2023/06/21

Data sheets of Takada RF Lab’s RF Products (Rev.2.0)

Takada RF Labs, Inc.

Table of contents

Preliminary
BBLAMP_56A_DS_Rev5.1_230110

56 Gb/s Broad-Band Linear Amplifier Module

BBLAMP_56A

1. Feature

Qualified MMIC Qualified 0.13 um GaAs PHEMT MMIC is assembled in the module.
Broad band F-3dB : 48 GHz (typ.)
High Gain S21 :12.7 dB (typ.) @ 500 MHz
Wide high linearity range Output high linearity range : 0 to 2.0 Vpp (typ.)
Input high linearity range : 0 to 0.47 Vpp (typ.)
High Output power P-1dBout:+13.9 dBm (3.13 Vpp) @ 28 GHz (typ.)
P-3dBout:+16.0 dBm (3.99Vpp) @ 28 GHz (typ.)
Fast digital signal operation
up to 56 Gb/s (baud) for NRZ, up to 112 Gb/s(56 Gbaud) for PAM4
Fast rise/fall time Tr/Tf (20-80%): 9 ps (typ.) @ 56 Gb/s NRZ
Small output jitter 1.5 ps (p-p), 0.5ps (rms) @ 56Gb/s NRZ
Single supply voltage +6.0V
Low power dissipation: 0.66W (typ.)
TIA operation available Zt of 49 dBΩ@ 500 MHz (Typ. , Internal chip on-wafer condition)
Coaxial connector interface V(1.85mm)/female for input, V(1.85mm)/female for output

2. Application

Fiber optic communication

Trans-impedance amplifier (TIA) for optical receiver up to 56 Gb/s (baud)
Laser driver of direct modulation laser (DML) for up to 56 Gb/s (baud)
Modulator driver of EADFB up to 56 Gb/s (baud)
PAM-4 signal linear amplification up to 112 Gb/s (56 Gbaud)

Micro-wave/Millimeter-wave /Terahertz-wave wireless communication

Base-band amplifier in wireless receiver/transmitter up to 56 Gb/s (baud)

3. Block diagram

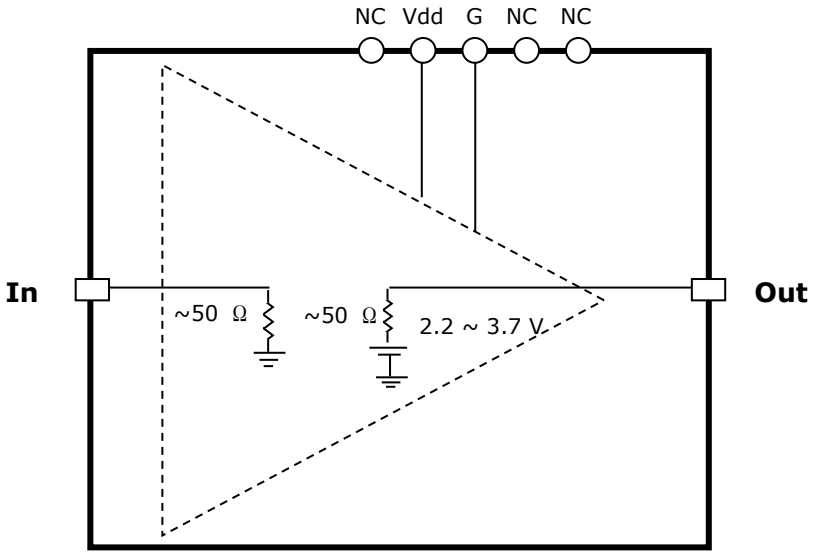
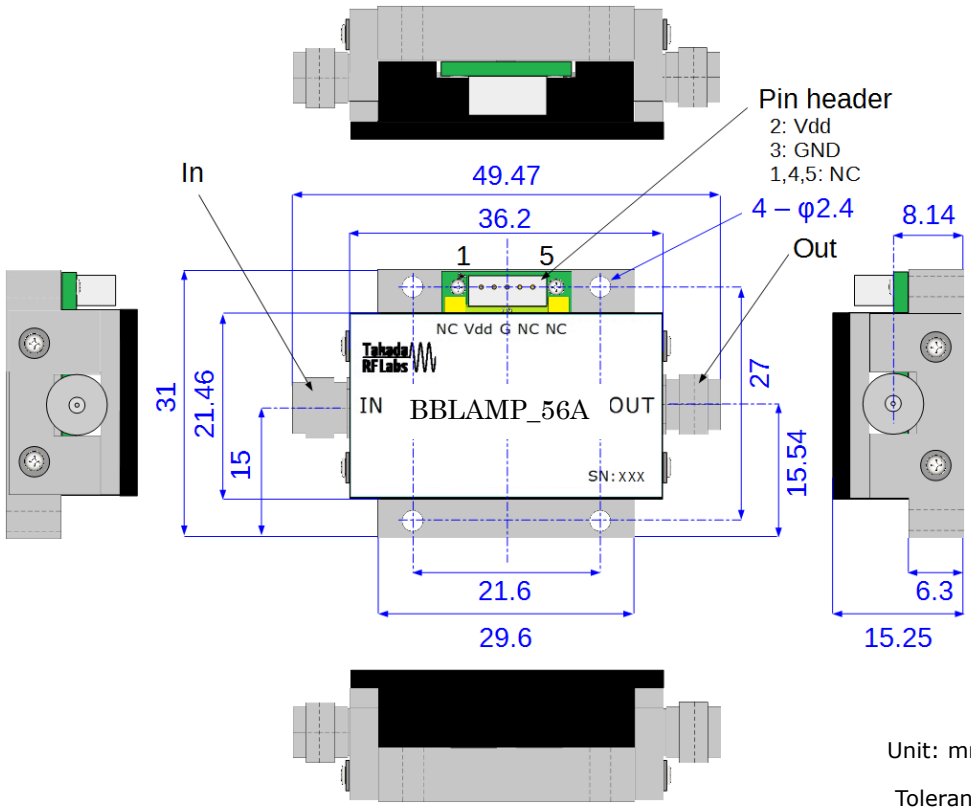


Fig. 1 Block diagram

4. Module structure



Unit: mm

Tolerance: +- 0.2

Weight: 35g

Fig. 2 Module structure

5. Terminal description

Name	Function	Note
In	Signal Input (DC Coupled, See Fig.1. Use external DC block for normal application except TIA operation)	V (1.85 mm) connector/ Female
Out	Signal Output (DC Coupled, See Fig.1. Use external DC block for normal application)	V (1.85 mm) connector/ Female
Vdd	Power supply (+6V)	Pin header (JST B5B-ZR)
G	Ground (0 V)	Pin header (JST B5B-ZR)
NC	No internally connected	Pin header (JST B5B-ZR)

6. Absolute maximum ratings

Related terminal	Parameter	Symbol	Unit	Min	Max
IN	Input power to In	Pin	dBm (Vpp)		+6.3 (1.29)
Vdd	Applied voltage to Vdd	Vd	V	-0.5	+8
Tmbop	Operating module bottom temperature no condensation (Note1)	Tmbop	℃	+5	+85
Tstrg	Storage temperature no condensation (Note1)	Tst	℃	+5	80

(Note 1) Module is not hermetically sealed.

7. Recommended operating condition and DC characteristics

Vdd=6.0 V unless otherwise indicated

Related terminal	Parameter	Symbol	Unit	Specification		
				Min	Typ	Max
Vdd	Supply voltage of Vdd	Vdd	V	+5.0	+6.0	+6.5
	Supply current of Vdd	Idd	mA		110	
	Power dissipation	Pdiss	W		0.66	
	DC voltage at input terminal @ Vdd=5.0 V	Vindc	V		0	
	DC voltage at output terminal@ Vdd=5.0 V	Voutdc	V	2.2	2.8	3.7
	Operating module bottom temperature	Tmbop	℃	+5	+25	+80

8. RF characteristics

Tmbop =25℃, Vdd=6.0 V unless otherwise indicated

Parameter	Symbol	Unit	Specification		
			Min.	Typ.	Max.
Gain (average of between 1 - 20 GHz), See Fig.3.	G	dB	10.5	12.7	

Flatness of G		Flatness	dB		< ±1.2	
High frequency cut-off (3 dB down from G) See Fig. 3		F-3dB	GHz	38	48	
Input reflection @<30 GHz See Fig.3		S11	dB		<-6.0	
Output reflection@<30 GHz See Fig.3		S22	dB		<-6.0	
Noise figure @ 20 GHz @ Vdd=5.0 V See Fig.5 (Note1)		NF	dB		2.5	
High linearity output voltage range @ 28 GHz (Note 2) See Fig.4.		HLRout	dBm (Vpp)		Up to +10.0 (0-2.0)	
High linearity input voltage range@ 28 GHz (Note 2) See Fig.4.		HLRin	dBm (Vpp)		Up to -2.64 (0-0.47)	
1 dB gain compression output power @28 GHz See Fig.4.		P-1dBout	dBm (Vpp)		+13.9 (3.13)	
1 dB gain compression input power @28 GHz See Fig.4.		P-1dBin	dBm (Vpp)		+2.04 (0.80)	
3 dB gain compression output power @28 GHz See Fig.4.		P-3dBout	dBm (Vpp)		+16.0 (3.99)	
3 dB gain compression input power @28 GHz See Fig.4.		P-3dBin	dBm (Vpp)		+6.1 (1.28)	
Trans-impedance gain @500 MHz @ Vdd=5.0 V (Note1)		Zt	dBΩ		49	
Equivalent input noise current @ 3 - 36 GHz @ Vdd=5.0 V (Note1)		Ieq	pA/Hz^0.5		6<Ieq<15	
Maximum input current (over load) @ Vdd=5.0 V (Note1)		IoL	mApp	3.5		
Maximum operating speed (NRZ), linear range			Gb/s (Gbaud)		56(56)	
Maximum operating speed (PAM4), linear range			Gb/s (Gbaud)		112(56)	
Rise/fall time @ 56 Gb/s (NRZ), linear range See Fig.7.			Tr/Tf (20-80%)		8.1	
Output jitter @ 56 Gb/s (NRZ), linear range See Fig.7.	peak to peak		ps		1.5	
	rms		ps		0.5	

(Note 1) data of internal chip at on-wafer condition

(Note 2) High linearity range is defined as input/output range having 0.22 dB (5%) gain comp ression.

9. Typical performance (Ta=25 ℃, AC coupled for input and output)

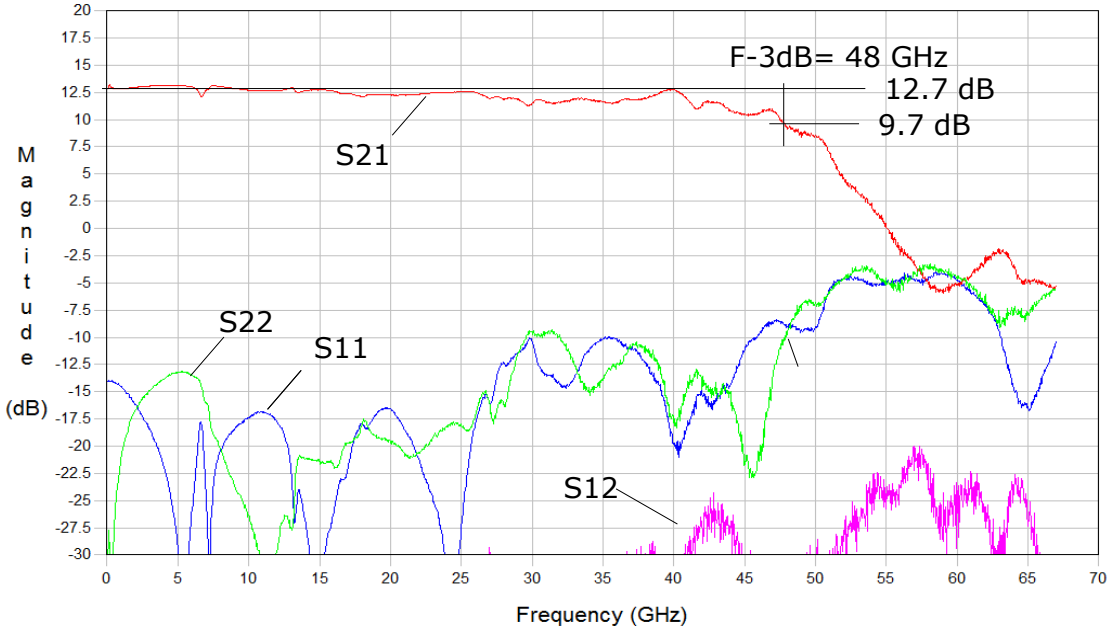


Fig. 3 S-parameter (Vdd=6.0 V)

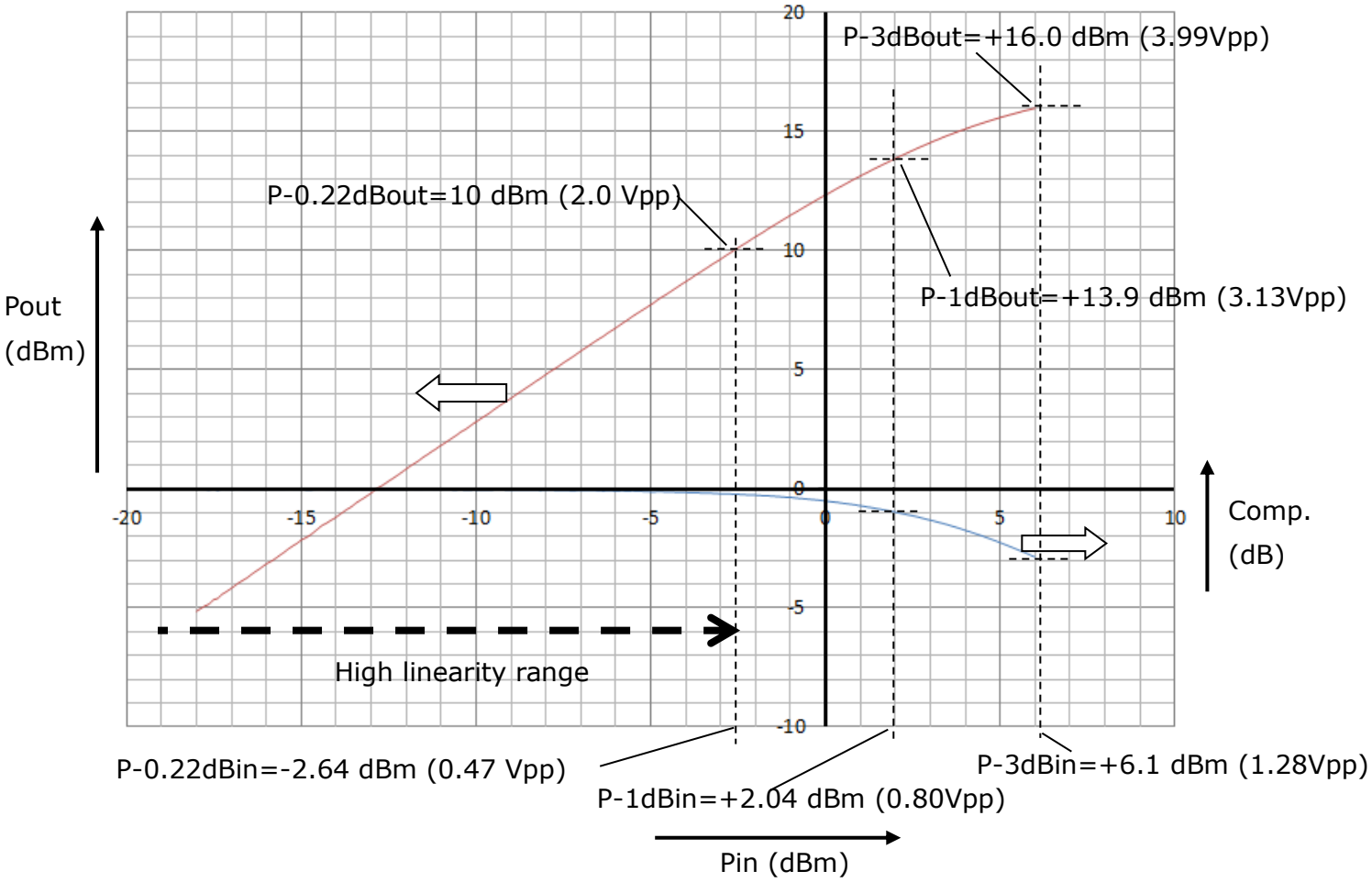


Fig.4 Output power (Pout) and Gain compression(Comp.) VS Input power(Pin) (@28 GHz, Vdd=6.0V)

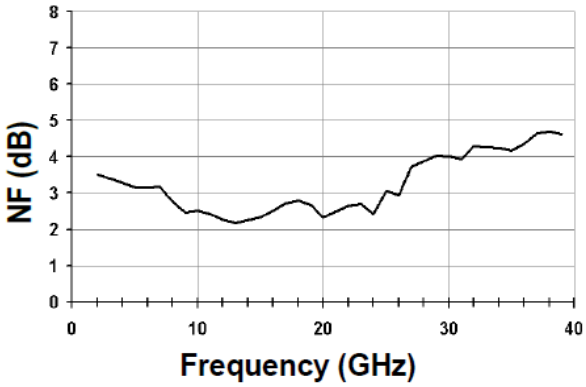


Fig.5 Noise Figure (NF)
(Internal chip at on-wafer condition, Vdd=5.0 V)

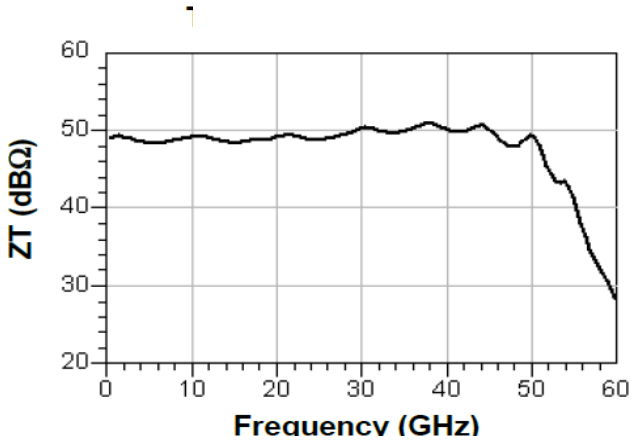


Fig.6 Trans-impedance gain (ZT)
(Internal chip at on-wafer condition, Vdd=5.0V)

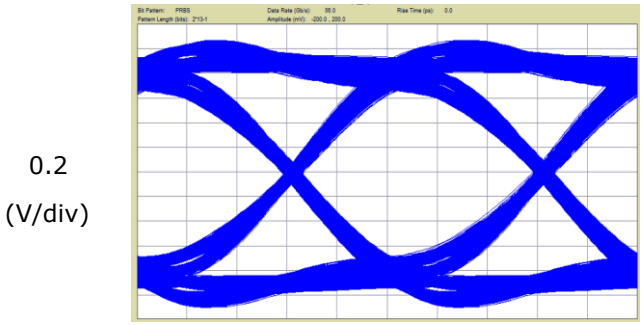


Fig.7 56 Gb/s (Gbaud) NRZ Output eye-diagram
Input: (0.4 Vpp, tr/tf:0ps), Vdd=6.0 V

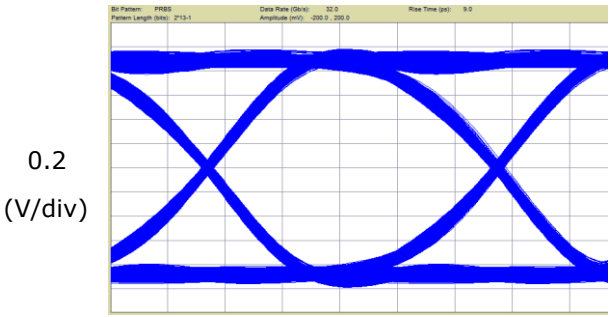


Fig.8 32 Gb/s (Gbaud) NRZ Output eye-diagram
Input: (0.4 Vpp, tr/tf:9 ps), Vdd=6.0 V

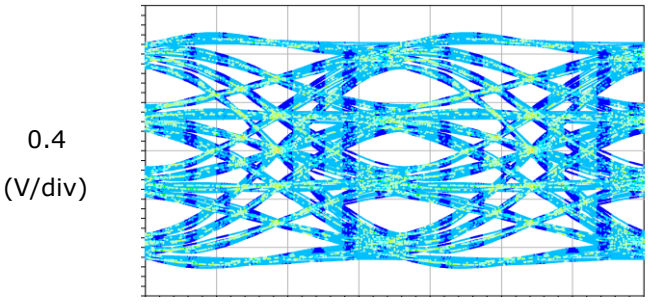


Fig.9 112 Gb/s (56 Gbaud) PAM4 Output eye-diagram
Input: (0.4 Vpp, tr/tf:9 ps), Vdd=6.0 V

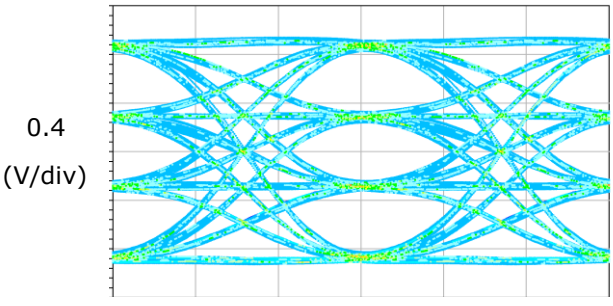


Fig.10 64 Gb/s (32 Gbaud) PAM4 Output eye-diagram
Input: (0.4 Vpp, tr/tf:12 ps), Vdd=6.0 V

(Note 3) Above eye diagrams are obtained from measured S-parameter by using frequency-domain to time-domain conversion software

10. Sample Implementation

1) Operation as **Trans-impedance amplifier (TIA)**

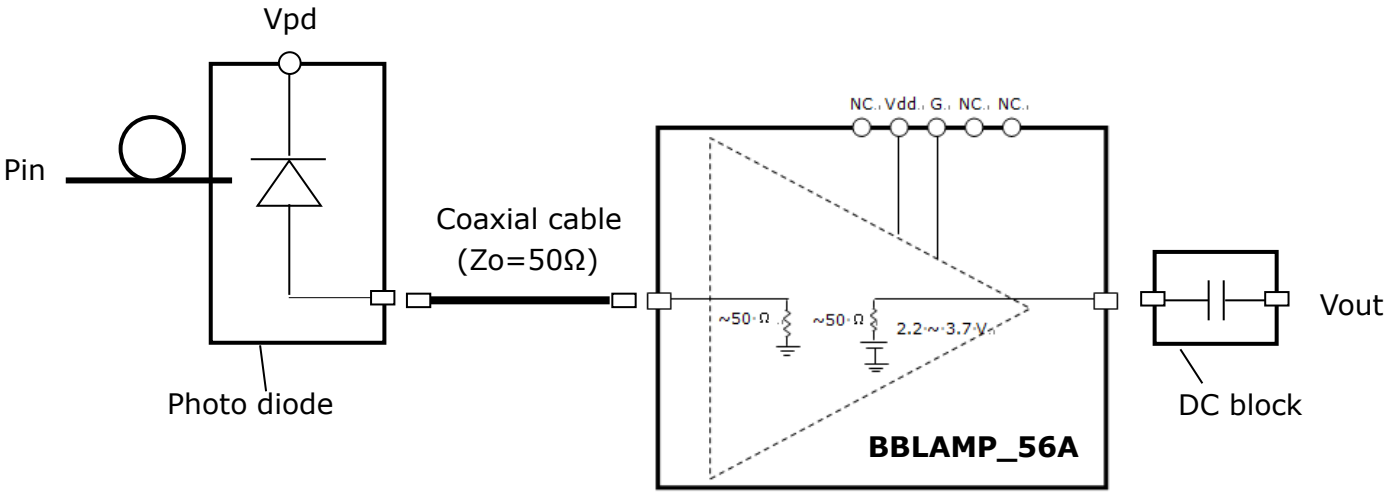


Fig. 11　Operation as TIA

2) Operation as **Laser driver** for Direct modulation Laser (DML)

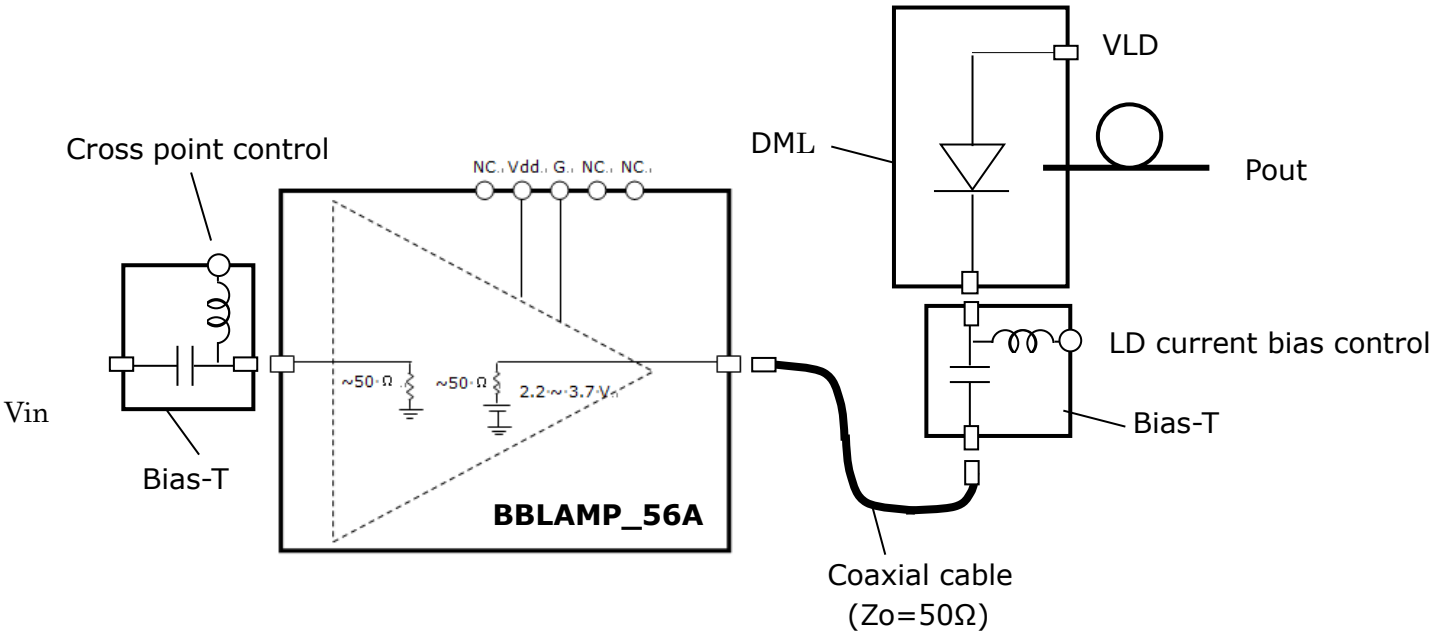


Fig. 12　Operation as Laser driver

3) Operation as **Linear modulator driver** for EADFB

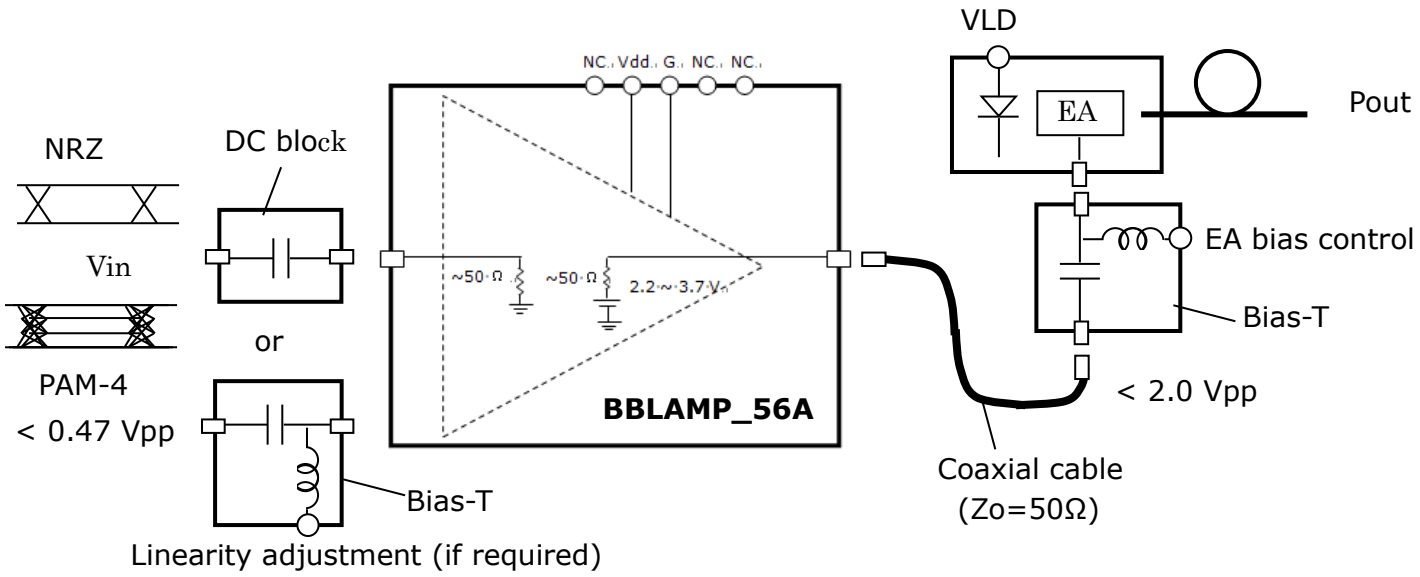


Fig. 13 Operation as NRZ/PAM-4 signal Linear modulator driver for EADFB

4) Operation as **Base-band amplifier** in wireless receiver and transmitter

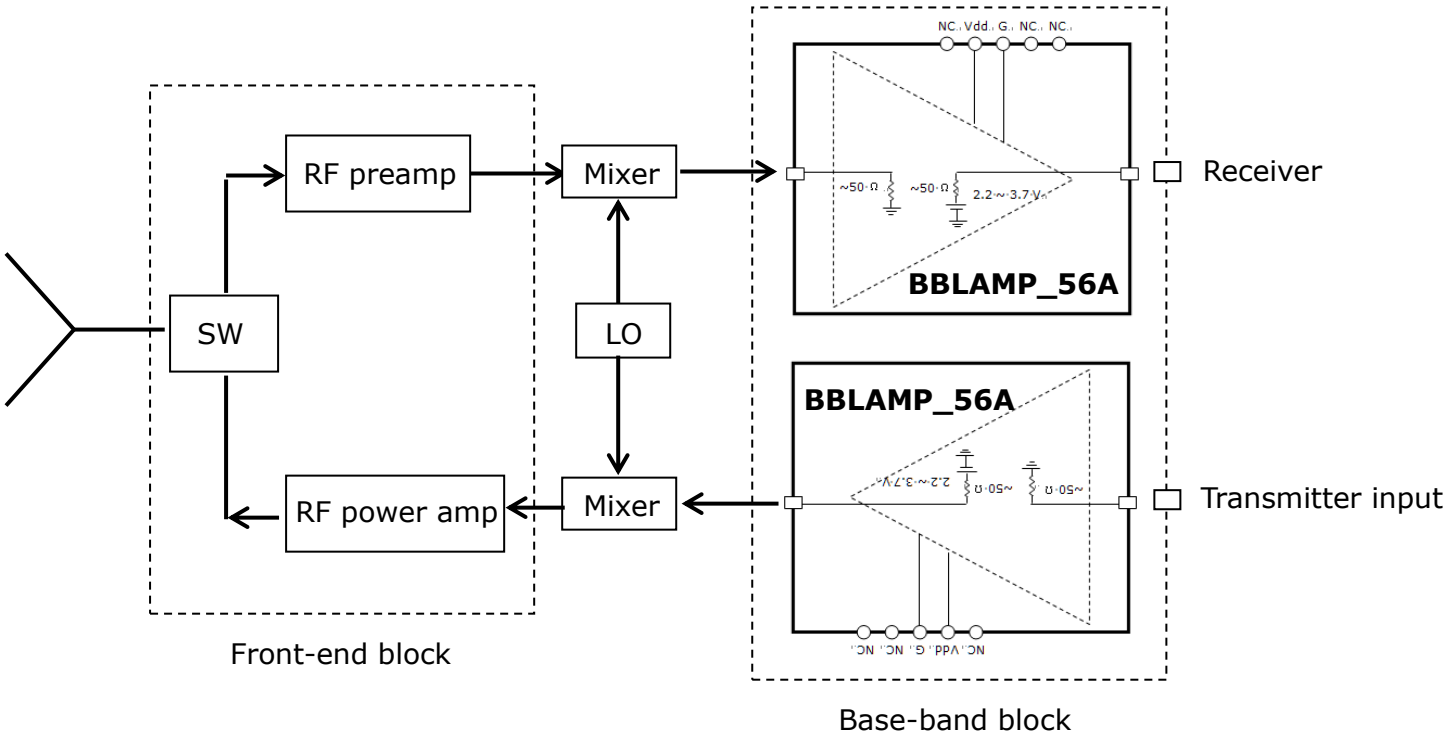


Fig. 14 Operation as Base-band amplifier in wireless receiver/transmitter

11. Precaution

(A) This product uses ESD sensitive high-speed devices. We recommend that the product is handled with appropriate precaution described below.

1) Connect the ground (G) terminal of module to the highest quality ground line in the room and connect this terminal to the ground terminal of test equipment as well.

2) Use ESD protection wrist strap which is connected to module ground.

(B) Do not apply abnormal mechanical stress and/or shock to the module

(C) This module is not hermetically sealed.

12. Attachment

1 pieces of 30 cm DC cable harness that is connected to the pin header.

(Vdd: White, G: Black)

2014/3/14
Datasheet
FA20C_DS Rev.1.0

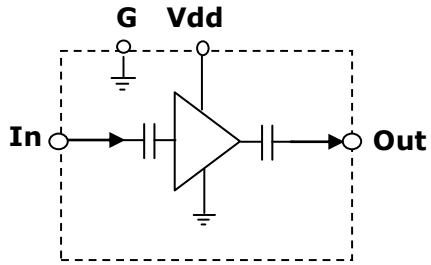
8-20 GHz Amplifier

FA20C

1. Application

Amplification for sub-rate clock (10 ~ 16 GHz) of 20 ~ 32 Gb/s optical transmission system, etc

2. Block diagram



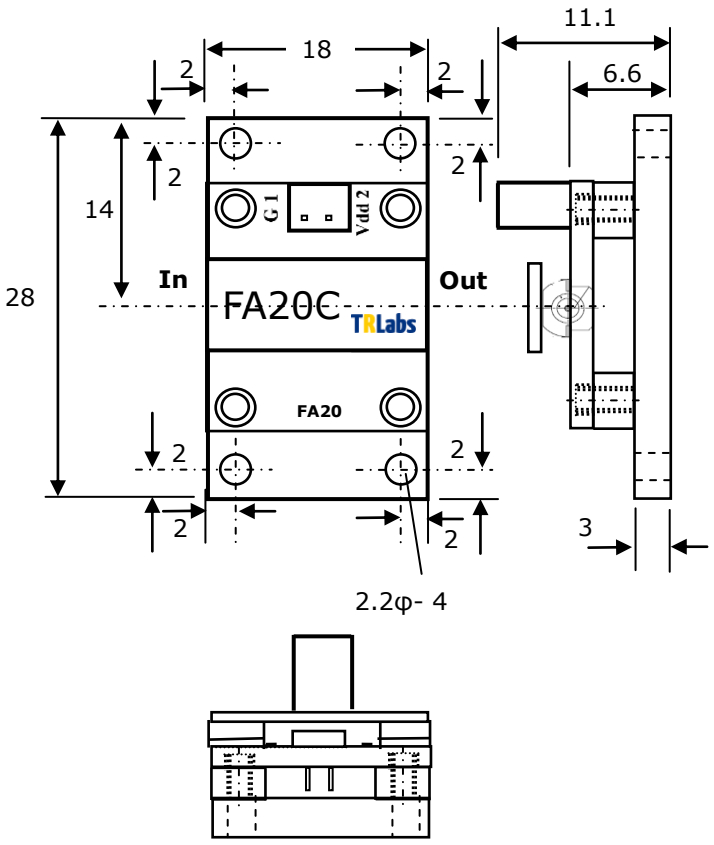


Fig. 1 Module structure

3. Terminal description

No	Name	Function	Note
1	In	Signal Intput (Internal AC Coupled)	SMPM/P
2	Out	Signal Outtput (Internal AC Coupled)	SMPM/P
4	Vdd	Supply Voltage (5V)	Pin header
3	G	Ground	Pin header

4. Absolute maximum ratings

Related terminal	Parameter	Symbol	Unit	Min	Max
Vdd	Applied voltage of Vdd	Vdd	V		5.5
In	Apply voltage of In	Pin	dBm		+10
	Storage temperature	Tst	Degree C	-40	80

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Takada RF Labs

2014/3/14
Datasheet
FA20C_DS Rev.1.0

5. Characteristics (Ta=25 [Degree C])

Related terminal	Parameter		Symbol	Unit	Specification		
					Min	Typ	Max
In, Out	Gain (See Fig.2)	at 10GHz	S21-10	dB		19	
		at 20 GHz	S21-20	dB		17	
	Isolation		S12	dB	See Fig.2		
In	Input return loss		S11	dB		> 12	
Out	Output return loss		S22	dB		> 10	
	1 dB compression output power		P1B	dBm		19	
Vdd	Supply voltage		Vdd	V	4.75	5	5.25
	Supply Current of Vdd		Idd	mA		120	
	Power dissipation		Pdis	W		0.6	

6. Typical performance (Vdd=5.0 [V], Ta=25 [Degree C])

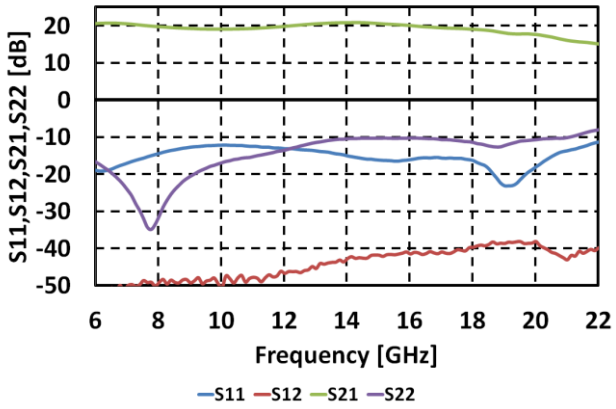

Fig.2 S11, S12, S21, S22 vs Frequency

7. Precaution

This product uses ESD sensitive high-speed devices. We recommend that the product is handled with appropriate precaution described below.

1) Connect the ground (G) terminal of FA20C to the highest quality ground line in the room and connect this terminal to the ground terminal of test equipment as well.
2) Use ESD protection wrist strap which is connected FA20C ground.
3) Avoid abnormal mechanical shock.

8. Attachment

1) 30 cm Jumper cable with pin header socket: 1

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2014/3/14
Datasheet
FA30A_DS Rev.1.0

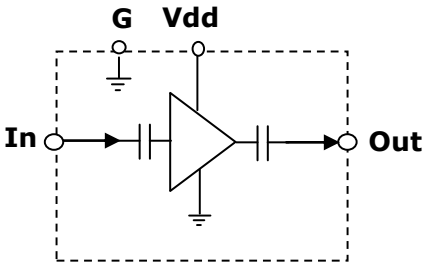
12-28 GHz Amplifier

FA30A

1. Application

Amplification for full-rate clock (20 ~ 28 GHz) of 20 ~ 28 Gb/s optical transmission system, etc

2. Block diagram



3. Terminal description

No	Name	Function	Note
1	In	Signal Intput (Internal AC Coupled)	SMPM/P
2	Out	Signal Outtput (Internal AC Coupled)	SMPM/P
4	Vdd	Supply Voltage (5V)	Pin header
3	G	Ground	Pin header

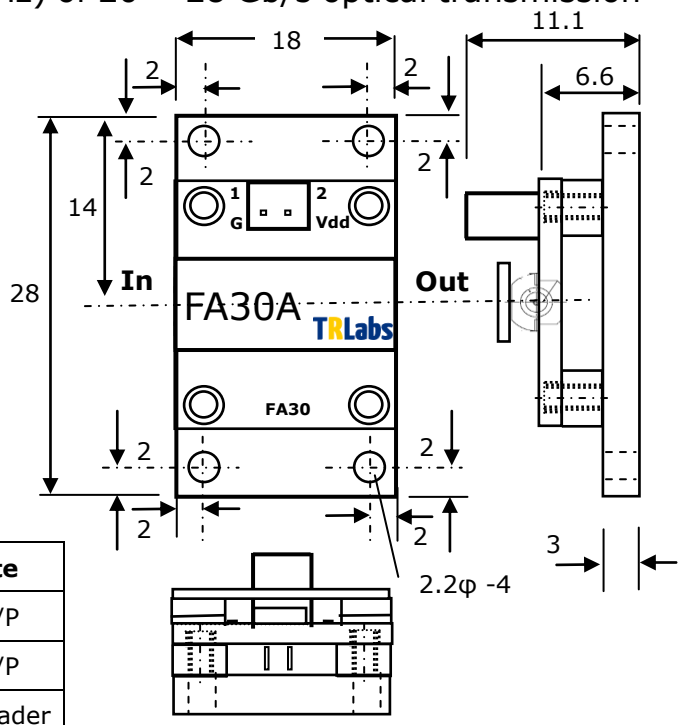


Fig. 1 Module structure

4. Absolute maximum ratings

Related terminal	Parameter	Symbol	Unit	Min	Max
Vdd	Applied voltage of Vdd	Vdd	V		5.5
In	Apply voltage of In	Pin	dBm		+10
	Storage temperature	Tst	Degree C	-40	80

5. Characteristics (Ta=25 [Degree C])

Related terminal	Parameter		Symbol	Unit	Specification		
					Min	Typ	Max
In, Out	Gain (See Fig.2)	at 14GHz	S21-14	dB		13	
		at 28GHz	S21-28	dB		10	

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	Isolation		S12	dB	See Fig.2		
In	Input return loss	at 14GHz	S11-14	dB		13	
		at 28GHz	S11-28	dB		8	
Out	Output return loss	at 14GHz	S22-14	dB		15	
		at 28GHz	S22-28	dB		6	
Out	1 dB compression output power		P1B	dBm		15	
Vdd	Supply voltage		Vdd	V	4.75	5	5.25
	Supply Current of Vdd		Idd	mA		100	
	Power dissipation		Pdis	W		0.5	

6. Typical performance (Vdd=5.0 [V], Ta=25 [Degree C])

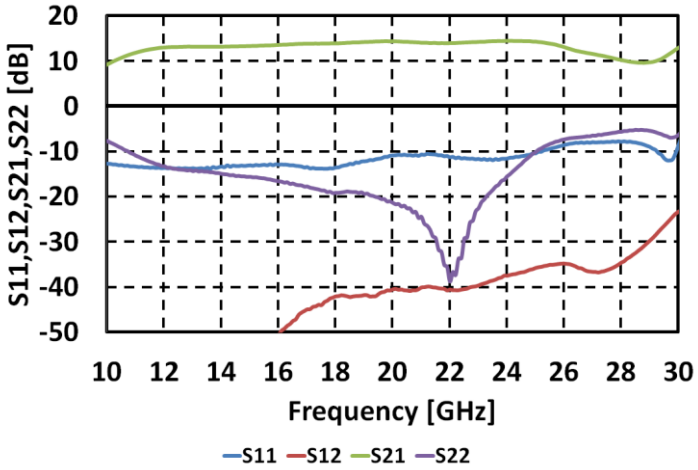

Fig.2 S11, S12, S21, S22 vs Frequency

7. Precaution

This product uses ESD sensitive high-speed devices. We recommend that the product is handled with appropriate precaution described below.

1) Connect the ground (G) terminal of FA30A to the highest quality ground line in the room and connect this terminal to the ground terminal of test equipment as well.
2) Use ESD protection wrist strap which is connected FA30A ground.
3) Avoid abnormal mechanical shock.

