

# DC / DC converter

## BP5232A25 / BP5232A33 / BP5233A33 / BP5234A33

The BP5232A25, BP5232A33, BP5233A33 and BP5234A33 are DC / DC converters that use PWM system and VFM system. They contain control circuits, switching devices and coils, and operate by only connecting an I/O smoothing capacitor.

With a high efficiency of power conversion, the modules are available in stand-alone SIP packages with no heat sink required.

### ●Applications

Power supplies for copiers, personal computers, facsimiles, industrial equipment, and AV equipment.

### ●Features

- 1) High power conversion efficiency. (BP5233A33 : 93%)
- 2) Large output current.
- 3) Low current consumption with no load. (BP5233A33 : 200 $\mu$ A Typ.)
- 4) High conversion efficiency. (85% at output current of 100mA)
- 5) Applicable to various purposes by fine-adjusting output voltage with external circuits.
- 6) Built-in ON / OFF switch.
- 7) Heat sink unnecessary.

### ●Absolute maximum ratings (Ta = 25°C)

Parameter	Symbol	Limits				Unit
		BP5232A25	BP5232A33	BP5233A33	BP5234A33	
Input voltage	V <sub>IN</sub>	7				V
Output current	I <sub>O</sub>	2*	2*	3*	4*	A
Operating temperature	T <sub>opr</sub>	-20 to +55				°C
Storage temperature	T <sub>stg</sub>	-25 to +80				°C

\* Derating required according to the input voltage and ambient temperature.

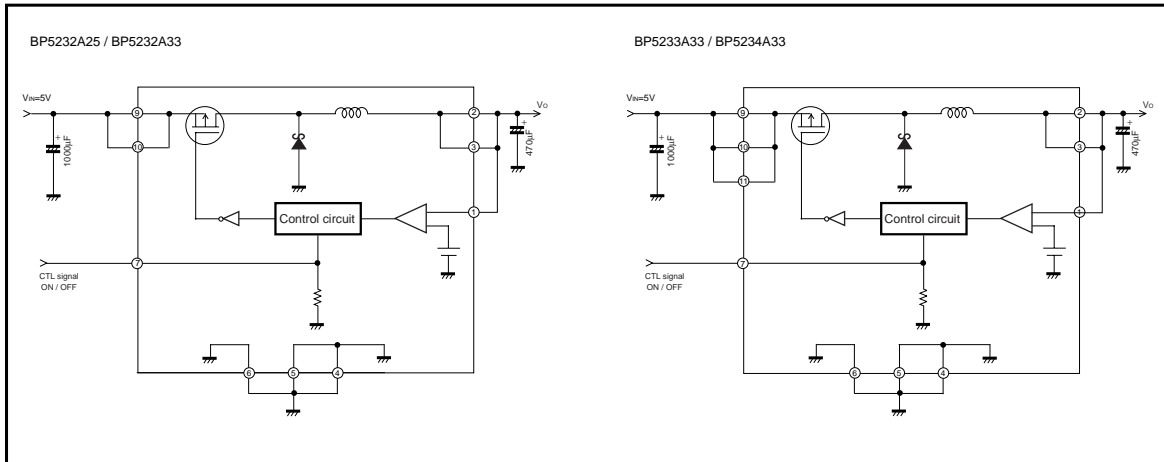
### ●Recommended operating conditions (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit
Input voltage	V <sub>IN</sub>	4.5	5.0	5.5	V

# BP5232A25/BP5232A33/BP5233A33/BP5234A33

## Power Module

### ●Block diagram



### ●Pin descriptions

BP5232A25 , 5232A33

Pin No.	Pin description
1	Feed back
2	V <sub>OUT1</sub>
3	V <sub>OUT2</sub>
4	GND
5	GND

Pin 8 is removed.

BP5233A33 , BP5234A33

Pin No.	Pin description	Pin No.	Pin description
1	Feed back	6	GND
2	V <sub>OUT1</sub>	7	CTL
3	V <sub>OUT2</sub>	9	V <sub>IN1</sub>
4	GND	10	V <sub>IN2</sub>
5	GND	11	V <sub>IN3</sub>

Pin 8 is removed.

