Ceramic Heating Controller (LCD)

Features

- High watt density Alumina Heaters
- Pulse trigger with high current for SCR
- Quickly Heat-Up and Quickly Lost-Heat Recover
- External adjustable to fit wide range heating plates
- External adjustable to fit TCR of sensors
- Full temperature compensation and insensitive to environment temperature
- Internal zener
- 11 heat temperature settings
- Auto power off for PT8A3351/3/5/7
- Backlights for indicating work status
- LCD screen for showing temperature setting
- Dual Temperature (Fahrenheit/Centigrade) Display
- Wet function: It will keep heating on state to level 2.
- Dual voltage (120V/240V) operations.
- Support 3 keys, on/off, up and down
- SOIC-24, QFN-24 and TSSOP-24 package

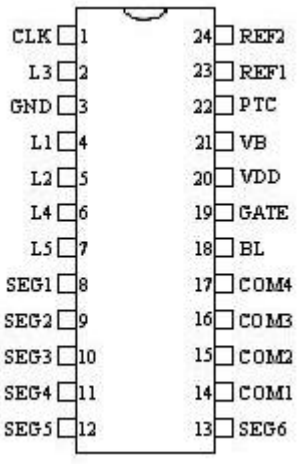
Description

The PT8A335xA/B is special designed for ceramic heating control with 11 temperature levels(show as below function comparison table). It can drive SCR directly and detect heater temperature by heater-self without extra temperature sensor. It has 3 keys for function setting. LCD displays and backlight indicate the working status. Build-in timer will be auto-power off after power on 1 hour for 60Hz or 1.2 hour for 50Hz.

