参考資料

COSEL

TEST DATA OF ZUW31215

(12.0V 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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(Final Page 20)

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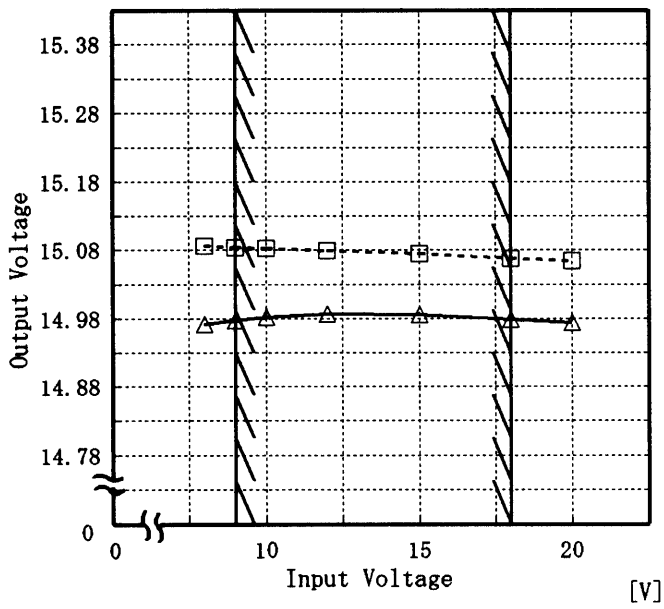
Model	ZUW31215
Item	Line Regulation 静的入力変動

Temperature 25℃
Testing Circuitry Figure A

Object +15V0.1A

1. Graph

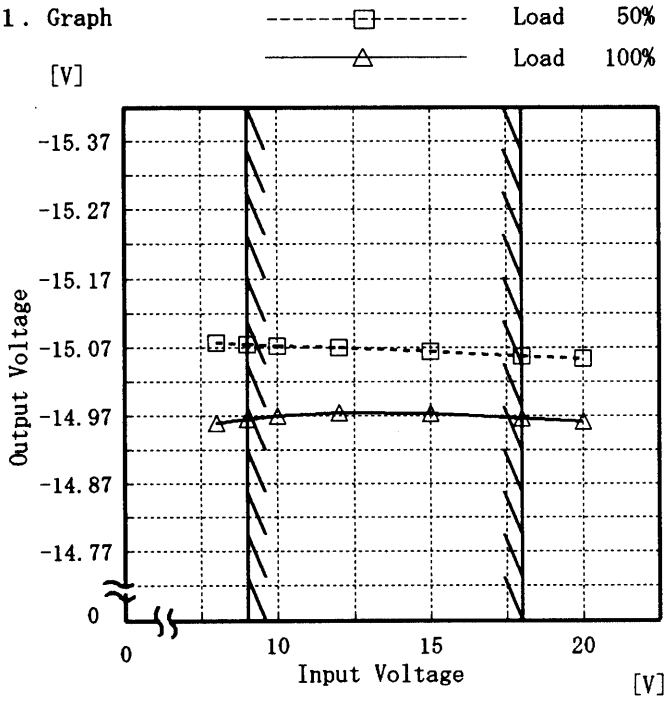


2. Values

Input Voltage [V]	Load 50% Output Volt. [V]	Load 100% Output Volt. [V]
8.0	15.086	14.971
9.0	15.084	14.978
10.0	15.082	14.982
12.0	15.080	14.986
15.0	15.074	14.985
18.0	15.068	14.979
20.0	15.064	14.974
—	—	—
—	—	—
—	—	—
—	—	—
—	—	—

Object −15V0.1A

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	-15.077	-14.959
9.0	-15.074	-14.965
10.0	-15.072	-14.970
12.0	-15.069	-14.974
15.0	-15.064	-14.973
18.0	-15.057	-14.967
20.0	-15.054	-14.962
—	—	—
—	—	—
—	—	—
—	—	—
—	—	—

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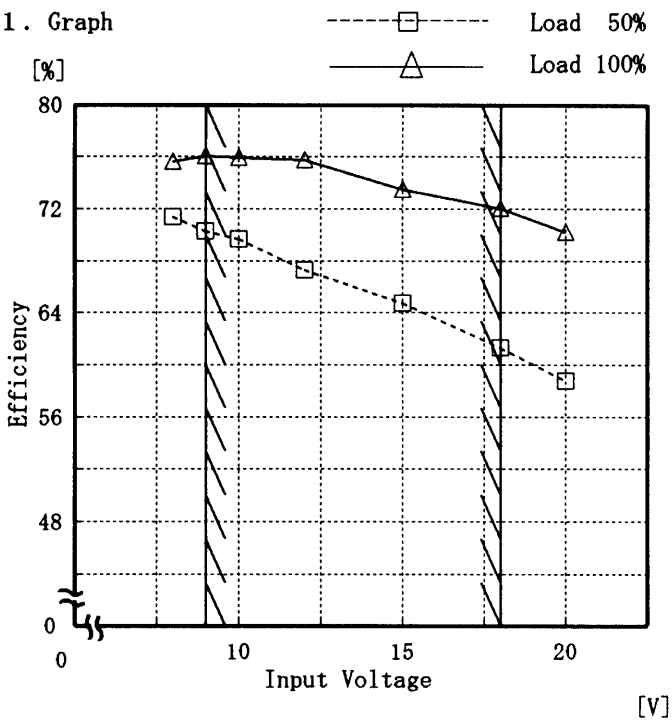
Model	ZUW31215
Item	Efficiency 効率
Object	――――――――――――

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	71.4	75.6
9.0	70.3	76.1
10.0	69.7	76.0
12.0	67.3	75.8
15.0	64.7	73.5
18.0	61.3	72.1
20.0	58.8	70.2
—	—	—
—	—	—
—	—	—
—	—	—
—	—	—

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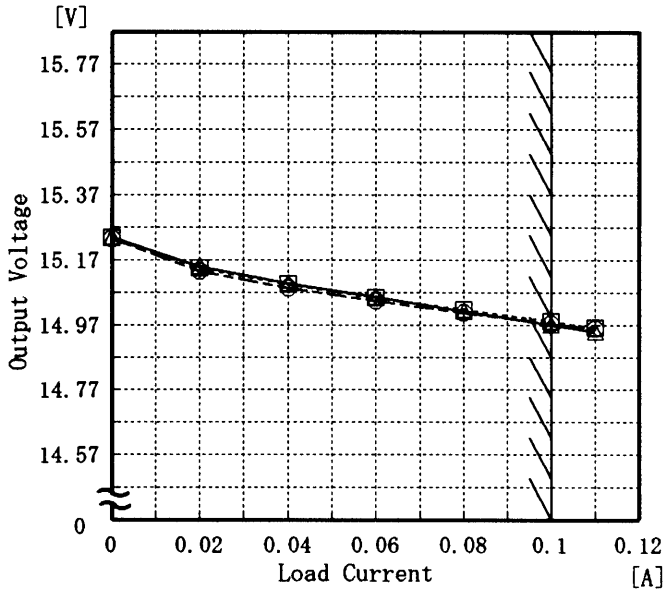
Model	ZUW31215
Item	Load Regulation 静的負荷変動

