

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.

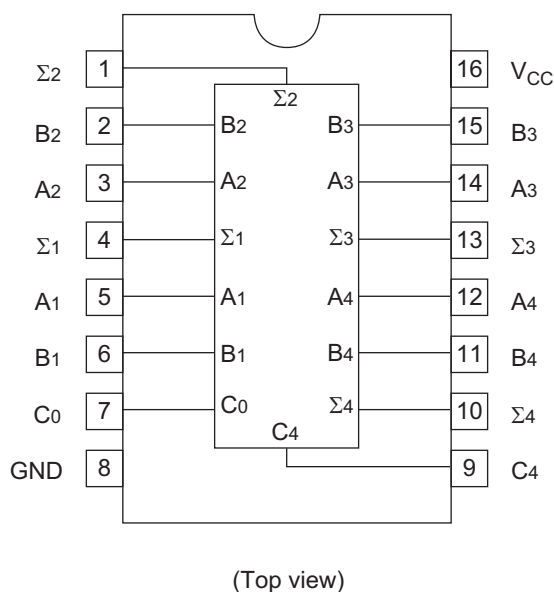
Features

- 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



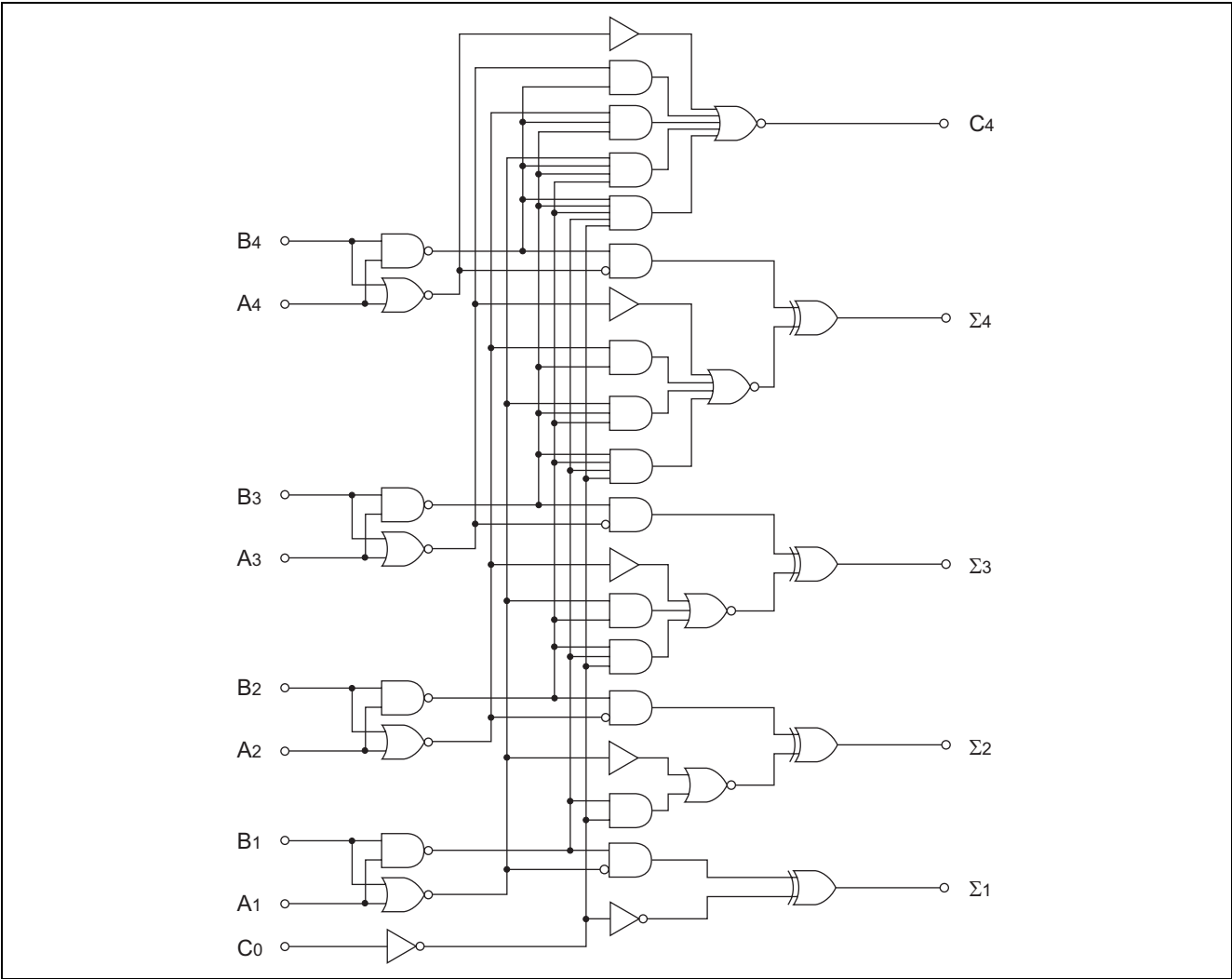
Function Table

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

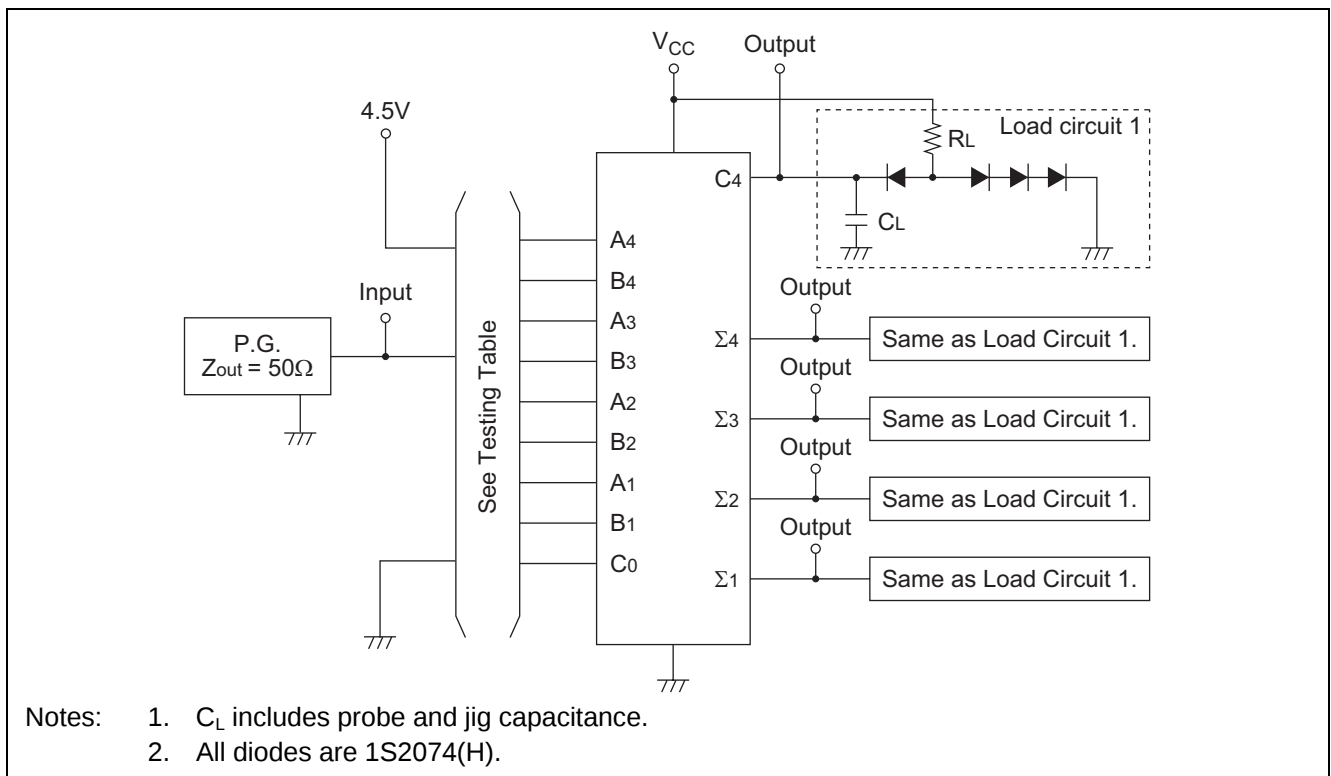
Switching Characteristics

(V_{CC} = 5 V, Ta = 25°C)

