

RF Amplifier for CD Players

Description

The CXA1821M is an IC developed for compact disc players. This IC incorporates an APC circuit and RF, focus error, and tracking error amplifiers for 3-spot optical pickup output. (The voltage-converted optical pickup output is supported.)

Features

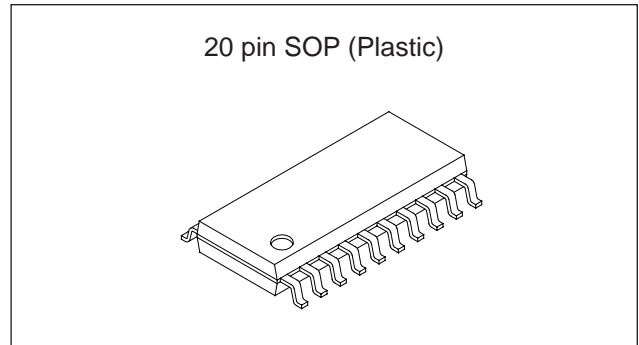
- Low power consumption (40mW at $\pm 2.5V$)
- APC circuit
- Both single power supply (+5V) and dual power supply ($\pm 2.5V$) operations possible.
- Compatible with pickup for LC and PD
- Supports the RF amplifier at double speed.

Applications

Compact disc players

Structure

Bipolar silicon monolithic IC



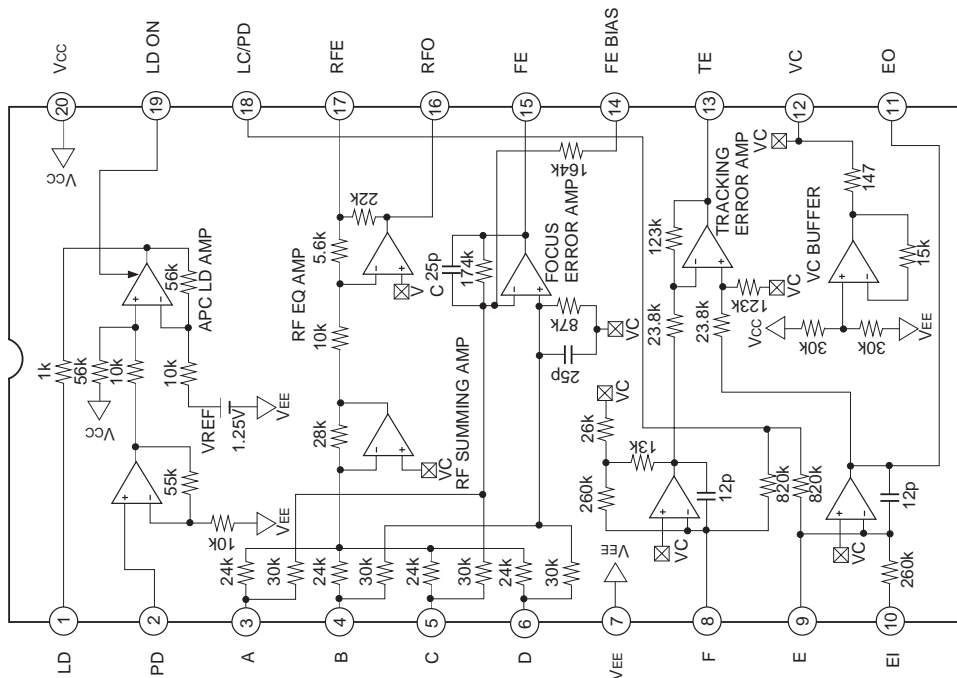
Absolute Maximum Ratings (Ta = 25°C)

• Supply voltage	V _{CC}	12	V
• Operating temperature	T _{opr}	-20 to +75	°C
• Storage temperature	T _{stg}	-65 to +150	°C
• Allowable power dissipation	PD	600	mW

Operating Conditions

• Supply voltage	V _{CC} - V _{EE}	2.8 to 11.0	V
------------------	-----------------------------------	-------------	---

Block Diagram and Pin Configuration



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.

Pin Description

Pin No.	Symbol	I/O	Equivalent circuit	Description
1	LD	O	<p>The circuit for Pin 1 (LD) shows a differential output stage. It consists of two NPN transistors with their emitters connected to VEE. The bases are connected to a common node through a 1k resistor. This common node is also connected to VCC through a 10k resistor. The collector of the right transistor is connected to Pin 1 through a 55.7k resistor. The collector of the left transistor is connected to VCC.</p>	Output pin of APC amplifier.
2	PD	I	<p>The circuit for Pin 2 (PD) shows a differential input stage. It consists of two NPN transistors with their emitters connected to VEE. The bases are connected to a common node through a 147 resistor. This common node is also connected to VCC through a 17µF capacitor. The collector of the right transistor is connected to VCC through a 55k resistor. The collector of the left transistor is connected to VEE through a 10k resistor.</p>	Input pin of APC amplifier.
3 4 5 6 14	A B C D FE BIAS	I I I I I	<p>The circuit for Pins 3, 4, 5, 6, and 14 shows a complex multi-stage amplifier. It consists of two differential input stages and two differential output stages. The input stages have bases connected to pins 3, 4, 5, and 6 through 24k resistors. The output stages have collectors connected to pins 3, 4, 5, and 6 through 30k resistors. The circuit includes various resistors (24k, 30k, 28k, 174k, 164k, 87k, 4.9k, 100µ, 8µ, 25p) and capacitors (17µ, 25p). It is powered by VCC and VEE, and includes VC pins for focus bias adjustment.</p>	Input pin of RF and FE amplifier for Pins 3, 4, 5 and 6; focus bias adjustment for Pin 14.
7	VEE	—		VEE.

