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## MM74HCT273 Octal D-Type Flip-Flop with Clear

### General Description

The MM74HCT273 utilizes advanced silicon-gate CMOS technology. It has an input threshold and output drive similar to LS-TTL with the low standby power of CMOS.

These positive edge-triggered flip-flops have a common clock and clear-independent Q outputs. Data on a D input, having the specified set-up and hold time, is transferred to the corresponding Q output on the positive-going transition of the clock pulse. The asynchronous clear forces all outputs LOW when it is LOW.

All inputs to this device are protected from damage due to electrostatic discharge by diodes to  $V_{CC}$  and ground.

MM74HCT devices are intended to interface TTL and NMOS components to CMOS components. These parts can be used as plug-in replacements to reduce system power consumption in existing designs.

### Features

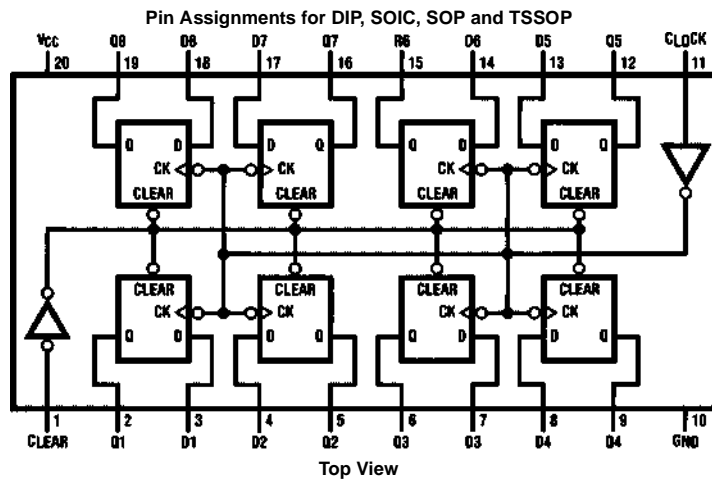
- Typical propagation delay: 20 ns
- Low quiescent current: 80  $\mu$ A maximum (74HCT series)
- Fanout of 10 LS-TTL loads

### Ordering Code:

Order Number	Package Number	Package Description
MM74HCT273WM	M20B	20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide
MM74HCT273SJ	M20D	20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
MM74HCT273MTC	MTC20	20-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide
MM74HCT273N	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 Diagram



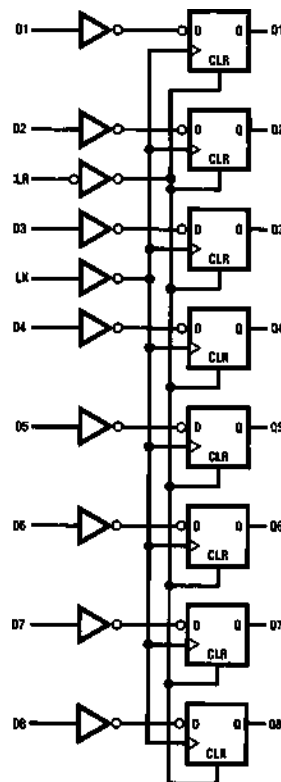
## Truth Table

(Each Flip-Flop)

Inputs			Outputs
Clear	Clock	D	Q
L	X	X	L
H	↑	H	H
H	↑	L	L
H	L	X	Q0

H = HIGH Level (steady-state)  
 L = LOW Level (steady-state)  
 X = Don't Care  
 ↑ = Transition from LOW-to-HIGH level  
 Q0 = The level of Q before the indicated steady-state input conditions were established.

## Logic Diagram



Absolute Maximum Ratings <sup>(Note 1)</sup>		Recommended Operating Conditions			
(Note 2)			<b>Min</b>	<b>Max</b>	<b>Units</b>
Supply Voltage ( $V_{CC}$ )	-0.5V to + 7.0V	Supply Voltage ( $V_{CC}$ )	4.5	5.5	V
DC Input Voltage ( $V_{IN}$ )	-1.5V to $V_{CC} + 1.5V$	DC Input or Output Voltage			
DC Output Voltage ( $V_{OUT}$ )	-0.5V to $V_{CC} + 0.5V$	( $V_{IN}, V_{OUT}$ )	0	$V_{CC}$	V
Clamp Diode Current ( $I_{IK}, I_{OK}$ )	$\pm 20$ mA	Operating Temperature Range ( $T_A$ )	-40	+85	$^{\circ}C$
DC Output Current, per Pin ( $I_{OUT}$ )	$\pm 25$ mA	Input Rise or Fall Times			
DC $V_{CC}$ or GND Current, per Pin ( $I_{CC}$ )	$\pm 50$ mA	( $t_r, t_f$ )		500	ns
Storage Temperature Range ( $T_{STG}$ )	-65 $^{\circ}C$ to + 150 $^{\circ}C$	<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/ $^{\circ}C$ from 65 $^{\circ}C$ to 85 $^{\circ}C$ .			
S.O. Package only	500 mW				
Lead Temperature ( $T_L$ )					
(Soldering, 10 seconds)	260 $^{\circ}C$				

