

RF Amplifier for CD Player and CD-ROM

Description

The CXA2525M/N is an IC for RF signal processing of CD player and CD-ROM.

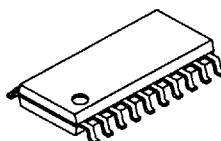
Features

- Wide-band RF amplifier. (RF signal $f_c \geq 12\text{MHz}$)
- RF equalizer (T type)
- EFM time constant can be adjusted (with switching function)
- APC (Automatic Power Control) function
- Power saving function

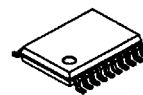
Functions

- RF summing amplifier
- RF equalizer
- Focus error amplifier
- Tracking error amplifier
- APC circuit

CXA2525M
20 pin SOP (Plastic)



CXA2525N
20 pin SSOP (Plastic)



Absolute Maximum Ratings

• Supply voltage	V_{CC}	7	V
• Storage temperature	T_{stg}	-65 to +150	°C
• Allowable power dissipation	P_D	500	mW

Operating Conditions

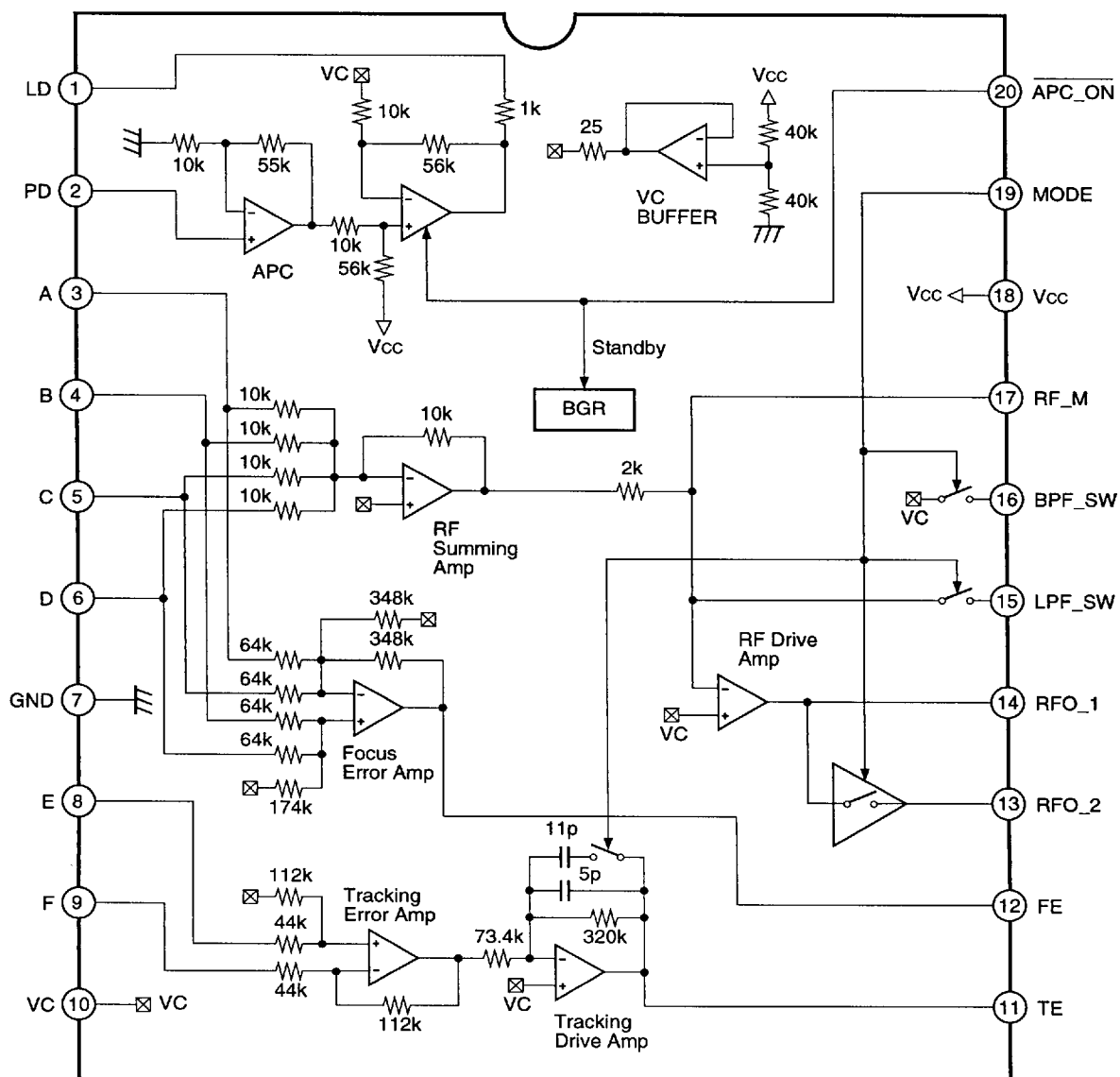
• Supply voltage	$V_{CC}-GND$	+3.0 to +5.5	V
• Operating temperature	T_{opr}	-20 to +75	°C

