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 (±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)

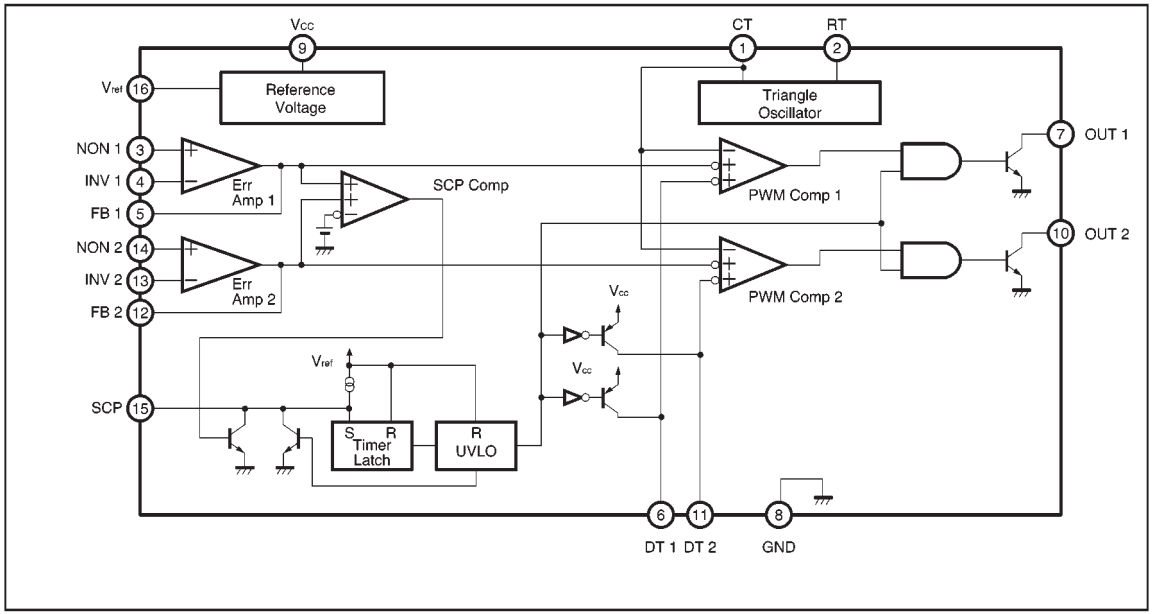
Parameter	Symbol	Limits	Unit
Power supply voltage	V_{CC}	36	V
Power dissipation	Pd	450*1	mW
Operating temperature	Topr	−40～+85	℃
Storage temperature	Tstg	−55～+125	℃
Output current	I_O	60*2	mA
Output voltage	V_O	36	V

*1 Reduced by 4.5mW for each increase in Ta of 1℃ over 25℃ (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	Vcc	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	Vref	Reference voltage output（1.222V）

●Electrical characteristics (unless otherwise noted, Ta = 25°C, and V_{CC} = 3V)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
〈Reference voltage block〉						
Output voltage	V_{ref}	1.210	1.222	1.234	V	I_{ref}=1mA
Input stability	V_{DLI}	—	3	10	mV	V_{CC}=2.5～35V
Load stability	V_{DLO}	—	1	10	mV	I_{ref}=0～5mA
〈Triangular wave oscillator〉						
Oscillation frequency	F_{OSC}	320	400	480	kHz	R_{RT}=5.1kΩ, C_{CT}=220pF
Frequency deviation	F_{DV}	—	1	—	%	V_{CC}=2.5～35V
〈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_{osc}=10kHz)	V_{t0}	0.96	1.01	1.06	V	Duty cycle=0%
	V_{t100}	0.46	0.49	0.52	V	Duty cycle=100%
On duty cycle	D_{ON}	45	55	65	%	Divide V_{ref} using 4.7kΩ and 7.5kΩ
Input bias current	I_{BDT}	—	0.1	1	μA	DT1, DT2=2.0V
Latch mode source current	I_{DT}	390	780	—	μA	DT1, DT2=0V
Latch input voltage	V_{DT}	V_{CC}−0.5	V_{CC}−0.04	—	V	I_{DT}=40 μA
〈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	AV	65	85	—	dB	—
Common-mode input voltage range	V_{OM}	0.3	—	1.5	V	V_{CC}=2.5～35V
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	FB=0.75V
Output source current	I_{OO}	50	70	90	μA	FB=0.75V
〈PWM comparator〉						
Input threshold voltage (f_{osc}=10kHz)	V_{t0}	0.96	1.01	1.06	V	Duty cycle=0%
	V_{t100}	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=10mA
Saturation voltage 2	V_{SAT2}	—	0.15	0.4	V	I_O=30mA
Leak current	I_{REAK}	—	0	5	μA	V_O=35V
〈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}=5.1kΩ

◎Not designed for radiation resistance.

