参考資料

COSEL

TEST DATA OF ZTW1R51212
(12.0V INPUT)

Regulated DC Power Supply

Date : Mar.5. 1998

Approved by : N. Shiraishi
Design Manager

Prepared by : T. Tsuri
Design Engineer

コーセル株式会社

COSEL CO.,LTD.

COSEL

CONTENTS

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

(Final Page 20)

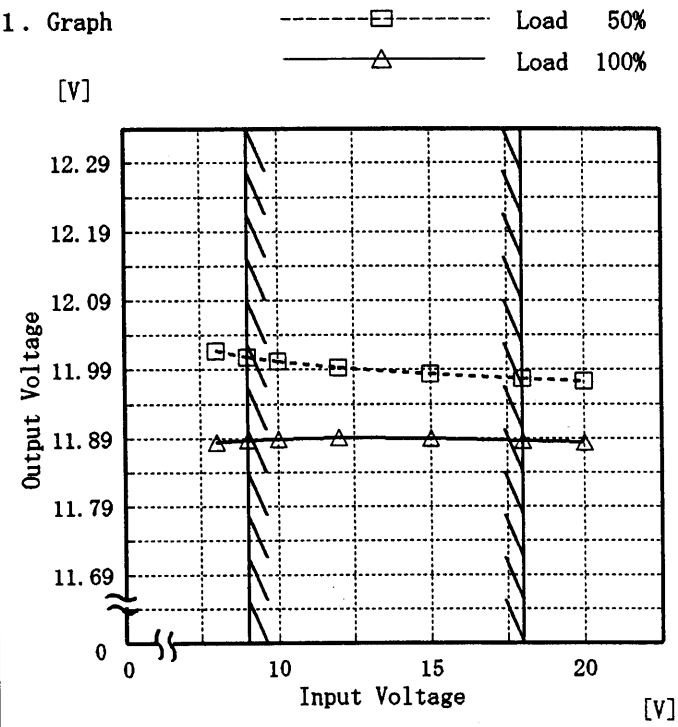
COSEL

Model	ZTW1R51212
Item	Line Regulation 静的入力変動

Temperature 25℃
Testing Circuitry Figure A

Object ＋12V0.065A

1. Graph

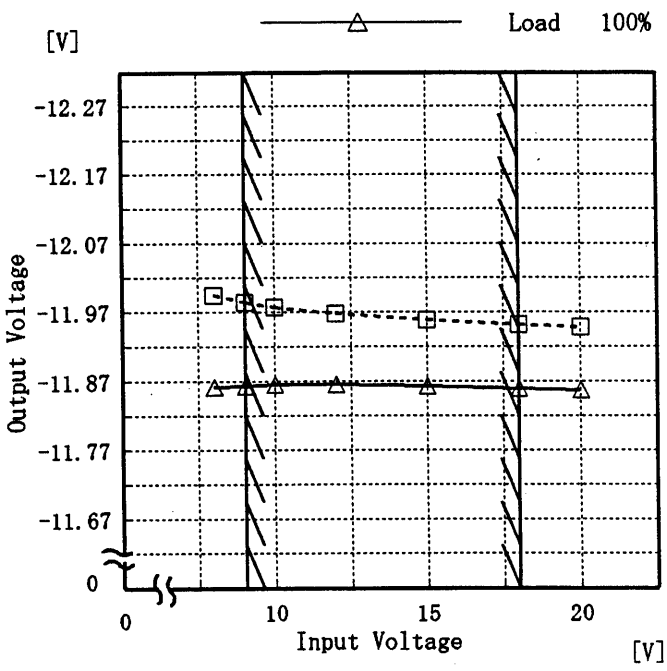


2. Values

Input Voltage [V]	Load 50% Output Volt. [V]	Load 100% Output Volt. [V]
8.0	12.017	11.884
9.0	12.008	11.887
10.0	12.002	11.889
12.0	11.993	11.891
15.0	11.984	11.889
18.0	11.977	11.886
20.0	11.973	11.884
—	—	—
—	—	—
—	—	—
—	—	—
—	—	—

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]
8.0	-11.994	-11.861
9.0	-11.984	-11.864
10.0	-11.977	-11.865
12.0	-11.968	-11.865
15.0	-11.958	-11.863
18.0	-11.951	-11.859
20.0	-11.947	-11.857
—	—	—
—	—	—
—	—	—
—	—	—
—	—	—

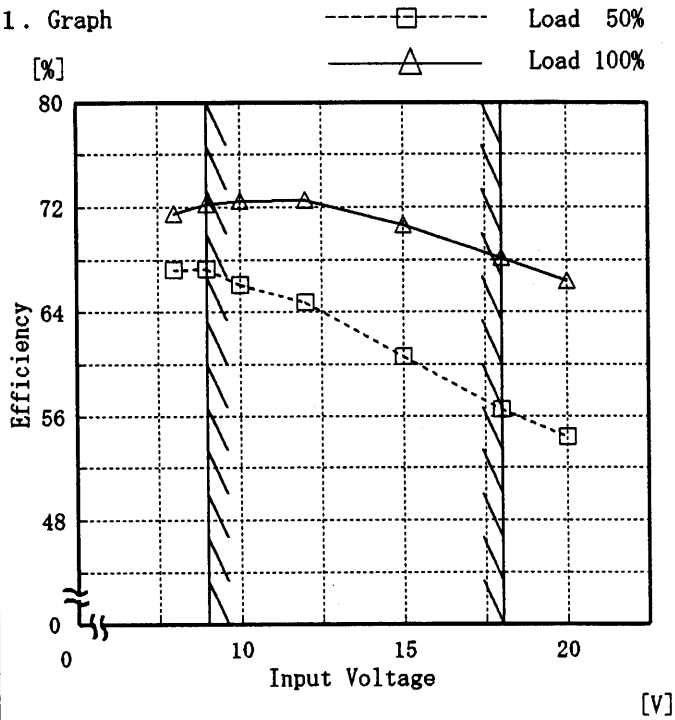
BC−3120

COSEL

Model	ZTW1R51212
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	67.2	71.5
9.0	67.3	72.2
10.0	66.1	72.5
12.0	64.8	72.5
15.0	60.6	70.7
18.0	56.5	68.2
20.0	54.4	66.4
—	—	—
—	—	—
—	—	—
—	—	—
—	—	—

