STRUCTURE Silicon Monolithic Integrated Circuit

TYPE 2 Channel Switching Regulator Controller

PRODUCT SERIES **BD9853FV**

PHISICAL DIMENSIONS Fig.1(Plastic Mold)
BLOCK DIAGRAM Fig.2
PIN CONFIGURATION Fig.3

FEATURE
1) Synchronous Switching Regulator Controller 2channels
2) FET(Pch/Nch) Direct Drive
3) Short Circuit Protection (SCP)
4) Under Voltage Lockout Function (UVLO)
5) Thermal Shut Down Function (TSD)
6) Independent ON/OFF Function in Each Channel with Soft Start Pin
7) SSOP – B16 Package

○Absolute Maximum Ratings (Ta = 25 ℃)

Parameter	Symbol	Limits	Unit
Supply Voltage (VCC-GND)	Vcc	18	V
VREGA-GND Voltage	VREGA	7	V
VCC-VREGB Voltage	VREGB	7	V
Power Dissipation	Pd	562(*1)	mW
Operating Temperature Range	Topr	-40～+85	℃
Junction Temperature	Tjmax	+150	℃
Storage Temperature Range	Tstg	-55～+150	℃

※ Reduced by 4.49mW for each increase in Ta of 1℃ over 25℃ (When mounted on a board 70×70×1.6tmm grass-epoxy PCB)

○Recommended Operating Conditions

Parameter	Symbol	Limits			Unit
		Min.	Typ.	Max.	
Supply Voltage	Vcc	4.5	12	16	V
Oscillator Frequency	fosc	100	1000	2000	KHz

Status of this document
The Japanese language version of this document shall be the official specification.
Any translation of this document shall be for reference only.

○Electrical Characteristics (Unless otherwise specified Ta=25℃, Vcc=12V,fosc=1000kHz,STB=3V)

Parameter	Symbol	Limits Min.	Limits Typ.	Limits Max.	Unit	Conditions
【Whole Device】						
Standby Current	Iccst	—	0	5	μA	STB=0V
Circuit Current	Icc	—	3.2	5.2	mA	INV1,INV2=2.5V
【Regulator for Driver REGA】						
Output Voltage	Vrega	4.5	5.0	5.5	V	
Output Current Capability	Irega	—	—	-100	mA	Vrega > 4.5V
【Regulator for Driver REGB】						
Output Voltage	Vregb	VCC-5.5	VCC-5.0	VCC-4.5	V	
Output Current Capability	Iregb	100	—	—	mA	Vregb < Vcc-4.5V
【Oscillator】						
