

## 74VHC132

### Quad 2-Input NAND Schmitt Trigger

#### General Description

The 74VHC132 is an advanced high speed CMOS 2-input NAND Schmitt Trigger Gate fabricated with silicon gate CMOS technology. It achieves the high-speed operation similar to Bipolar Schottky TTL while maintaining the CMOS low power dissipation. Pin configuration and function are the same as the VHC00 but the inputs have hysteresis between the positive-going and negative-going input thresholds, which are capable of transforming slowly changing input signals into sharply defined, jitter-free output signals, thus providing greater noise margin than conventional gates. An input protection circuit ensures that 0V to 7V can be applied to the input pins without regard to the supply voltage. This device can be used to interface 5V to 3V systems and two

supply systems such as battery backup. This circuit prevents device destruction due to mismatched supply and input voltages.

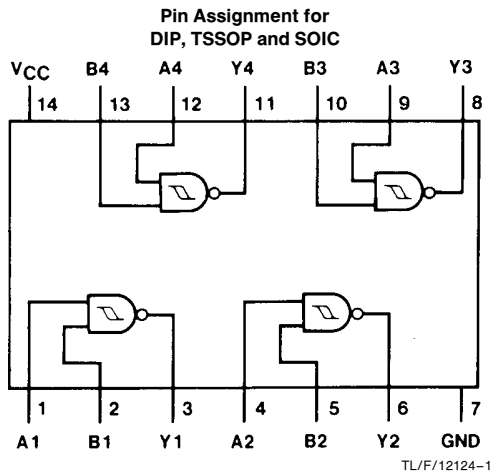
#### Features

- High noise immunity
- Power down protection
- Low power
- Low noise
- Balanced propagation delays
- Pin and function compatible with 74HC132

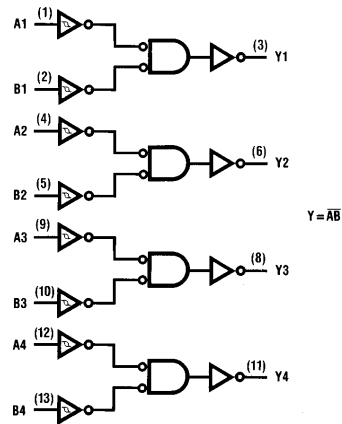
Commercial	Package Number	Package Description
74VHC132M	M14A	14-Lead Molded JEDEC SOIC
74VHC132SJ	M14D	14-Lead Molded EIAJ SOIC
74VHC132MTC	MTC14	14-Lead Molded JEDEC Type 1 TSSOP
74VHC132N	N14A	14-Lead Molded DIP

**Note:** Surface mount packages are also available on Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.

#### Connection Diagram



#### Logic Diagram



## Absolute Maximum Ratings (Note 1)

Supply Voltage ( $V_{CC}$ )	-0.5V to +7.0V
DC Input Voltage ( $V_{IN}$ )	-0.5V to +7.0V
DC Output Voltage ( $V_{OUT}$ )	-0.5V to $V_{CC}$ + 0.5V
Input Diode Current ( $I_{IK}$ )	-20 mA
Output Diode Current ( $I_{OK}$ )	±20 mA
DC Output Current ( $I_{OUT}$ )	±25 mA
DC $V_{CC}$ /GND Current ( $I_{CC}$ )	±50 mA
Storage Temperature ( $T_{STG}$ )	-65°C to +150°C
Lead Temperature ( $T_L$ ) (Soldering, 10 seconds)	260°C

Note 1: *Absolute Maximum Ratings are values beyond which the device may be damaged or have its useful life impaired. The databook specifications should be met, without exception, to ensure that the system design is reliable over its power supply, temperature, and output/input loading variables. National does not recommend operation outside databook specifications.*

## Recommended Operating Conditions

Supply Voltage ( $V_{CC}$ )	2.0V to +5.5V
Input Voltage ( $V_{IN}$ )	0V to +5.5V
Output Voltage ( $V_{OUT}$ )	0V to $V_{CC}$
Operating Temperature ( $T_{OPR}$ )	-40°C to +85°C

