

## 82C86H

CMOS Octal Bus Transceiver

**NOT RECOMMENDED FOR NEW DESIGNS**  
**NO RECOMMENDED REPLACEMENT**  
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FN2977  
 Rev 2.00  
 June 2004

### Features

- Full Eight Bit Bi-Directional Bus Interface
- Industry Standard 8286 Compatible Pinout
- High Drive Capability
  - B Side  $I_{OL}$  ..... 20mA
  - A Side  $I_{OL}$  ..... 12mA
- Three-State Outputs
- Propagation Delay ..... 35ns Max.
- Gated Inputs
  - Reduce Operating Power
  - Eliminate the Need for Pull-Up Resistors
- Single 5V Power Supply
- Low Power Operation..... ICCSB = 10 $\mu$ A
- Operating Temperature Range
  - ID82C86H ..... -40°C to +85°C

### Description

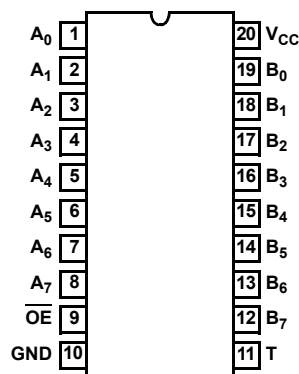
The Intersil 82C86H is a high performance CMOS Octal Transceiver manufactured using a self-aligned silicon gate CMOS process (Scaled SAJI IV). The 82C86H provides a full eight-bit bi-directional bus interface in a 20 lead package. The Transmit (T) control determines the data direction. The active low output enable ( $\overline{OE}$ ) permits simple interface to the 80C86, 80C88 and other microprocessors. The 82C86H has gated inputs, eliminating the need for pull-up/pull-down resistors and reducing overall system operating power dissipation.

### Ordering Information

| PART NUMBER | PACKAGE      | TEMP. RANGE    | PKG DWG. # |
|-------------|--------------|----------------|------------|
| 8MHz        |              |                |            |
| ID82C86H    | 20 Ld CERDIP | -40°C to +85°C | F20.3      |

### Pinout

82C86H (CERDIP)  
 TOP VIEW



TRUTH TABLE

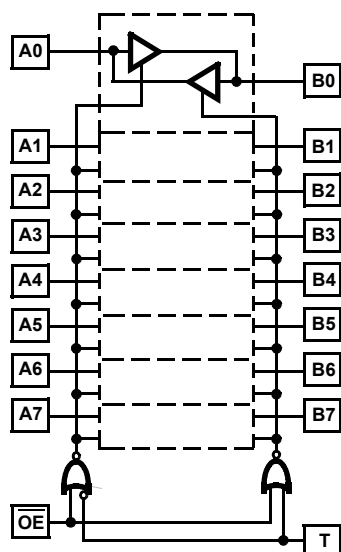
| T | OE | A    | B    |
|---|----|------|------|
| X | H  | Hi-Z | Hi-Z |
| H | L  | I    | O    |
| L | L  | O    | I    |

H = Logic One  
 L = Logic Zero  
 I = Input Mode  
 O = Output Mode  
 X = Don't Care  
 Hi-Z = High Impedance

PIN NAMES

| PIN                            | DESCRIPTION              |
|--------------------------------|--------------------------|
| A <sub>0</sub> -A <sub>7</sub> | Local Bus Data I/O Pins  |
| B <sub>0</sub> -B <sub>7</sub> | System Bus Data I/O Pins |
| T                              | Transmit Control Input   |
| OE                             | Active Low Output Enable |

## Functional Diagram



## Gated Inputs

During normal system operation of a latch, signals on the bus at the device inputs will become high impedance or make transitions unrelated to the operation of the latch. These unrelated input transitions switch the input circuitry and typically cause an increase in power dissipation in CMOS devices by creating a low resistance path between  $V_{CC}$  and GND when the signal is at or near the input switching threshold. Additionally, if the driving signal becomes high impedance ("float" condition), it could create an indeterminate logic state at the inputs and cause a disruption in device operation.

