ASL59D4 Data Sheet

1.2 GHz CATV Push-pull Amplifier MMIC

1. Product Overview

1.1 Features

- 50 ~ 1200 MHz Bandwidth
- 20 dB Flat Gain over 50 ~ 1200 MHz
- High Output Power: 108 dBμV
- 1.5 dB NF at 500 MHz
- Single Supply: +6.5 V

1.2 Applications

- Low Noise Amplifier for CATV
- Other Low Distortion and Low Noise Applications

1.3 Package Profile & RoHS Compliance

	
TSSOP24, 7.8x6.4 mm^2, surface mount	RoHS-compliant

2. Summary on Product Performances

2.1 Typical Performance

Supply voltage = +6.5 V, T_A = +25 °C, Z_O = 75 Ω.

Parameter	Typical					
Frequency	50	500	860	1002	1200	MHz
Noise Figure	1.4	1.5	1.6	1.7	1.9	dB
Gain	20.0	20.0	20.0	20.4	21.0	dB
S11	-18	-18	-18	-18	-15	dB
S22	-18	-18	-18	-18	-15	dB
OIP3[1)]	44.0	45.0	41.5	41.0	41.0	dBm
OIP2[2)]	68					dBm
P1dB	28	28	28	28	28	dBm
CSO[3)](@ 84 Ch, PAL)	60					dBc
CSO[3)](@ 60 Ch, PAL)	64					dBc
CTB[3)](@ 84 Ch, PAL)	63					dBc
CTB[3)](@ 60 Ch, PAL)	69					dBc
Current	420					mA
Device Voltage	+6.5					V

1) OIP3 is measured with two tones at an output power of +12 dBm/tone separated by 6 MHz.
2) OIP2 is measured with two tones at an output power of +14 dBm/tone at F1(400 MHz)+F2(450 MHz).
3) CSO & CTB measured at Pout = 108 dBμV.

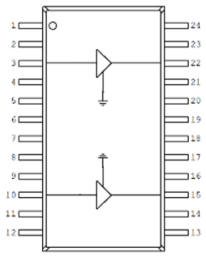
2.2 Product Specification

Supply voltage = +6.5 V, T_A = +25 °C, Z_O = 75 Ω.

Parameter	Min	Typ	Max	Unit
Frequency		500		MHz
Noise Figure		1.5		dB
Gain		20.0		dB
S11		-18		dB
S22		-18		dB
OIP3[1)]		45.0		dBm
OIP2[2)]		68		dBm
P1dB		28		dBm
Current		420		mA
Device Voltage		+6.5		V

1) OIP3 is measured with two tones at an output power of +12 dBm/tone separated by 6 MHz.
2) OIP2 is measured with two tones at an output power of +14 dBm/tone at F1(400 MHz)+F2(450 MHz).

2.3 Pin Configuration

Pin	Description	Simplified Outline
3	RF_IN 1	
10	RF_IN 2	
15	RF_OUT 2	
22	RF_OUT 1	
Others	NC or GND	

Note: Backside metal paddle is RF and DC ground.

2.4 Absolute Maximum Ratings

Parameters	Max. Ratings
Operation Case Temperature	-40 to +85 °C
Storage Temperature	-40 to +150 °C
Device Voltage	+9 V
Maximum Current	500 mA
Operation Junction Temperature	+150 °C
Input RF Power (CW, 75 Ω matched)	+25 dBm

2.5 Thermal Resistance

Symbol	Description	Typ	Unit
R_{th}	Thermal resistance from junction to lead	9	°C/W

2.6 ESD Classification & Moisture Sensitivity Level

ESD Classification

HBM	Class 1B	Voltage Level: 750 V
MM	Class A	Voltage Level: 175 V

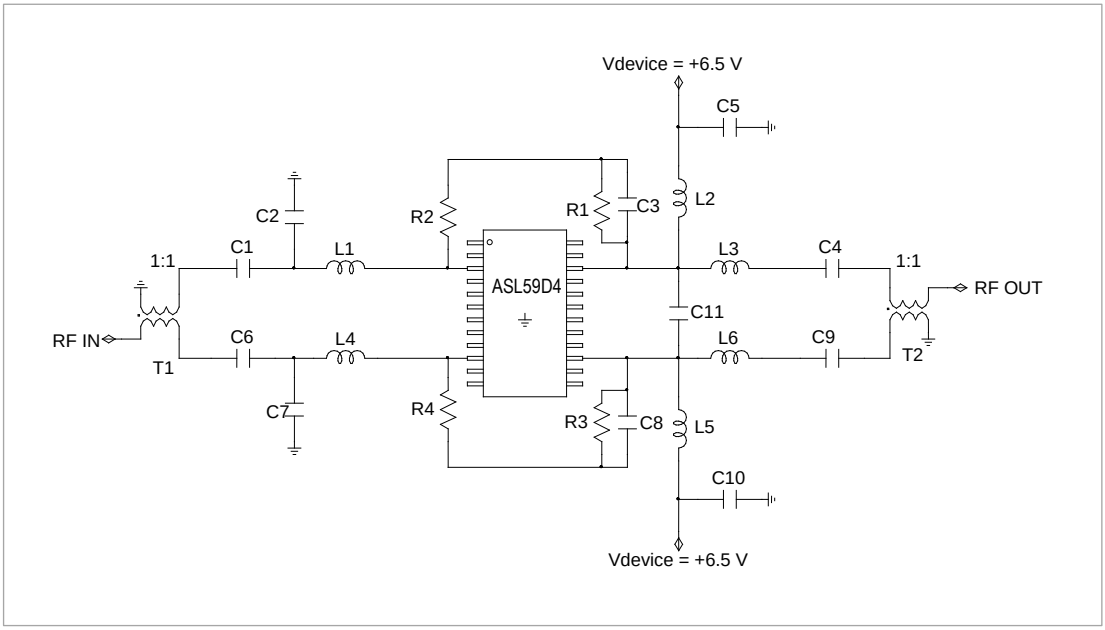
CAUTION: Gallium Arsenide Integrated Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

