



# LA5695M

## Dual Protection IC for Heating/Cooling and OA Equipment

### Overview

The LA5695M is a protection IC for heating/cooling and OA equipment.

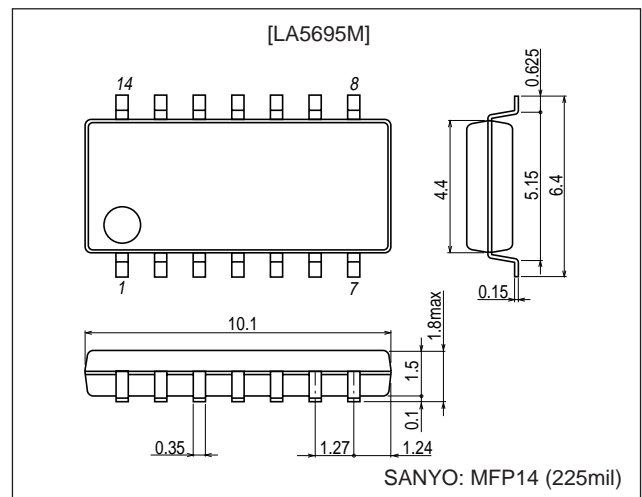
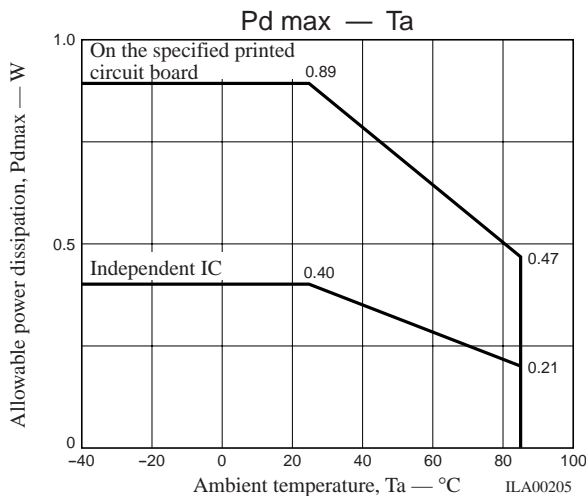
### Functions

- Supply voltage abnormality detection circuit
- Driver output with built-in output delay circuit
- Can be controlled from 8 input pins.

### Package Dimensions

unit: mm

3034A-MFP14



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## Specifications

### Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V <sub>CC</sub> max		18	V
Maximum output current	I <sub>C</sub> max		5	mA
Maximum input voltage	V <sub>IN</sub> max		18	V
Allowable power dissipation	Pd max	Independent IC, Design guarantee value*	0.4	W
Operating temperature	Topr	Design guarantee value*	-40 to +85	°C
Storage temperature	Tstg	Design guarantee value*	-55 to +150	°C

Note: \* The design guarantee values are not measured.

### Allowable Operating Ranges at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage range	V <sub>CC</sub>		5 ± 0.25	V