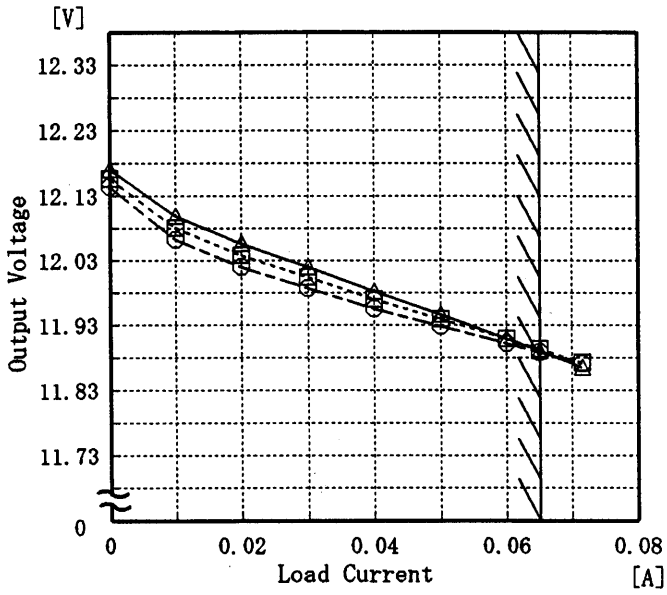
COSEL

Model	ZTW1R51212
Item	Load Regulation 静的負荷変動

Temperature 25℃
Testing Circuitry Figure A

Object ＋12V0.065A

1. Graph

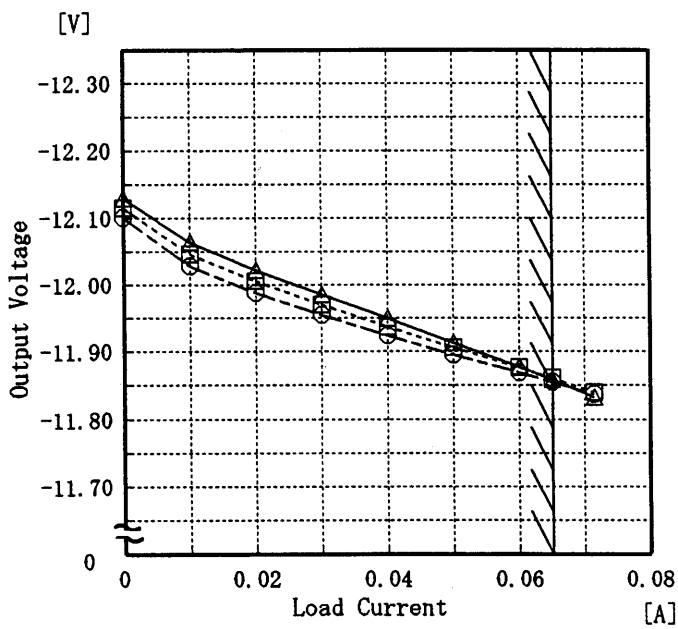


2. Values

Load Current [A]	Input Volt. 9.0[V] Output Volt. [V]	Input Volt. 12.0[V] Output Volt. [V]	Input Volt. 18.0[V] Output Volt. [V]
0.000	12.172	12.157	12.144
0.010	12.100	12.081	12.063
0.020	12.057	12.039	12.021
0.030	12.020	12.004	11.987
0.040	11.983	11.971	11.956
0.050	11.947	11.940	11.928
0.060	11.910	11.909	11.901
0.065	11.891	11.893	11.888
0.072	11.865	11.873	11.871
—	—	—	—

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

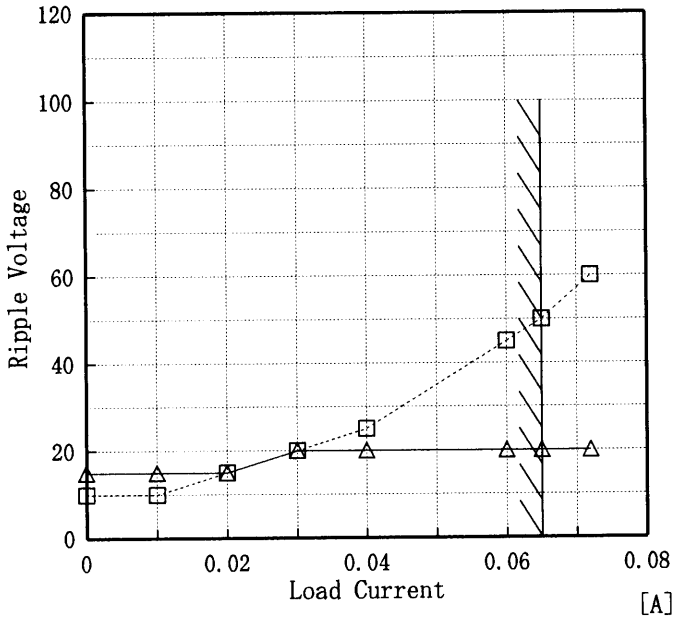
Load Current [A]	Input Volt. 9.0[V] Output Volt. [V]	Input Volt. 12.0[V] Output Volt. [V]	Input Volt. 18.0[V] Output Volt. [V]
0.000	-12.130	-12.116	-12.102
0.010	-12.065	-12.047	-12.030
0.020	-12.023	-12.006	-11.989
0.030	-11.986	-11.971	-11.955
0.040	-11.950	-11.938	-11.924
0.050	-11.913	-11.907	-11.896
0.060	-11.878	-11.877	-11.870
0.065	-11.858	-11.861	-11.856
0.072	-11.832	-11.840	-11.838
—	—	—	—

COSEL

Model	ZTW1R51212
Item	Ripple Voltage(by Load Current) リップル電圧(負荷電流特性)
Object	+12V0.065A

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

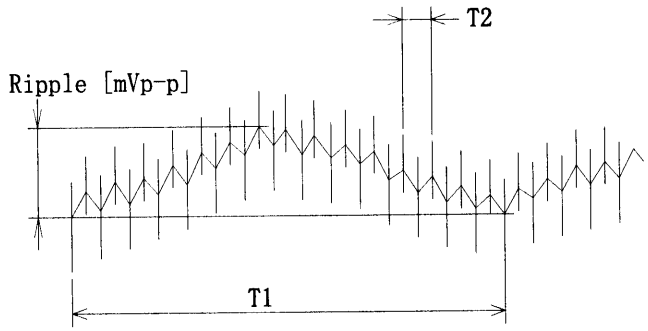


Fig. Complex Ripple Wave Form
図 リップル波形詳細図

2. Values

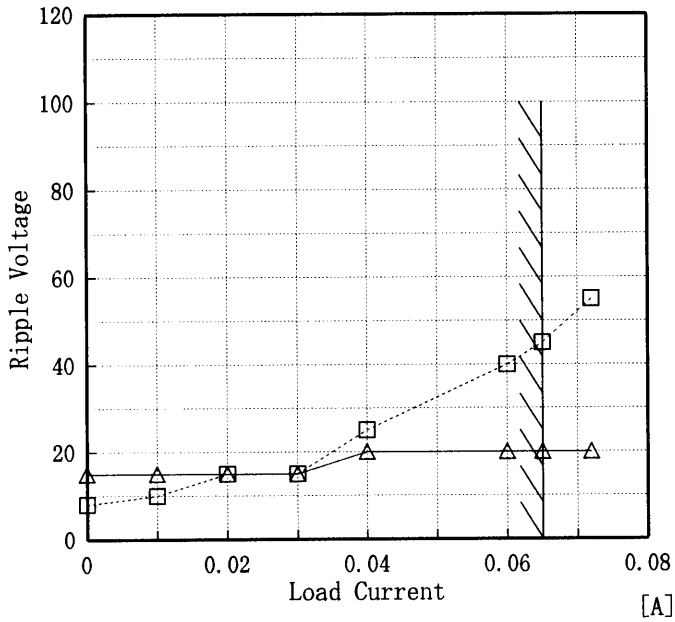
Load Current [A]	Input Volt. 9.0 [V] Ripple Output Volt. [mV]	Input Volt. 18.0 [V] Ripple Output Volt. [mV]
0.000	10	15
0.010	10	15
0.020	15	15
0.030	20	20
0.040	25	20
0.060	45	20
0.065	50	20
0.072	60	20
—	—	—
—	—	—
—	—	—

COSEL

Model	ZTW1R51212
Item	Ripple Voltage(by Load Current) リップル電圧(負荷電流特性)
Object	-12V0.065A