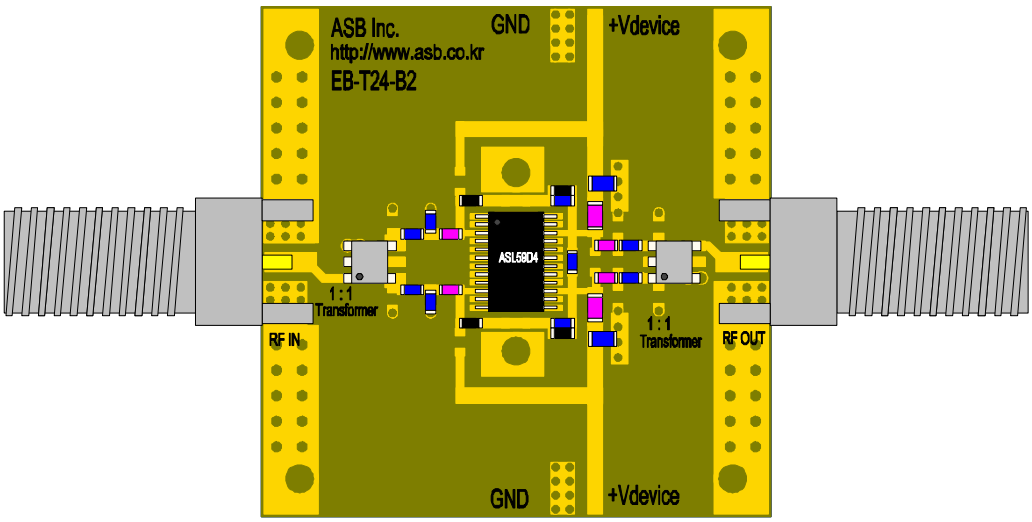
Moisture Sensitivity Level

Level 3 at 260 °C reflow

3. Application: 50 ~ 1002 MHz

3.1 Application Circuit & Evaluation Board





PCB Information	
Material	FR4
Thickness (mm)	0.8
Size (mm)	40x40
EB No.	EB-T24-B2

Bill of Material

Symbol	Value	Size	Description	Manufacturer
ASL59D4		-	MMIC Amplifier	ASB
C5, C10	10 μF	2012	Decoupling capacitor	MURATA
C1, C4, C6, C9	1 μF	1608	DC blocking capacitor	MURATA
C3, C8	1 μF	1608	Feedback capacitor	MURATA
C11	1.5 pF	1608	Matching capacitor	MURATA
C2, C7	2.2 pF	1608	Matching capacitor	MURATA
R2, R4	430 Ω	1608	Feedback resistor	Samsung
R1, R3	62 kΩ	1608	Bias resistor	Samsung
L1, L4	2.2 nH	1608	Matching inductor	MURATA
L3, L6	2.7 nH	1608	Matching inductor	MURATA
L2, L5	1 μH	3216	RF choke inductor	MURATA
T1[1], T2[1]	1 : 1	SM-22	Transformer balun	MACOM

1) MABA007159

3.2 Performance Table

Supply voltage = +6.5 V, T_A = +25 °C, Z_O = 75 Ω.

