

DATA SHEET		Date	Apr.01,2002
Model	CBS2002428	Temp.	25 °C
Test	Static electricity immunity test 静電気放電試験	Humid.	40 %Rh
		Tested by	T.Oiwake

- Method — according to EN61000-4-2 —
  - Points to be applied voltage  
電圧印加箇所  
Input pin / Output pin / Case pin / RC pin / TRM pin  
入力ピン / 出力ピン / ケースピン / RCピン / TRMピン
  - Testing shall be satisfied at the lower levels given below  
印加電圧はレベル1から4まで順次実施(下表参照)
  - Change the polarity (+/-) of applied voltage  
印加極性 +/- の条件でそれぞれ実施
  - For the time interval between successive single discharges an initial value of 1s. is recommended.  
On preselected points at least ten single discharges shall be applied.  
1秒以上の間隔で各ポイント10回実施
  - Contact discharge method  
接触放電で実施

Test levels of EN61000-4-2

Level	1	2	3	4
Contact discharge [kV]	2	4	6	8
Air discharge [kV]	2	4	8	15

- Conditions
  - Input : DC24V
  - Output : Rated output
  - Ambient temp. : 25±10°C
- Conditions of Acceptability
 

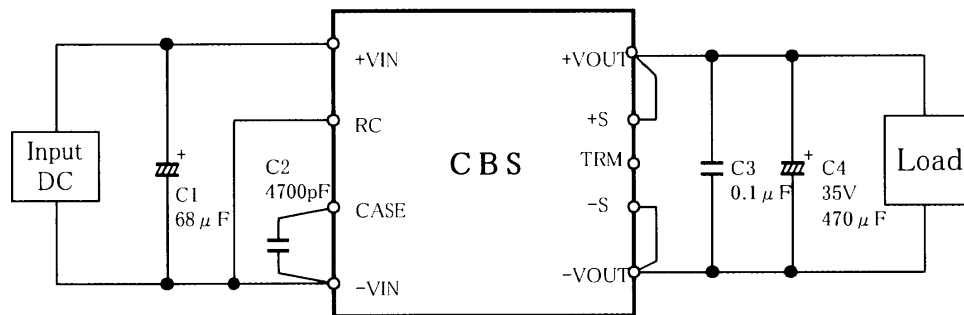
According to EN50082-2 (EN61000-4-2 Level 2)  
EN50082-2(EN61000-4-2 レベル2)を満足すること

#### 4. Result

No.	Level	Voltage [kV]	Polarity	Pin to be tested						
				+VIN	-VIN	+VOUT,+S	-VOUT,-S	CASE	RC	TRM
1	1	2	+	OK	OK	OK	OK	OK	OK	OK
2			-	OK	OK	OK	OK	OK	OK	OK
3	2	4	+	OK	OK	OK	OK	OK	OK	OK
4			-	OK	OK	OK	OK	OK	OK	OK
5	3	6	+	OK	OK	OK	OK	OK	OK	OK
6			-	OK	OK	OK	OK	OK	OK	OK
7	4	8	+	OK	OK	OK	OK	OK	OK	OK
8			-	OK	OK	OK	OK	OK	OK	OK

All are satisfactory to item 3: OK

5. Testing circuitry



- C1: 50V68  $\mu$  F PMseries(nichicon)  
 C2: DE1307-640E472M-KH(MURATA)  
 C3: MDD21H104M(Nitsuko)  
 C4: 35V470  $\mu$  F LXZseries(NIPPON CHEMI-CON)

Fig. Testing circuitry

DATA SHEET		Date	Apr.17,2002
Model	CBS2002428	Temp.	25 °C
Test	Radiated, radio-frequency, electromagnetic field immunity test 放射無線周波電磁界イミュニティ試験	Humid.	40 %Rh
		Tested by	T.Oiwake

## 1. Method — according to EN61000-4-3 —

These tests are defined for measuring the effect that electromagnetic radiation has on the equipment connected. The tests shall be made in a shielded enclosure.

対象機器に対する電磁放射の影響を測定する。試験はシールドルームで行われること。

- (1) Frequency band : 80MHz to 1000MHz  
周波数範囲 : 80MHz から 1000MHz

- (2) Test levels  
試験レベル

Test levels of EN61000-4-3

Level	Testing field strength V/m
1	1
2	3
3	10

## 2. Conditions

- (1) Input : DC24V  
(2) Output : Rated output  
(3) Ambient temp. :  $25 \pm 10^{\circ}\text{C}$   
(4) Testing circuitry : Fig.1

