SONY CXB1118AQ/1128AQ

Laser Driver

Description

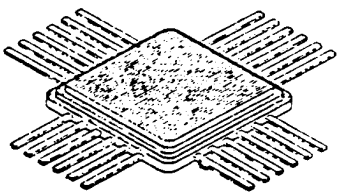
The CXB1118AQ/1128AQ is a bipolar IC which can switch maximum pulse modulation current of 100mA/60mA at a speed of f_{DMAX}=1.4Gbps (NRZ). It is ideal as a laser driver for optical communications and optomagnetic applications.

Features

- Ultra-high speed operation
  f_{DMAX}=1.4Gbps (NRZ) (min)
- Maximum pulse modulation current
  I_Q=100mA * 1
  I_Q=60mA * 2
- Maximum bias output current
  I_{BIAS}=100mA
- Pulse modulation output voltage range
  V_Q=−2.5 to +2.0V
- Bias output voltage range
  V_{BIAS}=−2.5 to +2.0V
- Input signal monitor output
- Pulse modulation current monitor output
- Bias current monitor output

* 1 CXB1118AQ * 2 CXB1128AQ

24pin QFP (Metal)



Applications

Optical communications, measurements, optomagnetic applications

Structure

Bipolar silicon monolithic IC

Recommended Operating Conditions

• Supply voltage	V_{EE}	−5.46 to −4.94	V
• Input voltage	V_{IN}	ECL 10KH level	V
• Operating case temperature	T_C	0 to 85	°C

Absolute Maximum Ratings

• Supply voltage	V_{EE}	−7.0 to +0.3	V
• Operating case temperature	T_C	−55 to +125	°C
• Storage temperature	T_{stg}	−65 to +150	°C
• Data input voltage	V_I	V_{EE} to +0.5	V
• Pulse modulation current adjustment input current	I_{QADJ}	0 to 30	mA
• Bias current adjustment input voltage	V_{BADJ}	V_{EE} to V_{EE}+2.0	V
• Absolute maximum pulse modulation current * 1	I_Q	120	mA
• Absolute maximum pulse modulation current * 2	I_Q	80	mA
• Absolute maximum bias current	I_B	120	mA
• Absolute maximum pulse modulation monitor current * 1	I_{SQ}	20	mA
• Absolute maximum pulse modulation monitor current * 2	I_{SQ}	15	mA
• Absolute maximum bias monitor current	I_{SB}	15	mA
• Pulse modulation output voltage	V_D	V_{EE} to V_{EE}+10.0	V
• Bias output voltage	V_B	V_{EE} to V_{EE}+10.0	V
• Pulse modulation monitor voltage	V_{SD}	V_{EE} to V_{EE}+10.0	V
• Bias monitor voltage	V_{SB}	V_{EE} to V_{EE}+10.0	V

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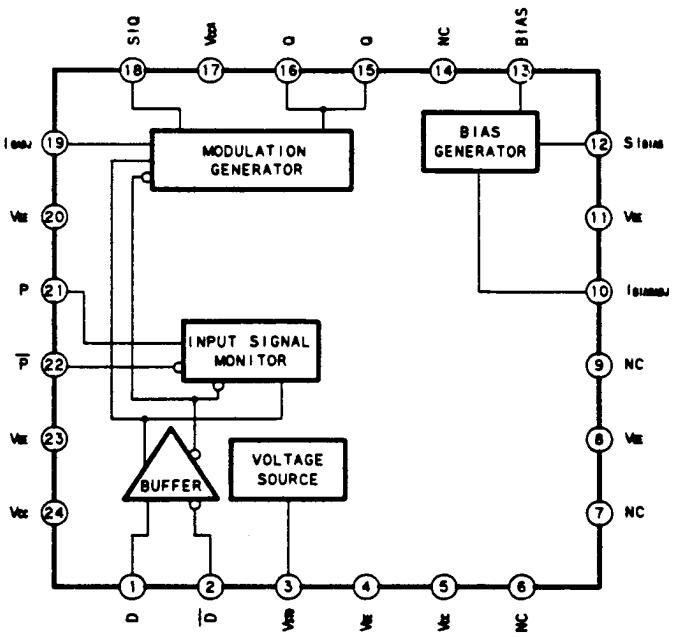
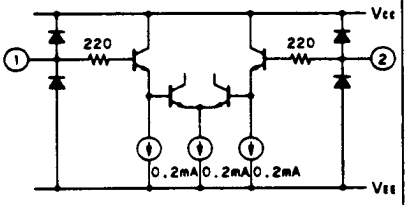
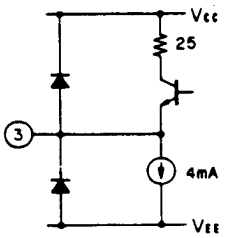
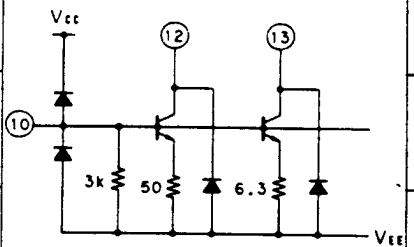
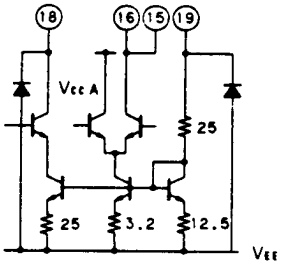
E92209-HP

