

Features

- Full power output at 120VAC and 240VAC
- Auto temperature control with NTC
- NTC open protection
- Multi mode LED indicator
- Pulse trigger for high current SCR/TRIAC (up to 100mA)
- Auto Heating off after heating timer timeout (1hour)
- Internal Zener
- Low cost 8-Pin DIP and SOIC package

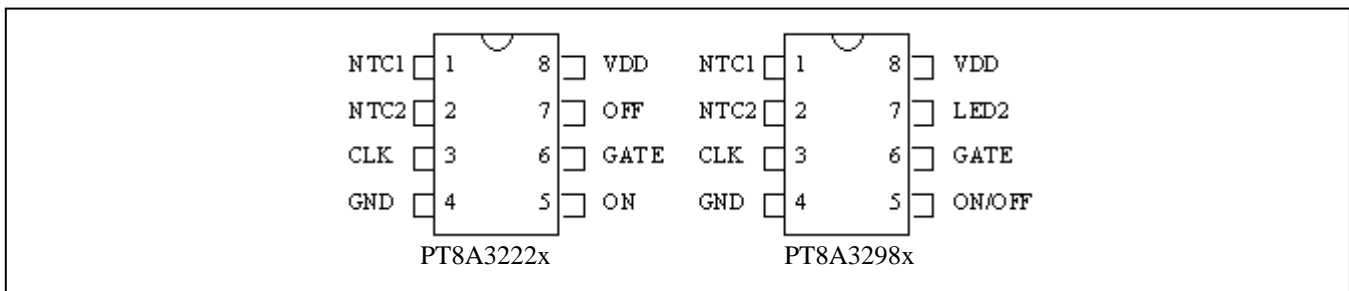
Description

The PT8A3222x/3298x are mixed signal CMOS LSI chips designed as heating controller with help of external NTC (Negative Temperature Component). NTC open protection is implemented for device safety.

