Quadruple 2-Input XOR Gates

General Description

This device contains four independent 2-input XOR gates. Each gate performs the Boolean function $Y = A \oplus B$ in positive logic.

Features

- Designed for 2V to 6V V_{CC} Operation
- Over-voltage Tolerant Inputs Accept Voltages to 6V
- ±5.2mA Balanced Output Sink and Source Capability
- Buffered Inputs: CMOS Level
- Supports Fan-Out Up to 10 LSTTL Loads
- Significant Power Reduction Compared to LSTTL Logic ICs
- ESD Protection Complies with JESD22 Standard
  -- HBM: ±2000V Pass (JEDEC JS-001)
  -- CDM: ±1000V Pass (JEDEC JS-002)
- Latch-up Performance Exceeds ±200mA per JEDEC JESD78F
- Part No. and Package Information

Part No.	Package	Packing Option	MSL
ET74HC86M	SOP14 (3.9mm × 8.65mm)	Tape and Reel, 4K/Reel	3
ET74HC86V	TSSOP14 (4.4mm × 5.0mm)	Tape and Reel, 4K/Reel	3

Applications

- Detect Phase Differences In Input Signals
- Create a Select-able Inverter / Buffer

Pin Configuration

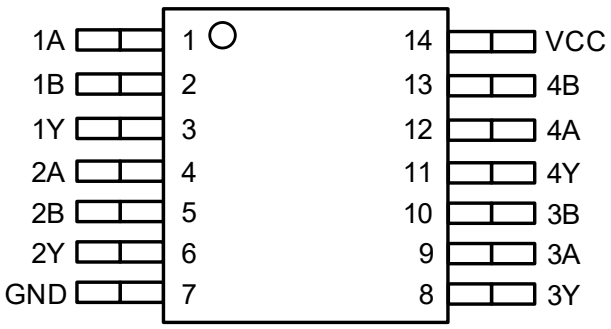


Figure1. Pin Configuration

Pin Functions

Pin		I/O	Description
Name	No.		
1A	1	Input	Channel 1, Input A
1B	2	Input	Channel 1, Input B
1Y	3	Output	Channel 1, Output Y
2A	4	Input	Channel 2, Input A
2B	5	Input	Channel 2, Input B
2Y	6	Output	Channel 2, Output Y
GND	7	—	Ground
3Y	8	Output	Channel 3, Output Y
3A	9	Input	Channel 3, Input A
3B	10	Input	Channel 3, Input B
4Y	11	Output	Channel 4, Output Y
4A	12	Input	Channel 4, Input A
4B	13	Input	Channel 4, Input B
VCC	14	—	Positive Supply

Block Diagram

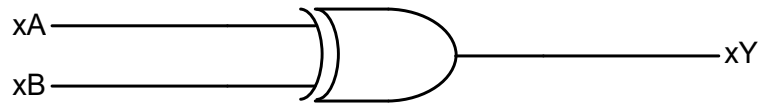


Figure2. Logic Symbol

Functional Table

Input		Output
xA	xB	xY
L	L	L
L	H	H
H	L	H
H	H	L

Absolute Maximum Ratings

Over operating free-air temperature range (unless otherwise noted)

Symbol	Parameter		Value	Unit
V_{CC}	DC Supply Voltage (VCC Pin)		-0.5 to 6.5	V
V_I	DC Input Voltage(1)		-0.5 ≤ V_I ≤ 6.5	V
V_O	DC Output Voltage Output in Higher or Low State		-0.5 to V_{CC} + 0.5	V
I_{IK}	DC Input Diode Current, V_I < GND		-20	mA
I_{OK}	DC Output Diode Current, V_O < GND, V_O > V_{CC}		±20	mA
I_O	DC Output Sink Current		±25	mA
I_{CC}	DC Supply Current Per Supply Pin		50	mA
I_{GND}	DC Ground Current Per Supply Pin		-50	mA
T_{STG}	Storage Temperature Range		-65 to 150	°C
T_L	Lead Temperature, Soldering 10 Seconds		260	°C
T_J	Max Junction Temperature		150	°C
V_{ESD}	ESD Classification	Human Body Model (2)	±2000	V
		Charged Device Model (3)	±1000	
I_{LU}	Max Latch Up Current Above V_{CC} and GND at 125°C (4)		±200	mA

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

Note1: I_O absolute maximum rating must be observed.

