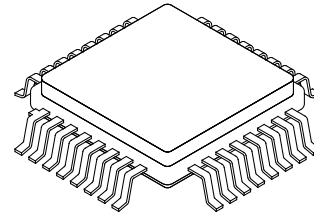


## Laser Driver

### Description

The CXB1548Q-Y is a high-speed monolithic Laser Driver/Current Switch with ECL input level. Open collector outputs are provided at the output pins (Q,  $\bar{Q}$ ) and have the capability of driving modulation current of 60mA<sub>pp</sub> at a max. data rate of 2.0Gbps (NRZ). DRIVADJ and SDRIV inputs control the modulation current amplitude, and BIASADJ, SBIAS inputs control the bias current. Modulation and bias current can be controlled by either voltage or current through these pins. This device includes three Operational Amplifiers and Laser Shutdown function.

32 pin QFP (Ceramic)



### Features

- Maximum data rate (NRZ): 2.0Gbps (Typ.)
- Differential Data input: ECL
- On chip three Operational Amplifiers
- Laser Shutdown Input: TTL

### Applications

- SONET/SDH: 155,622Mb/s, 1.2Gb/s
- Fiber channel: 133,266,532Mb/s, 1.062Gb/s
- FDDI: 125Mb/s ESCON: 200Mb/s HDTV: 1.5Gb/s

### Absolute Maximum Ratings

• Supply voltage	$V_{CC} - V_{EE}$	-0.3 to +7.0	V
• Input voltage	$V_{IN}$	$V_{EE}$ to +0.5	V
• Differential input voltage	$ V_{IN} - \bar{V}_{IN} $	0 to 2.5	V
• Output current (Continuous)	$I_Q, I_{BIAS}$	0 to 80	mA
Input current (Continuous)	$I_{DRVADJ}$	0 to 8	mA
	$I_{BIASADJ}$	0 to 8	mA
• Storage temperature	$T_{stg}$	-65 to +150	°C

### Recommended Operating Conditions

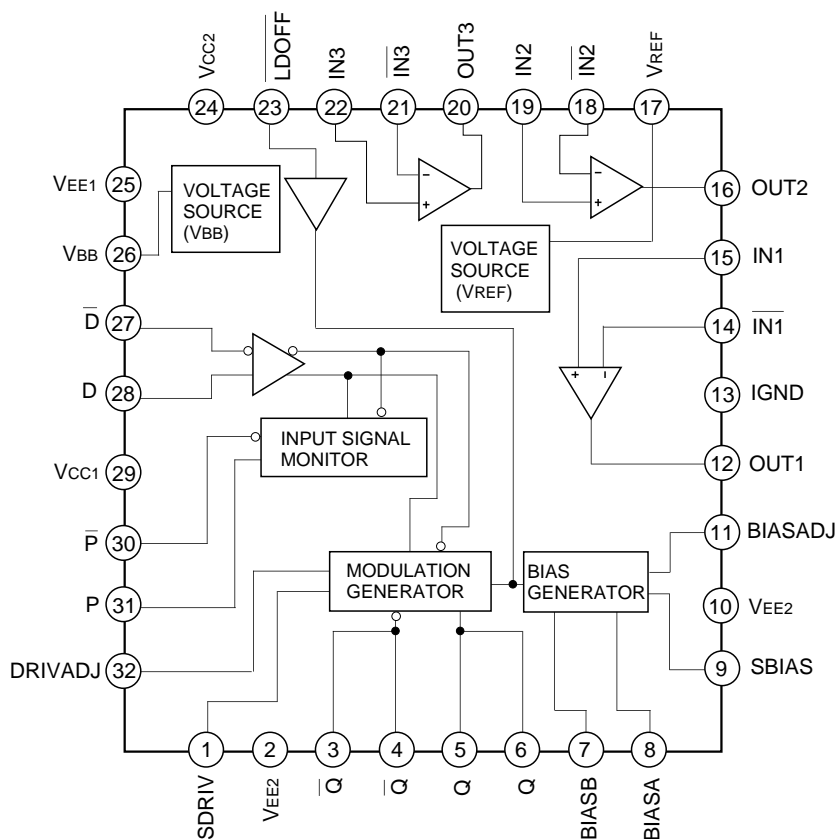
• DC power supply voltage	$V_{CC} - V_{EE}$	4.75 to 5.46	V
• Operating case temperature	$T_c$	0 to +85	°C

### Structure

Bipolar silicon monolithic IC

Sony reserves the right to change products and specifications without prior notice. This information does not convey any license by any implication or otherwise under any patents or other right. Application circuits shown, if any, are typical examples illustrating the operation of the devices. Sony cannot assume responsibility for any problems arising out of the use of these circuits.

