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Texas Instruments SN74LVTH574IPWREP

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Distributor of Texas Instruments: Excellent Integrated System Limited Datasheet of SN74LVTH574IPWREP - IC D-TYPE POS TRG SNGL 20TSSOP Contact us: sales@integrated-circuit.com Website: www.integrated-circuit.com

SN74LVTH574-EP 3.3-V ABT OCTAL EDGE-TRIGGERED D-TYPE FLIP-FLOP WITH 3-STATE OUTPUTS SCBS774 – NOVEMBER 2003

- Controlled Baseline

 One Assembly/Test Site, One Fabrication Site
- Enhanced Diminishing Manufacturing Sources (DMS) Support
- Enhanced Product-Change Notification
- Qualification Pedigree[†]
- Supports Mixed-Mode Signal Operation (5-V Input and Output Voltages With 3.3-V V_{CC})
- Supports Unregulated Battery Operation Down To 2.7 V
- Typical V_{OLP} (Output Ground Bounce)
 <0.8 V at V_{CC} = 3.3 V, T_A = 25°C
- I_{off} and Power-Up 3-State Support Hot Insertion

[†] Component qualification in accordance with JEDEC and industry standards to ensure reliable operation over an extended temperature range. This includes, but is not limited to, Highly Accelerated Stress Test (HAST) or biased 85/85, temperature cycle, autoclave or unbiased HAST, electromigration, bond intermetallic life, and mold compound life. Such qualification testing should not be viewed as justifying use of this component beyond specified performance and environmental limits.

- Bus Hold on Data Inputs Eliminates the Need for External Pullup/Pulldown Resistors
- Latch-Up Performance Exceeds 500 mA Per JESD 17
- ESD Protection Exceeds JESD 22
 - 2000-V Human-Body Model (A114-A)
 - 200-V Machine Model (A115-A)

-	PW PACKAGE (TOP VIEW)								
OE [1	υ	20	Vcc					
1D [2		19] 1Q					
2D	3		18] 2Q					
3D [4		17] 3Q					
4D [5		16] 4Q					
5D [6		15] 5Q					
6D [7		14] 6Q					
7D [8		13] 7Q					
8D [9		12] 8Q					
GND [10		11	CLK					

description/ordering information

This octal flip-flop is designed specifically for low-voltage (3.3-V) V_{CC} operation, but with the capability to provide a TTL interface to a 5-V system environment.

The eight flip-flops of the SN74LVTH574 are edge-triggered D-type flip-flops. On the positive transition of the clock (CLK) input, the Q outputs are set to the logic levels set up at the data (D) inputs.

A buffered output-enable (\overline{OE}) input can be used to place the eight outputs in either a normal logic state (high or low logic levels) or a high-impedance state. In the high-impedance state, the outputs neither load nor drive the bus lines significantly. The high-impedance state and increased drive provide the capability to drive bus lines without need for interface or pullup components.

OE does not affect the internal operations of the flip-flops. Old data can be retained or new data can be entered while the outputs are in the high-impedance state.

To ensure the high-impedance state during power up or power down, \overline{OE} should be tied to V_{CC} through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

ORDERING INFORMATION

TA	PACKAG	GE‡	ORDERABLE PART NUMBER	TOP-SIDE MARKING						
-40°C to 85°C	TSSOP – PW	Tape and reel	SN74LVTH574IPWREP	LH574EP						
-40°C to 85°C TSSOP – PW Tape and reel SN74LVTH574IPWREP LH574EP										

[‡] Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.



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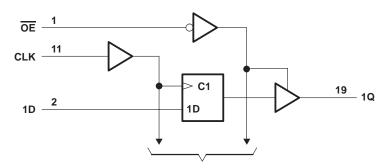
description/ordering information (continued)

Active bus-hold circuitry is provided to hold unused or floating data inputs at a valid logic level. Use of pullup or pulldown resistors with the bus-hold circuitry is not recommended.

This device is fully specified for hot-insertion applications using I_{off} and power-up 3-state. The I_{off} circuitry disables the outputs, preventing damaging current backflow through the devices when they are powered down. The power-up 3-state circuitry places the outputs in the high-impedance state during power up and power down, which prevents driver conflict.

FUNCTION TABLE (each flip-flop)										
	INPUTS		OUTPUT							
OE	CLK	D	Q							
L	\uparrow	Н	Н							
L	\uparrow	L	L							
L	H or L	Х	Q ₀							
н	Х	Х	Z							

logic diagram (positive logic)



To Seven Other Channels

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

Supply voltage range, V _{CC}	–0.5 V to 4.6 V
Input voltage range, V _I (see Note 1)	–0.5 V to 7 V
Voltage range applied to any output in the high-impedance	
or power-off state, V _O (see Note 1)	–0.5 V to 7 V
Voltage range applied to any output in the high state, V _O (see Note 1)	–0.5 V to V _{CC} + 0.5 V
Current into any output in the low state, Io	128 mA
Current into any output in the high state, I _O (see Note 2)	64 mA
Input clamp current, I _{IK} (V _I < 0)	–50 mA
Output clamp current, I _{OK} (V _O < 0)	–50 mA
Package thermal impedance, θ_{JA} (see Note 3)	83°C/W
Storage temperature range, T _{stg}	–65°C to 150°C

[†] Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

NOTES: 1. The input and output negative-voltage ratings may be exceeded if the input and output clamp-current ratings are observed.

