

RF Wideband Transistors

Selection guide

FIRST GENERATION NPN WIDEBAND TRANSISTORS (f_T up to 3.5 GHz)

f_T / I_C CURVE (see Fig.1)	PACKAGE					
	LEADED	SURFACE-MOUNT				
	SOT54	SOT23	SOT89	SOT143	SOT223	SOT323
(1)		BFT25				
(2)		BF747 BF547				BF547W
(3)	BF689K BF763	BFS17				BFS17W
(4)		BFS17A		BFG17A		
(5)		BFR53				
(6)			BFQ17		BFG16A	

SECOND GENERATION WIDEBAND TRANSISTORS (f_T up to 6 GHz)

f_T / I_C CURVE (see Fig.1)	POLARITY	PACKAGE					
		CERAMIC	SURFACE-MOUNT				
		SOT122	SOT23	SOT89	SOT143 (note 1)	SOT223	SOT323
(7)	NPN		BFR92(A)		BFG92A (/X)(/XR)		BFR92AW
	PNP		BFT92				BFT92W
(8)	NPN		BFR93(A)		BFG93A (/X)(/XR)	BFG94	BFR93AW
(9)	PNP		BFT93				BFT93W
(10)	NPN		BFR106	BFQ19		BFG97	
	PNP			BFQ149		BFG31	
(11)	NPN	BFQ34		BFQ18A		BFG35	
(12)	NPN	BFQ68					
(13)	NPN	BFQ136					

Note

- SOT143 package is available with alternative pinning.
European pinning - no type number suffix; USA pinning - suffix /X; Japanese pinning - suffix /XR.
Brackets around the suffixes (/X) and (/XR) denote pinning options. No brackets means no options, (e.g. BFG10W/X: only available with USA pinning).

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THIRD GENERATION NPN WIDEBAND TRANSISTORS (f_T up to 8 GHz)

f_T / I_C CURVE (see Fig.1)	PACKAGE				
	CERAMIC	SURFACE-MOUNT			
	SOT172	SOT23	SOT143 (note 1)	SOT223	SOT323
(14)		BFQ67	BFG67 (/X)(/XR)		BFQ67W
(15)			BFG197 (/X)(/XR)	BFG198	
(16)	BFQ135			BFG135	
(17)	BFQ270				

Note

- SOT143 package is available with alternative pinning.
European pinning - no type number suffix; USA pinning - suffix /X; Japanese pinning - suffix /XR.
Brackets around the suffixes (/X) and (/XR) denote pinning options. No brackets means no options, (e.g. BFG10W/X: only available with USA pinning).

FOURTH GENERATION NPN WIDEBAND TRANSISTORS (f_T up to 10 GHz)

f_T / I_C CURVE (see Fig.1)	PACKAGE							
	CERAMIC	SURFACE-MOUNT						
	SOT172	SOT23	SOT143 (note 1)	SOT223	SOT323	SOT343 (note 1)	SOT353	SOT363
(18)		BFT25A	BFG25A/X		BFS25A	BFG25AW (/X)(/XR)		
(19)		BFR505	BFG505 (/X)(/XR)		BFS505	BFG505W (/X)(/XR)	BFC505 BFE505	BFM505
(20)		BFR520	BFG520 (/X)(/XR)		BFS520	BFG520W (/X)(/XR)	BFC520 BFE520	BFM520
(21)		BFR540	BFG540 (/X)(/XR)	BFG541	BFS540	BFG540W (/X)(/XR)		
(22)			BFG590 (/X)(/XR)	BFG591		BFG590W (/X)(/XR)		
(23)	BFQ621		BFG10(/X)			BFG10W/X		
(24)			BFG11(/X)			BFG11W/X		

Note

- SOT143 and SOT343 packages are available with alternative pinning.
European pinning - no type number suffix; USA pinning - suffix /X; Japanese pinning - suffix /XR.
Brackets around the suffixes (/X) and (/XR) denote pinning options. No brackets means no options, (e.g. BFG10W/X: only available with USA pinning).