Block Diagram and Pin Assignment



Truth table

LDOFF	D	Q	P
H	L	H	H
H	H	L	L
L	L	H	H
L	H	H	L

\* In a case of resistor load

Pin Description

Pin No.	Symbol	Typical Voltage (V)		Equivalent circuit	Description	
		DC	AC			
1	SDRIV	0mA to 8mA*1 0mA to 6mA*2	—		Modulation generator current monitor.	
32	DRIVADJ	V <sub>EE</sub> to V <sub>EE</sub> +2.5V	—		Modulation generator current adjustment.	
2, 10	V <sub>EE</sub> 2	-5.2V	—		Negative power supply pin.	
3	$\bar{Q}$	—	0mA to 60mA*1 0mA to 40mA*2		Modulation generator current output.	
4			0mA to 60mA*1 0mA to 40mA*2			
5	Q	—	0mA to 60mA*1 0mA to 40mA*2			
6			0mA to 60mA*1 0mA to 40mA*2			
7	BIASB	0mA to 30mA	—			Bias generator current output.
8	BIASA					Bias generator current monitor.
9	SBIAS	0mA to 8mA	—		Bias generator current adjustment.	
11	BIASADJ	V <sub>EE</sub> to V <sub>EE</sub> +2.5V	—		Output pin for OpAmp.	
12	OUT1	V <sub>EE</sub> +0.7V to -1.0V	—		Input pins for OpAmp.	
14	$\bar{IN}1$				Input pins for OpAmp.	
15	IN1				Output pin for OpAmp.	
16	OUT2				Input pins for OpAmp.	
18	$\bar{IN}2$				Input pins for OpAmp.	
19	IN2				Output pin for OpAmp.	
20	OUT3				Input pins for OpAmp.	
21	$\bar{IN}3$				Output pin for OpAmp.	
22	IN3	Input pins for OpAmp.				
13	IGND	open or V <sub>EE</sub>	—	OpAmp switch pin IGND = V <sub>EE</sub> : active IGND = OPEN: inactive		

\*1 V<sub>EE</sub> = -5.46V to -4.94V

\*2 V<sub>EE</sub> = -4.94V to -4.75V

Pin No.	Symbol	Typical Voltage (V)		Equivalent circuit	Description
		DC	AC		
17	V <sub>REF</sub>	V <sub>EE</sub> +2.5V	—		Reference voltage (V <sub>REF</sub> – V <sub>EE</sub> : 2.5V) Max. drive current ±3mA
23	LDOFF	open or V <sub>EE</sub> .	—		<p>Shut down switch pin</p> <p>LDOFF = L (V<sub>EE</sub>): shut down</p> <p>LDOFF = H (open): Laser active</p>
24	V <sub>CC2</sub>	0V	—		Positive Power supply pin.
25	V <sub>EE1</sub>	–5.2V	—		Negative Power supply pin.
26	V <sub>BB</sub>	–1.3V	—		Reference voltage (–1.3V) Use for the reference voltage in the case of single-phase input. Max. drive current ±200µA
25	V <sub>EE1</sub>	–5.2V	—		Negative power supply pin.
27	D̄	—	–1.84V to –0.81V		Data signal input.
28	D				
29	V <sub>CC1</sub>	0V	—		

Pin No.	Symbol	Typical Voltage (V)		Equivalent circuit	Description
		DC	AC		
30	$\bar{P}$	—	0mA to 2.7mA		Input signal monitor output.
31	P	—			

## Electrical Characteristics

### • DC Electrical Characteristics

#### Laser Driver part

( $V_{CC1} = V_{CC2} = \text{GND}$ ,  $V_{EE1} = V_{EE2} = -5.46$  to  $-4.75\text{V}$ ,  $T_c = 0$  to  $+85^\circ\text{C}$ )

