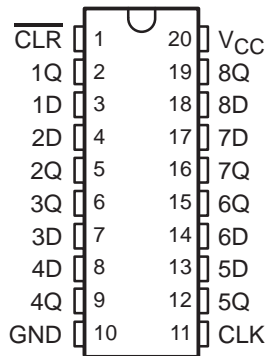


# SN54LVTH273, SN74LVTH273 3.3-V ABT OCTAL D-TYPE FLIP-FLOPS WITH CLEAR

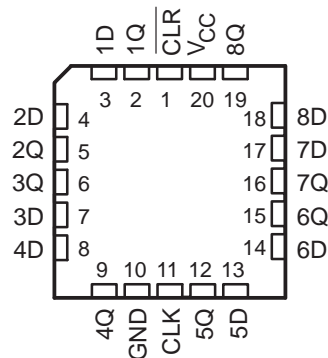
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- Support Mixed-Mode Signal Operation (5-V Input and Output Voltages With 3.3-V  $V_{CC}$ )
- Typical  $V_{OLP}$  (Output Ground Bounce)  $<0.8$  V at  $V_{CC} = 3.3$  V,  $T_A = 25^\circ\text{C}$
- Support Unregulated Battery Operation Down To 2.7 V
- Buffered Clock and Direct-Clear Inputs
- Individual Data Input to Each Flip-Flop
- $I_{off}$  Supports Partial-Power-Down-Mode Operation
- 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)

SN54LVTH273 . . . J PACKAGE  
SN74LVTH273 . . . DB, DW, NS, OR PW PACKAGE  
(TOP VIEW)



SN54LVTH273 . . . FK PACKAGE  
(TOP VIEW)



## description/ordering information

These octal D-type flip-flops are 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 'LVTH273 devices are positive-edge-triggered flip-flops with a direct-clear input. Information at the data (D) inputs meeting the setup-time requirements is transferred to the Q outputs on the positive-going edge of the clock pulse. Clock triggering occurs at a particular voltage level and is not directly related to the transition time of the positive-going pulse. When the clock (CLK) input is at either the high or low level, the D-input signal has no effect at the output.

## ORDERING INFORMATION

$T_A$	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
-40°C to 85°C	SOIC – DW	Tube	SN74LVTH273DW	LVTH273
		Tape and reel	SN74LVTH273DWR	
	SOP – NS	Tape and reel	SN74LVTH273NSR	LVTH273
	SSOP – DB	Tape and reel	SN74LVTH273DBR	LXH273
	TSSOP – PW	Tube	SN74LVTH273PW	LXH273
Tape and reel		SN74LVTH273PWR		
-55°C to 125°C	CDIP – J	Tube	SNJ54LVTH273J	SNJ54LVTH273J
	LCCC – FK	Tube	SNJ54LVTH273FK	SNJ54LVTH273FK

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



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 **TEXAS  
INSTRUMENTS**

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# SN54LVTH273, SN74LVTH273

## 3.3-V ABT OCTAL D-TYPE FLIP-FLOPS WITH CLEAR

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### description/ordering information (continued)

