

Octal 3-STATE Buffer

MM74HC244

General Description

The MM74HC244 is a non-inverting buffer and has two active low enables ($1\overline{G}$ and $2\overline{G}$); each enable independently controls 4 buffers. This device does not have Schmitt trigger inputs.

These 3-STATE buffers utilize advanced silicon-gate CMOS technology and are general purpose high speed non-inverting buffers. They possess high drive current outputs which enable high speed operation even when driving large bus capacitances. These circuits achieve speeds comparable to low power Schottky devices, while retaining the advantage of CMOS circuitry, i.e., high noise immunity, and low power consumption. All three devices have a fanout of 15 LS-TTL equivalent inputs.

All inputs are protected from damage due to static discharge by diodes to V_{CC} and ground.

Features

- Typical Propagation Delay: 14 ns
- 3-STATE Outputs for Connection to System Buses
- Wide Power Supply Range: 2–6 V
- Low Quiescent Supply Current: 160 μ A
- Output Current: 6 mA
- These are Pb-Free Devices

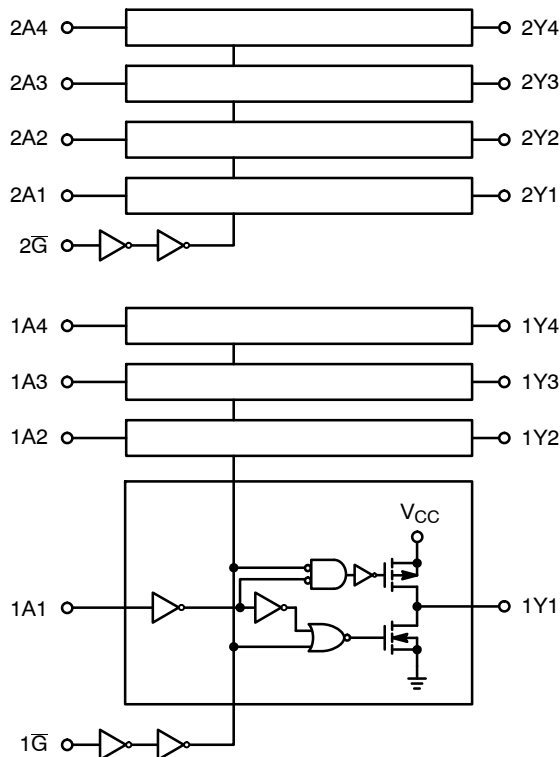
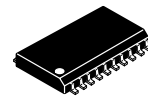


Figure 1. Logic Diagram



SOIC-20
CASE 751BJ

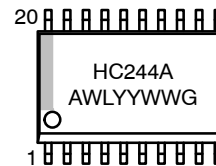


TSSOP-20
CASE 948AQ

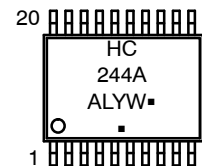


TSSOP-20 WB
CASE 948E

MARKING DIAGRAMS



(SOIC-20)



(TSSOP-20,
TSSOP-20WB)

HC240A = Specific Device Code

A = Assembly Location

L/WL = Wafer Lot

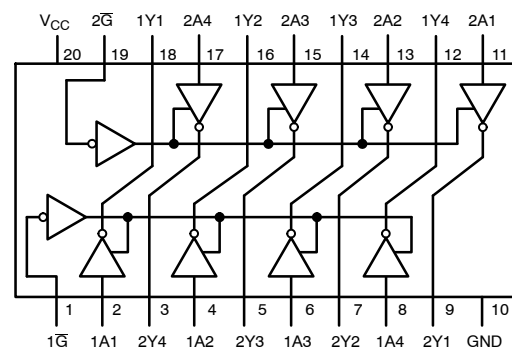
Y/Y = Year

W/WW = Work Week

▪ or G = Pb-Free Package

(Note: Microdot may be in either location)

CONNECTION DIAGRAM



(Top View)

TRUTH TABLE

$1\overline{G}$	1A	1Y	$2\overline{G}$	2A	2Y
L	L	L	L	L	L
L	H	H	L	H	H
H	L	Z	H	L	Z
H	H	Z	H	H	Z

H = HIGH Level

L = LOW Level

Z = HIGH Impedance

ORDERING INFORMATION

See detailed ordering, marking and shipping information on page 4 of this data sheet.

