

# CDx4HC240、CDx4HCT240、CD74HC241、CDx4HCT241、CDx4HC244、CDx4HCT244 ハイスピード CMOS ロジック・オクタール・バッファ/ライン・ドライバ、3 ステート

## 1 特長

- HC/HCT240 反転
- HC/HCT241 非反転
- HC/HCT244 非反転
- 8ns の伝搬遅延 (標準値、 $V_{CC} = 5V$ 、 $C_L = 15pF$ 、 $T_A = 25^\circ C$ 、HC240 の場合)
- 3 ステート出力
- バッファ付き入力
- 大電流バス・ドライバ出力
- ファンアウト (全温度範囲にわたって)
  - 標準出力: 10 個の LSTTL 負荷
  - バス・ドライバ出力: 15 個の LSTTL 負荷
- 広い動作温度範囲:  $-55^\circ C \sim 125^\circ C$
- 平衡な伝搬遅延と遷移時間
- LSTTL ロジック IC に比べて消費電力を大幅削減
- HC タイプ:
  - 2V~6V で動作
  - 優れたノイズ耐性:  $V_{CC}$  に対して  $N_{IL} = 30\%$ 、 $N_{IH} = 30\%$  ( $V_{CC} = 5V$  時)
- HCT タイプ:
  - 4.5V~5.5V で動作
  - LSTTL 入力ロジックと直接互換、 $V_{IL} = 0.8V$  (最大値)、 $V_{IH} = 2V$  (最小値)
  - CMOS 入力互換、 $V_{OL}$ 、 $V_{OH}$  で  $I_L \leq 1\mu A$

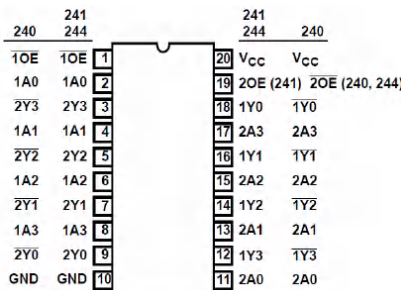
## 2 概要

'HC240 と 'HCT240 は、2 つのアクティブ Low 出力イネーブルを備えた反転 3 ステート・バッファです。CD74HC241、'HCT241、'HC244、'HCT244 は、非反転 3 ステート・バッファです。241 は 1 つのアクティブ High 出力イネーブルと 1 つのアクティブ Low 出力イネーブルを備えており、244 は 2 つのアクティブ Low 出力イネーブルを備えていることのみが異なります。3 つのタイプはすべて同じピン配置です。

### パッケージ情報

部品番号	パッケージ <sup>(1)</sup>	本体サイズ (公称)
CD74HC240	M (SOIC, 20)	12.80mm × 7.50mm
	E (PDIP, 20)	25.40mm × 6.35mm
CD54HC240	F (CDIP, 20)	26.92mm × 6.92mm
CD74HCT240	M (SOIC, 20)	12.80mm × 7.50mm
	E (PDIP, 20)	25.40mm × 6.35mm
	PW (TSSOP, 20)	6.50mm × 4.40mm
CD54HCT240	F (CDIP, 20)	26.92mm × 6.92mm
CD74HC241	M (SOIC, 20)	12.80mm × 7.50mm
	E (PDIP, 20)	25.40mm × 6.35mm
CD74HCT241	M (SOIC, 20)	12.80mm × 7.50mm
	E (PDIP, 20)	25.40mm × 6.35mm
CD54HCT241	F (CDIP, 20)	26.92mm × 6.92mm
CD74HC244	M (SOIC, 20)	12.80mm × 7.50mm
	E (PDIP, 20)	25.40mm × 6.35mm
CD54HC244	F (CDIP, 20)	26.92mm × 6.92mm
CD74HCT244	M (SOIC, 20)	12.80mm × 7.50mm
	E (PDIP, 20)	25.40mm × 6.35mm
CD54HCT244	F (CDIP, 20)	26.92mm × 6.92mm

(1) 利用可能なパッケージについては、このデータシートの末尾にある注文情報を参照してください。



ピン配置図



## Table of Contents

<b>1 特長</b> .....	<b>1</b>	<b>7 Detailed Description</b> .....	<b>13</b>
<b>2 概要</b> .....	<b>1</b>	7.1 Overview.....	13
<b>3 Revision History</b> .....	<b>2</b>	7.2 Functional Block Diagram.....	13
<b>4 Pin Configuration and Functions</b> .....	<b>3</b>	<b>8 Power Supply Recommendations</b> .....	<b>15</b>
<b>5 Specifications</b> .....	<b>4</b>	<b>9 Layout</b> .....	<b>15</b>
5.1 Absolute Maximum Ratings <sup>(1)</sup> .....	4	9.1 Layout Guidelines.....	15
5.2 Recommended Operating Conditions.....	4	<b>10 Device and Documentation Support</b> .....	<b>16</b>
5.3 Thermal Information.....	4	10.1 Receiving Notification of Documentation Updates..	16
5.4 Electrical Characteristics '240.....	5	10.2 サポート・リソース.....	16
5.5 Electrical Characteristics '241.....	6	10.3 Trademarks.....	16
5.6 Electrical Characteristics '244.....	7	10.4 Electrostatic Discharge Caution.....	16
5.7 Switching Characteristics '240.....	8	10.5 Glossary.....	16
5.8 Switching Characteristics '241.....	8	<b>11 Mechanical, Packaging, and Orderable Information</b> .....	<b>16</b>
5.9 Switching Characteristics '244.....	9		
<b>6 Parameter Measurement Information</b> .....	<b>11</b>		

### 3 Revision History

資料番号末尾の英字は改訂を表しています。その改訂履歴は英語版に準じています。

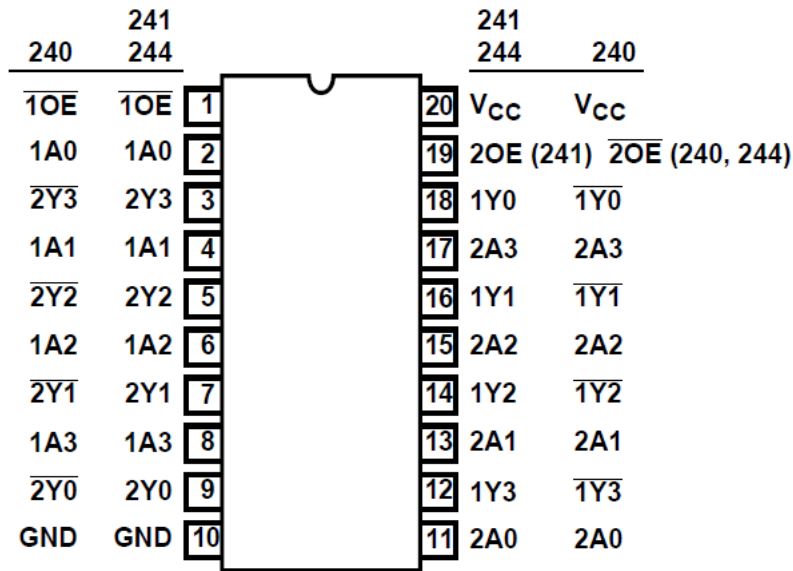
#### Changes from Revision E (October 2004) to Revision F (February 2022) Page

