

- Member of the Texas Instruments Widebus™ Family
- Optimized for 1.8-V Operation and is 3.6-V I/O Tolerant to Support Mixed-Mode Signal Operation
- $I_{off}$  Supports Partial-Power-Down Mode Operation
- Sub 1-V Operable
- Max  $t_{pd}$  of 2 ns at 1.8 V
- Low Power Consumption, 20- $\mu$ A Max  $I_{CC}$
- $\pm 8$ -mA Output Drive at 1.8 V
- Latch-Up Performance Exceeds 100 mA Per JESD 78, Class II
- ESD Protection Exceeds JESD 22
  - 2000-V Human-Body Model (A114-A)
  - 200-V Machine Model (A115-A)
  - 1000-V Charged-Device Model (C101)

#### description/ordering information

This 16-bit buffer/driver is operational at 0.8-V to 2.7-V  $V_{CC}$ , but is designed specifically for 1.65-V to 1.95-V  $V_{CC}$  operation.

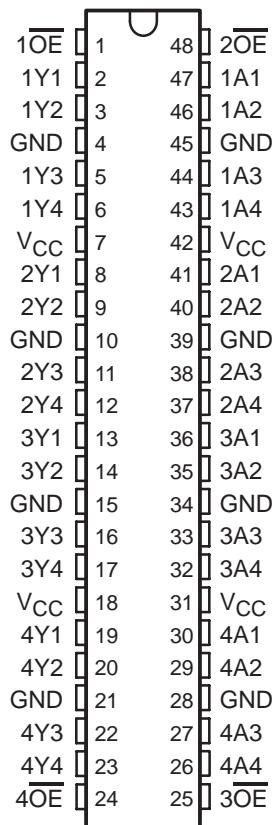
The SN74AUC16240 is designed specifically to improve the performance and density of 3-state memory address drivers, clock drivers, and bus-oriented receivers and transmitters.

The device can be used as four 4-bit buffers, two 8-bit buffers, or one 16-bit buffer. It provides inverting outputs and symmetrical active-low output-enable ( $\overline{OE}$ ) inputs.

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.

This device is fully specified for partial-power-down applications using  $I_{off}$ . The  $I_{off}$  circuitry disables the outputs, preventing damaging current backflow through the device when it is powered down.

DGG OR DGV PACKAGE  
(TOP VIEW)



#### ORDERING INFORMATION

TA	PACKAGE <sup>†</sup>		ORDERABLE PART NUMBER	TOP-SIDE MARKING
–40°C to 85°C	TSSOP – DGG	Tape and reel	SN74AUC16240DGGR	AUC16240
	TVSOP – DGV	Tape and reel	SN74AUC16240DGVR	MH240
	VFBGA – GQL	Tape and reel	SN74AUC16240GQLR	MH240

<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).



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 **TEXAS  
INSTRUMENTS**

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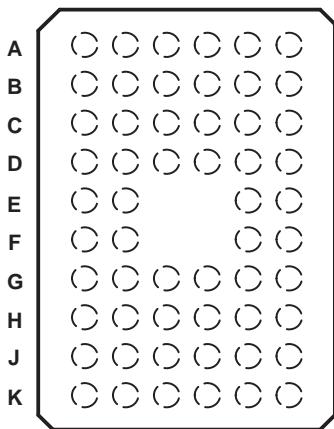
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**SN74AUC16240**  
**16-BIT BUFFER/DRIVER**  
**WITH 3-STATE OUTPUTS**

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**GQL PACKAGE**  
**(TOP VIEW)**