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

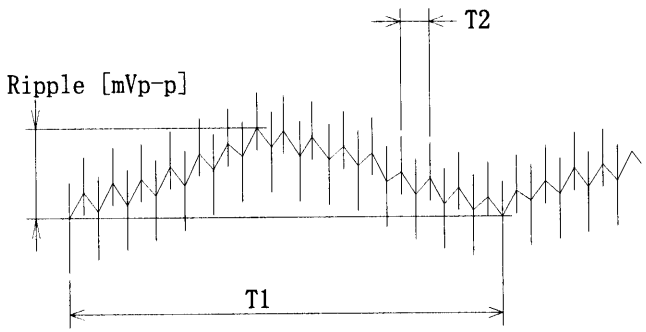


Fig. Complex Ripple Wave Form
図 リップル波形詳細図

2. Values

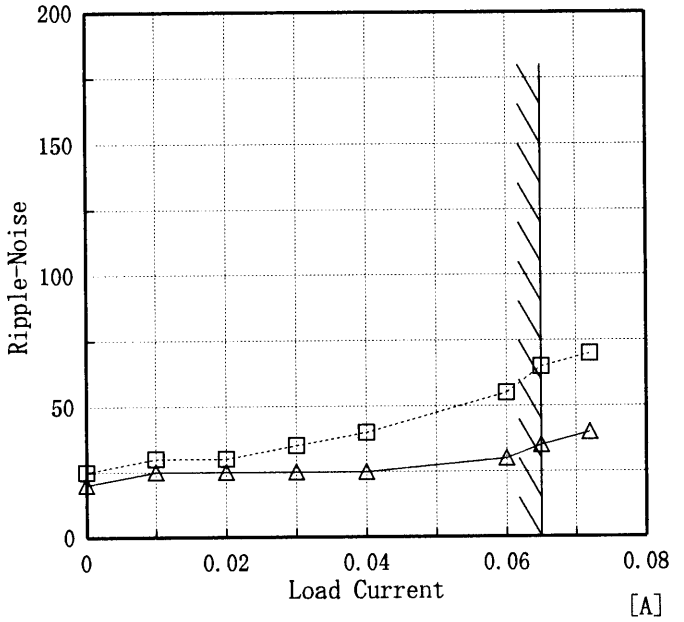
Load Current [A]	Input Volt. 9.0 [V] Ripple Output Volt. [mV]	Input Volt. 18.0 [V] Ripple Output Volt. [mV]
0.000	8	15
0.010	10	15
0.020	15	15
0.030	15	15
0.040	25	20
0.060	40	20
0.065	45	20
0.072	55	20
—	—	—
—	—	—
—	—	—

COSEL

Model	ZTW1R51212
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

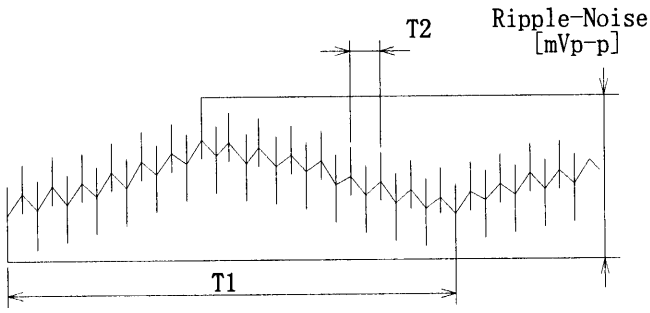


Fig. Complex Ripple Wave Form
図 リップル波形詳細図

2. Values

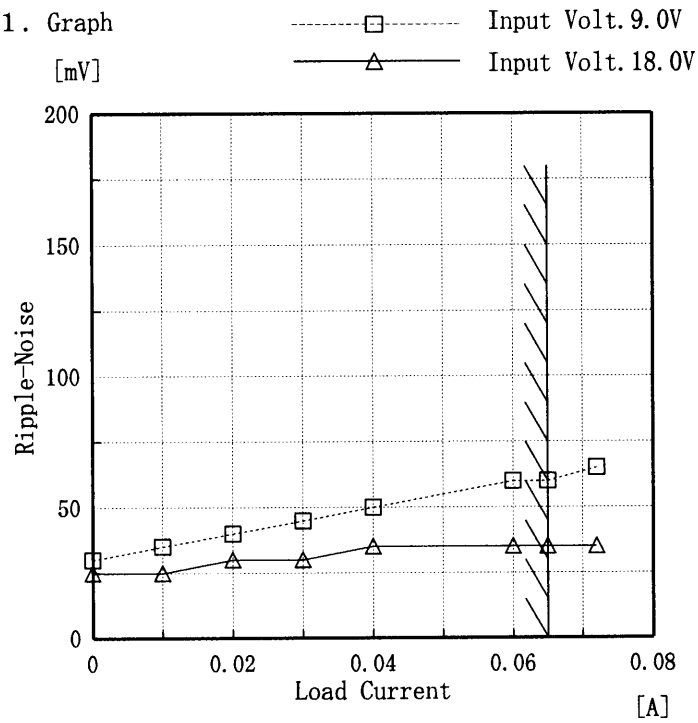
Load current [A]	Input Volt. 9.0 [V] Ripple-Noise [mV]	Input Volt. 18.0 [V] Ripple-Noise [mV]
0.000	25	20
0.010	30	25
0.020	30	25
0.030	35	25
0.040	40	25
0.060	55	30
0.065	65	35
0.072	70	40
—	—	—
—	—	—
—	—	—

COSEL

Model	ZTW1R51212
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

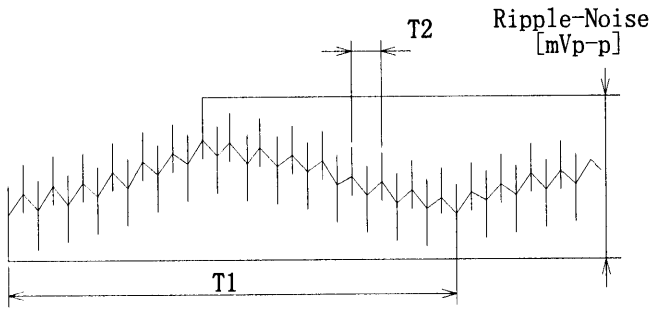


Fig. Complex Ripple Wave Form
図 リップル波形詳細図

2. Values

Load current [A]	Input Volt. 9.0 [V] Ripple-Noise [mV]	Input Volt. 18.0 [V] Ripple-Noise [mV]
0.000	30	25
0.010	35	25
0.020	40	30
0.030	45	30
0.040	50	35
0.060	60	35
0.065	60	35
0.072	65	35
—	—	—
—	—	—
—	—	—

