System Power Supply for TV Series

FET Controller Type
3ch System Power Supply ICs

BD8621EFV

No.09034EAT03

●Description

BD8621EFV has realized the high performance and reliability required as a power supply for thin-screen TV.
With built-in FET 1ch current mode control, the DC/DC Converter series has the advantage of high-speed load response and wide phase margin.
Due to the high-speed load response, it is most suitable for TV-purpose processors with increasingly high performance, and due to the wide phase margin it leaves a good margin for board pattern & constant setting and so facilitates its application design.
As a high-reliability design, it has various built-in protection circuits (overcurrent protection, output voltage abnormal protection, thermal protection, and off-latch function at the time of abnormality etc.), therefore as an advantage it does not easily damage in every possible abnormal condition such as all-pin short circuit test etc. and hence most suitable for thin-screen TV which requires the high reliability.

●Features

1) 3A output current
2) Low RDS(ON) internal switches (PchMOS:75mΩ, NchMOS:55mΩ)
3) ±1% reference voltage accuracy
4) Programmable frequency : 250kHz-1MHz
5) (Frequency in programmable by adjusting RT resistance or synchronizing with SYNCLK terminal.)
6) Terminal RT OPEN/SHORT detecting function
7) Over current protection function
8) Output over voltage/low voltage protection function (over : FB > VREF +60mV , low : FB < VREF -60mV)
9) Timer off latch function in abnormal circumstances
10) Thermal shutdown function
11) Under voltage protection
12) Soft start/start delay circuit
13) Soft start time out function
14) Protecting BUS function with terminal PDET
15) HTSSOP-B20 package

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●**Electrical characteristics**

(Unless otherwise noted Ta=25℃, VIN=3.3V, GND=0V)

Parameter	Symbol	Specification value			UNIT	Condition
		MIN	TYP	MAX		
VIN supply current (operating)	$I_{Q\ active}$	-	220	350	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 PDET output current	I_{PDET}	0.4	-	-	mA	V_{PDET}< 0.3V
Oscillation frequency	f_{OSC}	500	550	600	kHz	R_{RT}= 220kΩ
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}	10	20	-	μA	
FC source current	I_{FCSO}	-	-20	-10	μA	
SS/DELAY terminal source current	I_{SSSO}	2	4	6	μA	
Terminal PDET pull-up resistor	R_{PDET}	100	170	250	kΩ	

V_{FB} :FB terminal voltage, V_{EN} :EN terminal voltage, V_{FC} :FC terminal voltage, V_{PDET}: PDET terminal voltage

Current capability should not exceed Pd.

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●Block Diagram

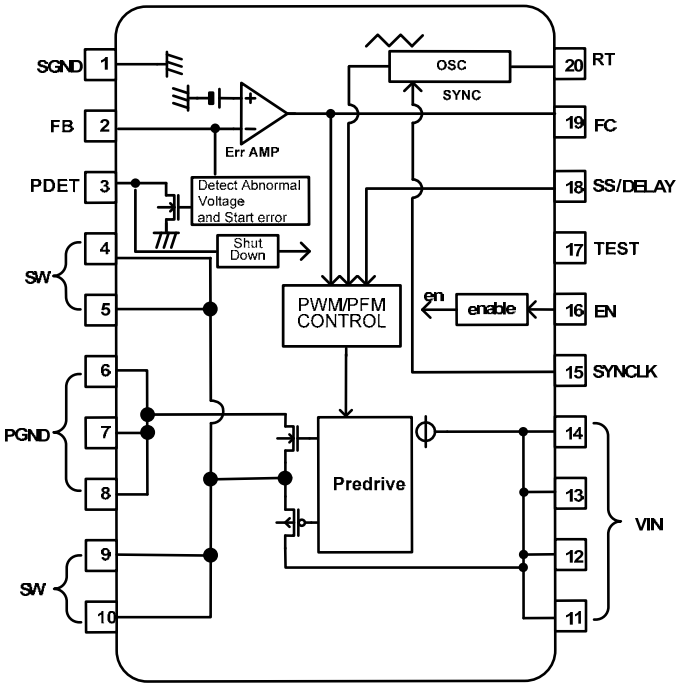


Fig1 Block diagram

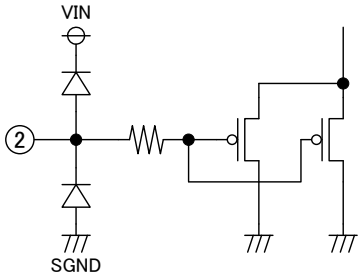
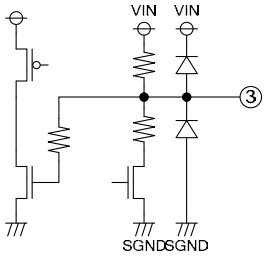
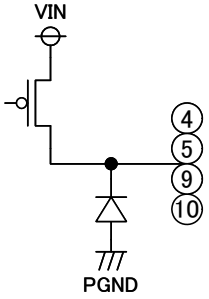
●Pin Description

