

MM88C29 • MM88C30

Quad Single-Ended Line Driver • Dual Differential Line Driver

General Description

The MM88C30 is a dual differential line driver that also performs the dual four-input NAND or dual four-input AND function. The absence of a clamp diode to V_{CC} in the input protection circuitry of the MM88C30 allows a CMOS user to interface systems operating at different voltage levels. Thus, a CMOS digital signal source can operate at a V_{CC} voltage greater than the V_{CC} voltage of the MM88C30 line driver. The differential output of the MM88C30 eliminates ground-loop errors.

The MM88C29 is a non-inverting single-wire transmission line driver. Since the output ON resistance is a low 20Ω typ., the device can be used to drive lamps, relays, solenoids, and clock lines, besides driving data lines.

Features

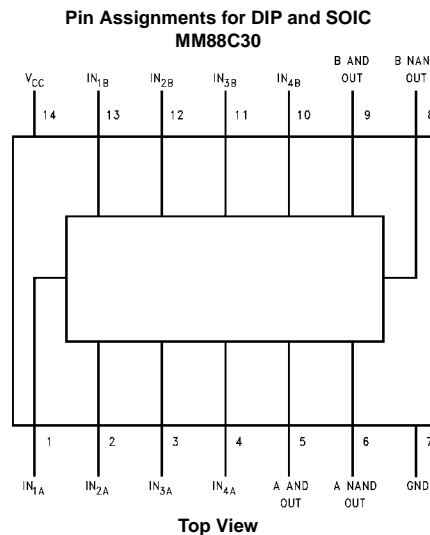
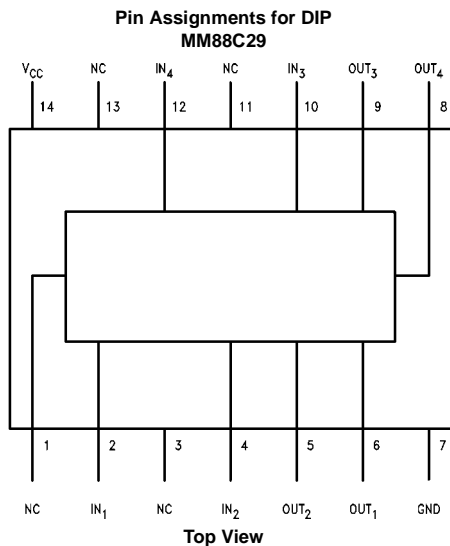
- Wide supply voltage range: 3V to 15V
- High noise immunity: $0.45 V_{CC}$ (typ.)
- Low output ON resistance: 20Ω (typ.)

Ordering Code:

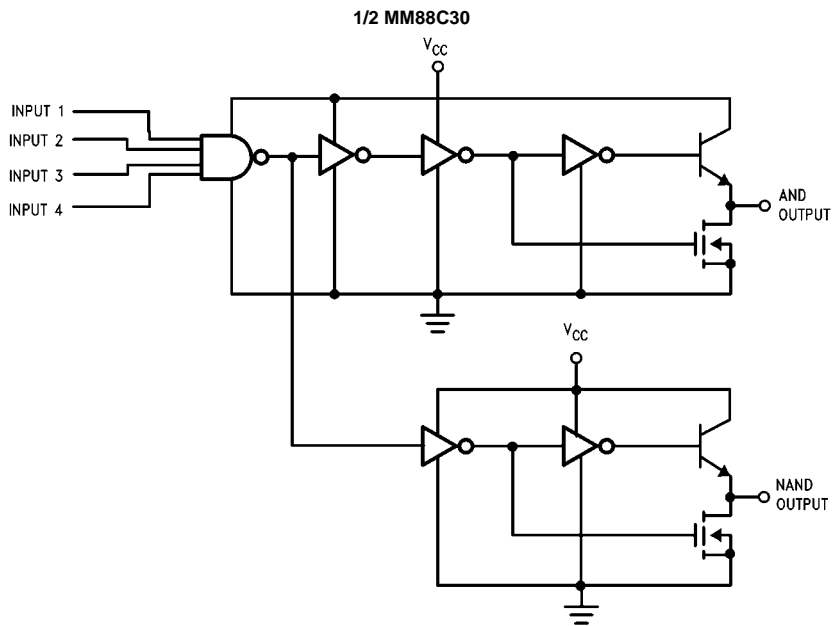
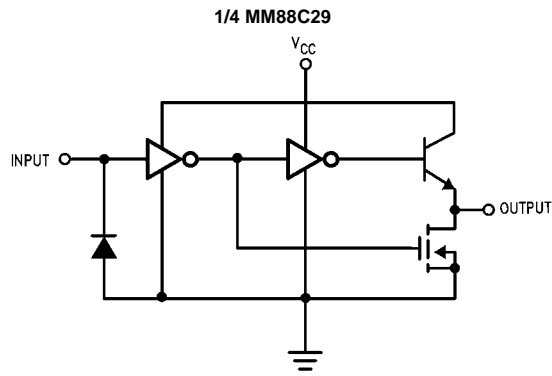
| Order Number | Package Number | Package Description |
|--------------|----------------|--|
| MM88C29N | N14A | 14-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide |
| MM88C30M | M14A | 14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-120, 0.150" Narrow |
| MM88C30N | N14A | 14-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide |

Devices also available in Tape and Reel. Specify by appending suffix letter "X" to the ordering code.

Connection Diagrams



Logic Diagrams



| Absolute Maximum Ratings (Note 1) | | Average Current at Output | |
|-----------------------------------|-------------------------|-------------------------------------|-------|
| Voltage at Any Pin (Note 2) | -0.3V to $V_{CC} + 16V$ | MM88C30 | 50 mA |
| Operating Temperature Range | -40°C to +85°C | MM88C29 | 25 mA |
| Storage Temperature | -65°C to +150°C | Maximum Junction Temperature, T_j | 150°C |
| Power Dissipation (P_D) | | Lead Temperature | |
| Dual-In-Line | 700 mW | (Soldering, 10 seconds) | 260°C |
| Small Outline | 500 mW | | |
| Operating V_{CC} Range | 3V to 15V | | |
| Absolute Maximum V_{CC} | 18V | | |

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 Electrical Characteristics tables provide conditions for actual device operation.

Note 2: AC Parameters are guaranteed by DC correlated testing.

