

SN54LS673, SN54LS674, SN74LS673, SN74LS674 16-BIT SHIFT REGISTERS

SDLS195 – MARCH 1985 – REVISED MARCH 1988

'LS673

- 16-Bit Serial-In, Serial-Out Shift Register with 16-Bit Parallel-Out Storage Register
- Performs Serial-to-Parallel Conversion

'LS674

- 16-Bit Parallel-In, Serial-Out Shift Register
- Performs Parallel-to-Serial Conversion

description

SN54LS673, SN74LS673

The 'LS673 is a 16-bit shift register and a 16-bit storage register in a single 24-pin package. A three-state input/output (SER/Q15) port to the shift register allows serial entry and/or reading of data. The storage register is connected in a parallel data loop with the shift register and may be asynchronously cleared by taking the store-clear input low. The storage register may be parallel loaded with shift-register data to provide shift-register status via the parallel outputs. The shift register can be parallel loaded with the storage-register data upon command.

A high logic level at the chip-level ($\overline{CS}$) input disables both the shift-register clock and the storage register clock and places SER/Q15 in the high-impedance state. The store-clear function is not disabled by the chip select.

Caution must be exercised to prevent false clocking of either the shift register or the storage register via the chip-select input. The shift clock should be low during the low-to-high transition of chip select and the store clock should be low during the high-to-low transition of chip select.

SN54LS674, SN74LS674

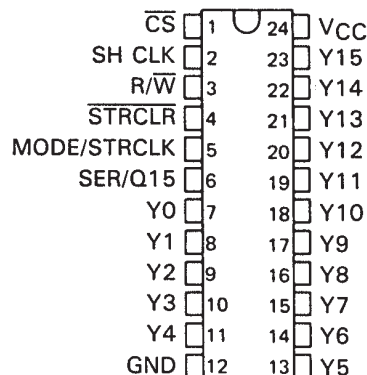
The 'LS674 is a 16-bit parallel-in, serial-out shift register. A three-state input/output (SER/Q15) port provides access for entering a serial data or reading the shift-register word in a recirculating loop.

The device has four basic modes of operation:

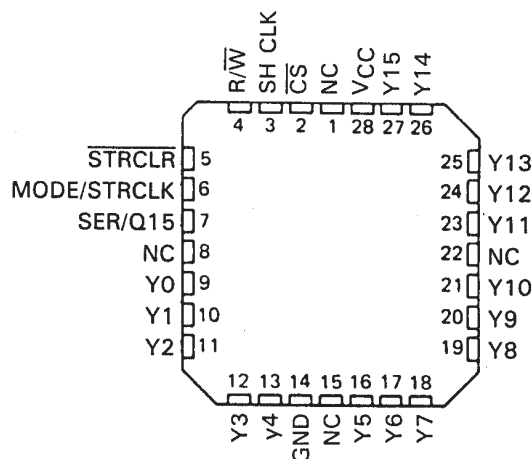
- 1) Hold (do nothing)
- 2) Write (serially via input/output)
- 3) Read (serially)
- 4) Load (parallel via data inputs)

Low-to-high-level changes at the chip select input should be made only when the clock input is low to prevent false clocking.

SN54LS673 . . . J OR W PACKAGE SN74LS673 . . . DW OR N PACKAGE (TOP VIEW)



SN54LS673 . . . FK PACKAGE (TOP VIEW)

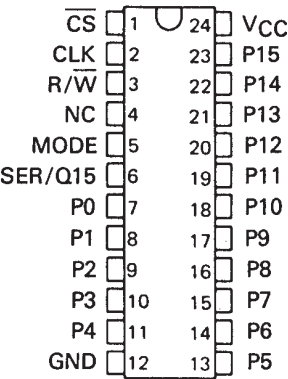


NC—No internal connection

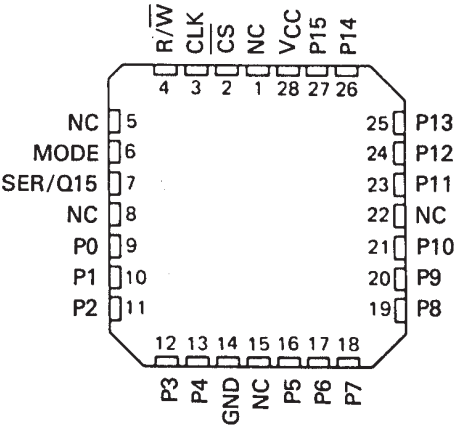
SN54LS673, SN54LS674, SN74LS673, SN74LS674
16-BIT SHIFT REGISTERS

SDLS195 – MARCH 1985 – REVISED MARCH 1988

SN54LS674 . . . J OR W PACKAGE
SN74LS674 . . . DW OR N PACKAGE
(TOP VIEW)



SN54LS674 . . . FK PACKAGE
(TOP VIEW)



'LS673
FUNCTION TABLE

INPUTS					SER/ Q15	SHIFT REGISTER FUNCTIONS				STORAGE REGISTER FUNCTIONS	
CS	R/W	SH CLK	STRCLR	MODE/ STRCLK		SHIFT	READ FROM SERIAL OUTPUT	WRITE INTO SERIAL INPUT	PARALLEL LOAD	CLEAR	LOAD
H	X	X	X	X	Z	NO	NO	NO	NO		NO
X	X	X	L	X						YES	
L	L	↓	X	X	Z	YES	NO	YES	NO		
L	H	X	X	X	Q15		YES	NO			NO
L	H	↓	X	L	Q14n	YES	YES	NO	NO		NO
L	H	↓	L	H	L	NO	YES		YES	YES	NO
L	H	↓	H	H	Y15n	NO	YES		YES	NO	NO
L	L	X	H	↑	Z		NO		NO	NO	YES

