参考資料

COSEL

TEST DATA OF ZUW32412

(24.0V INPUT)

Regulated DC Power Supply

Date : Nov.5. 1996

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Design Manager

Prepared by : Y. Nagai
Design Engineer

コーセル株式会社

COSEL CO.,LTD.

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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)

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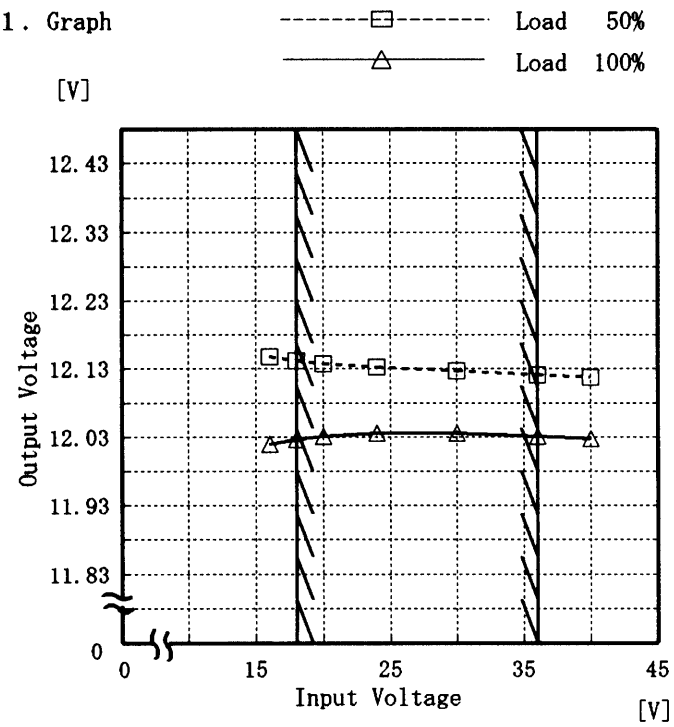
Model	ZUW32412	Temperature	25℃
Item	Line Regulation 静的入力変動	Testing Circuitry	Figure A

Object +12V0.13A

1. Graph

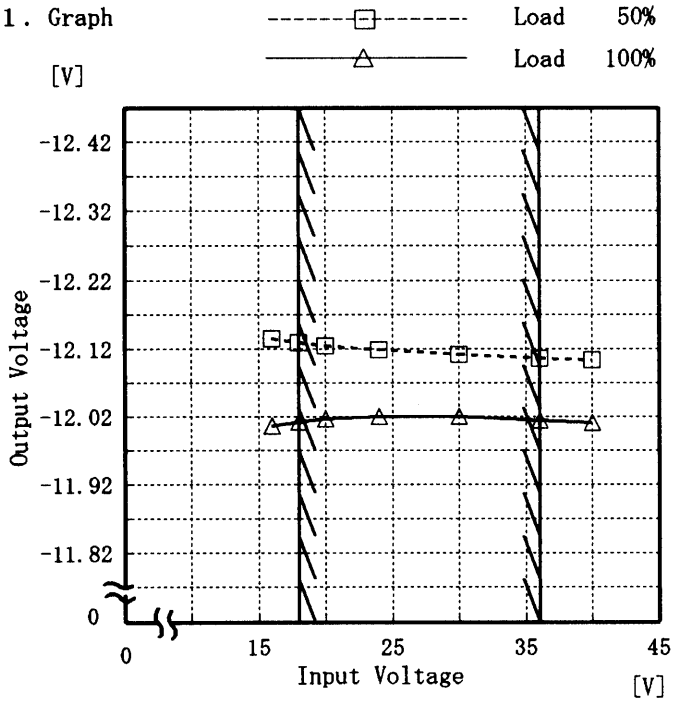


2. Values

Input Voltage [V]	Load 50% Output Volt. [V]	Load 100% Output Volt. [V]
16.0	12.148	12.019
18.0	12.142	12.026
20.0	12.138	12.031
24.0	12.133	12.035
30.0	12.127	12.035
36.0	12.121	12.031
40.0	12.118	12.027
—	—	—
—	—	—
—	—	—
—	—	—
—	—	—

Object −12V0.13A

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]
16.0	-12.135	-12.006
18.0	-12.129	-12.012
20.0	-12.125	-12.016
24.0	-12.119	-12.020
30.0	-12.112	-12.020
36.0	-12.106	-12.014
40.0	-12.103	-12.011
—	—	—
—	—	—
—	—	—
—	—	—
—	—	—

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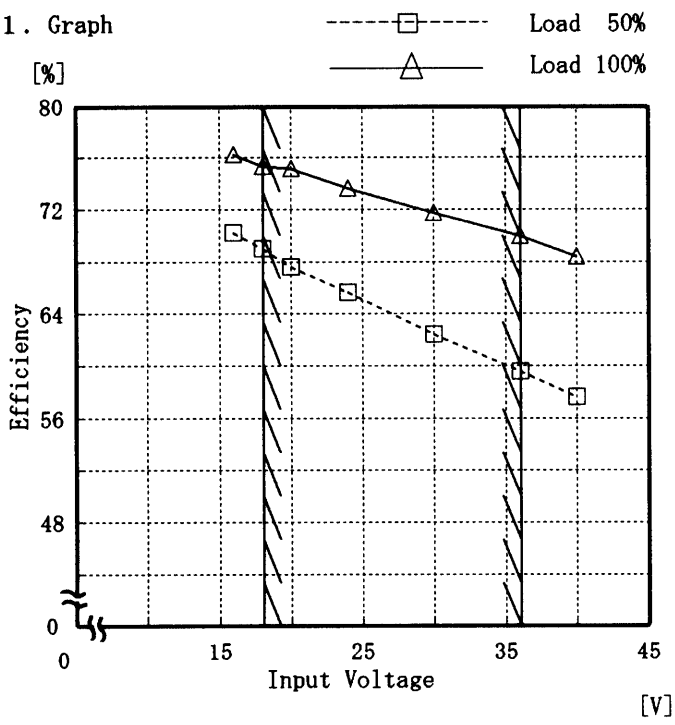
Model	ZUW32412
Item	Efficiency 効率
Object	――――――――

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 [%]
16.0	70.2	76.3
18.0	69.0	75.4
20.0	67.6	75.2
24.0	65.7	73.6
30.0	62.4	71.7
36.0	59.6	70.0
40.0	57.6	68.4
—	—	—
—	—	—
—	—	—
—	—	—
—	—	—

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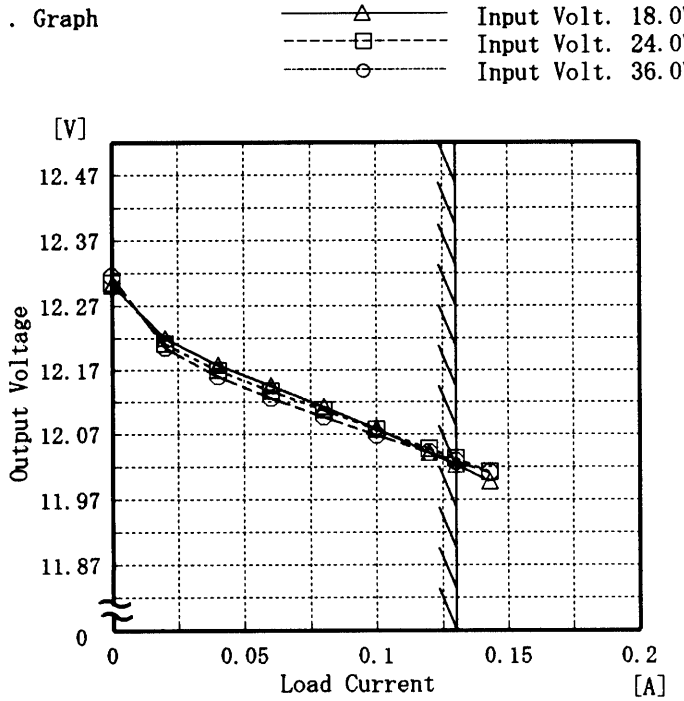
Model	ZUW32412	Temperature	25℃
Item	Load Regulation 静的負荷変動	Testing Circuitry	Figure A

