

## FEATURES

- Members of the Texas Instruments Widebus™ Family
- State-of-the-Art EPIC-IIB™ BiCMOS Design Significantly Reduces Power Dissipation
- Latch-Up Performance Exceeds 500 mA Per JESD 70
- 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 ( $-32\text{-mA } I_{OH}$ ,  $64\text{-mA } I_{OL}$ )
- Package Options Include Plastic 300-mil 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

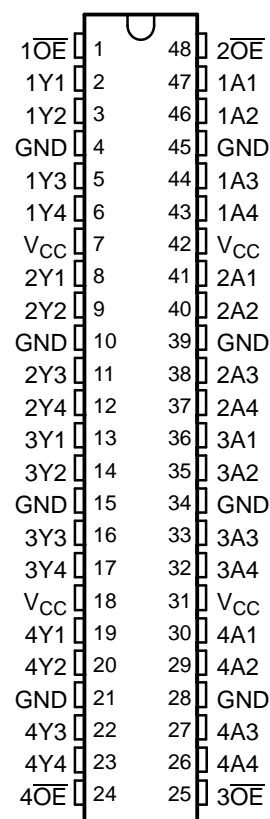
## DESCRIPTION

The SN54ABT16244 and SN74ABT16244A 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 true outputs and symmetrical  $\overline{OE}$  (active-low output-enable) 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 SN54ABT16244 is characterized for operation over the full military temperature range of  $-55^\circ\text{C}$  to  $125^\circ\text{C}$ . The SN74ABT16244A is characterized for operation from  $-40^\circ\text{C}$  to  $85^\circ\text{C}$ .

SN54ABT16244... WD PACKAGE  
SN74ABT16244A... DGG, DGV, OR DL PACKAGE  
(TOP VIEW)



**FUNCTION TABLE**  
**(EACH BUFFER)**

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



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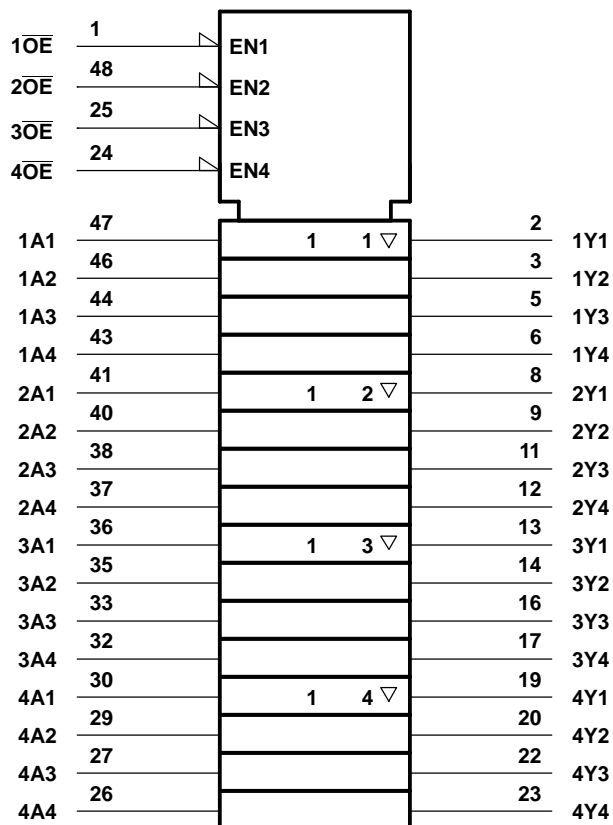
PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of the Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

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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.

