

SN74LV373A-Q1 具有三态输出的八路透明 D 类锁存器

1 特性

- 符合汽车应用要求
- V_{CC} 工作范围为 2V 至 5.5V
- 5V 时 t_{pd} 最大值为 8.5ns
- $V_{CC} = 3.3V$ 、 $T_A = 25^{\circ}C$ 时, V_{OHV} (输出 V_{OH} 下冲) 典型值大于 2.3V
- 所有端口上均支持以混合模式电压运行
- I_{off} 支持局部断电模式运行
- 闩锁性能超过 250mA, 符合 JESD 17 规范

2 应用

- 将数字信号与时钟同步
- 使用更少的输入来监控信号
- 将开关转换为拨动开关

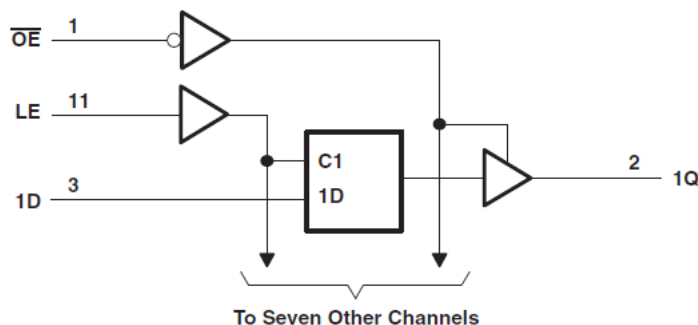
3 说明

SN74LV373A-Q1 器件是一款八路透明 D 类锁存器, 可在 2V 至 5.5 V_{CC} 下运行。在锁存使能 (LE) 输入为高电平时, Q 输出将跟随数据 (D) 输出。当 LE 为低电平时, Q 输出锁存在 D 输入端设置的逻辑电平。

封装信息⁽¹⁾

器件型号	封装	封装尺寸 (标称值)
SN74LV373A-Q1	PW (TSSOP, 20)	6.50mm × 4.40mm

(1) 如需了解所有可用封装, 请参阅数据表末尾的可订购产品附录。



逻辑图 (正逻辑)



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4 Revision History

注：以前版本的页码可能与当前版本的页码不同

Changes from Revision C (October 2007) to Revision D (March 2023)	Page
• 添加了应用、封装信息表、引脚功能表、ESD 等级表、热性能信息表、器件功能模式、应用和实施部分、电源相关建议部分、布局部分、器件和文档支持部分以及机械、封装和可订购信息部分.....	1
• Updated thermal values for PW package from $R^{\theta}_{JA} = 83$ to 128.2, all values in $^{\circ}\text{C/W}$	5

5 Pin Configuration and Functions

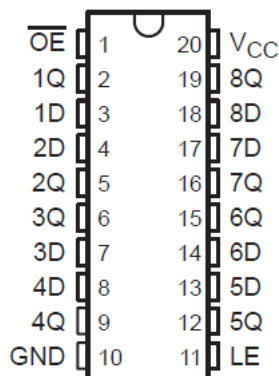


图 5-1. SN74LV373A-Q1 TSSOP -PW Package (Top View)

表 5-1. Pin Function

PIN		TYPE	DESCRIPTION
NAME	NO.		
OE	1	Input	Output enable, active low
1Q	2	Output	Output for channel 1
1D	3	Input	Input for channel 1
2D	4	Input	Input for channel 2
2Q	5	Output	Output for channel 2
3Q	6	Output	Output for channel 3
3D	7	Input	Input for channel 3
4D	8	Input	Input for channel 4
4Q	9	Output	Output for channel 4
GND	10	—	Ground
LE	11	Input	Latch enable
5Q	12	Output	Output for channel 5
5D	13	Input	Input for channel 5
6D	14	Input	Input for channel 6
6Q	15	Output	Output for channel 6
7Q	16	Output	Output for channel 7
7D	17	Input	Input for channel 7
8D	18	Input	Input for channel 8
8Q	19	Output	Output for channel 8
V _{CC}	20	—	Positive supply
Thermal Pad ₁		—	The thermal pad can be connect to GND or left floating. Do not connect to any other signal or supply.

