参考資料

TEST DATA OF MGFW32415

Regulated DC Power Supply
January 6, 2017

Approved by : Takayuki Fukuda
Takayuki Fukuda Design Manager

Prepared by : Takaaki Sekiguchi
Takaaki Sekiguchi Design Engineer

COSEL CO.,LTD.

COSEL

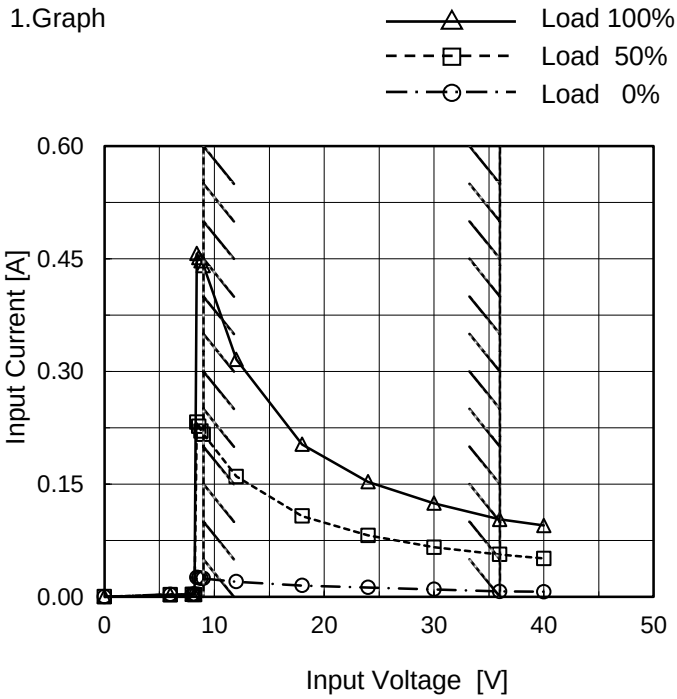
CONTENTS

COSEL

Model	MGFW32415
Item	Input Current (by Input Voltage)
Object	————————

Temperature 25°C
Testing Circuitry Figure A

1.Graph



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

2.Values

Input Voltage [V]	Input Current [A]		
	Load 0%	Load 50%	Load 100%
0.0	0.000	0.000	0.000
6.0	0.003	0.003	0.003
8.0	0.003	0.003	0.003
8.2	0.003	0.003	0.003
8.4	0.026	0.233	0.457
8.6	0.025	0.227	0.452
8.8	0.025	0.221	0.447
9.0	0.024	0.216	0.441
12.0	0.020	0.160	0.316
18.0	0.015	0.108	0.203
24.0	0.012	0.082	0.153
30.0	0.010	0.066	0.125
36.0	0.007	0.056	0.103
40.0	0.007	0.051	0.095
--	-	-	-
--	-	-	-
--	-	-	-
--	-	-	-

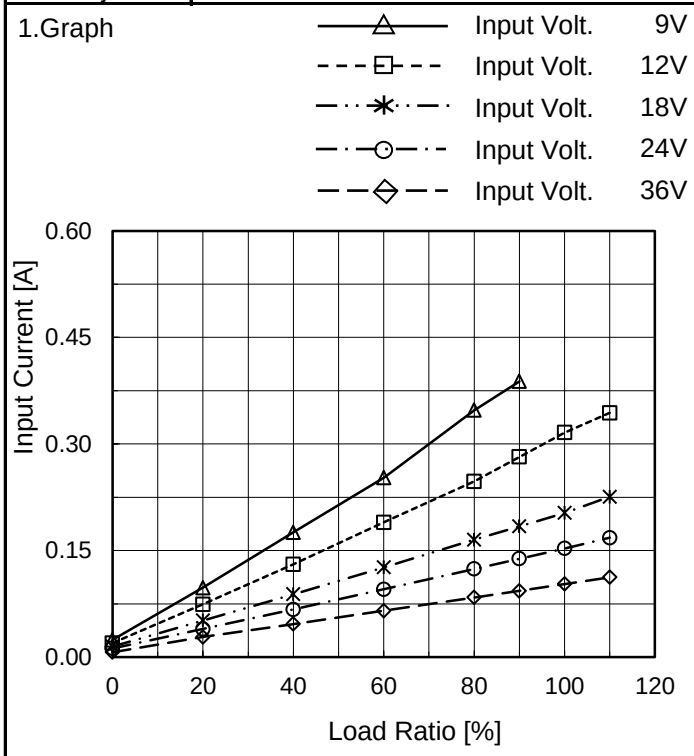
BC-11007

COSEL

Model	MGFW32415
Item	Input Current (by Load Ratio)
Object	————————

Temperature 25°C
Testing Circuitry Figure A

1.Graph



2.Values

Load Ratio [%]	Input Current [A]				
	Input Volt. 9[V]	Input Volt. 12[V]	Input Volt. 18[V]	Input Volt. 24[V]	Input Volt. 36[V]
0	0.024	0.020	0.015	0.012	0.007
20	0.098	0.074	0.052	0.040	0.028
40	0.176	0.131	0.089	0.067	0.047
60	0.253	0.190	0.126	0.095	0.065
80	0.348	0.247	0.165	0.124	0.084
90	0.388	0.282	0.184	0.138	0.093
100	- ※	0.316	0.203	0.153	0.103
110	- ※	0.344	0.226	0.168	0.112
--	-	-	-	-	-
--	-	-	-	-	-
--	-	-	-	-	-

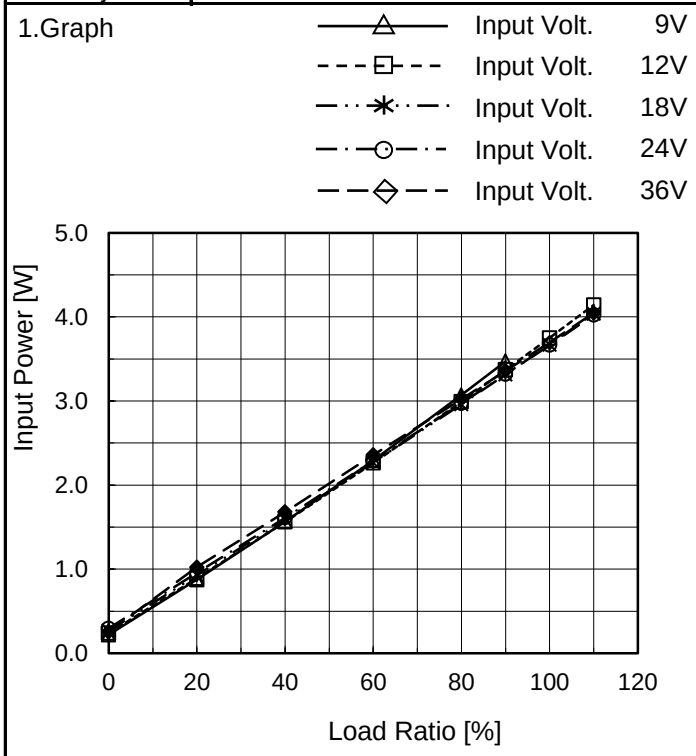
※ Maximum output current at minimum input Voltage is 80% of rated load current. Refer to instruction manuals for details of input derating.

COSEL

Model	MGFW32415
Item	Input Power (by Load Ratio)
Object	————————

Temperature 25°C
Testing Circuitry Figure A

1.Graph



2.Values

Load Ratio [%]	Input Power [W]				
	Input Volt. 9[V]	Input Volt. 12[V]	Input Volt. 18[V]	Input Volt. 24[V]	Input Volt. 36[V]
0	0.22	0.24	0.27	0.30	0.25
20	0.87	0.89	0.93	0.95	1.02
40	1.56	1.56	1.59	1.61	1.68
60	2.29	2.26	2.27	2.29	2.36
80	3.07	2.99	2.96	2.97	3.02
90	3.47	3.37	3.31	3.32	3.36
100	- ※	3.75	3.67	3.66	3.69
110	- ※	4.14	4.04	4.02	4.05
--	-	-	-	-	-
--	-	-	-	-	-
--	-	-	-	-	-

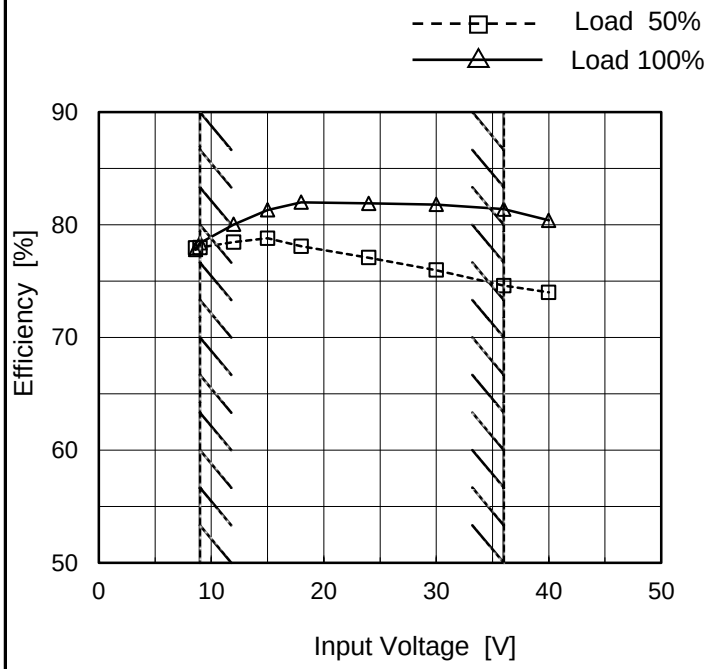
※ Maximum output current at minimum input Voltage is 80% of rated load current. Refer to instruction manuals for details of input derating.

