参考資料

COSEL

TEST DATA OF ZUW1R52412

(24.0V INPUT)

Regulated DC Power Supply

Date : June 14. 1996

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Design Manager

Prepared by : K. Shimano
Design Engineer

コーセル株式会社

COSEL CO.,LTD.

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(Final Page 20)

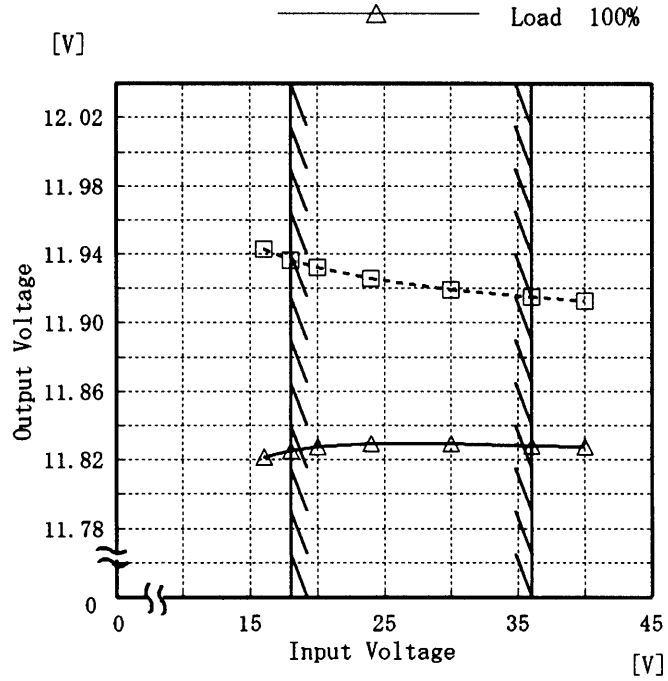
COSEL

Model	ZUW1R52412
Item	Line Regulation 静的入力変動

Temperature 25℃
Testing Circuitry Figure A

Object +12V0.065A

1. Graph

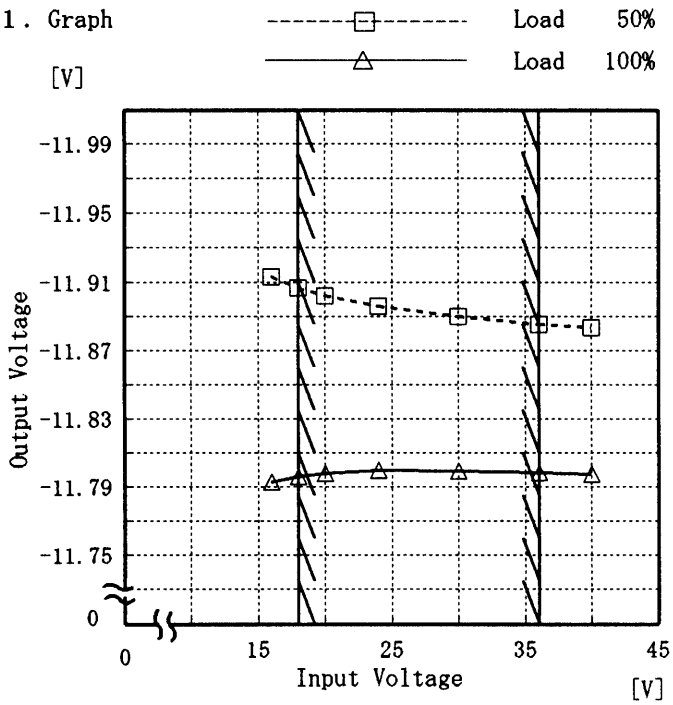


2. Values

Input Voltage [V]	Load 50% Output Volt. [V]	Load 100% Output Volt. [V]
16.0	11.943	11.822
18.0	11.936	11.825
20.0	11.932	11.827
24.0	11.926	11.829
30.0	11.919	11.829
36.0	11.915	11.828
40.0	11.913	11.828
—	—	—
—	—	—
—	—	—
—	—	—
—	—	—

Object −12V0.065A

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	-11.913	-11.793
18.0	-11.906	-11.796
20.0	-11.902	-11.798
24.0	-11.896	-11.800
30.0	-11.890	-11.799
36.0	-11.885	-11.798
40.0	-11.883	-11.798
—	—	—
—	—	—
—	—	—
—	—	—
—	—	—

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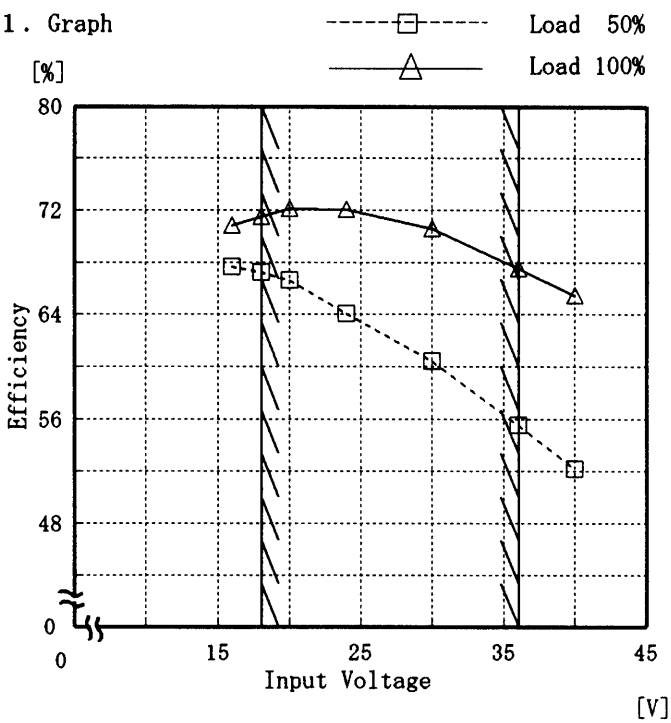
Model	ZUW1R52412
Item	Efficiency 効率
Object	———————————

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	67.7	70.8
18.0	67.3	71.5
20.0	66.6	72.1
24.0	64.1	72.1
30.0	60.4	70.6
36.0	55.6	67.5
40.0	52.2	65.5
—	—	—
—	—	—
—	—	—
—	—	—
—	—	—

