COSEL

参考資料

TEST DATA OF MGFW1R52412

Regulated DC Power Supply
December 28, 2016

Approved by : Takayuki Fukuda
Takayuki Fukuda Design Manager

Prepared by : Takaaki Sekiguchi
Takaaki Sekiguchi Design Engineer

COSEL CO.,LTD.

COSEL

CONTENTS

1.Input Current (by Input Voltage) ・・・・・・・・・・・・・・・・・・・・・・・・ 1
2.Input Current (by Load Ratio) ・・・・・・・・・・・・・・・・・・・・・・・・・ 2
3.Input Power (by Load Ratio) ・・・・・・・・・・・・・・・・・・・・・・・・・・ 3
4.Efficiency (by Input Voltage) ・・・・・・・・・・・・・・・・・・・・・・・・・ 4
5.Efficiency (by Load Ratio) ・・・・・・・・・・・・・・・・・・・・・・・・・・・ 5
6.Line Regulation ・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・ 6
7.Load Regulation ・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・ 7
8.Dynamic Load Response ・・・・・・・・・・・・・・・・・・・・・・・・・・・・ 8
9.Ripple Voltage (by Load Current) ・・・・・・・・・・・・・・・・・・・・・・・ 10
10.Ripple-Noise ・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・ 12
11.Ripple Voltage (by Ambient Temperature) ・・・・・・・・・・・・・・・・・・ 14
12.Ambient Temperature Drift ・・・・・・・・・・・・・・・・・・・・・・・・・・ 15
13.Output Voltage Accuracy ・・・・・・・・・・・・・・・・・・・・・・・・・・・ 16
14.Time Lapse Drift ・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・ 17
15.Rise and Fall Time ・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・ 18
16.Minimum Input Voltage for Regulated Output Voltage ・・・・・・・・・・・・ 20
17.Overcurrent Protection ・・・・・・・・・・・・・・・・・・・・・・・・・・・・ 21
18.Switching frequency (by Load Current) ・・・・・・・・・・・・・・・・・・・ 22
19.Figure of Testing Circuitry ・・・・・・・・・・・・・・・・・・・・・・・・・・ 23

(Final Page 23)

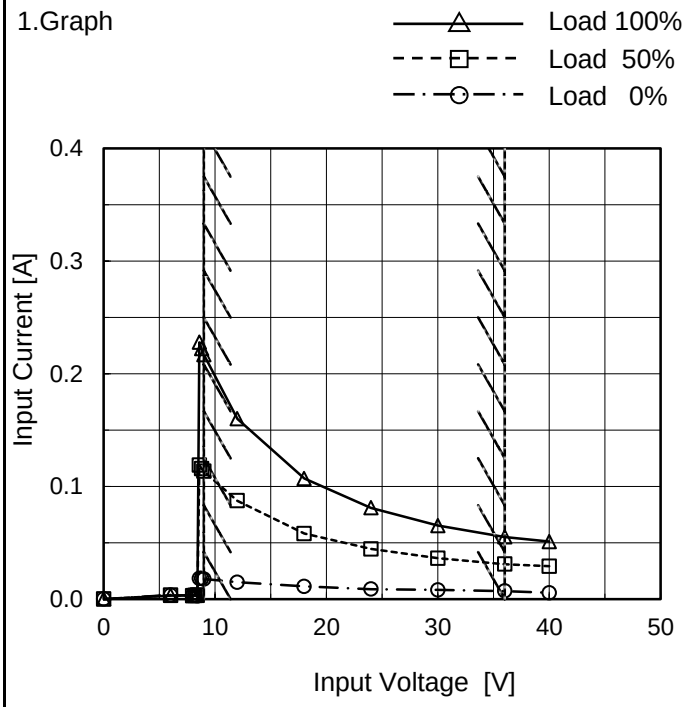
参考資料

COSEL

Model	MGFW1R52412
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	0.004	0.004	0.003
8.0	0.003	0.003	0.003
8.2	0.003	0.003	0.003
8.4	0.003	0.004	0.003
8.6	0.018	0.119	0.228
8.8	0.018	0.116	0.222
9.0	0.018	0.113	0.217
12.0	0.015	0.087	0.160
18.0	0.011	0.058	0.107
24.0	0.009	0.045	0.081
30.0	0.008	0.036	0.065
36.0	0.007	0.031	0.055
40.0	0.006	0.029	0.051
--	-	-	-
--	-	-	-
--	-	-	-
--	-	-	-

