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NTE955MC
Integrated Circuit
CMOS Timing Circuit

Description:

The NTE955MC is a monolithic timing circuit in an 8–Lead DIP type package fabricated using CMOS process. This timer is fully compatible with CMOS, TTL, and MOS logic and operates at frequencies up to 2MHz. Because of its high impedance, this device uses smaller timing capacitors than those used by the NE555. As a result, more accurate time delays and oscillations are possible. Power consumption is low across the full range of power supply voltage.

Like the NE555, the NTE955MC has a trigger level equal to approximately one–third of the supply voltage and a threshold level equal to approximately two–thirds of the supply voltage. These levels can be altered by use of the control voltage terminal (Pin5). When the trigger input (Pin2) falls below the trigger level, the flip–flop is set and the output goes high. If Pin2 is above the trigger level and the threshold input (Pin6) is above the threshold level, the flip–flop is reset and the output is low. The reset input (Pin4) can override all other inputs and can be used to initiate a new timing cycle. If Pin4 is low, the flip–flop is reset and the output is low. Whenever the output is low, a low–impedance path is provided between the discharge terminal (Pin7) and GND. All unused inputs should be tied to an appropriate logic level to prevent false triggering.

While the CMOS output is capable of sinking over 100mA and sourcing over 10mA, the NTE955MC exhibits greatly reduced supply–current spikes during output transitions. This minimizes the need for the large decoupling capacitors required by the NE555.

Features:

- Direct Replacement for 555 Timers
- Very Low Power Consumption: 1mW Typ at V_{DD} = 5V
- Operates in Both Astable and Monostable Modes
- CMOS Output Capable of Swinging Rail to Rail
- High Output Current Capability:
  - Sink 100mA Typ
  - Source 10mA Typ
- Output Fully Compatible with CMOS, TTL, and MOS
- Low Supply Current Reduces Spikes During Output Transitions
- Single Supply Operation from 2V to 15V

Applications:

- Precision Timing
- Pulse Generation
- Sequential Timing
- Time Delay Generation
- Pulse Width Modulation
- Pulse Position Modulation
- Linear Ramp Generator

Absolute Maximum Ratings: (T_A = +25°C, Note 1 unless otherwise specified)

Power Supply Voltage (Note 2), V_{DD} 18V
Input Voltage Range (Any Input), V_I . . . . . –0.3 to V_{DD}
Sink Current, Discharge or Output 150mA
Source Current, Output, I_O 15mA
Continuous Total Power Dissipation, P_D 1000mW
Derate Above 25°C . . . . . 8mW/°C
Operating Temperature Range, T_A . . . . . 0° to +70°C
Storage Temperature Range, T_{stg} . . . . . –65° to +150°C
Lead Temperature (During Soldering, 10sec), T_L . . . . . +260°C

Note 1. Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under “Recommended Operating Conditions” is not implied. Exposure to absolute–maximum–rated conditions for extended periods may affect device reliability.

Note 2. All voltage values are with respect to network GND.

Recommended Operating Conditions:

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Supply Voltage	V_{DD}		2	–	15	V
Operating Ambient Temperature Range	T_A		0	–	70	°C

Electrical Characteristics: (T_A = +25°C, V_{DD} = 2V unless otherwise specified)

