

## **Excellent Integrated System Limited**

Stocking Distributor

Click to view price, real time Inventory, Delivery & Lifecycle Information:

[Texas Instruments](#)

[SN74LVCZ16240ADGGR](#)

For any questions, you can email us directly:

[sales@integrated-circuit.com](mailto:sales@integrated-circuit.com)

**SN74LVCZ16240A**  
**16-BIT BUFFER/DRIVER**  
**WITH 3-STATE OUTPUTS**

SCES276D – JUNE 1999 – REVISED AUGUST 2002

- Member of the Texas Instruments Widebus™ Family
- Operates From 2.7 V to 3.6 V
- Inputs Accept Voltages to 5.5 V
- Max  $t_{pd}$  of 4.2 ns at 3.3 V
- $I_{off}$  and Power-Up 3-State Support Hot Insertion
- Supports Mixed-Mode Signal Operation on All Ports (5-V Input/Output Voltage With 3.3-V  $V_{CC}$ )
- Latch-Up Performance Exceeds 100 mA Per JESD 78, Class II
- ESD Protection Exceeds JESD 22
  - 2000-V Human-Body Model (A114-A)
  - 1000-V Charged-Device Model (C101)

#### description/ordering information

This 16-bit buffer/driver is designed for 2.7-V to 3.6-V  $V_{CC}$  operation.

The SN74LVCZ16240A is designed specifically to improve both the performance and density of 3-state memory address drivers, clock drivers, and bus-oriented receivers and transmitters.

The device can be used as four 4-bit buffers, two 8-bit buffers, or one 16-bit buffer. This device provides inverting outputs.

Inputs can be driven from either 3.3-V or 5-V devices. This feature allows the use of these devices as translators in a mixed 3.3-V/5-V system environment.

During power up or power down when  $V_{CC}$  is between 0 and 1.5 V, the device is in the high-impedance state. However, to ensure the high-impedance state above 1.5 V,  $\overline{OE}$  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.

**DGG, DGV, OR DL PACKAGE  
(TOP VIEW)**

1	48	2	20
1Y1	2	47	1A1
1Y2	3	46	1A2
GND	4	45	GND
1Y3	5	44	1A3
1Y4	6	43	1A4
$V_{CC}$	7	42	$V_{CC}$
2Y1	8	41	2A1
2Y2	9	40	2A2
GND	10	39	GND
2Y3	11	38	2A3
2Y4	12	37	2A4
3Y1	13	36	3A1
3Y2	14	35	3A2
GND	15	34	GND
3Y3	16	33	3A3
3Y4	17	32	3A4
$V_{CC}$	18	31	$V_{CC}$
4Y1	19	30	4A1
4Y2	20	29	4A2
GND	21	28	GND
4Y3	22	27	4A3
4Y4	23	26	4A4
4OE	24	25	3OE

#### ORDERING INFORMATION

TA	PACKAGE <sup>†</sup>	ORDERABLE PART NUMBER	TOP-SIDE MARKING
–40°C to 85°C	SSOP – DL	Tube	SN74LVCZ16240ADL
		Tape and reel	SN74LVCZ16240ADLR
	TSSOP – DGG	Tape and reel	SN74LVCZ16240ADGGR
TVSOP – DGV		Tape and reel	SN74LVCZ16240ADGVR
			CW240A

<sup>†</sup> 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).



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.

Widebus is a trademark of Texas Instruments.

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.

