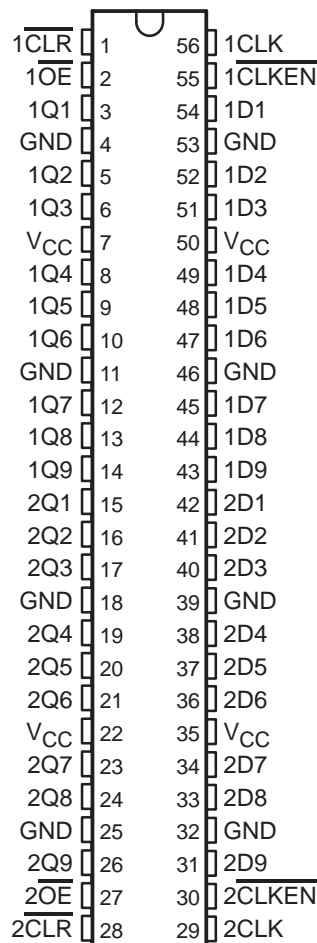


# SN54ABT16823, SN74ABT16823 18-BIT BUS-INTERFACE FLIP-FLOPS WITH 3-STATE OUTPUTS

SCBS217C – JUNE 1992 – REVISED JANUARY 1997

- Members of the Texas Instruments *Widebus*™ Family
- State-of-the-Art *EPIC-II B*™ BiCMOS Design Significantly Reduces Power Dissipation
- High-Impedance State During Power Up and Power Down
- ESD Protection Exceeds 2000 V Per MIL-STD-883, Method 3015; Exceeds 200 V Using Machine Model (C = 200 pF, R = 0)
- 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-mA  $I_{OH}$ , 64-mA  $I_{OL}$ )
- Package Options Include Plastic 300-mil Shrink Small-Outline (DL), Thin Shrink Small-Outline (DGG) Packages and 380-mil Fine-Pitch Ceramic Flat (WD) Package Using 25-mil Center-to-Center Spacings

SN54ABT16823 . . . WD PACKAGE  
SN74ABT16823 . . . DGG OR DL PACKAGE  
(TOP VIEW)



## description

These 18-bit flip-flops feature 3-state outputs designed specifically for driving highly capacitive or relatively low-impedance loads. They are particularly suitable for implementing wider buffer registers, I/O ports, bidirectional bus drivers with parity, and working registers.

The 'ABT16823 can be used as two 9-bit flip-flops or one 18-bit flip-flop. With the clock-enable ( $\overline{\text{CLKEN}}$ ) input low, the D-type flip-flops enter data on the low-to-high transitions of the clock. Taking  $\overline{\text{CLKEN}}$  high disables the clock buffer, latching the outputs. Taking the clear ( $\overline{\text{CLR}}$ ) input low causes the Q outputs to go low independently of the clock.

A buffered output-enable ( $\overline{\text{OE}}$ ) input can be used to place the nine outputs in either a normal logic state (high or low logic level) or a high-impedance state. In the high-impedance state, the outputs neither load nor drive the bus lines significantly. The high-impedance state and increased drive provide the capability to drive bus lines without need for interface or pullup components.

$\overline{\text{OE}}$  does not affect the internal operation of the flip-flops. Old data can be retained or new data can be entered while the outputs are in the high-impedance state.



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.

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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  
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**SN54ABT16823, SN74ABT16823**  
**18-BIT BUS-INTERFACE FLIP-FLOPS**  
**WITH 3-STATE OUTPUTS**

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---

**description (continued)**

When  $V_{CC}$  is between 0 and 2.1 V, the device is in the high-impedance state during power up or power down. However, to ensure the high-impedance state above 2.1 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/current-sourcing capability of the driver.

The SN54ABT16823 is characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74ABT16823 is characterized for operation from  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ .

