

HD74LS283

4-bit Binary Full Adder

REJ03D0476-0300

Rev.3.00

Jul.15.2005

The HD74LS283 adder is electrically and functionally identical to the HD74LS83A, respectively; only the arrangement of the terminals has been changed.

This improved full adder performs the addition of two 4-bit binary words.

The sum (Σ) outputs are provided for each bit and the resultant carry (C_4) is obtained from the fourth bits generating the carry term in then nanoseconds.

The adder logic, including the carry, is implemented in its true form.

End around carry can be accomplished without the need for logic or level inversion.

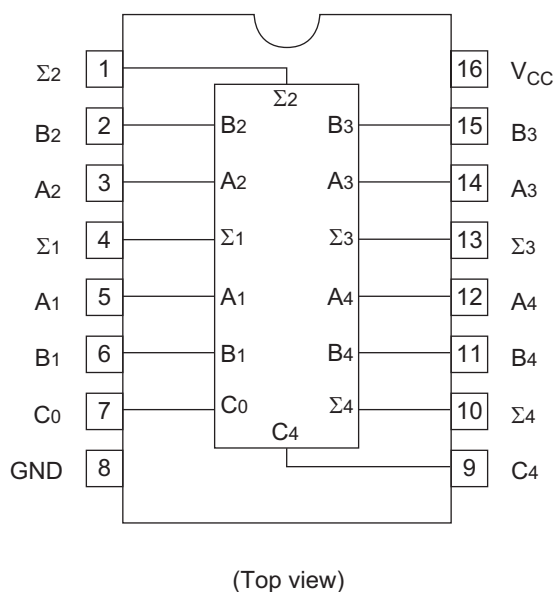
Features

- Ordering Information

| Part Name | Package Type | Package Code (Previous Code) | Package Abbreviation | Taping Abbreviation (Quantity) |
|---------------|--------------------|---------------------------------|-------------------------|-----------------------------------|
| HD74LS283P | DILP-16 pin | PRDP0016AE-B (DP-16FV) | P | — |
| HD74LS283FPEL | SOP-16 pin (JEITA) | PRSP0016DH-B (FP-16DAV) | FP | EL (2,000 pcs/reel) |

Note: Please consult the sales office for the above package availability.

