

# HBS-Compatible Driver and Receiver Monolithic IC MM1192

## Outline

This IC conforms to the HBS (Home Bus) specification, and has functions for reception and transmission of data. AMI is adopted for the waveforms of signals handled by the transmission and reception units, designed for connection to twisted-pair lines.

The IC can be driven by a single 5V power supply, and incorporates an output transistor to reduce external components.

It connects a wide range of equipment such as telephone equipment, security devices, audio or video equipment, and air-conditioning equipment to a bus line to enable mutual communication between equipment.

## Features

1. Space saving
2. High reliability
3. Replaces pulse transformers
4. Enables to drive with a single 5V power supply
5. Low cost
6. Easy circuit design
7. Few external components

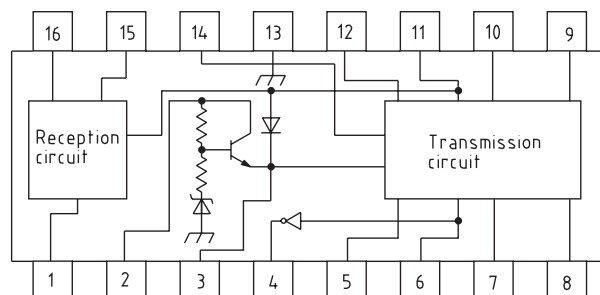
## Applications

1. Telephone equipment
2. Security devices
3. Audio and video equipment
4. Air-conditioning equipment
5. A wide range of other equipment and devices

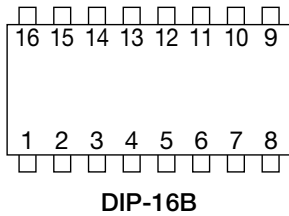
## Package

DIP-16B (MM1192XD)

## Block Diagram



Pin Assignment



|   |                     |    |                 |
|---|---------------------|----|-----------------|
| 1 | Reception DATA OUT  | 9  | OUT (A)         |
| 2 | V <sub>IN</sub>     | 10 | OUT (B)         |
| 3 | Boost capacitor pin | 11 | V <sub>CC</sub> |
| 4 | Boost capacitor pin | 12 | COLLECTOR (b)   |
| 5 | RESET               | 13 | GND             |
| 6 | DATA IN             | 14 | COLLECTOR (a)   |
| 7 | out (b)             | 15 | IN (2)          |
| 8 | out (a)             | 16 | IN (1)          |

Absolute Maximum Ratings (Ta=25°C)

| Item                                   | Symbol               | Ratings   | Units |
|--|----------------------|-----------|-------|
| Storage temperature                    | T <sub>STG</sub>     | -40~+125  | °C    |
| Operating temperature                  | T <sub>OPR</sub>     | -20~+70   | °C    |
| Power supply voltage                   | V <sub>CC</sub> max. | -0.3~+7   | V     |
| Operating power supply voltage         | V <sub>CCOP</sub>    | 4.5~5.5   | V     |
| Allowable loss                         | P <sub>d</sub>       | 450       | mW    |
| Recommended power supply voltage range | V <sub>CCOP2</sub>   | 4.75~5.25 | V     |
| Bias voltage range (V <sub>IN</sub> )  | V <sub>INOP</sub>    | 8.0~40    | V     |

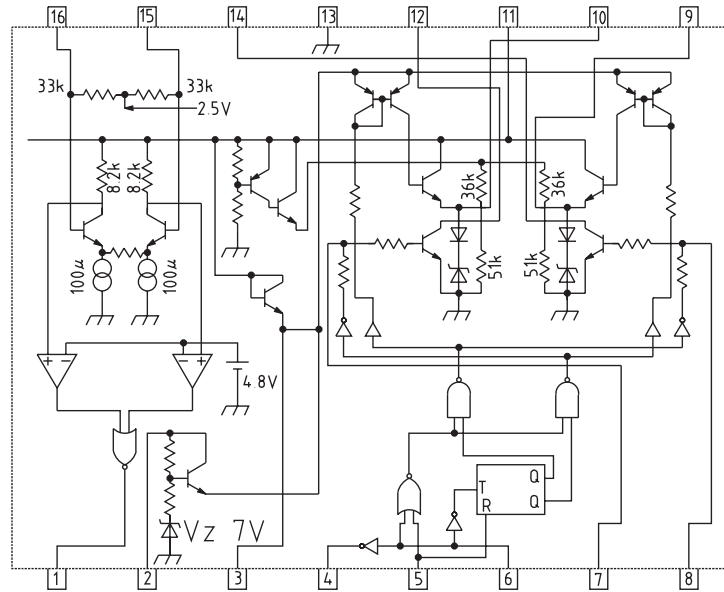
Electrical Characteristics (Except where noted otherwise, Ta=25°C, V<sub>CC</sub>=5V, F<sub>transmit</sub>=10kHz (DUTY=50%) R<sub>L</sub>=36Ω)