**FUNCTION TABLE**  
 (each 9-bit flip-flop)

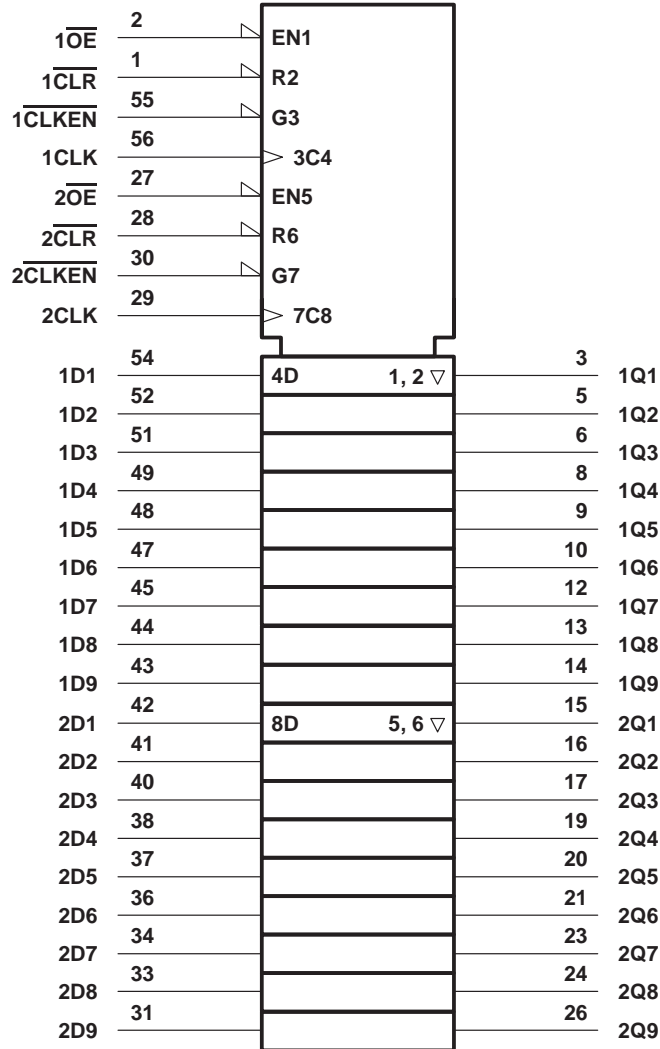
INPUTS					OUTPUT Q
$\overline{OE}$	$\overline{CLR}$	$\overline{CLKEN}$	CLK	D	
L	L	X	X	X	L
L	H	L	↑	H	H
L	H	L	↑	L	L
L	H	L	L	X	$Q_0$
L	H	H	X	X	$Q_0$
H	X	X	X	X	Z



SN54ABT16823, SN74ABT16823  
 18-BIT BUS-INTERFACE FLIP-FLOPS  
 WITH 3-STATE OUTPUTS

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logic symbol†

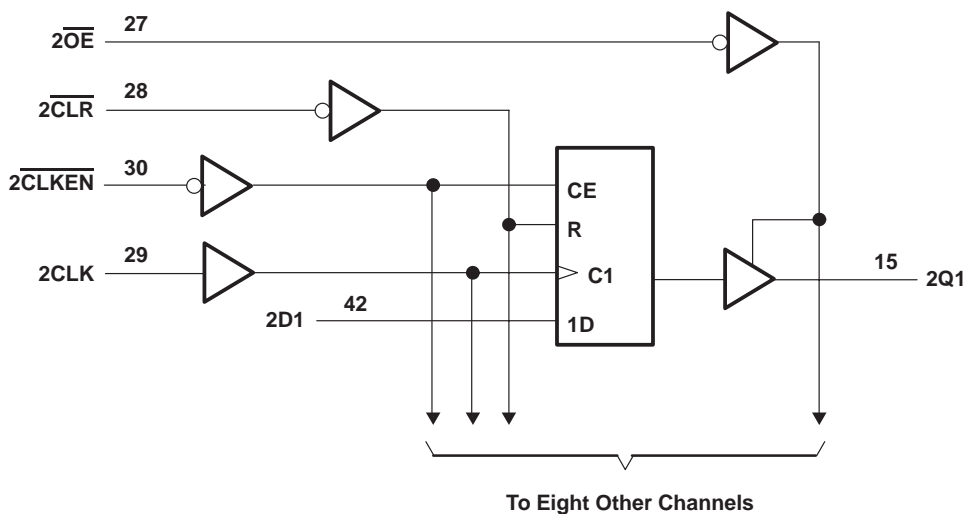
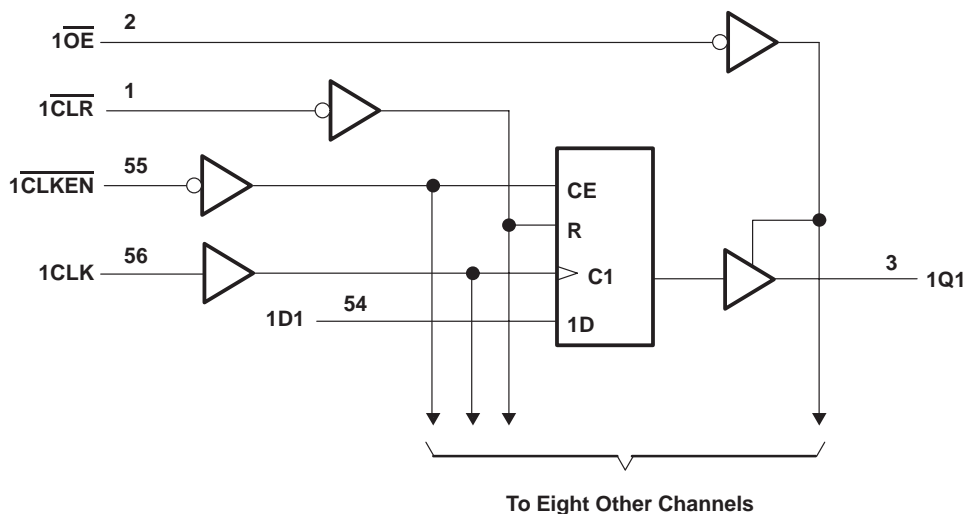


† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

# SN54ABT16823, SN74ABT16823 18-BIT BUS-INTERFACE FLIP-FLOPS WITH 3-STATE OUTPUTS

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## logic diagram (positive logic)



# SN54ABT16823, SN74ABT16823 18-BIT BUS-INTERFACE FLIP-FLOPS WITH 3-STATE OUTPUTS

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## 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 high or power-off state, $V_O$ .....	–0.5 V to 5.5 V
Current into any output in the low state, $I_O$ : SN54ABT16823 .....	96 mA
SN74ABT16823 .....	128 mA
Input clamp current, $I_{IK}$ ( $V_I < 0$ ) .....	–18 mA
Output clamp current, $I_{OK}$ ( $V_O < 0$ ) .....	–50 mA
Package thermal impedance, $\theta_{JA}$ (see Note 2): DGG package .....	81°C/W
DL package .....	74°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 negative-voltage ratings may be exceeded if the input and output clamp-current ratings are observed.  
2. The package thermal impedance is calculated in accordance with EIA/JEDEC Std JESD51.

## recommended operating conditions (see Note 3)

		SN54ABT16823		SN74ABT16823		UNIT
		MIN	MAX	MIN	MAX	
$V_{CC}$	Supply voltage	4.5	5.5	4.5	5.5	V
$V_{IH}$	High-level input voltage	2		2		V
$V_{IL}$	Low-level input voltage		0.8		0.8	V
$V_I$	Input voltage	0	$V_{CC}$	0	$V_{CC}$	V
$I_{OH}$	High-level output current		–24		–32	mA
$I_{OL}$	Low-level output current		48		64	mA
$\Delta t/\Delta v$	Input transition rise or fall rate		10		10	ns/V
						Outputs enabled
$\Delta t/\Delta V_{CC}$	Power-up ramp rate	200		200		μs/V
$T_A$	Operating free-air temperature	–55	125	–40	85	°C

NOTE 3: Unused inputs must be held high or low to prevent them from floating.



