FAN8002D2

2-Channel Motor Drive

Features

- 2-Channel BTL driver with mute circuit
- Built-in 2-regulator
- Built-in 2-comparator
- Built-in thermal shutdown circuit
- Built-in mute circuit
- Built-in switch circuit
- Built-in OP-AMP circuit
- Operating supply voltage: 4.5~13.2V
- Corresponds to 3.6V DSP

Description

The FAN8002D is a monolithic integrated circuit, suitable for a 2-ch motor driver which drives the focus actuator, tracking actuator.

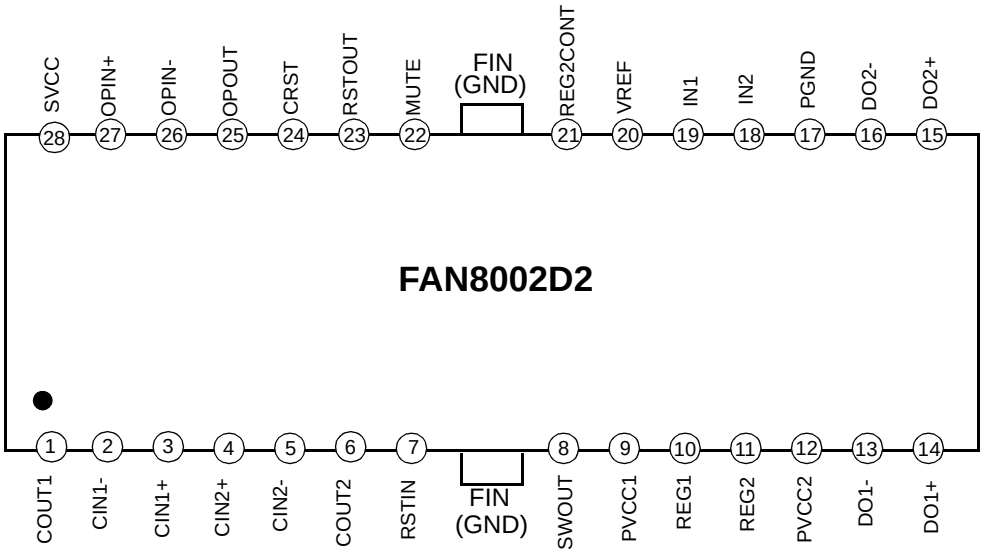
28-SSOPH-300

Ordering Information

Device	Package	Operating Temperature
FAN8002D2	28-SSOPH-300	–35°C ~ 85°C
FAN800D2TF	28-SSOPH-300	–35°C ~ 85°C

Rev. 1.0.1
Jul. 2000.