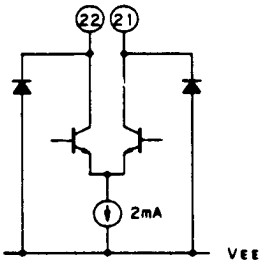
Block Diagram and Pin Configuration



Pin Description

Pin No.	Symbol	Standard current voltage DC	Standard current voltage AC	Equivalent circuit	Description
1	D	—	−0.7V ~ −1.8V		Data signal input. Because the electric potential is unstable when this pin is left open, always input either ECL high level, low level, or the reference electric potential.
2	$\overline{D}$	—	−0.7V ~ −1.8V		
3	V_{STD}	−1.3V	—		Standard voltage. (−1.3V) Use for the reference voltage in the case of single-phase input.

Pin No.	Symbol	Standard current voltage		Equivalent circuit	Description
		DC	AC		
4, 8	V_{EE}	−5.2V	—		Negative power supply.
5	V_{CC}	0.0V	—		Positive power supply.
6, 7, 9	NC	—	—		Not connected.
10	$I_{BIASADJ}$	−3.7V ~ −5.2V	—		Bias generator current adjustment.
12	SI_{BIAS}	0mA ~ 12.5mA	—		Bias generator current monitor.
13	BIAS	0mA ~ 100mA	—		Bias generator current output.
11	V_{EE}	−5.2V	—		Negative power supply.
14	NC	—	—		Not connected.
15, 16	Q	—	0mA ~ 100mA * 1		Modulation generator current output.
		—	0mA ~ 60mA * 2		
18	SIQ	0mA ~ 12.5mA * 1	—		Modulation generator current monitor.
		0mA ~ 7.5mA * 2	—		
19	I_{QADJ}	0mA ~ 25mA * 1	—		Modulation generator current adjustment.
		0mA ~ 15mA * 2	—		
17	V_{CCA}	0.0V	—		Positive power supply pin for output.
20	V_{EE}	−5.2V	—		Negative power supply.

Pin No.	Symbol	Standard current voltage		Equivalent circuit	Description
		DC	AC		
21	P	—	0mA ~ 2mA		Input signal monitor output.
22	$\overline{P}$	—	0mA ~ 2mA		
23	V_{EE}	−5.2V	—		Negative power supply.
24	V_{CC}	0.0V	—		Positive power supply.

* 2 → CXB1118AQ * 2 → CXB1128AQ

Electrical Characteristics

DC Characteristics $V_{EE}=-5.46$ to -4.94V, Tc=0 to 85°C

Item	Symbol	Input pin	Output pin	Measurement conditions	Min.	Typ.	Max.	Unit
Supply current	I_{EE}	—	—	I_Q=100mA, * 1 I_{BIAS}=100mA	−360	−310	—	mA
				I_Q=60mA, * 2 I_{BIAS}=100mA	−300	−255	—	
Pulse modulation current	I_Q	19	15, 16	T_C=25°C * 1	0	—	100	
				T_C=25°C * 2	0	—	60	
Pulse modulation output voltage range	V_Q	—			−2.5	—	2.0	V
Bias current	I_{BIAS}	10	13	T_C=25°C	0	—	100	mA
Bias output voltage range	V_{BIAS}	—			−2.5	—	2.0	V
Pulse modulation monitor output voltage range	V_{SQ}	—	18		−2.5	—	2.0	
Bias monitor output voltage range	V_{SBIAS}	—	12		−2.5	—	2.0	
Input signal monitor current	I_P	—	21, 22	T_C=25°C D pin on High: P output D pin on Low: $\bar{P}$ output	1.0	2.0	3.0	mA
Input signal monitor voltage range	V_P	—			−2.5	—	2.0	V
Current ratio Q pin and I_{QADJ} pin	I_Q/I_{QADJ}	—	—	I_Q=100mA	3.0	4.0	5.0	—
Current ratio Q pin and SIQ pin	I_Q/I_{SQ}	—	—	I_Q=100mA	7.0	8.0	9.0	
Current ratio BIAS pin and SI_{BIAS} pin	I_{BIAS}/I_{SBIAS}	—	—	I_{BIAS}=100mA	7.0	8.0	9.0	
High level data input voltage	V_{DH}	1, 2	—		−1.17	—	—	V
Low level data input voltage	V_{DL}				—	—	−1.45	
High level input current	I_{DH}				—	—	10	μA
$I_{BIASADJ}$ pin Input current	$I_{BIASADJ}$	10	—	I_{BIAS}=100mA	—	—	5.0	mA
Standard voltage	V_{STD}	—	3		−1.40	−1.30	−1.20	V