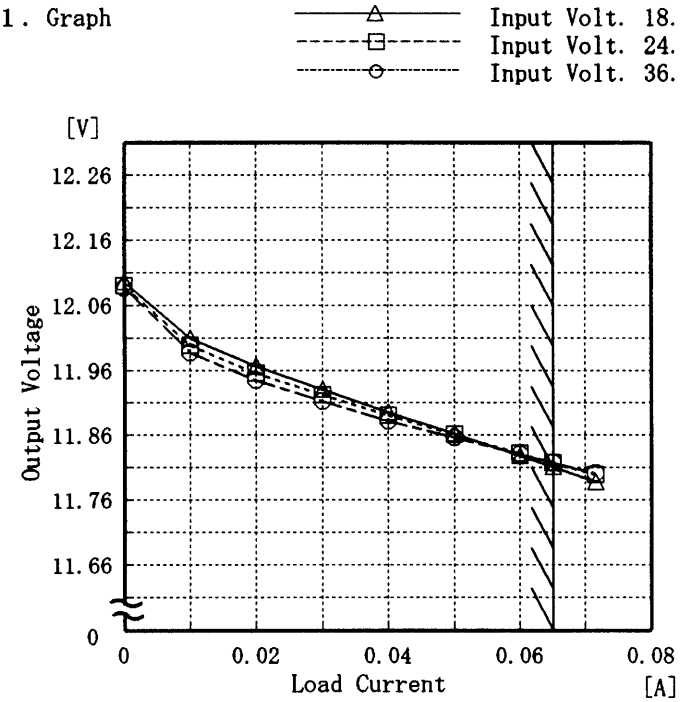
COSEL

Model	ZUW1R52412
Item	Load Regulation 静的負荷変動

Temperature 25℃
Testing Circuitry Figure A

Object +12V0.065A

1. Graph

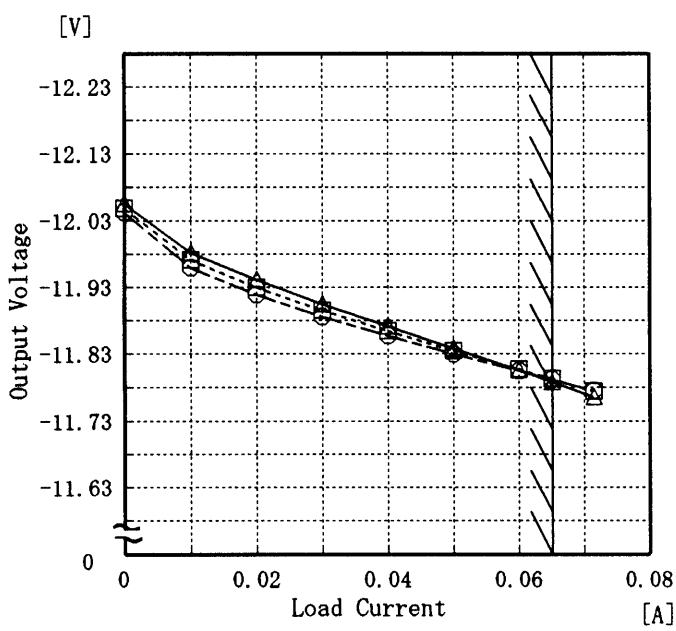


2. Values

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	12.097	12.090	12.087
0.010	12.010	11.999	11.988
0.020	11.967	11.956	11.946
0.030	11.931	11.922	11.913
0.040	11.895	11.890	11.882
0.050	11.862	11.861	11.856
0.060	11.828	11.832	11.830
0.065	11.811	11.818	11.818
0.072	11.788	11.799	11.802
—	—	—	—

Object −12V0.065A

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	-12.057	-12.049	-12.044
0.010	-11.983	-11.972	-11.961
0.020	-11.942	-11.931	-11.920
0.030	-11.906	-11.897	-11.887
0.040	-11.872	-11.865	-11.857
0.050	-11.839	-11.836	-11.830
0.060	-11.806	-11.808	-11.805
0.065	-11.789	-11.794	-11.793
0.072	-11.766	-11.775	-11.776
—	—	—	—

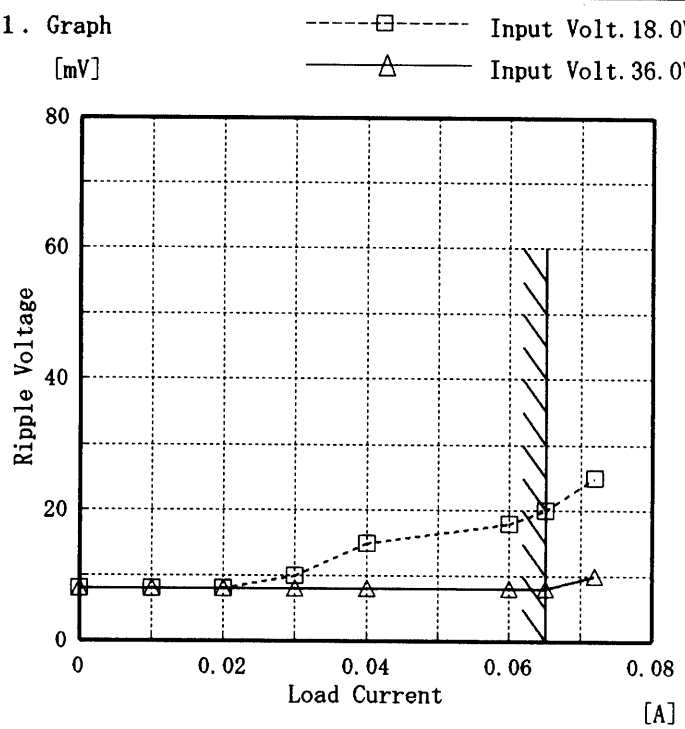
Note: Slanted line shows the range of the rated load current.
(注)斜線は定格負荷電流範囲を示す。

COSEL

Model	ZUW1R52412
Item	Ripple Voltage(by Load Current) リップル電圧(負荷電流特性)
Object	+12V 0.065A

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

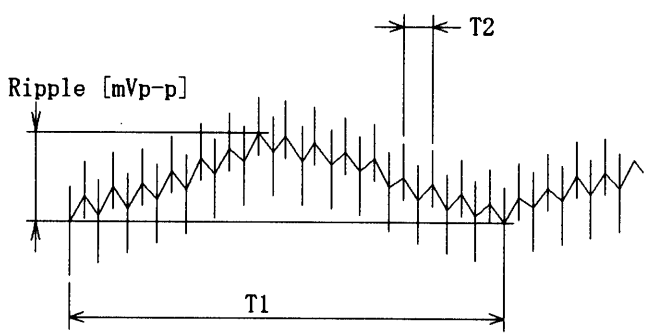


Fig. Complex Ripple Wave Form
図 リップル波形詳細図

2. Values

Load Current [A]	Input Volt. 18.0 [V] Ripple Output Volt. [mV]	Input Volt. 36.0 [V] Ripple Output Volt. [mV]
0.000	8	8
0.010	8	8
0.020	8	8
0.030	10	8
0.040	15	8
0.060	18	8
0.065	20	8
0.072	25	10
—	—	—
—	—	—
—	—	—

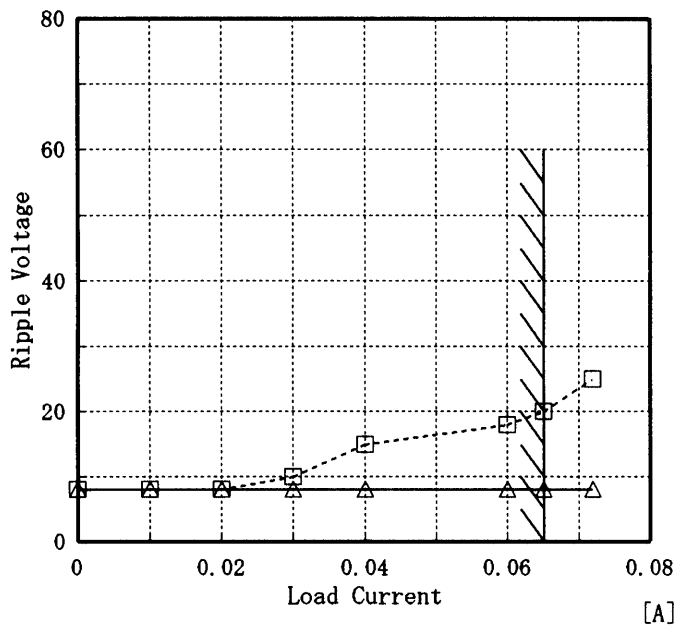
COSEL

Model	ZUW1R52412
Item	Ripple Voltage(by Load Current) リップル電圧(負荷電流特性)
Object	−12V 0.065A

Temperature 25℃
Testing Circuitry Figure A

1. Graph

[mV]