- 最新のデータシート規格を反映するように、文書全体の採番、書式設定、表、図、相互参照を更新..... 1

#### Changes from Revision F (February 2022) to Revision G (October 2022) Page

- Increased RθJA for packages: DW (73 to 109.1); DB (82 to 122.7); N (67 to 84.6); NS (64 to 113.4); PW (108 to 131.8)..... 4

## 4 Pin Configuration and Functions



J, N, DW, or PW package  
 20-Pin CDIP, PDIP, SOIC, or TSSOP  
 Top View

## 5 Specifications

### 5.1 Absolute Maximum Ratings<sup>(1)</sup>

		MIN	MAX	UNIT
V <sub>CC</sub>	Supply voltage	-0.5	7	V
I <sub>IK</sub>	Input clamp diode current	For V <sub>I</sub> < -0.5 V or V <sub>I</sub> > V <sub>CC</sub> + 0.5 V		±20 mA
I <sub>OK</sub>	Output clamp diode current	For V <sub>O</sub> < -0.5 V or V <sub>O</sub> > V <sub>CC</sub> + 0.5 V		±20 mA
I <sub>O</sub>	Drain current, per output	For -0.5 V < V <sub>O</sub> < V <sub>CC</sub> + 0.5 V		±35 mA
I <sub>O</sub>	Output source or sink current per output pin	For V <sub>O</sub> > -0.5 V or V <sub>O</sub> < V <sub>CC</sub> + 0.5 V		±25 mA
I <sub>CC</sub>	Continuous current through V <sub>CC</sub> or GND			±70 mA
T <sub>J</sub>	Junction temperature			150 °C
T <sub>stg</sub>	Storage temperature range	-65	150	°C
	Lead temperature (Soldering 10s) (SOIC - lead tips only)			300 °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.

### 5.2 Recommended Operating Conditions

		MIN	MAX	UNIT	
V <sub>CC</sub>	Supply voltage range	HC types	2	6	V
		HCT types	4.5	5.5	
V <sub>I</sub> , V <sub>O</sub>	Input or output voltage	0	V <sub>CC</sub>	V	
t <sub>t</sub>	Input rise and fall time	2 V	1000		ns
		4.5 V	500		
		6 V	400		
T <sub>A</sub>	Temperature range	-55	125	°C	

### 5.3 Thermal Information

THERMAL METRIC		DW (SOIC)	DB (SSOP)	N (PDIP)	NS (SO)	PW (TSSOP)	UNIT
		20 PINS	20 PINS	20 PINS	20 PINS	20 PINS	
R <sub>θJA</sub>	Junction-to-ambient thermal resistance <sup>(1)</sup>	109.1	122.7	84.6	113.4	131.8	°C/W
R <sub>θJC (top)</sub>	Junction-to-case (top) thermal resistance	76	81.6	72.5	78.6	72.2	°C/W
R <sub>θJB</sub>	Junction-to-board thermal resistance	77.6	77.5	65.3	78.4	82.8	°C/W
Ψ <sub>JT</sub>	Junction-to-top characterization parameter	51.5	46.1	55.3	47.1	21.5	°C/W
Ψ <sub>JB</sub>	Junction-to-board characterization parameter	77.1	77.1	65.2	78.1	82.4	°C/W
R <sub>θJC (bot)</sub>	Junction-to-case (bottom) thermal resistance	N/A	N/A	N/A	N/A	N/A	°C/W

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

## 5.4 Electrical Characteristics '240

PARAMETER	TEST CONDITIONS <sup>(2)</sup>	V <sub>CC</sub> (V)	25°C			–40°C to 85°C		–55°C to 125°C		UNIT	
			MIN	TYP	MAX	MIN	MAX	MIN	MAX		
<b>HC TYPES</b>											
V <sub>IH</sub>	High level input voltage		2	1.5		1.5		1.5		V	
			4.5	3.15		3.15		3.15			
			6	4.2		4.2		4.2			
V <sub>IL</sub>	Low level input voltage		2		0.5		0.5		0.5	V	
			4.5		1.35		1.35		1.35		
			6		1.8		1.8		1.8		
V <sub>OH</sub>	High level output voltage	I <sub>OH</sub> = – 20 μA	2	1.9		1.9		1.9		V	
		I <sub>OH</sub> = – 20 μA	4.5	4.4		4.4		4.4			
		I <sub>OH</sub> = – 20 μA	6	5.9		5.9		5.9			
	High level output voltage	I <sub>OH</sub> = – 6 mA	4.5	3.98		3.84		3.7			
		I <sub>OH</sub> = – 7.8 mA	6	5.48		5.34		5.2			
V <sub>OL</sub>	Low level output voltage	I <sub>OL</sub> = 20 μA	2		0.1		0.1		0.1	V	
		I <sub>OL</sub> = 20 μA	4.5		0.1		0.1		0.1		
		I <sub>OL</sub> = 20 μA	6		0.1		0.1		0.1		
	Low level output voltage	I <sub>OL</sub> = 6 mA	4.5		0.26		0.33		0.4		
		I <sub>OL</sub> = 7.8 mA	6		0.26		0.33		0.4		
I <sub>I</sub>	Input leakage current	V <sub>I</sub> = V <sub>CC</sub> or GND	6		±0.1		±1		±1	μA	
I <sub>CC</sub>	Supply current	V <sub>I</sub> = V <sub>CC</sub> or GND	6		8		80		160	μA	
I <sub>OZ</sub>	Three-state leakage current		6		±0.5		±0.5		±10	μA	
<b>HCT TYPES</b>											
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>OH</sub> = – 20 μA	4.5	4.4		4.4		4.4		V	
	High level output voltage	V <sub>OH</sub> = – 6 mA	4.5	3.98		3.84		3.7			
V <sub>OL</sub>	Low level output voltage	V <sub>OL</sub> = 20 μA	4.5		0.1		0.1		0.1	V	
	Low level output voltage	V <sub>OL</sub> = 6 mA	4.5		0.26		0.33		0.4		
I <sub>I</sub>	Input leakage current	V <sub>I</sub> = V <sub>CC</sub> or GND	5.5		±0.1		±1		±1	μA	
I <sub>CC</sub>	Supply current	V <sub>I</sub> = V <sub>CC</sub> or GND	5.5		8		80		160	μA	
I <sub>OZ</sub>	Three-state leakage current		5.5		±0.5		±5		±10	μA	
ΔI <sub>CC</sub> <sup>(1)</sup>	Additional supply current per input pin	nA0 - A3 inputs held at V <sub>CC</sub> – 2.1	4.5 to 5.5		100	540		675		735	μA
		1 $\overline{O}E$ inputs held at V <sub>CC</sub> – 2.1	4.5 to 5.5		100	252		315		343	μA
		2 $\overline{O}E$ inputs held at V <sub>CC</sub> – 2.1	4.5 to 5.5		100	252		315		343	μA