1 2 3 4 5 6



**terminal assignments**

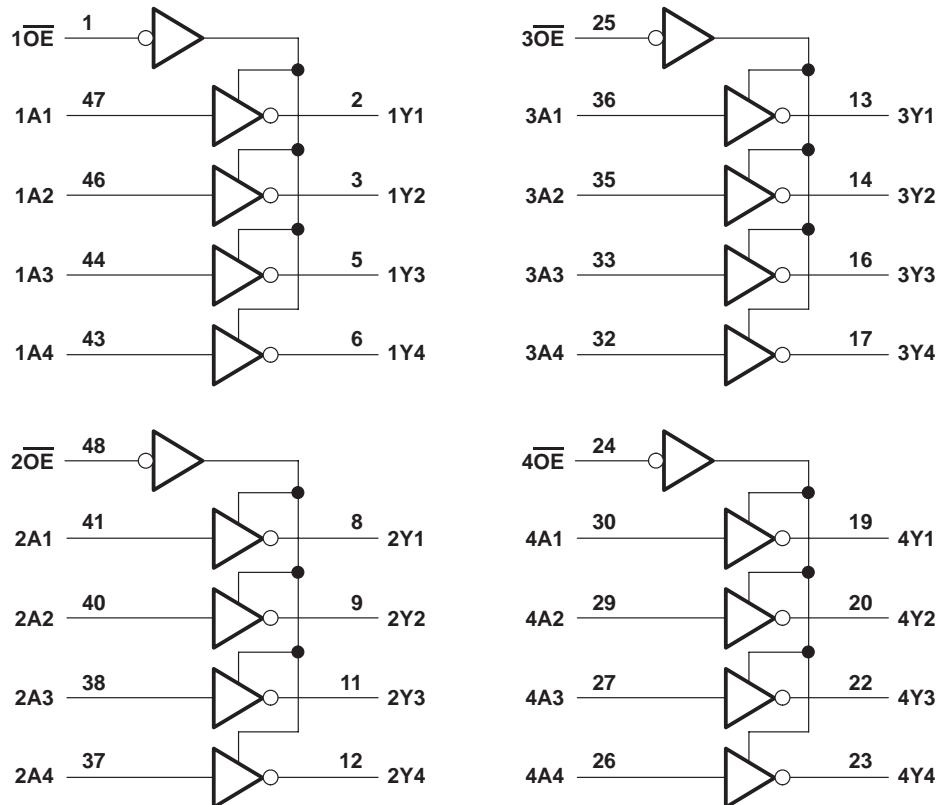
	1	2	3	4	5	6
A	$\overline{1OE}$	NC	NC	NC	NC	$\overline{2OE}$
B	1Y2	1Y1	GND	GND	1A1	1A2
C	1Y4	1Y3	$V_{CC}$	$V_{CC}$	1A3	1A4
D	2Y2	2Y1	GND	GND	2A1	2A2
E	2Y4	2Y3			2A3	2A4
F	3Y1	3Y2			3A2	3A1
G	3Y3	3Y4	GND	GND	3A4	3A3
H	4Y1	4Y2	$V_{CC}$	$V_{CC}$	4A2	4A1
J	4Y3	4Y4	GND	GND	4A4	4A3
K	$\overline{4OE}$	NC	NC	NC	NC	$\overline{3OE}$

NC - No internal connection

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

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

## logic diagram (positive logic)



Pin numbers shown are for the DGG and DGV packages.

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

Supply voltage range, $V_{CC}$ .....	-0.5 V to 3.6 V
Input voltage range, $V_I$ (see Note 1) .....	-0.5 V to 3.6 V
Voltage range applied to any output in the high-impedance or power-off state, $V_O$ (see Note 1) .....	-0.5 V to 3.6 V
Output voltage range, $V_O$ (see Note 1) .....	-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, $I_O$ .....	$\pm 20$ mA
Continuous current through $V_{CC}$ or GND .....	$\pm 100$ mA
Package thermal impedance, $\theta_{JA}$ (see Note 2):	
DGG package .....	70°C/W
DGV package .....	58°C/W
GQL package .....	42°C/W
Storage temperature range, $T_{stq}$ .....	-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 package thermal impedance is calculated in accordance with JESD 51-7.