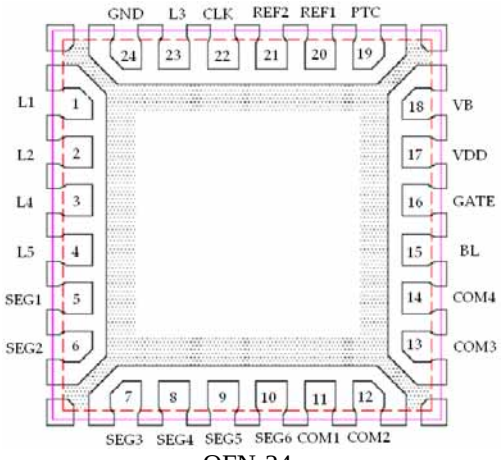
Applications

- Ceramic heating controller

Pin Configuration



SOIC-24/TSSOP-24

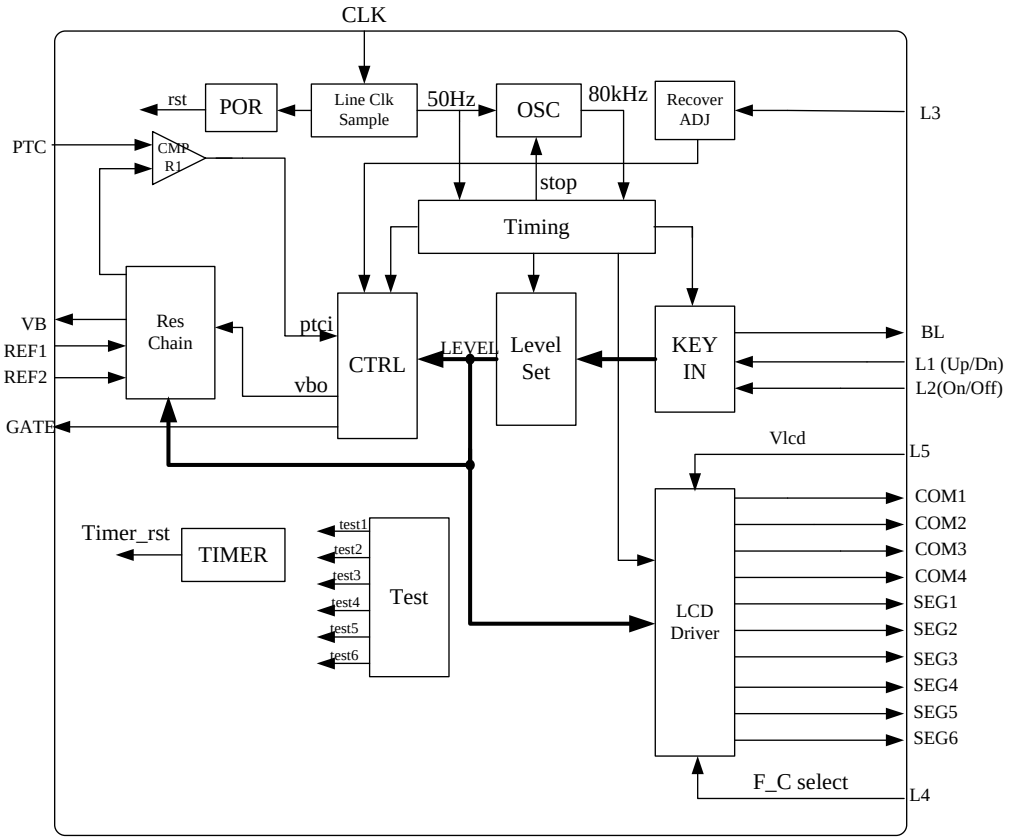


QFN-24

Pin Description

Name	Pin No.		Type	Description
	SOIC-24/TSSOP-24	QFN-24		
CLK	1	22	I	Clock input from power line and Detect operation voltage.
L3	2	23	I	Input to adjust Recovery Rate.
L1	4	1	I	Power on/off key inputs
L2	5	2	I	Up and down key inputs.
L4	6	3	I	High: LCD shows °F, Low : LCD shows °C.
L5	7	4	I	Supply LCD power.
SEG1,SEG2, SEG3,SEG4, SEG5,SEG6,	8,9,10,11,12,13	5,6,7,8,9,10	O	LCD digits control output.
COM1,COM 2, COM3,COM 4	14,15,16,17	11,12,13,14	O	LCD digits control output.
BL	18	15	O	Drive LCD backlight
GATE	19	16	O	SCR trigger output, active high
VB	21	18	O	PTC sampling power source
PTC	22	19	I	Temperature sensor input
REF1	23	20	I	Reference 1 for internal comparator
REF2	24	21	O	Reference 2 for internal comparator
GND	3	24	Power	Ground and Power
VDD	20	17		

Block Diagram



Maximum Ratings

Storage Temperature	-55°C to +150°C
Ambient Temperature with Power applied	-20°C to +85°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, VB only)	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

Sym	Parameter	Pin	Min	Typ	Max	Unit
V_{DD}	Operating Voltage	VDD	4.0	-	Vz	V
T_A	Operating temperature	-	-20	-	85	°C

DC Electrical Characteristics (V_{DD} = 4.0~Vz, T_A = -20 ~ 85ºC, unless otherwise noted)

Symbol	Description	Test Conditions		Min	Type	Max	Unit
I_{IH}	Input high current	PIN: PTC CLK	$V_{IN} = V_{DD}$	-	-	5	μA
		PIN: L1, L2,L3,L4	$V_{IN} = V_{DD}$ Vclk=5V (L1, L2, L4 is of input)	-	-	5	
I_{IL}	Input low current	PIN: PTC CLK	V_{IN} = GND	-	-	-5	μA
		PIN: L3，L4	V_{IN} = GND Vclk=GND (L4 is of input)	-	-50	-	
		PIN: L1, L2	V_{DD} =4.5V V_{IN} = 2.0V (L1, L2 is of input)	-0.06	-	-0.20	mA
V_{IH}	Input High Voltage	PIN: L1, L2	-	0.8 V_{DD}	-	-	V
V_{IL}	Input Low Voltage	PIN: L1, L2	-	-	-	0.4 V_{DD}	
Vlcd	Supply LCD power	PIN: L5	-	-	-	V_{DD}	
V_{IT}	Input Threshold Voltage	VT1_Level	V_{DD} =4.5V L3	3.0	3.5	4.0	V
		VT2_Level		1.2	1.7	2.2	V
I_{OH}	Output High Current	PIN: GATE	V_{DD} = 4.5V Vout = 2.5V	-15	-	-	mA
		PIN: BL	V_{DD} =4.5V Vout =4.0V	-3.0	-	-	
I_{OL}	Output Low Current	PIN: GATE	V_{DD} = 4.5V Vout =0.5V	4.0	-	-	mA
		PIN: BL	V_{DD} =4.5V Vout =0.5V	4.0	-	-	
V_{LCD}	Output High Voltage	PIN:COM1,COM2, COM3, COM4, SEG1, SEG2, SEG3, SEG4, SEG,5,SEG6,	Level3, V_{DD} =4.5V	0.9VL5	VL5	1.1VL5	-
			Level2, V_{DD} =4.5V	0.6VL5	0.66VL5	0.73VL5	
			Level1, V_{DD} =4.5V	0.3VL5	0.33VL5	3.7VL5	
R_{ON_VB}	Resistor of switch on	PIN: VDD to VB	VDD=4.5V Iout = 100mA	-	-	15	ohms
R_{ON_TS}	Resistor of Rma_TSet	PIN: VDD to REF2	VDD=4.5V Iout = 50uA	37.2	46.5	55.8	K ohms
R_{ON_SP}	Resistor of Rma_Speed	PIN: REF1 to REF2	VDD=4.5V Iout = 1mA	1	1.5	3.0	K ohms

Power Supply Characteristics

Symbol	Description	Test Conditions	Min	Type	Max	Unit
V_{POR}	Voltage of POR	-	1.5	-	2.5	V
I_{DD}	Current consumption	No loading, V_{DD} =4.5V	-	-	400	μA
V_{DD}	Supply voltage	Control function normal	4.0	-	V_Z	V
V_Z	Voltage of Zener	I_{DD}=500uA~20mA	4.5	5.0	5.5	V
TPO_{off}	Power off timer	F_{CLK}=60Hz	55	60	65	Minute

Line Clock Synchronization Characteristics

Symbol	Description	Test Conditions		Min	Type	Max	Unit
V_{T_CLK}	Input Threshold Voltage of CLK Pin	Level 2	-	1.7	1.88	2.1	mV
		VTL_Level1	V_{DD} =4.5V VT_Level2 is high	-200	-250	-300	
		VTH_Level1		-100	-150	-200	
		VTL_Level1	V_{DD} =4.5V VT_Level2 is low	-125	-175	-225	
		VTH_Level1		-40	-90	-140	
F_{CLK}	Frequency of CLK	-		-	50/60	-	Hz