(1) For dual-supply systems theoretical worst case (V<sub>I</sub> = 2.4 V, V<sub>CC</sub> = 5.5 V) specification is 1.8 mA.

(2) V<sub>I</sub> = V<sub>IH</sub> or V<sub>IL</sub>, unless otherwise noted.

## 5.5 Electrical Characteristics '241

PARAMETER	TEST CONDITIONS <sup>(2)</sup>	V <sub>CC</sub> (V)	25°C			–40°C to 85°C		–55°C to 125°C		UNIT	
			MIN	TYP	MAX	MIN	MAX	MIN	MAX		
<b>HC TYPES</b>											
V <sub>IH</sub>	High level input voltage		2	1.5		1.5		1.5		V	
			4.5	3.15		3.15		3.15			
			6	4.2		4.2		4.2			
V <sub>IL</sub>	Low level input voltage		2		0.5		0.5		0.5	V	
			4.5		1.35		1.35		1.35		
			6		1.8		1.8		1.8		
V <sub>OH</sub>	High level output voltage	I <sub>OH</sub> = – 20 μA	2	1.9		1.9		1.9		V	
		I <sub>OH</sub> = – 20 μA	4.5	4.4		4.4		4.4			
		I <sub>OH</sub> = – 20 μA	6	5.9		5.9		5.9			
	High level output voltage	I <sub>OH</sub> = – 6 mA	4.5	3.98		3.84		3.7			
		I <sub>OH</sub> = – 7.8 mA	6	5.48		5.34		5.2			
V <sub>OL</sub>	Low level output voltage	I <sub>OL</sub> = 20 μA	2		0.1		0.1		0.1	V	
		I <sub>OL</sub> = 20 μA	4.5		0.1		0.1		0.1		
		I <sub>OL</sub> = 20 μA	6		0.1		0.1		0.1		
	Low level output voltage	I <sub>OL</sub> = 6 mA	4.5		0.26		0.33		0.4		
		I <sub>OL</sub> = 7.8 mA	6		0.26		0.33		0.4		
I <sub>I</sub>	Input leakage current	V <sub>I</sub> = V <sub>CC</sub> or GND	6		±0.1		±1		±1	μA	
I <sub>CC</sub>	Supply current	V <sub>I</sub> = V <sub>CC</sub> or GND	6		8		80		160	μA	
I <sub>OZ</sub>	Three-state leakage current		6		±0.5		±0.5		±10	μA	
<b>HCT TYPES</b>											
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>OH</sub> = – 20 μA	4.5	4.4		4.4		4.4		V	
	High level output voltage	V <sub>OH</sub> = – 6 mA	4.5	3.98		3.84		3.7			
V <sub>OL</sub>	Low level output voltage	V <sub>OL</sub> = 20 μA	4.5		0.1		0.1		0.1	V	
	Low level output voltage	V <sub>OL</sub> = 6 mA	4.5		0.26		0.33		0.4		
I <sub>I</sub>	Input leakage current	V <sub>I</sub> = V <sub>CC</sub> or GND	5.5		±0.1		±1		±1	μA	
I <sub>CC</sub>	Supply current	V <sub>I</sub> = V <sub>CC</sub> or GND	5.5		8		80		160	μA	
I <sub>OZ</sub>	Three-state leakage current		5.5		±0.5		±5		±10	μA	
ΔI <sub>CC</sub> <sup>(1)</sup>	Additional supply current per input pin	nA0 - A3 inputs held at V <sub>CC</sub> – 2.1	4.5 to 5.5		100	252		315		343	μA
		1OE inputs held at V <sub>CC</sub> – 2.1	4.5 to 5.5		100	252		315		343	μA
		2OE inputs held at V <sub>CC</sub> – 2.1	4.5 to 5.5		100	540		675		735	μA

(1) For dual-supply systems theoretical worst case (V<sub>I</sub> = 2.4 V, V<sub>CC</sub> = 5.5 V) specification is 1.8 mA.

(2) V<sub>I</sub> = V<sub>IH</sub> or V<sub>IL</sub>, unless otherwise noted.

