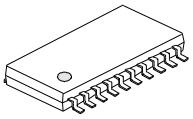
RF AMPLIFIER FOR DIGITAL SERVO SYSTEM

DESCRIPTION

SA9616 can be used for (ALPC) and signal conversion between CD optical pickup head and decoding chip.

This IC incorporates an interface to general CD optical pickup photodiode, RF signal amplifier and equalizer, VREF generation circuit and automatic optical power switching control (It is adaptive for CD-A/V, CD-R, CD-R/W, CD-ROM).



SOP-20-300-1.27

FEATURES

* RF amplitude automatic adjustment circuit (It is adaptive for CD-A/V, CD-R, CD-R/W, CD-ROM)
* RF system equalizer
* Automatic laser power control circuit(ALPC)
* Operating voltage range (3V -7V), power consumption (150mW @5V)

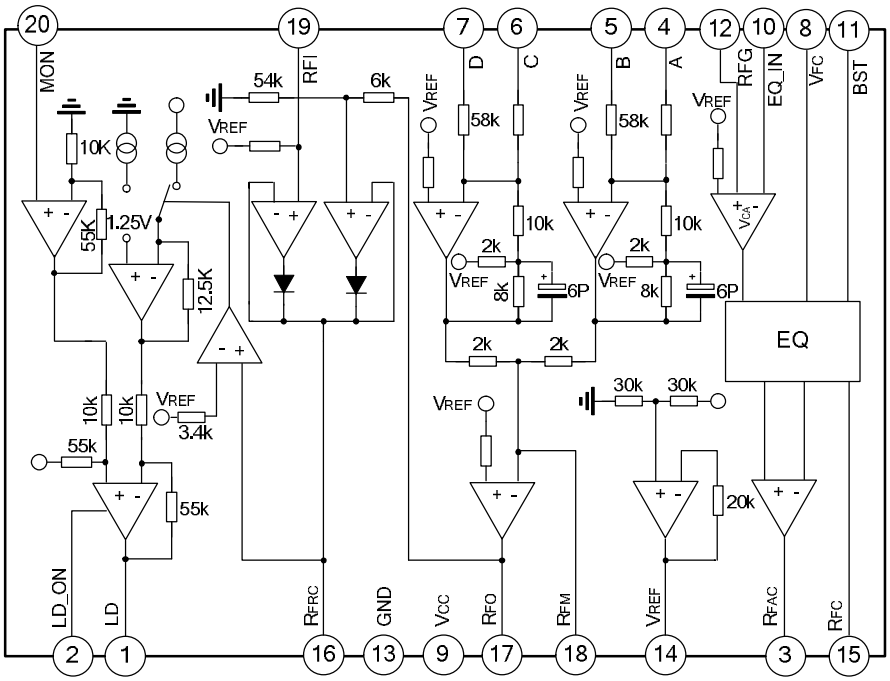
ORDERING INFORMATION

Device	Package
SA9616	SOP-20-300-1.27

APPLICATIONS

* CD Players
* VCD Players

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS (Tamb=25°C)

Characteristics	Symbol	Rating	Unit
Supply Voltage	V_{DD}	-0.5 ~+9	V
Operating Temperature	Tmax	-20 ~+75	°C
Operating Temperature	Pmax	500	mW

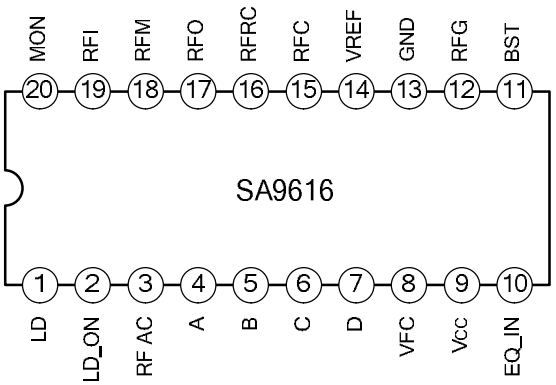
DC ELECTRICAL CHARACTERISTICS

Characteristics	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Supply Voltage	V_{DD}		3.0	5.0	7.0	V
Current Consumption	I_{DD}	V_{DD}=5V	--	30	--	mA
Bias Output Of Photoelectric Signal	V_{REF}	V_{DD}=5V	--	2.5	--	V

