参考資料

COSEL

TEST DATA OF ZUW1R52415

(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)

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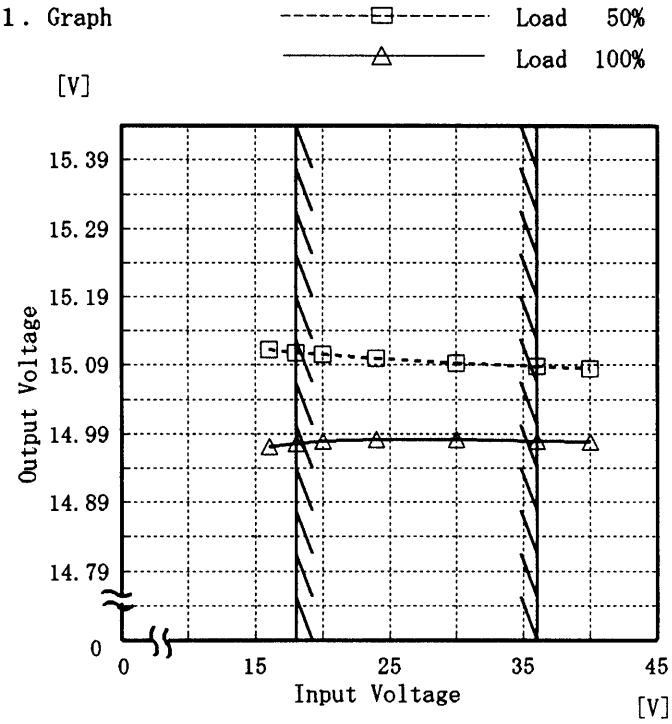
Model	ZUW1R52415
Item	Line Regulation 静的入力変動

Temperature 25℃
Testing Circuitry Figure A

Object ＋15V0.05A

1. Graph

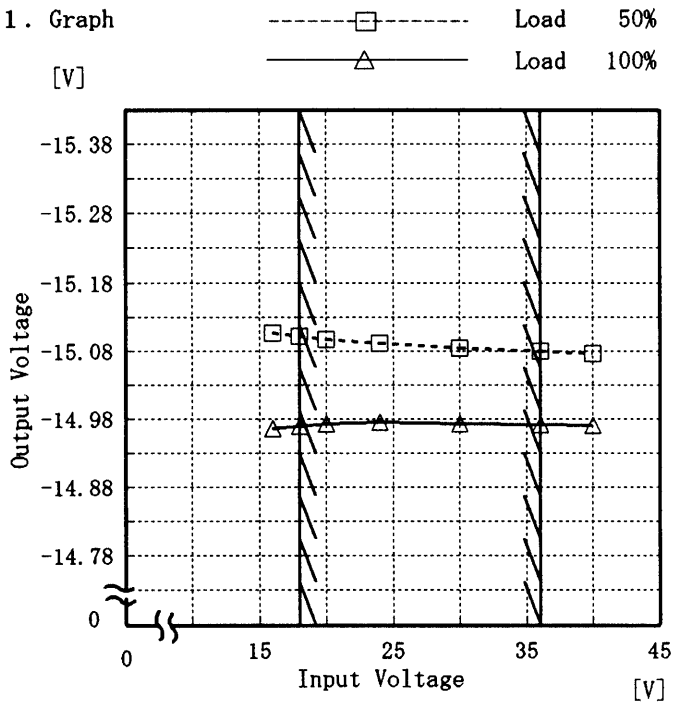


2. Values

Input Voltage [V]	Load 50% Output Volt. [V]	Load 100% Output Volt. [V]
16.0	15.113	14.971
18.0	15.108	14.976
20.0	15.105	14.979
24.0	15.100	14.982
30.0	15.093	14.982
36.0	15.088	14.980
40.0	15.085	14.979
—	—	—
—	—	—
—	—	—
—	—	—
—	—	—

Object －15V0.05A

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	-15.106	-14.966
18.0	-15.101	-14.970
20.0	-15.097	-14.973
24.0	-15.091	-14.975
30.0	-15.085	-14.974
36.0	-15.079	-14.972
40.0	-15.077	-14.971
—	—	—
—	—	—
—	—	—
—	—	—
—	—	—

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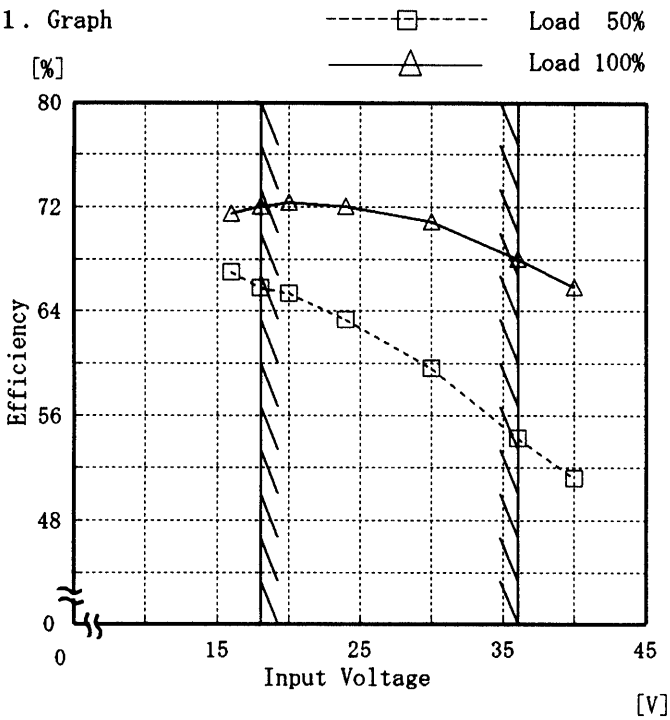
COSEL

Model	ZUW1R52415
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	67.0	71.5
18.0	65.8	72.0
20.0	65.4	72.4
24.0	63.3	72.0
30.0	59.6	70.9
36.0	54.3	68.0
40.0	51.2	65.8
—	—	—
—	—	—
—	—	—
—	—	—
—	—	—

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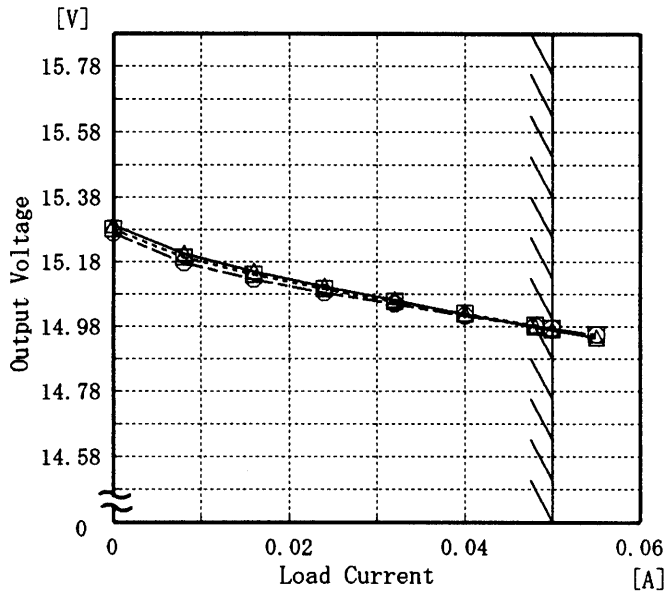
Model	ZUW1R52415
Item	Load Regulation 静的負荷変動