8. Attachment

1) 30 cm Jumper cable with pin header socket: 1

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2014/3/14
Datasheet
FA40A_DS Rev.1.0

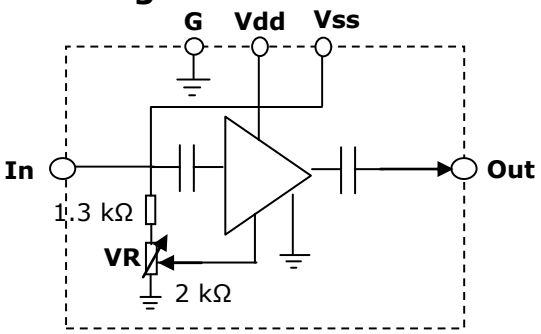
20-40 GHz Amplifier

FA40A

1. Application

Amplification for full-rate clock (20 ~ 40 GHz) of 20 ~ 40 Gb/s optical transmission system, etc

2. Block diagram



3. Terminal description

No	Name	Function	Note
1	In	Signal Intput (Internal AC Coupled)	SMPM/P
2	Out	Signal Outtput (Internal AC Coupled)	SMPM/P
3	Vdd	Supply Voltage (5V)	Pin header
4	Vss	Supply Voltage (-3.3V)	Pin header
5	G	Ground	Pin header
6	VR	Internal use, do not rotate the screw.	Potentiometer

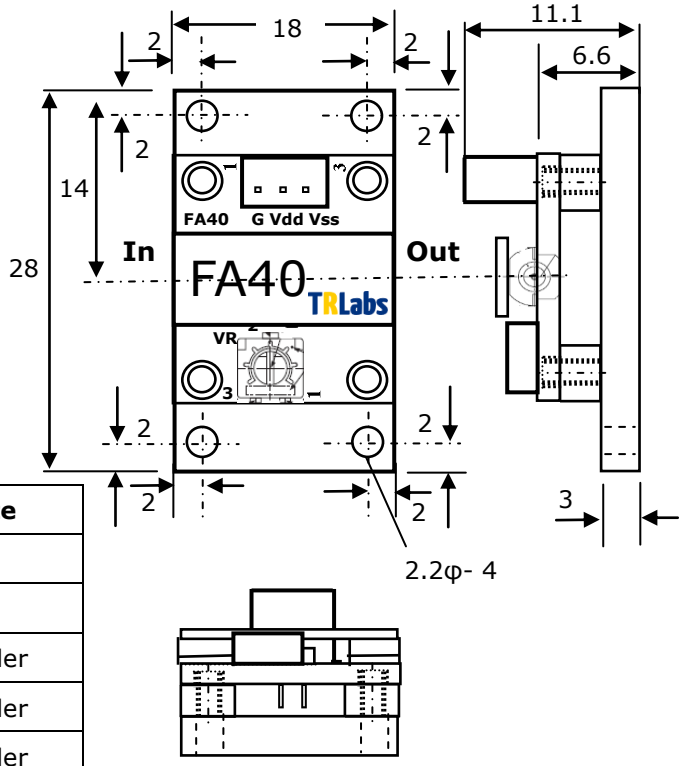


Fig. 1 Module structure

4. Absolute maximum ratings

Related terminal	Parameter	Symbol	Unit	Min	Max
Vdd	Applied voltage of Vdd	Vdd	V		5.5
Vss	Applied voltage of Vss			-4	0
In	Apply voltage of In	Pin	dBm		+15
	Storage temperature	Tst	Degree C	-40	80

5. Characteristics (Ta=25 [Degree C])

Related terminal	Parameter		Symbol	Unit	Specification		
					Min	Typ	Max
In, Out	Gain	at 32 GHz	S21-32	dB		12	

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	See Fig.2	at 28 GHz	S21-28	dB		15	
	Isolation		S12	dB	See Fig.2		
In	Input return loss	at 32 GHz	S11-32	dB		> 7	
		at 28 GHz	S11-28	dB		> 10	
Out	Output return loss	at 32 GHz	S22-32	dB		> 4	
		at 28 GHz	S22-28	dB		> 10	
Out	1 dB compression output power		P1B	dBm		21	
Vdd	Supply voltage		Vdd	V	4.75	5	5.25
	Supply Current of Vdd		Idd	mA		300	
Vss	Supply voltage		Vss	V	-3.45	-3.3	-3.15
	Supply Current of Vss		Iss	mA		1	
	Power dissipation		Pdis	W		1.5	

6. Typical performance (Vdd=5.0 [V], Ta=25 [Degree C])

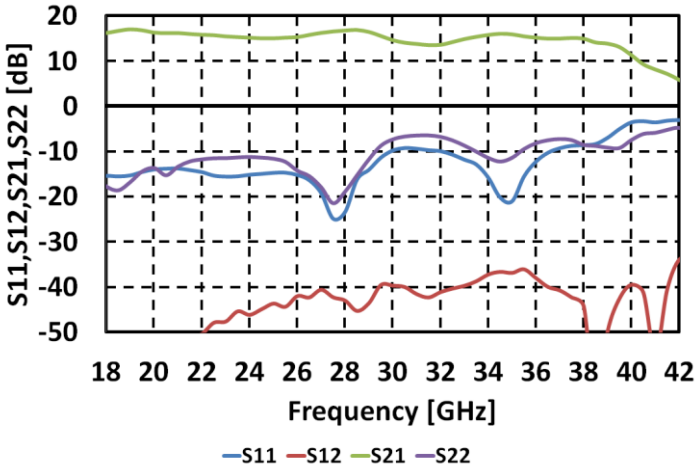

Fig.2 S11, S12, S21, S22 vs Frequency

7. Precaution

This product uses ESD sensitive high-speed devices. We recommend that the product is handled with appropriate precaution described below.

1) Connect the ground (G) terminal of FA40A to the highest quality ground line in the room and connect this terminal to the ground terminal of test equipment as well.
2) Use ESD protection wrist strap which is connected FA40A ground.
3) Avoid abnormal mechanical shock.

8. Attachment

1) 30 cm Jumper cable with pin header socket: 1

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2014/3/14
Datasheet
VA15A_DS Rev.1.0

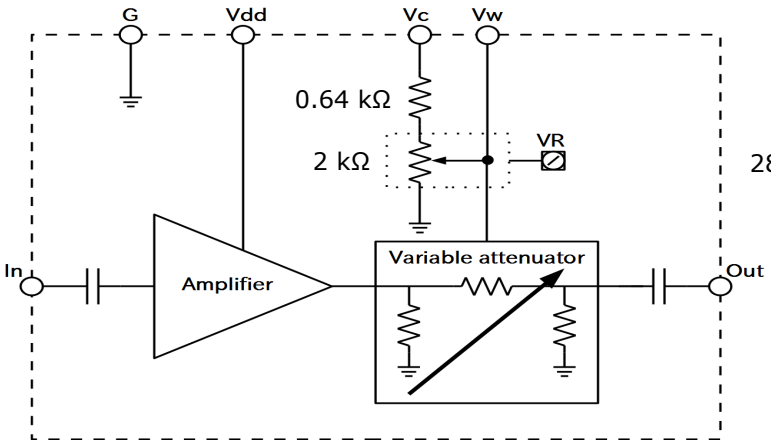
6-18GHz Variable Gain Amplifier

VA15A

1. Application

Amplification with output amplitude adjustment for sub-rate clock (10 ~ 16 GHz) of 20 ~ 32 Gb/s optical transmission system, etc

2. Block diagram



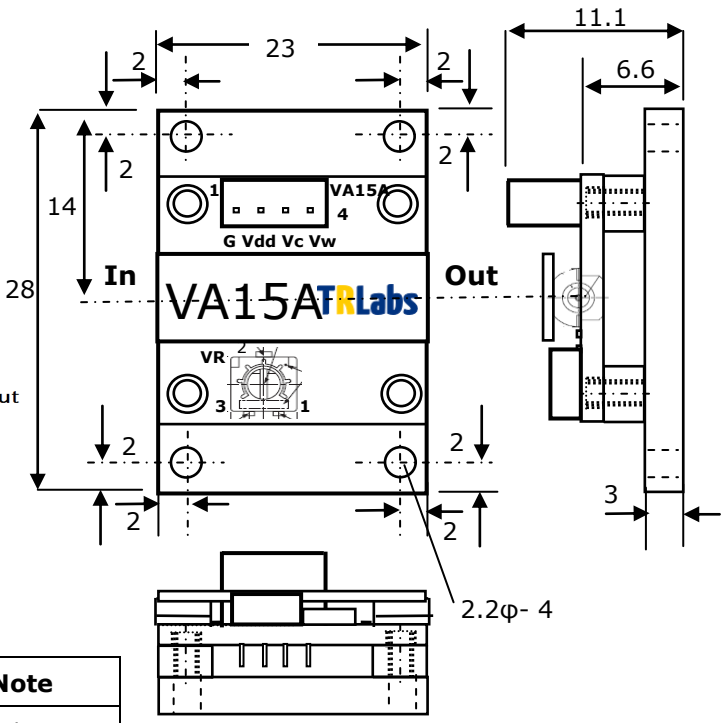


Fig. 1 Module structure

3. Terminal description

No	Name	Function	Note
1	In	Signal Input (Internal AC Coupled)	SMPM/P
2	Out	Signal Output (Internal AC Coupled)	SMPM/P
3	G	Ground	Pin header
4	Vdd	Supply Voltage for amplifier (5V)	Pin header
5	Vc	Supply voltage (-3.3 V)	Pin header
6	Vw	Wiper voltage of potentiometer (Apply this voltage at most clock wise)	Pin header
7	VR	Screw of variable resister	Potentiometer

4. Absolute maximum ratings

Terminal	Parameter	Symbol	Unit	Min	Max
Vdd	Supply voltage of amplifier	Vdd	V		6
Vc	Supply voltage of variable attenuator	Vc	V		-4
Vw	Supply voltage of wiper voltage of potentiometer	Vw	V		-4
In	Signal Input	Pin	dBm		+15

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	Storage temperature	Tst	Degree C	-40	80

5. Characteristics (Ta=25 [Degree C])

Related terminal	Parameter		Symbol	Unit	Specification		
					Min	Typ	Max
In, Out	Operation frequency		BW	GHz	6		18
VR, Vw	Maximum Gain	|S21|max at 6GHz	G6max	dB		12	
	(at most clockwise VR)	|S21|max at 10GHz	G10max			16	
	See Fig.2	|S21|max at 18GHz	G18max			9	
	Minimum Gain	|S21|min at 6GHz	G6min	dB		-11	
	(at most counter-clockwise VR)	|S21|min at 10GHz	G10min			-12	
	See Fig.2	|S21|min at 18GHz	G18min			-23	
	Dynamic range (Gmax-Gmin)		Dy	dB		30	
In	Input return loss		MAG|S11|	dB	See Fig.4		
Out, In	Output return loss		MAG|S22|	dB	See Fig.5		
	Input power for 1 dB compression at any gain		P-1dB	dBm		4	
Vdd	Supply voltage of amplifier		Vdd	V	4.75	5	5.25
Vc	Supply voltage of variable attenuator		Vc	V	-3.5	-3.3	-3.1
Vw	Wiper voltage of potentiometer for gain control		Vw	V	-2.5		0
Vdd	Supply Current of Vdd		Idd	mA		90	
Vc	Supply current of Vc		Ic	mA		1.5	
Vdd,Vc	Power dissipation		Pdis	W		0.5	0.7

6. Typical Performance (Vdd=5.0 [V], Ta=25 [Degree C])

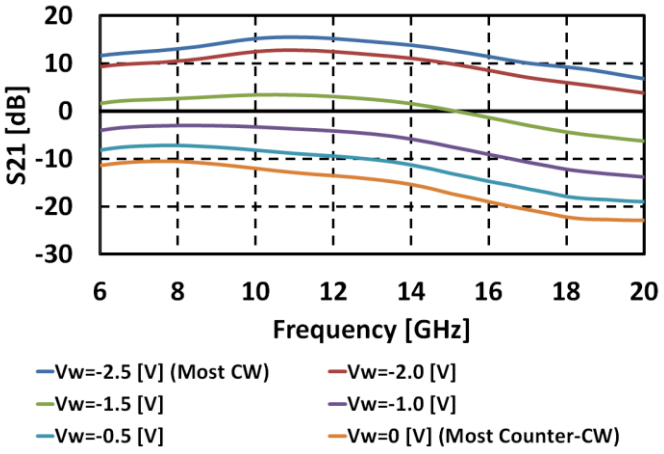


Fig. 2 S21 vs Frequency over Vw

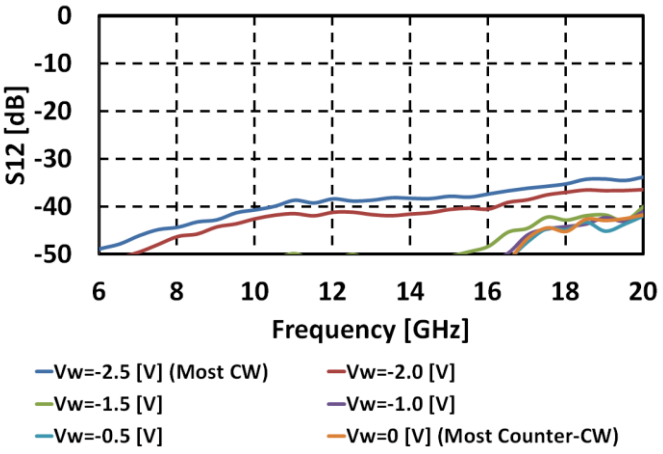


Fig. 3 S12 vs Frequency over Vw

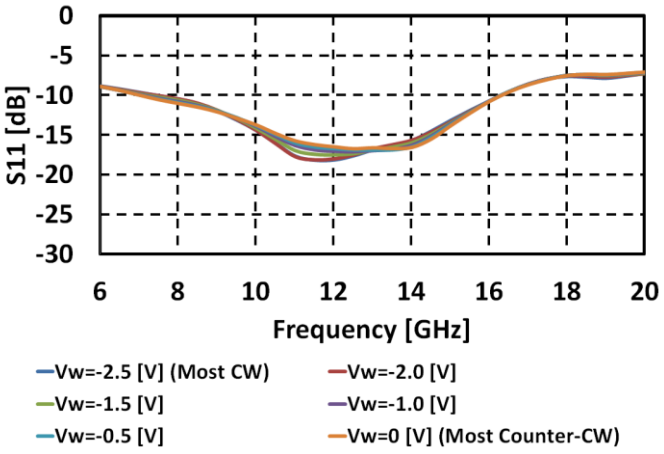


Fig. 4 S11 vs Frequency over Vw

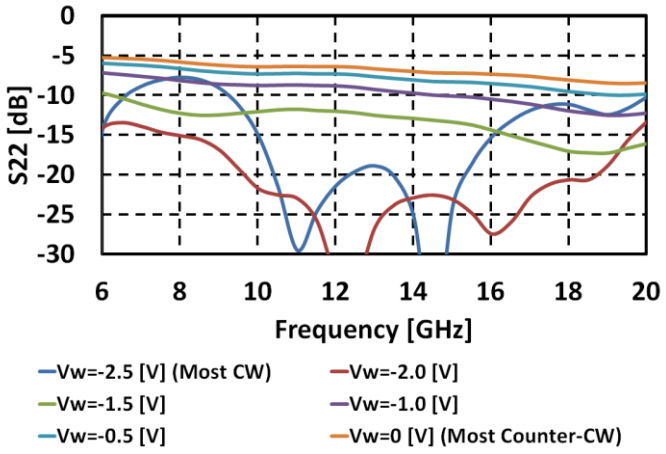


Fig. 5 S22 vs Frequency over Vw

7. Precaution

This product uses ESD sensitive high-speed devices. Handle it with appropriate precaution described below.

1) Connect the ground (G) terminal of VA15A to the highest quality ground line in the room and connect this terminal to the ground terminal of test equipment as well.
2) Use ESD protection wrist strap which is connected to VA15A ground.
3) Avoid abnormal mechanical shock.

8. Attachment

1) 30 cm Jumper cable with pin header socket: 1

2014/3/14
Datasheet
VA30A_DS Rev.1.0

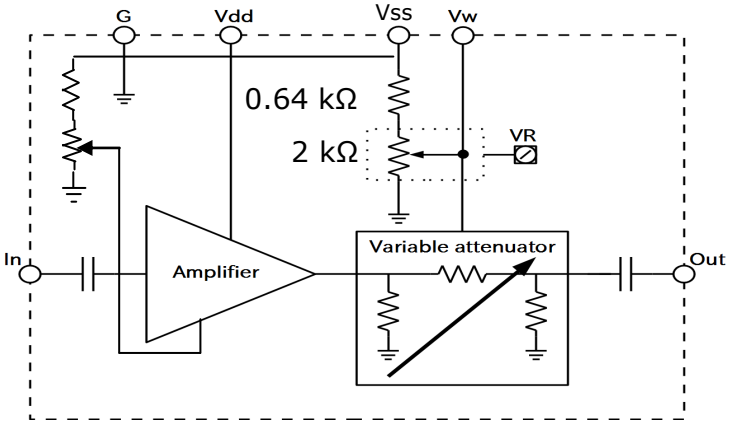
18-32GHz Variable Gain Amplifier

VA30A

1. Application

Amplification with output amplitude adjustment for full-rate clock (20 ~ 32 GHz) of 20 ~ 32 Gb/s optical transmission system, etc

2. Block diagram



3. Terminal description

No	Name	Function	Note
1	In	Signal Input (Internal AC Coupled)	SMPM/P
2	Out	Signal Output (Internal AC Coupled)	SMPM/P
3	G	Ground	Pin header
4	Vdd	Supply Voltage for amplifier (5V)	Pin header
5	Vss	Supply voltage (-3.3 V)	Pin header
6	Vw	Wiper voltage of potentiometer	Pin header
7	VR1	Screw of variable resister	Potentiometer
8	VR2	Internal use, do not rotate the screw.	Potentiometer

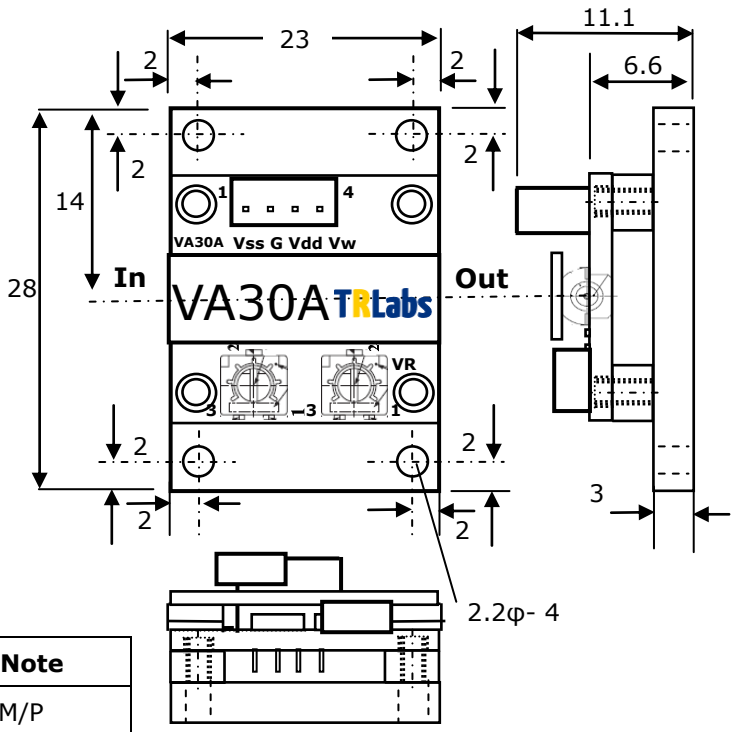


Fig.1 Module structure

4. Absolute maximum ratings

Related terminal	Parameter	Symbol	Unit	Min	Max
Vdd	Supply voltage of amplifier	Vdd	V		6
Vss	Supply voltage of amplifier and variable attenuator	Vc	V		-4
Vw	Supply voltage of wiper voltage of potentiometer	Vw	V		-4
In	Signal Input	Pin	dBm		+15

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Takada RF Labs

2014/3/14
Datasheet
VA30A_DS Rev.1.0

	Storage temperature	Tst	Degree C	-40	80

5. Characteristics (Ta=25 [Degree C])

Related terminal	Parameter		Symbol	Unit	Specification		
					Min	Typ	Max
In, Out	Operation frequency		BW	GHz	18		32
VR, Vw	Maximum Gain	|S21|max at 20GHz	G20max	dB		15	
	(at most clockwise VR)	|S21|max at 25GHz	G25max			13	
	See Fig.2	|S21|max at 28GHz	G28max			12	
	Minimum Gain	|S21|min at 20GHz	G20min	dB		-16	
	(at most counter-clockwise VR)	|S21|min at 25GHz	G25min			-18	
	See Fig.2	|S21|min at 28GHz	G28min			-18	
	Dynamic range (Gmax-Gmin)		Dyr	dB		31	
In	Input return loss		MAG|S11|	dB	See Fig.4		
Out, In	Output return loss		MAG|S22|	dB	See Fig.5		
	Input power for 1 dB compression for any gain setting		P-1dB	dBm		3	
Vdd	Supply voltage of amplifier		Vdd	V	4.75	5	5.25
Vss	Supply voltage of amplifier and variable attenuator		Vc	V	-3.5	-3.3	-3.1
Vw	Wiper voltage of potentiometer for gain control		Vw	V	-2.5		0
Vdd	Supply Current of Vdd		Idd	mA		280	
Vss	Supply current of Vc		Ic	mA		2	
Vw	Supplu current of Vw		Iw	mA		2	
Vdd,Vc	Power dissipation		Pdis	W		1.5	

6. Typical Performance (Vdd=5.0 [V], Ta=25 [Degree C])

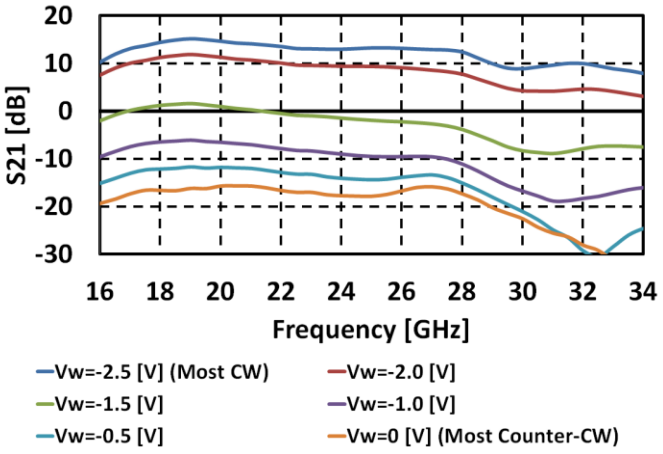

Fig. 2 S21 vs Frequency over Vw

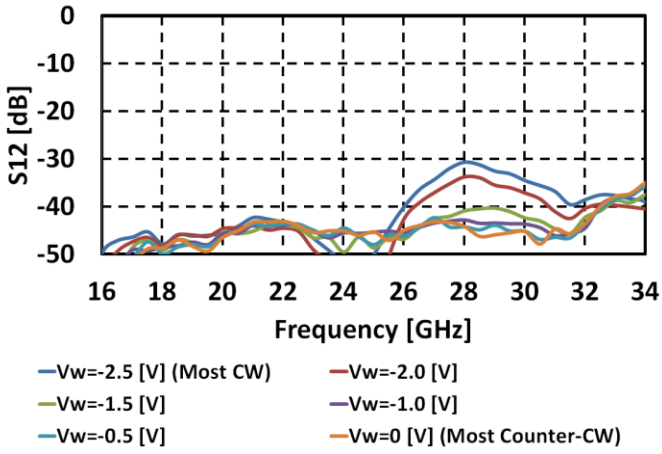

Fig. 3 S12 vs Frequency over Vw

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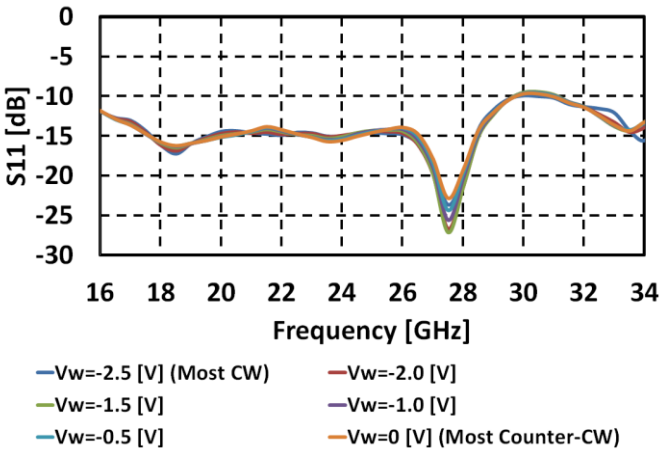


Fig. 4 S11 vs Frequency over Vw

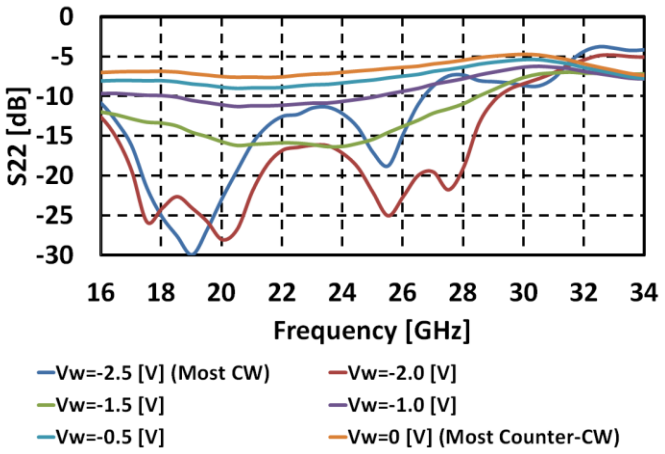


Fig. 5 S22 vs Frequency over Vw

7. Precaution

This product uses ESD sensitive high-speed devices. Handle it with appropriate precaution described below.

1) Connect the ground (G) terminal of VA30A to the highest quality ground line in the room and connect this terminal to the ground terminal of test equipment as well.
2) Use ESD protection wrist strap which is connected to VA30A ground.
3) Avoid abnormal mechanical shock.

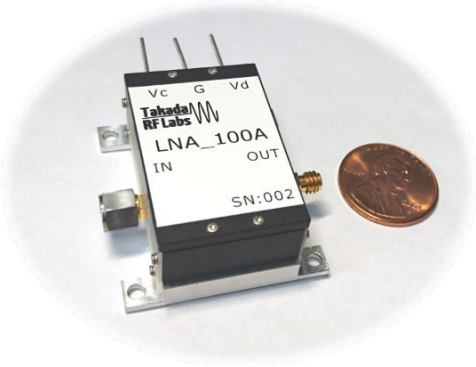
8. Attachment

1) 30 cm Jumper cable with pin header socket: 1

Advanced Product Information
LNA_100A_API_Rev1.1_170516

65-110 GHz Amplifier Module

LNA_100A



1. Feature

1) Wideband : 65-110 GHz output
2) Variable gain
3) Coaxial connector interface: 1mm (P or J)

2. Application

Signal amplification for E-band (71-86 GHz) wireless communication
Signal amplification for 70/80 GHz band radar system
Signal amplification for W-band (75-110GHz) security application (Millimeter wave imaging)

3. Block diagram

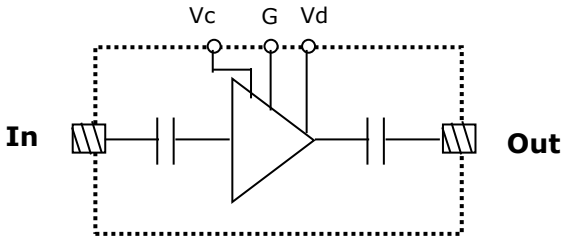


Fig. 1 Block diagram

4. Module structure

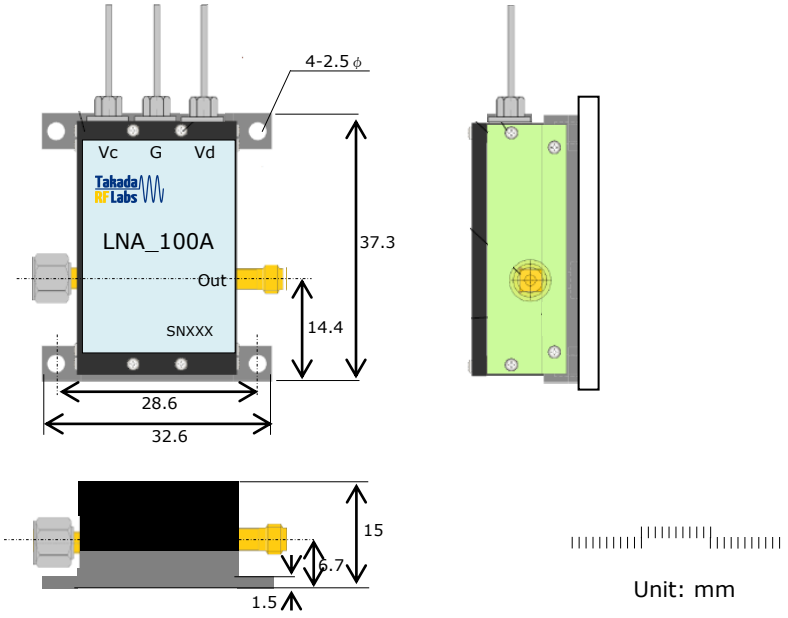


Fig. 2 Module structure

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5. Terminal description

Name	Function	Note
In	Signal Input (Internally AC Coupled)	1mm (P or J)
Out	Signal Output (Internally AC Coupled)	1mm(P or J)
Vd	Power supply (+1V)	EMI filter
Vc	Gain control (0 V)	EMI filter
G	Ground (0 V)	EMI filter

6. Absolute maximum ratings

Related terminal	Parameter	Symbol	Unit	Min	Max
IN	Input power to In (-0.1V<Vc< 0.1V	Pin	dBm		0
Vd	Applied voltage to Vd	Vd	V	+2	
	Current of Vd	ID	mA		50
Vc	Applied voltage to Vc	Vc	V	-2	+0.6
Tmbop	Operating module bottom temperature (no condensation)	Tmbop	℃	+5	+70
Tstrg	Storage temperature	Tst	℃	-40	85

7. Recommended operating condition and DC characteristics

Related terminal	Parameter	Symbol	Unit	Specification		
				Min	Typ	Max
Vd	Supply voltage of Vd	Vd	V		+1.0	+1.2
Vd	Supply voltage of Vc	Vc	V		0	0.1
	Operating module bottom temperature	Tmbop	℃		25	
Vd	Supply current of Vd (@Vd=1.0 V, VC=0.0V)	Id	mA		33	
Vc	Supply current of Vc (@Vd=1.0 V, VC=0.0V)	Ic	mA		<1	

8. RF Performance

Tmbop =25℃

Parameter		Symbol	Unit	Specification		
				Min.	Typ.	Max.
Gain		S21	dB		See Fig.3, Fig.4	
Input return loss		S11	dB		See Fig.3	
Output return loss		S22	dB		See Fig.3	
Isolation		S12	dB		See Fig.3	
Noise figure @ 75 to 110 GHz (on wafer measurement)		NF	dB		3.3	
3dB compression output point	@78 GHz	Pout-3dB	dBm		+1	
	@96 GHz				-6.2	
Saturation output power	@78 GHz	Psat	dBm		+1.5	
	@96 GHz				-1.0	

9. Typical performance

(measured with Keysight VNA N5247A + N5261A + N5250CX10)

1) S-parameter

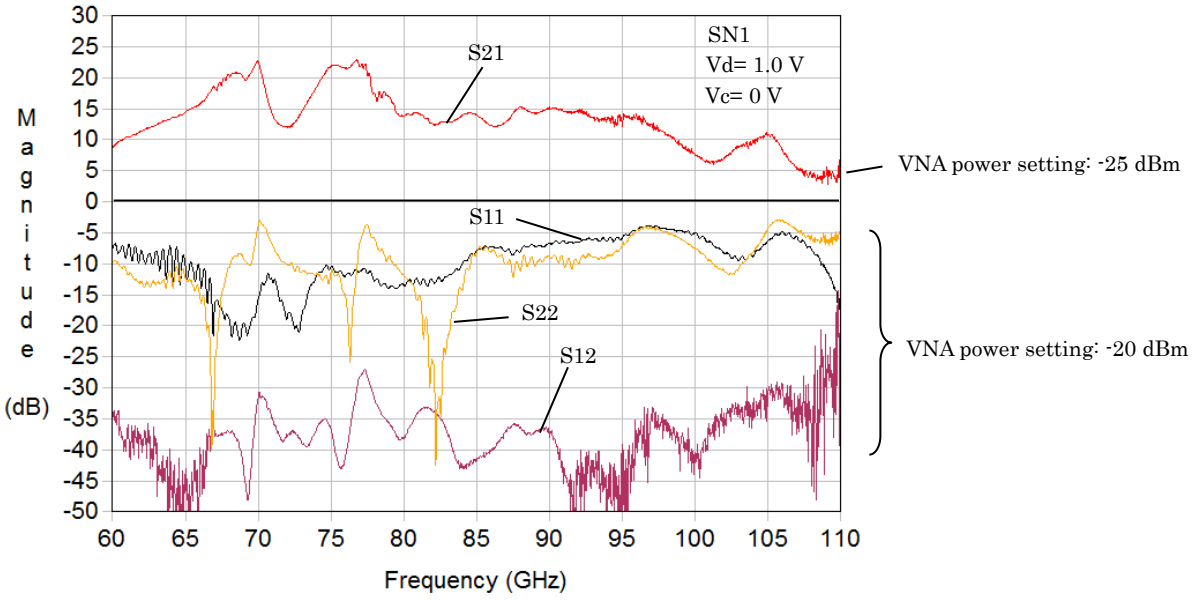
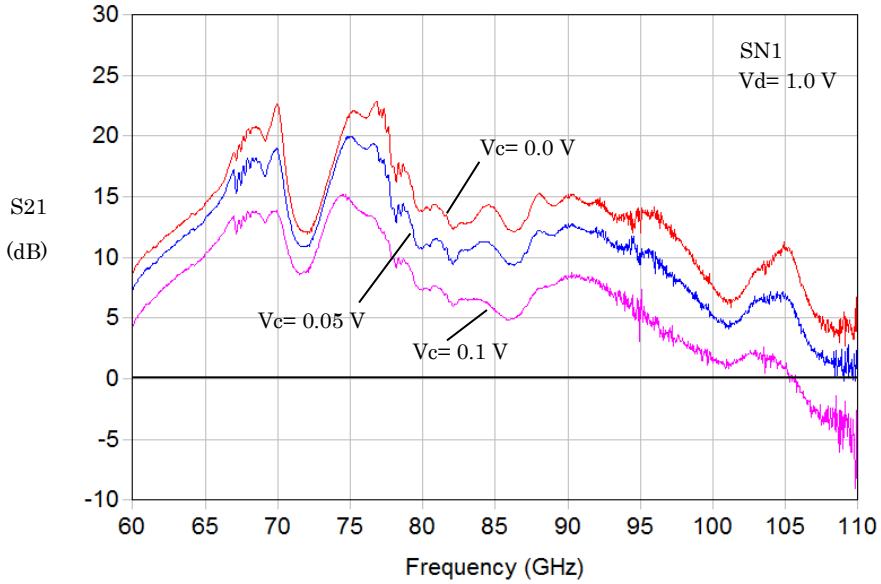


Fig. 3 S-parameter

2) Variable gain characteristics



S21 as a function of control voltage Vc

10. Precaution

(A) This product uses ESD sensitive high-speed devices. We recommend that the product is handled with appropriate precaution described below.

1) Connect the ground (G) terminal of module to the highest quality ground line in the room and connect this terminal to the ground terminal of test equipment as well.

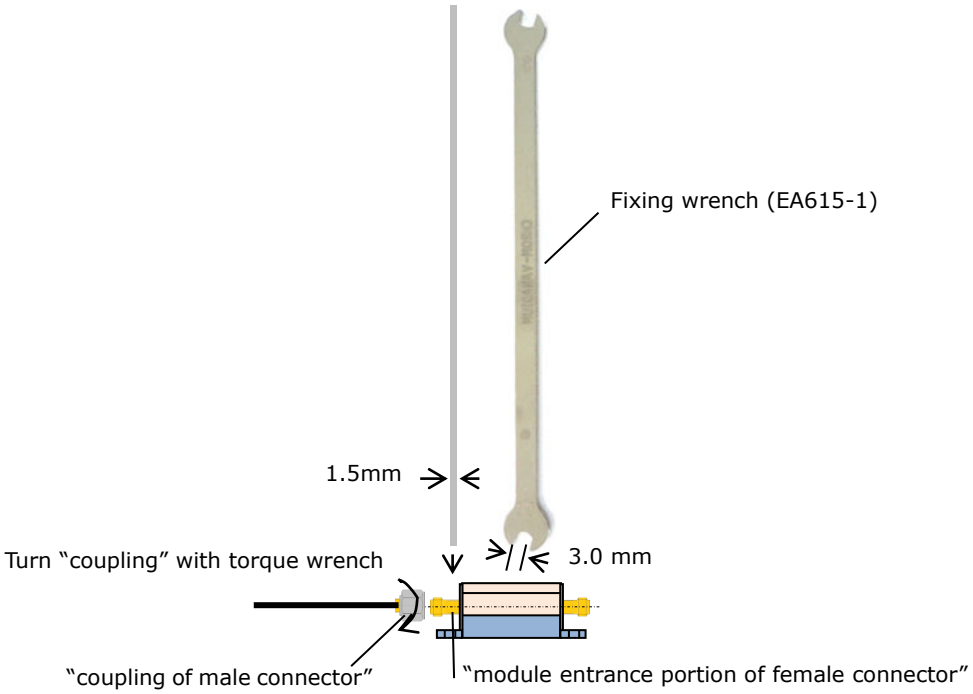
2) Use ESD protection wrist strap which is connected to module ground.

(B) When connecting 1mm-coaxial connector cable to the module, use "torque wrench" with torque of 45 N-cm.

Special note:

Turn "coupling of male connector" with torque wrench. At this time, you must use a "fixing wrench (EA615-1, made by ESCO)" which is put onto module entrance portion of female connector.

Do not turn the coupling without using the "fixing wrench", otherwise, it gives abnormal mechanical stress to the module and damages it.



(C) Avoid abnormal mechanical shock to the module.

2014/3/4
Datasheet
SG20A_DS Rev.1.0

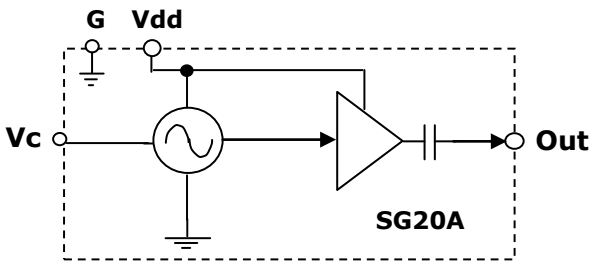
10-20 GHz Voltage Controlled Oscillator

SG20A

1. Application

Handy signal generation for sub-rate clock (10 ~ 16 GHz) of 20 ~ 32 Gb/s optical transmission system, etc

2. Block diagram



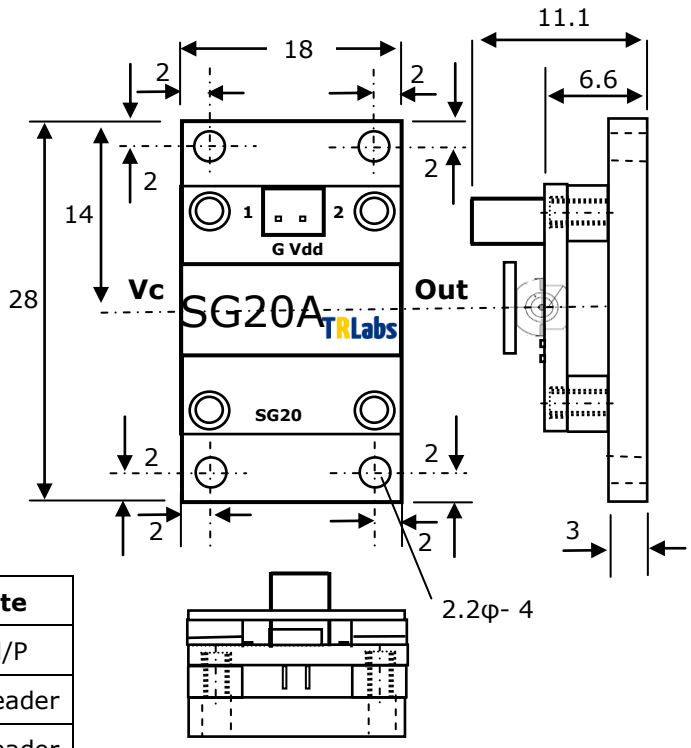


Fig. 1 Module structure

3. Terminal description

No	Name	Function	Note
1	Out	Signal Output (Internal AC Coupled)	SMPM/P
2	Vdd	Supply Voltage (5V)	Pin header
3	G	Ground	Pin header
4	Vc	Frequency control voltage	SMPM/P

4. Absolute maximum ratings

Related terminal	Parameter	Symbol	Unit	Min	Max
Vdd	Applied voltage of Vdd	Vdd	V		5.5
Vc	Apply voltage of Vc	Vc	V	-0.5	25
	Storage temperature	Tst	Degree C	-40	80

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Takada RF Labs

2014/3/4
Datasheet
SG20A_DS Rev.1.0

5. Characteristics (Ta=25 [Degree C])

Related terminal	Parameter	Symbol	Unit	Specification		
				Min	Typ	Max
Out	Output frequency (Typical)	Fout	GHz	10		20
	Output Power	Pout	dBm	See Fig.3		
Vc	Frequency Control voltage range		V	0 to 20 V (typ.) See Fig.2		
Vdd	Supply voltage	Vdd	V	4.75	5	5.25
Vdd	Supply Current of Vdd	Idd	mA		80	
Vc	Supply current of Vc	Ic	mA		0.05	
Vdd	Power dissipation	Pdis	W		0.40	

6. Typical performance (Vdd=5.0 [V] Ta=25 [Degree C])

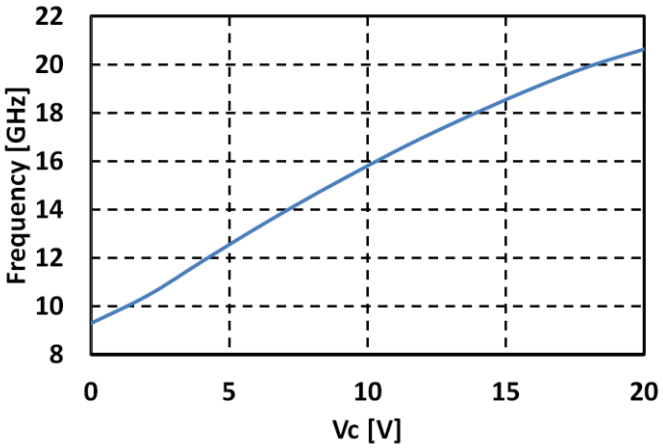

Fig.2 Output freq. vs Control voltage Vc

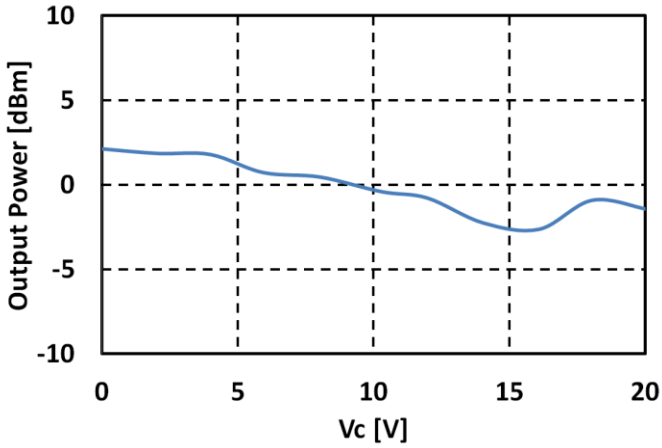

Fig.3 Output power vs Control voltage Vc

7. Precaution

This product uses ESD sensitive high-speed devices. We recommend that the product is handled with appropriate precaution described below.

1) Connect the ground (G) terminal of SG20A to the highest quality ground line in the room and connect this terminal to the ground terminal of test equipment as well.
2) Use ESD protection wrist strap which is connected to SG20A ground.
3) Avoid abnormal mechanical shock.

