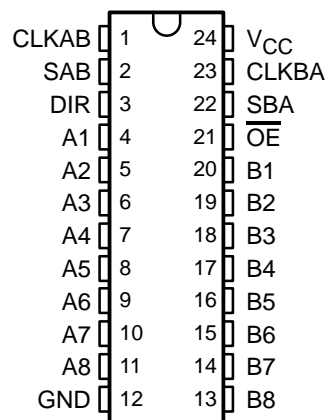


# CD54HC646, CD74HCT646 OCTAL BUS TRANSCEIVERS AND REGISTERS WITH 3-STATE OUTPUTS

SCHS278B – APRIL 2003 – REVISED APRIL 2003

- 2-V to 6-V  $V_{CC}$  Operation (CD54HC646)
- 4.5-V to 5.5-V  $V_{CC}$  Operation (CD74HCT646)
- Wide Operating Temperature Range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$
- Balanced Propagation Delays and Transition Times
- Standard Outputs Drive Up To 15 LS-TTL Loads
- Significant Power Reduction Compared to LS-TTL Logic ICs
- Inputs Are TTL-Voltage Compatible (CD74HCT646)
- Independent Registers for A and B Buses
- Multiplexed Real-Time and Stored Data
- True Data Paths

CD54HC646 . . . F PACKAGE  
CD74HCT646 . . . M PACKAGE  
(TOP VIEW)



## description/ordering information

The CD54HC646 and CD74HCT646 consist of bus-transceiver circuits with 3-state outputs, D-type flip-flops, and control circuitry arranged for multiplexed transmission of data directly from the input bus or from the internal registers. Data on the A or B bus is clocked into the registers on the low-to-high transition of the appropriate clock (CLKAB or CLKBA) input. Figure 1 illustrates the four fundamental bus-management functions that can be performed with these devices.

Output-enable ( $\overline{\text{OE}}$ ) and direction-control (DIR) inputs control the transceiver functions. In the transceiver mode, data present at the high-impedance port can be stored in either or both registers.

The select-control (SAB and SBA) inputs can multiplex stored and real-time (transparent mode) data. DIR determines which bus receives data when  $\overline{\text{OE}}$  is active (low). In the isolation mode ( $\overline{\text{OE}}$  high), A data can be stored in one register and/or B data can be stored in the other register.

When an output function is disabled, the input function still is enabled and can be used to store data. Only one of the two buses, A or B, can be driven at a time.

To ensure the high-impedance state during power up or power down,  $\overline{\text{OE}}$  should be tied to  $V_{CC}$  through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

## ORDERING INFORMATION

$T_A$	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
$-55^{\circ}\text{C}$ to $125^{\circ}\text{C}$	SOIC – M	Tape and reel	CD74HCT646M96	HCT646M
	CDIP – F	Tube	CD54HC646F3A	CD54HC646F3A

† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at [www.ti.com/sc/package](http://www.ti.com/sc/package).



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 **TEXAS  
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**FUNCTION TABLE**

INPUTS						DATA I/O		OPERATION OR FUNCTION
$\overline{OE}$	DIR	CLKAB	CLKBA	SAB	SBA	A1–A8	B1–B8	
X	X	↑	X	X	X	Input	Unspecified†	Store A, B unspecified†
X	X	X	↑	X	X	Unspecified†	Input	Store B, A unspecified†
H	X	↑	↑	X	X	Input	Input	Store A and B data
H	X	H or L	H or L	X	X	Input disabled	Input disabled	Isolation, hold storage
L	L	X	X	X	L	Output	Input	Real-time B data to A bus
L	L	X	H or L	X	H	Output	Input	Stored B data to A bus
L	H	X	X	L	X	Input	Output	Real-time A data to B bus
L	H	H or L	X	H	X	Input	Output	Stored A data to B bus

† The data-output functions can be enabled or disabled by various signals at  $\overline{OE}$  and DIR. Data-input functions always are enabled; i.e., data at the bus terminals is stored on every low-to-high transition of the clock inputs.