Applications

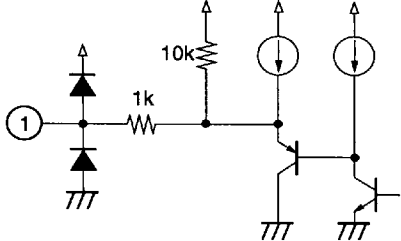
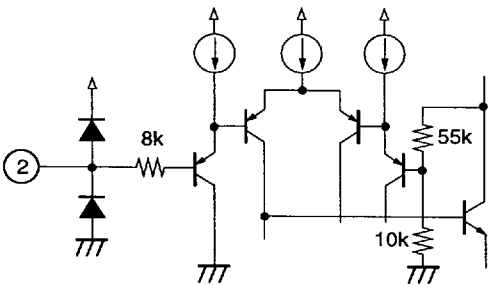
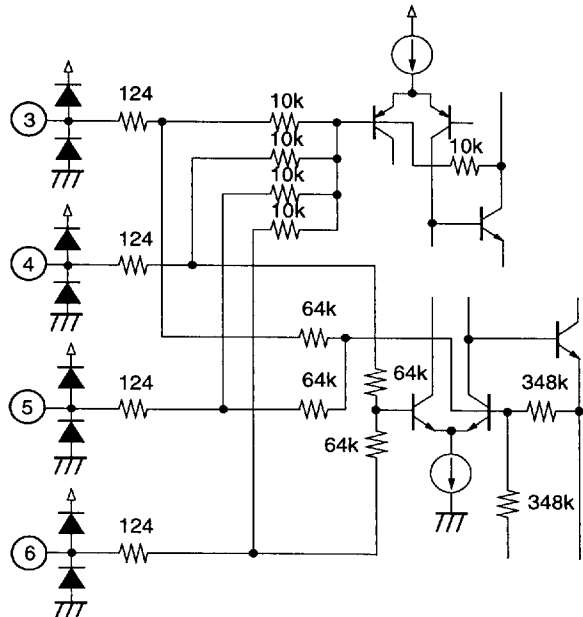
- CD players
- CD-ROM drives

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Block Diagram



Pin Description

Pin No.	Symbol	I/O	Equivalent circuit	Description
1	LD	O		APC amplifier output.
2	PD	I		APC amplifier input.
3 4 5 6	A B C D	I I I I		Input of RF summing amplifier and focus error amplifier.
7	GND			Ground.

Pin No.	Symbol	I/O	Equivalent circuit	Description
8 9 11	E F TE	I O		Tracking error amplifier input for Pins 8 and 9; tracking error drive output for Pin 11.
10	VC	O		$(V_{CC} + GND) / 2$ DC voltage output.
12	FE	O		Focus error amplifier output for Pin 12.
13	RFO_2	O		Buffer switch output which sets the RF signal time constant. OFF when Pin 19 is connected to V_{CC} , ON when it is connected to GND.
14 17	RFO_1 RF_M	O I		Non-inversion input of RF drive amplifier for Pin 17; RF signal output for Pin 14; resistance value connected between Pins 14 and 17 which determines the low frequency gain of RF drive amplifier.

Pin No.	Symbol	I/O	Equivalent circuit	Description
15	LPF_SW	O		Transistor switch output which sets the LPF cut-off frequency of RF amplifier. OFF when Pin 19 is connected to Vcc, ON when it is connected to GND.
16	BPF_SW	O		Transistor switch output which sets the RF amplifier BPF boost. OFF when Pin 19 is connected to Vcc, ON when it is connected to GND.
18	Vcc			Vcc.
19	MODE	I		Multiple-speed mode switching input. Vcc : High multiple-speed mode GND: Low multiple-speed mode
20	APC_ON	I		APC amplifier ON/OFF switching. OFF when connecting to Vcc; ON when connecting to GND.

