TYPE	TYPICAL POWER DISSIPATION	TYPICAL DELAY (4-BIT WORDS)
'85	275 mW	23 ns
'LS85	52 mW	24 ns
'S85	365 mW	11 ns

description

These four-bit magnitude comparators perform comparison of straight binary and straight BCD (8-4-2-1) codes. Three fully decoded decisions about two 4-bit words (A, B) are made and are externally available at three outputs. These devices are fully expandable to any number of bits without external gates. Words of greater length may be compared by connecting comparators in cascade. The A > B, A < B, and A = B outputs of a stage handling less-significant bits are connected to the corresponding A > B, A < B, and A = B inputs of the next stage handling more-significant bits. The stage handling the least-significant bits must have a high-level voltage applied to the A = B input. The cascading paths of the '85, 'LS85, and 'S85 are implemented with only a two-gate-level delay to reduce overall comparison times for long words. An alternate method of cascading which further reduces the comparison time is shown in the typical application data.

SN5485, SN54LS85, SN54S85 . . . J OR W PACKAGE
SN7485 . . . N PACKAGE
SN74LS85, SN74S85 . . . D OR N PACKAGE
(TOP VIEW)

B3	1	16	V_{CC}
A< Bin	2	15	A3
A = Bin	3	14	B2
A> Bin	4	13	A2
A> Bout	5	12	A1
A = Bout	6	11	B1
A< Bout	7	10	A0
GND	8	9	B0

SN54LS85, SN54S85 . . . FK PACKAGE
(TOP VIEW)

Top pins (3, 2, 1, 20, 19): A< Bin, B3, NC, V_{CC}, A3

A = Bin	4	18	B2
A> Bin	5	17	A2
NC	6	16	NC
A> Bout	7	15	A1
A = Bout	8	14	B1

Bottom pins (9, 10, 11, 12, 13): A< Bout, GND, NC, B0, A0
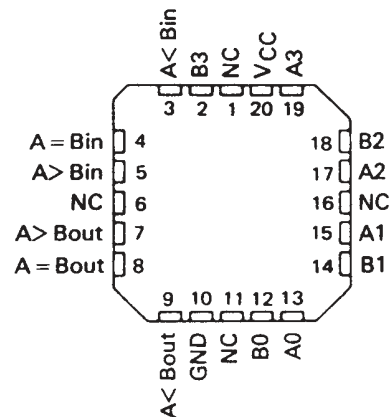
NC - No internal connection

FUNCTION TABLE

COMPARING INPUTS				CASCADING INPUTS			OUTPUTS		
A3, B3	A2, B2	A1, B1	A0, B0	A > B	A < B	A = B	A > B	A < B	A = B
A3 > B3	X	X	X	X	X	X	H	L	L
A3 < B3	X	X	X	X	X	X	L	H	L
A3 = B3	A2 > B2	X	X	X	X	X	H	L	L
A3 = B3	A2 < B2	X	X	X	X	X	L	H	L
A3 = B2	A2 = B2	A1 > B1	X	X	X	X	H	L	L
A3 = B3	A2 = B2	A1 < B1	X	X	X	X	L	H	L
A2 = B3	A2 = B2	A1 = B1	A0 > B0	X	X	X	H	L	L
A3 = B3	A2 = B2	A1 = B1	A0 < B0	X	X	X	L	H	L
A3 = B3	A2 = B2	A1 = B1	A0 = B0	H	L	L	H	L	L
A3 = B3	A2 = B2	A1 = B1	A0 = B0	L	H	L	L	H	L
A3 = B3	A2 = B2	A1 = B1	A0 = B0	X	X	H	L	L	H
A3 = B3	A2 = B2	A1 = B1	A0 = B0	H	H	L	L	L	L
A3 = B3	A2 = B2	A1 = B1	A0 = B0	L	L	L	H	H	L

