

AN8019K, AN8019S

DC-DC Converter IC Incorporated Transmitting/Receiving Circuit for HBS

Overview

The AN8019K/S incorporates the transmitting/receiving circuit complying with the HBS standards.

Since the highly precise DC-DC converter is built in it, the unstable power supply in the bus line can be easily stabilized. Also, it incorporates the reset output circuit, which generates the system reset signal.

It is suitable for the interface unit with bus line of the wide range of equipment such as that related to telephone, air conditioner or home security.

Features

[DC-DC block]

- Highly-precise output voltage ($5V \pm 5\%$)
- Built-in error amplifier for overcurrent detection
- Circuit preventing malfunction at low input
- Dead time control/Soft start

[Reset output block]

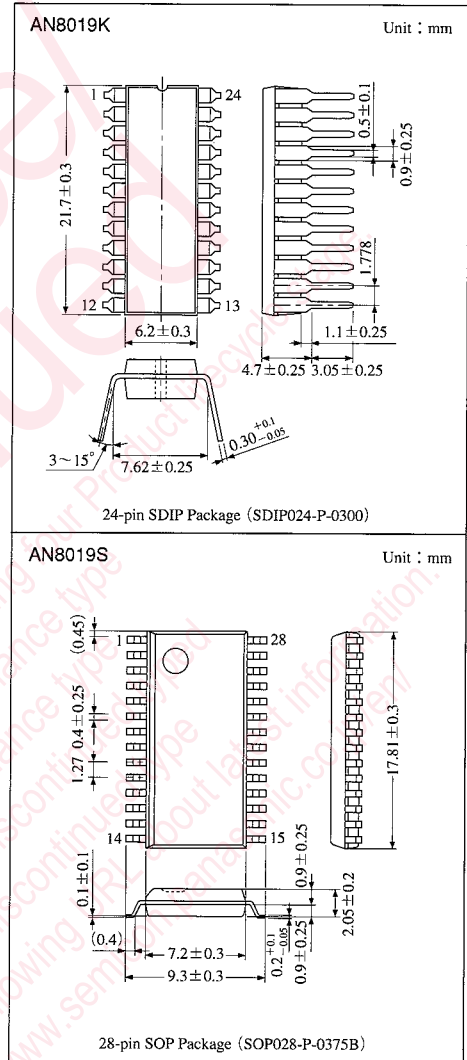
- Detection voltage ($4.2 \pm 0.25V$)
- Hysteresis width (200mV typ.)

[AMI transmitting/receiving block]

