SCBS004F - OCTOBER 1987 - REVISED MARCH 2003

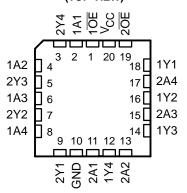
- Operating Voltage Range of 4.5 V to 5.5 V
- State-of-the-Art BiCMOS Design Significantly Reduces I_{CCZ}

SN54BCT240 . . . J OR W PACKAGE SN74BCT240 . . . DB, DW, N, OR NS PACKAGE (TOP VIEW)

	•	•	
1 <u>0E</u> [1	7 20] v _{cc}
1A1 [2	19	20E
2Y4 [3	18] 1Y1
1A2 [4	17	2A4
2Y3 [5	16] 1Y2
1A3 [6	15] 2A3
2Y2 [7	14	1Y3
1A4 [8	13	2A2
2Y1 [9	12] 1Y4
GND [10	11] 2A1

- 3-State Outputs Drive Bus Lines or Buffer Memory Address Registers
- ESD Protection Exceeds JESD 22
 2000-V Human-Body Model (A114-A)

SN54BCT240 . . . FK PACKAGE (TOP VIEW)



description/ordering information

These octal buffers and line drivers are designed specifically to improve both the performance and density of 3-state memory address drivers, clock drivers, and bus-oriented receivers and transmitters. Together with the 'BCT241 and 'BCT244 devices, these devices provide the choice of selected combinations of inverting and noninverting outputs, symmetrical $\overline{\text{OE}}$ (active-low output-enable) inputs, and complementary $\overline{\text{OE}}$ inputs. These devices feature high fan-out and improved fan-in.

To ensure the high-impedance state during power up or power down, \overline{OE} should 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.

ORDERING INFORMATION

TA	PACKA	GEŤ	ORDERABLE PART NUMBER	TOP-SIDE MARKING	
	PDIP – N	Tube	SN74BCT240N	SN74BCT240N	
0°C to 70°C	SOIC - DW	Tube	SN74BCT240DW	BCT240	
	30IC - DVV	Tape and reel	SN74BCT240DWR	BC1240	
	SOP – NS	Tape and reel	SN74BCT240NSR	BCT240	
	SSOP – DB	Tape and reel	SN74BCT240DBR	BT240	
	CDIP – J	Tube	SNJ54BCT240J	SNJ54BCT240J	
–55°C to 125°C	CFP – W	Tube	SNJ54BCT240W	SNJ54BCT240W	
	LCCC – FK	Tube	SNJ54BCT240FK	SNJ54BCT240FK	

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



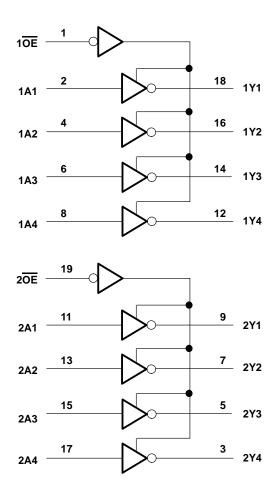
Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.



FUNCTION TABLE (each buffer)

INPU	JTS	OUTPUT
OE	Α	Y
L	Н	L
L	L	Н
Н	Χ	Z

logic diagram (positive logic)





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absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†

Supply voltage range, V _{CC}	0.5 V to 7 V
Input voltage range, V _I (see Note 1)	
Voltage range applied to any output in the disabled or power-off state, VO	–0.5 V to 5.5 V
Voltage range applied to any output in the high state, V _O	–0.5 V to V _{CC}
Input clamp current, I _{IK}	–30 mA
Current into any output in the low state: SN54BCT240	96 mA
SN74BCT240	128 mA
Package thermal impedance, θ_{JA} (see Note 2): DB package	70°C/W
DW package	58°C/W
N package	69°C/W
NS package	60°C/W
Storage temperature range, T _{stg}	–65°C to 150°C

[†] Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

NOTES: 1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

2. The package thermal impedance is calculated in accordance with JESD 51-7.

recommended operating conditions (see Note 3)

		SN54BCT240			SN	74BCT2	40	UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	UNII
VCC	Supply voltage	4.5	5	5.5	4.5	5	5.5	V
VIH	High-level input voltage	2			2			V
V_{IL}	Low-level input voltage			0.8			0.8	V
liK	Input clamp current			-18			-18	mA
ІОН	High-level output current			-12			-15	mA
loL	Low-level output current			48			64	mA
TA	Operating free-air temperature	-55		125	0		70	°C

NOTE 3: 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, literature number SCBA004.



