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Fairchild Semiconductor
MM74C221N

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November 1987
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MM74C221
Dual Monostable Multivibrator

General Description

The MM74C221 dual monostable multivibrator is a monolithic complementary MOS integrated circuit. Each multivibrator features a negative-transition-triggered input and a positive-transition-triggered input, either of which can be used as an inhibit input, and a clear input.

Once fired, the output pulses are independent of further transitions of the A and B inputs and are a function of the external timing components C_{EXT} and R_{EXT}. The pulse width is stable over a wide range of temperature and V_{CC}.

Pulse stability will be limited by the accuracy of external timing components. The pulse width is approximately defined by the relationship $t_{W(OUT)} \approx C_{EXT} R_{EXT}$. For further information and applications, see AN-138.

Features

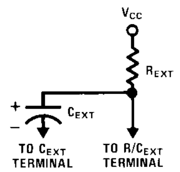
- Wide supply voltage range: 4.5V to 15V
- Guaranteed noise margin: 1.0V
- High noise immunity: 0.45 V_{CC} (typ.)
- Low power TTL compatibility: fan out of 2 driving 74L

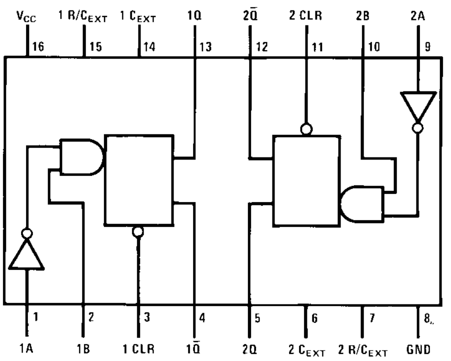
Ordering Code:

Order Number	Package Number	Package Description
74MMC221N	N16E	16-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide

Connection Diagrams

Timing Component





Top View

Truth Table

Inputs			Outputs	
Clear	A	B	Q	$\overline{Q}$
L	X	X	L	H
X	H	X	L	H
X	X	L	L	H
H	L	↑	⊓	⊔
H	↓	H	⊓	⊔

H = HIGH Level
L = LOW Level
X= Irrelevant
↑ = Transition from LOW-to-HIGH
↓ = Transition from HIGH-to-LOW
⊓ = One HIGH Level Pulse
⊔ = One LOW Level Pulse

Absolute Maximum Ratings (Note 1)

Voltage at Any Pin	−0.3V to V_{CC} + 0.3V
Operating Temperature Range	−55°C to +125°C
Storage Temperature Range	−65°C to +150°C
Power Dissipation	
Dual-In-Line	700 mW
Small Outline	500 mW
Operating V_{CC} Range	4.5V to 15V
Absolute Maximum V_{CC}	18V
$R_{EXT} \geq 80\ V_{CC}$ (Ω)	
Lead Temperature	
(Soldering, 10 seconds)	260°C

Note 1: "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. Except for "Operating Temperature Range" they are not meant to imply that the devices should be operated at these limits. The Electrical Characteristics table provides conditions for actual device operation.

