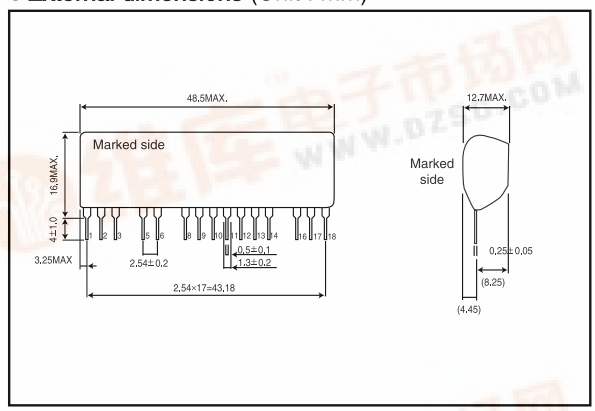
DC/DC converter BP5450

8V to 16V input, 1.5 to 5V/1.2A output

●Description

BP5450 is a 2-output DC/DC converter that uses PWM system. It contains control circuits, switching devices, rectifying devices, and coils, and operates by only connecting an I/O smmothing capacitor, and an output voltage setting resistor.
High efficiency of power conversion enables the module to make small with no heat sink reguired.
It can be applied to various purposes by setting the output voltage and controlling output ON and OFF.

●External dimensions (Unit : mm)



●Applications

Power supplies for OA appliances(copy machine, personal computer, facsimile), AV appliances,
Car stereo, Car navigation system,
Communication appliances, industrial appliances.

●Features

1) 2-output
2) High power conversion
3) Output ON-OFF pin
4) Output voltage setting pin (Vo range:1.5 to 5V(Typ.))
5) Built-in reset・フ shaped overcurrent protection circuit
6) Small number of external components reguired
7) Heat sink unnecessary
8) Short・small package:SIP18

●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit	Condition
Input voltage	V_{in}	24	V	DC
Operating temperature range	Topr	−20 to +85	℃	
Storage temperature range	Tstg	−25 to +100	℃	
Allowable max surface temperature	Tsmax	100	℃	Ambient temperrature+The module self-heating ≤ Tsmax
Power dissipation(1 output)	Pd1	1.0	W	Only 1 output operating *1
Power dissipation(2 output operating)	Pd2	1.3	W	2 output simultaneous operating *1
Maximum output current	Io(Max.)	1200	mA	*1
Maximum output voltage	Vo(Max.)	6.0	V	

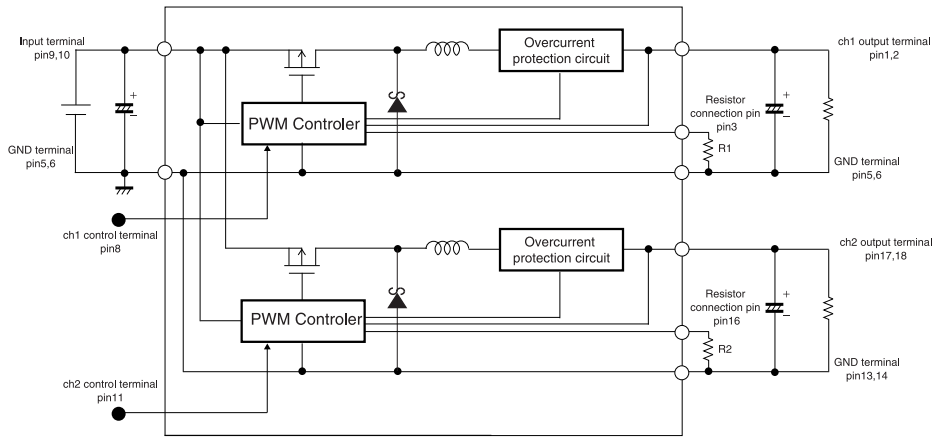
*1 Load must be decreased by ambient temperature, input voltage, and output voltage. Please refer to derating curve.