## 5.6 Electrical Characteristics '244

PARAMETER	TEST CONDITIONS <sup>(2)</sup>	V <sub>CC</sub> (V)	25°C			–40°C to 85°C		–55°C to 125°C		UNIT	
			MIN	TYP	MAX	MIN	MAX	MIN	MAX		
<b>HC TYPES</b>											
V <sub>IH</sub>	High level input voltage		2	1.5		1.5		1.5		V	
			4.5	3.15		3.15		3.15			
			6	4.2		4.2		4.2			
V <sub>IL</sub>	Low level input voltage		2		0.5		0.5		0.5	V	
			4.5		1.35		1.35		1.35		
			6		1.8		1.8		1.8		
V <sub>OH</sub>	High level output voltage	I <sub>OH</sub> = – 20 μA	2	1.9		1.9		1.9		V	
		I <sub>OH</sub> = – 20 μA	4.5	4.4		4.4		4.4			
		I <sub>OH</sub> = – 20 μA	6	5.9		5.9		5.9			
	High level output voltage	I <sub>OH</sub> = – 6 mA	4.5	3.98		3.84		3.7			
		I <sub>OH</sub> = – 7.8 mA	6	5.48		5.34		5.2			
V <sub>OL</sub>	Low level output voltage	I <sub>OL</sub> = 20 μA	2		0.1		0.1		0.1	V	
		I <sub>OL</sub> = 20 μA	4.5		0.1		0.1		0.1		
		I <sub>OL</sub> = 20 μA	6		0.1		0.1		0.1		
	Low level output voltage	I <sub>OL</sub> = 6 mA	4.5		0.26		0.33		0.4		
		I <sub>OL</sub> = 7.8 mA	6		0.26		0.33		0.4		
I <sub>I</sub>	Input leakage current	V <sub>I</sub> = V <sub>CC</sub> or GND	6		±0.1		±1		±1	μA	
I <sub>CC</sub>	Supply current	V <sub>I</sub> = V <sub>CC</sub> or GND	6		8		80		160	μA	
I <sub>OZ</sub>	Three-state leakage current		6		±0.5		±0.5		±10	μA	
<b>HCT TYPES</b>											
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>OH</sub> = – 20 μA	4.5	4.4		4.4		4.4		V	
	High level output voltage	V <sub>OH</sub> = – 6 mA	4.5	3.98		3.84		3.7			
V <sub>OL</sub>	Low level output voltage	V <sub>OL</sub> = 20 μA	4.5		0.1		0.1		0.1	V	
	Low level output voltage	V <sub>OL</sub> = 6 mA	4.5		0.26		0.33		0.4		
I <sub>I</sub>	Input leakage current	V <sub>I</sub> = V <sub>CC</sub> or GND	5.5		±0.1		±1		±1	μA	
I <sub>CC</sub>	Supply current	V <sub>I</sub> = V <sub>CC</sub> or GND	5.5		8		80		160	μA	
I <sub>OZ</sub>	Three-state leakage current		5.5		±0.5		±5		±10	μA	
ΔI <sub>CC</sub> <sup>(1)</sup>	Additional supply current per input pin	nA0 - A3 inputs held at V <sub>CC</sub> – 2.1	4.5 to 5.5		100	252		315		343	μA
		1 $\overline{O}E$ inputs held at V <sub>CC</sub> – 2.1	4.5 to 5.5		100	252		315		343	μA
		2 $\overline{O}E$ inputs held at V <sub>CC</sub> – 2.1	4.5 to 5.5		100	252		315		343	μA

(1) For dual-supply systems theoretical worst case (V<sub>I</sub> = 2.4 V, V<sub>CC</sub> = 5.5 V) specification is 1.8 mA.

(2) V<sub>I</sub> = V<sub>IH</sub> or V<sub>IL</sub>, unless otherwise noted.

## 5.7 Switching Characteristics '240

$C_L = 50$  pF, Input  $t_r$ ,  $t_f = 6$  ns

PARAMETER		$V_{CC}$ (V)	25°C			–40°C to 85°C			–55°C to 125°C			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
<b>HC TYPES</b>												
$t_{PLH}$ , $t_{PHL}$	Propagation delay	2		100		125		150	ns			
	Data to outputs	4.5	8 <sup>(3)</sup>	20		25		30				
		6		17		21		26				
$t_{THL}$ , $t_{TLH}$	Output enable and disable time	2		150		190		225	ns			
		4.5		30		38		45				
		5	12									
$t_{TLH}$ , $t_{THL}$	Output transition time	2		60		75		90	ns			
		4.5		12		15		18				
		6		10		13		15				
$C_I$	Input capacitance		10	10		10		10	pF			
$C_O$	Three-state output capacitance			20		20		20	pF			
$C_{PD}$	Power dissipation capacitance <sup>(1) (2)</sup>	5	38 <sup>(3)</sup>						pF			
<b>HCT TYPES</b>												
$t_{PHL}$ , $t_{PLH}$	Data to outputs	4.5	9 <sup>(3)</sup>	22		28		33	ns			
$t_{TLH}$ , $t_{THL}$	Output enable and disable times	4.5		30		38		45	ns			
$t_{THL}$ , $t_{TLH}$	Output transition time	4.5		12		15		18	ns			
$C_I$	Input capacitance		10	10		10		10	pF			
$C_{PD}$	Power dissipation capacitance <sup>(1) (2)</sup>	5	40						pF			

(1)  $C_{PD}$  is used to determine the dynamic power consumption, per channel.

(2)  $P_D = V_{CC}^2 f_i (C_{PD} + C_L)$  where  $f_i$  = input frequency,  $f_o$  = output frequency,  $C_L$  = output load capacitance,  $V_{CC}$  = supply voltage.

(3)  $C_L = 15$  pF and  $V_{CC} = 5$  V.



## 5.8 Switching Characteristics '241

 $C_L = 50 \text{ pF}$ , Input  $t_r$ ,  $t_f = 6 \text{ ns}$ 

PARAMETER		$V_{CC}$ (V)	25°C			–40°C to 85°C			–55°C to 125°C			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
<b>HC TYPES</b>												
$t_{PLH}$ , $t_{PHL}$	Propagation delay Data to outputs	2		110		140		165	ns			
		4.5		9 <sup>(3)</sup>	22		28	33				
		6		19		24		28				
$t_{THL}$ , $t_{TLH}$	Output enable and disable time	2		150		190		225	ns			
		4.5		30		38		45				
		5		12								
$t_{TLH}$ , $t_{THL}$	Output transition time	2		60		75		90	ns			
		4.5		12		15		18				
		6		10		13		15				
$C_I$	Input capacitance		10	10		10		10	pF			
$C_O$	Three-state output capacitance			20		20		20	pF			
$C_{PD}$	Power dissipation capacitance <sup>(1) (2)</sup>	5		34 <sup>(3)</sup>					pF			
<b>HCT TYPES</b>												
$t_{PHL}$ , $t_{PLH}$	Data to outputs	4.5		10 <sup>(3)</sup>	25		31		38	ns		
$t_{TLH}$ , $t_{THL}$	Output enable and disable times	4.5		30		38		45	ns			
$t_{THL}$ , $t_{TLH}$	Output transition time	4.5		12		15		18	ns			
$C_I$	Input capacitance		10	10		10		10	pF			
$C_{PD}$	Power dissipation capacitance <sup>(1) (2)</sup>	5		38					pF			

(1)  $C_{PD}$  is used to determine the dynamic power consumption, per channel.

(2)  $P_D = V_{CC}^2 f_i (C_{PD} + C_L)$  where  $f_i$  = input frequency,  $f_o$  = output frequency,  $C_L$  = output load capacitance,  $V_{CC}$  = supply voltage.

