SN54HCT374, SN74HCT374 OCTAL EDGE-TRIGGERED D-TYPE FLIP-FLOPS WITH 3-STATE OUTPUTS

询"SN54HCT374-SP"供应商

SCLS005D - MARCH 1984 - REVISED AUGUST 2003

- Operating Voltage Range of 4.5 V to 5.5 V
- High-Current 3-State True Outputs Can
 Drive Up To 15 LSTTL Loads
- Low Power Consumption, 80-μA Max I_{CC}
- Typical t_{pd} = 22 ns
- ±6-mA Output Drive at 5 V
- Low Input Current of 1 μA Max
- Inputs Are TTL-Voltage Compatible
- Eight D-Type Flip-Flops in a Single Package
- Full Parallel Access for Loading

description/ordering information

These 8-bit flip-flops feature 3-state outputs designed specifically for driving highly capacitive or relatively low-impedance loads. They are particularly suitable for implementing buffer registers, I/O ports, bidirectional bus drivers, and working registers.

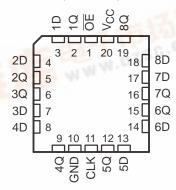
The eight flip-flops of the 'HCT374 devices are edge-triggered D-type flip-flops. On the positive transition of the clock (CLK) input, the Q outputs are set to the logic levels that were set up at the data (D) inputs.

An output-enable (OE) input places the eight outputs in either a normal logic state (high or low

SN54HCT374 . . . J OR W PACKAGE SN74HCT374 . . . DB, DW, N, NS, OR PW PACKAGE (TOP VIEW)



SN54HCT374 . . . FK PACKAGE (TOP VIEW)



logic levels) or the high-impedance state. In the high-impedance state, the outputs neither load nor drive the bus lines significantly. The high-impedance state and increased drive provide the capability to drive bus lines without interface or pullup components.

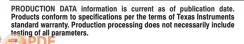
ORDERING INFORMATION

TA	PACKAC	3E†	ORDERABLE PART NUMBER	TOP-SIDE MARKING
and CP	PDIP – N	Tube of 20	SN74HCT374N	SN74HCT374N
FIG.	0010 014	Tube of 25	SN74HCT374DW	LIOTOZA
TIST W	SOIC – DW	Reel of 2000	SN74HCT374DWR	HCT374
4000 to 0500	SOP - NS	Reel of 2000	SN74HCT374NSR	HCT374
-40°C to 85°C	SSOP - DB	Reel of 2000	SN74HCT374DBR	HT374
		Tube of 70	SN74HCT374PW	a-4117
	TSSOP - PW	Reel of 2000	SN74HCT374PWR	HT374
		Reel of 250	SN74HCT374PWT	M. Sel.
	CDIP – J	Tube of 20	SNJ54HCT374J	SNJ54HCT374J
-55°C to 125°C	CFP – W	Tube of 85	SNJ54HCT374W	SNJ54HCT374W
	LCCC - FK	Tube of 55	SNJ54HCT374FK	SNJ54HCT374FK

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



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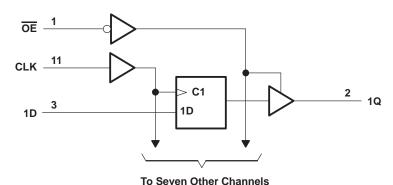
description/ordering information (continued)

OE does not affect the internal operations of the flip-flops. Old data can be retained or new data can be entered while the outputs are in the high-impedance state.

FUNCTION TABLE (each flip-flop)

	INPUTS		OUTPUT
OE	CLK	D	Q
L	1	Н	Н
L	\uparrow	L	L
L	H or L	Χ	Q ₀
Н	Χ	Χ	Z

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 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 current, $I_O(V_O = 0 \text{ to } V_{CC})$.		±35 mA
Continuous current through V _{CC} or GND		±70 mA
Package thermal impedance, θ _{JA} (see Note 2): [DB package	70°C/W
	DW package	58°C/W
N	N package	69°C/W
N	NS package	60°C/W
F	PW package	83°C/W
Storage temperature range, T _{sto}		-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 (see Note 3)

			SN	54HCT3	74	SN	74HCT3	74	
			MIN	NOM	MAX	MIN	NOM	MAX	UNIT
VCC	Supply voltage		4.5	5	5.5	4.5	5	5.5	V
VIH	High-level input voltage	V _{CC} = 4.5 V to 5.5 V	2			2			V
V _{IL}	Low-level input voltage	V _{CC} = 4.5 V to 5.5 V			0.8			0.8	V
VI	Input voltage		0		VCC	0		VCC	V
VO	Output voltage		0		VCC	0		VCC	V
Δt/Δν	Input transition rise/fall time				500			500	ns
TA	Operating free-air temperature		-55		125	-40		85	°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.

