

SN54ALS10A, SN54AS10, SN74ALS10A, SN74AS10 TRIPLE 3-INPUT POSITIVE-NAND GATES

SDAS002B – MARCH 1984 – REVISED DECEMBER 1994

- Package Options Include Plastic Small-Outline (D) Packages, Ceramic Chip Carriers (FK), and Standard Plastic (N) and Ceramic (J) 300-mil DIPs

description

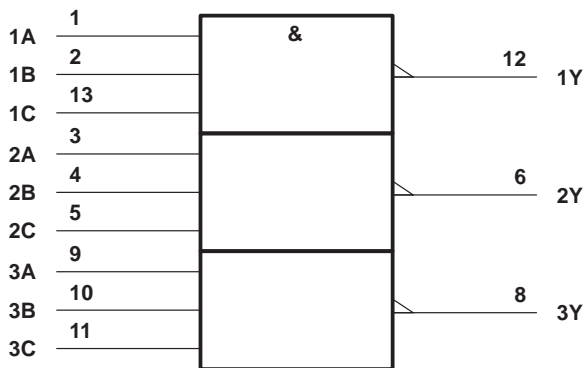
These devices contain three independent 3-input positive-NAND gates. They perform the Boolean functions $Y = \overline{A \cdot B \cdot C}$ or $Y = \overline{A + B + C}$ in positive logic.

The SN54ALS10A and SN54AS10 are characterized for operation over the full military temperature range of -55°C to 125°C . The SN74ALS10A and SN74AS10 are characterized for operation from 0°C to 70°C .

FUNCTION TABLE
(each gate)

INPUTS			OUTPUT
A	B	C	Y
H	H	H	L
L	X	X	H
X	L	X	H
X	X	L	H

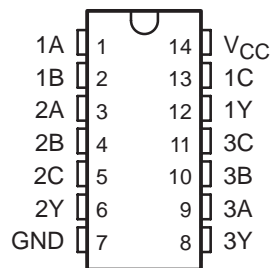
logic symbol†



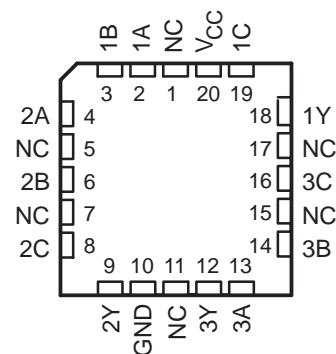
† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

Pin numbers shown are for the D, J, and N packages.

SN54ALS10A, SN54AS10 . . . J PACKAGE
SN74ALS10A, SN74AS10 . . . D OR N PACKAGE
(TOP VIEW)

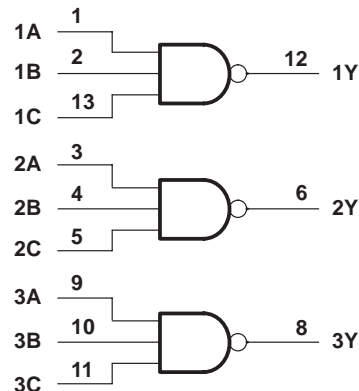


SN54ALS10A, SN54AS10 . . . FK PACKAGE
(TOP VIEW)



NC – No internal connection

logic diagram (positive logic)



SN54ALS10A, SN54AS10, SN74ALS10A, SN74AS10 TRIPLE 3-INPUT POSITIVE-NAND GATES

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

Supply voltage, V_{CC}	7 V
Input voltage, V_I	7 V
Operating free-air temperature range, T_A : SN54ALS10A	-55°C to 125°C
SN74ALS10A	0°C to 70°C
Storage temperature range	-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.

recommended operating conditions

		SN54ALS10A			SN74ALS10A			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V_{CC}	Supply voltage	4.5	5	5.5	4.5	5	5.5	V
V_{IH}	High-level input voltage	2			2			V
V_{IL}	Low-level input voltage	0.8‡			0.8			V
		0.7§						
I_{OH}	High-level output current	-0.4			-0.4			mA
I_{OL}	Low-level output current	4			8			mA
T_A	Operating free-air temperature	-55			125			°C

‡ Applies over temperature range -55°C to 70°C

§ Applies over temperature range 70°C to 125°C

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

PARAMETER	TEST CONDITIONS	SN54ALS10A			SN74ALS10A			UNIT
		MIN	TYP††	MAX	MIN	TYP††	MAX	
V_{IK}	$V_{CC} = 4.5 V$, $I_I = -18 mA$	-1.5			-1.5			V
V_{OH}	$V_{CC} = 4.5 V$ to $5.5 V$, $I_{OH} = -0.4 mA$	$V_{CC} - 2$			$V_{CC} - 2$			V
V_{OL}	$V_{CC} = 4.5 V$	$I_{OL} = 4 mA$			0.25 0.4			V
		$I_{OL} = 8 mA$			0.35 0.5			
I_I	$V_{CC} = 5.5 V$, $V_I = 7 V$	0.1			0.1			mA
I_{IH}	$V_{CC} = 5.5 V$, $V_I = 2.7 V$	20			20			μA
I_{IL}	$V_{CC} = 5.5 V$, $V_I = 0.4 V$	-0.1			-0.1			mA
$I_{O\#}$	$V_{CC} = 5.5 V$, $V_O = 2.25 V$	-20		-112	-30		-112	mA
I_{CCH}	$V_{CC} = 5.5 V$, $V_I = 0$	0.32		0.6	0.32		0.6	mA
I_{CCL}	$V_{CC} = 5.5 V$, $V_I = 4.5 V$	1.2		2.2	1.2		2.2	mA

†† All typical values are at $V_{CC} = 5 V$, $T_A = 25°C$.

