

SN54ABT843, SN74ABT843 9-BIT BUS-INTERFACE D-TYPE LATCHES WITH 3-STATE OUTPUTS

SCBS197D – FEBRUARY 1991 – REVISED MAY 1997

- State-of-the-Art *EPIC-IIB™* BiCMOS Design Significantly Reduces Power Dissipation
- Latch-Up Performance Exceeds 500 mA Per JEDEC Standard JESD-17
- Typical V_{OLP} (Output Ground Bounce) < 1 V at $V_{CC} = 5$ V, $T_A = 25^\circ\text{C}$
- High-Drive Outputs ($-32\text{-mA } I_{OH}$, $64\text{-mA } I_{OL}$)
- Package Options Include Plastic Small-Outline (DW) and Shrink Small-Outline (DB) Packages, Ceramic Chip Carriers (FK), Ceramic Flat (W) Package, and Plastic (NT) and Ceramic (JT) DIPs

description

The 'ABT843 9-bit latches are designed specifically for driving highly capacitive or relatively low-impedance loads. They are particularly suitable for implementing buffer registers, I/O ports, bidirectional bus drivers, and working registers.

The nine transparent D-type latches provide true data at the outputs.

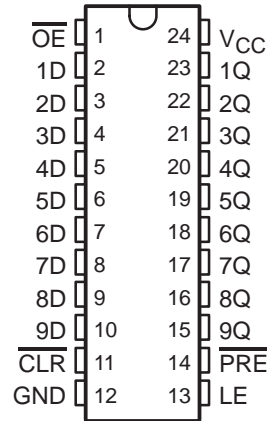
A buffered output-enable (\overline{OE}) input can be used to place the nine outputs in either a normal logic state (high or low logic levels) or a high-impedance state. The outputs are also in the high-impedance state during power-up and power-down conditions. The outputs remain in the high-impedance state while the device is powered down. 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{OE} does not affect the internal operations of the latch. Previously stored data can be retained or new data can be entered while the outputs are in the high-impedance state.

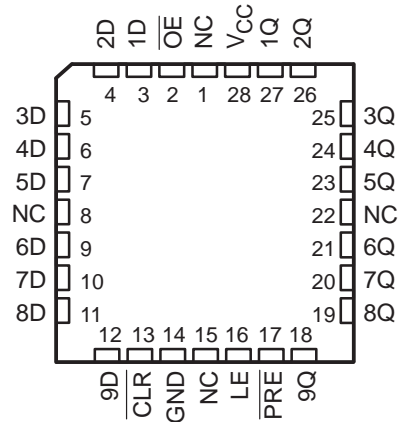
To ensure the high-impedance state during power up or power down, \overline{OE} should be tied to V_{CC} through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

The SN54ABT843 is characterized for operation over the full military temperature range of -55°C to 125°C . The SN74ABT843 is characterized for operation from -40°C to 85°C .

SN54ABT843 . . . JT OR W PACKAGE
SN74ABT843 . . . DB, DW, OR NT PACKAGE
(TOP VIEW)



SN54ABT843 . . . FK PACKAGE
(TOP VIEW)



NC – No internal connection



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EPIC-IIB is a trademark of Texas Instruments Incorporated.

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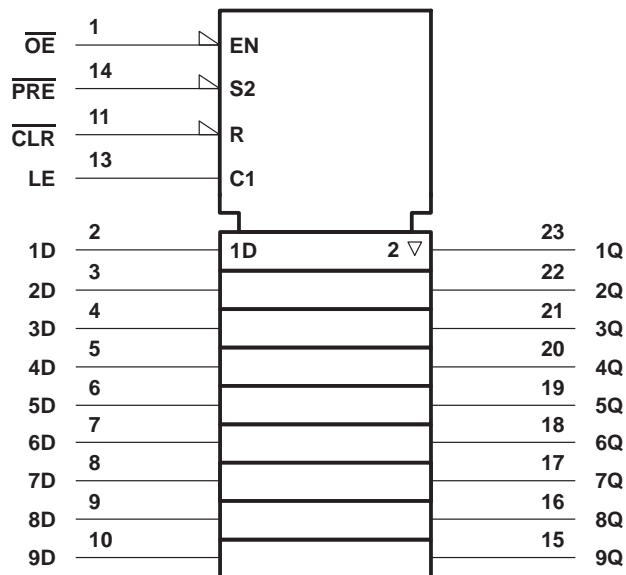
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FUNCTION TABLE