Object +12V0.13A

1. Graph

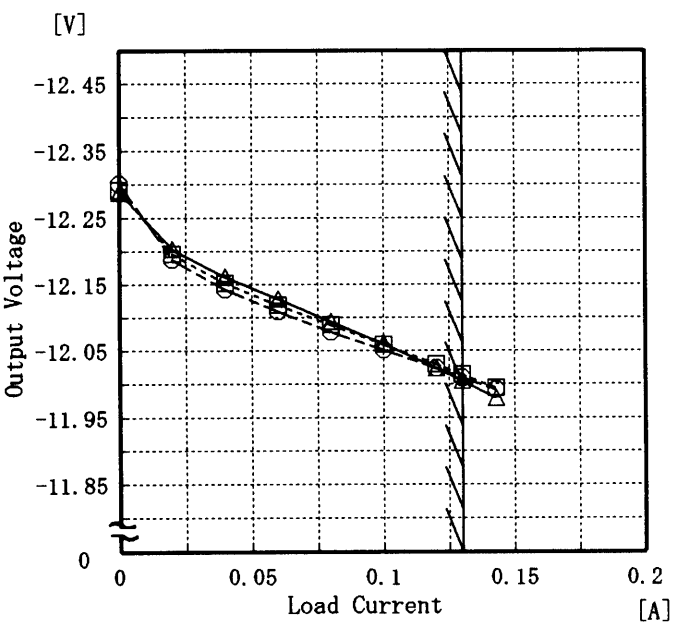


2. Values

Load Current [A]	Input Volt. 18.0[V] Output Volt. [V]	Input Volt. 24.0[V] Output Volt. [V]	Input Volt. 36.0[V] Output Volt. [V]
0.000	12.302	12.306	12.315
0.020	12.220	12.212	12.205
0.040	12.179	12.170	12.160
0.060	12.145	12.137	12.126
0.080	12.112	12.107	12.097
0.100	12.078	12.078	12.069
0.120	12.042	12.048	12.042
0.130	12.023	12.033	12.029
0.143	11.998	12.013	12.011
—	—	—	—

Object −12V0.13A

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. 18.0[V] Output Volt. [V]	Input Volt. 24.0[V] Output Volt. [V]	Input Volt. 36.0[V] Output Volt. [V]
0.000	-12.289	-12.292	-12.302
0.020	-12.205	-12.196	-12.189
0.040	-12.163	-12.153	-12.143
0.060	-12.129	-12.120	-12.109
0.080	-12.095	-12.089	-12.079
0.100	-12.061	-12.060	-12.051
0.120	-12.025	-12.030	-12.024
0.130	-12.006	-12.015	-12.011
0.143	-11.979	-11.994	-11.993
—	—	—	—

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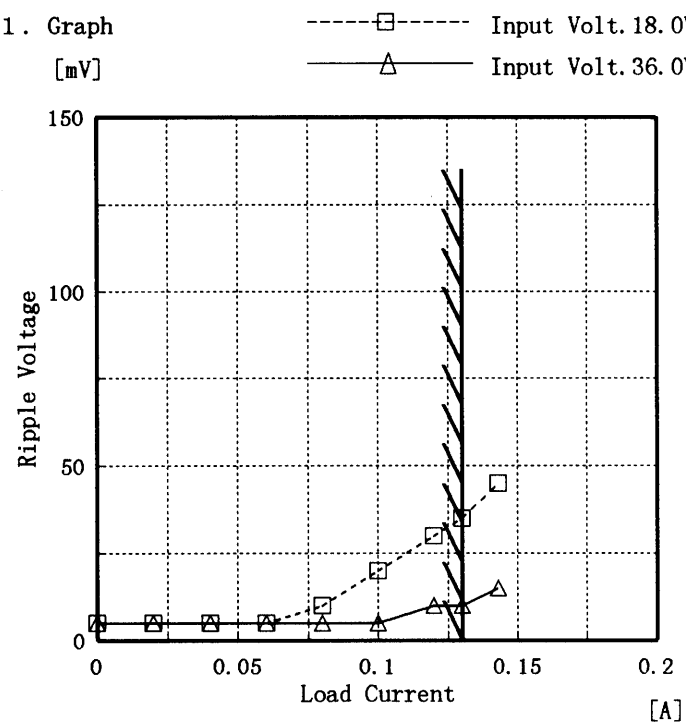
Model	ZUW32412
Item	Ripple Voltage(by Load Current) リップル電圧(負荷電流特性)
Object	+12V0.13A

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

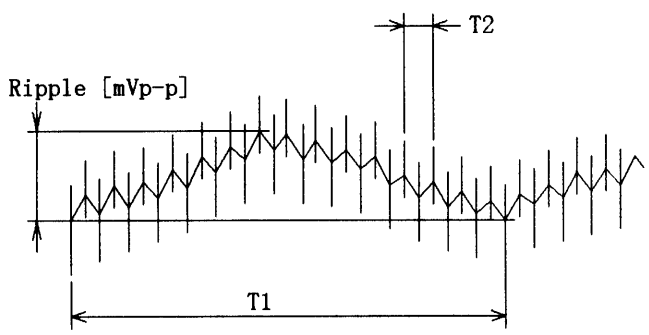


Fig. Complex Ripple Wave Form
図 リップル波形詳細図

2. Values

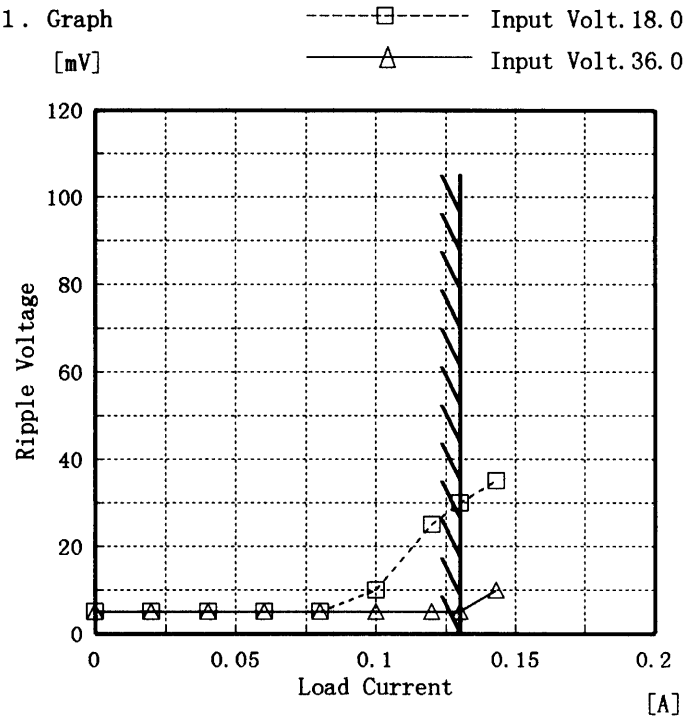
Load Current [A]	Input Volt. 18.0 [V] Ripple Output Volt. [mV]	Input Volt. 36.0 [V] Ripple Output Volt. [mV]
0.00	5	5
0.02	5	5
0.04	5	5
0.06	5	5
0.08	10	5
0.10	20	5
0.12	30	10
0.13	35	10
0.14	45	15
—	—	—
—	—	—

COSEL

Model	ZUW32412
Item	Ripple Voltage(by Load Current) リップル電圧(負荷電流特性)
Object	−12V0.13A

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

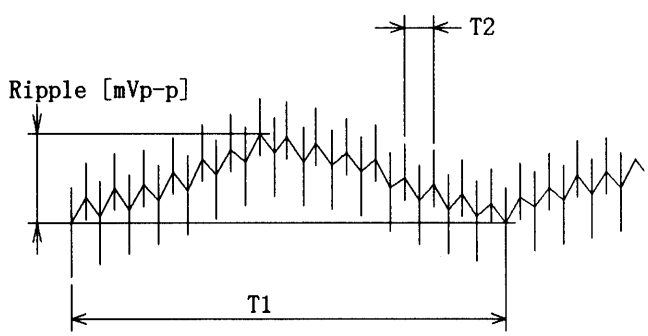


Fig. Complex Ripple Wave Form
図 リップル波形詳細図

2. Values

Load Current [A]	Input Volt. 18.0 [V] Ripple Output Volt. [mV]	Input Volt. 36.0 [V] Ripple Output Volt. [mV]
0.00	5	5
0.02	5	5
0.04	5	5
0.06	5	5
0.08	5	5
0.10	10	5
0.12	25	5
0.13	30	5
0.14	35	10
—	—	—
—	—	—

