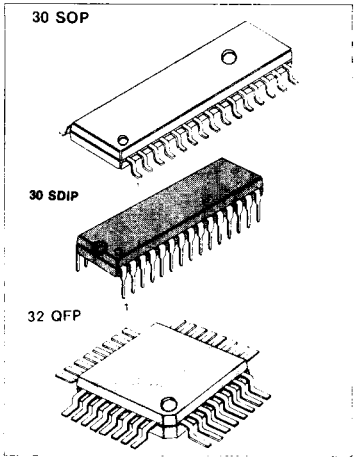
RF AMP FOR CDP

The KA9201, which is the RF amplifier, is a monolithic integrated circuit designed for three-spot type optical pick-up of the compact disc player.
It consists of a RF signal processing circuit, Focus Error AMP, Tracking Error AMP, Focus OK Detector, Mirror Detector, Defect Detector, EFM Comparator and automatic power controller for laser diode.



FEATURES

- Functions: RF AMP
  Focus Error AMP
  Tracking Error AMP
  Focus OK Detector
  Mirror Detector
  Defect Detector
  EFM (Eight to Fourteen Modulation) Comparator
  Automatic Asymmetry Control AMP
  Center Voltage Buffer
  APC (Automatic Power Control) AMP for Photo-Diode and Laser-Diode drive

ORDERING INFORMATION

Device	Package	Operating Temperature
KA9201M	30 SDIP	−25°C ~ +75°C
KA9201D	30 SOP	
KA9201Q	32 QFP	

- Single power supply operation (+5V) as well as split power supply operation (±5V)
- Low power consumption (100mW at ±5V, 50mW at +5V)
- Built-in automaticpower controller use for P-sub and N-sub of the laser diode
- Minimum number of external components required
- Built-in disc defect detection circuit for improvement to play ability
- Recommend operation supply voltage range: V_{CC}-V_{EE}: 3.4 ~ 11V
  V_{CC}-D_{GND}: 3.4 ~ 5.5V
- Power Supply Condition:

	V_{CC}	V_{EE}	V_C	V_R (V_{ref})	D_{GND}
Single Power Supply	Power Supply	GND	V_R	VC	GND
Split Power Supply	+ Power Supply	− Power Supply	D_{GND}	No Connecting	GND

