

2-channel switching regulator controller

BA9744FV

The BA9744FV is a 2-channel switching regulator controller that uses the PWM method. Both circuits can be used for DC/DC conversion for step-up, step-down, and inverting. The IC comes in an extremely compact package, making it ideal for use in portable equipment.

●Applications

DC/DC converters for video cameras and notebook computers etc.

●Features

- 1) High-accuracy reference voltage circuit ($\pm 1\%$).
- 2) Timer-latch, short-circuit protection circuit.
- 3) Miss-operation prevention circuit for low-voltage input.
- 4) Reference voltage with output (1.222V).
- 5) Reset period adjustment is possible over the entire duty range.

●Absolute maximum ratings (Ta = 25°C)

Parameter	Symbol	Limits	Unit
Power supply voltage	V _{CC}	36	V
Power dissipation	P _d	450*1	mW
Operating temperature	T _{opr}	-40~+85	°C
Storage temperature	T _{stg}	-55~+125	°C
Output current	I _o	60*2	mA
Output voltage	V _o	36	V

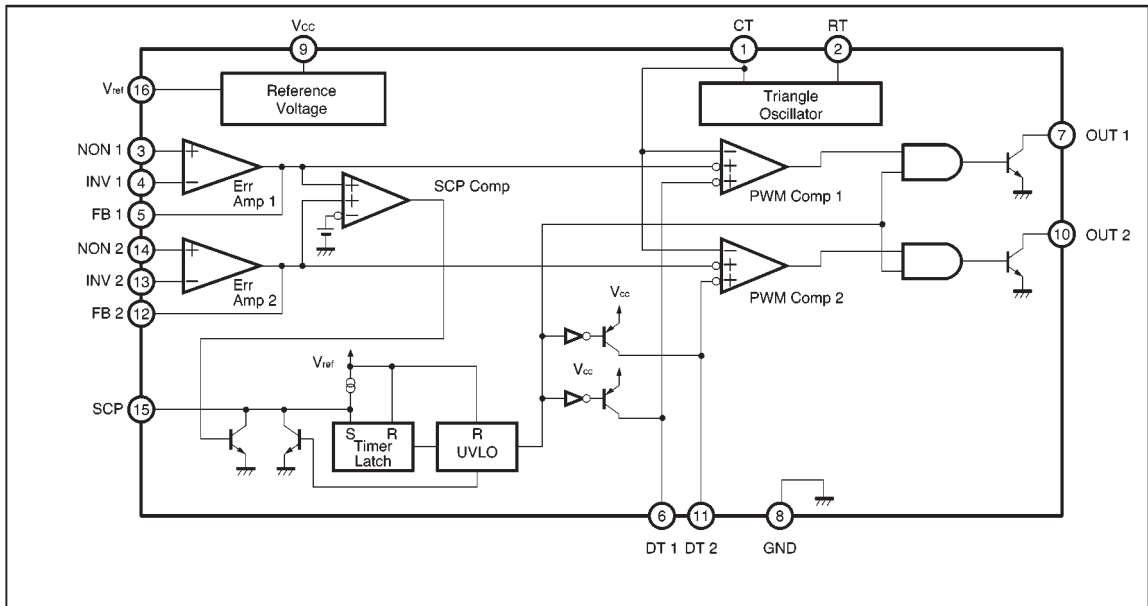
*1 Reduced by 4.5mW for each increase in Ta of 1°C over 25°C (when mounted on a 50mm×50mm×1.6mm PC board).

*2 Should not exceed Pd or ASO values.

●Recommended operating conditions (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit.
Power supply voltage	V _{CC}	2.5	3.0	35	V
Output current	I _o	—	—	30	mA
Output voltage	V _o	—	—	35	V
Error amplifier input voltage	V _{OM}	0.3	—	1.5	V
Timing capacitor	C _{CT}	100	—	15000	pF
Timing resistor	R _{RT}	3	—	15	kΩ
Oscillator frequency	F _{OSC}	10	—	800	kHz

● Block diagram



● Pin descriptions

Pin No.	Pin name	Function
1	CT	External timing capacitor
2	RT	External timing resistor
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 _{cc}	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 _{ref}	Reference voltage output (1.222V)