| Item                  | Symbol                         | Measurement conditions | Min.                                   | Typ. | Max. | Units |      |                  |
|-----------------------|--------------------------------|------------------------|--|------|------|-------|------|------------------|
| Transmission Circuits | Power supply current 1         | ICCO                   | No signal (5PIN="H")                   |      | 8    | 13    | mA   |                  |
|                       | Power supply current 2         | ICCON                  | In transmission FL=10kHz, RL=36Ω       |      | 75   | 90    | mA   |                  |
|                       | Transmission output voltage    | V <sub>TO</sub>        | Both pins 9 and 10                     |      | 3.8  | 4.2   | 4.6  | V <sub>P-P</sub> |
|                       | Transmission waveform symmetry | V <sub>TR</sub>        | V <sub>TO1</sub> /V <sub>TO2</sub>     |      | 0.75 | 1.0   | 1.25 |                  |
|                       | Reception sensitivity          | V <sub>RS</sub>        |  |      | 0.65 | 0.75  | 0.85 | V <sub>P-P</sub> |
|                       | Noise resistance               | V <sub>RN</sub>        | Level at which no errors are output    |      | 0.55 |       |      | V <sub>P-P</sub> |
|                       | Input impedance                | R <sub>IN</sub>        | Both pins 15 and 16                    |      | 25   | 36    | 46   | kΩ               |
|                       | Transmission delay time 1      | T <sub>d1</sub>        | cf. transmit/receive waveform diagrams |      |      | 0.4   |      | μs               |
|                       | Transmission delay time 2      | T <sub>d2</sub>        | cf. transmit/receive waveform diagrams |      |      | 0.5   |      | μs               |
|                       | Transmission delay time 3      | T <sub>d3</sub>        | cf. transmit/receive waveform diagrams |      |      | 1.0   |      | μs               |
|                       | Transmission delay time 4      | T <sub>d4</sub>        | cf. transmit/receive waveform diagrams |      |      | 1.2   |      | μs               |
|                       | Reception output H voltage     | V <sub>ROH</sub>       |  |      | 4.5  |       |      | V                |
|                       | Reception output L voltage     | V <sub>ROL</sub>       |  |      |      |       | 0.5  | V                |
|                       | Transmission waveform LOSS 1   | V <sub>TLS1</sub>      | V <sub>T</sub> =5V applied, power on   |      | 4.5  |       |      | V                |
|                       | Transmission waveform LOSS 2   | V <sub>TLS2</sub>      | V <sub>T</sub> =5V applied, power off  |      | 4.5  |       |      | V                |
| Input/Output          | H level input voltage          | V <sub>LH</sub>        |  |      | 2.4  |       |      | V                |
|                       | L level input voltage          | V <sub>LIL</sub>       |  |      |      |       | 0.6  | V                |
|                       | H level input current          | I <sub>LH</sub>        | V <sub>DATA IN</sub> =2.4V             |      |      |       | 10   | μA               |
|                       | L level input current          | I <sub>LIL</sub>       | V <sub>DATA IN</sub> =0.4V             |      |      |       | -300 | μA               |
|                       | Bootstrap output H voltage     | V <sub>BR</sub>        |  |      | 7.5  | 8.0   |      | V                |

When a negative voltage is applied to pins 7, 8, 9 and 10, there should be no abnormal operation of internal circuits between 0 and 6V. However, if a negative voltage exceeding -6V is applied, thyristor operation may result, so it is recommended that an external clamping diode be added.

In addition, no measures have been taken for a negative voltage at pins 12 and 14. Hence if a negative voltage is applied to pins 12 and 14, the internal transistor should not be used.