Pin Assignments



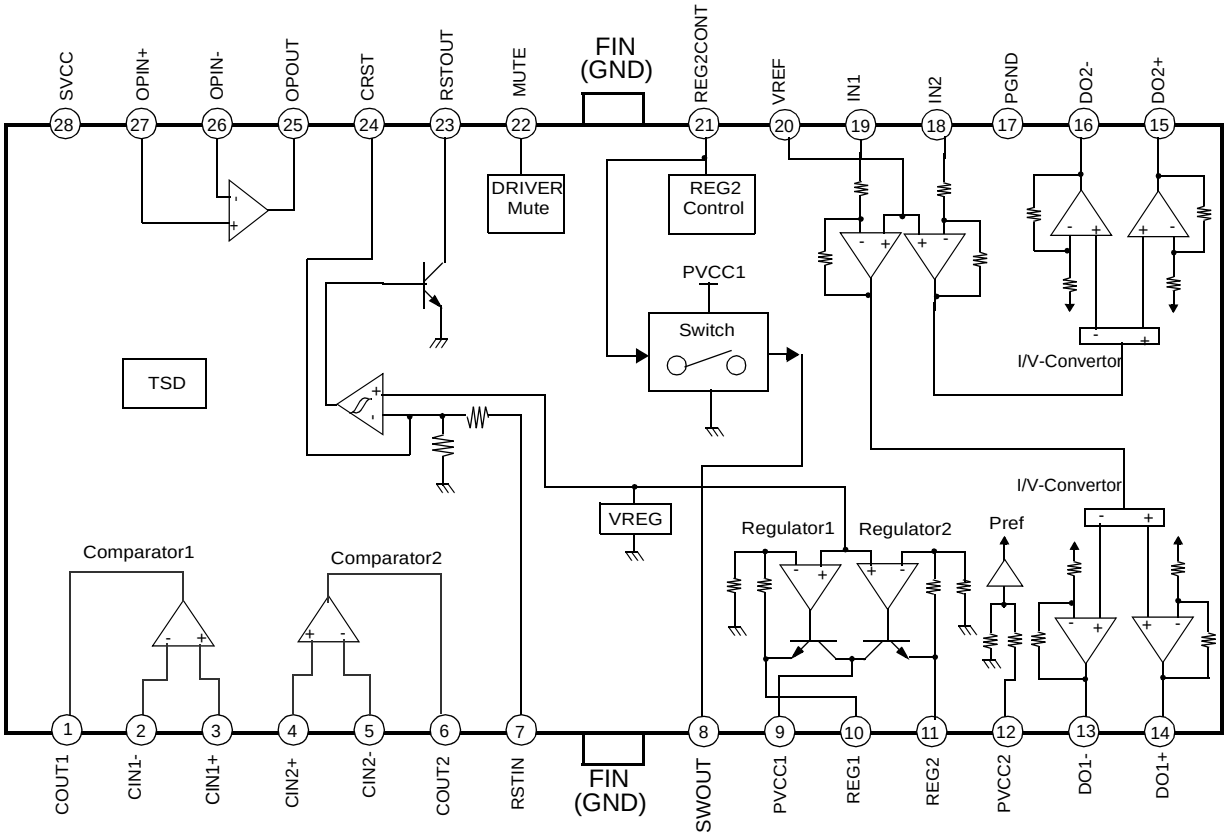
Pin Definitions

Pin Number	Pin Name	I/O	Pin Function Description
1	COUT1	O	Comparator1 Output
2	CIN1-	I	Comparator1 (-) Input
3	CIN1+	I	Comparator1 (+) Input
4	CIN2+	I	Comparator2 (+) Input
5	CIN2-	I	Comparator2 (-) Input
6	COUT2	O	Comparator2 Output
7	RSTIN	I	Reset Input
8	SWOUT	O	Switch Output
9	PVCC1	-	Power Supply1 (Reg,switch Part)
10	REG1	O	Regulator1 Output
11	REG2	O	Regulator2 Output
12	PVCC2	-	Power Supply 2 (Drive Power Output Part)
13	DO1-	O	Drive1 Output (-)
14	DO1+	O	Drive1 Output (+)
15	DO2+	O	Drive1 Output (+)
16	DO2-	O	Drive1 Output (-)
17	PGND	-	Power Ground
18	IN2	I	CH2 Drive Input
19	IN1	I	CH1 Drive Input
20	VREF	I	Reference Voltage
21	REG2 CONT	I	Regulator2 On/off Control
22	MUTE	I	Drive Mute

