

# AN2108NFHQ

## Camera Signal Processing(CDS + AGC + Gamma)

## ■ Overview

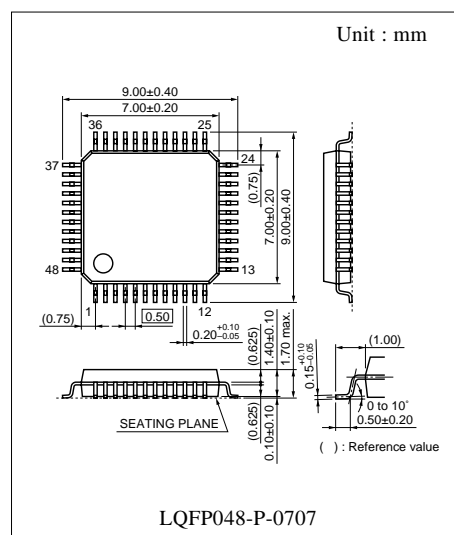
The AN2108NFHQ is a single-chip IC that processes video-signal of CCD-camera and has functions of CDS, AGC, pre-knee and pre-aperture circuits. This CDS circuit is capable of high speed sampling of max. 30 MHz to support high-resolution CCD-camera systems (XGA, SXGA, etc.). AGC and OB level(black level) adjustments can be controlled with on-chip 8-bit DAC.

## ■ Features

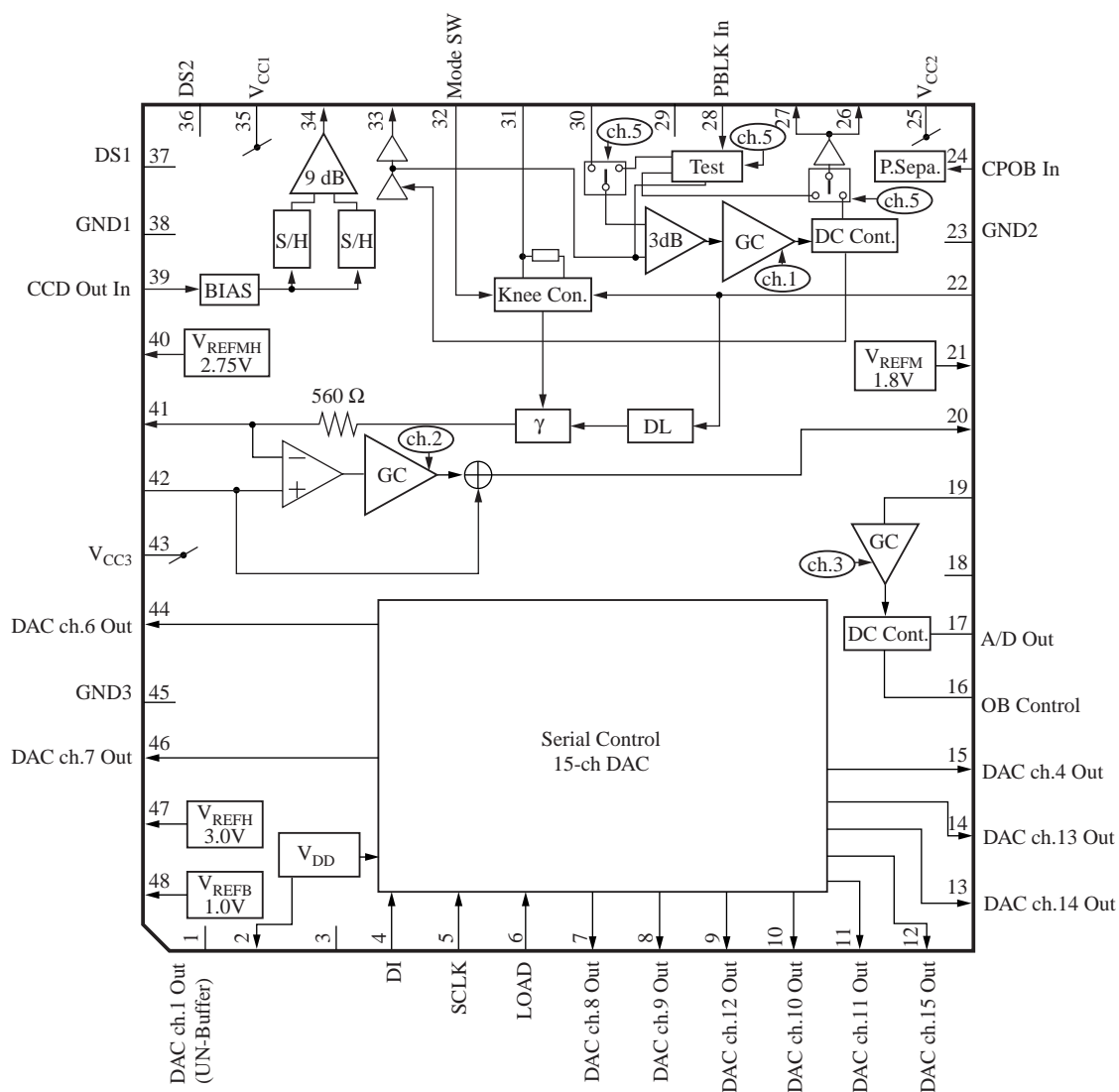
- Capable of high speed sampling of max. 30 MHz
- Capable of controlling OB level at the last output stage
- Capable of switching between 2 modes of pre-knee characteristic
- On-chip DAC(8-bit, 15-channel)for adjustment (11-channels for internal and external outputs)

