

## CD74AC540、CDx4ACT54x、CDx4AC541 八路三态缓冲器/线路驱动器

### 1 特性

- 防 SCR 闩锁 CMOS 工艺和电路设计
- 双极 FAST<sup>®</sup>/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。
- ±24mA 输出驱动电流
  - 扇出到 15 个 FAST<sup>®</sup> IC
  - 驱动 50 Ω 传输线路

CD54/74AC/ACT540 是具有两个低电平有效输出使能端的反相三态缓冲器。CD54/74AC/ACT541 是具有两个低电平有效输出使能端的同相三态缓冲器。

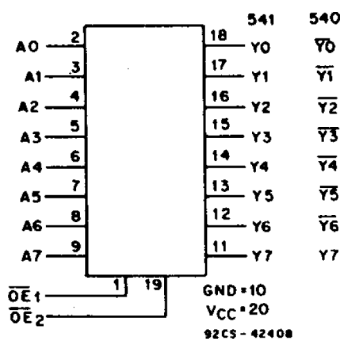
#### 器件信息

器件型号	封装 <sup>(1)</sup>	封装尺寸 <sup>(2)</sup>	本体尺寸 <sup>(3)</sup>
CD74AC540、 CDx4ACT54x、 CDx4AC541	DW (SOIC, 20)	12.8mm x 10.3mm	12.8mm x 7.5mm
	DB (SSOP, 20)	7.2mm x 7.8mm	7.2mm x 5.3mm
	N (PDIP, 20)	24.33mm x 9.4mm	24.33mm x 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。

### 2 说明

CD54/74AC540、-541 和 CD54/74ACT540、-541 八路缓冲器/线路驱动器使用 RCA 高级 CMOS 技术。



功能方框图

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### 3 Pin Configuration and Functions

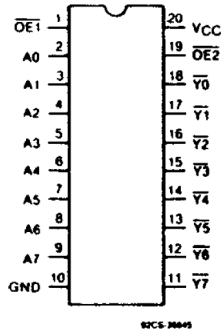


图 3-1. CDx4AC540, CDx4ACT540

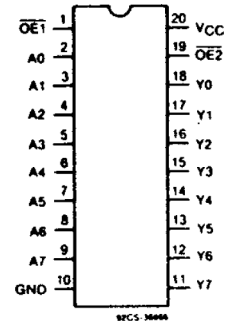


图 3-2. CDx4AC541, CDx4ACT541

表 3-1. Pin Functions

PIN			
NO.	NAME	I/O <sup>1</sup>	DESCRIPTION
!MR	1	I	Master reset, active low
Q0	2	O	Output Q0
D0	3	I	Input D0
D1	4	I	Input D1
Q1	5	O	Output Q1
Q2	6	O	Output Q2
D2	7	I	Input D2
D3	8	I	Input D3
Q3	9	O	Output Q3
GND	10	-	Ground
CP	11	I	Clock, rising edge triggered
Q4	12	O	Output Q4
D4	13	I	Input D4
D5	14	I	Input D5
Q5	15	O	Output Q5
Q6	16	O	Output Q6
D6	17	I	Input D6
D7	18	I	Input D7
Q7	19	O	Output Q7
V <sub>CC</sub>	20	-	Supply

1. I = input, O = output, P = power, FB = feedback, GND = ground, N/A = not applicable

## 4 Specifications

### 4.1 Absolute Maximum Ratings

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

		MIN	MAX	UNIT
V <sub>CC</sub>	Supply voltage	-0.5	6	V
I <sub>IK</sub>	Input diode current (V <sub>I</sub> < -0.5 or V <sub>I</sub> > V <sub>CC</sub> + 0.5 V)		±20	mA
I <sub>OK</sub>	Output diode current (V <sub>O</sub> < -0.5 or V <sub>O</sub> > V <sub>CC</sub> + 0.5 V)		±50	mA
I <sub>O</sub>	Output source or sink current per output PIN (V <sub>O</sub> > -0.5 or V <sub>O</sub> < V <sub>CC</sub> + 0.5 V)		±50	mA
	V <sub>CC</sub> or ground current, I <sub>CC</sub> or I <sub>GND</sub> <sup>(1)</sup>		±100	mA
T <sub>stg</sub>	Storage temperature	-65	+150	°C

(1) For up to 4 outputs per device: add ±25 mA for each additional output.

