MM78C29,MM78C30,MM88C29,MM88C30

MM78C29 MM88C29 Quad Single-Ended Line Driver MM78C30 MM88C30 Dual

Differential Line Driver

TEXAS INSTRUMENTS

Literature Number: SNOS351A

National *Semiconductor*

MM78C29/MM88C29 Quad Single-Ended Line Driver
MM78C30/MM88C30 Dual Differential Line Driver

General Description

The MM78C30/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 MM78C30/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 MM78C30 line driver. The differential output of the MM78C30/MM88C30 eliminates ground-loop errors.

The MM78C29/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.)
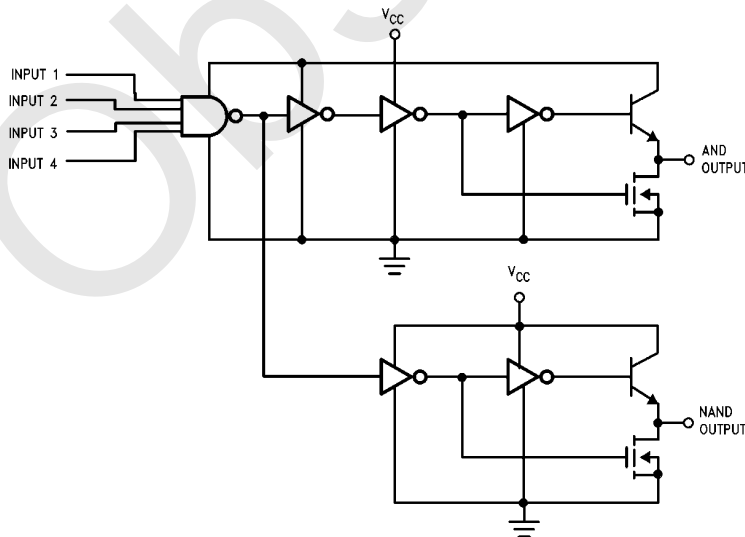■ Low output ON resistance 20Ω (typ.)

Logic Diagrams

1/4 MM78C29/MM88C29
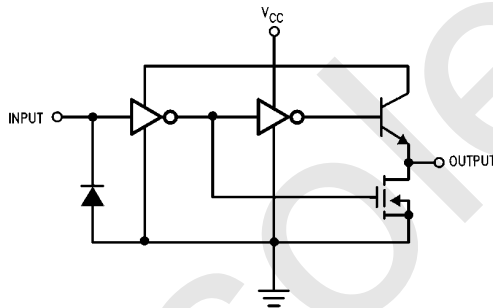
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1/2 MM78C30/MM88C30

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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 (Note 1)	$-0.3V$ to $V_{CC} + 16V$
Operating Temperature Range	
MM78C29/MM78C30	$-55°C$ to $+125°C$
MM88C29/MM88C30	$-40°C$ to $+85°C$
Storage Temperature	$-65°C$ to $+150°C$
Power Dissipation (P_D)	
Dual-In-Line	700 mW
Small Outline	500 mW

Operating V_{CC} Range	3V to 15V
Absolute Maximum V_{CC}	18V
Average Current at Output	
MM78C30/MM88C30	50 mA
MM78C29/MM88C29	25 mA
Maximum Junction Temperature, T_j	150°C
Lead Temperature	
(Soldering, 10 seconds)	260°C

