

# SN54164, SN54LS164, SN74164, SN74LS164 8-BIT PARALLEL-OUT SERIAL SHIFT REGISTERS

MARCH 1974 — REVISED MARCH 1988

- Gated Serial Inputs
- Fully Buffered Clock and Serial Inputs
- Asynchronous Clear

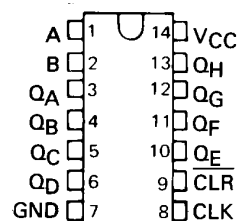
TYPE	TYPICAL MAXIMUM CLOCK FREQUENCY	TYPICAL POWER DISSIPATION
'164	36 MHz	21 mW per bit
'LS164	36 MHz	10 mW per bit

## description

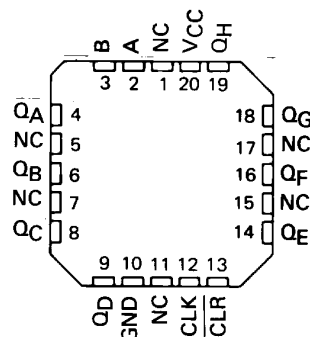
These 8-bit shift registers feature gated serial inputs and an asynchronous clear. The gated serial inputs (A and B) permit complete control over incoming data as a low at either input inhibits entry of the new data and resets the first flip-flop to the low level at the next clock pulse. A high-level input enables the other input which will then determine the state of the first flip-flop. Data at the serial inputs may be changed while the clock is high or low, but only information meeting the setup-time requirements will be entered. Clocking occurs on the low-to-high-level transition of the clock input. All inputs are diode-clamped to minimize transmission-line effects.

The SN54164 and SN54LS164 are characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74164 and SN74LS164 are characterized for operation from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ .

SN54164, SN54LS164 . . . J OR W PACKAGE  
SN74164 . . . N PACKAGE  
SN74LS164 . . . D OR N PACKAGE  
(TOP VIEW)



SN54LS164 . . . FK PACKAGE  
(TOP VIEW)



NC — No internal connection

FUNCTION TABLE

INPUTS				OUTPUTS		
CLEAR	CLOCK	A	B	QA	QB . . . QH	
L	X	X	X	L	L	L
H	L	X	X	QA0	QB0	QH0
H	↑	H	H	H	QAn	QGn
H	↑	L	X	L	QAn	QGn
H	↑	X	L	L	QAn	QGn

H = high level (steady state), L = low level (steady state)

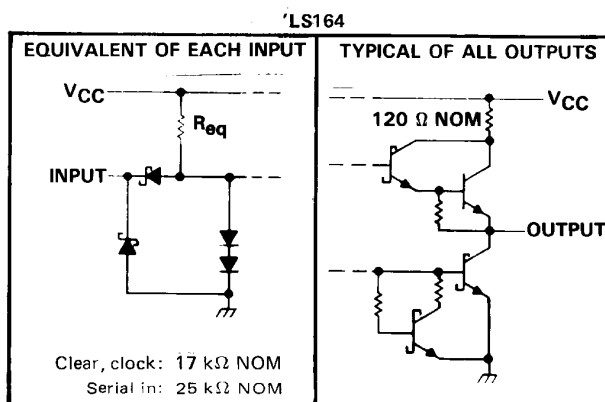
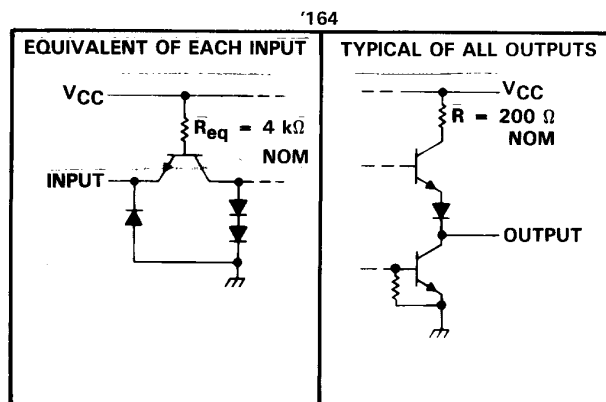
X = irrelevant (any input, including transitions)

↑ = transition from low to high level.

QA0, QB0, QH0 = the level of QA, QB, or QH, respectively, before the indicated steady-state input conditions were established.

QAn, QGn = the level of QA or QG before the most-recent ↑ transition of the clock; indicates a one-bit shift.