Pin No.	Symbol	I/O	Equivalent circuit	Description
8 9 10 11 18	F E EI EO LC/PD	I I — — I		<p>Input pin of tracking error amplifier for Pins 8 and 9. An external resistor for V-I conversion should be connected because these pins are for current input. Gain adjustment of input signal from Pin 9 for Pins 10 and 11. Pin 18 is a bias for LC when connected to Vcc and for PD IC when left open.</p>
12	VC	O		<p>DC voltage output pin of $(V_{CC} + V_{EE})/2$. Connect to GND when dual power supply ($\pm 2.5V$) is used; connect a smoothing capacitor when single power supply (+5V) is used.</p>
13	TE	O		<p>Output pin of tracking error amplifier. The F-E signal is output.</p>
15	FE	O		<p>Output pin of focus error amplifier.</p>

Pin No.	Symbol	I/O	Equivalent circuit	Description
16	RFO	O		Output pin of RF amplifier.
17	RFE	—		Equalizing pin is used of RF amplifier. Frequency response can be adjusted by connecting CR to this pin.
19	LD ON	I		ON/OFF selection pin of APC amplifier. ON for Vcc and OFF for VEE
20	VCC	—		Vcc.

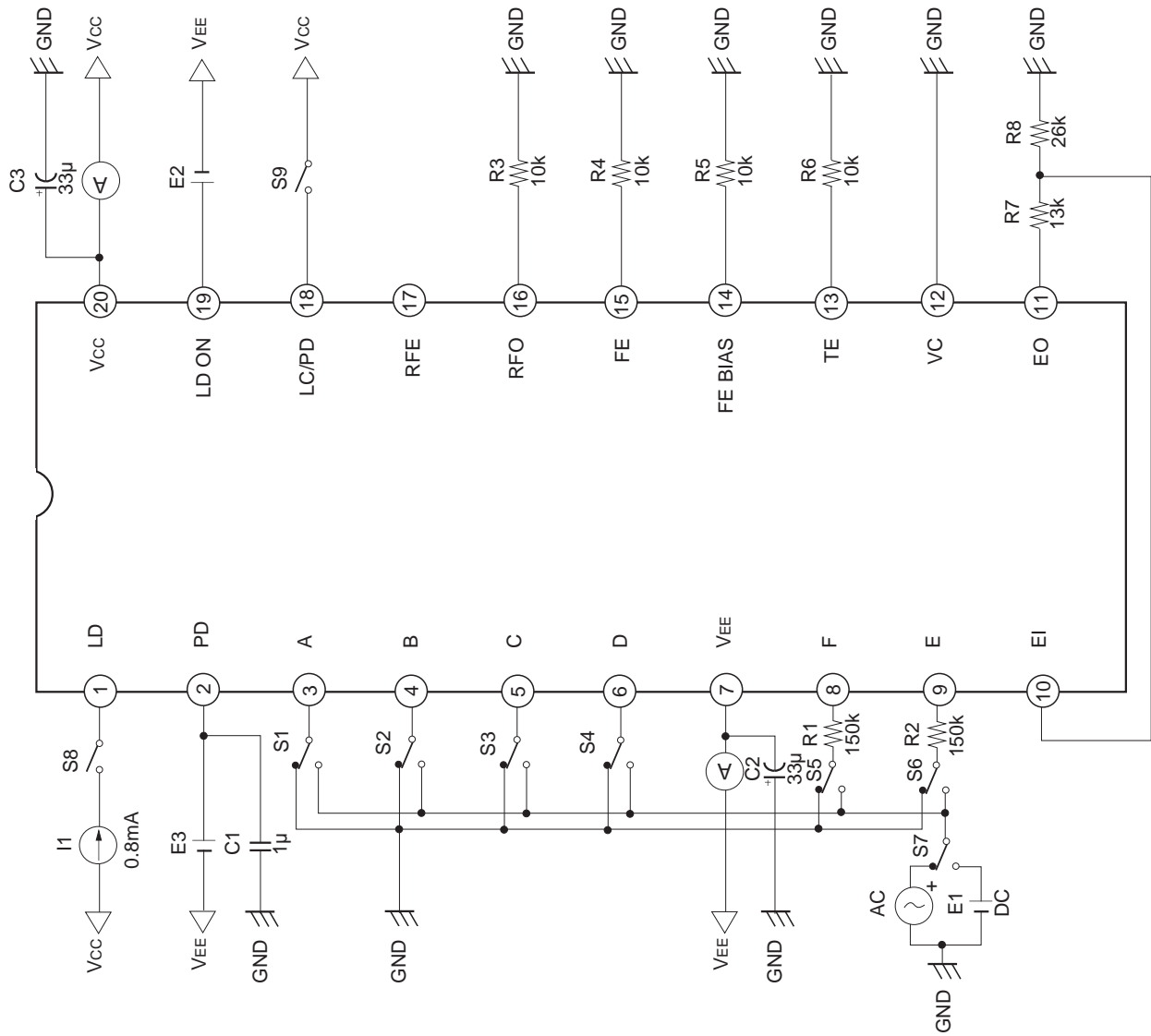
Power supply $\pm 2.5V$ ($V_{CC} = 2.5V$, $V_{EE} = -2.5V$, $V_C = GND$)

