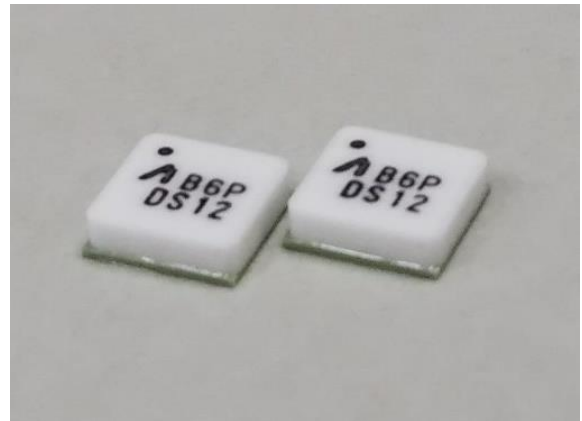


56Gbaud Differential Linear Amplifier **AG5PB6P**

Features

- Operating baud rate : 56Gbaud
- Linear differential output voltage : 3.0Vppd
- Gain control range : -12dB~+15dB
- Peaking control range : 15dB
- Power consumption : 1.8W typ.
- I/O interface : Differential
- 28pin QFN Package : 5mm×5mm×1.6mm
- Input/Output DC block capacitors included



Applications

- Booster amplifier for measuring equipment
- Driver for 400GbE(PAM4) optical modulators etc.

Absolute maximum ratings

Item	Symbol	Condition	Rating		Unit
			min.	max.	
Input Voltage (single-ended input voltage to each input port (IN/INb))	V_{IN}	-	-	1.0	Vpp
Supply Voltage	V_{CC1}	-	-0.5	6.0	V
	V_{CC2}	-	-0.5	5.0	
	V_T	-	-0.5	7.5	
Output Amplitude Control Bias	V_{amp}	-	-0.5	2.5	V
Gain/Peaking Control Bias	V_{gG}	-	-1.5	7.0	V
	V_{gP}	-	-1.5	7.0	
Current Source Bias	V_{CSG}	-	-0.5	5.0	V
	V_{CSP}	-	-0.5	5.0	
Input DC Voltage	V_{INDC}	-	-7.0	10.0	V
Output DC Voltage	V_{OUTDC}	-	-4.0	10.0	V
Operating Temperature	T_C	-	5	85	°C
Storage Temperature	T_{stg}	-	-40	90	°C

Recommended conditions

Item	Symbol	Condition	Specification			Unit
			min.	typ.	max.	
Supply Voltage	V_{CC1}	-		4.7	-	V
	V_{CC2}	-		4.0	-	
	V_T	-		6.2	-	
Output Amplitude Control Bias	V_{amp}	-	0.0	2.0	2.2	V
Gain/peaking Control Bias	V_{gG}	-	0.9	-	5.0	V
	V_{gP}	-	-1.0	-	5.0	
Current Source Bias	V_{CSG}	-	0.0	4.0	-	V
	V_{CSP}	-	0.0	4.2	-	
Differential Input Signal Level	V_{in}	-	-	-	0.8	Vppd
Input/Output Interface	AC coupled (DC block capacitors are included in PKG)					
Case Temperature Backside	T_C	-	5	-	50	°C

Specifications

Electrical characteristics

$T_C=25\text{ }^\circ\text{C}$, $V_{CC1}=4.7\text{ V}$, $V_{CC2}=4.0\text{ V}$, $V_T=6.2\text{ V}$, $V_{CSG}=4.0\text{ V}$, $V_{CSP}=0.0\text{ V}$, $Z_{in}=50\text{ }\Omega$, $Z_{out}=50\text{ }\Omega$

