

March 1998

## Ultra High Frequency Transistor Arrays

### Features

- NPN Transistor ( $f_T$ ) ..... 8GHz
- NPN Current Gain ( $h_{FE}$ )..... 70
- NPN Early Voltage ( $V_A$ ) ..... 50V
- PNP Transistor ( $f_T$ )..... 5.5GHz
- PNP Current Gain ( $h_{FE}$ )..... 40
- PNP Early Voltage ( $V_A$ ) ..... 25V
- Noise Figure (50 $\Omega$ ) at 1.0GHz ..... 3.5dB
- Collector-to-Collector Leakage..... <1pA
- Complete Isolation Between Transistors
- Pin Compatible with Industry Standard 3XXX Series Arrays

### Applications

- VHF/UHF Amplifiers
- VHF/UHF Mixers
- IF Converters
- Synchronous Detectors

### Description

The HFA3046, HFA3096, HFA3127 and the HFA3128 are Ultra High Frequency Transistor Arrays that are fabricated from Harris Semiconductor's complementary bipolar UHF-1 process. Each array consists of five dielectrically isolated transistors on a common monolithic substrate. The NPN transistors exhibit a  $f_T$  of 8GHz while the PNP transistors provide a  $f_T$  of 5.5GHz. Both types exhibit low noise (3.5dB), making them ideal for high frequency amplifier and mixer applications.

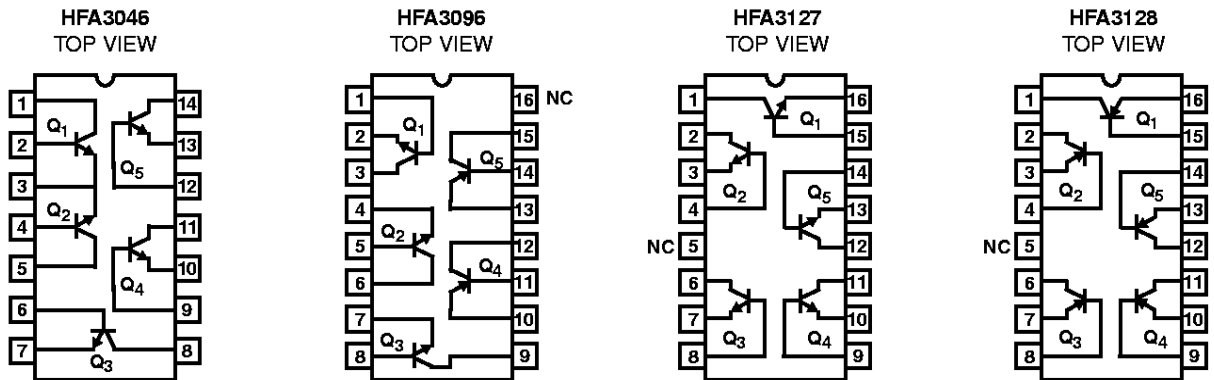
The HFA3046 and HFA3127 are all NPN arrays while the HFA3128 has all PNP transistors. The HFA3096 is an NPN-PNP combination. Access is provided to each of the terminals for the individual transistors for maximum application flexibility. Monolithic construction of these transistor arrays provides close electrical and thermal matching of the five transistors.

For PSPICE models, please request AnswerFAX document number 663046. Harris also provides an Application Note illustrating the use of these devices as RF amplifiers (request AnswerFAX document 99315).

### Ordering Information

PART NUMBER	TEMP. RANGE (°C)	PACKAGE	PKG. NO.
HFA3046B	-55 to 125	14 Ld SOIC	M14.15
HFA3096B	-55 to 125	16 Ld SOIC	M16.15
HFA3127B	-55 to 125	16 Ld SOIC	M16.15
HFA3128B	-55 to 125	16 Ld SOIC	M16.15

### Pinouts



## HFA3046, HFA3096, HFA3127, HFA3128

### Absolute Maximum Ratings

Collector to Emitter Voltage (Open Base).....	8V
Collector to Base Voltage (Open Emitter).....	12V
Emitter to Base Voltage (Reverse Bias).....	5.5V
Collector Current (100% Duty Cycle).....	18.5mA at $T_J = 150^\circ\text{C}$ 34mA at $T_J = 125^\circ\text{C}$ 37mA at $T_J = 110^\circ\text{C}$
Peak Collector Current (Any Condition).....	65mA

### Thermal Information

Thermal Resistance (Typical, Note 1)	$\theta_{JA}$ ( $^\circ\text{C}/\text{W}$ )
14 Ld SOIC Package.....	120
16 Ld SOIC Package.....	115
Maximum Power Dissipation (Any One Transistor).....	0.15W
Maximum Junction Temperature (Die).....	175 $^\circ\text{C}$
Maximum Junction Temperature (Plastic Package).....	150 $^\circ\text{C}$
Maximum Storage Temperature Range.....	-65 $^\circ\text{C}$ to 150 $^\circ\text{C}$
Maximum Lead Temperature (Soldering 10s).....	300 $^\circ\text{C}$
(SOIC - Lead Tips Only)	

### Operating Conditions

Temperature Range ..... -55 $^\circ\text{C}$  to 125 $^\circ\text{C}$

*CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.*

#### NOTE:

- $\theta_{JA}$  is measured with the component mounted on an evaluation PC board in free air.

