参考資料

COSEL

TEST DATA OF ZTW1R51215
(12.0V INPUT)

Regulated DC Power Supply

Date : Mar.5. 1998

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Design Manager

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Design Engineer

コーセル株式会社

COSEL CO.,LTD.

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(Final Page 20)

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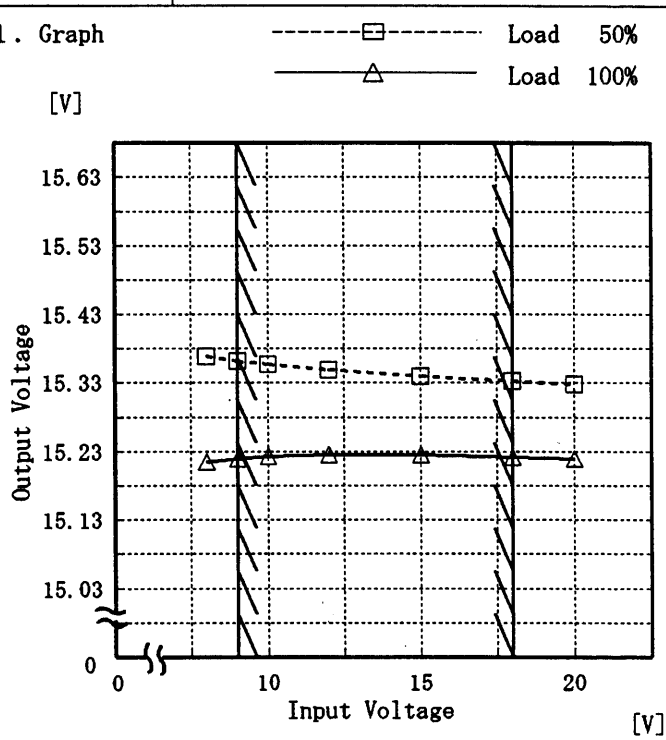
Model	ZTW1R51215
Item	Line Regulation 静的入力変動

Temperature 25℃
Testing Circuitry Figure A

Object ＋15V0.05A

1. Graph

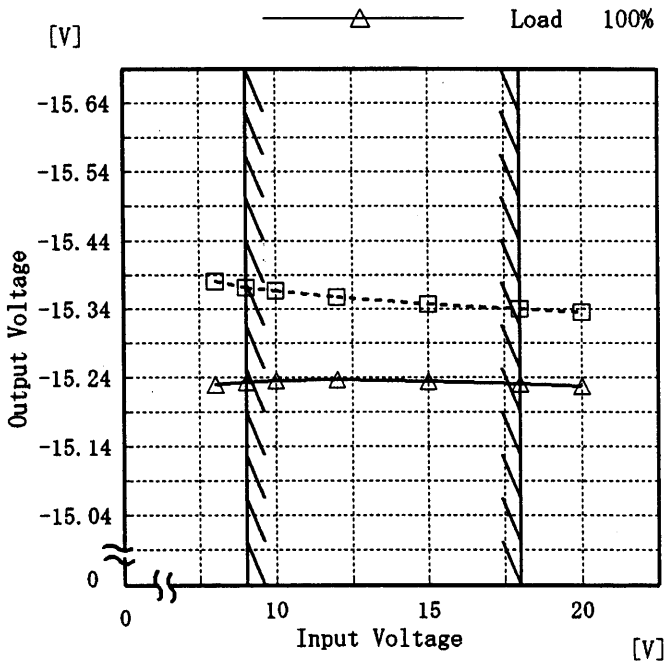


2. Values

Input Voltage [V]	Load 50% Output Volt. [V]	Load 100% Output Volt. [V]
8.0	15.369	15.215
9.0	15.362	15.220
10.0	15.357	15.223
12.0	15.349	15.226
15.0	15.340	15.225
18.0	15.333	15.222
20.0	15.329	15.220
—	—	—
—	—	—
—	—	—
—	—	—
—	—	—

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]
8.0	-15.380	-15.230
9.0	-15.371	-15.233
10.0	-15.366	-15.235
12.0	-15.357	-15.236
15.0	-15.347	-15.234
18.0	-15.339	-15.230
20.0	-15.335	-15.228
—	—	—
—	—	—
—	—	—
—	—	—
—	—	—

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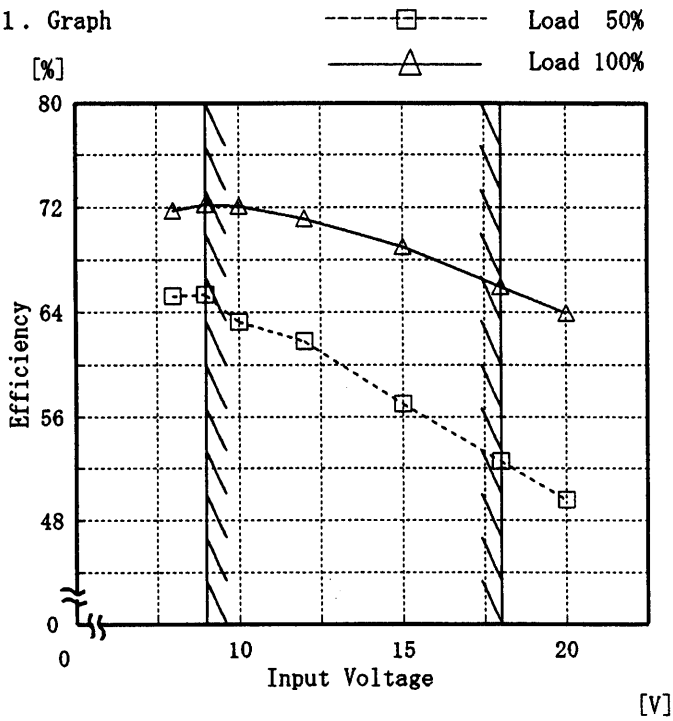
COSEL

Model	ZTW1R51215
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	65.2	71.7
9.0	65.3	72.2
10.0	63.3	72.1
12.0	61.8	71.1
15.0	57.0	69.0
18.0	52.5	65.9
20.0	49.6	63.9
—	—	—
—	—	—
—	—	—
—	—	—
—	—	—