Item	Condition	Specification			Unit
		min.	typ.	max.	
Baud Rate	-	-	56	-	Gbaud
Differential Output Voltage	$V_{gG}=5.0\text{ V}$ $V_{amp}=2.0\text{ V}$	-	3.0	-	Vppd
Gain Control Range (@1 GHz)	$V_{gG}=0\text{ V} - 5.0\text{ V}$ $V_{amp}=2.0\text{ V}$	-5	-	15	dB
	$V_{gG}=0\text{ V} - 5.0\text{ V}$ $V_{amp}=0.0\text{ V}$	-12	-	15	dB
Peaking Control Range (SDD21@43 GHz /SDD21@1 GHz)	$V_{gG}=5.0\text{ V}$ $V_{amp}=2.0\text{ V}$ $V_{CSP}=4.2\text{ V}$ $V_{CSG}=0.0\text{ V}$	-	15	-	dB
Bandwidth	-3dB (low end) $V_{gG}=5.0\text{ V}$ $V_{amp}=2.0\text{ V}$	-	250	-	kHz
	-3dB (high end) $V_{gG}=5.0\text{ V}$ $V_{amp}=2.0\text{ V}$	-	45	-	GHz
Input Return Loss (40 M - 20 GHz)	$V_{gG}=5.0\text{ V}$ $V_{amp}=2.0\text{ V}$	-	10	-	dB
Output Return Loss (40 M - 20 GHz)	$V_{gG}=5.0\text{ V}$ $V_{amp}=2.0\text{ V}$	-	10	-	dB
Temperature monitor Thermistor resistance	$T_C=25\text{ }^\circ\text{C}$ $B=3930\pm 50\text{K}$	9.5	10	10.5	k Ω

Power supply

$T_C=25\text{ }^\circ\text{C}$, $V_{CC1}=4.7\text{ V}$, $V_{CC2}=4.0\text{ V}$, $V_T=6.2\text{ V}$, $V_{amp}=2.0\text{ V}$, $V_{CSG}=4.0\text{ V}$, $V_{CSP}=4.2\text{ V}$

Item	Condition	Specification			Unit
		min.	typ.	max.	
I_{CC1}	-	-	130	-	mA
I_{CC2}	-	-	100	-	
I_T	-	-	125	-	
I_{amp}	-	-	7	-	mA
I_{gG}	$V_{gG}=0.9 - 5.0\text{ V}$	-0.1	-	0.2	
I_{gP}	$V_{gP}=-1.0 - 5.0\text{ V}$	-0.3	-	0.2	
I_{CSG}	-	-	7.4	-	
I_{CSP}	-	-	8.0	-	

Sequence of power supply

To prevent damage to the product, turn on the power in the order of power 1 (V_T) and next is power 2 (V_{CC1} , V_{CC2} , V_{gG} , V_{gP}) and next is power 3 (V_{amp} , V_{CSG} , V_{CSP}). When turning off the power, follow the reverse procedure of the turning on the power.

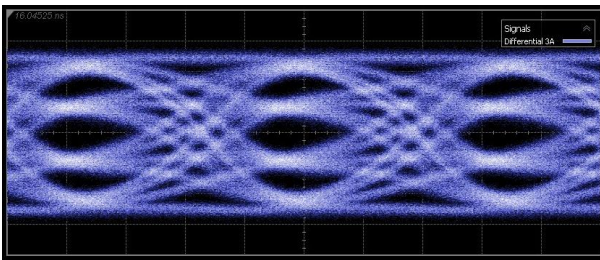
Caution

Do not turn on the power when the output signal pin is open or shorted.

Electrical Characteristics

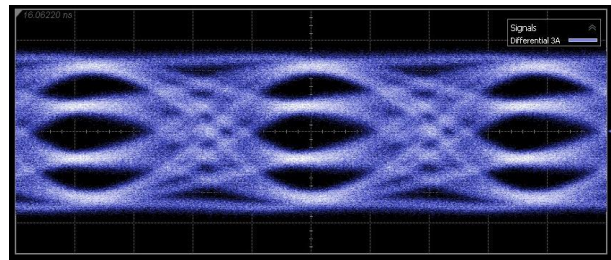
Typical output waveform (at maximum gain)

