

# 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 ( $\Sigma$ ) 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.

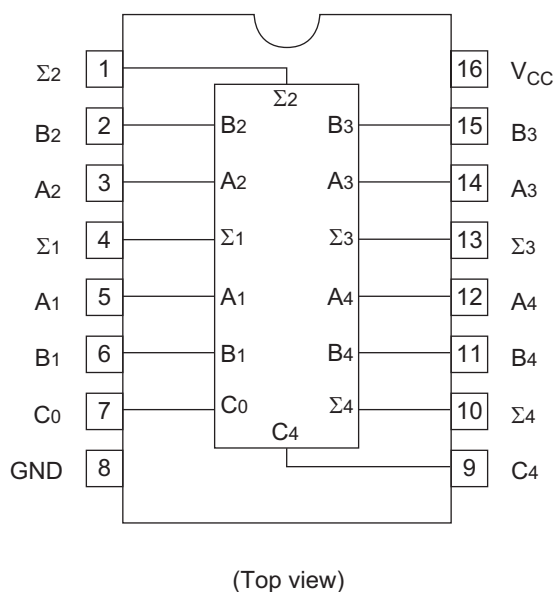
### Features

- 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



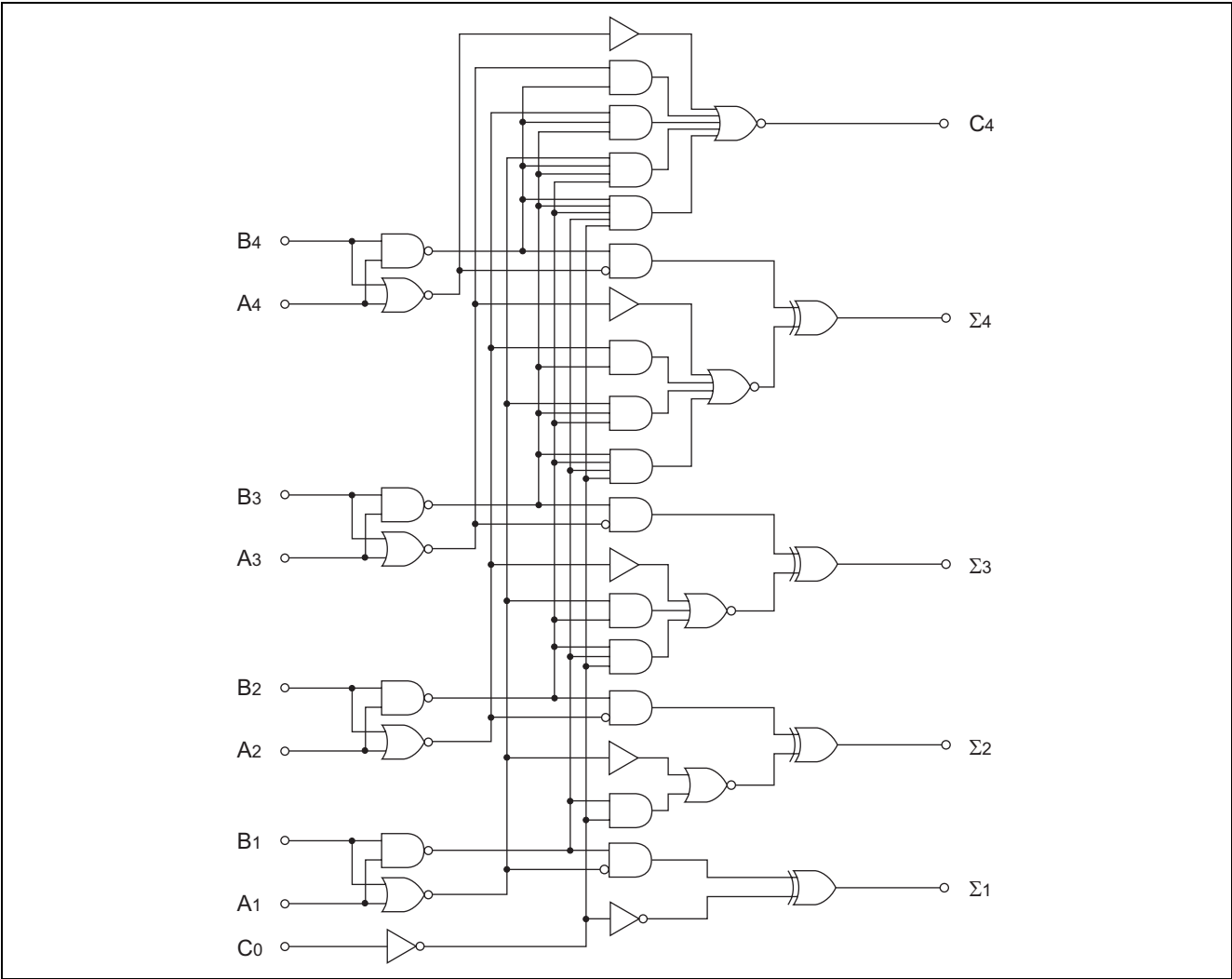
## Function Table

Inputs				Outputs					
				When $C_0 = L$			When $C_0 = H$		
				When $C_2 = L$			When $C_2 = H$		
$A_1$ $A_3$	$B_1$ $B_3$	$A_2$ $A_4$	$B_2$ $B_4$	$\Sigma_1$ $\Sigma_3$	$\Sigma_2$ $\Sigma_4$	$C_2$ $C_4$	$\Sigma_1$ $\Sigma_3$	$\Sigma_2$ $\Sigma_4$	$C_2$ $C_4$
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  $\Sigma_1$  and  $\Sigma_2$  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  $\Sigma_3$ ,  $\Sigma_4$ , 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 <sub>IH</sub>	2.0	—	—	V		
		V <sub>IL</sub>	—	—	0.8	V		
Output voltage		V <sub>OH</sub>	2.7	—	—	V	V <sub>CC</sub> = 4.75 V, V <sub>IH</sub> = 2 V, V <sub>IL</sub> = 0.8 V, I <sub>OH</sub> = −400 μA	
