

TEST DATA OF MGW104815

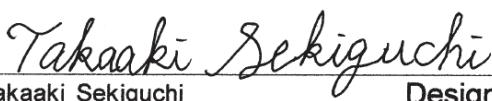
Regulated DC Power Supply
November 7, 2016

Approved by :


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Design Engineer

COSEL CO.,LTD.



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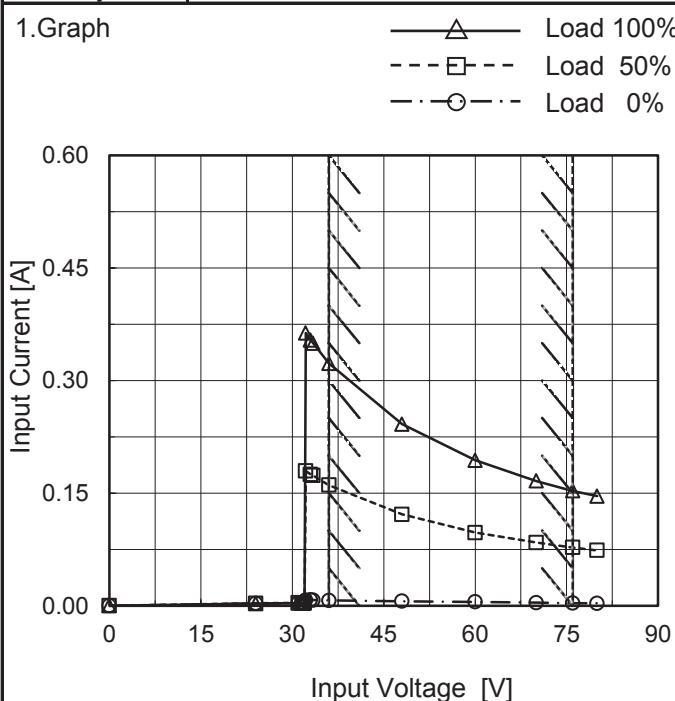
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Model	MGW104815
Item	Input Current (by Input Voltage)
Object	_____

1.Graph



Note: Slanted line shows the range of the rated input voltage.

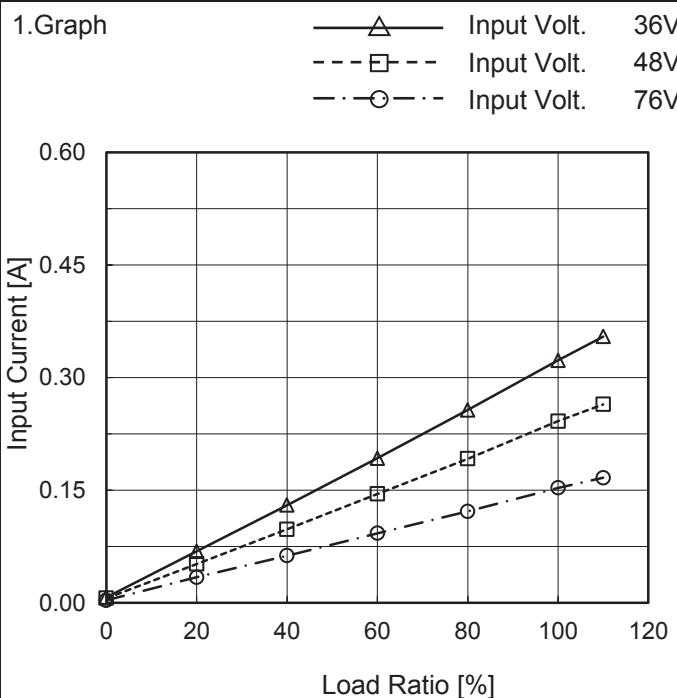
 Temperature 25°C
 Testing Circuitry Figure A

2.Values

Input Voltage [V]	Input Current [A]		
	Load 0%	Load 50%	Load 100%
0.0	0.000	0.000	0.000
24.0	0.003	0.003	0.003
31.0	0.004	0.004	0.003
31.6	0.003	0.003	0.004
31.8	0.004	0.003	0.004
32.0	0.004	0.004	0.004
32.2	0.008	0.180	0.364
33.0	0.008	0.175	0.354
33.4	0.007	0.174	0.350
36.0	0.007	0.161	0.323
48.0	0.006	0.122	0.242
60.0	0.005	0.098	0.194
70.0	0.004	0.084	0.166
76.0	0.003	0.078	0.153
80.0	0.003	0.074	0.146
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COSEL

Model	MGW104815
Item	Input Current (by Load Ratio)
Object	_____

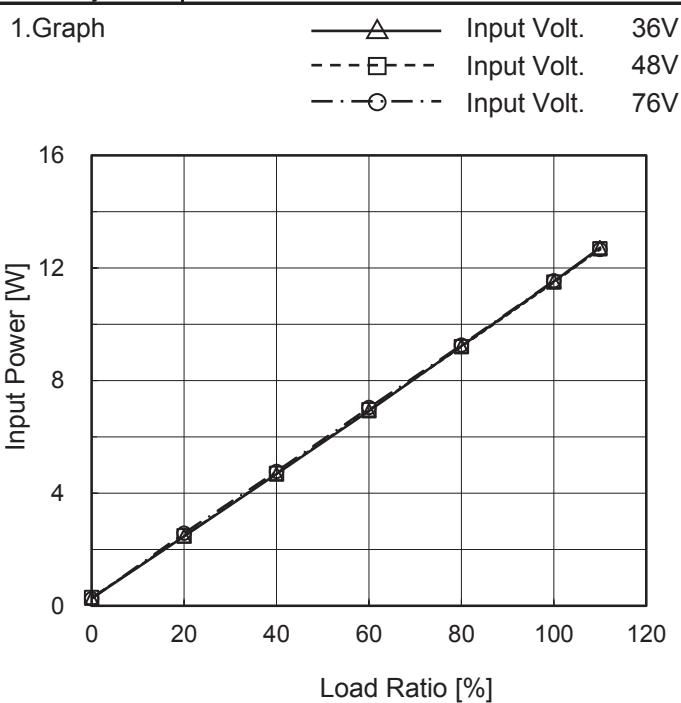

 Temperature 25°C
 Testing Circuitry Figure A

2.Values

Load Ratio [%]	Input Current [A]		
	Input Volt. 36[V]	Input Volt. 48[V]	Input Volt. 76[V]
0	0.007	0.006	0.003
20	0.068	0.052	0.034
40	0.130	0.098	0.063
60	0.193	0.145	0.093
80	0.257	0.192	0.122
100	0.323	0.242	0.153
110	0.355	0.264	0.167
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--	-	-	-
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COSEL

Model	MGW104815
Item	Input Power (by Load Ratio)
Object	_____


 Temperature 25°C
 Testing Circuitry Figure A

2.Values

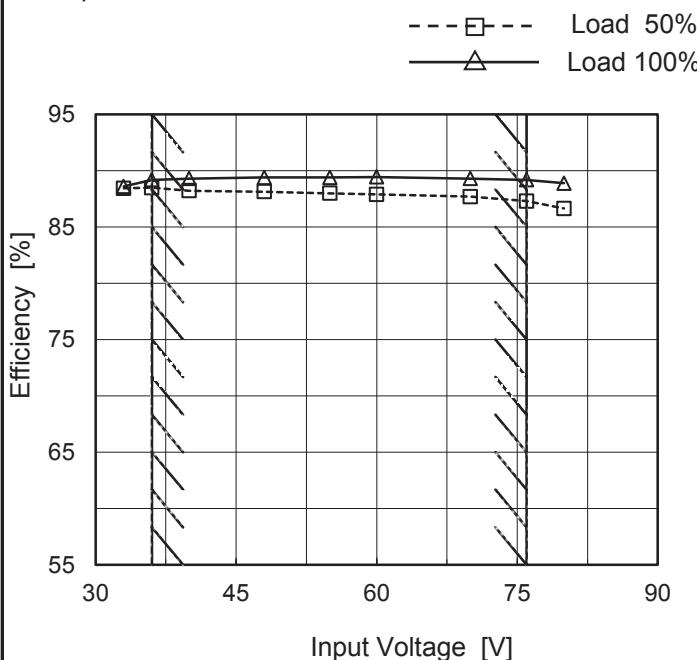
Load Ratio [%]	Input Power [W]		
	Input Volt. 36[V]	Input Volt. 48[V]	Input Volt. 76[V]
0	0.26	0.29	0.25
20	2.47	2.48	2.58
40	4.68	4.70	4.77
60	6.92	6.96	7.04
80	9.23	9.21	9.26
100	11.53	11.50	11.55
110	12.73	12.68	12.66
--	-	-	-
--	-	-	-
--	-	-	-
--	-	-	-