(Ta = 25°C, Vcc = 2.5V, GND = VC, VEE = -2.5V)

Electrical Characteristics

Measure- ment No.	Measurement item	Symbol	SW conditions				Bias conditions				Measure- ment point	Description of output waveform and measurement method	Min.	Typ.	Max.	Unit
			S1	S2	S3	S4	E1	E2	E3	E4						
1	Current consumption	I _{cc}					0V	300mV	2.0V	-2.0V	18	Pin DC current measurement	—	6.6	12	mA
2	Current consumption	I _{EE}						300mV		▼	7	Pin DC current measurement	-12	-6.6	—	mA
3	Standby current	I _{stb}						300mV		2.0V	18	Pin DC current measurement	—	1.65	3	mA
4	Offset voltage	V1-1						0V	▼	-2.0V	14	Pin DC current measurement	-80	-5	150	mV
5	Offset voltage	V1-2							-2.0V		13	Pin DC current measurement	-100	50	200	mV
6	Voltage gain	G1-1	O	O					2.0V		14	V1 = 100mVpp, f = 100kHz	16.5	20	23	dB
7	Voltage gain	G1-2	O	O					-2.0V		14	V1 = 100mVpp, f = 100kHz	16.5	20	23	dB
8	Voltage gain	G1-3	O	O					-2.0V		13	V1 = 100mVpp, f = 100kHz	16.5	20	23	dB
9	Frequency response	F1-1	O	O					2.0V		14	V1 = 50mVpp, f = 12MHz Difference for G1-1	-3	—	—	dB
10	Frequency response	F1-2	O	O			▼		-2.0V		13	V1 = 50mVpp, f = 4MHz Difference for G1-2	-3	—	—	dB
11	Maximum output amplitude H	V1-2	O	O			300mV		2.0V		14	DC voltage measurement	1.3	—	—	V
12	Maximum output amplitude L	V1-3	O	O			-300mV				▼	DC voltage measurement	—	—	-0.3	V
13	Offset voltage	V2-1					0V				12	DC voltage measurement	-50	-15	50	mV
14	Voltage gain 1	G2-1	O									V1 = 100mVpp, f = 1kHz	17.7	20.7	23.7	dB
15	Voltage gain 2	G2-2		O								V1 = 100mVpp, f = 1kHz	17.7	20.7	23.7	dB
16	Voltage gain difference	G2-3										G2-1 to G2-2	-3	0	3	dB
17	Frequency response 1	F2-1	O									V1 = 100mVpp, f = 20kHz Difference for G2-1	-4	—	—	dB
18	Frequency response 2	F2-2		O			▼					V1 = 100mVpp, f = 20kHz Difference for G2-2	-4	—	—	dB
19	Maximum output amplitude H	V2-2		O			300mV					DC voltage measurement	1.9	—	—	V
20	Maximum output amplitude L	V2-3	O				300mV	▼	▼	▼	▼	DC voltage measurement	—	—	-1.9	V

Measure- ment No.	Measurement item	Symbol	SW conditions				Bias conditions				Measure- ment point	Description of output waveform and measurement method	Min.	Typ.	Max.	Unit
			S1	S2	S3	S4	E1	E2	E3	E4						
21	Offset voltage	V3-1					0V	0V	2.0V	-2.0V	11	DC voltage measurement	-50	0	50	mV
22	Voltage gain 1	G3-1										V1 = 100mVpp, f = 1kHz	17.9	20.9	23.9	dB
23	Voltage gain 2	G3-2				O						V1 = 100mVpp, f = 1kHz	17.9	20.9	23.9	dB
24	Voltage gain difference	G3-3								▼		G3-1 to G3-2	-3	0	3	dB
25	Frequency response 1	F3-1				O			-2.0V			V1 = 100mVpp, f = 20kHz Difference for G3-1	-4	—	—	dB
26	Frequency response 2	F3-2				O			-2.0V			V1 = 100mVpp, f = 20kHz Difference for G3-2	-4	—	—	dB
27	Frequency response 3	F3-3				O			2.0V			V1 = 100mVpp, f = 70kHz Difference for G3-1	-4	—	—	dB
28	Frequency response 4	F3-4				O		▼				V1 = 100mVpp, f = 70kHz Difference for G3-2	-4	—	—	dB
29	Maximum output amplitude H	V3-2				O	300mV					DC voltage measurement	1.9	—	—	V
30	Maximum output amplitude L	V3-3				O	300mV	▼			▼	DC voltage measurement	—	—	-1.9	V
31	Offset voltage 1	V4-1					0V	69mV			1	DC voltage measurement	—	-1.6	-0.1	V
32	Offset voltage 2	V4-2						123mV				DC voltage measurement	-1.2	0.1	1.6	V
33	Offset voltage 3	V4-3						177mV		▼		DC voltage measurement	0.8	2.1	—	V
34	Offset voltage 4	V4-4						0V		2.0V		DC voltage measurement	1.8	2	—	V
35	Offset voltage 5	V4-5								-2.0V	▼	I1 = 0.8mADC, DC voltage measurement	—	—	0	V
36	Offset voltage	V5-1					▼	▼	▼	▼	10	DC voltage measurement	-0.1	—	0.1	V

[illegible]

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.

