T-77-17

IR3P66 CDS Amp IC

Description

The IR3P66 is a CDS/AMP IC for a CCD area sensor.

This IC receives the CCD area sensor output, clamps the feed-through level of the sensor output, samples and holds the signal level and then outputs it.

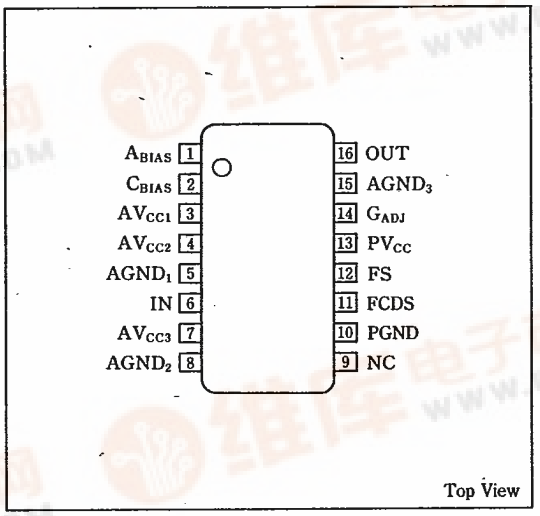
A built-in amplifier varies the gain within the range from 0 to 6dB.

The functions of the IR3P66 are the same as that of the IR3P68 except for an internal amplifier.

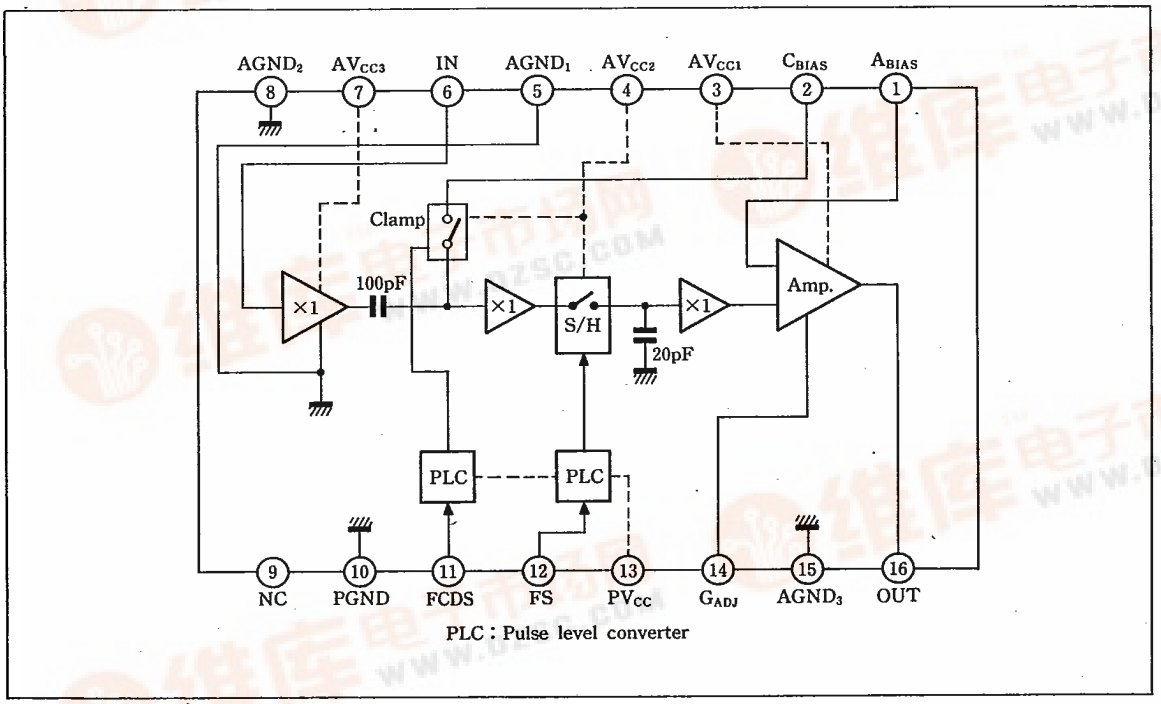
Features

1. Reduces the low range noise included in the CCD area sensor output
2. Incorporates a clamp capacitor
3. Incorporates variable gain amplifier (0~6dB)
4. 5V single power supply
5. 16-pin small outline package

