

# FC122

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## *Fan Speed Control IC*



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## FC122

# Fan Speed Control IC

## General Description

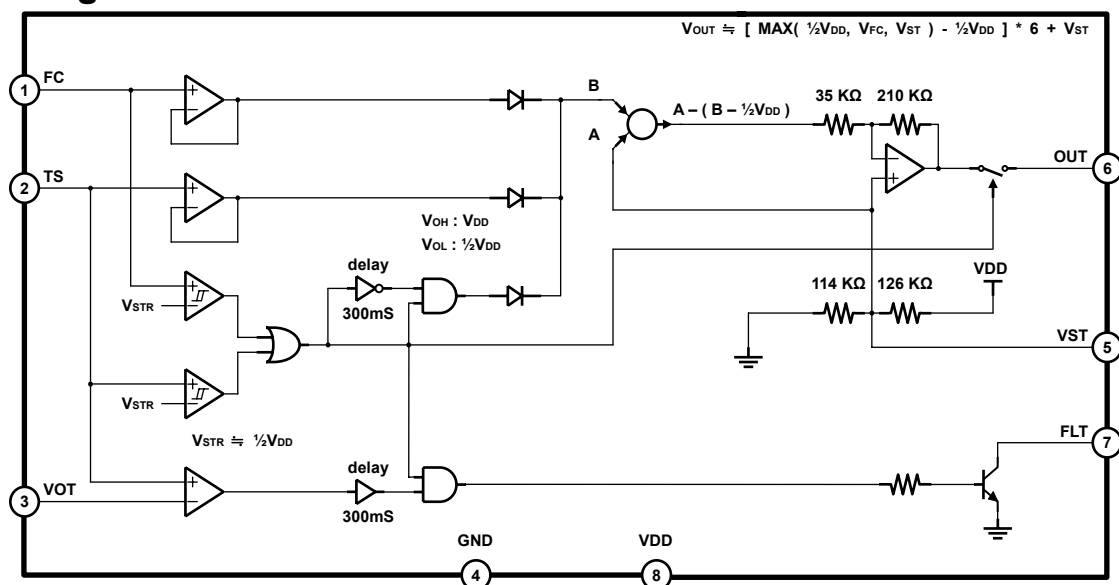
The FC122 is a linear fan-speed-control IC designed for power supply. It is a flexible solution to fan speed control according to the NLX/ATX/PS98 fan speed control specification.

The FC122 incorporate one linear fan-speed-control input, and one temperature sensor input for fan-speed-control and monitoring ambient status. Additional output is provided to report if temperature fault is sensed.

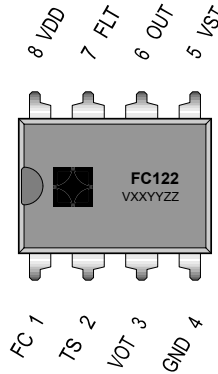
## Features

- Linear fan speed control for high reliable power supply use
- NLX/ATX/PS98 fan control compliant
- Low power consumption
- Adjustable I/O voltage mapping for wide range of application design
- Auto-started fan driving for over temperature protection
- Fault output provided for easy programming control
- Low pin count 8-pin DIP package

## Block Diagram



## Pin Description



Pin No.	Pin Name	Signal Type	Description
1	FC	Analog Input	Fan speed control input
2	TS	Analog Input	Sensing voltage from an external thermistor
3	VOT	Analog Input	Reference voltage for over-temperature detection
4	GND	Ground	Ground
5	VST	Analog Input	Fan start voltage
6	OUT	Analog Output	Output voltage
7	FLT	Digital Output	Open-collector output for over-temperature fault
8	VDD	Power	Supply voltage

## Absolute Maximum Ratings (Unless otherwise noted, $T_A = 25\text{ }^\circ\text{C}$ )

Parameter	Rating
Supply Voltage ( $V_{DD}$ )	< +16.0 V
Input Voltage Range ( $V_I$ )	- 0.3 V to $V_{DD} + 0.3$ V
Output Voltage Range ( $V_O$ )	- 0.3 V to $V_{DD} + 0.3$ V
Junction Temperature ( $T_J$ )	< 150 $^\circ\text{C}$
Operating Temperature ( $T_{opr}$ )	0 $^\circ\text{C}$ to + 70 $^\circ\text{C}$
Storage Temperature ( $T_{stg}$ )	- 55 $^\circ\text{C}$ to + 150 $^\circ\text{C}$
ESD Susceptibility (ESD)	> 2000 V