- Complying with HBS standards
- Twist pair, co-axial switching allowed

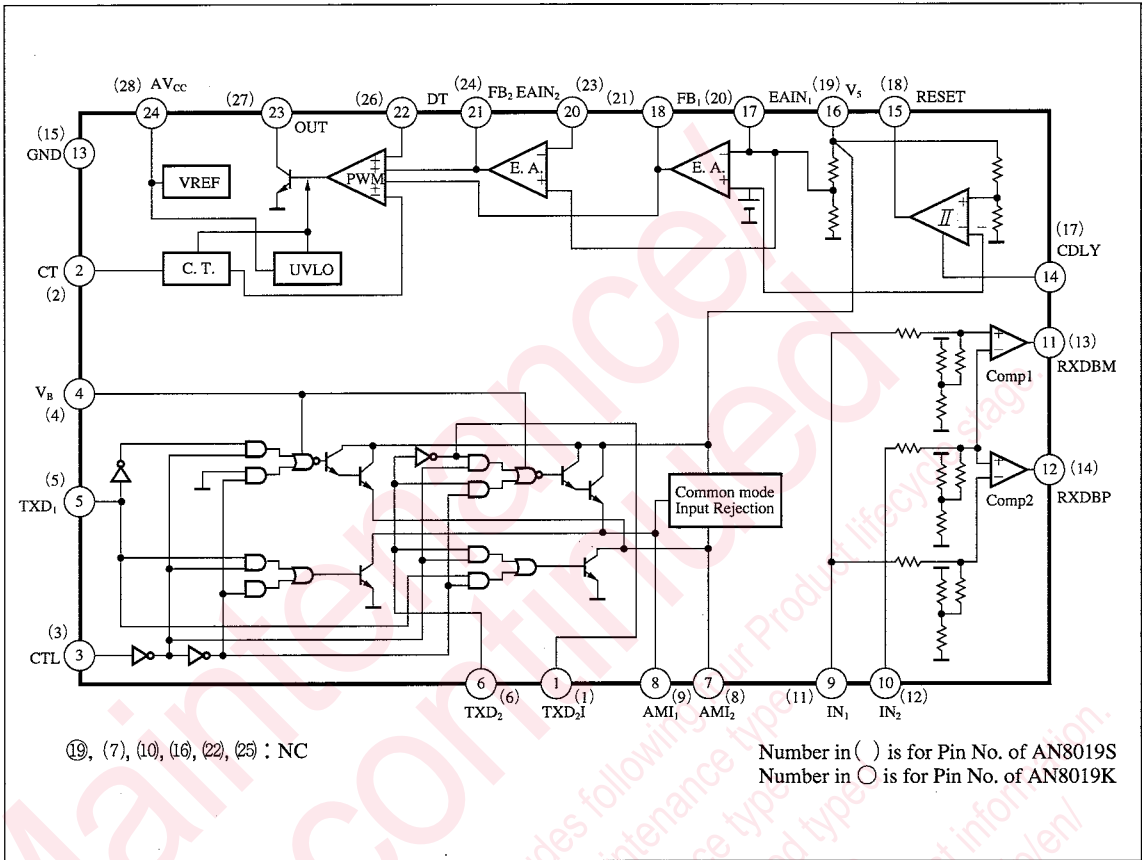
[Others]

- Package of DIL/SO type available



Voltage
Regu-
lators

■ Block Diagram



■ Absolute Maximum Ratings (Ta=25°C)

| Parameter | Symbol | Rating | Unit |
|-------------------------------|----------------------------------|----------------|------|
| Supply voltage | AV _{CC} /V ₅ | 36/6 | V |
| Supply current | I _{CC} /I _S | 20/100 | mA |
| Power dissipation | AN8019K | P _D | 600 |
| | AN8019S | | 532 |
| Operating ambient temperature | T _{opr} | -20 to +75 | °C |
| Storage temperature | T _{stg} | -55 to +150 | °C |

* The power dissipation specified for the AN8019S is a value when the IC is mounted on the glass epoxy board (50×50×0.8mm).

■ Recommended Operating Range (Ta=25°C)

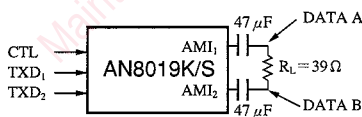
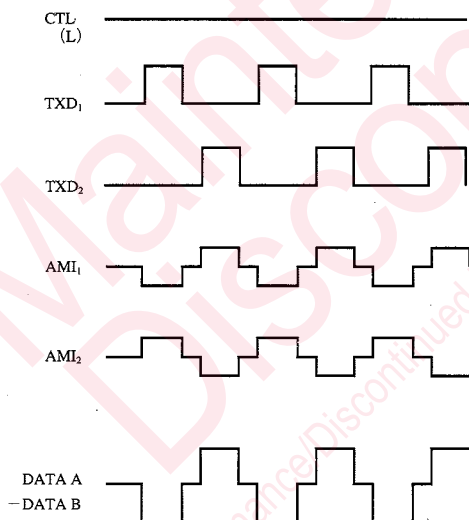
| Parameter | Symbol | Range |
|--------------------------|------------------|--------------|
| Operating supply voltage | AV _{CC} | 10V to 35.5V |
| Operating supply voltage | V ₅ | 4.5V to 5.5V |

■ Electrical Characteristics ($V_{CC}=20V, T_a=25^{\circ}C$)