Pin Arrangement



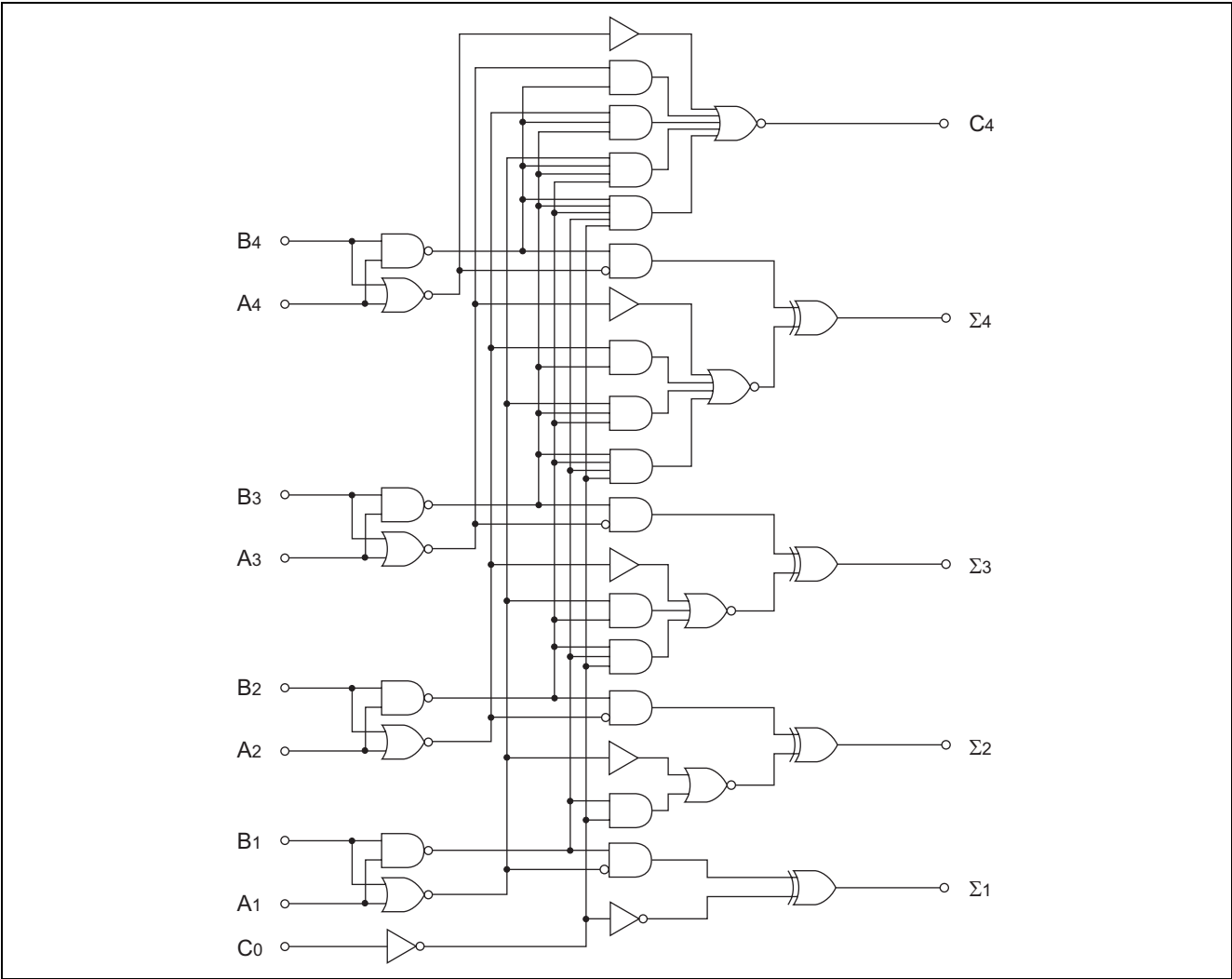
Function Table

| Inputs | | | | Outputs | | | | | |
|----------------|----------------|----------------|----------------|--------------------------|--------------------------|----------------|--------------------------|--------------------------|----------------|
| | | | | When $C_0 = L$ | | | When $C_0 = H$ | | |
| | | | | When $C_2 = L$ | | | When $C_2 = H$ | | |
| A_1 A_3 | B_1 B_3 | A_2 A_4 | B_2 B_4 | Σ_1 Σ_3 | Σ_2 Σ_4 | C_2 C_4 | Σ_1 Σ_3 | Σ_2 Σ_4 | C_2 C_4 |
| L | L | L | L | L | L | L | H | L | L |
| H | L | L | L | H | L | L | L | H | L |
| L | H | L | L | H | L | L | L | H | L |
| H | H | L | L | L | H | L | H | H | L |
| L | L | H | L | L | H | L | H | H | L |
| H | L | H | L | H | H | L | L | L | H |
| L | H | H | L | H | H | L | L | L | H |
| H | H | H | L | L | L | H | H | L | H |
| L | L | L | H | L | H | L | H | H | L |
| H | L | L | H | H | H | L | L | L | H |
| L | H | L | H | H | H | L | L | L | H |
| H | H | L | H | L | L | H | H | L | H |
| L | L | H | H | L | L | H | H | L | H |
| H | L | H | H | H | L | H | L | H | H |
| L | H | H | H | H | L | H | L | H | H |
| H | H | H | H | L | H | H | H | H | H |

H; high level, L; low level

Note: Input conditions at A_1 , B_1 , A_2 , B_2 , and C_0 are used to determine outputs Σ_1 and Σ_2 and the value of the internal carry C_2 . The values at C_2 , A_3 , B_3 , A_4 , and B_4 are then used to determine outputs Σ_3 , Σ_4 , and C_4 .