### ●Electrical characteristics

BP5232A25 (Unless otherwise noted, V<sub>IN</sub>=5V, I<sub>O</sub>=1A, SW=1, T<sub>a</sub>=25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	Measurement circuit
Input voltage	V <sub>IN</sub>	4.5	5	5.5	V		Fig.1
Output voltage	V <sub>O</sub>	2.4	2.5	2.6	V		Fig.1
Output current	I <sub>O</sub>	–	–	2	A	*1	Fig.1
Current consumption at no load	I <sub>IN</sub>	–	200	300	µA		Fig.1
Load regulation	ΔV <sub>O</sub>	–	13	33	mV	I <sub>O</sub> =0.1A to 2A	Fig.1
Output ripple voltage	v <sub>γ</sub>	–	33	100	mV <sub>PP</sub>	*2	Fig.1
Power conversion efficiency	η	84	89	–	%		Fig.1
CTL pin ON voltage	V <sub>ON</sub>	1.8	–	–	V		Fig.1
CTL pin OFF voltage	V <sub>OFF</sub>	–	–	0.3	V	SW=2	Fig.1
		(Alternatively, when OPEN)					

\*1 Derating required according to the input voltage and ambient temperature.

\*2 Pulse noise not included.

# BP5232A25/BP5232A33/BP5233A33/BP5234A33

## Power Module

BP5232A33 (Unless otherwise noted,  $V_{IN}=5V$ ,  $I_o=1A$ ,  $SW=1$ ,  $T_a=25^{\circ}C$ )

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	Measurement circuit
Input voltage	$V_{IN}$	4.5	5	5.5	V		Fig.1
Output voltage	$V_O$	3.17	3.3	3.43	V		Fig.1
Output current	$I_o$	–	–	2	A	*1	Fig.1
Current consumption at no load	$I_{IN}$	–	200	300	$\mu A$		Fig.1
Load regulation	$\Delta V_O$	–	16	42	mV	$I_o=0.1A$ to 2A	Fig.1
Output ripple voltage	$v_{\gamma}$	–	33	100	mV <sub>PP</sub>	*2	Fig.1
Power conversion efficiency	$\eta$	88	93	–	%		Fig.1
CTL pin ON voltage	$V_{ON}$	1.8	–	–	V		Fig.1
CTL pin OFF voltage	$V_{OFF}$	–	–	0.3	V	SW=2 (Alternatively, when OPEN)	Fig.1

\*1 Derating required according to the input voltage and ambient temperature.

\*2 Pulse noise not included.

BP5233A33 (Unless otherwise noted,  $V_{IN}=5V$ ,  $I_o=1.5A$ ,  $SW=1$ ,  $T_a=25^{\circ}C$ )

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	Measurement circuit
Input voltage	$V_{IN}$	4.5	5	5.5	V		Fig.2
Output voltage	$V_O$	3.17	3.3	3.43	V		Fig.2
Output current	$I_o$	–	–	3	A	*1	Fig.2
Current consumption at no load	$I_{IN}$	–	200	300	$\mu A$		Fig.2
Load regulation	$\Delta V_O$	–	16	42	mV	$I_o=0.1A$ to 3A	Fig.2
Output ripple voltage	$v_{\gamma}$	–	33	150	mV <sub>PP</sub>	*2	Fig.2
Power conversion efficiency	$\eta$	88	93	–	%		Fig.2
CTL pin ON voltage	$V_{ON}$	1.8	–	–	V		Fig.2
CTL pin OFF voltage	$V_{OFF}$	–	–	0.3	V	SW=2 (Alternatively, when OPEN)	Fig.2

\*1 Derating required according to the input voltage and ambient temperature.

\*2 Pulse noise not included.