6 Specifications

6.1 Absolute Maximum Ratings

Over operating free-air temperature range (unless otherwise noted)⁽¹⁾

			MIN	MAX	UNIT
V_{CC}	Supply voltage		- 0.5	7	V
V_I	Input voltage ⁽²⁾		- 0.5	7	V
V_O	Voltage range applied to any output in the high-impedance or power-off state ⁽²⁾		- 0.5	7	V
V_O	Output voltage ⁽²⁾ ⁽³⁾		- 0.5	$V_{CC} + 0.5$	V
I_{IK}	Input clamp current	$V_I < 0$		- 20	mA
I_{OK}	Output clamp current	$V_O < 0$		- 50	mA
I_O	Continuous output current	$V_O = 0$ to V_{CC}		± 35	mA
	Continuous current through V_{CC} or GND			± 70	mA
θ_{JA}	Package thermal impedance			83	°C/W
T_{stg}	Storage temperature		- 65	150	°C

- (1) 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. The package thermal impedance is calculated in accordance with JESD 51-7.
- (2) The input and output negative-voltage ratings may be exceeded if the input and output current ratings are observed.
- (3) This value is limited to 5.5 V maximum.

6.2 ESD Ratings

			VALUE	UNIT
$V_{(ESD)}$	Electrostatic discharge	Human body model (HBM), per AEC Q100-002 HBM ESD Classification Level 2 ⁽¹⁾	± 4000	V
		Charged device model (CDM), per AEC Q100-011 CDM ESD Classification Level C4B	± 2000	

- (1) AEC Q100-002 indicate that HBM stressing shall be in accordance with the ANSI/ESDA/JEDEC JS-001 specification.

6.3 Recommended Operating Conditions

over operating free-air temperature range (unless otherwise noted)⁽¹⁾

			MIN	MAX	UNIT
V _{CC}	Supply voltage		2	5.5	V
V _{IH}	High-level input voltage	V _{CC} = 2 V	1.5		V
		V _{CC} = 2.3 V to 2.7 V	V _{CC} × 0.7		
		V _{CC} = 3 V to 3.6 V	V _{CC} × 0.7		
		V _{CC} = 4.5 V to 5.5 V	V _{CC} × 0.7		
V _{IL}	Low-level input voltage	V _{CC} = 2 V		0.5	V
		V _{CC} = 2.3 V to 2.7 V		V _{CC} × 0.3	
		V _{CC} = 3 V to 3.6 V		V _{CC} × 0.3	
		V _{CC} = 4.5 V to 5.5 V		V _{CC} × 0.3	
V _I	Input voltage		0	5.5	V
V _O	Output voltage	High or low state	0	V _{CC}	V
		3-state	0	5.5	
I _{OH}	High-level output current	V _{CC} = 2 V		– 50	μA
		V _{CC} = 2.3 V to 2.7 V		– 2	mA
		V _{CC} = 3 V to 3.6 V		– 8	
		V _{CC} = 4.5 V to 5.5 V		– 16	
I _{OL}	Low-level output current	V _{CC} = 2 V		50	μA
		V _{CC} = 2.3 V to 2.7 V		2	mA
		V _{CC} = 3 V to 3.6 V		8	
		V _{CC} = 4.5 V to 5.5 V		16	
Δ t / Δ v	Input transition rise or fall rate	V _{CC} = 2.3 V to 2.7 V		200	ns/V
		V _{CC} = 3 V to 3.6 V		100	
		V _{CC} = 4.5 V to 5.5 V		20	
T _A	Operating free-air temperature		– 40	85	°C

(1) All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation. See [Implications of Slow or Floating CMOS Inputs](#).

6.4 Thermal Information

THERMAL METRIC ⁽¹⁾		SN74LV373A-Q1	UNIT
		PW (TSSOP)	
		20 PINS	
R _{θJA}	Junction-to-ambient thermal resistance	128.2	°C/W

(1) For more information about traditional and new thermal metrics, see [Semiconductor and IC Package Thermal Metrics](#).

