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Ceramic Heating Controller

Features

- High watt density Alumina Heaters
- High current pulse trigger for SCR
- Quickly Heating-Up and Quickly Lost-Heat-Recover
- Dual voltage 120VAC / 240VAC
- Internal 5v zener
- Insensitive to environment temperature
- Auto power off (Optional)
- DIP-8 and SOIC-8 package

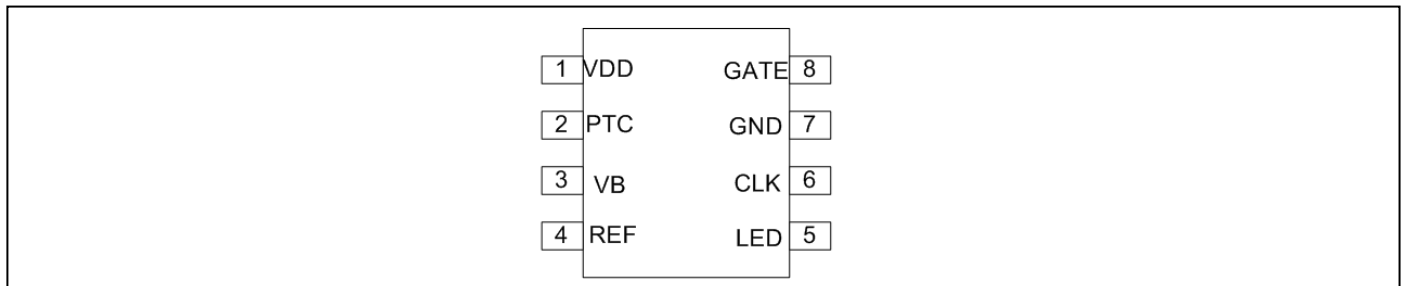
Description

The PT8A330X is specially designed for ceramic heating control system. It can set the temperature continuously. It can drive SCR directly and detect the heater temperature without extra temperature sensor. It has one key, two keys and no key for function setting and has one LED for working state indication. Build-in timer will automatically power off after turn on for 1 hour @ 60Hz or 1.2 hour @ 50Hz (for PT8A3300/1/4/5).