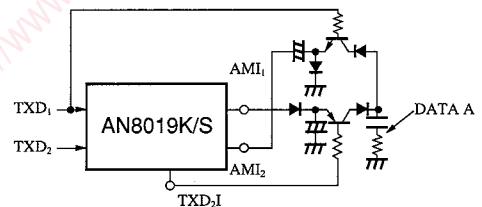
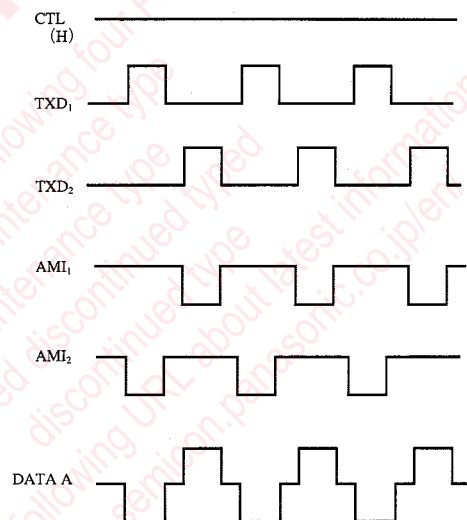
| Parameter | Symbol | Condition | min | typ | max | Unit |
|--|------------------|------------------------|------|-----|------|-----------|
| Output voltage | V_O | | 4.75 | 5 | 5.25 | V |
| Triangular oscillation frequency | f_{OSC} | $CT=330pF$ | 60 | 80 | 100 | kHz |
| Maximum duty ratio | D_{max} | $CT=330pF$ | 85 | — | — | % |
| PWM output voltage | V_{OUT} | $I_O=30mA$ | — | — | 1.2 | V |
| Reset threshold voltage | V_{SEN} | | 3.95 | 4.2 | 4.45 | V |
| Reset hysteresis voltage | ΔV_{SEN} | | 100 | 200 | 300 | mV |
| Reset output voltage | V_{RESET} | $I_{RESET}=1mA$ | — | — | 0.5 | V |
| AMI output voltage L | V_{OL} | $R_L=39\Omega, V_B=5V$ | — | — | 0.5 | V |
| AMI output voltage H | V_{OH} | $R_L=39\Omega, V_B=5V$ | 2.5 | — | — | V |
| OFF output impedance | Z_{OUT} | | 40 | 60 | — | $k\Omega$ |
| Reception sensitivity of receiving block | V_{RS} | | 0.6 | 1 | 1.4 | V |
| OFF input impedance | Z_{IN} | | 33 | 50 | — | $k\Omega$ |
| Delay time for transmission/reception | T_{dly} | | — | 1 | 2 | μs |