TEXAS INSTRUMENTS

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1

logic diagrams (positive logic)
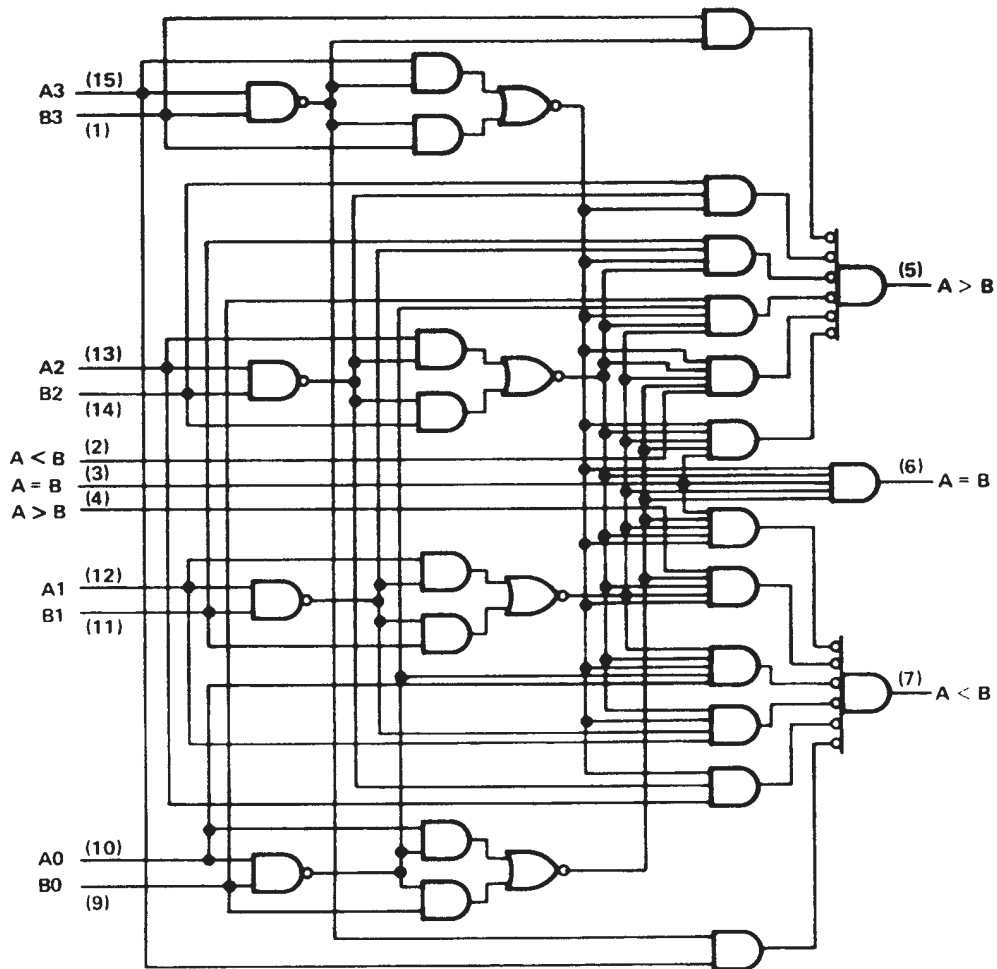
logic symbol†
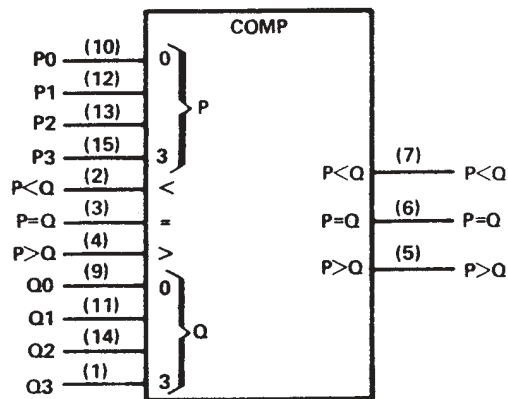
†This symbol is in accordancae with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.
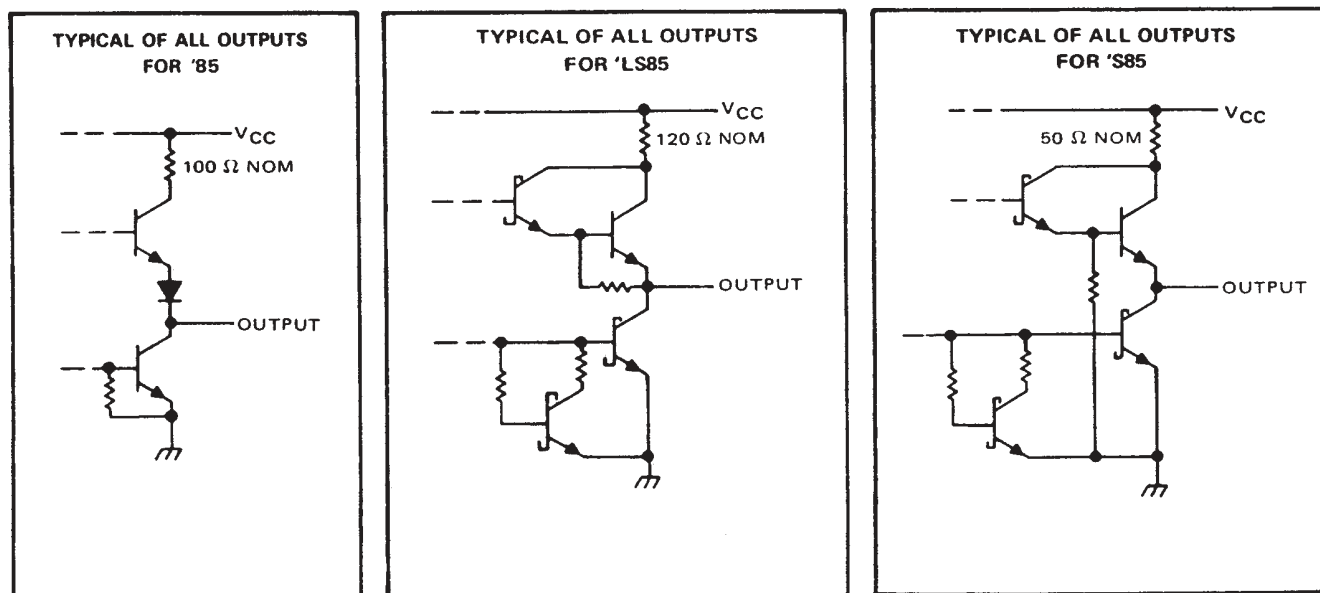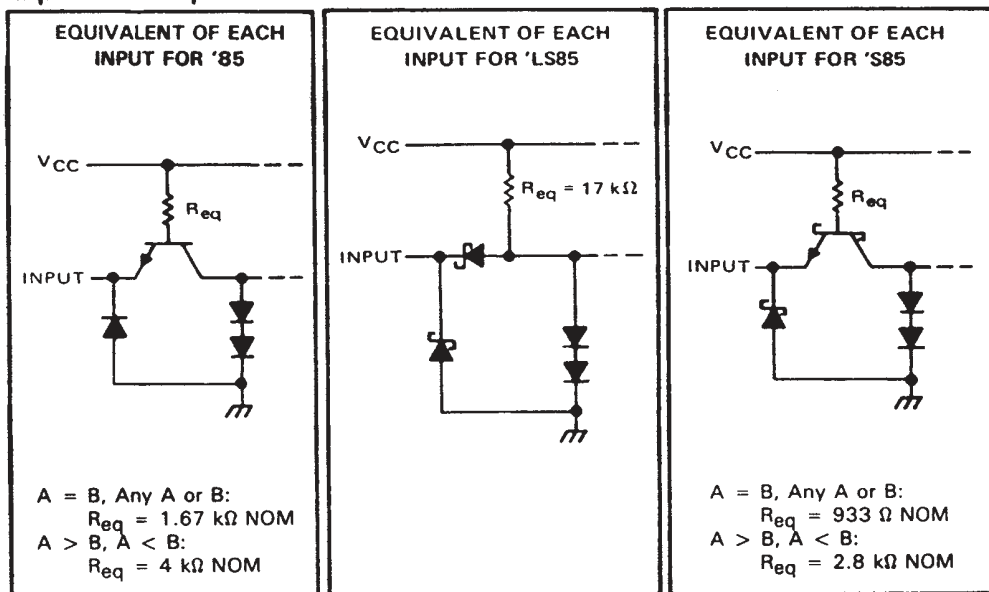Pin numbers shown are for D, J, N, and W packages.

schematics of inputs and outputs

EQUIVALENT OF EACH INPUT FOR '85

A = B, Any A or B:
R_{eq} = 1.67 kΩ NOM
A > B, A < B:
R_{eq} = 4 kΩ NOM

EQUIVALENT OF EACH INPUT FOR 'LS85

R_{eq} = 17 kΩ

EQUIVALENT OF EACH INPUT FOR 'S85

A = B, Any A or B:
R_{eq} = 933 Ω NOM
A > B, A < B:
R_{eq} = 2.8 kΩ NOM

TYPICAL OF ALL OUTPUTS FOR '85

100 Ω NOM

TYPICAL OF ALL OUTPUTS FOR 'LS85

120 Ω NOM

TYPICAL OF ALL OUTPUTS FOR 'S85

50 Ω NOM

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

	SN54' SN54S'	SN54LS'	SN74' SN74S'	SN74LS'	UNIT
Supply voltage, V_{CC} (see Note 1)	7	7	7	7	V
Input voltage	5.5	7	5.5	7	V
Interemitter voltage (see Note 2)	5.5		5.5		V
Operating free-air temperature range	– 55 to 125		– 0 to 70		°C
Storage temperature range	– 65 to 150		– 65 to 150		°C