Parameter	Typical			
Frequency	50	500	1002	MHz
Noise Figure	1.4	1.5	1.7	dB
Gain	20.0	20.0	20.4	dB
S11	-18	-18	-18	dB
S22	-18	-18	-18	dB
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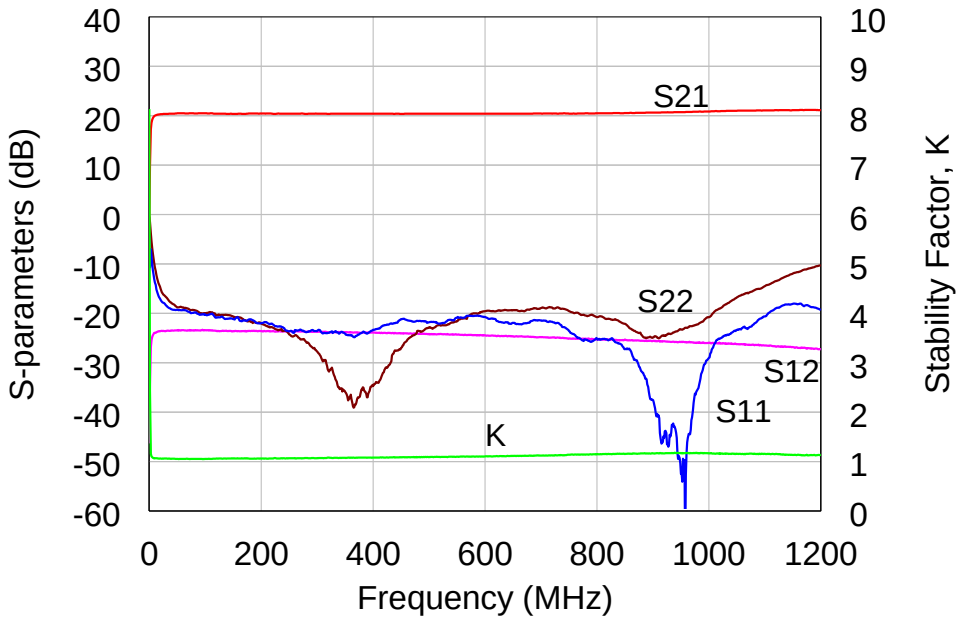
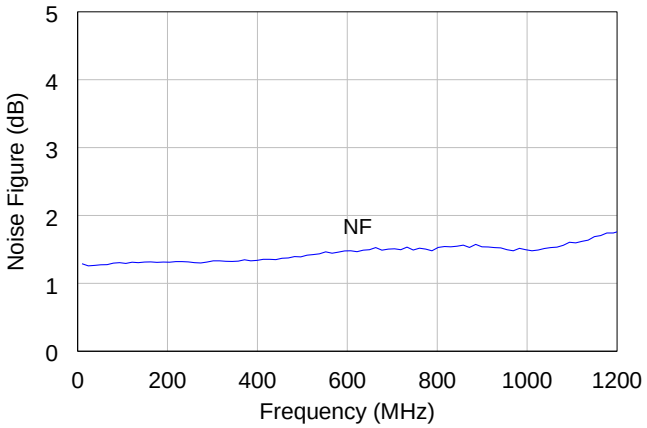
Current	420			mA
Device Voltage	+6.5			V

1) OIP3 is measured with two tones at an output power of +12 dBm/tone separated by 6 MHz.
2) OIP2 is measured with two tones at an output power of +14 dBm/tone at F1(400 MHz)+F2(450 MHz).
3) CSO & CTB measured at Pout = 108 dBμV.