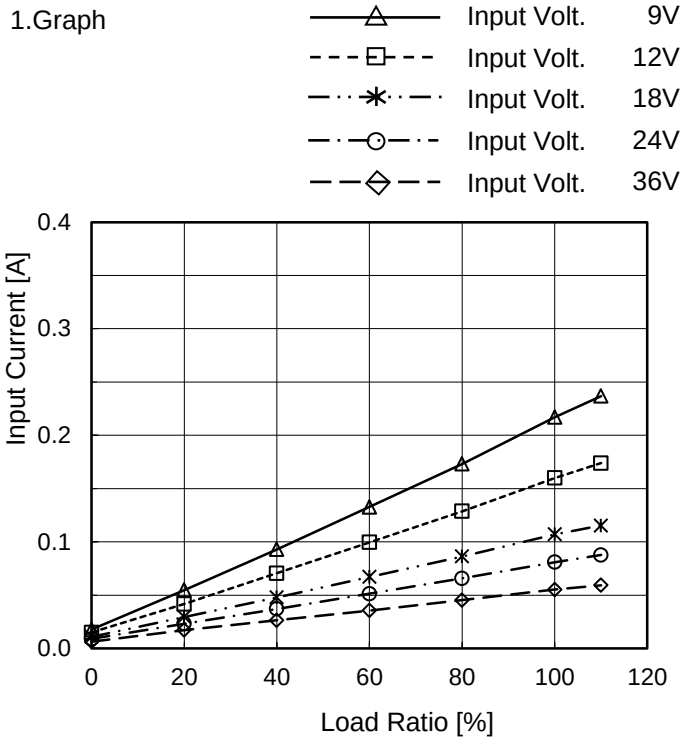
BC-10970

COSEL

Model	MGFW1R52412
Item	Input Current (by Load Ratio)
Object	――――――――

Temperature 25°C
Testing Circuitry Figure A

1.Graph



2.Values

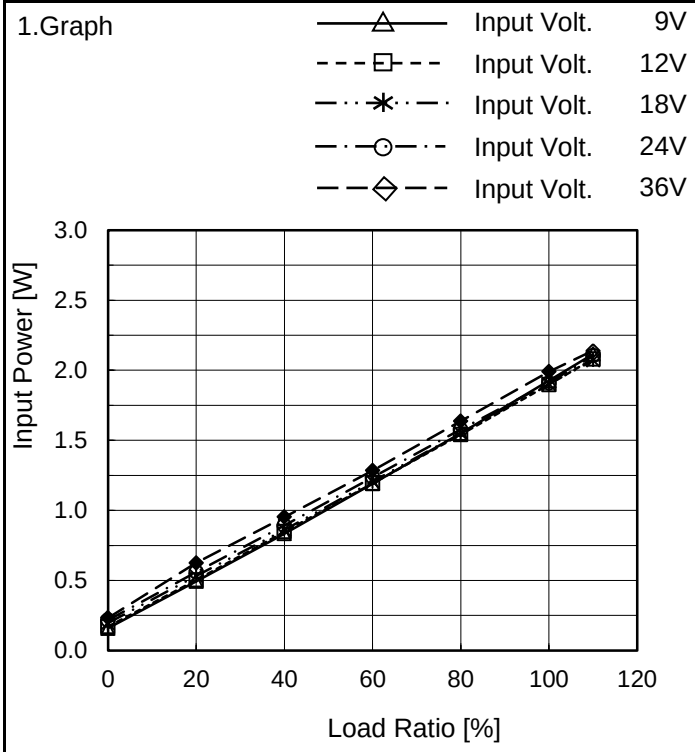
Load Ratio [%]	Input Current [A]				
	Input Volt. 9[V]	Input Volt. 12[V]	Input Volt. 18[V]	Input Volt. 24[V]	Input Volt. 36[V]
0	0.018	0.015	0.011	0.009	0.007
20	0.055	0.042	0.030	0.023	0.017
40	0.093	0.071	0.048	0.037	0.026
60	0.133	0.100	0.067	0.051	0.036
80	0.173	0.129	0.086	0.066	0.045
100	0.217	0.160	0.107	0.081	0.055
110	0.237	0.174	0.115	0.088	0.059
--	-	-	-	-	-
--	-	-	-	-	-
--	-	-	-	-	-
--	-	-	-	-	-

COSEL

Model	MGFW1R52412
Item	Input Power (by Load Ratio)
Object	――――――――

Temperature 25°C
Testing Circuitry Figure A

1.Graph



2.Values

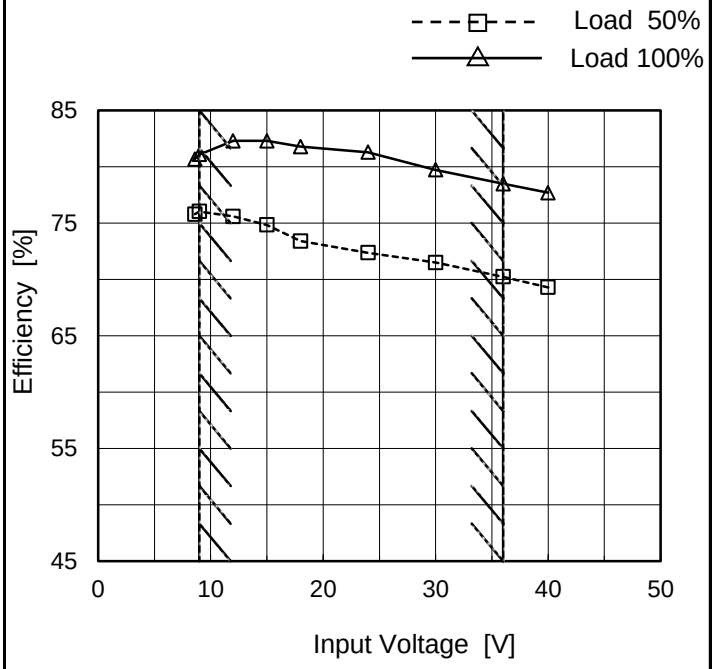
Load Ratio [%]	Input Power [W]				
	Input Volt. 9[V]	Input Volt. 12[V]	Input Volt. 18[V]	Input Volt. 24[V]	Input Volt. 36[V]
0	0.16	0.17	0.20	0.22	0.23
20	0.49	0.50	0.53	0.56	0.62
40	0.83	0.85	0.86	0.89	0.95
60	1.19	1.19	1.21	1.24	1.28
80	1.55	1.54	1.55	1.58	1.64
100	1.92	1.90	1.90	1.91	1.99
110	2.12	2.08	2.07	2.10	2.14
--	-	-	-	-	-
--	-	-	-	-	-
--	-	-	-	-	-
--	-	-	-	-	-

COSEL

Model	MGFW1R52412
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

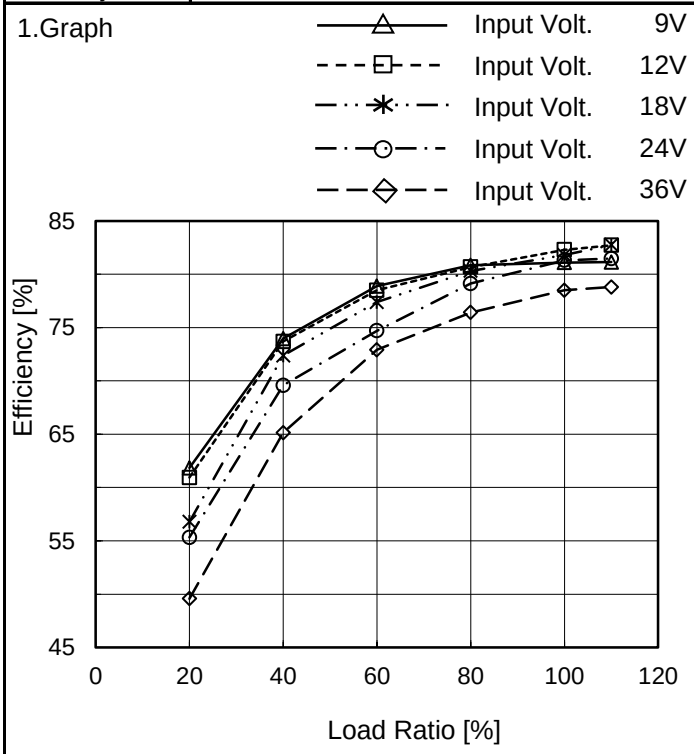
Input Voltage [V]	Efficiency [%]	
	Load 50%	Load 100%
8.6	75.8	80.7
9.0	76.0	81.1
12.0	75.6	82.3
15.0	74.8	82.3
18.0	73.4	81.8
24.0	72.4	81.3
30.0	71.5	79.7
36.0	70.2	78.5
40.0	69.3	77.7

COSEL

Model	MGFW1R52412
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	61.8	60.9	56.8	55.3	49.6
40	74.0	73.7	72.4	69.6	65.1
60	78.9	78.5	77.4	74.7	72.9
80	80.8	80.7	80.3	79.1	76.4
100	81.1	82.3	81.8	81.3	78.5
110	81.1	82.7	82.7	81.5	78.8
--	-	-	-	-	-
--	-	-	-	-	-
--	-	-	-	-	-
--	-	-	-	-	-