(3)  $C_L = 15 \text{ pF}$  and  $V_{CC} = 5 \text{ V}$ .

## 5.9 Switching Characteristics '244

$C_L = 50$  pF, Input  $t_r$ ,  $t_f = 6$  ns

PARAMETER		$V_{CC}$ (V)	25°C			–40°C to 85°C			–55°C to 125°C			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
<b>HC TYPES</b>												
$t_{PLH}$ , $t_{PHL}$	Propagation delay Data to outputs	2		110		140		165	ns			
		4.5		9 <sup>(3)</sup>		28		33				
		6		19		24		28				
$t_{THL}$ , $t_{TLH}$	Output enable and disable time	2		150		190		225	ns			
		4.5		30		38		45				
		5		12								
$t_{TLH}$ , $t_{THL}$	Output transition time	2		60		75		90	ns			
		4.5		12		15		18				
		6		10		13		15				
$C_I$	Input capacitance		10	10		10		10	pF			
$C_O$	Three-state output capacitance			20		20		20	pF			
$C_{PD}$	Power dissipation capacitance <sup>(1) (2)</sup>	5		46 <sup>(3)</sup>					pF			
<b>HCT TYPES</b>												
$t_{PHL}$ , $t_{PLH}$	Data to outputs	4.5		10 <sup>(3)</sup>	25		31		38	ns		
$t_{TLH}$ , $t_{THL}$	Output enable and disable times	4.5		30		38		45	ns			
$t_{THL}$ , $t_{TLH}$	Output transition time	4.5		12		15		18	ns			
$C_I$	Input capacitance		10	10		10		10	pF			
$C_{PD}$	Power dissipation capacitance <sup>(1) (2)</sup>	5		40					pF			

(1)  $C_{PD}$  is used to determine the dynamic power consumption, per channel.

(2)  $P_D = V_{CC}^2 f_i (C_{PD} + C_L)$  where  $f_i$  = input frequency,  $f_o$  = output frequency,  $C_L$  = output load capacitance,  $V_{CC}$  = supply voltage.

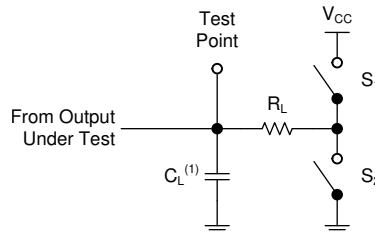
(3)  $C_L = 15$  pF and  $V_{CC} = 5$  V.

## 6 Parameter Measurement Information

Phase relationships between waveforms were chosen arbitrarily. All input pulses are supplied by generators having the following characteristics:  $PRR \leq 1 \text{ MHz}$ ,  $Z_O = 50 \Omega$ ,  $t_t < 6 \text{ ns}$ .

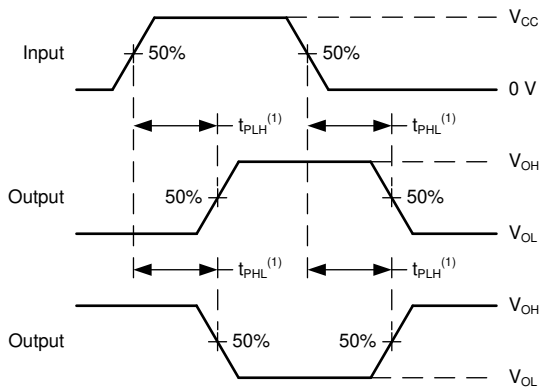
For clock inputs,  $f_{\text{max}}$  is measured when the input duty cycle is 50%.

The outputs are measured one at a time with one input transition per measurement.



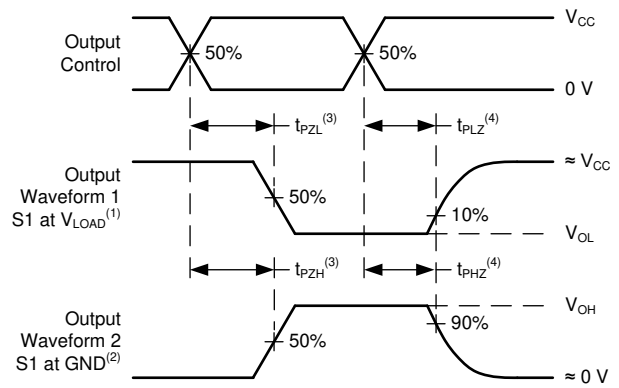
(1)  $C_L$  includes probe and test-fixture capacitance.

**6-1. Load Circuit for 3-State Outputs**



(1) The greater between  $t_{\text{PLH}}$  and  $t_{\text{PHL}}$  is the same as  $t_{\text{pd}}$ .

**6-2. Voltage Waveforms, Propagation Delays for Standard CMOS Inputs**



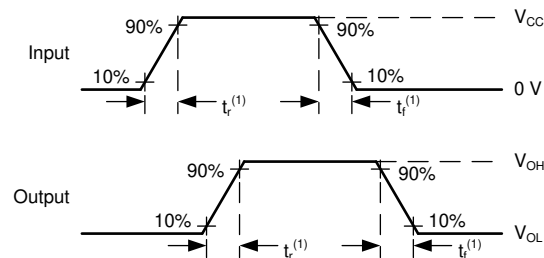
(1) S1 = CLOSED; S2 = OPEN.

(2) S1 = OPEN; S2 = CLOSED.

(3)  $t_{\text{PZL}}$  and  $t_{\text{PHZ}}$  are the same as  $t_{\text{dis}}$ .

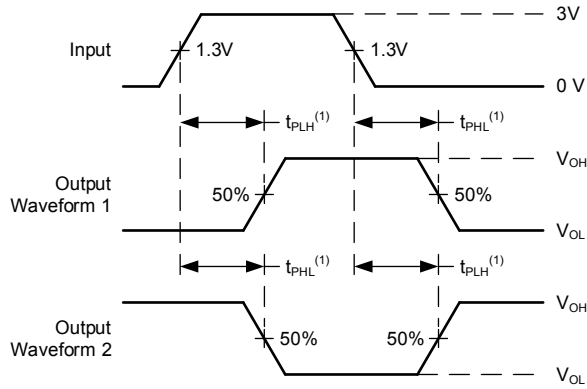
(4)  $t_{\text{PZL}}$  and  $t_{\text{PZH}}$  are the same as  $t_{\text{en}}$ .