# SN54ABT16244, SN74ABT16244A 16-BIT BUFFERS/DRIVERS WITH 3-STATE OUTPUTS

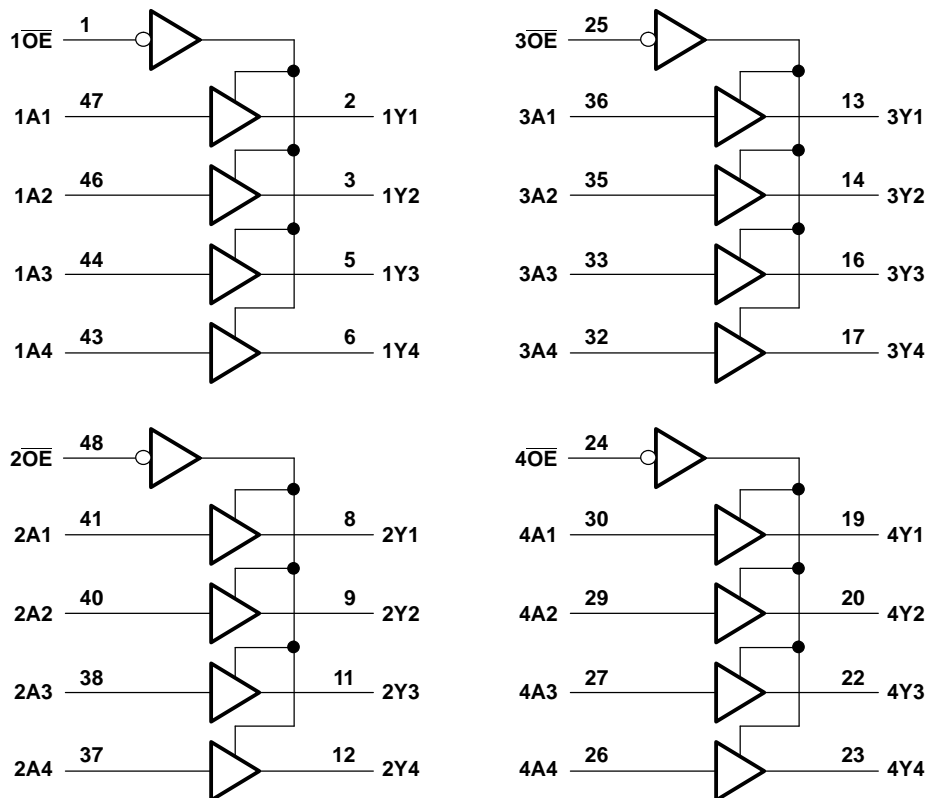
SCBS073H—SEPTEMBER 1991—REVISED AUGUST 2005

LOGIC SYMBOL<sup>(1)</sup>



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

**LOGIC DIAGRAM (POSITIVE LOGIC)**



**Absolute Maximum Ratings<sup>(1)</sup>**

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

		MIN	MAX	UNIT
$V_{CC}$	Supply voltage range	-0.5	7	V
$V_I$	Input voltage range <sup>(2)</sup>	-0.5	7	V
$V_O$	Voltage range applied to any output in the high or power-off state	-0.5	5.5	V
$I_O$	Current into any output in the low state	SN54ABT16244		96
		SN74ABT16244A		128
$I_{IK}$	Input clamp current	$V_I < 0$		-18
$I_{OK}$	Output clamp current	$V_O < 0$		-50
$\theta_{JA}$	Package thermal impedance <sup>(3)</sup>	DGG package		89
		DGV package		93
		DL package		94
$T_{stg}$	Storage temperature range	-65	150	°C

- (1) 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.
- (2) The input and output negative-voltage ratings may be exceeded if the input and output clamp-current ratings are observed.
- (3) The package thermal impedance is calculated in accordance with EIA/JEDEC Std JESD 51.

# SN54ABT16244, SN74ABT16244A

## 16-BIT BUFFERS/DRIVERS

### WITH 3-STATE OUTPUTS

SCBS073H–SEPTEMBER 1991–REVISED AUGUST 2005

#### Recommended Operating Conditions<sup>(1)</sup>

		SN54ABT16244		SN74ABT16244A		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

(1) 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 <sup>(1)</sup>			SN54ABT16244		SN74ABT16244A		UNIT
			MIN	TYP <sup>(2)</sup>	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, I <sub>OH</sub> = –24 mA	2			2				
		V <sub>CC</sub> = 4.5 V, I <sub>OH</sub> = –32 mA	2 <sup>(3)</sup>					2		
V <sub>OL</sub>		V <sub>CC</sub> = 4.5 V, I <sub>OL</sub> = 48 mA			0.55		0.55			V
		V <sub>CC</sub> = 4.5 V, I <sub>OL</sub> = 64 mA			0.55 <sup>(3)</sup>				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 <sup>(4)</sup>		10		10 <sup>(4)</sup>	μA
I <sub>OZL</sub>		V <sub>CC</sub> = 5.5 V, V <sub>O</sub> = 0.5 V			–10 <sup>(4)</sup>		–10		–10 <sup>(4)</sup>	μA
I <sub>off</sub>		V <sub>CC</sub> = 0, V <sub>I</sub> or V <sub>O</sub> ≤ 5.5 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> <sup>(5)</sup>		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, Outputs high			3		2		3	mA
		I <sub>O</sub> = 0, Outputs low			32		32		32	
		V <sub>I</sub> = V <sub>CC</sub> or GND, Outputs disabled			3		2		3	
ΔI <sub>CC</sub> <sup>(6)</sup>	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			0.05		1.5		0.05	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			0.05		1.5		0.05	
C <sub>i</sub>		V <sub>I</sub> = 2.5 V or 0.5 V			3					pF
C <sub>o</sub>		V <sub>O</sub> = 2.5 V or 0.5 V			6					pF

(1) Characteristics for T<sub>A</sub> = 25°C apply to the SN74ABT16244A only.