The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current, I_{OS} .



SN54ALS10A, SN54AS10, SN74ALS10A, SN74AS10 TRIPLE 3-INPUT POSITIVE-NAND GATES

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switching characteristics (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _{CC} = 4.5 V to 5.5 V, C _L = 50 pF, R _L = 500 Ω, T _A = MIN to MAX†				UNIT
			SN54ALS10A		SN74ALS10A		
			MIN	MAX	MIN	MAX	
t _{PLH}	A, B, or C	Y	2	12	2	11	ns
t _{PHL}			2	12	2	10	

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

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

Supply voltage, V _{CC}	7 V
Input voltage, V _I	7 V
Operating free-air temperature range, T _A : SN54AS10	-55°C to 125°C
SN74AS10	0°C to 70°C
Storage temperature range	-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.

recommended operating conditions

	SN54AS10			SN74AS10			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
V _{CC} Supply voltage	4.5	5	5.5	4.5	5	5.5	V
V _{IH} High-level input voltage	2			2			V
V _{IL} Low-level input voltage			0.8			0.8	V
I _{OH} High-level output current			-2			-2	mA
I _{OL} Low-level output current			20			20	mA
T _A Operating free-air temperature	-55		125	0		70	°C

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

PARAMETER	TEST CONDITIONS	SN54AS10			SN74AS10			UNIT
		MIN	TYP§	MAX	MIN	TYP§	MAX	
V _{IK}	V _{CC} = 4.5 V, I _I = -18 mA			-1.2			-1.2	V
V _{OH}	V _{CC} = 4.5 V to 5.5 V, I _{OH} = -2 mA	V _{CC} - 2			V _{CC} - 2			V
V _{OL}	V _{CC} = 4.5 V, I _{OL} = 20 mA	0.35	0.5		0.35	0.5		V
I _I	V _{CC} = 5.5 V, V _I = 7 V			0.1			0.1	mA
I _{IH}	V _{CC} = 5.5 V, V _I = 2.7 V			20			20	μA
I _{IL}	V _{CC} = 5.5 V, V _I = 0.4 V			-0.5			-0.5	mA
I _O ¶	V _{CC} = 5.5 V, V _O = 2.25 V	-30		-112	-30		-112	mA
I _{CCH}	V _{CC} = 5.5 V, V _I = 0		1.5	2.4		1.5	2.4	mA
I _{CCL}	V _{CC} = 5.5 V, V _I = 4.5 V		8.1	13		8.1	13	mA

§ All typical values are at V_{CC} = 5 V, T_A = 25°C.

¶ The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current, I_{OS}.



SN54ALS10A, SN54AS10, SN74ALS10A, SN74AS10 TRIPLE 3-INPUT POSITIVE-NAND GATES

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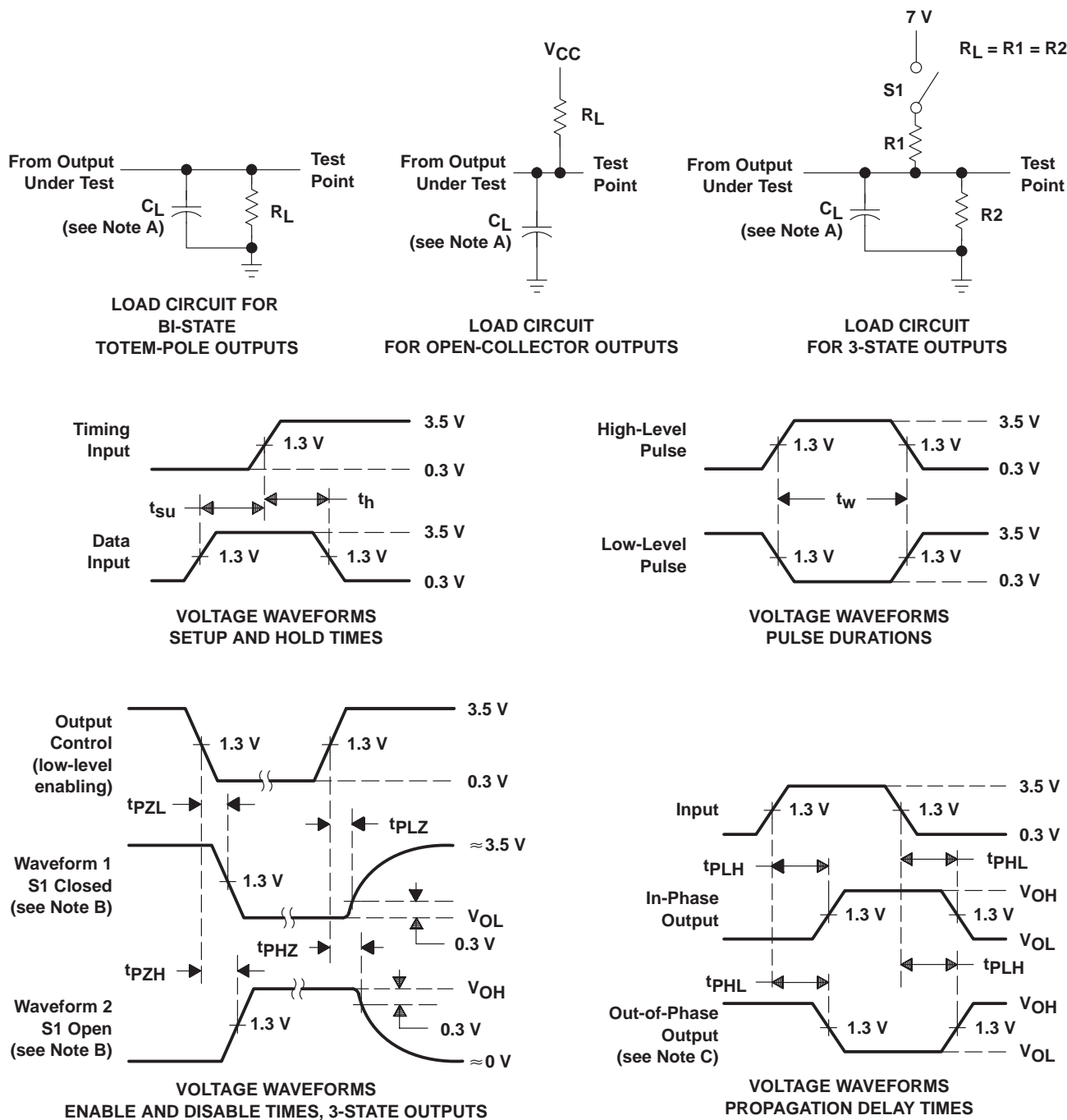
switching characteristics (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V},$ $C_L = 50 \text{ pF},$ $R_L = 500 \Omega,$ $T_A = \text{MIN to MAX}^\dagger$				UNIT
			SN54AS10		SN74AS10		
			MIN	MAX	MIN	MAX	
t_{PLH}	A, B, or C	Y	1	5	1	4.5	ns
t_{PHL}			1	5	1	4.5	