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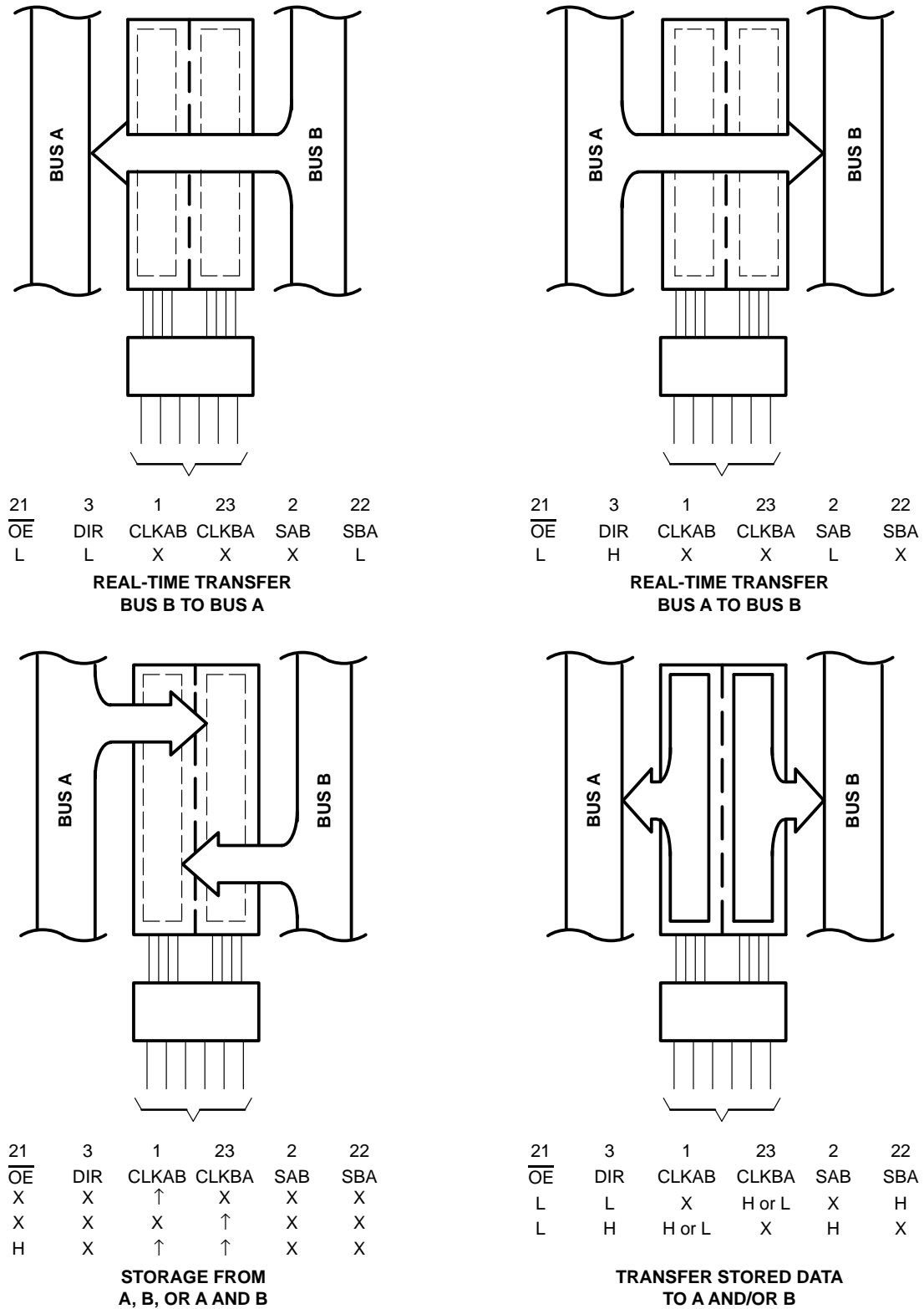
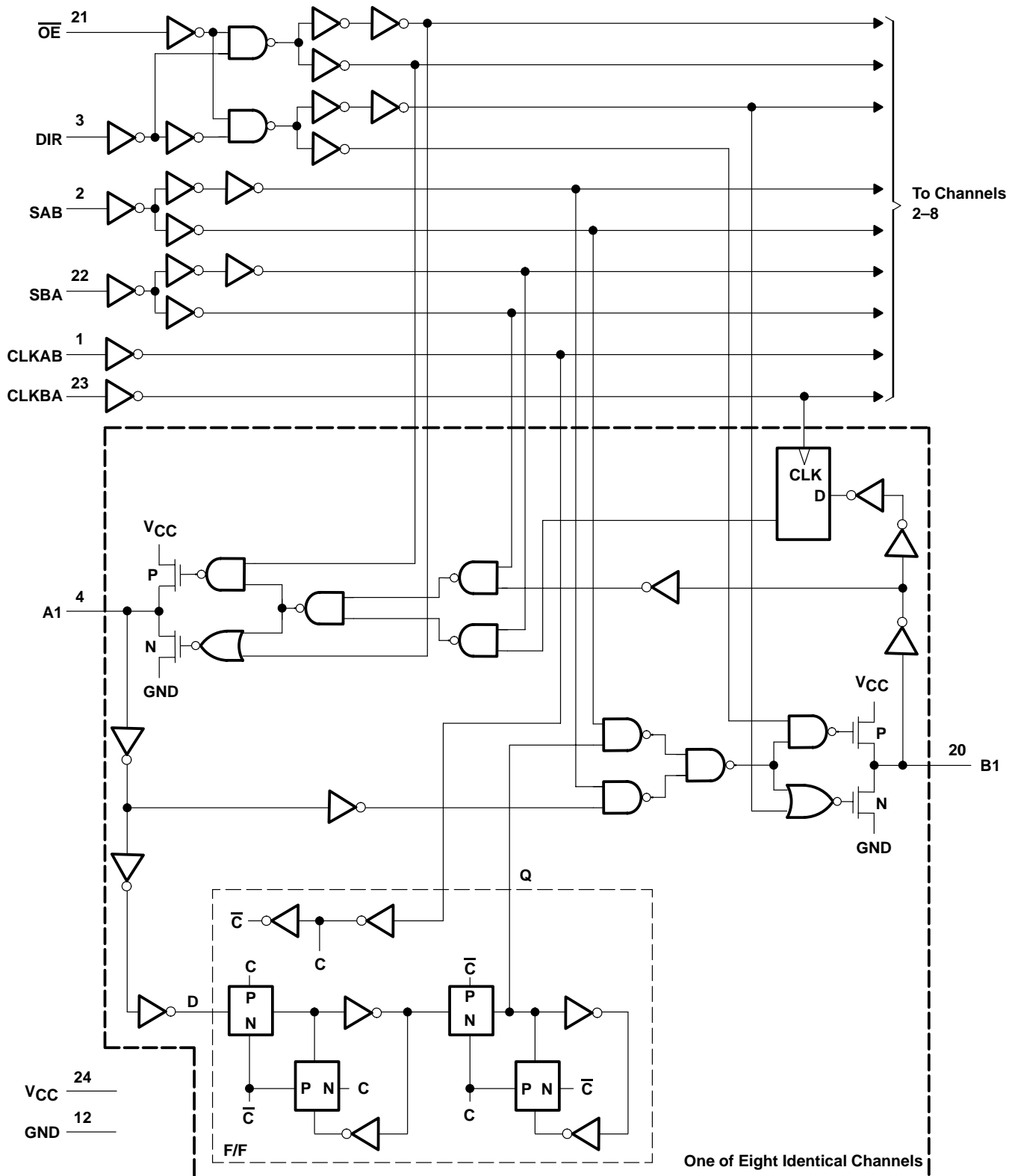


