

# 2-channel switching regulator controller

## BA9743AFV

The BA9743AFV is a 2-channel switching regulator controller that uses a pulse width modulation (PWM) system. Both channels can be used for DC / DC converter operations including step up, step down, and inverting. Because the IC is compactly packaged, it is best suited for use as a power supply in portable equipment.

### ●Applications

DC / DC converters in VCRs, notebook computers, etc.

### ●Features

- 1) Built-in reference voltage current ( $\pm 1\%$ ).
- 2) Timer latch, short-circuit protection circuit is built in.
- 3) Circuit to prevent malfunction during low input voltage is built in.
- 4) Built-in reference voltage (2.505V) output pin.
- 5) Rest period is adjustable over the whole range of duty ratio.

### ●Absolute maximum ratings (Ta = 25°C)

Parameter	Symbol	Limits	Unit
Power supply voltage	V <sub>CC</sub>	36	V
Power dissipation	P <sub>d</sub>	450*1	mW
Operating temperature	T <sub>opr</sub>	-40~+85	°C
Storage temperature	T <sub>stg</sub>	-55~+125	°C
Output pin current	I <sub>o</sub>	120*2	mA
Output pin voltage	V <sub>o</sub>	36	V

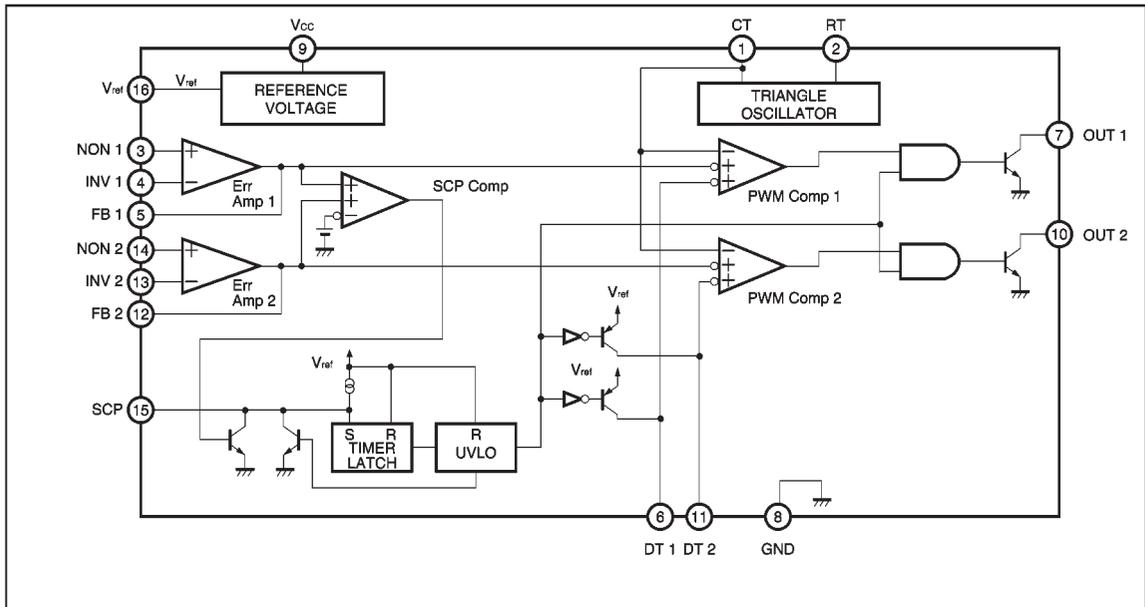
\*1 Reduced by 4.5 mW for each increase in Ta of 1°C over 25°C  
(when mounted on a board 50.0×50.0×1.6 mm).

\*2 Should not exceed Pd- or ASO-value.

### ●Recommended operating conditions (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit
Power supply voltage	V <sub>CC</sub>	3.6	6.0	35	V
Output pin current	I <sub>o</sub>	—	—	100	mA
Output pin voltage	V <sub>o</sub>	—	—	35	V
Error amplifier input voltage	V <sub>OM</sub>	0.3	—	1.6	V
Timing capacitance	C <sub>CT</sub>	100	—	15000	pF
Timing resistance	R <sub>RT</sub>	5.1	—	50	kΩ
Oscillation frequency	F <sub>OSC</sub>	10	—	800	kHz