[†] For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.



PARAMETER MEASUREMENT INFORMATION
SERIES 54ALS/74ALS AND 54AS/74AS DEVICES



- NOTES: A. C_L includes probe and jig 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. When measuring propagation delay items of 3-state outputs, switch S1 is open.
 D. All input pulses have the following characteristics: $PRR \leq 1$ MHz, $t_r = t_f = 2$ ns, duty cycle = 50%.
 E. The outputs are measured one at a time with one transition per measurement.

Figure 1. Load Circuits and Voltage Waveforms

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)
5962-86865012A	ACTIVE	LCCC	FK	20	1	TBD	Call TI	Call TI	
5962-8686501CA	ACTIVE	CDIP	J	14	1	TBD	Call TI	Call TI	
5962-8686501DA	ACTIVE	CFP	W	14	1	TBD	Call TI	Call TI	
JM38510/37002B2A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	
JM38510/37002BCA	ACTIVE	CDIP	J	14	1	TBD	A42	N / A for Pkg Type	
M38510/37002B2A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	
M38510/37002BCA	ACTIVE	CDIP	J	14	1	TBD	A42	N / A for Pkg Type	
SN54ALS10AJ	ACTIVE	CDIP	J	14	1	TBD	A42	N / A for Pkg Type	
SN54AS10J	ACTIVE	CDIP	J	14	1	TBD	A42	N / A for Pkg Type	
SN74ALS10AD	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
SN74ALS10ADE4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
SN74ALS10ADG4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
SN74ALS10ADR	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
SN74ALS10ADRE4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
SN74ALS10ADRG4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
SN74ALS10AN	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	
SN74ALS10ANE4	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	
SN74ALS10ANSR	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
SN74ALS10ANSRE4	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
SN74ALS10ANSRG4	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
SN74AS10D	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/ Ball Finish	MSL Peak Temp ⁽³⁾	Samples (Requires Login)
SN74AS10DE4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
SN74AS10DG4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
SN74AS10DR	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
SN74AS10DRE4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
SN74AS10DRG4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
SN74AS10N	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	
SN74AS10N3	OBSOLETE	PDIP	N	14		TBD	Call TI	Call TI	
SN74AS10NE4	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	
SN74AS10NSR	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
SN74AS10NSRE4	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
SN74AS10NSRG4	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
SNJ54ALS10AFK	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	
SNJ54ALS10AJ	ACTIVE	CDIP	J	14	1	TBD	A42	N / A for Pkg Type	
SNJ54ALS10AW	ACTIVE	CFP	W	14	1	TBD	A42	N / A for Pkg Type	
SNJ54AS10FK	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	
SNJ54AS10J	ACTIVE	CDIP	J	14	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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OTHER QUALIFIED VERSIONS OF SN54ALS10A, SN54AS10, SN74ALS10A, SN74AS10 :

● Catalog: [SN74ALS10A](#), [SN74AS10](#)

● Military: [SN54ALS10A](#), [SN54AS10](#)

NOTE: Qualified Version Definitions:

● Catalog - TI's standard catalog product

● Military - QML certified for Military and Defense Applications

TAPE AND REEL INFORMATION
REEL DIMENSIONS

TAPE DIMENSIONS


A0	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

TAPE AND REEL INFORMATION

*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
SN74ALS10ADR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
SN74ALS10ANSR	SO	NS	14	2000	330.0	16.4	8.2	10.5	2.5	12.0	16.0	Q1
SN74AS10DR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
SN74AS10NSR	SO	NS	14	2000	330.0	16.4	8.2	10.5	2.5	12.0	16.0	Q1