COSEL

Model	MGFW32415
Item	Efficiency (by Input Voltage)
Object	――――――――――

Temperature 25°C
Testing Circuitry Figure A

1.Graph



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

2.Values

Input Voltage [V]	Efficiency [%]	
	Load 50%	Load 100%
8.6	77.9	77.8 ※1
9.0	78.0	78.4 ※1
12.0	78.5	80.0
15.0	78.8	81.3
18.0	78.1	82.0
24.0	77.1	81.9
30.0	76.0	81.8
36.0	74.6	81.4
40.0	74.0	80.4

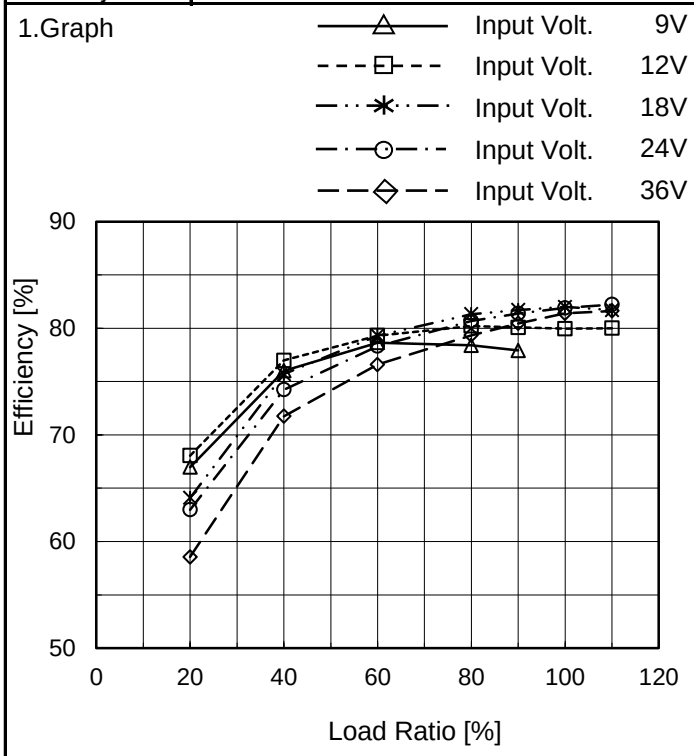
※1：Load 80%

COSEL

Model	MGFW32415
Item	Efficiency (by Load Ratio)
Object	――――――

Temperature 25°C
Testing Circuitry Figure A

1.Graph



2.Values

Load Ratio [%]	Efficiency [%]				
	Input Volt. 9[V]	Input Volt. 12[V]	Input Volt. 18[V]	Input Volt. 24[V]	Input Volt. 36[V]
0	-	-	-	-	-
20	67.0	68.1	64.1	63.0	58.6
40	76.0	77.0	75.7	74.2	71.7
60	78.7	79.3	79.3	78.3	76.6
80	78.4	80.2	81.3	80.7	79.3
90	77.9	80.1	81.7	81.4	80.4
100	- ※	80.0	82.0	81.9	81.4
110	- ※	80.0	81.7	82.2	81.6
--	-	-	-	-	-
--	-	-	-	-	-
--	-	-	-	-	-

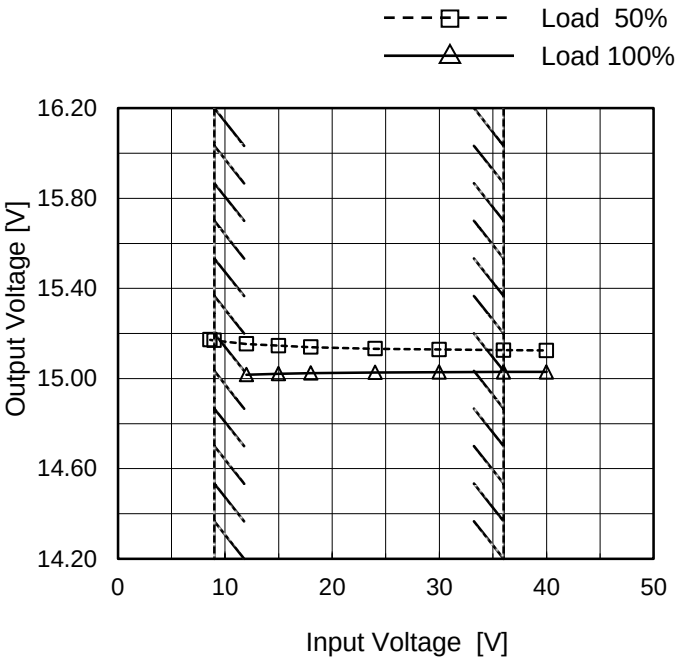
※ Maximum output current at minimum input Voltage is 80% of rated load current. Refer to instruction manuals for details of input derating.

COSEL

Model	MGFW32415
Item	Line Regulation
Object	+15V0.1A

Temperature 25°C
Testing Circuitry Figure A

1.Graph



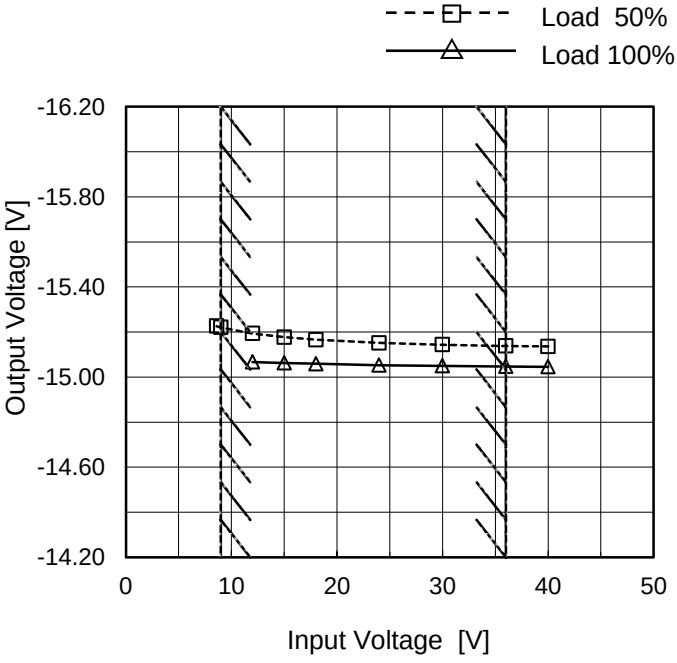
2.Values

Input Voltage [V]	Output Voltage [V]	
	Load 50%	Load 100%
8.6	15.172	- ※
9.0	15.169	- ※
12.0	15.154	15.017
15.0	15.146	15.022
18.0	15.139	15.024
24.0	15.133	15.027
30.0	15.129	15.028
36.0	15.126	15.029
40.0	15.125	15.029

-15V: Rated Load Current

Object	-15V0.1A

1.Graph



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

2.Values

Input Voltage [V]	Output Voltage [V]	
	Load 50%	Load 100%
8.6	-15.226	- ※
9.0	-15.220	- ※
12.0	-15.194	-15.067
15.0	-15.177	-15.063
18.0	-15.166	-15.059
24.0	-15.152	-15.053
30.0	-15.144	-15.050
36.0	-15.138	-15.047
40.0	-15.136	-15.046

+15V: Rated Load Current

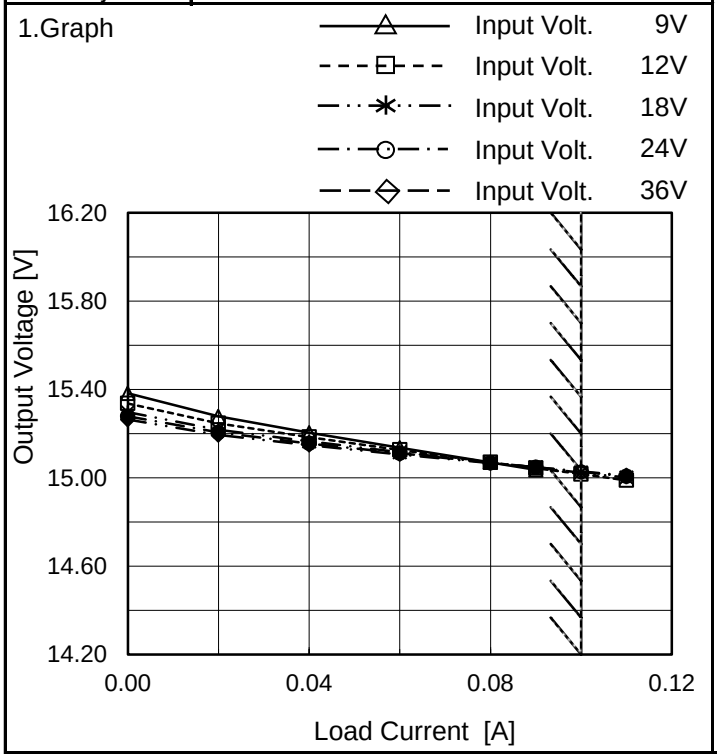
※ Maximum output current at minimum input Voltage is 80% of rated load current. Refer to instruction manuals for details of input derating.