**6-3. Voltage Waveforms, Standard CMOS Inputs Propagation Delays**



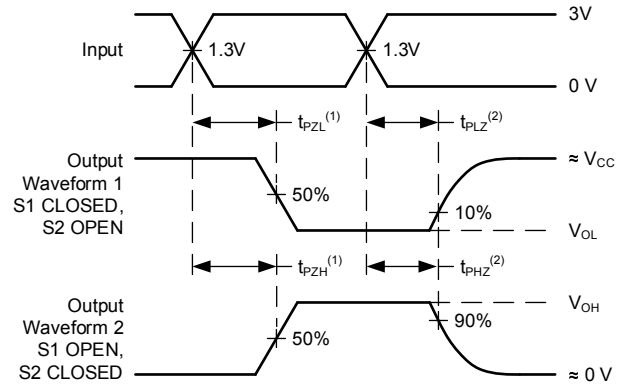
(1) The greater between  $t_r$  and  $t_f$  is the same as  $t_t$ .

**6-4. Voltage Waveforms, Input and Output Transition Times for Standard CMOS Inputs**



(1) The greater between  $t_{PLH}$  and  $t_{PHL}$  is the same as  $t_{pd}$ .

**6-5. Voltage Waveforms, Propagation Delays for TTL-Compatible Inputs**



(1)  $t_{PLZ}$  and  $t_{PHZ}$  are the same as  $t_{dis}$ .

(2)  $t_{PZL}$  and  $t_{PZH}$  are the same as  $t_{en}$ .

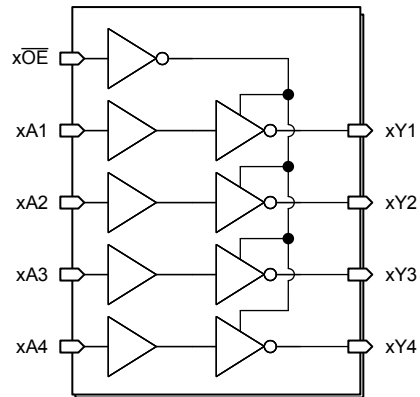
**6-6. Voltage Waveforms, TTL-Compatible CMOS Inputs Propagation Delays**

## 7 Detailed Description

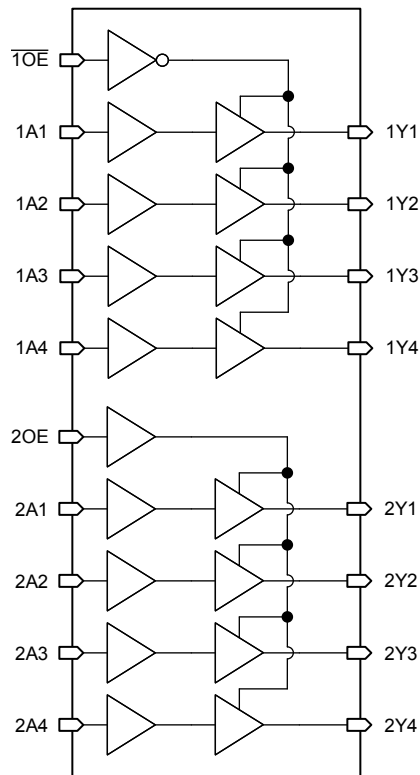
### 7.1 Overview

The 'HC240 and 'HCT240 are inverting three-state buffers having two active-low output enables. The CD74HC241, 'HCT241, 'HC244 and 'HCT244 are non-inverting threestate buffers that differ only in that the 241 has one activehigh and one active-low output enable, and the 244 has two active-low output enables. All three types have identical pinouts.

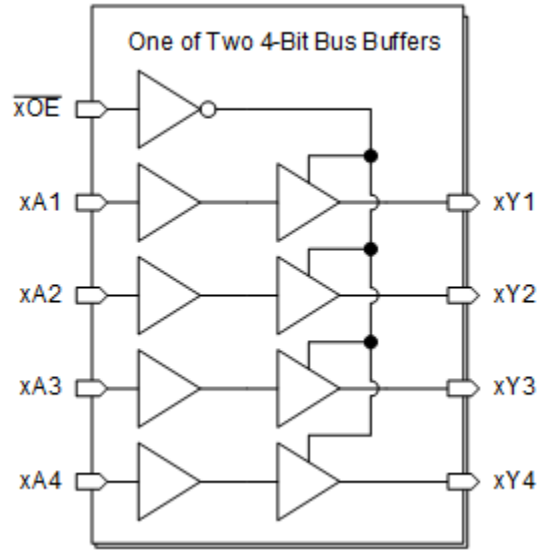
### 7.2 Functional Block Diagram



7-1. Functional Block Diagram '240



7-2. Functional Block Diagram '241



7-3. Functional Block Diagram '244

## 8 Power Supply Recommendations

The power supply can be any voltage between the minimum and maximum supply voltage rating located in the *Recommended Operating Conditions*. Each  $V_{CC}$  terminal should have a good bypass capacitor to prevent power disturbance. A 0.1- $\mu\text{F}$  capacitor is recommended for this device. It is acceptable to parallel multiple bypass capacitors to reject different frequencies of noise. The 0.1- $\mu\text{F}$  and 1- $\mu\text{F}$  capacitors are commonly used in parallel. The bypass capacitor should be installed as close to the power terminal as possible for best results.

## 9 Layout

### 9.1 Layout Guidelines

When using multiple-input and multiple-channel logic devices, inputs must not ever be left floating. 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 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.

## 10 Device and Documentation Support

TI offers an extensive line of development tools. Tools and software to evaluate the performance of the device, generate code, and develop solutions are listed below.

### 10.1 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on [ti.com](http://ti.com). Click on *Subscribe to updates* to register and receive a weekly digest of any product information that has changed. For change details, review the revision history included in any revised document.

### 10.2 サポート・リソース

TI E2E™ サポート・フォーラムは、エンジニアが検証済みの回答と設計に関するヒントをエキスパートから迅速かつ直接得ることができる場所です。既存の回答を検索したり、独自の質問をしたりすることで、設計に必要な支援を迅速に得ることができます。

リンクされているコンテンツは、該当する貢献者により、現状のまま提供されるものです。これらは TI の仕様を構成するものではなく、必ずしも TI の見解を反映したものではありません。TI の [使用条件](#) を参照してください。

### 10.3 Trademarks

TI E2E™ is a trademark of Texas Instruments.

