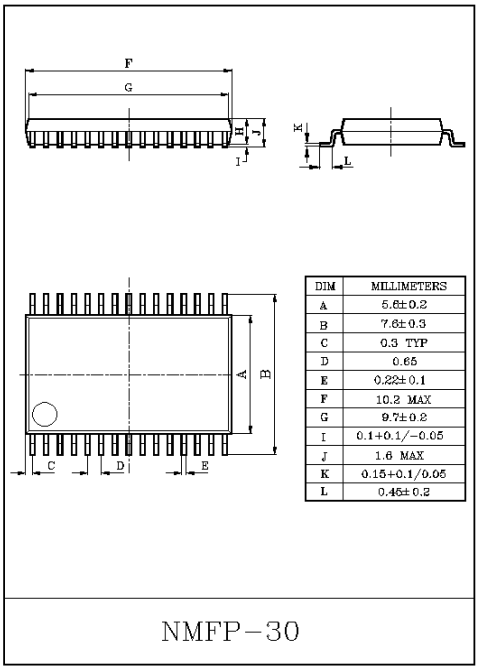
RF Amplifier for Digital Servo CD System

KIA2122FN is a 3-beam type PUH and 1-beam type PUH compatible RF Amplifier for Digital Servo to be used in the CD system.

In combination with a CMOS single chip processor KIC9432AF, KIC9462F, a CD system can be composed very simply.



DIM	MILLIMETERS
A	5.6±0.2
B	7.6±0.3
C	0.3 TYP
D	0.65
E	0.22±0.1
F	10.2 MAX
G	9.7±0.2
I	0.1+0.1/−0.05
J	1.6 MAX
K	0.15+0.1/0.05
L	0.45±0.2