Block Diagram



Absolute Maximum Ratings

| Item | Symbol | Ratings | Unit |
|---------------------|-----------|-------------|------|
| Supply voltage | V_{CC} | 7 | V |
| Input voltage | V_{IN} | 7 | V |
| Power dissipation | P_T | 400 | mW |
| Storage temperature | T_{stg} | -65 to +150 | °C |

Note: Voltage value, unless otherwise noted, are with respect to network ground terminal.

Recommended Operating Conditions

| Item | Symbol | Min | Typ | Max | Unit |
|-----------------------|-----------|------|------|------|------|
| Supply voltage | V_{CC} | 4.75 | 5.00 | 5.25 | V |
| Output current | I_{OH} | — | — | -400 | μA |
| | I_{OL} | — | — | 8 | mA |
| Operating temperature | T_{opr} | -20 | 25 | 75 | °C |

Electrical Characteristics

(Ta = -20 to +75 °C)

| Item | | Symbol | min. | typ.* | max. | Unit | Condition | |
|------------------------------|-----------------------|-----------------|------|-------|------|------|---|--|
| Input voltage | | V _{IH} | 2.0 | — | — | V | | |
| | | V _{IL} | — | — | 0.8 | V | | |
| Output voltage | | V _{OH} | 2.7 | — | — | V | V _{CC} = 4.75 V, V _{IH} = 2 V, V _{IL} = 0.8 V, I _{OH} = −400 μA | |
| | | V _{OL} | — | — | 0.4 | V | I _{OL} = 4 mA | V _{CC} = 4.75 V, V _{IH} = 2 V, V _{IL} = 0.8 V |
| | | | — | — | 0.5 | | I _{OL} = 8 mA | |
| Input current | except C ₀ | I _{IH} | — | — | 40 | μA | V _{CC} = 5.25 V, V _I = 2.7 V | |
| | C ₀ | | — | — | 20 | | | |
| | except C ₀ | I _{IL} | — | — | −0.8 | mA | V _{CC} = 5.25 V, V _I = 0.4 V | |
| | C ₀ | | — | — | −0.4 | | | |
| | except C ₀ | I _I | — | — | 0.2 | mA | V _{CC} = 5.25 V, V _I = 7 V | |
| | C ₀ | | — | — | 0.1 | | | |
| Short-circuit output current | | I _{OS} | −20 | — | −100 | mA | V _{CC} = 5.25 V | |
| Supply current | | I _{CC} | — | 22 | 39 | mA | All inputs grounded | V _{CC} = 5.25 V |
| | | | — | 19 | 34 | | All B low other inputs at 4.5V | |
| | | | — | 19 | 34 | | All inputs at 4.5V | |
| Input clamp voltage | | V _{IK} | — | — | −1.5 | V | V _{CC} = 4.75 V, I _{IN} = −18 mA | |