8. Attachment

1) 30 cm Jumper cable with pin header socket: 1
2) SMPM-DC conversion cable: 1

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2014/3/4
Datasheet
SG30A_DS Rev.1.0

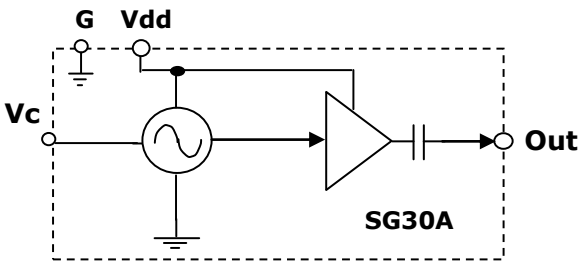
20-28 GHz Voltage Controlled Oscillator

SG30A

1. Application

Handy signal generation for full-rate clock (20 ~ 28 GHz) of 20 ~ 28 Gb/s optical transmission system, etc

2. Block diagram



3. Terminal description

No	Name	Function	Note
1	Out	Signal Output (Internal AC Coupled)	SMPM/P
2	Vdd	Supply Voltage (5V)	Pin header
3	G	Ground	Pin header
4	Vc	Frequency control voltage	SMPM/P

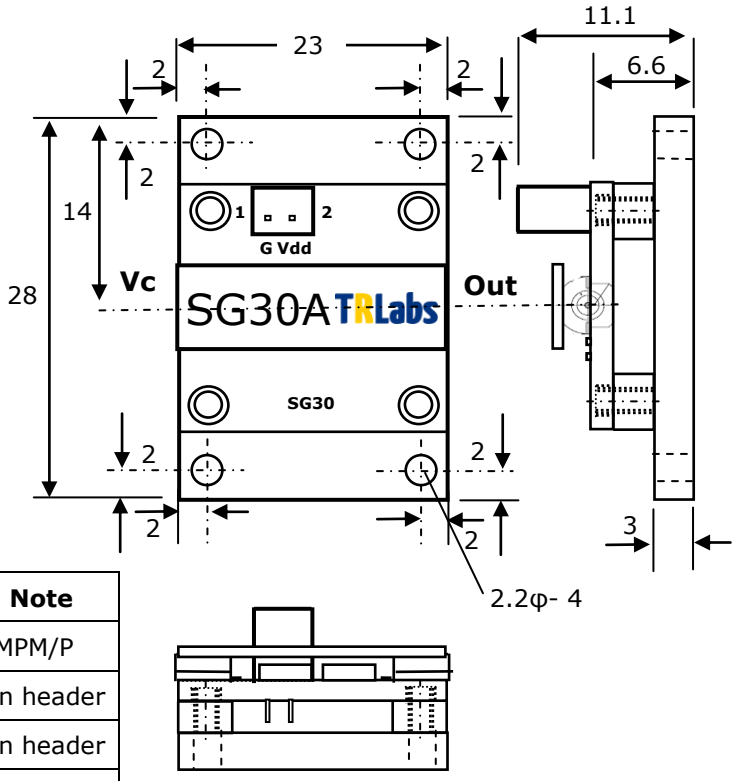


Fig.1 Module structure

4. Absolute maximum ratings

Related terminal	Parameter	Symbol	Unit	Min	Max
Vdd	Applied voltage of Vdd	Vdd	V		5.5
Vc	Apply voltage of Vc	Vc	V	-0.5	25
	Storage temperature	Tst	Degree C	-40	80

5. Characteristics (Ta=25 [Degree C)]

Related terminal	Parameter	Symbol	Unit	Specification		
				Min	Typ	Max
Out	Output frequency (Typical)	Fout	GHz	20		28

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	Output Power	Pout	dBm	See Fig.3		
Vc	Frequency Control voltage range		V	0 to 7 V (typ.) See Fig.2		
Vdd	Supply voltage	Vdd	V	4.75	5	5.25
Vdd	Supply Current of Vdd	Idd	mA		160	
Vc	Supply current of Vc	Ic	mA		0.05	
Vdd	Power dissipation	Pdis	W		0.8	

6. Typical performance (Vdd=5.0 [V], Ta=25 [Degree C])

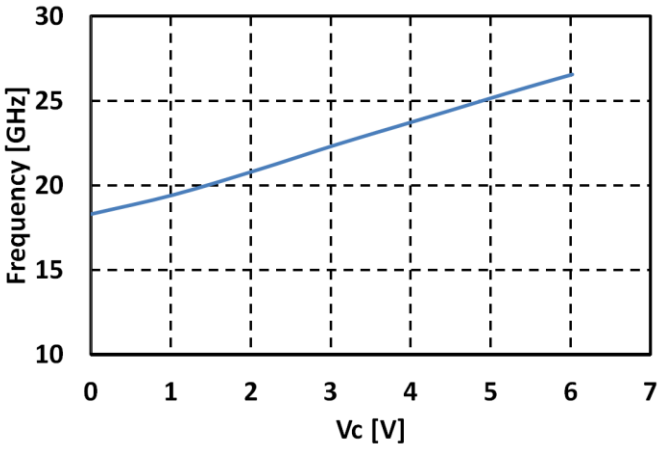

Fig.2 Output frequency vs Control voltage Vc

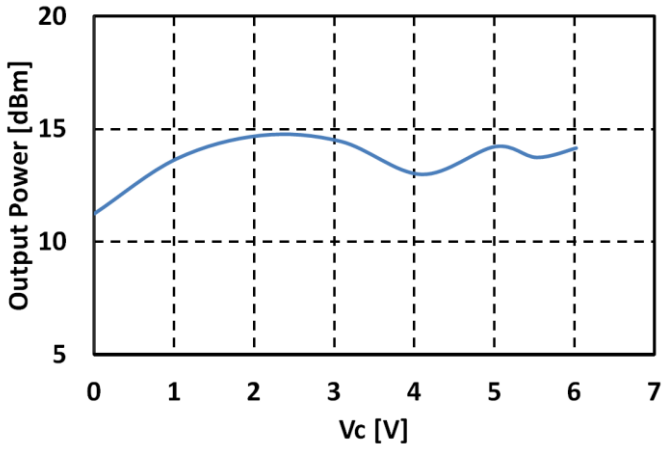

Fig.3 Output power vs Control voltage Vc

7. Precaution

This product uses ESD sensitive high-speed devices. We recommend that the product is handled with appropriate precaution described below.

1) Connect the ground (G) terminal of SG30A to the highest quality ground line in the room and connect this terminal to the ground terminal of test equipment as well.
2) Use ESD protection wrist strap which is connected to SG30A ground.
3) Avoid abnormal mechanical shock.

8. Attachment

1) 30 cm Jumper cable with pin header socket: 1
2) SMPM-DC conversion cable: 1

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2014/3/14
Datasheet
ML25B_DS Rev.1.0

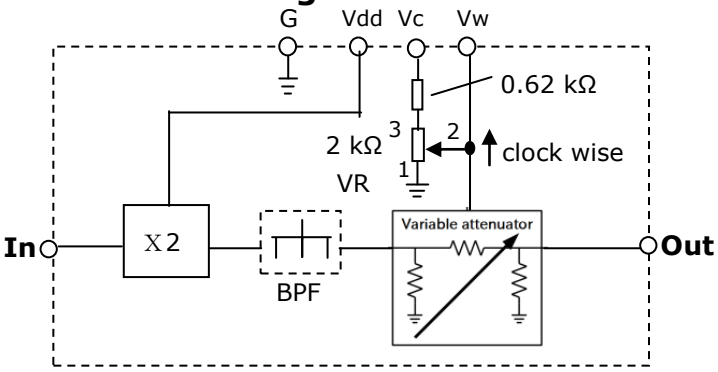
19-28 GHz out x2 freq. Multiplier with filter/variable ATT

ML25B

1. Application

x2 multiplication with filtering out fundamental frequency and output amplitude adjustment for full-rate clock (20 ~ 28 GHz) of 20 ~ 28 Gb/s optical transmission system, etc

2. Block diagram



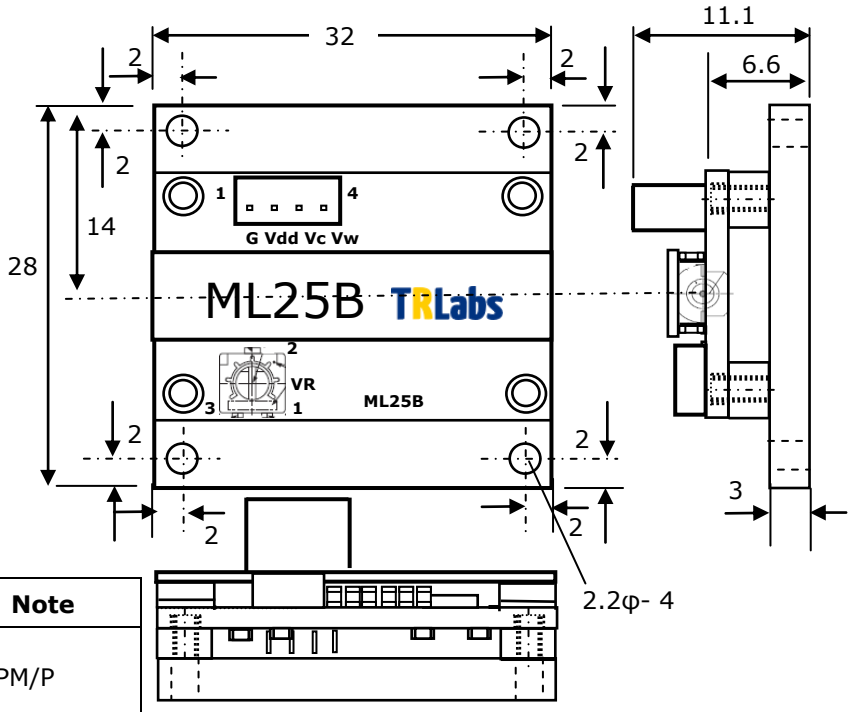


Fig. 1 Module structure

3. Terminal description

No	Name	Function	Note
1	In	Signal Input (Internal AC Coupled)	SMPM/P
2	Out	Signal Output (Internal AC Coupled)	SMPM/P
3	G	Ground	Pin header
4	Vdd	Supply Voltage for multiplier (5V)	Pin header
5	Vc	Supply voltage (-3.3 V)	Pin header
6	Vw	Wiper voltage of potentiometer (Apply this voltage at most clock wise VR with Vc left open)	Pin header
7	VR	Screw of variable resister	Potentiometer

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Takada RF Labs

2014/3/14
Datasheet
ML25B_DS Rev.1.0

4. Absolute maximum ratings

Terminal	Parameter	Symbol	Unit	Min	Max
Vdd	Supply voltage of multiplier	Vdd	V		6
Vc	Supply voltage of variable attenuator	Vc	V		-4
Vw	Supply voltage of wiper voltage of potentiometer	Vw	V		-4
In	Signal Input	Pin	dBm		+13
	Storage temperature	Tst	Degree C	-40	80

5. Characteristics (Ta=25 [Degree C])

Related terminal	Parameter		Symbol	Unit	Specification		
					Min	Typ	Max
In	Input frequency		fin	GHz	9.5		14
	Input power		Pin	dBm	+ 2		+7
	Input return loss	fout < 25 GHz	RLinL	dB		< 10	
		fout > 25 GHz	RLinH	dB		< 5	
Out	Output frequency		fout	GHz	19		28
	Maximum output power	fout 19 GHz		dB		+ 12	
		fout 28GHz		dB		+ 11	
	Output power attenuation range		Attra	dB		30	
	Output return loss		RLout	dB		>8	
	Fundamental wave rejection ratio		Rej20	dB		>20	
VR, Vw	Wiper voltage range (clockwise VR more negative)		Vw	V	-2.5		0
Vdd	Supply voltage of multiplier		Vdd	V	4.75	5	5.25
Vc	Supply voltage of variable attenuator		Vc	V	-3.5	-3.3	-3.1
Vdd	Supply Current of Vdd		Idd	mA		160	
Vc	Supply current of Vc		Ic	mA		1.5	
Vdd,Vc	Power dissipation		Pdis	W		0.8	

6. Precaution

This product uses ESD sensitive high-speed devices. Handle it with appropriate precaution described below.

1) Connect the ground (G) terminal of ML25B to the highest quality ground line in the room and connect this terminal to the ground terminal of test equipment as well.
2) Use ESD protection wrist strap which is connected to ML25B ground.
3) Avoid abnormal mechanical shock.

7. Attachment

1) 30 cm Jumper cable with pin header socket: 1

Takada RF Labs

Advanced Product Information
X3A_80A_API_Rev.1.0_170321

65-87 GHz Output Frequency Tripler Module

X3A_80A

1. Feature

1) Wideband : 65-87 GHz output
2) Coaxial connector interface: SMPM (P), 1mm (P or J)

2. Application

Signal amplification for E-band (71-86 GHz) wireless communication
, 70/80 GHz band radar system and security application (Millimeter wave imaging)

3. Functional block diagram

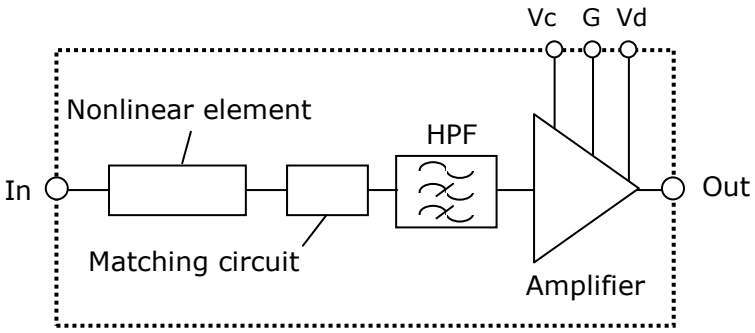
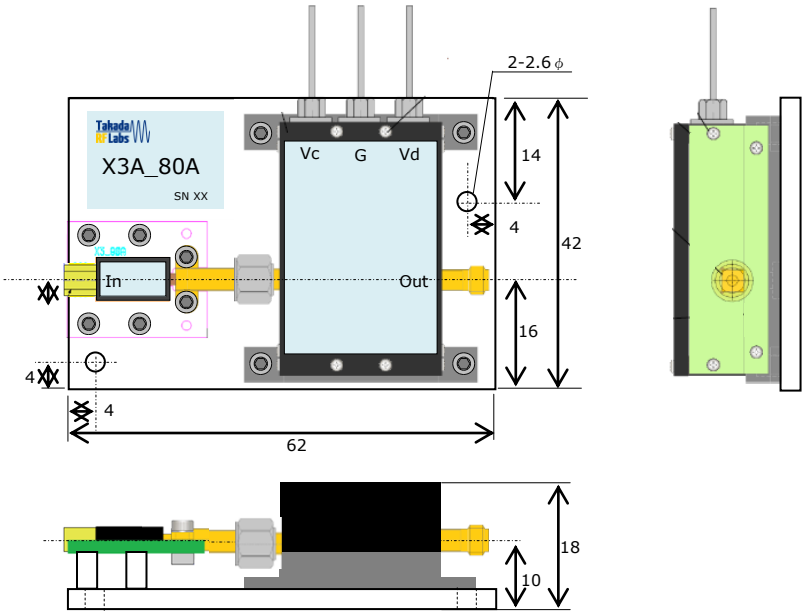


Fig. 1 Functional block diagram

4. Module structure



Unit: mm

Fig. 2 Module structure

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5. Terminal description

Name	Function	Note
In	Signal input (Internally DC Coupled to GND)	SMPM (P) , GPPO compatible Cable-assembly fixing base is available for users who want to use K-connector (2.92mm) interface.
Out	Signal output (Internally DC Coupled to GND)	1mm(P or J)
Vd	Power supply of output amplifier (+1 V)	EMI filter
Vc	Gain control (0 V)	EMI filter
G	Ground (0V)	EMI filter

6. Absolute maximum ratings

Related terminal	Parameter	Symbol	Unit	Min	Max
IN	Input power to In	Pin	dBm		+13 (TBD)
Vd	Applied voltage to Vd	Vd	V	+2	
	Current of Vd	ID	mA		50
Vc	Applied voltage to Vc	Vc	V	-2	+0.6
Tcop	Operating case bottom temperature (no condensation)	Tcop	℃	+5	+70
Tstrg	Storage temperature	Tst	℃	-40	85

7. Recommended operating condition and DC characteristics

Related terminal	Parameter	Symbol	Unit	Specification		
				Min	Typ	Max
Vd	Supply voltage of Vd	Vd	V		+1.0	
Vd	Supply voltage of Vc	Vc	V	-0.1	0	0.1
	Operating module bottom temperature (TBD)	Tmbop	℃		25	
Vd	Supply current of Vd	Id	mA		33	
Vc	Supply current of Vc	Ic	mA		<1	

8. RF Performance

Tmbop=25℃

Related terminal	Parameter	Symbol	Unit	Specification		
				Min	Typ	Max
In	Signal input frequency	fin	GHz	21.66		29
	Signal input power	Pin	dBm		9	
Out	Signal output frequency	Fout	GHz	65		87
	Signal output power	Pout	dBm	0 dBm typ. @75 GHz, See Fig.3.		
	2nd harmonics suppression against Pout	SHS	dBc		<-16	

9. Typical performance

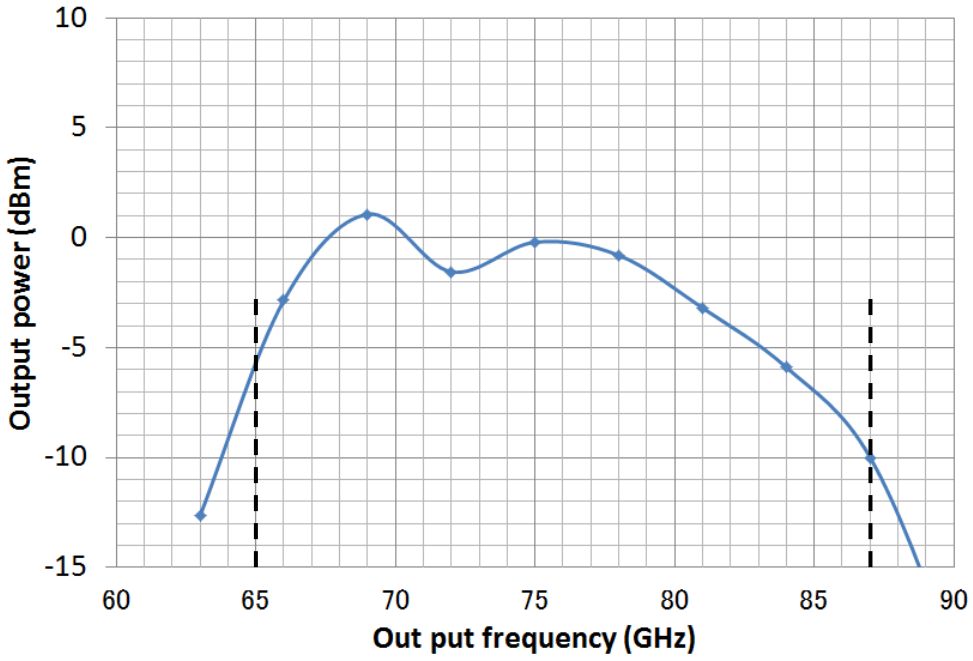


Fig. 3 Output power vs output frequency (Pin=+9 dBm, Vd=1.0 V, Vc=0 V)

10. Precaution

(A) This product uses ESD sensitive high-speed devices.
Use ESD protection wrist strap which is connected module ground.

(B)

(B-1) When connecting SMPM of the module to other connector interface devices, **use cables which have good connector-mating to Corning Gilbert GPPO™.**

(B-2) When connecting the SMPM cable to the module, use your hands only. **Do not use pliers.** This avoids the use of inadequate connectors to be forced to push onto the SMPM of the module with abnormal mechanical power. If using adequate connectors, it is very easy to push on by hands.

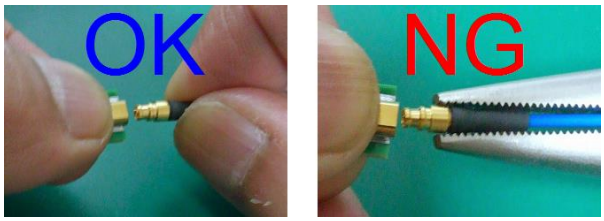


Fig.C1 How to connect the SMPM cable to the module

(B-3) When taking off the SMPM cable from the module, use SMPM **removal tool** such as shown below.

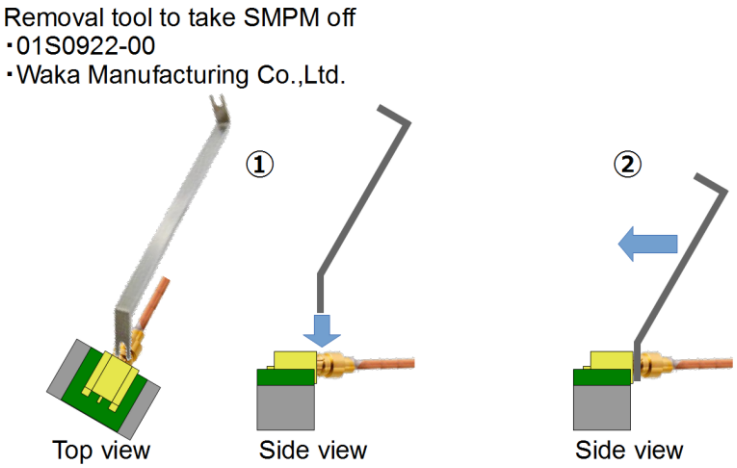


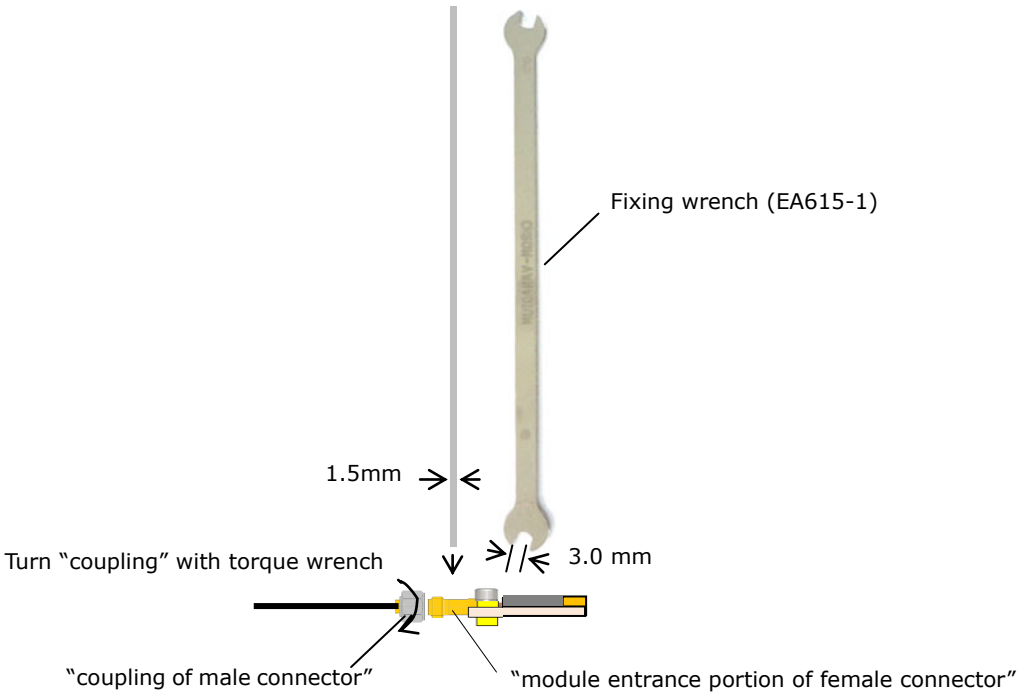
Fig.C2 How to take off SMPM cable from the module

(C) When connecting 1mm-coaxial connector cable to the module, use "torque wrench" with torque of 45 N-cm.

Special note:

Turn "coupling of male connector" with torque wrench. At this time, you must use a "fixing wrench (EA615-1, made by ESCO)" which is put onto module entrance portion of female connector.

Do not turn the coupling without using the "fixing wrench", otherwise, it gives abnormal mechanical stress to the module and damages it.



(D) Avoid abnormal mechanical shock to the module.

2014/3/14
Datasheet
PS14B_DS Rev.1.0

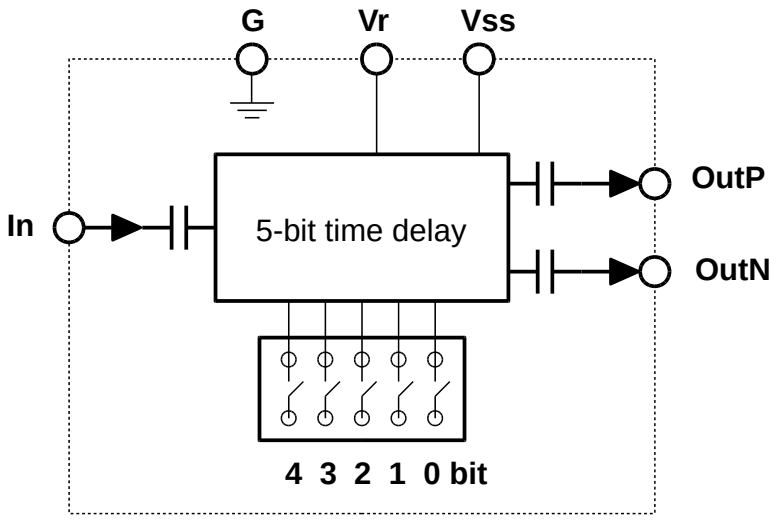
14 GHz / 12.5 Gb/s Time Delay with variable amplification

PS14B

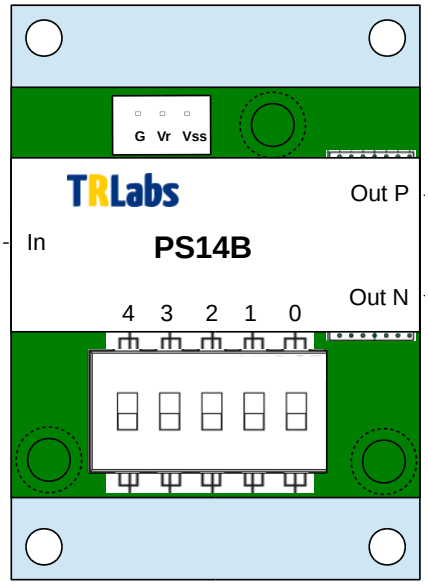
1. Application

Phase adjustment for sub-rate clock (10 to 14 GHz) of 20 to 28 Gb/s optical transmission system and 12.5 Gb/s data signals.

2. Block diagram



3. Top view



4. Terminal description

No	Name	Function	Note
1	In	Signal Input (Internal AC Coupled)	SMPM/P
2	OutP	Signal Output Positive (Internal AC Coupled)	SMPM/P
3	OutN	Signal Output Negative (Internal AC Coupled)	SMPM/P
4	G	Ground	Pin header
5	Vss	Supply Voltage (-3.3V)	Pin header
6	Vr	Amplitude adjustment of signal outputs (OutP and OutN)	Pin header
7	0	Delay Control 0^{th} bit (1:ON)	Switch
8	1	Delay Control 1^{st} bit (1:ON)	Switch
9	2	Delay Control 2^{nd} bit (1:ON)	Switch
10	3	Delay Control 3^{rd} bit (1:ON)	Switch

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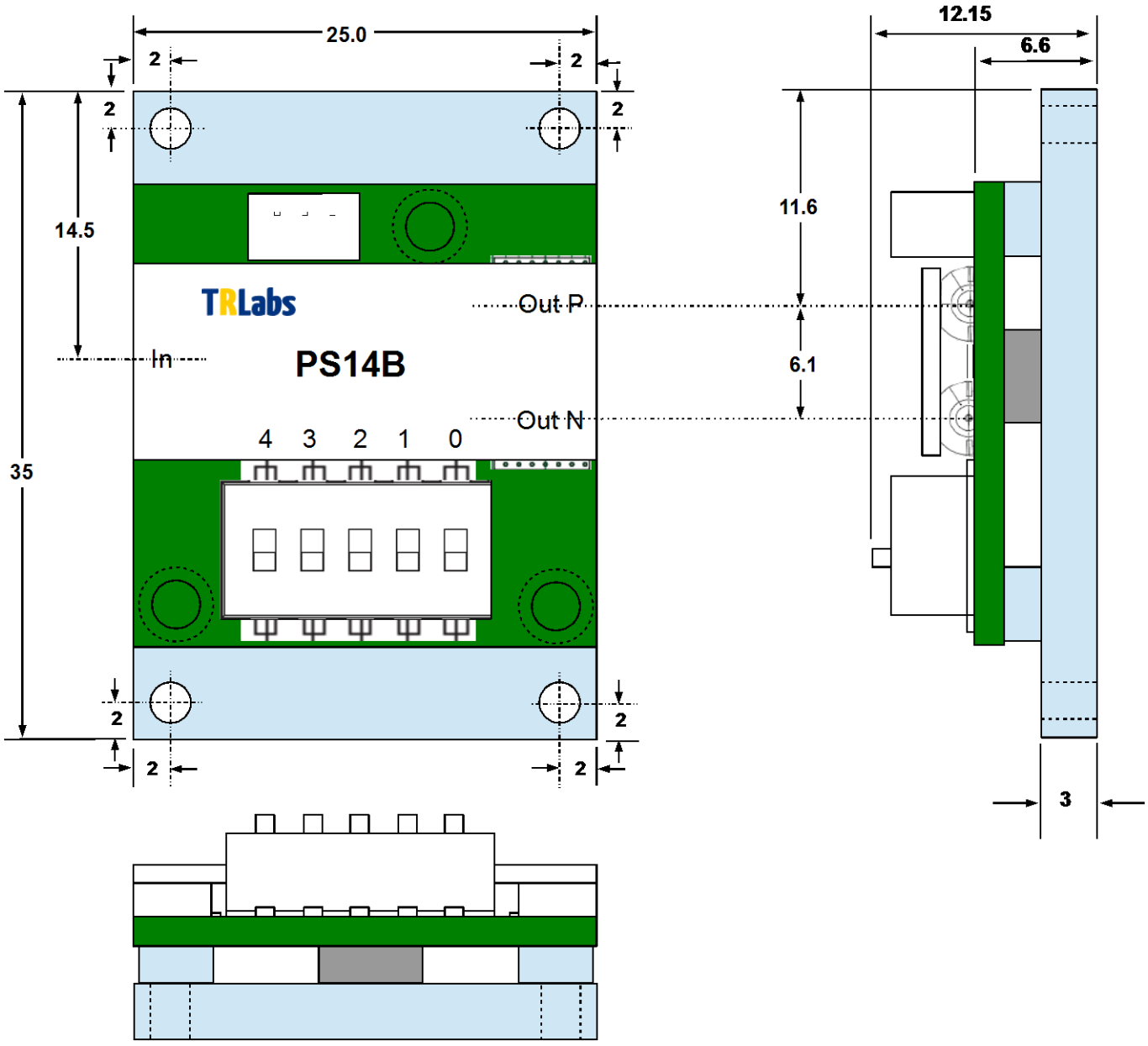
11	4	Delay Control 4th bit (1:ON)	Switch
12	G	Ground	Pin header

5. Structure (unit: mm, tolerance: ±0.1 mm)



6. Absolute maximum ratings

Related terminal	Parameter	Symbol	Unit	Min	Max
Vss	Applied voltage of Vss		V	-3.75	+0.5
Vr	Applied voltage of Vr		V	-2.0	+0.5
In	Apply voltage of In	Pin	dBm		+4 (1Vpp)
	Storage temperature	Tst	Degree C	-40	80

Takada RF Labs

2014/3/14
Datasheet
PS14B_DS Rev.1.0

7. Characteristics (Ta=25 [Degree C])

Related terminal	Parameter	Symbol	Unit	Specification		
				Min	Typ	Max
	Operating maximum frequency	fmax	GHz		14	
	Operating maximum bit-rate	Bmax	Gb/s		12.5	
In, OutP/OutN	Maximum time delay variation		ps		90	
	Time delay control		bit		5	
	Time delay setting resolution		ps		3	
	S21 Frequency dependence (large signal)		dB		See Fig.3	
In	Minimum input power Maximum input power Input return loss at 12.5 GHz, See Fig. 4	Pinmin Pinmax S11	dBm dBm dB		-30 (20 mVp p) 3 (0.9 Vpp) 8	
OutP/OutN	Output power at 12.5 GHz (Vr=0V) Output power at 12.5 GHz (Vr=0.4V) Output power at 12.5 GHz (Vr=－1.2V)	Pout	dBm		-4 (0.4 Vpp) -2.2 (0.6 Vpp) -6 (0.25 Vpp)	
	Output return loss at 12.5 GHz, See Fig. 4	S22	dB		7	
Vss	Supply voltage	Vss	V	-3.45	-3.3	-3.15
	Supply Current of Vss	Iss	mA		0.18	
Vr	Supply voltage for amplitude control of OutP/OutN	Vr	V	-1.2		+0.4
Pdiss	Power dissipation	Pdis	W		0.6	

8. Typical performance (Vss=－3.3 [V], Ta=25 [Degree C])

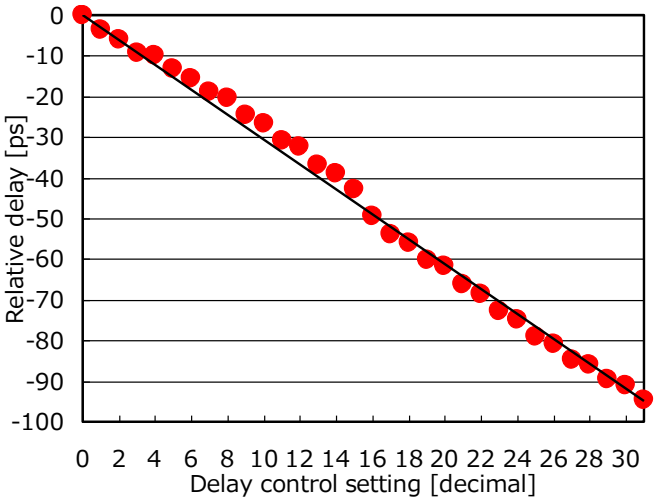


Fig. 1 Time delay vs control switch setting

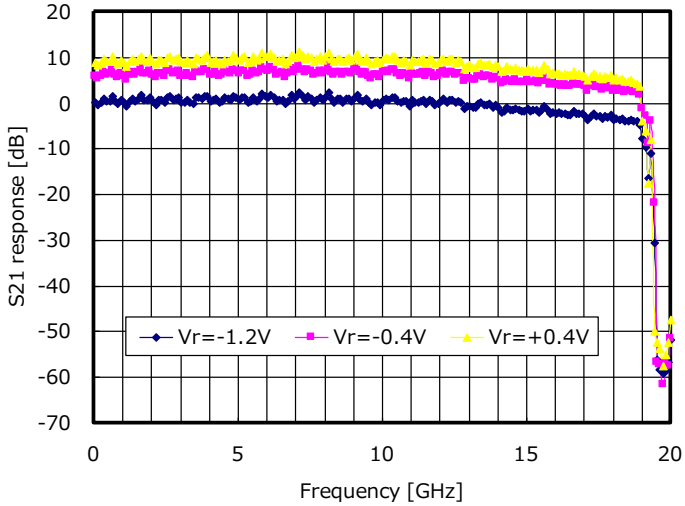


Fig. 2 RF output power vs Vr voltage

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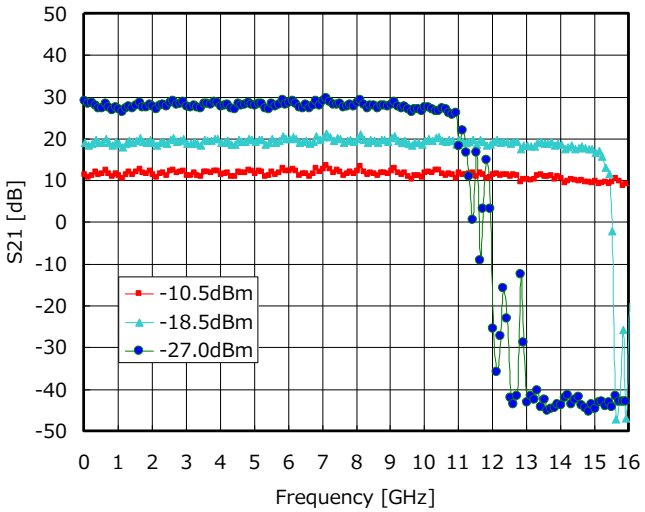

Fig. 3 S21 responses when input RF power was -10.5, -18.5, and -27.0 dBm.

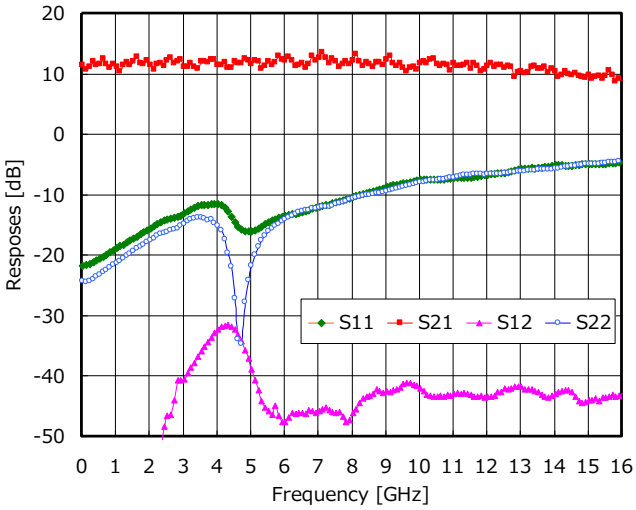

Fig. 4 S-parameter responses when input RF power was -10.5dBm.

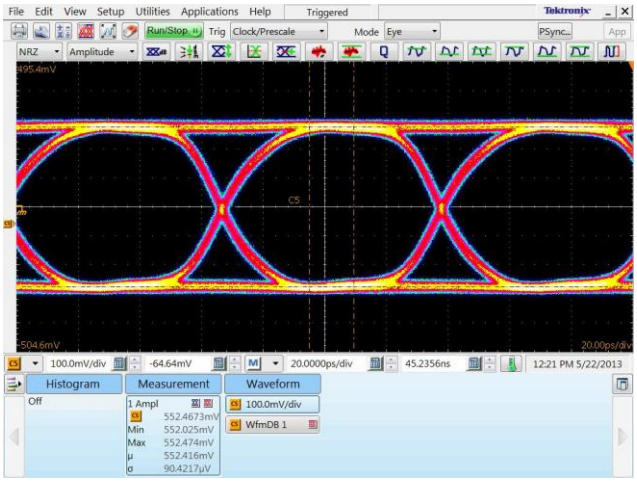

Fig. 5 14-Gb/s eye pattern when input voltage was 0.35Vpp.

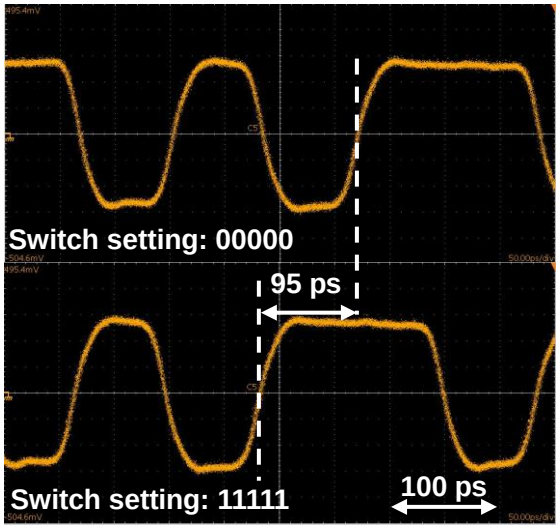

Fig. 6 12.5-Gb/s triggered patterns when delay control switch setting was (00000) and (11111).

9. Precaution

This product uses ESD sensitive high-speed devices. We recommend that the product is handled with appropriate precaution described below.

1) Connect the ground (G) terminal of PS14B to the highest quality ground line in the room and connect this terminal to the ground terminal of test equipment as well.
2) Use ESD protection wrist strap which is connected PS14B ground.
3) Avoid abnormal mechanical shock.