### Electrical Specifications $T_A = 25^\circ\text{C}$

PARAMETER	TEST CONDITIONS	DIE			SOIC			UNITS
		MIN	TYP	MAX	MIN	TYP	MAX	
<b>DC NPN CHARACTERISTICS</b>								
Collector-to-Base Breakdown Voltage, $V_{(BR)CBO}$	$I_C = 100\mu\text{A}$ , $I_E = 0$	12	18	-	12	18	-	V
Collector-to-Emitter Breakdown Voltage, $V_{(BR)CEO}$	$I_C = 100\mu\text{A}$ , $I_B = 0$	8	12	-	8	12	-	V
Collector-to-Emitter Breakdown Voltage, $V_{(BR)CES}$	$I_C = 100\mu\text{A}$ , Base Shorted to Emitter	10	20	-	10	20	-	V
Emitter-to-Base Breakdown Voltage, $V_{(BR)EBO}$	$I_E = 10\mu\text{A}$ , $I_C = 0$	5.5	6	-	5.5	6	-	V
Collector-Cutoff-Current, $I_{CEO}$	$V_{CE} = 6\text{V}$ , $I_B = 0$	-	2	100	-	2	100	nA
Collector-Cutoff-Current, $I_{CBO}$	$V_{CB} = 8\text{V}$ , $I_E = 0$	-	0.1	10	-	0.1	10	nA
Collector-to-Emitter Saturation Voltage, $V_{CE(SAT)}$	$I_C = 10\text{mA}$ , $I_B = 1\text{mA}$	-	0.3	0.5	-	0.3	0.5	V
Base-to-Emitter Voltage, $V_{BE}$	$I_C = 10\text{mA}$	-	0.85	0.95	-	0.85	0.95	V
DC Forward-Current Transfer Ratio, $h_{FE}$	$I_C = 10\text{mA}$ $V_{CE} = 2\text{V}$	40	70	-	40	70	-	
Early Voltage, $V_A$	$I_C = 1\text{mA}$ , $V_{CE} = 3.5\text{V}$	20	50	-	20	50	-	V
Base-to-Emitter Voltage Drift	$I_C = 10\text{mA}$	-	-1.5	-	-	-1.5	-	mV/ $^\circ\text{C}$
Collector-to-Collector Leakage		-	1	-	-	1	-	pA

### Electrical Specifications $T_A = 25^\circ\text{C}$

PARAMETER	TEST CONDITIONS	DIE			SOIC			UNITS
		MIN	TYP	MAX	MIN	TYP	MAX	
<b>DYNAMIC NPN CHARACTERISTICS</b>								
Noise Figure	$f = 1.0\text{GHz}$ , $V_{CE} = 5\text{V}$ , $I_C = 5\text{mA}$ , $Z_S = 50\Omega$	-	3.5	-	-	3.5	-	dB
$f_T$ Current Gain-Bandwidth Product	$I_C = 1\text{mA}$ , $V_{CE} = 5\text{V}$	-	5.5	-	-	5.5	-	GHz
	$I_C = 10\text{mA}$ , $V_{CE} = 5\text{V}$	-	8	-	-	8	-	GHz
Power Gain-Bandwidth Product, $f_{MAX}$	$I_C = 10\text{mA}$ , $V_{CE} = 5\text{V}$	-	6	-	-	2.5	-	GHz
Base-to-Emitter Capacitance	$V_{BE} = -3\text{V}$	-	200	-	-	500	-	fF
Collector-to-Base Capacitance	$V_{CB} = 3\text{V}$	-	200	-	-	500	-	fF

