# Am2956/Am2957

## Octal Latches with Three-State Outputs

## DISTINCTIVE CHARACTERISTICS

- 8-bit, high-speed parallel latches
- Am2956 has non-inverting inputs
- Am2957 has inverting inputs
- $V_{OL} = 0.5V$ (max) at $I_{OL} = 32mA$

- Hysteresis on latch enable input for improved noise margin
- 3-state outputs interface directly with bus organized systems

## GENERAL DESCRIPTION

The Am2956 and Am2957 are octal latches with 3-state outputs for bus organized system applications. The latches appear to be transparent to the data (data changes asynchronously) when latch enable, G, is HIGH. When G is LOW, the data that meets the set-up times is latched. Data appears on the bus when the output enable, $\overline{OE}$, is LOW.

When $\overline{OE}$ is HIGH the bus output is in the high-impedance state.

The Am2956 presents non-inverted data at the outputs while the Am2957 is inverting.

The devices are packaged in a space-saving (0.3-inch row spacing) 20-pin package.
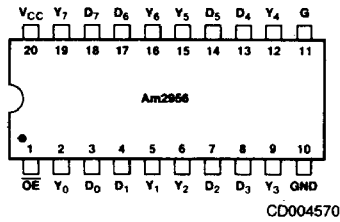
## BLOCK DIAGRAM



BD002430
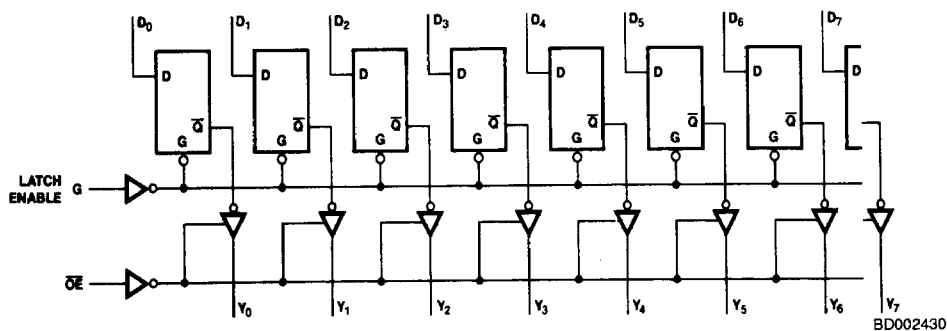
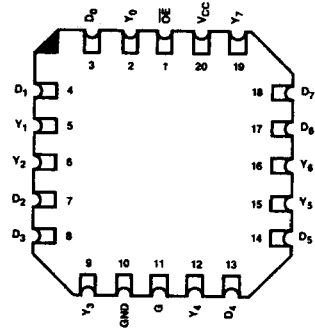Inputs $D_0$ through $D_7$ are inverted on the Am2957.

## RELATED PRODUCTS

| Part No. | Description |
|---|---|
| Am29841-46 | 8, 9, 10-Bit Latches |

03604B

# CONNECTION DIAGRAM
## Top View

**D-20, P-20**

| Vcc | Y7 | D7 | D6 | Y6 | Y5 | D5 | D4 | Y4 | G |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 |

Am2956

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| OE | Y0 | D0 | D1 | Y1 | Y2 | D2 | D3 | Y3 | GND |

CD004570

**L-20-1**

CD004580

Note: Pin 1 is marked for orientation

F-20 pin configuration identical to D-20, P-20.

## LOGIC SYMBOL

| 3 | 4 | 7 | 8 | 13 | 14 | 17 | 18 |
|-----|-----|-----|-----|-----|-----|-----|-----|
| D0 | D1 | D2 | D3 | D4 | D5 | D6 | D7 |

11 — G

Am2956

1 — OE

| Y0 | Y1 | Y2 | Y3 | Y4 | Y5 | Y6 | Y7 |
|-----|-----|-----|-----|-----|-----|-----|-----|
| 2 | 5 | 6 | 9 | 12 | 15 | 16 | 19 |

LS000980
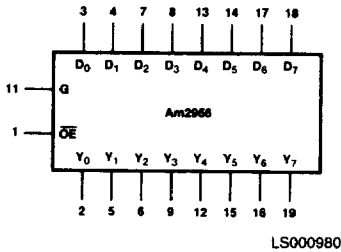
Note: Inputs $D_0$ through $D_7$ are inverted
on the Am2957