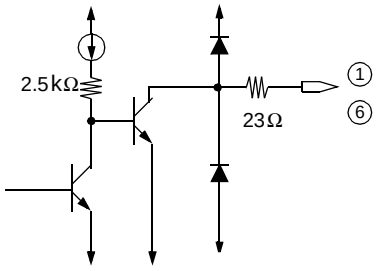
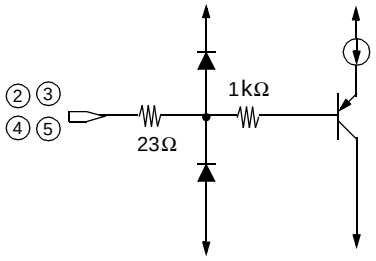
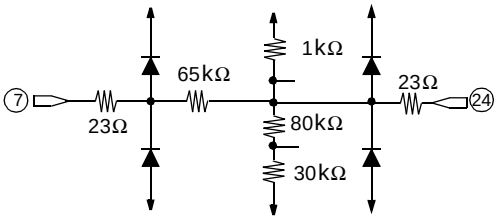
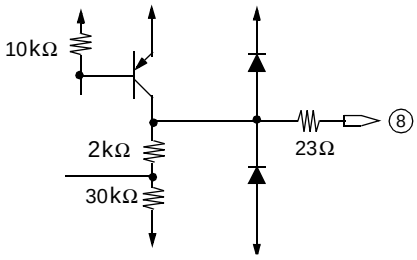
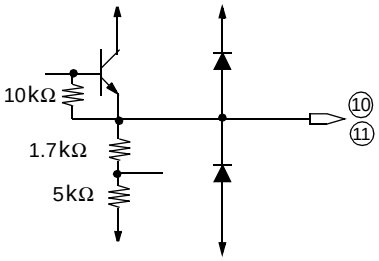
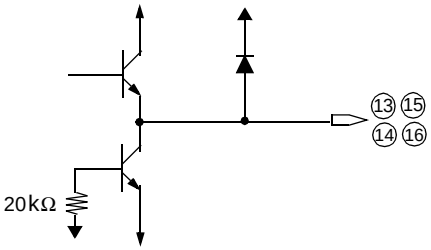
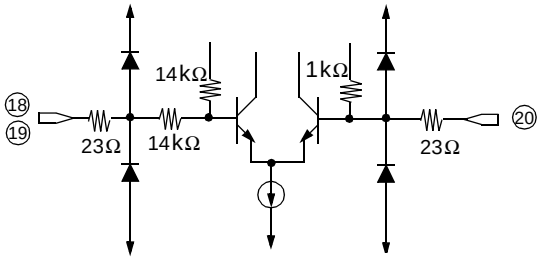
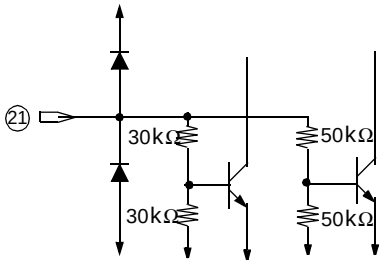
Pin Definitions (Continued)

Pin Number	Pin Name	I/O	Pin Function Description
23	RSTOUT	O	Reset Output
24	CRST	-	Reset Capacitor
25	OPOUT	-	Opamp Output
26	OPIN -	-	Opamp Input -
27	OPIN +	-	Opamp Input +
28	SVCC	-	Signal Supply (Comparator, Reset, Opamp Drive Pre-amp Part)

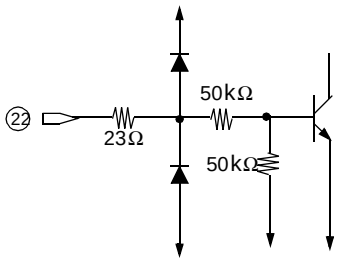
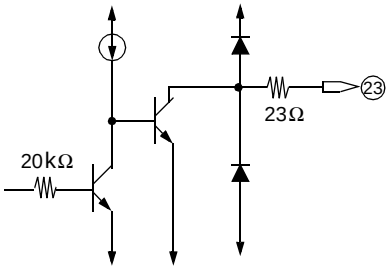
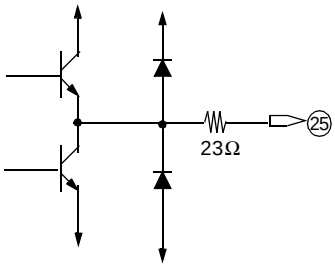
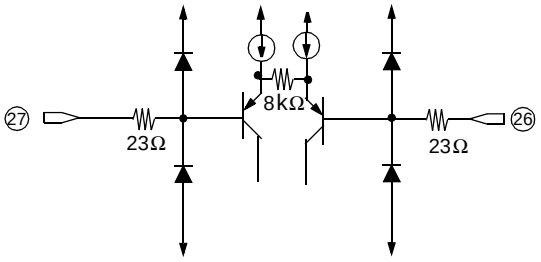
Block Diagram



Equivalent Circuits

Comparator Output	Comparator Input
	
Reset Input & Reset Capacitor	**Switch Output**
	
Regulator Output	**Btl Driver Output**
	
Vref & Btl Driver Input	**Reg2 & Switch Control Input**
	

Equivalent Circuits (Continued)