## schematics of inputs and outputs

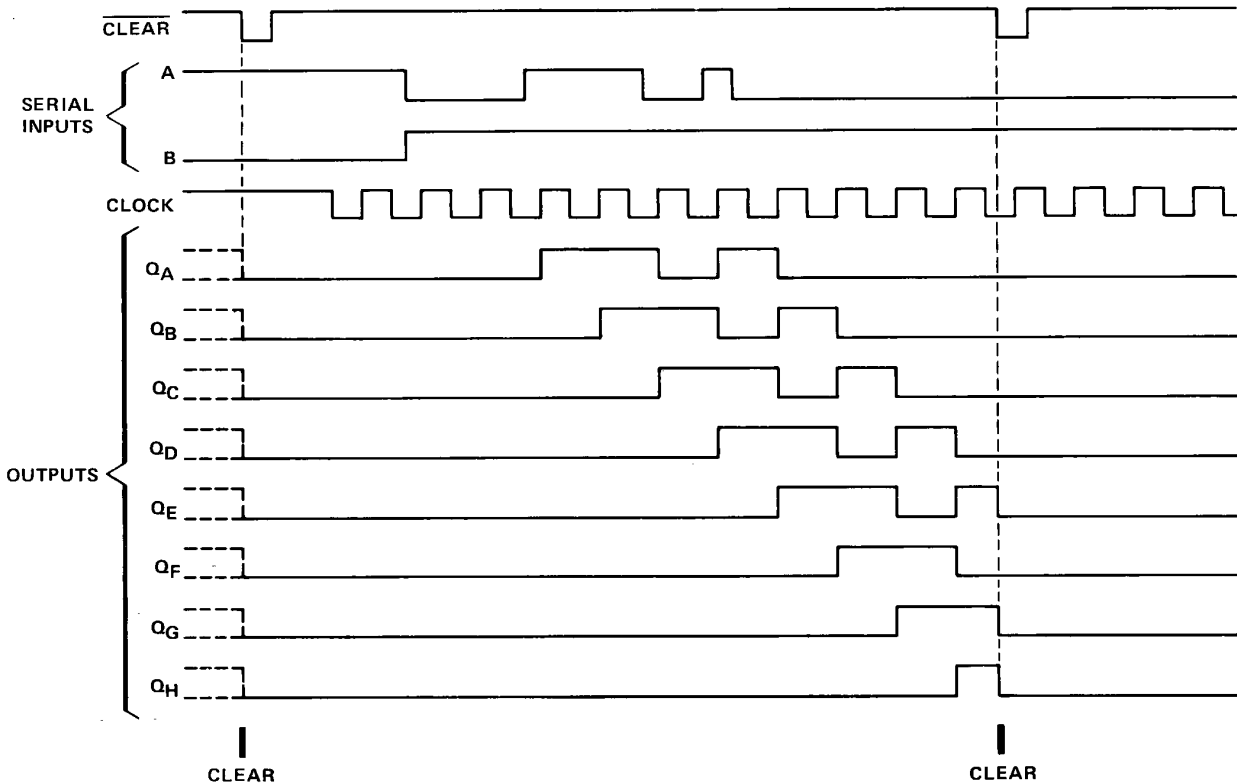


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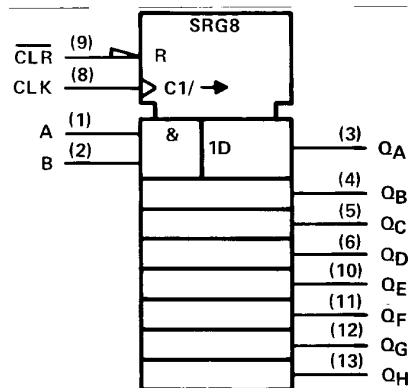
TTL Devices