**SN54ABT16823, SN74ABT16823**  
**18-BIT BUS-INTERFACE FLIP-FLOPS**  
**WITH 3-STATE OUTPUTS**

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

PARAMETER	TEST CONDITIONS	T <sub>A</sub> = 25°C			SN54ABT16823		SN74ABT16823		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	I <sub>OH</sub> = -24 mA			2		2			
I <sub>OH</sub> = -32 mA				2*				2		
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> = 0 to 5.5 V, V <sub>I</sub> = V <sub>CC</sub> or GND			±1		±1		±1	µA	
I <sub>OZPU</sub>	V <sub>CC</sub> = 0 to 2.1 V, V <sub>O</sub> = 0.5 V to 2.7 V, $\overline{OE} = X$			±50		±50		±50	µA	
I <sub>OZPD</sub>	V <sub>CC</sub> = 2.1 V to 0, V <sub>O</sub> = 0.5 V to 2.7 V, $\overline{OE} = X$			±50		±50		±50	µA	
I <sub>OZH</sub>	V <sub>CC</sub> = 2.1 V to 5.5 V, V <sub>O</sub> = 2.7 V, $\overline{OE} \geq 2$ V			10**		50		10	µA	
I <sub>OZL</sub>	V <sub>CC</sub> = 2.1 V to 5.5 V, V <sub>O</sub> = 0.5 V, $\overline{OE} \geq 2$ V			-10**		-50		-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>	Outputs high	V <sub>CC</sub> = 5.5 V, V <sub>O</sub> = 5.5 V				50		50	µA	
I <sub>O‡</sub>		V <sub>CC</sub> = 5.5 V, V <sub>O</sub> = 2.5 V			-50	-100	-200	-50	-200	mA
I <sub>CC</sub>	Outputs high	V <sub>CC</sub> = 5.5 V, I <sub>O</sub> = 0, V <sub>I</sub> = V <sub>CC</sub> or GND				0.5		0.5	mA	
	Outputs low					80		80		
	Outputs disabled					0.5		0.5		
ΔI <sub>CC</sub> §		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	mA	
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.

\*\* These limits apply only to the SN74ABT16823.

† 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.



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timing requirements over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see Figure 1)

		$V_{CC} = 5\text{ V},$ $T_A = 25^\circ\text{C}$		SN54ABT16823		SN74ABT16823		UNIT
		MIN	MAX	MIN	MAX	MIN	MAX	
$f_{\text{clock}}$	Clock frequency	0	150	0	150	0	150	MHz
$t_w$	Pulse duration	$\overline{\text{CLR}}$ low	3.3	3.3	3.3	3.3	3.3	ns
		CLK high or low	3.3	3.3	3.3	3.3		
$t_{\text{su}}$	Setup time before $\text{CLK}\uparrow$	$\overline{\text{CLR}}$ inactive	1.6	2	1.6	1.6	ns	
		Data	1.7	1.7	1.7	1.7		
		$\overline{\text{CLKEN}}$ low	2.8	2.8	2.8	2.8		
$t_h$	Hold time after $\text{CLK}\uparrow$	Data	1.2	1.2	1.2	1.2	ns	
		$\overline{\text{CLKEN}}$ low	0.6	0.6	0.6	0.6		

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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	SN54ABT16823					UNIT
			$V_{CC} = 5\text{ V},$ $T_A = 25^\circ\text{C}$			MIN	MAX	
			MIN	TYP	MAX			
$f_{\text{max}}$			150			150	MHz	
$t_{\text{PLH}}$	CLK	Q	1.6	3.9	5.5	1.6	7.7	ns
$t_{\text{PHL}}$			2.1	3.9	5.4	2.1	6.4	
$t_{\text{PHL}}$	$\overline{\text{CLR}}$	Q	1.9	4.1	5.3	1.9	6.3	ns
$t_{\text{PZH}}$	$\overline{\text{OE}}$	Q	1	3.1	4.2	1	5.1	ns
$t_{\text{PZL}}$			1.5	3.5	4.6	1.5	5.7	
$t_{\text{PHZ}}$	$\overline{\text{OE}}$	Q	2.2	4.3	6	2.2	6.8	ns
$t_{\text{PLZ}}$			1.6	4.3	6.4	1.6	9.9	

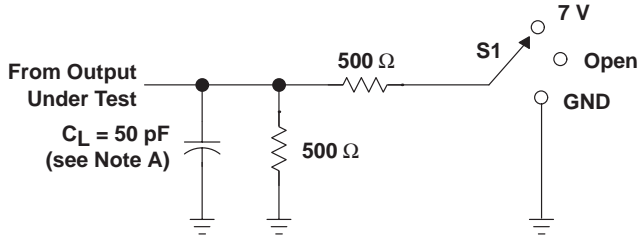
switching characteristics over recommended ranges of supply voltage and operating free-air temperature,  $C_L = 50\text{ pF}$  (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	SN74ABT16823					UNIT
			$V_{CC} = 5\text{ V},$ $T_A = 25^\circ\text{C}$			MIN	MAX	
			MIN	TYP	MAX			
$f_{\text{max}}$			150			150	MHz	
$t_{\text{PLH}}$	CLK	Q	1.6	3.9	5.5	1.6	6.8	ns
$t_{\text{PHL}}$			2.1	3.9	5.4	2.1	6	
$t_{\text{PHL}}$	$\overline{\text{CLR}}$	Q	1.9	4.1	5.3	1.9	6.1	ns
$t_{\text{PZH}}$	$\overline{\text{OE}}$	Q	1	3.1	4.2	1	4.9	ns
$t_{\text{PZL}}$			1.5	3.5	4.6	1.5	5.5	
$t_{\text{PHZ}}$	$\overline{\text{OE}}$	Q	2.2	4.3	5.6	2.2	6.1	ns
$t_{\text{PLZ}}$			1.6	4.3	6.4	1.6	8.7	