2. This current flows only when the output is in the high state and $V_O > V_{CC}$.

3. The package thermal impedance is calculated in accordance with JESD 51-7.





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recommended operating conditions (see Note 4)

			MIN	MAX	UNIT
VCC	Supply voltage		2.7	3.6	V
VIH	High-level input voltage		2		V
VIL	Low-level input voltage			0.8	V
VI	Input voltage			5.5	V
IOH	High-level output current			-32	mA
IOL	Low-level output current			64	mA
$\Delta t/\Delta v$	Input transition rise or fall rate	Outputs enabled		10	ns/V
$\Delta t/\Delta V_{CC}$	Power-up ramp rate		200		μs/V
TA	Operating free-air temperature		-40	85	°C

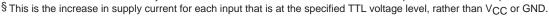
NOTE 4: All unused control inputs of the device must be held at V_{CC} or GND to ensure proper device operation. Refer to the TI application report, Implications of Slow or Floating CMOS Inputs, literature number SCBA004.

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

PAI	RAMETER	TEST CONDITIC	NS	MIN	TYP†	MAX	UNIT	
VIK		V _{CC} = 2.7 V,	lı = –18 mA			-1.2	V	
		$V_{CC} = 2.7 V \text{ to } 3.6 V,$	I _{OH} = −100 μA	V _{CC} -0.	.2			
VOH		V _{CC} = 2.7 V,	I _{OH} = –8 mA	2.4			V	
		V _{CC} = 3 V,	I _{OH} = -32 mA	2				
		No. 271	I _{OL} = 100 μA			0.2		
		$V_{CC} = 2.7 V$	I _{OL} = 24 mA			0.5		
VOL			I _{OL} = 16 mA			0.4	V	
		V _{CC} = 3 V	I _{OL} = 32 mA			0.5		
			I _{OL} = 64 mA			0.55		
	Control inputo	V _{CC} = 0 or 3.6 V,	V _I = 5.5 V			10		
1.	Control inputs	V _{CC} = 3.6 V,	$V_I = V_{CC} \text{ or } GND$			±1	0	
Ч	II Control inputs VCC Data inputs VCC Ioff VCC II(hold) Data inputs VCC	No. 201	VI = VCC			1	1 ^{μA}	
		V _{CC} = 3.6 V	$V_{I} = 0$		-5			
loff		$V_{CC} = 0,$	V_{I} or $V_{O} = 0$ to 4.5 V			±100	μA	
			V _I = 0.8 V	75				
ll(hold)	Data inputs	V _{CC} = 3 V	V _I = 2 V	-75			μA	
. ,		$V_{CC} = 3.6 V^{\ddagger},$	V _I = 0 to 3.6 V			±500		
IOZH		V _{CC} = 3.6 V,	$V_{O} = 3 V$			5	μA	
IOZL		V _{CC} = 3.6 V,	$V_{O} = 0.5 V$			-5	μΑ	
IOZPU		$V_{CC} = 0$ to 1.5 V, $V_O = 0.5$ V to 3 V, $\overline{OE} = dc$	on't care			±100	μA	
IOZPD		V_{CC} = 1.5 V to 0, V_{O} = 0.5 V to 3 V, \overline{OE} = de	on't care			±100	μA	
			Outputs high			0.19		
ICC		$V_{CC} = 3.6 \text{ V}, I_{O} = 0, V_{I} = V_{CC} \text{ or GND}$	Outputs low			5	mA	
			Outputs disabled			0.19		
∆ICC§		V_{CC} = 3 V to 3.6 V, One input at V_{CC} – 0.6 V	V, Other inputs at V_{CC} or GND			0.2	mA	
Ci		V _I = 3 V or 0			3		pF	
Co		$V_{O} = 3 V \text{ or } 0$			7		pF	

[†] All typical values are at V_{CC} = 3.3 V, T_A = 25°C.

[‡]This is the bus-hold maximum dynamic current. It is the minimum overdrive current required to switch the input from one state to another.