Temperature 25℃
Testing Circuitry Figure A

Object +15V0.1A

1. Graph

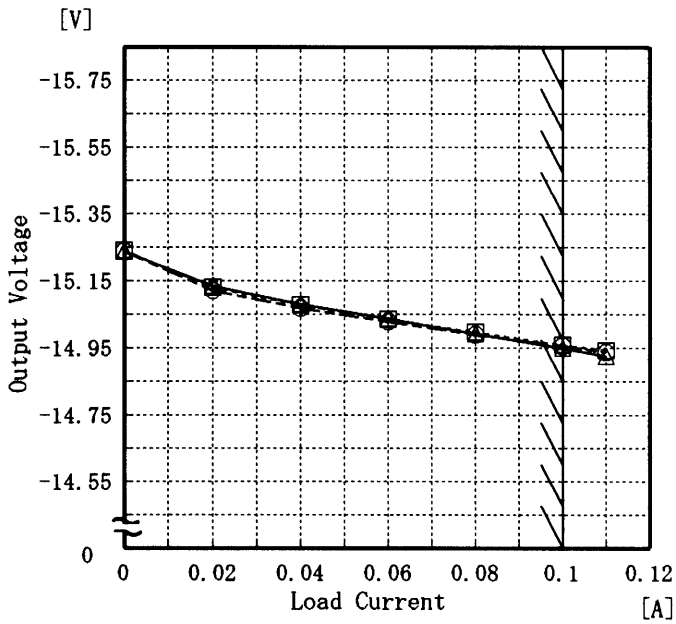


2. Values

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	15.241	15.239	15.236
0.020	15.151	15.146	15.136
0.040	15.100	15.096	15.085
0.060	15.056	15.056	15.045
0.080	15.015	15.018	15.010
0.100	14.972	14.982	14.976
0.110	14.950	14.963	14.959
—	—	—	—
—	—	—	—
—	—	—	—

Object −15V0.1A

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	-15.240	-15.240	-15.240
0.020	-15.136	-15.132	-15.123
0.040	-15.083	-15.079	-15.070
0.060	-15.039	-15.038	-15.029
0.080	-14.995	-14.999	-14.992
0.100	-14.952	-14.962	-14.957
0.110	-14.928	-14.943	-14.940
—	—	—	—
—	—	—	—
—	—	—	—

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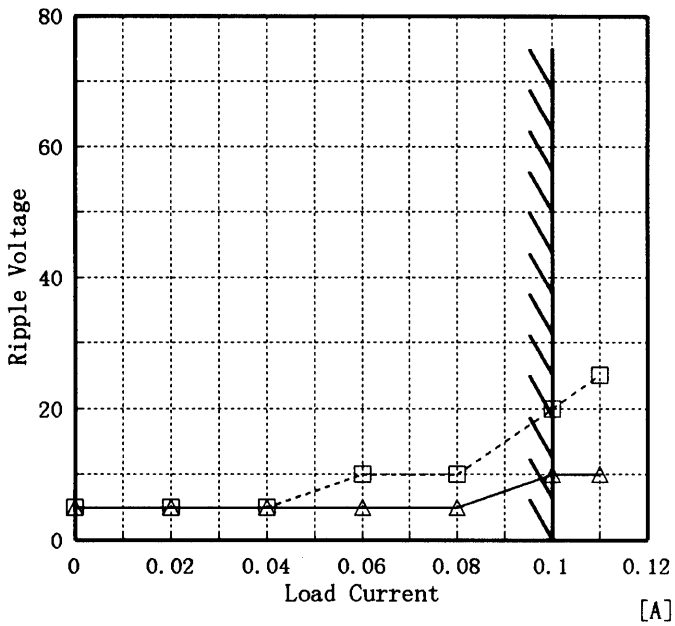
Model	ZUW31215
Item	Ripple Voltage(by Load Current) リップル電圧(負荷電流特性)
Object	+15V0.1A

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

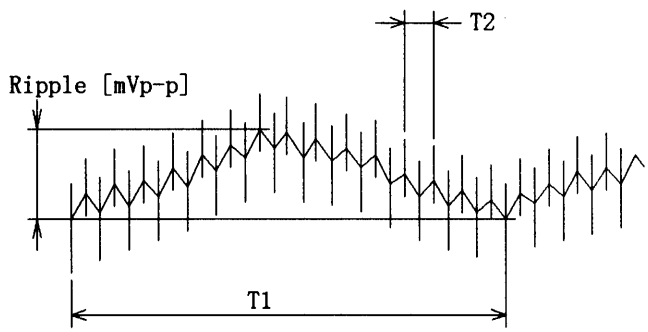


Fig. Complex Ripple Wave Form
図　リップル波形詳細図

2. Values

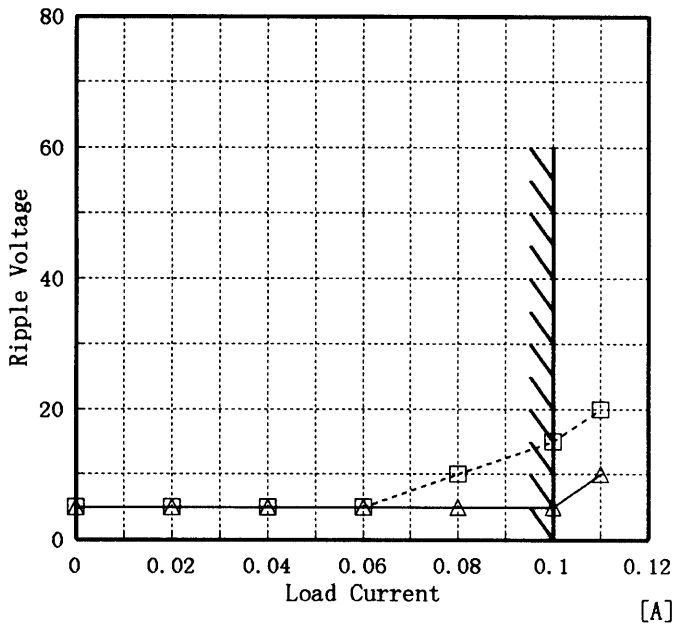
Load Current [A]	Input Volt. 9.0 [V] Ripple Output Volt. [mV]	Input Volt. 18.0 [V] Ripple Output Volt. [mV]
0.00	5	5
0.02	5	5
0.04	5	5
0.06	10	5
0.08	10	5
0.10	20	10
0.11	25	10
—	—	—
—	—	—
—	—	—
—	—	—

COSEL

Model	ZUW31215
Item	Ripple Voltage(by Load Current) リップル電圧(負荷電流特性)
Object	−15V0.1A

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

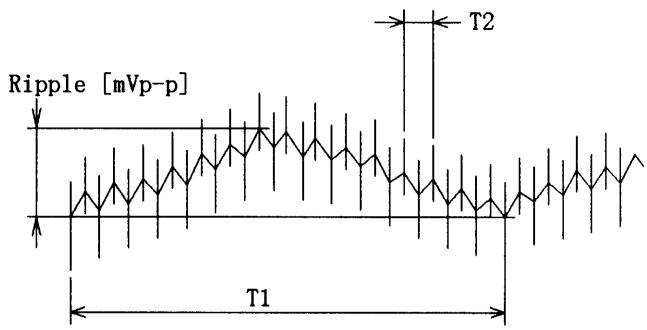


Fig. Complex Ripple Wave Form
図　リップル波形詳細図

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
0.02	5	5
0.04	5	5
0.06	5	5
0.08	10	5
0.10	15	5
0.11	20	10
—	—	—
—	—	—
—	—	—
—	—	—

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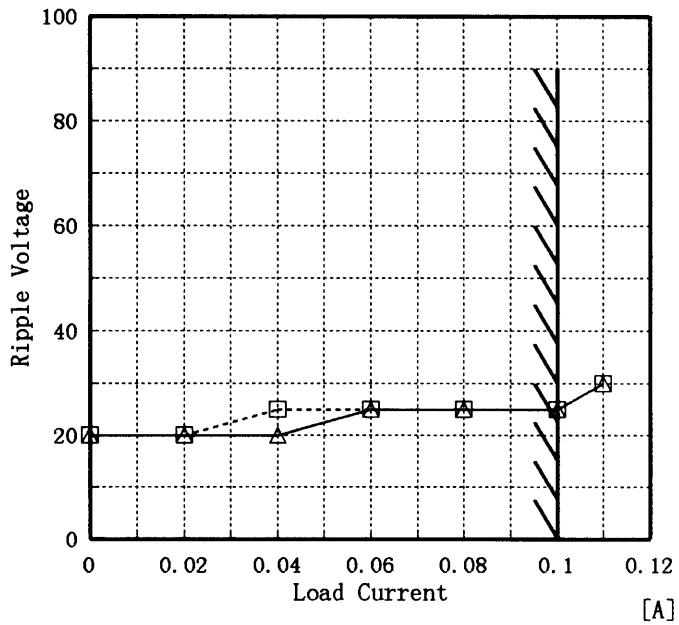
Model	ZUW31215
Item	Ripple-Noise リップルノイズ
Object	+15V0.1A