■ Timing Chart

Timing chart of twist pair specifications

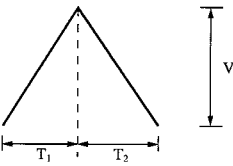


Timing chart of co-axial specifications



Voltage Regulators

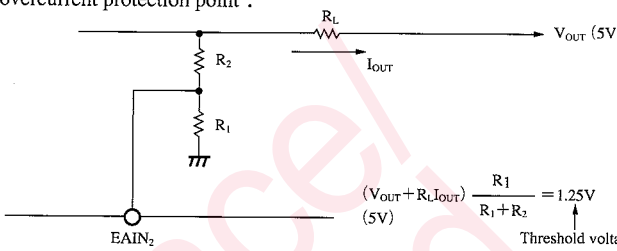
Pin Descriptions

| Pin No. | Symbol | Terminal description |
|----------------------------------|--------------------|--|
| 1 (1) | TXD ₂ I | <ul style="list-style-type: none"> Terminal outputting the reverse signal of the microcomputer-transmission output signal (TXD₂). The application of co-axial cables only used (Open for AMI) |
| 2 (2) | CT | <ul style="list-style-type: none"> Triangular oscillation capacitor terminal  $T_1 = \frac{CV}{I_c \text{ (Charging current)}} \quad T_2 = \frac{CV}{I_d \text{ (Discharging current)}}$ <p>Oscillation frequency</p> $f = \frac{1}{T_1 + T_2} = \frac{I_c \cdot I_d}{CV(I_c + I_d)} \text{ [Hz]}$ <p>Normally, $\left. \begin{array}{l} V=0.63V \\ I_c=35 \mu A \\ I_d=32 \mu A \end{array} \right\}$ When $C=330pF, f=80kHz$</p> |
| 3 (3) | CTL | <ul style="list-style-type: none"> Control (twist pair, co-axial switching) terminal "L" for twist pair, "H" for co-axial switching |
| 4 (4) | V _B | <ul style="list-style-type: none"> Bias terminal (For amplification of AMI amplitude) By applying V_B=7V, AMI amplitude of 3.5V (R_L=100Ω) is realized. <HBS standards : 2.5V (R_L=39Ω) > V_B and V5 are shorted when it is used under the ordinal HBS standards. |
| 5 (5) | TXD ₁ | <ul style="list-style-type: none"> Microcomputer-transmitted signal inputting terminal |
| 6 (6) | TXD ₂ | <ul style="list-style-type: none"> Terminal inputting the signal transmitted from microcomputer |
| 7 (8) | AMI ₂ | <ul style="list-style-type: none"> *AMI signal output terminal : Terminal outputting the AMI signal to bus line |
| 8 (9) | AMI ₁ | |
| 9 (11) | IN ₁ | <ul style="list-style-type: none"> Reception comparator inputting terminal Terminal inputting the signal from bus line |
| 10 (12) | IN ₂ | |
| 11 (13) | RXDBM | <ul style="list-style-type: none"> Reception comparator output terminal Terminal transmitting the output of reception comparator to microcomputer |
| 12 (14) | RXDBP | |
| 13 (15) | GND | <ul style="list-style-type: none"> Ground terminal |
| 14 (17) | CDLY | <ul style="list-style-type: none"> Capacitance terminal for reset delay The capacitive connector terminal inserts the delay time (T_d) since the reset signal is outputted after the microcomputer system is stabilized. $T_d = \frac{CV}{I_c \text{ (Charging current)}} \text{ [ms]}$ <p>Normally, $\left. \begin{array}{l} V=0.7V \\ I_c=7 \mu A \end{array} \right\}$ When $C=0.1 \mu F, T_d=10ms$</p> |
| 15 (18) | RESET | <ul style="list-style-type: none"> Reset signal outputting terminal It outputs the following signal to microcomputer : "H" when V5 is 4.2V or more, and "L" when V5 is 4.0V or less. Hysteresis width : 0.2V, Open collector output type |
| 16 (19) | V ₅ | <ul style="list-style-type: none"> 5V inputting terminal The supply voltage input of AMI transmission/reception circuit block (4.5 to 5.5V) It uses the output of DC-DC converter (5±0.25V) or external power supply. At the same time, it also functions as the reset detection input terminal of the microcomputer reset circuit. |
| 17 (20) | EAIN ₁ | <ul style="list-style-type: none"> Input terminal of error amplifier <p>Threshold voltage : 1.25V</p> |
| 18 (21) | FB ₁ | <ul style="list-style-type: none"> Output terminal of error amplifier |
| 19 (7) (10) (16) (22) (25) | NC | |

Number in () is a pin number for the AN8019S (Surface-mount type)