* 1 → CXB1118AQ * 2 → CXB1128AQ

AC Characteristics $V_{EE}=-5.46$ to -4.94V, $T_C=0$ to 85°C
CXB1118AQ: RL=15Ω, I_Q=100mA, CXB1128AQ: RL=25Ω, I_Q=60mA

Item	Symbol	Input pin	Output pin	Measurement conditions	Min.	Typ.	Max.	Unit
Maximum data rate	f_{Dmax}	1, 2	15, 16	NRZ	1.4	1.5	—	Gbps
Rise time	T_{TLH}			20%~80% * 1	130	210	310	ps
				20~80% * 2	120	200	300	
Fall time	T_{THL}			20~80% * 1	100	180	280	
				20~80% * 2	100	170	270	
Propagation delay time	T_{PLHQ}			V_{TH} (IN)=−1.3V, V_{TH} (OUT)=−0.75V Output amplitude 1.5V * 1	660	760	900	
				* 2	640	730	850	
	T_{PHLQ}			* 1	610	710	840	
				* 2	600	690	800	
	T_{PLHP}		21, 22	R_L=50Ω V_{TH}(IN)=1.3V V_{TH}(OUT)=−50mV Output amplitude 100mV	300	400	500	
	T_{PHLP}				300	400	500	

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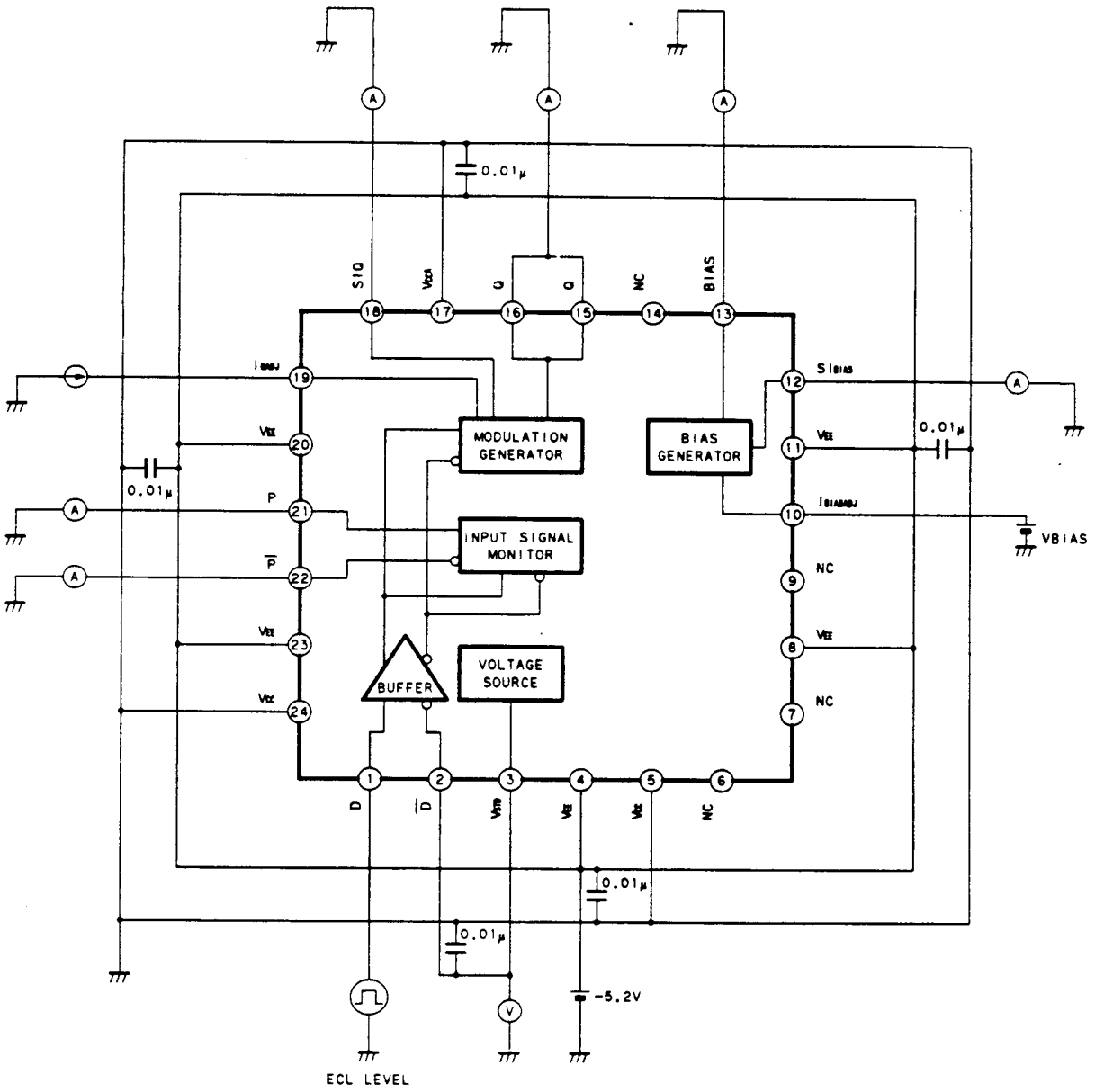
Electrical Characteristics Test Circuit