Applications

- Ceramic heating controller

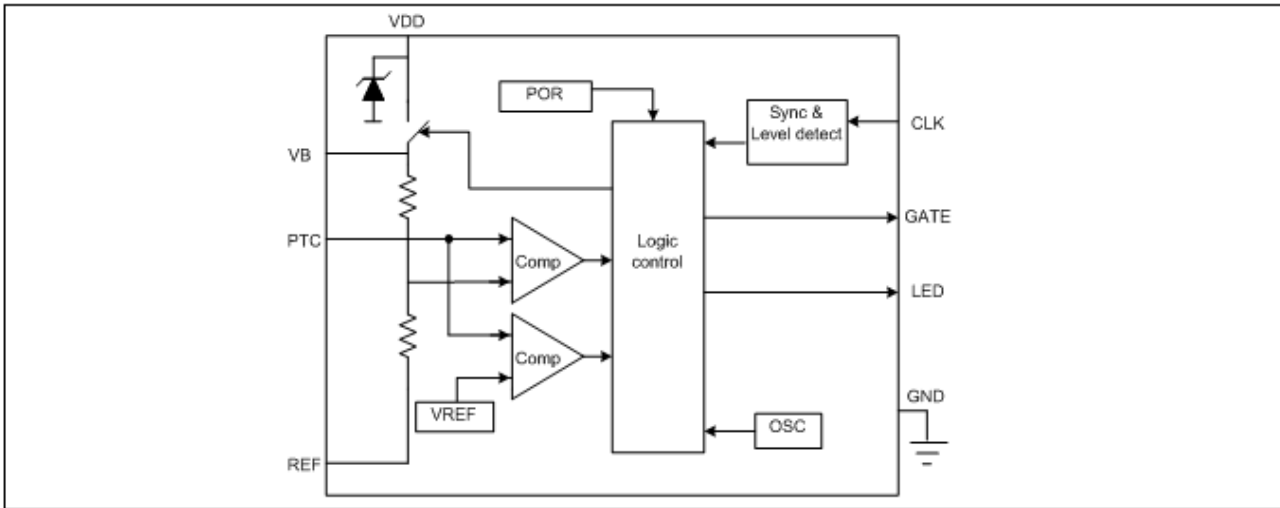
Pin Configuration



Pin Description

| Name | Pin No. | Type | Description |
|------|---------|-------|---|
| VDD | 1 | power | Power input or can be used as OFF push button input |
| PTC | 2 | I | Temperature sensor input and ON push button input in two key option or ON/OFF toggle button in one key option |
| VB | 3 | O | Sampling bias voltage |
| REF | 4 | O | Reference for internal comparator |
| LED | 5 | O | LED driver output |
| CLK | 6 | I | Clock input from AC power line |
| GND | 7 | power | Power Ground |
| GATE | 8 | O | SCR trigger output, active high |

Block Diagram



Maximum Ratings

| | |
|--|-----------------|
| Storage Temperature | -55°C to +150°C |
| Supply Voltage to Ground Potential (Input & V _{DD} Only)..... | -0.5V to +6.5V |
| Supply Voltage to Ground Potential (Output s Only) | -0.5V to +6.5V |
| DC Input Voltage | -0.5V to +6.5V |
| Input/Output Current | 50mA |
| Input/Output Current(Pin VDD, VBonly)..... | 200mA |
| 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 | Description | Min | Type | Max | Unit |
|-----------------|-----------------------|-----|------|-----|------|
| T _A | Operation Temperature | -20 | - | +85 | °C |
| V _{DD} | Supply voltage | 4.0 | 4.5 | 5.0 | V |

Electrical Characteristics ($V_{DD} = 4.5$, $T_A = -20 \sim 85^\circ\text{C}$, unless otherwise noted)

DC Electrical Characteristics

| Symbol | Description | Test Conditions | | Min | Type | Max | Unit |
|------------------|----------------------------------|--------------------------|---|-------------|------|-----|---------------|
| I_{IH} | Input high current | PIN: PTC ,CLK | $V_{IN} = V_{DD}$ | - | - | 5 | μA |
| I_{IL} | Input low current | PIN: PTC ,CLK, REF | $V_{IN} = \text{GND}$ | - | - | -5 | μA |
| R_{REF} | The resistor between REF and GND | PIN: REF | $V_{IN} = 1\text{V}$ | 20 | 47 | 80 | K Ohms |
| I_{OH} | Output High Current | PIN: GATE | $V_{DD} = 4.5\text{V}$ $V_{OUT} = 2.5\text{V}$ | -15 | - | - | mA |
| I_{OL} | Output Low Current | PIN: GATE | $V_{DD} = 4.5\text{V}$ $V_{OUT} = 0.5\text{V}$ | 4.0 | - | - | mA |
| $I_{VB_{SHORT}}$ | Output short current | PIN: VB, VB short to GND | | IC No break | - | - | mA |
| R_{ON_VB} | Resistor of switch on | PIN: VDD to VB | $V_{DD} = 4.5\text{V}$ $I_{OUT} = 100\text{mA}$ | - | - | 15 | Ohms |
| R_{OFF_VB} | Resistor of switch off | PIN: VDD to VB | $V_{DD} = 4.5\text{V}$ $I_{OUT} < 1\mu\text{A}$ | 5M | - | — | Ohms |
| R_{ON_TS} | Resistor of Rma_TSet | PIN: VB to REF | $V_{DD} = 4.5\text{V}$ $I_{OUT} = 50\mu\text{A}$ | 35 | - | 65 | K ohms |
| I_{OH} | Output High Current | PIN: LED | $V_{DD} = 4.5\text{V}$ $V_{OUT} = 3.5\text{V}$ | -3 | - | - | mA |
| I_{OL} | Output Low Current | PIN: LED | $V_{DD} = 4.5\text{V}$ $V_{OUT} = 1.5\text{V}$ | 5 | - | - | mA |