AC ELECTRICAL CHARACTERISTICS (V_{DD}=5V)

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Diode Control Input	MON		--	0.13	--	V
Photoelectric Input 1(A)	A	DA11	0	--	0.60	V
		KSS213	0	--	0.15	V
Photoelectric Input 2(B)	B	DA11	0	--	0.60	V
		KSS213	0	--	0.15	V
Photoelectric Input 3(C)	C	DA11	0	--	0.60	V
		KSS213	0	--	0.15	V
Photoelectric Input 4(D)	D	DA11	0	--	0.60	V
		KSS213	0	--	0.15	V
Gain Of RF Signal	GAIN	The resistor connected between RFM and RFO is 5.5KΩ A, B, C, D are input pins, RFO is output pin	15.0	16.0	17.0	dB
Range Of VCA Gain	VGA	R_{FG}=V_{REF}+1.0V R_{FG}=V_{REF}-1.0V R_{FC}=220K Input frequency 1.6MHz	-5.8	--	7.2	dB
EQ Center Frequency 1	f_{C1}	V_{FC}=V_{REF}, R_{FC}=300K V_{FC}=V_{REF}, R_{FC}=50K Input frequency 1.6MHz	0.85	--	3.0	MHz
EQ Center Frequency 2	f_{C2}	R_{FC}=220K, V_{FC}=V_{REF}+1.0V R_{FC}=220K, V_{FC}=V_{REF}-1.0V Input frequency 1.6MHz	0.56	--	1.5	MHz
Boost Of EQ Center Frequency	GFC	R_{FC}=220K, V_{FC}=V_{REF} Input frequency 1.6MHz	-7.4	--	6.1	dB

PIN CONFIGURATION



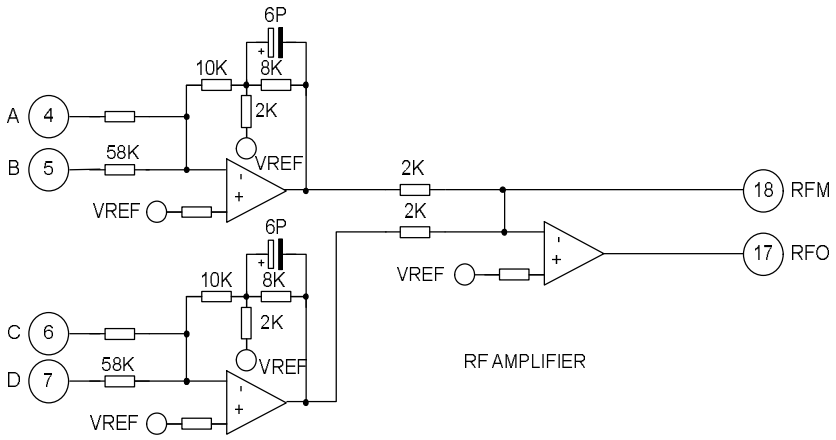
PIN DESCRIPTION

Pin No.	Symbol	Pin Description
1	LD	APC circuit output pin.
2	LD_ON	ALPC circuit ON/OFF switching pin.
3	RFAC	EQ output pin
4	A	Photoelectric input 1 pin
5	B	Photoelectric input 2 pin
6	C	Photoelectric input 3 pin
7	D	Photoelectric input 4 pin
8	VFC	Equalizer center frequency adjust pin.
9	VCC	Power supply pin.
10	EQ_IN	EQ input pin
11	BST	Equalizer for adjustment of boost level
12	RFG	Input for setting the EQ gain
13	GND	Ground.
14	VREF	Bias output pin of OEIC
15	RFC	Input for setting the EQ center frequency
16	RFRC	Generating a detecting voltage for RF signal(external RC filter element)
17	RFO	RF amplitude control output pin
18	RFM	RF amplifier inverted output pin. RF amplifier gain is determined by the resistor connected between RFO pin and RFM pin.
19	RFI	RF signal amplitude detecting input(coupling form RFO)
20	MON	Diode control input pin.

