

Two-channel switching regulator controller

BA9741F / BA9741FS

The BA9741F and BA9741FS are two-channel switching regulator controllers that use the PWM method. Both circuits can be used for DC to DC conversion for step-up, step-down, and inverting. The IC comes in a 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 (2.5V).
- 5) Rest 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 | BA9741F | P _d | 500*1 |
| | BA9741FS | P _d | 650*1 |
| Operating temperature | T _{opr} | -40~+85 | °C |
| Storage temperature | T _{stg} | -55~+125 | °C |
| Output current | I _o | 120*2 | mA |
| Output voltage | V _o | 36 | V |

*1 When mounted on 70mm×70mm ×1.6mm glass epoxy board.

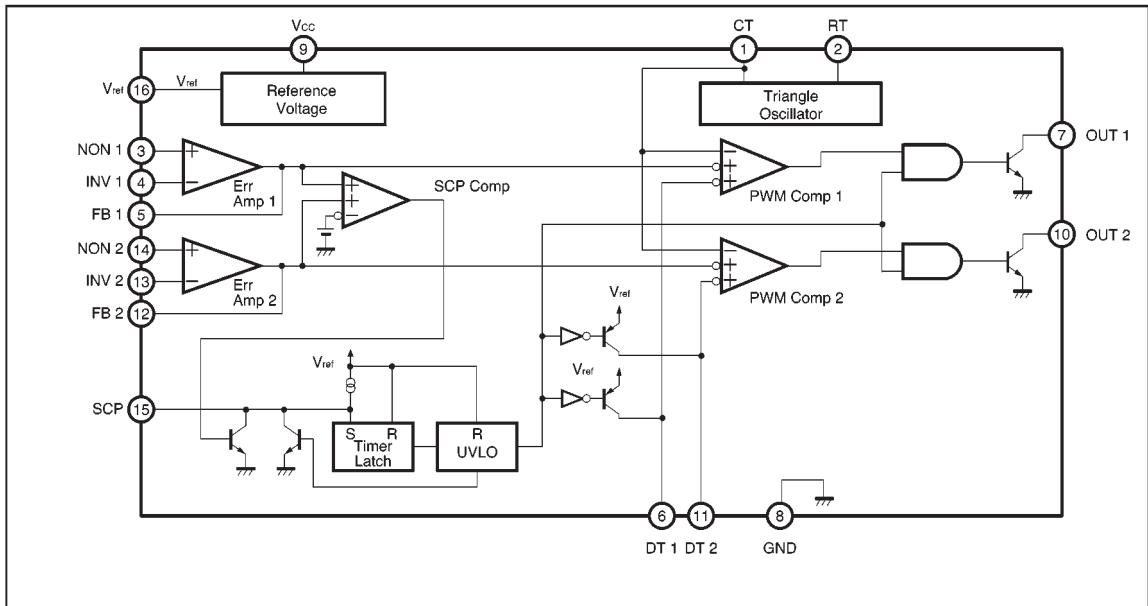
Reduced by 5.0mW(BA9741F), 6.5mW(BA9741FS) for each increase in Ta of 1°C over 25°C.

*2 Should not exceed P_d and ASO values.

●Recommended operating conditions (Ta = 25°C)

| Parameter | Symbol | Min. | Typ. | Max. | Unit |
|-------------------------------|------------------|------|------|-------|------|
| Power supply voltage | V _{CC} | 3.6 | 6.0 | 35 | V |
| Output current | I _o | — | — | 100 | mA |
| Output voltage | V _o | — | — | 35 | V |
| Error amplifier input voltage | V _{OM} | 0.3 | — | 1.6 | V |
| Timing capacitor | C _{CT} | 100 | — | 15000 | pF |
| Timing resistor | R _{RT} | 5.1 | — | 50 | 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 | Error amplifier 1 output |
| 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 | Error amplifier 2 output |
| 13 | INV2 | Negative input for error amplifier 2 |
| 14 | NON2 | Positive input for error amplifier 2 |
| 15 | SCP | Time latch setting |
| 16 | V _{ref} | Reference voltage output (2.5V) |

●Electrical characteristics (unless otherwise noted, Ta = 25°C, and Vcc = 6V)