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

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**recommended operating conditions (see Note 3)**

		MIN	MAX	UNIT
$V_{CC}$	Supply voltage	0.8	2.7	V
$V_{IH}$	High-level input voltage	$V_{CC} = 0.8\text{ V}$	$V_{CC}$	V
		$V_{CC} = 1.1\text{ V to }1.95\text{ V}$	$0.65 \times V_{CC}$	
		$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	1.7	
$V_{IL}$	Low-level input voltage	$V_{CC} = 0.8\text{ V}$	0	V
		$V_{CC} = 1.1\text{ V to }1.95\text{ V}$	$0.35 \times V_{CC}$	
		$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	0.7	
$V_I$	Input voltage	0	3.6	V
$V_O$	Output voltage	0	$V_{CC}$	V
$I_{OH}$	High-level output current	$V_{CC} = 0.8\text{ V}$	-0.7	mA
		$V_{CC} = 1.1\text{ V}$	-3	
		$V_{CC} = 1.4\text{ V}$	-5	
		$V_{CC} = 1.65\text{ V}$	-8	
		$V_{CC} = 2.3\text{ V}$	-9	
$I_{OL}$	Low-level output current	$V_{CC} = 0.8\text{ V}$	0.7	mA
		$V_{CC} = 1.1\text{ V}$	3	
		$V_{CC} = 1.4\text{ V}$	5	
		$V_{CC} = 1.65\text{ V}$	8	
		$V_{CC} = 2.3\text{ V}$	9	
$\Delta t/\Delta V$	Input transition rise or fall rate	$V_{CC} = 0.8\text{ V, }1.3\text{ V}$	20	ns/V
		$V_{CC} = 1.6\text{ V, }1.95\text{ V}$	10	
		$V_{CC} = 2.7\text{ V}$	5	
$T_A$	Operating free-air temperature	-40	85	°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	V <sub>CC</sub>	MIN	TYP <sup>†</sup>	MAX	UNIT
V <sub>OH</sub>	I <sub>OH</sub> = -100 µA	0.8 V to 2.7 V	V <sub>CC</sub> –0.1			V
	I <sub>OH</sub> = -0.7 mA	0.8 V		0.55		
	I <sub>OH</sub> = -3 mA	1.1 V		0.8		
	I <sub>OH</sub> = -5 mA	1.4 V		1		
	I <sub>OH</sub> = -8 mA	1.65 V		1.2		
	I <sub>OH</sub> = -9 mA	2.3 V		1.8		
V <sub>OL</sub>	I <sub>OL</sub> = 100 µA	0.8 V to 2.7 V		0.2		V
	I <sub>OL</sub> = 0.7 mA	0.8 V		0.25		
	I <sub>OL</sub> = 3 mA	1.1 V		0.3		
	I <sub>OL</sub> = 5 mA	1.4 V		0.4		
	I <sub>OL</sub> = 8 mA	1.65 V		0.45		
	I <sub>OL</sub> = 9 mA	2.3 V		0.6		
I <sub>I</sub>	A or $\overline{OE}$ inputs	V <sub>I</sub> = V <sub>CC</sub> or GND	0 to 2.7 V		±5	µA
I <sub>off</sub>		V <sub>I</sub> or V <sub>O</sub> = 2.7 V	0		±10	µA
I <sub>OZ</sub>		V <sub>O</sub> = V <sub>CC</sub> or GND	2.7 V		±10	µA
I <sub>CC</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND,	I <sub>O</sub> = 0	0.8 V to 2.7 V		20	µA
C <sub>i</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND		2.5 V		3 4	pF
C <sub>o</sub>	V <sub>O</sub> = V <sub>CC</sub> or GND		2.5 V		5.5 6	pF

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

switching characteristics over recommended operating free-air temperature range (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V <sub>CC</sub> = 0.8 V	V <sub>CC</sub> = 1.2 V ± 0.1 V	V <sub>CC</sub> = 1.5 V ± 0.1 V	V <sub>CC</sub> = 1.8 V ± 0.15 V	V <sub>CC</sub> = 2.5 V ± 0.2 V	UNIT
			TYP	MIN MAX	MIN MAX	MIN TYP MAX	MIN MAX	
t <sub>pd</sub>	A	Y	5.9	0.9 2.6	0.7 1.8	0.6 1.4 2	0.4 1.6	ns
t <sub>en</sub>	$\overline{OE}$	Y	7.9	1.2 3.8	0.8 2.5	0.7 1.5 2.5	0.7 2	ns
t <sub>dis</sub>	$\overline{OE}$	Y	9.3	2.1 6	1.5 4.8	1.8 2.7 4.5	0.6 2.3	ns

