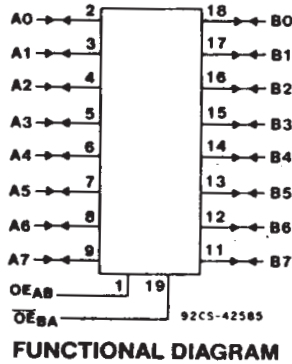


# CD54/74AC623 CD54/74ACT623



Data sheet acquired from Harris Semiconductor  
SCHS286A - October 2003



## Octal-Bus Transceiver, 3-State, Non-Inverting

**Type Features:**

- Buffered inputs
- Typical propagation delay:  
4.5 ns @  $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$ ,  $C_L = 50\text{ pF}$

**Family Features:**

- Exceeds 2-kV ESD Protection - MIL-STD-883, Method 3015
- SCR-Latchup-resistant CMOS process and circuit design
- Speed of bipolar FAST\*/AS/S with significantly reduced power consumption
- Balanced propagation delays
- AC types feature 1.5-V to 5.5-V operation and balanced noise immunity at 30% of the supply
- $\pm 24\text{-mA}$  output drive current
  - Fanout to 15 FAST\* ICs
  - Drives 50-ohm transmission lines

\*FAST is a Registered Trademark of Fairchild Semiconductor Corp.

The RCA CD54/74AC623 and CD54/74ACT623 octal-bus transceivers use the RCA ADVANCED CMOS technology. They are non-inverting, 3-state, bidirectional transceiver-buffers that allow for two-way transmission from "A" bus to "B" bus or "B" bus to "A" bus, depending on the logic levels of the Output Enable ( $OE_{AB}$ ,  $OE_{BA}$ ) inputs.

The dual Output Enable provision gives these devices the capability to store data by simultaneously enabling  $OE_{AB}$  and  $OE_{BA}$ . Each output reinforces its input under these conditions, and when all other data sources to the bus lines are at high-impedance, both sets of bus lines will remain in their last states.

The CD74AC623 is supplied in 20-lead dual-in-line plastic packages (E suffix) and in 20-lead small-outline packages (M, M96, and NSR suffixes). The CD74ACT623 is supplied in 20-lead small-outline packages (M96 suffix). Both package types are operable over the following temperature ranges: Commercial (0 to 70°C); Industrial (-40 to +85°C); and Extended Industrial/Military (-55 to +125°C).

The CD54AC623 and CD54ACT623, available in chip form (H suffix), are operable over the -55 to +125°C temperature range.

**TRUTH TABLE**

OUTPUT ENABLE INPUTS		OPERATION
$OE_{BA}$	$OE_{AB}$	
L	L	B DATA TO A BUS
H	H	A DATA TO B BUS
H	L	ISOLATION
L	H	B DATA TO A BUS, A DATA TO B BUS

H = High level, L = Low level

Note: To prevent excess currents in the High-Z (isolation) modes, all I/O terminals should be terminated with 10 kΩ to 1 MΩ resistors.

This data sheet is applicable to the CD74AC623 and CD54/74ACT623. The CD54AC623 was not acquired from Harris Semiconductor.