Figure 1. Bus-Management Functions

# CD54HC646, CD74HCT646 OCTAL BUS TRANSCEIVERS AND REGISTERS WITH 3-STATE OUTPUTS

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## logic diagram (positive logic)



# CD54HC646, CD74HCT646 OCTAL BUS TRANSCEIVERS AND REGISTERS WITH 3-STATE OUTPUTS

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

Supply voltage range, $V_{CC}$ .....	–0.5 V to 7 V
Input clamp current, $I_{IK}$ ( $V_I < 0$ or $V_I > V_{CC}$ ) (see Note 1) .....	±20 mA
Output clamp current, $I_{OK}$ ( $V_O < 0$ or $V_O > V_{CC}$ ) (see Note 1) .....	±20 mA
Continuous output drain current per output, $I_O$ ( $V_O = 0$ to $V_{CC}$ ) .....	±35 mA
Continuous current through $V_{CC}$ or GND .....	±50 mA
Package thermal impedance, $\theta_{JA}$ (see Note 2) M package .....	46°C/W
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 voltage ratings may be exceeded if the input and output current ratings are observed.  
2. The package thermal impedance is calculated in accordance with JESD 51-7.

## recommended operating conditions for CD54HC646 (see Note 3)

		MIN	MAX	UNIT
$V_{CC}$	Supply voltage	2	6	V
$V_{IH}$	High-level input voltage	$V_{CC} = 2$ V	1.5	V
		$V_{CC} = 4.5$ V	3.15	
		$V_{CC} = 6$ V	4.2	
$V_{IL}$	Low-level input voltage	$V_{CC} = 2$ V	0.5	V
		$V_{CC} = 4.5$ V	1.35	
		$V_{CC} = 6$ V	1.8	
$V_I$	Input voltage	0	$V_{CC}$	V
$V_O$	Output voltage	0	$V_{CC}$	V
$t_t$	Input transition (rise and fall) time	$V_{CC} = 2$ V	1000	ns
		$V_{CC} = 4.5$ V	500	
		$V_{CC} = 6$ V	400	
$T_A$	Operating free-air temperature	–55	125	°C

NOTE 3: All unused inputs of the device must be held at  $V_{CC}$  or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

## recommended operating conditions for CD74HCT646 (see Note 3)

		MIN	MAX	UNIT
$V_{CC}$	Supply voltage	4.5	5.5	V
$V_{IH}$	High-level input voltage	2		V
$V_{IL}$	Low-level input voltage		0.8	V
$V_I$	Input voltage		$V_{CC}$	V
$V_O$	Output voltage		$V_{CC}$	V
$t_t$	Input transition (rise and fall) time		500	ns
$T_A$	Operating free-air temperature	–55	125	°C

NOTE 4: All unused inputs of the device must be held at  $V_{CC}$  or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.