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timing requirements over recommended operating free-air temperature range (unless otherwise noted) (see Figure 1)

		= V _{CC} ± 0.3	3.3 V 3 V	V _{CC} =	2.7 V	UNIT
		MIN	MAX	MIN	MAX	
fclock	Clock frequency		150		150	MHz
tw	Pulse duration, CLK high or low	3.3		3.3		ns
t _{su}	Setup time, data before CLK1	2		2.4		ns
^t h	Hold time, data after CLK1	0.3		0		ns

switching characteristics over recommended free-air temperature, $C_L = 50 \text{ pF}$ (unless otherwise noted) (see Figure 1)

PARAMETER	FROM	TO	V	CC = 3.3 ± 0.3 V	v	V _{CC} =	UNIT	
	(INPUT)	(OUTPUT)	MIN	TYP†	MAX	MIN	MAX	
f _{max}			150			150		MHz
^t PLH	CLK	â	1.8	3	4.5		5.3	
^t PHL	CEK	Q	1.8	3	4.5		5.3	ns
^t PZH	OE	â	1.5	3.2	4.8		5.9	
^t PZL	OE	Q	1.5	3.5	4.8		5.9	ns
^t PHZ	OE	Ô	2	3.5	4.8		5.1	
^t PLZ	UE	Q	2	3.2	4.4		4.4	ns

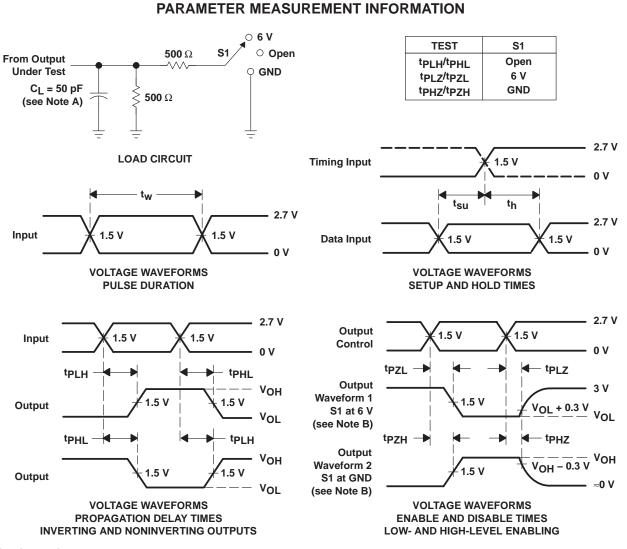
[†] All typical values are at V_{CC} = 3.3 V, T_A = 25°C.





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- NOTES: A. CI includes probe and jig capacitance.
 - Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. В. 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 10 MHz, Z_O = 50 Ω , t_f \leq 2.5 ns, t_f \leq 2.5 ns.
 - D. The outputs are measured one at a time with one transition per measurement.
 - E. All parameters and waveforms are not applicable to all devices.

Figure 1. Load Circuit and Voltage Waveforms





31-May-2014

PACKAGING INFORMATION

www.ti.com

Orderable Device	Status	Package Type	Package	Pins	Package	Eco Plan	Lead/Ball Finish	MSL Peak Temp	Op Temp (°C)	Device Marking	Samples
	(1)		Drawing		Qty	(2)	(6)	(3)		(4/5)	
SN74LVTH574IPWREP	ACTIVE	TSSOP	PW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	LH574EP	Samples
V62/04679-01XE	ACTIVE	TSSOP	PW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	LH574EP	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) 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/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.

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

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Addendum-Page 1



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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 SN74LVTH574-EP :

Catalog: SN74LVTH574

Military: SN54LVTH574

NOTE: Qualified Version Definitions:

- Catalog TI's standard catalog product
- Military QML certified for Military and Defense Applications

Addendum-Page 2



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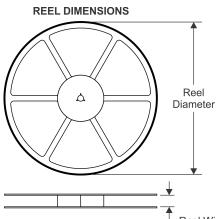


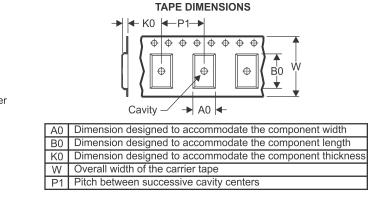
PACKAGE MATERIALS INFORMATION

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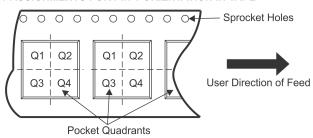
TAPE AND REEL INFORMATION





Reel Width (W1)

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All	dimensions	are	nominal	

Device	Package Type	Package Drawing		SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74LVTH574IPWREP	TSSOP	PW	20	2000	330.0	16.4	6.95	7.1	1.6	8.0	16.0	Q1



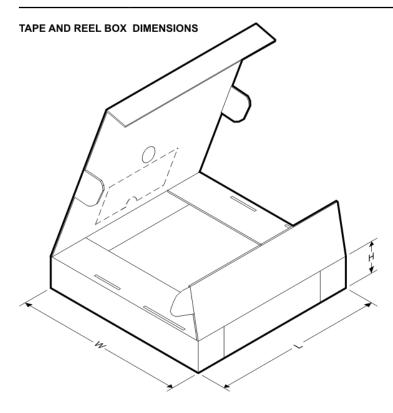
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PACKAGE MATERIALS INFORMATION

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*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74LVTH574IPWREP	TSSOP	PW	20	2000	367.0	367.0	38.0



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