MM74HC244

MAXIMUM RATINGS (Note 1)

Symbol	Parameter	Value	Unit
V _{CC}	Supply Voltage	–0.5 to +6.5	V
V _{IN}	DC Input Voltage	–0.5 to V _{CC} + 0.5	V
V _{OUT}	DC Output Voltage	–0.5 to V _{CC} + 0.5	V
I _{IK} , I _{OK}	Clamp Diode Current	±20	mA
I _{OUT}	DC Output Current, per Pin	±35	mA
I _{CC}	DC VCC or GND Current, per Pin	±70	mA
T _{STG}	Storage Temperature Range	–65 to +150	°C
P _D	Power Dissipation SOIC–20W TSSOP–20	1302 833	mW
T _L	Lead Temperature (Soldering 10 seconds)	260	°C

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.

1. Unless otherwise specified all voltages are referenced to ground.

RECOMMENDED OPERATING CONDITIONS (Note 1)

Symbol	Parameter	Min	Max	Unit
V _{CC}	Supply Voltage	2	6	V
V _{IN} , V _{OUT}	DC Input or Output Voltage	0	V _{CC}	V
T _A	Operating Temperature Range	–55	+125	°C
t _r , t _f	Input Rise or Fall Times V _{CC} = 2.0 V V _{CC} = 4.5 V V _{CC} = 6.0 V	– – –	1000 500 400	ns

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

DC ELECTRICAL CHARACTERISTICS (Note 2)

Symbol	Parameter	Conditions	V _{CC} (V)	T _A = 25°C		–40°C ≤ T _A ≤ 85°C		–55°C ≤ T _A ≤ 125°C		Unit
				Typ	Guaranteed Limits					
V _{IH}	Minimum HIGH Level Input Voltage		2.0	–	1.5	1.5	1.5	V		
			4.5	–	3.15	3.15	3.15			
			6.0	–	4.2	4.2	4.2			
V _{IL}	Maximum LOW Level Input Voltage		2.0	–	0.5	0.5	0.5	V		
			4.5	–	1.35	1.35	1.35			
			6.0	–	1.8	1.8	1.8			
V _{OH}	Minimum HIGH Level Output Voltage	V _{IN} = V _{IH} or V _{IL} I _{OUT} ≤ 20 μA	2.0	2.0	1.9	1.9	1.9	V		
			4.5	4.5	4.4	4.4	4.4			
		6.0	6.0	5.9	5.9	5.9				
			V _{IN} = V _{IH} or V _{IL} I _{OUT} ≤ 6.0 mA I _{OUT} ≤ 7.8 mA	4.5	4.2	3.98	3.84	3.7	V	
		6.0	5.7	5.4	5.34	5.2				
V _{OL}	Maximum LOW Level Output Voltage	V _{IN} = V _{IH} or V _{IL} I _{OUT} ≤ 20 μA	2.0	0	0.1	0.1	0.1	V		
			4.5	0	0.1	0.1	0.1			
		6.0	0	0.1	0.1	0.1				
			V _{IN} = V _{IH} or V _{IL} I _{OUT} ≤ 6.0 mA I _{OUT} ≤ 7.8 mA	4.5	0.2	0.26	0.33	0.4	V	
		6.0	0.2	0.26	0.33	0.4				
I _{IN}	Maximum Input Current	V _{IN} = V _{CC} or GND	6.0	–	±0.1	±1.0	±1.0	μA		

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DC ELECTRICAL CHARACTERISTICS (Note 2) (continued)

Symbol	Parameter	Conditions	V _{CC} (V)	T _A = 25°C		-40°C ≤ T _A ≤ 85°C		-55°C ≤ T _A ≤ 125°C		Unit
				Typ	Guaranteed Limits					
I _{OZ}	Maximum 3-STATE Output Leakage Current	V _{IN} = V _{IH} or V _{IL} V _{OUT} = V _{CC} or GND G = V _{IH}	6.0	–	±0.5	±5		±10		μA
I _{CC}	Maximum Quiescent Supply Current	V _{IN} = V _{CC} or GND I _{OUT} = 0 μA	6.0	–	8.0	80		160		μA

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

2. For a power supply of 5 V ±10% the worst case output voltages (V_{OH}, and V_{OL}) occur for HC at 4.5 V. Thus the 4.5 V values should be used when designing with this supply. Worst case V_{IH} and V_{IL} occur at V_{CC} = 5.5 V and 4.5 V respectively. (The V_{IH} value at 5.5 V is 3.85 V.) The worst case leakage current (I_{IN}, I_{CC}, and I_{OZ}) occur for CMOS at the higher voltage and so the 6.0 V values should be used.