Applications

- Curler
- Straightener

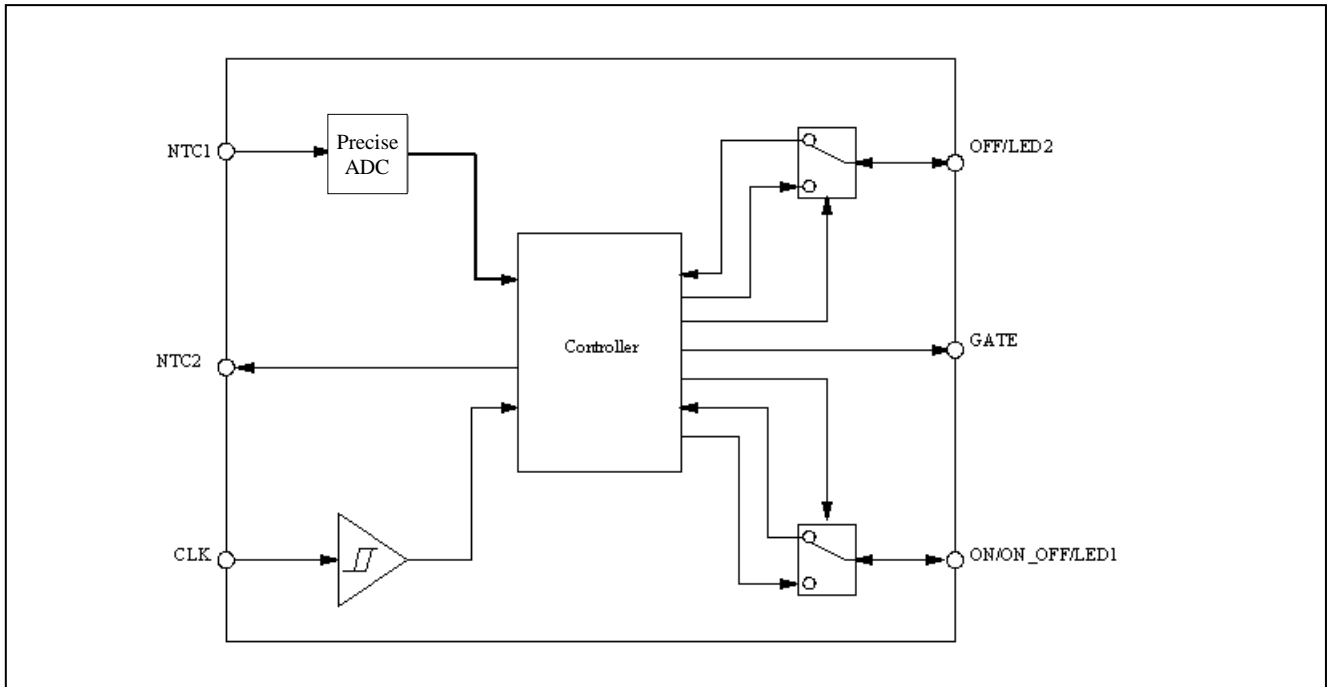
Pin Configuration



Pin Description

| Part No. | | Pin No. | I/O | Description |
|-----------|-----------|---------|-------|---|
| PT8A3222x | PT8A3298x | | | |
| NTC1 | NTC1 | 1 | I | NTC voltage input, NTC open detection input |
| NTC2 | NTC2 | 2 | O | Output signal for NTC open detection |
| CLK | CLK | 3 | I | Clock input from power line |
| ON | ON_OFF | 5 | I/O | PT8A3222x: Heating-on button input. and LED1 driving output PT8A3298x: Heating-on/off button input and LED1 driving output |
| GATE | GATE | 6 | O | SCR/TRIAC trigger output |
| OFF | LED2 | 7 | I/O | PT8A3222x: Heating-off button input and LED2 driving output PT8A3298x: LED2 driving output |
| GND | GND | 4 | Power | Ground and Power |
| VDD | VDD | 8 | | |

Block Diagram



Maximum Ratings

| | |
|--|-----------------|
| Storage Temperature | -65°C to +150°C |
| Supply Voltage to Ground Potential (Input & V _{DD} Only)..... | -0.5V to +5.5V |
| Supply Voltage to Ground Potential (Outputs Only) | -0.5V to +5.5V |
| DC Input Voltage | -0.5V to +5.5V |
| 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

| Symbol | Pin | Parameter | Min | Typ | Max | Unit |
|----------------|-----|-----------------------|-----|-------|-----|------|
| Frequency | CLK | Input CLK Frequency | - | 50/60 | - | Hz |
| T _A | - | Operating temperature | -20 | - | 85 | °C |

AC Electrical Characteristics

(T_A = -20 ~ 85 °C, unless otherwise noted)

| Symbol | Description | Test Conditions | Min | Type | Max | Unit |
|-------------------|------------------------|---|-----|-------|-----|--------|
| F _{CLK} | Frequency of CLK | - | - | 50/60 | - | Hz |
| T _{GATE} | Width of trigger pulse | PT8A3222x, V _{DD} =4.0~5.5V | 240 | 300 | 360 | μS |
| | | PT8A3298x, V _{DD} =4.0V~V _Z | 240 | 300 | 360 | |
| Timer | Power off timer | F _{CLK} = 50Hz/60Hz | 59 | 60 | 61 | Minute |

DC Electrical Characteristics ($V_{DD} = 4.0 \sim V_Z$, $T_A = -20 \sim 85 \text{ }^\circ\text{C}$, unless otherwise noted)