56Gbaud PAM4



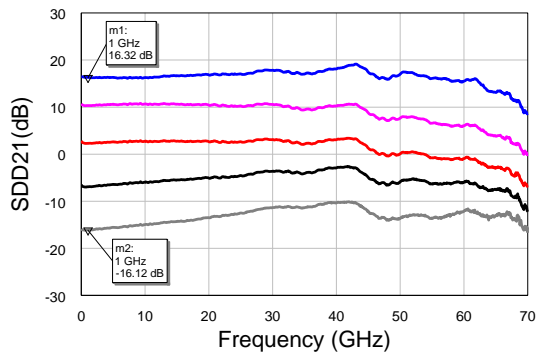
Vout : 3.05Vpp(diff.) Linearity: 0.89

53Gbaud PAM4

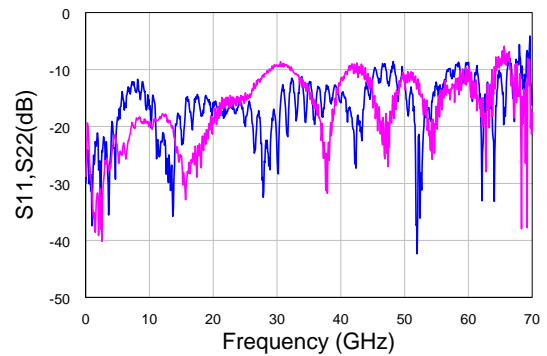


Vout : 2.99Vpp(diff.) Linearity: 0.91

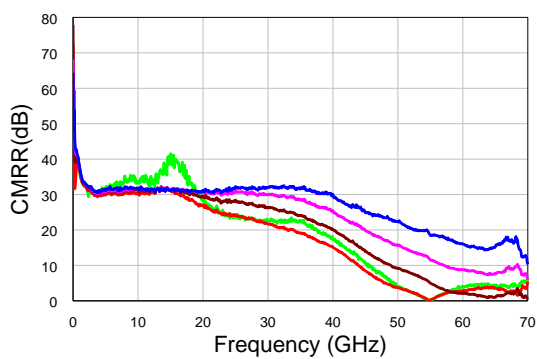
Frequency Response



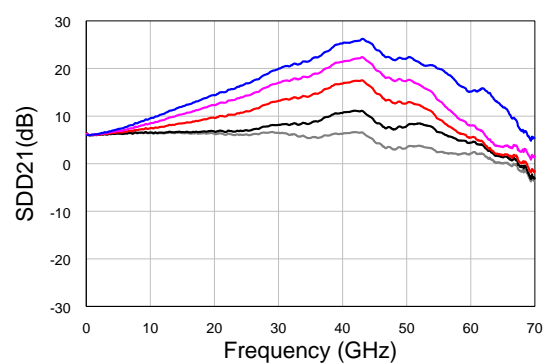
Differential mode gain at adjusting gain
(SDD21)



Reflection characteristics at maximum gain
(Red line : S11, Blueline : S22)