**Technical Data**  
**CD54/74AC623**  
**CD54/74ACT623**

**MAXIMUM RATINGS, Absolute-Maximum Values:**

DC SUPPLY-VOLTAGE ( $V_{CC}$ )	.....	-0.5 to 6 V
DC INPUT DIODE CURRENT, $I_{IK}$ (for $V_I < -0.5$ V or $V_I > V_{CC} + 0.5$ V)	.....	$\pm 20$ mA
DC OUTPUT DIODE CURRENT, $I_{OK}$ (for $V_O < -0.5$ V or $V_O > V_{CC} + 0.5$ V)	.....	$\pm 50$ mA
DC OUTPUT SOURCE OR SINK CURRENT per Output Pin, $I_O$ (for $V_O > -0.5$ V or $V_O < V_{CC} + 0.5$ V)	.....	$\pm 50$ mA
DC $V_{CC}$ or GROUND CURRENT ( $I_{CC}$ or $I_{GND}$ )	.....	$\pm 100$ mA*
POWER DISSIPATION PER PACKAGE ( $P_D$ ):		
For $T_A = -55$ to $+100^\circ\text{C}$ (PACKAGE TYPE E)	.....	500 mW
For $T_A = +100$ to $+125^\circ\text{C}$ (PACKAGE TYPE E)	.....	Derate Linearly at 8 mW/ $^\circ\text{C}$ to 300 mW
For $T_A = -55$ to $+70^\circ\text{C}$ (PACKAGE TYPE M)	.....	400 mW
For $T_A = +70$ to $+125^\circ\text{C}$ (PACKAGE TYPE M)	.....	Derate Linearly at 6 mW/ $^\circ\text{C}$ to 70 mW
OPERATING-TEMPERATURE RANGE ( $T_A$ )	.....	$-55$ to $+125^\circ\text{C}$
STORAGE TEMPERATURE ( $T_{STG}$ )	.....	$-65$ to $+150^\circ\text{C}$
LEAD TEMPERATURE (DURING SOLDERING):		
At distance $1/16 \pm 1/32$ in. ( $1.59 \pm 0.79$ mm) from case for 10 s maximum	.....	$+265^\circ\text{C}$
Unit inserted into PC board min. thickness $1/16$ in. ( $1.59$ mm) with solder contacting lead tips only	.....	$+300^\circ\text{C}$

\*For up to 4 outputs per device; add  $\pm 25$  mA for each additional output.

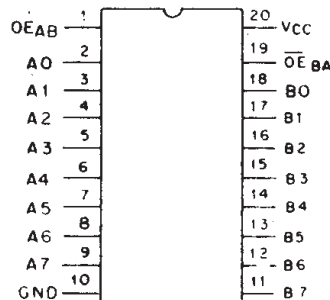
**RECOMMENDED OPERATING CONDITIONS:**

For maximum reliability, normal operating conditions should be selected so that operation is always within the following ranges:

CHARACTERISTIC	LIMITS		UNITS
	MIN.	MAX.	
Supply-Voltage Range, $V_{CC}$ *: (For $T_A =$ Full Package-Temperature Range)			
AC Types	1.5	5.5	V
ACT Types	4.5	5.5	V
DC Input or Output Voltage, $V_I, V_O$	0	$V_{CC}$	V
Operating Temperature, $T_A$	-55	+125	$^\circ\text{C}$
Input Rise and Fall Slew Rate, $dt/dv$			
at 1.5 V to 3 V (AC Types)	0	50	ns/V
at 3.6 V to 5.5 V (AC Types)	0	20	ns/V
at 4.5 V to 5.5 V (ACT Types)	0	10	ns/V

\*Unless otherwise specified, all voltages are referenced to ground.

