



## NTE2764 Integrated Circuit NMOS, 64K Erasable EPROM, 200ns

### **Description:**

The NTE2764 is a 65,536-bit (8192 X 8 bit) Ultraviolet Erasable and Electrically Programmable Read-Only Memory (EPROM) in a 28-Lead DIP type package which operates from a single +5V supply, making it ideal for microprocessor applications. It features an output enable control and offers a standby mode with an attendant 67% savings in power consumption.

A distinctive feature of the NTE2764 is a separate output control, output enable ( $\overline{OE}$ ) from the chip enable control ( $\overline{CE}$ ). The  $\overline{OE}$  control eliminates bus contention in multiple-bus microprocessor systems. The NTE2764 features fast, simple one-pulse programming controlled by TTL-level signals. Total programming time for all 65,536 bits is 420 seconds.

### **Features:**

- Ultraviolet Erasable and Electrically Programmable
- Access Time: 250ns Max
- Single Location Programming
- Programmable with Single Pulse
- Low Power Dissipation: 150mA Max (Active Current)  
50mA Max (Standby Current)
- Input/Output TTL Compatible for Reading and Programming
- Single +5V Power Supply
- Three-State Outputs

### **Absolute Maximum Ratings:** ( $T_A = +25^\circ\text{C}$ , Note 1 unless otherwise specified)

Supply Voltage, $V_{CC}$ .....	-0.6 to +6V
Supply Voltage, $V_{PP}$ .....	-0.6 to +22V
Output Voltage, $V_{OUT}$ .....	-0.6 to +6V
Input Voltage, $V_{IN}$ .....	-0.6 to +6V
Operating Temperature Range, $T_{opr}$ .....	-10°C to +80°C
Storage Temperature Range, $T_{stg}$ .....	-65°C to +125°C

Note 1. Exposing the device to stresses above those listed in Absolute Maximum Ratings could cause permanent damage. The device is not meant to be operated under conditions outside the limits described in the operational sections of this specification. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

**DC Electrical Characteristics:** ( $V_{CC} = +5V \pm 5\%$  unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>Read Mode and Standby Mode</b> ( $T_A = 0^\circ$ to $+70^\circ\text{C}$ )						
Output High Voltage	$V_{OH}$	$I_{OH} = -400\mu\text{A}$	2.4	–	–	V
Output Low Voltage	$V_{OL}$	$I_{OL} = 2.1\text{mA}$	–	–	0.45	V
Input High Voltage	$V_{IH}$		2.0	–	$V_{CC} + 1$	V
Input Low Voltage	$V_{IL}$		-0.1	–	+0.8	V
Output Leakage Current	$I_{LO}$	$V_{OUT} = 5.25\text{V}$	–	–	10	$\mu\text{A}$
Input Leakage Current	$I_{LI}$	$V_{IN} = 5.25\text{V}$	–	–	10	$\mu\text{A}$
$V_{CC}$ Current Standby	$I_{CC1}$	$\overline{CE} = V_{IH}$	–	–	50	mA
		$\overline{OE} = \overline{CE} = V_{IL}$	–	–	150	mA
<b>Program, Program Verify, and Program Inhibit Mode</b> ( $T_A = +25^\circ \pm 5^\circ\text{C}$ , $V_{PP} = +21\text{V} \pm 0.5\text{V}$ )						
Input High Voltage	$V_{IH}$		2.0	–	$V_{CC} + 1$	V
Input Low Voltage	$V_{IL}$		-0.1	–	+0.8	V
Input Leakage Current	$I_{LI}$	$V_{IN} = V_{IL}$ or $V_{IH}$	–	–	10	$\mu\text{A}$
Output High Voltage	$V_{OH}$	$I_{OH} = -400\mu\text{A}$	2.4	–	–	V
Output Low Voltage	$V_{OL}$	$I_{OL} = 2.1\text{mA}$	–	–	0.45	V
$V_{CC}$ Current	$I_{CC}$		–	–	150	mA
$V_{PP}$ Current	$I_{PP}$	$\overline{CE} = V_{IL}$ , $\overline{PGM} = V_{IL}$	–	–	30	mA

**AC Electrical Characteristics:** ( $V_{CC} = +5V \pm 5\%$  unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>Read Mode and Standby Mode</b> ( $T_A = 0^\circ$ to $+70^\circ\text{C}$ , Note 2)						
Address to Output Delay	$t_{ACC}$	$\overline{CE} = \overline{OE} = V_{IL}$	–	–	250	ns
$\overline{CE}$ to Output Delay	$t_{CE}$	$\overline{OE} = V_{IL}$	–	–	250	ns
Output Enable to Output Delay	$t_{OE}$	$\overline{CE} = V_{IL}$	10	–	100	ns
Output Enable High to Output Float	$t_{DF}$	$\overline{CE} = V_{IL}$	0	–	90	ns
Address to Output Hold	$t_{OH}$	$\overline{CE} = \overline{OE} = V_{IL}$	0	–	–	ns
<b>Read Mode and Standby Mode</b> ( $T_A = +25^\circ\text{C} \pm 5^\circ\text{C}$ , $V_{PP} = +21\text{V} \pm 5\text{V}$ , Note 3)						
Address Setup Time	$t_{AS}$		2	–	–	$\mu\text{s}$
$\overline{OE}$ Setup Time	$t_{OES}$		2	–	–	$\mu\text{s}$