NOTES: 1. Voltage values, except interemitter voltage, are with respect to network ground terminal.
2. This is the voltage between two emitters of a multiple-emitter input transistor. This rating applies to each A input in conjunction with its respective B input of the '85 and 'S85.

recommended operating conditions

	SN5485			SN7485			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
Supply voltage, V_{CC}	4.5	5	5.5	4.75	5	5.25	V
High-level output current, I_{OH}			−400			−400	μA
Low-level output current, I_{OL}			16			16	mA
Operating free-air temperature, T_A	−55		125	0		70	°C

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

PARAMETER		TEST CONDITIONS[†]			MIN	TYP[‡]	MAX	UNIT
V_{IH}	High-level input voltage				2			V
V_{IL}	Low-level input voltage						0.8	V
V_{IK}	Input clamp voltage	V_{CC} = MIN,	I_I = −12 mA				−1.5	V
V_{OH}	High-level output voltage	V_{CC} = MIN, V_{IL} = 0.8 V,	V_{IH} = 2 V, I_{OH} = −400 μA		2.4	3.4		V
V_{OL}	Low-level output voltage	V_{CC} = MIN, V_{IL} = 0.8 V,	V_{IH} = 2 V, I_{OL} = 16 mA			0.2	0.4	V
I_I	Input current at maximum input voltage	V_{CC} = MAX,	V_I = 5.5 V				1	mA
I_{IH}	High-level input current	A < B, A > B inputs	V_{CC} = MAX,	V_I = 2.4 V			40	μA
		all other inputs					120	
I_{IL}	Low-level input current	A < B, A > B inputs	V_{CC} = MAX,	V_I = 0.4 V			−1.6	mA
		all other inputs					−4.8	
I_{OS}	Short-circuit output current[§]	V_{CC} = MAX, V_O = 0	SN5485		−20		−55	mA
			SN7485		−18		−55	
I_{CC}	Supply current	V_{CC} = MAX, See Note 4				55	88	mA

[†]For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.
[‡]All typical values are at V_{CC} = 5 V, T_A = 25°C.
[§]Not more than one output should be shorted at a time.
NOTE 4: I_{CC} is measured with outputs open, A = B grounded, and all other inputs at 4.5 V.

switching characteristics, V_{CC} = 5 V, T_A = 25°C

PARAMETER[¶]	FROM INPUT	TO OUTPUT	NUMBER OF GATE LEVELS	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH}	Any A or B data input	A < B, A > B	1			7		ns
			2			12		
			3			17	26	
		A = B	4			23	35	
t_{PHL}	Any A or B data input	A < B, A > B	1	C_L = 15 pF, R_L = 400 Ω, See Note 5		11		ns
			2			15		
			3			20	30	
		A = B	4			20	30	
t_{PLH}	A < B or A = B	A > B	1			7	11	ns
t_{PHL}	A < B or A = B	A > B	1			11	17	ns
t_{PLH}	A = B	A = B	2			13	20	ns
t_{PHL}	A = B	A = B	2			11	17	ns
t_{PLH}	A > B or A = B	A < B	1			7	11	ns
t_{PHL}	A > B or A = B	A < B	1			11	17	ns

[¶]t_{PLH} = propagation delay time, low-to-high-level output
t_{PHL} = propagation delay time, high-to-low-level output
NOTE 5: Load circuits and voltage waveforms are shown in Section 1.

TEXAS
INSTRUMENTS

recommended operating conditions

	SN54LS85			SN74LS85			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
Supply voltage, V_{CC}	4.5	5	5.5	4.75	5	5.25	V
High-level output current, I_{OH}			−400			−400	μA
Low-level output current, I_{OL}			4			8	mA
Operating free-air temperature, T_A	−55		125	0		70	°C

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

PARAMETER		TEST CONDITIONS[†]		SN54LS85			SN74LS85			UNIT
				MIN	TYP[‡]	MAX	MIN	TYP[‡]	MAX	
V_{IH}	High-level input voltage			2			2			V
V_{IL}	Low-level input voltage					0.7			0.7	V
V_{IK}	Input clamp voltage	V_{CC} = MIN,	I_I = −18 mA			−1.5			−1.5	V
V_{OH}	High-level output voltage	V_{CC} = MIN, V_{IH} = 2 V, $V_{IL} = V_{IL}$ max, I_{OH} = −400 μA		2.5	3.4		2.7	3.4		V
V_{OL}	Low-level output voltage	V_{CC} = MIN, V_{IH} = 2 V, $V_{IL} = V_{IL}$ max	I_{OL} = 4 mA		0.25	0.4		0.25	0.4	V
			I_{OL} = 8 mA					0.35	0.5	
I_I	Input current at maximum input voltage	A < B, A > B inputs	V_{CC} = MAX, V_I = 7 V			0.1			0.1	mA
		all other inputs				0.3			0.3	
I_{IH}	High-level input current	A < B, A > B inputs	V_{CC} = MAX, V_I = 2.7 V			20			20	μA
		all other inputs				60			60	
I_{IL}	Low-level input current	A < B, A > B inputs	V_{CC} = MAX, V_I = 0.4 V			−0.4			−0.4	mA
		all other inputs				−1.2			−1.2	
I_{OS}	Short-circuit output current[§]	V_{CC} = MAX		−20		−100	−20		−100	mA
I_{CC}	Supply current	V_{CC} = MAX,	See Note 4		10.4	20		10.4	20	mA

[†] For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.
[‡] All typical values are at V_{CC} = 5 V, T_A = 25°C.
[§] Not more than one output should be shorted at a time, and duration of the short-circuit should not exceed one second.
NOTE 4: I_{CC} is measured with outputs open, A = B grounded, and all other inputs at 4.5 V.

switching characteristics, V_{CC} = 5 V, T_A = 25°C

PARAMETER[¶]	FROM INPUT	TO OUTPUT	NUMBER OF GATE LEVELS	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH}	Any A or B data input	A < B, A > B	1			14		ns
			2			19		
			3			24	36	
		A = B	4			27	45	
t_{PHL}	Any A or B data input	A < B, A > B	1	C_L = 15 pF, R_L = 2 kΩ, See Note 5		11		ns
			2			15		
			3			20	30	
		A = B	4			23	45	
t_{PLH}	A < B or A = B	A > B	1			14	22	ns
t_{PHL}	A < B or A = B	A > B	1			11	17	ns
t_{PLH}	A = B	A = B	2			13	20	ns
t_{PHL}	A = B	A = B	2			13	26	ns
t_{PLH}	A > B or A = B	A < B	1			14	22	ns
t_{PHL}	A > B or A = B	A < B	1			11	17	ns

[¶] t_{PLH} = propagation delay time, low-to-high-level output
t_{PHL} = propagation delay time, high-to-low-level output
NOTE 5: Load circuits and voltage waveforms are shown in Section 1.