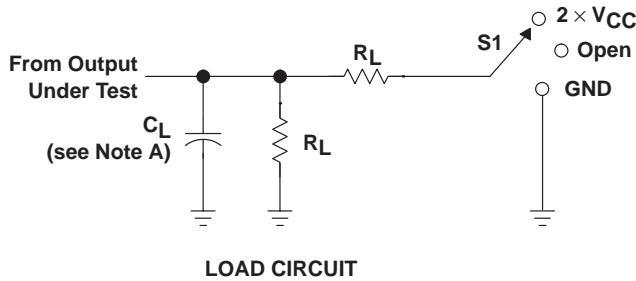
operating characteristics, T<sub>A</sub> = 25°C

C <sub>pd</sub>	Power dissipation capacitance	Outputs enabled Outputs disabled	f = 10 MHz	V <sub>CC</sub> = 0.8 V	V <sub>CC</sub> = 1.2 V	V <sub>CC</sub> = 1.5 V	V <sub>CC</sub> = 1.8 V	V <sub>CC</sub> = 2.5 V	UNIT
				TYP	TYP	TYP	TYP	TYP	
				24	24	25	26	30	
				2	2	2	3	4	pF

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

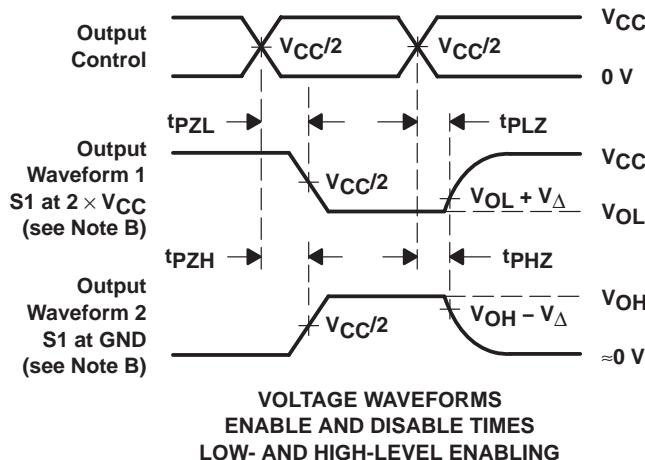
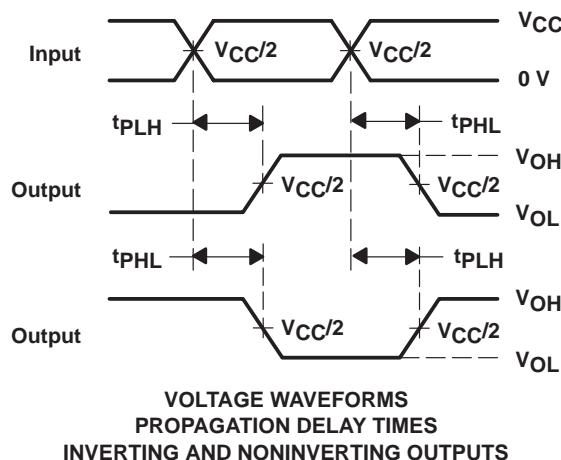
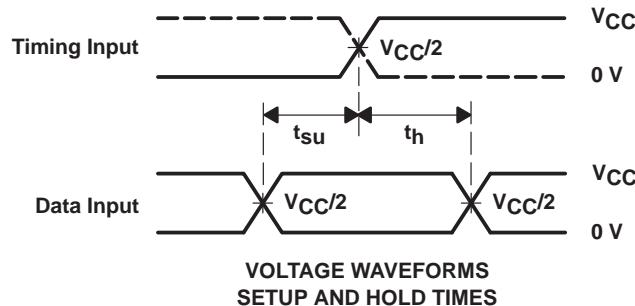
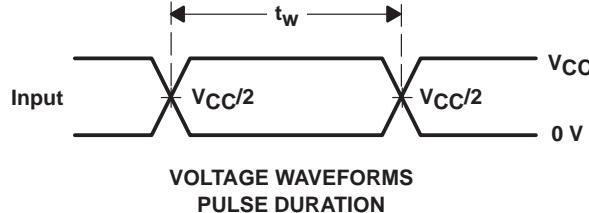
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**PARAMETER MEASUREMENT INFORMATION**