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

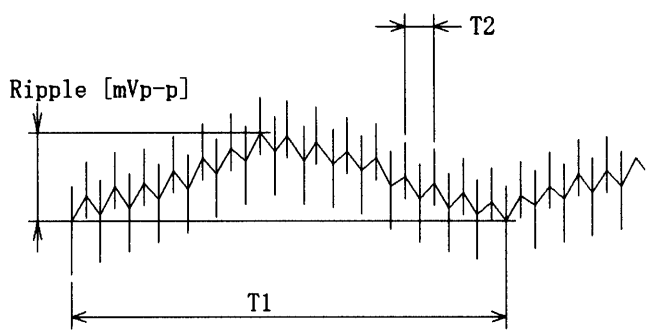


Fig. Complex Ripple Wave Form
図 リップル波形詳細図

2. Values

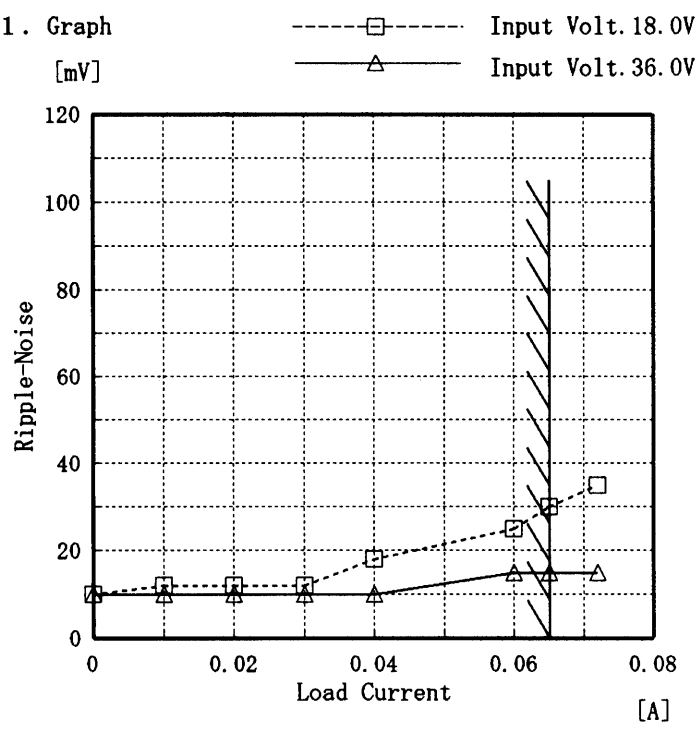
Load Current [A]	Input Volt. 18.0 [V] Ripple Output Volt. [mV]	Input Volt. 36.0 [V] Ripple Output Volt. [mV]
0.000	8	8
0.010	8	8
0.020	8	8
0.030	10	8
0.040	15	8
0.060	18	8
0.065	20	8
0.072	25	8
—	—	—
—	—	—
—	—	—

COSEL

Model	ZUW1R52412
Item	Ripple-Noise リップルノイズ
Object	+12V0.065A

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

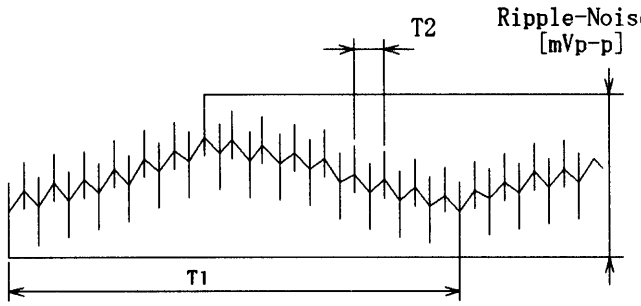


Fig. Complex Ripple Wave Form
図 リップル波形詳細図

2. Values

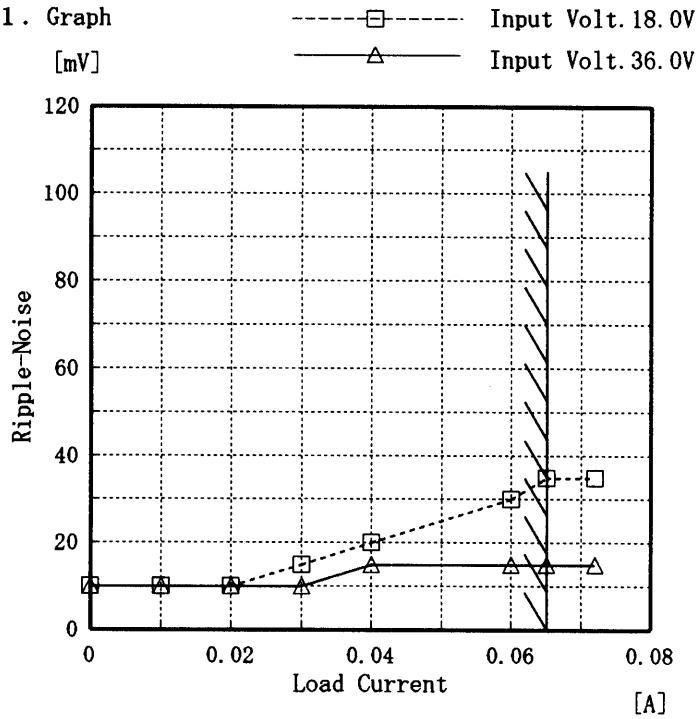
Load current [A]	Input Volt. 18.0 [V] Ripple-Noise [mV]	Input Volt. 36.0 [V] Ripple-Noise [mV]
0.000	10	10
0.010	12	10
0.020	12	10
0.030	12	10
0.040	18	10
0.060	25	15
0.065	30	15
0.072	35	15
—	—	—
—	—	—
—	—	—

COSEL

Model	ZUW1R52412
Item	Ripple-Noise リップルノイズ
Object	−12V0.065A

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

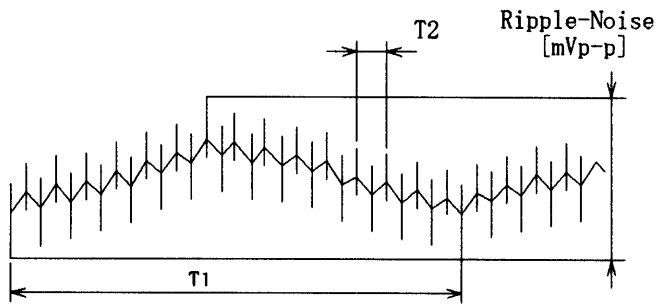


Fig. Complex Ripple Wave Form
図 リップル波形詳細図

2. Values

Load current [A]	Input Volt. 18.0 [V] Ripple-Noise [mV]	Input Volt. 36.0 [V] Ripple-Noise [mV]
0.000	10	10
0.010	10	10
0.020	10	10
0.030	15	10
0.040	20	15
0.060	30	15
0.065	35	15
0.072	35	15
—	—	—
—	—	—
—	—	—

