

# SN74F543 OCTAL REGISTERED TRANSCEIVER WITH 3-STATE OUTPUTS

SDFS025B – D2942, MARCH 1987 – REVISED OCTOBER 1993

- 3-State True Outputs
- Back-to-Back Registers for Storage
- Package Options Include Plastic Small-Outline and Shrink Small-Outline Packages and Standard Plastic 300-mil DIPs

## description

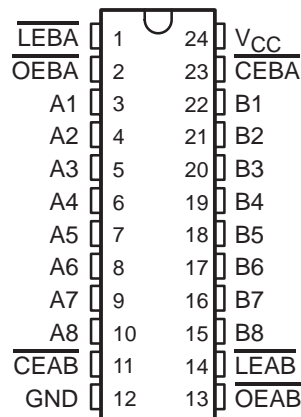
The SN74F543 octal transceiver contains two sets of D-type latches for temporary storage of data flowing in either direction. Separate latch-enable ( $\overline{LEAB}$  or  $\overline{LEBA}$ ) and output enable ( $\overline{OEAB}$  or  $\overline{OEBA}$ ) inputs are provided for each register to permit independent control in either direction of data flow. The A outputs are characterized to sink 24 mA while the B outputs are characterized to sink 64 mA.

The A-to-B enable ( $\overline{CEAB}$ ) input must be low in order to enter data from A or to output data from B. Having  $\overline{CEAB}$  low and  $\overline{LEAB}$  low makes the A-to-B latches transparent; a subsequent low-to-high transition of  $\overline{LEAB}$  puts the A latches in the storage mode. With  $\overline{CEAB}$  and  $\overline{OEAB}$  both low, the 3-state B outputs are active and reflect the data present at the output of the A latches. Data flow from B to A is similar, but requires using the  $\overline{CEBA}$ ,  $\overline{LEBA}$ , and  $\overline{OEBA}$  inputs.

The SN74F543 is available in TI's shrink small-outline package (DB), which provides the same I/O pin count and functionality of standard small-outline packages in less than half the printed-circuit-board area.

The SN74F543 is characterized for operation from 0°C to 70°C.

DB, DW, OR NT PACKAGE  
(TOP VIEW)



FUNCTION TABLE†

INPUTS				OUTPUT
$\overline{CEAB}$	$\overline{LEAB}$	$\overline{OEAB}$	A	B
H	X	X	X	Z
X	X	H	X	Z
L	H	L	X	$B_0^\ddagger$
L	L	L	L	L
L	L	L	H	H

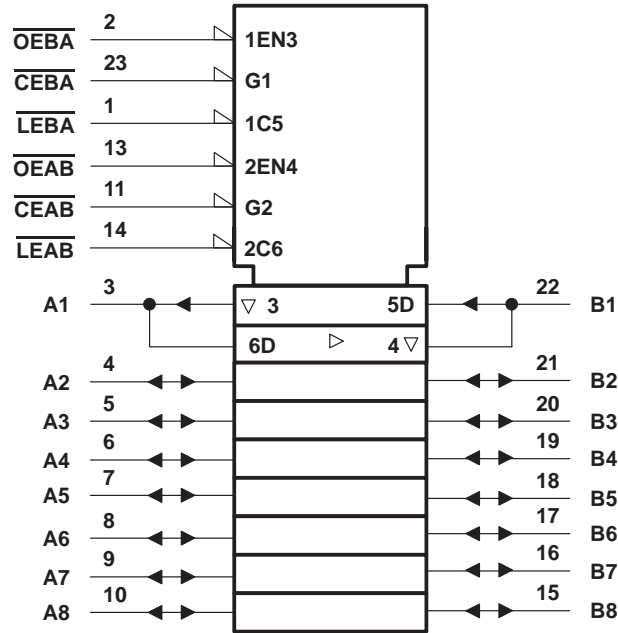
† A-to-B data flow is shown; B-to-A flow control is the same except that it uses  $\overline{CEBA}$ ,  $\overline{LEBA}$ , and  $\overline{OEBA}$ .

‡ Output level before the indicated steady-state input conditions were established.