FIFTH GENERATION NPN WIDEBAND TRANSISTORS (f_T up to 25 GHz)

f_T / I_C CURVE (see Fig.1)	PACKAGE
	SURFACE-MOUNT
	SOT343
(25)	BFG403W
(26)	BFG410W
(27)	BFG425W
(28)	BFG21W

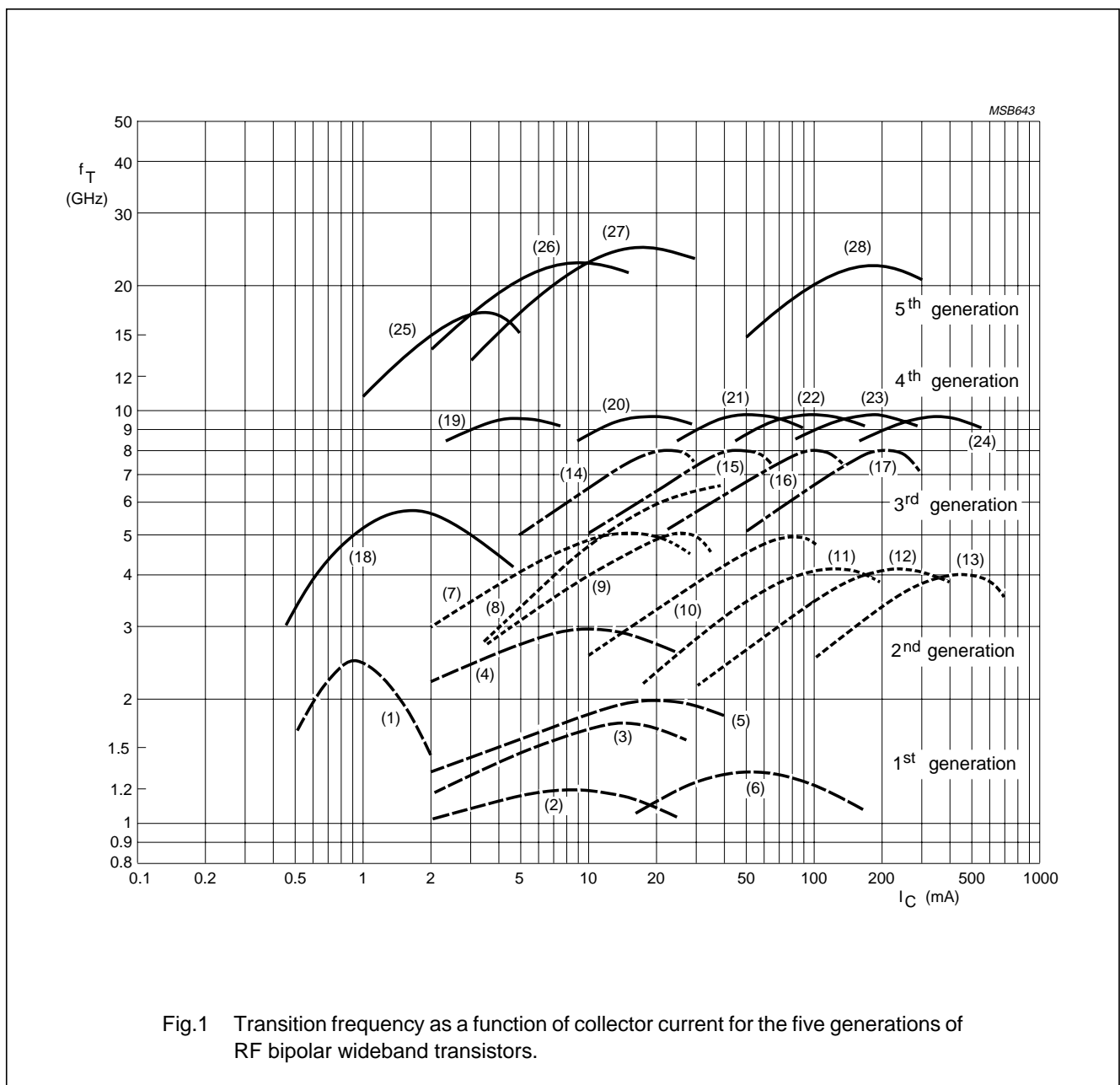


Fig.1 Transition frequency as a function of collector current for the five generations of RF bipolar wideband transistors.

