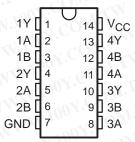
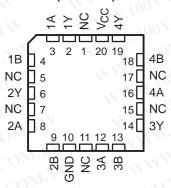
- Wide Operating Voltage Range of 2 V to 6 V
- **Outputs Can Drive Up To 10 LSTTL Loads**
- Low Power Consumption, 20-µA Max ICC

SN54HC02...J OR W PACKAGE SN74HC02...D, DB, N, NS, OR PW PACKAGE (TOP VIEW)



- Typical $t_{pd} = 8 \text{ ns}$
- ±4-mA Output Drive at 5 V
- Low Input Current of 1 µA Max

SN54HC02...FK PACKAGE (TOP VIEW)



NC - No internal connection

description/ordering information

The 'HC02 devices contain four independent 2-input NOR gates. They perform the Boolean function $Y = \overline{A + B}$ or $Y = \overline{A} \cdot \overline{B}$ in positive logic.

ORDERING INFORMATION

TA	PACK	AGET	ORDERABLE PART NUMBER	TOP-SIDE MARKING
4	PDIP – N	Tube of 25	SN74HC02N	SN74HC02N
	1007	Tube of 50	SN74HC02D	COMPL
	SOIC - D	Reel of 2500	SN74HC02DR	HC02
	MAN. TO	Reel of 250	SN74HC02DT	ON.COM
–40°C to 85°C	SOP - NS	Reel of 2000	SN74HC02NSR	HC02
	SSOP – DB	Reel of 2000	SN74HC02DBR	HC02
	MM	Tube of 90	SN74HC02PW	100Y.
	TSSOP - PW	Reel of 2000	SN74HC02PWR	HC02
	W.W.	Reel of 250	SN74HC02PWT	A Trace COJ
	CDIP – J	Tube of 25	SNJ54HC02J	SNJ54HC02J
–55°C to 125°C	CFP – W	Tube of 150	SNJ54HC02W	SNJ54HC02W
	LCCC – FK	Tube of 55	SNJ54HC02FK	SNJ54HC02FK

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

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Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.



FUNCTION TABLE (each gate)

INP	UTS	OUTPUT
Α	В	Y
H	X	MIL
X	H	FCO
L	LV.	H

logic diagram (positive logic)



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

Supply voltage range, V _{CC}	Tativity of COM.	0.5 V to 7 V
Input clamp current, I_{IK} ($V_I < 0$ or $V_I > V_{CC}$) (s		
Output clamp current, IOK (VO < 0 or VO > VC		
Continuous output current, IO (VO = 0 to VCC)	······································	±25 mA
Continuous current through V _{CC} or GND		±50 mA
Package thermal impedance, θ _{JA} (see Note 2)): D package	86°C/W
M.I. COM.	DB package	96°C/W
	N package	80°C/W
	NS package	76°C/W
	PW package	113°C/W
Storage temperature range, T _{stq}	11111111111111111111111111111111111111	. −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)

	W	M.M.M. JOA. CO.		N54HC0	2	S	N74HC0	2	
			MIN NOM MAX			MIN NOM MAX			UNIT
Vcc	Supply voltage	111.100 r. COM.	2	5	6	2	5	6	V
		V _{CC} = 2 V	1.5		Ma.	1.5	11.	αM^{Λ}	N.
V_{IH}	High-level input voltage	V _{CC} = 4.5 V	3.15		MM	3.15	MY.C	- A [V
		V _{CC} = 6 V	4.2	1	XXI ^X	4.2	.01.	$\mathbb{C}\Omega_{M_{p}}$	TV
		V _{CC} = 2 V	$M_{T,T}$	_T	0.5	www.	Ina	0.5	
V_{IL}	Low-level input voltage	V _{CC} = 4.5 V	TIM		1.35	41	1700 x	1.35	V
		V _{CC} = 6 V		WT		MW	100	1.8	
٧ _I	Input voltage	MW.Io	0 0	-CVV	Vсс	0	W. 2	VCC	V
۷o	Output voltage	W.100 -	0	. 1	Vcc	0		Vcc	V
		V _{CC} = 2 V		VIIA	1000			1000	
Δt/Δv Input transit	Input transition rise/fall time	V _{CC} = 4.5 V	I.Co.		500		•	500	ns
		V _{CC} = 6 V			400			400	
T _A	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)

