E-pHEMT MMIC

AE314 (Preliminary)

RFHIC

Product Features

- Low Noise Figure
- Higher Gain
- Higher linearity
- SOT89 SMD Type package
- Higher productivity
- Lower manufacturing cost
- -64dBc CSO 135 Channels @ +20dBmV/ch
- -74dBc CTB 135 Channels @ +20dBmV/ch
- -82dBc XMD 135 Channels @ +20dBmV/ch
- Pb-free/RoHS compliant

Application

- Low Noise Amplifier for CATV, Satellite
- Cable Modem
- FTTH (G-PON, GE-PON)
- Optical node



Package : SOT-89

Description

AE314 is designed as low cost drive amplifiers for many applications including FTTH, CATV System.
This MMIC is based on Gallium Arsenide Enhancement Mode pHEMT which shows low current draw and very low noise.
The data in this spec sheet is valid only for 75 ohm application.

◎ Specifications (50MHz~2200MHz)

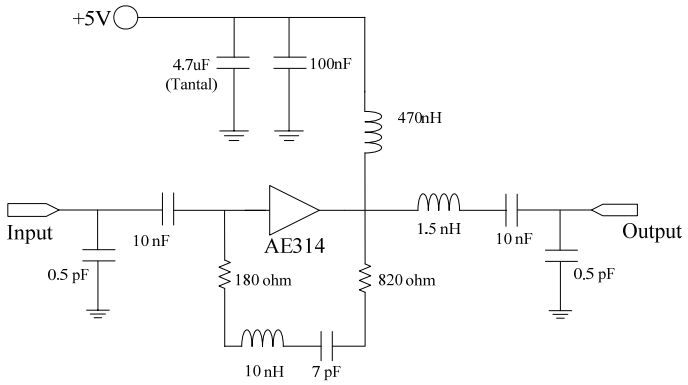
PARAMETER		UNIT	MIN	TYP	MAX	Condition
Frequency		MHz	50 ~ 2200			
Gain		dB		21.3 19.2		At 500MHz At 2000MHz
Gain Flatness				2.5		
Input Return Loss		dB		-8	-4.3	
Output Return Loss		dB		-8	-3.5	
Output IP3		dBm	33	36		At 1000MHz/+10dBm 2tone
1dB Compression Point		dBm	19	22		At 1000MHz
Noise Figure		dB		2	3	
CSO	30 ~ 870MHz	dBc		-64		135 channel, +20dBmV/ch
CTB		dBc		-74		135 channel, +20dBmV/ch
XMOD		dBc		-82		135 channel, +20dBmV/ch
DC Current		mA		100		Vdd = 5.0V

NOTE
1. Test conditions unless otherwise noted. Ta=25℃, Vdd=+5V, 75Ω system
2. OIP3 measured with 2 tones at an output power of +10dBm/tone separated by 1MHz, Test Freq = 1000MHz

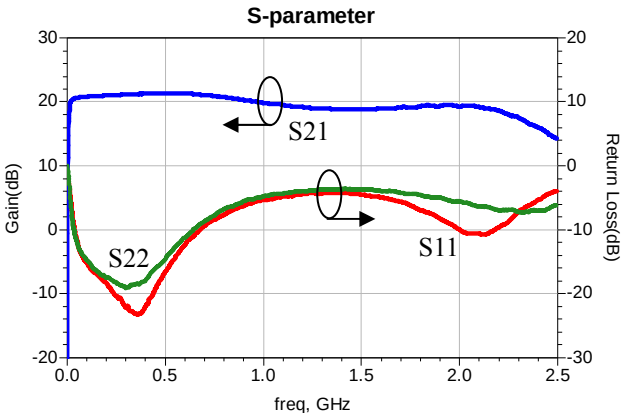
Absolute Minimum and Maximum Ratings

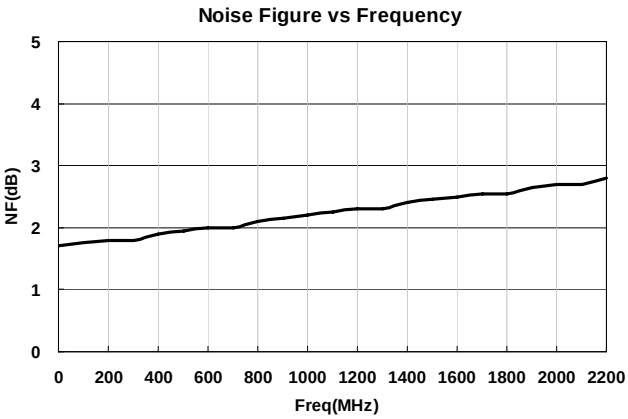
PARAMETER	UNIT	MIN	TYP	MAX
Device Voltage	VDC		+5	+5.5
Operating Temperature	℃	-40		+85
Storage Temperature	℃	-40		+150