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TYPE NUMBER	f_T / I_C CURVE (see Fig.1)	POLARITY	PACKAGE	RATINGS		
				V_{CE0} (V)	I_C (mA)	P_{tot} (mW)
BF547	(2)	NPN	SOT23	20	50	300
BF547W	(2)	NPN	SOT323	20	50	300
BF689K	(3)	NPN	SOT54	15	25	360
BF747	(2)	NPN	SOT23	20	50	300
BF763	(3)	NPN	SOT54	25	25	360
BFC505	(19)	NPN	SOT353	8	18	500
BFC520	(20)	NPN	SOT353	8	70	1000
BFE505	(19)	NPN	SOT353	8	18	500
BFE520	(20)	NPN	SOT353	8	70	1000
BFG10(/X)	(23)	NPN	SOT143	8	250	250
BFG10W/X	(23)	NPN	SOT343	10	250	400
BFG11(/X)	(24)	NPN	SOT143	8	500	400
BFG11W/X	(24)	NPN	SOT343	8	500	760
BFG16A	(6)	NPN	SOT223	25	150	1000
BFG17A	(4)	NPN	SOT143	15	50	300
BFG25A/X	(18)	NPN	SOT143	5	6.5	32
BFG25AW(/X)(/XR)	(18)	NPN	SOT343	5	6.5	500
BFG31	(10)	PNP	SOT223	15	100	1000
BFG35	(11)	NPN	SOT223	18	150	1000
BFG67(/X)(/XR)	(14)	NPN	SOT143	10	50	380
BFG92A(/X)(/XR)	(7)	NPN	SOT143	15	25	400
BFG93A(/X)(/XR)	(8)	NPN	SOT143	12	35	300
BFG94	(8)	NPN	SOT223	12	60	700
BFG97	(10)	NPN	SOT223	15	100	1000
BFG135	(16)	NPN	SOT223	15	150	1000
BFG197(/X)(/XR)	(15)	NPN	SOT143	10	100	350
BFG198	(15)	NPN	SOT223	10	100	1000
BFG403W	(25)	NPN	SOT343	4.5	3.6	16
BFG410W	(26)	NPN	SOT343	4.5	12	54
BFG425W	(27)	NPN	SOT343	4.5	30	135
BFG505(/X)(/XR)	(19)	NPN	SOT143	15 ⁽¹⁾	18	150
BFG505W(X)(/XR)	(19)	NPN	SOT343	15 ⁽¹⁾	18	500
BFG520(X)(/XR)	(20)	NPN	SOT143	15 ⁽¹⁾	70	300

Note

1. V_{CES} .

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TYPE NUMBER	CHARACTERISTICS, typical values											
	f_T (GHz)	F (dB)	G_{UM} (dB)	@ f (MHz)	F (dB)	G_{UM} (dB)	@ f (MHz)	$V_o^{(1)}$ (mV)	P_L (dBm)	ITO (dBm)	@ I_C (mA)	& V_{CE} (V)
BF547	1.2		20	100								
BF547W	1.2		20	100								
BF689K	1.8	4		100	3	16 ⁽³⁾	200					
BF747	1.2		20	100								
BF763	1.8	5		800								
BFC505	7.3	1.8		900	3.5		2000					
BFC520	7	1.3		900								
BFE505	9	1.2		900	1.9		2000					
BFE520	9	1.1		900	1.9		2000					
BFG10(/X)			7 ⁽³⁾	1900								
BFG10W/X			10 ⁽²⁾⁽³⁾	900		7 ⁽³⁾	1900					
BFG11(/X)			5 ⁽³⁾	1900								
BFG11W/X						6 ⁽²⁾⁽³⁾	1900					
BFG16A	1.5		10	500								
BFG17A	2.8	2.5	15	800								
BFG25A/X	5	1.8	18	1000								
BFG25AW(/X)(/XR)	5	2	16	1000								
BFG31	5		16	500		12	800	550			70	10
BFG35	4		15	500		11	800	750			100	10
BFG67(/X)(/XR)	8	1.7	17	1000	2.5	10	2000					
BFG92A(/X)(/XR)	5	2	16	1000	3	11	2000					
BFG93A(/X)(/XR)	6	1.7	16	1000	2.3	10	2000					
BFG94	6	2.7		500	3	13.5	1000	500	21.5	34	45	10
BFG97	5.5	2	16	500		12	800	700			70	10
BFG135	7		16	500		12	800	850			100	10
BFG197(/X)(/XR)	7.5	2.3	16	1000		10	2000					
BFG198	8		18	500		15	800	700			70	8
BFG403W	17	1		900	1.6		2000			6	1	1
BFG410W	22	0.9		900	1.2		2000			15	10	2
BFG425W	25	0.8		900	1.2		2000			22	25	2
BFG505(/X)(/XR)	9	1.6	20	900	1.9	13	2000		4	10	5	6
BFG505W(/X)(/XR)	9	1.6	19	900	1.9	12	2000		4	10	5	6
BFG520(/X)(/XR)	9	1.6	19	900	1.9	13	2000	275	17	26	20	6