COSEL

Model	MGFW32415
Item	Load Regulation
Object	+15V0.1A

Temperature 25°C
Testing Circuitry Figure A

1.Graph



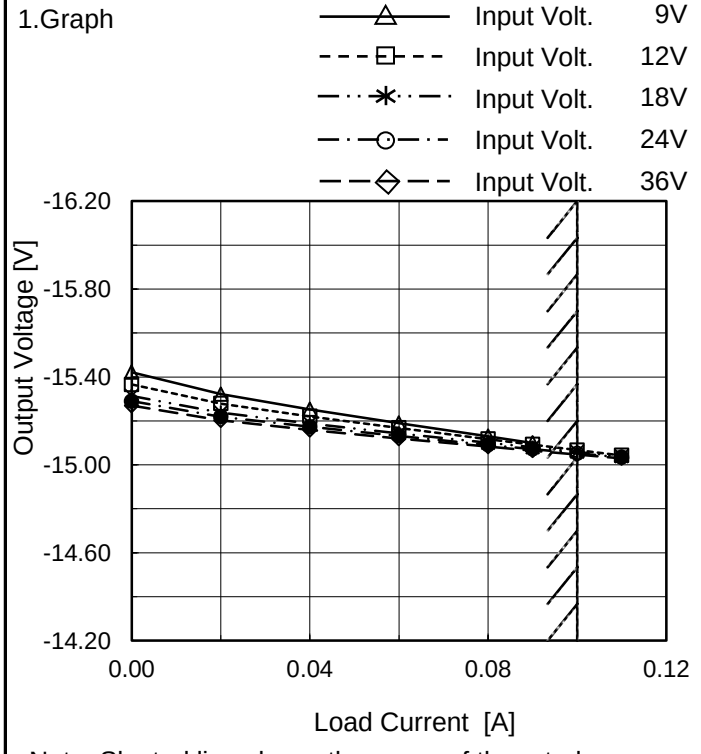
2.Values

Load Current [A]	Output Voltage [V]				
	Input Volt. 9[V]	Input Volt. 12[V]	Input Volt. 18[V]	Input Volt. 24[V]	Input Volt. 36[V]
0.00	15.383	15.337	15.297	15.279	15.264
0.02	15.278	15.247	15.218	15.206	15.194
0.04	15.204	15.184	15.165	15.156	15.148
0.06	15.136	15.126	15.116	15.111	15.106
0.08	15.070	15.070	15.069	15.068	15.067
0.09	15.036	15.044	15.047	15.048	15.048
0.10	- ※	15.017	15.024	15.027	15.029
0.11	- ※	14.989	15.001	15.006	15.010
--	-	-	-	-	-
--	-	-	-	-	-
--	-	-	-	-	-

-15V: Rated Load Current

Object	-15V0.1A

1.Graph



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

2.Values

Load Current [A]	Output Voltage [V]				
	Input Volt. 9[V]	Input Volt. 12[V]	Input Volt. 18[V]	Input Volt. 24[V]	Input Volt. 36[V]
0.00	-15.422	-15.365	-15.314	-15.290	-15.270
0.02	-15.322	-15.279	-15.238	-15.219	-15.202
0.04	-15.253	-15.221	-15.189	-15.173	-15.159
0.06	-15.190	-15.168	-15.144	-15.132	-15.120
0.08	-15.130	-15.117	-15.101	-15.091	-15.083
0.09	-15.099	-15.092	-15.080	-15.072	-15.065
0.10	- ※	-15.067	-15.059	-15.053	-15.047
0.11	- ※	-15.043	-15.038	-15.034	-15.030
--	-	-	-	-	-
--	-	-	-	-	-
--	-	-	-	-	-

+15V: Rated Load Current

※ Maximum output current at minimum input Voltage is 80% of rated load current. Refer to instruction manuals for details of input derating.

BC-11007

COSEL

Model	MGFW32415
Item	Dynamic Load Response
Object	+15V0.1A

Temperature 25°C
Testing Circuitry Figure A

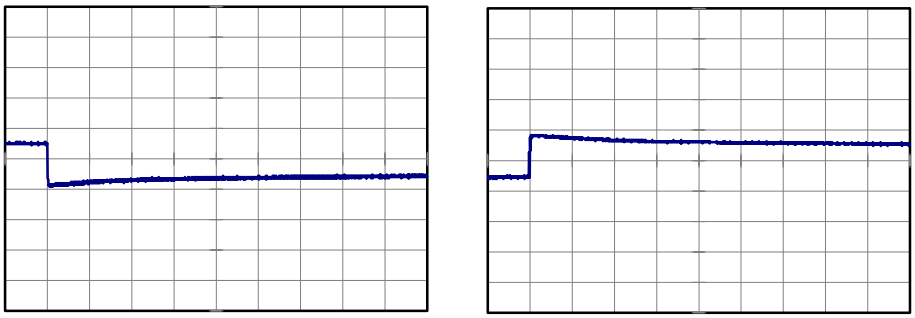
Input Volt. 24 V
-15V:rated load current.
Cycle 100 ms

t1,t2 = 100 μs

Load Current

t1 t2

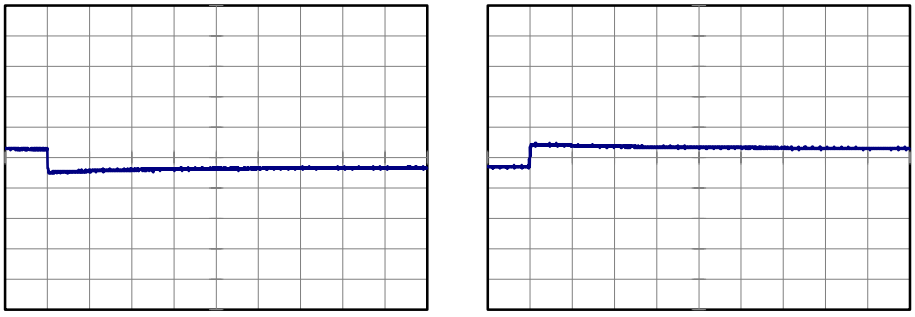
Min.Load (0A)←→
Load 100% (0.1A)



200 mV/div

4 ms/div 4 ms/div

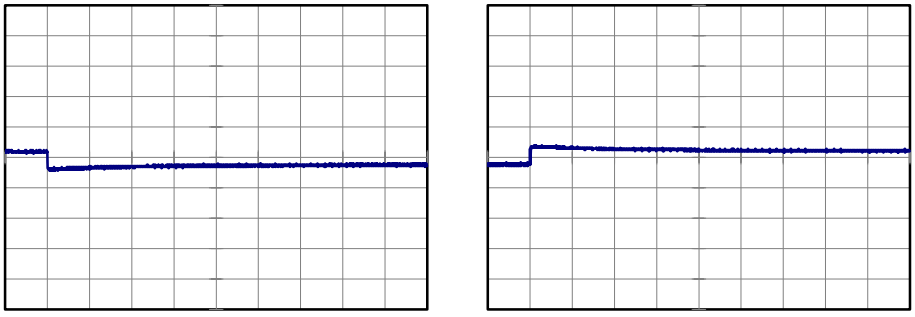
Min.Load (0A)←→
Load 50% (0.05A)



200 mV/div

4 ms/div 4 ms/div

Load 50% (0.05A)←→
Load 100% (0.1A)



200 mV/div

4 ms/div 4 ms/div

COSEL

Model	MGFW32415	
Item	Dynamic Load Response	Temperature 25°C Testing Circuitry Figure A
Object	-15V0.1A	

Input Volt. 24 V

+15V:rated load current.

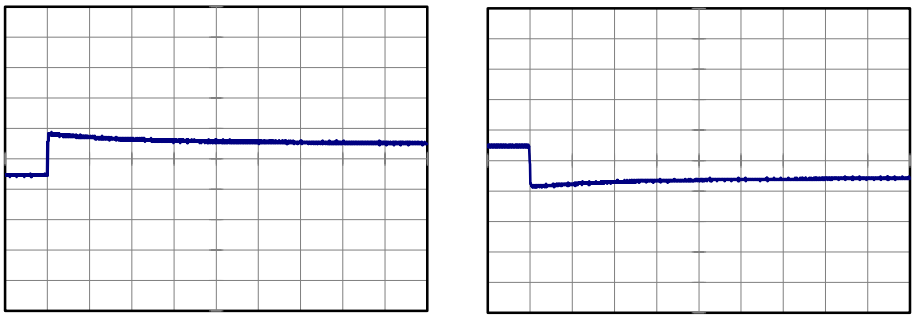
Cycle 100 ms

t1,t2 = 100 μ s

Load Current

t1 t2

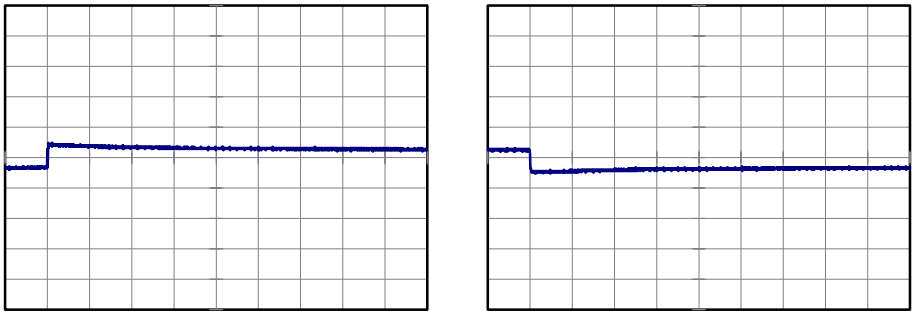
Min.Load (0A)←→
Load 100% (0.1A)



200 mV/div

4 ms/div 4 ms/div

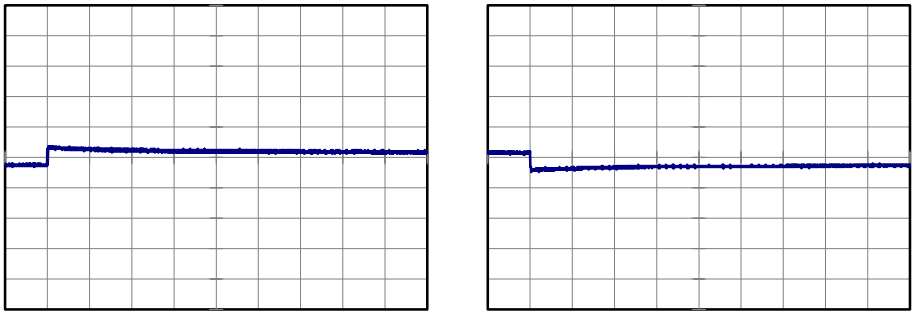
Min.Load (0A)←→
Load 50% (0.05A)



200 mV/div

4 ms/div 4 ms/div

Load 50% (0.05A)←→
Load 100% (0.1A)