10. Attachment

1) 30 cm Jumper cable with pin header socket: 1

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2014/3/14
Datasheet
DV30A_DS Rev.1.0

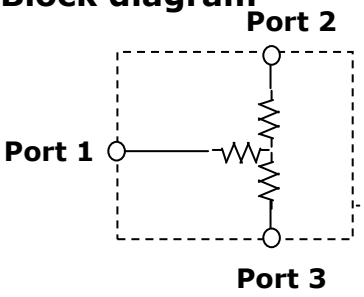
DC - 32 GHz Power Divider

DV30A

1. Application

Power divider for data and clock of 32 Gb/s optical transmission system, etc

2. Block diagram



3. Terminal description

No	Name	Function	Note
1	Port 1	Signal Input/Output 1	SMPM/P
2	Port 2	Signal Input/Output 2	SMPM/P
3	Port 3	Signal Input/Output 3	SMPM/P

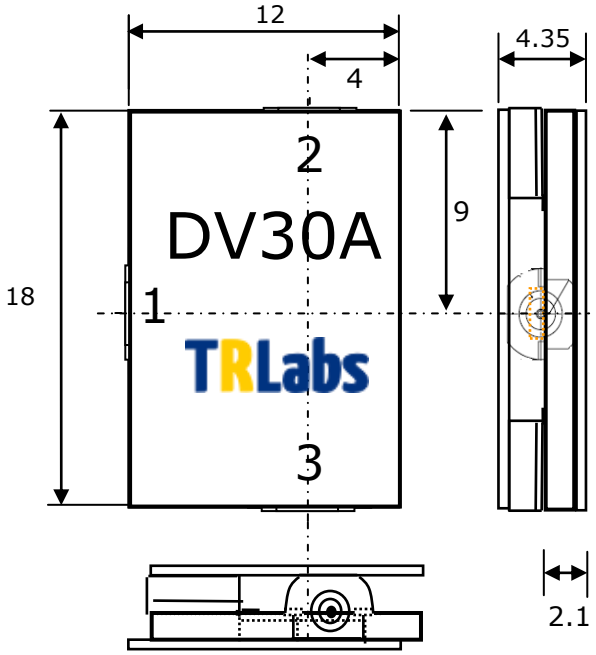


Fig. 1 Module structure

4. Absolute maximum ratings

Terminal	Parameter	Symbol	Unit	Min	Max
Port1, Port2, Port3, Port4	Applied power	Pin	dBm		> 18.5
	Storage temperature	Tst	Degree C	-40	80

5. Characteristics (Ta=25 [Degree C])

Related terminal	Parameter	Symbol	Unit	Specification		
				Min	Typ	Max
Port1, Port2,	Typical S21 (0 to 32 GHz) Other ports are 50 ohm terminated. See Fig.2	S21	dB	-12		-6
Port1, Port3	Typical S31 (0 to 32 GHz) Other ports are 50 ohm terminated. See Fig.3	S31	dB	-12		-6
Port1	S11 (0 to 32 GHz)	S11	dB	See Fig.4		
Port2	S22 (0 to 32 GHz)	S22	dB	See Fig.5		
Port3	S33 (0 to 32 GHz)	S33	dB	See Fig.6		
Port1, Port2, Port3, Port4	Input power	Pin	dBm			> 18.5

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6. Typical performance (Ta=25 [Degree C])

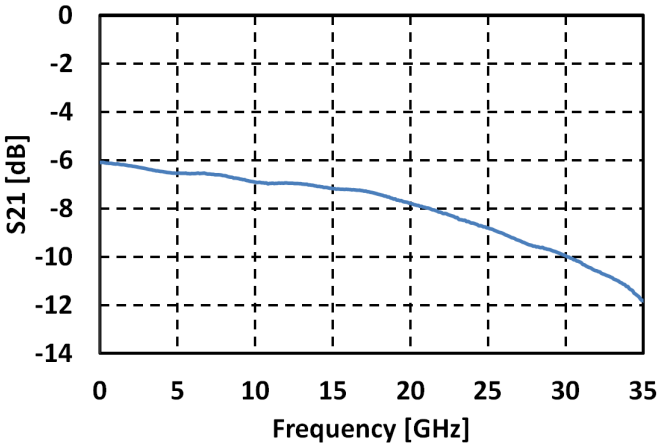

Fig. 2 S21 vs Frequency

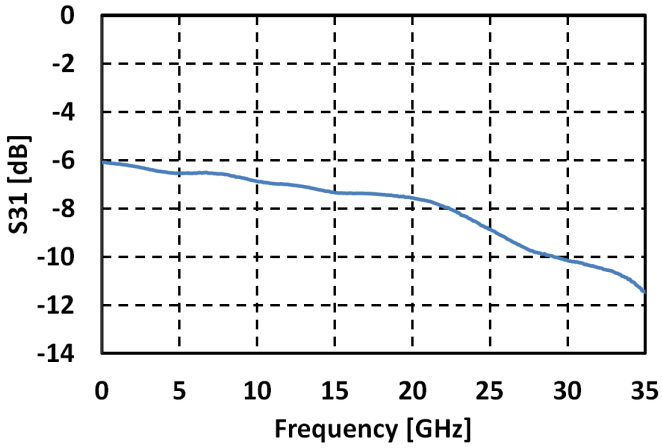

Fig. 3 S31 vs Frequency

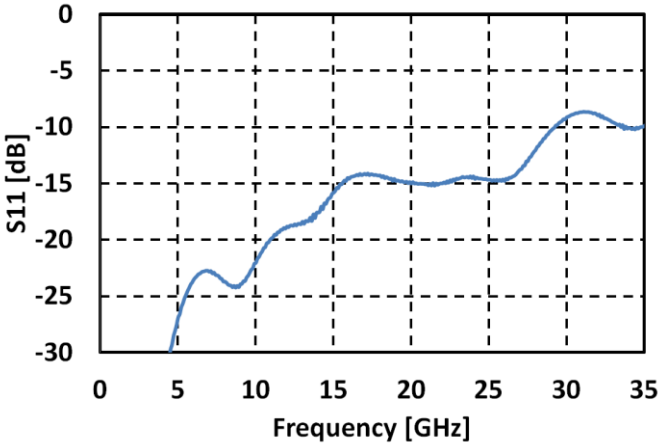

Fig. 4 S11 vs Frequency

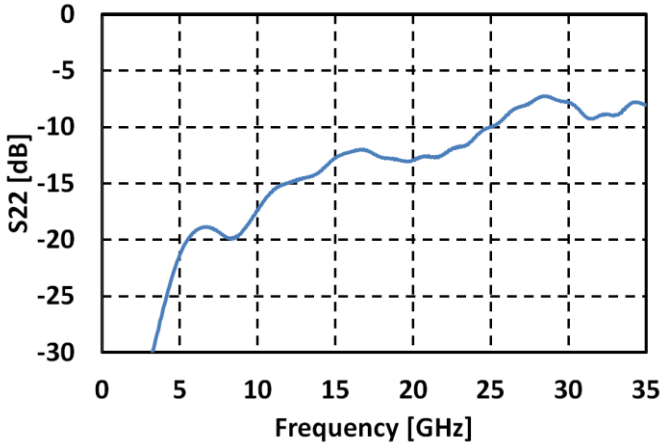

Fig. 5 S22 vs Frequency

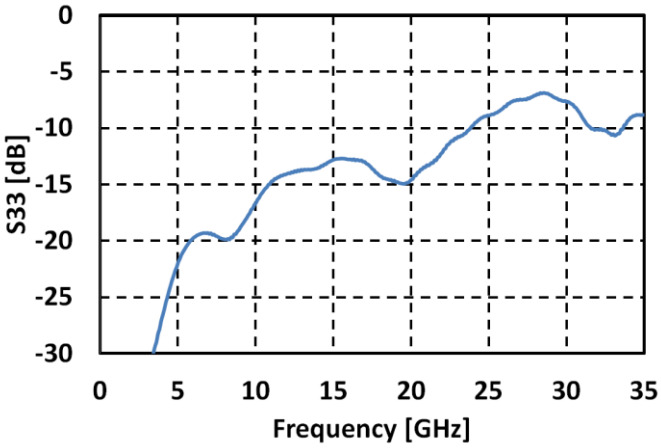

Fig. 6 S33 vs Frequency

2014/3/14
Datasheet
DV15A_DS Rev.1.0

10-18 GHz 3dB Directional Coupler

DV15A

1. Application

Low loss power divider for sub-rate clock (10 ~ 16 GHz) for 20 ~ 32 Gb/s optical transmission system, etc

2. Block diagram

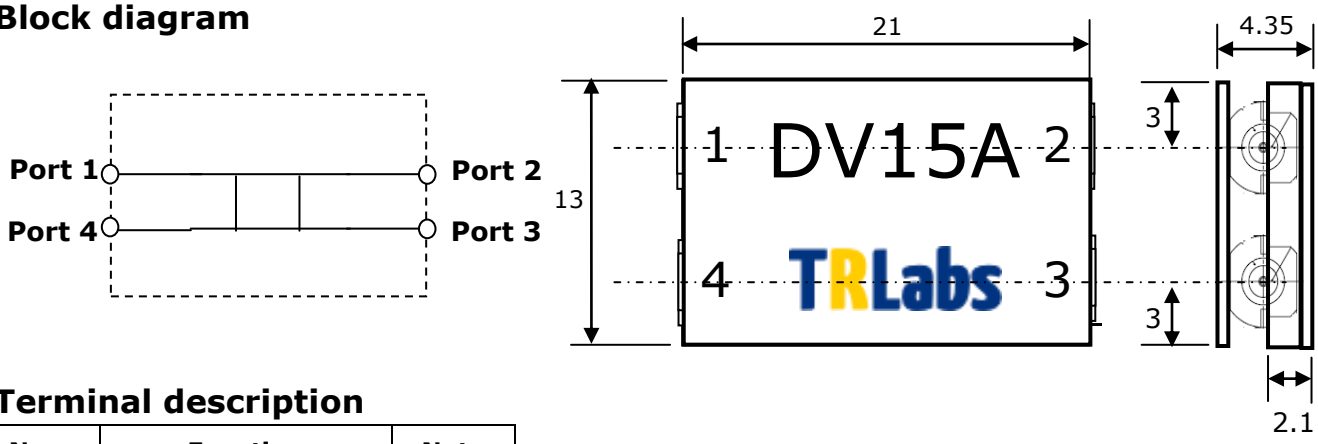

Fig. 1 Module structure

3. Terminal description

No	Name	Function	Note
1	Port 1	Signal Input/Output 1	SMPM/P
2	Port 2	Signal Input/Output 2	SMPM/P
3	Port 3	Signal Input/Output 3	SMPM/P
4	Port 4	Signal Input/Output 4	SMPM/P

4. Absolute maximum ratings

Terminal	Parameter	Symbol	Unit	Min	Max
Port1, Port2, Port3, Port4	Applied power	Pin	dBm		> 18.5
	Storage temperature	Tst	Degree C	-40	80

5. Characteristics (Ta=25 [Degree C])

Related terminal	Parameter	Symbol	Unit	Specification		
				Min	Typ	Max
Port1, Port2	Typical S21 (10 to 18 GHz) Other ports are 50 ohm terminated. See Fig.2	S21	dB	-5		-3.2
Port1, Port3	Typical S31 (10 to 18 GHz) Other ports are 50 ohm terminated. See Fig.3	S31	dB	-5.1		-3.5

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2014/3/14
Datasheet
DV15A_DS Rev.1.0

Port1, Port4	S41 (10 to 18 GHz) Other ports are 50 ohm terminated. See Fig.4	S41	dB		< -17	
Port1	S11 (10 to 18 GHz) Other ports are 50 ohm terminated.	S11	dB	See Fig.5		
Port2	S22 (10 to 18 GHz) Other ports are 50 ohm terminated.	S22	dB	See Fig.6		
Port3	S33 (10 to 18 GHz) Other ports are 50 ohm terminated.	S33	dB	See Fig.7		
Port4	S44 (10 to 18 GHz) Other ports are 50 ohm terminated.	S44	dB	See Fig.8		
Port1, Port2, Port3, Port4	Input power	Pin	dBm			> 18.5

6. Typical performance (Ta=25 [Degree C])

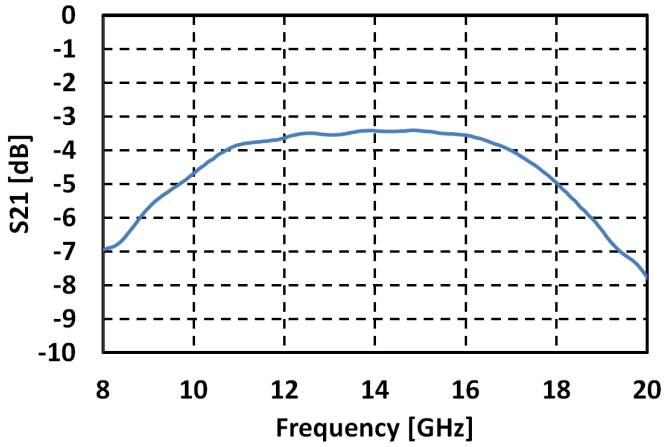

Fig. 2 S21 vs Frequency

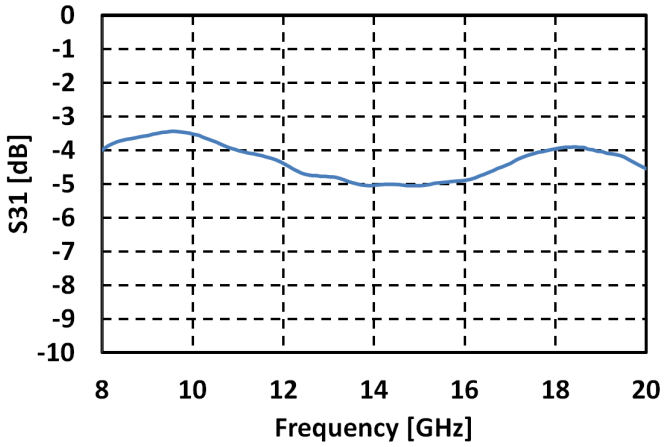

Fig. 3 S31 vs Frequency

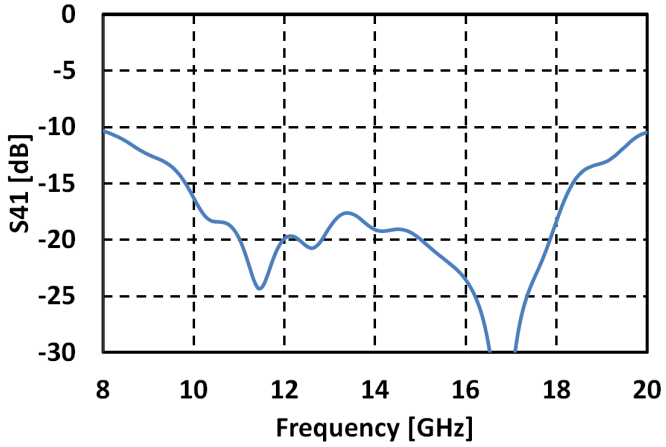

Fig. 4 S41 vs Frequency

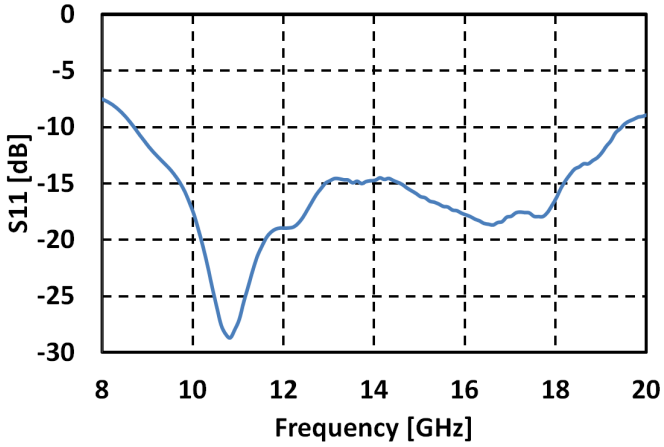

Fig. 5 S11 vs Frequency

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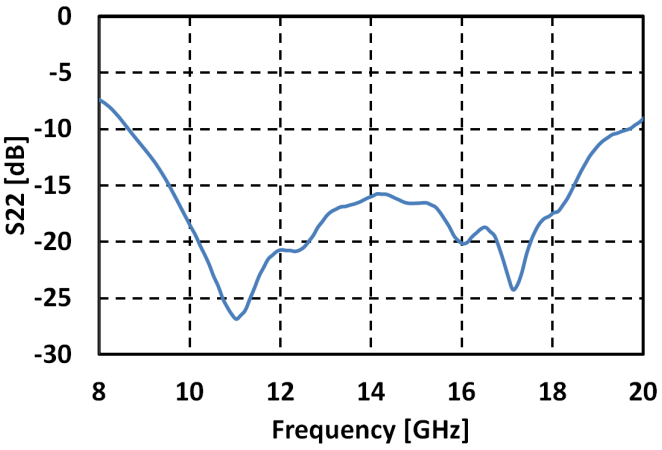


Fig. 6 S22 vs Frequency

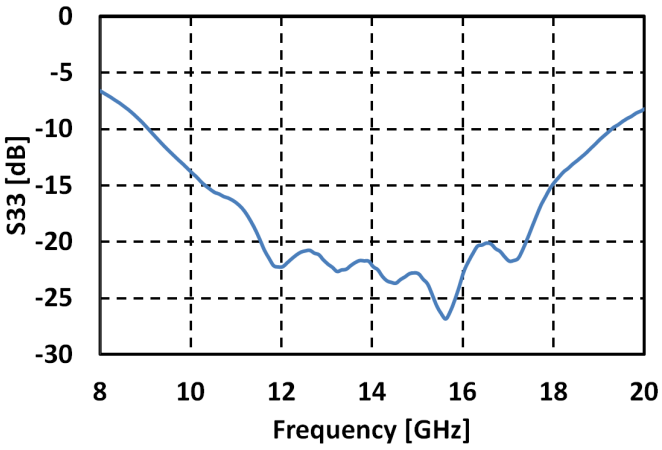


Fig. 7 S33 vs Frequency

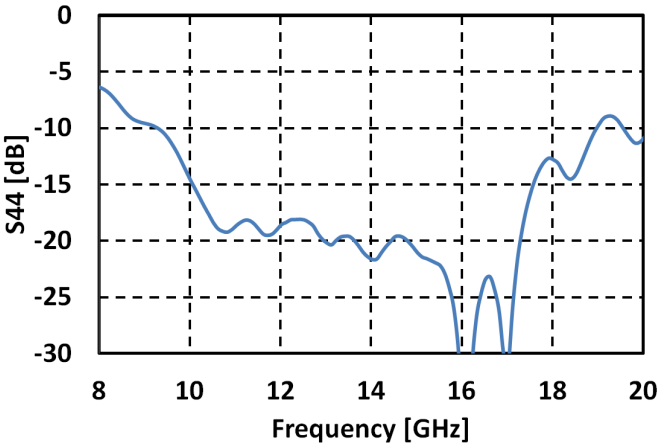


Fig. 8 S44 vs Frequency

2014/3/3
Datasheet
DV25A_DS Rev.1.0

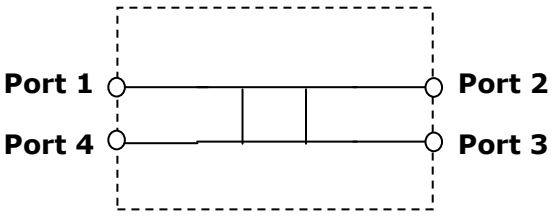
18-32 GHz 3dB Directional Coupler

DV25A

1. Application

Low loss power divider for full-rate clock (20 ~ 32 GHz) for 20 ~ 32 Gb/s optical transmission system, etc

2. Block diagram



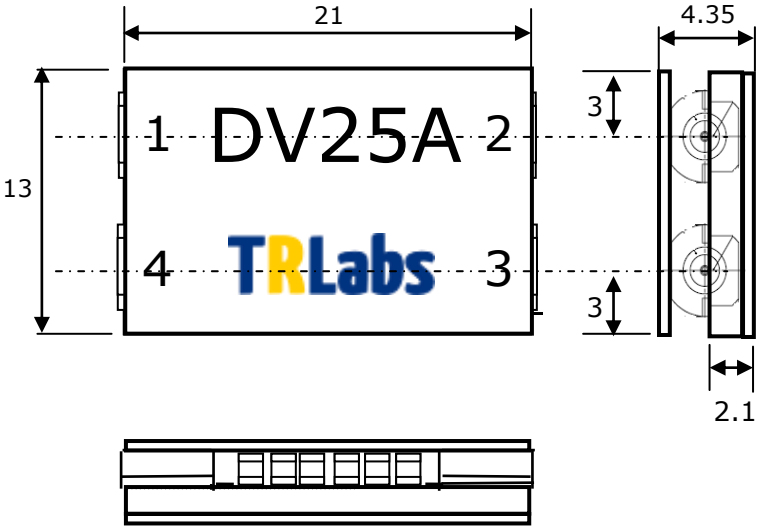


Fig. 1 Module structure

3. Terminal description

No	Name	Function	Note
1	Port 1	Signal Input/Output 1	SMPM/P
2	Port 2	Signal Input/Output 2	SMPM/P
3	Port 3	Signal Input/Output 3	SMPM/P
4	Port 4	Signal Input/Output 4	SMPM/P

4. Absolute maximum ratings

Terminal	Parameter	Symbol	Unit	Min	Max
Port 1, Port2, Port3, Port4	Applied power	Pin	dBm		>18.5
	Storage temperature	Tst	Degree C	-40	80

5. Characteristics (Ta=25 [Degree C])

Related terminal	Parameter	Symbol	Unit	Specification		
				Min	Typ	Max
Port1, Port2,	Typical S21 (18 to 32 GHz) Other ports are 50 ohm terminated. See Fig.2	S21	dB	-8.2		-4.5
Port1, Port3	Typical S31 (18 to 32 GHz) Other ports are 50 ohm terminated. See Fig.3	S31	dB	-6.2		-4.0

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Port1, Port4	S41 (18 to 32 GHz) Other ports are 50 ohm terminated. See Fig.4	S41	dB		<-12	
Port1	S11 (18 to 32 GHz) Other ports are 50 ohm terminated.	S11	dB	See Fig.5		
Port2	S22 (18 to 32 GHz) Other ports are 50 ohm terminated.	S22	dB	See Fig.6		
Port3	S33 (18 to 32 GHz) Other ports are 50 ohm terminated.	S33	dB	See Fig.7		
Port4	S44 (18 to 32 GHz) Other ports are 50 ohm terminated.	S44	dB	See Fig.8		
Port1, Port2, Port3, Port4	Input power	Pin	dBm			>18.5

6. Typical performance (Ta=25 [Degree C])

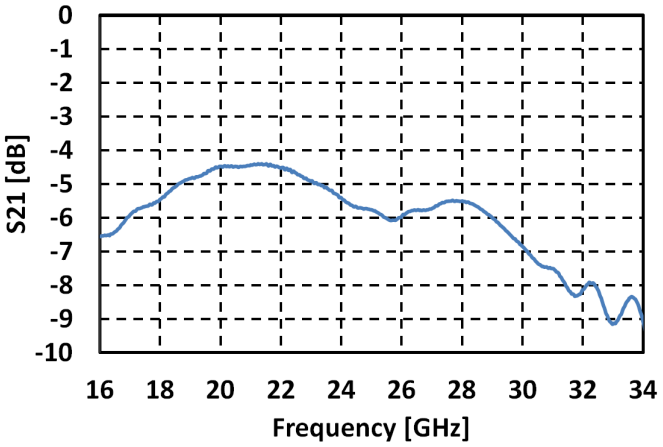


Fig. 2 S21 vs Frequency

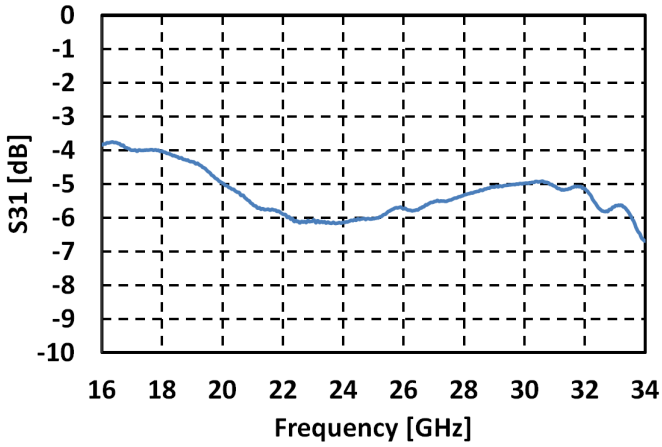


Fig. 3 S31 vs Frequency

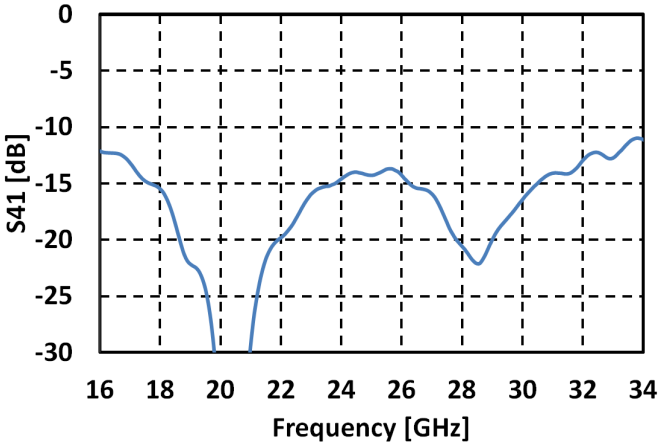


Fig. 4 S41 vs Frequency

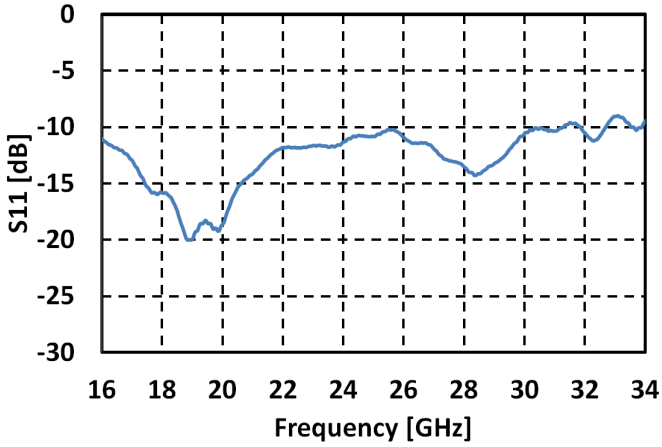


Fig. 5 S11 vs Frequency

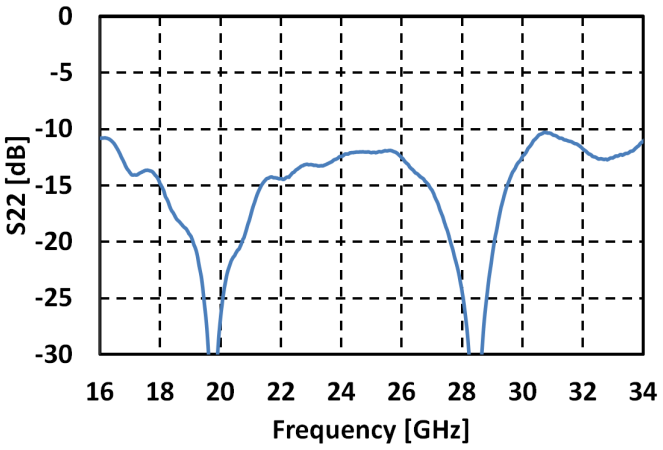


Fig. 6　S22 vs Frequency

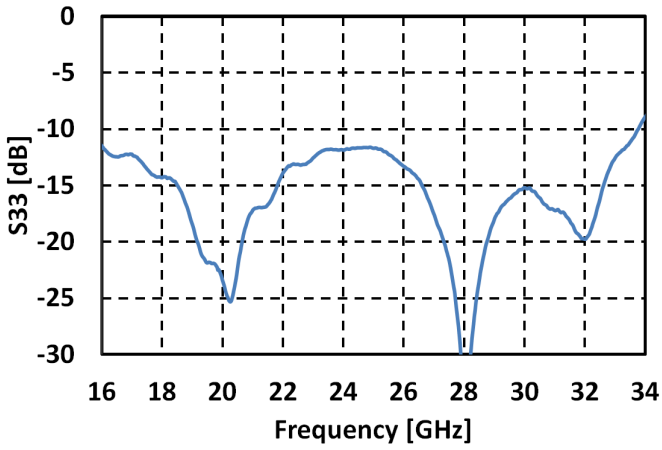


Fig. 7　S33 vs Frequency

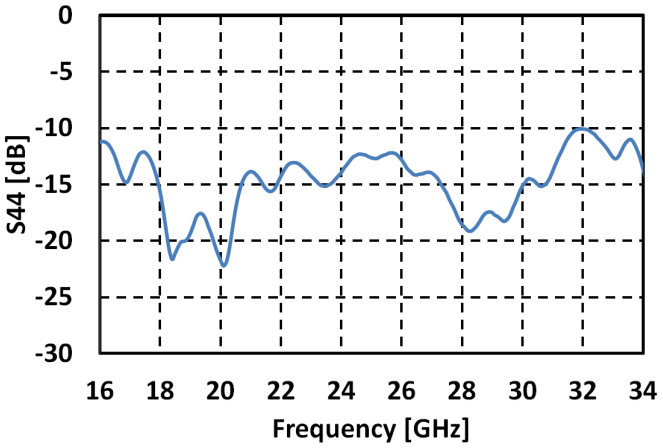


Fig. 8　S44 vs Frequency

2014/3/3
Datasheet
AT03_DS Rev.1.0

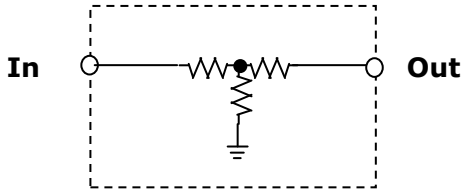
40 GHz 3dB Attenuator

AT03

1. Application

Attenuation for data and clock of 40 Gb/s optical transmission system, etc

2. Block diagram



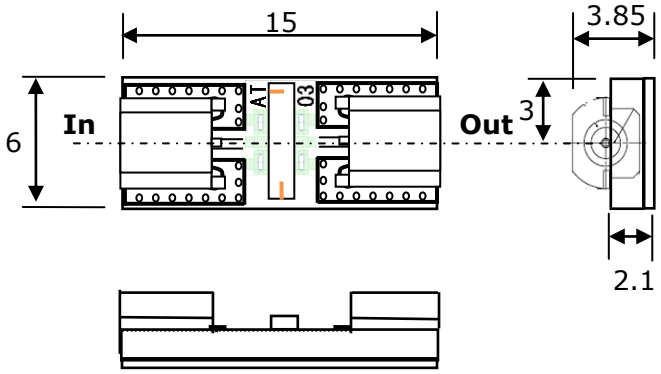


Fig. 1 Module structure

3. Terminal description

No	Name	Function	Note
1	In	Signal Input	SMPM/P
2	Out	Signal Output	SMPM/P

4. Absolute maximum ratings

Terminal	Parameter	Symbol	Unit	Min	Max
In	Applied Input power	Pin	dBm		>18.5
	Storage temperature	Tst	Degree C	-40	80

5. Characteristics (Ta=25 [Degree C])

Related terminal	Parameter	Symbol	Unit	Specification		
				Min	Typ	Max
In, Out	Typical S21 (0 to 40 GHz) See Fig.2	S21	dB	-5.0	-3	-2.5
In	S11 (0 to 40 GHz)	S11	dB	See Fig.3		
Out	S22 (0 to 40 GHz)	S22	dB	See Fig.4		
In	Input power	Pin	dBm			>18.5

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6. Typical performance (Ta=25 [Degree C])

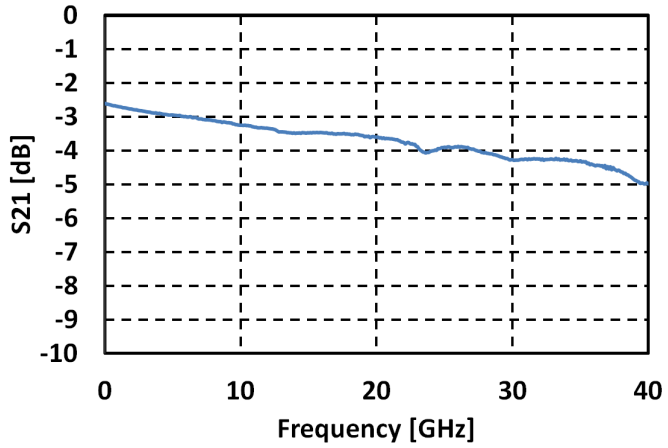


Fig.2 S21 vs Frequency

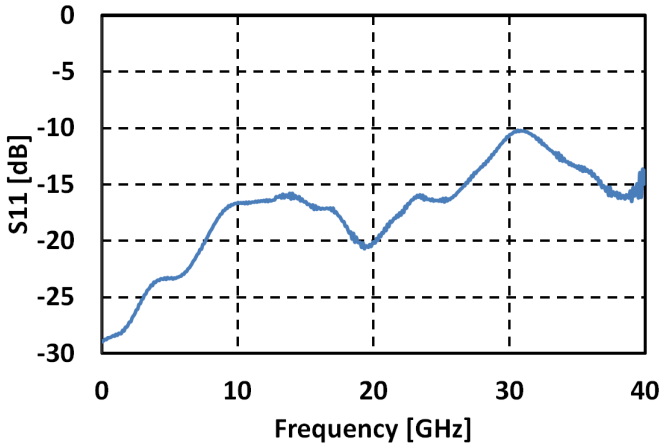


Fig.3 S11 vs Frequency

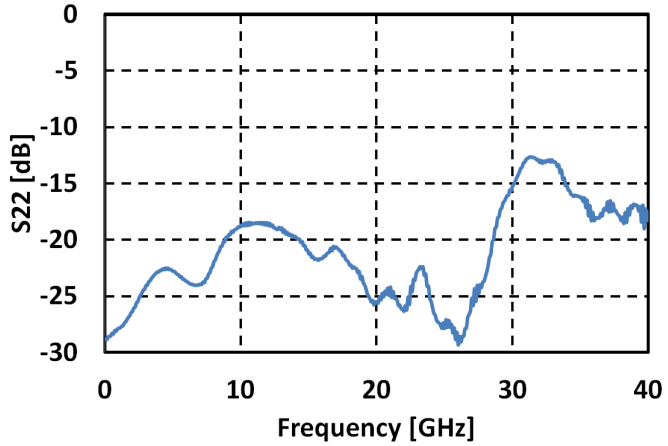


Fig.4 S22 vs Frequency

2014/3/3
Datasheet
AT06_DS Rev.1.0

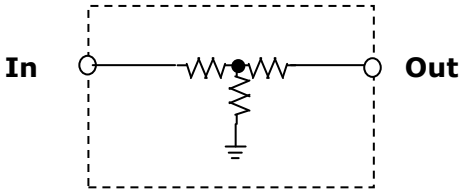
40 GHz 6dB Attenuator

AT06

1. Application

Attenuation for data and clock of 40 Gb/s optical transmission system, etc

2. Block diagram



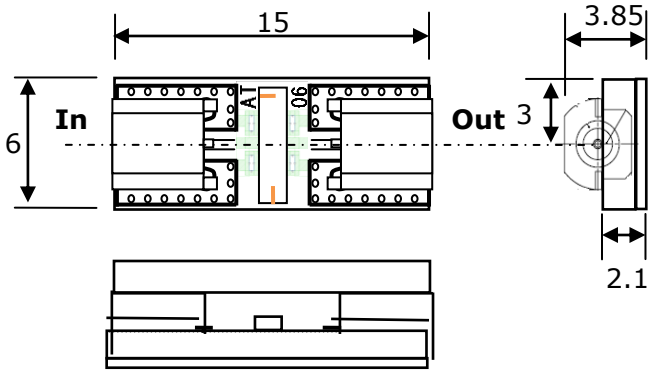


Fig. 1 Module structure

3. Terminal description

No	Name	Function	Note
1	In	Signal Input	SMPM/P
2	Out	Signal Output	SMPM/P

4. Absolute maximum ratings

Terminal	Parameter	Symbol	Unit	Min	Max
In	Applied Input power	Pin	dBm		>18.5
	Storage temperature	Tst	Degree C	-40	80

5. Characteristics (Ta=25 [Degree C])

Related terminal	Parameter	Symbol	Unit	Specification		
				Min	Typ	Max
In, Out	Typical S21 (0 to 40 GHz) See Fig.2	S21	dB	-8.7	-6	-5.7
In	S11 (0 to 40 GHz)	S11	dB	See Fig.3		
Out	S22 (0 to 40 GHz)	S22	dB	See Fig.4		
In	Input power	Pin	dBm			>18.5

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6. Typical performance (Ta=25 [Degree C])

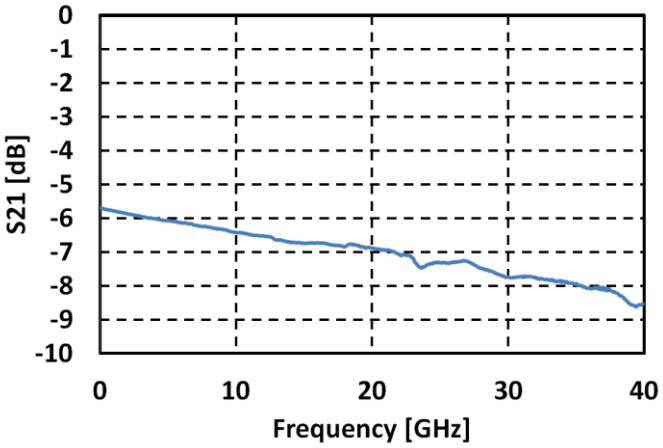


Fig.2 S21 vs Frequency

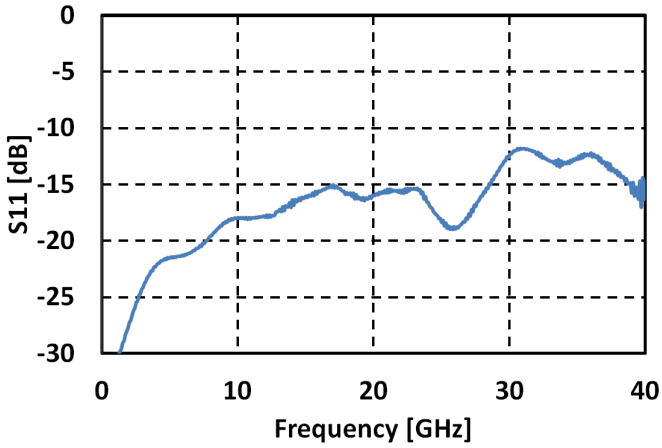


Fig.3 S11 vs Frequency

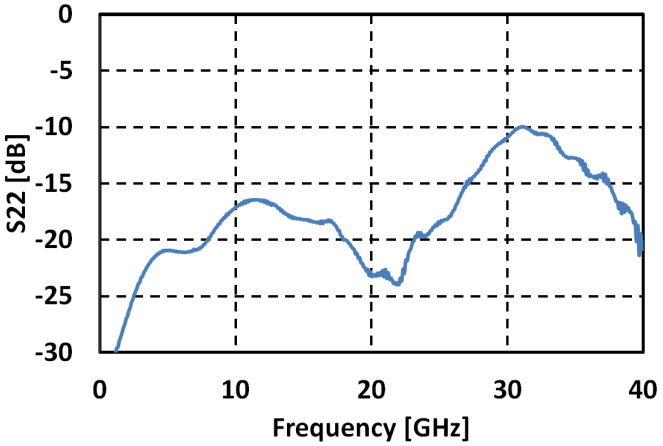


Fig.4 S22 vs Frequency

2014/3/14
Datasheet
AT10_DS Rev.1.0

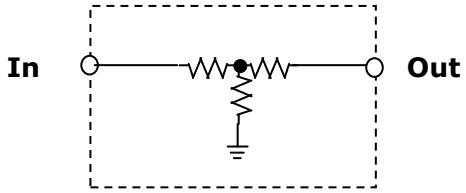
35 GHz 10dB Attenuator

AT10

1. Application

Attenuation for data and clock of 32 Gb/s optical transmission system, etc

2. Block diagram



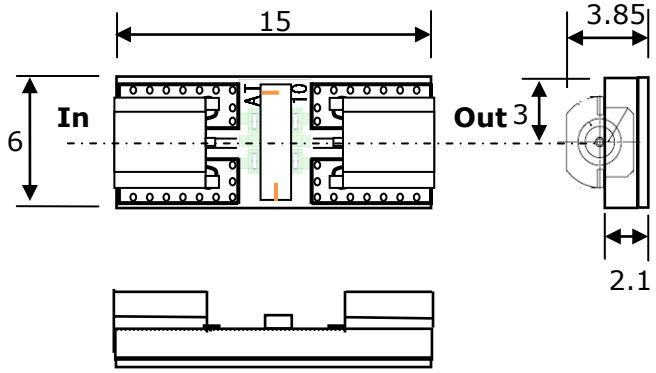


Fig. 1 Module structure

3. Terminal description

No	Name	Function	Note
1	In	Signal Input	SMPM/P
2	Out	Signal Output	SMPM/P

4. Absolute maximum ratings

Terminal	Parameter	Symbol	Unit	Min	Max
In	Applied Input power	Pin	dBm		>18.5
	Storage temperature	Tst	Degree C	-40	80

5. Characteristics (Ta=25 [Degree C])

Related terminal	Parameter	Symbol	Unit	Specification		
				Min	Typ	Max
In, Out	Typical S21 (0 to 35 GHz) See Fig.2	S21	dB	-11.5	-10	-9
In	S11 (0 to 35 GHz)	S11	dB	See Fig.3		
Out	S22 (0 to 35 GHz)	S22	dB	See Fig.4		
In	Input power	Pin	dBm			>18.5

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6. Typical performance (Ta=25 [Degree C])

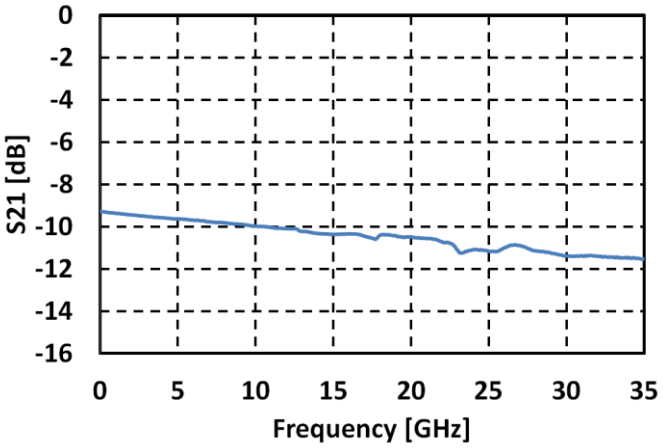


Fig.2 S21 vs Frequency

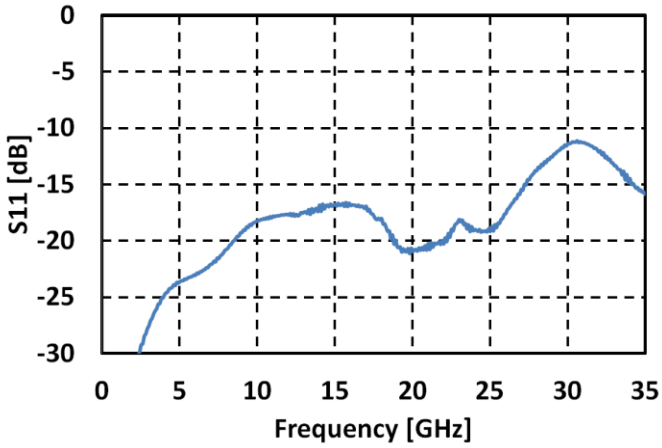


Fig.3 S11 vs Frequency

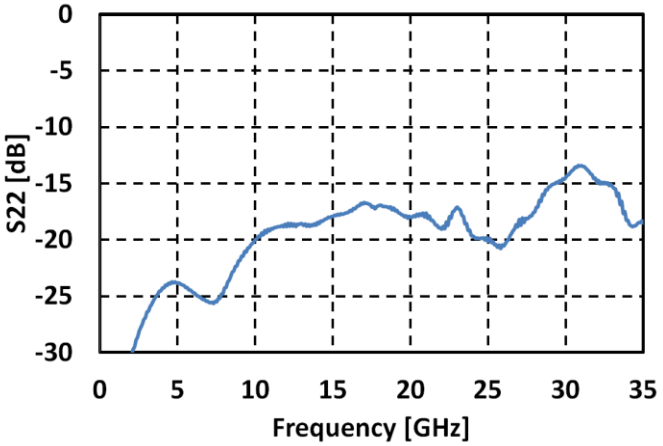


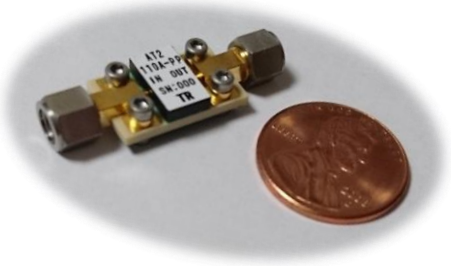
Fig.4 S22 vs Frequency

Takada RF Labs

Advanced Product Information
AT2_110A_API_Rev.1.0_160629

70-110 GHz 2dB Attenuator

AT2_110A-XY



1. Features

1) small ripple: ±0.2 dB in the range of 70-110 GHz
2) Coaxial connector RF interface: 1mm (P) or 1mm (J)

2. Application

Attenuation in the range of 70-110 GHz

3. Block diagram

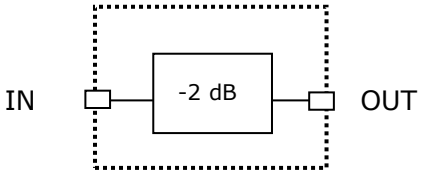
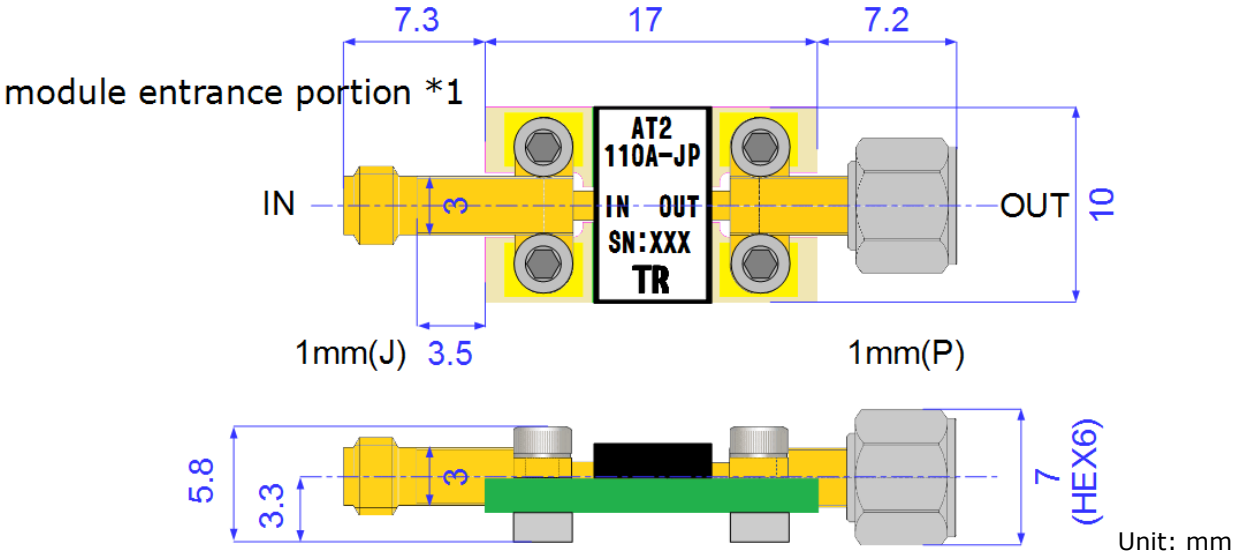


Fig.1 Block diagram

4. Module structure



*1: For detail of "module entrance portion", see [10. Precaution] at P.3.