## DC Electrical Characteristics

$V_{CC} = 5V \pm 10\%$  unless otherwise specified

Symbol	Parameter	Conditions	$T_A = 25^{\circ}C$		$T_A = -40^{\circ}C$ to $85^{\circ}C$	$T_A = -55^{\circ}C$ 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	$V_{IN} = V_{IH}$ 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}  = 4.0$ mA, $V_{CC} = 4.5V$	5.2	4.98	4.84	4.7	V
$V_{OL}$	Minimum 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}  = 4.0$ mA, $V_{CC} = 4.5V$	0.2	0.26	0.33	0.4	V
$I_{IN}$	Maximum Input Current	$V_{IN} = V_{CC}$ or GND, $V_{IH}$ or $V_{IL}$		$\pm 0.1$	$\pm 1.0$	$\pm 1.0$	$\mu A$
		$V_{IN} = V_{CC}$ or GND		8	80	160	$\mu A$
$I_{CC}$	Maximum Quiescent Supply Current	$I_{OUT} = 0 \mu A$		0.6	0.8	0.9	mA
		$V_{IN} = 2.4V$ or $0.5V$ (Note 4)					

**Note 4:** Measured per pin, all other inputs held at  $V_{CC}$  or GND.

### AC Electrical Characteristics

$V_{CC} = 5V$ ,  $T_A = 25^\circ C$ ,  $C_L = 15$  pF,  $t_r = t_f = 6$  ns

Symbol	Parameter	Conditions	Typ	Guaranteed Limits	Units
$f_{MAX}$	Maximum Operating Frequency		68	30	MHz
$t_{PHL}$ , $t_{PLH}$	Maximum Propagation Delay from Clock to Q		18	30	ns
$t_{PHL}$ , $t_{PLH}$	Maximum Propagation Delay from Clear to Q		21	30	ns
$t_{REM}$	Minimum Removal Time, Clear to Clock		-1	5	ns
$t_S$	Minimum Set-Up Time D to Clock		6	20	ns
$t_H$	Minimum Hold Time Clock to D		-3	5	ns
$t_W$	Minimum Pulse Width Clock or Clear		10	16	ns

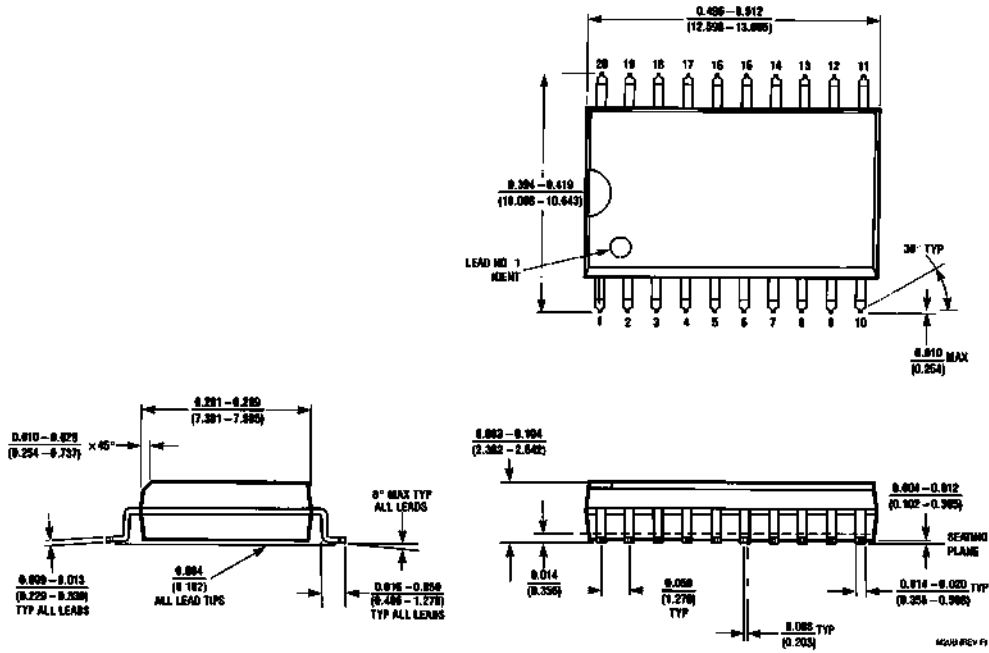
### AC Electrical Characteristics

$V_{CC} = 5.0V \pm 10\%$ ,  $C_L = 50$  pF,  $t_r = t_f = 6$  ns unless otherwise specified