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

$V_{CC}$	$C_L$	$R_L$	$V_{\Delta}$
0.8 V	15 pF	2 k $\Omega$	0.1 V
1.2 V $\pm$ 0.1 V	15 pF	2 k $\Omega$	0.1 V
1.5 V $\pm$ 0.1 V	15 pF	2 k $\Omega$	0.1 V
1.8 V $\pm$ 0.15 V	30 pF	1 k $\Omega$	0.15 V
2.5 V $\pm$ 0.2 V	30 pF	500 $\Omega$	0.15 V



NOTES: A.  $C_L$  includes probe and jig capacitance.

B. 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.

C. All input pulses are supplied by generators having the following characteristics: PRR  $\leq$  10 MHz,  $Z_O = 50\Omega$ , slew rate  $\geq 1\text{ V/ns}$ .

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

E.  $t_{PLZ}$  and  $t_{PHZ}$  are the same as  $t_{dis}$ .

F.  $t_{PZL}$  and  $t_{PZH}$  are the same as  $t_{en}$ .

G.  $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{pd}$ .

H. 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
SN74AUC16240DGGR	ACTIVE	TSSOP	DGG	48	2000	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	-40 to 85	AUC16240	<b>Samples</b>
SN74AUC16240DGVR	ACTIVE	TVSOP	DGV	48	2000	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	-40 to 85	MH240	<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) **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.

(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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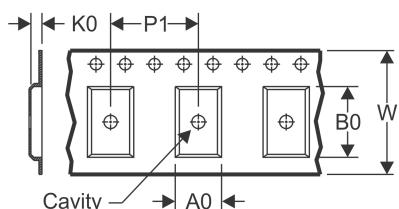


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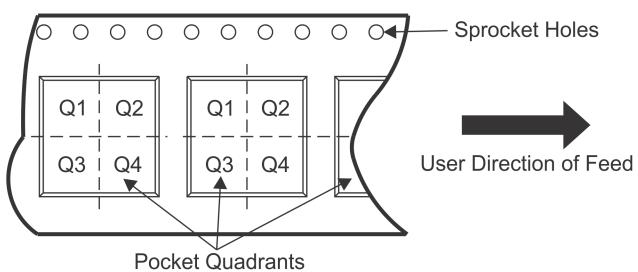
## PACKAGE OPTION ADDENDUM

6-Feb-2020

**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

**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
SN74AUC16240DGGR	TSSOP	DGG	48	2000	330.0	24.4	8.6	13.0	1.8	12.0	24.0	Q1
SN74AUC16240DGVR	TVSOP	DGV	48	2000	330.0	16.4	7.1	10.2	1.6	12.0	16.0	Q1

