# Heating Controller

## Features

- Dual Voltage (120V/240V) operations
- Auto temperature control with NTC
- NTC open protection
- Multi mode LED indicator
- Direct drive SCR
- Auto Heating off after heating timer timeout
- Low cost 8-Pin DIP and SOIC package

## Applications

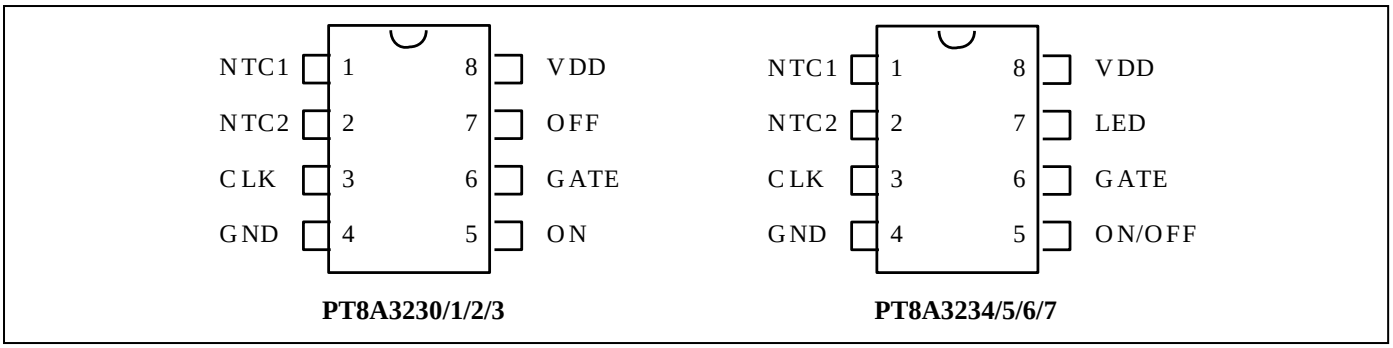
- Hair Curler

## Description

The PT8A3230/1/2/3/14/5/6/7 is a mixed signal CMOS LSI chip designed for the automatic controller of heat with external NTC (Negative Temperature Component). NTC open protection is implemented for device safety. When NTC is open, it will cut off GATE output to disable heating, and the LED1 will flash at 1/8 CLK.

The device can be used in both 120V and 240V power line supplier, automatically adjusting the heating power according to the power line voltage to avoid heating appliance damage.

## Pin Configuration




**PT8A3230/1/2/3** **PT8A3234/5/6/7**

## Pin Description

| No. | Pin Name | | I/O | | Description |
|---|---|---|---|---|---|
| | PT8A323 0/1/2/3 | PT8A323 4/5/6/7 | PT8A323 0/1/2/3 | PT8A323 4/5/6/7 | |
| 1 | NTC1 | NTC1 | I | I | NTC voltage input, NTC open detection input. |
| 2 | NTC2 | NTC2 | O | O | Output signal for NTC open detection. |
| 3 | CLK | CLK | I | I | Clock input from power line. |
| 4 | GND | GND | GND | GND | Ground. |
| 5 | ON | ON/OFF | I/O | I/O | Heating-on button input for PT8A3230/1/2/3 or Heating-on/off input for PT8A3234/5/6/7 and LED driving output. |
| 6 | GATE | GATE | O | O | SCR trigger output, active high. |
| 7 | OFF | LED | I/O | O | Heating-off button input and LED2 driving output for PT8A3230/1/2/3 or only LED2 driving output for PT8A3234/5/6/7. |
| 8 | VDD | VDD | Power | Power | Power. |

## Maximum Ratings

Storage Temperature……..- 65°C to +150°C
Ambient Temperature with Power Applied……-20 °C to +85 °C
Supply Voltage to Ground Potential (Inputs & $V_{CC}$ only)…….- 0.5 to +6.0V
Supply Voltage to Ground Potential (Outputs & D/O only) …… - 0.5 to +6.0V
DC Input Voltage ……- 0.5V to $V_{CC}$ +0.5V
DC Output Current …… 20mA
Power Dissipation…… 500mW

**Note:**
Stresses greater than those listed under MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

### Recommended Operation Conditions

| Sym | Pin | Description | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $V_{CC}$ | VDD | Supply voltage. | 3.5 | 5.0 | 5.5 | V |
| $f_{CLK}$ | CLK | Input clock frequency | - | 50/60 | - | Hz |
| $T_A$ | - | Operation temperature | -20 | - | 85 | °C |