## ■ Applications

- Digital still cameras, Camcorders, PC cameras, Monitoring cameras, CCD camera modules, CCD digital camera systems



# ■ Block Diagram



## ■ Pin Descriptions

Pin No.	Description	Pin No.	Description
1	DAC CH1 OUT(UN-Buffer)	25	V <sub>CC2</sub>
2	V <sub>DD</sub> OUT(3.5 V)	26	AGC OUT 1
3	V <sub>SS</sub>	27	AGC OUT 2
4	DI	28	PBLK IN
5	SCLK	29	AGC DET
6	LOAD	30	AGC IN
7	DAC ch.8 OUT	31	Trap OUT
8	DAC ch.9 OUT	32	Gamma MODE SW
9	DAC ch.12 OUT	33	AGC REF OUT
10	DAC ch.10 OUT	34	CDS OUT
11	DAC ch.11 OUT	35	V <sub>CC2</sub>
12	DAC ch.15 OUT	36	Sampling Puls DS2 IN
13	DAC ch.14 OUT	37	Sampling Puls DS1 IN
14	DAC ch.13 OUT	38	GND 1
15	DAC ch.4 OUT	39	CCD OUT IN
16	OB Control	40	V <sub>REFMH</sub> OUT(2.7 V)
17	A/D OUT	41	Gamma OUT
18	Sub Amp. DET	42	Pre-aperture DL IN
19	Sub Amp. IN	43	V <sub>CC3</sub>
20	Pre-aperture OUT	44	DAC ch.6 OUT
21	V <sub>REFM</sub> OUT(1.8 V)	45	GND 3
22	Gamma IN	46	DAC ch.7 OUT
23	GND 2	47	V <sub>REFH</sub> OUT(3.0 V)
24	CPOB IN	48	V <sub>REFB</sub> OUT(1.0 V)

### ■ Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit
Supply voltage	$V_{CC}$	5.5	V
Supply current	$I_{CC}$	—	mA
Power dissipation <sup>*2</sup>	$P_D$	226	mW
Operating ambient temperature <sup>*1</sup>	$T_{opr}$	−20 to +7.5	°C
Storage temperature <sup>*1</sup>	$T_{stg}$	−55 to +125	°C

Note) \*1 :  $T_a = 25\text{ °C}$ , except storage temperature and operating ambient temperature.

\*2 : The above power dissipation shows the package power dissipation at  $T_a = 75\text{ °C}$ , in free-air.

