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DATASHEET

HFA3046, HFA3096, HFA3127, HFA3128

Ultra High Frequency Transistor Arrays

FN3076
Rev.16.00
Jan 24, 2019

The HFA3046, HFA3096, HFA3127 and the HFA3128 are ultra high frequency transistor arrays that are fabricated from the Renesas 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.

Application note AN9315 illustrates the use of these devices as RF amplifiers.

Related Literature

For a full list of related documents, visit our website:

- HFA3046, HFA3096, HFA3127, HFA3128 device pages

Features

- NPN transistor (f_T) 8GHz
- NPN current gain (h_{FE}) 130
- NPN early voltage (V_A). 50V
- PNP transistor (f_T) 5.5GHz
- PNP current gain (h_{FE}) 60
- PNP early voltage (V_A). 20V
- Noise figure (50Ω) at 1.0GHz. 3.5dB
- Collector to collector leakage . . . . . <1pA
- Complete isolation between transistors
- Pin compatible with industry standard 3XXX series arrays
- Pb-free (RoHS compliant)

Applications

- VHF/UHF amplifiers
- VHF/UHF mixers
- IF converters
- Synchronous detectors

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Ordering Information

PART NUMBER (Notes 2, 3)	PART MARKING	TEMP. RANGE (°C)	TAPE AND REEL (UNITS) (Note 1)	PACKAGE (RoHS Compliant)	PKG. DWG. #
HFA3046BZ	HFA3046BZ	-55 to +125	-	14 Ld SOIC	M14.15
HFA3096BZ	HFA3096BZ	-55 to +125	-	16 Ld SOIC	M16.15
HFA3096BZ96	HFA3096BZ	-55 to +125	2.5k	16 Ld SOIC	M16.15
HFA3127BZ	HFA3127BZ	-55 to +125	-	16 Ld SOIC	M16.15
HFA3127BZ96	HFA3127BZ	-55 to +125	2.5k	16 Ld SOIC	M16.15
HFA3127RZ	127Z	-55 to +125	-	16 Ld 3x3 QFN	L16.3x3
HFA3127RZ96	127Z	-55 to +125	6k	16 Ld 3x3 QFN	L16.3x3
HFA3128BZ (No longer available or supported)	HFA3128BZ	-55 to +125	-	16 Ld SOIC	M16.15
HFA3128RZ (No longer available or supported)	128Z	-55 to +125	-	16 Ld 3x3 QFN	L16.3x3

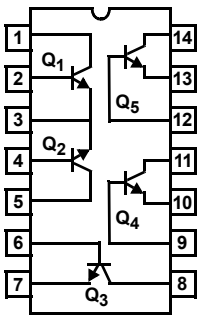
NOTE:

1. See TB347 for details about reel specifications.
2. These Pb-free plastic packaged products employ special Pb-free material sets, molding compounds/die attach materials, and 100% matte tin plate plus anneal (e3 termination finish, which is RoHS compliant and compatible with both SnPb and Pb-free soldering operations). Pb-free products are MSL classified at Pb-free peak reflow temperatures that meet or exceed the Pb-free requirements of IPC/JEDEC J STD-020.
3. For Moisture Sensitivity Level (MSL), see the HFA3046, HFA3096, HFA3127, or HFA3128 device page. For more information about MSL, see TB363.

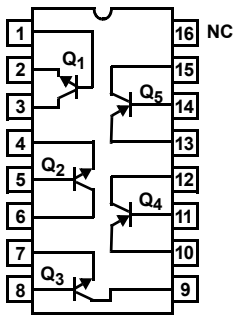
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Pinouts

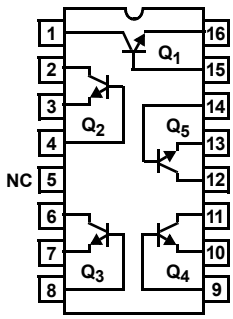
HFA3046
(14 LD SOIC)
TOP VIEW



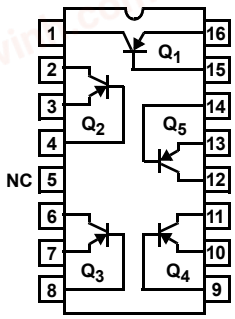
HFA3096
(16 LD SOIC)
TOP VIEW



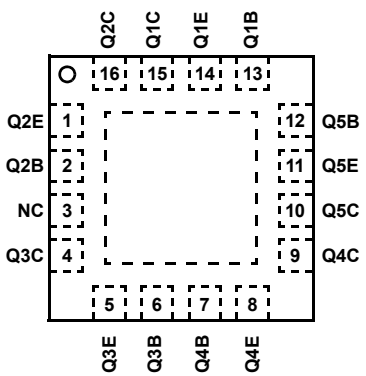
HFA3127
(16 LD SOIC)
TOP VIEW



HFA3128
(16 LD SOIC)
TOP VIEW



HFA3127, HFA3128
(16 LD 3X3 QFN)
TOP VIEW



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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°C
34mA at T_J = +125°C
37mA at T_J = +110°C
Peak Collector Current (Any Condition). 65mA

