

CDx4AC574、CDx4ACT574 三态正边沿触发式八路 D 型触发器

1 特性

- 防 SCR 闩锁 CMOS 工艺和电路设计
- 双极 FAST*/AS/S 的速度，同时功耗显著降低
- 平衡传播延迟
- 交流类型的工作电压范围为 1.5V 至 5.5V，并在电源电压的 30% 时具有平衡的抗噪性能
- $\pm 24\text{mA}$ 输出驱动电流
 - 扇出到 15 个 FAST* IC
 - 驱动 $50\ \Omega$ 传输线路

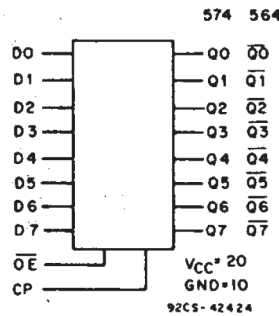
2 说明

CDx4AC574 和 CDx4ACT574 三态正边沿触发式八路 D 型触发器使用 RCA 高级 CMOS 技术。

器件信息

器件型号	封装 ⁽¹⁾	封装尺寸 ⁽²⁾	本体尺寸 ⁽³⁾
CDx4AC/ACT574	DW (SOIC, 20)	12.80mm × 10.3mm	12.80mm × 7.50mm
	N (PDIP, 20)	24.33mm × 9.4mm	24.33mm × 6.35mm

- (1) 有关所有可用封装，请参阅节 10。
- (2) 封装尺寸 (长 × 宽) 为标称值，并包括引脚 (如适用)。
- (3) 本体尺寸 (长 × 宽) 为标称值，不包括引脚。



功能方框图

*FAST 是 Fairchild Semiconductor Corp. 的注册商标。



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3 Pin Configuration and Functions

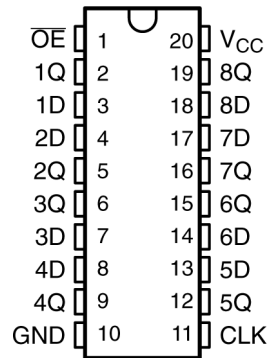


图 3-1. CDx4AC/ACT574 DW Package, 20-Pin SOIC; N Package, 20-Pin PDIP (Top View)

表 3-1. Pin Functions

PIN		TYPE	DESCRIPTION
NAME	NO.		
OE	1	I	Active low enable
1Q	2	O	Data output
1D	3	I	Data input
2D	4	I	Data input
2Q	5	O	Data output
3Q	6	O	Data output
3D	7	I	Data input
4D	8	I	Data input
4Q	9	O	Data output
GND	10	-	Ground pin
CLK	11	I	Clock pin
5Q	12	O	Data output
5D	13	I	Data input
6D	14	I	Data input
6Q	15	O	Data output
7Q	16	O	Data output
7D	17	I	Data input
8D	18	I	Data input
8Q	19	O	Data output
V _{CC}	20	-	Power pin

4 Specifications

4.1 Absolute Maximum Ratings

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

		MIN	MAX	UNIT
V _{CC}	Supply-voltage	-0.5	6	V
I _{IK}	Input diode current	(V _I < -0.5 V or V _I > V _{CC} + 0.5 V)	±20	mA
I _{OK}	Output diode current	(V _O < -0.5 V or V _O > V _{CC} + 0.5 V)	±50	mA
I _O	Output source or sink current per output pin	(V _O > -0.5 V or V _O < V _{CC} ± 0.5 V)	±50	mA
V _{CC} or ground current (I _{CC} or I _{GND})			±100	mA ⁽²⁾
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.
- (2) For up to 4 outputs per device; add ± 25 mA for each additional output.

4.2 ESD Ratings

			VALUE	UNIT
V _(ESD)	Electrostatic discharge	Human body model (HBM), per ANSI/ESDA/JEDEC JS-001, all pins ⁽¹⁾	±2000	V

- (1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.