Power Supply Characteristics

| Symbol | Description | Test Conditions | Min | Type | Max | Unit |
|-------------|--|--|------|------|------|---------------|
| V_{POR} | Voltage of POR | - | 2.0 | - | 3.0 | V |
| V_{KON} | Input Threshold Voltage of PTC Pin for key detecting | $R_{ON} = 10\text{ohm}$ | 0.8 | 1 | 1.1 | V |
| I_{DD} | Current consumption | No loading, $V_{DD} = 4.5\text{V}$ (Internal zener doesn't work) | - | 200 | 400 | μA |
| V_{DD} | Supply voltage | $I_{DD} = 0.3 \sim 10\text{mA}$ (according to the zener inside) Control function normal | 4.0 | - | 5.5 | V |
| TPO_{off} | Power off timer | $F_{CLK} = 50\text{Hz}$ | 1.15 | 1.2 | 1.25 | Hour |

Line Clock Synchronization Characteristics

| Symbol | Description | Test Conditions | Min | Type | Max | Unit |
|-------------|--------------------------------------|---|------|-------|------|------|
| F_{CLK} | Frequency of CLK | - | - | 50/60 | - | Hz |
| V_{LEVEL} | Input voltage of CLK Pin | - | 1.69 | 1.88 | 2.07 | V |
| V_{TCLK} | Compare Threshold Voltage of CLK Pin | Low level, AC=220V/50Hz $V_{DD} = 4.5V$, | -200 | -250 | -300 | mV |
| | | High level, AC=220V/50Hz $V_{DD} = 4.5V$, | -100 | -150 | -200 | mV |
| | | Low level, AC=110V/60Hz $V_{DD} = 4.5V$ | -240 | -190 | -140 | mV |
| | | High level, AC=110V/60Hz $V_{DD} = 4.5V$ | -140 | -90 | -60 | mV |

VB and GATE Pulse Characteristics

| Symbol | Description | Test Conditions | Min | Type | Max | Unit |
|----------------|-----------------------------|--|-----|------|-----|---------|
| T_{al_VB} | Width of VB pulse | $T_A = 25^\circ C$, $V_{DD} = 4.5V$ | 80 | 100 | 120 | μs |
| | | $V_{DD} = 4.5V$ $T_A = -20 \sim 85^\circ C$ | 60 | - | 150 | μs |
| T_{al_GATE} | Width of Gate trigger pulse | $T_A = 25^\circ C$, $V_{DD} = 4.5V$ | 160 | 200 | 240 | μs |
| | | $V_{DD} = 4.5V$ $T_A = -20 \sim 85^\circ C$ | 120 | - | 300 | μs |

EMC Electrical Characteristics

| Symbol | Description | Test Conditions | Min | Type | Max | Unit |
|--------|-------------------------------|---|------|------|-----|----------|
| EFT | IEC61000-4-4 Transient/Bursts | EN/IEC61000-4-4 is Electrical fast transient / burst immunity test, requirement > 1000V pulse amplitude ($T_r=5ns$, $T_w=50ns$, $Z=50$ ohms, burst duration 15 ms, burst period 300 ms, burst frequency 2,5 kHz) | 2000 | - | - | V_{PP} |

Temperature Control Characteristics

| Symbol | Description | Test Conditions | Min | Type | Max | Unit | |
|----------------|---|---|---|------------------------------|------------------------------|------------------------------|---|
| V_T | Normal heat-up Threshold Voltage | $V_{DD} = 4.5V$ $V_{REF}=0.7V$ Test GATE output about 50% heating power | - | $0.5(V_B - V_{REF})$ | - | V | |
| V_{TH} | Fast heat-up Threshold Voltage | PT8A330xL (x: 0~7) | $V_{DD}=4.5V$ $V_{REF}=0.7V$ Test GATE output about 50% heating power | $V_T + 0.4\%(V_B - V_{REF})$ | $V_T + 0.6\%(V_B - V_{REF})$ | $V_T + 0.8\%(V_B - V_{REF})$ | V |
| | | PT8A330xH (x: 0~7) | | $V_T + 1.9\%(V_B - V_{REF})$ | $V_T + 2.1\%(V_B - V_{REF})$ | $V_T + 2.3\%(V_B - V_{REF})$ | |
| $V_T(-50C)$ | ON/OFF key detection Threshold Voltage on Pin PTC | $V_{DD} = 4.5V$ $V_{REF}=0.7V$ Test GATE output about 50% heating power | - | $0.27(V_B - V_{REF})$ | - | V | |
| V_{OS_COMP} | Input Offset Voltage of Comparator | Pin: PTC | -3mV | - | +3mV | mV | |
| T-heat | Heating cycle time | $F_{CLK} = 50Hz$ | - | 200 | - | ms | |