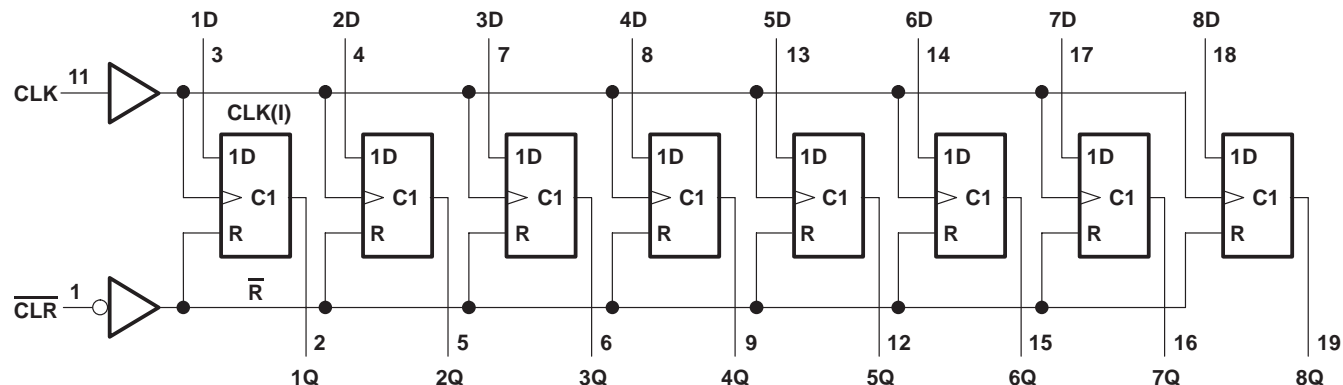
Active bus-hold circuitry holds unused or undriven inputs at a valid logic state. Use of pullup or pulldown resistors with the bus-hold circuitry is not recommended.

These devices are fully specified for partial-power-down applications using  $I_{off}$ . The  $I_{off}$  circuitry disables the outputs, preventing damaging current backflow through the devices when they are powered down.

FUNCTION TABLE  
(each flip-flop)

INPUTS			OUTPUT
$\overline{\text{CLR}}$	CLK	D	Q
L	X	X	L
H	↑	H	H
H	↑	L	L
H	H or L	X	$Q_0$

### logic diagram (positive logic)



# SN54LVTH273, SN74LVTH273 3.3-V ABT OCTAL D-TYPE FLIP-FLOPS WITH CLEAR

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## 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 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, $I_{OL}$ : SN54LVTH273 .....	96 mA
SN74LVTH273 .....	128 mA
Current into any output in the high state, $I_{OH}$ (see Note 2): SN54LVTH273 .....	48 mA
SN74LVTH273 .....	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, $\theta_{JA}$ (see Note 3): DB package .....	70°C/W
DW package .....	58°C/W
NS package .....	60°C/W
PW package .....	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.

## recommended operating conditions (see Note 4)

	SN54LVTH273		SN74LVTH273		UNIT
	MIN	MAX	MIN	MAX	
$V_{CC}$ Supply voltage	2.7	3.6	2.7	3.6	V
$V_{IH}$ High-level input voltage	2		2		V
$V_{IL}$ Low-level input voltage		0.8		0.8	V
$V_I$ Input voltage		5.5		5.5	V
$I_{OH}$ High-level output current		–24		–32	mA
$I_{OL}$ Low-level output current		48		64	mA
$\Delta t/\Delta v$ Input transition rise or fall rate		10		10	ns/V
$T_A$ Operating free-air temperature	–55	125	–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.