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。

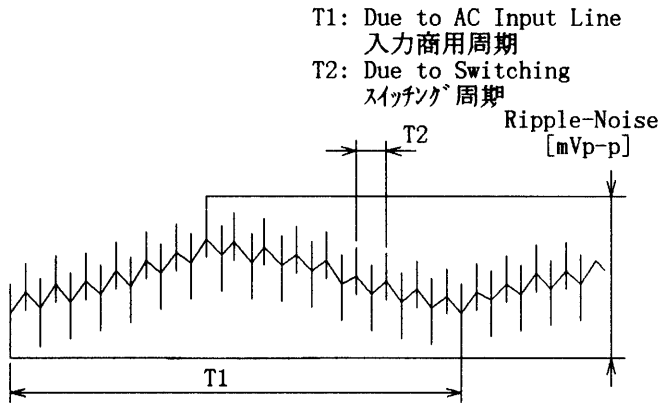


Fig. Complex Ripple Wave Form
図 リップル波形詳細図

2. Values

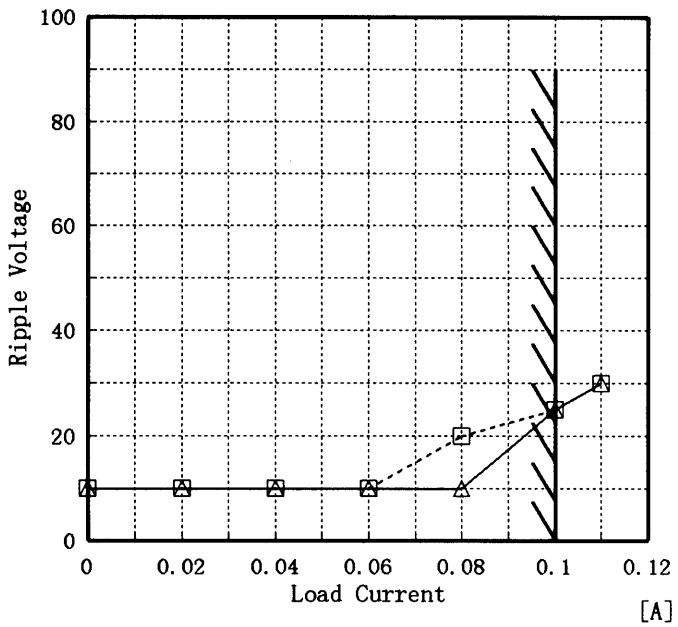
Load Current [A]	Input Volt. 9.0 [V] Ripple Output Volt. [mV]	Input Volt. 18.0 [V] Ripple Output Volt. [mV]
0.00	20	20
0.02	20	20
0.04	25	20
0.06	25	25
0.08	25	25
0.10	25	25
0.11	30	30
—	—	—
—	—	—
—	—	—
—	—	—

COSEL

Model	ZUW31215
Item	Ripple-Noise リップルノイズ
Object	−15V0.1A

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。

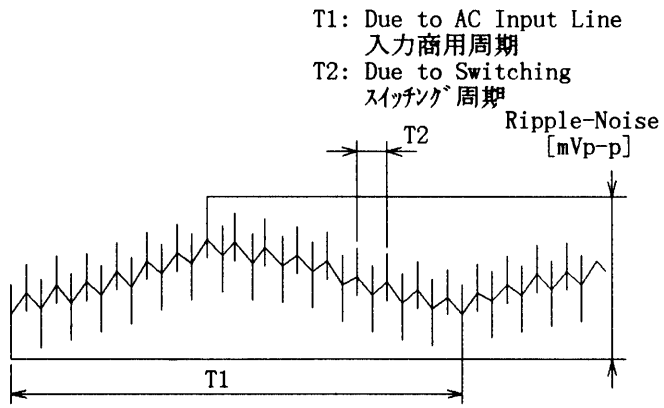


Fig. Complex Ripple Wave Form
図 リップル波形詳細図

2. Values

Load Current [A]	Input Volt. 9.0 [V] Ripple Output Volt. [mV]	Input Volt. 18.0 [V] Ripple Output Volt. [mV]
0.00	10	10
0.02	10	10
0.04	10	10
0.06	10	10
0.08	20	10
0.10	25	25
0.11	30	30
—	—	—
—	—	—
—	—	—
—	—	—

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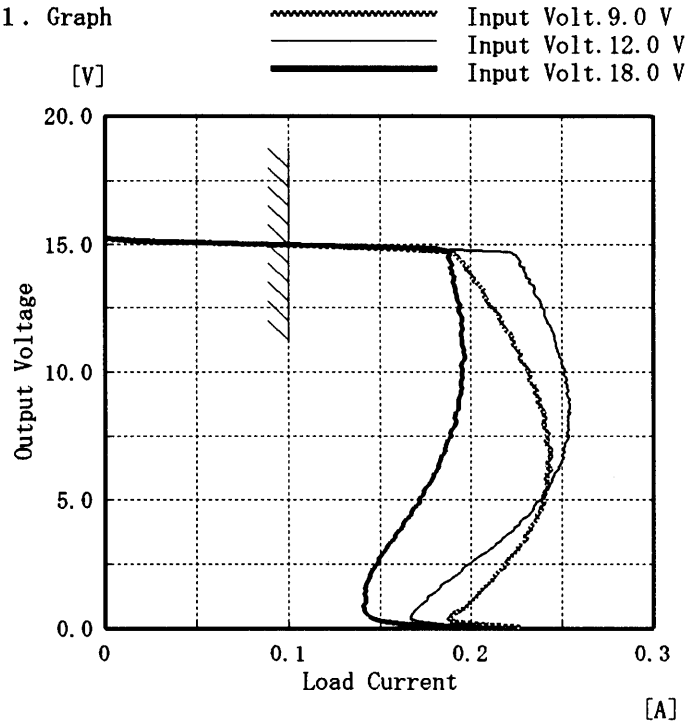
Model	ZUW31215
Item	Overcurrent Protection 過電流保護

Temperature 25℃
Testing Circuitry Figure A

Object +15V0.1A

1. Graph

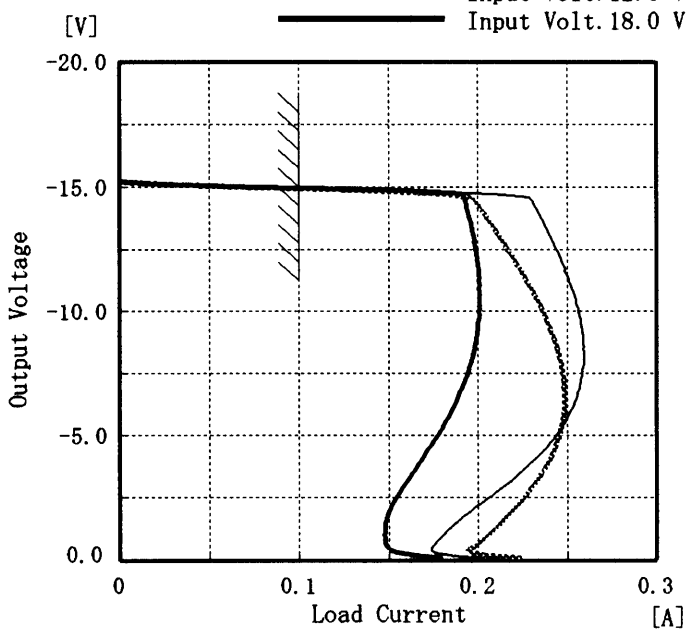


2. Values

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]
15.00	0.067	0.067	0.061
14.25	0.196	0.226	0.189
13.50	0.201	0.232	0.190
12.00	0.215	0.241	0.195
10.50	0.226	0.248	0.196
9.00	0.236	0.253	0.194
7.50	0.242	0.254	0.189
6.00	0.241	0.245	0.180
4.50	0.238	0.233	0.167
3.00	0.225	0.210	0.153
1.50	0.206	0.182	0.142
0.00	0.227	0.207	0.184