Note: * V_{CC} = 5 V, Ta = 25°C

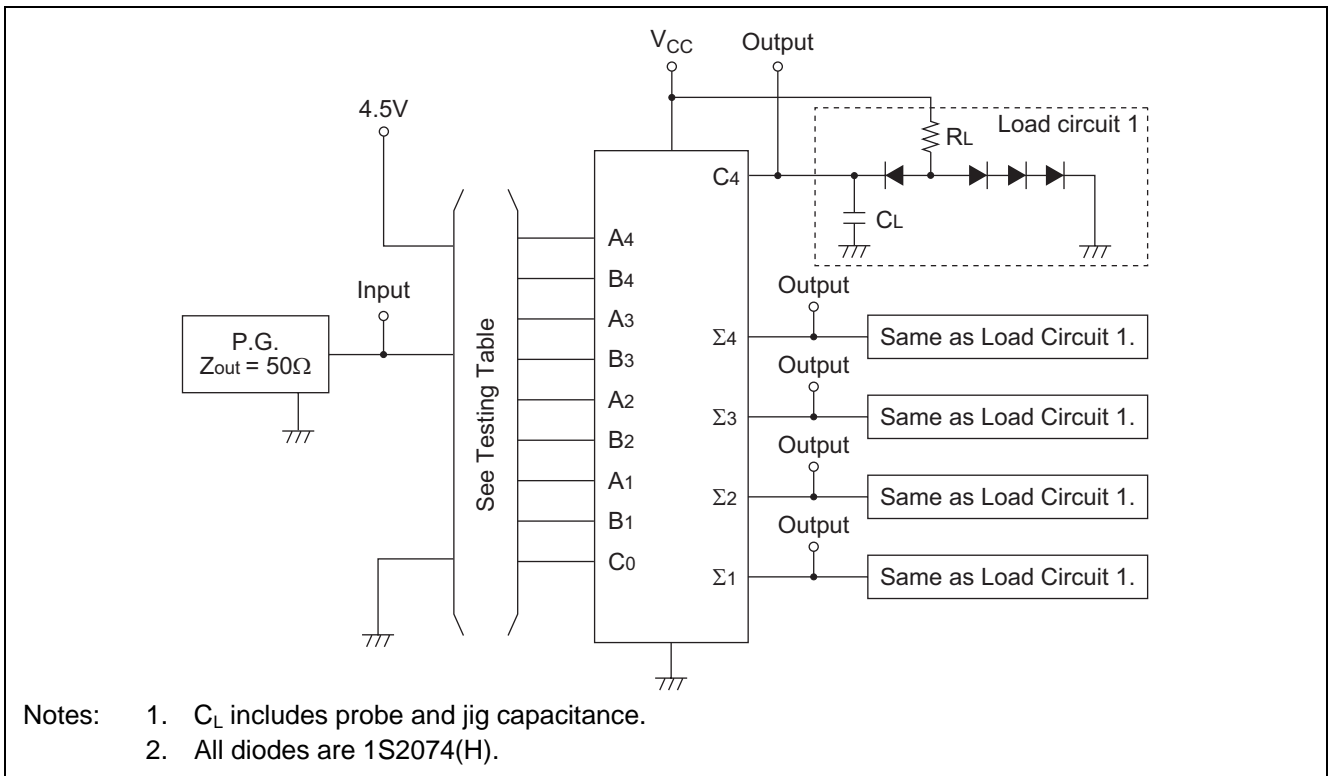
Switching Characteristics

(V_{CC} = 5 V, Ta = 25°C)