Fig.2 Structure of AT2_110A-JP

5. Terminal description

Name	Function	Note
IN	Input signal	1mm (P) or 1mm (J)
OUT	Output signal	1mm (P) or 1mm (J)

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6. Absolute maximum ratings

Related terminal	Parameter	Symbol	Unit	Min	Max
IN/ OUT	Applied power	Pin	dBm		+20 (TBD)
Tstrg	Storage temperature	Tst	℃	-40	85

7. Recommended operation condition

Related terminal	Parameter	Symbol	Unit	Specification		
				Min	Typ	Max
	Operating ambient temperature	Ta	℃	5	25	70

8. RF Performance

Related terminal	Parameter	Symbol	Unit	Specification		
				Min	Typ	Max
IN, OUT	RF Signal frequency	frf	GHz	70		110
	Mag S21 at 70 GHz	S21	dB		-1.8	
	Mag S21 at 90 GHz	S21	dB		-2.0	
	Mag S21 at 110 GHz	S21	dB		-2.2	
	S21 ripple	Rpl	dB		±0.2	
IN	Mag S11 at 70-110GHz	S11	dB		< -14	
OUT	Mag S22 at 70-110GHz	S21	dB		< -14	

9. Typical performance

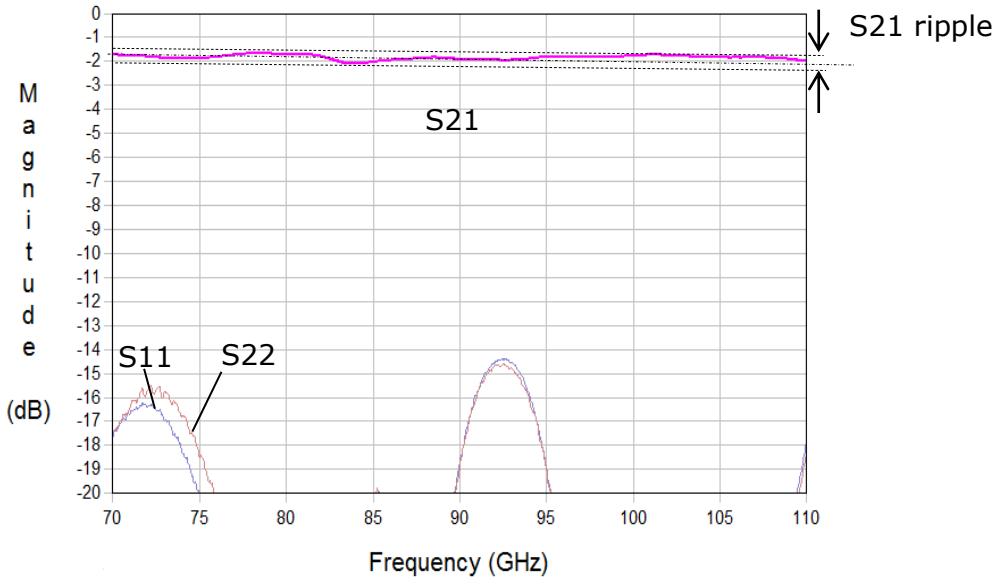


Fig. 3 Typical S-parameter of AT2_110A

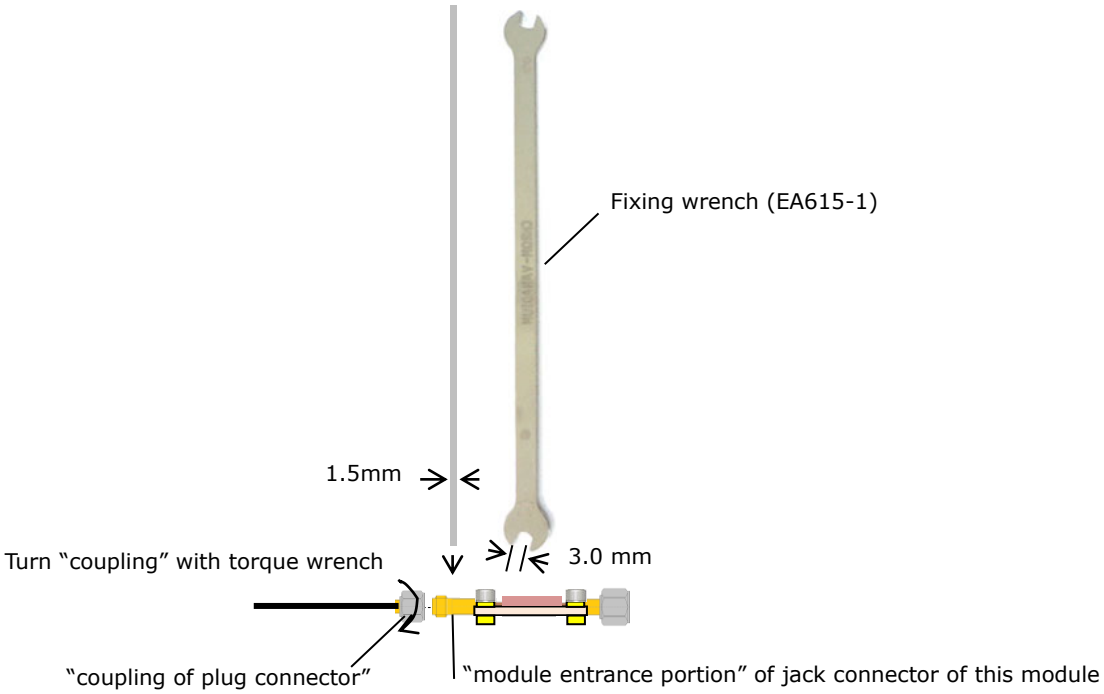
10. Precaution

(1) When connecting 1mm-coaxial connector cable to the module, use "torque wrench" with torque of 45 N-cm.

Special note:

Turn "coupling of plug (male) connector" with torque wrench. At this time, you must use a "fixing wrench (EA615-1, made by ESCO)" which is put onto "module entrance portion" of jack (female) connector.

Do not turn the coupling without using the "fixing wrench", otherwise, it gives abnormal mechanical stress to the module and damages it.



(2) Avoid abnormal mechanical shock to the product.

11. Product ordering code

AT2_110A-XY

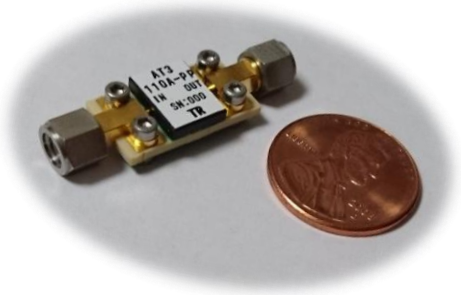
- IN connector: P (plug) or J (jack)
- OUT connector: P (plug) or J (jack)

Takada RF Labs

Advanced Product Information
AT3_110A_API_Rev.1.0_160629

70-110 GHz 3dB Attenuator

AT3_110A-XY



1. Features

1) small ripple: ±0.4 dB in the range of 70-110 GHz
2) Coaxial connector RF interface: 1mm (P) or 1mm (J)

2. Application

Attenuation in the range of 70-110 GHz

3. Block diagram

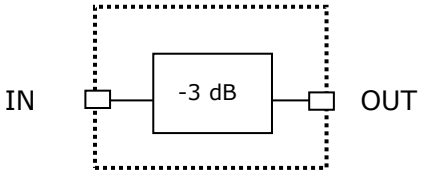
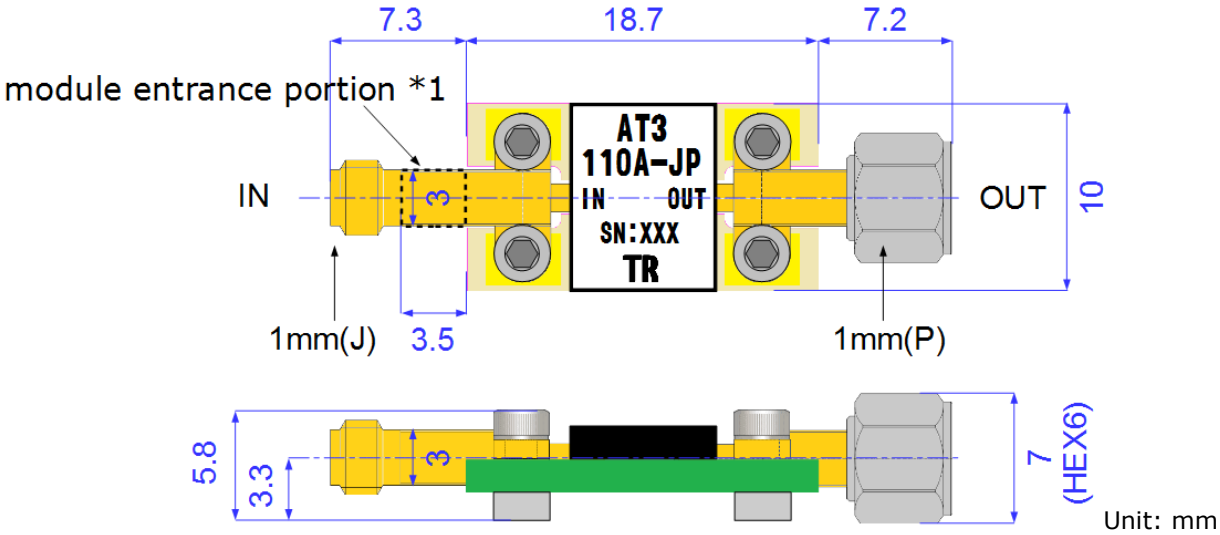


Fig.1 Block diagram

4. Module structure



*1: For detail of "module entrance portion", see [10. Precaution] at P.3.

Fig.2 Structure of AT3_110A-JP

5. Terminal description

Name	Function	Note
IN	Input signal	1mm (P) or 1mm (J)
OUT	Output signal	1mm (P) or 1mm (J)

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6. Absolute maximum ratings

Related terminal	Parameter	Symbol	Unit	Min	Max
IN / OUT	Applied power	Pin	dBm		+20 (TBD)
Tstrg	Storage temperature	Tst	℃	-40	85

7. Recommended operation condition

Related terminal	Parameter	Symbol	Unit	Specification		
				Min	Typ	Max
	Operating ambient temperature	Tmb	℃	5	25	70

8. RF Performance

Related terminal	Parameter	Symbol	Unit	Specification		
				Min	Typ	Max
IN, OUT	RF Signal frequency	frf	GHz	70		110
	Mag S21 at 70 GHz	S21	dB		-2.5	
	Mag S21 at 90 GHz	S21	dB		-3.0	
	Mag S21 at 110 GHz	S21	dB		-3.5	
	S21 ripple	Rpl	dB		±0.4	
IN	Mag S11 at 70-110GHz	S11	dB		< -11	
OUT	Mag S22 at 70-110GHz	S22	dB		< -11	

9. Typical performance

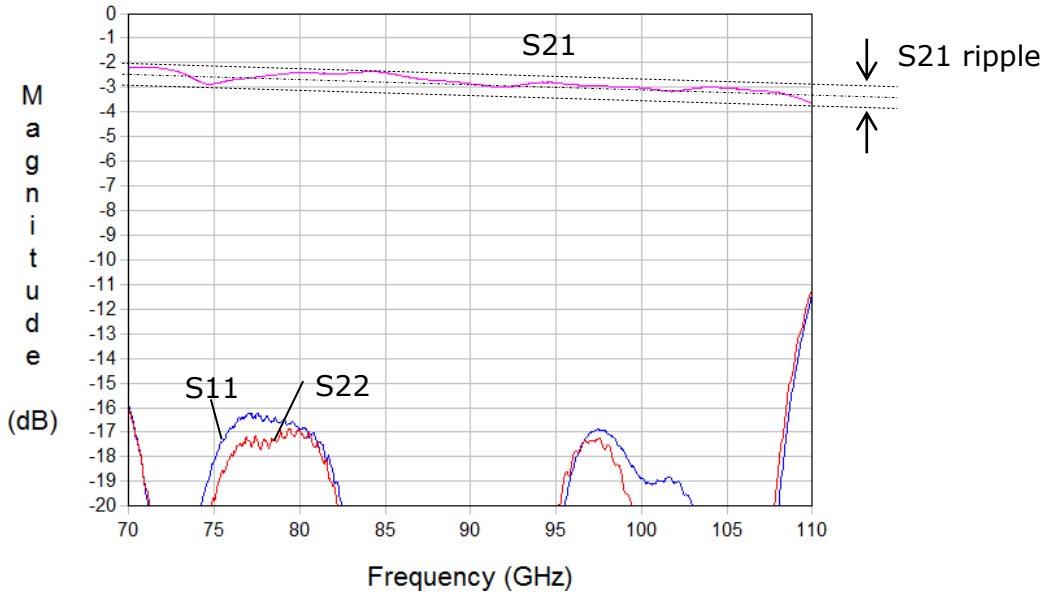


Fig.3 Typical S-parameter of AT3_110A

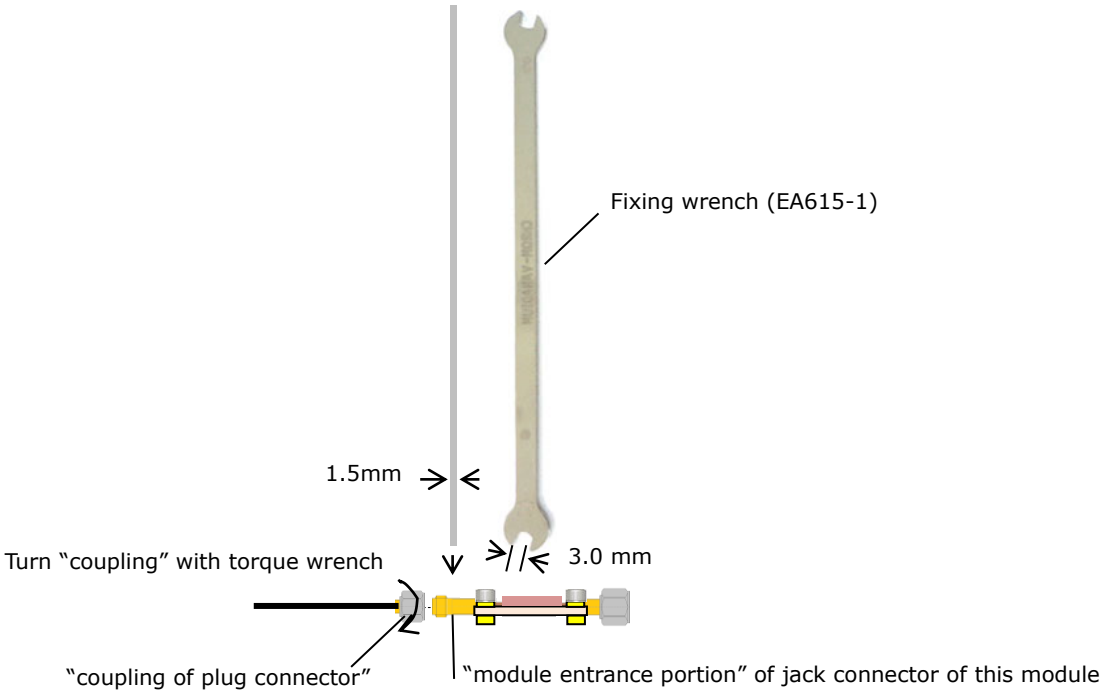
10. Precaution

(1) When connecting 1mm-coaxial connector cable to the module, use "torque wrench" with torque of 45 N-cm.

Special note:

Turn "coupling of plug (male) connector" with torque wrench. At this time, you must use a "fixing wrench (EA615-1, made by ESCO)" which is put onto "module entrance portion" of jack (female) connector.

Do not turn the coupling without using the "fixing wrench", otherwise, it gives abnormal mechanical stress to the module and damages it.



(2) Avoid abnormal mechanical shock to the product.

11. Product ordering code

AT3_110A-XY

- IN connector: P (plug) or J (jack)
- OUT connector: P (plug) or J (jack)

Takada RF Labs

Advanced Product Information
AT5_110A_API_Rev.1.0_160629

70-110 GHz 5dB Attenuator

AT5_110A_XY

1. Features

1) small ripple: ±0.4 dB in the range of 70-110 GHz

2) Coaxial connector RF interface: 1mm (P) or 1mm (J)

2. Application

Attenuation in the range of 70-110 GHz

3. Block diagram

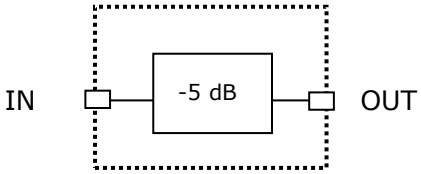
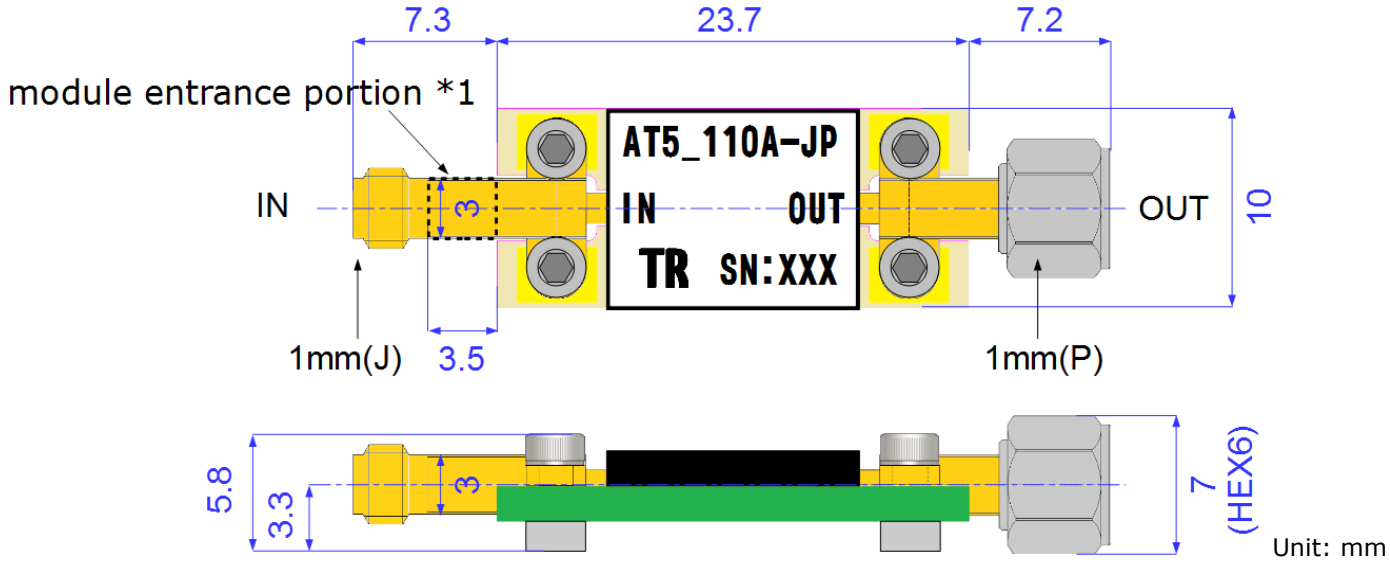


Fig.1 Block diagram

4. Module structure



*1: For detail of "module entrance portion", see [10. Precaution] at P.3.

Fig.2 Structure of AT5_110A-JP

5. Terminal description

Name	Function	Note
IN	Input signal	1mm (P) or 1mm (J)
OUT	Output signal	1mm (P) or 1mm (J)

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6. Absolute maximum ratings

Related terminal	Parameter	Symbol	Unit	Min	Max
IN/ OUT	Applied power	Pin	dBm		+20 (TBD)
Tstrg	Storage temperature	Tst	℃	-40	85

7. Recommended operation condition

Related terminal	Parameter	Symbol	Unit	Specification		
				Min	Typ	Max
	Operating ambient temperature (TBD)	Ta	℃	5	25	70

8. RF Performance

Related terminal	Parameter	Symbol	Unit	Specification		
				Min	Typ	Max
IN, OUT	RF Signal frequency	frf	GHz	70		110
	Mag S21 at 70 GHz	S21	dB		-3.2	
	Mag S21 at 90 GHz	S21	dB		-4.6	
	Mag S21 at 110 GHz	S21	dB		-6.0	
	S21 ripple	Rpl	dB		±0.4	
IN	Mag S11 at 70-110GHz	S11	dB		< -12	
OUT	Mag S22 at 70-110GHz	S21	dB		< -12	

9. Typical performance

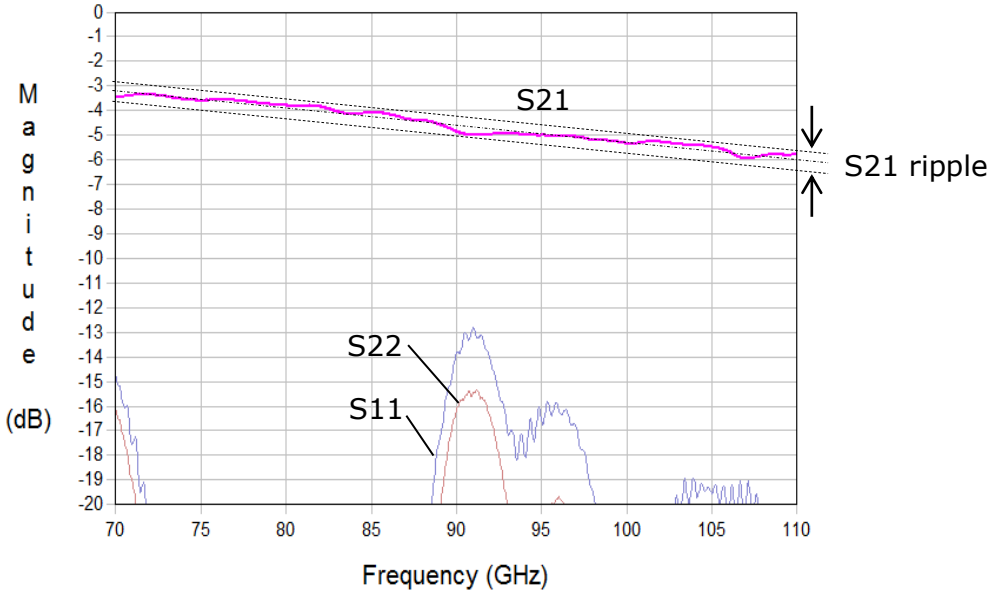


Fig.3 Typical S-parameter of AT5_110A

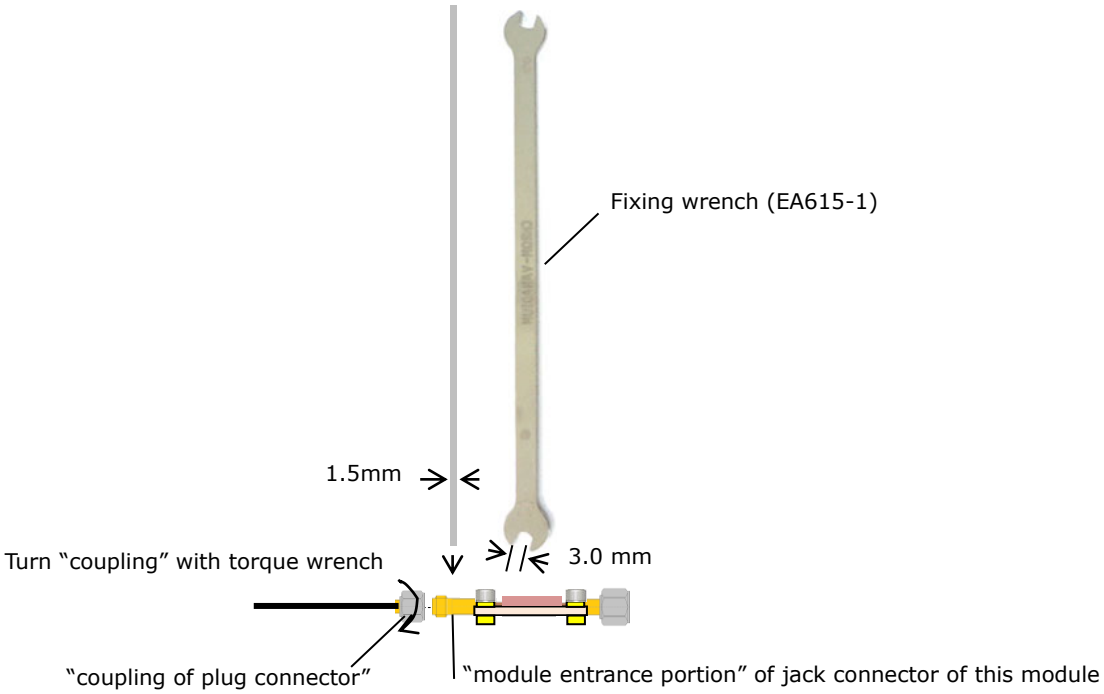
10. Precaution

(1) When connecting 1mm-coaxial connector cable to the module, use "torque wrench" with torque of 45 N-cm.

Special note:

Turn "coupling of plug (male) connector" with torque wrench. At this time, you must use a "fixing wrench (EA615-1, made by ESCO)" which is put onto "module entrance portion" of jack (female) connector.

Do not turn the coupling without using the "fixing wrench", otherwise, it gives abnormal mechanical stress to the module and damages it.



(2) Avoid abnormal mechanical shock to the product.

11. Product ordering code

AT5_110A-XY

- IN connector: P (plug) or J (jack)
- OUT connector: P (plug) or J (jack)

Takada RF Labs

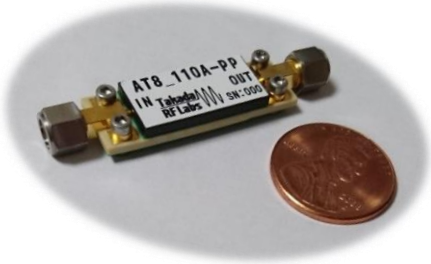
Advanced Product Information
AT8_110A_API_Rev.1.0_160629

70-110 GHz 8dB Attenuator

AT8_110A-XY

1. Features

1) Small ripple: ±0.5 dB in the range of 70-110 GHz
2) Coaxial connector RF interface: 1mm (P) or 1mm (J)



2. Application

Attenuation in the range of 70-110 GHz

3. Block diagram

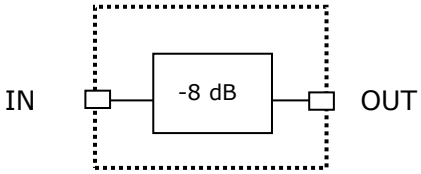
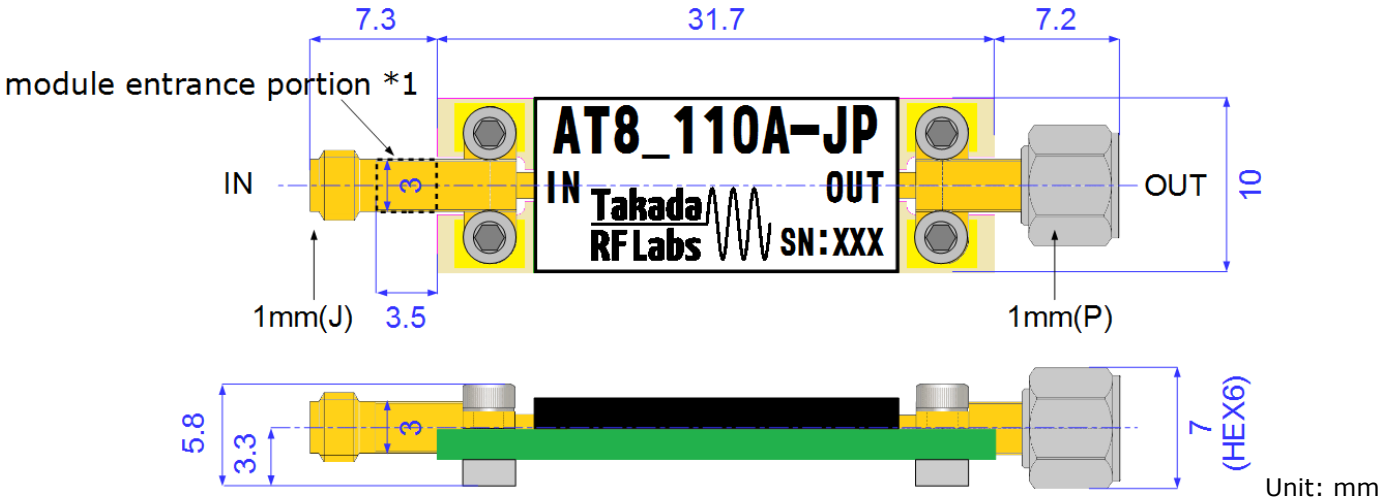


Fig. 1 Block diagram

4. Module structure



*1: For detail of "module entrance portion", see [10. Precaution] at P.3.

Fig.2 Structure of AT5_110A-JP

5. Terminal description

Name	Function	Note
IN	Input signal	1mm (P) or 1mm (J)
OUT	Output signal	1mm (P) or 1mm (J)

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6. Absolute maximum ratings

Related terminal	Parameter	Symbol	Unit	Min	Max
IN/ OUT	Applied power	Pin	dBm		+20 (TBD)
Tstrg	Storage temperature	Tst	℃	-40	85

7. Recommended operation condition

Related terminal	Parameter	Symbol	Unit	Specification		
				Min	Typ	Max
	Operating ambient temperature	Tmb	℃	5	25	70

8. RF Performance

Related terminal	Parameter	Symbol	Unit	Specification		
				Min	Typ	Max
IN, OUT	RF Signal frequency	frf	GHz	70		110
	Mag S21 at 70 GHz	S21	dB		-6.5	
	Mag S21 at 90 GHz	S21	dB		-8.0	
	Mag S21 at 110 GHz	S21	dB		-9.5	
	S21 ripple	Rpl	dB		±0.5	
IN	Mag S11 at 70-110GHz	S11	dB		< -13	
OUT	Mag S22 at 70-110GHz	S21	dB		< -11	

9. Typical performance

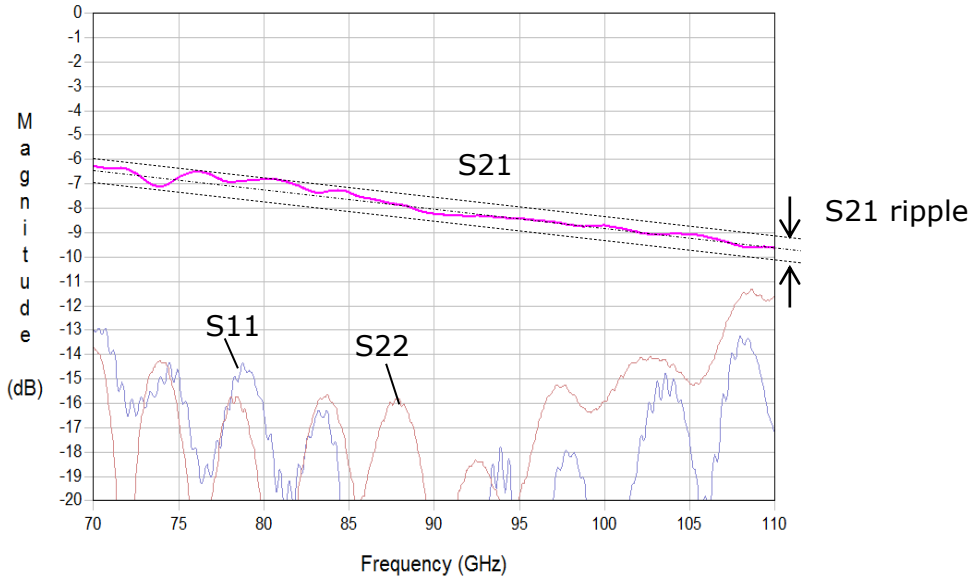


Fig. 3 Typical S-parameter of AT8_110A

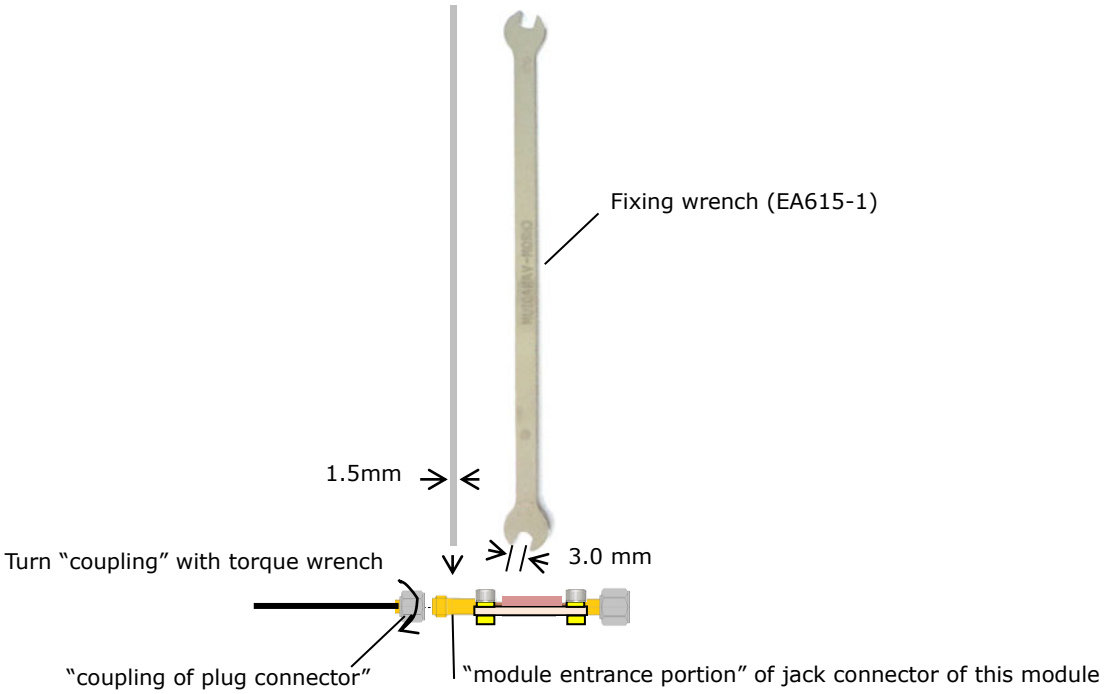
10. Precaution

(1) When connecting 1mm-coaxial connector cable to the module, use "torque wrench" with torque of 45 N-cm.

Special note:

Turn "coupling of plug (male) connector" with torque wrench. At this time, you must use a "fixing wrench (EA615-1, made by ESCO)" which is put onto "module entrance portion" of jack (female) connector.

Do not turn the coupling without using the "fixing wrench", otherwise, it gives abnormal mechanical stress to the module and damages it.



(2) Avoid abnormal mechanical shock to the product.

11. Product ordering code

AT8_110A-XY

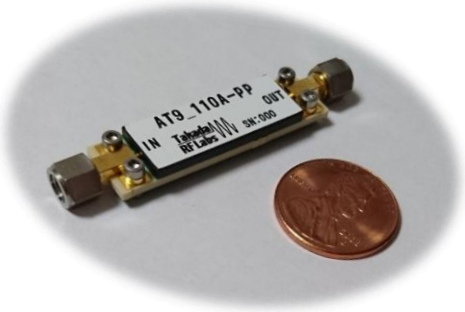
- IN connector: P (plug) or J (jack)
- OUT connector: P (plug) or J (jack)

Takada RF Labs

Advanced Product Information
AT9_110A_API_Rev.1.0_160629

70-110 GHz 9dB Attenuator

AT9_110A-XY



1. Features

1) small ripple: ±0.5 dB in the range of 70-110 GHz
2) Coaxial connector RF interface: 1mm (P) or 1mm (J)

2. Application

Attenuation in the range of 70-110 GHz

3. Block diagram

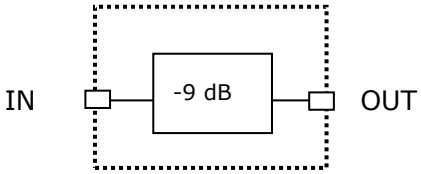
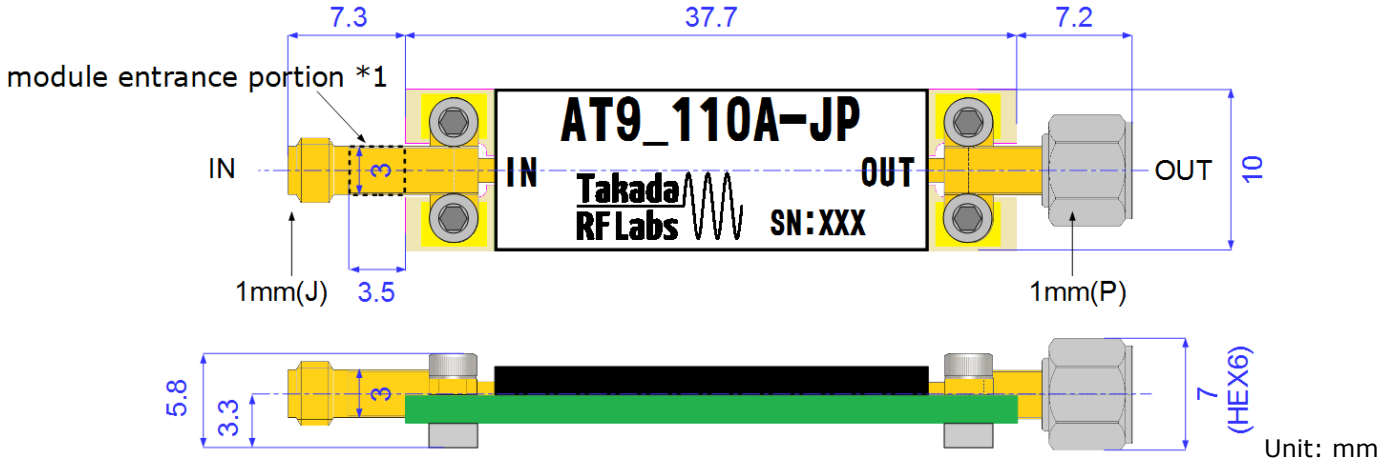


Fig.1 Block diagram

4. Module structure



*1: For detail of "module entrance portion", see [10. Precaution] at P.3.

Fig.2 Structure of AT9_110A-JP

5. Terminal description

Name	Function	Note
IN	Input signal	1mm (P) or 1mm (J)
OUT	Output signal	1mm (P) or 1mm (J)

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6. Absolute maximum ratings

Related terminal	Parameter	Symbol	Unit	Min	Max
IN/ OUT	Applied power	Pin	dBm		+20 (TBD)
Tstrg	Storage temperature	Tst	℃	-40	85

7. Recommended operation condition

Related terminal	Parameter	Symbol	Unit	Specification		
				Min	Typ	Max
	Operating ambient temperature	Ta	℃	5	25	70

8. RF Performance

Related terminal	Parameter	Symbol	Unit	Specification		
				Min	Typ	Max
IN, OUT	RF Signal frequency	frf	GHz	70		110
	Mag S21 at 70 GHz	S21	dB		-7.5	
	Mag S21 at 90 GHz	S21	dB		-9.0	
	Mag S21 at 110 GHz	S21	dB		-10.5	
	S21 ripple	Rpl	dB		±0.5	
IN	Mag S11 at 70-110GHz	S11	dB		< -13	
OUT	Mag S22 at 70-110GHz	S21	dB		< -13	

9. Typical performance

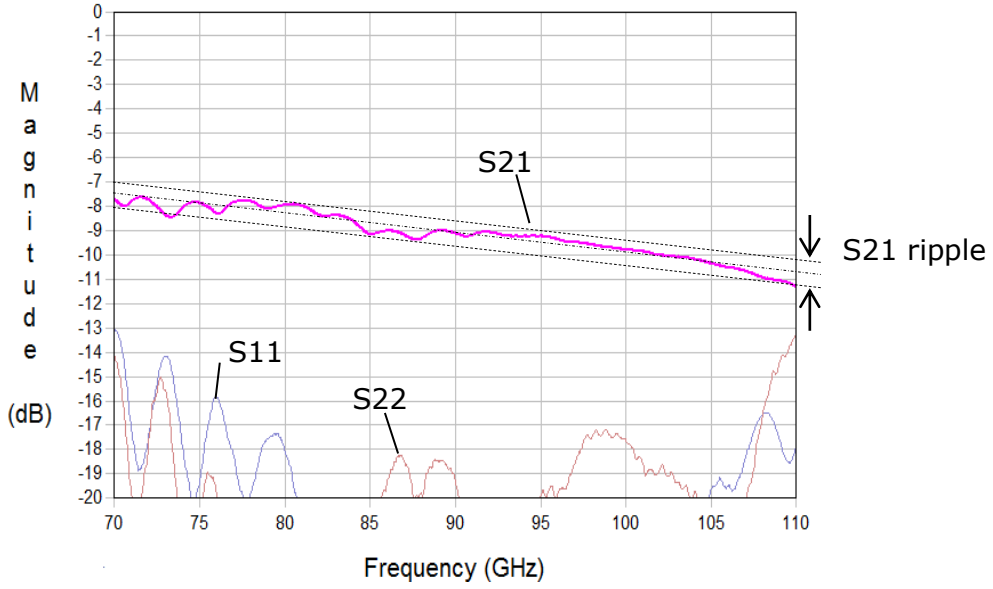


Fig.3 Typical S-parameter of AT9_110A

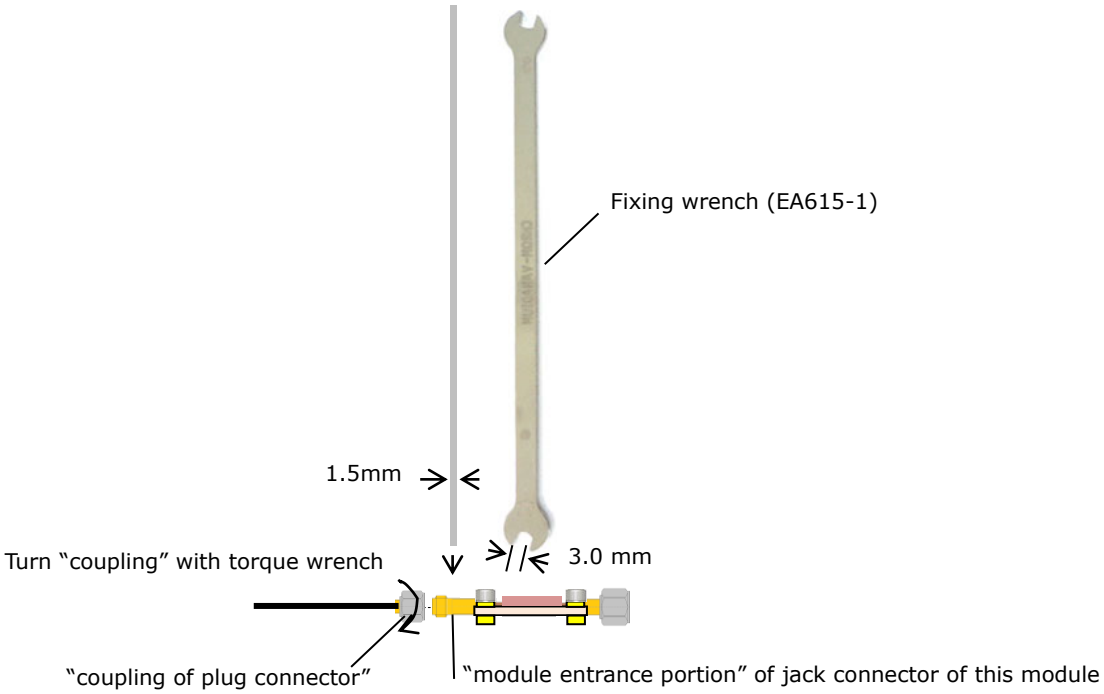
10. Precaution

(1) When connecting 1mm-coaxial connector cable to the module, use "torque wrench" with torque of 45 N-cm.

Special note:

Turn "coupling of plug (male) connector" with torque wrench. At this time, you must use a "fixing wrench (EA615-1, made by ESCO)" which is put onto "module entrance portion" of jack (female) connector.

Do not turn the coupling without using the "fixing wrench", otherwise, it gives abnormal mechanical stress to the module and damages it.



(2) Avoid abnormal mechanical shock to the product.