Electrical Characteristics

Measurement No.	Measurement item	Symbol	SW conditions									Bias conditions			Measurement pin	Description of I/O waveform and measurement method	Min.	Typ.	Max.	Unit	
			1	2	3	4	5	6	7	8	9	E1	E2	E3							
1	Current consumption	ICC														20	Input GND	—	7.23	11.0	mA
2		IEE														7	Input GND	-11.0	-7.23	—	—
3	Offset voltage 1	V16-1													16	Input GND	-25.0	—	25.0	mV	
5		Voltage gain	V16-2												16	Input 1kHz 100 mVp-p	19.2	22.1	25.2	dB	
6	Maximum output amplitude H	V16-3								280mV				16	Output DC measurement	1.3	—	—	V		
7	Maximum output amplitude L	V16-4								-280mV				16	Output DC measurement	—	—	-0.3	—		
8	Offset voltage	V15-1												15	Input GND	-30.0	0	30.0	mV		
9	Voltage gain 1	V15-2												15	Input 1kHz 260 mVp-p	18.3	21.2	24.3	dB		
10	Voltage gain 2	V15-3												15	Input 1kHz 260 mVp-p	18.3	21.2	24.3	dB		
11	Voltage gain difference	V15-4												15	V15-4 = V15-2 - V15-3	-3.0	0	3.0	—		
12	Maximum output amplitude L	V15-5								310mV				15	Output DC measurement	—	—	-1.9	—		
13	Maximum output amplitude H	V15-6								310mV				15	Output DC measurement	1.9	—	—	—		
14	Offset voltage	V13-1												13	Input GND	-30	0	30	mV		
15	Voltage gain 1	V13-2												13	Input 1kHz 140 mVp-p	19.8	22.7	25.8	dB		
16	Voltage gain 2	V13-3												13	Input 1kHz 140 mVp-p	19.8	22.7	25.8	dB		
17	Voltage gain difference	V13-4												13	V13-4 = V13-2 - V13-3	-3.0	0	3.0	—		
18	Maximum output amplitude H	V13-5								270mV				13	Output DC measurement	1.9	—	—	—		
19	Maximum output amplitude L	V13-6								270mV				13	Output DC measurement	—	—	-1.9	—		
20	Output voltage 1	V1-1												1	Output DC measurement	—	-1.7	-0.3	—		
21	Output voltage 2	V1-2									2.0V			1	Output DC measurement	-1.5	0.0	1.1	V		
22	Output voltage 3	V1-3									2.0V			1	Output DC measurement	0.6	2.0	—	—		
23	Output voltage 4	V1-4									0.5V			1	LD OFF	2.1	2.3	—	—		
24	Maximum output amplitude	V1-5									2.0V			1	I ₁ = 0.8mA	—	—	0.0	—		
25	Output voltage 1	V12-1												12	Output DC measurement	-100	—	+100	mV		

* O in the SW conditions represents the ON state.

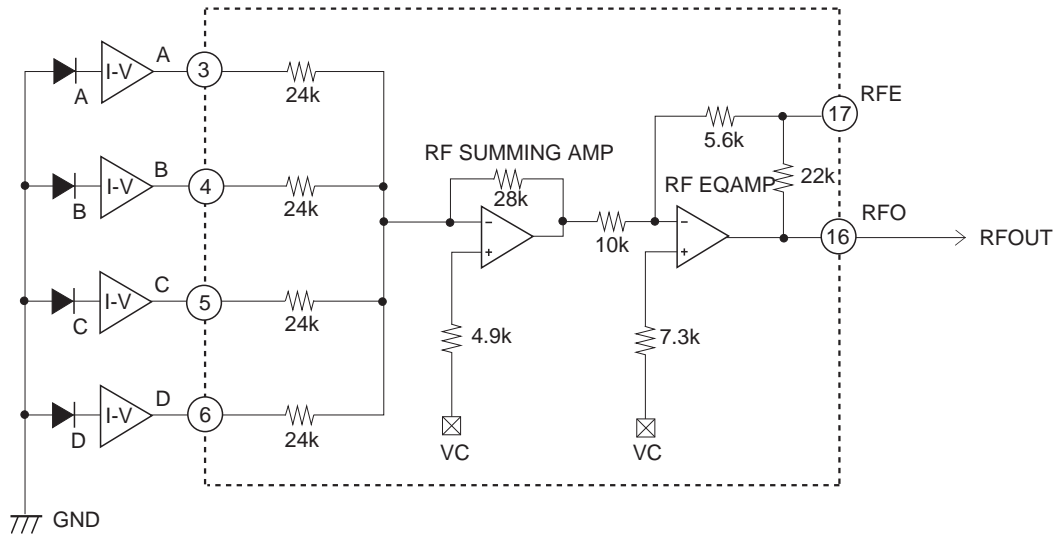
Electrical Characteristics Measurement Circuit