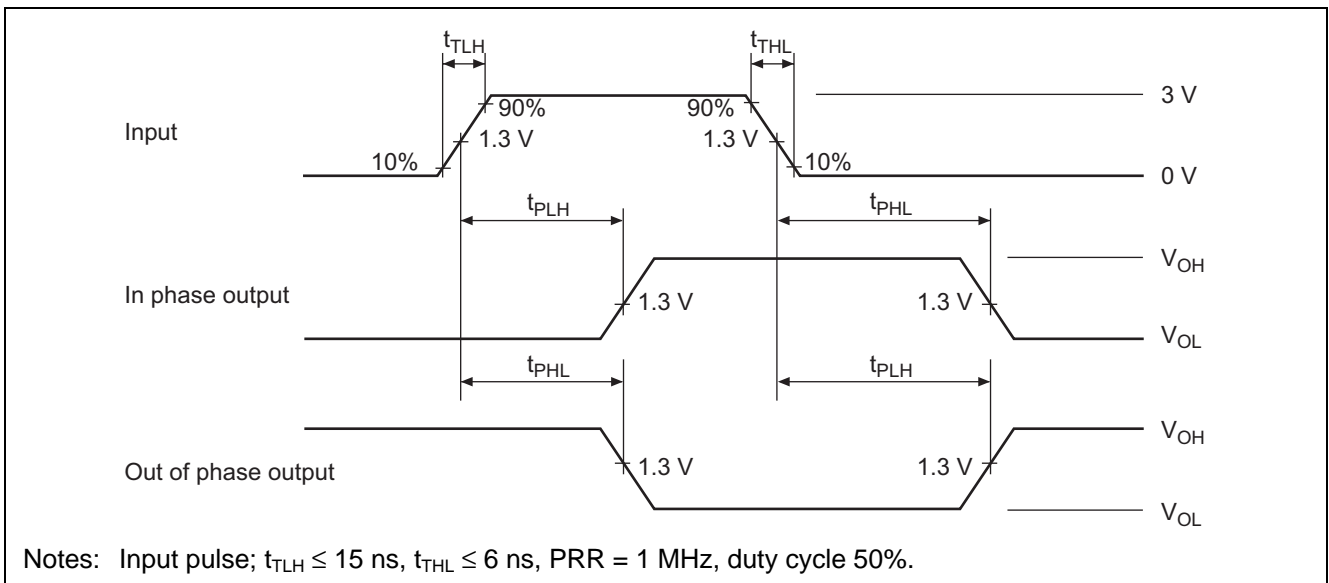
| Item | Symbol | Inputs | Outputs | min. | typ. | max. | Unit | Condition |
|------------------------|------------------|----------------|----------------|------|------|------|------|---|
| Propagation delay time | t _{PLH} | C ₀ | Σi | — | 16 | 24 | ns | C _L = 15 pF, R _L = 2 kΩ |
| | t _{PHL} | | | — | 15 | 24 | ns | |
| | t _{PLH} | Ai, Bi | Σi | — | 15 | 24 | ns | |
| | t _{PHL} | | | — | 15 | 24 | ns | |
| | t _{PLH} | C ₀ | C ₄ | — | 11 | 17 | ns | |
| | t _{PHL} | | | — | 11 | 22 | ns | |
| | t _{PLH} | Ai, Bi | C ₄ | — | 11 | 17 | ns | |
| | t _{PHL} | | | — | 12 | 17 | ns | |