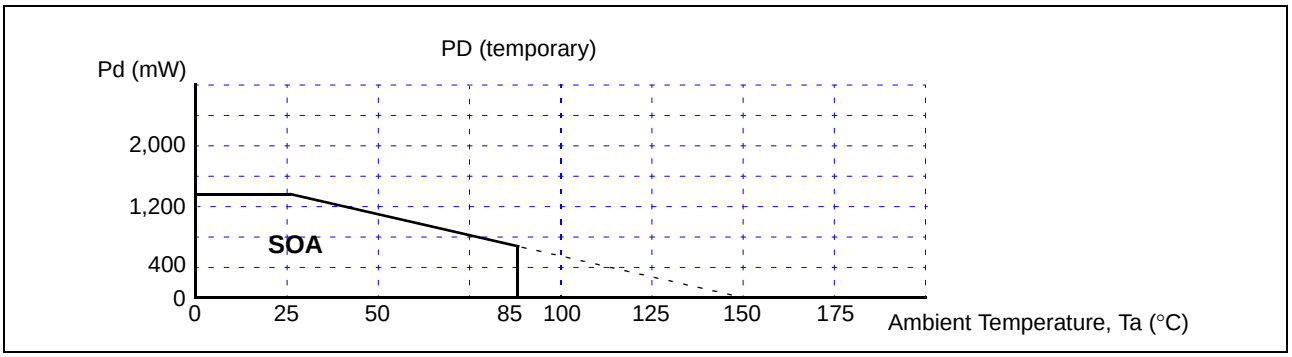
Mute Input	Reset Output
	
Op-amp Output	**Op-amp Input**
	

Absolute Maximum Ratings (Ta = 25 °C)

Parameter	Symbol	Value	Unit
Maximum supply voltage	V_{CCmax}	15	V
Power dissipation	P_d	1.4[note]	W
Operating temperature range	T_{opr}	-35 ~ +85	°C
Storage temperature range	T_{stg}	-55 ~ +150	°C

NOTE:

1. When mounted on a 76.2mm × 114mm × 1.57mm PCB (Phenolic resin material).
2. Power dissipation reduces 11.2mW/°C for using above Ta = 25°C
3. Do not exceed Pd and SOA(Safe operating area).



Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit
Signal Supply Voltage	SVCC	4.5	-	13.2	V
Power Supply Voltage 1	PVCC1	4.5	-	SVCC	V
Power Supply Voltage 2	PVCC2	4.0	-	SVCC	V

Electrical Characteristics

(Unless otherwise specified, Ta = 25 °C, V_{CC} = VM12 = VM3,4 = 5V,Vref=1.65V, Comparator out=Hi-Z)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Quiescent Current 1	I_{CC1}	V_{IN} =Vref, Pin21=0V, Pin22=5V	-	9	-	mA
Quiescent Current 2	I_{CC2}	V_{IN} = Vref, Pin21=5V, Pin22=5V	-	19	-	mA
Quiescent Current 3	I_{CC3}	V_{IN} = Vref, Pin21=5V, Pin22=0V	-	15	-	mA
Quiescent Current 4	Icc4	V_{IN} = Vref, Pin21=0V, Pin22=0V	-	6	-	mA
DRIVE PART						
Output Offset Voltage	V_{OO}	V_{IN} = Vref	-50	-	+50	mV
Maximum output voltage1	V_{OM1}	SV_{CC}=5V, R_L=24ohm,	3.1	3.5	-	V
Maximum output voltage2	V_{OM2}	SV_{CC}=12V, R_L=24ohm	3.6	4.0	-	V
Closed loop voltage gain	G_{VC}	V_{IN}=0.1Vrms, f=1KHz, Rext=0	10.5	12	13.5	dB
Mute on voltage	V_{MON}	Pin22 = Variation	GND	-	0.5	V
Mute off voltage	V_{MOFF}	Pin22 = Variation	2	-	Vcc	V
REGULATOR PART						
Maximum output current	Iomax	-	200	-	-	mA
Regulator output voltage	Vreg	I_L=50mA	3.5	3.6	3.7	V
Load regulation	ΔVrl	I_L=0~200mA	-40	-	10	mV
Line regulation	ΔVcc	V_{CC}=4.5~5.5V	-	10	30	mV
Regulator2 on voltage	Vr2on	Pin21=Variation	2.0	-	Vcc	V
Regulator2 off voltage	Vr2off	Pin21=Variation	GND	-	0.5	V
COMPARATOR PART						
Input offset voltage	Vio	-	-	-	4.0	mV
Input offset current	Iio	-	-	5.0	-	nA
Input bias current	Ib	-	-	25	250	nA
Common mode input voltage	Vicm	-	0	-	3.5	V
Output sink current	Isink	-	3.0	-	-	mA
Slew rate	SR	V_{IN}=4Vp_p, f=100KHz,Square	-	1.3	-	us
RESET PART						
Reset on voltage	Vrston	V_{CT}l=H / L	4.1	4.2	4.3	V
Reset hysteresis voltage	Vrsthys	V_{CT}l=H / L /H	100	-	200	mV
Low level output voltage	VoL	R_L=4.7 K	-	100	200	mV
SWITCH PART						
Upper satuaration voltage	Vupsat	V_{CC}=5V, Iout=150mA	-	0.13	0.2	V
Output off current	Ioff	V_{CC}=5V	-	-	20	μA
OP-AMP PART						