## Electrical Characteristics (T<sub>A</sub>= 25°C, V<sub>DD</sub>= 12V)

Parameter	Symbol	Conditions	MIN	TYP	MAX	Unit
<b>Power Supply</b>						
Supply Voltage	V <sub>DD</sub>		11.4	12	12.6	V
Supply Current	I <sub>DD</sub>				2	mA

Parameter	Symbol	Conditions	MIN	TYP	MAX	Unit
<b>Analog Input ( FC )</b>						
Start Voltage ( $\approx \frac{1}{2}V_{DD}$ )	V <sub>STR (FC)</sub>		6.03	6.1	6.17	V
Hysteresis	V <sub>HYST (FC)</sub>		50	100	150	mV

Parameter	Symbol	Conditions	MIN	TYP	MAX	Unit
<b>Analog Input ( TS )</b>						
Start Voltage ( $\approx \frac{1}{2}V_{DD}$ )	V <sub>STR (TS)</sub>		6.03	6.1	6.17	V
Hysteresis	V <sub>HYST (TS)</sub>		250	300	350	mV

Parameter	Symbol	Conditions	MIN	TYP	MAX	Unit
<b>Analog Input ( VOT )</b>						
Input Voltage ( $< V_{DD} - 2.0V$ )	V <sub>VOT</sub>		6.0		10.0	V

Parameter	Symbol	Conditions	MIN	TYP	MAX	Unit
<b>Analog Input ( VST )</b>						
Resistance to V <sub>DD</sub>	R <sub>DD</sub>			126		KΩ
Resistance to V <sub>SS</sub>	R <sub>SS</sub>			114		KΩ
Input Voltage ( $< V_{DD} - 2.0V$ )	V <sub>ST</sub>		1.0		10.0	V

Parameter	Symbol	Conditions	MIN	TYP	MAX	Unit
<b>Analog Output ( OUT )</b>						
Start Interval	T <sub>START</sub>		240	300	360	mS
Source Current	I <sub>OUT</sub>				5	mA
Gain	A <sub>OUT</sub>	V <sub>ST</sub> = 5.7 V		6		

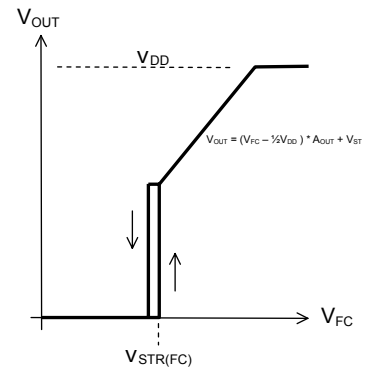
Parameter	Symbol	Conditions	MIN	TYP	MAX	Unit
<b>Open Collector Digital Outputs ( FLT )</b>						
Delay Time	T <sub>FLT</sub>		240	300	360	mS
Output Low Voltage	V <sub>OL</sub>	I <sub>OL</sub> = 1 mA			0.4	V

## Functional Description

### 1. Fan Speed Control:

The output voltage ( $V_{OUT}$ ) can be controlled by fan control input ( $V_{FC}$ ).

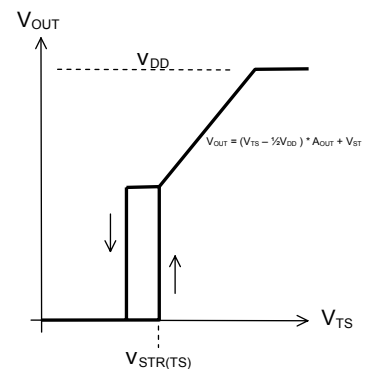
$$V_{FC} \geq V_{STR(FC)} : V_{OUT} = (V_{FC} - \frac{1}{2}V_{DD}) * A_{OUT} + V_{ST}$$