**SN54ABT16823, SN74ABT16823**  
**18-BIT BUS-INTERFACE FLIP-FLOPS**  
**WITH 3-STATE OUTPUTS**

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**PARAMETER MEASUREMENT INFORMATION**

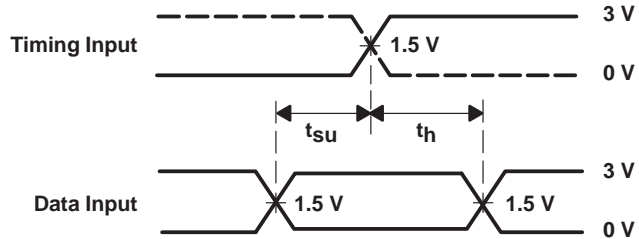


**LOAD CIRCUIT**

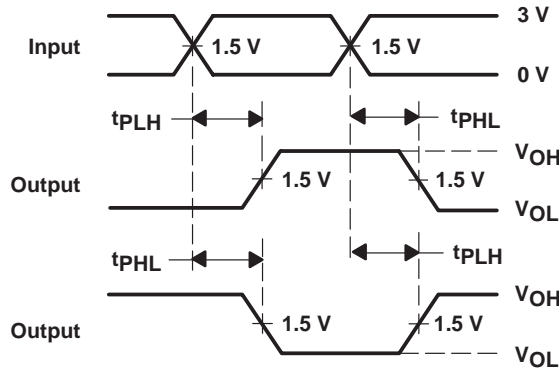
TEST	S1
$t_{PLH}/t_{PHL}$	Open
$t_{PLZ}/t_{PZL}$	7 V
$t_{PHZ}/t_{PZH}$	Open



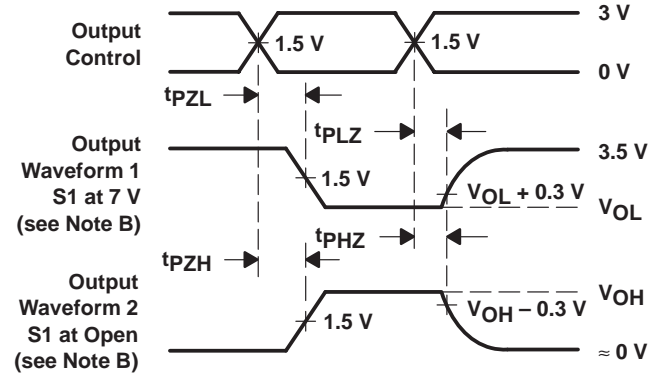
**VOLTAGE WAVEFORMS**  
**PULSE DURATION**



**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:  $PRR \leq 10$  MHz,  $Z_O = 50 \Omega$ ,  $t_r \leq 2.5$  ns,  $t_f \leq 2.5$  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="#">SN74ABT16823DGGR</a>	Active	Production	TSSOP (DGG)   56	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT16823
SN74ABT16823DGGR.B	Active	Production	TSSOP (DGG)   56	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT16823
SN74ABT16823DGGRG4	Active	Production	TSSOP (DGG)   56	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT16823
SN74ABT16823DGGRG4.B	Active	Production	TSSOP (DGG)   56	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT16823
<a href="#">SN74ABT16823DGVR</a>	Active	Production	TVSOP (DGV)   56	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	AH823
SN74ABT16823DGVR.B	Active	Production	TVSOP (DGV)   56	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	AH823
<a href="#">SN74ABT16823DL</a>	Active	Production	SSOP (DL)   56	20   TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT16823
SN74ABT16823DL.B	Active	Production	SSOP (DL)   56	20   TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT16823
<a href="#">SN74ABT16823DLR</a>	Active	Production	SSOP (DL)   56	1000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT16823
SN74ABT16823DLR.B	Active	Production	SSOP (DL)   56	1000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT16823