(2) All typical values are at V<sub>CC</sub> = 5 V.

(3) On products compliant to MIL-PRF-38535, this parameter does not apply.

(4) This data-sheet limit may vary among suppliers.

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

(6) 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.

## Switching Characteristics

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

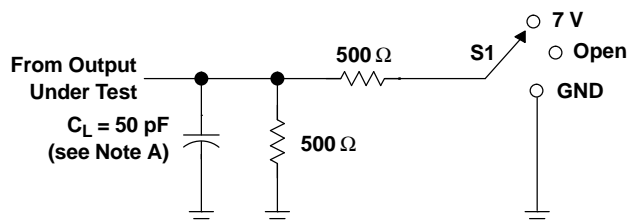
PARAMETER	FROM (INPUT)	TO (OUTPUT)	SN54ABT16244					UNIT
			V <sub>CC</sub> = 5 V, T <sub>A</sub> = 25°C			MIN	MAX	
			MIN	TYP	MAX			
t <sub>PLH</sub>	A	Y	0.7	2.3	3.2	0.7	3.6	ns
t <sub>PHL</sub>			0.5	2.6	3.7	0.5	4.2	
t <sub>PZH</sub>	OE	Y	0.7	3	4	0.7	4.9	ns
t <sub>PZL</sub>			0.9	3.2	5.5	0.9	6.5	
t <sub>PHZ</sub>	OE	Y	1.7	3.6	5	1.7	6	ns
t <sub>PLZ</sub>			1.5	2.9	4.7	1.5	5.7	

## Switching Characteristics

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

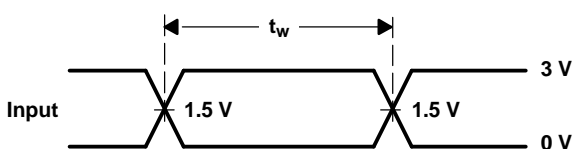
PARAMETER	FROM (INPUT)	TO (OUTPUT)	SN74ABT16244A					UNIT
			V <sub>CC</sub> = 5 V, T <sub>A</sub> = 25°C			MIN	MAX	
			MIN	TYP	MAX			
t <sub>PLH</sub>	A or B	Y	1	2.3	3.2	1	3.5	ns
t <sub>PHL</sub>			1	2.6	3.7	1	4.1	
t <sub>PZH</sub>	OE	Y	1	3	3.8	1	4.8	ns
t <sub>PZL</sub>			1	3.2	4	1	4.8	
t <sub>PHZ</sub>	OE	Y	1	3.6	4.4	1	4.8	ns
t <sub>PLZ</sub>			1	2.9	3.7	1	4.1	

## PARAMETER MEASUREMENT INFORMATION

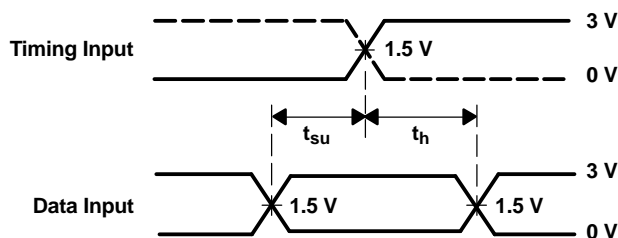


LOAD CIRCUIT

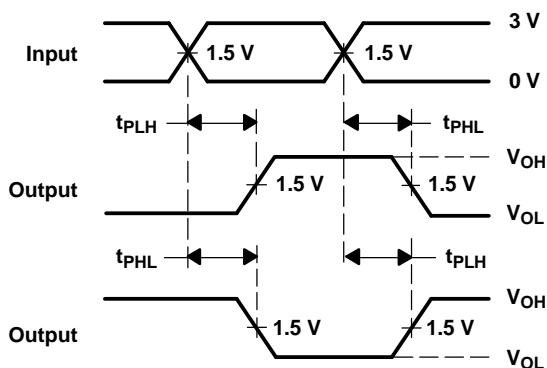
TEST	S1
$t_{PLH}/t_{PHL}$	Open
$t_{PLZ}/t_{PZL}$	7 V
$t_{PHZ}/t_{PZH}$	Open



