

February 1996

**Features**

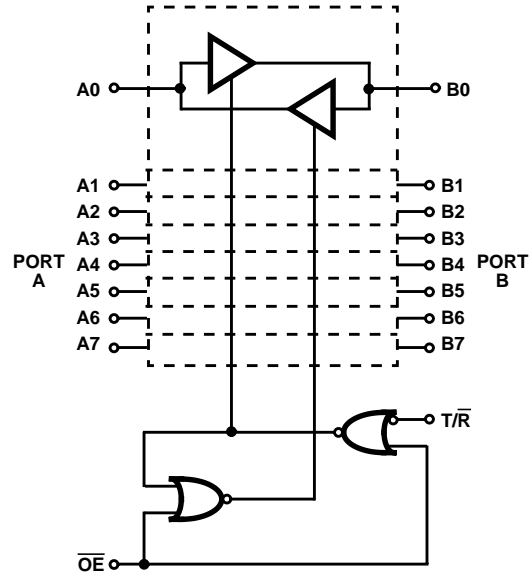
- Devices QML Qualified in Accordance With MIL-PRF-38535
- Detailed Electrical and Screening Requirements are Contained in SMD# 5962-95714 and Intersil' QM Plan
- Radiation Hardened
  - Total Dose  $1 \times 10^5$  RAD (Si)
  - Latch-Up Immune EPI-CMOS  $> 1 \times 10^{12}$  RAD (Si)/s
- Bidirectional Three-State Input/Outputs
- Low Propagation Delay Time
- Low Power Consumption
- Single Power Supply +5V
- Electrically Equivalent to Sandia SA2997
- Military Temperature Range  $-55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$

**Description**

The Intersil HS-82C08RH is a radiation-hardened octal bus transceiver with three-state outputs. It is manufactured using a self-aligned, junction isolated CMOS process and is designed for use with the HS-80C08RH radiation-hardened microprocessor. The HS-82C08RH allows asynchronous two-way communication between data buses. The direction of data flow is determined by the logic level on the transmit/receive ( $T/\bar{R}$ ) input. A logic high on the  $T/\bar{R}$  input specifies data flow from Port A to Port B of the device. Conversely, a logic low on the  $T/\bar{R}$  input specifies data flow from Port B to Port A. The Output Enable input disables both ports by placing them in the high impedance state.

The HS-82C08RH is ideally suited for a wide variety of buffering applications in radiation-hardened microcomputer systems.

**Functional Diagram**



TRUTH TABLE

| INPUTS        |                   | OPERATION |        |
|---------------|-------------------|-----------|--------|
| OUTPUT ENABLE | TRANSMIT /RECEIVE | PORT A    | PORT B |
| 0             | 0                 | Out       | In     |
| 0             | 1                 | In        | Out    |
| 1             | X                 | High Z    | High Z |

X = Don't Care

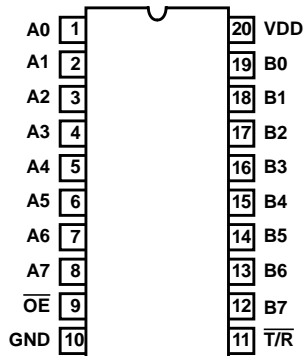
**Ordering Information**

| PART NUMBER        | TEMPERATURE RANGE                               | SCREENING LEVEL       | PACKAGE                  |
|--------------------|---|-----------------------|--------------------------|
| 5962R9571401QRC    | $-55^{\circ}\text{C}$ to $+125^{\circ}\text{C}$ | MIL-PRF-38535 Level Q | 20 Lead SBDIP            |
| 5962R9571401QXC    | $-55^{\circ}\text{C}$ to $+125^{\circ}\text{C}$ | MIL-PRF-38535 Level Q | 20 Lead Ceramic Flatpack |
| 5962R9571401VRC    | $-55^{\circ}\text{C}$ to $+125^{\circ}\text{C}$ | MIL-PRF-38535 Level V | 20 Lead SBDIP            |
| 5962R9571401VXC    | $-55^{\circ}\text{C}$ to $+125^{\circ}\text{C}$ | MIL-PRF-38535 Level V | 20 Lead Ceramic Flatpack |
| HS1-82C08RH/SAMPLE | $+25^{\circ}\text{C}$                           | SAMPLE                | 20 Lead SBDIP            |
| HS9-82C08RH/SAMPLE | $+25^{\circ}\text{C}$                           | SAMPLE                | 20 Lead Ceramic Flatpack |

