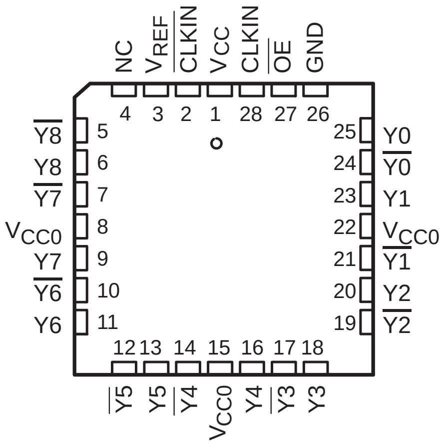
SCAS321G – SEPTEMBER 1993 – REVISED AUGUST 1999

- **Low-Output Skew for Clock-Distribution Applications**
- **Differential Low-Voltage Pseudo-ECL (LVPECL)-Compatible Inputs and Outputs**
- **Distributes Differential Clock Inputs to Nine Differential Clock Outputs**
- **Output Reference Voltage, V_{REF}, Allows Distribution From a Single-Ended Clock Input**
- **Single-Ended LVPECL-Compatible Output Enable**
- **Packaged in Plastic Chip Carrier**

FN PACKAGE
(TOP VIEW)



NC – No internal connection

description

The differential LVPECL clock-driver circuit distributes one pair of differential LVPECL clock inputs (CLKIN, $\overline{\text{CLKIN}}$) to nine pairs of differential clock (Y, $\overline{\text{Y}}$) outputs with minimum skew for clock distribution. It is specifically designed for driving 50-Ω transmission lines.

When the output-enable ($\overline{\text{OE}}$) is low, the nine differential outputs switch at the same frequency as the differential clock inputs. When $\overline{\text{OE}}$ is high, the nine differential outputs are in static states (Y outputs are in the low state, $\overline{\text{Y}}$ outputs are in the high state).

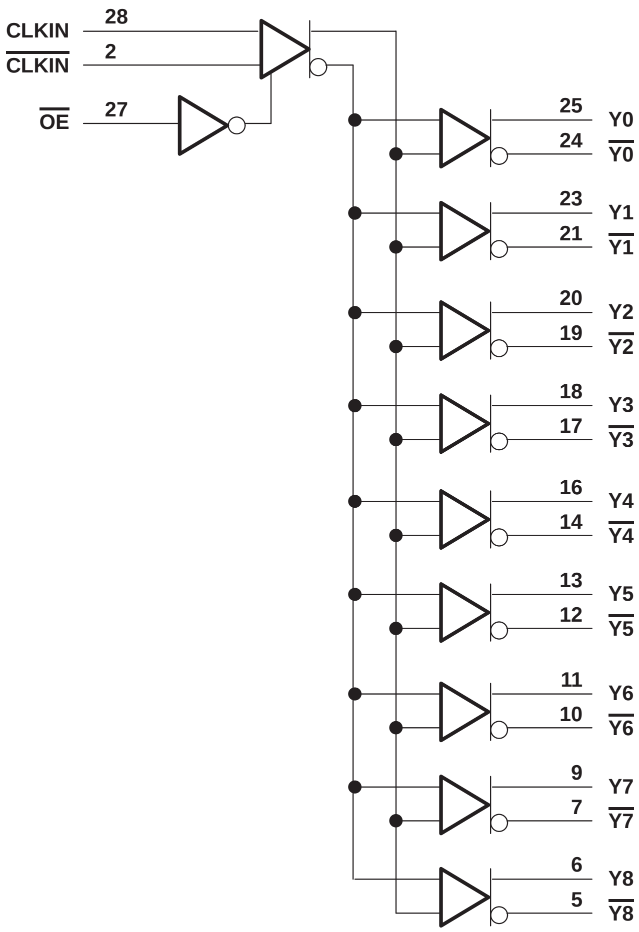
The V_{REF} output can be strapped to the $\overline{\text{CLKIN}}$ input for a single-ended CLKIN input.