BLOCK DIAGRAM

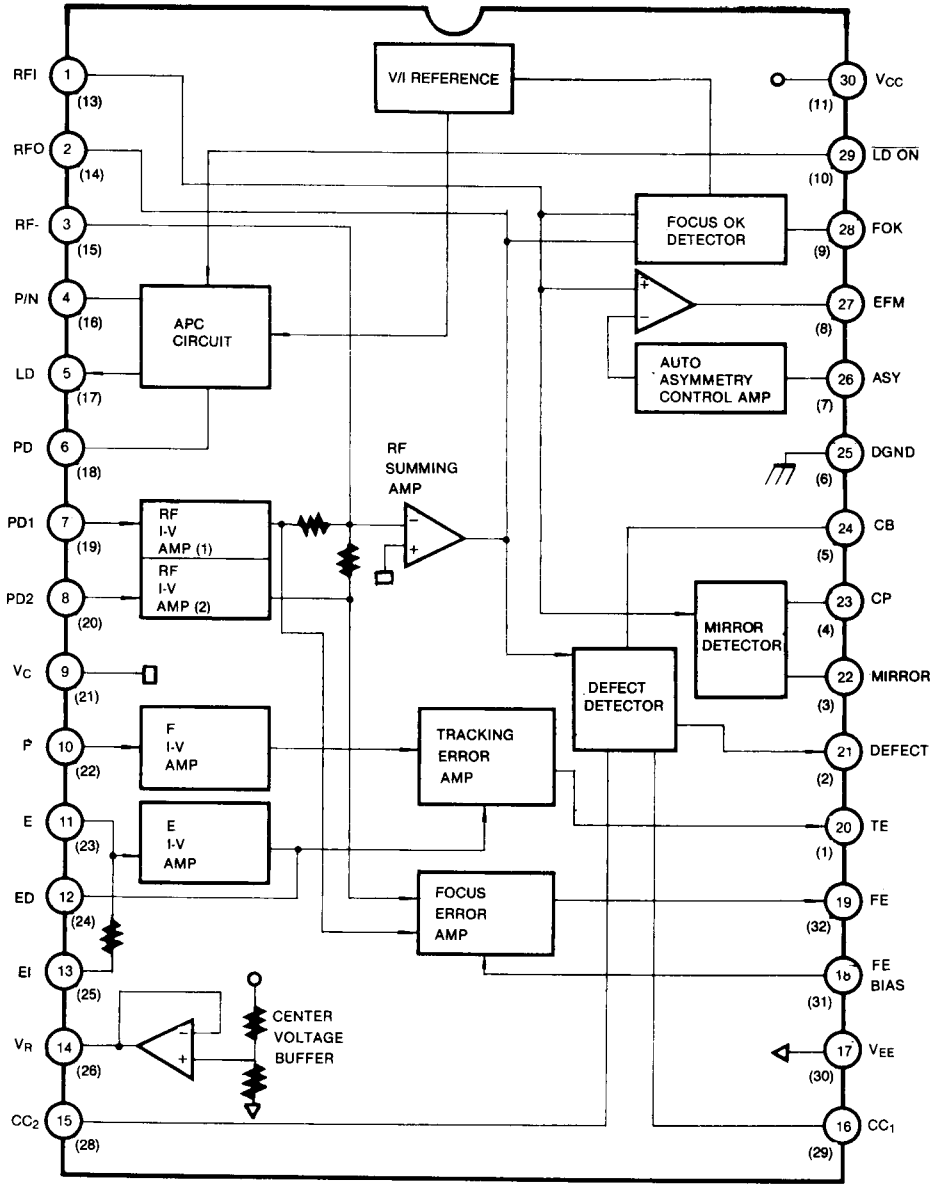


Fig. 1

· PIN12, 27 of 32 QFP is NC

* The number of ( ) is the TYPE of 32 QFP

ABSOLUTE MAXIMUM RATINGS (Ta = 25°C)

Characteristic	Symbol	Value	Unit
Supply Voltage	$V_{CC} - V_{EE}$	12	V
Power Dissipation	P_D	800	mW
Operating Temperature	T_{OPR}	−25 ~ +75	°C
Storage Temperature	T_{STG}	−55 ~ +150	°C

ELECTRICAL CHARACTERISTICS

(Ta = 25°C, V_{CC} = 2.5V, V_{EE} = D_{GND} = −2.5V, VC = GND, unless otherwise specified)

Stage	No	Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Circuit Current	1	V_{CC} Current	I_{CC}	DC Current	8.0	11.4	15.5	mA
	2	V_{EE} Current	I_{EE}		−15.0	−11.0	−7.5	mA
	3	D_{GND} Current	I_D (GND)		−1.1	−0.85	−0.6	mA
RF AMP	4	Input Offset Voltage	V_{IO1}	DC voltage	−50	0	50	mV
	5	Voltage Gain	G_{V1}	V_i = 2KHz, 40mV sinewave, Output; sinewave	25.1	28.1	31.1	dB
	6	Maximum Output Amplitude	$V_{O\,(MAX)\,1}$	V_i = 0.2V DC Output; + peak voltage	1.3			V
	7	Maximum Output Amplitude	$V_{O\,(MAX)\,2}$	V_i = −0.2V DC Output; − peak voltage			−0.3	V
Focus Error AMP	8	Input Offset Voltage	V_{IO2}	DC voltage	−20		120	mV
	9	Voltage Gain	G_{V2}	V_i = 1KHz, 32mV sinewave, Output; sinewave	27	30	33	dB
	10	Voltage Gain	G_{V3}		27	30	33	dB
	11	Gain Difference	ΔG_{V1}		−3	0	3	dB
	12	Maximum Output Amplitude H	$V_{OH\,(MAX)\,1}$	V_i = −0.2V DC Output; − peak voltage	1.9			V
	13	Maximum Output Amplitude L	$V_{OL\,(MAX)\,1}$	V_i = 0.2V DC Output; − peak voltage			−1.9	V
Tracking Error AMP	14	Input Offset Voltage	V_{IO3}	DC voltage	−50		50	mV
	15	Voltage Gain F	G_{V4}	V_i = 1KHz, 0.3V sinewave, input to output ratio Output; sinewave	7	10	13	dB
	16	Voltage Gain E	G_{V5}		7	10	13	dB
	17	Gain Difference	ΔG_{V2}		−3	0	3	dB
	18	Maximum Output Amplitude H	$V_{OH\,(MAX)\,2}$	V_i = 2.0V DC Output; + peak voltage	1.9			V
	19	Maximum Output Amplitude L	$V_{OL\,(MAX)\,2}$	V_i = −2.0V DC Output; − peak voltage			−1.9	V

ELECTRICAL CHARACTERISTICS (Continued)

