Quad 2-input OR gate 74HC32; 74HCT32

FEATURES

- Wide supply voltage range from 2.0 to 6.0 V
- Symmetrical output impedance
- High noise immunity
- Low power dissipation
- Balanced propagation delays
- ESD protection:
  HBM EIA/JESD22-A114-A exceeds 2000 V
  MM EIA/JESD22-A115-A exceeds 200 V.

GENERAL DESCRIPTION

The 74HC/HCT32 is a high-speed Si-gate CMOS device and is pin compatible with low power Schottky TTL (LSTTL). They are specified in compliance with JEDEC standard no. 7A.

The 74HC/HCT32 provides the 2-input OR function.

QUICK REFERENCE DATA

GND = 0 V; T_{amb} = 25 °C; $t_r = t_f$ = 6 ns.

SYMBOL	PARAMETER	CONDITIONS	TYPICAL		UNIT
			HC	HCT	
t_{PHL}/t_{PLH}	propagation delay nA, nB to nY	C_L = 15 pF; V_{CC} = 5 V	6	9	ns
C_I	input capacitance		3.5	3.5	pF
C_{PD}	power dissipation capacitance per gate	notes 1 and 2	16	28	pF

Notes

1. 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 Volts;
   N = total load switching outputs;
   $\Sigma(C_L \times V_{CC}^2 \times f_o)$ = sum of the outputs.
2. For 74HC32 the condition is V_I = GND to V_{CC}.
   For 74HCT32 the condition is V_I = GND to V_{CC} – 1.5 V.

FUNCTION TABLE

See note 1.

INPUT		OUTPUT
nA	nB	nY
L	L	L
L	H	H
H	L	H
H	H	H

Note

1. H = HIGH voltage level;
   L = LOW voltage level.

ORDERING INFORMATION

TYPE NUMBER	PACKAGE				
	TEMPERATURE RANGE	PINS	PACKAGE	MATERIAL	CODE
74HC32N	–40 to +125 °C	14	DIP14	plastic	SOT27-1
74HCT32N	–40 to +125 °C	14	DIP14	plastic	SOT27-1
74HC32D	–40 to +125 °C	14	SO14	plastic	SOT108-1
74HCT32D	–40 to +125 °C	14	SO14	plastic	SOT108-1
74HC32DB	–40 to +125 °C	14	SSOP14	plastic	SOT337-1
74HCT32DB	–40 to +125 °C	14	SSOP14	plastic	SOT337-1
74HC32PW	–40 to +125 °C	14	TSSOP14	plastic	SOT402-1
74HCT32PW	–40 to +125 °C	14	TSSOP14	plastic	SOT402-1
74HC32BQ	–40 to +125 °C	14	DHVQFN14	plastic	SOT762-1
74HCT32BQ	–40 to +125 °C	14	DHVQFN14	plastic	SOT762-1

PINNING

PIN	SYMBOL	DESCRIPTION
1	1A	data input
2	1B	data input
3	1Y	data output
4	2A	data input
5	2B	data input
6	2Y	data output
7	GND	ground (0 V)
8	3Y	data output
9	3A	data input
10	3B	data input
11	4Y	data output
12	4A	data input
13	4B	data input
14	V_{CC}	supply voltage

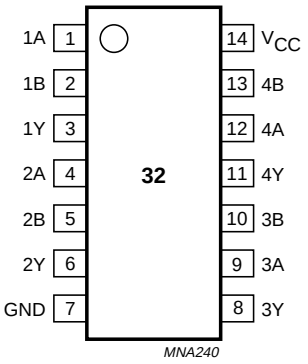


Fig.1 Pin configuration DIP14, SO14 and (T)SSOP14.

RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER	CONDITIONS	74HC32			74HCT32			UNIT
			MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
V_{CC}	supply voltage		2.0	5.0	6.0	4.5	5.0	5.5	V
V_I	input voltage		0	–	V_{CC}	0	–	V_{CC}	V
V_O	output voltage		0	–	V_{CC}	0	–	V_{CC}	V
T_{amb}	operating ambient temperature		–40	+25	+125	–40	+25	+125	°C
t_r, t_f	input rise and fall times	V_{CC} = 2.0 V	–	–	1000	–	–	–	ns
		V_{CC} = 4.5 V	–	6.0	500	–	6.0	500	ns
		V_{CC} = 6.0 V	–	–	400	–	–	–	ns

LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 60134); voltages are referenced to GND (ground = 0 V).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CC}	supply voltage		–0.5	+7.0	V
I_{IK}	input diode current	$V_I < -0.5$ V or $V_I > V_{CC} + 0.5$ V; note 1	–	±20	mA
I_{OK}	output diode current	$V_O < -0.5$ V or $V_O > V_{CC} + 0.5$ V; note 1	–	±20	mA
I_O	output source or sink current	$-0.5 \text{ V} < V_O < V_{CC} + 0.5$ V; note 1	–	±25	mA
I_{CC}; I_{GND}	V_{CC} or GND current	note 1	–	±50	mA
T_{stg}	storage temperature		–65	+150	°C
P_{tot}	power dissipation	T_{amb} = –40 to +125 °C; note 2	–	300	mW

Notes

1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.
2. For DIP14 packages: above 70 °C the value of P_{tot} derates linearly with 12 mW/K.
   For SO14 packages: above 70 °C the value of P_{tot} derates linearly with 8 mW/K.
   For SSOP14 and TSSOP14 packages: above 60 °C the value of P_{tot} derates linearly with 5.5 mW/K.
   For DHVQFN14 packages: above 60 °C the value of P_{tot} derates linearly with 4.5 mW/K.

Family 74HCT

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

SYMBOL	PARAMETER	CONDITIONS		MIN.	TYP.	MAX.	UNIT
		OTHER	V_{CC} (V)				
T_{amb} = 25 °C; note 1							
V_{IH}	HIGH-level input voltage		4.5 to 5.5	2.0	1.6	–	V
V_{IL}	LOW-level input voltage		4.5 to 5.5	–	1.2	0.8	V
V_{OH}	HIGH-level output voltage	V_I = V_{IH} or V_{IL}					
		I_O = –20 µA	4.5	4.4	4.5	–	V
		I_O = –4 mA	4.5	3.98	4.32	–	V
V_{OL}	LOW-level output voltage	V_I = V_{IH} or V_{IL}					
		I_O = 20 µA	4.5	–	0	0.1	V
		I_O = 4 mA	4.5	–	0.15	0.25	V
I_{LI}	input leakage current	V_I = V_{CC} or GND	5.5	–	–	±0.1	µA
I_{CC}	quiescent supply current	V_I = V_{CC} or GND; I_O = 0	5.5	–	–	2.0	µA
ΔI_{CC}	additional quiescent supply current per input	V_I = V_{CC} – 2.1 V; I_O = 0	4.5 to 5.5	–	–	430	µA
T_{amb} = –40 to +85 °C							
V_{IH}	HIGH-level input voltage		4.5 to 5.5	2.0	–	–	V
V_{IL}	LOW-level input voltage		4.5 to 5.5	–	–	0.8	V
V_{OH}	HIGH-level output voltage	V_I = V_{IH} or V_{IL}					
		I_O = –20 µA	4.5	4.4	–	–	V
		I_O = –4 mA	4.5	3.84	–	–	V
V_{OL}	LOW-level output voltage	V_I = V_{IH} or V_{IL}					
		I_O = 20 µA	4.5	–	–	0.1	V
		I_O = 4 mA	4.5	–	–	0.33	V
I_{LI}	input leakage current	V_I = V_{CC} or GND	5.5	–	–	±1.0	µA
I_{CC}	quiescent supply current	V_I = V_{CC} or GND; I_O = 0	5.5	–	–	20	µA
ΔI_{CC}	additional quiescent supply current per input	V_I = V_{CC} – 2.1 V; I_O = 0	4.5 to 5.5	–	–	540	µA

SYMBOL	PARAMETER	CONDITIONS		MIN.	TYP.	MAX.	UNIT
		OTHER	V_{CC} (V)				
T_{amb} = −40 to +125 °C							
V_{IH}	HIGH-level input voltage		4.5 to 5.5	2.0	–	–	V
V_{IL}	LOW-level input voltage		4.5 to 5.5	–	–	0.8	V
V_{OH}	HIGH-level output voltage	V_I = V_{IH} or V_{IL}					
		I_O = –20 μA	4.5	4.4	–	–	V
		I_O = –4 mA	4.5	3.7	–	–	V
V_{OL}	LOW-level output voltage	V_I = V_{IH} or V_{IL}					
		I_O = 20 μA	4.5	–	–	0.1	V
		I_O = 4 mA	4.5	–	–	0.4	V
I_{LI}	input leakage current	V_I = V_{CC} or GND	5.5	–	–	±1.0	μA
I_{CC}	quiescent supply current	V_I = V_{CC} or GND; I_O = 0	5.5	–	–	40	μA
ΔI_{CC}	additional quiescent supply current per input	V_I = V_{CC} − 2.1 V; I_O = 0	4.5 to 5.5	–	–	590	μA

Note

1. All typical values are measured at T_{amb} = 25 °C.

Family 74HCT

GND = 0 V; $t_r = t_f$ = 6 ns; C_L = 50 pF.