4.3 Recommended Operating Conditions

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

CHARACTERISTIC		MIN	MAX	UNIT
V _{CC} ⁽²⁾	Supply-voltage range: (For T _A = full package-temperature range)			
	AC types	1.5	5.5	V
	ACT types	4.5	5.5	V
V _I , V _O	Input or output voltage	0	V _{CC}	V
T _A	Operating temperature	-55	+ 125	°C
dt/dv	Input rise and fall slew rate			
	at 1.5 V to 3 V (AC types)	0	50	ns/V
	at 3.6 V to 5.5 V (AC types)	0	20	ns/V
	at 4.5 V to 5.5 V (ACT types)	0	10	ns/V

- (1) 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](#).
- (2) Unless otherwise specified, all voltages are referenced to ground.

4.4 Thermal Information

THERMAL METRIC ⁽¹⁾		CDx4AC/ACT574		UNIT
		DW (SOIC)	N (PDIP)	
		20 PINS	20 PINS	
R _{θJA}	Junction-to-ambient thermal resistance	101.2	50	°C/W

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

4.5 Static Electrical Characteristics: AC Series

CHARACTERISTICS	TEST CONDITIONS		V _{CC} (V)	AMBIENT TEMPERATURE (T _A) - °C						UNIT
				+25		-40 to +85		-55 to +125		
	V _I (V)	I _O (mA)		MIN	MAX	MIN	MAX	MIN	MAX	
V _{IH} High-Level Input Voltage			1.5	1.2	—	1.2	—	1.2	—	V
			3	2.1	—	2.1	—	2.1	—	
			5.5	3.85	—	3.85	—	3.85	—	
V _{IL} Low-Level Input Voltage			1.5	—	0.3	—	0.3	—	0.3	V
			3	—	0.9	—	0.9	—	0.9	
			5.5	—	1.65	—	1.65	—	1.65	
V _{OH} High-Level Output Voltage	V _{IH} or V _{IL} (1), (2)	-0.05	1.5	1.4	—	1.4	—	1.4	—	V
		-0.05	3	2.9	—	2.9	—	2.9	—	
		-0.05	4.5	4.4	—	4.4	—	4.4	—	
		-4	3	2.58	—	2.48	—	2.4	—	
		-24	4.5	3.94	—	3.8	—	3.7	—	
		-75	5.5	—	—	3.85	—	—	—	
V _{OL} Low-Level Output Voltage	V _{IH} or V _{IL} (1), (2)	0.05	1.5	—	0.1	—	0.1	—	0.1	V
		0.05	3	—	0.1	—	0.1	—	0.1	
		0.05	4.5	—	0.1	—	0.1	—	0.1	
		12	3	—	0.36	—	0.44	—	0.5	
		24	4.5	—	0.36	—	0.44	—	0.5	
		75	5.5	—	—	—	1.65	—	—	
I _I Input Leakage Current	V _{CC} or GND		5.5	—	±0.1	—	±1	—	±1	μA
I _{OZ} 3-State Leakage Current	V _{IH} or V _{IL} V _O = V _{CC} or GND		5.5	—	±0.5	—	±5	—	±10	μA
I _{CC} Quiescent Supply Current, MSI	V _{CC} or GND	0	5.5	—	8	—	80	—	160	μA

(1) Test one output at a time for a 1-second maximum duration. Measurement is made by forcing current and measuring voltage to minimize power dissipation.

(2) Test verifies a minimum 50-ohm transmission-line-drive capability at +85°C. 75 ohms at +125°C.

4.6 Static Electrical Characteristics: ACT Series

CHARACTERISTICS	TEST CONDITIONS		V _{CC} (V)	AMBIENT TEMPERATURE (T _A) - °C						UNIT
				+25		-40 to +85		-55 to +125		
	V _I (V)	I _O (mA)		MIN	MAX	MIN	MAX	MIN	MAX	
V _{IH} High-Level Input Voltage			4.5 to 5.5	2	—	2	—	2	—	V
V _{IL} Low-Level Input Voltage			4.5 to 5.5	—	0.8	—	0.8	—	0.8	V
V _{OH} High-Level Output Voltage	V _{IH} or V _{IL} (1), (2)	-0.05	4.5	4.4	—	4.4	—	4.4	—	V
		-24	4.5	3.94	—	3.8	—	3.7	—	
		-75	5.5	—	—	3.85	—	—	—	
		-50	5.5	—	—	—	—	3.85	—	