## DC Electrical Characteristics

(Unless otherwise noted, $V_{CC}$ = 3.5 ~ 5V, $T_A$ = -20 ~ 85℃)

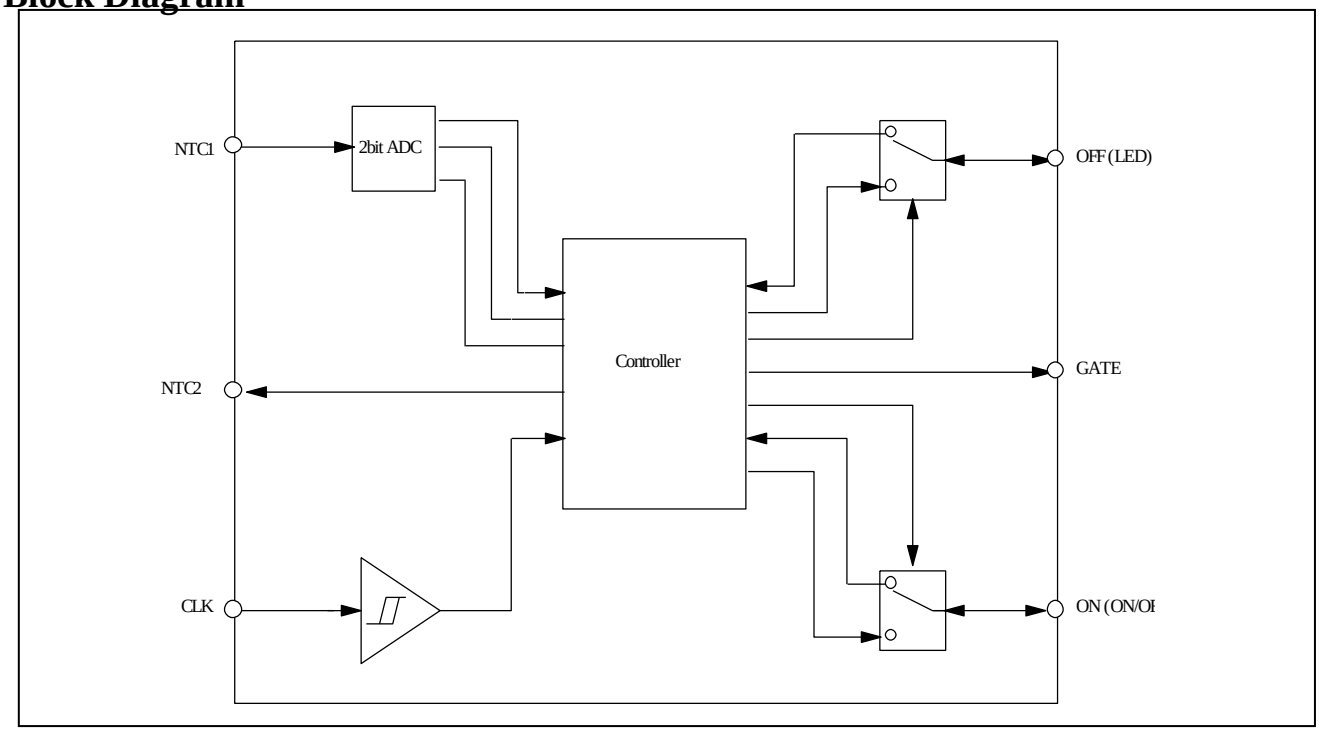
| Sym | Description | Test conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $I_{IH}$ | Input high current | PIN: NTC1, CLK | $V_{IN} = V_{CC}$ | - | - | 5 | μA |
| | | PIN: NTC2 | $V_{IN} = V_{CC}$ Output high impedance | - | - | 100 | nA |
| $I_{IL}$ | Input low current | PIN: NTC1, CLK | $V_{IN}$ = GND | - | - | -5 | μA |
| | | PIN: NTC2 | $V_{IN}$ = 0 Output high impedance | - | - | -100 | nA |
| $I_{OH}$ | Output high current | PIN: GATE | $V_{CC}$ = 5.0V Vout = 4.5V | -1.5 | - | - | mA |
| $I_{OL}$ | Output low current | PIN: NTC2 | $V_{CC}$ = 5.0V Vout =0.5V | 2.0 | - | - | mA |
| | | PIN: GATE | | 2.5 | - | - | mA |
| $V_{NTC0}$ | Input voltage 0 | PIN: NTC1 | | $0.29V_{CC}$ | $0.31V_{CC}$ | $0.33V_{CC}$ | V |
| $V_{NTC1}$ | Input voltage 1 | PIN: NTC1 | | $0.37V_{CC}$ | $0.385V_{CC}$ | $0.40V_{CC}$ | |
| $V_{NTC2}$ | Input voltage 2 | PIN: NTC1 | | $0.39V_{CC}$ | $0.40V_{CC}$ | $0.41V_{CC}$ | |
| $I_{CC}$ | Current consumption | NTC1, CLK tied to GND, $V_{CC}$ = 5.0V | | - | - | 250 | μA |