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	$V_{CC} = 5V$	3.5			V
		$V_{CC} = 10V$	8			V
$V_{IN(0)}$	Logical "0" Input Voltage	$V_{CC} = 5V$			1.5	V
		$V_{CC} = 10V$			2	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 MM78C29/MM78C30	$V_{OUT} = V_{CC} - 1.6V$, $V_{CC} \geq 4.5V$, $T_j = 25°C$	-57	-80		mA
		$T_j = 125°C$	-32	-50		mA
	MM88C29/MM88C30	$V_{OUT} = V_{CC} - 1.6V$, $V_{CC} \geq 4.75V$, $T_j = 25°C$	-47	-80		mA
		$T_j = 85°C$	-32	-60		mA
	MM78C29/MM88C29 MM78C30/MM88C30	$V_{OUT} = V_{CC} - 0.8V$ $V_{CC} \geq 4.5V$	-2	-20		mA
I_{SINK}	Output Sink Current MM78C29/MM78C30	$V_{OUT} = 0.4V$, $V_{CC} = 4.5V$, $T_j = 25°C$	11	20		mA
		$T_j = 125°C$	8	14		mA
		$V_{OUT} = 0.4V$, $V_{CC} = 10V$, $T_j = 25°C$	22	40		mA
		$T_j = 125°C$	16	28		mA
	MM88C29/MM88C30	$V_{OUT} = 0.4V$, $V_{CC} = 4.75V$, $T_j = 25°C$	9.5	22		mA
		$T_j = 85°C$	8	18		mA
		$V_{OUT} = 0.4V$, $V_{CC} = 10V$, $T_j = 25°C$	19	40		mA
		$T_j = 125°C$	15.5	33		mA
I_{SOURCE}	Output Source Resistance MM78C29/MM78C30	$V_{OUT} = V_{CC} - 1.6V$, $V_{CC} \geq 4.5V$, $T_j = 25°C$		20	28	Ω
		$T_j = 125°C$		32	50	Ω
	MM88C29/MM88C30	$V_{OUT} = V_{CC} - 1.6V$, $V_{CC} \geq 4.75V$, $T_j = 25°C$		20	34	Ω
		$T_j = 85°C$		27	50	Ω

DC Electrical Characteristics
Min/Max limits apply across temperature range, unless otherwise noted (Continued)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
OUTPUT DRIVE (Continued)						
I_{SINK}	Output Sink Resistance MM78C29/MM78C30	$V_{OUT} = 0.4V$, $V_{CC} = 4.50V$, $T_j = 25°C$ $T_j = 125°C$		20 28	36 50	Ω Ω
		$V_{OUT} = 0.4V$, $V_{CC} = 10V$, $T_j = 25°C$ $T_j = 125°C$		10 14	18 25	Ω Ω
	MM88C29/MM88C30	$V_{OUT} = 0.4V$, $V_{CC} = 4.75V$, $T_j = 25°C$ $T_j = 85°C$		18 22	41 50	Ω Ω
		$V_{OUT} = 0.4V$, $V_{CC} = 10V$, $T_j = 25°C$ $T_j = 85°C$		10 12	21 26	Ω Ω
	Output Resistance Temperature Coefficient Source Sink			0.55 0.40		%/°C %/°C
θ_{JA}	Thermal Resistance MM78C29/MM78C30 (D-Package)			100		°C/W
	MM88C29/MM88C30 (N-Package)			150		°C/W

AC Electrical Characteristics* $T_A = 25°C$, $C_L = 50$ pF

Symbol	Parameter	Conditions	Min	Typ	Max	Units
t_{pd}	Propagation Delay Time to Logical "1" or "0" MM78C29/MM88C29	(See *Figure 2*) $V_{CC} = 5V$ $V_{CC} = 10V$		80 35	200 100	ns ns
	MM78C30/MM88C30	$V_{CC} = 5V$ $V_{CC} = 10V$		110 50	350 150	ns ns
t_{pd}	Differential Propagation Delay Time to Logical "1" or "0" MM78C30/MM88C30	$R_L = 100\Omega$, $C_L = 5000$ pF (See *Figure 1*) $V_{CC} = 5V$ $V_{CC} = 10V$			400 150	ns ns
C_{IN}	Input Capacitance MM78C29/MM88C29 MM78C30/MM88C30	(Note 3) (Note 3)		5.0 5.0		pF pF
C_{PD}	Power Dissipation Capacitance MM78C29/MM88C29 MM78C30/MM88C30	(Note 3) (Note 3)		150 200		pF pF

*AC Parameters are guaranteed by DC correlated testing.

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.

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 (CMOS Logic Databook).

Connection Diagrams

Dual-In-Line Package
MM78C29/MM88C29

```
 V_CC   NC    IN_4   NC   IN_3  OUT_3  OUT_4
 14     13    12     11    10    9      8

  1      2     3      4     5     6      7
 NC    IN_1    NC   IN_2  OUT_2 OUT_1  GND
```

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Top View
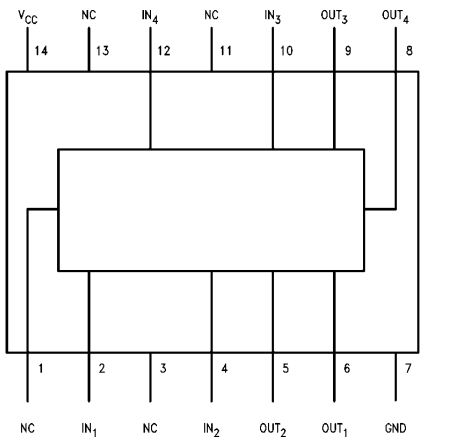
Order Number MM88C29M or MM88C29N