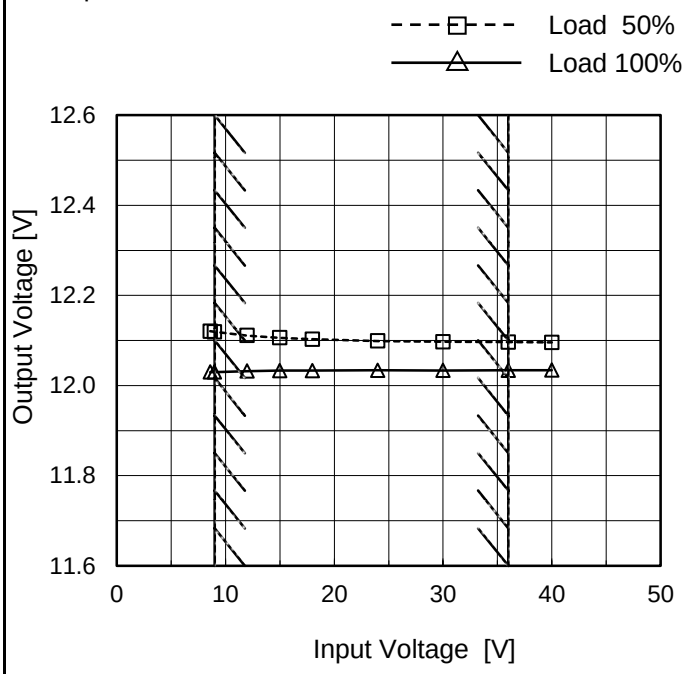
BC-10970

COSEL

Model	MGFW1R52412
Item	Line Regulation
Object	+12V0.065A

Temperature 25°C
Testing Circuitry Figure A

1.Graph



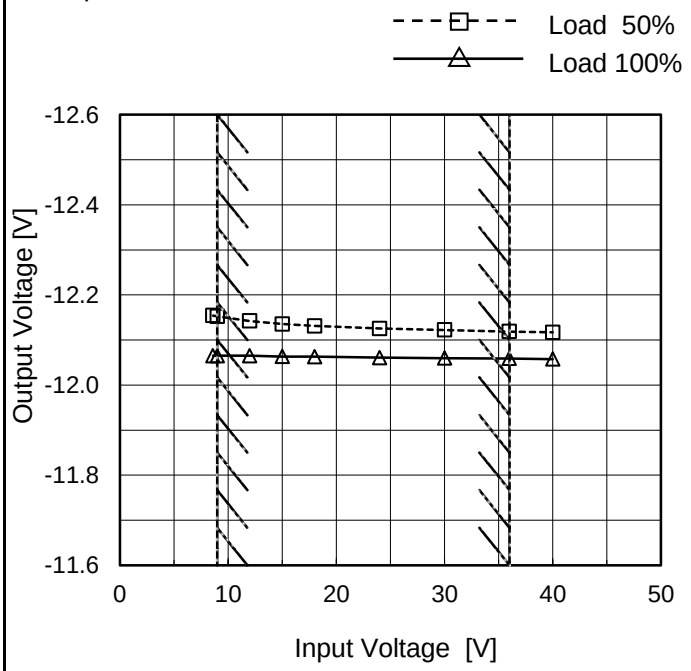
2.Values

Input Voltage [V]	Output Voltage [V]	
	Load 50%	Load 100%
8.6	12.121	12.030
9.0	12.119	12.030
12.0	12.111	12.032
15.0	12.106	12.033
18.0	12.103	12.033
24.0	12.099	12.034
30.0	12.097	12.034
36.0	12.096	12.034
40.0	12.096	12.034

-12V : Rated Load Current

Object	-12V0.065A

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	-12.154	-12.065
9.0	-12.153	-12.065
12.0	-12.142	-12.065
15.0	-12.135	-12.064
18.0	-12.131	-12.063
24.0	-12.126	-12.061
30.0	-12.122	-12.060
36.0	-12.119	-12.059
40.0	-12.117	-12.058

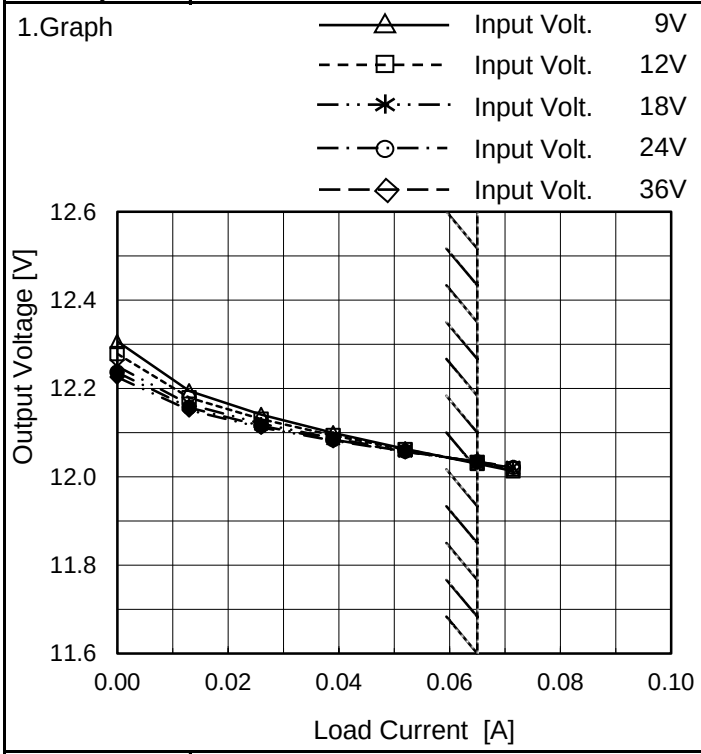
+12V : Rated Load Current

COSEL

Model	MGFW1R52412
Item	Load Regulation
Object	+12V0.065A

Temperature 25°C
Testing Circuitry Figure A

1.Graph



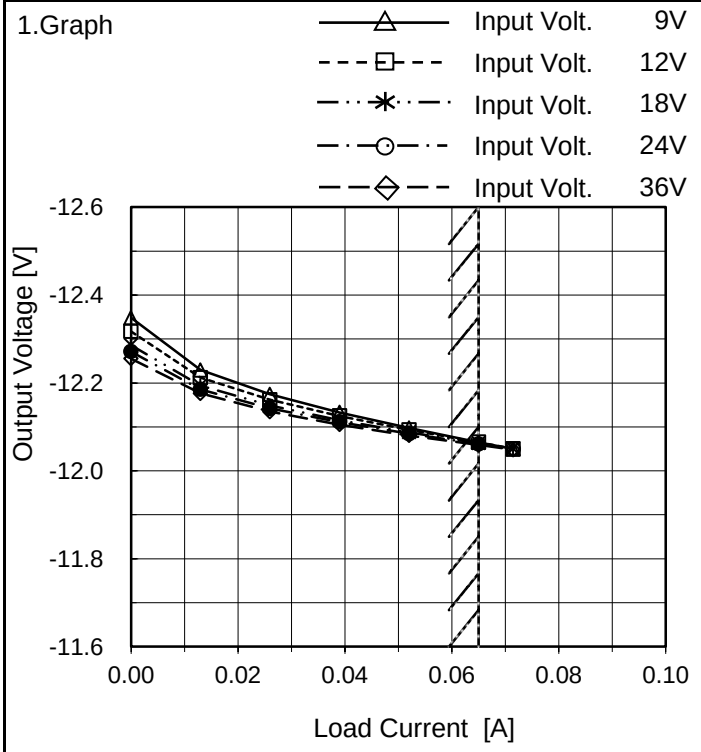
2.Values

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]
0.000	12.307	12.279	12.250	12.237	12.226
0.013	12.195	12.179	12.164	12.157	12.151
0.026	12.141	12.131	12.120	12.115	12.112
0.039	12.099	12.093	12.087	12.084	12.082
0.052	12.063	12.062	12.059	12.058	12.057
0.065	12.030	12.032	12.033	12.034	12.034
0.072	12.013	12.018	12.020	12.021	12.023
--	-	-	-	-	-
--	-	-	-	-	-
--	-	-	-	-	-
--	-	-	-	-	-