# SN54LVTH273, SN74LVTH273

## 3.3-V ABT OCTAL D-TYPE FLIP-FLOPS WITH CLEAR

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

PARAMETER	TEST CONDITIONS	SN54LVTH273			SN74LVTH273			UNIT
		MIN	TYP†	MAX	MIN	TYP†	MAX	
$V_{IK}$	$V_{CC} = 2.7\text{ V}$ , $I_I = -18\text{ mA}$			-1.2			-1.2	V
$V_{OH}$	$V_{CC} = 2.7\text{ V to }3.6\text{ V}$ , $I_{OH} = -100\text{ }\mu\text{A}$			$V_{CC}-0.2$			$V_{CC}-0.2$	V
	$V_{CC} = 2.7\text{ V}$ , $I_{OH} = -8\text{ mA}$			2.4			2.4	
	$V_{CC} = 3\text{ V}$			2			2	
$V_{OL}$	$V_{CC} = 2.7\text{ V}$	$I_{OL} = 100\text{ }\mu\text{A}$					0.2	0.2
		$I_{OL} = 24\text{ mA}$					0.5	0.5
	$V_{CC} = 3\text{ V}$	$I_{OL} = 16\text{ mA}$					0.4	0.4
		$I_{OL} = 32\text{ mA}$					0.5	0.5
		$I_{OL} = 48\text{ mA}$					0.55	
		$I_{OL} = 64\text{ mA}$						0.55
$I_I$	$V_{CC} = 0\text{ or }3.6\text{ V}$ , $V_I = 5.5\text{ V}$					10	10	$\mu\text{A}$
	Control inputs $V_{CC} = 3.6\text{ V}$ , $V_I = V_{CC}\text{ or GND}$					$\pm 1$	$\pm 1$	
	Data inputs $V_{CC} = 3.6\text{ V}$					1	1	
		$V_I = 0$				-5	-5	
$I_{off}$	$V_{CC} = 0$ , $V_I\text{ or }V_O = 0\text{ to }4.5\text{ V}$						$\pm 100$	$\mu\text{A}$
$I_{I(\text{hold})}$	Data inputs $V_{CC} = 3\text{ V}$	$V_I = 0.8\text{ V}$		75		75		$\mu\text{A}$
		$V_I = 2\text{ V}$		-75		-75		
	$V_{CC} = 3.6\text{ V}^\ddagger$ , $V_I = 0\text{ to }3.6\text{ V}$						500 -750	
$I_{CC}$	$V_{CC} = 3.6\text{ V}$ , $I_O = 0$ , $V_I = V_{CC}\text{ or GND}$	Outputs high		0.19		0.19		mA
		Outputs low		5		5		
$\Delta I_{CC}^\S$	$V_{CC} = 3\text{ V to }3.6\text{ V}$ , One input at $V_{CC} - 0.6\text{ V}$ , Other inputs at $V_{CC}\text{ or GND}$			0.2		0.2		mA
$C_i$	$V_I = 3\text{ V or }0$			4		4		pF

† All typical values are at  $V_{CC} = 3.3\text{ V}$ ,  $T_A = 25^\circ\text{C}$ .

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

§ This is the increase in supply current for each input that is at the specified TTL voltage level, rather than  $V_{CC}$  or GND.

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

		SN54LVTH273				SN74LVTH273				UNIT
		$V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$		$V_{CC} = 2.7\text{ V}$		$V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$		$V_{CC} = 2.7\text{ V}$		
		MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
$f_{\text{clock}}$	Clock frequency	150				150				MHz
$t_w$	Pulse duration	3.3		3.3		3.3		3.3		ns
$t_{su}$	Setup time	Data high or low before CLK↑	2.3		2.7		2.3		2.7	ns
		CLR high before CLK↑	2.3		2.7		2.3		2.7	
$t_h$	Hold time, data high or low after CLK↑	0		0		0		0		ns

PRODUCT PREVIEW information concerns products in the formative or design phase of development. Characteristic data and other specifications are design goals. Texas Instruments reserves the right to change or discontinue these products without notice.



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# SN54LVTH273, SN74LVTH273 3.3-V ABT OCTAL D-TYPE FLIP-FLOPS WITH CLEAR

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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	SN54LVTH273				SN74LVTH273				UNIT	
			$V_{CC} = 3.3 \text{ V}$ $\pm 0.3 \text{ V}$		$V_{CC} = 2.7 \text{ V}$		$V_{CC} = 3.3 \text{ V}$ $\pm 0.3 \text{ V}$		$V_{CC} = 2.7 \text{ V}$			
			MIN	MAX	MIN	MAX	MIN	TYP†	MAX	MIN		MAX
$f_{max}$			150				150				MHz	
$t_{PLH}$	CLK	Any Q	1.6	5	5.6		1.7	3.2	4.9	5.5		ns
$t_{PHL}$			1.8	4.9	5.2		1.9	3.2	4.8	5.1		
$t_{PHL}$	$\overline{\text{CLR}}$	Any Q	1.5	4.4	4.8		1.6	2.7	4.3	4.7		ns