Temperature 25℃
Testing Circuitry Figure A

Object ＋15V0.05A

1. Graph

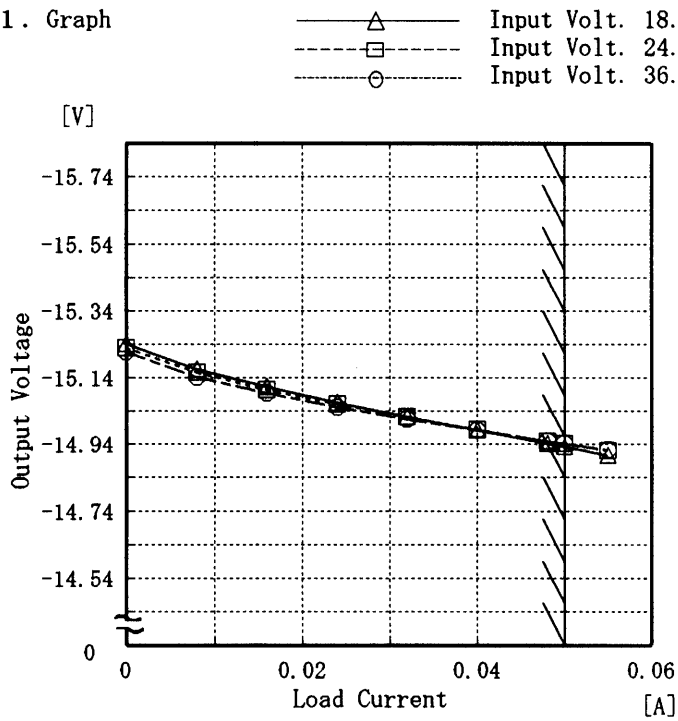


2. Values

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	15.296	15.283	15.271
0.008	15.207	15.194	15.179
0.016	15.151	15.141	15.127
0.024	15.105	15.097	15.086
0.032	15.063	15.059	15.050
0.040	15.020	15.020	15.014
0.048	14.980	14.985	14.982
0.050	14.970	14.976	14.974
0.055	14.945	14.955	14.955
—	—	—	—

Object −15V0.05A

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	-15.243	-15.230	-15.219
0.008	-15.168	-15.157	-15.145
0.016	-15.114	-15.107	-15.096
0.024	-15.068	-15.063	-15.054
0.032	-15.025	-15.024	-15.018
0.040	-14.984	-14.987	-14.984
0.048	-14.944	-14.951	-14.952
0.050	-14.934	-14.943	-14.944
0.055	-14.909	-14.921	-14.924
—	—	—	—

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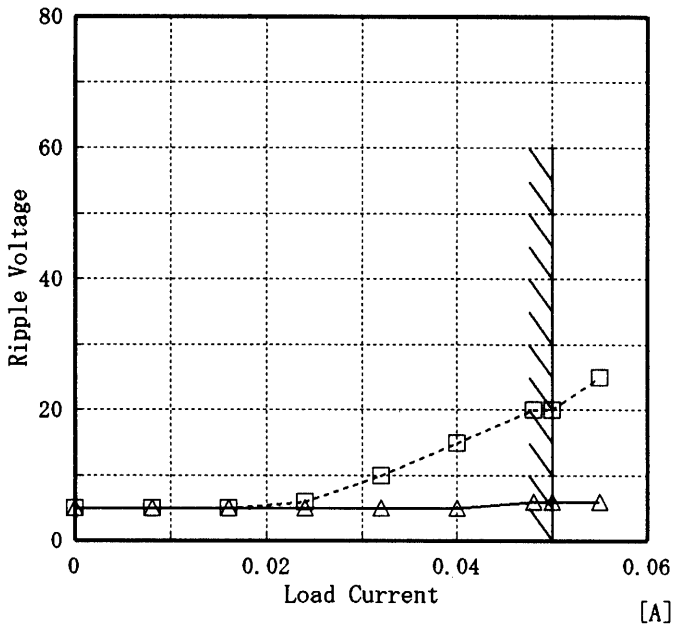
Model	ZUW1R52415
Item	Ripple Voltage(by Load Current) リップル電圧(負荷電流特性)
Object	+15V 0.05A

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。

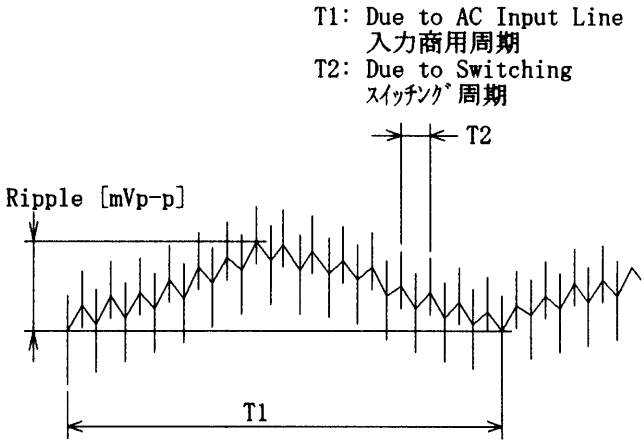


Fig. Complex Ripple Wave Form
図 リップル波形詳細図

2. Values

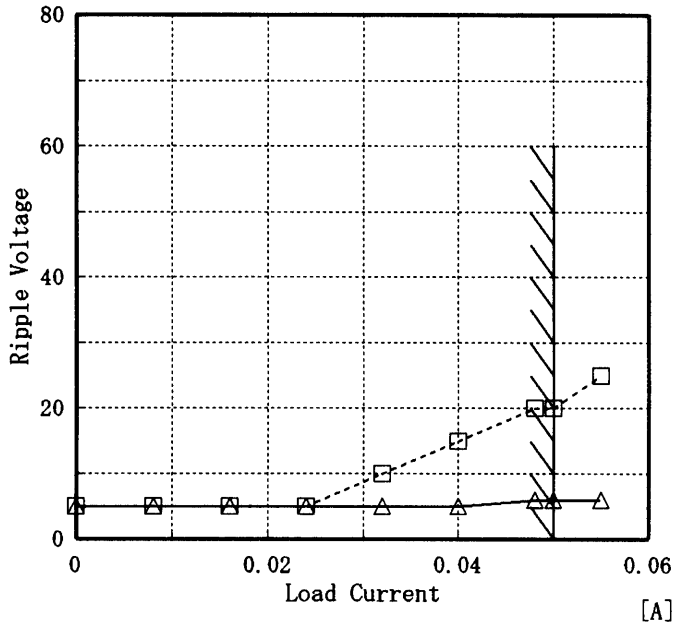
Load Current [A]	Input Volt. 18.0 [V] Ripple Output Volt. [mV]	Input Volt. 36.0 [V] Ripple Output Volt. [mV]
0.000	5	5
0.008	5	5
0.016	5	5
0.024	6	5
0.032	10	5
0.040	15	5
0.048	20	6
0.050	20	6
0.055	25	6
—	—	—
—	—	—

COSEL

Model	ZUW1R52415
Item	Ripple Voltage(by Load Current) リップル電圧(負荷電流特性)
Object	−15V 0.05A

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。

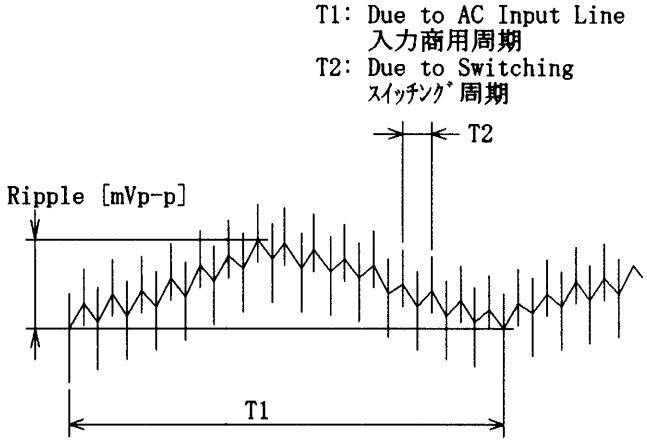


Fig. Complex Ripple Wave Form
図 リップル波形詳細図

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	5	5
0.008	5	5
0.016	5	5
0.024	5	5
0.032	10	5
0.040	15	5
0.048	20	6
0.050	20	6
0.055	25	6
—	—	—
—	—	—