すべての商標は、それぞれの所有者に帰属します。

### 10.4 Electrostatic Discharge Caution



This integrated circuit can be damaged by ESD. Texas Instruments recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

### 10.5 Glossary

[TI Glossary](#) This glossary lists and explains terms, acronyms, and definitions.

## 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 Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead finish/ Ball material (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
CD54HC240F3A	ACTIVE	CDIP	J	20	20	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	8407401RA CD54HC240F3A	<a href="#">Samples</a>
CD54HC244F	ACTIVE	CDIP	J	20	20	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	CD54HC244F	<a href="#">Samples</a>
CD54HC244F3A	ACTIVE	CDIP	J	20	20	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	8409601RA CD54HC244F3A	<a href="#">Samples</a>
CD54HCT240F3A	ACTIVE	CDIP	J	20	20	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	8550501RA CD54HCT240F3A	<a href="#">Samples</a>
CD54HCT241F3A	ACTIVE	CDIP	J	20	20	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	CD54HCT241F3A	<a href="#">Samples</a>
CD54HCT244F	ACTIVE	CDIP	J	20	20	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	CD54HCT244F	<a href="#">Samples</a>
CD54HCT244F3A	ACTIVE	CDIP	J	20	20	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	8513001RA CD54HCT244F3A	<a href="#">Samples</a>
CD74HC240E	ACTIVE	PDIP	N	20	20	RoHS & Green	NIPDAU	N / A for Pkg Type	-55 to 125	CD74HC240E	<a href="#">Samples</a>
CD74HC240M	OBSOLETE	SOIC	DW	20		TBD	Call TI	Call TI	-55 to 125	HC240M	
CD74HC240M96	ACTIVE	SOIC	DW	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-55 to 125	HC240M	<a href="#">Samples</a>
CD74HC241E	ACTIVE	PDIP	N	20	20	RoHS & Green	NIPDAU	N / A for Pkg Type	-55 to 125	CD74HC241E	<a href="#">Samples</a>
CD74HC241M	OBSOLETE	SOIC	DW	20		TBD	Call TI	Call TI	-55 to 125	HC241M	
CD74HC241M96	ACTIVE	SOIC	DW	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-55 to 125	HC241M	<a href="#">Samples</a>
CD74HC244E	ACTIVE	PDIP	N	20	20	RoHS & Green	NIPDAU	N / A for Pkg Type	-55 to 125	CD74HC244E	<a href="#">Samples</a>
CD74HC244EE4	ACTIVE	PDIP	N	20	20	RoHS & Green	NIPDAU	N / A for Pkg Type	-55 to 125	CD74HC244E	<a href="#">Samples</a>
CD74HC244M	OBSOLETE	SOIC	DW	20		TBD	Call TI	Call TI	-55 to 125	HC244M	
CD74HC244M96	ACTIVE	SOIC	DW	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-55 to 125	HC244M	<a href="#">Samples</a>
CD74HC244M96E4	ACTIVE	SOIC	DW	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-55 to 125	HC244M	<a href="#">Samples</a>
CD74HC244M96G4	ACTIVE	SOIC	DW	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-55 to 125	HC244M	<a href="#">Samples</a>

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead finish/ Ball material (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
CD74HCT240E	ACTIVE	PDIP	N	20	20	RoHS & Green	NIPDAU	N / A for Pkg Type	-55 to 125	CD74HCT240E	<a href="#">Samples</a>
CD74HCT240EE4	ACTIVE	PDIP	N	20	20	RoHS & Green	NIPDAU	N / A for Pkg Type	-55 to 125	CD74HCT240E	<a href="#">Samples</a>
CD74HCT240M	OBSOLETE	SOIC	DW	20		TBD	Call TI	Call TI	-55 to 125	HCT240M	
CD74HCT240M96	ACTIVE	SOIC	DW	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-55 to 125	HCT240M	<a href="#">Samples</a>
CD74HCT240PW	OBSOLETE	TSSOP	PW	20		TBD	Call TI	Call TI	-55 to 125	HK240	
CD74HCT240PWR	ACTIVE	TSSOP	PW	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-55 to 125	HK240	<a href="#">Samples</a>
CD74HCT240PWT	OBSOLETE	TSSOP	PW	20		TBD	Call TI	Call TI	-55 to 125	HK240	
CD74HCT241E	ACTIVE	PDIP	N	20	20	RoHS & Green	NIPDAU	N / A for Pkg Type	-55 to 125	CD74HCT241E	<a href="#">Samples</a>
CD74HCT241M96	ACTIVE	SOIC	DW	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-55 to 125	HCT241M	<a href="#">Samples</a>
CD74HCT244E	ACTIVE	PDIP	N	20	20	RoHS & Green	NIPDAU	N / A for Pkg Type	-55 to 125	CD74HCT244E	<a href="#">Samples</a>
CD74HCT244M	OBSOLETE	SOIC	DW	20		TBD	Call TI	Call TI	-55 to 125	HCT244M	
CD74HCT244M96	ACTIVE	SOIC	DW	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-55 to 125	HCT244M	<a href="#">Samples</a>

(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) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

**RoHS Exempt:** TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

**Green:** TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

(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.

<sup>(5)</sup> 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.

<sup>(6)</sup> Lead finish/Ball material - Orderable Devices 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.

**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 CD54HC240, CD54HC244, CD54HCT240, CD54HCT241, CD54HCT244, CD74HC240, CD74HC244, CD74HCT240, CD74HCT241, CD74HCT244 :**

● Catalog : [CD74HC240](#), [CD74HC244](#), [CD74HCT240](#), [CD74HCT241](#), [CD74HCT244](#)

● Military : [CD54HC240](#), [CD54HC244](#), [CD54HCT240](#), [CD54HCT241](#), [CD54HCT244](#)

NOTE: Qualified Version Definitions:

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

**TAPE AND REEL INFORMATION**

**QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE**


\*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
CD74HC240M96	SOIC	DW	20	2000	330.0	24.4	10.8	13.3	2.7	12.0	24.0	Q1
CD74HC241M96	SOIC	DW	20	2000	330.0	24.4	10.8	13.3	2.7	12.0	24.0	Q1
CD74HC244M96	SOIC	DW	20	2000	330.0	24.4	10.8	13.3	2.7	12.0	24.0	Q1
CD74HCT240M96	SOIC	DW	20	2000	330.0	24.4	10.8	13.3	2.7	12.0	24.0	Q1
CD74HCT240PWR	TSSOP	PW	20	2000	330.0	16.4	6.95	7.1	1.6	8.0	16.0	Q1
CD74HCT241M96	SOIC	DW	20	2000	330.0	24.4	10.8	13.3	2.7	12.0	24.0	Q1
CD74HCT241M96	SOIC	DW	20	2000	330.0	24.4	10.9	13.3	2.7	12.0	24.0	Q1
CD74HCT244M96	SOIC	DW	20	2000	330.0	24.4	10.8	13.3	2.7	12.0	24.0	Q1
CD74HCT244M96	SOIC	DW	20	2000	330.0	24.4	10.9	13.3	2.7	12.0	24.0	Q1