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Coniditions |
|---|-------------------|------|------|------|------|---|
| 〈Reference voltage block〉 | | | | | | |
| Output voltage | V _{ref} | 2.4 | 2.5 | 2.6 | V | I _{ref} =1mA |
| Input stability | V _{DLI} | — | 1 | 10 | mV | V _{CC} =3.6~35V |
| Load stability | V _{BLO} | — | 1 | 10 | mV | I _{ref} =0~5mA |
| 〈Triangular wave oscillator〉 | | | | | | |
| Oscillation frequency | F _{OSC} | 320 | 400 | 480 | kHz | R _{FT} =10kΩ, C _{CT} =220pF |
| Frequency deviation | F _{ΔV} | — | 1 | — | % | V _{CC} =3.6~35V |
| 〈Protection circuit〉 | | | | | | |
| Threshold voltage | V _{IT} | 1.48 | 1.64 | 1.80 | V | — |
| Standby voltage | V _{STB} | — | 50 | 100 | mV | No pull up |
| Latch voltage | V _{LT} | — | 30 | 100 | mV | No pull up |
| Source current | I _{SCP} | 1.5 | 2.5 | 3.5 | μA | — |
| Comparator threshold voltage | V _{CT} | 0.9 | 1.05 | 1.2 | V | 5pin, 12pin |
| 〈Rest period adjustment circuit〉 | | | | | | |
| Input threshold voltage (f _{osc} = 10kHz) | V _{I0} | 1.79 | 1.97 | 2.15 | V | Duty cycle=0% |
| | V _{I100} | 1.32 | 1.48 | 1.64 | V | Duty cycle=100% |
| On duty cycle | D _{ON} | 45 | 55 | 65 | % | Divide V _{ref} usung 13kΩ and 27kΩ |
| Input bias current | I _{BDT} | — | 0.1 | 1 | μA | DT1, DT2=2.0V |
| Latch mode source current | I _{DT} | 200 | 560 | — | μA | DT1, DT2=0V |
| Latch input voltage | V _{DT} | 2.28 | 2.48 | — | V | I _{DT} =40 μA |
| 〈Low-voltage input miss-operation prevention circuit〉 | | | | | | |
| Threshold voltage | V _{UT} | — | 2.53 | — | V | — |
| 〈Error amplifier〉 | | | | | | |
| Input offset voltage | V _{IO} | — | — | 6 | mV | — |
| Input offset current | I _{IO} | — | — | 30 | nA | — |
| Input bias current | I _B | — | 15 | 100 | nA | — |
| Open circuit gain | AV | 70 | 85 | — | dB | — |
| Common-mode input voltage range | V _{OM} | 0.3 | — | 1.6 | V | V _{CC} =3.6~35V |
| Common-mode rejection ratio | CMRR | 60 | 80 | — | dB | — |
| Maximum output voltage | V _{OH} | 2.3 | 2.5 | — | V | — |
| Minimum input voltage | V _{OL} | — | 0.7 | 0.9 | V | — |
| Output sink current | I _{OI} | 3 | 20 | — | mA | FB=1.25V |
| Output source current | I _{OO} | 45 | 75 | — | μA | FB=1.25V |
| 〈PWM comparator〉 | | | | | | |
| Input threshold voltage (f _{osc} = 10kHz) | V _{I0} | 1.79 | 1.97 | 2.15 | V | Duty cycle=0% |
| | V _{I100} | 1.32 | 1.48 | 1.64 | V | Duty cycle=100% |

©Not designed for radiation resistance.

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Coniditions |
|-----------------------------|------------|------|------|------|---------|--------------------|
| 〈Output block〉 | | | | | | |
| Saturation voltage | V_{SAT} | — | 0.8 | 1.2 | V | $I_o=75mA$ |
| Leak current | I_{REAK} | — | 0 | 5 | μA | $V_o=35V$ |
| 〈Total device〉 | | | | | | |
| Standby current | I_{CCS} | — | 1.3 | 1.8 | mA | When output is off |
| Average current consumption | I_{CCA} | — | 1.6 | 2.3 | mA | $R_{RT}=10k\Omega$ |