COSEL

Model	MGW104815
Item	Efficiency (by Input Voltage)
Object	_____

 Temperature 25°C
 Testing Circuitry Figure A

1.Graph



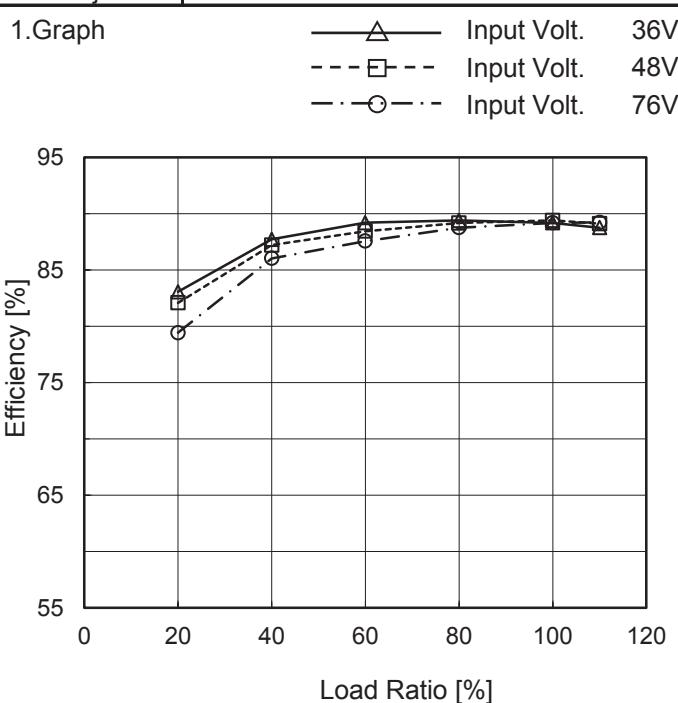
2.Values

Input Voltage [V]	Efficiency [%]	
	Load 50%	Load 100%
33	88.4	88.6
36	88.5	89.2
40	88.2	89.3
48	88.1	89.4
55	88.0	89.4
60	87.9	89.4
70	87.7	89.3
76	87.3	89.2
80	86.7	88.9

Note: Slanted line shows the range of the rated input voltage.

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Model	MGW104815
Item	Efficiency (by Load Ratio)
Object	_____


 Temperature 25°C
 Testing Circuitry Figure A

2.Values

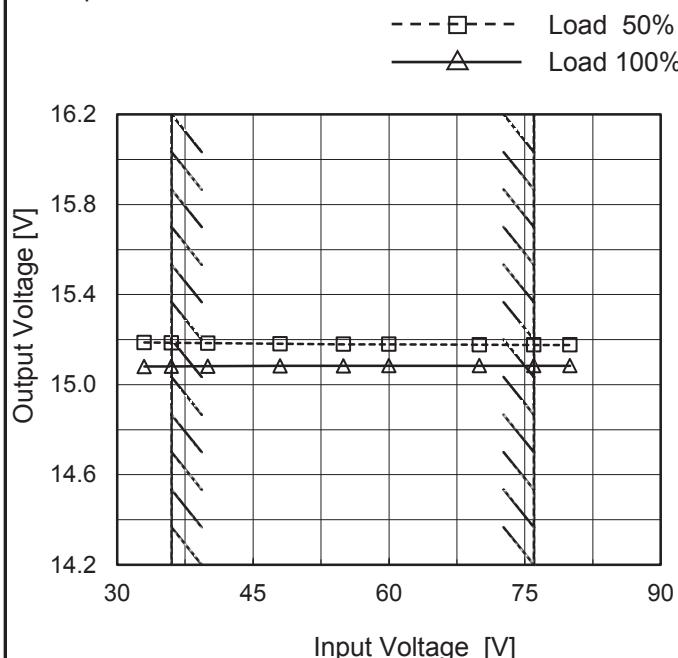
Load Ratio [%]	Efficiency [%]		
	Input Volt. 36[V]	Input Volt. 48[V]	Input Volt. 76[V]
0	-	-	-
20	83.1	82.1	79.4
40	87.7	87.2	86.0
60	89.2	88.4	87.6
80	89.4	89.2	88.8
100	89.2	89.4	89.2
110	88.8	89.1	89.2
--	-	-	-
--	-	-	-
--	-	-	-
--	-	-	-

COSEL

Model	MGW104815
Item	Line Regulation
Object	+15V0.34A

Temperature 25°C
Testing Circuitry Figure A

1.Graph

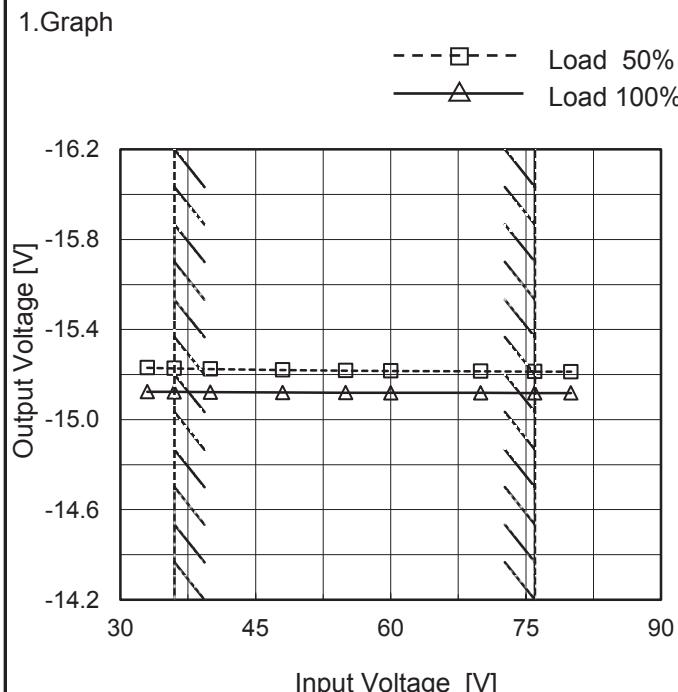


2.Values

Input Voltage [V]	Output Voltage [V]	
	Load 50%	Load 100%
33	15.187	15.081
36	15.186	15.081
40	15.184	15.082
48	15.182	15.083
55	15.180	15.084
60	15.179	15.084
70	15.177	15.084
76	15.177	15.084
80	15.176	15.084

-15V: Rated Load Current

Object -15V0.34A

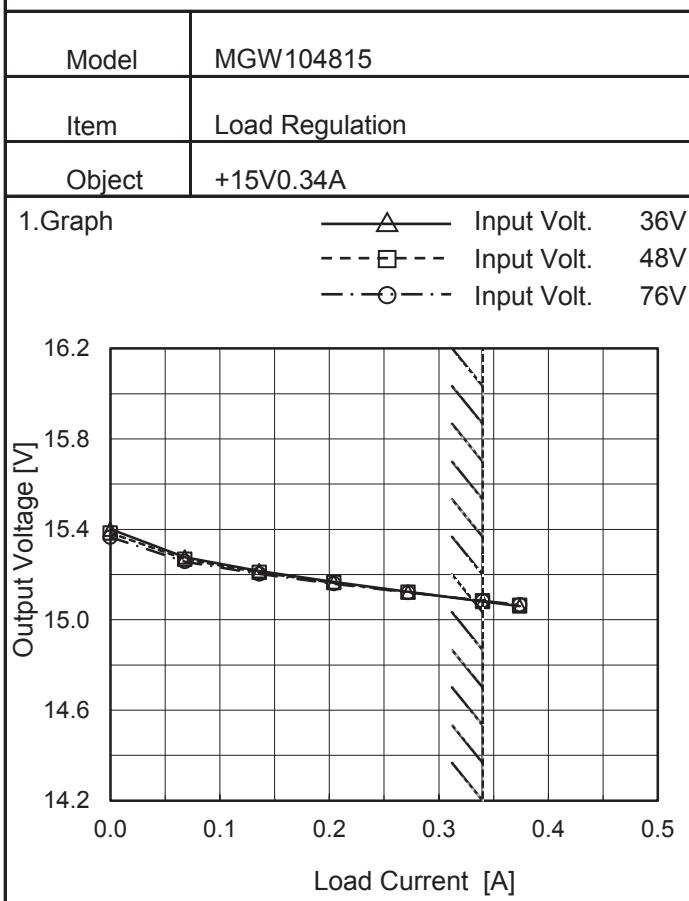


2.Values

Input Voltage [V]	Output Voltage [V]	
	Load 50%	Load 100%
33	-15.230	-15.124
36	-15.228	-15.123
40	-15.224	-15.122
48	-15.220	-15.120
55	-15.218	-15.120
60	-15.217	-15.119
70	-15.215	-15.119
76	-15.214	-15.118
80	-15.213	-15.118

+15V: Rated Load Current

Note: Slanted line shows the range of the rated input voltage.