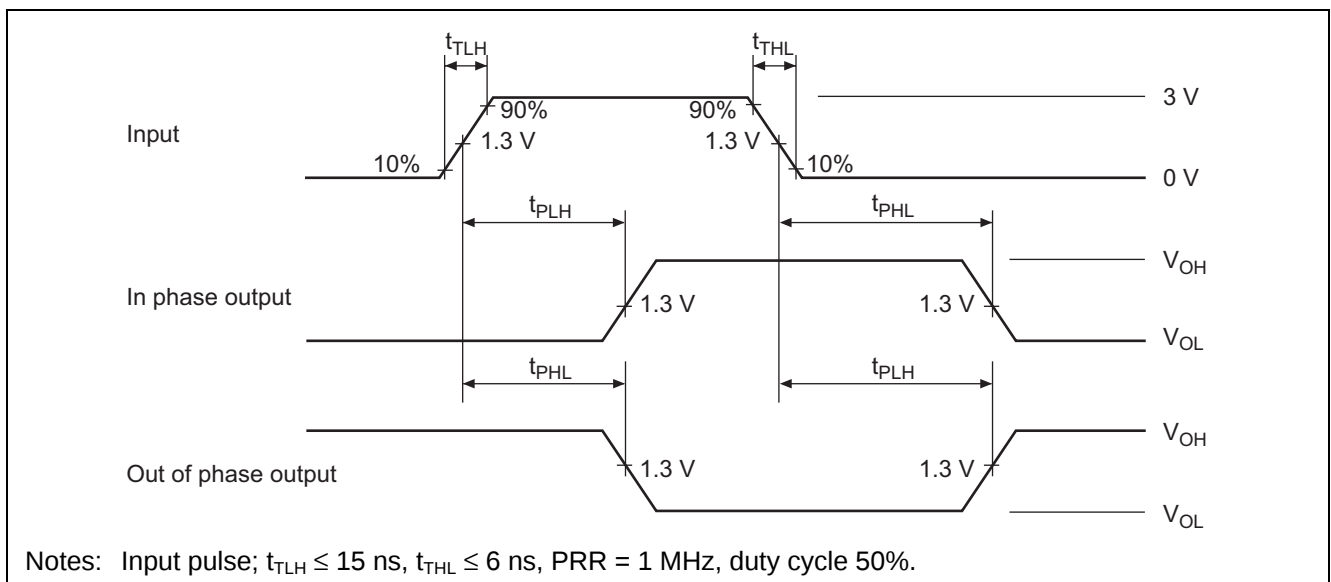
Item	Symbol	Inputs	Outputs	min.	typ.	max.	Unit	Condition
Propagation delay time	t _{PLH}	C ₀	Σi	—	16	24	ns	C _L = 15 pF, R _L = 2 kΩ
	t _{PHL}			—	15	24	ns	
	t _{PLH}	Ai, Bi	Σi	—	15	24	ns	
	t _{PHL}			—	15	24	ns	
	t _{PLH}	C ₀	C ₄	—	11	17	ns	
	t _{PHL}			—	11	22	ns	
	t _{PLH}	Ai, Bi	C ₄	—	11	17	ns	
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