## AC Electrical Characteristics

(Unless otherwise noted, $V_{CC}$ = 3.5 ~ 5V, $T_A$ = -20 ~ 85℃)

| Sym | Description | Test conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $f_{CLK}$ | CLK frequency | - | - | 50/60 | - | Hz |
| Timer | Power off timer | $F_{CLK}$= 50Hz | 1.15 | 1.2 | 1.25 | Hour |

## Block Diagram




# Function Description

## State description

**Reset:** The device will be at reset state after power-on.
**Heating-on:** The device will be at heating-on state after heating-on button is pressed.
**Heating-off:** This device enters heating-off state after its power-on reset or heating timer timeout or heating-off button pressed.

**Timer**

Once the device enters Heating-on state, internal timer start counting. It reaches timeout state and exit heating-on state after 216000 clock period, that is, the heating time is about 1 hour for 60Hz CLK signal, and 1.2 hour for 50Hz.

**Control signal output**

When working in Heating-on state, GATE/LED output will be related to NTC input and CLK input amplitude.

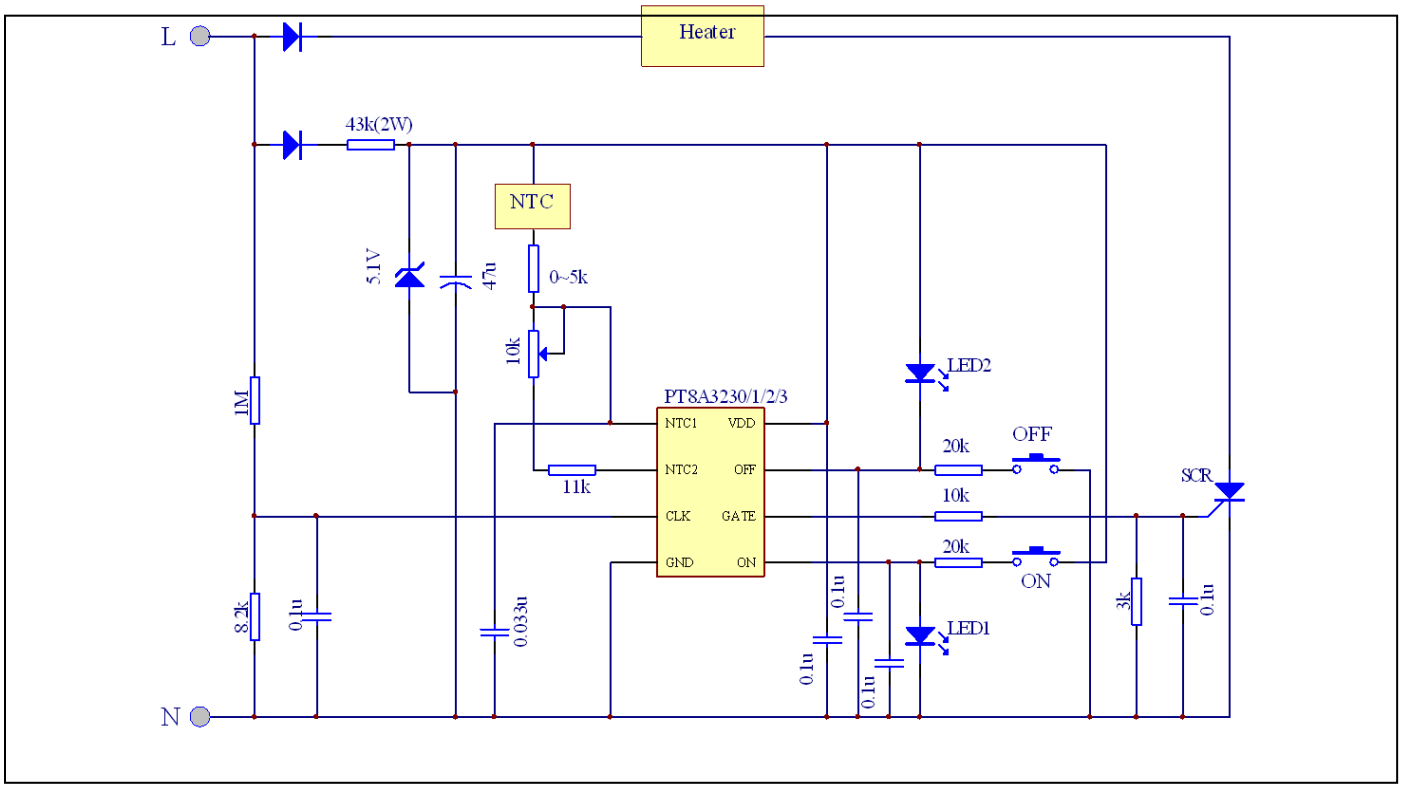
**Effect of NTC and CLK input voltage on GATE and LED indication**