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**TERMINAL ASSIGNMENT**

# CD54/74AC623

## CD54/74ACT623

STATIC ELECTRICAL CHARACTERISTICS: AC Series

CHARACTERISTICS	TEST CONDITIONS		V <sub>CC</sub> (V)	AMBIENT TEMPERATURE (T <sub>A</sub> ) - °C						UNITS	
				+25		-40 to +85		-55 to +125			
	V <sub>I</sub> (V)	I <sub>O</sub> (mA)		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.		
High-Level Input Voltage V <sub>IH</sub>			1.5	1.2	—	1.2	—	1.2	—	V	
			3	2.1	—	2.1	—	2.1	—		
			5.5	3.85	—	3.85	—	3.85	—		
Low-Level Input Voltage V <sub>IL</sub>			1.5	—	0.3	—	0.3	—	0.3	V	
			3	—	0.9	—	0.9	—	0.9		
			5.5	—	1.65	—	1.65	—	1.65		
High-Level Output Voltage V <sub>OH</sub>	V <sub>IH</sub> or V <sub>IL</sub>	#, *	-0.05	1.5	1.4	—	1.4	—	1.4	V	
			-0.05	3	2.9	—	2.9	—	2.9		
			-0.05	4.5	4.4	—	4.4	—	4.4		
			-4	3	2.58	—	2.48	—	2.4		
			-24	4.5	3.94	—	3.8	—	3.7		
			-75	5.5	—	—	3.85	—	—		
			-50	5.5	—	—	—	—	3.85		
Low-Level Output Voltage V <sub>OL</sub>	V <sub>IH</sub> or V <sub>IL</sub>	#, *	0.05	1.5	—	0.1	—	0.1	—	V	
			0.05	3	—	0.1	—	0.1	—		
			0.05	4.5	—	0.1	—	0.1	—		
			12	3	—	0.36	—	0.44	—		0.5
			24	4.5	—	0.36	—	0.44	—		0.5
			75	5.5	—	—	—	1.65	—		—
			50	5.5	—	—	—	—	—		1.65
Input Leakage Current I <sub>I</sub>	V <sub>CC</sub> or GND		5.5	—	±0.1	—	±1	—	±1	μA	
3-State Leakage Current I <sub>OZ</sub>	V <sub>IH</sub> or V <sub>IL</sub> V <sub>O</sub> = V <sub>CC</sub> or GND		5.5	—	±0.5	—	±5	—	±10	μA	
Quiescent Supply Current, MSI I <sub>CC</sub>	V <sub>CC</sub> or GND	0	5.5	—	8	—	80	—	160	μA	

#Test one output at a time for a 1-second maximum duration. Measurement is made by forcing current and measuring voltage to minimize power dissipation.

\*Test verifies a minimum 50-ohm transmission-line-drive capability at +85°C, 75 ohms at +125°C.

Technical Data  
**CD54/74AC623**  
**CD54/74ACT623**

STATIC ELECTRICAL CHARACTERISTICS: ACT Series

CHARACTERISTICS	TEST CONDITIONS		V <sub>CC</sub> (V)	AMBIENT TEMPERATURE (T <sub>A</sub> ) - °C						UNITS	
				+25		-40 to +85		-55 to +125			
				MIN.	MAX.	MIN.	MAX.	MIN.	MAX.		
High-Level Input Voltage	V <sub>IH</sub>		4.5 to 5.5	2	—	2	—	2	—	V	
Low-Level Input Voltage	V <sub>IL</sub>		4.5 to 5.5	—	0.8	—	0.8	—	0.8	V	
High-Level Output Voltage	V <sub>O<sub>H</sub></sub>	V <sub>IH</sub> or V <sub>IL</sub> #, *	-0.05	4.5	4.4	—	4.4	—	4.4	—	V
			-24	4.5	3.94	—	3.8	—	3.7	—	
			-75	5.5	—	—	3.85	—	—	—	
			-50	5.5	—	—	—	—	3.85	—	
Low-Level Output Voltage	V <sub>O<sub>L</sub></sub>	V <sub>IH</sub> or V <sub>IL</sub> #, *	0.05	4.5	—	0.1	—	0.1	—	0.1	V
			24	4.5	—	0.36	—	0.44	—	0.5	
			75	5.5	—	—	—	1.65	—	—	
			50	5.5	—	—	—	—	—	1.65	
Input Leakage Current	I <sub>I</sub>	V <sub>CC</sub> or GND	5.5	—	±0.1	—	±1	—	±1	μA	
3-State Leakage Current	I <sub>OZ</sub>	V <sub>IH</sub> or V <sub>IL</sub> V <sub>O</sub> = V <sub>CC</sub> or GND	5.5	—	±0.5	—	±5	—	±10	μA	
Quiescent Supply Current, MSI	I <sub>CC</sub>	V <sub>CC</sub> or GND	0	5.5	—	8	—	80	—	160	μA
Additional Quiescent Supply Current per Input Pin TTL Inputs High 1 Unit Load	ΔI <sub>CC</sub>	V <sub>CC</sub> -2.1	4.5 to 5.5	—	2.4	—	2.8	—	3	mA	

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#Test one output at a time for a 1-second maximum duration. Measurement is made by forcing current and measuring voltage to minimize power dissipation.