3.3 Plot of S-parameter & Stability Factor

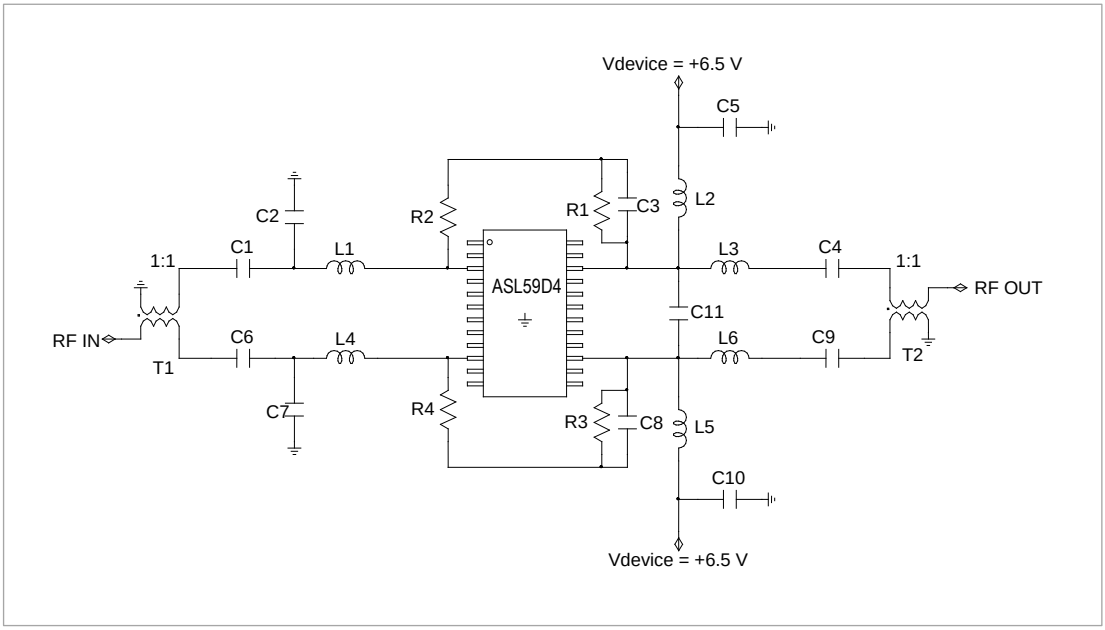


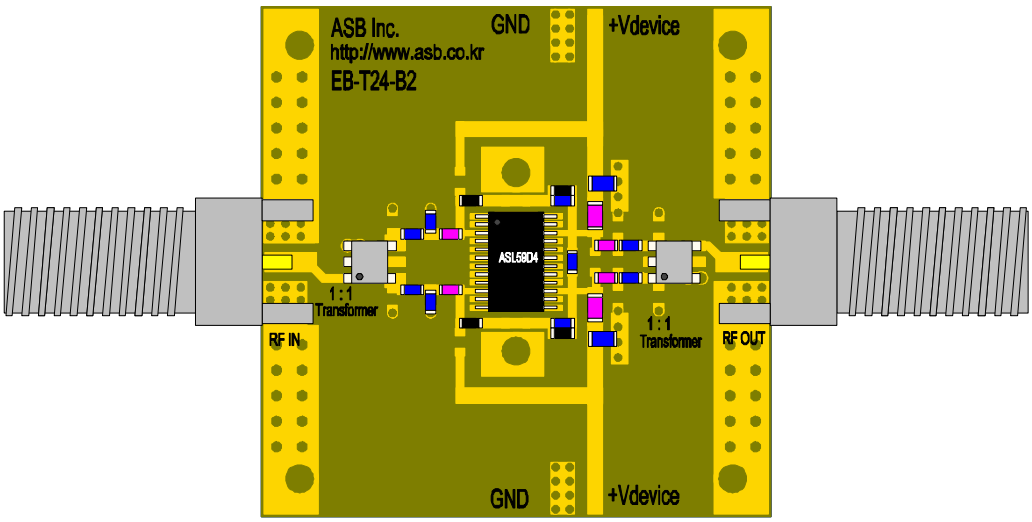
3.4 Plots of Performances with Temperature



4. Application: 50 ~ 1200 MHz

4.1 Application Circuit & Evaluation Board





PCB Information	
Material	FR4
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EB No.	EB-T24-B2

Bill of Material

Symbol	Value	Size	Description	Manufacturer
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C5, C10	10 μF	2012	Decoupling capacitor	MURATA
C1, C4, C6, C9	1 μF	1608	DC blocking capacitor	MURATA
C3, C8	1 μF	1608	Feedback capacitor	MURATA
C11	1.5 pF	1608	Matching capacitor	MURATA
C2, C7	2.0 pF	1608	Matching capacitor	MURATA
R2, R4	390 Ω	1608	Feedback resistor	Samsung
R1, R3	62 kΩ	1608	Bias resistor	Samsung
L1, L4	2.2 nH	1608	Matching inductor	MURATA
L3, L6	1.8 nH	1608	Matching inductor	MURATA
L2, L5	1 μH	3216	RF choke inductor	MURATA
T1[1)], T2[1)]	1 : 1	SM-22	Transformer balun	MACOM

1) MABA007159

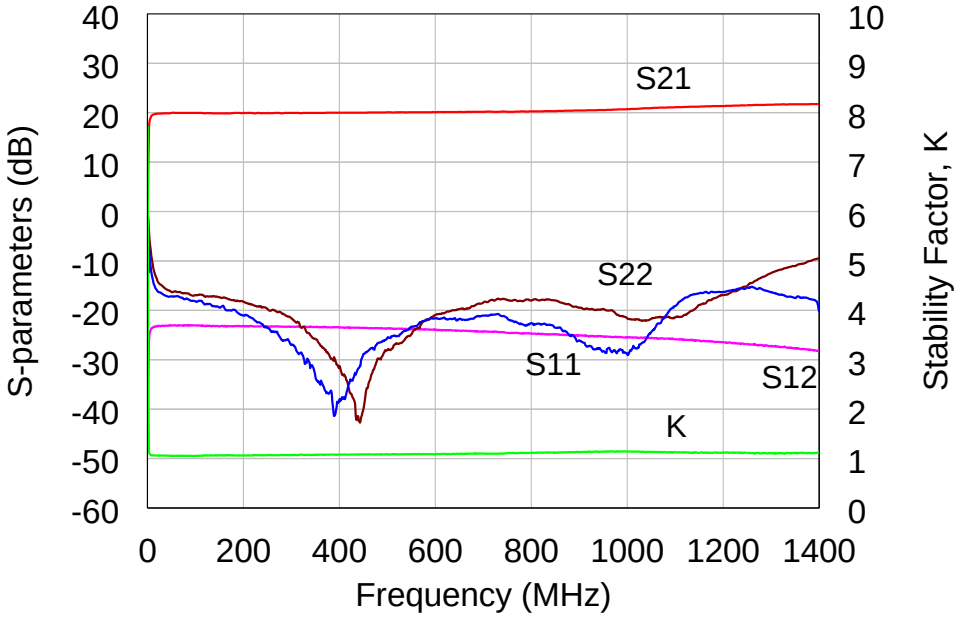
4.2 Performance Table

Supply voltage = +6.5 V, T_A = +25 °C, Z_O = 75 Ω.

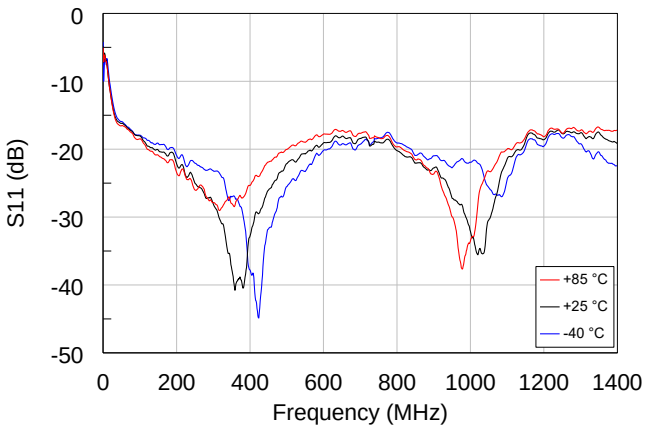
Parameter	Typical			
Frequency	50	500	1200	MHz
Noise Figure	1.4	1.6	1.9	dB
Gain	19.5	19.6	21.0	dB
S11	-15	-17	-15	dB
S22	-15	-17	-15	dB
OIP3[1)]	44.0	45.0	41.0	dBm
OIP2[2)]	70			dBm
P1dB	28	28	28	dBm
Current	420			mA
Device Voltage	+6.5			V