Copyright © 2002, Texas Instruments Incorporated



POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

**SN74LVCZ16240A**  
**16-BIT BUFFER/DRIVER**  
**WITH 3-STATE OUTPUTS**

SCES276D – JUNE 1999 – REVISED AUGUST 2002

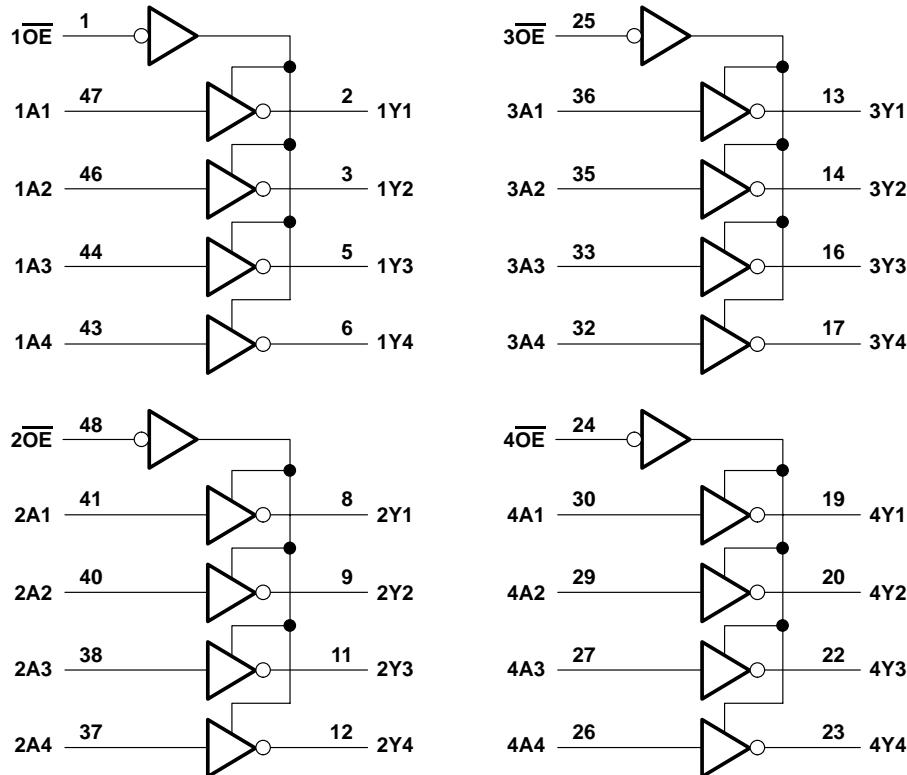
**description/ordering information (continued)**

This device is fully specified for hot-insertion applications using  $I_{off}$  and power-up 3-state. The  $I_{off}$  circuitry disables the outputs, preventing damaging current backflow through the device when it is powered down ( $V_{CC} = 0$  V). The power-up 3-state circuitry places the outputs in the high-impedance state during power up and power down, which prevents driver conflict.

**FUNCTION TABLE**  
 (each 4-bit buffer)

INPUTS		OUTPUT
$\overline{OE}$	A	Y
L	H	L
L	L	H
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 6.5 V
Input voltage range, $V_I$ (see Note 1) .....	–0.5 V to 6.5 V
Voltage range applied to any output in the high-impedance or power-off state, $V_O$ (see Note 1) .....	–0.5 V to 6.5 V
Voltage range applied to any output in the high or low state, $V_O$ (see Notes 1 and 2) .....	–0.5 V to $V_{CC}$ + 0.5 V
Input clamp current, $I_{IK}$ ( $V_I < 0$ ) .....	–50 mA
Output clamp current, $I_{OK}$ ( $V_O < 0$ ) .....	–50 mA
Continuous output current, $I_O$ .....	±50 mA
Continuous current through each $V_{CC}$ or GND .....	±100 mA
Package thermal impedance, $\theta_{JA}$ (see Note 3):	
DGG package .....	70°C/W
DGV package .....	58°C/W
DL package .....	63°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 negative-voltage and output voltage ratings may be exceeded if the input and output current ratings are observed.  
 2. The value of  $V_{CC}$  is provided in the recommended operating conditions table.  
 3. The package thermal impedance is calculated in accordance with JESD 51-7.