CHARACTERISTICS	TEST CONDITIONS		V _{CC} (V)	AMBIENT TEMPERATURE (T _A) - °C						UNIT
				+25		-40 to +85		-55 to +125		
	V _I (V)	I _O (mA)		MIN	MAX	MIN	MAX	MIN	MAX	
V _{OL} Low-Level Output Voltage	V _{IH} or V _{IL} (1), (2)	0.05	4.5	—	±0.1	—	±1	—	±1	V
		24	4.5	—	0.36	—	0.44	—	0.5	
		75	5.5	—	—	—	1.65	—	—	
		50	5.5	—	—	—	—	—	1.65	
I _I Input Leakage Current	V _{CC} or GND		5.5	—	±0.1	—	±1	—	±1	μA
I _{OZ} 3-State Leakage Current	V _{IH} or V _{IL} V _O = V _{CC} or GND		5.5	—	±0.5	—	±5	—	±10	μA
I _{CC} Quiescent Supply Current, MSI	V _{CC} or GND	0	5.5	—	8	—	80	—	160	μA
ΔI _{CC} Additional Quiescent Supply Current per Input Pin	V _{CC} -2.1		4.5 to 5.5	—	2.4	—	2.8	—	3	mA
		TTL Inputs High								
		1 Unit Load								

- (1) Test one output at a time for a 1-second maximum duration. Measurement is made by forcing current and measuring voltage to minimize power dissipation.
- (2) Test verifies a minimum 50-ohm transmission-line-drive capability at +85°C, 75 ohms at +125°C.

表 4-1. Act Input Loading Table

INPUT	UNIT LOADS ⁽¹⁾
D, OE	0-7
CP	1.17

- (1) Unit load is ΔI_{CC} limit specified in Static Characteristics Chart, e.g., 2.4 mA max. @ 25°C.

4.7 Prerequisite for Switching: AC Series

SYMBOL	CHARACTERISTICS	V _{CC} (V)	AMBIENT TEMPERATURE (T _A) - °C				UNIT
			-40 to +85		-55 to +125		
			MIN	MAX	MIN	MAX	
t _w	Clock Pulse Width	1.5	44	—	50	—	ns
		3.3 ⁽¹⁾	4.9	—	5.6	—	
		5 ⁽²⁾	3.5	—	4	—	
t _{SU}	Setup Time Data to Clock	1.5	2	—	2	—	ns
		3.3	2	—	2	—	
		5	2	—	2	—	
t _H	Hold Time Data to Clock	1.5	2	—	2	—	ns
		3.3	2	—	2	—	
		5	2	—	2	—	
f _{MAX}	Maximum Clock Frequency	1.5	11	—	10	—	MHz
		3.3	101	—	89	—	
		5	143	—	125	—	

- (1) 3.3 V; min. is @ 3 V
- (2) 5 V; min. is @ 4.5 V

4.8 Switching Characteristics: AC Series

$t_r, t_f = 3 \text{ ns}, C_L = 50 \text{ pF}$

SYMBOL	CHARACTERISTICS	V _{CC} (V)	AMBIENT TEMPERATURE (T _A) -°C				UNIT
			-40 to +85		-55 to +125		
			MIN	MAX	MIN	MAX	
t _{PLH} t _{PHL}	Propagation Delays: Clock to Q AC574	1.5	—	123	—	135	ns
		3.3 ⁽¹⁾	4	13.7	3.8	15.1	
		5 ⁽²⁾	2.9	9.8	2.7	10.8	
t _{PLH} t _{PHL}	Clock to \bar{Q} AC564	1.5	—	128	—	141	ns
		3.3	4.1	14.4	4	15.8	
		5	2.9	10.3	2.8	11.3	
t _{PZL} t _{PZH}	Output Enable to Q, \bar{O}	1.5	—	165	—	181	ns
		3.3	5.6	19.2	5.5	21.8	
		5	3.7	13.2	3.6	14.5	
t _{PLZ} t _{PHZ}	Output Disable to Q, \bar{Q}	1.5	—	165	—	181	ns
		3.3	4.7	16.5	4.5	18.1	
		5	3.7	13.2	3.6	14.5	
C _{PD} ⁽³⁾	Power Dissipation Capacitance	—	67 Typ.		67 Typ.		pF
V _{OHV}	Min. (Valley) V _{OH}		4 Typ. @25°C				V
	During Switching of Other Outputs (Output Under Test Not Switching)	5					
V _{OLP}	Max. (Peak) V _{OL}		1 Typ. @25°C				V
	During Switching of Other Outputs (Output Under Test Not Switching)	5					
C _I	Input Capacitance	—	—	10	—	10	pF
C _O	3-State Output Capacitance	—	—	15	—	15	pF

(1) 3.3 V: min. is @ 3.6 V

(2) 5 V: min. is @ 5.5 V

(3) C_{PD} is used to determine the dynamic power consumption, per flip flop.