-12V : Rated Load Current

Object	-12V0.065A

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]
0.000	-12.348	-12.317	-12.286	-12.271	-12.255
0.013	-12.229	-12.212	-12.194	-12.185	-12.176
0.026	-12.174	-12.162	-12.149	-12.142	-12.135
0.039	-12.133	-12.125	-12.115	-12.111	-12.105
0.052	-12.098	-12.093	-12.088	-12.085	-12.081
0.065	-12.065	-12.065	-12.063	-12.061	-12.059
0.072	-12.049	-12.050	-12.050	-12.050	-12.048
--	-	-	-	-	-
--	-	-	-	-	-
--	-	-	-	-	-
--	-	-	-	-	-

+12V : Rated Load Current

COSEL

Model	MGFW1R52412	Temperature 25°C
Item	Dynamic Load Response	Testing Circuitry Figure A
Object	+12V0.065A	

Input Volt. 24 V

-12V:rated load current.

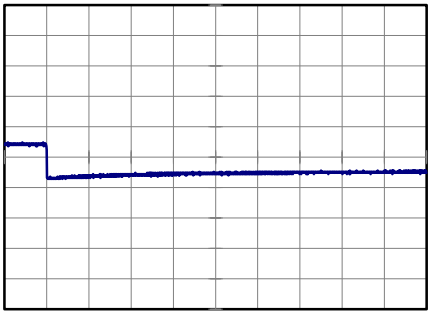
Cycle 100 ms

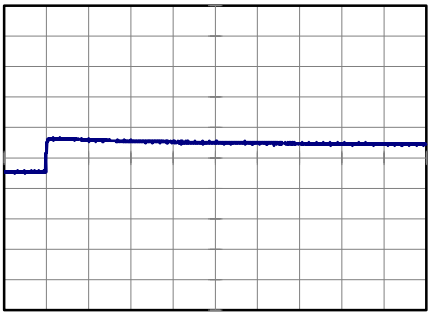
t1,t2 = 100 μs

Load Current

t1 t2

Min.Load (0A)←→
Load 100% (0.065A)

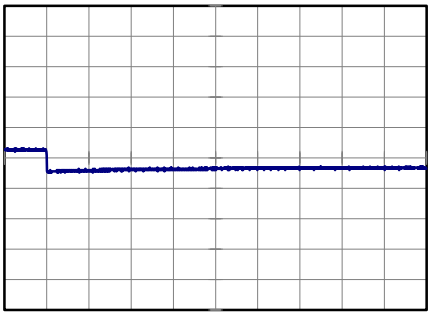


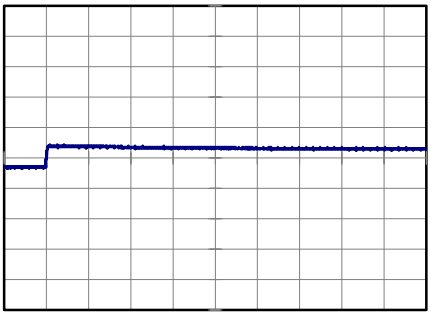


200 mV/div

4 ms/div 4 ms/div

Min.Load (0A)←→
Load 50% (0.0325A)

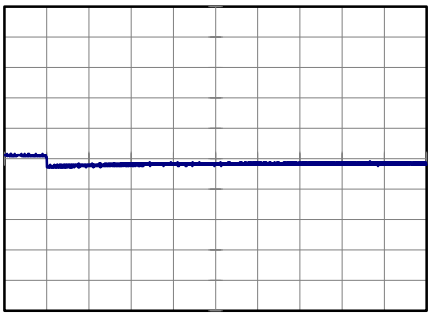


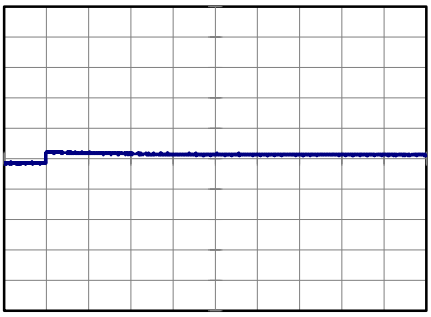


200 mV/div

4 ms/div 4 ms/div

Load 50% (0.0325A)←→
Load 100% (0.065A)





200 mV/div

4 ms/div 4 ms/div

COSEL

Model	MGFW1R52412	
Item	Dynamic Load Response	Temperature 25°C Testing Circuitry Figure A
Object	-12V0.065A	

Input Volt. 24 V

+12V:rated load current.

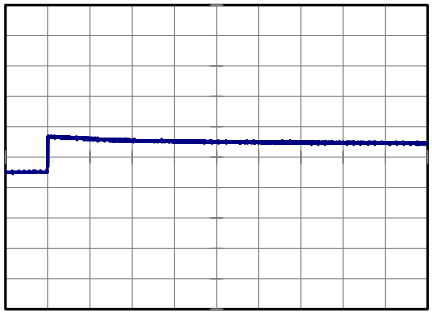
Cycle 100 ms

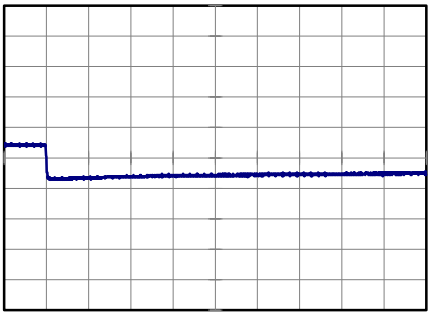
t1,t2 = 100 μs

Load Current

t1 t2

Min.Load (0A)←→
Load 100% (0.065A)

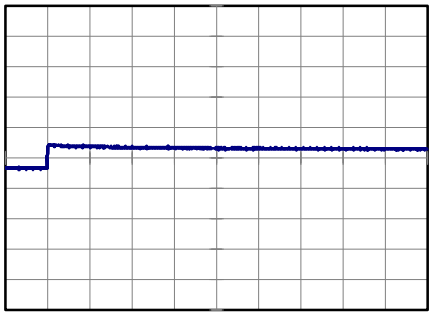


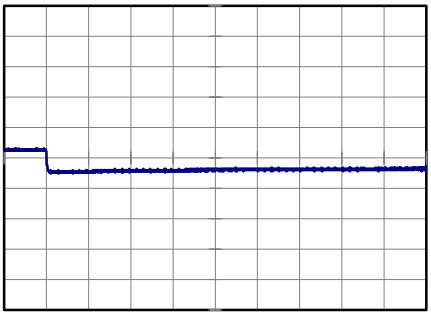


200 mV/div

4 ms/div 4 ms/div

Min.Load (0A)←→
Load 50% (0.0325A)