### Electrical Characteristics at Ta = 25°C, V<sub>CC</sub> = 5 V

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Supply voltage	V <sub>CC</sub>		3.5	5.0	6.0	V
Output delay time	T <sub>DC1</sub>	With C fixed.	14	15	16	s
Detection frequency setting range	fw C2		0.5		40	Hz
Detection frequency	f C2	With C fixed.		1		Hz
Circuit current	I <sub>CC</sub>			6.0	10	mA
[VCC Rise/Fall Detection Block]						
Voltage rise detection level	V <sub>CC</sub> THH		6		7	V
Voltage fall detection level	V <sub>CC</sub> THL		2.5	3.0	3.5	V
Hysteresis	V <sub>CC</sub> HYS	When detecting a rising voltage	0.05		1.0	V
	V <sub>CC</sub> LYS	When detecting a falling voltage	50		200	mV
Minimum operating voltage	V <sub>CC</sub> LV				2.0	V
[Input Circuits]						
Input pull-up resistor	RPUL IN	IN1, 2, 3, 4, 5, 7, 8	14.0	16.5	19.0	kΩ
High-level input voltage	V <sub>IN</sub> H		0.7 × V <sub>CC</sub>		V <sub>CC</sub>	V
Low-level input voltage	V <sub>IN</sub> L		-0.3		0.3 × V <sub>CC</sub>	V
[Test Pin]						
High-level output voltage	V <sub>TP</sub> H	Pin 11	4.0		V <sub>CC</sub>	V
Low-level output voltage	V <sub>TP</sub> L	Pin 11	GND		0.3	V
Output pull-down resistor	RPUL TP	Pin 11 = GND	18.3	21.5	24.8	kΩ
[Output Delay Circuit]						
High-level output voltage	V <sub>OUT</sub> TH	R <sub>O</sub> = 2.2 kΩ	4			V
Low-level output voltage	V <sub>OUT</sub> L	Pin 14, Output = Low, I <sub>sink</sub> =2.5 mA			0.4	V
Output sink current	I <sub>O</sub> sink	Pin 14, R <sub>O</sub> = 2.2 kΩ	1.8			mA
Pin 14 leakage current	I <sub>O</sub> leak		0		10	μA
Pin 8 inverted detection voltage	V <sub>TH8</sub> H		2.3	2.5	2.7	V
Pin 8 hold clear voltage	V <sub>TH8</sub> L		0.8		1.2	V
Pin 8 voltage (hold state)	V <sub>8LAT</sub>		4.0		5.1	V
Pin 8 voltage (hold state after a clear operation)	V <sub>8ULT1</sub>		2.5	2.7	2.9	V
Pin 8 voltage (cleared)	V <sub>8ULT2</sub>	Pin 8 = 180 Ω	-0.05		0.1	V
Pin 8 output resistance	R <sub>OUT8</sub>		0.8	1	1.4	kΩ
[Frequency Detection Block]						
Pin 5 high-level input current	I <sub>IN5</sub> H	Pin 5 = V <sub>CC</sub>		0	100	μA
Pin 5 high-level input voltage	V <sub>IN5</sub> H	Pin 5 = open	4.9		5.1	V
Pin 5 low-level input current	I <sub>IN5</sub> L		146	194	243	μA
Pin 10 high-level voltage	V <sub>10</sub> H	Pin 5 = GND	4.7		5.1	V
Pin 10 low-level voltage	V <sub>10</sub> L	Pin 5 = open	-0.1		0.1	V
Pin 10 inverted detection voltage	V <sub>TH10</sub>		2.3	2.5	2.7	V
Pin 10 source current	I <sub>10SRC</sub>	Pin 5 = GND	60		110	μA
Pin 10 sink current	I <sub>10SINK</sub>	Pin 5 = open	140		240	μA

Note: The AC characteristics are target ratings.

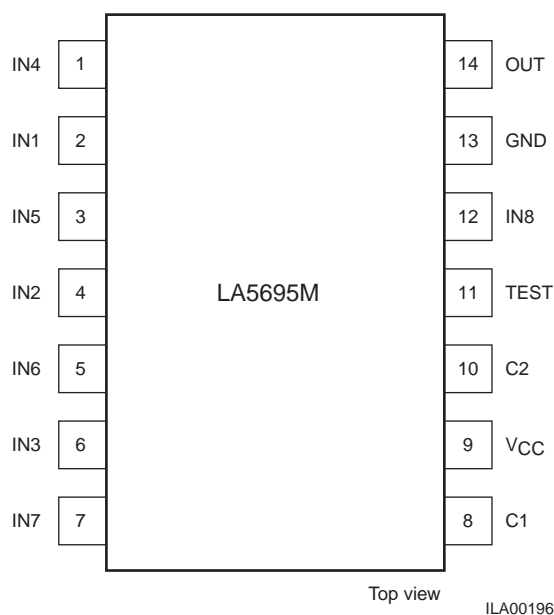
## LA5695M

### Operating Functions Table

IN1	IN2	IN3	IN4	IN5	IN6	IN7	IN8	V <sub>CC</sub>	OUT
H	H	*	*	*	*	*	*	*	L .
H	*	H	*	*	*	*	*	*	L .
*	*	*	H	H	*	*	*	*	L .
*	*	*	H	*	⏏ !	H	*	*	L .
*	*	*	H	*	*	*	H	*	L .
*	*	*	*	*	*	*	*	V <sub>CC</sub> ≥ 6 V	L .
								V <sub>CC</sub> ≤ 3 V	L .
Combinations other than the above									H