11. Product ordering code

AT9_110A-XY

- IN connector: P (plug) or J (jack)
- OUT connector: P (plug) or J (jack)

2014/3/5
Datasheet
VT30A_DS Rev.1.0

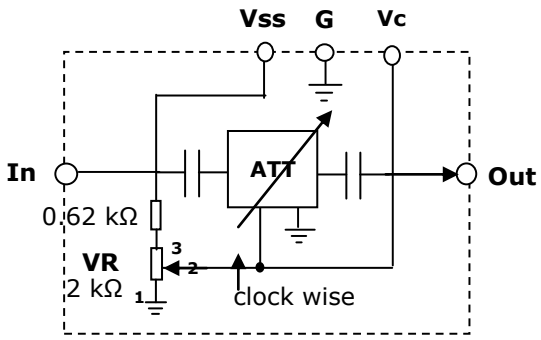
6-30GHz Variable Attenuator

VT30A

1. Application

Output amplitude adjustment for full-rate clock (20 ~ 28 GHz) of 20 ~ 28 Gb/s optical transmission system, etc

2. Block diagram



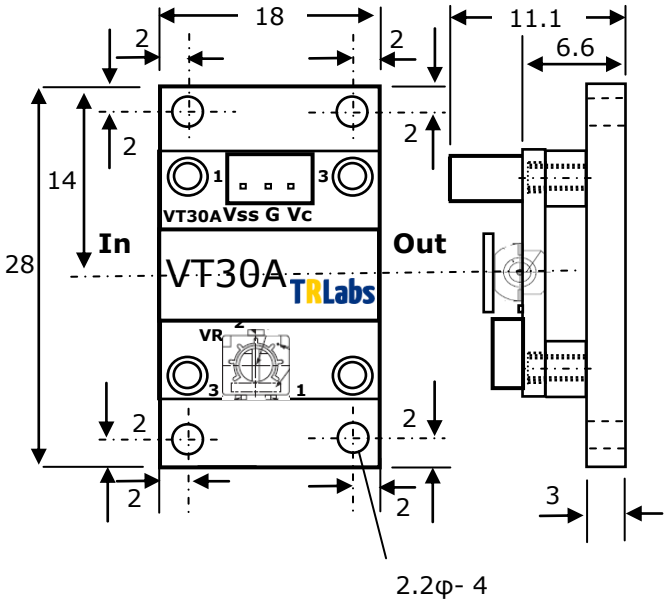


Fig.1 Module structure

3. Terminal description

No	Name	Function	Note
1	In	Signal Intput (Internal AC Coupled)	SMPM/P
2	Out	Signal Outtput (Internal AC Coupled)	SMPM/P
3	Vss	Supply Voltage (-3.3V)	Pin header
4	G	Ground	Pin header
5	Vc	Attenuation control voltage (0 to -3V)	Pin header
6	VR	To increases attenuation, rotate counter-clock wise	Potentiometer

4. Absolute maximum ratings

Related terminal	Parameter	Symbol	Unit	Min	Max
Vc	Applied voltage of Vc	Vdd	V	- 4	0

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2014/3/5
Datasheet
VT30A_DS Rev.1.0

Vss	Applied voltage of Vss			-5	0
In	Apply voltage of In	Pin	dBm		+30
	Storage temperature	Tst	Degree C	-40	80

5. Characteristics (Ta=25 [Degree C])

Related terminal	Parameter		Symbol	Unit	Specification		
					Min	Typ	Max
In, Out	Insertion loss See Fig.2	at 5 GHz	IL5	dB		1	
		at 28 GHz	IL28	dB		4	
	Attenuation range, See Fig.2		Attr	dB		30	
In	Input return loss		S11	dB	See Fig.4		
	1 dB compression input power (any attenuation)		Pin1dB	dBm		25	
Out	Output return loss		S22	dB	See Fig.5		
Vc	Attenuation control voltage See Fig.3		Vc	V	-2.5		0
	Supply Current of Vc		Ic	mA		1.5	
Vss	Supply Voltage (-3.3V)		Vss	V	-3.45	-3.3	-3.15
	Supply Current of Vss		Iss	mA		1.3	
	Power dissipation		Pdis	mW		10	

6. Typical performance (Vss=-3.3 [V] Ta=25 [Degree C])

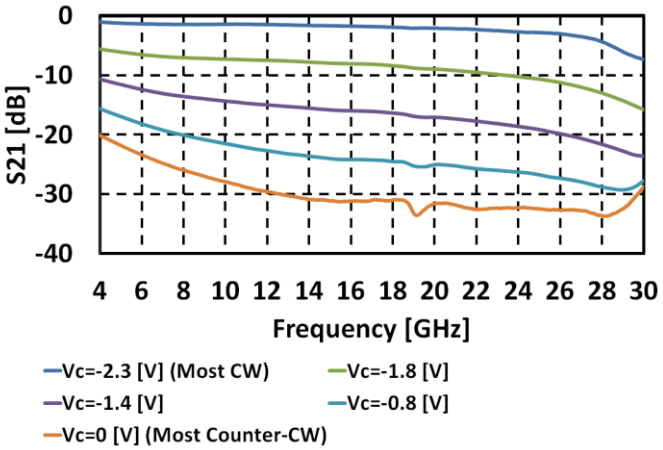


Fig.2 S21 vs Frequency over Vc

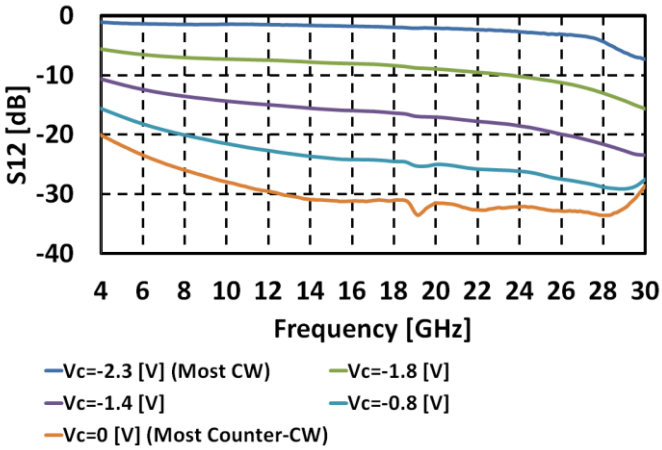


Fig.3 S12 vs Control voltage Vc

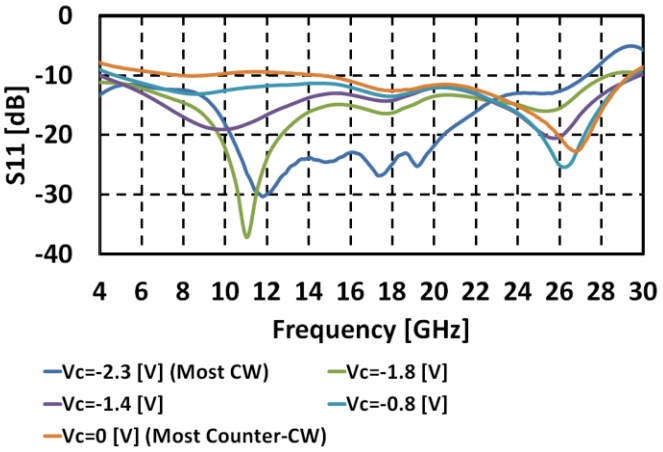


Fig.4 S11 vs Control voltage Vc

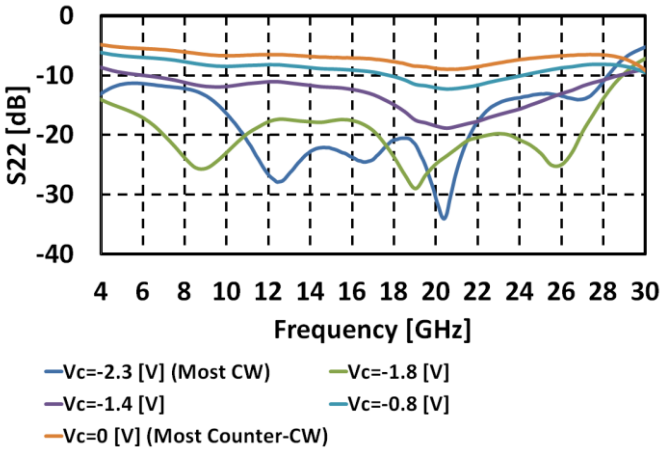


Fig.5 S22 vs Control voltage Vc

7. Precaution

This product uses ESD sensitive high-speed devices. We recommend that the product is handled with appropriate precaution described below.

1) Connect the ground (G) terminal of VT30A to the highest quality ground line in the room and connect this terminal to the ground terminal of test equipment as well.
2) Use ESD protection wrist strap which is connected to VT30A ground.
3) Avoid abnormal mechanical shock.

8. Attachment

1) 30 cm Jumper cable with pin header socket: 1

2014/3/14
Datasheet
DB40A_DS Rev.1.0

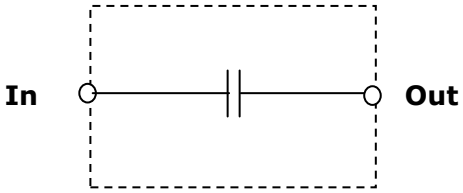
20 kHz - 40 GHz DC Block

DB40A

1. Application

AC coupling for 20 ~ 40 Gb/s optical transmission system, etc

2. Block diagram



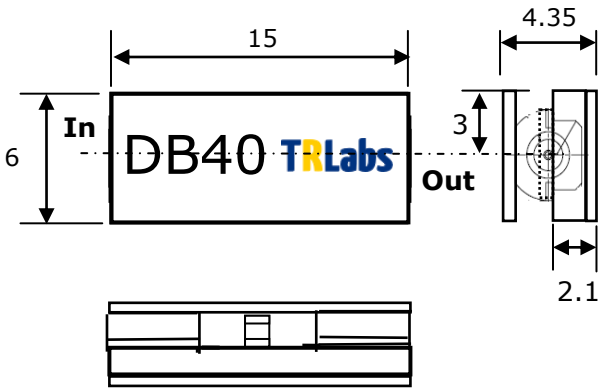


Fig. 1 Module structure

3. Terminal description

No	Name	Function	Note
1	In	Signal Input	SMPM/P
2	Out	Signal Output	SMPM/P

4. Absolute maximum ratings

Terminal	Parameter	Symbol	Unit	Min	Max
In	Applied Input power	Pin	dBm		>18.5
	Storage temperature	Tst	Degree C	-40	80

5. Characteristics (Ta=25 [Degree C])

Related terminal	Parameter	Symbol	Unit	Specification		
				Min	Typ	Max
In, Out	Typical S21 (0 to 40 GHz) See Fig.2	S21	dB		> -2.2	-
	Low frequency cut-off frequency	fcr	kHz		20	
In	Typical S11 (20 to 30 GHz) See Fig.3	S11	dB		< -15	
Out	Typical S22 (20 to 30 GHz) See Fig.4	S22	dB		< -15	
In	Input power	Pin	dBm			> 18.5

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2014/3/14
Datasheet
DB40A_DS Rev.1.0

6. Typical performance (Ta=25 [Degree C])

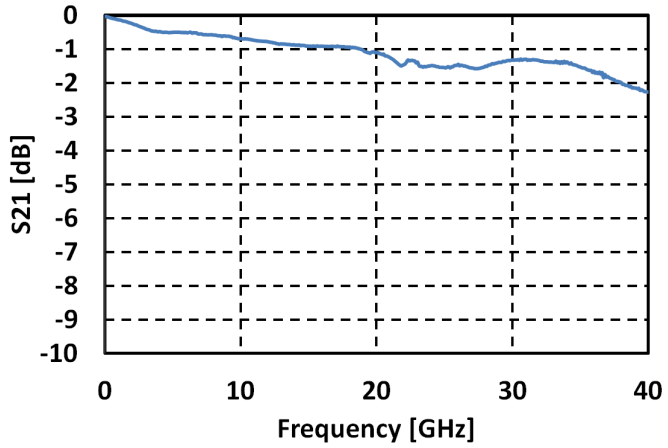


Fig.2 S21 vs Frequency

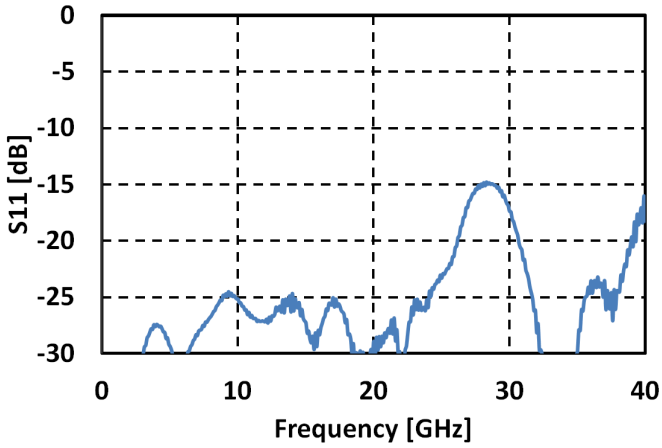


Fig.3 S11 vs Frequency

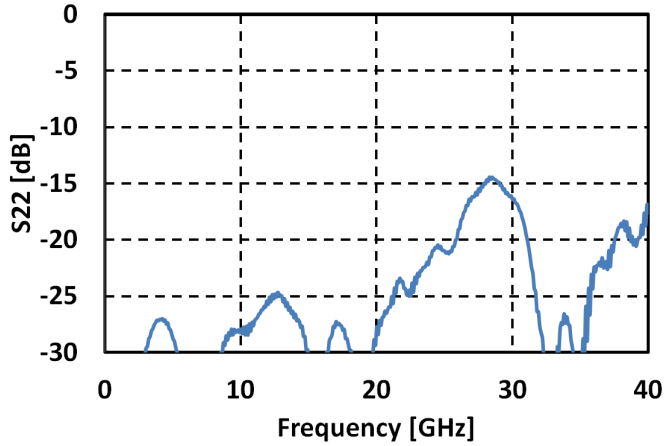


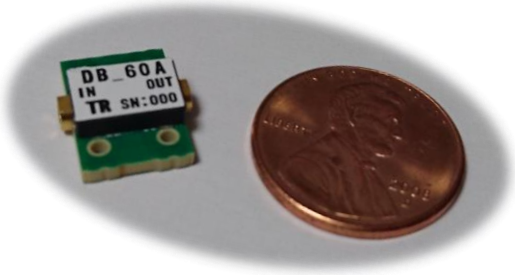
Fig.4 S22 vs Frequency

Takada RF Labs

Advanced Product Information
DB_60A_API_Rev.1.0_160629

60 GHz DC Block

DB_60A



1. Features

1) Wideband: 50kHz-60 GHz
2) Coaxial connector RF interface: G3PO

2. Application

DC block for AC coupling

3. Block diagram

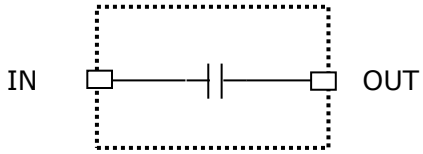
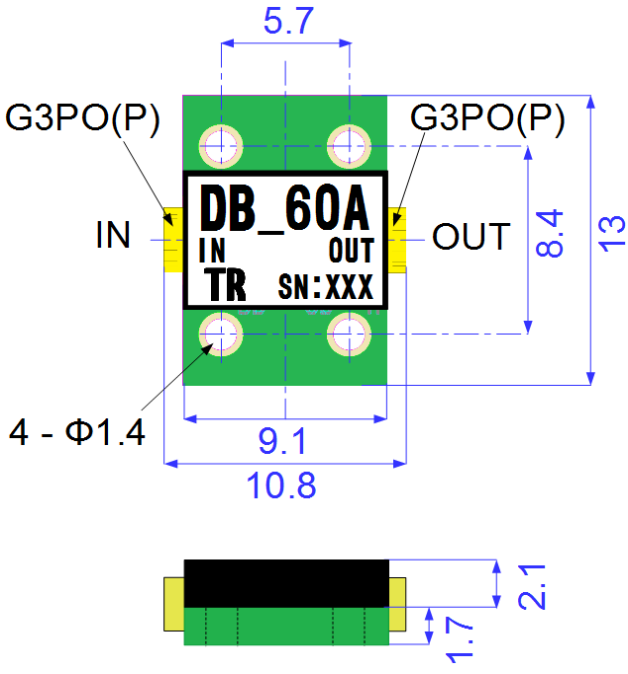


Fig. 1 Block diagram

4. Module structure



Unit: mm

Fig.2 DB_60A structure

5. Terminal description

Name	Function	Note
IN	Input signal	G3PO(P)
OUT	Output signal	G3PO(P)

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Takada RF Labs

Advanced Product Information
DB_60A_API_Rev.1.0_160629

6. Absolute maximum ratings

Related terminal	Parameter	Symbol	Unit	Min	Max
IN / OUT	Applied power	Pin	dBm		> 18.5
	Applied Voltage	Vindc	V		16
Tstrg	Storage temperature	Tst	℃	-40	85

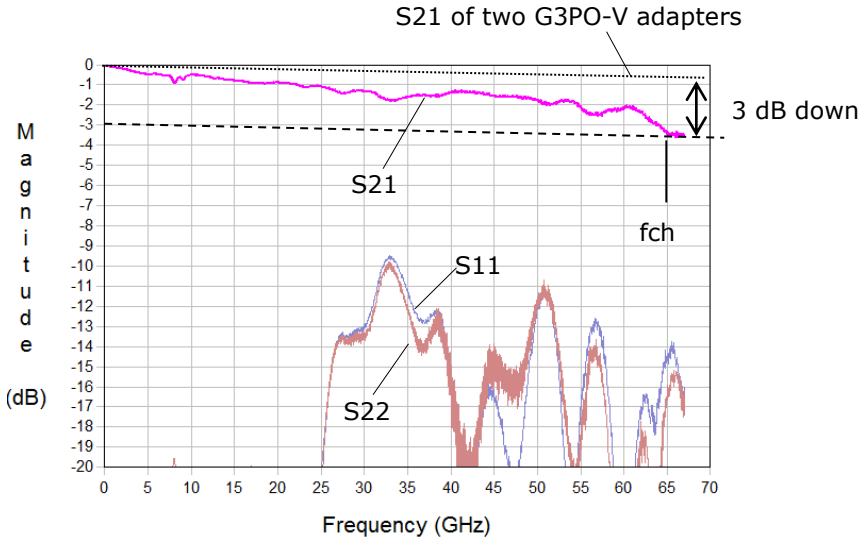
7. Recommended operation condition

Related terminal	Parameter	Symbol	Unit	Specification		
				Min	Typ	Max
	Operating ambient temperature	Ta	℃	5	25	70

8. RF Performance

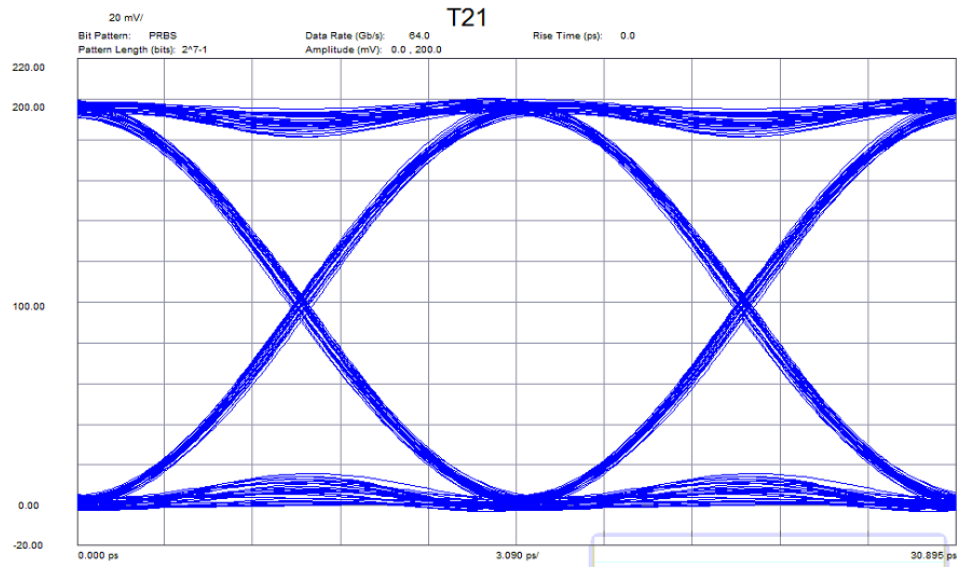
Related terminal	Parameter	Symbol	Unit	Specification		
				Min	Typ	Max
IN, OUT	High frequency 3dBdown cutoff	fch	GHz		65	
	Low frequency 3dBdown cutoff	fcl	Hz		50k	
	Maximum data speed (NRZ)	MDR	Gb/s		> 64	
	Mag S11/S22 @ <65 GHz	RL-60	dB		< -9.5	

9. Typical performance



This data includes G3PO-V adapters for input and output.

Fig.3 S-parameter of DB_60A



20 mV / div

3.09 ps / div

This is obtained from measured S-parameter by frequency-to-time domain conversion (input signal amplitude=200 mV, input signal tr/tf=0 ps).

Fig.4 64 Gb/s output eye diagram of PRBS 2^7-1 NRZ signal

10. Precaution

(1) When connecting G3PO of the module to other connector interface devices, **use cables which have good connector-mating to Corning Gilbert G3PO**.

(2) When connecting a G3PO cable to the module, use your hands only. **Do not use pliers.** This avoids the use of inadequate connectors to be forced to push onto G3PO of the module with abnormal mechanical power. If using adequate connectors, it is very easy to push on by hands.

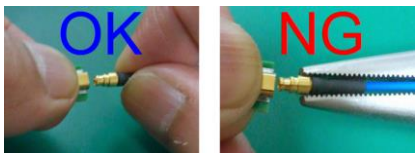


Fig.C1 How to connect a G3PO cable to the module

(3) Do not apply abnormal mechanical stress and/or shock to the G3PO connector!

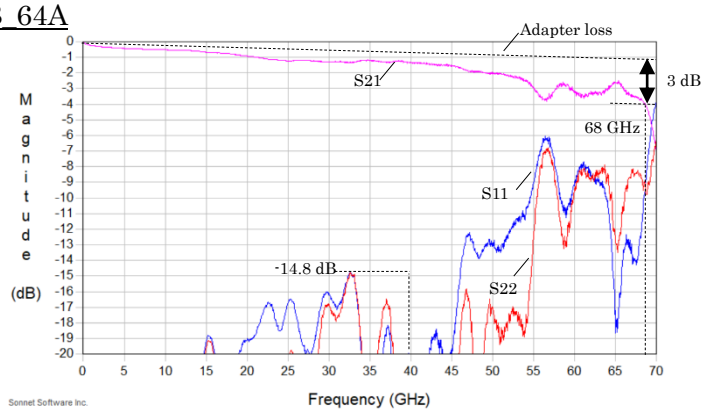
181013

G3PO 64 Gbaud　DC Block, Bias-T, DC Feed の性能

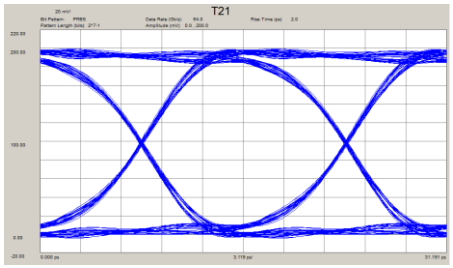
特長：超小型,　　G3PO, 64 Gb/s(baud)動作

製品名	型番	開発時のモジュール名	Operating speed (Gb/s)	3 dB band width F-3dB (GHz)	Return loss @ < 40 GHz (dB)
DC Block	DB_64A	DB_90A	Up to 64	68	< -14.8
Bias -T	BT_64A	BT_90A	Up to 64	56	< -9.2
DC Feed	DF_64A	DC-FEED_90A	Up to 64	63	< -9.8

DB_64A



S-parameter (including adaptor)



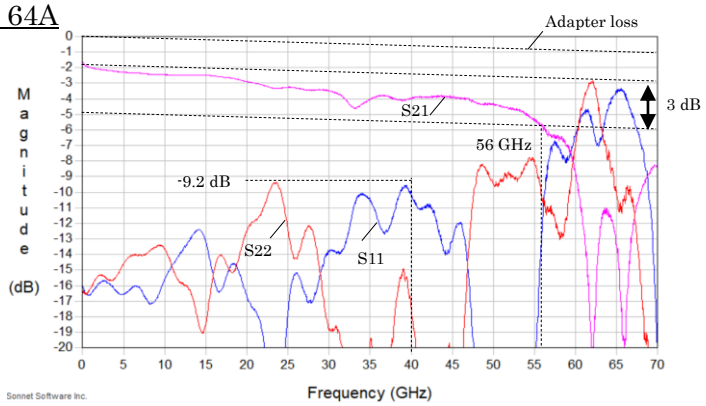
0.1 (V/ div)

3.12　(ps/div)

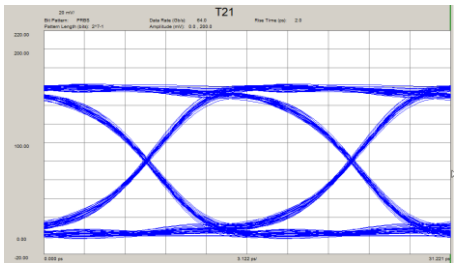
Output eye diagram at 64 Gb/s

(Input: 1 Vpp, NRZ PRBS 2^7-1, tr/tf (20-80%)= 2 ps)

BT_64A



S-parameter (including adaptor)



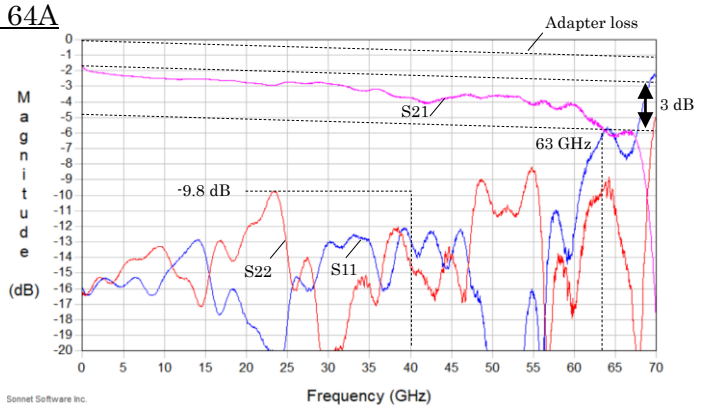
0.1 (V/ div)

3.12　(ps/div)

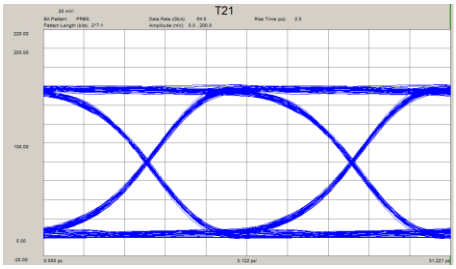
Output eye diagram at 64 Gb/s

(Input: 1 Vpp, NRZ PRBS 2^7-1, tr/tf (20-80%)= 2 ps)

DF_64A



S-parameter (including adaptor)



0.1 (V/ div)

3.12　(ps/div)

Output eye diagram at 64 Gb/s

(Input: 1 Vpp, NRZ PRBS 2^7-1, tr/tf (20-80%)= 2 ps)

2014/3/4
Datasheet
TM40L_DS Rev.1.0

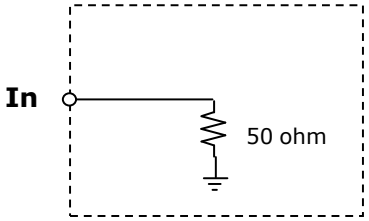
40 GHz 50Ω Terminator

TM40L

1. Application

50 ohm termination for 10-40 Gb/s optical transmission system, etc

2. Block diagram



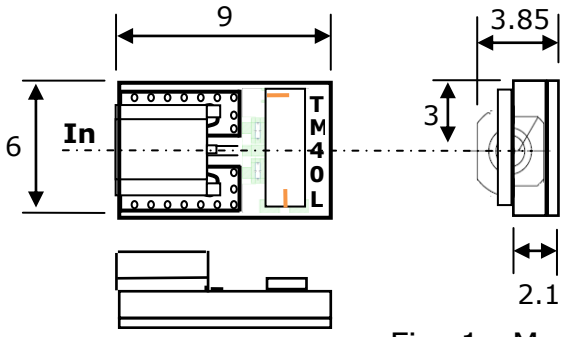


Fig. 1 Module structure

3. Terminal description

No	Name	Function	Note
1	In	Signal Iutput	SMPM/P

4. Absolute maximum ratings

Terminal	Parameter	Symbol	Unit	Min	Max
In	Applied Input power	Pin	dBm		>18.5
	Storage temperature	Tst	Degree C	-40	80

5. Characteristics (Ta=25 [Degree C])

Related terminal	Parameter	Symbol	Unit	Specification		
				Min	Typ	Max
In	S11 See Fig.2	S11	dB		<-15	
	Input power	Pin	dBm			>18.5

6. Typical performance (Ta=25 [Degree C])

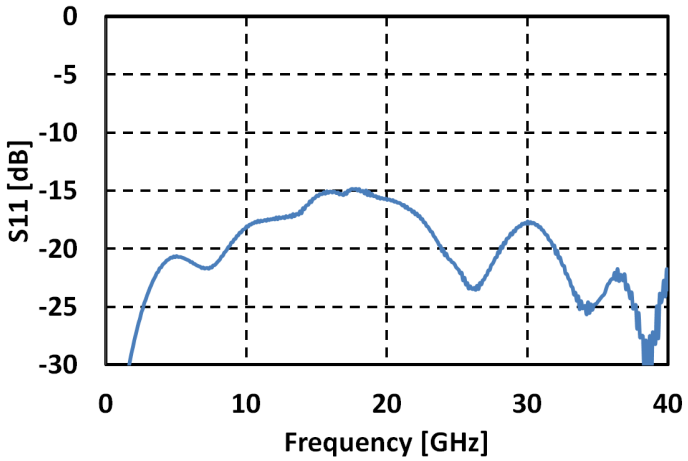


Fig.2 S11 vs Frequency

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Advanced Product Information
TM_110A_API_Rev.1.1_190218

110 GHz 50 ohm Terminator

TM_110A

1. Feature

1) Wideband: DC-110 GHz
2) Coaxial connector RF interface: 1mm (P or J)

2. Application

50-ohm termination

3. Block diagram

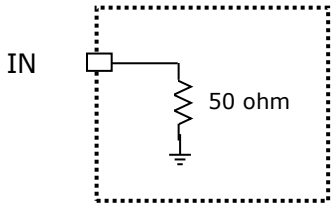
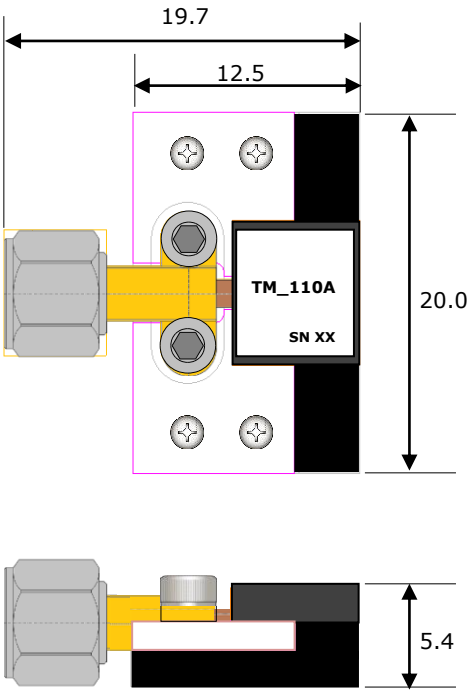


Fig. 1 Block diagram

4. Module structure



UNIT: mm

Fig. 2 Structure of TM_110A

Takada RF Labs, Inc., 922-3 Minamiyana, Hadano city, Kanagawa 257-0003, JAPAN
URL: https://www.TakadaRF.com/ E-mail: contact@TakadaRF.com Phone: 0463-26-3048

5. Terminal description

Name	Function	Note
IN	Input signal	1mm (P) or (J)

6. Absolute maximum ratings

Related terminal	Parameter	Symbol	Unit	Min	Max
IN/ OUT	Applied power	Pin	dBm		+20 (TBD)
Tstrg	Storage temperature	Tst	℃	-40	85

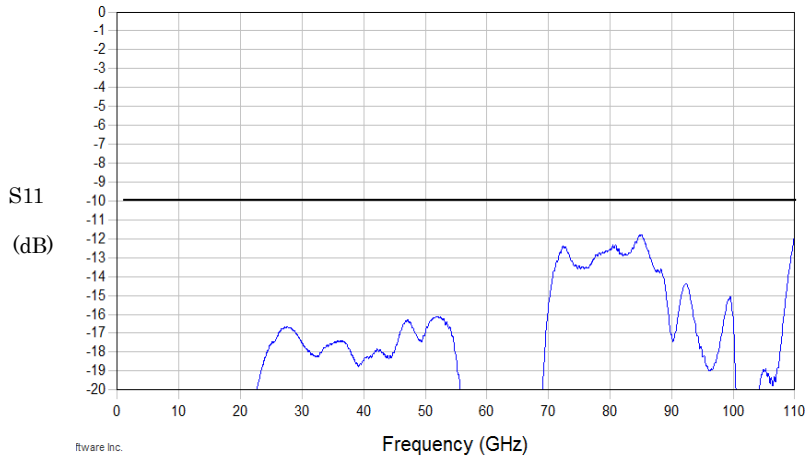
7. Recommended operation condition

Related terminal	Parameter	Symbol	Unit	Specification		
				Min	Typ	Max
	Operating module bottom temperature (TBD)	Tmb	℃	5	25	70

8. RF Performance (TBD)

Related terminal	Parameter	Symbol	Unit	Specification		
				Min	Typ	Max
IN	RF Signal frequency	frf	GHz	DC		110
IN	Mag S11 at DC-65 GHz	S11	dB		< -16	
IN	Mag S11 at 65-110GHz	S21	dB		< -12	

9. Typical performance



(Note)
If you need better termination performance, connect attenuator AT3_110A in front of TM_110A. Then, you will get return loss of <-15 dB at DC to 109 GHz range.

Fig. 3 Frequency dependence of S11

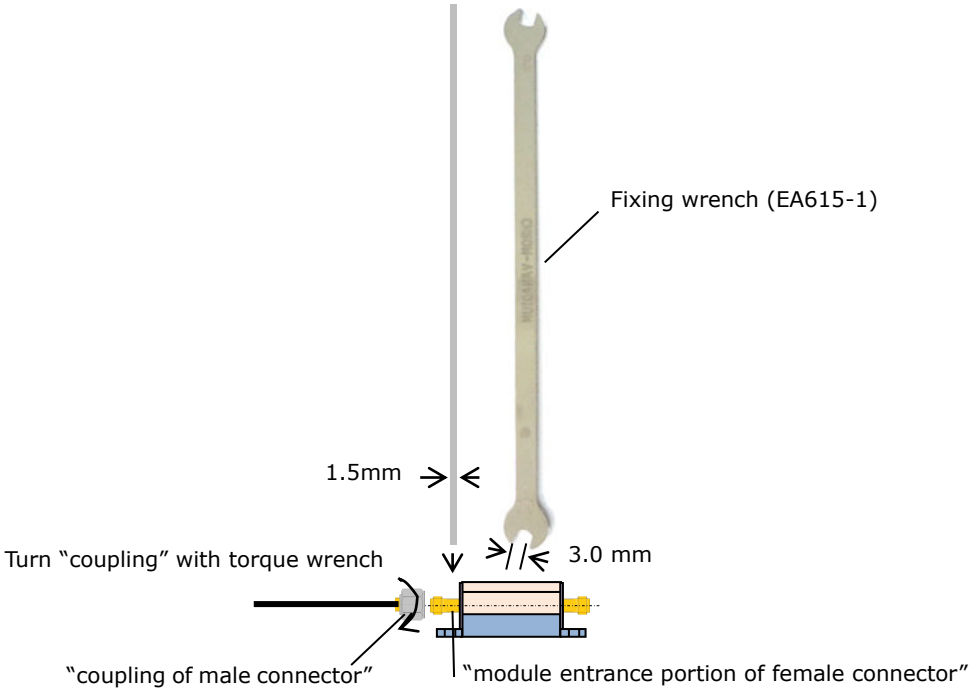
10. Precaution

(A) When connecting 1mm-coaxial connector cable to the module, use "torque wrench" with torque of 45 N-cm.

Special note:

Turn "coupling of male connector" with torque wrench. At this time, you must use a "fixing wrench (EA615-1, made by ESCO)" which is put onto module entrance portion of female connector.

Do not turn the coupling without using the "fixing wrench", otherwise, it gives abnormal mechanical stress to the module and damages it.



(B) Avoid abnormal mechanical shock to the module.

Advanced Product Information
PD_110A_API_Rev.1.0_170321

30kHz-110 GHz Broad-band Power Detector Module

PD_110A

1. Feature

1) Ultra-broad band : 30 kHz-110 GHz
2) Coaxial connector interface: 1mm-coaxial connector (P or J)

2. Application

RF signal power measurement tool for millimeter wave R&D

3. Block diagram

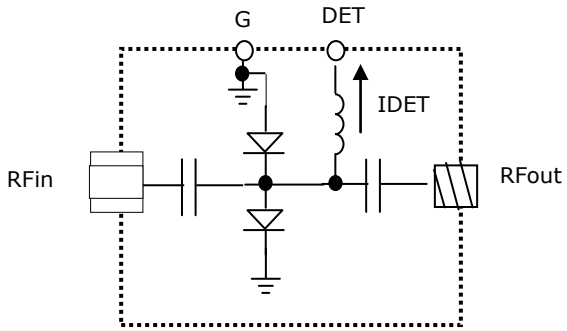


Fig. 1 Block diagram of PD_110A

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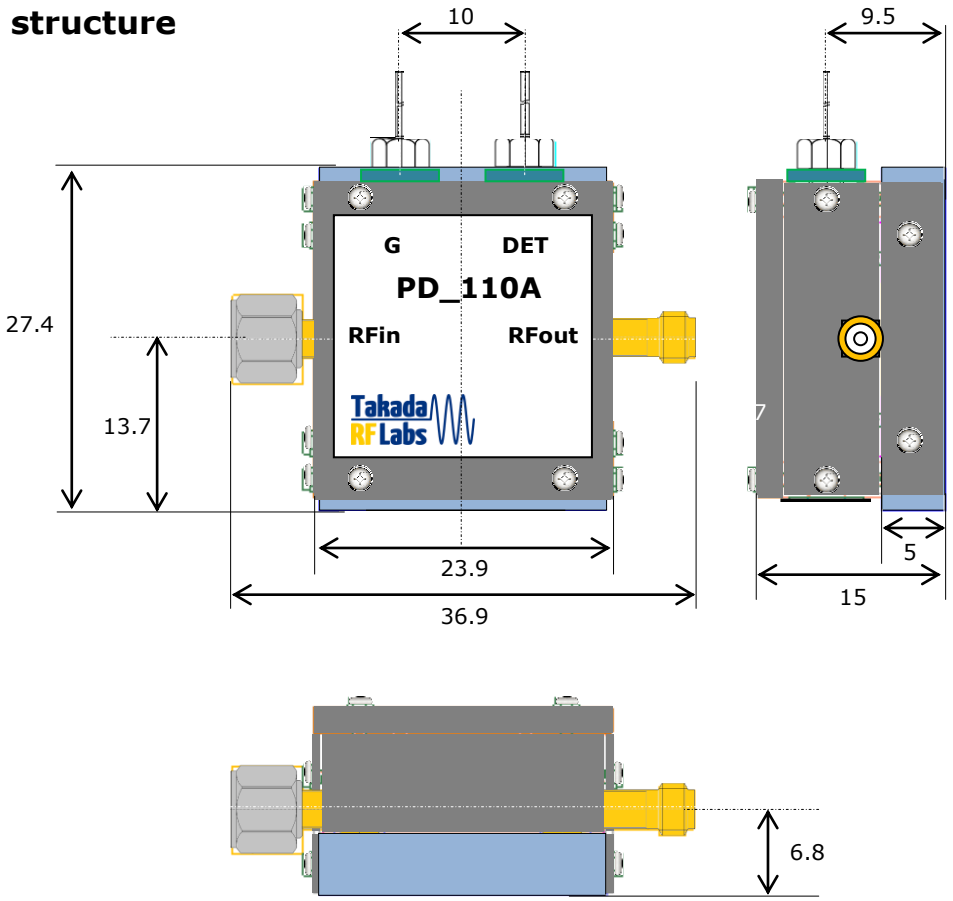
URL: http://www.TakadaRF.com/ E-mail: contact@TakadaRF.com Phone: 0463-26-3048

4. Module structure



単位： mm

Fig. 2 Module structure

5. Terminal description

Name	Function	Note
RFin	Signal Input (Internally AC Coupled)	1mm (P or J)
RFout	Signal Output (Internally AC Coupled) Terminate with 50-ohm.	1mm (P or J)
DET	Detector output Connect this terminal to input of trans-impedance amplifier TIA. TIA design will be supported.	EMI filter
G	Ground (0 V)	EMI filter

6. Absolute maximum ratings

Related terminal	Parameter	Symbol	Unit	Min	Max
RFin	Input power	Pin	dBm		+3 (TBD)
Tstrg	Storage temperature	Tst	℃	-40	85

7. Recommended operation condition

Parameter	Symbol	Unit	Specification		
			Min	Typ	Max
Operating module bottom Temperature	Tmb	℃	5	25	80
Input signal frequency	fin	Hz	30k		110G
Bias voltage at DET (See Fig. 6)	Vbias	V		0.67	
RF input power	Pin	dBm	-30		+2

8. RF Performance

Tmb=25℃

Related terminal	Parameter	Symbol	Unit	Specification		
				Min	Typ	Max
	DET current (IDET) vs RF Input power(Pin)				See Fig. 3	
RFin, DET	Responsibity = IDET /Pin	Res	A/W		See Fig. 4	
RFin, RFout	Insertion loss	S21	dB		See Fig. 5	
RFin	Input return loss	S11	dB		See Fig. 6, Fig.7	
RFout	Output return loss	S22	dB		See Fig. 6	

9. Typical performance

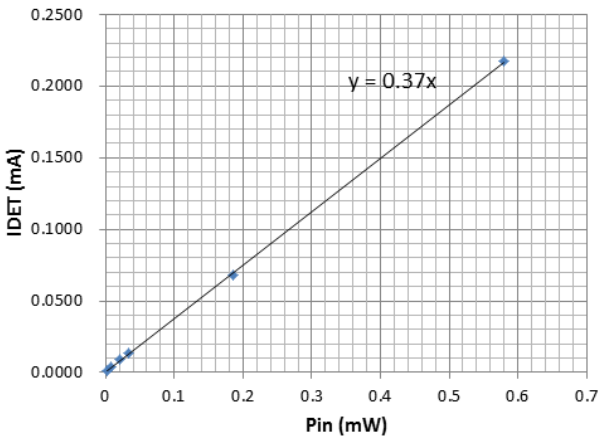


Fig. 3 DET current vs Input power (78 GHz)

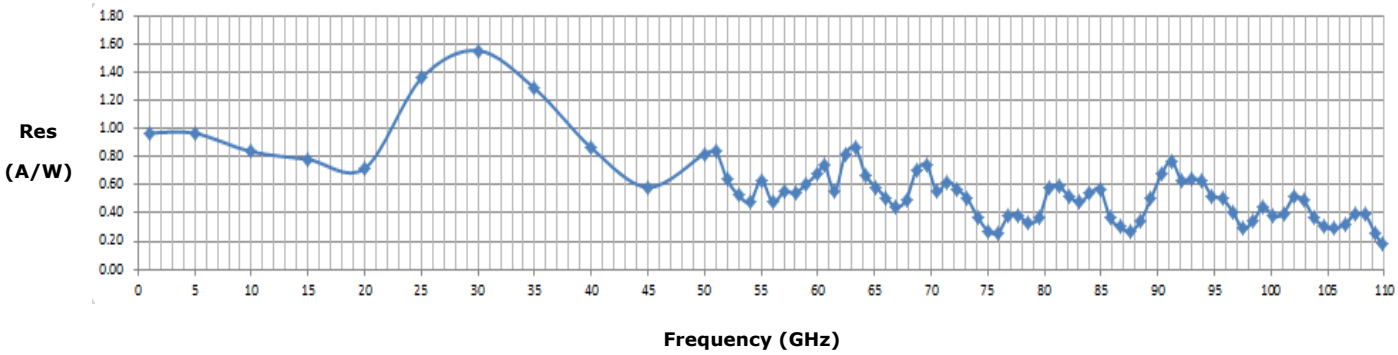


Fig.4 Responsivity vs frequency (RFout is terminated with terminator TM110A)