\*Test verifies a minimum 50-ohm transmission-line-drive capability at +85°C, 75 ohms at +125°C.

**ACT INPUT LOADING TABLE**

INPUT	UNIT LOAD*
An, Bn	0.83
$\overline{OE}_{BA}$	0.64
$\overline{OE}_{AB}$	0.15

\*Unit load is ΔI<sub>CC</sub> limit specified in Static Characteristics Chart, e.g., 2.4 mA max. @ 25°C.

Technical Data

# CD54/74AC623

# CD54/74ACT623

SWITCHING CHARACTERISTICS: AC Series;  $t_r, t_f = 3 \text{ ns}$ ,  $C_L = 50 \text{ pF}$

CHARACTERISTICS	SYMBOL	$V_{CC}$ (V)	AMBIENT TEMPERATURE ( $T_A$ ) - °C				UNITS
			-40 to +85		-55 to +125		
			MIN.	MAX.	MIN.	MAX.	
Propagation Delays: Data to Output	$t_{PLH}$	1.5	—	108	—	120	ns
	$t_{PHL}$	3.3* 5†	3.5 2.5	12.2 8.7	3.4 2.4	13.4 9.6	
Output Disable to Output	$t_{PLZ}$	1.5	—	153	—	168	ns
	$t_{PHZ}$	3.3 5	4.8 3.5	17.1 12.2	4.7 3.4	18.8 13.4	
Output Enable to Output	$t_{PZL}$	1.5	—	153	—	168	ns
	$t_{PZH}$	3.3 5	4.8 3.5	17.1 12.2	4.7 3.4	18.8 13.4	
Power Dissipation Capacitance	$C_{PD}\S$	—	66 Typ.		66 Typ.		pF
Min. (Valley) $V_{OH}$ During Switching of Other Outputs (Output Under Test Not Switching)	$V_{OHV}$ See Fig. 1	5	4 Typ. @ 25°C				V
Max. (Peak) $V_{OL}$ During Switching of Other Outputs (Output Under Test Not Switching)	$V_{OLP}$ See Fig. 1	5	1 Typ. @ 25°C				V
Input Capacitance	$C_i$	—	—	10	—	10	pF
3-State Output Capacitance	$C_o$	—	—	15	—	15	pF

SWITCHING CHARACTERISTICS: ACT Series;  $t_r, t_f = 3 \text{ ns}$ ,  $C_L = 50 \text{ pF}$

CHARACTERISTICS	SYMBOL	$V_{CC}$ (V)	AMBIENT TEMPERATURE ( $T_A$ ) - °C				UNITS
			-40 to +85		-55 to +125		
			MIN.	MAX.	MIN.	MAX.	
Propagation Delays: Data to Output	$t_{PLH}$ $t_{PHL}$	5†	2.7	9.6	2.7	10.6	ns
	Output Disable to Output	$t_{PLZ}$ $t_{PHZ}$	5	3.7	13.1	3.6	
Output Enable to Output		$t_{PZH}$ $t_{PZL}$	5	3.7	13.1	3.6	14.4
	Power Dissipation Capacitance	$C_{PD}\S$	—	66 Typ.		66 Typ.	
Min. (Valley) $V_{OH}$ During Switching of Other Outputs (Output Under Test Not Switching)	$V_{OHV}$ See Fig. 1	5	4 Typ. @ 25°C				V
Max. (Peak) $V_{OL}$ During Switching of Other Outputs (Output Under Test Not Switching)	$V_{OLP}$ See Fig. 1	5	1 Typ. @ 25°C				V
Input Capacitance	$C_i$	—	—	10	—	10	pF
3-State Output Capacitance	$C_o$	—	—	15	—	15	pF