Stage	No	Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
APC AMP	20	Output Voltage 1	V_{O1}	V_i = 190mV DC	1.4			V
	21	Output Voltage 2	V_{O2}	V_i = 90mV DC			−1.4	V
	22	Output Voltage 3	V_{O3}	V_i = 100mV DC	1.4			V
	23	Output Voltage 4	V_{O4}	V_i = 170mV DC			−1.4	V
	24	Output Voltage 5	V_{O5}	V_i = 0V DC	1.4			V
	25	Output Voltage 6	V_{O6}	V_i = 0V DC			−1.4	V
	26	Maximum Output Amplitude H	$V_{OH\ (MAX)\ 3}$	Va = 0V, Ia = −0.8mA Output; + peak voltage	0			V
	27	Maximum Output Amplitude L	$V_{OL\ (MAX)\ 3}$	Va = 0.6V, Ia = 0.8mA Output; − peak voltage			0	V
Focus OK	28	Threshold Voltage	V_{TH1}	V_i = output (V_{CC} + D_{GND})/2 must be adjusted by the DC voltage across RFI and RFO	−430	−390	−350	mV
	29	High Output Voltage	$V_{OH\ (FOK)\ 1}$	Input across RFI and RFO 1V, 375mV/(DC) sinewave, Output; pulse	2.2			V
	30	Low Output Voltage	$V_{OL\ (FOK)\ 1}$				1.8	V
	31	Maximum Operating Frequency	$f_{(MAX)}$		45			KHz
Mirror AMP	32	High Output Voltage	$V_{OH\ (MIR)\ 1}$	V_i = 10KHz 0.8V, −0.4V(DC) sinewave, Output; pulse	1.8			V
	33	Low Output Voltage	$V_{OL\ (MIR)\ 1}$				−2.2	V
	34	Mirror Hold Frequency Response	$f_{RES\ (M)}$	V_i = 0.8V, 0.2V(DC), f(carrier) = 500KHz AM modulation Output; pulse		400	600	Hz
	35	Bottom Hold Frequency Response	$f_{RES\ (B)}$	V_i = 0.8V, 0.4V(DC) sinewave, Output; pulse		500	900	Hz
	36	Maximum Input Operating Frequency	$f_{I\ (MAX)\ 1}$		30	70		KHz
	37	Minimum Input Voltage	$V_{I\ (MIN)\ 1}$	V_i = 10KHz, 0.4V(DC) sinewave, Output; pulse		0.1	0.2	V
	38	Maximum Input Voltage	$V_{I\ (MAX)\ 1}$		1.8			V
Defect AMP	39	High Output Voltage	$V_{OH\ (DEF)\ 1}$	V_i = 32mV, + 15mV(DC) sinewave, Output; pulse	1.8			V
	40	Low Output Voltage	$V_{OL\ (DEF)\ 1}$				−2.2	V

ELECTRICAL CHARACTERISTICS (Continued)

Stage	No	Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Defect AMP	41	Minimum Input Operating Frequency	$f_{I(MIN)2}$	V_i = 32mV, +15mV/(DC) sinewave, Output; pulse		670	1000	Hz
	42	Maximum Input Operating Frequency	$f_{I(MAX)2}$		2.0	4.7		KHz
	43	Mininum Input Voltage	$V_{I(MIN)2}$	V_i = 50Hz, 15mV(DC) pulsewave, symmetry; 95% Output; pulse		0.3	0.5	V
	44	Maximum Input Voltage	$V_{I(MAX)2}$		1.8			V
EFM Comparator	45	Duty Cycle 1	D_1	V_i = 750KHz, 0.7V sinewave, Output; DC voltage	−50	0	50	mV
	46	Duty Cycle 2	D_2	V_i = 750KHz, 0.7V, +0.25V(DC) sinewave Output; DC voltage	0	50	100	mV
	47	High Output Voltage	$V_{OH(EFM)1}$	V_i = 750KHz, 0.7V sinewave Output; pulse	1.2			V
	48	Low Output Voltage	$V_{OL(EFM)1}$				−1.2	V
	49	Minimum Input Voltage	$V_{I(MIN)3}$	V_i = 750KHz sinewave Output; pulse			0.12	V
	50	Maximum Input Voltage	$V_{I(MAX)3}$		1.8			V
	51	Maximum Input Operating Frequency	$f_{I(MAX)3}$	V_i = 750KHz, 0.7V sinewave, Output; pulse	4.0			MHz
Center Voltage Buffer	52	Input Offset Voltage	V_{IO4}	DC voltage	−100	0	100	mV
	53	Maximum Output Current (+)	$I_{O+(MAX)}$		5			mA
	54	Maximum Output Current (−)	$I_{O-(MAX)}$				−5	mA
(Ta = 25°C, V_{CC} = 5.0V, V_{EE} = −5.0V, D_{GND} = VC = GND, unless otherwide specified)								
RF AMP	55	Maximum Output Amplitude (H)	$V_{OH(MAX)4}$	V_i = 0.2V DC Output; DC voltage	3.5			V
	56	Maximum Output Amplitude (L)	$V_{OL(MAX)4}$	V_i = −0.2V DC Output; DC voltage			0.3	V
Focus Error AMP	57	Maximum Output Amplitude (H)	$V_{OH(MAX)5}$	V_i = −0.2V DC Output; DC voltage	4.2			V
	58	Maximum Output Amplitude (L)	$V_{OL(MAX)5}$	V_i = 0.2V DC Output; DC voltage			−2.2	V
Tracking Error AMP	59	Maximum Output Amplitude (H)	$V_{OH(MAX)6}$	V_i = 2.0V DC Output; DC voltage	4.2			V
	60	Maximum Output Amplitude (L)	$V_{OL(MAX)6}$	V_i = −2.0V DC Output; DC voltage			−2.2	V

ELECTRICAL CHARACTERISTICS (Continued)