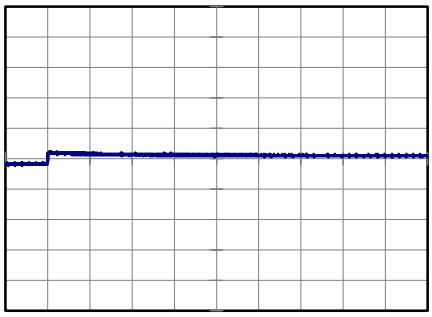


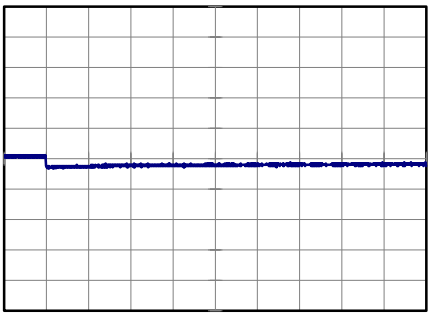


200 mV/div

4 ms/div 4 ms/div

Load 50% (0.0325A)←→
Load 100% (0.065A)





200 mV/div

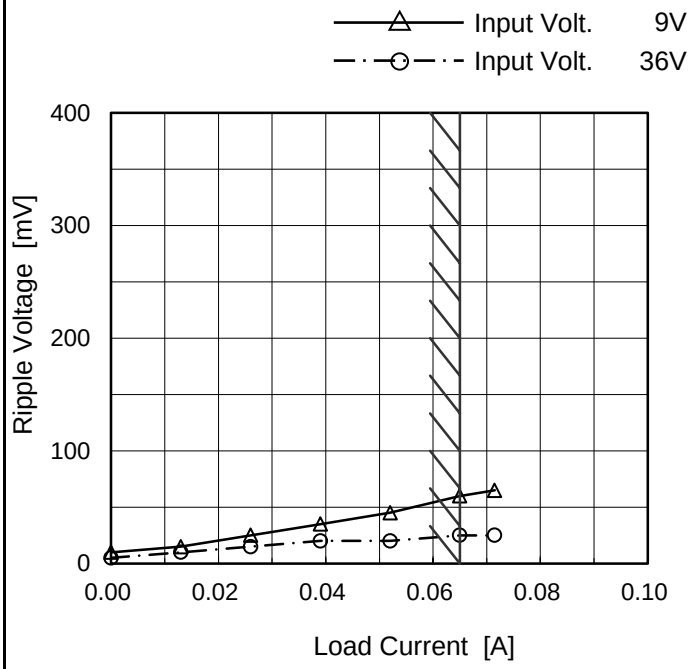
4 ms/div 4 ms/div

COSEL

Model	MGFW1R52412
Item	Ripple Voltage (by Load Current)
Object	+12V0.065A

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]

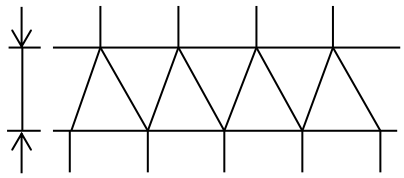


Fig.Complex Ripple Wave Form

2.Values

Load Current [A]	Ripple Voltage [mV]	
	Input Volt. 9 [V]	Input Volt. 36 [V]
0.000	10	5
0.013	15	10
0.026	25	15
0.039	35	20
0.052	45	20
0.065	60	25
0.072	65	25
--	-	-
--	-	-
--	-	-
--	-	-

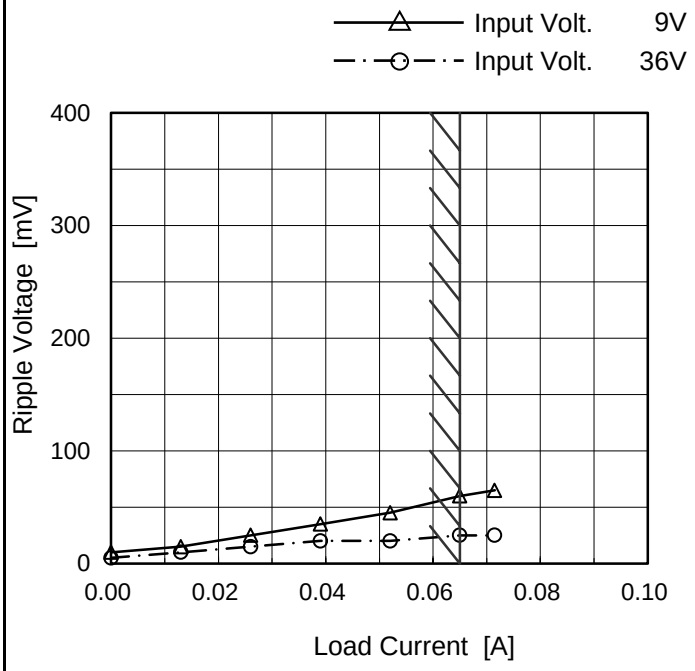
-12V: Rated Load Current

COSEL

Model	MGFW1R52412
Item	Ripple Voltage (by Load Current)
Object	-12V0.065A

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]

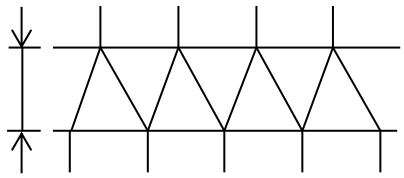


Fig.Complex Ripple Wave Form

2.Values

Load Current [A]	Ripple Voltage [mV]	
	Input Volt. 9 [V]	Input Volt. 36 [V]
0.000	10	5
0.013	15	10
0.026	25	15
0.039	35	20
0.052	45	20
0.065	60	25
0.072	65	25
--	-	-
--	-	-
--	-	-
--	-	-

+12V: Rated Load Current

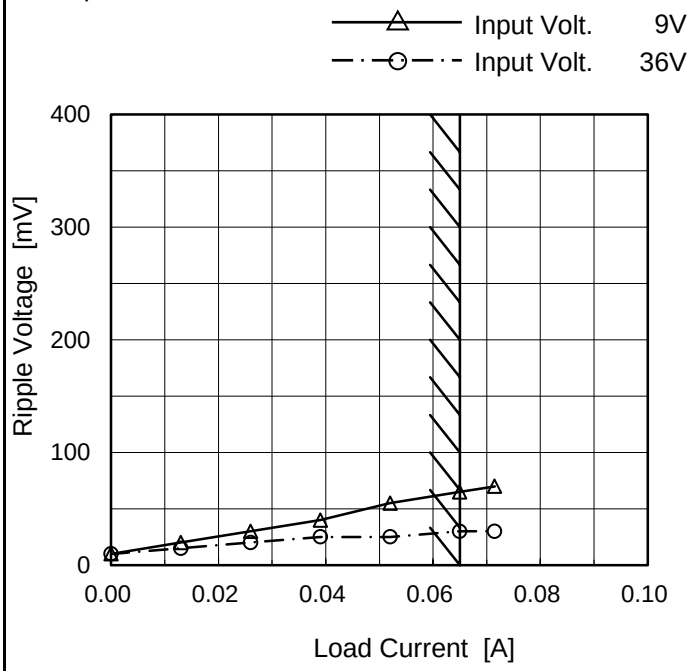
BC-10970

COSEL

Model	MGFW1R52412
Item	Ripple-Noise
Object	+12V0.065A

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]