No.	Symbol	Description	Explanation
1	SGND	Signal GND terminal	Small signal system GND
2	FB	Feed back terminal	Output voltage detection
3	PDET	Off latch signal output	Protecting BUS communication terminal
4	SW	Output terminal	Switching output
5	SW		
6	PGND	Power GND terminal	GND for power MOSFET
7	PGND		
8	PGND		
9	SW	Output terminal	Power Mos output
10	SW		
11	VIN	Power supply input terminal	Power supply input. The decoupling is done to PGND
12	VIN		
13	VIN		
14	VIN		
15	REG	Internal Regulator	Synchronizable switching output terminal frequency with external clock
16	EN	Enable input	ON/OFF control for device operation
17	TEST	Terminal for test	SGND short in the set.
18	SS/DELAY	Soft start adjustment capacity connection terminal	The soft start time is adjusted with the connected capacitor
19	FC	Error amplifier output	Error amplifier phase compensation point
20	RT	Frequency adjustment resistance connection terminal	The switching frequency is set by the connected resistance

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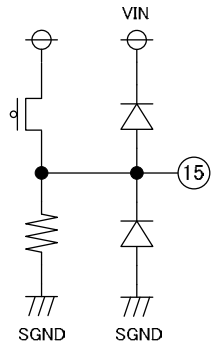
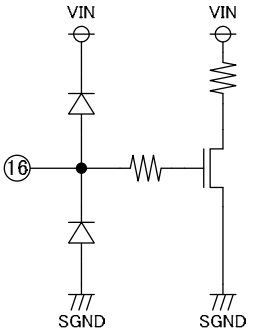
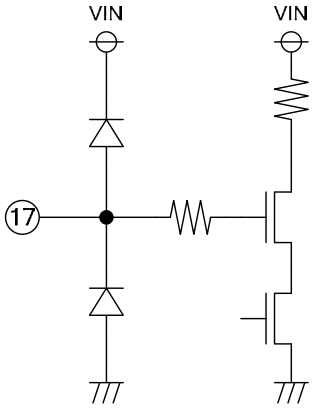
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●**Pin equivalence circuit diagram**

No.	Symbol	Explanation	Terminal equivalent circuit diagram
1	SGND	GND (connected 0V)	
2	FB	Output voltage detection terminal	
3	PDET	Protecting BUS I/O terminal	
4,5,9,10	SW	Output terminal	
6,7,8	PGND	Power GND (Same voltage as SGND)	
11,12,13,14	VIN	Power supply input terminal	

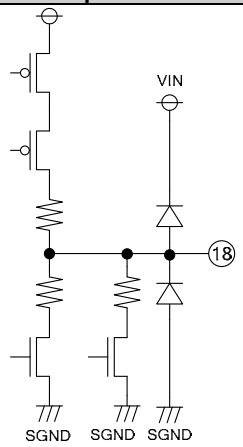
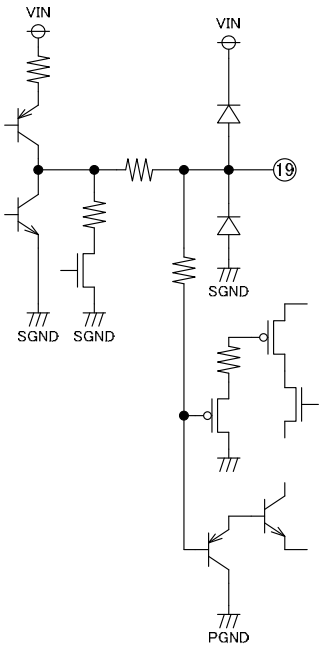
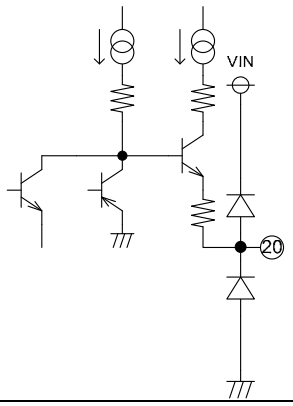
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No.	Symbol	Explanation	Terminal equivalent circuit diagram
15	REG	Internal Regulator output voltage	
16	EN	Enable terminal	
17	TEST	Using at test mode	

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No.	Symbol	Explanation	Terminal equivalent circuit diagram
18	SS /DELAY	Soft start time adjustment terminal	
19	FC	Error amplifier compensation terminal	
20	RT	Oscillator frequency adjustment terminal	

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●Operation description

Enable control

The device can be controlled ON/OFF by EN terminal (16 pin) voltage.
An internal circuit starts when VEN reaches 1.1V.