Electrical Characteristics (Continued)

(Unless otherwise specified, Ta = 25 °C, V_{CC} = VM12 = VM3,4 = 5V,Vref=1.65V, Comparator out=Hi-Z

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Input offset voltage	V_{OF}	-	-7	0	+7	mV
Input bias current	I_{B1}	-	-	-	200	nA
High level output voltage	V_{OH1}	-	4.4	4.7	-	V
Low level output voltage	V_{OL1}	-	-	0.1	0.4	V
Output sink current	I_{SINK}	R_L=1Kohm	2	4	-	mA
Output source current	I_{SOU1}	R_L=1Kohm	2	4	-	mA
Common mode input range	VICM	-	-0.3	-	4.0	V
Open Loop voltage gain	G_{VO1}	f=1kHz, V_{IN}=-75dB	-	80	-	dB
Ripple rejection ratio	RR1	f=120Hz, V_{IN}=-20dB	-	65	-	dB
slew rate	SR1	f=120Hz, 2Vp-p	-	1.2	-	V/us
Common Mode rejection ratio	CMRR	f=1kHz, V_{IN}=-20dB	-	80	-	dB

Application Information

1. Reference Input

Pin 20 (REF) is a reference Input pin.

- Reference Input
  The applied voltage at the reference input pin must be between 1.5 (V) and 3.5 (V), when Vcc = 5V.

2. Channel Mute Function

These pins are used for channel mute operation.

- When the mute pin (pin22) is Low level, the mute circuit is enabled and the output circuits are muted.(both CH1, CH2)
- When the voltage of the mute pin (pin22) is High level, the mute circuit is disabled and the output circuits operate normally.
- If the chip temperature rises above 175 °C, then the thermal shutdown (TSD) circuit is activated and the output circuits are muted.
- Mute(pin 22)-CH1, 2 mute control input pin.