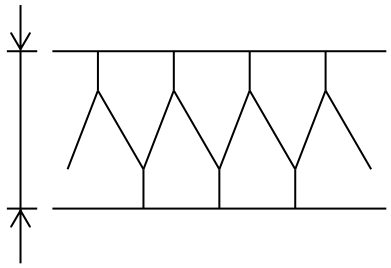


Fig.Complex Ripple Noise Wave Form

2.Values

Load Current [A]	Ripple-Noise [mV]	
	Input Volt. 9 [V]	Input Volt. 36 [V]
0.000	10	10
0.013	20	15
0.026	30	20
0.039	40	25
0.052	55	25
0.065	65	30
0.072	70	30
--	-	-
--	-	-
--	-	-
--	-	-

-12V: Rated Load Current

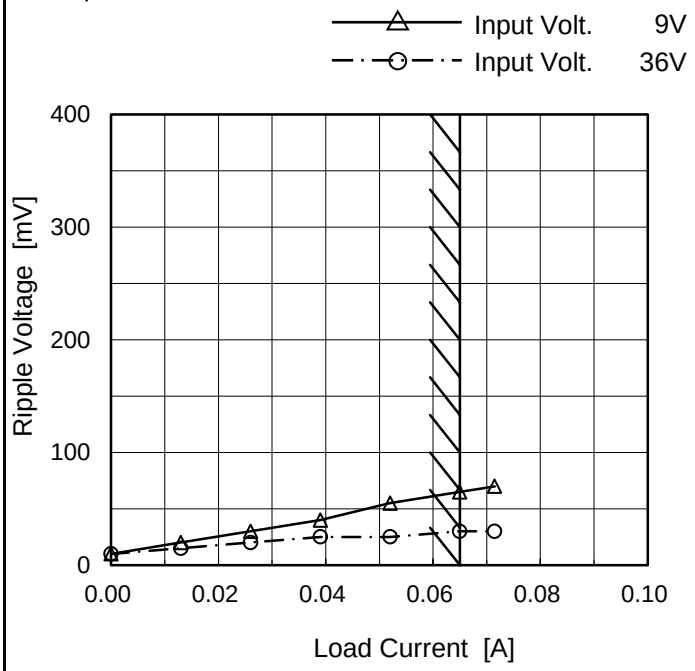
BC-10970

COSEL

Model	MGFW1R52412
Item	Ripple-Noise
Object	-12V0.065A

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]

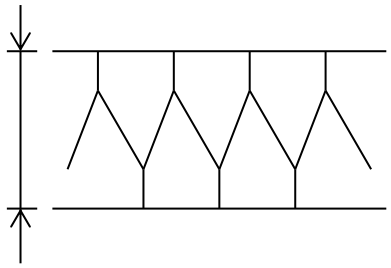


Fig.Complex Ripple Noise Wave Form

2.Values

Load Current [A]	Ripple-Noise [mV]	
	Input Volt. 9 [V]	Input Volt. 36 [V]
0.000	10	10
0.013	20	15
0.026	30	20
0.039	40	25
0.052	55	25
0.065	65	30
0.072	70	30
--	-	-
--	-	-
--	-	-
--	-	-

+12V: Rated Load Current

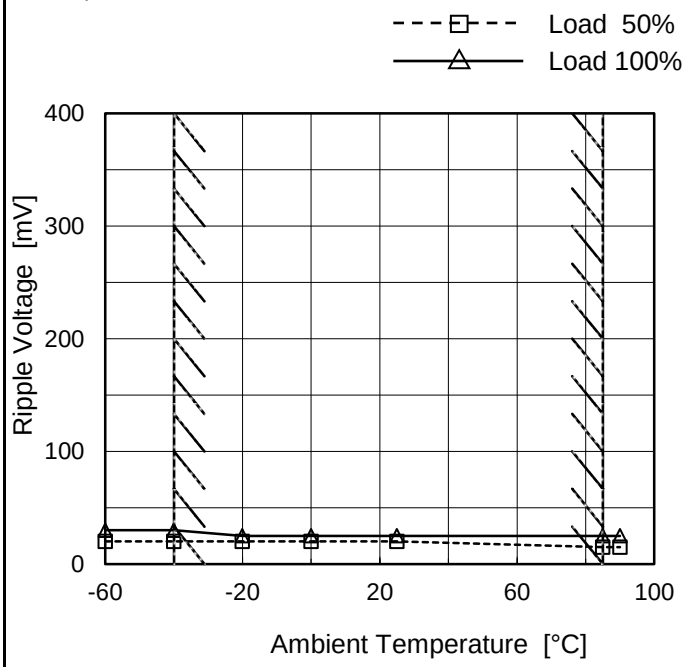
BC-10970

COSEL

Model	MGFW1R52412
Item	Ripple Voltage (by Ambient Temp.)
Object	+12V0.065A

Testing Circuitry Figure B

1.Graph



Input Volt. 24V

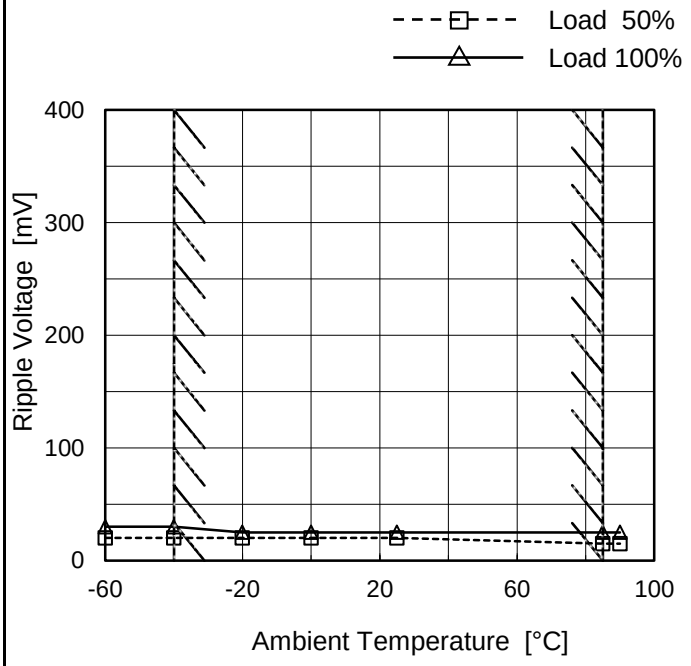
2.Values

Ambient Temperature [°C]	Ripple Voltage [mV]	
	Load 50%	Load 100%
-60	20	30
-40	20	30
-20	20	25
0	20	25
25	20	25
85	15	25
90	15	25
--	-	-
--	-	-
--	-	-
--	-	-

-12V: Rated Load Current

Object	-12V0.065A

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	20	30
-40	20	30
-20	20	25
0	20	25
25	20	25
85	15	25
90	15	25
--	-	-
--	-	-
--	-	-
--	-	-