**recommended operating conditions (see Note 4)**

		MIN	MAX	UNIT
$V_{CC}$	Supply voltage	2.7	3.6	V
$V_{IH}$	High-level input voltage	$V_{CC} = 2.7$ V to 3.6 V	2	V
$V_{IL}$	Low-level input voltage	$V_{CC} = 2.7$ V to 3.6 V	0.8	V
$V_I$	Input voltage	0	5.5	V
$V_O$	Output voltage	High or low state 3-state	0 5.5	V
$I_{OH}$	High-level output current	$V_{CC} = 2.7$ V $V_{CC} = 3$ V	–12 –24	mA
$I_{OL}$	Low-level output current	$V_{CC} = 2.7$ V $V_{CC} = 3$ V	12 24	mA
$\Delta t/\Delta v$	Input transition rise or fall rate		10	ns/V
$\Delta t/\Delta V_{CC}$	Power-up ramp rate		150	μs/V
$T_A$	Operating free-air temperature	–40	85	°C

NOTE 4: 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.

**SN74LVCZ16240A**  
**16-BIT BUFFER/DRIVER**  
**WITH 3-STATE OUTPUTS**

SCES276D – JUNE 1999 – REVISED AUGUST 2002

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

PARAMETER	TEST CONDITIONS	V <sub>CC</sub>	MIN	TY <sup>†</sup>	MAX	UNIT
V <sub>OH</sub>	I <sub>OH</sub> = -100 $\mu$ A	2.7 V to 3.6 V	V <sub>CC</sub> - 0.2			V
	I <sub>OH</sub> = -12 mA	2.7 V	2.2			
	I <sub>OH</sub> = -24 mA	3 V	2.4			
	I <sub>OH</sub> = -24 mA	3 V	2.2			
V <sub>OL</sub>	I <sub>OL</sub> = 100 $\mu$ A	2.7 V to 3.6 V	0.2			V
	I <sub>OL</sub> = 12 mA	2.7 V	0.4			
	I <sub>OL</sub> = 24 mA	3 V	0.55			
I <sub>I</sub>	V <sub>I</sub> = 0 to 5.5 V	3.6 V	3.6	$\pm$ 5	$\mu$ A	
I <sub>off</sub>	V <sub>I</sub> or V <sub>O</sub> = 5.5 V	0	0	$\pm$ 5	$\mu$ A	
I <sub>OZ</sub>	V <sub>O</sub> = 0 to 5.5 V	3.6 V	3.6	$\pm$ 5	$\mu$ A	
I <sub>OZPU</sub>	V <sub>O</sub> = 0.5 V to 2.5 V, $\overline{OE}$ = don't care	0 to 1.5 V	0 to 1.5	$\pm$ 5	$\mu$ A	
I <sub>OZPD</sub>	V <sub>O</sub> = 0.5 V to 2.5 V, $\overline{OE}$ = don't care	1.5 V to 0	1.5 to 0	$\pm$ 5	$\mu$ A	
I <sub>CC</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND	3.6 V $\leq$ V <sub>I</sub> $\leq$ 5.5 V <sup>‡</sup>	I <sub>O</sub> = 0	3.6 V	100	$\mu$ A
	3.6 V $\leq$ V <sub>I</sub> $\leq$ 5.5 V <sup>‡</sup>				100	
$\Delta$ I <sub>CC</sub>	One input at V <sub>CC</sub> - 0.6 V, Other inputs at V <sub>CC</sub> or GND		2.7 V to 3.6 V	2.7	100	$\mu$ A
C <sub>i</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND		3.3 V	3.3	4.5	pF
C <sub>o</sub>	V <sub>O</sub> = V <sub>CC</sub> or GND		3.3 V	3.3	6	pF

<sup>†</sup> All typical values are at V<sub>CC</sub> = 3.3 V, T<sub>A</sub> = 25°C.

<sup>‡</sup> This applies in the disabled state only.

