

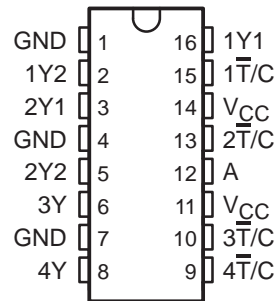
CDC328

1-LINE TO 6-LINE CLOCK DRIVER WITH SELECTABLE POLARITY

SCBS116B – JANUARY 1991 – REVISED MARCH 1994

- Replaces SN74ABT328
- Low Output Skew for Clock-Distribution and Clock-Generation Applications
- TTL-Compatible Inputs and Outputs
- Distributes One Clock Input to Six Clock Outputs
- Polarity Control Selects True or Complementary Outputs
- Distributed V_{CC} and GND Pins Reduce Switching Noise
- High-Drive Outputs ($-15\text{-mA } I_{OH}$, $64\text{-mA } I_{OL}$)
- State-of-the-Art *EPIC-II B*™ BiCMOS Design Significantly Reduces Power Dissipation
- Package Options Include Plastic Small-Outline (D) and Shrink Small-Outline (DB) Packages

D OR DB PACKAGE
(TOP VIEW)



description

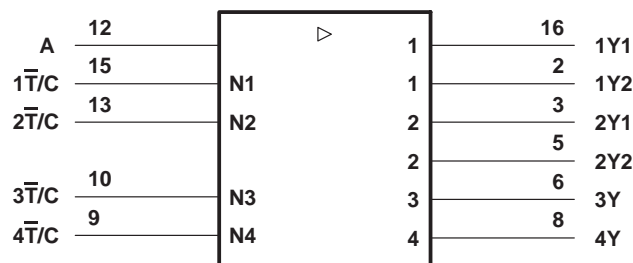
The CDC328 contains a clock-driver circuit that distributes one input signal to six outputs with minimum skew for clock distribution. Through the use of the polarity-control inputs ($\overline{T/C}$), various combinations of true and complementary outputs can be obtained.

The CDC328 is characterized for operation from -40°C to 85°C .

FUNCTION TABLE

INPUTS		OUTPUT
$\overline{T/C}$	A	Y
L	L	L
L	H	H
H	L	H
H	H	L

logic symbol†



† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

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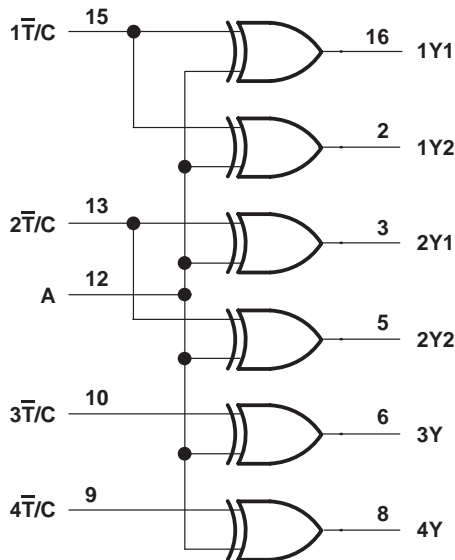
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logic diagram (positive logic)



absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†

Supply voltage range, V_{CC}	-0.5 V to 7 V
Input voltage range, V_I (see Note 1)	-0.5 V to 7 V
Voltage range applied to any output in the high state or power-off state, V_O (see Note 1)	-0.5 V to $V_{CC} + 0.5$ V
Current into any output in the low state, I_O	128 mA
Input clamp current, I_{IK} ($V_I < 0$)	-18 mA
Output clamp current, I_{OK} ($V_O < 0$)	-50 mA
Continuous total power dissipation at (or below) 25°C free-air temperature (see Note 2)	1000 mW
Storage temperature range, T_{stg}	-65°C to 150°C

† Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

- NOTES: 1. The input and output negative-voltage ratings may be exceeded if the input and output clamp-current ratings are observed.
 2. For operation above 25°C free-air temperature, derate to 478 mW at 85°C at the rate of 8.7 mW/°C.

recommended operating conditions (see Note 3)

		MIN	NOM	MAX	UNIT
V_{CC}	Supply voltage	4.75	5	5.25	V
V_{IH}	High-level input voltage	2			V
V_{IL}	Low-level input voltage			0.8	V
V_I	Input voltage	0		V_{CC}	V
I_{OH}	High-level output current			-15	mA
I_{OL}	Low-level output current			64	mA
$\Delta t/\Delta v$	Input transition rise or fall rate			5	ns/V
f_{clock}	Input clock frequency			80	MHz
T_A	Operating free-air temperature	-40		85	°C