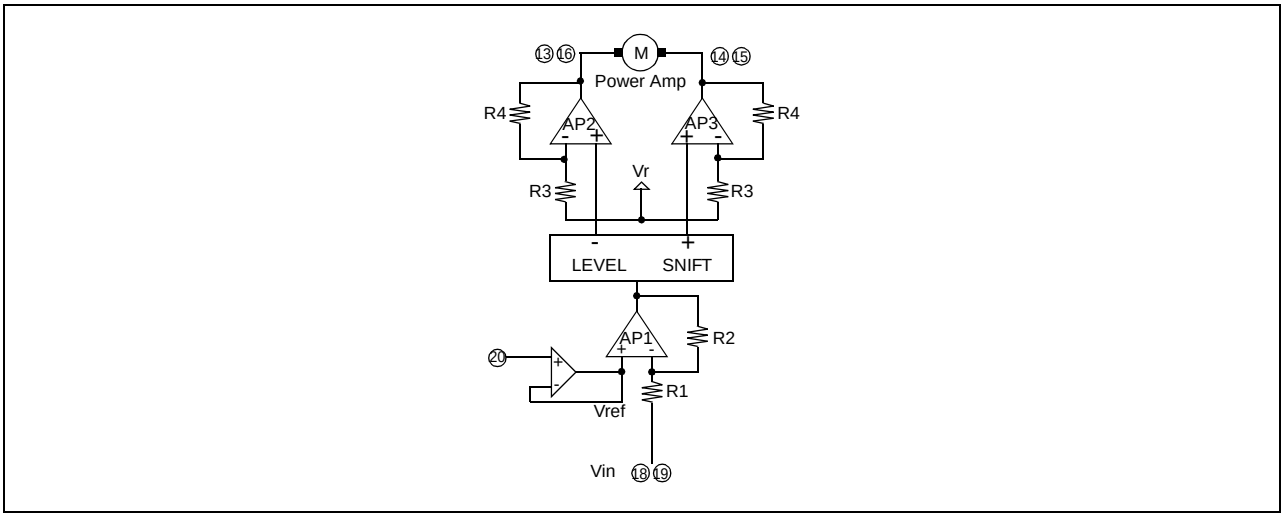
3. Protection Function

Thermal Shutdown (TSD)

- 1) If the chip temperature rises above 175 °C the thermal shutdown (TSD) circuit is activated and the output circuit is in the Mute state, that is Off state.
- The TSD circuit has a temperature hysteresis of 25°C.

4. Focus, Tracking Actuator

- The reference voltage REF is given externally through pin 20
- The input signal is amplified by R2/R1 times and then fed to the level shift circuit.
- The level shift circuit produces the differential output voltages and drives the two output power amplifiers. Since the differential gain of the output amplifiers is equal to $2 \times (1+ R4/R3)$, the input signal is amplified by $(R2/R1) \times 2 \times (1+R4/R3)$.
- If the total gain is too high, you can reduce the closed loop gain by adding an external resistance at pin18, 19
- The power reference voltage (Vr) is about a half of the supply voltage(VM).



5. Regulator & Control Function

The regulator circuit is illustrated in the figure.1.

- The capacitor is used as a ripple eliminator and should have a good temperature characteristics.
- The regulator output voltage is calculated as follows

$$V_{REG} = (1 + R1/R2) \times 2.5 = 3.4V$$

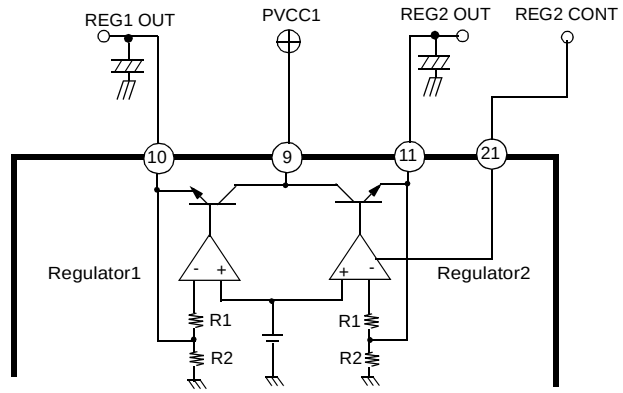


Figure 1.

- When the voltage of the pin21 is high (above 2.0V), the regulator operates normally.
  On the other hand, when the voltage of the pin21 is low (below 0.5V), the regulator will be turned off.
  Truth table is as follows

Pin#21	Regulator 2
High	Turn On
Low	Turn Off

6. Reset Circuit

The reset circuit is illustrated in the figure.2.

- 1) The capacitor is used for delay.

