参考資料

COSEL

TEST DATA OF ZUW101212
(12.0V INPUT)

Regulated DC Power Supply

Date : Sep 21. 1996

Approved by : T. Sugimori
Design Manager

Prepared by : M. Takashima
Design Engineer

コーセル株式会社

COSEL CO., LTD.

参考資料

COSEL

CONTENTS

1. Line Regulation ・・・・・・・・・・・・・・・・・・・・・・ 1
静的入力変動
2. Efficiency ・・・・・・・・・・・・・・・・・・・・・・・・ 2
効率
3. Load Regulation ・・・・・・・・・・・・・・・・・・・・・ 3
静的負荷変動
4. Ripple Voltage (by Load Current) ・・・・・・・・・・・・・ 4
リップル電圧(負荷電流特性)
5. Ripple-Noise ・・・・・・・・・・・・・・・・・・・・・・・ 6
リップルノイズ
6. Overcurrent Protection ・・・・・・・・・・・・・・・・・・ 8
過電流保護
7. Dynamic Load Responce ・・・・・・・・・・・・・・・・・・ 9
動的負荷変動
8. Rise and Fall Time ・・・・・・・・・・・・・・・・・・・・ 11
立上り、立下がり時間
9. Ambient Temperature Drift ・・・・・・・・・・・・・・・・ 13
周囲温度変動
10. Minimum Input Voltage for Regulated Output Voltage ・・・ 14
最低レギュレーション電圧
11. Ripple Voltage (by Ambient Temperature) ・・・・・・・・・ 15
リップル電圧 (周囲温度特性)
12. Time Lapse Drift ・・・・・・・・・・・・・・・・・・・・ 16
経時ドリフト
13. Output Voltage Accuracy ・・・・・・・・・・・・・・・・・ 17
定電圧精度
14. Condensation ・・・・・・・・・・・・・・・・・・・・・・ 18
結露特性
15. Figure of Testing Circuitry ・・・・・・・・・・・・・・・ 20
測定回路図

(Final Page 20)

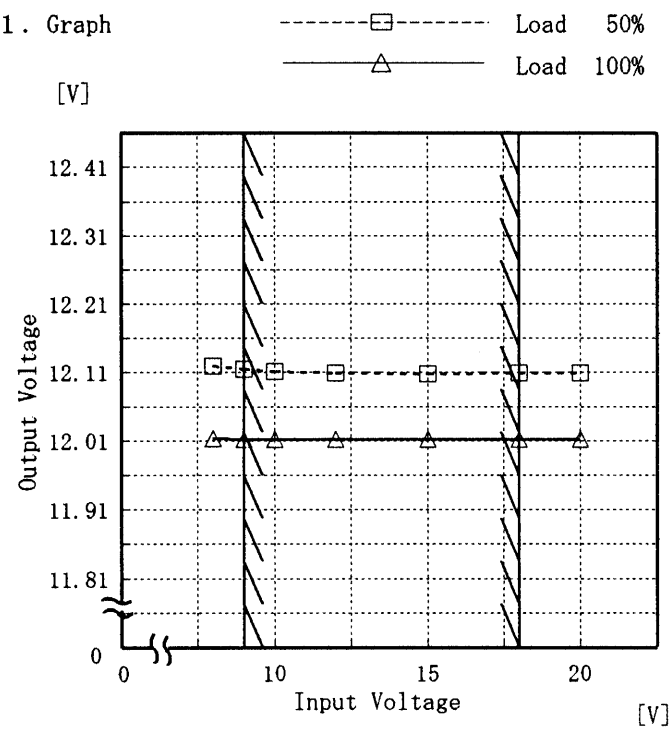
COSEL

Model	ZUW101212
Item	Line Regulation 静的入力変動

Temperature 25℃
Testing Circuitry Figure A

Object +12V0.450A

1. Graph

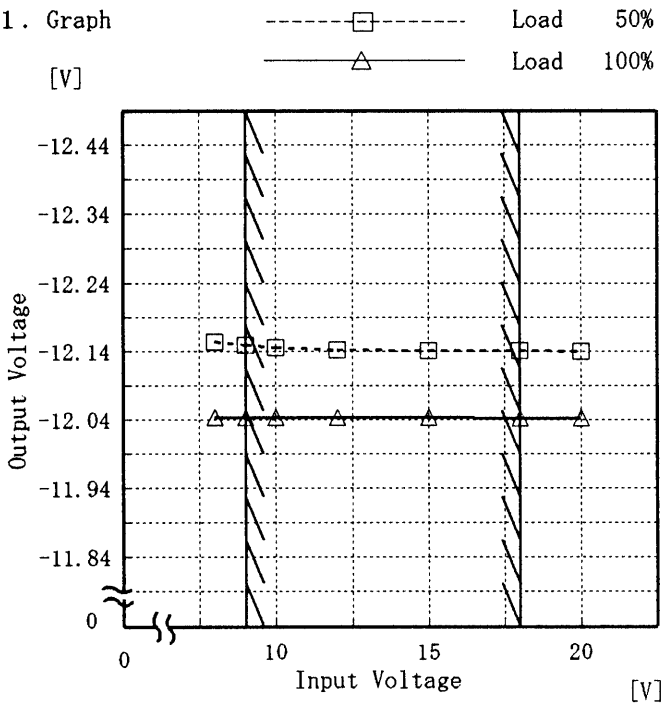


2. Values

Input Voltage [V]	Load 50% Output Volt. [V]	Load 100% Output Volt. [V]
8.0	12.120	12.013
9.0	12.115	12.012
10.0	12.112	12.012
12.0	12.109	12.012
15.0	12.108	12.012
18.0	12.109	12.012
20.0	12.109	12.012
—	—	—
—	—	—
—	—	—
—	—	—
—	—	—

Object −12V0.450A

1. Graph



Note: Slanted line shows the range of the rated input voltage.
(注)斜線は定格入力電圧範囲を示す。

2. Values

Input Voltage [V]	Load 50% Output Volt. [V]	Load 100% Output Volt. [V]
8.0	-12.153	-12.044
9.0	-12.149	-12.044
10.0	-12.145	-12.043
12.0	-12.142	-12.043
15.0	-12.140	-12.043
18.0	-12.140	-12.043
20.0	-12.140	-12.042
—	—	—
—	—	—
—	—	—
—	—	—
—	—	—

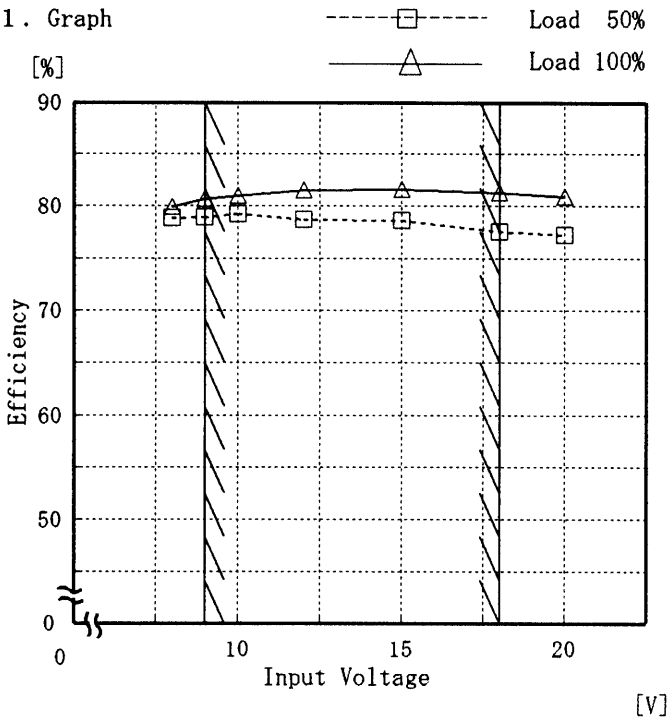
BC−2077

COSEL

Model	ZUW101212
Item	Efficiency 効率
Object	――――――――――――――

Temperature 25℃
Testing Circuitry Figure A

1. Graph



Note: Slanted line shows the range of the rated input voltage.

