



February 1984  
 Revised July 1999

## MM74HCT240 • MM74HCT244

### Inverting Octal 3-STATE Buffer • Octal 3-STATE Buffer

#### General Description

The MM74HCT240 and MM74HCT244 3-STATE buffers utilize advanced silicon-gate CMOS technology and are general purpose high speed inverting and 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 low power consumption of CMOS. All three devices are TTL input compatible and have a fanout of 15 LS-TTL equivalent inputs.

MM74HCT devices are intended to interface between TTL and NMOS components and standard CMOS devices. These parts are also plug-in replacements for LS-TTL devices and can be used to reduce power consumption in existing designs.

The MM74HCT240 is an inverting buffer and the MM74HCT244 is a non-inverting buffer. Each device has two active low enables (1G and 2G), and each enable independently controls 4 buffers.

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

#### Features

- TTL input compatible
- Typical propagation delay: 14 ns
- 3-STATE outputs for connection to system buses
- Low quiescent current: 80  $\mu$ A
- High output drive current: 6 mA (min)

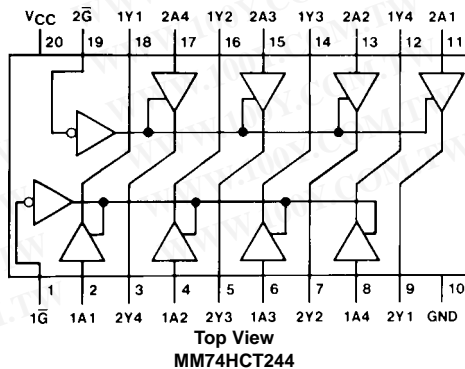
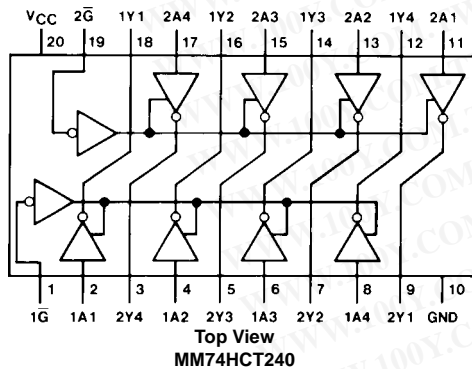
#### Ordering Code:

Order Number	Package Number	Package Description
MM74HCT240WM	M20B	20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide
MM74HCT240SJ	M20D	20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
MM74HCT240MTC	MTC20	20-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide
MM74HCT240N	N20A	20-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide
MM74HCT244WM	M20B	20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide
MM74HCT244SJ	M20D	20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
MM74HCT244MTC	MTC20	20-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide
MM74HCT244N	N20A	20-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide

Devices also available in Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.

#### Connection Diagrams

Pin Assignments for DIP, SOIC, SOP and TSSOP



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### Truth Tables

MM74HCT240

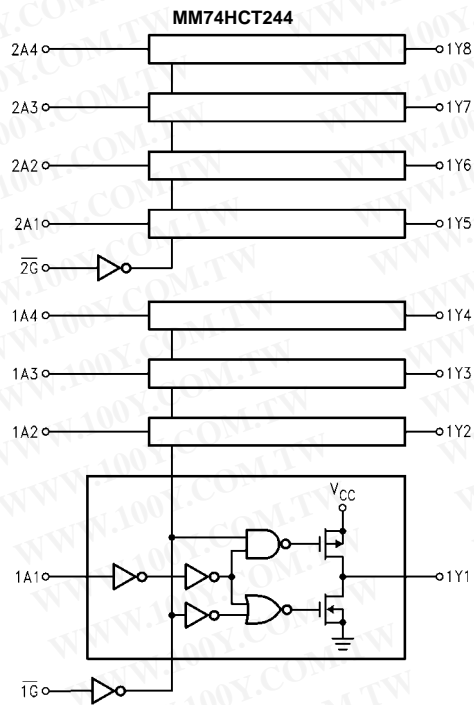
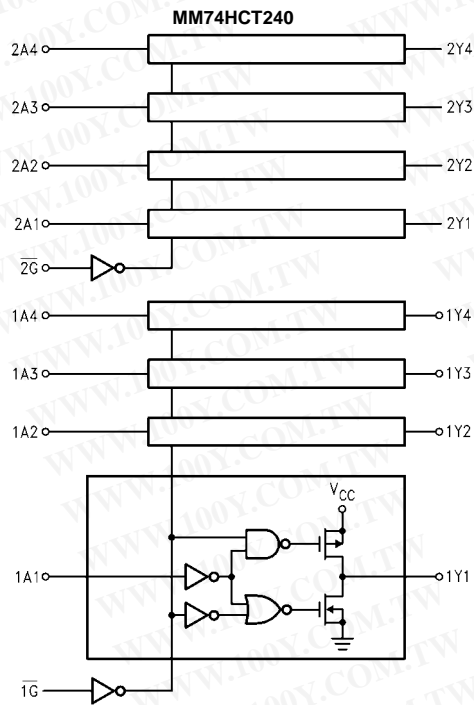
$\overline{1G}$	1A	1Y	$\overline{2G}$	2A	2Y
L	L	H	L	L	H
L	H	L	L	H	L
H	L	Z	H	L	Z
H	H	Z	H	H	Z