TEXAS INSTRUMENTS

recommended operating conditions

	SN54S85 MIN	SN54S85 NOM	SN54S85 MAX	SN74S85 MIN	SN74S85 NOM	SN74S85 MAX	UNIT
Supply voltage, V_{CC}	4.5	5	5.5	4.75	5	5.25	V
High-level output current, I_{OH}			−1			−1	mA
Low-level output current, I_{OL}			20			20	mA
Operating free-air temperature, T_A	−55		125	0		70	°C

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

	PARAMETER		TEST CONDITIONS†		MIN	TYP‡	MAX	UNIT
V_{IH}	High-level input voltage				2			V
V_{IL}	Low-level input voltage						0.8	V
V_{IK}	Input clamp voltage		V_{CC} = MIN, I_I = −18 mA				−1.2	V
V_{OH}	High-level output voltage		V_{CC} = MIN, V_{IH} = 2 V, V_{IL} = 0.8 V, I_{OH} = −1 mA	SN54S85	2.5	3.4		V
				SN74S85	2.7	3.4		
V_{OL}	Low-level output voltage		V_{CC} = MIN, V_{IH} = 2 V, V_{IL} = 0.8 V, I_{OL} = 20 mA				0.5	V
I_I	Input current at maximum input voltage		V_{CC} = MAX, V_I = 5.5 V				1	mA
I_{IH}	High-level input current	A < B, A > B inputs	V_{CC} = MAX, V_I = 2.7 V				50	μA
		all other inputs					150	
I_{IL}	Low-level input current	A < B, A > B inputs	V_{CC} = MAX, V_I = 0.5 V				−2	mA
		all other inputs					−6	
I_{OS}	Short-circuit output current§		V_{CC} = MAX		−40		−100	mA
I_{CC}	Supply current		V_{CC} = MAX, See Note 4			73	115	mA
			V_{CC} = MAX, T_A = 125°C, See Note 4	SN54S85W			110	

†For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.
‡All typical values are at V_{CC} = 5 V, T_A = 25°C.
§Not more than one output should be shorted at a time, and duration of the short-circuit should not exceed one second.
NOTE 4: I_{CC} is measured with outputs open, A = B grounded, and all other inputs at 4.5 V.

switching characteristics, V_{CC} = 5 V, T_A = 25°C

PARAMETER¶	FROM INPUT	TO OUTPUT	NUMBER OF GATE LEVELS	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH}	Any A or B data input	A < B, A > B	1			5		ns
			2			7.5		
			3			10.5	16	
		A = B	4			12	18	
t_{PHL}	Any A or B data input	A < B, A > B	1	C_L = 15 pF, R_L = 280 Ω, See Note 5		5.5		ns
			2			7		
			3			11	16.5	
		A = B	4			11	16.5	
t_{PLH}	A < B or A = B	A > B	1			5	7.5	ns
t_{PHL}	A < B or A = B	A > B	1			5.5	8.5	ns
t_{PLH}	A = B	A = B	2			7	10.5	ns
t_{PHL}	A = B	A = B	2			5	7.5	ns
t_{PLH}	A > B or A = B	A < B	1			5	7.5	ns
t_{PHL}	A > B or A = B	A < B	1			5.5	8.5	ns

¶t_{PLH} = propagation delay time, low-to-high-level output
t_{PHL} = propagation delay time, high-to-low-level output
NOTE 5: Load circuits and voltage waveforms are shown in Section 1.

TYPICAL APPLICATION DATA

COMPARISON OF TWO N-BIT WORDS

This application demonstrates how these magnitude comparators can be cascaded to compare longer words. The example illustrated shows the comparison of two 24-bit words; however, the design is expandable to n-bits. As an example, one comparator can be used with five of the 24-bit comparators illustrated to expand the word length to 120-bits. Typical comparison times for various word lengths using the '85, 'LS85, or 'S85 are:

WORD LENGTH	NUMBER OF PKGS	'85	'LS85	'S85
1-4 bits	1	23 ns	24 ns	11 ns
5-24 bits	2-6	46 ns	48 ns	22 ns
25-120 bits	8-31	69 ns	72 ns	33 ns