NMFP-30

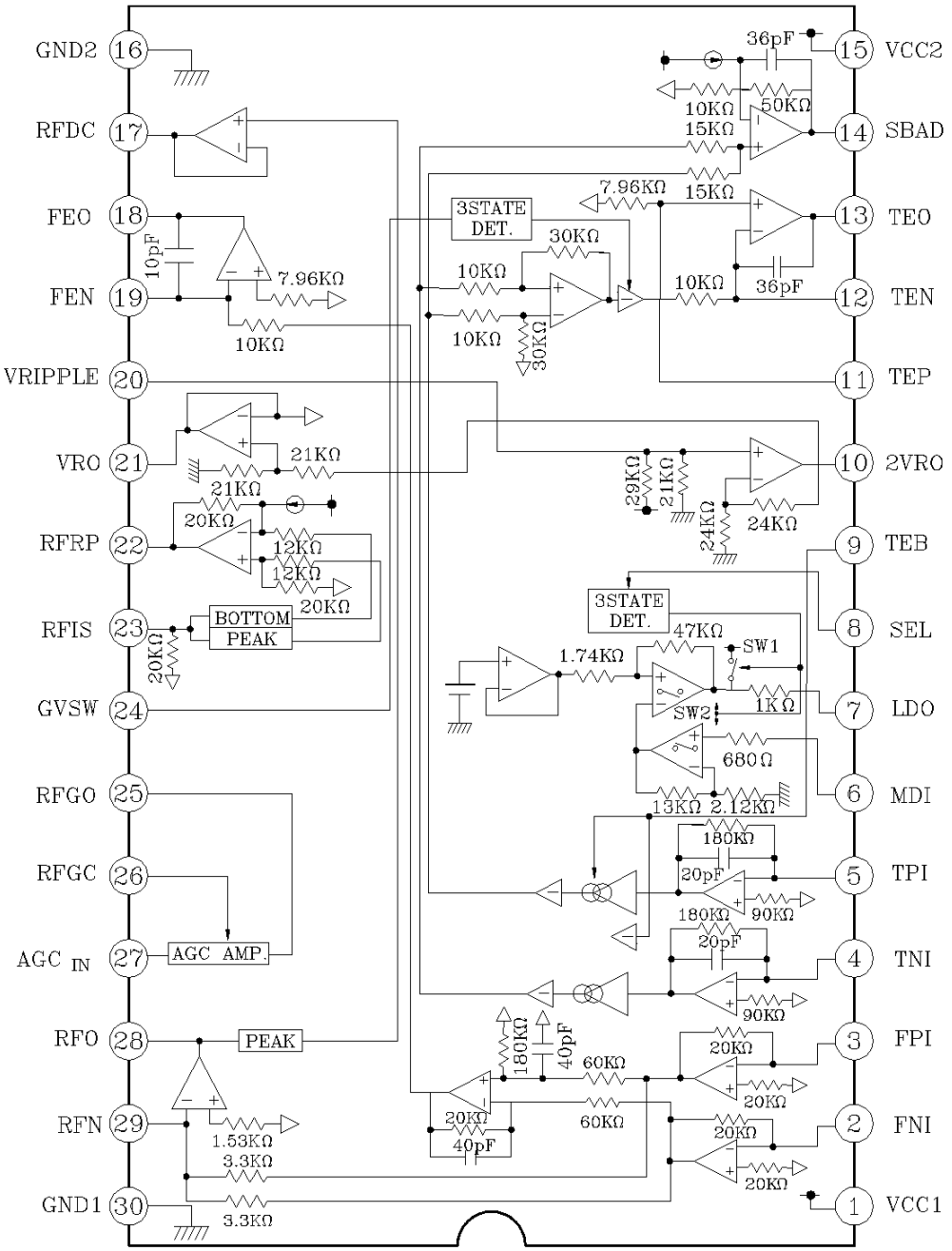
FEATURES

- Built-in amplifier for reference (V_{REF}, $2V_{REF}$) supply.
- Built in auto laser power control circuit.
- Built in RF amplifier.
- Built in focus error amp and tracking error amp.
- Built-in sub-beam adder signal amplifier.
- Capable of tracking balance control with KIC9432AF, KIC9462F.
- Capable of RF gain adjustment circuit with KIC9432AF, KIC9462F.
- Built in signal amplifier for track counter.
- Capable of 4 times speed operation.

MAXIMUM RATINGS (Ta=25℃)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Power Supply Voltage	V_{CC}	8	V
Power Dissipation	P_D	500	mW
Operating Temperature	T_{opr}	-40~85	℃
Storage Temperature	T_{stg}	-55~150	℃

BLOCK DIAGRAM



SEL	LDC		
	SW1	SW2	SW3
GND	ON	OFF	OFF
Hiz	OFF	ON	ON
V_{CC}	OFF	ON	ON

GVSW	TE GAIN
GND	-3dB
Hiz	0dB
V_{CC}	+3dB

ELECTRICAL CHARACTERISTICS (Unless otherwise specified, V_{CC}=5V, Ta=25℃)
AC CHARACTERISTICS