●Electrical characteristics (unless otherwise noted, $T_a = 25^\circ\text{C}$, and $V_{CC} = 3\text{V}$)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
〈Reference voltage block〉						
Output voltage	V_{ref}	1.210	1.222	1.234	V	$I_{\text{ref}}=1\text{mA}$
Input stability	V_{DLI}	—	3	10	mV	$V_{\text{CC}}=2.5\sim 35\text{V}$
Load stability	V_{DLO}	—	1	10	mV	$I_{\text{ref}}=0\sim 5\text{mA}$
〈Triangular wave oscillator〉						
Oscillation frequency	F_{OSC}	320	400	480	kHz	$R_{\text{RT}}=5.1\text{k}\Omega$, $C_{\text{CT}}=220\text{pF}$
Frequency deviation	F_{DV}	—	1	—	%	$V_{\text{CC}}=2.5\sim 35\text{V}$
〈Protection circuit〉						
Threshold voltage	V_{IT}	0.98	1.18	1.38	V	—
Standby voltage	V_{STB}	—	50	100	mV	No pull up
Latch voltage	V_{LT}	—	23	100	mV	No pull up
Source current	I_{SCP}	1.0	2.0	3.0	μA	—
Comparator threshold voltage	V_{CT}	0.15	0.25	0.35	V	5pin, 12pin
〈Rest period adjustment circuit〉						
Input threshold voltage ($f_{\text{osc}}=10\text{kHz}$)	V_{IO}	0.96	1.01	1.06	V	Duty cycle=0%
	V_{I100}	0.46	0.49	0.52	V	Duty cycle=100%
On duty cycle	D_{ON}	45	55	65	%	Divide V_{ref} using $4.7\text{k}\Omega$ and $7.5\text{k}\Omega$
Input bias current	I_{BDT}	—	0.1	1	μA	$DT1, DT2=2.0\text{V}$
Latch mode source current	I_{DT}	390	780	—	μA	$DT1, DT2=0\text{V}$
Latch input voltage	V_{DT}	$V_{\text{CC}}-0.5$	$V_{\text{CC}}-0.04$	—	V	$I_{\text{DT}}=40\mu\text{A}$
〈Low-voltage input miss-operation prevention circuit〉						
Threshold voltage	V_{UT}	1.6	1.9	2.2	V	—
〈Error amplifier〉						
Input offset voltage	V_{IO}	—	0	6	mV	—
Input offset current	I_{IO}	—	0	30	nA	—
Input bias current	I_{IB}	—	15	100	nA	—
Open loop gain	A_{V}	65	85	—	dB	—
Common-mode input voltage range	V_{OM}	0.3	—	1.5	V	$V_{\text{CC}}=2.5\sim 35\text{V}$
Common-mode rejection ratio	CMRR	60	80	—	dB	—
Maximum output voltage	V_{OH}	1.5	2.0	—	V	—
Minimum output voltage	V_{OL}	—	0.1	0.3	V	—
Output sink current	I_{OI}	1	2.1	—	mA	$\text{FB}=0.75\text{V}$
Output source current	I_{OO}	50	70	90	μA	$\text{FB}=0.75\text{V}$
〈PWM comparator〉						
Input threshold voltage ($f_{\text{osc}}=10\text{kHz}$)	V_{IO}	0.96	1.01	1.06	V	Duty cycle=0%
	V_{I100}	0.46	0.49	0.52	V	Duty cycle=100%

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
〈Output block〉						
Saturation voltage 1	V_{SAT1}	—	0.06	0.3	V	$I_o=10\text{mA}$
Saturation voltage 2	V_{SAT2}	—	0.15	0.4	V	$I_o=30\text{mA}$
Leak current	I_{LEAK}	—	0	5	μA	$V_o=35\text{V}$
〈Total device〉						
Standby current	I_{CCS}	—	3.6	5.0	mA	When output is off
Average current consumption	I_{CCA}	—	3.9	5.6	mA	$R_{RT}=5.1\text{k}\Omega$

©Not designed for radiation resistance.