INPUTS					OUTPUT
PRE	CLR	OE	LE	D	Q
L	X	L	X	X	H
H	L	L	X	X	L
H	H	L	H	L	L
H	H	L	H	H	H
H	H	L	L	X	Q ₀
X	X	H	X	X	Z

logic symbol†

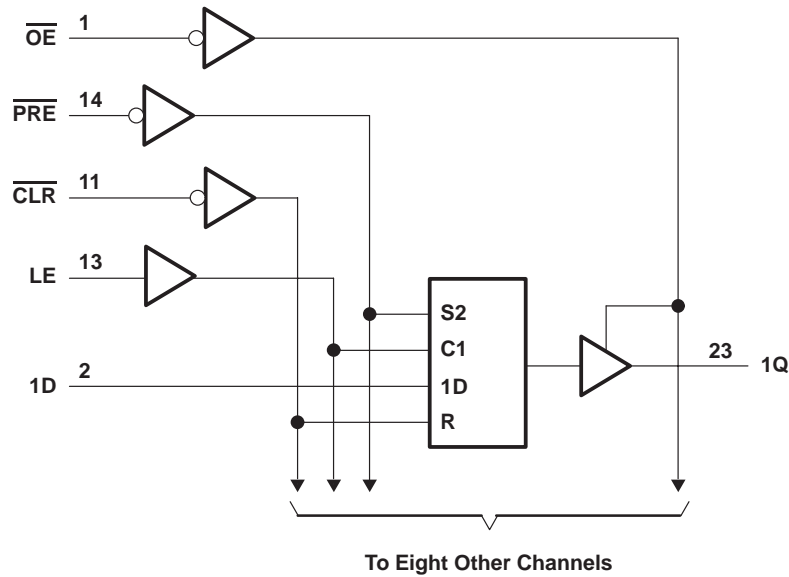


† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12. Pin numbers shown are for the DB, DW, JT, NT, and W packages.

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logic diagram (positive logic)



Pin numbers shown are for the DB, DW, JT, NT, and W packages.

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 : SN54ABT843	96 mA
SN74ABT843	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, θ_{JA} (see Note 2): DB package	104°C/W
DW package	81°C/W
NT package	67°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. This is a stress rating only, and functional operation of the device at these or any other conditions beyond those indicated in the "recommended operating conditions" section of this specification 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, except for through-hole packages, which use a trace length of zero.

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recommended operating conditions (see Note 3)

		SN54ABT843		SN74ABT843		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		5		5	ns/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.