DADAMETER	TEST CONDITIONS		T _A = 25°C		;	SN54I	HC02	SN74I	UNIT		
PARAMETER	IESI C	VCC	MIN	TYP	MAX	MIN	MAX	MIN	MAX	UNI	
WW = 10	OY.		2 V	1.9	1.998		1.9	atvi 1	1.9	coM	. 1
	MY.COM	I _{OH} = -20 μA	4.5 V	4.4	4.499	V	4.4	VV .	4.4	.01	
VOH	VI = VIH or VIL	IN V	6 V	5.9	5.999	N	5.9	11/1/1/	5.9	i.Co.	V
	100 r. COM	I _{OH} = -4 mA	4.5 V	3.98	4.3	-33	3.7	OT WY	3.84	A CO	
WW. 100X.C	100Y.	I _{OH} = -5.2 mA	6 V	5.48	5.8	LA	5.2	V 1	5.34	-1 (1	
MM, WY.CO.	WT	2 V	OOX.	0.002	0.1		0.1	-x110	0.1		
	M.Io. CO	$I_{OL} = 20 \mu A$	4.5 V	· on V	0.001	0.1		0.1	1	0.1	
V _{OL}	$V_I = V_{IH}$ or V_{IL}	OM.1	6 V	Too	0.001	0.1	N.	0.1	MW.	0.1	CV
	1007.0	I _{OL} = 4 mA	4.5 V	N.100	0.17	0.26	-7	0.4	Wire	0.33	
MMM. 100X.	I _{OL} = 5.2 mA	6 V	×1 10	0.15	0.26	W	0.4	N	0.33		
I _I	$V_I = V_{CC}$ or 0	COM	6 V	111.	±0.1	±100	TW	±1000	WW	±1000	nA
Icc	$V_I = V_{CC}$ or 0,	I _O = 0	6 V	WW.		2	- TI	40	WW	20	μΑ
Ci	W 100	T. OM.TW	2 V to 6 V		3	10	I'r	10		10	pF

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

DADAMETED	FROM	TO (OUTPUT)	- V	T,	4 = 25°C	27	SN54I	HC02	SN74I	HC02	LIAUT				
PARAMETER	(INPUT)		N Vcc	MIN	TYP	MAX	MIN	MAX	MIN	MAX	UNIT				
	MMM	OUX.CO.	2 V	W	45	90		135		115	_ 1				
t _{pd}	A or B	YOM.	4.5 V	1	9	9 18	1 C 27		23	23	ns				
	W TITE		6 V		8	15	41 CO	23		20					
	WWW.10	1 100 Y.	2 V		38	75	11.	110	44	95	- 1				
t _t		MM W.	Y.COM	Y.Cos	Y.Co	Y.Co.	Y.CO	4.5 V		8	15	OYL	22	UN	19
			6 V		6	13	anv.	19	TW	16					

operating characteristics, T_A = 25°C

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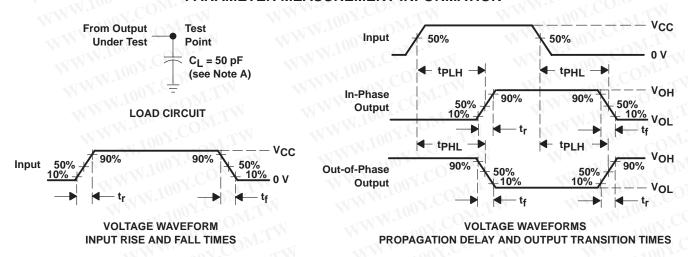
	PARAMETER	TEST CONDITIONS	TYP	UNIT
C _{pd}	Power dissipation capacitance per gate	No load	22	pF
	MAN. TO OA COM. THE	MMM. COL	TW	
	TANA CO.	1007.00		

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PARAMETER MEASUREMENT INFORMATION



- NOTES: A. C_L includes probe and test-fixture capacitance.
 - B. Phase relationships between waveforms were chosen arbitrarily. All input pulses are supplied by generators having the following characteristics: PRR \leq 1 MHz, $Z_O = 50 \Omega$, $t_f = 6$ ns, $t_f = 6$ ns.
 - C. The outputs are measured one at a time with one input transition per measurement.
 - D. tpLH and tpHL are the same as tpd.