## HFA3046, HFA3096, HFA3127, HFA3128

### Electrical Specifications $T_A = 25^\circ\text{C}$

PARAMETER	TEST CONDITIONS	DIE			SOIC			UNITS
		MIN	TYP	MAX	MIN	TYP	MAX	
<b>DC PNP CHARACTERISTICS</b>								
Collector-to-Base Breakdown Voltage, $V_{(BR)CBO}$	$I_C = -100\mu\text{A}, I_E = 0$	10	15	-	10	15	-	V
Collector-to-Emitter Breakdown Voltage, $V_{(BR)CEO}$	$I_C = -100\mu\text{A}, I_B = 0$	8	15	-	8	15	-	V
Collector-to-Emitter Breakdown Voltage, $V_{(BR)CES}$	$I_C = -100\mu\text{A}$ , Base Shorted to Emitter	10	15	-	10	15	-	V
Emitter-to-Base Breakdown Voltage, $V_{(BR)EBO}$	$I_E = -10\mu\text{A}, I_C = 0$	4.5	5	-	4.5	5	-	V
Collector-Cutoff-Current, $I_{CEO}$	$V_{CE} = -6\text{V}, I_B = 0$	-	2	100	-	2	100	nA
Collector-Cutoff-Current, $I_{CBO}$	$V_{CB} = -8\text{V}, I_E = 0$	-	0.1	10	-	0.1	10	nA
Collector-to-Emitter Saturation Voltage, $V_{CE(SAT)}$	$I_C = -10\text{mA}, I_B = -1\text{mA}$	-	0.3	0.5	-	0.3	0.5	V
Base-to-Emitter Voltage, $V_{BE}$	$I_C = -10\text{mA}$	-	0.85	0.95	-	0.85	0.95	V
DC Forward-Current Transfer Ratio, $h_{FE}$	$I_C = -10\text{mA}, V_{CE} = -2\text{V}$	20	35	-	20	35	-	
Early Voltage, $V_A$	$I_C = -1\text{mA}, V_{CE} = -3.5\text{V}$	10	25	-	10	25	-	V
Base-to-Emitter Voltage Drift	$I_C = -10\text{mA}$	-	-1.5	-	-	-1.5	-	mV/ $^\circ\text{C}$
Collector-to-Collector Leakage		-	1	-	-	1	-	pA

### Electrical Specifications $T_A = 25^\circ\text{C}$

PARAMETER	TEST CONDITIONS	DIE			SOIC			UNITS
		MIN	TYP	MAX	MIN	TYP	MAX	
<b>DYNAMIC PNP CHARACTERISTICS</b>								
Noise Figure	$f = 1.0\text{GHz}, V_{CE} = -5\text{V}, I_C = -5\text{mA}, Z_S = 50\Omega$	-	3.5	-	-	3.5	-	dB
$f_T$ Current Gain-Bandwidth Product	$I_C = -1\text{mA}, V_{CE} = -5\text{V}$	-	2	-	-	2	-	GHz
	$I_C = -10\text{mA}, V_{CE} = -5\text{V}$	-	5.5	-	-	5.5	-	GHz
Power Gain-Bandwidth Product	$I_C = -10\text{mA}, V_{CE} = -5\text{V}$	-	3	-	-	2	-	GHz
Base-to-Emitter Capacitance	$V_{BE} = 3\text{V}$	-	200	-	-	500	-	fF
Collector-to-Base Capacitance	$V_{CB} = -3\text{V}$	-	300	-	-	600	-	fF

### Electrical Specifications $T_A = 25^\circ\text{C}$

PARAMETER	TEST CONDITIONS	DIE			SOIC			UNITS
		MIN	TYP	MAX	MIN	TYP	MAX	
<b>DIFFERENTIAL PAIR MATCHING CHARACTERISTICS FOR THE HFA3046</b>								
Input Offset Voltage	$I_C = 10\text{mA}, V_{CE} = 5\text{V}$	-	1.5	5.0	-	1.5	5.0	mV
Input Offset Current	$I_C = 10\text{mA}, V_{CE} = 5\text{V}$	-	5	25	-	5	25	$\mu\text{A}$
Input Offset Voltage TC	$I_C = 10\text{mA}, V_{CE} = 5\text{V}$	-	0.5	-	-	0.5	-	$\mu\text{V}/^\circ\text{C}$

S-Parameter and PSpice model data is available from Harris Sales Offices.

