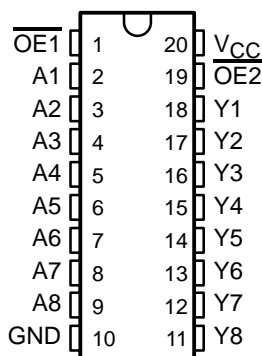


# SN54BCT540, SN74BCT540A OCTAL BUFFERS/DRIVERS WITH 3-STATE OUTPUTS

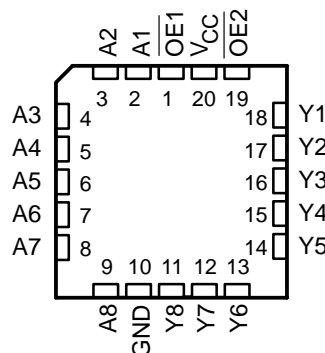
SCBS012E – JULY 1988 – REVISED MARCH 2003

- Operating Voltage Range of 4.5 V to 5.5 V
- State-of-the-Art BiCMOS Design Significantly Reduces  $I_{CCZ}$
- 3-State Outputs Drive Bus Lines or Buffer Memory Address Registers
- P-N-P Inputs Reduce DC Loading
- Data Flow-Through Pinout (All Inputs on Opposite Side From Outputs)
- ESD Protection Exceeds JESD 22
  - 2000-V Human-Body Model (A114-A)
  - 200-V Machine Model (A115-A)
  - 1000-V Charged-Device Model (C101)

SN54BCT540 . . . J OR W PACKAGE  
SN74BCT540A . . . DW, N, OR NS PACKAGE  
(TOP VIEW)



SN54BCT540 . . . FK PACKAGE  
(TOP VIEW)



## description/ordering information

The SN54BCT540 and SN74BCT540A octal buffers and line drivers are ideal for driving bus lines or buffer memory-address registers. The devices feature inputs and outputs on opposite sides of the package to facilitate printed circuit board layout.

The 3-state control gate is a 2-input AND gate with active-low inputs so that if either output-enable ( $\overline{OE1}$  or  $\overline{OE2}$ ) input is high, all corresponding outputs are in the high-impedance state.

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

T <sub>A</sub>	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
0°C to 70°C	PDIP – N	Tube	SN74BCT540AN	SN74BCT540AN
	SOIC – DW	Tube	SN74BCT540ADW	BCT540A
		Tape and reel	SN74BCT540ADWR	
–55°C to 125°C	SOP – NS	Tape and reel	SN74BCT540ANSR	BCT540A
	CDIP – J	Tube	SNJ54BCT540J	SNJ54BCT540J
	CFP – W	Tube	SNJ54BCT540W	SNJ54BCT540W
LCCC – FK		Tube	SNJ54BCT540FK	SNJ54BCT540FK

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



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PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

 **TEXAS  
INSTRUMENTS**

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On products compliant to MIL-PRF-38535, all parameters are tested unless otherwise noted. On all other products, production processing does not necessarily include testing of all parameters.

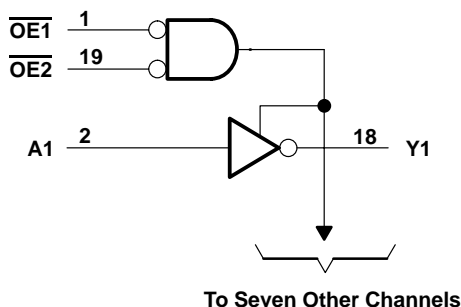
**SN54BCT540, SN74BCT540A**  
**OCTAL BUFFERS/DRIVERS**  
**WITH 3-STATE OUTPUTS**

SCBS012E – JULY 1988 – REVISED MARCH 2003

**FUNCTION TABLE**

INPUTS			OUTPUT Y
$\overline{OE1}$	$\overline{OE2}$	A	
L	L	L	H
L	L	H	L
H	X	X	Z
X	H	X	Z

**logic diagram (positive logic)**



**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) .....	-0.5 V to 7 V
Voltage range applied to any output in the disabled or power-off state, $V_O$ .....	-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: SN54BCT540 .....	96 mA
SN74BCT540A .....	128 mA
Package thermal impedance, $\theta_{JA}$ (see Note 2): 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.