Note2: HBM tested per JEDEC JS-001;

Note3: CDM tested per JEDEC JS-002;

Note4: Latch up Current Maximum Rating tested per JEDEC JESD78F.

Thermal Characteristics

Symbol	Ratings	Package		Unit
		SOP14	TSSOP14	
$R_{\theta JA}$	Thermal Characteristics, Thermal Resistance, Junction-to-Air	90	125	°C/W

Recommended Operating Conditions

Over operating free-air temperature range (unless otherwise noted)

Symbol	Parameter		Min	Max	Unit
V_{CC}	Supply Voltage		2	6	V
V_I	Input Voltage		0	V_{CC}	V
V_O	Output Voltage		0	V_{CC}	V
T_A	Operating Free Air Temperature		-40	125	°C
t_t	Input Transition Time	V_{CC} = 2V		1000	ns
		V_{CC} = 4.5V		500	
		V_{CC} = 6V		400	
		V_{CC} = 5.5V		400	

Electrical Characteristics

Over operating free-air temperature range; typical values measured at T_A = 25°C (unless otherwise noted)

Symbol	Parameter	Condition		V_{CC} (V)	T_A = 25°C			-40°C ≤ T_A ≤ 125°C		Unit
					Min	Typ	Max	Min	Max	
V_{IH}	High-Level Input Voltage			2	1.5			1.5		V
				4.5	3.15			3.15		
				6	4.2			4.2		
V_{IL}	Low-Level Input Voltage			2			0.5		0.5	V
				4.5			1.35		1.35	
				6			1.8		1.8	
V_{OH}	High-Level Output Voltage	V_I = V_{IH} or V_{IL}	I_{OH} =-20μA	2	1.9			1.9		V
				4.5	4.4			4.4		
				6	5.9			5.9		
			I_{OH} =-4mA	4.5	3.98			3.7		
			I_{OH} =-5.2mA	6	5.48			5.2		
V_{OL}	Low-Level Output Voltage	V_I = V_{IH} or V_{IL}	I_{OH} =20μA	2			0.1		0.1	V
				4.5			0.1		0.1	
				6			0.1		0.1	
			I_{OH} =4mA	4.5			0.26		0.4	
			I_{OH} =5.2mA	6			0.26		0.4	
I_I	Input Leakage Current	V_I = V_{CC} or 0V		6			±0.1		±1	μA
I_{CC}	Supply Current	V_I = V_{CC} or 0V	I_O = 0mA	6			2		40	μA

Switching Characteristics

t_r = t_f = 3ns;

Over operating free-air temperature range; typical values measured at T_A = 25°C (unless otherwise noted)

Symbol	Parameter	Condition	V_{CC} (V)	T_A = 25°C			-40°C ≤ T_A ≤ 125°C		Unit
				Min	Typ	Max	Min	Max	
t_{PLH} t_{PHL}	Propagation Delay	C_L = 50pF	2		12	25		50	ns
			4.5		4	10		20	
			6		3.5	8		18	
		C_L = 15pF	5		2.5	7		15	

Capacitance Characteristics

Symbol	Parameter	Condition	Typ	Unit
C_{IN}	Input Capacitance	V_{CC} = 5V, V_I = 0V or V_{CC}	5	pF
C_{PD}	Power Dissipation Capacitance (5)	10MHz, V_{CC} = 5V, V_I = 0V or V_{CC}	10	pF

Note5: C_{PD} is used to determine the dynamic power dissipation (P_D in μW).