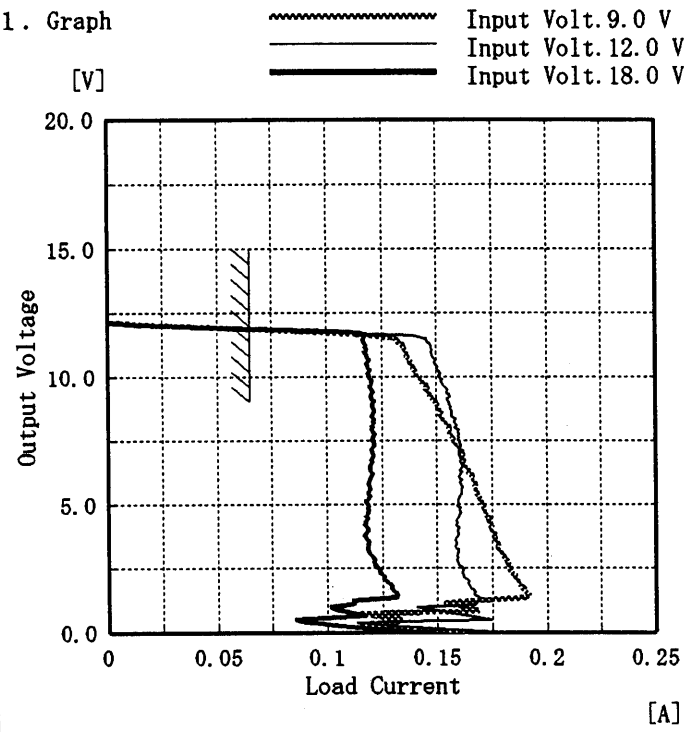
COSEL

Model	ZTW1R51212
Item	Overcurrent Protection 過電流保護

Temperature 25℃
Testing Circuitry Figure A

Object ＋12V0.065A

1. Graph

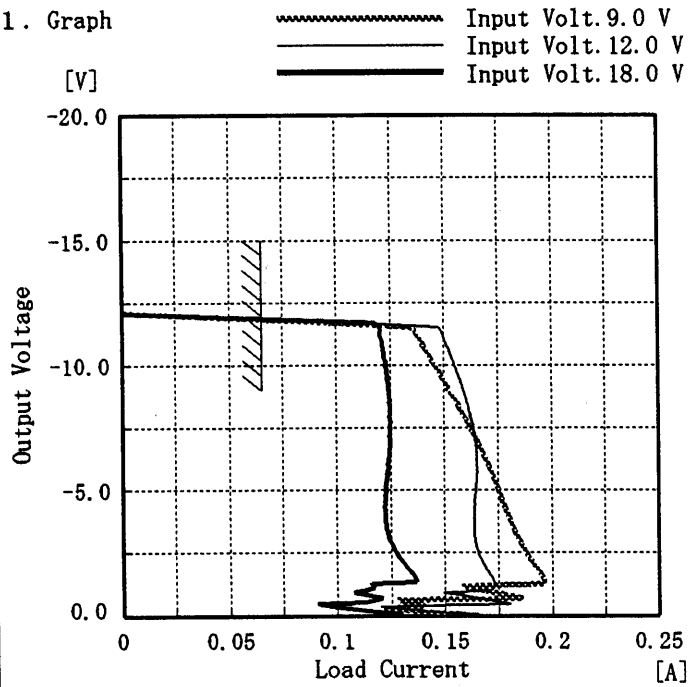


2. Values

Output Voltage [V]	Input Volt. 9.0[V] Load Current [A]	Input Volt. 12.0[V] Load Current [A]	Input Volt. 18.0[V] Load Current [A]
12.00	0.075	0.097	0.103
11.40	0.132	0.145	0.117
10.80	0.137	0.148	0.118
9.60	0.145	0.153	0.120
8.40	0.152	0.157	0.120
7.20	0.159	0.160	0.121
6.00	0.166	0.160	0.120
4.80	0.171	0.161	0.118
3.60	0.176	0.158	0.119
2.40	0.183	0.161	0.124
1.20	0.165	0.168	0.111
0.00	0.164	0.176	0.138

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. 9.0[V] Load Current [A]	Input Volt. 12.0[V] Load Current [A]	Input Volt. 18.0[V] Load Current [A]
-12.00	0.080	0.103	0.109
-11.40	0.136	0.149	0.120
-10.80	0.140	0.151	0.121
-9.60	0.148	0.156	0.123
-8.40	0.156	0.161	0.125
-7.20	0.164	0.164	0.125
-6.00	0.170	0.165	0.124
-4.80	0.176	0.164	0.123
-3.60	0.181	0.164	0.123
-2.40	0.188	0.165	0.128
-1.20	0.196	0.173	0.116
0.00	0.156	0.165	0.130

BC−3120

COSEL

Model	ZTW1R51212		
Item	Dynamic Load Responce 動的負荷変動	Temperature Testing Circuitry	25℃ Figure A
Object	+12V0.065A		

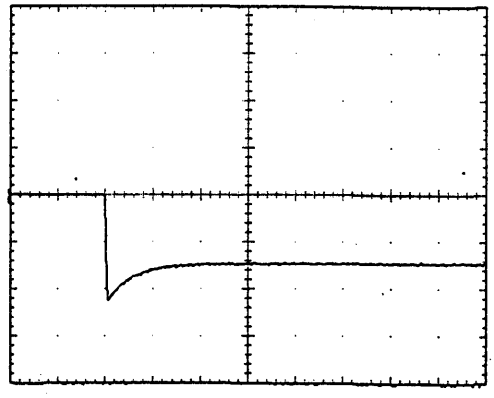
Input Volt. 12.0 V

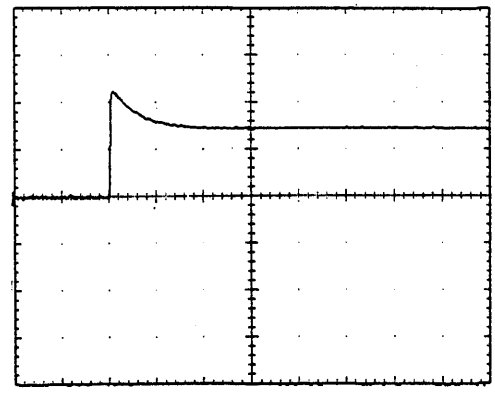
Cycle 100 mS

Load Current

Min. Load ⟷
Load 100 %

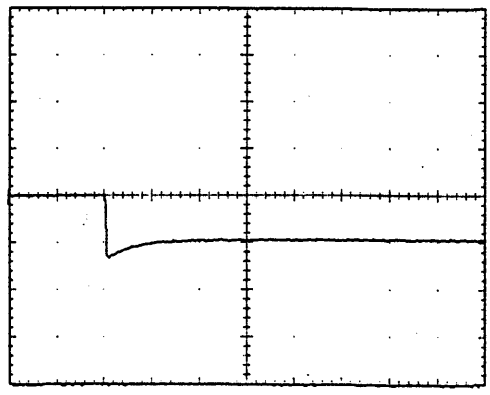
200 mV/div

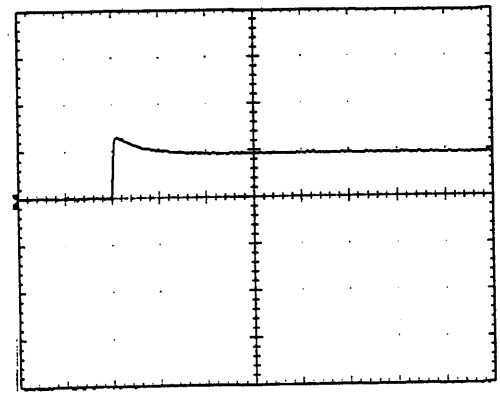




Min. Load ⟷
Load 50 %

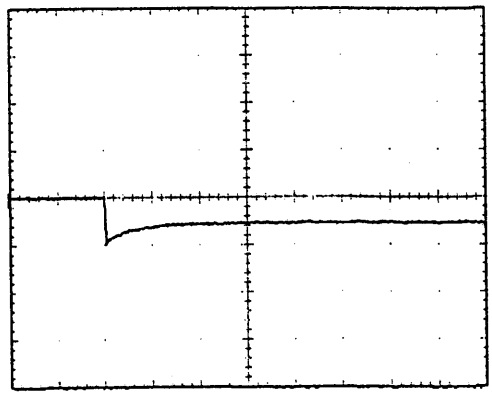
200 mV/div

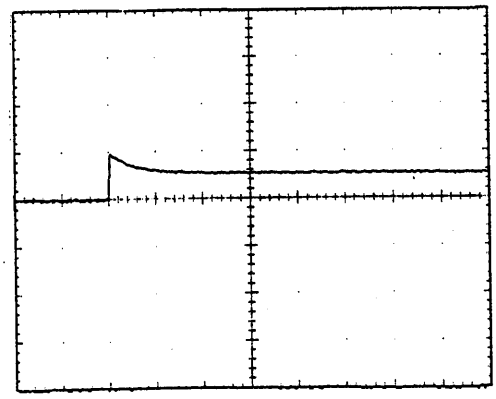




Load 50%⟷
Load 100 %

200 mV/div





1 mS/div

BC－3120

COSEL

Model	ZTW1R51212		
Item	Dynamic Load Responce 動的負荷変動	Temperature Testing Circuitry	25℃ Figure A
Object	−12V0.065A		