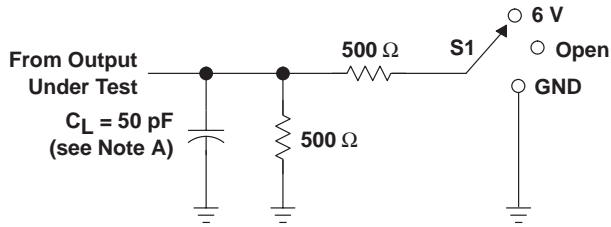
† All typical values are at  $V_{CC} = 3.3 \text{ V}$ ,  $T_A = 25^\circ\text{C}$ .

# SN54LVTH273, SN74LVTH273

## 3.3-V ABT OCTAL D-TYPE FLIP-FLOPS WITH CLEAR

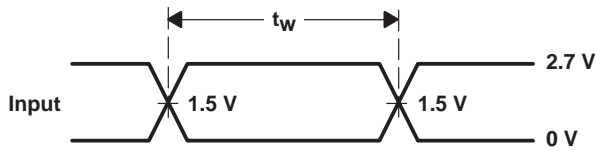
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### PARAMETER MEASUREMENT INFORMATION

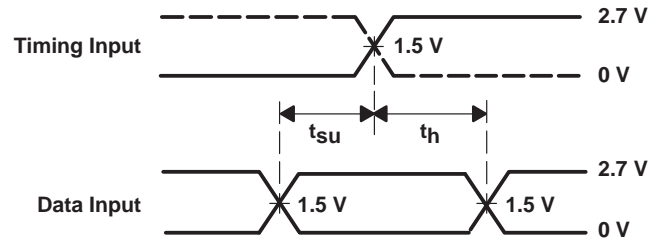


LOAD CIRCUIT

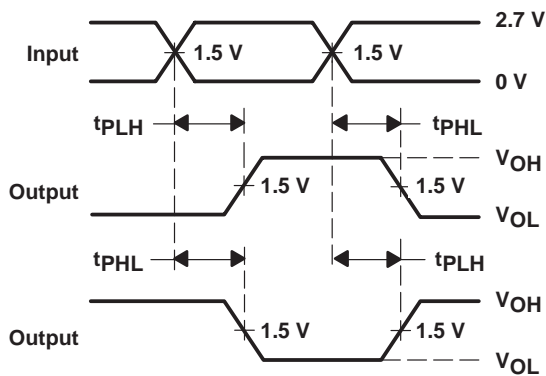
TEST	S1
$t_{PLH}/t_{PHL}$	Open
$t_{PLZ}/t_{PZL}$	6 V
$t_{PHZ}/t_{PZH}$	GND



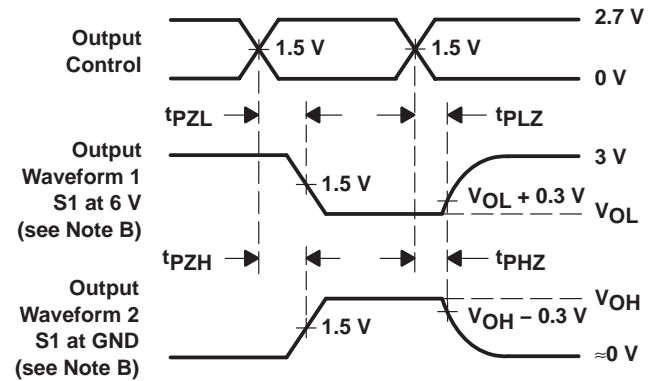
VOLTAGE WAVEFORMS  
PULSE DURATION



VOLTAGE WAVEFORMS  
SETUP AND HOLD TIMES



VOLTAGE WAVEFORMS  
PROPAGATION DELAY TIMES  
INVERTING AND NONINVERTING OUTPUTS



VOLTAGE WAVEFORMS  
ENABLE AND DISABLE TIMES  
LOW- AND HIGH-LEVEL ENABLING

- 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:  $PRR \leq 10 \text{ MHz}$ ,  $Z_O = 50 \Omega$ ,  $t_r \leq 2.5 \text{ ns}$ ,  $t_f \leq 2.5 \text{ ns}$ .  
 D. The outputs are measured one at a time with one transition per measurement.

