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# HD74HC442/HD74HC443/HD74HC444

Quad. Tridirectional Bus Transceiver  
(with noninverted 3-state outputs)

Quad. Tridirectional Bus Transceiver  
(with inverted 3-state outputs)

Quad Tridirectional Bus Transceiver  
(with noninverted/inverted 3-state outputs)

## HITACHI

ADE-205-506 (Z)

1st. Edition

September 2000

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### Description

These bus transceivers are designed for a synchronous three-way communication between four-line data buses. They give the designer a choice of selecting inverting, noninverting or a combination of inverting and noninverting data paths with 3-state outputs.

The  $S_0$  and  $S_1$  inputs select the bus from which data are to be transferred. The  $\overline{G}$  inputs enable the bus or buses to which data are to be transferred. The port for any bus selected for input and any other bus not enabled for output will be at high impedance.

### Features

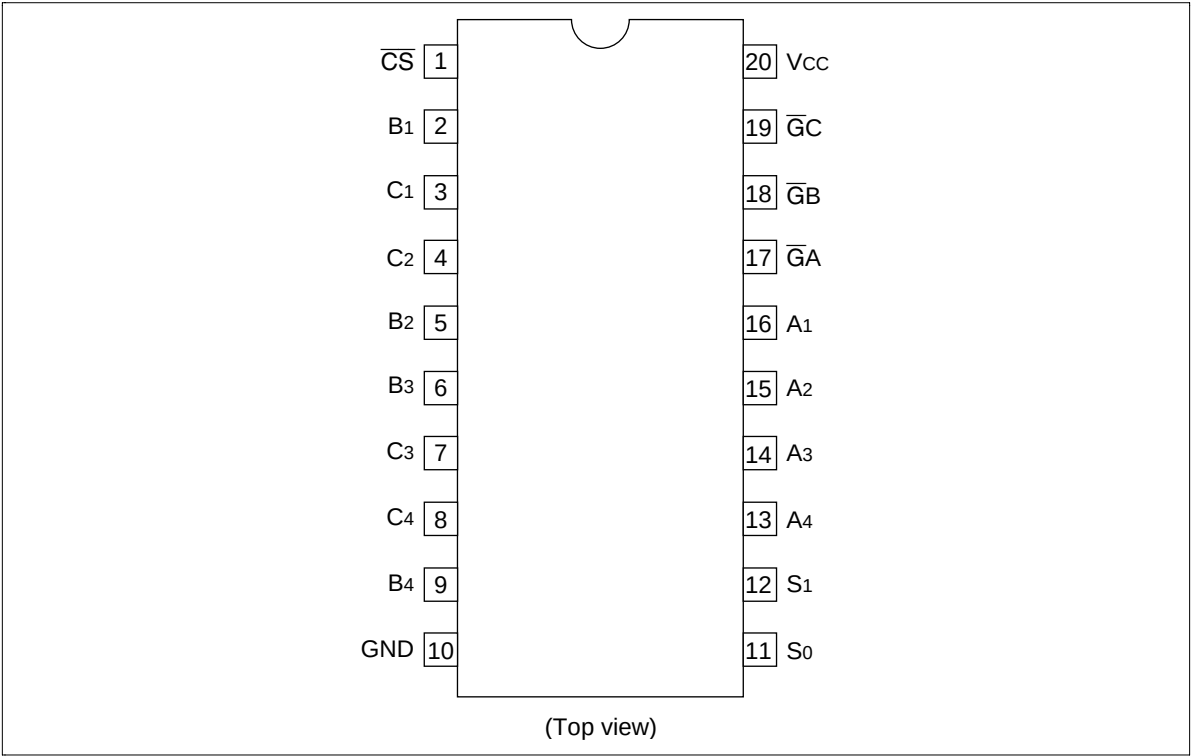
- High Speed Operation
- High Output Current: Fanout of 15 LSTTL Loads
- Wide Operating Voltage:  $V_{CC} = 2$  to 6 V
- Low Input Current: 1  $\mu$ A max
- Low Quiescent Supply Current:  $I_{CC}$  (static) = 4  $\mu$ A max ( $T_a = 25^\circ\text{C}$ )