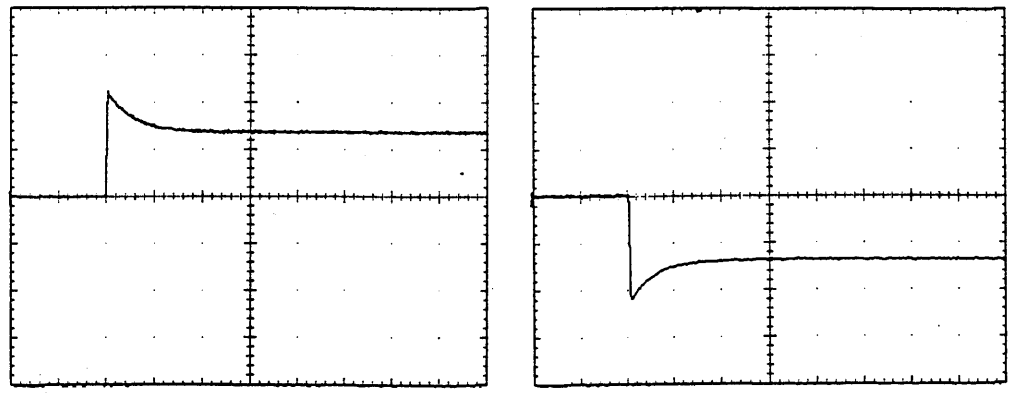
Input Volt. 12.0 V

Cycle 100 mS

Load Current

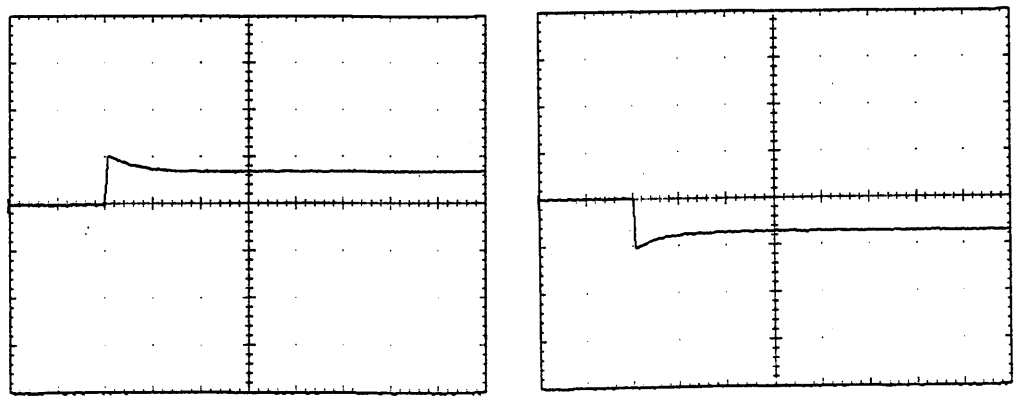
Min. Load ⟷
Load 100 %

200 mV/div



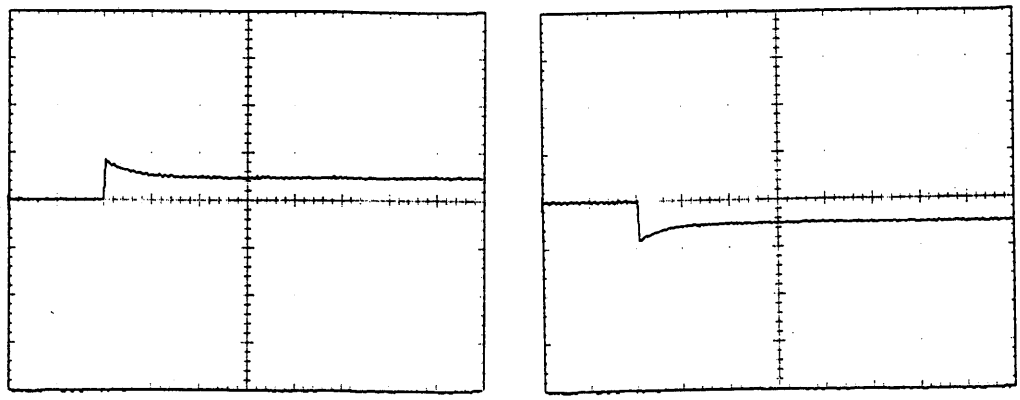
Min. Load ⟷
Load 50 %

200 mV/div



Load 50%⟷
Load 100 %

200 mV/div



1 mS/div

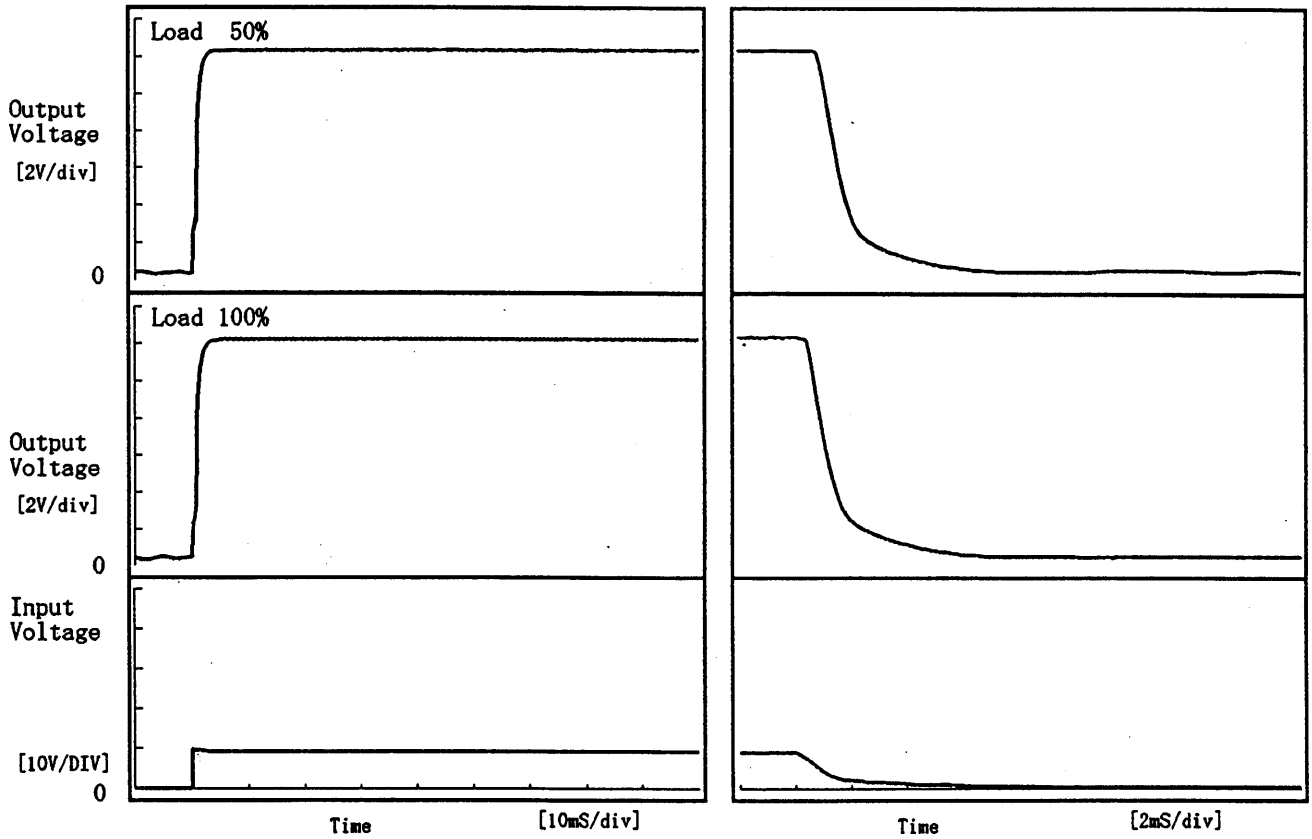
BC−3120

COSEL

Model	ZTW1R51212		
Item	Rise and Fall Time 立上り、立下り時間	Temperature Testing Circuitry	25℃ Figure A
Object	+12V0.065A		

1. Graph

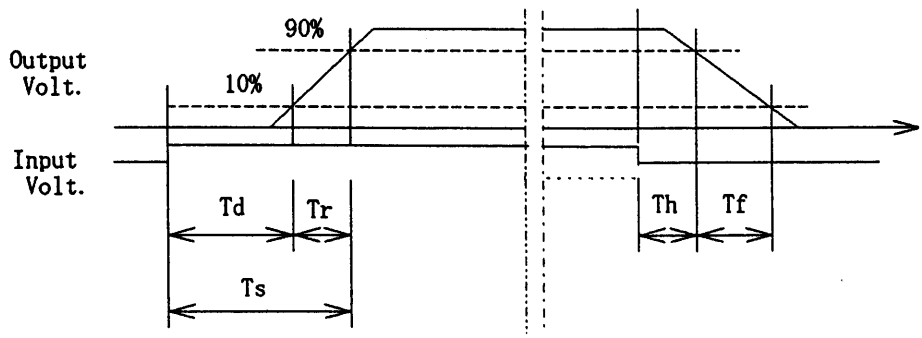
Input Volt. 9.0 V



2. Values

[mS]

Load \ Time	T d	T r	T s	T h	T f
50 %	0.05	1.55	1.60	0.97	2.58
100 %	0.05	1.65	1.70	0.59	2.66