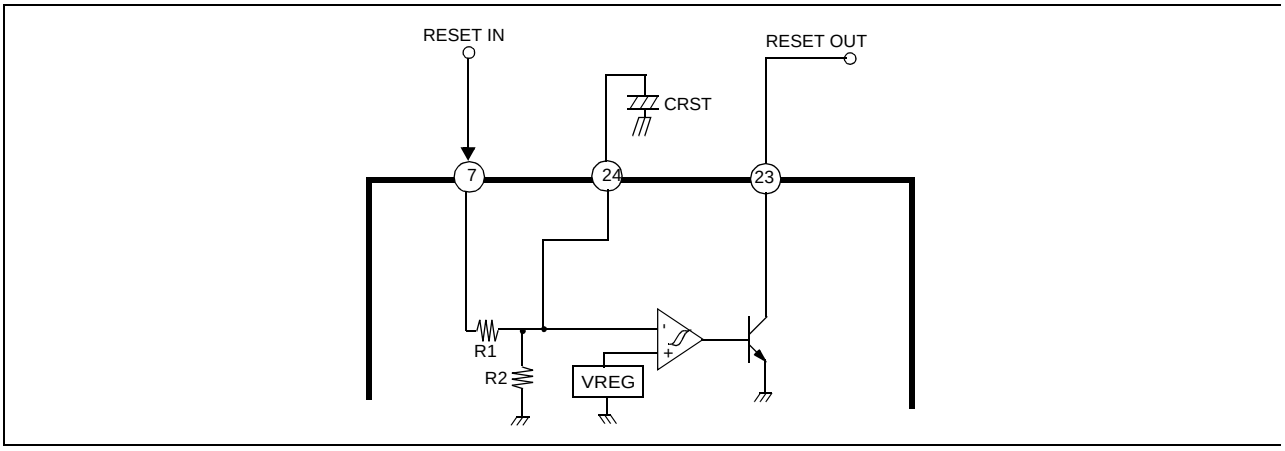


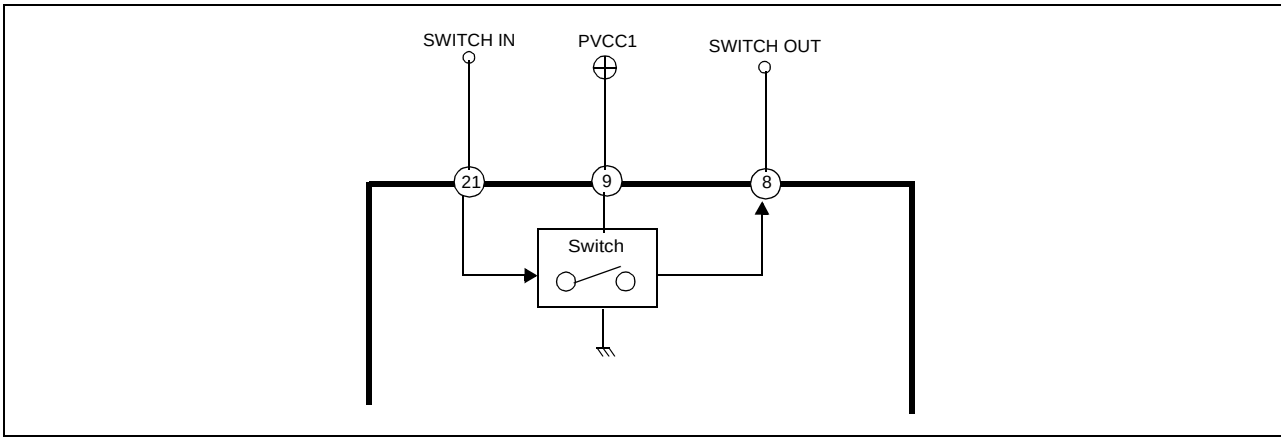
Figure 2.

- 2) When the voltage of the pin7 is above 4.2V, the output of the reset circuit is OPEN (no load).
  On the other hand, when the voltage of the pin7 is low , the output of the reset circuit is low.
  Truth table is as follows

Pin#7	Reset Output
High	Open
Low	Low

7. Switch Circuit

The switch circuit is illustrated in the figure.3.

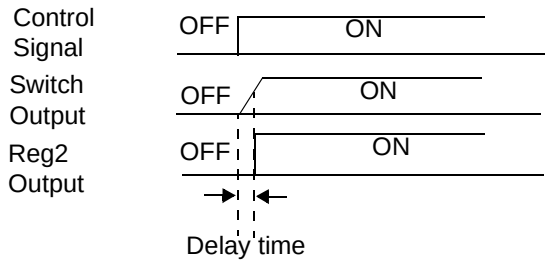


When the voltage of the pin21 is high (above 2.0V), the output of the switch circuit is above 4.8V.
On the other hand, when the voltage of the pin21 is low (below 0.5V), the routput of the reset circuit is below 0.5V.

