COSEL

Qualification of CHS series (Bus Converter applications) to Intermediate Bus Architecture

VER2.0

CHS series

1. Ordering information

CHS	200	48	05	－□
①	②	③	④	⑤

① Series name

CHS： CHS Series

② Output Power

60	80	120	200	300	400	500
60W	80W	120W	200W	300W※	400W	500W

※200W(only CHS30024)

③ Input Voltage

24	48
18V-36V	36V-76V

④ Output Voltage

	CHS60	CHS80	CHS120	CHS200	CHS300		CHS400	CHS500
					24	48		
3.3V	●	●	●	●	-	-	-	-
5V	●	●	●	●	●	-	-	-
10V	-	-	-	-	-	●	●	-
12V	●	●	●	●	●	●	●	●
15V	-	-	-	-	●	-	-	-

⑤ Option

	CHS60	CHS80	CHS120	CHS200	CHS300		CHS400	CHS500
					24	48		
B	-	-	●※	●	●	●	●	●
L2	-	-	●	●	●	●	●	●
L5	-	-	●	●	●	●	●	●
P	-	-	-	-	-	-	●	●
R	●	●	●	●	●	●	●	●
S	●	●	●	-	-	-	-	-
U	●	●	●	●	●	●	●	●
BC	-	-	-	-	●	-	-	-
I	-	-	-	-	-	●	●	●

B : Baseplate option with mounting hole M3(※without mounting hole M3)
L2: Pin length 5.3mm
L5: 5pins type (+S,-S,TRM less)
P : Parallel operation (5pins :without +S,-S and TRM)
R : with remote ON/OFF positive logic control
S : SMD
U : Shut down in protection circuit working
BC : Baseplate and case option with mounting hole M3
I : with the PMBus interface(only CHS3004810/4812, CHS4004812, CHS5004812)

2. Pin configuration／ External view

2.1 Pin configuration

Fig.2.1.1
Pin connection
for CHS60
(bottom view)

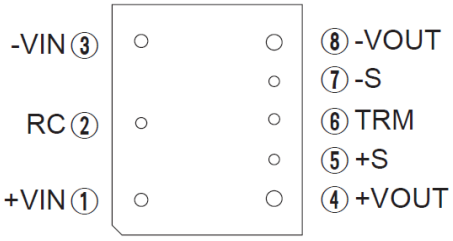


Fig.2.1.2
Pin connection
for CHS80
(bottom view)

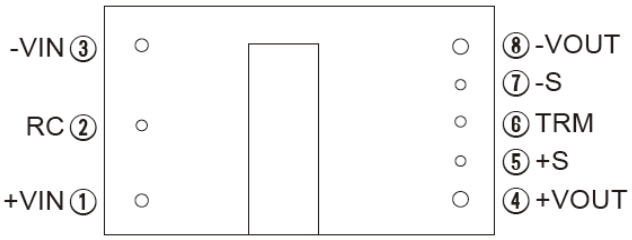


Fig.2.1.3
Pin connection
for CHS120
(bottom view)

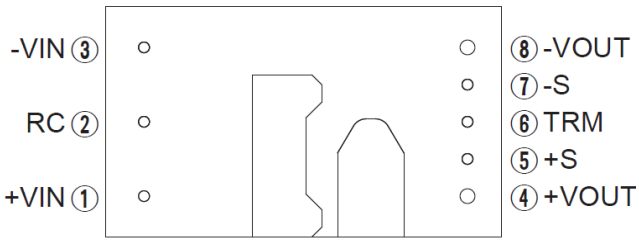


Fig.2.1.4
Pin connection
for CHS200
(bottom view)

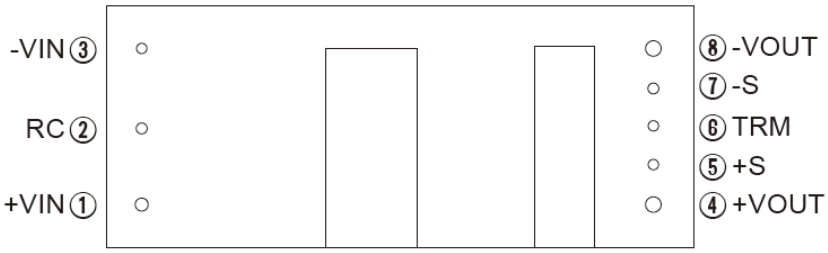


Fig.2.1.5
Pin connection
for CHS300
(bottom view)

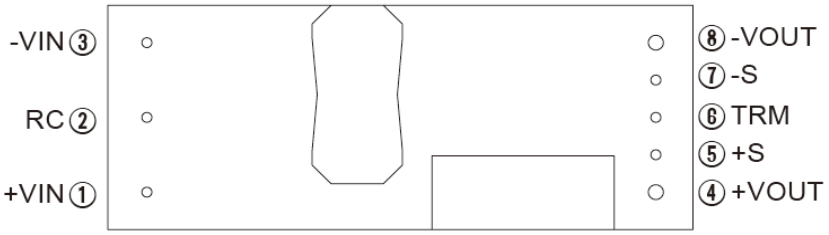


Fig.2.1.6
Pin connection
for CHS400 / 500
(bottom view)

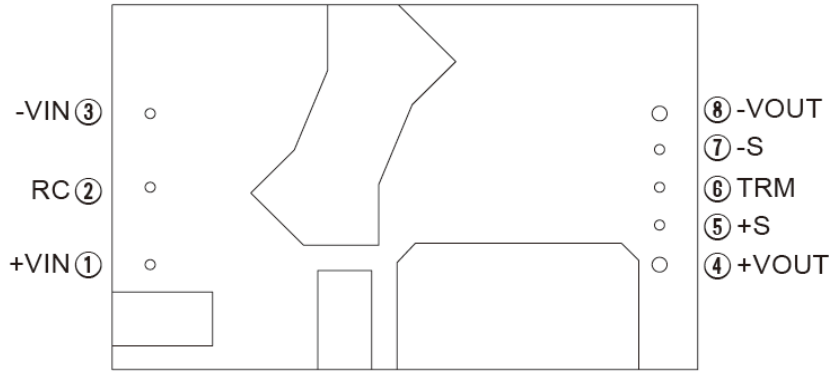


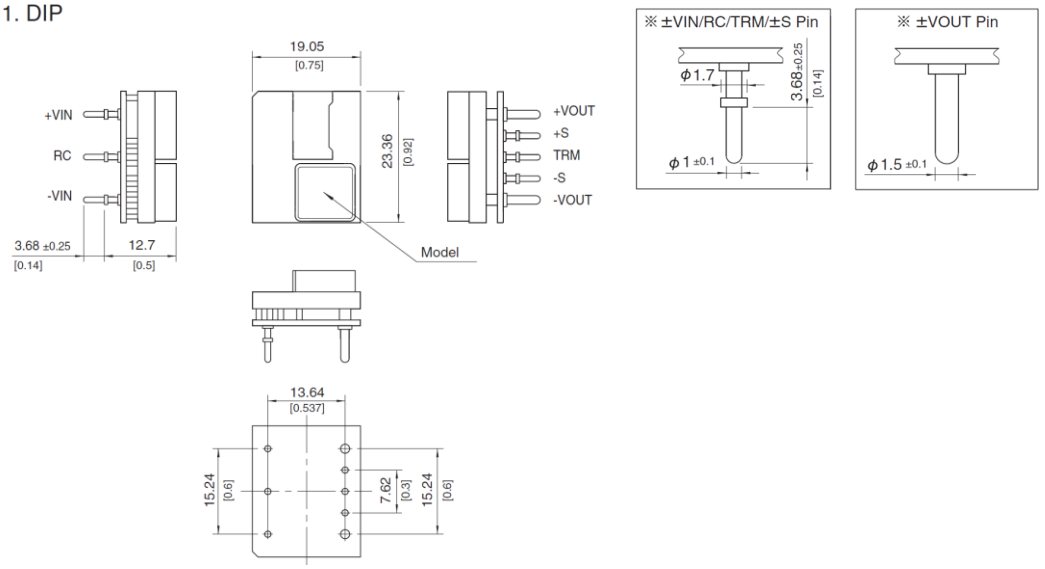
Table.2.1.1
Pin connection and function of CHS

No.	Pin Connection	Function
①	+VIN	+DC input
②	RC	Remote ON/OFF
③	-VIN	-DC input
④	+VOUT	+DC output
⑤	+S	+Remote sensing
⑥	TRM	Adjustment of output voltage
⑦	-S	-Remote sensing
⑧	-VOUT	-DC output

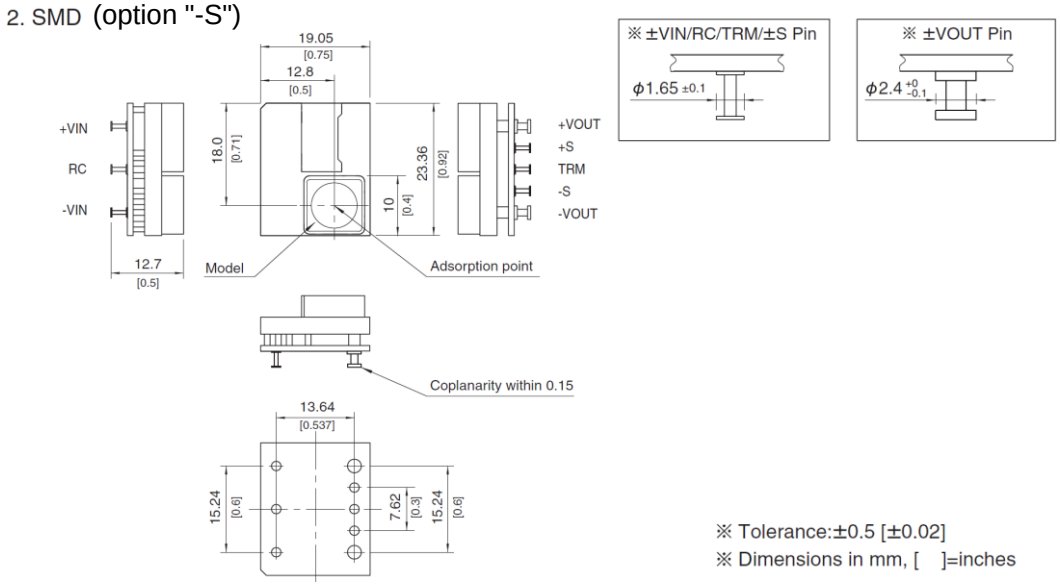
2.2 External view

Fig.2.2.1
External view for CHS60

1. DIP



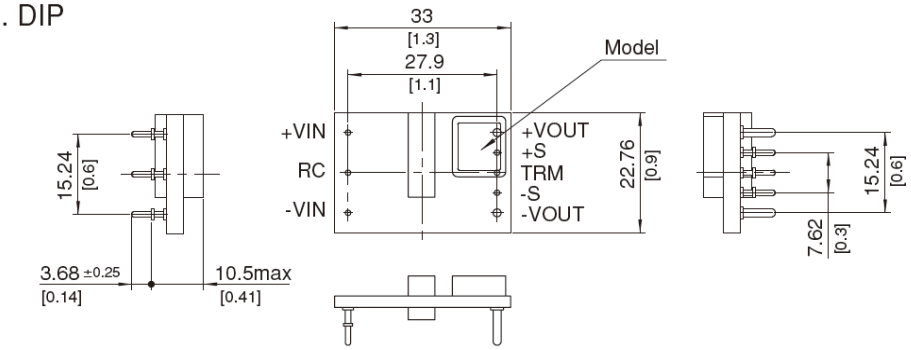
2. SMD (option "-S")

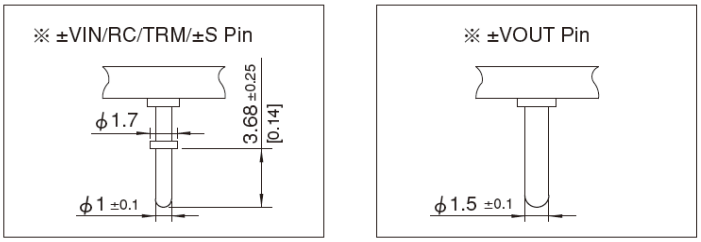


※ Tolerance:±0.5 [±0.02]
※ Dimensions in mm, [ ]=inches

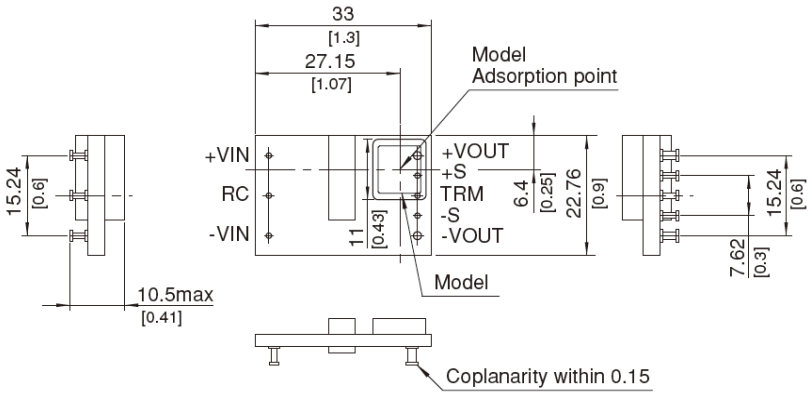
Fig.2.2.2
External view
for CHS80

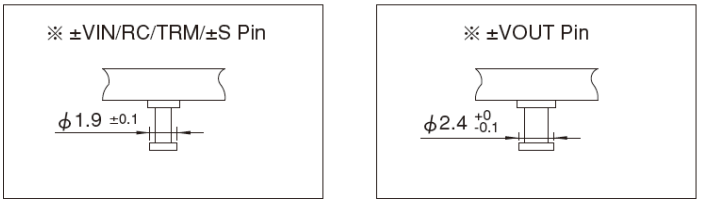
1. DIP





2. SMD (option "-S")

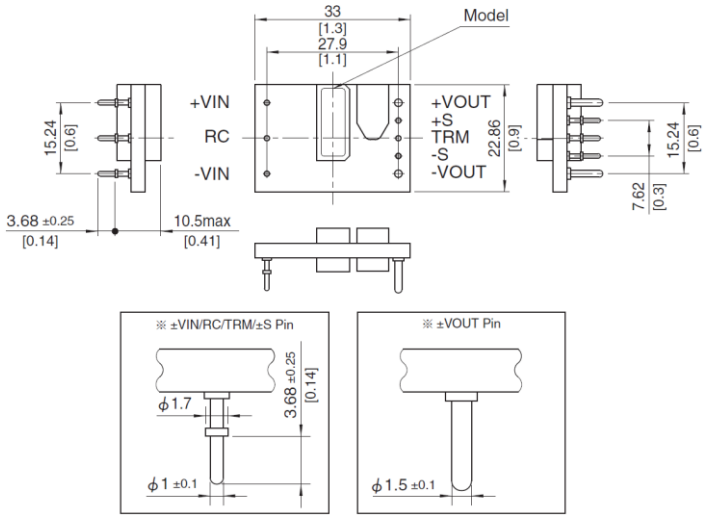




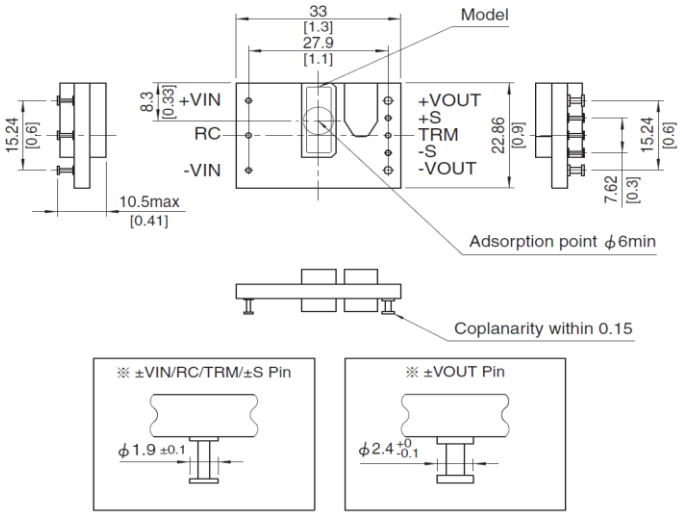
※ Tolerance : ±0.5
※ Dimensions in mm, [ ]=inches

Fig.2.2.3
External view
for CHS120

1. DIP

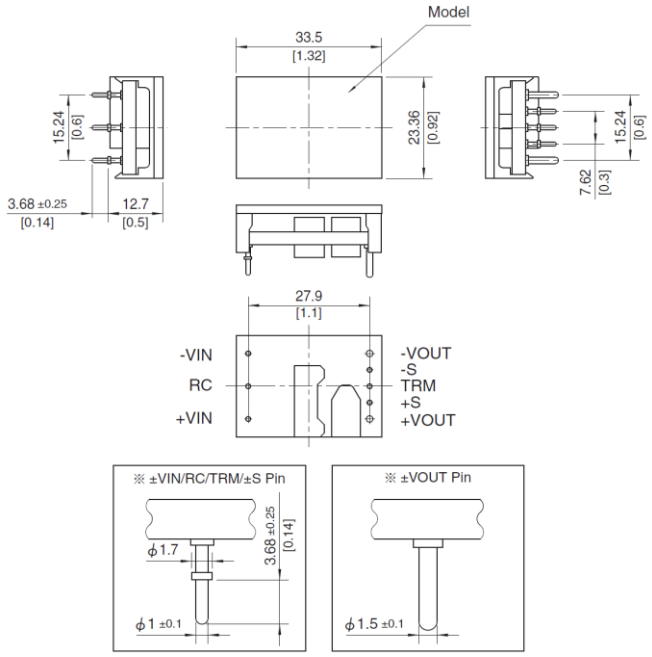


2. SMD (option "-S")

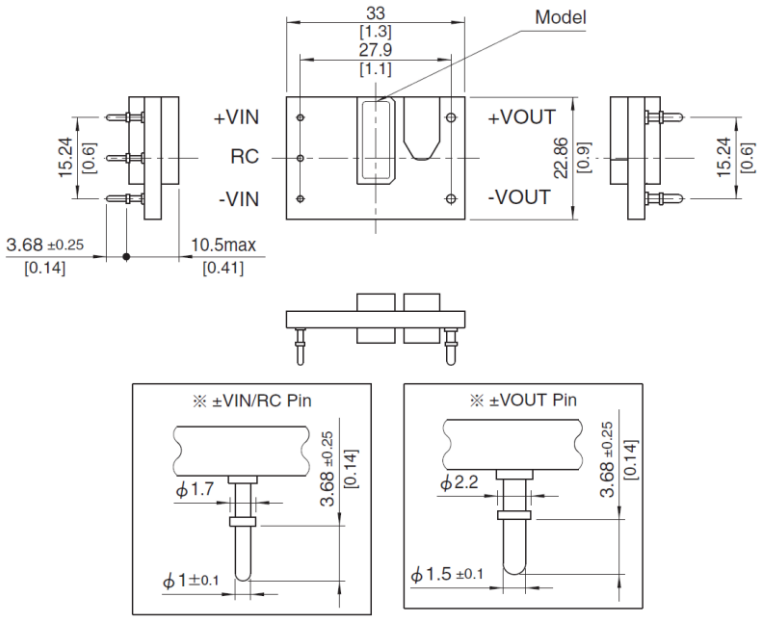


※ Tolerance : ±0.5
※ Dimensions in mm, [ ]=inches

3. BasePlate (option "-B")



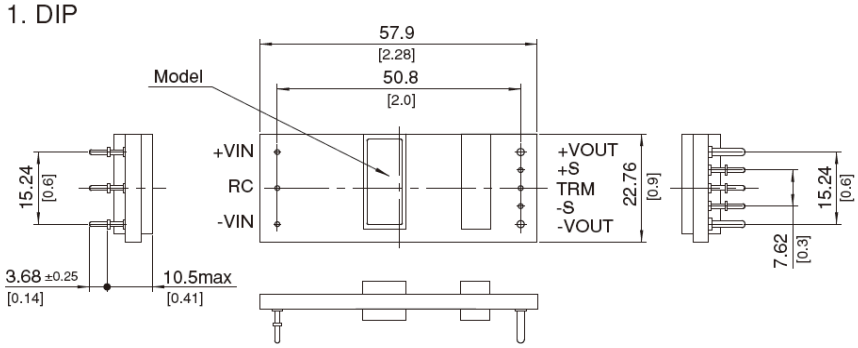
4. 5pins type (option "-L5")



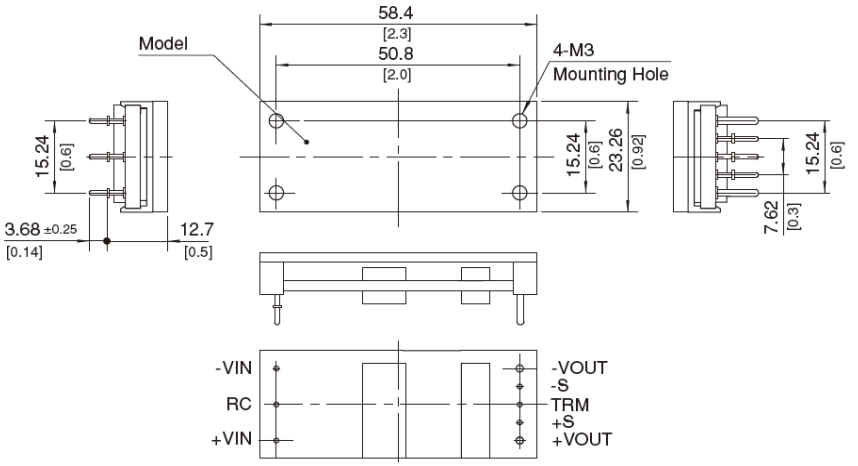
※ Tolerance : ±0.5
※ Dimensions in mm, [ ]=inches

Fig.2.2.4
External view
for CHS200

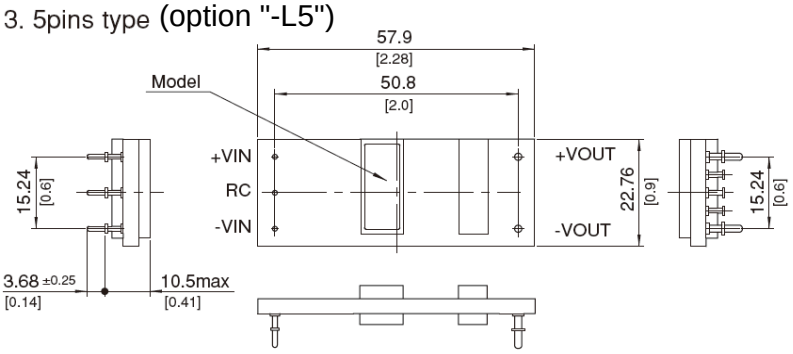
1. DIP

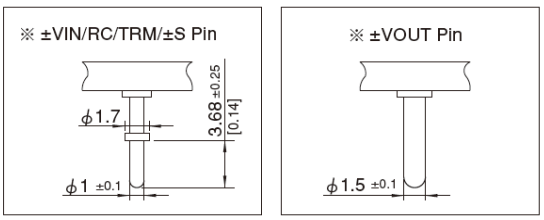


2. BasePlate (option "-B")



3. 5pins type (option "-L5")

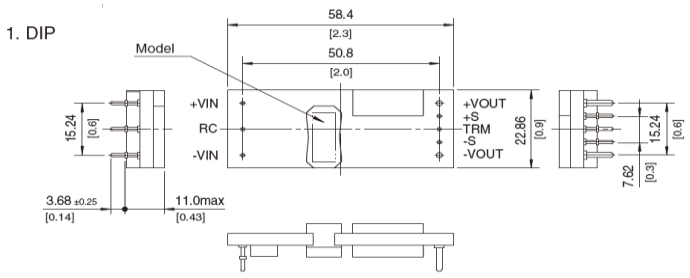




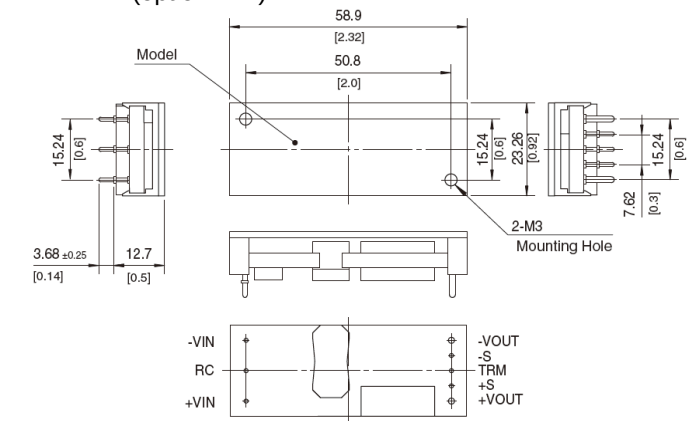
※ Tolerance : ±0.5
※ Dimensions in mm, [ ]=inches

Fig.2.2.5
External view
for CHS300

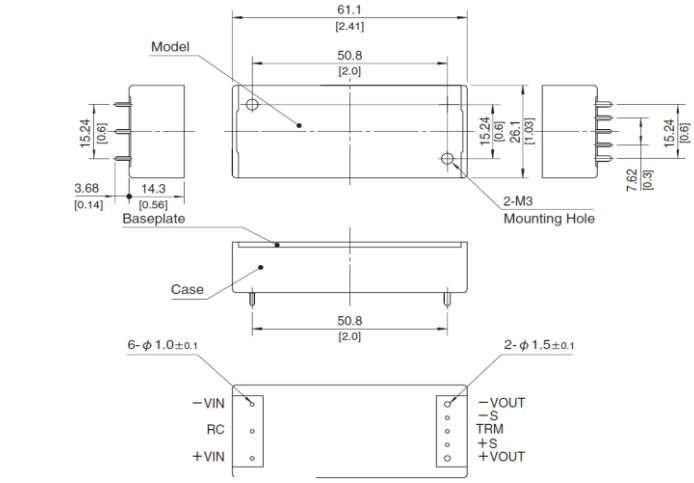
1. DIP



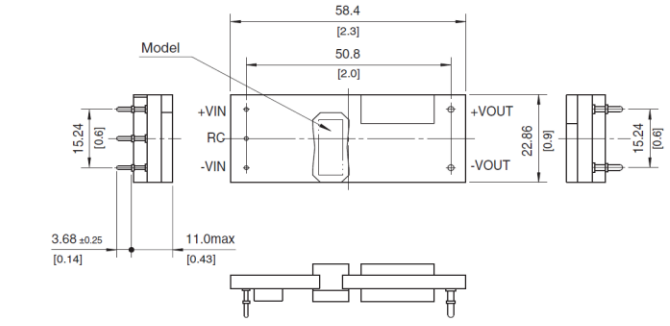
2. BasePlate (option "-B")

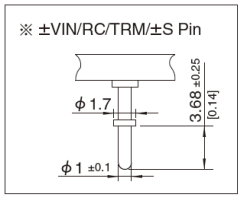


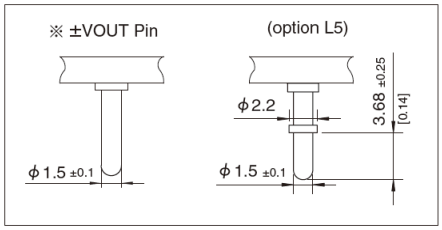
3. Baseplate and case (option "-BC")



4. 5pins type (option "-L5")



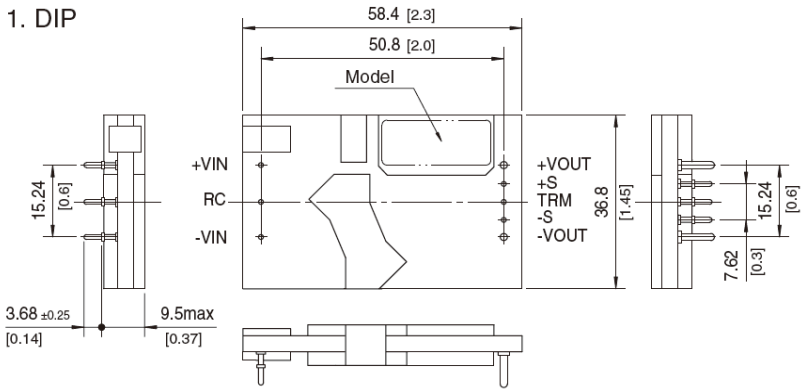




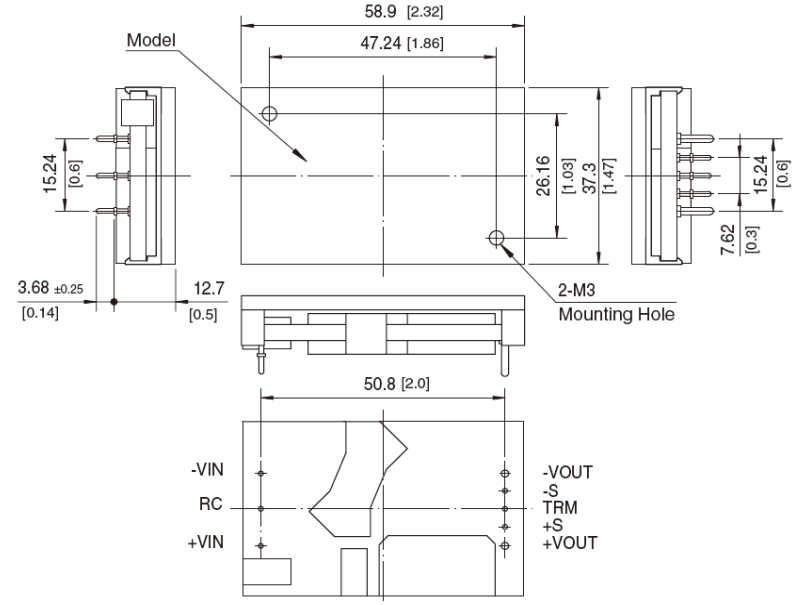
※ Tolerance : ±0.5
※ Dimensions in mm, [ ]=inches

Fig.2.2.6
External view
for CHS400 / CHS500

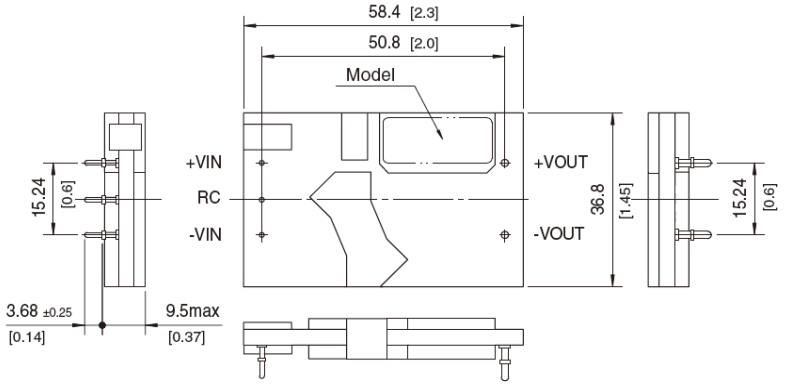
1. DIP

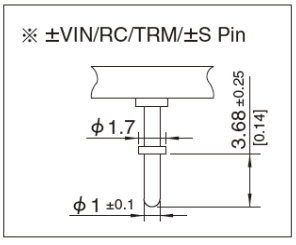


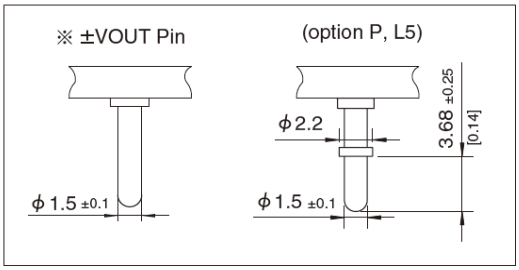
2. BasePlate (option "-B")



3. Parallel operation (option "-P")
5pins type (option "-L5")







※ Tolerance : ±0.5
※ Dimensions in mm, [ ]=inches

3. Do's and Don'ts for module

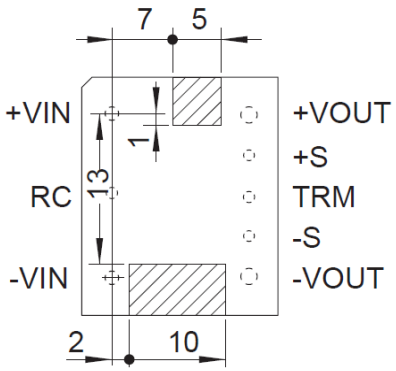
3.1 Isolation

- For a receiving inspection, such as Hi-Pot test, gradually increase(decrease) the voltage for a start (shut down). Avoid using Hi-Pot tester with the timer because it may generate voltage a few times higher than the applied voltage, at ON/OFF of a timer.