### 2. Temperature Protection:

Pin-TS connects to an external thermistor network for monitoring ambient temperature. The input signal ( $V_{TS}$ ) will decide the minimum output voltage ( $V_{OUT}$ ).

$$V_{TS} \geq V_{STR(TS)} : V_{OUT} = (V_{TS} - \frac{1}{2}V_{DD}) * A_{OUT} + V_{ST}$$



### 3. Drive output:

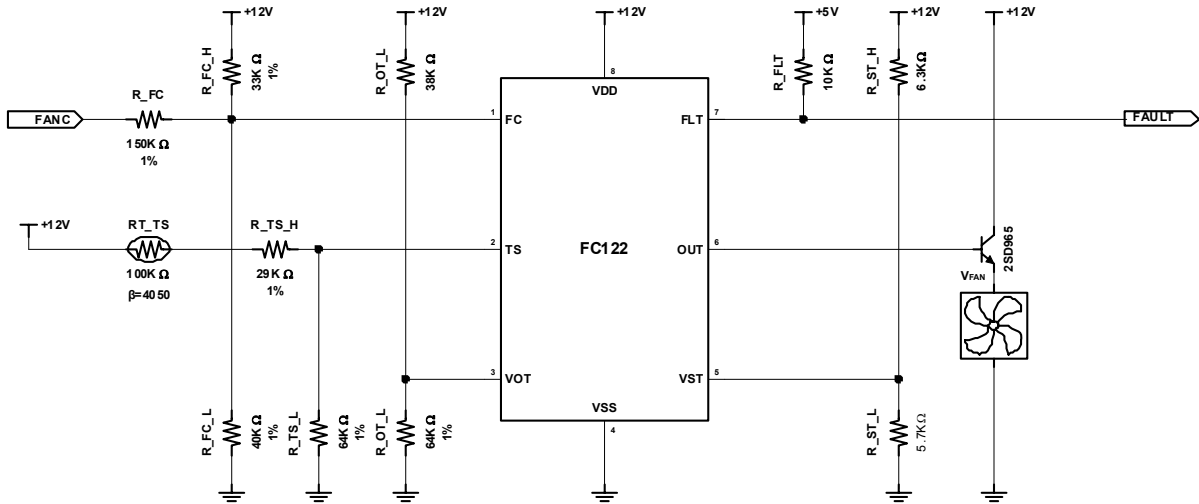
Whenever the fan is started from the off state, it will induce an start-up interval of 0.3 sec, the Pin-OUT will drive full duty in this period and then continue with the voltage determined by MAX ( $V_{FC}$ ,  $V_{TS}$ ).

### 4. Fault output:

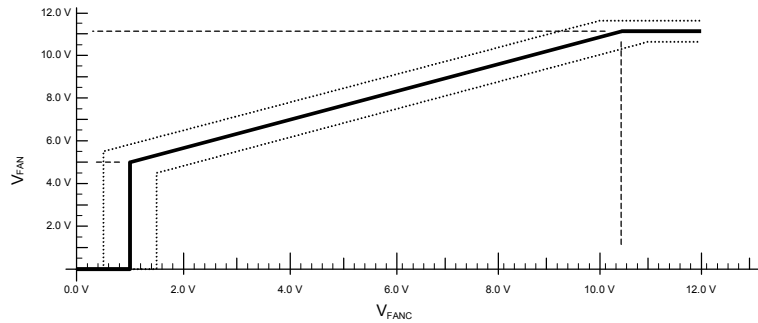
Pin-FLT is an open collector, and active low signal. It will be pulled to low to indicate that over-temperature has occurred.

Over-temperature: When  $V_{TS}$  exceed  $V_{VOT}$ .