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Power supply current	$I_{EE}$	$I_Q = 0\text{mA}$ , $I_{BIAS} = 0\text{mA}$	-99	-69	—	mA
		$I_Q = 60\text{mA}$ , $I_{BIAS} = 60\text{mA}$	-240	-203	—	
Max. Modulation current	$I_Q$	$V_{EE} = -5.46$ to $-4.94\text{V}$	60	—	—	mA
		$V_{EE} = -4.94$ to $-4.75\text{V}$	40	—	—	
Modulation output voltage range	$V_Q$	$T_c = 25^\circ\text{C}$	-2.5	—	+2.0	V
Max. Bias current	$I_{BIAS}$	$I_{BIASA} + I_{BIASB}$	60	—	—	mA
Bias output voltage range	$V_{BIAS}$		-2.7	—	0	V
Modulation current monitor output voltage range	$V_{SQ}$		-2.7	—	0	
Bias current monitor output voltage range	$V_{SBIAS}$		-2.7	—	0	
Input signal monitor current	$I_P$		1	1.7	2.7	mA
Input signal monitor output voltage range	$V_P$	$T_c = 25^\circ\text{C}$	-2.5	—	+2.0	V
ECL input High voltage	$V_{EDH}$		-1.17	—	-0.81	
ECL input Low voltage	$V_{EDL}$		-1.84	—	-1.48	
ECL input High current	$I_{EDH}$		—	—	20	$\mu\text{A}$
TTL input High voltage	$V_{TDH}$		$V_{EE} + 2.0$	—	$V_{CC}$	V
TTL input Low voltage	$V_{TDL}$		$V_{EE} - 0.5$	—	$V_{EE} + 0.8$	
TTL input High current	$I_{TDH}$		—	—	10	$\mu\text{A}$
TTL input Low current	$I_{TDL}$		-320	—	—	
Reference bias voltage for OP Amp.	$V_{REF}$	$V_{REF} - V_{EE}$	2.25	2.5	2.75	V
Reference bias voltage	$V_{BB}$		-1.38	-1.32	-1.26	

#### Ratio of current setup

Item	Symbol	Condition	Min.	Typ.	Max.
Modulation current vs. Modulation monitor current	S1	at voltage control application	9.0	11.4	12.0
Modulation current vs. Modulation control current	S2	at current control application	6.5	8.6	10.5
Bias current vs. Bias monitor current	S3	at voltage control application	11.0	12.0	13.0
Bias current vs. Bias control current	S4	at current control application	7.4	9.8	12.0

### • AC Electrical Characteristics

#### Laser Driver part

( $V_{CC1} = V_{CC2} = \text{GND}$ ,  $V_{EE1} = V_{EE2} = -5.46$  to  $-4.75\text{V}$ ,  $T_c = 0$  to  $+85^\circ\text{C}$ ,  $R_I = 25\Omega$  to  $\text{GND}$ )

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Max. Data rate	$f_{D\text{MAX}}$	NRZ	1.6	2.0	—	Gbps
Shut Down Time	$T_{\text{SHUT}}$		—	—	30	$\mu\text{s}$
Rise time	$T_{\text{TLH}}$	20 to 80%	—	170	—	ps
Fall time	$T_{\text{THL}}$	$I_Q = 60\text{mA}$ , $I_{BIAS} = 0$	—	150	—	