Figure 1. Load Circuit and Voltage Waveforms





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PACKAGE OPTION ADDENDUM

18-Jul-2006

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Packag Qty	e Eco Plan ⁽²⁾	Lead/Ball Finisl	n MSL Peak Temp ⁽³
5962-8404101VCA	ACTIVE	CDIP	J. I.	14	01	TBD	A42 SNPB	N / A for Pkg Type
5962-8404101VDA	ACTIVE	CFP	W	14	_1	TBD	A42	N / A for Pkg Type
84041012A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type
8404101CA	ACTIVE	CDIP	3	14	1.9	TBD	A42 SNPB	N / A for Pkg Type
8404101DA	ACTIVE	CFP	W	14	10	TBD	A42	N / A for Pkg Type
JM38510/65101B2A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type
JM38510/65101BCA	ACTIVE	CDIP	J	14	001	TBD	A42 SNPB	N / A for Pkg Type
JM38510/65101BDA	ACTIVE	CFP	W	14	11	TBD	A42	N / A for Pkg Type
SN54HC02J	ACTIVE	CDIP	J	14	1	TBD	A42 SNPB	N / A for Pkg Type
SN74HC02D	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HC02DBLE	OBSOLETE	SSOP	DB	14	W.In.	TBD	Call TI	Call TI
SN74HC02DBR	ACTIVE	SSOP	DB	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HC02DBRE4	ACTIVE	SSOP	DB	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HC02DE4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HC02DR	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HC02DRE4	ACTIVE	SOIC	D D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HC02DRG4	ACTIVE	SOIC	OND	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HC02DT	ACTIVE	SOIC	COD	14	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HC02DTE4	ACTIVE	SOIC	D	14	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HC02N	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74HC02N3	OBSOLETE	PDIP	NCO	14	XXI	TBD	Call TI	Call TI
SN74HC02NE4	ACTIVE	PDIP	100 N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74HC02NSR	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HC02NSRG4	ACTIVE	SO	NS	C 14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HC02PW	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIN
SN74HC02PWE4	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIN
SN74HC02PWG4	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIN
SN74HC02PWLE	OBSOLETE	TSSOP	PW	14	$1.CO^{\frac{1}{2}}$	TBD	Call TI	Call TI
SN74HC02PWR	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIN
SN74HC02PWRE4	ACTIVE	TSSOP	PW	14	2000	Green (RoHS &	CU NIPDAU	Level-1-260C-UNLIM





n 18-Jul-2006

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	e Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp (3
11001	M_{II}	41	. N.100	-10	$O_{M^{*}r}$	no Sb/Br)	MW.In	COM
SN74HC02PWRG4	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HC02PWT	ACTIVE	TSSOP	PW	14	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HC02PWTE4	ACTIVE	TSSOP	PW	14	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SNJ54HC02FK	ACTIVE	LCCC	FK	20	11	TBD	POST-PLATE	N / A for Pkg Type
SNJ54HC02J	ACTIVE	CDIP	J	14	1 C	TBD	A42 SNPB	N / A for Pkg Type
SNJ54HC02W	ACTIVE	CFP	W	14	1	TBD	A42	N / A for Pkg Type
SNV54HC02J	ACTIVE	CDIP	J	14	100 x.	TBD	Call TI	Call TI
SNV54HC02W	ACTIVE	CFP	W	14	You.	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), 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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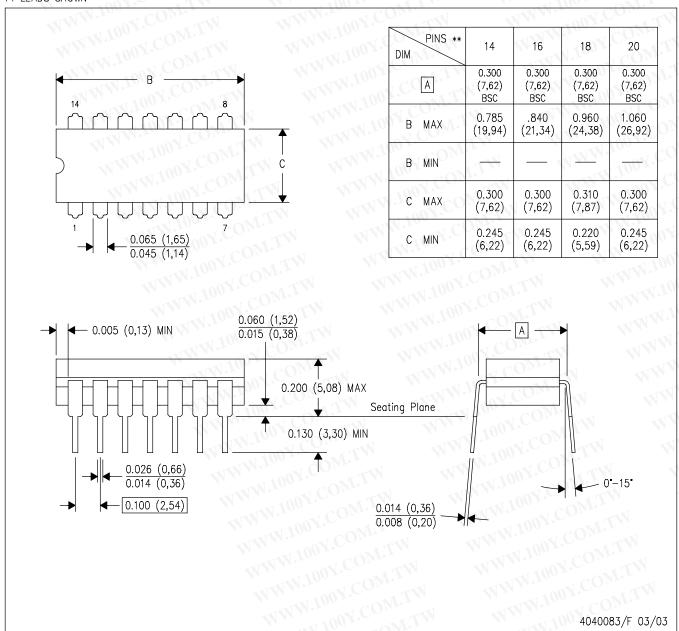
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J(R-GDIP-T**)