**TAPE AND REEL BOX DIMENSIONS**

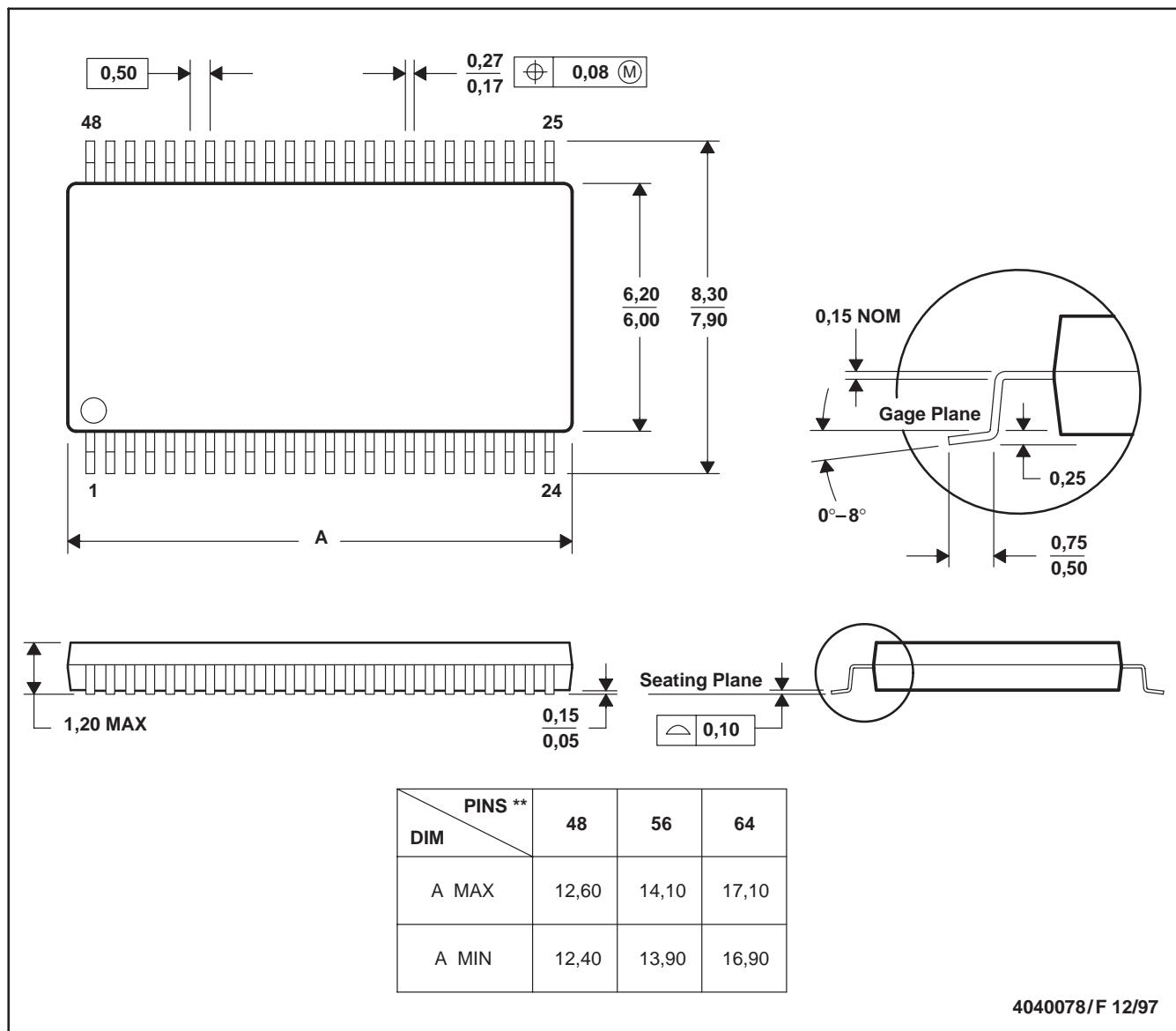

\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74AUC16240DGGR	TSSOP	DGG	48	2000	367.0	367.0	45.0
SN74AUC16240DGVR	TVSOP	DGV	48	2000	367.0	367.0	38.0