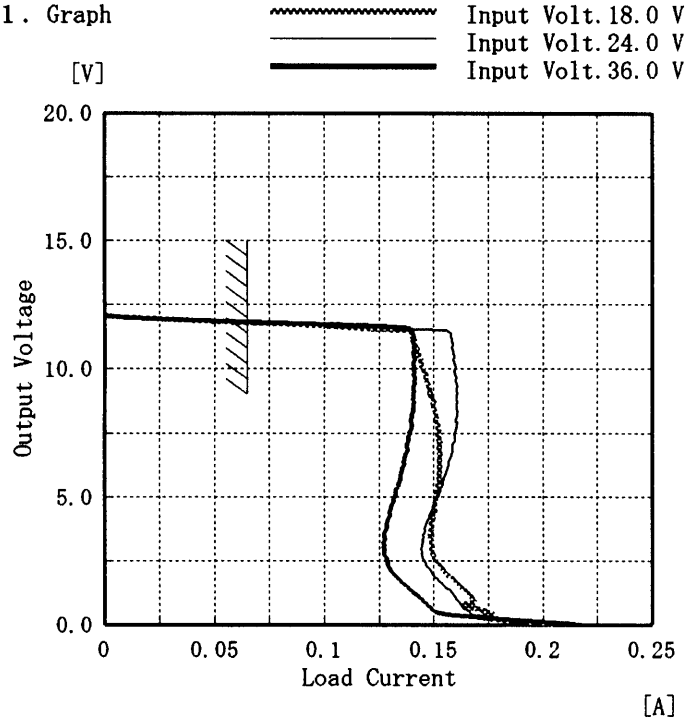
COSEL

Model	ZUW1R52412
Item	Overcurrent Protection 過電流保護

Temperature 25℃
Testing Circuitry Figure A

Object ＋12V0.065A

1. Graph

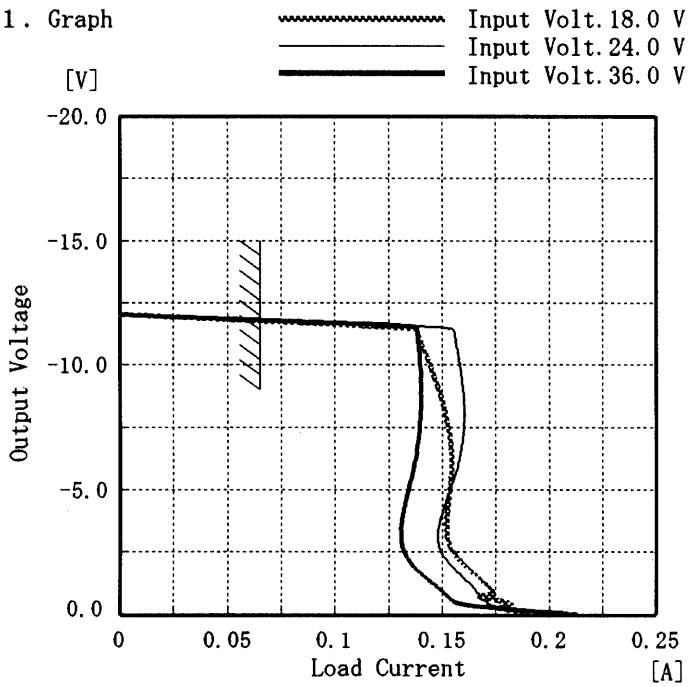


2. Values

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	0.088	0.096	0.102
11.40	0.140	0.158	0.140
10.80	0.142	0.158	0.141
9.60	0.146	0.160	0.141
8.40	0.150	0.160	0.141
7.20	0.152	0.159	0.138
6.00	0.152	0.156	0.135
4.80	0.150	0.151	0.132
3.60	0.148	0.146	0.128
2.40	0.151	0.146	0.129
1.20	0.165	0.158	0.141
0.00	0.205	0.220	0.215

Object －12V0.065A

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	0.102	0.114	0.123
-11.40	0.138	0.155	0.138
-10.80	0.140	0.156	0.139
-9.60	0.145	0.159	0.140
-8.40	0.150	0.160	0.140
-7.20	0.153	0.160	0.139
-6.00	0.154	0.157	0.137
-4.80	0.153	0.153	0.134
-3.60	0.152	0.149	0.131
-2.40	0.155	0.150	0.133
-1.20	0.170	0.162	0.145
0.00	0.199	0.213	0.207

COSEL

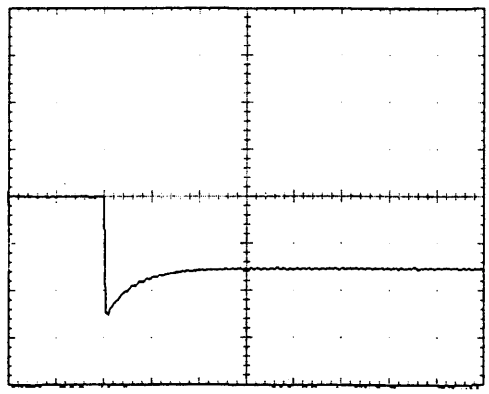
Model	ZUW1R52412
Item	Dynamic Load Responce 動的負荷変動
Object	+12V0.065A

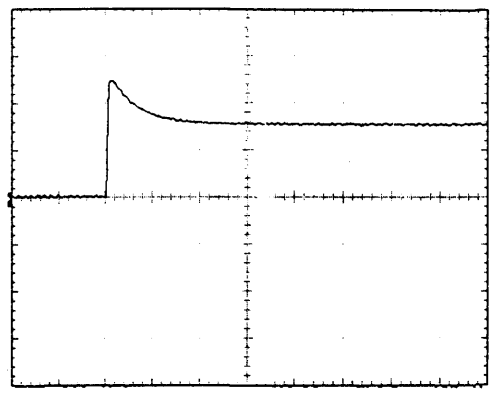
Temperature 25℃
Testing Circuitry Figure A

Input Volt. 24.0 V
Cycle 100 mS

Load Current

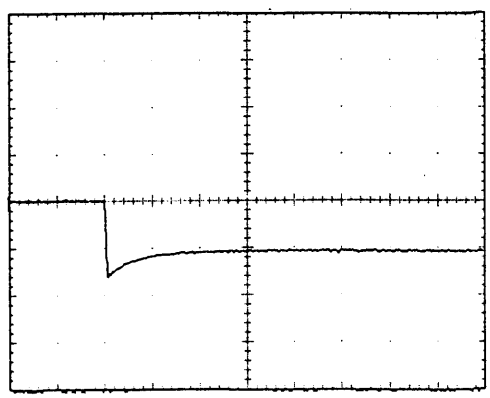
Min. Load ⟷
Load 100 %

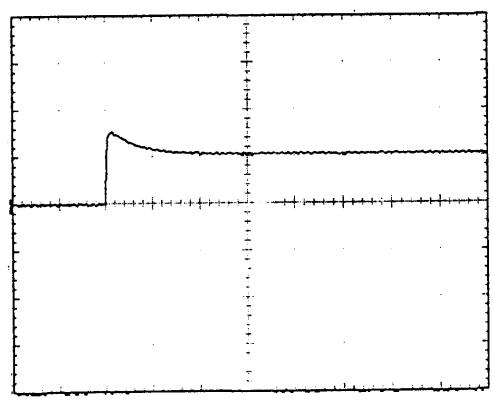




200 mV/div

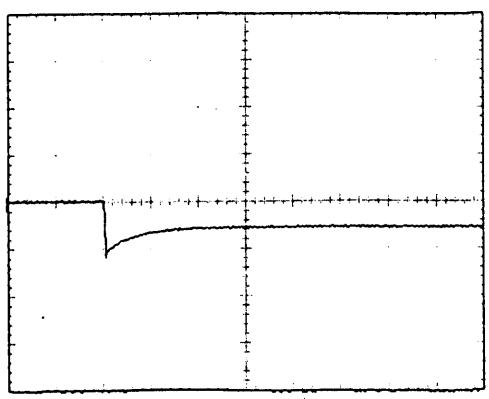
Min. Load ⟷
Load 50 %

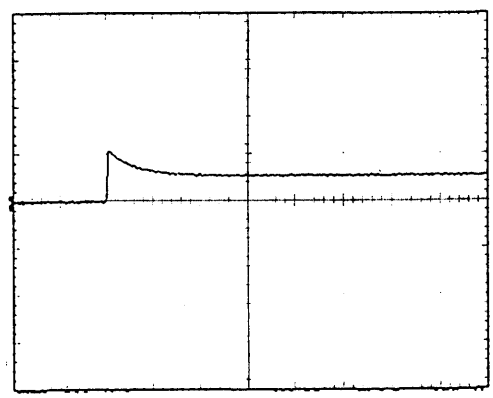




200 mV/div

Load 50%⟷
Load 100 %





200 mV/div

1 mS/div

COSEL

Model	ZUW1R52412		
Item	Dynamic Load Responce 動的負荷変動	Temperature Testing Circuitry	25℃ Figure A
Object	−12V0.065A		