## Note 2. Test Conditions:

Output Load: 1 TTL gate and  $C_L = 100\text{pF}$ 

Input Rise and fall Times: 20ns

Input Pulse Levels: 0.8V to 2.2V

Timing Measurement Reference Level:

Inputs: 1.0V and 2.0V

Outputs: 0.8V and 2.0V

## Note 3. Test Conditions:

Input Pulse Levels: 0.8V to 2.2V

Input Timing Reference Level: 1.0V and 2.0V

Output Timing Reference Level: 0.8V and 2.0V

Input Rise and fall Times: 20ns

**AC Electrical Characteristics (Cont'd):** ( $V_{CC} = +5V \pm 5\%$  unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>Read Mode and Standby Mode (Cont'd)</b> ( $T_A = +25^\circ C \pm 5^\circ C$ , $V_{PP} = +21V \pm 5V$ , Note 3)						
Data Setup Time	$t_{DS}$		2	–	–	$\mu s$
Address Hold Time	$t_{AH}$		0	–	–	$\mu s$
$\overline{CE}$ Setup Time	$t_{CES}$		2	–	–	$\mu s$
Data Hold Time	$t_{DH}$		2	–	–	$\mu s$
Chip Enable to Output Float Delay	$t_{DF}$		0	–	130	ns
Data Valid from $\overline{OE}$	$t_{OE}$		–	–	150	ns
Program Pulse Width	$t_{PW}$		45	50	55	ms
$V_{PP}$ Setup Time	$t_{VS}$		2	–	–	$\mu s$

**Note 3. Test Conditions:**

Input Pulse Levels: 0.8V to 2.2V  
 Input Timing Reference Level: 1.0V and 2.0V  
 Output Timing Reference Level: 0.8V and 2.0V  
 Input Rise and fall Times: 20ns

**Capacitance:** ( $T_A = +25^\circ C$ ,  $f = 1MHz$  unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Input Capacitance	$C_{IN}$	$V_{IN} = 0V$	–	–	6	pF
Output Capacitance	$C_{OUT}$	$V_{OUT} = 0V$	–	–	12	pF

**Mode Selection:** (Note 4)

Mode	CE	OE	PGM	$V_{PP}$	$V_{CC}$	$O_0 - O_7$
Read	$V_{IL}$	$V_{IL}$	$V_{IH}$	$V_{CC}$	$V_{CC}$	$D_{OUT}$
Standby	$V_{IH}$	X	X	$V_{CC}$	$V_{CC}$	High Z
Program	$V_{IL}$	X	$V_{IL}$	$V_{PP}$	$V_{CC}$	$D_{IN}$
Program Verify	$V_{IL}$	$V_{IL}$	$V_{IH}$	$V_{PP}$	$V_{CC}$	$D_{OUT}$
Program Inhibit	$V_{IH}$	X	X	$V_{PP}$	$V_{CC}$	High Z

Note 4. X can be either  $V_{IL}$  or  $V_{IH}$ .

**Function:**

The NTE2764 operates from a single +5V power supply, making it ideal for microprocessor applications. Programming of the NTE2764 is achieved with a single 50ms TTL pulse. Total programming time for all 65,536 bits is 420 sec. Due to the simplicity of the programming requirements, devices on boards and in systems may be easily programmed without any special programmer.

The NTE2764 features a standby mode which reduces the power dissipation from a maximum active power dissipation of 788mW to a maximum standby power dissipation of 262mW. This results in a 67% savings with no increase in access time.

Erase of the NTE2764 programmed data can be attained when exposed to light with wavelengths shorter than approximately 4,000 Angstroms. It should be noted that constant exposure to direct sunlight or room level fluorescent lighting could erase the NTE2764. Consequently, if the NTE2764 is to be exposed to these types of lighting conditions for long periods of time, its window should be masked to prevent unintentional erasure.

### Output Deselect:

The data outputs of two or more NTE2764s may be wire-ORed together to the same data bus. In order to prevent bus contention problems between devices, all but the selected NTE2764s should be deselected by raising the  $\overline{CE}$  input to a TTL high.  $\overline{OE}$  input should be made common to all devices and connected to the READ line from the system control BUS. These connections offer the lowest average power consumption.