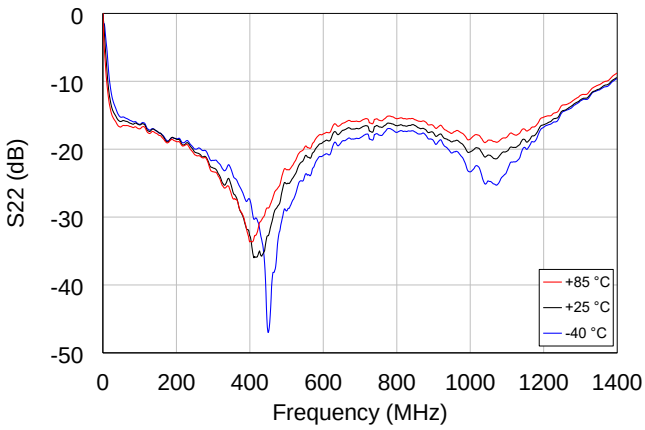
1) OIP3 is measured with two tones at an output power of +12 dBm/tone separated by 6 MHz.
2) OIP2 is measured with two tones at an output power of +14 dBm/tone at F1(400 MHz)+F2(450 MHz).

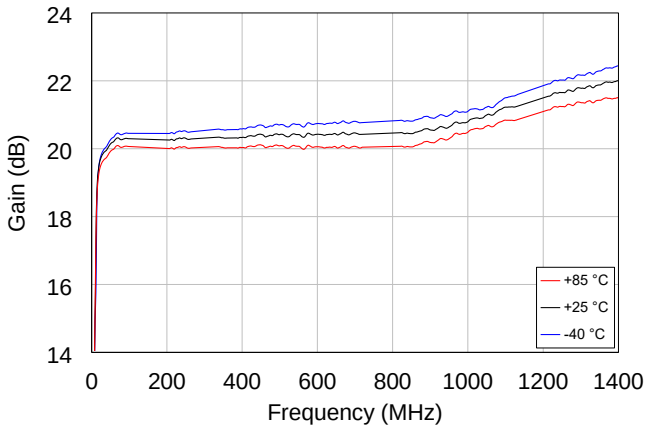
4.3 Plot of S-parameter & Stability Factor

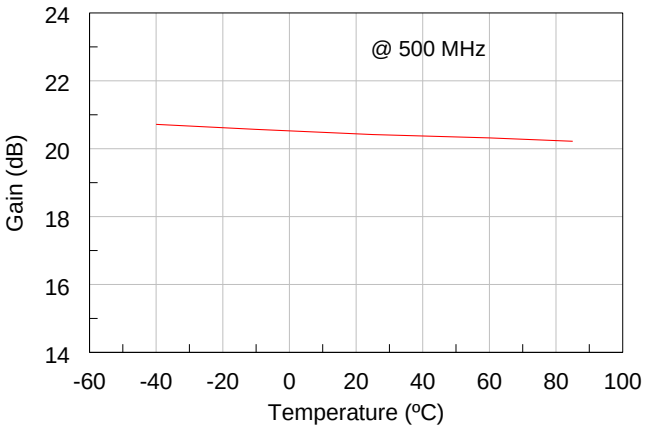


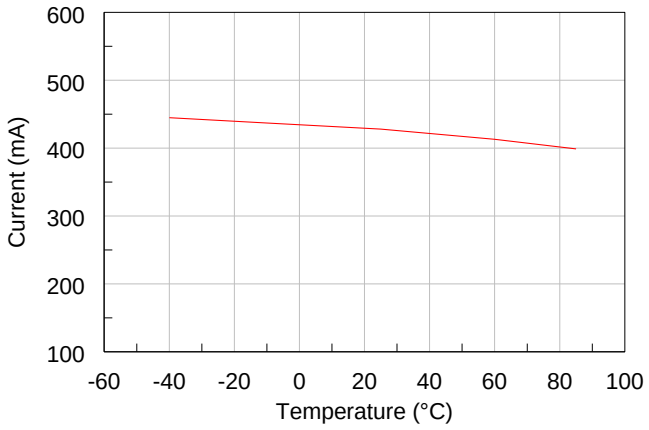
4.1 Plots of Performances with Temperature

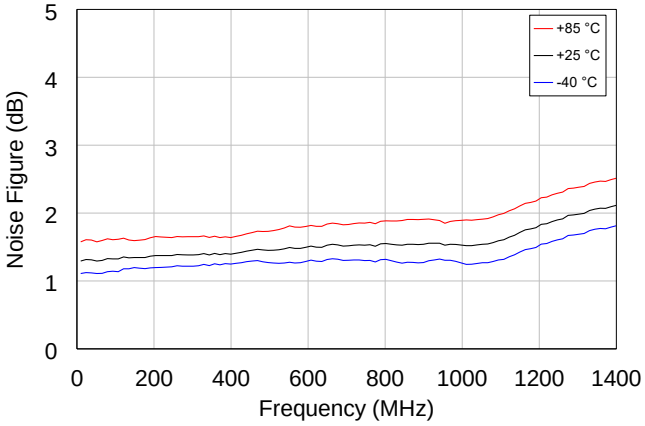





Gain (dB)
Frequency (MHz)
+85 °C
+25 °C
-40 °C


@ 500 MHz
Gain (dB)
Temperature (ºC)