DC Electrical Characteristics

Max/min limits apply across temperature range, unless otherwise noted

Symbol	Parameter	Conditions	Min	Typ	Max	Units
CMOS to CMOS						
$V_{IN(1)}$	Logical "1" Input Voltage	V_{CC} = 5V V_{CC} = 10V	3.5 8.0			V
$V_{IN(0)}$	Logical "0" Input Voltage	V_{CC} = 5V V_{CC} = 10V			1.5 2.0	V
$V_{OUT(1)}$	Logical "1" Output Voltage	V_{CC} = 5V, I_O = −10 µA V_{CC} = 10V, I_O = −10 µA	4.5 9.0			V
$V_{OUT(0)}$	Logical "0" Output Voltage	V_{CC} = 5V, I_O = +10 µA V_{CC} = 10V, I_O = +10 µA			0.5 1	V
$I_{IN(1)}$	Logical "1" Input Current	V_{CC} = 15V, V_{IN} = 15V		0.005	1.0	µA
$I_{IN(0)}$	Logical "0" Input Current	V_{CC} = 15V, V_{IN} = 0V	−1.0	−0.005		µA
I_{CC}	Supply Current (Standby)	V_{CC} = 15V, R_{EXT} = ∞, Q1, Q2 = Logic "0" (Note 2)		0.05	300	µA
I_{CC}	Supply Current (During Output Pulse)	V_{CC} = 15V, Q1 = Logic "1", Q2 = Logic "0" (Figure 4)		15		mA
		V_{CC} = 5V, Q1 = Logic "1", Q2 = Logic "0" (Figure 4)		2		mA
	Leakage Current at R/C_{EXT}Pin	V_{CC} = 15V, V_{CEXT} = 5V		0.01	3.0	µA
CMOS/LPTTL Interface						
$V_{IN(1)}$	Logical "1" Input Voltage	V_{CC} = 4.75V	V_{CC} − 1.5			V
$V_{IN(0)}$	Logical "0" Input Voltage	V_{CC} = 4.75V			0.8	V
$V_{OUT(1)}$	Logical "1" Output Voltage	V_{CC} = 4.75V, I_O = −360 µA	2.4			V
$V_{OUT(0)}$	Logical "0" Output Voltage	V_{CC} = 4.75V, I_O = 360 µA			0.4	V
Output Drive (See Family Characteristics Data Sheet) (Short Circuit Current)						
I_{SOURCE}	Output Source Current (P-Channel)	V_{CC} = 5V T_A = 25°C, V_{OUT} = 0V	−1.75			mA
I_{SOURCE}	Output Source Current (P-Channel)	V_{CC} = 10V T_A = 25°C, V_{OUT} = 0V	−8			mA
I_{SINK}	Output Sink Current (N-Channel)	V_{CC} = 5V T_A = 25°C, V_{OUT} = V_{CC}	1.75			mA
I_{SINK}	Output Sink Current (N-Channel)	V_{CC} = 10V T_A = 25°C, V_{OUT} = V_{CC}	8			mA

Note 2: In Standby (Q = Logic "0") the power dissipated equals the leakage current plus V_{CC}/R_{EXT}.

AC Electrical Characteristics (Note 3)

$T_A = 25°C$, $C_L = 50$ pF, unless otherwise noted

Symbol	Parameter	Conditions	Min	Typ	Max	Units
$t_{pd\ A,\ B}$	Propagation Delay from Trigger Input (A, B) to Output Q, $\overline{Q}$	$V_{CC} = 5V$ $V_{CC} = 10V$		250 120	500 250	ns
$t_{pd\ CL}$	Propagation Delay from Clear Input (CL) to Output Q, $\overline{Q}$	$V_{CC} = 5V$ $V_{CC} = 10V$		250 120	500 250	ns
t_S	Time Prior to Trigger Input (A, B) that Clear must be Set	$V_{CC} = 5V$ $V_{CC} = 10V$	150 60	50 20		ns
$t_{W(A,\ B)}$	Trigger Input (A, B) Pulse Width	$V_{CC} = 5V$ $V_{CC} = 10V$	150 70	50 30		ns
$t_{W(CL)}$	Clear Input (CL) Pulse Width	$V_{CC} = 5V$ $V_{CC} = 10V$	150 70	50 30		ns
$t_{W(OUT)}$	Q or $\overline{Q}$ Output Pulse Width	$V_{CC} = 5V$, $R_{EXT} = 10k$, $C_{EXT} = 0$ pF		900		ns
		$V_{CC} = 10V$, $R_{EXT} = 10k$, $C_{EXT} = 0$ pF		350		ns
		$V_{CC} = 15V$, $R_{EXT} = 10k$, $C_{EXT} = 0$ pF		320		ns
		$V_{CC} = 5V$, $R_{EXT} = 10k$, $C_{EXT} = 1000$ pF (Figure 1)	9.0	10.6	12.2	µs
		$V_{CC} = 10V$, $R_{EXT} = 10k$, $C_{EXT} = 1000$ pF (Figure 1)	9.0	10	11	µs
		$V_{CC} = 15V$, $R_{EXT} = 10k$, $C_{EXT} = 1000$ pF (Figure 1)	8.9	9.8	10.8	µs
		$V_{CC} = 5V$, $R_{EXT} = 10k$, $C_{EXT} = 0.1$ µF (Figure 3)	900	1020	1200	µs
		$V_{CC} = 10V$, $R_{EXT} = 10k$, $C_{EXT} = 0.1$ µF (Figure 3)	900	1000	1100	µs
		$V_{CC} = 15V$, $R_{EXT} = 10k$, $C_{EXT} = 0.1$ µF (Figure 3)	900	990	1100	µs
R_{ON}	ON Resistance of Transistor between R/C_{EXT} to C_{EXT}	$V_{CC} = 5V$ (Note 4) $V_{CC} = 10V$ (Note 4) $V_{CC} = 15V$ (Note 4)		50 25 16.7	150 65 45	Ω
	Output Duty Cycle	R = 10k, C = 1000 pF R = 10k, C = 0.1 µF (Note 5)			90 90	%
C_{IN}	Input Capacitance	R/C_{EXT} Input (Note 6) Any Other Input (Note 6)		15 5	25	pF

