

# AN8130K

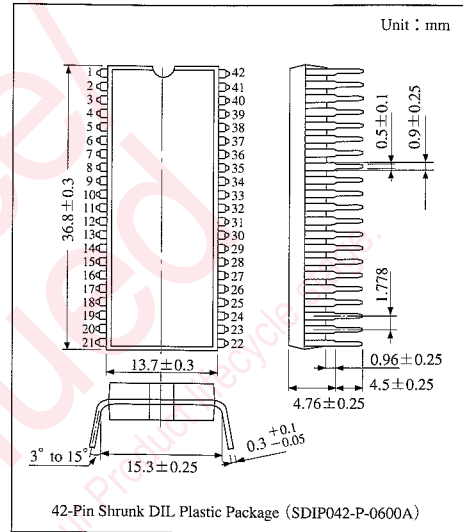
## High-speed and Low Power Consumption 10-bit A/D Converter IC

### Overview

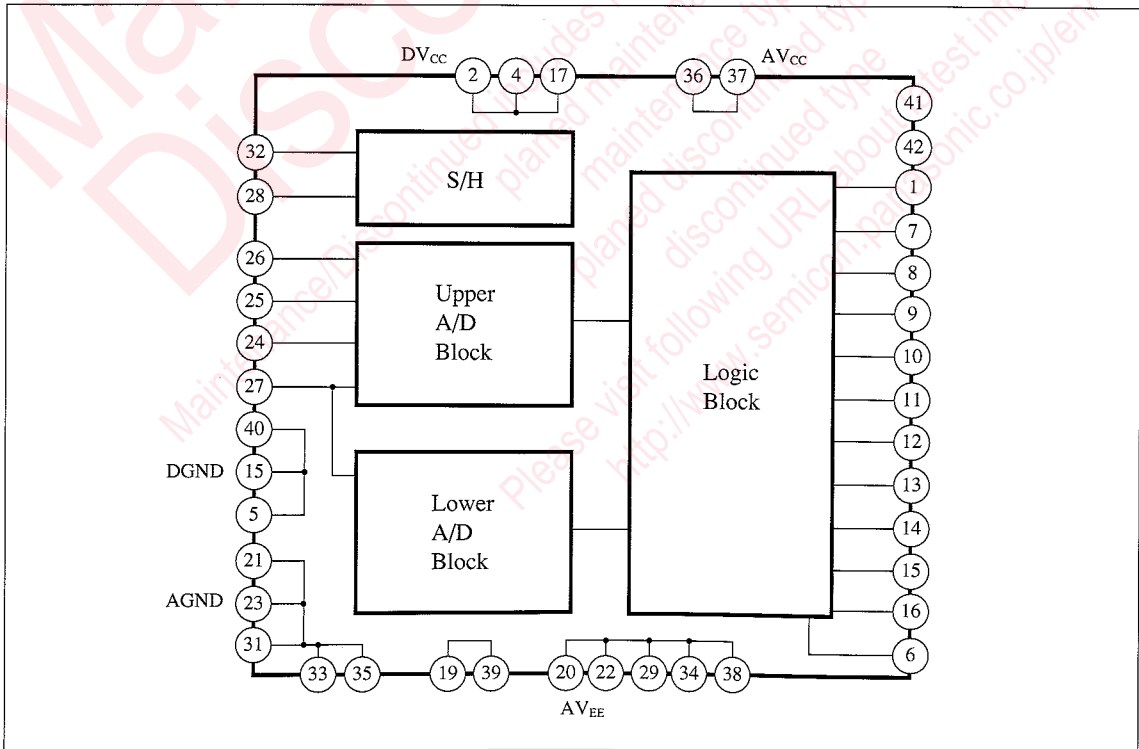
The AN8130K is a 10-bit A/D converter for video processing and it offers low power consumption adopting Bi-CMOS process.

