

STRUCTURE
PRODUCT SERIES

Silicon Monolithic Integrated Circuit
5-Channel Switching Regulator Controller for Digital Still Camera

TYPE

B D 9 7 3 0 K V

FEATURES

- BD9730KV is a 5-channel controller that includes all of the circuits required constructing a switching regulator.
The circuits on the chip include a triangular-wave oscillator, a reference voltage circuit, a PWM comparator, a C-MOS type driver, and a short-circuit-protector.
- The IC is capable of driving both FET and bipolar external transistors.
(For bipolar transistors, the base current is user-adjustable.)
- Short Circuit Protector (SCP) for overload condition is included.
- The reference voltage of channel 1 and 5 can be selected externally.
- Channel 1,4 and 5 can be switched ON/OFF individually.
- Dead Time Control (DTC) for all channels is included for each channel.
- VQFP—48 PIN package

○Absolute maximum ratings (Ta=25°C)

Parameter	Symbol	Limits	Units
Power Supply Voltage	Vmax	- 0.3 to 12	V
Power Dissipation	Pd	400(*1)	mW
		900(*2)	mW
Operating Temperature	Topr	- 20 to +85	°C
Storage Temperature	Tstg	- 55 to +125	°C

(*1) With no external heat sink, the power dissipation reduces by 4.0 mW/°C over 25°C.

(*2) Reduced by 9.0 mW/°C over 25°C, when mounted on a PCB (70.0mm × 70.0mm × 1.6mm).

○Recommended operating conditions

Parameter	Symbol	Spec.			Units
		Min.	Typ.	Max.	
Power Supply Voltage	VCC	2.8	—	11	V
Oscillator Frequency	fosc	100	—	700	kHz
Output Current	IOUT	—	—	30	mA
Timing Resistor	RT	5	—	30	kΩ
Timing Capacitor	CT	100	—	10000	pF
NON1,5 input range	VNON1,5	0.3	—	1.5	V

(*3) VREGA drops under VCC=2.6V

○Electrical characteristics (Ta=25°C, Vcc=6V, fosc=0.20MHz, STB1-5=3V, unless otherwise noted)

Parameter	Symbol	Spec.			Units	Conditions
		Min.	Typ.	Max.		
Standby Current	Ist	—	—	10	μA	STB1~5=0V
Circuit Current	Icc	—	4.5	9.5	mA	
【Reference Voltage】						
Reference Voltage	Vref	1.485	1.5	1.515	V	Iref=−1mA
Line Regulation	DVLI	—	4.0	12.5	mV	Vcc=3.0V~9.5V
Load Regulation	DVLo	—	1.0	7.5	mV	Iref=−0.1mA~−1mA
Short-Circuit Output Current	Ios	4	16	—	mA	Vref=0V
【Internal Regulator】						
REGA Output Voltage	VREGA	2.4	2.5	2.6	V	Ireg=−1mA
【Over Current Shutdown】						
Channel 1-5 Threshold Voltage	Vsc1~5	1.425	1.5	1.575	V	VSCP1~5=2V~1V
【Protection Circuit】						
SCP Threshold Voltage	Vtsc	0.90	1.0	1.10	V	VSCP=0V~1.5V
SCP Standby Voltage	Vssc	—	22	170	mV	
SCP Output Current	Iscp	−2	−4	−6	μA	VSCP=0.1V
【Triangular wave oscillator】						
Oscillator Frequency	f osc1	0.179	0.20	0.221	MHz	RT=24kΩ,CT=220pF
Frequency Stability (Vcc)	Df	—	1	5	%	Vcc=2.8V→9.5V
RT Output Voltage	VRT	0.78	1	1.22	V	
CT Output Current	Icso	32.2	46	59.8	μA	VCT=1.7V,RT=24kΩ
CT Input Current	Icsi	−29.4	−42	−54.6	μA	VCT=1.7V,RT=24kΩ
【Error Amp】						
Low-level Output Voltage	VOL	—	—	0.3	V	INV=2V
High-level Output Voltage	VOH	VREGA−0.3V	—	—	V	INV=0V
【PWM Comparator】						
DTC Input Current	IDT	—	−1	−5	μA	VDT=1V
Input Threshold Voltage	Vt0	—	1.49	—	V	V1:DUTY0%
	Vt100	—	1.95	—	V	V1:DUTY100%
【Output circuit】						
High-level Output Voltage on driving	VSATH	VCC−0.3	VCC−0.1	—	V	I _o =10mA
Low-level Output Voltage on driving	VSATL	—	0.1	0.3	V	I _o =−10mA
Maximum Source Current	I _{source}	—	—	30	mA	
Maximum Sink Current	I _{sink}	—	—	−30	mA	
【STB 1-5】						
STB Pull-down Resistor	RSTB	250	400	700	kΩ	
STB Control Voltage	ON	VSTBL	2.0	—	V	
	OFF	VSTBH	−0.3	—	V	