$P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o)$ where:

f_i = input frequency in MHz;

f_o = output frequency in MHz;

C_L = output load capacitance in pF;

V_{CC} = supply voltage in V;

N = number of inputs switching;

$\Sigma(C_L \times V_{CC}^2 \times f_o)$ = sum of outputs.

AC Test Circuit

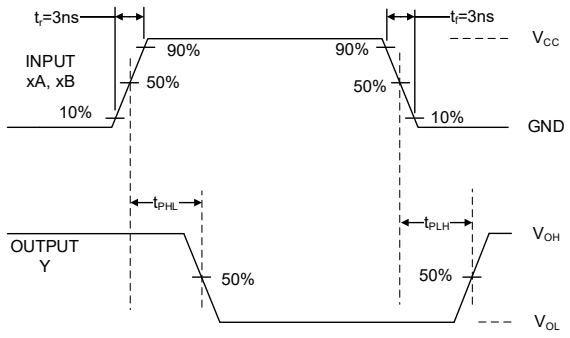


Figure3. Switching Waveform

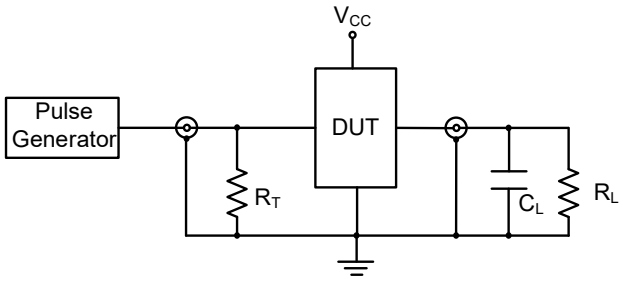
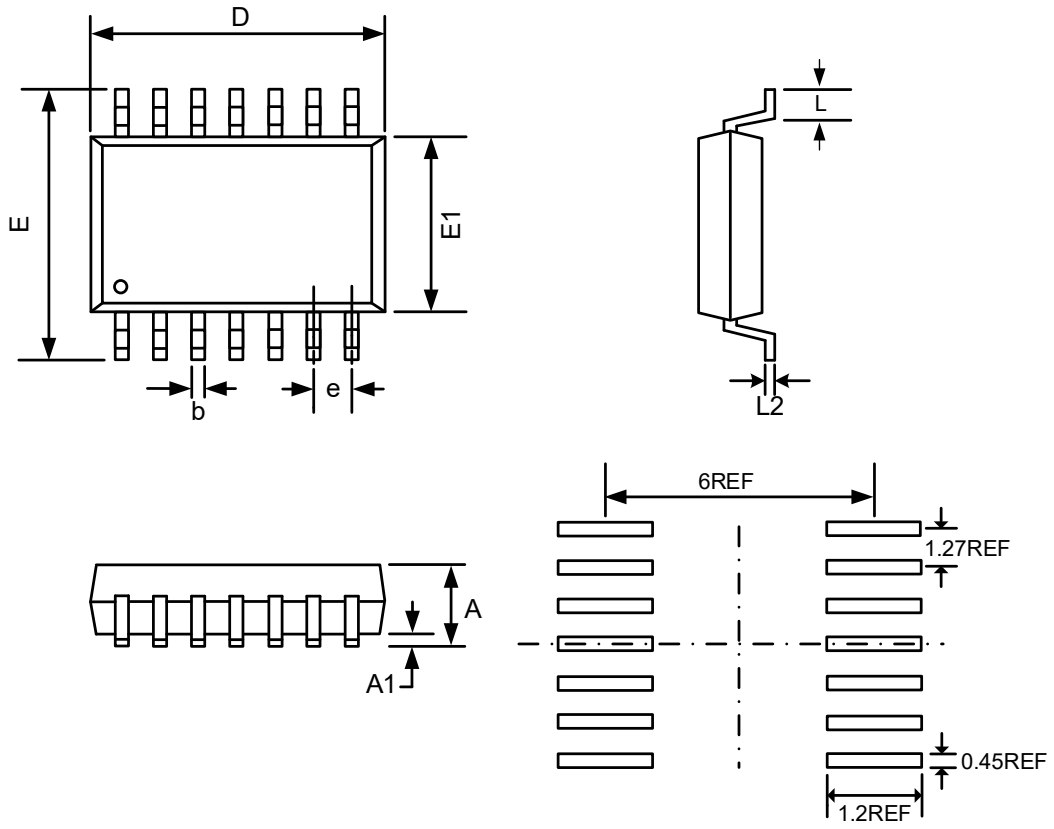