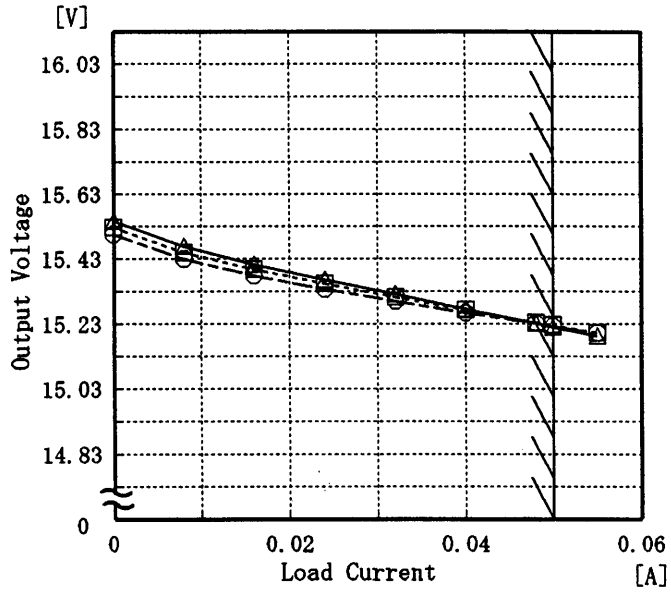
COSEL

Model	ZTW1R51215
Item	Load Regulation 静的負荷変動

Temperature 25℃
Testing Circuitry Figure A

Object +15V0.05A

1. Graph

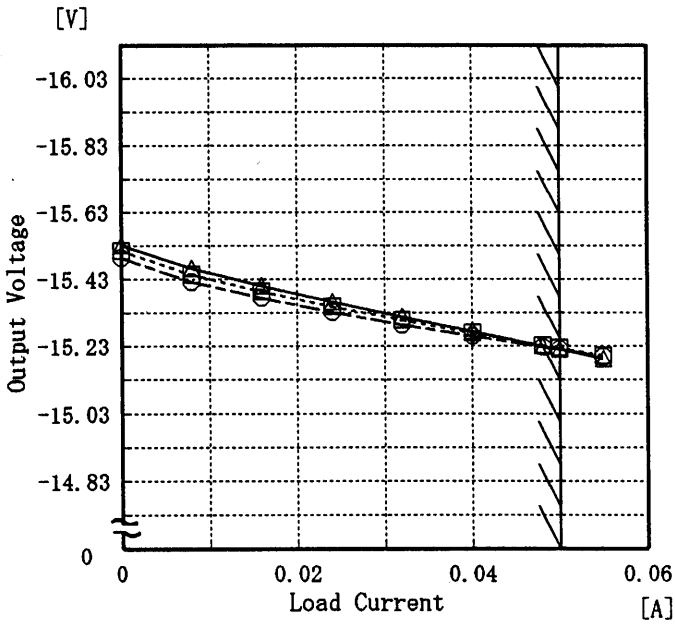


2. Values

Load Current [A]	Input Volt. 9.0[V] Output Volt. [V]	Input Volt. 12.0[V] Output Volt. [V]	Input Volt. 18.0[V] Output Volt. [V]
0.000	15.547	15.528	15.506
0.008	15.469	15.450	15.430
0.016	15.414	15.397	15.379
0.024	15.366	15.353	15.337
0.032	15.322	15.313	15.300
0.040	15.276	15.273	15.264
0.048	15.232	15.236	15.231
0.050	15.221	15.227	15.223
0.055	15.193	15.203	15.203
—	—	—	—

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. 9.0[V] Output Volt. [V]	Input Volt. 12.0[V] Output Volt. [V]	Input Volt. 18.0[V] Output Volt. [V]
0.000	-15.535	-15.517	-15.496
0.008	-15.464	-15.445	-15.425
0.016	-15.411	-15.395	-15.376
0.024	-15.364	-15.350	-15.334
0.032	-15.319	-15.310	-15.296
0.040	-15.276	-15.272	-15.262
0.048	-15.232	-15.235	-15.229
0.050	-15.221	-15.226	-15.221
0.055	-15.194	-15.203	-15.201
—	—	—	—

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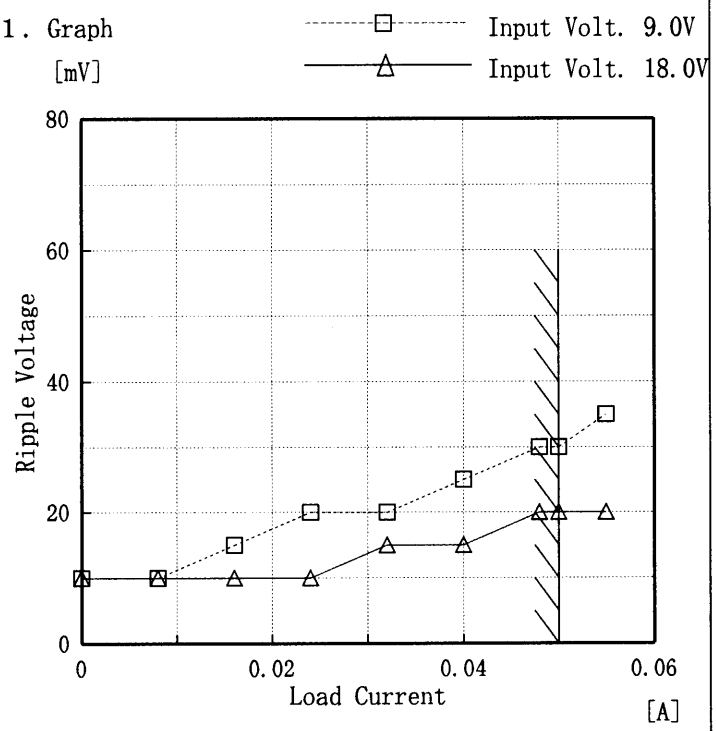
COSEL

Model	ZTW1R51215
Item	Ripple Voltage(by Load Current) リップル電圧(負荷電流特性)
Object	+15V0.05A

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。

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

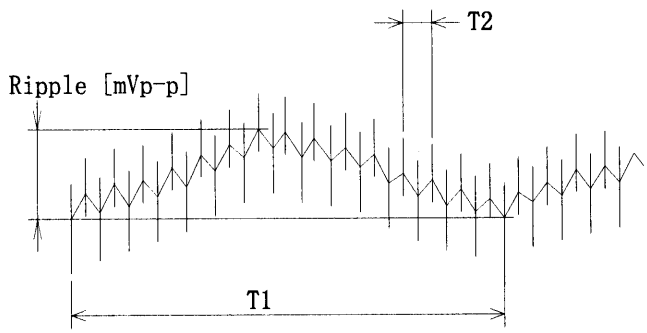


Fig. Complex Ripple Wave Form
図 リップル波形詳細図

2. Values

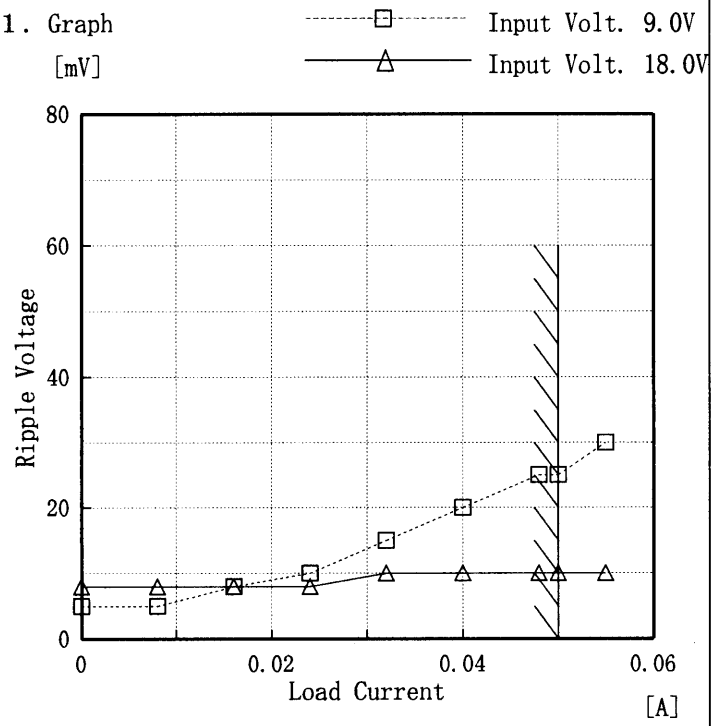
Load Current [A]	Input Volt. 9.0 [V] Ripple Output Volt. [mV]	Input Volt. 18.0 [V] Ripple Output Volt. [mV]
0.000	10	10
0.008	10	10
0.016	15	10
0.024	20	10
0.032	20	15
0.040	25	15
0.048	30	20
0.050	30	20
0.055	35	20
—	—	—
—	—	—

COSEL

Model	ZTW1R51215
Item	Ripple Voltage(by Load Current) リップル電圧(負荷電流特性)
Object	-15V0.05A