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

PARAMETER	TEST CONDITIONS	$T_A = 25^\circ\text{C}$			SN54ABT843		SN74ABT843		UNIT	
		MIN	TYP†	MAX	MIN	MAX	MIN	MAX		
V_{IK}	$V_{CC} = 4.5\text{ V}$, $I_I = -18\text{ mA}$			-1.2		-1.2		-1.2	V	
V_{OH}	$V_{CC} = 4.5\text{ V}$, $I_{OH} = -3\text{ mA}$		2.5		2.5		2.5		V	
	$V_{CC} = 5\text{ V}$, $I_{OH} = -3\text{ mA}$		3		3		3			
	$V_{CC} = 4.5\text{ V}$	$I_{OH} = -24\text{ mA}$				2				
								2		
V_{OL}	$V_{CC} = 4.5\text{ V}$	$I_{OL} = 48\text{ mA}$				0.55			V	
		$I_{OL} = 64\text{ mA}$			0.55*			0.55		
V_{hys}			100						mV	
I_I	$V_{CC} = 5.5\text{ V}$, $V_I = V_{CC}$ or GND			± 1		± 1		± 1	μA	
I_{OZH}^\ddagger	$V_{CC} = 5.5\text{ V}$, $V_O = 2.7\text{ V}$			10		10		10	μA	
I_{OZL}^\ddagger	$V_{CC} = 5.5\text{ V}$, $V_O = 0.5\text{ V}$			-10		-10		-10	μA	
I_{off}	$V_{CC} = 0$, V_I or $V_O \leq 4.5\text{ V}$			± 100				± 100	μA	
I_{CEX}	$V_{CC} = 5.5\text{ V}$, $V_O = 5.5\text{ V}$	Outputs high		50		50		50	μA	
$I_{O\S}^\S$	$V_{CC} = 5.5\text{ V}$, $V_O = 2.5\text{ V}$	-50	-140	-180		-50	-180	-50	-180	mA
I_{CC}	$V_{CC} = 5.5\text{ V}$, $I_O = \text{Open}$, $V_I = V_{CC}$ or GND	Outputs high		1	250		250		250	μA
		Outputs low		24	34		34		34	mA
		Outputs disabled		0.5	250		250		250	μA
ΔI_{CC}^\parallel	$V_{CC} = 5.5\text{ V}$, One input at 3.4 V, Other inputs at V_{CC} or GND			1.5		1.5		1.5	mA	
C_i	$V_I = 2.5\text{ V}$ or 0.5 V			4					pF	
C_o	$V_O = 2.5\text{ V}$ or 0.5 V			7					pF	

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

† All typical values are at $V_{CC} = 5\text{ V}$.

‡ The parameters I_{OZH} and I_{OZL} include the input leakage current.

§ 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_{CC} or GND.



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timing requirements over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see Figures 1 and 2)

		$V_{CC} = 5\text{ V},$ $T_A = 25^\circ\text{C}$		SN54ABT843		SN74ABT843		UNIT
		MIN	MAX	MIN	MAX	MIN	MAX	
t_w	Pulse duration	$\overline{\text{CLR}}$ low		5.5	5.5	5.5	5.5	ns
		$\overline{\text{PRE}}$ low		4.5	4.5	4.5	4.5	
		LE low		3.3	3.3	3.3	3.4	
t_{su}	Setup time	Data before LE \downarrow	Low	2.5	2.5	2.5	2.5	ns
			High	3	3	3	3	
		$\overline{\text{PRE}}$ inactive		1.6	1.6	1.6	1.6	
		$\overline{\text{CLR}}$ inactive		2	2	2	2	
t_h	Hold time, data after LE \downarrow	High		1	1	1	1	ns
		Low		1.5 \dagger	2.3 \dagger	1.5 \dagger	1.5 \dagger	

\dagger This data sheet limit may vary among suppliers.