The CDC111 is characterized for operation from 0°C to 70°C.

FUNCTION TABLE

INPUTS			OUTPUTS	
CLKIN	$\overline{\text{CLKIN}}$	$\overline{\text{OE}}$	Yn	$\overline{\text{Yn}}$
X	X	H	L	H
L	H	L	L	H
H	L	L	H	L
L	V_{REF}	L	L	H
H	V_{REF}	L	H	L
V_{REF}	L	L	H	L
V_{REF}	H	L	L	H

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 4.6 V
Input voltage range, V_I (see Note 1) . . . . –0.5 V to V_{CC} + 0.5 V
Output voltage range, V_O (see Note 1) . . . . –0.5 V to V_{CC} + 0.5 V
Input clamp current, I_{IK} ($V_I < 0$) . . . . –18 mA
Output clamp current, I_{OK} ($V_O < 0$ or $V_O > V_{CC}$) . . . . –18 mA
Continuous output current, I_O (V_O = 0 to V_{CC}) . . . . –50 mA
Continuous current through V_{CC} or GND . . . . ± 80 mA
Maximum power dissipation at T_A = 55°C (in still air) (see Note 2) . . . . 525 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. The maximum package power dissipation is calculated using a juction temperature of 150°C and a board trace length of 750 mils. For more information, refer to the *Package Thermal Considerations* application note in the *ABT Advanced BiCMOS Technology Data Book*, literature number SCBD002.

recommended operating conditions (see Note 3)

			MIN	MAX	UNIT
V_{CC}	Supply voltage		3	3.6	V
V_{IH}	High-level input voltage	V_{CC} = 3 V to 3.6 V	V_{CC}–1.165	V_{CC}–0.88	V
		V_{CC} = 3.3 V	2.135	2.420	V
V_{IL}	Low-level input voltage	V_{CC} = 3 V to 3.6 V	V_{CC}–1.81	V_{CC}–1.475	V
		V_{CC} = 3.3 V	1.49	1.825	V
T_A	Operating free-air temperature		0	70	°C
f_{clock}	Input frequency			500	MHz

NOTE 3: $V_{CC} = V_{CCO}$

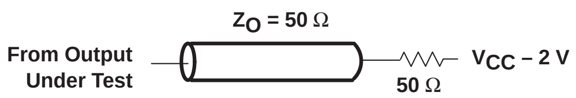
electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS		MIN	MAX	UNIT
V_{REF}	V_{CC} = 3 V to 3.6 V		V_{CC}–1.38	V_{CC}–1.26	V
	V_{CC} = 3.3 V		1.92	2.04	
V_{OH}	V_{CC} = 3 V to 3.6 V		V_{CC}–1.025	V_{CC}–0.88	V
	V_{CC} = 3.3 V		2.275	2.42	
V_{OL}	V_{CC} = 3 V to 3.6 V		V_{CC}–1.81	V_{CC}–1.62	V
	V_{CC} = 3.3 V		1.49	1.68	
I_I	V_I = 2.4 V,	V_{CC} = 3 .6 V		150	µA
I_{CC}	I_O = 0,	V_{CC} = 3 .6 V		80	mA

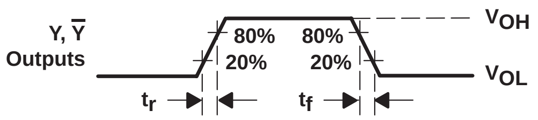
switching characteristics over recommended operating free-air temperature range, V_{CC} = 3.3 V ± 0.3 V (see Figures 1 and 2)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	MIN	MAX	UNIT
t_{PLH}	CLKIN, $\overline{CLKIN}$	Y, $\overline{Y}$	450	600	ps
t_{PHL}			450	600	
t_{PHL}	$\overline{OE}$	Y, $\overline{Y}$		900	ps
$t_{sk(o)}$		Y, $\overline{Y}$		50	ps
$t_{sk(pr)}$		Y, $\overline{Y}$		150	ps
t_r		Y, $\overline{Y}$	200	600	ps
t_f		Y, $\overline{Y}$	200	600	ps