**switching characteristics over recommended operating free-air temperature range, C<sub>L</sub> = 50 pF (unless otherwise noted) (see Figure 1)**

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V <sub>CC</sub> = 2.7 V		V <sub>CC</sub> = 3.3 V $\pm$ 0.3 V		UNIT
			MIN	MAX	MIN	MAX	
t <sub>pd</sub>	A	Y	1	4.5	1	4.2	ns
t <sub>en</sub>	$\overline{OE}$	Y	1.5	5	1.5	4.7	ns
t <sub>dis</sub>	$\overline{OE}$	Y	1.5	6.2	1.5	5.9	ns

**switching characteristics over recommended operating free-air temperature range, C<sub>L</sub> = 30 pF (unless otherwise noted) (see Figure 1)**

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V <sub>CC</sub> = 2.7 V		V <sub>CC</sub> = 3.3 V $\pm$ 0.3 V		UNIT
			MIN	MAX	MIN	MAX	
t <sub>pd</sub>	A	Y	1	4.4	1	4.1	ns
t <sub>en</sub>	$\overline{OE}$	Y	1	4.8	1	4.5	ns
t <sub>dis</sub>	$\overline{OE}$	Y	1.4	5.9	1.4	5.6	ns

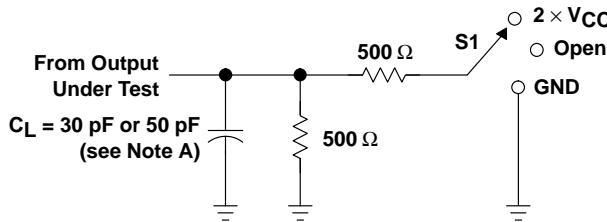
**operating characteristics, T<sub>A</sub> = 25°C**

PARAMETER	TEST CONDITIONS	V <sub>CC</sub> = 3.3 V		UNIT
		TYP		
C <sub>pd</sub> Power dissipation capacitance per buffer/driver	Outputs enabled	31		pF
	Outputs disabled	3.5		

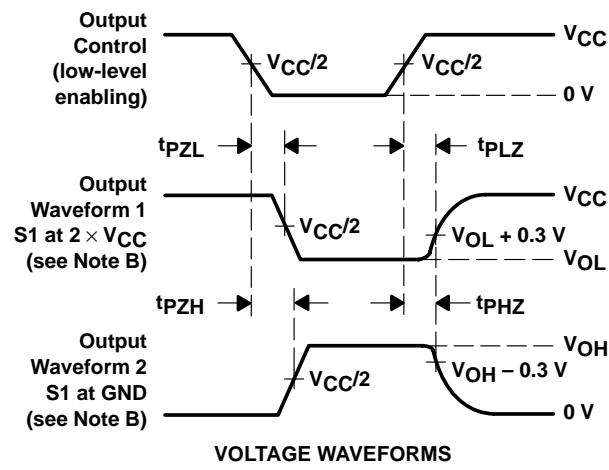
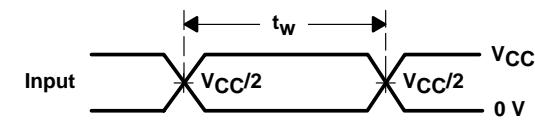
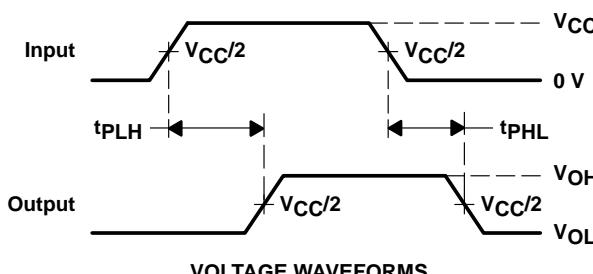
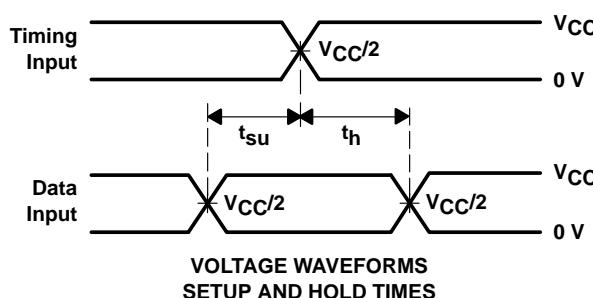


POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

**PARAMETER MEASUREMENT INFORMATION**  
 **$V_{CC} = 2.7\text{ V AND }3.3\text{ V} \pm 0.3\text{ V}$**



TEST	S1
$t_{pd}$	Open
$t_{PLZ}/t_{PZL}$	$2 \times V_{CC}$
$t_{PHZ}/t_{PZH}$	GND



NOTES:

- $C_L$  includes probe and jig capacitance.
- 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.
- All input pulses are supplied by generators having the following characteristics:  $PRR \leq 10\text{ MHz}$ ,  $Z_O = 50\text{ Ω}$ ,  $t_r \leq 2\text{ ns}$ ,  $t_f \leq 2\text{ ns}$ .
- The outputs are measured one at a time with one transition per measurement.
- $t_{PLZ}$  and  $t_{PHZ}$  are the same as  $t_{dis}$ .
- $t_{PZL}$  and  $t_{PZH}$  are the same as  $t_{en}$ .
- $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{pd}$ .
- 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
SN74LVCZ16240ADGGR	ACTIVE	TSSOP	DGG	48	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	LVCZ16240A	<b>Samples</b>

(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) 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.

**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.

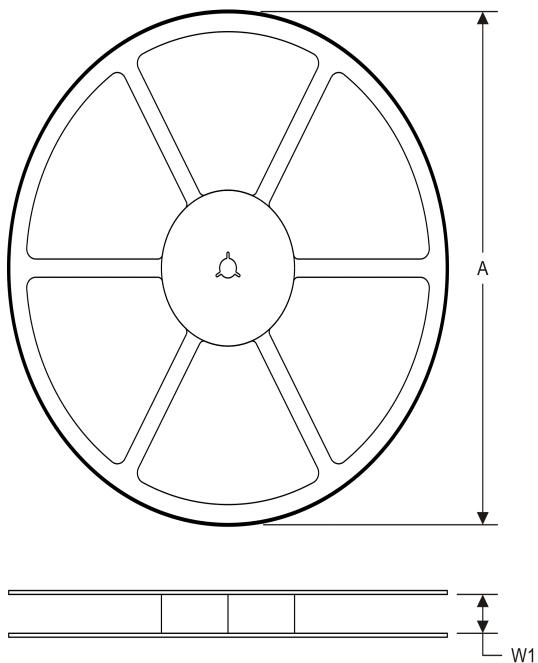
In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.