### ■ Recommended Operating Range

Parameter	Symbol	Range	Unit
Supply voltage	$V_{CC}$	4.5 to 5.1	V

### ■ Electrical Characteristics at $V_{CC} = 4.8\text{ V}$ , $T_a = 25 \pm 2\text{ °C}$

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Circuit current	$I_{TOT}$	$V_{CC} = 4.8\text{ V}$	30	40	50	mA
Reference voltage 1	$V_{REF1}$	$V_{CC} = 4.8\text{ V}$	3.3	3.6	3.9	V
Reference voltage 2	$V_{REF2}$	$V_{CC} = 4.8\text{ V}$	2.9	3.0	3.1	V
Reference voltage 3	$V_{REF3}$	$V_{CC} = 4.8\text{ V}$	2.65	2.75	2.85	V
Reference voltage 4	$V_{REF4}$	$V_{CC} = 4.8\text{ V}$	1.7	1.8	1.9	V
Reference voltage 5	$V_{REF5}$	$V_{CC} = 4.8\text{ V}$	0.9	1.0	1.1	V
Pulse separation	CPOB	$V_{CC} = 4.8\text{ V}$	1.1	1.4	1.7	V
Sampling pulse threshold 1	$V_{TH1}$	$V_{CC} = 4.8\text{ V}$	1.15	1.45	1.75	V
Sampling pulse threshold 2	$V_{TH2}$	$V_{CC} = 4.8\text{ V}$	1.15	1.45	1.75	V
AGC frequency characteristic	$G_{FA}$	10 MHz Sine wave 300 mV <sub>pp</sub>	−1.8	−0.4	1.0	dB
AGC level adjustment	$V_{ADJ1}$	10 stair step 300 mV <sub>pp</sub>	46	60	7A	Hex
AGC output D-range	$V_{AG3}$	10 stair step 1.2 V <sub>pp</sub>	1080	1200	1320	mV <sub>pp</sub>
AGC min. gain	$G_{AG4}$	10 stair step 1.2 V <sub>pp</sub>	—	−3	−5	dB
AGC max. gain	$G_{AG5}$	10 stair step 50 mV <sub>pp</sub>	21	24	—	dB
Test signal adjustment	$V_{TE}$	PBLK input	C0	CE	DF	Hex
Gamma frequency characteristic	$G_{FG}$	10 MHz Sine wave 300 mV <sub>pp</sub>	−2.2	−1.0	0.2	dB
Gamma characteristic 1	$V_{GM1}$	10 stair step 600 mV <sub>pp</sub> 3rd stage Pin32 = GND	162	180	198	mV <sub>pp</sub>
Gamma characteristic 2	$V_{GM2}$	10 stair step 600 mV <sub>pp</sub> 6th stage Pin32 = GND	−1.0	0	1.0	dB
Gamma characteristic 3	$V_{GM}$	10 stair step 600 mV <sub>pp</sub> 9th stage Pin32 = GND	30	80	130	mV <sub>pp</sub>

**■ Electrical Characteristics at  $V_{CC} = 4.8 \text{ V}$ ,  $T_a = 25 \pm 2 \text{ }^{\circ}\text{C}$ (Continued)**

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Gamma characteristic 4	$V_{GM4}$	10 stair step 720 mV <sub>PP</sub> Pin32 = GND	1.22	2.02	3.82	dB
Gamma characteristic 5	$V_{GM6}$	10 stair step 600 mV <sub>PP</sub> 9th stage Pin32 = GND	10	30	50	mV <sub>PP</sub>
Pre-aperture frequency characteristic	$G_{FG}$	10 MHz Sine wave 300 mV <sub>PP</sub>	-1.6	-0.4	0.8	dB
Pre-aperture output D-range	$V_{PR3}$	10 stair step 800 mV <sub>PP</sub>	700	800	900	mV <sub>PP</sub>
Pre-aperture gain 1	$V_{PR5}$	9 MHz Sine wave 300 mV <sub>PP</sub>	—	-0.2	0.5	dB
Pre-aperture gain 2	$V_{PR4}$	9 MHz Sine wave 300 mV <sub>PP</sub>	5.0	7.0	—	dB
Output amplifier frequency characteristic	$G_{FB}$	10 MHz Sine wave 300 mV <sub>PP</sub>	-1.6	-0.4	0.8	dB
Output amplifier level adjustment	$V_{ADJ2}$	10 stair step 300 mV <sub>PP</sub>	7B	90	A5	Hex
Output amplifier output D-range	$V_{AD5}$	10 stair step 1000 mV <sub>PP</sub>	2200	2450	2700	mV <sub>PP</sub>
Output amplifier gain 1	$G_{AD1}$	10 stair step 300 mV <sub>PP</sub>	—	2.5	4.0	dB
Output amplifier gain 2	$G_{AD2}$	10 stair step 300 mV <sub>PP</sub>	13.5	15.5	—	dB
Output amplifier gain 3	$G_{AD4}$	10 stair step 600 mV <sub>PP</sub>	-1.0	0	1.0	dB
A/D Out output DC 1	$V_{OFF1}$	Pin16 = 1.0 V	-70	0	70	mV
A/D Out output DC 2	$V_{OFF2}$	Pin16 = 1.4 V	-70	0	70	mV
Total frequency characteristic	$G_{FT}$		-3.5	-2.0	-0.5	dB
9 dB amplifier gain	$G_1$	Sampling pulse 10 MHz CDS input 300 mV <sub>PP</sub>	7.6	8.6	9.6	dB