Operating Information

Temperature Range . . . . . -55°C to +125°C

Thermal Information

Thermal Resistance (Typical)	θ_{JA} (°C/W)	θ_{JC} (°C/W)
14 Ld SOIC Package (Note 4)	120	N/A
16 Ld SOIC Package (Note 4)	115	N/A
QFN Package (Notes 5, 6).	57	10

Maximum Power Dissipation (Any One Transistor) 0.15W
Maximum Junction Temperature (Die) . . . . . +175°C
Maximum Junction Temperature (Plastic Package) . . . . . +150°C
Maximum Storage Temperature Range . . . . . -65°C to +150°C
Pb-Free Reflow Profile. . . . . see TB493

CAUTION: Stresses above those listed in "Absolute Maximum Ratings" can 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.

NOTES:

4. θ_{JA} is measured with the component mounted on an evaluation PC board in free air.
5. For θ_{JC}, the "case temp" location is the center of the exposed metal pad on the package underside.
6. θ_{JA} is measured with the component mounted on a high-effective thermal conductivity test board in free air. See TB379 for details.

Electrical Specifications T_A = +25°C

PARAMETER	TEST CONDITIONS	DIE			SOIC, QFN			UNIT
		MIN	TYP	MAX	MIN	TYP	MAX	
DC NPN CHARACTERISTICS								
Collector to Base Breakdown Voltage, $V_{(BR)CBO}$	I_C = 100µA, I_E = 0	12	18	-	12	18	-	V
Collector to Emitter Breakdown Voltage, $V_{(BR)CEO}$	I_C = 100µA, I_B = 0	8	12	-	8	12	-	V
Collector to Emitter Breakdown Voltage, $V_{(BR)CES}$	I_C = 100µA, Base Shorted to Emitter	10	20	-	10	20	-	V
Emitter to Base Breakdown Voltage, $V_{(BR)EBO}$	I_E = 10µA, I_C = 0	5.5	6	-	5.5	6	-	V
Collector-Cutoff-Current, I_{CEO}	V_{CE} = 6V, I_B = 0	-	2	100	-	2	100	nA
Collector-Cutoff-Current, I_{CBO}	V_{CB} = 8V, I_E = 0	-	0.1	10	-	0.1	10	nA
Collector to Emitter Saturation Voltage, $V_{CE(SAT)}$	I_C = 10mA, I_B = 1mA	-	0.3	0.5	-	0.3	0.5	V
Base to Emitter Voltage, V_{BE}	I_C = 10mA	-	0.85	0.95	-	0.85	0.95	V
DC Forward-Current Transfer Ratio, h_{FE}	I_C = 10mA, V_{CE} = 2V	40	130	-	40	130	-	
Early Voltage, V_A	I_C = 1mA, V_{CE} = 3.5V	20	50	-	20	50	-	V
Base to Emitter Voltage Drift	I_C = 10mA	-	-1.5	-	-	-1.5	-	mV/°C
Collector to Collector Leakage		-	1	-	-	1	-	pA
DYNAMIC NPN CHARACTERISTICS								
Noise Figure	f = 1.0GHz, V_{CE} = 5V, I_C = 5mA, Z_S = 50Ω	-	3.5	-	-	3.5	-	dB
f_T Current Gain-Bandwidth Product	I_C = 1mA, V_{CE} = 5V	-	5.5	-	-	5.5	-	GHz
	I_C = 10mA, V_{CE} = 5V	-	8	-	-	8	-	GHz
Power Gain-Bandwidth Product, f_{MAX}	I_C = 10mA, V_{CE} = 5V	-	6	-	-	2.5	-	GHz
Base to Emitter Capacitance	V_{BE} = -3V	-	200	-	-	500	-	fF
Collector to Base Capacitance	V_{CB} = 3V	-	200	-	-	500	-	fF

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Electrical Specifications T_A = +25°C