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CERAMIC DUAL IN-LINE PACKAGE

14 LEADS SHOWN



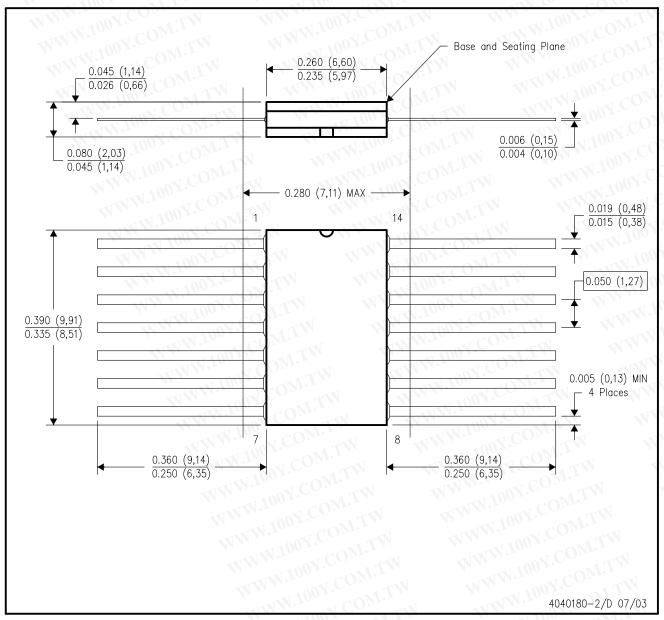
NOTES:

- 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.

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W (R-GDFP-F14)

CERAMIC DUAL FLATPACK



NOTES:

- В.
- This drawing is subject to change without notice.

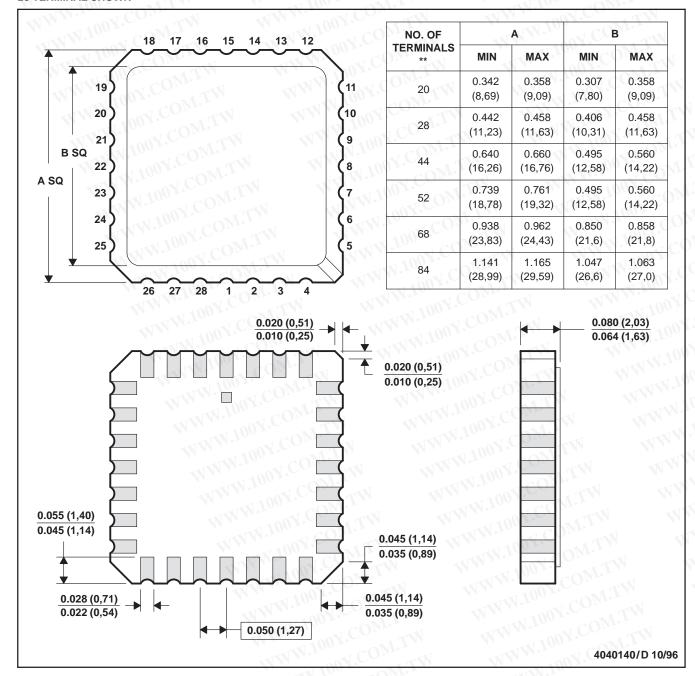
 This package can be hermatically a first market and the control of the cont This package can be hermetically sealed with a ceramic lid using glass frit. C.
- Index point is provided on cap for terminal identification only.
- WWW.100Y.COM.TW E. Falls within MIL STD 1835 GDFP1-F14 and JEDEC MO-092AB