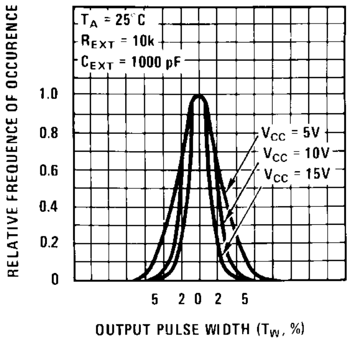
Note 3: AC Parameters are guaranteed by DC correlated testing.

Note 4: See AN-138 for detailed explanation R_{ON}.

Note 5: Maximum output duty cycle = $R_{EXT}/R_{EXT} + 1000$.

Note 6: Capacitance is guaranteed by periodic testing.

Typical Performance Characteristics



0% Point pulse width:

At V_{CC} = 5V, T_W = 10.6 µs

At V_{CC} = 10V, T_W = 10 µs

At V_{CC} = 15V, T_W = 9.8 µs

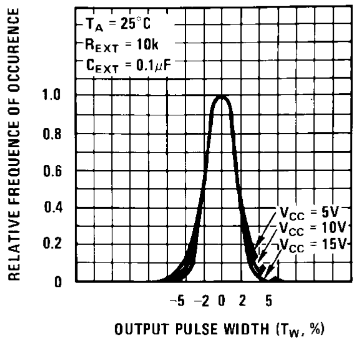
Percentage of units within +4%:

At V_{CC} = 5V, 90% of units

At V_{CC} = 10V, 95% of units

At V_{CC} = 15V, 98% of units

FIGURE 1. Typical Distribution of Units for Output Pulse Width



0% Point pulse width:

At V_{CC} = 5V, T_W = 1020 µs

At V_{CC} = 10V, T_W = 1000 µs

At V_{CC} = 15V, T_W = 982 µs

Percentage of units within +4%:

At V_{CC} = 5V, 95% of units

At V_{CC} = 10V, 97% of units

At V_{CC} = 15V, 98% of units

FIGURE 3. Typical Distribution of Units for Output Pulse Width

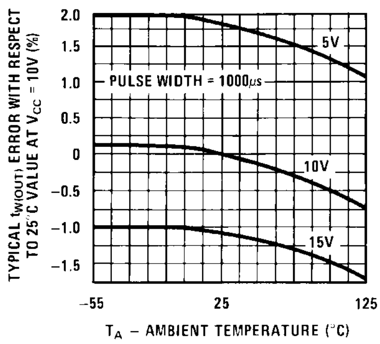


FIGURE 2. Typical Variation in Output Pulse Width vs Temperature

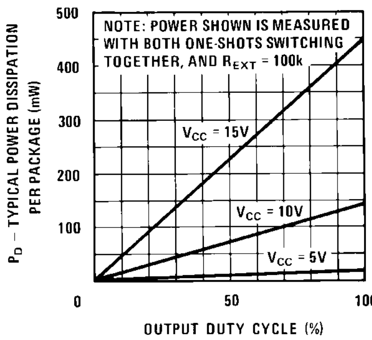
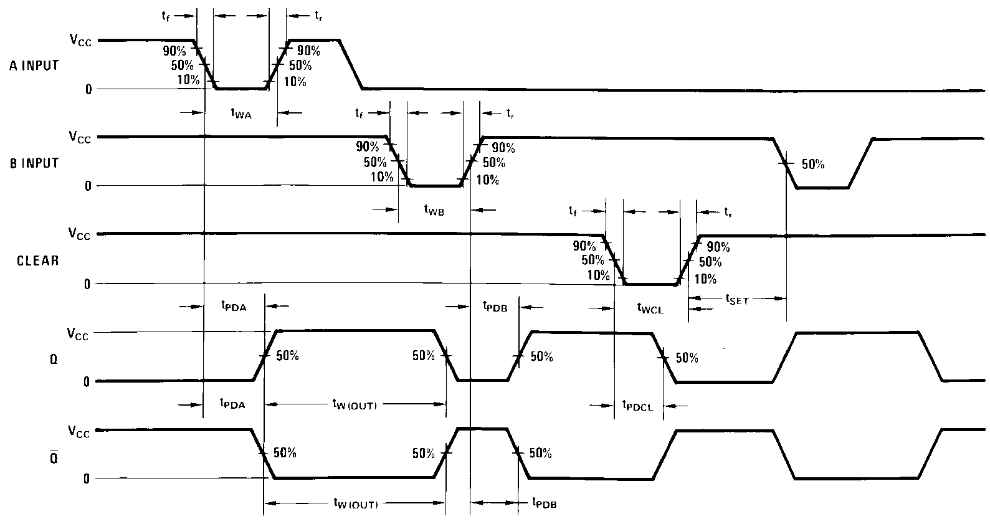


FIGURE 4. Typical Power Dissipation per Package

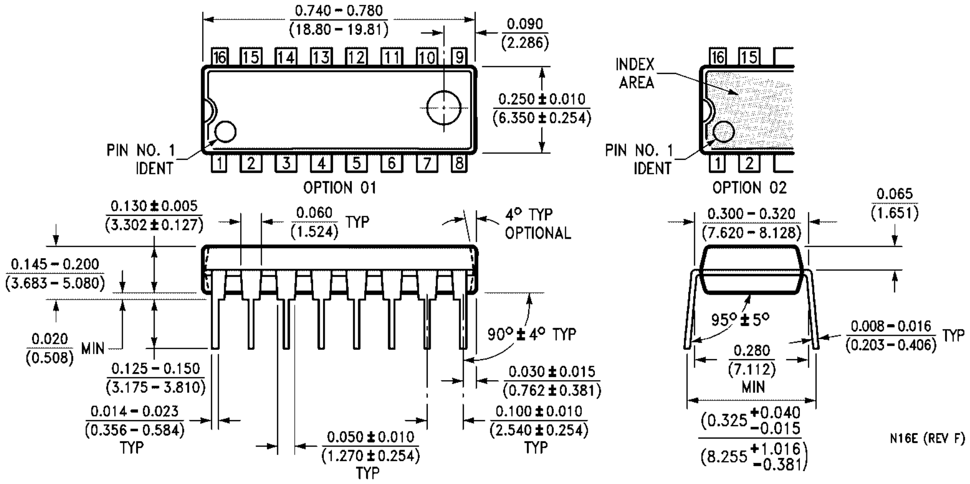
Typical Performance Characteristics (Continued)

Switching Time Waveforms



$t_r = t_f = 20$ ns

Physical Dimensions inches (millimeters) unless otherwise noted



16-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide
Package Number N16E