Notes

1. At $d_{im} = -60$ dB, measured according to DIN45004B, par. 6.3: 3-tone test.
2. Minimum value.
3. Power gain G_p .

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TYPE NUMBER	f_T / I_C CURVE (see Fig.1)	POLARITY	PACKAGE	RATINGS		
				V_{CE0} (V)	I_C (mA)	P_{tot} (mW)
BFG520W(X)/XR)	(20)	NPN	SOT343	15 ⁽¹⁾	70	500
BFG540(X)/XR)	(21)	NPN	SOT143	15 ⁽¹⁾	120	500
BFG540W(X)/XR)	(21)	NPN	SOT343	15 ⁽¹⁾	120	500
BFG541	(21)	NPN	SOT223	15 ⁽¹⁾	120	650
BFG590(X)/XR)	(22)	NPN	SOT143	15	200	400
BFG590W(X)/XR)	(22)	NPN	SOT343	15	200	500
BFG591	(22)	NPN	SOT223	15	200	2000
BFM505	(19)	NPN	SOT363	8	18	500
BFM520	(20)	NPN	SOT363	8	70	1000

Note

1. V_{CES} .

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TYPE NUMBER	CHARACTERISTICS, typical values											
	f_T (GHz)	F (dB)	G_{UM} (dB)	@ f (MHz)	F (dB)	G_{UM} (dB)	@ f (MHz)	$V_o^{(1)}$ (mV)	P_L (dBm)	ITO (dBm)	@ I_C (mA)	& V_{CE} (V)
BFG520W(X)/XR	9	1.6	17	900	1.85	11	2000	275	17	26	20	6
BFG540(X)/XR	9	1.9	18	900	2.1	11	2000	500	21	34	40	8
BFG540W(X)/XR	9	1.9	16	900	2.1	10	2000	500	21	34	40	8
BFG541	9	1.9	15	900	2.1	9	2000	500	21	34	40	8
BFG590(X)/XR	5		13	900		7.5	2000					
BFG590W(X)/XR	5		13	900		7.5	2000		21		80	5
BFG591	7		13	900		7.5	2000					
BFM505	9	1.4	17	900	1.9	10	2000					
BFM520	9	1.7	15	900	1.9	9	2000					

Note

1. At $d_{im} = -60$ dB, measured according to DIN45004B, par. 6.3: 3-tone test.

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TYPE NUMBER	f_T / I_C CURVE (see Fig.1)	POLARITY	PACKAGE	RATINGS		
				V_{CE0} (V)	I_C (mA)	P_{tot} (mW)
BFQ17	(6)	NPN	SOT89	25	150	1000
BFQ18A	(11)	NPN	SOT89	18	150	1000
BFQ19	(10)	NPN	SOT89	15	100	1000
BFQ34	(11)	NPN	SOT122	18	150	2700
BFQ67	(14)	NPN	SOT23	10	50	300
BFQ67W	(14)	NPN	SOT323	10	50	300
BFQ68	(12)	NPN	SOT122	18	300	4500
BFQ135	(16)	NPN	SOT172	19	150	2700
BFQ136	(13)	NPN	SOT122	18	600	9000
BFQ149	(10)	PNP	SOT89	15	100	1000
BFQ270	(17)	NPN	SOT172	19	500	10000
BFQ540	(21)	NPN	SOT89	12	120	1200
BFQ621	(23)	NPN	SOT172	16	150	800
BFR53	(5)	NPN	SOT23	10	50	250
BFR92	(7)	NPN	SOT23	15	25	300
BFR92A	(7)	NPN	SOT23	15	25	300
BFR92AW	(7)	NPN	SOT323	15	25	300
BFR93	(8)	NPN	SOT23	12	35	300
BFR93A	(8)	NPN	SOT23	12	35	300
BFR93AW	(8)	NPN	SOT323	12	35	300
BFR94A	(8)	NPN	SOT122	25	150	3500
BFR106	(10)	NPN	SOT23	15	100	500
BFR505	(19)	NPN	SOT23	15 ⁽¹⁾	18	150
BFR520	(20)	NPN	SOT23	15 ⁽¹⁾	70	300
BFR540	(21)	NPN	SOT23	15 ⁽¹⁾	120	480
BFS17	(3)	NPN	SOT23	15	25	300
BFS17A	(4)	NPN	SOT23	15	25	300
BFS17W	(3)	NPN	SOT323	15	50	300
BFS25A	(18)	NPN	SOT323	5	6.5	32
BFS505	(19)	NPN	SOT323	15 ⁽¹⁾	18	150
BFS520	(20)	NPN	SOT323	15 ⁽¹⁾	70	300
BFS540	(21)	NPN	SOT323	15 ⁽¹⁾	120	500
BFT25	(1)	NPN	SOT23	5	6.5	30
BFT25A	(18)	NPN	SOT23	5	6.5	32
BFT92	(7)	PNP	SOT23	15	25	300
BFT92W	(7)	PNP	SOT323	15	35	300
BFT93	(9)	PNP	SOT23	12	35	300