Pin Connections



Block Diagram



PLC : Pulse level converter

■ Pin Functions

Pin No.	Symbol	I/O	Pin function
1	A_{BIAS}	I	Bias level pin for an amplifier An internal bias resistor sets the bias level
2	C_{BIAS}	I	Reference voltage pin to clamp the feedthrough level of a CCD area sensor output
3	AV_{CC1}		Power supply for an amplifier
4	AV_{CC2}		Power supply for a clamp, and sample and hold
5	$AGND_1$		Analog GND (for input)
6	IN	I	Inputs the CCD area sensor output by a capacitor conjunction
7	AV_{CC3}		V_{CC} for inputs (buffer)
8	$AGND_2$		GND for inputs (buffer), clamps and sample and hold
9	NC		
10	PGND		GND for pulses
11	FCDS	I	Pulse input to clamp the feedthrough level of a CCD area sensor output. Clamped by an "High" level
12	FS	I	Pulse input to sample/hold the signal level of a CCD area sensor output. Held by an "Low" level
13	PV_{CC}		Power supply for a pulse level converter
14	G_{ADJ}	I	Amplifier gain adjusting input pin
15	$AGND_3$		GND for an amplifier
16	OUT	O	Amplifier output

■ Absolute Maximum Ratings

(Ta=25℃)

Parameter	Symbol	Conditions	Rating	Unit
Supply voltage	AV_{CC1}~AV_{CC3}		7	V
	PV_{CC}		7	V
Input voltage	V_{ia}	Pins 1, 2, 6 and 14	0~AV_{CC}	V
	V_{ip}	Pins 11 and 12	−0.2~PV_{CC}+0.2	V
Output current	$\|I_O\|$	Pin 16	5	mA
Power dissipation	P_D	Operating temperature range	300	mW
Operating temperature	T_{opr}		−10~+60	℃
Storage temperature	T_{stg}		−55~+150	℃

■ Electrical Characteristics (1)

(V_{CC}=5V, Ta=25℃)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Operating supply voltage	AV_{CC1}~AV_{CC3} PV_{CC}	Pins 3, 4, 7 and 13 (Ta=−10~60℃)	4.75	5.00	5.25	V
Supply current	I_{CC1}	Pin 3 of the circuit 1	3.3	5.0	7.5	mA
	I_{CC2}	Pin 4 of the circuit 1	0.9	1.4	2.1	
	I_{CC3}	Pin 7 of the circuit 1	1.3	2.0	3.0	
	PI_{CC}	Pin 13 of the circuit 1	5.3	8.0	13	
Open terminal voltage						
Input open terminal voltage	V_6	Pin 6 of the circuit 2	2.4	2.5	2.6	V
	V_2	Pin 2 of the circuit 2	2.95	3.08	3.20	
	V_1	Pin 1 of the circuit 2	2.68	2.80	2.92	
Output voltage	V_{16}	Pin 16 of the circuit 2	1.9	2.15	2.4	V
Input current						
Input current	I_{14}	Pin 14 of the circuit 3	−20	−5	10	μA