# SN54BCT540, SN74BCT540A OCTAL BUFFERS/DRIVERS WITH 3-STATE OUTPUTS

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## recommended operating conditions (see Note 3)

		SN54BCT540			SN74BCT540A			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
$V_{CC}$	Supply voltage	4.5	5	5.5	4.5	5	5.5	V
$V_{IH}$	High-level input voltage	2			2			V
$V_{IL}$	Low-level input voltage			0.8			0.8	V
$I_{IK}$	Input clamp current			-18			-18	mA
$I_{OH}$	High-level output current			-12			-15	mA
$I_{OL}$	Low-level output current			48			64	mA
$T_A$	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.

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

PARAMETER	TEST CONDITIONS		SN54BCT540			SN74BCT540A			UNIT
			MIN	TYP†	MAX	MIN	TYP†	MAX	
$V_{IK}$	$V_{CC} = 4.5\text{ V}$ ,	$I_I = -18\text{ mA}$			-1.2			-1.2	V
$V_{OH}$	$V_{CC} = 4.5\text{ V}$	$I_{OH} = -3\text{ mA}$	2.4	3.3		2.4	3.3		V
		$I_{OH} = -12\text{ mA}$	2	3.2					
		$I_{OH} = -15\text{ mA}$				2	3.1		
$V_{OL}$	$V_{CC} = 4.5\text{ V}$	$I_{OL} = 48\text{ mA}$		0.38	0.55				V
		$I_{OL} = 64\text{ mA}$					0.42	0.55	
$I_I$	$V_{CC} = 5.5\text{ V}$ ,	$V_I = 7\text{ V}$			0.1			0.1	mA
$I_{IH}$	$V_{CC} = 5.5\text{ V}$ ,	$V_I = 2.7\text{ V}$			20			20	μA
$I_{IL}$	$V_{CC} = 5.5\text{ V}$ ,	$V_I = 0.5\text{ V}$			-0.6			-0.6	mA
$I_{OS}‡$	$V_{CC} = 5.5\text{ V}$ ,	$V_O = 0$	-100		-225	-100		-225	mA
$I_{OZH}$	$V_{CC} = 5.5\text{ V}$ ,	$V_O = 2.7\text{ V}$			50			50	μA
$I_{OZL}$	$V_{CC} = 5.5\text{ V}$ ,	$V_O = 0.5\text{ V}$			-50			-50	μA
$I_{CCH}$	$V_{CC} = 5.5\text{ V}$			20	30		20	30	mA
$I_{CCL}$	$V_{CC} = 5.5\text{ V}$			45	71		45	71	mA
$I_{CCZ}$	$V_{CC} = 5.5\text{ V}$			3	6		3	6	mA
$C_i$	$V_{CC} = 5\text{ V}$ ,	$V_I = 2.5\text{ V}$ or $0.5\text{ V}$		6			5		pF
$C_o$	$V_{CC} = 5\text{ V}$ ,	$V_O = 2.5\text{ V}$ or $0.5\text{ V}$		10			10		pF

† All typical values are at  $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$ .

‡ Not more than one output should be tested at a time, and the duration of the test should not exceed one second.

**SN54BCT540, SN74BCT540A**  
**OCTAL BUFFERS/DRIVERS**  
**WITH 3-STATE OUTPUTS**

SCBS012E – JULY 1988 – REVISED MARCH 2003

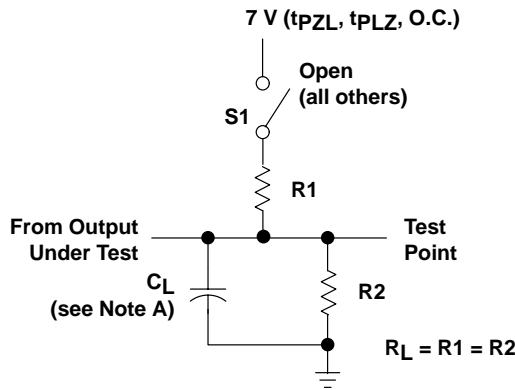
**switching characteristics (see Figure 1)**