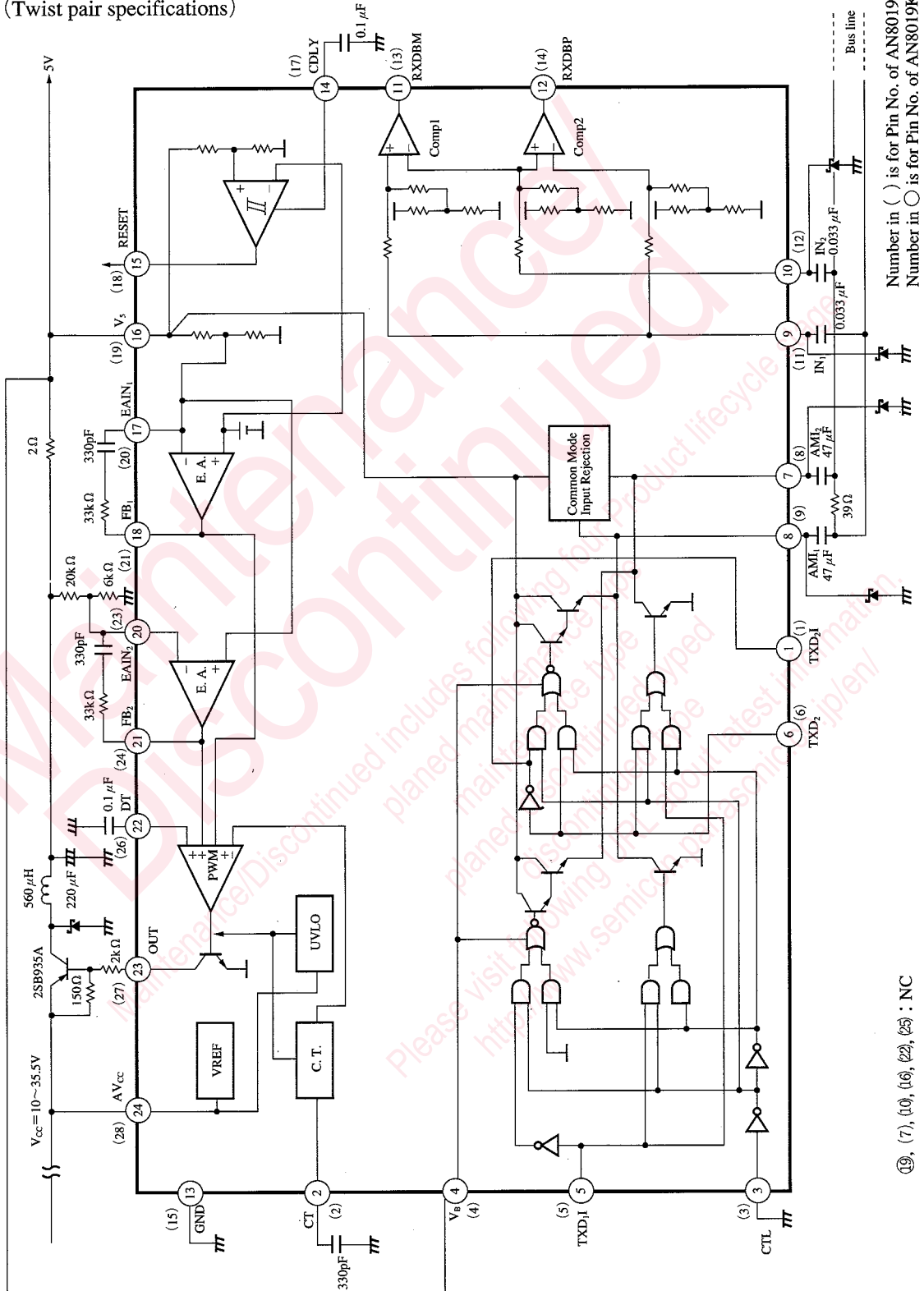
*AMI Digital signal transmission waveform with three values of zero, plus and minus

■ Pin Descriptions (cont.)

| Pin No. | Symbol | Terminal description |
|---------|-------------------|--|
| 20 (23) | EAIN ₂ | <ul style="list-style-type: none"> Input terminal of error amplifier for overcurrent detection Setting the overcurrent protection point :  <p>For $V_{OUT}=5V$ } $I_{OUT}(\text{max.})=200\text{mA}$ $R_L=2\Omega$ } $R_1=6k\Omega$ $R_2=20k\Omega$</p> <p>$(V_{OUT} + R_L I_{OUT}) \frac{R_1}{R_1 + R_2} = 1.25V$ (5V) Threshold voltage</p> |
| 21 (24) | FB ₂ | Output terminal of error amplifier for overcurrent detection |
| 22 (26) | DT | <ul style="list-style-type: none"> Dead time control terminal It sets the maximum duty ratio to 90% (typ.). By the external capacitance the soft start of SW power supply block can be realized. |
| 23 (27) | OUT | <ul style="list-style-type: none"> Switching output terminal Output current $I_{OUT}=30\text{mA}$ (max.) |
| 24 (28) | AV _{CC} | <ul style="list-style-type: none"> Supply voltage input voltage Operating supply voltage range: 10 to 35.5V |

Number in () is a pin number for the AN8019S (surface mount type)