**HFA3046, HFA3096, HFA3127, HFA3128**

**Common Emitter S-Parameters of NPN 3 $\mu$ m x 50 $\mu$ m Transistor**

FREQ. (Hz)	S <sub>11</sub>	PHASE(S <sub>11</sub> )	S <sub>21</sub>	PHASE(S <sub>21</sub> )	S <sub>12</sub>	PHASE(S <sub>12</sub> )	S <sub>22</sub>	PHASE(S <sub>22</sub> )
<b>V<sub>CE</sub> = 5V and I<sub>C</sub> = 5mA</b>								
1.0E+08	0.83	-11.78	11.07	168.57	1.41E-02	78.88	0.97	-11.05
2.0E+08	0.79	-22.82	10.51	157.89	2.69E-02	68.63	0.93	-21.35
3.0E+08	0.73	-32.64	9.75	148.44	3.75E-02	59.58	0.86	-30.44
4.0E+08	0.67	-41.08	8.91	140.36	4.57E-02	51.90	0.79	-38.16
5.0E+08	0.61	-48.23	8.10	133.56	5.19E-02	45.50	0.73	-44.59
6.0E+08	0.55	-54.27	7.35	127.88	5.65E-02	40.21	0.67	-49.93
7.0E+08	0.50	-59.41	6.69	123.10	6.00E-02	35.82	0.62	-54.37
8.0E+08	0.46	-63.81	6.11	119.04	6.27E-02	32.15	0.57	-58.10
9.0E+08	0.42	-67.63	5.61	115.57	6.47E-02	29.07	0.53	-61.25
1.0E+09	0.39	-70.98	5.17	112.55	6.63E-02	26.45	0.50	-63.96
1.1E+09	0.36	-73.95	4.79	109.91	6.75E-02	24.19	0.47	-66.31
1.2E+09	0.34	-76.62	4.45	107.57	6.85E-02	22.24	0.45	-68.37
1.3E+09	0.32	-79.04	4.15	105.47	6.93E-02	20.53	0.43	-70.19
1.4E+09	0.30	-81.25	3.89	103.57	7.00E-02	19.02	0.41	-71.83
1.5E+09	0.28	-83.28	3.66	101.84	7.05E-02	17.69	0.40	-73.31
1.6E+09	0.27	-85.17	3.45	100.26	7.10E-02	16.49	0.39	-74.66
1.7E+09	0.25	-86.92	3.27	98.79	7.13E-02	15.41	0.38	-75.90
1.8E+09	0.24	-88.57	3.10	97.43	7.17E-02	14.43	0.37	-77.05
1.9E+09	0.23	-90.12	2.94	96.15	7.19E-02	13.54	0.36	-78.12
2.0E+09	0.22	-91.59	2.80	94.95	7.21E-02	12.73	0.35	-79.13
2.1E+09	0.21	-92.98	2.68	93.81	7.23E-02	11.98	0.35	-80.09
2.2E+09	0.20	-94.30	2.56	92.73	7.25E-02	11.29	0.34	-80.99
2.3E+09	0.20	-95.57	2.45	91.70	7.27E-02	10.64	0.34	-81.85
2.4E+09	0.19	-96.78	2.35	90.72	7.28E-02	10.05	0.33	-82.68
2.5E+09	0.18	-97.93	2.26	89.78	7.29E-02	9.49	0.33	-83.47
2.6E+09	0.18	-99.05	2.18	88.87	7.30E-02	8.96	0.33	-84.23
2.7E+09	0.17	-100.12	2.10	88.00	7.31E-02	8.47	0.33	-84.97
2.8E+09	0.17	-101.15	2.02	87.15	7.31E-02	8.01	0.33	-85.68
2.9E+09	0.16	-102.15	1.96	86.33	7.32E-02	7.57	0.33	-86.37
3.0E+09	0.16	-103.11	1.89	85.54	7.32E-02	7.16	0.33	-87.05
<b>V<sub>CE</sub> = 5V and I<sub>C</sub> = 10mA</b>								
1.0E+08	0.72	-16.43	15.12	165.22	1.27E-02	75.41	0.95	-14.26
2.0E+08	0.67	-31.26	13.90	152.04	2.34E-02	62.89	0.88	-26.95
3.0E+08	0.60	-43.76	12.39	141.18	3.13E-02	52.58	0.79	-37.31
4.0E+08	0.53	-54.00	10.92	132.57	3.68E-02	44.50	0.70	-45.45
5.0E+08	0.47	-62.38	9.62	125.78	4.05E-02	38.23	0.63	-51.77
6.0E+08	0.42	-69.35	8.53	120.37	4.31E-02	33.34	0.57	-56.72
7.0E+08	0.37	-75.26	7.62	116.00	4.49E-02	29.47	0.51	-60.65
8.0E+08	0.34	-80.36	6.86	112.39	4.63E-02	26.37	0.47	-63.85
9.0E+08	0.31	-84.84	6.22	109.36	4.72E-02	23.84	0.44	-66.49
1.0E+09	0.29	-88.83	5.69	106.77	4.80E-02	21.75	0.41	-68.71

**HFA3046, HFA3096, HFA3127, HFA3128**

**Common Emitter S-Parameters of NPN 3 $\mu$ m x 50 $\mu$ m Transistor** (Continued)

FREQ. (Hz)	S <sub>11</sub>	PHASE(S <sub>11</sub> )	S <sub>21</sub>	PHASE(S <sub>21</sub> )	S <sub>12</sub>	PHASE(S <sub>12</sub> )	S <sub>22</sub>	PHASE(S <sub>22</sub> )
1.1E+09	0.27	-92.44	5.23	104.51	4.86E-02	20.00	0.39	-70.62
1.2E+09	0.25	-95.73	4.83	102.53	4.90E-02	18.52	0.37	-72.28
1.3E+09	0.24	-98.75	4.49	100.75	4.94E-02	17.25	0.35	-73.76
1.4E+09	0.22	-101.55	4.19	99.16	4.97E-02	16.15	0.34	-75.08
1.5E+09	0.21	-104.15	3.93	97.70	4.99E-02	15.19	0.33	-76.28
1.6E+09	0.20	-106.57	3.70	96.36	5.01E-02	14.34	0.32	-77.38
1.7E+09	0.20	-108.85	3.49	95.12	5.03E-02	13.60	0.31	-78.41
1.8E+09	0.19	-110.98	3.30	93.96	5.05E-02	12.94	0.31	-79.37
1.9E+09	0.18	-113.00	3.13	92.87	5.06E-02	12.34	0.30	-80.27
2.0E+09	0.18	-114.90	2.98	91.85	5.07E-02	11.81	0.30	-81.13
2.1E+09	0.17	-116.69	2.84	90.87	5.08E-02	11.33	0.30	-81.95
2.2E+09	0.17	-118.39	2.72	89.94	5.09E-02	10.89	0.29	-82.74
2.3E+09	0.16	-120.01	2.60	89.06	5.10E-02	10.50	0.29	-83.50
2.4E+09	0.16	-121.54	2.49	88.21	5.11E-02	10.13	0.29	-84.24
2.5E+09	0.16	-122.99	2.39	87.39	5.12E-02	9.80	0.29	-84.95
2.6E+09	0.15	-124.37	2.30	86.60	5.12E-02	9.49	0.29	-85.64
2.7E+09	0.15	-125.69	2.22	85.83	5.13E-02	9.21	0.29	-86.32
2.8E+09	0.15	-126.94	2.14	85.09	5.13E-02	8.95	0.29	-86.98
2.9E+09	0.15	-128.14	2.06	84.36	5.14E-02	8.71	0.29	-87.62
3.0E+09	0.14	-129.27	1.99	83.66	5.15E-02	8.49	0.29	-88.25