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

DADAMETED	TEOT 00	TEST CONDITIONS		Т	A = 25°C	;	SN54H	CT374	SN74H	CT374	UNIT
PARAMETER	TEST CO	INDITIONS	v _{CC}	MIN	TYP	MAX	MIN	MAX	MIN	MAX	UNII
V	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	I _{OH} = -20 μA	4.5.1/	4.4	4.499		4.4		4.4		.,
Voн	VI = VIH or VIL	$I_{OH} = -6 \text{ mA}$	4.5 V	3.98	4.3		3.7		3.84		V
V	V VV	I _{OL} = 20 μA	4.5.1/		0.001	0.1		0.1		0.1	.,
VOL	VI = VIH or VIL	$I_{OL} = 6 \text{ mA}$	4.5 V		0.17	0.26		0.4		0.33	V
lj	$V_I = V_{CC}$ or 0		5.5 V		±0.1	±100		±1000		±1000	nA
loz	$V_O = V_{CC}$ or 0		5.5 V		±0.01	±0.5		±10		±5	μΑ
ICC	$V_I = V_{CC}$ or 0,	IO = 0	5.5 V			8		160		80	μΑ
Δl _{CC} †	One input at 0.5 V Other inputs at 0 o		5.5 V		1.4	2.4		3		2.9	mA
Ci			4.5 V to 5.5 V		3	10		10		10	pF

[†] This is the increase in supply current for each input that is at one of the specified TTL voltage levels, rather than 0 V or V_{CC}.

timing requirements over recommended operating free-air temperature range (unless otherwise noted)

		V	$T_A = 1$	25°C	SN54H	CT374	SN74H	CT374	LINUT
		vcc	MIN	MAX	MIN	MAX	MIN	MAX	UNIT
4	Clash fragues as	4.5 V		31		21		25	N 41 1-
fclock	Clock frequency	5.5 V		36		23		28	MHz
	Dulan dissection OLIVISTAL colonia	4.5 V	16		24		20		
t _W	Pulse duration, CLK high or low	5.5 V	14		22		18		ns
	Octors there whate hadens OUAT	4.5 V	20		30		25		
t _{su}	Setup time, data before CLK↑	5.5 V	17		27		23		ns
4.	Hold time, data after CLK↑	4.5 V	10		10		10		20
th	Hold time, data after OLICI	5.5 V	10		10		10		ns

SN54HCT374, SN74HCT374 OCTAL EDGE-TRIGGERED D-TYPE FLIP-FLOPS WITH 3-STATE OUTPUTS

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switching characteristics over recommended operating free-air temperature range, C_L = 50 pF (unless otherwise noted) (see Figure 1)

	FROM	то	,,	T	λ = 25°C	;	SN54H	CT374	SN74H	CT374	
PARAMETER	(INPUT)	(OUTPUT)	VCC	MIN	TYP	MAX	MIN	MAX	MIN	MAX	UNIT
			4.5 V	31	36		21		25		N 41 1-
f _{max}			5.5 V	36	40		23		28		MHz
4 .	CL K	A O	4.5 V		30	36		54		45	
^t pd	CLK	Any Q	5.5 V		25	32		49		41	ns
	ŌĒ	A O	4.5 V		26	30		45		38	
t _{en}	OE	Any Q	5.5 V		23	27		41		34	ns
4	ŌĒ	A O	4.5 V		23	30		45		38	
^t dis	OE	Any Q	5.5 V		22	27		41		34	ns
4.		Any O	4.5 V		10	12		18		15	20
t _t		Any Q	5.5 V		9	11		16		14	ns

switching characteristics over recommended operating free-air temperature range, C_L = 150 pF (unless otherwise noted) (see Figure 1)