200 mV/div

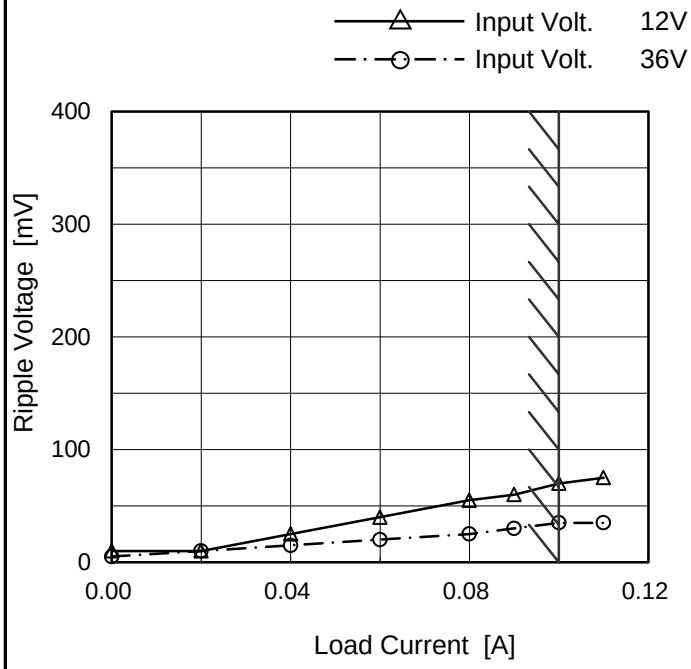
4 ms/div 4 ms/div

COSEL

Model	MGFW32415
Item	Ripple Voltage (by Load Current)
Object	+15V0.1A

Temperature 25°C
Testing Circuitry Figure B

1.Graph



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

Ripple [mVp-p]

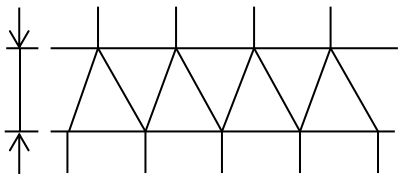


Fig.Complex Ripple Wave Form

2.Values

Load Current [A]	Ripple Voltage [mV]	
	Input Volt. 12 [V]	Input Volt. 36 [V]
0.00	10	5
0.02	10	10
0.04	25	15
0.06	40	20
0.08	55	25
0.09	60	30
0.10	70	35
0.11	75	35
--	-	-
--	-	-
--	-	-

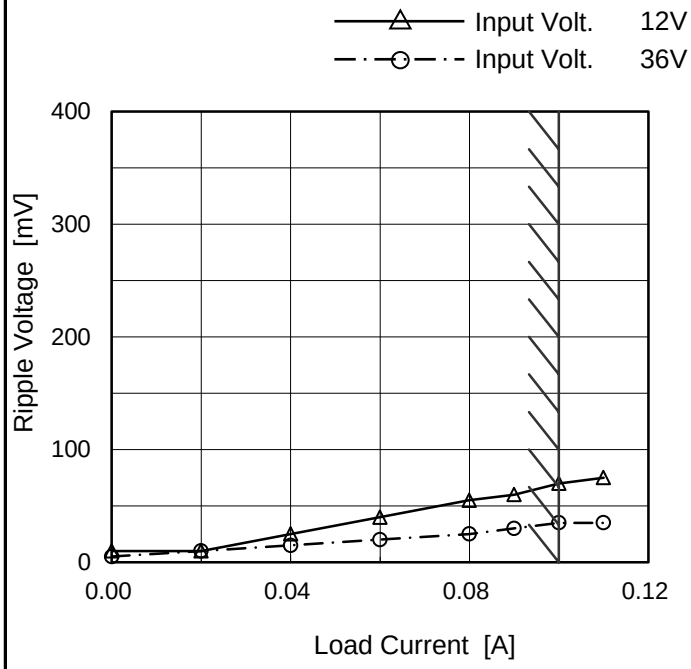
-15V: Rated Load Current

COSEL

Model	MGFW32415
Item	Ripple Voltage (by Load Current)
Object	-15V0.1A

Temperature 25°C
Testing Circuitry Figure B

1.Graph



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

Ripple [mVp-p]

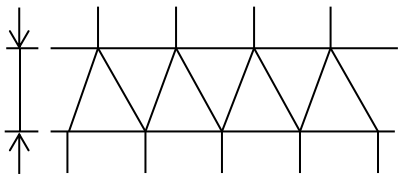


Fig.Complex Ripple Wave Form

2.Values

Load Current [A]	Ripple Voltage [mV]	
	Input Volt. 12 [V]	Input Volt. 36 [V]
0.00	10	5
0.02	10	10
0.04	25	15
0.06	40	20
0.08	55	25
0.09	60	30
0.10	70	35
0.11	75	35
--	-	-
--	-	-
--	-	-

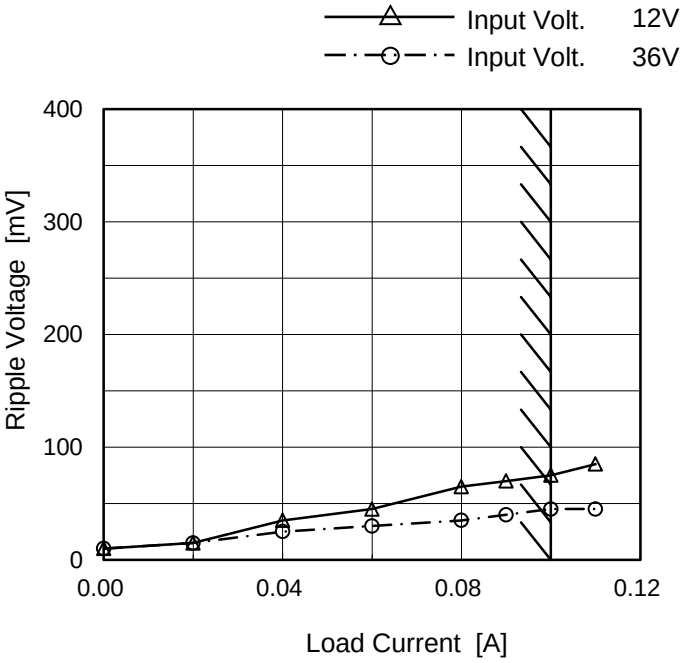
+15V: Rated Load Current

COSEL

Model	MGFW32415
Item	Ripple-Noise
Object	+15V0.1A

Temperature 25°C
Testing Circuitry Figure B

1.Graph



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]

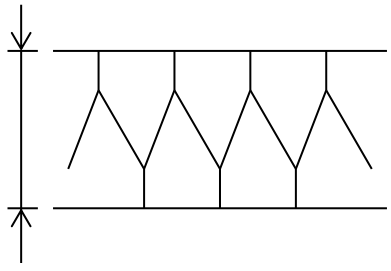


Fig.Complex Ripple Noise Wave Form

2.Values

Load Current [A]	Ripple-Noise [mV]	
	Input Volt. 12 [V]	Input Volt. 36 [V]
0.00	10	10
0.02	15	15
0.04	35	25
0.06	45	30
0.08	65	35
0.09	70	40
0.10	75	45
0.11	85	45
--	-	-
--	-	-
--	-	-

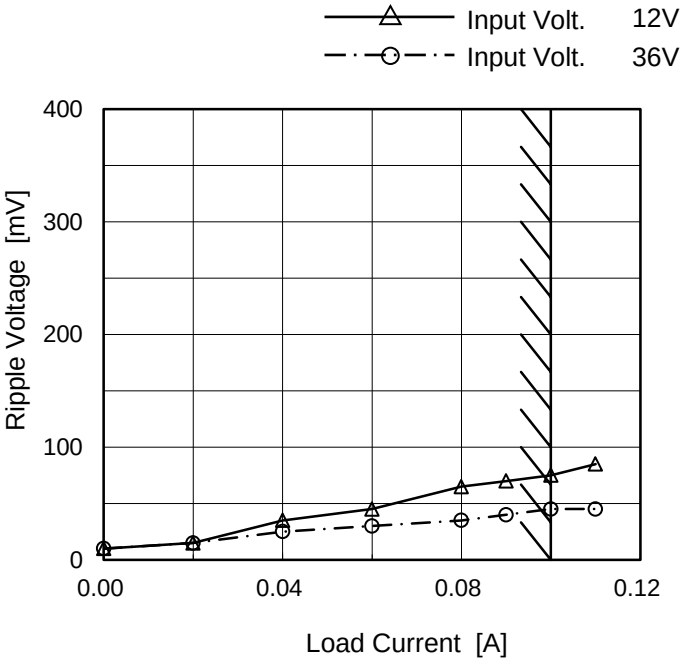
-15V: Rated Load Current

COSEL

Model	MGFW32415
Item	Ripple-Noise
Object	-15V0.1A

Temperature 25°C
Testing Circuitry Figure B

1.Graph



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]

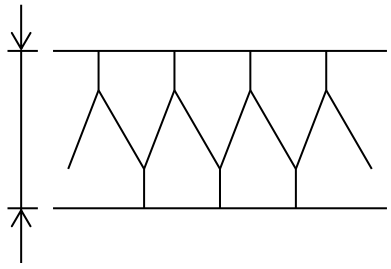


Fig.Complex Ripple Noise Wave Form

2.Values

Load Current [A]	Ripple-Noise [mV]	
	Input Volt. 12 [V]	Input Volt. 36 [V]
0.00	10	10
0.02	15	15
0.04	35	25
0.06	45	30
0.08	65	35
0.09	70	40
0.10	75	45
0.11	85	45
--	-	-
--	-	-
--	-	-