6.5 Electrical Characteristics

over operating free-air temperature range (unless otherwise noted).

PARAMETER	TEST CONDITIONS	V _{CC}	MIN	TYP	MAX	UNIT
V _{OH}	I _{OH} = - 50 µA	2 V to 5.5 V	V _{CC} - 0.1			V
	I _{OH} = - 2 mA	2.3 V	2			
	I _{OH} = - 8 mA	3 V	2.48			
	I _{OH} = - 16 mA	4.5 V	3.8			
V _{OL}	I _{OL} = 50 µA	2 V to 5.5 V	0.1			V
	I _{OL} = 2 mA	2.3 V	0.4			
	I _{OL} = 8 mA	3 V	0.44			
	I _{OL} = 16 mA	4.5 V	0.55			
I _I	V _I = 5.5 V or GND	0 V to 5.5 V	±1			µA
I _{OZ}	V _O = V _{CC} or GND	5.5 V	±5			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 V	5			µA
C _i	V _I = V _{CC} or GND	3.3 V	2.9			pF

6.6 Timing Requirements, 2.5 V ± 0.2 V

over recommended operating free-air temperature range (unless otherwise noted) (see 图 7-1)

			MIN	MAX	UNIT
t _w	Pulse duration, LE high		6.5		ns
t _{su}	Setup time, data before LE ↓	High or low	5		ns
t _h	Hold time, data after LE ↓	High or low	1.5		ns

6.7 Timing Requirements, V_{CC} = 3.3 V ± 0.3 V

over recommended operating free-air temperature range (unless otherwise noted) (see 图 7-1)

			MIN	MAX	UNIT
t _w	Pulse duration, LE high		5		ns
t _{su}	Setup time, data before LE ↓	High or low	4		ns
t _h	Hold time, data after LE ↓	High or low	1		ns

6.8 Timing Requirements, V_{CC} = 5 V ± 0.5 V

over recommended operating free-air temperature range (unless otherwise noted) (see 图 7-1)

			MIN	MAX	UNIT
t _w	Pulse duration, LE high		5		ns
t _{su}	Setup time, data before LE ↓	High or low	4		ns
t _h	Hold time, data after LE ↓	High or low	1		ns

6.9 Switching Characteristics

over operating free-air temperature range (unless otherwise noted) (see 图 7-1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	2.5 V ± 0.2 V		3.3 V ± 0.3 V		5 V ± 0.5 V		UNIT
				MIN	MAX	MIN	MAX	MIN	MAX	
t _{pd}	D	Q	C _L = 15 pF	1	17	1	13.5	1	8.5	ns
	LE	Q		1	19	1	13	1	8.5	
t _{en}	OE	Q		1	19	1	13.5	1	9.5	ns
t _{dis}	OE	Q		1	15	1	12	1	8.5	ns

over operating free-air temperature range (unless otherwise noted) (see 图 7-1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	2.5 V ± 0.2 V		3.3 V ± 0.3 V		5 V ± 0.5 V		UNIT
				MIN	MAX	MIN	MAX	MIN	MAX	
t _{pd}	D	Q	C _L = 50 pF	1	21	1	17	1	10.5	ns
	LE	Q		1	22	1	16.5	1	10.5	
t _{en}	OE	Q		1	22	1	17	1	11.5	ns
t _{dis}	OE	Q		1	19	1	15	1	10.5	ns
t _{sk(o)}			C _L = 50 pF		2		1.5		1	ns

6.10 Noise Characteristics

V_{CC} = 3.3 V, C_L = 50 pF, T_A = 25°C

PARAMETER ⁽¹⁾		SN74LV373A-Q1			UNIT
		MIN	TYP	MAX	
V _{OL(P)}	Quiet output, maximum dynamic V _{OL}		0.6	0.8	V
V _{OL(V)}	Quiet output, minimum dynamic V _{OL}		- 0.6	- 0.8	V
V _{OH(V)}	Quiet output, minimum dynamic V _{OH}		2.9		V
V _{IH(D)}	High-level dynamic input voltage	2.31			V
V _{IL(D)}	Low-level dynamic input voltage			0.99	V