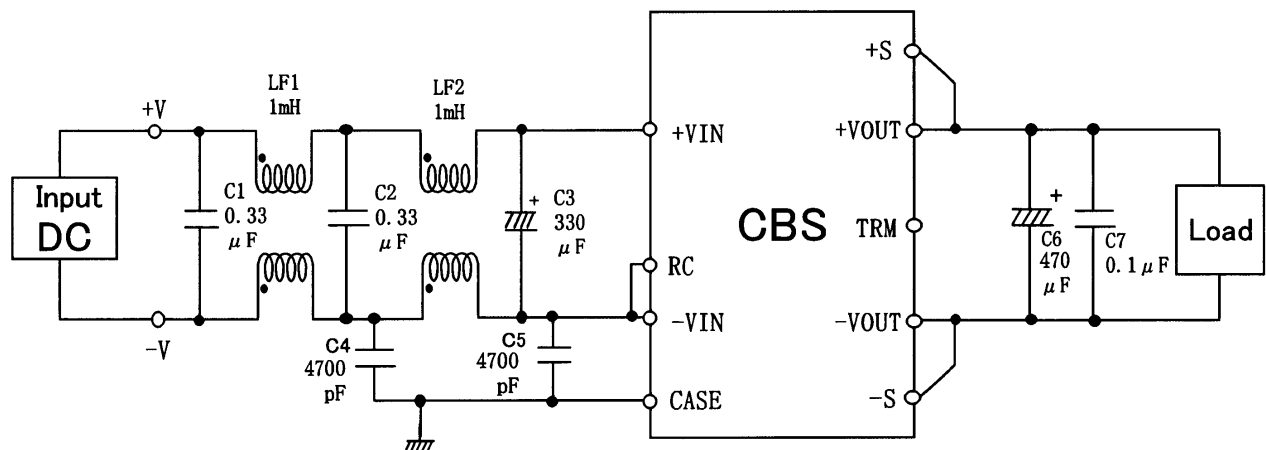


Fig.1 Testing circuitry

## 3. Conditions of Acceptability

According to EN61000-4-3 Level3  
EN61000-4-3 レベル3を満足すること

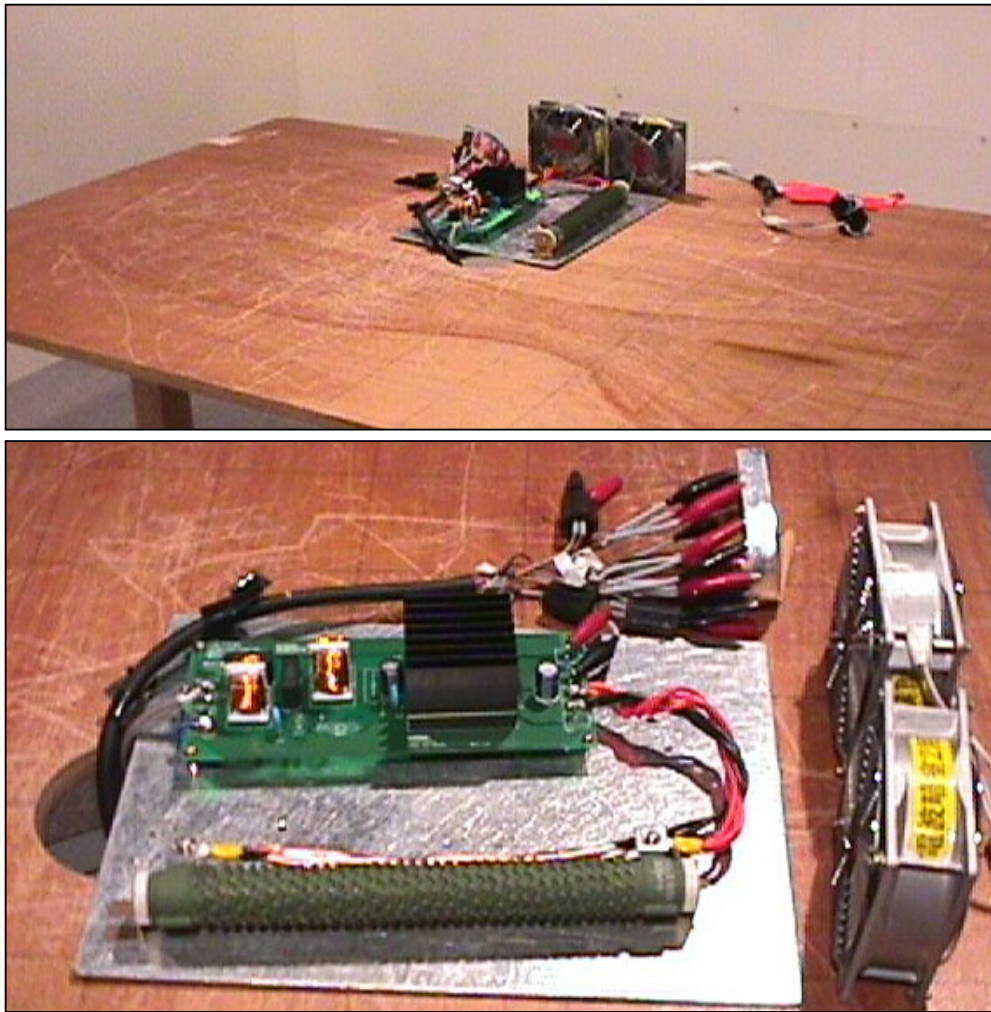
## 4. Result

No.	Level	Testing field strength [V/m]	Result
1	1	1	OK
2	2	3	OK
3	3	10	OK

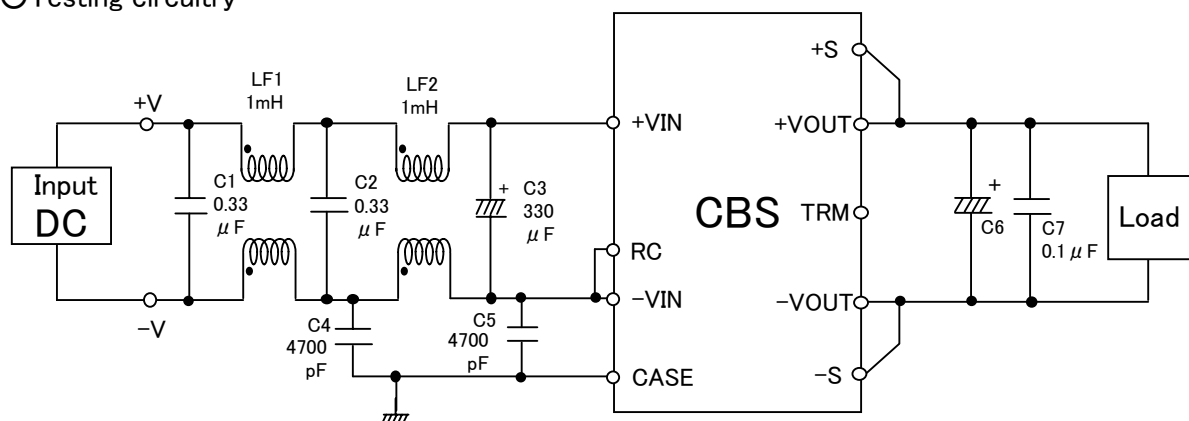
All are satisfactory to item 3: OK

Test : Radiated Susceptability  
 Model Name : CBS2002405/28

○Photographs of Test Set-Up



○Testing circuitry



LF1, LF2 : SC-10-10J (TOKIN)

C1, C2 : CFJC22E334M (Nitsuko)

C3 : 50V 330  $\mu$ F PMseries (nichicon)

C4, C5 : DE1307-640E472M-KH (MURATA)

C6 : CBS2002405 10V 2200  $\mu$ F LXZseries (NIPPON CHEMI-CON)

CBS2002428 35V 470  $\mu$ F LXZseries (NIPPON CHEMI-CON)

C7 : MDD21H104M (Nitsuko)

Fig. Testing circuitry

DATA SHEET			Date	Apr.4,2002
Model	CBS2002424	Temp.	25 °C	
Test	Electrical fast transient/burst immunity test 電氣的ファーストランシエントバースト試験	Humid.	40 %Rh	
		Tested by	T.Oiwake	

1. Method — according to EN61000-4-4 —

(1) Points to be applied voltage  
電圧印加箇所

- 1) Between input terminal(L) and ground plane  