FK (S-CQCC-N**)

28 TERMINAL SHOWN

LEADLESS CERAMIC CHIP CARRIER



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

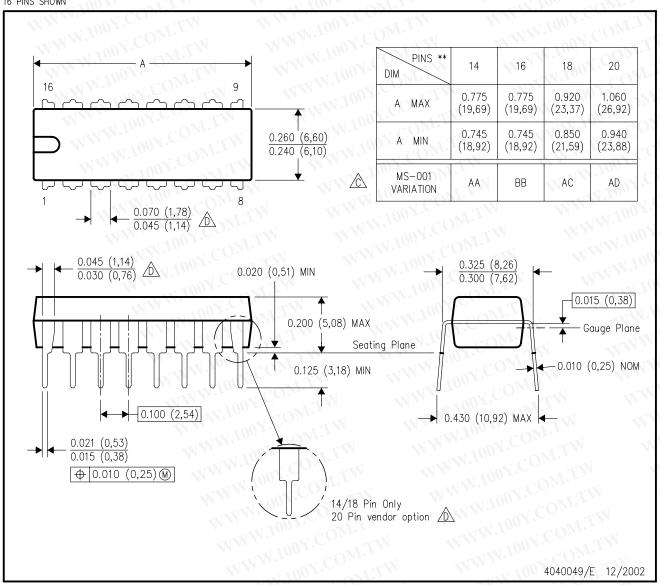
- B. This drawing is subject to change without notice.
- C. This package can be hermetically sealed with a metal lid.
- D. The terminals are gold plated.
- E. Falls within JEDEC MS-004



N (R-PDIP-T**)

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN



NOTES:

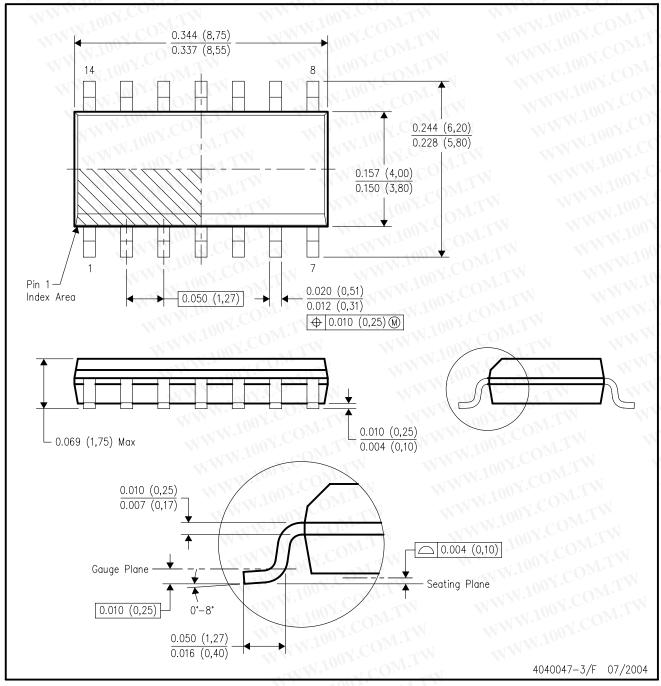
- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
- ⚠ The 20 pin end lead shoulder width is a vendor option, either half or full width.



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D (R-PDSO-G14)

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-012 variation AB.