SN54BCT240, SN74BCT240 **OCTAL BUFFERS/DRIVERS WITH 3-STATE OUTPUTS**

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

DADAMETED		TOT COMPITIONS	SN	54BCT2	40	SN	74BCT2	40	LINIT
PARAMETER	15	EST CONDITIONS	MIN	TYP [†]	MAX	MIN	TYP [†]	MAX	UNIT
VIK	$V_{CC} = 4.5 \text{ V},$	I _I = -18 mA			-1.2			-1.2	V
		$I_{OH} = -3 \text{ mA}$	2.4	3.3		2.4	3.3		
Voн	V _{CC} = 4.5 V	$I_{OH} = -12 \text{ mA}$	2	3.2					V
		$I_{OH} = -15 \text{ mA}$				2	3.1		
\/o\	V _{CC} = 4.5 V	$I_{OL} = 48 \text{ mA}$		0.38	0.55				٧
VOL	VCC = 4.5 V	$I_{OL} = 64 \text{ mA}$					0.42	0.55	V
lį	$V_{CC} = 5.5 V,$	V _I = 7 V			0.1			0.1	mA
lіН	$V_{CC} = 5.5 V,$	V _I = 2.7 V			20			20	μΑ
I _{IL}	$V_{CC} = 5.5 V,$	V _I = 0.5 V			-1			-1	mA
lozh	$V_{CC} = 5.5 V$,	V _O = 2.7 V			50			50	μΑ
lozL	$V_{CC} = 5.5 V,$	V _O = 0.5 V			-50			-50	μΑ
los [‡]	$V_{CC} = 5.5 V,$	V _O = 0	-100		-225	-100		-225	mA
Іссн	$V_{CC} = 5.5 V,$	Outputs open		19	31		19	31	mA
^I CCL	$V_{CC} = 5.5 \text{ V},$	Outputs open		46	71		46	71	mA
Iccz	$V_{CC} = 5.5 \text{ V},$	Outputs open		6	9		6	9	mA
C _i	V _{CC} = 5 V,	V _I = 2.5 V or 0.5 V		6			6		pF
Co	V _{CC} = 5 V,	V _O = 2.5 V or 0.5 V		11			11		pF

switching characteristics (see Figure 1)

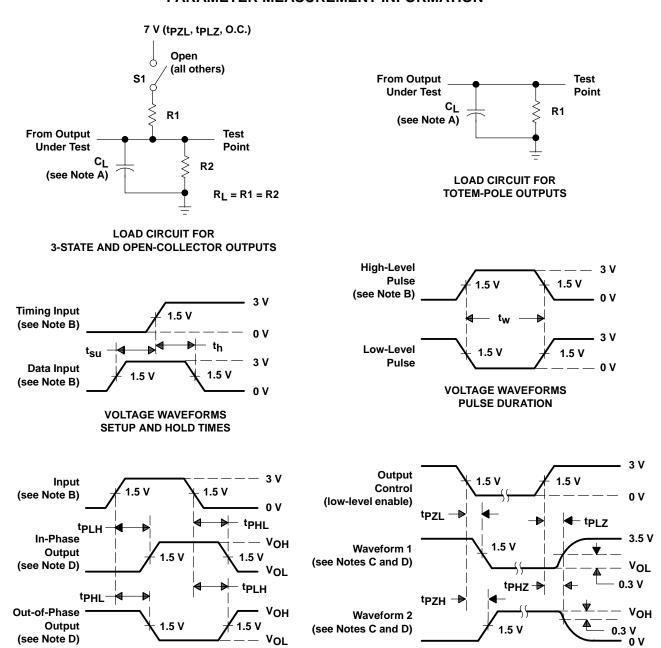
PARAMETER	FROM (INPUT)	TO (OUTPUT)	C _L R1 R2	C = 5 V = 50 pl = 500 g = 500 g = 25°C	F, Ω, Ω,	C _L R1 R2	= 50 pl 2 = 500 = 2 = 500 =	2,	V,	UNIT	
			'BCT240			SN54B	CT240	SN74BCT240			
			MIN	TYP	MAX	MIN	MAX	MIN	MAX		
t _{PLH}	А	Υ	0.5	3.3	4.8	0.5	6.4	0.5	5.6	ns	
^t PHL	A		'	ľ	0.4	1.8	3.5	0.4	4.5	0.4	4
^t PZH	ŌĒ	Y	1	6.4	7.9	1	9.2	1	8.8	ns	
^t PZL	OE	Y	1	7.5	9.4	1	10.8	1	10.5	115	
^t PHZ	ŌĒ	Y	1	6	6.8	1	8.5	1	8.1	ns	
t _{PLZ}			1	6.7	8.1	1	10.6	1	9.5	115	

[§] For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.