Figure 1. Load Circuit and Voltage Waveforms

**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>
SN74LVTH273DBLE	OBSOLETE	SSOP	DB	20		TBD	Call TI	Call TI
SN74LVTH273DBR	ACTIVE	SSOP	DB	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVTH273DBRE4	ACTIVE	SSOP	DB	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVTH273DBRG4	ACTIVE	SSOP	DB	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVTH273DW	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVTH273DWE4	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVTH273DWG4	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVTH273DWR	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVTH273DWRE4	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVTH273DWRG4	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVTH273NSR	ACTIVE	SO	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVTH273NSRE4	ACTIVE	SO	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVTH273NSRG4	ACTIVE	SO	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVTH273PW	ACTIVE	TSSOP	PW	20	70	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVTH273PWE4	ACTIVE	TSSOP	PW	20	70	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVTH273PWG4	ACTIVE	TSSOP	PW	20	70	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVTH273PWLE	OBSOLETE	TSSOP	PW	20		TBD	Call TI	Call TI
SN74LVTH273PWR	ACTIVE	TSSOP	PW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVTH273PWRE4	ACTIVE	TSSOP	PW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVTH273PWRG4	ACTIVE	TSSOP	PW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM

<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)

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

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**OTHER QUALIFIED VERSIONS OF SN74LVTH273 :**

- Enhanced Product: [SN74LVTH273-EP](#)

NOTE: Qualified Version Definitions:

- Enhanced Product - Supports Defense, Aerospace and Medical Applications



**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

**TAPE AND REEL INFORMATION**

\*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
SN74LVTH273DBR	SSOP	DB	20	2000	330.0	16.4	8.2	7.5	2.5	12.0	16.0	Q1
SN74LVTH273DWR	SOIC	DW	20	2000	330.0	24.4	10.8	13.0	2.7	12.0	24.0	Q1
SN74LVTH273NSR	SO	NS	20	2000	330.0	24.4	8.2	13.0	2.5	12.0	24.0	Q1
SN74LVTH273PWR	TSSOP	PW	20	2000	330.0	16.4	6.95	7.1	1.6	8.0	16.0	Q1
SN74LVTH273PWR	TSSOP	PW	20	2000	330.0	16.4	6.95	7.1	1.6	8.0	16.0	Q1
SN74LVTH273PWRG4	TSSOP	PW	20	2000	330.0	16.4	6.95	7.1	1.6	8.0	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)
SN74LVTH273DBR	SSOP	DB	20	2000	367.0	367.0	38.0
SN74LVTH273DWR	SOIC	DW	20	2000	367.0	367.0	45.0
SN74LVTH273NSR	SO	NS	20	2000	367.0	367.0	45.0
SN74LVTH273PWR	TSSOP	PW	20	2000	364.0	364.0	27.0
SN74LVTH273PWR	TSSOP	PW	20	2000	367.0	367.0	38.0
SN74LVTH273PWRG4	TSSOP	PW	20	2000	367.0	367.0	38.0

DW (R-PDSO-G20)