Object −15V0.1A

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]
-15.00	0.078	0.080	0.075
-14.25	0.200	0.231	0.194
-13.50	0.207	0.236	0.196
-12.00	0.220	0.246	0.200
-10.50	0.232	0.254	0.201
-9.00	0.242	0.259	0.199
-7.50	0.247	0.258	0.194
-6.00	0.248	0.252	0.185
-4.50	0.244	0.239	0.174
-3.00	0.231	0.215	0.159
-1.50	0.213	0.188	0.148
0.00	0.224	0.202	0.180

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Model	ZUW31215		
Item	Dynamic Load Responce 動的負荷変動	Temperature Testing Circuitry	25℃ Figure A
Object	+15V0.1A		

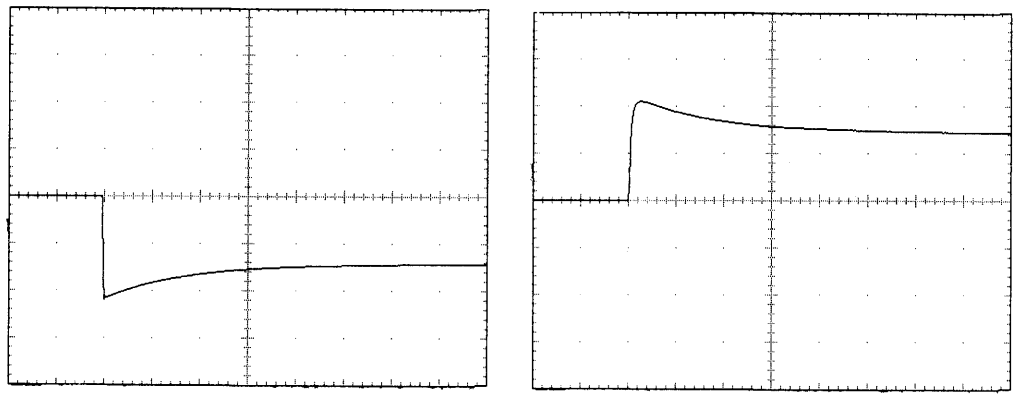
Input Volt. 12.0 V

Cycle 100 mS

Load Current

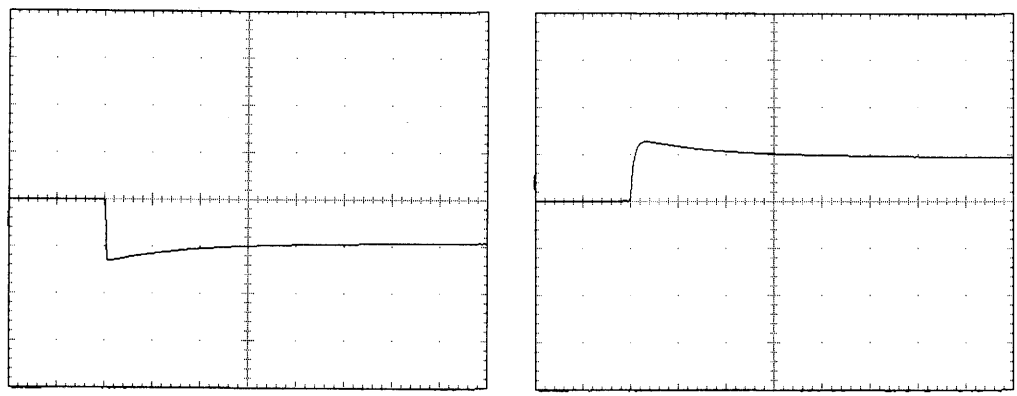
Min. Load ←→
Load 100 %

200 mV/div



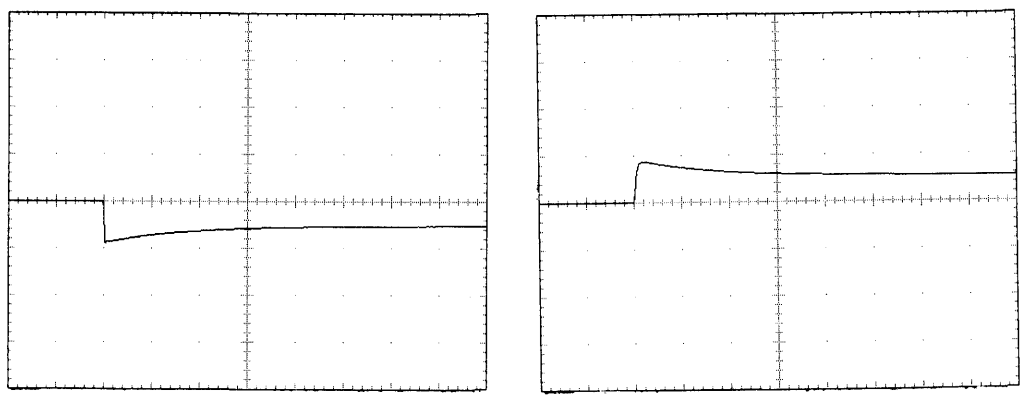
Min. Load ←→
Load 50 %

200 mV/div



Load 50%←→
Load 100 %

200 mV/div



1 mS/div

COSEL

Model	ZUW31215		
Item	Dynamic Load Responce 動的負荷変動	Temperature Testing Circuitry	25℃ Figure A
Object	−15V0.1A		