+12V: Rated Load Current

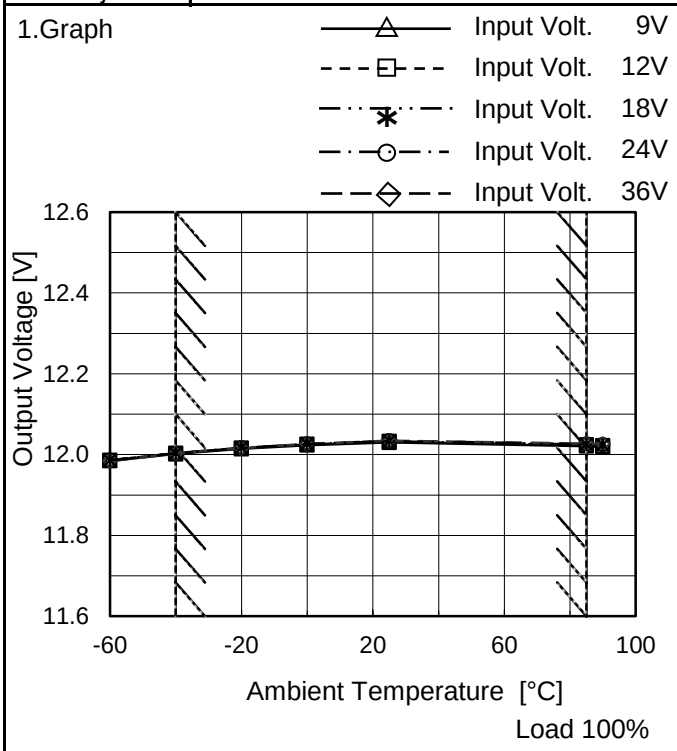
COSEL

Model	MGFW1R52412
Item	Ambient Temperature Drift

Testing Circuitry Figure A

Object +12V0.065A

1.Graph



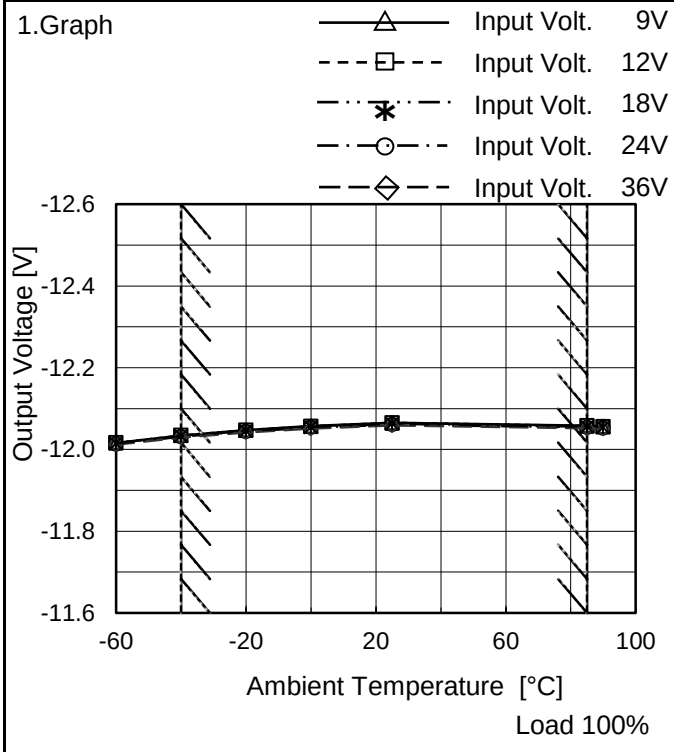
2.Values

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	11.984	11.986	11.986	11.985	11.984
-40	12.002	12.003	12.003	12.003	12.002
-20	12.014	12.016	12.016	12.017	12.016
0	12.023	12.025	12.026	12.026	12.026
25	12.030	12.032	12.033	12.034	12.034
85	12.021	12.024	12.025	12.026	12.027
90	12.019	12.022	12.024	12.024	12.026
--	-	-	-	-	-
--	-	-	-	-	-
--	-	-	-	-	-
--	-	-	-	-	-

-12V : Rated Load Current

Object -12V0.065A

1.Graph



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

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	-12.016	-12.016	-12.015	-12.014	-12.012
-40	-12.034	-12.034	-12.033	-12.032	-12.029
-20	-12.048	-12.047	-12.046	-12.044	-12.042
0	-12.057	-12.057	-12.055	-12.054	-12.051
25	-12.065	-12.065	-12.063	-12.061	-12.059
85	-12.058	-12.058	-12.056	-12.054	-12.052
90	-12.056	-12.056	-12.054	-12.053	-12.051
--	-	-	-	-	-
--	-	-	-	-	-
--	-	-	-	-	-
--	-	-	-	-	-

+12V : Rated Load Current

COSEL

Model	MGFW1R52412	
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 - 85°C

Input Voltage : 9 - 36V

Load Current (AVR 1) : 0 - 0.065A (AVR 2) : 0 - 0.065A

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

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

2.Values

Object	+12V0.065A					
Item	Temperature [°C]	Input Voltage[V]	Output		Output Voltage Accuracy	
			Current[A]	Voltage[V]	Value [mV]	Ratio [%]
Maximum Voltage	85	9	0	12.339	±313	±2.6
Minimum Voltage	85	9	0.065	11.714		

Object	-12V0.065A					
Item	Temperature [°C]	Input Voltage[V]	Output		Output Voltage Accuracy	
			Current[A]	Voltage[V]	Value [mV]	Ratio [%]
Maximum Voltage	85	9	0	-12.380	±313	±2.6
Minimum Voltage	85	9	0.065	-11.755		