• AC & DC Electrical Characteristics

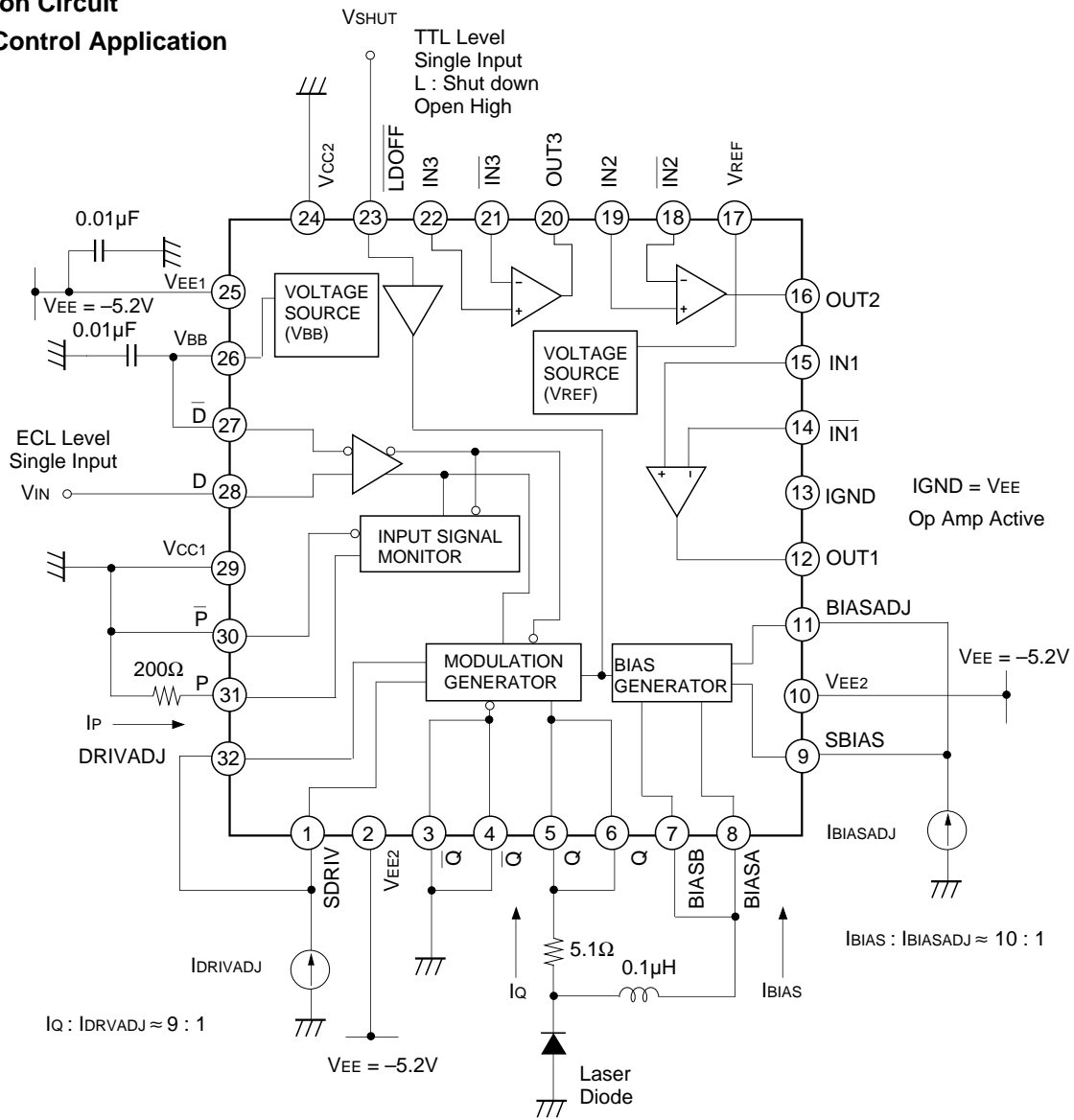
Operational Amplifier part

( $V_{CC2} = GND, V_{EE1} = IGND = -5.46$  to  $-4.75V, T_c = 0$  to  $+85^{\circ}C$ )