(注)斜線は定格入力電圧範囲を示す。

2. Values

Input Voltage [V]	Load 50% Efficiency [%]	Load 100% Efficiency [%]
8.0	78.9	79.9
9.0	78.9	80.7
10.0	79.2	81.0
12.0	78.7	81.5
15.0	78.6	81.6
18.0	77.6	81.3
20.0	77.3	80.9
—	—	—
—	—	—
—	—	—
—	—	—
—	—	—

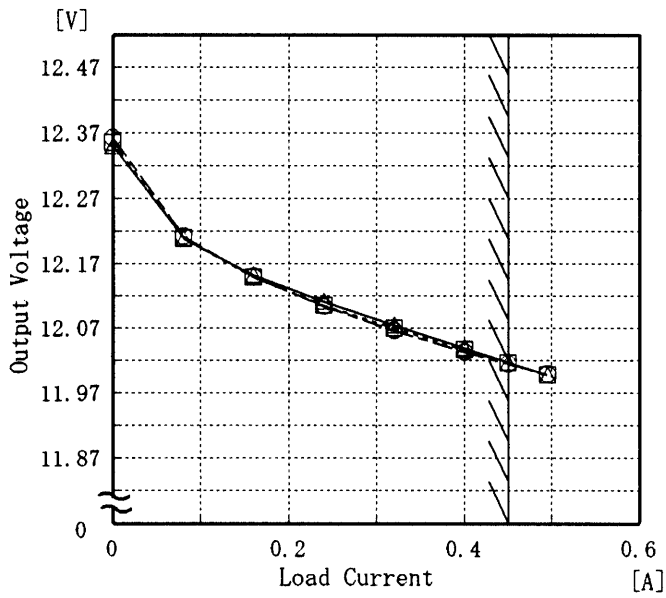
COSEL

Model	ZUW101212
Item	Load Regulation 静的負荷変動

Temperature 25℃
Testing Circuitry Figure A

Object ＋12V0.450A

1. Graph

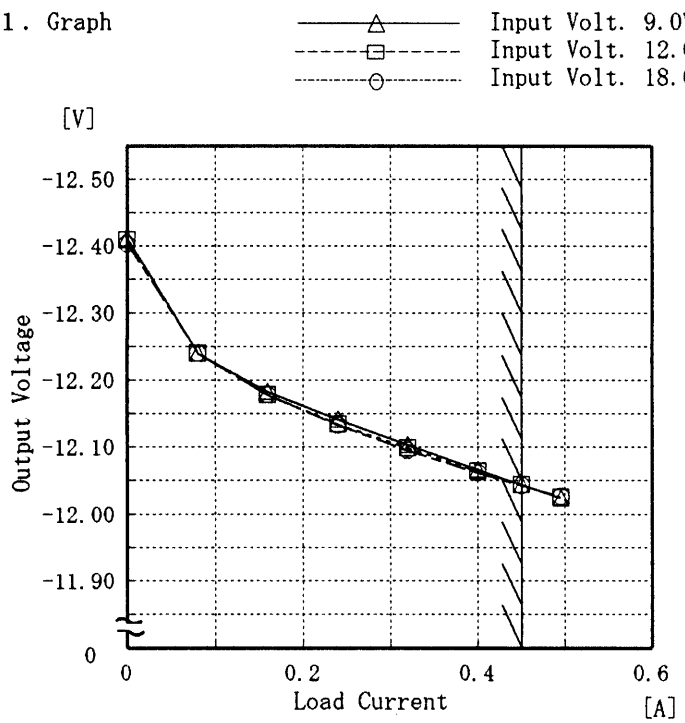


2. Values

Load Current [A]	Input Volt. 9.0[V] Output Volt. [V]	Input Volt. 12.0[V] Output Volt. [V]	Input Volt. 18.0[V] Output Volt. [V]
0.000	12.351	12.356	12.363
0.080	12.210	12.211	12.213
0.160	12.153	12.149	12.151
0.240	12.112	12.105	12.104
0.320	12.075	12.069	12.066
0.400	12.039	12.036	12.034
0.450	12.017	12.016	12.015
0.495	11.998	11.998	11.999
—	—	—	—
—	—	—	—

Object −12V0.450A

1. Graph



Note: Slanted line shows the range of the rated load current.
(注)斜線は定格負荷電流範囲を示す。

2. Values

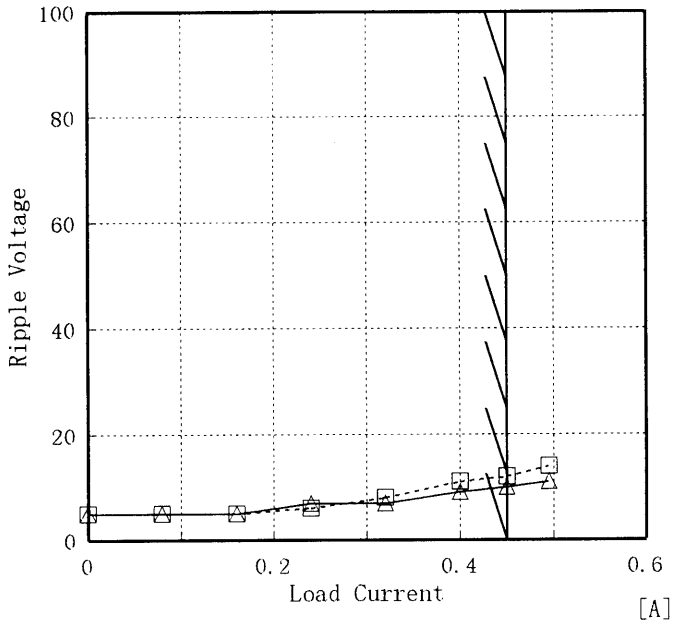
Load Current [A]	Input Volt. 9.0[V] Output Volt. [V]	Input Volt. 12.0[V] Output Volt. [V]	Input Volt. 18.0[V] Output Volt. [V]
0.000	-12.412	-12.410	-12.404
0.080	-12.241	-12.241	-12.241
0.160	-12.183	-12.180	-12.179
0.240	-12.142	-12.135	-12.134
0.320	-12.104	-12.099	-12.095
0.400	-12.068	-12.065	-12.063
0.450	-12.045	-12.045	-12.044
0.495	-12.025	-12.026	-12.027
—	—	—	—
—	—	—	—

COSEL

Model	ZUW101212
Item	Ripple Voltage(by Load Current) リップル電圧(負荷電流特性)
Object	+12V0.45A

Temperature 25℃
Testing Circuitry Figure A

1. Graph



Ripple Voltage is shown as p-p in the figure below.

Note: Slanted line shows the range of the rated load current.

リップル電圧は、下図ｐ－ｐ値で示される。
(注)斜線は定格負荷電流範囲を示す。

T1: Due to AC Input Line
入力商用周期
T2: Due to Switching
ｽｲｯﾁﾝｸﾞ周期

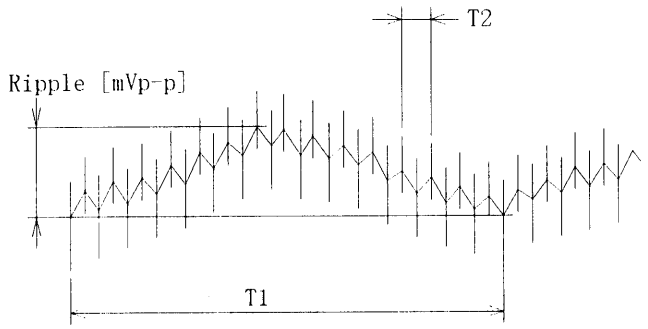


Fig. Complex Ripple Wave Form
図　リップル波形詳細図

2. Values

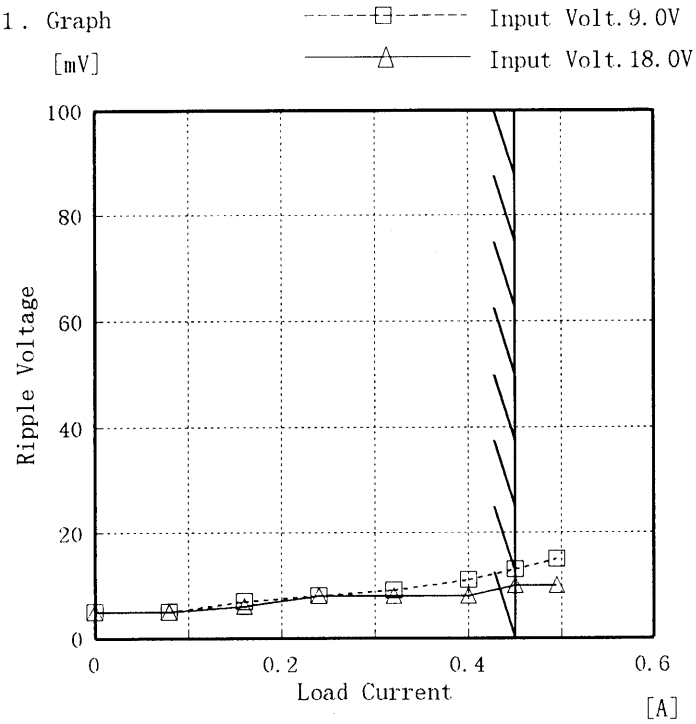
Load Current [A]	Input Volt. 9.0 [V] Ripple Output Volt. [mV]	Input Volt. 18.0 [V] Ripple Output Volt. [mV]
0.00	5	5
0.08	5	5
0.16	5	5
0.24	6	7
0.32	8	7
0.40	11	9
0.45	12	10
0.50	14	11
—	—	—
—	—	—
—	—	—

COSEL

Model	ZUW101212
Item	Ripple Voltage(by Load Current) リップル電圧(負荷電流特性)
Object	−12V0.45A

Temperature 25℃
Testing Circuitry Figure A

1. Graph



Ripple Voltage is shown as p-p in the figure below.

Note: Slanted line shows the range of the rated load current.