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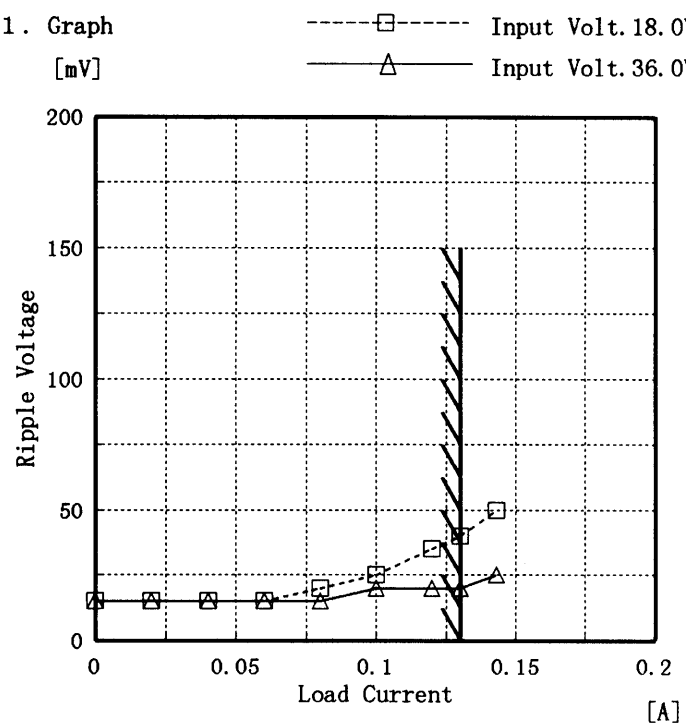
Model	ZUW32412
Item	Ripple-Noise リップルノイズ
Object	+12V0.13A

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。

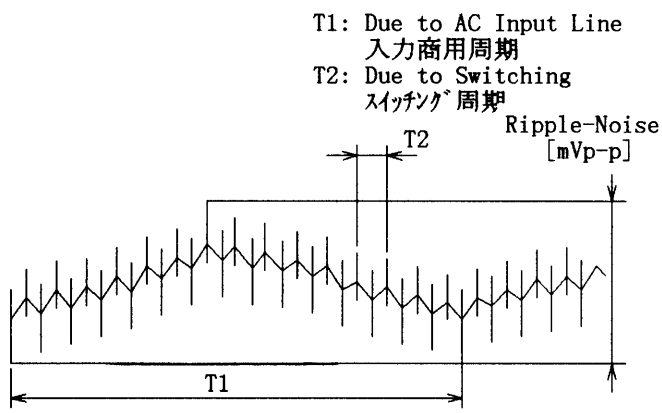


Fig. Complex Ripple Wave Form
図 リップル波形詳細図

2. Values

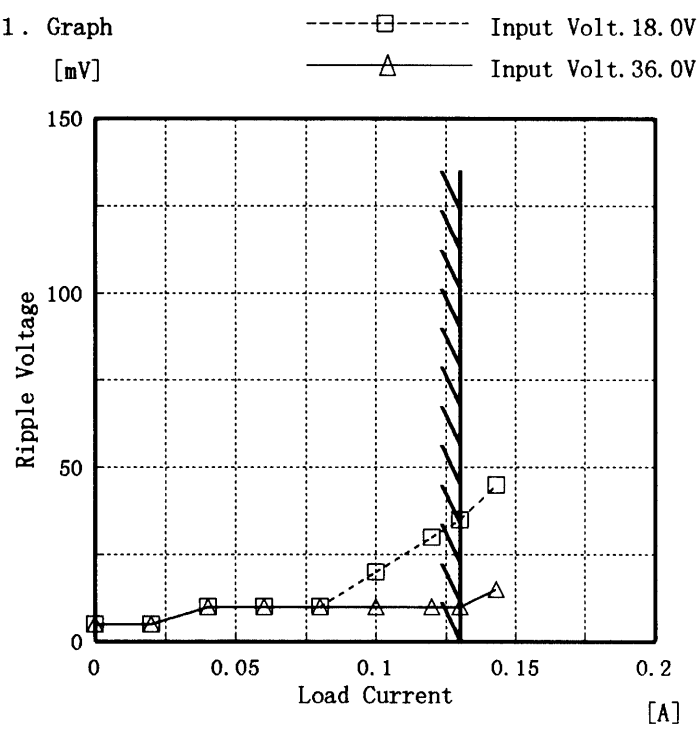
Load Current [A]	Input Volt. 18.0 [V] Ripple Output Volt. [mV]	Input Volt. 36.0 [V] Ripple Output Volt. [mV]
0.00	15	15
0.02	15	15
0.04	15	15
0.06	15	15
0.08	20	15
0.10	25	20
0.12	35	20
0.13	40	20
0.14	50	25
—	—	—
—	—	—

COSEL

Model	ZUW32412
Item	Ripple-Noise リップルノイズ
Object	−12V0.13A

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。

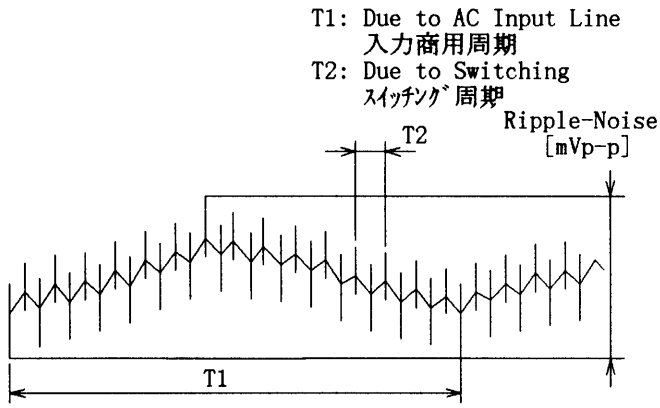


Fig. Complex Ripple Wave Form
図 リップル波形詳細図

2. Values

Load Current [A]	Input Volt. 18.0 [V] Ripple Output Volt. [mV]	Input Volt. 36.0 [V] Ripple Output Volt. [mV]
0.00	5	5
0.02	5	5
0.04	10	10
0.06	10	10
0.08	10	10
0.10	20	10
0.12	30	10
0.13	35	10
0.14	45	15
—	—	—
—	—	—

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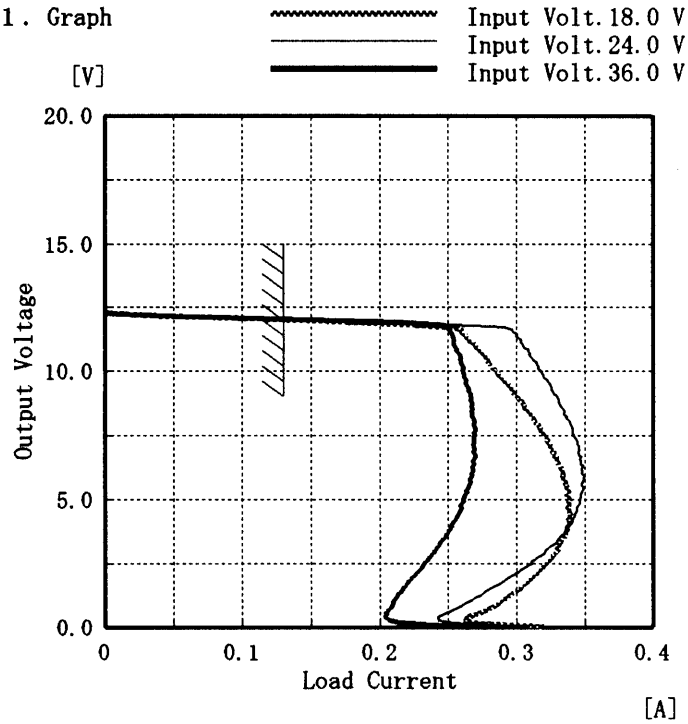
Model	ZUW32412
Item	Overcurrent Protection 過電流保護