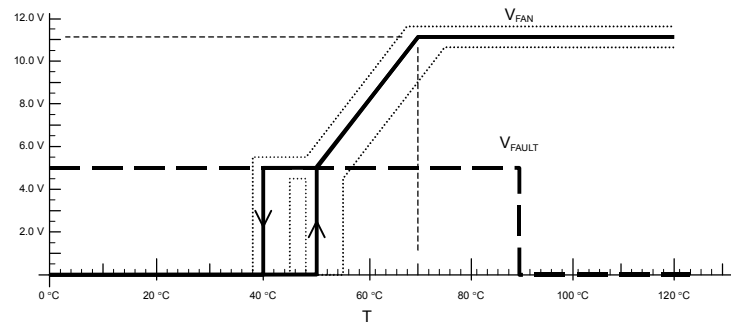
## Typical Applications



### 1. Fan speed control:



### 2. Temperature protection:



## Application Notes

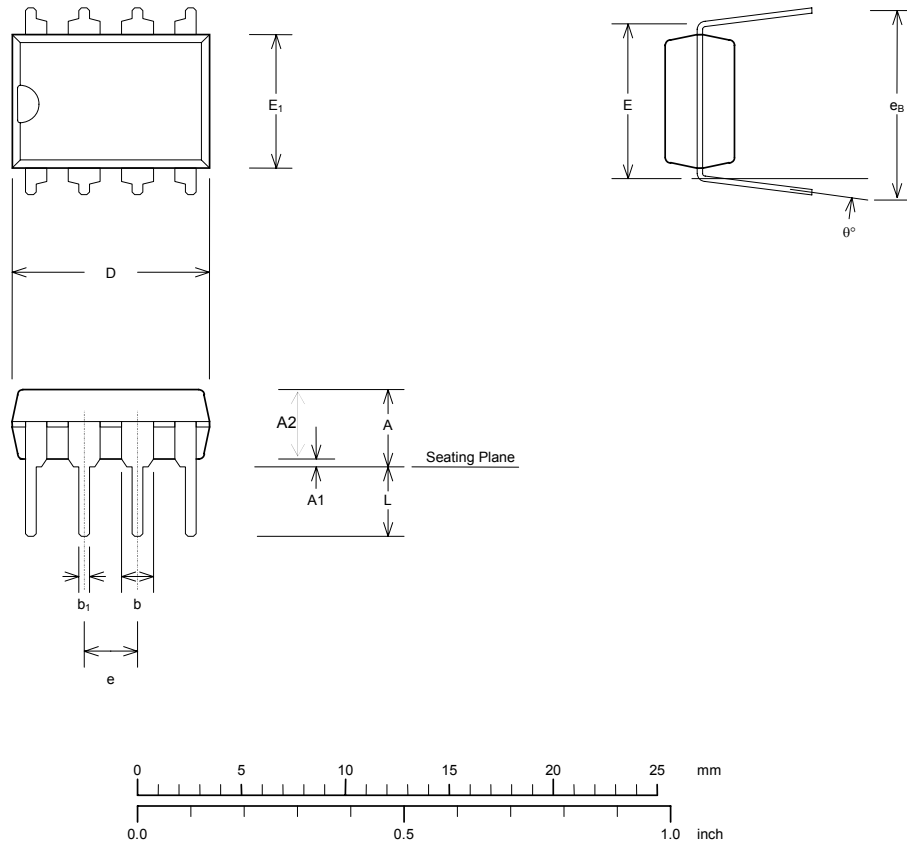
- About the pins that are unnecessary in certain cases:

FC122 provides a highly flexible solution to fan speed control. But in some cases only parts of its functions are needed. When this occurs please refer to the following table to see what to do with these unnecessary pins.

<i>Pin #</i>	<i>Name</i>	<i>Description</i>	<i>What to do</i>
1	FC	Fan speed control input	Grounding
2	TS	Sensing voltage at thermistor	Grounding
3	VOT	Reference voltage for Over-temperature detecting	VDD
7	FLT	Fault open collector output	floating

## Package Specification

( 8-pin DIP )