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。

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

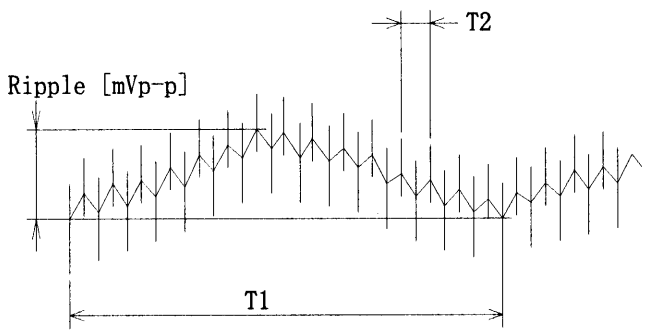


Fig. Complex Ripple Wave Form
図 リップル波形詳細図

2. Values

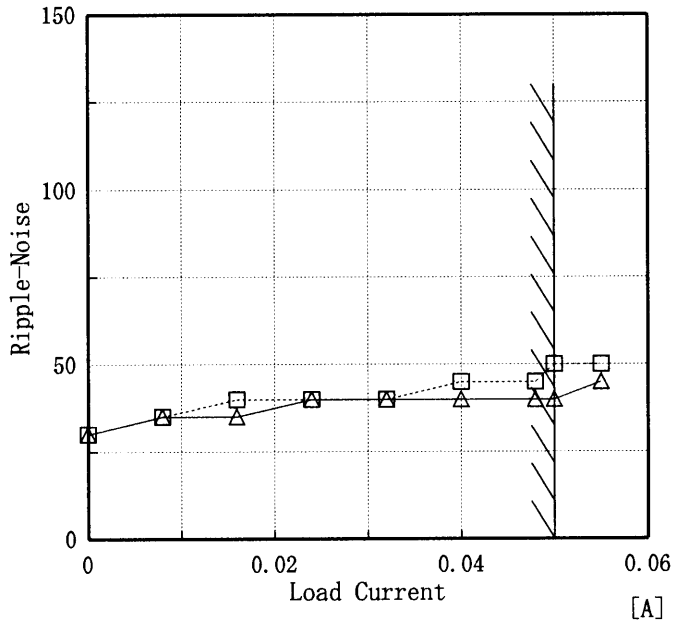
Load Current [A]	Input Volt. 9.0 [V] Ripple Output Volt. [mV]	Input Volt. 18.0 [V] Ripple Output Volt. [mV]
0.000	5	8
0.008	5	8
0.016	8	8
0.024	10	8
0.032	15	10
0.040	20	10
0.048	25	10
0.050	25	10
0.055	30	10
—	—	—
—	—	—

COSEL

Model	ZTW1R51215
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

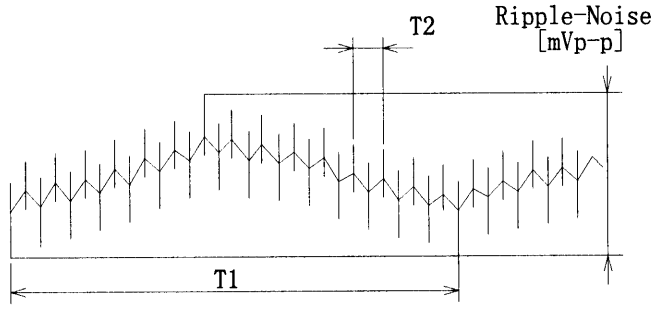


Fig. Complex Ripple Wave Form
図 リップル波形詳細図

2. Values

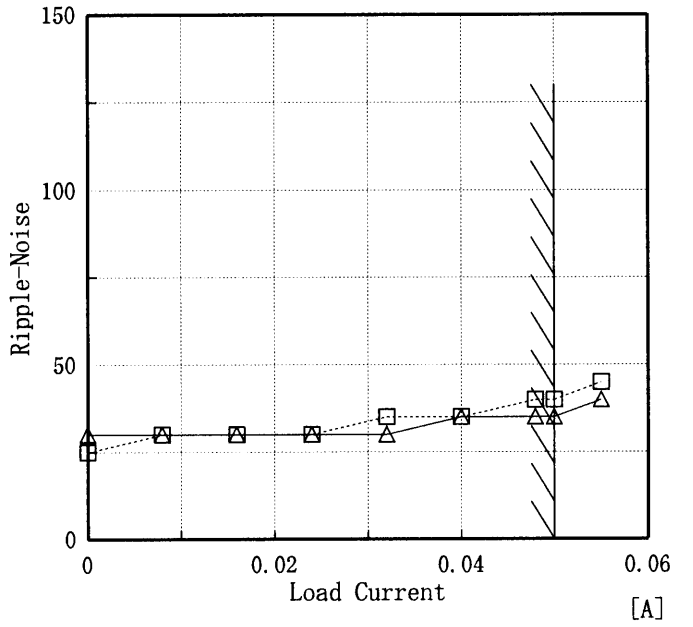
Load current [A]	Input Volt. 9.0 [V] Ripple-Noise [mV]	Input Volt. 18.0 [V] Ripple-Noise [mV]
0.000	30	30
0.008	35	35
0.016	40	35
0.024	40	40
0.032	40	40
0.040	45	40
0.048	45	40
0.050	50	40
0.055	50	45
—	—	—
—	—	—

COSEL

Model	ZTW1R51215
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

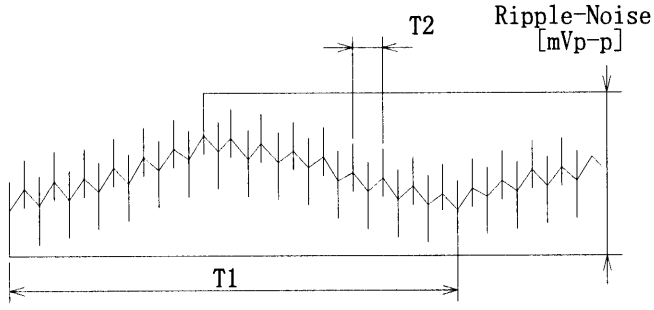


Fig. Complex Ripple Wave Form
図 リップル波形詳細図

2. Values

Load current [A]	Input Volt. 9.0 [V] Ripple-Noise [mV]	Input Volt. 18.0 [V] Ripple-Noise [mV]
0.000	25	30
0.008	30	30
0.016	30	30
0.024	30	30
0.032	35	30
0.040	35	35
0.048	40	35
0.050	40	35
0.055	45	40
—	—	—
—	—	—