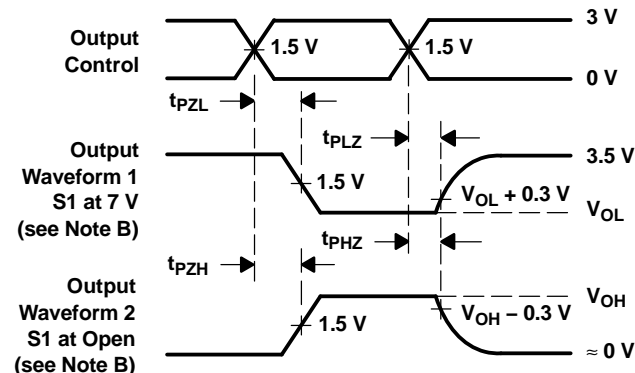
VOLTAGE WAVEFORMS  
PULSE DURATION



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:
- $C_L$  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:  $PRR \leq 10 \text{ MHz}$ ,  $Z_O = 50 \Omega$ ,  $t_r \leq 2.5 \text{ ns}$ ,  $t_f \leq 2.5 \text{ ns}$ .
  - 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="#">5962-9317401MXA</a>	Active	Production	CFP (WD)   48	15   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-9317401MX A SNJ54ABT16244W D
74ABT16244ADGGR1G4	Active	Production	TSSOP (DGG)   48	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT16244A
74ABT16244ADGGR1G4.B	Active	Production	TSSOP (DGG)   48	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT16244A
<a href="#">SN74ABT16244ADGGR</a>	Active	Production	TSSOP (DGG)   48	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT16244A
SN74ABT16244ADGGR.B	Active	Production	TSSOP (DGG)   48	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT16244A
<a href="#">SN74ABT16244ADGVR</a>	Active	Production	TVSOP (DGV)   48	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	AH244A
SN74ABT16244ADGVR.B	Active	Production	TVSOP (DGV)   48	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	AH244A
<a href="#">SN74ABT16244ADL</a>	Active	Production	SSOP (DL)   48	25   TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT16244A
SN74ABT16244ADL.B	Active	Production	SSOP (DL)   48	25   TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT16244A
SN74ABT16244ADLG4	Active	Production	SSOP (DL)   48	25   TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT16244A
<a href="#">SN74ABT16244ADLR</a>	Active	Production	SSOP (DL)   48	1000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT16244A
SN74ABT16244ADLR.B	Active	Production	SSOP (DL)   48	1000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT16244A
SN74ABT16244ADLRG4	Active	Production	SSOP (DL)   48	1000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT16244A
<a href="#">SNJ54ABT16244WD</a>	Active	Production	CFP (WD)   48	15   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-9317401MX A SNJ54ABT16244W D

(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.

<sup>(5)</sup> **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.

<sup>(6)</sup> **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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## 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
74ABT16244ADGGR1G4	TSSOP	DGG	48	2000	330.0	24.4	8.6	13.0	1.8	12.0	24.0	Q1
SN74ABT16244ADGGR	TSSOP	DGG	48	2000	330.0	24.4	8.6	13.0	1.8	12.0	24.0	Q1
SN74ABT16244ADGVR	TVSOP	DGV	48	2000	330.0	16.4	7.1	10.2	1.6	12.0	16.0	Q1
SN74ABT16244ADLR	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)
74ABT16244ADGGR1G4	TSSOP	DGG	48	2000	356.0	356.0	45.0
SN74ABT16244ADGGR	TSSOP	DGG	48	2000	356.0	356.0	45.0
SN74ABT16244ADGVR	TVSOP	DGV	48	2000	353.0	353.0	32.0
SN74ABT16244ADLR	SSOP	DL	48	1000	356.0	356.0	53.0