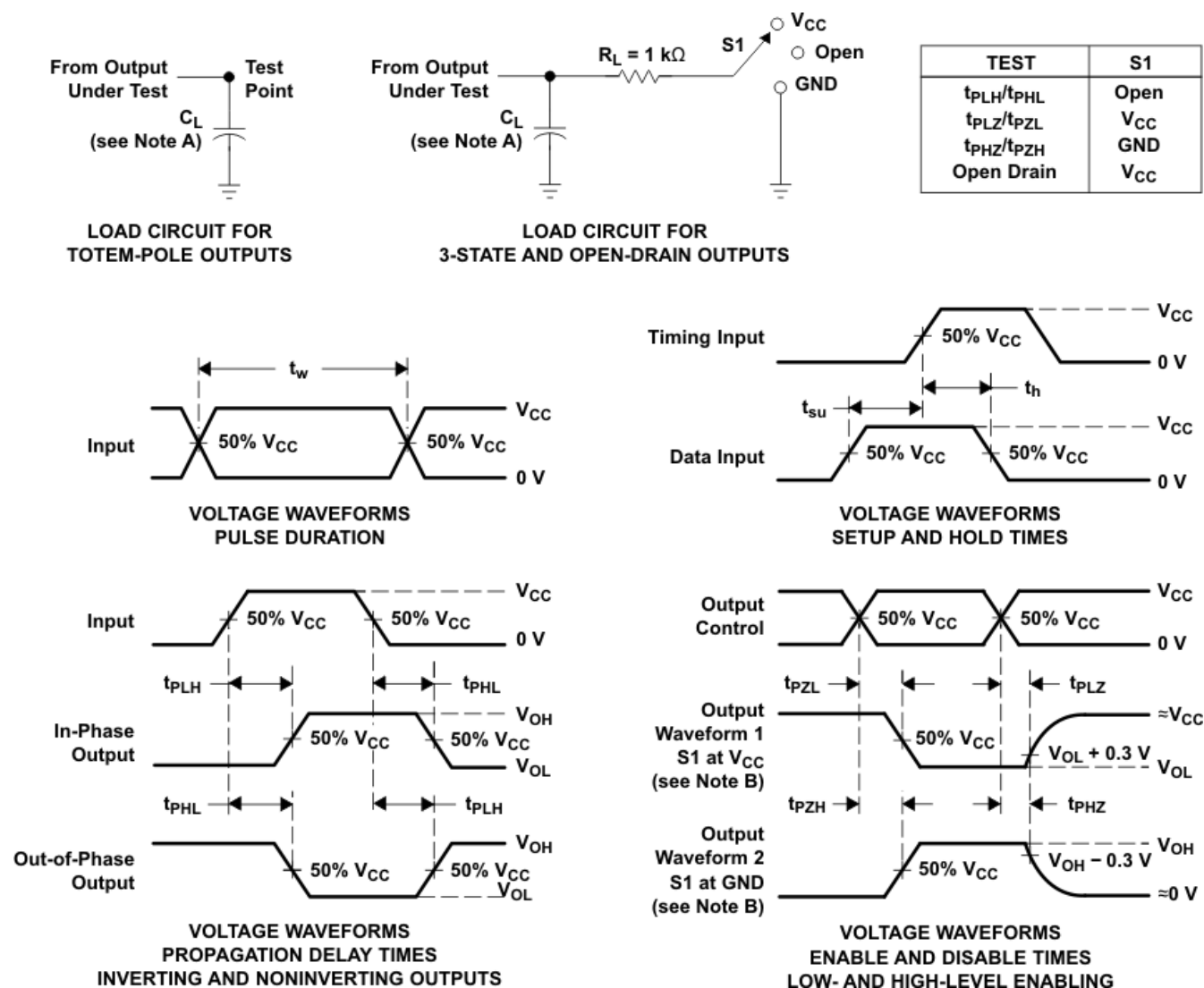
(1) Characteristics for surface-mount packages only.

