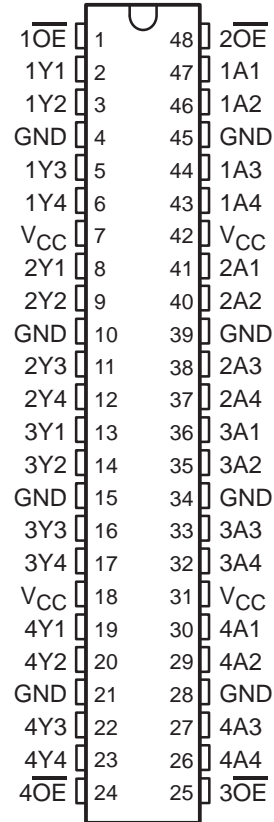


# SN54ABT16240A, SN74ABT16240A 16-BIT BUFFERS/DRIVERS WITH 3-STATE OUTPUTS

SCBS095G – DECEMBER 1991 – REVISED OCTOBER 1998

- Members of the Texas Instruments *Widebus™* Family
- State-of-the-Art *EPIC-II B™* BiCMOS Design Significantly Reduces Power Dissipation
- Typical  $V_{OLP}$  (Output Ground Bounce) < 1 V at  $V_{CC} = 5$  V,  $T_A = 25^\circ\text{C}$
- Distributed  $V_{CC}$  and GND Pin Configuration Minimizes High-Speed Switching Noise
- Flow-Through Architecture Optimizes PCB Layout
- High-Drive Outputs ( $-32\text{-mA } I_{OH}$ ,  $64\text{-mA } I_{OL}$ )
- Latch-Up Performance Exceeds 500 mA Per JESD 17
- ESD Protection Exceeds 2000 V Per MIL-STD-883, Method 3015; Exceeds 200 V Using Machine Model ( $C = 200$  pF,  $R = 0$ )
- Package Options Include Plastic Shrink Small-Outline (DL), Thin Shrink Small-Outline (DGG), and Thin Very Small-Outline (DGV) Packages and 380-mil Fine-Pitch Ceramic Flat (WD) Package Using 25-mil Center-to-Center Spacings

SN54ABT16240A . . . WD PACKAGE  
SN74ABT16240A . . . DGG, DGV, OR DL PACKAGE  
(TOP VIEW)



## description

The 'ABT16240A devices are 16-bit buffers and line drivers designed specifically to improve both the performance and density of 3-state memory address drivers, clock drivers, and bus-oriented receivers and transmitters.

These devices can be used as four 4-bit buffers, two 8-bit buffers, or one 16-bit buffer. These devices provide 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.

The SN54ABT16240A is characterized for operation over the full military temperature range of  $-55^\circ\text{C}$  to  $125^\circ\text{C}$ . The SN74ABT16240A is characterized for operation from  $-40^\circ\text{C}$  to  $85^\circ\text{C}$ .



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 and EPIC-II B are trademarks of Texas Instruments Incorporated.

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.

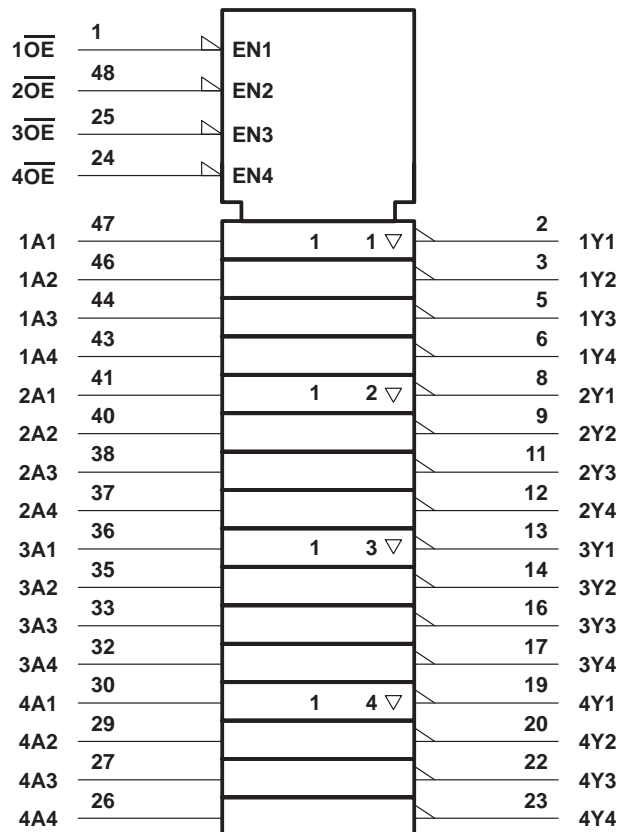
**SN54ABT16240A, SN74ABT16240A**  
**16-BIT BUFFERS/DRIVERS**  
**WITH 3-STATE OUTPUTS**