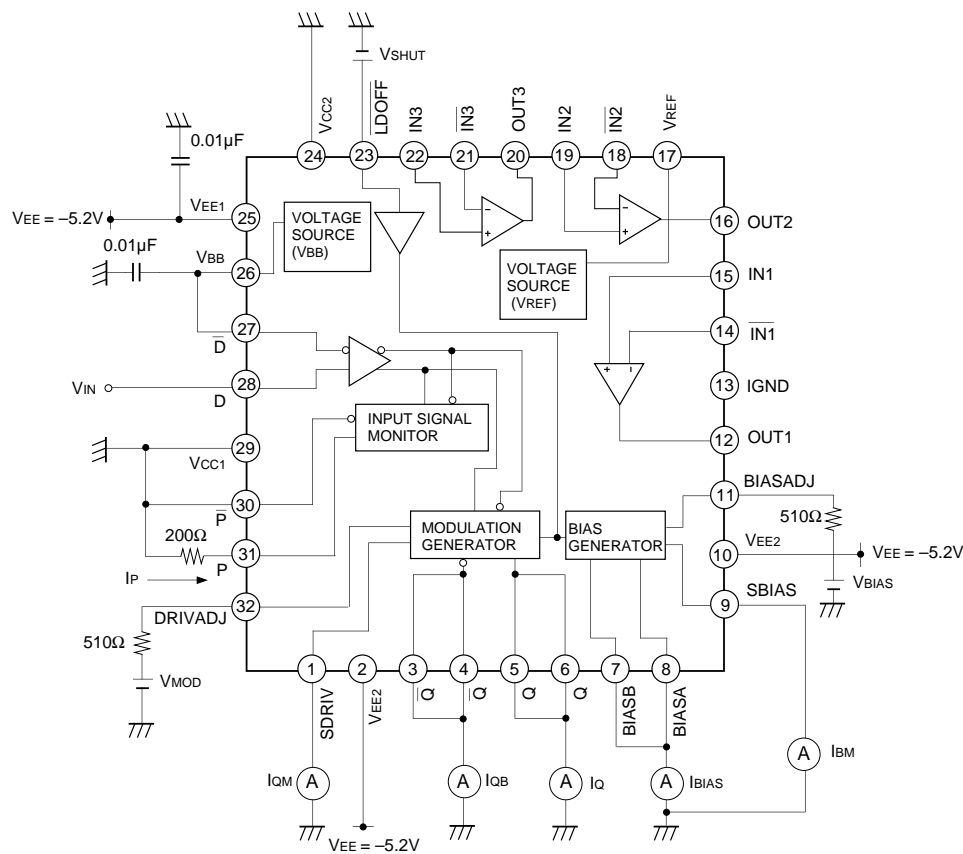
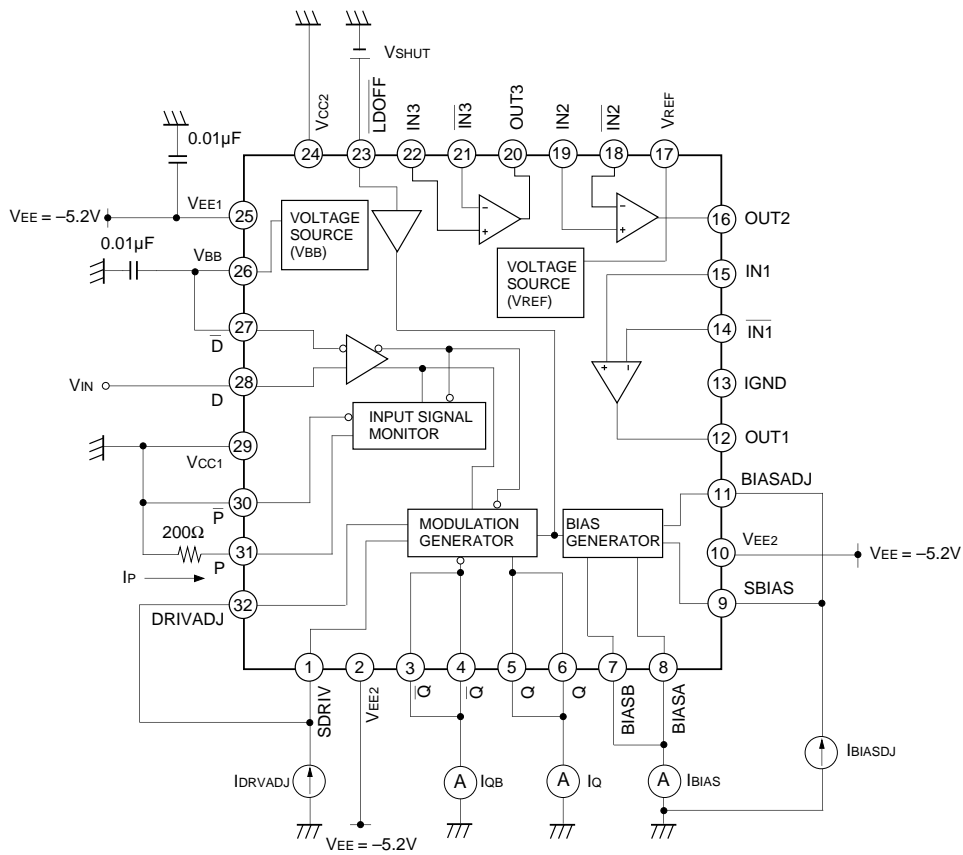
Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Power supply current	$I_{EE}$		—	-9.0	—	mA
Input offset voltage	$V_{off}$		—	1.0	—	mV
Input bias current	$I_b$		—	-1.0	—	$\mu A$
Input offset current	$I_{off}$		—	200	—	nA
Input voltage range	$V_{in}$		$V_{EE} + 0.7$	—	-1.0	V
Open Loop Gain	$A_v$		—	40	—	dB
Output voltage range	$V_o$		$V_{EE} + 0.7$	—	-1.0	V
Input Impedance	$Z_{in}$		1.0	—	—	$M\Omega$
Slew Rate	SR		—	18	—	$V/\mu s$
Unity Gain Band width	$f_{unit}$		30	—	—	MHz
Output drive current range	$I_o$		-3.0	—	3.0	mA