HD74HC442/HD74HC443/HD74HC444

Function Table

| Inputs          |       |       | Transfers Between Buses |                 |                 |                                    |                                                          |                                                          |
|-----------------|-------|-------|-------------------------|-----------------|-----------------|------------------------------------|----------------------------------------------------------|----------------------------------------------------------|
| $\overline{CS}$ | $S_1$ | $S_0$ | $\overline{GA}$         | $\overline{GB}$ | $\overline{GC}$ | HD74HC442                          | HD74HC443                                                | HD74HC444                                                |
| H               | X     | X     | X                       | X               | X               | None                               | None                                                     | None                                                     |
| X               | H     | H     | X                       | X               | X               | None                               | None                                                     | None                                                     |
| X               | X     | X     | H                       | H               | H               | None                               | None                                                     | None                                                     |
| X               | L     | L     | X                       | H               | H               | None                               | None                                                     | None                                                     |
| X               | L     | H     | H                       | X               | H               | None                               | None                                                     | None                                                     |
| X               | H     | L     | H                       | H               | X               | None                               | None                                                     | None                                                     |
| L               | L     | L     | X                       | L               | L               | $A \rightarrow B, A \rightarrow C$ | $\overline{A} \rightarrow B, \overline{A} \rightarrow C$ | $\overline{A} \rightarrow B, \overline{A} \rightarrow C$ |
| L               | L     | H     | L                       | X               | L               | $B \rightarrow C, B \rightarrow A$ | $\overline{B} \rightarrow C, \overline{B} \rightarrow A$ | $B \rightarrow C, \overline{B} \rightarrow A$            |
| L               | H     | L     | L                       | L               | X               | $C \rightarrow A, C \rightarrow B$ | $\overline{C} \rightarrow A, \overline{C} \rightarrow B$ | $\overline{C} \rightarrow A, C \rightarrow B$            |
| L               | L     | L     | X                       | L               | H               | $A \rightarrow B$                  | $\overline{A} \rightarrow B$                             | $\overline{A} \rightarrow B$                             |
| L               | L     | H     | H                       | X               | L               | $B \rightarrow C$                  | $\overline{B} \rightarrow C$                             | $B \rightarrow C$                                        |
| L               | H     | L     | L                       | H               | X               | $C \rightarrow A$                  | $\overline{C} \rightarrow A$                             | $\overline{C} \rightarrow A$                             |
| L               | L     | L     | X                       | H               | L               | $A \rightarrow C$                  | $\overline{A} \rightarrow C$                             | $\overline{A} \rightarrow C$                             |
| L               | L     | H     | L                       | X               | H               | $B \rightarrow A$                  | $\overline{B} \rightarrow A$                             | $\overline{B} \rightarrow A$                             |
| L               | H     | L     | H                       | L               | X               | $C \rightarrow B$                  | $\overline{C} \rightarrow B$                             | $C \rightarrow B$                                        |