| Symbol | Description | Test Conditions | | Min | Type | Max | Unit |
|------------|---|--|---|-------|-------|-------|---------------|
| I_{IH} | Input high current | PIN: CLK | $V_{IN} = V_{DD}$ | - | - | 1 | μA |
| | | PIN: NTC1 | $V_{IN} = V_{DD}$ | - | - | 1 | μA |
| | | PIN: NTC2 | $V_{IN} = V_{DD}$, Output High impedance | - | - | 1 | μA |
| I_{IL} | Input low current | PIN: CLK | $V_{IN} = \text{GND}$ | - | - | -1 | μA |
| | | PIN: NTC1 | $V_{IN} = \text{GND}$ | - | - | -1 | μA |
| | | PIN: NTC2 | $V_{IN} = \text{GND}$, Output High impedance | - | - | -1 | μA |
| I_{OH} | Output High current | PIN: GATE | $V_{DD}=4.5\text{V}, V_{out}=0.7\text{V}$, pulse following rise edge | -3.5 | -4.5 | -5.5 | mA |
| | | | $V_{DD}=4.5\text{V}, V_{out}=0.7\text{V}$, pulse following fall edge | -60 | -75 | - | mA |
| | | PIN: ON_OFF | $V_{DD}=4.5\text{V}$, $V_{out}=1.9\text{V}$ (PT8A3298x) | -1 | - | - | mA |
| | | PIN: ON | $V_{DD}=4.5\text{V}$, $V_{out}=1.9\text{V}$ (PT8A3222x) | -1 | - | - | mA |
| | | PIN: OFF | $V_{DD}=4.5\text{V}$, $V_{out}=3.1\text{V}$ (PT8A3222x) | -45 | - | -180 | μA |
| I_{OL} | Output Low current | PIN: NTC2 | $V_{DD}=4.5\text{V}$, $V_{out}=0.5\text{V}$ | 4.5 | - | - | mA |
| | | PIN: GATE | $V_{DD}=4.5\text{V}$, $V_{out}=0.5\text{V}$ | 4.5 | - | - | mA |
| | | PIN: LED2 | $V_{DD}=4.5\text{V}$, $V_{out}=2.6\text{V}$ (PT8A3298x) | 1 | - | - | mA |
| | | PIN: OFF | $V_{DD}=4.5\text{V}$, $V_{out}=2.6\text{V}$ (PT8A3222x) | 1 | - | - | mA |
| | | PIN: ON_OFF | $V_{DD}=4.5\text{V}$, $V_{out}=1.9\text{V}$ (PT8A3298x) | 80 | - | 200 | μA |
| V_{NTC1} | Input Voltage1 of NTC1 Pin | $V_{DD}=4.5\text{V}$ | | 1.960 | 1.980 | 2.000 | V |
| V_{NTC2} | Input Voltage2 of NTC1 Pin | $V_{DD}=4.5\text{V}$ | | 2.095 | 2.115 | 2.135 | V |
| V_{NTC3} | Input Voltage3 of NTC1 Pin | $V_{DD}=4.5\text{V}$ | | 2.230 | 2.250 | 2.270 | V |
| V_{NTCO} | Input NTC open Voltage of NTC1 Pin | - | | 1.1 | 1.28 | 1.4 | V |
| VT_1 | Input Threshold Voltage of Pin 5 | $V_{DD}=4.5\text{V}$ | | 0.5 | - | 1.5 | V |
| VT_2 | Input Threshold Voltage of Pin 7 | $V_{DD}=4.5\text{V}$ | | 3.5 | - | 4.5 | V |
| VT_{CLK} | Input Threshold Voltage of CLK Pin for detect Power level | VTL_Level $V_{DD}=4.5\text{V}$ | | 1.7 | 1.9 | 2.1 | V |
| | Input Threshold Voltage of CLK Pin in CLK rise edge | VTL_CLK1 | $V_{DD}=4.5\text{V}$ VT_Level2 is high | -180 | -226 | -275 | mV |
| | | VTH_CLK1 | | -141 | -176 | -211 | mV |
| | | VTL_CLK1 | $V_{DD}=4.5\text{V}$ VT_Level2 is low | -135 | -168 | -201 | mV |
| | | VTH_CLK1 | | -95 | -118 | -141 | mV |
| | Input Threshold Voltage of CLK Pin in CLK fall edge | VTL_CLK2 | $V_{DD}=4.5\text{V}$ VT_Level2 is high | 154 | 192 | 230 | mV |
| | | VTH_CLK2 | | 194 | 242 | 290 | mV |
| | | VTL_CLK2 | $V_{DD}=4.5\text{V}$ VT_Level2 is low | 96 | 120 | 144 | mV |
| VTH_CLK2 | | 136 | | 170 | 204 | mV | |
| V_{POR} | Voltage of POR | - | | 2.7 | - | 3.7 | V |
| V_Z | Voltage of Zener | $I_{DD}=500\mu\text{A} \sim 10\text{mA}$ | | 4.5 | 5.0 | 5.5 | V |
| I_{DD} | Current consumption | NTC1, CLK pin tied to ground $V_{DD}=4.5\text{V}$ | | - | - | 500 | μA |

Functional Description

- State description

- Reset

The device will be of reset state after power-on.