Oscillator Frequency	fosc	900	1000	1100	kHz	RRT=8.2kΩ OUTH=2200pF,OUTL=1000pF
Oscillator Frequency Coefficient1	Dfosc1	-2	0	2	%	Vcc=4.5～5V
Oscillator Frequency Coefficient2	Dfosc2	-2	0	2	%	Vcc=5～18V
【Error Amplifier】						
Threshold Voltage	Vthea	0.79	0.80	0.81	V	
Input Bias Current	Ibias	-230	-115	—	nA	
Voltage Gain	Av	60	80	100	dB	DC GAIN
Max. Output Voltage	Vfbh	Vrega-0.85	—	—	V	
Min. Output Voltage	Vfbl	—	—	0.85	V	
Output Sink Current	Isink	2	11	—	mA	INV=2.5V, FB=2.5V
Output Source Current	Isource	—	-15	-2	mA	INV=0V, FB=2.5V
【PWM Comparator】						
0% Threshold Voltage	Vth0	1.4	1.5	1.6	V	FB Voltage
100% Threshold Voltage	Vth100	2.4	2.5	2.6	V	FB Voltage
【FET Driver】						
On Resistance (OUT1H)	RonP	1.6	3.2	4.8	Ω	OUT=Hi
	RonN	1.7	3.4	5.1	Ω	OUT=Lo
On Resistance (OUT1L)	RonP	1.6	3.2	4.8	Ω	OUT=Hi
	RonN	1.7	3.4	5.1	Ω	OUT=Lo
On Resistance (OUT2H)	RonP	1.6	3.2	4.5	Ω	OUT=Hi
	RonN	1.7	3.4	5.1	Ω	OUT=Lo
On Resistance (OUT2L)	RonP	1.6	3.2	4.8	Ω	OUT=Hi
	RonN	1.7	3.4	5.1	Ω	OUT=Lo
Dead TIME (turn on)	tdt ON	30	70	120	ns	OUT H,L H→L OUTH=2200pF,OUTL=1000pF
Dead TIME (turn off)	tdt OFF	25	60	115	ns	OUT H,L L→H OUTH=2200pF,OUTL=1000pF
【Control Block】						
Threshold Voltage	Vstb	0.6	1.5	2.4	V	
Sink Current	Istb	6	15	30	μA	
【Soft Start Block】						
Soft Start Start-yo Voltage	Vstasoft	0.2	0.3	0.4	V	Output OFF when Vscp/SOFT＜Vstass
Standby Voltage	Vstsoft	—	—	40	mV	SCP/SOFT Voltage
Source Current	Isosoft	-3.2	-2.3	-1.4	μA	Vscp/SOFT=0.6V
【Short Circuit Protection (SCP)】						
Timer Start Voltage	Vtime	0.50	0.56	0.62	V	INV Voltage
Threshold Voltage	Vthscp	2.2	2.3	2.4	V	SCP/SOFT Voltage
Standby Voltage	Vstscp	1.21	1.35	1.49	V	SCP/SOFT Voltage (When soft start ends)
Source Current	Isoscp	-3.2	-2.3	-1.4	μA	SCP/SOFT=1.8V
【Under Voltage Lockout (UVLO)】						
Threshold Voltage	Vuvlo	4.0	4.15	4.30	V	Vcc sweep down
Hysteresis Voltage	DVuvlo	0.05	0.1	0.15	V	