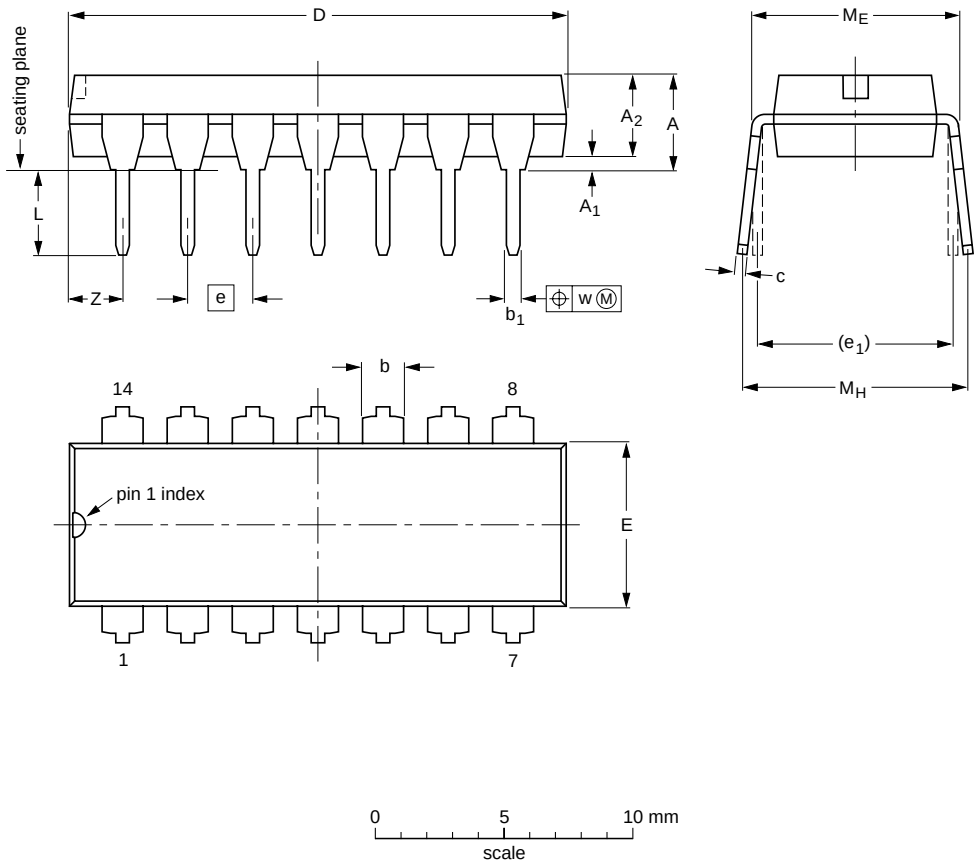
SYMBOL	PARAMETER	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
		WAVEFORMS	V_{CC} (V)				
T_{amb} = 25 °C; note 1							
t_{PHL}/t_{PLH}	propagation delay nA, nB to nY	see Figs 6 and 7	4.5	–	11	24	ns
t_{THL}/t_{TLH}	output transition time	see Figs 6 and 7	4.5	–	7	15	ns
T_{amb} = −40 to +85 °C							
t_{PHL}/t_{PLH}	propagation delay nA, nB to nY	see Figs 6 and 7	4.5	–	–	30	ns
t_{THL}/t_{TLH}	output transition time	see Figs 6 and 7	4.5	–	–	19	ns
T_{amb} = −40 to +125 °C							
t_{PHL}/t_{PLH}	propagation delay nA, nB to nY	see Figs 6 and 7	4.5	–	–	36	ns
t_{THL}/t_{TLH}	output transition time	see Figs 6 and 7	4.5	–	–	22	ns