Current (mA)
Temperature (°C)


Noise Figure (dB)
Frequency (MHz)
+85 °C
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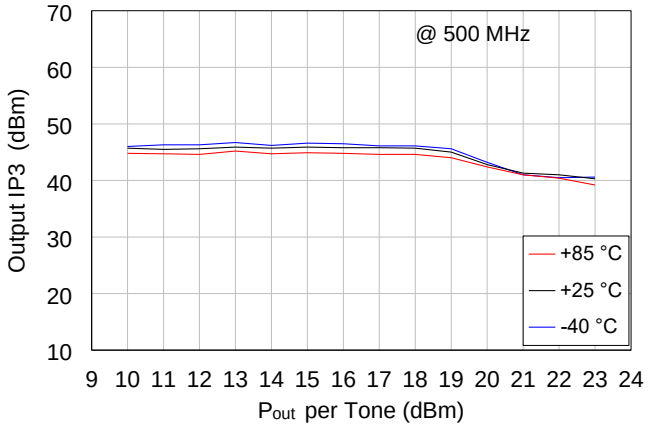
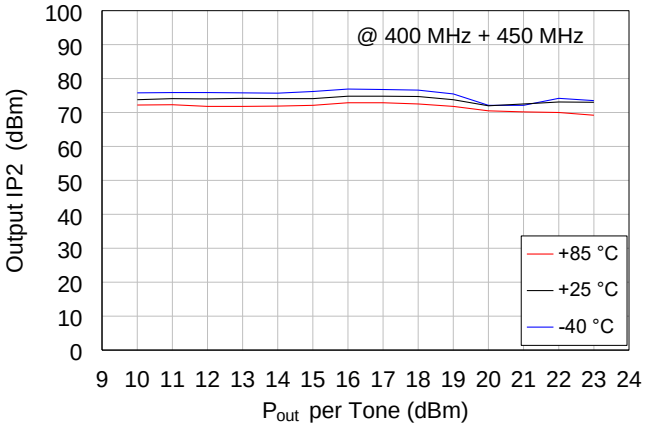
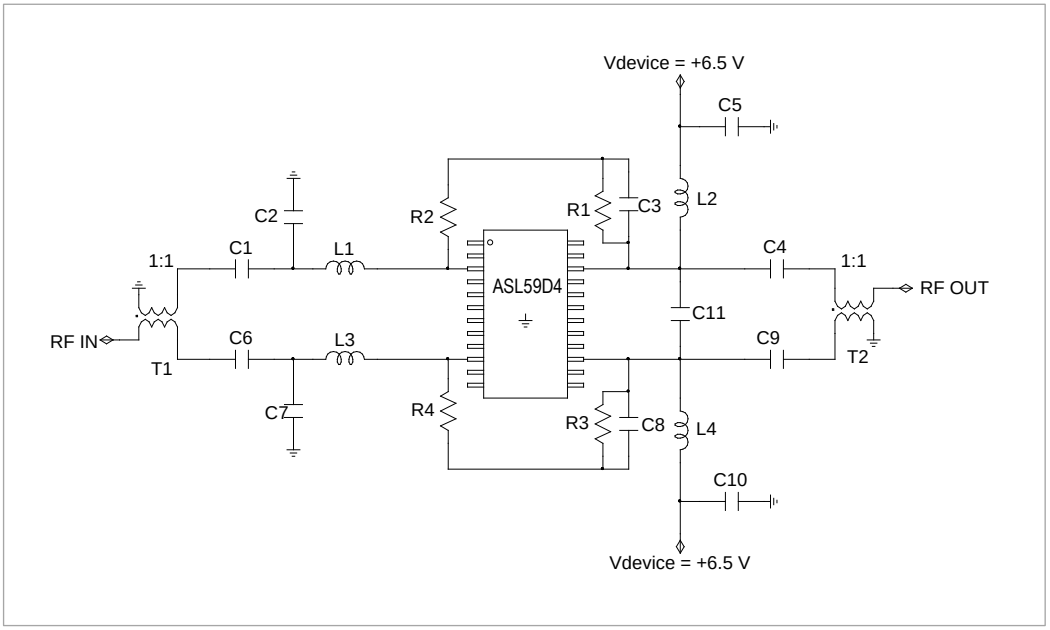
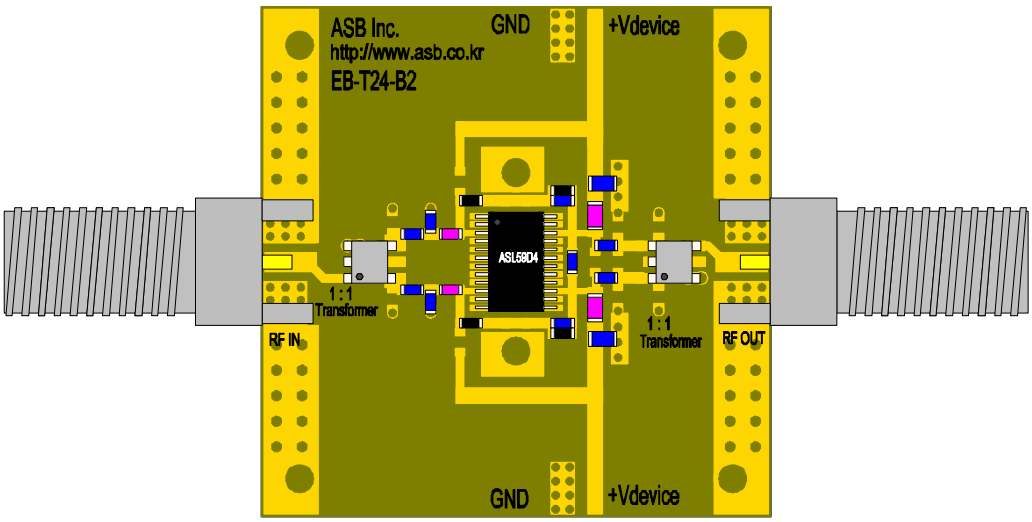