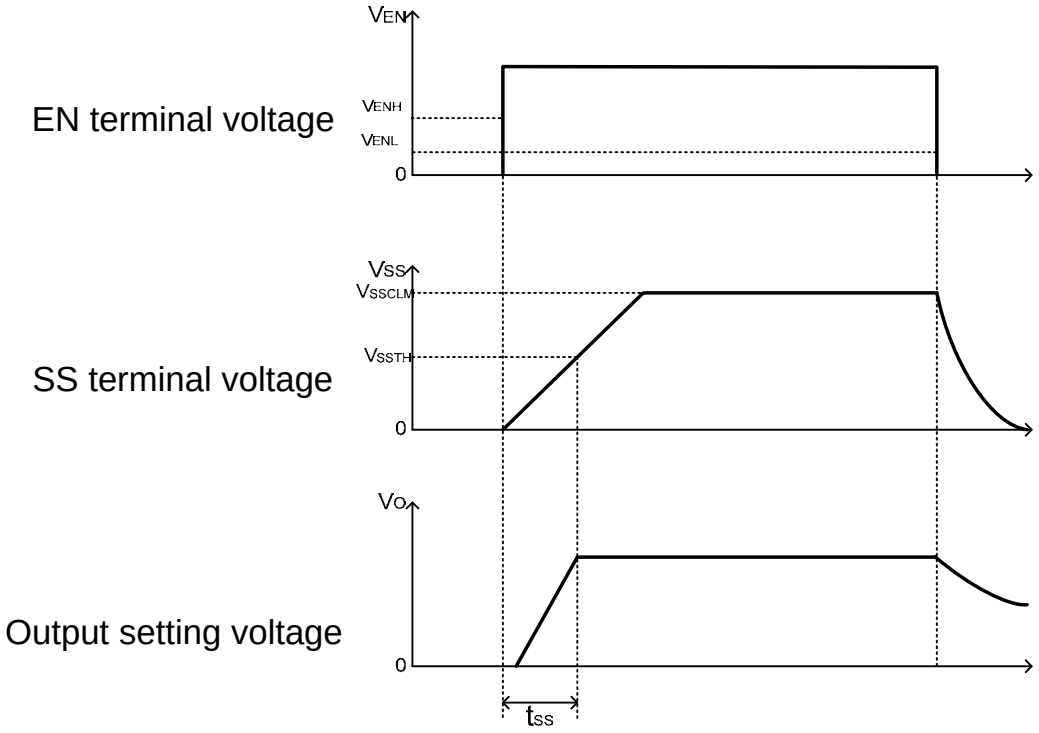


Fig.2 ON/OFF transition wave form in EN controlling

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Soft start time set function

As for BD8621EFV, output can do soft start without overshoot by charging soft start capacity (CSS) connected between SS and SGND terminal.
Also, soft start time (tss) can be set by setting soft start capacity (CSS) arbitrarily.

OSC oscillation frequency setting function

The output oscillation frequency can be set by connecting resistance between terminal RT (20 pins) and SGND (range = 250kHz - 1MHz)
The relation between RT terminal resistance and the oscillation frequency follows Fig.3.

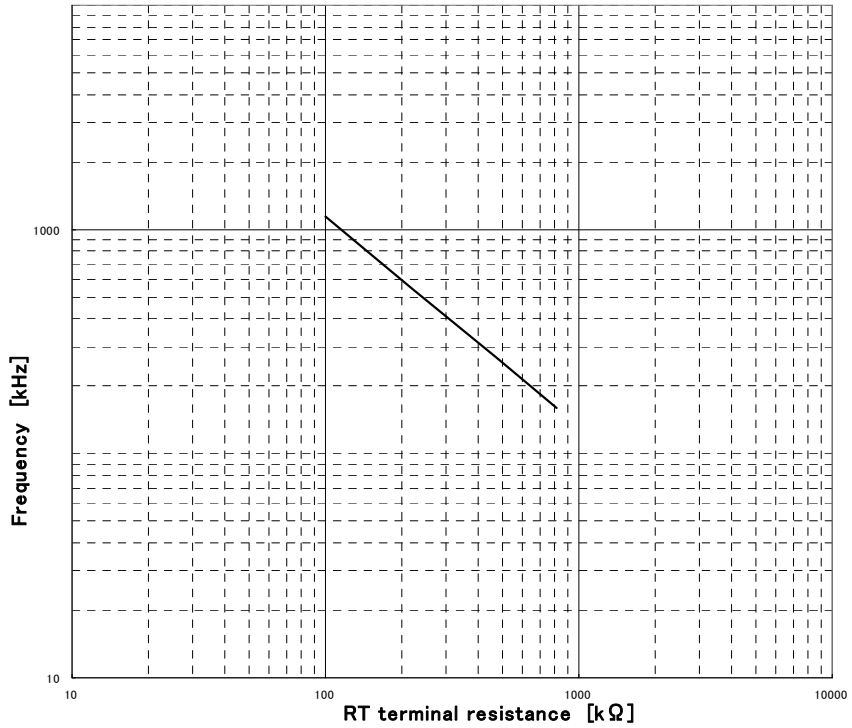


Fig.3 RT resistance-oscillation frequency

Switching frequency synchronization

An internal transmitter of BD8621EFV can be synchronized with the external clock signal connected with the terminal SYNCLK (15 pins).
The frequency of external clock can be set within the range of 250kHz-1MHz. In this case, please set the RT resistance that may become about -20% value of the external clock frequency.
* Be short-circuited SYNCLK terminal to SGND when a frequency synchronous function is not used.

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●Protection function

Protection circuit is effective for destruction prevention due to accident so that avoid using under continuous protection operation.

Low voltage protection function (LVP)

The voltage of the terminal FB (2 pins) is compared with internal reference voltage VREF.
If FB terminal voltage falls below V_{LVP}(= VREF -60mV) and the state continues for 500us, output changes to low voltage and the state is fixed. In that case , PDET (3pin) output changes to L.