### Features

- 10-bit resolution
- High speed : max. conversion rate 20MSPS
- Low power consumption : 750mW
- S/H circuit built-in
- Serial/parallel type



### Block Diagram



### Absolute Maximum Ratings (Ta=25°C)

| Parameter                     | Symbol                                 | Rating                             | Unit |
|-------------------------------|--|------------------------------------|------|
| Supply voltage                | V <sub>EE</sub>                        | -6 to +0.5                         | V    |
|                               | V <sub>CC</sub>                        | -0.5 to +6                         | V    |
| Analog input voltage          | V <sub>IN</sub>                        | V <sub>EE</sub> to V <sub>CC</sub> | V    |
| Digital input voltage         | V <sub>CLKSH</sub> /V <sub>CLKAD</sub> | -0.5 to V <sub>CC</sub> +0.5       | V    |
| Reference voltage             | V <sub>RB</sub> /V <sub>RT</sub>       | V <sub>EE</sub> to +0.5            | V    |
| Digital output current        | I <sub>OH</sub>                        | -15                                | mA   |
| Power dissipation             | P <sub>D</sub>                         | 1100                               | mW   |
| Operating ambient temperature | T <sub>opr</sub>                       | -20 to +70                         | °C   |
| Storage temperature           | T <sub>stg</sub>                       | -55 to +150                        | °C   |

### Recommended Operating Range (Ta=25°C)

| Parameter                   | Symbol           | min             | typ  | max             | Unit |
|-----------------------------|------------------|-----------------|------|-----------------|------|
| Positive supply voltage     | V <sub>CC</sub>  | 4.75            | 5    | 5.25            | V    |
| Negative supply voltage     | V <sub>EE</sub>  | -5.25           | -5   | -4.75           | V    |
| Reference voltage           | V <sub>RT</sub>  | —               | 0    | —               | V    |
|                             | V <sub>RB</sub>  | —               | -2   | —               | V    |
| Analog input voltage        | V <sub>IN</sub>  | V <sub>RB</sub> | —    | V <sub>RT</sub> | V    |
| Digital input voltage       | V <sub>IH</sub>  | 2               | —    | 4               | V    |
|                             | V <sub>IL</sub>  | 0               | —    | 0.8             | V    |
| Digital output current      | I <sub>OH</sub>  | —               | -0.4 | —               | mA   |
|                             | I <sub>OL</sub>  | —               | 1.6  | —               | mA   |
| S/H clock input pulse width | t <sub>H</sub> * | 15              | 20   | —               | ns   |
| A/D clock input pulse width | t <sub>H</sub> * | 35              | 40   | —               | ns   |

\* At f<sub>CLK</sub> = 16MHz

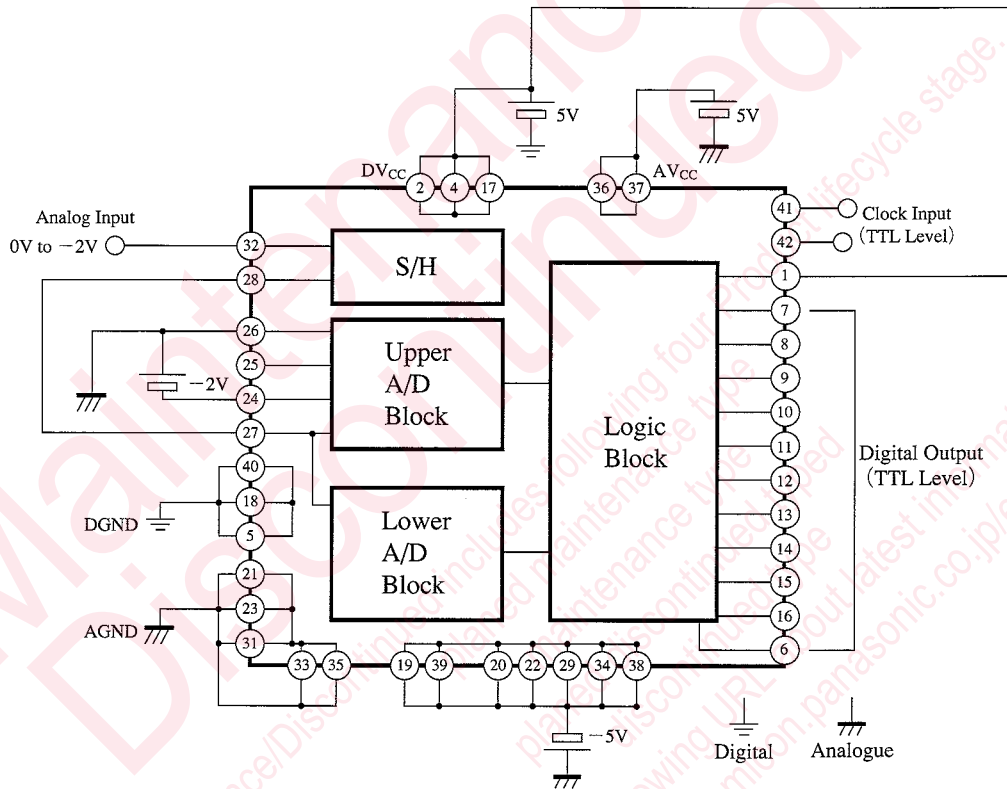
### Electrical Characteristics (V<sub>CC</sub>=5V, V<sub>EE</sub>=-5V, Ta=25°C)

