



ELECTRONICS, INC.
 44 FARRAND STREET
 BLOOMFIELD, NJ 07003
 (973) 748-5089
<http://www.nteinc.com>

NTE4045B Integrated Circuit CMOS, 21-Stage Counter

Description:

The NTE4045B is a timing circuit in a 16-Lead DIP type package consisting of 21 counter stages, two output-shaping flip-flops, two inverter output drivers, and input inverters for use in a crystal oscillator. The NTE4045B configuration provides 21 flip-flop counting stages, and two flip-flops for shaping the output waveform for a 3.125% duty cycle. Push-pull operation is provided by the inverter output drivers.

Features:

- Very Low Operating Dissipation: < 1mW (Typ) at $V_{DD} = 5V$, $f\phi = 1MHz$
- Output Drivers with Sink or Source Capability: 7mA (Typ) at $V_{DD} = 5V$
- Medium Speed (Typ): $f\phi = 25Mhz$ at $V_{DD} = 10V$
- 5V, 10V, and 15V Parametric Ratings

Applications:

- Digital Equipment in which Ultra-Low Dissipation and/or Operation using a Battery Source is Required
- Accurate Timing from a Crystal Oscillator for Timing Applications such as Wall Clocks, Table Clocks, Automobile Clocks, and Digital Timing References in any Circuit Requiring Accurately Timed Outputs at various Intervals in the Counting Sequence
- Driving Miniature Synchronous Motors, Stepping Motors, or External Bipolar Transistors in Push-Pull Fashion

Absolute Maximum Ratings:

DC Supply Voltage Range (Voltages referenced to V_{SS}), V_{DD}	-0.5 to +20.0V
Input Voltage Range (All Inputs)	-0.5 to $V_{DD} + 0.5V$
DC Input Current (Any One Input)	$\pm 10mA$
Power Dissipation (Per Package), P_D	
For $T_A = -55^\circ$ to $+100^\circ C$	500mW
For $T_A = +100^\circ$ to $+125^\circ C$	Derate Linearly at 12mW/ $^\circ C$ to 200mW
Device Dissipation (Per Output Transistor)	
For $T_A =$ Full Package Temperature Range	100mW
Operating Temperature Range, T_A	-55° to $+125^\circ C$
Storage Temperature Range, T_{stg}	-65° to $+150^\circ C$
Lead Temperature (During Soldering, 10sec max), T_L	$+265^\circ C$

Recommended Operating Conditions: (Note 1)

Parameter	V _{DD}	Min	Max	Unit
Supply–Voltage Range (For T _A = Full Package Temperature Range)	–	3	18	V
Minimum Input–Pulse Width, t _W	5V	–	100	ns
	10V	–	50	ns
	15V	–	40	ns
Maximum Input–Pulse Frequency (External Pulse Source), f _φ	5V	5	–	MHz
	10V	12	–	MHz
	15V	15	–	MHz

Note 1. For maximum reliability, nominal operating conditions should be selected so that operation is always within the “Recommended Operating Conditions”.

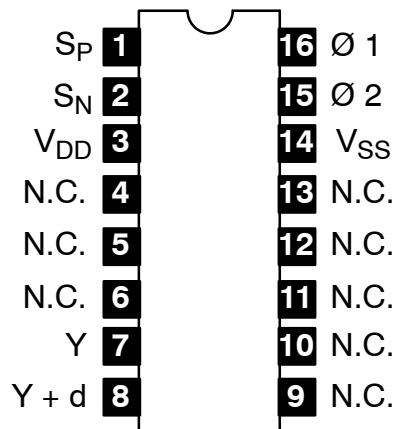
Static Electrical Characteristics:

Characteristic	Conditions			Limits at Indicated Temperature (°C)							Units
	V _O (V)	V _{IN} (V)	V _{DD} (V)	–55°C	–40°C	+85°C	+125°C	+25°C			
								Min.	Typ.	Max.	
Quiescent Device Current I _{DD} Max	–	0,5	5	5.0	5.0	150	150	–	0.04	5.0	μA
	–	0,10	10	10.0	10.0	300	300	–	0.04	10.0	μA
	–	0,15	15	20.0	20.0	600	600	–	0.04	20.0	μA
	–	0,20	20	1000	100	3000	3000	–	0.08	100	μA
Output Low (Sink) Current I _{OL} Min.	0.4	0,5	5	4.5	4.3	2.9	2.5	3.6	7.0	–	mA
	0.5	0,10	10	11.2	10.5	7.7	6.3	9.1	18.0	–	mA
	1.5	0,15	15	29.4	28.0	19.6	16.8	23.8	47.0	–	mA
Output High (Source) Current I _{OH} Min.	4.6	0,5	5	–4.5	–4.3	–2.9	–2.5	–3.6	–7.0	–	mA
	9.5	0,10	10	–11.2	–10.5	–7.7	–6.3	–9.1	–18.0	–	mA
	13.5	0,15	15	–29.4	–28.0	–19.6	–16.8	–23.8	–47.0	–	mA
Pin15 Output Low and High Current I _{OL} , I _{OH}	0.4,4.6	0,5	5	–				±0.1	±0.18	–	mA
	0.5,9.5	0,10	10	–				±0.2	±0.3	–	mA
	1.5,13.5	0,15	15	–				±0.5	±1.0	–	mA
Output Voltage Low–Level V _{OL} Max.	–	5	5	0.05				–	0	0.05	V
	–	10	10	0.05				–	0	0.05	V
	–	15	15	0.05				–	0	0.05	V
Output Voltage High–Level V _{OH} Min.	–	5	5	4.95				4.95	5	–	V
	–	10	10	9.95				9.95	10	–	V
	–	15	15	14.95				14.95	15	–	V
Input Low Voltage V _{IL} Max.	0.5,4.5	–	5	1.5				–	–	1.5	V
	1,9	–	10	3.0				–	–	3.0	V
	1.5,13.5	–	15	4.0				–	–	4.0	V
Input High Voltage V _{IH} Min.	0.5,4.5	–	5	3.5				3.5	–	–	V
	1,9	–	10	7.0				7.0	–	–	V
	1.5,13.5	–	15	11.0				11.0	–	–	V
Input Current, I _{IN} Max.	–	0,18	18	±0.1	±0.1	±1.0	±1.0	–	±10 ^{–5}	±0.1	μA

Dynamic Electrical Characteristics: ($T_A = +25^\circ\text{C}$, $C_L = 50\text{pF}$, $R_L = 200\text{k}\Omega$, t_r and $t_f = 20\text{ns}$ unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit	
Propagation Delay Time ϕ_1 to y or y+d out	t_{PHL} or t_{PLH}	$V_{\text{DD}} = 5\text{V}$	–	2.2	5.5	ns	
		$V_{\text{DD}} = 10\text{V}$	–	0.9	2.7	ns	
		$V_{\text{DD}} = 15\text{V}$	–	0.65	2.0	ns	
Transition Time	t_{THL} or t_{TLH}	$V_{\text{DD}} = 5\text{V}$	–	25	50	ns	
		$V_{\text{DD}} = 10\text{V}$	–	13	25	ns	
		$V_{\text{DD}} = 15\text{V}$	–	10	20	ns	
Minimum Input–Pulse Width	t_{W}	$V_{\text{DD}} = 5\text{V}$	–	50	100	ns	
		$V_{\text{DD}} = 10\text{V}$	–	25	50	ns	
		$V_{\text{DD}} = 15\text{V}$	–	20	40	ns	
Input–Pulse Rise or Fall Time	$t_{r\phi}$, $t_{f\phi}$	$V_{\text{DD}} = 5\text{V}$	–	–	500	μs	
		$V_{\text{DD}} = 10\text{V}$	–	–	500	μs	
		$V_{\text{DD}} = 15\text{V}$	–	–	500	μs	
Maximum Input–Pulse Frequency (External Pulse Source)	$f\phi$	$V_{\text{DD}} = 5\text{V}$	5	10	–	MHz	
		$V_{\text{DD}} = 10\text{V}$	12	25	–	MHz	
		$V_{\text{DD}} = 15\text{V}$	15	30	–	MHz	
Input Capacitance	C_{IN}	Any Input	–	5.0	7.5	pF	
Variation of Output Frequency (Unit–to–Unit)		$V_{\text{DD}} = 5\text{V}$	f = 5MHz	–	0.05	–	%
		$V_{\text{DD}} = 10\text{V}$		–	0.03	–	%
		$V_{\text{DD}} = 15\text{V}$		–	0.1	–	%
RC Oscillator Operation							
Maximum Oscillator Frequency	f_{OSC}	$V_{\text{DD}} = 5\text{V}$	$R_X = 50\text{k}\Omega$, $R_S = 560\text{k}\Omega$, $C_X = 50\text{pF}$	45	60	75	kHz
		$V_{\text{DD}} = 10\text{V}$		45	60	75	kHz
		$V_{\text{DD}} = 15\text{V}$		45	60	75	kHz

Pin Connection Diagram



Note: Observe power supply connections, V_{DD} is Pin3 & V_{SS} is Pin14, **NOT** Pins 16 & 8 respectively as in other 4000 Series 16–Lead devices.

