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

MODEL NAME : **BD8641EFV**

FEATURES :
- Synchronous rectification with built-in FET type DC/DC converter
- Reference voltage accuracy FB 0.8V±1%
- Switching frequency 250kHz～2.3MHz (Synchronizable with external clock.)
- Over current protection circuit
- Thermal shutdown
- Output voltage watch (VDET) function
- Input low voltage detection (UVLO) function
- Soft start / Start delay circuit

◎ABSOLUTE MAXIMUM RATING (Ta=25℃)

Parameter	Symbol	Limits	Unit
Input supply voltage	PV_{IN}, SV_{IN}	7	V
Input terminal voltage	V_{INP} *1	V_{IN}	V
Output terminal voltage	V_{OUT} *2	V_{IN}	V
Output current	I_{OUT}	4	A
Power dissipation	Pd	3.2*3	W
Operating temperature	Topr	-40 ～ 85	℃
Storage temperature	Tstg	-55 ～ 150	℃

*1 V_{INP} Application terminal : SYNCLK, EN, SS/DELAY, FB
*2 V_{OUT} Application terminal : SW, VDET, FC, RT
*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℃, 25.6mW shall be reduced per 1

◎Operation condition

Parameter	Symbol	MIN	TYP	MAX	Unit
Input supply voltage	V_{IN}	3.0	-	5.5	V
Output current	I_{OUT}	-	-	3	A

This product is not designed for protection against radioactive rays.

Status of this document
The Japanese version of this document is the formal specification.
A customer may use this translation version only for a reference to help reading the formal version.
If there are any differences in translation version of this document, formal version takes priority.

Be careful to handle because the content of the description of this material might correspond to the labor (technology in the design, manufacturing, and use) in foreign country exchange and Foreign Trade Control Law.

Application example
- **ROHM cannot provide adequate confirmation of patents.**
- **The product described in this specification is designed to be used with ordinary electronic equipment or devices (such as audio-visual equipment, office-automation equipment, communications devices, electrical appliances, and electronic toys).**
  Should you intend to use this product with equipment or devices which require an extremely high level of reliability and the malfunction of which would directly endanger human life (such as medical instruments, transportation equipment, aerospace machinery, nuclear-reactor controllers, fuel controllers and other safety devices), please be sure to consult with our sales representative in advance.
- **ROHM assumes no responsibility for use of any circuits described herein, conveys no license under any patent or other right, and makes no representations that the circuits are free from patent infringement.**

◎Electrical characteristic

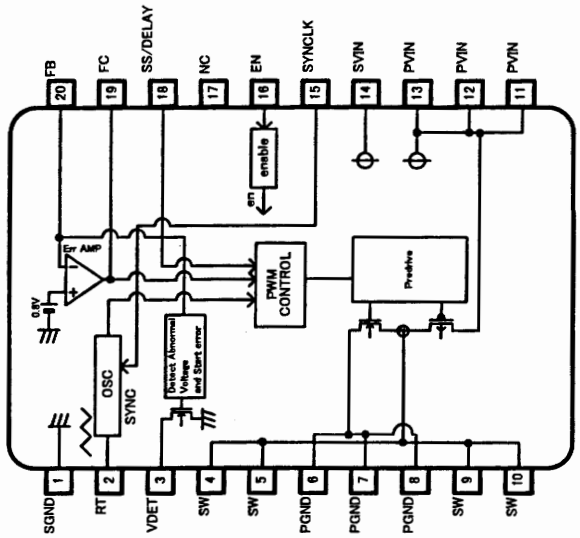
(Unless otherwise noted Ta=25□, PV_{IN}, SV_{IN}=3.3V, GND=0V)

Parameter	Symbol	Specification value			UNIT	Condition
		MIN	TYP	MAX		
VIN supply current (operating)	I_{Q_active}	-	380	570	μA	V_{FB} = 0.83V, V_{FC} = 1V
VIN supply current (standby)	I_{Q_stby}	-	0	1	μA	V_{EN} = 0V
Reference voltage (VREF)	V_{REF}	0.792	0.8	0.808	V	
Output rise detection voltage	V_{OVP}	30	60	90	mV	Monitoring FB terminal
Output decrease detection voltage	V_{LVP}	-90	-60	-30	mV	Monitoring FB terminal
Terminal VDET output current	I_{VDET}	0.4	-	-	mA	V_{VDET} < 0.3V
Oscillation frequency	f_{OSC}	2.0	2.3	2.6	MHz	R_{RT} = 43kΩ
Pch FET ON resistance	R_{PFET}	-	75	110	mΩ	I_{SW} = 1A
Nch FET ON resistance	R_{NFET}	-	55	90	mΩ	I_{SW} = -1A
UVLO voltage	V_{UVLO}	2.35	2.50	2.65	V	
SW leak current	I_{LSW}	-	0	1	μA	V_{EN}= 0V, V_{IN} = 5.5V
EN terminal H threshold voltage	V_{ENH}	1.1	-	-	V	
EN terminal L threshold voltage	V_{ENL}	-	-	0.4	V	
FC sink current	I_{FCSI}	5	10	-	μA	
FC source current	I_{FCSO}	-	-10	-5	μA	
SS/DELAY terminal source current	I_{SSSO}	2	4	6	μA	

●V_{FB}:FB terminal voltage、V_{EN} :EN terminal voltage、V_{FC} :FC terminal voltage、V_{VDET}: VDET terminal voltage

●Current capability should not exceed Pd.