Application Circuit: 50MHz ~ 2200MHz, 75ohm System



Typical RF Performance: VDD=5V, IDS=100mA, Ta=25℃, 75ohm System





Multi-Tone Test 135CH_FLAT@Output Power +20dBmV/Ch

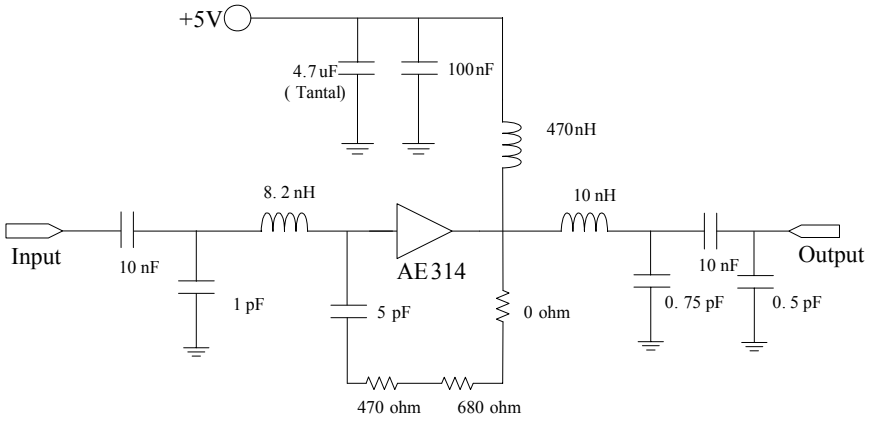
Level: +20dBmV	Tilt: 135CH_FLAT									
FRQ	XMD(NCTA)	CTB_RAW	CTB_COR	N-FLR	CSU_RAW	CSU_COR	CSU_FRQ	CSL_RAW	CSL_COR	CSL_FRQ
55.25	89.3	77.6	81.9	77.8	77.2	81.5	55.99	64	64.2	53.99
77.25	91.8	77.8	82.1	78.2	64.9	65.1	78	77.6	82	76.61
109.25	89.3	77.3	81.7	77.8	77.2	81.5	110.44	64.6	64.8	107.99
211.25	88.7	76.7	81.1	77.3	74.9	79.3	212.5	65.3	65.6	209.99
331.25	86.8	76.2	80.5	76.9	72.9	75.5	332.5	65.5	65.9	329.99
445.25	85.9	76.8	81.2	77.1	71.9	73.4	446.49	66.5	66.8	443.99
547.25	86.1	75.9	80.2	76.1	69.9	71	548.5	66.7	67.3	545.99
637.25	84.3	76	80.3	76.4	69.8	70.9	638.49	69.8	70.9	635.99
745.25	83.2	75.9	80.2	76.2	67.7	68.4	746.49	73.1	76.1	743.99
859.25	82.1	74.8	79.1	75.3	67	67.7	860.49	74.2	78.6	858.49
Min	82.1	74.8	79.1	75.3	64.9	65.1	55.99	64	64.2	53.99
Max	91.8	77.8	82.1	78.2	77.2	81.5	860.49	77.6	82	858.49

◎ Specifications (50MHz~1000MHz)