Pin Arrangement

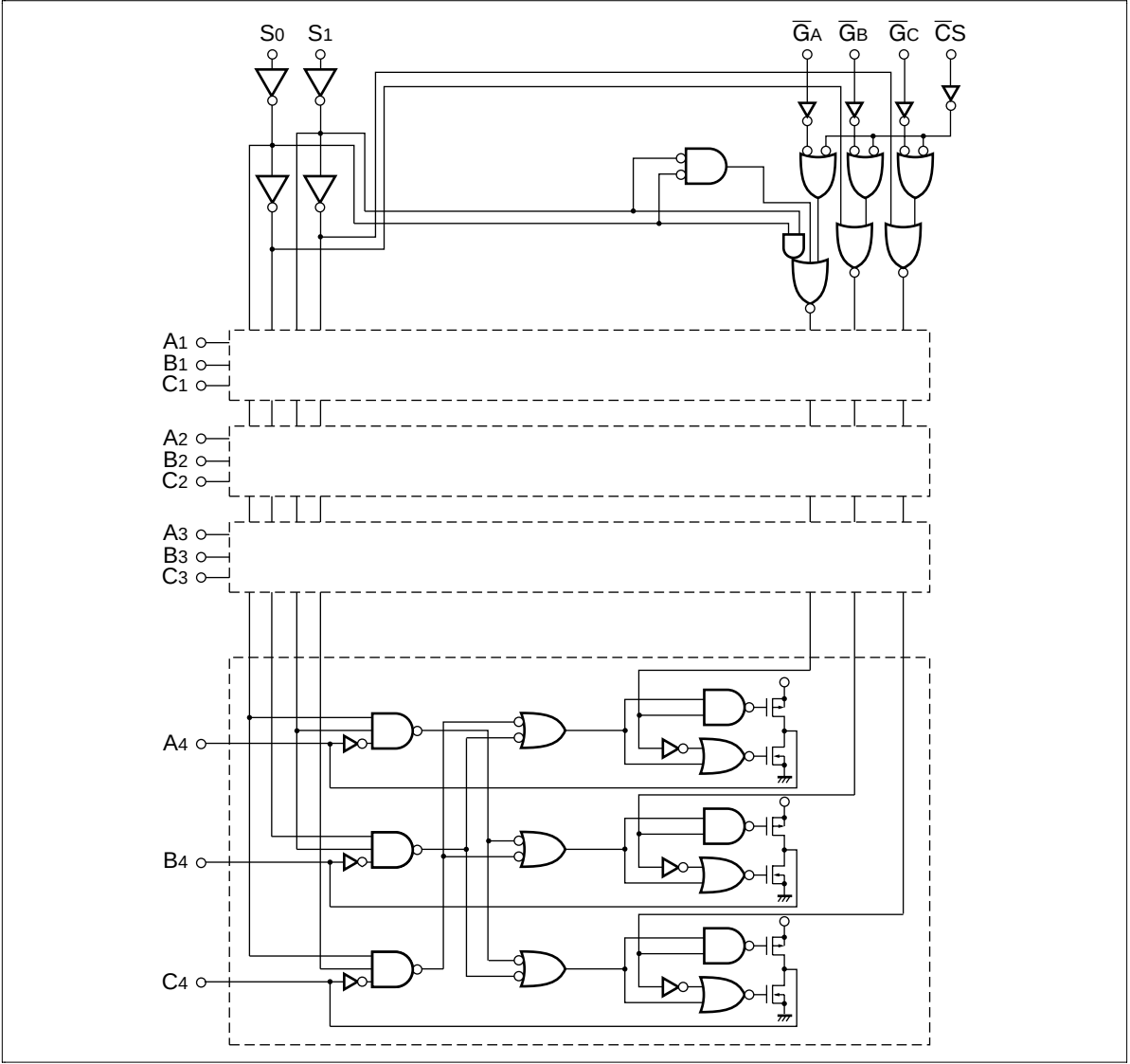


Absolute Maximum Ratings

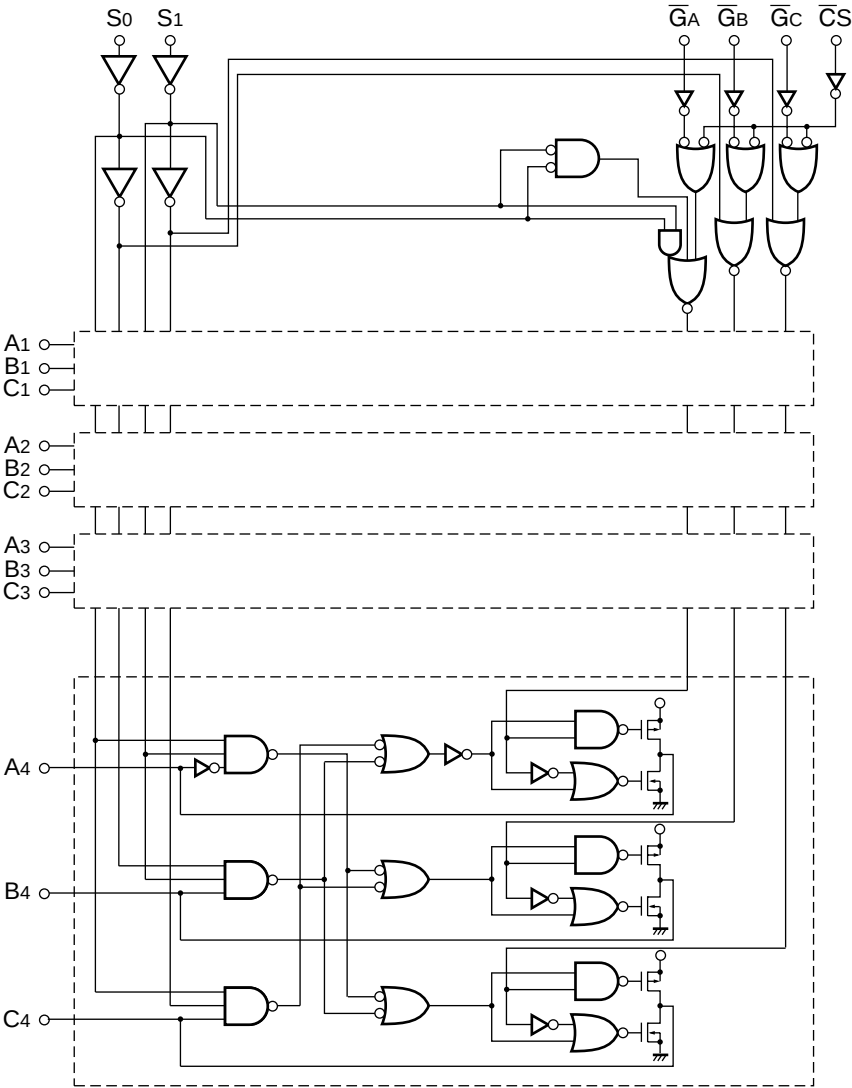
| Item                              | Symbol            | Rating                 | Unit |
|-----------------------------------|-------------------|------------------------|------|
| Supply voltage range              | $V_{CC}$          | -0.5 to +7.0           | V    |
| Input voltage                     | $V_{IN}$          | -0.5 to $V_{CC} + 0.5$ | V    |
| Output voltage                    | $V_{OUT}$         | -0.5 to $V_{CC} + 0.5$ | V    |
| Output current                    | $I_{OUT}$         | ±35                    | mA   |
| DC current drain per $V_{CC}$ GND | $I_{CC}, I_{GND}$ | ±75                    | mA   |
| DC input diode current            | $I_{IK}$          | ±20                    | mA   |
| DC output diode current           | $I_{OK}$          | ±20                    | mA   |
| Power Dissipation per package     | $P_T$             | 500                    | mW   |
| Storage temperature               | Tstg              | -65 to +150            | °C   |