リップル電圧は、下図ｐ－ｐ値で示される。
(注)斜線は定格負荷電流範囲を示す。

T1: Due to AC Input Line
入力商用周期
T2: Due to Switching
ｽｲｯﾁﾝｸﾞ周期

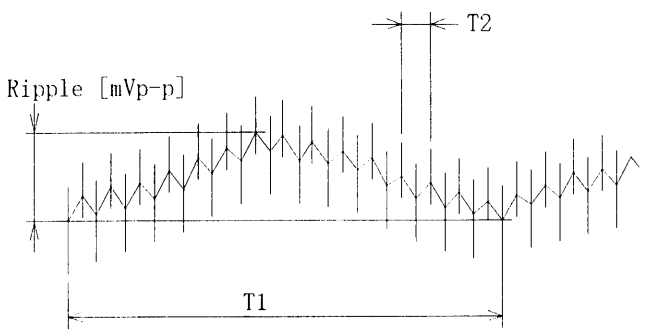


Fig. Complex Ripple Wave Form
図 リップル波形詳細図

2. Values

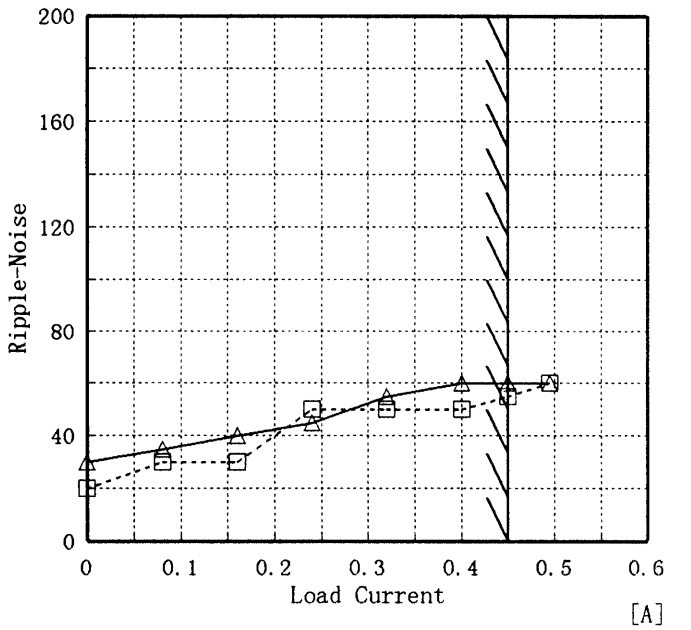
Load Current [A]	Input Volt. 9.0 [V] Ripple Output Volt. [mV]	Input Volt. 18.0 [V] Ripple Output Volt. [mV]
0.00	5	5
0.08	5	5
0.16	7	6
0.24	8	8
0.32	9	8
0.40	11	8
0.45	13	10
0.50	15	10
—	—	—
—	—	—
—	—	—

COSEL

Model	ZUW101212
Item	Ripple-Noise リップルノイズ
Object	+12V0.450A

Temperature 25℃
Testing Circuitry Figure A

1. Graph



Ripple-Noise is shown as p-p in the figure below.
Note: Slanted line shows the range of the rated load current.

リップルノイズは、下図ｐ－ｐ値で示される。
(注)斜線は定格負荷電流範囲を示す。

T1: Due to AC Input Line
入力商用周期
T2: Due to Switching
ｽｲｯﾁﾝｸﾞ周期

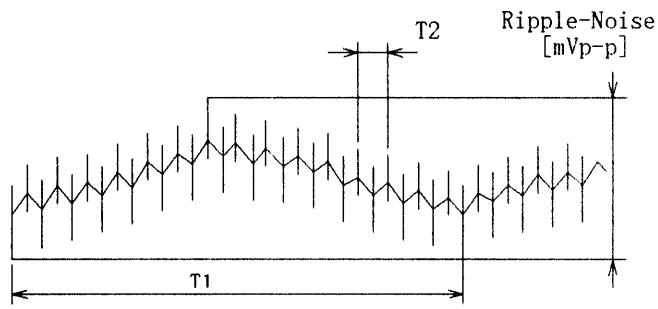


Fig. Complex Ripple Wave Form
図 リップル波形詳細図

2. Values

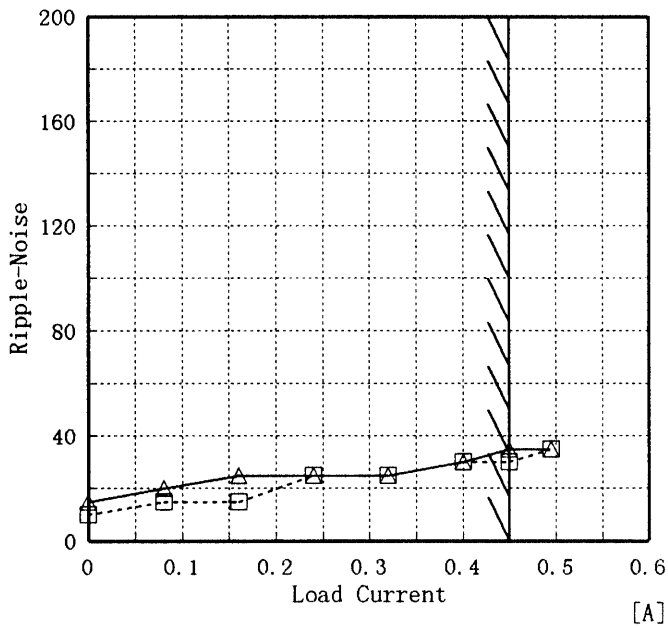
Load current [A]	Input Volt. 9.0 [V] Ripple-Noise [mV]	Input Volt. 18.0 [V] Ripple-Noise [mV]
0.00	20	30
0.08	30	35
0.16	30	40
0.24	50	45
0.32	50	55
0.40	50	60
0.45	55	60
0.50	60	60
—	—	—
—	—	—
—	—	—

COSEL

Model	ZUW101212
Item	Ripple-Noise リップルノイズ
Object	-12V0.450A

Temperature 25℃
Testing Circuitry Figure A

1. Graph



Ripple-Noise is shown as p-p in the figure below.
Note: Slanted line shows the range of the rated load current.

リップルノイズは、下図ｐ－ｐ値で示される。
(注)斜線は定格負荷電流範囲を示す。

T1: Due to AC Input Line
入力商用周期
T2: Due to Switching
ｽｲｯﾁﾝｸﾞ周期

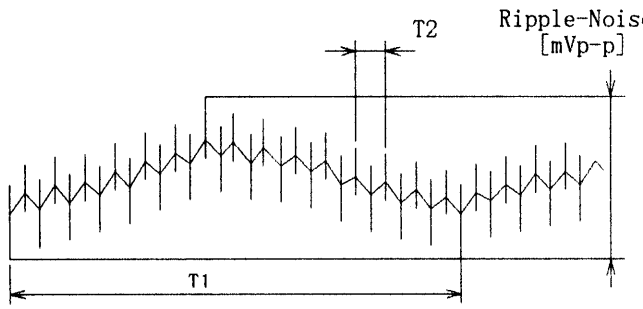


Fig. Complex Ripple Wave Form
図 リップル波形詳細図

2. Values

Load current [A]	Input Volt. 9.0 [V] Ripple-Noise [mV]	Input Volt. 18.0 [V] Ripple-Noise [mV]
0.00	10	15
0.08	15	20
0.16	15	25
0.24	25	25
0.32	25	25
0.40	30	30
0.45	30	35
0.50	35	35
—	—	—
—	—	—
—	—	—