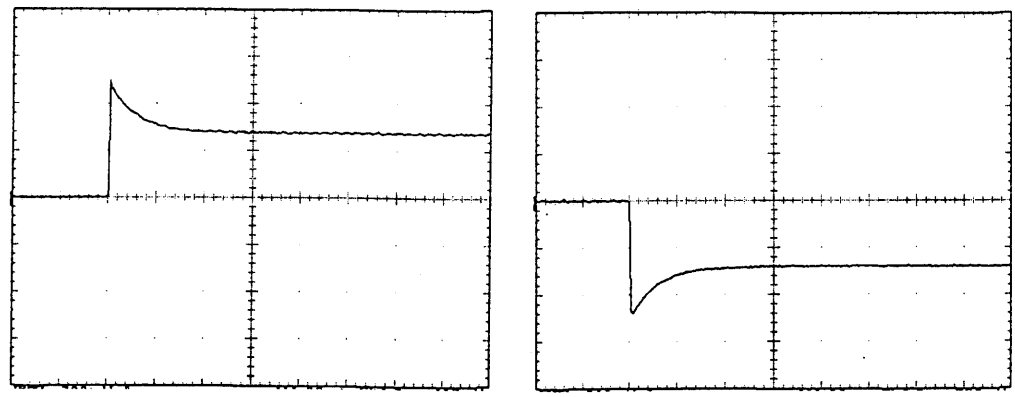
Input Volt. 24.0 V

Cycle 100 mS

Load Current

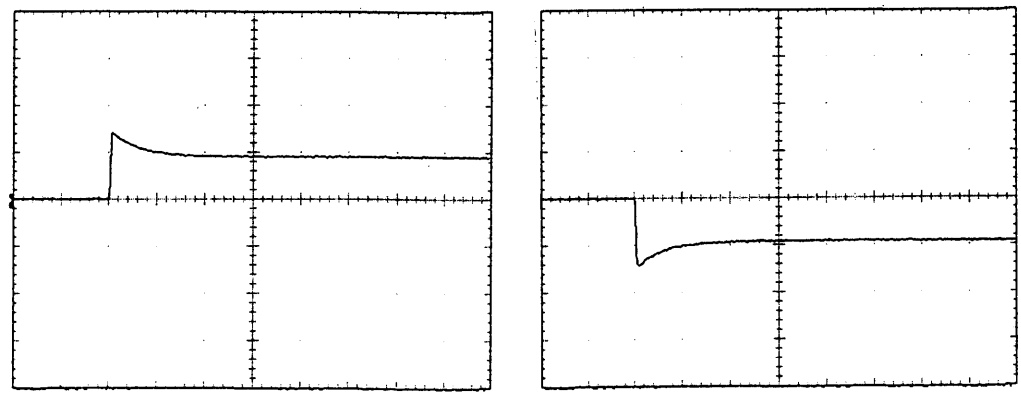
Min. Load ⟷
Load 100 %

200 mV/div



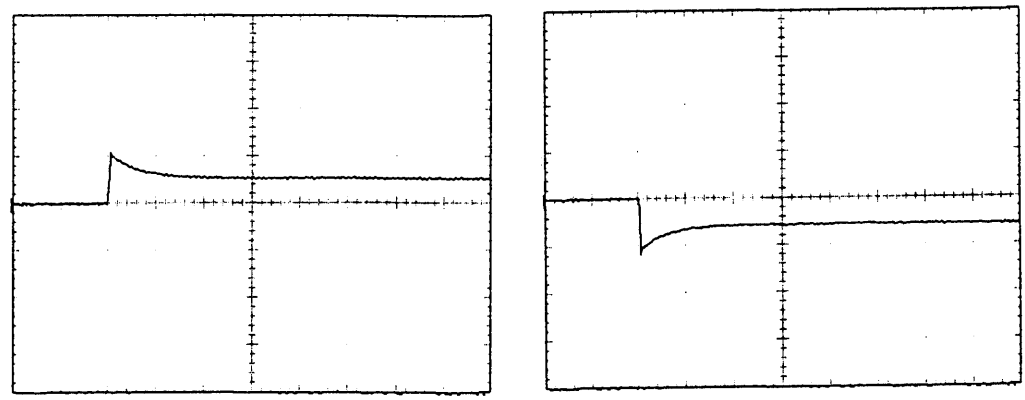
Min. Load ⟷
Load 50 %

200 mV/div



Load 50%⟷
Load 100 %

200 mV/div



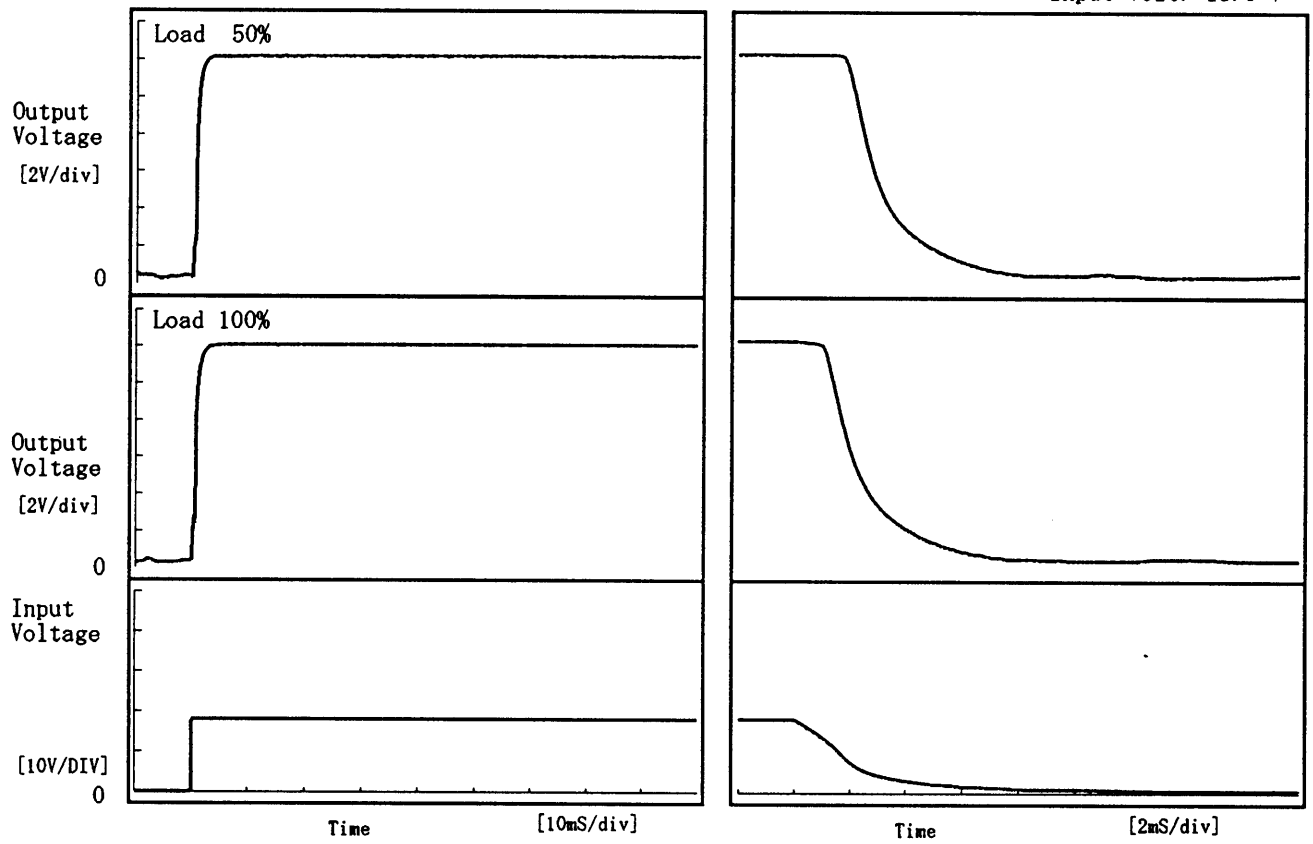
1 mS/div

COSEL

Model	ZUW1R52412		
Item	Rise and Fall Time 立上り、立下り時間	Temperature	25℃
		Testing Circuitry	Figure A
Object	+12V0.065A		

1. Graph

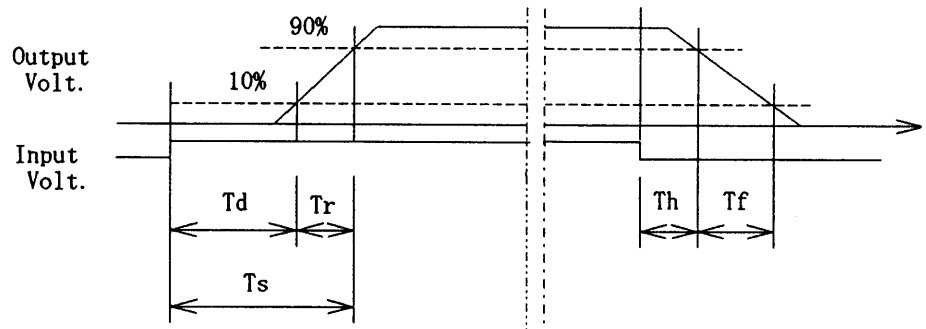
Input Volt. 18.0 V



2. Values

[mS]

Load \ Time	T d	T r	T s	T h	T f
50 %	0.05	1.50	1.55	2.03	3.67
100 %	0.05	1.60	1.65	1.25	3.70