switching characteristics over recommended ranges of supply voltage and operating free-air temperature, $C_L = 50\text{ pF}$ (unless otherwise noted) (see Figures 1 and 2)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 5\text{ V},$ $T_A = 25^\circ\text{C}$			SN54ABT843		SN74ABT843		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{PLH}	D	Q	1.2 \dagger	3.8	5.2	1.2 \dagger	7.8	1.2 \dagger	6.7 \dagger	ns
t_{PHL}			1.5 \dagger	3.4	6.3	1.5 \dagger	7.3	1.5 \dagger	7.2	
t_{PLH}	LE	Q	1.7 \dagger	4.4	5.6	1.7 \dagger	8.3	1.7 \dagger	7.2 \dagger	ns
t_{PHL}			1.9 \dagger	4.1	6.3	1.3 \dagger	7.2	1.9 \dagger	6.9	
t_{PLH}	$\overline{\text{PRE}}$	Q	2.2	5	6.2	2.2	8.3	2.2	7.4	ns
t_{PHL}			2.1 \dagger	4.1	6.5	2.1 \dagger	7.5	2.1 \dagger	7.2	
t_{PLH}	$\overline{\text{CLR}}$	Q	2 \dagger	4.4	6.3	2 \dagger	7.6	2 \dagger	7.1	ns
t_{PHL}			1.9 \dagger	4.5	6.8	1.9 \dagger	8.1	1.9 \dagger	8	
t_{PZH}	$\overline{\text{OE}}$	Q	1	3.4	4.5 \dagger	1	6.4	1	5.7 \dagger	ns
t_{PZL}			2	4.3	5.7 \dagger	2	6.6	2	6.5	
t_{PHZ}	$\overline{\text{OE}}$	Q	2.4 \dagger	4.9	6.2	2.4 \dagger	7.3	2.4 \dagger	6.8	ns
t_{PLZ}			1.5 \dagger	4.2	6.3	1.5 \dagger	7	1.5 \dagger	5.9 \dagger	

\dagger This data sheet limit may vary among suppliers.

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recovery-time waveform

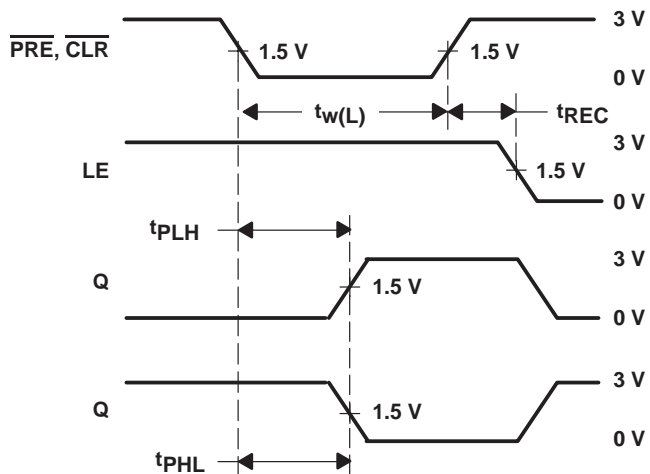
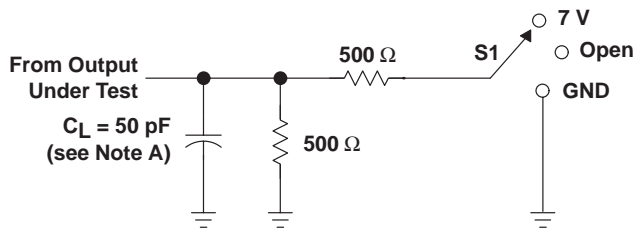


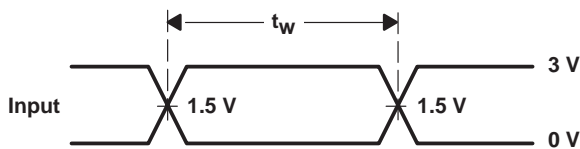
Figure 1. $\overline{\text{CLR}}$ and $\overline{\text{PRE}}$ Pulse Duration, $\overline{\text{CLR}}$ and $\overline{\text{PRE}}$ to Output Delay, and $\overline{\text{CLR}}$ and $\overline{\text{PRE}}$ to Latch-Enable Recovery Time

