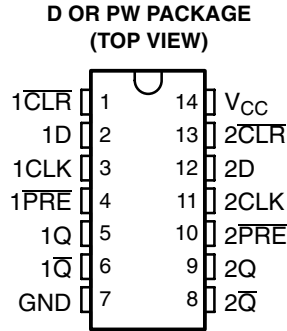


SN74LV74A-Q1

DUAL POSITIVE-EDGE-TRIGGERED D-TYPE FLIP-FLOP

SCLS556B – DECEMBER 2003 – REVISED APRIL 2008

- **Qualified for Automotive Applications**
- **2-V to 5.5-V V_{CC} Operation**
- **Max t_{pd} of 13 ns at 5 V**
- **Typical V_{OLP} (Output Ground Bounce)**
 <0.8 V at $V_{CC} = 3.3$ V, $T_A = 25^\circ\text{C}$
- **Typical V_{OHV} (Output V_{OH} Undershoot)**
 >2.3 V at $V_{CC} = 3.3$ V, $T_A = 25^\circ\text{C}$
- **Support Mixed-Mode Voltage Operation on All Ports**
- **I_{off} Supports Partial-Power-Down Mode Operation**
- **Latch-Up Performance Exceeds 250 mA Per JESD 17**
- **ESD Protection Exceeds JESD 22**
 - 2000-V Human-Body Model (A114-A)
 - 200-V Machine Model (A115-A)
 - 1000-V Charged-Device Model (C101)



description/ordering informationS

This dual positive-edge-triggered D-type flip-flop is designed for 2-V to 5.5-V V_{CC} operation.

A low level at the preset (\overline{PRE}) or clear (\overline{CLR}) inputs sets or resets the outputs, regardless of the levels of the other inputs. When \overline{PRE} and \overline{CLR} are inactive (high), data at the data (D) inputs meeting the setup-time requirements is transferred to the outputs on the positive-going edge of the clock pulse. Clock triggering occurs at a voltage level and is not directly related to the rise time of the clock pulse. Following the hold-time interval, data at the D input can be changed without affecting the levels at the outputs.

This device is fully specified for partial-power-down applications using I_{off} . The I_{off} circuitry disables the outputs, preventing damaging current backflow through the device when it is powered down.

ORDERING INFORMATION[†]

T_A	PACKAGE [‡]		ORDERABLE PART NUMBER	TOP-SIDE MARKING
-40°C to 125°C	SOIC – D	Tape and reel	SN74LV74AQDRQ1	LV74A
	TSSOP – PW	Tape and reel	SN74LV74AQPWRQ1	LV74A

[†] For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI web site at <http://www.ti.com>.

[‡] Package drawings, thermal data, and symbolization are available at <http://www.ti.com/packaging>.



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PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

**TEXAS
INSTRUMENTS**

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SN74LV74A-Q1

DUAL POSITIVE-EDGE-TRIGGERED D-TYPE FLIP-FLOP

SCLS556B – DECEMBER 2003 – REVISED APRIL 2008

recommended operating conditions (see Note 4)

		MIN	MAX	UNIT
V_{CC}	Supply voltage	2	5.5	V
V_{IH}	High-level input voltage	$V_{CC} = 2\text{ V}$	1.5	V
		$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	$V_{CC} \times 0.7$	
		$V_{CC} = 3\text{ V to }3.6\text{ V}$	$V_{CC} \times 0.7$	
		$V_{CC} = 4.5\text{ V to }5.5\text{ V}$	$V_{CC} \times 0.7$	
V_{IL}	Low-level input voltage	$V_{CC} = 2\text{ V}$	0.5	V
		$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	$V_{CC} \times 0.3$	
		$V_{CC} = 3\text{ V to }3.6\text{ V}$	$V_{CC} \times 0.3$	
		$V_{CC} = 4.5\text{ V to }5.5\text{ V}$	$V_{CC} \times 0.3$	
V_I	Input voltage	0	5.5	V
V_O	Output voltage	0	V_{CC}	V
I_{OH}	High-level output current	$V_{CC} = 2\text{ V}$	-50	μA
		$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	-2	mA
		$V_{CC} = 3\text{ V to }3.6\text{ V}$	-6	
		$V_{CC} = 4.5\text{ V to }5.5\text{ V}$	-12	
I_{OL}	Low-level output current	$V_{CC} = 2\text{ V}$	50	μA
		$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	2	mA
		$V_{CC} = 3\text{ V to }3.6\text{ V}$	6	
		$V_{CC} = 4.5\text{ V to }5.5\text{ V}$	12	
$\Delta t/\Delta v$	Input transition rise or fall rate	$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	200	ns/V
		$V_{CC} = 3\text{ V to }3.6\text{ V}$	100	
		$V_{CC} = 4.5\text{ V to }5.5\text{ V}$	20	
T_A	Operating free-air temperature	-40	125	$^{\circ}\text{C}$

