ASA303A Data Sheet

50 ~ 1200 MHz Gain Adjustable Trans-impedance Amplifier MMIC

1. Product Overview

1.1 General Description

ASA303A, a trans-impedance amplifier (TIA) with voltage controlled attenuator, has a high linearity and low noise over a wide range of frequency up to 1.2 GHz, being suitable for use in the FTTH, optical receiver, distribution amplifiers, and drop-in amplifiers of CATV systems. The amplifier is available in a QFN24 plastic encapsulated package and passes through the stringent DC, RF, and reliability tests.

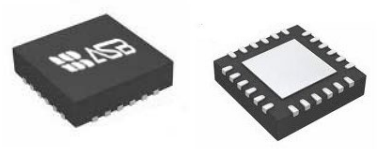
1.2 Features

- Operating Frequency at 50 ~ 1200 MHz
- Optical Input from -8 dBm to +2 dBm
- Trans-impedance Gain Adjustable from 35 dB to 5 dB @ V_{ctrl} = 0.0 ~ 3.3 V
- Gain Flatness: ±1.55 dB over V_{ctrl} = 0.0 ~ 3.3 V @ 50 ~ 860 MHz,
  ±1.65 dB over V_{ctrl} = 0.0 ~ 3.3 V @ 50 ~ 1000 MHz,
  ±1.65 dB over V_{ctrl} = 0.0 ~ 3.3 V @ 50 ~ 1200 MHz
- Output Power: 84 dBμV @ CENELEC-42, 82 dBμV @ PAL-98
- Single +5 V, 245 mA

1.3 Applications

- FTTH
- Optical Receiver
- Distribution Amplifier
- Drop-in Amplifier

1.4 Package Profile & RoHS Compliance

 QFN24, 4x4 mm^2, surface mount	 RoHS-compliant

2. Summary on Product Performances

2.1 Typical Performance

Supply voltage = +5 V, T_A = +25 °C, Z_O = 75 Ω.

Parameters	Test Conditions	Min	Typ	Max	Units
Gain Max	50 ~ 1200 MHz, V_{ctrl} = 0 V	33		36	dB
Gain Adjustable Range	Over V_{ctrl} = 0.0 ~ 3.3 V		30		dB
Gain Flatness	Over V_{ctrl} = 0.0 ~ 3.3 V @ 50 ~ 860 MHz Over V_{ctrl} = 0.0 ~ 3.3 V @ 50 ~ 1000 MHz Over V_{ctrl} = 0.0 ~ 3.3 V @ 50 ~ 1200 MHz		± 1.55 ± 1.65 ± 1.65		dB dB dB
Output Return Loss	50 ~ 1200 MHz, over V_{ctrl} = 0.0 ~ 3.3 V			-10	dB
EIN	50 ~ 1200 MHz, V_{ctrl} = 0.0 V			7.8	pA/rtHz
CN	Optical Input = +2 dBm		52[1], 53[2]		dBc
CSO	Optical Input = -8 dBm		67[1], 65[2]		dBc
	Optical Input = +2 dBm		66[1], 72[2]		dBc
CTB	Optical Input = -8 dBm		67[1], 67[2]		dBc
	Optical Input = +2 dBm		66[1], 66[2]		dBc
Current Consumption	V_{device} = +5 V	220	245	270	mA

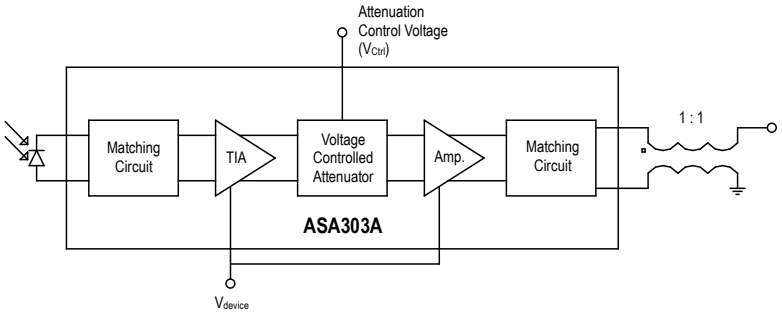
1) For Pout = 82 dBμV, 527.25 MHz of PAL 98 channels.
2) For Pout = 84 dBμV, 743.25 MHz of CENELEC 42 channels.