Parameter	Symbol	Conditions			MIN.	TYP.	MAX.	Unit
Pulse level converter (For clamp and S/H)								
Input "Low" voltage	V_{IL}	Pin 11 and 12		Circuit 4			0.8	V
Input "High" voltage	V_{IH}				2.0			V
Input "Low" current	I_{IL}		V_{IL}=0V	Circuit 3	−1.1	−0.8	−0.5	mA
Input "High" current	I_{IH}		V_{IL}=5V		−10	1	10	μA
Input impedance	R_{IN}	Pin 6	Resistors	Circuit 5	8	12		kΩ
	C_{IN}		Capacitors			4	6	pF
	R_{cbias}	Pin 2				9.5		kΩ
	R_{abias}	Pin 1				11.5		kΩ
Output impedance	R_{OUT}	Pin 16 for resistors f=1MHz		Circuit 7		190	300	Ω
Input dynamic range	DR	Pin 6, Gain=6dB			0.6	0.9		V_{P-P}
Gain	G_1	V_{14}=0V		Circuit 6	−1	0	1	
	G_2	V_{14}=1.7V			2	3	4	dB
	G_3	V_{14}=5V			5	6	7	
S/H slew rate	V_{16}	Amp. gain=0dB			0.6	0.9		V/20ns
Hold voltage fluctuation						−20		mV/μs
Hold mode feedthrough		f=1MHz IN=300mV Gain=6dB		Circuit 8		−55	−45	dB
S/H offset error		VFS=10MHz, gain=6dB		Circuit 9		8		mV
Sampling transition noise		VFS=10MHz, gain=6dB				40		mV_{P-P}
Clamp low frequency rejection ratio		f=100kHz IN=0.3V_{P-P}		Circuit 10		−33	−27	dB
Linearity error		V_{IN}=0.2~0.6V_{P-P} Sampling=10MHz		Circuit 7		0.5	1	%
Clamp pulse width					20			ns
Sample pulse width					20			ns

* The electrode of current coming into IC is defined as positive.

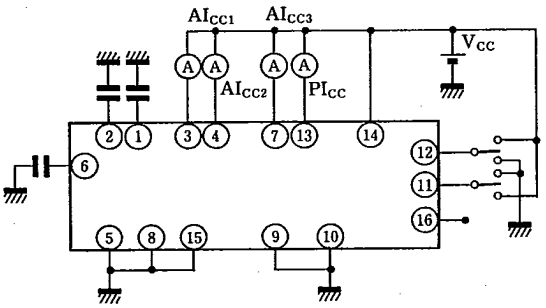
■ Electrical Characteristics (2)

(AV_{CC}=PV_{CC}=4.75~5.25V, Ta=−10~+60°C)

Parameter	Symbol	Conditions		MIN.	TYP.	MAX.	Unit
Supply current	AI_{CC1}	Pin 3		2.8		10.3	mA
	AI_{CC2}	Pin 4		0.7		2.3	mA
	AI_{CC3}	Pin 7		1.1		3.5	mA
	PI_{CC}	Pin 13		4.5		15	mA
Input "Low" voltage	V_{IL}	FCDS FS				0.7	V
Input "High" voltage	V_{IH}			2.0			V
Input "Low" current	I_{IL}		V_{IN}=0V	−1.2		−0.4	μA
Input "High" current	I_{IH}		V_{IN}=5V	−10		10	μA
Input current	I_I	Pin 14		−25		25	μA
Open input voltage	V_{IN}	Pin 6		2.2		2.8	V
	V_{cbias}	Pin 2		2.75		3.40	V
	V_{abias}	Pin 1		2.5		3.1	V
Open output voltage	V_{OUT}	V_{11}=V_{12}=V_{CC}		1.65		2.55	V
Amplifier gain	G	V_{14}=0~1V		−1.5		1.5	dB
		V_{14}=1.7V_{CC} /5		1.5		4.5	
		V_{14}=2.5~5V		4.5		7.5	

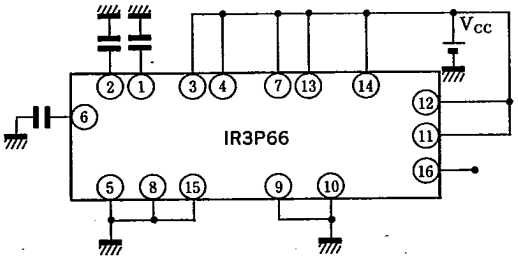
■ Test Circuits

(1) AI_{CC}, PI_{CC}

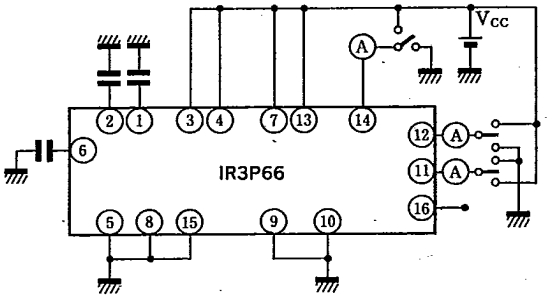


- AI_{CC1}~AI_{CC3} must be measured under conditions that V_{CC}=5V, and pins 11 and 12=5V.
- PI_{CC} must be measured under conditions that V_{CC}=5V, and pins 11 and 12=0V.