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**electrical characteristics for CD54HC646 over recommended operating free-air temperature range (unless otherwise noted)**

PARAMETER	TEST CONDITIONS		V <sub>CC</sub>	T <sub>A</sub> = 25°C		T <sub>A</sub> = -55°C TO 125°C		T <sub>A</sub> = -40°C TO 85°C		UNIT
				MIN	MAX	MIN	MAX	MIN	MAX	
V <sub>OH</sub>	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OH</sub> = -20 μA	2 V	1.9		1.9		1.9		V
			4.5 V	4.4		4.4		4.4		
			6 V	5.9		5.9		5.9		
		I <sub>OH</sub> = -6 mA	4.5 V	3.98		3.7		3.84		
		I <sub>OH</sub> = -7.8 mA	6 V	5.48		5.2		5.34		
V <sub>OL</sub>	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OL</sub> = 20 μA	2 V		0.1		0.1		0.1	V
			4.5 V		0.1		0.1		0.1	
			6 V		0.1		0.1		0.1	
		I <sub>OL</sub> = 6 mA	4.5 V		0.26		0.4		0.33	
		I <sub>OL</sub> = 7.8 mA	6 V		0.26		0.4		0.33	
I <sub>I</sub>	V <sub>I</sub> = V <sub>CC</sub> or 0		6 V		±0.1		±1		±1	μA
I <sub>OZ</sub>	V <sub>O</sub> = V <sub>CC</sub> or 0		6 V		±0.5		±10		±5	μA
I <sub>CC</sub>	V <sub>I</sub> = V <sub>CC</sub> or 0, I <sub>O</sub> = 0		6 V		8		160		80	μA
C <sub>i</sub>					10		10		10	pF
C <sub>o</sub>					20		20		20	pF

**electrical characteristics for CD74HCT646 over recommended operating free-air temperature range (unless otherwise noted)**

PARAMETER	TEST CONDITIONS		V <sub>CC</sub>	T <sub>A</sub> = 25°C			T <sub>A</sub> = -55°C TO 125°C		T <sub>A</sub> = -40°C TO 85°C		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V <sub>OH</sub>	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OH</sub> = -20 μA	4.5 V	4.4			4.4		4.4	V	
		I <sub>OH</sub> = -6 mA		3.98			3.7		3.84		
V <sub>OL</sub>	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OL</sub> = 20 μA	4.5 V		0.1		0.1		0.1	V	
		I <sub>OL</sub> = 6 mA			0.26		0.4		0.33		
I <sub>I</sub>	V <sub>I</sub> = V <sub>CC</sub> to GND		5.5 V		±0.1		±1		±1	μA	
I <sub>OZ</sub>	V <sub>O</sub> = V <sub>CC</sub> or 0		5.5 V		±0.5		±10		±5	μA	
I <sub>CC</sub>	V <sub>I</sub> = V <sub>CC</sub> or 0, I <sub>O</sub> = 0		5.5 V		8		160		80	μA	
ΔI <sub>CC</sub> †	One input at V <sub>CC</sub> - 2.1 V, Other inputs at 0 or V <sub>CC</sub>		4.5 V to 5.5 V		100	360		490		450	μA
C <sub>i</sub>					10		10		10	pF	
C <sub>o</sub>					20		20		20	pF	

† Additional quiescent supply current per input pin, TTL inputs high, 1 unit load



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**HCT INPUT LOADING TABLE**

INPUT	UNIT LOAD†
$\overline{OE}$	1.3
DIR	0.75
CLKAB or CLKBA	0.6
SAB or SBA	0.45
A or B	0.3

† Unit Load is  $\Delta I_{CC}$  limit specified in electrical characteristics table (e.g., 360  $\mu$ A max at 25°C).

**timing requirements for CD54HC646 over recommended operating free-air temperature range (unless otherwise noted) (see Figure 2)**

	$V_{CC}$	$T_A = 25^\circ\text{C}$		$T_A = -55^\circ\text{C}$ TO $125^\circ\text{C}$		$T_A = -40^\circ\text{C}$ TO $85^\circ\text{C}$		UNIT
		MIN	MAX	MIN	MAX	MIN	MAX	
$f_{\text{clock}}$ Clock frequency	2 V		6		4		5	MHz
	4.5 V		30		20		25	
	6 V		35		23		29	
$t_w$ Pulse duration, CLKBA or CLKAB high or low	2 V		80		120		100	ns
	4.5 V		16		24		20	
	6 V		14		20		17	
$t_{su}$ Setup time, A before CLKAB $\uparrow$ or B before CLKBA $\uparrow$	2 V		60		90		75	ns
	4.5 V		12		18		15	
	6 V		10		15		13	
$t_h$ Hold time, A after CLKAB $\uparrow$ or B after CLKBA $\uparrow$	2 V		35		55		45	ns
	4.5 V		7		11		9	
	6 V		6		9		8	

**timing requirements for CD74HCT646 over recommended operating free-air temperature range,  $V_{CC} = 4.5\text{ V}$  (unless otherwise noted) (see Figure 3)**

	$T_A = 25^\circ\text{C}$		$T_A = -55^\circ\text{C}$ TO $125^\circ\text{C}$		$T_A = -40^\circ\text{C}$ TO $85^\circ\text{C}$		UNIT
	MIN	MAX	MIN	MAX	MIN	MAX	
$f_{\text{clock}}$ Clock frequency		25		17		20	MHz
$t_w$ Pulse duration, CLKBA or CLKAB high or low		25		38		31	ns
$t_{su}$ Setup time, A before CLKAB $\uparrow$ or B before CLKBA $\uparrow$		12		18		15	ns
$t_h$ Hold time, A after CLKAB $\uparrow$ or B after CLKBA $\uparrow$		5		5		5	ns