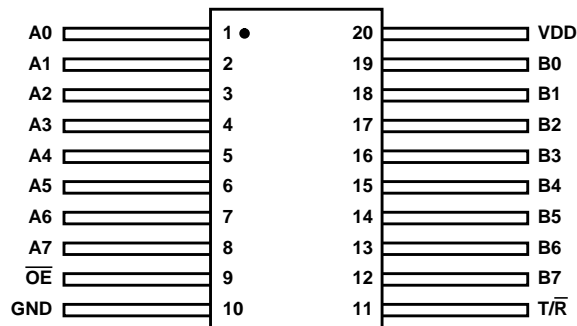
# HS-82C08RH

## Pinouts

**20 LEAD CERAMIC DUAL-IN-LINE  
METAL-SEAL PACKAGE (SBDIP) MIL-STD-1835, CDIP2-T20  
TOP VIEW**

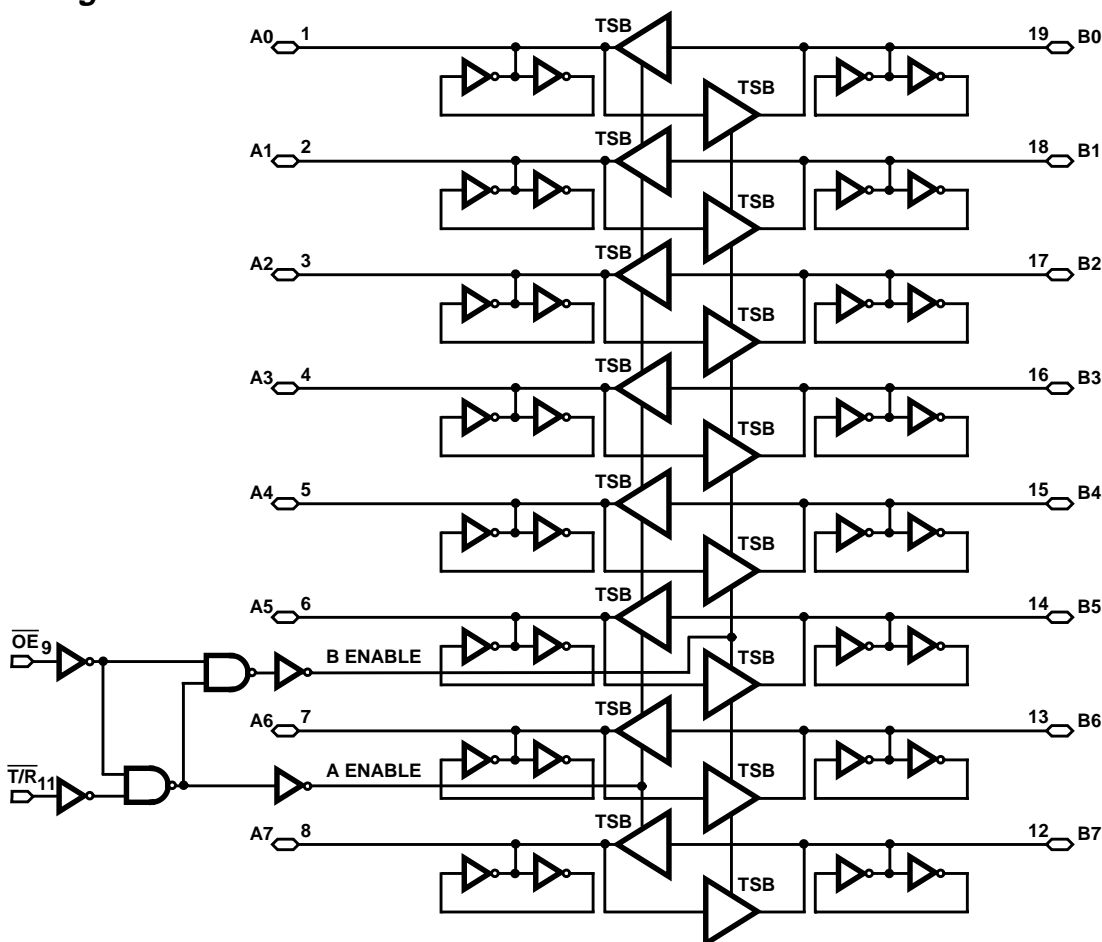


**20 LEAD CERAMIC METAL SEAL  
FLATPACK PACKAGE (FLATPACK) MIL-STD-1835, CDFP4-F20  
TOP VIEW**



| PIN   | DESCRIPTION              | PIN | DESCRIPTION              |
|-------|--------------------------|-----|--------------------------|
| A0-A7 | Local Bus Data I/O Pins  | T/R | Transmit/Receive Input   |
| B0-B7 | System Bus Data I/O Pins | OE  | Active Low Output Enable |