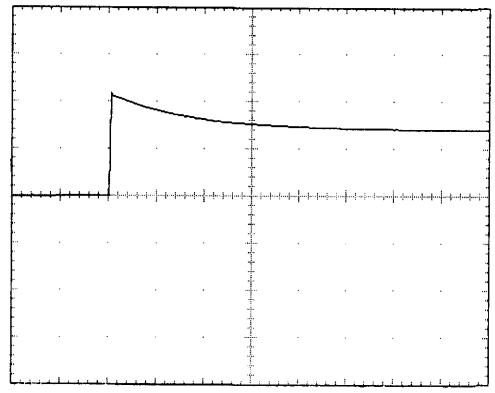
Input Volt. 12.0 V

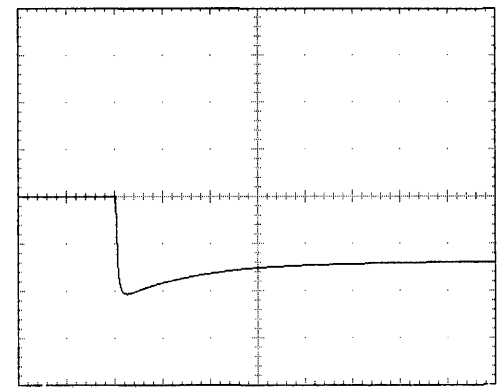
Cycle 100 mS

Load Current

Min. Load ←→
Load 100 %

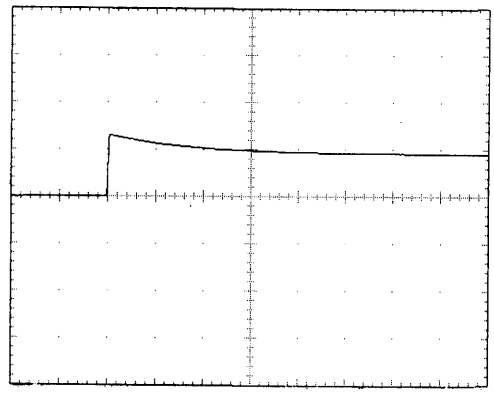
200 mV/div

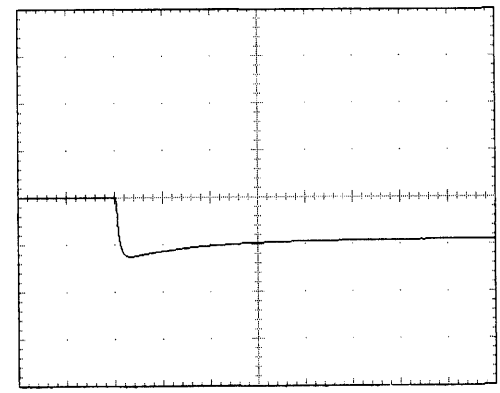




Min. Load ←→
Load 50 %

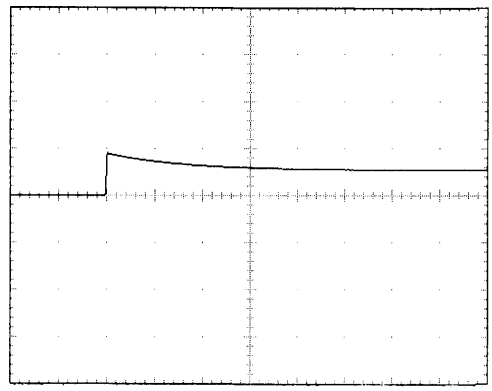
200 mV/div

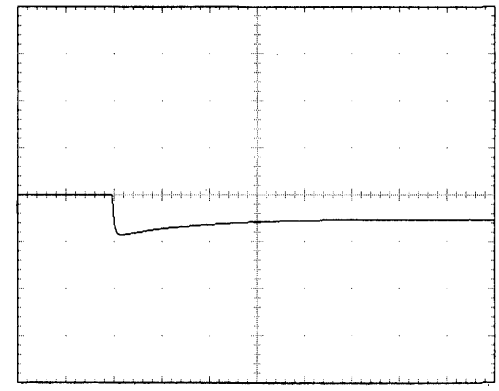




Load 50%←→
Load 100 %

200 mV/div





1 mS/div

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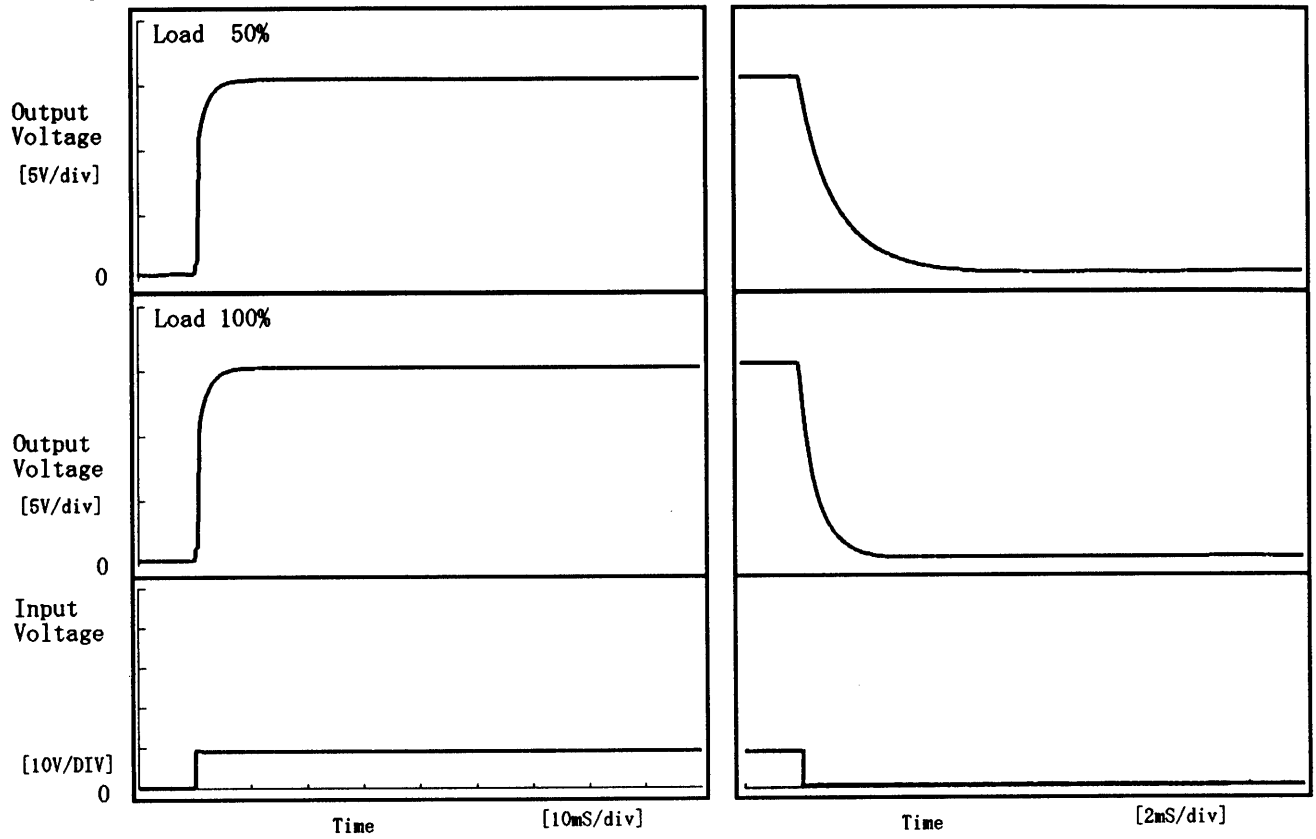
Model	ZUW31215		
Item	Rise and Fall Time 立上り、立下り時間	Temperature Testing Circuitry	25℃ Figure A
Object	+15V0.1A		

1. Graph

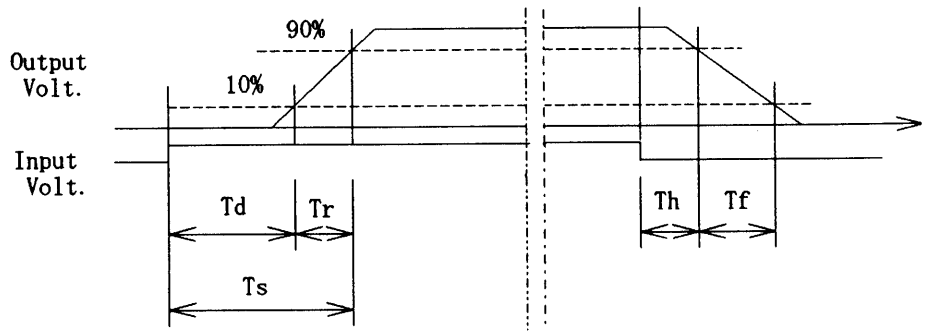
Input Volt. 9.0 V



2. Values

[mS]

Load \ Time	T d	T r	T s	T h	T f
50 %	0.55	2.10	2.65	0.22	3.23
100 %	0.55	2.30	2.85	0.13	1.46