		V <sub>OL</sub>	—	—	0.4	V	I <sub>OL</sub> = 4 mA	V <sub>CC</sub> = 4.75 V, V <sub>IH</sub> = 2 V, V <sub>IL</sub> = 0.8 V
			—	—	0.5		I <sub>OL</sub> = 8 mA	
Input current	except C <sub>0</sub>	I <sub>IH</sub>	—	—	40	μA	V <sub>CC</sub> = 5.25 V, V <sub>I</sub> = 2.7 V	
	C <sub>0</sub>		—	—	20			
	except C <sub>0</sub>	I <sub>IL</sub>	—	—	−0.8	mA	V <sub>CC</sub> = 5.25 V, V <sub>I</sub> = 0.4 V	
	C <sub>0</sub>		—	—	−0.4			
	except C <sub>0</sub>	I <sub>I</sub>	—	—	0.2	mA	V <sub>CC</sub> = 5.25 V, V <sub>I</sub> = 7 V	
	C <sub>0</sub>		—	—	0.1			
Short-circuit output current		I <sub>OS</sub>	−20	—	−100	mA	V <sub>CC</sub> = 5.25 V	
Supply current		I <sub>CC</sub>	—	22	39	mA	All inputs grounded	V <sub>CC</sub> = 5.25 V
			—	19	34		All B low other inputs at 4.5V	
			—	19	34		All inputs at 4.5V	
Input clamp voltage		V <sub>IK</sub>	—	—	−1.5	V	V <sub>CC</sub> = 4.75 V, I <sub>IN</sub> = −18 mA	

