

RF AMPLIFIER FOR DIGITAL SERVO SYSTEM

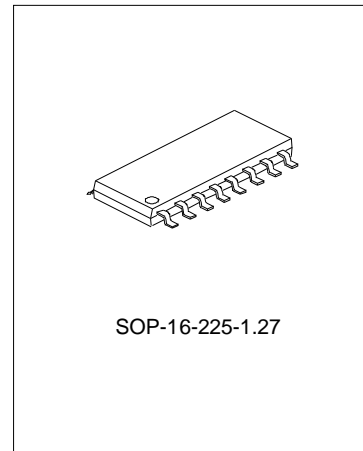
DESCRIPTION

SA9614 is a RF amplifier, used for signal conversion and auto laser power control (ALPC) between the CD optical pickup head and decoding chip.

SA9614 includes interface of CD optical diode, RF signal amplifier and equalizer, VREF generation circuit, automatic optical power switching circuit (it suits for CD-A/V, CD-R, CD-RW, CD-ROM).

FEATURES

- * RF amplitude automatic adjustment circuit (it suits for CD-A/V, CD-R, CD-RW, CD-ROM).
- * RF signal equalizer (including VCA).
- * Auto laser power control circuit (ALPC).
- * Operating voltage: 3V -7V, power dissipation (150mW @5V).



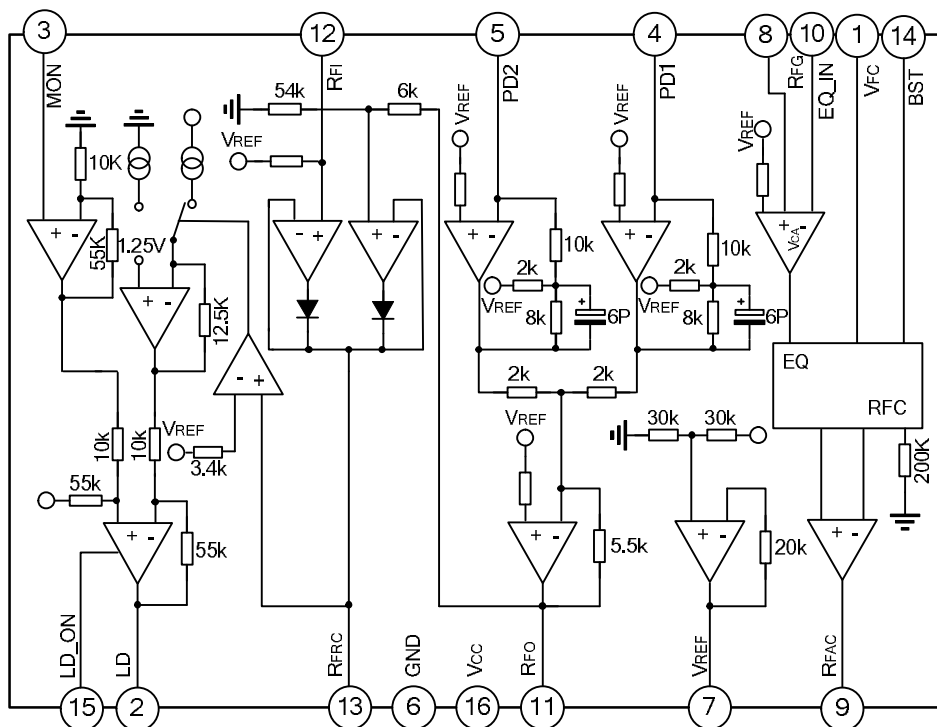
ORDERING INFORMATION

Device	Package
SA9614	SOP-16-225-1.27

APPLICATIONS

- * CD Players
- * VCD Players

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATING (T_{amb}=25°C)

Characteristics	Symbol	Rating	Unit
Power Supply Voltage	VDD	-0.5 ~ +9	V
Operating Temperature	T _{max}	-20 ~ +75	°C
Max. Power Dissipation	P _{max}	500	mW