COMPARISON OF TWO 24-BIT WORDS

PACKAGE OPTION ADDENDUM
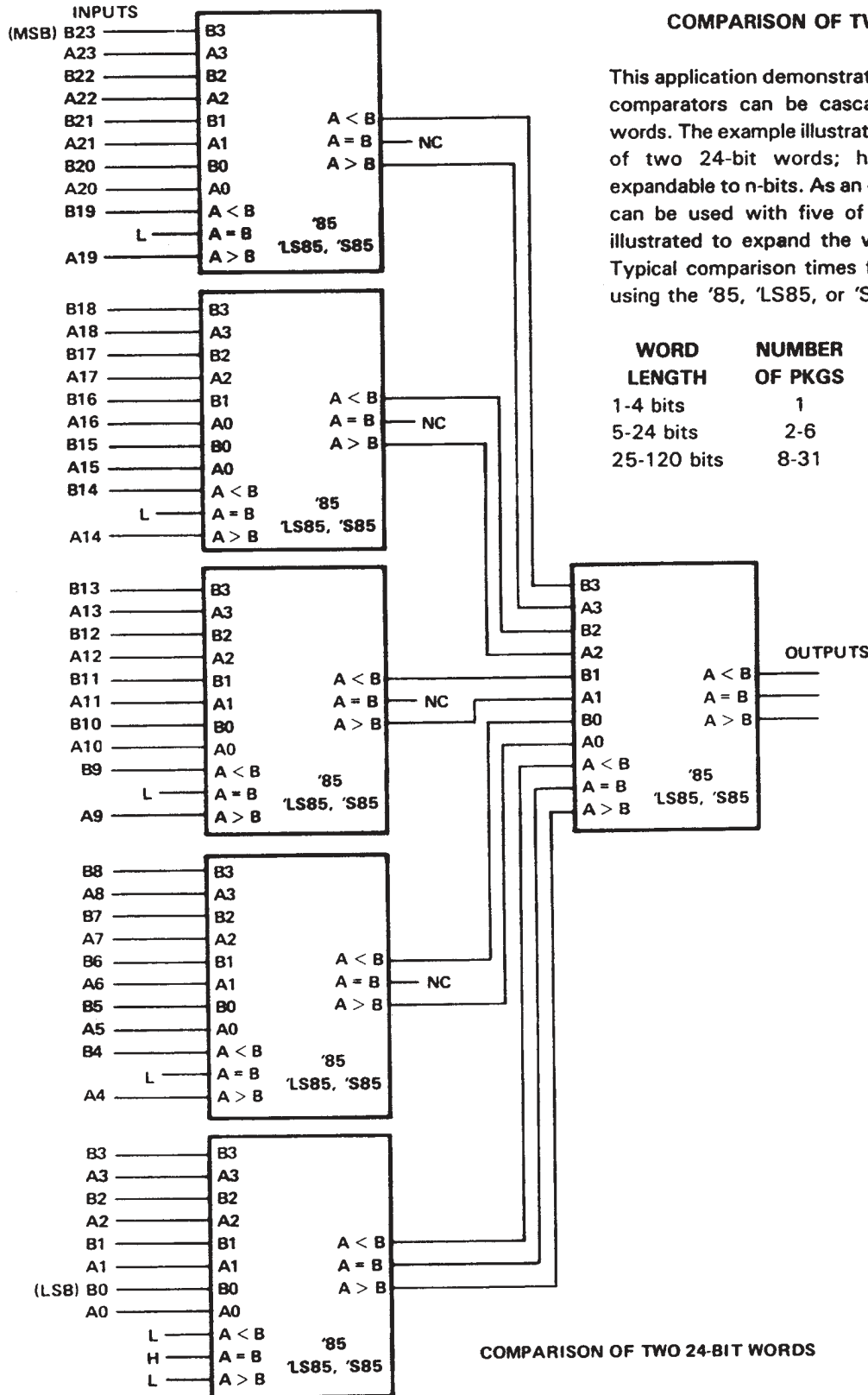
PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead finish/ Ball material (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
5962-9754701Q2A	ACTIVE	LCCC	FK	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-9754701Q2A SNJ54LS 85FK	Samples
5962-9754701QEA	ACTIVE	CDIP	J	16	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-9754701QE A SNJ54LS85J	Samples
5962-9754701QFA	ACTIVE	CFP	W	16	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-9754701QF A SNJ54LS85W	Samples
JM38510/08201BEA	ACTIVE	CDIP	J	16	1	Non-RoHS & Green	SNPB	N / A Pkg Type	-55 to 125	JM38510/ 08201BEA	Samples
JM38510/31101B2A	ACTIVE	LCCC	FK	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	JM38510/ 31101B2A	Samples
JM38510/31101BEA	ACTIVE	CDIP	J	16	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	JM38510/ 31101BEA	Samples
JM38510/31101BFA	ACTIVE	CFP	W	16	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	JM38510/ 31101BFA	Samples
M38510/08201BEA	ACTIVE	CDIP	J	16	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	JM38510/ 08201BEA	Samples
M38510/31101B2A	ACTIVE	LCCC	FK	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	JM38510/ 31101B2A	Samples
M38510/31101BEA	ACTIVE	CDIP	J	16	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	JM38510/ 31101BEA	Samples
M38510/31101BFA	ACTIVE	CFP	W	16	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	JM38510/ 31101BFA	Samples
SN54LS85J	ACTIVE	CDIP	J	16	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	SN54LS85J	Samples
SN54S85J	ACTIVE	CDIP	J	16	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	SN54S85J	Samples
SN74LS85D	LIFEBUY	SOIC	D	16	40	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	LS85	
SN74LS85DR	ACTIVE	SOIC	D	16	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	LS85	Samples
SN74LS85N	ACTIVE	PDIP	N	16	25	RoHS & Green	NIPDAU	N / A for Pkg Type	0 to 70	SN74LS85N	Samples

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead finish/ Ball material (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
SN74LS85NSR	ACTIVE	SO	NS	16	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	74LS85	Samples
SN74S85D	ACTIVE	SOIC	D	16	40	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	S85	Samples
SN74S85N	ACTIVE	PDIP	N	16	25	RoHS & Green	NIPDAU	N / A for Pkg Type	0 to 70	SN74S85N	Samples
SNJ54LS85FK	ACTIVE	LCCC	FK	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-9754701Q2A SNJ54LS 85FK	Samples
SNJ54LS85J	ACTIVE	CDIP	J	16	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-9754701QEA SNJ54LS85J	Samples
SNJ54LS85W	ACTIVE	CFP	W	16	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-9754701QFA SNJ54LS85W	Samples
SNJ54S85FK	ACTIVE	LCCC	FK	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	SNJ54S 85FK	Samples
SNJ54S85J	ACTIVE	CDIP	J	16	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	SNJ54S85J	Samples

[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] **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".
RoHS Exempt: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.
Green: TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

[3] MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

[4] There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead finish/Ball material - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

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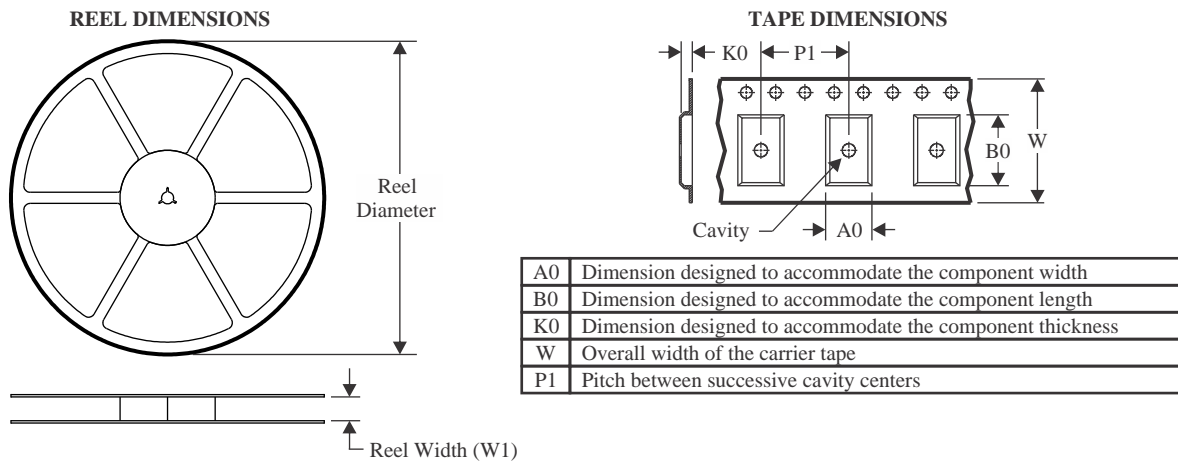
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OTHER QUALIFIED VERSIONS OF SN54LS85, SN54S85, SN74LS85, SN74S85 :

- Catalog : SN74LS85, SN74S85

- Military : SN54LS85, SN54S85

NOTE: Qualified Version Definitions:

  - Catalog - TI's standard catalog product

  - Military - QML certified for Military and Defense Applications

![Texas Instruments logo]