Stage	No	Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
APC AMP	61	Output Voltage 7	V_{O7}	V_i = 190mV DC Output DC voltage	1.4			V
	62	Output Voltage 8	V_{O8}	V_i = 90mV DC Output DC voltage			−1.4	V
	63	Output Voltage 9	V_{O9}	V_i = 100mV DC Output DC voltage	1.4			V
	64	Output voltage 10	V_{O10}	V_i = 170mV DC Output DC voltage			−1.4	V
	65	Output Voltage 11	V_{O11}	V_i = 0V DC Output DC voltage	3.8			V
	66	Output Voltage 12	V_{O12}	V_i = 190mV DC Output DC voltage			−3.8	V
	67	Maximum Output Amplitude H	$V_{OH\ (MAX)\ 7}$	Va = 0V DC, Ia = −0.8mA Output; DC voltage	2.5			V
	68	Maximum Output Amplitude L	$V_{OL\ (MAX)\ 7}$	Va = 0.6V DC, Ia = 0.8mA Output; DC voltage			−2.5	V
Focus OK AMP	69	Threshold Voltage	V_{TH2}	Input DC voltage; output $(V_{CC} + D_{GND})/2$ must be adjusted by the DC voltage across RFI And RFO	−430	−390	−350	mV
	70	High Output Voltage	$V_{OH\ (FOK)\ 2}$	V_i = 1V, −375mV(DC) across RFI and RFO; sinewave, Output; pulse	4.7			V
	71	Low Output Voltage	$V_{OL\ (FOK)\ 2}$				0.7	V
Mirror AMP	72	High Output Voltage	$V_{OH\ (MIR)\ 2}$	V_i = 10KHz 0.8V, −0.4V(DC) sinewave, Output; pulse	4.3			V
	73	Low Output Voltage	$V_{OL\ (MIR)\ 2}$				0.3	V
Defect AMP	74	High Output Voltage	$V_{OH\ (DEF)\ 2}$	V_i = 1KHz 32mV, +15mV(DC) sinewave, Output; pulse	4.3			V
	75	Low Output Voltage	$V_{OL\ (DEF)\ 2}$				−0.3	V
EFM Comparator	76	Duty 3	D_3	V_i = 750KHz 0.7V sinewave Output; DC voltage	2.45	2.50	2.55	V
	77	Duty 4	D_4	V_i = 750KHz 0.7V, +0.25V(DC) sinewave Output; pulse	2.50	2.55	2.60	V
	78	High Output Voltage	$V_{OH\ (EFM)\ 2}$	V_i = 750KHz 0.7V, sinewave, Output; pulse	3.7			V
	79	Low Output Voltage	$V_{OL\ (EFM)\ 2}$				1.3	

