

STRUCTURE : Silicon Monolithic Integrated Circuit  
 PRODUCT NAME : Synchronous rectification with built-in FET type DC/DC converter IC  
 MODEL NAME : **BD8646FV**

- FEATURES :
- Synchronous rectification with built-in FET type DC/DC converter
  - Output current 2A
  - Reference voltage accuracy FB  $0.8V \pm 1\%$
  - Switching frequency 100kHz ~ 600kHz
  - Over current protection circuit
  - Thermal shutdown
  - Input low voltage detection UVLO
  - Soft start / Start delay circuit
  - Programmable OFFLATCH time

ABSOLUTE MAXIMUM RATING (Ta=25 )

Parameter	Symbol	Limits	Unit
Input supply voltage	$V_{IN}$	20	V
BOOT terminal voltage	$V_{BOOT}$	28	V
EN terminal voltage	$V_{EN}$	GND-0.3 ~ $V_{IN}+0.3$	V
Input terminal voltage	$V_{INP}^{*1}$	GND-0.3 ~ 7	V
SW terminal voltage	$V_{SW}$	GND-0.3 ~ $V_{IN}+0.3$	V
Output switch current	$I_{OUT}$	$2.5^{*2}$	A
Power dissipation	$P_d$	$2.06^{*3}$	W
Operating temperature	$T_{opr}$	-20 ~ 85	
Storage temperature	$T_{stg}$	-55 ~ 150	
Maximum Junction Temperature	$T_{jmax}$	150	

\*1  $V_{INP}$  Application terminal: SS/DELAY, FB, FC, RT, PSET

\*2 Do not however exceed  $P_d$ .

\*3 (70mm × 70mm, thickness 1.6mm, and four layer glass epoxy substrates) When mounting substrate and the package back exposure part are connected with solder.  
 Operating at higher than Ta=25 , 9.5mW shall be reduced per 1

Operation condition

Parameter	Symbol	MIN	TYP	MAX	Unit
Input supply voltage	$V_{IN}$	4.5	-	18.0	V
Output switch current	$I_{OUT}$	-	-	2.0	A

This product is not designed for protection against radioactive rays.

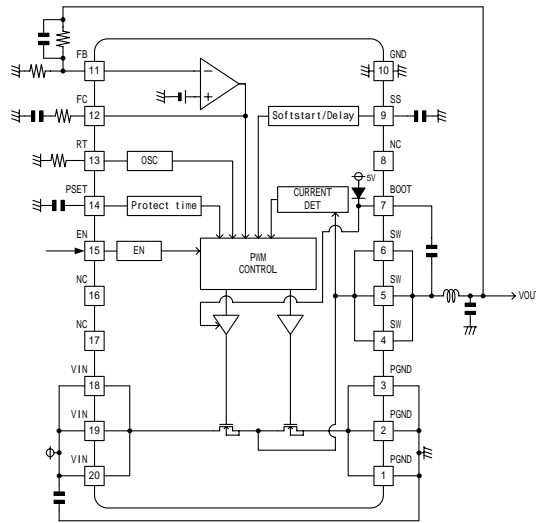
Electrical characteristic

(Unless otherwise noted Ta=25 , VIN=12V, VEN= 3V)