| Parameter                    | Symbol           | Condition                                      | min  | typ  | max  | Unit |
|------------------------------|------------------|--|------|------|------|------|
| Supply current               | DI <sub>CC</sub> |  | —    | 5    | 10   | mA   |
|                              | AI <sub>CC</sub> |  | —    | 14   | 28   | mA   |
|                              | I <sub>EE</sub>  |  | -164 | -131 | —    | mA   |
| Reference resistor current   | I <sub>RT</sub>  | V <sub>RT</sub> =0V                            | 2.4  | 3    | 3.6  | mA   |
|                              | I <sub>RB</sub>  | V <sub>RB</sub> =-2V                           | -3.6 | -3   | -2.4 | mA   |
| Input bias current           | I <sub>IN</sub>  | V <sub>INSB</sub> =-1V                         | —    | 10   | 100  | μA   |
| Clock input current          | I <sub>IH</sub>  | V <sub>CLKAD</sub> =V <sub>CLKSH</sub> =2.7V   | —    | 1    | 8    | μA   |
|                              | I <sub>IL</sub>  | V <sub>CLKAD</sub> =V <sub>CLKSH</sub> =0.4V   | —    | 1    | 8    | μA   |
| Digital output voltage       | V <sub>OH</sub>  | I <sub>OB</sub> =-400 μA                       | 2.7  | 3.4  | —    | V    |
|                              | V <sub>OL</sub>  | I <sub>OL</sub> =1.6mA                         | —    | —    | 0.4  | V    |
| Linearity error              | E <sub>L</sub>   | V <sub>IN</sub> =2V <sub>PP</sub>              | —    | ±1   | —    | LSB  |
| Differential linearity error | E <sub>D</sub>   | V <sub>IN</sub> =2V <sub>PP</sub>              | —    | ±0.5 | ±1   | LSB  |
| Maximum conversion rate      | F <sub>C</sub>   | V <sub>IN</sub> =2V <sub>PP</sub>              | 20   | —    | —    | MSPS |
| Quantization noise           | S/N              | f <sub>CLK</sub> =16MHz, f <sub>IN</sub> =1MHz | —    | 53   | —    | dB   |
|                              |                  | f <sub>CLK</sub> =16MHz, f <sub>IN</sub> =8MHz | —    | 49   | —    | dB   |
|                              |                  | f <sub>CLK</sub> =20MHz, f <sub>IN</sub> =1MHz | —    | 52   | —    | dB   |
|                              |                  | f <sub>CLK</sub> =20MHz, f <sub>IN</sub> =8MHz | —    | 47   | —    | dB   |