Table 1 output low voltage protection function

EN terminal	SS terminal	FB terminal	Low voltage protection function	Low voltage protection operation
$>V_{ENH}$	>1.4V(typ)	$<V_{LVP}$	Effective	ON
		$>V_{LVP}$		OFF
	<1.4V(typ)	-	Invalidity	OFF
$<V_{ENL}$	-	-	Invalidity	OFF

* Low voltage protection function is available when SS terminal voltage becomes more than 1.4V (typ) in the transition to ON control (during soft start).

Over voltage protection function(OVP)

The voltage of the terminal FB is compared with internal reference voltage VREF.
If FB terminal voltage is over Vovp (=VREF +60mV) and the state is continues for 500usec, output changes to low voltage and the state is fixed.

Table 2 output overvoltage protection function

EN terminal	SS terminal	FB terminal	Over voltage protection function	Over voltage protection operation
$>V_{ENH}$	>1.4V(typ)	$>V_{OVP}$	Effective	ON
		$<V_{OVP}$		OFF
	<1.4V(typ)	-	Invalidity	OFF
$<V_{ENL}$	-	-	Invalidity	OFF

* Over voltage protection function is available when SS terminal voltage becomes more than 1.4V (typ) in the transition to ON control (during soft start).

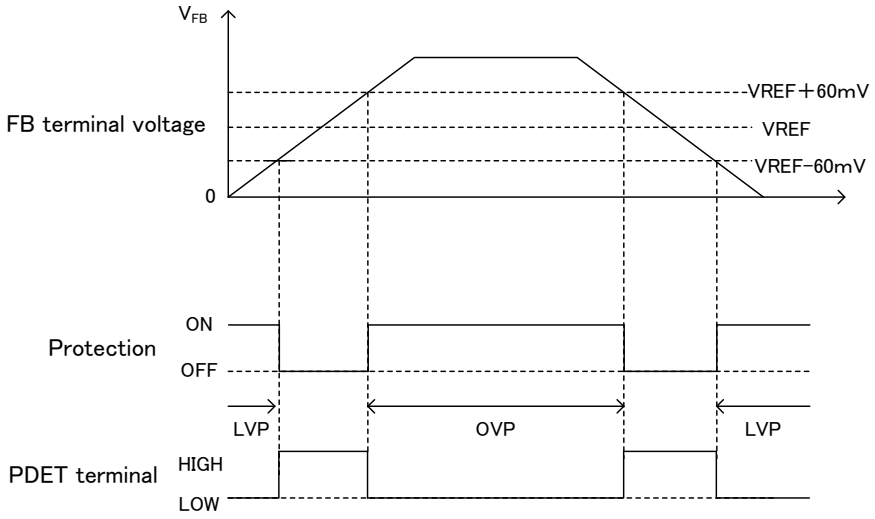


Fig.4 Output voltage error detection range

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Under voltage lock out protection (UVLO)

As for BD8621EFV, the power-supply voltage decrease detection protection circuit is built in.
It the input voltage decrease below the UVLO voltage (2.5V typ), the device state changes to the standby mode (Moreover, to prevent the chattering of the output) hysteresis width of 100mV(typ) has been installed in the UVLO cancel voltage.

RT terminal open/short protection function (RTO/RTS)

RT terminal opening/short protection function prevent the clock from abnormal oscillation.
If RT terminal open/short protection function is detected, output voltage changes to low level and is fixed.

Terminal RT opening/short protection function is available if the state continue for 500usec, abnormal detection operates when the state continues about 500μsec(typ).

Soft start time-out function

If VSS doesn't exceed VSSTH within 64msec (typ) since a soft start began, BD8621EFV controls an off latch.
Vo is fixed in a low level.

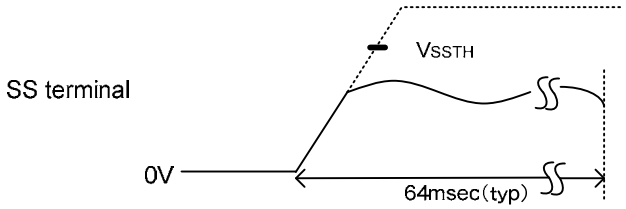


Fig.5 Soft start time-out

Thermal shut down function

Thermal shut down circuit (TSD circuit) is built into BD8621EFV. When the temperature of the chip exceeds Tjmax=175, the DC/DC converter is fixed in a low voltage.
TSD function is aimed to shut down IC from thermal reckless driving under an abnormal state to exceed Tjmax=175.
It aims at neither protection nor the guarantee of the set. Therefore, please do not use this function to protect the set.

Over current protection function

The over current protection function has been achieved by limiting the current that flows on high side MOSFET.
The current is controlled in every one cycle of the switching frequency. When an abnormal state continues for about 500μsec(typ), the output is fixed in a low level.

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Protecting BUS function with terminal PDET

The terminal PDET (3 pins) monitors whether IC is normal or not. When IC becomes abnormal, the PDET output is reduced at "L" level with the output voltage fixed “L” level at the same time. Moreover, it is possible to make the output fix in a low level by compulsorily reducing the terminal PDET at "L" level from the outside.
When two or more BD8621EFV is used in the application, this function prevents the IC from destroying, because one IC error transmits all other ICs by PDET line in the condition that PDET terminals are connected each other.