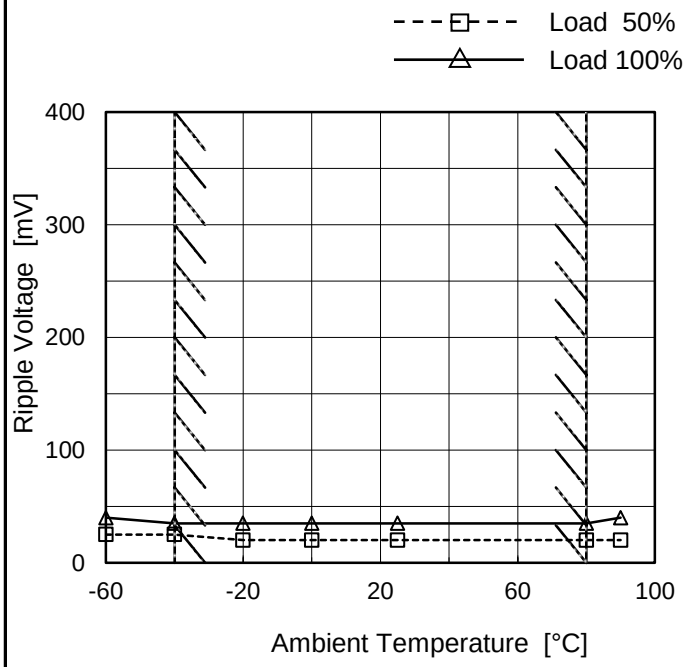
+15V: Rated Load Current

COSEL

Model	MGFW32415
Item	Ripple Voltage (by Ambient Temp.)
Object	+15V0.1A

Testing Circuitry Figure B

1.Graph



Input Volt. 24V

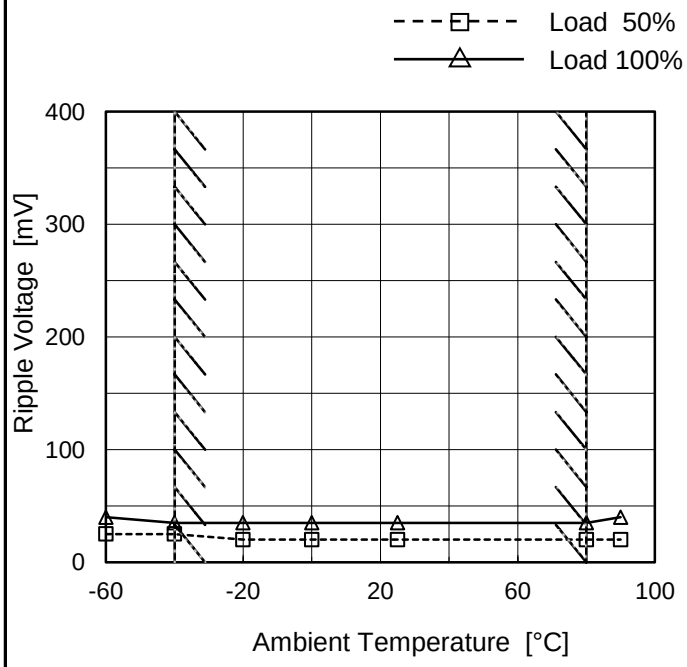
2.Values

Ambient Temperature [°C]	Ripple Voltage [mV]	
	Load 50%	Load 100%
-60	25	40
-40	25	35
-20	20	35
0	20	35
25	20	35
80	20	35
90	20	40
--	-	-
--	-	-
--	-	-
--	-	-

-15V: Rated Load Current

Object	-15V0.1A

1.Graph



Input Volt. 24V

Measured by 100 MHz Oscilloscope.

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

2.Values

Ambient Temperature [°C]	Ripple Voltage [mV]	
	Load 50%	Load 100%
-60	25	40
-40	25	35
-20	20	35
0	20	35
25	20	35
80	20	35
90	20	40
--	-	-
--	-	-
--	-	-
--	-	-

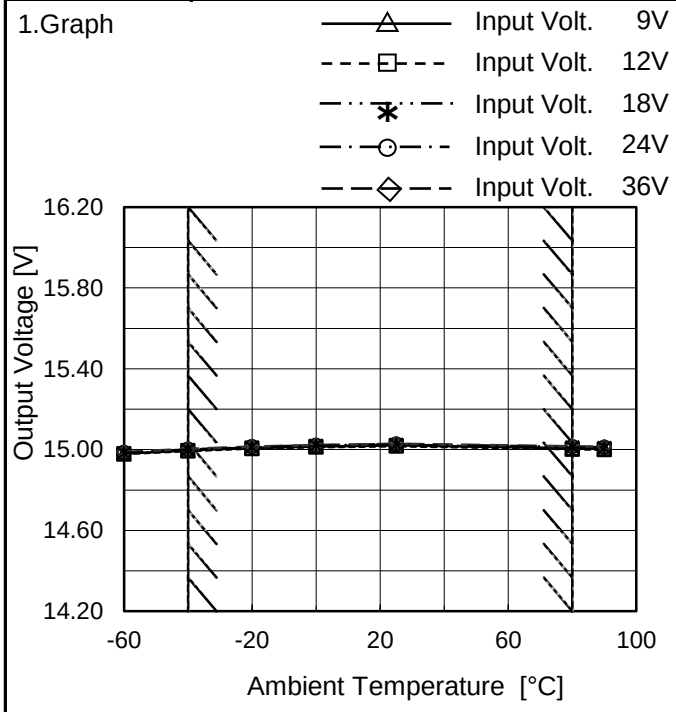
+15V: Rated Load Current

COSEL

Model	MGFW32415
Item	Ambient Temperature Drift
Object	+15V0.1A

Testing Circuitry Figure A

1.Graph



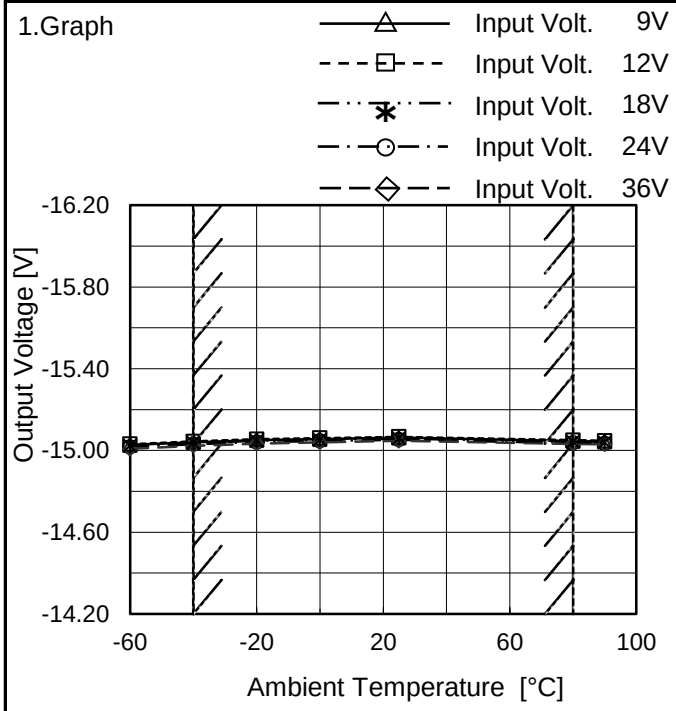
2.Values

Ambient Temperature [°C]	Output Voltage [V] Input Volt. 9[V]	Input Volt. 12[V]	Input Volt. 18[V]	Input Volt. 24[V]	Input Volt. 36[V]
-60	14.980	14.978	14.983	14.985	14.988
-40	14.995	14.993	14.998	15.001	15.003
-20	15.008	15.005	15.011	15.014	15.016
0	15.015	15.012	15.018	15.021	15.023
25	15.021	15.017	15.024	15.027	15.029
80	15.006	15.002	15.010	15.014	15.016
90	15.004	14.999	15.008	15.011	15.014
--	-	-	-	-	-
--	-	-	-	-	-
--	-	-	-	-	-
--	-	-	-	-	-

-15V: Rated Load Current

Object	-15V0.1A

1.Graph



2.Values

Ambient Temperature [°C]	Output Voltage [V] Input Volt. 9[V]	Input Volt. 12[V]	Input Volt. 18[V]	Input Volt. 24[V]	Input Volt. 36[V]
-60	-15.027	-15.030	-15.024	-15.018	-15.008
-40	-15.040	-15.044	-15.037	-15.031	-15.023
-20	-15.051	-15.055	-15.047	-15.041	-15.034
0	-15.056	-15.060	-15.052	-15.047	-15.040
25	-15.063	-15.067	-15.059	-15.053	-15.047
80	-15.046	-15.050	-15.042	-15.037	-15.032
90	-15.044	-15.048	-15.039	-15.035	-15.030
--	-	-	-	-	-
--	-	-	-	-	-
--	-	-	-	-	-
--	-	-	-	-	-

+15V: Rated Load Current

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

Note: In case of Input Volt. 9V, Load 80%. Other case Load 100%.