4.9 Prerequisite for Switching: ACT Series

SYMBOL	CHARACTERISTICS	V _{CC} (V)	AMBIENT TEMPERATURE (T _A) -°C				UNIT
			-40 to +85		-55 to +125		
			MIN	MAX	MIN	MAX	
t _W	Clock Pulse Width	5 ⁽¹⁾	3.9	—	4.5	—	ns
t _{SU}	Setup Time Data to Clock	5	2	—	2	—	ns
t _H	Hold Time Data to Clock	5	2.6	—	3	—	ns
f _{MAX}	Maximum Clock Frequency	5	125	—	110	—	MHz

(1) 5 V: min. is @ 4.5 V

4.10 Switching Characteristics: ACT Series

$t_r, t_f = 3 \text{ ns}, C_L = 50 \text{ pF}$

SYMBOL	CHARACTERISTICS	V _{CC} (V)	AMBIENT TEMPERATURE (T _A) -°C				UNITS
			-40 to +85		-55 to +125		
			MIN	MAX	MIN	MAX	
t _{PLH} t _{PHL}	Propagation Delays: Clock to Q ACT574	5 ⁽¹⁾	2.9	10.2	2.8	11.2	ns
t _{PLH} t _{PHL}	Clock to \bar{Q} ACT564	5	3	10.6	2.9	11.7	ns

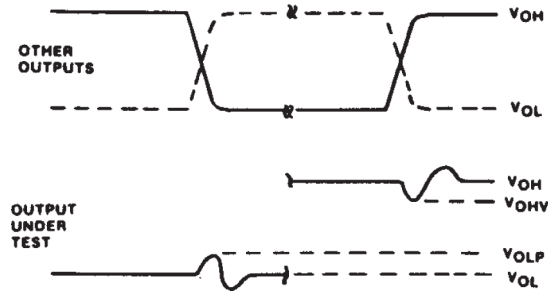
$t_r, t_f = 3 \text{ ns}, C_L = 50 \text{ pF}$

SYMBOL	CHARACTERISTICS	V _{CC} (V)	AMBIENT TEMPERATURE (T _A) -°C				UNITS
			-40 to +85		-55 to +125		
			MIN	MAX	MIN	MAX	
t _{PLZ} t _{PHZ} t _{PZL} t _{PZH}	Output Enable and Disable to Q ACT574	5	3.7	13.2	3.6	14.5	ns
t _{PLZ} t _{PHZ} t _{PZL} t _{PZH}	Output Enable and Disable to \bar{Q} ACT564	5	3.7	13.2	3.6	14.5	ns
C _{PD} ⁽²⁾	Power Dissipation Capacitance	—	67 Typ.		67 Typ.		pF
V _{OHV}	Min. (Valley) V _{OH} During Switching of Other Outputs (Output Under Test Not Switching)	5	4 Typ. @25°C				V
V _{OLP}	Max. (Peak) V _{OL} During Switching of Other Outputs (Output Under Test Not Switching)	5	1 Typ. @ 25°C				V
C _I	Input Capacitance	—	—	10	—	10	pF
C _O	3-State Output Capacitance	—	—	15	—	15	pF

(1) 5 V: min. is @ 5.5 V

(2) C_{PD} is used to determine the dynamic power consumption, per flip flop.