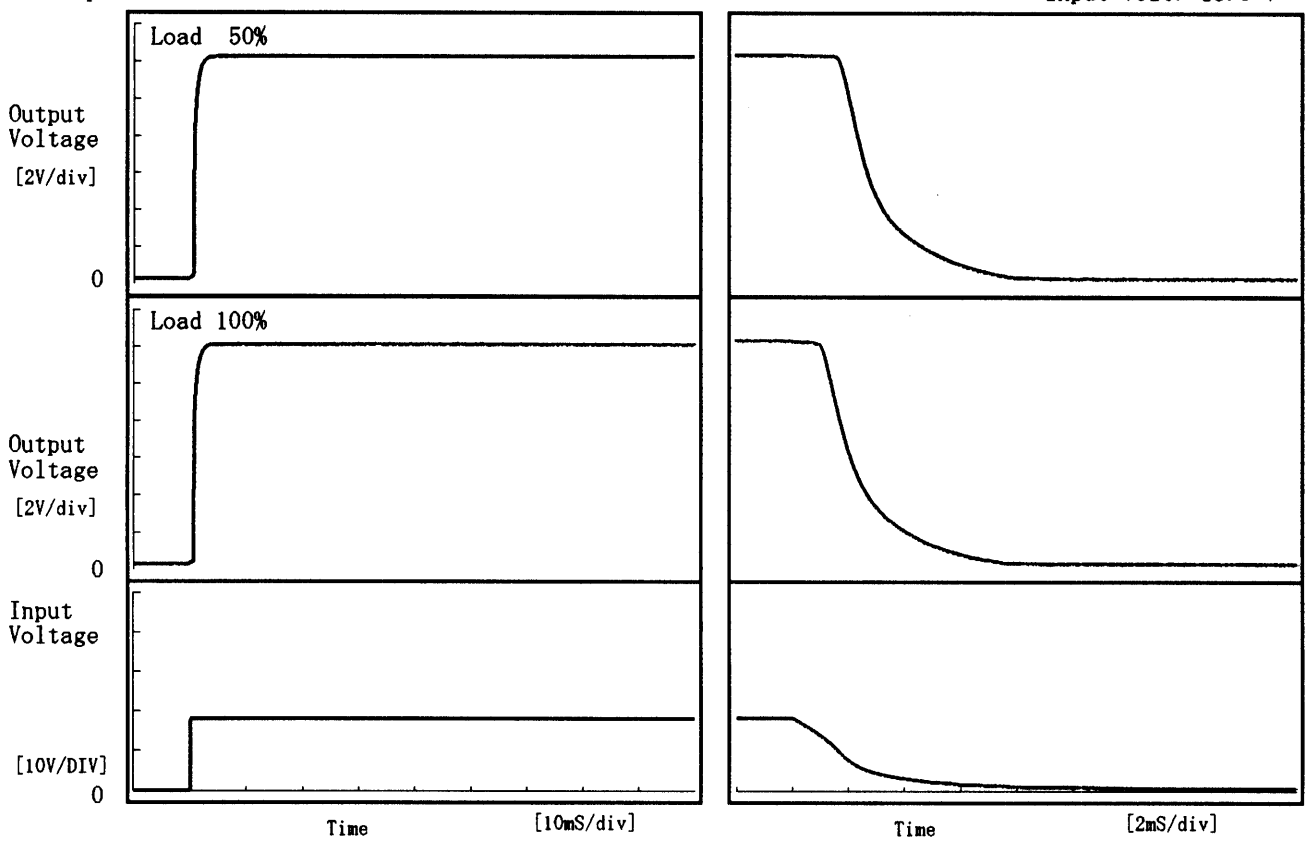


COSEL

Model	ZUW1R52412		
Item	Rise and Fall Time 立上り、立下り時間	Temperature	25℃
		Testing Circuitry	Figure A
Object	-12V0.065A		

1. Graph

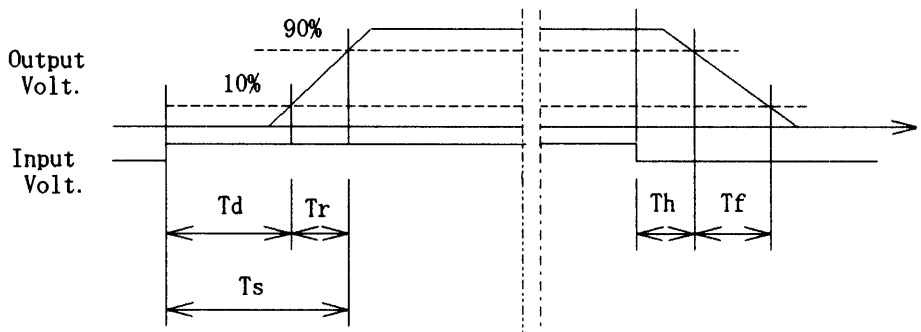
Input Volt. 18.0 V



2. Values

[mS]

Load \ Time	T d	T r	T s	T h	T f
50 %	0.55	0.95	1.50	1.89	3.52
100 %	0.55	1.00	1.55	1.25	3.60



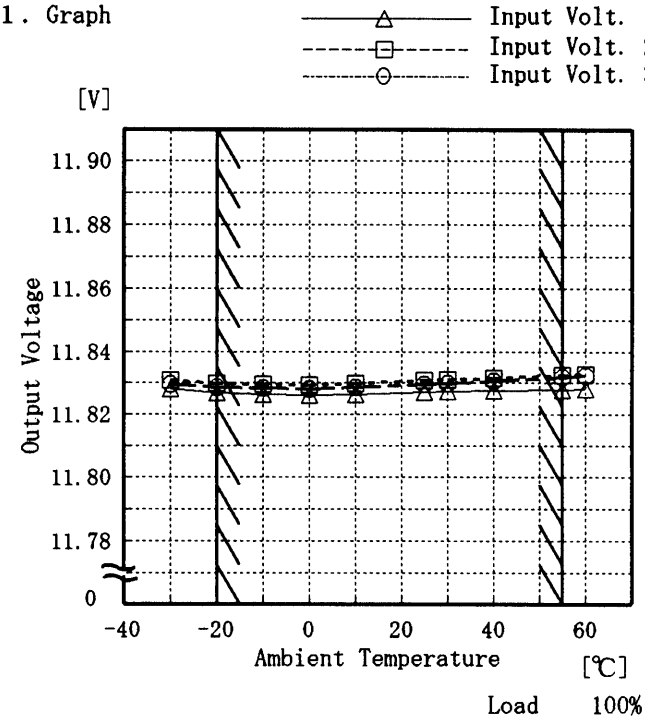
COSEL

Model	ZUW1R52412
Item	Ambient Temperature Drift 周囲温度変動

Testing Circuitry Figure A

Object +12V0.065A

1. Graph

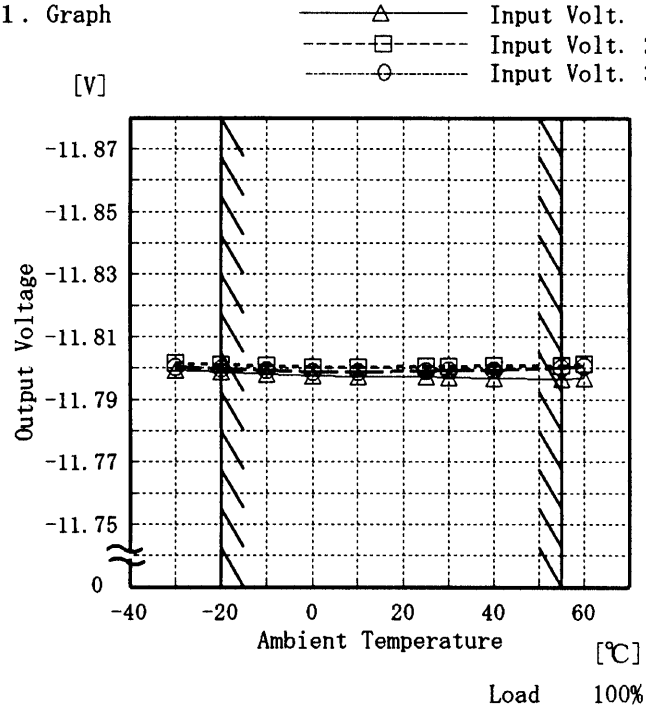


2. Values

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	11.828	11.831	11.830
-20	11.827	11.830	11.829
-10	11.826	11.830	11.828
0	11.826	11.829	11.828
10	11.826	11.830	11.828
25	11.827	11.831	11.829
30	11.827	11.831	11.830
40	11.828	11.832	11.831
55	11.828	11.832	11.832
60	11.828	11.833	11.832
—	—	—	—