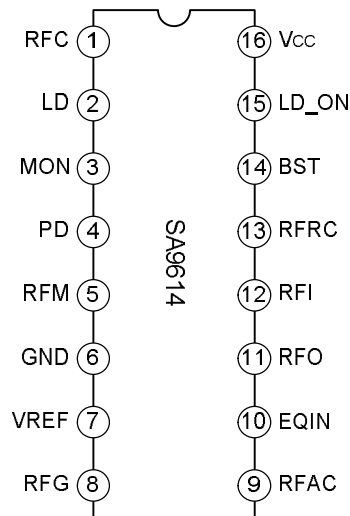
DC ELECTRICAL CHARACTERISTICS

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Power Supply Voltage	VDD		3.0	5.0	7.0	V
Photo-Electrical Bias Output Voltage	VREF	VDD=5V		30		mA
		VDD=5V	—	2.5	—	V

AC electrical characteristics (V_{DD}=5V)

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Diode Monitor signal Input	MON		—	0.13	—	V
Photoelectric Signal Input	PD	DA11	0	—	0.60	V
		KSS213	0	—	0.15	V
RF Signal Gain	GAIN	PD is input pins, RFO is output pin		15		dB
VCA Gain Control Range	VGA	RFG=VREF+1V RFG=VREF-1V Adjust RFC to make 1.6MHz as the maximum advance frequency, and BST is no connection.	1.40		14.55	dB
Equalizer Center Frequency 1	FC1	VFC=VREF, RFC=300K VFC=VREF, RFC=50K Input 1.6MHz	0.4		2.4	MHZ
Boost Of Equalizer Center Frequency	GFC	BST=VREF+1V, BST=VREF-1V, Adjust RFC to make 1.6MHz as the maximum advance frequency, and BST is no connection.	1.10		11.80	dB

PIN CONFIGURATION



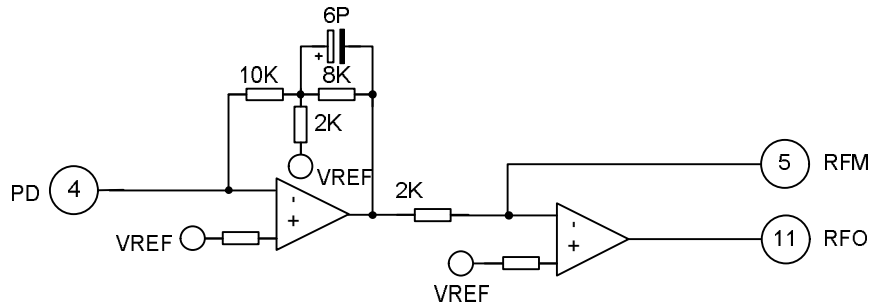
PIN DESCRIPTION

Pin no.	Pin name	I/O	Pin descriptions
1	RFC	I	Input for setting the EQ center frequency
2	LD	O	APC circuit output pin.
3	MON	I	Diode monitor signal feedback pin..
4	PD	I	Photoelectric signal Input
5	RFM	I	RF amplifier inverted side output pin. RF amplifier gain is determined by the resistor connected between RFO pin and RFM pin.
6	GND	I	Ground
7	VREF	O	OEIC bias output pin..
8	RFG	I	Equalizer gain setting pin..
9	RFAC	O	Equalizer output pin..
10	EQIN	I	Equalizer input pin..
11	RFO	O	RF signal amplifier output pin.
12	RFI	I	RF signal amplitude detect input pin (coupling from RFO).
13	RFRC	O	RF signal amplitude detect voltage generate pin (connect RC components).
14	BST	I	Equalizer center frequency setting. pin..
15	LD_ON	I	APC circuit switch ON/OFF, low active.
16	Vcc	I	Power supply pin..

FUNCTION DESCRIPTION

SA9614 includes RF signal amplifier, RF equalizer, RF amplitude detector, auto laser power controller, etc.

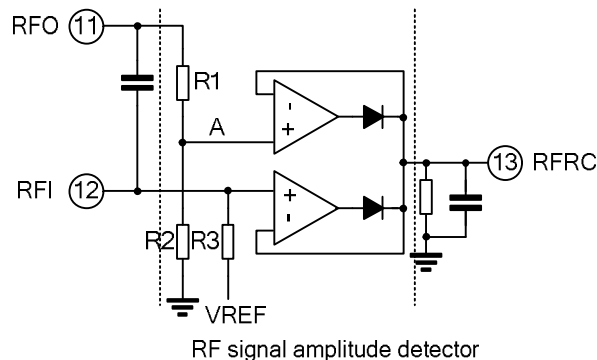
RF amplifier



The above figure is RF signal channel diagram. PD is input pin of laser pickup head. RFO is the output pin., RFM is the feedback input pin of the amplifier.