2.2 Product Specification

Supply voltage = +5 V, T_A = +25 °C, Z_O = 75 Ω.

Parameter	Min	Typ	Max	Unit
Frequency		500		MHz
Gain Max.	33		36	dB
Output Return Loss			-10	dB
Current Consumption	220	245	270	mA

2.3 Application Block Diagram



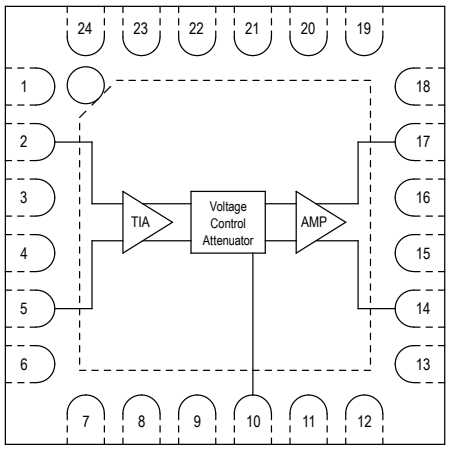
2.4 Absolute Maximum Ratings

Parameters	Max. Ratings
Operation Case Temperature	-40 to +85 °C
Storage Temperature	-40 to +150 °C
Device Voltage	+6 V
Operation Junction Temperature	+160 °C
Input RF Power (CW)	+20 dBm
Maximum Current	300 mA

2.5 Thermal Resistance

Symbol	Description	Typ	Unit
R_{th}	Thermal resistance from junction to lead	22	°C/W