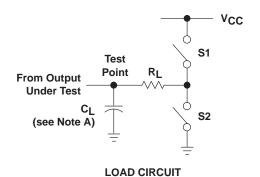
PARAMETER FROM		то	.,	T	ղ = 25°C	;	SN54H	CT374	SN74H	CT374		
PARAMETER	(INPUT)	(OUTPUT)	VCC	MIN	TYP	MAX	MIN	MAX	MIN	MAX	UNIT	
	01.14	A O	4.5 V		40	46		69		58		
^t pd	CLK	Any Q	Any Q	5.5 V		35	41		62		52	ns
	ŌĒ	A O	4.5 V		34	40		60		50		
^t en	OE	Any Q	5.5 V		29	36		54		45	ns	
_		Amy O	4.5 V		18	42		63		53		
ιţ		Any Q	5.5 V		16	38		57		48	ns	

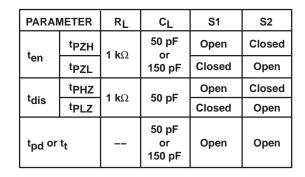
operating characteristics, $T_A = 25^{\circ}C$

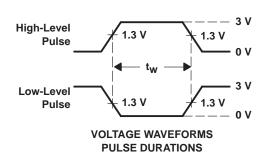
	PARAMETER	TEST CONDITIONS	TYP	UNIT
Cp	Power dissipation capacitance per flip-flop	No load	85	pF

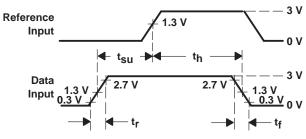


PARAMETER MEASUREMENT INFORMATION

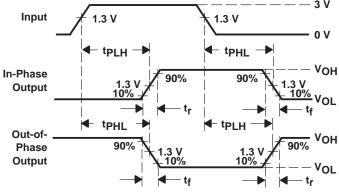


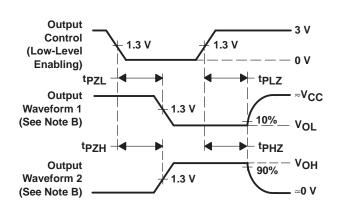






VOLTAGE WAVEFORMS
SETUP AND HOLD AND INPUT RISE AND FALL TIMES





VOLTAGE WAVEFORMS
PROPAGATION DELAY AND OUTPUT RISE AND FALL TIMES

VOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES FOR 3-STATE OUTPUTS

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 Ω , t_f = 6 ns.
- D. For clock inputs, f_{max} is measured when the input duty cycle is 50%.
- E. The outputs are measured one at a time with one input transition per measurement.
- F. tpLz and tpHz are the same as tdis.
- G. tp7I and tp7H are the same as ten.
- H. t_{PLH} and t_{PHL} are the same as t_{pd} .

Figure 1. Load Circuit and Voltage Waveforms







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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⁾
5962-8550701VRA	ACTIVE	CDIP	J	20	1	TBD	A42	N / A for Pkg Type
5962-8550701VSA	ACTIVE	CFP	W	20	1	TBD	Call TI	N / A for Pkg Type
85507012A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type
8550701RA	ACTIVE	CDIP	J	20	1	TBD	A42	N / A for Pkg Type
JM38510/65652BRA	ACTIVE	CDIP	J	20	1	TBD	A42	N / A for Pkg Type
SN54HCT374J	ACTIVE	CDIP	J	20	1	TBD	A42	N / A for Pkg Type
SN74HCT374DBR	ACTIVE	SSOP	DB	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HCT374DBRE4	ACTIVE	SSOP	DB	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HCT374DBRG4	ACTIVE	SSOP	DB	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HCT374DW	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HCT374DWE4	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HCT374DWG4	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HCT374DWR	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HCT374DWRE4	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HCT374DWRG4	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HCT374N	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74HCT374N3	OBSOLETE	PDIP	N	20		TBD	Call TI	Call TI
SN74HCT374NE4	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74HCT374NSR	ACTIVE	so	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HCT374NSRE4	ACTIVE	so	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HCT374NSRG4	ACTIVE	SO	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HCT374PW	ACTIVE	TSSOP	PW	20	70	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HCT374PWE4	ACTIVE	TSSOP	PW	20	70	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HCT374PWG4	ACTIVE	TSSOP	PW	20	70	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HCT374PWR	ACTIVE	TSSOP	PW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HCT374PWRE4	ACTIVE	TSSOP	PW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HCT374PWRG4	ACTIVE	TSSOP	PW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HCT374PWT	ACTIVE	TSSOP	PW	20	250	Green (RoHS &	CU NIPDAU	Level-1-260C-UNLIM