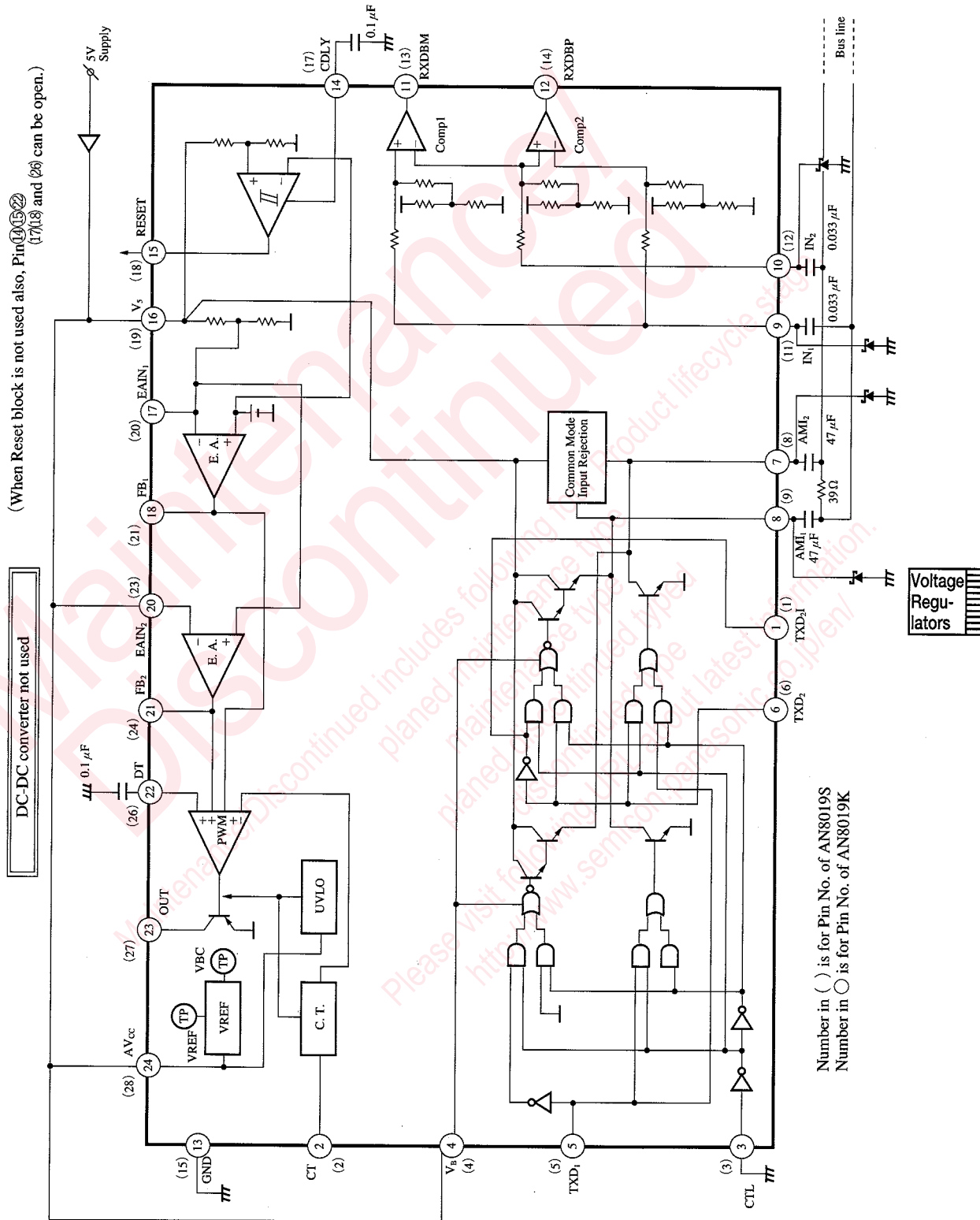
Application Circuit 1
(Twist pair specifications)



