

# MM54C08,MM74C08

*MM54C08 MM74C08 Quad 2-Input AND Gate*



Literature Number: SNOS317A

## MM54C08/MM74C08 Quad 2-Input AND Gate

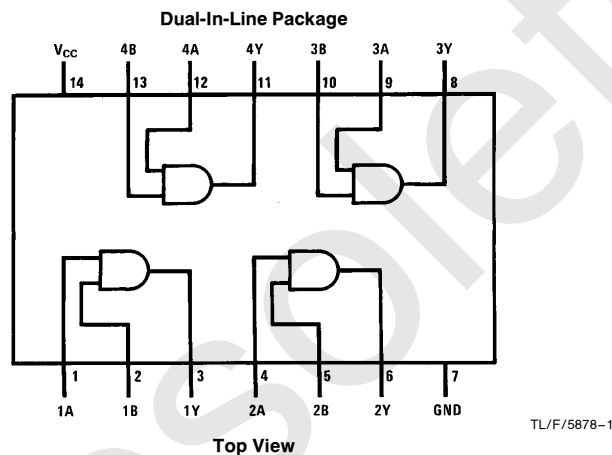
### General Description

Employing complementary MOS (CMOS) transistors to achieve wide power supply operating range, low power consumption and high noise margin, these gates provide basic functions used in the implementation of digital integrated circuit systems. The N- and P-channel enhancement mode transistors provide a symmetrical circuit with output swing essentially equal to the supply voltage. No DC power other than that caused by leakage current is consumed during static condition. All inputs are protected from damage due to static discharge by diode clamps to  $V_{CC}$  and GND.

### Features

- Wide supply voltage range 3.0V to 15V
- Guaranteed noise margin 1.0V
- High noise immunity  $0.45 V_{CC}$  (typ.)
- Low power Fan out of 2 driving 74L
- TTL compatibility
- Low power consumption 10 nW/package (typ.)

### Connection Diagram and Truth Table



Order Number MM54C08 or MM74C08

| Inputs |   | Outputs |
|--------|---|---------|
| A      | B | Y       |
| L      | L | L       |
| L      | H | L       |
| H      | L | L       |
| H      | H | H       |

H = High Level L = Low Level

## Absolute Maximum Ratings (Note 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

|                             |                          |
|-----------------------------|--------------------------|
| Voltage at Any Pin          | −0.3V to $V_{CC} + 0.3V$ |
| Operating Temperature Range | −55°C to +125°C          |
| MM54C08                     | −40°C to +85°C           |
| MM74C08                     |                          |

|                             |                 |
|-----------------------------|-----------------|
| Storage Temperature Range   | −65°C to +150°C |
| Power Dissipation ( $P_D$ ) |                 |
| Dual-In-Line                | 700 mW          |
| Small Outline               | 500 mW          |
| Operating $V_{CC}$ Range    | 3.0V to 15V     |
| Absolute Maximum $V_{CC}$   | 18V             |
| Lead Temperature            |                 |
| (Soldering, 10 seconds)     | 260°C           |

## DC Electrical Characteristics

Min/Max limits apply across the guaranteed temperature range, unless otherwise noted