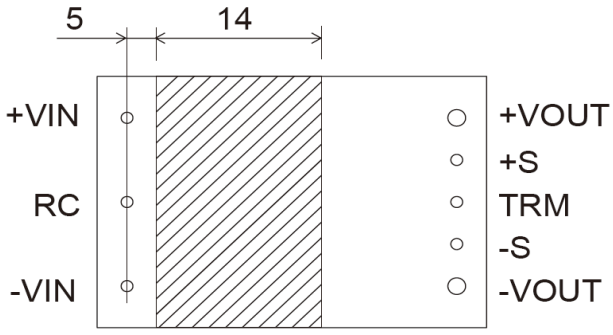
3.2 Mounting method

- The unit can be mounted in any direction. When two or more power supplies are used side by side, position them with proper intervals to allow enough air ventilation. The temperature around each power supply should not exceed the temperature range shown in derating curve.
- Avoid placing the DC input line pattern layout underneath the unit, it will increase the line conducted noise. Make sure to leave an ample distance between the line pattern layout and the unit. Also avoid placing the DC output line pattern underneath the unit because it may increase the output noise. Lay out the pattern away from the unit.
- Avoid placing the signal line pattern layout underneath the unit, this power supply might become unstable.
  Lay out the pattern away from the unit.
- Avoid placing pattern layout in hatched area in Fig.3.2.1 to insulate between pattern and power supply.

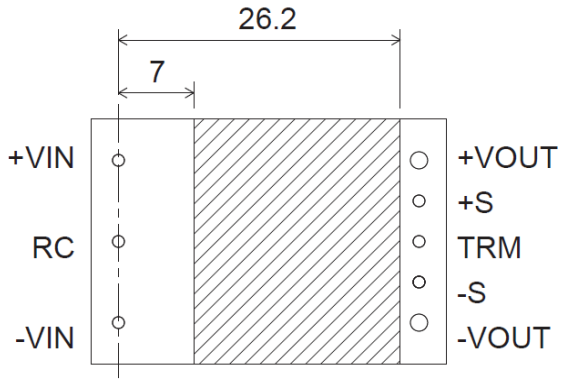
Fig.3.2.1
Prohibition area of
Pattern layout(top view)
Dimension (mm)



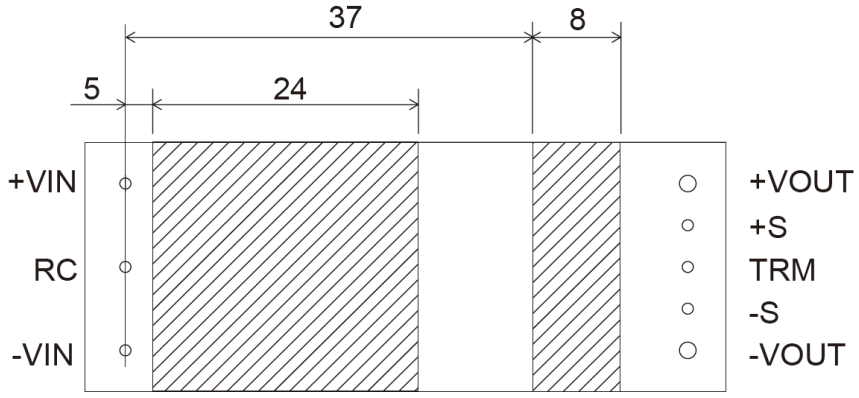
(a) CHS60



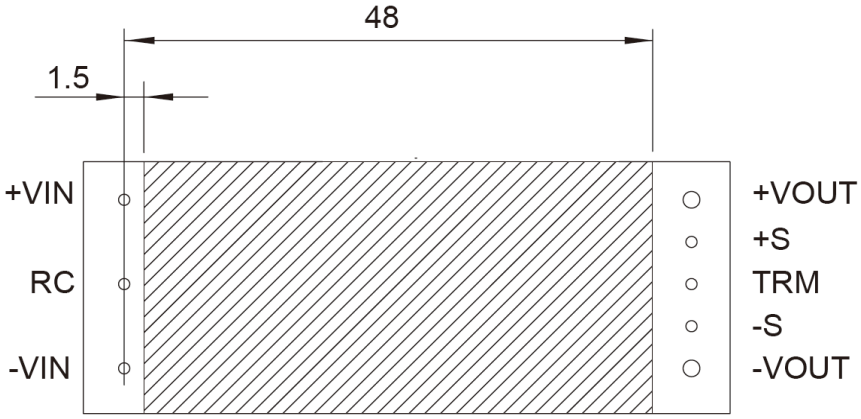
(b) CHS80



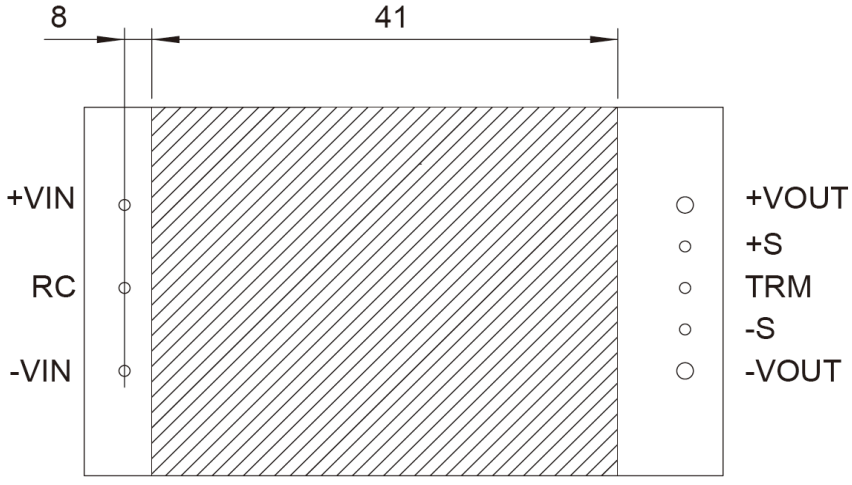
(c) CHS120



(d) CHS200



(e) CHS300



(f) CHS400 / 500

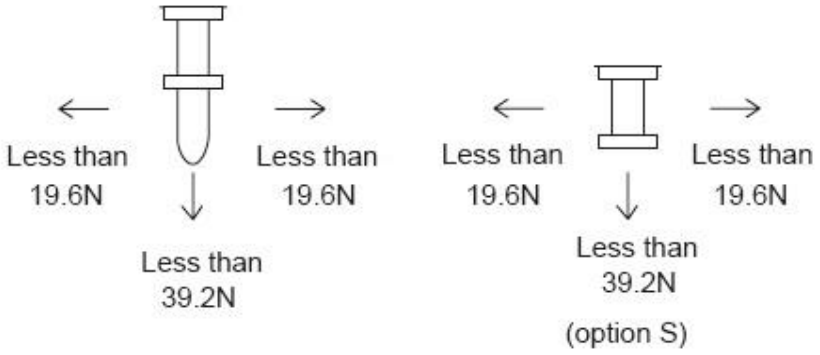
3.3 Stress onto the pins

- When too much stress is applied to the pins of the power supply, the internal connection may be weakened.As shown in Fig.3.3.1, avoid applying stress of more than 19.6N (2kgf) on the pins
  horizontally and more than 39.2N (4kgf) vertically.

- The pins are soldered on PWB internally, therefore, do not pull or bend them with abnormal forces.

- Fix the unit on PCB (using silicone rubber or fixing fittings) to reduce the stress onto the pins.

Fig.3.3.1
Stress to the pins



3.4 Cleaning

- When cleaning is necessary, clean under the following conditions.
  Method : Varnishing, ultrasonic wave and vapor
  Cleaning agents : IPA (Solvent type)
  Total time : 2 minutes or less

- Do not apply pressure to the lead and name plate with a brush or scratch it during the cleaning.

- After cleaning, dry them enough.

3.5 Soldering

(1) Flow Soldering :260℃ 15 seconds or less
(2) Soldering Iron :maximum 450℃ 5 seconds or less
(3) Reflow Soldering (option "-S")

■ Fig.3.5.1 shows conditions for the reflow soldering for option "-S" of CHS series. Please make sure that the temperatures of pin terminals +VIN and -VOUT shown in Fig.3.5.1 do not exceed the temperatures shown in Fig.3.5.2.

■ If time or temperature of the reflow soldering goes beyond the conditions, reliability of internal components may be compromised.
Please use the unit under the recommended reflow conditions.

Fig.3.5.1
Temperature Measuring Points when Setting Reflow Soldering Conditions

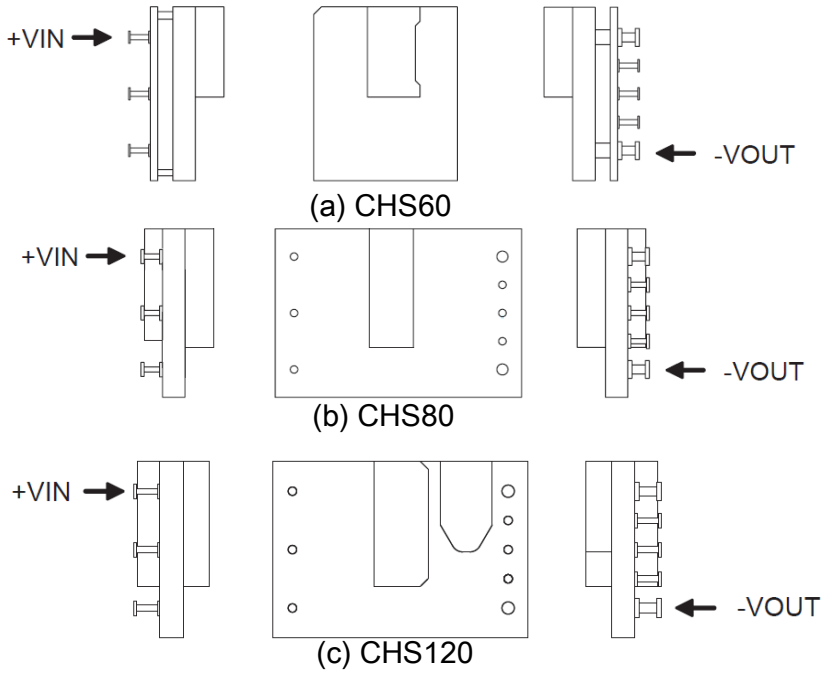
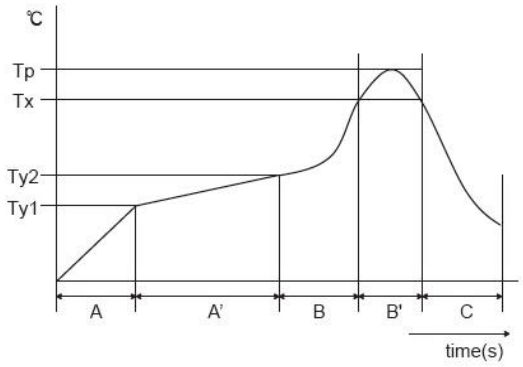


Fig.3.5.2
Recommend Reflow Soldering Conditions



A	1.0 - 5.0℃/s
A'	Ty1:160±10℃ Ty2:180±10℃ Ty1 - Ty2:120s max
B	1.0 - 5.0℃/s
B'	Tp:Max245℃ 10s max Tx:220℃ or more:70s max
C	1.0 - 5.0℃/s

- Notes to use option "-S"

■ Solder iron or other similar methods are not recommneded soldering method for option "-S" because it may not be able to retain connectioin reliability between the PCB and the Pins. Solder reflow is the acceptable mounting system for the option.

■ Option "-S" is not reusable product after soldered on any application PCB.

3.6 Safety standard

■ To apply for safety standard approval using this power supply, the following conditions must be met.
- This unit must be used as a component of the end-use equipment.
- The equipment must contain basic inslulation between input and output.
  If double or reinforced insulation is required, it has to be provided by the end-use equipment in accordance with the final build-in condition.
- Safety approved fuse must be externally installed on input side.

3.7 Automatic Mounting (CHS series : option "-S")

■ To mount CHS series automatically, use the coil area near the center of the PCB as an adsorption point. Please see the External View for details of the adsorption point.
If the bottom dead point of a suction nozzle is too low when mounting excessive force is applied to the coil, it could cause damage. Please mount carefully.

3.8 Storage method (CHS series : option "-S")

■ To stock unpacked products in your inventory, it is recommended to keep them under controlled condition, 5-30℃, 60%RH and use them within a year.
■ 24-hour baking is recommended at 125℃, if unpacked products were kept under uncontrolled condition, which is 30℃, 60%RH or higher.
Original trays are not heat-resistant. Please move them to heat-resistant trays in preparation to bake.
To check moisture condition in the pack. Silica gel pacet has some moisture condition indicator particles.
Indicated blue means good. Pink means alarm to bake it.
■ Notification. The tray will be deformed and the power supply might be damaged, if the vacuum pressure is too much to reseal.

3.9 Stress to the product

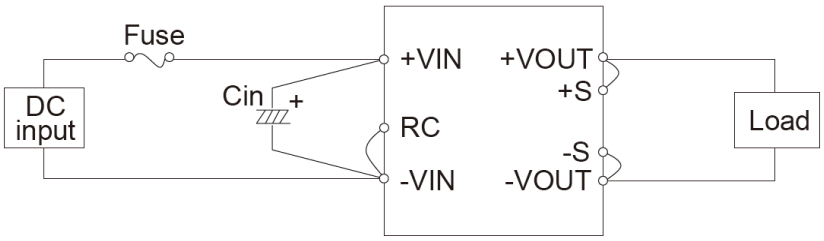
■ CHS series transformer core and choke coil are attached by glue.
Thres is a possibility that the core will be removed and power supply will be damaged when they receive stress by the fall or somekind of stress.

4. Connection method for standard use

4.1 Connection for standard use

- In order to use the power supply, it is necessary to wire as shown in Fig.4.1.1
- Short the following pins to turn on the power supply.
  -VIN ⇔ RC, +VOUT ⇔ +S, -VOUT ⇔ -S
- The CHS series handle only the DC input.
  Avoid applying AC input directly.
  It will damage the power supply.

Fig.4.1.1
Connection for
standard use of CHS



Cin : External capacitor on the input side

4.2 Wiring input pin

(1) External fuse

- Fuse is not built-in on input side. In order to protect the unit, install the normal-blow type fuse on input side.
- When the input voltage from a front end unit is supplied to multiple units, install the normal-blow type fuse in each unit.

Table.4.2.1
Recommended fuse
(Normal-blow type)

Model	CHS30024
Rated current	20A

Model	CHS6048	CHS8048	CHS12048
Rated current	5A	7A	10A
Model	CHS20048/CHS30048	CHS40048	CHS50048
Rated current	15A	20A	30A

(2) External capacitor on the input side

■ Install an external capacitor Cin, between +VIN and -VIN input pins for low line-noise and for stable operation of the power supply.

Table.4.2.2
Recommended external input capacitor (Ceramic)

Model	CHS30024
Cin	660μF or more

Model	CHS6048	CHS8048	CHS12048	CHS20048
Cin	66μF or more	33μF or more	47μF or more	100μF or more
Model	CHS30048/CHS40048/CHS50048			
Cin	200μF or more			

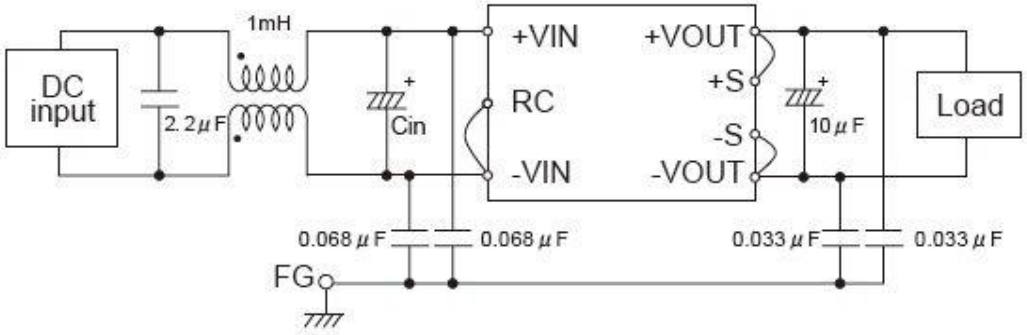
■ Capacitance Refer to Table.4.2.2
Ta = -20 to +85℃ Electrolytic or Ceramic capacitor
Ta = -40 to +85℃ Ceramic capacitor

■ Cin is within 50mm for pins. Make sure that ripple current of Cin is less than its rating.

(3) Recommendation for noise-filter

■ Install an external input filter as shown in Fig.4.2.1 in order to reduce conducted noise. Cin is shown in Table.4.2.2

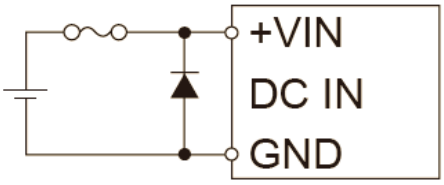
Fig.4.2.1
Example of recommended external input filter



(4) Reverse input voltage protection

■ Avoid the reverse polarity input voltage. It will damage the power supply.
It is possible to protect the unit from the reverse input voltage by installing an external diode as shown in Fig.4.2.2.

Fig.4.2.2
Reserse input voltage protection



4.3 Wiring output pin

- When the CHS series supplies the pulse current for the pulse load, please install a capacitor Co between +VOUT and -VOUT pins.
  Recommended capacitance of Co is shown in Table 4.3.1, 4.3.2.
- If output current decreases rapidly, output voltage rises transiently and the overvoltage protection circuit may operate.
  In this case, please install a capacitor Co.
- Select a high frequency type capacitor. Output ripple and startup waveform may be influenced by ESR-ESL of the capacitor and the wiring impedance.
- Make sure that ripple current of Co is than its rating.

Table.4.3.1
Recommended capacitance Co
(CHS60, CHS80, CHS120)

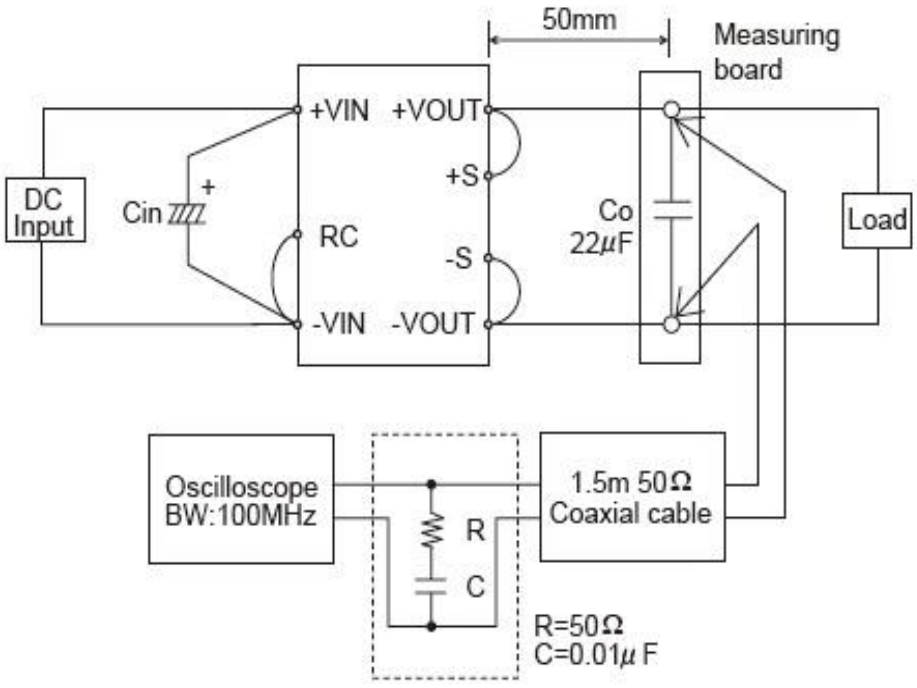
No.	Output voltage	CHS60	CHS80	CHS120
1	3.3V	0 - 20,000μF	0 - 20,000μF	0 - 20,000μF
2	5V	0 - 10,000μF	0 - 10,000μF	0 - 10,000μF
3	12V	0 - 2,200μF	0 - 1,000μF	0 - 2,200μF

Table.4.3.2
Recommended capacitance Co
(CHS200, CHS300, CHS400, CHS500)

No.	Output voltage	CHS200	CHS300	CHS400/CHS500
1	3.3V	0 - 40,000μF	–	–
2	5V	0 - 20,000μF	0 - 20,000μF	–
3	10V	–	0 - 2,200μF	0 - 4,000μF
4	12V	0 - 2,200μF	0 - 2,200μF	0 - 4,000μF
5	15V	–	0 - 2,200μF	–

- Ripple and Ripple Noise are measured, as shown in the Fig.4.3.1.
  Cin is shown in Table 4.2.2.

Fig.4.3.1
Measuring method of
Ripple and Ripple Noise

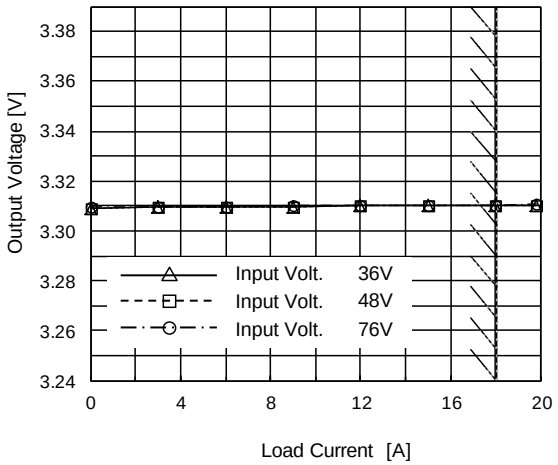


5. Overview

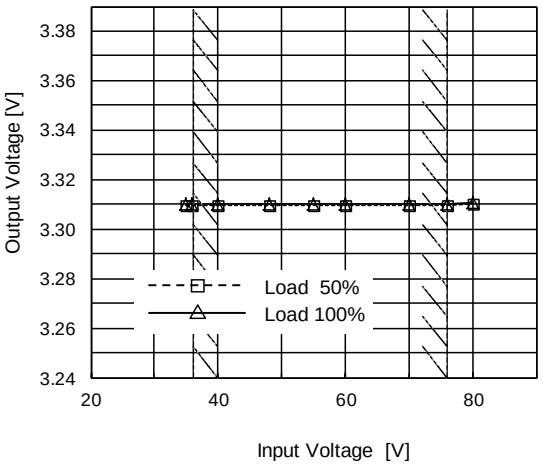
5.1 CHS60

5.1.1 CHS60483R3

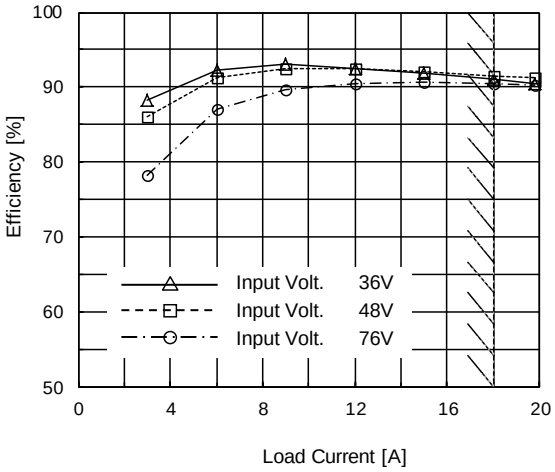
Fig.5.1.1
Overview of
CHS60483R3 at 25℃



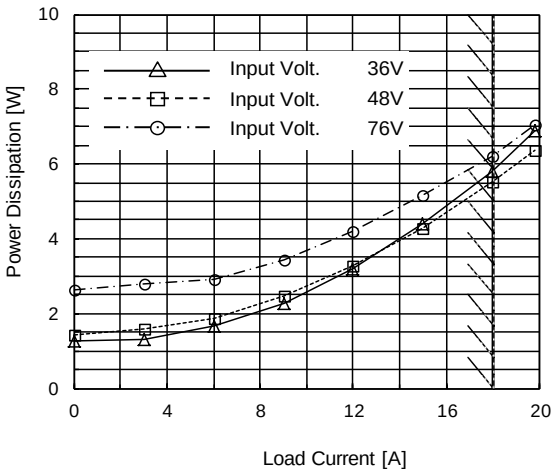
(a) Load Regulation



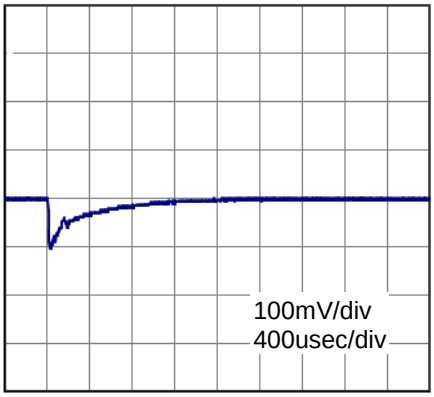
(b) Line Regulation



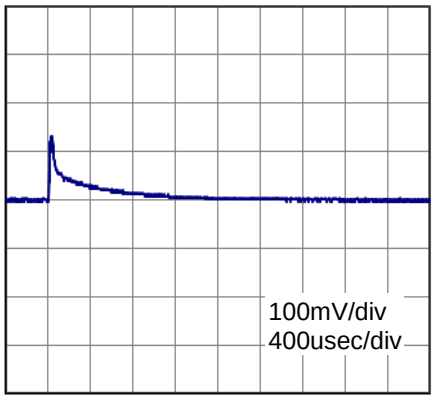
(c) Efficiency (by Load Current)



(d) Power Dissipation(by Load Current)



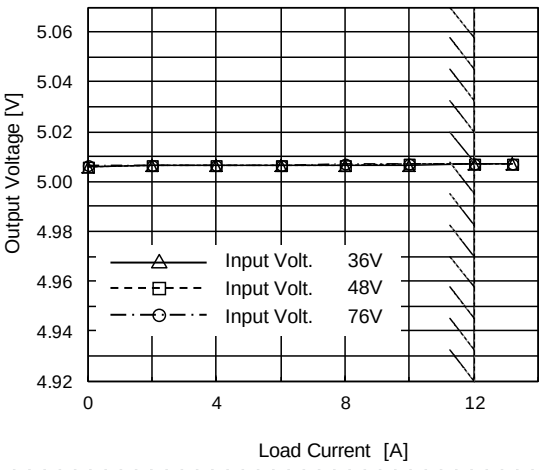
(e) Dynamic Load Response
Load 50%(9A)→Load 100%(18A)／50us
Vin 48V,Vout 3.3V



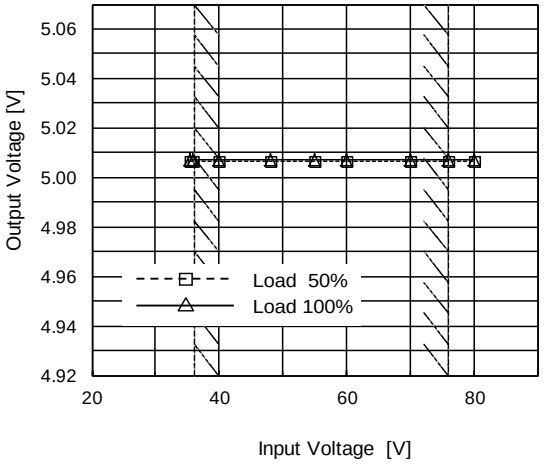
(f) Dynamic Load Response
Load 100%(18A)→Load 50%(9A)／50us
Vin 48V,Vout 3.3V

5.1.2 CHS604805

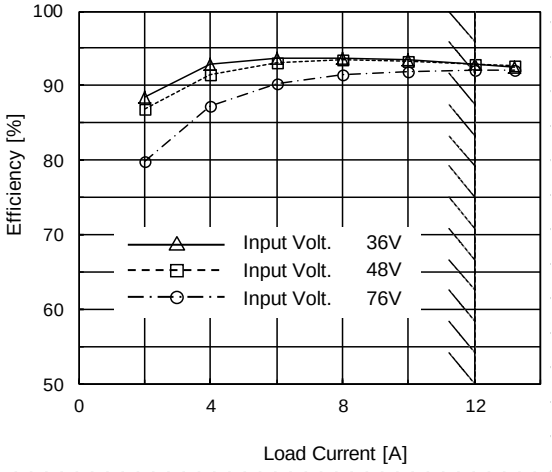
Fig.5.1.2
Overview of
CHS604805 at 25℃



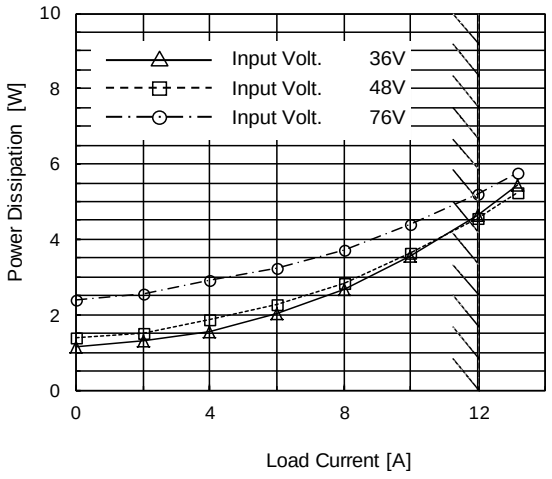
(a) Load Regulation



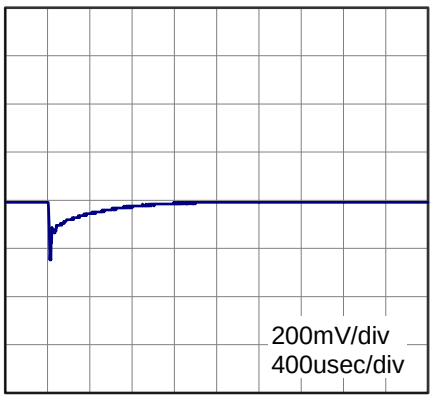
(b) Line Regulation



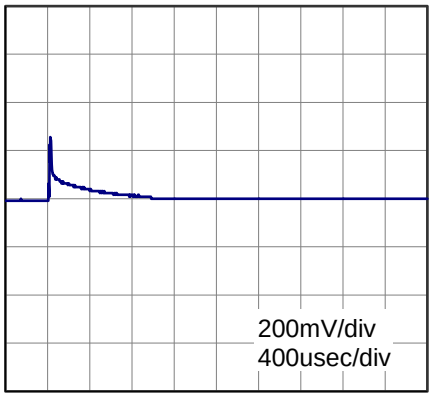
(c) Efficiency (by Load Current)



(d) Power Dissipation(by Load Current)