Notes: \* The level, high or low, of items marked with an asterisk (\*) have no influence on the OUT pin.  
 Example: When both IN1 and IN2 are high, the OUT pin will be low, regardless of other inputs.  
 ! Items marked with an exclamation mark (!) apply when the input pulse frequency (with a 50% duty) is under the set value.  
 . . Items marked with a double dot ( . . ) indicate the state after the delay time has elapsed once the input conditions have been met.  
 OUT indicates the pin 14 output.

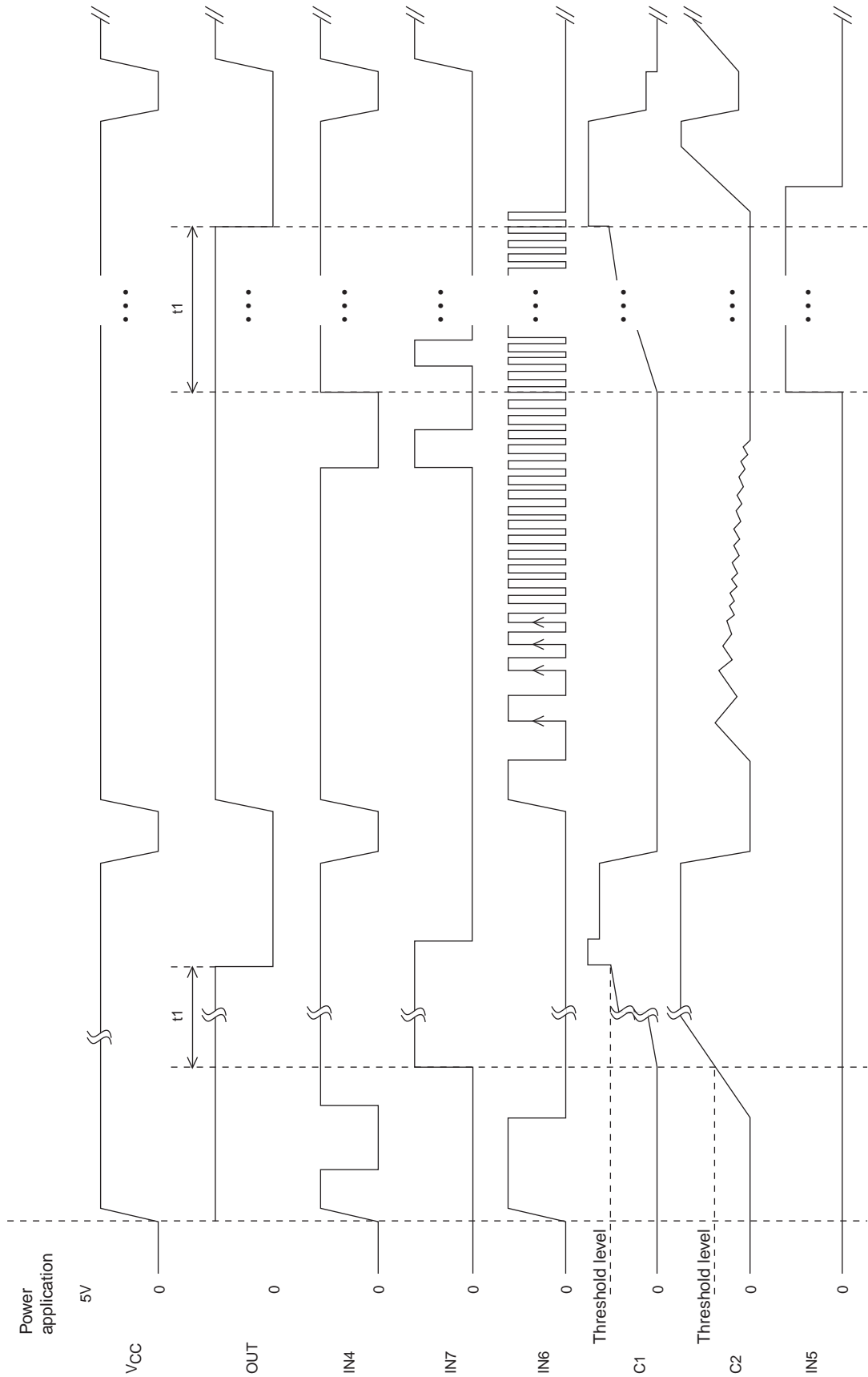
### Pin Assignment



Pin Functions

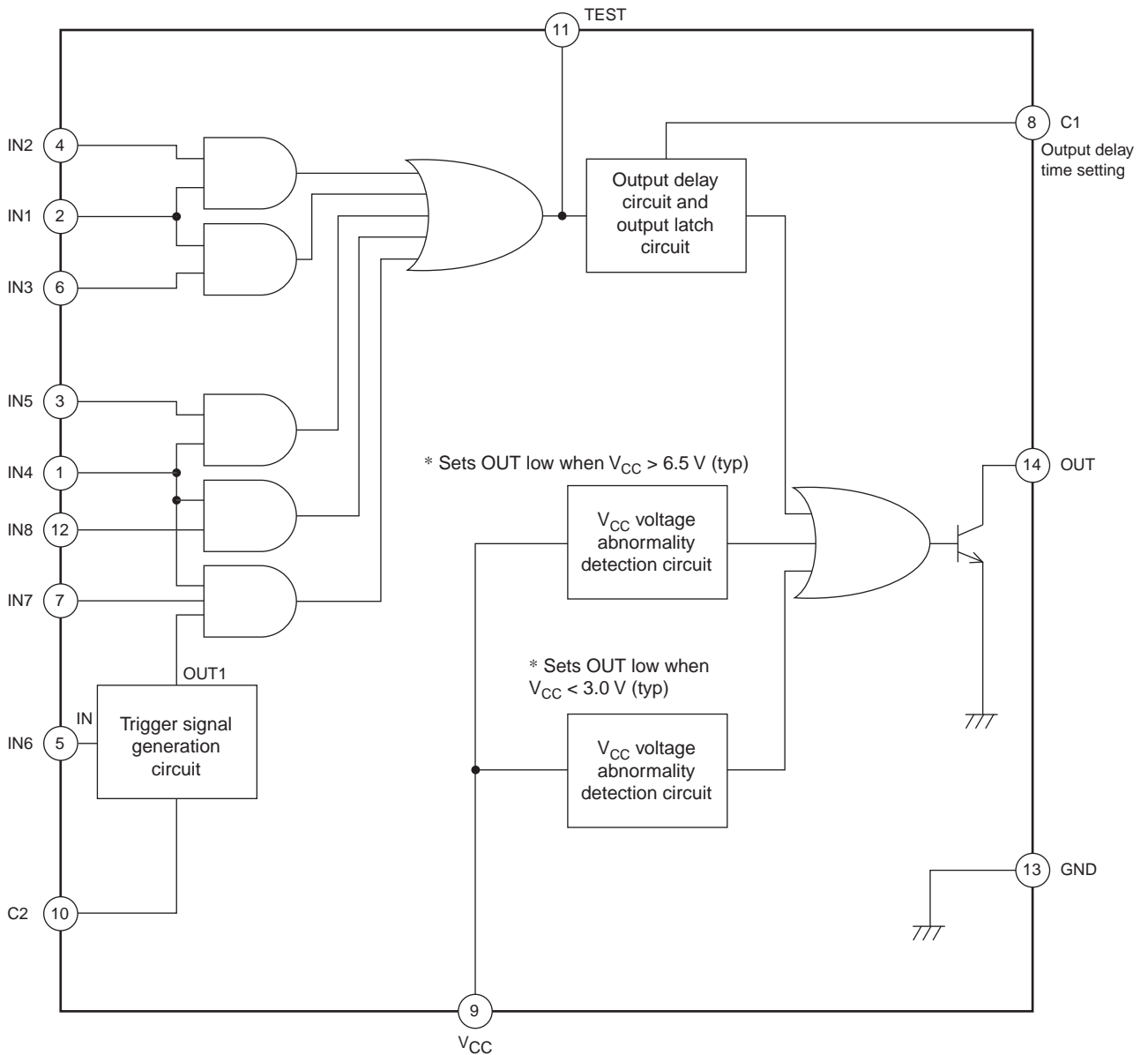
Pin No.	Pin name	Description	Equivalent circuit
2 4	IN1 IN2	Input AND and OR block. The pull-up resistance is 15 kΩ.	<p style="text-align: right;">ILA00197</p>
2 6	IN1 IN3	These are the same as IN1/IN2.	
1 3	IN4 IN5	These are the same as IN1/IN2.	
1 7	IN4 IN7	These are the same as IN1/IN2.	
1 12	IN4 IN8	These are the same as IN1/IN2.	
5 10	IN6 C2	IN6: pulse waveform input. The trigger waveform is output from the C2 capacitor (0.1 μF).	<p style="text-align: right;">ILA00198</p>
8	C1	C1 is pulled up by a 220 kΩ resistor and pulled down by 100 μF capacitor. The comparator switches 15 seconds later at about 1 Hz. Tr1 = 3 S, Tr2 = 13 S	<p style="text-align: right;">ILA00199</p>
9	V <sub>CC</sub>	Any condition other than 3.1 V < V <sub>CC</sub> < 6.7 V is seen as an abnormal state.	
14	OUT	Output pin	
13	GND	Minimum potential for this IC.	
11	TEST	OR circuit output block. The output is pulled down by a 20 kΩ resistor.	<p style="text-align: right;">ILA00200</p>