@ 500 MHz
Output IP3 (dBm)
Pout per Tone (dBm)
+85 °C
+25 °C
-40 °C


@ 400 MHz + 450 MHz
Output IP2 (dBm)
Pout per Tone (dBm)
+85 °C
+25 °C
-40 °C

5. Application: 50 ~ 860 MHz

5.1 Application Circuit & Evaluation Board





PCB Information	
Material	FR4
Thickness (mm)	0.8
Size (mm)	40x40
EB No.	EB-T24-B2

Bill of Material

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C1, C4, C6, C9	1 μF	1608	DC blocking capacitor	MURATA
C3, C8	1 μF	1608	Feedback capacitor	MURATA
C2, C7, C11	1.2 pF	1608	Matching capacitor	MURATA
R2, R4	430 Ω	1608	Feedback resistor	Samsung
R1, R3	62 kΩ	1608	Bias resistor	Samsung
L1, L3	3.3 nH	1608	Matching inductor	MURATA
L2, L4	1 μH	3216	RF choke inductor	MURATA
T1[1)], T2[1)]	1 : 1	SM-22	Transformer balun	MACOM

1) MABA007159

5.2 Performance Table

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Parameter	Typical			
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Noise Figure	1.4	1.5	1.6	dB
Gain	20.0	20.0	20.0	dB
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OIP3[1)]	44.0	45.0	41.5	dBm
OIP2[2)]	70			dBm
P1dB	28	28	28	dBm
Current	420			mA
Device Voltage	+6.5			V

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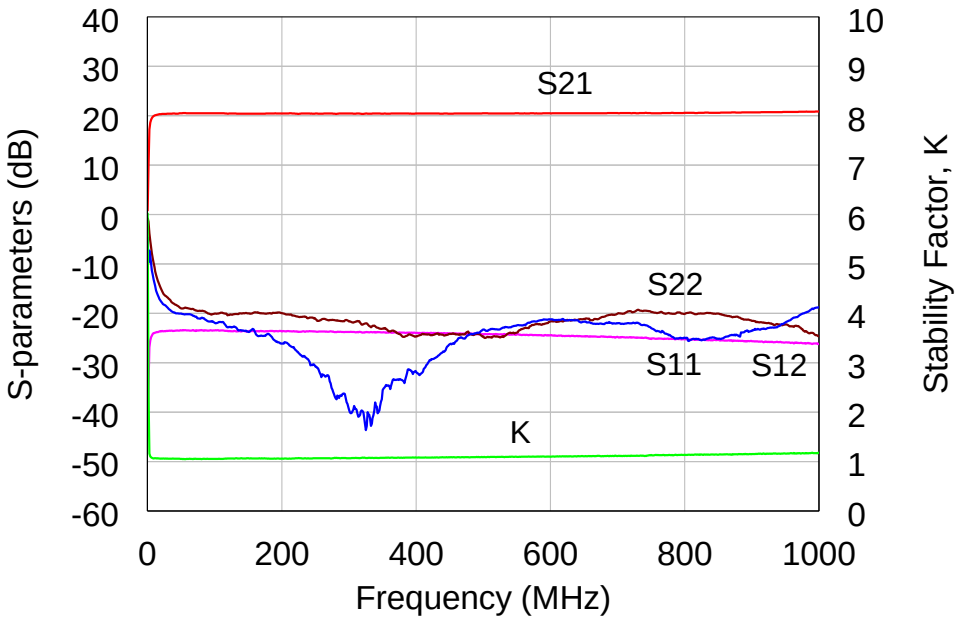
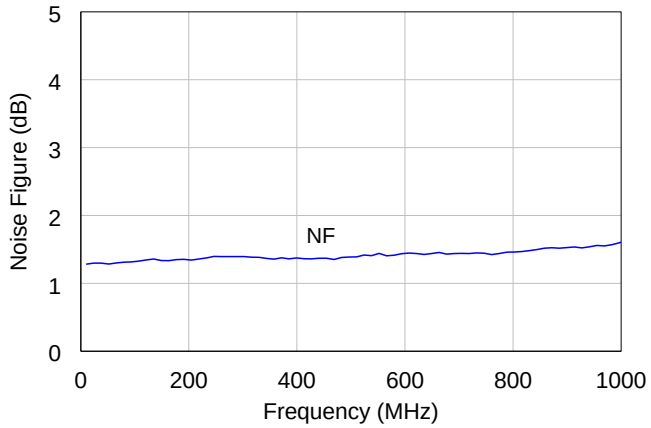
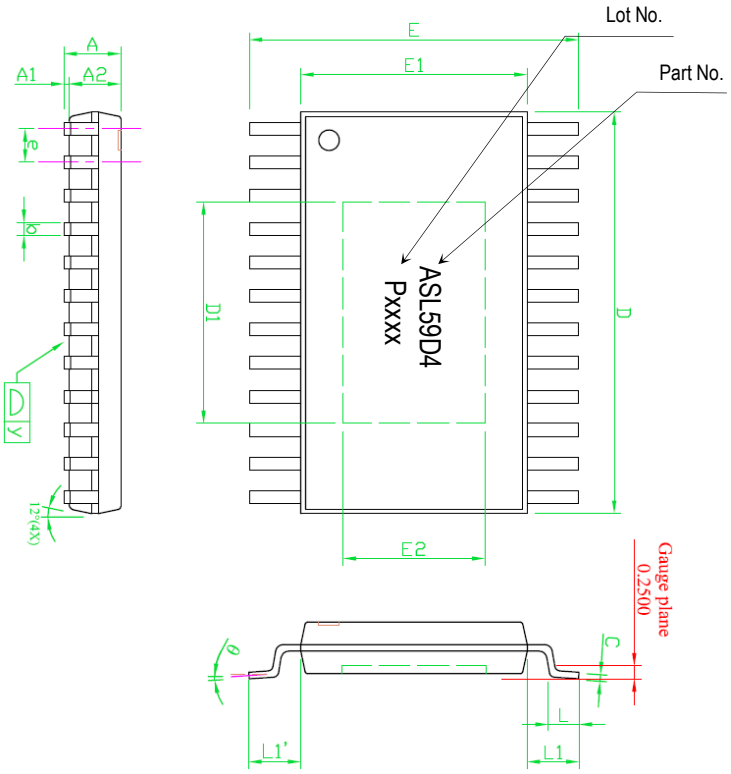
5.3 Plot of S-parameter & Stability Factor