入力端子 (L) — グラントプレーン間
- 2) Between input terminal(N) and ground plane  
入力端子 (N) — グラントプレーン間
- 3) Between FG terminal and ground plane  
FG端子 — グラントプレーン間
- 4) Between output terminal and ground plane  
出力端子 — グラントプレーン間

(2) Testing shall be satisfied at the lower levels given below  
印加電圧はレベル1から4まで順次実施(下表参照)

(3) Change the polarity (+/-) of applied voltage  
印加極性 +/-の条件でそれぞれ実施

(4) The period of applied voltage is 1 minute  
電圧印加時間は1分間

Test levels of EN61000-4-4

Level	1	2	3	4
Voltage peak [kV]	0.5	1	2	4
Repetition rate [kHz]	5	5	5	2.5

2. Conditions

- (1) Input : DC24V
- (2) Output : Rated output
- (3) Ambient temp. : 25±10°C

3. Conditions of Acceptability

According to EN50082-2 (EN61000-4-4 Level 3)  
EN50082-2(EN61000-4-4 レベル3)を満足すること

4. Result

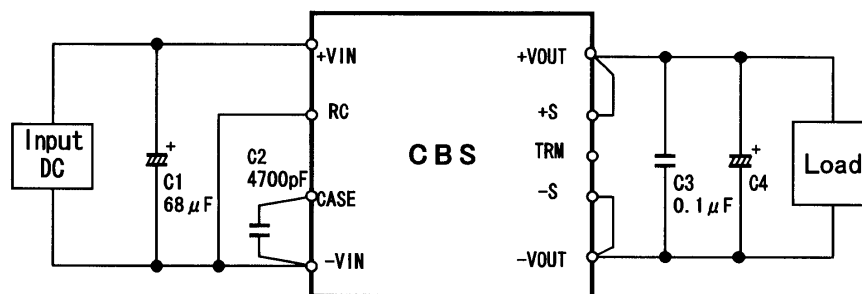
No.	Level	Voltage [kV]	Polarity	Pin to be tested					
				+VIN	-VIN	+VOUT,+S	-VOUT,-S	CASE	RC
1	1	0.5	+	OK	OK	OK	OK	OK	OK
2			-	OK	OK	OK	OK	OK	OK
3	2	1	+	OK	OK	OK	OK	OK	OK
4			-	OK	OK	OK	OK	OK	OK
5	3	2	+	OK	OK	OK	OK	OK	OK
6			-	OK	OK	OK	OK	OK	OK
7	4	4	+	OK	OK	OK	OK	OK	OK
8			-	OK	OK	OK	OK	OK	OK