Function description

- Input Button**

One key: (Only for PT8A3304/5/6/7(H/L))
The PTC input will toggle Heating-on and Heating-off key function. Once Heating-on the heater will rise to the desired temperature.

Two key: (Only for PT8A3300/1/2/3(H/L))
Have two buttons to toggle Heating-on and Heating-off respectively.

- One LED Indicator**

Flash: (Only for PT8A3300/2/4/6)
When turn -on, the LED will flash (1.5Hz @50Hz power CLK) to indicate the heater is being heated, and keep lighting while reaching the desired temperature

Constant (Only for PT8A3301/3/5/7)
The LED will keep lighting after turn-on

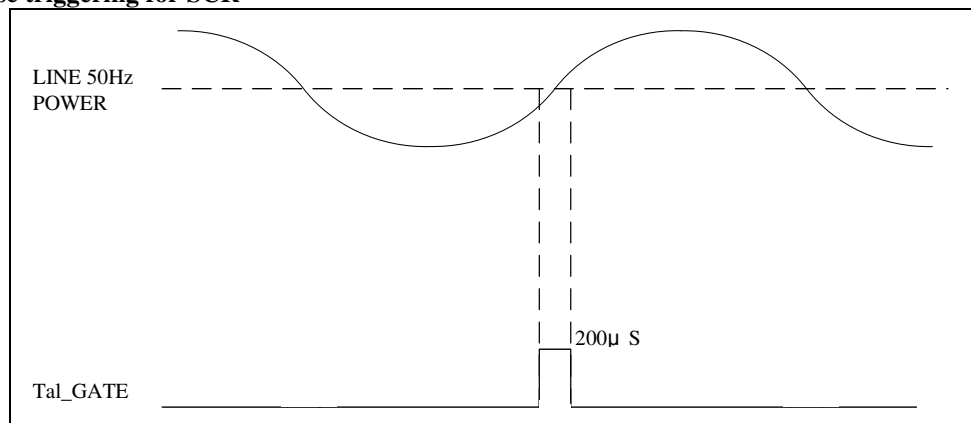
- Reset**

After power on the chip will be reset by POR circuit, LED is disabled. GATE is low level.

- Timer**

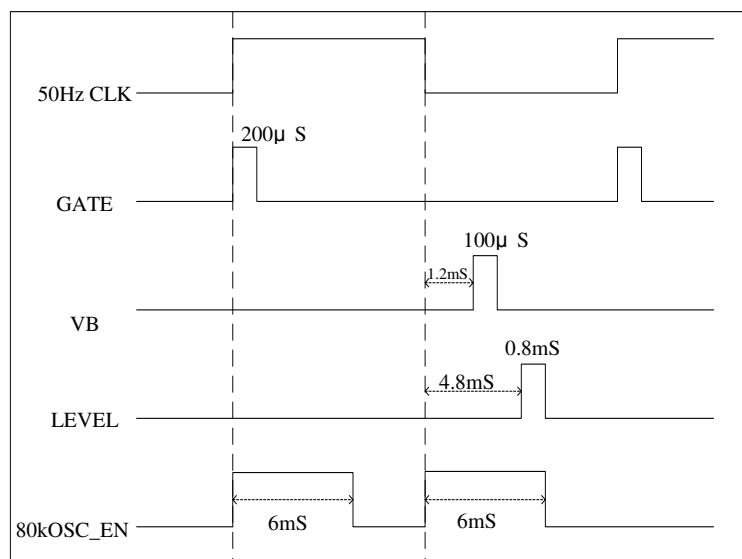
Once push down the ON button and without pushing down the OFF button during the heating-on state, the internal timer will start to count ,After 216000 clock period, the IC will power off the heater until pushing down the ON button again. For the 60Hz CLK signal, the maximal heating time is about 1 hour; and 1.2 hour for 50Hz (for PT8A3300/1/4/5).

