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## 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)

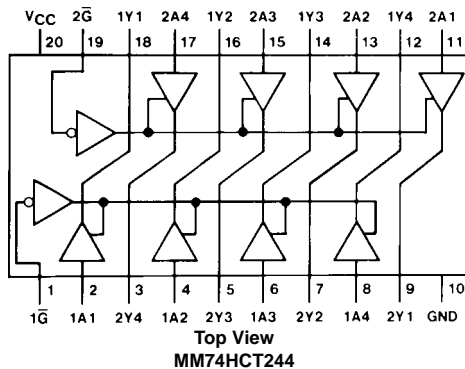
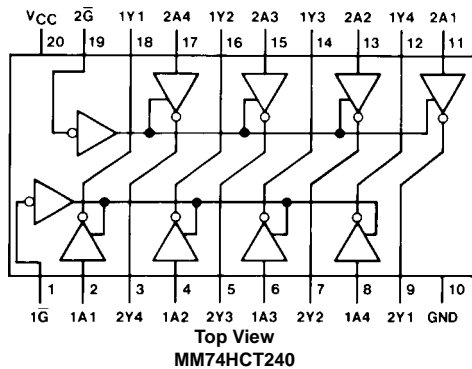
#### Ordering Code:

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



### Truth Tables

MM74HCT240

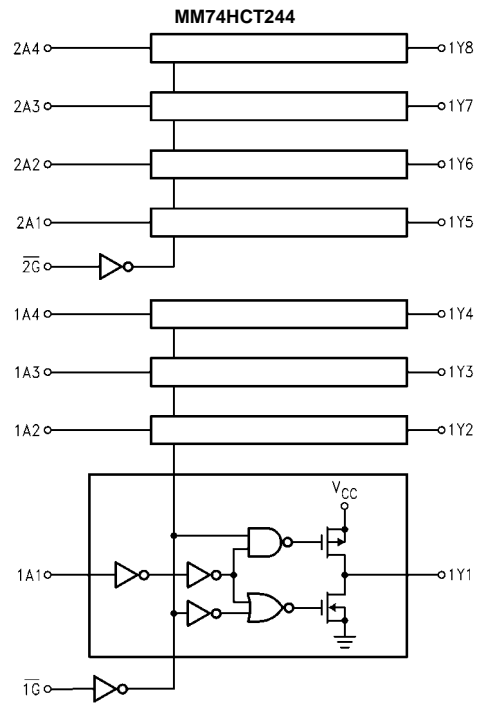
1 $\bar{G}$	1A	1Y	2 $\bar{G}$	2A	2Y
L	L	H	L	L	H
L	H	L	L	H	L
H	L	Z	H	L	Z
H	H	Z	H	H	Z

H = HIGH Level      L = LOW Level      Z = High Impedance

MM74HCT244

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

### Logic Diagrams



### Absolute Maximum Ratings (Note 1)

(Note 2)

Supply Voltage ( $V_{CC}$ )	-0.5 to +7.0V
DC Input Voltage ( $V_{IN}$ )	-1.5 to $V_{CC} + 1.5V$
DC Output Voltage ( $V_{OUT}$ )	-0.5 to $V_{CC} + 0.5V$
Clamp Diode Current ( $I_{IK}, I_{OK}$ )	$\pm 20$ mA
DC Output Current, per pin ( $I_{OUT}$ )	$\pm 35$ mA
DC $V_{CC}$ or GND Current, per pin ( $I_{CC}$ )	$\pm 70$ mA
Storage Temperature Range ( $T_{STG}$ )	-65°C to +150°C
Power Dissipation ( $P_D$ )	
<small>(Note 3)</small>	600 mW
S.O. Package only	500 mW
Lead Temperature ( $T_L$ )	
(Soldering 10 seconds)	260°C