Object −12V0.065A

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. 18.0[V] Output Volt. [V]	Input Volt. 24.0[V] Output Volt. [V]	Input Volt. 36.0[V] Output Volt. [V]
-30	-11.799	-11.802	-11.800
-20	-11.799	-11.801	-11.800
-10	-11.798	-11.801	-11.799
0	-11.798	-11.800	-11.799
10	-11.797	-11.800	-11.799
25	-11.797	-11.801	-11.799
30	-11.797	-11.801	-11.799
40	-11.797	-11.801	-11.799
55	-11.797	-11.801	-11.800
60	-11.797	-11.801	-11.801
—	—	—	—

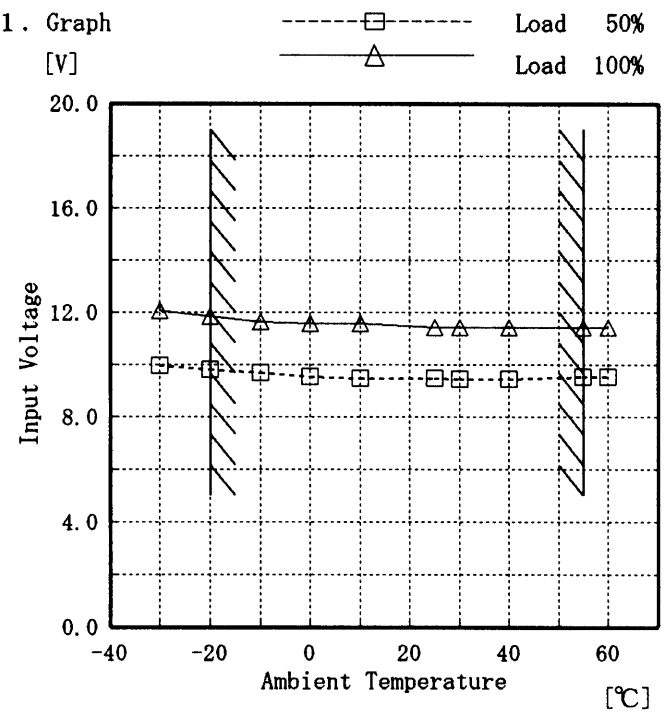
COSEL

Model	ZUW1R52412
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 +12V0.065A

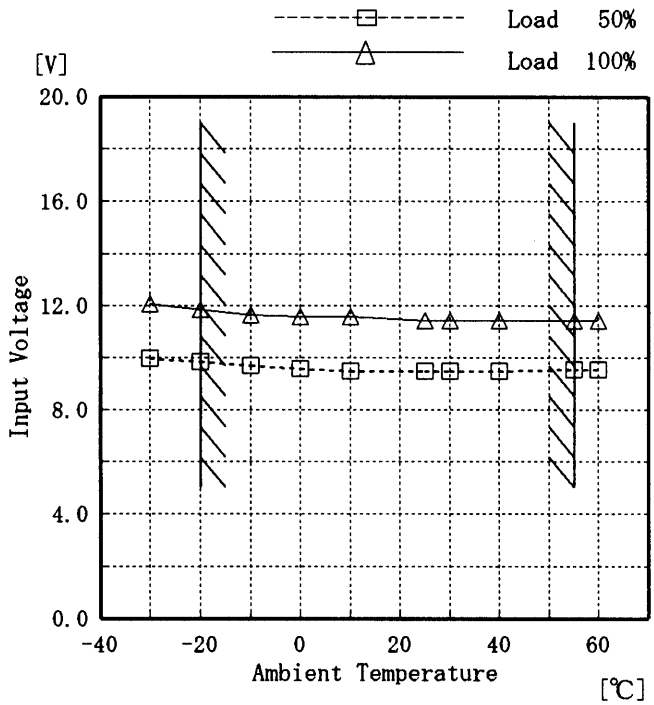
1. Graph



2. Values

Ambient Temp. [℃]	Load 50% Input Volt. [V]	Load 100% Input Volt. [V]
-30	10.0	12.1
-20	9.8	11.9
-10	9.7	11.7
0	9.6	11.6
10	9.5	11.6
25	9.5	11.4
30	9.5	11.4
40	9.5	11.4
55	9.6	11.4
60	9.6	11.4
—	—	—

Object −12V0.065A



2. Values

Ambient Temp. [℃]	Load 50% Input Volt. [V]	Load 100% Input Volt. [V]
-30	10.0	12.1
-20	9.8	11.9
-10	9.7	11.7
0	9.6	11.6
10	9.5	11.6
25	9.5	11.4
30	9.5	11.4
40	9.5	11.4
55	9.6	11.4
60	9.6	11.4
—	—	—

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。

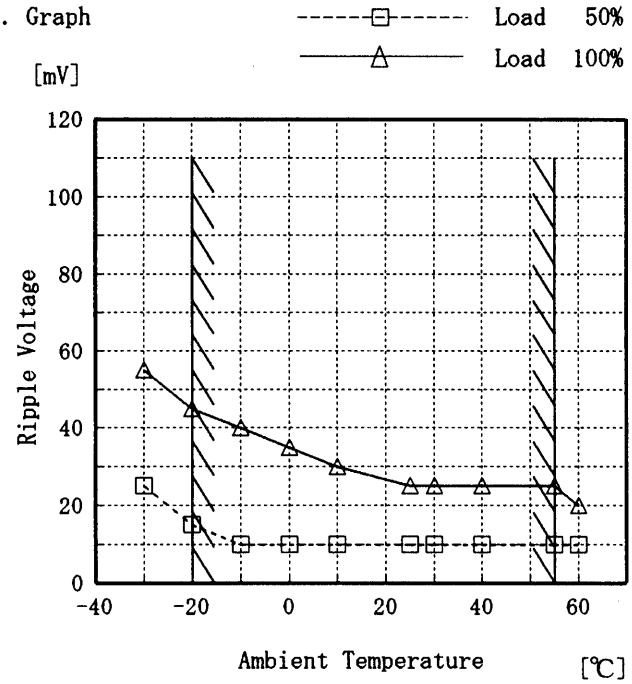
COSEL

Model	ZUW1R52412
Item	Ripple Voltage (by Ambient Temp.) リップル電圧 (周囲温度特性)

Testing Circuitry Figure A

Object ＋12V0.065A

1. Graph



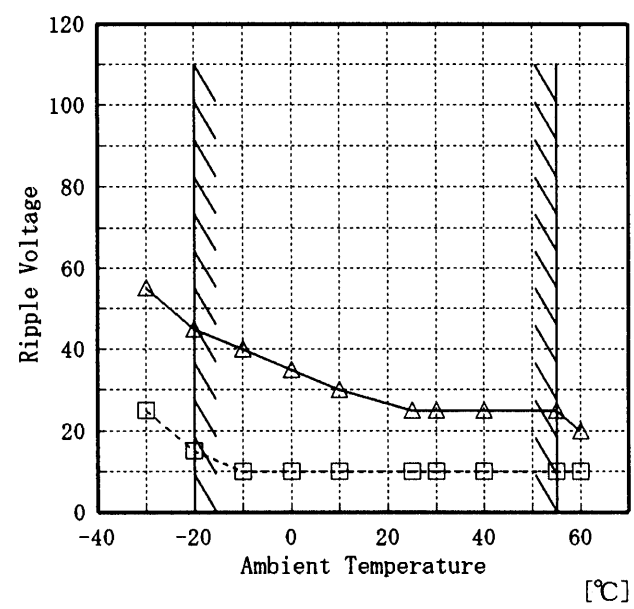
Input Volt. 18.0 V

2. Values

Ambient Temp. [℃]	Load 50% Ripple Output Volt. [mV]	Load 100% Ripple Output Volt. [mV]
-30	25	55
-20	15	45
-10	10	40
0	10	35
10	10	30
25	10	25
30	10	25
40	10	25
55	10	25
60	10	20
—	—	—