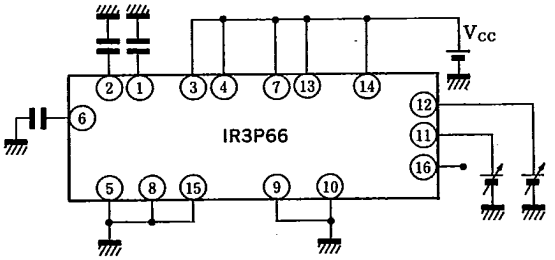
(2) Open input terminal voltage, Open output terminal voltage



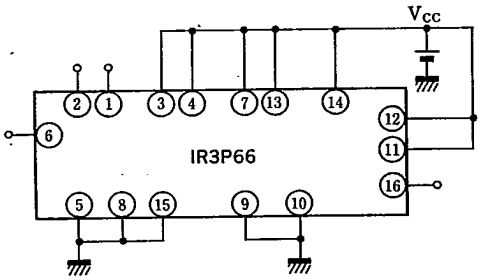
(3) I_{IL}, I_{IH}, I_{14}



(4) V_{IL}, V_{IH}

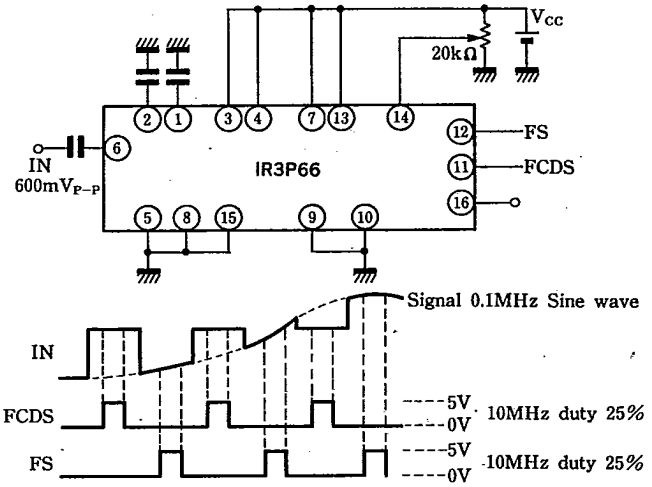


(5) Input terminal impedance, output terminal impedance

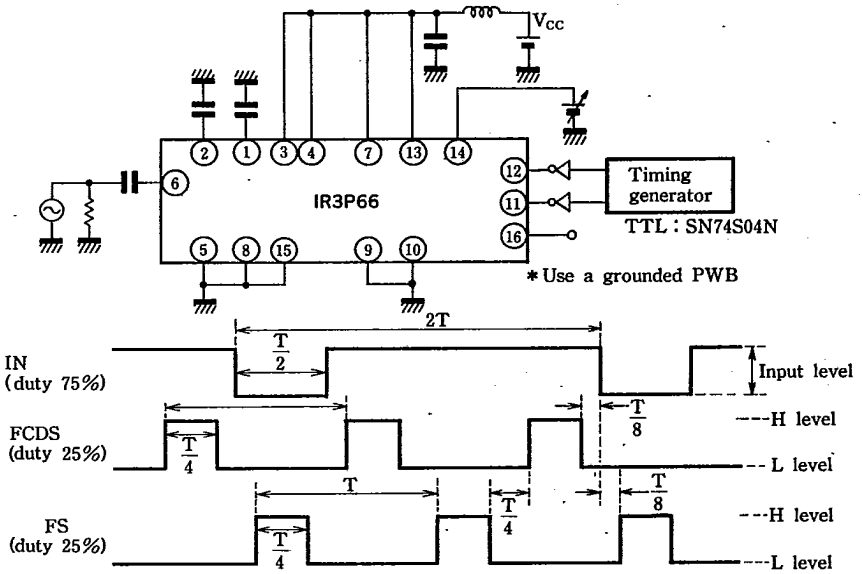


On a vector impedance meter f=1MHz

(6) Gain

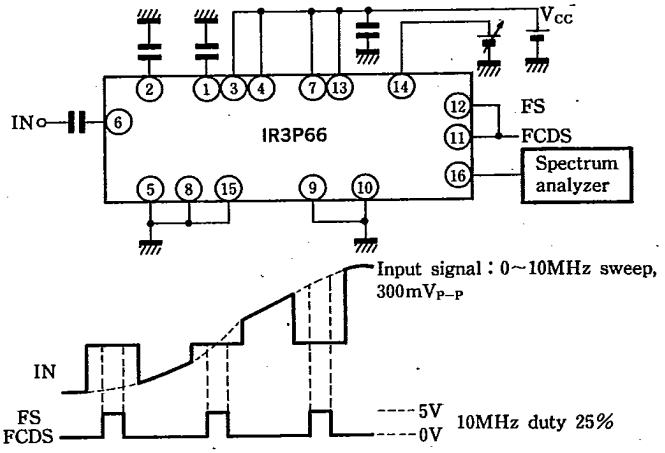