5 Parameter Measurement Information



- A. V_{OHV} AND V_{OLP} are measured with respect to a ground REFERENCE NEAR THE OUTPUT UNDER TEST.
- B. INPUT PULSES HAVE THE FOLLOWING CHARACTERISTICS: $PRR \leq 1$ MHz, $t_r = 3$ ns, $t_f = 3$ ns, SKEW 1 ns.
- C. R.F. FIXTURE WITH 700-MHz DESIGN RULES REQUIRED. IC SHOULD BE SOLDERED INTO TEST BOARD AND BYPASSED WITH $0.1 \mu\text{F}$ CAPACITOR. SCOPE AND PROBES REQUIRE 700-MHz BANDWIDTH.
- D. 92CS-42406

图 5-1. Simultaneous Switching Transient Waveforms.

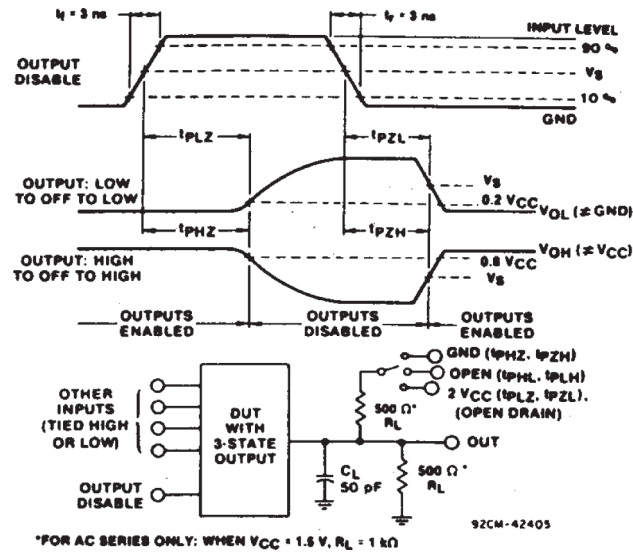
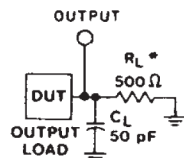
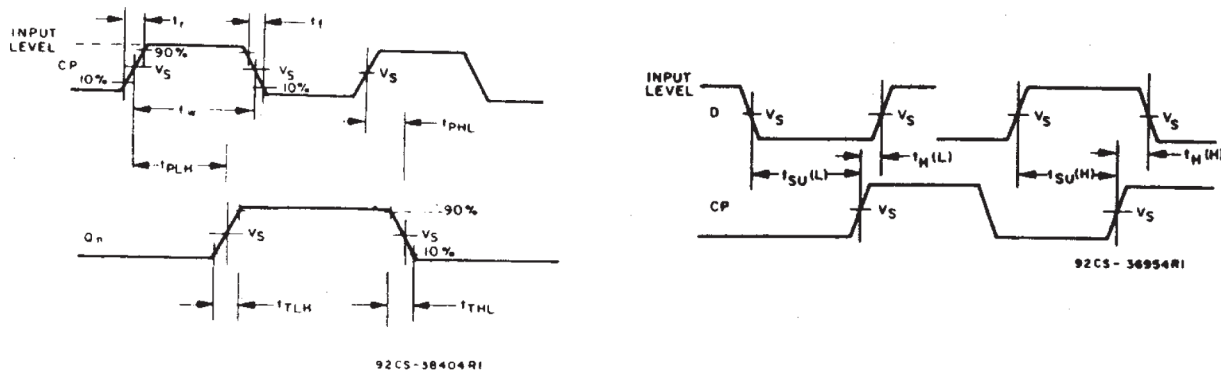


图 5-2. Three-state Propagation Delay Waveforms and Test Circuit.



*FOR AC SERIES ONLY: WHEN
VCC = 1.5 V, RL = 1 kΩ

92LS-42189

图 5-3. Propagation Delays Times and Test Circuit.

	CD54/74AC	CD54/74ACT
Input Level	V _{CC}	3 V
Input Switching Voltage, V _S	0.5 V _{CC}	1.5 V
Output Switching Voltage, V _S	0.5 V _{CC}	0.5 V _{CC}

6 Detailed Description

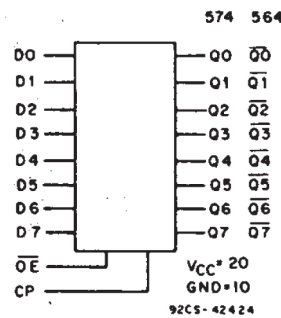
6.1 Overview

The CD54/74AC574 and the CD54/74ACT574 octal D-type, 3-state, positive-edge-triggered flip-flops use the RCA ADVANCED CMOS technology. The eight flip-flops enter data into their registers on the LOW-to-HIGH transition of the clock (CP). The Output Enable (\overline{OE}) controls the 3-state outputs and is independent of the register operation. When the Output Enable (\overline{OE}) is HIGH, the outputs are in the high-impedance state. The CD54/74AC/ACT574 share the same pin configurations, and the CD54/74AC/ACT574 has non-inverted outputs.