NOTE 4: All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

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

PARAMETER	TEST CONDITIONS	V_{CC}	MIN	TYP	MAX	UNIT
V_{OH}	$I_{OH} = -50\ \mu\text{A}$	2 V to 5.5 V	$V_{CC} - 0.1$			V
	$I_{OH} = -2\ \text{mA}$	2.3 V	2			
	$I_{OH} = -6\ \text{mA}$	3 V	2.48			
	$I_{OH} = -12\ \text{mA}$	4.5 V	3.8			
V_{OL}	$I_{OL} = 50\ \mu\text{A}$	2 V to 5.5 V			0.1	V
	$I_{OL} = 2\ \text{mA}$	2.3 V			0.4	
	$I_{OL} = 6\ \text{mA}$	3 V			0.44	
	$I_{OL} = 12\ \text{mA}$	4.5 V			0.55	
I_I	$V_I = 5.5\ \text{V}$ or GND	0 to 5.5 V			± 1	μA
I_{CC}	$V_I = V_{CC}$ or GND, $I_O = 0$	5.5 V			20	μA
I_{off}	V_I or $V_O = 0$ to 5.5 V	0			5	μA
C_i	$V_I = V_{CC}$ or GND	3.3 V		2		pF
		5 V		2		



SN74LV74A-Q1

DUAL POSITIVE-EDGE-TRIGGERED D-TYPE FLIP-FLOP

SCLS556B – DECEMBER 2003 – REVISED APRIL 2008

timing requirements over recommended operating free-air temperature range, $V_{CC} = 2.5\text{ V} \pm 0.2\text{ V}$ (unless otherwise noted) (see Figure 1)

PARAMETER		$T_A = 25^\circ\text{C}$		MIN	MAX	UNIT
		MIN	MAX			
t_w	Pulse duration	PRE or $\overline{\text{CLR}}$ low	8	9	ns	
		CLK	8	9		
t_{su}	Setup time before CLK \uparrow	Data	8	9	ns	
		PRE or $\overline{\text{CLR}}$ inactive	7	7		
t_h	Hold time, data after CLK \uparrow		0.5	0.5	ns	

timing requirements over recommended operating free-air temperature range, $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$ (unless otherwise noted) (see Figure 1)

PARAMETER		$T_A = 25^\circ\text{C}$		MIN	MAX	UNIT
		MIN	MAX			
t_w	Pulse duration	PRE or $\overline{\text{CLR}}$ low	6	7	ns	
		CLK	6	7		
t_{su}	Setup time before CLK \uparrow	Data	6	7	ns	
		PRE or $\overline{\text{CLR}}$ inactive	5	5		
t_h	Hold time, data after CLK \uparrow		0.5	0.5	ns	

timing requirements over recommended operating free-air temperature range, $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$ (unless otherwise noted) (see Figure 1)

PARAMETER		$T_A = 25^\circ\text{C}$		MIN	MAX	UNIT
		MIN	MAX			
t_w	Pulse duration	PRE or $\overline{\text{CLR}}$ low	5	5	ns	
		CLK	5	5		
t_{su}	Setup time before CLK \uparrow	Data	5	5	ns	
		PRE or $\overline{\text{CLR}}$ inactive	3	3		
t_h	Hold time, data after CLK \uparrow		0.5	0.5	ns	

switching characteristics over recommended operating free-air temperature range, $V_{CC} = 2.5\text{ V} \pm 0.2\text{ V}$ (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	$T_A = 25^\circ\text{C}$			MIN	MAX	UNIT
				MIN	TYP	MAX			
f_{max}			$C_L = 50\text{ pF}$	30	70		25		MHz
t_{pd}	$\overline{\text{PRE}}$ or $\overline{\text{CLR}}$	Q or \overline{Q}	$C_L = 50\text{ pF}$		13	17.4	1	20	ns
	CLK				14.2	20	1	23	

switching characteristics over recommended operating free-air temperature range, $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$ (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	$T_A = 25^\circ\text{C}$			MIN	MAX	UNIT
				MIN	TYP	MAX			
f_{max}			$C_L = 50\text{ pF}$	50	90		45		MHz
t_{pd}	$\overline{\text{PRE}}$ or $\overline{\text{CLR}}$	Q or \overline{Q}	$C_L = 50\text{ pF}$		9.2	15.8	1	18	ns
	CLK				10.2	15.4	1	18	