PARAMETER	TEST CONDITIONS	DIE			SOIC, QFN			UNITS
		MIN	TYP	MAX	MIN	TYP	MAX	
DC PNP CHARACTERISTICS								
Collector to Base Breakdown Voltage, $V_{(BR)CBO}$	I_C = -100µA, I_E = 0	10	15	-	10	15	-	V
Collector to Emitter Breakdown Voltage, $V_{(BR)CEO}$	I_C = -100µA, I_B = 0	8	15	-	8	15	-	V
Collector to Emitter Breakdown Voltage, $V_{(BR)CES}$	I_C = -100µA, Base Shorted to Emitter	10	15	-	10	15	-	V
Emitter to Base Breakdown Voltage, $V_{(BR)EBO}$	I_E = -10µA, I_C = 0	4.5	5	-	4.5	5	-	V
Collector Cutoff Current, I_{CEO}	V_{CE} = -6V, I_B = 0	-	2	100	-	2	100	nA
Collector Cutoff Current, I_{CBO}	V_{CB} = -8V, I_E = 0	-	0.1	10	-	0.1	10	nA
Collector to Emitter Saturation Voltage, $V_{CE(SAT)}$	I_C = -10mA, I_B = -1mA	-	0.3	0.5	-	0.3	0.5	V
Base to Emitter Voltage, V_{BE}	I_C = -10mA	-	0.85	0.95	-	0.85	0.95	V
DC Forward-Current Transfer Ratio, h_{FE}	I_C = -10mA, V_{CE} = -2V	20	60	-	20	60	-	
Early Voltage, V_A	I_C = -1mA, V_{CE} = -3.5V	10	20	-	10	20	-	V
Base to Emitter Voltage Drift	I_C = -10mA	-	-1.5	-	-	-1.5	-	mV/°C
Collector to Collector Leakage		-	1	-	-	1	-	pA
DYNAMIC PNP CHARACTERISTICS								
Noise Figure	f = 1.0GHz, V_{CE} = -5V, I_C = -5mA, Z_S = 50Ω	-	3.5	-	-	3.5	-	dB
f_T Current Gain-Bandwidth Product	I_C = -1mA, V_{CE} = -5V	-	2	-	-	2	-	GHz
	I_C = -10mA, V_{CE} = -5V	-	5.5	-	-	5.5	-	GHz
Power Gain-Bandwidth Product	I_C = -10mA, V_{CE} = -5V	-	3	-	-	2	-	GHz
Base to Emitter Capacitance	V_{BE} = 3V	-	200	-	-	500	-	fF
Collector to Base Capacitance	V_{CB} = -3V	-	300	-	-	600	-	fF

Common Emitter S-Parameters of NPN 3µm x 50µm Transistor

FREQ. (Hz)	$\|S_{11}\|$	PHASE(S_{11})	$\|S_{21}\|$	PHASE(S_{21})	$\|S_{12}\|$	PHASE(S_{12})	$\|S_{22}\|$	PHASE(S_{22})
V_{CE} = 5V and I_C = 5mA								
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

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Common Emitter S-Parameters of NPN 3µm x 50µm Transistor (Continued)

FREQ. (Hz)	$\|S_{11}\|$	PHASE(S_{11})	$\|S_{21}\|$	PHASE(S_{21})	$\|S_{12}\|$	PHASE(S_{12})	$\|S_{22}\|$	PHASE(S_{22})
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
V_{CE} = 5V and I_C = 10mA								
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
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

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Common Emitter S-Parameters of NPN 3µm x 50µm Transistor (Continued)

FREQ. (Hz)	$\|S_{11}\|$	PHASE(S_{11})	$\|S_{21}\|$	PHASE(S_{21})	$\|S_{12}\|$	PHASE(S_{12})	$\|S_{22}\|$	PHASE(S_{22})
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 3µm x 50µm Transistor

FREQ. (Hz)	$\|S_{11}\|$	PHASE(S_{11})	$\|S_{21}\|$	PHASE(S_{21})	$\|S_{12}\|$	PHASE(S_{12})	$\|S_{22}\|$	PHASE(S_{22})
V_{CE} = -5V and I_C = -5mA								
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
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

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Common Emitter S-Parameters of PNP 3µmx50µm Transistor (Continued)

FREQ. (Hz)	$\|S_{11}\|$	PHASE(S_{11})	$\|S_{21}\|$	PHASE(S_{21})	$\|S_{12}\|$	PHASE(S_{12})	$\|S_{22}\|$	PHASE(S_{22})
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
V_{CE} = -5V, I_C = -10mA								
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