Testing Method

Test Circuit



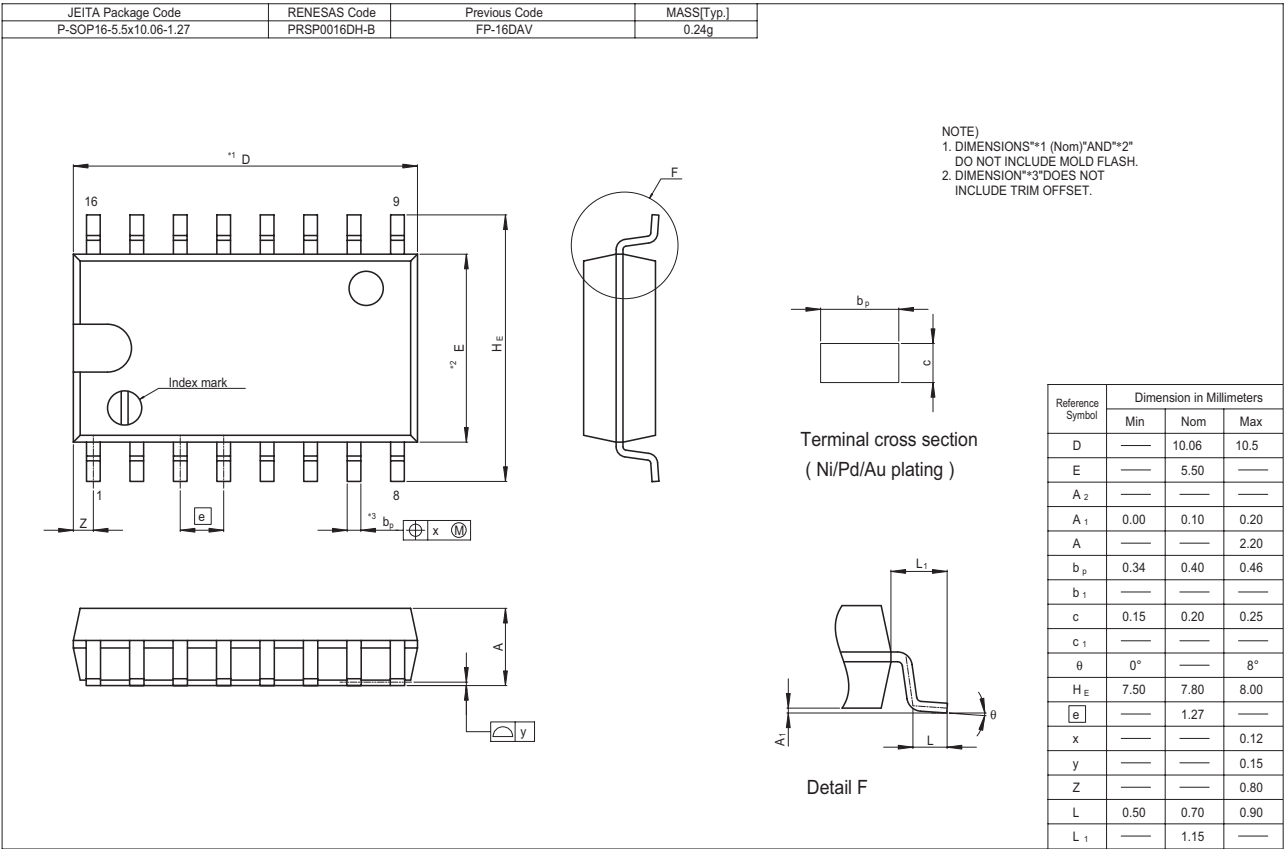
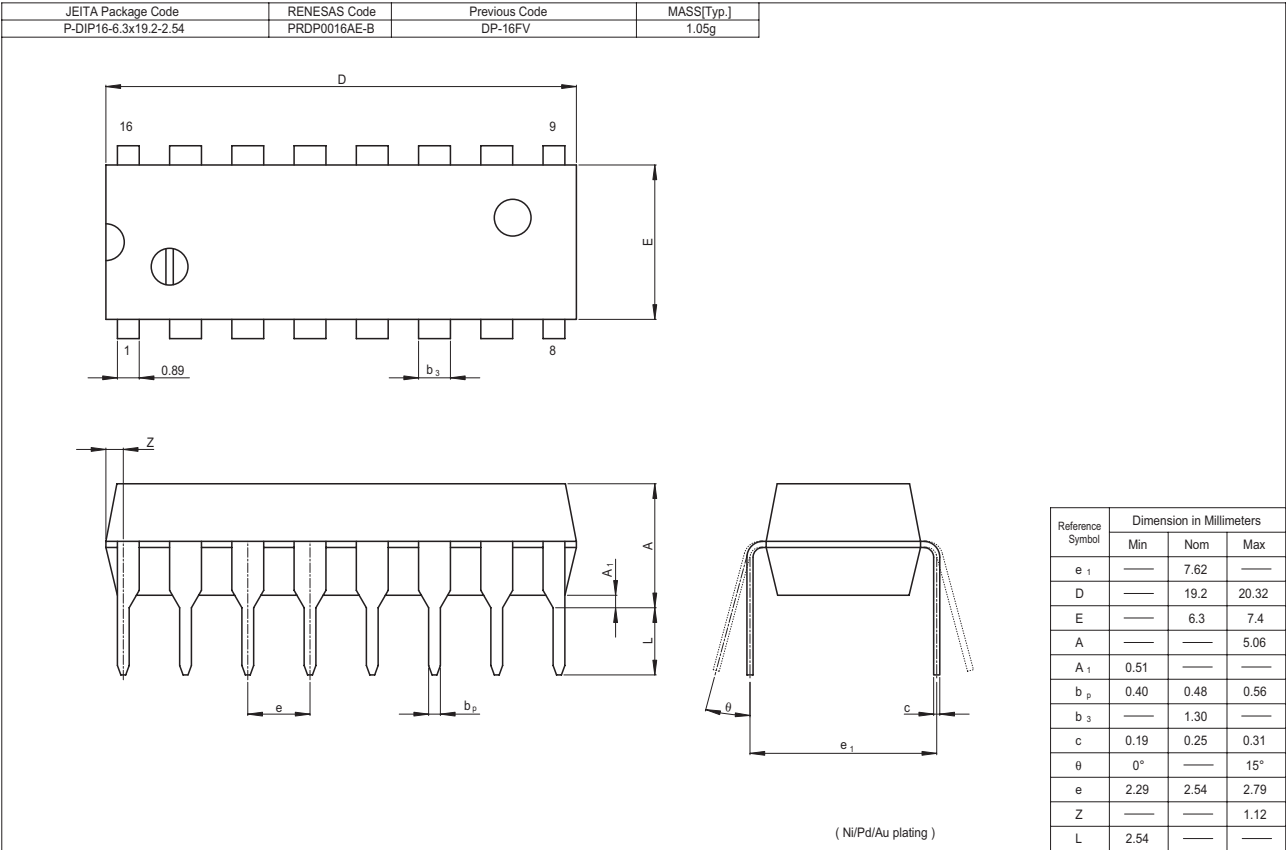
Waveform



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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