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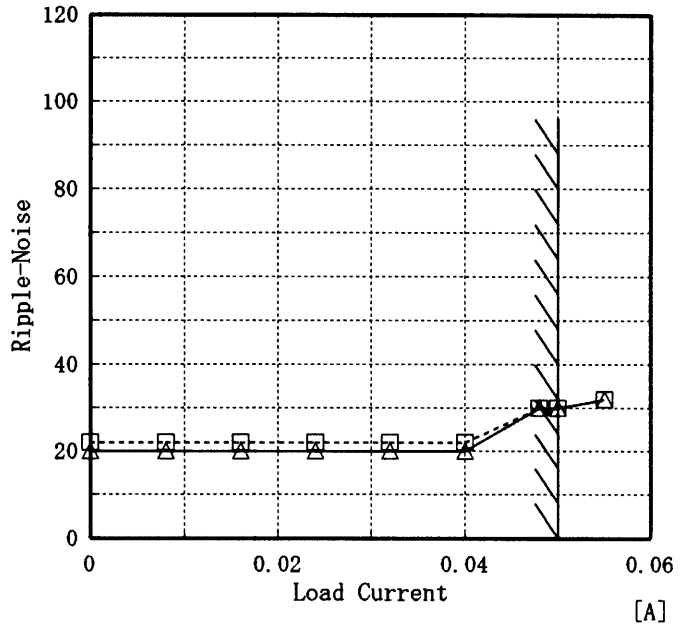
Model	ZUW1R52415
Item	Ripple-Noise リップルノイズ
Object	+15V0.05A

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

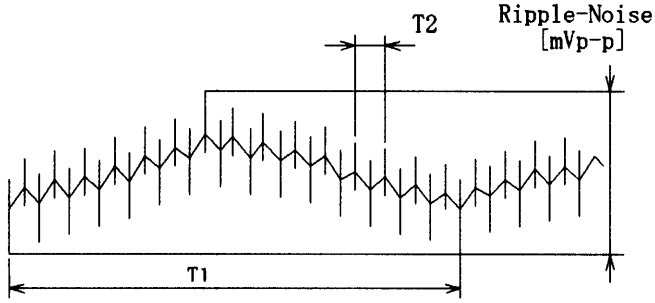


Fig. Complex Ripple Wave Form
図 リップル波形詳細図

2. Values

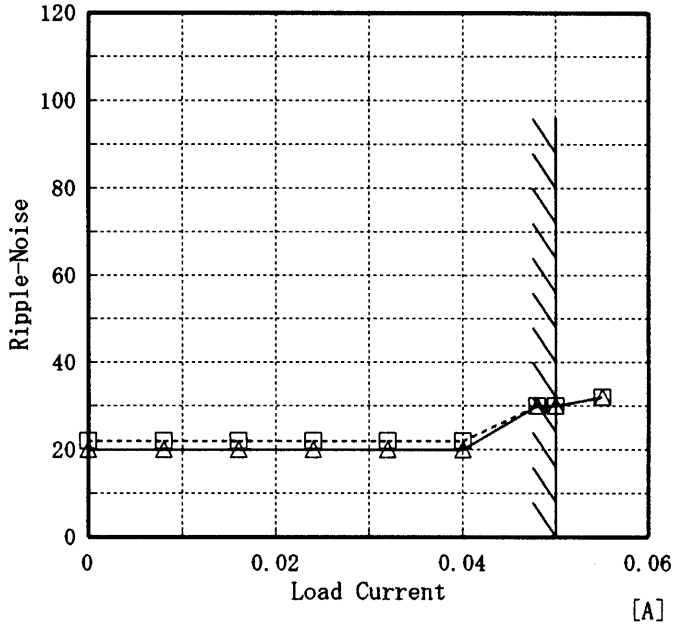
Load current [A]	Input Volt. 18.0 [V] Ripple-Noise [mV]	Input Volt. 36.0 [V] Ripple-Noise [mV]
0.000	22	20
0.008	22	20
0.016	22	20
0.024	22	20
0.032	22	20
0.040	22	20
0.048	30	30
0.050	30	30
0.055	32	32
—	—	—
—	—	—

COSEL

Model	ZUW1R52415
Item	Ripple-Noise リップルノイズ
Object	−15V0.05A

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

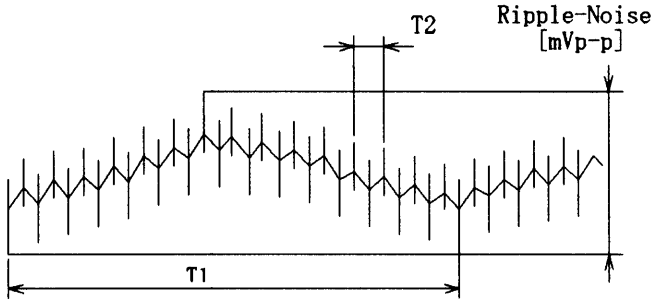


Fig. Complex Ripple Wave Form
図 リップル波形詳細図

2. Values

Load current [A]	Input Volt. 18.0 [V] Ripple-Noise [mV]	Input Volt. 36.0 [V] Ripple-Noise [mV]
0.000	22	20
0.008	22	20
0.016	22	20
0.024	22	20
0.032	22	20
0.040	22	20
0.048	30	30
0.050	30	30
0.055	32	32
—	—	—
—	—	—

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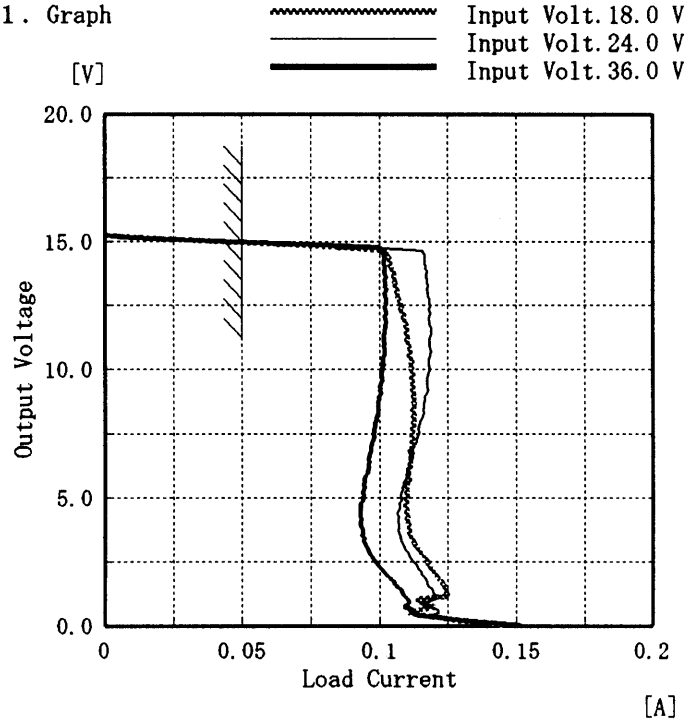
Model	ZUW1R52415
Item	Overcurrent Protection 過電流保護