●Recommended operating conditions (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit
Input voltae	V_{in}	8.0	12.0	16.0	V

●Block diagram

BP5450



●Pin descriptions

BP5450

Pin No.	Pin description
1	ch1 output pin
2	ch1 output pin
3	ch1 Output voltage adjustment R1 pin
5	GND
6	GND
8	ch1 ON/OFF control pin
9	12V input pin
10	12V input pin

Pin No.	Pin description
11	ch2 ON/OFF control pin
12	NC
13	GND
14	GND
16	ch2 Output voltage adjustment R2 pin
17	ch2 output pin
18	ch2 output pin

Pin4,7,15pin is not used.
For output voltage adjustment R1, and R2, please use the resistor (Power dissipation : more than 1/10W, Resistor : less than 68kΩ).
If the precision for output voltage is reguired, the product of 0.5% precision should be used.

● Electrical characteristic BP5450 (Unless otherwise noted, Ta=25℃, V_{in}=12V(DC), I_{O1}=1000mA, I_{O2}=1000mA)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	Measurement circuit
Input voltage	V_{in}	8.0	12.0	16.0	V	DC	Fig.1
Output voltage 1	V_{O1}	3.09	3.26	3.43	V	R1=6.2k ,Precision1%	Fig.1
Output voltage 2	V_{O2}	4.75	5.0	5.25	V	R2=3.3k ,Precision1%	Fig.1
Output current 1	I_{O1}	–	–	1200	mA	*1	Fig.1
Output current 2	I_{O2}	–	–	1200	mA	*1	Fig.1
Line regulation 1	V_{r1}	–	–	0.10	V	Vin=8 to 16V *3	Fig.1
Line regulation 2	V_{r2}	–	–	0.10	V	Vin=8 to 16V *3	Fig.1
Load regulation 1	V_{l1}	–	–	0.10	V	Io1=0 to 1000mA *4	Fig.1
Load regulation 2	V_{l2}	–	–	0.10	V	Io2=0 to 1000mA *4	Fig.1
Output ripple voltage 1	V_{p1}	–	0.05	0.10	V_{PP}	*2	Fig.1
Output ripple voltage 2	V_{p2}	–	0.05	0.10	V_{PP}	*2	Fig.1
Control ON voltage 1	V_{on1}	2	–	V_{in}	V		Fig.1
Control ON voltage 2	V_{on2}	2	–	V_{in}	V		Fig.1
Control OFF voltage 1	V_{off1}	–	–	1	V		Fig.1
Control OFF voltage 2	V_{off2}	–	–	1	V		Fig.1
Stand by input current	I_{stb}	–	0	0.02	mA	Vctl1=Vctl2=GND	Fig.1
Oscillation frequency	f_{osc}	–	300	–	kHz		Fig.1
Power conversion efficiency	η	82	85	–	%	Vctl1=Vctl2=Vin *5	Fig.1

*1 Load must be decreased by ambient temperature, input voltage, and output voltage. Please refer to the derating curve.
*2 Output ripple voltage may be changed by the used smoothing capacitor, measurement environment, and layout of peripheral parts.
*3 Line regulation : Regulation of output voltage accompanied with the regulation of input voltage. Regulation is measured with output current fixed.
*4 Load regulation : Regulation of input voltage accompanied with the regulation of output voltage. Regulation is measured with input voltage fixed.

*5 Power conversion efficiency $\eta = \frac{(Vo1 \times Io1)+(Vo2 \times Io2)}{Vin \times Iin} \times 100[\%]$

*6 Output ripple voltage : Measured in PEAK-TO-PEAK of ripple current, and BAND WIDTH 20MHz. Spike noise is not included.