| Working state | Power line voltage | NTC (NTC open detection) | NTC (normal temp detection) | GATE （Trigger of SCR） | LED （Pin 5） | | |
|---|---|---|---|---|---|---|---|
| | | | | | PT8A3230/2/4/6 | | PT8A3231/3/5/7 |
| | | | | | $V_{NTC}$ up | $V_{NTC}$ down | |
| ON | 240V | NTC<10M(Ohm) | 0 ~ $V_{NTC0}$ | 25% | Flash1* | Flash1 | On |
| | | | $V_{NTC0}$ ~ $V_{NTC1}$ | 12.5% | Flash1 | Flash1 | On |
| | | | $V_{NTC1}$ ~ $V_{NTC2}$ | | | On | |
| | | | $V_{NTC2}$ ~ $V_{DD}$ | 0 | On | On | On |
| | 120V | | 0 ~ $V_{NTC0}$ | 100% | Flash1 | Flash1 | On |
| | | | $V_{NTC0}$ ~ $V_{NTC1}$ | 50% | Flash1 | Flash1 | On |
| | | | $V_{NTC1}$ ~ $V_{NTC2}$ | | | On | |
| | | | $V_{NTC2}$ ~ $V_{DD}$ | 0 | On | On | On |
| OFF | X* | | X | 0 | Off | Off | Off |
| X | X | NTC>20M(Ohm) | X | 0 | Flash2* | Off | Off |