## TAPE AND REEL BOX DIMENSIONS



\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
CD74HC240M96	SOIC	DW	20	2000	367.0	367.0	45.0
CD74HC241M96	SOIC	DW	20	2000	367.0	367.0	45.0
CD74HC244M96	SOIC	DW	20	2000	367.0	367.0	45.0
CD74HCT240M96	SOIC	DW	20	2000	367.0	367.0	45.0
CD74HCT240PWR	TSSOP	PW	20	2000	356.0	356.0	35.0
CD74HCT241M96	SOIC	DW	20	2000	367.0	367.0	45.0
CD74HCT241M96	SOIC	DW	20	2000	356.0	356.0	41.0
CD74HCT244M96	SOIC	DW	20	2000	367.0	367.0	45.0
CD74HCT244M96	SOIC	DW	20	2000	356.0	356.0	41.0

**TUBE**


\*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (μm)	B (mm)
CD74HC240E	N	PDIP	20	20	506	13.97	11230	4.32
CD74HC241E	N	PDIP	20	20	506	13.97	11230	4.32
CD74HC244E	N	PDIP	20	20	506	13.97	11230	4.32
CD74HC244EE4	N	PDIP	20	20	506	13.97	11230	4.32
CD74HCT240E	N	PDIP	20	20	506	13.97	11230	4.32
CD74HCT240EE4	N	PDIP	20	20	506	13.97	11230	4.32
CD74HCT241E	N	PDIP	20	20	506	13.97	11230	4.32
CD74HCT244E	N	PDIP	20	20	506	13.97	11230	4.32

J (R-GDIP-T\*\*)

14 LEADS SHOWN

CERAMIC DUAL IN-LINE PACKAGE



DIM \ PINS **	14	16	18	20
A	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC
B MAX	0.785 (19,94)	.840 (21,34)	0.960 (24,38)	1.060 (26,92)
B MIN	—	—	—	—
C MAX	0.300 (7,62)	0.300 (7,62)	0.310 (7,87)	0.300 (7,62)
C MIN	0.245 (6,22)	0.245 (6,22)	0.220 (5,59)	0.245 (6,22)



4040083/F 03/03

- NOTES:
- All linear dimensions are in inches (millimeters).
  - This drawing is subject to change without notice.
  - This package is hermetically sealed with a ceramic lid using glass frit.
  - Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.
  - Falls within MIL STD 1835 GDIP1-T14, GDIP1-T16, GDIP1-T18 and GDIP1-T20.

N (R-PDIP-T\*\*)

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN



- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
  - The 20 pin end lead shoulder width is a vendor option, either half or full width.



# DW0020A



# PACKAGE OUTLINE

## SOIC - 2.65 mm max height

SOIC



4220724/A 05/2016

### NOTES:

1. All linear dimensions are in millimeters. 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 0.43 mm per side.
5. Reference JEDEC registration MS-013.

# EXAMPLE BOARD LAYOUT

DW0020A

SOIC - 2.65 mm max height

SOIC



LAND PATTERN EXAMPLE  
SCALE:6X



SOLDER MASK DETAILS

4220724/A 05/2016

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

DW0020A

SOIC - 2.65 mm max height

SOIC



SOLDER PASTE EXAMPLE  
BASED ON 0.125 mm THICK STENCIL  
SCALE:6X

4220724/A 05/2016

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.



4220206/A 02/2017

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.

# EXAMPLE BOARD LAYOUT

PW0020A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE: 10X



SOLDER MASK DETAILS

4220206/A 02/2017

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

4220206/A 02/2017

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.

## 重要なお知らせと免責事項

テキサス・インスツルメンツは、技術データと信頼性データ(データシートを含みます)、設計リソース(リファレンス デザインを含みます)、アプリケーションや設計に関する各種アドバイス、Web ツール、安全性情報、その他のリソースを、欠陥が存在する可能性のある「現状のまま」提供しており、商品性および特定目的に対する適合性の黙示保証、第三者の知的財産権の非侵害保証を含むいかなる保証も、明示的または黙示的にかかわらず拒否します。

これらのリソースは、テキサス・インスツルメンツ製品を使用する設計の経験を積んだ開発者への提供を意図したものです。(1) お客様のアプリケーションに適したテキサス・インスツルメンツ製品の選定、(2) お客様のアプリケーションの設計、検証、試験、(3) お客様のアプリケーションに該当する各種規格や、その他のあらゆる安全性、セキュリティ、規制、または他の要件への確実な適合に関する責任を、お客様のみが単独で負うものとします。

上記の各種リソースは、予告なく変更される可能性があります。これらのリソースは、リソースで説明されているテキサス・インスツルメンツ製品を使用するアプリケーションの開発の目的でのみ、テキサス・インスツルメンツはその使用をお客様に許諾します。これらのリソースに関して、他の目的で複製することや掲載することは禁止されています。テキサス・インスツルメンツや第三者の知的財産権のライセンスが付与されている訳ではありません。お客様は、これらのリソースを自身で使用した結果発生するあらゆる申し立て、損害、費用、損失、責任について、テキサス・インスツルメンツおよびその代理人を完全に補償するものとし、テキサス・インスツルメンツは一切の責任を拒否します。

テキサス・インスツルメンツの製品は、[テキサス・インスツルメンツの販売条件](#)、または [ti.com](https://www.ti.com) やかかるテキサス・インスツルメンツ製品の関連資料などのいずれかを通じて提供する適用可能な条項の下で提供されています。テキサス・インスツルメンツがこれらのリソースを提供することは、適用されるテキサス・インスツルメンツの保証または他の保証の放棄の拡大や変更を意味するものではありません。

お客様がいかなる追加条項または代替条項を提案した場合でも、テキサス・インスツルメンツはそれらに異議を唱え、拒否します。

郵送先住所：Texas Instruments, Post Office Box 655303, Dallas, Texas 75265  
Copyright © 2025, Texas Instruments Incorporated