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

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

logic symbol†



† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.



# SN54ABT16240A, SN74ABT16240A

## 16-BIT BUFFERS/DRIVERS

### WITH 3-STATE OUTPUTS

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

		SN54ABT16240A		SN74ABT16240A		UNIT
		MIN	MAX	MIN	MAX	
V <sub>CC</sub>	Supply voltage	4.5	5.5	4.5	5.5	V
V <sub>IH</sub>	High-level input voltage	2		2		V
V <sub>IL</sub>	Low-level input voltage		0.8		0.8	V
V <sub>I</sub>	Input voltage	0	V <sub>CC</sub>	0	V <sub>CC</sub>	V
I <sub>OH</sub>	High-level output current		-24		-32	mA
I <sub>OL</sub>	Low-level output current		48		64	mA
Δt/Δv	Input transition rise or fall rate	Outputs enabled		10	10	ns/V
T <sub>A</sub>	Operating free-air temperature	-55	125	-40	85	°C

NOTE 3: All unused inputs of the device must be held at V<sub>CC</sub> 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	T <sub>A</sub> = 25°C			SN54ABT16240A		SN74ABT16240A		UNIT	
		MIN	TYP†	MAX	MIN	MAX	MIN	MAX		
V <sub>IK</sub>	V <sub>CC</sub> = 4.5 V, I <sub>I</sub> = -18 mA			-1.2		-1.2		-1.2	V	
V <sub>OH</sub>	V <sub>CC</sub> = 4.5 V, I <sub>OH</sub> = -3 mA	2.5			2.5		2.5		V	
	V <sub>CC</sub> = 5 V, I <sub>OH</sub> = -3 mA	3			3		3			
	V <sub>CC</sub> = 4.5 V									
V <sub>OL</sub>	V <sub>CC</sub> = 4.5 V	I <sub>OL</sub> = 48 mA		0.55		0.55			V	
		I <sub>OL</sub> = 64 mA		0.55*			0.55			
V <sub>hys</sub>			100						mV	
I <sub>I</sub>	V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = V <sub>CC</sub> or GND			±1		±1		±1	μA	
I <sub>OZH</sub>	V <sub>CC</sub> = 5.5 V, V <sub>O</sub> = 2.7 V			10		10		10	μA	
I <sub>OZL</sub>	V <sub>CC</sub> = 5.5 V, V <sub>O</sub> = 0.5 V			-10		-10		-10	μA	
I <sub>off</sub>	V <sub>CC</sub> = 0, V <sub>I</sub> or V <sub>O</sub> ≤ 4.5 V			±100				±100	μA	
I <sub>CEX</sub>	V <sub>CC</sub> = 5.5 V, V <sub>O</sub> = 5.5 V	Outputs high		50		50		50	μA	
I <sub>O‡</sub>	V <sub>CC</sub> = 5.5 V, V <sub>O</sub> = 2.5 V	-50	-100	-180	-50	-180	-50	-180	mA	
I <sub>CC</sub>	V <sub>CC</sub> = 5.5 V, I <sub>O</sub> = 0, V <sub>I</sub> = V <sub>CC</sub> or GND	Outputs high		3		3		3	mA	
		Outputs low		34		34		34		
		Outputs disabled		3		3		3		
ΔI <sub>CC</sub> §	Data inputs	V <sub>CC</sub> = 5.5 V, One input at 3.4 V, Other inputs at V <sub>CC</sub> or GND	Outputs enabled		1		1.5		1	mA
			Outputs disabled		0.05		1		0.05	
	Control inputs	V <sub>CC</sub> = 5.5 V, One input at 3.4 V, Other inputs at V <sub>CC</sub> or GND		1.5		1.5		1.5		
C <sub>i</sub>	V <sub>I</sub> = 2.5 V or 0.5 V		3.5						pF	
C <sub>o</sub>	V <sub>O</sub> = 2.5 V or 0.5 V		7.5						pF	

\* On products compliant to MIL-PRF-38535, this parameter does not apply.