Symbol	Parameter	Conditions	$T_A = 25^\circ C$		$T_A = -40^\circ C$ to $85^\circ C$	$T_A = -55^\circ C$ to $125^\circ C$	Units
			Typ	Guaranteed Limits			
$f_{MAX}$	Maximum Operating Frequency		68	27	21	18	MHz
$t_{PHL}$ , $t_{PLH}$	Maximum Propagation Delay from Clock to Q		22	37	46	56	ns
$t_{PHL}$ , $t_{PLH}$	Maximum Propagation Delay from Clear to Q		25	35	44	52	ns
$t_{REM}$	Minimum Removal Time Clear to Clock		-1	5	6	7	ns
$t_S$	Minimum Set-Up Time D to Clock		6	20	25	30	ns
$t_H$	Minimum Hold Time Clock to D		-3	5	5	5	ns
$t_W$	Minimum Pulse Width Clock or Clear		10	16	25	30	ns
$t_r$ , $t_f$	Maximum Input Rise and Fall Time, Clock			500	500	500	ns
$t_{THL}$ , $t_{TLH}$	Maximum Output Rise and Fall Time		11	15	19	22	ns
$C_{PD}$	Power Dissipation Capacitance (Note 5)	(Per Flip-Flop)	50				pF
$C_{IN}$	Maximum Input Capacitance		6	10	10	10	pF

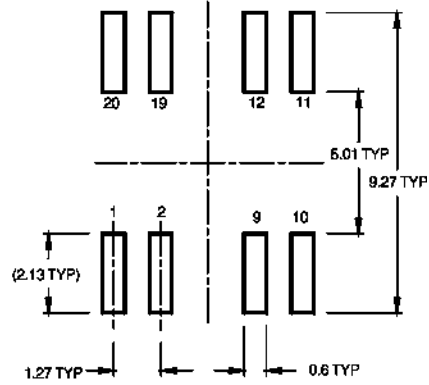
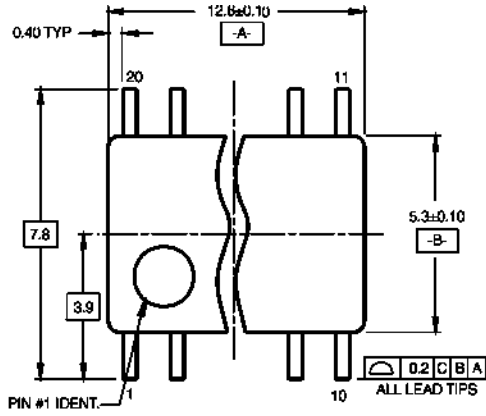
**Note 5:**  $C_{PD}$  determines the no load dynamic power consumption,  $P_D = C_{PD} V_{CC}^2 f + I_{CC} V_{CC}$ , and the no load dynamic current consumption,  $I_S = C_{PD} V_{CC}^2 f + I_{CC}$ .

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

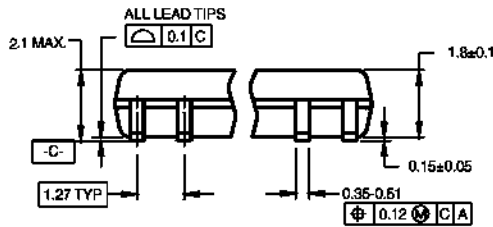


20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide  
Package Number M20B

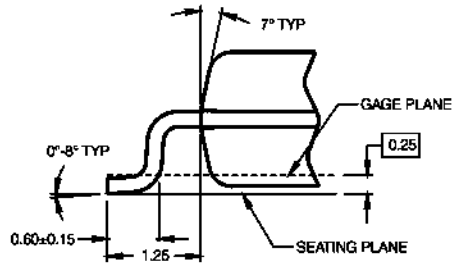
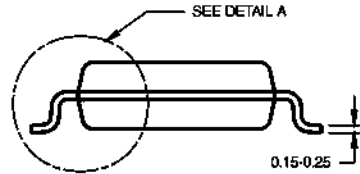
**Physical Dimensions** inches (millimeters) unless otherwise noted (Continued)