BP5234A33 (Unless otherwise noted,  $V_{IN}=5V$ ,  $I_o=2A$ ,  $SW=1$ ,  $T_a=25^{\circ}C$ )

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	Measurement circuit
Input voltage	$V_{IN}$	4.5	5	5.5	V		Fig.2
Output voltage	$V_O$	3.17	3.3	3.43	V		Fig.2
Output current	$I_o$	–	–	4	A	*1	Fig.2
Current consumption at no load	$I_{IN}$	–	200	300	$\mu A$		Fig.2
Load regulation	$\Delta V_O$	–	16	42	mV	$I_o=0.1A$ to 4A	Fig.2
Output ripple voltage	$v_{\gamma}$	–	33	150	mV <sub>PP</sub>	*2	Fig.2
Power conversion efficiency	$\eta$	88	93	–	%		Fig.2
CTL pin ON voltage	$V_{ON}$	1.8	–	–	V		Fig.2
CTL pin OFF voltage	$V_{OFF}$	–	–	0.3	V	SW=2 (Alternatively, when OPEN)	Fig.2

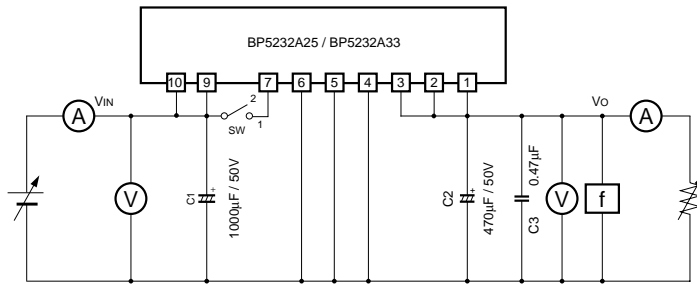
\*1 Derating required according to the input voltage and ambient temperature.

\*2 Pulse noise not included.

# BP5232A25/BP5232A33/BP5233A33/BP5234A33

## Power Module

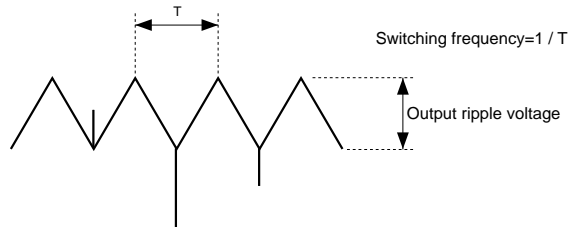
### ●Measurement circuit



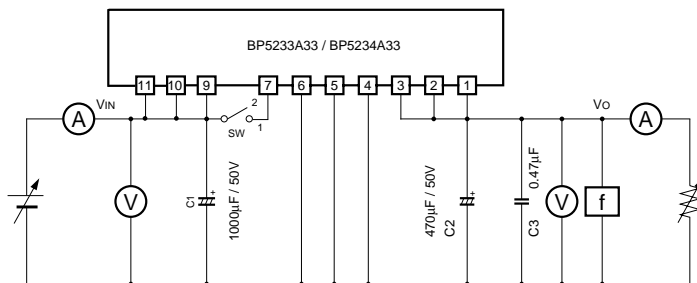
f : frequency counter  
 C1, C2 : Low impedance type  
 C3 : film capacitor

=A large ripple current flows to the input smoothing capacitor due to the output load. Be minded to use within the allowable ripple current of the capacitor.  
 =The capacitor with a particularly low impedance is used as the output smoothing capacitor C2 so as to suppress the output ripple voltage. Select the capacitor according to the purpose of use in each case.

Fig.1



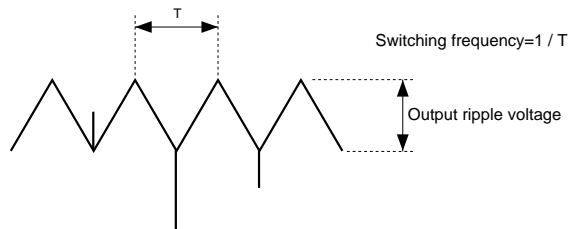
Note that the output ripple voltage depends on the type and characteristics of the output capacitor.



f : frequency counter  
 C1, C2 : Low impedance type  
 C3 : film capacitor

=A large ripple current flows to the input smoothing capacitor due to the output load. Be minded to use within the allowable ripple current of the capacitor.  
 =The capacitor with a particularly low impedance is used as the output smoothing capacitor C2 so as to suppress the output ripple voltage. Select the capacitor according to the purpose of use in each case.