2.6 Pin Descriptions

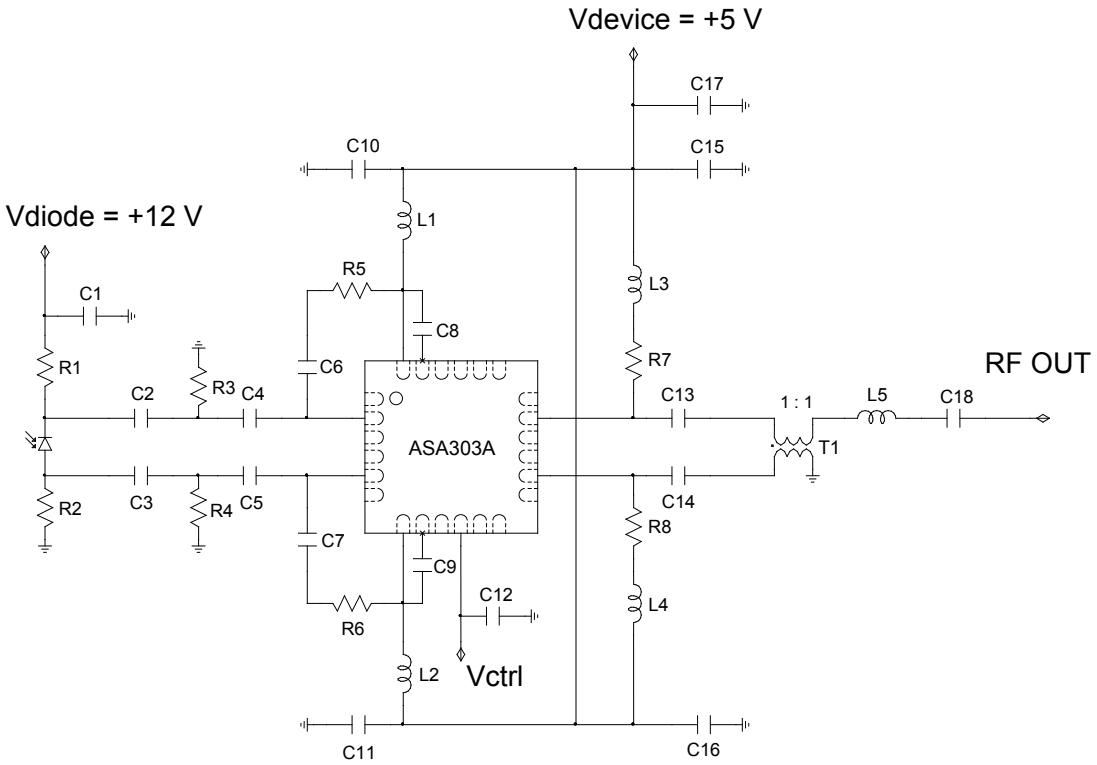


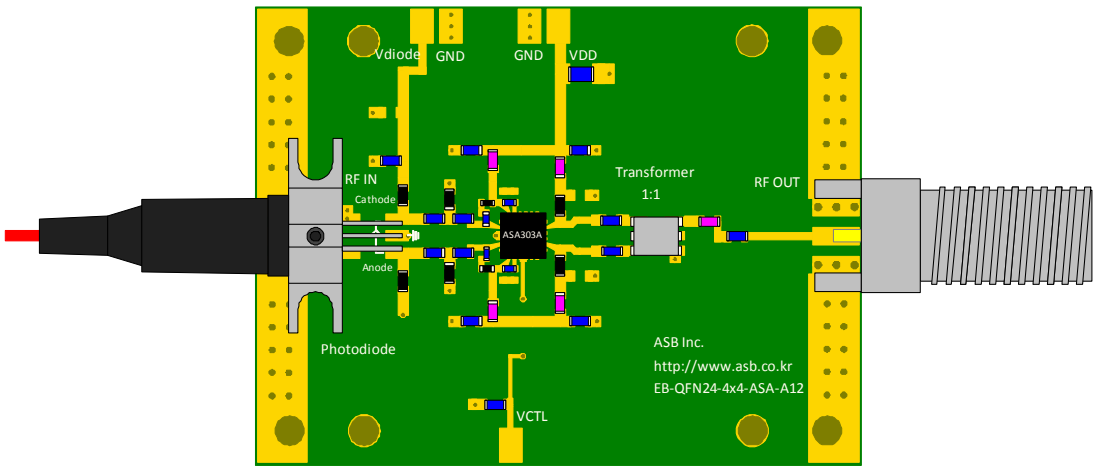
(NOTE)
The left schematic is the top view of QFN24 plastic package with a circled pin 1 mark and a dotted lead & metal exposed paddle on its bottom.

Pin	Pin Name	Description	Pin	Pin Name	Description
1	NC	No connection	14	OUT B	Output B
2	TIA IN A	TIA input A	15	NC	No connection
3	NC	No connection	16	NC	No connection
4	NC	No connection	17	OUT A	Output A
5	TIA IN B	TIA input B	18	NC	No connection
6	NC	No connection	19	NC	No connection
7	TIA Bias B	TIA VDD B	20	NC	No connection
8	NC	No connection	21	NC	No connection
9	NC	No connection	22	NC	No connection
10	V_{ctrl}	Gain control voltage	23	NC	No connection
11	NC	No connection	24	TIA Bias A	TIA VDD A
12	NC	No connection	25	Paddle	RF & DC Ground
13	NC	No connection			