- Heating on

The device will be in heating-on state after heating-on button is on

- Heating off

This device enters heating-off state after its power-on reset enabled or heating timer timeout.

- NTC open protection

When NTC is open, NTC1 pin will be pulled low in the NTC open detection period.

- Timer

If the timer is enabled, the IC will be auto heating-off after working 1 hour in any case of 50Hz and 60 Hz.

- Control signal output

When working in Heating-on state, Gate/LED output will be related to NTC1 input and CLK input amplitude.

Effect of NTC and $V_{T_{CLK}}$ (Level 2) on GATE and LED indication

| Working State | NTC (NTC open detection) | NTC (Normal temp detection) | LED | | | |
|---------------|--------------------------|-----------------------------|---------|-------------|----------|-------------|
| | | | Flash | | No Flash | |
| | | | Mode1 | | Mode1 | |
| | | | LED1 | LED2 | LED1 | LED2 |
| ON | $V_{NTCO} \sim V_{DD}$ | $0 \sim V_{NTC1}$ | Flash1* | On | On | Off |
| | | $V_{NTC1} \sim V_{DD}$ | On | Flash1 | On | On |
| Off | | X | Off | Off | Off | Off |
| X | $0 \sim V_{NTCO}$ | X | Flash2* | Invert LED1 | Flash2 | Invert LED1 |

*Note: 1) X means any input.

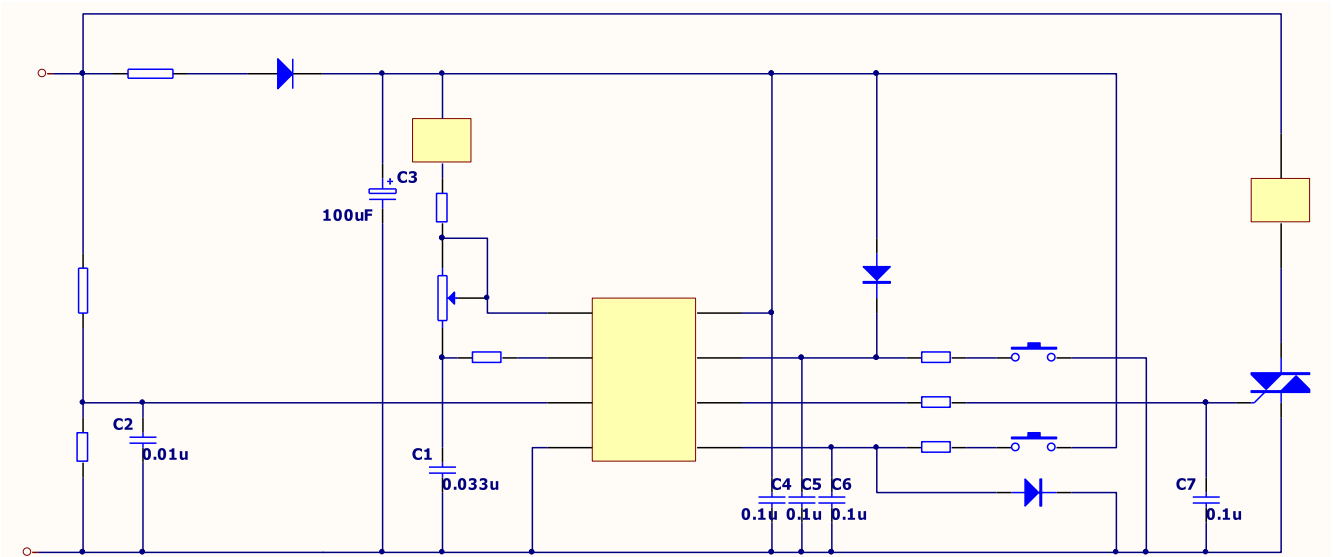
2) Flash1 frequency is 1/32 clock from pin CLK.