All are satisfactory to item 3: OK



## 5. Testing circuitry



C4 : 470  $\mu$ F 35V Electrolytic capacitor

Fig. Testing circuitry

DATA SHEET		Date	2002/4/17
Model	CBS2002428	Temp.	25 °C
Test	Surge immunity test サージ・イミュニティ試験	Humid.	40 %Rh
		Tested by	T.Oiwake

## 1. Method — according to EN61000-4-5 —

### (1) Points to be applied voltage

電圧印加箇所

— Line to line (ライン - ライン間 : ノーマル) —

#### 1) Between input pin (+V) and input pin (-V)

入力ピン(+V) - 入力ピン(-V)

— Line to case pin (ライン - ケースピン間 : コモン) —

#### 2) Between input pin (+V) and case pin

入力ピン(+V) - ケースピン

#### 3) Between input pin (-V) and case pin

入力ピン(-V) - ケースピン

### (2) Test at the selected levels shown below

印加電圧(レベル)は、下表に従う

### (3) Change the polarity (+/-) of applied voltage

印加極性 +/- の条件でそれぞれ実施

### (4) Number of tests : Six positive and six negative at selected points.

試験の回数 : それぞれの印加箇所、正負各6回試験する

### (5) Repetition rate : maximum 1/min.

繰り返し速度 : 最大1回/分 (1分以上の間隔をおく)

Test levels of EN61000-4-5

Level	1	2	3	4
Test voltage [kV]	0.5	1	2	4

## 2. Conditions

- (1) Input : DC24V
- (2) Output : Rated output
- (3) Ambient temp. : 25±10°C
- (4) Testing circuitry : Refer to item 5

## 3. Conditions of Acceptability

Line to line : According to EN50082-2 (EN61000-4-5 Level 3)

ライン - ライン間 (ノーマル) : EN50082-2 (EN61000-4-5 レベル3) を満足すること

Line to earth : According to EN50082-2 (EN61000-4-5 Level 4)

ライン - ケースピン間 (コモン) : EN50082-2 (EN61000-4-5 レベル4) を満足すること

## 4. Result

No.	Voltage [kV]	Polarity	Line (+V) - Line (-V)
1	0.5	+	OK
2		-	OK
3	1	+	OK
4		-	OK
5	2	+	OK
6		-	OK

No.	Voltage [kV]	Polarity	Line (+V) - Case pin	Line (-V) - Case pin
1	0.5	+	OK	OK
2		-	OK	OK
3	1	+	OK	OK
4		-	OK	OK
5	2	+	OK	OK
6		-	OK	OK
7	4	+	OK	OK
8		-	OK	OK

All are satisfactory to item 3: OK

5. Testing circuitry

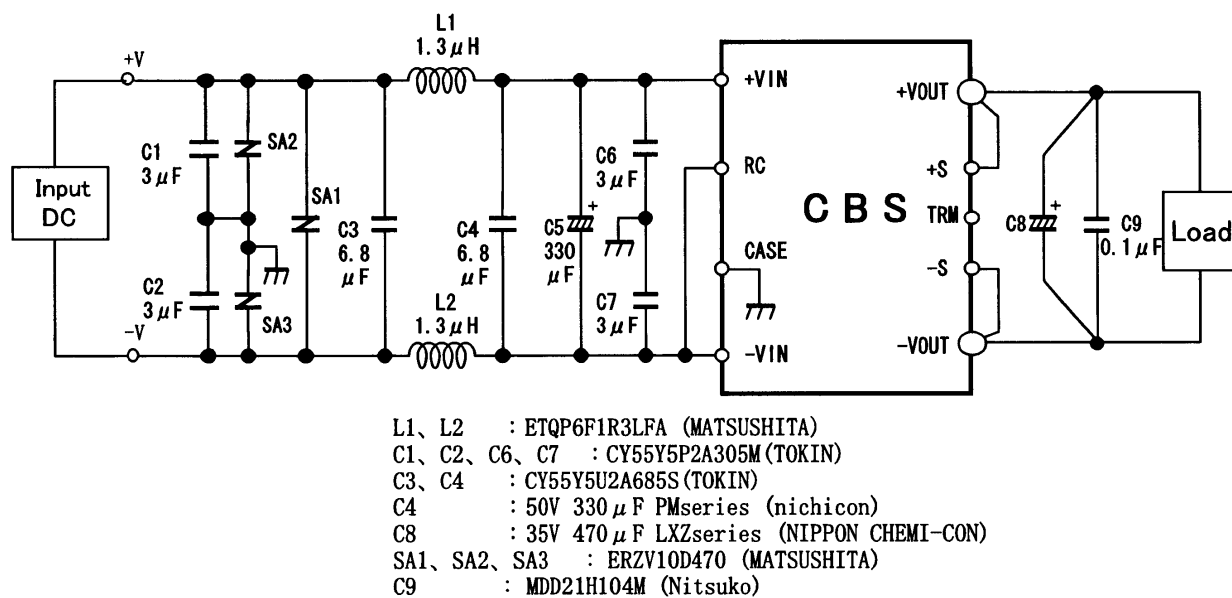


Fig. Testing circuitry



DATA SHEET		Date	2002/4/17
Model	CBS2002428	Temp.	25 °C
Test	Surge immunity test サージ・immunity試験	Humid.	40 %Rh
		Tested by	T.Oiwake