† All typical values are at V<sub>CC</sub> = 5 V.

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

§ This is the increase in supply current for each input that is at the specified TTL voltage level rather than V<sub>CC</sub> or GND.



**SN54ABT16240A, SN74ABT16240A**  
**16-BIT BUFFERS/DRIVERS**  
**WITH 3-STATE OUTPUTS**

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switching characteristics over recommended ranges of supply voltage and operating free-air temperature,  $C_L = 50$  pF (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	SN54ABT16240A					UNIT
			$V_{CC} = 5$ V, $T_A = 25^\circ$ C			MIN	MAX	
			MIN	TYP	MAX			
$t_{PLH}$	A	Y	0.8	2.7	3.8	0.8	4.8	ns
$t_{PHL}$			1.1	3.1	4.3			
$t_{PZH}$	$\overline{OE}$	Y	1.3	3.3	4.3	1.3	5.4	ns
$t_{PZL}$			1.4	3.4	6.2			
$t_{PHZ}$	$\overline{OE}$	Y	1.6	3.6	6.2	1.6	7.2	ns
$t_{PLZ}$			1.4	3	5.1			

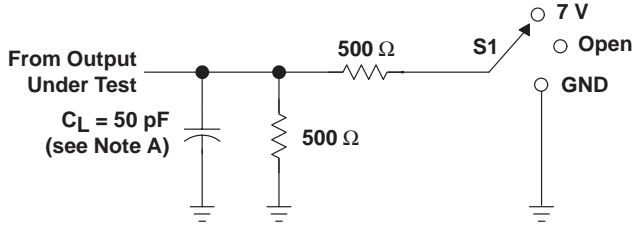
switching characteristics over recommended ranges of supply voltage and operating free-air temperature,  $C_L = 50$  pF (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	SN74ABT16240A					UNIT
			$V_{CC} = 5$ V, $T_A = 25^\circ$ C			MIN	MAX	
			MIN	TYP	MAX			
$t_{PLH}$	A	Y	1	2.7	3.8	1	4.7	ns
$t_{PHL}$			1.1	3.1	4.3			
$t_{PZH}$	$\overline{OE}$	Y	1.3	3.3	4.3	1.3	5.3	ns
$t_{PZL}$			1.4	3.4	6.2			
$t_{PHZ}$	$\overline{OE}$	Y	1.6	3.6	4.8	1.6	6.1	ns
$t_{PLZ}$			1.4	3	5.1			

**SN54ABT16240A, SN74ABT16240A**  
**16-BIT BUFFERS/DRIVERS**  
**WITH 3-STATE OUTPUTS**

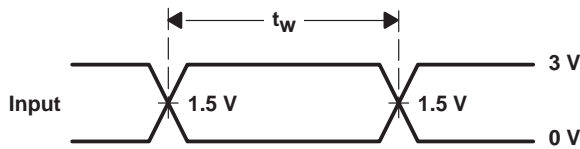
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**PARAMETER MEASUREMENT INFORMATION**

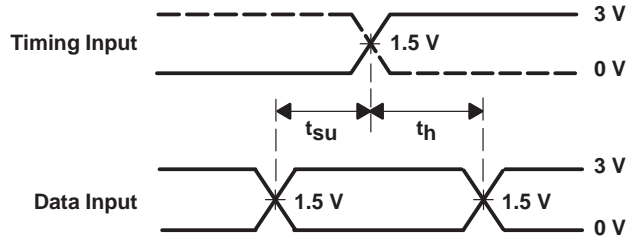


**LOAD CIRCUIT**

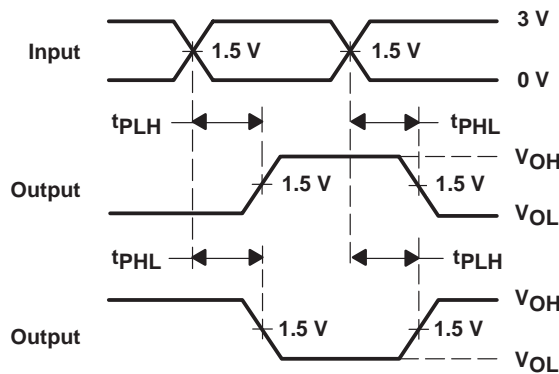
TEST	S1
$t_{PLH}/t_{PHL}$	Open
$t_{PLZ}/t_{PZL}$	7 V
$t_{PHZ}/t_{PZH}$	Open