Note

1. V_{CES} .

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TYPE NUMBER	CHARACTERISTICS, typical values											
	f_T (GHz)	F (dB)	G_{UM} (dB)	@ f (MHz)	F (dB)	G_{UM} (dB)	@ f (MHz)	$V_o^{(1)}$ (mV)	P_L (dBm)	ITO (dBm)	@ I_C (mA)	& V_{CE} (V)
BFQ17	1.5		16	200		6.5	800					
BFQ18A	4											
BFQ19	5.5	3.3	11.5	500		7.5	800					
BFQ34	4	8	16.3	500				1200	26	45	120	15
BFQ67	8	1.7	14	1000	2.7	8	2000					
BFQ67W	8	2	13	1000	2.7	8	2000					
BFQ68	4		13	800				1600	28	47	240	15
BFQ135	6.5		17	500		13.5	800	1200			120	18
BFQ136	4		12.5	800				2500			500	15
BFQ149	5	3.75	12	500								
BFQ270	6		16	500		10	1000	1600			240	18
BFQ540	9	1.9		900				500			40	8
BFQ621	7		18.5	500				1200			120	18
BFR53	2	5 ⁽²⁾		500		10.5	800					
BFR92	5	2.4	18	500				150			14	10
BFR92A	5	2.1	14	1000	3	8	2000	150			14	10
BFR92AW	5	2	14	1000	3	8	2000					
BFR93	5	1.9	16.5	500								
BFR93A	6	1.9	13	1000	3	7	2000	425			30	8
BFR93AW	5	1.5	13	1000	2.1	8	2000					
BFR94A	3.5	8		200	5	13.5	500					
BFR106	5	3.5	11.5	800				350			50	9
BFR505	9	1.6	17	900	1.9	10	2000		4	10	5	6
BFR520	9	1.6	15	900	1.9	9	2000		17	26	20	6
BFR540	9	1.9	14	900	2.1	7	2000	550	21	34	40	8
BFS17	1	4.5		500								
BFS17A	2.8	2.5	13.5	800				150			14	10
BFS17W	1.6	4.5		500								
BFS25A	5	1.8	13	1000								
BFS505	9	1.6	17	900	1.9	10	2000		4	10	5	6
BFS520	9	1.6	15	900	1.9	9	2000		17	26	20	6
BFS540	9	1.9	14	900	2.1	8	2000		21	34	40	8
BFT25	2.3	3.8	18	500		12	800					
BFT25A	5	1.8	15	1000								
BFT92	5	2.5	18	500				150			14	10
BFT92W	5	2.5	17	500	3	11	1000					
BFT93	5	2.4	16.5	500				300			30	5

Notes

1. At $d_{im} = -60$ dB, measured according to DIN45004B, par. 6.3: 3-tone test.
2. Maximum value.

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TYPE NUMBER	f_T / I_C CURVE (see Fig.1)	POLARITY	PACKAGE	RATINGS		
				V_{CEO} (V)	I_C (mA)	P_{tot} (mW)
BFT93W	(9)	PNP	SOT323	12	50	300
MPSH10		NPN	SOT54	25	40	1000
PMBT3640		PNP	SOT23	12	80	350
PMBTH10		NPN	SOT23	25	40	400
PMBTH81		PNP	SOT23	20	40	400