5.4 Plots of Noise Figure

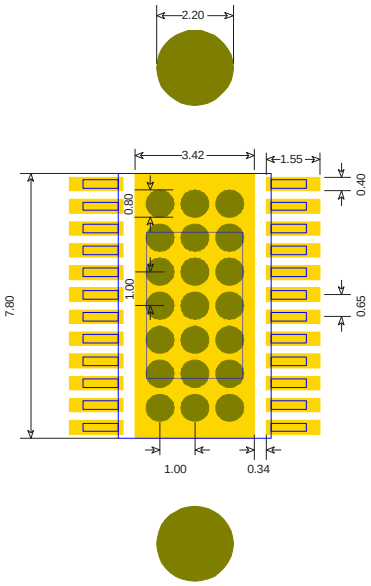


6. Package Outline (TSSOP24)



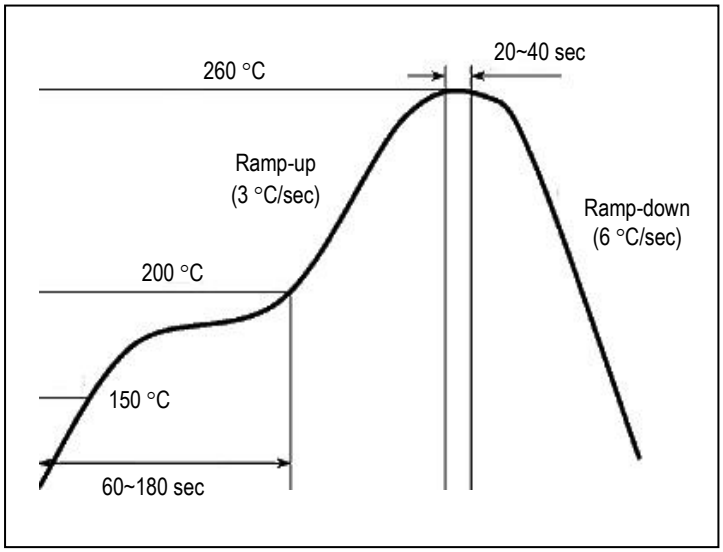
Symbols	Dimensions (In mm)		
	MIN	NOM	MAX
A	---	---	1.15
A1	0.00	----	0.10
A2	0.80	1.00	1.05
b	0.19	---	0.30
C	0.09	---	0.20
D	7.70	7.80	7.90
D1	4.086	4.286	4.486
E	6.20	6.40	6.60
E1	4.30	4.40	4.50
E2	2.55	2.75	2.95
e	---	0.65	---
L	0.45	0.60	0.75
y	---	---	0.10
θ	0°	---	8°
|L1-L1'|	---	---	0.12
L1		1.00REF	

7. Surface Mount Recommendation (In mm)



NOTE
1. Add as much copper as possible to inner and outer layers near the part to ensure optimal thermal performance.
2. To ensure reliable operation, device ground paddle-to-ground pad soldering is critical. Recommended is that thermal grease should be used for better thermal performance.
3. Add mounting screws near the part to fasten the board to a heat sinker. Ensure that the ground & thermal via region contacts the heat sinker.
4. A proper heat dissipation path underneath the area of the PCB for the mounted device is strictly required for proper thermal operation. Damage to the device can result from inappropriate heat dissipation.

8. Recommended Soldering Reflow Profile



(End of Datasheet)