DC Electrical Characteristics

Min/Max limits apply across temperature range unless otherwise noted

| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
|---------------------|--|---|------------|------------|----------|----------------------|
| CMOS TO CMOS | | | | | | |
| $V_{IN(1)}$ | Logical "1" Input Voltage | $V_{CC} = 5V$ $V_{CC} = 10V$ | 3.5 8 | | | V V |
| $V_{IN(0)}$ | Logical "0" Input Voltage | $V_{CC} = 5V$ $V_{CC} = 10V$ | | | 1.5 2 | V V |
| $I_{IN(1)}$ | Logical "1" Input Current | $V_{CC} = 15V, V_{IN} = 15V$ | | 0.005 | 1 | μA |
| $I_{IN(0)}$ | Logical "0" Input Current | $V_{CC} = 15V, V_{IN} = 0V$ | -1 | -0.005 | | μA |
| I_{CC} | Supply Current | $V_{CC} = 5V$ | | 0.05 | 100 | mA |
| OUTPUT DRIVE | | | | | | |
| I_{SOURCE} | Output Source Current | $V_{OUT} = V_{CC} - 1.6V,$ $V_{CC} \geq 4.75V, T_j = 25^\circ C$ $T_j = 85^\circ C$ | -47 -32 | -80 -60 | | mA mA |
| | | MM88C29 MM88C30 $V_{OUT} = V_{CC} - 0.8V$ $V_{CC} \geq 4.5V$ | -2 | -20 | | mA |
| I_{SINK} | Output Sink Current | $V_{OUT} = 0.4V, V_{CC} = 4.75V,$ $T_j = 25^\circ C$ $T_j = 85^\circ C$ | 9.5 8 | 22 18 | | mA mA |
| | | $V_{OUT} = 0.4V, V_{CC} = 10V,$ $T_j = 25^\circ C$ $T_j = 125^\circ C$ | 19 15.5 | 40 33 | | mA mA |
| | | | | | | |
| I_{SOURCE} | Output Source Resistance | $V_{OUT} = V_{CC} - 1.6V,$ $V_{CC} \geq 4.75V, T_j = 25^\circ C$ $T_j = 85^\circ C$ | | 20 27 | 34 50 | Ω Ω |
| | | | | | | |
| I_{SINK} | Output Sink Resistance | $V_{OUT} = 0.4V, V_{CC} = 4.75V,$ $T_j = 25^\circ C$ $T_j = 85^\circ C$ | | 18 22 | 41 50 | Ω Ω |
| | | $V_{OUT} = 0.4V, V_{CC} = 10V,$ $T_j = 25^\circ C$ $T_j = 85^\circ C$ | | 10 12 | 21 26 | Ω Ω |
| | | | | | | |
| | Output Resistance Temperature Coefficient | | | | | |
| | Source | | | 0.55 | | %/ $^\circ C$ |
| | Sink | | | 0.40 | | %/ $^\circ C$ |
| θ_{JA} | Thermal Resistance (N-Package) | | | 150 | | $^\circ C/W$ |

AC Electrical Characteristics (Note 2)
 $T_A = 25^\circ\text{C}$, $C_L = 50 \text{ pF}$

| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
|----------|--|--|-----|-----------|------------|----------|
| t_{pd} | Propagation Delay Time to Logical "1" or "0" MM88C29 | (See Figure 1) $V_{CC} = 5V$ $V_{CC} = 10V$ | | 80 35 | 200 100 | ns ns |
| | | MM88C30 $V_{CC} = 5V$ $V_{CC} = 10V$ | | 110 50 | 350 150 | ns ns |
| t_{pd} | Differential Propagation Delay Time to Logical "1" or "0" MM88C30 | $R_L = 100\Omega$, $C_L = 5000 \text{ pF}$ (See Figure 2) $V_{CC} = 5V$ $V_{CC} = 10V$ | | | 400 150 | ns ns |
| C_{IN} | Input Capacitance MM88C29 MM88C30 | (Note 3) | | 5.0 | | pF |
| | | (Note 3) | | 5.0 | | pF |
| C_{PD} | Power Dissipation Capacitance MM88C29 MM88C30 | (Note 3) | | 150 | | pF |
| | | (Note 3) | | 200 | | pF |

Note 3: Capacitance is guaranteed by periodic testing.
Note 4: C_{PD} determines the no load AC power consumption of any CMOS device. For complete explanation see Family Characteristics application note AN-90 (CMOS Logic Databook).

AC Test Circuits

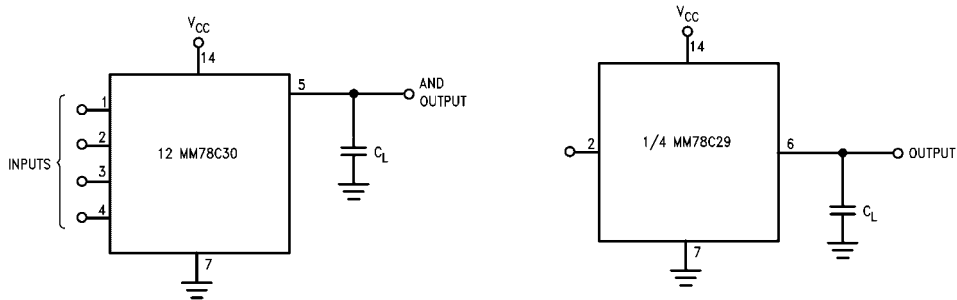


FIGURE 1.