3) Flash2 frequency is 1/8 clock from pin CLK.

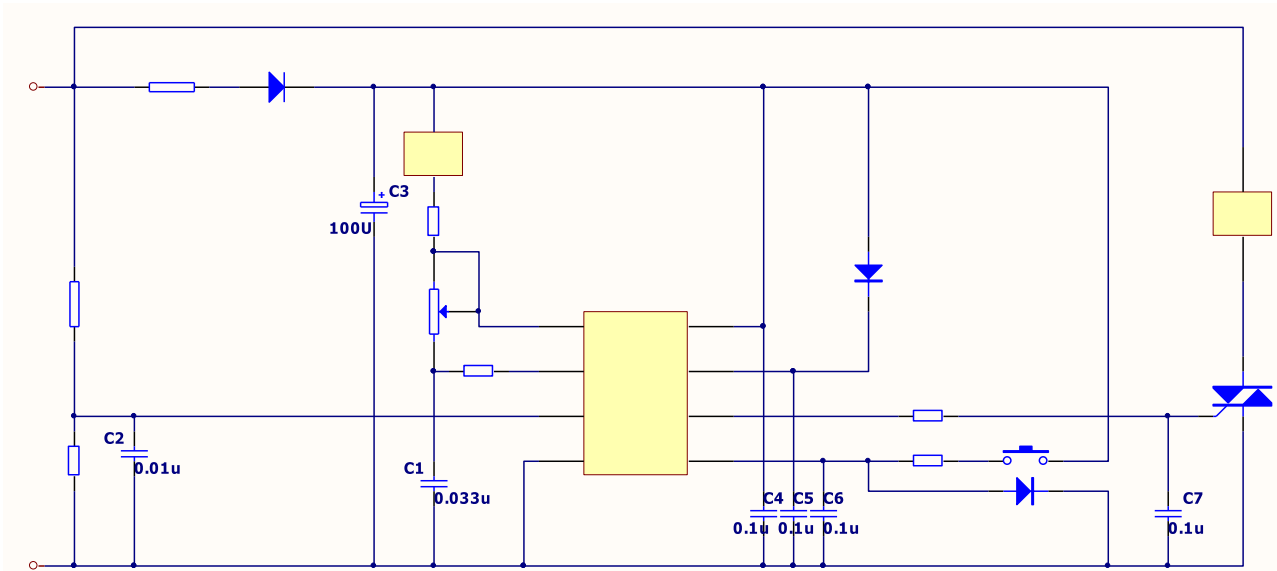
| Working State | NTC (NTC open detection) | NTC (Normal temp detection) | GATE (trigger to SCR/TRIAC) |
|---------------|--------------------------|-----------------------------|-----------------------------|
| ON | $V_{NTCO} \sim V_{DD}$ | $0 \sim V_{NTC1}$ | 100% |
| | | $V_{NTC1} \sim V_{NTC2}$ | 50% |
| | | $V_{NTC2} \sim V_{NTC3}$ | 25% |
| | | $V_{NTC3} \sim V_{DD}$ | 0 |
| Off | | X | 0 |
| X | $0 \sim V_{NTCO}$ | X | 0 |