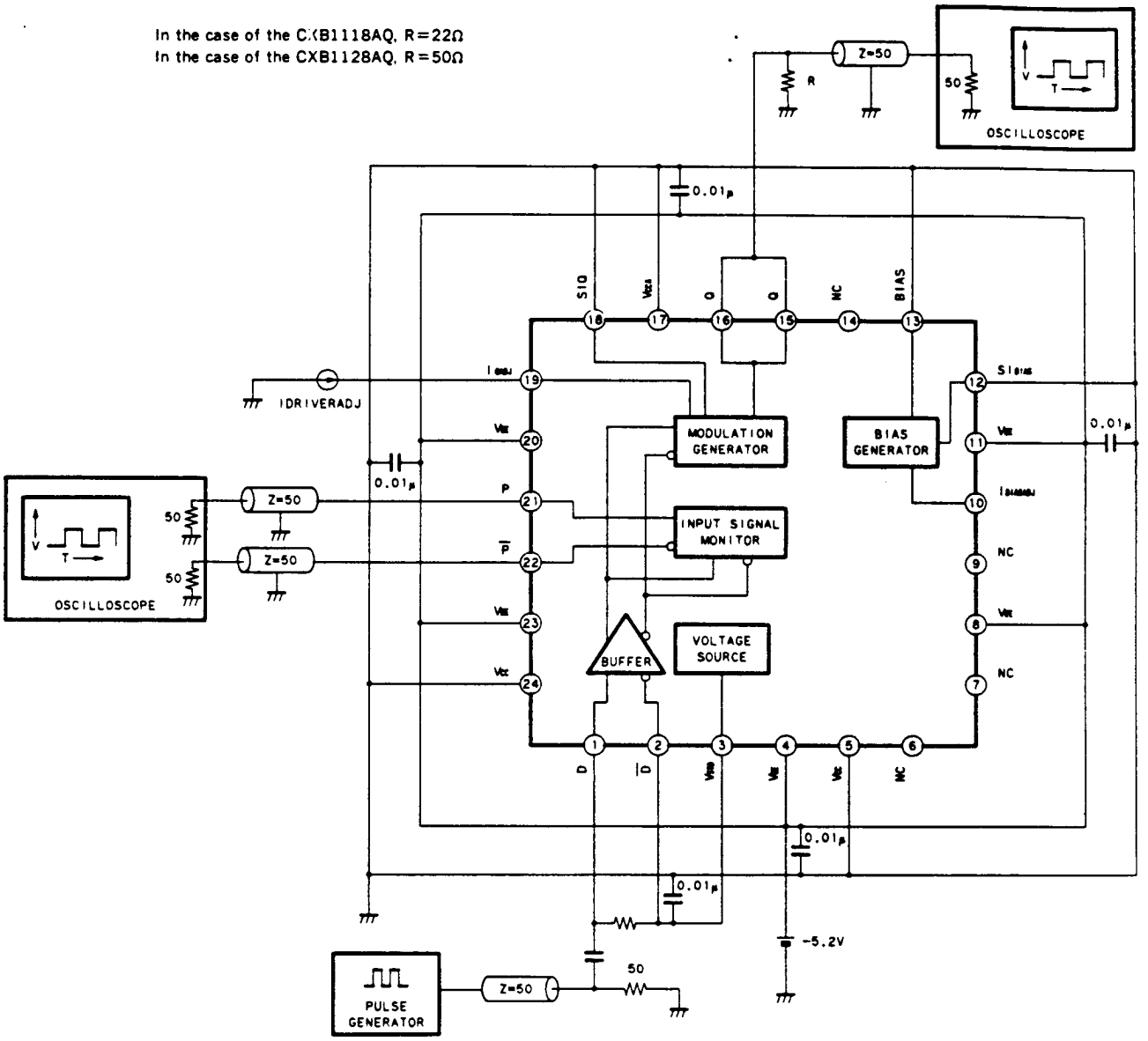
DC Characteristics



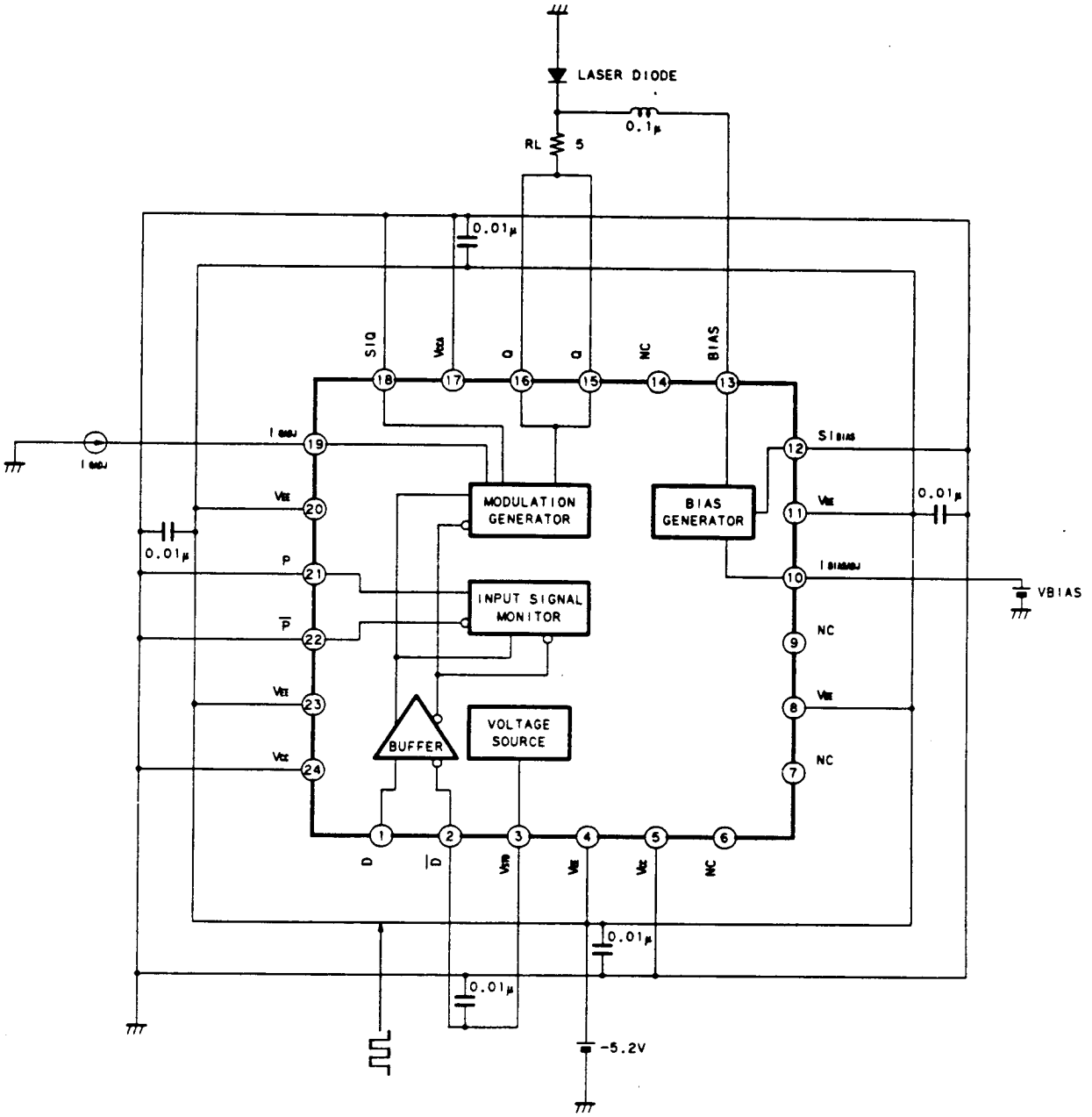
Electrical Characteristics Test Circuit

AC Characteristics

In the case of the CXB1118AQ, R=22Ω
In the case of the CXB1128AQ, R=50Ω



Application Circuit



Application circuits shown are typical examples illustrating the operation of the devices. Sony cannot assume responsibility for any problems arising out of the use of these circuits or for any infringement of third party patent and other right due to same.