Fig.2



Note that the output ripple voltage depends on the type and characteristics of the output capacitor.

# BP5232A25/BP5232A33/BP5233A33/BP5234A33

## Power Module

### ●Circuit operation

- (1) The basic application examples are shown in Fig.3. The externally installed parts are only the input and output smoothing capacitors.
- (2) Switching on and off the output voltage is allowed. The output can be switched off by making pin 7 to be low or open (high impedance). (See Fig.4.)
- (3) Fine adjustment of the output voltage is allowed. The fine adjustment of output voltage can be performed from pin 1 via the resistor by connecting the output terminal (pin 2, 3) and GND. (See Fig.5.)

### Basic application

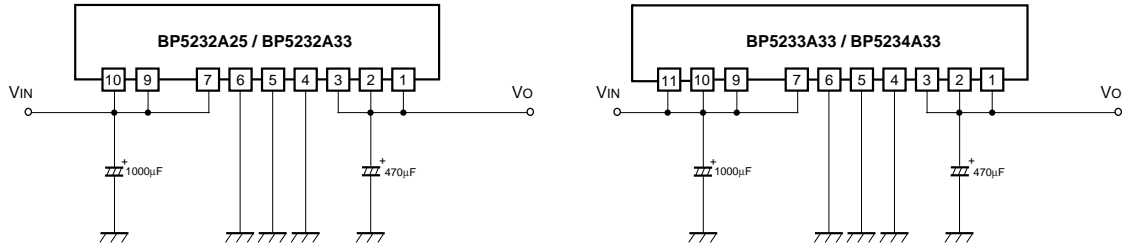


Fig.3

### Output ON / OFF control

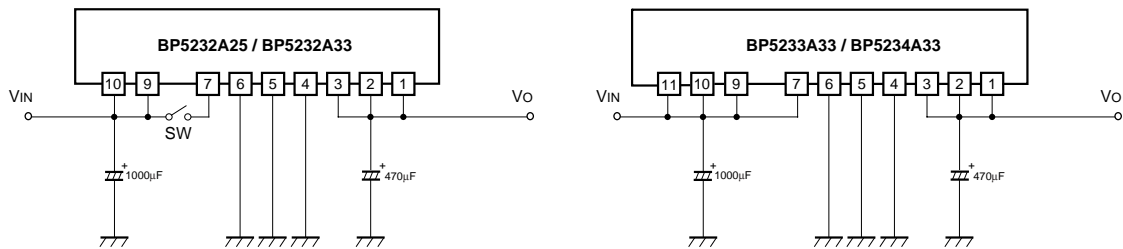
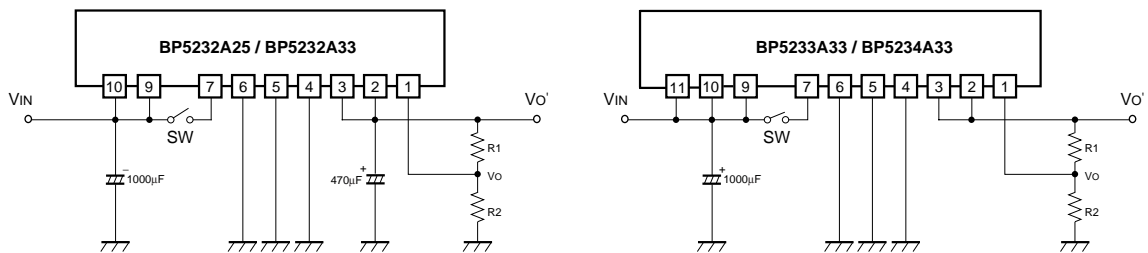


Fig.4

### Output voltage fine adjustment



Vo' value setting equations

$$Vo' = Vo \left( 1 + \frac{R1}{R2} \right) \quad R1 + R2 \leq 50k\Omega$$

It is recommended that the output voltage should be adjusted within the range of  $\pm 10\%$  of the rated output voltage, so that the performance of the module can fully be exhibited.