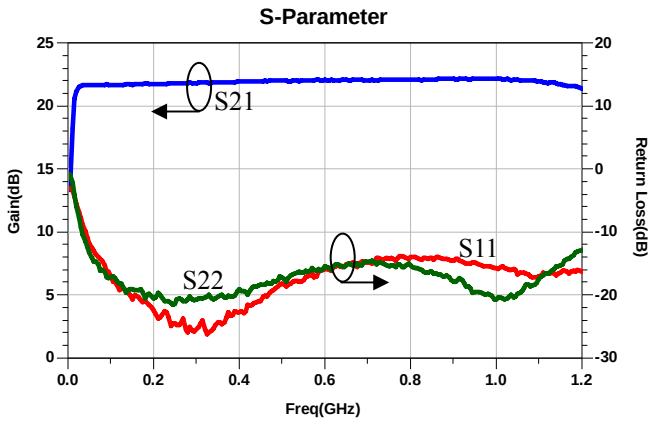
PARAMETER		UNIT	MIN	TYP	MAX	Condition
Frequency		MHz	50 ~ 1000			
Gain		dB	20	22		
Input Return Loss		dB		-17		
Output Return Loss		dB		-16		
Output IP3		dBm	35	38		At 500MHz/+5dBm 2tone
1dB Compression Point		dBm	18	21		At 500MHz
Noise Figure		dB		2	3	
CSO	30 ~ 870MHz	dBc		-53	-49	135 channel, +30dBmV/ch
CTB		dBc		-63	-58	135 channel, +30dBmV/ch
XMOD		dBc		-63	-58	135 channel, +30dBmV/ch
DC Current		mA		100		Vdd = 5.0V

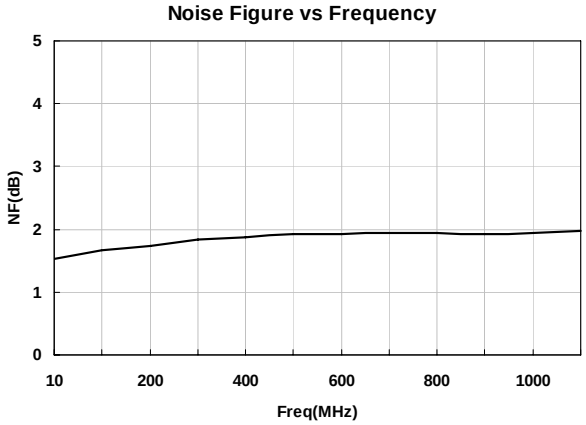
NOTE
1. Test conditions unless otherwise noted. Test Freq = 500MHz, Ta=25℃, Vdd=+5V, 75Ω system
2. OIP3 measured with 2 tones at an output power of +5dBm/tone separated by 1MHz, Test Freq = 500MHz

Application Circuit: 50MHz ~ 1000MHz, 75ohm System



Typical RF Performance: VDD=5V, IDS=100mA, Ta=25℃, 75ohm System





Multi-Tone Test 135CH_FLAT@Output Power +30dBmV/Ch

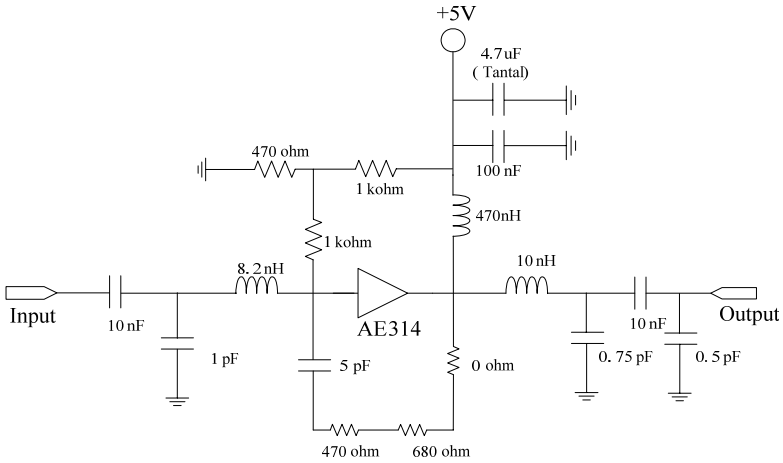
Level: +30dBmV	Tilt: 135CH_FLAT									
FRQ	XMD(NCTA)	CTB_RAW	CTB_COR	N-FLR	CSU_RAW	CSU_COR	CSU_FRQ	CSL_RAW	CSL_COR	CSL_FRQ
55.25	68.6	73.5	76.1	76.9	75.9	80.3	55.99	54.8	54.8	53.99
77.25	68.9	74.1	77.1	77	54.8	54.8	77.99	76.6	80.9	76.18
109.25	68.7	72.5	74.4	77.2	74.1	77.1	109.99	54.7	54.7	107.99
211.25	67.5	72	73.6	77	70.9	72	212.5	53.9	53.9	209.99
331.25	66.7	70.7	72.1	76	66.3	66.8	332.5	55	55	329.99
445.25	65.8	69.8	70.8	76.7	65.1	65.4	446.49	56.1	56.1	443.98
547.25	66.3	69.6	71.2	74.6	62.8	63.1	548.5	57.7	57.7	545.98
637.25	65.4	68.6	69.6	75.3	62.1	62.3	638.49	60.6	60.8	635.98
745.25	64.8	68.2	69.3	74.8	60.6	60.8	746.49	65.1	65.6	743.99
859.25	64	67.1	68.6	72.7	58.3	58.4	860.49	70.2	73.8	858.49
Min	64	67.1	68.6	72.7	54.8	54.8	55.99	53.9	53.9	53.99
Max	68.9	74.1	77.1	77.2	75.9	80.3	860.49	76.6	80.9	858.49