The Intersil 82C8X series of bus drivers eliminates these conditions by turning off data inputs when data is latched (STB = logic zero for the 82C82/83H) and when the device is disabled ( $\overline{OE}$  = logic one for the 82C86H/87H). These gated inputs disconnect the input circuitry from the  $V_{CC}$  and ground power supply pins by turning off the upper P-channel and lower N-channel (See Figures 1 and 2). No current flow from  $V_{CC}$  to GND occurs during input transitions and invalid logic states from floating inputs are not transmitted. The next stage is held to a valid logic level internal to the device.

D.C. input voltage levels can also cause an increase in ICC if these input levels approach the minimum  $V_{IH}$  or maximum  $V_{IL}$  conditions. This is due to the operation of the input circuitry in its linear operating region (partially conducting state). The 82C8X series gated inputs mean that this condition will occur only during the time the device is in the transparent mode (STB = logic one). ICC remains below the maximum ICC standby specification of  $10\mu A$  during the time inputs are disabled, thereby greatly reducing the average power dissipation of the 82C8X series devices.

## Decoupling Capacitors

The transient current required to charge and discharge the 300pF load capacitance specified in the 82C86H/87H data sheet is determined by:

$$I = C_L (dv/dt) \quad (\text{EQ. 1})$$

Assuming that all outputs change state at the same time and that  $dv/dt$  is constant;

$$I = C_L \frac{(V_{CC} \times 80\%)}{tR/tF} \quad (\text{EQ. 2})$$

where  $tR = 20\text{ns}$ ,  $V_{CC} = 5.0\text{V}$ ,  $C_L = 300\text{pF}$  on each eight outputs.

$$I = (80 \times 300 \times 10^{-12}) \times (5.0\text{V} \times 0.8) / (20 \times 10^{-9}) \quad (\text{EQ. 3})$$

$$= 480\text{mA}$$

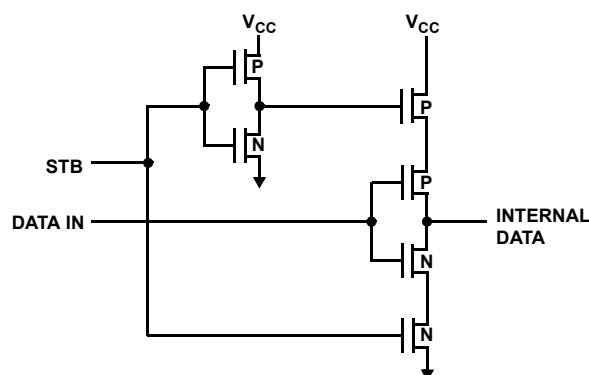


FIGURE 1. 82C82/83H

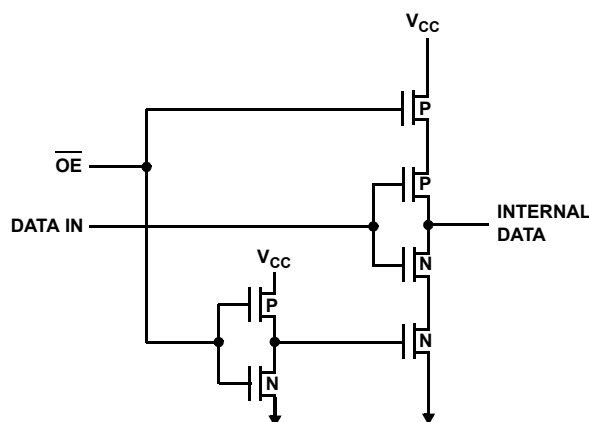


FIGURE 2. 82C86H/87H GATED INPUTS

This current spike may cause a large negative voltage spike on  $V_{CC}$  which could cause improper operation of the device. To filter out this noise, it is recommended that a  $0.1\mu F$  ceramic disc capacitor be placed between  $V_{CC}$  and GND at each device, with placement being as near to the device as possible.