■ Electrical Characteristics (cont.) ( $V_{CC}=5V$ ,  $V_{EE}=-5V$ ,  $T_a=25^\circ C$ )

| Parameter            | Symbol       | Condition   | min | typ | max | Unit |
|----------------------|--------------|---|-----|-----|-----|------|
| Differential gain    | DG           | IRE standard 15kHz Sawtooth 40% subcarrier $f_{CLK}=20MHz$ , Nolock | —   | 0.5 | 1   | %    |
| Differential phase   | DP           |   | —   | 0.5 | 1   | deg  |
| Digital output delay | $\tau_d$     |   | —   | 33  | —   | ns   |
| Clock delay          | $\tau_{CLK}$ | $f_{CLK}=16MHz$   | -5  | 0   | 5   | ns   |
| Input capacitance    | $C_{IN}$     |   | —   | 10  | —   | pF   |
| Input offset voltage | $V_{OFS}$    |   | —   | 0   | —   | V    |

■ Application Circuit



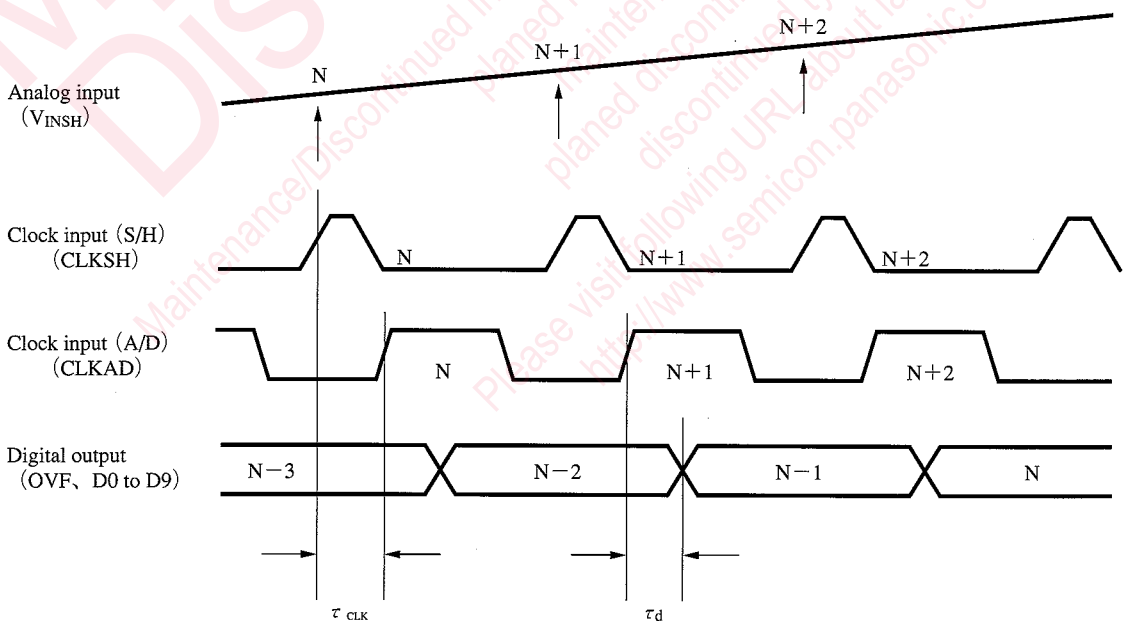
■ Pin Descriptions

| Pin No. | Symbol           | Description                     | Typ. waveform              | Voltage level    | Pin No.                        | Symbol            | Description                      | Typ. waveform              | Voltage level |
|---------|------------------|---------------------------------|----------------------------|------------------|--------------------------------|-------------------|----------------------------------|----------------------------|---------------|
| 1       | INV              | Digital output inversion pin    | —                          | TTL              | 22                             | AV <sub>EE</sub>  | Analog negative supply voltage   | —                          | -5V           |
| 2       | DV <sub>CC</sub> | Digital positive supply voltage | —                          | 5V               | 23                             | AGND              | Analog GND                       | —                          | 0V            |
| 3       | N.C.             | Non connection                  | —                          | —                | 24                             | V <sub>RB</sub>   | Reference voltage low level      | —                          | -2V           |
| 4       | DV <sub>CC</sub> | Digital positive supply voltage | —                          | 5V               | 25                             | V <sub>RM</sub>   | Reference voltage midpoint level | —                          | —             |
| 5       | DGND             | Digital GND                     | —                          | 0V               | 26                             | V <sub>RT</sub>   | Reference voltage high level     | —                          | 0V            |
| 6       | OVF              | Overflow pin                    | Refer to the timing chart. | TTL              | 27                             | V <sub>INAD</sub> | Analog input (A/D)               | ⌚                          | 0 to -2V      |
| 7       | D0               | Digital output (LSB)            |                            |                  | 28                             | V <sub>OSH</sub>  | Analog output (S/H)              | ⌚                          | 0 to -2V      |
| 8       | D1               | Digital output                  |                            |                  | 29                             | AV <sub>EE</sub>  | Analog negative supply voltage   | —                          | -5V           |
| 9       | D2               | Digital output                  |                            |                  | 30                             | NC                | Non connection                   | —                          | —             |
| 10      | D3               | Digital output                  |                            |                  | 31                             | AGND              | Analog GND                       | —                          | 0V            |