CHARACTERISTIC		SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Power Supply	Assured Supply Voltage	V_{CC}	1		4.5	5.0	5.5	V
	Power Supply Voltage	I_{CC}	1	SEL=V_{CC}	18	23	30	mA
Reference Voltage : $2V_{REF}$	Reference Voltage	2VR	1		4.0	4.2	4.4	V
	Output Current	I_{OH2}	1	⊿=-0.1V	3.0	-	-	mA
	Input Current	I_{OL2}	1	⊿=+0.1V	0.1	-	-	mA
Reference Voltage : V_{REF}	Reference Voltage	VR	1		2.0	2.1	2.2	V
	Reference Voltage Limit	⊿VR	1	2xVR/2VR-1	-3.0	0.0	+3.0	%
	Output Current	I_{OH1}	1	⊿=-0.1V	5.0	-	-	mA
	Input Current	I_{OL1}	1	⊿=+0.1V	5.0	-	-	mA
RF1 FPI(FNI) →RFO	Transfer Resistance	R_T	1	f=100kHz, R_{NF}=22kΩ	12.0	13.3	14.6	kΩ
	Frequency Characteristic	f_C	1	-32dB point	-	5.0	-	MHz
	Output Slew Rate	SR	1	C_{RFO}=20pF	10	20	-	V/μS
	Noise/Distortion Rate	THD	1	f=100kHz, V_{RFO}=1.2V_{p-p}	-	-40	-	dB
	Upper Limit Output Voltage	V_{OH}	1	GND reference	3.6	-	-	V
	Lower Limit Output Voltage	V_{OL}	1	GND reference	-	-	0.7	V
	Permissive Load Resistance	R_{LM}	1	-	10	-	-	kΩ
RFDC	Detection Frequency Characteristic	f_C	-	-	-	40	-	kHz
	Permissive Load Resistance	R_{LM}	-	-	-	-	-	kΩ
RF2(AGC) RFO →RFGO	Voltage Gain	⊿G_V	1	f=100Hz, V_{RFGC}=0~42V	-	12	-	dB
	Frequency Characteristic	f_C	1	-3dB point, V_{RFGC}=2.1V	-	5.0	-	MHz
	Output Slew Rate	SR	1	C_{RFGO}=20pF	10	20	-	V/μS
	Upper Limit Output Voltage	V_{OH}	1	GND reference	3.6	-	-	V
	Lower Limit Output Voltage	V_{OL}	1	GND reference	-	-	0.7	V
	Noise/Distortion Rate	THD	1	f=100kHz, V_{RFGO}=1.2V_{p-p}	-	-40	-	dB
	Permissive Load Resistance	R_{LM}	1		10	-	-	kΩ
APC MDI →LDO	Gain Voltage	G_V	1	f=1kHz	-	200	-	V/V
	Operation Reference Voltage	V_{MDI}	1	V_{LDO}=3.5V_{DC}	170	178	192	mV
	LD Off Voltage	V_{LDOP}	1	LDC=L, V_{CC} reference, SEL=L	-0.7	-	-	V
	Input Vias Current	I_L	1	V_{MDI}=178mV	-200	-	+200	nA

CHARACTERISTIC		SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
FE FPI(FNI) →FEO	Transfer Resistance	R_T	-	f=1kHz, R_{NF}=39kΩ	210	234	257	kΩ
	Gain Balance	GB	-		-1.0	-	+1.0	dB
	Frequency Characteristic	f_C	-	-3dB point	-	22	-	kHz
	Output Offset Voltage	V_{OS}	-	FPI/FN1 input open, VR reference	-50	-	+50	mV
	Noise/Distortion Rate	THD	-	f=1kHz, V_{FEO}=2.4V_{p-p}	-	-40	-	dB
	Upper Limit Output Voltage	V_{OH}	-	GND reference	3.8	-	-	V
	Lower Limit Output Voltage	V_{OL}	-	GND reference	-	-	0.5	V
	Permissive Load Resistance	R_{LM}	-	-	10	-	-	kΩ
TE TPI(TN1) →TEO	Transfer Resistance 1	R_{T1}	-	f=1kHz, R_{NF}=33kΩ GVSW=GND	1.03	1.29	1.55	MΩ
	Transfer Resistance 2	R_{T2}	-	f=1kHz, R_{NF}=33kΩ GVSW=Hiz	1.42	1.78	2.14	
	Transfer Resistance 3	R_{T3}	-	f=1kHz, R_{NF}=33kΩ GVSW=V_{CC}	1.96	2.46	2.95	
	Transfer Resistance Range	ΔR_T	-	TEB=VR reference, GVSW=Hiz, TN1 input TEB=GND				
	Max. Transfer Resistance				40	45	50	%
	Max. Transfer Resistance			TEB=2VR	-50	-45	-40	%
	Gain Balance	GB	-	TEB=VR	-1.0	-	+1.0	dB
	Frequency Characteristic	f_C	-	-3dB point, R_{NF}=33kΩ	-	44	-	kHz
	Output Offset Voltage	V_{OS}	-	VR reference, input open	-100	-	+100	mV
	Noise/Distortion Rate	THD	-	f=1kHz, V_{TEO}=2.0V_{p-p}	-	-40	-	dB
	Upper Limit Output Voltage	V_{OH}	-	GND reference	38	-	-	V
	Lower Limit Output Voltage	V_{OL}	-	GND reference	-	-	0.5	V
	Permissive Load Resistance	R_{LM}	-	-	10	-	-	kΩ
SBAD TPI(TN1) →SBAD	Transfer Resistance	R_T	-	f=1kHz, TEB=VR	432	540	648	kΩ
	Frequency Characteristic	f_C	-	-3dB point	-	44	-	kHz
	Noise/Distortion Rate	THD	-	f=1kHz, V_{SBAD}=1.5V_{P-P}	-	-40	-	dB
	Operation Reference Voltage	V_{OPR}	-	VR reference, RT1=180kΩ	-1.1	-1.0	-0.9	V
	Upper Limit Output Voltage	V_{OH}	-	GND reference	3.8	-	-	V
	Permissive Load Resistance	R_{LM}	-		10	-	-	kΩ
RFRP RFRPIN →LDO	Gain Voltage	G_V	-		-	1.67	-	V/V
	Detection Frequency Characteristic	f_C	-	SEL=V_{CC}	-	100	-	kHz
	Operation Reference Voltage 1	V_{OPR1}	-	VR reference, No signal	-1.1	-1.0	-0.9	V
	Operation Reference Voltage 2	V_{OPR2}	-	VR reference, 700kHz, 1.2V_{P-P}	0.65	0.75	0.85	V
	Permissive Load Resistance	R_{LM}	-		10	-	-	kΩ