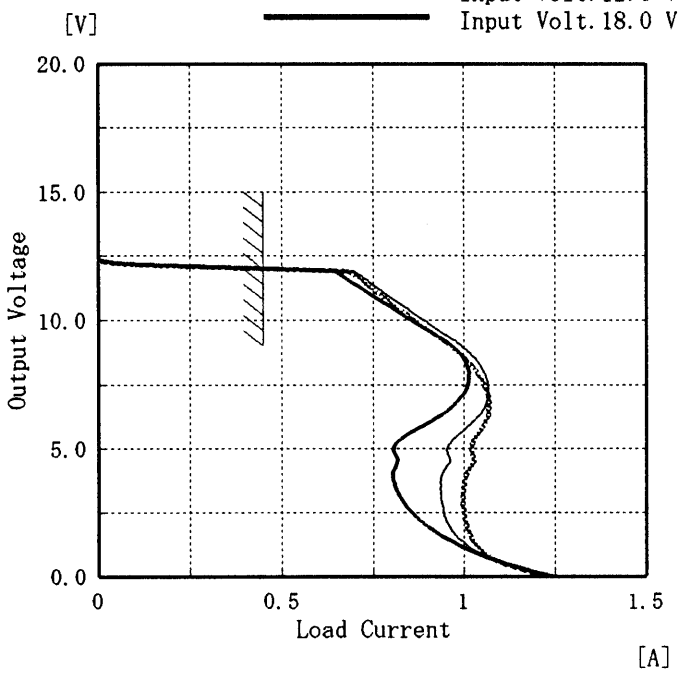
COSEL

Model	ZUW101212
Item	Overcurrent Protection 過電流保護

Temperature 25℃
Testing Circuitry Figure A

Object ＋12V0.450A

1. Graph

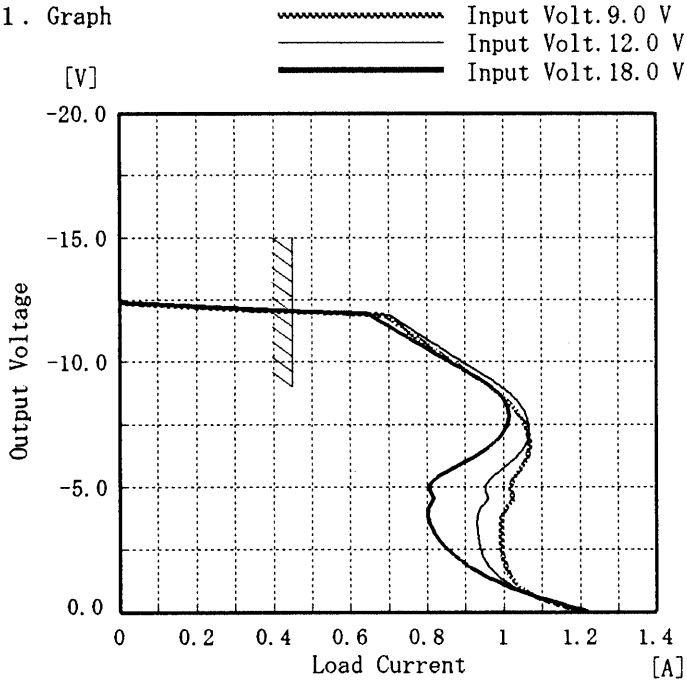


2. Values

Output Voltage [V]	Input Volt. 9.0[V] Load Current [A]	Input Volt. 12.0[V] Load Current [A]	Input Volt. 18.0[V] Load Current [A]
12.00	0.401	0.394	0.388
11.40	0.732	0.749	0.694
10.80	0.788	0.807	0.765
9.60	0.906	0.926	0.895
8.40	1.005	1.032	1.003
7.20	1.062	1.066	1.002
6.00	1.057	1.020	0.904
4.80	1.019	0.952	0.806
3.60	0.998	0.934	0.808
2.40	0.998	0.943	0.861
1.20	1.028	1.004	0.978
0.00	1.236	1.250	1.234

Object −12V0.450A

1. Graph



Note: Slanted line shows the range of the rated load current.

(注)斜線は定格負荷電流範囲を示す。

2. Values

Output Voltage [V]	Input Volt. 9.0[V] Load Current [A]	Input Volt. 12.0[V] Load Current [A]	Input Volt. 18.0[V] Load Current [A]
-12.00	0.620	0.637	0.642
-11.40	0.734	0.751	0.703
-10.80	0.790	0.810	0.767
-9.60	0.898	0.924	0.892
-8.40	1.005	1.032	1.003
-7.20	1.062	1.066	1.001
-6.00	1.055	1.019	0.901
-4.80	1.018	0.951	0.807
-3.60	0.994	0.930	0.805
-2.40	0.994	0.941	0.860
-1.20	1.029	1.008	0.985
0.00	1.208	1.223	1.207

BC−2077

COSEL

Model	ZUW101212		
Item	Dynamic Load Responce 動的負荷変動	Temperature Testing Circuitry	25℃ Figure A
Object	+12V0.450A		

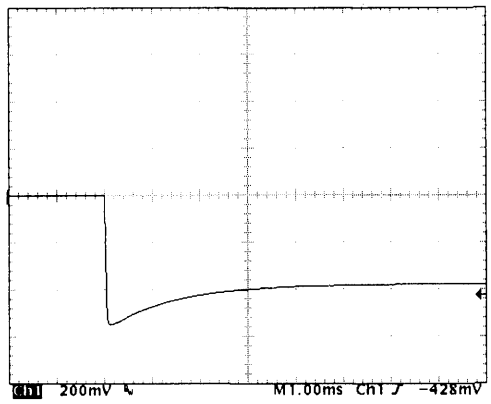
Input Volt. 12 V

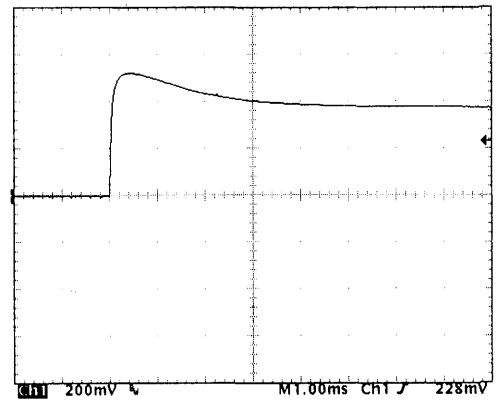
Cycle 100 mS

Load Current

Min. Load ←→
Load 100 %

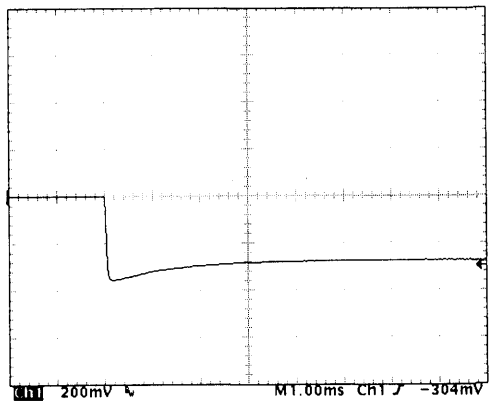
200 mV/div

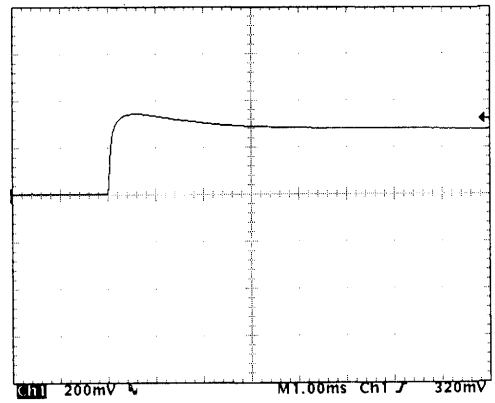




Min. Load ←→
Load 50 %

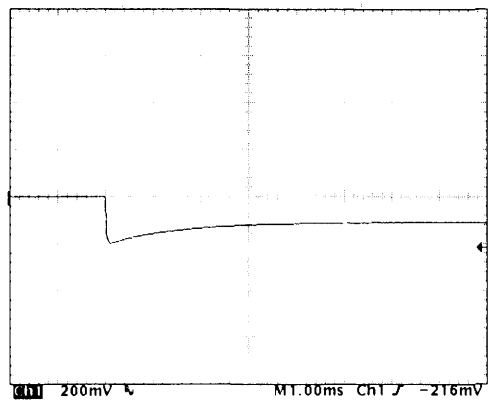
200 mV/div

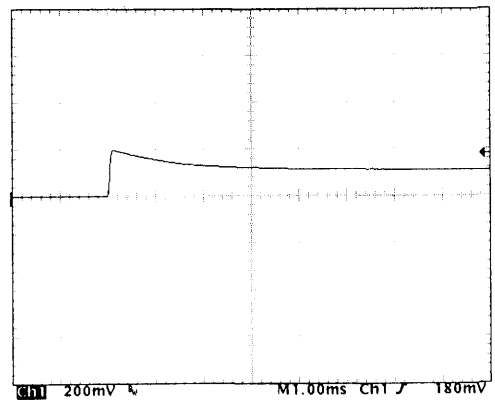




Load 50%←→
Load 100 %

200 mV/div





1 mS/div

COSEL

Model	ZUW101212
Item	Dynamic Load Responce 動的負荷変動
Object	-12V0.450A

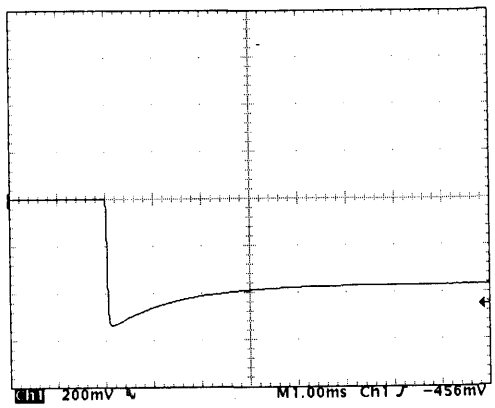
Temperature 25℃
Testing Circuitry Figure A