Application Circuit

Current Control Application

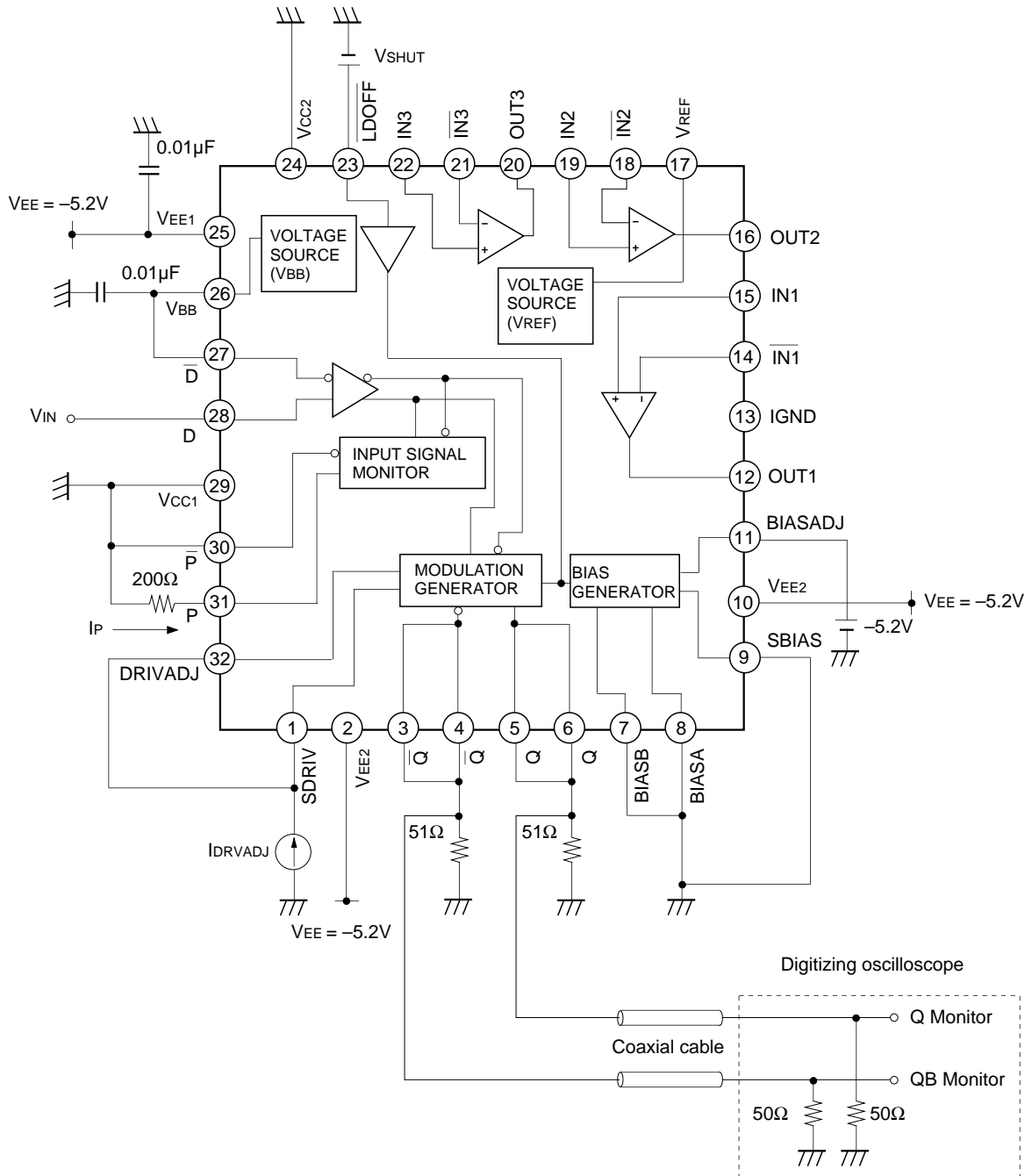


Measurement Circuit (DC)