PLASTIC SMALL OUTLINE

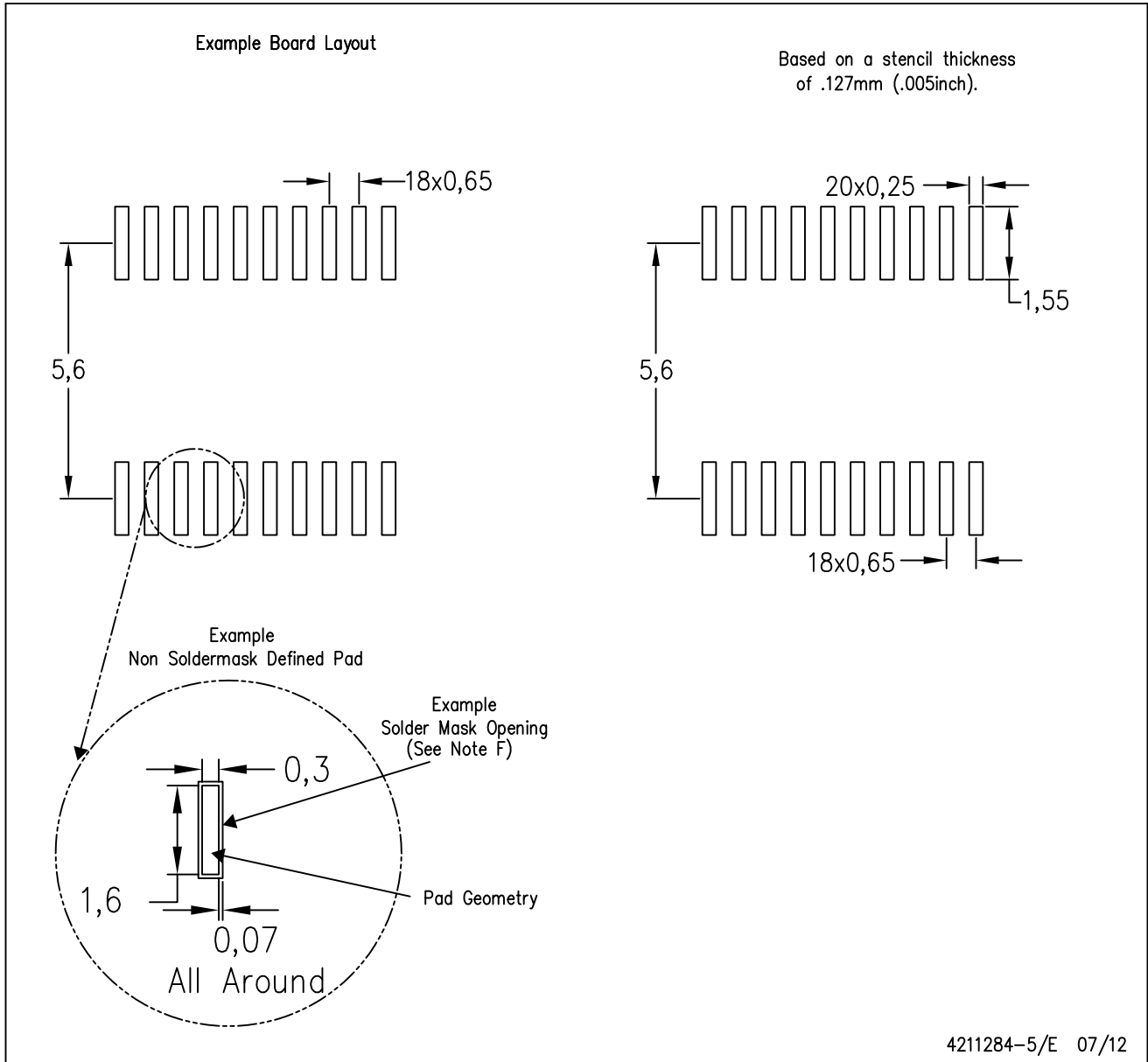


- NOTES:
- All linear dimensions are in inches (millimeters). Dimensioning and tolerancing per ASME Y14.5M-1994.
  - This drawing is subject to change without notice.
  - Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
  - Falls within JEDEC MS-013 variation AC.



PW (R-PDSO-G20)

PLASTIC SMALL OUTLINE



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

# MECHANICAL DATA

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

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN



- 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.

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

PLASTIC SMALL-OUTLINE

28 PINS SHOWN



- 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.  
 D. Falls within JEDEC MO-150

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