Parameter	Symbol	Specification value			UNIT	Condition
		MIN	TYP	MAX		
VIN supply current (operating)	$I_{Q_{active}}$	-	1.5	2.5	mA	$V_{FB} = 0.75V$
VIN supply current (standby)	$I_{Q_{stby}}$	-	0.8	1.2	mA	$V_{EN} = 0V$
Reference voltage (VREF)	$V_{FB}$	0.792	0.8	0.808	V	FB-FC Short
Oscillation frequency	$f_{OSC}$	270	300	330	kHz	$R_{RT} = 56k$
High side FET ON resistance	$R_{HFET}$	-	120	170	m	$I_{SW} = -1A$
Low side FET ON resistance	$R_{LFET}$	-	120	170	m	$I_{SW} = 1A$
UVLO voltage	$V_{UVLO}$	3.8	4.0	4.2	V	VIN Sweep
SW leak current	$I_{LSW}$	-	0	5	$\mu A$	$V_{EN} = 0V$
EN terminal H threshold voltage	$V_{ENH}$	1.6	-	-	V	
EN terminal L threshold voltage	$V_{ENL}$	-	-	0.4	V	
SS/DELAY terminal source current	$I_{SSSO}$	2.8	4	5.2	$\mu A$	$V_{SS} = 1V$
SS/DELAY FB Offset voltage	$V_{SSFBOST}$	450	600	750	mV	$V_{SS} = 1V$
PSET terminal source current	$I_{PSET}$	3	5	7	$\mu A$	$V_{PSET} = 2V$
PSET terminal threshold voltage	$V_{PSET}$	0.8	1.0	1.2	V	

$V_{FB}$ :FB terminal voltage,  $V_{EN}$ :EN terminal voltage,  $V_{SS}$ :SS/DELAY terminal voltage,  $V_{PSET}$ :PSET terminal voltage,  $R_{RT}$ :RT resistor  
Current capability should not exceed Pd.

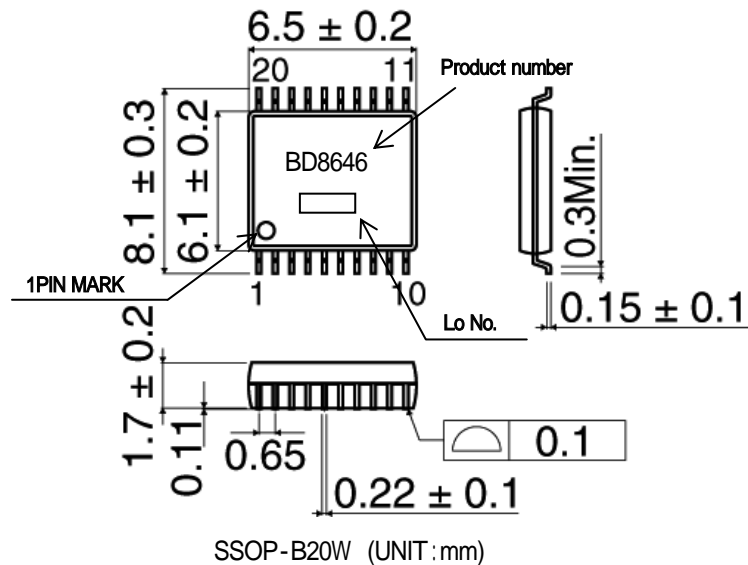
BLOCK DIAGRAM



PIN ASSIGNMENT

No.	Symbol	Description	No.	Symbol	Description
1	PGND	Power GND terminal	11	FB	Feedback terminal
2	PGND	Power GND terminal	12	FC	Phase amends terminal
3	PGND	Power GND terminal	13	RT	Frequency adjustment resistance connection terminal
4	SW	Switching output terminal	14	PSET	Adjust OFF LATCH time terminal
5	SW	Switching output terminal	15	EN	Enable input
6	SW	Switching output terminal	16	NC	-
7	BOOT	Boot strap terminal	17	NC	-
8	NC	-	18	VIN	Power supply input terminal
9	SS/DELAY	Soft start adjustment capacity connection terminal	19	VIN	Power supply input terminal
10	GND	Signal GND terminal	20	VIN	Power supply input terminal

PACKAGE OUTLINE



## NOTE ON USE

### 1. About the absolute maximum rating

Attention is brushed off enough to the quality control, it is likely to destroy when the absolute maximum rating such as impressed voltages (VCC\_IN,DCIN) and ranges (Topr) of the operating temperature as it is exceeded, the mode of breakings of the short or the opening, etc. cannot be specified, and examine it in this IC to give physical measures for safety such as fuses when a special mode that exceeds the absolute maximum rating is assumed.

### 2. GND pin voltage

GND terminal should be connected the lowest voltage, under all conditions. And all terminals except SW should be under GND terminal voltage under all conditions including transient situations. If a terminal exists under GND, it should be inserting a bypass route.