# CD54HC646, CD74HCT646 OCTAL BUS TRANSCEIVERS AND REGISTERS WITH 3-STATE OUTPUTS

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switching characteristics for CD54HC646 over recommended operating free-air temperature range (unless otherwise noted) (see Figure 2)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	V <sub>CC</sub>	T <sub>A</sub> = 25°C			T <sub>A</sub> = -55°C TO 125°C		T <sub>A</sub> = -40°C TO 85°C		UNIT	
					MIN	TYP	MAX	MIN	MAX	MIN	MAX		
f <sub>max</sub>			C <sub>L</sub> = 50 pF	2 V	6			4		5	MHz		
				4.5 V	30			20		25			
				6 V	35			23		29			
			C <sub>L</sub> = 15 pF	5 V	60								
t <sub>pd</sub>	CLKBA or CLKAB	A or B	C <sub>L</sub> = 50 pF	2 V		220		330		275	ns		
				4.5 V		44		66		55			
				6 V		37		56		47			
			C <sub>L</sub> = 15 pF	5 V	18								
	A or B	B or A	C <sub>L</sub> = 50 pF	2 V		135		205		170			
				4.5 V		27		41		34			
				6 V		23		35		29			
			C <sub>L</sub> = 15 pF	5 V	12								
			SBA or SBA†	A or B	C <sub>L</sub> = 50 pF	2 V		170		255			215
						4.5 V		34		51			43
	6 V					29		43		37			
	C <sub>L</sub> = 15 pF	5 V			14								
t <sub>en</sub>	$\overline{\text{OE}}$	A or B	C <sub>L</sub> = 50 pF	2 V		175		265		220			
				4.5 V		35		53		44			
				6 V		30		45		37			
			C <sub>L</sub> = 15 pF	5 V	14								
t <sub>dis</sub>	$\overline{\text{OE}}$	A or B	C <sub>L</sub> = 50 pF	2 V		175		265		220			
				4.5 V		35		53		44			
				6 V		30		45		37			
			C <sub>L</sub> = 15 pF	5 V	14								
t <sub>t</sub>		Any	C <sub>L</sub> = 50 pF	2 V		60		90		75			
				4.5 V		12		18		15			
				6 V		10		15		13			

† These parameters are measured with the internal output state of the storage register opposite that of the bus input.



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**switching characteristics for CD74HCT646 over recommended operating free-air temperature range (unless otherwise noted) (see Figure 3)**

PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	V <sub>CC</sub>	T <sub>A</sub> = 25°C			T <sub>A</sub> = -55°C TO 125°C		T <sub>A</sub> = -40°C TO 85°C		UNIT
					MIN	TYP	MAX	MIN	MAX	MIN	MAX	
f <sub>max</sub>			C <sub>L</sub> = 50 pF	4.5 V	25			17		20	MHz	
			C <sub>L</sub> = 15 pF	5 V		45						
t <sub>pd</sub>	CLKBA or CLKAB	A or B	C <sub>L</sub> = 50 pF	4.5 V			44	66	55	ns		
			C <sub>L</sub> = 15 pF	5 V		18						
	A or B	B or A	C <sub>L</sub> = 50 pF	4.5 V			37	56	46			
			C <sub>L</sub> = 15 pF	5 V		15						
	SBA or SAB†	A or B	C <sub>L</sub> = 50 pF	4.5 V			46	69	58			
			C <sub>L</sub> = 15 pF	5 V		19						
t <sub>en</sub>	$\overline{OE}$	A or B	C <sub>L</sub> = 50 pF	4.5 V			45	68	56	ns		
			C <sub>L</sub> = 15 pF	5 V		19						
t <sub>dis</sub>	$\overline{OE}$	A or B	C <sub>L</sub> = 50 pF	4.5 V			35	53	44	ns		
			C <sub>L</sub> = 15 pF	5 V		14						
t <sub>t</sub>			C <sub>L</sub> = 50 pF	4.5 V			12	18	15	ns		

† These parameters are measured with the internal output state of the storage register opposite that of the bus input.

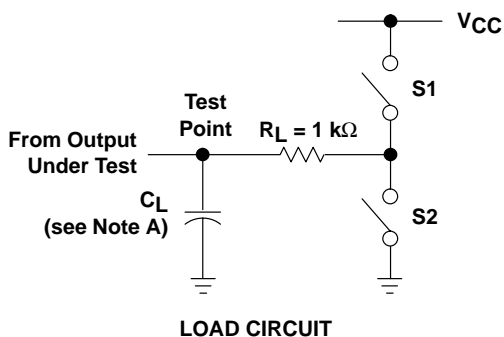
**operating characteristics, V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C**