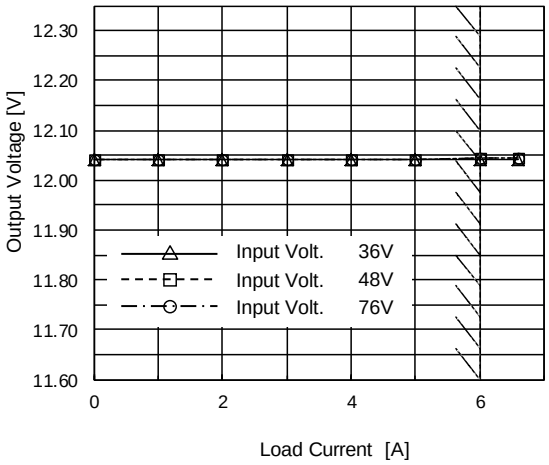
(e) Dynamic Load Response
Load 50%(6A)→Load 100%(12A)／50us
Vin 48V,Vout 5.0V



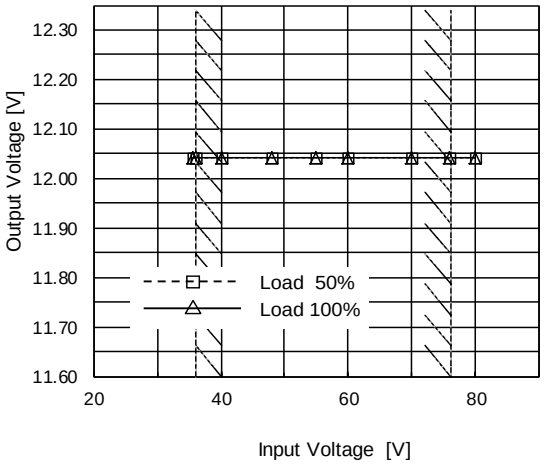
(f) Dynamic Load Response
Load 100%(12A)→Load 50%(6A)／50us
Vin 48V,Vout 5.0V

5.1.3 CHS604812

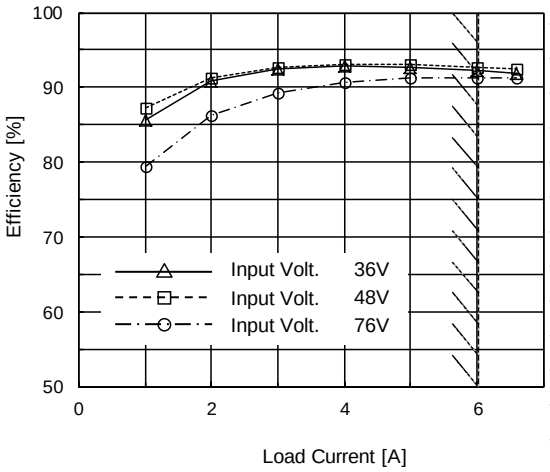
Fig.5.1.3
Overview of
CHS604812 at 25℃



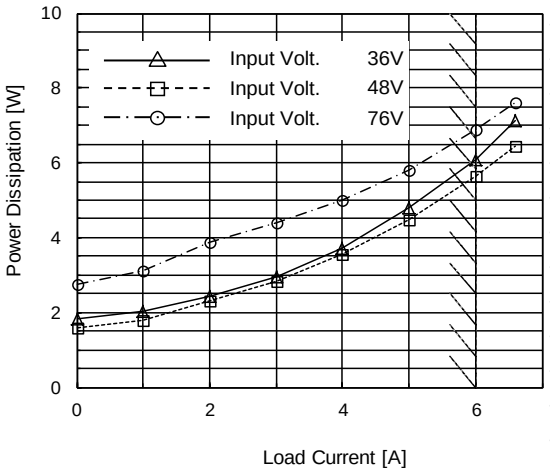
(a) Load Regulation



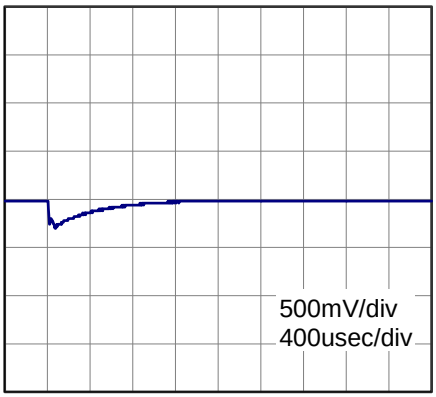
(b) Line Regulation



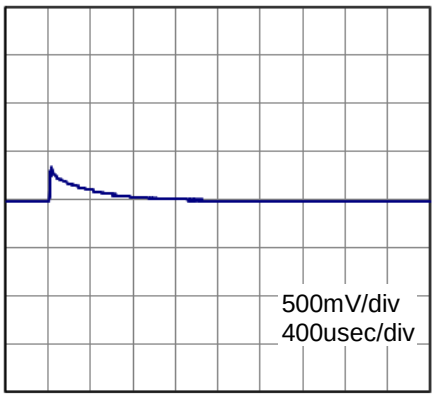
(c) Efficiency (by Load Current)



(d) Power Dissipation(by Load Current)



(e) Dynamic Load Response
Load 50%(3A)→Load 100%(6A)／50us
Vin 48V,Vout 12V

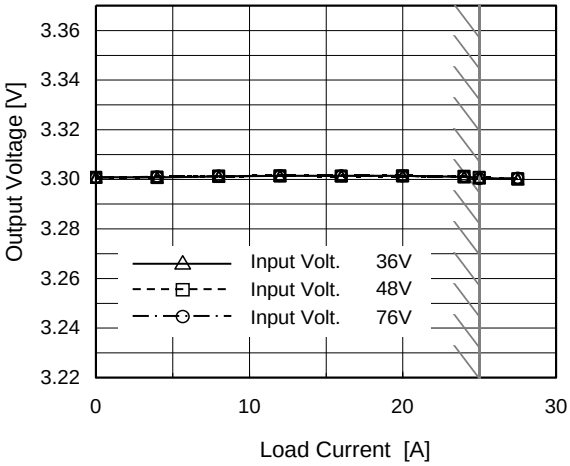


(f) Dynamic Load Response
Load 100%(6A)→Load 50%(3A)／50us
Vin 48V,Vout 12V

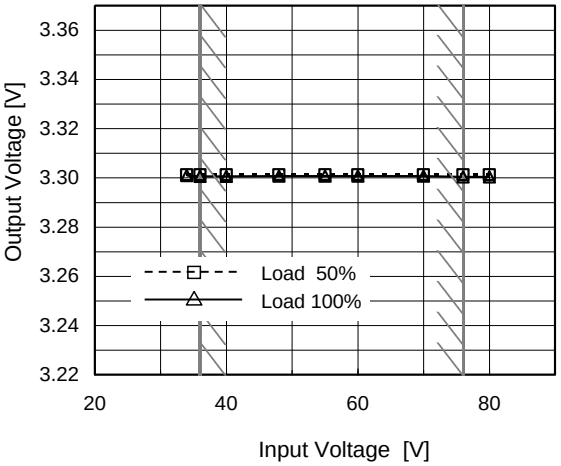
5.2 CHS80

5.2.1 CHS80483R3

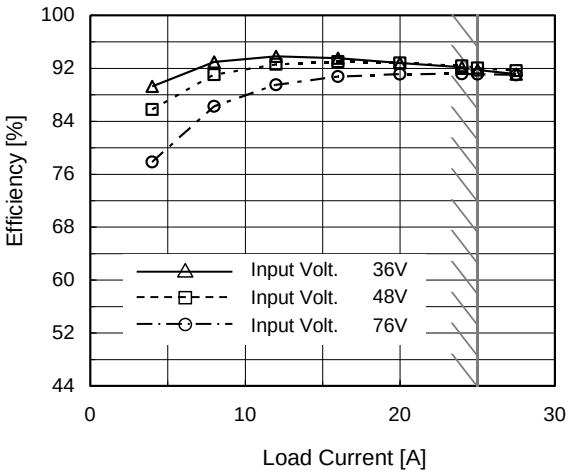
Fig.5.2.1 Overview of CHS80483R3 at 25℃



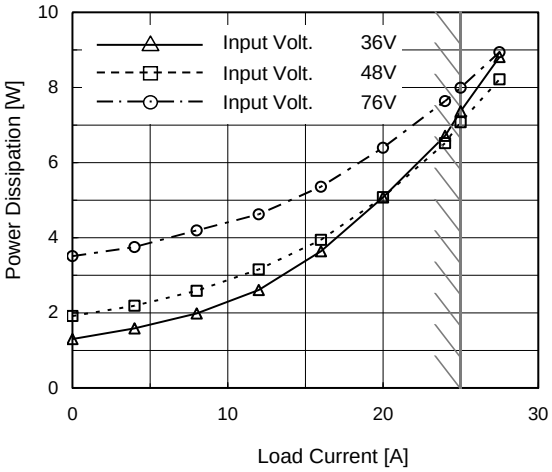
(a) Load Regulation



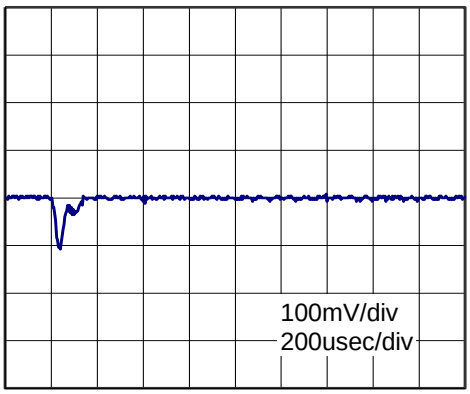
(b) Line Regulation



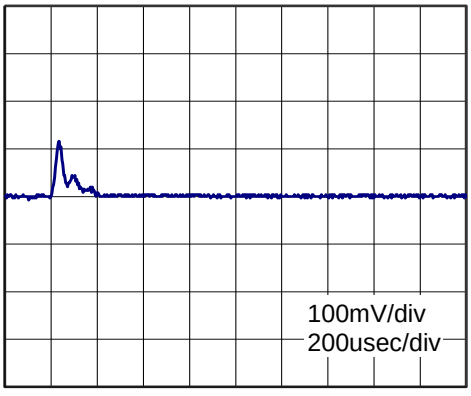
(c) Efficiency (by Load Current)



(d) Power Dissipation(by Load Current)



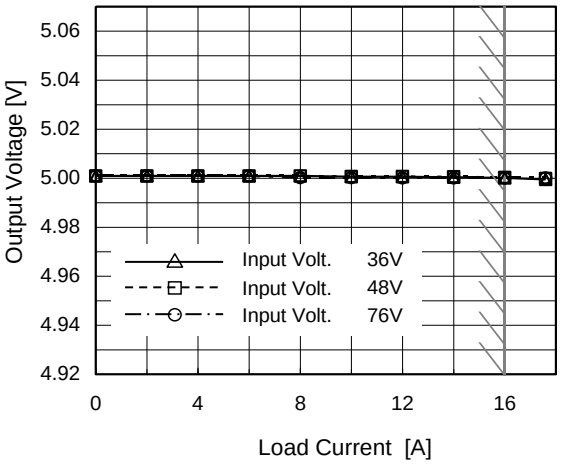
(e) Dynamic Load Response
Load 50%(12.5A)→Load 100%(25A)／50us
Vin 48V,Vout 3.3V



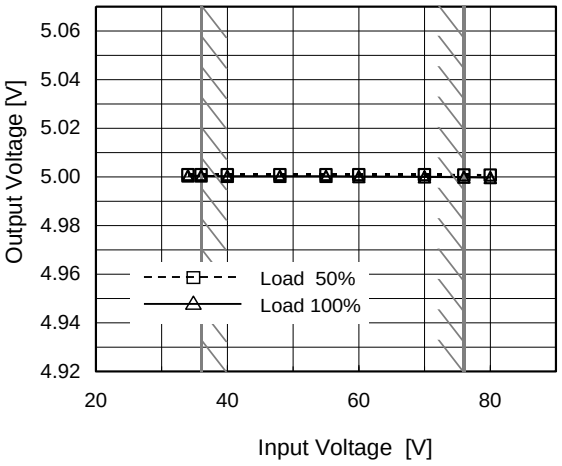
(f) Dynamic Load Response
Load 100%(25A)→Load 50%(12.5A)／50us
Vin 48V,Vout 3.3V

5.2.2 CHS804805

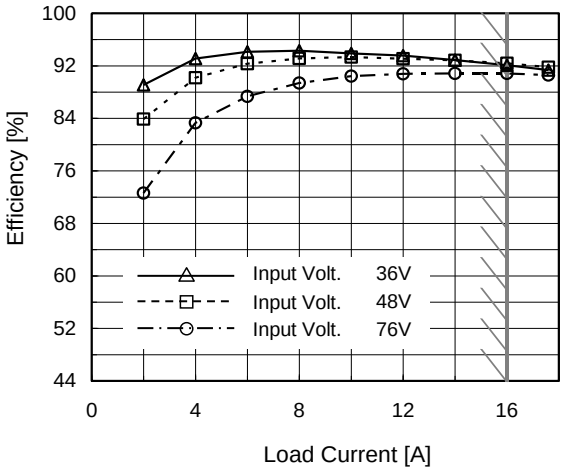
Fig.5.2.2
Overview of
CHS804805 at 25℃



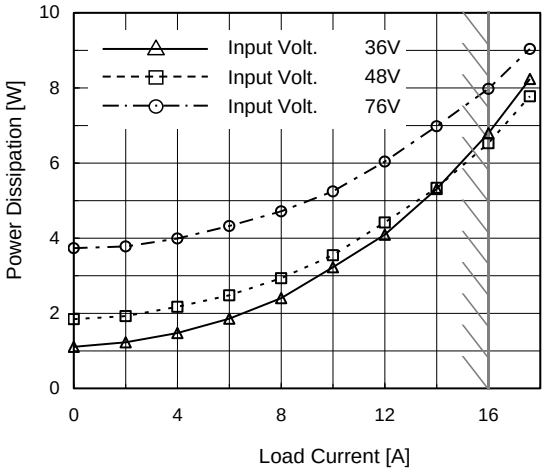
(a) Load Regulation



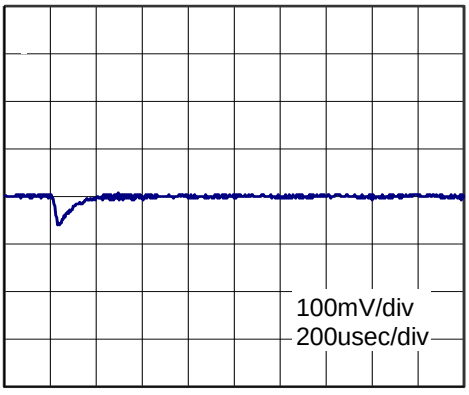
(b) Line Regulation



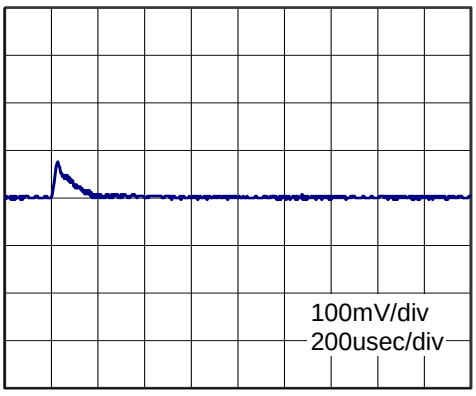
(c) Efficiency (by Load Current)



(d) Power Dissipation(by Load Current)



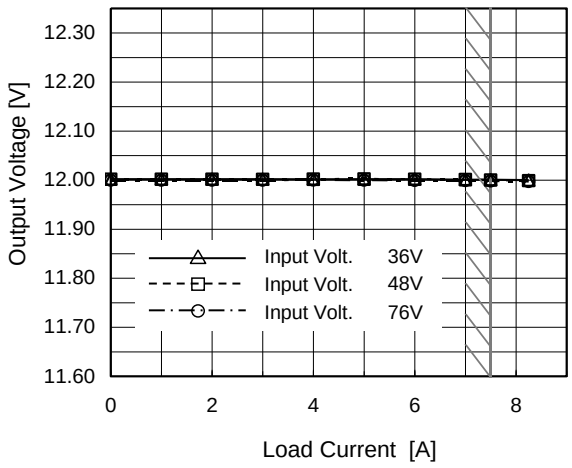
(e) Dynamic Load Response
Load 50%(8A)→Load 100%(16A)／50us
Vin 48V,Vout 5.0V



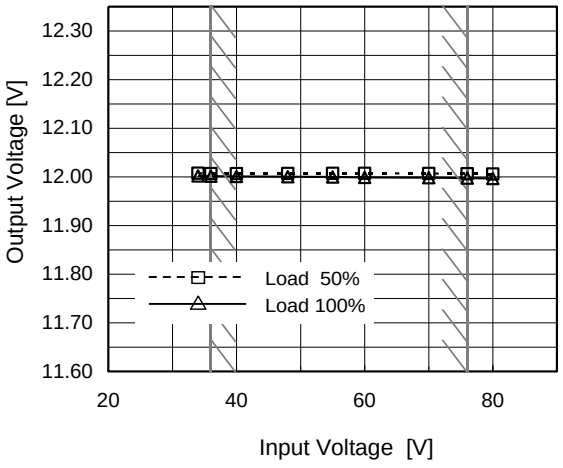
(f) Dynamic Load Response
Load 100%(16A)→Load 50%(8A)／50us
Vin 48V,Vout 5.0V

5.2.3 CHS804812

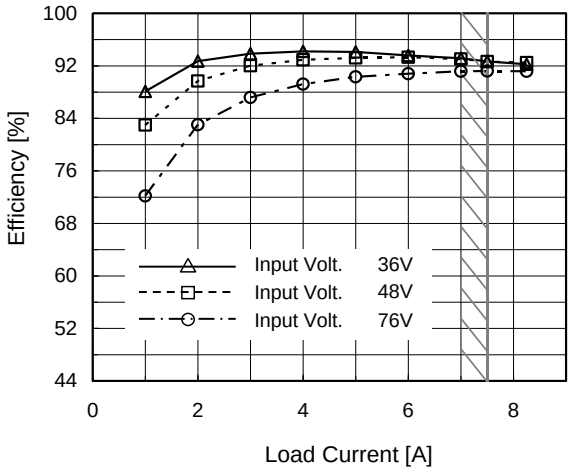
Fig.5.2.3
Overview of
CHS804812 at 25℃



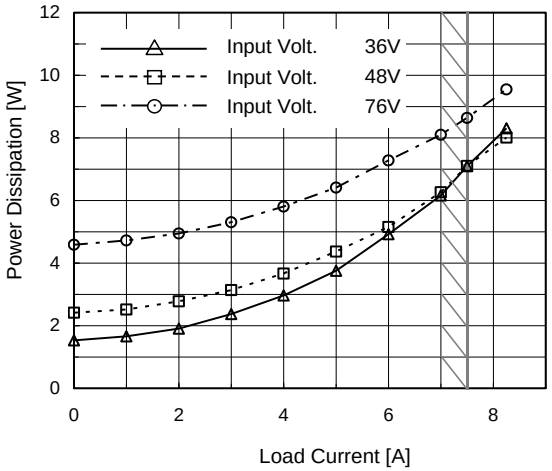
(a) Load Regulation



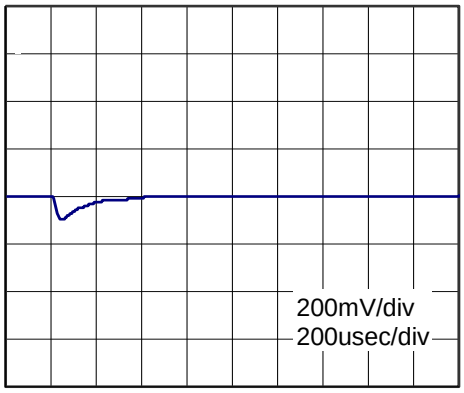
(b) Line Regulation



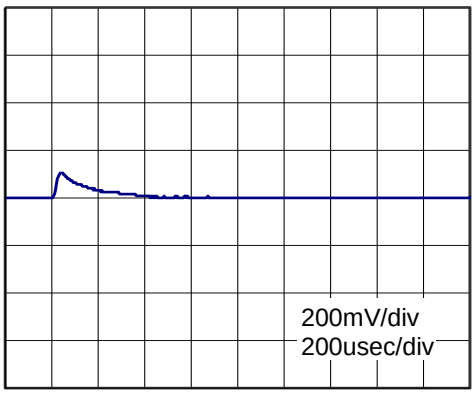
(c) Efficiency (by Load Current)



(d) Power Dissipation(by Load Current)



(e) Dynamic Load Response
Load 50%(3.75A)→Load 100%(7.5A)／50us
Vin 48V,Vout 12V

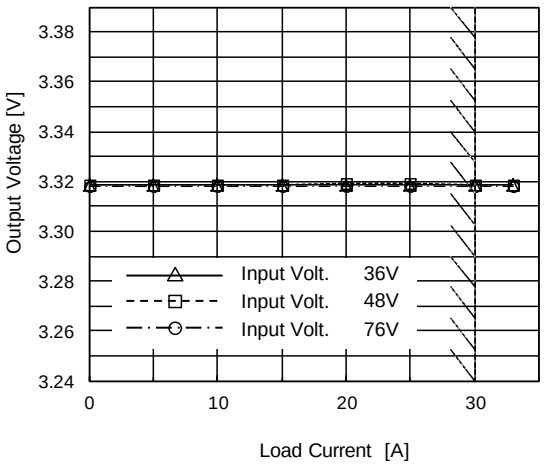


(f) Dynamic Load Response
Load 100%(7.5A)→Load 50%(3.75A)／50us
Vin 48V,Vout 12V

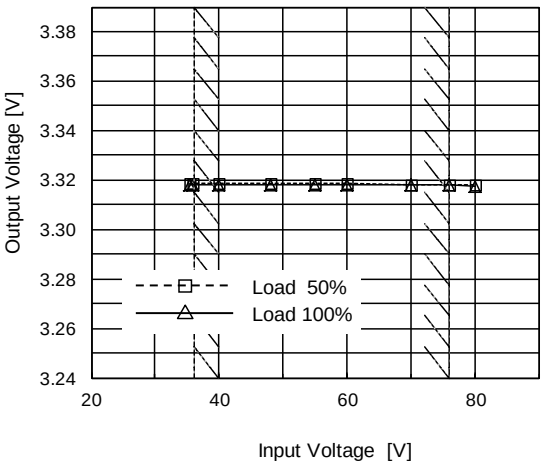
5.3 CHS120

5.3.1 CHS120483R3

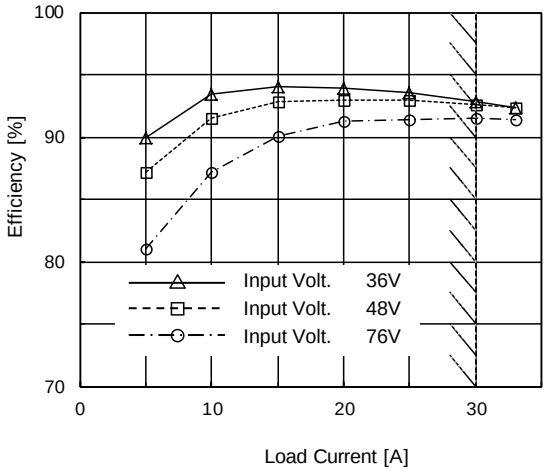
Fig.5.3.1
Overview of
CHS120483R3 at 25℃



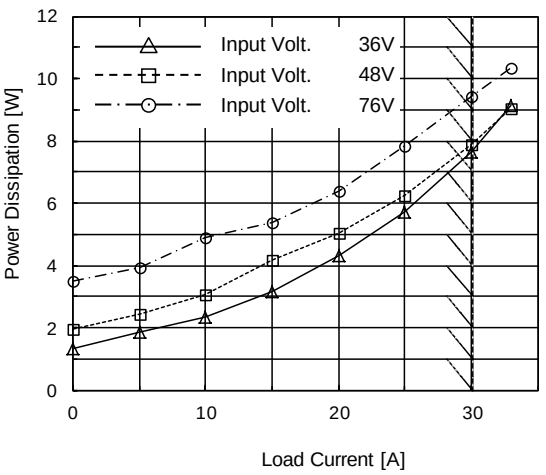
(a) Load Regulation



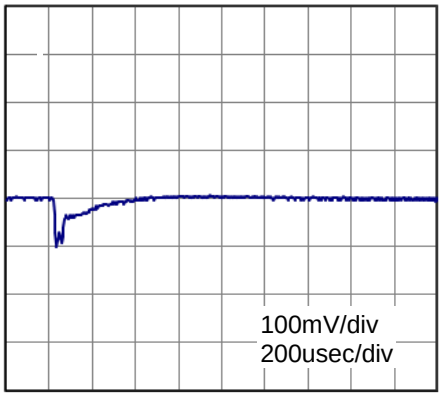
(b) Line Regulation



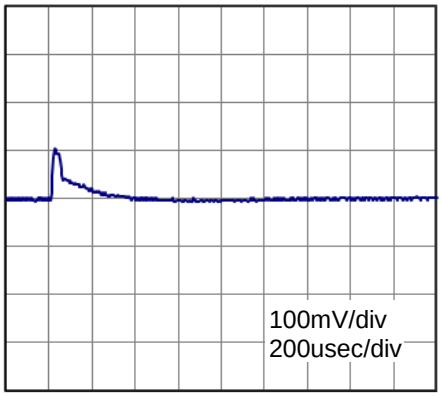
(c) Efficiency (by Load Current)



(d) Power Dissipation(by Load Current)



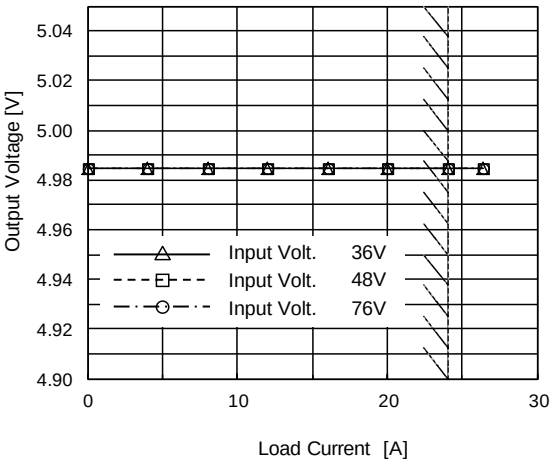
(e) Dynamic Load Response
Load 50%(15A)→Load 100%(30A)／50us
Vin 48V,Vout 3.3V



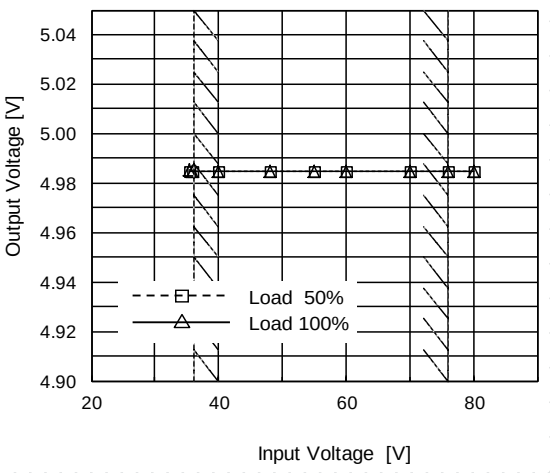
(f) Dynamic Load Response
Load 100%(30A)→Load 50%(15A)／50us
Vin 48V,Vout 3.3V

5.3.2 CHS1204805

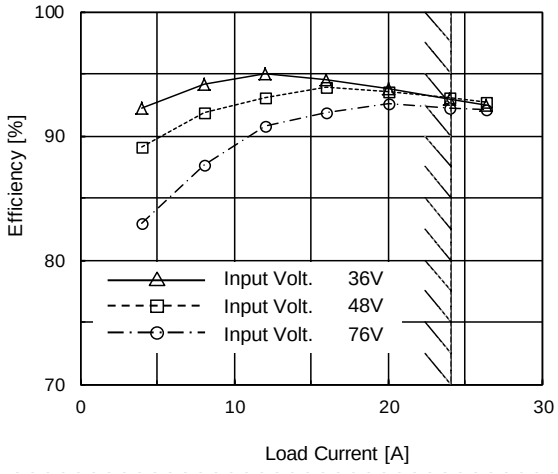
Fig.5.3.2
Overview of
CHS1204805 at 25℃



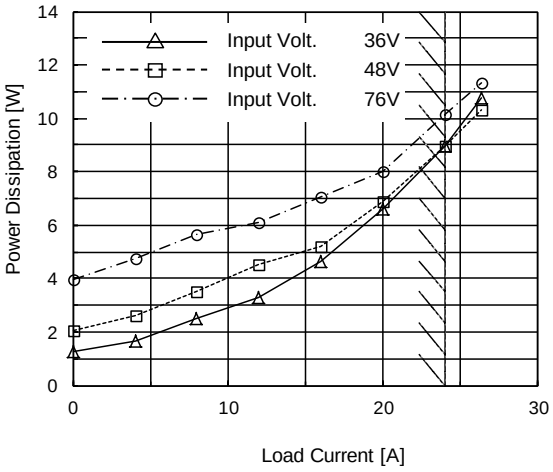
(a) Load Regulation



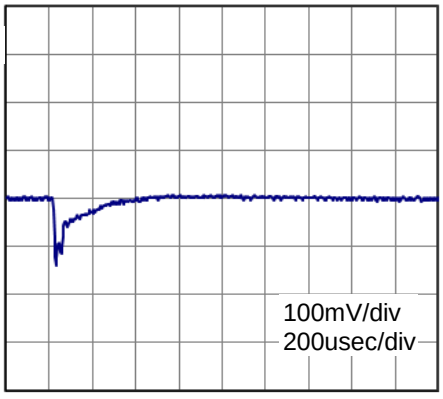
(b) Line Regulation



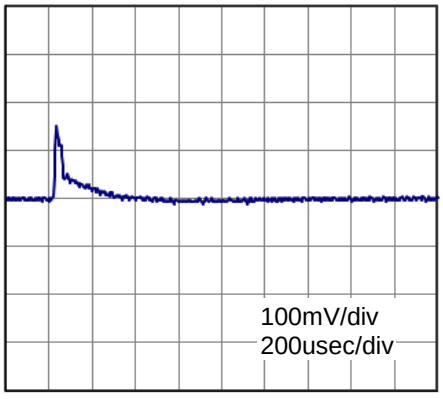
(c) Efficiency (by Load Current)



(d) Power Dissipation(by Load Current)



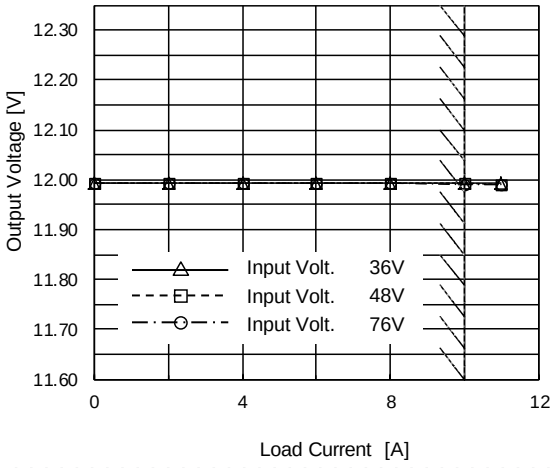
(e) Dynamic Load Response
Load 50%(12A)→Load 100%(24A)／50us
Vin 48V,Vout 5.0V