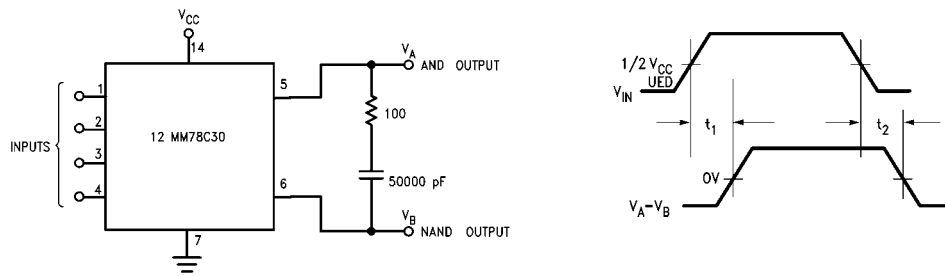
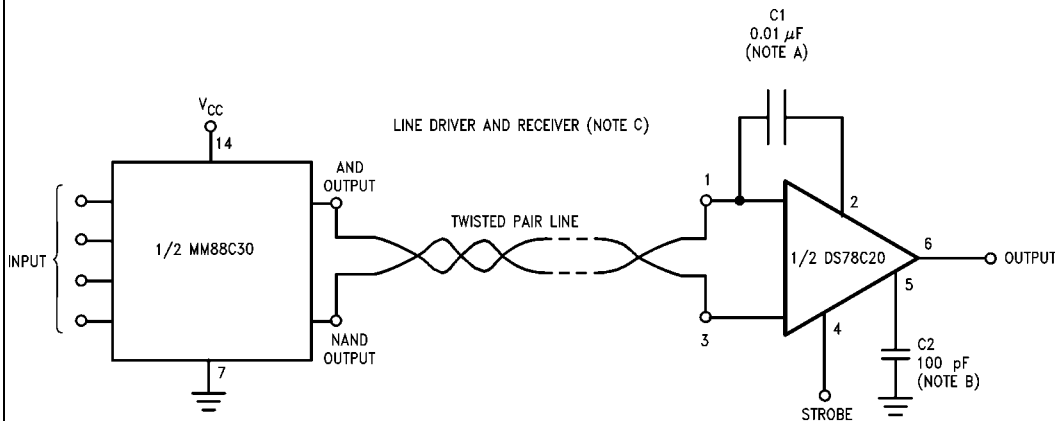


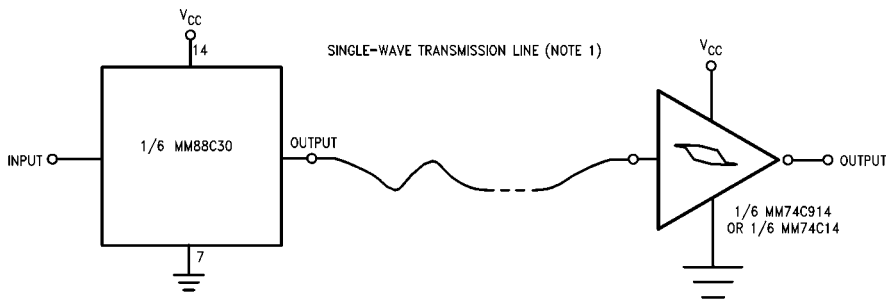
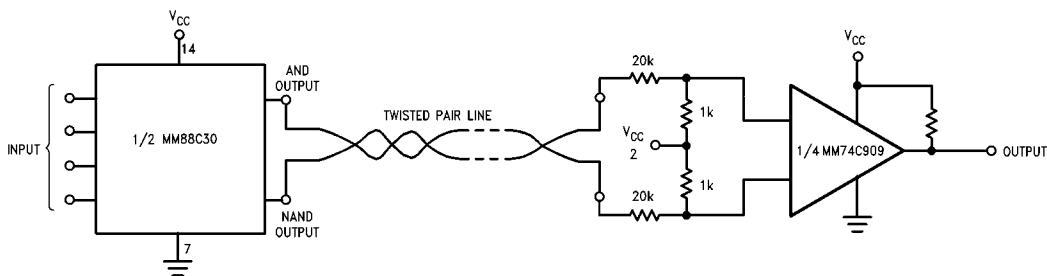
FIGURE 2.