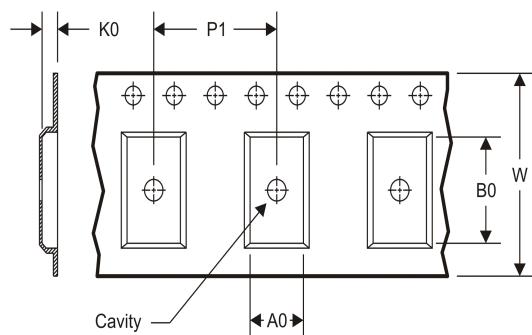
## PACKAGE MATERIALS INFORMATION

### TAPE AND REEL INFORMATION

#### REEL DIMENSIONS



#### TAPE DIMENSIONS



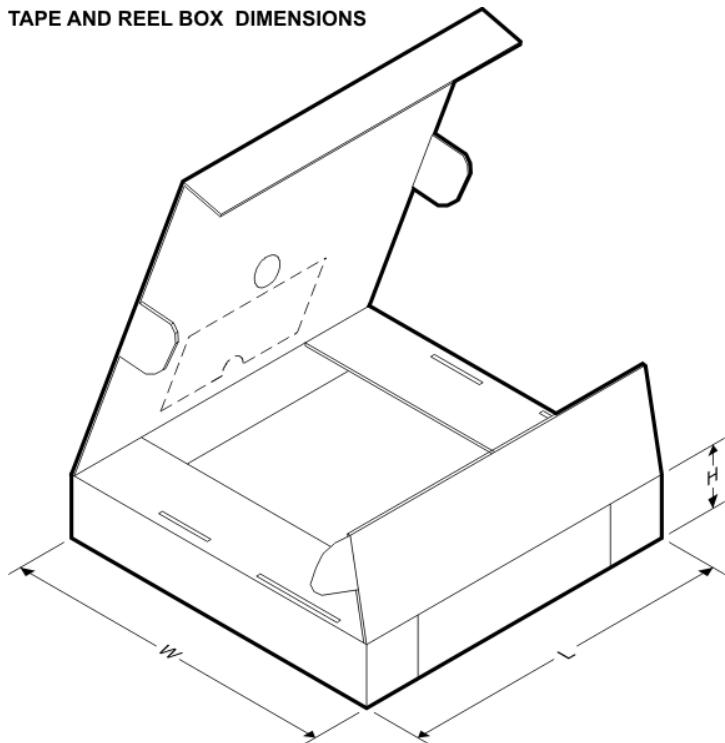
A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

#### TAPE AND REEL INFORMATION

\*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
SN74LVCZ16240ADGGR	TSSOP	DGG	48	2000	330.0	24.4	8.6	15.8	1.8	12.0	24.0	Q1

**TAPE AND REEL BOX DIMENSIONS**



\*All dimensions are nominal

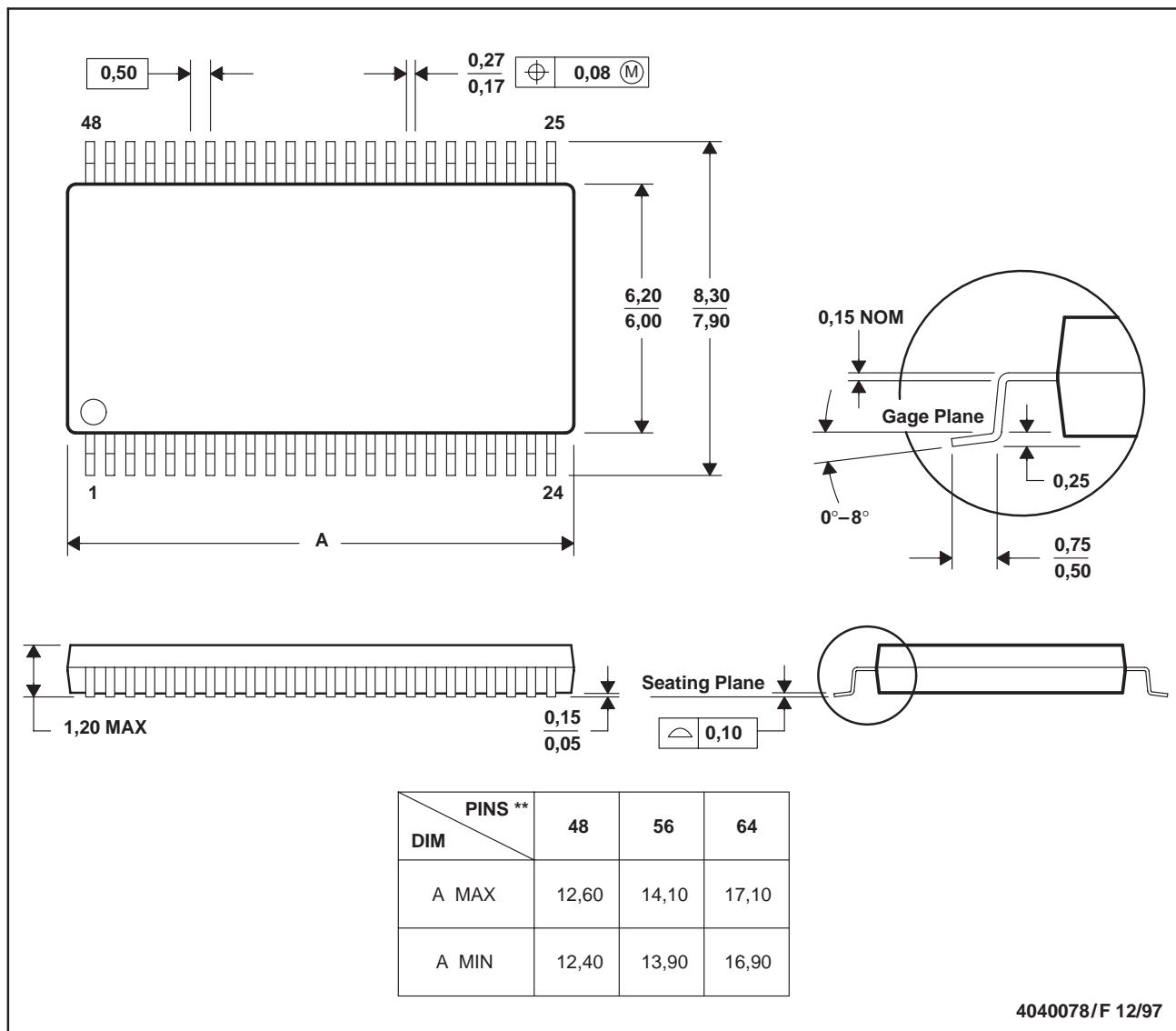
Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74LVCZ16240ADGGR	TSSOP	DGG	48	2000	367.0	367.0	45.0