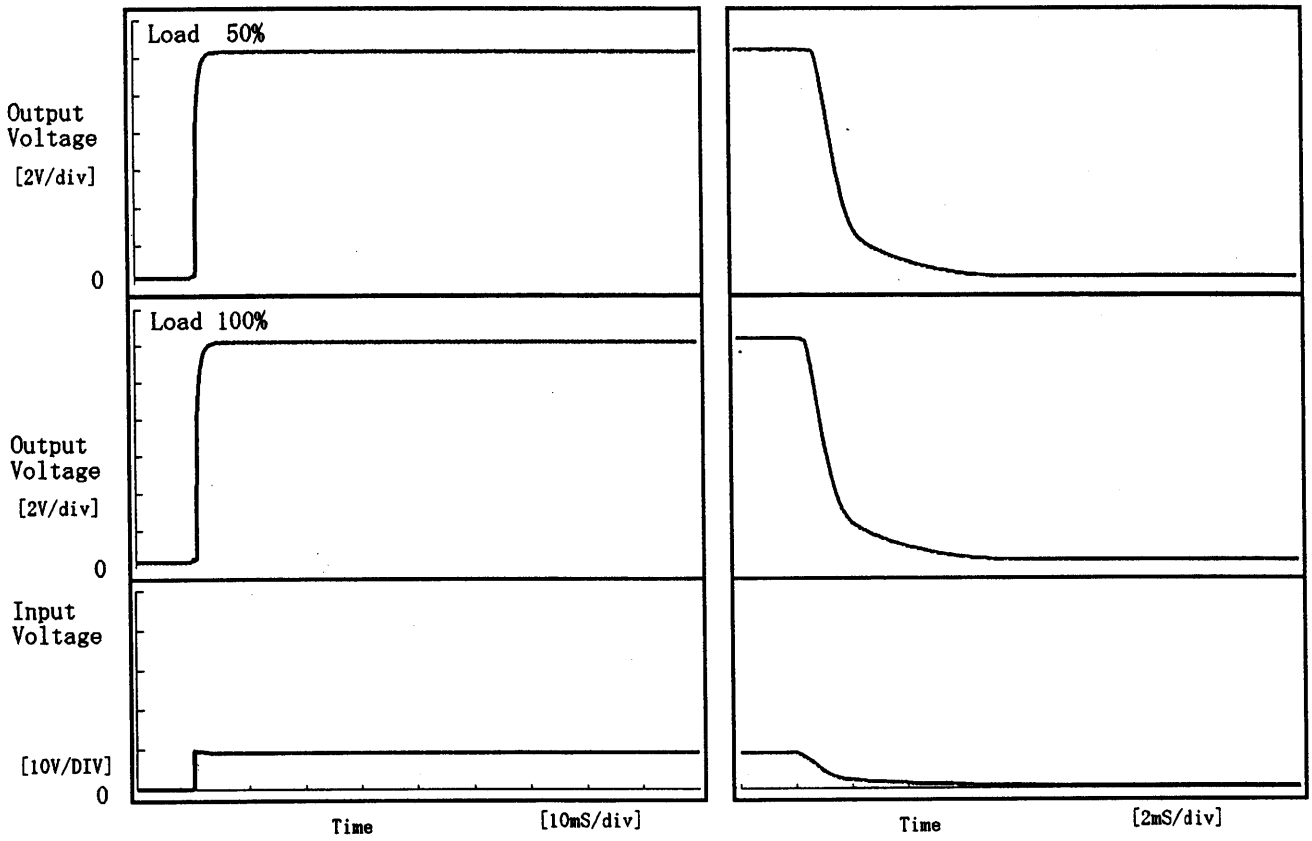


COSEL

Model	ZTW1R51212		
Item	Rise and Fall Time 立上り、立下り時間	Temperature Testing Circuitry	25℃ Figure A
Object	-12V0.065A		

1. Graph

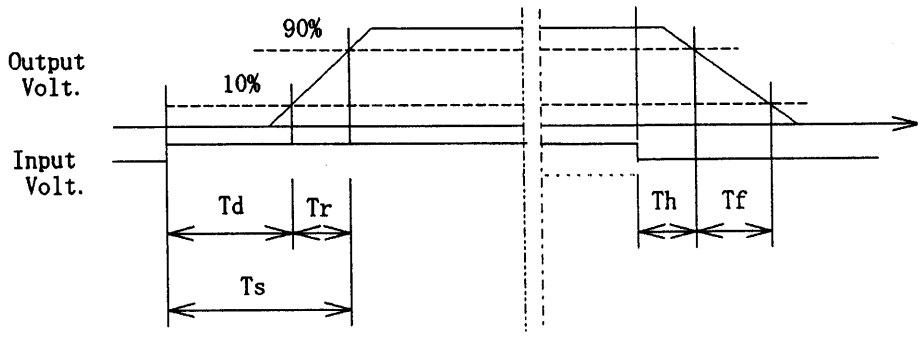
Input Volt. 9.0 V



2. Values

[mS]

Load \ Time	T d	T r	T s	T h	T f
50 %	0.70	0.95	1.65	0.96	2.45
100 %	0.70	1.00	1.70	0.59	2.60



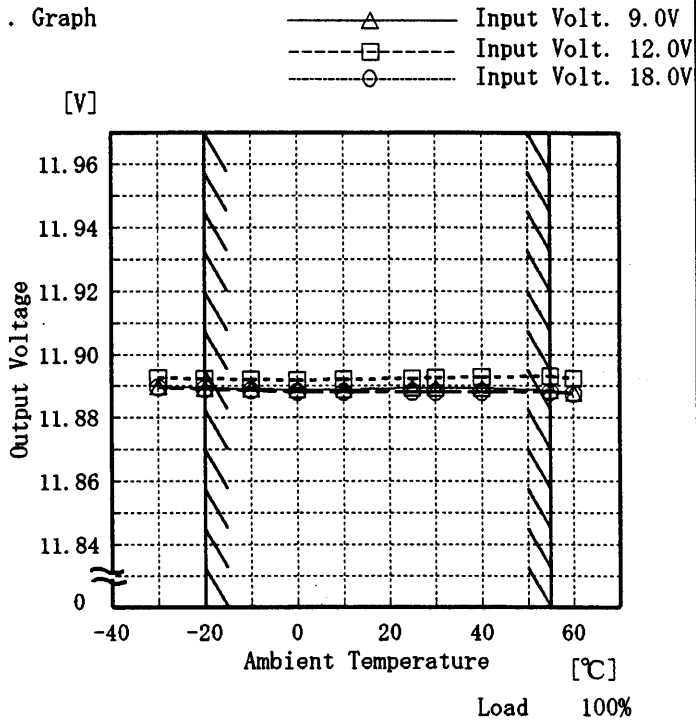
COSEL

Model	ZTW1R51212
Item	Ambient Temperature Drift 周囲温度変動

Testing Circuitry Figure A

Object ＋12V0.065A

1. Graph

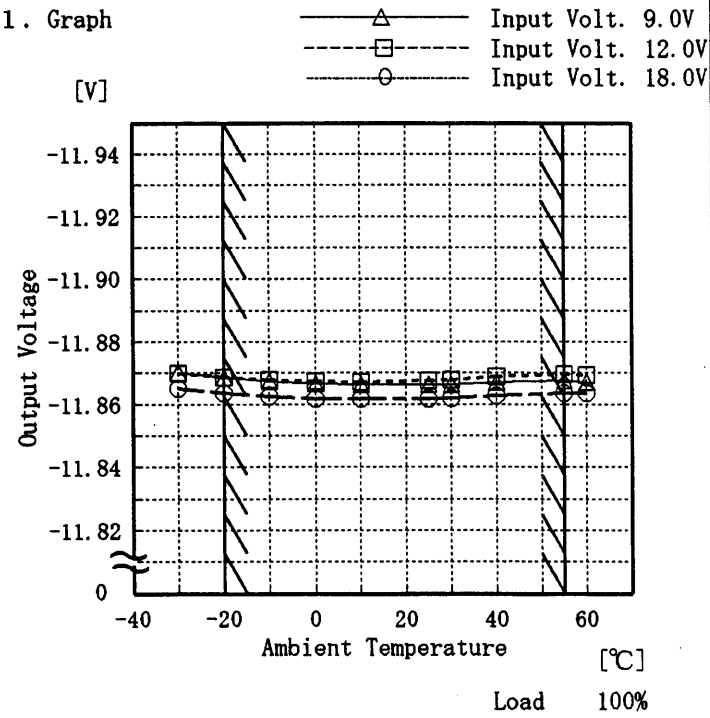


2. Values

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	11.890	11.893	11.889
-20	11.889	11.892	11.889
-10	11.889	11.892	11.889
0	11.889	11.892	11.888
10	11.889	11.892	11.888
25	11.889	11.892	11.888
30	11.889	11.893	11.888
40	11.889	11.893	11.888
55	11.889	11.893	11.888
60	11.888	11.892	11.887
—	—	—	—