GATE Pulse Characteristics

Symbol	Description	Test Conditions	Min	Type	Max	Unit
Tal_Gate	Width of Gate trigger pulse	TA=25 ºC, V_{DD} = 4.5V	160	200	240	µs
		V_{DD} = 4.0 ~ Vz T_A = -20 ~ 85ºC	120	-	300	µs
Tal_VB	Width of VB pulse	TA=25 ºC, V_{DD} = 5.0V	80	100	120	µs
		V_{DD} = 4.5 ~ 5.5V T_A = -20 ~ 85ºC	60	-	150	µs

Temperature Control Characteristics

Symbol	Description	Test Conditions	Min	Type	Max	Unit
T-heat	Minimum Heating cycle time	F_{CLK}= 50Hz	-	200	-	ms

EMC Electrical Characteristics (V_{DD} = 4.0 ~Vz, T_A = -20 ~ 85ºC, unless otherwise noted)

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 (tr=5ns, tw=50ns, Z=50 ohms, burst duration 15 ms, burst period 300 ms, burst frequency 2,5 kHz)	2000	-	-	Vpp

Temperature Control Characteristics

Symbol	Description	Test Conditions	Min	Type	Max	Unit
VT_{100}	Threshold Voltage Level (100°C)	V_{DD} = 4.5V V_{REF2}=0.7V V_{REF1}=0~100%(V_B-V_{REF2}) Test GATE output about 50% heating power	0.443 (VB-V_{REF2})	0.447 (VB-V_{REF2})	0.451 (VB-V_{REF2})	V
VT_{110}	Threshold Voltage Level (110°C)		0.450 (VB-V_{REF2})	0.454 (VB-V_{REF2})	0.458 (VB-V_{REF2})	
VT_{120}	Threshold Voltage Level (120°C)		0.457 (VB-V_{REF2})	0.461 (VB-V_{REF2})	0.465 (VB-V_{REF2})	
VT_{130}	Threshold Voltage Level (130°C)		0.463 (VB-V_{REF2})	0.467 (VB-V_{REF2})	0.471 (VB-V_{REF2})	
VT_{140}	Threshold Voltage Level (140°C)		0.471 (VB-V_{REF2})	0.475 (VB-V_{REF2})	0.479 (VB-V_{REF2})	
VT_{150}	Threshold Voltage Level (150°C)		0.477 (VB-V_{REF2})	0.481 (VB-V_{REF2})	0.485 (VB-V_{REF2})	
VT_{160}	Threshold Voltage Level (160°C)		0.484 (VB-V_{REF2})	0.488 (VB-V_{REF2})	0.492 (VB-V_{REF2})	
VT_{170}	Threshold Voltage Level (170°C)		0.490 (VB-V_{REF2})	0.494 (VB-V_{REF2})	0.498 (VB-V_{REF2})	
VT_{180}	Threshold Voltage Level (180°C)		0.496 (VB-V_{REF2})	0.500 (VB-V_{REF2})	0.504 (VB-V_{REF2})	
VT_{190}	Threshold Voltage Level (190°C)		0.502 (VB-V_{REF2})	0.506 (VB-V_{REF2})	0.510 (VB-V_{REF2})	
VT_{200}	Threshold Voltage Level (200°C)		0.508 (VB-V_{REF2})	0.512 (VB-V_{REF2})	0.516 (VB-V_{REF2})	
VT_{210}	Threshold Voltage Level (210°C)		0.514 (VB-V_{REF2})	0.518 (VB-V_{REF2})	0.522 (VB-V_{REF2})	
VT_{220}	Threshold Voltage Level (220°C)		0.522 (VB-V_{REF2})	0.526 (VB-V_{REF2})	0.530 (VB-V_{REF2})	
VT_{230}	Threshold Voltage Level (230°C)		0.525 (VB-V_{REF2})	0.529 (VB-V_{REF2})	0.533 (VB-V_{REF2})	
VT_{100H}	Heat-up Threshold Voltage Level (100°C)	V_{DD}=4.5V V_{REF2}=0.7V V_{REF1}=50%(V_B-V_{REF2}) Test GATE output about 50% heating power	VT_{100} +1.2%(VB-V_{REF2})	VT_{100} +2.4%(VB-V_{REF2})	VT_{100} +2.6%(VB-V_{REF2})	V
VT_{110H}	Heat-up Threshold Voltage Level (110°C)		VT_{110} +2.0%(VB-V_{REF2})	VT_{110} +2.2%(VB-V_{REF2})	VT_{110} +2.4%(VB-V_{REF2})	
VT_{120H}	Heat-up Threshold Voltage Level (120°C)		VT_{120} +1.9%(VB-V_{REF2})	VT_{120} +2.1%(VB-V_{REF2})	VT_{120} +2.3%(VB-V_{REF2})	
VT_{130H}	Heat-up Threshold Voltage Level (130°C)		VT_{130} +1.8%(VB-V_{REF2})	VT_{130} +2.0%(VB-V_{REF2})	VT_{130} +2.2%(VB-V_{REF2})	
VT_{140H}	Heat-up Threshold Voltage Level (140°C		VT_{140} +1.7%(VB-V_{REF2})	VT_{140} +1.9%(VB-V_{REF2})	VT_{140} +2.1%(VB-V_{REF2})	
VT_{150H}	Heat-up Threshold Voltage Level (150°C)		VT_{150} +1.6%(VB-V_{REF2})	VT_{150} +1. 8(VB-V_{REF2})	VT_{150} +2.0%(VB-V_{REF2})	
VT_{160H}	Heat-up Threshold Voltage Level (160°C)		VT_{160} +1.5%(VB-V_{REF2})	VT_{160} +1.7%(VB-V_{REF2})	VT_{160} +1.9%(VB-V_{REF2})	
VT_{170H}	Heat-up Threshold Voltage Level (170°C)		VT_{170} +1.4%(VB-V_{REF2})	VT_{170} +1.6%(VB-V_{REF2})	VT_{170} +1.8%(VB-V_{REF2})	
VT_{180H}	Heat-up Threshold Voltage Level (180°C)		VT_{180} +1.3%(VB-V_{REF2})	VT_{180} +1.5%(VB-V_{REF2})	VT_{180} +1.7%(VB-V_{REF2})	
VT_{190H}	Heat-up Threshold Voltage Level (190°C)		VT_{190} +1.2%(VB-V_{REF2})	VT_{190} +1.4%(VB-V_{REF2})	VT_{190} +1.6%(VB-V_{REF2})	
VT_{200H}	Heat-up Threshold Voltage Level (200°C)		VT_{200} +1.1%(VB-V_{REF2})	VT_{200} +1.3%(VB-V_{REF2})	VT_{200} +1.5%(VB-V_{REF2})	
VT_{210H}	Heat-up Threshold Voltage Level (210°C)		VT_{210} +1.0%(VB-V_{REF2})	VT_{210} +1.2%(VB-V_{REF2})	VT_{210} +1.4%(VB-V_{REF2})	
VT_{220H}	Heat-up Threshold Voltage Level (220°C)		VT_{220} +1.0%(VB-V_{REF2})	VT_{220} +1.2%(VB-V_{REF2})	VT_{220} +1.4%(VB-V_{REF2})	
VT_{230H}	Heat-up Threshold Voltage Level (230°C)		VT_{230} +0.9%(VB-V_{REF2})	VT_{230} +1.1%(VB-V_{REF2})	VT_{230} +1.3%(VB-V_{REF2})	
VT_{TRAN}	Voltage Level transfer	Test GATE output about 10~90%	VT-4mV		VT+4mV	mV
V_{OS_COMP}	Input Offset Voltage of Comparator	PIN: PTC	-4mV		+4mV	mV