PARAMETER	TYP	UNIT
C <sub>pd</sub> Power dissipation capacitance	52	pF

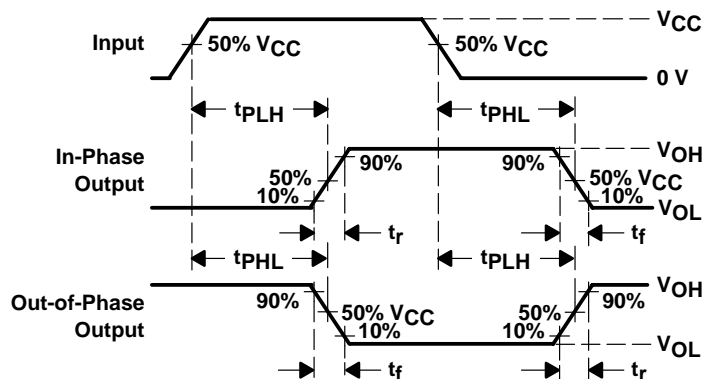
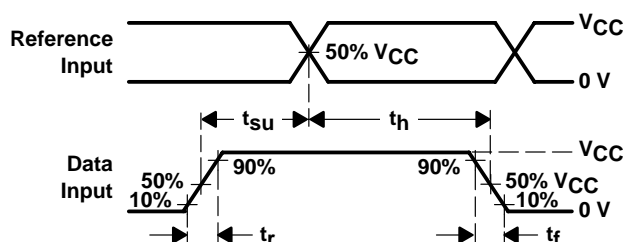
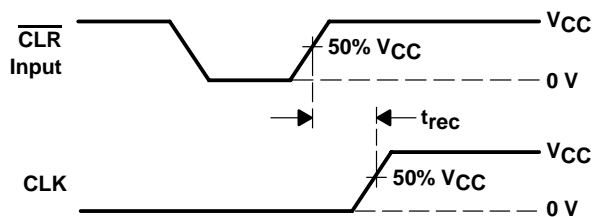
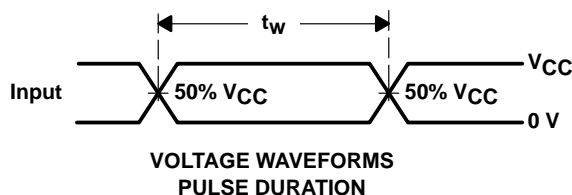
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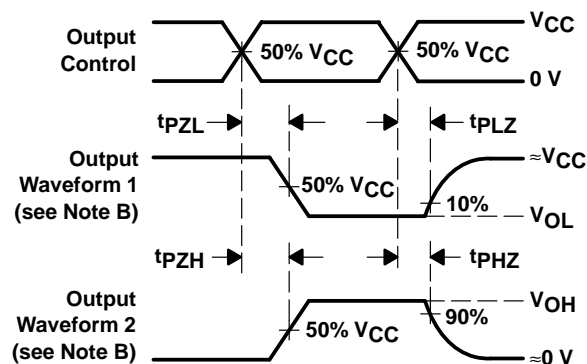
## PARAMETER MEASUREMENT INFORMATION – CD54HC646



PARAMETER	S1	S2	
$t_{en}$	tPZH	Open	Closed
	tPZL	Closed	Open
$t_{dis}$	tPHZ	Open	Closed
	tPLZ	Closed	Open
$t_{pd}$ or $t_t$	Open	Open	