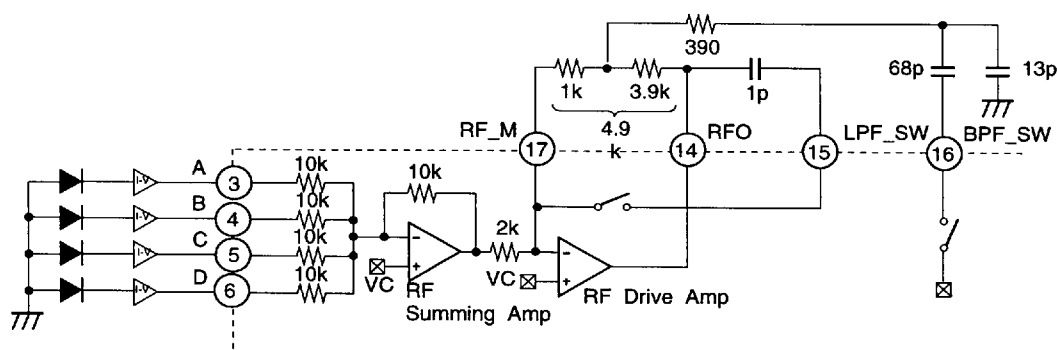
Note on Operation

The RF AC maximum output amplitude is 1.3 Vpp when Pin 13 and 14 are capacitor-coupled shown in Application Circuit.

Description of Operation

RF Amplifier

The signal currents from the photodiodes A, B, C and D are I-V converted, and input to Pins 3, 4, 5 and 6. These signals are added at the RF summing amplifier and inverted at the RF drive amplifier and then output to Pin 14.

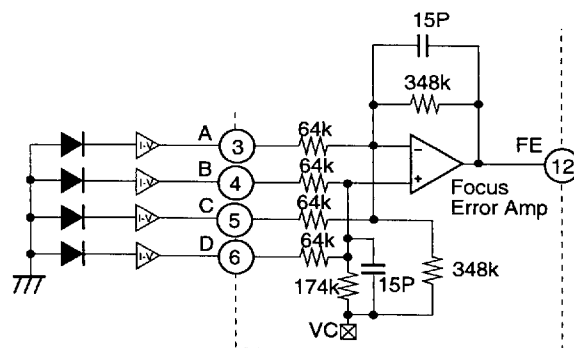


The low frequency component of RFO output voltage is as follows:

$$V_{RFO} = \frac{10k}{10k} \times \frac{4.9k}{2k} \times (A + B + C + D)$$
$$= 2.45 \times (A + B + C + D)$$

Focus Error Amplifier

The operation of $(B + D) - (A + C)$ is performed and the resulting signal is output to Pin 12.

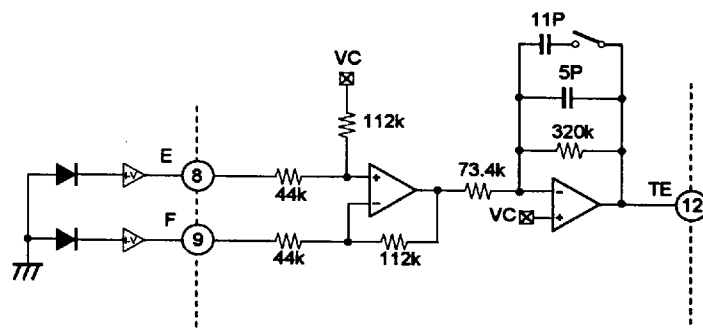


The low frequency component of FE output voltage is as follows:

$$V_{FE} = \frac{348k}{64k} \times (B + D - A - C)$$
$$= 5.43 \times (B + D - A + C)$$

Tracking Error Amplifier

Each signal current from the photodiodes E and F is I-V converted and input to Pins 8 and 9. These signals undergo operational amplification at the tracking error amplifier and tracking drive amplifier, and are output to Pin 12.