Number in () is for Pin No. of AN8019S
Number in ○ is for Pin No. of AN8019K

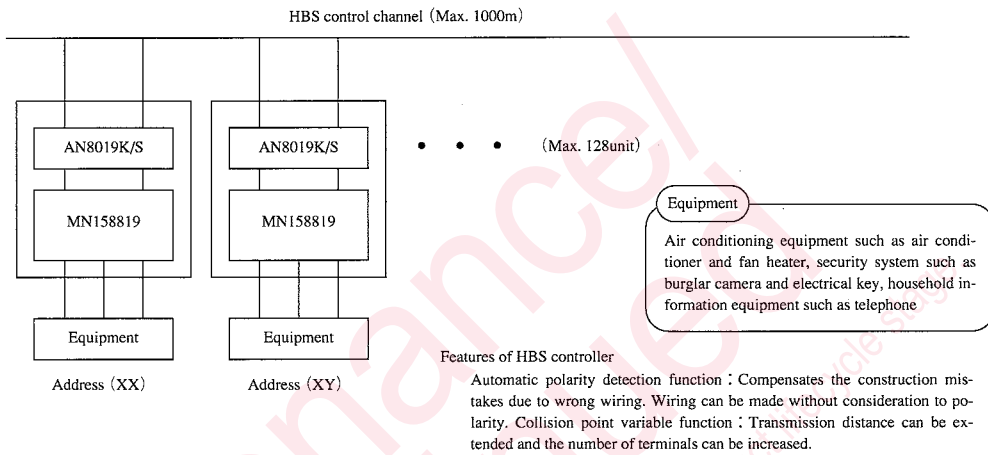
⑩, (7), (10), (16), (22), (25) : NC

Application Circuit 2
(Twist pair specifications)

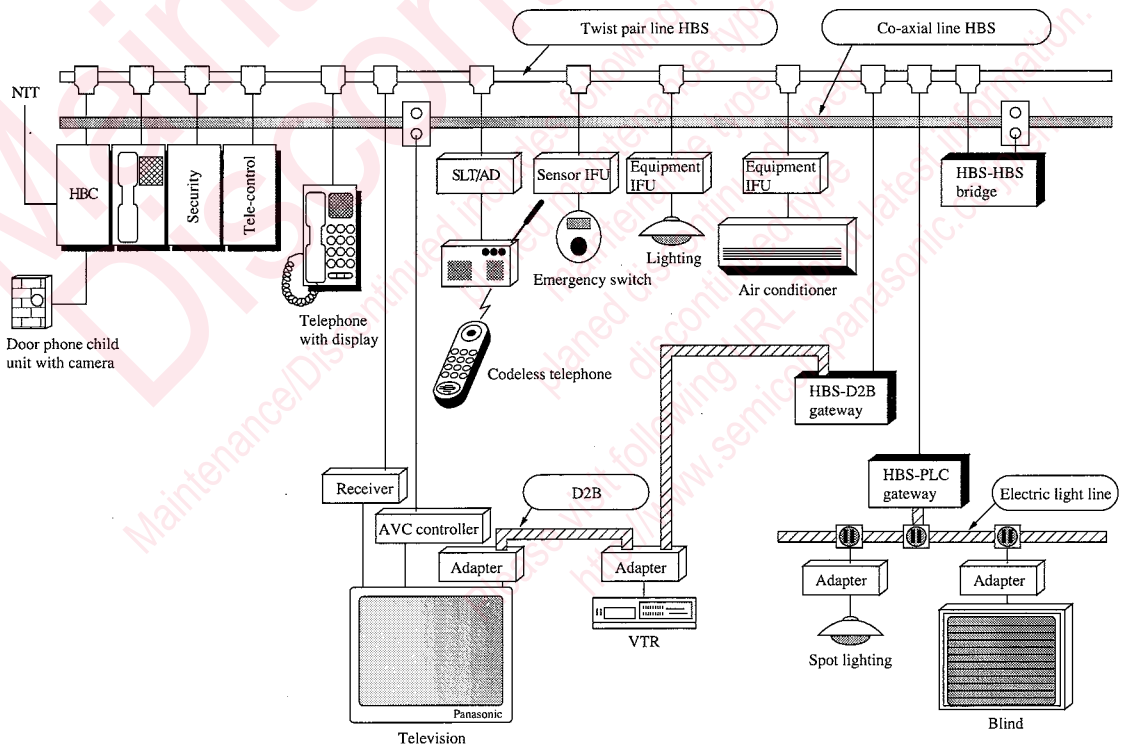


■ For Reference

Equipment construction with the MN158819 and AN8019K/S



HBS system



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