Description of Functions

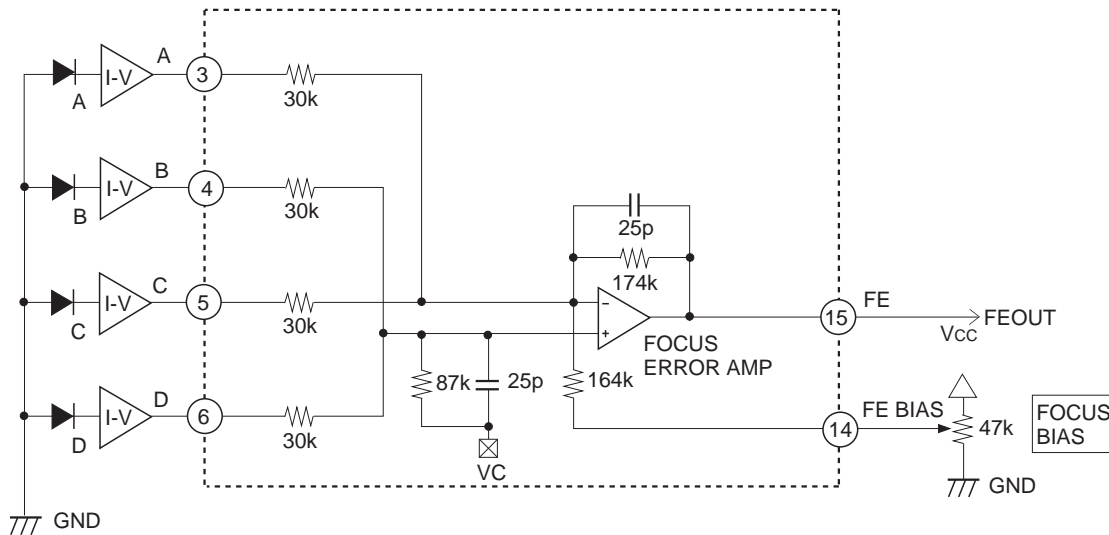
RF Amplifier

Each signal current from the photodiodes A, B, C and D is I-V converted, and input to Pins 3, 4, 5 and 6. These signals are added by the RF summing amplifier and equalized by the RF equalizing amplifier and then output to Pin 16. When the RF signal is equalized, an equalizing circuit is added to Pin 17.



Focus Error Amplifier

The operation of $(B + D) - (A + C)$ is performed and the signal is output to Pin 15. Pin 14 is used for bias adjustment of the focus error signal.

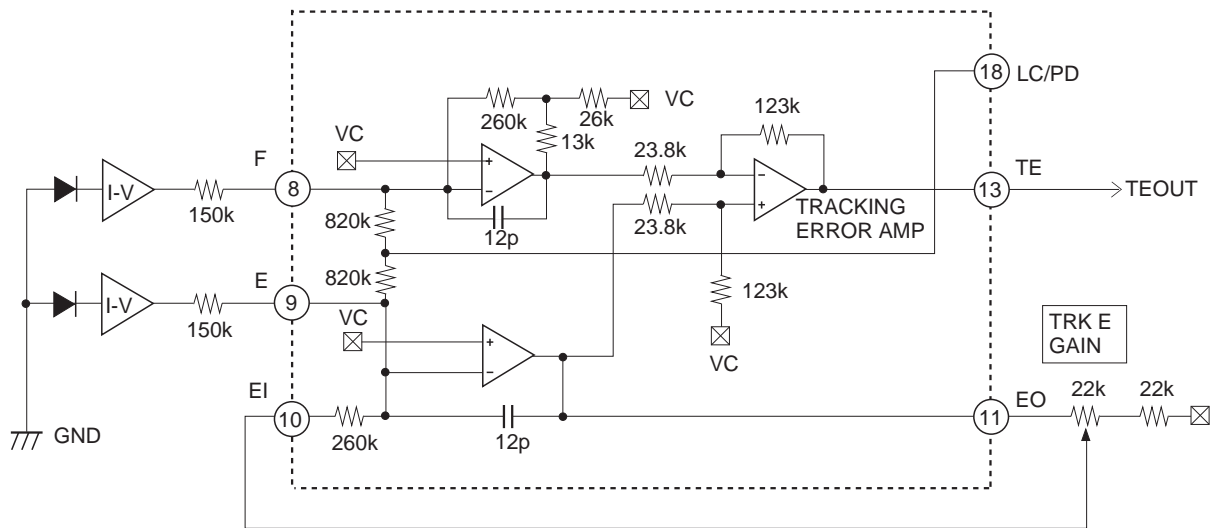


Tracking Error Amplifier

Each signal current from the photodiodes E and F is I-V converted and input to Pins 8 and 9 via an input resistor which determines the gain. The signal is amplified by the gain amplifier, operated by the tracking error amplifier and then the (F-E) signal is output to Pin 13.