Temperature 25℃
Testing Circuitry Figure A

Object +12V0.13A

1. Graph

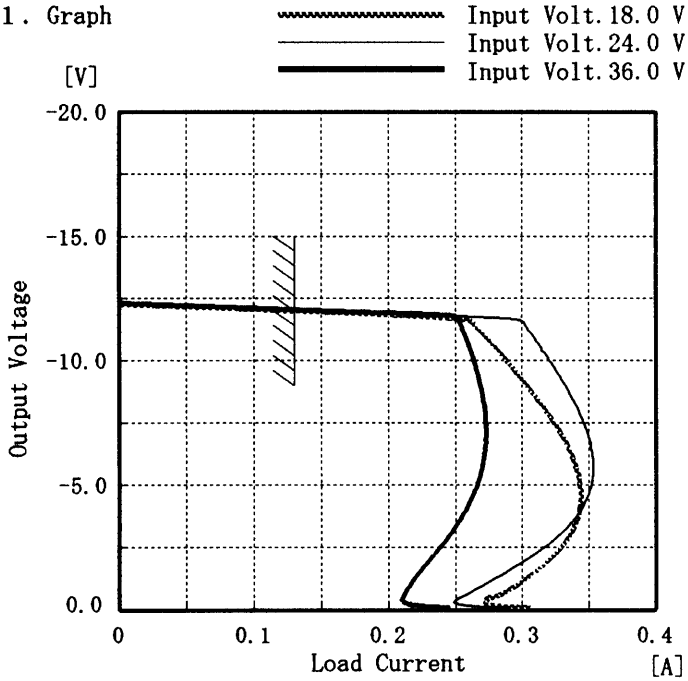


2. Values

Output Voltage [V]	Input Volt. 18.0[V] Load Current [A]	Input Volt. 24.0[V] Load Current [A]	Input Volt. 36.0[V] Load Current [A]
12.00	0.155	0.169	0.171
11.40	0.262	0.300	0.253
10.80	0.271	0.308	0.256
9.60	0.292	0.323	0.264
8.40	0.308	0.335	0.267
7.20	0.322	0.345	0.269
6.00	0.334	0.348	0.267
4.80	0.339	0.346	0.260
3.60	0.336	0.334	0.249
2.40	0.320	0.309	0.231
1.20	0.295	0.274	0.213
0.00	0.320	0.306	0.260

Object −12V0.13A

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. 18.0[V] Load Current [A]	Input Volt. 24.0[V] Load Current [A]	Input Volt. 36.0[V] Load Current [A]
-12.00	0.146	0.155	0.157
-11.40	0.266	0.303	0.255
-10.80	0.275	0.310	0.259
-9.60	0.294	0.325	0.266
-8.40	0.311	0.337	0.271
-7.20	0.326	0.347	0.273
-6.00	0.338	0.353	0.271
-4.80	0.343	0.350	0.265
-3.60	0.341	0.339	0.254
-2.40	0.327	0.314	0.237
-1.20	0.301	0.278	0.219
0.00	0.306	0.291	0.246

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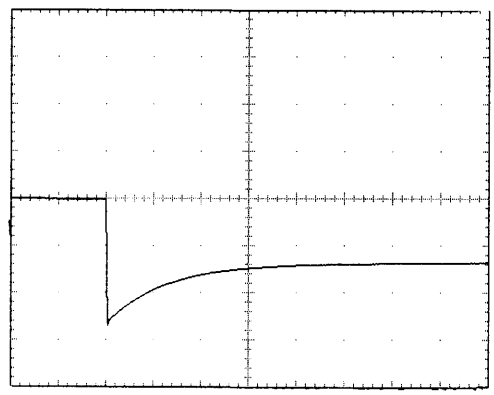
Model	ZUW32412		
Item	Dynamic Load Responce 動的負荷変動	Temperature Testing Circuitry	25℃ Figure A
Object	+12V0.13A		

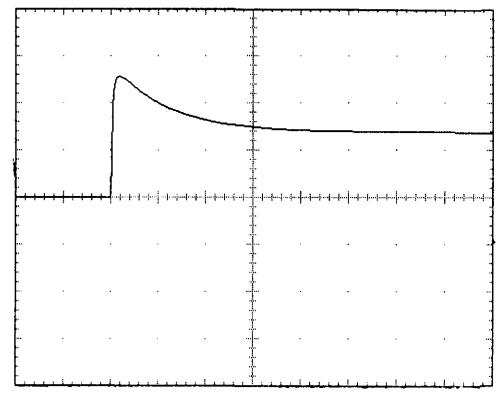
Input Volt. 24.0 V

Cycle 100 mS

Load Current

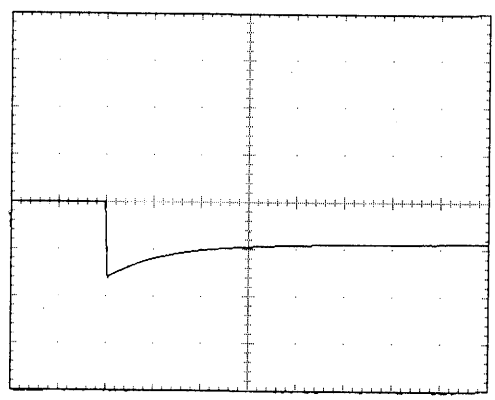
Min. Load ⟷
Load 100 %

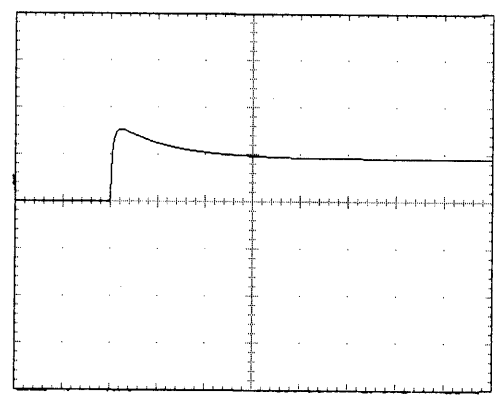




200 mV/div

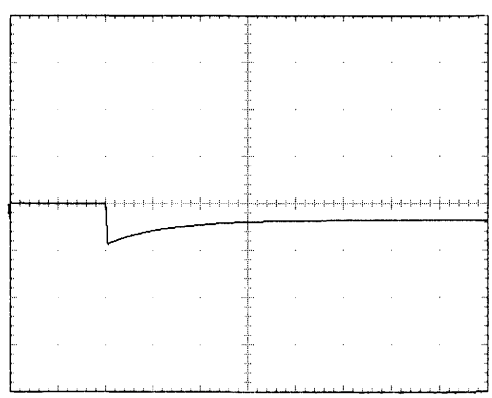
Min. Load ⟷
Load 50 %

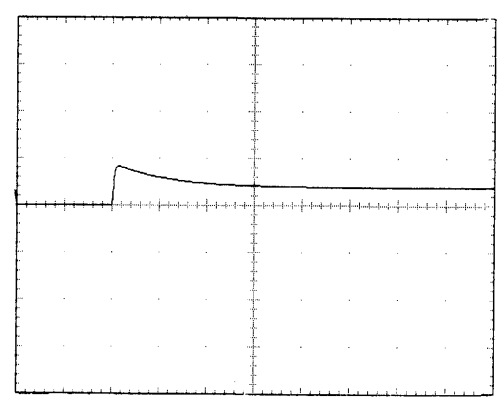




200 mV/div

Load 50%⟷
Load 100 %





200 mV/div

1 mS/div

COSEL

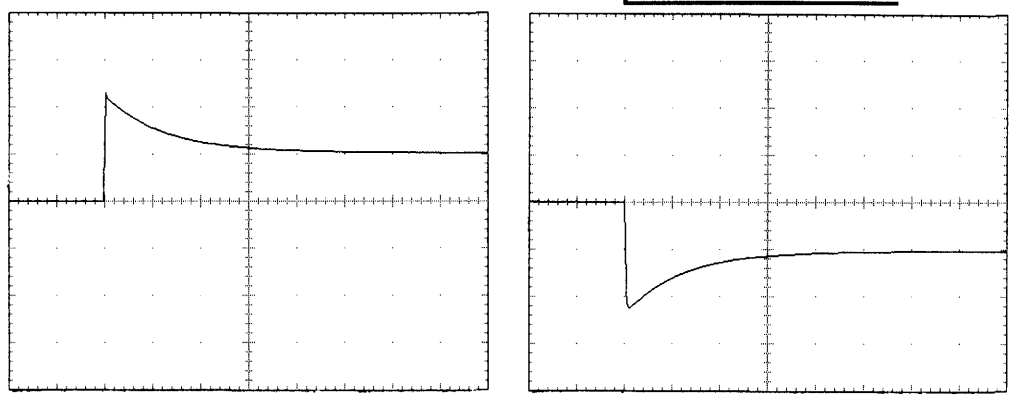
Model	ZUW32412		
Item	Dynamic Load Responce 動的負荷変動	Temperature Testing Circuitry	25℃ Figure A
Object	−12V0.13A		