'LS674 FUNCTION TABLE

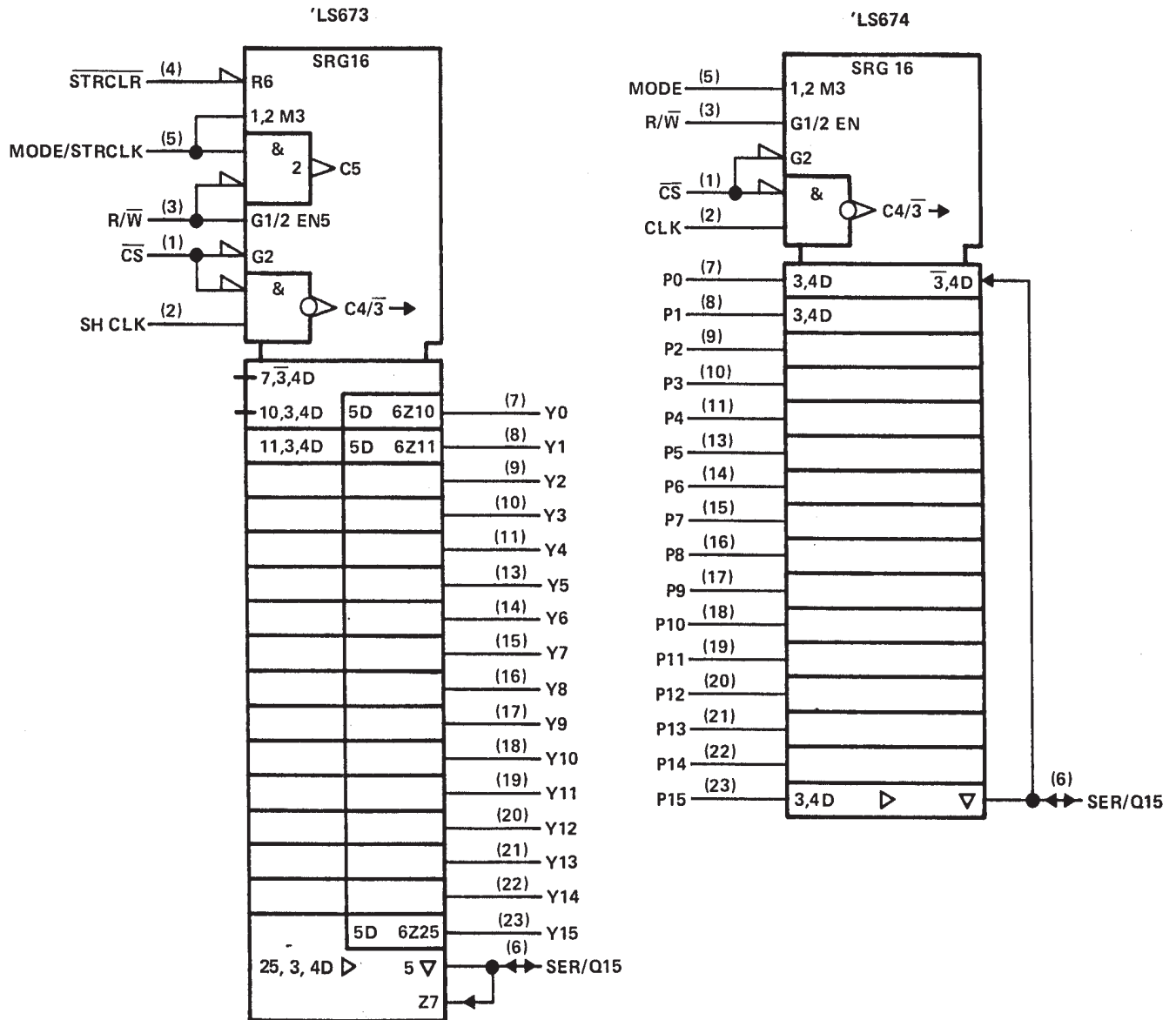
INPUTS				SER/ Q15	OPERATION
CS	R/W	MODE	CLK		
H	X	X	X	Z	Do nothing
L	L	X	↓	Z	Shift and write (serial load)
L	H	L	↓	Q14n	Shift and read
L	H	H	↓	P15	Parallel load

H = high level (steady state)
L = low level (steady state)
↑ = transition from low to high level
↓ = transition from high to low level
X = irrelevant (any input including transitions)
Z = high impedance, input mode
Q14n = content of 14th bit of the shift register before the most recent ↓ transition of the clock.
Q15 = present content of 15th bit of the shift register
Y15n = content of the 15th bit of the storage register before the most recent ↓ transition of the clock.
P15 = level of input P15