**Absolute Maximum Ratings**

Supply Voltage . . . . . +8.0V  
 Input, Output or I/O Voltage . . . . . GND -0.5V to  $V_{CC} + 0.5V$   
 ESD Classification . . . . . Class 1

**Operating Conditions**

Operating Voltage Range . . . . . +4.5V to +5.5V  
 Operating Temperature Range . . . . . -40°C to +85°C

**Thermal Information**

Thermal Resistance (Typical)  $\theta_{JA}$  (°C/W)  $\theta_{JC}$  (°C/W)  
 CERDIP Package . . . . . 70 16  
 Maximum Storage Temperature Range . . . . . -65°C to +150°C  
 Maximum Junction Temperature . . . . . +175°C  
 Maximum Lead Temperature (Soldering 10s) . . . . . +300°C

**Die Characteristics**

Gate Count . . . . . 265 Gates

**CAUTION:** Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

**DC Electrical Specifications**  $V_{CC} = 5.0V \pm 10\%$ ;  $T_A = -40^\circ\text{C}$  to  $+85^\circ\text{C}$ 

| SYMBOL   | PARAMETER                      | MIN            | MAX  | UNITS         | TEST CONDITIONS                                                                                    |
|----------|--------------------------------|----------------|------|---------------|----------------------------------------------------------------------------------------------------|
| $V_{IH}$ | Logical One                    | 2.0            | -    | V             | C82C86H, I82C86H                                                                                   |
|          | Input Voltage                  | 2.2            |      | V             | M82C86H (Note 1)                                                                                   |
| $V_{IL}$ | Logical Zero Input Voltage     | -              | 0.8  | V             |                                                                                                    |
| $V_{OH}$ | Logical One Output Voltage     |                |      |               |                                                                                                    |
|          | B Outputs                      | 3.0            |      | V             | $I_{OH} = -8\text{mA}$                                                                             |
|          | A Outputs                      | 3.0            |      | V             | $I_{OH} = -4\text{mA}$                                                                             |
|          | A or B Outputs                 | $V_{CC} - 0.4$ |      | V             | $I_{OH} = -100\mu\text{A}$                                                                         |
| $V_{OL}$ | Logical Zero Output Voltage    |                |      |               |                                                                                                    |
|          | B Outputs                      |                | 0.45 | V             | $I_{OL} = 20\text{mA}$                                                                             |
|          | A Outputs                      |                | 0.45 | V             | $I_{OL} = 12\text{mA}$                                                                             |
| $I_I$    | Input Leakage Current          | -10.0          | 10.0 | $\mu\text{A}$ | $V_{IN} = \text{GND or } V_{CC}$ DIP Pins 9, 11                                                    |
| $I_O$    | Output Leakage Current         | -10.0          | 10.0 | $\mu\text{A}$ | $V_O = \text{GND or } V_{CC}$ , $\overline{OE} \nlessgtr V_{CC} - 0.5V$<br>DIP Pins 1 - 8, 12 - 19 |
| ICCSB    | Standby Power Supply Current   | -              | 10   | $\mu\text{A}$ | $V_{IN} = V_{CC}$ or GND, $V_{CC} = 5.5V$ , Outputs Open                                           |
| ICCOP    | Operating Power Supply Current | -              | 1    | mA/MHz        | $T_A = +25^\circ\text{C}$ , Typical (See Note 2)                                                   |

**NOTES:**

- $V_{IH}$  is measured by applying a pulse of magnitude =  $V_{IH(MIN)}$  to one data input at a time and checking the corresponding device output for a valid logical "1" during valid input high time. Control pins ( $\overline{T}$ ,  $\overline{OE}$ ) are tested separately with all device data input pins at  $V_{CC} - 0.4$
- Typical ICCOP = 1mA/MHz of read/ cycle time. (Example: 1.0 $\mu\text{s}$  read/write cycle time = 1mA).