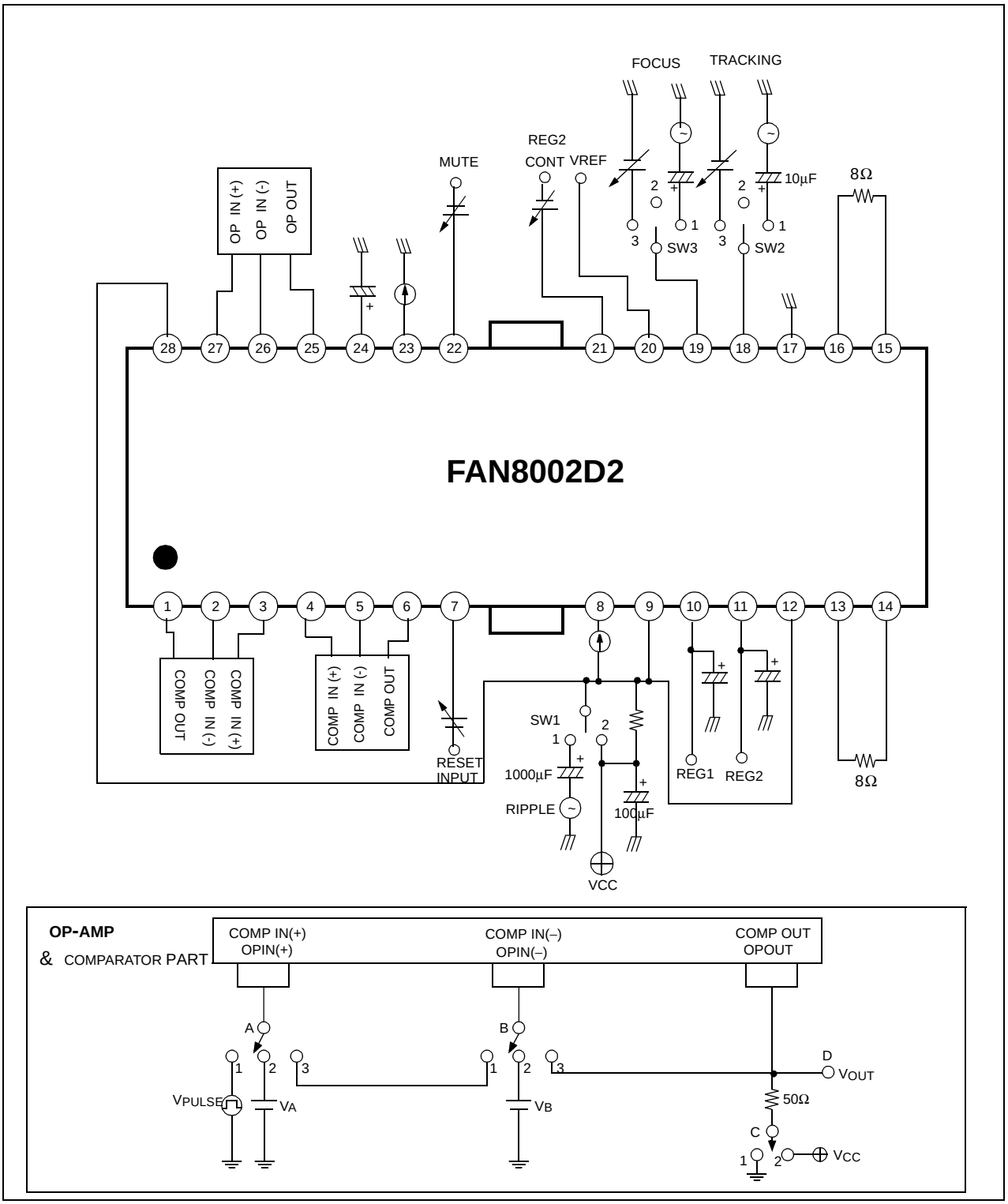
Truth table is as follows

Pin#21	Switch Output
High	Above 4.8v
Low	Below 0.5v

The regulator2 control pin and the switch control pin is same(pin21).
If the pin21 is high, first switch circuit operates and then regulator circuit operates normally.
The operation is illustrated in the following time table



Test Circuit



Application Circuit

(Voltage Control Mode)