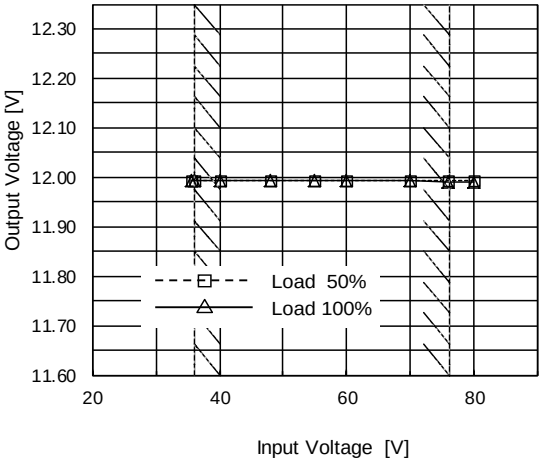
(f) Dynamic Load Response
Load 100%(24A)→Load 50%(12A)／50us
Vin 48V,Vout 5.0V

5.3.3 CHS1204812

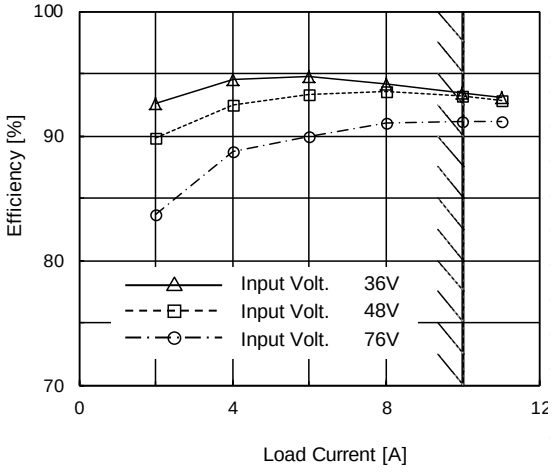
Fig.5.3.3
Overview of
CHS1204812 at 25℃



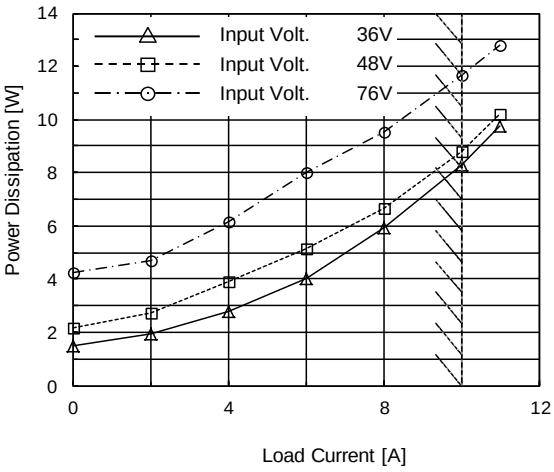
(a) Load Regulation



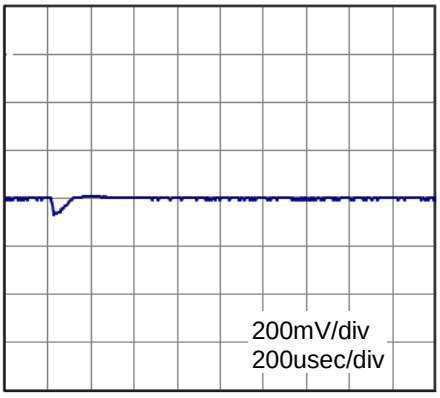
(b) Line Regulation



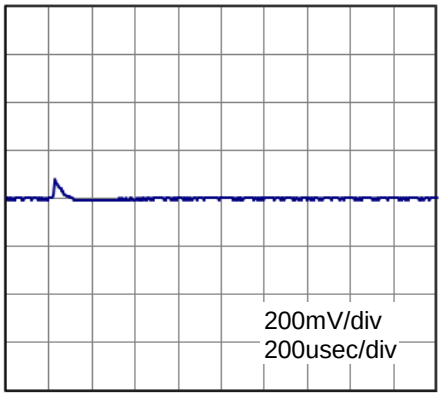
(c) Efficiency (by Load Current)



(d) Power Dissipation(by Load Current)



(e) Dynamic Load Response
Load 50%(5A)→Load 100%(10A)／50us
Vin 48V,Vout 12V

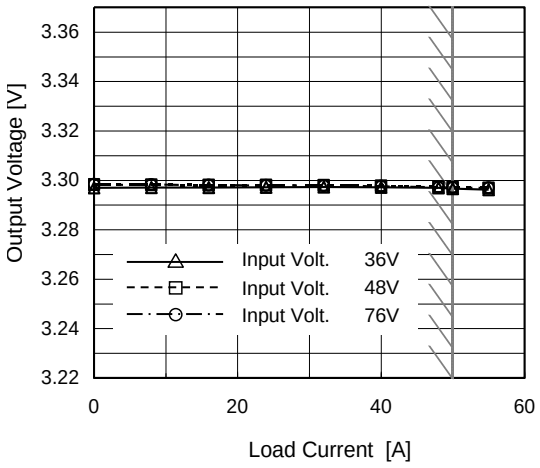


(f) Dynamic Load Response
Load 100%(10A)→Load 50%(5A)／50us
Vin 48V,Vout 12V

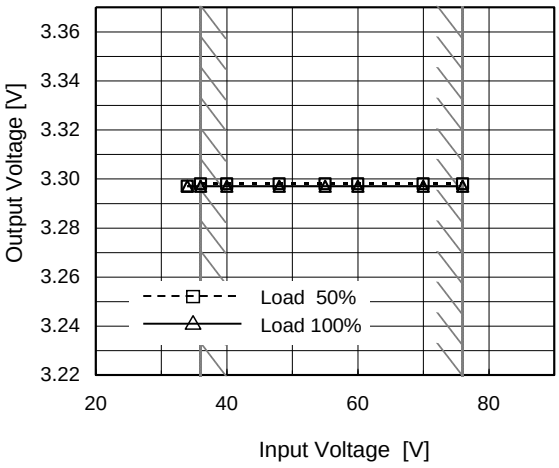
5.4 CHS200

5.4.1 CHS200483R3

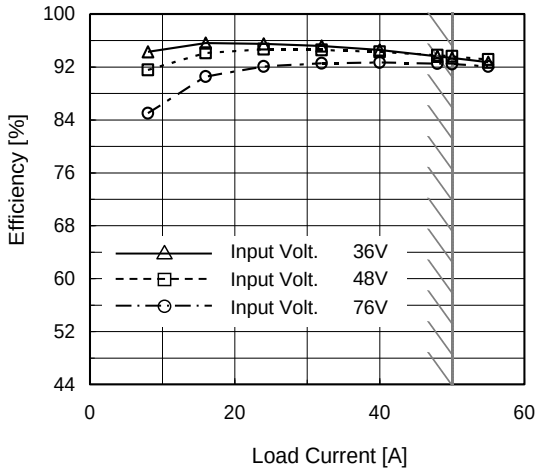
Fig.5.4.1
Overview of
CHS200483R3 at 25℃



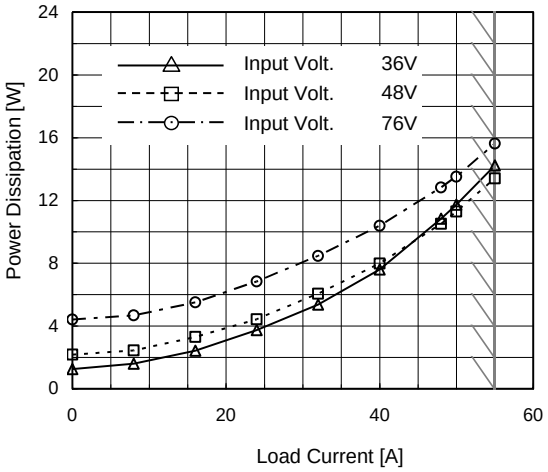
(a) Load Regulation



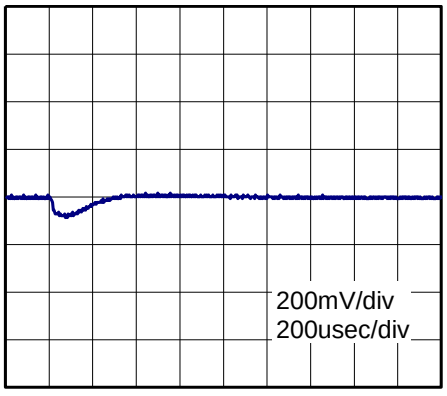
(b) Line Regulation



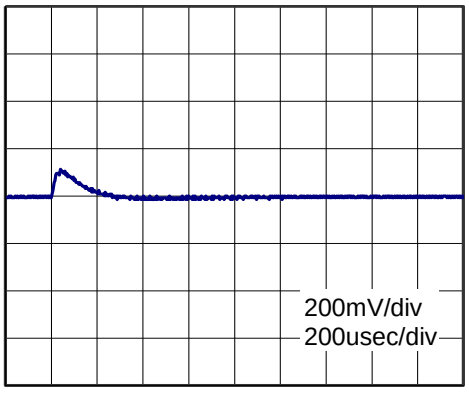
(c) Efficiency (by Load Current)



(d) Power Dissipation(by Load Current)



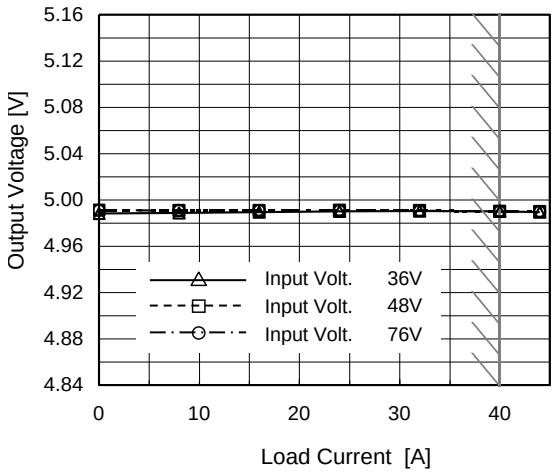
(e) Dynamic Load Response
Load 50%(25A)→Load 100%(50A)／50us
Vin 48V,Vout 3.3V



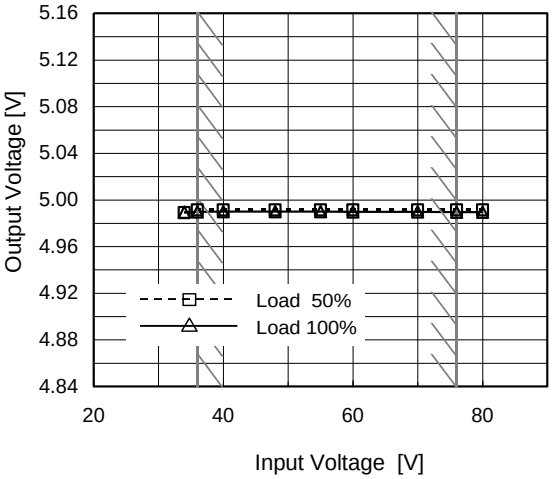
(f) Dynamic Load Response
Load 100%(50A)→Load 50%(25A)／50us
Vin 48V,Vout 3.3V

5.4.2 CHS2004805

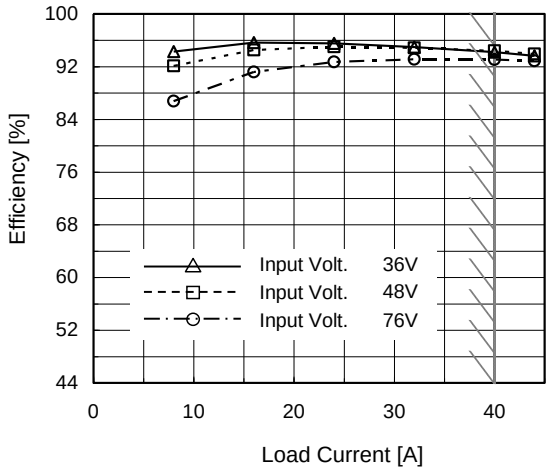
Fig.5.4.2
Overview of
CHS2004805 at 25℃



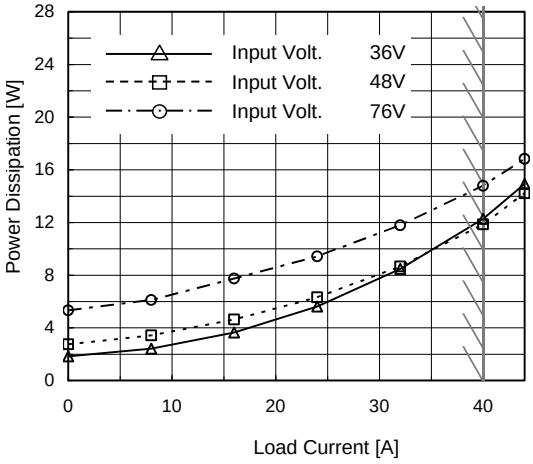
(a) Load Regulation



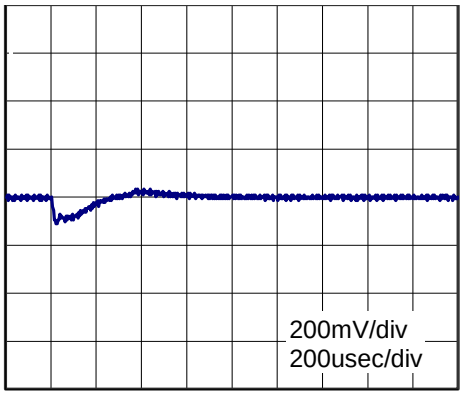
(b) Line Regulation



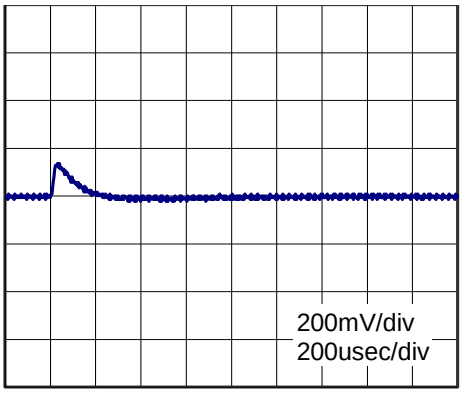
(c) Efficiency (by Load Current)



(d) Power Dissipation(by Load Current)



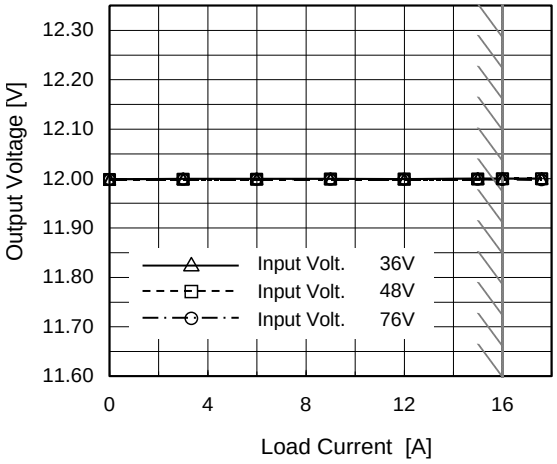
(e) Dynamic Load Response
Load 50%(20A)→Load 100%(40A)／50us
Vin 48V,Vout 5V



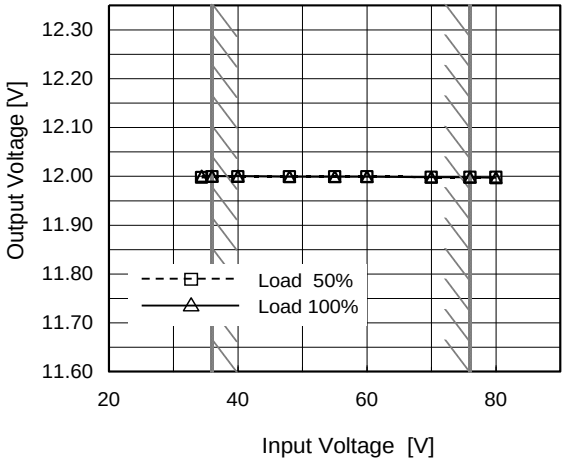
(f) Dynamic Load Response
Load 100%(40A)→Load 50%(20A)／50us
Vin 48V,Vout 5V

5.4.3 CHS2004812

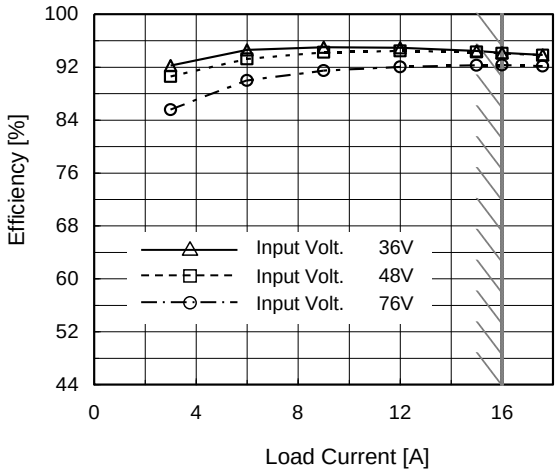
Fig.5.4.3
Overview of
CHS2004812 at 25℃



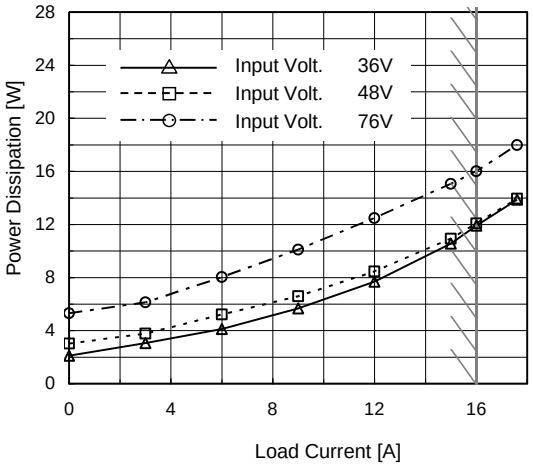
(a) Load Regulation



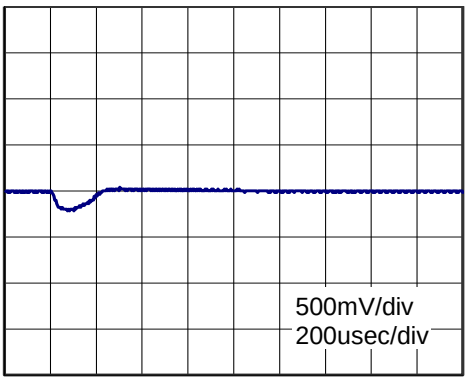
(b) Line Regulation



(c) Efficiency (by Load Current)

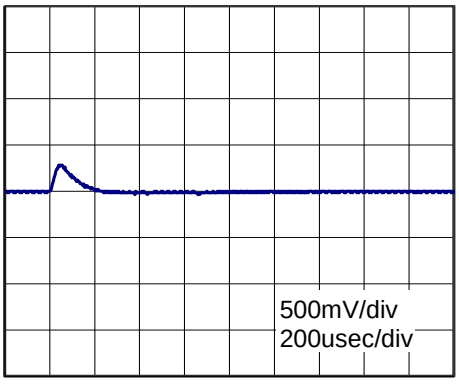


(d) Power Dissipation(by Load Current)



(e) Dynamic Load Response

Load 50%(8A)→Load 100%(16A)／50us
Vin 48V,Vout 12V



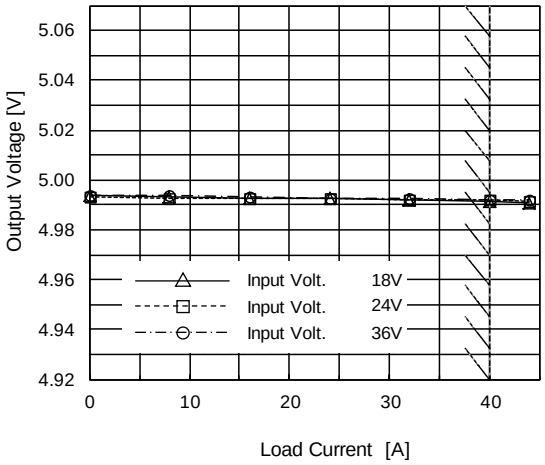
(f) Dynamic Load Response

Load 100%(16A)→Load 50%(8A)／50us
Vin 48V,Vout 12V

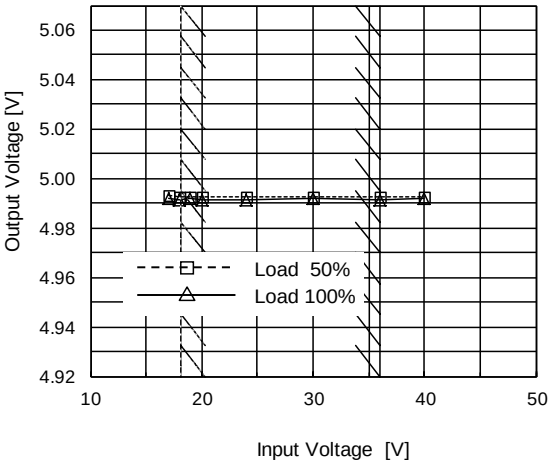
5.5 CHS300

5.5.1 CHS3002405

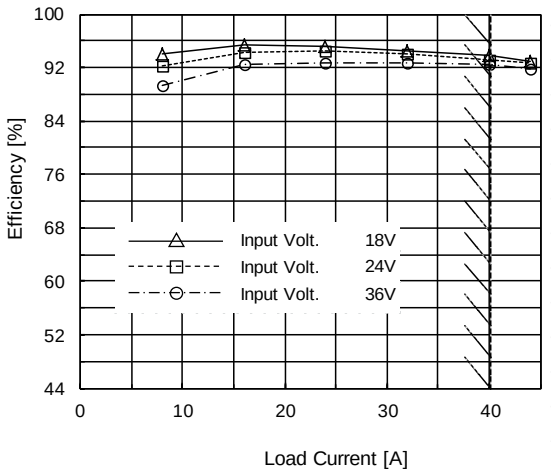
Fig.5.5.1
Overview of
CHS3002405 at 25℃



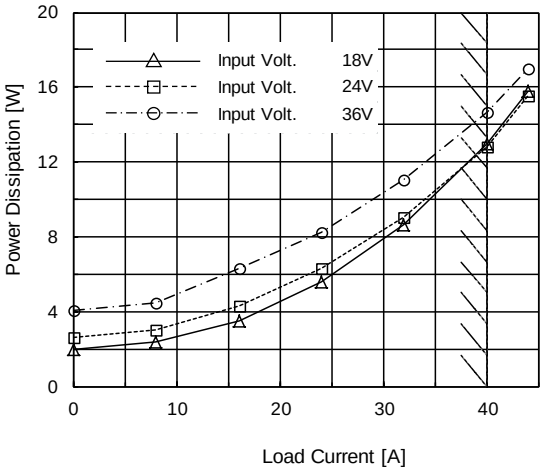
(a) Load Regulation



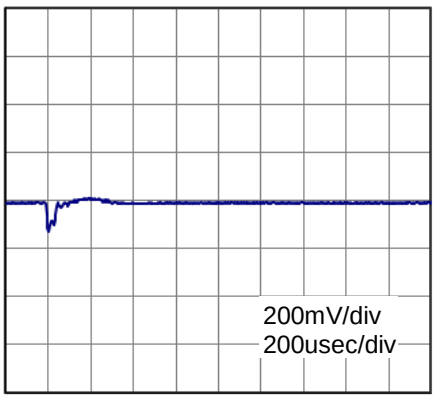
(b) Line Regulation



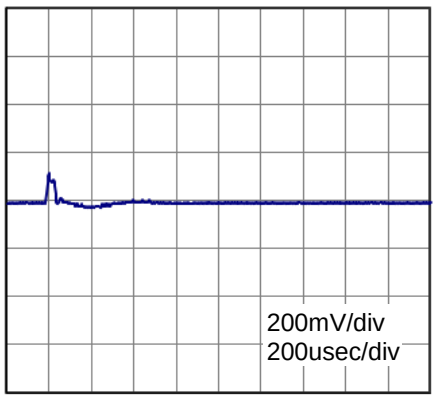
(c) Efficiency (by Load Current)



(d) Power Dissipation(by Load Current)



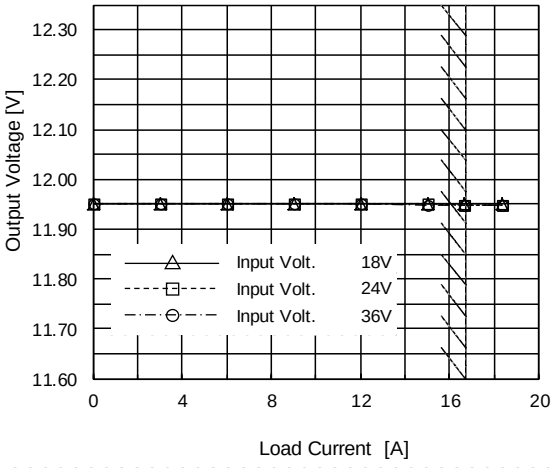
(e) Dynamic Load Response
Load 50%(20A)→Load 100%(40A)／50us
Vin 24V,Vout 5V



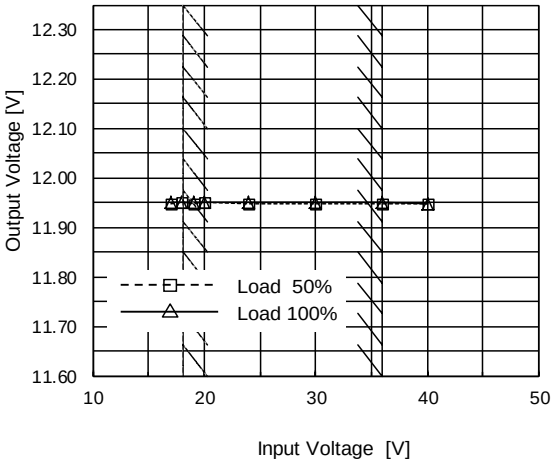
(f) Dynamic Load Response
Load 100%(40A)→Load 50%(20A)／50us
Vin 24V,Vout 5V

5.5.2 CHS3002412

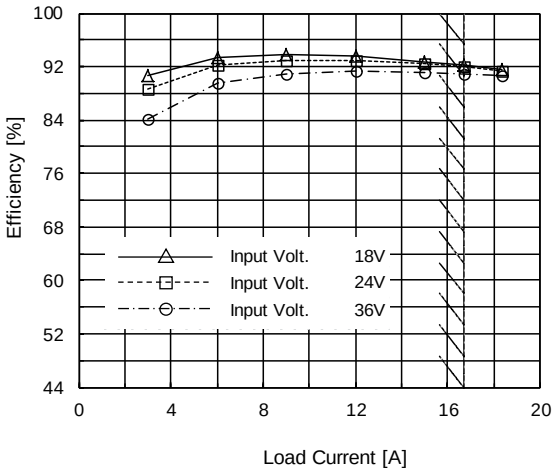
Fig.5.5.2 Overview of CHS3002412 at 25℃



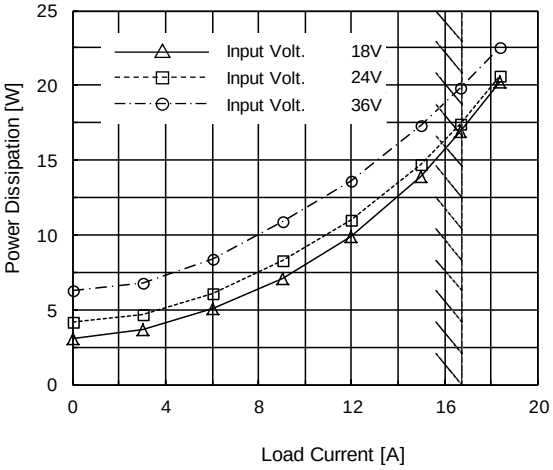
(a) Load Regulation



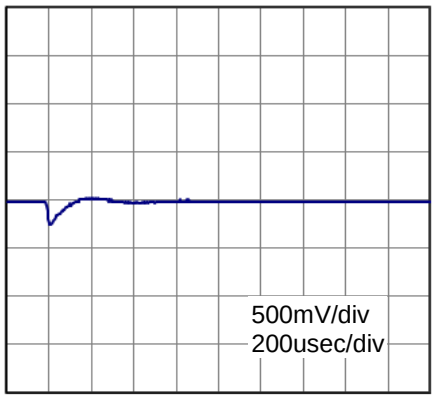
(b) Line Regulation



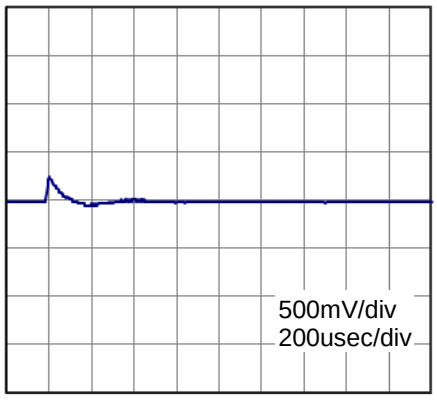
(c) Efficiency (by Load Current)



(d) Power Dissipation(by Load Current)



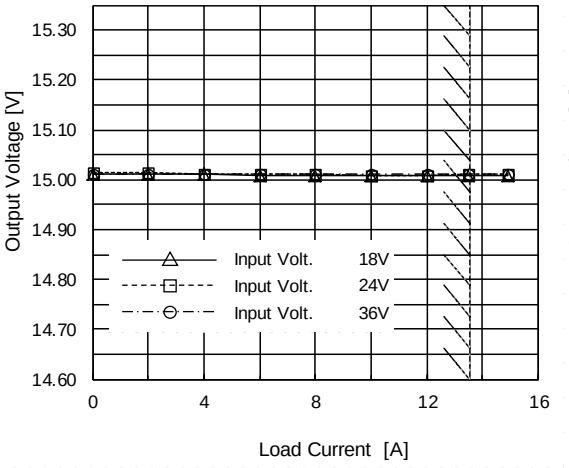
(e) Dynamic Load Response
Load 50%(8.35A)→Load 100%(16.7A)／50us
Vin 24V,Vout 12V



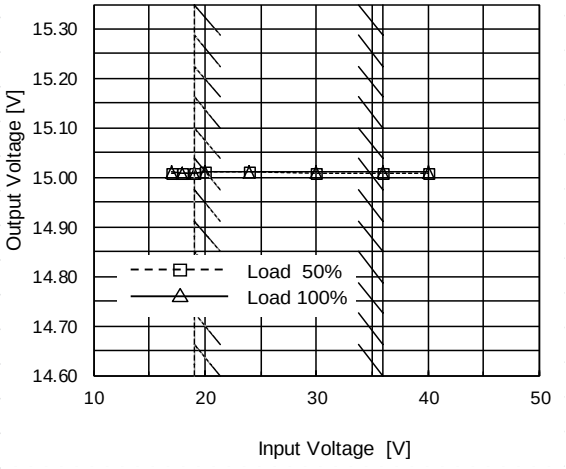
(f) Dynamic Load Response
Load 100%(16.7A)→Load 50%(8.35A)／50us Vin 24V,Vout 12V