## TUBE

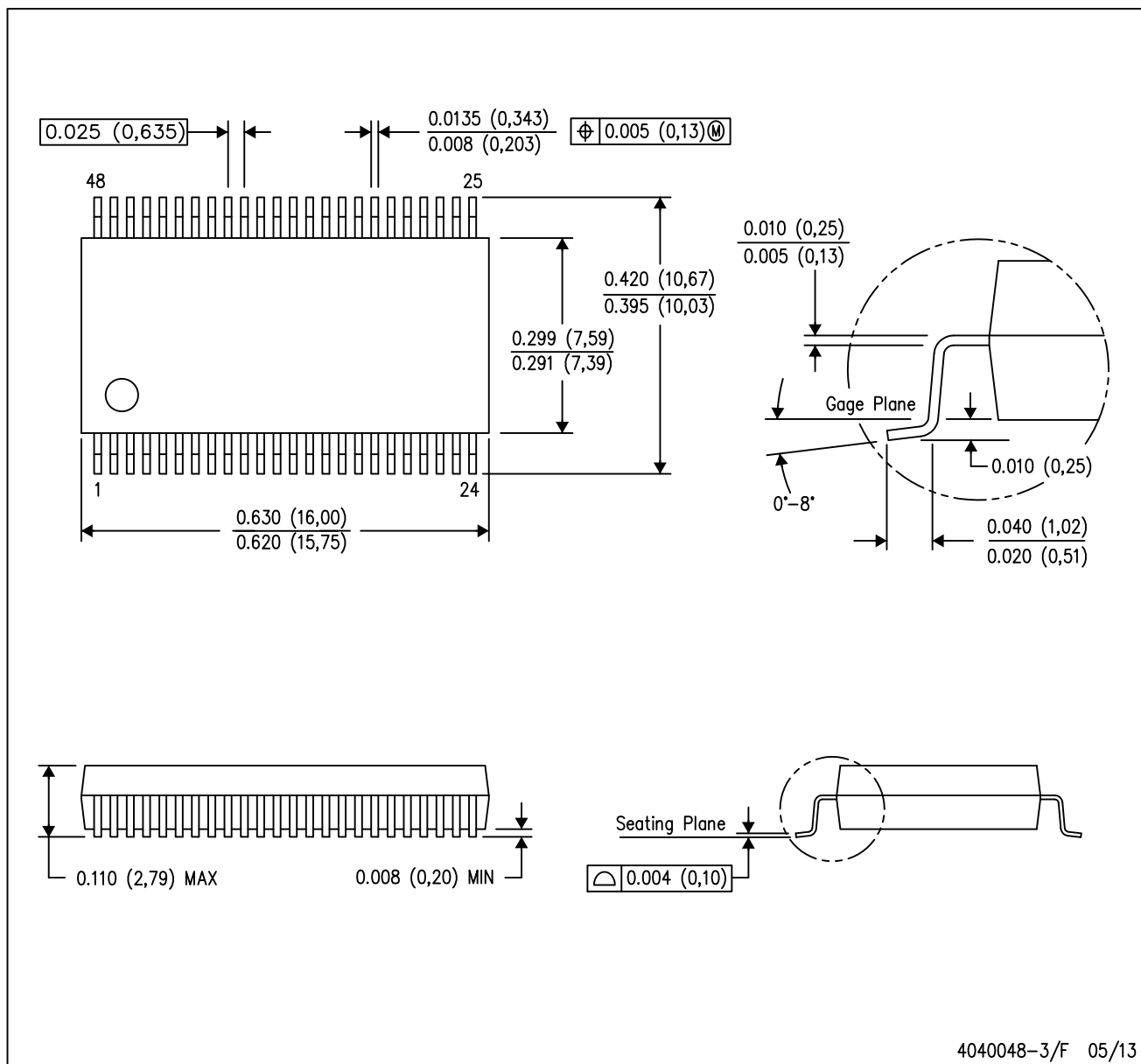


\*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (μm)	B (mm)
SN74ABT16244ADL	DL	SSOP	48	25	473.7	14.24	5110	7.87
SN74ABT16244ADL.B	DL	SSOP	48	25	473.7	14.24	5110	7.87
SN74ABT16244ADLG4	DL	SSOP	48	25	473.7	14.24	5110	7.87