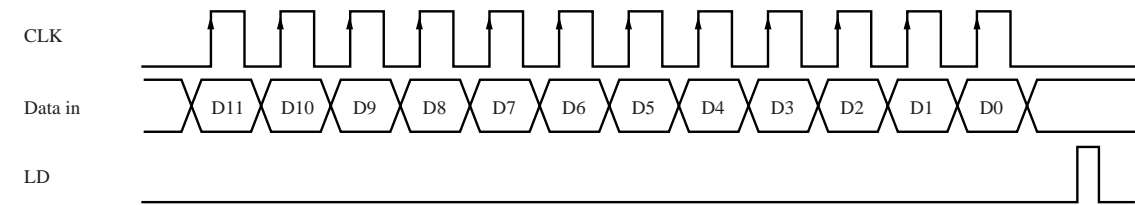
■ Electrical Characteristics(Continued)

• DAC serial Data Format

DAC serial Data Format												Address Selection		Function	
D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0	Don't Care		—	
0	0	0	0	0	0	0	0	0	0	0	0			AGC gain control	
1	0	0	0	0	0	0	0	0	0	0	1	CH1		Pre-aperture gain control	
0	1	0	0	0	0	0	0	0	0	1	0	CH2		Sub amp. gain control	
1	1	0	0	0	0	0	0	0	0	1	1	CH3		Output DC control	
0	0	1	0	0	0	0	0	0	0	0	0	CH4			
1	0	1	0	0	0	0	0	0	0	0	0	CH5		D7	D6
														AGC output pin signal switching	D5
														Pre-apa. On/Off	D4—D0
0	1	1	0	0	0	0	0	0	0	0	0	CH6		Output DC control	
1	1	1	0	0	0	0	0	0	0	0	0	CH7		Output DC control	
0	0	0	1	0	0	0	0	0	0	0	0	CH8		Output DC control	
1	0	0	1	0	0	0	0	0	0	0	0	CH9		Output DC control	
0	1	0	1	0	0	0	0	0	0	0	0	CH10		Output DC control	
1	1	0	1	0	0	0	0	0	0	0	0	CH11		Output DC control	
0	0	1	1	0	0	0	0	0	0	0	0	CH12		Output DC control	
1	0	1	1	0	0	0	0	0	0	0	0	CH13		Output DC control	
0	1	1	1	1	1	1	1	1	1	1	0	CH14		Output DC control	
1	1	1	1	1	1	1	1	1	1	1	1	CH15		Output DC control	

■ Electrical Caracteristics(Continued)

DAC serial data timing



ch.5

AGC output pin signal switching

D7	D6	Function
0	0	CDS signal output at AGC on
1	0	Test signal output at AGC on
1	1	Through output of test signal at AGC off

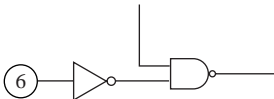
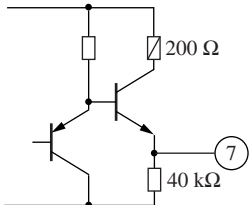
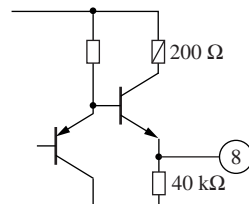
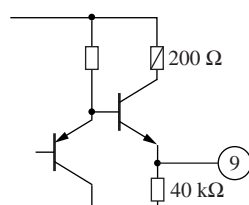
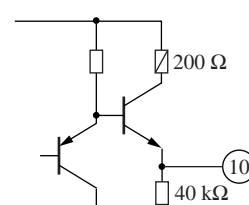
Pre-apa. on/off

D5	Function
0	Pre-aperture off
1	Pre-aperture on

■ Terminal Equivalent Circuit

Pin No.	Symbol	Equivalent Circuit	Function
1	CH1		0.6 to 2.9 V
2	V <sub>DD</sub>	—	3.5 V
3	V <sub>SS</sub>	—	—
4	DI		—
5	SCLK		—

■ Terminal Equivalent Circuit(Continued)