Dual-In-Line Package
MM78C30/MM88C30

```
 V_CC  IN_1B  IN_2B  IN_3B  IN_4B  B AND  B NAND
                                    OUT    OUT
 14     13    12     11    10    9      8

  1      2     3      4     5     6      7
 IN_1A  IN_2A IN_3A  IN_4A  A AND  A NAND GND
                            OUT    OUT
```

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Top View

Order Number MM88C30M or MM88C30N

For Complete Military 883 Specifications, see RETS Data Sheet.
Order Number MM78C29J/883, MM78C29W/883, MM78C30J/883 or MM78C30W/883

Typical Performance Characteristics
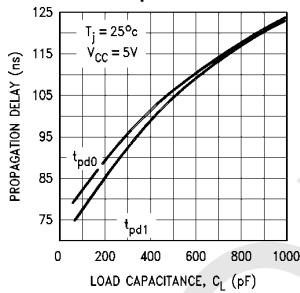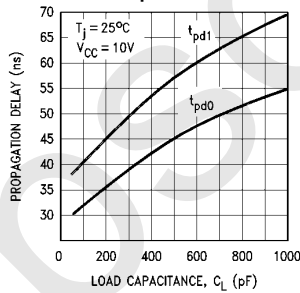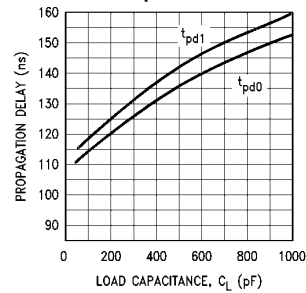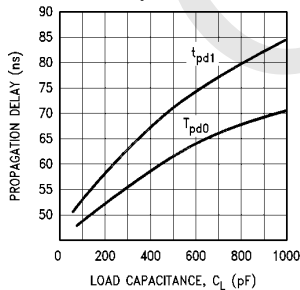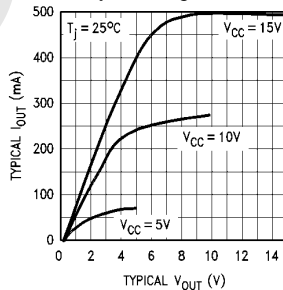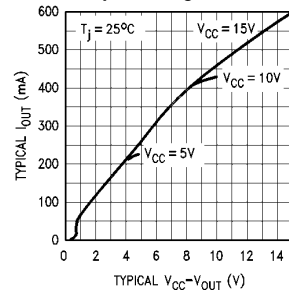
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AC Test Circuits
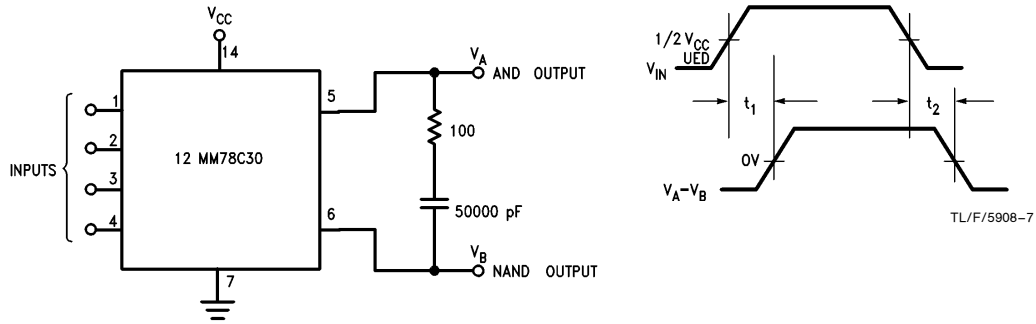
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FIGURE 1
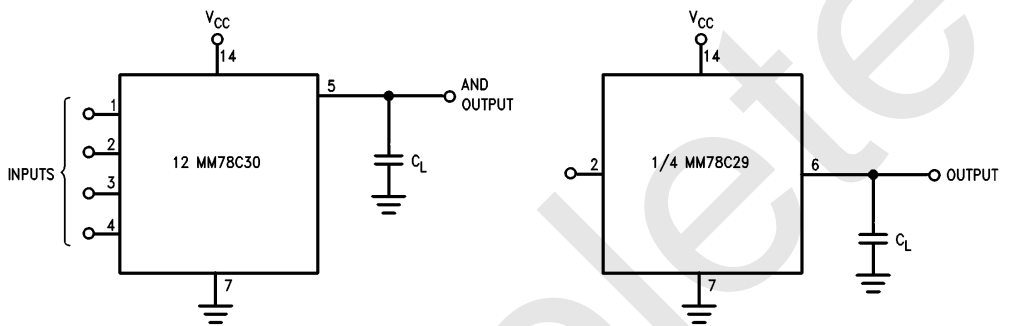
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FIGURE 2