Temperature 25℃
Testing Circuitry Figure A

Object ＋15V0.05A

1. Graph

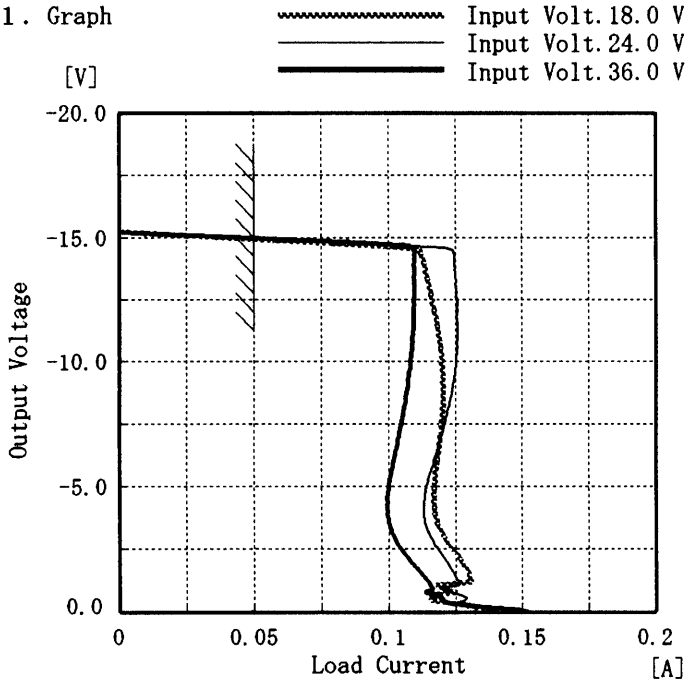


2. Values

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]
15.00	0.047	0.048	0.032
14.25	0.104	0.116	0.102
13.50	0.105	0.117	0.102
12.00	0.109	0.118	0.102
10.50	0.111	0.118	0.102
9.00	0.112	0.117	0.101
7.50	0.112	0.114	0.098
6.00	0.110	0.110	0.096
4.50	0.110	0.107	0.093
3.00	0.114	0.109	0.096
1.50	0.123	0.118	0.106
0.00	0.145	0.154	0.151

Object −15V0.05A

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]
-15.00	0.075	0.084	0.089
-14.25	0.112	0.124	0.110
-13.50	0.114	0.125	0.110
-12.00	0.117	0.126	0.110
-10.50	0.119	0.126	0.109
-9.00	0.120	0.124	0.107
-7.50	0.120	0.121	0.105
-6.00	0.118	0.117	0.102
-4.50	0.117	0.113	0.100
-3.00	0.120	0.115	0.101
-1.50	0.130	0.124	0.112
0.00	0.144	0.152	0.149

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Model	ZUW1R52415		
Item	Dynamic Load Responce 動的負荷変動	Temperature Testing Circuitry	25℃ Figure A
Object	+15V0.05A		

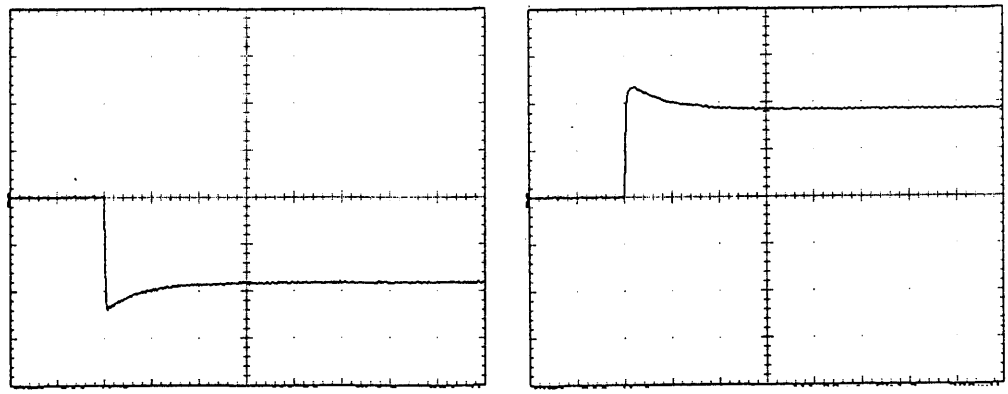
Input Volt. 24.0 V

Cycle 100 mS

Load Current

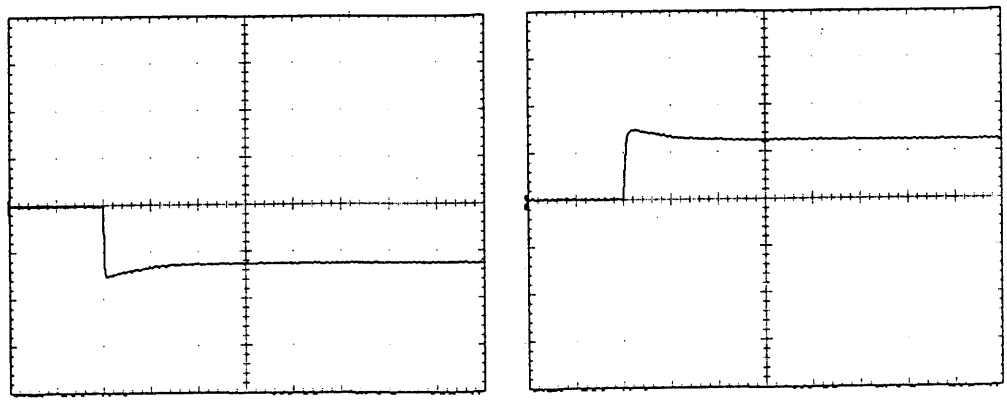
Min. Load ⟷
Load 100 %

200 mV/div



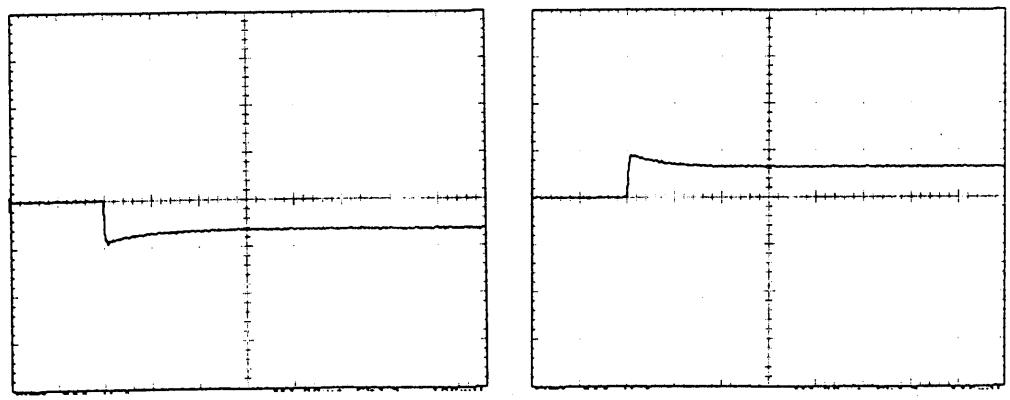
Min. Load ⟷
Load 50 %

200 mV/div



Load 50%⟷
Load 100 %

200 mV/div



1 mS/div

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Model	ZUW1R52415		
Item	Dynamic Load Responce 動的負荷変動	Temperature Testing Circuitry	25℃ Figure A
Object	−15V0.05A		