## Logic Diagram



NOTE: An important caveat that is applicable to CMOS devices in general is that unused inputs should never be left floating. This rule applies to inputs connected to a three-state bus. The need for external pull-up resistors during three-state bus conditions is eliminated by the presence of regenerative latches on the following HS-82C08RH pins. A0-7 and B0-7. The functional block diagram depicts one of these pins with the regenerative latch. When the CMOS driver assumes the high impedance state, the latch holds the bus in whatever logic state (high or low) it was before the three-state condition. A transient drive current of  $\pm 1.5\text{mA}$  at  $V_{DD}/2 \pm 0.5\text{V}$  for 10ns is required to switch the latch. Thus, CMOS device inputs connected to the bus are not allowed to float during three-state conditions.

# Specifications HS-82C08RH

## Absolute Maximum Ratings

|  |                      |
|--|----------------------|
| Supply Voltage . . . . .                   | +7.0V                |
| Input, Output or I/O Voltage . . . . .     | GND-0.3V to VDD+0.3V |
| Storage Temperature Range . . . . .        | -65°C to +150°C      |
| Junction Temperature . . . . .             | +175°C               |
| Lead Temperature (Soldering 10s) . . . . . | +300°C               |
| ESD Classification . . . . .               | Class 1              |

## Reliability Information

|  |               |               |
|--|---------------|---------------|
| Thermal Resistance   | $\theta_{JA}$ | $\theta_{JC}$ |
| 20 Lead SBDIP Package . . . . .  | 71°C/W        | 17°C/W        |
| 20 Lead Ceramic Flatpack Package . . . . .   | 85°C/W        | 25°C/W        |
| Maximum Package Power Dissipation at +125°C Ambient  |               |               |
| 20 Lead SBDIP Package . . . . .  | 0.70W         |               |
| 20 Lead Ceramic Flatpack Package . . . . .   | 0.59W         |               |
| If device power exceeds package dissipation capability, provide heat sinking or derate linearly at the following rate: |               |               |
| 20 Lead SBDIP Package . . . . .  | 14.1mW/C      |               |
| 20 Lead Ceramic Flatpack Package . . . . .   | 11.8mW/C      |               |

*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.*

## Operating Conditions

|                                       |                  |                              |                |
|---------------------------------------|------------------|------------------------------|----------------|
| Operating Voltage Range . . . . .     | +4.75V to +5.25V | Input Low Voltage . . . . .  | 0V to +1V      |
| Operating Temperature Range . . . . . | -55°C to +125°C  | Input High Voltage . . . . . | VDD -1V to VDD |

**TABLE 1. DC ELECTRICAL PERFORMANCE CHARACTERISTICS**

All Devices Guaranteed at Worst Case Limits and Conditions.

| PARAMETER                 | SYMBOL | CONDITIONS  | GROUP A SUBGROUPS | TEMPERATURE             | LIMITS |     | UNITS |
|---------------------------|--------|---|-------------------|-------------------------|--------|-----|-------|
|                           |        |   |                   |                         | MIN    | MAX |       |
| Input Leakage Current     | IIL    | VDD = 5.25V, VIN = VDD<br>Pin Under Test = 0V       | 1, 2, 3           | -55°C, +25°C,<br>+125°C | -1.0   | -   | μA    |
|                           | IIH    | VDD = 5.25V, VIN = 0V<br>Pin Under Test = 5.25V     | 1, 2, 3           | -55°C, +25°C,<br>+125°C | -      | 1.0 | μA    |
| High Level Output Voltage | VOH    | VDD = 4.75V, IOH = -2.0mA                           | 1, 2, 3           | -55°C, +25°C,<br>+125°C | 4.25   | -   | V     |
| Low Level Output Voltage  | VOL    | VDD = 5.25V, IOL = 2.0mA                            | 1, 2, 3           | -55°C, +25°C,<br>+125°C | -      | 0.5 | V     |
| Static Current            | SIDD   | VDD = 5.25V, VIN = GND                              | 1, 2, 3           | -55°C, +25°C,<br>+125°C | -      | 100 | μA    |
| Functional Test           | FT     | VDD = 4.75V to 5.25V<br>VIH = VDD -1.0V, VIL = 1.0V | 7, 8A, 8B         | -55°C, +25°C,<br>+125°C | -      | -   | -     |