◎ Specifications (50MHz~1000MHz, Bias Control)

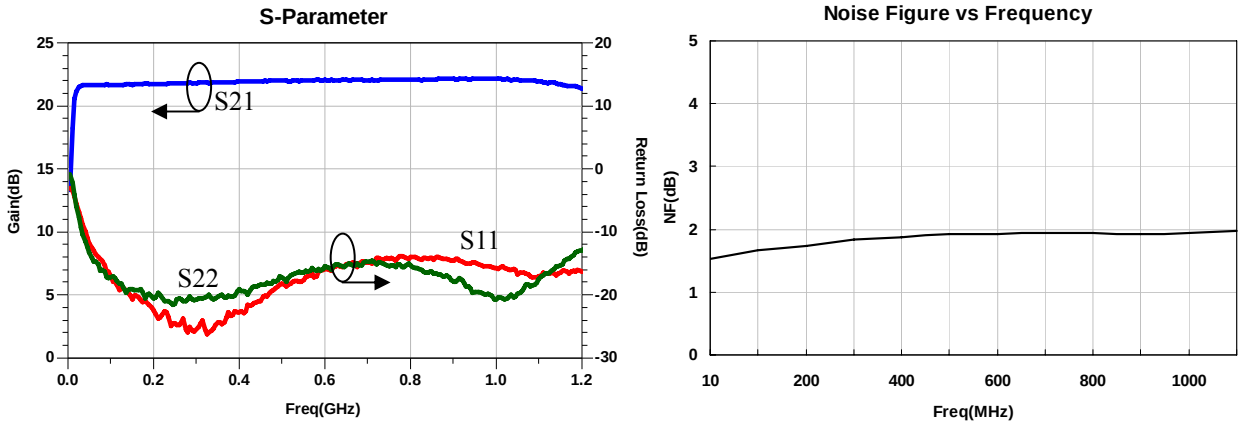
PARAMETER		UNIT	MIN	TYP	MAX	Condition
Frequency		MHz	50 ~ 1000			
Gain		dB	20	22		
Input Return Loss		dB		-17		
Output Return Loss		dB		-16		
Output IP3		dBm	35	38		At 500MHz/+5dBm 2tone
1dB Compression Point		dBm	18	21		At 500MHz
Noise Figure		dB		2.5	3.5	
CSO	30 ~ 870MHz	dBc		-60	-55	135 channel, +30dBmV/ch
CTB		dBc		-67	-62	135 channel, +30dBmV/ch
XMOD		dBc		-64	-59	135 channel, +30dBmV/ch
DC Current		mA		130		Vdd = 5.0V

NOTE
1. Test conditions unless otherwise noted. Test Freq = 500MHz, Ta=25℃, Vdd=+5V, 75Ω system
2. OIP3 measured with 2 tones at an output power of +5dBm/tone separated by 1MHz, Test Freq = 500MHz