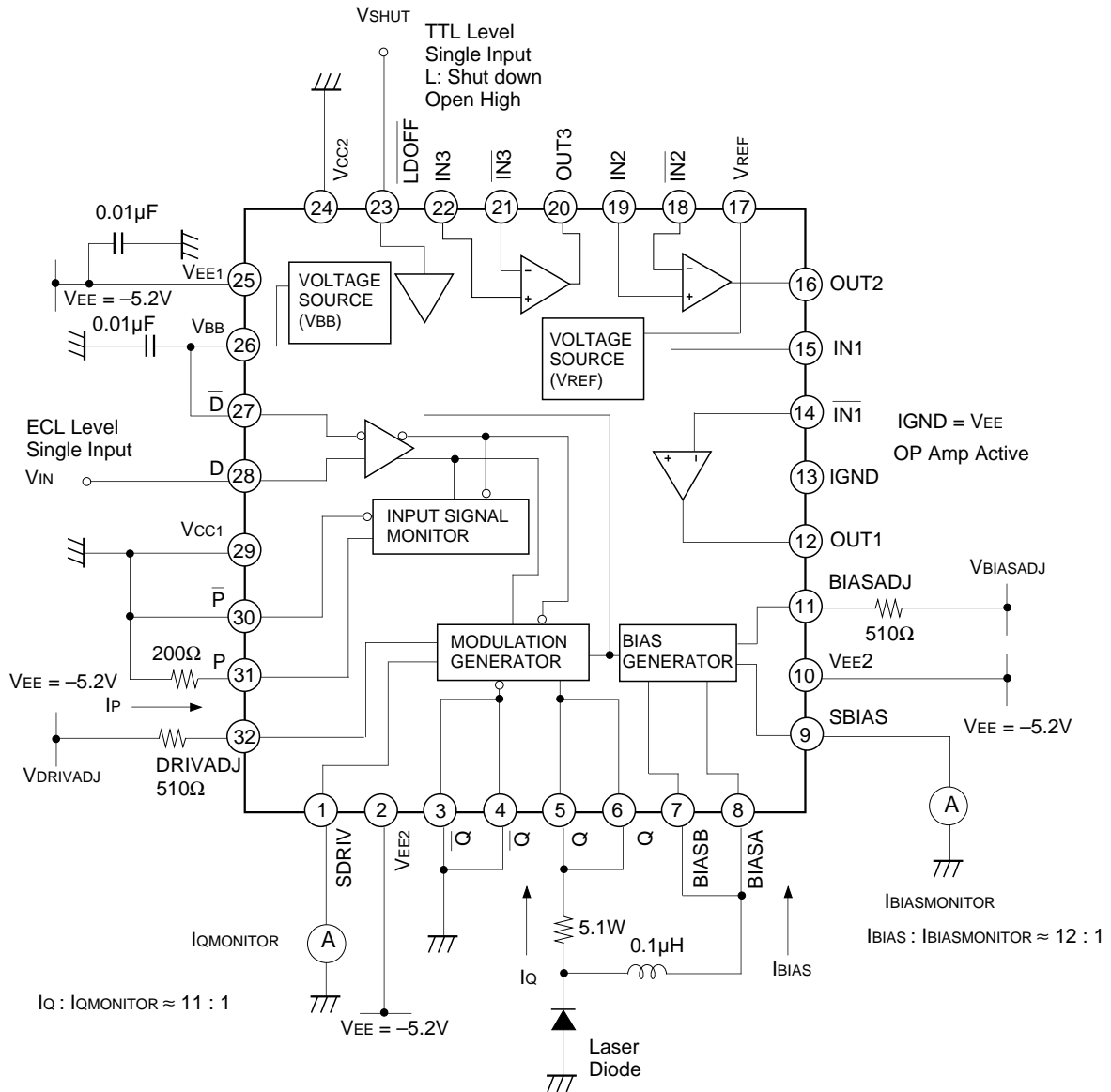




Measurement Circuit (AC)



Voltage Control Application

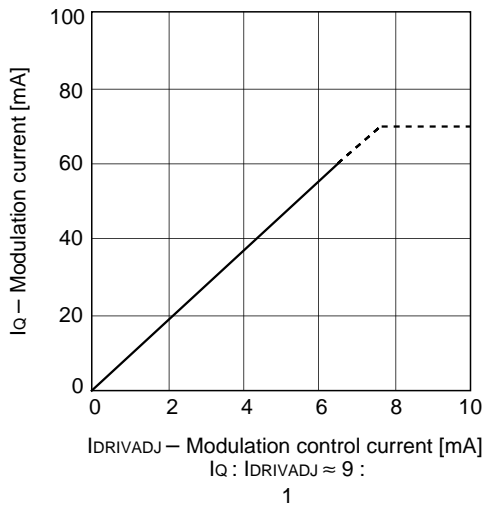


Cautions for Handling

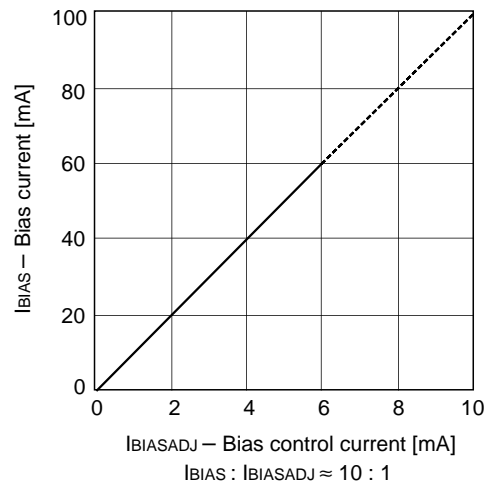
1. The outputs (Q,  $\bar{Q}$ , BIASA, BIASB, SDRIV, SBIAS, P and  $\bar{P}$ ) on this IC are the open collector type. Therefore, when these pins are not being used, connect them to Vcc.
2. When the inputs (DRIVEADJ and BIASADJ) are not being used, connect them to VEE.
3. Do not apply voltage over VEE + 2.5V to DRIVEADJ pin and BIASADJ pin.
4. In voltage control Application, do not apply voltage over the output voltage range to SDRIV pin and SBIAS pin. (see DC Characteristics of Laser Part and Voltage Control Application Circuit.)
5. Maximum drive current of VBB pin is  $\pm 200\mu\text{A}$ .
6. Maximum input differential voltage is 2.5V. ( $|D - \bar{D}|$ )
7. Maximum drive current of VREF pin is  $\pm 3\text{mA}$ .
8. As the electronic breakdown level is weak, take care to handle.