### 4.2 ESD Ratings

		VALUE	UNIT
V <sub>(ESD)</sub>	Electrostatic discharge Human-body model (HBM), per ANSI/ESDA/ JEDEC JS-001 <sup>1</sup>	±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)<sup>(1)</sup>

		MIN	MAX	UNIT
V <sub>CC</sub>	Supply voltage (For T <sub>A</sub> = full package-temperature range) AC types ACT types	1.5 4.5	5.5 5.5	V V
V <sub>I</sub> , V <sub>O</sub>	Input or output voltage	0	V <sub>CC</sub>	V
T <sub>A</sub>	Operating temperature	-55	+125	°C
dt/dv	Input rise and fall slew rate at 1.5V to 3V (AC types) at 3.6V to 5.5V (AC types) at 4.5V to 5.5V (ACT types)	0 0 0	50 20 10	ns/V ns/V ns/V

(1) Unless otherwise specified, all voltages are referenced to ground.

### 4.4 Thermal Information

THERMAL METRIC <sup>(1)</sup>		CD74AC540, CDx4ACT54x, CDx4AC541		UNIT
		N (PDIP)	DW (SOIC)	
		20 PINS	20 PINS	
R <sub>θJA</sub>	Thermal Resistance	69	101.2	°C/W

(1) The package thermal impedance is calculated in accordance with JESD 51.

## 4.5 Electrical Characteristics, AC Series

PARAMETER	TEST CONDITIONS		V <sub>CC</sub> (V)	(T <sub>A</sub> ) - °C						UNIT
				+25		-40 to +85		-55 to +125		
	V <sub>I</sub> (V)	I <sub>O</sub> (mA)		MIN	MAX	MIN	MAX	MIN	MAX	
V <sub>IH</sub> 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 <sub>IL</sub> 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 <sub>OH</sub> High-level output voltage	V <sub>IH</sub> or V <sub>IL</sub> (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	—	—	—	
		-50	5.5	—	—	—	—	3.85	—	
V <sub>OL</sub> Low-level output voltage	V <sub>IH</sub> or V <sub>IL</sub> (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	—	—	
		50	5.5	—	—	—	—	—	1.65	
I <sub>I</sub> Input leakage current	V <sub>CC</sub> or GND		5.5	—	±0.1	—	±1	—	±1	μA
I <sub>OZ</sub> 3-state leakage current	V <sub>IH</sub> or V <sub>IL</sub> V <sub>O</sub> = V <sub>CC</sub> or GND		5.5	—	±0.5	—	±5	—	±10	μA
I <sub>CC</sub> Quiescent supply current, MSI	V <sub>CC</sub> 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 Electrical Characteristics, ACT Series

PARAMETER	TEST CONDITIONS		V <sub>CC</sub> (V)	(T <sub>A</sub> ) - °C						UNIT	
				+25		-40 to +85		-55 to +125			
	V <sub>I</sub> (V)	I <sub>O</sub> (mA)		MIN	MAX	MIN	MAX	MIN	MAX		
V <sub>IH</sub>	High-level input voltage		4.5 to 5.5	2	—	2	—	2	—	V	
V <sub>IL</sub>	Low-level input voltage		4.5 to 5.5	—	0.8	—	0.8	—	0.8	V	
V <sub>OH</sub>	High-level output voltage	V <sub>IH</sub> or V <sub>IL</sub> (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	—	
V <sub>OL</sub>	Low-level output voltage	V <sub>IH</sub> or V <sub>IL</sub> (1), (2)	0.05	4.5	—	0.1	—	0.1	—	0.1	V
			24	4.5	—	0.36	—	0.44	—	0.5	
			75	5.5	—	—	—	1.65	—	—	
			50	5.5	—	—	—	—	—	1.65	
I <sub>I</sub>	Input leakage current	V <sub>CC</sub> or GND	5.5	—	±0.1	—	±1	—	±1	μA	
I <sub>OZ</sub>	3-state leakage current	V <sub>IH</sub> or V <sub>IL</sub> V <sub>O</sub> = V <sub>CC</sub> or GND	5.5	—	±0.5	—	±5	—	±10	μA	
I <sub>CC</sub>	Quiescent supply current, MSI	V <sub>CC</sub> or GND	0	5.5	—	8	—	80	—	160	μA
	Additional quiescent supply current per input pin	V <sub>CC</sub> -2.1	4.5 to 5.5	—	2.4	—	28	—	3	mA	
Δ I <sub>CC</sub>	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 LOAD <sup>(2)</sup>	
	540	541
DATA	1.42	0.5
OE1, OE2	1.3	1.3