○Not designed for radiation resistance.

Technical drawing of a BD9730KV integrated circuit package. The drawing includes a top view showing the package dimensions (9.0±0.2, 7.0±0.1, 0.75, 0.145±0.05/-0.03) and pin numbers (36, 25, 24, 12, 1, 4, 37). It also shows a side view with dimensions (1.625MAX, 1.425±0.05, 0.1±0.05, 0.5±0.1, 0.22±0.05/-0.04) and a cross-section view with dimensions (4°±5°, -4°). The package is labeled 'BD9730KV' and 'Lot No.'

Plastic mold
(UNIT : mm)

Rev.B

Pin No.	Pin Name
1,5,6,10,13	RBIAS 1,2,3,4,5
14,19,26,38,43	DTC 5,4,3,2,1
15,20,25,37,39	SCP 5,4,3,2,1
16,21,24,36,40	FB 5,4,3,2,1
17,22,23,35,41	INV 5,4,3,2,1
18,42	NON 5,1
27	RT
28	CT
29	SCP
30	GND
33	VREGA
32	VCC
34	VREF
44	PGND 1
45,46,47,48	STB 5,4,2,3,1
2,4,7,9,12	OUT 1,2,3,4,5
3	PVCC 1
8	PVCC 2
11	PGND 2

NOTE FOR USE

- (1) Absolute maximum rating
The device may be destroyed when applied voltage or operating temperature exceeds its absolute maximum rating. Because the source, such as short mode or open mode, cannot be identified if the device is destroyed, it is important to take physical safety measures (such as fusing) if a special mode in excess of absolute rating limits is to be implemented.
- (2) Supply line
Since the motor's reverse electromotive force gives rise to the return of regenerative current, measures should be taken to establish a channel for the current, such as adding a capacitor between the power supply and GND. In determining the approach to take, make sure that no problems will be posed by the various characteristics involved, such as capacitance loss at low temperatures with an electrolytic capacitor.
- (3) GND potential
Make sure the potential for the GND pin is always kept lower than the potentials of all other pins, regardless of the operating mode.
- (4) Thermal design
Be sure to factor in allowable power dissipation (Pd) in actual operation, and to build sufficient margin into the thermal design to accommodate this power loss.
- (5) Operation in strong magnetic fields
Use in strong electromagnetic fields may cause malfunctions. Exercise caution with respect to electromagnetic fields.
- (6) ASO
Set the parameters so that output Tr will not exceed the absolute maximum rating or ASO value when the IC is used.
- (7) Thermal shutdown circuit
This IC is provided with a built-in thermal shutdown (TSD) circuit, which is activated when the chip temperature reaches the threshold value listed below. When TSD is on, the device goes to high impedance mode. Note that the TSD circuit is provided for the exclusive purpose shutting down the IC in the presence of extreme heat, and is not designed to protect the IC per se or guarantee performance when or after extreme heat conditions occur. Therefore, do not operate the IC with the expectation of continued use or subsequent operation once the TSD is activated.
- (8) Mutual impedance
Use short and wide wiring tracks for the main supply and ground to keep the mutual impedance as small as possible. Use inductor and capacitor network to keep the ripple voltage minimum.
- (9) Voltage of STB pin
The threshold voltages of STB pin are 0.3V and 2.0V. STB state is set below 0.3V while action state is set beyond 2.0V. The region between 0.3V and 2.0V is not recommended and may cause improper operation.
- (10) Setting Max Duty
Max duty limit might not work normally at high frequency. Consider adequate margin when operating circuit above the maximum allowable switching frequency.
- (11) Please use the same power supply of driver block as that of main block.
This IC can't be used on the application that arbitrary voltage is applied to driver block.

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