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V <sub>CC</sub> = 5 V, C <sub>L</sub> = 50 pF, R <sub>1</sub> = 500 Ω, R <sub>2</sub> = 500 Ω, T <sub>A</sub> = 25°C			V <sub>CC</sub> = 4.5 V to 5.5 V, C <sub>L</sub> = 50 pF, R <sub>1</sub> = 500 Ω, R <sub>2</sub> = 500 Ω, T <sub>A</sub> = MIN to MAX <sup>§</sup>				UNIT
			BCT540			SN54BCT540		SN74BCT540A		
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t <sub>PLH</sub>	A	Y	2.5	4.1	5.8	1.9	7.2	2	6.9	ns
t <sub>PHL</sub>			0.6	1.9	3.5	0.3	4.5	0.3	4	
t <sub>PZH</sub>	$\overline{\text{OE}}$	Y	4	6.8	8.9	4.1	10.4	3.3	10.1	ns
t <sub>PZL</sub>			5	8	10	5.3	11.8	4.3	11.3	
t <sub>PHZ</sub>	$\overline{\text{OE}}$	Y	3.5	5.7	7.8	2.7	9.4	2.7	9	ns
t <sub>PLZ</sub>			3.8	5.5	7.4	3.5	8.9	3.5	8.5	

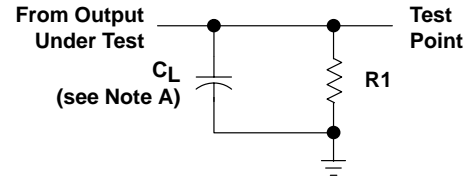
<sup>§</sup> For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.



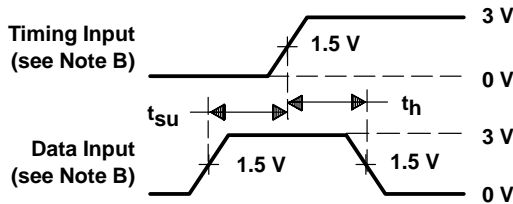
PARAMETER MEASUREMENT INFORMATION



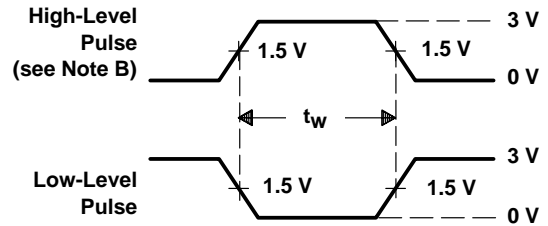
LOAD CIRCUIT FOR  
 3-STATE AND OPEN-COLLECTOR OUTPUTS



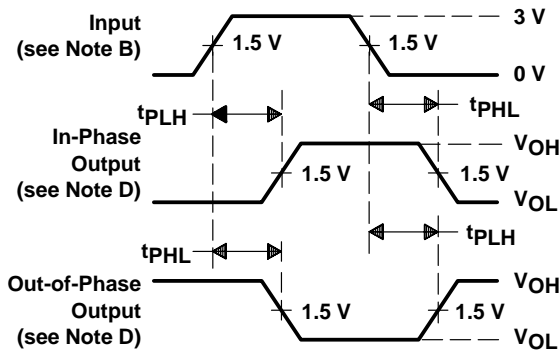
LOAD CIRCUIT FOR  
 TOTEM-POLE OUTPUTS



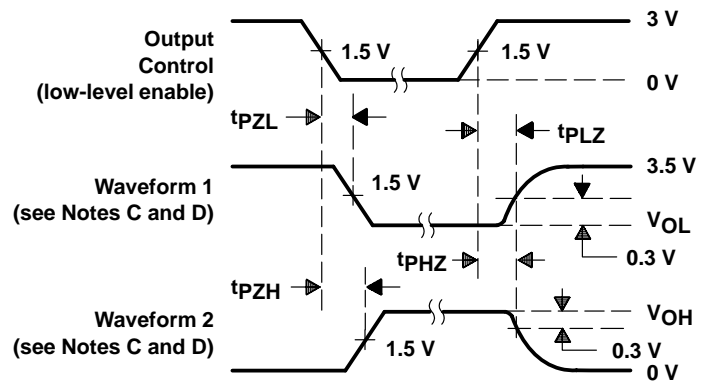
VOLTAGE WAVEFORMS  
 SETUP AND HOLD TIMES



VOLTAGE WAVEFORMS  
 PULSE DURATION



VOLTAGE WAVEFORMS  
 PROPAGATION DELAY TIMES (see Note D)