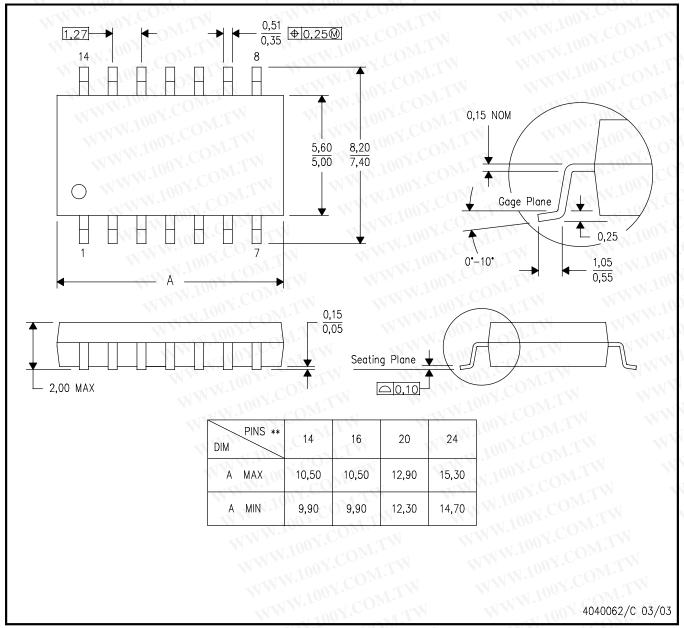


MECHANICAL DATA

NS (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.

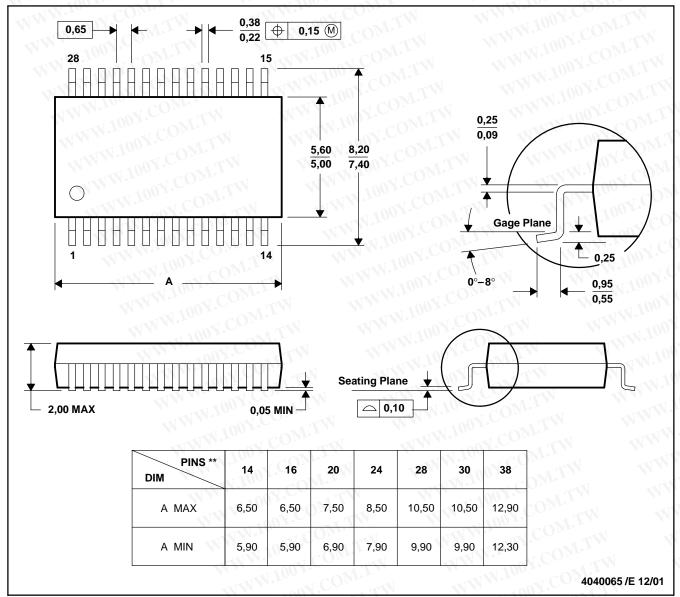
C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15.



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.

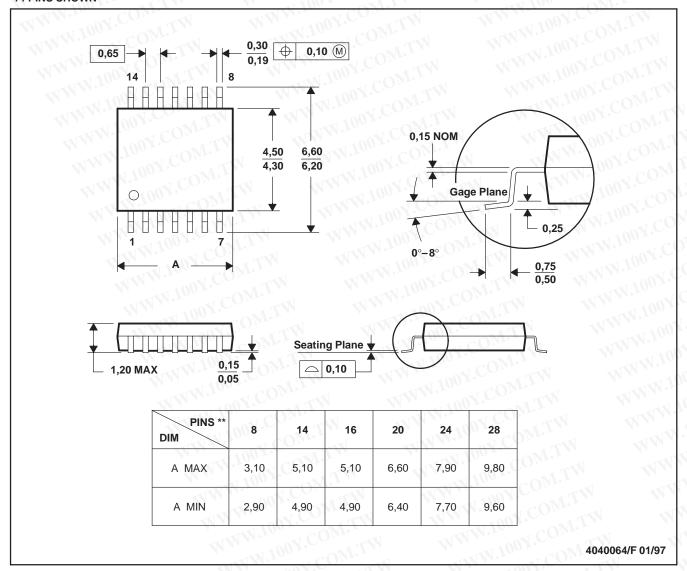
D. Falls within JEDEC MO-150



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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Power Mgmt	power.ti.com	Optical Networking	www.ti.com/opticalnetwork
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Low Power Wireless	www.ti.com/lpw	Telephony	www.ti.com/telephony
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