Object －12V0.065A

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	25	55
-20	15	45
-10	10	40
0	10	35
10	10	30
25	10	25
30	10	25
40	10	25
55	10	25
60	10	20
—	—	—

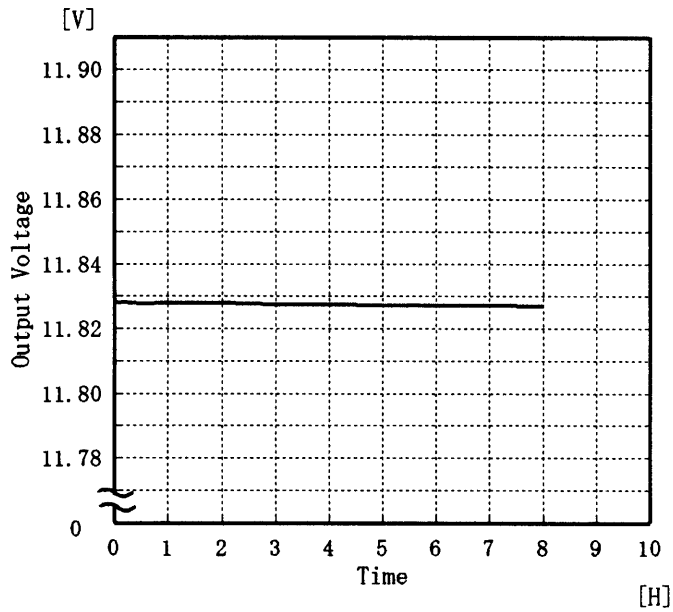
COSEL

Model	ZUW1R52412
Item	Time Lapse Drift 経時ドリフト

Temperature 25 ℃
Testing Circuitry Figure A

Object +12V0.065A

1. Graph



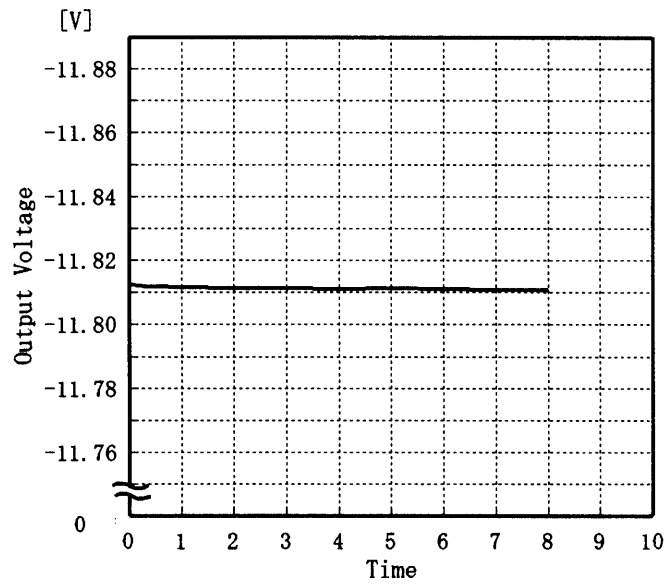
Input Volt. 24.0V
Load 100%

2. Values

Time since start [H]	Output Voltage [V]
0.0	11.829
0.5	11.828
1.0	11.828
2.0	11.828
3.0	11.828
4.0	11.828
5.0	11.827
6.0	11.827
7.0	11.827
8.0	11.827

Object −12V0.065A

1. Graph



Input Volt. 24.0V
Load 100%

2. Values

Time since start [H]	Output Voltage [V]
0.0	-11.813
0.5	-11.812
1.0	-11.812
2.0	-11.812
3.0	-11.812
4.0	-11.811
5.0	-11.812
6.0	-11.811
7.0	-11.811
8.0	-11.811

COSEL

Model	ZUW1R52412	
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) : 0.000～0.065 A

(AVR 2) : 0.000～0.065 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) 0.000～0.065 A

(AVR 2) 0.000～0.065 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 ＋12V0.065A

Item	Temperature [℃]	Input Voltage [V]	Output Current [A]	Output Voltage [V]	Output Voltage Accuracy [mV]	Output Voltage Accuracy (Ration) [%]
Maximum Voltage	55	24.0	0.065	11.832	±127	±1.1
Minimum Voltage	55	18.0	0.000	11.579		

Object －12V0.065A

Item	Temperature [℃]	Input Voltage [V]	Output Current [A]	Output Voltage [V]	Output Voltage Accuracy [mV]	Output Voltage Accuracy (Ration) [%]
Maximum Voltage	-20	24.0	0.065	-11.801	±135	±1.2
Minimum Voltage	55	18.0	0.000	-11.532		

COSEL

Model	ZUW1R52412	
Item	Condensation 結露特性	Testing Circuitry Figure A
Object	+12V 0.065A	

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	12.041	15	20
	2	11.968	15	20
	3	11.873	15	20
Load 100 %	1	11.996	25	30
	2	11.923	25	30
	3	11.841	25	30

Input Volt. 24.0 V

COSEL

Model	ZUW1R52412	
Item	Condensation 結露特性	Testing Circuitry Figure A
Object	−12V 0.065A	

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	-11.934	15	20
	2	-12.002	15	20
	3	-11.971	15	20
Load 100 %	1	-11.896	20	35
	2	-11.945	20	35
	3	-11.936	20	35

Input Volt. 24.0 V

COSEL

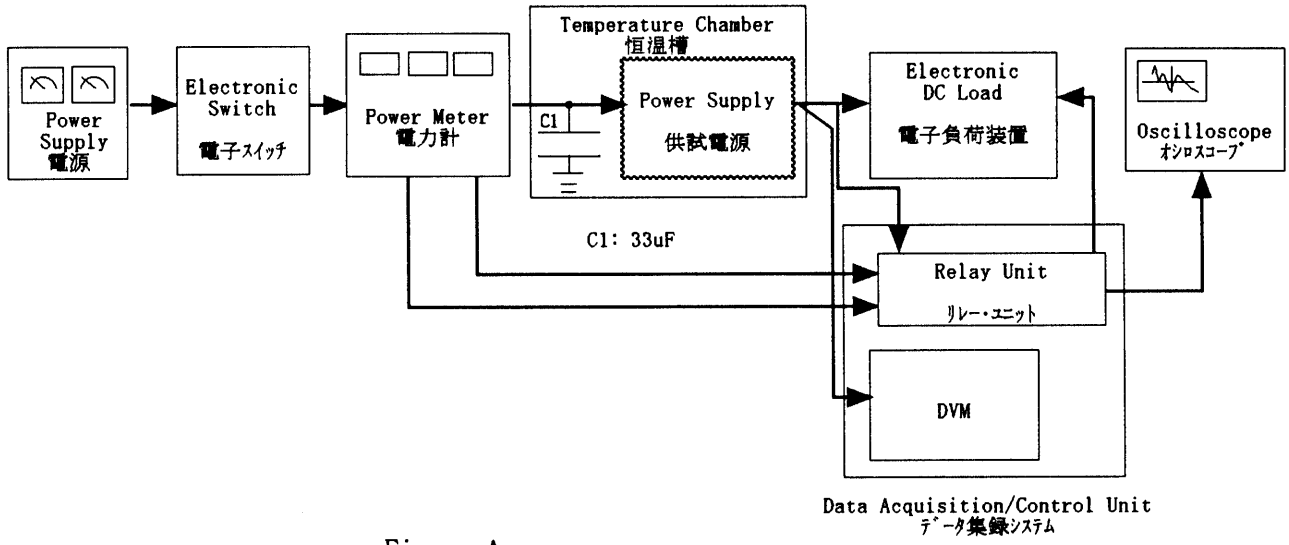


Figure A