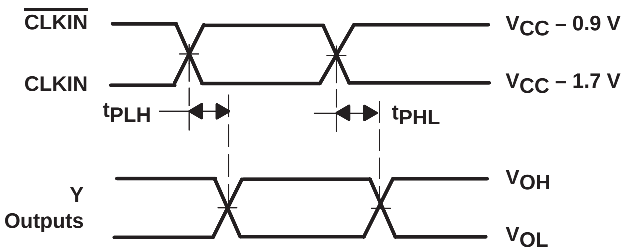
PARAMETER MEASUREMENT INFORMATION



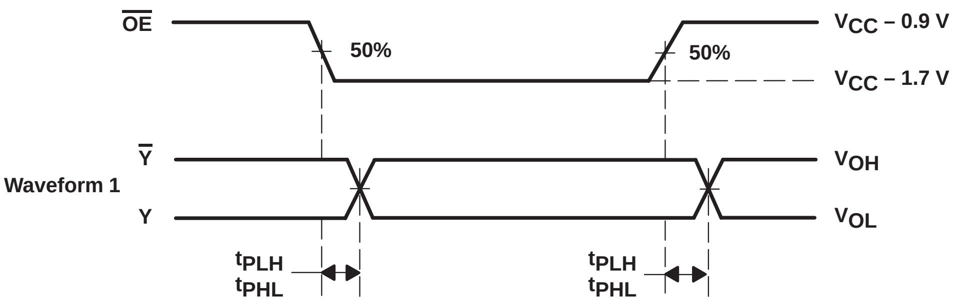
LOAD CIRCUIT



VOLTAGE WAVEFORMS
RISE AND FALL TIMES



VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES

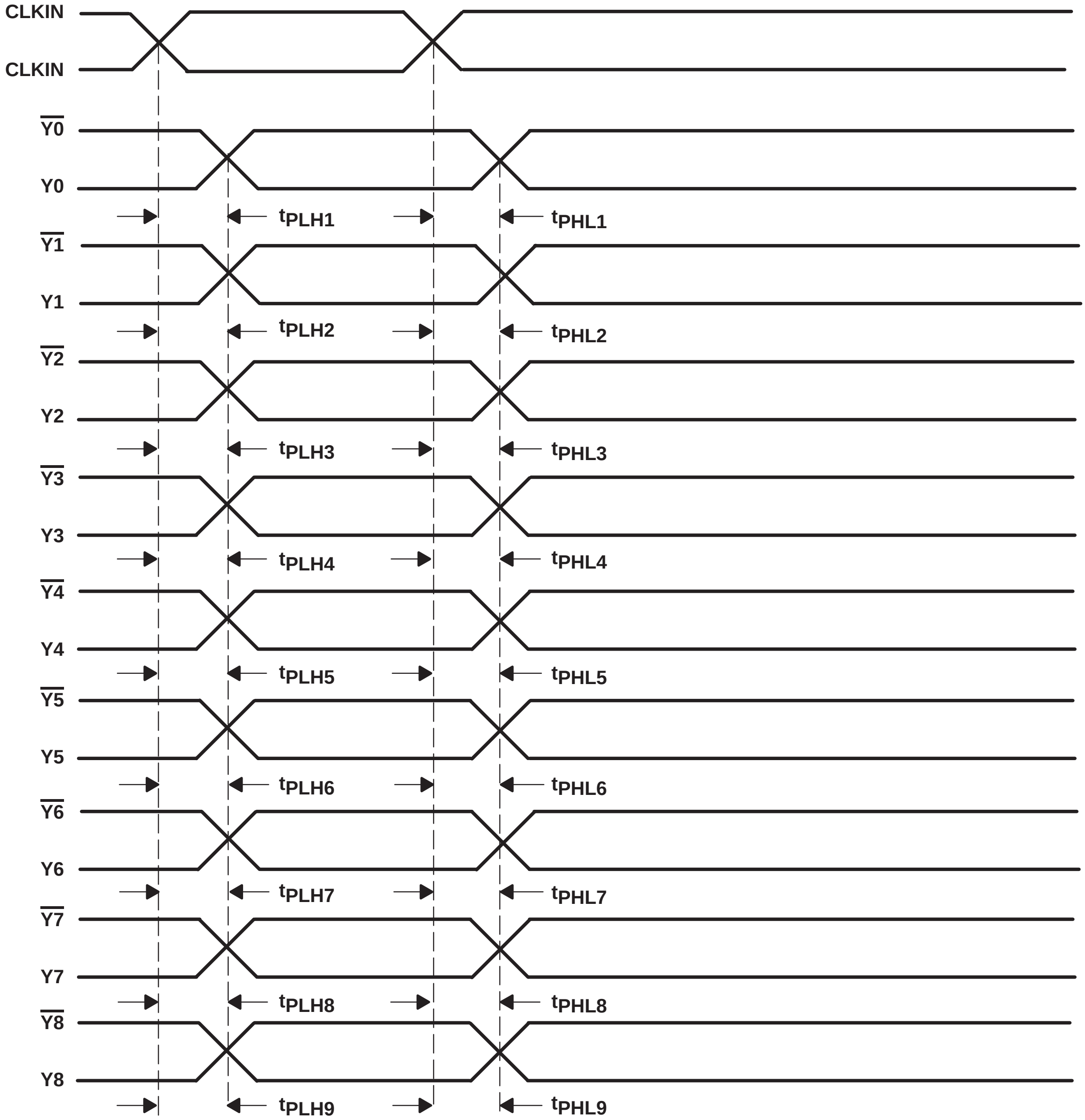


VOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES

NOTES: A. All input pulses are supplied by generators having the following characteristics: PRR ≤ 45 MHz, Z_O = 50 Ω, t_r ≤ 1 ns, t_f ≤ 1 ns.
B. Waveform 1 is for a $\overline{Y}$ output with internal conditions such that the output is high except when disabled by the output control, and for a Y output with internal conditions such that the output is low except when disabled by the output control.
C. The outputs are measured one at a time with one transition per measurement.

Figure 1. Load Circuit and Voltage Waveforms

PARAMETER MEASUREMENT INFORMATION



NOTES: A. Output skew, $t_{sk(o)}$, is calculated as the greater of:
- The difference between the fastest and slowest t_{PLHn} (n = 1, 2, . . . 9)
- The difference between the fastest and slowest t_{PHLn} (n = 1, 2, . . . 9)

B. Process skew, $t_{sk(pr)}$, is calculated as the greater of:
- The difference between the fastest and slowest t_{PLHn} (n = 1, 2, . . . 9)
- The difference between the fastest and slowest t_{PHLn} (n = 1, 2, . . . 9) across multiple devices

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

PACKAGE OPTION ADDENDUM

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)
CDC111FN	ACTIVE	PLCC	FN	28	37	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CDC111FNR	ACTIVE	PLCC	FN	28	750	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CDC111FNRG4	ACTIVE	PLCC	FN	28	750	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM

(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), Pb-Free (RoHS Exempt), 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.
Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.
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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PACKAGING INFORMATION

Orderable Device	Status [1]	Package Type	Package Drawing	Pins	Package Qty	Eco Plan [2]	Lead/ Ball Finish	MSL Peak Temp [3]	Samples (Requires Login)
CDC111FN	ACTIVE	PLCC	FN	28	37	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	Request Free Samples