(7) S/H slew rate

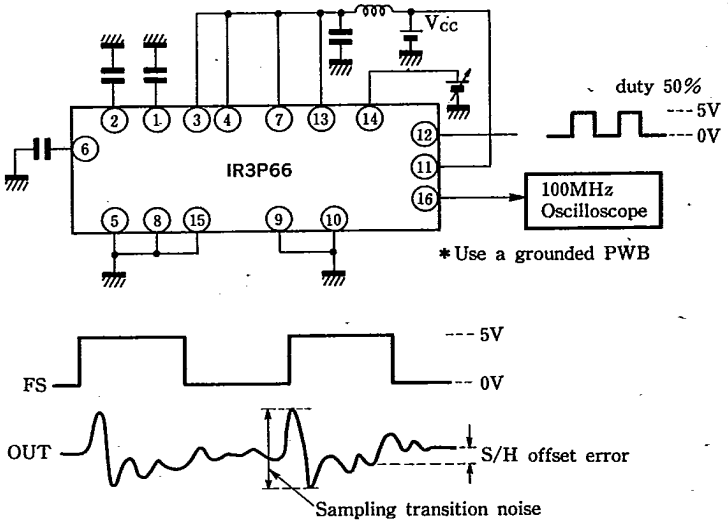


$T=\frac{1}{f}$ f : Sampling rate f=10MHz

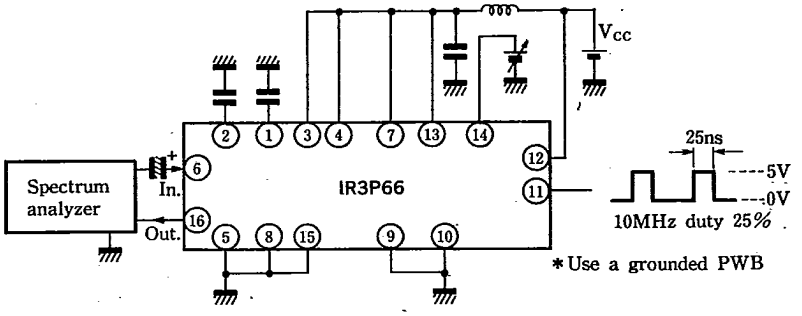
(8) Hold mode feedthrough



(9) Sample and hold offset error, sampling transition noise

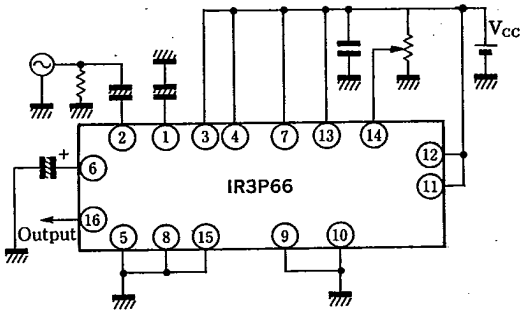


(10) Clamp frequency characteristics

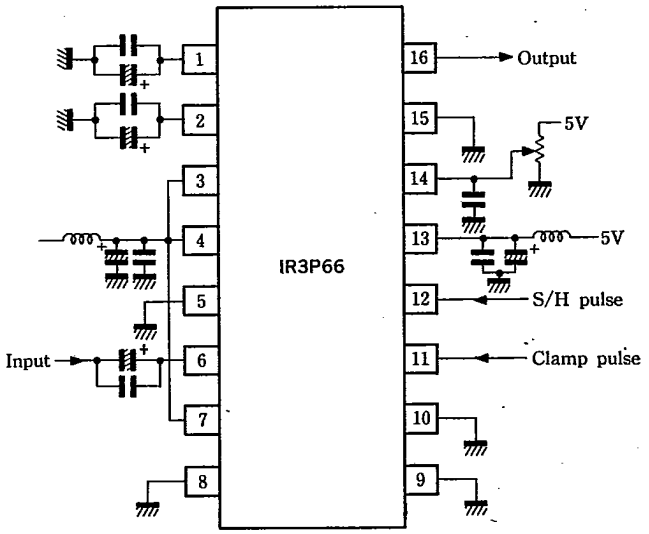


Input : 0~10MHz Sweep signal
$0.3V_{P-P}$