6.11 Operating Characteristics

T_A = 25°C

PARAMETER		TEST CONDITIONS	V _{CC}	TYP	UNIT
C _{pd}	Power dissipation capacitance (outputs enabled)	C _L = 50 pF, f = 10 MHz	3.3 V	17.4	pF
			5 V	19.5	

7 Parameter Measurement Information



- 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: $PRR \leq 1\text{ MHz}$, $Z_O = 50\ \Omega$, $t_r \leq 3\text{ ns}$, and $t_f \leq 3\text{ ns}$.
- 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.

图 7-1. Load Circuit and Voltage Waveforms

8 Detailed Description

8.1 Overview

A buffered output-enable ($\overline{OE}$) input can be used to place the eight outputs in either a normal logic state (high or low) or the 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.

$\overline{OE}$ does not affect the internal operations of the latches. 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, $\overline{OE}$ shall 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.

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.

8.2 Functional Block Diagram

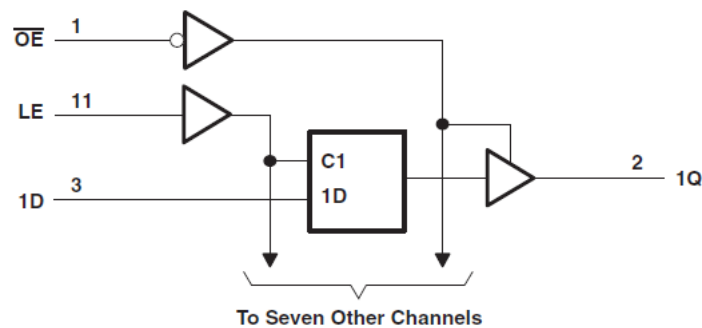


图 8-1. Logic Diagram (Positive Logic)

8.3 Device Functional Modes

表 8-1. Function Table

INPUTS ⁽¹⁾			OUTPUT ⁽²⁾
$\overline{\text{CLR}}$	CLK	D	Q
L	X	X	L
H	L, H, ↓	X	Q ₀
H	↑	L	L
H	↑	H	H

- (1) L = input low, H = input high, ↑ = input transitioning from low to high, ↓ = input transitioning from high to low, X = do not care
(2) L = output low, H = output high, Q₀ = previous state

9 Application and Implementation

备注

Information in the following applications sections is not part of the TI component specification, and TI does not warrant its accuracy or completeness. TI's customers are responsible for determining suitability of components for their purposes, as well as validating and testing their design implementation to confirm system functionality.

9.1 Power Supply Recommendations

The power supply can be any voltage between the minimum and maximum supply voltage rating located in the *Absolute Maximum Ratings* section. Each V_{CC} terminal must have a good bypass capacitor to prevent power disturbance. For devices with a single supply, TI recommends a 0.1- μ F capacitor; if there are multiple V_{CC} terminals, then TI recommends a 0.01- μ F or 0.022- μ F capacitor for each power terminal. Multiple bypass capacitors can be paralleled to reject different frequencies of noise. Frequencies of 0.1 μ F and 1 μ F are commonly used in parallel. The bypass capacitor must be installed as close as possible to the power terminal for best results.

9.2 Layout

9.2.1 Layout Guidelines

When using multiple bit logic devices, inputs should not float. In many cases, functions or parts of functions of digital logic devices are unused. Some examples are when only two inputs of a triple-input AND gate are used, or when only 3 of the 4-buffer gates are used. Such unused input pins must not be left unconnected because the undefined voltages at the outside connections result in undefined operational states. All unused inputs of digital logic devices must be connected to a logic high or logic low voltage, as defined by the input voltage specifications, to prevent them from floating. The logic level that must be applied to any particular unused input depends on the function of the device. Generally, the inputs are tied to GND or V_{CC} , whichever makes more sense for the logic function or is more convenient.