## DC Characteristics for 'VHC Family Devices

Symbol	Parameter	$V_{CC}$ (V)	74VHC			74VHC		Units	Conditions
			$T_A = 25^\circ\text{C}$			$T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$			
			Min	Typ	Max	Min	Max		
$V_P$	Positive Threshold Voltage	3.0		2.20		2.20	V		
		4.5		3.15		3.15			
		5.5		3.85		3.85			
$V_N$	Negative Threshold Voltage	3.0	0.90		0.90		V		
		4.5	1.35		1.35				
		5.5	1.65		1.65				
$V_H$	Hysteresis Output Voltage	3.0	0.30	1.20	0.30	1.20	V		
		4.5	0.40	1.40	0.40	1.40			
		5.5	0.50	1.60	0.50	1.60			
$V_{OH}$	High Level Output Voltage	2.0	1.9	2.0	1.9		V	$V_{IN} = V_{IH}$ or $V_{IL}$	$I_{OH} = -50 \mu\text{A}$
		3.0	2.9	3.0	2.9				
		4.5	4.4	4.5	4.4				
		3.0	2.58		2.48				V
4.5	3.94		3.80						
$V_{OL}$	Low Level Output Voltage	2.0		0.0	0.1	0.1	V	$V_{IN} = V_{IH}$ or $V_{IL}$	$I_{OL} = 50 \mu\text{A}$
		3.0		0.0	0.1	0.1			
		4.5		0.0	0.1	0.1			
		3.0		0.36	0.44	0.44			V
4.5		0.36	0.50	0.50					
$I_{IN}$	Input Leakage Current	0-5.5		±0.1		±1.0	μA	$V_{IN} = 5.5\text{V}$ or GND	
$I_{CC}$	Quiescent Supply Current	5.5		2.0		20.0	μA	$V_{IN} = V_{CC}$ or GND	

### DC Characteristics for 'VHC Family Devices:

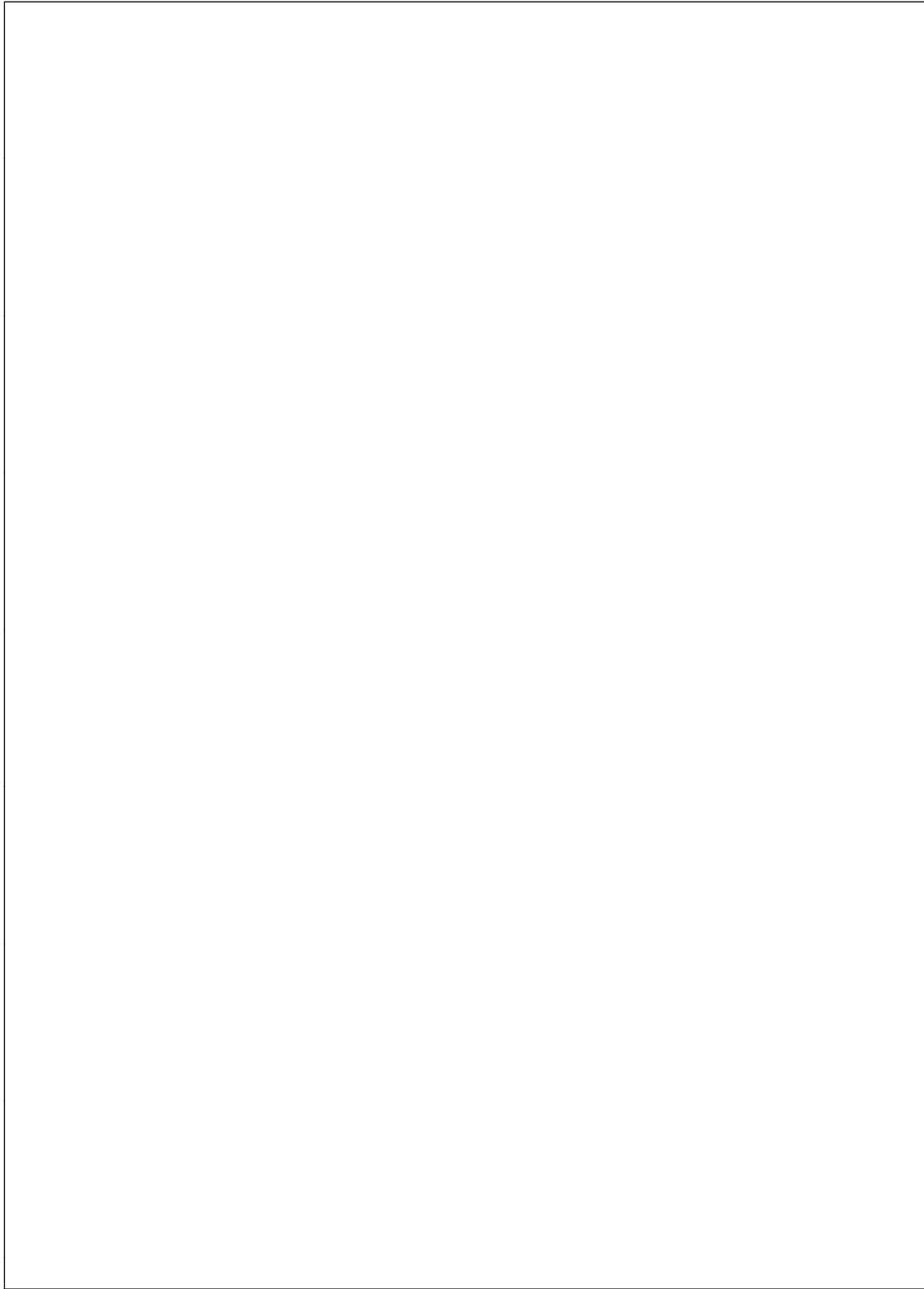
Symbol	Parameter	V <sub>CC</sub> (V)	74VHC		Units	Conditions
			T <sub>A</sub> = 25°C			
			Typ	Limit		
*V <sub>OLP</sub>	Quiet Output Maximum Dynamic V <sub>OL</sub>	5.0	0.3	0.8	V	C <sub>L</sub> = 50 pF
*V <sub>OLV</sub>	Quiet Output Maximum Dynamic V <sub>OL</sub>	5.0	-0.3	-0.8	V	C <sub>L</sub> = 50 pF
*V <sub>IHD</sub>	Maximum High Level Dynamic Input Voltage	5.0		3.5	V	C <sub>L</sub> = 50 pF
*V <sub>ILD</sub>	Maximum Low Level Dynamic Input Voltage	5.0		1.5	V	C <sub>L</sub> = 50 pF