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

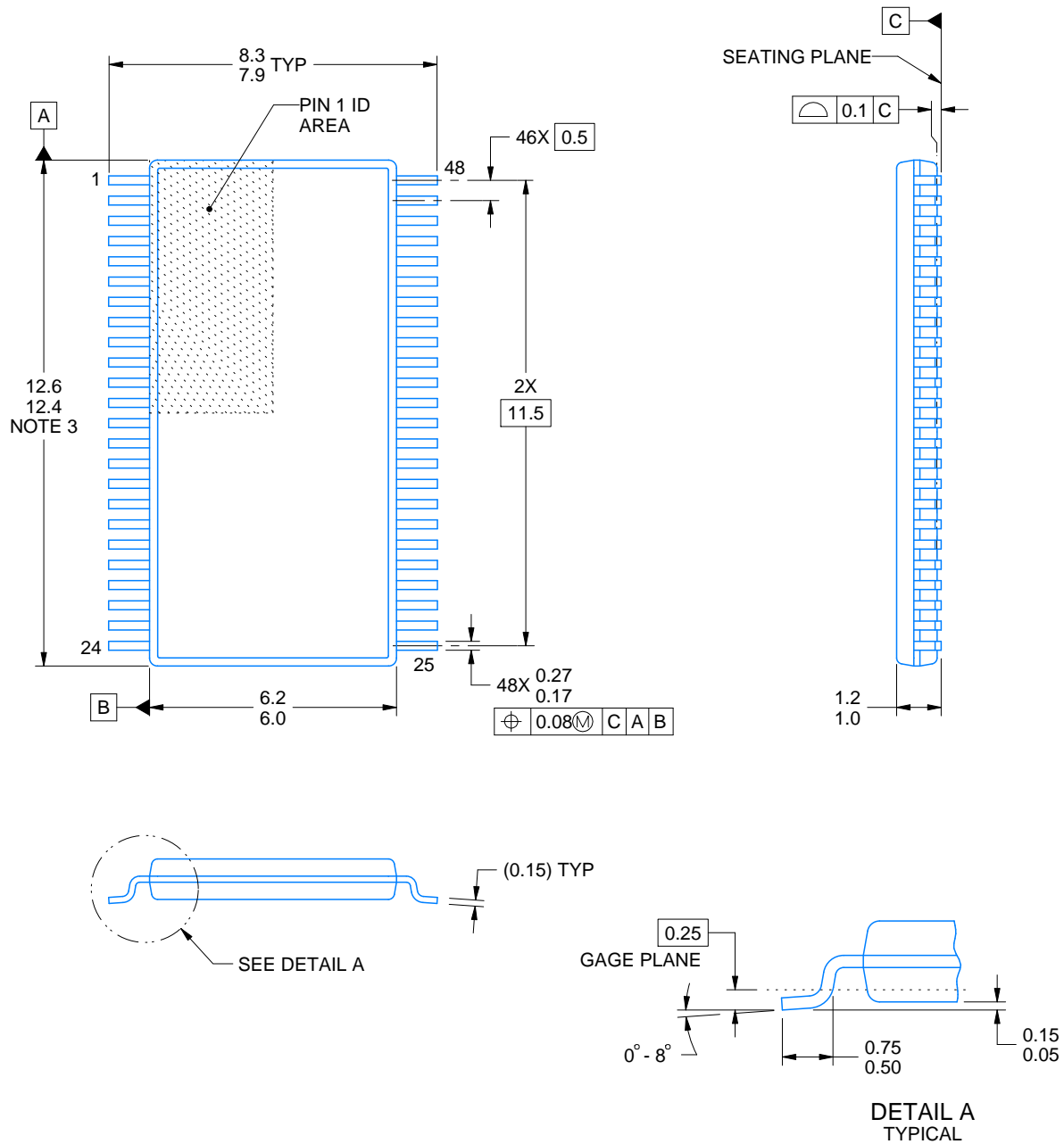
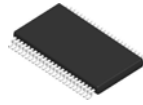
## DGV (R-PDSO-G\*\*)

## 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



4214859/B 11/2020

## NOTES:

1. All linear dimensions are in millimeters. Any 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. Reference JEDEC registration MO-153.