Description of Operation

1. Block description

1) MODULATION GENERATOR

The Q pins output the ECL level signal input to the D and $\overline{D}$ pins as the current signal. The amplitude of this current signal can be changed by the current input to the IQADJ pin. The ratio of the Q pin current amplitude and the IQADJ pin current is approximately 4 : 1.

In addition, a fixed current with one-eighth the Q pin current amplitude is output to the SIQ pin, and can be used as monitor for the Q pin current amplitude.

2) BIAS GENERATOR section

The current flowing in the BIAS and SIBIAS pins is controlled by the voltage input to the IBIASADJ pin. For the current value, refer to the representative characteristics graph.

In addition, a current with one-eighth the BIAS output current is output to the SIBIAS pin, and can be used as monitor for the BIAS pin current.

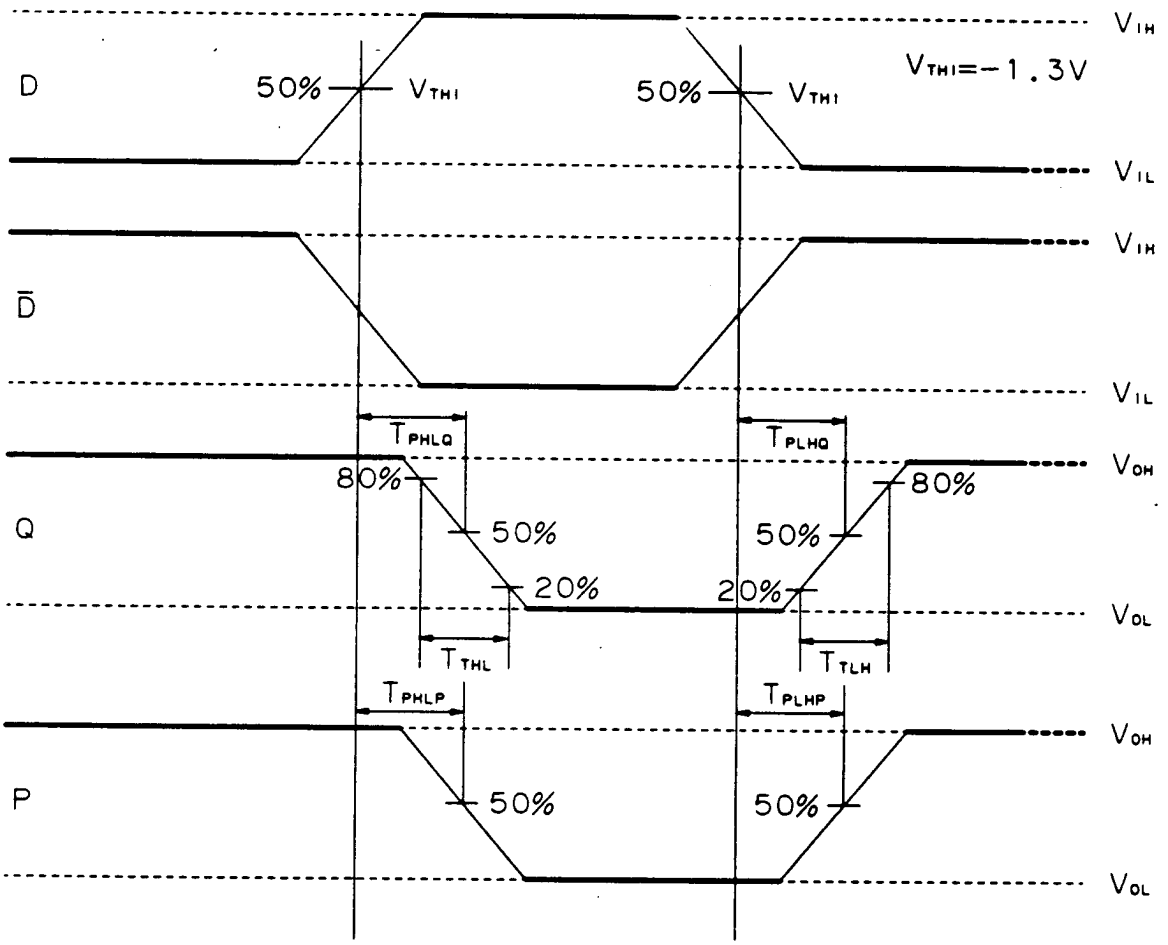
3) INPUT SIGNAL MONITOR section

The P and $\overline{P}$ pins output the ECL level signal input to the D and $\overline{D}$ pins as the current signal. By integrating this output, it is possible to use it for mark ratio detection.