## METALLIZATION AND PAD LAYOUT
### Am2956

| OE | 1 | | 20 | Vcc |
| Y0 | 2 | | 19 | Y7 |
| D0 | 3 | | 18 | D7 |
| D1 | 4 | | 17 | D6 |
| Y1 | 5 | | 16 | Y6 |
| Y2 | 6 | | 15 | Y5 |
| D2 | 7 | | 14 | D5 |
| D3 | 8 | | 13 | D4 |
| Y3 | 9 | | 12 | Y4 |
| GND | 10 | | 11 | G |

**DIE SIZE 0.066" x 0.119"**
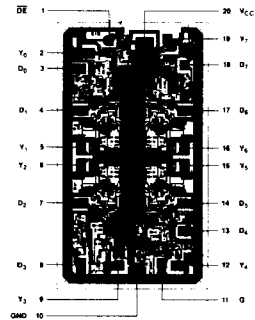
## ORDERING INFORMATION

AMD products are available in several packages and operating ranges. The order number is formed by a combination of the following: Device number, speed option (if applicable), package type, operating range and screening option (if desired).

Am2956/2957    D    C    B

Screening Option
    Blank – Standard processing
    B – Burn-in

Temperature (See Operating Range)
    C – Commercial (0°C to +70°C)
    M – Military (–55°C to +125°C)

Package
    D – 20-pin CERDIP
    F – 20-pin flatpak
    L – 20-pin leadless chip carrier
    P – 20-pin plastic DIP
    X – Dice

Device type
Octal Latches with 3-State Outputs

| Valid Combinations | |
|---|---|
| Am2956 Am2957 | PC DC, DCB, DM, DMB FM, FMB LC, LCB, LM, LMB XC, XM |

**Valid Combinations**

Consult the AMD sales office in your area to determine if a device is currently available in the combination you wish.

03604B

Refer to Page 13-1 for Essential Information on Military Devices

## PIN DESCRIPTION

| Pin No. | Name | I/O | Description |
|---------|------|-----|-------------|
| | $D_i/\overline{D}_i$ | I | The latch data inputs (Am2956, non-inverting/Am2957, inverting). |
| 11 | G | I | The latch enable input. The latches are transparent when G is HIGH. Input data is latched on the HIGH-to-LOW transition. |
| | Yi | O | The 3-state latch outputs. |
| 1 | $\overline{OE}$ | I | The output enable control. When $\overline{OE}$ is LOW, the outputs $Y_i$ are enabled. When $\overline{OE}$ is HIGH, the outputs $Y_i$ are in the high-impedance (off) state. |

## FUNCTION TABLES

### Am2956

| Inputs | | | Internal | Outputs | Function |
|--------|---|---|----------|---------|----------|
| $\overline{OE}$ | G | $D_i$ | $Q_I$ | $Y_I$ | |
| H | X | X | X | Z | Hi-Z |
| L | H | L | L | L | Transparent |
| L | H | H | H | H | Transparent |
| L | L | X | NC | NC | Latched |

### Am2957

| Inputs | | | Internal | Outputs | Function |
|--------|---|---|----------|---------|----------|
| $\overline{OE}$ | G | $\overline{D}_i$ | $Q_I$ | $Y_I$ | |
| H | X | X | X | Z | Hi-Z |
| L | H | L | H | H | Transparent |
| L | H | H | L | L | Transparent |
| L | L | X | NC | NC | Latched |