TEST CIRCUIT

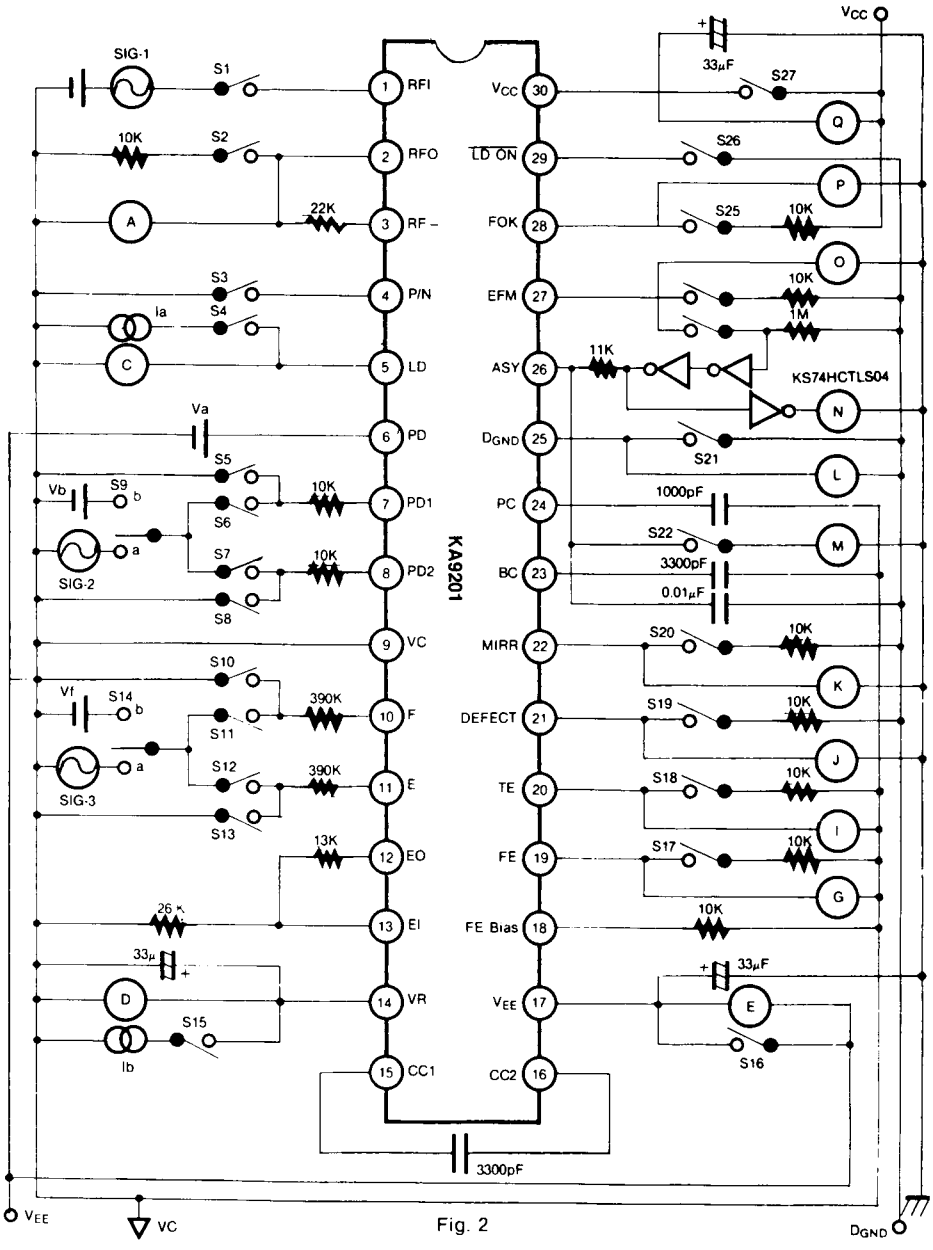


Fig. 2

*) Note: KS74HCTLS04: Supply Voltage = 5V

TEST METHODE (SWITCH CONDITION) (V_{CC} = 2.5V, V_{EE} = D_{GND} = −2.5V, V_C = GND)

Stage	No	Characteristic	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17	S18	S19	S20	S21	S22	S23	S24	S25	S26	S27	Input	Test Point
Circuit Current	1	I_{CC}			ON													ON	ON	ON	ON	ON	ON				ON	ON		—	Q
	2	I_{EE}			ON														ON	ON	ON	ON	ON				ON	ON	ON	—	E
	3	$I_{D\ (GND)}$																ON	ON	ON	ON	ON					ON		ON	—	L
RF AMP	4	V_{IO1}			ON													ON					ON					ON	ON	—	A
	5	G_{V1}						ON	ON									ON					ON						ON	SIG-2	A
	6	$V_{O\ (MAX)\ 1}$		ON				ON	ON		b							ON					ON						ON	V_b	A
	7	$V_{O\ (MAX)\ 2}$		ON				ON	ON		b							ON					ON						ON	V_b	A
Focus Error AMP	8	V_{IO2}																ON					ON					ON	ON	—	G
	9	G_{V2}						ON		ON	a							ON					ON						ON	SIG-2	G
	10	G_{V3}					ON		ON		a							ON					ON						ON	SIG-2	G
	11	ΔG_{V1}																													
	12	$V_{OH\ (MAX)\ 1}$						ON		ON	b								ON	ON				ON						ON	V_b	G
	13	$V_{OL\ (MAX)\ 1}$						ON		ON	b							ON	ON				ON						ON	V_b	G
Tracking Error AMP	14	V_{IO3}			ON													ON					ON					ON	ON	—	I
	15	G_{V4}											ON		ON	a		ON					ON						ON	SIG-3	I
	16	G_{V5}										ON		ON		a		ON					ON						ON	SIG-3	I
	17	ΔG_{V2}																													
	18	$V_{OH\ (MAX)\ 2}$											ON		ON	b		ON		ON			ON						ON	Vt	I
	19	$V_{OL\ (MAX)\ 2}$											ON		ON	b		ON		ON			ON						ON	Vt	I
APC AMP	20	V_{O1}																ON					ON					ON	ON	Va	C
	21	V_{O2}																ON					ON					ON	ON	Va	C
	22	V_{O3}			ON													ON					ON					ON	ON	Va	C
	23	V_{O4}			ON													ON					ON					ON	ON	Va	C
	24	V_{O5}																ON					ON						ON	Va	C
	25	V_{O6}			ON													ON					ON						ON	Va	C
	26	$V_{OH\ (MAX)\ 3}$			ON	ON												ON					ON					ON	ON	Va, Ia	C
	27	$V_{OL\ (MAX)\ 3}$			ON	ON												ON					ON					ON	ON	Va, Ia	C
Focus OK AMP	28	V_{TH1}	ON															ON					ON				ON		ON	SIG-1	P
	29	$V_{OH\ (FOK)\ 1}$	ON															ON					ON				ON		ON	SIG-1	P
	30	$V_{OL\ (FOK)\ 1}$	ON															ON					ON				ON		ON	SIG-1	P
	31	$f_{(MAX)}$	ON															ON					ON				ON		ON	SIG-1	P
Mirror AMP	32	$V_{OH\ (MIR)\ 1}$	ON															ON				ON	ON						ON	SIG-1	K
	33	$V_{OL\ (MIR)\ 1}$	ON															ON				ON	ON						ON	SIG-1	K
	34	$f_{RES\ (M)}$	ON															ON				ON	ON						ON	SIG-1	K
	35	$f_{RES\ (B)}$	ON															ON				ON	ON						ON	SIG-1	K
	36	$f_{I\ (MAX)\ 1}$	ON															ON				ON	ON						ON	SIG-1	K
	37	$f_{I\ (MIN)\ 1}$	ON															ON				ON	ON						ON	SIG-1	K
	38	$V_{I\ (MAX)\ 1}$	ON															ON				ON	ON						ON	SIG-1	K