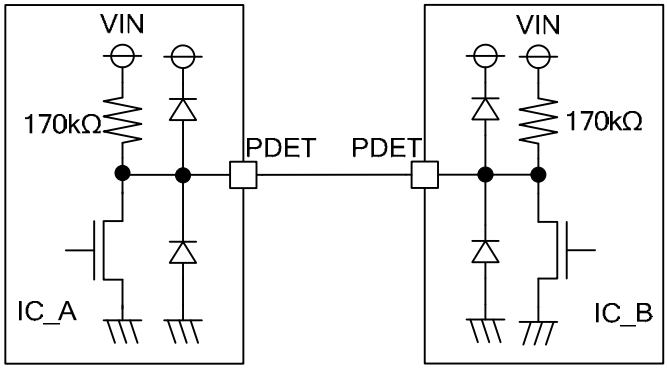


Fig.6 Protecting BUS communication

※Please give the terminal PDET as OPEN when you do not use protecting BUS function.

Error detection (off latch) release method

BD8621EFV enters the state of an off latch when the protection function operates.
To release the off latch state, EN terminal voltage should be changed to low level once time.

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●**Each characteristic reference data**

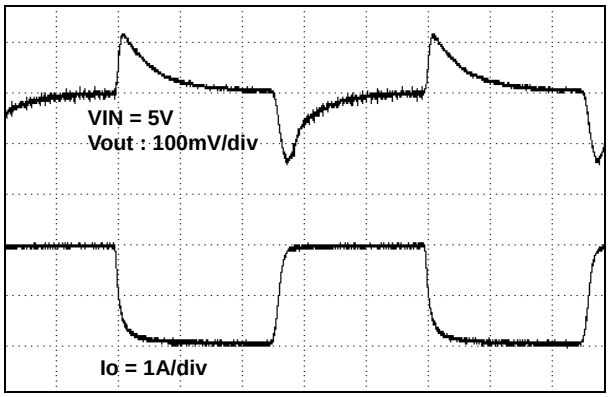


Fig.7 Output load response