FUNCTION DESCRIPTION

SA9616 incorporates RF amplifier, RF equalizer, RF amplitude detection circuit, automatic laser power control circuit, etc.

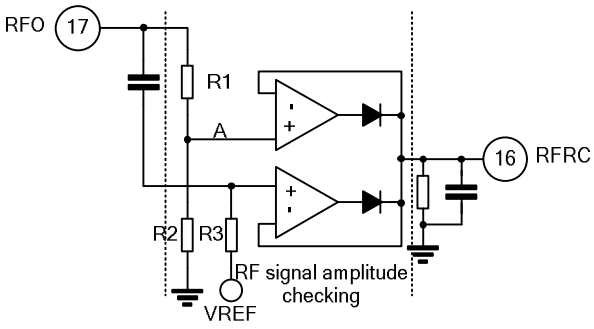
RF AMPLIFIER



As shown in the block diagram, A, B, C, D are four photoelectric input pins. RFO is the output of the sum of the four input signal. RFM is the feedback input pin of the adder. RFO is realized by adding A and B (A+B), C and D (C+D) by the first adder, then getting the sum (A+B+C+D) by the second adder.

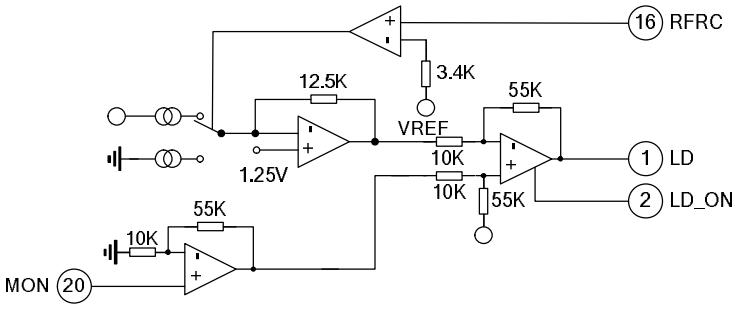
The feedback equivalent resistors of A, B, C, D input amplifiers equal 58KΩ, so the low frequency gain of the first adder is 58K/58K=1. The whole low frequency gain of the channel is determined by the gain of the second adder. Here, it is determined by the resistor connected between RFO pin and RFM pin. If the resistor equals 5.5KΩ, the whole low frequency gain (single input loop): AV=R/2K=2.75. Frequency response is determined by the capacitor parallel with RFI pin. The designing -3dB bandwidth is 1.8MHz.

RF AMPLITUDE DETECTION



RF amplitude detection input signal comes from the output pin RFO of RF amplifier. To enlarge the linear range of the amplitude detection, DC coupling input and AC coupling input has been used in this circuit. External RC filter connected to RFDC pin to determine the filtering time constants. And according to the RFO signal, a DC voltage correlate with the amplitude will generate in RFRC pin.