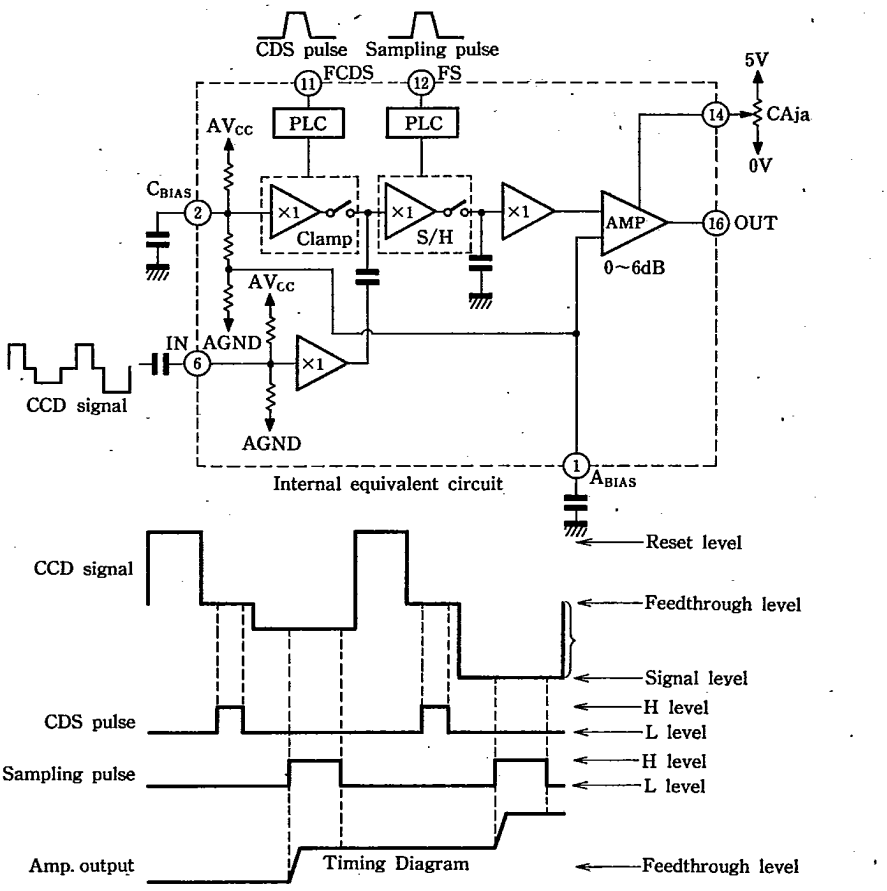
(11) Frequency characteristics



■ Basic Connection Diagram



■ Description of Operation



The IR3P66 inputs a CCD area sensor output by a capacitor conjunction, and clamps its feedthrough level at pin 2 (C_{BIAS} electrode). Then it samples and holds the difference between the signal level and the feedthrough level, which is amplified through a reverse amplifier to output.