Figure4. Test Circuit

Package Dimension

SOP14 (3.9mm × 8.65mm)

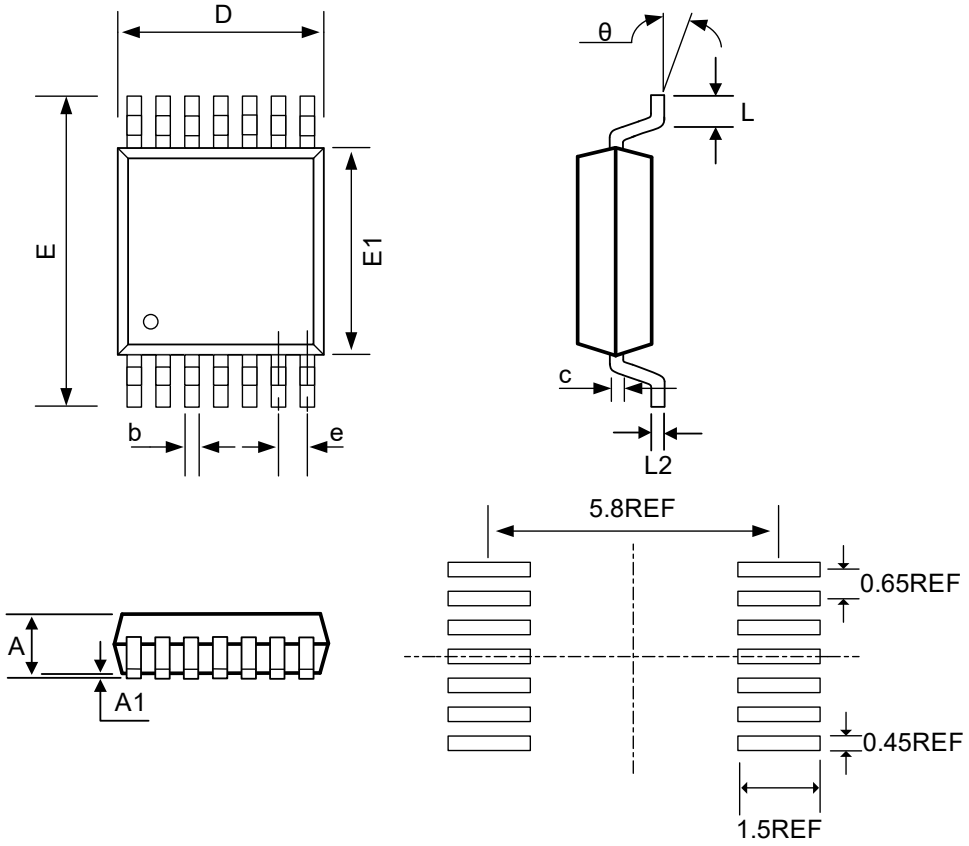


COMMON DIMENSIONS

(Unit: mm)

SYMBOL	MIN	MAX
A	--	1.75
A1	0.10	0.25
b	0.36	0.51
D	8.55	8.75
E	5.80	6.20
E1	3.80	4.00
e	1.22	1.32
L	0.45	0.75
L2	0.25 BSC	

TSSOP14 (4.4mm × 5.0mm)