### Recommended Operating Conditions

	Min	Max	Units
Supply Voltage ( $V_{CC}$ )	4.5	5.5	V
DC Input or Output Voltage ( $V_{IN}, V_{OUT}$ )	0	$V_{CC}$	V
Operating Temperature Range ( $T_A$ )	-40	+85	°C
Input Rise or Fall Times ( $t_r, t_f$ )		500	ns

**Note 1:** Absolute Maximum Ratings are those values beyond which damage to the device may occur.

**Note 2:** Unless otherwise specified all voltages are referenced to ground.

**Note 3:** Power Dissipation temperature derating — plastic "N" package: -12 mW/°C from 65°C to 85°C.

### DC Electrical Characteristics

$V_{CC} = 5V \pm 10\%$  (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 $V_{IL}$	$V_{CC}$	$V_{CC}-0.1$	$V_{CC}-0.1$	$V_{CC}-0.1$	V
		$ I_{OUT}  = 20 \mu A$	4.2	3.98	3.84	3.7	V
		$ I_{OUT}  = 6.0$ mA, $V_{CC} = 4.5V$ $ I_{OUT}  = 7.2$ mA, $V_{CC} = 5.5V$	5.2	4.98	4.84	4.7	V
$V_{OL}$	Maximum LOW Level Voltage	$V_{IN} = V_{IH}$ or $V_{IL}$	0	0.1	0.1	0.1	V
		$ I_{OUT}  = 20 \mu A$	0.2	0.26	0.33	0.4	V
		$ I_{OUT}  = 6.0$ mA, $V_{CC} = 4.5V$ $ I_{OUT}  = 7.2$ mA, $V_{CC} = 5.5V$	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 $\bar{G} = V_{IH}$ $G = V_{IL}$		$\pm 0.25$	$\pm 2.5$	$\pm 10$	$\mu A$
$I_{CC}$	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

**Note 4:** Measured per input. All other inputs at  $V_{CC}$  or GND.

### 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
			$C_L = 150$ 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	

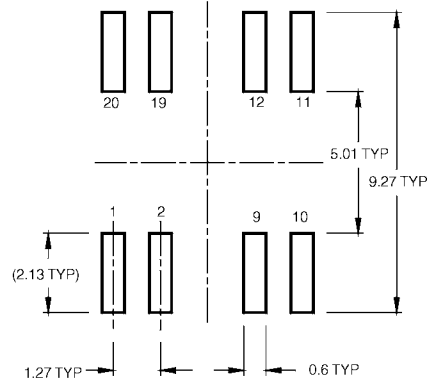
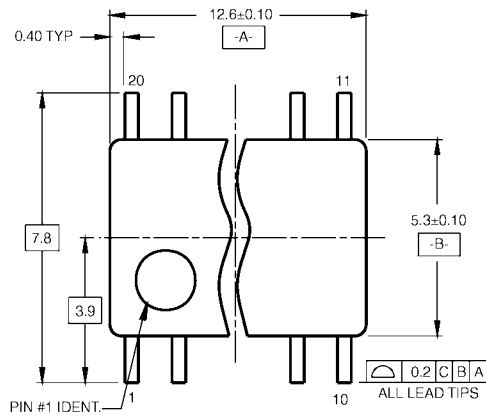
**Note 5:**  $C_{PD}$  determines the no load dynamic power consumption,  $P_D = C_{PD} V_{CC}^2 f + I_{CC} V_{CC}$ , and the no load dynamic current consumption,  $I_S = C_{PD} V_{CC} f + I_{CC}$ .

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

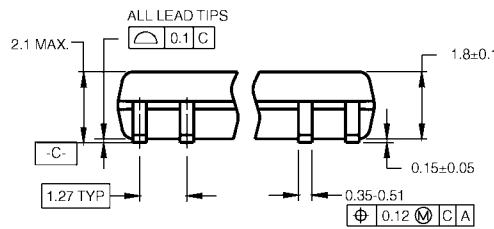


20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide  
Package Number M20B

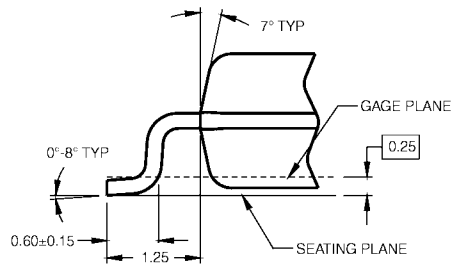
**Physical Dimensions** inches (millimeters) unless otherwise noted (Continued)