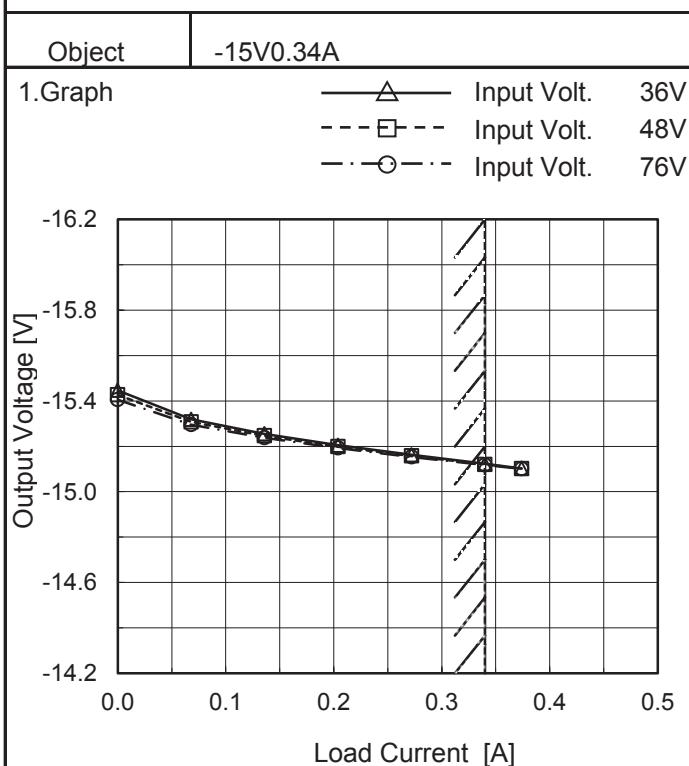
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Temperature 25°C
Testing Circuitry Figure A

2.Values

Load Current [A]	Output Voltage [V]		
	Input Volt. 36[V]	Input Volt. 48[V]	Input Volt. 76[V]
0.000	15.401	15.384	15.366
0.068	15.277	15.268	15.257
0.136	15.216	15.210	15.203
0.204	15.167	15.163	15.159
0.272	15.123	15.122	15.120
0.340	15.081	15.083	15.084
0.374	15.060	15.064	15.066
--	-	-	-
--	-	-	-
--	-	-	-
--	-	-	-

-15V: Rated Load Current



2.Values

Load Current [A]	Output Voltage [V]		
	Input Volt. 36[V]	Input Volt. 48[V]	Input Volt. 76[V]
0.000	-15.446	-15.427	-15.406
0.068	-15.319	-15.308	-15.296
0.136	-15.255	-15.246	-15.238
0.204	-15.205	-15.199	-15.193
0.272	-15.162	-15.157	-15.153
0.340	-15.123	-15.120	-15.118
0.374	-15.103	-15.102	-15.101
--	-	-	-
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--	-	-	-
--	-	-	-

+15V: Rated Load Current

Note: Slanted line shows the range of the rated load current.

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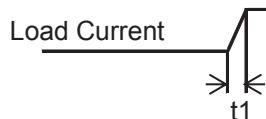
Model	MGW104815	Temperature	25°C
Item	Dynamic Load Response	Testing Circuitry	Figure A
Object	+15V0.34A		

Input Volt. 48 V

-15V:rated load current.

Cycle 100 ms

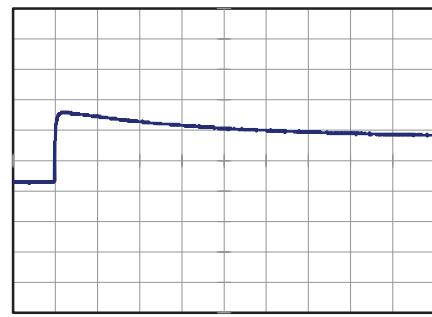
$t_1, t_2 = 100 \mu s$



Min.Load (0A)↔
Load 100% (0.34A)

200 mV/div

2 ms/div

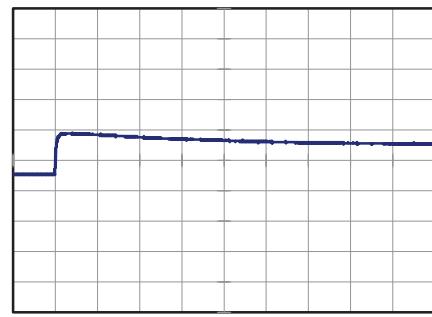


2 ms/div

Min.Load (0A)↔
Load 50% (0.17A)

200 mV/div

2 ms/div

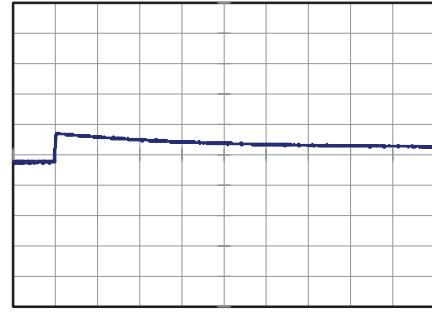


2 ms/div

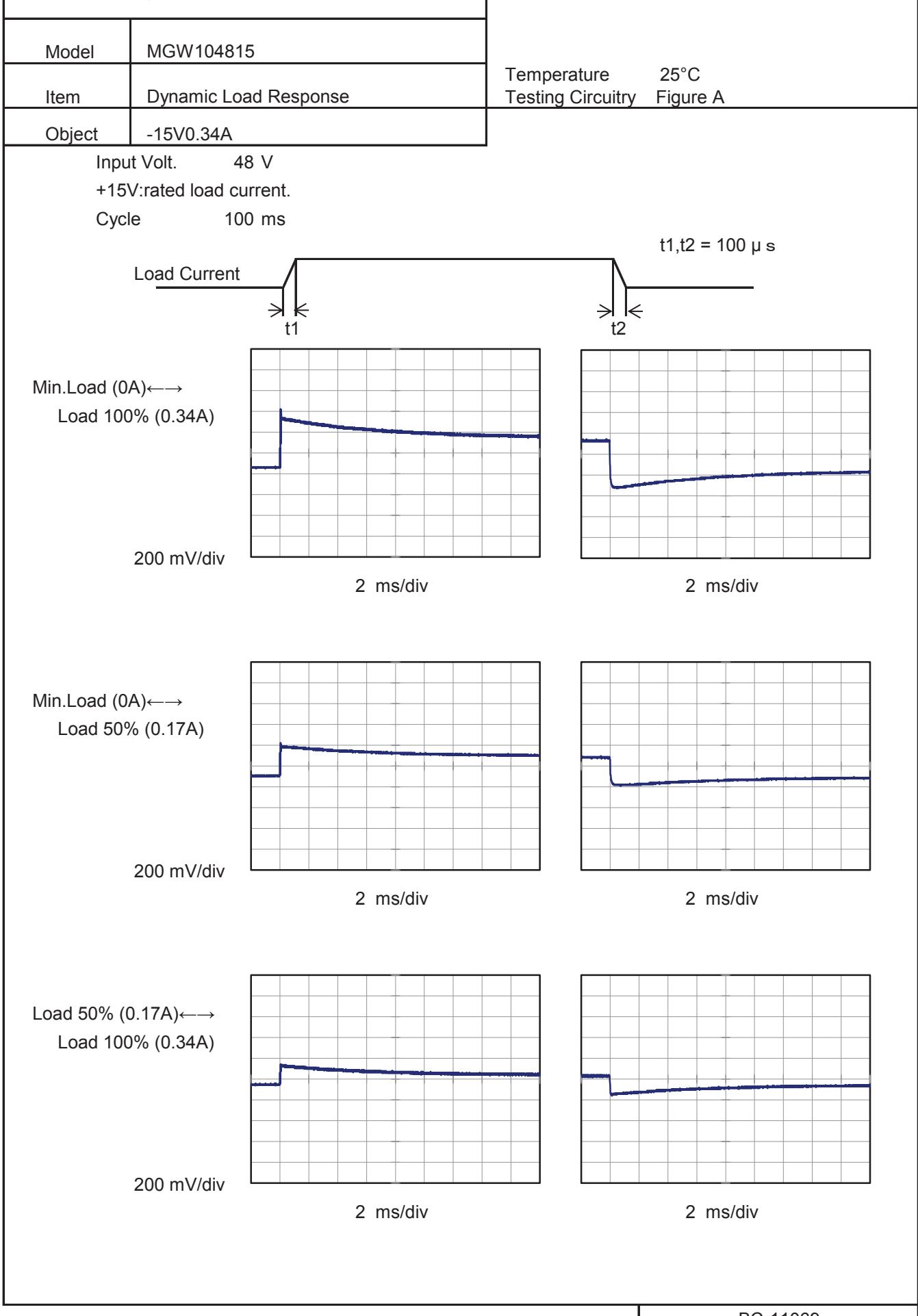
Load 50% (0.17A)↔
Load 100% (0.34A)

200 mV/div

2 ms/div



2 ms/div

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Model	MGW104815																																							
Item	Ripple Voltage (by Load Current)	Temperature 25°C Testing Circuitry Figure B																																						
Object	+15V0.34A																																							
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<p>Ripple [mVp-p]</p>																																								
<p>Fig.Complex Ripple Wave Form</p>																																								