**Capacitance**  $T_A = +25^\circ\text{C}$ 

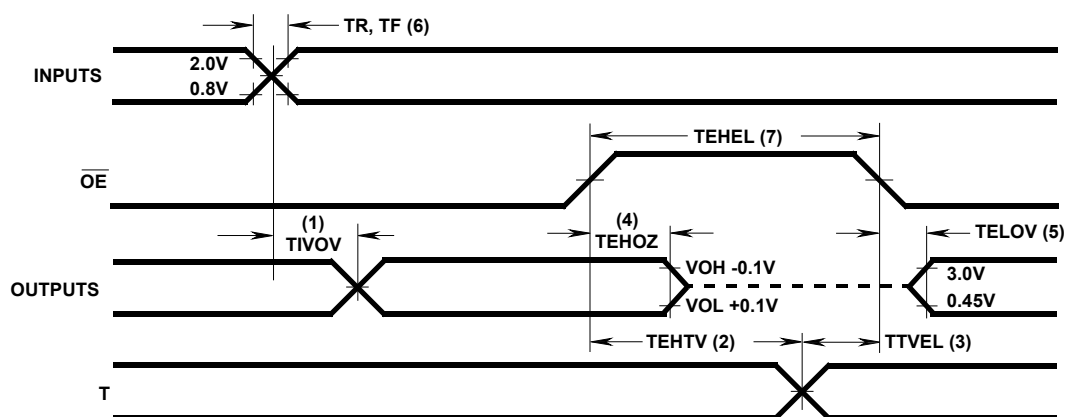
| SYMBOL | PARAMETER         | TYPICAL | UNITS | TEST CONDITIONS                                            |
|--------|-------------------|---------|-------|------------------------------------------------------------|
| CIN    | Input Capacitance |         |       | Freq = 1MHz, all measurements are referenced to device GND |
|        | B Inputs          | 18      | pF    |                                                            |
|        | A Inputs          | 14      | pF    |                                                            |

**AC Electrical Specifications**  $V_{CC} = 5.0V \pm 10\%$ ; Freq = 1MHz;  $T_A = -40^{\circ}C$  to  $+85^{\circ}C$ 

| SYMBOL     | PARAMETER                       | MIN | MAX | UNITS | TEST CONDITIONS |
|------------|---------------------------------|-----|-----|-------|-----------------|
| (1) TIVOV  | Input to Output Delay           |     |     |       | Notes 1, 2      |
|            | Inverting                       | 5   | 30  | ns    |                 |
|            | Non-Inverting                   | 5   | 32  | ns    |                 |
| (2) TEHTV  | Transmit/Receive Hold Time      | 5   | -   | ns    | Notes 1, 2      |
| (3) TTVEL  | Transmit/Receive Setup Time     | 10  | -   | ns    | Notes 1, 2      |
| (4) TEHOZ  | Output Disable Time             | 5   | 30  | ns    | Notes 1, 2      |
| (5) TELOV  | Output Enable Time              | 10  | 50  | ns    | Notes 1, 2      |
| (6) TR, TF | Input Rise/Fall Times           | -   | 20  | ns    | Notes 1, 2      |
| (7) TEHEL  | Minimum Output Enable High Time |     |     |       | Note 3          |
|            | 82C86H                          | 30  | -   | ns    |                 |
|            | 82C86H-5                        | 35  | -   | ns    |                 |

**NOTES:**

1. All AC parameters tested as per test circuits and definitions in timing waveforms and test load circuits. Input rise and fall times are driven at 1ns/V.
2. Input test signals must switch between  $V_{IL} - 0.4V$  and  $V_{IH} + 0.4V$ .
3. A system limitation only when changing direction. Not a measured parameter.

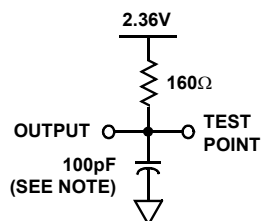
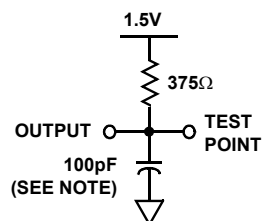
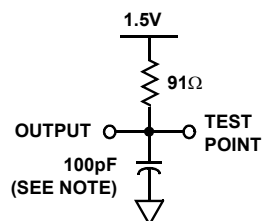
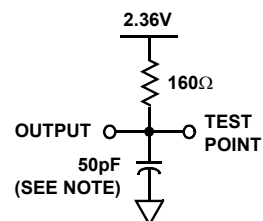
**Timing Waveform**

NOTE: All timing measurements are made at 1.5V unless otherwise noted.

## Test Load Circuits

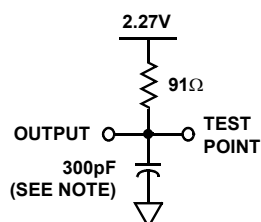
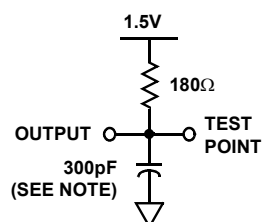
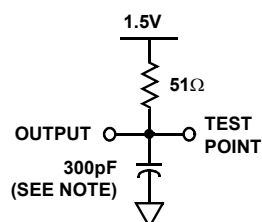
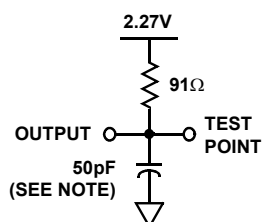
### A SIDE OUTPUTS