### 3. Power dissipation

If IC is used on condition that the power loss is over the power dissipation, the reliability will become worse by heat up, such as reduced output current capability. Also, be sure to use this IC within a power dissipation range allowing enough of margin.

### 4. Input supply voltage

Input supply pattern layout should be as short as possible.

### 5. About the short and the miss-installation between terminals

Note the direction and the miss-registration of IC enough when you install it in the set substrate. IC might destroy it as well as reversely connecting the power supply connector when installing it by mistake. Moreover, there is fear of destruction when the foreign body enters between terminals, the terminal, the power supply, and grandeur and it is short-circuited.

### 6. About operation in strong electromagnetic field

In use in strong electromagnetic field, note that there is a possibility of malfunctioning.

### 7. About the inspection by the set substrate

It is likely to suffer stress to IC and discharge electricity every one process when you connect the capacitor with the pin with low impedance when inspecting it in the set substrate. Moreover, detach it after connecting after the power supply is turned off without fail when detaching it to G in the inspection process, inspecting, and turning off the power supply. In addition, be give the earth to the assembly process as a static electricity measures, and careful enough when it transports and you preserve it.

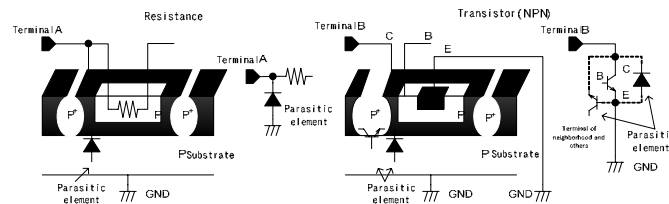
### 8. About each input terminal

This IC is a monolithic IC which has a P<sup>+</sup> isolations and P substrate to isolate elements each other.

This P layer and an N layer in each element form a PN junction to construct various parasitic elements.

For instance, the potential difference operates in resistance as shown in the figure below when resistance and the transistor connect it with the terminal and the playground (GND) >(terminal B) joint of PN operates as a parasitic diode in playground (GND) >(terminal A) transistor (NPN). In addition, the NPN transistor of parasitism works with N layer of the element of the above-mentioned parasitic diode and the neighborhood and others in transistor (NPN). A parasitic element in IC composition is inevitably formed because of the potential relation.

A parasitic element can operate, the interference with the circuit operation be caused, it malfunction, and, consequently, it cause destruction. Therefore, do not do the usage that a parasitic element operates as a voltage that is lower than the playground (GND;P substrate) is impressed to the input terminal enough. Moreover, do not impress the voltage to the input terminal when you do not impress the power-supply voltage to IC. Give each input terminal to me the voltage below the power-supply voltage or in the guarantee value of an electric characteristic when you similarly impress the power-supply voltage.



Example of IC of simple structure

### 9. Earth wiring pattern

If small signal GND and large current GND exist, disperse their pattern. In addition, for voltage change by pattern wiring impedance and large current not to change voltage of small signal GND, each ground terminal of IC must be connected at the one point on the set circuit board. As for GND of external parts, it is similar to the above-mentioned.

### 10. SW terminal

A counter-electromotive force may generate a negative potential at the SW terminal during connection to the particular application. Therefore, it should be inserting a bypass route between SW to GND.

### 11. About each output terminal

We recommend to put Diode for protection purpose in case of output pin connected with large load of impedance or reserve current occurred at initial and output off.

### 12. Thermal Shut Down Circuit

A temperature control is built in the IC to prevent the damage due to overheat. Therefore, the outputs are turned off when the thermal circuit works.

### 13. Over Output Current Protection

This IC has an over current protection, with prevents IC from being damage by short circuit at over current. However, It is recommend not to use that continuously operates the protection circuit (For instance, always the load that greatly exceeds the output current ability is connected or the output is short-circuited, etc.) in these protection circuits by an effective one to the destruction prevention due to broken accident.

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