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Typical Performance Curves

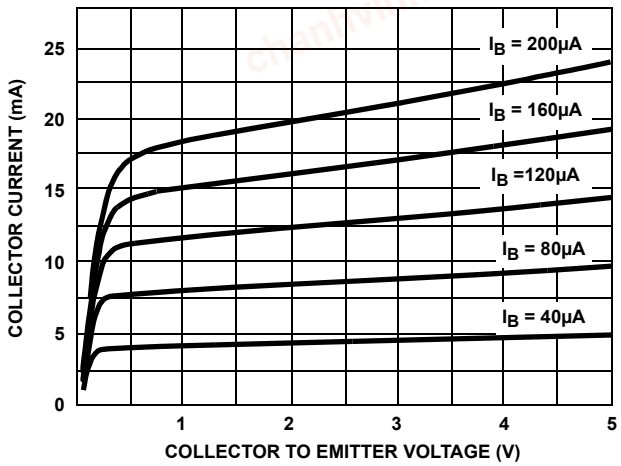


FIGURE 1. NPN COLLECTOR CURRENT vs COLLECTOR TO EMITTER VOLTAGE

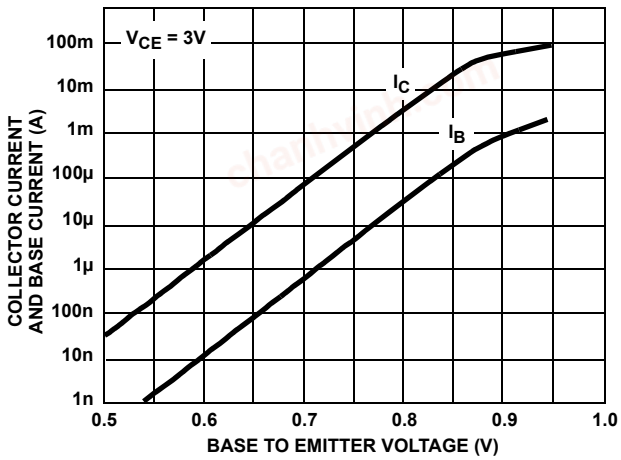


FIGURE 2. NPN COLLECTOR CURRENT AND BASE CURRENT vs BASE TO EMITTER VOLTAGE

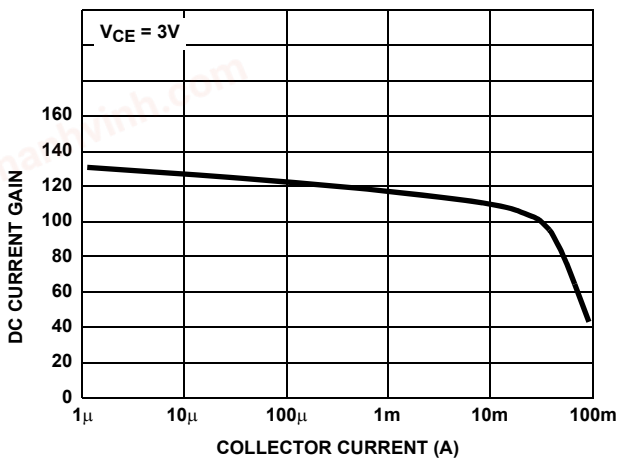


FIGURE 3. NPN DC CURRENT GAIN vs COLLECTOR CURRENT

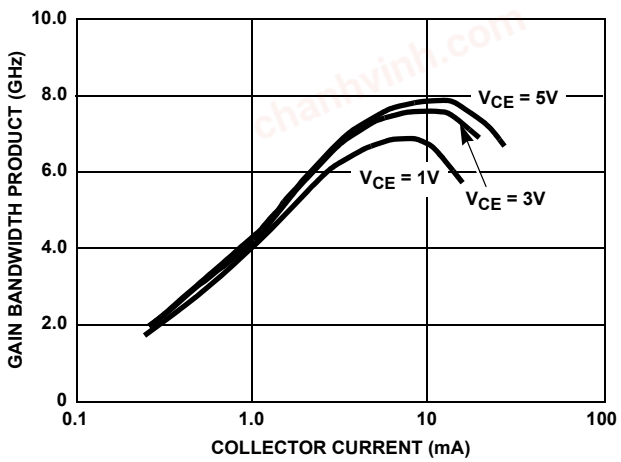


FIGURE 4. NPN GAIN BANDWIDTH PRODUCT vs COLLECTOR CURRENT (UHF 3 x 50 WITH BOND PADS)

