CMOS High Voltage Logic – MM74C14

Hex Schmitt Trigger Inverter in bare die form

Rev 1.0
17/02/2023

Description

The MM74C14 Hex Schmitt Trigger is a monolithic complementary MOS (CMOS) integrated circuit constructed with N-channel and P-channel enhancement transistors. The positive and negative going threshold voltages, V_{T+} and V_{T-}, show low variation with respect to temperature (typ. 0.0005V/°C at V_{CC} = 10V), and hysteresis, $V_{T+} - V_{T-} \geq 0.2$ V_{CC} is guaranteed. All inputs are protected from damage due to static discharge by diode clamps to V_{CC} and GND.

Features:

- Wide supply voltage range: 3V to 15V
- High noise immunity: 0.70 V_{CC} (typ.)
- Low power TTL compatibility:
  - o 0.40 V_{CC} (typ.)
  - o 0.20 V_{CC} (guaranteed)
- Hysteresis:
  - o 0.40 V_{CC} (typ.)
  - o 0.20 V_{CC} (guaranteed).

Ordering Information

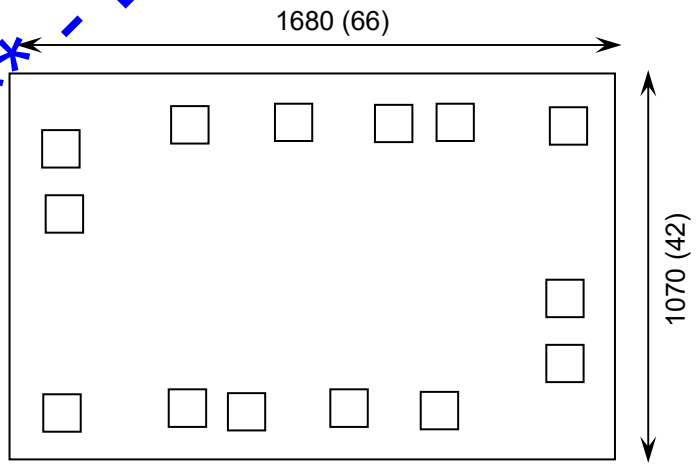
The following part suffixes apply:

- No suffix - MIL-STD-883 /2010B Visual Inspection

For High Reliability versions of this product please see

MM54C14

Die Dimensions in µm (mils)



Supply Formats:

- Default – Die in Waffle Pack (100 per tray capacity)
- Sawn Wafer on Tape – On request
- Unsawn Wafer – On request
- Die Thickness <> 350µm(14 Mils) – On request
- Assembled into Ceramic Package – On request

Mechanical Specification

Die Size (Unsawn)	1680 x 1070 66.14 x 42.13	µm mils
Minimum Bond Pad Size	105 x 105 4.713 x 4.13	µm mils
Die Thickness	350 (±20) 13.78 (±0.79)	µm mils
Top Metal Composition	Al 1%Si 1.1µm	
Back Metal Composition	N/A – Bare Si	

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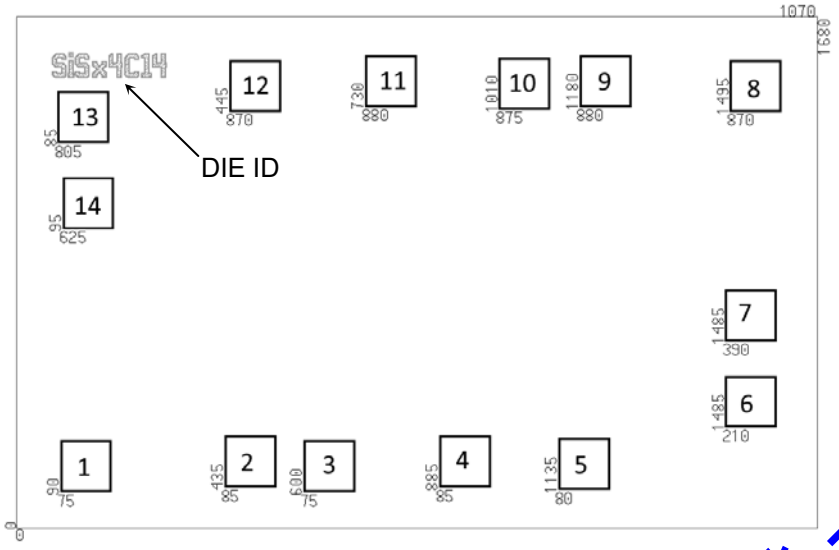
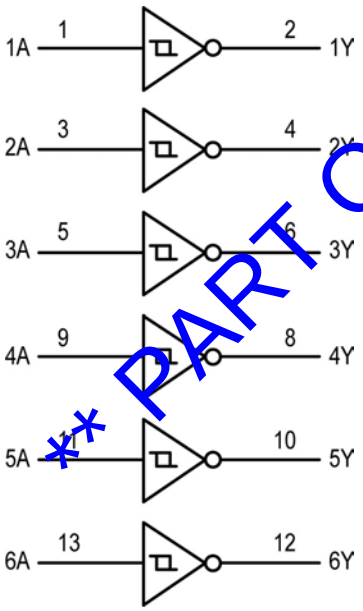
Pad Layout and Functions