VOLTAGE WAVEFORMS  
SETUP AND HOLD AND INPUT RISE AND FALL TIMES



VOLTAGE WAVEFORMS  
PROPAGATION DELAY AND OUTPUT TRANSITION TIMES

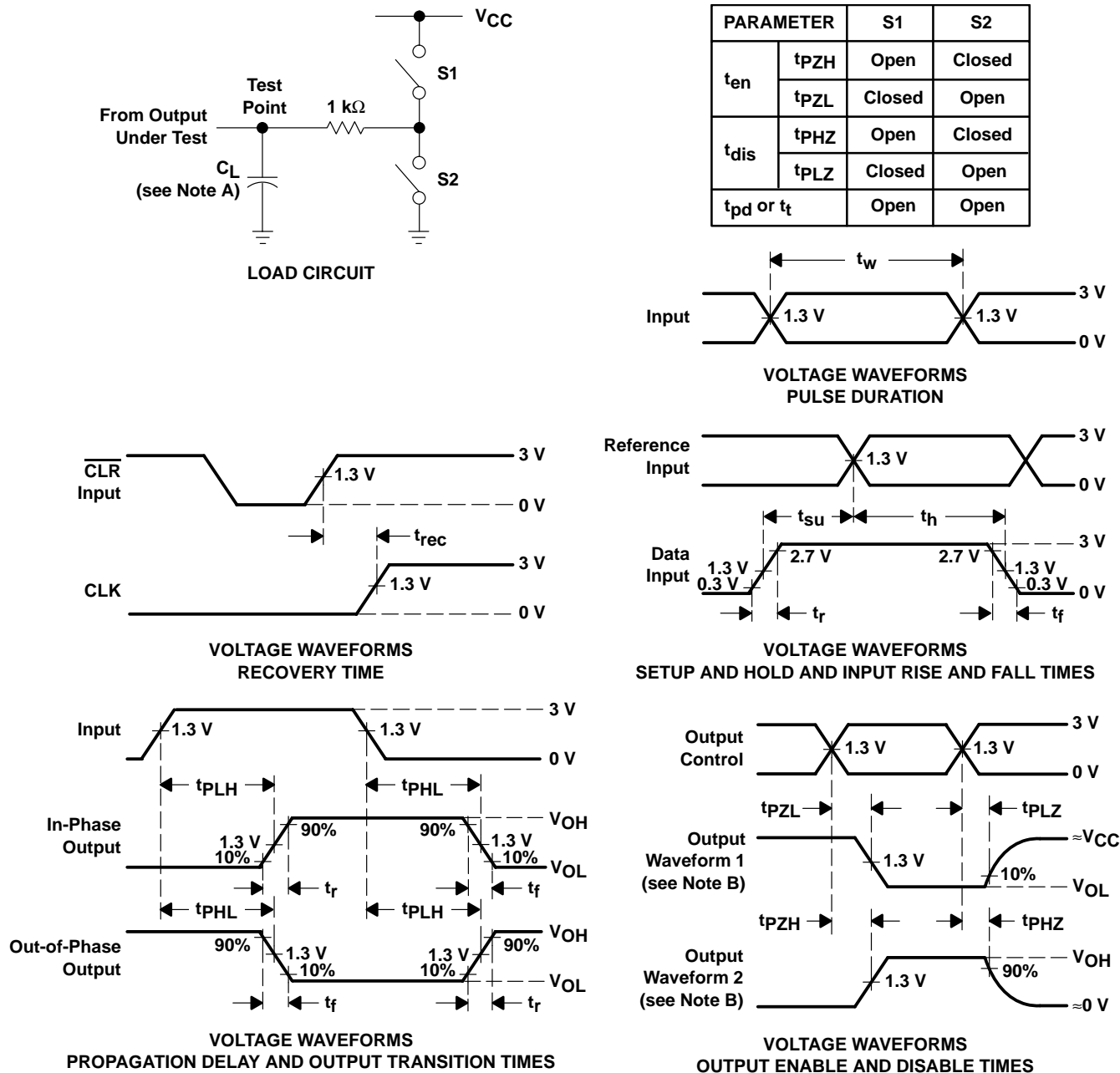
VOLTAGE WAVEFORMS  
OUTPUT ENABLE AND DISABLE TIMES

- NOTES: A.  $C_L$  includes probe and test-fixture capacitance.  
 B. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.  
 C. Phase relationships between waveforms were chosen arbitrarily. All input pulses are supplied by generators having the following characteristics:  $PRR \leq 1\text{ MHz}$ ,  $Z_O = 50\ \Omega$ ,  $t_r = 6\text{ ns}$ ,  $t_f = 6\text{ ns}$ .  
 D. For clock inputs,  $f_{max}$  is measured with the input duty cycle at 50%.  
 E. The outputs are measured one at a time with one input transition per measurement.  
 F.  $t_{PLZ}$  and  $t_{PHZ}$  are the same as  $t_{dis}$ .  
 G.  $t_{PZL}$  and  $t_{PZH}$  are the same as  $t_{en}$ .  
 H.  $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{pd}$ .

Figure 2. Load Circuit and Voltage Waveforms



PARAMETER MEASUREMENT INFORMATION – CD74HCT646



- NOTES:
- A.  $C_L$  includes probe and test-fixture capacitance.
  - B. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
  - C. Phase relationships between waveforms were chosen arbitrarily. All input pulses are supplied by generators having the following characteristics:  $PRR \leq 1$  MHz,  $Z_O = 50 \Omega$ ,  $t_r = 6$  ns,  $t_f = 6$  ns.
  - D. For clock inputs,  $f_{max}$  is measured with the input duty cycle at 50%.
  - E. The outputs are measured one at a time with one input transition per measurement.
  - F.  $t_{pLZ}$  and  $t_{pHZ}$  are the same as  $t_{dis}$ .
  - G.  $t_{pZL}$  and  $t_{pZH}$  are the same as  $t_{en}$ .
  - H.  $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{pd}$ .

Figure 3. Load Circuit and Voltage Waveforms

**PACKAGING INFORMATION**

Orderable Device	Status <sup>(1)</sup>	Package Type	Package Drawing	Pins	Package Qty	Eco Plan <sup>(2)</sup>	Lead/Ball Finish	MSL Peak Temp <sup>(3)</sup>
5962-8688501JA	ACTIVE	CDIP	J	24	1	TBD	Call TI	N / A for Pkg Type
CD54HC646F3A	ACTIVE	CDIP	J	24	1	TBD	Call TI	N / A for Pkg Type
CD74HCT646M96	ACTIVE	SOIC	DW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CD74HCT646M96E4	ACTIVE	SOIC	DW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CD74HCT646M96G4	ACTIVE	SOIC	DW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM

<sup>(1)</sup> 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.