Testing Method

Test Circuit



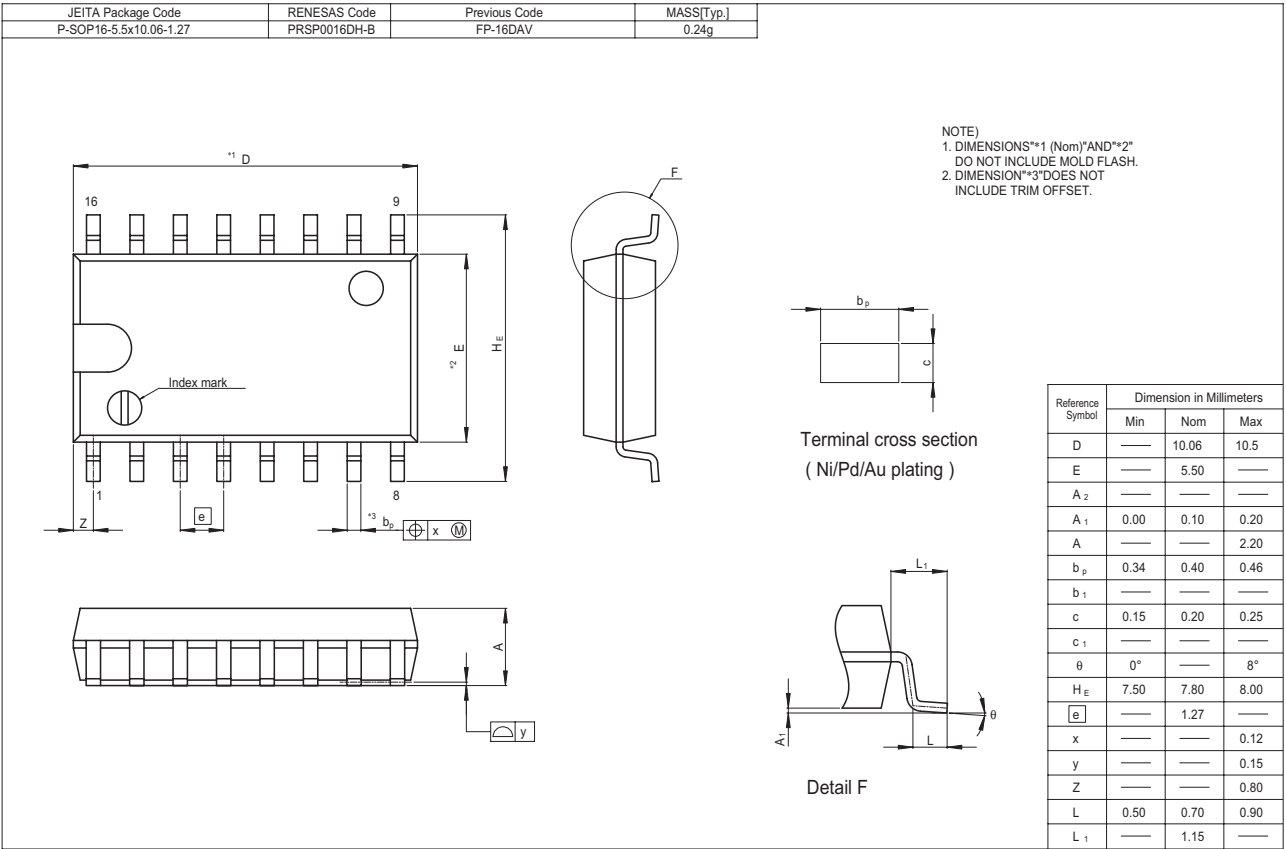
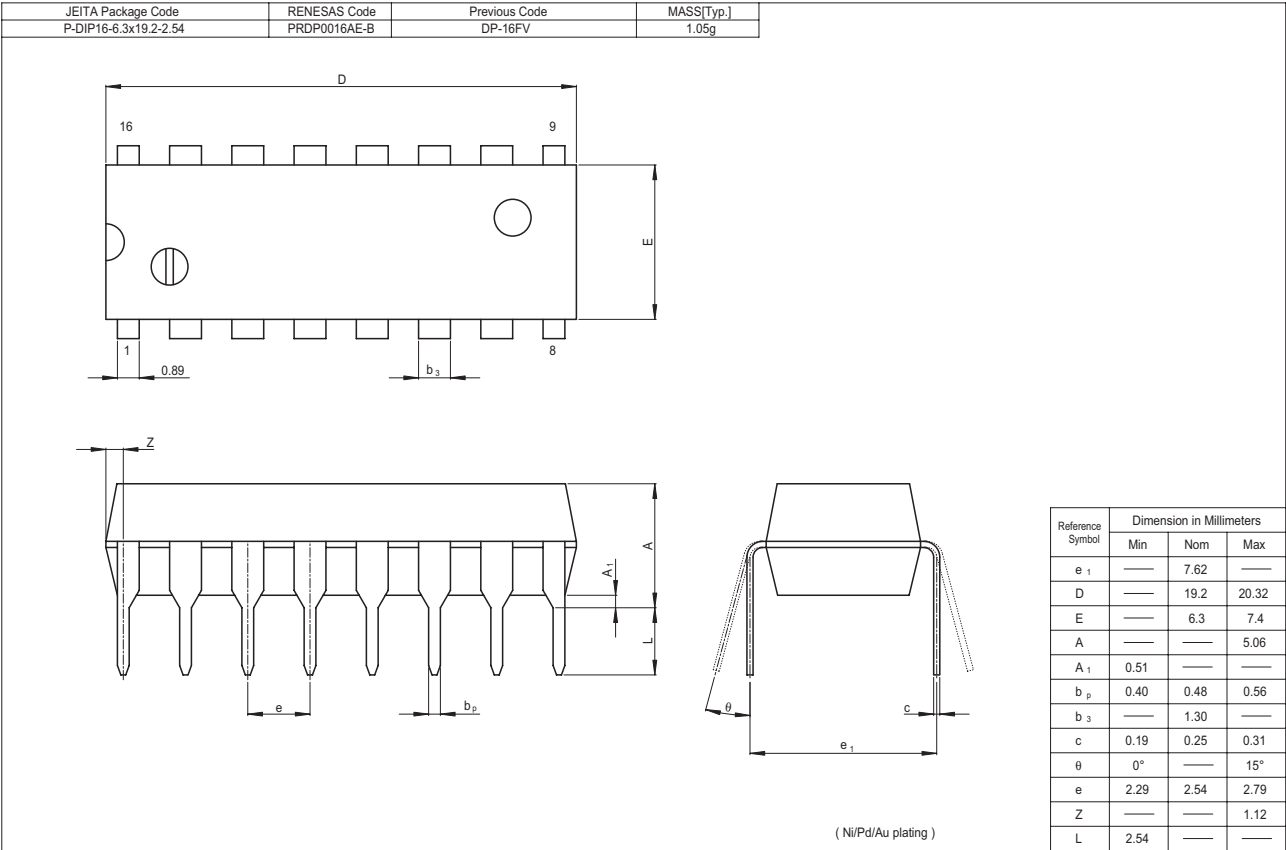
Waveform