# **SN54164, SN54LS164, SN74164, SN74LS164** **8-BIT PARALLEL-OUT SERIAL SHIFT REGISTERS**

typical clear, shift, and clear sequences



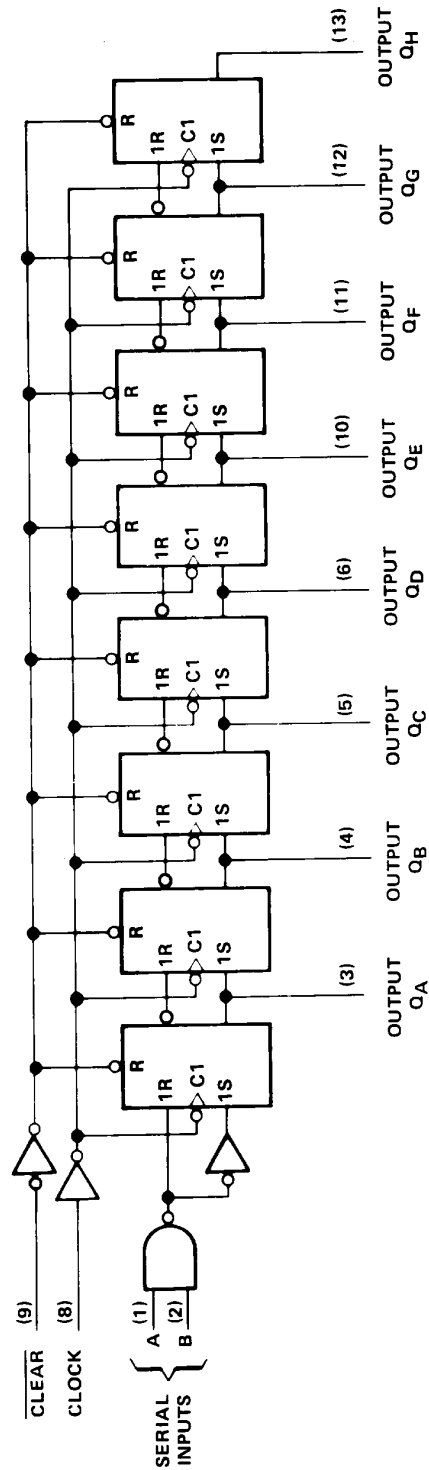
logic symbol†



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

**SN54164, SN54LS164, SN74164, SN74LS164**  
**8-BIT PARALLEL-OUT SERIAL SHIFT REGISTERS**

logic diagram (positive logic)



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TTL Devices

# SN54164, SN74164

## 8-BIT PARALLEL-OUT SERIAL SHIFT REGISTERS

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

Supply voltage, $V_{CC}$ (see Note 1)	7 V
Input voltage	5.5 V
Operating free-air temperature range: SN54164	–55°C to 125°C
SN74164	0°C to 70°C
Storage temperature range	–65°C to 150°C

NOTE 1: Voltage values are with respect to network ground terminal.

recommended operating conditions

	SN54164			SN74164			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	$\mu$ A
Low-level output current, $I_{OL}$			8			8	mA
Clock frequency, $f_{clock}$	0		25	0		25	MHz
Width of clock or clear input pulse, $t_W$	20			20			ns
Data setup time, $t_{SU}$ (see Figure 1)	15			15			ns
Data setup time, $t_{SU}$ (Clear Inactive) (see Figure 1)	20			20			ns
Data hold time, $t_H$ (see Figure 1)	5			5			ns
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†	SN54164			SN74164			UNIT
		MIN	TYP‡	MAX	MIN	TYP‡	MAX	
$V_{IH}$ High-level input voltage		2			2			V
$V_{IL}$ Low-level input voltage				0.8			0.8	V
$V_{IK}$ Input clamp voltage	$V_{CC} = \text{MIN}, I_I = -12 \text{ mA}$			–1.5			–1.5	V
$V_{OH}$ High-level output voltage	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V},$ $V_{IL} = 0.8 \text{ V}, I_{OH} = -400 \mu\text{A}$	2.4	3.2		2.4	3.2		V
$V_{OL}$ Low-level output voltage	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V},$ $V_{IL} = 0.8 \text{ V}, I_{OL} = 8 \text{ mA}$		0.2	0.4		0.2	0.4	V
$I_I$ Input current at maximum input voltage	$V_{CC} = \text{MAX}, V_I = 5.5 \text{ V},$			1			1	mA
$I_{IH}$ High-level input current	$V_{CC} = \text{MAX}, V_I = 2.4 \text{ V}$			40			40	$\mu$ A
$I_{IL}$ Low-level input current	$V_{CC} = \text{MAX}, V_I = 0.4 \text{ V}$			–1.6			–1.6	mA
$I_{OS}$ Short-circuit output current§	$V_{CC} = \text{MAX}$	–10		–27.5	–9		–27.5	mA
$I_{CC}$ Supply current	$V_{CC} = \text{MAX}, V_I(\text{clock}) = 0.4 \text{ V}$		30			30		mA
	See Note 2 $V_I(\text{clock}) = 2.4 \text{ V}$		37	54		37	54	

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

‡ All typical values are at  $V_{CC} = 5 \text{ V}, T_A = 25^\circ\text{C}$ .

§ Not more than two outputs should be shorted at a time.