Typical Applications

Digital Data Transmission
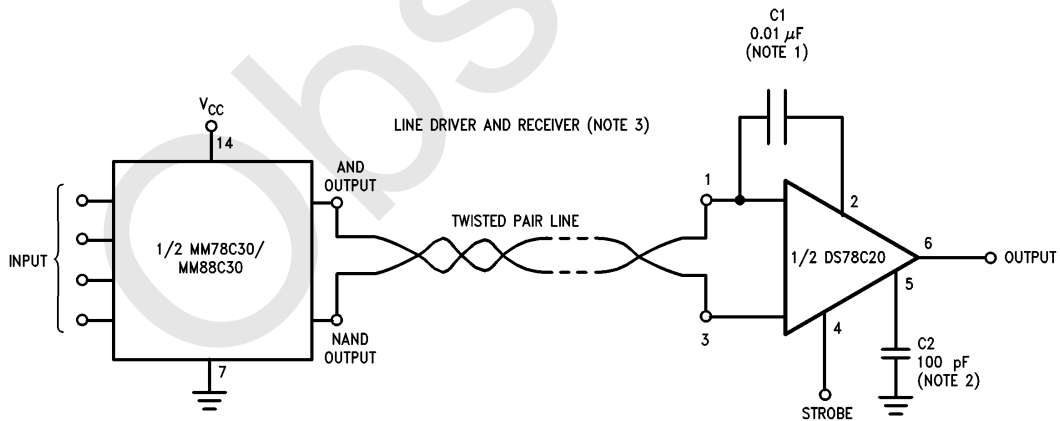
Note 1: Exact value depends on line length.

Note 2: Optional to control response time.

Note 3: V_{CC} = 4.5V to 5.5V for the DS7820, V_{CC} = 4.5V to 15V for the DS78C20.

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Typical Applications (Continued)
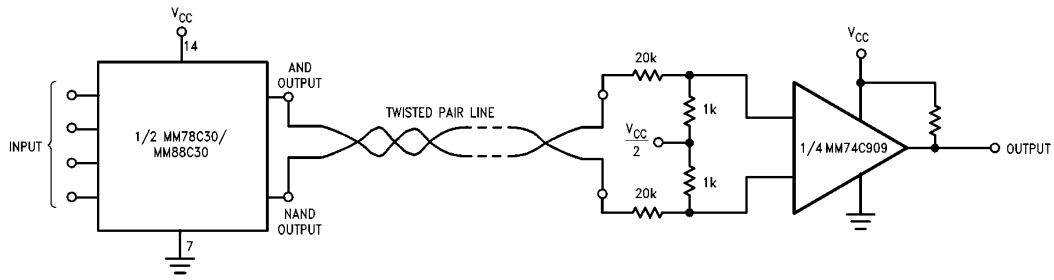
TL/F/5908–11
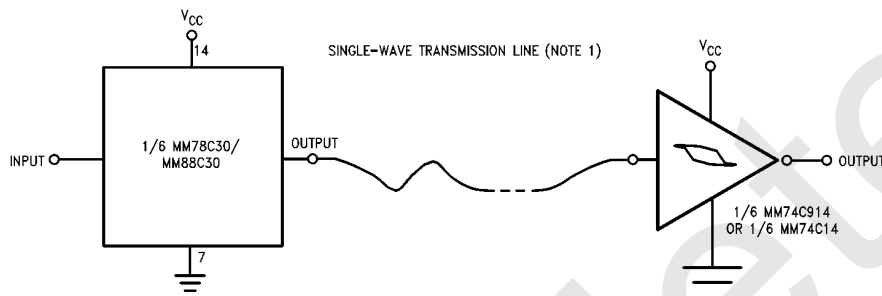
Note 1: V_{CC} is 3V to 15V

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Typical Data Rate vs Transmission Line Length
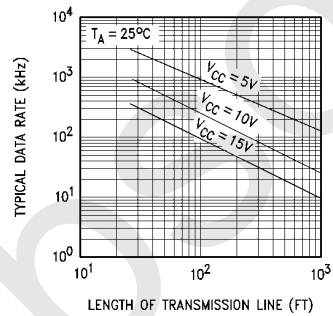
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Note 1: The transmission line used was #22 gauge unshielded twisted pair (40k termination).