The CD74AC/ACT574 are supplied in 20-lead dual-in-line plastic packages (E suffix) and in 20-lead dual-in-line small-outline plastic packages (M suffix). Both package types are operable over the following temperature ranges: Commercial (0 to 70°C); Industrial (-40 to +85°C); and Extended Industrial/Military (-55 to +125°C).

The CD54AC/ACT574, available in chip form (H suffix), are operable over the -55 to +125°C temperature range.

6.2 Functional Block Diagram



6.3 Device Functional Modes

表 6-1. Truth Table

Output Enable	Latch Enable	Data	AC/ACT373 Output
L	H	H	H
L	H	L	L
L	L	I	L
L	L	h	H
H	X	X	Z

7 Application and Implementation

备注

以下应用部分中的信息不属于 TI 器件规格的范围，TI 不担保其准确性和完整性。TI 的客户应负责确定器件是否适用于其应用。客户应验证并测试其设计，以确保系统功能。

7.1 Power Supply Recommendations

The power supply can be any voltage between the min and max supply voltage rating located in [节 4.3](#).

Each V_{CC} terminal should have a good bypass capacitor to prevent power disturbance. For devices with a single supply, TI recommends 0.1 μF and if there are multiple V_{CC} terminals, then TI recommends .01 μF or .022 μF for each power terminal. It is okay to parallel multiple bypass capacitors to reject different frequencies of noise. A 0.1 μF and 1 μF are commonly used in parallel. The bypass capacitor should be installed as close to the power terminal as possible for best results.

7.2 Layout

7.2.1 Layout Guidelines

When using multiple bit logic devices inputs should not ever float. In many cases, functions or parts of functions of digital logic devices are unused, for example, when only two inputs of a triple-input AND gate are used or only three of the four buffer gates are used. Such input pins should not be left unconnected because the undefined voltages at the outside connections result in undefined operational states. Specified below are the rules that must be observed under all circumstances. All unused inputs of digital logic devices must be connected to a high or low bias to prevent them from floating. The logic level that should be applied to any particular unused input depends on the function of the device. Generally they will be tied to GND or V_{CC} whichever make more sense or is more convenient. Floating outputs is generally acceptable, unless the part is a transceiver. If the transceiver has an output enable pin it will disable the outputs section of the part when asserted. This will not disable the input section of the I.O's so they also cannot float when disabled.

8 Device and Documentation Support

8.1 Documentation Support (Analog)

8.1.1 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 8-1. Related Links

PARTS	PRODUCT FOLDER	SAMPLE & BUY	TECHNICAL DOCUMENTS	TOOLS & SOFTWARE	SUPPORT & COMMUNITY
CD54AC574	Click here	Click here	Click here	Click here	Click here
CD74AC574	Click here	Click here	Click here	Click here	Click here
CD54ACT574	Click here	Click here	Click here	Click here	Click here
CD74ACT574	Click here	Click here	Click here	Click here	Click here

8.2 接收文档更新通知

要接收文档更新通知，请导航至 ti.com 上的器件产品文件夹。点击 [通知](#) 进行注册，即可每周接收产品信息更改摘要。有关更改的详细信息，请查看任何已修订文档中包含的修订历史记录。

8.3 支持资源

[TI E2E™ 中文支持论坛](#) 是工程师的重要参考资料，可直接从专家处获得快速、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，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](#)。

8.4 Trademarks

TI E2E™ is a trademark of Texas Instruments.

所有商标均为其各自所有者的财产。

8.5 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。

8.6 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。

9 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 * (December 1998) to Revision A (May 2024)	Page
• 添加了 器件信息表 、 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 、 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 R ^θ JA values: DW = 40 to 101.2, all values in °C/W	4

10 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.

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