PACKAGE OPTION ADDENDUM

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Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins I	Package Qty	e Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp (3)
						no Sb/Br)		
SN74HCT374PWTE4	ACTIVE	TSSOP	PW	20	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HCT374PWTG4	ACTIVE	TSSOP	PW	20	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SNJ54HCT374FK	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type
SNJ54HCT374J	ACTIVE	CDIP	J	20	1	TBD	A42	N / A for Pkg Type

(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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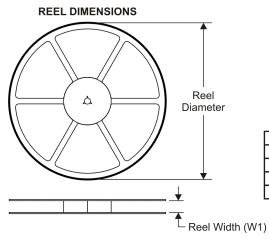
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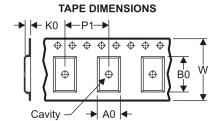


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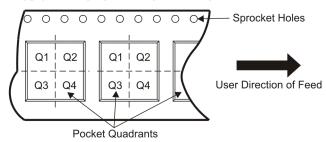
TAPE AND REEL INFORMATION





	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE

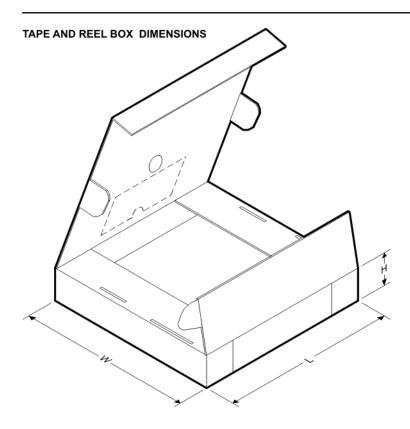


*All dimensions are nominal

All dimensions are nominal												
Device	Package Type	Package Drawing		SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74HCT374DBR	SSOP	DB	20	2000	330.0	16.4	8.2	7.5	2.5	12.0	16.0	Q1
SN74HCT374DWR	SOIC	DW	20	2000	330.0	24.4	10.8	13.0	2.7	12.0	24.0	Q1
SN74HCT374NSR	SO	NS	20	2000	330.0	24.4	8.2	13.0	2.5	12.0	24.0	Q1
SN74HCT374PWR	TSSOP	PW	20	2000	330.0	16.4	6.95	7.1	1.6	8.0	16.0	Q1
SN74HCT374PWT	TSSOP	PW	20	250	330.0	16.4	6.95	7.1	1.6	8.0	16.0	Q1

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*All dimensions are nominal

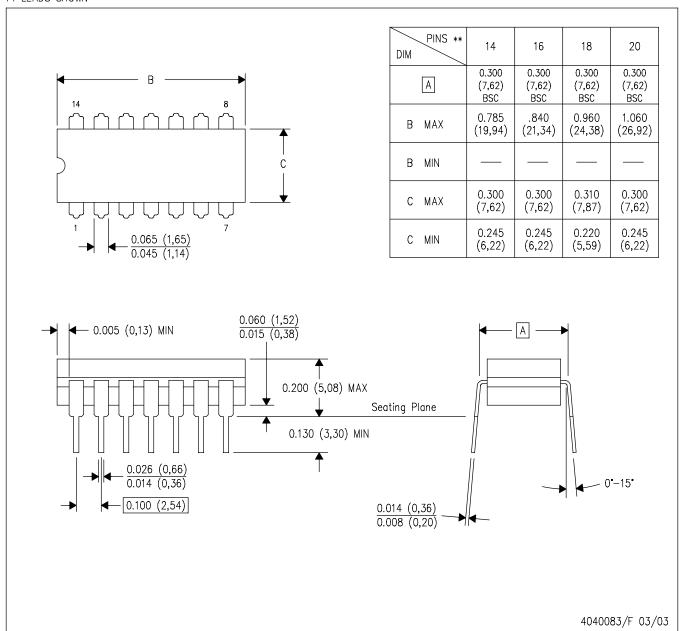
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Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74HCT374DBR	SSOP	DB	20	2000	346.0	346.0	33.0
SN74HCT374DWR	SOIC	DW	20	2000	346.0	346.0	41.0
SN74HCT374NSR	SO	NS	20	2000	346.0	346.0	41.0
SN74HCT374PWR	TSSOP	PW	20	2000	346.0	346.0	33.0
SN74HCT374PWT	TSSOP	PW	20	250	346.0	346.0	33.0