\*3.3 V: min. is @ 3.6 V  
max. is @ 3 V

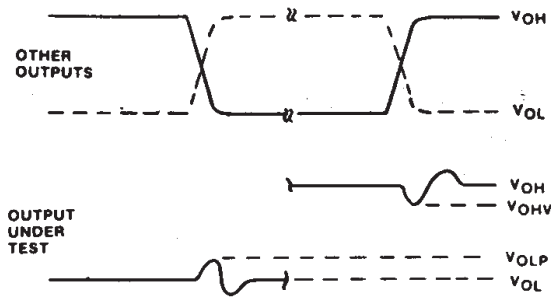
†5 V: min. is @ 5.5 V  
max. is @ 4.5 V

§ $C_{PD}$  is used to determine the dynamic power consumption, per channel.

For AC series:  $P_D = V_{CC}^2 f_i (C_{PD} + C_L)$

For ACT series:  $P_D = V_{CC}^2 f_i (C_{PD} + C_L) + V_{CC} \Delta I_{CC}$  where  $f_i$  = input frequency  
 $C_L$  = output load capacitance  
 $V_{CC}$  = supply voltage.

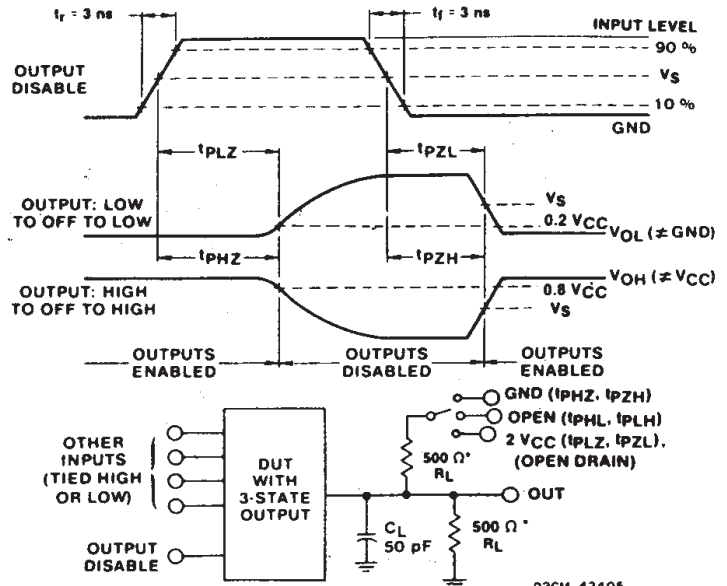
**PARAMETER MEASUREMENT INFORMATION**



- NOTES:**
1.  $V_{OHV}$  and  $V_{OLP}$  ARE MEASURED WITH RESPECT TO A GROUND REFERENCE NEAR THE OUTPUT UNDER TEST.
  2. INPUT PULSES HAVE THE FOLLOWING CHARACTERISTICS:  
 $PRR \leq 1$  MHz,  $t_r = 3$  ns,  $t_f = 3$  ns, SKEW 1 ns.
  3. R.F. FIXTURE WITH 700-MHz DESIGN RULES REQUIRED. IC SHOULD BE SOLDERED INTO TEST BOARD AND BYPASSED WITH  $0.1 \mu\text{F}$  CAPACITOR. SCOPE AND PROBES REQUIRE 700-MHz BANDWIDTH.

92CS-4240E

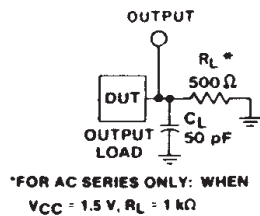
Fig. 1 - Simultaneous switching transient waveforms.