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

## PLASTIC SMALL-OUTLINE PACKAGE

48 PINS SHOWN

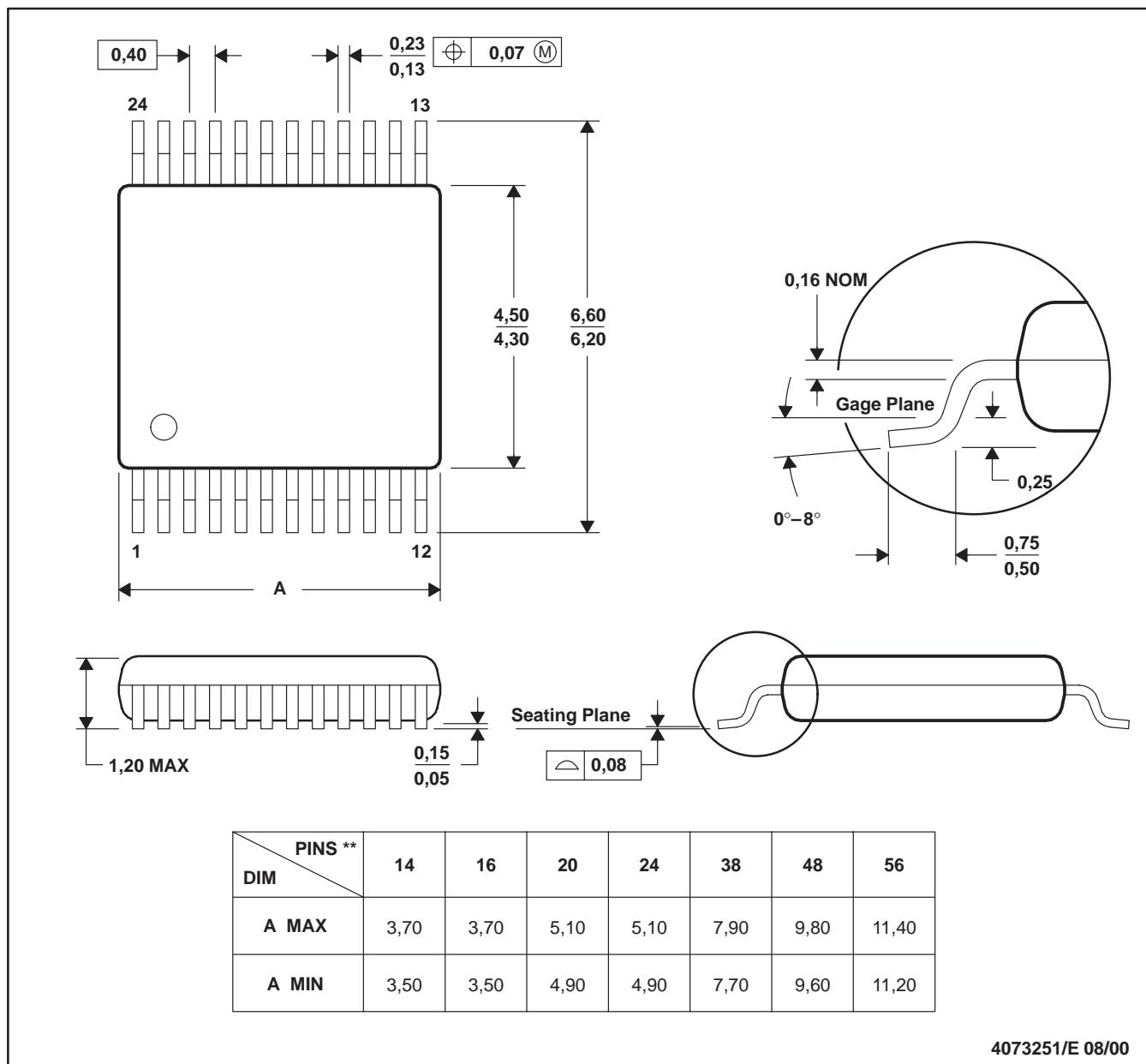


NOTES: A. All linear dimensions are in millimeters.  
 B. This drawing is subject to change without notice.  
 C. Body dimensions do not include mold protrusion not to exceed 0,15.  
 D. Falls within JEDEC MO-153

## DGV (R-PDSO-G\*\*)

## PLASTIC SMALL-OUTLINE

24 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 per side.  
 D. Falls within JEDEC: 24/48 Pins – MO-153  
 14/16/20/56 Pins – MO-194

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