TAPE AND REEL BOX DIMENSIONS

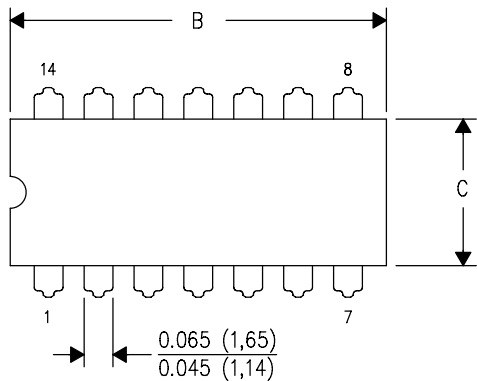

*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74ALS10ADR	SOIC	D	14	2500	367.0	367.0	38.0
SN74ALS10ANSR	SO	NS	14	2000	367.0	367.0	38.0
SN74AS10DR	SOIC	D	14	2500	367.0	367.0	38.0
SN74AS10NSR	SO	NS	14	2000	367.0	367.0	38.0

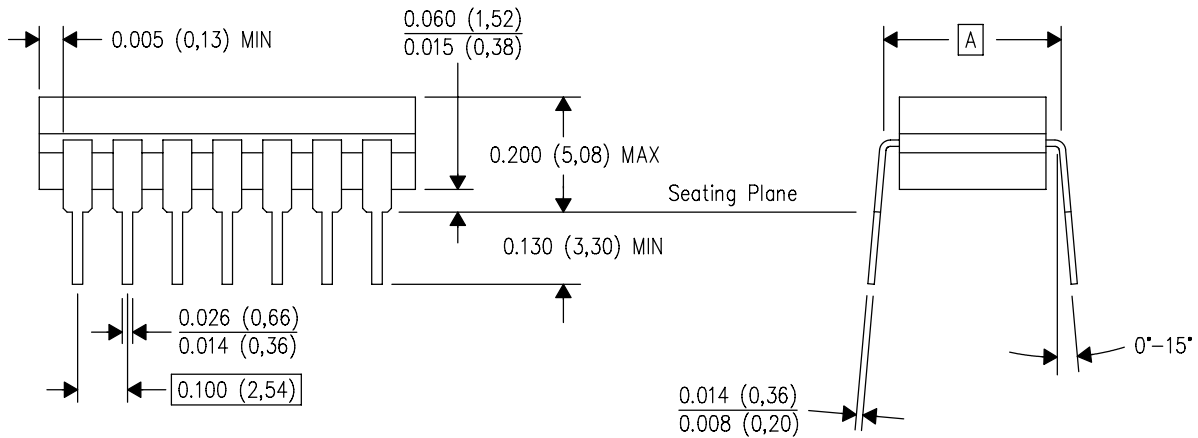
J (R-GDIP-T**)

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)