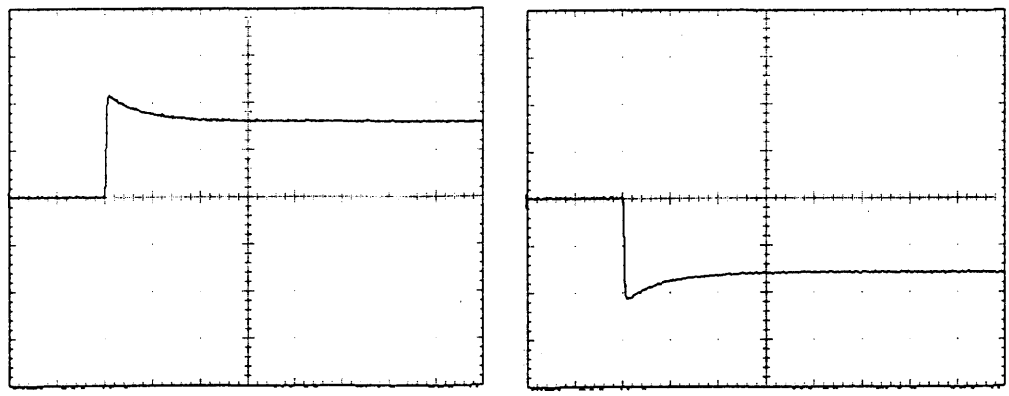
Input Volt. 24.0 V

Cycle 100 mS

Load Current

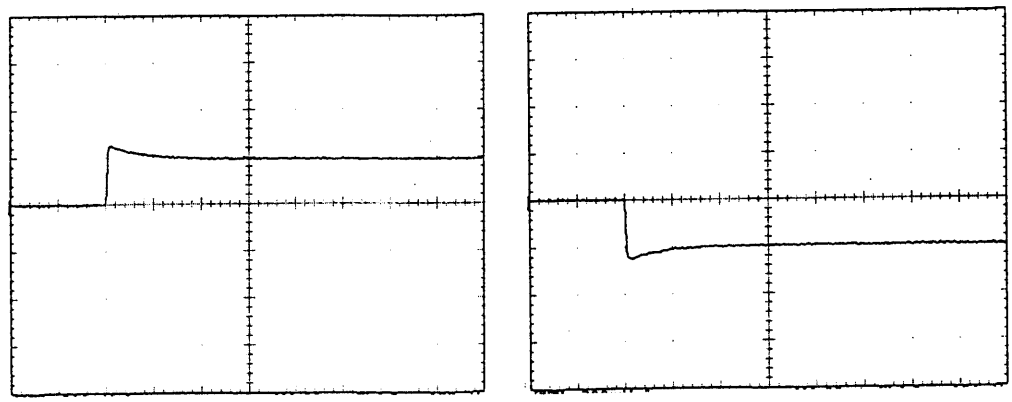
Min. Load ⟷
Load 100 %

200 mV/div



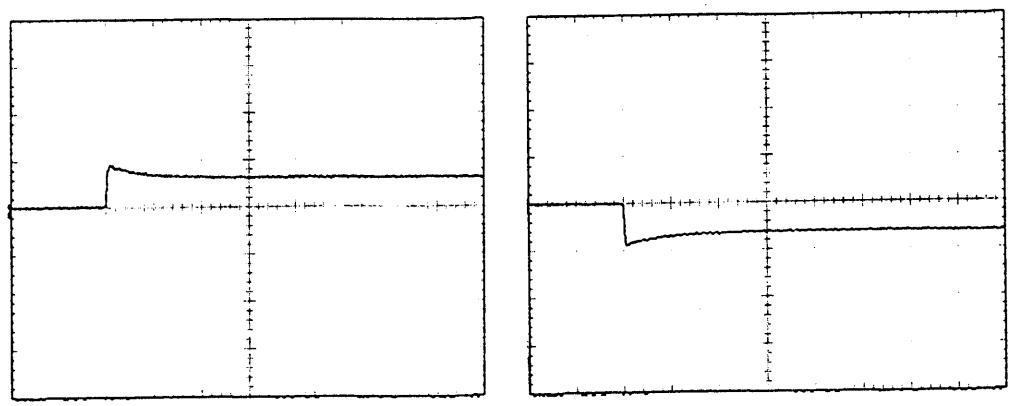
Min. Load ⟷
Load 50 %

200 mV/div



Load 50%⟷
Load 100 %

200 mV/div



1 mS/div

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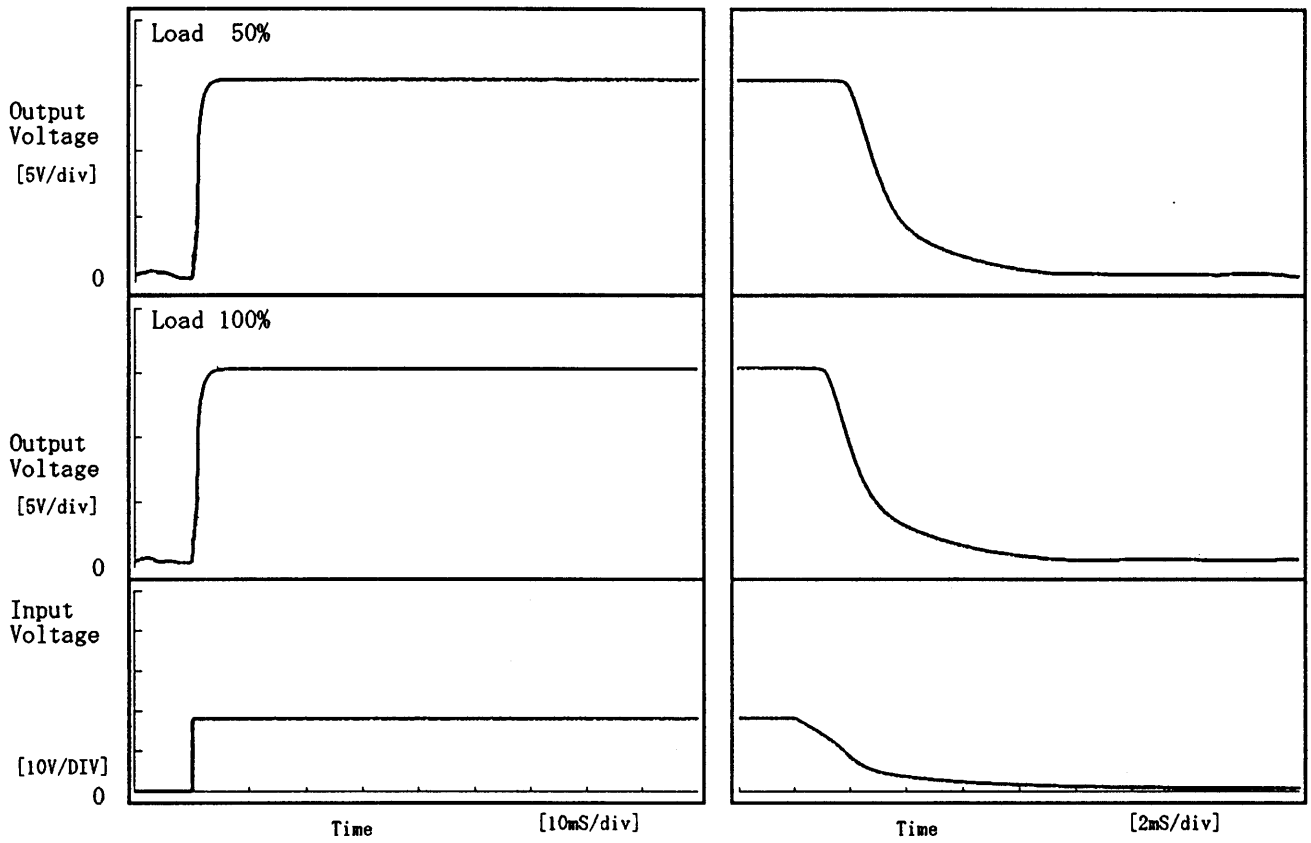
COSEL

Model	ZUW1R52415		
Item	Rise and Fall Time 立上り、立下り時間	Temperature Testing Circuitry	25℃ Figure A
Object	+15V0.05A		

1. Graph

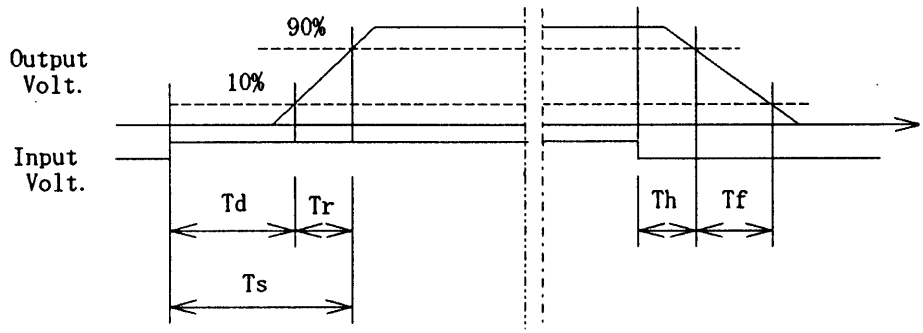
Input Volt. 18.0 V



2. Values

[mS]

Time / Load	Td	Tr	Ts	Th	Tf
50 %	0.10	1.70	1.80	2.19	4.30
100 %	0.10	1.80	1.90	1.40	4.42