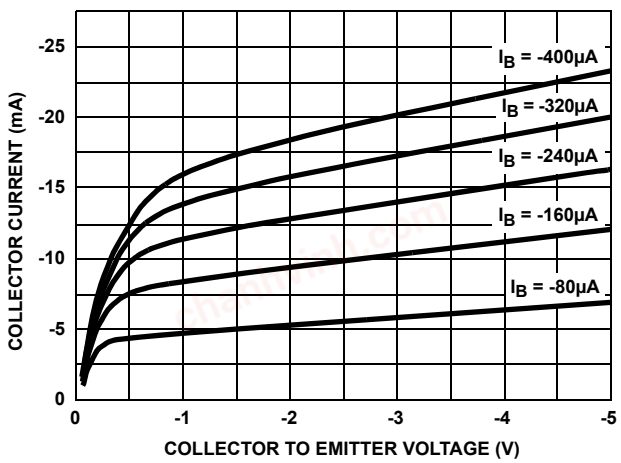


FIGURE 5. PNP COLLECTOR CURRENT vs COLLECTOR TO EMITTER VOLTAGE

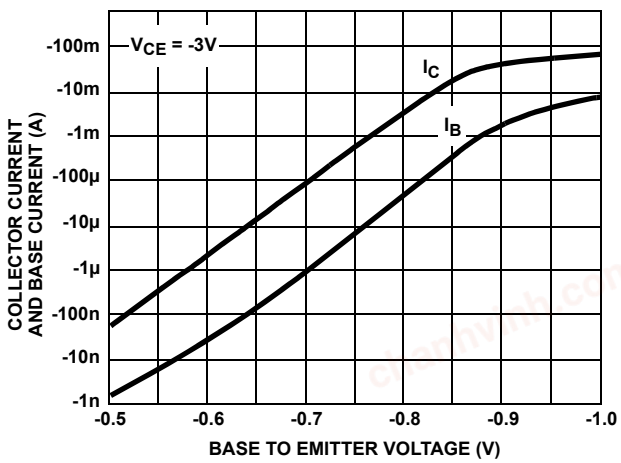


FIGURE 6. PNP COLLECTOR CURRENT AND BASE CURRENT vs BASE TO EMITTER VOLTAGE

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Typical Performance Curves (Continued)

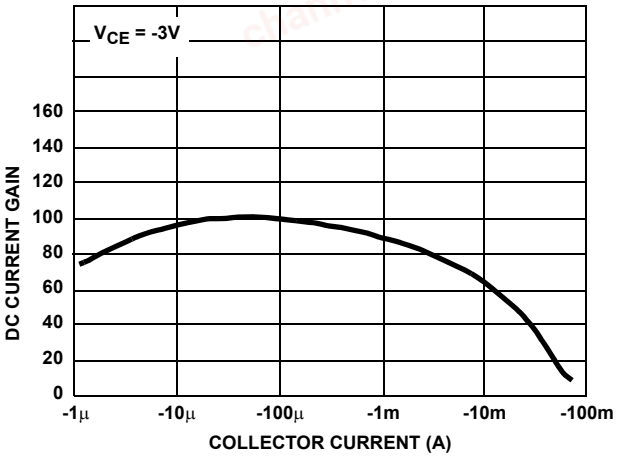


FIGURE 7. PNP DC CURRENT GAIN vs COLLECTOR CURRENT

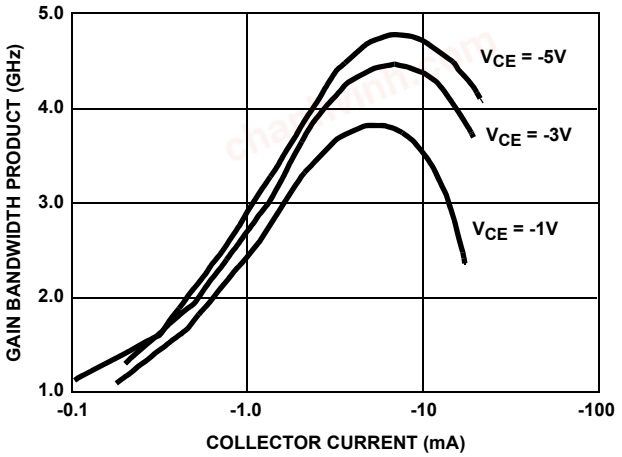


FIGURE 8. PNP GAIN BANDWIDTH PRODUCT vs COLLECTOR CURRENT (UHF 3 x 50 WITH BOND PADS)

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Die Characteristics

DIE DIMENSIONS:

53 mils x 52 mils
1340µm x 1320µm

METALLIZATION:

Type: Metal 1: AlCu(2%)/TiW
Thickness: Metal 1: 8kÅ ±0.4kÅ
Type: Metal 2: AlCu(2%)
Thickness: Metal 2: 16kÅ ±0.8kÅ

PASSIVATION:

Type: Nitride
Thickness: 4kÅ ±0.5kÅ

PROCESS:

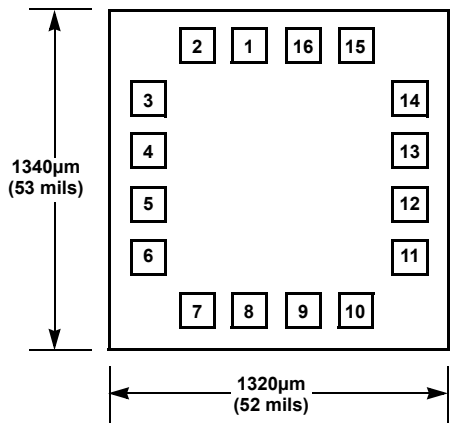
UHF-1

SUBSTRATE POTENTIAL: (POWERED UP)

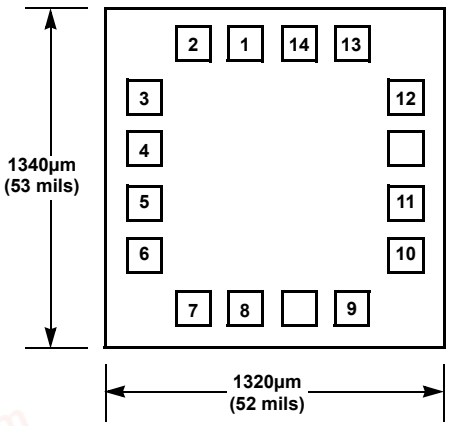
Unbiased

Metallization Mask Layout

HFA3096, HFA3127, HFA3128



HFA3046



Pad numbers correspond to SOIC pinout.