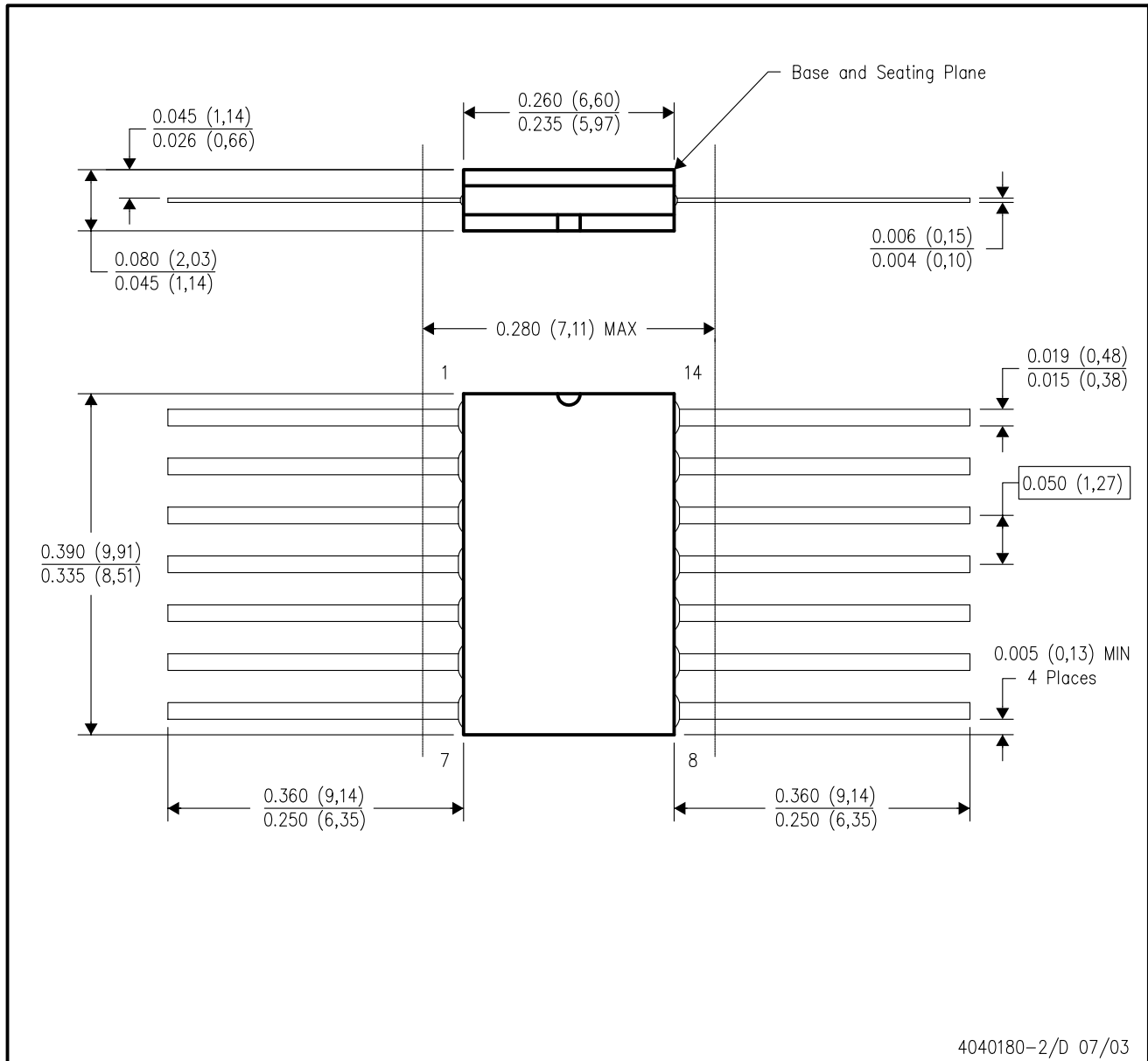


4040083/F 03/03

- NOTES:
- 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-F14)

CERAMIC DUAL FLATPACK

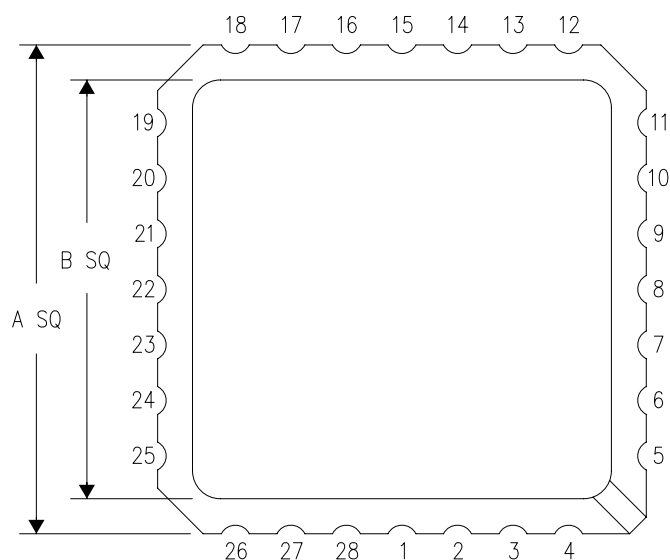


- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - C. This package can be hermetically sealed with a ceramic lid using glass frit.
 - D. Index point is provided on cap for terminal identification only.
 - E. Falls within MIL STD 1835 GDFP1-F14 and JEDEC MO-092AB

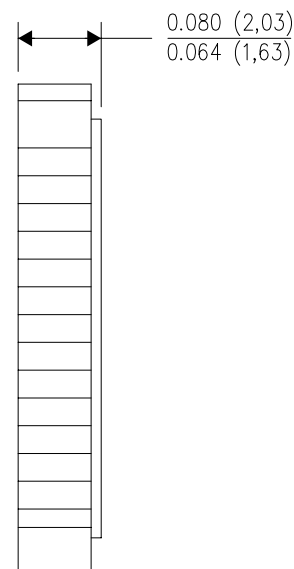
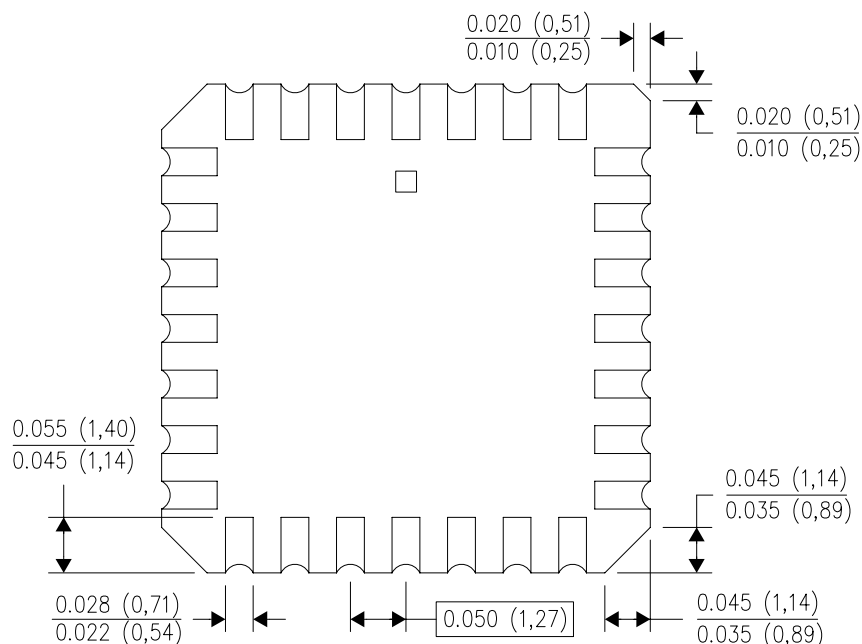
FK (S-CQCC-N**)

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN



NO. OF TERMINALS **	A		B	
	MIN	MAX	MIN	MAX
20	0.342 (8,69)	0.358 (9,09)	0.307 (7,80)	0.358 (9,09)
28	0.442 (11,23)	0.458 (11,63)	0.406 (10,31)	0.458 (11,63)
44	0.640 (16,26)	0.660 (16,76)	0.495 (12,58)	0.560 (14,22)
52	0.740 (18,78)	0.761 (19,32)	0.495 (12,58)	0.560 (14,22)
68	0.938 (23,83)	0.962 (24,43)	0.850 (21,6)	0.858 (21,8)
84	1.141 (28,99)	1.165 (29,59)	1.047 (26,6)	1.063 (27,0)