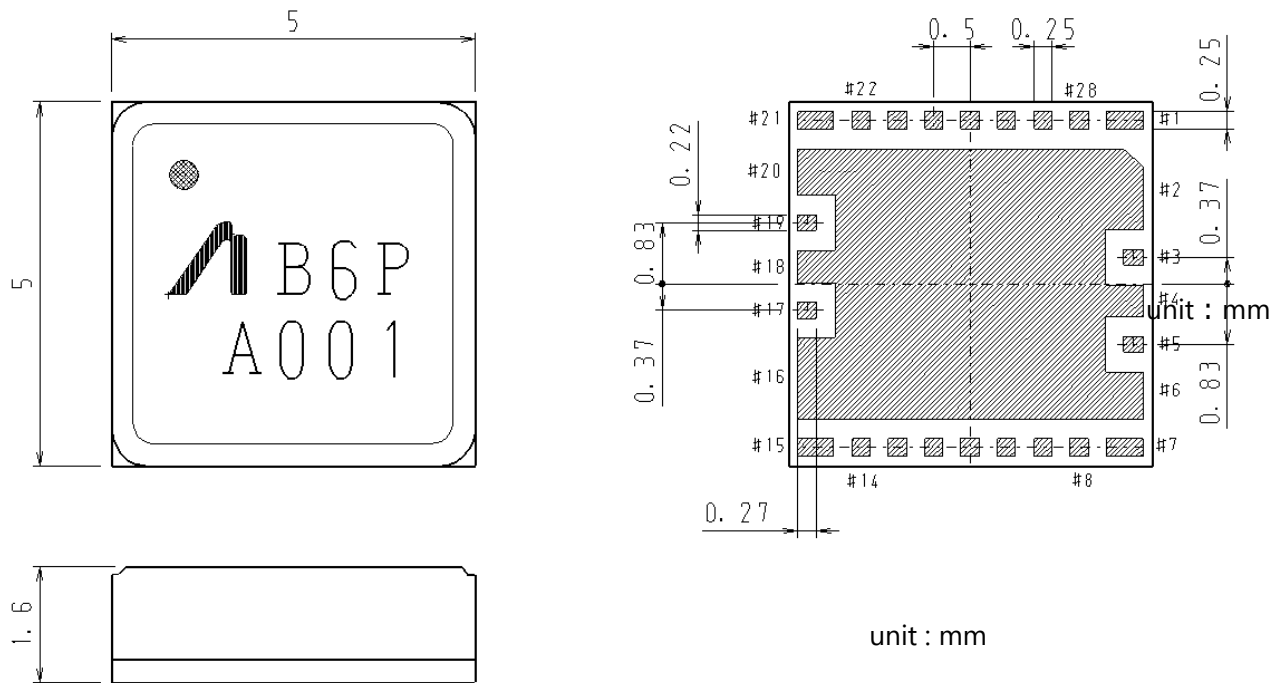


CMRR at adjusting gain



Differential mode gain during peaking adjustment
(SDD21)

Dimensions



PIN assign In the following table, "No." refers to the pin number.

No.	Symbol	FUNCTION
1	GND	Ground
2	GND	Ground
3	INP	Input port (Non-invert)
4	GND	Ground
5	INN	Input port (Invert)
6	GND	Ground
7	GND	Ground
8	NC	No contact
9	VgP	VPA* ¹ gain tuning bias
10	VCSP	VPA current source tuning bias
11	VCSG	VGA* ² current source tuning bias
12	NC	No contact
13	VgG	VGA* ¹ gain tuning bias
14	Vamp	Output amplitude tuning bias

No.	Symbol	FUNCTION
15	GND	Ground
16	GND	Ground
17	OUTP	Output port (Non-invert)
18	GND	Ground
19	OUTN	Output port (Invert)
20	GND	Ground
21	GND	Ground
22	TM	Temperature monitor
23	VCC2	Power supply voltage
24	MP	OUTP swing level monitor
25	MN	OUTN swing level monitor
26	VT	Power supply voltage
27	VCC2	Power supply voltage
28	VCC1	Power supply voltage

*1 Variable-peaking amplifier

*2 Variable-gain amplifier

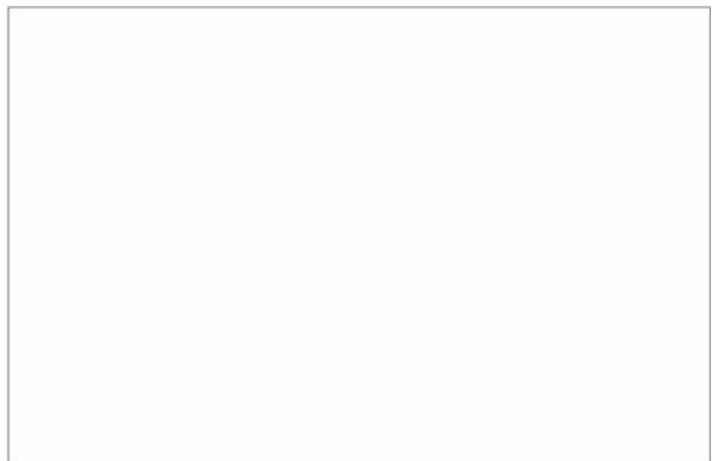


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