● Application circuit

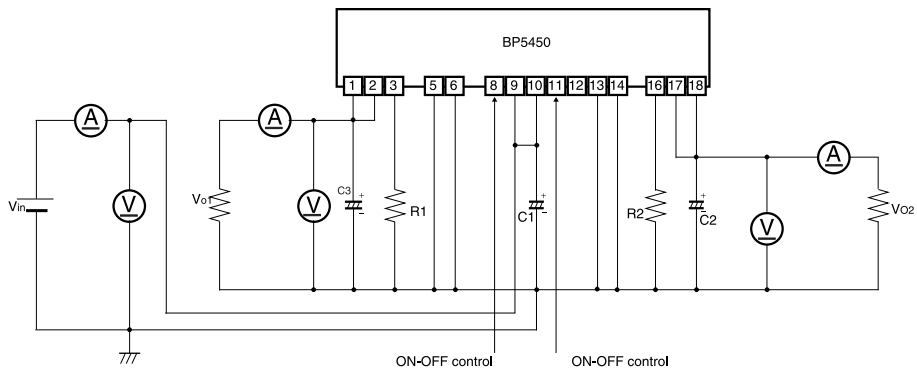


Fig.1

*The circuit adove is the minimum required circuit to guarantee the electric characteristics.
*GND pin (pin5,6 and pin13,14) are connected inside.
*Output voltage setting resistor R1,R2 must be used. When R1,R2 is not used, Vo=1.25V.

<External components>

Symbol	Applications	Characteristics	Maker	Part name
C1	Capacitor for input voltage smoothing	470μF/50V Low impedance type for power supply	Nichikon	UHD1H471MHR
C2,C3	Capacitor for output voltage smoothing	470μF/10V Low impedance type for power supply	Nichikon	UHC1A471MPR
R1	ch1 output voltage setting resistor	6.2k precision 1%		
R2	ch2 output voltage setting resistor	3.3k precision 1%		

● Application example

For acutual usage, Please kindly evaluate and confirm our part mounted in your product, Especially, Please make sure to confirm the load current does not exceed Max. rated current by using the current prove.

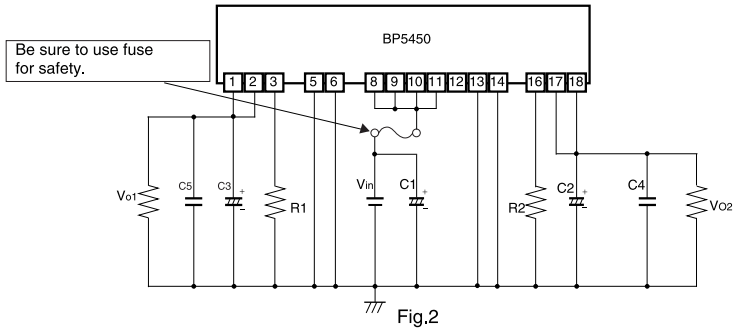


Fig.2

<Output voltage setting resistor>

Vo[V]	R1(or R2) [ ]
5.0	3.3k
3.26	6.2k
2.5	10k
1.5	51k

▪Equation(channel1)

$$Vo1=Vref\times(1+\frac{10k\pm1\%}{R1})\ [V]$$

∗Vref=1.25V ±1%

▪Equation(channel2)

$$Vo2=Vref\times(1+\frac{10k\pm1\%}{R2})\ [V]$$

● External components setting

Symbol	Part name	Requried characterisitics
FUSE	Fuse	Please make sure to use quick acting fuse 2.0 to 3.0A.
C1	Capacitor for input voltage smoothing	Capacitance : 100 to 470μF, Rated voltage : 25V or higher, Ripple current is 700mArms above.
C2,C3	Capacitor for output voltage smoothing	Capacitance : 100 to 470μF, Rated voltage : 10V or higher, ESR is 50 to 100m . Ripple current is 750mA abobe.
C4,C5	For noise terminal voltage reduction	Capacitance : 0.01 to 0.1μF, Rated voltage : 10V or higher, Film capacitor or ceramic capacitor. Please set it, if necessary.
R1,R2	Ouput voltage setting resistor	Power dissipation : 1/10W or higher, Resistance : 68kΩ or lower If the precision for output voltage is required, please use the product of 0.5% precision.