DEVELOPMENT TYPES

TYPE NUMBER	f_T / I_C CURVE (see Fig.1)	POLARITY	PACKAGE	RATINGS		
				V_{CEO} (V)	I_C (mA)	P_{tot} (mW)
BFG21W	(28)	NPN	SOT343	4.5	200 ⁽¹⁾	600

Note

1. Typical value.

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TYPE NUMBER	CHARACTERISTICS, typical values											
	f _T (GHz)	F (dB)	G _{UM} (dB)	@ f (MHz)	F (dB)	G _{UM} (dB)	@ f (MHz)	V _o ⁽¹⁾ (mV)	P _L (dBm)	ITO (dBm)	@ I _c (mA)	& V _{CE} (V)
BFT93W	5	2.4	15.5	500	3	10	1000					
MPSH10	0.65 ⁽²⁾											
PMBT3640	0.5 ⁽²⁾											
PMBTH10	0.65 ⁽²⁾											
PMBTH81	0.6 ⁽²⁾											

Notes

1. At d_{im} = -60 dB, measured according to DIN45004B, par. 6.3: 3-tone test.
2. Minimum value.

DEVELOPMENT TYPES

TYPE NUMBER	CHARACTERISTICS, typical values											
	f _T (GHz)	F (dB)	G _{UM} (dB)	@ f (MHz)	F (dB)	G _{UM} (dB)	@ f (MHz)	V _o ⁽¹⁾ (mV)	P _L (dBm)	ITO (dBm)	@ I _c (mA)	& V _{CE} (V)
BFG21W	18 ⁽²⁾		10 ⁽²⁾⁽³⁾	1900								

Notes

1. At d_{im} = -60 dB, measured according to DIN45004B, par. 6.3: 3-tone test.
2. Minimum value.
3. Power gain G_p.

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LINE-UPS

Analog cellular (AMPS, (E)TACS, NMT) 900 MHz

INPUT POWER (mW)	1 st STAGE	2 nd STAGE	3 rd STAGE	P _L (W)	SUPPLY VOLTAGE (V)
Bipolar					
1	BFG540/X	BLT80	BLT81	1.2	6
1	BFG540/X	BLT70	BLT71	1.2	4.8
1	BFG10W/X	BLT71/8	–	1.2	4.8

Digital cellular (GSM) 900 MHz

INPUT POWER (mW)	1 st STAGE	2 nd STAGE	3 rd STAGE	P _L (W)	SUPPLY VOLTAGE (V)
Bipolar					
1	BFG540W/X	BFG10W/X	BLT82	3.5 pulsed	6

Portable transmitters (860 MHz to 960 MHz)

INPUT POWER (mW)	1 st STAGE	2 nd STAGE	3 rd STAGE	P _L (W)	SUPPLY VOLTAGE (V)
Bipolar					
1	BFG540	BLT80	BLT81	1.2	6
15	BFG93A	BLT80	BLT92/SL	3	7.5

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RF wideband transmitters for pager front-end (see Fig.2)

FUNCTION	TYPE NUMBER	REMARKS
RF amplifier	BFC505	higher gain, lower noise, high isolation (0.3 mA)
	BFG403W	high performance, low voltage, low current
	BFR505	higher gain, lower noise (1 mA)
	BFT25A	lowest current (0.2 mA)
Oscillator, mixer or buffer	BFQ67	choice of the transistor is determined by the available current and the required performance
	BFR92A	
	BFR505	
	BFT25A	

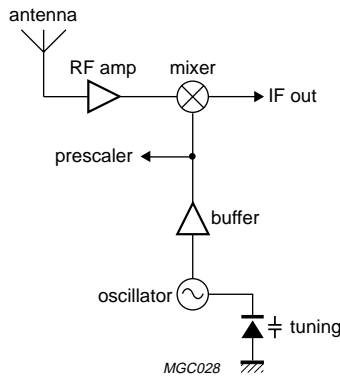


Fig.2 Typical front-end section for pagers.