SN74LV74A-Q1

DUAL POSITIVE-EDGE-TRIGGERED D-TYPE FLIP-FLOP

SCLS556B – DECEMBER 2003 – REVISED APRIL 2008

switching characteristics over recommended operating free-air temperature range, $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$ (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	$T_A = 25^\circ\text{C}$			MIN	MAX	UNIT
				MIN	TYP	MAX			
f_{\max}			$C_L = 50\text{ pF}$	90	140		75		MHz
t_{pd}	PRE or CLR	Q or \bar{Q}	$C_L = 50\text{ pF}$		6.6	9.7	1	12	ns
	CLK				7.2	9.3	1	13	

noise characteristics, $V_{CC} = 3.3\text{ V}$, $C_L = 50\text{ pF}$, $T_A = 25^\circ\text{C}$ (see Note 5)

PARAMETER		MIN	TYP	MAX	UNIT
$V_{OL(P)}$	Quiet output, maximum dynamic V_{OL}		0.1	0.8	V
$V_{OL(V)}$	Quiet output, minimum dynamic V_{OL}		0	-0.8	V
$V_{OH(V)}$	Quiet output, minimum dynamic V_{OH}		3.2		V
$V_{IH(D)}$	High-level dynamic input voltage	2.31			V
$V_{IL(D)}$	Low-level dynamic input voltage			0.99	V

NOTE 5: Characteristics are for surface-mount packages only.

operating characteristics, $T_A = 25^\circ\text{C}$

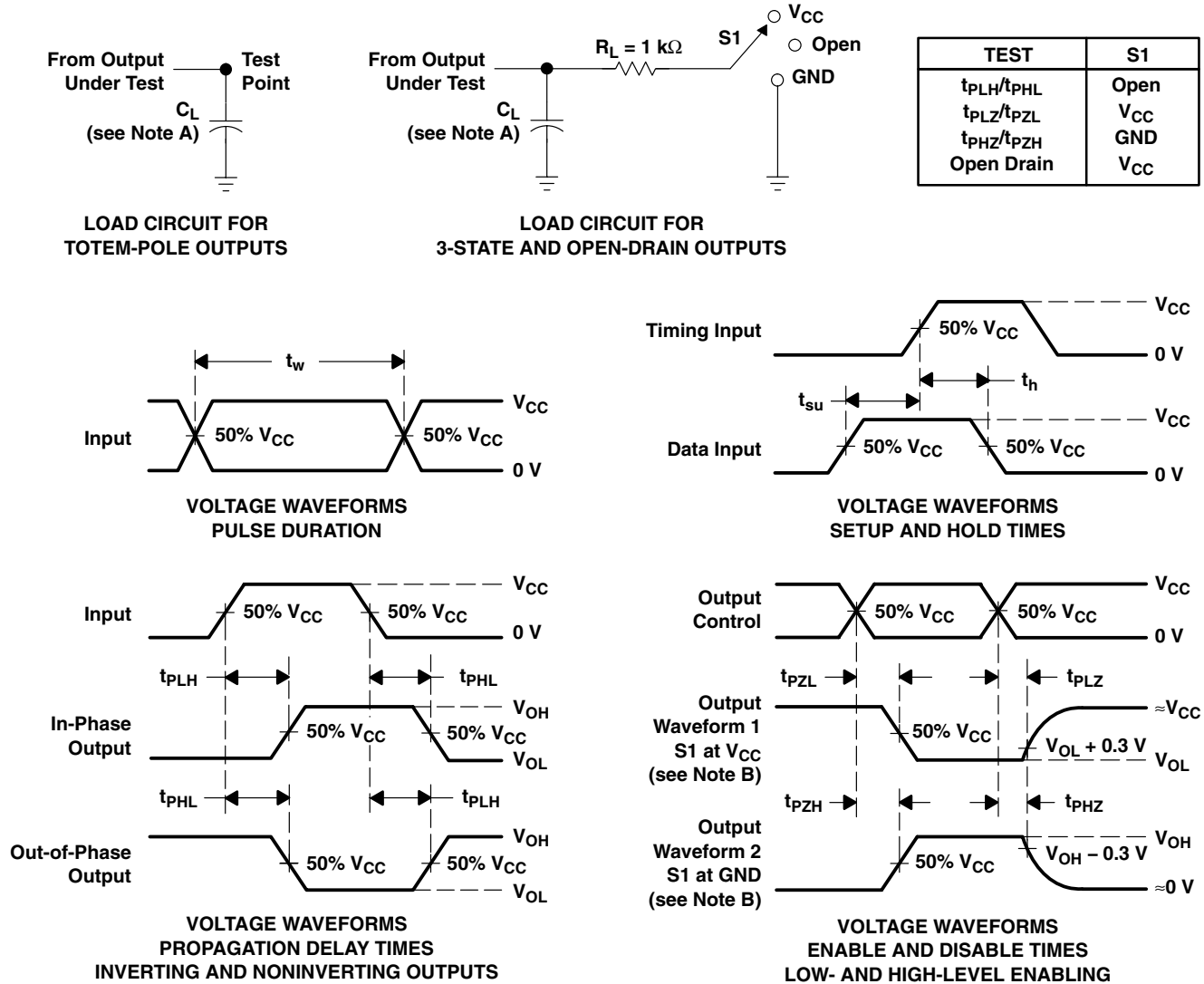
PARAMETER		TEST CONDITIONS	V_{CC}	TYP	UNIT
C_{pd}	Power dissipation capacitance	$C_L = 50\text{ pF}$, $f = 10\text{ MHz}$	3.3 V	21	pF
			5 V	23	