**TABLE 2. AC ELECTRICAL PERFORMANCE CHARACTERISTICS**

| PARAMETER   | SYMBOL | GROUP A SUBGROUPS | TEMPERATURE          | LIMITS |     | UNITS |
|---|--------|-------------------|----------------------|--------|-----|-------|
|   |        |                   |                      | MIN    | MAX |       |
| <b>PORT DATA/MODE SPECIFICATIONS</b>                                  |        |                   |                      |        |     |       |
| Propagation Delay to Logical "1" from Port A, B to Port B, A          | TPDLH  | 9, 10, 11         | -55°C, +25°C, +125°C | -      | 65  | ns    |
| Propagation Delay to Logical "0" from Port A, B to Port B, A          | TPDHL  | 9, 10, 11         | -55°C, +25°C, +125°C | -      | 80  | ns    |
| Propagation Delay from High-Impedance to Logical "1" from T/R to Port | TPRTH  | 9, 10, 11         | -55°C, +25°C, +125°C | -      | 75  | ns    |
| Propagation Delay from High-Impedance to Logical "0" from T/R to Port | TPRTL  | 9, 10, 11         | -55°C, +25°C, +125°C | -      | 130 | ns    |
| Propagation Delay from High-Impedance to Logical "1" from OE to Port  | TPZH   | 9, 10, 11         | -55°C, +25°C, +125°C | -      | 70  | ns    |
| Propagation Delay from High-Impedance to Logical "0" from OE to Port  | TPZL   | 9, 10, 11         | -55°C, +25°C, +125°C | -      | 130 | ns    |

# Specifications HS-82C08RH

**TABLE 3. ELECTRICAL PERFORMANCE CHARACTERISTICS**

| PARAMETER   | SYMBOL | (NOTE)<br>CONDITIONS  | TEMPERATURE | LIMITS |     | UNITS |
|---|--------|---|-------------|--------|-----|-------|
|   |        |   |             | MIN    | MAX |       |
| In/Out Capacitance  | CI/O   | VDD = Open, f = 1MHz<br>All Measurements Referenced to GND. | +25°C       | -      | 10  | pF    |
| <b>TRANSMIT/RECEIVE MODE SPECIFICATIONS (AC Parameters)</b>           |        |   |             |        |     |       |
| Propagation Delay from Logical "1" to High-Impedance from T/R to Port | TPHZTR |   | +25°C       | -      | 35  | ns    |
| Propagation Delay from Logical "0" to High-Impedance from T/R to Port | TPLZTR |   | +25°C       | -      | 35  | ns    |
| Propagation Delay from Logical "1" to High-Impedance from OE to Port  | TPHZ   |   | +25°C       | -      | 35  | ns    |
| Propagation Delay from Logical "0" to High-Impedance from OE to Port  | TPLZ   |   | +25°C       | -      | 35  | ns    |

NOTE:

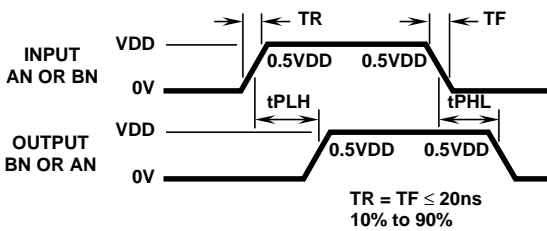
- The parameters listed are controlled via design or process parameters and are not directly tested. These parameters are characterized upon initial design release and upon design changes which could affect these characteristics.

**TABLE 4. POST 100K RAD ELECTRICAL PERFORMANCE CHARACTERISTICS**

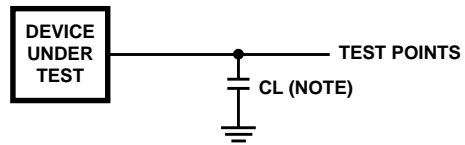
NOTE: The Post Irradiation test conditions and limits are the same as those listed in Table 1 and Table 2.