3. Application: 50 ~ 1200 MHz

3.1 Application Circuit & Evaluation Board





Bill of Material

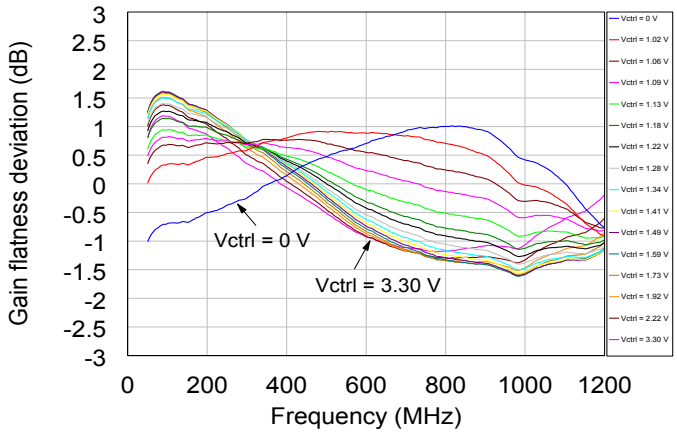
Symbol	Size	Value	Manufacturer
ASA303A	-	-	ASB
C1, C10, C11, C12, C15, C16	1608	1.0 μF	MURATA
C2, C3, C4, C5, C13, C14, C18	1608	0.1 μF	MURATA
C6, C7, C8, C9	1005	0.1 μF	MURATA
C17	2012	10 μF	MURATA
R1, R2	1608	1.5 kΩ	Samsung
R3, R4	1608	250 Ω	Samsung
R5, R6	1005	510 Ω	Samsung
R7, R8	1608	10 Ω	Samsung
L1, L2, L3, L4	1608	1.0 μH	MURATA
L5	1608	5.6 nH	MURATA
T1[1)]	SM-164	1:1	MACOM

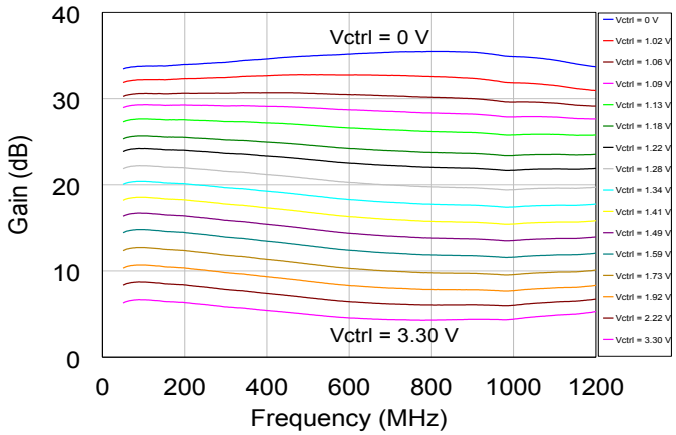
1) MABACT0040

(Intentionally Blanked)

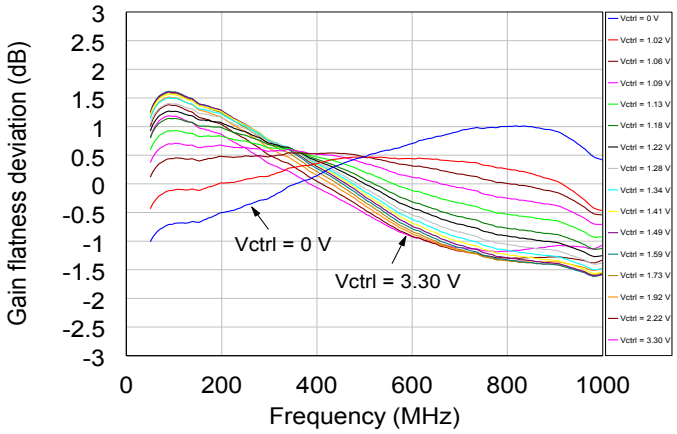
3.2 Plots of Performances

Gain Flatness Deviation (50 ~ 1200 MHz)