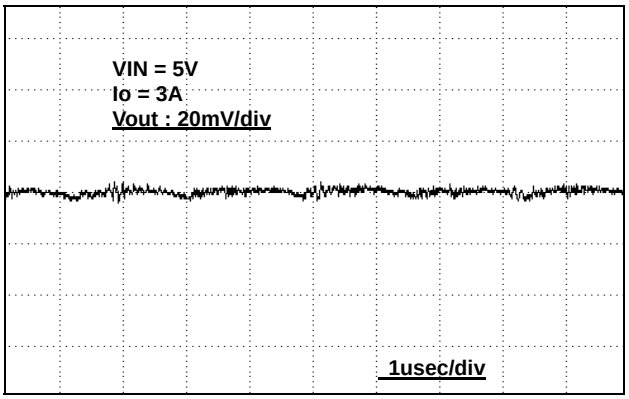


Fig.8 Output ripple

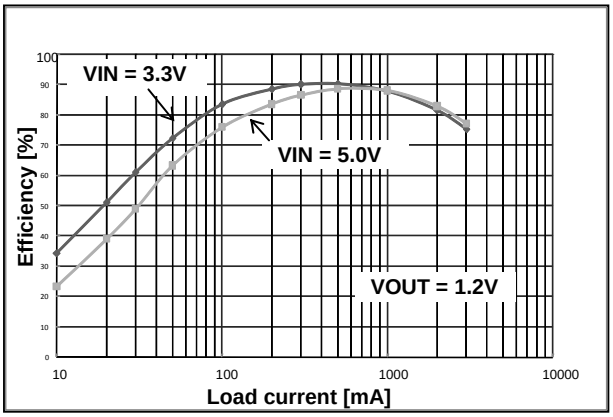


Fig.9 Efficiency

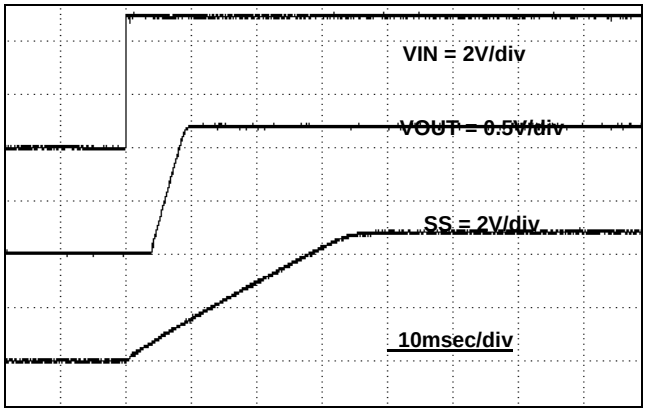


Fig.10 Soft start

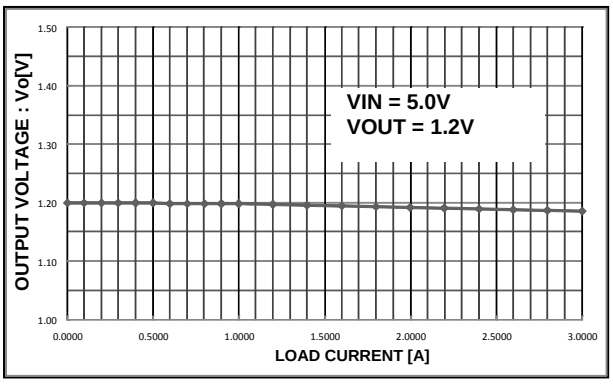


Fig.11 Regulation

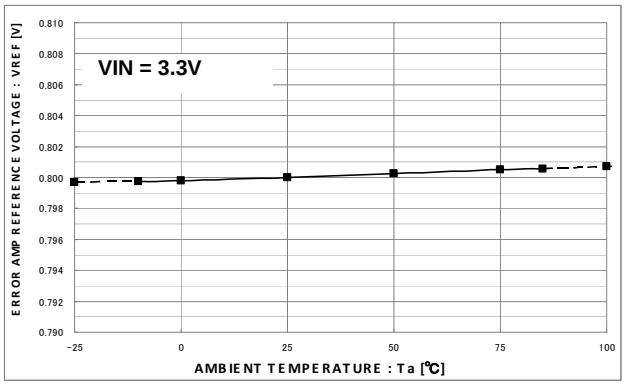


Fig.12 Reference voltage - Temperature characteristic

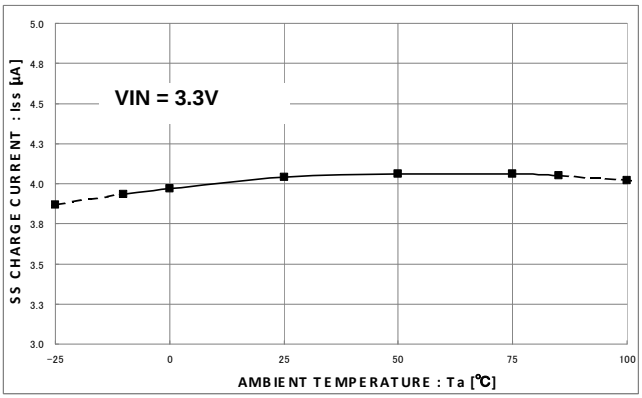


Fig.13 SS Charging current - Temperature characteristic

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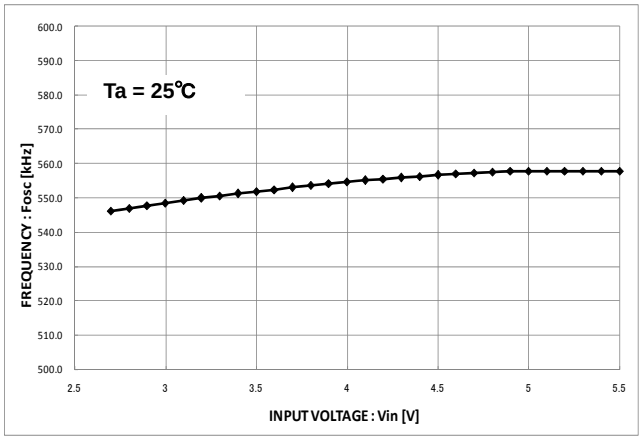