TIOV LOAD CIRCUIT

TELOV OUTPUT HIGH  
ENABLE LOAD CIRCUITTELOV OUTPUT LOW  
ENABLE LOAD CIRCUITTEHOZ OUTPUT LOW/HIGH  
DISABLE LOAD CIRCUIT

### B SIDE OUTPUTS

TIOV LOAD CIRCUIT

TELOV OUTPUT HIGH  
ENABLE LOAD CIRCUITTELOV OUTPUT LOW  
ENABLE LOAD CIRCUITTEHOZ OUTPUT LOW/HIGH  
DISABLE LOAD CIRCUIT

NOTE: Includes jig and stray capacitance.

## Die Characteristics

### DIE DIMENSIONS:

138.6 x 155.5 x 19 ± 1mils

### METALLIZATION:

Type: Si - Al

Thickness: 11kÅ ± 1kÅ

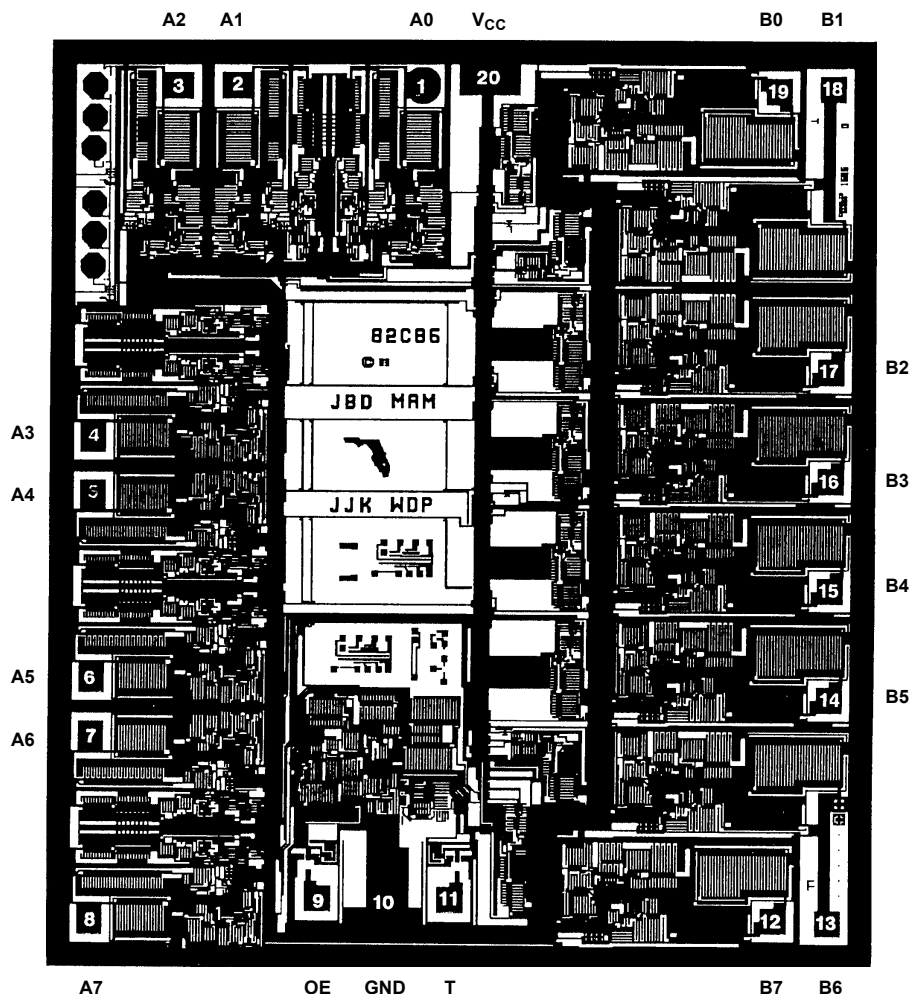
### GLASSIVATION:

Type: SiO<sub>2</sub>

Thickness: 8kÅ ± 1kÅ

## Metallization Mask Layout

82C86H



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