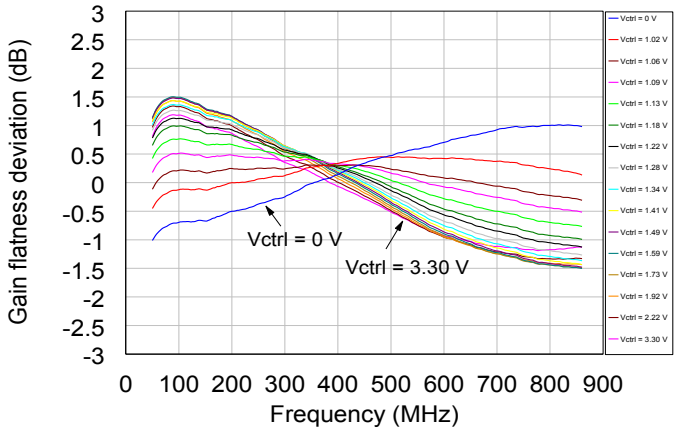


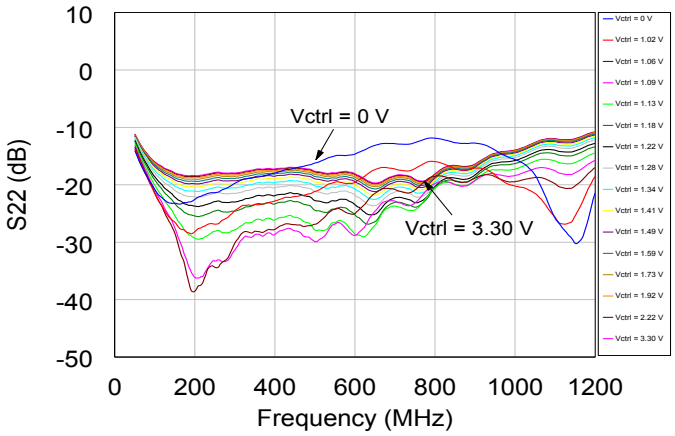


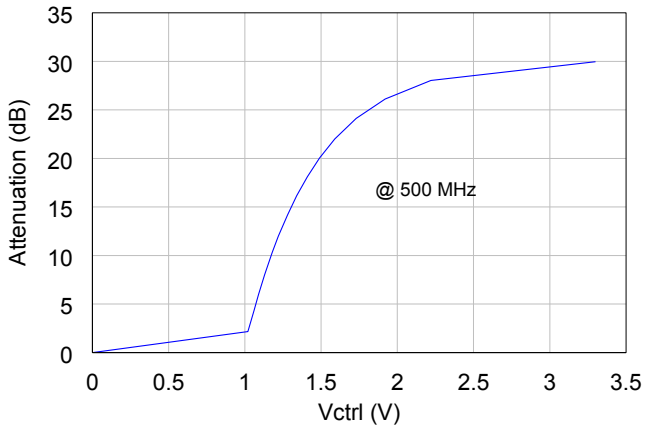
Gain Flatness Deviation (50 ~ 1000 MHz)

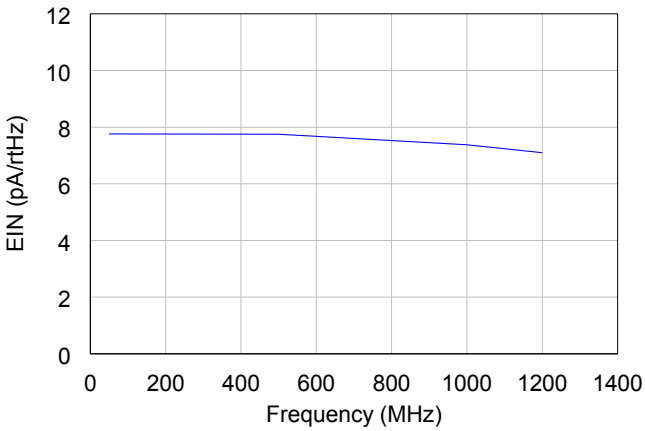


Gain Flatness Deviation (50 ~ 860 MHz)

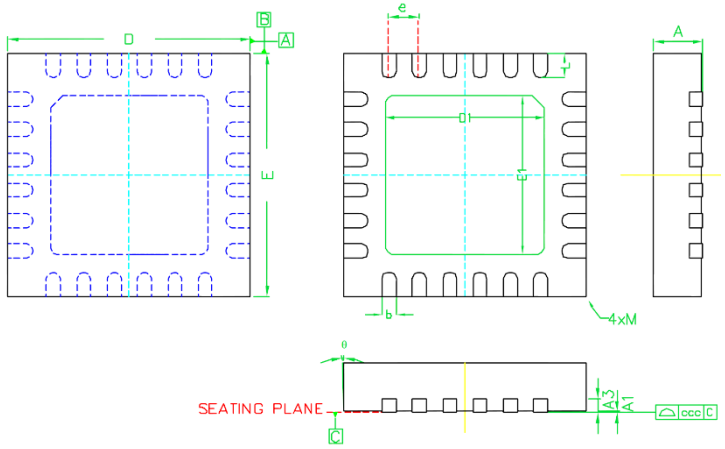





35
30
25
20
15
10
5
0
Attenuation (dB)
@ 500 MHz
0
0.5
1
1.5
2
2.5
3
3.5
Vctrl (V)