SN54LS673, SN54LS674, SN74LS673, SN74LS674 16-BIT SHIFT REGISTERS

SDLS195 – MARCH 1985 – REVISED MARCH 1988

logic symbols†

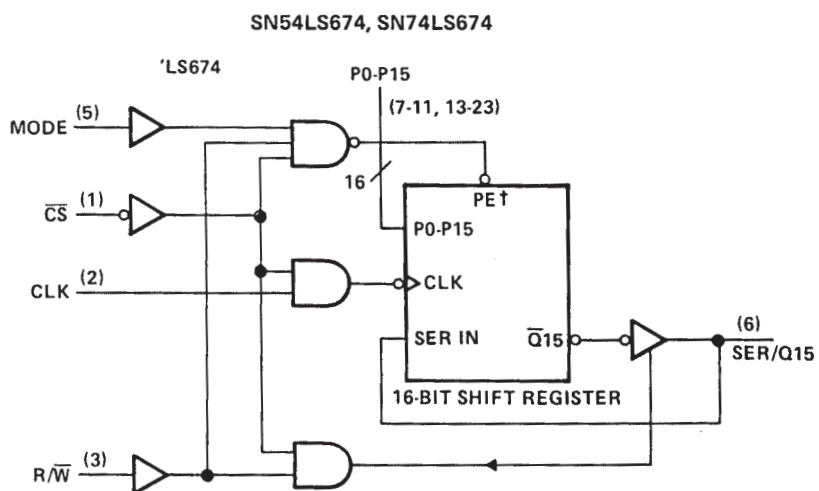
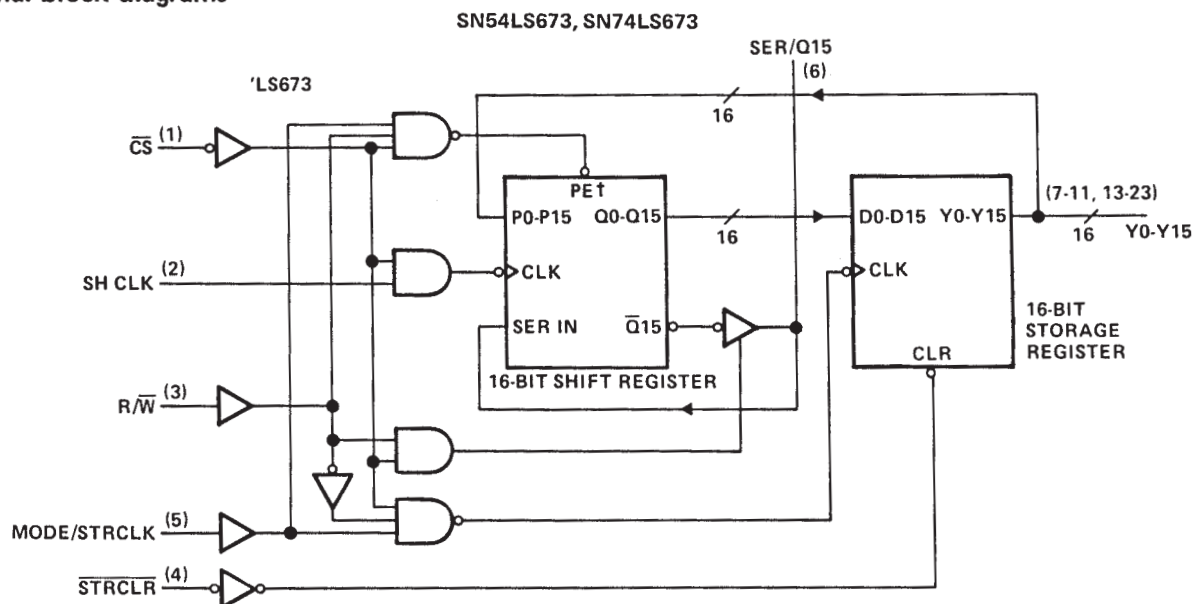


†These symbols are in accordance with ANSI/IEEE Std. 91-1984 and IEC Publication 617-12.
Pin numbers shown are for DW, J, N, and W packages.

SN54LS673, SN54LS674, SN74LS673, SN74LS674 16-BIT SHIFT REGISTERS

SDLS195 – MARCH 1985 – REVISED MARCH 1988

functional block diagrams



†When PE is active, data is synchronously parallel loaded into the shift registers from the 16 P inputs and no shifting takes place. Pin numbers shown are for DW, J, N, and W packages.

SDLS195 – MARCH 1985 – REVISED MARCH 1988

EQUIVALENT OF SER/Q15 AND PARALLEL INPUTS	EQUIVALENT OF OTHER INPUTS	SER/Q15 OUTPUT	TYPICAL OF Y0 THRU Y15 OUTPUTS ('LS673 ONLY)
SER/Q15: $R_{eq} = 20\text{ k}\Omega\text{ NOM}$ PARALLEL INPUTS: $R_{eq} = 30\text{ k}\Omega\text{ NOM}$			

Supply voltage, V _{CC} (see Note 1)	7 V
Input voltage: SER/Q15	5.5 V
All others	7 V
Off-state output voltage	5.5 V
Operating free-air temperature range: SN54LS673, SN54LS674	−55°C to 125°C
SN74LS673, SN74LS674	0°C to 70°C
Storage temperature range	−65°C to 150°C

			SN54LS'			SN74LS'			UNIT	
			MIN	NOM	MAX	MIN	NOM	MAX		
V _{CC}	Supply voltage		4.5	5	5.5	4.75	5	5.25	V	
I _{OH}	High-level output current	SER/Q15	−1			−2.6			mA	
		Y0 thru Y15	−0.4			−0.4				
I _{OL}	Low-level output current	SER/Q15	12			24			mA	
		Y0 thru Y15	4			8				
f _{clock}	Clock frequency		0		20	0		20	MHz	
t _{w(clock)}	Width of clock input pulse		20			20			ns	
t _{w(clear)}	Width of clear input pulse		20			20			ns	
t _{su}	Setup time	SER/Q15	20			20			ns	
		P0 thru P15	20			20				
		Mode	35			35				
		R/ $\overline{W}$, $\overline{CS}$	35			35				
		SH CLK ↓ to Mode/STR CLK ↑ See Note 2	25			25				
t _h	Hold time	SER/Q15	0			0			ns	
		P0 thru P15	'LS673		0	0				
			'LS674		5.0	5.0				
		Mode	0			0				
T _A	Operating free-air temperature		−55		125	0		70	°C	

NOTE 2: This setup time ensures the storage register will see stable data from the shift register.