\*FOR AC SERIES ONLY: WHEN  $V_{CC} = 1.5$  V,  $R_L = 1$  k $\Omega$

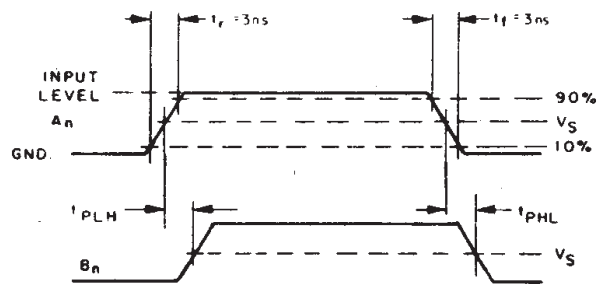
92CM-42405

Fig. 2 - Three-state propagation delay times and test circuit.



\*FOR AC SERIES ONLY: WHEN  $V_{CC} = 1.5$  V,  $R_L = 1$  k $\Omega$

92CS-42589



92CS-42587

Fig. 3 - Propagation delay times and test circuit.

	CD54/74AC	CD54/74ACT
Input Level	$V_{CC}$	3 V
Input Switching Voltage, $V_S$	$0.5 V_{CC}$	1.5 V
Output Switching Voltage, $V_S$	$0.5 V_{CC}$	$0.5 V_{CC}$

**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>
CD54ACT623F3A	ACTIVE	CDIP	J	20	1	TBD	A42	N / A for Pkg Type
CD74AC623E	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
CD74AC623EE4	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
CD74AC623M	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CD74AC623M96	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CD74AC623M96E4	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CD74AC623M96G4	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CD74AC623ME4	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CD74AC623MG4	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CD74AC623NSR	ACTIVE	SO	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CD74AC623NSRE4	ACTIVE	SO	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CD74AC623NSRG4	ACTIVE	SO	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CD74ACT623M96	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CD74ACT623M96E4	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CD74ACT623M96G4	ACTIVE	SOIC	DW	20	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.

**OBSELETE:** 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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**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
CD74AC623M96	SOIC	DW	20	2000	330.0	24.4	10.8	13.0	2.7	12.0	24.0	Q1
CD74AC623NSR	SO	NS	20	2000	330.0	24.4	8.2	13.0	2.5	12.0	24.0	Q1
CD74ACT623M96	SOIC	DW	20	2000	330.0	24.4	10.8	13.0	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)
CD74AC623M96	SOIC	DW	20	2000	346.0	346.0	41.0
CD74AC623NSR	SO	NS	20	2000	346.0	346.0	41.0
CD74ACT623M96	SOIC	DW	20	2000	346.0	346.0	41.0

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

14 LEADS SHOWN

CERAMIC DUAL IN-LINE PACKAGE



DIM \ PINS **	14	16	18	20
A	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC
B MAX	0.785 (19,94)	.840 (21,34)	0.960 (24,38)	1.060 (26,92)
B MIN	—	—	—	—
C MAX	0.300 (7,62)	0.300 (7,62)	0.310 (7,87)	0.300 (7,62)
C MIN	0.245 (6,22)	0.245 (6,22)	0.220 (5,59)	0.245 (6,22)



4040083/F 03/03

- NOTES:
- All linear dimensions are in inches (millimeters).
  - This drawing is subject to change without notice.
  - This package is hermetically sealed with a ceramic lid using glass frit.
  - Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.
  - Falls within MIL STD 1835 GDIP1-T14, GDIP1-T16, GDIP1-T18 and GDIP1-T20.