Note: \* V<sub>CC</sub> = 5 V, Ta = 25°C

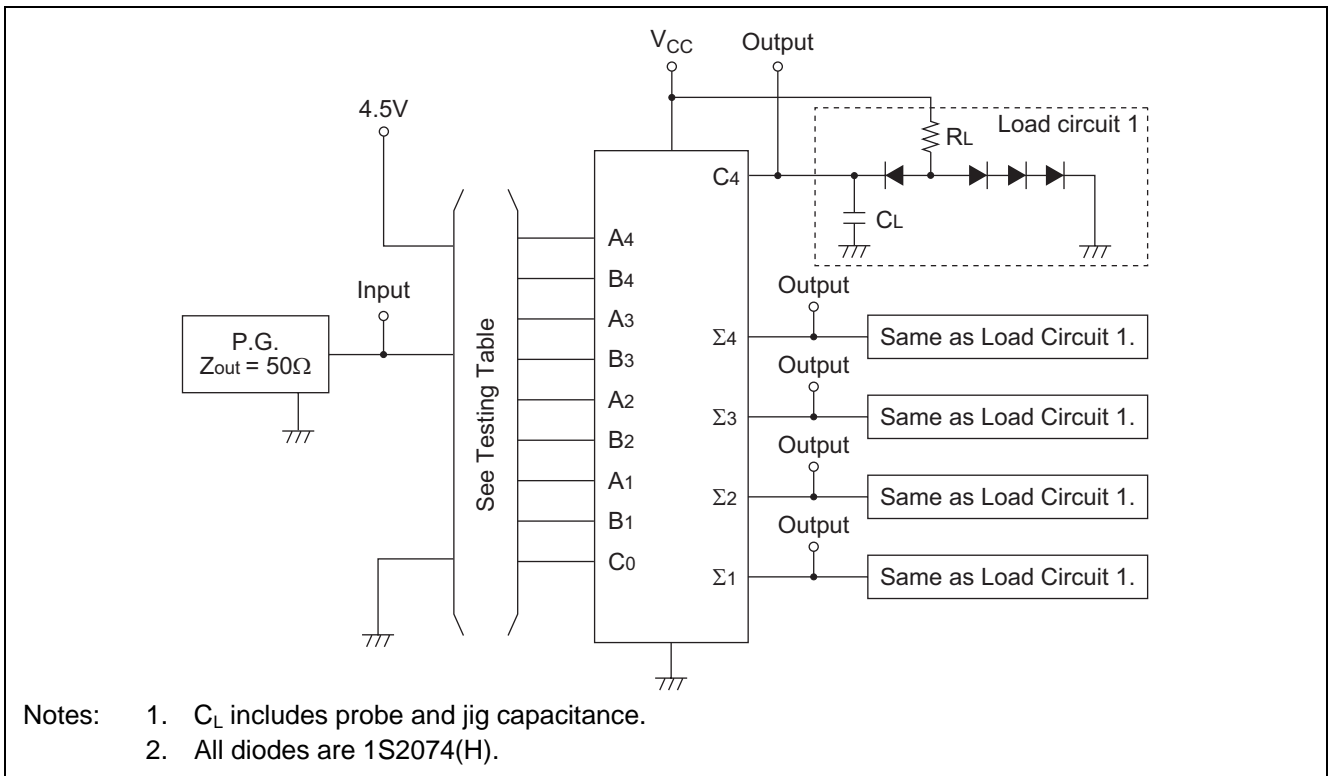
## Switching Characteristics

(V<sub>CC</sub> = 5 V, Ta = 25°C)

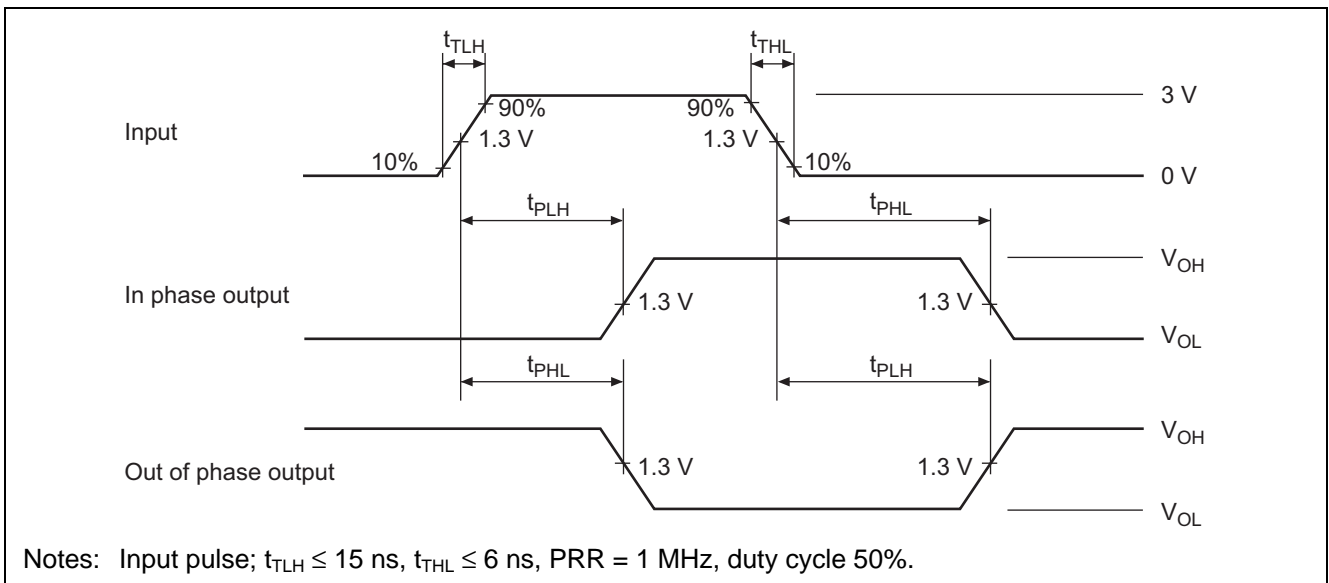
Item	Symbol	Inputs	Outputs	min.	typ.	max.	Unit	Condition
Propagation delay time	t <sub>PLH</sub>	C <sub>0</sub>	Σi	—	16	24	ns	C <sub>L</sub> = 15 pF, R <sub>L</sub> = 2 kΩ
	t <sub>PHL</sub>			—	15	24	ns	
	t <sub>PLH</sub>	Ai, Bi	Σi	—	15	24	ns	
	t <sub>PHL</sub>			—	15	24	ns	
	t <sub>PLH</sub>	C <sub>0</sub>	C <sub>4</sub>	—	11	17	ns	
	t <sub>PHL</sub>			—	11	22	ns	
	t <sub>PLH</sub>	Ai, Bi	C <sub>4</sub>	—	11	17	ns	
	t <sub>PHL</sub>			—	12	17	ns	