**LAND PATTERN RECOMMENDATION**



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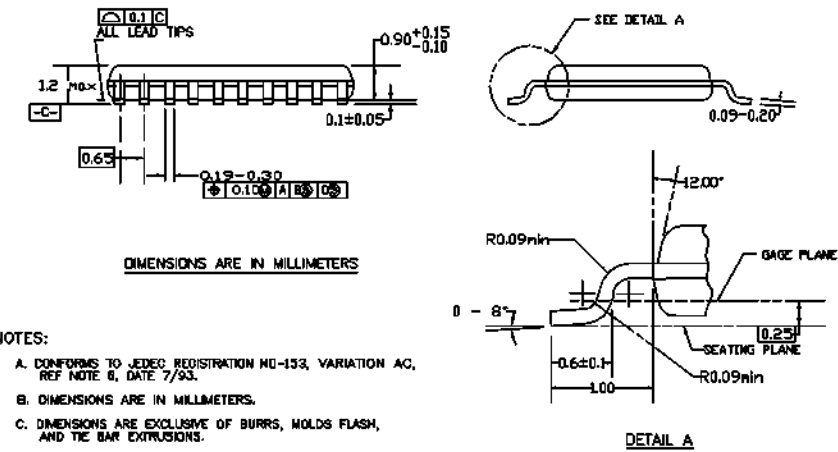
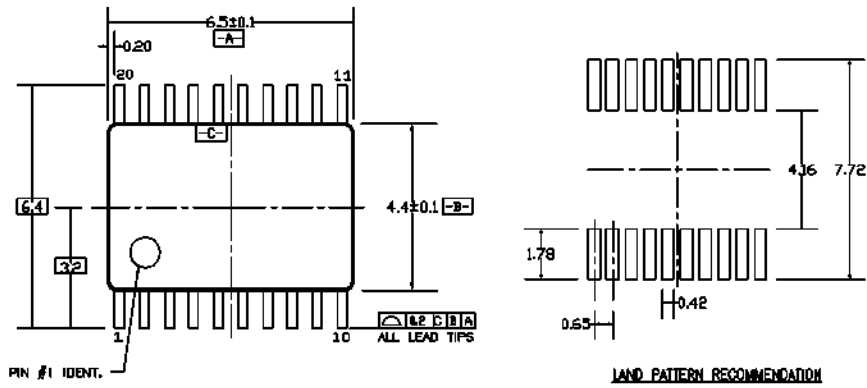
**DETAIL A**

- 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)

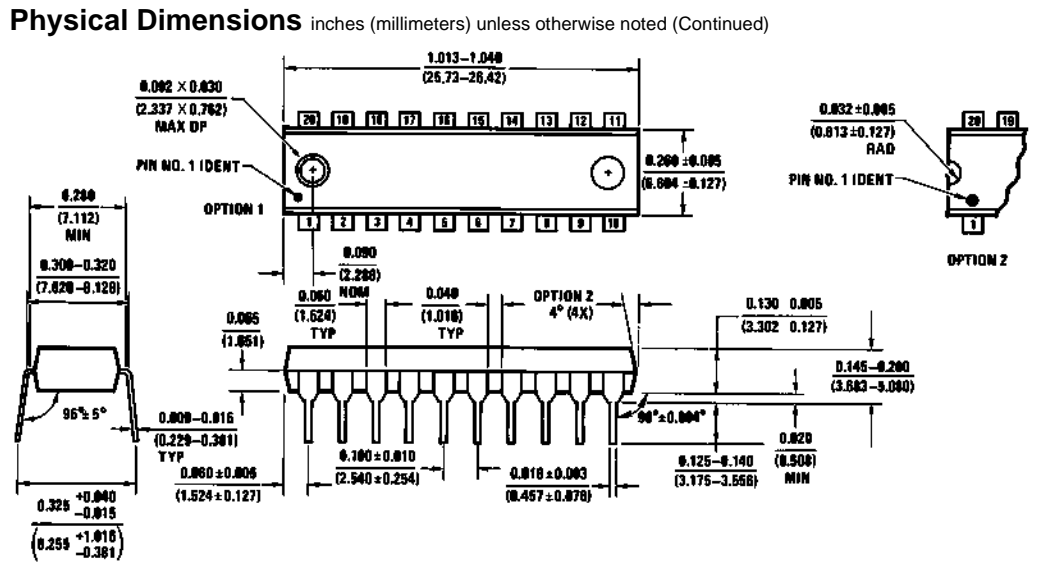


- NOTES:
- A. CONFORMS TO JEDEC REGISTRATION MO-153, VARIATION AC, REF NOTE 6, DATE 7/93.
  - B. DIMENSIONS ARE IN MILLIMETERS.
  - C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLDS FLASH, AND THE BAR EXTRUSIONS.
  - D. DIMENSIONS AND TOLERANCES PER ANSI Y14.5M, 1982.

MTC20REVD1

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





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


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