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J (R-GDIP-T**)

CERAMIC DUAL IN-LINE PACKAGE

14 LEADS SHOWN



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

W (R-GDFP-F20)

CERAMIC DUAL FLATPACK



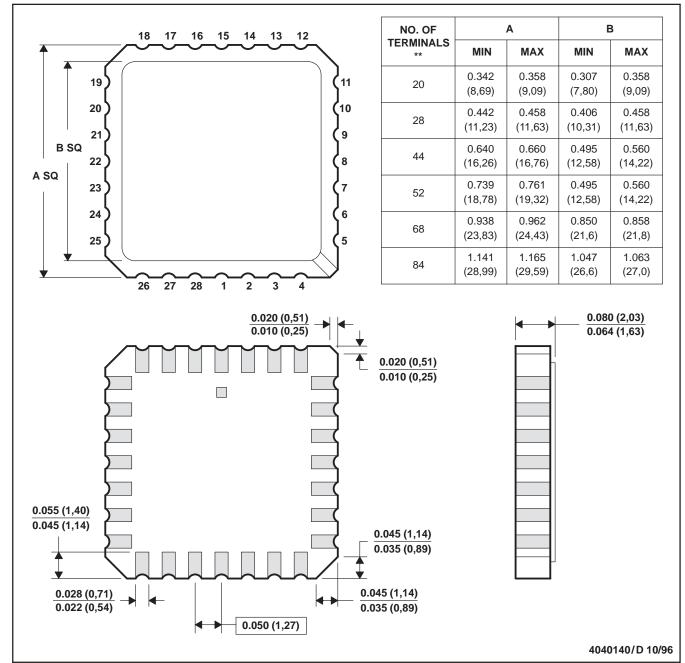
- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- C. This package can be hermetically sealed with a ceramic lid using glass frit.
- D. Index point is provided on cap for terminal identification only.
- E. Falls within Mil-Std 1835 GDFP2-F20



FK (S-CQCC-N**)

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN



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

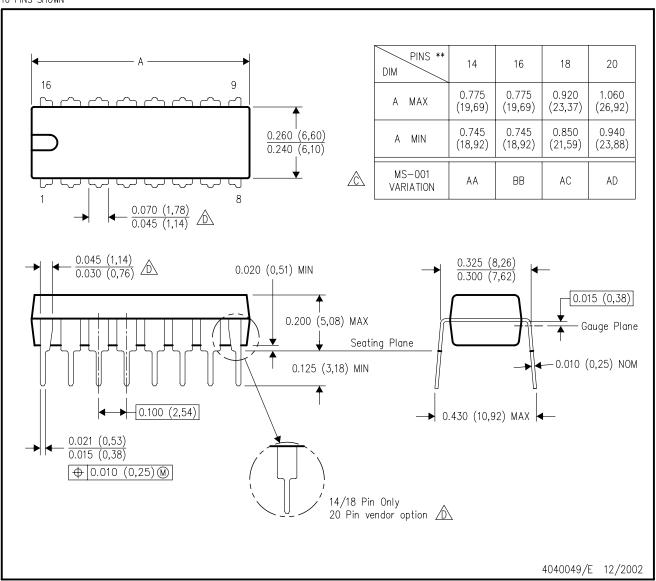
- B. This drawing is subject to change without notice.
- C. This package can be hermetically sealed with a metal lid.
- D. The terminals are gold plated.
- E. Falls within JEDEC MS-004