MM74HCT244

$\overline{1G}$	1A	1Y	$\overline{2G}$	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

### Logic Diagrams



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<b>Absolute Maximum Ratings</b> (Note 1)		<b>Recommended Operating Conditions</b>					
(Note 2)							
Supply Voltage ( $V_{CC}$ )	-0.5 to +7.0V	Supply Voltage ( $V_{CC}$ )	<b>Min</b> 4.5 <b>Max</b> 5.5 <b>Units</b> V				
DC Input Voltage ( $V_{IN}$ )	-1.5 to $V_{CC} + 1.5V$	DC Input or Output Voltage	0 $V_{CC}$ V				
DC Output Voltage ( $V_{OUT}$ )	-0.5 to $V_{CC} + 0.5V$	( $V_{IN}, V_{OUT}$ )					
Clamp Diode Current ( $I_{IK}, I_{OK}$ )	$\pm 20$ mA	Operating Temperature Range ( $T_A$ )	-40 +85 °C				
DC Output Current, per pin ( $I_{OUT}$ )	$\pm 35$ mA	Input Rise or Fall Times					
DC $V_{CC}$ or GND Current, per pin ( $I_{CC}$ )	$\pm 70$ mA	( $t_r, t_f$ )	500 ns				
Storage Temperature Range ( $T_{STG}$ )	-65°C to +150°C	<b>Note 1:</b> Absolute Maximum Ratings are those values beyond which damage to the device may occur.					
Power Dissipation ( $P_D$ )		<b>Note 2:</b> Unless otherwise specified all voltages are referenced to ground.					
(Note 3)	600 mW	<b>Note 3:</b> Power Dissipation temperature derating — plastic "N" package: -12 mW/°C from 65°C to 85°C.					
S.O. Package only	500 mW						
Lead Temperature ( $T_L$ )							
(Soldering 10 seconds)	260°C						
<b>DC Electrical Characteristics</b>							
$V_{CC} = 5V \pm 10\%$ (unless otherwise specified)							
Symbol	Parameter	Conditions	$T_A = 25^\circ C$		$T_A = -40$ to $85^\circ C$	$T_A = -55^\circ$ to $125^\circ C$	Units
			Typ	Guaranteed Limits			
$V_{IH}$	Minimum HIGH Level Input Voltage			2.0	2.0	2.0	V
$V_{IL}$	Maximum LOW Level Input Voltage			0.8	0.8	0.8	V
$V_{OH}$	Minimum HIGH Level Output Voltage	$V_{IN-EE} = V_{IH}$ or $V_{IL}$ $ I_{OUT}  = 20 \mu A$ $ I_{OUT}  = 6.0$ mA, $V_{CC} = 4.5V$ $ I_{OUT}  = 7.2$ mA, $V_{CC} = 5.5V$	$V_{CC}$	$V_{CC}-0.1$	$V_{CC}-0.1$	$V_{CC}-0.1$	V
			4.2	3.98	3.84	3.7	V
			5.2	4.98	4.84	4.7	V
$V_{OL}$	Maximum LOW Level Voltage	$V_{IN} = V_{IH}$ or $V_{IL}$ $ I_{OUT}  = 20 \mu A$ $ I_{OUT}  = 6.0$ mA, $V_{CC} = 4.5V$ $ I_{OUT}  = 7.2$ mA, $V_{CC} = 5.5V$	0	0.1	0.1	0.1	V
			0.2	0.26	0.33	0.4	V
			0.2	0.26	0.33	0.4	V
$I_{IN}$	Maximum Input Current	$V_{IN} = V_{CC}$ or GND, $V_{IH}$ or $V_{IL}$		$\pm 0.05$	$\pm 0.5$	$\pm 1.0$	$\mu A$
$I_{OZ}$	Maximum 3-STATE Output Leakage Current	$V_{OUT} = V_{CC}$ or GND $G = V_{IH}$ $G = V_{IL}$		$\pm 0.25$	$\pm 2.5$	$\pm 10$	$\mu A$
$I_{CC}$	Maximum Quiescent Supply Current	$V_{IN} = V_{CC}$ or GND $I_{OUT} = 0 \mu A$		4.0	40	160	$\mu A$
		$V_{IN} = 2.4V$ or $0.5V$ (Note 4)	0.6	1.0	1.3	1.5	mA
<b>Note 4:</b> Measured per input. All other inputs at $V_{CC}$ or GND.							