SN74LV74A-Q1

DUAL POSITIVE-EDGE-TRIGGERED D-TYPE FLIP-FLOP

SCLS556B – DECEMBER 2003 – REVISED APRIL 2008

PARAMETER MEASUREMENT INFORMATION



- 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. All input pulses are supplied by generators having the following characteristics: PRR $\leq 1\text{ MHz}$, $Z_O = 50\ \Omega$, $t_r \leq 3\text{ ns}$, $t_f \leq 3\text{ ns}$.
 - D. The outputs are measured one at a time, with one input transition per measurement.
 - E. t_{PLZ} and t_{PHZ} are the same as t_{dis} .
 - F. t_{PZL} and t_{PZH} are the same as t_{en} .
 - G. t_{PHL} and t_{PLH} are the same as t_{pd} .
 - H. All parameters and waveforms are not applicable to all devices.

Figure 1. Load Circuit and Voltage Waveforms

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
SN74LV74AQDRG4Q1	ACTIVE	SOIC	D	14	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LV74A	Samples
SN74LV74AQDRQ1	ACTIVE	SOIC	D	14	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LV74A	Samples
SN74LV74AQPWRG4Q1	ACTIVE	TSSOP	PW	14	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LV74A	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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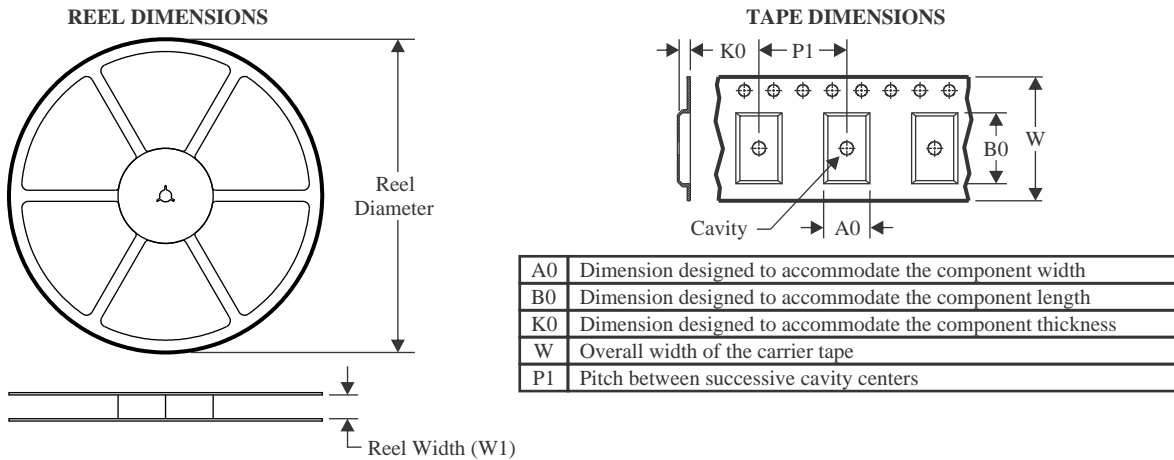
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OTHER QUALIFIED VERSIONS OF SN74LV74A-Q1 :

- Catalog: [SN74LV74A](#)
- Enhanced Product: [SN74LV74A-EP](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product
- Enhanced Product - Supports Defense, Aerospace and Medical Applications

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
SN74LV74AQPWRG4Q1	TSSOP	PW	14	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1