H = HIGH
L = LOW
X = Don't Care

NC = No Change
Z = High Impedance

## APPLICATION
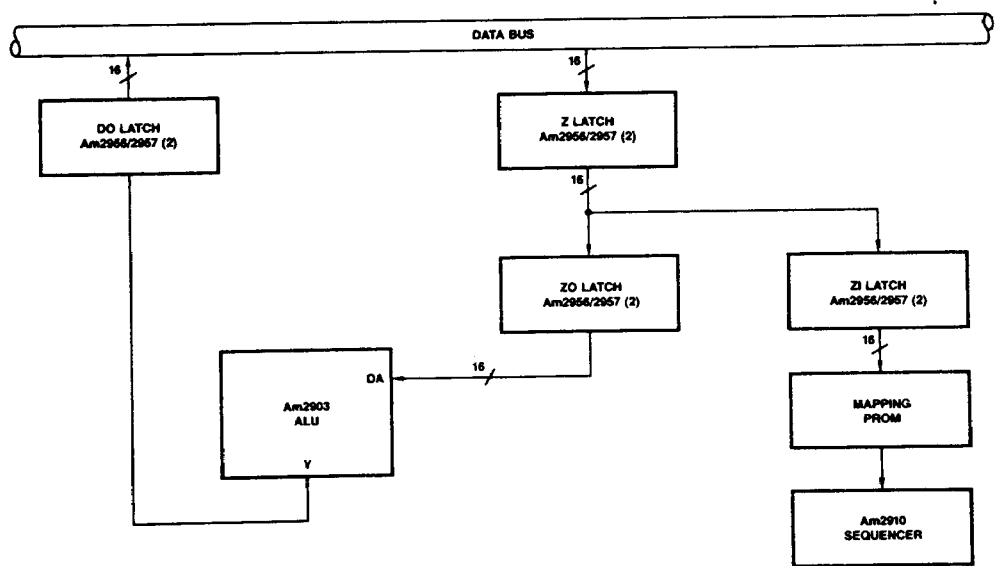


AF001880

Transparent Latches are used in high performance CPU designs. The Z Latch configuration shown provides overlapped fetch of machine instructions and operand data.

03604B

## ABSOLUTE MAXIMUM RATINGS

Storage Temperature .......................... −65°C to +150°C
(Ambient) Temperature Under Bias ....... −55°C to +125°C
Supply Voltage to Ground Potential
(Pin 16 to Pin 8) Continuous .............. −0.5V to +7.0V
DC Voltage Applied to Outputs For
High Output State ....................... −0.5V to +$V_{CC}$ max
DC Input Voltage ................................ −0.5V to +5.5V
DC Output Current, Into Outputs ........................ 30mA
DC Input Current ................................ −30 to +5.0mA

Stresses above those listed under ABSOLUTE MAXIMUM
RATINGS may cause permanent device failure. Functionality
at or above these limits is not implied. Exposure to absolute
maximum ratings for extended periods may affect device
reliability.

## OPERATING RANGES

Commercial (C) Devices
Temperature ...................................... 0°C to +70°C
Supply Voltage ........................... +4.75V to +5.25V

Military (M) Devices
Temperature ............................... −55°C to +125°C
Supply Voltage .............................. +4.5V to +5.5V
Operating ranges define those limits over which the function-
ality of the device is guaranteed.

## DC CHARACTERISTICS over operating range unless otherwise specified

| Parameters | Description | | Test Conditons (Note 2) | | Min | Typ (Note 1) | Max | Units |
|---|---|---|---|---|---|---|---|---|
| $V_{OH}$ | Output HIGH Voltage | $V_{CC}$ = MIN $V_{IN} = V_{IH}$ or $V_{IL}$ | MIL, $I_{OH}$ = −2.0mA | | 2.4 | 3.4 | | Volts |
| | | | COM'L, $I_{OH}$ = −6.5mA | | 2.4 | 3.1 | | |
| $V_{OL}$ | Output LOW Voltage | $V_{CC}$ = MIN $V_{IN} = V_{IH}$ or $V_{IL}$ | $I_{OL}$ = 20mA | | | | .46 | Volts |
| | | | $I_{OL}$ = 32mA | | | | .5 | |
| $V_{IH}$ | Input HIGH Level | Guaranteed input logical HIGH voltage for all inputs | | | 2.0 | | | Volts |
| $V_{IL}$ | Input LOW Level | Guaranteed input logical LOW voltage for all inputs | | | | | 0.8 | Volts |
| $V_I$ | Input Clamp Voltage | $V_{CC}$ = MIN, $I_{IN}$ = −18mA | | | | | −1.2 | Volts |
| $I_{IL}$ | Input LOW Current | $V_{CC}$ = MAX, $V_{IN}$ = 0.5V | | | | | −250 | µA |
| $I_{IN}$ | Input HIGH Current | $V_{CC}$ = MAX, $V_{IN}$ = 2.7V | | | | | 50 | µA |
| $I_I$ | Input HIGH Current | $V_{CC}$ = MAX, $V_{IN}$ = 5.5V | | | | | 1.0 | mA |
| $I_{OZ}$ | Off-State (High-Impedance) Output Current | $V_{CC}$ = MAX | $V_0$ = 0.5V | | | | −50 | µA |
| | | | $V_0$ = 2.4V | | | | 50 | |
| $I_{SC}$ | Output Short Circuit Current (Note 3) | $V_{CC}$ = MAX | | −40 | | | −100 | mA |
| $I_{CC}$ | Power Supply Current (Note 4) | 2956 | $V_{CC}$ = MAX | | | | 105 | 160 | mA |
| | | 2957 | | | | | 110 | 168 | |