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AC Electrical Characteristics						
MM74HCT240, MM74HCT244 $V_{CC} = 5.0V$ , $t_r = t_f = 6 ns$ , $T_A = 25^\circ C$ (unless otherwise specified)						
Symbol	Parameter	Conditions	Typ	Guaranteed Limits	Units	
$t_{PHL}$ , $t_{PLH}$	Maximum Output Propagation Delay	$C_L = 45 pF$	14	18	ns	
$t_{PZL}$ , $t_{PZH}$	Maximum Output Enable Time	$C_L = 45 pF$ $R_L = 1 k\Omega$	20	30	ns	
$t_{PLZ}$ , $t_{PHZ}$	Maximum Output Disable Time	$C_L = 5 pF$ $R_L = 1 k\Omega$	16	25	ns	

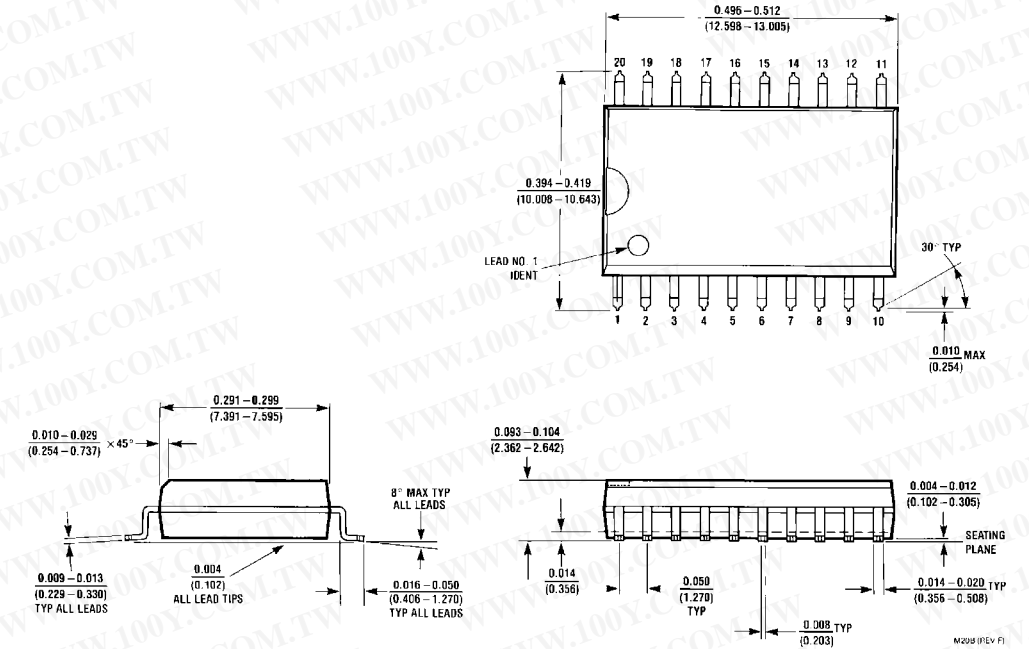
  

AC Electrical Characteristics							
MM74HCT240, MM74HCT244 $V_{CC} = 5.0V \pm 10\%$ , $t_r = t_f = 6 ns$ (unless otherwise specified)							
Symbol	Parameter	Conditions	$T_A = 25^\circ C$			Units	
			Typ	Guaranteed Limits			
$t_{PHL}$ , $t_{PLH}$	Maximum Output Propagation Delay	$C_L = 50 pF$	14	20	25	30	ns