Model	MGFW32415	
Item	Output Voltage Accuracy	Testing Circuitry Figure A

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 - 80°C
Input Voltage : 12 - 36V
Load Current (AVR 1) : 0 - 0.1A (AVR 2) : 0 - 0.1A

* Output Voltage Accuracy = ±(Maximum of Output Voltage - Minimum of Output Voltage) / 2

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

2.Values

Object	+15V0.1A					
Item	Temperature [°C]	Input Voltage[V]	Output		Output Voltage Accuracy	
			Current[A]	Voltage[V]	Value [mV]	Ratio [%]
Maximum Voltage	80	12	0	15.339	±312	±2.1
Minimum Voltage	80	12	0.1	14.715		

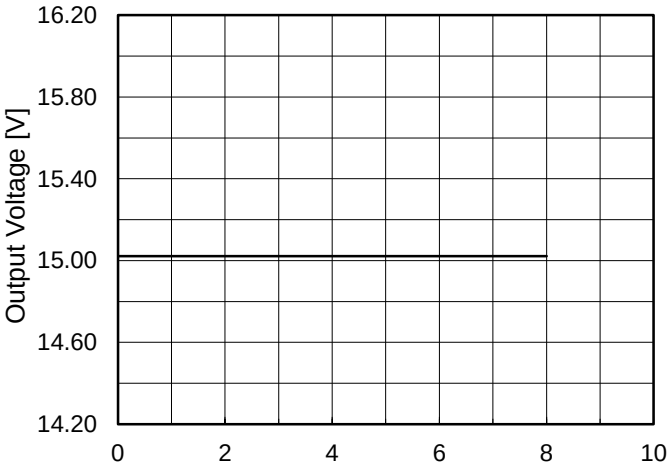
Object	-15V0.1A					
Item	Temperature [°C]	Input Voltage[V]	Output		Output Voltage Accuracy	
			Current[A]	Voltage[V]	Value [mV]	Ratio [%]
Maximum Voltage	80	12	0	-15.364	±312	±2.1
Minimum Voltage	80	12	0.1	-14.741		

COSEL

Model	MGFW32415
Item	Time Lapse Drift
Object	+15V0.1A

Temperature 25°C
Testing Circuitry Figure A

1.Graph



Input Volt. 24V
Load 100%

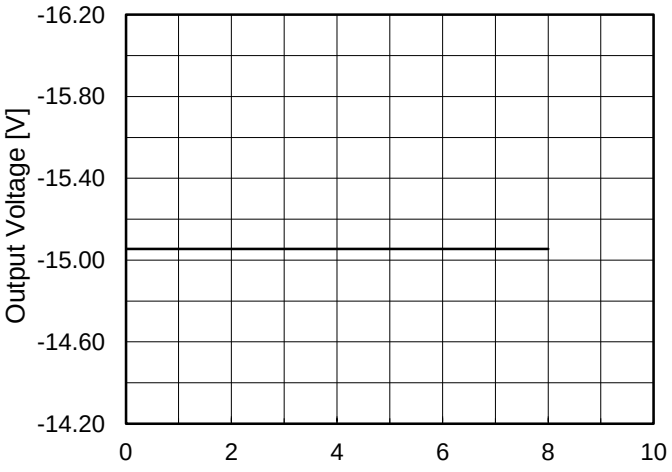
2.Values

Time since start [H]	Output Voltage [V]
0.0	15.023
0.5	15.022
1.0	15.022
2.0	15.022
3.0	15.022
4.0	15.022
5.0	15.021
6.0	15.022
7.0	15.022
8.0	15.022

-15V: Rated Load Current

Object	-15V0.1A

1.Graph



Input Volt. 24V
Load 100%

2.Values

Time since start [H]	Output Voltage [V]
0.0	-15.055
0.5	-15.054
1.0	-15.055
2.0	-15.055
3.0	-15.055
4.0	-15.055
5.0	-15.055
6.0	-15.055
7.0	-15.055
8.0	-15.055

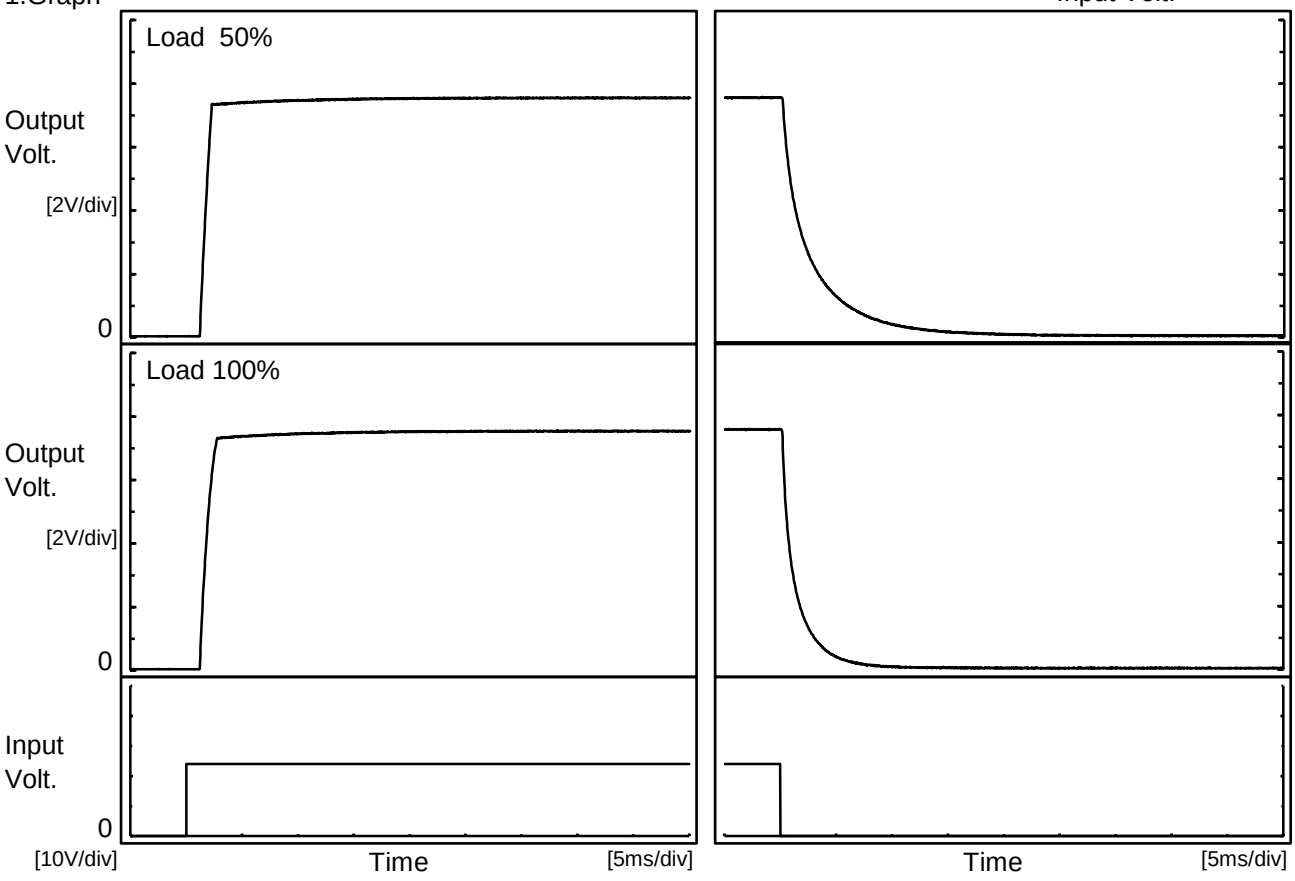
+15V: Rated Load Current

COSEL

Model	MGFW32415	
Item	Rise and Fall Time	Temperature 25°C Testing Circuitry Figure A
Object	+15V0.1A	

1.Graph

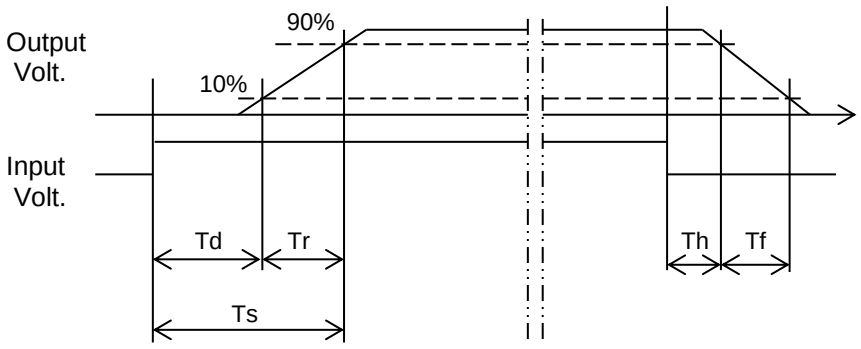
Input Volt. 24 V



2.Values

[ms]