PACKAGE MATERIALS INFORMATION

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

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE
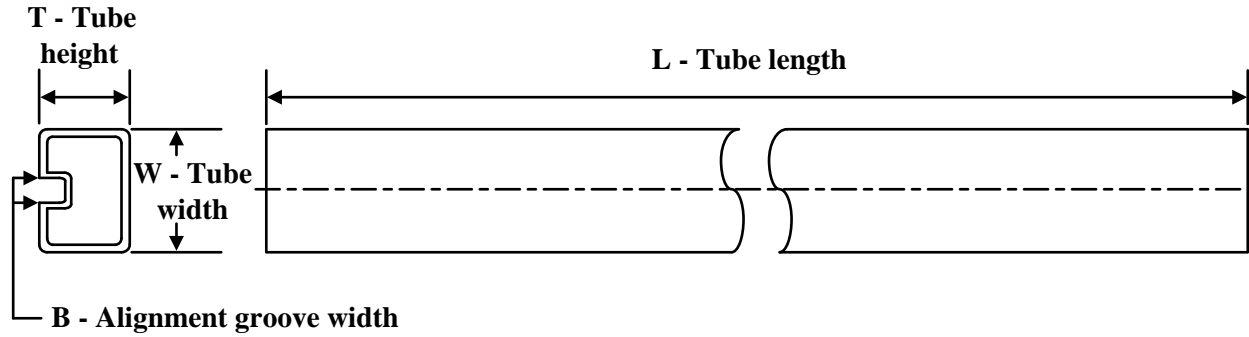

*All dimensions are nominal

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
SN74LS85DR	SOIC	D	16	2500	330.0	16.4	6.5	10.3	2.1	8.0	16.0	Q1
SN74LS85NSR	SO	NS	16	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)
SN74LS85DR	SOIC	D	16	2500	340.5	336.1	32.0
SN74LS85NSR	SO	NS	16	2000	356.0	356.0	35.0

TUBE

T - Tube height

L - Tube length

W - Tube width

B - Alignment groove width

*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (µm)	B (mm)
5962-9754701Q2A	FK	LCCC	20	1	506.98	12.06	2030	NA
5962-9754701QFA	W	CFP	16	1	506.98	26.16	6220	NA
JM38510/31101B2A	FK	LCCC	20	1	506.98	12.06	2030	NA
JM38510/31101BFA	W	CFP	16	1	506.98	26.16	6220	NA
M38510/31101B2A	FK	LCCC	20	1	506.98	12.06	2030	NA
M38510/31101BFA	W	CFP	16	1	506.98	26.16	6220	NA
SN74LS85D	D	SOIC	16	40	507	8	3940	4.32
SN74LS85N	N	PDIP	16	25	506	13.97	11230	4.32
SN74LS85N	N	PDIP	16	25	506	13.97	11230	4.32
SN74S85D	D	SOIC	16	40	507	8	3940	4.32
SN74S85N	N	PDIP	16	25	506	13.97	11230	4.32
SN74S85N	N	PDIP	16	25	506	13.97	11230	4.32
SNJ54LS85FK	FK	LCCC	20	1	506.98	12.06	2030	NA
SNJ54LS85W	W	CFP	16	1	506.98	26.16	6220	NA
SNJ54S85FK	FK	LCCC	20	1	506.98	12.06	2030	NA

C

SEATING PLANE

0.1 C

8.2 / 7.4 TYP

A

PIN 1 ID AREA

14X 1.27

1

16

10.4 / 10.0 NOTE 3

2X 8.89

8

9

B

5.4 / 5.2 NOTE 4

16X 0.51 / 0.35

⊕ 0.25 Ⓜ C A B

2.00 MAX

SEE DETAIL A

0.15 TYP

0.25

GAGE PLANE

0.3 / 0.1

0° - 10°

1.05 / 0.55
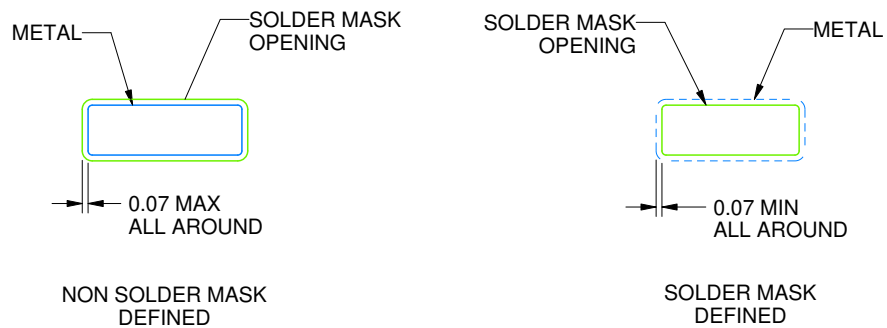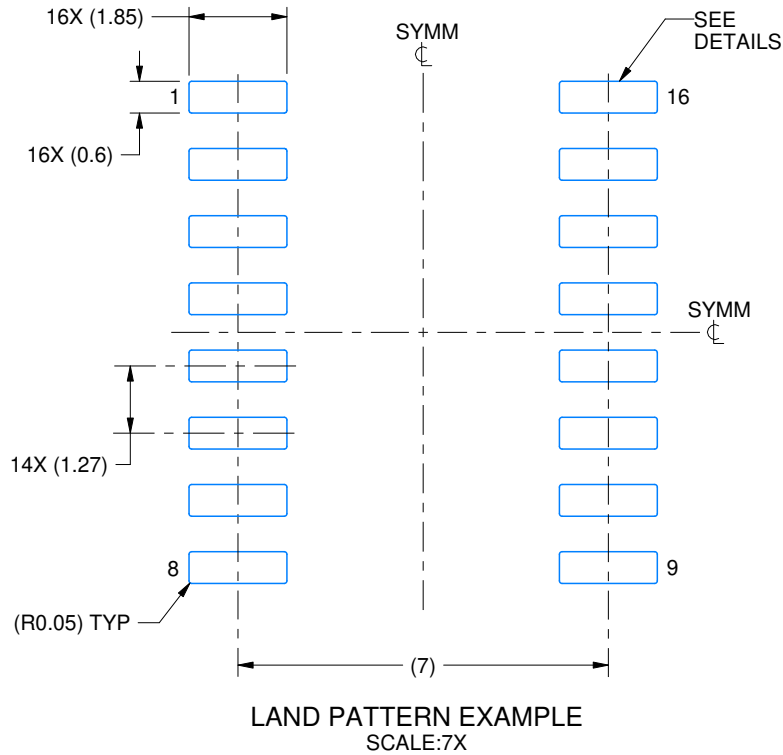
(1.25)