Example of Representative Characteristics

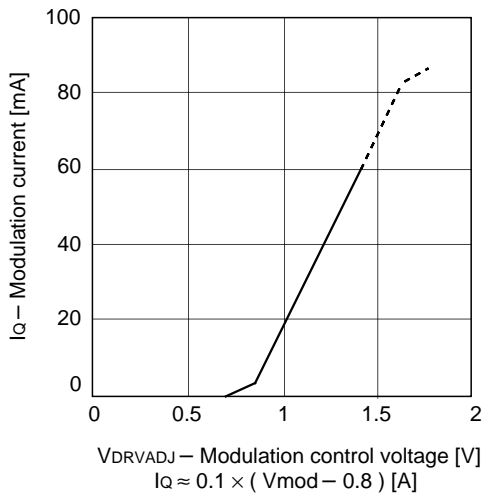
Modulation current vs. Modulation control current



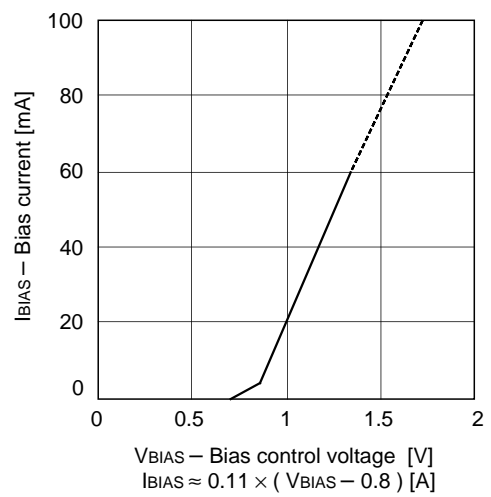
Bias current vs. Bias control current



Modulation current vs. Modulation control voltage



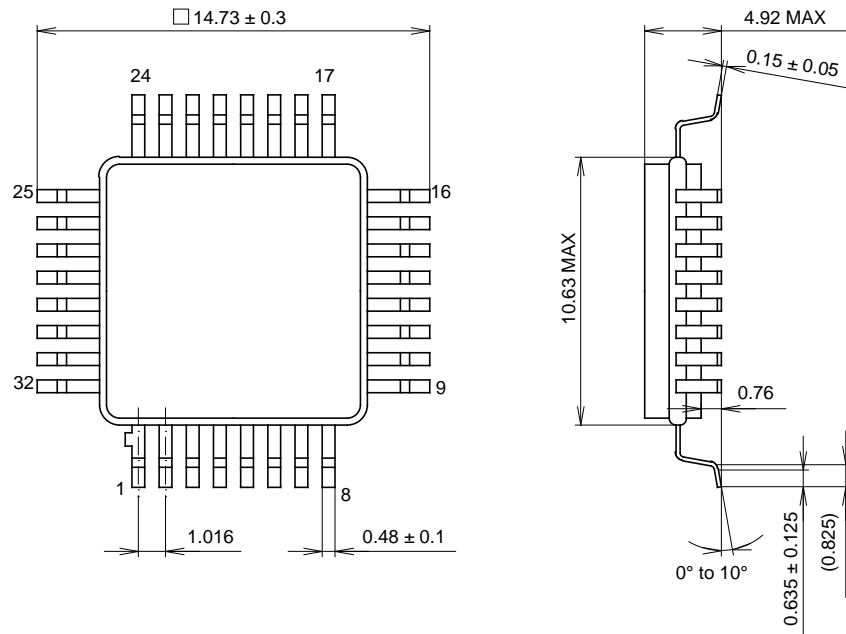
Bias current vs. Bias control voltage



Package Outline

Unit: mm

32PIN QFP (CERAMIC)



SONY CODE	QFP-32C-L01
EIAJ CODE	XQFP023-G-0000-A
JEDEC CODE	_____

PACKAGE STRUCTURE

PACKAGE MATERIAL	CERAMIC
LEAD TREATMENT	TIN PLATING
LEAD MATERIAL	42 ALLOY
PACKAGE WEIGHT	0.3g