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Revision History

The revision history provided is for informational purposes only and is believed to be accurate, but not warranted. Please go to the web to make sure that you have the latest revision.

DATE	REVISION	CHANGE
Jan 24, 2019	FN3076.16	Added Related Literature section. Updated ordering information table by adding tape and reel versions, and updating notes. Updated links throughout document. Updated POD M16.15 to the latest revision, changes are as follows: -Update graphics to new standard layout, removing the dimension table. Updated disclaimer.
Aug 11, 2015	FN3076.15	Added Revision History beginning with Rev 15. Updated ordering information table with “No longer available or supported” next to HFA3128 part numbers

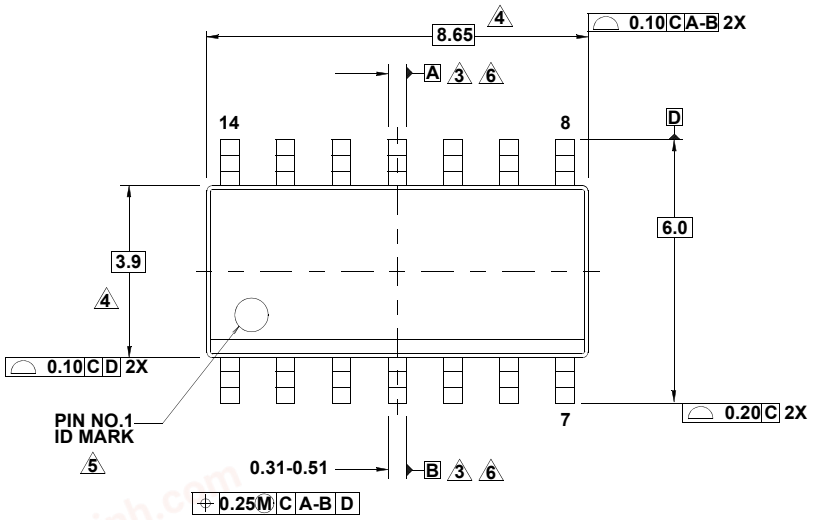
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Package Outline Drawings

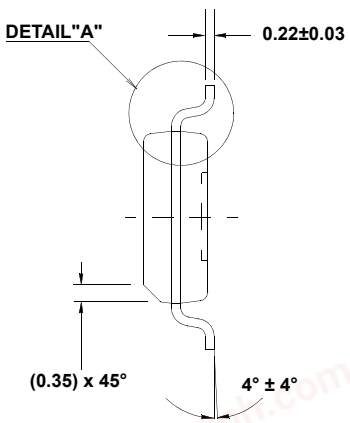
For the most recent package outline drawing, see M14.15.

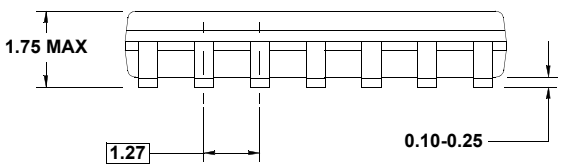
M14.15

14 LEAD NARROW BODY SMALL OUTLINE PLASTIC PACKAGE
Rev 1, 10/09

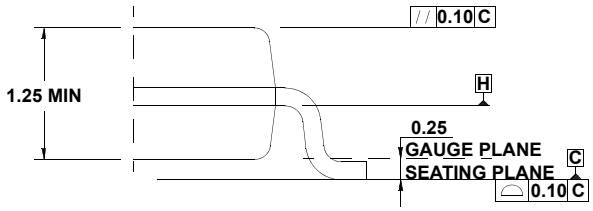


TOP VIEW

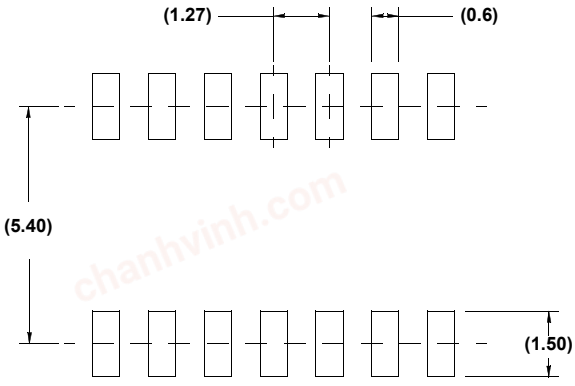




SIDE VIEW



DETAIL "A"



TYPICAL RECOMMENDED LAND PATTERN

NOTES:

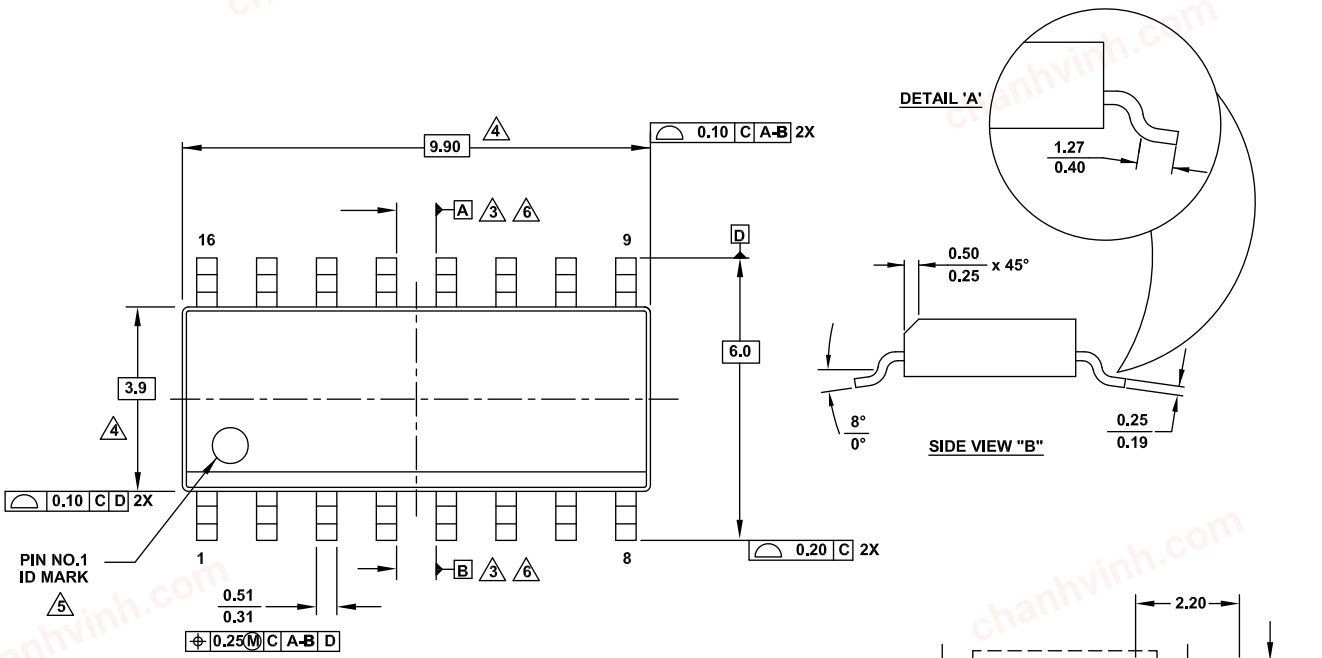
1. Dimensions are in millimeters.
   Dimensions in ( ) for Reference Only.
2. Dimensioning and tolerancing conform to AMSEY14.5m-1994.
3. Datums A and B to be determined at Datum H.
4. Dimension does not include interlead flash or protrusions.
   Interlead flash or protrusions shall not exceed 0.25mm per side.
5. The pin #1 indentifier may be either a mold or mark feature.
6. Does not include dambar protrusion. Allowable dambar protrusion shall be 0.10mm total in excess of lead width at maximum condition.
7. Reference to JEDEC MS-012-AB.

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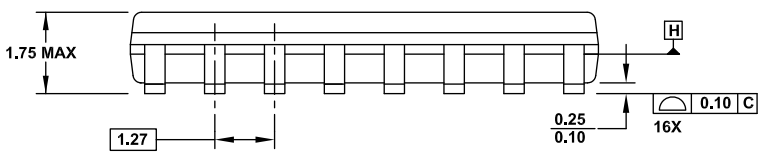
M16.15 (JEDEC MS-012-AC ISSUE C)

For the most recent package outline drawing, see M16.15.

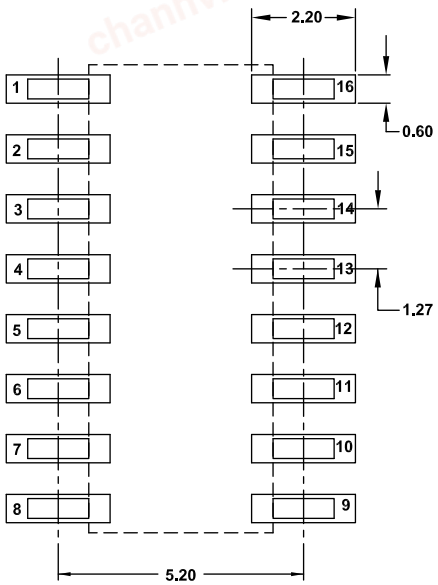
16 LEAD NARROW BODY SMALL OUTLINE PLASTIC PACKAGE
Rev 2, 11/17