DETAIL A TYPICAL
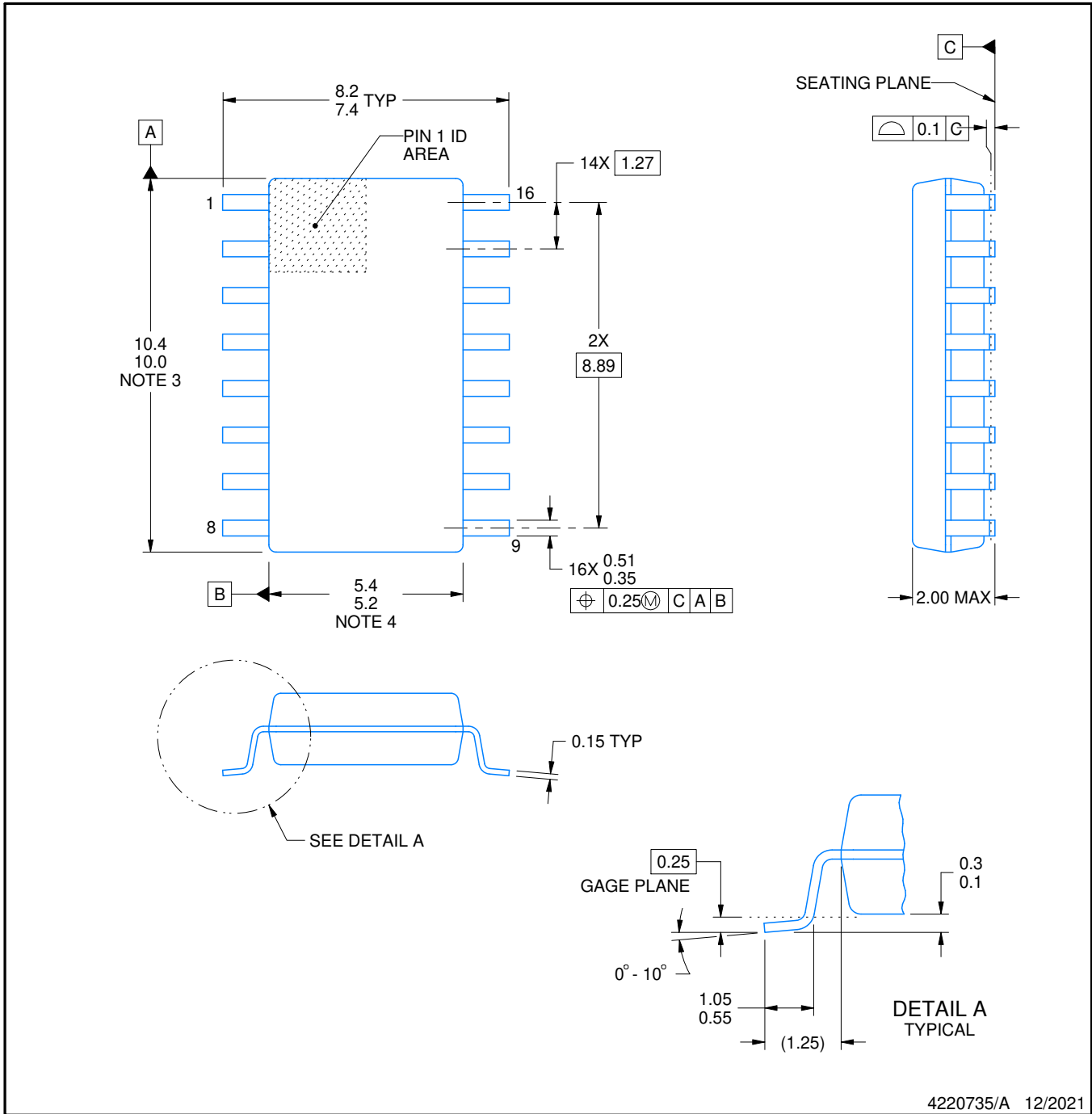
4220735/A   12/2021

NOTES:

1. All linear dimensions are in millimeters. Dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm, per side.
4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm, per side.

TEXAS INSTRUMENTS

www.ti.com

16X (1.85)

SYMM
℄

SEE
DETAILS

1

16

16X (0.6)

SYMM
℄

14X (1.27)

8

9

(R0.05) TYP

(7)

LAND PATTERN EXAMPLE
SCALE:7X

METAL

SOLDER MASK
OPENING

SOLDER MASK
OPENING

METAL

0.07 MAX
ALL AROUND

0.07 MIN
ALL AROUND

NON SOLDER MASK
DEFINED

SOLDER MASK
DEFINED

SOLDER MASK DETAILS

4220735/A   12/2021

NOTES: (continued)

5. Publication IPC-7351 may have alternate designs.
6. Solder mask tolerances between and around signal pads can vary based on board fabrication site.
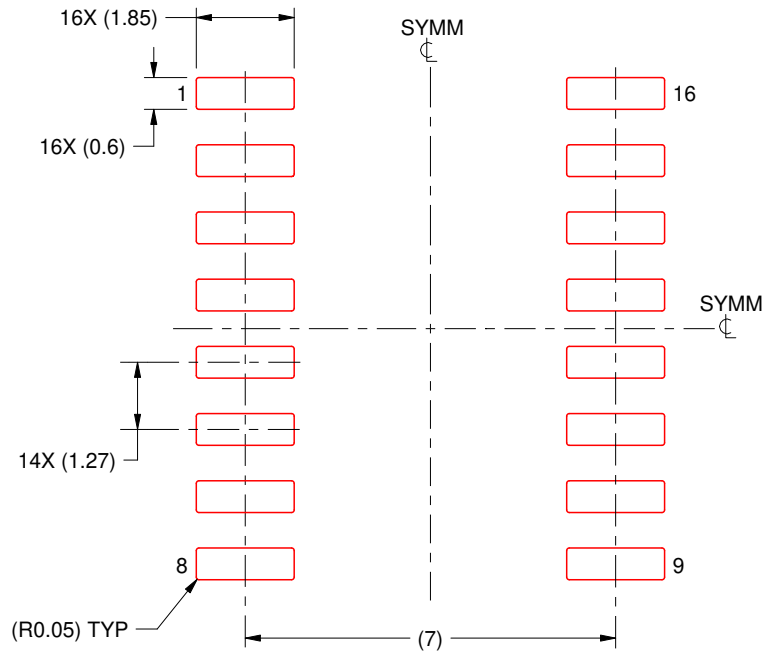
16X (1.85)

SYMM

1

16X (0.6)

16

14X (1.27)

SYMM

8

9

(R0.05) TYP

(7)

SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE:7X

4220735/A 12/2021

NOTES: (continued)

7. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate
   design recommendations.
8. Board assembly site may have different recommendations for stencil design.

D (R−PDSO−G16)   PLASTIC SMALL OUTLINE

0.394 (10,00)
0.386 (9,80)
△C

16   9

0.244 (6,20)
0.228 (5,80)

0.157 (4,00)
0.150 (3,80) △D

Pin 1
Index Area

1   8

0.050 (1,27)

0.020 (0,51)
0.012 (0,31)

⊕ 0.010 (0,25) Ⓜ

0.069 (1,75) Max

0.010 (0,25)
0.004 (0,10)

0.010 (0,25)
0.005 (0,13)

0.004 (0,10)

Gauge Plane

Seating Plane

0.010 (0,25)   0°−8°

0.050 (1,27)
0.016 (0,40)

4040047−6/M   06/11

NOTES: A. All linear dimensions are in inches (millimeters).
         B. This drawing is subject to change without notice.
      △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.
      △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 AC.