9.2.1.1 Layout Example

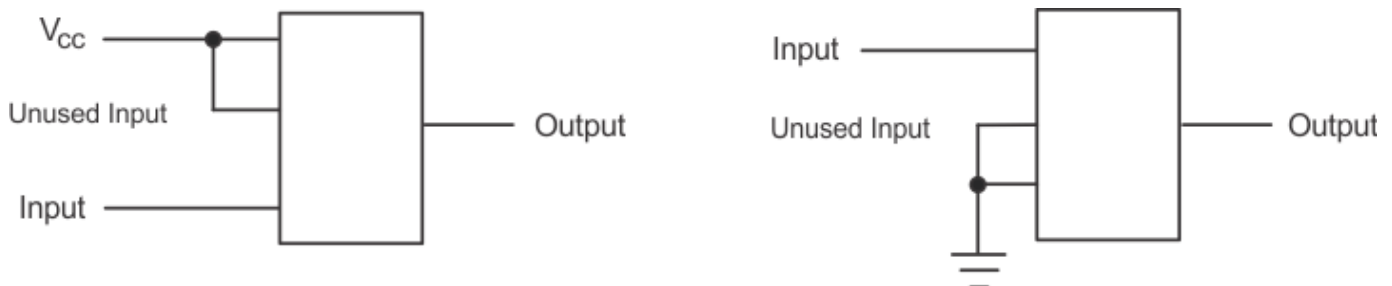


图 9-1. Layout Diagram

10 Device and Documentation Support

10.1 Documentation Support

10.1.1 Related Documentation

The table below lists quick access links. Categories include technical documents, support and community resources, tools and software, and quick access to sample or buy.

表 10-1. Related Links

PARTS	PRODUCT FOLDER	SAMPLE & BUY	TECHNICAL DOCUMENTS	TOOLS & SOFTWARE	SUPPORT & COMMUNITY
SN74LV373A-Q1	Click here	Click here	Click here	Click here	Click here

10.2 Receiving Notification of Documentation Updates

To receive notification of documentation updates—including silicon errata—go to the product folder for your device on [ti.com](#). In the upper right-hand corner, click the *Alert me* button. This registers you to receive a weekly digest of product information that has changed (if any). For change details, check the revision history of any revised document.

10.3 支持资源

TI E2E™ 支持论坛是工程师的重要参考资料，可直接从专家获得快速、经过验证的解答和设计帮助。搜索现有解答或提出自己的问题可获得所需的快速设计帮助。

链接的内容由各个贡献者“按原样”提供。这些内容并不构成 TI 技术规范，并且不一定反映 TI 的观点；请参阅 TI 的《使用条款》。

10.4 Trademarks

TI E2E™ is a trademark of Texas Instruments.

所有商标均为其各自所有者的财产。

10.5 静电放电警告



静电放电 (ESD) 会损坏这个集成电路。德州仪器 (TI) 建议通过适当的预防措施处理所有集成电路。如果不遵守正确的处理和安装程序，可能会损坏集成电路。

ESD 的损坏小至导致微小的性能降级，大至整个器件故障。精密的集成电路可能更容易受到损坏，这是因为非常细微的参数更改都可能会导致器件与其发布的规格不相符。

10.6 术语表

TI 术语表 本术语表列出并解释了术语、首字母缩略词和定义。

11 Mechanical, Packaging, and Orderable Information

The following pages include mechanical, packaging, and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the left-hand navigation.

PACKAGING INFORMATION

Orderable part number	Status (1)	Material type (2)	Package Pins	Package qty Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
SN74LV373AIPWRG4Q1	Active	Production	TSSOP (PW) 20	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	LV373AI
SN74LV373AIPWRG4Q1.A	Active	Production	TSSOP (PW) 20	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	LV373AI
SN74LV373AIPWRQ1	Active	Production	TSSOP (PW) 20	2000 LARGE T&R	Yes	NIPDAU	Level-3-260C-168 HR	-40 to 85	LV373AI
SN74LV373AIPWRQ1.A	Active	Production	TSSOP (PW) 20	2000 LARGE T&R	Yes	NIPDAU	Level-3-260C-168 HR	-40 to 85	LV373AI

⁽¹⁾ **Status:** For more details on status, see our [product life cycle](#).