TOP VIEW



SIDE VIEW



TYPICAL RECOMMENDED LAND PATTERN

NOTES:

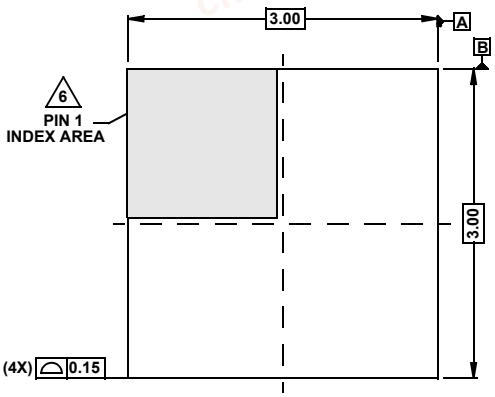
1. Dimensions are in millimeters.
2. Dimensioning and tolerancing conform to AMSE Y14.5m-1994.
3. Datums A and B to be determined at Datum H.
4. Dimension does not include interlead flash or protrusions. Interlead flash or protrusions shall not exceed 0.25mm per side.
5. The pin #1 identifier may be either a mold or mark feature.
6. Does not include dambar protrusion. Allowable dambar protrusion shall be 0.10mm total in excess of lead width at maximum condition.
7. Reference to JEDEC MS-012-AC

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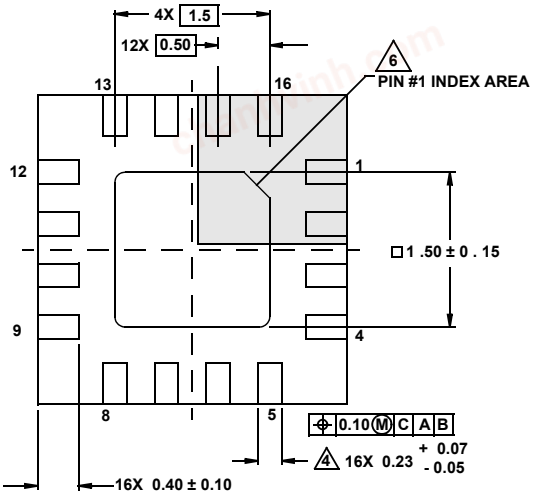
L16.3x3

16 LEAD QUAD FLAT NO-LEAD PLASTIC PACKAGE
Rev 2, 4/07

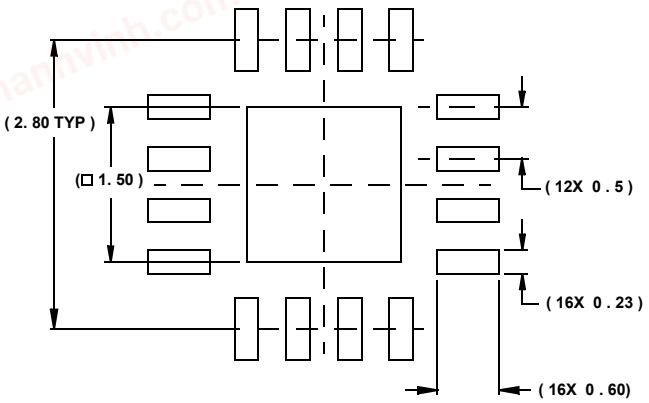
For the most recent package outline drawing, see L16.3x3.



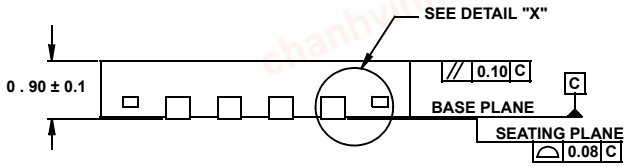
TOP VIEW



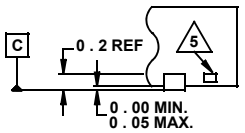
BOTTOM VIEW



TYPICAL RECOMMENDED LAND PATTERN



SIDE VIEW



DETAIL "X"

NOTES:

1. Dimensions are in millimeters.
   Dimensions in ( ) for Reference Only.
2. Dimensioning and tolerancing conform to AMSE Y14.5m-1994.
3. Unless otherwise specified, tolerance : Decimal ± 0.05
4. Dimension b applies to the metallized terminal and is measured between 0.15mm and 0.30mm from the terminal tip.
5. Tiebar shown (if present) is a non-functional feature.
6. The configuration of the pin #1 identifier is optional, but must be located within the zone indicated. The pin #1 indentifier may be either a mold or mark feature.

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(Rev.4.0-1 November 2017)

Corporate Headquarters

TOYOSU FORESIA, 3-2-24 Toyosu,
Koto-ku, Tokyo 135-0061, Japan
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Contact Information

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