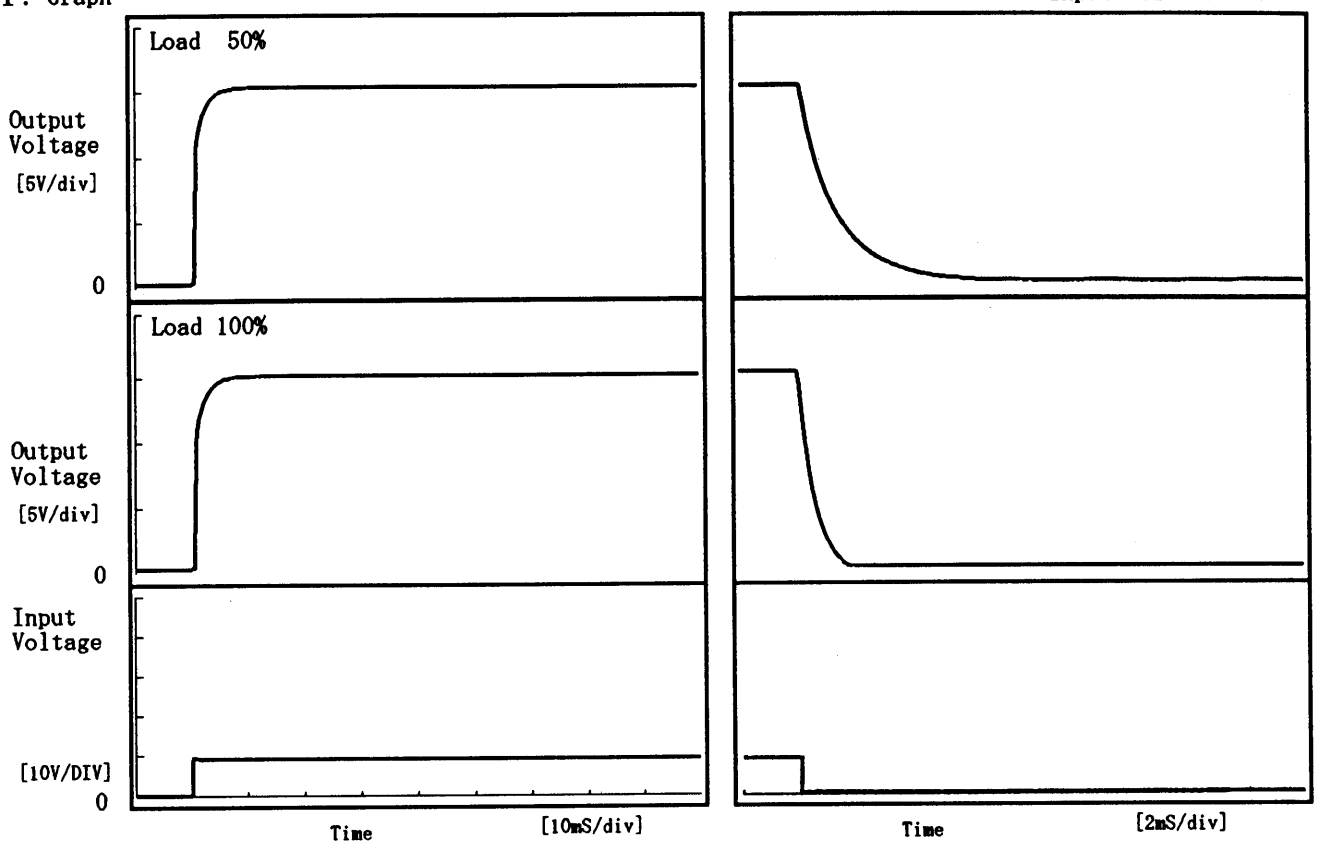


COSEL

Model	ZUW31215	Temperature	25℃
Item	Rise and Fall Time 立上り、立下り時間	Testing Circuitry	Figure A
Object	-15V0.1A		

1. Graph

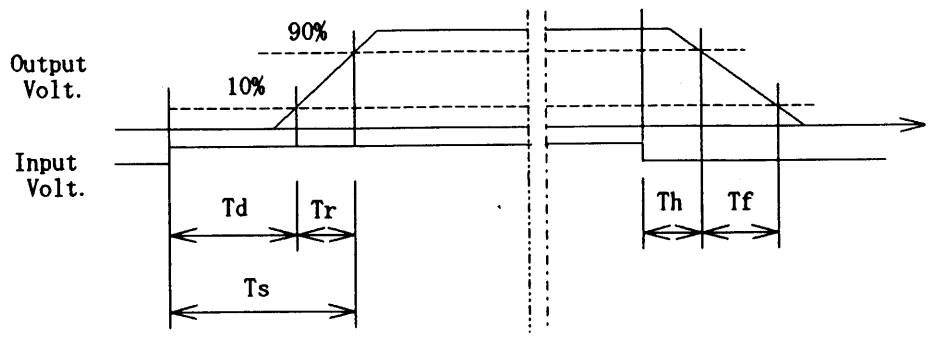
Input Volt. 9.0 V



2. Values

[mS]

Load \ Time	Td	Tr	Ts	Th	Tf
50 %	0.55	2.15	2.70	0.22	2.91
100 %	0.55	2.35	2.90	0.13	1.14



BC-2038

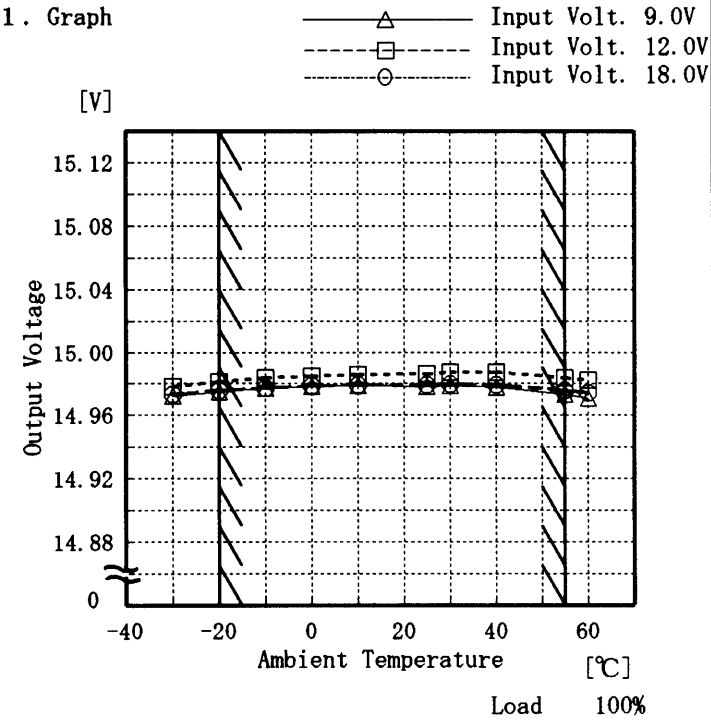
COSEL

Model	ZUW31215
Item	Ambient Temperature Drift 周囲温度変動

Testing Circuitry Figure A

Object +15V0.1A

1. Graph

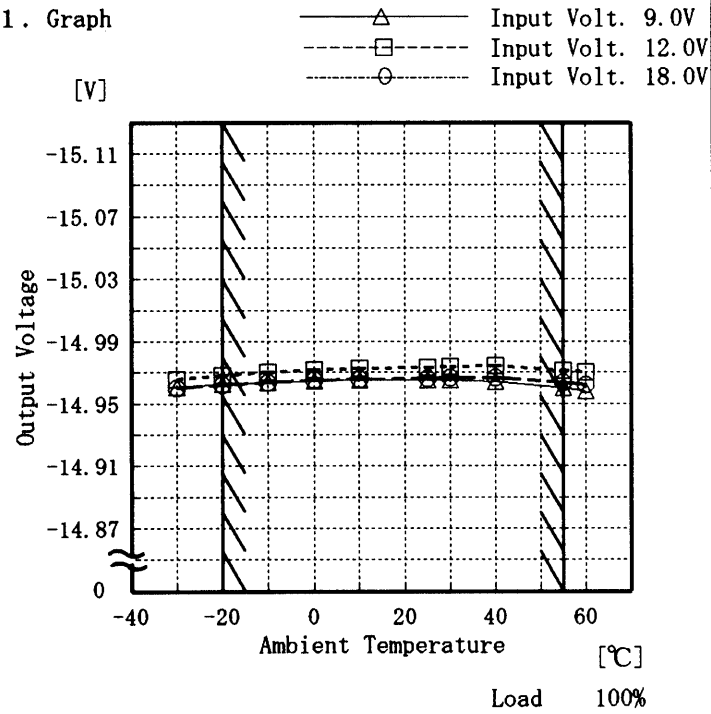


2. Values

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	14.972	14.978	14.973
-20	14.975	14.981	14.976
-10	14.977	14.983	14.977
0	14.978	14.985	14.978
10	14.979	14.986	14.979
25	14.978	14.986	14.979
30	14.978	14.987	14.980
40	14.977	14.987	14.979
55	14.973	14.984	14.975
60	14.970	14.982	14.974
—	—	—	—