5.5.3 CHS3002415

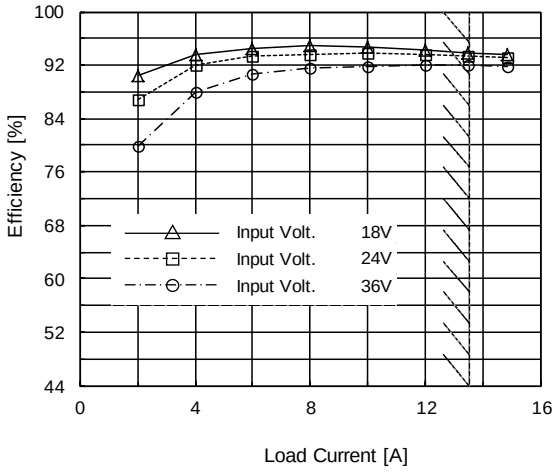
Fig.5.5.3
Overview of
CHS3002415 at 25℃



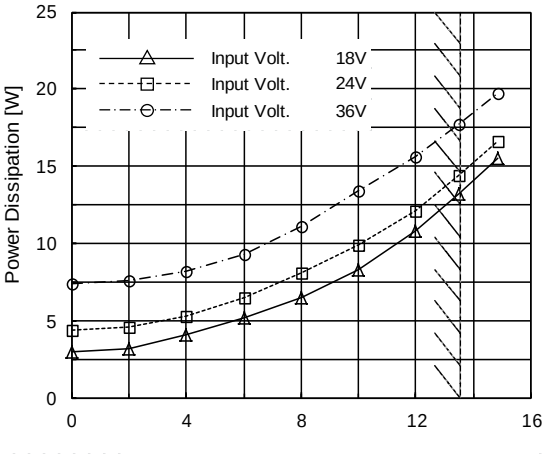
(a) Load Regulation



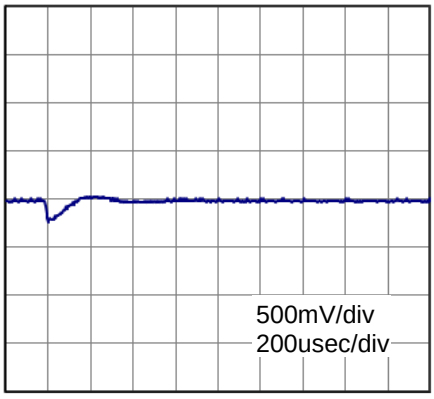
(b) Line Regulation



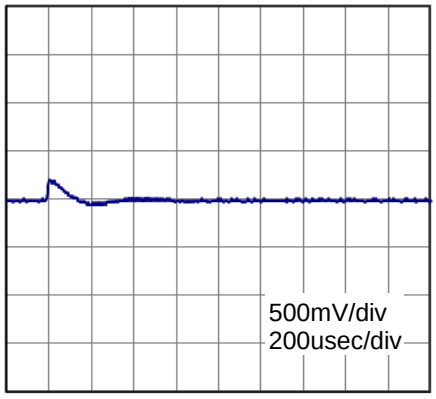
(c) Efficiency (by Load Current)



(d) Power Dissipation(by Load Current)



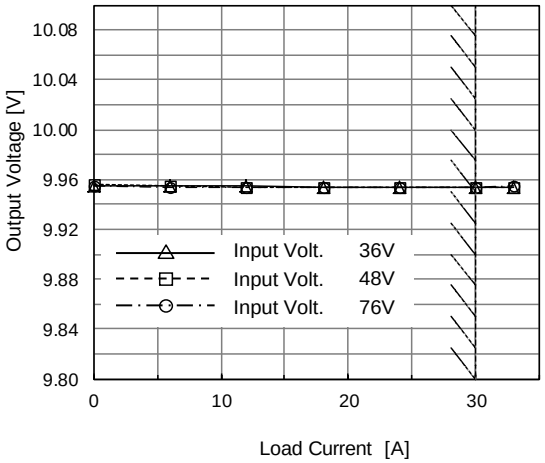
(e) Dynamic Load Response
Load 50%(6.75A)→Load 100%(13.5A)／50us
Vin 24V,Vout 15V



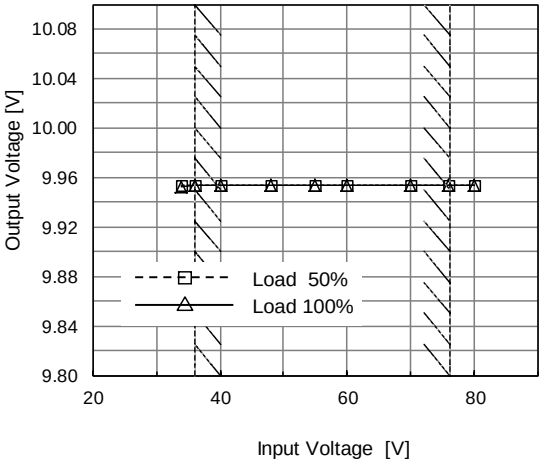
(f) Dynamic Load Response
Load 100%(13.5A)→Load 50%(6.75A)／
50us Vin 24V,Vout 15V

5.5.4 CHS3004810

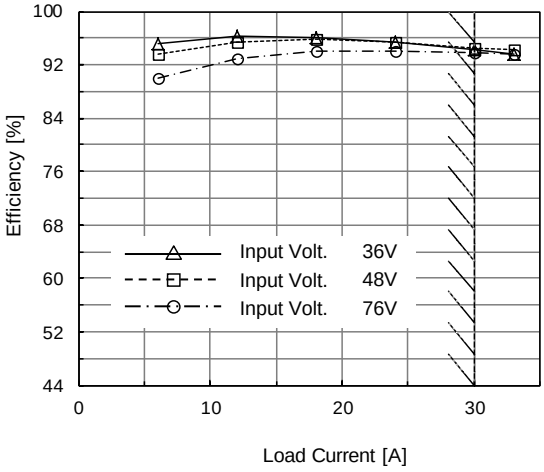
Fig.5.5.4 Overview of CHS3004810 at 25℃



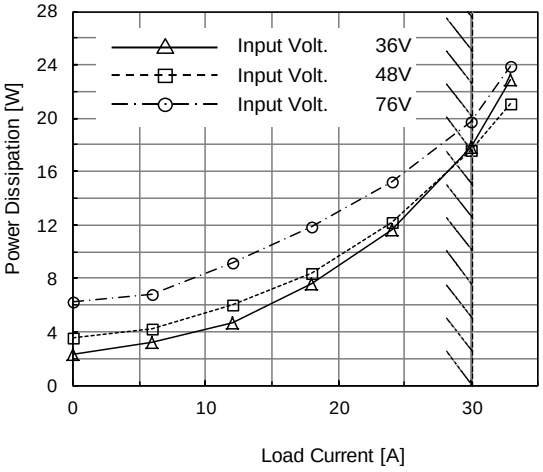
(a) Load Regulation



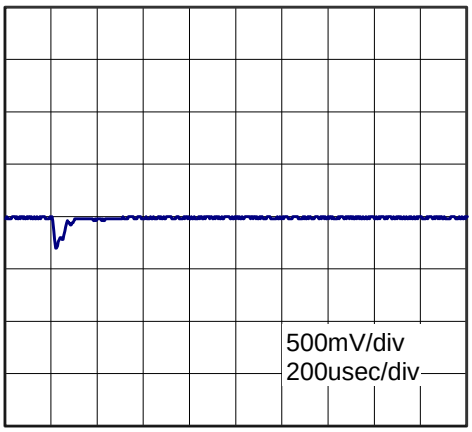
(b) Line Regulation



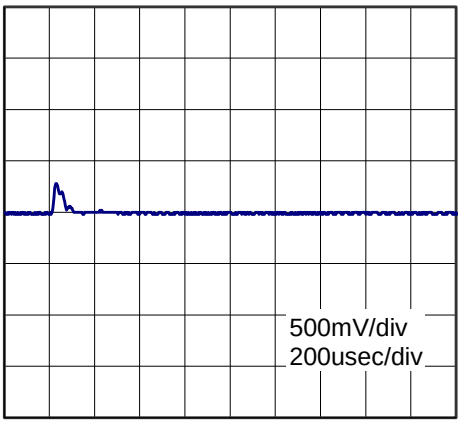
(c) Efficiency (by Load Current)



(d) Power Dissipation(by Load Current)



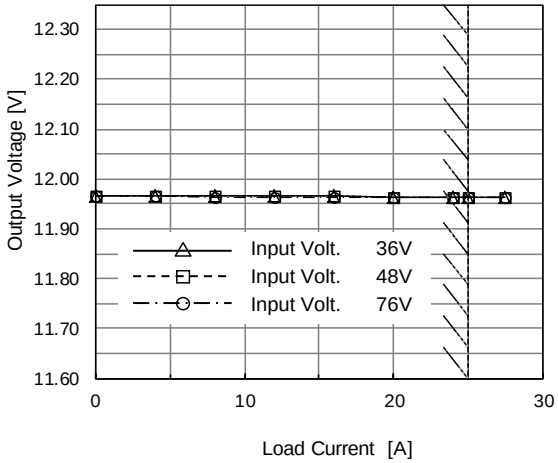
(e) Dynamic Load Response
Load 50%(15A)→Load 100%(30A)／50us
Vin 48V,Vout 10V



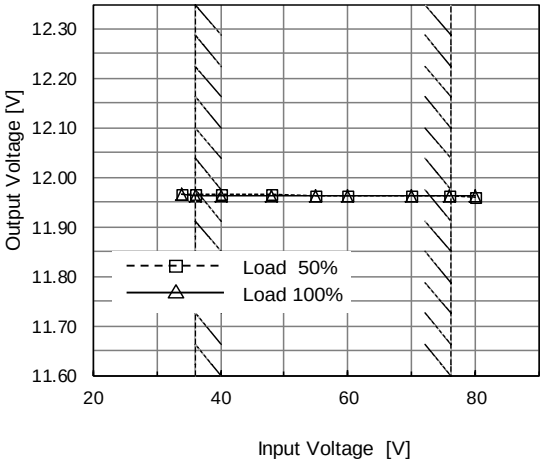
(f) Dynamic Load Response
Load 100%(30A)→Load 50%(15A)／50us
Vin 48V,Vout 10V

5.5.5 CHS3004812

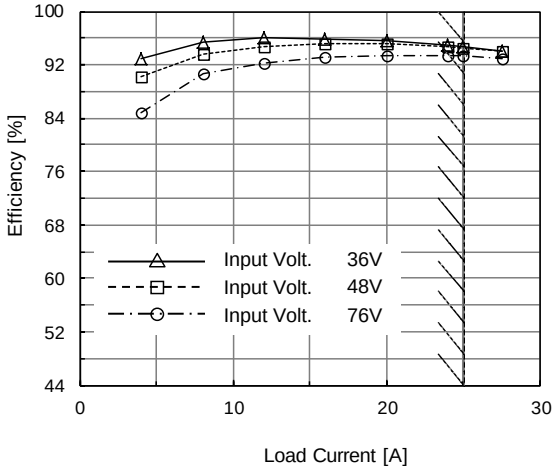
Fig.5.5.5
Overview of
CHS3004812 at 25℃



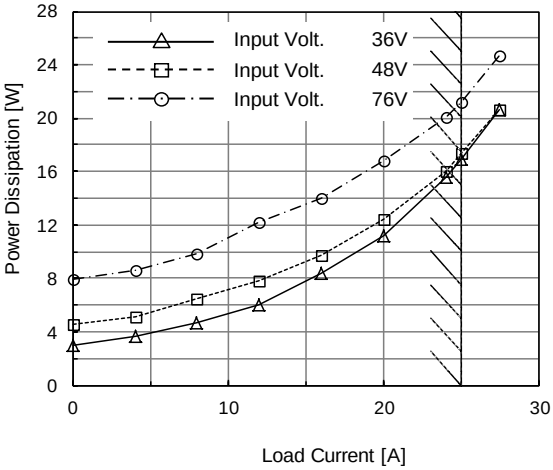
(a) Load Regulation



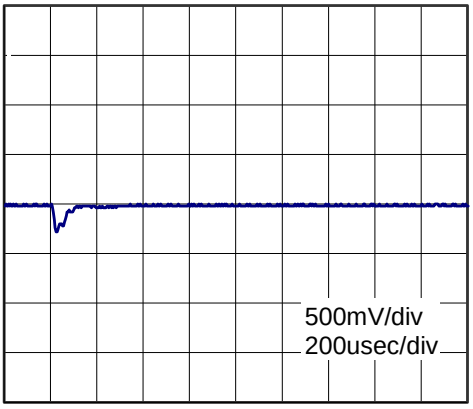
(b) Line Regulation



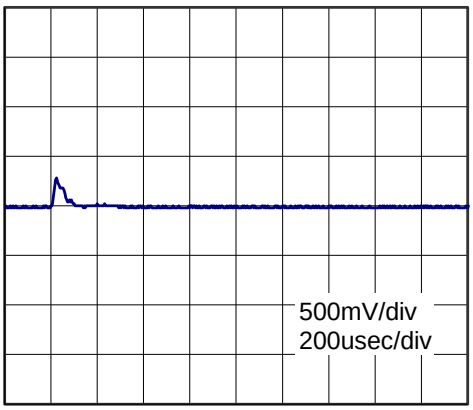
(c) Efficiency (by Load Current)



(d) Power Dissipation(by Load Current)



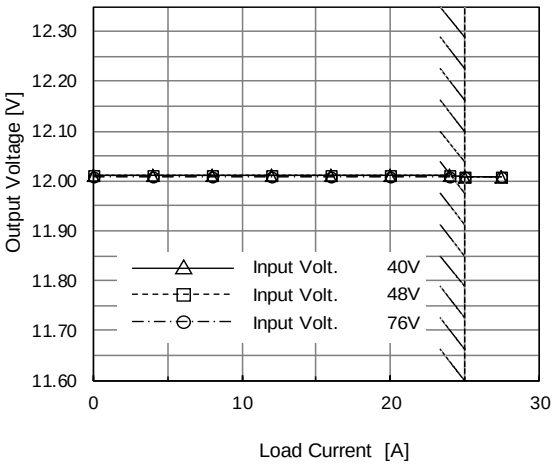
(e) Dynamic Load Response
Load 50%(12.5A)→Load 100%(25A)／50us
Vin 48V,Vout 12V



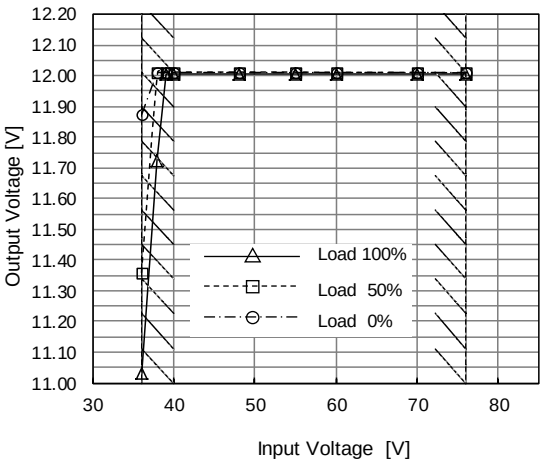
(f) Dynamic Load Response
Load 100%(25A)→Load 50%(12.5A)／50us
Vin 48V,Vout 12V

5.5.6 CHS3004812H

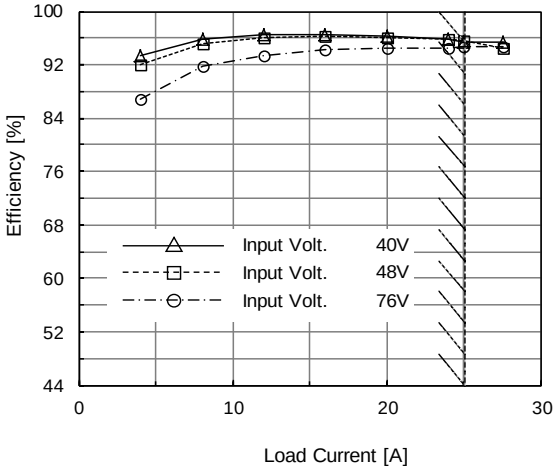
Fig.5.5.6 Overview of CHS3004812H at 25℃



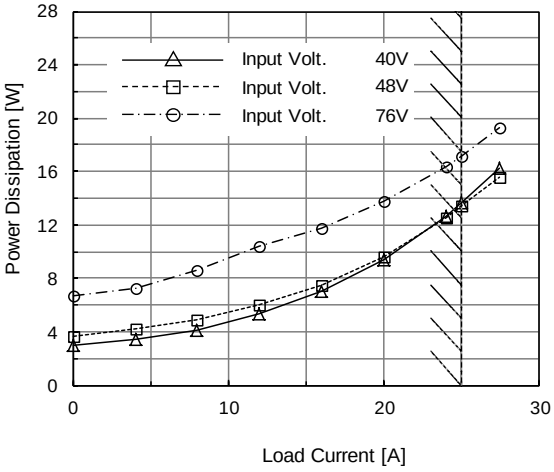
(a) Load Regulation



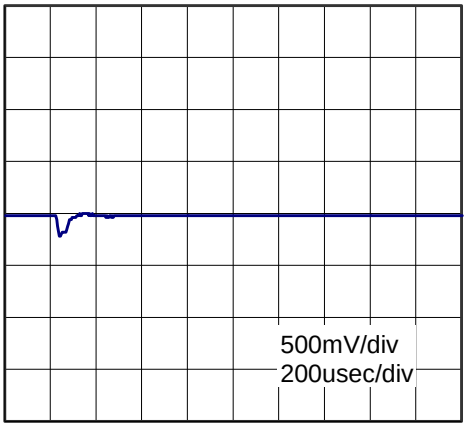
(b) Line Regulation



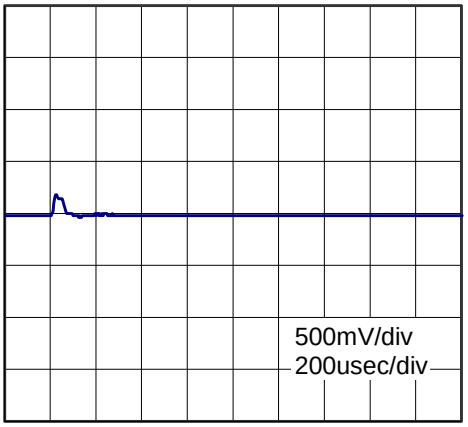
(c) Efficiency (by Load Current)



(d) Power Dissipation(by Load Current)



(e) Dynamic Load Response
Load 50%(12.5A)→Load 100%(25A)／50us
Vin 48V,Vout 12V

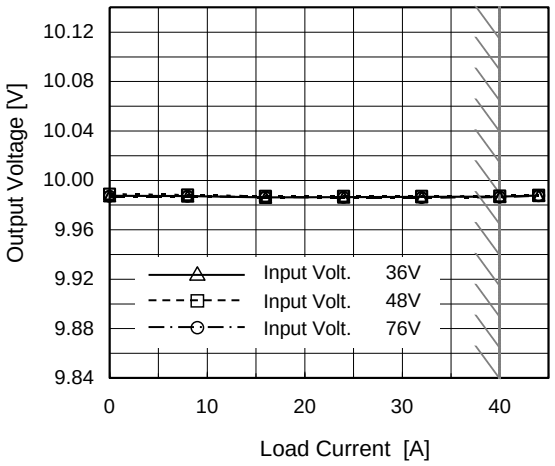


(f) Dynamic Load Response
Load 100%(25A)→Load 50%(12.5A)／50us
Vin 48V,Vout 12V

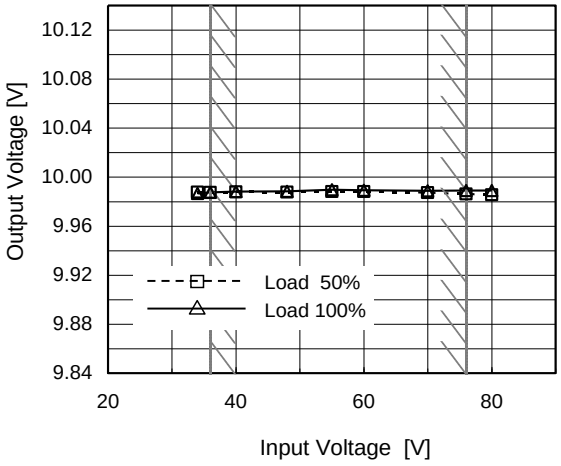
5.6 CHS400

5.6.1 CHS4004810

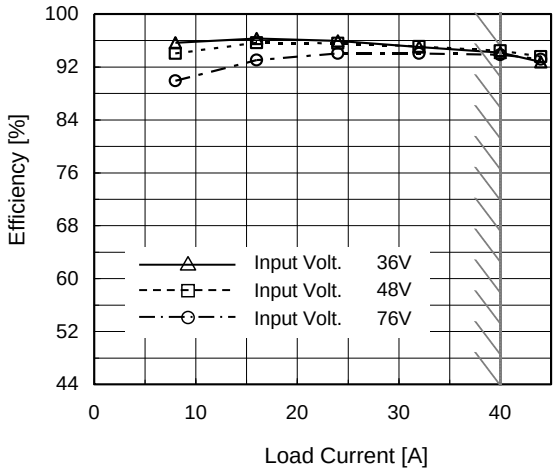
Fig.5.6.1
Overview of
CHS4004810 at 25℃



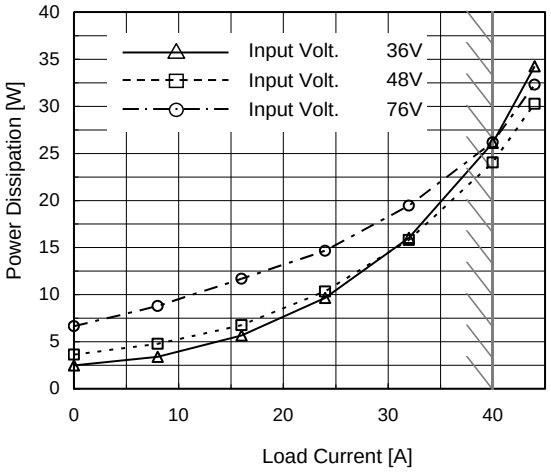
(a) Load Regulation



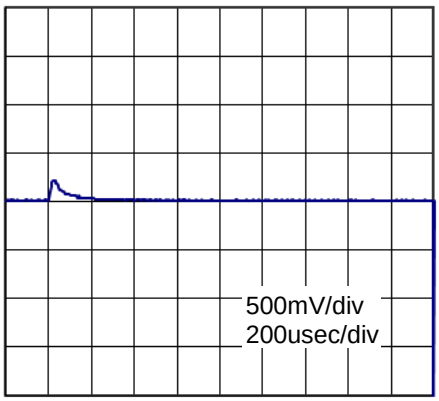
(b) Line Regulation



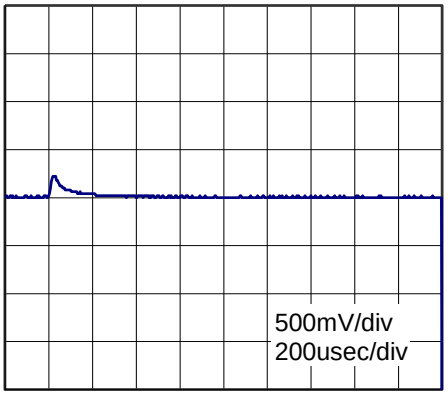
(c) Efficiency (by Load Current)



(d) Power Dissipation(by Load Current)



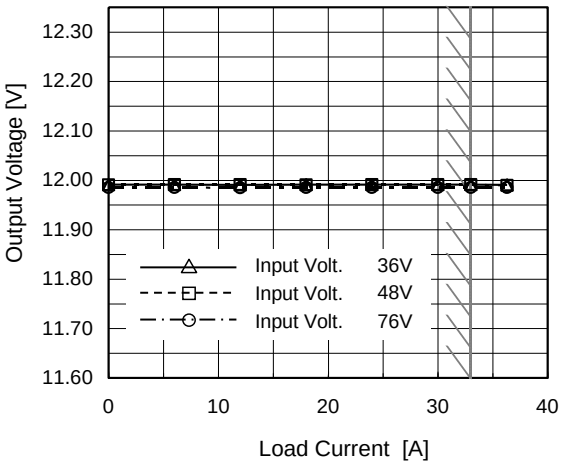
(e) Dynamic Load Response
Load 50%(20A)→Load 100%(40A)／50us
Vin 48V,Vout 10V



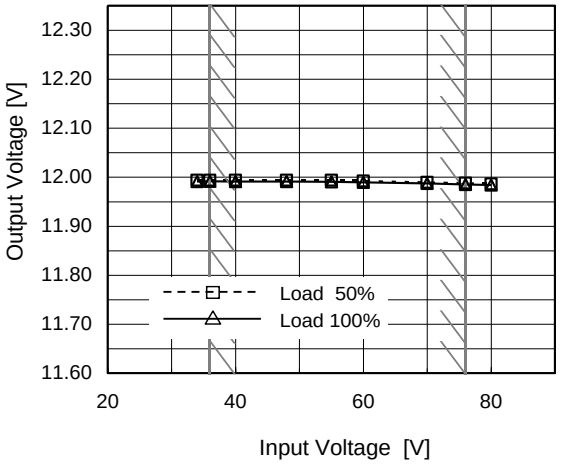
(f) Dynamic Load Response
Load 100%(40A)→Load 50%(20A)／50us
Vin 48V,Vout 10V

5.6.2 CHS4004812

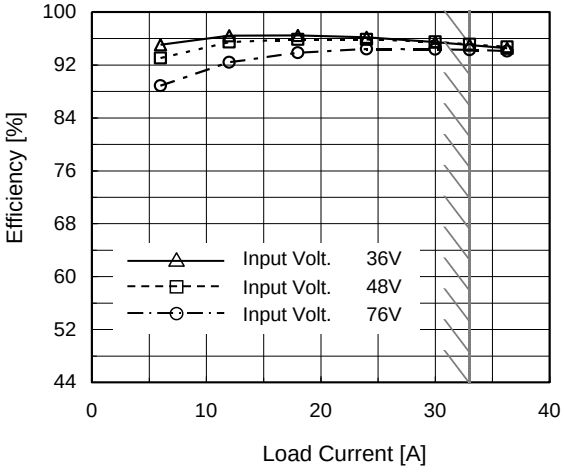
Fig.5.6.2
Overview of
CHS4004812 at 25℃



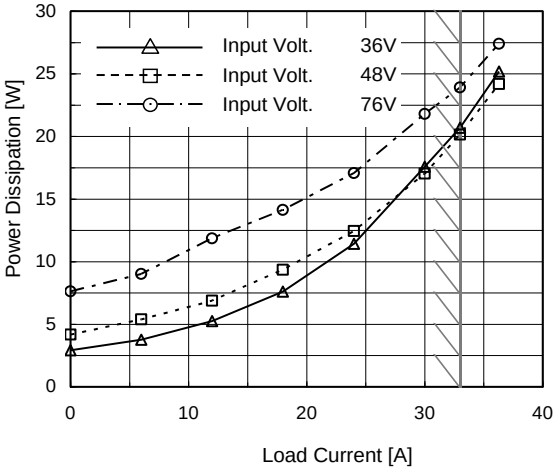
(a) Load Regulation



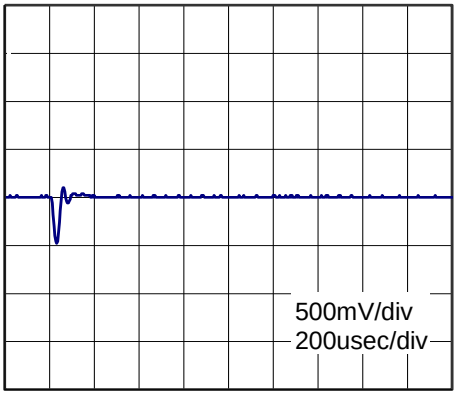
(b) Line Regulation



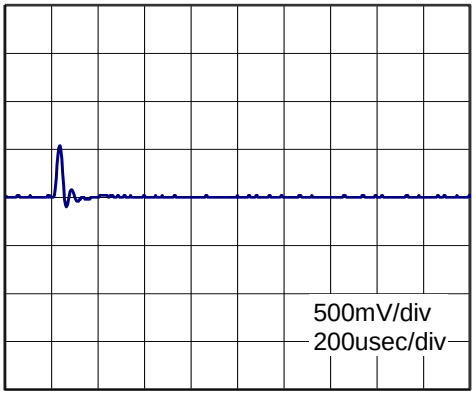
(c) Efficiency (by Load Current)



(d) Power Dissipation(by Load Current)



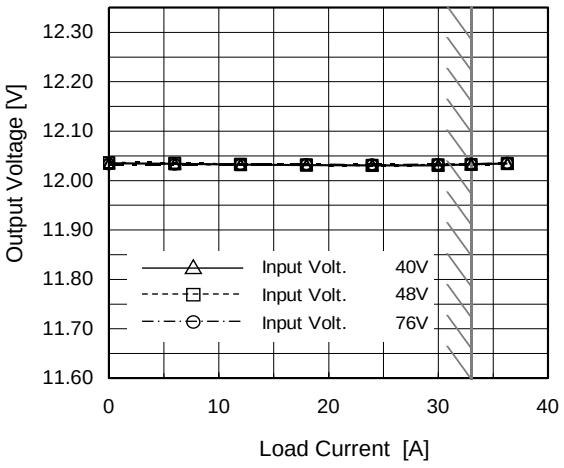
(e) Dynamic Load Response
Load 50%(16.5A)→Load 100%(33A)／50us
Vin 48V,Vout 12V



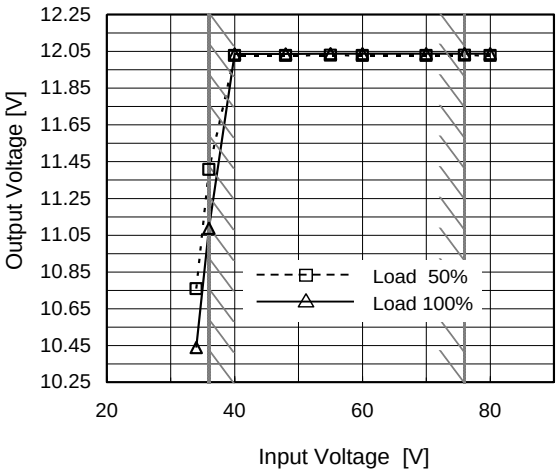
(f) Dynamic Load Response
Load 100%(33A)→Load 50%(16.5A)／50us
Vin 48V,Vout 12V

5.6.3 CHS4004812H

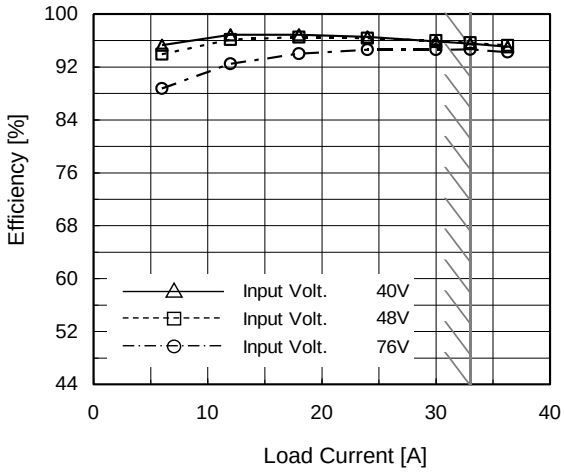
Fig.5.6.3
Overview of
CHS4004812H at 25℃