COSEL

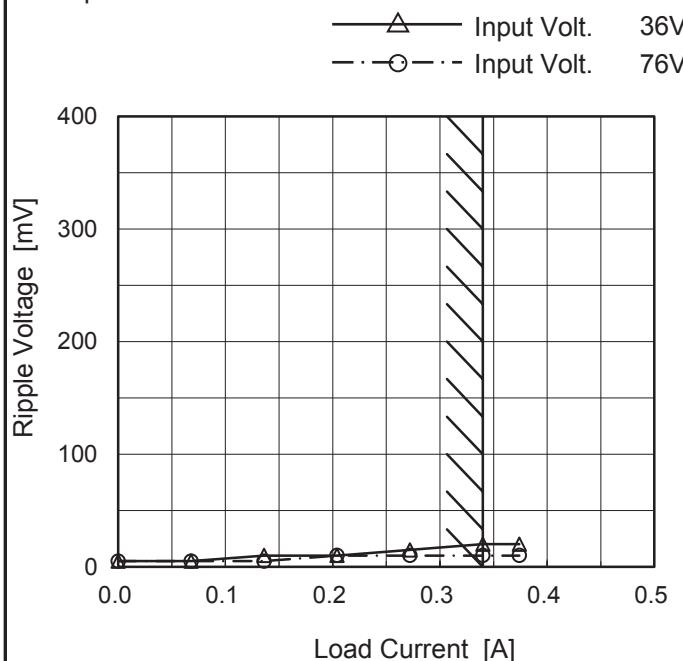
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	Input Volt. 36 [V]	Input Volt. 76 [V]																																						
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<p>Ripple [mVp-p]</p>																																								
<p>Fig.Complex Ripple Wave Form</p>																																								

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Model	MGW104815
Item	Ripple-Noise
Object	+15V0.34A

Temperature 25°C
Testing Circuitry Figure B

1.Graph



2.Values

Load Current [A]	Ripple-Noise [mV]	
	Input Volt. 36 [V]	Input Volt. 76 [V]
0.000	5	5
0.068	5	5
0.136	10	5
0.204	10	10
0.272	15	10
0.340	20	10
0.374	20	10
--	-	-
--	-	-
--	-	-
--	-	-

-15V: Rated Load Current

Measured by 100 MHz Oscilloscope.
 Ripple-Noise is shown as p-p in the figure below.
 Note: Slanted line shows the range of the rated load current.

Ripple Noise[mVp-p]

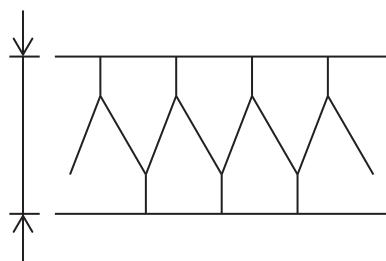


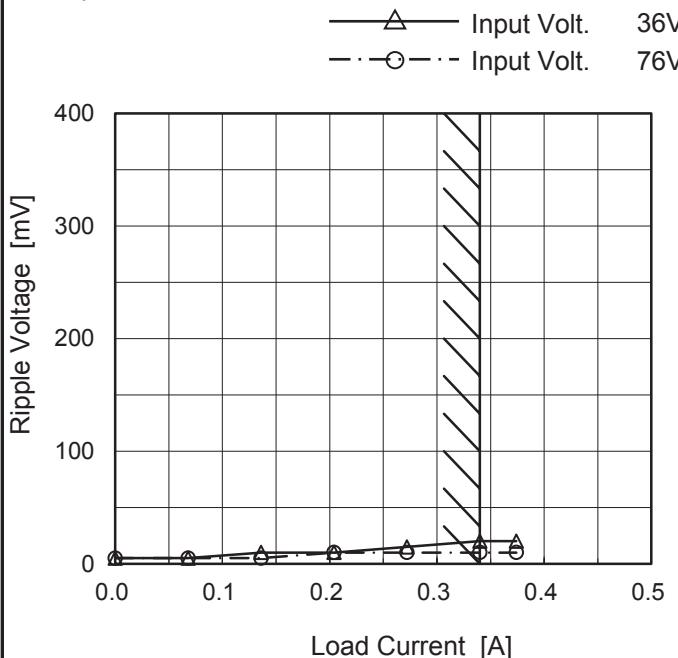
Fig.Complex Ripple Noise Wave Form

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Model	MGW104815
Item	Ripple-Noise
Object	-15V0.34A

 Temperature 25°C
 Testing Circuitry Figure B

1.Graph



2.Values

Load Current [A]	Ripple-Noise [mV]	
	Input Volt. 36 [V]	Input Volt. 76 [V]
0.000	5	5
0.068	5	5
0.136	10	5
0.204	10	10
0.272	15	10
0.340	20	10
0.374	20	10
--	-	-
--	-	-
--	-	-
--	-	-

+15V: Rated Load Current

Measured by 100 MHz Oscilloscope.
 Ripple-Noise is shown as p-p in the figure below.
 Note: Slanted line shows the range of the rated load current.

Ripple Noise[mVp-p]

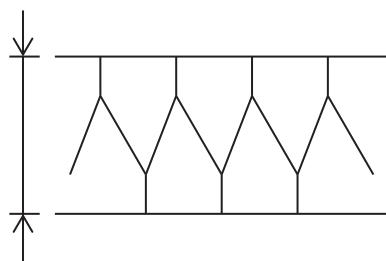
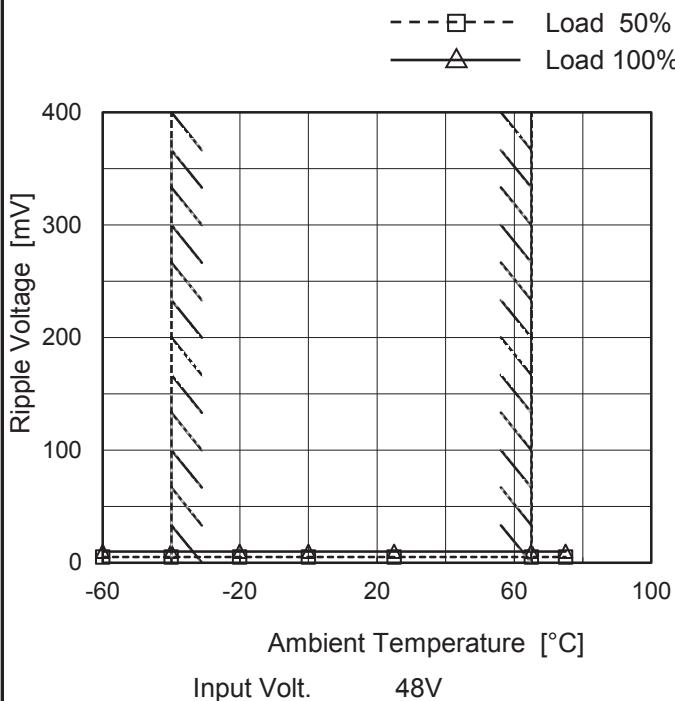


Fig.Complex Ripple Noise Wave Form

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Model	MGW104815
Item	Ripple Voltage (by Ambient Temp.)
Object	+15V0.34A

1.Graph



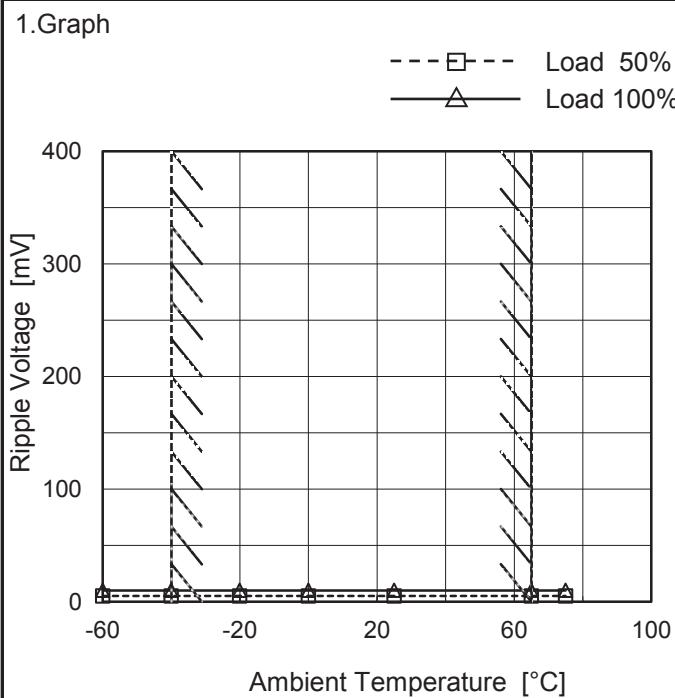
Testing Circuitry Figure B

2.Values

Ambient Temperature [°C]	Ripple Voltage [mV]	
	Load 50%	Load 100%
-60	5	10
-40	5	10
-20	5	5
0	5	5
25	5	5
65	5	10
75	5	10
--	-	-
--	-	-
--	-	-
--	-	-

