $I_C = 5$ mA, $V_{CE} = 3$ V, **BFY640-02**	F_{10Hz}	-	-	200	nV/√Hz

[1]Different type variants available

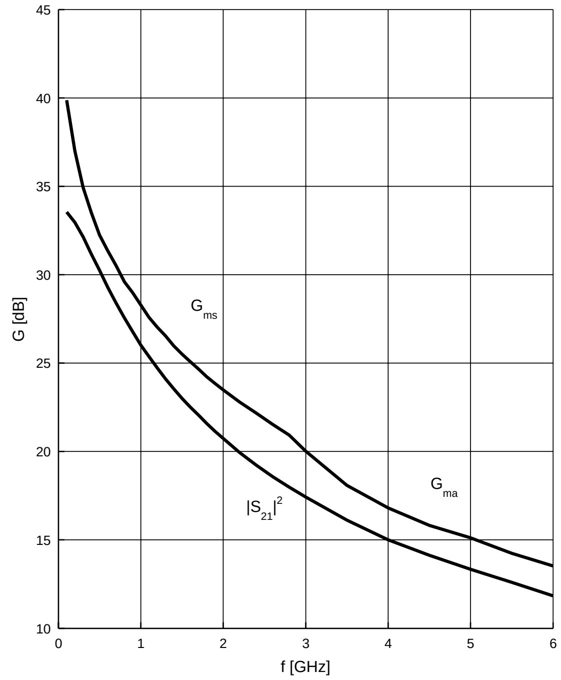
Transition frequency $f_T = f(I_C)$

V_{CE} = 5 V



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

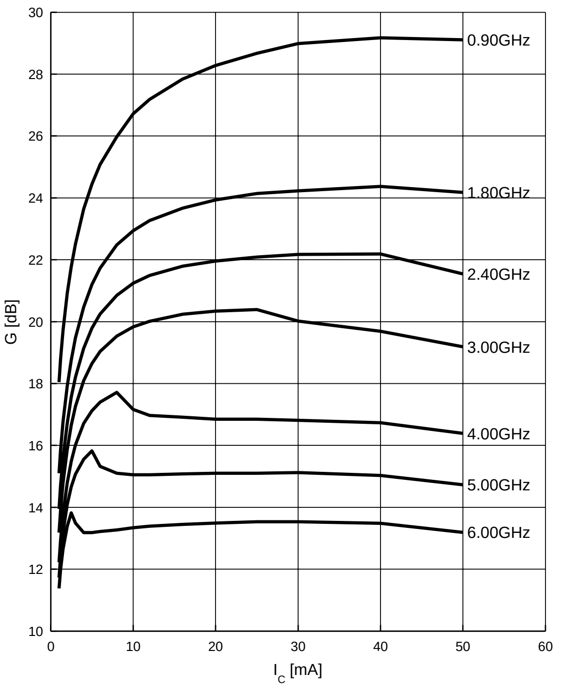
V_{CE} = 3 V, I_C = 25 mA



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

V_{CE} = 3 V

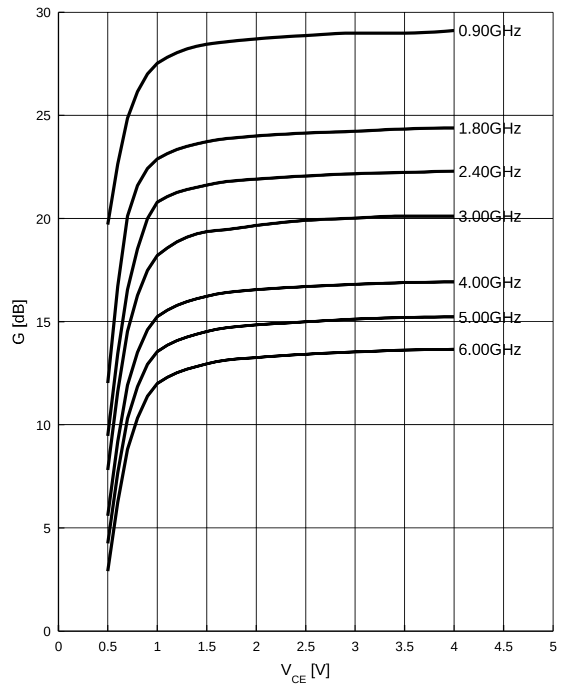
f = parameter in GHz



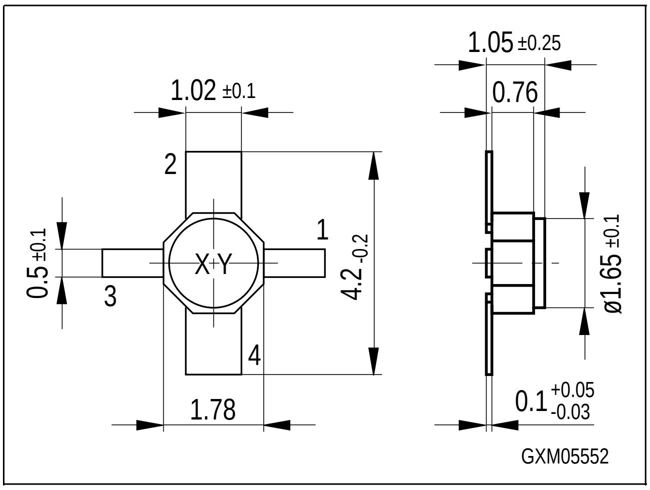
Power gain G_{ma}, $G_{ms} = f\ (V_{CE})$

I_C = 200 mA

f = parameter in GHz



Micro-X1 Package



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