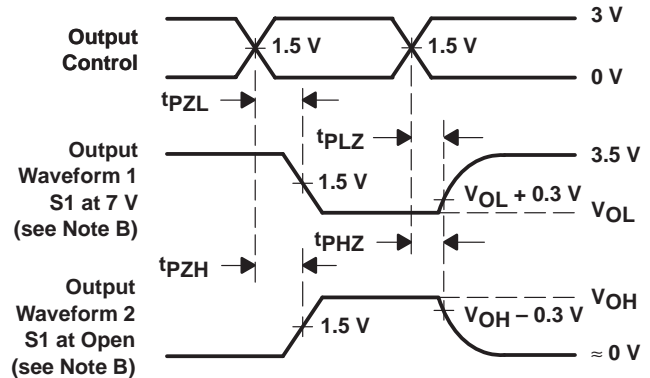
**VOLTAGE WAVEFORMS  
 PULSE DURATION**



**VOLTAGE WAVEFORMS  
 SETUP AND HOLD TIMES**



**VOLTAGE WAVEFORMS  
 PROPAGATION DELAY TIMES  
 INVERTING AND NONINVERTING OUTPUTS**



**VOLTAGE WAVEFORMS  
 ENABLE AND DISABLE TIMES  
 LOW- AND HIGH-LEVEL ENABLING**

- 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:  $PRR \leq 10 \text{ MHz}$ ,  $Z_O = 50 \Omega$ ,  $t_r \leq 2.5 \text{ ns}$ ,  $t_f \leq 2.5 \text{ ns}$ .  
 D. The outputs are measured one at a time with one transition per measurement.

**Figure 1. Load Circuit and Voltage Waveforms**

**PACKAGING INFORMATION**

Orderable part number	Status (1)	Material type (2)	Package   Pins	Package qty   Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
<a href="#">5962-9319901MXA</a>	Active	Production	CFP (WD)   48	15   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-9319901MX A SNJ54ABT16240A WD
74ABT16240ADGGRG4	Active	Production	TSSOP (DGG)   48	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT16240A
74ABT16240ADGGRG4.B	Active	Production	TSSOP (DGG)   48	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT16240A
74ABT16240ADGVRG4	Active	Production	TVSOP (DGV)   48	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	AH240A
74ABT16240ADGVRG4.B	Active	Production	TVSOP (DGV)   48	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	AH240A
<a href="#">SN74ABT16240ADGGR</a>	Active	Production	TSSOP (DGG)   48	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT16240A
SN74ABT16240ADGGR.B	Active	Production	TSSOP (DGG)   48	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT16240A
<a href="#">SN74ABT16240ADGVR</a>	Active	Production	TVSOP (DGV)   48	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	AH240A
SN74ABT16240ADGVR.B	Active	Production	TVSOP (DGV)   48	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	AH240A
<a href="#">SN74ABT16240ADL</a>	Active	Production	SSOP (DL)   48	25   TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT16240A
SN74ABT16240ADL.B	Active	Production	SSOP (DL)   48	25   TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT16240A
SN74ABT16240ADLG4	Active	Production	SSOP (DL)   48	25   TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT16240A
<a href="#">SN74ABT16240ADLR</a>	Active	Production	SSOP (DL)   48	1000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT16240A
SN74ABT16240ADLR.B	Active	Production	SSOP (DL)   48	1000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT16240A
SN74ABT16240ADLRG4	Active	Production	SSOP (DL)   48	1000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT16240A
SN74ABT16240ADLRG4.B	Active	Production	SSOP (DL)   48	1000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT16240A
<a href="#">SNJ54ABT16240AWD</a>	Active	Production	CFP (WD)   48	15   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-9319901MX A SNJ54ABT16240A WD

(1) **Status:** For more details on status, see our [product life cycle](#).