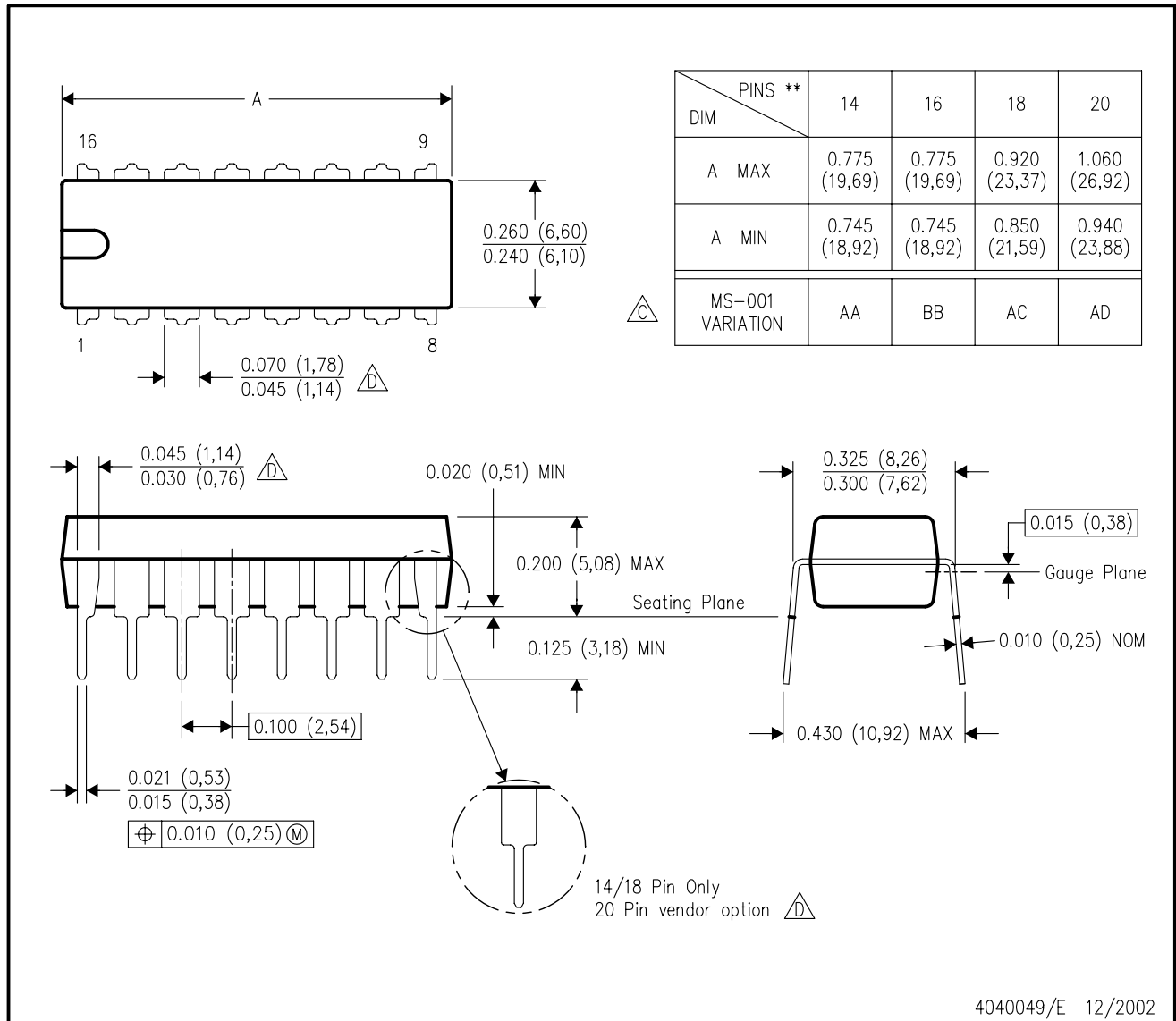
4040140/D 01/11

- NOTES:
- All linear dimensions are in inches (millimeters).
 - This drawing is subject to change without notice.
 - This package can be hermetically sealed with a metal lid.
 - Falls within JEDEC MS-004

N (R-PDIP-T**)