NOTE 3: Unused inputs must be held high or low.



electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS		MIN	TYP†	MAX	UNIT
V_{IK}	$V_{CC} = 4.75\text{ V}$,	$I_I = -18\text{ mA}$			-1.2	V
V_{OH}	$V_{CC} = 4.75\text{ V}$,	$I_{OH} = -15\text{ mA}$	2.5			V
V_{OL}	$V_{CC} = 4.75\text{ V}$,	$I_{OL} = 64\text{ mA}$			0.55	V
I_I	$V_{CC} = 5.25\text{ V}$,	$V_I = V_{CC}$ or GND			± 1	μA
I_O^\ddagger	$V_{CC} = 5.25\text{ V}$,	$V_O = 2.5\text{ V}$	-15		-100	mA
I_{CC}	$V_{CC} = 5.25\text{ V}$, $V_I = V_{CC}$ or GND	$I_O = 0$,	Outputs high		50	μA
			Outputs low		20	30
C_i	$V_I = 2.5\text{ V}$ or 0.5 V			3		pF

† All typical values are at $V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$

‡ Not more than one output should be tested at a time, and the duration of the test should not exceed one second.

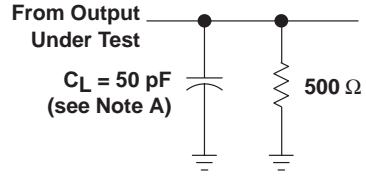
switching characteristics over recommended ranges of supply voltage and operating free-air temperature (see Figures 1 and 2)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	MIN	TYP	MAX	UNIT
t_{PLH}	A	Any Y	1.7		7	ns
t_{PHL}			1.5		5.4	
t_{PLH}	\bar{T}/C	Any Y	1.5		8	ns
t_{PHL}			1.4		6.6	
$t_{sk(o)}$	A	Any Y (same phase)			0.7	ns
		Any Y (any phase)			2.6	
t_r				1.2		ns
t_f				0.5		ns

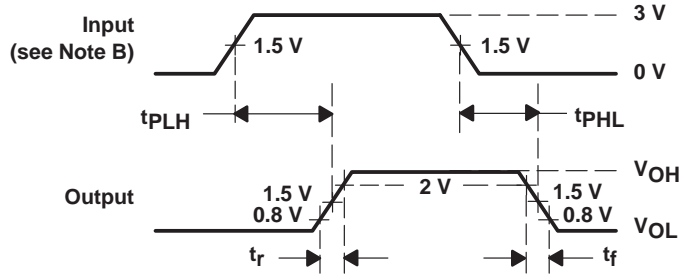
switching characteristics, $V_{CC} = 5\text{ V} \pm 0.25\text{ V}$, $T_A = 25^\circ\text{C}$ to 70°C (see Figures 1 and 2)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	MIN	MAX	UNIT
t_{PLH}	A	Any Y	2.1	6.1	ns
t_{PHL}			1.7	4.8	
$t_{sk(o)}$	A	Any Y (same phase)		0.7	ns
		Any Y (any phase)		2.1	