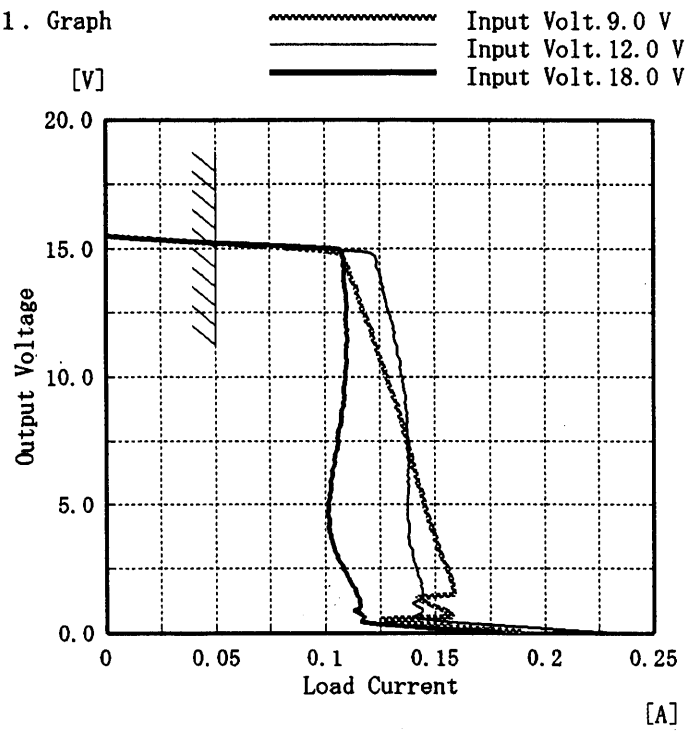
COSEL

Model	ZTW1R51215
Item	Overcurrent Protection 過電流保護

Temperature 25℃
Testing Circuitry Figure A

Object ＋15V0.05A

1. Graph

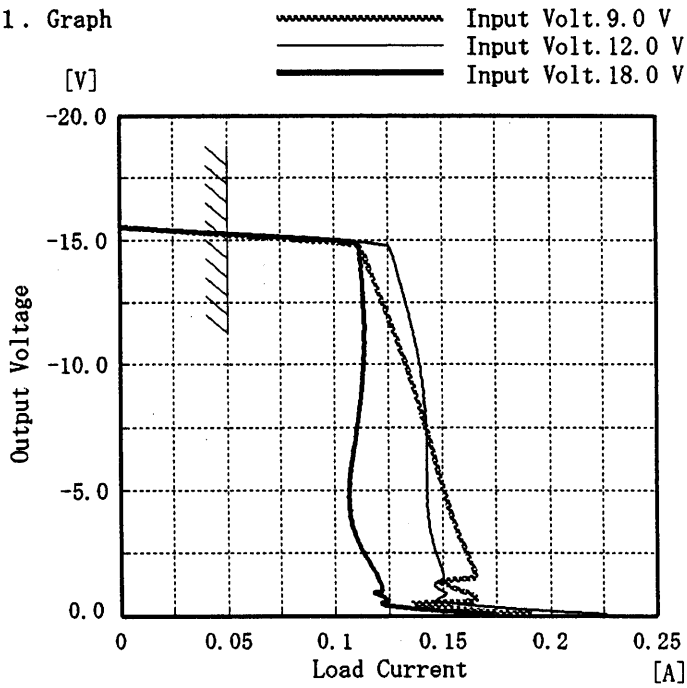


2. Values

Output Voltage [V]	Input Volt. 9.0[V] Load Current [A]	Input Volt. 12.0[V] Load Current [A]	Input Volt. 18.0[V] Load Current [A]
15.00	0.080	0.100	0.106
14.25	0.110	0.124	0.109
13.50	0.114	0.126	0.109
12.00	0.120	0.131	0.110
10.50	0.126	0.134	0.110
9.00	0.131	0.137	0.109
7.50	0.137	0.138	0.106
6.00	0.142	0.138	0.103
4.50	0.146	0.137	0.101
3.00	0.152	0.139	0.105
1.50	0.159	0.144	0.114
0.00	0.189	0.231	0.179

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. 9.0[V] Load Current [A]	Input Volt. 12.0[V] Load Current [A]	Input Volt. 18.0[V] Load Current [A]
-15.00	0.087	0.097	0.110
-14.25	0.114	0.127	0.112
-13.50	0.118	0.130	0.113
-12.00	0.124	0.135	0.114
-10.50	0.131	0.138	0.114
-9.00	0.136	0.141	0.113
-7.50	0.142	0.142	0.110
-6.00	0.147	0.142	0.108
-4.50	0.152	0.143	0.107
-3.00	0.158	0.145	0.110
-1.50	0.165	0.150	0.120
0.00	0.191	0.226	0.174

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Model	ZTW1R51215		
Item	Dynamic Load Responce 動的負荷変動	Temperature Testing Circuitry	25℃ Figure A
Object	+15V0.05A		

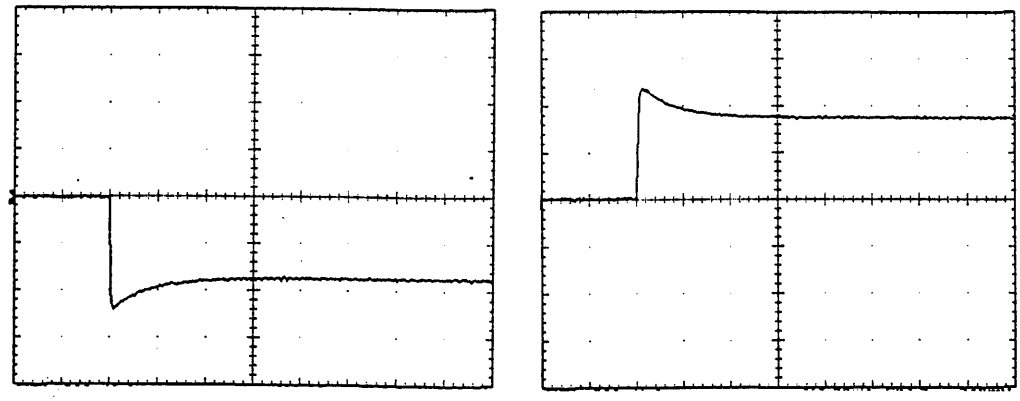
Input Volt. 12.0 V

Cycle 100 mS

Load Current

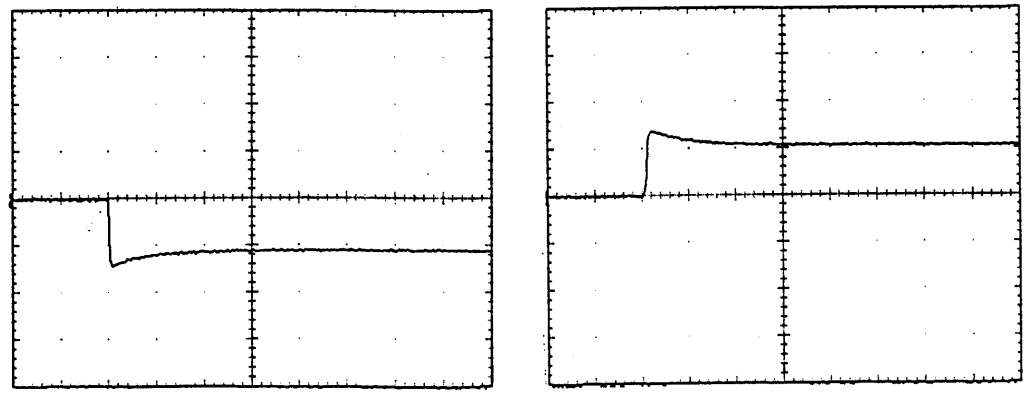
Min. Load ⟷
Load 100 %

200 mV/div



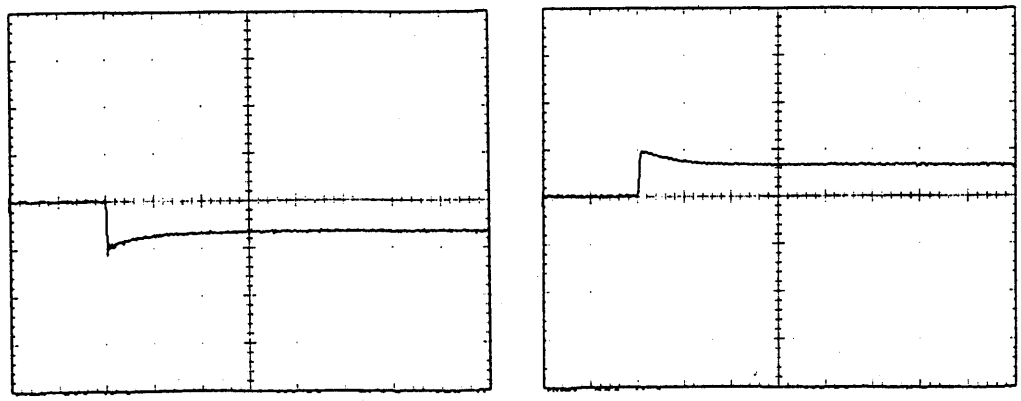
Min. Load ⟷
Load 50 %

200 mV/div



Load 50%⟷
Load 100 %

200 mV/div



1 mS/div

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Model	ZTW1R51215		
Item	Dynamic Load Responce 動的負荷変動	Temperature Testing Circuitry	25℃ Figure A
Object	−15V0.05A		