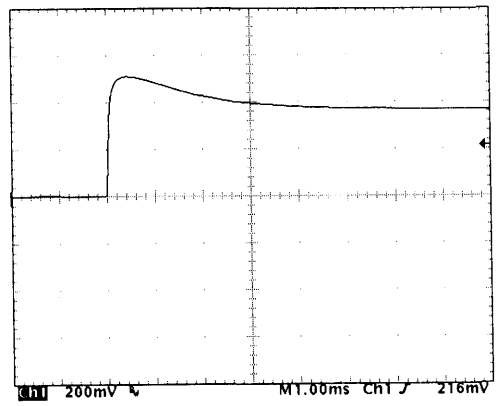
Input Volt. 12 V
Cycle 100 mS

Load Current

Min. Load ←→
Load 100 %

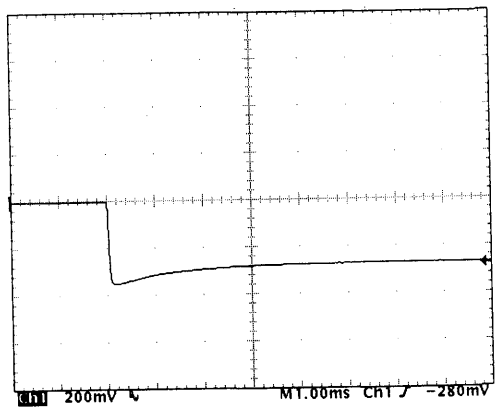
200 mV/div

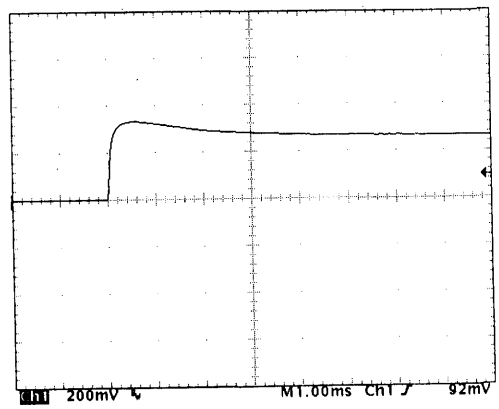




Min. Load ←→
Load 50 %

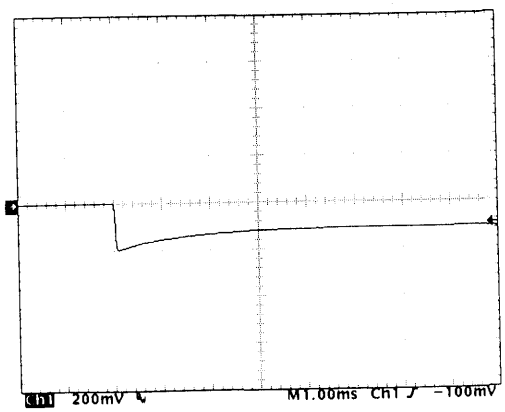
200 mV/div

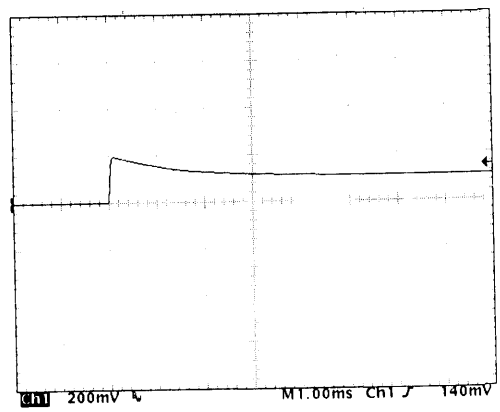




Load 50%←→
Load 100 %

200 mV/div





1 mS/div

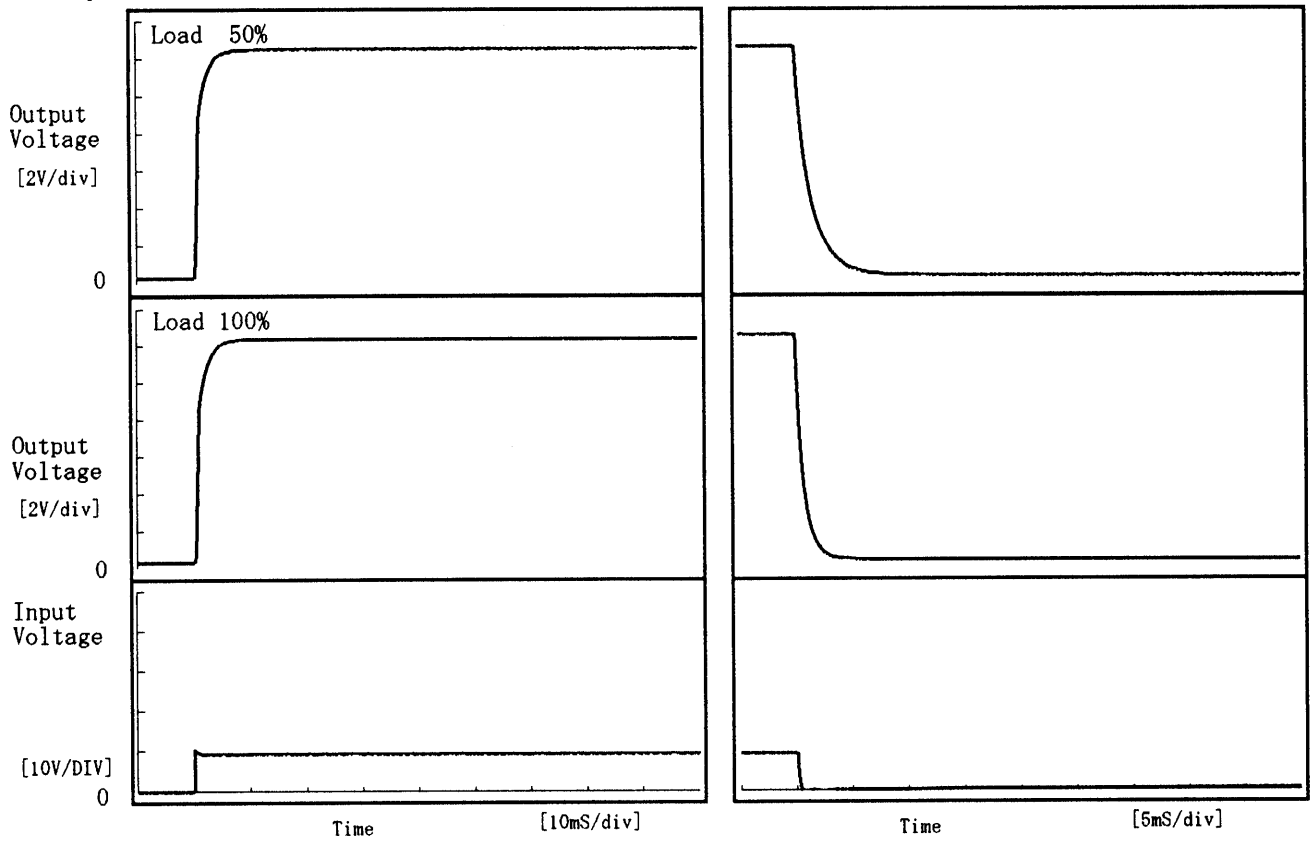
BC－2077

COSEL

Model	ZUW101212		
Item	Rise and Fall Time 立上り、立下り時間	Temperature Testing Circuitry	25℃ Figure A
Object	+12V0.450A		

1. Graph

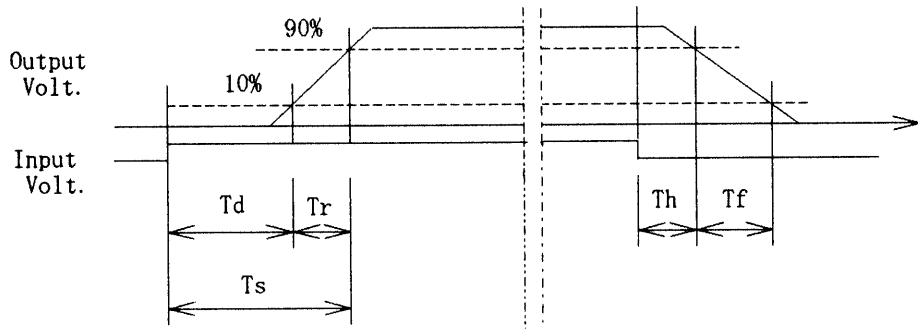
Input Volt. 9.0 V



2. Values

[mS]

Load \ Time	T d	T r	T s	T h	T f
50 %	0.45	2.05	2.50	0.20	3.48
100 %	0.45	2.25	2.70	0.13	1.73