Application Circuit: 50MHz ~ 1000MHz, 75ohm System, Bias Control



Typical RF Performance: V_{DD}=5V, I_{DS}=130mA, Ta=25℃, 75ohm System



Multi-Tone Test 135CH_FLAT@Output Power +30dBmV/Ch

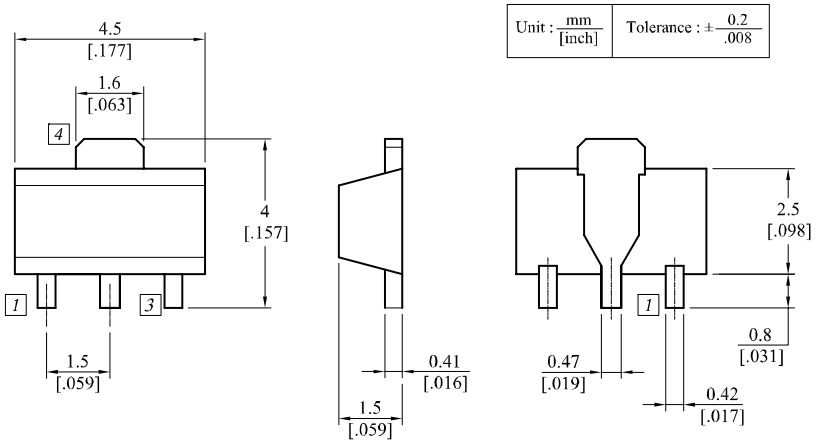
Level: +30dBmV	Tilt: 135CH_FLAT									
FRQ	XMD(NCTA)	CTB_RAW	CTB_COR	N-FLR	CSU_RAW	CSU_COR	CSU_FRQ	CSL_RAW	CSL_COR	CSL_FRQ
55.25	71.5	74.6	79	75.8	75.7	80	55.98	62.3	62.5	53.99
77.25	75	75.2	79.5	75.9	62.6	62.8	77.99	75.6	80	76.03
109.25	73.6	75.1	79.4	76.4	75.8	80.2	109.99	62.1	62.2	107.99
211.25	73.9	75.1	79.4	76.4	72.1	74	212.5	61.8	62	209.99
331.25	73.2	73.7	78.1	75	68.6	69.7	332.49	61.9	62.1	329.99
445.25	72.4	74.2	78.5	75.9	67.1	67.7	446.49	62.6	62.8	443.99
547.25	72.8	72.9	77.2	73.6	63.9	64.4	548.49	63.6	64	545.99
637.25	72.2	72.9	77.2	74.2	63.7	64.2	638.49	66.3	67	635.99
745.25	71.4	72.1	76.5	73.8	62.4	62.7	746.49	69.8	72	743.99
859.25	70.9	70.7	75.1	71.7	60.8	61.1	860.5	70.7	75	858.49
Min	70.9	70.7	75.1	71.7	60.8	61.1	55.98	61.8	62	53.99
Max	75	75.2	79.5	76.4	75.8	80.2	860.5	75.6	80	858.49

ESD Protection

For a safe use in all situations, it is recommended to have proper ESD control techniques while the device is being handled. Here are some recommended precautions;

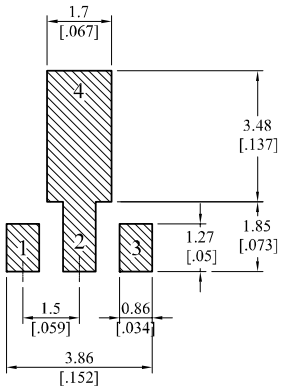
- Person at a workbench should be earthed via a wrist strap and a resistor.
- All mains-powered equipment should be connected to the mains via an earth-leakage switch.
- Equipment cases should be grounded.
- Relative humidity should be maintained between 40% and 50%.
- An ionizer is recommended.
- Keep static materials, such as plastic envelopes and plastic trays etc. away from the workbench

Dimensions

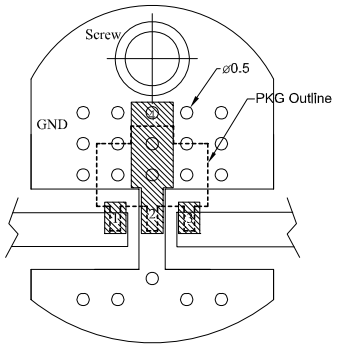


Pin No	Function
1	Input
2	Ground
3	Output/Bias
4	Ground

PCB Pad Layout



Recommended Mounting Configuration



Mounting Configuration Notes

1.Ground / thermal via holes are critical for the proper performance of this device.
2. Add as much copper as possible to inner and outer layers near the part to ensure optimal thermal performance.
3. Mounting screws can be added near the part to fasten the board to a heatsink. Ensure that the ground / thermal via hole region contacts the heatsink.
4. Do not put solder mask on the backside of the PCB in the region where the board contacts the heatsink.
5. RF trace width depends upon the PCB material and construction.
6. Use 1 oz. Copper minimum.
7. All dimensions are in millimeters.

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