1. Method — according to EN61000-4-5 —

(1) Points to be applied voltage

電圧印加箇所

— Line to line (ライン - ライン間 : ノーマル) —

1) Between input pin (+V) and input pin (-V)

入力ピン(+V) - 入力ピン(-V)

— Line to case pin (ライン - ケースピン間 : コモン) —

2) Between input pin (+V) and case pin

入力ピン(+V) - ケースピン

3) Between input pin (-V) and case pin

入力ピン(-V) - ケースピン

(2) Test at the selected levels shown below

印加電圧(レベル)は、下表に従う

(3) Change the polarity (+/-) of applied voltage

印加極性 +/- の条件でそれぞれ実施

(4) Number of tests : Six positive and six negative at selected points.

試験の回数 : それぞれの印加箇所、正負各6回試験する

(5) Repetition rate : maximum 1/min.

繰り返し速度 : 最大1回/分 (1分以上の間隔をおく)

Test levels of EN61000-4-5

Level	1	2	3	4
Test voltage [kV]	0.5	1	2	4

2. Conditions

(1) Input : DC24V

(2) Output : Rated output

(3) Ambient temp. : 25 ± 10°C

(4) Testing circuitry : Refer to item 5

3. Conditions of Acceptability

Line to line : According to EN50082-2 (EN61000-4-5 Level 3)

ライン - ライン間 (ノーマル) : EN50082-2 (EN61000-4-5 レベル3) を満足すること

Line to earth : According to EN50082-2 (EN61000-4-5 Level 4)

ライン - ケースピン間 (コモン) : EN50082-2 (EN61000-4-5 レベル4) を満足すること

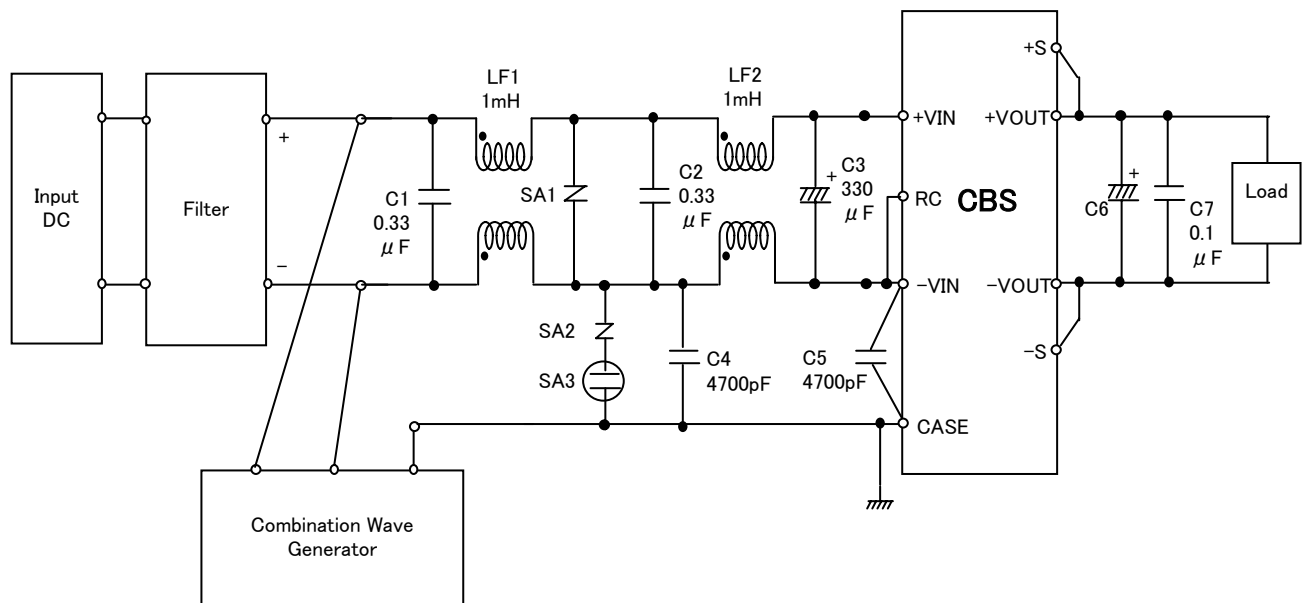
4. Result

No.	Voltage [kV]	Polarity	Line (+V) - Line (-V)
1	0.5	+	OK
2		-	OK
3	1	+	OK
4		-	OK
5	2	+	OK
6		-	OK

No.	Voltage [kV]	Polarity	Line (+V) - Case pin	Line (-V) - Case pin
1	0.5	+	OK	OK
2		-	OK	OK
3	1	+	OK	OK
4		-	OK	OK
5	2	+	OK	OK
6		-	OK	OK
7	4	+	OK	OK
8		-	OK	OK