\*Parameter guaranteed by design

### AC Electrical Characteristics for 'VHC Family Devices

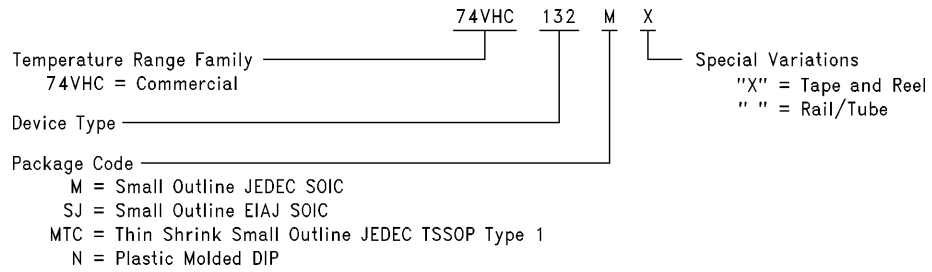
Symbol	Parameter	V <sub>CC</sub> (V)	74VHC			74VHC		Units	Conditions
			T <sub>A</sub> = 25°C			T <sub>A</sub> = -40°C to +85°C			
			Min	Typ	Max	Min	Max		
t <sub>PHL</sub> , t <sub>PHL</sub>	Propagation Delay	3.3 ± 0.3	6.1	11.9	1.0	14.0	ns	C <sub>L</sub> = 15 pF	
			8.0	15.4	1.0	17.5		C <sub>L</sub> = 50 pF	
		5.0 ± 0.5	3.9	7.7	1.0	9.0	ns	C <sub>L</sub> = 15 pF	
			5.9	9.7	1.0	11.0		C <sub>L</sub> = 50 pF	
C <sub>IN</sub>	Input Capacitance		4	10		10	pF	V <sub>CC</sub> = Open	
C <sub>PD</sub>	Power Dissipation Capacitance		16				pF	(Note 1)	

**Note 1:** C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load. Average operating current can be obtained from the equation: I<sub>CC (opr.)</sub> = C<sub>PD</sub> \* V<sub>CC</sub> \* I<sub>IN</sub> + I<sub>CC</sub>/4 (per gate)