PAD	FUNCTION	COORDINATES (µm)	
		X	Y
1	1A	90	75
2	1Y	435	85
3	2A	600	75
4	2Y	885	85
5	3A	1135	80
6	3Y	1485	210
7	GND	1485	390
8	4Y	1495	870
9	4A	1180	880
10	5Y	1010	875
11	5A	730	880
12	6Y	445	870
13	6A	85	805
14	V_{CC}	95	625
CONNECT CHIP BACK TO V_{CC}			

Logic Diagram



Pad 14 = V_{CC}
Pad 7 = GND

Function Table

INPUT A	OUTPUT Y
L	H
H	L

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Absolute Maximum Ratings[1]

PARAMETER	SYMBOL	VALUE	UNIT
Voltage at any input pin	V_{IN}	-0.3 to V_{CC} + 0.3	V
Voltage at any output pin	V_{OUT}	-0.3 to V_{CC} + 0.3	V
Operating V_{CC} range	V_{CC}	3 to 15	V
Absolute maximum V_{CC}	$V_{CC(MAX)}$	18	V
Maximum Power Dissipation[2]	P_D	700	mW
Operating Temperature Range	T_A	-40 to +85	°C
Storage Temperature Range	T_{STG}	-65 to +150	°C

1. Operation above the absolute maximum rating may cause device failure. Operation at the absolute maximum ratings, for extended periods, may reduce device reliability. **2.** Measured in plastic DIP package, results in die form are dependent on die attach and assembly method.

DC Electrical Characteristics T_A = -40 to +85°C unless otherwise stated

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNITS
CMOS TO CMOS						
Positive Going Threshold Voltage	V_{T+}	V_{CC} = 5V	3.0	3.6	4.3	V
		V_{CC} = 10V	6.0	6.8	8.6	V
		V_{CC} = 15V	9.0	10.0	12.9	V
Negative Going Threshold Voltage	V_{T-}	V_{CC} = 5V	0.7	1.4	2.0	V
		V_{CC} = 10V	1.4	3.2	4.0	V
		V_{CC} = 15V	2.1	5.0	6.0	V
Hysteresis	$V_{T+} - V_{T-}$	V_{CC} = 5V	1.0	2.2	3.6	V
		V_{CC} = 10V	2.0	3.6	7.2	V
		V_{CC} = 15V	3.0	5.0	10.8	V
Logical “1” Output Voltage	$V_{OUT(1)}$	V_{CC} = 5V, I_O = -10µA	4.5	-	-	V
		V_{CC} = 10V, I_O = -10µA	9.0	-	-	V
Logical “0” Output Voltage	$V_{OUT(0)}$	V_{CC} = 5V, I_O = 10µA	-	-	0.5	V
		V_{CC} = 10V, I_O = 10µA	-	-	1.0	V
Logical “1” Input Current	$I_{IN(1)}$	V_{CC} = 15V, V_{IN} = 15V	-	0.005	1.0	µA
Logical “0” Input Current	$I_{IN(0)}$	V_{CC} = 15V, V_{IN} = 0V	-1.0	-0.005	-	µA
Supply Current	I_{CC}	V_{CC} =15V,V_{IN}=0V/15V	-	0.05	15	µA
Supply Current[3]	I_{CC}	V_{CC} = 5V, V_{IN} = 2.5V	-	20	-	µA
		V_{CC} = 10V, V_{IN} = 5V	-	200	-	µA
		V_{CC} = 15V, V_{IN} = 7.5V	-	600	-	µA

3. Only one of the six inputs is at ½ V_{CC}; the others are either at V_{CC} or GND.

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DC Electrical Characteristics T_A = -40 to +85°C unless otherwise stated