Input Volt. 24.0 V

Cycle 100 mS

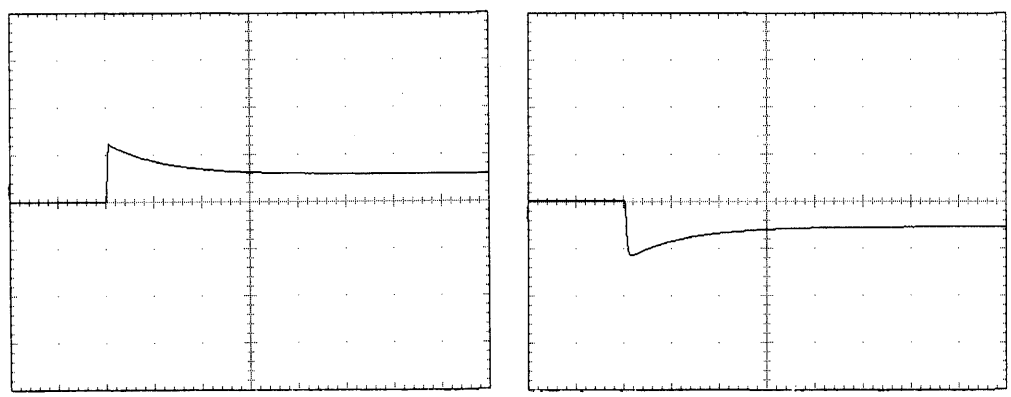
Load Current

Min. Load ⟷
Load 100 %



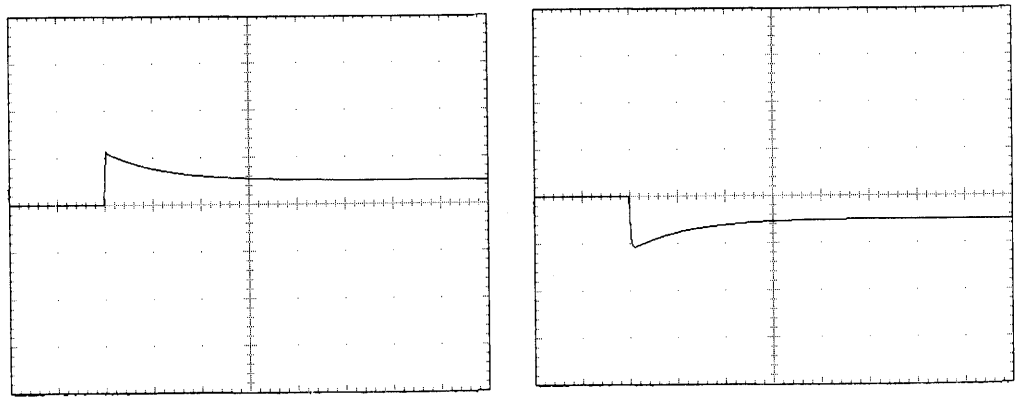
200 mV/div

Min. Load ⟷
Load 50 %



200 mV/div

Load 50%⟷
Load 100 %



200 mV/div

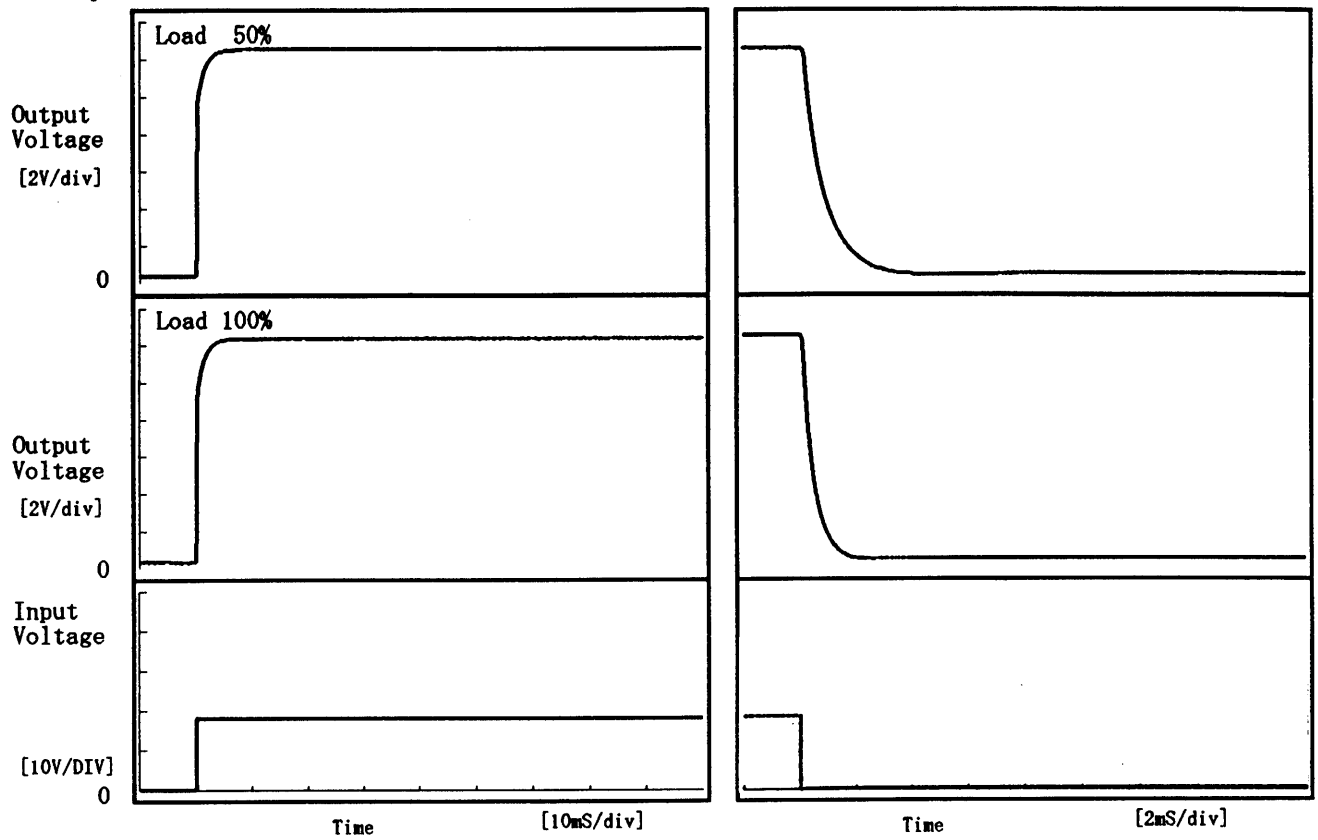
1 mS/div

COSEL

Model	ZUW32412		
Item	Rise and Fall Time 立上り、立下り時間	Temperature	25℃
		Testing Circuitry	Figure A
Object	+12V 0.13A		

1. Graph

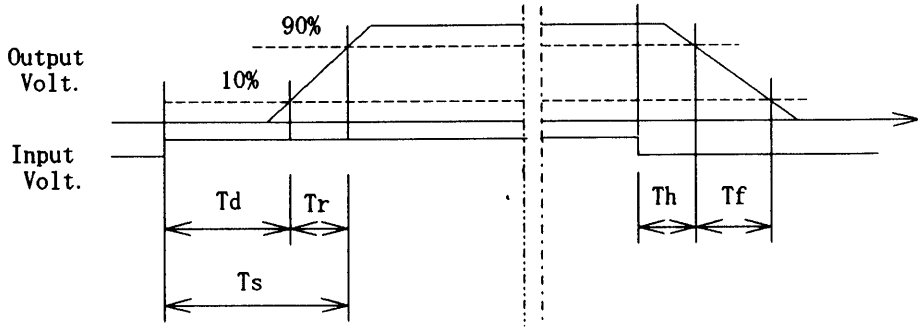
Input Volt. 18.0 V



2. Values

[mS]

Load \ Time	T d	T r	T s	T h	T f
50 %	0.05	1.15	1.20	0.23	1.80
100 %	0.05	1.30	1.35	0.15	0.95