SN54LS673, SN54LS674, SN74LS673, SN74LS674

16-BIT SHIFT REGISTERS

SDLS195 – MARCH 1985 – REVISED MARCH 1988

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

PARAMETER			TEST CONDITIONS†	SN54LS'		SN74LS'		UNIT	
				MIN	TYP‡	MAX	MIN		TYP‡
V _{IH}	High-level input voltage				2		2		V
V _{IL}	Low-level input voltage						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	SER/Q15	V _{CC} = MIN, V _{IH} = 2 V,		2.4	3.2	2.4	3.1	V
		Y0 thru Y15¶	V _{IL} = V _{ILmax} , I _{OH} = MAX		2.5	3.4	2.7	3.4	
V _{OL}	Low-level output voltage	SER/Q15	V _{CC} = MIN, V _{IH} = 2 V,	I _{OL} = 12 mA	0.25	0.4	0.25	0.4	V
				I _{OL} = 24 mA			0.35	0.5	
		Y0 thru Y15¶	V _{IL} = V _{ILmax}	I _{OL} = 4 mA	0.25	0.4	0.25	0.4	
				I _{OL} = 8 mA			0.35	0.5	
I _{OZH}	Off-state output current, high-level voltage applied	SER/Q15	V _{CC} = MAX, V _{IH} = 2 V, V _{IL} = V _{ILmax} , V _O = 2.7 V		40		40		μA
I _{OZL}	Off-state output current, low-level voltage applied	SER/Q15	V _{CC} = MAX, V _{IH} = 2 V, V _{IL} = V _{ILmax} , V _O = 0.4 V		- 0.4		- 0.4		mA
I _I	Input current at maximum input voltage	SER/Q15	V _{CC} = MAX	V _I = 5.5 V	0.1		0.1		mA
		Others		V _I = 7 V	0.1		0.1		
I _{IH}	High-level input current	SER/Q15	V _{CC} = MAX, V _I = 2.7 V		40		40		μA
		Others			20		20		
I _{IL}	Low-level input current		V _{CC} = MAX, V _I = 0.4 V		-0.4		-0.4		mA
I _{OS}	Short-circuit output current§	SER/Q15	V _{CC} = MAX		-30	-130	-30	-130	mA
		Y0 thru Y15¶			-20	-100	-20	-100	
I _{CC}	Supply current	'LS673	V _{CC} = MAX		50	80	52	80	mA
		'LS674			25	40	25	40	

† 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.

¶ 'LS673 only.

switching characteristics, V_{CC} = 5 V, T_A = 25°C, see note 2

PARAMETER	'LS673		'LS674		TEST CONDITIONS	MIN	TYP	MAX	UNIT
	FROM	TO	FROM	TO					
f _{max}	SH CLK	SER/Q15	CLK	SER/Q15	R _L = 667 Ω, C _L = 45 pF	20	28		MHz
t _{PHL}	STRCLR	Y0 thru Y15			R _L = 2 kΩ, C _L = 15 pF		25	40	ns
t _{PLH}	MODE/	Y0 thru Y15					28	45	
t _{PHL}	STRCLK						30	45	
t _{PLH}	SH CLK	SER/Q15	CLK	SER/Q15	R _L = 667 Ω, C _L = 45 pF		21	33	ns
t _{PHL}							26	40	
t _{PZH}	CS, R/W	SER/Q15	CS, R/W	SER/Q15	R _L = 667 Ω, C _L = 45 pF		30	45	ns
t _{PZL}							30	45	
t _{PHZ}	CS, R/W	SER/Q15	CS, R/W	SER/Q15	R _L = 667 Ω, C _L = 5 pF		25	40	ns
t _{PLZ}							25	40	

NOTE 2: Load circuits and voltage waveforms are shown in Section 1.



POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
5962-88602013A	ACTIVE	LCCC	FK	28	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	5962- 88602013A SNJ54LS 673FK	Samples
5962-8860201JA	ACTIVE	CDIP	J	24	1	TBD	Call TI	N / A for Pkg Type	-55 to 125	5962-8860201JA SNJ54LS673J	Samples
5962-8860201JA	ACTIVE	CDIP	J	24	1	TBD	Call TI	N / A for Pkg Type	-55 to 125	5962-8860201JA SNJ54LS673J	Samples
5962-8860201KA	OBSOLETE	CFP	W	24		TBD	Call TI	Call TI	-55 to 125		
5962-8860201KA	OBSOLETE	CFP	W	24		TBD	Call TI	Call TI	-55 to 125		
5962-8860201LA	ACTIVE	CDIP	JT	24	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-8860201LA SNJ54LS673JT	Samples
5962-8860201LA	ACTIVE	CDIP	JT	24	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-8860201LA SNJ54LS673JT	Samples
5962-88607013A	ACTIVE	LCCC	FK	28	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	5962- 88607013A SNJ54LS 674FK	Samples
5962-88607013A	ACTIVE	LCCC	FK	28	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	5962- 88607013A SNJ54LS 674FK	Samples
5962-8860701JA	ACTIVE	CDIP	J	24	1	TBD	Call TI	N / A for Pkg Type	-55 to 125	5962-8860701JA SNJ54LS674J	Samples
5962-8860701JA	ACTIVE	CDIP	J	24	1	TBD	Call TI	N / A for Pkg Type	-55 to 125	5962-8860701JA SNJ54LS674J	Samples
5962-8860701KA	OBSOLETE	CFP	W	24		TBD	Call TI	Call TI	-55 to 125		
5962-8860701KA	OBSOLETE	CFP	W	24		TBD	Call TI	Call TI	-55 to 125		
SN54LS673J	ACTIVE	CDIP	J	24	1	TBD	Call TI	N / A for Pkg Type	-55 to 125	SN54LS673J	Samples
SN54LS673J	ACTIVE	CDIP	J	24	1	TBD	Call TI	N / A for Pkg Type	-55 to 125	SN54LS673J	Samples
SN54LS674J	ACTIVE	CDIP	J	24	1	TBD	Call TI	N / A for Pkg Type	-55 to 125	SN54LS674J	Samples
SN54LS674J	ACTIVE	CDIP	J	24	1	TBD	Call TI	N / A for Pkg Type	-55 to 125	SN54LS674J	Samples