<sup>(2)</sup> 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)

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

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**OTHER QUALIFIED VERSIONS OF CD54HC646 :**

- Catalog: [CD74HC646](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product

**TAPE AND REEL INFORMATION**



**QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE**



\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
CD74HCT646M96	SOIC	DW	24	2000	330.0	24.4	10.75	15.7	2.7	12.0	24.0	Q1

**TAPE AND REEL BOX DIMENSIONS**



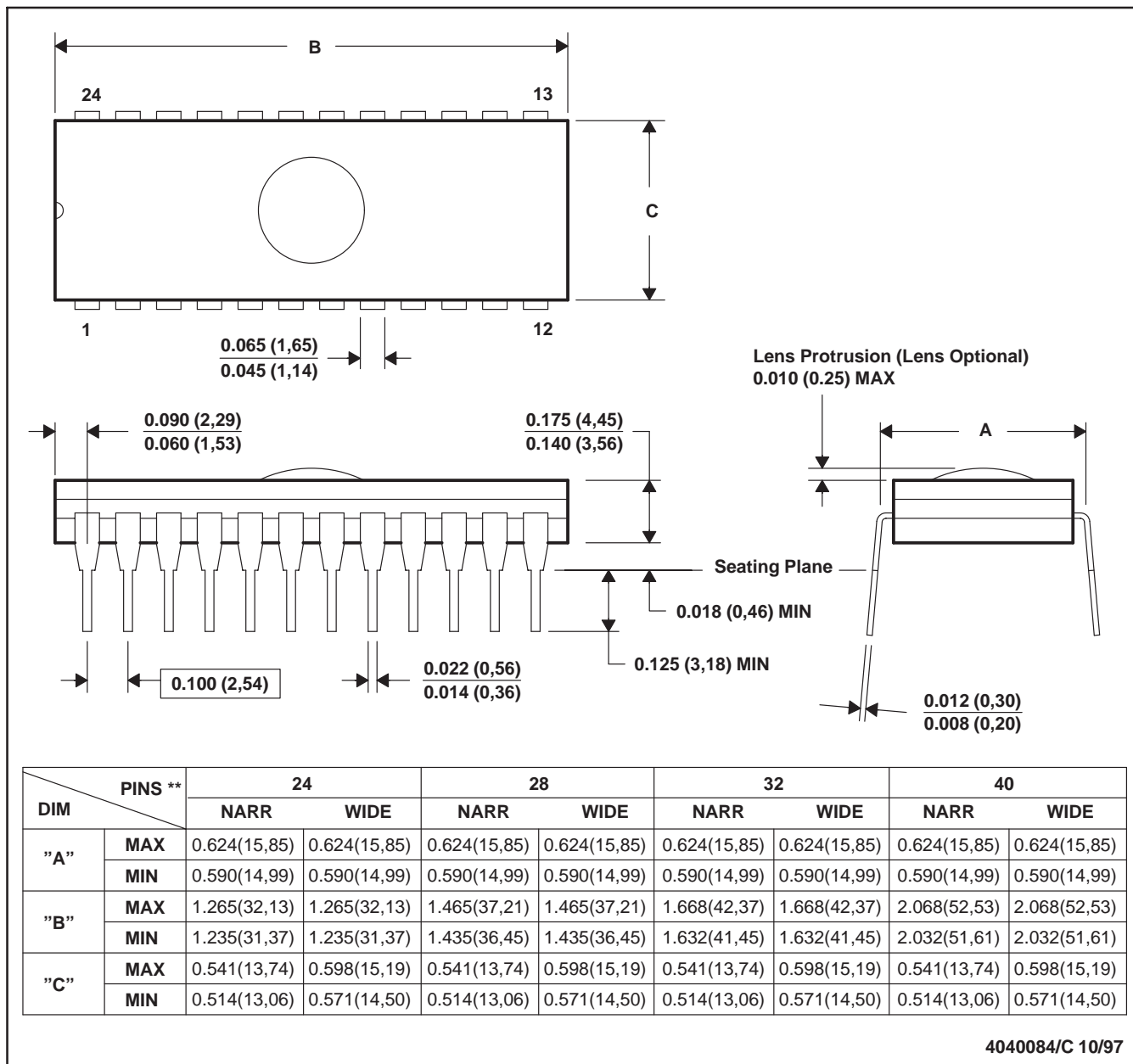
\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
CD74HCT646M96	SOIC	DW	24	2000	346.0	346.0	41.0

J (R-GDIP-T\*\*)

CERAMIC DUAL-IN-LINE PACKAGE

24 PINS SHOWN



- NOTES: A. All linear dimensions are in inches (millimeters).  
 B. This drawing is subject to change without notice.  
 C. Window (lens) added to this group of packages (24-, 28-, 32-, 40-pin).  
 D. This package can be hermetically sealed with a ceramic lid using glass frit.  
 E. Index point is provided on cap for terminal identification.

DW (R-PDSO-G24)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in inches (millimeters). Dimensioning and tolerancing per ASME Y14.5M-1994.
  - B. This drawing is subject to change without notice.
  - C. Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
  - D. Falls within JEDEC MS-013 variation AD.

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