N (R-PDIP-T**)

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN

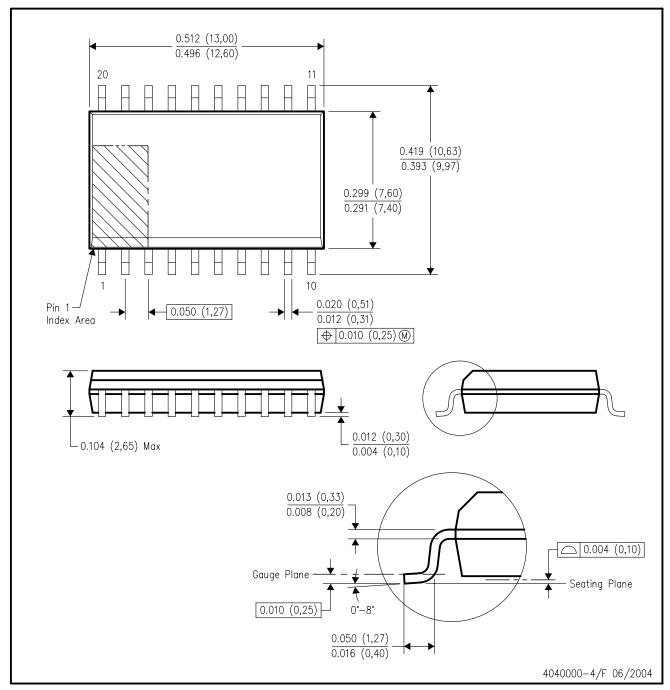


- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
- The 20 pin end lead shoulder width is a vendor option, either half or full width.



DW (R-PDSO-G20)

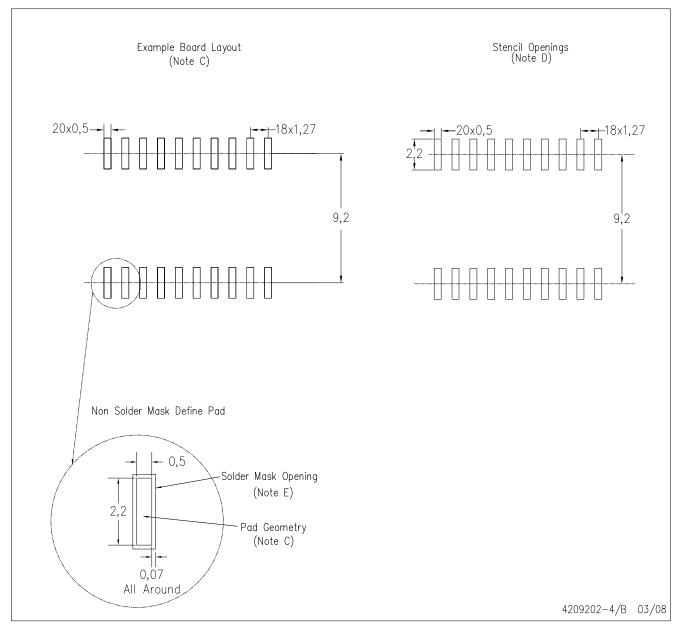
PLASTIC SMALL-OUTLINE PACKAGE



- 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.



DW (R-PDSO-G20)



- A. All linear dimensions are in millimeters.
- B. This drawing is subject to change without notice.
- C. Customers should place a note on the circuit board fabrication drawing not to alter the center solder mask defined pad.
- D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC—7525
- E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