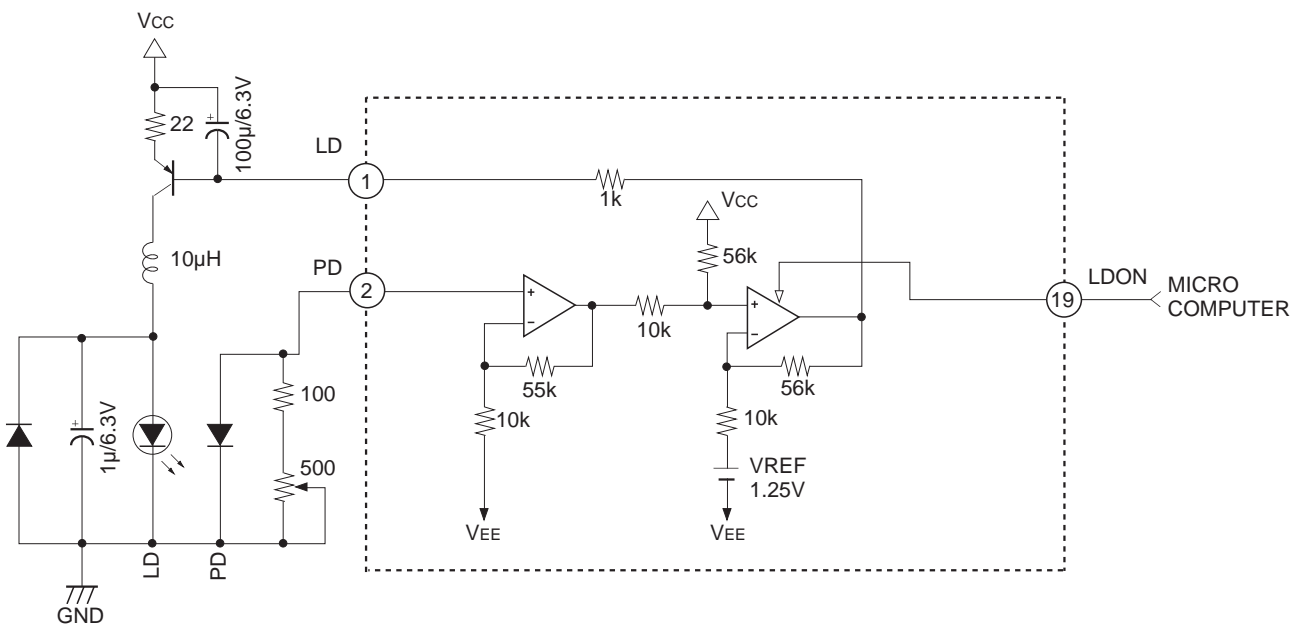
The E input gain can be adjusted by Pin 11.

Pin 18 can be used as a bias for LC when connected to VCC and as a bias for PD IC when left open.



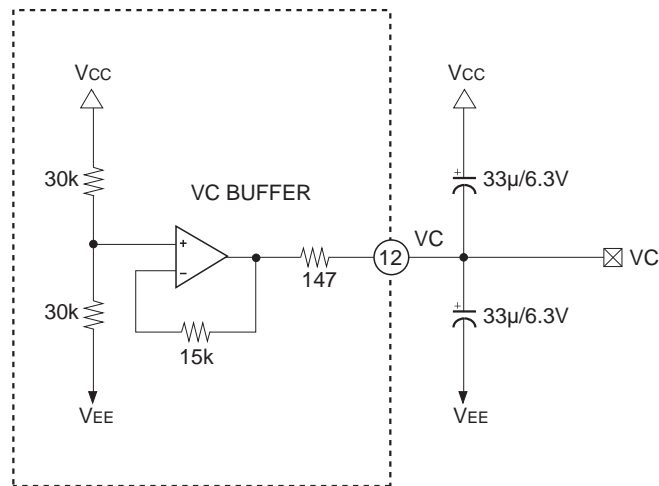
APC Circuit

When the laser diode is driven with constant current, the optical output possesses large negative temperature characteristics. Therefore, the current must be controlled with the monitor photodiode to ensure the output remains constant. This constitutes the APC circuit. When LD ON pin is connected to Vcc, APC is ON; connected to VEE, it is OFF.



Center Voltage Generation Circuit

This circuit provides the center potential when this IC is used at single power supply. The maximum current is approximately $\pm 3\text{mA}$. The output impedance is approximately 147Ω . Connect this circuit to GND when used at dual power supply.