All are satisfactory to item 3: OK

## 5. Testing circuitry



- LF1、LF2 : SC-10-10J (TOKIN)  
 C1、C2 : CFJC22E3334M (Nitsuko)  
 C3 : 50V 330  $\mu$ F PMseries (nichicon)  
 C4、C5 : DE1307-640E472M-KH (MURATA)  
 C6 : 35V 470  $\mu$ F LXZseries (NIPPON CHEMI-CON)  
 C7 : MDD21H104M (Nitsuko)  
 SA1、SA2 : ERZV10D470 (MATSUSHITA)  
 SA3 : DSA-302MA (MITSUBISHI)

Fig. Testing circuitry



## CBS20048 EMI/EMS Test result

May 13, 2003  
Design engineering dep.

Approved : *J. Yasuda*

Prepared : *T. Oiwake*

No.	Test item	Conditions	Conditions of Acceptability	Result
1	Line conduction	(1) Rated input(DC48V) (2) Rated load (3) Ambient temp. $25 \pm 10^{\circ}\text{C}$ (4) Testing circuitry Fig.1 and Fig.3	(1)Meets the undermentioned standard. FCC Part15 classB , VCCI classB CISPR22 classB , EN55022-B	OK
2	Radiated emission	(1) Rated input(DC48V) (2) Rated load (3) Ambient temp. $25 \pm 10^{\circ}\text{C}$ (4) Testing circuitry Fig.1 and Fig.3	(1)Meets the undermentioned standard. FCC Part15 classB , VCCI classB CISPR22 classB , EN55022-B	OK
3	Static electricity immunity test (EN61000-4-2)	(1) Rated input(DC48V) (2) Rated load (3) Ambient temp. $25 \pm 10^{\circ}\text{C}$ (4) Contact discharge voltage 8[kV] (EN61000-4-2 Level 4) (5) Testing circuitry Fig.5	(1)No protection circuit failure. (2)No output voltage drop with control circuit failure. (3)No any other function failure	OK
4	Radiated, radio-frequency, electromagnetic field immunity test (EN61000-4-3)	(1) Rated input(DC48V) (2) Rated load (3) Ambient temp. $25 \pm 10^{\circ}\text{C}$ (4)Testing field strength 10[V/m] (EN61000-4-3 Level 3) (5) Testing circuitry Fig.3	(1)No protection circuit failure. (2)No output voltage drop with control circuit failure. (3)No any other function failure	OK
5	Electrical fast transient/ burst immunity test (EN61000-4-4)	(1) Rated input(DC48V) (2) Rated load (3) Ambient temp. $25 \pm 10^{\circ}\text{C}$ (4) Test peak voltage 4[kV] (IEC61000-4-4 Level 4) (5) Testing circuitry Fig.5	(1)No protection circuit failure. (2)No output voltage drop with control circuit failure. (3)No any other function failure	OK
6	Surge immunity test (EN61000-4-5)	(1) Rated input(DC48V) (2) Rated load (3) Ambient temp. $25 \pm 10^{\circ}\text{C}$ (4) Test voltage Line to line 2[kV] (Level 3) Line to earth 4[kV] (Level 4) (5) Testing circuitry Fig.2 and Fig.4	(1)The power supply is not stop (2)Circuit does not malfunction. (3)No abnormality of the insulation destruction etc. (4)Parts are no damaged.	OK
7	Immunity to conducted disturbances, induced by radio-frequency fields (EN61000-4-6)	(1) Rated input (DC48V) (2) Rated load (3) Ambient temp. $25 \pm 10^{\circ}\text{C}$ (4) Voltage level (e.m.f.) 10[V] (EN61000-4-6 Level 3) (5) Testing circuitry Fig.3	(1)No protection circuit failure. (2)No output voltage drop with control circuit failure. (3)No any other function failure	OK

## ○EMI/EMS testing circuitry

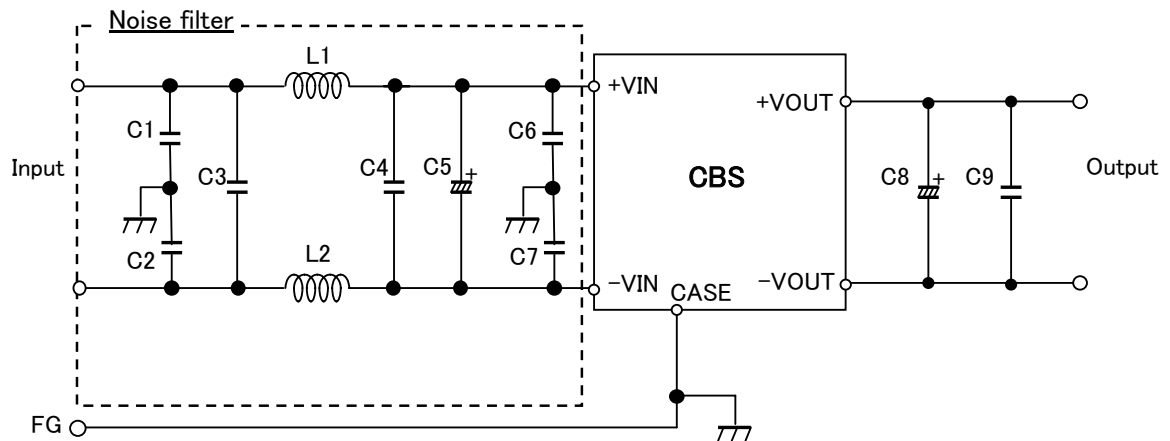


Fig.1 testing circuitry (No.1 and No.2)