Functional Description

- **3 Input Buttons**

  On/Off: This button will toggle Heating-on or Heating-off.

  1) For PT8A3351A/2A/3A/4A/5A/6A/7A/8A

  After plug in power cord, then push on/off button to heating-on, the level of temperature setting selected is as below:

Part No.	Pin L4: high	Pin L4: low
PT8A3351A/2A	300 F	150°C
PT8A3353A/4A	355 F	180°C
PT8A3355A/6A	340 F	170°C
PT8A3357A/8A	395 F	200°C

  After push on/off button to heating-off, then heating-on, the level of temperature setting selected is same as former setting before heating-off.

  2). For PT8A3351B/2B/3B/4B/5B/6B/7B/8B

  Once heating-on, the level of temperature setting selected is as below:

Part No.	Pin L4: high	Pin L4: low
PT8A3351B/2B	300 F	150°C
PT8A3353B/4B	355 F	180°C
PT8A3355B/6B	340 F	170°C
PT8A3357B/8B	395 F	200°C

  Up: Temperature up adjustment button. Push Up button once, the temperature setting increases one level until the highest level is reached.

  Down: Temperature down adjustment button**.** Push Down button once, the temperature setting reduces one level until the lowest level is reached.

- **LCD Indicator**

  The display on LCD indicates the temperature settings.

  During heating-up, the temperature setting level on LCD flashes, its frequency is 1.5Hz. When the temperature reaches 27°F -45°F (15°C -25°C) less than the level of temperature setting, LCD is always on.

  When adjust from low temperature setting level to high, LCD will flash twice. Its frequency is 1.5Hz.

- **Reset**

  After power on the chip will be reset by internal POR circuit, LCD is disabled. GATE and Backlight pins output are low level.

- **LCD Backlight**

  Pin BL outputs high level under power on state, and low level under power off state.

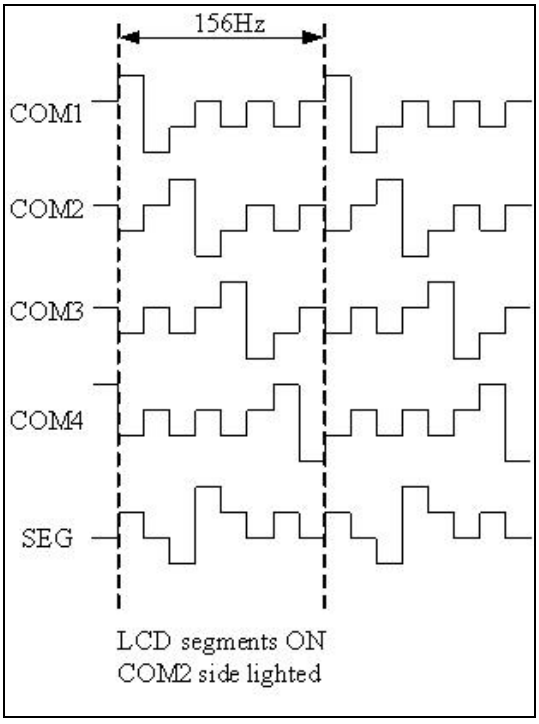
- **Timer (Only for PT8A3351/3/5/7)**

  Once IC enters Heating-on state, internal timer will start to count. It'll be timeout and auto heating-off about 1 hour for 60Hz or 1.2 hour for 50Hz.