## 4.7 Switching Characteristics, AC Series

 $t_r, t_f = 3\text{ns}, C_L = 50\text{pF}$  (See 节 5)

PARAMETER			V <sub>CC</sub> (V)	(T <sub>A</sub> ) - °C				UNIT
				-40 to +85		-55 to +125		
				MIN	MAX	MIN	MAX	
Propagation Delays:								
Data to Output								
		AC540						
t <sub>PLH</sub>			1.5	-	77	-	85	
t <sub>PHL</sub>			3.3*	2.4	8.6	2.4	9.5	ns
			5†	1.8	6.2	1.7	6.8	
		AC541						
t <sub>PLH</sub>			1.5	-	89	-	98	
t <sub>PHL</sub>			3.3	2.8	9.9	2.7	10.9	ns
			5	2.1	7.1	2	7.8	
		Enable, to Output to Output						
t <sub>PZL</sub>			1.5	-	136	-	150	
t <sub>PZH</sub>			3.3	4.6	16.4	4.5	18	ns
			5	3.1	10.9	3	12	
		Disable to Output to Output						
t <sub>PLZ</sub>			1.5	-	136	-	150	
t <sub>PHZ</sub>			3.3	3.9	13.6	3.8	15	ns
			5	3.1	10.9	3	12	
C <sub>PD</sub> ‡	Power Dissipation Capacitance	AC540	-	60 Typ.		60 Typ.		pF
		AC541	-	60 Typ.		60 Typ.		
V <sub>OHV</sub>	Min. (Valley) V <sub>OH</sub>	During Switching of Other Outputs (Output Under Test Not Switching)	5	4 Typ. @ 25°C				V
V <sub>OLP</sub>	Max. (Peak) V <sub>OL</sub>	During Switching of Other Outputs (Output Under Test Not Switching)	5	1 Typ. @ 25°C				V
C <sub>I</sub>	Input Capacitance		-	-	10	-	10	pF
C <sub>O</sub>	3-State Output Capacitance		-	-	15	-	15	pF

## 4.8 Switching Characteristics, ACT Series

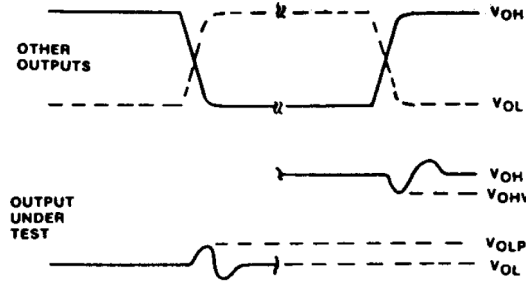
$t_r, t_f = 3\text{ns}, C_L = 50\text{pF}$  (See 节 5)

PARAMETER		$V_{CC}$ (V)	$(T_A) - ^\circ\text{C}$				UNIT
			-40 to +85		-55 to =125		
			MIN	MAX	MIN	MAX	
$t_{PLH}$ $t_{PHL}$ $t_{PZL}$ $t_{PZH}$ $t_{PLZ}$ $t_{PHZ}$	Propagation Delays:						
	Data to Output: ACT540	5 <sup>(1)</sup>	1.9	6.5	1.8	7.2	ns
	ACT541	5 <sup>(1)</sup>	2.1	7.5	2.1	8.2	ns
	Enable to Output	5	5	3.5	12.2	3.4	ns
	Disable to Output	5	3.5	12.2	3.4	13.4	ns
$C_{PD}$ <small>CPD is used to determine the dynamic power consumption, per channel.</small>	Power Dissipation Capacitance ACT540/ ACT541	—	60 Typ.		60 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) 5V: min. is @5.5 V  
 (2)  $C_{PD}$  is used to determine the dynamic power consumption, per channel.