PARAMETER MEASUREMENT INFORMATION

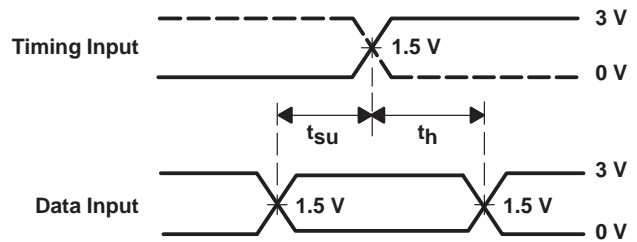


LOAD CIRCUIT

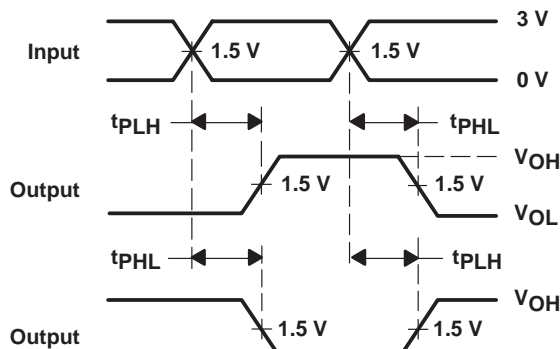
TEST	S1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	7 V
t_{PHZ}/t_{PZH}	Open



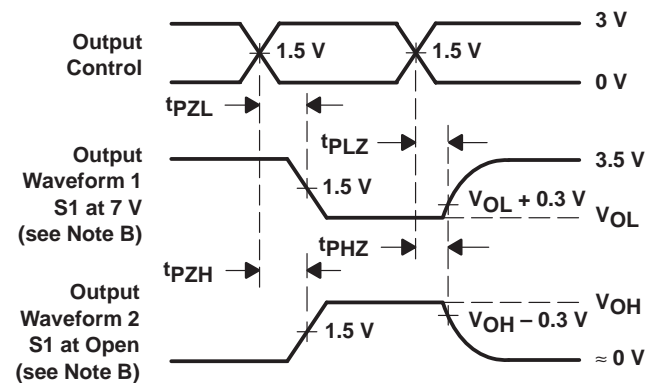
VOLTAGE WAVEFORMS
PULSE DURATION



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 2. Load Circuit and Voltage Waveforms

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead finish/ Ball material (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
5962-9571201QLA	ACTIVE	CDIP	JT	24	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-9571201QL A SNJ54ABT843JT	Samples
SN74ABT843DBR	ACTIVE	SSOP	DB	24	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	AB843	Samples
SN74ABT843DBRG4	ACTIVE	SSOP	DB	24	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	AB843	Samples
SN74ABT843DW	ACTIVE	SOIC	DW	24	25	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT843	Samples
SN74ABT843DWR	ACTIVE	SOIC	DW	24	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT843	Samples
SNJ54ABT843JT	ACTIVE	CDIP	JT	24	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-9571201QL A SNJ54ABT843JT	Samples

(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 finish/Ball material - Orderable Devices 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.

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OTHER QUALIFIED VERSIONS OF SN54ABT843, SN74ABT843 :

- Catalog: [SN74ABT843](#)
- Military: [SN54ABT843](#)

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
SN74ABT843DBR	SSOP	DB	24	2000	330.0	16.4	8.2	8.8	2.5	12.0	16.0	Q1
SN74ABT843DWR	SOIC	DW	24	2000	330.0	24.4	10.75	15.7	2.7	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)
SN74ABT843DBR	SSOP	DB	24	2000	853.0	449.0	35.0
SN74ABT843DWR	SOIC	DW	24	2000	350.0	350.0	43.0

JT (R-GDIP-T**)

CERAMIC DUAL-IN-LINE

24 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.
 E. Falls within MIL STD 1835 GDIP3-T24, GDIP4-T28, and JEDEC MO-058 AA, MO-058 AB

DW (R-PDSO-G24)