MTSS003D – JANUARY 1995 – REVISED JANUARY 1998

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

**PLASTIC SMALL-OUTLINE PACKAGE**

48 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 protrusion not to exceed 0,15.  
 D. Falls within JEDEC MO-153

## IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46, latest issue, and to discontinue any product or service per JESD48, latest issue. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products (also referred to herein as "components") are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its components to the specifications applicable at the time of sale, in accordance with the warranty in TI's terms and conditions of sale of semiconductor products. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by applicable law, testing of all parameters of each component is not necessarily performed.

TI assumes no liability for applications assistance or the design of Buyers' products. Buyers are responsible for their products and applications using TI components. To minimize the risks associated with Buyers' products and applications, Buyers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI components or services are used. Information published by TI regarding third-party products or services does not constitute a license to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of significant portions of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI components or services with statements different from or beyond the parameters stated by TI for that component or service voids all express and any implied warranties for the associated TI component or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Buyer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of TI components in its applications, notwithstanding any applications-related information or support that may be provided by TI. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm and take appropriate remedial actions. Buyer will fully indemnify TI and its representatives against any damages arising out of the use of any TI components in safety-critical applications.

In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI's goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those TI components which TI has specifically designated as military grade or "enhanced plastic" are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have **not** been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.

Products	Applications
Audio	<a href="http://www.ti.com/audio">www.ti.com/audio</a>
Amplifiers	<a href="http://amplifier.ti.com">amplifier.ti.com</a>
Data Converters	<a href="http://dataconverter.ti.com">dataconverter.ti.com</a>
DLP® Products	<a href="http://www.dlp.com">www.dlp.com</a>
DSP	<a href="http://dsp.ti.com">dsp.ti.com</a>
Clocks and Timers	<a href="http://www.ti.com/clocks">www.ti.com/clocks</a>
Interface	<a href="http://interface.ti.com">interface.ti.com</a>
Logic	<a href="http://logic.ti.com">logic.ti.com</a>
Power Mgmt	<a href="http://power.ti.com">power.ti.com</a>
Microcontrollers	<a href="http://microcontroller.ti.com">microcontroller.ti.com</a>
RFID	<a href="http://www.ti-rfid.com">www.ti-rfid.com</a>
OMAP Applications Processors	<a href="http://www.ti.com/omap">www.ti.com/omap</a>
Wireless Connectivity	<a href="http://www.ti.com/wirelessconnectivity">www.ti.com/wirelessconnectivity</a>
	<b>TI E2E Community</b>
	<a href="http://e2e.ti.com">e2e.ti.com</a>