-15V: Rated Load Current

1.Graph



2.Values

Ambient Temperature [°C]	Ripple Voltage [mV]	
	Load 50%	Load 100%
-60	5	10
-40	5	10
-20	5	10
0	5	10
25	5	10
65	5	10
75	5	10
--	-	-
--	-	-
--	-	-
--	-	-

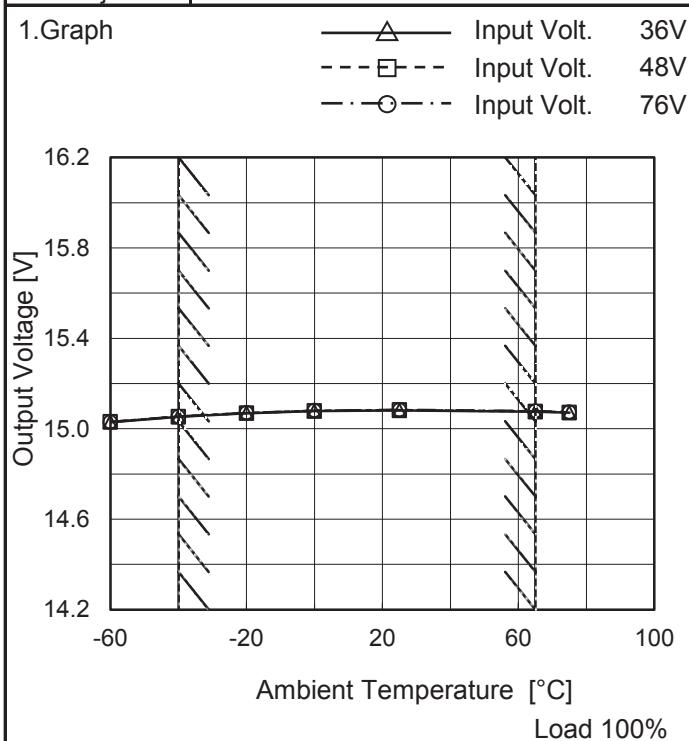
+15V: Rated Load Current

Measured by 100 MHz Oscilloscope.

Note: Slanted line shows the range of the rated ambient temperature.

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Model	MGW104815
Item	Ambient Temperature Drift
Object	+15V0.34A

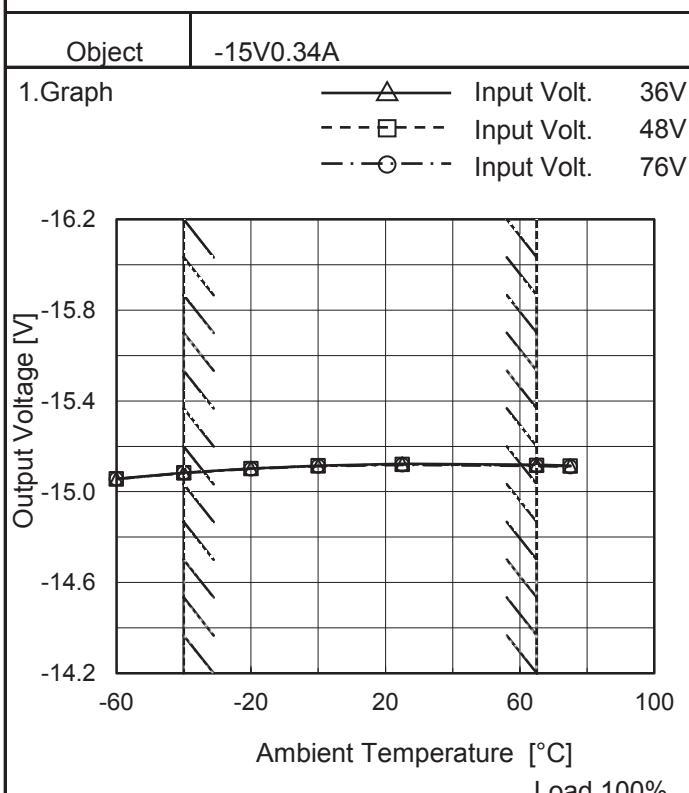


Testing Circuitry Figure A

2.Values

Ambient Temperature [°C]	Output Voltage [V]		
	Input Volt. 36[V]	Input Volt. 48[V]	Input Volt. 76[V]
-60	15.029	15.030	15.030
-40	15.052	15.054	15.054
-20	15.069	15.070	15.070
0	15.078	15.080	15.080
25	15.081	15.083	15.084
65	15.075	15.077	15.078
75	15.071	15.073	15.074
--	-	-	-
--	-	-	-
--	-	-	-
--	-	-	-

-15V: Rated Load Current



2.Values

Ambient Temperature [°C]	Output Voltage [V]		
	Input Volt. 36[V]	Input Volt. 48[V]	Input Volt. 76[V]
-60	-15.057	-15.056	-15.056
-40	-15.084	-15.083	-15.083
-20	-15.102	-15.102	-15.101
0	-15.115	-15.114	-15.113
25	-15.123	-15.120	-15.118
65	-15.119	-15.116	-15.114
75	-15.115	-15.112	-15.110
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--	-	-	-

+15V: Rated Load Current

Note: Slanted line shows the range of the rated ambient temperature.



Model	MGW104815	Testing Circuitry Figure A
Item	Output Voltage Accuracy	

1. 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 : -40 - 65°C

Input Voltage : 36 - 76V

Load Current (AVR 1) : 0 - 0.34A (AVR 2) : 0 - 0.34A

* Output Voltage Accuracy = $\pm(\text{Maximum of Output Voltage} - \text{Minimum of Output Voltage}) / 2$

$$\text{* Output Voltage Accuracy (Ratio)} = \frac{\text{Output Voltage Accuracy}}{\text{Rated Output Voltage}} \times 100$$

2. Values

Object	+15V0.34A			Output		Output Voltage Accuracy	
Item	Temperature [°C]	Input Voltage[V]		Current[A]	Voltage[V]	Value [mV]	Ratio [%]
Maximum Voltage	65	36		0	15.411	±330	±2.2
Minimum Voltage	65	36		0.34	14.751		

Object	-15V0.34A			Output		Output Voltage Accuracy	
Item	Temperature [°C]	Input Voltage[V]		Current[A]	Voltage[V]	Value [mV]	Ratio [%]
Maximum Voltage	65	36		0	-15.455	±330	±2.2
Minimum Voltage	65	36		0.34	-14.796		

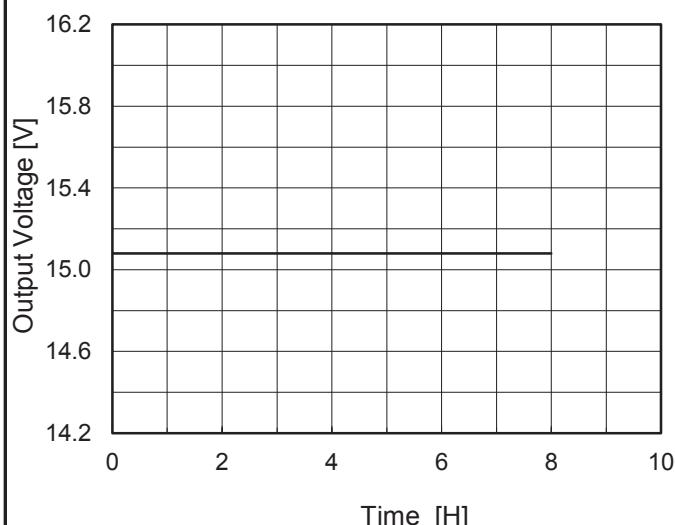
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Model MGW104815

Item Time Lapse Drift

Object +15V0.34A

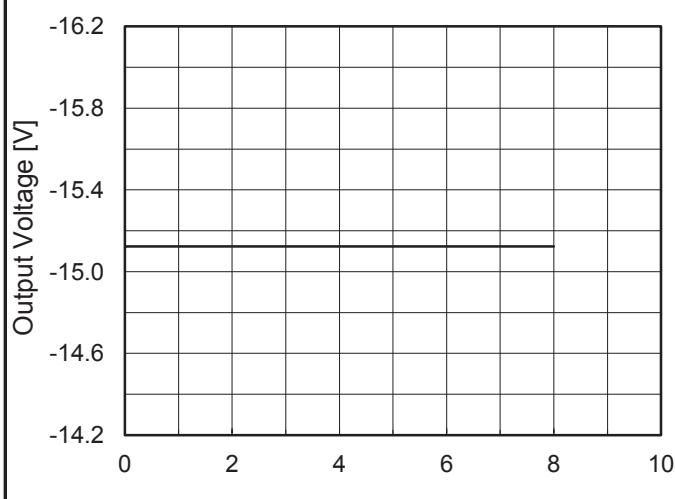
1.Graph



Input Volt. 48V
Load 100%

Object -15V0.34A

1.Graph



Input Volt. 48V
Load 100%

Temperature 25°C
Testing Circuitry Figure A

2.Values

Time since start [H]	Output Voltage [V]
0.0	15.079
0.5	15.080
1.0	15.080
2.0	15.080
3.0	15.080
4.0	15.080
5.0	15.080
6.0	15.080
7.0	15.080
8.0	15.080