(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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**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
SN74ABT16823DGGR	TSSOP	DGG	56	2000	330.0	24.4	8.9	14.7	1.4	12.0	24.0	Q1
SN74ABT16823DGGRG4	TSSOP	DGG	56	2000	330.0	24.4	8.9	14.7	1.4	12.0	24.0	Q1
SN74ABT16823DGVR	TVSOP	DGV	56	2000	330.0	24.4	6.8	11.7	1.6	12.0	24.0	Q1
SN74ABT16823DLR	SSOP	DL	56	1000	330.0	32.4	11.35	18.67	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)
SN74ABT16823DGGR	TSSOP	DGG	56	2000	356.0	356.0	45.0
SN74ABT16823DGGRG4	TSSOP	DGG	56	2000	356.0	356.0	45.0
SN74ABT16823DGVR	TVSOP	DGV	56	2000	356.0	356.0	45.0
SN74ABT16823DLR	SSOP	DL	56	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)
SN74ABT16823DL	DL	SSOP	56	20	473.7	14.24	5110	7.87
SN74ABT16823DL.B	DL	SSOP	56	20	473.7	14.24	5110	7.87

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

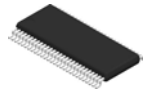
PLASTIC SMALL-OUTLINE

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

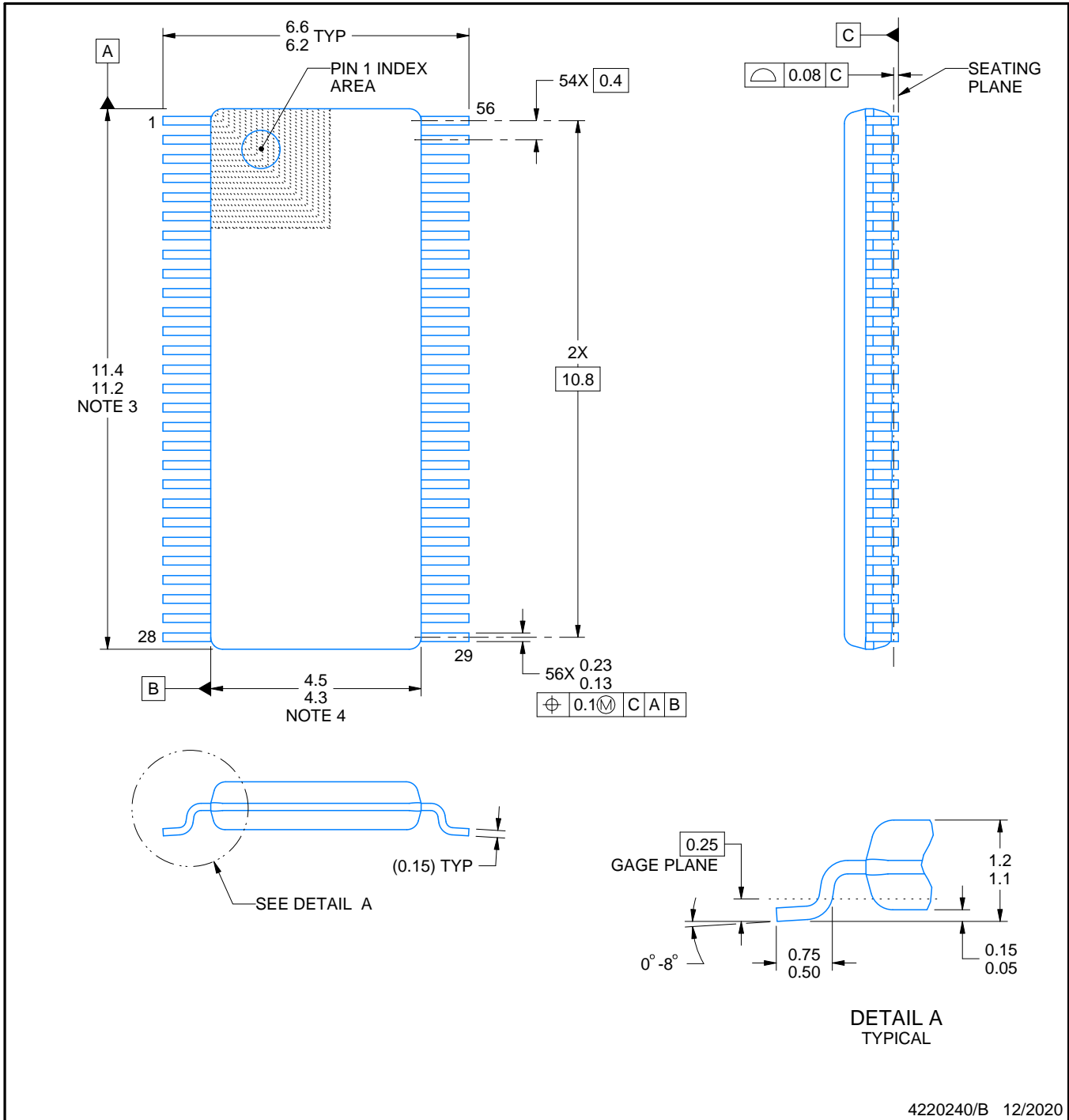
DGV0056A



# PACKAGE OUTLINE

TVSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



4220240/B 12/2020

**NOTES:**

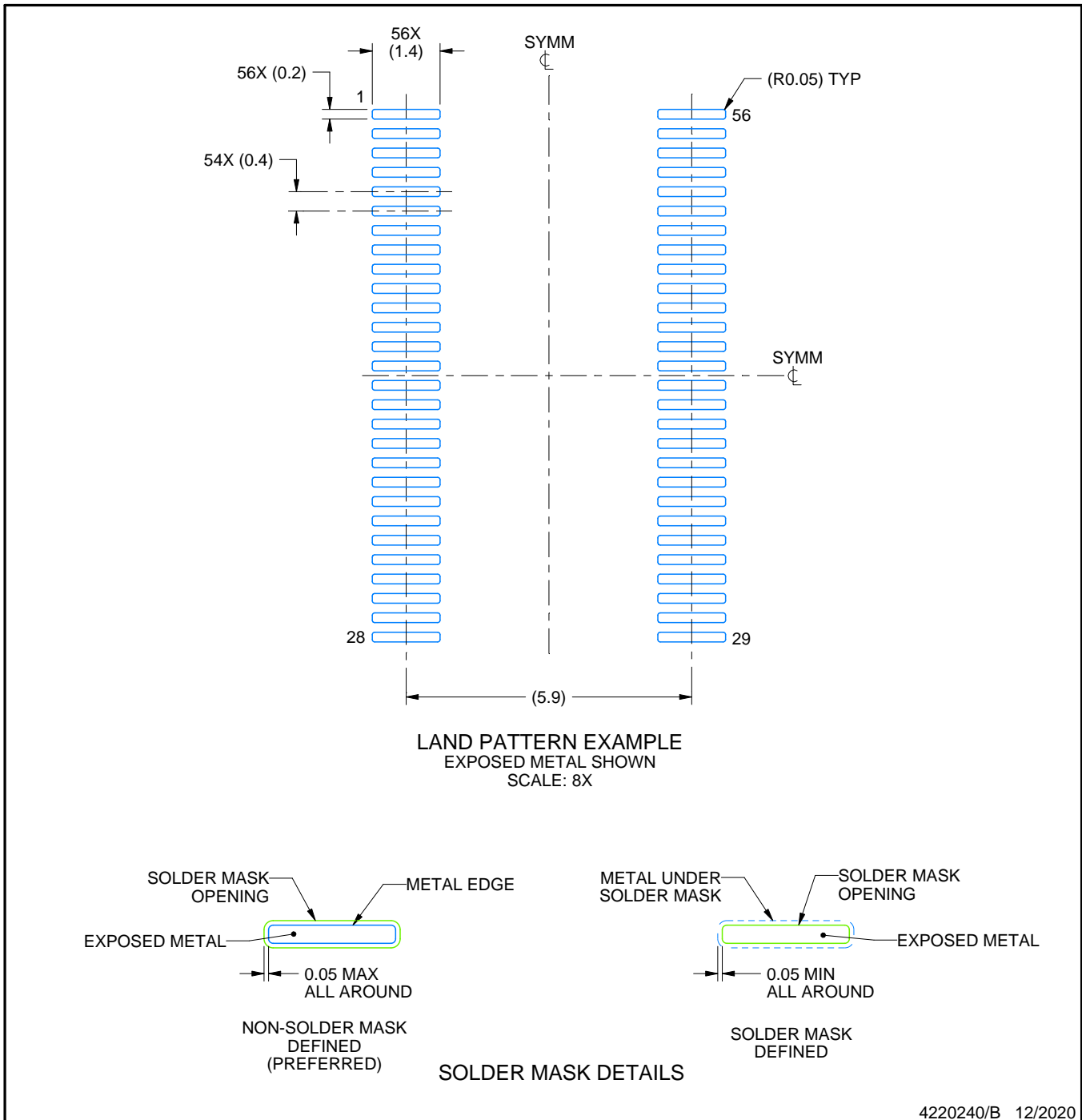
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm per side.
4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm per side.
5. Reference JEDEC registration MO-194.