## Testing Method

### Test Circuit



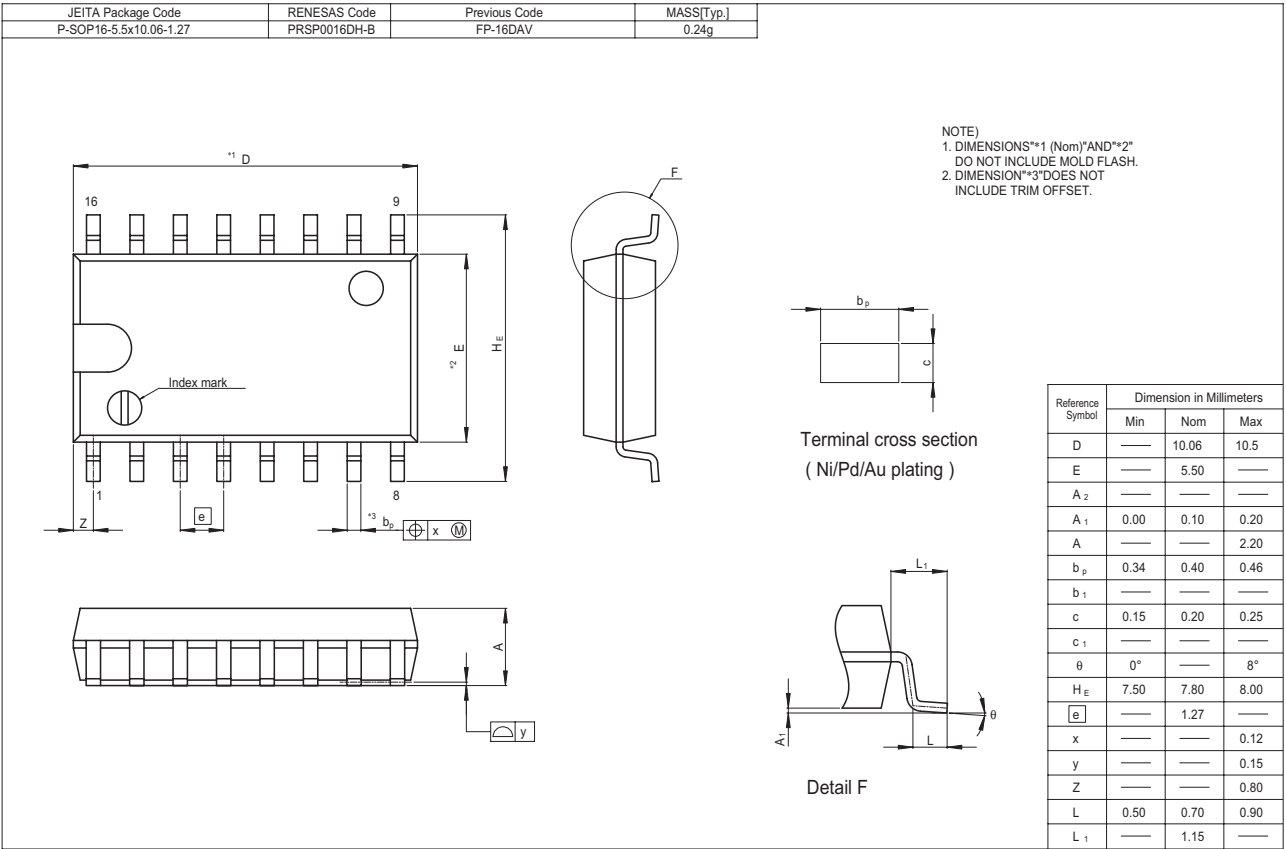
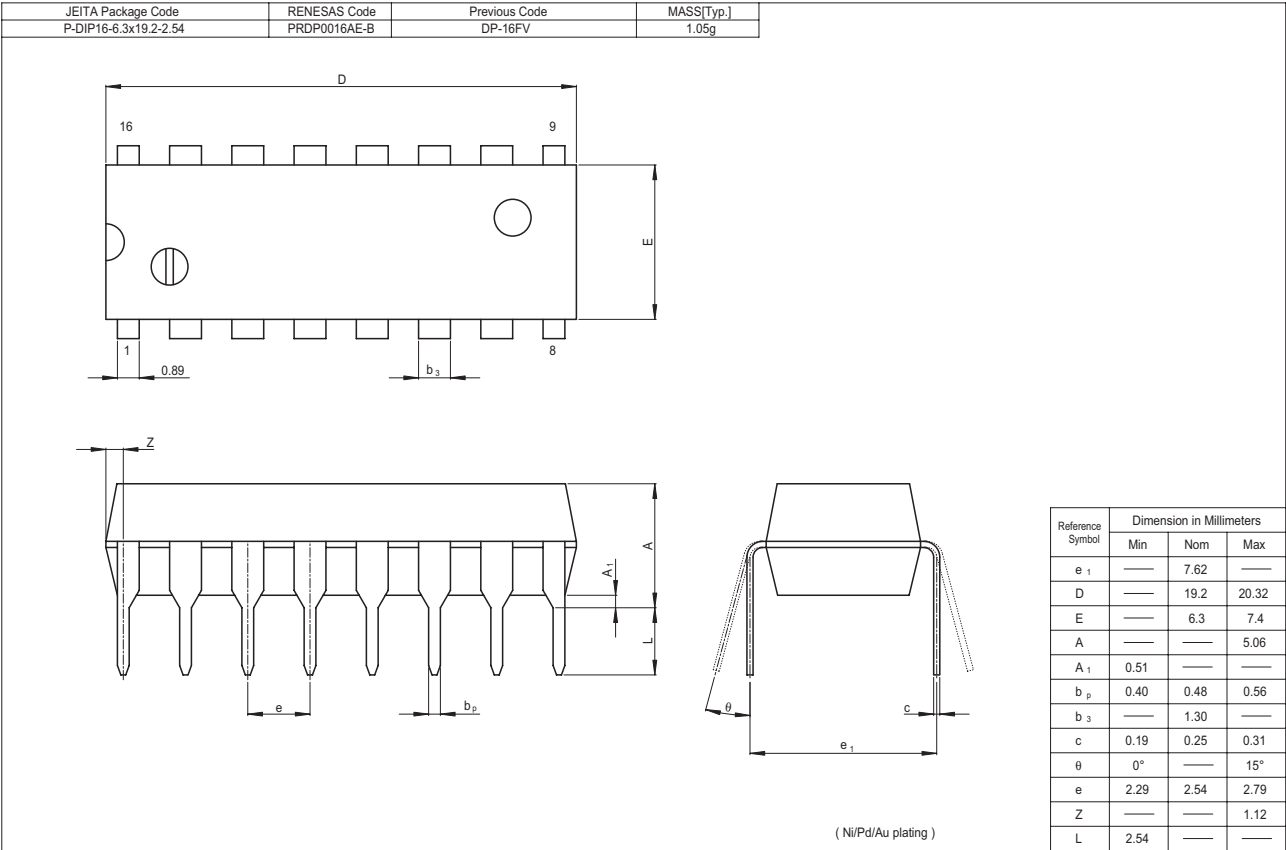
### Waveform



Testing Table

Item	From input to output	Inputs									Outputs				
		B <sub>4</sub>	A <sub>4</sub>	B <sub>3</sub>	A <sub>3</sub>	B <sub>2</sub>	A <sub>2</sub>	B <sub>1</sub>	A <sub>1</sub>	C <sub>0</sub>	C <sub>4</sub>	Σ <sub>4</sub>	Σ <sub>3</sub>	Σ <sub>2</sub>	Σ <sub>1</sub>
t <sub>PLH</sub> t <sub>PHL</sub>	C <sub>0</sub> →Σ <sub>i</sub> or C <sub>4</sub>	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 <sub>i</sub> or B <sub>i</sub> →Σ <sub>i</sub> or C <sub>4</sub>	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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