Fig.14 Switching frequency-power-supply voltage

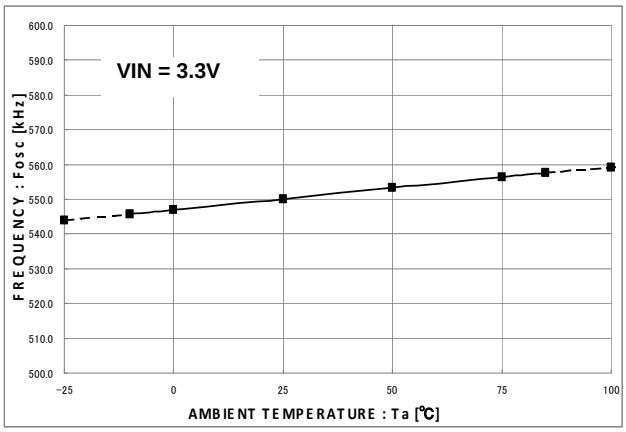


Fig.15 Switching frequency-temperature characteristic

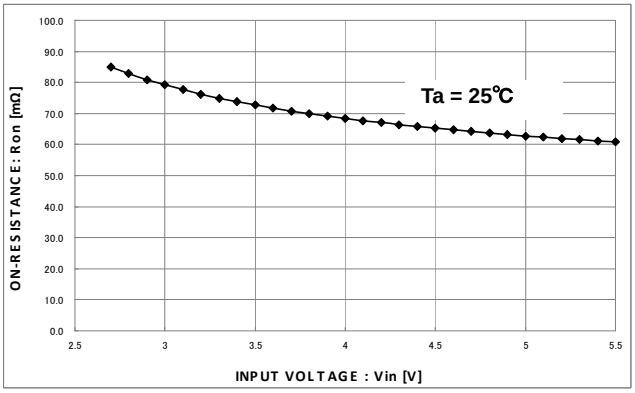


Fig.16 PMOS on resistance-power-supply voltage

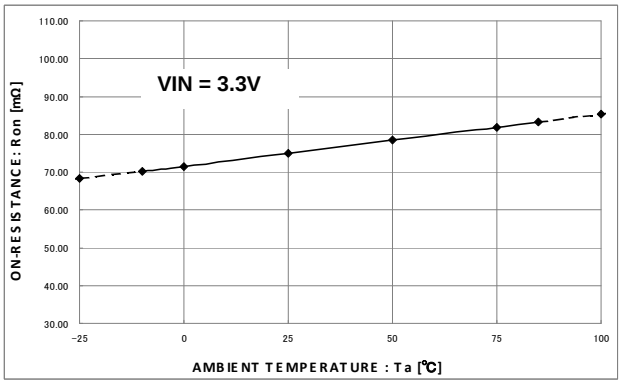


Fig.17 PMOS on resistance-temperature characteristic

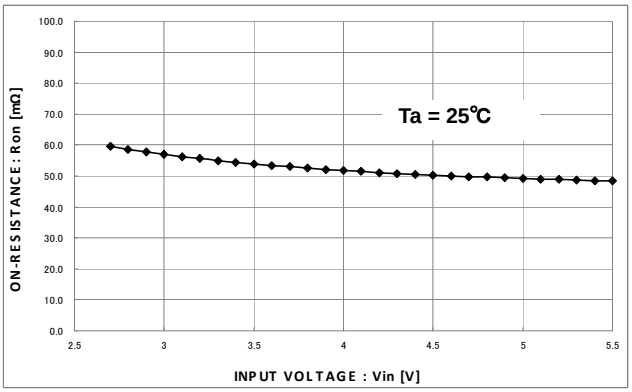


Fig.18 NMOS on resistance-power-supply voltage

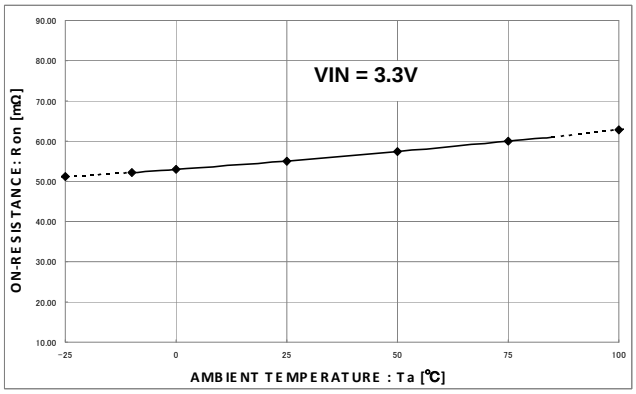


Fig.19 NMOS on resistance-temperature characteristic

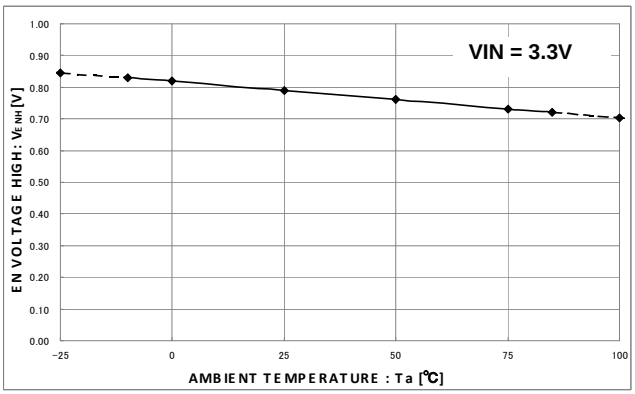


Fig.20 Terminal EN H voltage-temperature characteristic

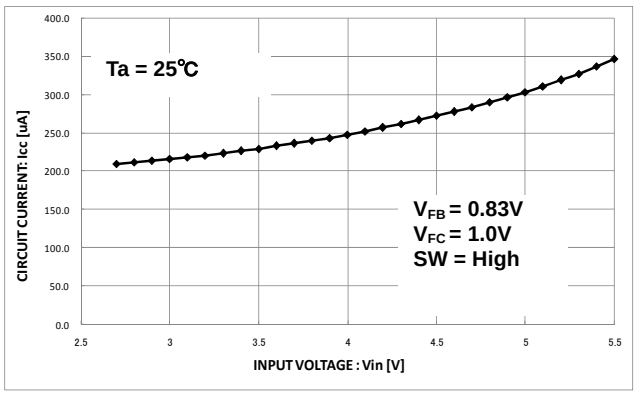


Fig.21 Circuit current-power-supply voltage characteristic

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●Ordering part number

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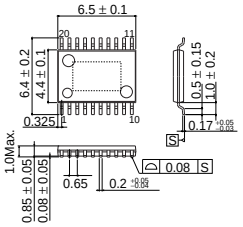
Part No.

Package
EFV: HTSSOP-B20

Packaging and forming specification
E2: Embossed tape and reel

HTSSOP-B20

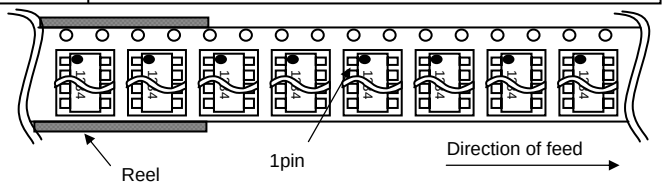
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(Unit:mm)

<Tape and Reel information>

Tape	Embossed carrier tape
Quantity	2500pcs
Direction of feed	E2 (The direction is the 1pin of product is at the upper left when you hold reel on the left hand and you pull out the tape on the right hand)



※When you order , please order in times the amount of package quantity.