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNITS
CMOS/LPTTL INTERFACE						
Logical "1" Input Voltage	$V_{IN(1)}$	V_{CC} = 5V	4.3	-		V
Logical "0" Input Voltage	$V_{IN(0)}$	V_{CC} = 5V	-	-	0.7	V
Logical "1" Output Voltage	$V_{OUT(1)}$	V_{CC}= 4.75V, I_O= -360µA	2.4	-	-	V
Logical "0" Output Voltage	$V_{OUT(0)}$	V_{CC} =4.75V, I_O = 360µA	-	-	0.4	V
OUTPUT DRIVE CURRENT T_A = 25°C						
Output Source Current (P-Channel)	I_{SOURCE}	V_{CC} = 5V, V_{OUT} = 0V	-1.75	-3.3	-	mA
		V_{CC} = 10V, V_{OUT} = 0V	-8.0	-15	-	mA
Output Source Current (N-Channel)	I_{SINK}	V_{CC} = 5V, V_{OUT} = V_{CC}	1.75	3.6	-	mA
		V_{CC} = 10V, V_{OUT} = V_{CC}	8.0	16	-	mA
DYNAMIC ELECTRICAL CHARACTERISTICS[4] T_A = 25°C, C_L = 50pF unless otherwise stated						
Propagation Delay from Input to Output	t_{PD0}, t_{PD1}	V_{CC} = 5V	-	220	400	ns
		V_{CC} = 10V	-	80	200	ns
Input Capacitance	C_{IN}	Any Input	-	5.0	-	pF
Power Dissipation Capacitance[5]	C_{PD}	Per Gate	-	20	-	pF

4. Not production tested in die form, characterized by chip design.
5. Used to determine the no-load dynamic power consumption: $P_D = C_{PD} V_{CC}^2 f + I_{CC} V_{CC}$.

Typical Characteristics

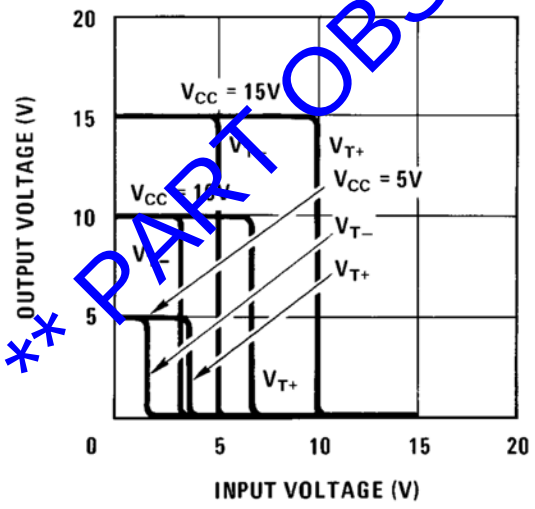

Figure 1 – Transfer Characteristics

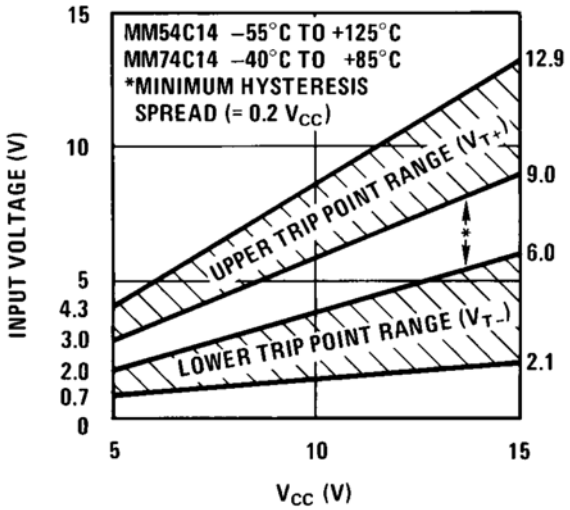

Figure 2 – Guaranteed Trip Point Range

Typical Characteristics continued

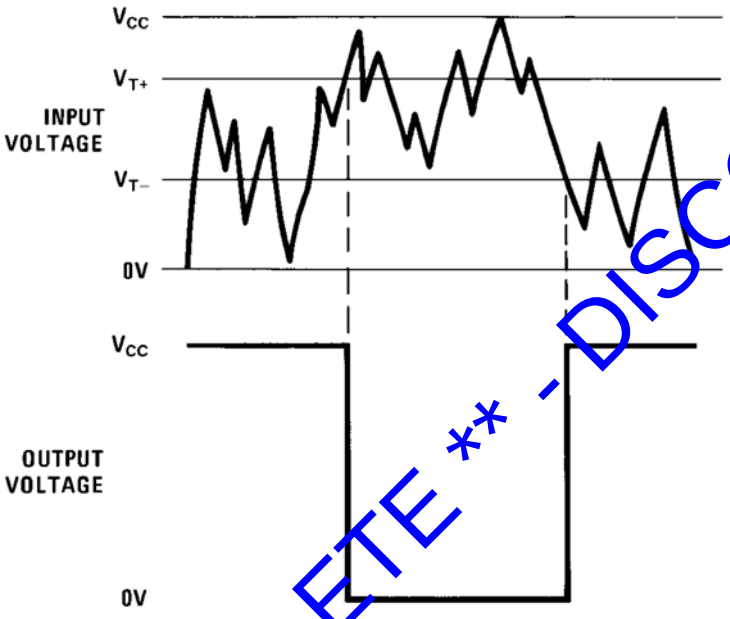

Figure 3 – Waveform