| Symbol                                                                                                   | Parameter                         | Conditions                               | Min            | Typ    | Max | Units   |
|----------------------------------------------------------------------------------------------------------|-----------------------------------|------------------------------------------|----------------|--------|-----|---------|
| CMOS TO CMOS                                                                                             |                                   |                                          |                |        |     |         |
| $V_{IN(1)}$                                                                                              | Logical “1” Input Voltage         | $V_{CC} = 5.0V$                          | 3.5            |        |     | V       |
|                                                                                                          |                                   | $V_{CC} = 10V$                           | 8.0            |        |     | V       |
| $V_{IN(0)}$                                                                                              | Logical “0” Input Voltage         | $V_{CC} = 5.0V$                          |                |        | 1.5 | V       |
|                                                                                                          |                                   | $V_{CC} = 10V$                           |                |        | 2.0 | V       |
| $V_{OUT(1)}$                                                                                             | Logical “1” Output Voltage        | $V_{CC} = 5.0V, I_O = -10\ \mu A$        | 4.5            |        |     | V       |
|                                                                                                          |                                   | $V_{CC} = 10V, I_O = -10\ \mu A$         | 9.0            |        |     | V       |
| $V_{OUT(0)}$                                                                                             | Logical “0” Output Voltage        | $V_{CC} = 5.0V, I_O = 10\ \mu A$         |                |        | 0.5 | V       |
|                                                                                                          |                                   | $V_{CC} = 10V, I_O = 10\ \mu A$          |                |        | 1.0 | V       |
| $I_{IN(1)}$                                                                                              | Logical “1” Input Current         | $V_{CC} = 15V, V_{IN} = 15V$             |                | 0.005  | 1.0 | $\mu A$ |
| $I_{IN(0)}$                                                                                              | Logical “0” Input Current         | $V_{CC} = 15V, V_{IN} = 0V$              | -1.0           | -0.005 |     | $\mu A$ |
| $I_{CC}$                                                                                                 | Supply Current                    | $V_{CC} = 15V$                           |                | 0.01   | 15  | $\mu A$ |
| CMOS/LPTTL INTERFACE                                                                                     |                                   |                                          |                |        |     |         |
| $V_{IN(1)}$                                                                                              | Logical “1” Input Voltage         | 54C, $V_{CC} = 4.5V$                     | $V_{CC} - 1.5$ |        |     | V       |
|                                                                                                          |                                   | 74C, $V_{CC} = 4.75V$                    | $V_{CC} - 1.5$ |        |     | V       |
| $V_{IN(0)}$                                                                                              | Logical “0” Input Voltage         | 54C, $V_{CC} = 4.5V$                     |                |        | 0.8 | V       |
|                                                                                                          |                                   | 74C, $V_{CC} = 4.75V$                    |                |        | 0.8 | V       |
| $V_{OUT(1)}$                                                                                             | Logical “1” Output Voltage        | 54C, $V_{CC} = 4.5V, I_O = -360\ \mu A$  | 2.4            |        |     | V       |
|                                                                                                          |                                   | 74C, $V_{CC} = 4.75V, I_O = -360\ \mu A$ | 2.4            |        |     | V       |
| $V_{OUT(0)}$                                                                                             | Logical “0” Output Voltage        | 54C, $V_{CC} = 4.5V, I_O = 360\ \mu A$   |                |        | 0.4 | V       |
|                                                                                                          |                                   | 74C, $V_{CC} = 4.75V, I_O = 360\ \mu A$  |                |        | 0.4 | V       |
| OUTPUT DRIVE (see 54C/74C Family Characteristics Data Sheet) $T_A = 25^{\circ}C$ (short circuit current) |                                   |                                          |                |        |     |         |
| $I_{SOURCE}$                                                                                             | Output Source Current (P-Channel) | $V_{CC} = 5.0V, V_{OUT} = 0V$            | -1.75          | -3.3   |     | mA      |
| $I_{SOURCE}$                                                                                             | Output Source Current (P-Channel) | $V_{CC} = 10V, V_{OUT} = 0V$             | -8.0           | 15     |     | mA      |
| $I_{SINK}$                                                                                               | Output Sink Current (N-Channel)   | $V_{CC} = 5.0V, V_{OUT} = V_{CC}$        | 1.75           | 3.6    |     | mA      |
| $I_{SINK}$                                                                                               | Output Sink Current (N-Channel)   | $V_{CC} = 10V, V_{OUT} = V_{CC}$         | 8.0            | 16     |     | mA      |

**Note 1:** “Absolute Maximum Ratings” are those values beyond which the safety of the device cannot be guaranteed. Except for “Operating Temperature Range” they are not meant to imply that the devices should be operated at these limits. The table of “Electrical Characteristics” provides conditions for actual device operation.