## 5 Parameter Measurement Information

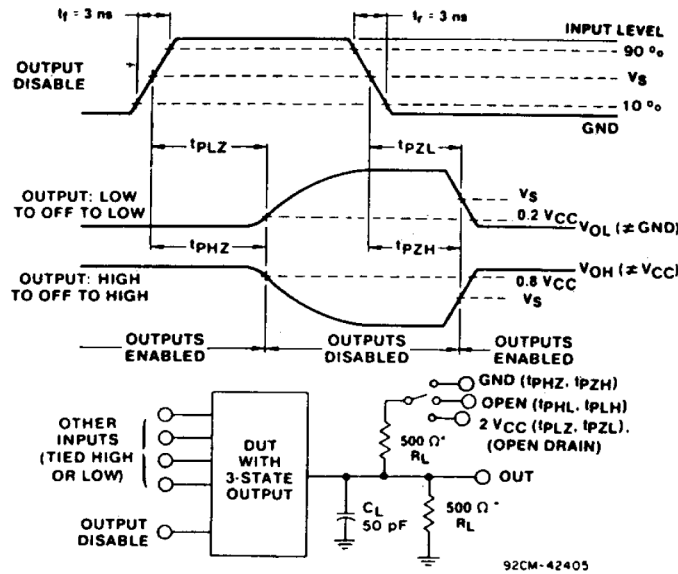


- NOTES:**
1.  $V_{OHV}$  AND  $V_{OLP}$  ARE MEASURED WITH RESPECT TO A GROUND REFERENCE NEAR THE OUTPUT UNDER TEST.
  2. INPUT PULSES HAVE THE FOLLOWING CHARACTERISTICS:  
 $PRR \leq 1$  MHz,  $t_r = 3$  ns,  $t_f = 3$  ns, SKEW 1 ns.
  3. R.F. FIXTURE WITH 700-MHz DESIGN RULES REQUIRED. IC SHOULD BE SOLDERED INTO TEST BOARD AND BYPASSED WITH  $0.1 \mu F$  CAPACITOR. SCOPE AND PROBES REQUIRE 700-MHz BANDWIDTH.

92CS-42406

- $V_{OHV}$  AND  $V_{OLP}$  ARE MEASURED WITH RESPECT TO A GROUND REFERENCE NEAR THE OUTPUT UNDER TEST,
- INPUT PULSES HAVE THE FOLLOWING CHARACTERISTICS:  $PRR \leq 1$  MHz,  $t_r = 3$  ns,  $t_f = 3$  ns, SKEW 1 ns.
- R.F. FIXTURE WITH 700-MHz DESIGN RULES REQUIRED. IC SHOULD BE SOLDERED INTO TEST BOARD AND BYPASSED WITH  $0.1 \mu F$  CAPACITOR. SCOPE AND PROBES REQUIRE 700-MHz BANDWIDTH.
- 92CS-42406

图 5-1. Simultaneous Switching Transient Waveforms.