LAND PATTERN RECOMMENDATION



DIMENSIONS ARE IN MILLIMETERS



DETAIL A

- NOTES:
- A. CONFORMS TO EIAJ EDR-7320 REGISTRATION, ESTABLISHED IN DECEMBER, 1998.
  - B. DIMENSIONS ARE IN MILLIMETERS.
  - C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.

M20DRevB1

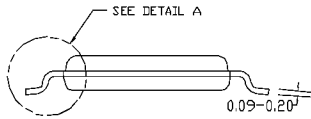
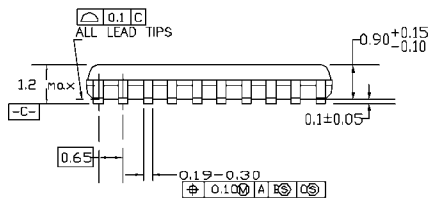
**20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide  
Package Number M20D**

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

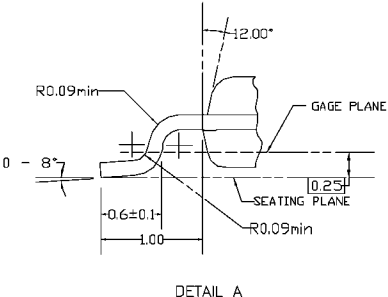


PIN #1 IDENT.

LAND PATTERN RECOMMENDATION



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DETAIL A

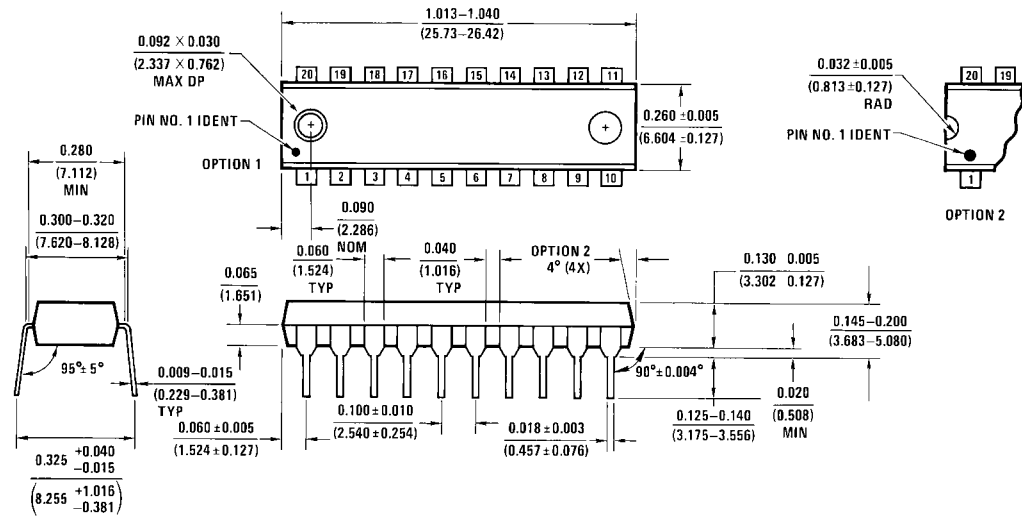
- NOTES:
- A. CONFORMS TO JEDEC REGISTRATION MO-153, VARIATION AC, REF NOTE 6, DATE 7/93.
  - B. DIMENSIONS ARE IN MILLIMETERS.
  - C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLDS FLASH, AND TIE BAR EXTRUSIONS.
  - D. DIMENSIONS AND TOLERANCES PER ANSI Y14.5M, 1982.

MTC20REVD1

**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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