Note

1. All typical values are measured at T_{amb} = 25 °C.

PACKAGE OUTLINES

DIP14: plastic dual in-line package; 14 leads (300 mil) **SOT27-1**



DIMENSIONS (inch dimensions are derived from the original mm dimensions)

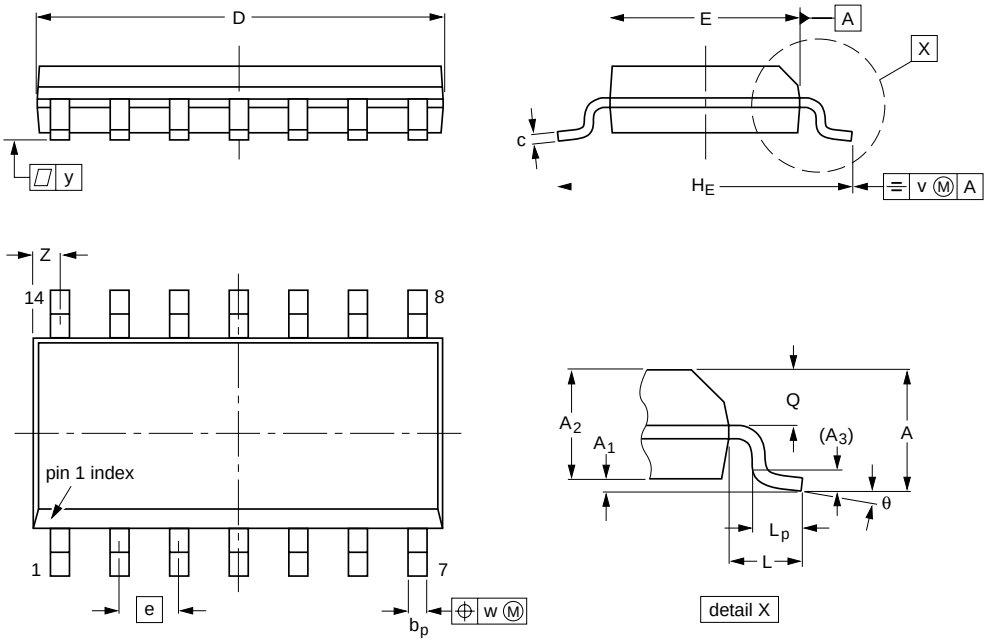
UNIT	A max.	A_1 min.	A_2 max.	b	b_1	c	D (1)	E (1)	e	e_1	L	M_E	M_H	w	Z (1) max.
mm	4.2	0.51	3.2	1.73 1.13	0.53 0.38	0.36 0.23	19.50 18.55	6.48 6.20	2.54	7.62	3.60 3.05	8.25 7.80	10.0 8.3	0.254	2.2
inches	0.17	0.02	0.13	0.068 0.044	0.021 0.015	0.014 0.009	0.77 0.73	0.26 0.24	0.1	0.3	0.14 0.12	0.32 0.31	0.39 0.33	0.01	0.087

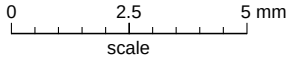
Note

1. Plastic or metal protrusions of 0.25 mm (0.01 inch) maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	
	IEC	JEDEC	JEITA			
SOT27-1	050G04	MO-001	SC-501-14			

SO14: plastic small outline package; 14 leads; body width 3.9 mm **SOT108-1**





DIMENSIONS (inch dimensions are derived from the original mm dimensions)

UNIT	A max.	A_1	A_2	A_3	b_p	c	$D^{(1)}$	$E^{(1)}$	e	H_E	L	L_p	Q	v	w	y	$Z^{(1)}$	θ
mm	1.75	0.25 0.10	1.45 1.25	0.25	0.49 0.36	0.25 0.19	8.75 8.55	4.0 3.8	1.27	6.2 5.8	1.05	1.0 0.4	0.7 0.6	0.25	0.25	0.1	0.7 0.3	8^o 0^o
inches	0.069	0.010 0.004	0.057 0.049	0.01	0.019 0.014	0.0100 0.0075	0.35 0.34	0.16 0.15	0.05	0.244 0.228	0.041	0.039 0.016	0.028 0.024	0.01	0.01	0.004	0.028 0.012	

Note

1. Plastic or metal protrusions of 0.15 mm (0.006 inch) maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	
	IEC	JEDEC	JEITA			
SOT108-1	076E06	MS-012				