TEST METHODE (SWITCH CONDITION) (Continued)

Stage	No	Characteristic	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17	S18	S19	S20	S21	S22	S23	S24	S25	S26	S27	Input	Test Point
Defect AMP	39	$V_{OH\ (DEF)\ 1}$						ON	ON		a							ON			ON		ON						ON	SIG-2	J
	40	$V_{OL\ (DEF)\ 1}$						ON	ON		a							ON			ON		ON						ON	SIG-2	J
	41	$f_{I\ (MIN)\ 2}$						ON	ON		a							ON			ON		ON						ON	SIG-2	J
	42	$f_{I\ (MAX)\ 2}$						ON	ON		a							ON			ON		ON						ON	SIG-2	J
	43	$V_{I\ (MIN)\ 2}$						ON	ON		a							ON			ON		ON						ON	SIG-2	J
	44	$V_{I\ (MAX)\ 2}$						ON	ON		a							ON			ON		ON						ON	SIG-2	J
EFM Comparator	45	D_1	ON		ON													ON					ON	ON	ON				ON	SIG-1	M
	46	D_2	ON		ON													ON					ON	ON	ON				ON	SIG-1	M
	47	$V_{OH\ (EFM)\ 1}$	ON															ON					ON		ON	ON			ON	SIG-1	O
	48	$V_{OL\ (EFM)\ 1}$	ON															ON					ON		ON	ON			ON	SIG-1	O
	49	$V_{I\ (MIN)\ 3}$	ON															ON					ON	ON					ON	SIG-1	N
	50	$V_{I\ (MAX)\ 3}$	ON															ON					ON	ON					ON	SIG-1	N
	51	$f_{I\ (MAX)\ 3}$	ON															ON					ON	ON					ON	SIG-1	N
Center Voltage Buffer	52	V_{IO4}			ON													ON					ON						ON	—	D
	53	$I_{O+\ (MAX)}$			ON												ON	ON					ON						ON	Ib	D
	54	$I_{O-\ (MAX)}$			ON												ON	ON					ON						ON	Ib	D
(V_{CC} = 5.0V, V_{EE} = −5.0V, D_{GND} = V_C = GND)																															
RF AMP	55	$V_{OH\ (MAX)\ 4}$		ON				ON	ON		b							ON					ON						ON	Vb	A
	56	$V_{OL\ (MAX)\ 4}$		ON				ON	ON		b							ON					ON						ON	Vb	A
Focus Error AMP	57	$V_{OH\ (MAX)\ 5}$						ON		ON	b							ON	ON				ON						ON	Vb	G
	58	$V_{OL\ (MAX)\ 5}$						ON		ON	b							ON	ON				ON						ON	Vb	G
Tracking Error AMP	59	$V_{OH\ (MAX)\ 6}$											ON		ON	b		ON		ON			ON						ON	Vt	I
	60	$V_{OL\ (MAX)\ 6}$											ON		ON	b		ON		ON			ON						ON	Vt	I
APC AMP	61	V_{O7}																ON					ON					ON	ON	Va	C
	62	V_{O8}																ON					ON					ON	ON	Va	C
	63	V_{O9}			ON													ON					ON					ON	ON	Va	C
	64	V_{O10}			ON													ON					ON					ON	ON	Va	C
	65	V_{O11}																ON					ON						ON	Va	C
	66	V_{O12}			ON													ON					ON						ON	Va	C
	67	$V_{OH\ (MAX)\ 7}$			ON	ON												ON					ON					ON	ON	Va, Ia	C
	68	$V_{OL\ (MAX)\ 7}$			ON	ON												ON					ON					ON	ON	Va, Ia	C
Focus OK AMP	69	V_{TH2}	ON															ON					ON				ON		ON	SIG-1	P
	70	$V_{OH\ (FOK)\ 2}$	ON															ON					ON				ON		ON	SIG-1	P
	71	$V_{OL\ (FOK)\ 2}$	ON															ON					ON				ON		ON	SIG-1	P
Mirror AMP	72	$V_{OH\ (MIR)\ 2}$	ON															ON				ON	ON						ON	SIG-1	K
	73	$V_{OL\ (MIR)\ 2}$	ON															ON				ON	ON						ON	SIG-1	K
Defect AMP	74	$V_{OH\ (DEF)\ 2}$						ON	ON		a							ON			ON		ON						ON	SIG-2	J
	75	$V_{OL\ (DEF)\ 2}$						ON	ON		a							ON			ON		ON						ON	SIG-2	J
EFM Comparator	76	D_3	ON		ON													ON					ON	ON	ON				ON	SIG-1	M
	77	D_4	ON		ON													ON					ON	ON	ON				ON	SIG-1	M
	78	$V_{OH\ (EFM)\ 2}$	ON															ON					ON		ON	ON			ON	SIG-1	O
	79	$V_{OL\ (EFM)\ 2}$	ON															ON					ON		ON	ON			ON	SIG-1	O