Fig.5

Power Module

●Operation notes

- (1) The output current should be reduced according to an increase in the input voltage or ambient temperature. Use the module within the derating curve range.
- (2) In case that the output is controlled by switching on and off utilizing pin 7 or in case that the input voltage is applied, a large inrush electrical current may flow. Be minded to use within the allowable operating range. This allowable operating range is specified by the safety operating range of the switching transistor in the module. The amount of the inrush current varies depending on the output impedance of the input power supply or the capacity value of the capacitor to be connected to the output.
- (3) Protection circuit for output current is incorporated. In case that the output is short-circuited, the output will be latched by switching off. The protection circuit can be cancelled by making CTL terminal active state (CTL=HIGH), after once making it standby state (CTL=LOW), or by resupplying the power. However, in case that the protection circuit is cancelled by resupplying the power source, it may not be cancelled even by resupplying the power source in the state that the electrical charge is remained in CIN (the state that voltage is remained in VIN) even after the power source is switched off.
- (4) The rising time of the input voltage should be made within 5ms. There may be a case that the protection circuit is activated.
- (5) I / O smoothing capacitors should be connected between I / O and GND terminals.
- (6) Normally, use by short-circuiting pins 1, 2, 3, pins 4, 5, 6, and pins 9, 10, 11 (BP5232A25) respectively.
- (7) A large ripple current flows to the input smoothing capacitor due to the output load. Be minded to use within the allowable ripple current of the capacitor.
- (8) The capacitor with a particularly low impedance is used as the output smoothing capacitor C2 so as to suppress the output ripple voltage. Select the capacitor according to the purpose of use in each case.