APC LOOP



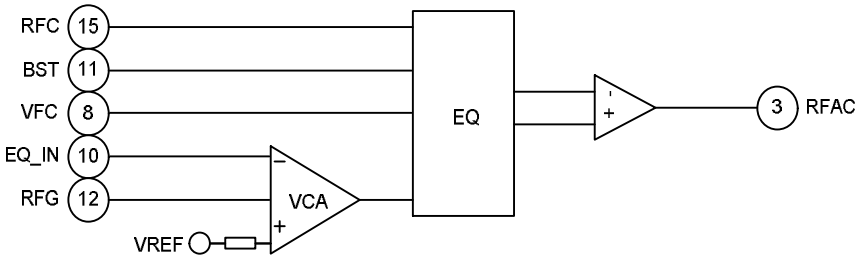
APC Loop

Automatic power control circuit mainly insures the emission diode to generate constant power under different states (such as temperature). APC loop realizes the constant power by monitoring and controlling the receiving power of diode, thus to stabilize the input amplitude of RF signal.

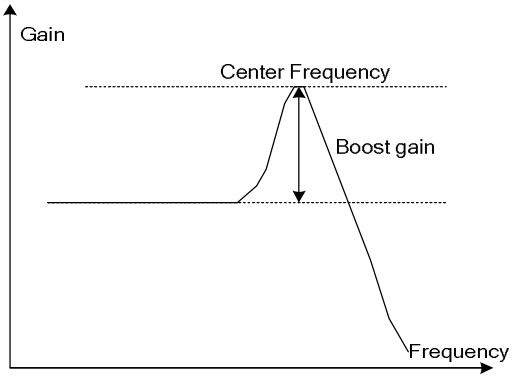
Add an automatic power control circuit in APC loop to adapt to the RF input signals of different disks. It is to adjust the output power by detecting the RF input signals and thus to adapt to various disks.

The block diagram is shown above. MON is the monitor and control pin of power; LD is the driver output, which is connected to external PNP transistor. LD_ON is the enable pin of APC module which is high level active, and APC loop is working, or else the APC is in standby state.

EQUALIZER CIRCUIT (Contains VCA and output)



EQ LOOP



EQ curve

Equalizer contains controllable gain amplifier（VCA）, equalize circuit and signal amplify output section .

RFG is the gain control port of VCA, and EQ_IN is the signal input port of VCA. When the potential of RFG is equal to VREF, the low frequency gain of VCA is 0dB; when the potential of RFG is equal to VREF+1V, the gain of VCA is +8 dB; when the potential of RFG is equal to VREF-1V, the gain of VCA is -8 dB. In actual application, you can adjust the output amplitude by adjusting the potential of RFG.

The signal enters the equalizer after passing through the controllable gain amplifier. The primary parameter center frequency and boost gain can be set by RFC, VFC, and BST.

The center frequency of the equalizer curve can be adjusted by changing the ground resistance of RFC, and the external resistor is usually between 50 KHz and 200 KHz. The center frequency is between 1MHz and 5MHz.

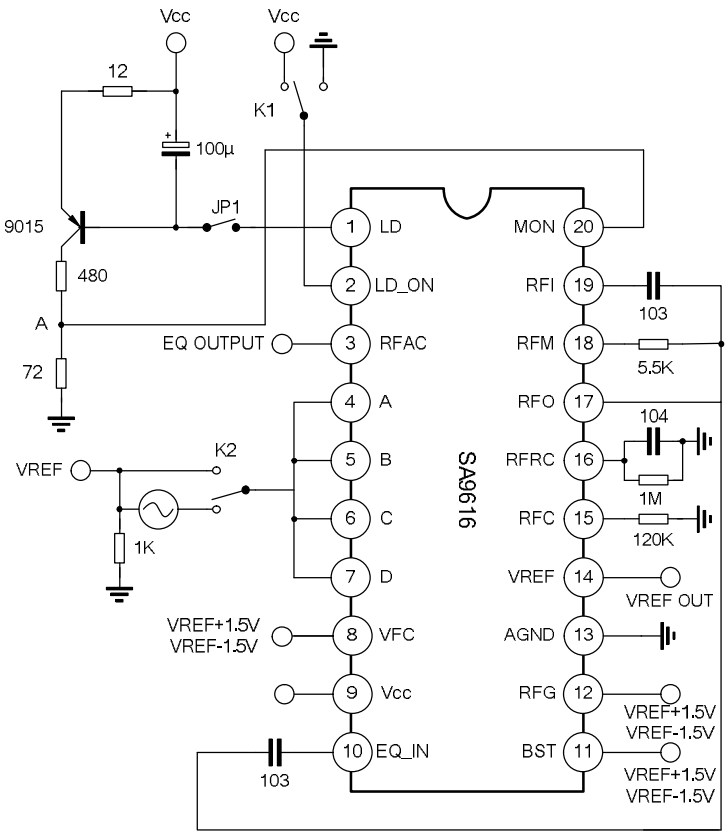
The center frequency also can be adjusted through changing the voltage of VFC. When the potential of VFC is equal to VREF, it does not affect the center frequency, and the center frequency is determined by the external resistor of RFC; When the potential of VFC is equal to VREF+1, the center frequency is 1.5 times of original one; When the potential of VFC is equal to VREF-1, the center frequency is 0.5 times of original one.