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN

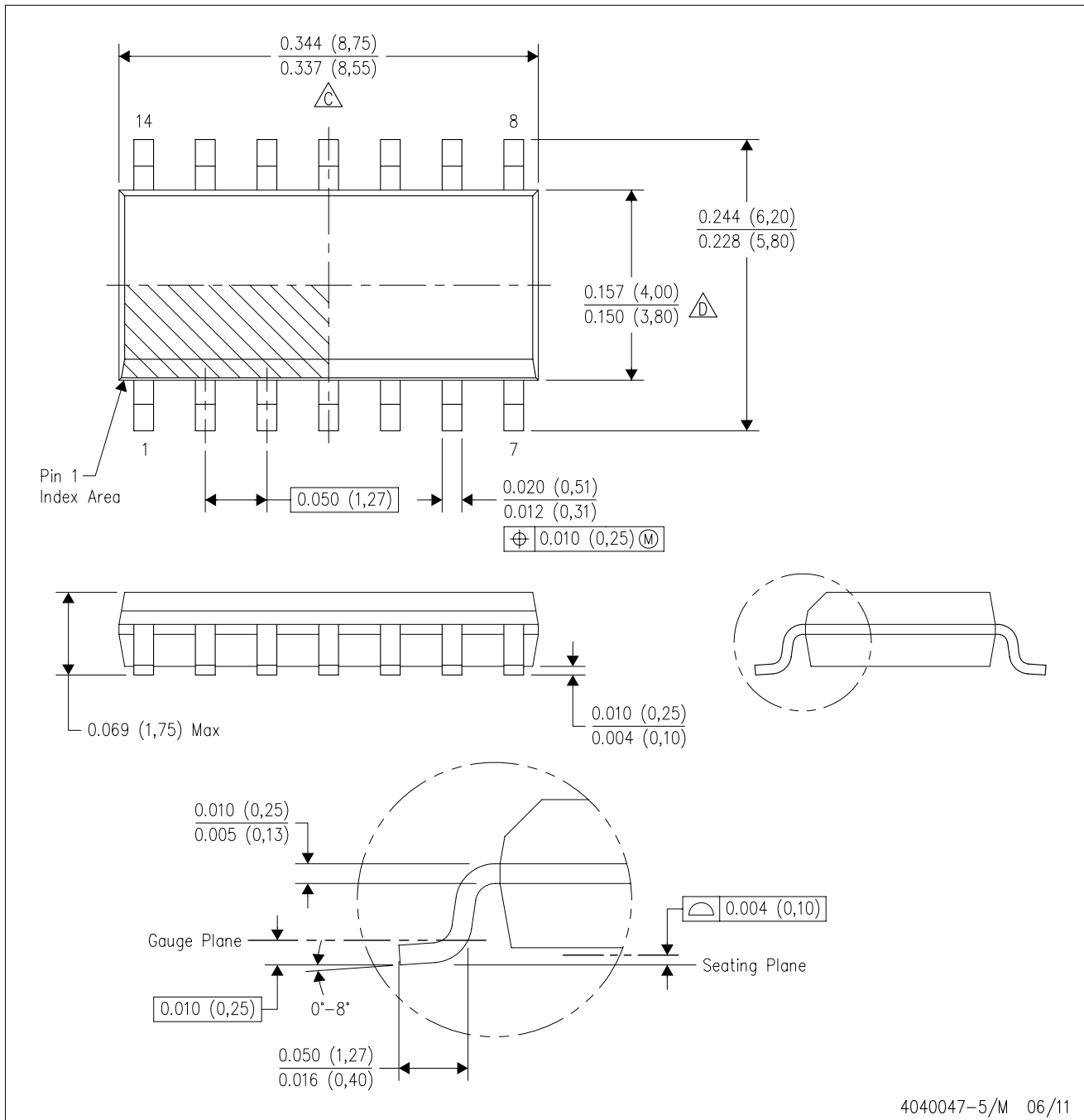


- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - C Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
 - D The 20 pin end lead shoulder width is a vendor option, either half or full width.

4040049/E 12/2002

D (R-PDSO-G14)

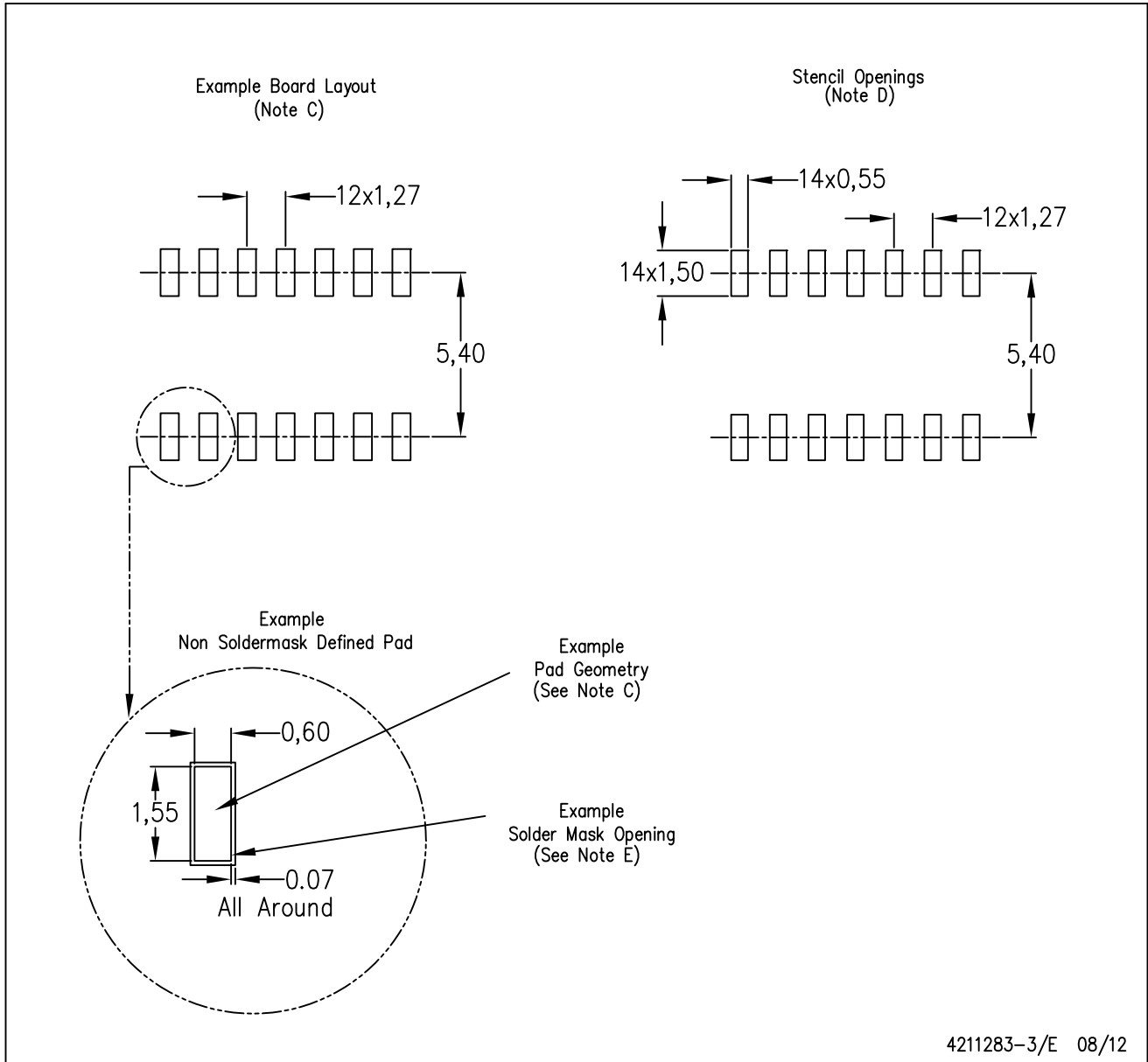
PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - $\triangle C$ Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0,15) each side.
 - $\triangle D$ Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.
 - E. Reference JEDEC MS-012 variation AB.