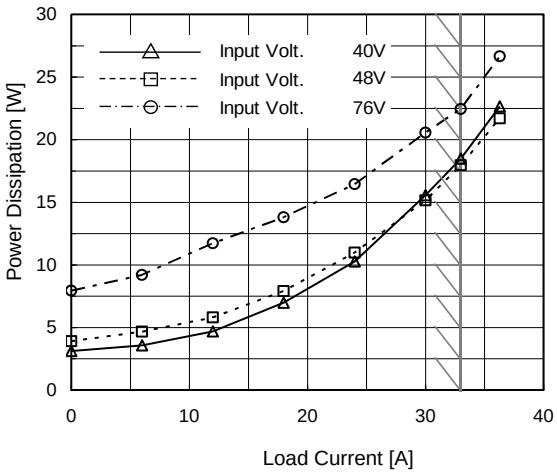
(a) Load Regulation



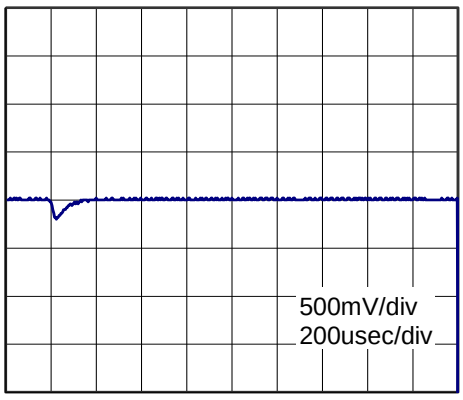
(b) Line Regulation



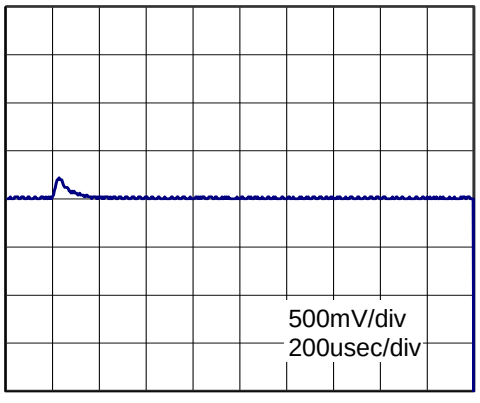
(c) Efficiency (by Load Current)



(d) Power Dissipation(by Load Current)



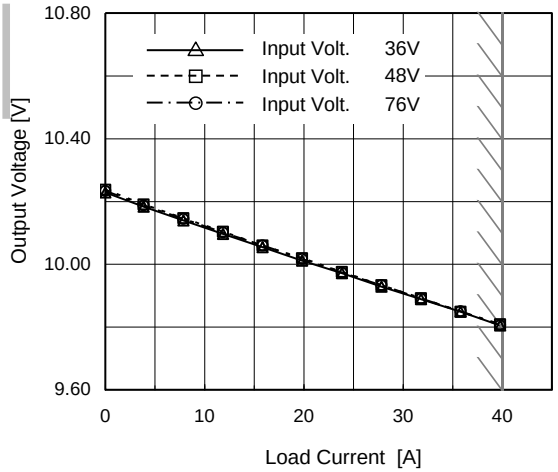
(e) Dynamic Load Response
Load 50%(16.5A)→Load 100%(33A)／50us
Vin 48V,Vout 12V



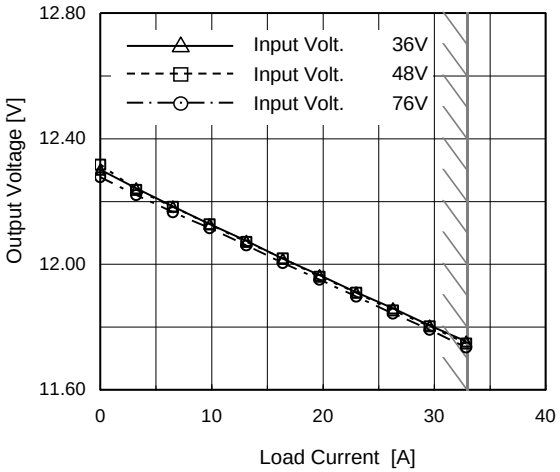
(f) Dynamic Load Response
Load 100%(33A)→Load 50%(16.5A)／50us
Vin 48V,Vout 12V

● CHS40048☐☐-P (Option "-P") Load Regulation

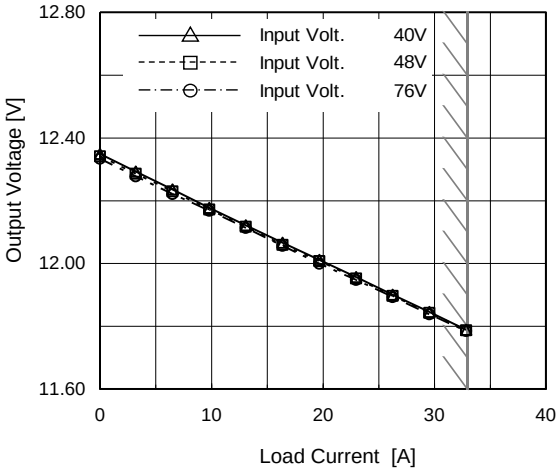
Fig.5.6.4
Load Regulation of
Option "-P"



(a) CHS4004810-P



(b) CHS4004812-P

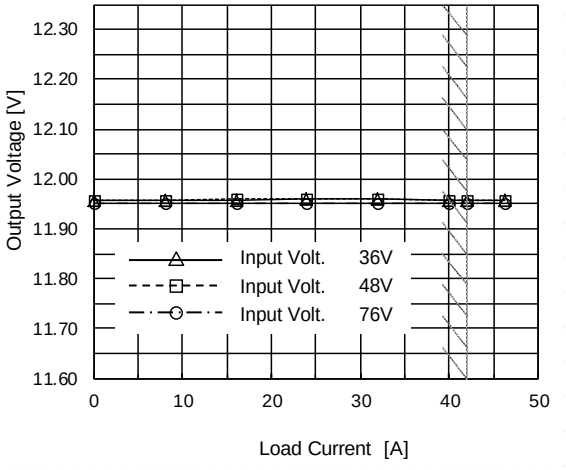


(c) CHS4004812H-P

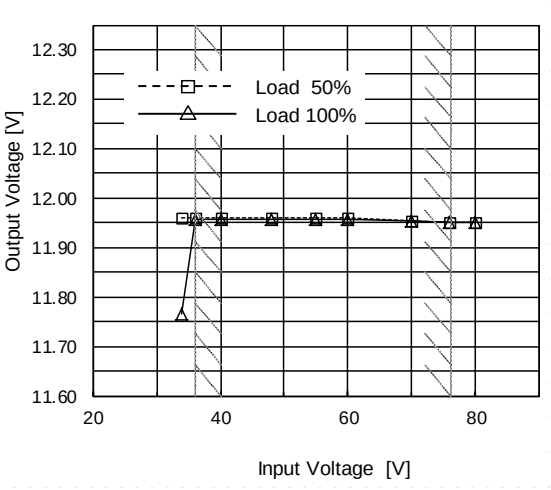
5.7 CHS500

5.7.1 CHS5004812

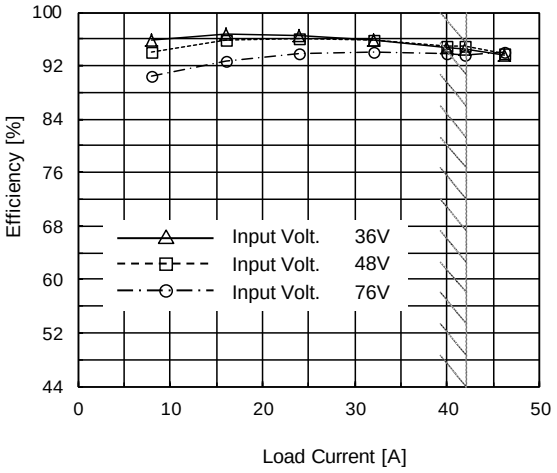
Fig.5.7.1
Overview of
CHS5004812 at 25℃



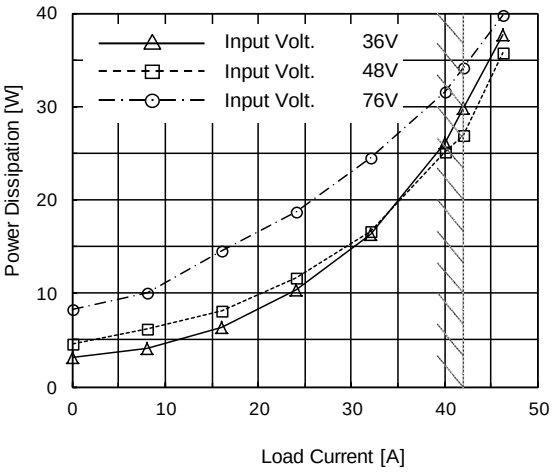
(a) Load Regulation



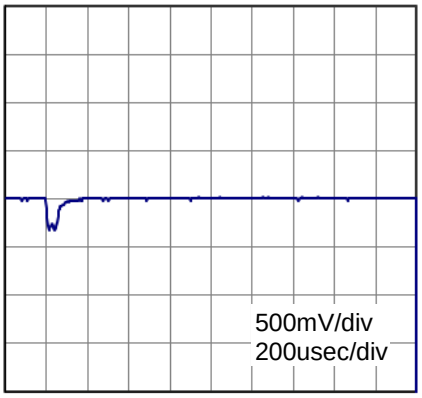
(b) Line Regulation



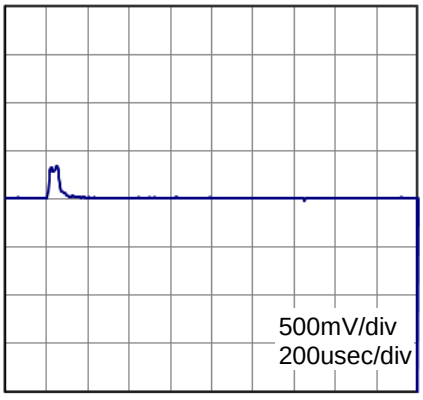
(c) Efficiency (by Load Current)



(d) Power Dissipation(by Load Current)



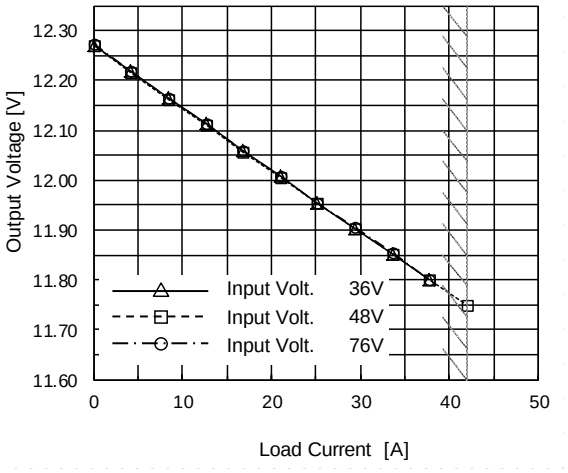
(e) Dynamic Load Response
Load 50%(21A)→Load 100%(42A)／50us
Vin 48V,Vout 12V



(f) Dynamic Load Response
Load 100%(42A)→Load 50%(21A)／50us
Vin 48V,Vout 12V

● CHS5004812-P (Option "-P") Load Regulation

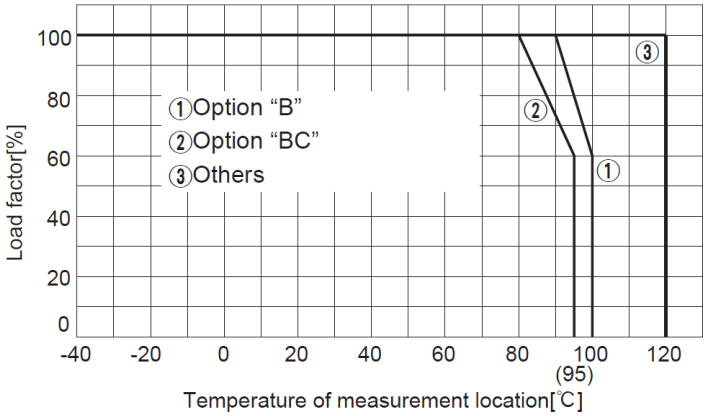
Fig.5.7.2
Load Regulation of
Option "-P"



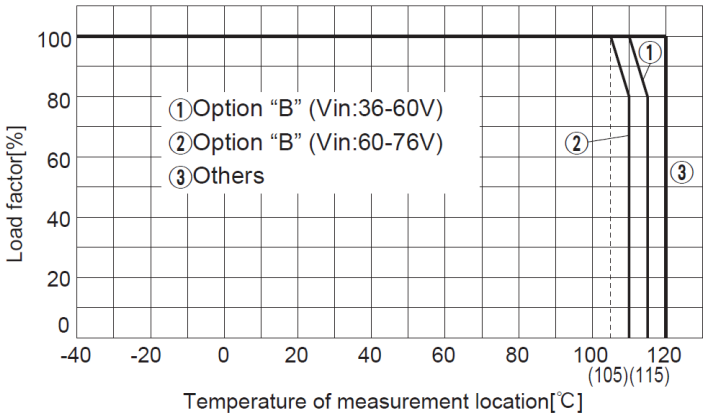
5.8 Derating

■ Use with the convection cooling or the forced air cooling.
Make sure the temperatures at temperature mesurement locations shown from Fig5.8.2~ Fig5.8.8 below are on or under the derating curve in Fig5.8.1.
Ambient temperature must be kept at 85℃ or under.

Fig.5.8.1
Derating curve
for CHS



(a) CHS60, CHS80, CHS200, CHS300, CHS400, CHS500



(b) CHS120

Fig.5.8.2
Temperature
measurement
location for CHS60

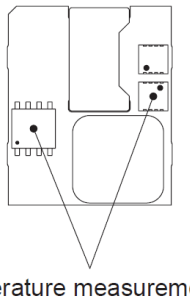


Fig.5.8.3
Temperature
measurement
location for CHS80

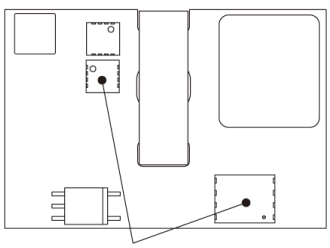


Fig.5.8.4 Temperature measurement location for CHS120

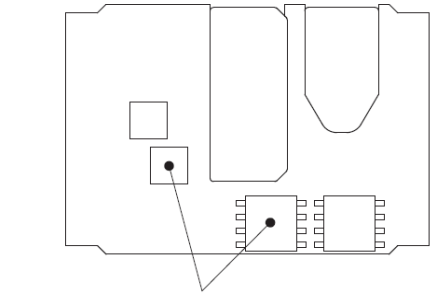


Fig.5.8.5 Temperature measurement location for CHS200

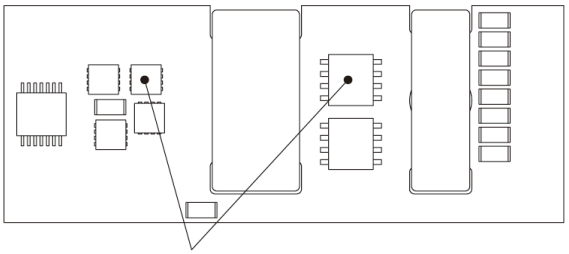


Fig.5.8.6 Temperature measurement location for CHS300

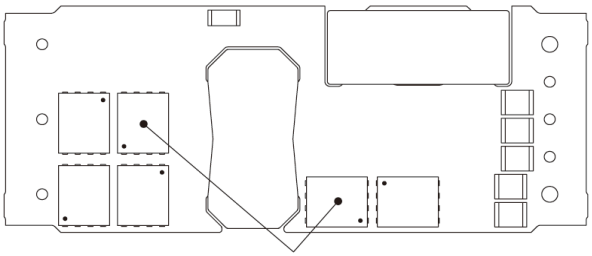


Fig.5.8.7 Temperature measurement location for CHS400

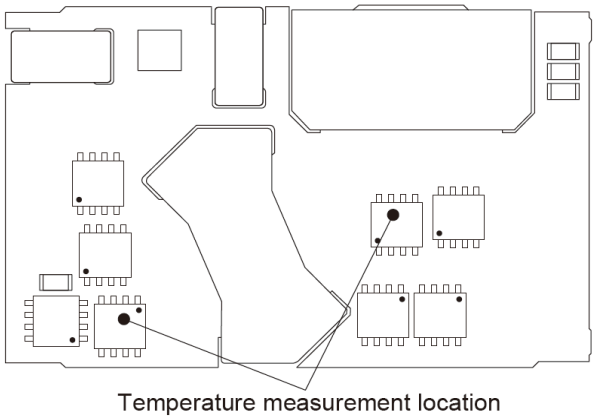
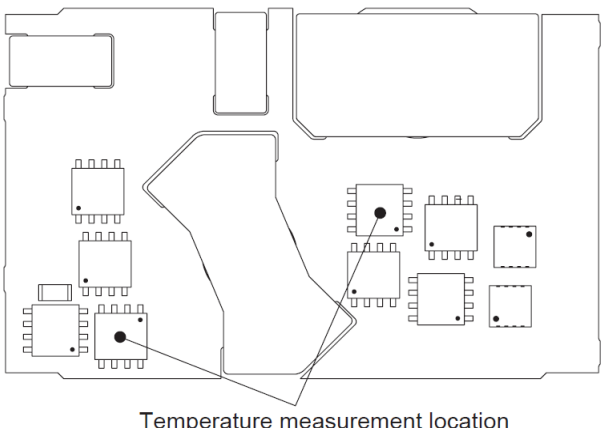


Fig.5.8.8 Temperature measurement location for CHS500



■ For option “-B” which is used with the convection cooling, forced air cooling or conduction cooling, use the temperature measurement location as shown in Fig.5.8.9 ～ Fig.5.8.11.

Fig.5.8.9
Measurement location
(CHS120 option "-B")

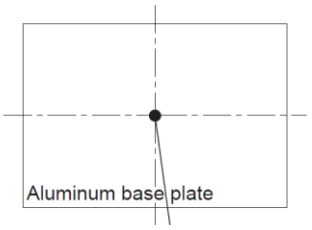


Fig.5.8.10
Measurement location
(CHS200/CHS300
option "-B")

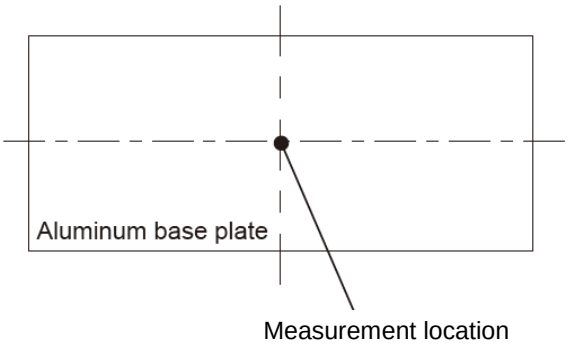
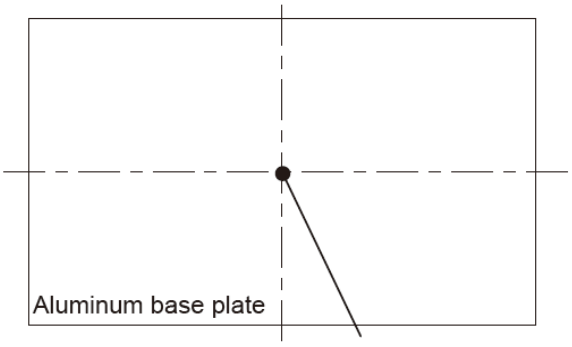


Fig.5.8.11
Measurement location
(CHS400/CHS500
option "-B")



■ Fig.5.8.13 ~ 5.8.34 show the derating curve in the condition that is measured as shown in Fig.5.8.12.
Verify final design by actual temperature measurement.
The temperature measurement lacation as shown in Fig.5.8.2 ~ Fig.5.8.8 must keep below 120℃.