**Common Emitter S-Parameters of PNP 3 $\mu$ m x 50 $\mu$ m Transistor**

FREQ. (Hz)	S <sub>11</sub>	PHASE(S <sub>11</sub> )	S <sub>21</sub>	PHASE(S <sub>21</sub> )	S <sub>12</sub>	PHASE(S <sub>12</sub> )	S <sub>22</sub>	PHASE(S <sub>22</sub> )
<b>V<sub>CE</sub> = -5V and I<sub>C</sub> = -5mA</b>								
1.0E+08	0.72	-16.65	10.11	166.77	1.66E-02	77.18	0.96	-10.76
2.0E+08	0.68	-32.12	9.44	154.69	3.10E-02	65.94	0.90	-20.38
3.0E+08	0.62	-45.73	8.57	144.40	4.23E-02	56.39	0.82	-28.25
4.0E+08	0.57	-57.39	7.68	135.95	5.05E-02	48.66	0.74	-34.31
5.0E+08	0.52	-67.32	6.86	129.11	5.64E-02	42.52	0.67	-38.81
6.0E+08	0.47	-75.83	6.14	123.55	6.07E-02	37.66	0.61	-42.10
7.0E+08	0.43	-83.18	5.53	118.98	6.37E-02	33.79	0.55	-44.47
8.0E+08	0.40	-89.60	5.01	115.17	6.60E-02	30.67	0.51	-46.15
9.0E+08	0.38	-95.26	4.56	111.94	6.77E-02	28.14	0.47	-47.33
1.0E+09	0.36	-100.29	4.18	109.17	6.91E-02	26.06	0.44	-48.15
1.1E+09	0.34	-104.80	3.86	106.76	7.01E-02	24.33	0.41	-48.69
1.2E+09	0.33	-108.86	3.58	104.63	7.09E-02	22.89	0.39	-49.05
1.3E+09	0.32	-112.53	3.33	102.72	7.16E-02	21.67	0.37	-49.26
1.4E+09	0.30	-115.86	3.12	101.01	7.22E-02	20.64	0.36	-49.38
1.5E+09	0.30	-118.90	2.92	99.44	7.27E-02	19.76	0.34	-49.43
1.6E+09	0.29	-121.69	2.75	98.01	7.32E-02	19.00	0.33	-49.44
1.7E+09	0.28	-124.24	2.60	96.68	7.35E-02	18.35	0.32	-49.43
1.8E+09	0.28	-126.59	2.47	95.44	7.39E-02	17.79	0.31	-49.40
1.9E+09	0.27	-128.76	2.34	94.29	7.42E-02	17.30	0.30	-49.38