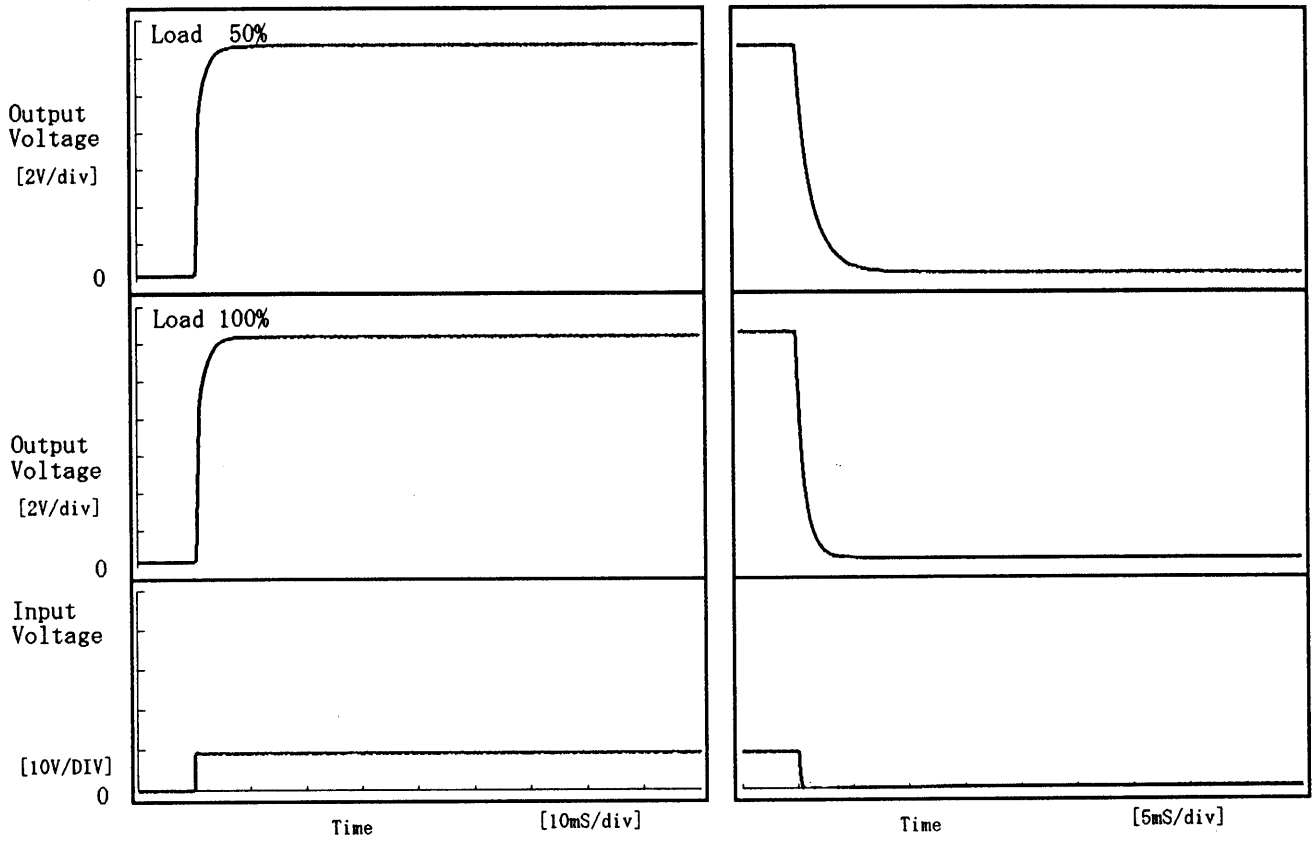
BC−2077

COSEL

Model	ZUW101212		
Item	Rise and Fall Time 立上り、立下り時間	Temperature Testing Circuitry	25℃ Figure A
Object	-12V0.450A		

1. Graph

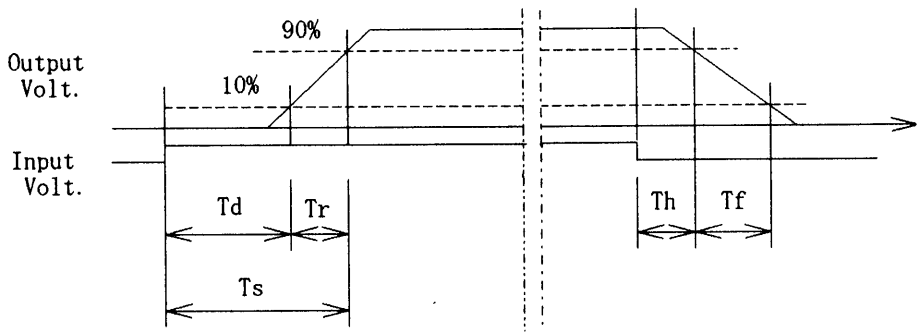
Input Volt. 9.0 V



2. Values

[mS]

Load \ Time	Td	Tr	Ts	Th	Tf
50 %	0.45	1.85	2.30	0.20	3.48
100 %	0.45	2.20	2.65	0.13	1.73



BC−2077

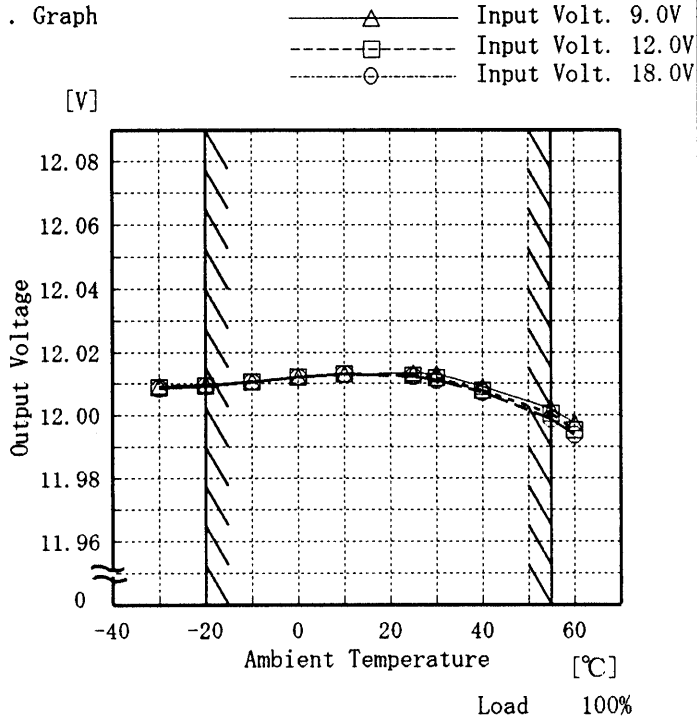
COSEL

Model	ZUW101212
Item	Ambient Temperature Drift 周囲温度変動

Testing Circuitry Figure A

Object ＋12V0.450A

1. Graph

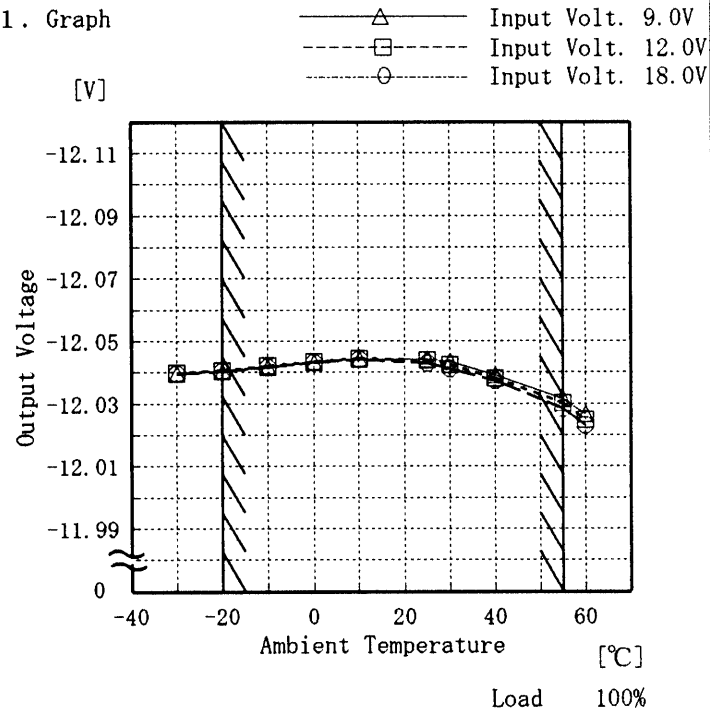


2. Values

Temperature [℃]	Input Volt. 9.0[V] Output Volt. [V]	Input Volt. 12.0[V] Output Volt. [V]	Input Volt. 18.0[V] Output Volt. [V]
-30	12.009	12.009	12.009
-20	12.010	12.009	12.009
-10	12.011	12.011	12.011
0	12.012	12.012	12.012
10	12.013	12.013	12.013
25	12.013	12.013	12.012
30	12.013	12.012	12.011
40	12.009	12.008	12.007
55	12.002	12.000	11.999
60	11.998	11.995	11.994
—	—	—	—

Object －12V0.450A

1. Graph



Note: Slanted line shows the range of the rated ambient temperature.