Load \ Time	Td	Tr	Ts	Th	Tf
50 %	1.3	0.9	2.2	0.3	6.7
100 %	1.3	1.2	2.5	0.2	3.3

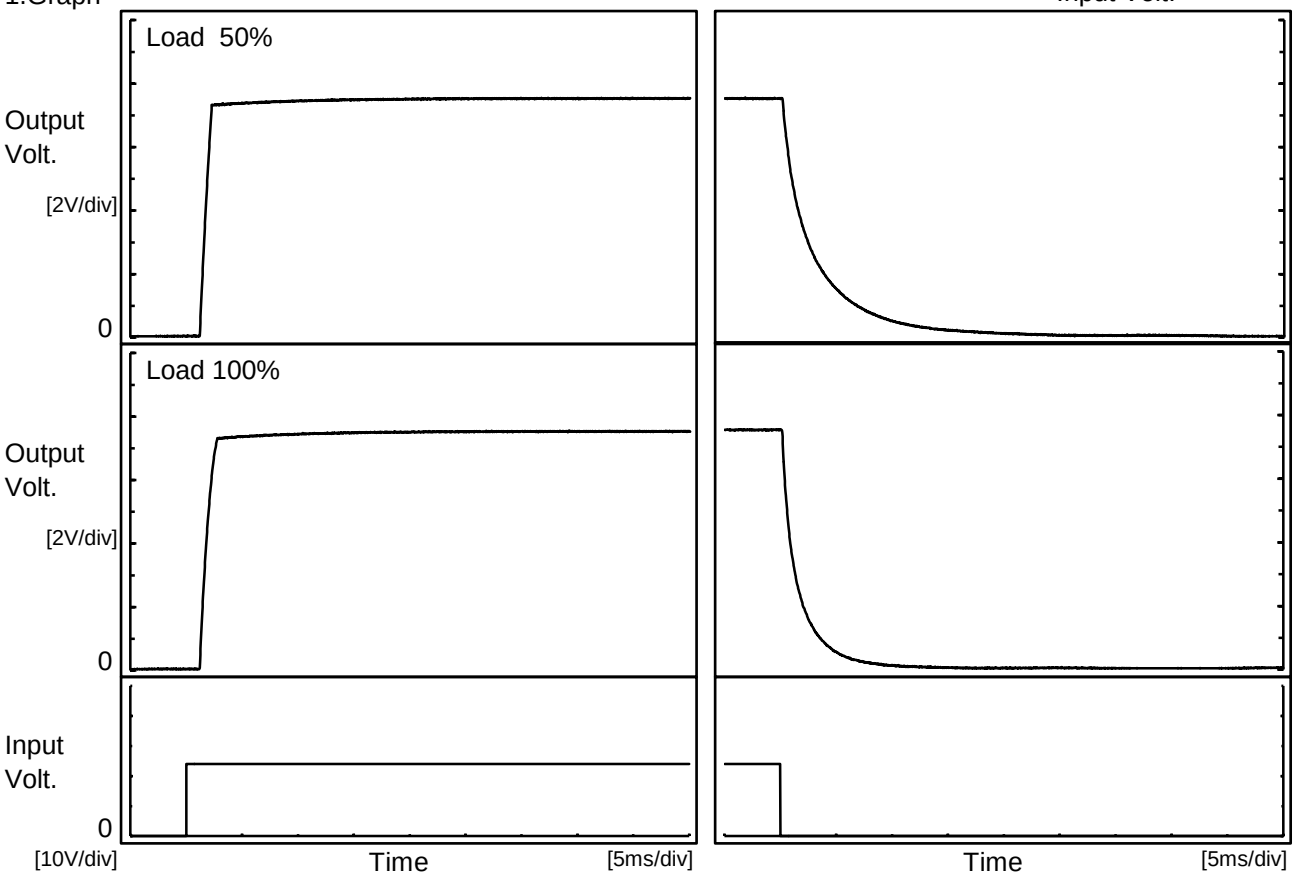


COSEL

Model	MGFW32415	
Item	Rise and Fall Time	Temperature 25°C Testing Circuitry Figure A
Object	-15V0.1A	

1.Graph

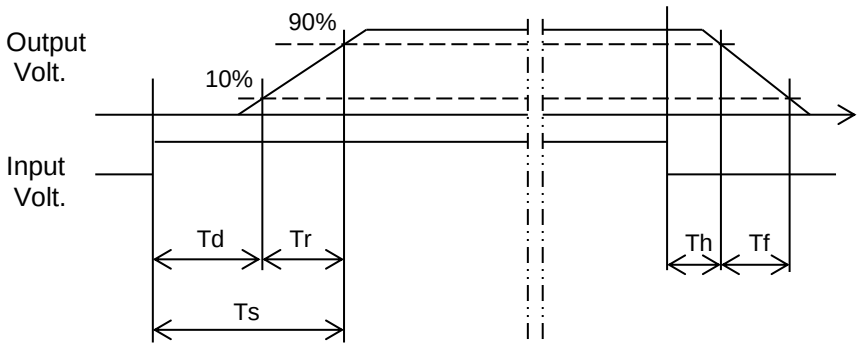
Input Volt. 24 V



2.Values

[ms]

Load \ Time	Td	Tr	Ts	Th	Tf
50 %	1.3	0.9	2.2	0.4	7.6
100 %	1.3	1.2	2.5	0.3	3.8



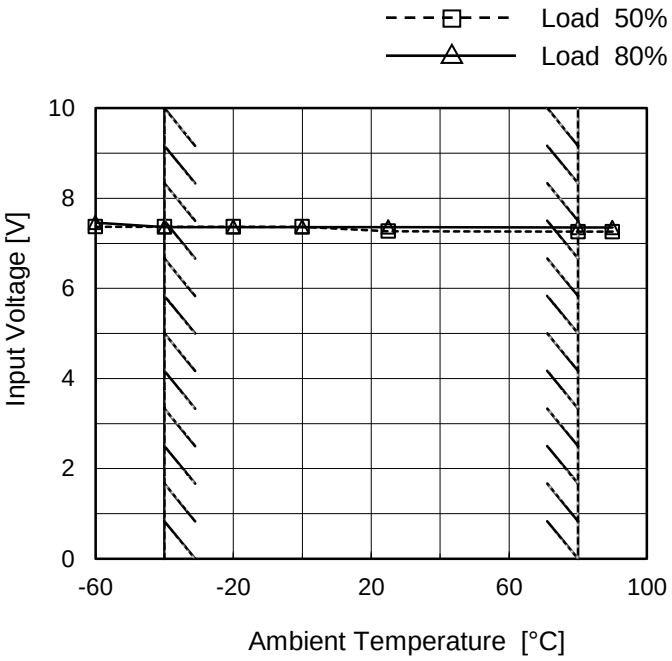
COSEL

Model	MGFW32415
Item	Minimum Input Voltage for Regulated Output Voltage

Testing Circuitry Figure A

Object +15V0.1A

1.Graph

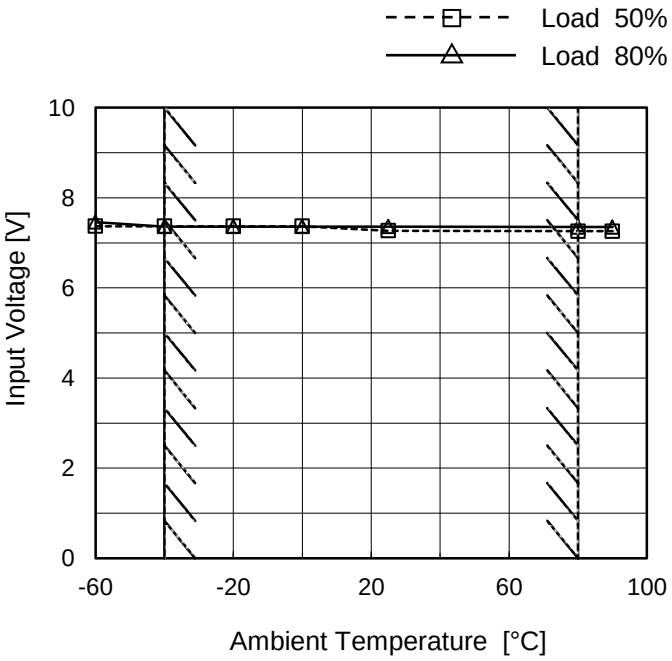


2.Values

Ambient Temperature [°C]	Input Voltage [V]	
	Load 50%	Load 80%
-60	7.4	7.5
-40	7.4	7.4
-20	7.4	7.4
0	7.4	7.4
25	7.3	7.4
80	7.3	7.4
90	7.3	7.4
--	-	-
--	-	-
--	-	-
--	-	-

Object -15V0.1A

1.Graph



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

2.Values

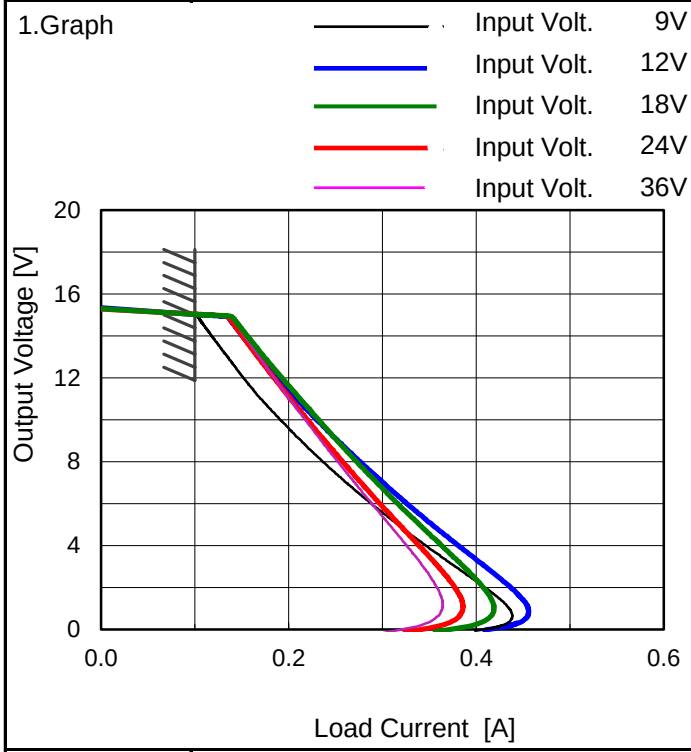
Ambient Temperature [°C]	Input Voltage [V]	
	Load 50%	Load 80%
-60	7.4	7.5
-40	7.4	7.4
-20	7.4	7.4
0	7.4	7.4
25	7.3	7.4
80	7.3	7.4
90	7.3	7.4
--	-	-
--	-	-
--	-	-
--	-	-

COSEL

Model	MGFW32415
Item	Overcurrent Protection
Object	+15V0.1A

Temperature 25°C
Testing Circuitry Figure A

1.Graph



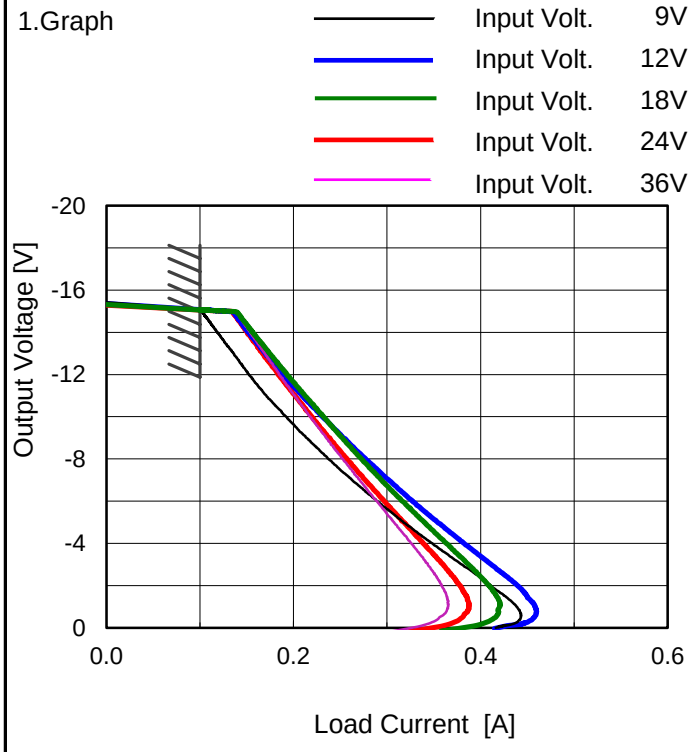
2.Values

Output Voltage [V]	Load Current [A]				
	Input Volt. 9[V]	Input Volt. 12[V]	Input Volt. 18[V]	Input Volt. 24[V]	Input Volt. 36[V]
14.3	0.114	0.146	0.151	0.147	0.149
13.5	0.126	0.159	0.165	0.159	0.160
12.0	0.151	0.188	0.193	0.184	0.184
10.5	0.181	0.218	0.221	0.211	0.208
9.0	0.212	0.252	0.252	0.238	0.234
7.5	0.248	0.287	0.283	0.267	0.261
6.0	0.288	0.326	0.316	0.297	0.288
4.5	0.330	0.367	0.351	0.328	0.316
3.0	0.377	0.410	0.386	0.359	0.343
1.5	0.424	0.448	0.415	0.384	0.363
0.0	0.399	0.409	0.356	0.324	0.301
--	-	-	-	-	-