Fig.5.8.12
Measuring method

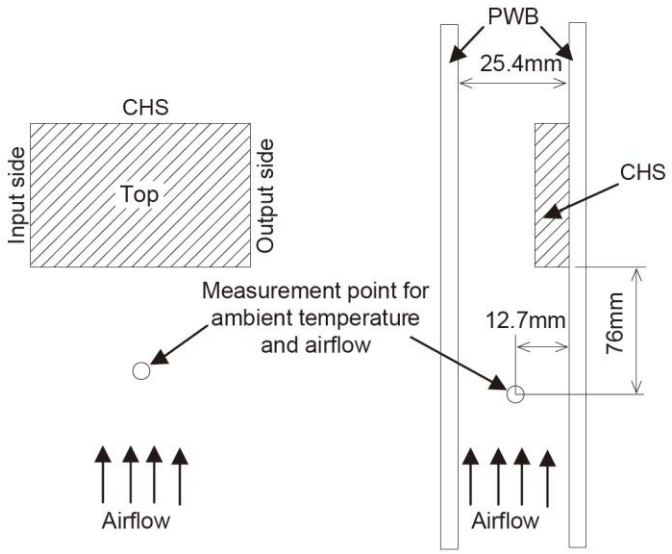


Fig.5.8.13
Derating curve
for CHS60483R3
Vin=48V

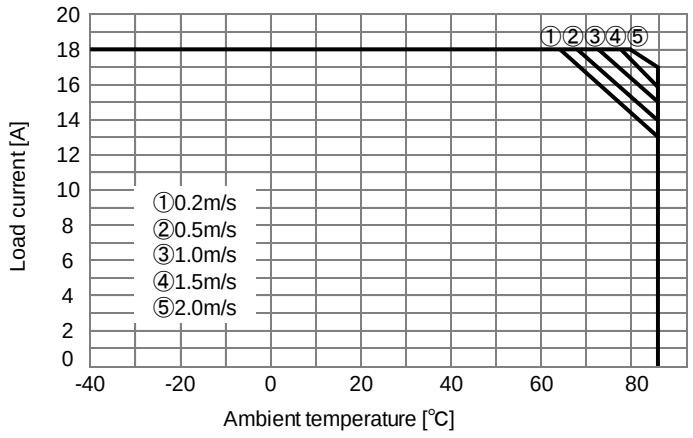


Fig.5.8.14
Derating curve
for CHS604805
Vin=48V

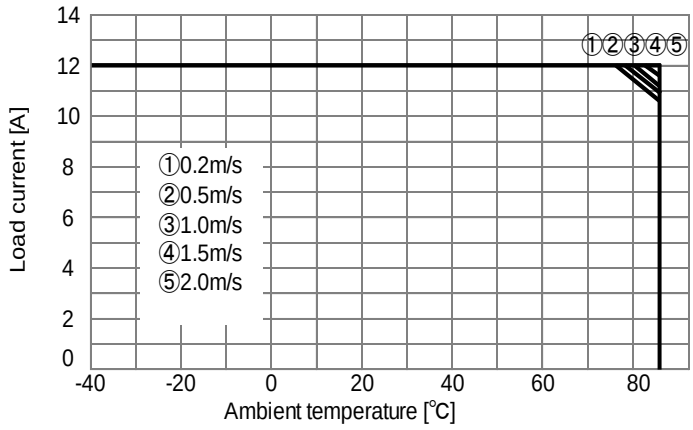


Fig.5.8.15
Derating curve
for CHS604812
Vin=48V

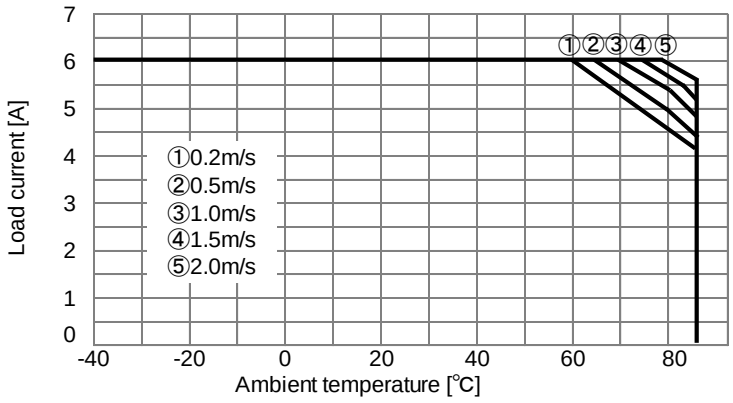


Fig.5.8.16
Derating curve
for CHS80483R3
Vin=48V

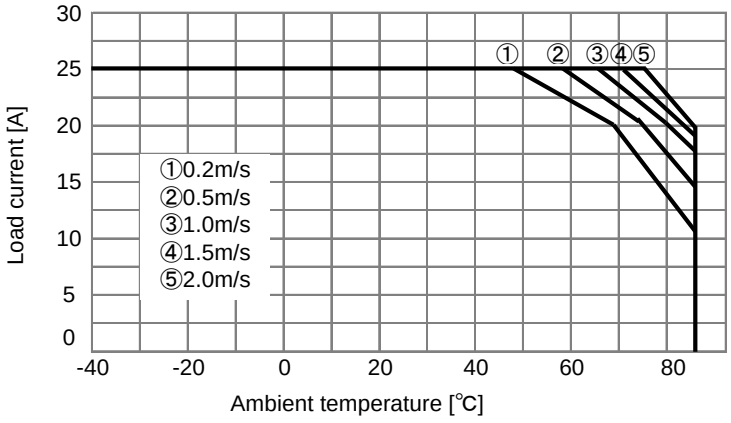


Fig.5.8.17
Derating curve
for CHS804805
Vin=48V

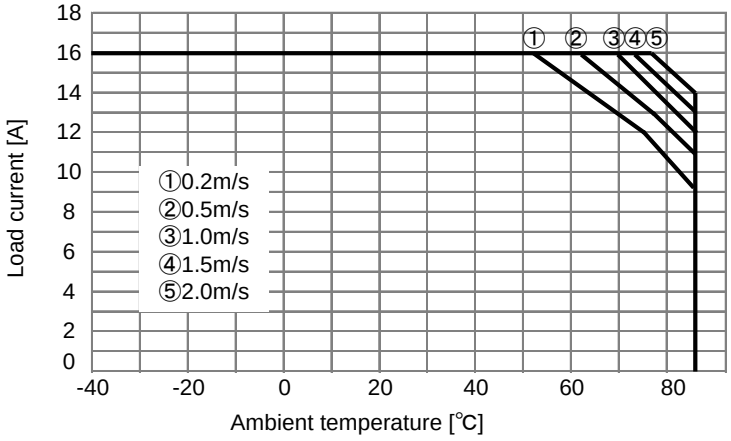


Fig.5.8.18
Derating curve
for CHS804812
Vin=48V

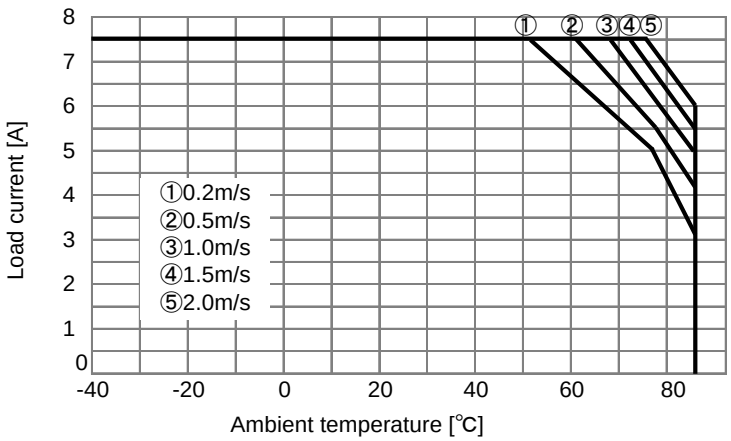


Fig.5.8.19
Derating curve
for CHS120483R3
Vin=48V

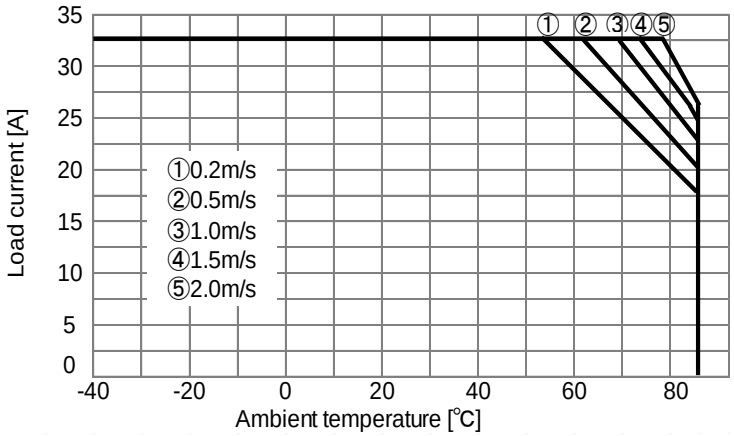


Fig.5.8.20
Derating curve
for CHS1204805
Vin=48V

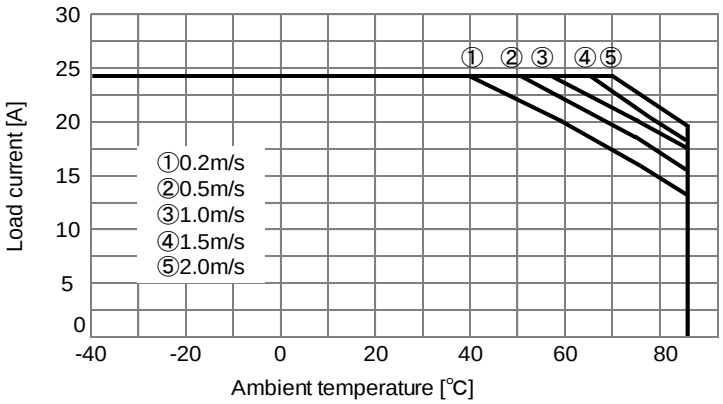


Fig.5.8.21
Derating curve
for CHS1204812
Vin=48V

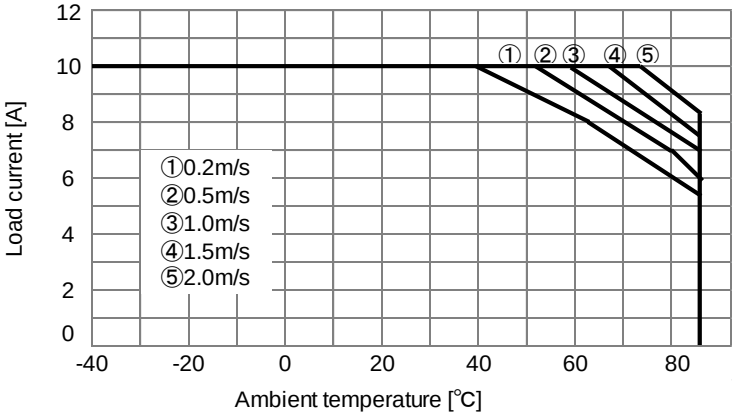


Fig.5.8.22
Derating curve
for CHS200483R3
Vin=48V

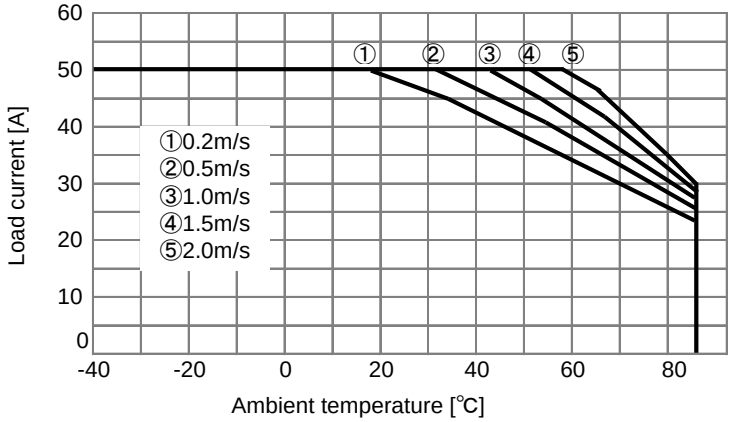


Fig.5.8.23
Derating curve
for CHS2004805
Vin=48V

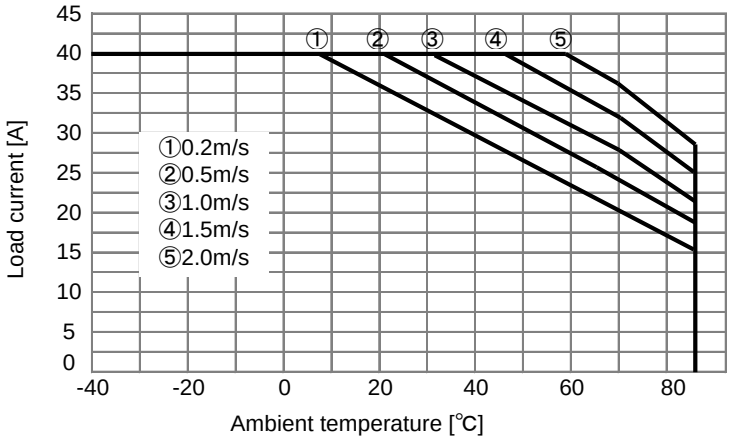


Fig.5.8.24
Derating curve
for CHS2004812
Vin=48V

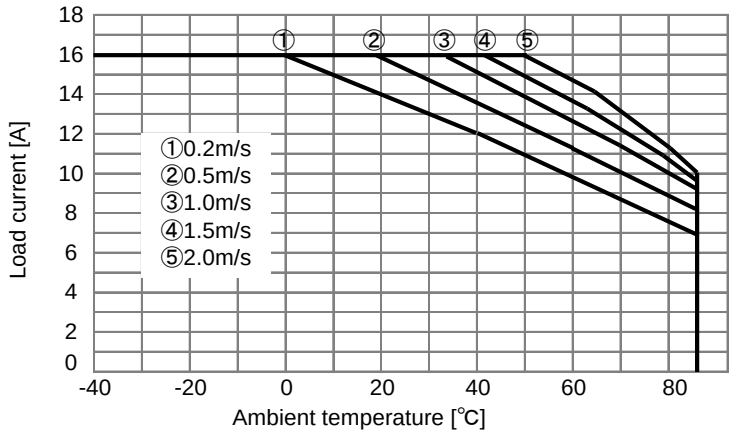


Fig.5.8.25
Derating curve
for CHS3002405
Vin=24V

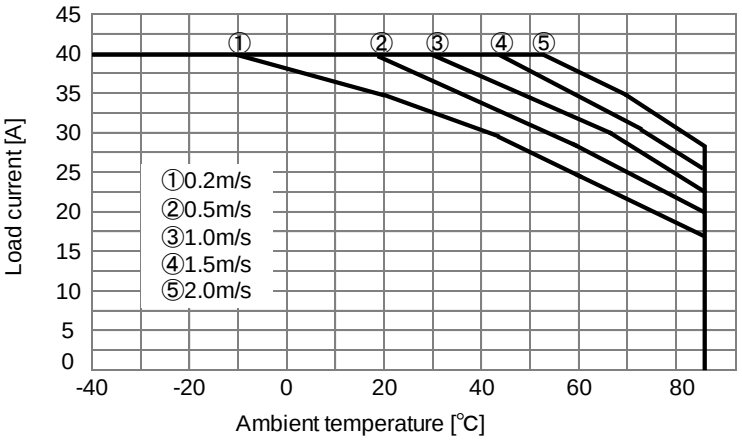


Fig.5.8.26
Derating curve
for CHS3002412
Vin=24V

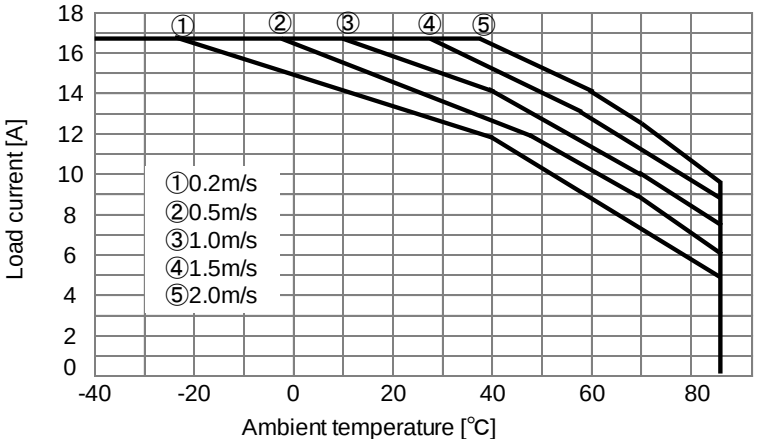


Fig.5.8.27
Derating curve
for CHS3002415
Vin=24V

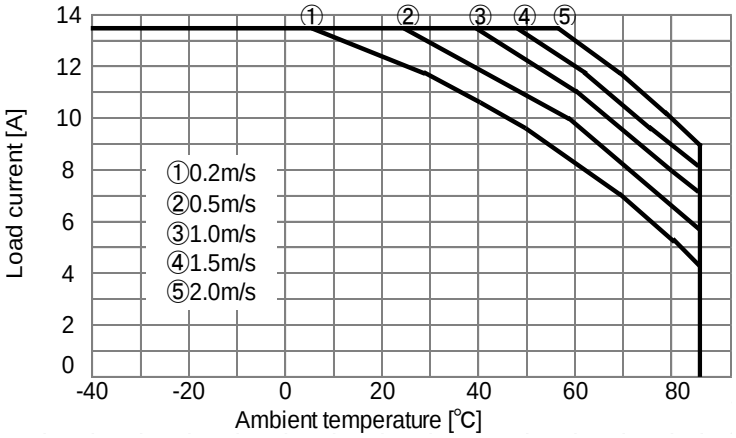


Fig.5.8.28
Derating curve
for CHS3004810
Vin=48V

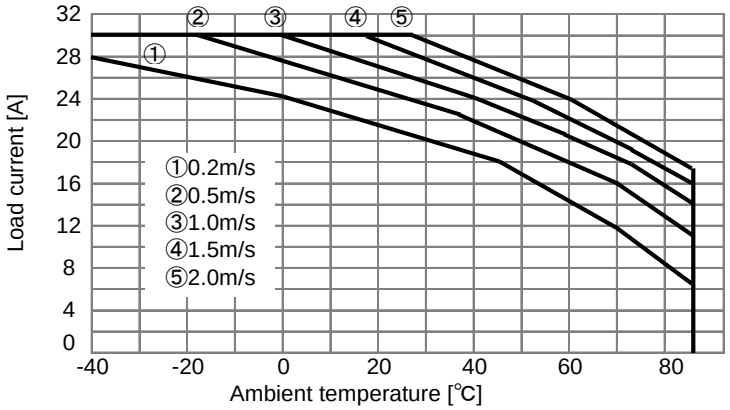


Fig.5.8.29
Derating curve
for CHS3004812
Vin=48V

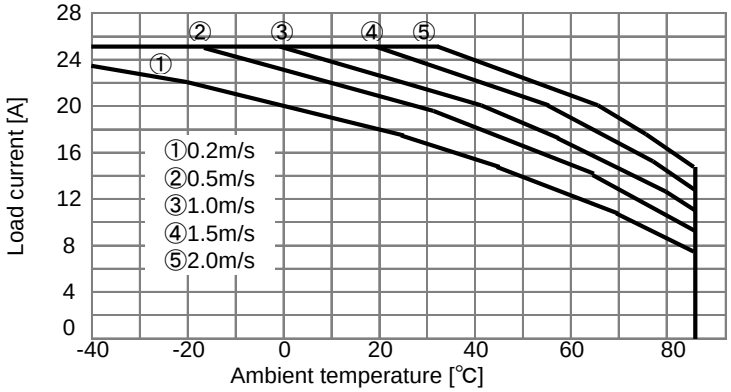


Fig.5.8.30
Derating curve
for CHS3004812H
Vin=48V

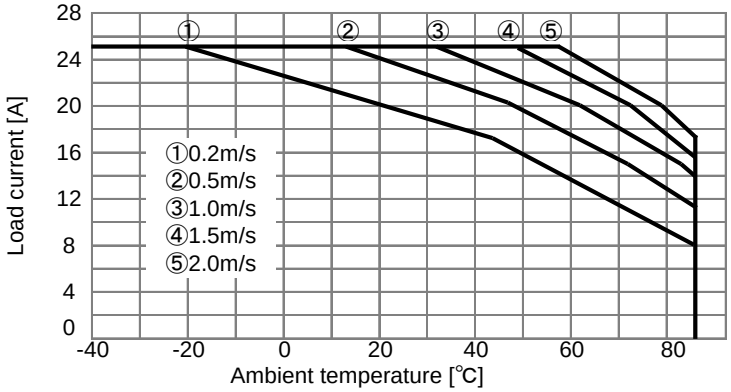


Fig.5.8.31
Derating curve
for CHS4004810
Vin=48V

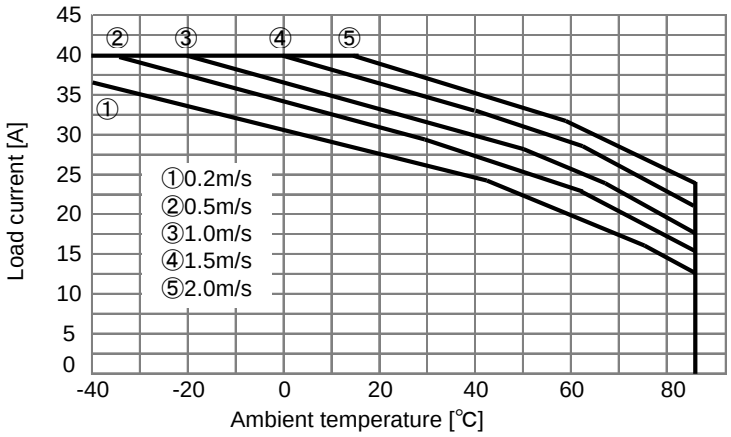


Fig.5.8.32
Derating curve
for CHS4004812
Vin=48V

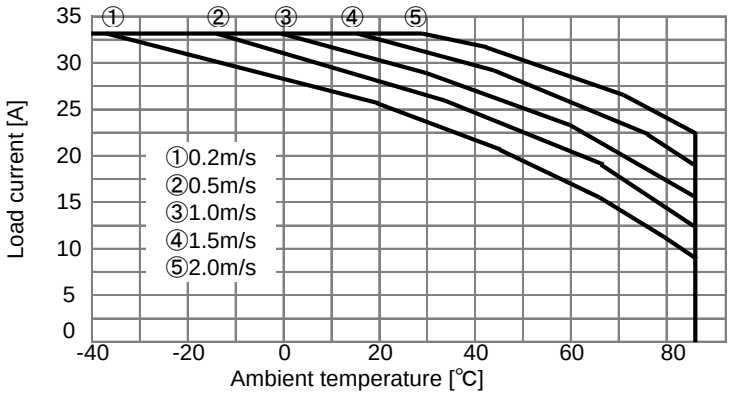


Fig.5.8.33
Derating curve
for CHS4004812H
Vin=48V

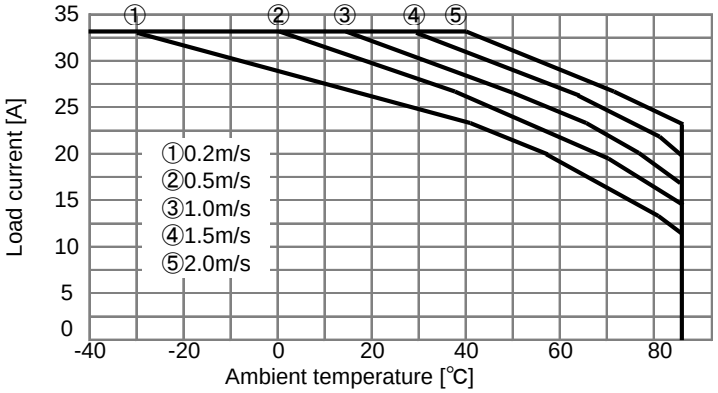
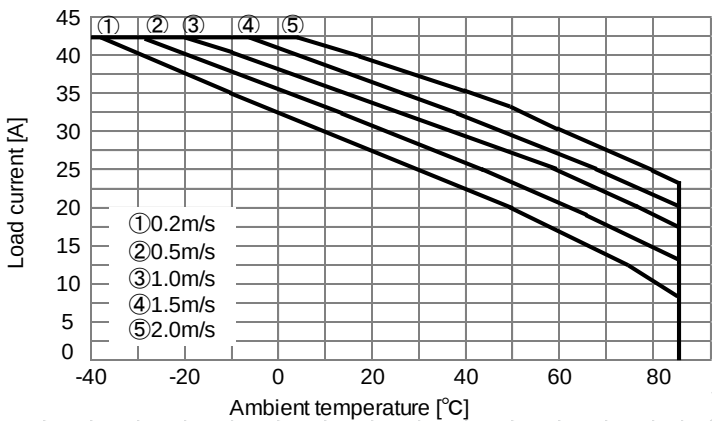


Fig.5.8.34
Derating curve
for CHS5004812
Vin=48V



6. Adjustable voltage range

6.1 Output voltage adjusting method by external potentiometor

- Output voltage is adjustable by the external potentiometer.
- When the output voltage adjustment is used, note that the over voltage protection circuit operates when the output voltage is set to for CHS
- If the output voltage drops under the output voltage adjustment range, the Low voltage protection operates.
- By connecting the external potentiometer (VR1) and resistors (R1,R2), output voltage becomes adjustable, as shown in Fig.6.1.1. Recommended external parts are shown in Table 6.1.1.
- The wiring to the potentiometer should be as short as possible. The temperature coefficient could become worse, depending on the type of a resistor and potentiometer. Following parts are recommended for the power supply.
  Resistor : Metal film type, coefficient of less than ±100ppm/C
  Potentiometer : Cermet type, coefficient of less than ±300ppm/C
- When the output voltage adjustment is not used, open the TRM pin respectively.
- The changes speed of the TRM voltages should be less than 0.15V/ms, when changing output voltage to less than 90%of the rated.

Fig.6.1.1
Output voltage control circuit

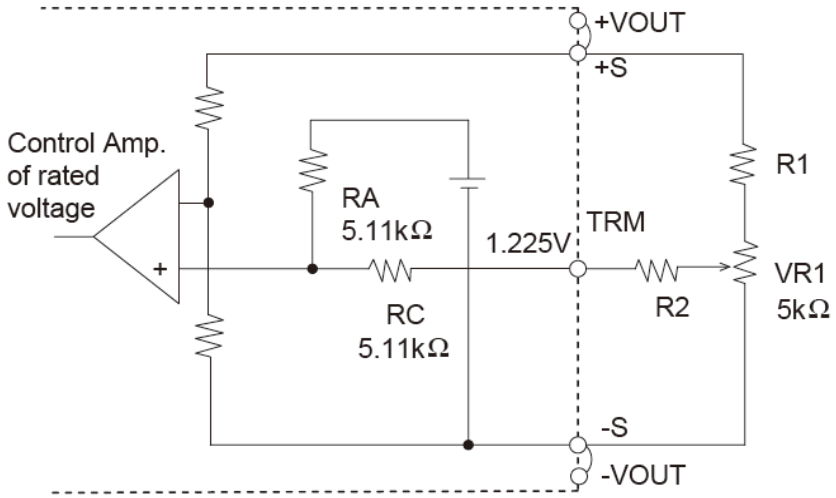


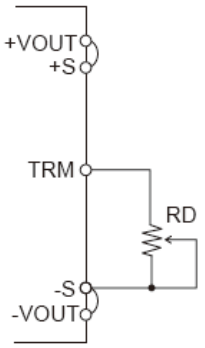
Table 6.1.1
Recommended value of external potentiometer & resistor

No.	VOUT	Output adjustable range					
		VOUT ±5%			VOUT ±10%		
		R1	R2	VR1	R1	R2	VR1
1	3.3V	2.2kΩ	68kΩ	5kΩ	2.2kΩ	33kΩ	5kΩ
2	5V	4.7kΩ	68kΩ		5.6kΩ	33kΩ	
3	10V	15kΩ	68kΩ		15kΩ	33kΩ	
4	12V	18kΩ	68kΩ		18kΩ	33kΩ	
5	15V	22kΩ	68kΩ		22kΩ	33kΩ	

6.2 Output voltage decreasing by external resistor

■ By connecting the external resistor (RD), output voltage becomes adjustable to decrease.
The external resistor (RD) is calculated by the following equation.

Fig.6.2.1
Connection for
output voltage decreasing



$$RD = \frac{5.11}{\Delta} - 10.22\ [k\Omega]$$

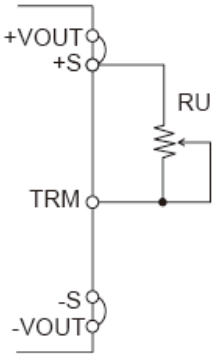
$$\Delta = \frac{V_{OR} - V_{OD}}{V_{OR}}$$

V_{OR} : Rated output voltage [V]
V_{OD} : Output voltage needed to set up [V]

6.3 Output voltage increasing by external resistor

■ By connecting the external resistor (RU), output voltage becomes adjustable to increase.
The external resistor (RU) is calculated by the following equation.

Fig.6.3.1
Connection for
output voltage increasing



$$RU = \frac{5.11 \times V_{OR} \times (1+\Delta)}{1.225 \times \Delta} - \frac{5.11}{\Delta} - 10.22\ [k\Omega]$$

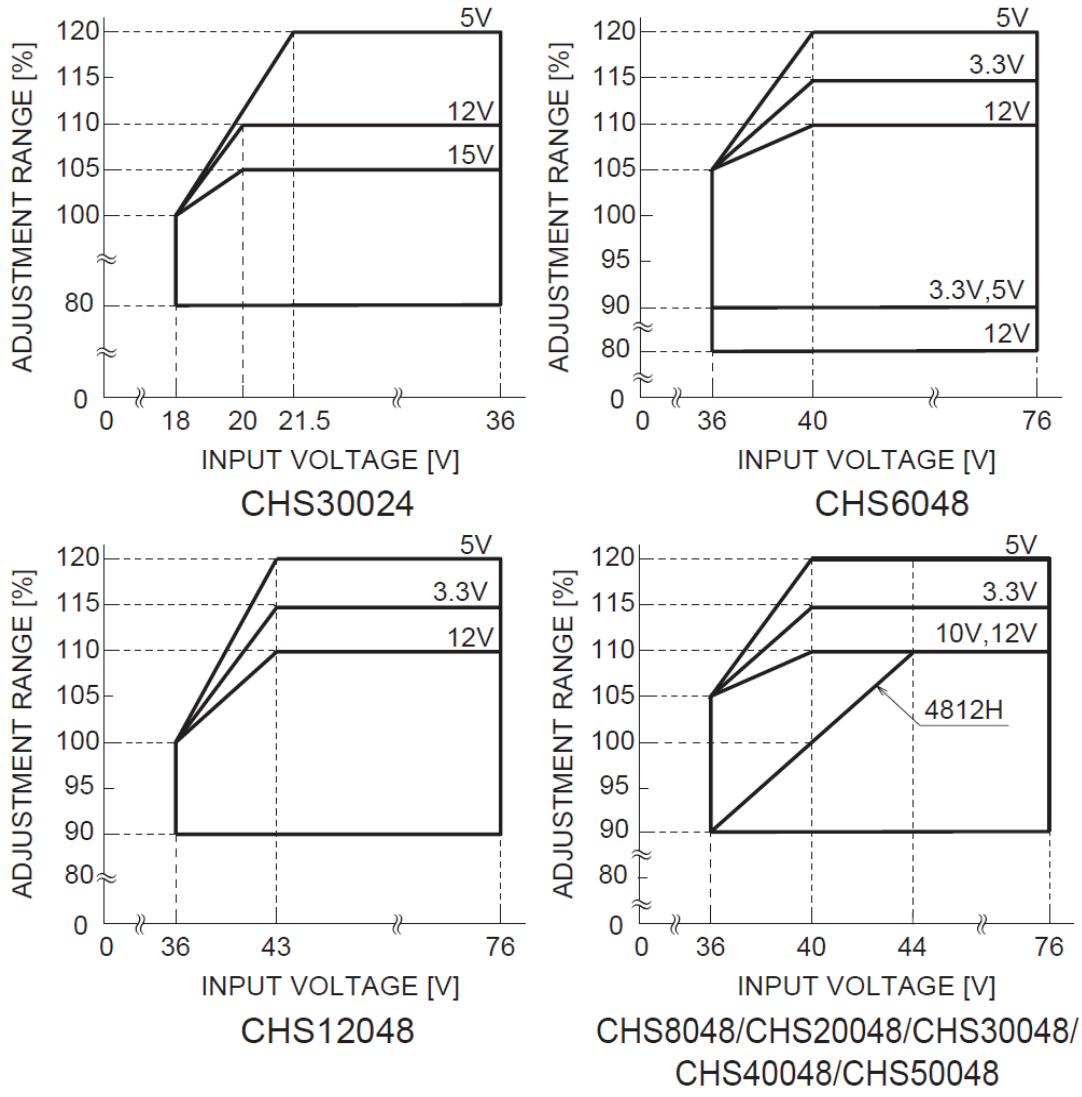
$$\Delta = \frac{V_{OU} - V_{OR}}{V_{OR}}$$

V_{OR} : Rated output voltage [V]
V_{OU} : Output voltage needed to set up [V]

6.4 Input voltage derating

■ When input voltage is 18-21.5V DC or 36-44V DC, the output voltage adjustment range becomes as shown in Fig.6.4.1.

Fig.6.4.1
CHS output voltage adjustment range



7. Protect circuit

7.1 Overcurrent Protection

- Over Current Protection (OCP) is built in and works at 105% of the rated current or higher. However, use in an over current situation must be avoided whenever possible. The output voltage of the power module will recover automatically if the fault causing over current is corrected.

  When the output voltage drops after OCP works, the power module enters a ”hiccup mode” where it repeatedly turns on and off at a certain frequency.

7.2 Overvoltage protection

- The overvoltage protection circuit is built-in. The DC input should be shut down if overvoltage protection is in operation.
  The output voltage of the power module will recover automatically if the fault causing over voltage is corrected.

  Remarks :
  Please note that devices inside the power supply might fail when voltage more than rated output voltage is applied to output pin of the power supply. This could happen when the customer tests the overvoltage performance of the unit.

7.3 Thermal protection

- When the power supply temperature is kept above 120℃, the thermal protection will be activated and simultaneously shut down the output.
  The output voltage of the power supply will recover automatically if the unit is cool down,

● Option "-U"

Option "-U" means output is shut down when the abovementioned protection circuit is activated.
If this happens, protection circuit can be inactivated by cycling the DC input power off for at least 1 second or toggling Remote ON/OFF signal.

8. Remote ON/OFF

■ Remote ON/OFF circuit is built-in on the input side (RC).
The ground pin of input side remote ON/OFF circuit is "-VIN" pin.

Table 8.1.1
Specification of
Remote ON/OFF
(CHS80,CHS200)

	ON/OFF logic	Between RC and GND	Output voltage
Standard	Negative	L level(0 - 0.8V) or short	ON
		H level(2.0 - 7.0V) or opent	OFF
Optional -R	Positive	L level(0 - 0.8V) or short	OFF
		H level(2.0 - 7.0) or opent	ON

When RC is "Low Level,fan out current is 0.1mA typ.
When Vcc is applied, use 2.0≦Vcc≦7.0V.

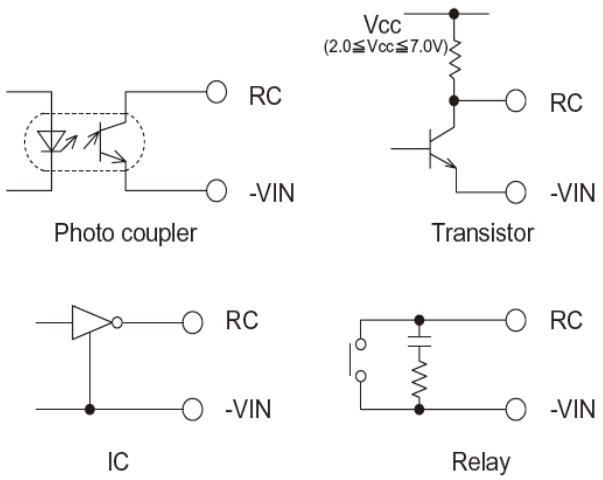
Table 8.1.2
Specification of
Remote ON/OFF
(CHS60, CHS120, CHS300
CHS400, CHS500)

	ON/OFF logic	Between RC and GND	Output voltage
Standard	Negative	L level(0 - 0.8V) or short	ON
		H level(4.0 - 7.0V) or opent	OFF
Optional -R	Positive	L level(0 - 0.8V) or short	OFF
		H level(4.0 - 7.0) or opent	ON

When RC is "Low Level,fan out current is 0.1mA typ.
When Vcc is applied, use 4.0≦Vcc≦7.0V.

■ When remote ON/OFF function is not used, please short between RC and -VIN (-R: open between RC and -VIN).

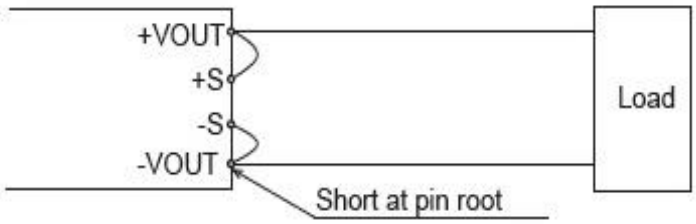
Fig 8.1.1
RC connection
example



9. Remote sensing

9.1 When the remote sensing function is not in use

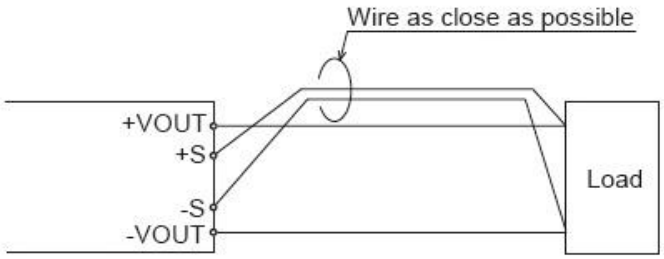
Fig. 9.1.1 Connection when the remote sensing is not in use



- When the remote sensing function is not in use, it is necessary to confirm that pins are shorted between +S and +VOUT ,and between -S and -VOUT.
- Wire between +S and +VOUT ,and between -S and -VOUT as short as possible. Loop wiring should be avoided. This power supply might become unstable by the noise coming from poor wiring.

9.2 When the remote sensing function is in use

Fig. 9.2.1 Connection when the remote sensing is in use



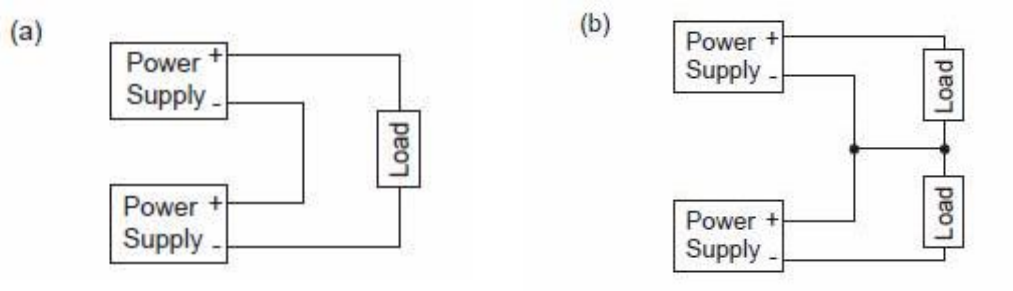
- Twisted-pair wire or shield wire should be used for sensing wire.
- Thick wire should be used for wiring between the power supply and a load. Line drop should be less than 0.3V. Voltage between +VOUT and -VOUT should remain within the output voltage adjustment range.
- If the sensing patterns are short, heavy-current is drawn and the pattern may be damaged. The pattern disconnection can be prevented by installing the protection parts as close as possible to a load.
- Output voltage might become unstable because of impedance of wiring and load condition when length of wire exceeds 40cm.

10. Serise operation / Parallel operation / Redundancy operation

10.1 Series operation

- Series operation is available by connecting the outputs of two or more power supplies, as shown below. Output current in series connection should be lower than the lowest rated current in each unit.

Fig. 10.1.1
Example of
Series operation



10.2 Parallel operation (CHS400 / CHS500 option "-P")

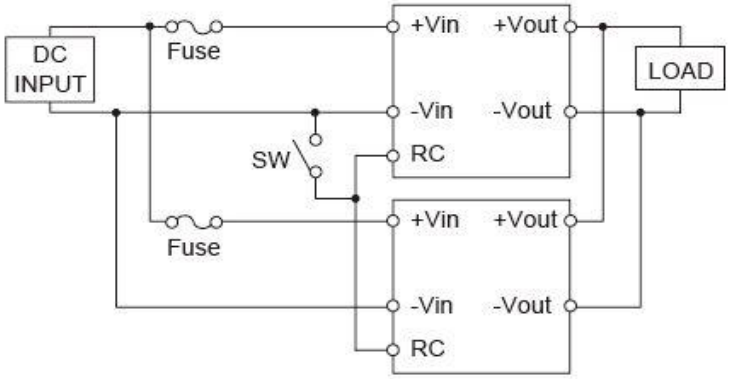
- Sensing and adjustment of the output voltage are not possible at the time of the use with option.

- As variance of output current drew from each power supply is maxmum 10%, the total output current must not exceed the value determined by the following equation.

  (Output current the Parallel operation)
  =(the rated current per unit) × (nunber of unit) × 0.9

  When the number of units in parallel operation increases, input current increase at the same time. Adequate wiring desing for input circuitry is required, such as circuit pattern, wiring and currentcapacity for equipment.
- Total number of units should be no more than 3 pieces.
- Thick wire should be used for wiring between the power supply and load, and line drop should be less than 0.3V.
- Connect each input pin for the lowest possible impedance.
- When the number of the units in parallel operation increases,inputcurrent increases. Adequate wiring design for input circuitry such as circuit pattern, wiring and current for equipment is required.

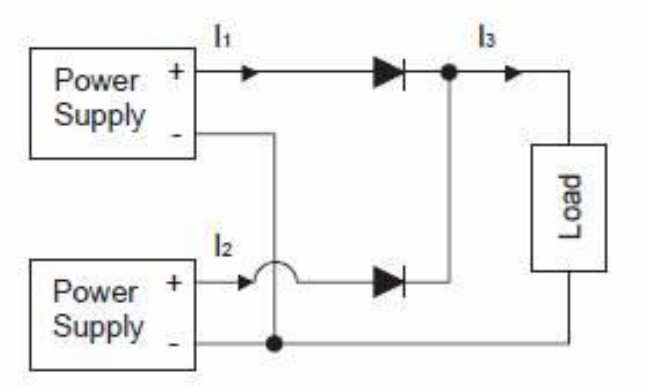
Fig. 10.2.1
Example of
parallel operation



10.3 Redundancy operation

■ Redundancy operation is available by wiring as shown below.