Timing Chart



ILA00201

Equivalent Circuit Block Diagram



ILA00202

[Trigger signal generation circuit]

When the input pulse (50% duty) is held low or high, OUT1 is set high. At other times, this circuit generates the trigger signal.

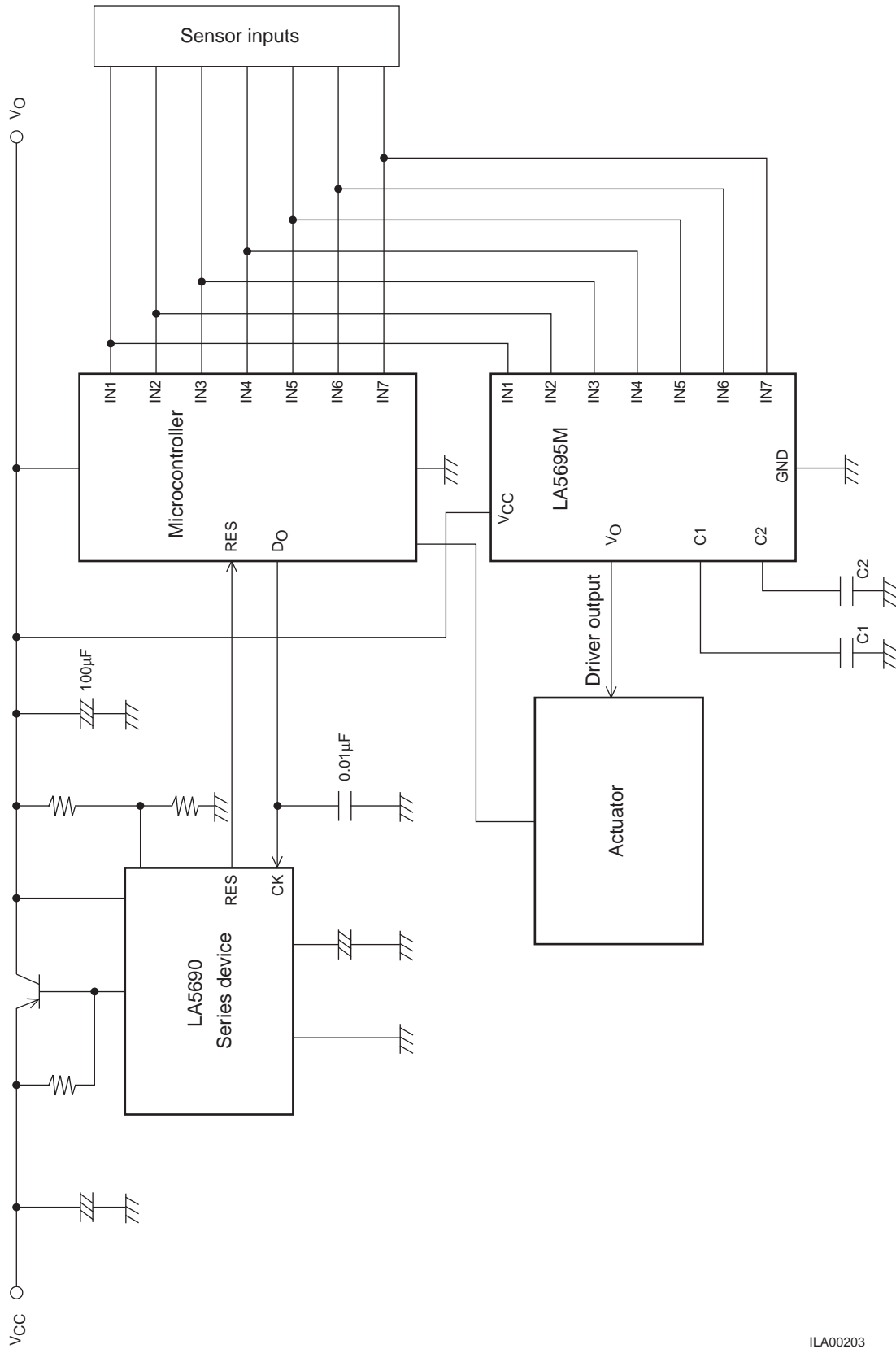
[Output delay circuit and output latch circuit]