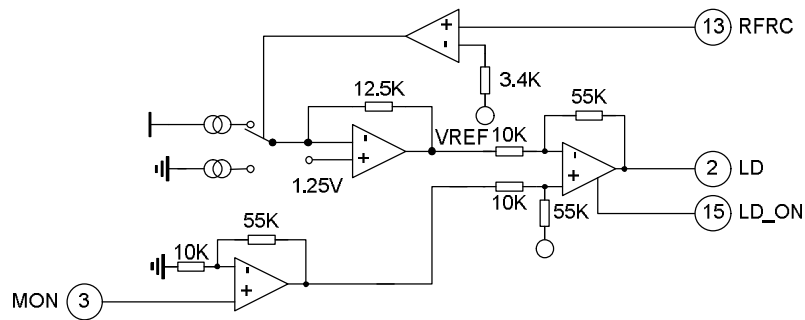
The feedback resistor of PD input amplifier is designed as 58kΩ, so the low frequency gain of first amplifier is $AV1=58K/RIN$. The gain of the second amplifier is determined by the resistor Rf connected between RFO pin and RFM pin. $AV2=Rf/2K$. Then the low frequency gain of RF amplifier is: $AV=AV1*AV2=Rf*58K/(RIN*2)$. Frequency response is determined by the capacitor paralleled with input adder, and the bandwidth of -3dB is 1.8MHz.

RF SIGNAL AMPLITUDE DETECTOR



The input signal of RF amplitude detector is from the RF amplifier output pin RFO. In order to enlarge the linear range of detect, this circuit adopts DC coupling input and AC coupling input, which refers to the above figure. RFRC connects with RC filter components which determine the filter time constant. RFRC pin will obtain a DC voltage correlated with RF amplitude according to the RFO input signal.

APC CIRCUIT



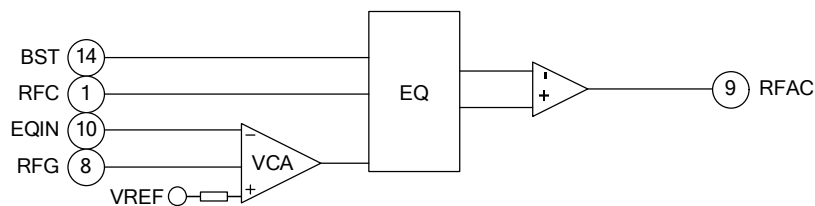
Constant power (APC) control circuit

The constant power circuit is used to generate the constant power when diode is in the different state. APC circuit realizes the constant power by monitoring the receiving power of diode, thereby to stabilize the RF input amplitude.

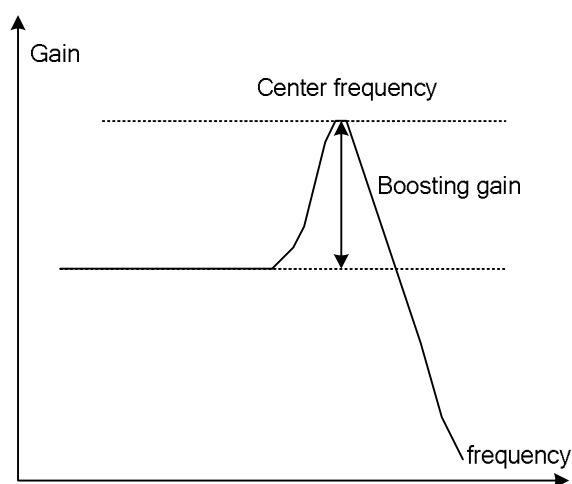
In order to adapt to RF input signal of different disks, APC circuit adds the auto power adjusting function. It is to adjust the output power by detecting the RF input signals and thus to adapt to various disks.

In the above figure, MON pin is the constant power monitor pin, LD is driver output pin which connects with a PNP transistor. LD_ON is the enable port of APC circuit, high level active.

EQUALIZER (INCLUDE VCA AND OUTPUT STAGE)



EQ circuit



EQ curve

The equalizer includes controllable gain amplifier (VCA) , equalizer circuit and signal amplifier.

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

The signal enters the equalizer after passing through the control gain amplifier. The main parameter center frequency and boost gain can be set by RFC and BST.