RF Wideband Transistors

Selection guide

RF wideband transistors for the receiver section in cordless/cellular phones (see Fig.3)

FUNCTION	TYPE NUMBER	SYSTEM FREQUENCY (MHz)	FEATURES
LNA	BFC505	1900	high isolation gain, low noise current
	BFG410W	900; 1900; 2500	very low noise
	BFG425W	900; 1900; 2500	very low noise
	BFR505	900; 1900	good performance at low current (1 mA)
	BFR520	900; 1900	higher gain, lower noise (10 mA)
Mixer	BFE505	900; 1900	balanced mixer in a single SOT353 package
	BFG505	900; 1900	good performance, low current
	BFG410W	900; 1900; 2500	low noise, high isolation
	BFG520	900; 1900	higher power to IF (10 mA)
	BFR93A	900	low cost, acceptable performance
Buffer and VCO	BFG410W	900; 1900; 2500	excellent isolation
	BFG505	1900	buffer and VCO in a single SOT353 package
	BFQ67	900	third generation, good performance
	BFR92A	900	excellent VCO, good buffer, low-cost
	BFR93A	900	excellent VCO, good buffer, low-cost
	BFR505	900; 1900	good VCO, high-gain buffer, low current
	BFR520	900; 1900	good VCO, higher output power
IF	BFS17A	40 to 100	any first or second generation transistor

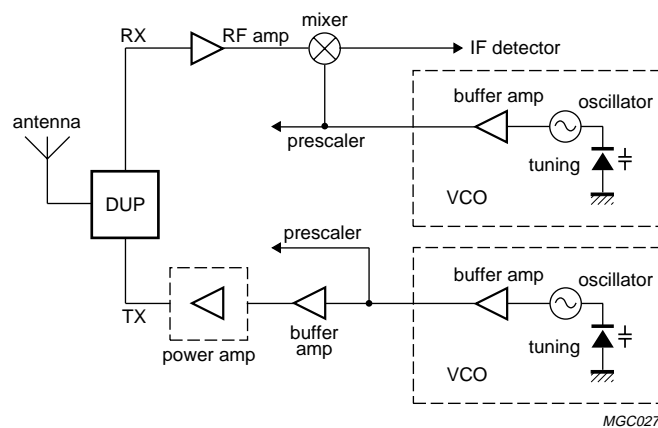


Fig.3 Typical RF section for cordless and cellular phones.

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Selection guide

RF wideband transistors for the receiver section in cordless/cellular phones (see Fig.3)

FUNCTION	SYSTEM FREQUENCY (MHz)	SOT23	SOT323	SOT143 ⁽¹⁾	SOT343 ⁽¹⁾	SOT353	SOT363
LNA	900; 1900	BFR505	BFS505	BFG505	BFG505W	BFC505	BFM505
	900; 1900	BFR 520	BFS520	BFG520	BFG520W	BFC520	BFM520
Mixer	900	BFR93A	BFR93AW	BFG93A			
	900; 1900	BFR505	BFS505	BFG505	BFG505W	BFE505	BFM505
	900; 1900	BFR520	BFS520	BFG520	BFG520W	BFE520	BFM520
Buffer and VCO	900	BFR92A	BFR92AW	BFG92A			
	900	BFR93A	BFR93AW	BFG93A			
	900	BFQ67	BFQ67W	BFG67			
	900; 1900	BFR505	BFS505	BFG505	BFG505W	BFC505	BFM505
	900; 1900	BFR520	BFS520	BFG520	BFG520W	BFC520	BFM520
IF	40 to 100	BF547	BF547W				
		BFS17	BFS17W	BFG17A			
		BFR92A	BFR92AW	BFG92A			

Note

1. Also available in /X and /XR versions.

RF Wideband Transistors

Selection guide

RF wideband transistors for the power amplifier section in cordless/cellular phones (see Fig.4)

SYSTEM	SUPPLY VOLTAGE (V)	P _{out} (mW)	SOT143	SOT343
CT1, CT1+, CT2, CT2+, CT3	3.3	driver for PA2	BFG67	
			BFG505	BFG505W
			BFG520	BFG520W
		15	BFG67	
		20	BFG520	BFG520W
DECT, PHP	3.3	400	BFG540/X	BFG540W/X
			BFG10/X	BFG10W/X
			BFG11/X	BFG11W/X