Pin No.	Symbol	Equivalent Circuit	Function
6	LOAD		—
7	CH8		0.15 to 3.60 V
8	CH9		0.15 to 3.60 V
9	CH12		0.15 to 3.60 V
10	CH10		0.15 to 3.60 V



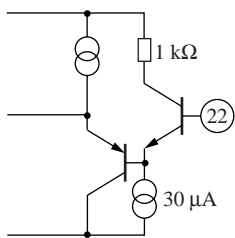
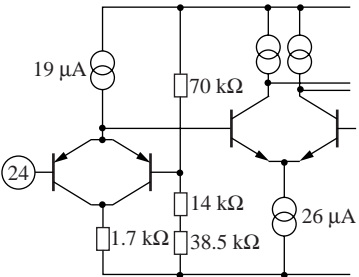
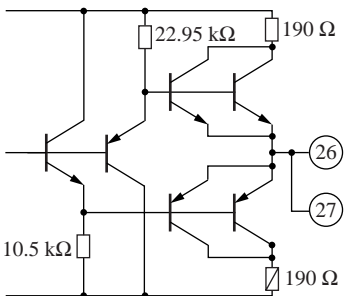
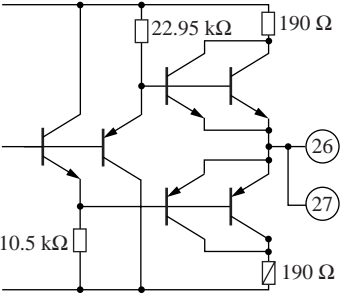
# ■ Terminal Equivalent Circuit(Continued)

Pin No.	Symbol	Equivalent Circuit	Function
11	CH10		0.15 to 3.60 V
12	CH15		0 to 3.6 V
13	CH14		0 to 3.6 V
14	CH13		0.15 to 3.60 V
15	CH4		0.15 to 3.60 V

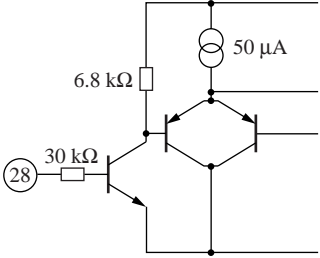
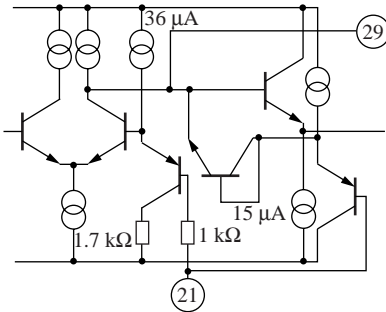
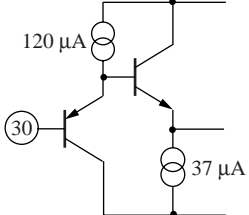
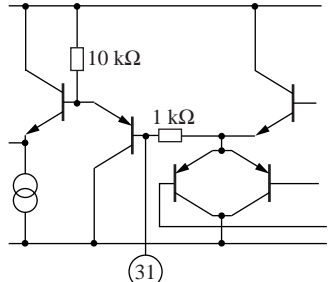
### ■ Terminal Equivalent Circuit(Continued)

Pin No.	Symbol	Equivalent Circuit	Function
16	OB CONT		—
17	A/D OUT		1.0 to 1.4 V
18	SUB DET		—
19	SUB AMP IN		—
20	PREAPA OUT		1.9 V

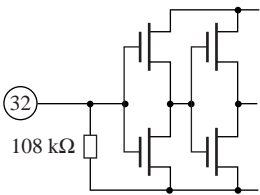
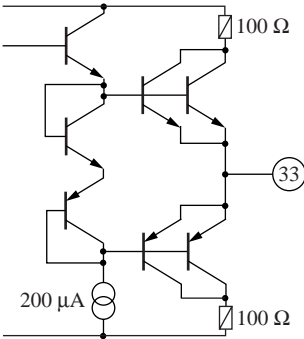
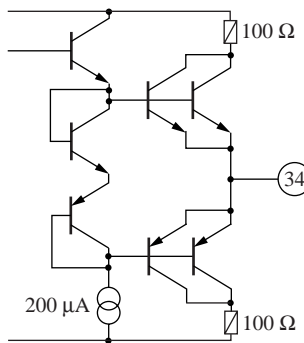
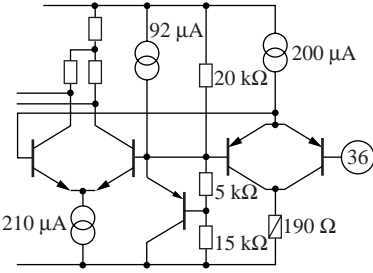
# ■ Terminal Equivalent Circuit(Continued)