Parameter	Symbol	Test Conditions		Min	Typ	Max	Unit
Threshold Voltage	V_{TH}			0.95	1.33	1.65	V
		T_A = 0° to +70°C		0.85	–	1.75	V
Threshold Current	I_{TH}			–	10	–	pA
		T_A = 0° to +70°C		–	75	–	pA
Trigger Voltage	V_T			0.4	0.67	0.95	V
		T_A = 0° to +70°C		0.3	–	1.05	V
Trigger Current	I_T			–	10	–	pA
		T_A = 0° to +70°C		–	75	–	pA
Reset Voltage	V_R			0.4	1.1	1.5	V
		T_A = 0° to +70°C		0.3	–	2.0	V
Reset Current	I_R			–	10	–	pA
		T_A = 0° to +70°C		–	75	–	pA
Control Voltage (Open Circuit) as a Percentage of Supply Voltage		T_A = 0° to +70°C		66.7%			
Discharge Switch On–State Voltage		I_{OL} = 1mA		–	0.03	0.2	V
			T_A = 0° to +70°C	–	–	0.25	V
Discharge Switch Off–State Current				–	0.1	–	nA
		T_A = 0° to +70°C		–	0.5	–	nA
High–Level Output Voltage	V_{OH}	I_{OH} = –300µA		1.5	1.9	–	V
			T_A = 0° to +70°C	1.5	–	–	V
Low–Level Output Voltage	V_{OL}	I_{OL} = 1mA		–	0.07	0.3	V
			T_A = 0° to +70°C	–	–	0.35	V
Supply Current	I_{DD}	Note 3		–	–	250	µA
			T_A = 0° to +70°C	–	–	400	µA

Note 3. These values apply for the expected operating configurations in which Pin6 is connected directly to Pin7 or Pin2.

Electrical Characteristics: (T_A = +25°C, V_{DD} = 5V unless otherwise specified)

Parameter	Symbol	Test Conditions		Min	Typ	Max	Unit
Threshold Voltage	V_{TH}			2.8	3.3	3.8	V
		T_A = 0° to +70°C		2.7	–	3.9	V
Threshold Current	I_{TH}			–	10	–	pA
		T_A = 0° to +70°C		–	75	–	pA
Trigger Voltage	V_T			1.36	1.66	1.96	V
		T_A = 0° to +70°C		1.26	–	2.06	V
Trigger Current	I_T			–	10	–	pA
		T_A = 0° to +70°C		–	75	–	pA
Reset Voltage	V_R			0.4	1.1	1.5	V
		T_A = 0° to +70°C		0.3	–	1.8	V
Reset Current	I_R			–	10	–	pA
		T_A = 0° to +70°C		–	75	–	pA
Control Voltage (Open Circuit) as a Percentage of Supply Voltage		T_A = 0° to +70°C		66.7%			
Discharge Switch On–State Voltage		I_{OL} = 10mA		–	0.14	0.5	V
			T_A = 0° to +70°C	–	–	0.6	V
Discharge Switch Off–State Current				–	0.1	–	nA
		T_A = 0° to +70°C		–	0.5	–	nA
High–Level Output Voltage	V_{OH}	I_{OH} = –1mA		4.1	4.8	–	V
			T_A = 0° to +70°C	4.1	–	–	V
Low–Level Output Voltage	V_{OL}	I_{OL} = 8mA		–	0.21	0.4	V
			T_A = 0° to +70°C	–	–	0.5	V
		I_{OL} = 5mA		–	0.13	0.3	V
			T_A = 0° to +70°C	–	–	0.4	V
		I_{OL} = 3.2mA		–	0.08	0.3	V
			T_A = 0° to +70°C	–	–	0.35	V
Supply Current	I_{DD}	Note 3		–	170	350	µA
			T_A = 0° to +70°C	–	–	500	µA

Note 3. These values apply for the expected operating configurations in which Pin6 is connected directly to Pin7 or Pin2.

Electrical Characteristics: (T_A = +25°C, V_{DD} = 15V unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Threshold Voltage	V_{TH}		9.45	10.0	10.55	V
		T_A = 0° to +70°C	9.35	–	10.65	V
Threshold Current	I_{TH}		–	10	–	pA
		T_A = 0° to +70°C	–	75	–	pA
Trigger Voltage	V_T		4.65	5.0	5.35	V
		T_A = 0° to +70°C	4.55	–	5.45	V
Trigger Current	I_T		–	10	–	pA
		T_A = 0° to +70°C	–	75	–	pA
Reset Voltage	V_R		0.4	1.1	1.5	V
		T_A = 0° to +70°C	0.3	–	1.8	V

Electrical Characteristics (Cont'd): (T_A = +25°C, V_{DD} = 15V unless otherwise specified)