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(Note1) Medical Equipment Classification of the Specific Applications

JAPAN	USA	EU	CHINA
CLASSⅢ	CLASSⅢ	CLASSⅡb	CLASSⅢ
CLASSⅣ		CLASSⅢ	

2. ROHM designs and manufactures its Products subject to strict quality control system. However, semiconductor products can fail or malfunction at a certain rate. Please be sure to implement, at your own responsibilities, adequate safety measures including but not limited to fail-safe design against the physical injury, damage to any property, which a failure or malfunction of our Products may cause. The following are examples of safety measures:
   [a] Installation of protection circuits or other protective devices to improve system safety
   [b] Installation of redundant circuits to reduce the impact of single or multiple circuit failure

3. Our Products are designed and manufactured for use under standard conditions and not under any special or extraordinary environments or conditions, as exemplified below. Accordingly, ROHM shall not be in any way responsible or liable for any damages, expenses or losses arising from the use of any ROHM's Products under any special or extraordinary environments or conditions. If you intend to use our Products under any special or extraordinary environments or conditions (as exemplified below), your independent verification and confirmation of product performance, reliability, etc, prior to use, must be necessary:
   [a] Use of our Products in any types of liquid, including water, oils, chemicals, and organic solvents
   [b] Use of our Products outdoors or in places where the Products are exposed to direct sunlight or dust
   [c] Use of our Products in places where the Products are exposed to sea wind or corrosive gases, including Cl_2, H_2S, NH_3, SO_2, and NO_2
   [d] Use of our Products in places where the Products are exposed to static electricity or electromagnetic waves
   [e] Use of our Products in proximity to heat-producing components, plastic cords, or other flammable items
   [f] Sealing or coating our Products with resin or other coating materials
   [g] Use of our Products without cleaning residue of flux (even if you use no-clean type fluxes, cleaning residue of flux is recommended); or Washing our Products by using water or water-soluble cleaning agents for cleaning residue after soldering
   [h] Use of the Products in places subject to dew condensation

4. The Products are not subject to radiation-proof design.

5. Please verify and confirm characteristics of the final or mounted products in using the Products.

6. In particular, if a transient load (a large amount of load applied in a short period of time, such as pulse. is applied, confirmation of performance characteristics after on-board mounting is strongly recommended. Avoid applying power exceeding normal rated power; exceeding the power rating under steady-state loading condition may negatively affect product performance and reliability.

7. De-rate Power Dissipation (Pd) depending on Ambient temperature (Ta). When used in sealed area, confirm the actual ambient temperature.

8. Confirm that operation temperature is within the specified range described in the product specification.

9. ROHM shall not be in any way responsible or liable for failure induced under deviant condition from what is defined in this document.

Precaution for Mounting / Circuit board design

1. When a highly active halogenous (chlorine, bromine, etc.) flux is used, the residue of flux may negatively affect product performance and reliability.

2. In principle, the reflow soldering method must be used; if flow soldering method is preferred, please consult with the ROHM representative in advance.

For details, please refer to ROHM Mounting specification

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Precautions Regarding Application Examples and External Circuits

1. If change is made to the constant of an external circuit, please allow a sufficient margin considering variations of the characteristics of the Products and external components, including transient characteristics, as well as static characteristics.

2. You agree that application notes, reference designs, and associated data and information contained in this document are presented only as guidance for Products use. Therefore, in case you use such information, you are solely responsible for it and you must exercise your own independent verification and judgment in the use of such information contained in this document. ROHM shall not be in any way responsible or liable for any damages, expenses or losses incurred by you or third parties arising from the use of such information.

Precaution for Electrostatic

This Product is electrostatic sensitive product, which may be damaged due to electrostatic discharge. Please take proper caution in your manufacturing process and storage so that voltage exceeding the Products maximum rating will not be applied to Products. Please take special care under dry condition (e.g. Grounding of human body / equipment / solder iron, isolation from charged objects, setting of Ionizer, friction prevention and temperature / humidity control).

Precaution for Storage / Transportation

1. Product performance and soldered connections may deteriorate if the Products are stored in the places where:
   - [a] the Products are exposed to sea winds or corrosive gases, including Cl2, H2S, NH3, SO2, and NO2
   - [b] the temperature or humidity exceeds those recommended by ROHM
   - [c] the Products are exposed to direct sunshine or condensation
   - [d] the Products are exposed to high Electrostatic

2. Even under ROHM recommended storage condition, solderability of products out of recommended storage time period may be degraded. It is strongly recommended to confirm solderability before using Products of which storage time is exceeding the recommended storage time period.

3. Store / transport cartons in the correct direction, which is indicated on a carton with a symbol. Otherwise bent leads may occur due to excessive stress applied when dropping of a carton.

4. Use Products within the specified time after opening a humidity barrier bag. Baking is required before using Products of which storage time is exceeding the recommended storage time period.

Precaution for Product Label

QR code printed on ROHM Products label is for ROHM's internal use only.

Precaution for Disposition

When disposing Products please dispose them properly using an authorized industry waste company.

Precaution for Foreign Exchange and Foreign Trade act

Since our Products might fall under controlled goods prescribed by the applicable foreign exchange and foreign trade act, please consult with ROHM representative in case of export.

Precaution Regarding Intellectual Property Rights

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