# MECHANICAL DATA

NS (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE PACKAGE

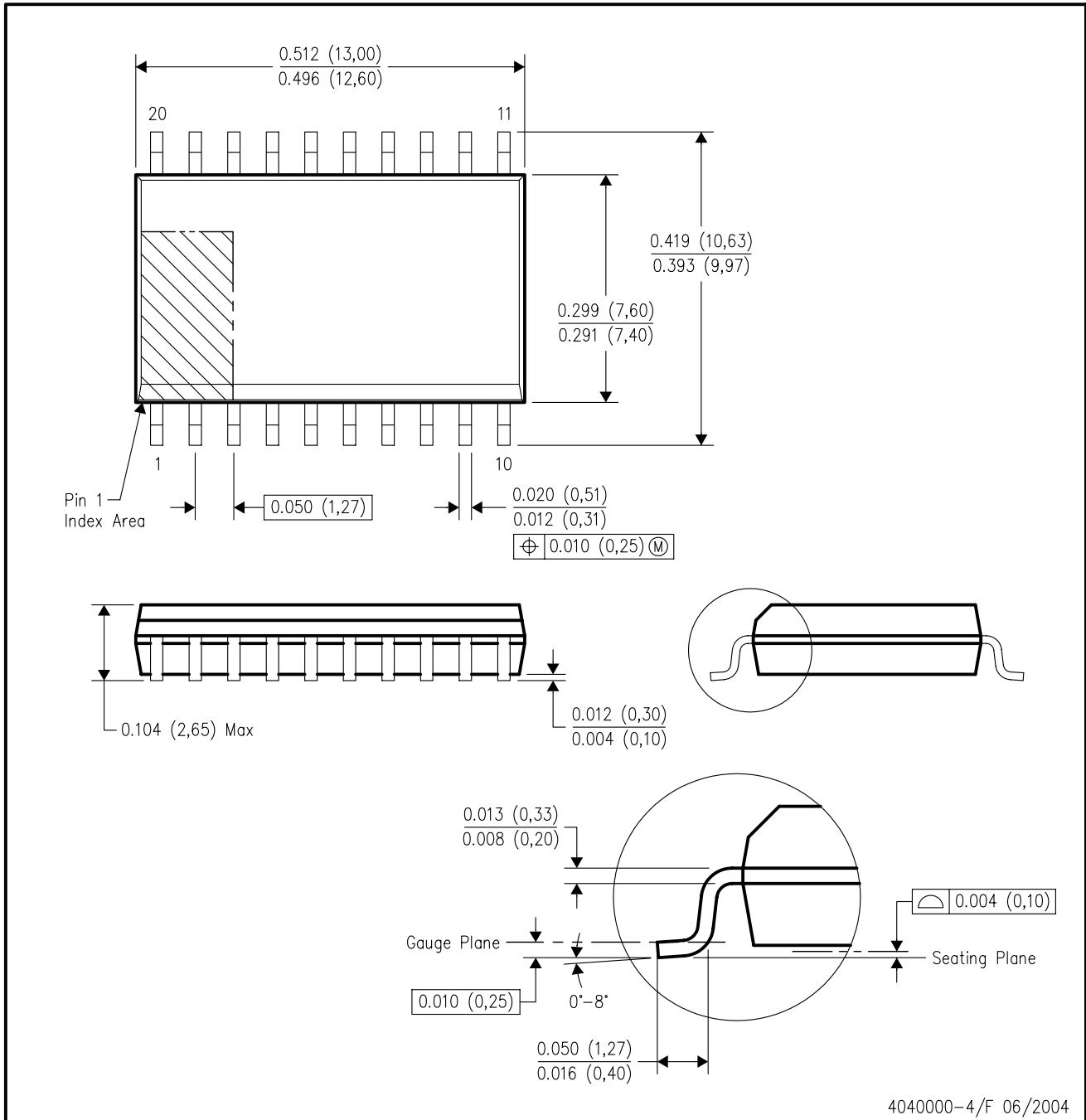
14-PINS SHOWN



- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15.

DW (R-PDSO-G20)

PLASTIC SMALL-OUTLINE PACKAGE



- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - 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 AC.

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PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN



- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
  - The 20 pin end lead shoulder width is a vendor option, either half or full width.

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