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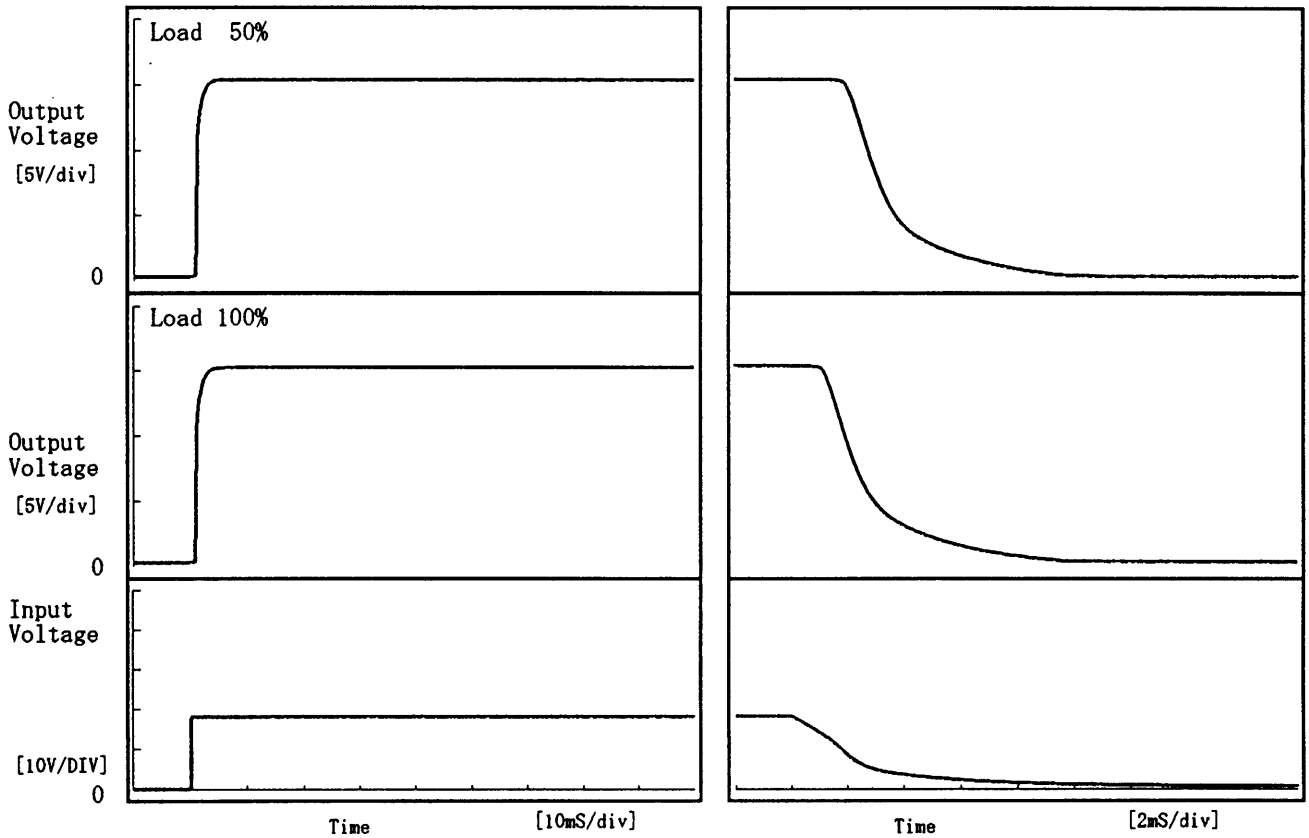
COSEL

Model	ZUW1R52415		
Item	Rise and Fall Time 立上り、立下り時間	Temperature Testing Circuitry	25℃ Figure A
Object	-15V0.05A		

1. Graph

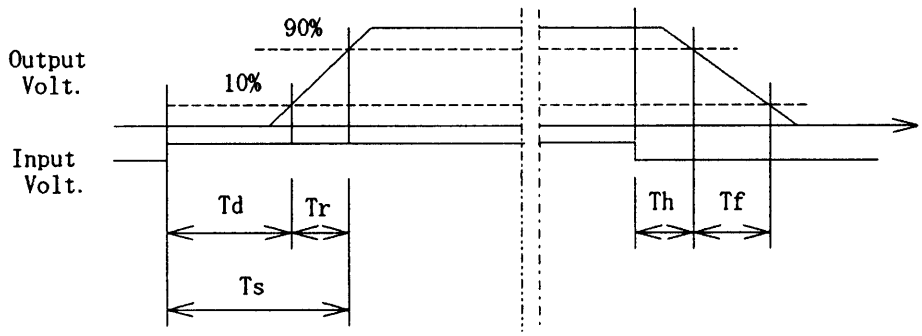
Input Volt. 18.0 V



2. Values

[mS]

Load \ Time	T d	T r	T s	T h	T f
50 %	0.75	1.10	1.85	2.20	4.18
100 %	0.75	1.15	1.90	1.39	4.38



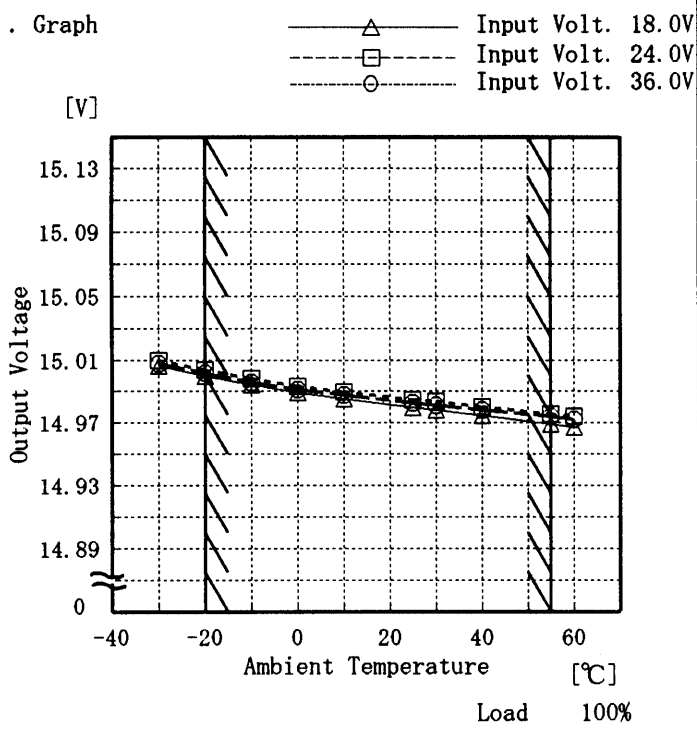
COSEL

Model	ZUW1R52415
Item	Ambient Temperature Drift 周囲温度変動

Testing Circuitry Figure A

Object ＋15V0.05A

1. Graph

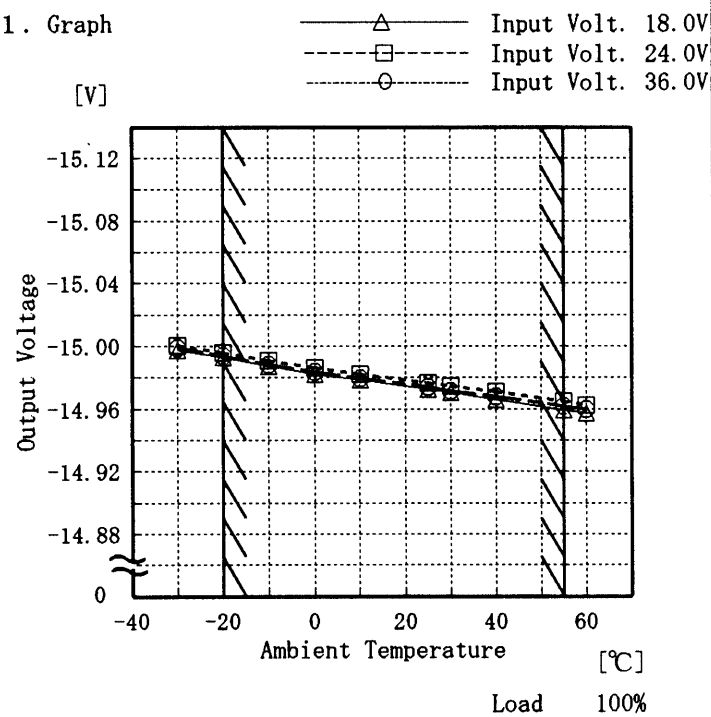


2. Values

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	15.006	15.010	15.008
-20	15.000	15.004	15.002
-10	14.994	14.998	14.996
0	14.989	14.993	14.991
10	14.985	14.990	14.987
25	14.980	14.985	14.982
30	14.978	14.983	14.981
40	14.974	14.980	14.978
55	14.969	14.976	14.974
60	14.967	14.974	14.972
—	—	—	—