## ● Block diagram



## ● Pin descriptions

Pin No.	Pin name	Function
1	CT	External timing capacitance
2	RT	External timing resistance
3	NON1	Positive input for error amplifier 1
4	INV1	Negative input for error amplifier 1
5	FB1	Output for error amplifier 1
6	DT1	Output 1 dead time / soft start setting
7	OUT1	Output 1
8	GND	Ground
9	V <sub>cc</sub>	Power supply
10	OUT2	Output 2
11	DT2	Output 2 dead time / soft start setting
12	FB2	Output for error amplifier 2
13	INV2	Negative input for error amplifier 2
14	NON2	Positive input for error amplifier 2
15	SCP	Timer latch setting
16	V <sub>ref</sub>	Reference voltage (2.505 V) output

●Electrical characteristics (unless otherwise noted, Ta = 25°C and V<sub>CC</sub> = 6V)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
〈Reference voltage section〉						
Output voltage	V <sub>ref</sub>	2.48	2.505	2.53	V	I <sub>ref</sub> =1mA
Input stability	V <sub>DLI</sub>	—	1	10	mV	V <sub>CC</sub> =3.6~35V
Load stability	V <sub>DLO</sub>	—	1	10	mV	I <sub>ref</sub> =0~5mA
〈Triangular wave oscillator section〉						
Oscillation frequency	F <sub>OSC</sub>	320	400	480	kHz	R <sub>RT</sub> =10kΩ, C <sub>CT</sub> =220pF
Frequency variation	F <sub>DV</sub>	—	1	—	%	V <sub>CC</sub> =3.6~35V
〈Protection circuit section〉						
Threshold voltage	V <sub>IT</sub>	1.48	1.64	1.80	V	
Standby voltage	V <sub>STB</sub>	—	50	100	mV	No pull-up
Latch voltage	V <sub>LT</sub>	—	30	100	mV	No pull-up
Source current	I <sub>SCP</sub>	1.5	2.5	3.5	μA	
Comparator threshold voltage	V <sub>CT</sub>	0.95	1.05	1.15	V	5pin, 12pin
〈Rest period adjustment circuit section〉						
Input threshold voltage (f <sub>osc</sub> =10kHz)	V <sub>I0</sub>	1.87	1.97	2.07	V	Duty cycle=0%
	V <sub>I100</sub>	1.38	1.48	1.58	V	Duty cycle=100%
ON duty cycle	D <sub>ON</sub>	45	55	65	%	V <sub>ref</sub> is divided by 13k and 27kΩ resistors
Input bias current	I <sub>BDT</sub>	—	0.1	1	μA	DT1, DT2=2.0V
Latch mode source current	I <sub>DT</sub>	200	560	—	μA	DT1, DT2=0V
Latch input voltage	V <sub>DT</sub>	2.28	2.48	—	V	I <sub>DT</sub> =40 μA
〈Low-input malfunction prevention circuit section〉						
Threshold voltage	V <sub>UT</sub>	2.23	2.53	2.83	V	
〈Error amplifier section〉						
Input offset voltage	V <sub>IO</sub>	—	—	6	mV	
Input offset current	I <sub>IO</sub>	—	—	30	nA	
Input bias current	I <sub>IB</sub>	—	15	100	nA	
Open loop gain	A <sub>V</sub>	70	85	—	dB	
Common-mode input voltage	V <sub>OM</sub>	0.3	—	1.6	V	V <sub>CC</sub> =3.6~35V
Common-mode rejection ratio	CMRR	60	80	—	dB	
Maximum output voltage	V <sub>OH</sub>	2.3	2.5	—	V	
Minimum output voltage	V <sub>OL</sub>	—	0.7	0.9	V	
Output sink current	I <sub>OI</sub>	3	20	—	mA	FB=1.25V
Output source current	I <sub>Oo</sub>	45	75	—	μA	FB=1.25V
〈PWM comparator section〉						
Input threshold voltage (f <sub>osc</sub> =10kHz)	V <sub>I0</sub>	1.87	1.97	2.07	V	Duty cycle=0%
	V <sub>I100</sub>	1.38	1.48	1.58	V	Duty cycle=100%
〈Output section〉						
Saturation voltage	V <sub>SAT</sub>	—	0.8	1.2	V	I <sub>O</sub> =75mA
Leakage current	I <sub>REAK</sub>	—	—	5	μA	V <sub>O</sub> =35V
〈Total device〉						
Standby current	I <sub>CCS</sub>	—	1.3	1.8	mA	When output is OFF
Average current dissipation	I <sub>CCA</sub>	—	1.6	2.3	mA	R <sub>RT</sub> =10kΩ

©Not designed for radiation resistance.

