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## **NTE2060 & NTE2061 Integrated Circuit PMOS LSI Alarm Clock Circuit**

### **Applications:**

- Alarm Clock
- Clock Radio
- Timer for Home Appliances
- Display of Elapsed Time

### **Functions:**

- Real Time Display
- Alarm With Snooze Function
- Sleep Timer (59 Minutes Max)

### **Features:**

- Single Chip P-Channel ED MOS LSI
- Direct Drive Capable:
  - LED (5mA or More, Red LED)
  - Fluorescent Display Tube (Light-Up Voltage 16V or Less)
- Wide Operating Voltage Range: -8V to -16V
- Capable of 50Hz or 60Hz Reference Frequency
- Two Selections of Display Mode:
  - AM/PM 12-Hour
  - 24-Hour
- 24-Hour Alarm Function
- Repeatable Snooze Function
- Presetable 59-Minute Down Counter (Sleep Timer)
- SNOOZE Pin can be used to Set the Sleep Timer with One Touch
- Clock Input Noise Eliminator
- Power Failure Indicating Function (All Digits Flashing):
  - 12H Display Mode → AM or OUTPUT of LSI
  - 24H Display Mode → AM, PM or b & c OUTPUT of LSI

**Absolute Maximum Ratings:** ( $T_A = +25^{\circ}\text{C}$ ,  $V_{SS} = 0\text{V}$  unless otherwise specified)

Maximum Supply Voltage, $V_{DDmax}$ .....	-18 to +0.3V
Input Voltage, $V_{IN}$ .....	$V_{DD} - 0.3$ to +0.3V
Output Voltage (Output Pin OFF), $V_{OUT}$ .....	$V_{DD} - 0.3$ to +0.3V
Allowable Power Dissipation ( $T_A = +70^{\circ}\text{C}$ ), $P_{Dmax}$ .....	900mW
Operating Temperature Range, $T_{opr}$ .....	$-30^{\circ}$ to $+70^{\circ}\text{C}$
Storage Temperature Range, $T_{stg}$ .....	$-55^{\circ}$ to $+125^{\circ}\text{C}$

**Recommended Operating Conditions:** ( $T_A = +25^{\circ}\text{C}$ ,  $V_{SS} = 0\text{V}$  unless otherwise specified)

Parameter	Symbol	Min	Typ	Max	Unit
Supply Voltage	$V_{DD}$	-16	-12	-8	V
Input "H" Level Voltage	$V_{IH}$	-1	-	0	V
Input "L" Level Voltage	$V_{IL}$	$V_{DD}$	-	$V_{DD} + 2$	V

**Electrical Characteristics:** ( $T_A = +25^{\circ}\text{C}$ ,  $V_{SS} = 0\text{V}$ ,  $V_{DD} = 12\text{V} \pm 2\text{V}$  unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>Output "H" Level Current</b> ALARM OUT, SLEEP OUT	$I_{OH(1)}$	$V_{OH} = V_{SS} - 2\text{V}$	0.5	-	-	mA
b & c, a & d	$I_{OH(2)}$	$V_{OH} = V_{SS} - 2.5\text{V}$	10	-	-	mA
1Hz	$I_{OH(3)}$	$V_{OH} = V_{SS} - 2.5\text{V}$	13	-	-	mA
All Other Outputs	$I_{OH(4)}$	$V_{OH} = V_{SS} - 2.5\text{V}$	5	-	Note 1	mA
<b>Output Leakage Current</b> ALARM OUT, SLEEP OUT	$I_{OL(1)}$	$V_{OL} = V_{DD}$	-	-	5	$\mu\text{A}$
All Other Outputs	$I_{OL(2)}$	$V_{OL} = V_{DD} + 1.8\text{V}$	-	-	50	$\mu\text{A}$
<b>Current Dissipation</b>	$I_{DD}$	$V_{DD} = -12\text{V}$	-	3	-	mA

Note 1. 11mA Max is allowed in the range where the power dissipation is 900mW and 1.2W at  $T_A = +70^{\circ}\text{C}$  and  $+25^{\circ}\text{C}$  respectively.

**Function Table A:**

Alarm Display Input	Seconds Display Input	Sleep Display Input	Display Mode
L	L	L	Real Time Display
H	L	L	Alarm Display
L	H	L	Seconds Display
H	H	L	Alarm Display
L	L	H	Sleep Display
H	L	H	Sleep Display
L	H	H	Sleep Display
H	H	H	Sleep Display

Note 2. "H": Input Pin —  $V_{SS}$  Level  
 "L": Input Pin —  $V_{DD}$  Level (or Open)

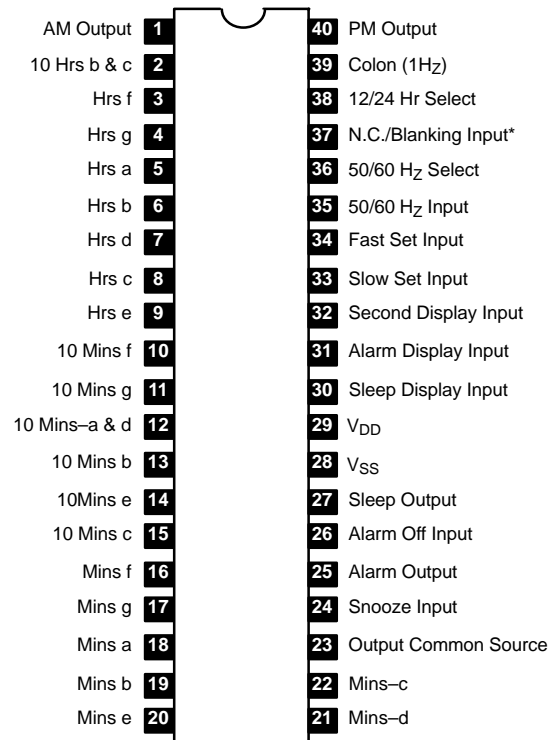
**Function Table B:**

Display Mode	Time Setting Input Pin	Function
Real Time Display	FAST	Minutes contents advance at a 60Hz (Note 3) rate.
	SLOW	Minutes contents advance at a 2Hz rate.
	BOTH	Minutes contents advance at a 60Hz (Note 3) rate.
Alarm Display	FAST	Minutes contents advance at a 60Hz (Note 3) rate.
	SLOW	Minutes contents advance at a 2Hz rate.
	BOTH	AM 12:00 is set when in the 12-hour display mode. 0:00 is set when in the 24-hour display mode.
Seconds Display	FAST	00 seconds is set. No carry to minutes is generated.
	SLOW	Seconds counting is stopped (Held).
	BOTH	(When in the 12-hour display mode) the real time counter is set to AM 12:00. (When in the 24-hour display mode) the real time counter is set to 0:00.
Sleep Display	FAST	Minutes contents advance at a 60Hz (Note 3) rate.
	SLOW	Minutes contents advance at a 2Hz rate.
	BOTH	Minutes contents advance at a 60Hz (Note 3) rate.

Note 3. For 50Hz use, 50Hz shall apply.

Note 4. Both means that 2 input pins of FAST and SLOW are set to “H”.

**Pin Connection Diagram**



**Note:** N.C. pin must not be used for external connection such as a relay point.  
Pin 37 is Blanking Input on the NTE2061