		$C_L = 150 pF$	20	28	35	42	ns
$t_{PZH}$ , $t_{PZL}$	Maximum Output Enable Time	$R_L = 1 k\Omega$ , $C_L = 50 pF$	21	30	38	45	ns
		$R_L = 1 k\Omega$ , $C_L = 150 pF$	26	42	53	63	ns
$t_{PHZ}$ , $t_{PLZ}$	Maximum Output Disable Time	$R_L = 1 k\Omega$ , $C_L = 50 pF$	16	25	32	38	ns
$t_{THL}$ , $t_{TLH}$	Maximum Output Rise and Fall Time	$C_L = 50 pF$	6	12	15	18	ns
$C_{IN}$	Maximum Input Capacitance		10	15	15	15	pF
$C_{OUT}$	Maximum Output Capacitance		15	20	20	20	pF
$C_{PD}$	Power Dissipation Capacitance (Note 5)	(per buffer) $\bar{G} = V_{CC}$ , $G = GND$	5				pF
		$\bar{G} = GND$ , $G = V_{CC}$	90				pF

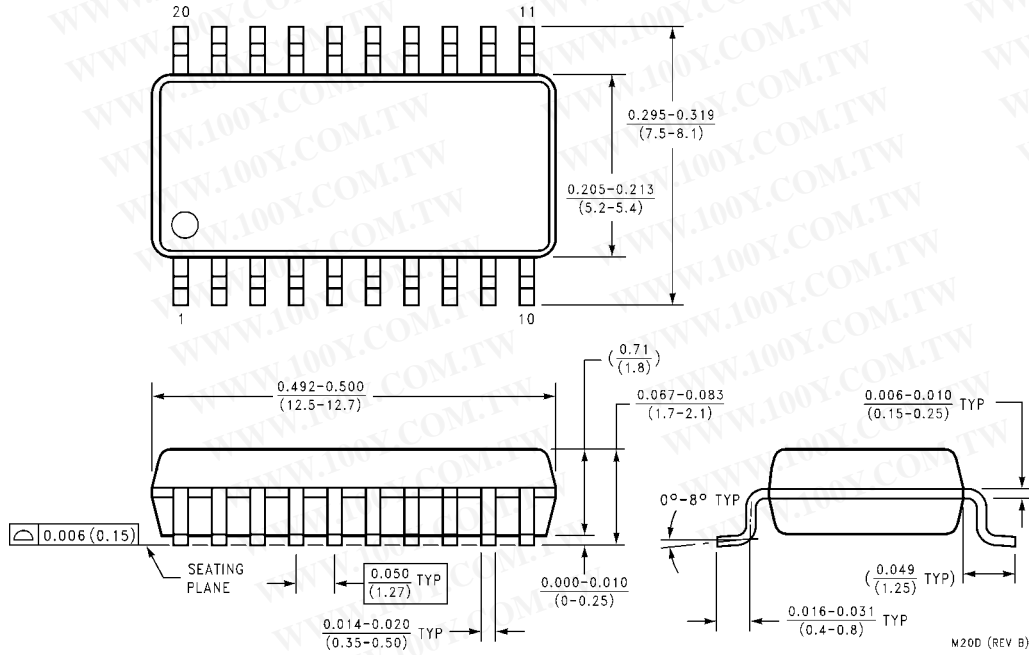
**Note 5:**  $C_{PD}$  determines the no load dynamic power consumption,  $P_D = C_{PD} V_{CC}^2 f + I_{CC} V_{CC}$ , and the no load dynamic current consumption,  $I_S = C_{PD} V_{CC} f + I_{CC}$ .