Typical Applications

Digital Data Transmission

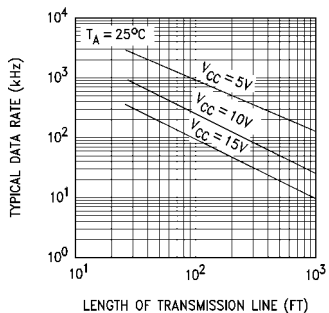


Note A: Exact value depends on line length.
 Note B: Optional to control response time.
 Note C: $V_{CC} = 4.5V$ to $5.5V$ for the DS7820, $V_{CC} = 4.5V$ to $15V$ for the DS78C20.



V_{CC} is 3V to 15V.

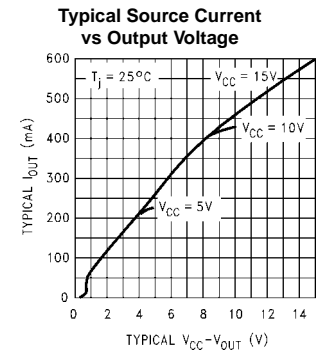
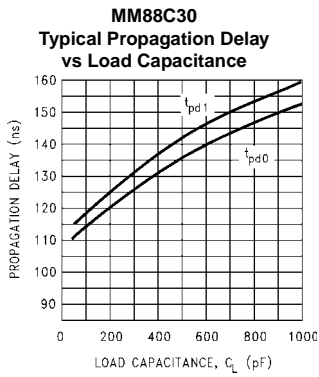
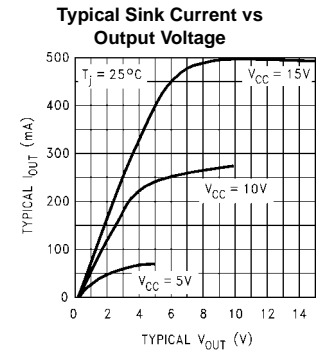
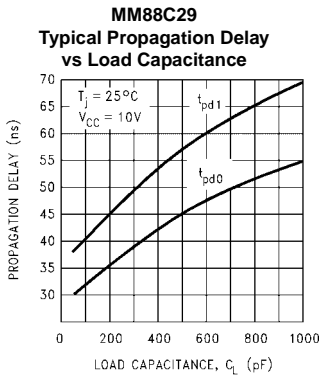
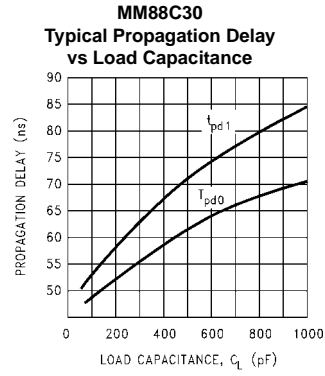
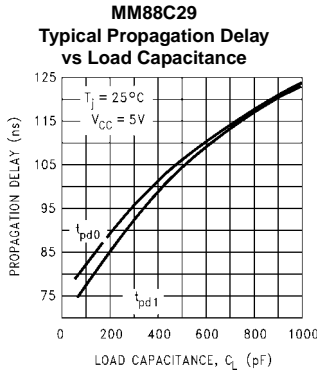
Typical Data Rate vs Transmission Line Length