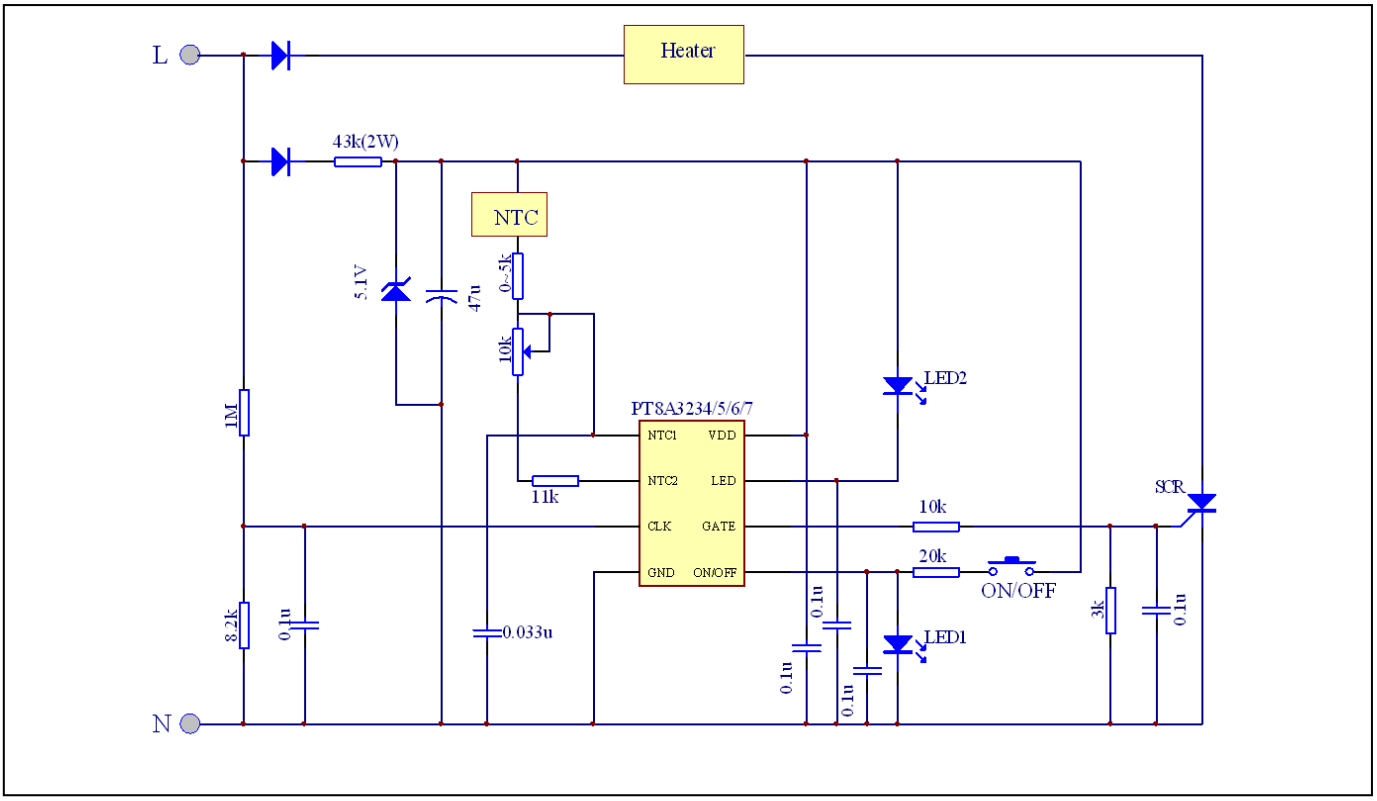
***Note**：1）X means any input.
2）Flash1 frequency if 1/32 CLK.
3）Flash2 frequency is 1/8 CLK.
4）LED2(Pin 7)is always in reverse with LED1.