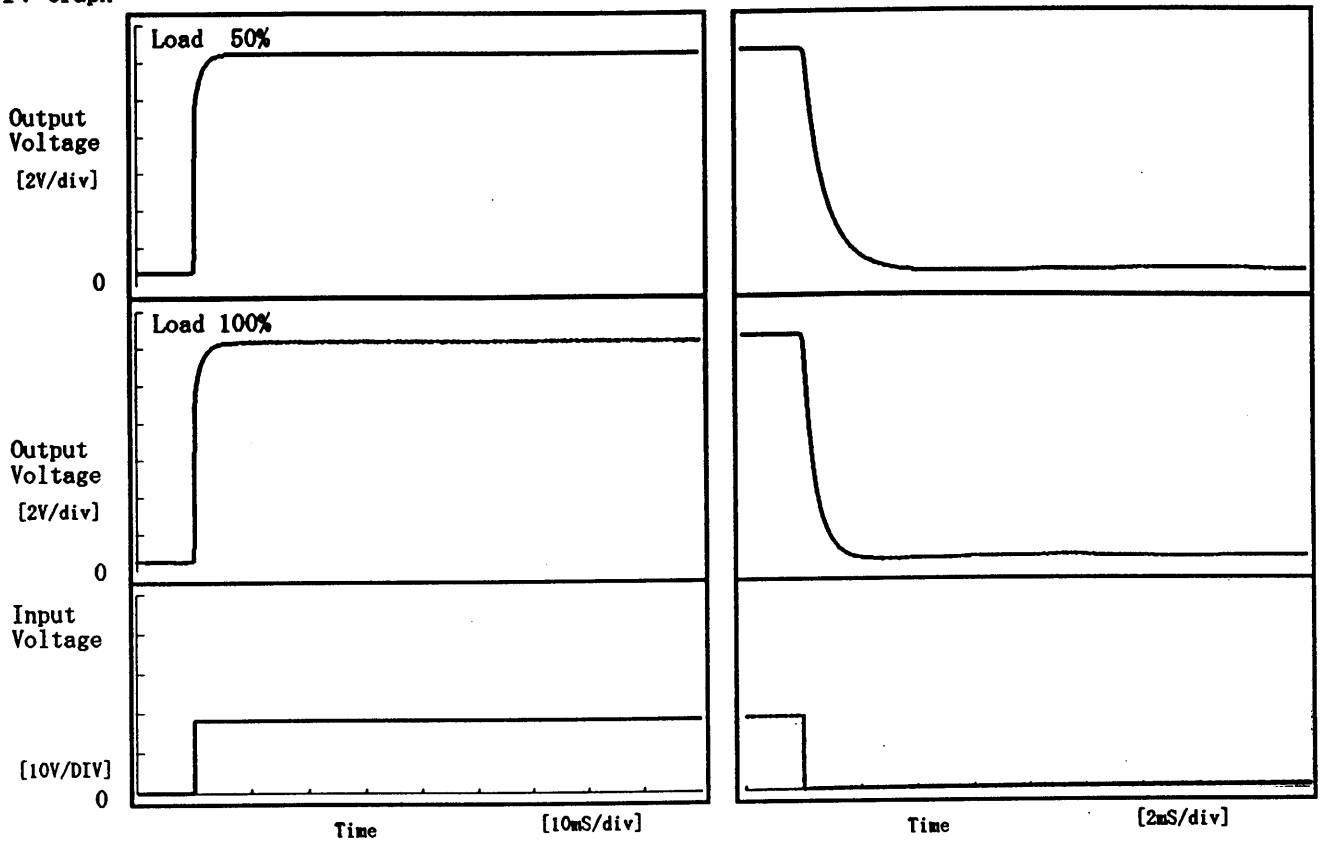
BC−2039

COSEL

Model	ZUW32412		
Item	Rise and Fall Time 立上り、立下り時間	Temperature	25℃
		Testing Circuitry	Figure A
Object	-12V 0.13A		

1. Graph

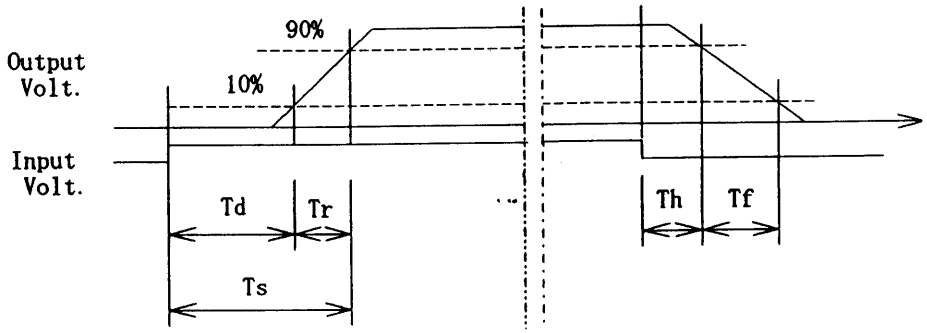
Input Volt. 18.0 V



2. Values

[mS]

Load \ Time	T d	T r	T s	T h	T f
50 %	0.05	1.20	1.25	0.23	1.84
100 %	0.05	1.35	1.40	0.16	0.95



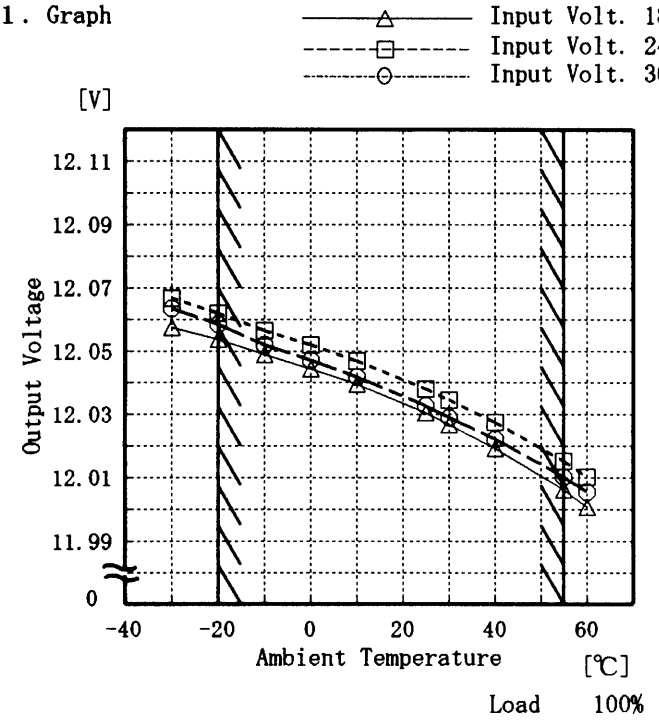
COSEL

Model	ZUW32412
Item	Ambient Temperature Drift 周囲温度変動

Testing Circuitry Figure A

Object +12V0.13A

1. Graph

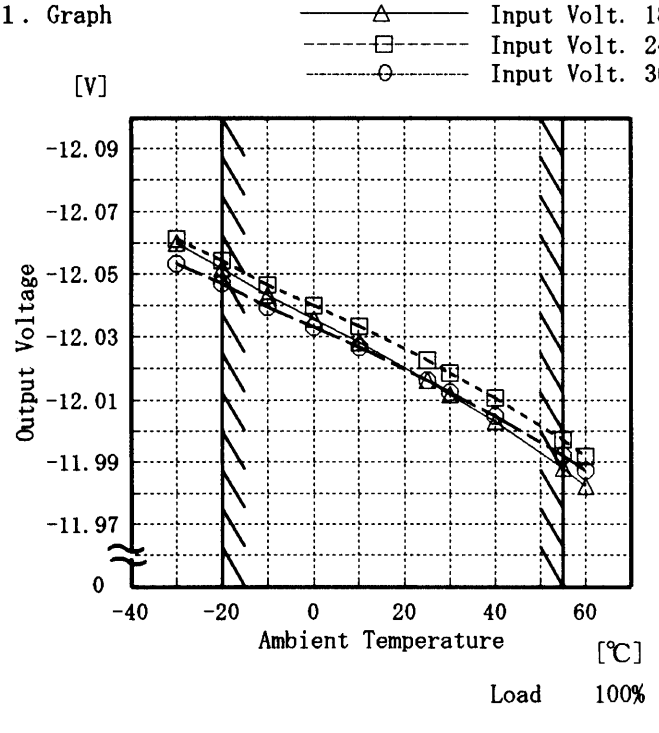


2. Values

Temperature [℃]	Input Volt. 18.0[V] Output Volt. [V]	Input Volt. 24.0[V] Output Volt. [V]	Input Volt. 36.0[V] Output Volt. [V]
-30	12.057	12.067	12.063
-20	12.054	12.062	12.058
-10	12.049	12.056	12.052
0	12.044	12.052	12.047
10	12.040	12.047	12.042
25	12.030	12.038	12.033
30	12.027	12.034	12.029
40	12.019	12.028	12.022
55	12.006	12.015	12.010
60	12.001	12.010	12.006
—	—	—	—