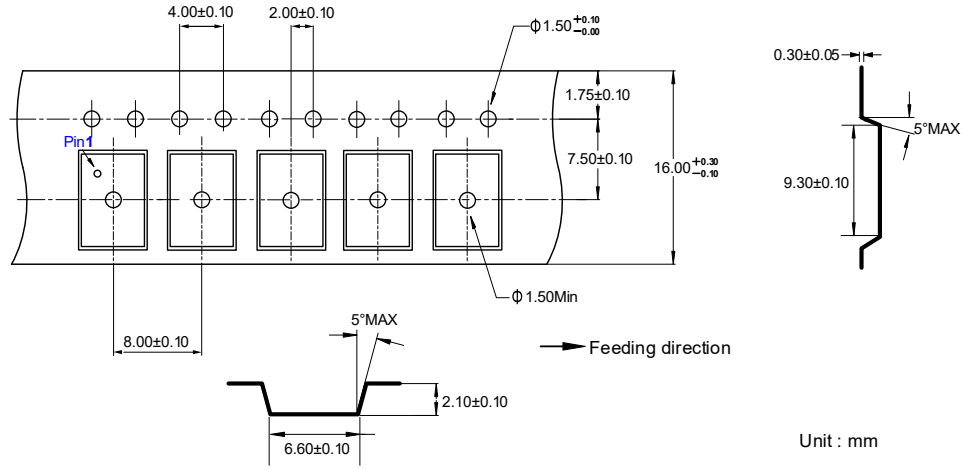
COMMON DIMENSIONS

(Unit: mm)

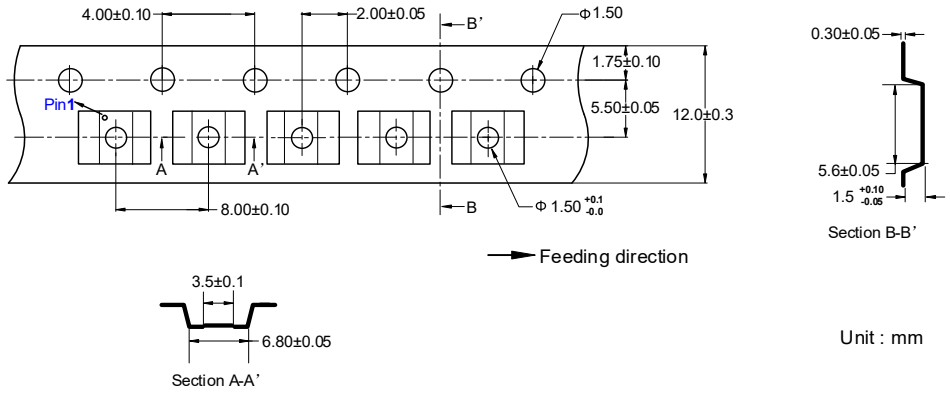
SYMBOL	MIN	MAX
A	--	1.20
A1	0.05	0.15
b	0.19	0.30
c	0.15 REF	
D	4.90	5.10
E	6.20	6.60
E1	4.30	4.50
e	0.65BSC	
L	0.50	0.72
L2	0.25 REF	
θ	0°	8°

Tape Information

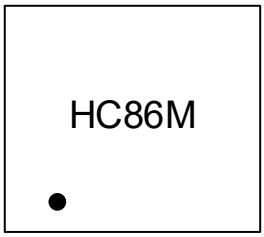
SOP14 (3.9mm × 8.65mm)



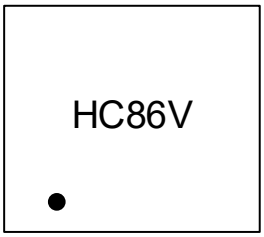
TSSOP14 (4.4mm × 5.0mm)



Marking Information



ET74HC86M
HC86M = Part Number



ET74HC86V
HC86V = Part Number

Revision History and Checking Table

Version	Date	Revision Item	Modifier	Function & Spec Checking	Package & Tape Checking
0.0	2023-08-10	Preliminary Version	Wang anran	Tu guozhu	Liu jiaying
1.0	2024-02-28	Update EC table	Wang anran	Tu guozhu	Liu jiaying
1.1	2026-05-14	Update Format, Tape and Marking	Xu tao	Yang xiaoxu	Liu jiaying