High Current pulse triggering for SCR

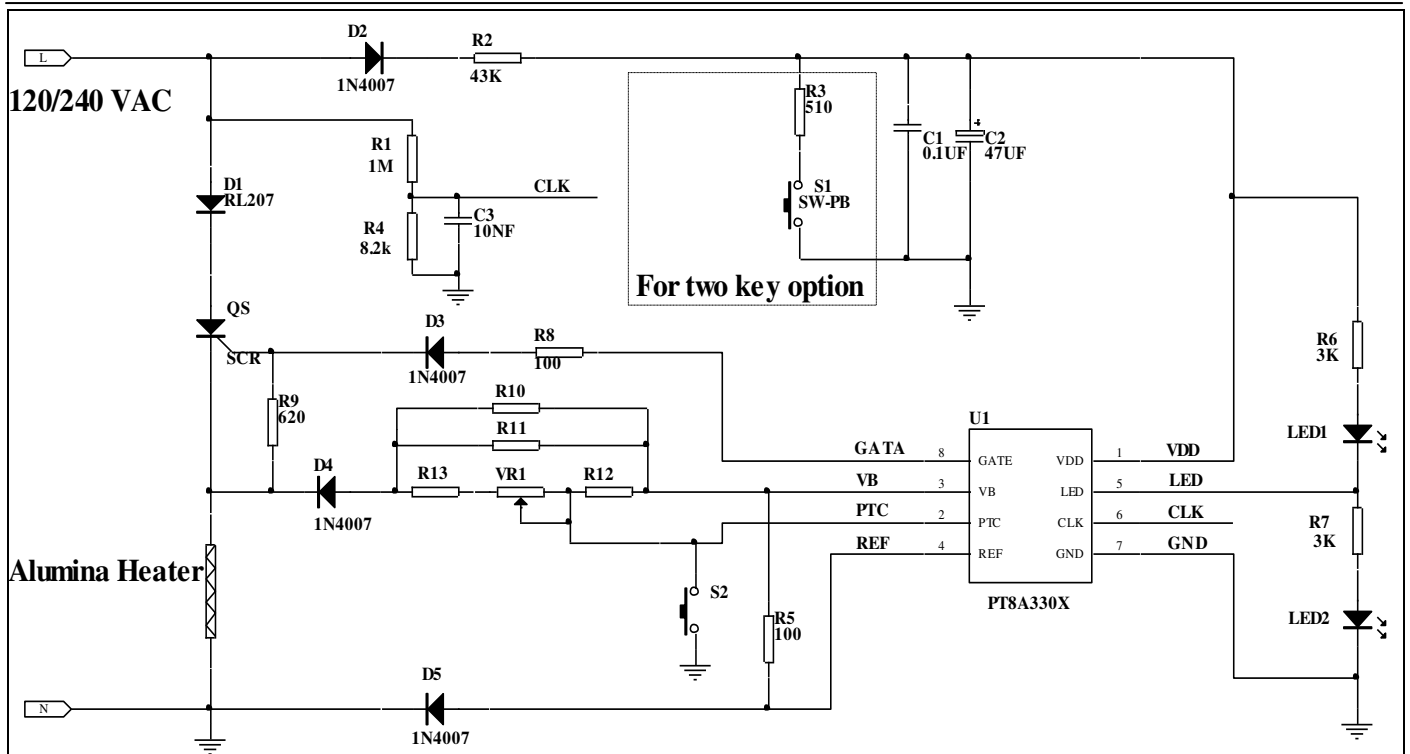


- High trigger peak current (>15mA), enough to trigger 20A SCR
- Pulse triggering current to reduce the false self trigger by the leakage of SCR at high temperature environment.
- Tal_GATE = 200us