The low frequency component of TE output voltage is as follows:

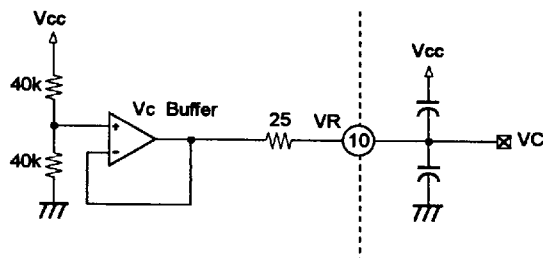
$$V_{TE} = \frac{112k}{44k} \times \frac{320k}{73.4k} \times (F - E)$$

$$= 11.1 \times (F - E)$$

Center Voltage Generation Circuit

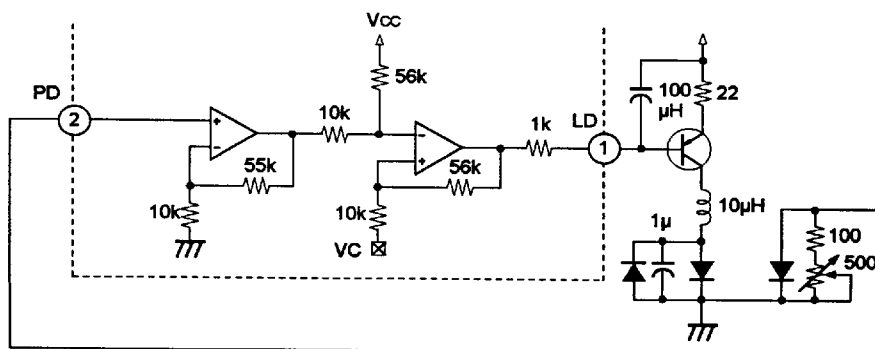
The center voltage of VR = (V_{CC} + GND) is supplied.

The maximum current is approximately ±3mA.



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. When APC_ON pin is connected to GND, APC is ON; connected to V_{CC}, it is OFF.

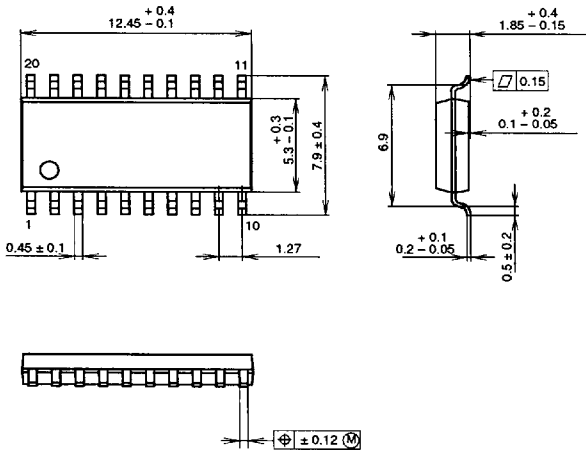


Package Outline

Unit: mm

CXA2525M

20PIN SOP (PLASTIC) 300mil

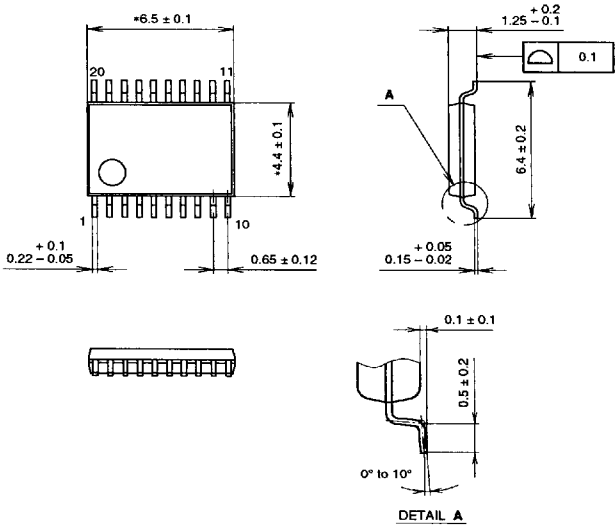


PACKAGE STRUCTURE

SONY CODE	SOP-20P-L01	PACKAGE MATERIAL	EPOXY / PHENOL RESIN
EIAJ CODE	*SOP020-P-0300-A	LEAD TREATMENT	SOLDER PLATING
JEDEC CODE		LEAD MATERIAL	COPPER ALLOY
		PACKAGE WEIGHT	0.3g

CXA2525N

20PIN SSOP (PLASTIC)



NOTE: Dimension "*" does not include mold protrusion.

PACKAGE STRUCTURE

SONY CODE	SSOP-20P-L01	PACKAGE MATERIAL	EPOXY RESIN
EIAJ CODE	SSOP020-P-0044	LEAD TREATMENT	SOLDER / PALLADIUM PLATING
JEDEC CODE		LEAD MATERIAL	COPPER / 42 ALLOY
		PACKAGE WEIGHT	0.1g