-15V: Rated Load Current

2.Values

Time since start [H]	Output Voltage [V]
0.0	-15.120
0.5	-15.124
1.0	-15.124
2.0	-15.124
3.0	-15.124
4.0	-15.124
5.0	-15.124
6.0	-15.124
7.0	-15.124
8.0	-15.124

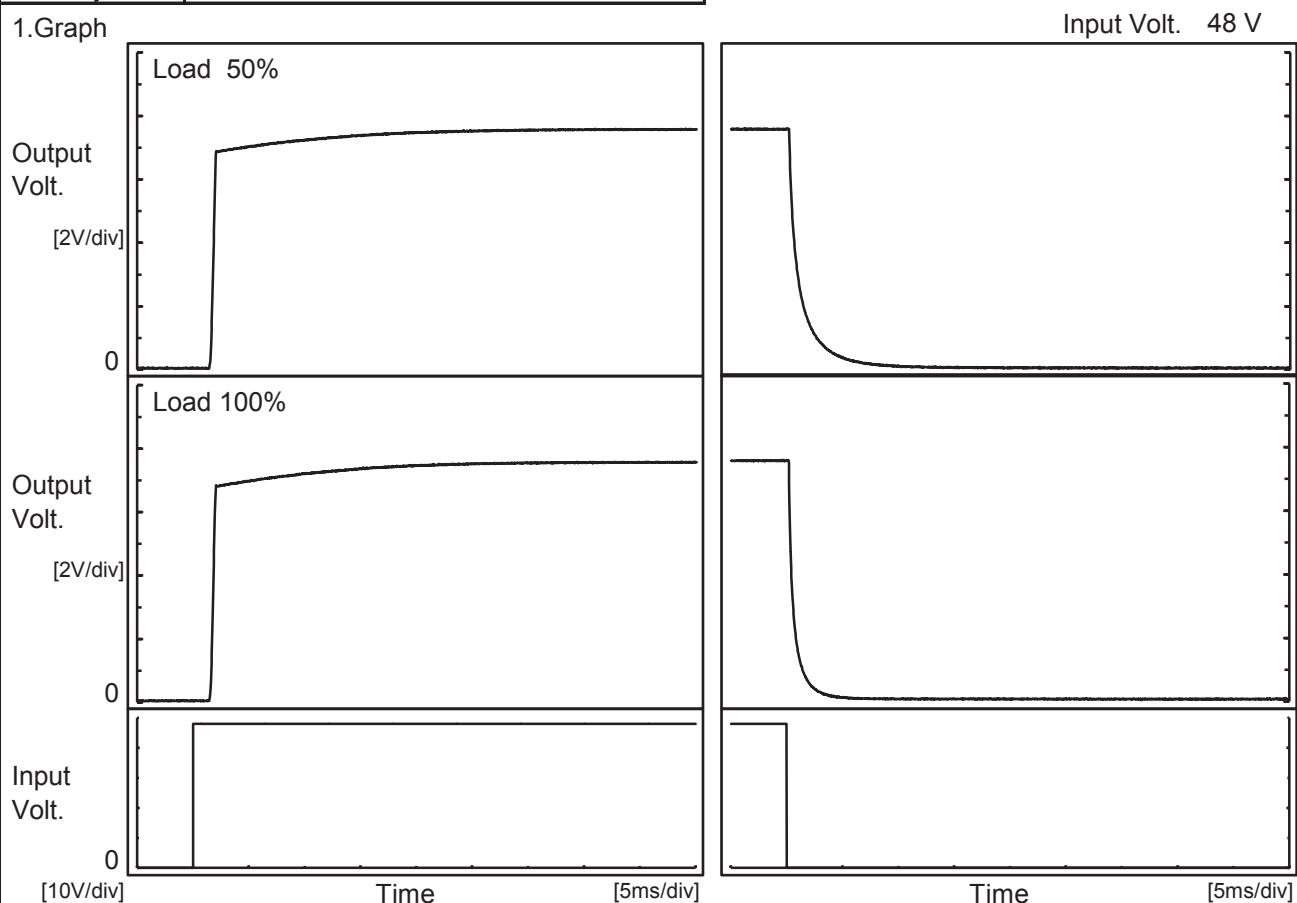
+15V: Rated Load Current

COSEL

Model	MGW104815
Item	Rise and Fall Time
Object	+15V0.34A

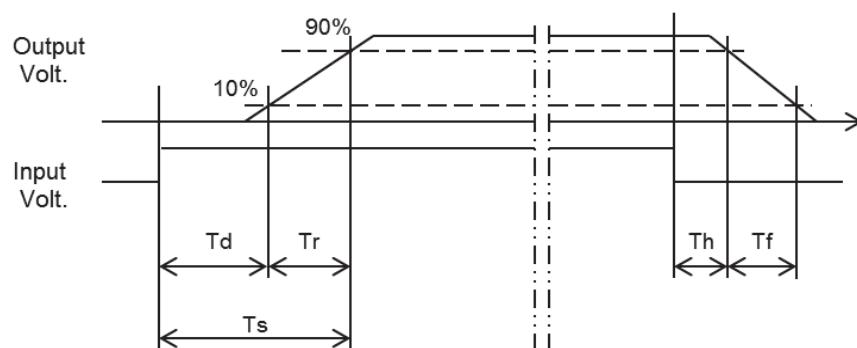
Temperature 25°C
Testing Circuitry Figure A

1. Graph



2. Values

Load	Time	Td	Tr	Ts	Th	Tf	[ms]
50 %		1.6	0.4	2.0	0.3	2.9	
100 %		1.6	0.4	2.0	0.2	1.4	