Setting the voltage of BST can regulate the boost gain of center frequency. When the potential of BST is equal to VREF, the gain is set at +5dB; when the potential of BST is equal to VREF+1, the gain is set at +8dB; when the potential of BST is equal to VREF-1; the gain is set at -1dB.

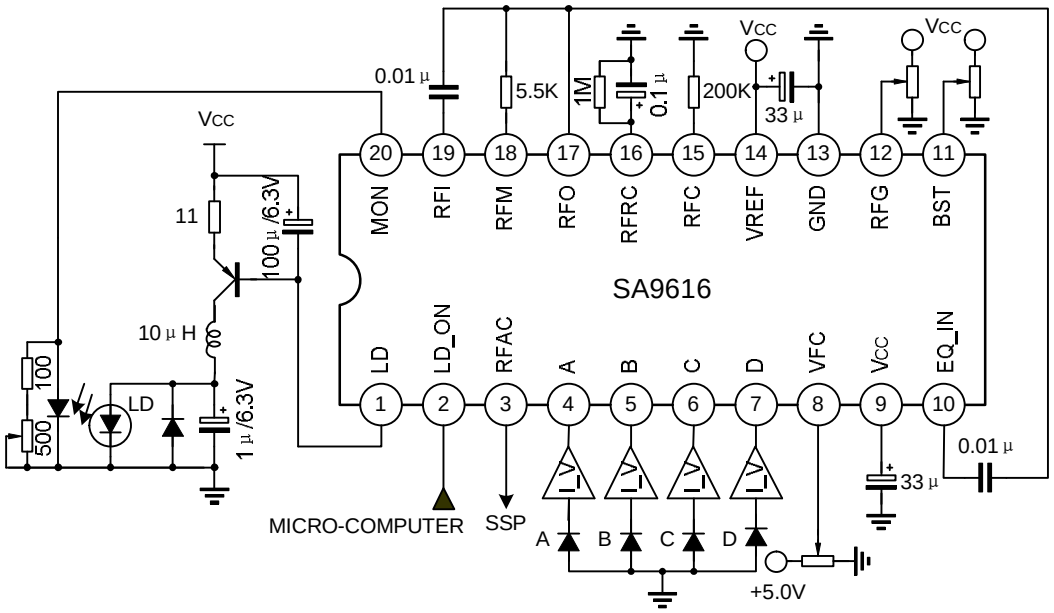
You will get the needed equalizer curve and satisfy the system design by adjusting RFC, VFC, and BST.

The signal amplitude reduced after equalizing, so we need to add an amplifier to compensate the gain, increase the capability of drive and reduce the output resistance. RFAC is the output port of the amplifier. After the signal passing through the last amplifier, the output amplitude is adjusted to the same as before.

TEST CIRCUIT



TYPICAL APPLICATION CIRCUIT



PACKAGE OUTLINE

SOP-20-300-1.27 UNIT: mm