Notes: 1. Typical limits are at $V_{CC}$ = 5.0V, 25°C ambient and maximum loading.
2. For conditions shown as MIN or MAX use the appropiate value specified under Operating Ranges for the applicable device type.
3. Not more than one output should be shorted at a time. Duration of the short circuit test should not exceed one second.
4. Inputs grounded; outputs open.

03604B

## SWITCHING CHARACTERISTICS ($T_A = +25°C$, $V_{CC} = 5.0V$)
### Am2956

| Parameters | Description | Test Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| $t_{PLH}$ | Enable to Output | | | 7 | 14 | ns |
| $t_{PHL}$ | | | | 12 | 18 | ns |
| $t_{PLH}$ | Data Input to Output | | | 5 | 9 | ns |
| $t_{PHL}$ | | | | 9 | 13 | ns |
| $t_{s}(H)$ | HIGH Data to Enable | | 0 | | | ns |
| $t_{s}(L)$ | LOW Data to Enable | $C_L = 15pF$ | 0 | | | ns |
| $t_{h}(H)$ | HIGH Data to Enable | $R_L = 280\Omega$ | 10 | | | ns |
| $t_{h}(L)$ | LOW Data to Enable | | 10 | | | ns |
| $t_{pwH}$ | Enable Pulse Width | | 6 | | | ns |
| $t_{pwL}$ | | | 7.3 | | | ns |
| $t_{ZH}$ | $\overline{OE}$ to $Y_i$ | | | 8 | 15 | ns |
| $t_{ZL}$ | | | | 11 | 18 | ns |
| $t_{HZ}$ | $\overline{OE}$ to $Y_i$ | $C_L = 5pF$ | | 6 | 9 | ns |
| $t_{LZ}$ | | $R_L = 280\Omega$ | | 8 | 12 | ns |

*Switching Characteristics' performance over the operating temperature range is guaranteed by testing defined in Group A, Subgroup 9.

**5**

## SWITCHING CHARACTERISTICS ($T_A = +25°C$, $V_{CC} = 5.0V$)
### Am2957

| Parameters | Description | Test Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| $t_{PLH}$ | Enable to Output | | | 17 | 24 | ns |
| $t_{PHL}$ | | | | 19 | 26 | ns |
| $t_{PLH}$ | Data Input to Output | | | 10 | 14 | ns |
| $t_{PHL}$ | | | | 14 | 20 | ns |
| $t_{s}(H)$ | HIGH Data to Enable | | 0 | | | ns |
| $t_{s}(L)$ | LOW Data to Enable | $C_L = 15pF$ | 0 | | | ns |
| $t_{h}(H)$ | HIGH Data to Enable | $R_L = 280\Omega$ | 10 | | | ns |
| $t_{h}(L)$ | LOW Data to Enable | | 10 | | | ns |
| $t_{pwH}$ | Enable Pulse Width | | 6 | | | ns |
| $t_{pwL}$ | | | 7.3 | | | ns |
| $t_{ZH}$ | $\overline{OE}$ to $Y_i$ | | | 8 | 15 | ns |
| $t_{ZL}$ | | | | 11 | 18 | ns |
| $t_{HZ}$ | $\overline{OE}$ to $Y_i$ | $C_L = 5pF$ | | 6 | 9 | ns |
| $t_{LZ}$ | | $R_L = 280\Omega$ | | 8 | 10 | ns |

03604B

Refer to Page 13-1 for Essential Information on Military Devices