APPLICATION CIRCUIT

1) +5V Single Power Supply for P-sub Laser Diode

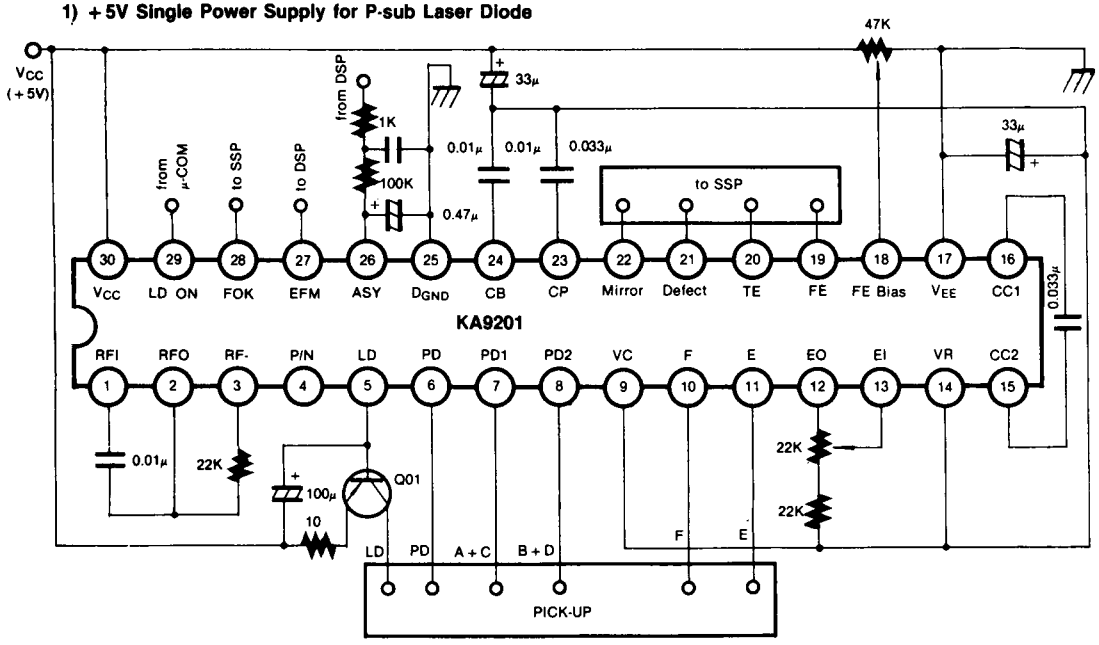


Fig. 3

2) +5V Single Power Supply for N-sub Laser Diode

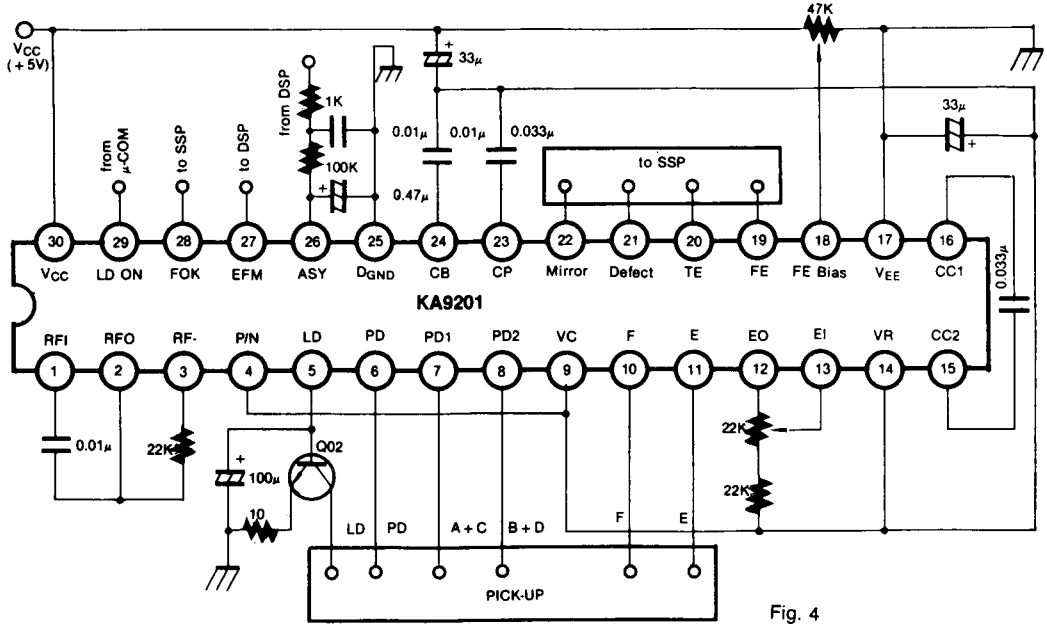


Fig. 4