**HFA3046, HFA3096, HFA3127, HFA3128**

**Common Emitter S-Parameters of PNP 3 $\mu$ m x 50 $\mu$ m Transistor (Continued)**

FREQ. (Hz)	S <sub>11</sub>	PHASE(S <sub>11</sub> )	S <sub>21</sub>	PHASE(S <sub>21</sub> )	S <sub>12</sub>	PHASE(S <sub>12</sub> )	S <sub>22</sub>	PHASE(S <sub>22</sub> )
2.0E+09	0.27	-130.77	2.23	93.19	7.45E-02	16.88	0.30	-49.36
2.1E+09	0.26	-132.63	2.13	92.16	7.47E-02	16.52	0.29	-49.35
2.2E+09	0.26	-134.35	2.04	91.18	7.50E-02	16.20	0.28	-49.35
2.3E+09	0.26	-135.96	1.95	90.24	7.52E-02	15.92	0.28	-49.38
2.4E+09	0.25	-137.46	1.87	89.34	7.55E-02	15.68	0.28	-49.42
2.5E+09	0.25	-138.86	1.80	88.48	7.57E-02	15.48	0.27	-49.49
2.6E+09	0.25	-140.17	1.73	87.65	7.59E-02	15.30	0.27	-49.56
2.7E+09	0.25	-141.39	1.67	86.85	7.61E-02	15.15	0.26	-49.67
2.8E+09	0.25	-142.54	1.61	86.07	7.63E-02	15.01	0.26	-49.81
2.9E+09	0.24	-143.62	1.56	85.31	7.65E-02	14.90	0.26	-49.96
3.0E+09	0.24	-144.64	1.51	84.58	7.67E-02	14.81	0.26	-50.13
<b>V<sub>CE</sub> = -5V, I<sub>C</sub> = -10mA</b>								
1.0E+08	0.58	-23.24	13.03	163.45	1.43E-02	73.38	0.93	-13.46
2.0E+08	0.53	-44.07	11.75	149.11	2.58E-02	60.43	0.85	-24.76
3.0E+08	0.48	-61.50	10.25	137.78	3.38E-02	50.16	0.74	-33.10
4.0E+08	0.43	-75.73	8.88	129.12	3.90E-02	42.49	0.65	-38.83
5.0E+08	0.40	-87.36	7.72	122.49	4.25E-02	36.81	0.58	-42.63
6.0E+08	0.37	-96.94	6.78	117.33	4.48E-02	32.59	0.51	-45.07
7.0E+08	0.35	-104.92	6.01	113.22	4.64E-02	29.39	0.47	-46.60
8.0E+08	0.33	-111.64	5.39	109.85	4.76E-02	26.94	0.43	-47.49
9.0E+08	0.32	-117.36	4.87	107.05	4.85E-02	25.04	0.40	-47.97
1.0E+09	0.31	-122.27	4.44	104.66	4.92E-02	23.55	0.37	-48.18
1.1E+09	0.30	-126.51	4.07	102.59	4.97E-02	22.37	0.35	-48.20
1.2E+09	0.30	-130.21	3.76	100.76	5.02E-02	21.44	0.33	-48.11
1.3E+09	0.29	-133.46	3.49	99.14	5.06E-02	20.70	0.32	-47.95
1.4E+09	0.29	-136.33	3.25	97.67	5.09E-02	20.11	0.31	-47.77
1.5E+09	0.28	-138.89	3.05	96.33	5.12E-02	19.65	0.30	-47.58
1.6E+09	0.28	-141.17	2.87	95.10	5.15E-02	19.29	0.29	-47.39
1.7E+09	0.28	-143.21	2.70	93.96	5.18E-02	19.01	0.28	-47.23
1.8E+09	0.28	-145.06	2.56	92.90	5.21E-02	18.80	0.27	-47.09
1.9E+09	0.27	-146.73	2.43	91.90	5.23E-02	18.65	0.27	-46.98
2.0E+09	0.27	-148.26	2.31	90.95	5.26E-02	18.55	0.26	-46.91
2.1E+09	0.27	-149.65	2.20	90.05	5.28E-02	18.49	0.26	-46.87
2.2E+09	0.27	-150.92	2.10	89.20	5.30E-02	18.46	0.25	-46.87
2.3E+09	0.27	-152.10	2.01	88.37	5.33E-02	18.47	0.25	-46.90
2.4E+09	0.27	-153.18	1.93	87.59	5.35E-02	18.50	0.25	-46.97
2.5E+09	0.27	-154.17	1.86	86.82	5.38E-02	18.55	0.24	-47.07
2.6E+09	0.26	-155.10	1.79	86.09	5.40E-02	18.62	0.24	-47.18
2.7E+09	0.26	-155.96	1.72	85.38	5.42E-02	18.71	0.24	-47.34
2.8E+09	0.26	-156.76	1.66	84.68	5.45E-02	18.80	0.24	-47.55
2.9E+09	0.26	-157.51	1.60	84.01	5.47E-02	18.91	0.24	-47.76
3.0E+09	0.26	-158.21	1.55	83.35	5.50E-02	19.03	0.23	-48.00