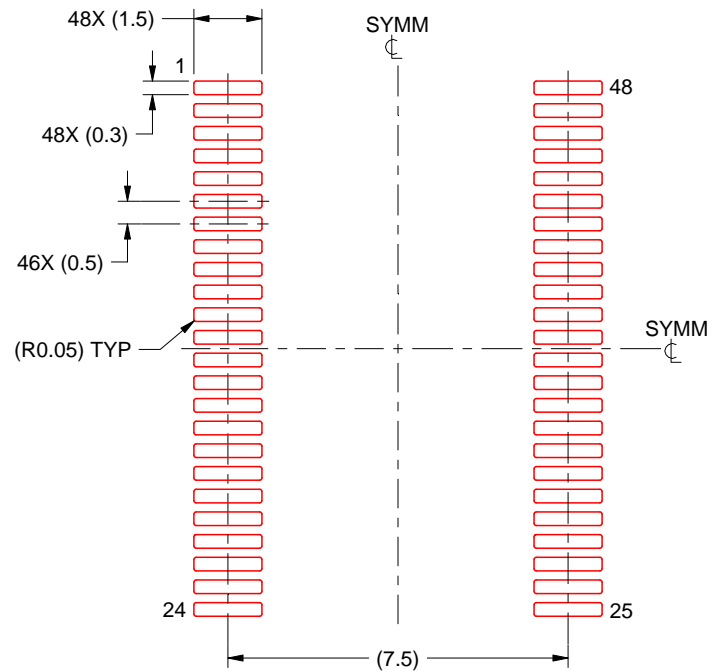


# EXAMPLE STENCIL DESIGN

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)

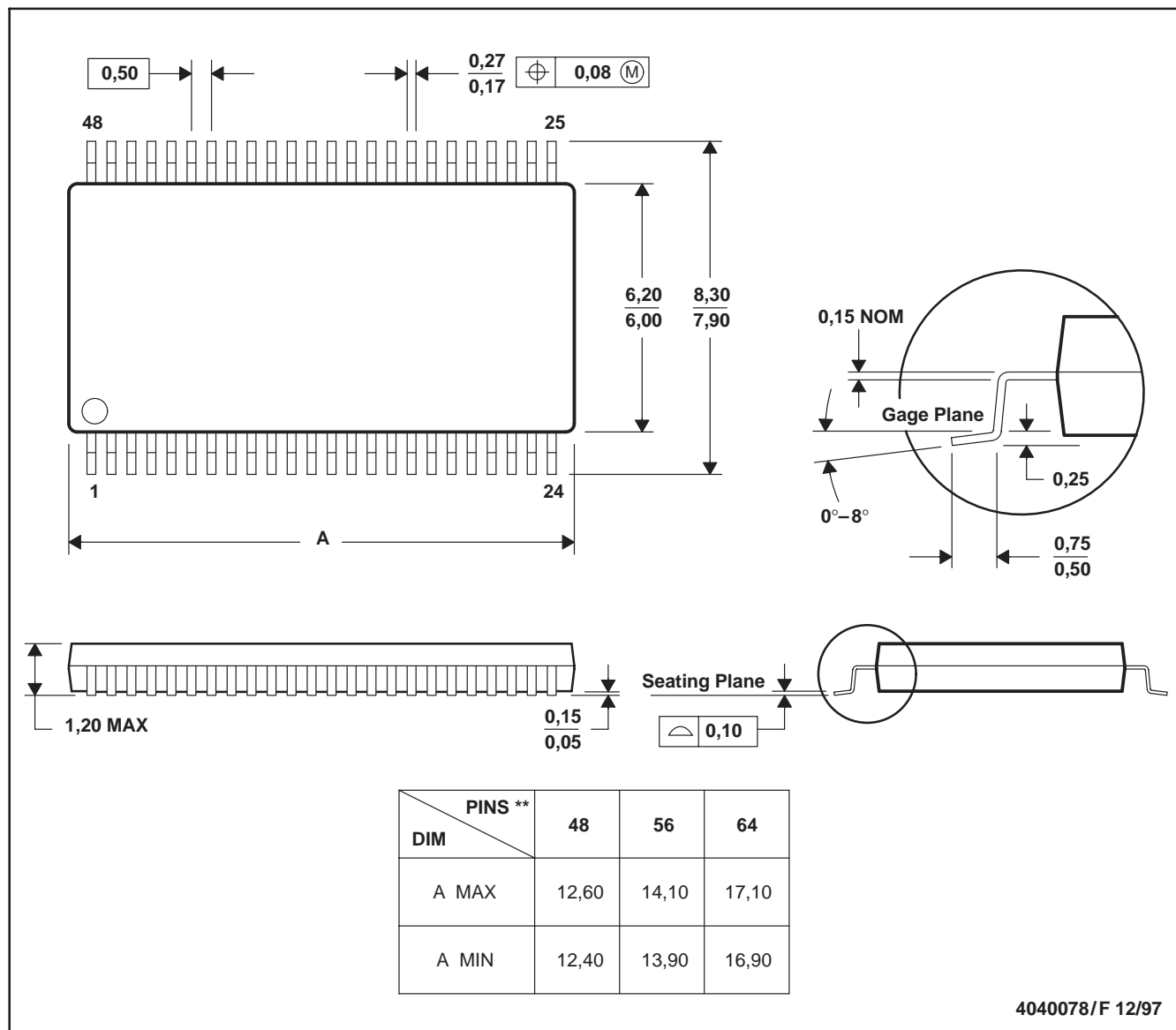
7. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
8. Board assembly site may have different recommendations for stencil design.