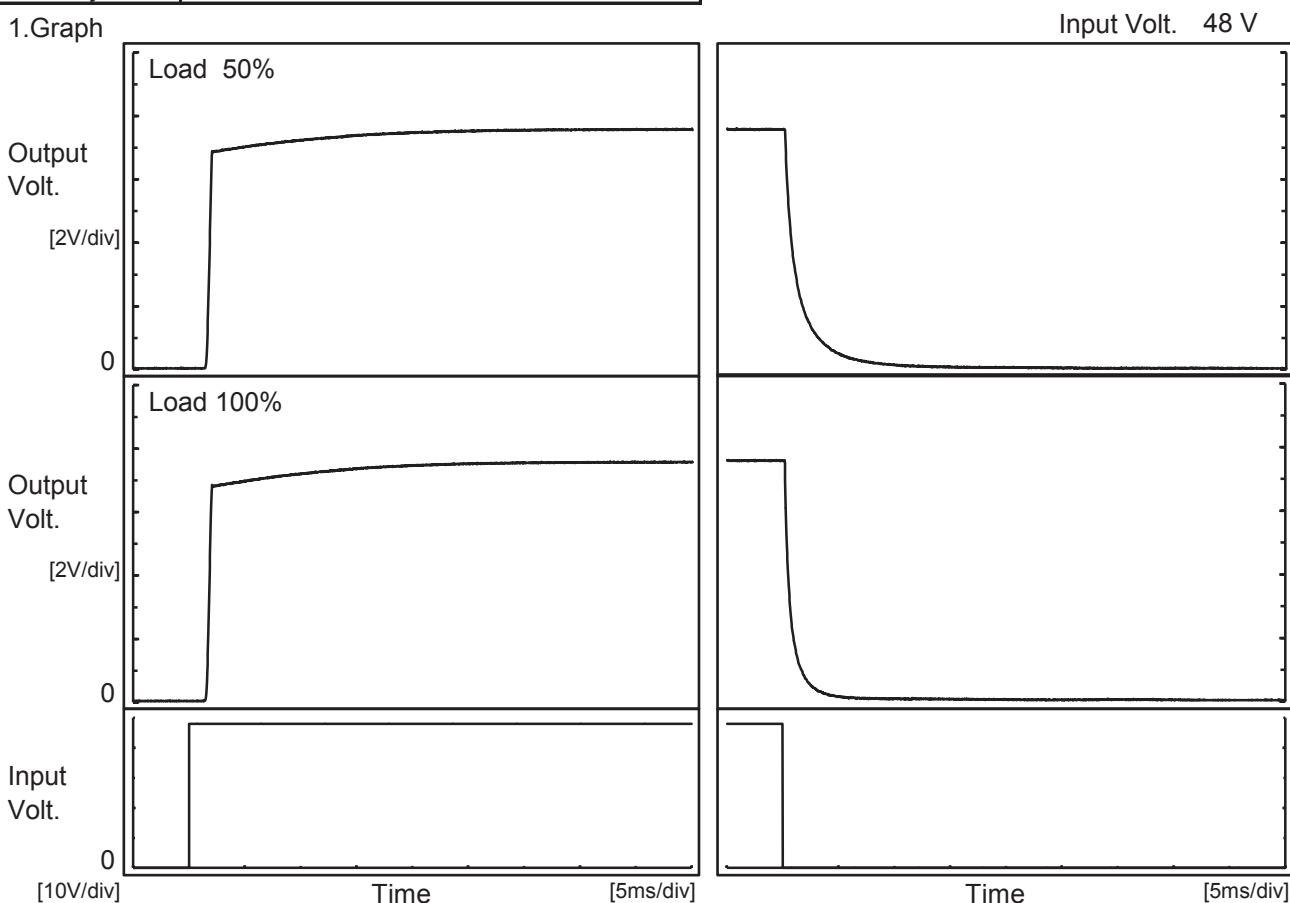


COSEL

Model	MGW104815
Item	Rise and Fall Time
Object	-15V0.34A

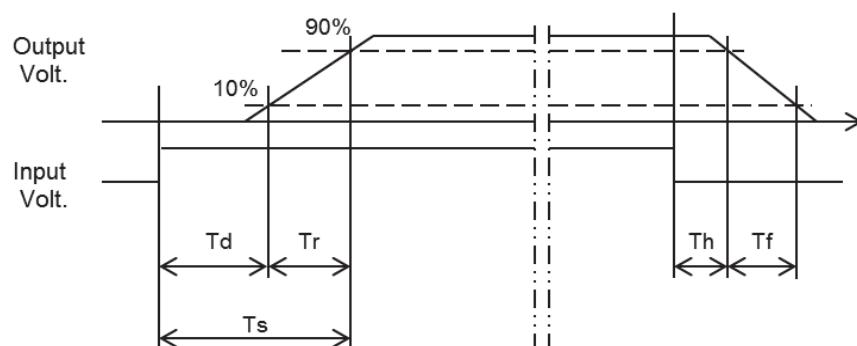
Temperature 25°C
Testing Circuitry Figure A

1. Graph



2. Values

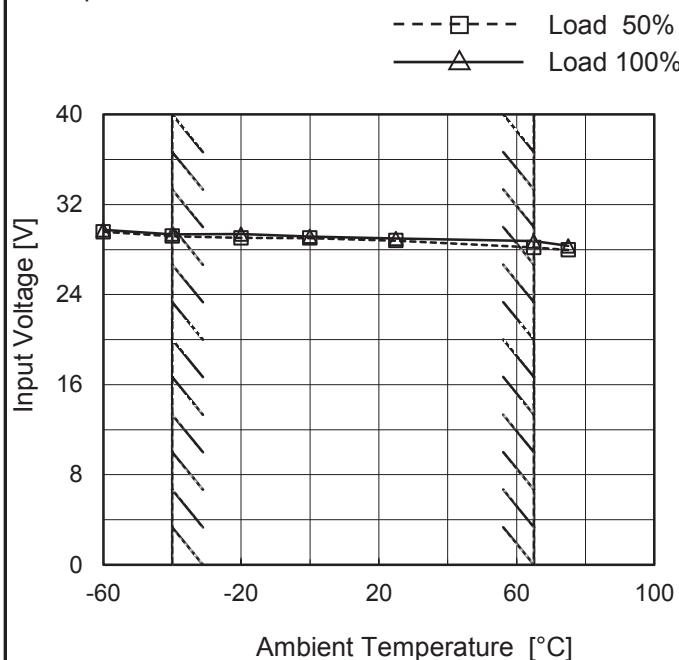
Load	Time	Td	Tr	Ts	Th	Tf	[ms]
50 %		1.6	0.4	2.0	0.3	3.5	
100 %		1.6	0.4	2.0	0.2	1.7	



COSEL

Model	MGW104815
Item	Minimum Input Voltage for Regulated Output Voltage
Object	+15V0.34A

1.Graph



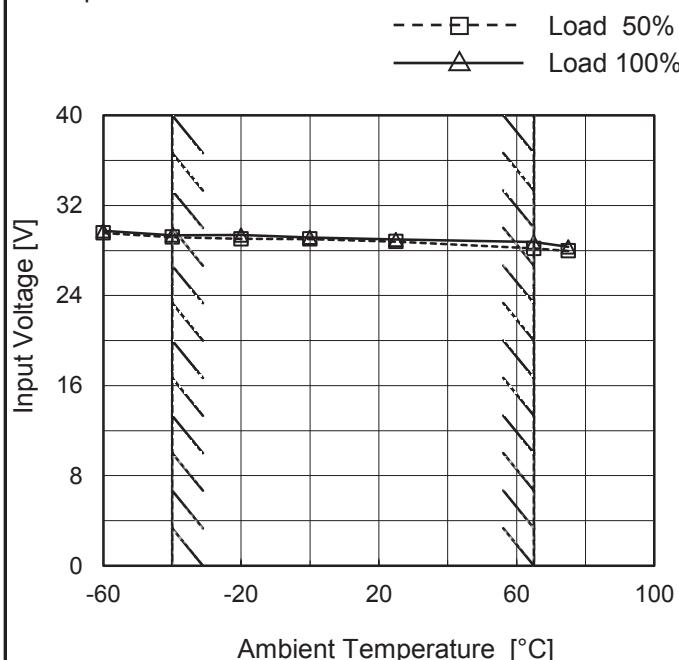
Testing Circuitry Figure A

2.Values

Ambient Temperature [°C]	Input Voltage [V]	
	Load 50%	Load 100%
-60	29.6	29.8
-40	29.2	29.4
-20	29.1	29.4
0	29.1	29.2
25	28.8	29.0
65	28.2	28.8
75	28.0	28.4
--	-	-
--	-	-
--	-	-
--	-	-

Object -15V0.34A

1.Graph



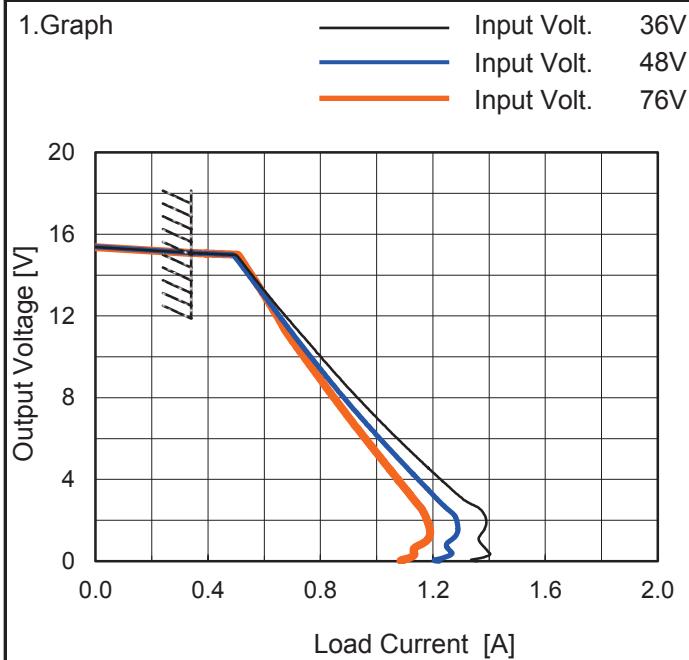
2.Values

Ambient Temperature [°C]	Input Voltage [V]	
	Load 50%	Load 100%
-60	29.6	29.8
-40	29.2	29.4
-20	29.1	29.4
0	29.1	29.2
25	28.8	29.0
65	28.2	28.8
75	28.0	28.4
--	-	-
--	-	-
--	-	-
--	-	-

Note: Slanted line shows the range of the rated ambient temperature.