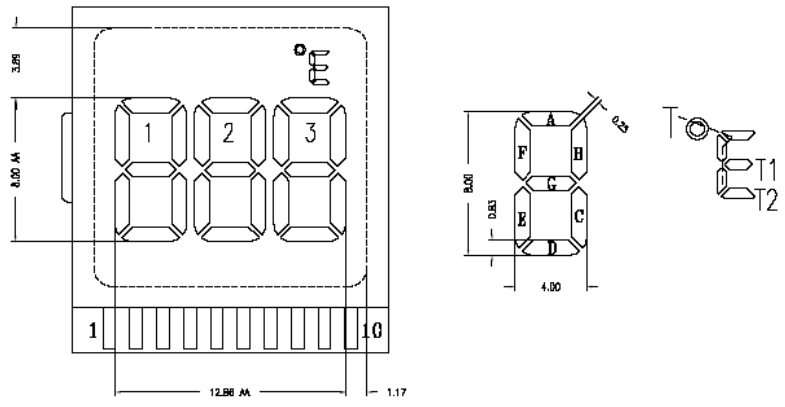
LCD Panel Specification

Item	Description	Item	Description
Front Polarizer	Transmissive, Adhesive	**Drive Condition**	1/4 Duty, 1/3 Bias, 3~5V
Polarizer Mode	Transflective/Positive	**Display Mode**	TN, Positive Mode
Storage Temperature	-10°C to +80°C	**Vrms_on**	$0.577V_{DD}$
Operating Temperature	0°C to +80°C	**Vrms_off**	$0.236V_{DD}$
Viewing Direction	6 O'CLOCK		