●Electrical characteristic curves

BP5232A25

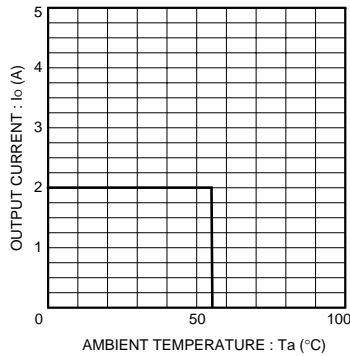


Fig.6 Derating curve

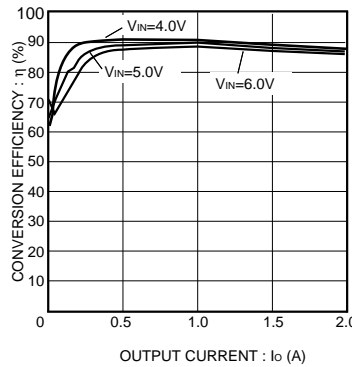


Fig.7 Conversion efficiency

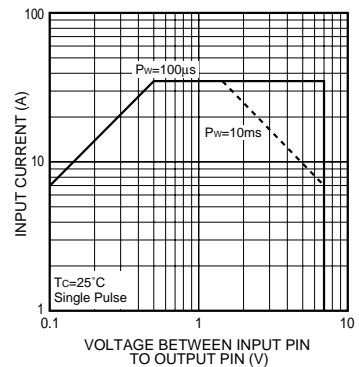


Fig.8 Safe operation range

BP5232A33

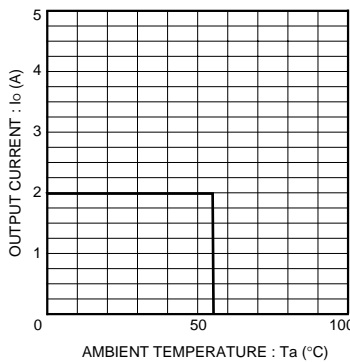


Fig.9 Derating curve

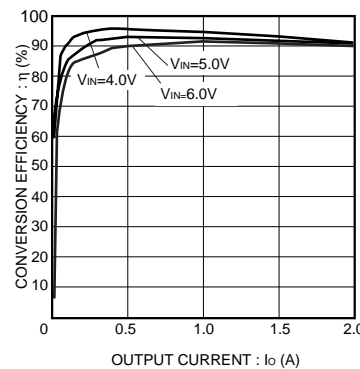


Fig.10 Conversion efficiency

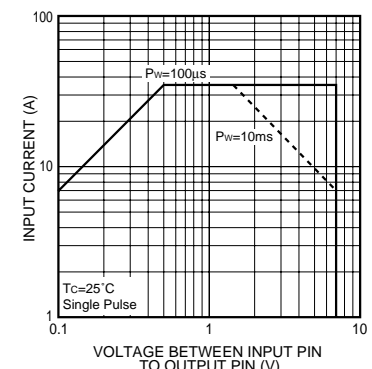


Fig.11 Safe operation range

# BP5232A25/BP5232A33/BP5233A33/BP5234A33

## Power Module

### BP5233A33

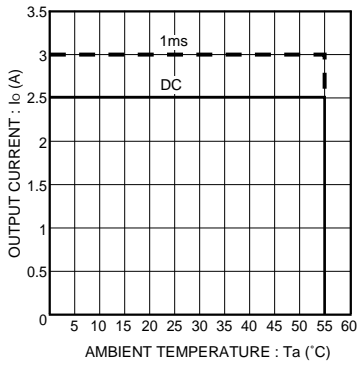


Fig.12 Derating curve

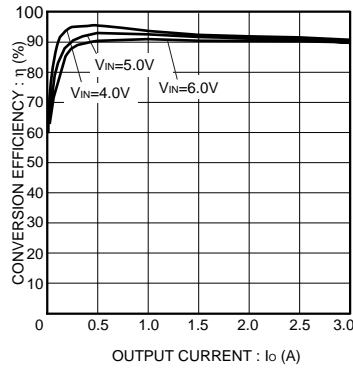


Fig.13 Conversion efficiency

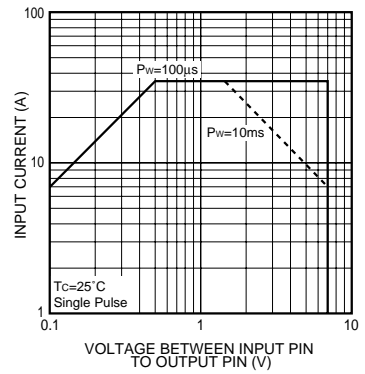


Fig.14 Safe operation range

### BP5234A33

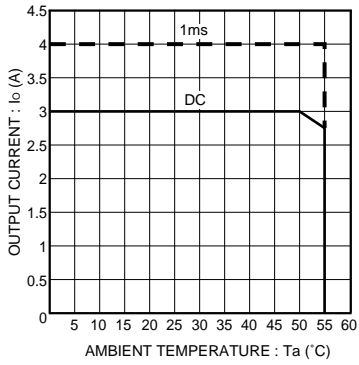


Fig.15 Derating curve

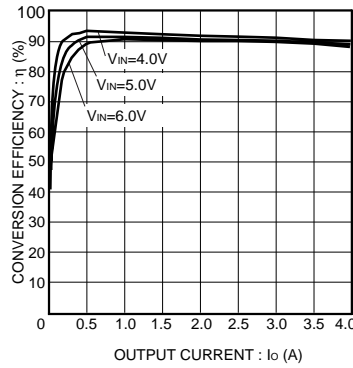


Fig.16 Conversion efficiency

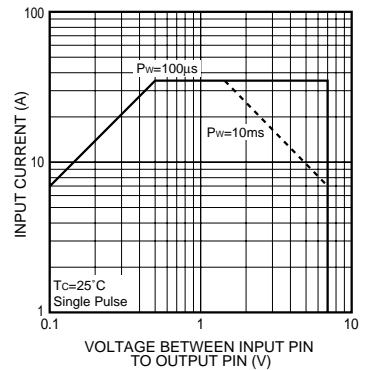
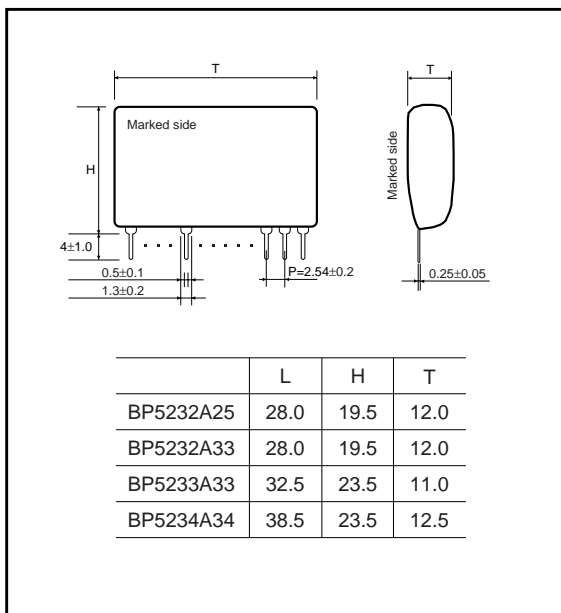


Fig.17 Safe operation range

### External dimensions (Unit : mm)



### Notes

- No technical content pages of this document may be reproduced in any form or transmitted by any means without prior permission of ROHM CO.,LTD.
- The contents described herein are subject to change without notice. The specifications for the product described in this document are for reference only. Upon actual use, therefore, please request that specifications to be separately delivered.
- Application circuit diagrams and circuit constants contained herein are shown as examples of standard use and operation. Please pay careful attention to the peripheral conditions when designing circuits and deciding upon circuit constants in the set.
- Any data, including, but not limited to application circuit diagrams information, described herein are intended only as illustrations of such devices and not as the specifications for such devices. ROHM CO.,LTD. disclaims any warranty that any use of such devices shall be free from infringement of any third party's intellectual property rights or other proprietary rights, and further, assumes no liability of whatsoever nature in the event of any such infringement, or arising from or connected with or related to the use of such devices.