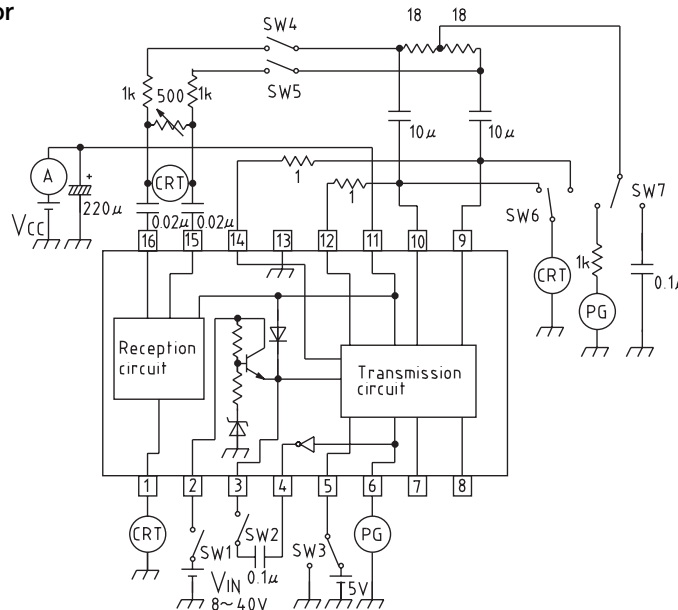
### Circuit Diagram



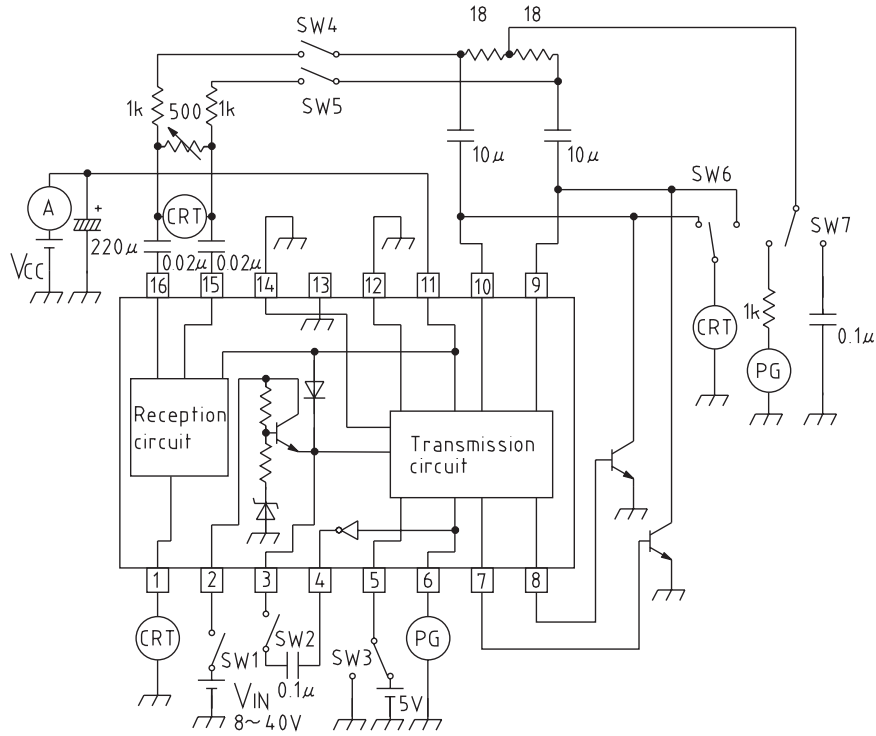
- Note 1: The peripheral components in the block diagram are the constants for  $F_{transmit}=10\text{kHz}$ . If the frequency is low, larger values should be chosen for the coupling capacitors between the receive and transmit pins and the bus line and for the capacitor connecting pins 3 and 4.
- Note 2: A block diagram is shown for an example application in which an external transistor is used; but depending on system conditions the internal transistor may be used, and no external transistor is needed. In such cases pins 7 and 8 are left open, a  $1\Omega$  resistance is inserted between pins 10 and 12, and a  $1\Omega$  resistance is inserted between pins 9 and 14.
- When the load resistance ( $36\Omega$ ) is to be varied during use, these resistances ( $1\Omega$ ) should be changed according to the load resistance. If these resistances are omitted, oscillation may occur at low temperature.
- \* This prevents abnormal operation of internal circuits within the range  $0 - -6\text{V}$  when negative voltage is impressed on pins 7, 8, 9 and 10. However, thyristor operation may start when negative voltage over  $-6\text{V}$  is impressed, so we recommend an external clamp diode.

### Measuring Circuit

#### 1. No external transistor



2. With external transistor



Timing Chart