Notes on Operation

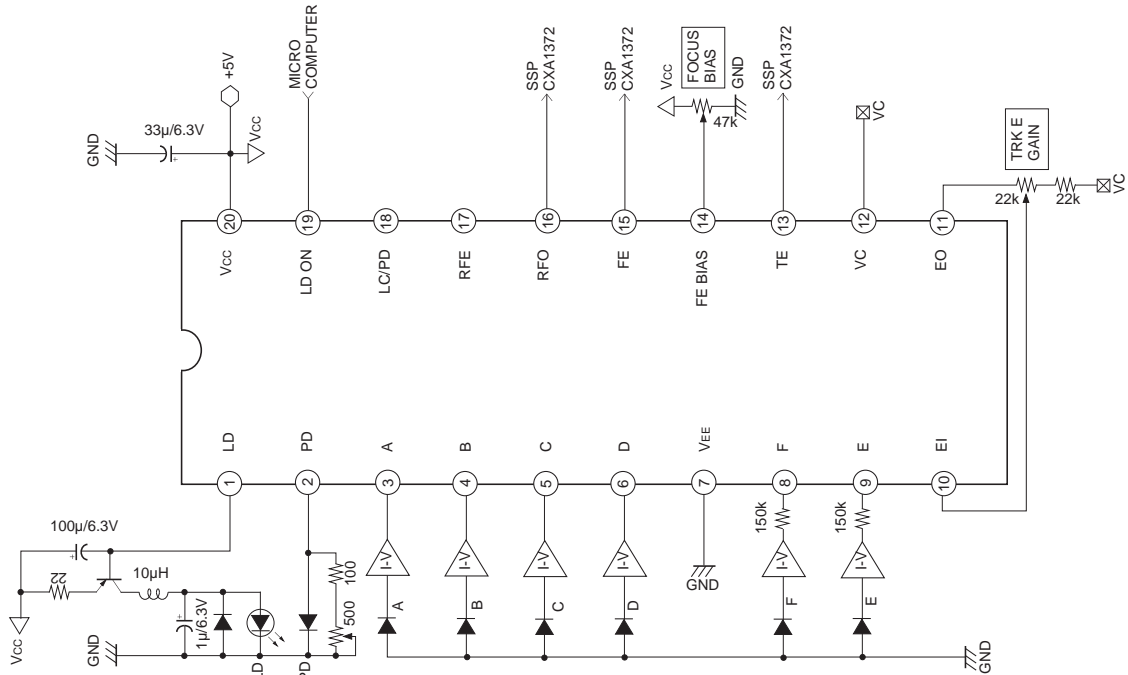
Power supply

The CXA1821M can be used either at dual power supply or single power supply. The table below shows the connection of power supply for each case.

	VCC	VEE	VC
Dual power supply	+power supply	-power supply	GND
Single power supply	Power supply	GND	OPEN

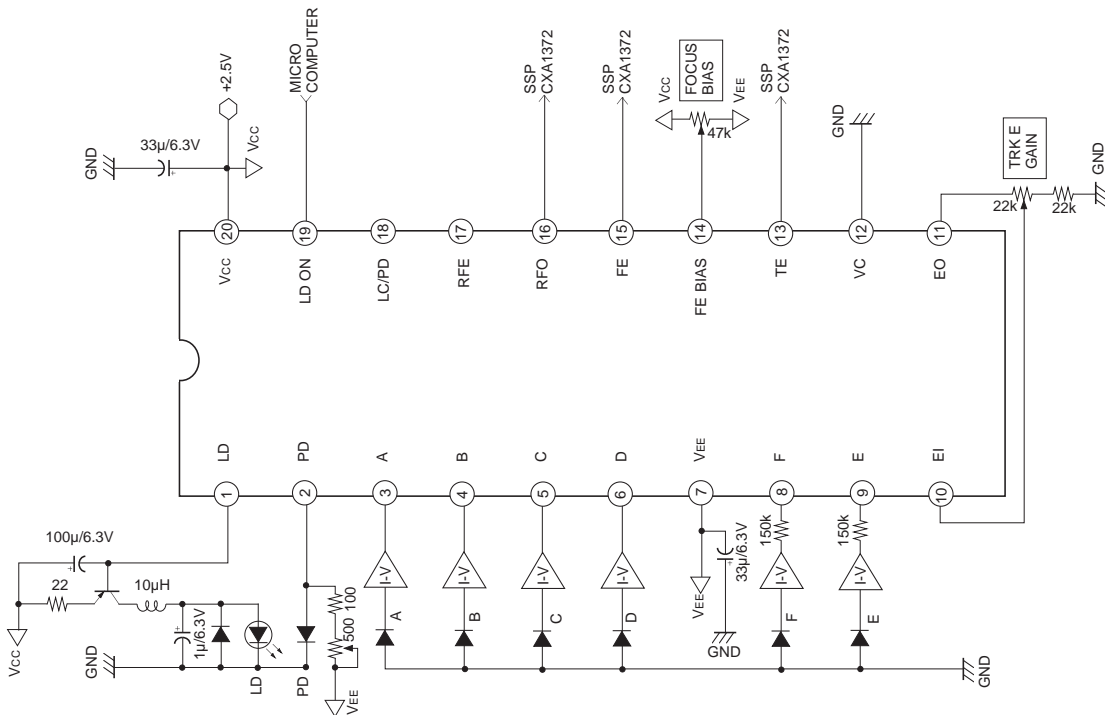
Application Circuit

- For single power supply +5V



* Connect Pin 18 to Vcc when LC is used.

- For dual power supply ±2.5V

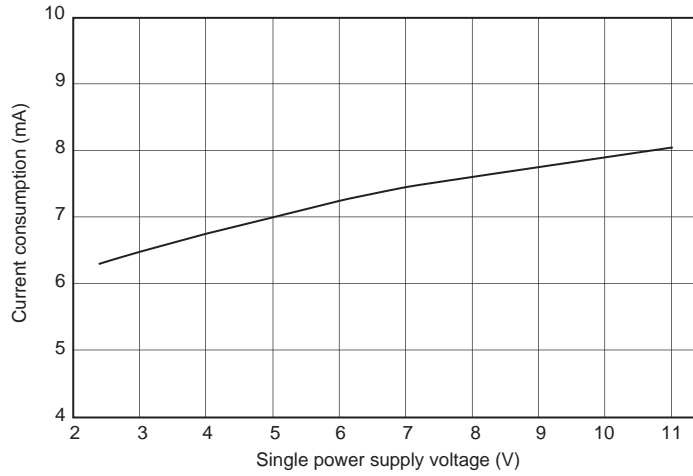


* Connect Pin 18 to Vcc when LC is used.