●Timing chart

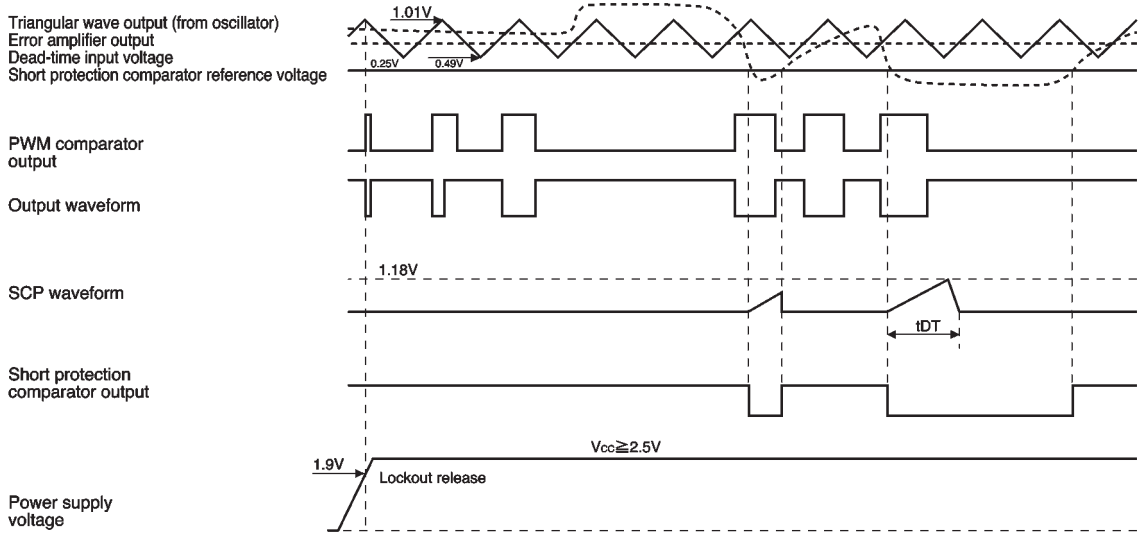


Fig.1

●Electrical characteristic curves

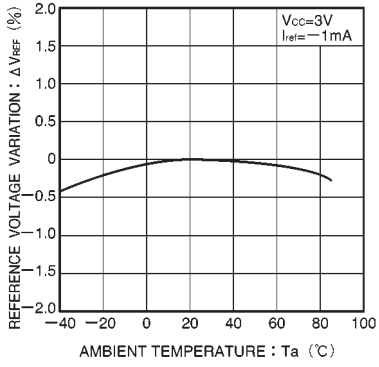


Fig.2 Reference voltage vs. ambient temperature

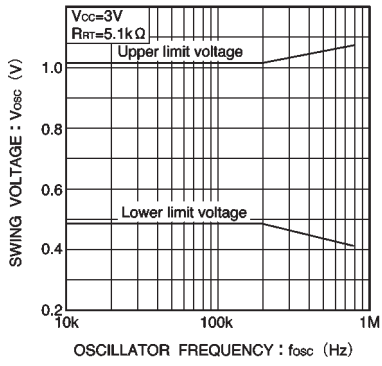


Fig.3 Swing voltage vs. frequency

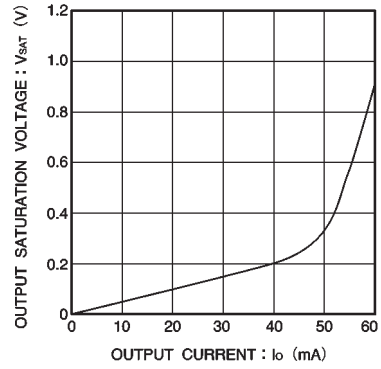


Fig.4 Output current vs.output saturation voltage

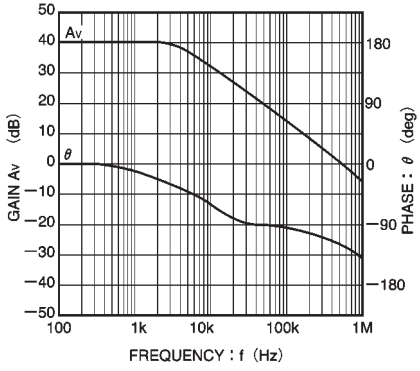


Fig.5 Error amplifier AC gain characteristic (40dB close)

●External dimensions (Units: mm)