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●Timing chart

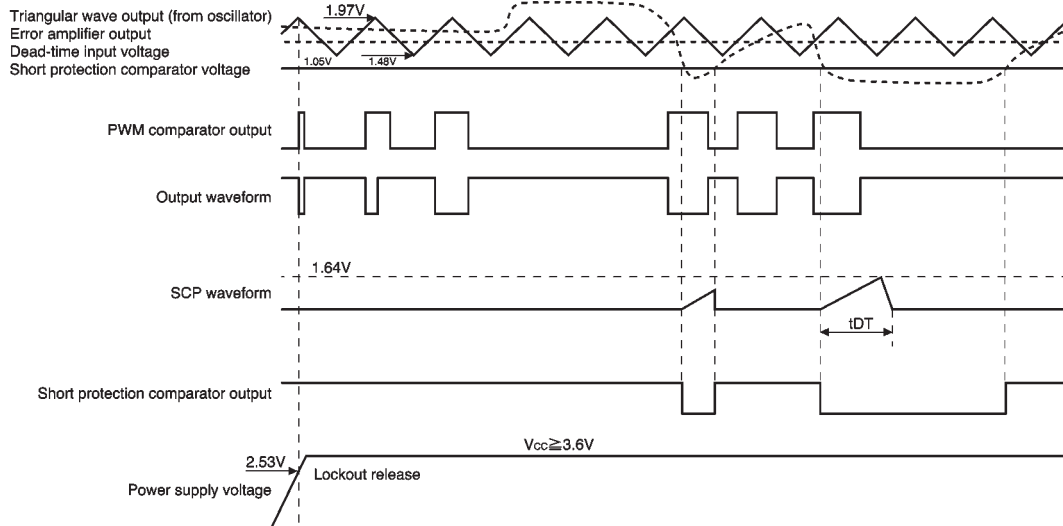


Fig.1

●Electrical characteristic curves

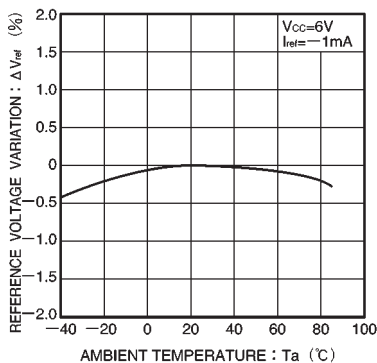


Fig.2 Reference voltage vs. ambient temperature

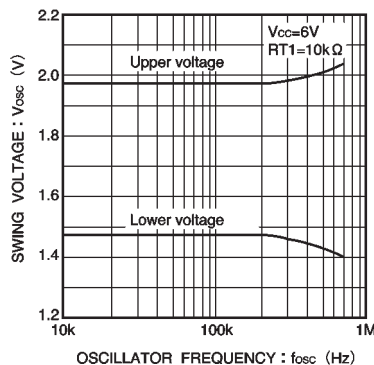


Fig.3 Swing voltage vs. frequency

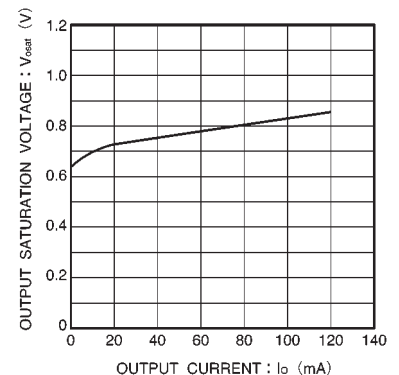


Fig.4 Output current vs. output saturation voltage

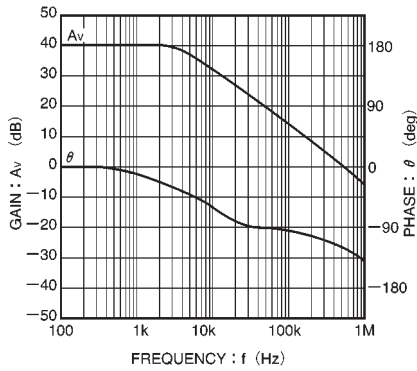


Fig.5 Error amplifier AC gain characteristic (40dB close)

● External dimensions (Units: mm)