Object −15V0.1A

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	-14.960	-14.966	-14.960
-20	-14.962	-14.968	-14.962
-10	-14.964	-14.970	-14.964
0	-14.965	-14.972	-14.965
10	-14.965	-14.973	-14.966
25	-14.965	-14.973	-14.966
30	-14.965	-14.974	-14.967
40	-14.964	-14.974	-14.967
55	-14.960	-14.971	-14.963
60	-14.958	-14.970	-14.962
—	—	—	—

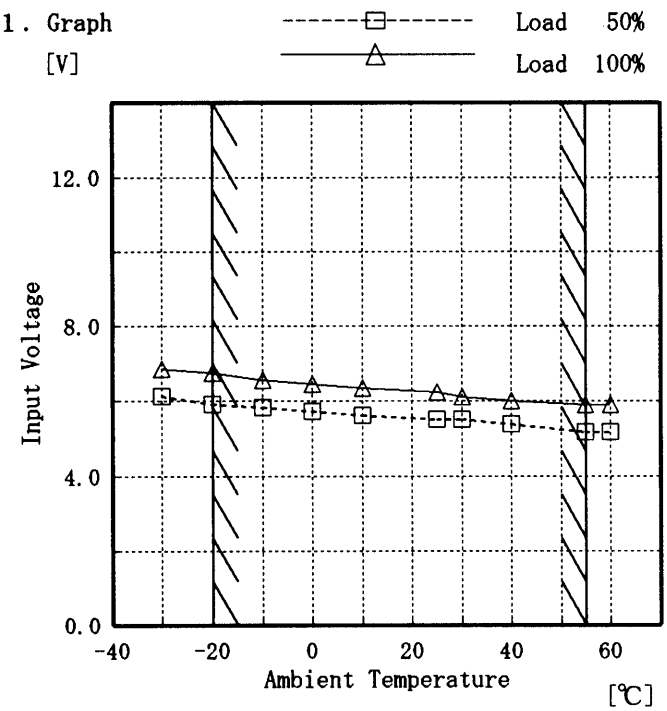
COSEL

Model	ZUW31215
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 +15V0.1A

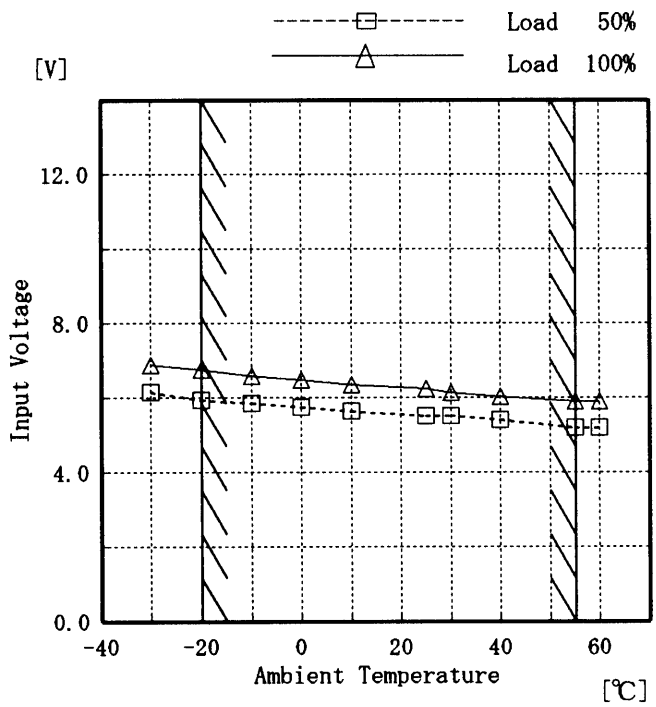
1. Graph



2. Values

Ambient Temp. [℃]	Load 50% Input Volt. [V]	Load 100% Input Volt. [V]
-30	6.1	6.9
-20	5.9	6.8
-10	5.8	6.6
0	5.7	6.5
10	5.6	6.3
25	5.5	6.2
30	5.5	6.1
40	5.4	6.0
55	5.2	5.9
60	5.2	5.9
—	—	—

Object −15V0.1A



2. Values

Ambient Temp. [℃]	Load 50% Input Volt. [V]	Load 100% Input Volt. [V]
-30	6.1	6.9
-20	5.9	6.8
-10	5.8	6.6
0	5.7	6.5
10	5.6	6.3
25	5.5	6.2
30	5.5	6.1
40	5.4	6.0
55	5.2	5.9
60	5.2	5.9
—	—	—

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。

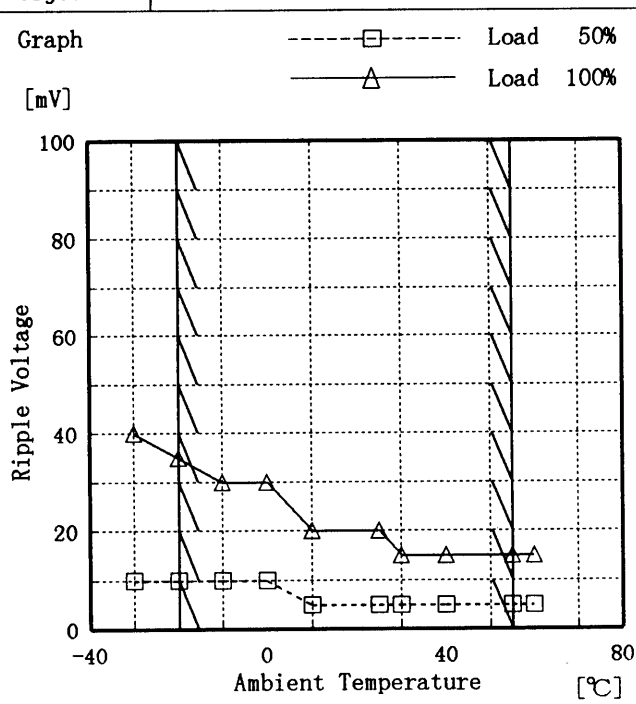
COSEL

Model	ZUW31215
Item	Ripple Voltage (by Ambient Temp.) リップル電圧（周囲温度特性）

Testing Circuitry Figure A

Object +15V0.1A

1. Graph



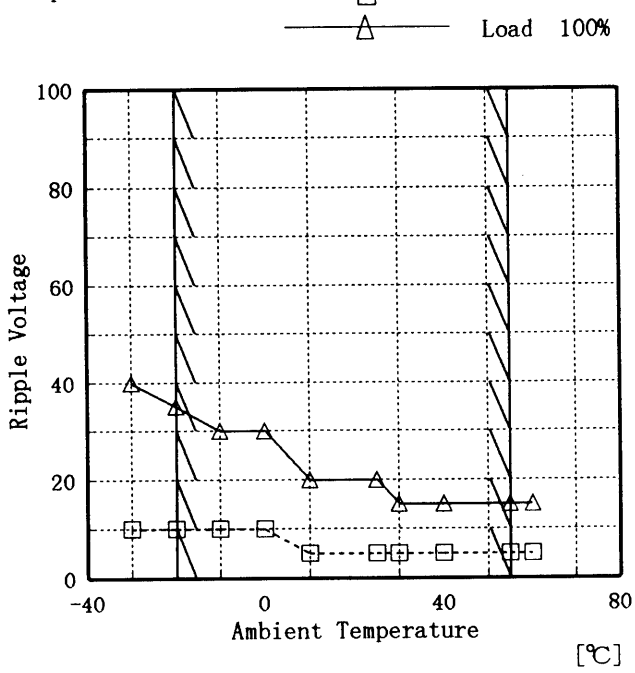
Input Volt. 9.0 V

2. Values

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

Object −15V0.1A

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	10	45
-20	10	40
-10	5	30
0	5	25
10	5	20
25	5	15
30	5	15
40	5	20
55	5	20
60	5	25
—	—	—