● Timing chart

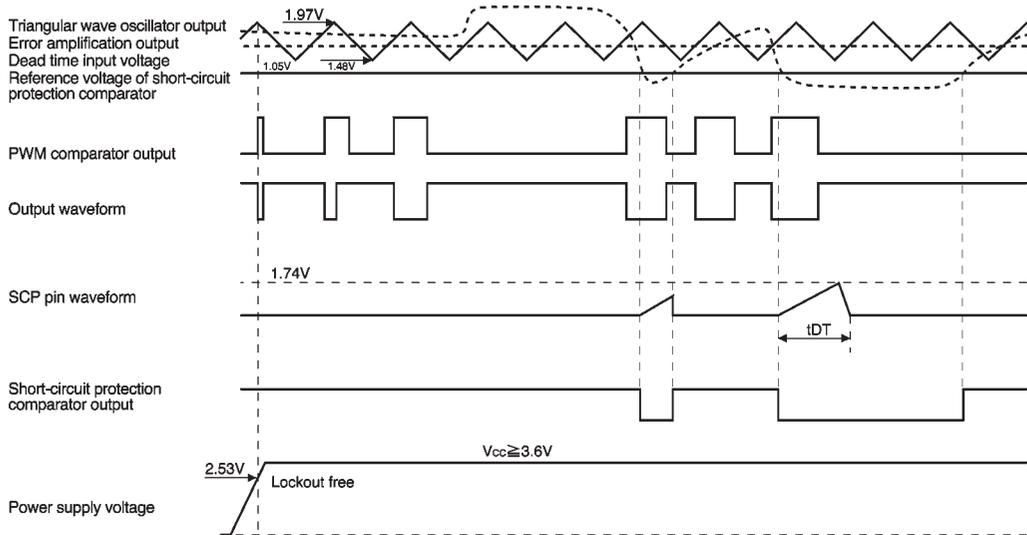


Fig.1

● Electrical characteristic curves

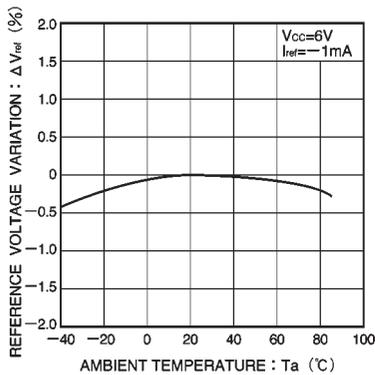


Fig.2 Reference voltage variation vs. ambient temperature

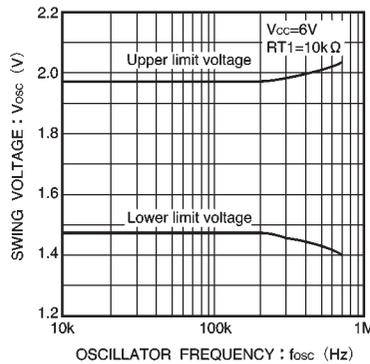


Fig.3 Swing voltage vs. oscillation frequency

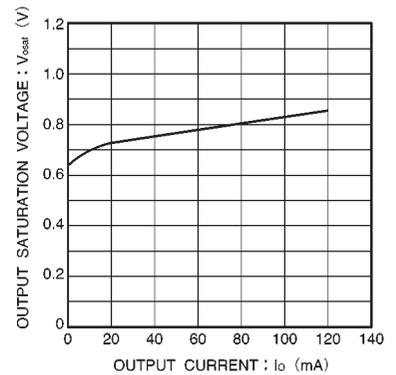


Fig.4 Output saturation voltage vs. output current

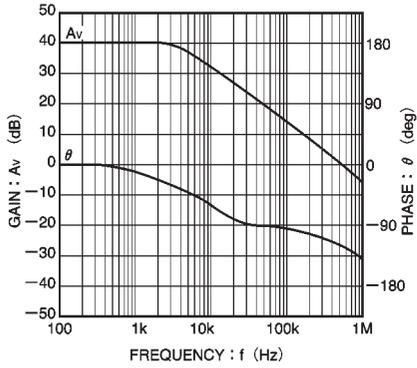


Fig.5 Gain and phase plotted against frequency for the error amplifier (40dB close)

● External dimensions (Units: mm)