NOTE 2:  $I_{CC}$  is measured with outputs open, serial inputs grounded, and a momentary ground, then 4.5 V, applied to clear.

switching characteristics,  $V_{CC} = 5 \text{ V}, T_A = 25^\circ\text{C}$

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
$f_{max}$ Maximum clock frequency	$C_L = 15 \text{ pF}$	25	36		MHz
$t_{PHL}$ Propagation delay time, high-to-low-level Q outputs from clear input	$C_L = 15 \text{ pF}$		24	36	ns
	$C_L = 50 \text{ pF}$		28	42	
$t_{PLH}$ Propagation delay time, low-to-high-level Q outputs from clock input	$C_L = 15 \text{ pF}$	8	17	27	ns
	$C_L = 50 \text{ pF}$	10	20	30	
$t_{PHL}$ Propagation delay time, high-to-low-level Q outputs from the clock input	$C_L = 15 \text{ pF}$	10	21	32	ns
	$C_L = 50 \text{ pF}$	10	25	37	

# SN54LS164, SN74LS164

## 8-BIT PARALLEL-OUT SERIAL SHIFT REGISTERS

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

Supply voltage, $V_{CC}$ (see Note 1)	7 V
Input voltage	7 V
Operating free-air temperature range: SN54LS164	–55°C to 125°C
SN74LS164	0°C to 70°C
Storage temperature range	–65°C to 150°C

NOTE 1: Voltage values are with respect to network ground terminal.

### recommended operating conditions

		SN54LS164			SN74LS164			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
$V_{CC}$	Supply voltage	4.5	5	5.5	4.75	5	5.25	V
$V_{IH}$	High-level input voltage	2			2			V
$V_{IL}$	Low-level input voltage			0.7			0.8	V
$I_{OH}$	High-level output current			–0.4			–0.4	mA
$I_{OL}$	Low-level output current			4			8	mA
$f_{clock}$	Clock frequency	0		25	0		25	MHz
$t_w$	Width of clock or clear input pulse	20			20			ns
$t_{su}$	Data setup time (See Figure 1)	15			15			ns
$t_{su}$	Clear inactive setup time (See Figure 1)	20			20			ns
$t_h$	Data hold time (See Figure 1)	5			5			ns
$T_A$	Operating free-air temperature	–55		125	0		70	°C

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

PARAMETER	TEST CONDITIONS†		SN54LS164		SN74LS164		UNIT
			MIN	TYP‡	MAX	MIN	
V <sub>IK</sub>	V <sub>CC</sub> = MIN, I <sub>I</sub> = –18 mA		–1.5		–1.5		V
V <sub>OH</sub>	V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V, V <sub>IL</sub> = MAX, I <sub>OH</sub> = –0.4 mA		2.5	3.5	2.7	3.5	V
V <sub>OL</sub>	V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V, V <sub>IL</sub> = MAX	I <sub>OL</sub> = 4 mA	0.25	0.4	0.25	0.4	V
		I <sub>OL</sub> = 8 mA			0.35	0.5	
I <sub>I</sub>	V <sub>CC</sub> = MAX, V <sub>I</sub> = 7 V		0.1		0.1		mA
I <sub>IH</sub>	V <sub>CC</sub> = MAX, V <sub>I</sub> = 2.7 V		20		20		μA
I <sub>IL</sub>	V <sub>CC</sub> = MAX, V <sub>I</sub> = 0.4 V		–0.4		–0.4		mA
I <sub>OS</sub>	V <sub>CC</sub> = MAX		–20	–100	–20	–100	mA
I <sub>CC</sub>	V <sub>CC</sub> = MAX, See Note 3		16	27	16	27	mA

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

‡All typical values are at  $V_{CC} = 5 \text{ V}, T_A = 25^\circ\text{C}$ .

§Not more than one output should be shorted at a time, and duration of the short-circuit should not exceed one second.

NOTE 3:  $I_{CC}$  is measured with outputs open, serial inputs grounded, the clock input at 2.4 V, and a momentary ground, then 4.5 V applied to clear.