[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), Pb-Free (RoHS Exempt), 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.
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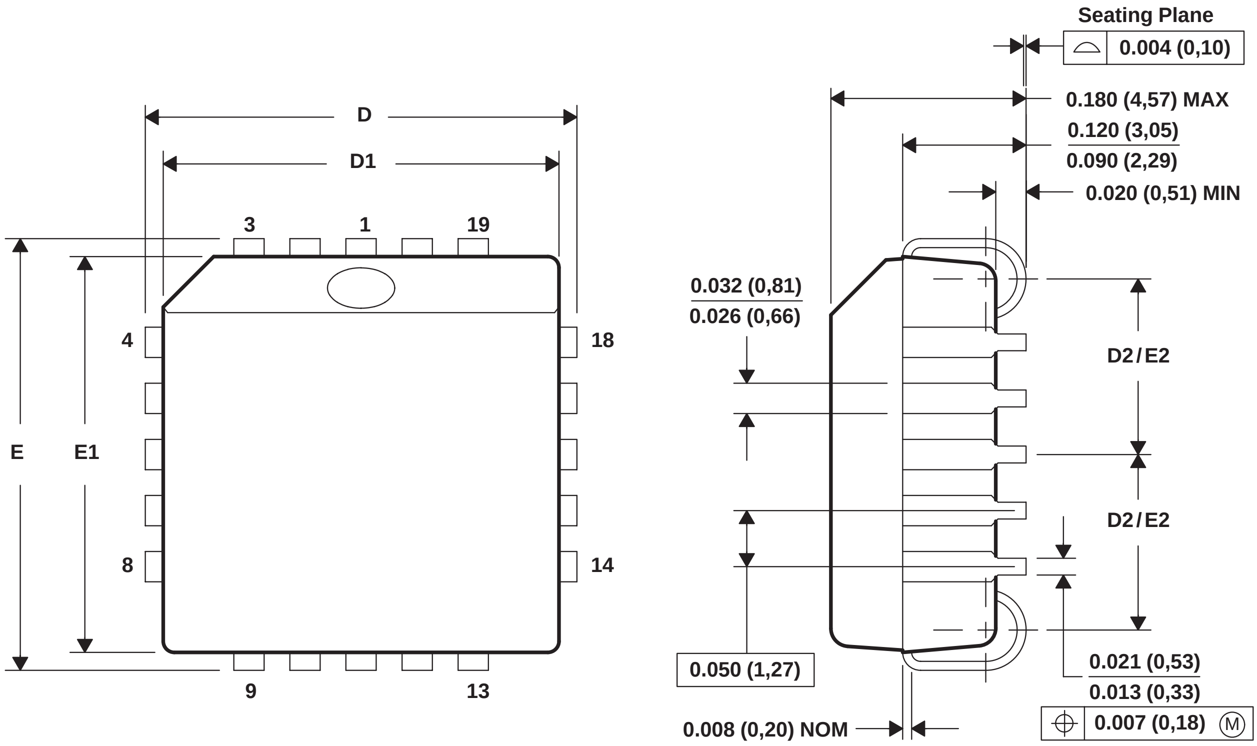
FN (S-PQCC-J**) PLASTIC J-LEADED CHIP CARRIER

20 PIN SHOWN



NO. OF PINS **	D / E		D1 / E1		D2 / E2	
	MIN	MAX	MIN	MAX	MIN	MAX
20	0.385 (9,78)	0.395 (10,03)	0.350 (8,89)	0.356 (9,04)	0.141 (3,58)	0.169 (4,29)
28	0.485 (12,32)	0.495 (12,57)	0.450 (11,43)	0.456 (11,58)	0.191 (4,85)	0.219 (5,56)
44	0.685 (17,40)	0.695 (17,65)	0.650 (16,51)	0.656 (16,66)	0.291 (7,39)	0.319 (8,10)
52	0.785 (19,94)	0.795 (20,19)	0.750 (19,05)	0.756 (19,20)	0.341 (8,66)	0.369 (9,37)
68	0.985 (25,02)	0.995 (25,27)	0.950 (24,13)	0.958 (24,33)	0.441 (11,20)	0.469 (11,91)
84	1.185 (30,10)	1.195 (30,35)	1.150 (29,21)	1.158 (29,41)	0.541 (13,74)	0.569 (14,45)

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NOTES: A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. Falls within JEDEC MS-018

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