Testing Table

| Item | From input to output | Inputs | | | | | | | | | Outputs | | | | |
|--------------------------------------|---|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| | | B ₄ | A ₄ | B ₃ | A ₃ | B ₂ | A ₂ | B ₁ | A ₁ | C ₀ | C ₄ | Σ ₄ | Σ ₃ | Σ ₂ | Σ ₁ |
| t _{PLH} t _{PHL} | C ₀ →Σ _i or C ₄ | GND | GND | GND | GND | GND | GND | GND | GND | IN | — | — | — | — | OUT |
| | | GND | 4.5V | GND | 4.5V | GND | 4.5V | GND | 4.5V | IN | OUT | OUT | OUT | OUT | OUT |
| | A _i or B _i →Σ _i or C ₄ | GND | GND | GND | GND | GND | GND | GND | IN | GND | — | — | — | — | OUT |
| | | | | | | | | IN | GND | | | | | | |
| | | GND | GND | GND | GND | GND | GND | GND | IN | GND | — | — | — | OUT | — |
| | | | | | | | | IN | GND | | | | | | |
| | | GND | GND | GND | IN | GND | GND | GND | GND | GND | — | — | OUT | — | — |
| | | | | IN | GND | | | | | | | | | | |
| | | GND | IN | GND | GND | GND | GND | GND | GND | GND | — | OUT | — | — | — |
| | | IN | GND | | | | | | | | | | | | |
| | | GND | GND | GND | GND | GND | GND | 4.5V | IN | GND | — | — | — | OUT | OUT |
| | | | | | | | | IN | 4.5V | | | | | | |
| | | GND | GND | GND | GND | 4.5V | IN | GND | GND | GND | — | — | OUT | OUT | — |
| | | | | | | IN | 4.5V | | | | | | | | |
| | | GND | GND | 4.5V | IN | GND | GND | GND | GND | GND | — | OUT | OUT | — | — |
| | | | | IN | 4.5V | | | | | | | | | | |
| | | 4.5V | IN | GND | GND | GND | GND | GND | GND | GND | OUT | OUT | — | — | — |
| | | IN | 4.5V | | | | | | | | | | | | |

Package Dimensions



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