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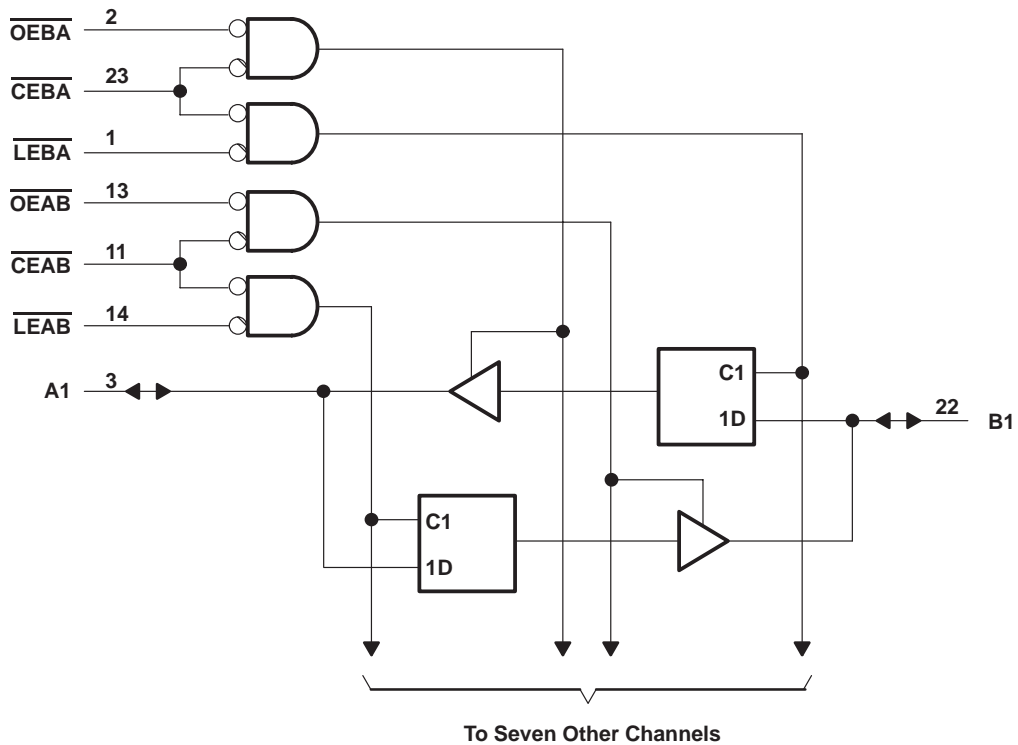
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## logic symbol†



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

## logic diagram (positive logic)



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**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, $V_I$ (excluding I/O ports) (see Note 1) .....	–1.2 V to 7 V
Input current range, $I_{IK}$ .....	–30 mA to 5 mA
Voltage range applied to any output in the disabled or power-off state .....	–0.5 V to 5.5 V
Voltage range applied to any output in the high state .....	–0.5 V to $V_{CC}$
Current into any output in the low state: A1–A8 .....	48 mA
B1–B8 .....	128 mA
Operating free-air temperature range .....	0°C to 70°C
Storage temperature range .....	–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.

NOTE 1: The input-voltage ratings may be exceeded provided the input-current ratings are observed.

**recommended operating conditions**

		MIN	NOM	MAX	UNIT
$V_{CC}$	Supply voltage	4.5	5	5.5	V
$V_{IH}$	High-level input voltage	2			V
$V_{IL}$	Low-level input voltage			0.8	V
$I_{IK}$	Input clamp current			–18	mA
$I_{OH}$	High-level output current	A1–A8		–3	mA
		B1–B8		–15	
$I_{OL}$	Low-level output current	A1–A8		24	mA
		B1–B8		64	
$T_A$	Operating free-air temperature	0		70	°C