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



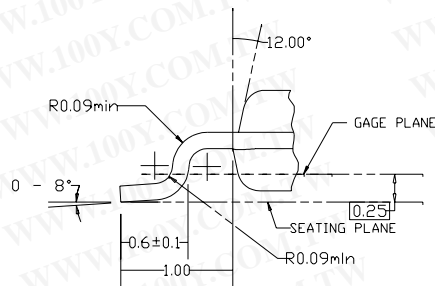
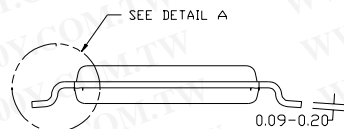
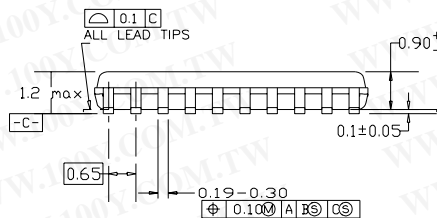
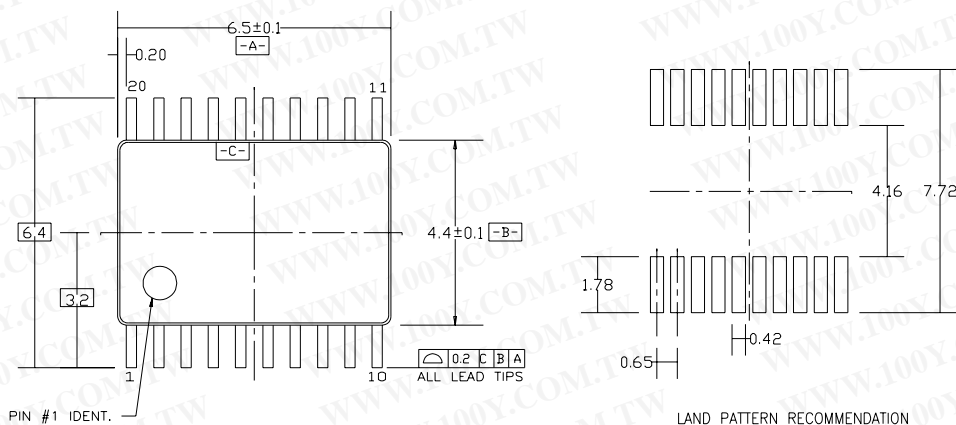
**20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide  
Package Number M20B**



**20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide  
Package Number M20D**

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



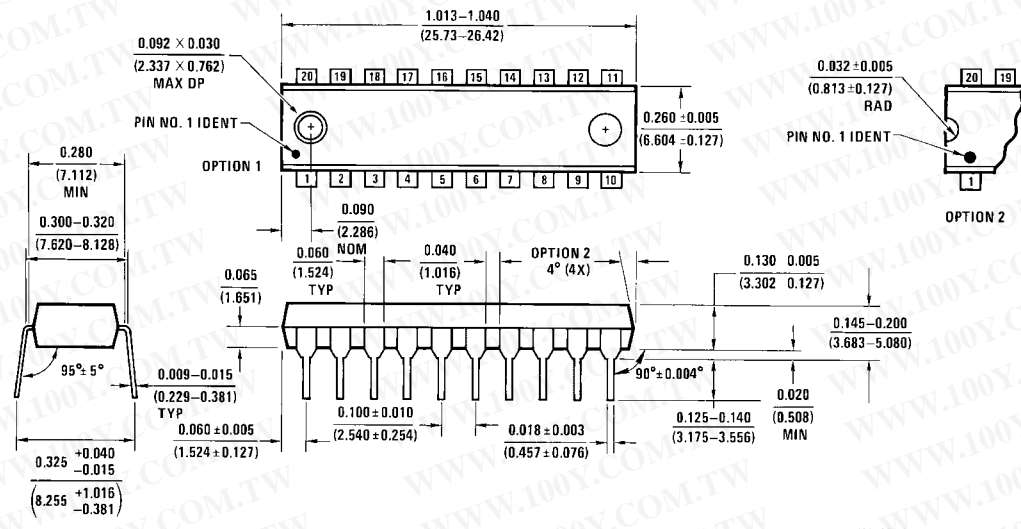
DIMENSIONS ARE IN MILLIMETERS

NOTES:

- A. CONFORMS TO JEDEC REGISTRATION MO-153, VARIATION AC, REF NOTE 6, DATE 7/93.
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLDS FLASH, AND TIE BAR EXTRUSIONS.
- D. DIMENSIONS AND TOLERANCES PER ANSI Y14.5M, 1982.

**20-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide  
Package Number MTC20**

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



20-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide Package Number N20A

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