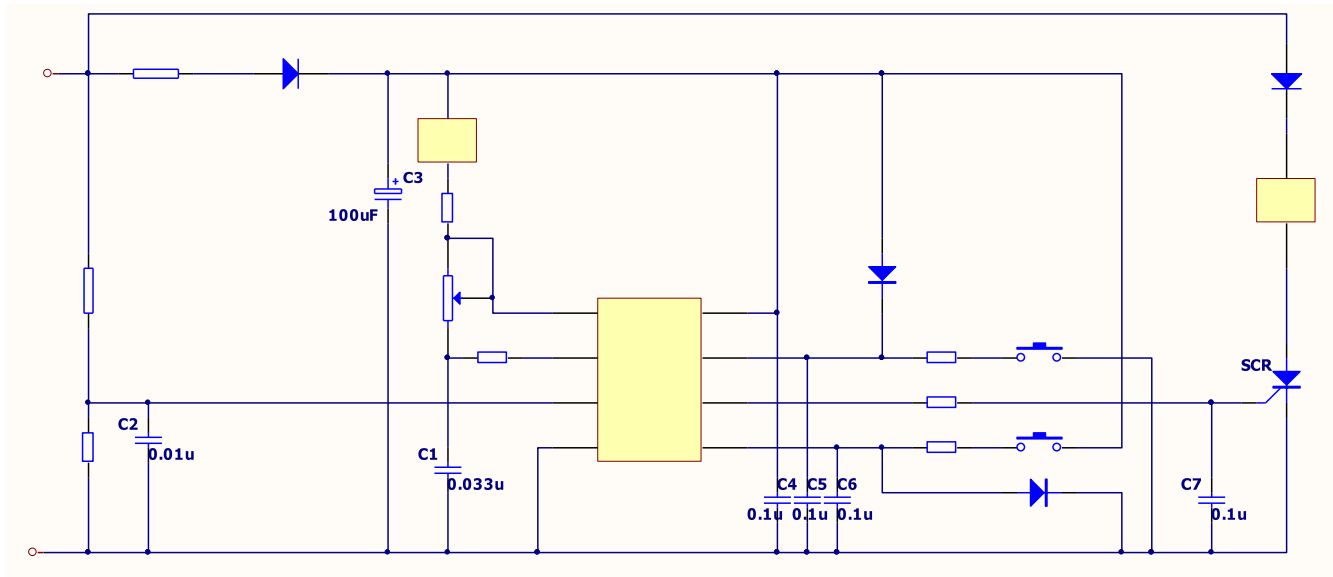
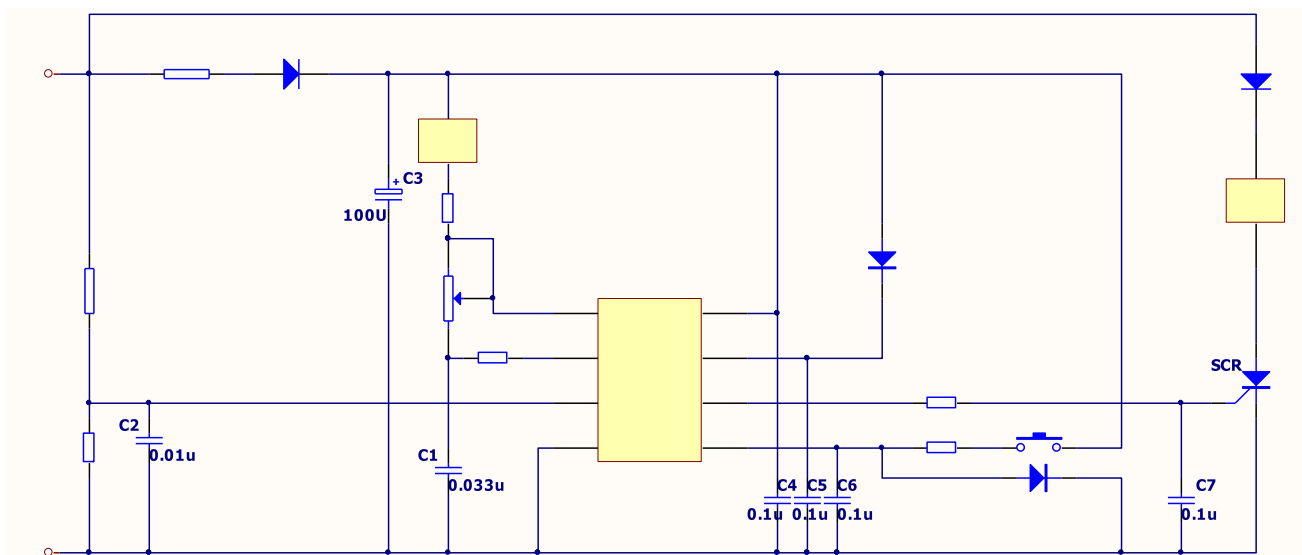
Application Circuit