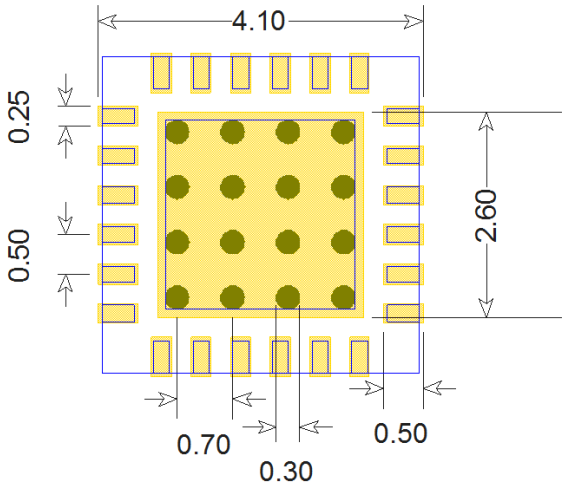

12
10
8
6
4
2
0
EIN (pA/rtHz)
0
200
400
600
800
1000
1200
1400
Frequency (MHz)

4. Package Outline (QFN24, 4.0x4.0x1.5 mm^3)



Symbols	Dimensions (In mm)		
	MIN	NOM	MAX
A	0.80	0.85	0.90
A1	0	0.010	0.030
A3	---	0.20REF	---
b	0.18	0.23	0.28
D	3.95	4.00	4.03
D1	---	2.60BSC	---
E	3.95	4.00	4.03
E1	---	2.60BSC	---
e	---	0.50BSC	---
L	0.35	0.40	0.45
θ	-12	---	0
ccc	---	0.08	---
M	---	---	0.05
Burr	0	0.030	0.060

5. Surface Mount Recommendation (In mm)



NOTE

1. The number and size of ground via holes in a circuit board is critical for thermal and RF grounding considerations.
2. Recommended is that the ground via holes be placed on the bottom of the exposed pad of the device for better RF and thermal performance, as shown in the drawing at the left side.

6. ESD Classification & Moisture Sensitivity Level

ESD Classification

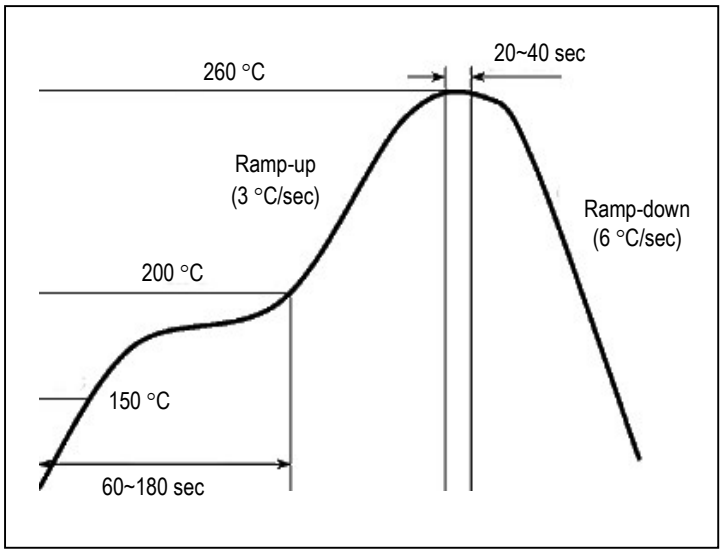
HBM	Class 1B	Voltage Level: 750 V

CAUTION: Gallium Arsenide Integrated Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

Moisture Sensitivity Level

MSL 3 at 260 °C reflow

7. Recommended Soldering Reflow Profile



(End of Datasheet)