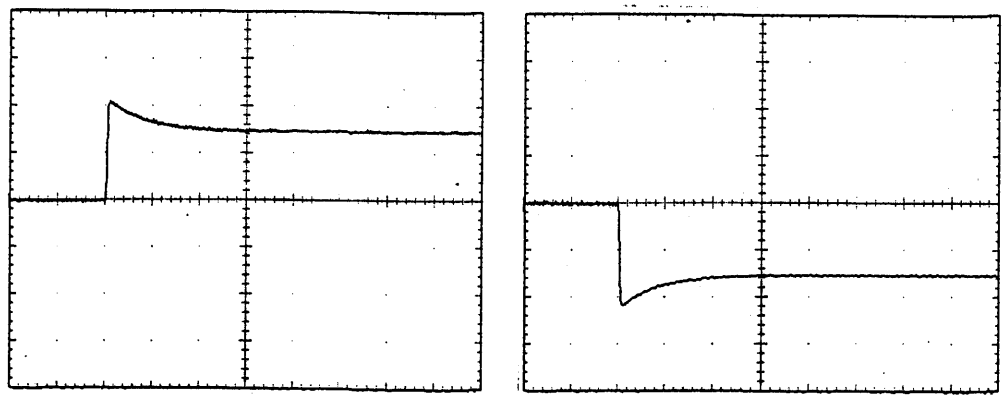
Input Volt. 12.0 V

Cycle 100 mS

Load Current

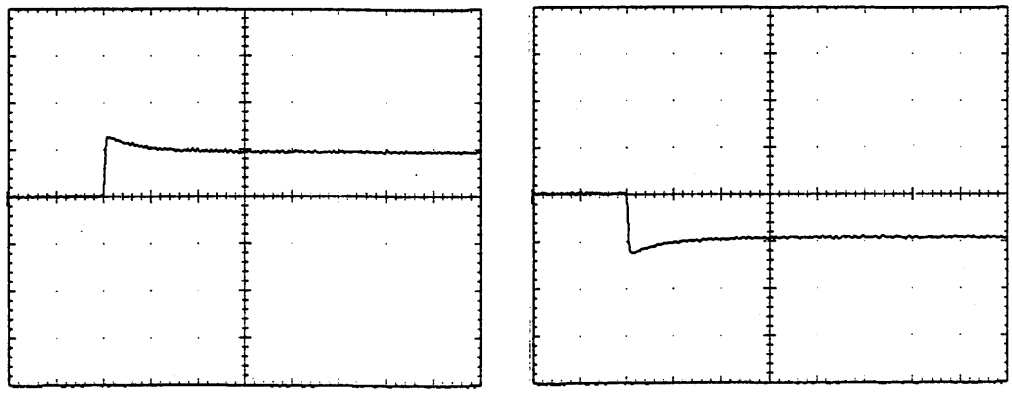
Min. Load ⟷
Load 100 %

200 mV/div



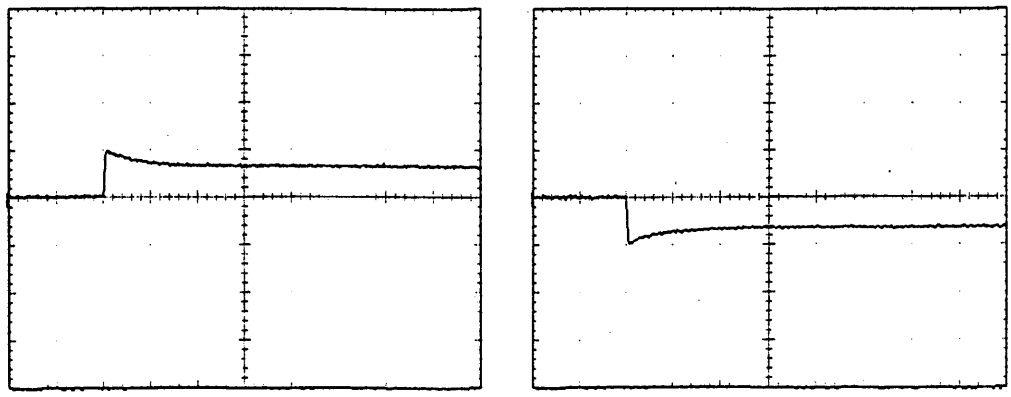
Min. Load ⟷
Load 50 %

200 mV/div



Load 50%⟷
Load 100 %

200 mV/div



1 mS/div

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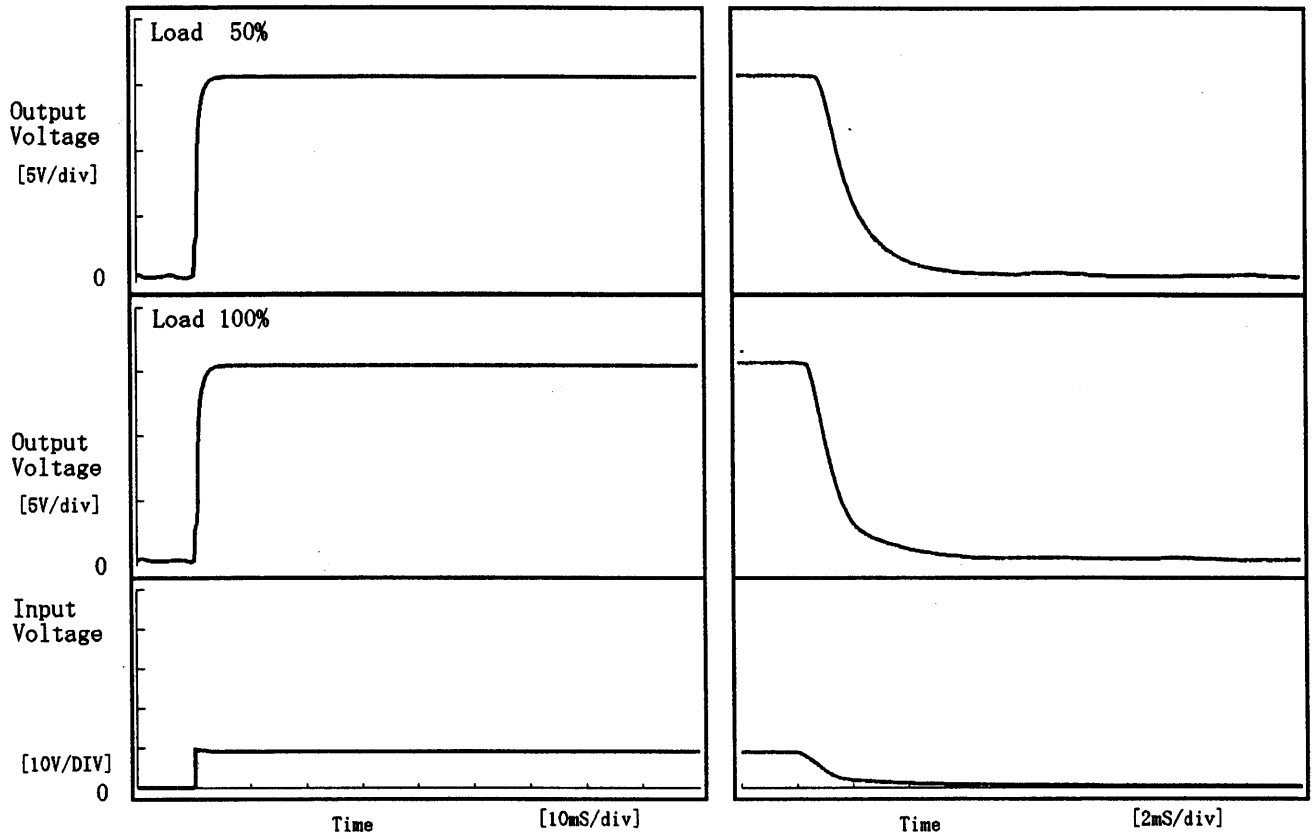
COSEL

Model	ZTW1R51215		
Item	Rise and Fall Time 立上り、立下り時間	Temperature Testing Circuitry	25℃ Figure A
Object	+15V0.05A		

1. Graph

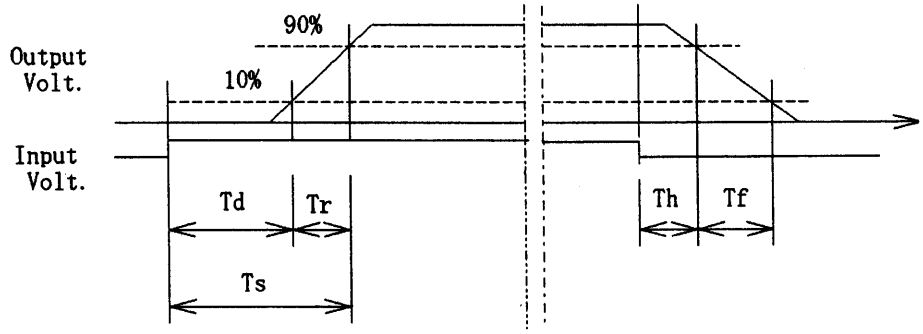
Input Volt. 9.0 V



2. Values

[mS]