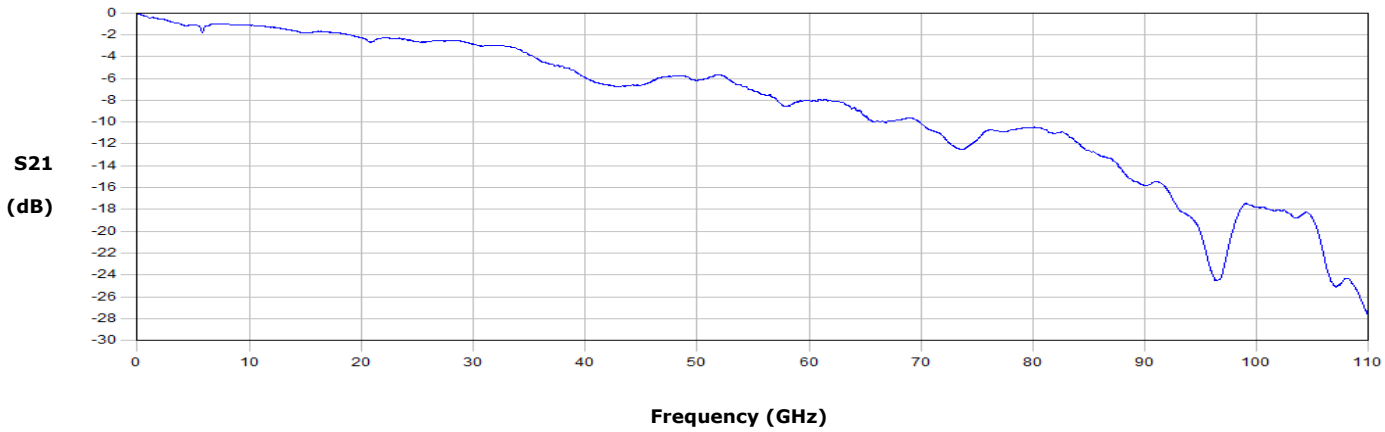


Fig.5 Insertion loss(RFin to RFout) vs frequency

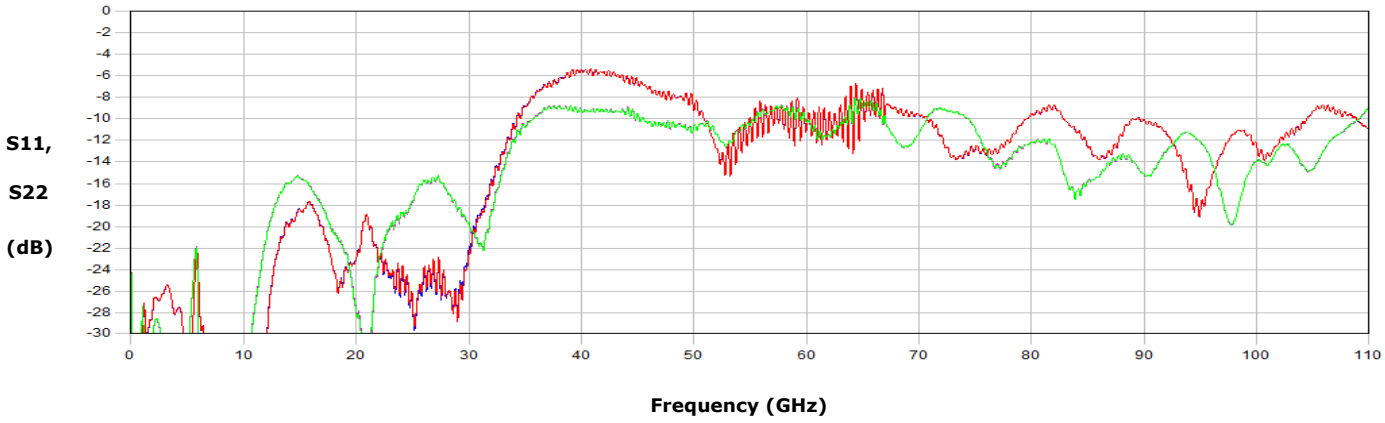


Fig.6 S11 and S22 vs frequency

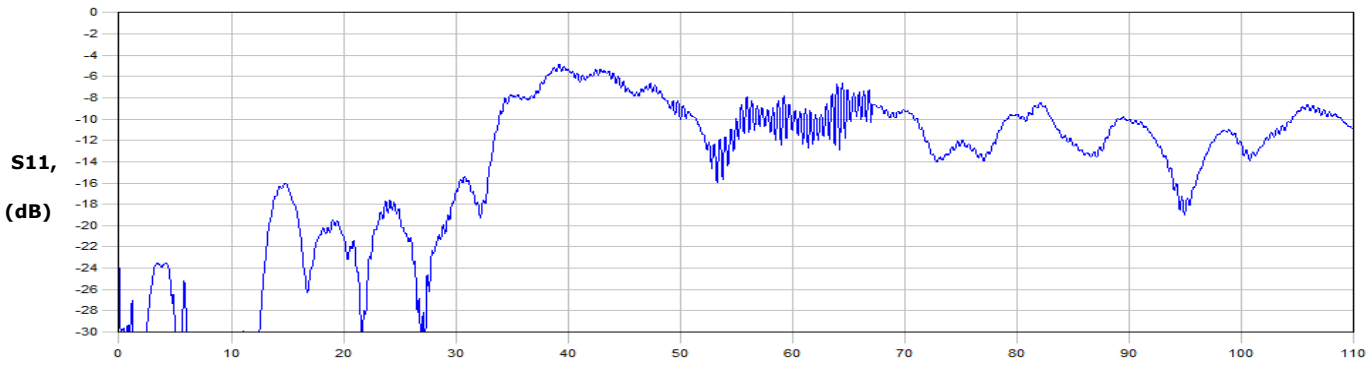


Fig.7 Input return loss vs frequency (RFout is terminated with terminator TM110A)

10. Implementation examples

(1) Example 1 (RF power monitoring for transmitter power stabilization)

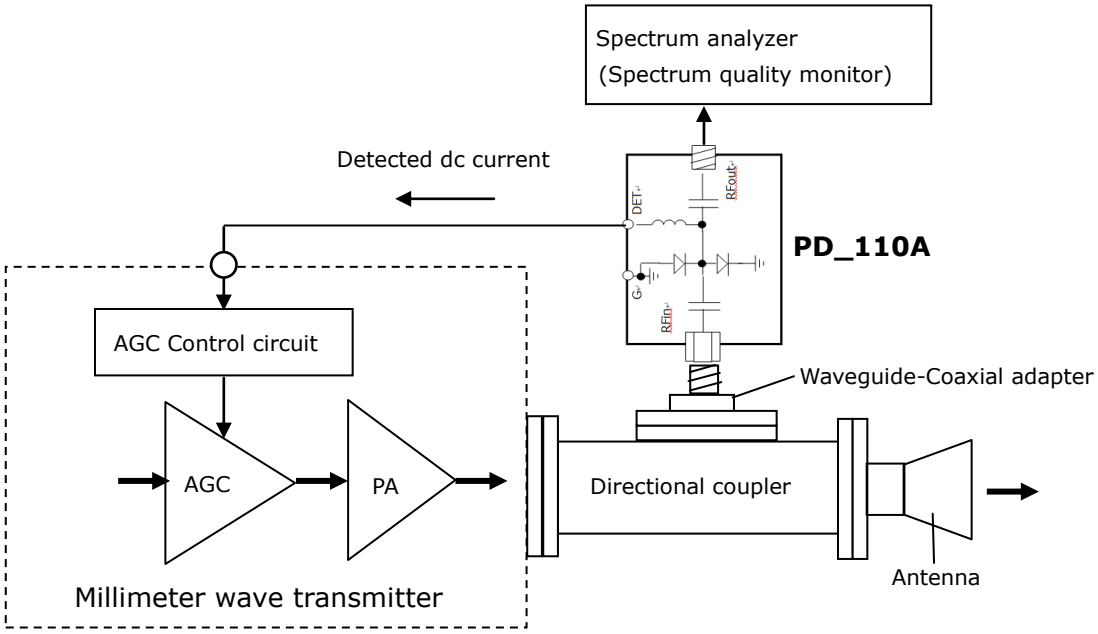


Fig. 8 Millimeter wave transmitter power stabilization system

(2) Example 2 (RF power measurement)

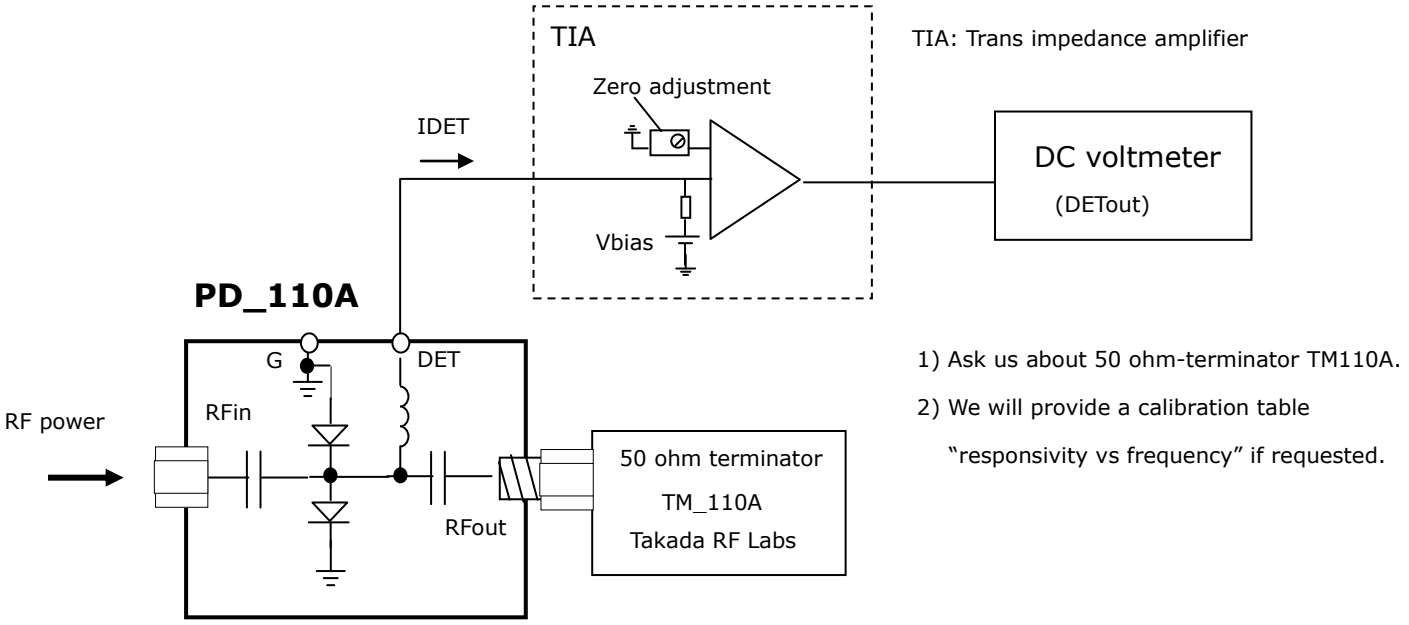


Fig. 9 RF power measurement system

11. Precaution

(A) This product uses ESD sensitive high-speed devices. We recommend that the product is handled with appropriate precaution described below.

1) Connect the ground (G) terminal of module to the highest quality ground line in the room and connect this terminal to the ground terminal of test equipment as well.

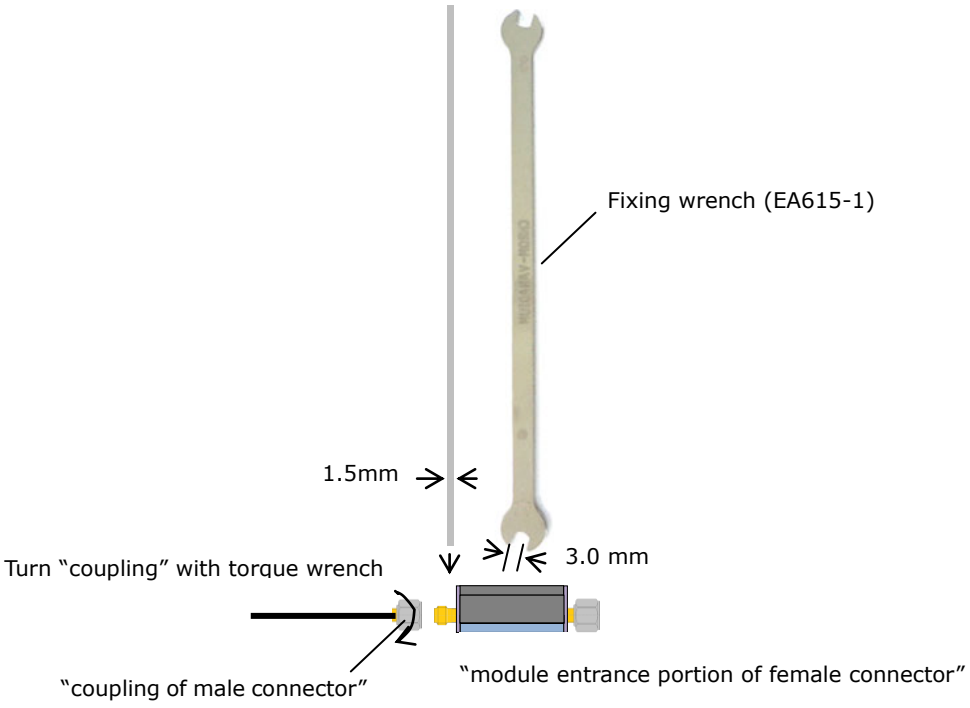
2) Use ESD protection wrist strap which is connected module ground.

(B) When connecting 1mm-coaxial connector cable to the module, use "torque wrench" with torque of 45 N-cm.

Special note:

Turn "coupling of male connector" with torque wrench. At this time, you must use a "fixing wrench (EA615-1, made by ESCO)" which is put onto module entrance portion of female connector.

Do not turn the coupling without using the "fixing wrench", otherwise, it gives abnormal mechanical stress to the module and damages it.



(C) Avoid abnormal mechanical shock to the module.

Takada RF Labs

Advanced Product Information
HPF_35A_API_Rev.1.0_160629

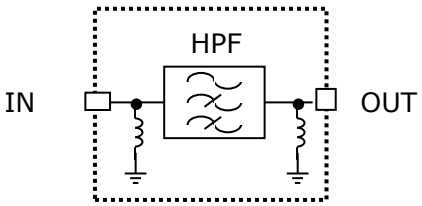
40-60 GHz Pass-Band High Pass Filter

HPF_35A

1. Feature

High pass filter to reject fundamental and sub-harmonics in frequency multipliers, etc

2. Block diagram



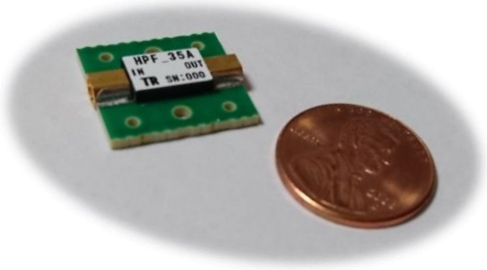
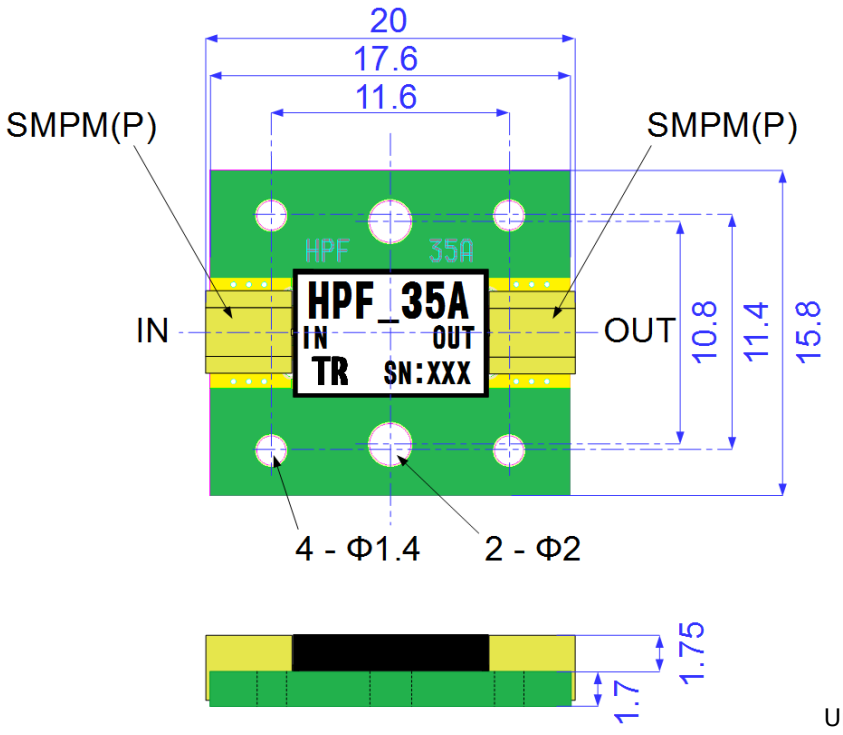


Fig.1 Block diagram

3. Structure



Unit: mm

Fig.2 HPF_35A structure

4. Terminal description

Name	Function	Note
IN	Input signal	SMPM(P)
OUT	Output signal	SMPM(P)

Takada RF Labs, Inc., 1208-7 Minamiyana, Hadano city, Kanagawa 257-0003, JAPAN
URL: http://www.TakadaRF.com/ E-mail: contact@TakadaRF.com Phone: 0463-26-3048

Takada RF Labs

Advanced Product Information
HPF_35A_API_Rev.1.0_160629

5. Absolute maximum ratings

Related terminal	Parameter	Symbol	Unit	Min	Max
IN / OUT	Applied power	Pin	dBm		+20 (TBD)
Tstrg	Storage temperature	Tst	℃	-40	85

6. Recommended operation condition

Related terminal	Parameter	Symbol	Unit	Specification		
				Min	Typ	Max
	Operating ambient temperature	Ta	℃	5	25	70

7. RF Performance

Related terminal	Parameters	Symbol	Unit	Specification		
				Min	Typ	Max
IN, OUT	Pass-band	PB	GHz		40-60	
	Pass-band Mag S21 @ 40 GHz	S21_40	dB		-2.0	
	Pass-band Mag S21 @ 50 GHz	S21_50	dB		-3.25	
	Pass-band Mag S21 @ 60 GHz	S21_60	dB		-4.5	
	Pass band ripple	PBR	dB		±1.5	
	Rejection-band Mag S21 @ <27 GHz	ILrej	dB		<-30	
	3 dB down cut-off frequency	fc	GHz		35	
	Rejection curve slope	RCS	dB/GHz		2.5	
IN	Pass band input return loss	RLin	dB		>8.5	
OUT	Pass band output return loss	RLout	dB		>8.5	

8. Typical performance

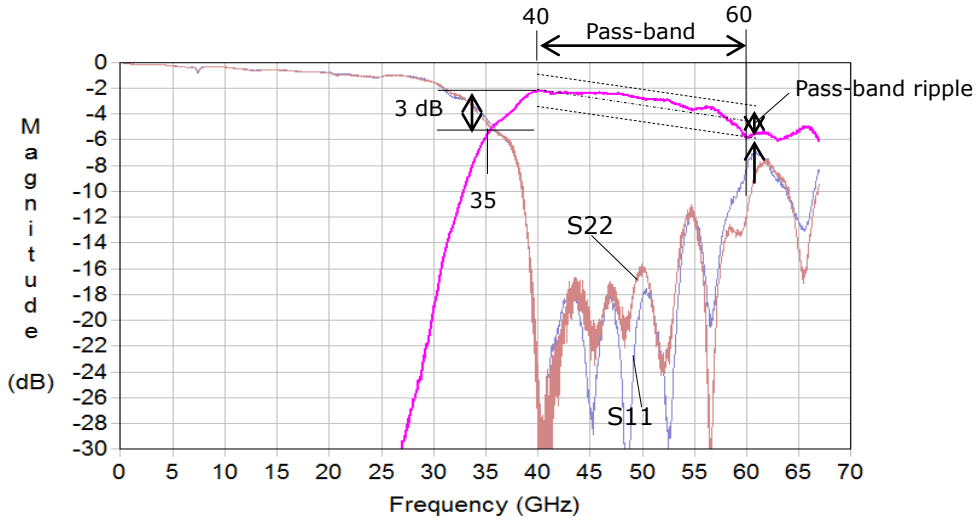


Fig.3 S-parameter of HPF_35A

9. Precaution

(1) When connecting SMPM of the module to other connector interface devices, **use cables which have good connector-mating to Corning Gilbert GPPO.** If you have any questions on this, please contact us.

(2) When connecting a SMPM (GPPO) cable to the module, use your hands only. **Do not use pliers.** This avoids the use of inadequate connectors to be forced to push onto SMPM of the module with abnormal mechanical power. If using adequate connectors, it is very easy to push on by hands.

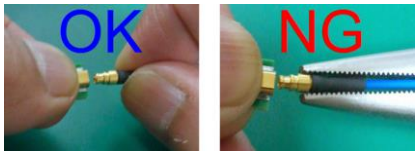


Fig.C1 How to connect a SMPM cable to the module

(3) When taking off a SMPM cable from the module, use a SMPM **removal tool** such as shown below.

Removal tool to take SMPM off
・01S0922-00
・Waka Manufacturing Co.,Ltd.

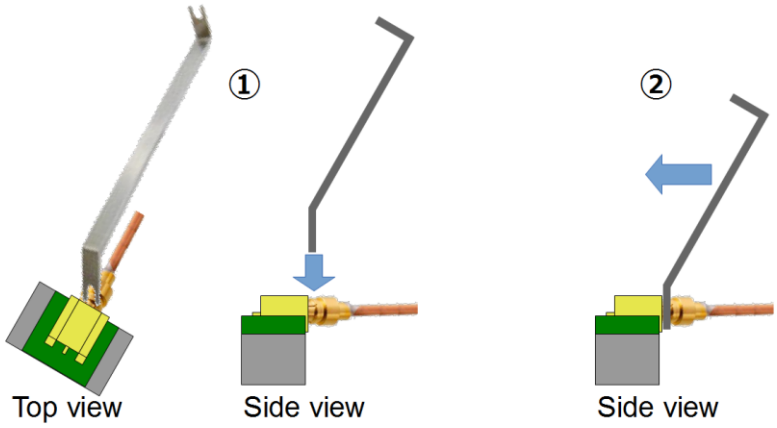


Fig.C2 How to take off SMPM cable from the module

(4) Do not apply abnormal mechanical stress and/or shock to a SMPM connector!

Takada RF Labs

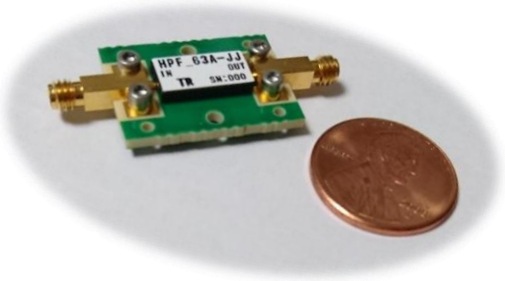
Advanced Product Information
HPF_63A_API_Rev.1.0_160629

70-110 GHz Pass-Band High Pass Filter

HPF_63A-XY

1. Feature

High pass filter for rejecting fundamental wave and sub-harmonics in frequency multiplier, etc



2. Block diagram

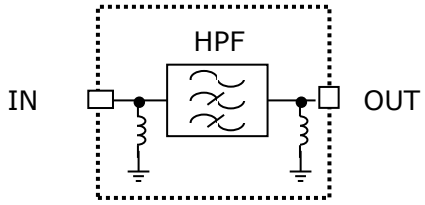
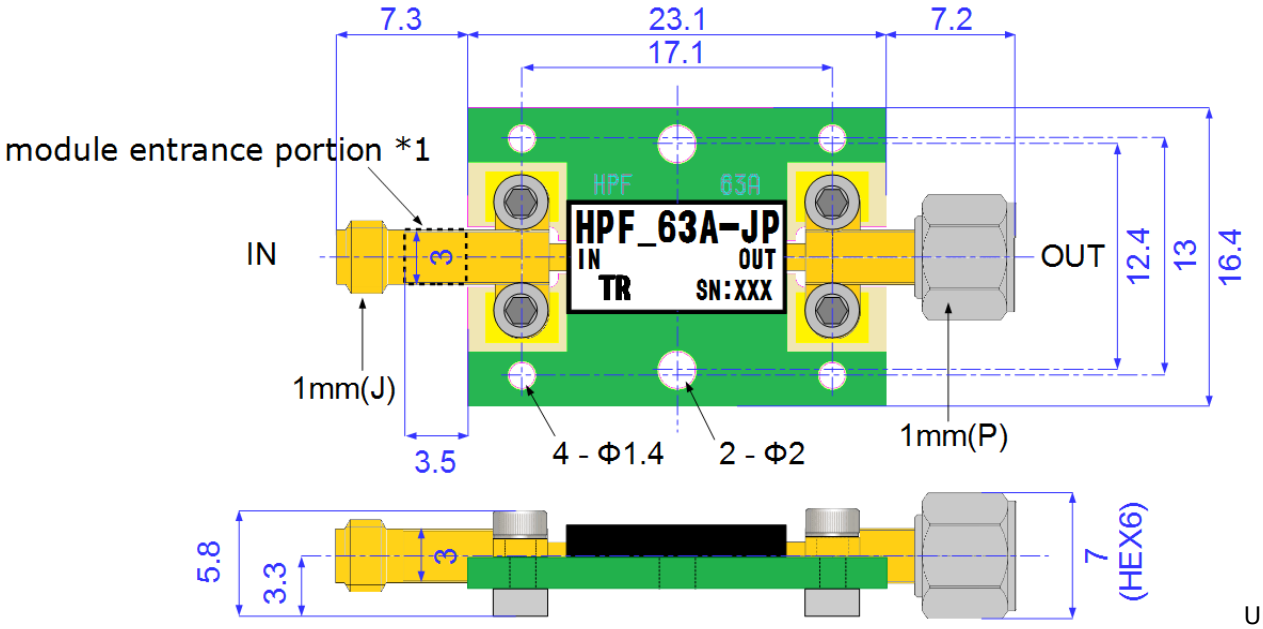


Fig.1 Block diagram

3. Structure



Unit: mm

*1: For detail of "module entrance portion", see [9. Precaution] at P.3.

Fig.2 Structure of HPF_63A-JP

4. Terminal description

Name	Function	Note
IN	Input signal	1mm (P) or 1mm (J)
OUT	Output signal	1mm (P) or 1mm (J)

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5. Absolute maximum ratings

Related terminal	Parameter	Symbol	Unit	Min	Max
IN / OUT	Applied power	Pin	dBm		+20 (TBD)
Tstrg	Storage temperature	Tst	℃	-40	85

6. Recommended operation condition

Related terminal	Parameter	Symbol	Unit	Specification		
				Min	Typ	Max
	Operating ambient temperature	Ta	℃	5	25	70

7. RF Performance

Related terminal	Parameter	Symbol	Unit	Specification		
				Min	Typ	Max
IN, OUT	Pass-band	PB	GHz		70-110	
	Pass-band Mag S21 @ 70 GHz	S21_70	dB		-4.5	
	Pass-band Mag S21 @ 90 GHz	S21_90	dB		-4.75	
	Pass-band Mag S21 @ 110 GHz	S21_110	dB		-5.0	
	Pass band ripple	PBR	dB		±0.9	
	Rejection-band Mag S21 @ <55 GHz	ILrej	dB		<-30	
	3 dB down cut-off frequency	fc	GHz		63	
	Rejection curve slope	RCS	dB/GHz		4	
IN	Pass band input return loss	RLin	dB		>9.5	
OUT	Pass band output return loss	RLout	dB		>9.5	

8. Typical performance

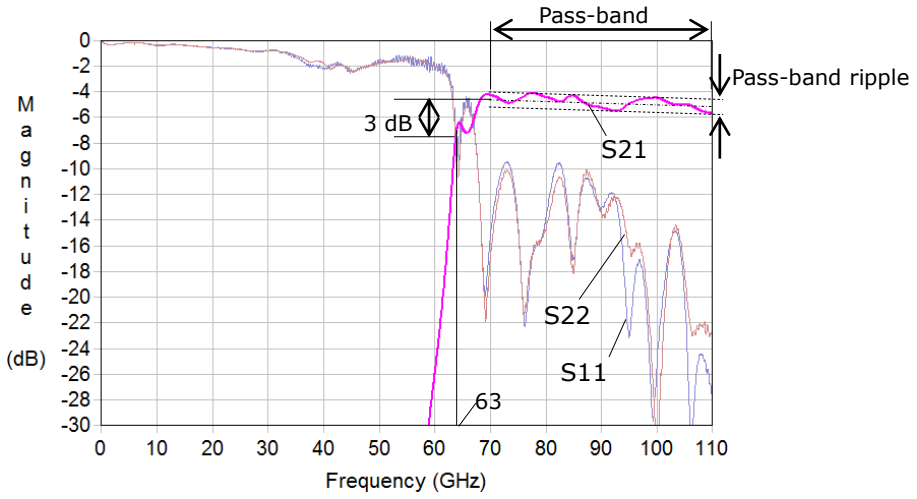


Fig.3 S-parameter of HPF_63A

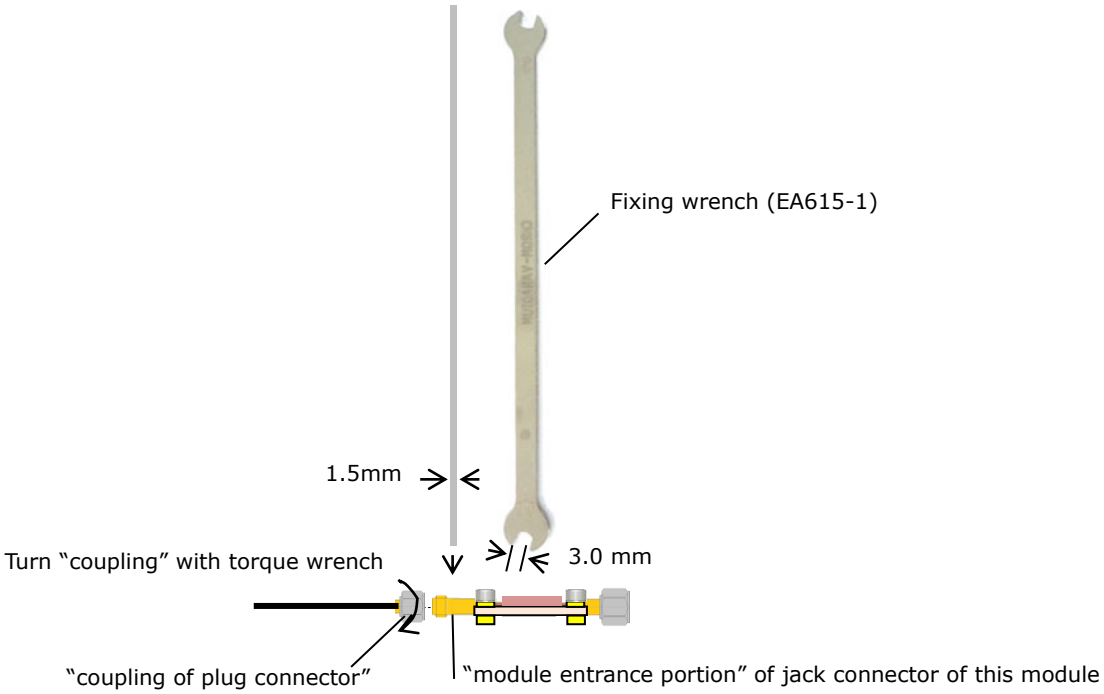
9. Precaution

(1) When connecting 1mm-coaxial connector cable to the module, use "torque wrench" with torque of 45 N-cm.

Special note:

Turn "coupling of plug (male) connector" with torque wrench. At this time, you must use a "fixing wrench (EA615-1, made by ESCO)" which is put onto "module entrance portion" of jack (female) connector.

Do not turn the coupling without using the "fixing wrench", otherwise, it gives abnormal mechanical stress to the module and damages it.



(2) Avoid abnormal mechanical shock to the product.

10. Product ordering code

HPF_63A-XY

- IN connector: P (plug) or J (jack)
- OUT connector: P (plug) or J (jack)

Takada RF Labs

Advanced Product Information
ADP_1X1YA_API_Rev.1.0_160629

1mm-connector Adapters

ADP_1X1YA

1. Feature

Adapter between connector of 1mm (P), or 1mm (J)

2. Block diagram

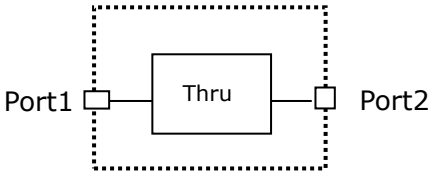
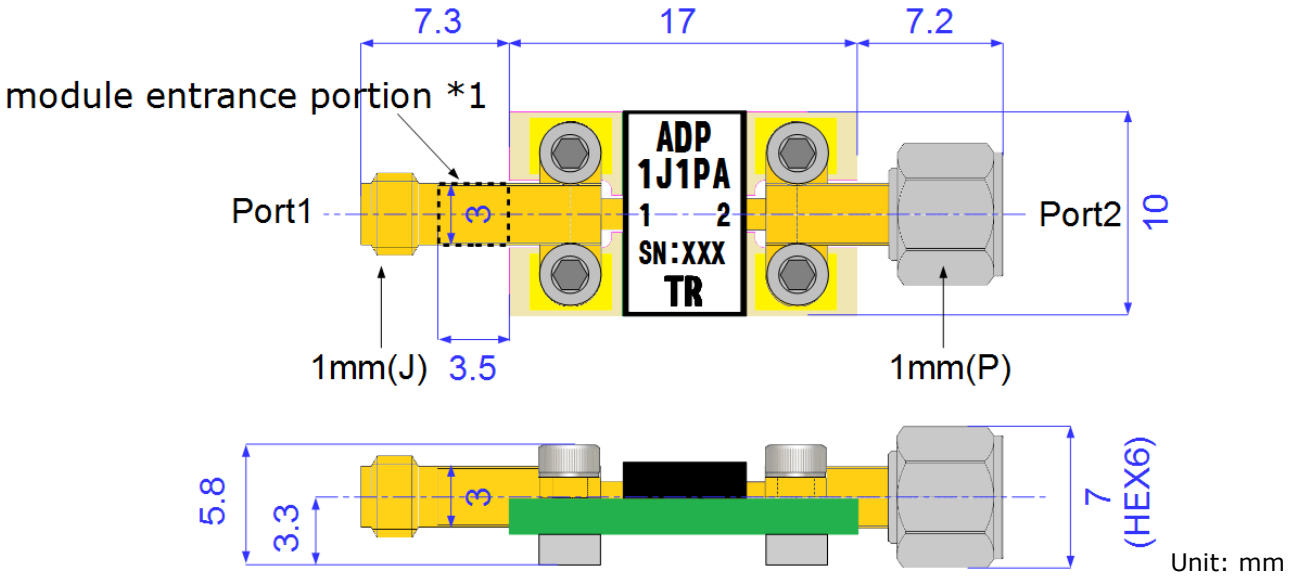


Fig. 1 Block diagram

3. Structure



*1: For detail of "module entrance portion", see [9. Precaution] at P.4.

Fig.2 Structure of ADP_1J1PA

4. Terminal description

Name	Function	Note
Port1	Port1	1mm (P) or 1mm (J)
Port2	Port2	1mm (P) or 1mm (J)

5. Absolute maximum ratings

Related terminal	Parameter	Symbol	Unit	Min	Max
Port1 / Port2	Applied power	Pin	dBm		+20 (TBD)
Tstrg	Storage temperature	Tst	℃	-40	85

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6. Recommended operation condition

Related terminal	Parameter	Symbol	Unit	Specification		
				Min	Typ	Max
	Operating ambient temperature	Ta	℃	5	25	70

7. RF Performance

Related terminal	Parameter	Symbol	Unit	Specification		
				Min	Typ	Max
Port1, Port2	S21 3dB down frequency	F-3dB	GHz		> 110	
Port1	S11 @ < 110 GHz	S11	dB		< -14	
Port2	S22 @ < 110 GHz	S22	dB		< -14	

8. Typical performance

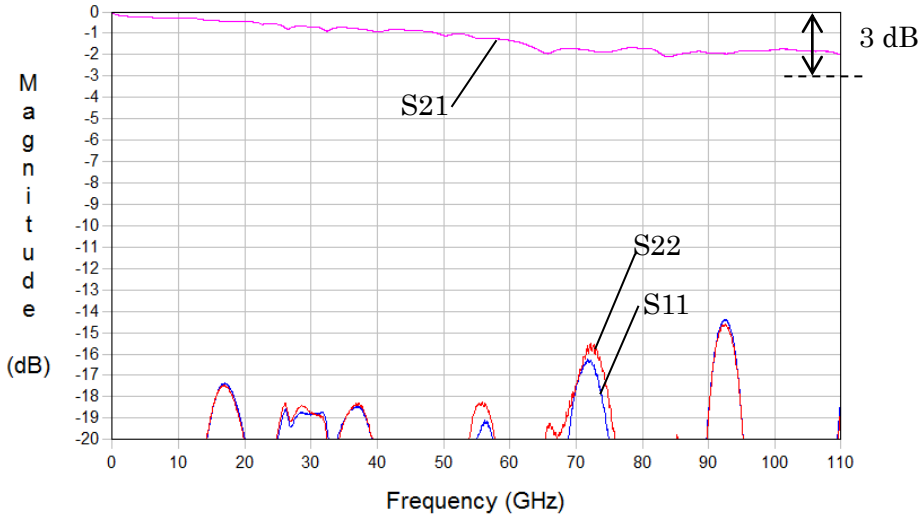
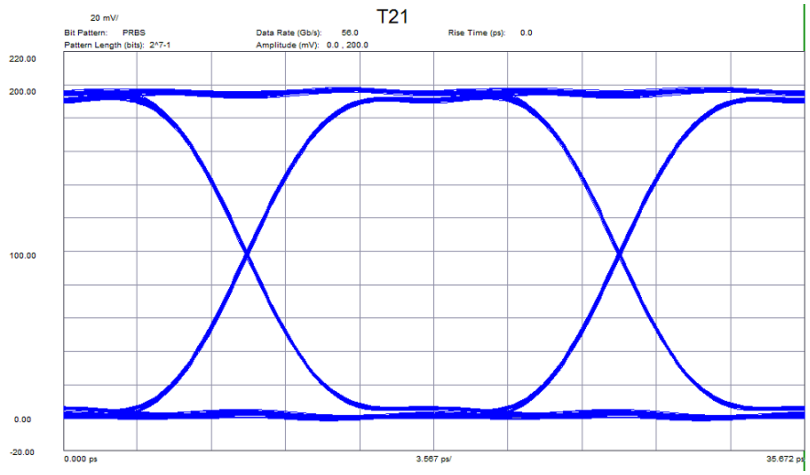


Fig.4 S-parameter of ADP_1P1PA

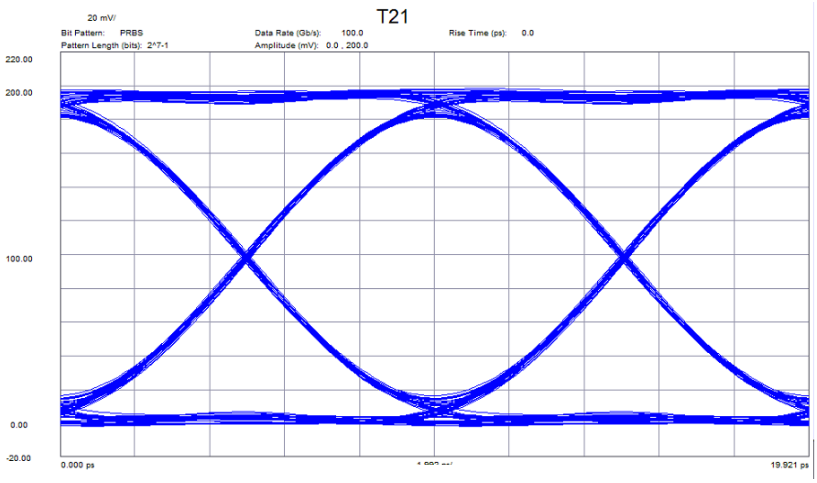


20 mV/div

3.6 ps/div

This is obtained from measured S-parameter by frequency-to-time domain conversion (input signal amplitude=200 mV, input signal tr/tf=0 ps).

Fig.4 56 Gb/s output eye diagram of PRBS 2^7-1 NRZ signal



20 mV/div

2.0 ps/div

This is obtained from measured S-parameter by frequency-to-time domain conversion (input signal amplitude=200 mV, input signal tr/tf=0 ps).

Fig.5 100 Gb/s output eye diagram of PRBS 2^7-1 NRZ signal

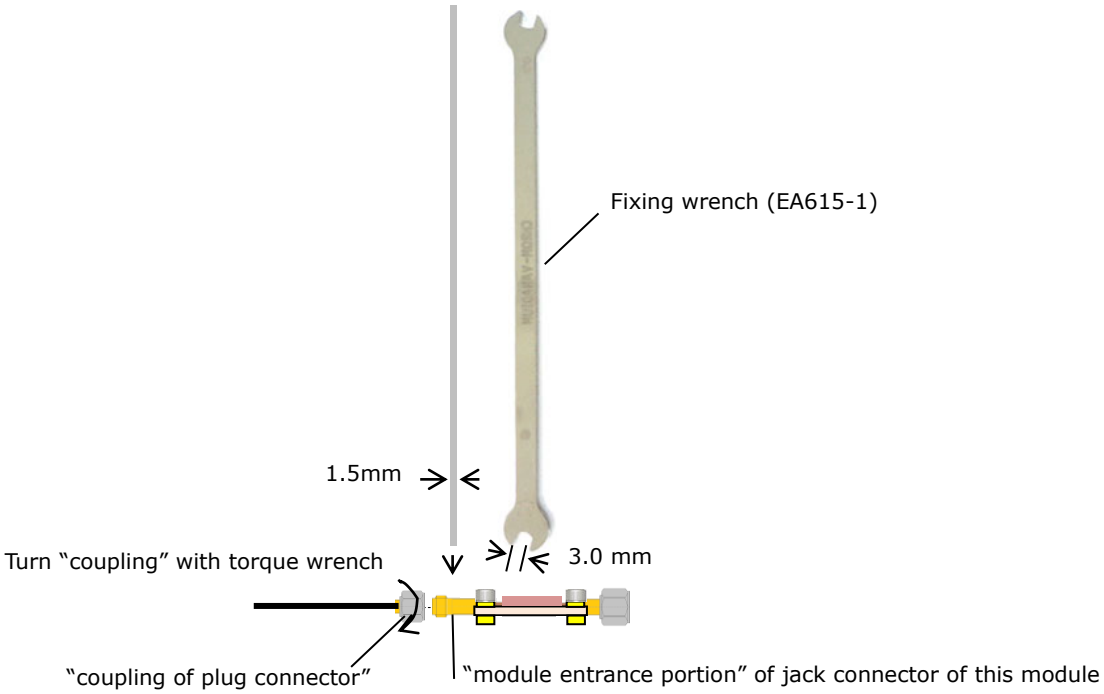
9. Precaution

(1) When connecting 1mm-coaxial connector cable to the module, use "torque wrench" with torque of 45 N-cm.

Special note:

Turn "coupling of plug (male) connector" with torque wrench. At this time, you must use a "fixing wrench (EA615-1, made by ESCO)" which is put onto "module entrance portion" of jack (female) connector.

Do not turn the coupling without using the "fixing wrench", otherwise, it gives abnormal mechanical stress to the module and damages it.



(2) Avoid abnormal mechanical shock to the product.