(2) **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

(3) **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.

(4) **Lead finish/Ball material:** Parts 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.

(5) **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

(6) **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

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**OTHER QUALIFIED VERSIONS OF SN54ABT16240A, SN74ABT16240A :**

- Catalog : [SN74ABT16240A](#)
- Military : [SN54ABT16240A](#)

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
74ABT16240ADGGRG4	TSSOP	DGG	48	2000	330.0	24.4	8.6	13.0	1.8	12.0	24.0	Q1
74ABT16240ADGVRG4	TVSOP	DGV	48	2000	330.0	16.4	7.1	10.2	1.6	12.0	16.0	Q1
SN74ABT16240ADGGR	TSSOP	DGG	48	2000	330.0	24.4	8.6	13.0	1.8	12.0	24.0	Q1
SN74ABT16240ADGVR	TVSOP	DGV	48	2000	330.0	16.4	7.1	10.2	1.6	12.0	16.0	Q1
SN74ABT16240ADLR	SSOP	DL	48	1000	330.0	32.4	11.35	16.2	3.1	16.0	32.0	Q1
SN74ABT16240ADLRG4	SSOP	DL	48	1000	330.0	32.4	11.35	16.2	3.1	16.0	32.0	Q1

**TAPE AND REEL BOX DIMENSIONS**


\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
74ABT16240ADGGRG4	TSSOP	DGG	48	2000	356.0	356.0	45.0
74ABT16240ADGVRG4	TVSOP	DGV	48	2000	353.0	353.0	32.0
SN74ABT16240ADGGR	TSSOP	DGG	48	2000	356.0	356.0	45.0
SN74ABT16240ADGVR	TVSOP	DGV	48	2000	353.0	353.0	32.0
SN74ABT16240ADLR	SSOP	DL	48	1000	356.0	356.0	53.0
SN74ABT16240ADLRG4	SSOP	DL	48	1000	356.0	356.0	53.0

**TUBE**


\*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (μm)	B (mm)
SN74ABT16240ADL	DL	SSOP	48	25	473.7	14.24	5110	7.87
SN74ABT16240ADL.B	DL	SSOP	48	25	473.7	14.24	5110	7.87
SN74ABT16240ADLG4	DL	SSOP	48	25	473.7	14.24	5110	7.87

WD (R-GDFP-F\*\*)

CERAMIC DUAL FLATPACK

48 LEADS SHOWN



- 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: GDFP1-F48 and JEDEC MO-146AA  
 GDFP1-F56 and JEDEC MO-146AB

# MECHANICAL DATA

DL (R-PDSO-G48)

PLASTIC SMALL-OUTLINE PACKAGE



- NOTES:
- All linear dimensions are in inches (millimeters).
  - This drawing is subject to change without notice.
  - Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
  - Falls within JEDEC MO-118

PowerPAD is a trademark of Texas Instruments.

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



# EXAMPLE BOARD LAYOUT

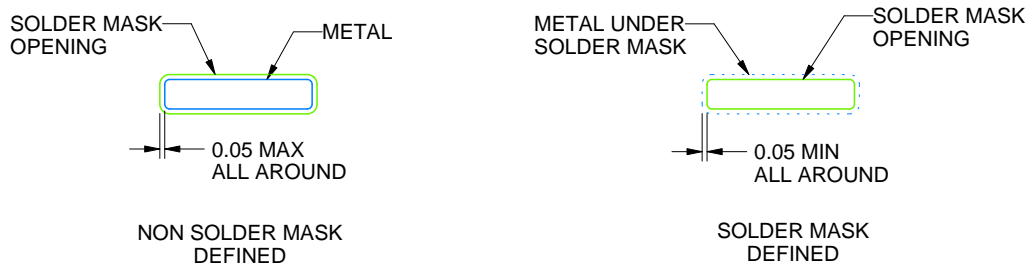
DGG0048A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE  
SCALE:6X



SOLDER MASK DETAILS

4214859/B 11/2020

NOTES: (continued)

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



# EXAMPLE STENCIL DESIGN

DGG0048A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



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

4214859/B 11/2020

NOTES: (continued)

7. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
8. Board assembly site may have different recommendations for stencil design.

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

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