Object −15V0.05A

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	-14.998	-15.001	-14.999
-20	-14.993	-14.996	-14.994
-10	-14.987	-14.991	-14.988
0	-14.982	-14.986	-14.984
10	-14.979	-14.982	-14.980
25	-14.973	-14.977	-14.974
30	-14.970	-14.975	-14.972
40	-14.966	-14.971	-14.968
55	-14.960	-14.965	-14.962
60	-14.957	-14.963	-14.960
—	—	—	—

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。

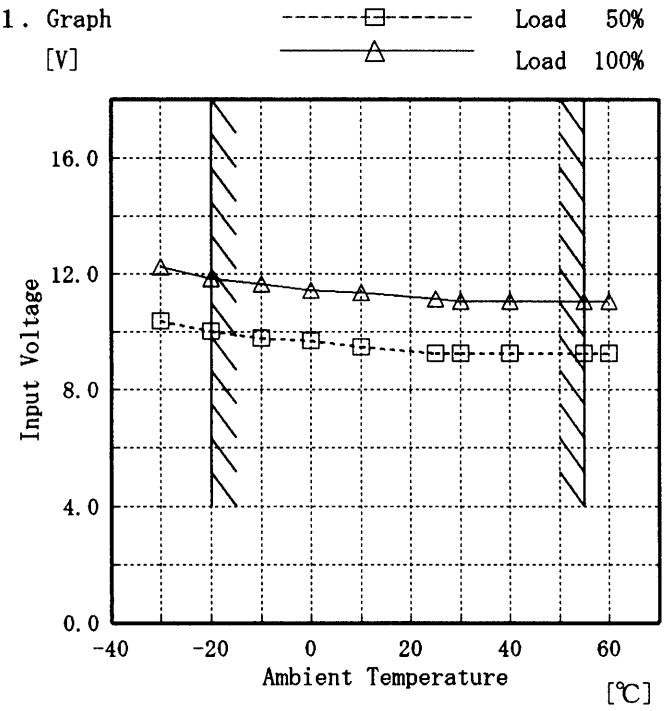
COSEL

Model	ZUW1R52415
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 ＋15V0.05A

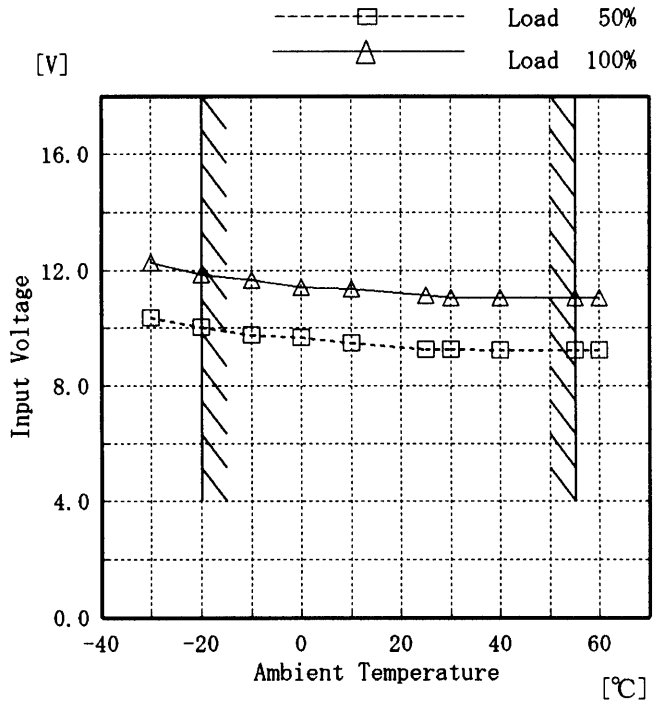
1. Graph



2. Values

Ambient Temp. [℃]	Load 50% Input Volt. [V]	Load 100% Input Volt. [V]
-30	10.4	12.3
-20	10.0	11.9
-10	9.8	11.6
0	9.7	11.4
10	9.5	11.4
25	9.3	11.1
30	9.3	11.1
40	9.3	11.1
55	9.3	11.1
60	9.3	11.1
—	—	—

Object －15V0.05A



2. Values

Ambient Temp. [℃]	Load 50% Input Volt. [V]	Load 100% Input Volt. [V]
-30	10.4	12.3
-20	10.0	11.9
-10	9.8	11.6
0	9.7	11.4
10	9.5	11.4
25	9.3	11.1
30	9.3	11.1
40	9.3	11.1
55	9.3	11.1
60	9.3	11.1
—	—	—