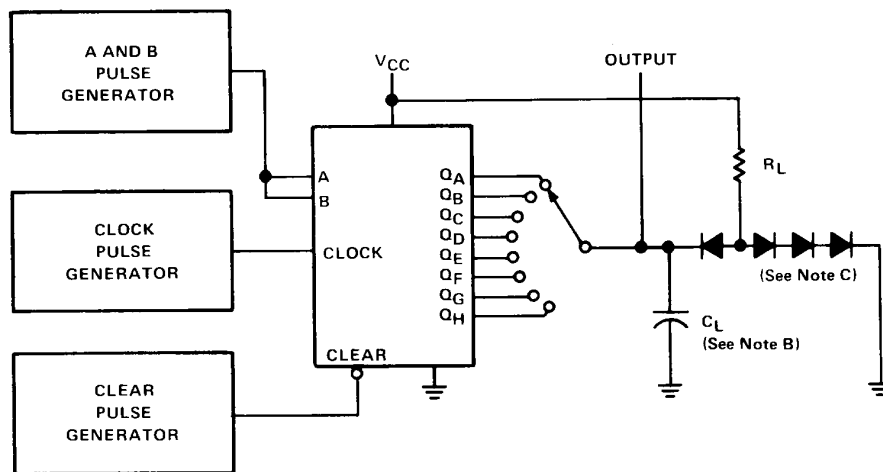
### switching characteristics, $V_{CC} = 5 \text{ V}, T_A = 25^\circ\text{C}$

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
$f_{max}$ Maximum clock frequency		25	36		MHz
$t_{PHL}$ Propagation delay time, high-to-low-level Q outputs from clear input	$R_L = 2 \text{ k}\Omega, C_L = 15 \text{ pF},$		24	36	ns
$t_{PLH}$ Propagation delay time, low-to-high-level Q outputs from clock input	See Figure 1		17	27	ns
$t_{PHL}$ Propagation delay time, high-to-low-level Q outputs from clock input			21	32	ns

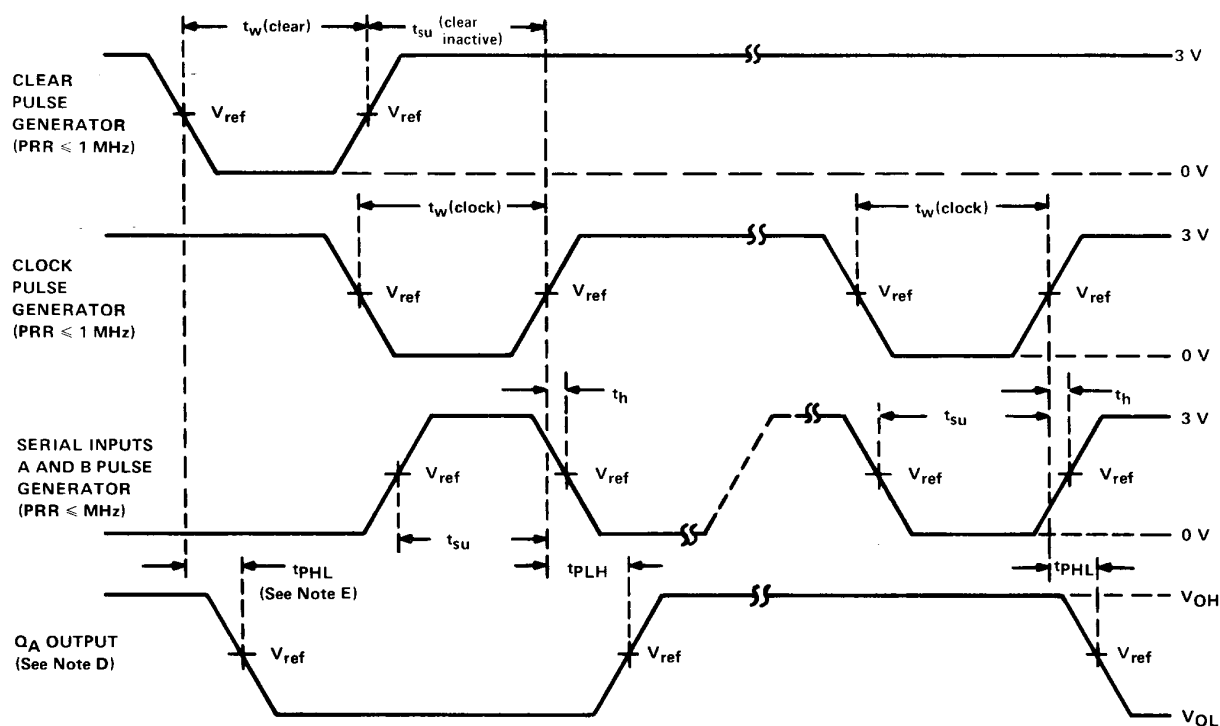
# SN54164, SN54LS164, SN74164, SN74LS164