PARAMETER MEASUREMENT INFORMATION



LOAD CIRCUIT FOR OUTPUTS

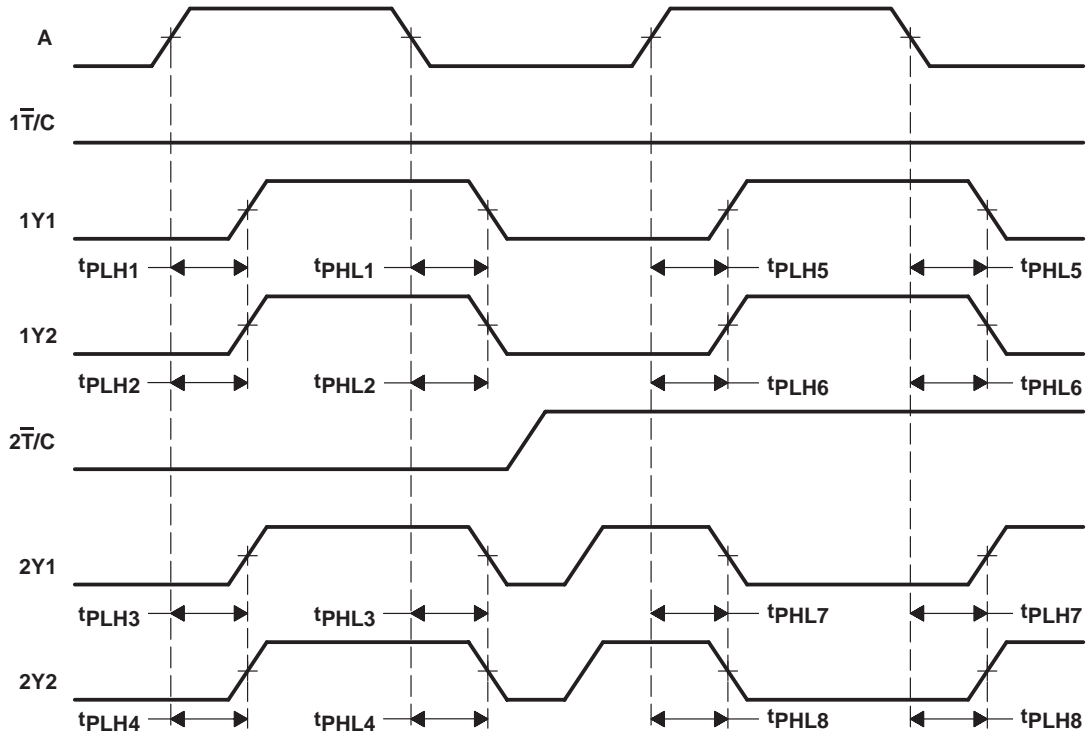


VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES

- NOTES: A. C_L includes probe and jig capacitance.
 B. All input pulses are supplied by generators having the following characteristics: $PRR \leq 10$ MHz, $Z_O = 50 \Omega$, $t_r \leq 2.5$ ns, $t_f \leq 2.5$ ns.

Figure 1. Load Circuit and Voltage Waveforms

PARAMETER MEASUREMENT INFORMATION



- NOTES: A. Output skew, $t_{sk(o)}$, from A to any Y (same phase), can be measured only between outputs for which the respective polarity-control inputs ($\overline{T/C}$) are at the same logic level. It is calculated as the greater of:
- The difference between the fastest and slowest of t_{PLH} from $A\uparrow$ to any Y (e.g., t_{PLHn} , $n = 1$ to 4; or t_{PLHn} , $n = 5$ to 6)
 - The difference between the fastest and slowest of t_{PHL} from $A\downarrow$ to any Y (e.g., t_{PHLn} , $n = 1$ to 4; or t_{PHLn} , $n = 5$ to 6)
 - The difference between the fastest and slowest of t_{PLH} from $A\downarrow$ to any Y (e.g., t_{PLHn} , $n = 7$ to 8)
 - The difference between the fastest and slowest of t_{PHL} from $A\uparrow$ to any Y (e.g., t_{PHLn} , $n = 7$ to 8)
- B. Output skew, $t_{sk(o)}$, from A to any Y (any phase), can be measured between outputs for which the respective polarity-control inputs ($\overline{T/C}$) are at the same or different logic levels. It is calculated as the greater of:
- The difference between the fastest and slowest of t_{PLH} from $A\uparrow$ to any Y or t_{PHL} from $A\uparrow$ to any Y (e.g., t_{PLHn} , $n = 1$ to 4; or t_{PLHn} , $n = 5$ to 6, and t_{PHLn} , $n = 7$ to 8)
 - The difference between the fastest and slowest of t_{PHL} from $A\downarrow$ to any Y or t_{PLH} from $A\downarrow$ to any Y (e.g., t_{PHLn} , $n = 1$ to 4; or t_{PHLn} , $n = 5$ to 6, and t_{PLHn} , $n = 7$ to 8)

Figure 2. Waveforms for Calculation of $t_{sk(o)}$

PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
CDC328D	OBSOLETE	SOIC	D	16		TBD	Call TI	Call TI
CDC328DBLE	OBSOLETE	SSOP	DB	16		TBD	Call TI	Call TI
CDC328DR	OBSOLETE	SOIC	D	16		TBD	Call TI	Call TI

⁽¹⁾ The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBSOLETE: TI has discontinued the production of the device.

⁽²⁾ Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS) or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

⁽³⁾ MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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