1) LCD signaling



2) Support 10 PIN 3~5V LCD

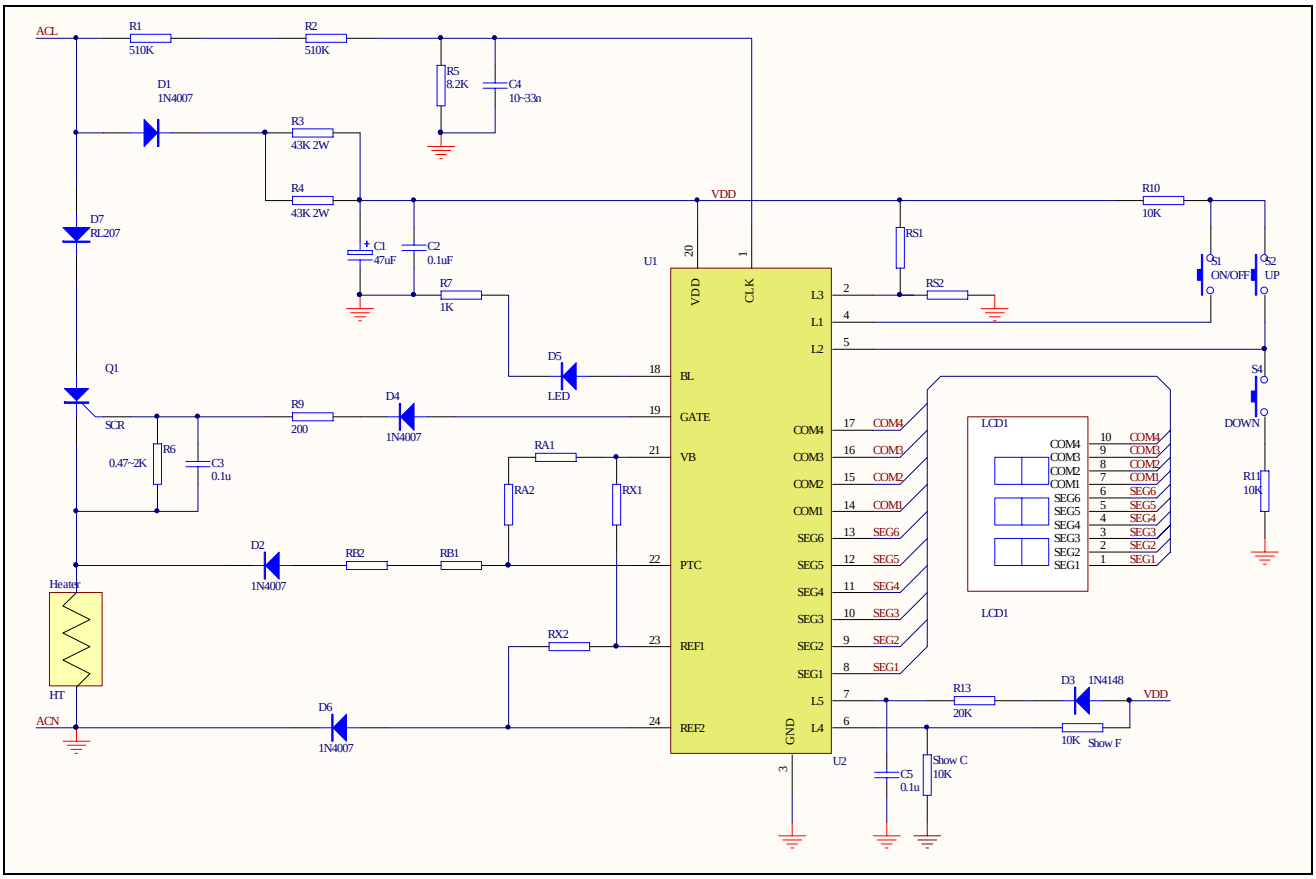


Truth Table

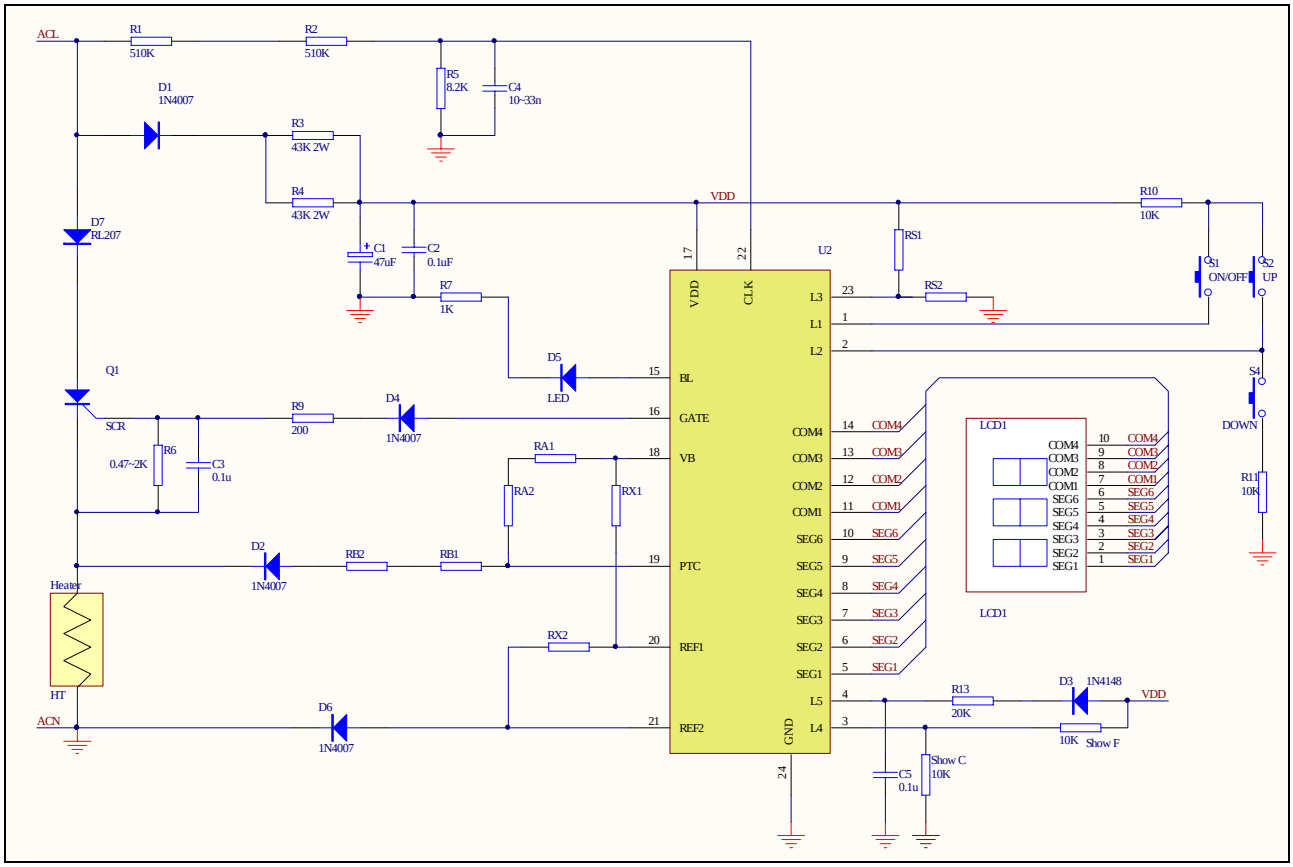
PIN	1	2	3	4	5	6	7	8	9	10
COM4	T	1D	T1	2D	T2	3D				COM4
COM3	1E	1C	2E	2C	3E	3C			COM3	
COM2	1G	1B	2G	2B	3G	3B		COM2		
COM1	1F	1A	2F	2A	3F	3A	COM1			