VOLTAGE WAVEFORMS  
 ENABLE AND DISABLE TIMES, 3-STATE OUTPUTS

- NOTES: A.  $C_L$  includes probe and jig capacitance.  
 B. All input pulses are supplied by generators having the following characteristics:  $PRR \leq 10$  MHz,  $t_r = t_f \leq 2.5$  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

**PACKAGING INFORMATION**

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
5962-9074801MRA	ACTIVE	CDIP	J	20	1	TBD	Call TI	N / A for Pkg Type	-55 to 125	5962-9074801MR A SNJ54BCT540J	<a href="#">Samples</a>
5962-9074801MSA	ACTIVE	CFP	W	20	1	TBD	Call TI	N / A for Pkg Type	-55 to 125	5962-9074801MS A SNJ54BCT540W	<a href="#">Samples</a>
SN74BCT540ADW	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	0 to 70	BCT540A	<a href="#">Samples</a>
SN74BCT540AN	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	NIPDAU	N / A for Pkg Type	0 to 70	SN74BCT540AN	<a href="#">Samples</a>
SN74BCT540ANSR	ACTIVE	SO	NS	20	2000	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	0 to 70	BCT540A	<a href="#">Samples</a>
SNJ54BCT540J	ACTIVE	CDIP	J	20	1	TBD	Call TI	N / A for Pkg Type	-55 to 125	5962-9074801MR A SNJ54BCT540J	<a href="#">Samples</a>
SNJ54BCT540W	ACTIVE	CFP	W	20	1	TBD	Call TI	N / A for Pkg Type	-55 to 125	5962-9074801MS A SNJ54BCT540W	<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/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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## 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
SN74BCT540ANSR	SO	NS	20	2000	330.0	24.4	8.4	13.0	2.5	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)
SN74BCT540ANSR	SO	NS	20	2000	367.0	367.0	45.0

# MECHANICAL DATA

NS (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE PACKAGE

14-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.

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

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN



4040049/E 12/2002

- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - (C) Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
  - (D) 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)

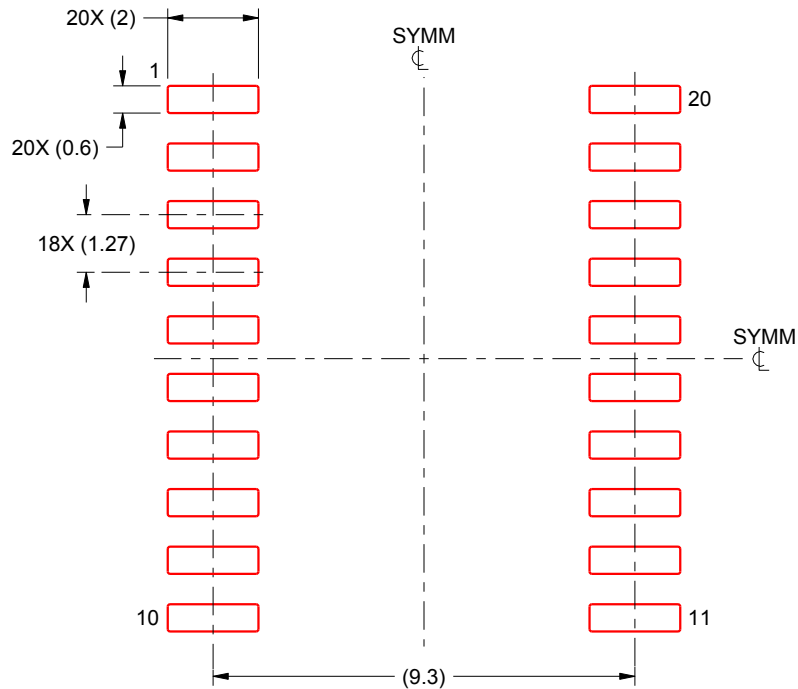
- 6. Publication IPC-7351 may have alternate designs.
- 7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

# 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.

W (R-GDFP-F20)

CERAMIC DUAL FLATPACK



- NOTES:
- 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 ceramic lid using glass frit.
  - D. Index point is provided on cap for terminal identification only.
  - E. Falls within Mil-Std 1835 GDFP2-F20

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.

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