4) VOLTAGE SOURCE section

The standard voltage is output to the V_{STD} pin. When ECL data input is input in single-phase, connect this pin to another data input pin.

2. CXB1118AQ/CXB1128AQ timing chart
Connects the following resistor between Q and Vcc:
CXB1118AQ: 15Ω; CXB1128AQ: 25Ω
Connects resistor of 750Ω between P-Vcc and P-Vcc.



Truth Table

D	Q	P
L	H	H
H	L	L

In the case of assuming resistor to the Q and P pins.

Notes on Operation

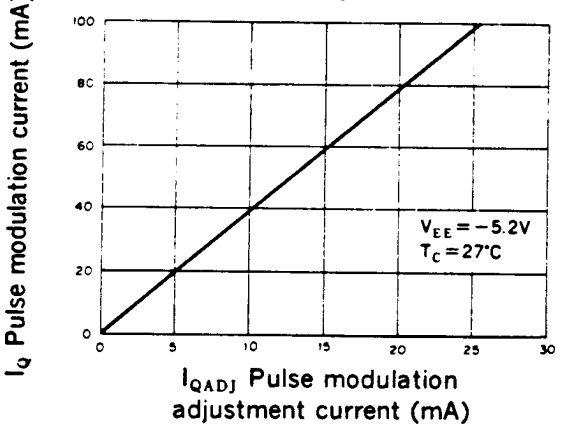
When using the CXB1118AQ/CXB1128AQ, pay careful attention to the following points.

1. Handling of output pins
   The outputs (Q, SIQ, BIAS, SIBIAS, P, and $\overline{P}$) on this IC are of the open collector type. Therefore, when these pins are not being used, connect them to Vcc.
2. Standard voltage V_{STD} pin
   Do not use this pin for any other purpose except for connection to the D or $\overline{D}$ pin of this IC.
3. Power supply decoupling capacitor
   Use a chip capacitor for the power supply decoupling capacitor, locate it as close as possible to this IC, and connect it to GND.
4. Output pins
   Pins 15 and 16 as the Q pins and must be connected when using this IC.
   When connecting the Q and BIAS pins to a laser diode, inserting inductance between the Q and BIAS pins (as shown in the Application Circuit) makes it possible to supply DC bias current to the laser diode without interfering with the output line impedance.
   When ringing occurs in the output, connect a damping resistance to the output pins as shown in the Application Circuit.
5. Input signal
   For D, $\overline{D}$ pins, signals should be input when the rise and fall times (20% to 80%) are 5ns or below.

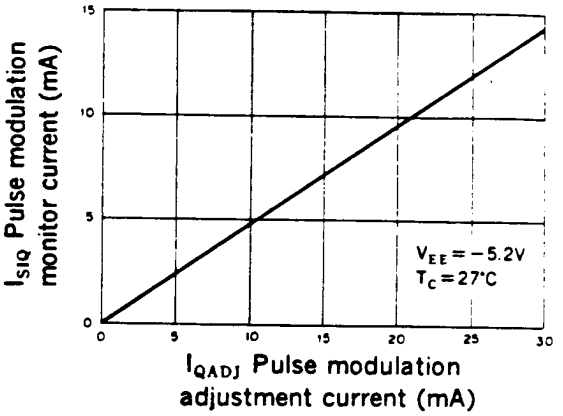
Example of Representative Characteristics

- Pulse modulation current characteristics (CXB1118AQ)

Pulse modulation current vs. Pulse modulation adjustment current

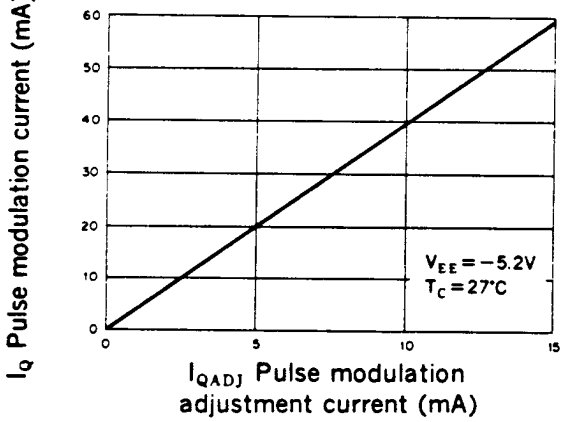


Pulse modulation monitor current vs. Pulse modulation adjustment current

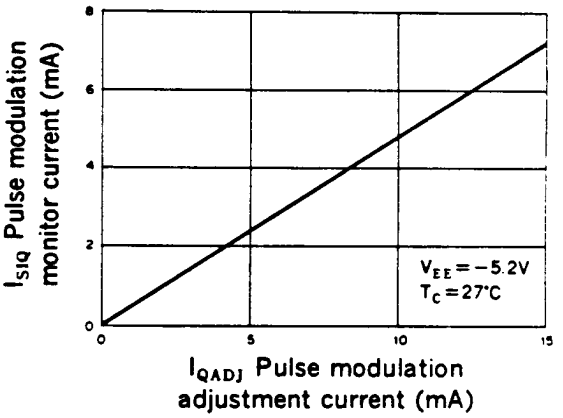


- Pulse modulation current characteristics (CXB1118AQ)