Typical Performance Curves

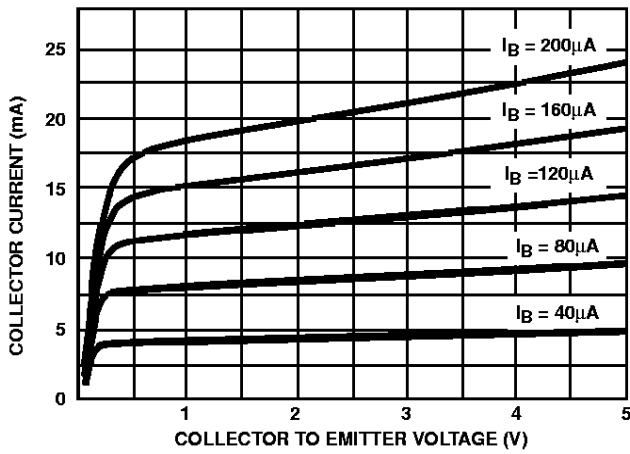


FIGURE 1. NPN COLLECTOR CURRENT vs COLLECTOR TO EMITTER VOLTAGE

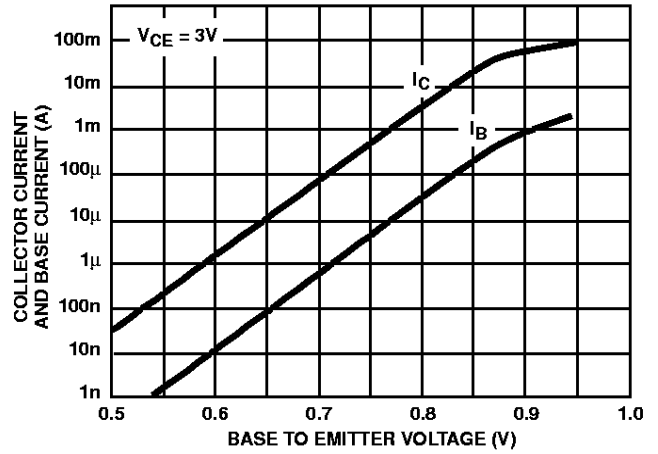


FIGURE 2. NPN COLLECTOR CURRENT AND BASE CURRENT vs BASE TO EMITTER VOLTAGE

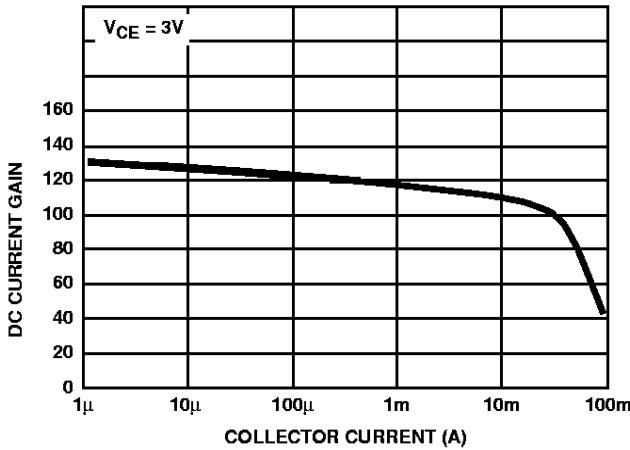


FIGURE 3. NPN DC CURRENT GAIN vs COLLECTOR CURRENT

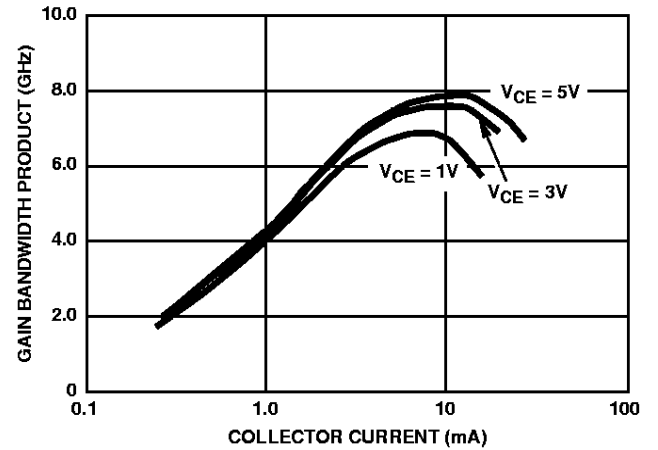


FIGURE 4. NPN GAIN BANDWIDTH PRODUCT vs COLLECTOR CURRENT (UHF 3 x 50 WITH BOND PADS)

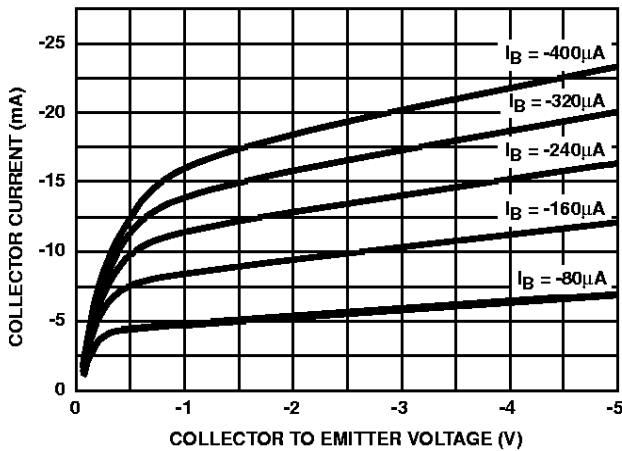


FIGURE 5. PNP COLLECTOR CURRENT vs COLLECTOR TO EMITTER VOLTAGE

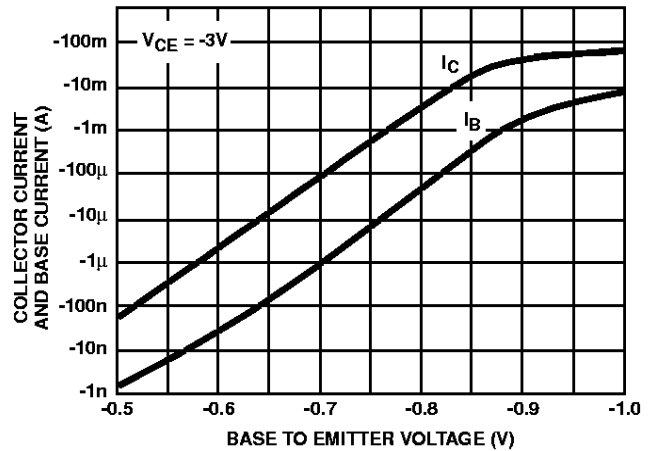


FIGURE 6. PNP COLLECTOR CURRENT AND BASE CURRENT vs BASE TO EMITTER VOLTAGE

Typical Performance Curves (Continued)