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
SN74LS673DW	ACTIVE	SOIC	DW	24	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LS673	Samples
SN74LS673DW	ACTIVE	SOIC	DW	24	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LS673	Samples
SN74LS673DWE4	ACTIVE	SOIC	DW	24	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LS673	Samples
SN74LS673DWE4	ACTIVE	SOIC	DW	24	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LS673	Samples
SN74LS673DWG4	ACTIVE	SOIC	DW	24	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LS673	Samples
SN74LS673DWG4	ACTIVE	SOIC	DW	24	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LS673	Samples
SN74LS673N	ACTIVE	PDIP	N	24	15	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	0 to 70	SN74LS673N	Samples
SN74LS673N	ACTIVE	PDIP	N	24	15	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	0 to 70	SN74LS673N	Samples
SN74LS673NE4	ACTIVE	PDIP	N	24	15	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	0 to 70	SN74LS673N	Samples
SN74LS673NE4	ACTIVE	PDIP	N	24	15	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	0 to 70	SN74LS673N	Samples
SN74LS674DW	ACTIVE	SOIC	DW	24	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LS674	Samples
SN74LS674DW	ACTIVE	SOIC	DW	24	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LS674	Samples
SN74LS674DWG4	ACTIVE	SOIC	DW	24	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LS674	Samples
SN74LS674DWG4	ACTIVE	SOIC	DW	24	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LS674	Samples
SN74LS674N	ACTIVE	PDIP	N	24	15	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	0 to 70	SN74LS674N	Samples
SN74LS674N	ACTIVE	PDIP	N	24	15	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	0 to 70	SN74LS674N	Samples
SN74LS674NE4	ACTIVE	PDIP	N	24	15	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	0 to 70	SN74LS674N	Samples
SN74LS674NE4	ACTIVE	PDIP	N	24	15	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	0 to 70	SN74LS674N	Samples

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
SNJ54LS673FK	ACTIVE	LCCC	FK	28	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	5962- 88602013A SNJ54LS 673FK	Samples
SNJ54LS673FK	ACTIVE	LCCC	FK	28	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	5962- 88602013A SNJ54LS 673FK	Samples
SNJ54LS673J	ACTIVE	CDIP	J	24	1	TBD	Call TI	N / A for Pkg Type	-55 to 125	5962-8860201JA SNJ54LS673J	Samples
SNJ54LS673J	ACTIVE	CDIP	J	24	1	TBD	Call TI	N / A for Pkg Type	-55 to 125	5962-8860201JA SNJ54LS673J	Samples
SNJ54LS673JT	ACTIVE	CDIP	JT	24	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-8860201LA SNJ54LS673JT	Samples
SNJ54LS673JT	ACTIVE	CDIP	JT	24	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-8860201LA SNJ54LS673JT	Samples
SNJ54LS673W	OBSOLETE	CFP	W	24		TBD	Call TI	Call TI	-55 to 125		
SNJ54LS673W	OBSOLETE	CFP	W	24		TBD	Call TI	Call TI	-55 to 125		
SNJ54LS674FK	ACTIVE	LCCC	FK	28	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	5962- 88607013A SNJ54LS 674FK	Samples
SNJ54LS674FK	ACTIVE	LCCC	FK	28	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	5962- 88607013A SNJ54LS 674FK	Samples
SNJ54LS674J	ACTIVE	CDIP	J	24	1	TBD	Call TI	N / A for Pkg Type	-55 to 125	5962-8860701JA SNJ54LS674J	Samples
SNJ54LS674J	ACTIVE	CDIP	J	24	1	TBD	Call TI	N / A for Pkg Type	-55 to 125	5962-8860701JA SNJ54LS674J	Samples
SNJ54LS674JT	ACTIVE	CDIP	JT	24	1	TBD	A42	N / A for Pkg Type	-55 to 125	SNJ54LS674JT	Samples
SNJ54LS674JT	ACTIVE	CDIP	JT	24	1	TBD	A42	N / A for Pkg Type	-55 to 125	SNJ54LS674JT	Samples
SNJ54LS674W	OBSOLETE	CFP	W	24		TBD	Call TI	Call TI	-55 to 125		
SNJ54LS674W	OBSOLETE	CFP	W	24		TBD	Call TI	Call TI	-55 to 125		

⁽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.

⁽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.

Important Information and Disclaimer: The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

OTHER QUALIFIED VERSIONS OF SN54LS673, SN54LS674, SN74LS673, SN74LS674 :

● Catalog: [SN74LS673](#), [SN74LS674](#)

● Military: [SN54LS673](#), [SN54LS674](#)