COSEL

Model	MGW104815
Item	Overcurrent Protection
Object	+15V0.34A

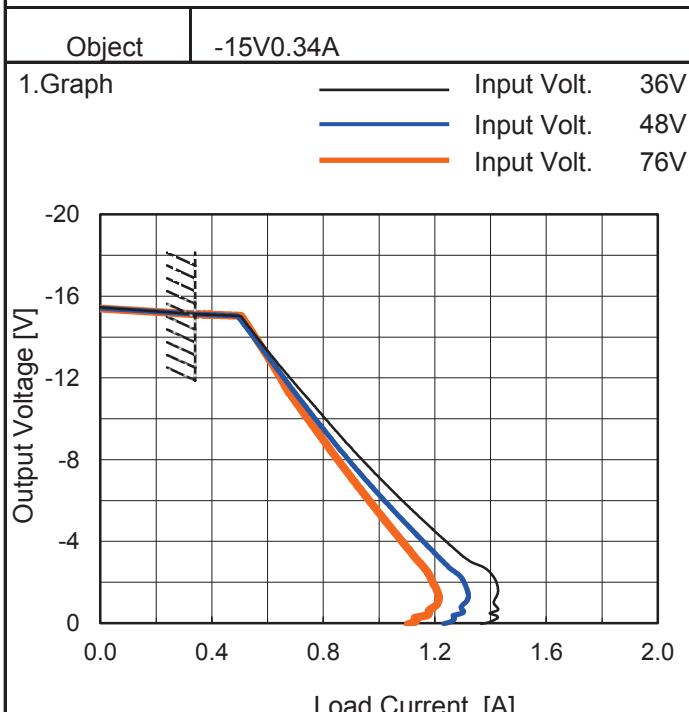


Temperature 25°C
Testing Circuitry Figure A

2.Values

Output Voltage [V]	Load Current [A]		
	Input Volt. 36[V]	Input Volt. 48[V]	Input Volt. 76[V]
14.25	0.54	0.53	0.54
13.50	0.59	0.57	0.58
12.00	0.67	0.65	0.64
10.50	0.77	0.74	0.71
9.00	0.86	0.82	0.79
7.50	0.96	0.91	0.87
6.00	1.07	1.01	0.96
4.50	1.19	1.11	1.05
3.00	1.31	1.22	1.13
1.50	1.38	1.29	1.19
0.00	1.36	1.22	1.09
--	-	-	-

-15V: Rated Load Current



2.Values

Output Voltage [V]	Load Current [A]		
	Input Volt. 36[V]	Input Volt. 48[V]	Input Volt. 76[V]
-14.25	0.55	0.54	0.54
-13.50	0.59	0.58	0.58
-12.00	0.68	0.66	0.65
-10.50	0.77	0.74	0.72
-9.00	0.87	0.83	0.80
-7.50	0.97	0.92	0.88
-6.00	1.08	1.02	0.96
-4.50	1.20	1.12	1.05
-3.00	1.33	1.23	1.14
-1.50	1.43	1.32	1.21
0.00	1.37	1.23	1.10
--	-	-	-

+15V: Rated Load Current

Note: Slanted line shows the range of the rated load current.

COSEL

Model	MGW104815	Temperature	25°C																																																			
Item	Switching Frequency (by Load Current)	Testing Circuitry	Figure A																																																			
Object	+/-15V0.34A																																																					
1.Graph	<p>—△— Input Volt. 36V - - - □ - - Input Volt. 48V - - ○ - - Input Volt. 76V</p>																																																					
2.Values	<table border="1"> <thead> <tr> <th rowspan="2">Load Current [A]</th> <th colspan="3">Frequency [kHz]</th> </tr> <tr> <th>Input Volt. 36[V]</th> <th>Input Volt. 48[V]</th> <th>Input Volt. 76[V]</th> </tr> </thead> <tbody> <tr> <td>0.000</td><td>621</td><td>662</td><td>689</td></tr> <tr> <td>0.068</td><td>435</td><td>491</td><td>555</td></tr> <tr> <td>0.136</td><td>334</td><td>386</td><td>451</td></tr> <tr> <td>0.204</td><td>271</td><td>317</td><td>380</td></tr> <tr> <td>0.272</td><td>228</td><td>270</td><td>329</td></tr> <tr> <td>0.340</td><td>196</td><td>235</td><td>290</td></tr> <tr> <td>0.374</td><td>184</td><td>221</td><td>273</td></tr> <tr> <td>--</td><td>-</td><td>-</td><td>-</td></tr> <tr> <td>--</td><td>-</td><td>-</td><td>-</td></tr> <tr> <td>--</td><td>-</td><td>-</td><td>-</td></tr> <tr> <td>--</td><td>-</td><td>-</td><td>-</td></tr> </tbody> </table>			Load Current [A]	Frequency [kHz]			Input Volt. 36[V]	Input Volt. 48[V]	Input Volt. 76[V]	0.000	621	662	689	0.068	435	491	555	0.136	334	386	451	0.204	271	317	380	0.272	228	270	329	0.340	196	235	290	0.374	184	221	273	--	-	-	-	--	-	-	-	--	-	-	-	--	-	-	-
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Note:	Slanted line shows the range of the rated load current.																																																					
-When load current is low, MG operates intermittently, so switching frequency would not become constant.																																																						

COSEL

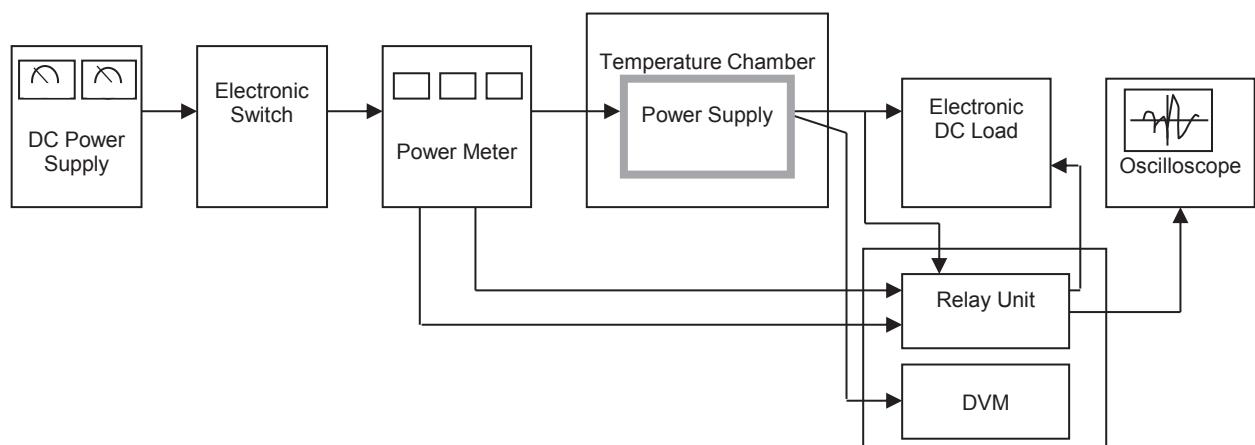


Figure A

Data Acquisition/Control Unit

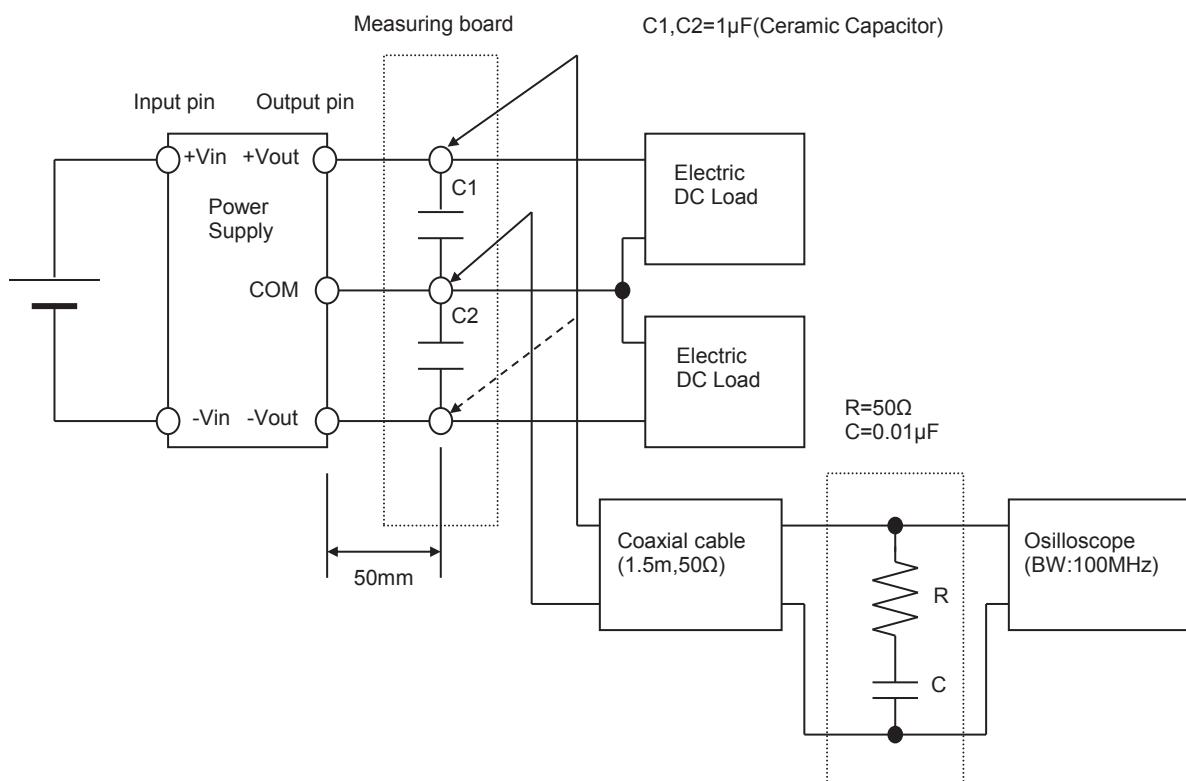


Figure B (Ripple and Ripple noise Characteristic)