AC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Conditions	Typ	Guaranteed Limit	Unit
t _{PHL} , t _{PLH}	Maximum Propagation Delay	C _L = 45 pF	14	20	ns
t _{PZH} , t _{PZL}	Maximum Enable Delay to Active Output	R _L = 1 kΩ, C _L = 45 pF	17	28	ns
t _{PHZ} , t _{PLZ}	Maximum Disable Delay from Active Output	R _L = 1 kΩ, C _L = 5 pF	15	25	ns

AC ELECTRICAL CHARACTERISTICS (V_{CC} = 2.0 V to 6.0 V, C_L = 50 pF, t_r = t_f = 6 ns (unless otherwise specified))

Symbol	Parameter	Conditions	V _{CC} (V)	T _A = 25°C		–40°C ≤ T _A ≤ 85°C		–55°C ≤ T _A ≤ 125°C		Unit
				Typ	Guaranteed Limits					
t _{PHL} , t _{PLH}	Maximum Propagation Delay	C _L = 50 pF	2.0	58	115	145	171	ns		
		C _L = 150 pF	2.0	83	165	208	246			
		C _L = 50 pF	4.5	14	23	29	34	ns		
		C _L = 150 pF	4.5	17	33	42	49			
		C _L = 50 pF	6.0	10	20	25	29	ns		
		C _L = 150 pF	6.0	14	28	35	42			
t _{PZH} , t _{PZL}	Maximum Output Enable Time	R _L = 1 kΩ						ns		
		C _L = 50 pF	2.0	75	150	189	224			
		C _L = 150 pF	2.0	100	200	252	298	ns		
		C _L = 50 pF	4.5	15	30	38	45			
		C _L = 150 pF	4.5	30	40	50	60	ns		
		C _L = 50 pF	6.0	13	26	32	38			
t _{PHZ} , t _{PLZ}	Maximum Output Disable Time	R _L = 1 kΩ	2.0	75	150	189	224	ns		
		C _L = 50 pF	4.5	15	30	38	45			
		C _L = 50 pF	6.0	13	26	32	38			
t _{TLH} , t _{THL}	Maximum Output Rise and Fall Time		2.0	–	60	75	90	ns		
			4.5	–	12	15	18			
			6.0	–	10	13	15			
C _{PD}	Power Dissipation Capacitance (Note 3)	(per buffer) G̅ = V _{IH} G̅ = V _{IL}	– –	12 50	– –	– –	– –	pF		
C _{IN}	Maximum Input Capacitance		–	5	10	10	10	pF		
C _{OUT}	Maximum Output Capacitance		–	10	20	20	20	pF		

3. C_{PD} determines the no load dynamic power consumption, P_D = C_{PD} · V_{CC}² · f + I_{CC} · V_{CC}, and the no load dynamic current consumption, I_S = C_{PD} · V_{CC} · f + I_{CC}.

MM74HC244

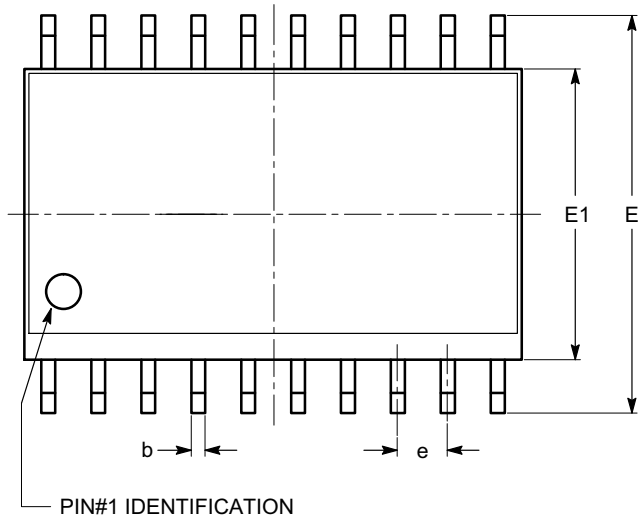
ORDERING INFORMATION

Device	Package	Shipping [†]
MM74HC244WM	SOIC-20 (Pb-Free)	38 Units / Tube
MM74HC244WMX	SOIC-20 (Pb-Free)	1000 / Tape & Reel
MM74HC244MTC	TSSOP-20 WB (Pb-Free)	75 Units / Tube
MM74HC244MTCX	TSSOP-20 (Pb-Free)	2500 / Tape & Reel