10. Product ordering code

ADP_1X1YA
- IN connector: P (plug) or J (jack)
- OUT connector: P (plug) or J (jack)

Takada RF Labs

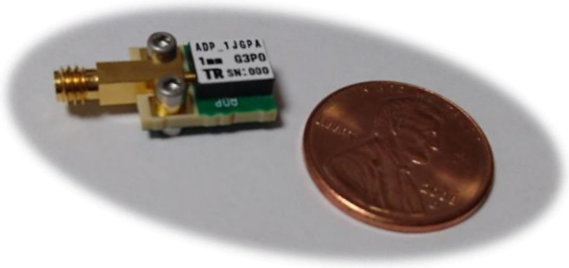
Advanced Product Information
ADP_1XGPA_API_Rev.1.0_160629

1mm-G3PO Adapter

ADP_1XGPA

1. Feature

Adapter with 1mm and G3PO (P)



2. Block diagram

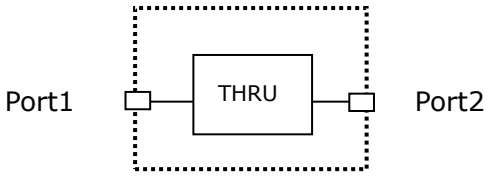
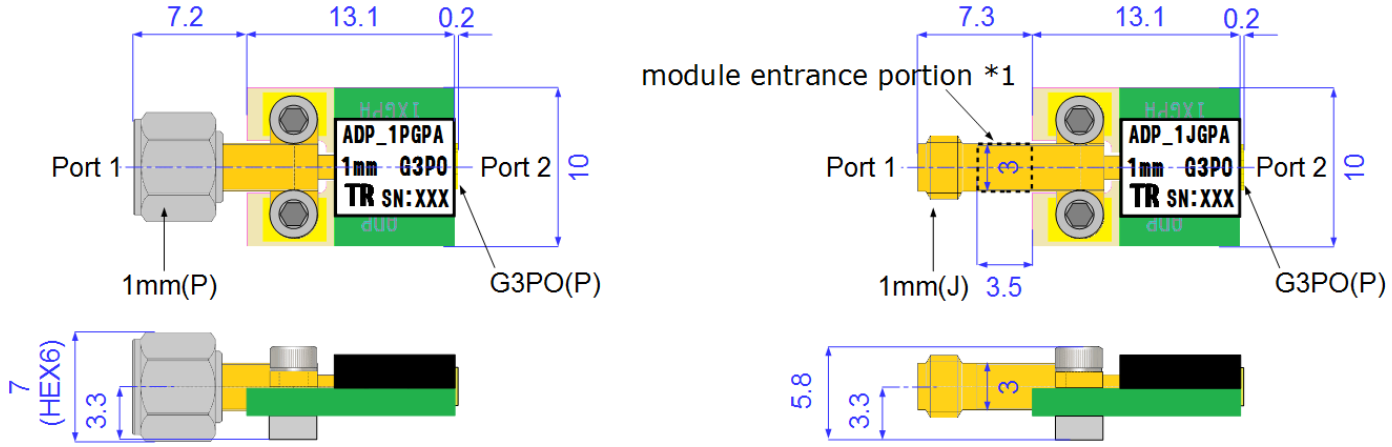


Fig.1 Block diagram

3. Structure



ADP_1PGPA ADP_1JGPA

*1: For detail of "module entrance portion", see [9. Precaution] at P.3.

Unit: mm

Fig.2 Structure of ADP_1PGPA, ADP_1JGPA

4. Terminal description

Name	Function	Note
Port1	Port1	1mm (P) or 1mm (J)
Port2	Port2	G3PO (P)

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5. Absolute maximum ratings

Related terminal	Parameter	Symbol	Unit	Min	Max
Port1 / Port2	Applied power	Pin	dBm		+20 (TBD)
Tstrg	Storage temperature	Tst	℃	-40	85

6. Recommended operation condition

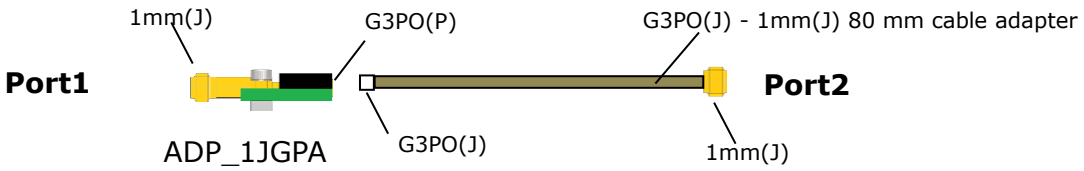
Related terminal	Parameter	Symbol	Unit	Specification		
				Min	Typ	Max
	Operating ambient temperature	Ta	℃	5	25	70

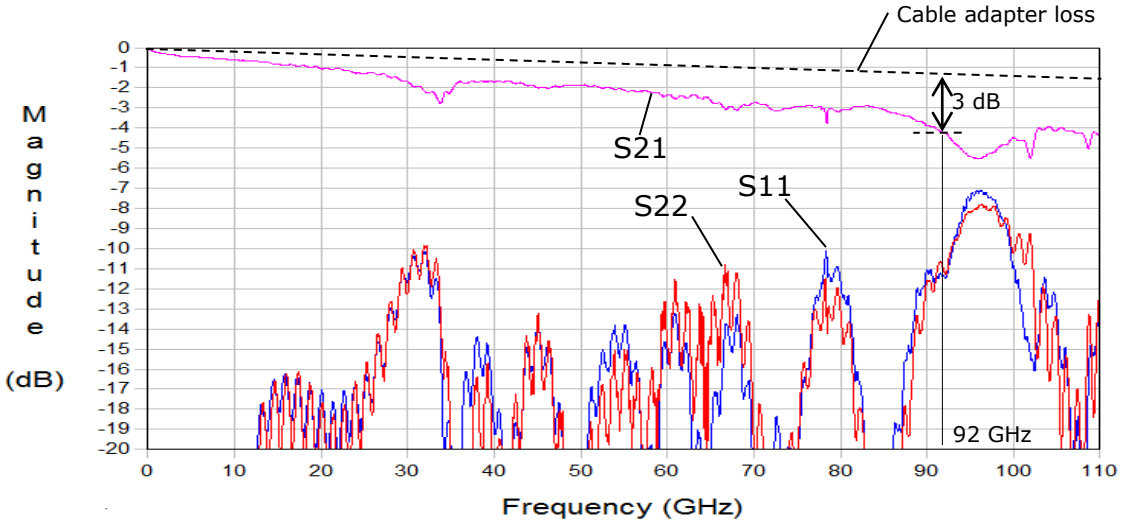
7. RF Performance

Related terminal	Parameter	Symbol	Unit	Specification		
				Min	Typ	Max
Port1, Port2	S21 3dB down frequency	F-3dB	GHz		92	
Port1	S11 @ < 90 GHz	S11	dB		< -10	
Port2	S22 @ < 90 GHz	S22	dB		< -10	

8. Typical performance

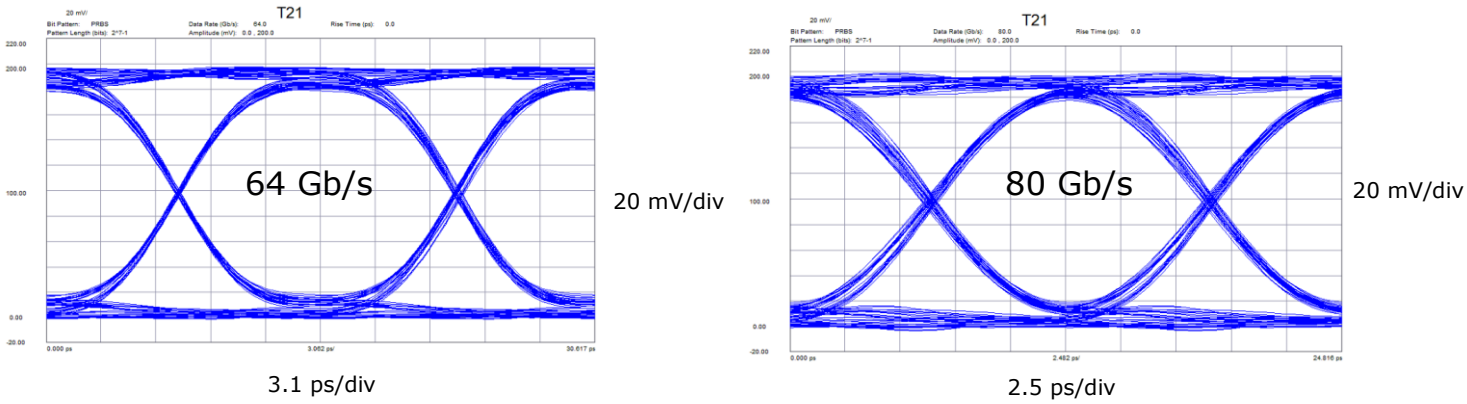
Measurement set-up





This data includes the loss of a G3PO(J) - 1mm(J) 80 mm cable adapter.

Fig.3 S-parameter of ADP_1JGPA



These are obtained from measured S-parameter of Fig.3 by frequency-to-time domain conversion (input signal amplitude=200 mV, input signal tr/tf=0 ps).

Fig.4 64 and 80 Gb/s output eye diagram of PRBS 2^7-1 NRZ signal

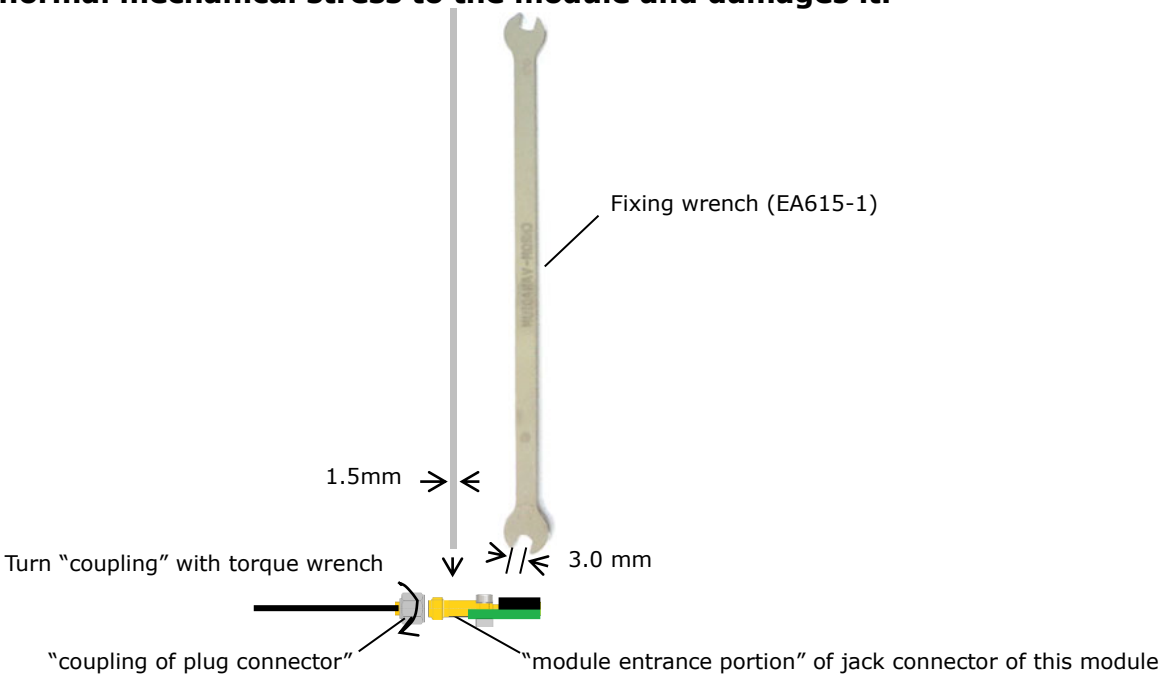
9. Precaution

(1) When connecting 1mm-coaxial connector cable to the module, use "torque wrench" with torque of 45 N-cm.

Special note:

Turn "coupling of plug (male) connector" with torque wrench. At this time, you must use a "fixing wrench (EA615-1, made by ESCO)" which is put onto "module entrance portion" of jack (female) connector.

Do not turn the coupling without using the "fixing wrench", otherwise, it gives abnormal mechanical stress to the module and damages it.



(2) When connecting G3PO of the module to other connector interface devices, **use cables which have good connector-mating to Corning Gilbert G3PO**.

(3) When connecting a G3PO cable to the module, use your hands only. **Do not use pliers.** This avoids the use of inadequate connectors to be forced to push onto G3PO of the module with abnormal mechanical power. If using adequate connectors, it is very easy to push on by hands.

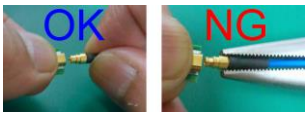


Fig.C1 How to connect a G3PO cable to the module

(4) Do not apply abnormal mechanical stress and/or shock to the G3PO connector!

(5) Avoid abnormal mechanical shock to the product.

10. Product ordering code

ADP_1XGPA
└──── 1mm connector: P (plug/male) or J (jack/female)

Takada RF Labs

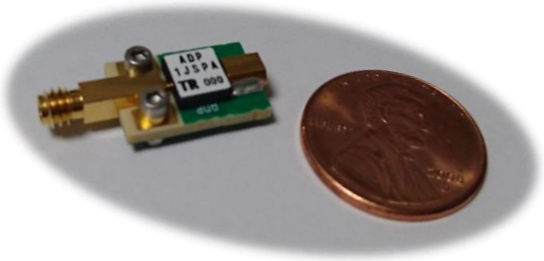
Advanced Product Information
ADP_1XSPA_API_Rev.1.0_160629

1mm-SMPM(P) Adapter

ADP_1XSPA

1. Feature

Adapter with 1mm and SMPM (P)



2. Block diagram

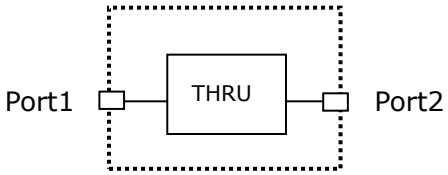
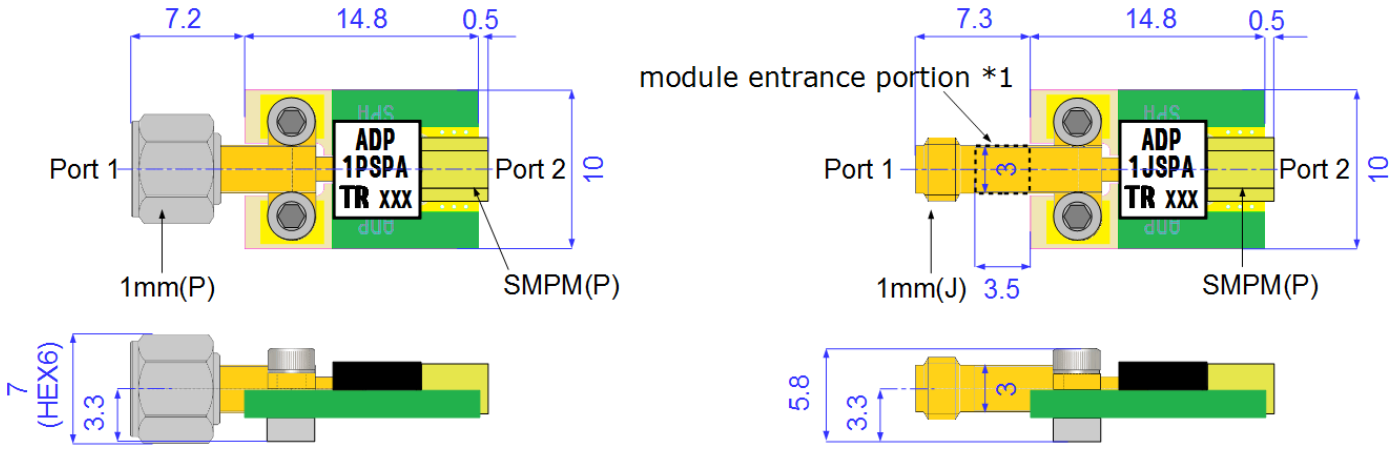


Fig.1 Block diagram

3. Structure



ADP_1PSPA ADP_1JSPA

*1: For detail of "module entrance portion", see [9. Precaution] at P.3.

Unit: mm

Fig.2 Structure of ADP_1PSPA, ADP_1JSPA

4. Terminal description

Name	Function	Note
Port1	Port1	1mm (P) or 1mm (J)
Port2	Port2	SMPM (P)

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5. Absolute maximum ratings

Related terminal	Parameter	Symbol	Unit	Min	Max
Port1 / Port2	Applied power	Pin	dBm		+20 (TBD)
Tstrg	Storage temperature	Tst	℃	-40	85

6. Recommended operation condition

Related terminal	Parameter	Symbol	Unit	Specification		
				Min	Typ	Max
	Operating ambient temperature (TBD)	Ta	℃	5	25	70

7. RF Performance

Related terminal	Parameter	Symbol	Unit	Specification		
				Min	Typ	Max
Port1, Port2	S21 3dB down frequency	F-3dB	GHz		65	
Port1	S11 @ < 60 GHz	S11	dB		< -13	
Port2	S22 @ < 60 GHz	S22	dB		< -13	

8. Typical performance

Measurement set-up

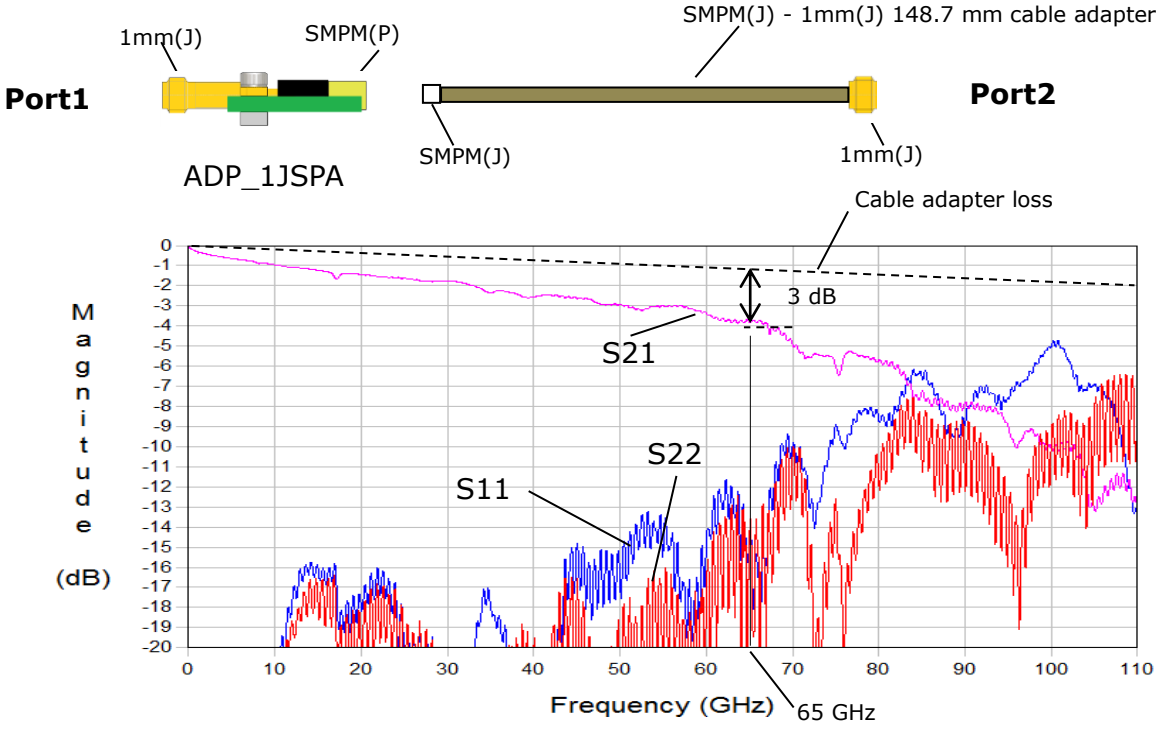
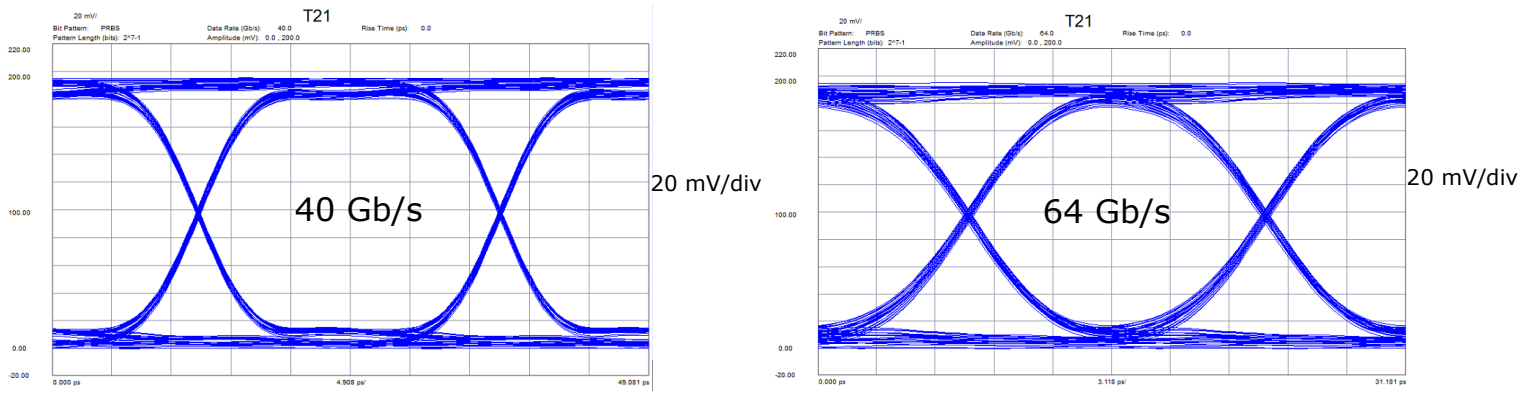


Fig.3 Typical S-parameter of ADP_1JSPA



These are obtained from measured S-parameter of Fig.3 by frequency-to-time domain conversion (input signal amplitude=200 mV, input signal tr/tf=0 ps).

Fig.4 40 and 64 Gb/s output eye diagram of PRBS 2^7-1 NRZ signal

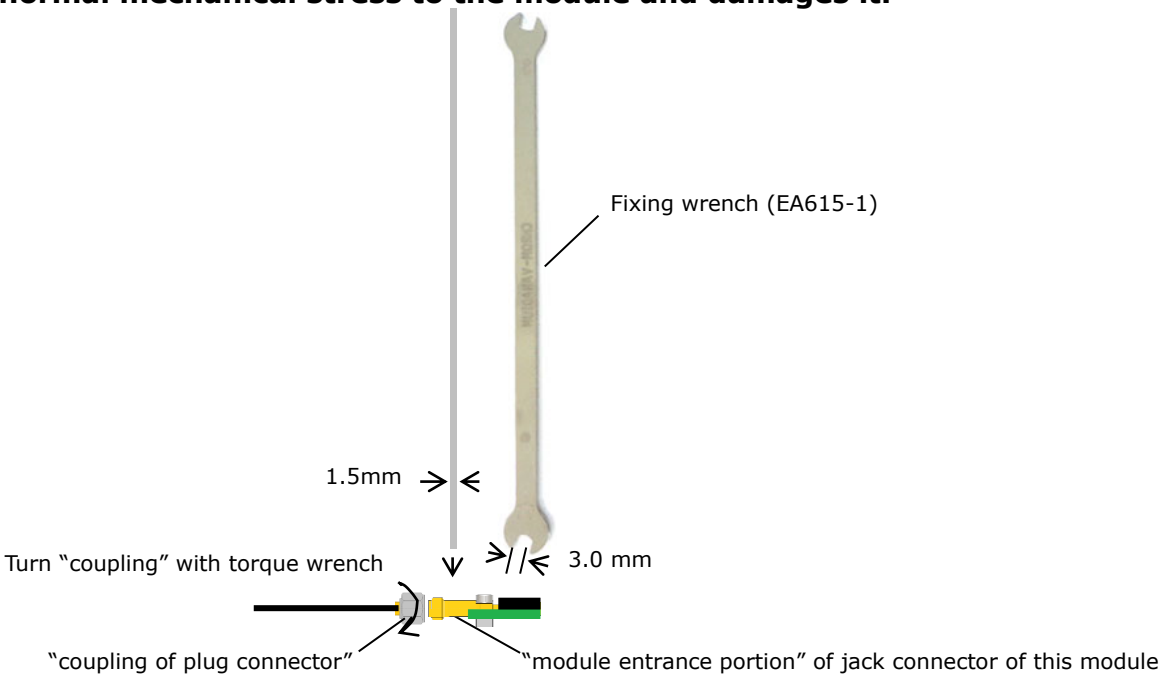
9. Precaution

(1) When connecting 1mm-coaxial connector cable to the module, use "torque wrench" with torque of 45 N-cm.

Special note:

Turn "coupling of plug (male) connector" with torque wrench. At this time, you must use a "fixing wrench (EA615-1, made by ESCO)" which is put onto "module entrance portion" of jack (female) connector.

Do not turn the coupling without using the "fixing wrench", otherwise, it gives abnormal mechanical stress to the module and damages it.



(2) When connecting SMPM of the module to other connector interface devices, **use cables which**

have good connector-mating to Corning Gilbert GPPO. If you have any questions on this, please contact us.

(3) When connecting a SMPM (GPPO) cable to the module, use your hands only. **Do not use pliers.** This avoids the use of inadequate connectors to be forced to push onto SMPM of the module with abnormal mechanical power. If using adequate connectors, it is very easy to push on by hands.

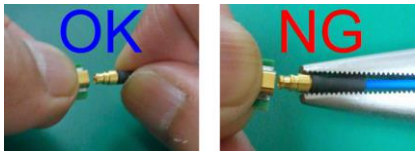


Fig.C1 How to connect a SMPM cable to the module

(4) When taking off a SMPM cable from the module, use a SMPM **removal tool** such as shown below.

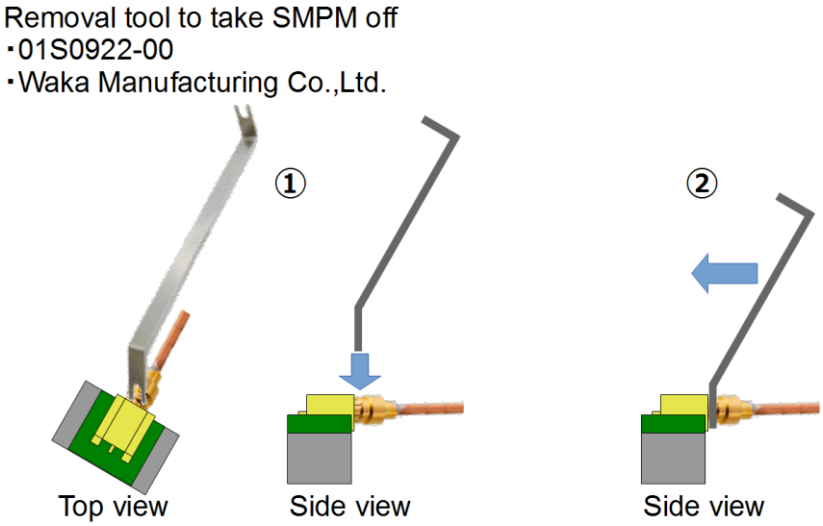


Fig.C2 How to take off SMPM cable from the module

(5) Do not apply abnormal mechanical stress and/or shock to a SMPM connector!

10. Product ordering code

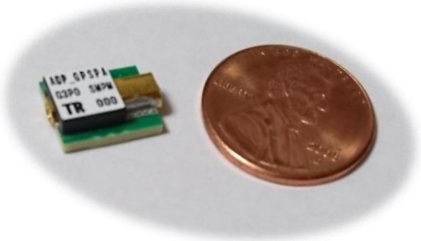
ADP_1XSPA
└——— 1mm connector: P (plug/male) or J (jack/female)

Takada RF Labs

Advanced Product Information
ADP_GPSPA_API_Rev.1.0_160629

G3PO(P)-SMPM(P) Adapter

ADP_GPSPA



1. Feature

Adapter with G3PO(P) and SMPM(P)

2. Block diagram

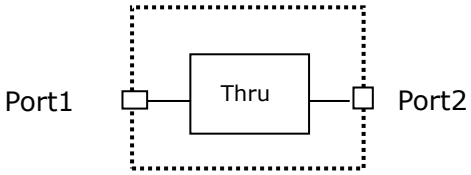
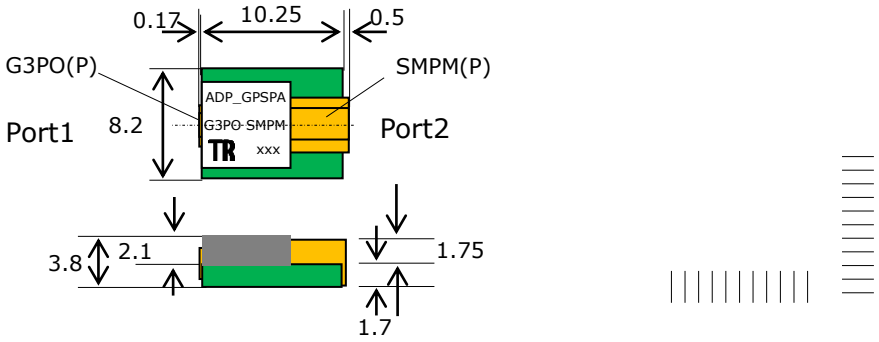


Fig.1 Block diagram

3. Structure



Unit: mm

Fig.2 Structure of ADP_GPSPA

4. Terminal description

Name	Function	Note
Port1	Port1	G3PO(P)
Port2	Port2	SMPM(P)

5. Absolute maximum ratings

Related terminal	Parameter	Symbol	Unit	Min	Max
Port1 / Port2	Applied power	Pin	dBm		+20 (TBD)
Tstrg	Storage temperature	Tst	℃	-40	85

6. Recommended operation condition

Related terminal	Parameter	Symbol	Unit	Specification		
				Min	Typ	Max
	Operating ambient temperature	Ta	℃	5	25	70

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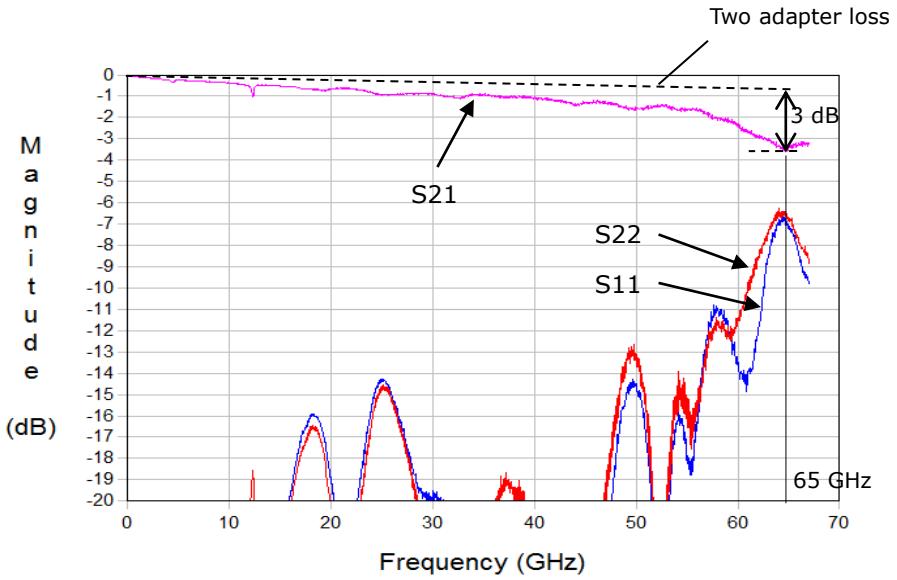
URL: http://www.TakadaRF.com/ E-mail: contact@TakadaRF.com Phone: 0463-26-3048

7. RF Performance

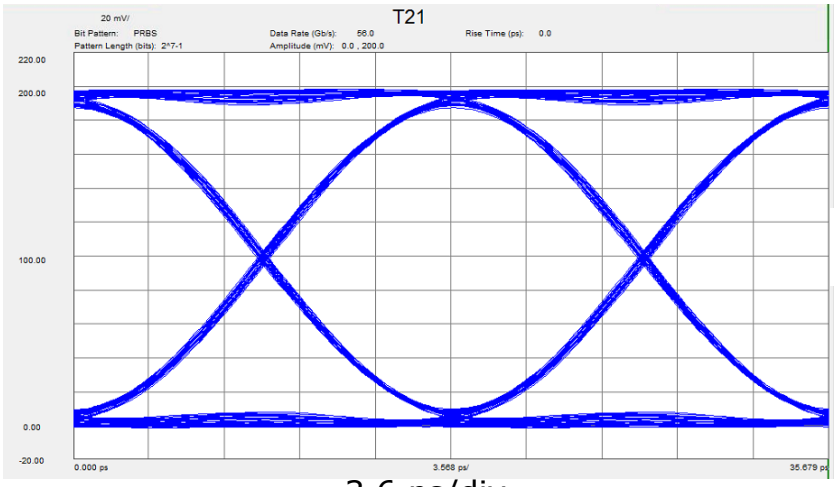
Related terminal	Parameter	Symbol	Unit	Specification		
				Min	Typ	Max
Port1, Port2	S21 3dB down frequency	F-3dB	GHz		65	
Port1	S11 @ < 56 GHz	S11	dB		< -13	
Port2	S22 @ < 56 GHz	S22	dB		< -12.5	

8. Typical performance



This data includes losses of a G3PO(J)-V(J) adapter and an SMPM(J)-V(J) adapter.

Fig.3 S-parameter of ADP_GPSPA



20 mV/div

3.6 ps/div

This is obtained from measured S-parameter by frequency-to-time domain conversion (input signal amplitude=200 mV, input signal tr/tf=0 ps).

Fig.4 56 Gb/s output eye diagram of PRBS 2^7-1 NRZ signal

9. Precaution

(1) When connecting G3PO of the module to other connector interface devices, **use cables which have good connector-mating to Corning Gilbert G3PO**.

(2) When connecting a G3PO cable to the module, use your hands only. **Do not use pliers.** This avoids the use of inadequate connectors to be forced to push onto G3PO of the module with abnormal mechanical power. If using adequate connectors, it is very easy to push on by hands.

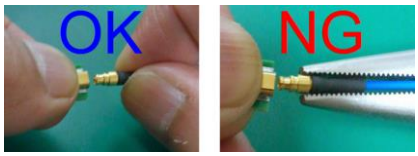


Fig.C1 How to connect a G3PO cable to the module

(3) Do not apply abnormal mechanical stress and/or shock to the G3PO connector!

(4) When connecting SMPM of the module to other connector interface devices, **use cables which have good connector-mating to Corning Gilbert GPPO.** If you have any questions on this, please contact us.

(5) When connecting a SMPM (GPPO) cable to the module, use your hands only. **Do not use pliers.** This avoids the use of inadequate connectors to be forced to push onto SMPM of the module with abnormal mechanical power. If using adequate connectors, it is very easy to push on by hands.

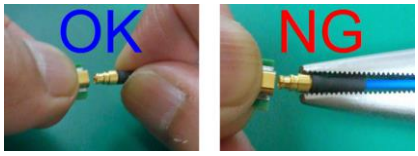


Fig.C2 How to connect a SMPM cable to the module

(6) When taking off a SMPM cable from the module, use a SMPM **removal tool** such as shown below.

Removal tool to take SMPM off
・01S0922-00
・Waka Manufacturing Co.,Ltd.

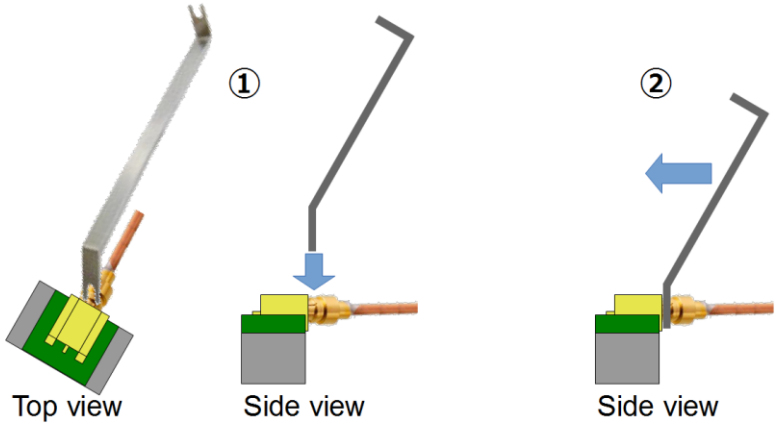


Fig.C3 How to take off SMPM cable from the module

(7) Do not apply abnormal mechanical stress and/or shock to a SMPM connector!

Takada RF Labs

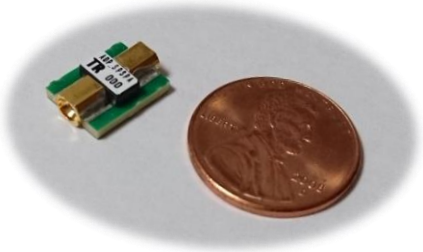
Advanced Product Information
ADP_SPSPA_API_Rev.1.1_160629

SMPM(P)-SMPM(P) Adapter

ADP_SPSPA

1. Feature

Adapter with SMPM(P) and SMPM(P)



2. Block diagram

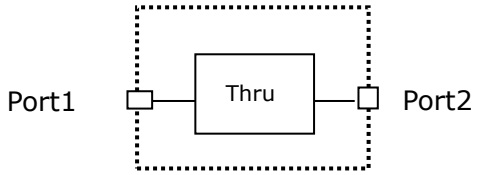


Fig.1 Block diagram

3. Structure

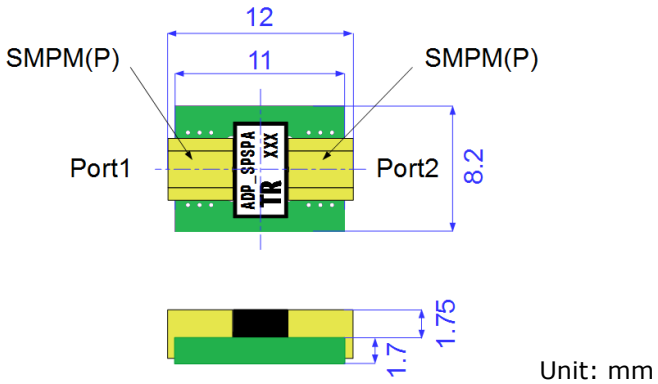


Fig.2 Structure of ADP_SPSPA

4. Terminal description

Name	Function	Note
Port1	Port1	SMPM(P)
Port2	Port2	SMPM(P)

5. Absolute maximum ratings

Related terminal	Parameter	Symbol	Unit	Min	Max
Port1 / Port2	Applied power	Pin	dBm		+20 (TBD)
Tstrg	Storage temperature	Tst	℃	-40	85

6. Recommended operation condition

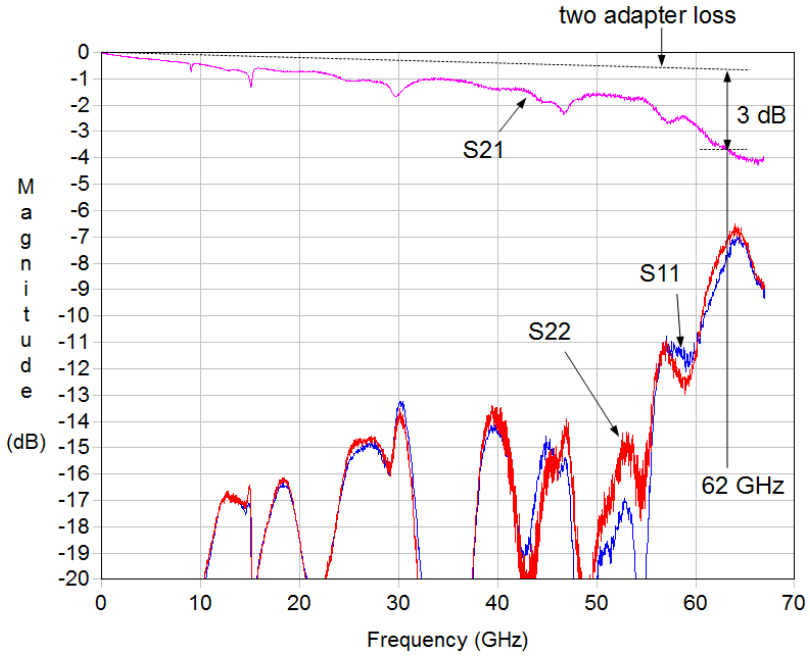
Related terminal	Parameter	Symbol	Unit	Specification		
				Min	Typ	Max
	Operating ambient temperature	Ta	℃	5	25	70

Takada RF Labs, Inc., 1208-7 Minamiyana, Hadano city, Kanagawa 257-0003, JAPAN
URL: http://www.TakadaRF.com/ E-mail: contact@TakadaRF.com Phone: 0463-26-3048

7. RF Performance

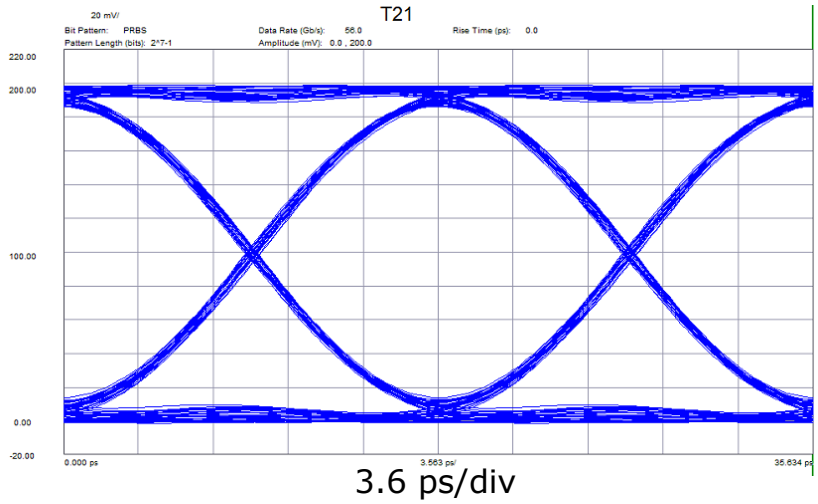
Related terminal	Parameter	Symbol	Unit	Specification		
				Min	Typ	Max
Port1, Port2	S21 3dB down frequency	F-3dB	GHz		62	
Port1	S11 @ < 56 GHz	S11	dB		< -13	
Port2	S22 @ < 56 GHz	S22	dB		< -13	

8. Typical performance



This data includes two SMPM-V adapters.

Fig.3 S-parameter of ADP_SPSPA



20 mV/div

3.6 ps/div

This is obtained from measured S-parameter by frequency-to-time domain conversion (input signal amplitude=200 mV, input signal tr/tf=0 ps).

Fig.4 56 Gb/s output eye diagram of PRBS 2^7-1 NRZ signal

9. Precaution

(1) When connecting SMPM of the module to other connector interface devices, **use cables which have good connector-mating to Corning Gilbert GPPO.** If you have any questions on this, please contact us.

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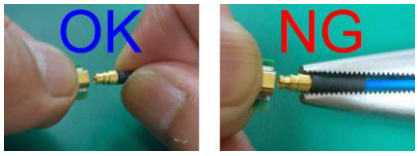

Fig.C1 How to connect a SMPM cable to the module

(3) When taking off a SMPM cable from the module, use a SMPM **removal tool** such as shown below.

Removal tool to take SMPM off
・01S0922-00
・Waka Manufacturing Co.,Ltd.

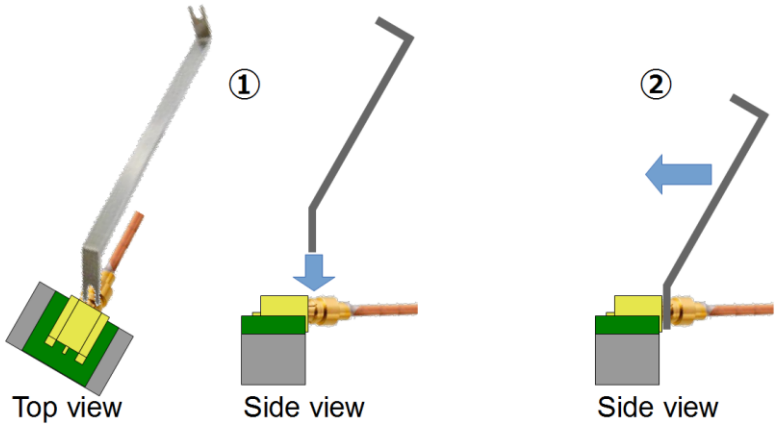

Fig.C2 How to take off SMPM cable from the module

(4) Do not apply abnormal mechanical stress and/or shock to a SMPM connector!