## AC Electrical Characteristics\*

(MM54C08/MM74C08)  $T_A = 25^\circ\text{C}$ ,  $C_L = 50\text{ pF}$ , unless otherwise specified

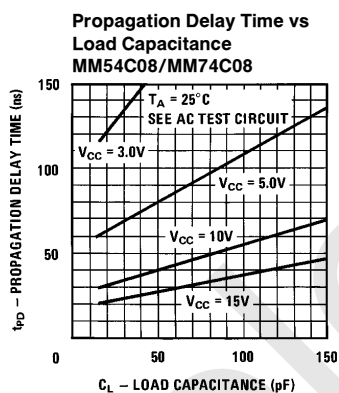
| Symbol                | Parameter                                    | Conditions             | Min | Typ | Max | Units |
|-----------------------|----------------------------------------------|------------------------|-----|-----|-----|-------|
| $t_{pd0}$ , $t_{pd1}$ | Propagation Delay Time to Logical "1" or "0" | $V_{CC} = 5.0\text{V}$ |     | 80  | 140 | ns    |
|                       |                                              | $V_{CC} = 10\text{V}$  |     | 40  | 70  | ns    |
| $C_{iN}$              | Input Capacitance                            | (Note 2)               |     | 5.0 |     | pF    |
| $C_{pD}$              | Power Dissipation Capacitance                | (Note 3) Per Gate      |     | 14  |     | pF    |

\*AC Parameters are guaranteed by DC correlated testing.

**Note 2:** Capacitance is guaranteed by periodic testing.

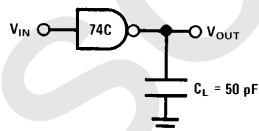
**Note 3:**  $C_{pD}$  determines the no load AC power consumption of any CMOS device. For complete explanation see 54C/74C Family Characteristics Application Note—AN-90.

## Typical Performance Characteristics



TL/F/5878-2

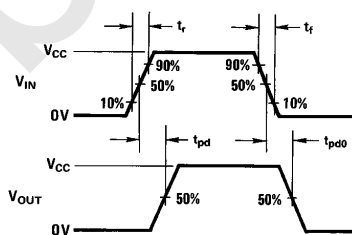
## AC Test Circuit



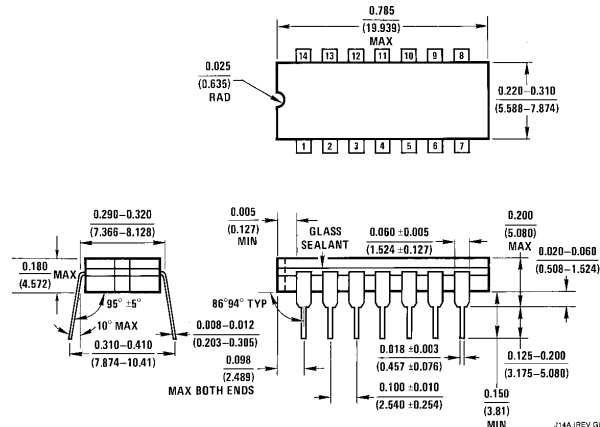
TL/F/5878-3

**Note:** Delays measured with input  $t_r$ ,  $t_f = 20\text{ ns}$

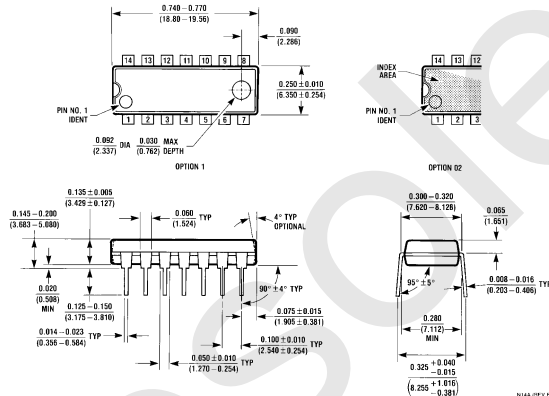
## Switching Time Waveforms



TL/F/5878-4

**Physical Dimensions** inches (millimeters)

**Ceramic Dual-In-Line Package (J)**  
**Order Number MM54C08J or MM74C08J**  
**NS Package Number J14A**



**Molded Dual-In-Line Package (N)**  
**Order Number MM54C08N or MM74C08N**  
**NS Package Number N14A**

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|                               |                                                                                          |
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