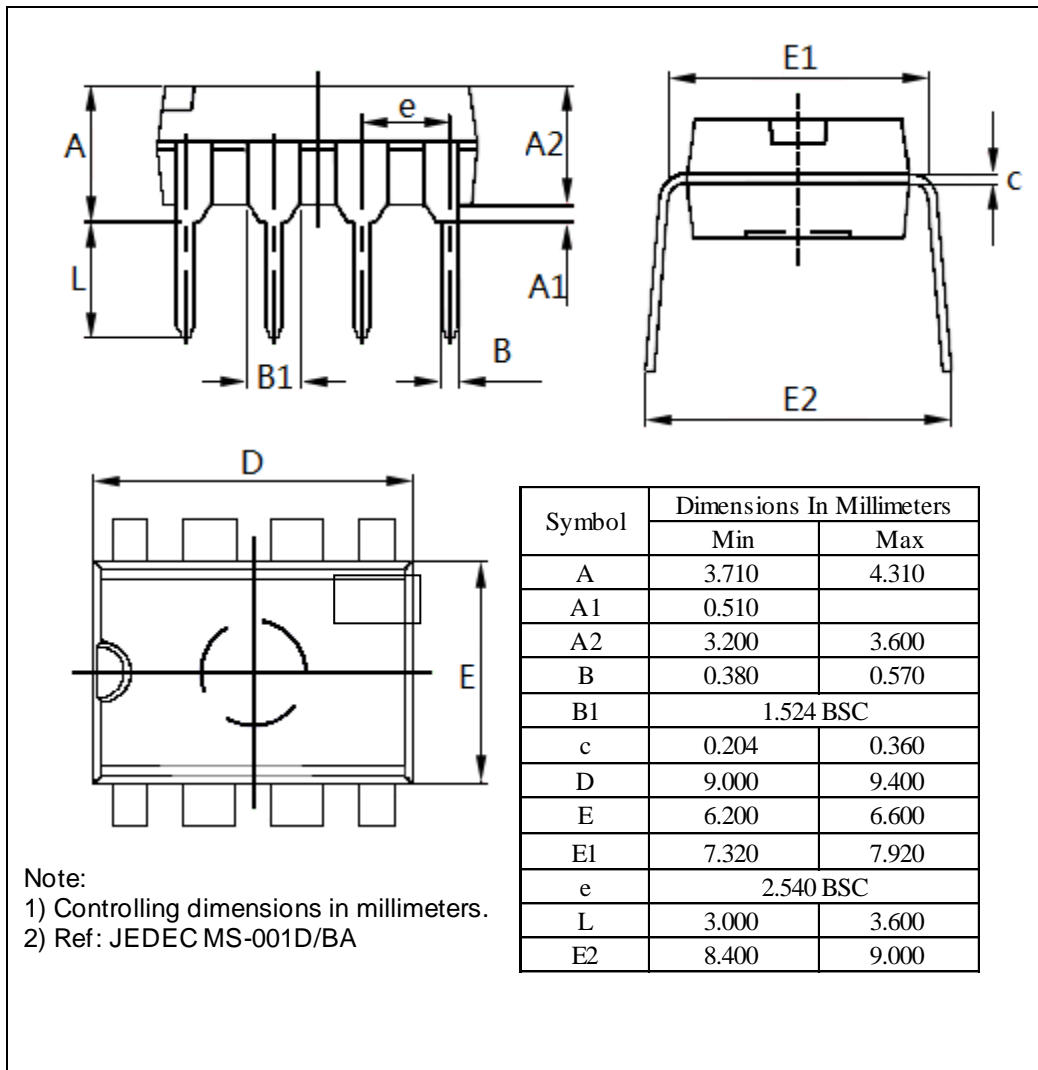
1. Application circuit for PT8A3222x with TRIAC driving