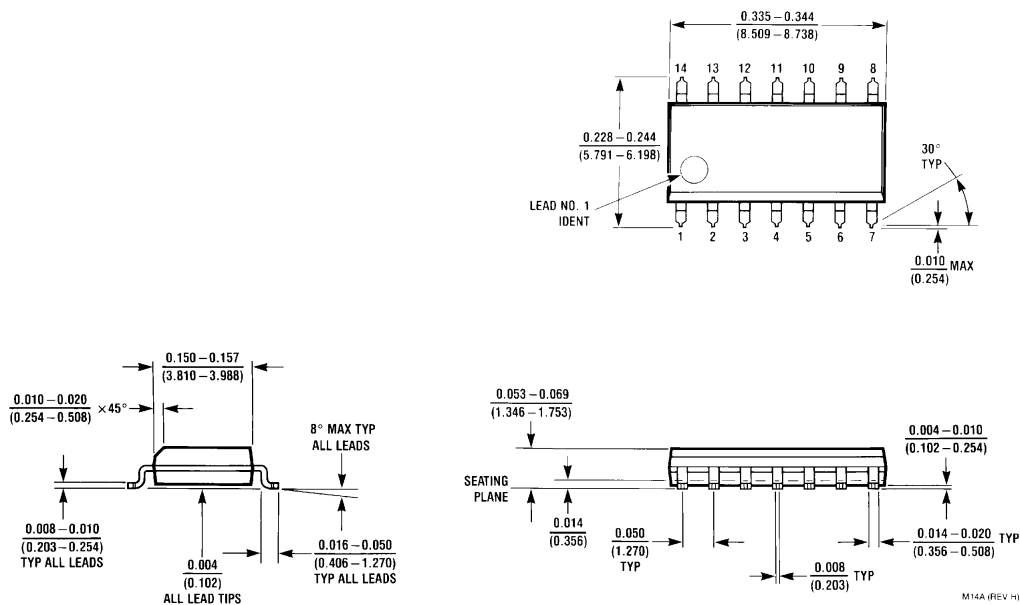
## Ordering Information

The device number is used to form part of a simplified purchasing code, where the package type and temperature range are defined as follows:



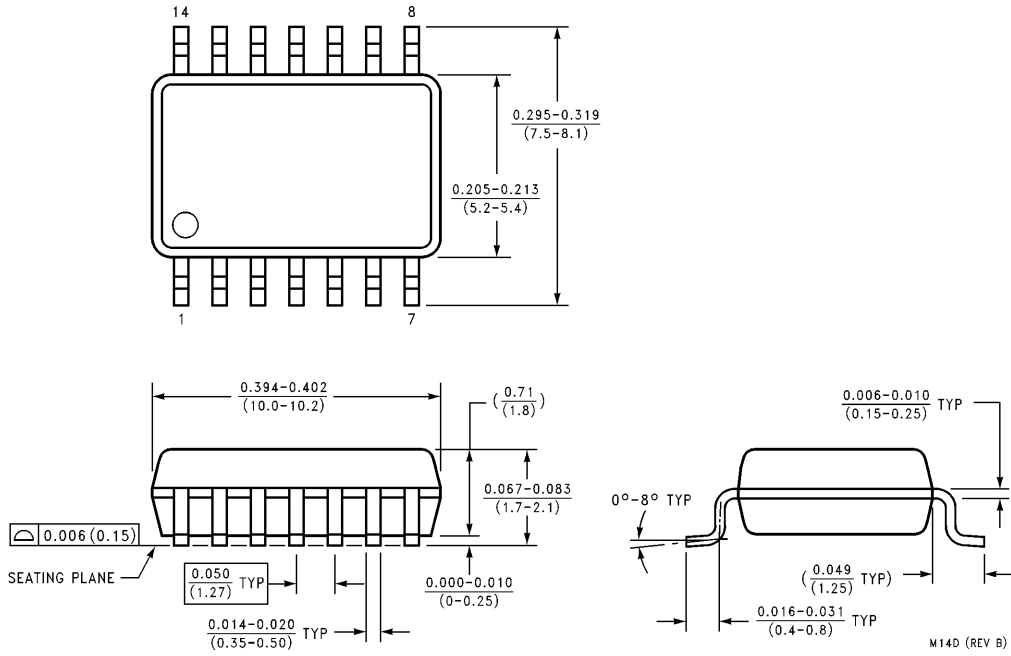
TL/F/12124-3

## Physical Dimensions inches (millimeters)



**14-Lead Molded JEDEC SOIC**  
**Order Number 74VHC132M**  
**NS Package Number M14A**

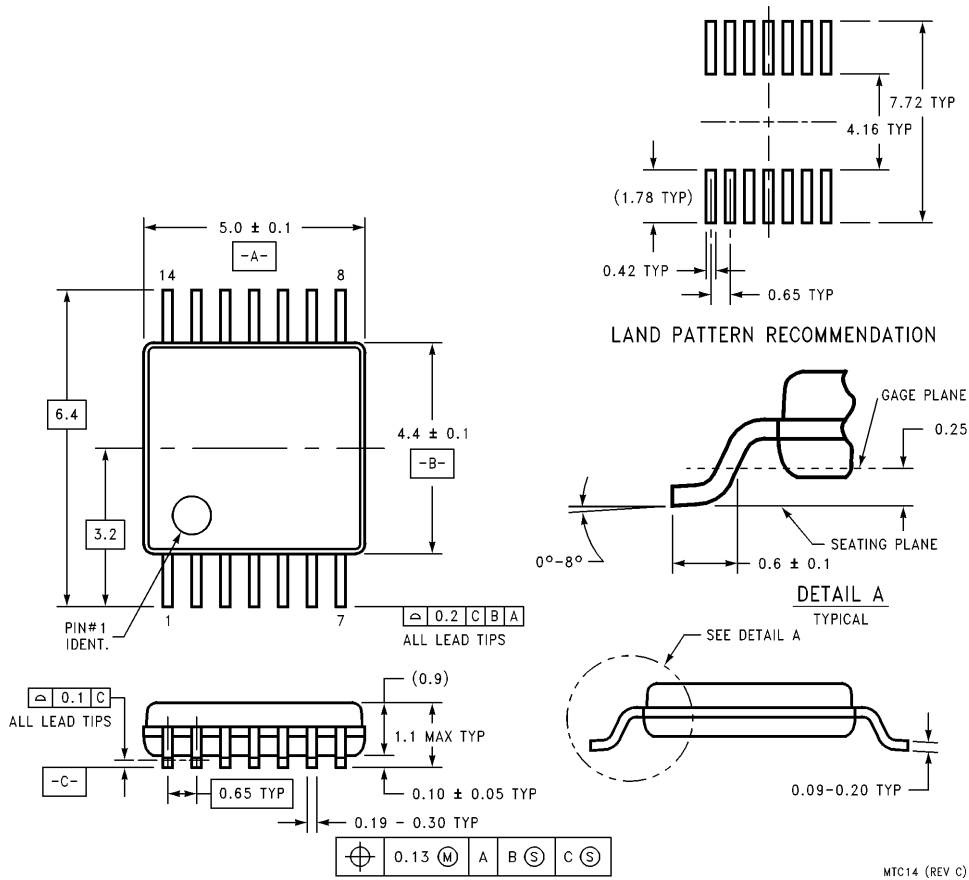
**Physical Dimensions** inches (millimeters) unless otherwise noted (Continued)



**14-Lead Molded EIAJ SOIC**  
**Order Number 74VHC132SJ**  
**NS Package Number M14D**

M14D (REV B)

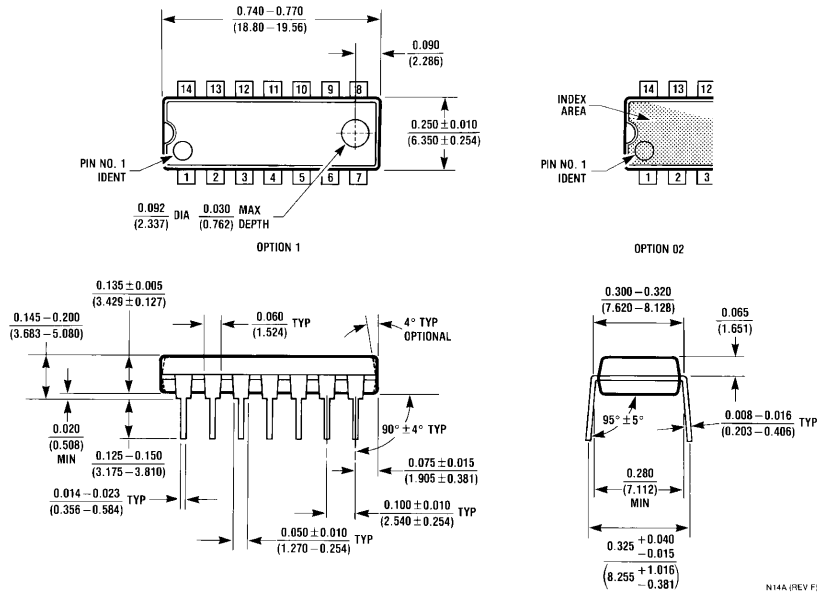
**Physical Dimensions** inches (millimeters) unless otherwise noted (Continued)



**14-Lead Molded JEDEC Type 1 TSSOP**  
**Order Number 74VHC132MTC**  
**NS Package Number MTC14**

MTC14 (REV C)

**Physical Dimensions** inches (millimeters) unless otherwise noted (Continued)



**14-Lead Molded DIP**  
**Order Number 74VHC132N**  
**NS Package Number N14A**

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