●Timing chart

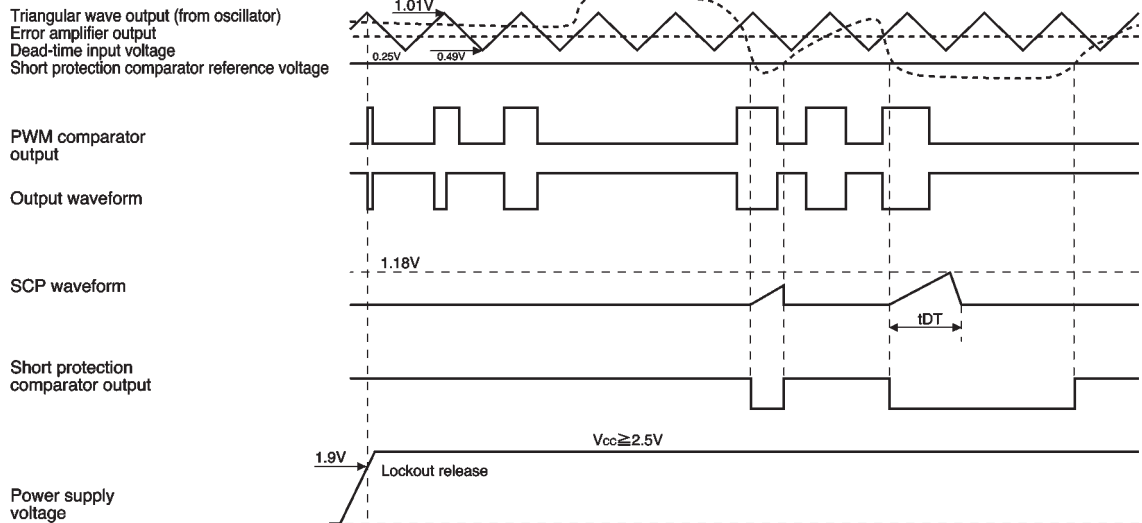


Fig.1

● Electrical characteristic curves

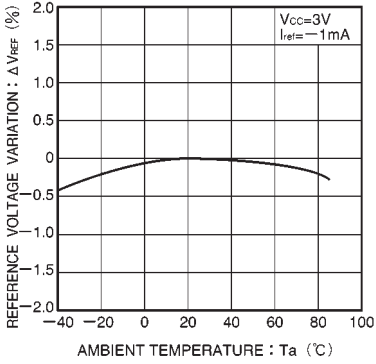


Fig.2 Reference voltage vs. ambient temperature

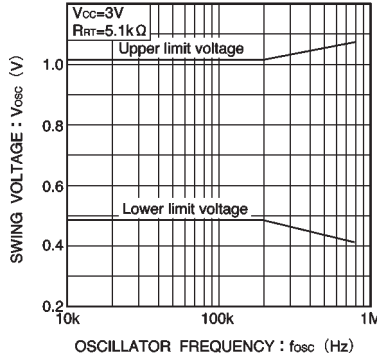


Fig.3 Swing voltage vs. frequency

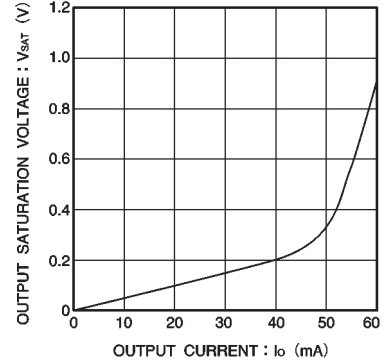


Fig.4 Output current vs. output saturation voltage

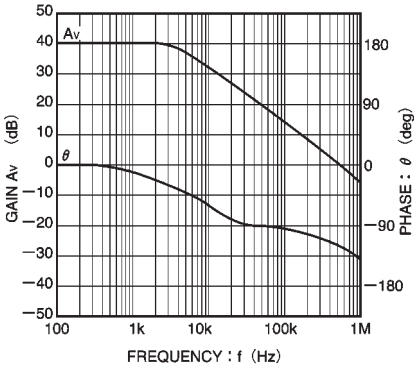


Fig.5 Error amplifier AC gain characteristic (40dB close)

● External dimensions (Units: mm)