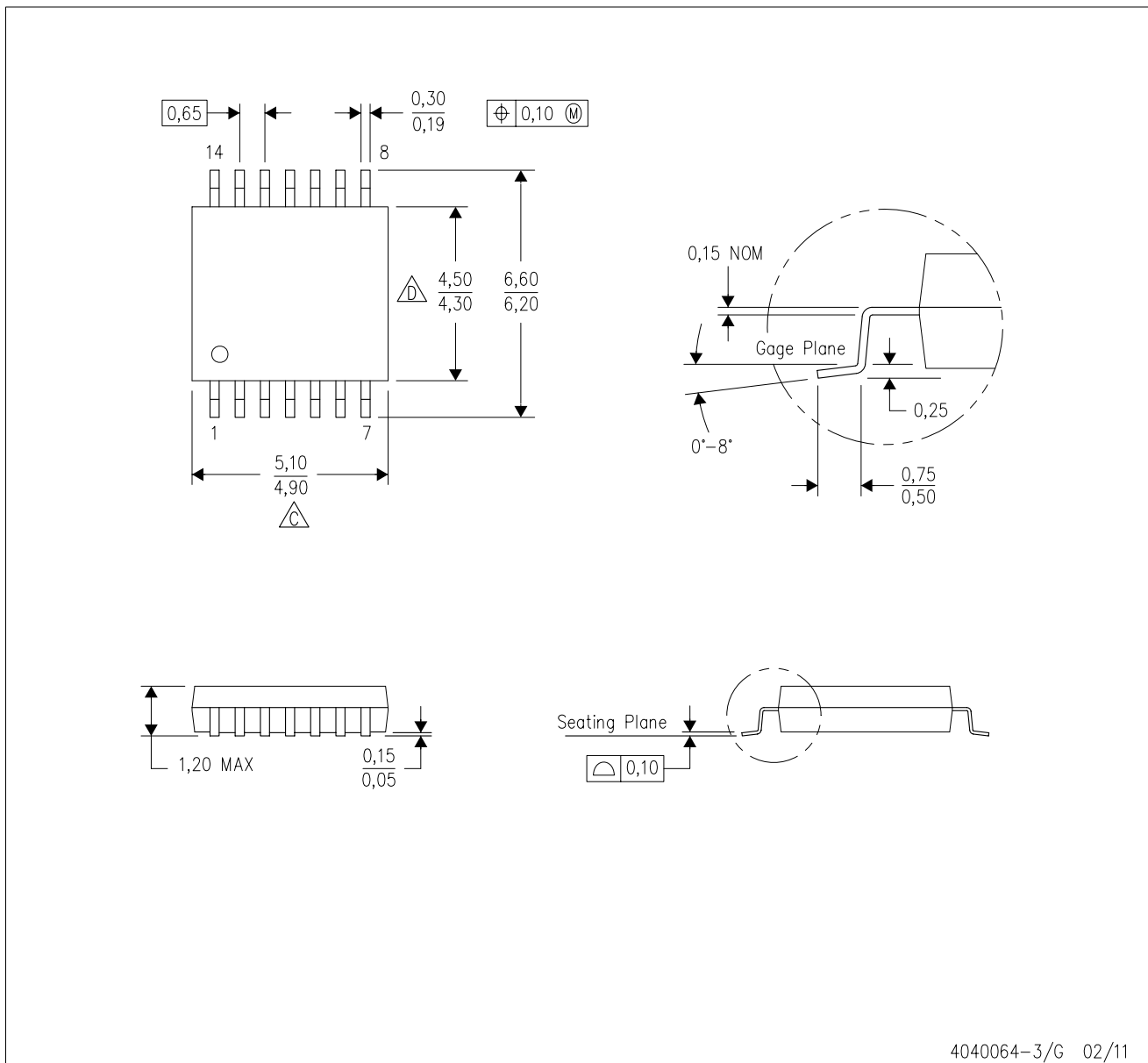
TAPE AND REEL BOX DIMENSIONS


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74LV74AQPWRG4Q1	TSSOP	PW	14	2000	356.0	356.0	35.0

PW (R-PDSO-G14)

PLASTIC SMALL OUTLINE



4040064-3/G 02/11

- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
 - 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 0,15 each side.
 - D. Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.
 - E. Falls within JEDEC MO-153

PW (R-PDSO-G14)

PLASTIC SMALL OUTLINE



4211284-2/G 08/15

- NOTES:
- All linear dimensions are in millimeters.
 - This drawing is subject to change without notice.
 - Publication IPC-7351 is recommended for alternate designs.
 - 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.
 - Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

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