Load \ Time	T d	T r	T s	T h	T f
50 %	0.10	1.40	1.50	1.12	2.79
100 %	0.10	1.50	1.60	0.67	2.60

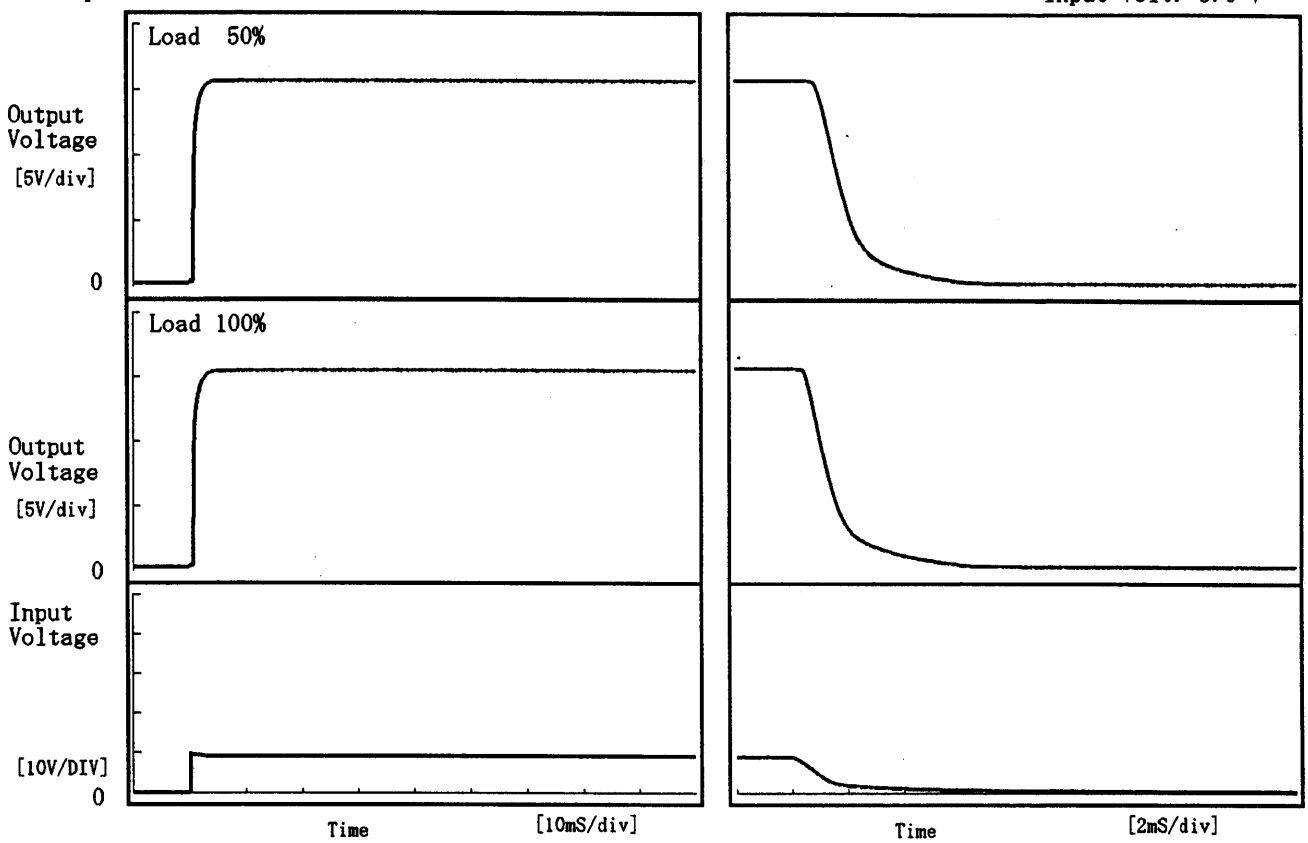


COSEL

Model	ZTW1R51215		
Item	Rise and Fall Time 立上り、立下り時間	Temperature Testing Circuitry	25℃ Figure A
Object	-15V0.05A		

1. Graph

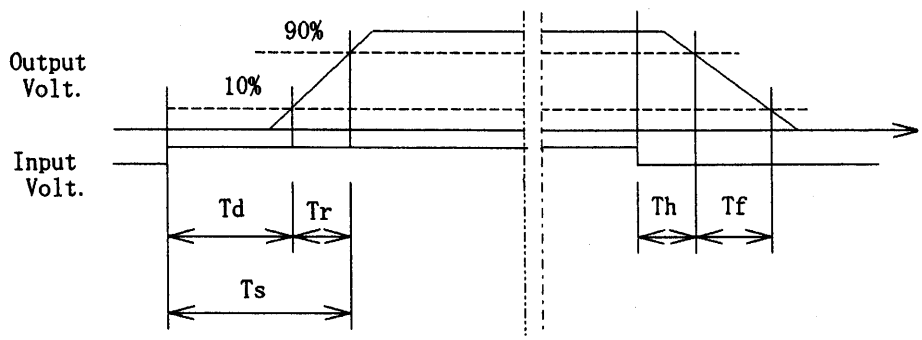
Input Volt. 9.0 V



2. Values

[mS]

Load \ Time	T d	T r	T s	T h	T f
50 %	0.55	0.95	1.50	1.10	2.37
100 %	0.55	1.05	1.60	0.67	2.51