Pulse modulation current vs. Pulse modulation adjustment current

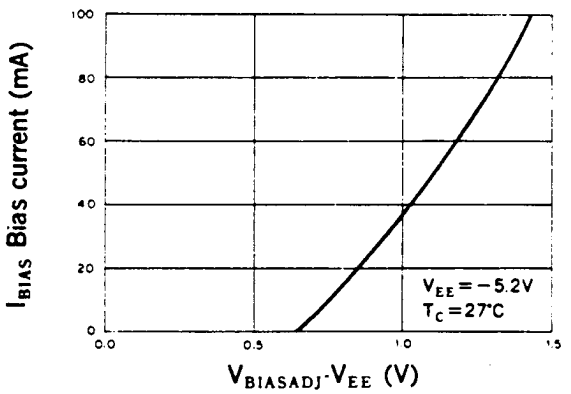


Pulse modulation monitor current vs. Pulse modulation adjustment current

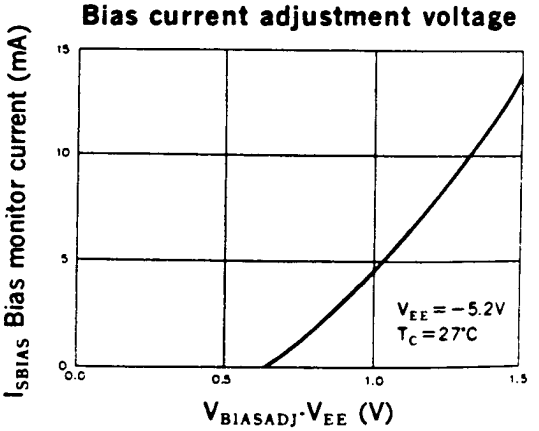


- Bias current characteristics

Bias output current vs. Bias current adjustment voltage

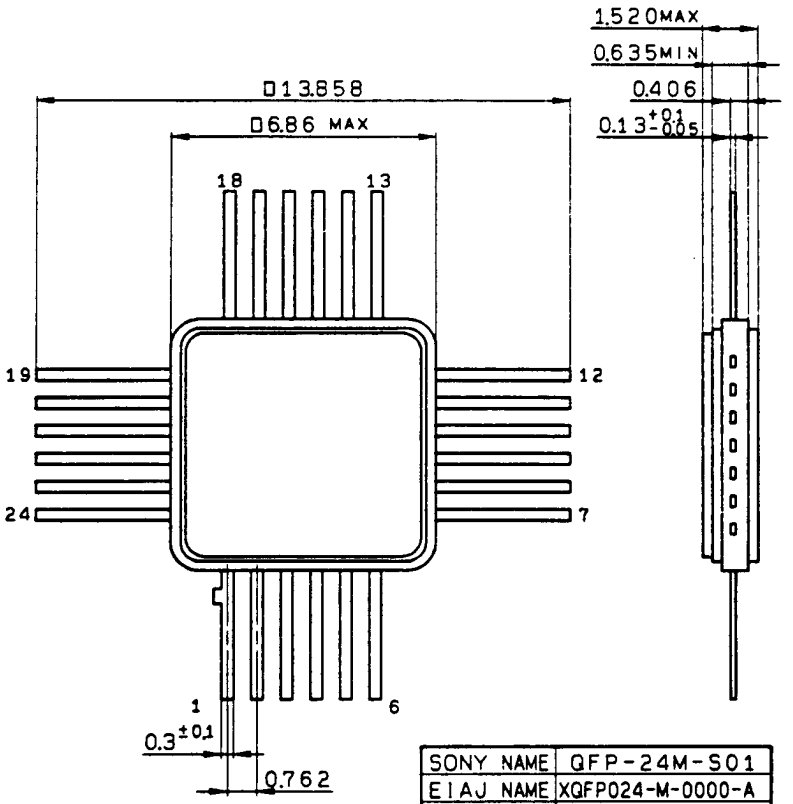


Bias monitor current vs. Bias current adjustment voltage



Package Outline **Unit : mm**

24pin QFP (Metal) 0.3g



SONY NAME	QFP-24M-S01
EIAJ NAME	XQFP024-M-0000-A
JEDEC CODE	———