Application Circuit

Application for SOIC-24/TSSOP-24 package

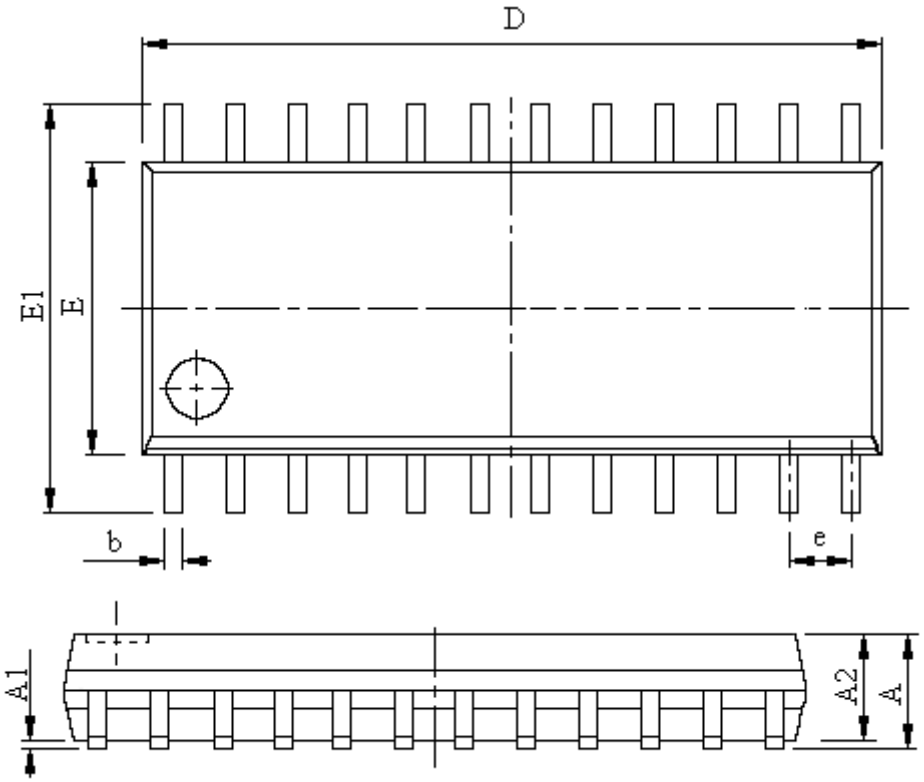


Application for QFN-24 package



Mechanical Information

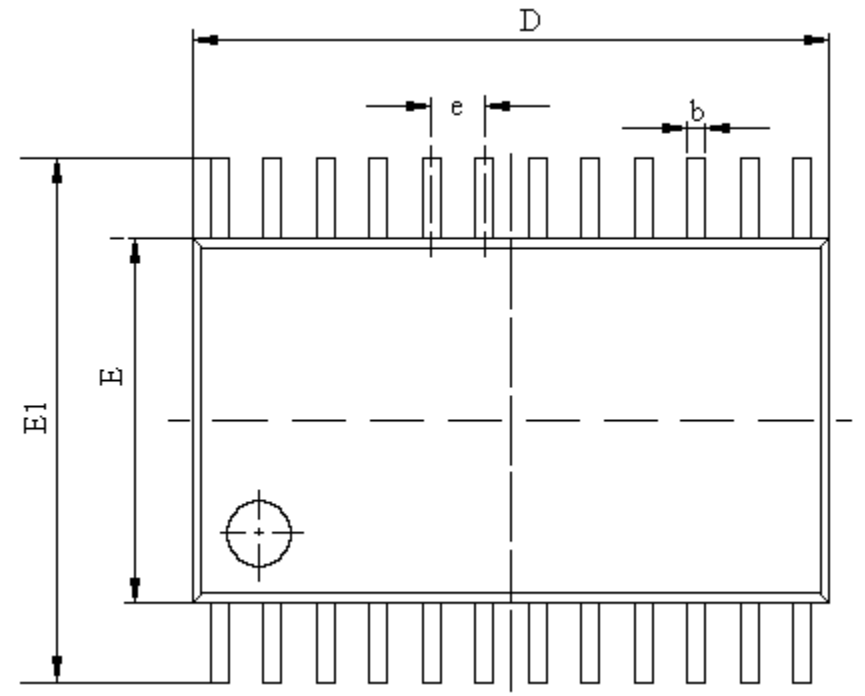
SE (Lead free SOIC-24)

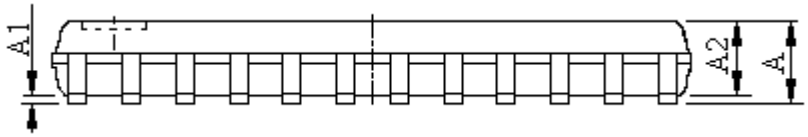


Note:
1) Controlling dimensions in millimeters.
2) Ref: JEDEC MS-013E/AD

PKG. DIMENSIONS(MM)		
SYMBOL	MIN	MAX
A	2.35	2.65
A1	0.10	0.30
A2	2.10	2.50
b	0.33	0.51
c	0.20	0.33
D	15.20	15.60
E	7.40	7.60
E1	10.21	10.61
e	1.27 BSC	
L	0.40	1.27
θ	0°	8°

LE (Lead free and Green TSSOP-24)