## 8-BIT PARALLEL-OUT SERIAL SHIFT REGISTERS

### PARAMETER MEASUREMENT INFORMATION



TEST CIRCUIT



VOLTAGE WAVEFORMS

- NOTES: A. The pulse generators have the following characteristics: duty cycle  $\leq 50\%$ ,  $Z_{out} \approx 50 \Omega$ ; for '164,  $t_r \leq 10$  ns,  $t_f \leq 10$  ns; and for 'LS164,  $t_r \leq 15$  ns,  $t_f \leq 6$  ns.
- B.  $C_L$  includes probe and jig capacitance.
- C. All diodes are 1N3064 or equivalent.
- D.  $Q_A$  output is illustrated. Relationship of serial input A and B data to other Q outputs is illustrated in the typical shift sequence.
- E. Outputs are set to the high level prior to the measurement of  $t_{PHL}$  from the clear input.
- F. For '164,  $V_{ref} = 1.5$  V; for 'LS164,  $V_{ref} = 1.3$  V.

FIGURE 1—SWITCHING TIMES

**PACKAGING INFORMATION**

Orderable Device	Status <sup>(1)</sup>	Package Type	Package Drawing	Pins	Package Qty	Eco Plan <sup>(2)</sup>	Lead/Ball Finish	MSL Peak Temp <sup>(3)</sup>
JM38510/00903BCA	OBSOLETE	CDIP	J	14		TBD	Call TI	Call TI
JM38510/30605B2A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type
JM38510/30605B2A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type
JM38510/30605BCA	ACTIVE	CDIP	J	14	1	TBD	A42	N / A for Pkg Type
JM38510/30605BCA	ACTIVE	CDIP	J	14	1	TBD	A42	N / A for Pkg Type
JM38510/30605BDA	ACTIVE	CFP	W	14	1	TBD	A42	N / A for Pkg Type
JM38510/30605BDA	ACTIVE	CFP	W	14	1	TBD	A42	N / A for Pkg Type
JM38510/30605SCA	ACTIVE	CDIP	J	14	1	TBD	A42	N / A for Pkg Type
JM38510/30605SCA	ACTIVE	CDIP	J	14	1	TBD	A42	N / A for Pkg Type
JM38510/30605SDA	ACTIVE	CFP	W	14	1	TBD	A42	N / A for Pkg Type
JM38510/30605SDA	ACTIVE	CFP	W	14	1	TBD	A42	N / A for Pkg Type
SN54164J	OBSOLETE	CDIP	J	14		TBD	Call TI	Call TI
SN54164J	OBSOLETE	CDIP	J	14		TBD	Call TI	Call TI
SN54LS164J	ACTIVE	CDIP	J	14	1	TBD	A42	N / A for Pkg Type
SN54LS164J	ACTIVE	CDIP	J	14	1	TBD	A42	N / A for Pkg Type
SN74164N	OBSOLETE	PDIP	N	14		TBD	Call TI	Call TI
SN74164N	OBSOLETE	PDIP	N	14		TBD	Call TI	Call TI
SN74LS164D	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS164D	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS164DE4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS164DE4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS164DG4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS164DG4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS164DR	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS164DR	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS164DRE4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS164DRE4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS164DRG4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS164DRG4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS164J	OBSOLETE	CDIP	J	14		TBD	Call TI	Call TI
SN74LS164J	OBSOLETE	CDIP	J	14		TBD	Call TI	Call TI
SN74LS164N	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74LS164N	ACTIVE	PDIP	N	14	25	Pb-Free	CU NIPDAU	N / A for Pkg Type

Orderable Device	Status <sup>(1)</sup>	Package Type	Package Drawing	Pins	Package Qty	Eco Plan <sup>(2)</sup>	Lead/Ball Finish	MSL Peak Temp <sup>(3)</sup>
(RoHS)								
SN74LS164N3	OBSOLETE	PDIP	N	14		TBD	Call TI	Call TI
SN74LS164N3	OBSOLETE	PDIP	N	14		TBD	Call TI	Call TI
SN74LS164NE4	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74LS164NE4	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74LS164NSR	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS164NSR	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS164NSRE4	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS164NSRE4	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS164NSRG4	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS164NSRG4	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SNJ54164J	OBSOLETE	CDIP	J	14		TBD	Call TI	Call TI
SNJ54164J	OBSOLETE	CDIP	J	14		TBD	Call TI	Call TI
SNJ54164W	OBSOLETE	CFP	W	14		TBD	Call TI	Call TI
SNJ54164W	OBSOLETE	CFP	W	14		TBD	Call TI	Call TI
SNJ54LS164FK	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type
SNJ54LS164FK	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type
SNJ54LS164J	ACTIVE	CDIP	J	14	1	TBD	A42	N / A for Pkg Type
SNJ54LS164J	ACTIVE	CDIP	J	14	1	TBD	A42	N / A for Pkg Type
SNJ54LS164W	ACTIVE	CFP	W	14	1	TBD	A42	N / A for Pkg Type
SNJ54LS164W	ACTIVE	CFP	W	14	1	TBD	A42	N / A for Pkg Type

<sup>(1)</sup> 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.