⁽²⁾ **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

⁽³⁾ **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.

⁽⁴⁾ **Lead finish/Ball material:** Parts 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.

⁽⁵⁾ **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

⁽⁶⁾ **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "-" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part 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 SN74LV373A-Q1 :

- Catalog : [SN74LV373A](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product

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
SN74LV373AIPWRG4Q1	TSSOP	PW	20	2000	330.0	16.4	6.95	7.0	1.4	8.0	16.0	Q1
SN74LV373AIPWRQ1	TSSOP	PW	20	2000	330.0	16.4	6.95	7.0	1.4	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)
SN74LV373AIPWRG4Q1	TSSOP	PW	20	2000	353.0	353.0	32.0
SN74LV373AIPWRQ1	TSSOP	PW	20	2000	353.0	353.0	32.0



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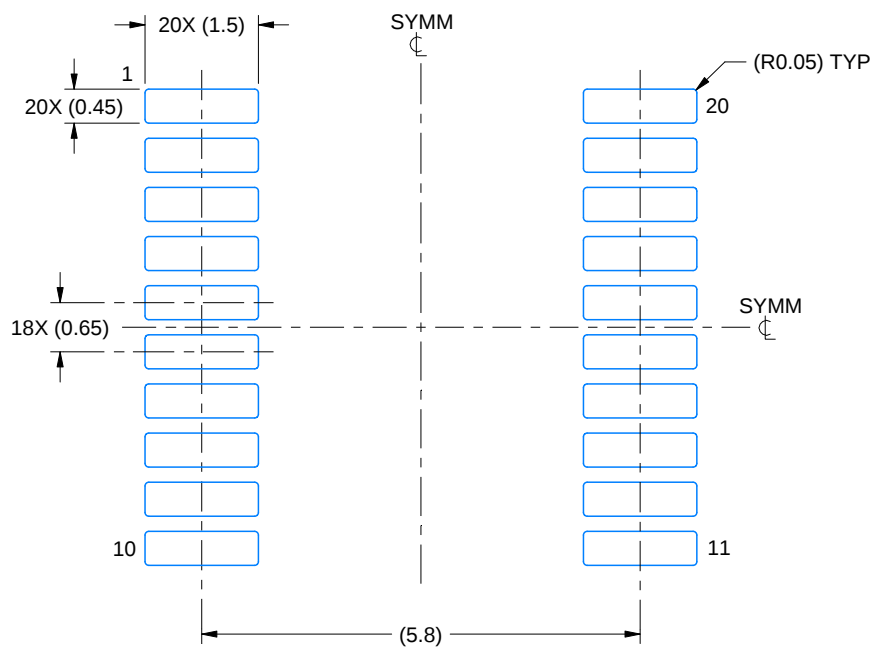
NOTES:

1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm per side.
4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm per side.
5. Reference JEDEC registration MO-153.

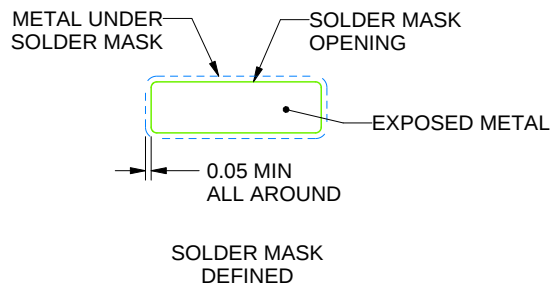
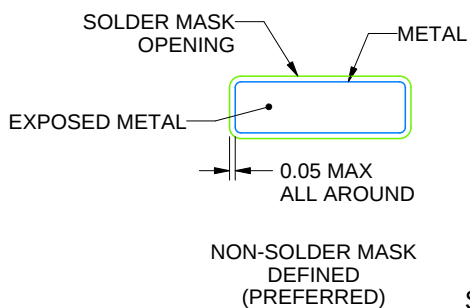
PW0020A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 10X



SOLDER MASK DETAILS

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NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

EXAMPLE STENCIL DESIGN

PW0020A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE: 10X

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NOTES: (continued)

8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

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