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. 9.0[V] Output Volt. [V]	Input Volt. 12.0[V] Output Volt. [V]	Input Volt. 18.0[V] Output Volt. [V]
-30	-11.870	-11.870	-11.865
-20	-11.869	-11.869	-11.863
-10	-11.867	-11.868	-11.862
0	-11.867	-11.867	-11.862
10	-11.866	-11.867	-11.862
25	-11.866	-11.868	-11.862
30	-11.866	-11.868	-11.862
40	-11.867	-11.869	-11.863
55	-11.867	-11.870	-11.864
60	-11.867	-11.869	-11.863
—	—	—	—

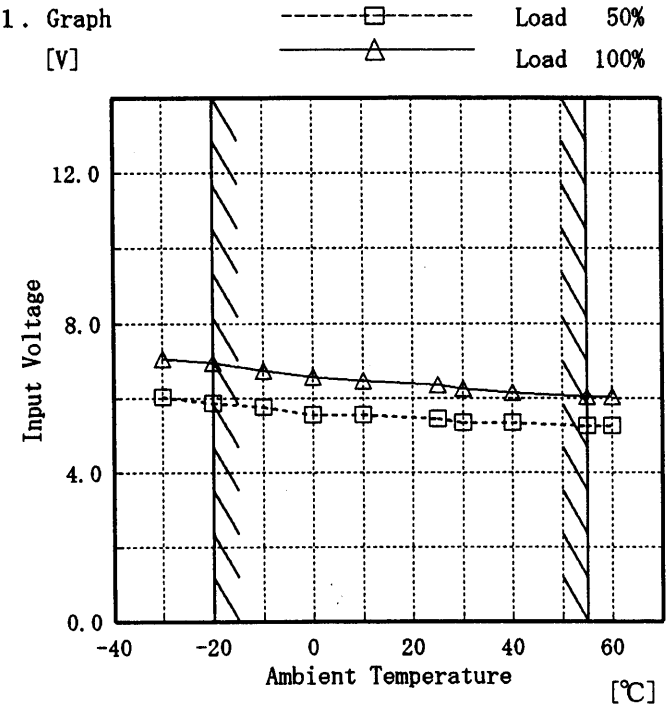
COSEL

Model	ZTW1R5 12 12
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

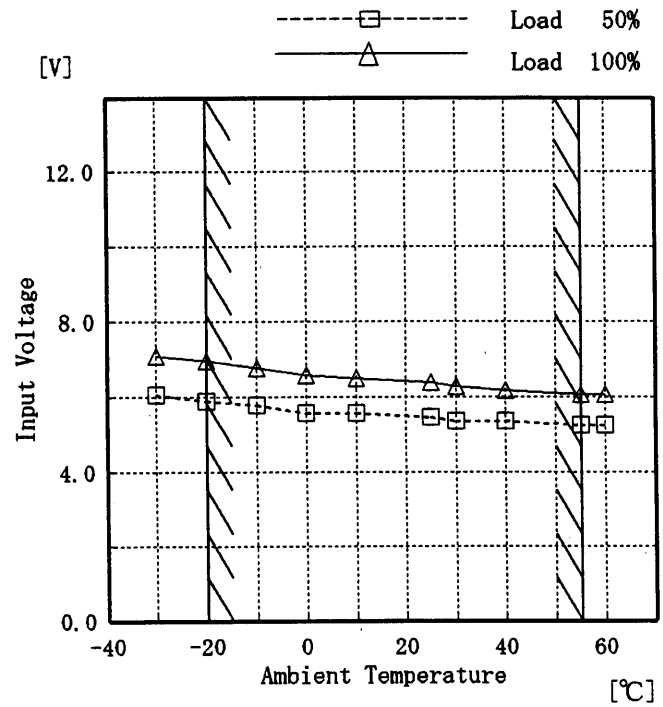
1. Graph



2. Values

Ambient Temp. [℃]	Load 50% Input Volt. [V]	Load 100% Input Volt. [V]
-30	6.1	7.1
-20	5.9	7.0
-10	5.8	6.8
0	5.6	6.6
10	5.6	6.5
25	5.5	6.4
30	5.4	6.3
40	5.4	6.2
55	5.3	6.1
60	5.3	6.1
—	—	—

Object －12V0.065A



2. Values

Ambient Temp. [℃]	Load 50% Input Volt. [V]	Load 100% Input Volt. [V]
-30	6.1	7.1
-20	5.9	7.0
-10	5.8	6.8
0	5.6	6.6
10	5.6	6.5
25	5.5	6.4
30	5.4	6.3
40	5.4	6.2
55	5.3	6.1
60	5.3	6.1
—	—	—

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。

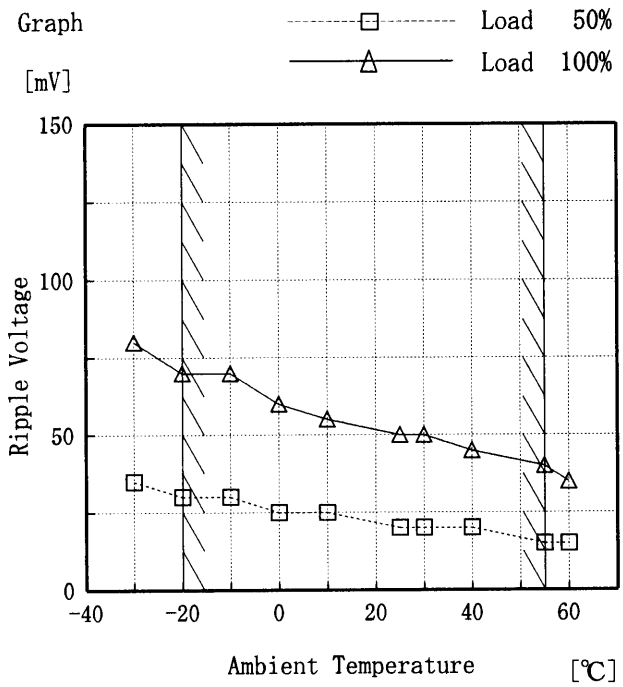
COSEL

Model	ZTW1R51212
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



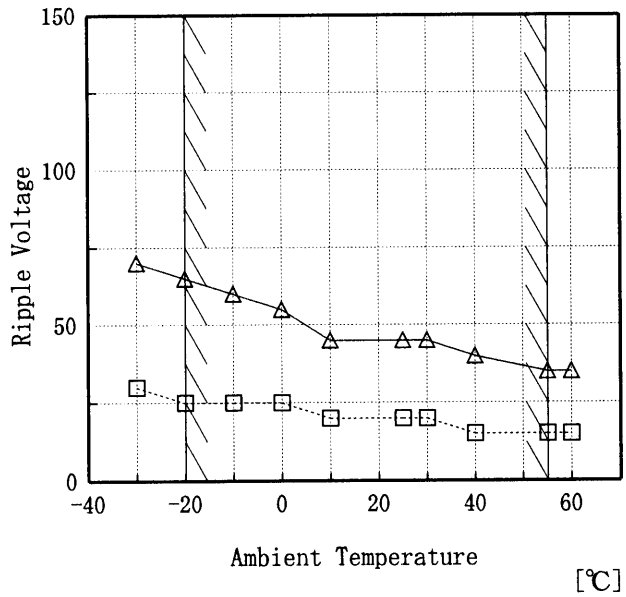
Input Volt.　9.0 V

2. Values

Ambient Temp. [℃]	Load 50% Ripple Output Volt. [mV]	Load 100% Ripple Output Volt. [mV]
-30	35	80
-20	30	70
-10	30	70
0	25	60
10	25	55
25	20	50
30	20	50
40	20	45
55	15	40
60	15	35
—	—	—