PIN FUNCTION

PIN No.	SYMBOL	I/O	FUNCTIONAL DESCRIPTION	REMARK
1	VCC1	-	Power supply input terminal	-
2	FNI	I	Main beam I-V amp input terminal	Connected to pin diode A, C
3	FPI	I	Main beam I-V amp input terminal	Connected to pin diode B, D
4	TN1	I	Sub beam I-V amp input terminal	Connected to pin diode E
5	TPI	I	Sub beam I-V amp input terminal	Connected to pin diode F
6	NDI	I	Monitor photo diode amp input terminal	Connected to monitor photo diode
7	LDO	O	Laser diode amp output terminal	Connected to laser control circuit.
8	SEL	I	Laser diode control signal input erminal and APC circuit ON/OFF control signal input terminal.	3 Signal input (V_{CC}, Hi-Z, GND)
9	TEB	I	Tracking error balance adjustment signal input terminal controlled by 3 PWM signal (PWM carrier=88.2kHz)	3 Signal input ($2V_{REF}$, VR, GND)
10	2VRO	O	Reference voltage($2V_{REF}$) output terminal $2V_{REF}$=4.2V when V_{CC}=5V	-
11	TEP	I	TE amp positive input terminal	-
12	TEN	I	TE amp negative input terminal	Connected to TEO through feedback register
13	TEO	O	TE error signal output terminal	-
14	SBAD	O	Sub beam adder signal output terminal	-
15	V_{CC2}	-	Power supply input terminal	-
16	GND2	-	Ground terminal	-
17	RFDC	O	RF signal peak detect output terminal	-
18	FEO	O	Focus error signal output terminal	-
19	FEN	I	FE amp negative input terminal	Connected to FEO through feedback register
20	VRIPPLE	O	Reference voltage ($2V_{REF}$) filter capacitor connecting terminal	-
21	VRO	O	Reference voltage (VREF) output terminal V_{REF}=2.1V when V_{CC}=5V.	-
22	RFRP	O	Track count signal output terminal	-
23	RFIS	I	RFRP detect circuit input terminal	Connected to RFO through condenser
24	GVSW	I	TE amp gain control signal input terminal	3 signal input (V_{CC}, Hiz, GND)
25	RFGO	O	RF gain signal output terminal	-
26	RFGC	I	RF amplitude adjustment control signal input terminal. Controlled by 3 PWM signal (PWM carrier=88.2kHz)	Input range : VR±2.1V
27	AGCI	I	RF Signal amplitude adjustment amp input terminal.	Connected to RFO through condenser
28	RFO	O	RF signal output terminal.	-
29	RFN	I	RF amp negative input terminal	-
30	GND1	-	Ground terminal	-