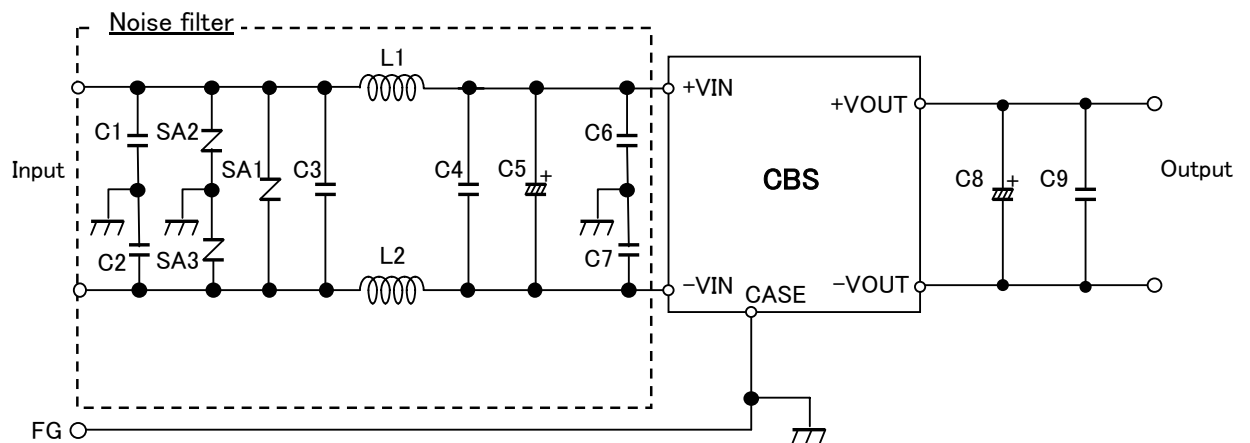


Fig.2 testing circuitry (No.6)

- |                        |  |
|------------------------|--|
| C1, C2, C3, C4, C6, C7 | : 3 $\mu$ F 100V Ceramic capacitor                         |
| C5                     | : 220 $\mu$ F 80V Electrolytic capacitor                   |
| C8                     | : 2200 $\mu$ F 10V Electrolytic capacitor (CBS2004803, 05) |
|                        | : 1000 $\mu$ F 25V Electrolytic capacitor (CBS2004812, 15) |
|                        | : 470 $\mu$ F 35V Electrolytic capacitor (CBS2004824, 28)  |
|                        | : 330 $\mu$ F 100V Electrolytic capacitor (CBS2004848)     |
| C9                     | : 0.1 $\mu$ F Film capacitor                               |
| L1, L2                 | : 1.3 $\mu$ H Choke Coil                                   |
| SA1                    | : ERZV10D101 (MATSUSHITA ELECTNIC CO., LTD.)               |
| SA2, SA3               | : ERZV07D820 (MATSUSHITA ELECTNIC CO., LTD.)               |
|                        | or equivalent  |

○EMI/EMS testing circuitry

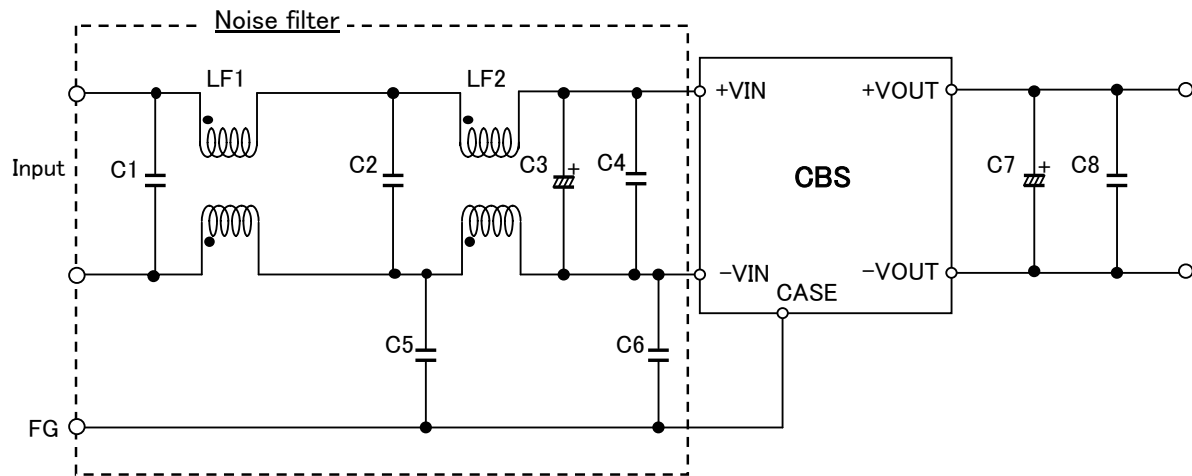


Fig.3 testing circuitry (No.1, No.2, No.4 and No.7)