The OUT pin is set low when the delay time set by the external capacitor (connected to the output delay time setting pin) elapses after the input goes high. Furthermore, once the output goes low, it is held in that state until the power supply is turned off.

[V<sub>CC</sub> voltage abnormality detection circuit]

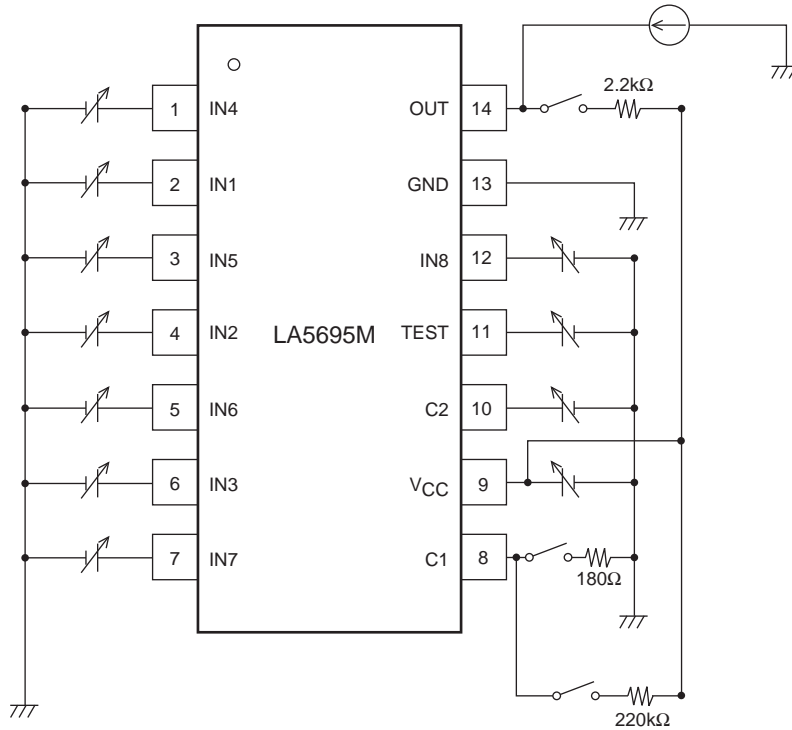
These circuits monitor the V<sub>CC</sub> voltage and set OUT low if the voltage exceeds the set range.

Sample Application Circuit



ILA00203

Test Circuit Diagram



ILA00204

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