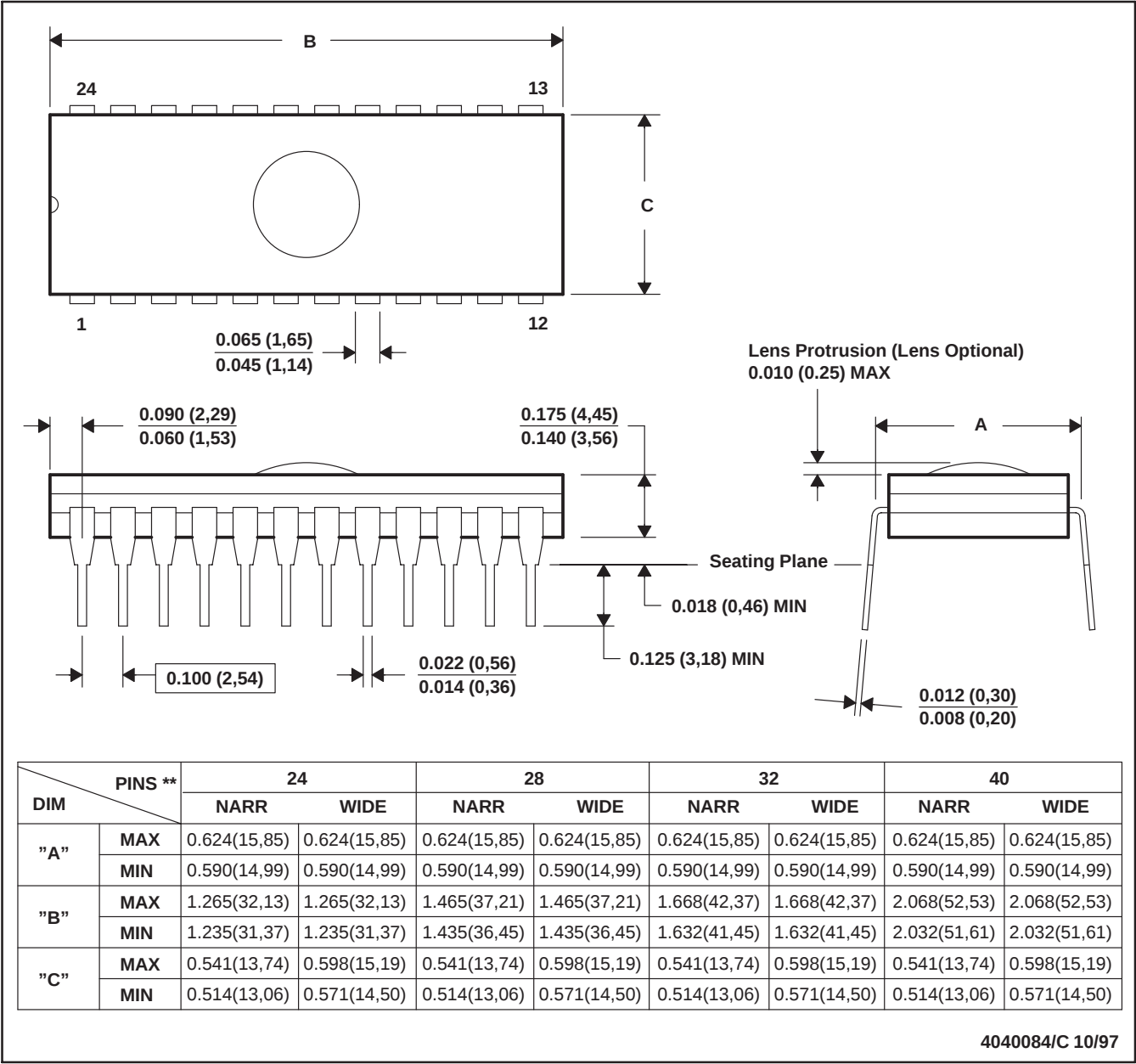
NOTE: Qualified Version Definitions:

● Catalog - TI's standard catalog product

-
- Military - QML certified for Military and Defense Applications

J (R-GDIP-T**)
24 PINS SHOWN

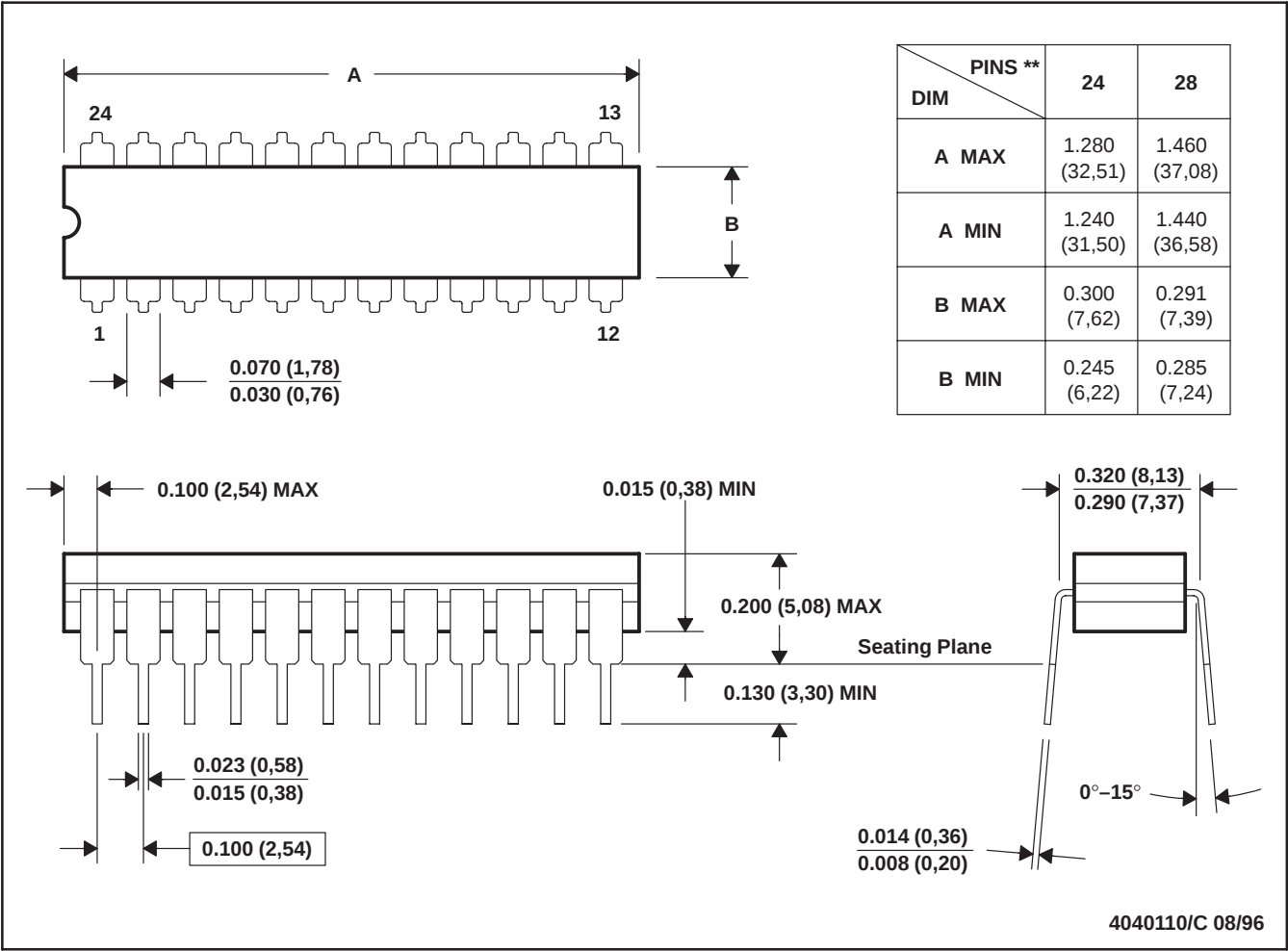
CERAMIC DUAL-IN-LINE PACKAGE



- NOTES: A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- C. Window (lens) added to this group of packages (24-, 28-, 32-, 40-pin).
- D. This package can be hermetically sealed with a ceramic lid using glass frit.
- E. Index point is provided on cap for terminal identification.

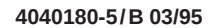
JT (R-GDIP-T**)
24 LEADS SHOWN

CERAMIC DUAL-IN-LINE



- 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.
E. Falls within MIL STD 1835 GDIP3-T24, GDIP4-T28, and JEDEC MO-058 AA, MO-058 AB

CERAMIC DUAL FLATPACK



- 

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)

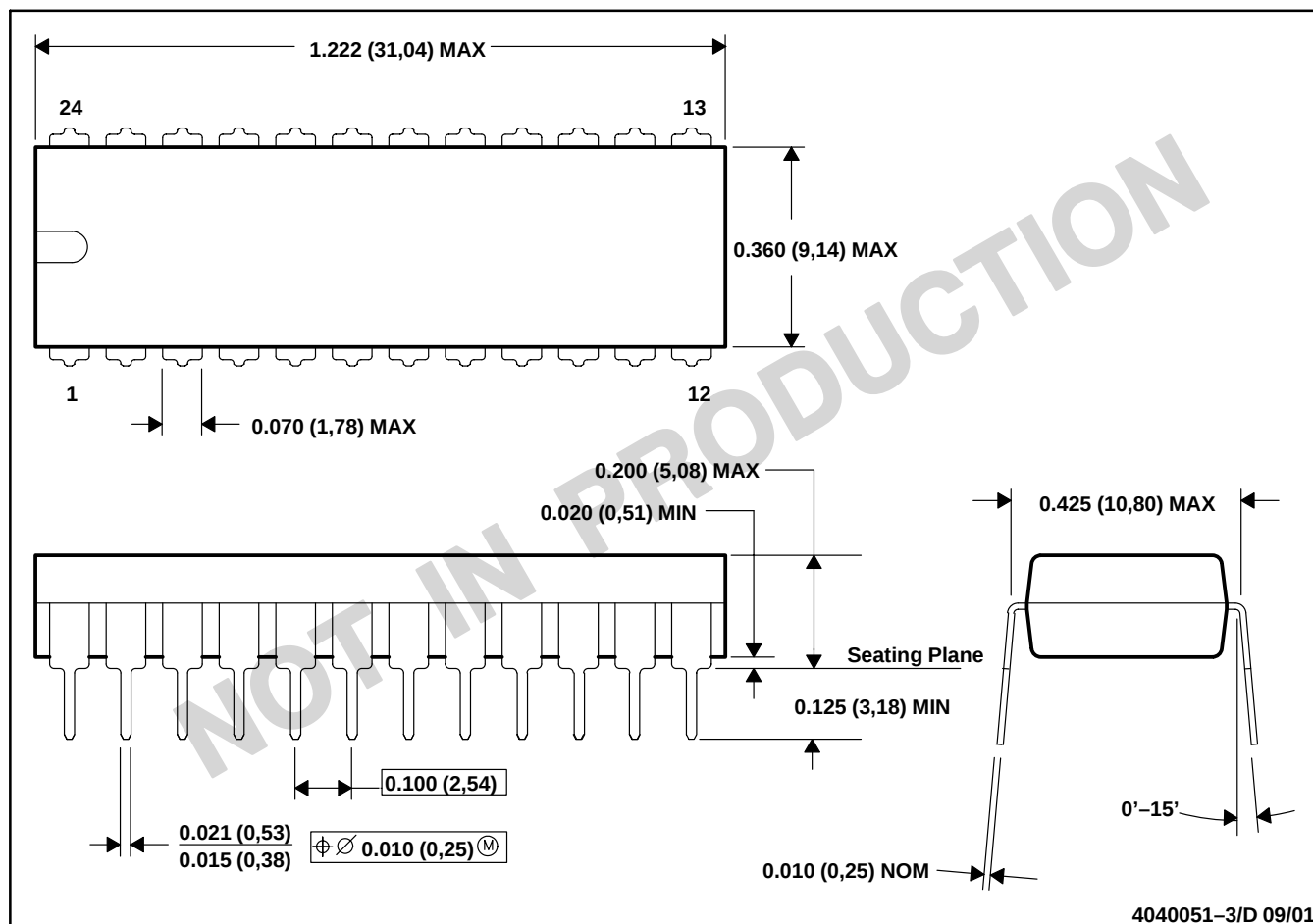


4040140/D 01/11

- 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-T24)