Parameter	Symbol	Test Conditions		Min	Typ	Max	Unit
Reset Current	I_R			–	10	–	pA
		T_A = 0° to +70°C		–	75	–	pA
Control Voltage (Open Circuit) as a Percentage of Supply Voltage		T_A = 0° to +70°C			66.7%		
Discharge Switch On–State Voltage		I_{OL} = 100mA		–	0.77	1.7	V
			T_A = 0° to +70°C	–	–	1.8	V
Discharge Switch Off–State Current				–	0.1	–	nA
		T_A = 0° to +70°C		–	0.5	–	nA
High–Level Output Voltage	V_{OH}	I_{OH} = –10mA		12.5	14.2	–	V
			T_A = 0° to +70°C	12.5	–	–	V
		I_{OH} = –5mA		13.5	14.6	–	V
			T_A = 0° to +70°C	13.5	–	–	V
		I_{OH} = –1mA		14.2	14.9	–	V
			T_A = 0° to +70°C	14.2	–	–	V
Low–Level Output Voltage	V_{OL}	I_{OL} = 100mA		–	1.28	3.2	V
			T_A = 0° to +70°C	–	–	3.8	V
		I_{OL} = 50mA		–	0.63	1.0	V
			T_A = 0° to +70°C	–	–	1.3	V
		I_{OL} = 10mA		–	0.12	0.3	V
			T_A = 0° to +70°C	–	–	0.4	V
Supply Current	I_{DD}	Note 3		–	360	600	µA
			T_A = 0° to +70°C	–	–	800	µA

Note 3. These values apply for the expected operating configurations in which Pin6 is connected directly to Pin7 or Pin2.

Operating Characteristics: (T_A = +25°C, V_{DD} = 5V unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Initial Error of Timing Interval (Note 4)		V_{DD} = 5V to 15V, C_T = 0.1µF, R_A = R_B = 1kΩ to 100kΩ	–	1%	3%	
Supply Voltage Sensitivity of Timing Interval			–	0.1	0.5	%/V
Output Pulse Rise Time	t_r	R_L = 10MΩ, C_L = 10pF	–	20	75	ns
Output Pulse Fall Time	t_f		–	15	60	ns
Maximum Frequency in Astable Mode	f_{max}	R_A = 470Ω, R_B = 200Ω, C_T = 200pF	1.2	2.1	–	MHz

Note 4. Timing interval error is defined as the difference between the measured value and the average value of a random sample from each process run.

Electrical Characteristics: (T_A = +25°C, V_{DD} = 5V unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Threshold Voltage	V_{TH}		2.8	3.3	3.8	V
Threshold Current	I_{TH}		–	10	–	pA
Trigger Voltage	V_T		1.36	1.66	1.96	V
Trigger Current	I_T		–	10	–	pA
Reset Voltage	V_R		0.4	1.1	1.5	V
Reset Current	I_R		–	10	–	pA

Electrical Characteristics (Cont'd): (T_A = +25°C, V_{DD} = 5V unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Control Voltage (Open Circuit) as a Percentage of Supply Voltage				66.7%		
Discharge Switch On–State Voltage		I_{OL} = 10mA	–	0.14	0.5	V
Discharge Switch Off–State Current			–	0.1	–	nA
High–Level Output Voltage	V_{OH}	I_{OH} = –1mA	4.1	4.8	–	V
Low–Level Output Voltage	V_{OL}	I_{OL} = 8mA	–	0.21	0.4	V
		I_{OL} = 5mA	–	0.13	0.3	V
		I_{OL} = 3.2mA	–	0.06	0.3	V
Supply Current	I_{DD}	Note 3	–	170	350	µA

Note 3. These values apply for the expected operating configurations in which Pin6 is connected directly to Pin7 or Pin2.

Function Table:

Threshold Voltage	Trigger Voltage	Reset Voltage	Output	Discharge Switch
Don't Care	Don't Care	< MIN	Low	On
Don't Care	< MIN	> MAX	High	Off
> MAX	> MAX	> MAX	Low	On
< MIN	> MAX	> MAX	As previously established	

Note 5. For conditions shown as MIN or MAX, use the appropriate value specified under electrical characteristics.

Pin Connection Diagram