D (R-PDSO-G14)

PLASTIC SMALL OUTLINE



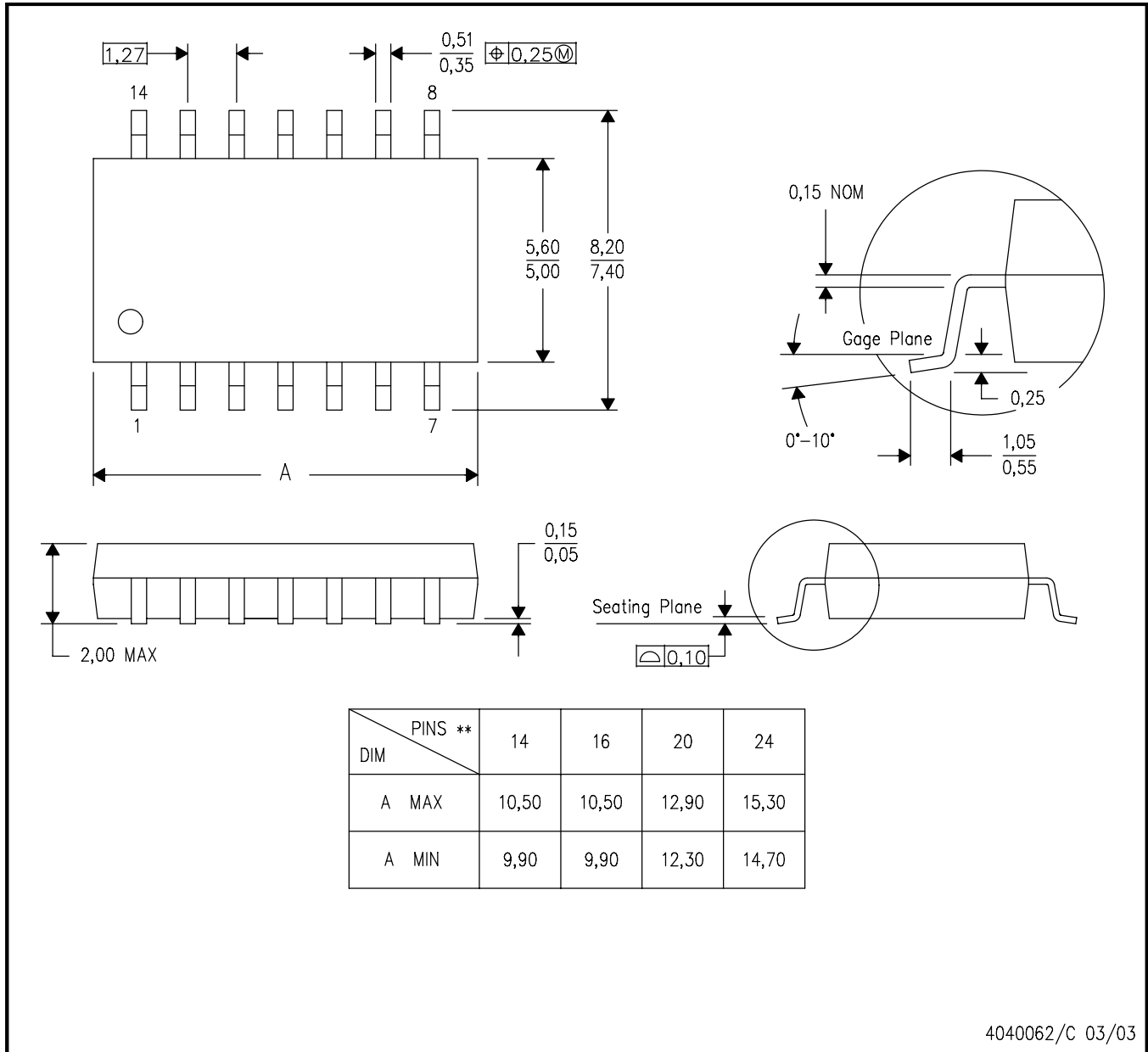
- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Publication IPC-7351 is recommended for alternate designs.
 - D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
 - E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

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.

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