# SN74F543

## OCTAL REGISTERED TRANSCEIVER WITH 3-STATE OUTPUTS

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

PARAMETER		TEST CONDITIONS		MIN	TYP†	MAX	UNIT
$V_{IK}$		$V_{CC} = 4.5\text{ V}$ ,	$I_I = -18\text{ mA}$			-1.2	V
$V_{OH}$	A1–A8	$V_{CC} = 4.5\text{ V}$	$I_{OH} = -1\text{ mA}$	2.5	3.4		V
			$I_{OH} = -3\text{ mA}$	2.4	3.3		
	B1–B8		$I_{OH} = -3\text{ mA}$	2.4	3.3		
			$I_{OH} = -15\text{ mA}$	2	3.1		
Any output		$V_{CC} = 4.75\text{ V}$ ,	$I_{OH} = -1\text{ mA to } -3\text{ mA}$	2.7			
$V_{OL}$	A1–A8	$V_{CC} = 4.5\text{ V}$	$I_{OL} = 24\text{ mA}$		0.3	0.5	V
	B1–B8		$I_{OL} = 64\text{ mA}$		0.42	0.55	
$I_I$	$\overline{OE}$ , $\overline{LE}$ , and $\overline{CE}$	$V_{CC} = 5.5\text{ V}$	$V_I = 7\text{ V}$			0.1	mA
	A and B ports		$V_I = 5.5\text{ V}$			1	
$I_{IH}‡$	$\overline{OE}$ , $\overline{LE}$ , and $\overline{CE}$	$V_{CC} = 5.5\text{ V}$ ,	$V_I = 2.7\text{ V}$			20	$\mu\text{A}$
	A and B ports					70	
$I_{IL}‡$	$\overline{OE}$ , $\overline{LE}$ , and $\overline{CE}$	$V_{CC} = 5.5\text{ V}$ ,	$V_I = 0.5\text{ V}$			-1.2	mA
	A and B ports					-0.65	
$I_{OS}§$	A1–A8	$V_{CC} = 5.5\text{ V}$ ,	$V_O = 0$			-60	mA
	B1–B8					-100	
$I_{CCH}$		$V_{CC} = 5.5\text{ V}$			67	100	mA
$I_{CCL}$		$V_{CC} = 5.5\text{ V}$			83	125	mA
$I_{CCZ}$		$V_{CC} = 5.5\text{ V}$			83	125	mA

† All typical values are at  $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$ .

‡ For I/O ports, the parameters  $I_{IH}$  and  $I_{IL}$  include the off-state output current.

§ Not more than one output should be shorted at a time, and the duration of the short circuit should not exceed one second.

### timing requirements

		$V_{CC} = 5\text{ V}$ , $T_A = 25^\circ\text{C}$		$V_{CC} = 4.5\text{ V to } 5.5\text{ V}$ , $T_A = \text{MIN to MAX}¶$		UNIT
		MIN	MAX	MIN	MAX	
$t_w$	Pulse duration	5		5		ns
$t_{su}$	Setup time, data before latch enable		High or low	3	3.5	ns
$t_h$	Hold time, data after latch enable		High or low	3	3.5	ns

¶ For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

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**switching characteristics (see Note 2)**

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V <sub>CC</sub> = 5 V, C <sub>L</sub> = 50 pF, R <sub>L</sub> = 500 Ω, T <sub>A</sub> = 25°C			V <sub>CC</sub> = 4.5 V to 5.5 V, C <sub>L</sub> = 50 pF, R <sub>L</sub> = 500 Ω, T <sub>A</sub> = MIN to MAX†		UNIT
			MIN	TYP	MAX	MIN	MAX	
t <sub>PLH</sub>	A or B	B or A	2.2	5.1	7.5	2.2	8.5	ns
t <sub>PHL</sub>			2.2	4.6	6.5	2.2	7.5	
t <sub>PLH</sub>	$\overline{LEBA}$	A	3.7	8.1	11	4.1	12.5	ns
t <sub>PHL</sub>			3.7	8.1	11	4.1	12.5	
t <sub>PLH</sub>	$\overline{LEAB}$	B	3.7	8.1	11	4.1	12.5	ns
t <sub>PHL</sub>			3.7	8.1	11	4.1	12.5	
t <sub>PZH</sub>	$\overline{OE}$ or $\overline{CE}$	A or B	2.2	6.6	9	2.2	10	ns
t <sub>PZL</sub>			3.2	7.1	10.5	3.2	12	
t <sub>PHZ</sub>	$\overline{OE}$ or $\overline{CE}$	A or B	1.7	5.6	8	1.7	9	ns
t <sub>PLZ</sub>			1.7	5.1	7.5	1.7	8.5	

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

NOTE 2: Load circuits and waveforms are shown in Section 1.



**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
SN74F543DBR	ACTIVE	SSOP	DB	24	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	F543	<a href="#">Samples</a>
SN74F543DW	OBSOLETE	SOIC	DW	24		TBD	Call TI	Call TI	0 to 70	F543	
SN74F543DWR	ACTIVE	SOIC	DW	24	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	F543	<a href="#">Samples</a>

(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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**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
SN74F543DBR	SSOP	DB	24	2000	330.0	16.4	8.2	8.8	2.5	12.0	16.0	Q1
SN74F543DWR	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)
SN74F543DBR	SSOP	DB	24	2000	356.0	356.0	35.0
SN74F543DWR	SOIC	DW	24	2000	350.0	350.0	43.0

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.

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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