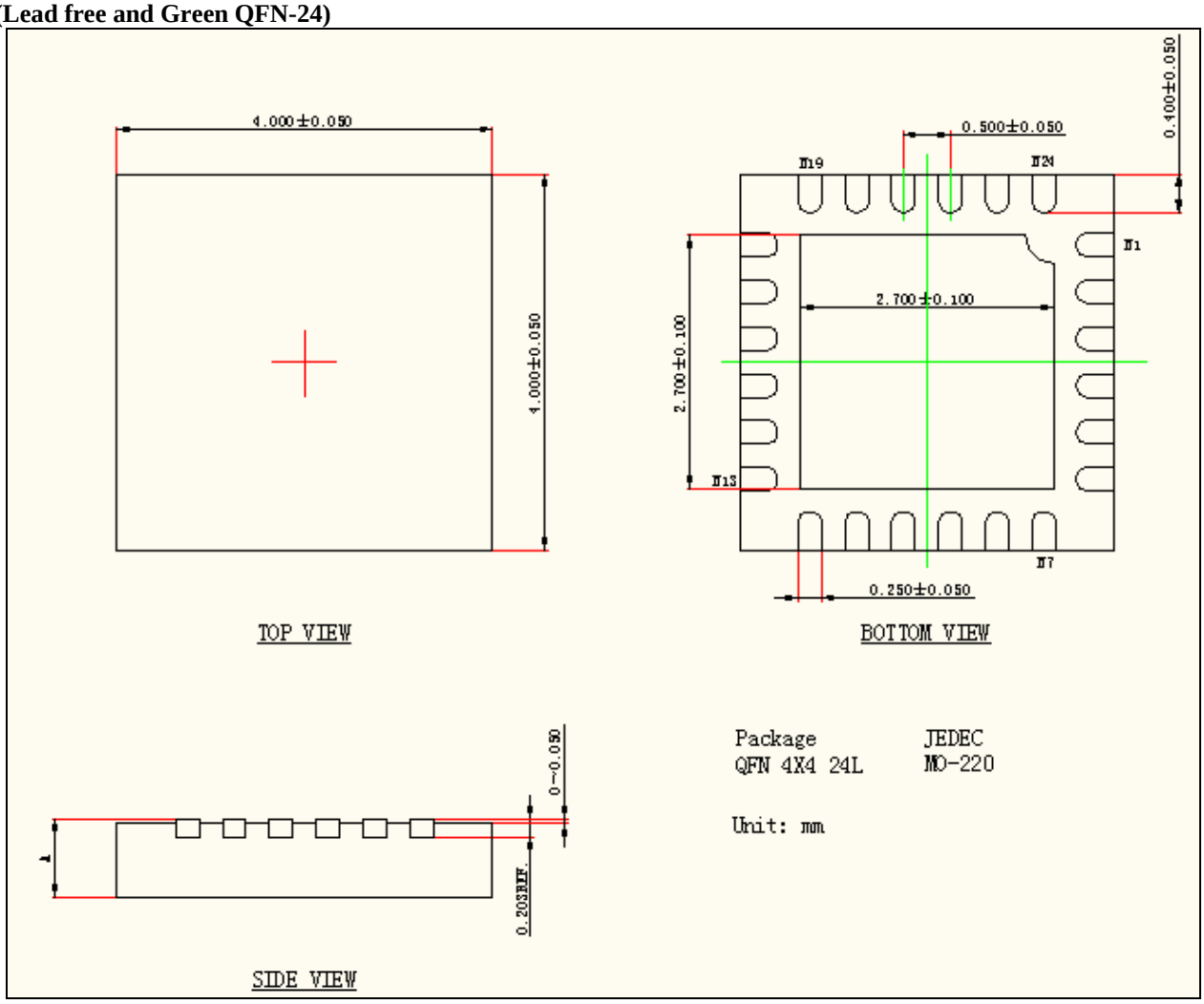




Note:
1)) Ref: JEDEC MO-153F/AD

PKG.	DIMENSIONS(MM)	
SYMBOL	MIN	MAX
A		1.100
A1	0.020	0.150
A2	0.800	1.000
b	0.190	0.300
c	0.090	0.200
D	7.700	7.900
E	4.300	4.500
E1	6.250	6.550
e	0.65 BSC	
L	0.500	0.700
θ	1°	7°

ZDE (Lead free and Green QFN-24)



Ordering Information

Part No.	Package Code	Package
PT8A335xASE	S	Lead free SOIC-24
PT8A335xBSE	S	Lead free SOIC-24
PT8A335xAZDE	ZD	Lead free and Green QFN-24
PT8A335xBZDE	ZD	Lead free and Green QFN-24
PT8A335xALE	L	Lead free and Green TSSOP-24
PT8A335xBLE	L	Lead free and Green TSSOP-24

Note:

- "x" shows 1-8, see below *Function Comparison Table*.
- E = Pb-free or Pb-free & Green
- Adding X Suffix= Tape/Reel

Function Comparison Table

P/N	Last setting load	Timer	Temperature Range	
			℃	℉
PT8A3351A	Y	Y	100-200	210-395
PT8A3351B*	N	Y	100-200	210-395
PT8A3352A*	Y	N	100-200	210-395
PT8A3352B*	N	N	100-200	210-395
PT8A3353A	Y	Y	130-230	265-445
PT8A3353B	N	Y	130-230	265-445
PT8A3354A*	Y	N	130-230	265-445
PT8A3354B*	N	N	130-230	265-445
PT8A3355A	Y	Y	120-220	250-430
PT8A3355B	N	Y	120-220	250-430
PT8A3356A*	Y	N	120-220	250-430
PT8A3356B*	N	N	120-220	250-430
PT8A3357A*	Y	Y	160-230	320-445
PT8A3357B*	N	Y	160-230	320-445
PT8A3358A*	Y	N	160-230	320-445
PT8A3358B*	N	N	160-230	320-445

Note: *Contact Pericom for availability.

PT8A335xA/B 11 temperature levels comparison table. Unit: °F

	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Level 9	Level 10	Level 11
PT8A3351A/B/2A/B	210	230	250	265	285	300	320	340	355	375	395
PT8A3353A/B/4A/B	265	285	300	320	340	355	375	395	410	430	445
PT8A3355A/B/6A/B	250	265	285	300	320	340	355	375	395	410	430
PT8A3357A/B/8A/B	320	340	355	375	395	410	430	445	\	\	\

PT8A335xA/B 11 temperature levels comparison table. Unit: °C

	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Level 9	Level 10	Level 11
PT8A3351A/B/2A/B	100	110	120	130	140	150	160	170	180	190	200
PT8A3353A/B/4A/B	130	140	150	160	170	180	190	200	210	220	230
PT8A3355A/B/6A/B	120	130	140	150	160	170	180	190	200	210	220
PT8A3357A/B/8A/B	160	170	180	190	200	210	220	230	\	\	\