(1) Please use it with R1, and R2 connected.

(2) Select R1, and R2 in the range of 3.0k to 68k . Please use R1, and R2 not to be shorted.

(3) When I/O voltage is adjusted, Be sure to set in the range of Vo=1.5 to 5.0V(Typ.).

(4) Select a capacitor for input voltage smoothing that has large allowable ripple current.

(5) When output ripple voltage is reduced, select a capacitor for output voltage smoothing that has low ESR (Equivalent series resistance.).

(6) When spike noise is reduced, use a capacitor for noise reduction, if necessary.

(7) Though GND pin(5,6 and 13,14pin) are connected inside, they must be connected outside.

(8) Please set a capacitor for I/O smoothing at the marked side of power module and connect with each pin using shortest wire.

(9) Vref 1.25V has ±1 dispersion at Ta=25℃.

● Derating curve

Please set output voltage and output current to make power dissipation of 1-output 1W or less, and to make sum of 2-outputs power dissipation 1.3W or less.
Power dissipation need to be reduced depending on the ambient temperature. Make sure to use it in the range of derating curve below.

*Power dissipation Pd=(Vin× Iin)-(Vo ×Io) [W]

[1-output power dissipation]
Power dissipation of 1-output must be in the range of derating curve below.

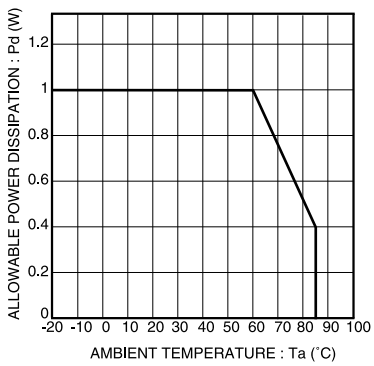


Fig.3 Derating curve of 1-output
When the ambient temperature is 60 to 85˚C
Derating curve=-0.025[˚C/W]

[Power dissipation when 2-outputs operting]
Sum of 2-outputs power dissipation must be in the range of derating curve below.

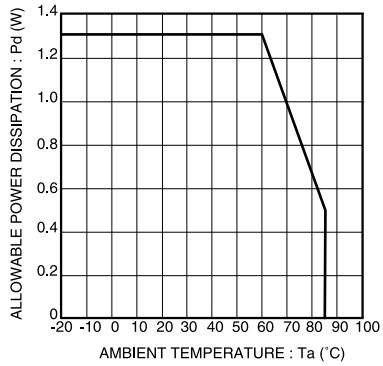


Fig.4 Derating curve when 2-outputs simultaneous operating
When the ambient temperature is 60 to 85˚C
Derating curve=-0.0325[˚C/W]

[Circuit dissipation of 1-output]