<sup>(2)</sup> 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)

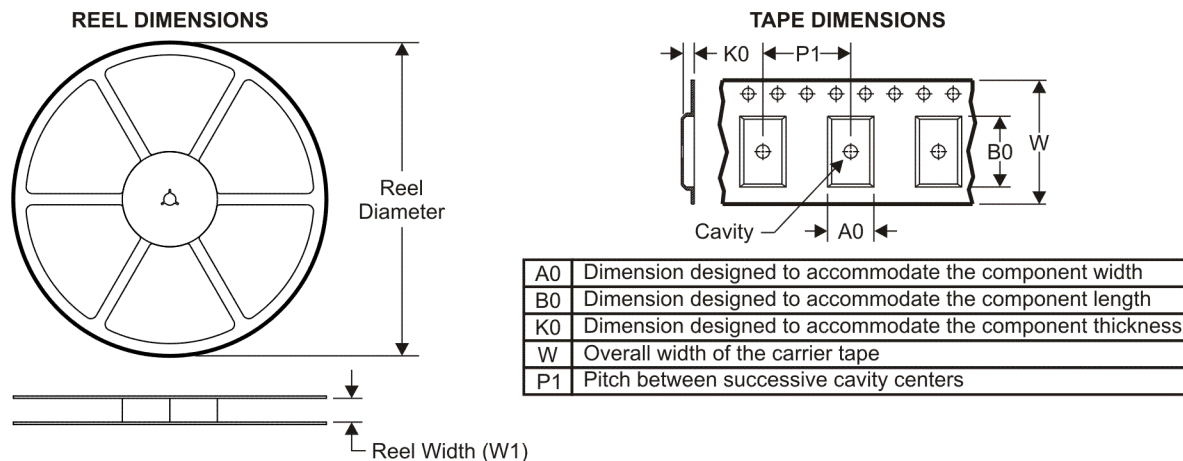
<sup>(3)</sup> MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.



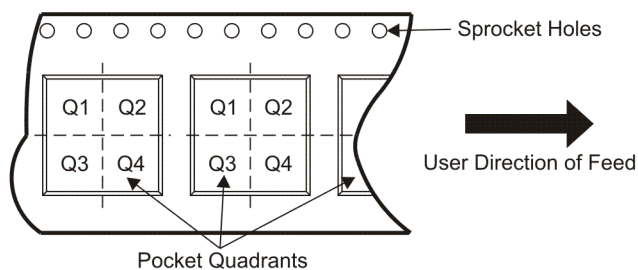
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**TAPE AND REEL INFORMATION**



**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
SN74LS164DR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
SN74LS164NSR	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)
SN74LS164DR	SOIC	D	14	2500	346.0	346.0	33.0
SN74LS164NSR	SO	NS	14	2000	346.0	346.0	33.0

## FK (S-CQCC-N\*\*)

## LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN



- 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.
  - The terminals are gold plated.
  - Falls within JEDEC MS-004

J (R-GDIP-T\*\*)

14 LEADS SHOWN

# CERAMIC DUAL IN-LINE PACKAGE



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)



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.