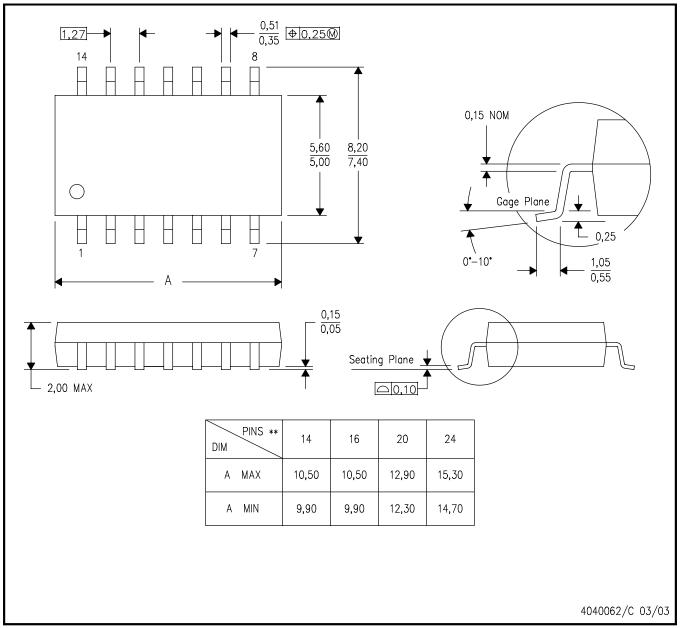


MECHANICAL DATA

NS (R-PDSO-G**)

14-PINS SHOWN

PLASTIC SMALL-OUTLINE PACKAGE



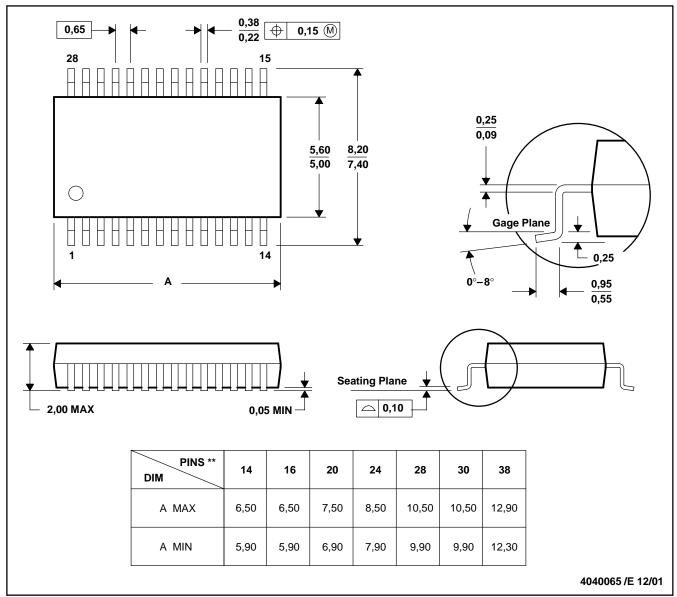
- A. All linear dimensions are in millimeters.
- B. This drawing is subject to change without notice.
- C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15.



DB (R-PDSO-G**)

PLASTIC SMALL-OUTLINE

28 PINS SHOWN



NOTES: A. All linear dimensions are in millimeters.

B. This drawing is subject to change without notice.

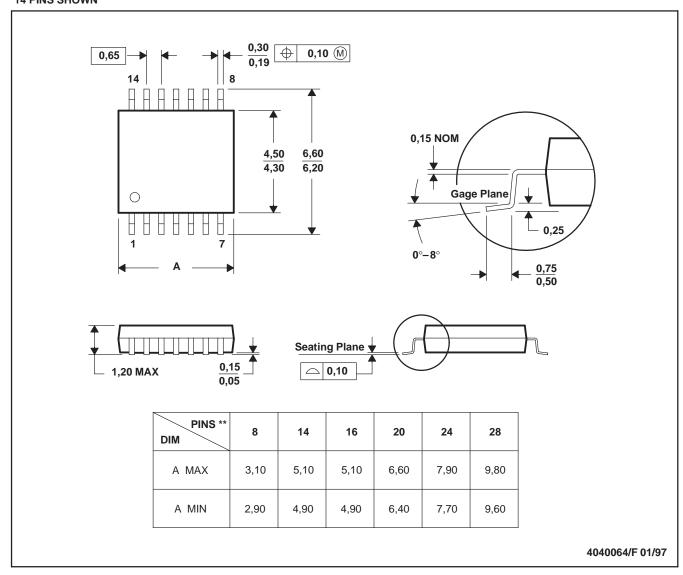
C. Body dimensions do not include mold flash or protrusion not to exceed 0,15.

D. Falls within JEDEC MO-150

PW (R-PDSO-G**)

14 PINS SHOWN

PLASTIC SMALL-OUTLINE PACKAGE



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.

D. Falls within JEDEC MO-153

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