(注)斜線は定格周囲温度範囲を示す。

2. Values

Temperature [℃]	Input Volt. 9.0[V] Output Volt. [V]	Input Volt. 12.0[V] Output Volt. [V]	Input Volt. 18.0[V] Output Volt. [V]
-30	-12.040	-12.040	-12.039
-20	-12.040	-12.041	-12.040
-10	-12.042	-12.042	-12.042
0	-12.043	-12.043	-12.043
10	-12.044	-12.044	-12.044
25	-12.044	-12.044	-12.043
30	-12.043	-12.042	-12.041
40	-12.039	-12.038	-12.037
55	-12.031	-12.030	-12.028
60	-12.027	-12.025	-12.023
—	—	—	—

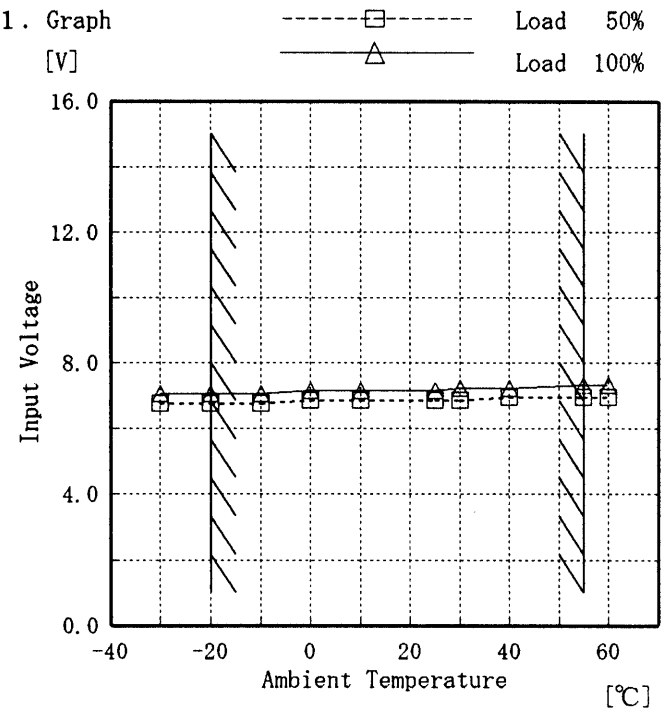
COSEL

Model	ZUW101212
Item	Minimum Input Voltage for Regulated Output Voltage 最低レギュレーション電圧

Testing Circuitry Figure A

Object ＋12V0.450A

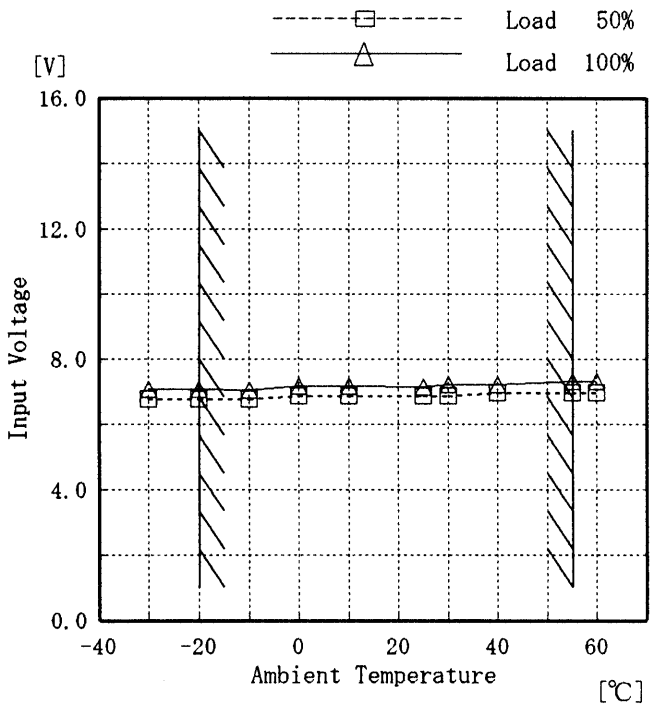
1. Graph



2. Values

Ambient Temp. [℃]	Load 50% Input Volt. [V]	Load 100% Input Volt. [V]
-30	6.8	7.1
-20	6.8	7.1
-10	6.8	7.1
0	6.9	7.2
10	6.9	7.2
25	6.9	7.2
30	6.9	7.2
40	7.0	7.2
55	7.0	7.3
60	7.0	7.3
—	—	—

Object －12V0.450A



2. Values

Ambient Temp. [℃]	Load 50% Input Volt. [V]	Load 100% Input Volt. [V]
-30	6.8	7.1
-20	6.8	7.1
-10	6.8	7.1
0	6.9	7.2
10	6.9	7.2
25	6.9	7.2
30	6.9	7.2
40	7.0	7.2
55	7.0	7.3
60	7.0	7.3
—	—	—

Note: Slanted line shows the range of the rated ambient temperature.

(注)斜線は定格周囲温度範囲を示す。

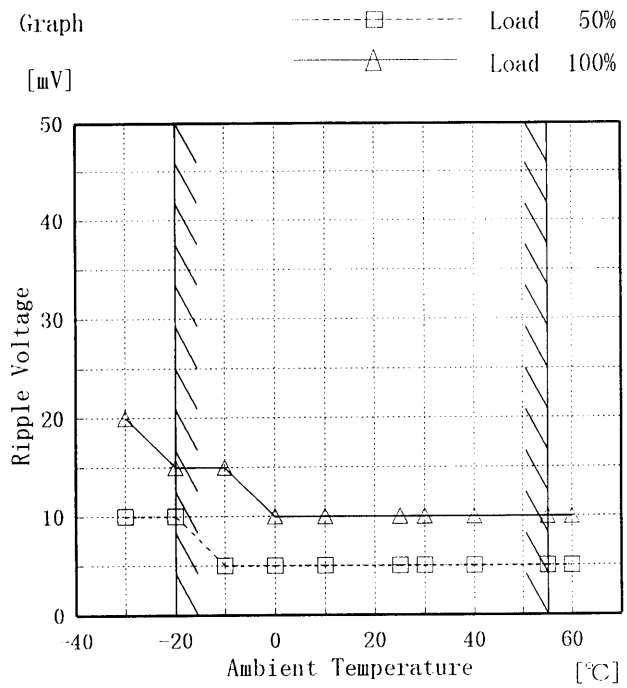
COSEL

Model	ZUW101212
Item	Ripple Voltage (by Ambient Temp.) リップル電圧（周囲温度特性）

Testing Circuitry　Figure A

Object　+12V0.450A

1. Graph



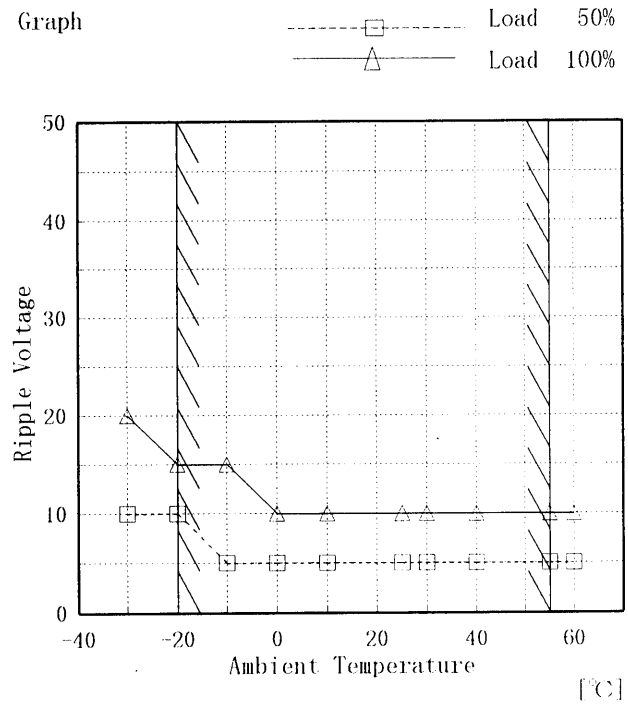
Input Volt.　9.0 V

2. Values

Ambient Temp. [℃]	Load 50% Ripple Output Volt. [mV]	Load 100% Ripple Output Volt. [mV]
-30	10	20
-20	10	15
-10	5	15
0	5	10
10	5	10
25	5	10
30	5	10
40	5	10
55	5	10
60	5	10
—	—	—

Object　−12V0.450A

1. Graph



Input Volt.　9.0 V

Note: Slanted line shows the range of the rated ambient temperature.

(注)斜線は定格周囲温度範囲を示す。

2. Values

Ambient Temp. [℃]	Load 50% Ripple Output Volt. [mV]	Load 100% Ripple Output Volt. [mV]
-30	15	25
-20	15	20
-10	10	15
0	10	15
10	5	10
25	5	10
30	5	10
40	5	10
55	5	10
60	5	10
—	—	—