# MECHANICAL DATA

NS (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE PACKAGE

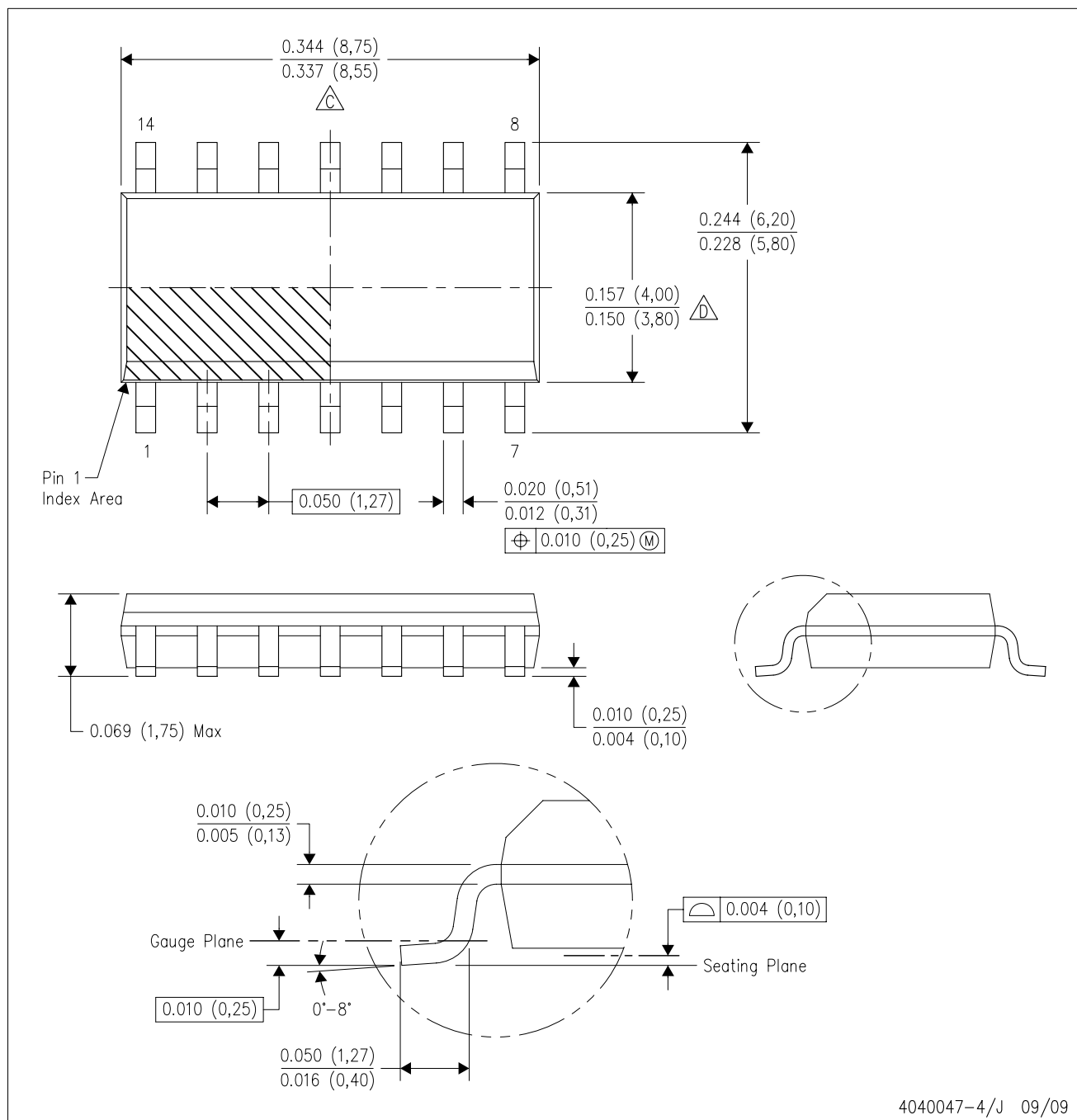
14-PINS SHOWN



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

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 length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed .006 (0,15) per end.  
 D. Body width does not include interlead flash. Interlead flash shall not exceed .017 (0,43) per side.  
 E. Reference JEDEC MS-012 variation AB.

W (R-GDFP-F14)

CERAMIC DUAL FLATPACK



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



## N (R-PDIP-T\*\*)

16 PINS SHOWN

## PLASTIC DUAL-IN-LINE PACKAGE



PINS **	14	16	18	20
DIM				
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



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.
  - 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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Interface	<a href="http://interface.ti.com">interface.ti.com</a>	Energy	<a href="http://www.ti.com/energy">www.ti.com/energy</a>
Logic	<a href="http://logic.ti.com">logic.ti.com</a>	Industrial	<a href="http://www.ti.com/industrial">www.ti.com/industrial</a>
Power Mgmt	<a href="http://power.ti.com">power.ti.com</a>	Medical	<a href="http://www.ti.com/medical">www.ti.com/medical</a>
Microcontrollers	<a href="http://microcontroller.ti.com">microcontroller.ti.com</a>	Security	<a href="http://www.ti.com/security">www.ti.com/security</a>
RFID	<a href="http://www.ti-rfid.com">www.ti-rfid.com</a>	Space, Avionics & Defense	<a href="http://www.ti.com/space-avionics-defense">www.ti.com/space-avionics-defense</a>
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