-15V: Rated Load Current

Object	-15V0.1A

1.Graph



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

2.Values

Output Voltage [V]	Load Current [A]				
	Input Volt. 9[V]	Input Volt. 12[V]	Input Volt. 18[V]	Input Volt. 24[V]	Input Volt. 36[V]
-14.3	0.114	0.147	0.152	0.147	0.150
-13.5	0.127	0.160	0.165	0.159	0.161
-12.0	0.152	0.189	0.193	0.184	0.184
-10.5	0.181	0.220	0.222	0.210	0.209
-9.0	0.213	0.253	0.252	0.238	0.234
-7.5	0.249	0.289	0.283	0.266	0.262
-6.0	0.289	0.327	0.315	0.296	0.288
-4.5	0.332	0.367	0.351	0.328	0.316
-3.0	0.380	0.411	0.387	0.360	0.344
-1.5	0.425	0.449	0.417	0.385	0.364
0.0	0.416	0.415	0.358	0.324	0.301
--	-	-	-	-	-

+15V: Rated Load Current

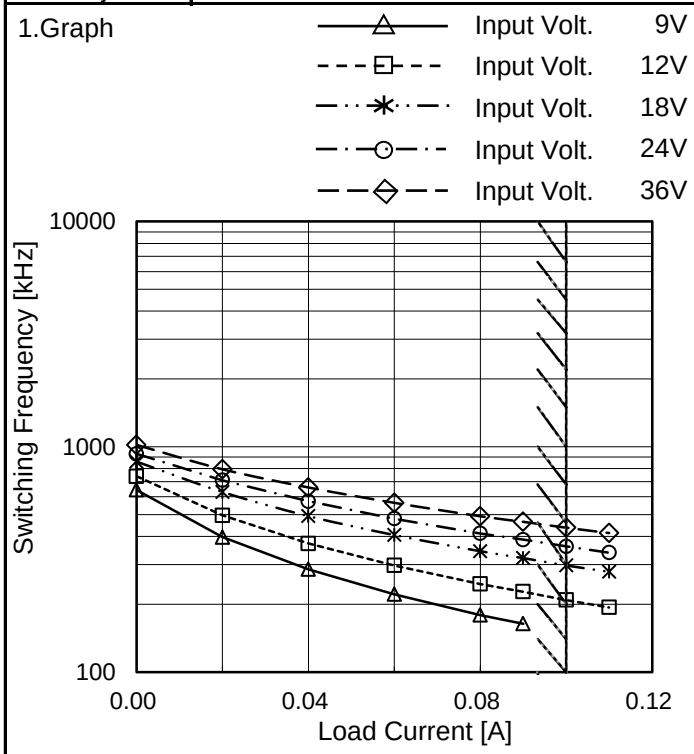
Maximum output current at minimum input Voltage is 80% of rated load current.
Refer to instruction manuals for details of input derating.

COSEL

Model	MGFW32415
Item	Switching frequency (by Load Current)
Object	+/-15V0.1A

Temperature 25°C
Testing Circuitry Figure A

1.Graph



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.

2.Values

Load Current [A]	Input Current [A]				
	Input Volt. 9[V]	Input Volt. 12[V]	Input Volt. 18[V]	Input Volt. 24[V]	Input Volt. 36[V]
0.00	644	740	860	930	1020
0.02	397	496	630	710	795
0.04	286	372	493	573	660
0.06	222	298	406	480	564
0.08	179	246	344	413	492
0.09	164	227	321	387	465
0.10	- ※	209	297	361	437
0.11	- ※	194	279	339	414
--	-	-	-	-	-
--	-	-	-	-	-
--	-	-	-	-	-

※ Maximum output current at minimum input Voltage is 80% of rated load current. Refer to instruction manuals for details of input derating.

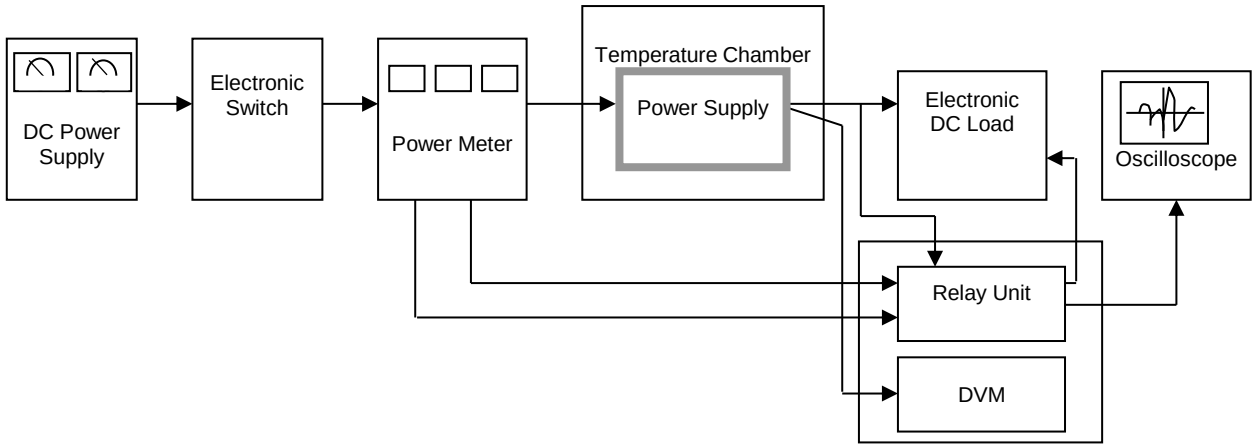


Figure A

Data Acquisition/Control Unit

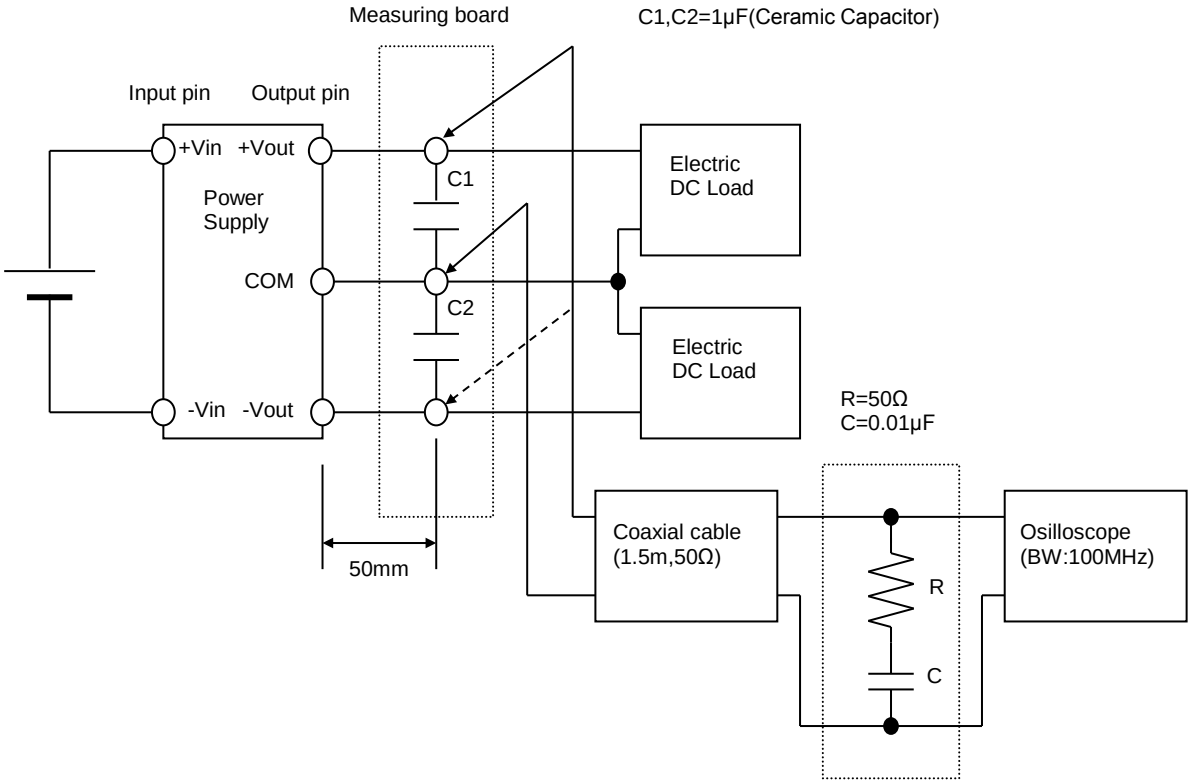


Figure B（Ripple and Ripple noise Characteristic）