◎This product is not designed for the protection against radioactive rays.

○PHYSICAL DEMENSIONS

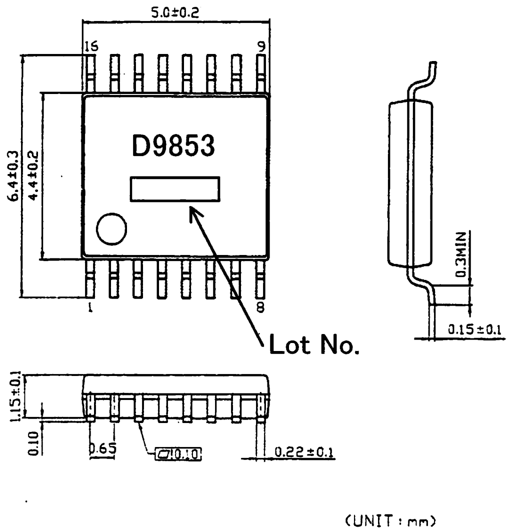


Fig.1

○BLOCK BIAGRAM

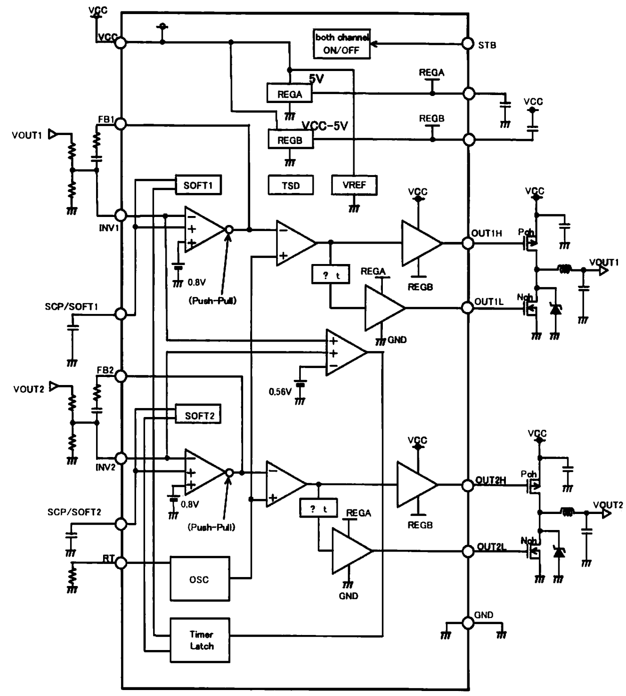


Fig.2

○PIN CONFIGURATION

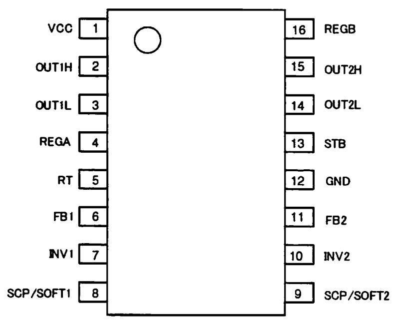


Fig.3

○PIN DESCRIPTION

Pin Number	Pin Name	Pin Descriptions
1	VCC	Input Supply Voltage
2	OUT1H	High Side (Main) FET Driver Output Pin (CH1)
3	OUT1L	Low Side (Synchronous) FET Driver Output Pin (CH1)
4	REGA	Internal Regulator Output Pin (5V Output, 1uF Ceramic Capacitor necessary)
5	RT	Oscillator Frequency Adjustment Pin with external Resistor
6	FB1	Error Amplifier Output Pin (CH1)
7	INV1	Error Amplifer Negative Input Pin (CH1)
8	SCP/SOFT1	Short Circuit Protection・Soft Start Delay Time Setting Pin with External Capacitor (CH1)
9	SCP/SOFT2	Short Circuit Protection・Soft Start Delay Time Setting Pin with External Capacitor (CH2)
10	INV2	Error Amplifer Negative Input Pin (CH2)
11	FB2	Error Amplifier Output Pin (CH2)
12	GND	Ground Pin
13	STB	ON/OFF Control Pin
14	OUT2L	Low Side (Synchronous) FET Driver Output Pin (CH2)
15	OUT2H	High Side (Main) FET Driver Output Pin (CH2)
16	REGB	Internal Regulator Output Pin (VCC-5V Output, 1uF Ceramic Capacitor necessary)

○Operation Notes

1) Absolute maximum ratings
Use of the IC in excess of absolute maximum ratings such as the applied voltage or operating temperature range may result in IC deterioration or damage. Assumptions should not be made regarding the state of the IC (short mode or open mode) when such damage is suffered. A physical safety measure such as a fuse should be implemented when use of the IC in a special mode where the absolute maximum ratings may be exceeded is anticipated.

2) GND potential
Ensure a minimum GND pin potential in all operating conditions. In addition, ensure that no pins other than the GND pin carry a voltage lower than or equal to the GND pin, including during actual transient phenomena.

3) Thermal design
Use a thermal design that allows for a sufficient margin in light of the power dissipation (Pd) in actual operating conditions.

4) Inter-pin shorts and mounting errors
Use caution when orienting and positioning the IC for mounting on printed circuit boards. Improper mounting may result in damage to the IC. Shorts between output pins or between output pins and the power supply and GND pin caused by the presence of a foreign object may result in damage to the IC.

5) Operation in a strong electromagnetic field
Use caution when using the IC in the presence of a strong electromagnetic field as doing so may cause the IC to malfunction.