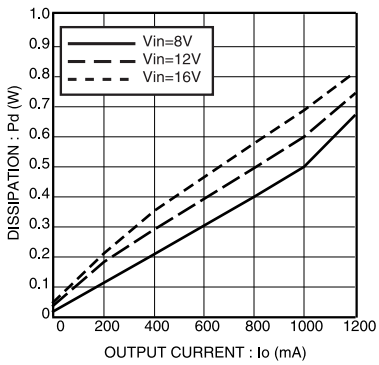


Fig.5 Circuit dissipation at Vo=2.5V

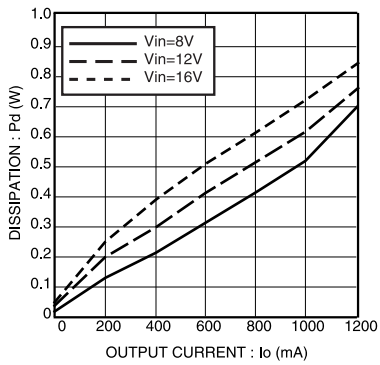


Fig.6 Circuit dissipation at Vo=3.3V

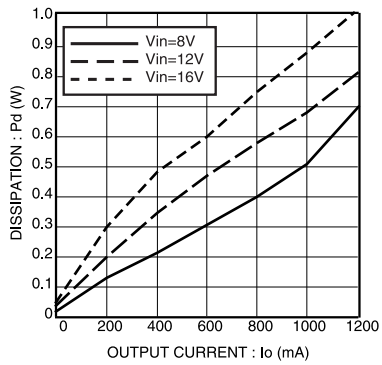


Fig.7 Circuit dissipation at Vo=5.0V

●Electrical characteristic curves

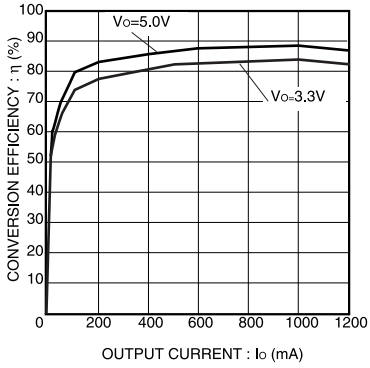


Fig.8 Power conversion efficiency

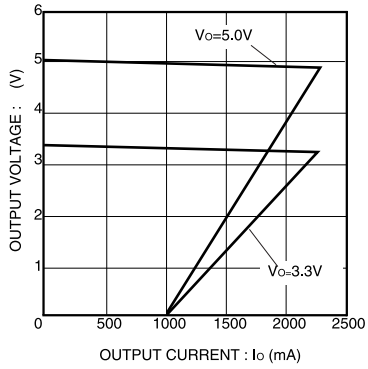


Fig.9 Load regulation

●Measurement of temperature

Please consider the propriety of the design by measuring the surface temperature of the module by reference to the derating curve(P63).

Please design it considering that the total of self-heating and ambient temperature for the most heated part of this module must not be exceeded 100℃ when it is estimated.
The black-painted part shown below is the most heatede part of this module.
If this module should be used when its surface temperature exceeds 100℃, there is fear that if exceeds the temperature rating of internal components and the reliability of this module may be declined strikingly.

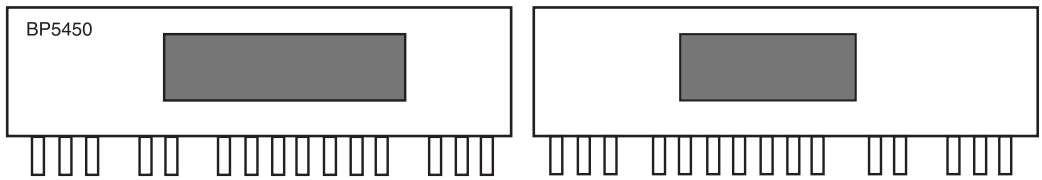


Fig.10 Most heated part

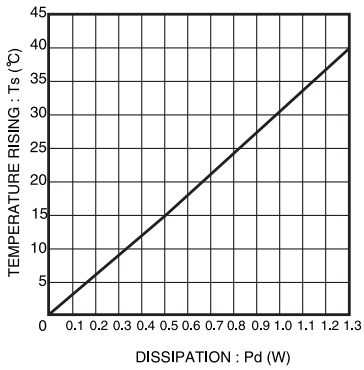


Fig.11 Temperature rising curve(reference data)

When you design the frame of the set, please set this module to operate efficiently.
And, be careful not to put heating components around the module.

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   [c] Use in places where the products are exposed to sea winds or corrosive gases, including Cl2, H2S, NH3, SO2, and NO2
   [d] Use in places where the products are exposed to static electricity or electromagnetic waves
   [e] Use in proximity to heat-producing components, plastic cords, or othe flammable items
   [f] Use involving sealing or coating the products with resin or other coating materials
   [g] Use involving unclean solder or use of water or water-soluble cleaning agents for cleaning after soldering
   [h] Use of the products in places subject to dew condensation
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