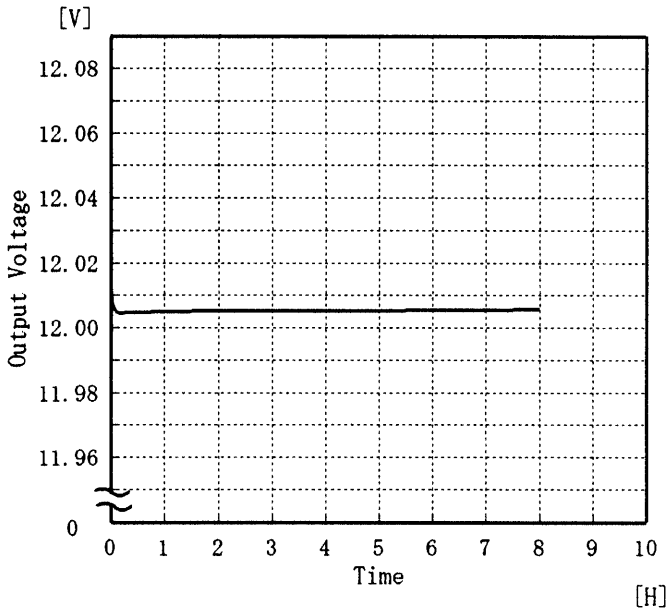
COSEL

Model	ZUW101212
Item	Time Lapse Drift 経時ドリフト

Temperature 25 ℃
Testing Circuitry Figure A

Object ＋12V0.450A

1. Graph



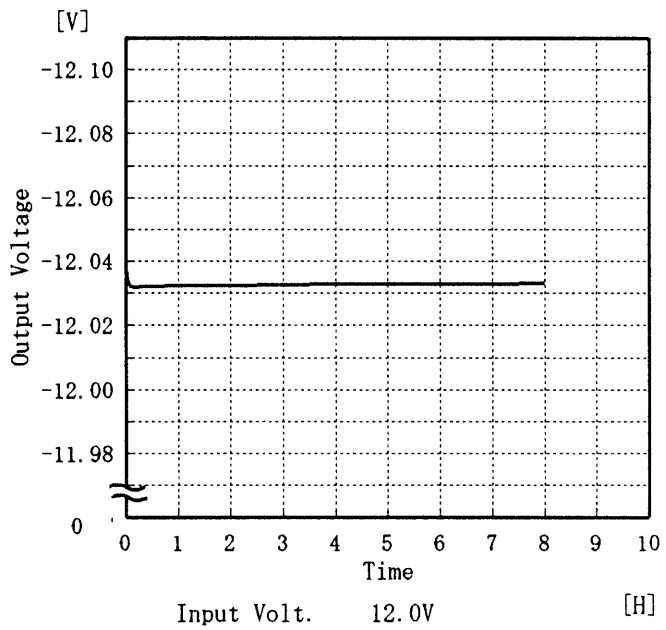
Input Volt. 12.0V
Load 100%

2. Values

Time since start [H]	Output Voltage [V]
0.0	12.011
0.5	12.005
1.0	12.005
2.0	12.005
3.0	12.005
4.0	12.005
5.0	12.006
6.0	12.006
7.0	12.006
8.0	12.006

Object －12V0.450A

1. Graph



Input Volt. 12.0V
Load 100%

2. Values

Time since start [H]	Output Voltage [V]
0.0	-12.038
0.5	-12.032
1.0	-12.032
2.0	-12.033
3.0	-12.033
4.0	-12.033
5.0	-12.033
6.0	-12.033
7.0	-12.033
8.0	-12.033

BC－2077

COSEL

Model	ZUW101212
Item	Output Voltage Accuracy 定電圧精度

Testing Circuitry Figure A

Output Voltage Accuracy

This is defined as the value of the output voltage, regulation load, ambient temperature and input voltage varied at random in the range as specified below.

Temperature : -20～55 ℃

Input Voltage : 9.0～18.0 V

Load Current (AVR 1) : 0.000～0.450 A

(AVR 2) : 0.000～0.450 A

* Output Voltage Accuracy = ±(Maximum of Output Voltage − Minimum of Output Voltage)／2

$$* \text{ Output Voltage Accuracy (Ration)} = \frac{\text{Voltage Accuracy}}{\text{Rated Output Voltage}} \times 100$$

定電圧精度

周囲温度、入力電圧、負荷を下記仕様内で、任意に変動させたときの出力電圧の変動をいう。

周囲温度 -20～55 ℃

入力電圧 9.0～18.0 V

負荷電流 (AVR 1) 0.000～0.450 A

(AVR 2) 0.000～0.450 A

* 定電圧精度(変動値) ＝ ±(出力電圧の最高値－出力電圧の最低値)／2

$$* \text{ 定電圧精度(変動率)} = \frac{\text{変動値}}{\text{定格出力電圧}} \times 100$$

Object ＋12V0.450A

Item	Temperature [℃]	Input Voltage [V]	Output Current [A]	Output Voltage [V]	Output Voltage Accuracy [mV]	Output Voltage Accuracy (Ration) [%]
Maximum Voltage	25	9.0	0.450	12.013	±194	±1.7
Minimum Voltage	55	9.0	0.000	11.625		

Object －12V0.450A

Item	Temperature [℃]	Input Voltage [V]	Output Current [A]	Output Voltage [V]	Output Voltage Accuracy [mV]	Output Voltage Accuracy (Ration) [%]
Maximum Voltage	25	9.0	0.450	-12.044	±187	±1.6
Minimum Voltage	55	18.0	0.000	-11.671		

COSEL

Model	ZUW101212
Item	Condensation 結露特性
Object	+12V0.450A

Testing Circuitry Figure A

1. Condensation test

Testing procedure is as follows.

① Keeping and cooling the unit in a tank at -10℃ for an hour with the input off.

② Taking it out of the tank and dewing itself in a room where the temperature is 25℃ and the humidity is 40%RH.

③ Testing electrical characteristics of the unit to confirm there be no fault.

④ Repeating ①,② and ③ three times.

1．結露特性試験

入力を切った状態で、恒温槽で－１０℃に冷却しておき、約１時間後に恒温槽から取り出し、室温２５℃、湿度４０%RHの状態におき結露させ、その電気的特性の測定を３度行い、異常のないことを確認する。

2. Values

	Times	Output Voltage [V]	Ripple Voltage [mV]	Ripple Noise [mV]
Load 50 %	1	12.078	10	65
	2	12.086	10	65
	3	12.085	10	65
Load 100 %	1	11.983	10	80
	2	11.993	10	80
	3	11.930	10	80

Input Volt. 12.0 V

COSEL

Model	ZUW101212
Item	Condensation 結露特性
Object	−12V0.450A

Testing Circuitry Figure A

1. Condensation test

Testing procedure is as follows.

① Keeping and cooling the unit in a tank at -10℃ for an hour with the input off.

② Taking it out of the tank and dewing itself in a room where the temperature is 25℃ and the humidity is 40%RH.

③ Testing electrical characteristics of the unit to confirm there be no fault.

④ Repeating ①,② and ③ three times.

1．結露特性試験

入力を切った状態で、恒温槽で－１０℃に冷却しておき、約１時間後に恒温槽から取り出し、室温２５℃、湿度４０%RHの状態におき結露させ、その電気的特性の測定を３度行い、異常のないことを確認する。

2. Values

	Times	Output Voltage [V]	Ripple Voltage [mV]	Ripple Noise [mV]
Load 50 %	1	12.108	10	40
	2	12.090	10	40
	3	12.095	10	40
Load 100 %	1	12.008	15	50
	2	11.997	15	50
	3	11.999	15	50

Input Volt. 12.0 V

COSEL

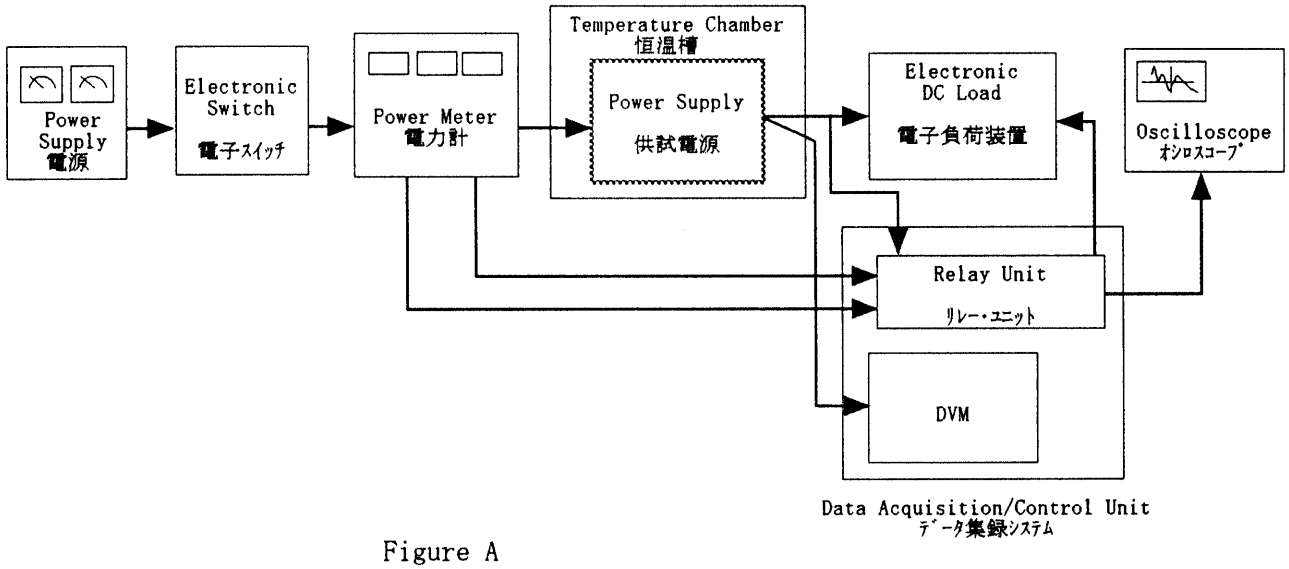


Figure A