Object	−12V0.065A

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	30	70
-20	25	65
-10	25	60
0	25	55
10	20	45
25	20	45
30	20	45
40	15	40
55	15	35
60	15	35
—	—	—

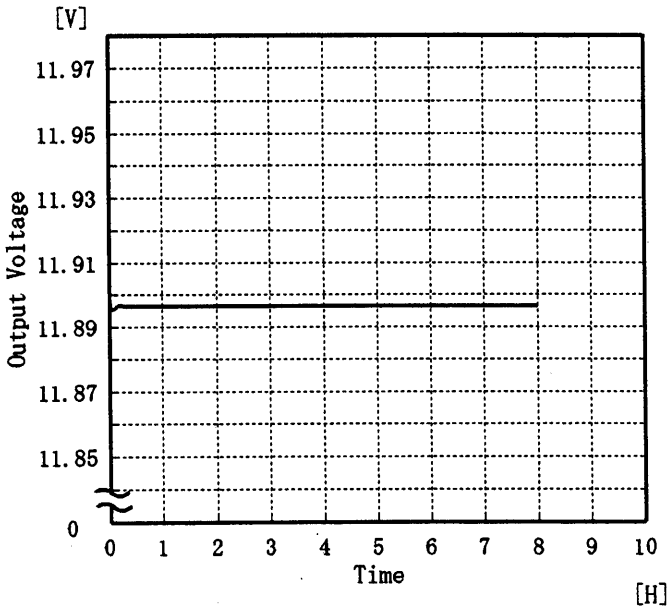
COSEL

Model	ZTW1R51212
Item	Time Lapse Drift 経時ドリフト

Temperature 25 ℃
Testing Circuitry Figure A

Object ＋12V0.065A

1. Graph



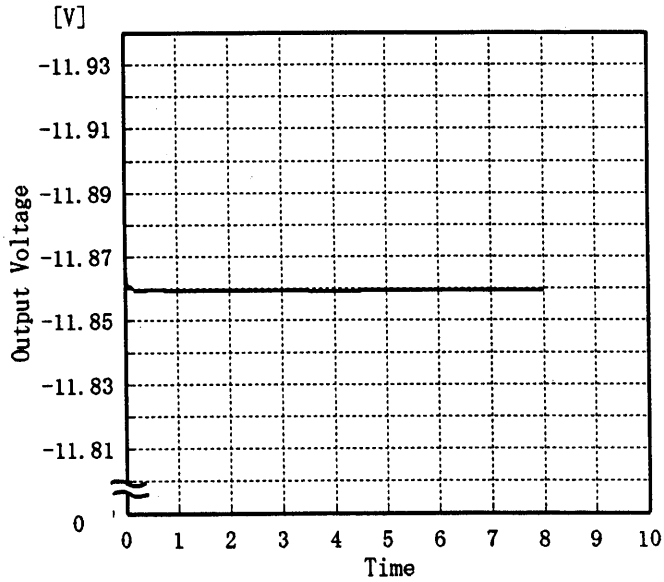
Input Volt. 12.0V
Load 100%

2. Values

Time since start [H]	Output Voltage [V]
0.0	11.899
0.5	11.897
1.0	11.897
2.0	11.897
3.0	11.897
4.0	11.897
5.0	11.897
6.0	11.897
7.0	11.897
8.0	11.897

Object －12V0.065A

1. Graph



Input Volt. 12.0V
Load 100%

2. Values

Time since start [H]	Output Voltage [V]
0.0	-11.865
0.5	-11.860
1.0	-11.860
2.0	-11.859
3.0	-11.860
4.0	-11.859
5.0	-11.860
6.0	-11.860
7.0	-11.860
8.0	-11.860

BC－3120

COSEL

Model	ZTW1R51212	
Item	Output Voltage Accuracy 定電圧精度	Testing Circuitry Figure A

Output Voltage Accuracy

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

Temperature : -20～55 ℃

Input Voltage : 9.0～18.0 V

Load Current (AVR 1) : 0.000～0.065 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 9.0～18.0 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	25	12.0	0.065	11.891	±129	±1.1
Minimum Voltage	55	9.0	0.000	11.634		

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	12.0	0.065	-11.869	±133	±1.2
Minimum Voltage	55	9.0	0.000	-11.603		

COSEL

Model	ZTW1R51212
Item	Condensation 結露特性
Object	+12V0.065A

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.

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行い、異常のないことを確認する。

2. Values

Item	Data	Testing Conditions
Output Voltage [V]	12.147	Input Volt.: 12V, Load Current:0.065A
Line Regulation [mV]	4	Input Volt.: 9～18V, Load Current:0.065A
Load Regulation [mV]	275	Input Volt.: 12V, Load Current:0～0.065A

COSEL

Model	ZTW1R51212
Item	Condensation 結露特性
Object	−12V0.065A

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.

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行い、異常のないことを確認する。

2. Values

Item	Data	Testing Conditions
Output Voltage [V]	-12.129	Input Volt.: 12V, Load Current:0.065A
Line Regulation [mV]	4	Input Volt.: 9～18V, Load Current:0.065A
Load Regulation [mV]	139	Input Volt.: 12V, Load Current:0～0.065A

COSEL

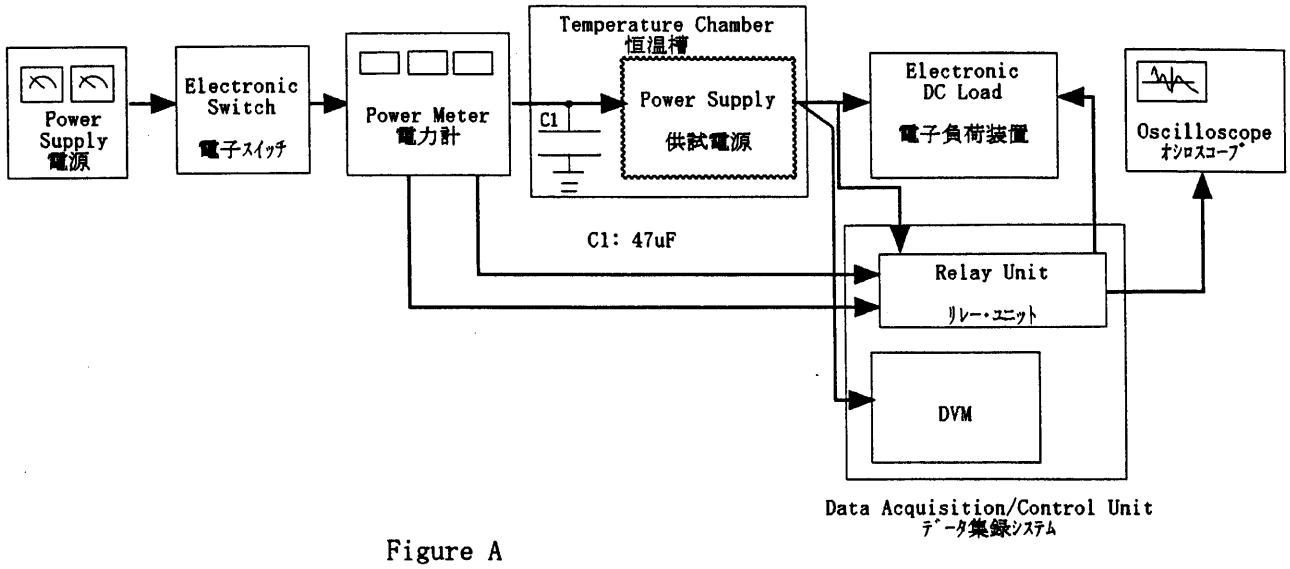


Figure A