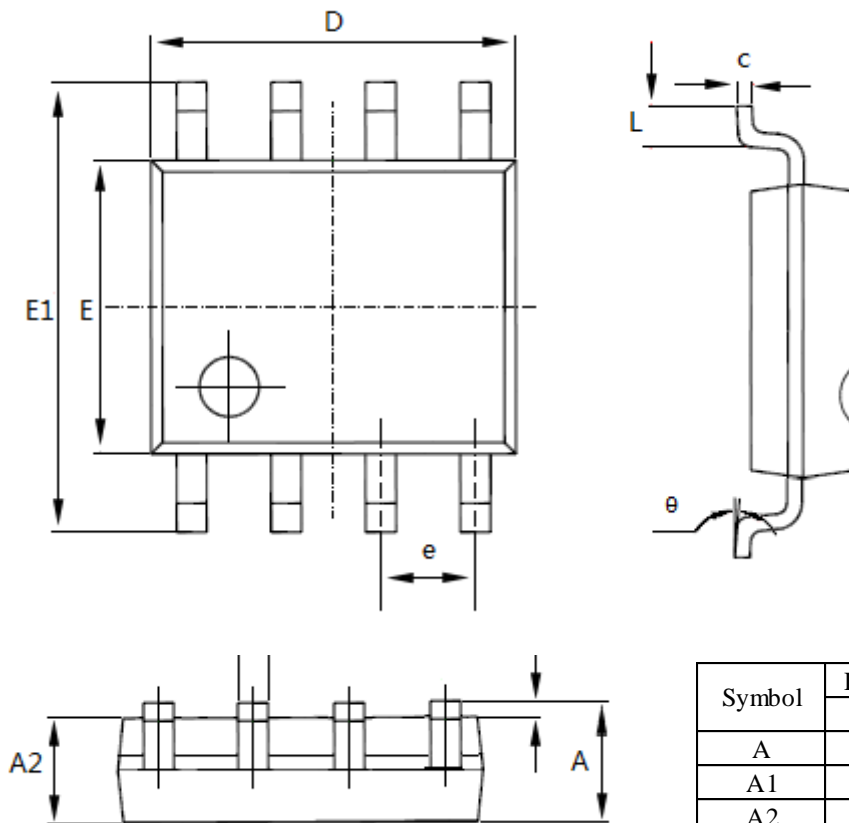


2. Application circuit for PT8A3298x with TRIAC driving



3. Application circuit for PT8A3222x with SCR driving

4. Application circuit for PT8A3298x with SCR driving


Mechanical Information
PE (DIP-8)


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 Cede | Package |
|-------------|--------------|--------------------------------|
| PT8A3222xPE | P | Lead free 8-Pin DIP |
| PT8A3298xPE | P | Lead free 8-Pin DIP |
| PT8A3222xWE | W | Lead free and Green 8-Pin SOIC |
| PT8A3298xWE | W | Lead free and Green 8-Pin SOIC |

Note: “x” shows different suffix. See *Function Comparison Table*.

- E = Pb-free or Pb-free & Green
- Adding X Suffix= Tape/Reel

Function Comparison Table

| Part No. | LED | | Timer | Switch (Key) | Pulse width(μS) | Part No. | LED | | Timer | Switch (Key) | Pulse width(μS) |
|------------|-------|------|-------|--------------|-----------------|------------|-------|------|-------|--------------|-----------------|
| | Flash | Mode | | | | | Flash | Mode | | | |
| PT8A3222 | Y | 1 | Y | Two | 300 | PT8A3298 | Y | 1 | Y | One | 300 |
| PT8A3222A* | N | 1 | Y | Two | 300 | PT8A3298A | N | 1 | Y | One | 300 |
| PT8A3222D* | Y | 1 | N | Two | 300 | PT8A3298D* | Y | 1 | N | One | 300 |
| PT8A3222E* | N | 1 | N | Two | 300 | PT8A3298E* | N | 1 | N | One | 300 |

*Note: Contact Pericom for availability.

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