Note 2: The curves generated assume that both drivers are driving equal lines, and that the maximum power is 500 mW/package.

Physical Dimensions inches (millimeters)
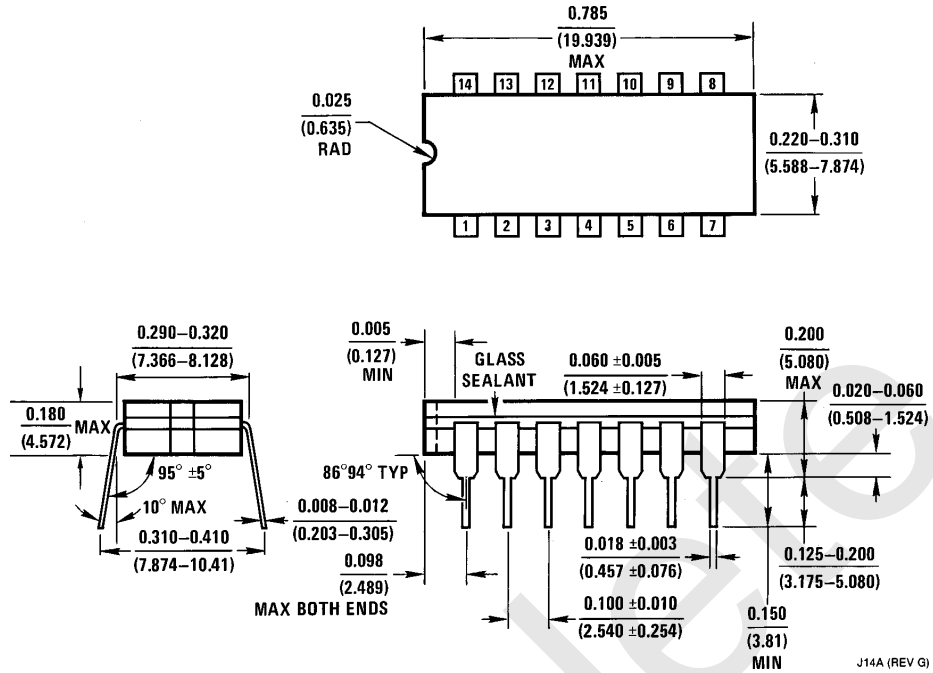
Ceramic Dual-In-Line Package (J)
Order Number MM78C29J, MM78C30J, MM88C29J or MM88C30J
NS Package Number J14A

J14A (REV G)

Physical Dimensions inches (millimeters) (Continued)
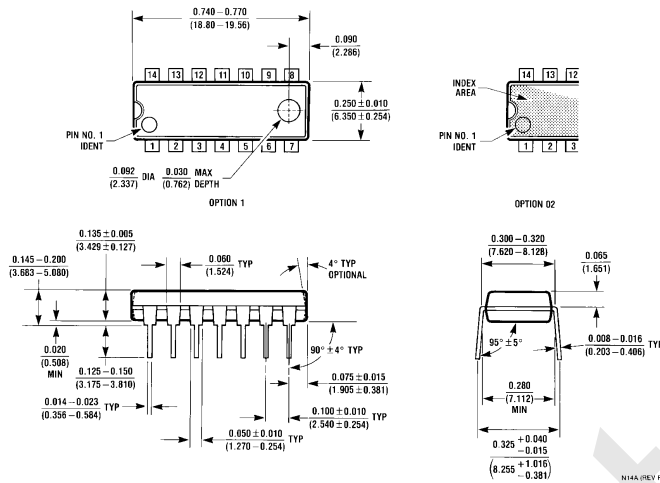
Molded Dual-In-Line Package (N)
Order Number MM78C29N, MM78C30N, MM88C29N or MM88C30N
NS Package Number N14A

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2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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