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。

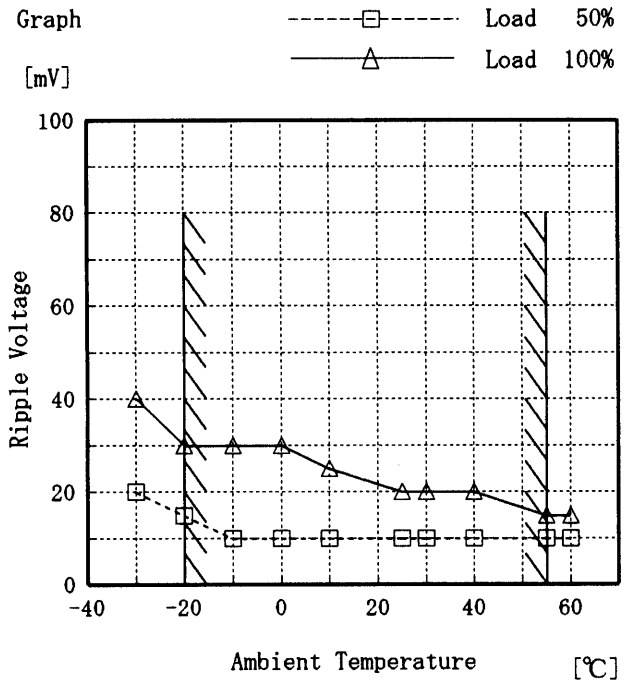
COSEL

Model	ZUW1R52415
Item	Ripple Voltage (by Ambient Temp.) リップル電圧（周囲温度特性）

Testing Circuitry Figure A

Object	+15V0.05A

1. Graph



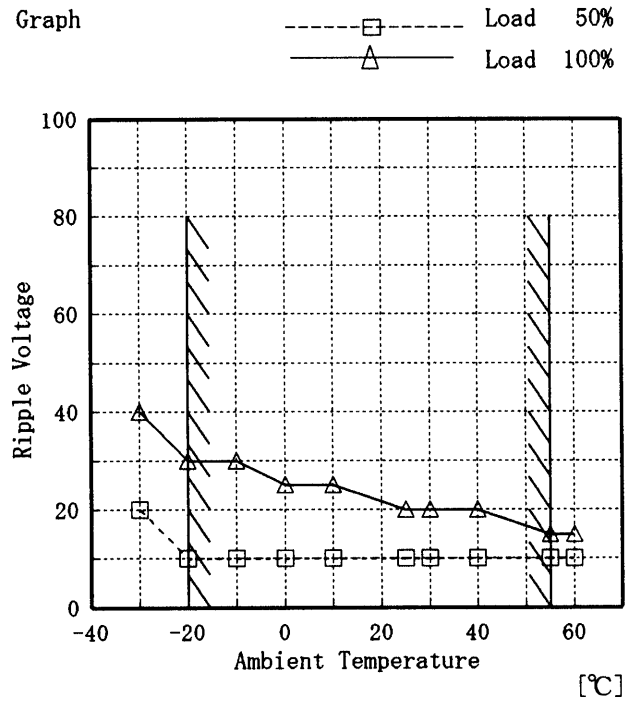
Input Volt. 18.0 V

2. Values

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

Object	−15V0.05A

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

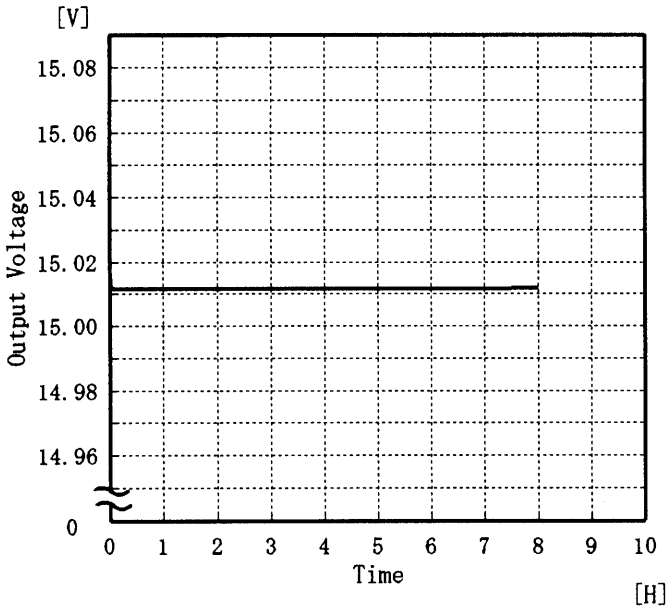
COSEL

Model	ZUW1R52415
Item	Time Lapse Drift 経時ドリフト

Temperature 25 ℃
Testing Circuitry Figure A

Object ＋15V0.05A

1. Graph



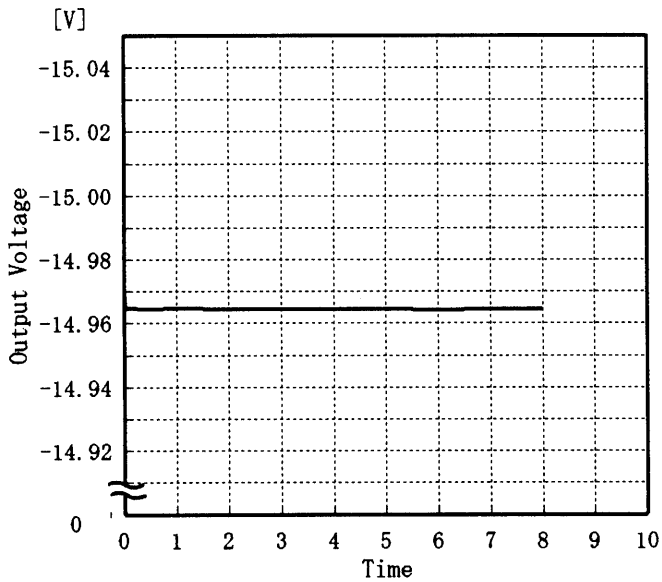
Input Volt. 24.0V
Load 100%

2. Values

Time since start [H]	Output Voltage [V]
0.0	15.017
0.5	15.012
1.0	15.012
2.0	15.012
3.0	15.012
4.0	15.012
5.0	15.012
6.0	15.012
7.0	15.012
8.0	15.012

Object －15V0.05A

1. Graph



Input Volt. 24.0V
Load 100%

2. Values

Time since start [H]	Output Voltage [V]
0.0	-14.971
0.5	-14.965
1.0	-14.965
2.0	-14.964
3.0	-14.965
4.0	-14.965
5.0	-14.964
6.0	-14.964
7.0	-14.965
8.0	-14.964

BC－2020

COSEL

Model	ZUW1R52415	
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) : 0.00～0.05 A

(AVR 2) : 0.00～0.05 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) 0.00～0.05 A

(AVR 2) 0.00～0.05 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 ＋15V0.05A

Item	Temperature [℃]	Input Voltage [V]	Output Current [A]	Output Voltage [V]	Output Voltage Accuracy [mV]	Output Voltage Accuracy (Ration) [%]
Maximum Voltage	-20	24.0	0.05	15.001	±160	±1.1
Minimum Voltage	25	18.0	0.00	14.681		

Object －15V0.05A

Item	Temperature [℃]	Input Voltage [V]	Output Current [A]	Output Voltage [V]	Output Voltage Accuracy [mV]	Output Voltage Accuracy (Ration) [%]
Maximum Voltage	-20	24.0	0.05	-14.995	±168	±1.2
Minimum Voltage	55	18.0	0.00	-14.659		

COSEL

Model	ZUW1R52415
Item	Condensation 結露特性
Object	+15V 0.05A

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	14.987	10	20
	2	15.023	10	20
	3	15.011	10	20
Load 100 %	1	14.965	20	30
	2	14.985	20	30
	3	14.966	20	30

Input Volt. 24.0 V

COSEL

Model	ZUW1R52415
Item	Condensation 結露特性
Object	−15V 0.05A

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	-15.123	10	20
	2	-14.825	10	20
	3	-14.963	10	20
Load 100 %	1	-15.076	20	30
	2	-14.800	20	30
	3	-14.921	20	30

Input Volt. 24.0 V

COSEL

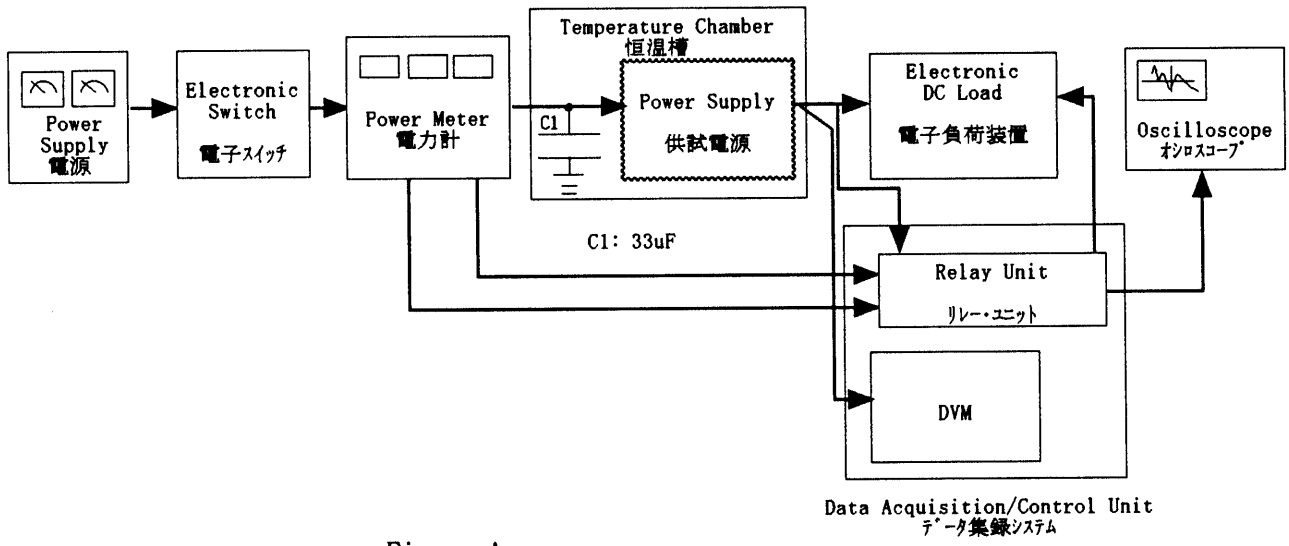


Figure A