Pin No.	Symbol	Equivalent Circuit	Function
21	$V_{REFM}$	—	1.8 V
22	GAMMA IN		—
23	GND2	—	—
24	CPOB IN		—
25	$V_{CC2}$	—	4.8 V
26	AGC OUT1		1.8 V
27	AGC OUT2		1.8 V

■ Terminal Equivalent Circuit(Continued)

Pin No.	Symbol	Equivalent Circuit	Function
28	PBLK IN		—
29	AGC DET		—
30	AGC IN		—
31	TRAP OUT		2.0 V

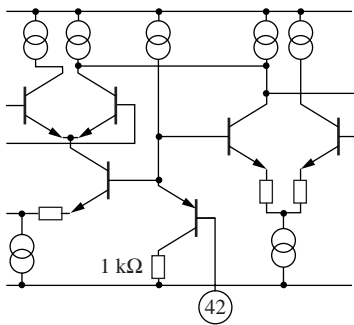
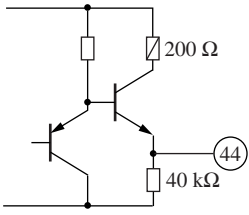
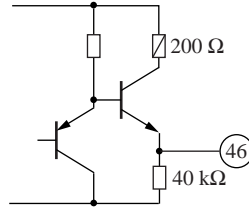
# ■ Terminal Equivalent Circuit(Continued)

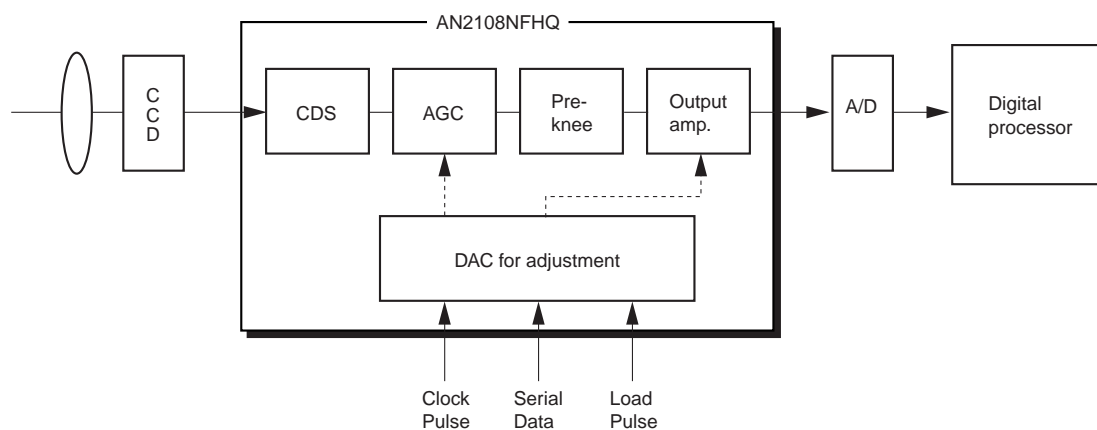
Pin No.	Symbol	Equivalent Circuit	Function
32	MODE SW		—
33	AGC REF		1.2 V
34	CDS OUT		1.2 V
35	V <sub>CC1</sub>	—	—
36	DS2		—

# ■ Terminal Equivalent Circuit(Continued)

Pin No.	Symbol	Equivalent Circuit	Function
37	DS1		—
38	GND1	—	—
39	CCD IN		—
40	$V_{REFMH}$	—	2.75 V
41	PREAPA OUT		1.9 V

# ■ Terminal Equivalent Circuit(Continued)

Pin No.	Symbol	Equivalent Circuit	Function
42	DL IN		—
43	$V_{CC3}$	—	4.8 V
44	CH6		0.15 to 3.60 V
45	GND2	—	—
46	CH7		0.15 to 3.60 V
47	$V_{REFH}$	—	3.0 V
48	$V_{REFB}$	—	1.0 V

**■ Application Circuit Example(CCD Camera)****■ Usage Notes**

- Supply power to Pins 25,35 and 43 simultaneously.