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

## PLASTIC SMALL-OUTLINE PACKAGE

48 PINS SHOWN

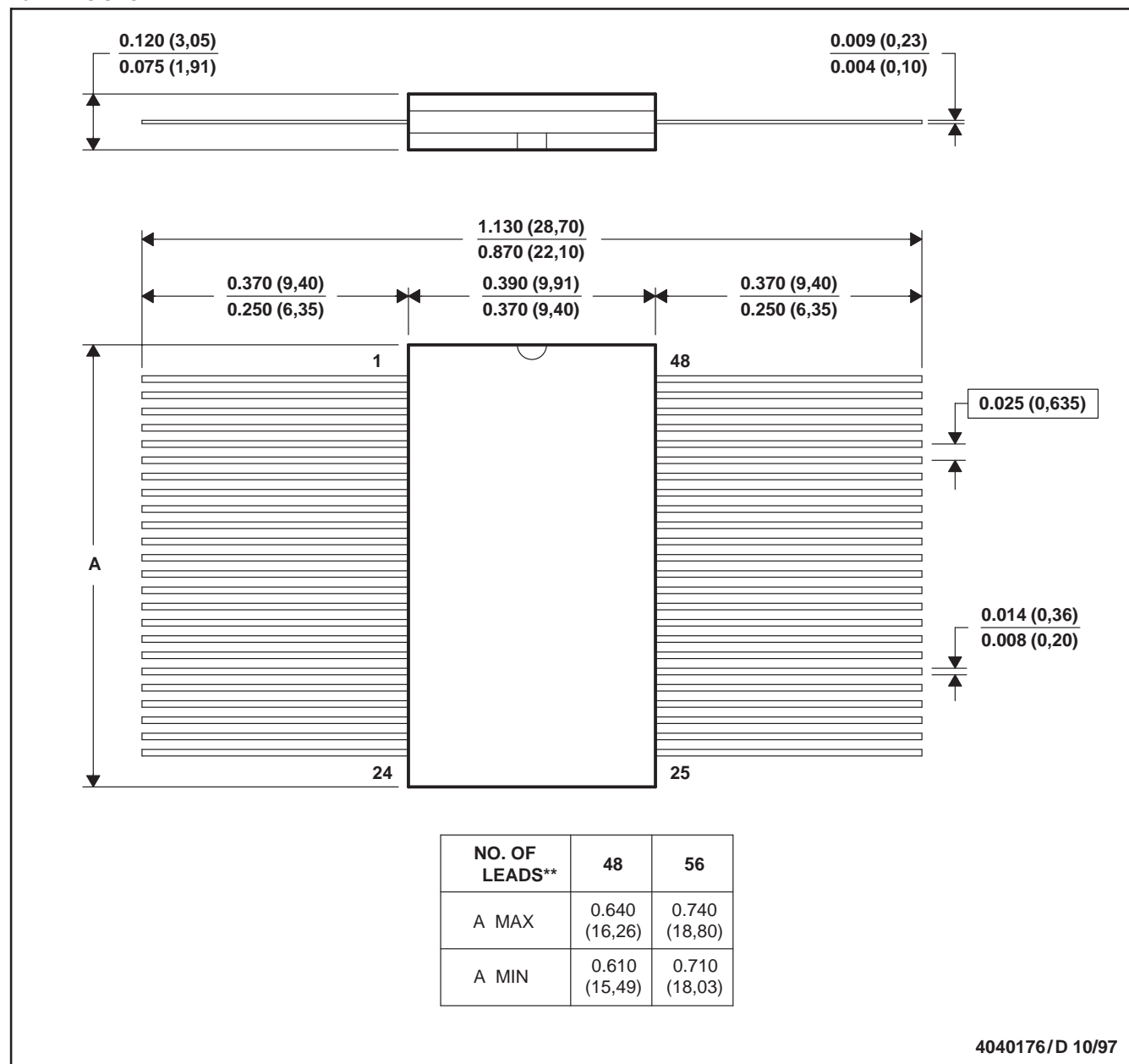


- NOTES: A. All linear dimensions are in millimeters.  
 B. This drawing is subject to change without notice.  
 C. Body dimensions do not include mold protrusion not to exceed 0,15.  
 D. Falls within JEDEC MO-153

## 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

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