# Typical Application Circuit

**PT8A3230/1/2/3 application circuit**

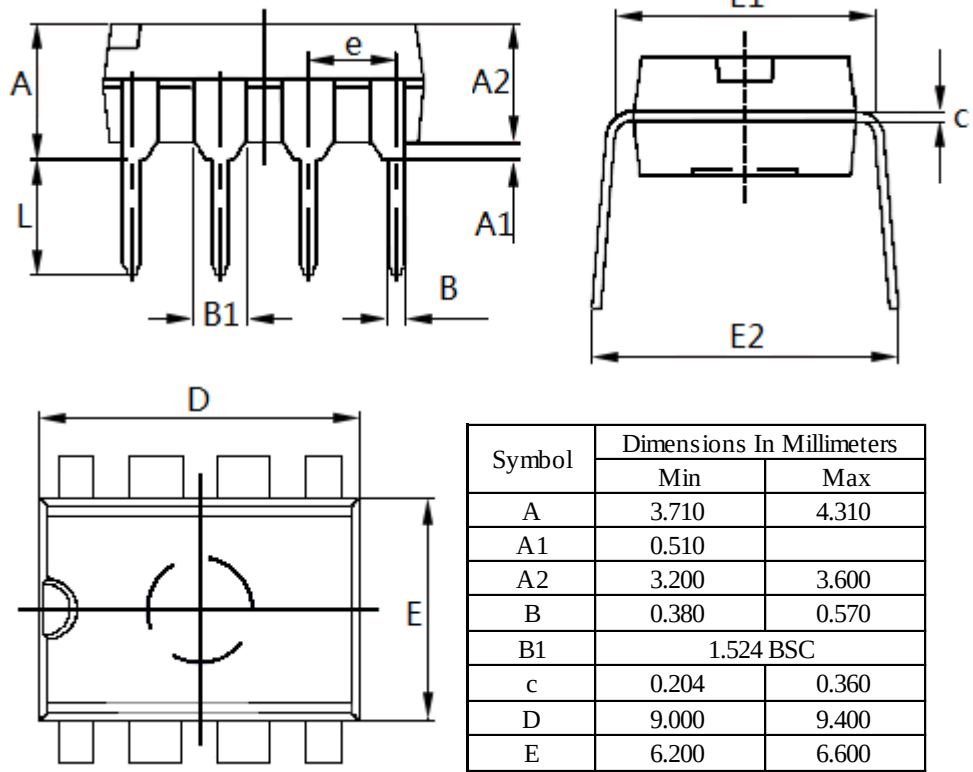



**PT8A3234/5/6/7application circuit**



## Mechanical Information

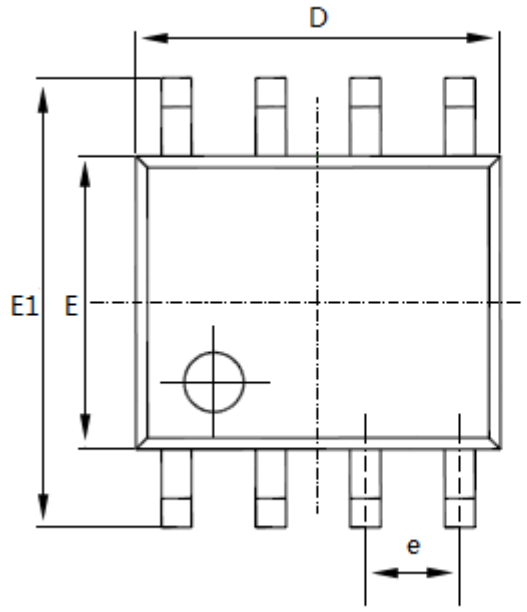
**PE (DIP-8)**

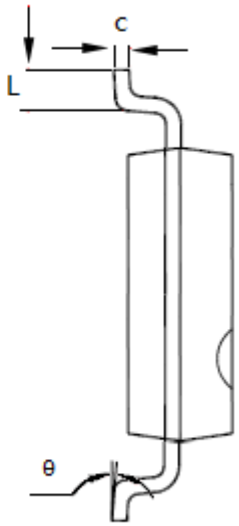


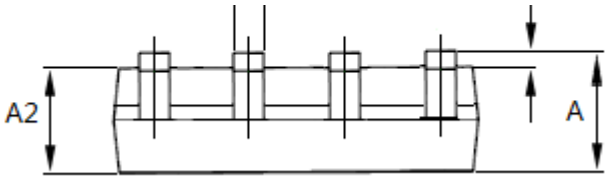

| Symbol | Dimensions In Millimeters | |
|---|---|---|
| | Min | Max |
| A | 3.710 | 4.310 |
| A1 | 0.510 | |
| A2 | 3.200 | 3.600 |
| B | 0.380 | 0.570 |
| B1 | 1.524 BSC | |
| c | 0.204 | 0.360 |
| D | 9.000 | 9.400 |
| E | 6.200 | 6.600 |
| E1 | 7.320 | 7.920 |
| e | 2.540 BSC | |
| L | 3.000 | 3.600 |
| E2 | 8.400 | 9.000 |

Note:
1) Controlling dimensions in millimeters.
2) Ref: JEDEC MS-001D/BA

**WE (SOIC-8)**




Note:
1) Controlling dimensions in millimeters.
2) Ref: JEDEC MS-012E/AA

| Symbol | Dimensions In Millimeters | |
|---|---|---|
| | Min | Max |
| A | 1.350 | 1.750 |
| A1 | 0.100 | 0.250 |
| A2 | 1.350 | 1.550 |
| b | 0.330 | 0.510 |
| c | 0.170 | 0.250 |
| D | 4.700 | 5.100 |
| E | 3.800 | 4.000 |
| E1 | 5.800 | 6.200 |
| e | 1.27 BSC | |
| L | 0.400 | 1.270 |
| θ | 0° | 8° |

## Ordering Information

| Part No. | Package Code | Package |
|---|---|---|
| PT8A323xPE | P | Lead free DIP-8 |
| PT8A323xWE | W | Lead free and Green SOIC-8 |

**Note:**

- x=0/1/2/3/4/5/6/7 show different part no with different function, details see below table.
- E = Pb-free or Pb-free & Green
- Adding X Suffix= Tape/Reel

### Part No Option

| Part No. | LED@ Heating on | Timer of Auto power off (1h@60Hz) | Control Keys |
|---|---|---|---|
| PT8A3230 | Flash | Y | Two Keys |
| PT8A3231 | Constant | Y | Two Keys |
| PT8A3232 | Flash | N | Two Keys |
| PT8A3233 | Constant | N | Two Keys |
| PT8A3234 | Flash | Y | Single Key |
| PT8A3235 | Constant | Y | Single Key |
| PT8A3236 | Flash | N | Single Key |
| PT8A3237 | Constant | N | Single Key |


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