MECHANICAL DATA

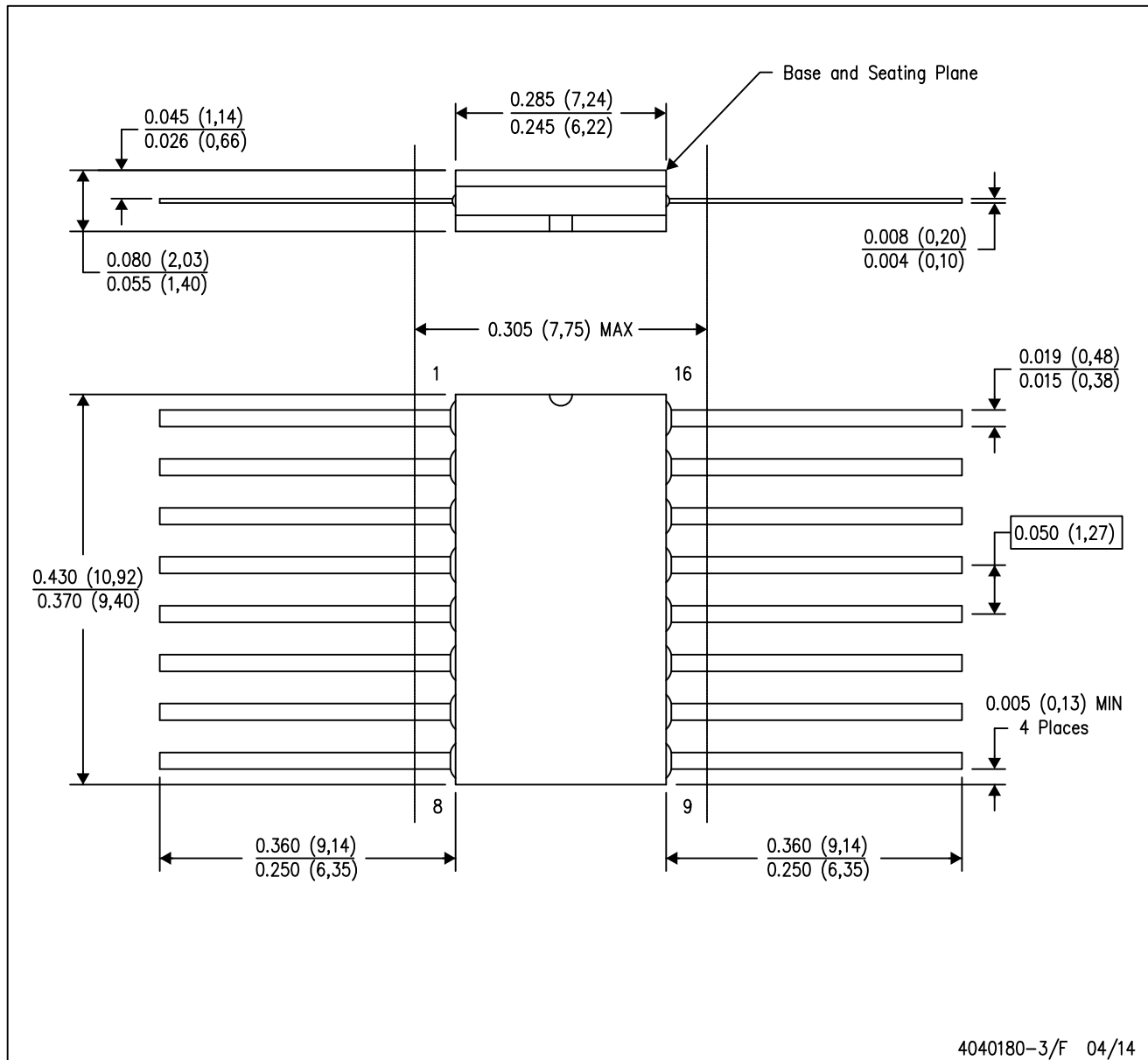NS (R-PDSO-G**)   **PLASTIC SMALL-OUTLINE PACKAGE**

14-PINS SHOWN

1,27

0,51 / 0,35   ⌖ 0,25 Ⓜ

14   8

5,60 / 5,00   8,20 / 7,40

1   7

A

0,15 NOM

Gage Plane

0,25

0°–10°

1,05 / 0,55

0,15 / 0,05

2,00 MAX

Seating Plane

0,10

DIM \\ PINS **	14	16	20	24
A MAX	10,50	10,50	12,90	15,30
A MIN	9,90	9,90	12,30	14,70

4040062/C 03/03

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.

W (R−GDFP−F16)   CERAMIC DUAL FLATPACK

Base and Seating Plane

0.285 (7,24)
0.245 (6,22)

0.045 (1,14)
0.026 (0,66)

0.008 (0,20)
0.004 (0,10)

0.080 (2,03)
0.055 (1,40)

0.305 (7,75) MAX

0.019 (0,48)
0.015 (0,38)

1   16

0.430 (10,92)
0.370 (9,40)

0.050 (1,27)

8   9

0.005 (0,13) MIN
4 Places

0.360 (9,14)
0.250 (6,35)

0.360 (9,14)
0.250 (6,35)

4040180−3/F   04/14

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 GDFP2−F16

FK 20

8.89 x 8.89, 1.27 mm pitch

This image is a representation of the package family, actual package may vary.
Refer to the product data sheet for package details.

4229370\A\

J (R−GDIP−T**)   CERAMIC DUAL IN−LINE PACKAGE
14 LEADS SHOWN

PINS ** DIM	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)

B

14   8

C

1   7

0.065 (1,65)
0.045 (1,14)

0.005 (0,13) MIN

0.060 (1,52)
0.015 (0,38)

0.200 (5,08) MAX

A

Seating Plane

0.130 (3,30) MIN

0.026 (0,66)
0.014 (0,36)

0.100 (2,54)

0°−15°

0.014 (0,36)
0.008 (0,20)

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.

N (R−PDIP−T**)   PLASTIC DUAL−IN−LINE PACKAGE
16 PINS SHOWN

PINS ** DIM	14	16	18	20
A MAX	0.775 (19,69)	0.775 (19,69)	0.920 (23,37)	1.060 (26,92)
A MIN	0.745 (18,92)	0.745 (18,92)	0.850 (21,59)	0.940 (23,88)
MS−001 VARIATION	AA	BB	AC	AD

0.260 (6,60)
0.240 (6,10)

0.070 (1,78)
0.045 (1,14)

0.045 (1,14)
0.030 (0,76)

0.020 (0,51) MIN

0.200 (5,08) MAX

Seating Plane

0.125 (3,18) MIN

0.100 (2,54)

0.021 (0,53)
0.015 (0,38)

⊕ 0.010 (0,25) Ⓜ

0.325 (8,26)
0.300 (7,62)

0.015 (0,38)

Gauge Plane

0.010 (0,25) NOM

0.430 (10,92) MAX

14/18 Pin Only
20 Pin vendor option

4040049/E 12/2002

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.

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