**TABLE 5. BURN-IN DELTA PARAMETERS (+25°C; In Accordance With SMD)**

## Switching Time Waveforms

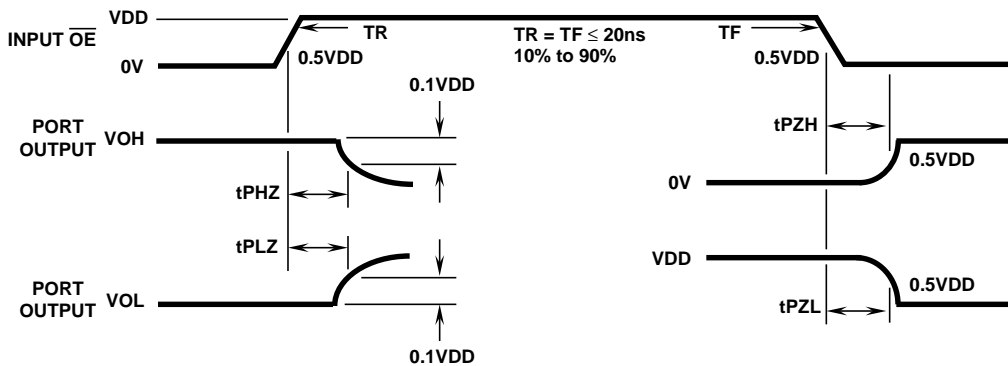


**FIGURE 1. PORT TO PORT**



NOTE: CL includes stray and jig capacitance.

**FIGURE 2. AC TESTING LOAD CIRCUIT**



**FIGURE 3. OE TO HIGH-IMPEDANCE, OE TO PORT OUTPUT**

# HS-82C08RH

## Metallization Topology

### DIE DIMENSIONS:

76.0 mils x 89.4 mils x 14 mils  $\pm$ 1 mil

### METALLIZATION:

Type: Si - Al

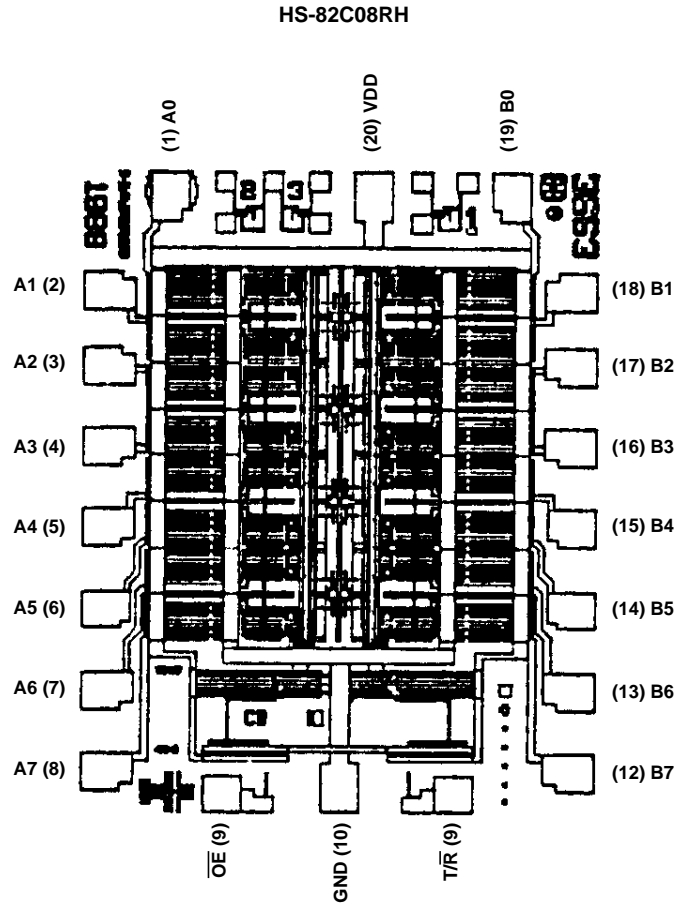
Thickness:  $11\text{k}\text{\AA} \pm 2\text{k}\text{\AA}$

### GLASSIVATION:

Type:  $\text{SiO}_2$

Thickness:  $8\text{k}\text{\AA} \pm 1\text{k}\text{\AA}$

## Metallization Mask Layout



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