Timing

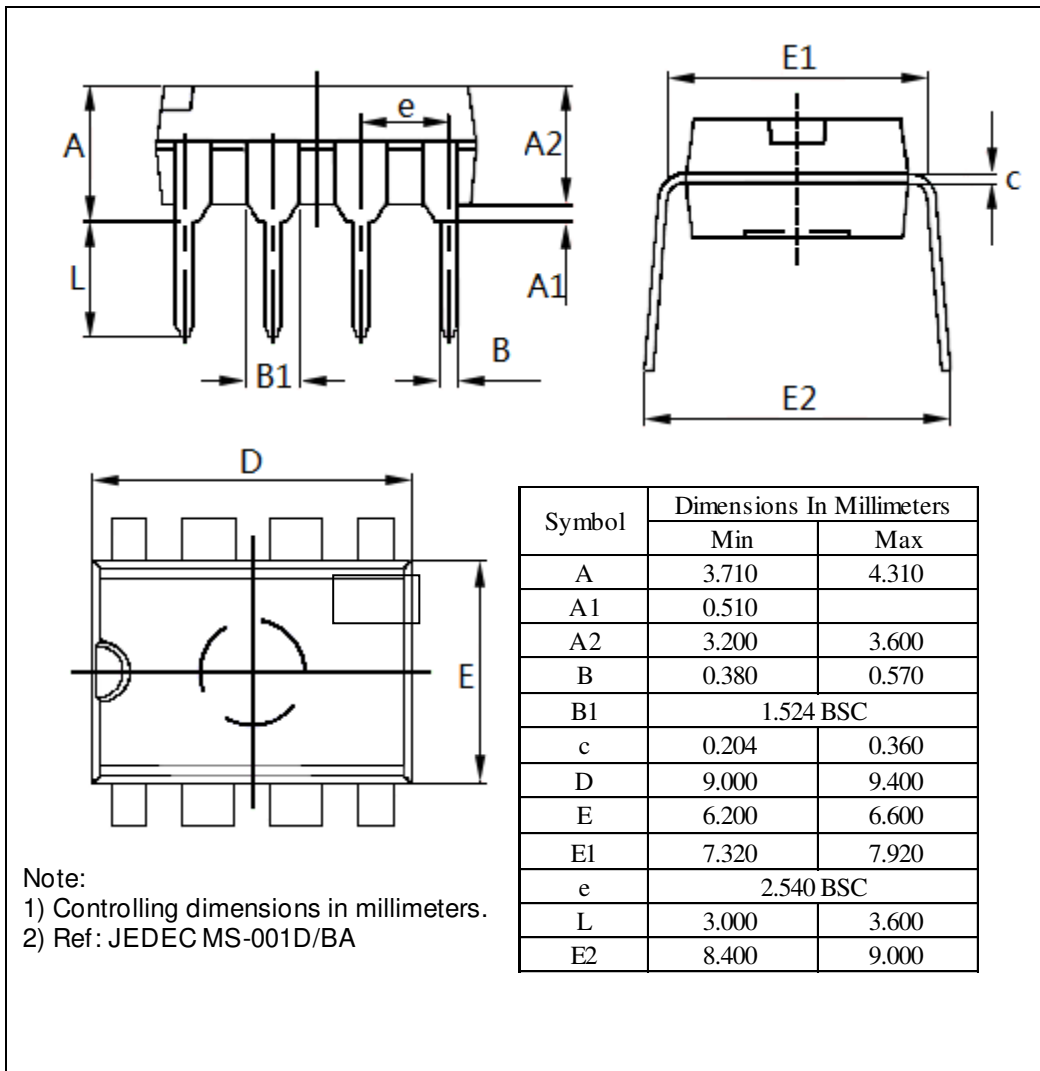


Application Circuit

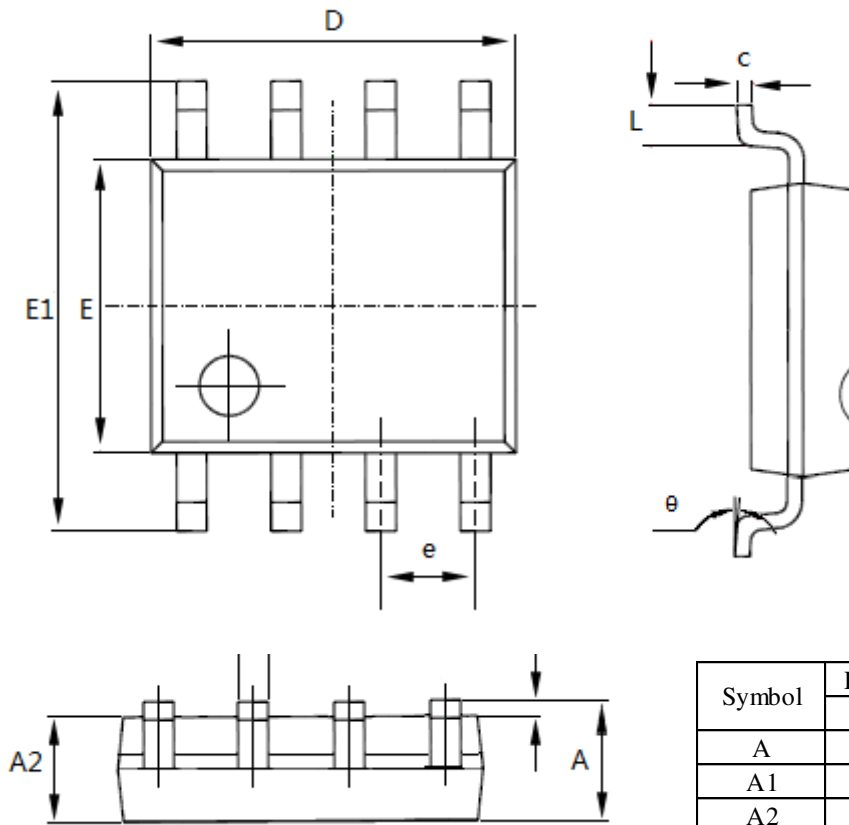


Mechanical Information

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 Code | Package |
|--------------|--------------|--------------------------------|
| PT8A330xLPE* | P | Lead free 8-pin DIP |
| PT8A330xLWE* | W | Lead free and Green 8-pin SOIC |
| PT8A330xHPE* | P | Lead free 8-pin DIP |
| PT8A330xHWE* | W | Lead free and Green 8-pin SOIC |

Note: *

- “x” shows 0~7 with different function see *Function Comparison Table*.
- E = Pb-free or Pb-free & Green
- Adding X Suffix= Tape/Reel
- *Contact Pericom for availability.

Function Comparison Table

| Part No. | IED | Timer | Switch On/OFF | | **VTH – VT |
|------------|----------|-------|---------------|---------|-----------------------------|
| PT8A3300H* | Flash | Y | - | Two Key | High overshoot when preheat |
| PT8A3300L* | Flash | Y | - | Two Key | Low overshoot when preheat |
| PT8A3301H* | Constant | Y | - | Two Key | High overshoot when preheat |
| PT8A3301L* | Constant | Y | - | Two Key | Low overshoot when preheat |
| PT8A3302H* | Flash | N | - | Two Key | High overshoot when preheat |
| PT8A3302L* | Flash | N | - | Two Key | Low overshoot when preheat |
| PT8A3303H* | Constant | N | - | Two Key | High overshoot when preheat |
| PT8A3303L* | Constant | N | - | Two Key | Low overshoot when preheat |
| PT8A3304H* | Flash | Y | One Key | - | High overshoot when preheat |
| PT8A3304L | Flash | Y | One Key | - | Low overshoot when preheat |
| PT8A3305H | Constant | Y | One Key | - | High overshoot when preheat |
| PT8A3305L | Constant | Y | One Key | - | Low overshoot when preheat |
| PT8A3306H* | Flash | N | One Key | - | High overshoot when preheat |
| PT8A3306L* | Flash | N | One Key | - | Low overshoot when preheat |
| PT8A3307H | Constant | N | One Key | - | High overshoot when preheat |
| PT8A3307L | Constant | N | One Key | - | Low overshoot when preheat |

Note:

- *Contact Pericom for availability.
- ** Refer to page 4