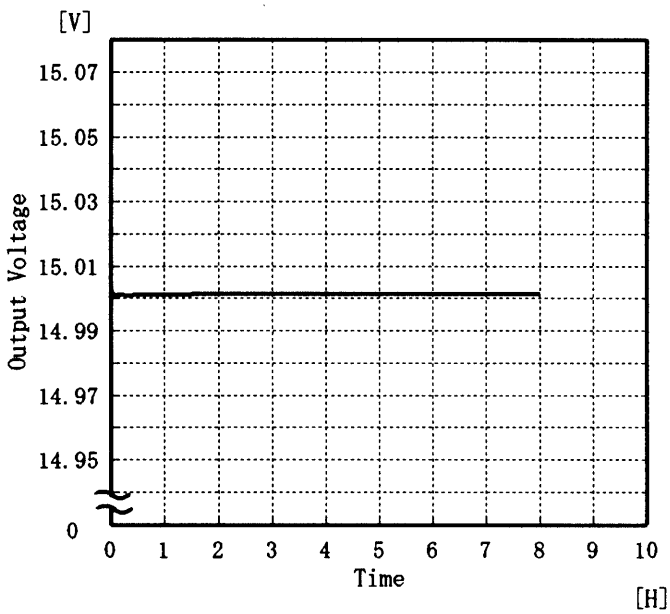
COSEL

Model	ZUW31215
Item	Time Lapse Drift 経時ドリフト

Temperature 25 ℃
Testing Circuitry Figure A

Object ＋15V0.1A

1. Graph



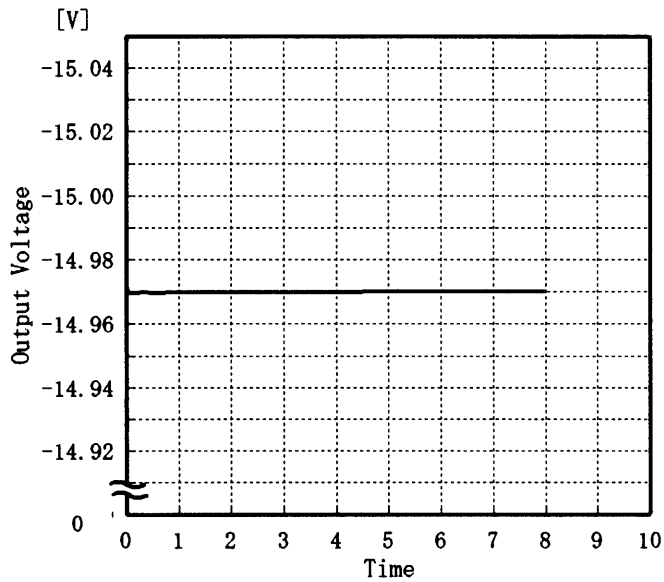
Input Volt. 12.0V
Load 100%

2. Values

Time since start [H]	Output Voltage [V]
0.0	15.003
0.5	15.001
1.0	15.001
2.0	15.001
3.0	15.001
4.0	15.001
5.0	15.002
6.0	15.001
7.0	15.002
8.0	15.002

Object －15V0.1A

1. Graph



Input Volt. 12.0V
Load 100%

2. Values

Time since start [H]	Output Voltage [V]
0.0	-14.972
0.5	-14.970
1.0	-14.970
2.0	-14.970
3.0	-14.970
4.0	-14.970
5.0	-14.970
6.0	-14.970
7.0	-14.970
8.0	-14.970

COSEL

Model	ZUW31215	
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) : 0.0～0.1 A

(AVR 2) : 0.0～0.1 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) 0.0～0.1 A

(AVR 2) 0.0～0.1 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 ＋15V0.1A

Item	Temperature [℃]	Input Voltage [V]	Output Current [A]	Output Voltage [V]	Output Voltage Accuracy [mV]	Output Voltage Accuracy (Ration) [%]
Maximum Voltage	25	12.0	0.1	14.986	±121	±0.9
Minimum Voltage	-20	9.0	0.0	14.745		

Object －15V0.1A

Item	Temperature [℃]	Input Voltage [V]	Output Current [A]	Output Voltage [V]	Output Voltage Accuracy [mV]	Output Voltage Accuracy (Ration) [%]
Maximum Voltage	25	12.0	0.1	-14.974	±114	±0.8
Minimum Voltage	55	9.0	0.0	-14.746		

COSEL

Model	ZUW31215
Item	Condensation 結露特性
Object	+15V0.1A

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	14.912	5	10
	2	14.905	5	10
	3	14.902	5	10
Load 100 %	1	14.819	10	20
	2	14.811	10	20
	3	14.811	10	20

Input Volt. 12.0 V

COSEL

Model	ZUW31215
Item	Condensation 結露特性
Object	−15V0.1A

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	-14.884	5	25
	2	-14.890	5	25
	3	-14.888	5	25
Load 100 %	1	-14.784	15	25
	2	-14.794	15	25
	3	-14.799	15	25

Input Volt. 12.0 V

COSEL

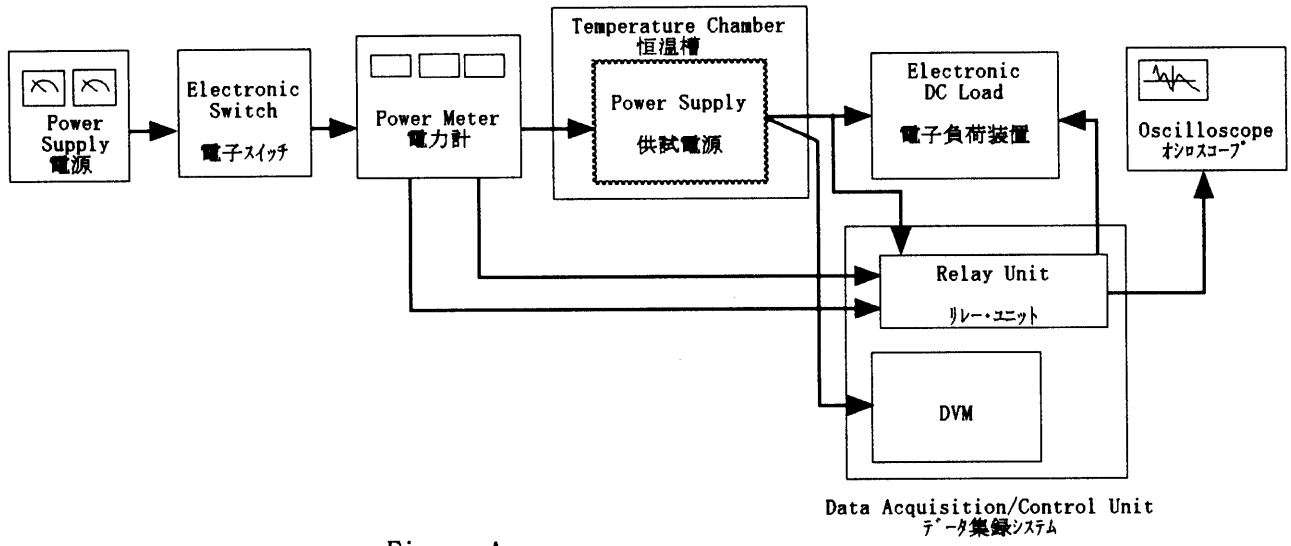


Figure A