Object −12V0.13A

1. Graph



2. Values

Temperature [℃]	Input Volt. 18.0[V] Output Volt. [V]	Input Volt. 24.0[V] Output Volt. [V]	Input Volt. 36.0[V] Output Volt. [V]
-30	-12.060	-12.061	-12.053
-20	-12.052	-12.054	-12.047
-10	-12.043	-12.046	-12.039
0	-12.036	-12.040	-12.033
10	-12.028	-12.033	-12.027
25	-12.016	-12.023	-12.016
30	-12.012	-12.018	-12.012
40	-12.003	-12.011	-12.005
55	-11.988	-11.997	-11.992
60	-11.982	-11.992	-11.987
—	—	—	—

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。

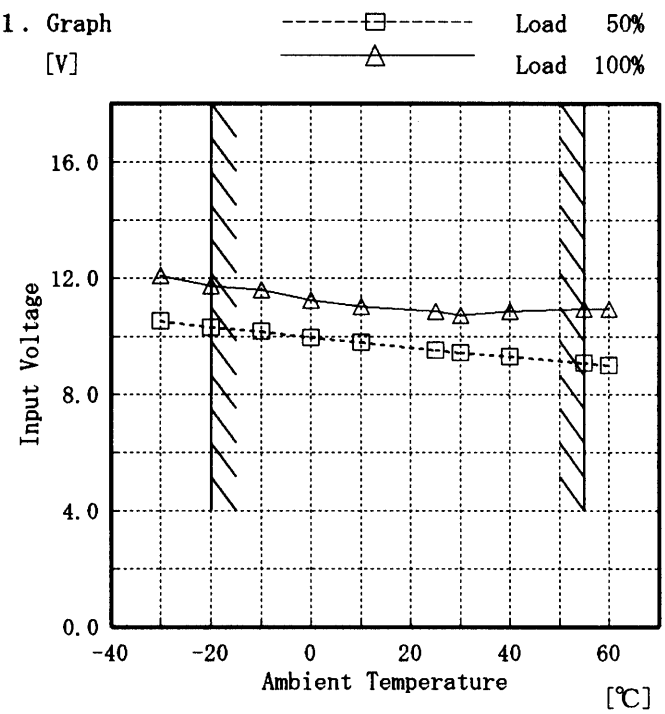
COSEL

Model	ZUW32412
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 +12V0.13A

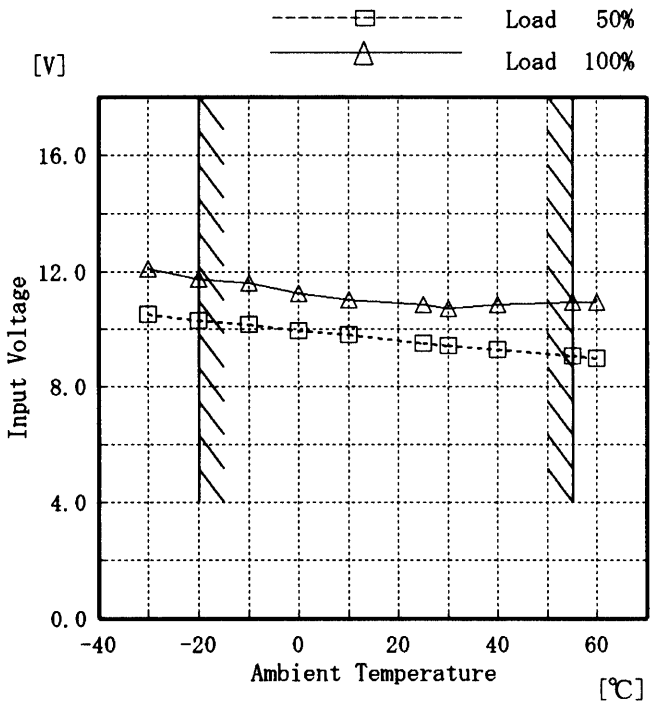
1. Graph



2. Values

Ambient Temp. [℃]	Load 50% Input Volt. [V]	Load 100% Input Volt. [V]
-30	10.5	12.1
-20	10.3	11.7
-10	10.2	11.6
0	10.0	11.2
10	9.8	11.0
25	9.5	10.9
30	9.4	10.7
40	9.3	10.9
55	9.1	10.9
60	9.0	10.9
—	—	—

Object −12V0.13A



2. Values

Ambient Temp. [℃]	Load 50% Input Volt. [V]	Load 100% Input Volt. [V]
-30	10.5	12.1
-20	10.3	11.7
-10	10.2	11.6
0	10.0	11.2
10	9.8	11.0
25	9.5	10.9
30	9.4	10.7
40	9.3	10.9
55	9.1	10.9
60	9.0	10.9
—	—	—

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。

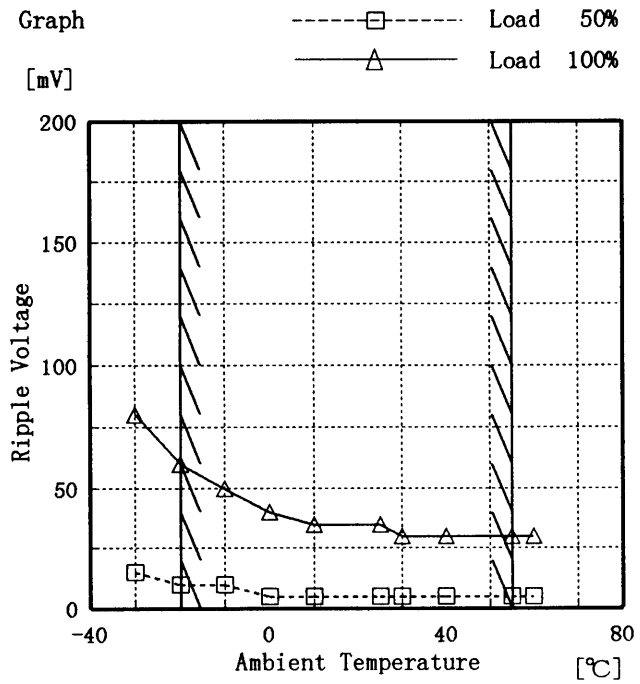
COSEL

Model	ZUW32412
Item	Ripple Voltage (by Ambient Temp.) リップル電圧 (周囲温度特性)

Testing Circuitry Figure A

Object +12V0.13A

1. Graph



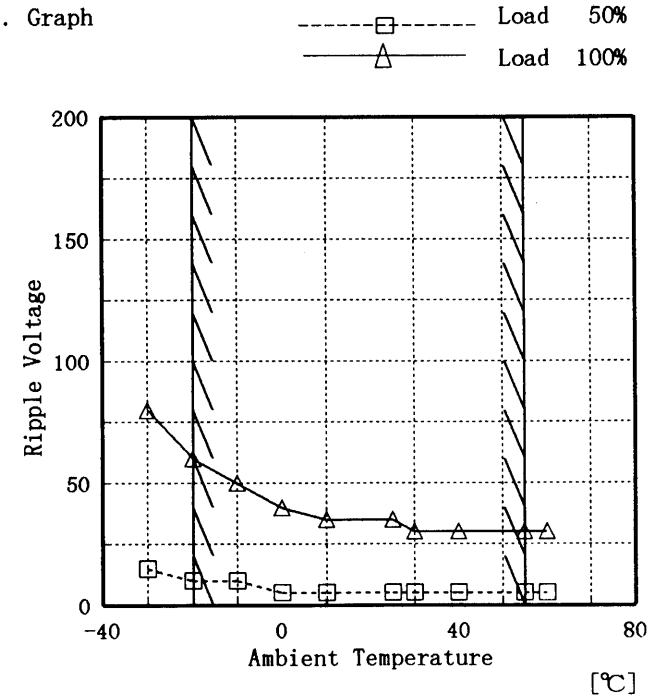
Input Volt. 18.0 V

2. Values

Ambient Temp. [℃]	Load 50% Ripple Output Volt. [mV]	Load 100% Ripple Output Volt. [mV]
-30	15	80
-20	10	60
-10	10	50
0	5	40
10	5	35
25	5	35
30	5	30
40	5	30
55	5	30
60	5	30
—	—	—