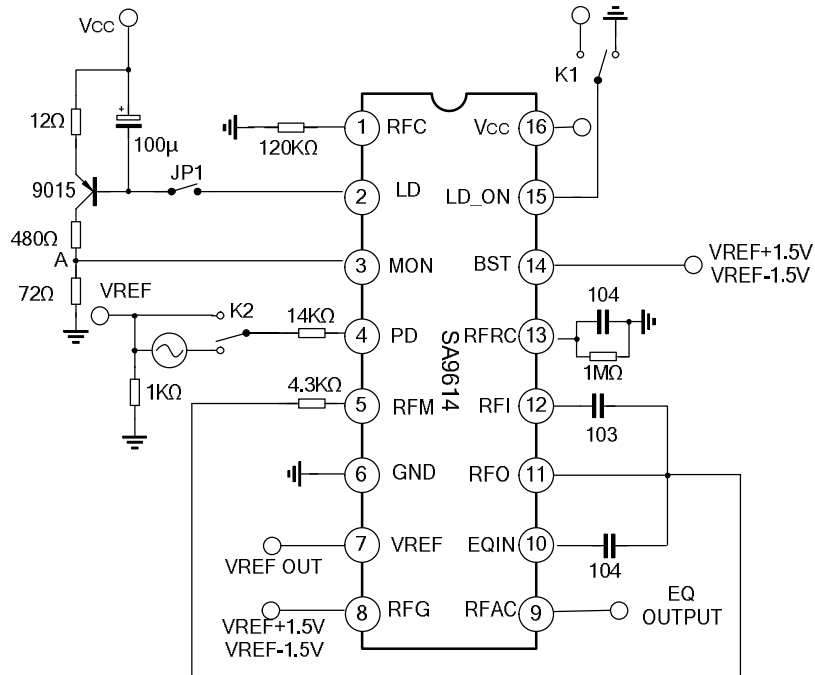
The center frequency of the equalizer curve can be adjusted by changing the ground resistance of RFC, and the external resistor is usually between 50 KHz and 200 KHz. The center frequency is between 1MHz and 5MHz.

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

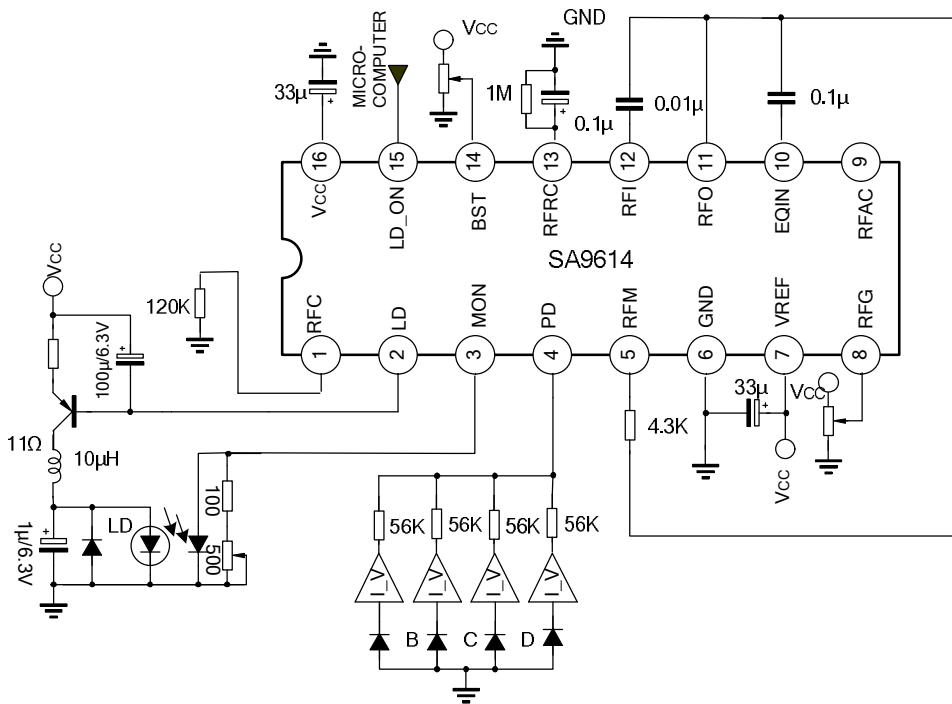
You will get the needed equalizer curve to satisfy the system design by adjusting RFC and BST.

The signal amplitude reduced after equalizing, so we need to add an amplifier to compensate the gain, increase the drive capability 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 equalizing.

TEST CIRCUIT



TYPICAL APPLICATION CIRCUIT



PACKAGE OUTLINE