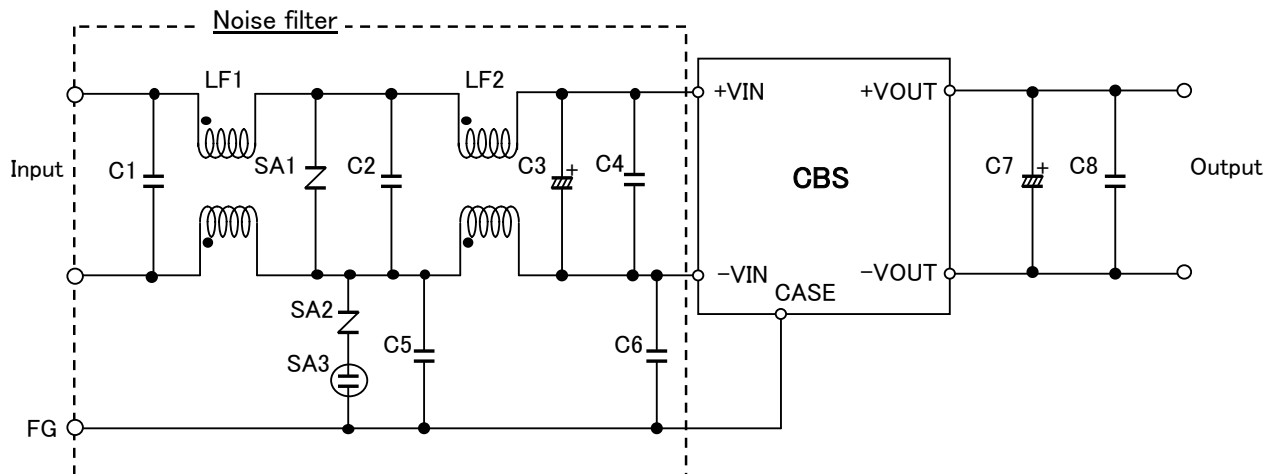


Fig.4 testing circuitry (No.6)

- C1、C2、C4 : 0.33  $\mu$  F 250V Film capacitor
- C3 : 33  $\mu$  F 100V Electrolytic capacitor
- C5、C6 : 4700pF 250V Ceramic capacitor
- C7 : 2200  $\mu$  F 10V Electrolytic capacitor (CBS2004803、05)
- : 1000  $\mu$  F 25V Electrolytic capacitor (CBS2004812、15)
- : 470  $\mu$  F 35V Electrolytic capacitor (CBS2004824、28)
- : 330  $\mu$  F 100V Electrolytic capacitor (CBS2004848)
- C8 : 0.1  $\mu$  F Film capacitor
- LF1、LF2 : 3.0mH 5A Common mode Choke Coil
- SA1、SA2 : ERZV10D101 (MATSUSHITA ELECTNIC CO., LTD.)
- SA3 : DSA-302MA (MITSUBISHI MATERIALS CORP ADVANCED PRODUCTS)
- or equivalent

○EMI/EMS testing circuitry

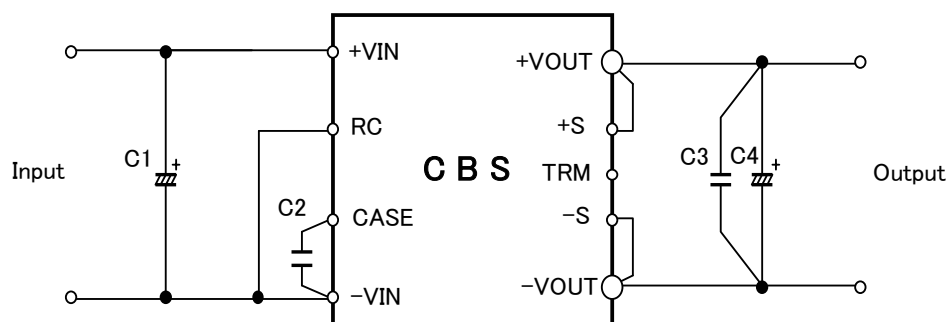


Fig.5 testing circuitry (No.3 and No.5)

- C1 : 33  $\mu$  F 100V Electrolytic capacitor
  - C2 : 4700pF 250V Seramic capacitor
  - C3 : 0.1  $\mu$  F Film capacitor
  - C4 : 2200  $\mu$  F 10V Electrolytic capacitor (CBS2004803、05)
  - : 1000  $\mu$  F 25V Electrolytic capacitor (CBS2004812、15)
  - : 470  $\mu$  F 35V Electrolytic capacitor (CBS2004824、28)
  - : 330  $\mu$  F 100V Electrolytic capacitor (CBS2004848)
- or equivalent