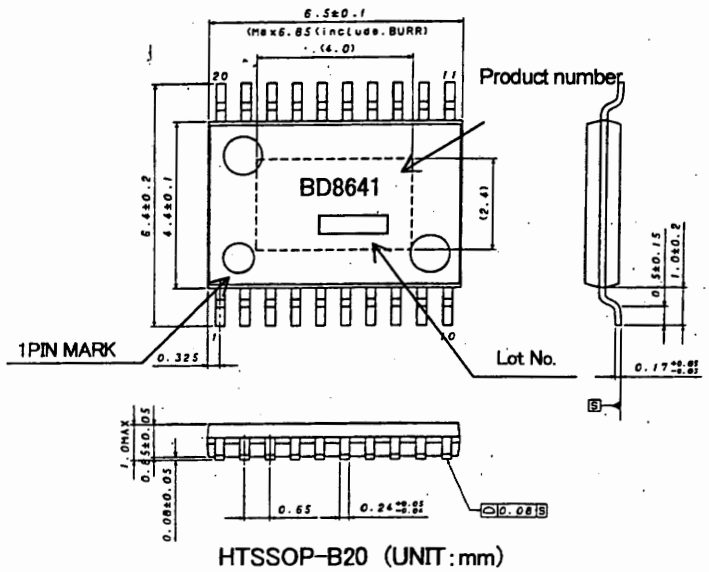
◎BLOCK DIAGRAM



◎PIN ASSIGNMENT

No.	Symbol	Description	No.	Symbol	Description
1	SGND	Signal GND terminal	11	PVIN	Power GND terminal
2	RT	Frequency adjustment resistance connection terminal	12	PVIN	Power GND terminal
3	VDET	Output abnormality detection terminal	13	PVIN	Power GND terminal
4	SW	Switching output terminal	14	SVIN	Signal system power supply input terminal
5	SW	Switching output terminal	15	SYNCLK	Input terminal for external clock synchronization
6	PGND	Power GND terminal	16	EN	Enable input
7	PGND	Power GND terminal	17	NC	-
8	PGND	Power GND terminal	18	SS/DELAY	Soft start adjustment capacity connection terminal
9	SW	Switching output terminal	19	FC	Phase amends terminal
10	SW	Switching output terminal	20	FB	Feedback terminal

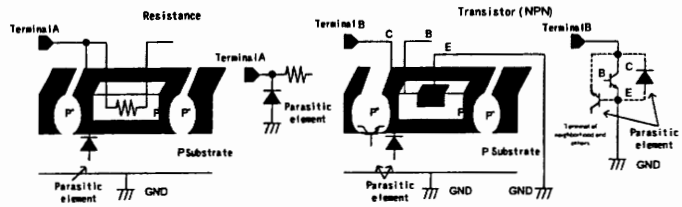
◎PACKAGE OUTLINE



HTSSOP-B20 (UNIT:mm)

◎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. About the reverse-connection of the power supply connector
   IC might destroy it by reversely connecting the power supply connector. Give measures such as putting the diode between power supply terminals of power supply and IC outside for the reverse-touching destruction protection.
3. Power supply line
   Please do measures such as putting the bypass capacitor in power supply-GND nearest pin of this IC as the route of the resurrection current to cause the return of the current in which it resurrected it by the counter electromotive force of the coil.
   Please confirm the characteristic of the electrolytic capacitor enough as the capacity omission etc. at the low temperature never happen, and decide it.
4. About grand potential
   Any state of operation must become the lowest potential about the potential of the terminal GND. Moreover, confirm whether there is terminal that is actually the voltage of GND or less including transients.
5. About the heat design
   Think about permissible loss (Pd) in an actual state of use, and do the heat design with the margin enough.
6. 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.
7. About operation in strong electromagnetic field
   In use in strong electromagnetic field, note that there is a possibility of malfunctioning.
8. About the capacitor during output-GND
   The current charged the capacitor with when VCC is 0V or is GND and is short-circuited when a big capacitor is connected between GND output by some factors flows into the output and it is likely to destroy it. Give the capacitor between GND output to 0.1μF or less.
9. 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. n addition, be give the earth to the assembly process as a static electricity measures, and careful enough when it transports and you preserve it.
10. About each input terminal
    This IC is a monolithic IC which has a P^+ 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

11. 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.
12. Thermal Shut-Down
    When a thermal shutdown operates, the DC/DC converter controller of all Ch is turned off. When a thermal shutdown is released, the DC/DC converter controller of all Ch becomes an operation beginning from turning off.