- Upon the sale of any such devices, other than for buyer's right to use such devices itself, resell or otherwise dispose of the same, no express or implied right or license to practice or commercially exploit any intellectual property rights or other proprietary rights owned or controlled by
- ROHM CO., LTD. is granted to any such buyer.
- Products listed in this document are no antiradiation design.

The products listed in this document are 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 these products 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.

#### About Export Control Order in Japan

Products described herein are the objects of controlled goods in Annex 1 (Item 16) of Export Trade Control Order in Japan.

In case of export from Japan, please confirm if it applies to "objective" criteria or an "informed" (by MITI clause) on the basis of "catch all controls for Non-Proliferation of Weapons of Mass Destruction.

# Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[ROHM Semiconductor:](#)

[BP5232A33](#)

## Данный компонент на территории Российской Федерации

### Вы можете приобрести в компании MosChip.

Для оперативного оформления запроса Вам необходимо перейти по данной ссылке:

<http://moschip.ru/get-element>

Вы можете разместить у нас заказ для любого Вашего проекта, будь то серийное производство или разработка единичного прибора.

В нашем ассортименте представлены ведущие мировые производители активных и пассивных электронных компонентов.

Нашей специализацией является поставка электронной компонентной базы двойного назначения, продукции таких производителей как XILINX, Intel (ex.ALTERA), Vicor, Microchip, Texas Instruments, Analog Devices, Mini-Circuits, Amphenol, Glenair.

Сотрудничество с глобальными дистрибьюторами электронных компонентов, предоставляет возможность заказывать и получать с международных складов практически любой перечень компонентов в оптимальные для Вас сроки.

На всех этапах разработки и производства наши партнеры могут получить квалифицированную поддержку опытных инженеров.

Система менеджмента качества компании отвечает требованиям в соответствии с ГОСТ Р ИСО 9001, ГОСТ РВ 0015-002 и ЭС РД 009

### Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: [info@moschip.ru](mailto:info@moschip.ru)

Skype отдела продаж:

moschip.ru

moschip.ru\_4

moschip.ru\_6

moschip.ru\_9