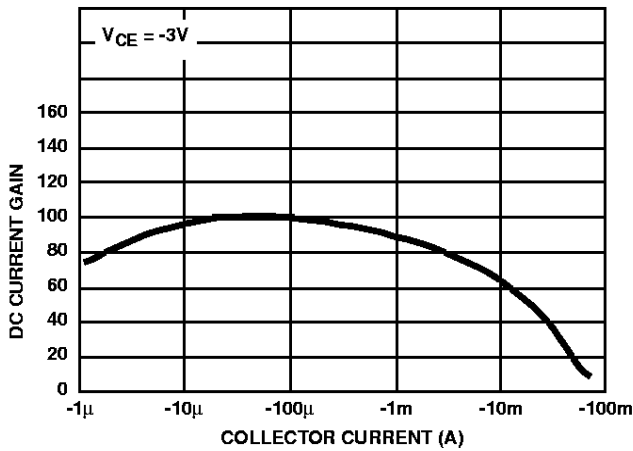


FIGURE 7. PNP DC CURRENT GAIN vs COLLECTOR CURRENT

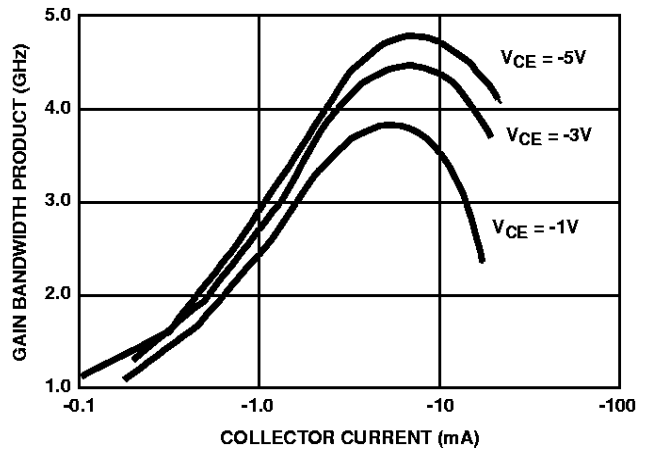


FIGURE 8. PNP GAIN BANDWIDTH PRODUCT vs COLLECTOR CURRENT (UHF 3 x 50 WITH BOND PADS)



# HFA3046, HFA3096, HFA3127, HFA3128

## Die Characteristics

### DIE DIMENSIONS:

53 mils x 52 mils x 19 mils  
1340 $\mu$ m x 1320 $\mu$ m x 483 $\mu$ m

### METALLIZATION:

Type: Metal 1: AlCu(2%)/TiW  
Thickness: Metal 1: 8k $\text{\AA}$   $\pm$ 0.4k $\text{\AA}$

Type: Metal 2: AlCu(2%)  
Thickness: Metal 2: 16k $\text{\AA}$  0.8k $\text{\AA}$

### PASSIVATION:

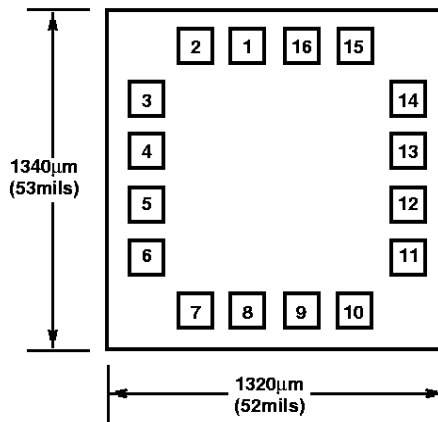
Type: Nitride  
Thickness: 4k $\text{\AA}$   $\pm$ 0.5k $\text{\AA}$

### PROCESS:

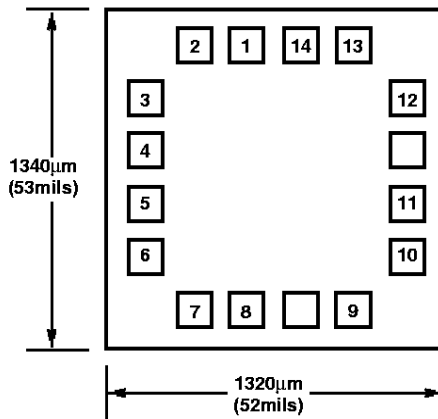
UHF-1

## Metallization Mask Layout

HFA3096, HFA3127, HFA3128



HFA3046



Pad numbers correspond to SOIC pinout.