\*FOR AC SERIES ONLY: WHEN  $V_{CC} = 1.5$  V,  $R_L = 1$  k $\Omega$

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

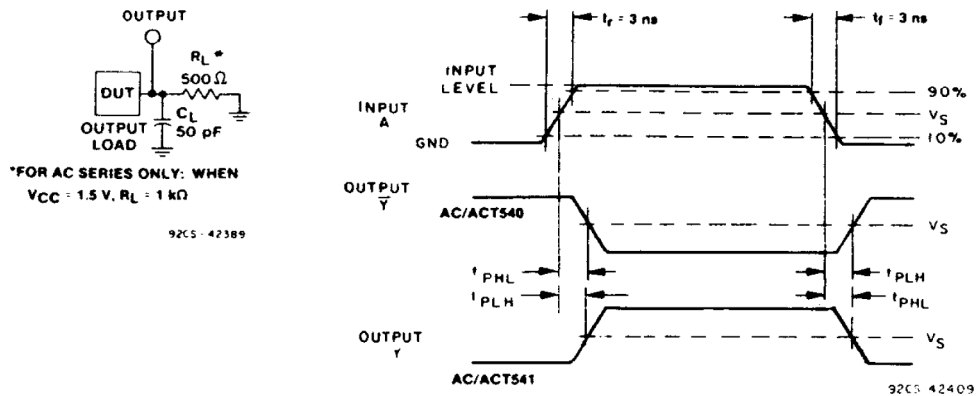


图 5-3. Propagation Delay Times and Test Circuit.

	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, $V_S$	$0.5 V_{CC}$	$0.5 V_{CC}$

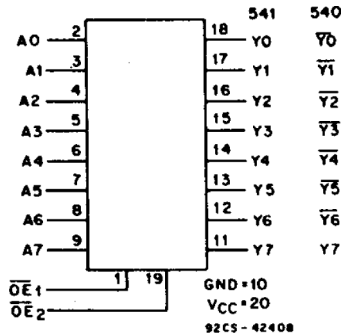
## 6 Detailed Description

### 6.1 Overview

The CD74AC540, -541, and CD74ACT540, -541 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: Industrial (-40 to +85°C) and Extended Industrial/Military (-55 to +125°C).

The CD54AC540, -541, and CD54ACT540, -541, 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

CD54/74AC/ACT540		
INPUTS		OUTPUTS
OE1, OE1	A	Y
L	L	H
L	H	L
H	X	Z

表 6-2. Truth Table

CD54/74AC/ACT541		
INPUTS		OUTPUTS
OE1, OE2	A	Y
L	L	L
L	H	H
H	X	Z

## 7 Application and Implementation

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### 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。

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### 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  $\mu\text{F}$  and if there are multiple  $V_{CC}$  terminals, then TI recommends .01  $\mu\text{F}$  or .022  $\mu\text{F}$  for each power terminal. It is okay to parallel multiple bypass capacitors to reject different frequencies of noise. A 0.1  $\mu\text{F}$  and 1  $\mu\text{F}$  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
CD74AC540	<a href="#">Click here</a>	<a href="#">Click here</a>	<a href="#">Click here</a>	<a href="#">Click here</a>	<a href="#">Click here</a>
CD54AC541	<a href="#">Click here</a>	<a href="#">Click here</a>	<a href="#">Click here</a>	<a href="#">Click here</a>	<a href="#">Click here</a>
CD74AC541	<a href="#">Click here</a>	<a href="#">Click here</a>	<a href="#">Click here</a>	<a href="#">Click here</a>	<a href="#">Click here</a>
CD54ACT540	<a href="#">Click here</a>	<a href="#">Click here</a>	<a href="#">Click here</a>	<a href="#">Click here</a>	<a href="#">Click here</a>
CD74ACT540	<a href="#">Click here</a>	<a href="#">Click here</a>	<a href="#">Click here</a>	<a href="#">Click here</a>	<a href="#">Click here</a>
CD54ACT541	<a href="#">Click here</a>	<a href="#">Click here</a>	<a href="#">Click here</a>	<a href="#">Click here</a>	<a href="#">Click here</a>
CD74ACT541	<a href="#">Click here</a>	<a href="#">Click here</a>	<a href="#">Click here</a>	<a href="#">Click here</a>	<a href="#">Click here</a>

### 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

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### 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 A (December 1998) to Revision B (May 2024)	Page
• 添加了 <a href="#">器件信息表</a> 、 <a href="#">引脚功能表</a> 、 <a href="#">ESD 等级表</a> 、 <a href="#">热性能信息表</a> 、 <a href="#">器件功能模式</a> 、 <a href="#">应用和实施部分</a> 、 <a href="#">器件和文档支持部分</a> 以及 <a href="#">机械、封装和可订购信息部分</a> .....	1
• Updated $\theta$ JA value: DW = 58 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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