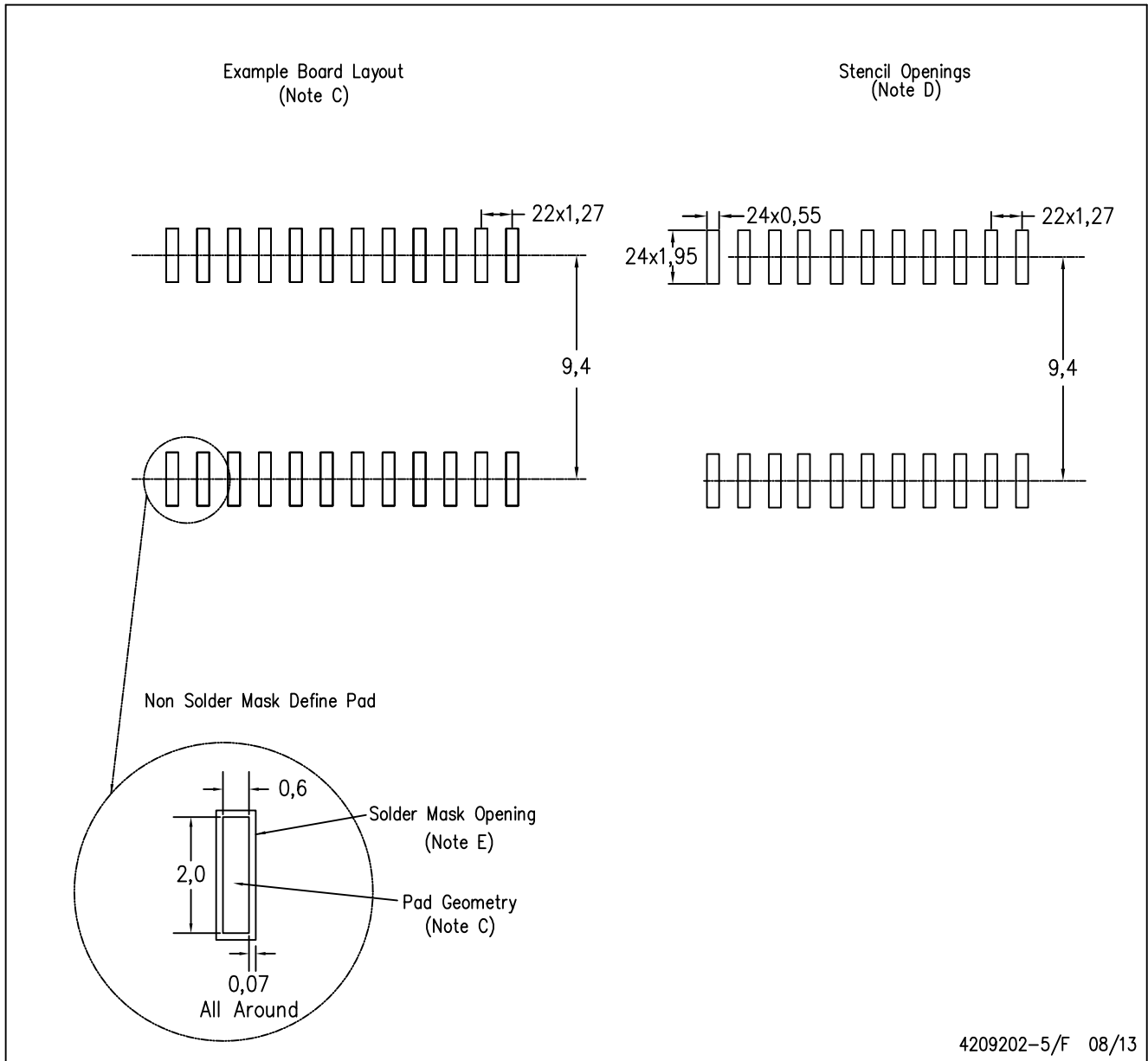
PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in inches (millimeters). Dimensioning and tolerancing per ASME Y14.5M-1994.
 - 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 MS-013 variation AD.

DW (R-PDSO-G24)

PLASTIC SMALL OUTLINE



4209202-5/F 08/13

- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Refer to IPC7351 for alternate board design.
 - D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525
 - E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

DB (R-PDSO-G**)

PLASTIC SMALL-OUTLINE

28 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.
 D. Falls within JEDEC MO-150

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