MOTOROLA

MC54F/74F13
MC54F/74F14

Advance Information

SCHMITT TRIGGERS/HEX INVERTERS

DESCRIPTION — The MC54F/74F13 and MC54F/74F14 contain logic gates/inverters which accept standard TTL input signals and provide standard TTL output levels. They are capable of transforming slowly changing input signals into sharply defined, jitter-free output signals. Additionally, they have greater noise margin than conventional inverters.

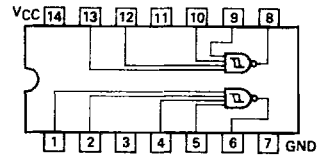
Each circuit contains a Schmitt trigger followed by a Darlington level shifter and a phase splitter driving a TTL totem pole output. The Schmitt trigger uses positive feedback to effectively speed-up slow input transitions, and provide different input threshold voltages for positive and negative-going transitions. This hysteresis between the positive-going and negative-going input thresholds (typically 800 mV) is determined internally by resistor ratios and is essentially insensitive to temperature and supply voltage variations.

SCHMITT TRIGGERS
DUAL 4-INPUT
NAND/HEX INVERTER

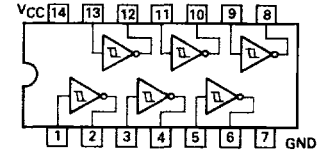
FAST™ SCHOTTKY TTL

LOGIC AND CONNECTION DIAGRAMS

MC54F/74F13



MC54F/74F14



J Suffix — Case 632-08 (Ceramic)
N Suffix — Case 646-06 (Plastic)
D Suffix — Case 751A-02 (SOIC)

GUARANTEED OPERATING RANGES

SYMBOL	PARAMETER		MIN	TYP	MAX	UNIT
V_{CC}	Supply Voltage	54, 74	4.5	5.0	5.5	V
T_A	Operating Ambient Temperature Range	54 74	−55 0	25 25	125 70	°C
I_{OH}	Output Current — High	54, 74			−1.0	mA
I_{OL}	Output Current — Low	54, 74			20	mA

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

SYMBOL	PARAMETER		LIMITS MIN	LIMITS TYP	LIMITS MAX	UNITS	TEST CONDITIONS	
V_{T+}	Positive-Going Threshold Voltage		1.5		2.0	V	V_{CC} = 5.0 V	
V_{T-}	Negative-Going Threshold Voltage		0.7		1.1	V	V_{CC} = 5.0 V	
$V_{T+}-V_{T-}$	Hysteresis		0.4	0.8		V	V_{CC} = 5.0 V	
V_{IH}	Input HIGH Voltage		2.0			V	Guaranteed Input HIGH Voltage	
V_{IL}	Input LOW Voltage				0.8	V	Guaranteed Input LOW Voltage	
V_{IK}	Input Clamp Diode Voltage				−1.2	V	V_{CC} = MIN, I_{IN} = −18 mA	
V_{OH}	Output HIGH Voltage	54, 74	2.5			V	I_{OH} = −1.0 mA	V_{CC} = 4.5
		74	2.7			V	I_{OH} = −1.0 mA	V_{CC} = 4.75
V_{OL}	Output LOW Voltage				0.5	V	I_{OL} = 20 mA	V_{CC} = MIN
I_{T+}	Input Current at Positive-Going Threshold			−0.14		mA	V_{CC} = 5.0 V, V_{IN} = V_{T+}	
I_{T-}	Input Current at Negative-Going Threshold			−0.18		mA	V_{CC} = 5.0 V, V_{IN} = V_{T-}	
I_{IH}	Input HIGH Current				20	μA	V_{CC} = MAX, V_{IN} = 2.7 V	
					0.1	mA	V_{CC} = MAX, V_{IN} = 7.0 V	
I_{IL}	Input LOW Current				−0.6	mA	V_{CC} = MAX, V_{IN} = 0.5 V	
I_{OS}	Output Short Circuit Current (Note 2)		−60		−150	mA	V_{CC} = MAX, V_{OUT} = 0 V	
I_{CCH}	Power Supply Current Total, Output HIGH	F13		4.5	8.5	mA	V_{CC} = MAX	
		F14		13	22			
I_{CCL}	Power Supply Current Total, Output LOW	F13		7.0	10			
		F14		23	32			

1. For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions for the applicable device type.
2. Not more than one output should be shorted at a time, nor for more than 1 second.

This document contains information on a new product. Specifications and information herein are subject to change without notice.

AC CHARACTERISTICS (C_L = 50 pF)

SYMBOL	PARAMETER		54/74F T_A = +25°C V_{CC} = +5.0 V		54F T_A = −55°C to +125°C V_{CC} = 5.0 V ± 10%		74F T_A = 0°C to 70°C V_{CC} = 5.0 V ± 10%		UNITS
			MIN	MAX	MIN	MAX	MIN	MAX	
t_{PLH}	Propagation Delay	F13	3.5	7.0	3.5	9.0	3.5	8.0	ns
t_{PHL}	Propagation Delay	F13	3.0	8.0	3.0	9.5	3.0	8.5	ns
t_{PLH}	Propagation Delay	F14	3.5	7.0	3.5	9.0	3.5	8.0	ns
t_{PHL}	Propagation Delay	F14	3.0	6.5	3.0	8.0	3.0	7.0	ns

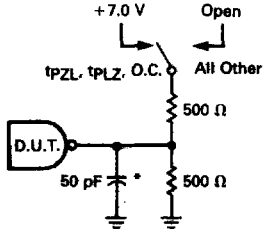
FUNCTION TABLE F13

Inputs				Outputs
A	B	C	D	O
L	X	X	X	H
X	L	X	X	H
X	X	L	X	H
X	X	X	L	H
H	H	H	H	L

H = HIGH Voltage Level
L = LOW Voltage Level
X = Immaterial

FUNCTION TABLE F14

Input	Output
A	O
L	H
H	L



*Includes Jig and Probe Capacitance

WAVEFORM FOR INVERTING FUNCTIONS