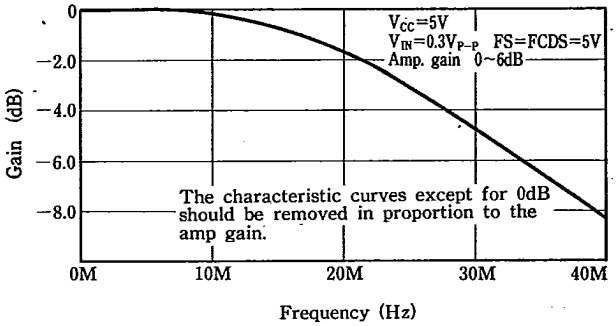
Switches of a clamp and a S/H circuit should be closed by turning a pulse input to "H" and opened to "L".

To apply voltages to pin 14 (G_{ADJ}) sets the amplifier gain within the range from 0 to 6dB.

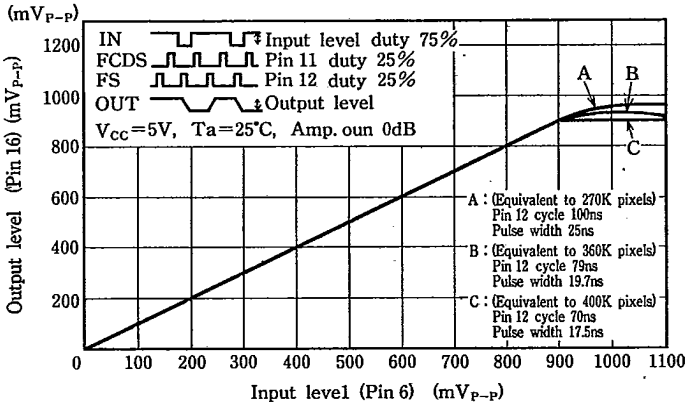
(Higher the voltage on pin 14, higher the gain.)

■ Electrical Characteristic Curves

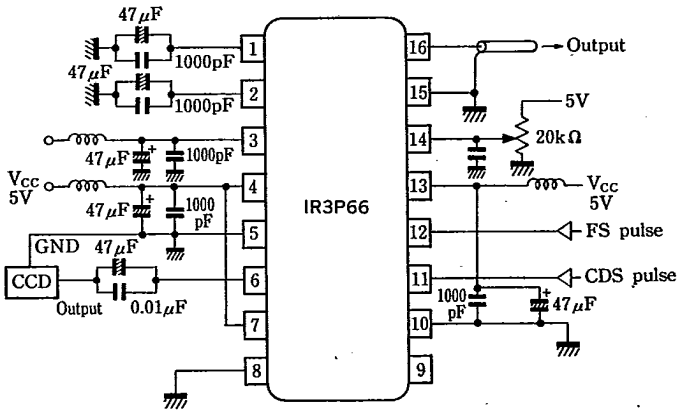
Frequency Characteristics



S/H, I/O Characteristics



■ Peripheral Circuit Example



- For the addition and removal of any external part, consider them in the mounted condition.
- The ground plane type with grounded on one side is recommended for the circuit board.
- $AGND_1$ (pin 5), $AGND_2$ (pin 8) and $AGND_3$ (pin 15) should be connected using the minimum distance and kept at low impedance.
- The bypass capacitor between the power source and GND should be connected using the minimum distance. The use of a chip capacitor is recommended.
- For the peaking coil of the power source, use the one with the self-oscillation frequency of about 100MHz.
- Use pin 5 for GND of the CCD area sensor, pin 10 for GND of FS and FCDS pulses, and pin 15 for GND of outputs.
- It is preferable that the NC pin is connected to GND.
- If there is any external influence, provide a shield plate on the top and bottom of the IC to prevent noise.

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