HD74HC443



HD74HC444



## DC Characteristics

| Item                     | Symbol          | V <sub>CC</sub> (V) | Ta = 25°C |     |      | Ta = -40 to +85°C |      | Unit | Test Conditions                                                             |                           |
|--------------------------|-----------------|---------------------|-----------|-----|------|-------------------|------|------|-----------------------------------------------------------------------------|---------------------------|
|                          |                 |                     | Min       | Typ | Max  | Min               | Max  |      |                                                                             |                           |
| Input voltage            | V <sub>IH</sub> | 2.0                 | 1.5       | —   | —    | 1.5               | —    | V    |                                                                             |                           |
|                          |                 | 4.5                 | 3.15      | —   | —    | 3.15              | —    |      |                                                                             |                           |
|                          |                 | 6.0                 | 4.2       | —   | —    | 4.2               | —    |      |                                                                             |                           |
|                          | V <sub>IL</sub> | 2.0                 | —         | —   | 0.5  | —                 | 0.5  | V    |                                                                             |                           |
|                          |                 | 4.5                 | —         | —   | 1.35 | —                 | 1.35 |      |                                                                             |                           |
|                          |                 | 6.0                 | —         | —   | 1.8  | —                 | 1.8  |      |                                                                             |                           |
| Output voltage           | V <sub>OH</sub> | 2.0                 | 1.9       | 2.0 | —    | 1.9               | —    | V    | Vin = V <sub>IH</sub> or V <sub>IL</sub> I <sub>OH</sub> = -20 μA           |                           |
|                          |                 | 4.5                 | 4.4       | 4.5 | —    | 4.4               | —    |      |                                                                             |                           |
|                          |                 | 6.0                 | 5.9       | 6.0 | —    | 5.9               | —    |      |                                                                             |                           |
|                          |                 | 4.5                 | 4.18      | —   | —    | 4.13              | —    |      |                                                                             | I <sub>OH</sub> = -6 mA   |
|                          |                 | 6.0                 | 5.68      | —   | —    | 5.63              | —    |      |                                                                             | I <sub>OH</sub> = -7.8 mA |
|                          | V <sub>OL</sub> | 2.0                 | —         | 0.0 | 0.1  | —                 | 0.1  | V    | Vin = V <sub>IH</sub> or V <sub>IL</sub> I <sub>OL</sub> = 20 μA            |                           |
|                          |                 | 4.5                 | —         | 0.0 | 0.1  | —                 | 0.1  |      |                                                                             |                           |
|                          |                 | 6.0                 | —         | 0.0 | 0.1  | —                 | 0.1  |      |                                                                             |                           |
|                          |                 | 4.5                 | —         | —   | 0.26 | —                 | 0.33 |      |                                                                             | I <sub>OL</sub> = 6 mA    |
|                          |                 | 6.0                 | —         | —   | 0.26 | —                 | 0.33 |      |                                                                             | I <sub>OL</sub> = 7.8 mA  |
| Off-state output current | I <sub>OZ</sub> | 6.0                 | —         | —   | ±0.5 | —                 | ±5.0 | μA   | Vin = V <sub>IH</sub> or V <sub>IL</sub> ,<br>Vout = V <sub>CC</sub> or GND |                           |
| Input current            | I <sub>in</sub> | 6.0                 | —         | —   | ±0.1 | —                 | ±1.0 | μA   | Vin = V <sub>CC</sub> or GND                                                |                           |
| Quiescent supply current | I <sub>CC</sub> | 6.0                 | —         | —   | 4.0  | —                 | 40   | μA   | Vin = V <sub>CC</sub> or GND, Iout = 0 μA                                   |                           |

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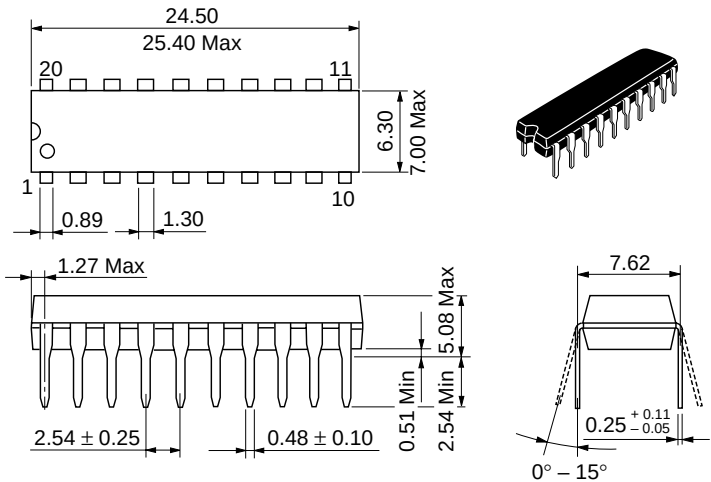
AC Characteristics (C<sub>L</sub> = 50 pF, Input t<sub>r</sub> = t<sub>f</sub> = 6 ns)