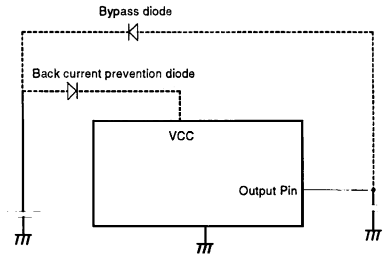
6) Thermal shutdown circuit (TSD circuit)
This IC incorporates a built-in thermal shutdown circuit (TSD circuit). The TSD circuit is designed only to shut the IC off to prevent runaway thermal operation. Do not continue to use the IC after operating this circuit or use the IC in an environment where the operation of the thermal shutdown circuit is assumed.

7) Testing on application boards
When testing the IC on an application board, connecting a capacitor to a pin with low impedance subjects the IC to stress. Always discharge capacitors after each process or step. Ground the IC during assembly steps as an antistatic measure, and use similar caution when transporting or storing the IC. Always turn the IC's power supply off before connecting it to or removing it from a jig or fixture during the inspection process.

8) Common impedance
Power supply and ground wiring should reflect consideration of the need to lower common impedance and minimize ripple as much as possible (by making wiring as short and thick as possible or rejecting ripple by incorporating inductance and capacitance).

9) Applications with modes that reverse VCC and pin potentials may cause damage to internal IC circuits.
For example, such damage might occur when VCC is shorted with the GND pin while an external capacitor is charged. It is recommended to insert a diode for preventing back current flow in series with VCC or bypass diodes between VCC and each pin.

10) Pin short and mistake fitting
Do not short-circuit between OUT pin and VCC pin, OUT pin and GND pin, or VCC pin and GND pin. When soldering the IC on circuit board, please be unusually cautious about theorientation and the position of the IC.

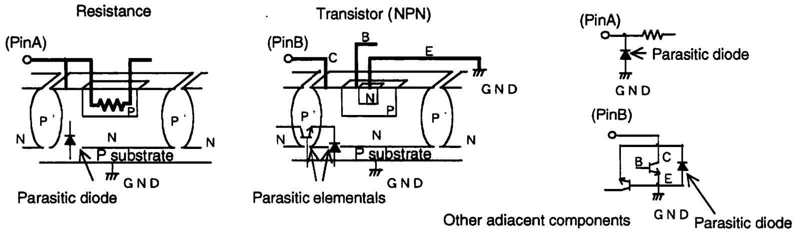


11) Timing resistor
Timing resistor connected between RT and GND, has to be placed near RT terminal. And pattern has to be short enough.

12) IC pin input
This monolithic IC contains P+ isolation and PCB layers between adjacent elements in order to keep them isolated.
P/N junctions are formed at the intersection of these P layers with the N layers of other elements to create a variety of parasitic elements.
For example, when a resistor and transistor are connected to pins as shown in following chart,

- O the P/N junction functions as a parasitic diode when GND > (Pin A) for the resistor or GND > (Pin B) for the transistor (NPN).
- O Similarly, when GND > (Pin B) for the transistor (NPN), the parasitic diode described above combines with the N layer of other adjacent elements to operate as a parasitic NPN transistor.

The formation of parasitic elements as a result of the relationships of the potentials of different pins is an inevitable result of the IC's architecture. The operation of parasitic elements can cause interference with circuit operation as well as IC malfunction and damage. For these reasons, it is necessary to use caution so that the IC is not used in a way that will trigger the operation of parasitic elements, such as by the application of voltages lower than the GND (PCB) voltage to input and output pins.



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Japan /
(Internal Sales)

Tokyo 2-1-1, Yaesu, Chuo-ku, Tokyo 104-0082
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Yokohama 2-4-8, Shin Yokohama, Kohoku-ku, Yokohama, Kanagawa 222-8575
TEL : +81(45)476-2131 FAX : +81(45)476-2128

Nagoya Dainagayo Building 9F 3-28-12, Meieki, Nakamura-ku, Nagoya,Aichi 450-0002
TEL : +81(52)581-8521 FAX : +81(52)561-2173

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TEL : +81(75)311-2121 FAX : +81(75)314-6559

(Contact address for overseas customers in Japan)

Yokohama TEL : +81(45)476-9270 FAX : +81(045)476-9271

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