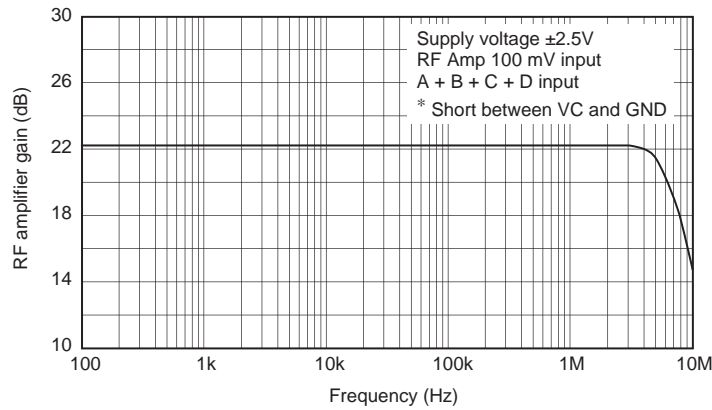
Application circuits shown are typical examples illustrating the operation of the devices. Sony cannot assume responsibility for any problems arising out of the use of these circuits or for any infringement of third party and other right due to same.

Example of Representative Characteristics

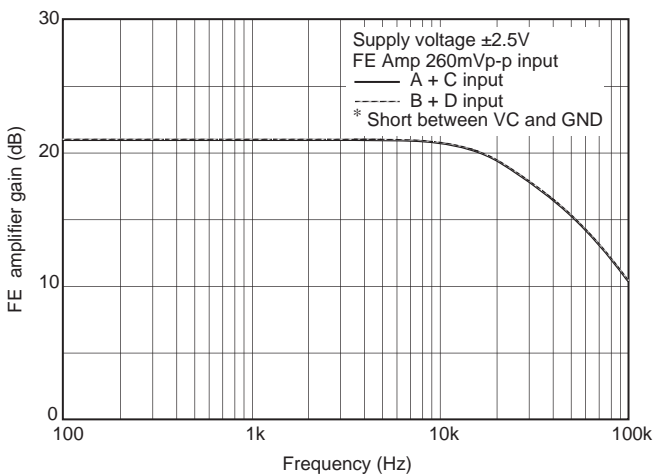
Current consumption characteristics



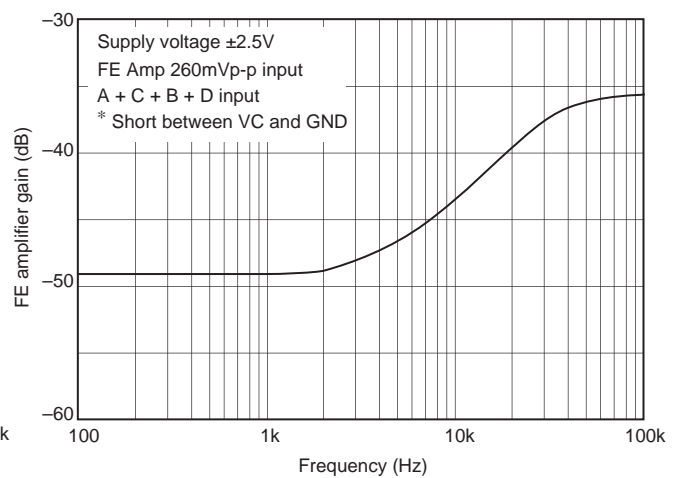
RF amplifier frequency characteristics

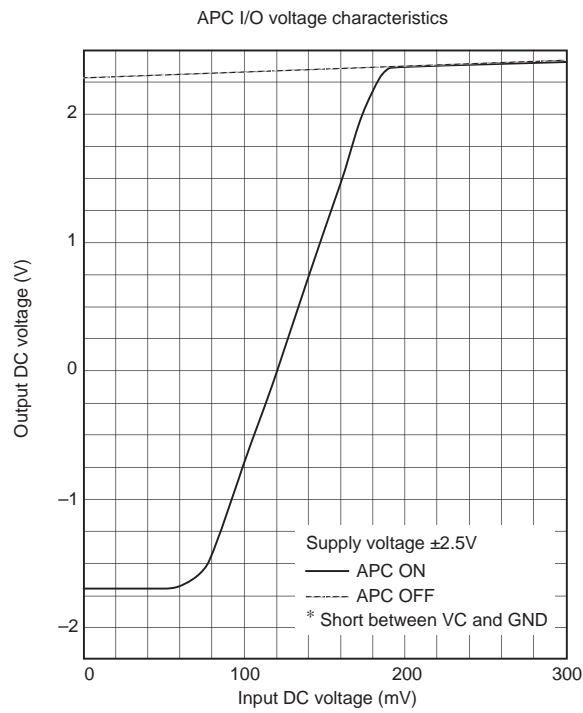