Object −12V0.13A

1. Graph



Input Volt. 18.0 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	10	75
-20	10	60
-10	10	50
0	10	40
10	5	35
25	5	30
30	5	30
40	5	30
55	5	30
60	5	35
—	—	—

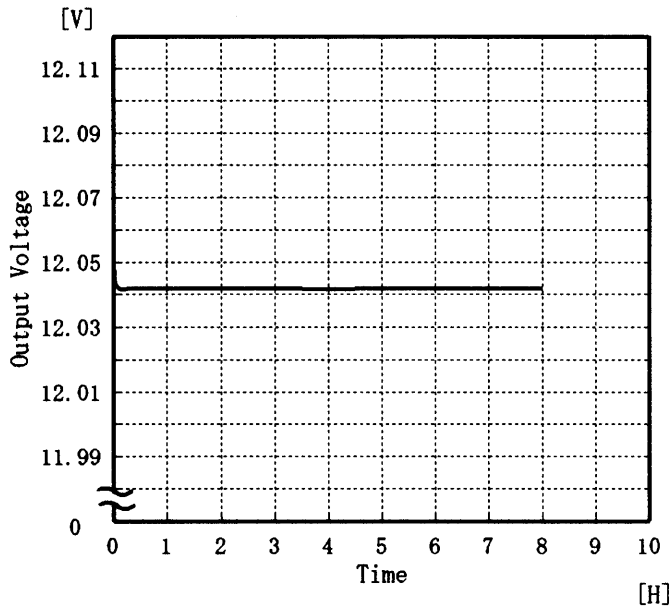
COSEL

Model	ZUW32412
Item	Time Lapse Drift 経時ドリフト

Temperature 25 ℃
Testing Circuitry Figure A

Object +12V0.13A

1. Graph



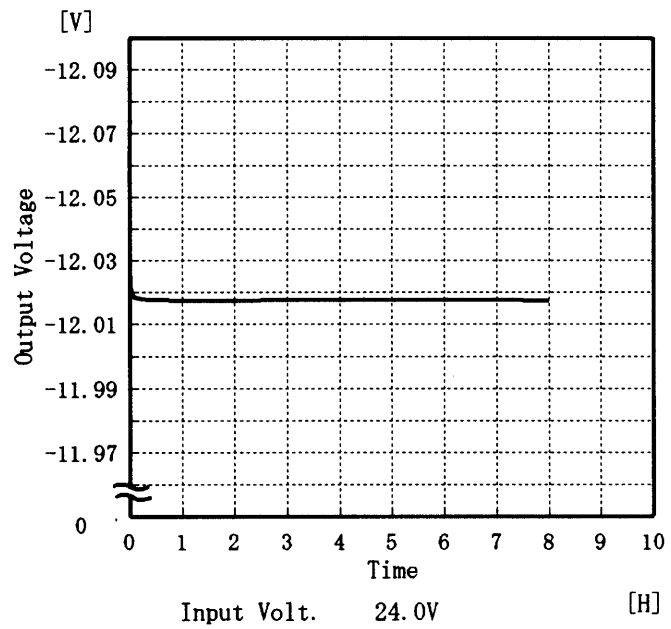
Input Volt. 24.0V
Load 100%

2. Values

Time since start [H]	Output Voltage [V]
0.0	12.050
0.5	12.042
1.0	12.042
2.0	12.042
3.0	12.042
4.0	12.042
5.0	12.042
6.0	12.042
7.0	12.042
8.0	12.042

Object −12V0.13A

1. Graph



Input Volt. 24.0V
Load 100%

2. Values

Time since start [H]	Output Voltage [V]
0.0	-12.028
0.5	-12.018
1.0	-12.018
2.0	-12.018
3.0	-12.018
4.0	-12.018
5.0	-12.018
6.0	-12.018
7.0	-12.018
8.0	-12.018

COSEL

Model	ZUW32412	
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 : 18.0～36.0 V

Load Current (AVR 1) : 0.00～0.13 A

(AVR 2) : 0.00～0.13 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 18.0～36.0 V

負荷電流 (AVR 1) 0.00～0.13 A

(AVR 2) 0.00～0.13 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 +12V0.13A

Item	Temperature [℃]	Input Voltage [V]	Output Current [A]	Output Voltage [V]	Output Voltage Accuracy [mV]	Output Voltage Accuracy(Ration)[%]
Maximum Voltage	-20	24.0	0.13	12.062	±144	±1.2
Minimum Voltage	25	18.0	0.00	11.775		

Object −12V0.13A

Item	Temperature [℃]	Input Voltage [V]	Output Current [A]	Output Voltage [V]	Output Voltage Accuracy [mV]	Output Voltage Accuracy(Ration)[%]
Maximum Voltage	-20	24.0	0.13	-12.054	±147	±1.3
Minimum Voltage	55	18.0	0.00	-11.760		

COSEL

Model	ZUW32412
Item	Condensation 結露特性
Object	+12V0.13A

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	12.138	5	15
	2	12.140	5	15
	3	12.134	5	15
Load 100 %	1	12.043	15	25
	2	12.044	15	25
	3	12.037	15	25

Input Volt. 24.0 V

COSEL

Model	ZUW32412
Item	Condensation 結露特性
Object	−12V0.13A

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	-12.125	5	15
	2	-12.125	5	15
	3	-12.125	5	15
Load 100 %	1	-12.036	15	25
	2	-12.029	15	25
	3	-12.037	15	25

Input Volt. 24.0 V

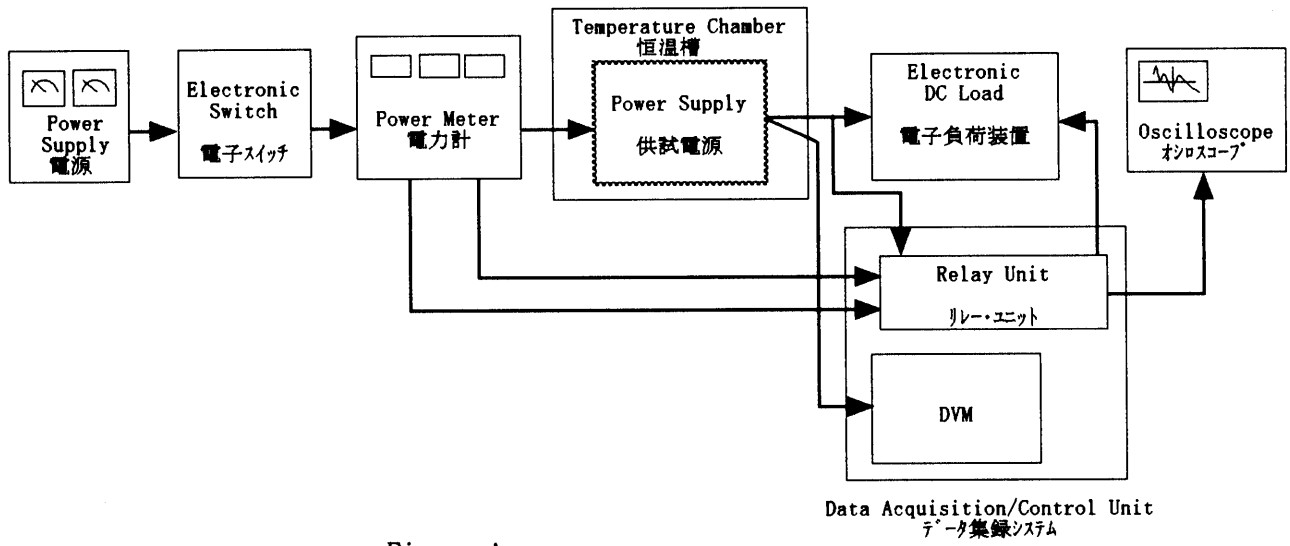

Power Supply
電源
Electronic Switch
電子スイッチ
Power Meter
電力計
Temperature Chamber
恒温槽
Power Supply
供試電源
Electronic DC Load
電子負荷装置
Oscilloscope
オシロスコープ
Relay Unit
リレー・ユニット
DVM
Data Acquisition/Control Unit
データ集録システム

Figure A