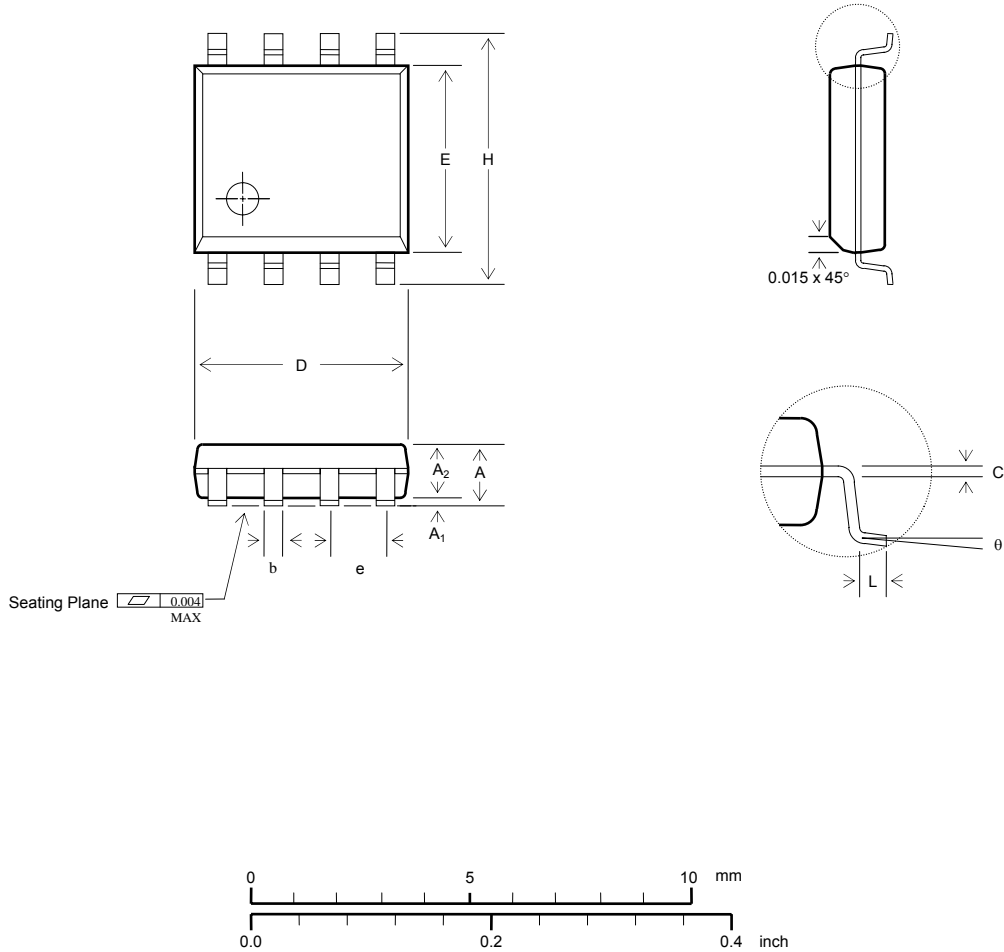


Symbol	Dimension in mm			Dimension in inch			NOTE
	Min	Normal	Max	Min	Normal	Max	
A			5.334			0.210	
A <sub>1</sub>	0.381			0.015			
A <sub>2</sub>	3.175	3.302	3.429	0.125	0.13	0.135	
b		1.524			0.06		
b <sub>1</sub>		0.457			0.018		
D	9.017	9.271	10.160	0.355	0.365	0.4	
E	7.366	7.620	7.874	0.290	0.300	0.310	
E <sub>1</sub>	6.223	6.376	6.528	0.245	0.251	0.257	
e		2.540			0.100		
e <sub>B</sub>	8.509	9.017	9.525	0.335	0.355	0.375	
L	2.921	3.302	3.810	0.115	0.13	0.150	
θ°	0	7	15	0	7	15	



**Package Specification (Continued)**

( 8-pin SOP )



Symbol	Dimension in mm			Dimension in inch			NOTE
	Min	Normal	Max	Min	Normal	Max	
A	1.346		1.753	0.053		0.069	
A <sub>1</sub>	0.102		0.254	0.004		0.010	
A <sub>2</sub>	1.346		1.499	0.053		0.059	
b		0.406				0.016	
c		0.203				0.008	
D	4.801		4.978	0.189		0.196	
E	3.810		3.988	0.150		0.157	
e		1.270				0.050	
H	5.791		6.198	0.228		0.244	
L		0.406				0.050	
$\theta^\circ$		0		8	0		8

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