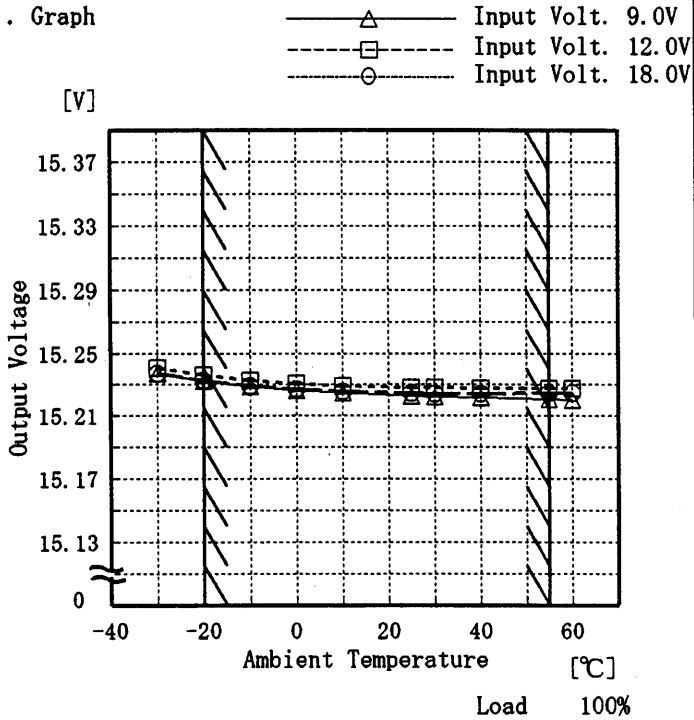
COSEL

Model	ZTW1R51215
Item	Ambient Temperature Drift 周囲温度変動

Testing Circuitry Figure A

Object ＋15V0.05A

1. Graph

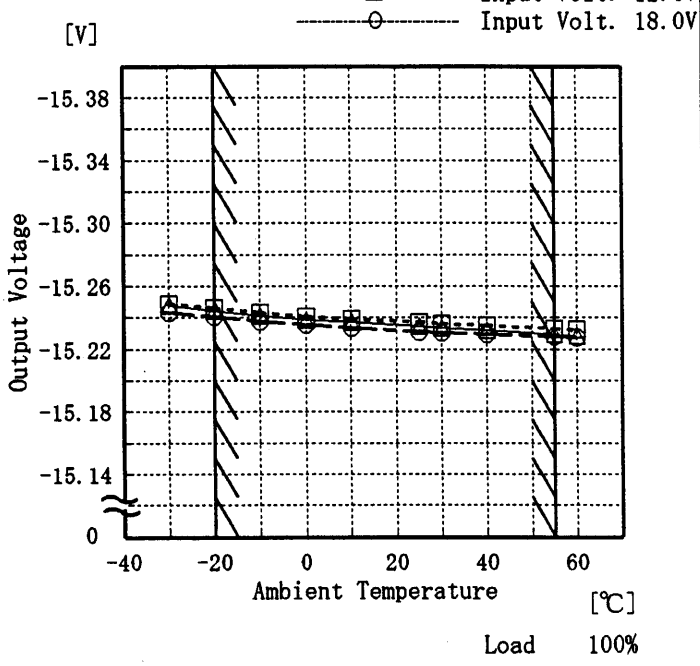


2. Values

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	15.237	15.241	15.237
-20	15.232	15.236	15.233
-10	15.228	15.233	15.229
0	15.226	15.231	15.227
10	15.224	15.229	15.226
25	15.223	15.228	15.224
30	15.222	15.228	15.224
40	15.222	15.228	15.224
55	15.221	15.228	15.225
60	15.220	15.227	15.225
—	—	—	—

Object −15V0.05A

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	-15.248	-15.249	-15.243
-20	-15.244	-15.246	-15.241
-10	-15.241	-15.243	-15.238
0	-15.239	-15.241	-15.236
10	-15.237	-15.239	-15.234
25	-15.234	-15.237	-15.231
30	-15.234	-15.236	-15.231
40	-15.232	-15.235	-15.230
55	-15.229	-15.233	-15.228
60	-15.229	-15.233	-15.227
—	—	—	—

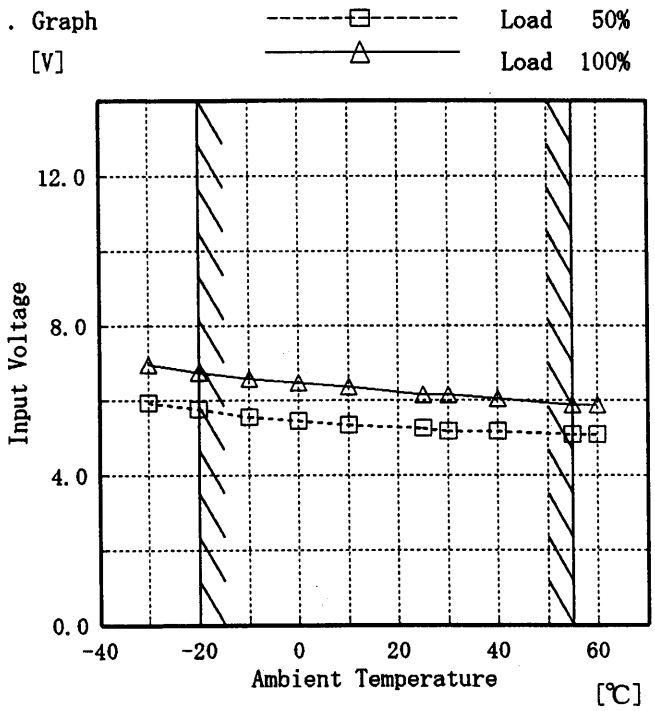
COSEL

Model	ZTW1R51215
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

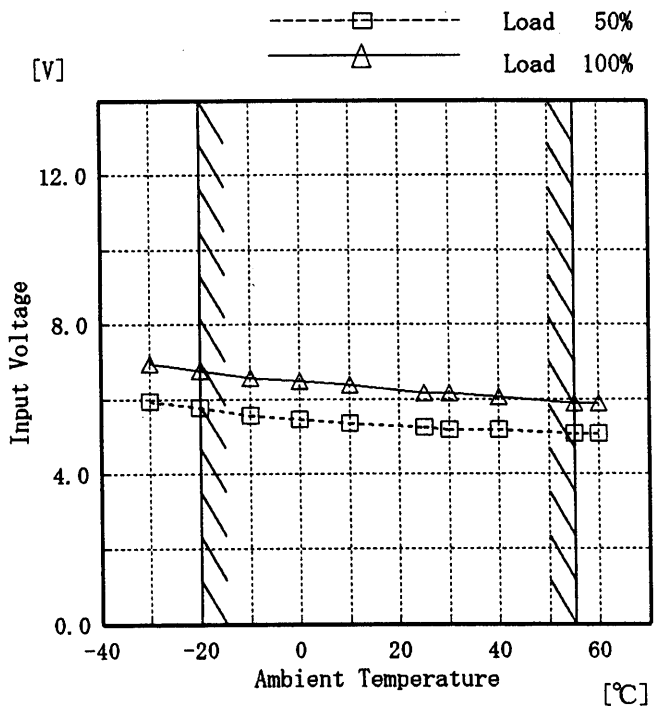
1. Graph



2. Values

Ambient Temp. [℃]	Load 50% Input Volt. [V]	Load 100% Input Volt. [V]
-30	6.0	7.0
-20	5.8	6.8
-10	5.6	6.6
0	5.5	6.5
10	5.4	6.4
25	5.3	6.2
30	5.2	6.2
40	5.2	6.1
55	5.1	5.9
60	5.1	5.9
—	—	—

Object －15V0.05A



2. Values

Ambient Temp. [℃]	Load 50% Input Volt. [V]	Load 100% Input Volt. [V]
-30	6.0	7.0
-20	5.8	6.8
-10	5.6	6.6
0	5.5	6.5
10	5.4	6.4
25	5.3	6.2
30	5.2	6.2
40	5.2	6.1
55	5.1	5.9
60	5.1	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。