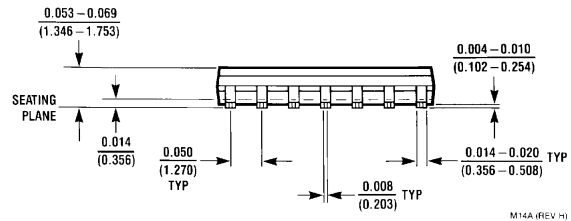
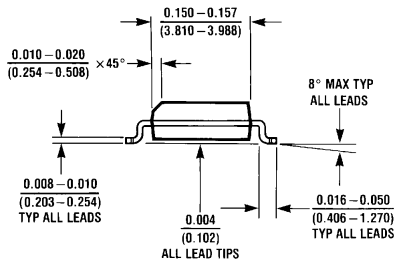
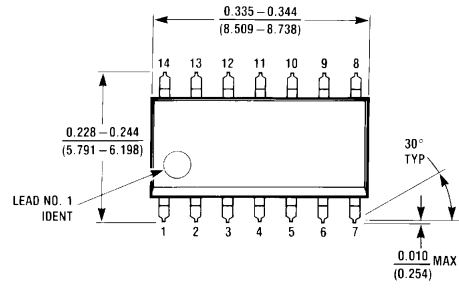
Note: The transmission line used was #22 gauge unshielded twisted pair (40k termination).

Note: The curves generated assume that both drivers are driving equal lines, and that the maximum power is 500 mW/package.

Typical Performance Characteristics



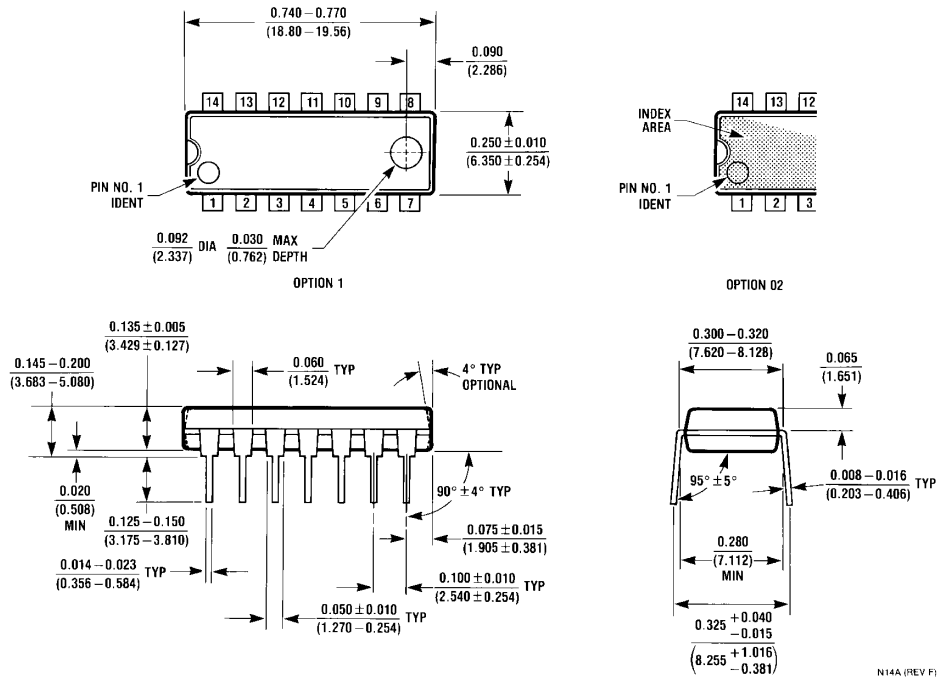
Physical Dimensions inches (millimeters) unless otherwise noted



**14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-120, 0.150" Narrow
Package Number M14A**

M14A (REV H)

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



14-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide Package Number N14A

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