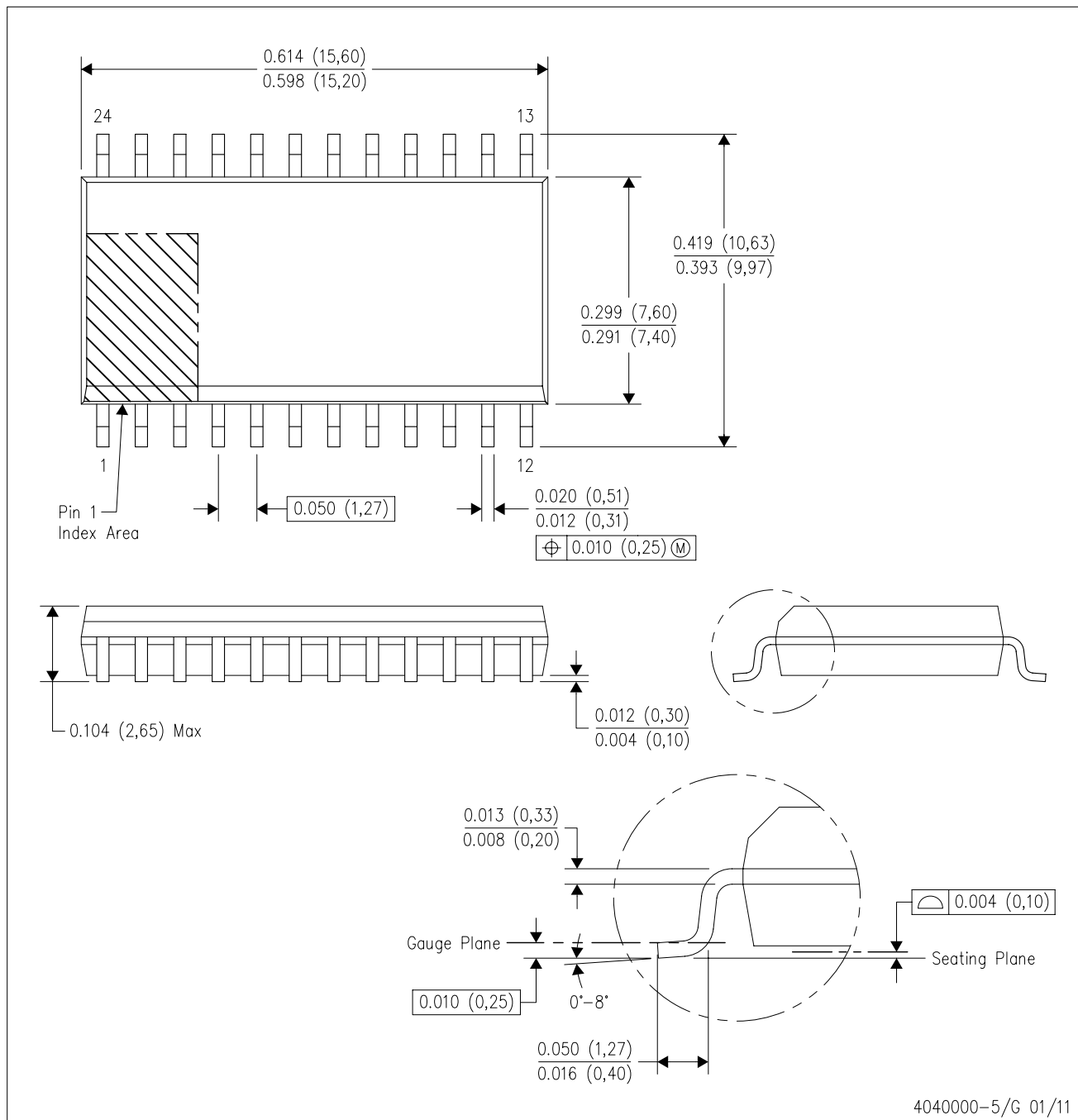
PLASTIC DUAL-IN-LINE



- NOTES: A. All linear dimensions are in inches (millimeters).
 B. This drawing is subject to change without notice.
 C. Falls within JEDEC MS-010

DW (R-PDSO-G24)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in inches (millimeters). Dimensioning and tolerancing per ASME Y14.5M-1994.
 - 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 AD.

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46, latest issue, and to discontinue any product or service per JESD48, latest issue. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products (also referred to herein as "components") are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its components to the specifications applicable at the time of sale, in accordance with the warranty in TI's terms and conditions of sale of semiconductor products. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by applicable law, testing of all parameters of each component is not necessarily performed.

TI assumes no liability for applications assistance or the design of Buyers' products. Buyers are responsible for their products and applications using TI components. To minimize the risks associated with Buyers' products and applications, Buyers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI components or services are used. Information published by TI regarding third-party products or services does not constitute a license to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of significant portions of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI components or services with statements different from or beyond the parameters stated by TI for that component or service voids all express and any implied warranties for the associated TI component or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Buyer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of TI components in its applications, notwithstanding any applications-related information or support that may be provided by TI. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm and take appropriate remedial actions. Buyer will fully indemnify TI and its representatives against any damages arising out of the use of any TI components in safety-critical applications.

In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI's goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those TI components which TI has specifically designated as military grade or "enhanced plastic" are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have **not** been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.

Products

Audio	www.ti.com/audio
Amplifiers	amplifier.ti.com
Data Converters	dataconverter.ti.com
DLP® Products	www.dlp.com
DSP	dsp.ti.com
Clocks and Timers	www.ti.com/clocks
Interface	interface.ti.com
Logic	logic.ti.com
Power Mgmt	power.ti.com
Microcontrollers	microcontroller.ti.com
RFID	www.ti-rfid.com
OMAP Applications Processors	www.ti.com/omap
Wireless Connectivity	www.ti.com/wirelessconnectivity

Applications

Automotive and Transportation	www.ti.com/automotive
Communications and Telecom	www.ti.com/communications
Computers and Peripherals	www.ti.com/computers
Consumer Electronics	www.ti.com/consumer-apps
Energy and Lighting	www.ti.com/energy
Industrial	www.ti.com/industrial
Medical	www.ti.com/medical
Security	www.ti.com/security
Space, Avionics and Defense	www.ti.com/space-avionics-defense
Video and Imaging	www.ti.com/video

TI E2E Community

e2e.ti.com