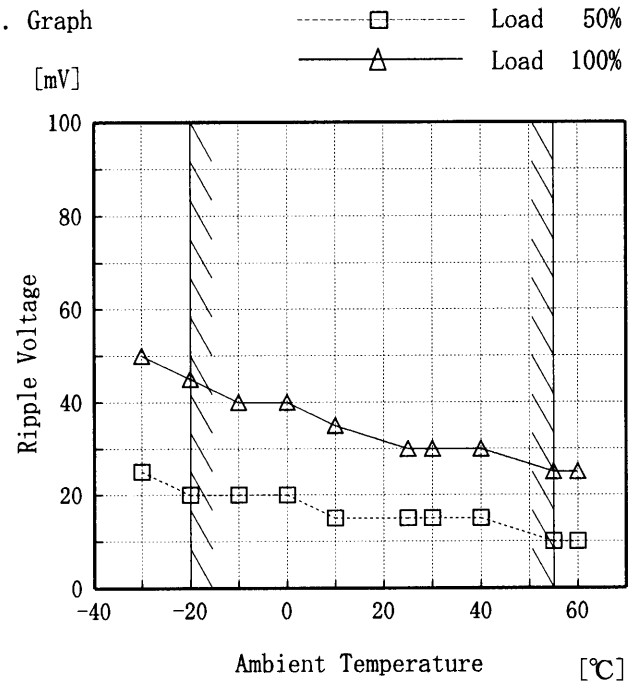
COSEL

Model	ZTW1R51215
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



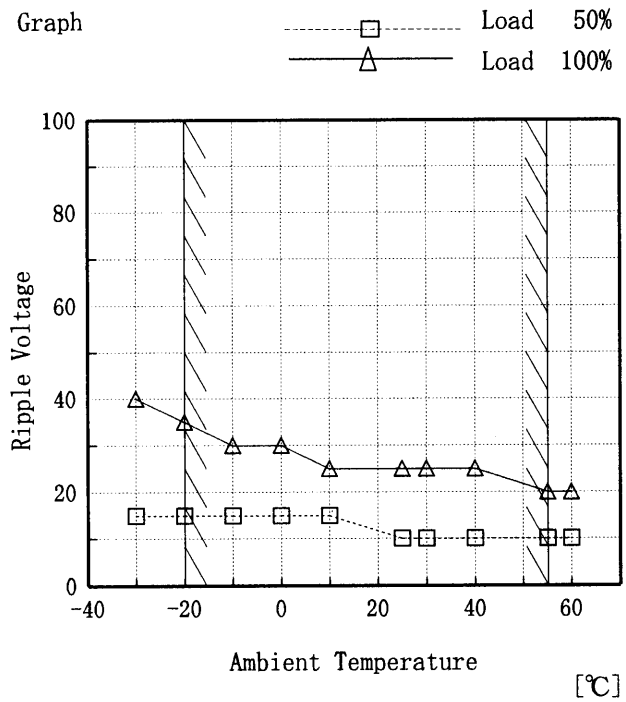
Input Volt.　9.0 V

2. Values

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

Object　－15V0.05A

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

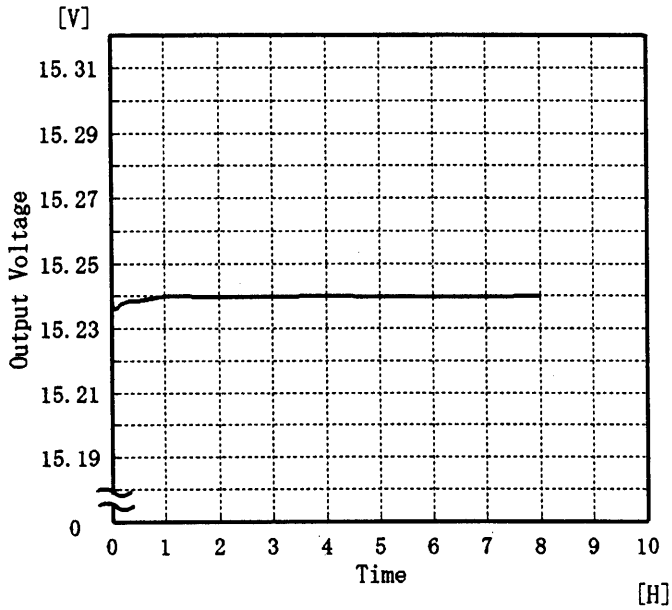
COSEL

Model	ZTW1R51215
Item	Time Lapse Drift 経時ドリフト

Temperature 25 ℃
Testing Circuitry Figure A

Object ＋15V0.05A

1. Graph



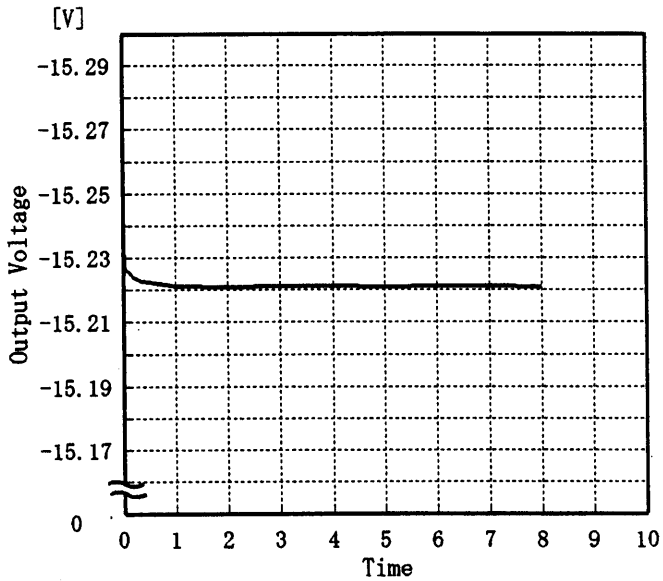
Input Volt. 12.0V
Load 100%

2. Values

Time since start [H]	Output Voltage [V]
0.0	15.239
0.5	15.239
1.0	15.240
2.0	15.240
3.0	15.240
4.0	15.240
5.0	15.240
6.0	15.240
7.0	15.240
8.0	15.240

Object －15V0.05A

1. Graph



Input Volt. 12.0V
Load 100%

2. Values

Time since start [H]	Output Voltage [V]
0.0	-15.235
0.5	-15.223
1.0	-15.221
2.0	-15.221
3.0	-15.221
4.0	-15.221
5.0	-15.221
6.0	-15.221
7.0	-15.221
8.0	-15.221

COSEL

Model	ZTW1R51215	
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) : 0.00～0.05 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 9.0～18.0 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	12.0	0.05	15.235	±155	±1.1
Minimum Voltage	55	9.0	0.00	14.925		

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	12.0	0.05	-15.245	±163	±1.1
Minimum Voltage	55	9.0	0.00	-14.920		

COSEL

Model	ZTW1R51215
Item	Condensation 結露特性
Object	+15V0.05A

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.

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]	15.336	Input Volt.: 12V, Load Current:0.05A
Line Regulation [mV]	4	Input Volt.: 9～18V, Load Current:0.05A
Load Regulation [mV]	311	Input Volt.: 12V, Load Current:0～0.05A

COSEL

Model	ZTW1R51215
Item	Condensation 結露特性
Object	−15V0.05A

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.

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]	-15.343	Input Volt.: 12V, Load Current:0.05A
Line Regulation [mV]	3	Input Volt.: 9～18V, Load Current:0.05A
Load Regulation [mV]	252	Input Volt.: 12V, Load Current:0～0.05A

COSEL

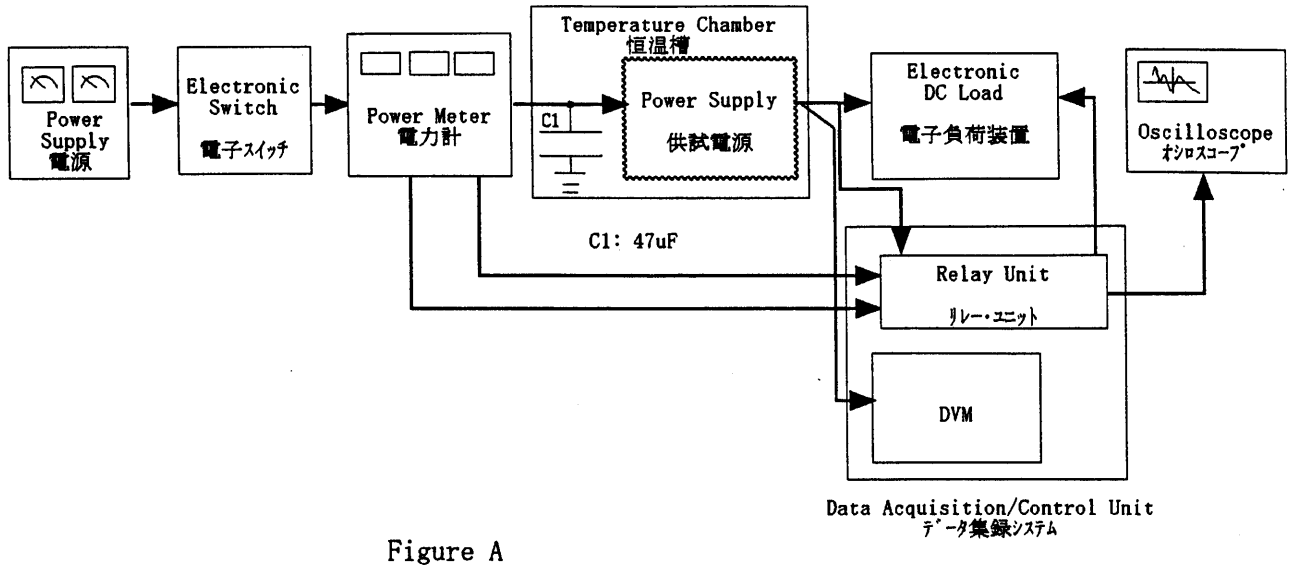


Figure A