[†] All typical values are at V_{CC} = 5 V. ‡ Not more than one output should be tested at a time, and the duration of the test should not exceed one second.

PARAMETER MEASUREMENT INFORMATION



VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES (see Note D)

VOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES, 3-STATE OUTPUTS

- NOTES: A. C_I includes probe and jig capacitance.
 - B. All input pulses are supplied by generators having the following characteristics: PRR \leq 10 MHz, $t_f = t_f \leq 2.5$ ns, duty cycle = 50%.
 - C. 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.
 - D. The outputs are measured one at a time with one transition per measurement.
 - E. When measuring propagation delay times of 3-state outputs, switch S1 is open.
 - F. All parameters and waveforms are not applicable to all devices.

Figure 1. Load Circuit and Voltage Waveforms







10-Jun-2014

PACKAGING INFORMATION

Orderable Device	Status	Package Type	Package Drawing	Pins	Package Qty	Eco Plan	Lead/Ball Finish (6)	MSL Peak Temp	Op Temp (°C)	Device Marking (4/5)	Samples
5962-9074201M2A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	5962- 9074201M2A SNJ54 BCT240FK	Samples
5962-9074201MRA	ACTIVE	CDIP	J	20	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9074201MR A SNJ54BCT240J	Samples
5962-9074201MSA	ACTIVE	CFP	W	20	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9074201MS A SNJ54BCT240W	Samples
SN74BCT240DBLE	OBSOLETI	E SSOP	DB	20		TBD	Call TI	Call TI	0 to 70		
SN74BCT240DW	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	BCT240	Samples
SN74BCT240N	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	0 to 70	SN74BCT240N	Samples
SN74BCT240NSR	ACTIVE	so	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	BCT240	Samples
SNJ54BCT240FK	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	5962- 9074201M2A SNJ54 BCT240FK	Samples
SNJ54BCT240J	ACTIVE	CDIP	J	20	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9074201MR A SNJ54BCT240J	Samples
SNJ54BCT240W	ACTIVE	CFP	W	20	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9074201MS A SNJ54BCT240W	Samples

⁽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.

PACKAGE OPTION ADDENDUM



10-Jun-2014

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes. **Pb-Free** (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

- (3) MSL, Peak Temp. The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.
- (4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.
- (5) 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.
- (6) Lead/Ball Finish Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

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OTHER QUALIFIED VERSIONS OF SN54BCT240, SN74BCT240:

Catalog: SN74BCT240

Military: SN54BCT240

NOTE: Qualified Version Definitions:

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

PACKAGE MATERIALS INFORMATION

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TAPE AND REEL INFORMATION





Α0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

Device	Package Type	Package Drawing			Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74BCT240NSR	SO	NS	20	2000	330.0	24.4	9.0	13.0	2.4	4.0	24.0	Q1

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*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74BCT240NSR	SO	NS	20	2000	367.0	367.0	45.0

14 LEADS SHOWN



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

W (R-GDFP-F20)

CERAMIC DUAL FLATPACK



- A. All linear dimensions are in inches (millimeters).
- This drawing is subject to change without notice.
- C. This package can be hermetically sealed with a ceramic lid using glass frit.

 D. Index point is provided on cap for terminal identification only.

 E. Falls within Mil—Std 1835 GDFP2—F20



FK (S-CQCC-N**)

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN



- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- C. This package can be hermetically sealed with a metal lid.
- D. Falls within JEDEC MS-004



N (R-PDIP-T**)

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN



- 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.





SOIC



- 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.



SOIC



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.



SOIC



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.



DB (R-PDSO-G**)

PLASTIC SMALL-OUTLINE

28 PINS SHOWN



NOTES: A. All linear dimensions are in millimeters.

B. This drawing is subject to change without notice.

C. Body dimensions do not include mold flash or protrusion not to exceed 0,15.

D. Falls within JEDEC MO-150

MECHANICAL DATA

NS (R-PDSO-G**)

14-PINS SHOWN

PLASTIC SMALL-OUTLINE PACKAGE



- A. All linear dimensions are in millimeters.
- B. This drawing is subject to change without notice.
- C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15.



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