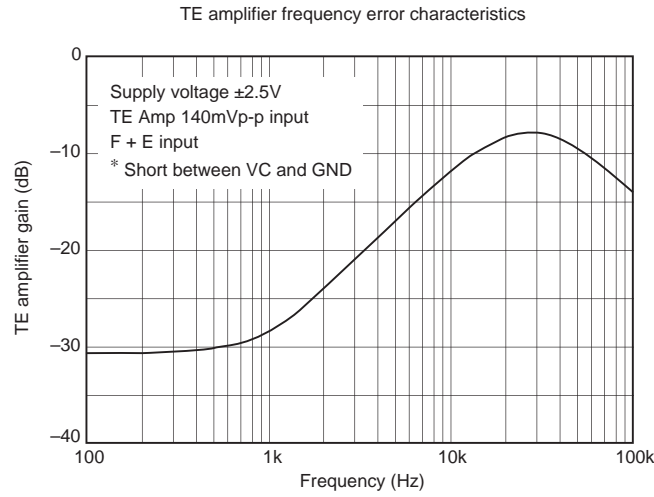
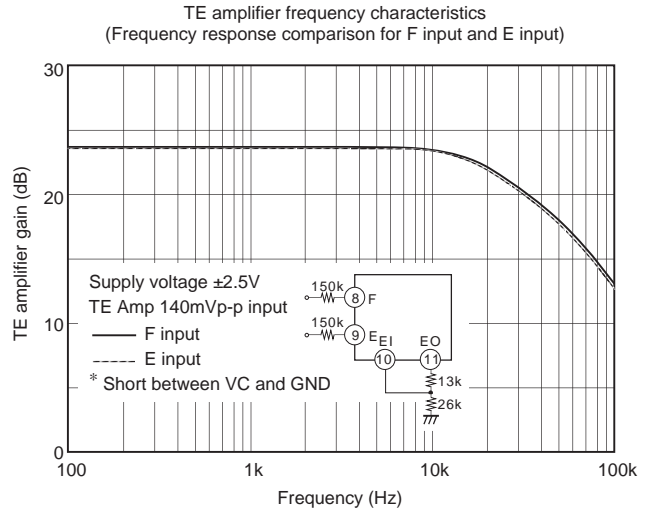
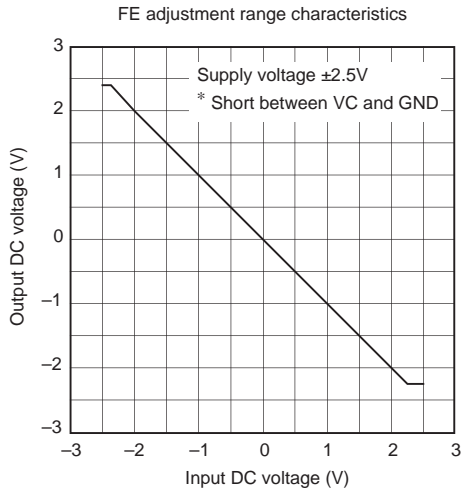


FE amplifier frequency characteristics
(Frequency response comparison for A+C input and B+D input)



FE amplifier frequency error characteristics

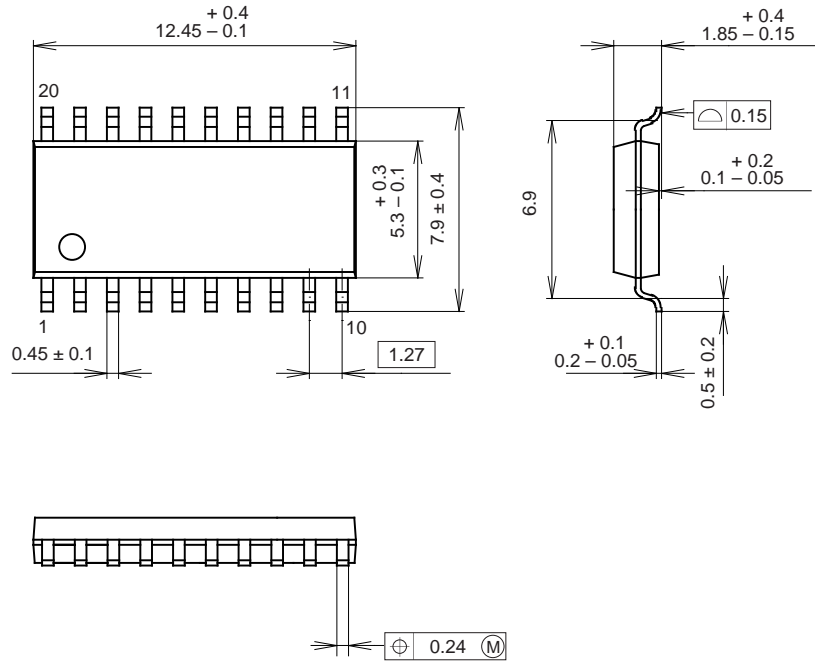




Package Outline

Unit: mm

20PIN SOP (PLASTIC)



PACKAGE STRUCTURE

SONY CODE	SOP-20P-L01
EIAJ CODE	SOP020-P-0300
JEDEC CODE	_____

PACKAGE MATERIAL	EPOXY RESIN
LEAD TREATMENT	SOLDER PLATING
LEAD MATERIAL	COPPER ALLOY
PACKAGE MASS	0.3g