# EXAMPLE BOARD LAYOUT

DGV0056A

TVSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



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.

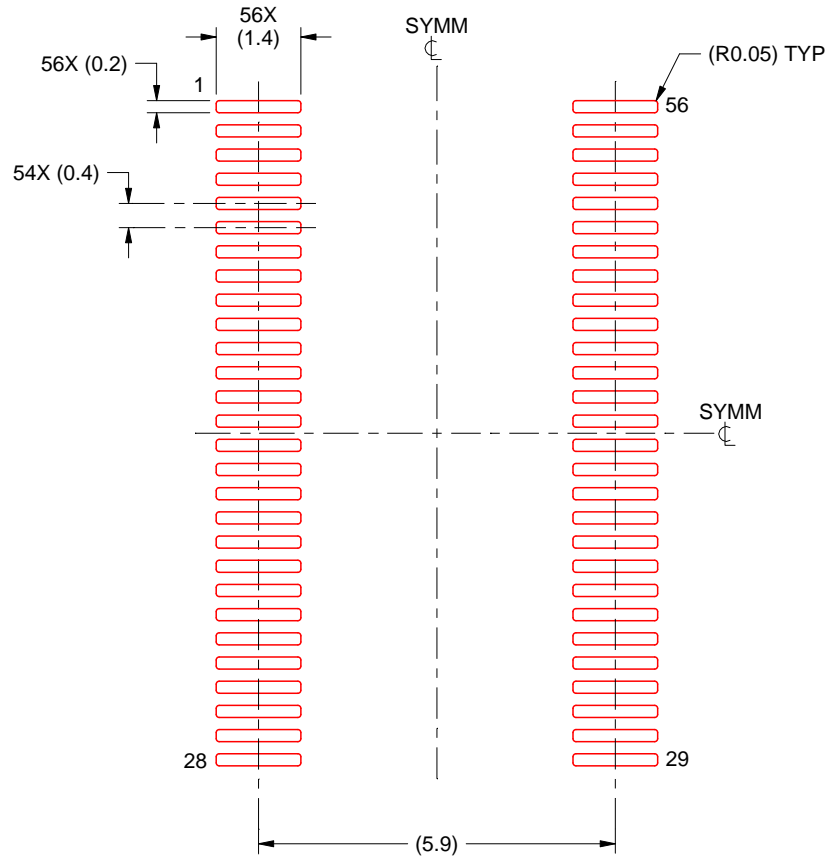


# EXAMPLE STENCIL DESIGN

DGV0056A

TVSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



SOLDER PASTE EXAMPLE  
BASED ON 0.125 mm THICK STENCIL  
SCALE: 8X

4220240/B 12/2020

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.

# MECHANICAL DATA

DL (R-PDSO-G56)

PLASTIC SMALL-OUTLINE PACKAGE



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

PowerPAD is a trademark of Texas Instruments.

# DGG0056A



# PACKAGE OUTLINE

## TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



4222167/A 07/2015

### NOTES:

- All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
- This drawing is subject to change without notice.
- 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.
- Reference JEDEC registration MO-153.

# EXAMPLE BOARD LAYOUT

DGG0056A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE  
SCALE:6X



SOLDER MASK DETAILS

4222167/A 07/2015

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

DGG0056A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



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

4222167/A 07/2015

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.

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