[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

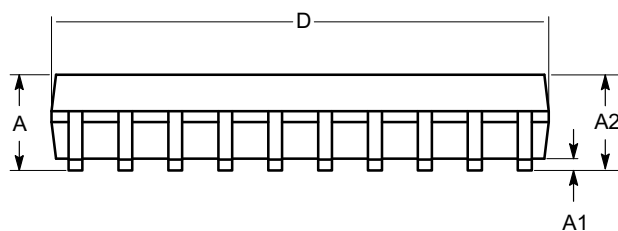
SOIC-20, 300 mils
CASE 751BJ
ISSUE O

DATE 19 DEC 2008

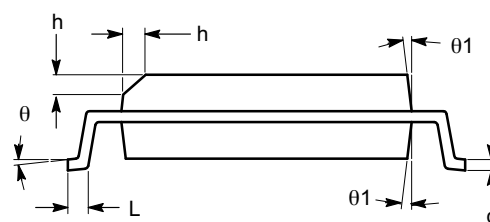


TOP VIEW

SYMBOL	MIN	NOM	MAX
A	2.36	2.49	2.64
A1	0.10		0.30
A2	2.05		2.55
b	0.31	0.41	0.51
c	0.20	0.27	0.33
D	12.60	12.80	13.00
E	10.01	10.30	10.64
E1	7.40	7.50	7.60
e	1.27 BSC		
h	0.25		0.75
L	0.40	0.81	1.27
θ	0°		8°
$\theta 1$	5°		15°



SIDE VIEW



END VIEW

Notes:

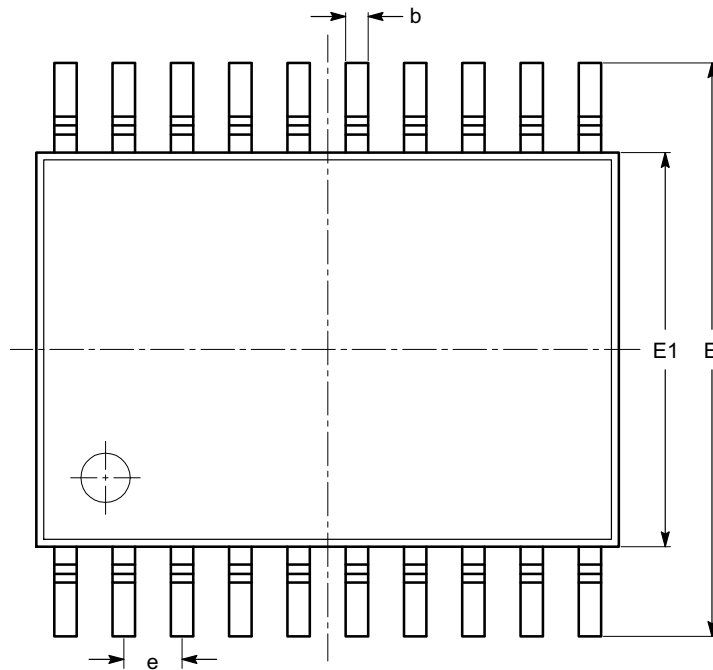
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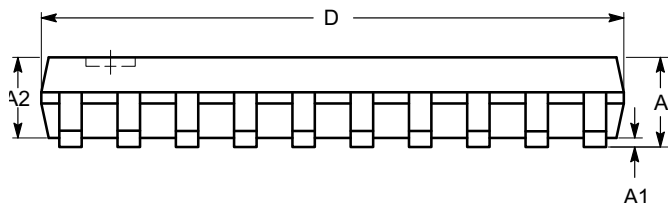
TSSOP20, 4.4x6.5
CASE 948AQ
ISSUE A

DATE 19 MAR 2009

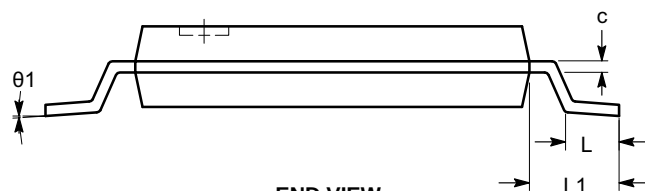


TOP VIEW

SYMBOL	MIN	NOM	MAX
A			1.20
A1	0.05		0.15
A2	0.80		1.05
b	0.19		0.30
c	0.09		0.20
D	6.40	6.50	6.60
E	6.30	6.40	6.50
E1	4.30	4.40	4.50
e	0.65 BSC		
L	0.45	0.60	0.75
L1	1.00 REF		
θ	0°		8°



SIDE VIEW



END VIEW

Notes:

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- (2) Complies with JEDEC MO-153.

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