APPLICATION CIRCUIT

3) ± 5V Split Power Supply for P-sub Laser Diode

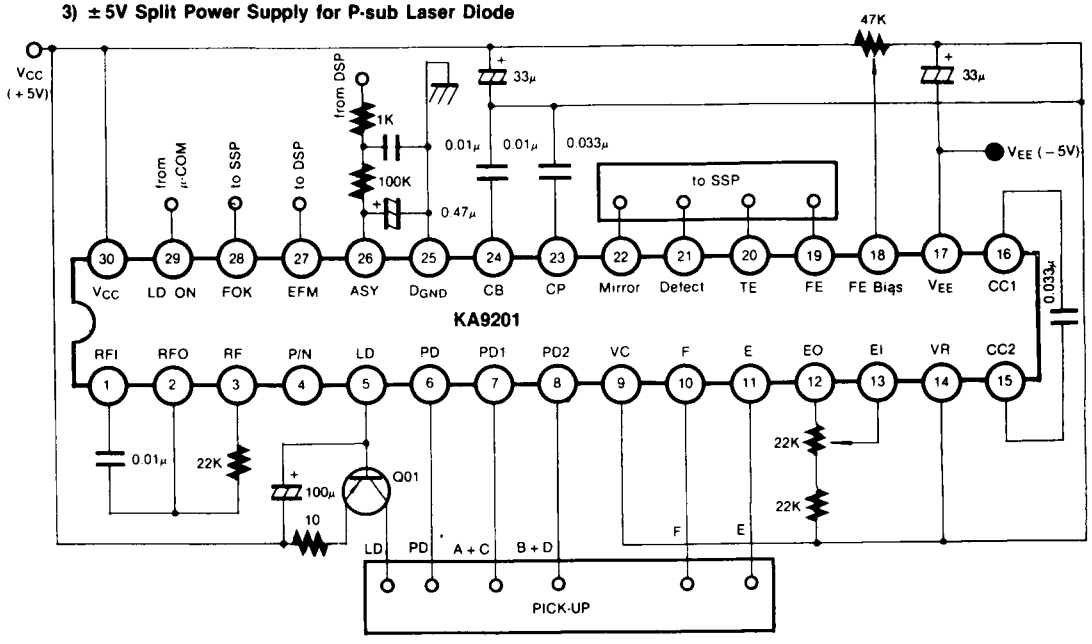


Fig. 5

4) ± 5V Split Power Supply for N-sub Laser Diode

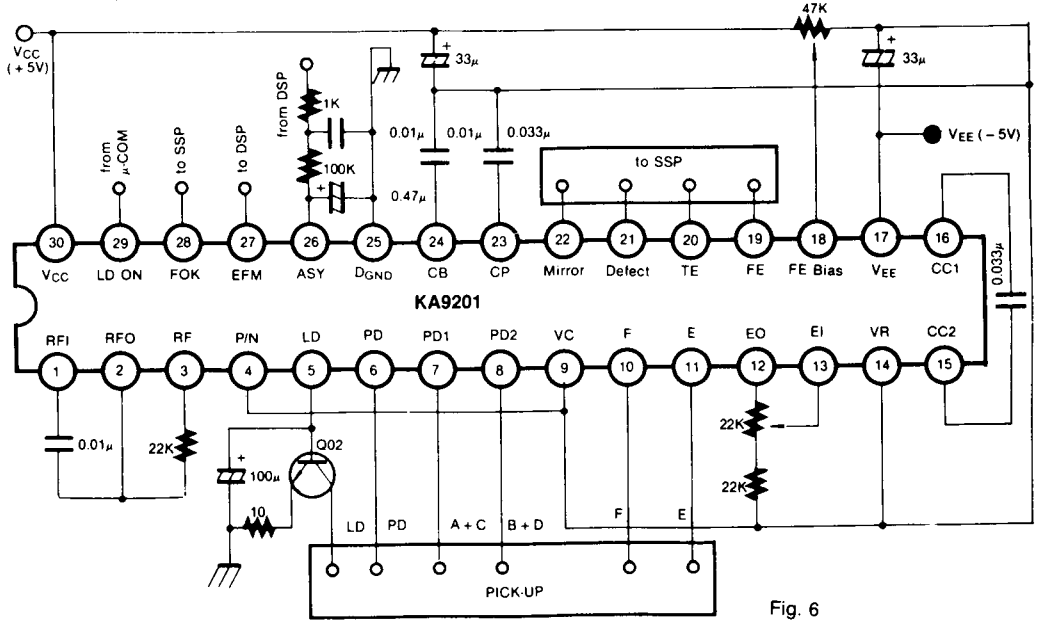


Fig. 6