| Item                   | Symbol           | V <sub>CC</sub> (V) | Ta = 25°C |     |     | Ta = -40 to +85°C |     | Unit | Test Conditions |
|------------------------|------------------|---------------------|-----------|-----|-----|-------------------|-----|------|-----------------|
|                        |                  |                     | Min       | Typ | Max | Min               | Max |      |                 |
| Propagation delay time | t <sub>PLH</sub> | 2.0                 | —         | —   | 200 | —                 | 250 | ns   |                 |
|                        | t <sub>PHL</sub> | 4.5                 | —         | —   | 40  | —                 | 50  |      |                 |
|                        |                  | 6.0                 | —         | —   | 34  | —                 | 43  |      |                 |
| Output enable time     | t <sub>ZH</sub>  | 2.0                 | —         | —   | 150 | —                 | 190 | ns   |                 |
|                        | t <sub>ZL</sub>  | 4.5                 | —         | —   | 30  | —                 | 38  |      |                 |
|                        |                  | 6.0                 | —         | —   | 26  | —                 | 33  |      |                 |
| Output disable time    | t <sub>HZ</sub>  | 2.0                 | —         | —   | 150 | —                 | 190 | ns   |                 |
|                        | t <sub>LZ</sub>  | 4.5                 | —         | —   | 30  | —                 | 38  |      |                 |
|                        |                  | 6.0                 | —         | —   | 26  | —                 | 33  |      |                 |
| Output rise/fall time  | t <sub>TLH</sub> | 2.0                 | —         | —   | 60  | —                 | 75  | ns   |                 |
|                        | t <sub>THL</sub> | 4.5                 | —         | —   | 12  | —                 | 15  |      |                 |
|                        |                  | 6.0                 | —         | —   | 10  | —                 | 13  |      |                 |
| Input capacitance      | C <sub>in</sub>  | —                   | —         | 5   | 10  | —                 | 10  | pF   |                 |



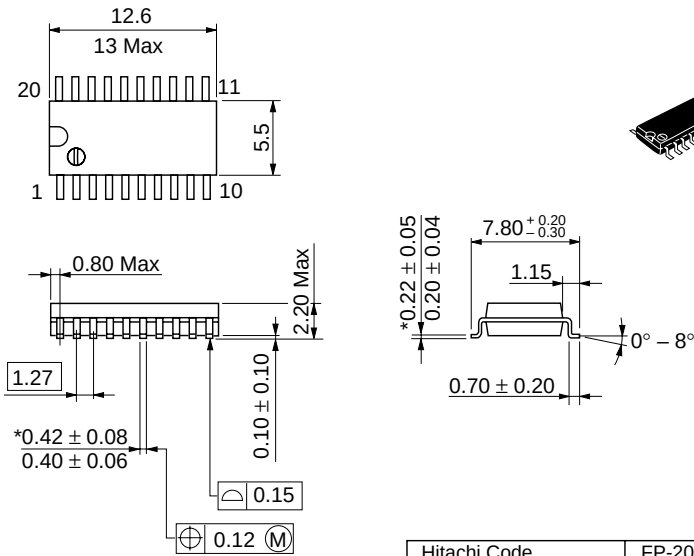
Package Dimensions

Unit: mm



|                        |          |
|------------------------|----------|
| Hitachi Code           | DP-20N   |
| JEDEC                  | —        |
| EIAJ                   | Conforms |
| Mass (reference value) | 1.26 g   |

Unit: mm

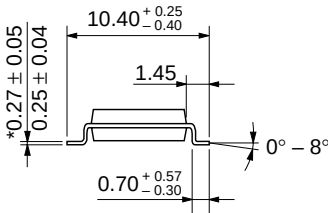
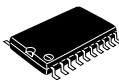
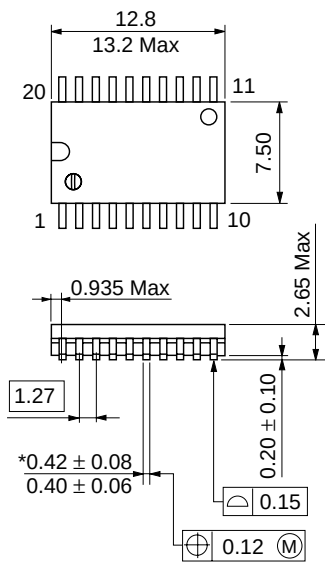


\*Dimension including the plating thickness  
Base material dimension

|                        |          |
|------------------------|----------|
| Hitachi Code           | FP-20DA  |
| JEDEC                  | —        |
| EIAJ                   | Conforms |
| Mass (reference value) | 0.31 g   |

HD74HC442/HD74HC443/HD74HC444

Unit: mm



\*Dimension including the plating thickness  
Base material dimension

|                        |          |
|------------------------|----------|
| Hitachi Code           | FP-20DB  |
| JEDEC                  | Conforms |
| EIAJ                   | —        |
| Mass (reference value) | 0.52 g   |

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