| 11      | D4               | Digital output                  |                            |                  | 32                             | V <sub>INSH</sub> | Analog input (S/H)               | ⌚                          | 0 to -2V      |
| 12      | D5               | Digital output                  |                            |                  | 33                             | AGND              | Analog GND                       | —                          | 0V            |
| 13      | D6               | Digital output                  |                            |                  | 34                             | AV <sub>EE</sub>  | Analog negative supply voltage   | —                          | -5V           |
| 14      | D7               | Digital output                  |                            |                  | 35                             | AGND              | Analog GND                       | —                          | 0V            |
| 15      | D8               | Digital output                  |                            |                  | 36                             | AV <sub>CC</sub>  | Analog positive supply voltage   | —                          | 5V            |
| 16      | D9               | Digital output (MSB)            | 37                         | AV <sub>CC</sub> | Analog positive supply voltage | —                 | 5V                               |                            |               |
| 17      | DV <sub>CC</sub> | Digital positive supply voltage | —                          | 5V               | 38                             | AV <sub>EE</sub>  | Analog negative supply voltage   | —                          | -5V           |
| 18      | DGND             | Digital GND                     | —                          | 0V               | 39                             | AV <sub>EE</sub>  | Analog negative supply voltage   | —                          | -5V           |
| 19      | AV <sub>EE</sub> | Analog negative supply voltage  | —                          | -5V              | 40                             | DGND              | Digital GND                      | —                          | 0V            |
| 20      | AV <sub>EE</sub> | Analog negative supply voltage  | —                          | -5V              | 41                             | CLKSH             | Clock input (S/H)                | Refer to the timing chart. | TTL           |
| 21      | AGND             | Analog GND                      | —                          | 0V               | 42                             | CLKAD             | Clock input (A/D)                |                            |               |

ICs for TV

■ Supplementary Explanation

• Timing Chart



■ Supplementary Explanation (cont.)

• Output Code

| Step | Input signal             | Digital output |   |
|------|--------------------------|----------------|---|
|      | 2.000VFS<br>1.953mV STEP | OVFM           | L |
|      |                          | 0123456789     |   |
|      | INV = "H"                |                |   |
| 000  | -0.000000                | 0000000000     |   |
| 001  | -0.001953                | 0000000001     |   |
| .    | .                        | .              |   |
| .    | .                        | .              |   |
| 511  | -0.998047                | 0011111111     |   |
| 512  | -1.000000                | 0100000000     |   |
| 513  | -1.001953                | 0100000001     |   |
| .    | .                        | .              |   |
| .    | .                        | .              |   |
| 1023 | -1.998047                | 0111111111     |   |
| 1024 | -2.000000                | 1111111111     |   |

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