Fig. 10.3.1
Example of
Redundancy operation



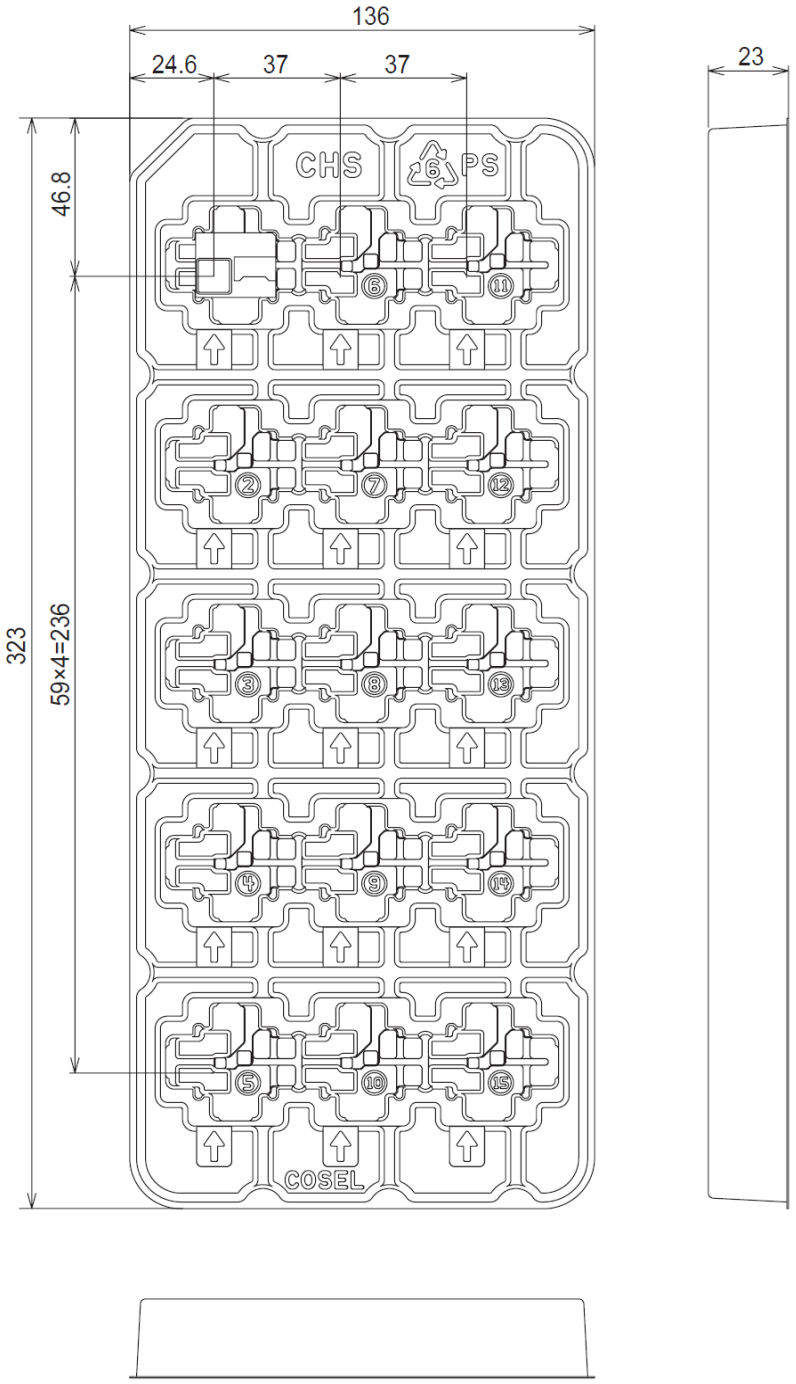
■ Even a slight difference in output voltage can affect the balance between the values of I1 and I2.
Please make sure that the value of I3 does not exceed the rated current of the power supply.

$I3 \leqq$ the rated current value

11. SMDtype(option "-S")package information

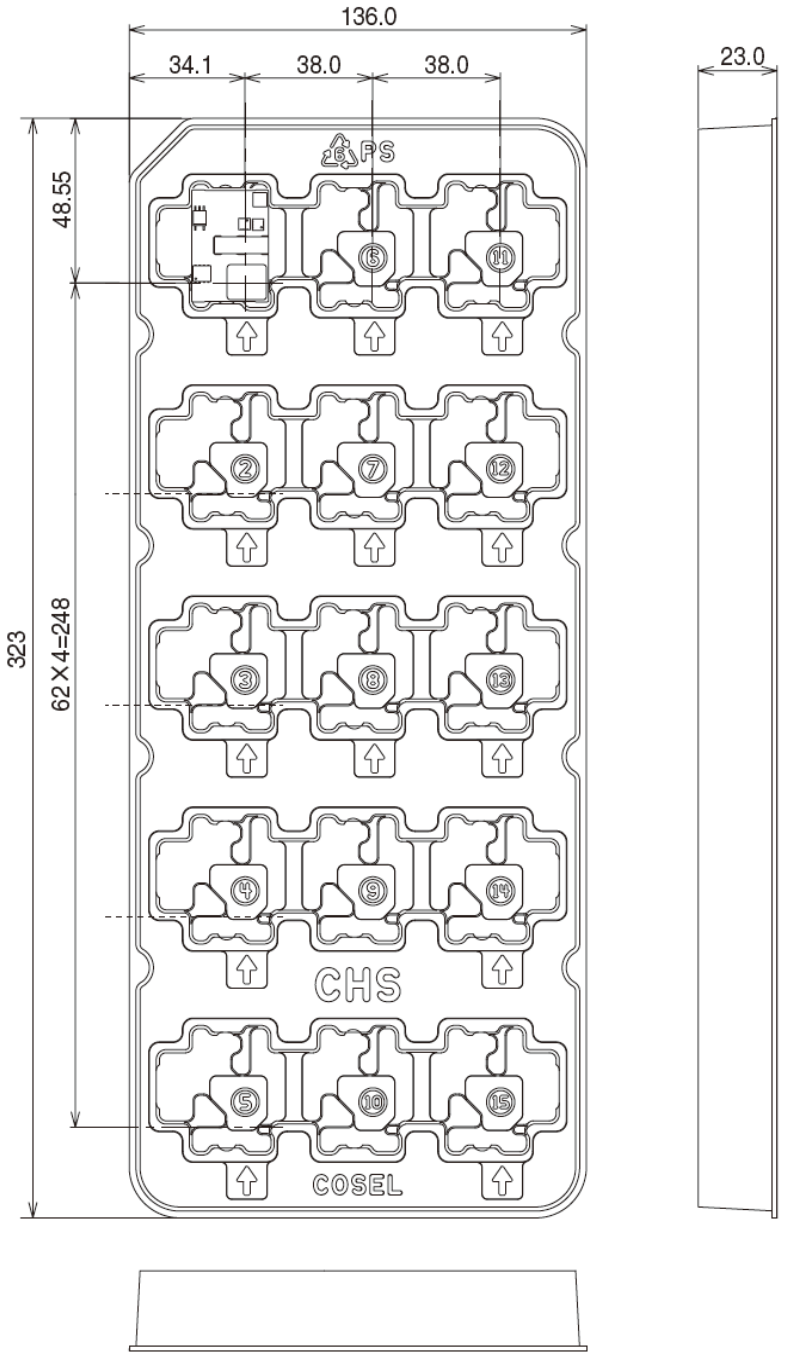
■ These are packed in a tray(Fig.11.1.1 to 11.1.3)
Please order "CHS□□-S" for tray type packaging.
Capacity of the tray is 15max.
In case of fractions, the units are stored in numerical order.

Fig. 11.1.1
Delivery package information(CHS60)



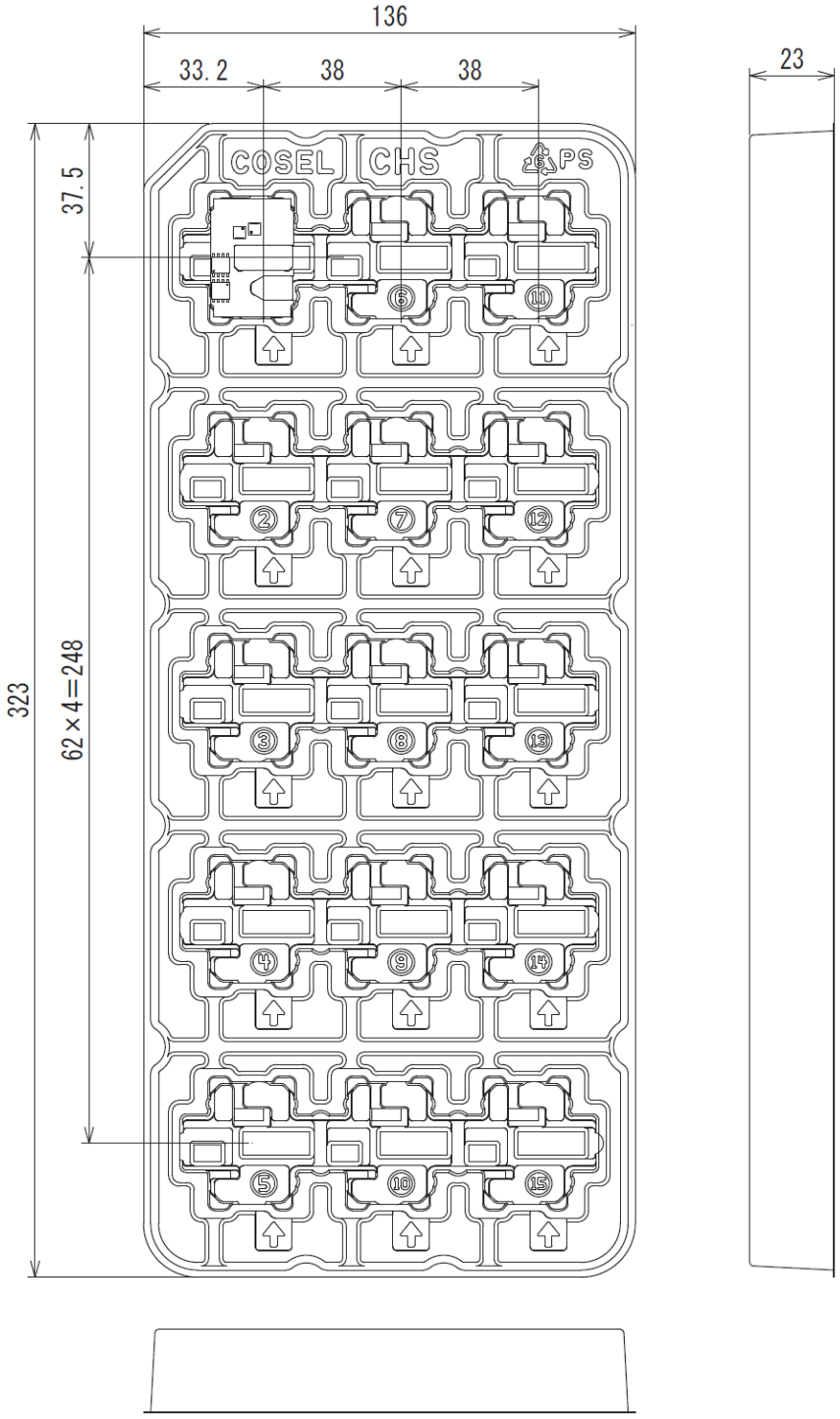
Dimensions in mm
Material : Conductive PS

Fig. 11.1.2
Delivery package information(CHS80)



Dimensions in mm
Material : Conductive PS

Fig. 11.1.3
Delivery package information(CHS120)



Dimensions in mm
Material : Conductive PS

COSEL

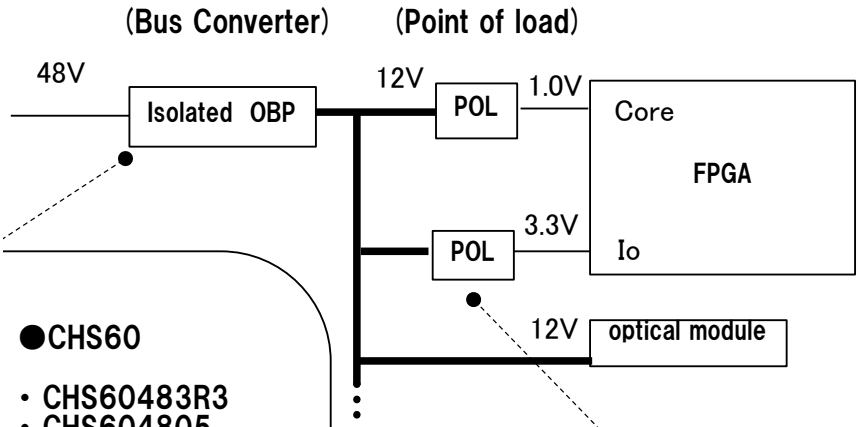
Qualification of Intermediate Bus Architecture

VER2.0

CHS series and BR series

1. Power Supply of Cosel for Intermediate Bus Architecture

Fig.1.1.1
Intermediate Bus
Architecture



CHS series

●CHS60

- CHS60483R3
- CHS604805
- CHS604812

●CHS80

- CHS80483R3
- CHS804805
- CHS804812

●CHS120

- CHS120483R3
- CHS1204805
- CHS1204812

●CHS200

- CHS200483R3
- CHS2004805
- CHS2004812

●CHS300

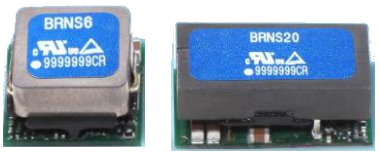
- CHS3004810
- CHS3004812
- CHS3004812H

●CHS400/500

- CHS4004810
- CHS4004812
- CHS4004812H
- CHS5004812

BR series

● BRNS6/12/20

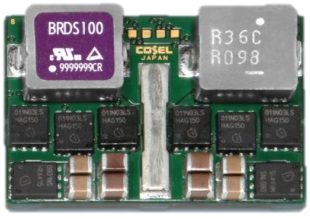


● BRFS30

● BRFS40/BRDS40

● BRFS50/50L/60,BRDS60

● BRFS100/BRDS100

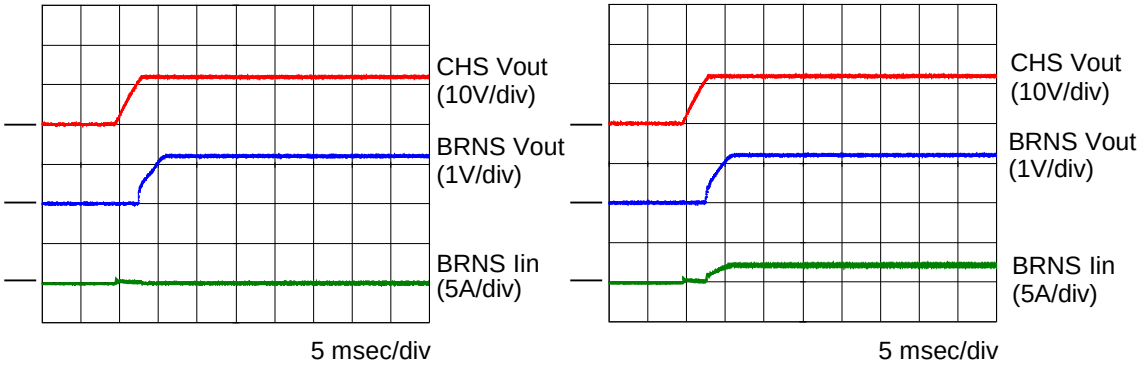


2. Applications data

2.1 Startup Sequence

2.1.1 CHS4004812 and BRNS20

Fig.2.1.1 Startup Sequence of CHS4004812 and BRNS20

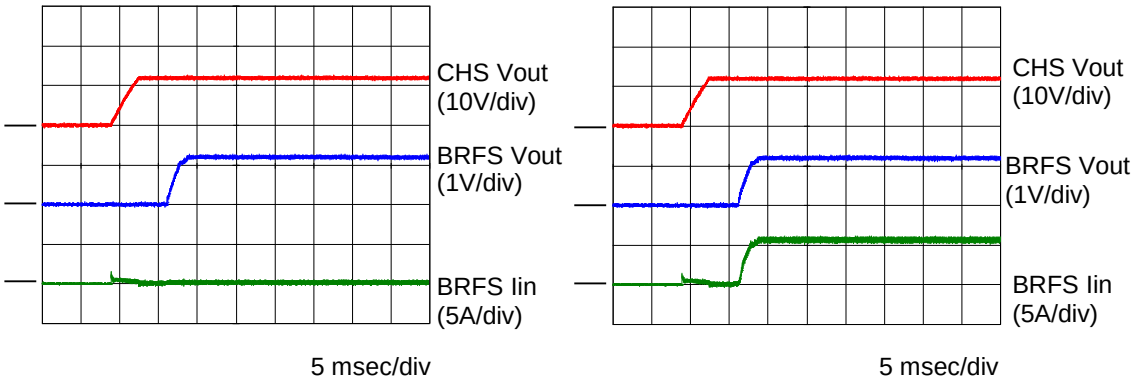


(a) BRNS20 Iout=0%(0A)

(b) BRNS20 Iout=100%(20A)

2.1.2 CHS4004812 and BRFS50

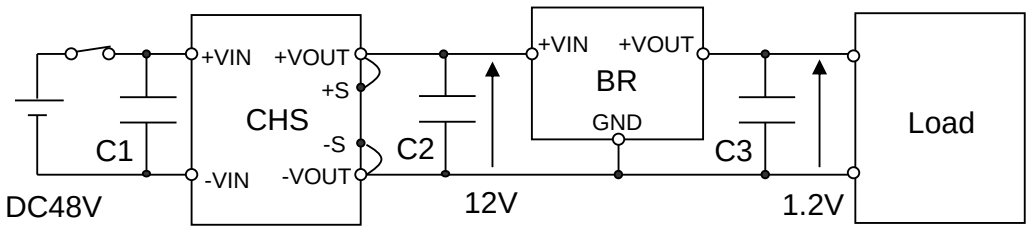
Fig.2.1.2 Startup Sequence of CHS4004812 and BRFS50



(a) BRFS50 Iout=0%(0A)

(b) BRFS50 Iout=100%(50A)

Fig.2.1.3 Measuring method of Startup Sequence

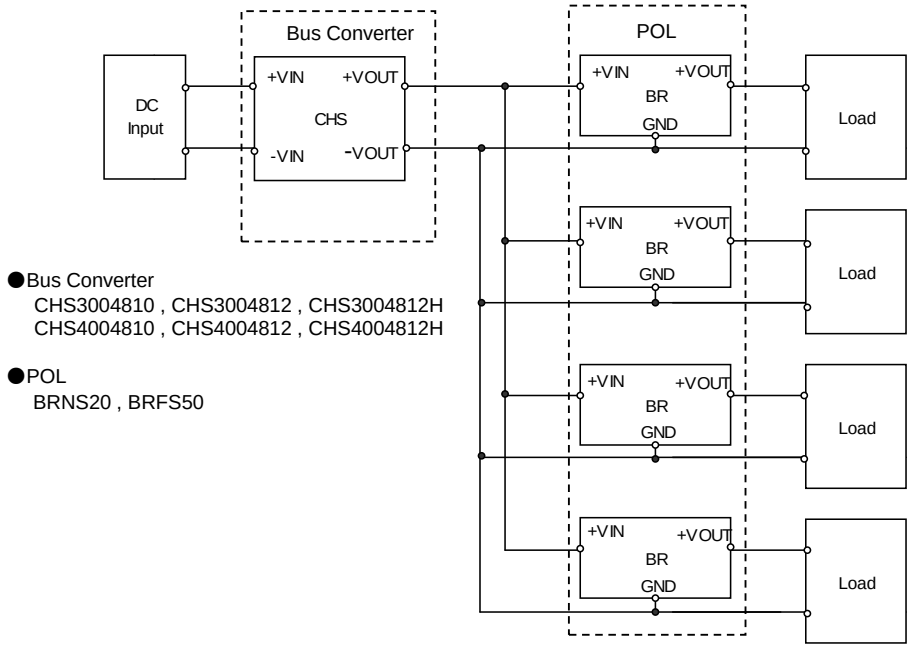


No.	Model	C1	C2	C3
1	CHS4004812 and BRNS20	100uFx3	22uFx3	100uFx2
2	CHS4004812 and BRFS50	100uFx3	22uFx4	100uFx2

2.2 Efficiency of the combination of CHS and BR

- When used in a 10V bus voltage, the efficiency of the device is higher than the bus voltage 12V.
- When using CHS300/4004812H, the efficiency of the device is higher than using CHS300/4004812.

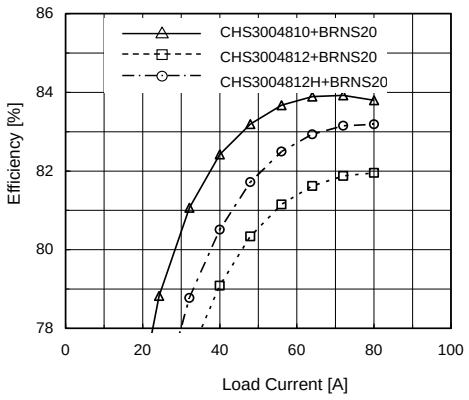
Fig.2.2.1
Test circuitry



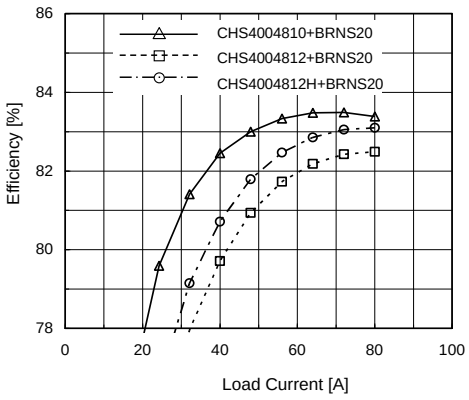
●Bus Converter
CHS3004810 , CHS3004812 , CHS3004812H
CHS4004810 , CHS4004812 , CHS4004812H

●POL
BRNS20 , BRFS50

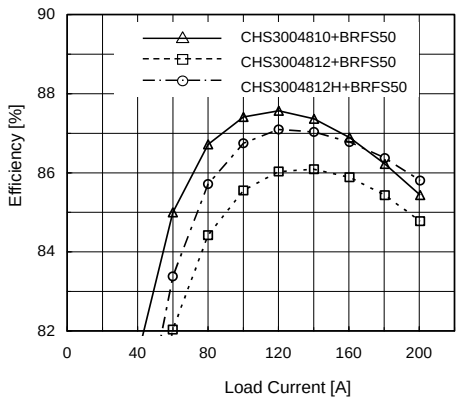
Fig.2.2.2
The efficiency of a combination of CHS and BR at 25℃



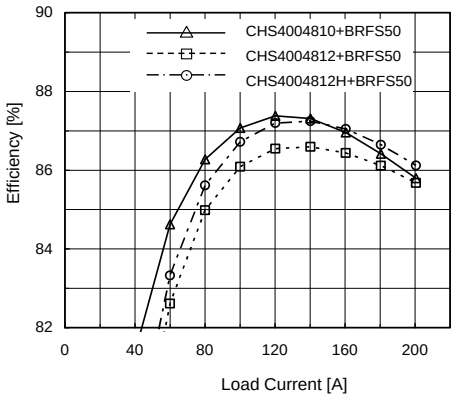
(a) Efficiency(CHS300 + BRNS20 x 4)
CHS300 Vin=48V , BRNS20 Vo=1.2V



(b) Efficiency(CHS400 + BRNS20 x 4)
CHS400 Vin=48V , BRNS20 Vo=1.2V

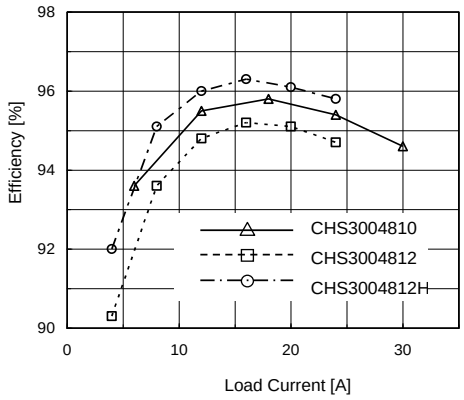


(c) Efficiency(CHS300 + BRFS50 x 4)
CHS300 Vin=48V , BRFS50 Vo=1.2V

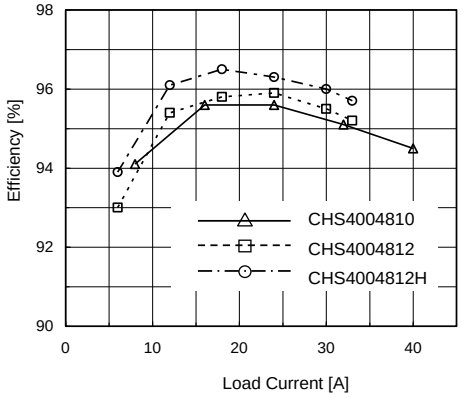


(d) Efficiency(CHS400 + BRFS50 x 4)
CHS300 Vin=48V , BRNS20 Vo=1.2V

Fig.2.2.3
The efficiency of
CHS300/400
at 25℃

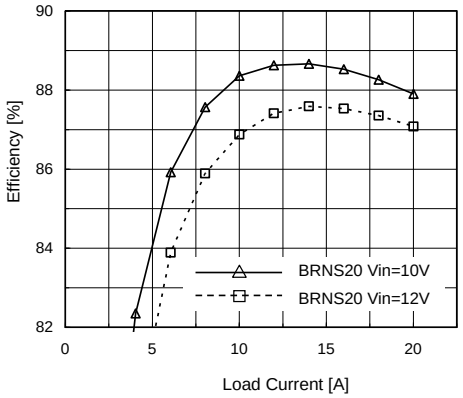


(a) Efficiency (CHS300)
CHS300 Vin=48V

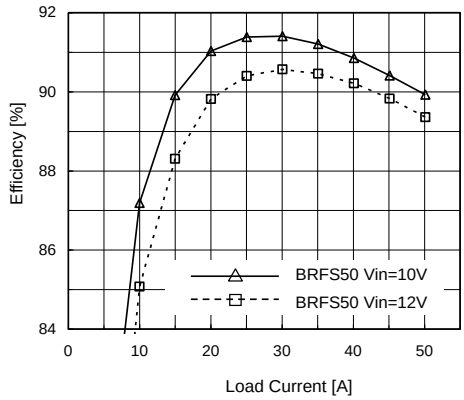


(b) Efficiency (CHS400)
CHS400 Vin=48V

Fig.2.2.4
The efficiency of
BRNS20/BRFS50
at 25℃



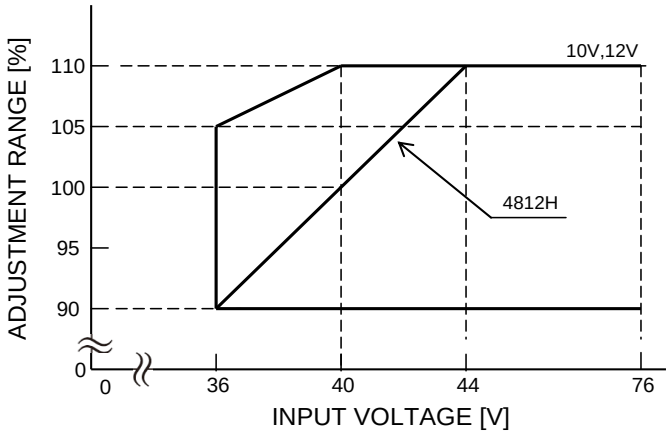
(a) Efficiency (BRNS20)
BRNS20 Vo=1.2V



(b) Efficiency (BRFS50)
BRFS50 Vo=1.2V

Remarks :
For CHS300/400 the output voltage adjustment range becomes as shown in Fig.2.2.5 When input voltage is 36-44VDC.

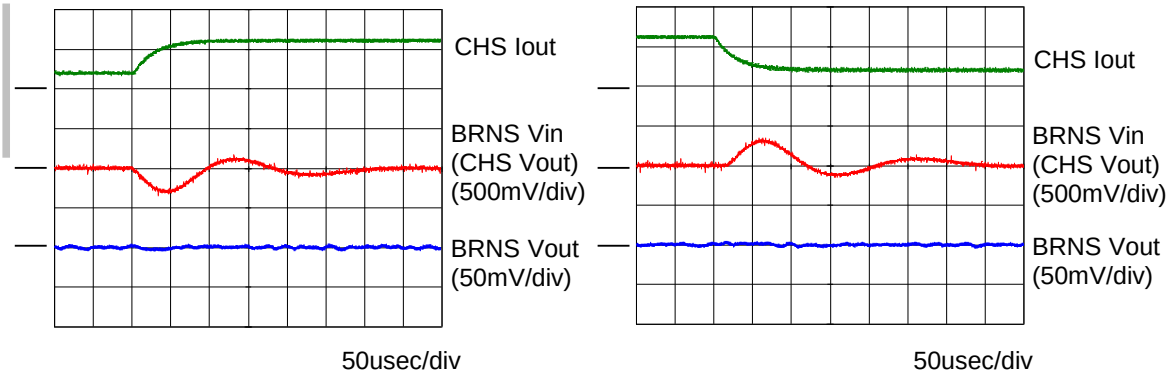
Fig.2.2.5
CHS300/400 Input
voltage derating



2.3 Dynamic Input Response

2.3.1 CHS4004812 and BRNS20

Fig.2.3.1
Dynamic Input Response
of CHS4004812
and BRNS20

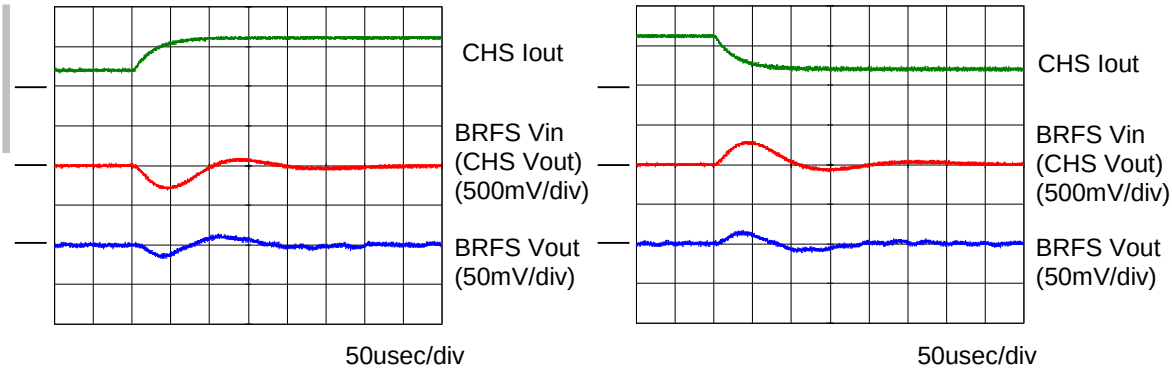


(a) Dynamic Input Response
Load 25%(8.25A)→Load 75%(24.75A)／50us

(b) Dynamic Input Response
Load 75%(24.75A)→Load 25%(8.25A)／50us

2.3.2 CHS4004812 and BRFS50

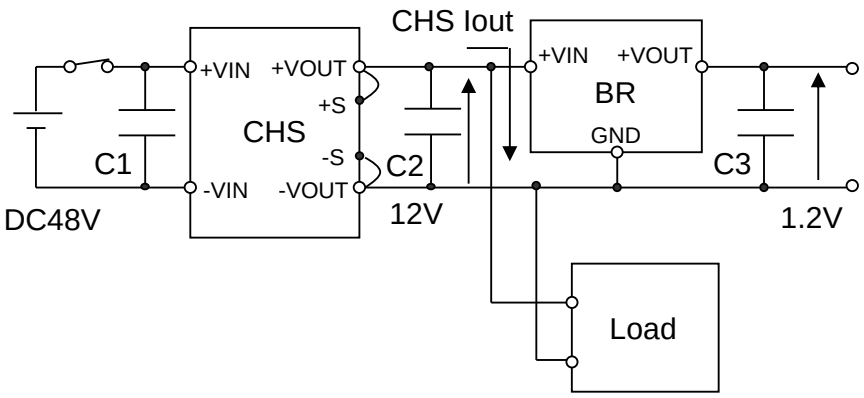
Fig.2.3.2
Dynamic Input Response
of CHS4004812
and BRFS50



(a) Dynamic Input Response
Load 25%(8.25A)→Load 75%(24.75A)／50us

(b) Dynamic Input Response
Load 75%(24.75A)→Load 25%(8.25A)／50us

Fig.2.3.3
Measuring method
of Dynamic Input
Response



No.	Model	C1	C2	C3
1	CHS4004812 and BRNS20	100uFx3	22uFx3	100uFx2
2	CHS4004812 and BRFS50	100uFx3	22uFx4	100uFx2