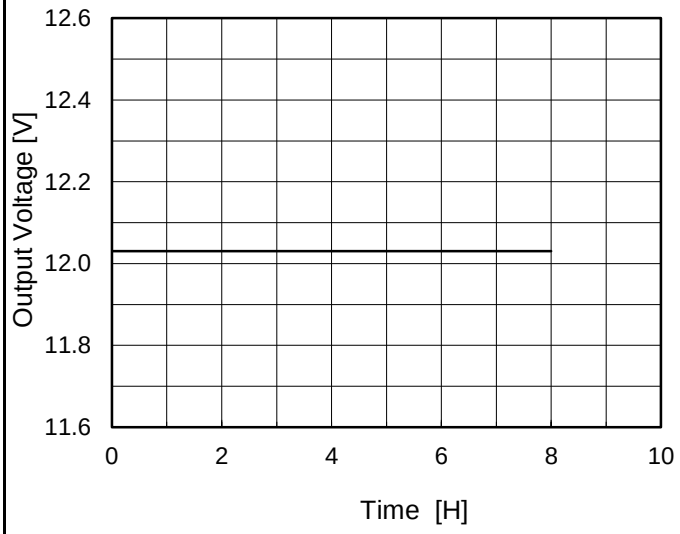
COSEL

Model	MGFW1R52412
Item	Time Lapse Drift

Temperature 25°C
Testing Circuitry Figure A

Object +12V0.065A

1.Graph



Input Volt. 24V
Load 100%

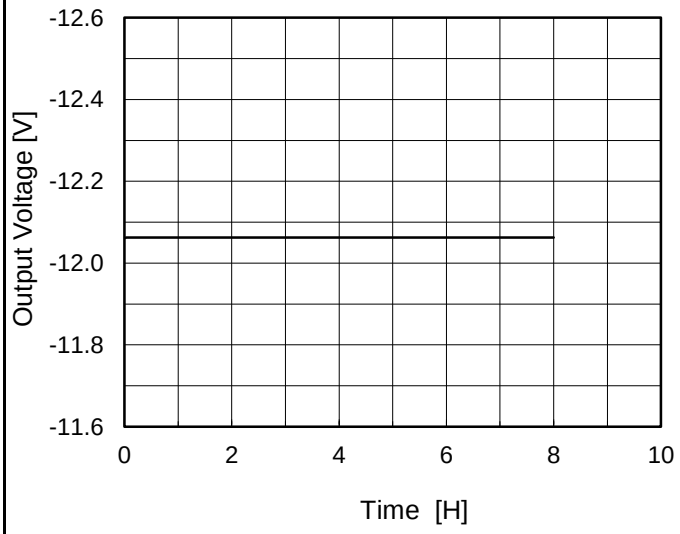
2.Values

Time since start [H]	Output Voltage [V]
0.0	12.031
0.5	12.031
1.0	12.031
2.0	12.031
3.0	12.031
4.0	12.030
5.0	12.031
6.0	12.031
7.0	12.030
8.0	12.030

-12V : Rated Load Current

Object -12V0.065A

1.Graph



Input Volt. 24V
Load 100%

2.Values

Time since start [H]	Output Voltage [V]
0.0	-12.062
0.5	-12.062
1.0	-12.062
2.0	-12.062
3.0	-12.062
4.0	-12.062
5.0	-12.062
6.0	-12.063
7.0	-12.063
8.0	-12.063

+12V : Rated Load Current

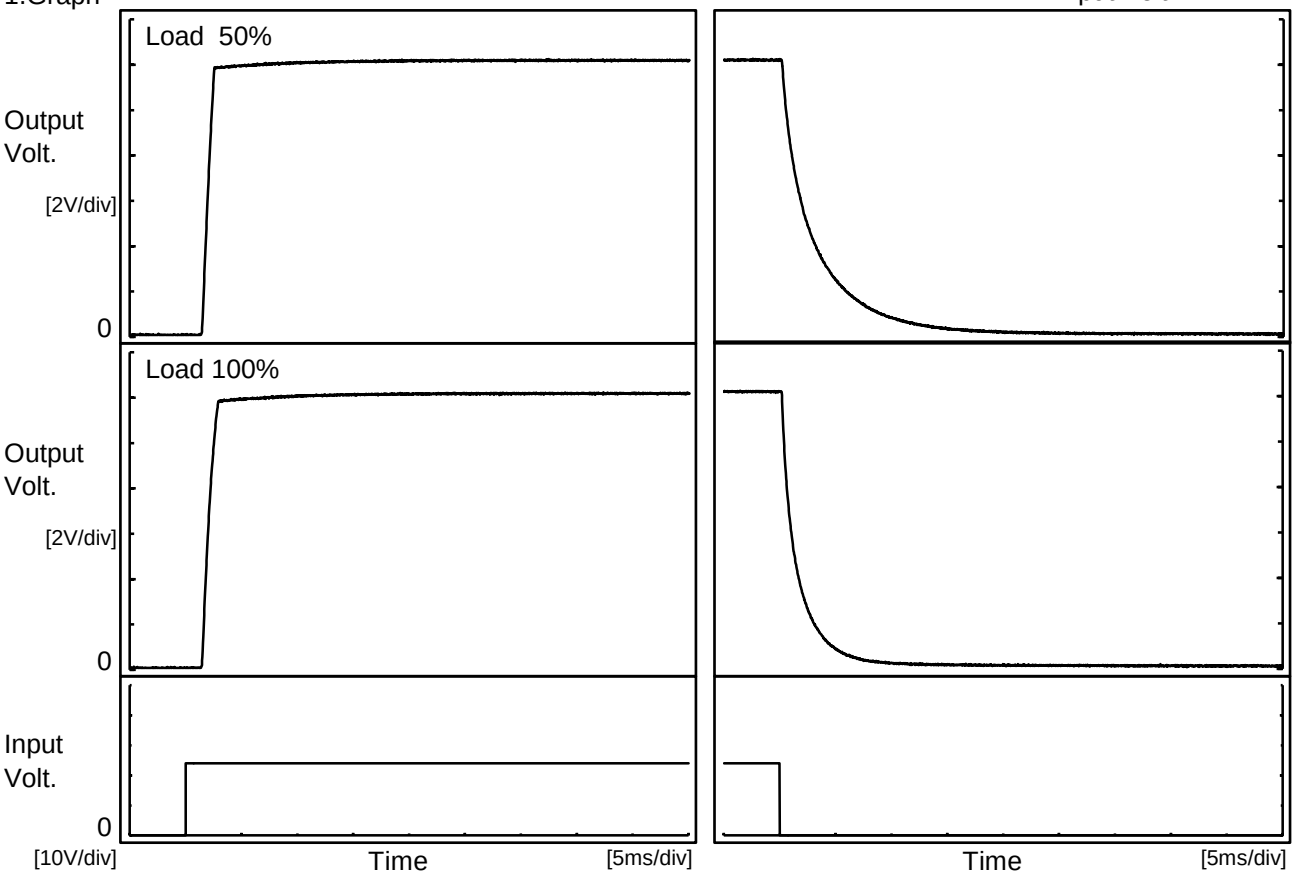
COSEL

Model	MGFW1R52412
Item	Rise and Fall Time
Object	+12V0.065A

Temperature 25°C
Testing Circuitry Figure A

1.Graph

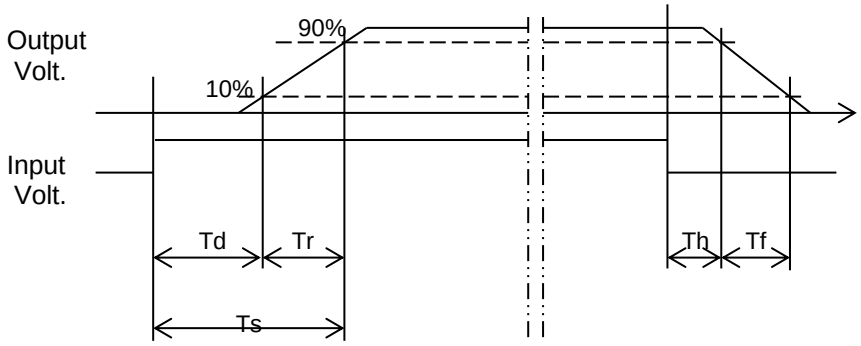
Input Volt. 24 V



2.Values

[ms]

Load \ Time	Td	Tr	Ts	Th	Tf
50 %	1.6	0.9	2.5	0.4	7.6
100 %	1.6	1.1	2.7	0.3	3.8



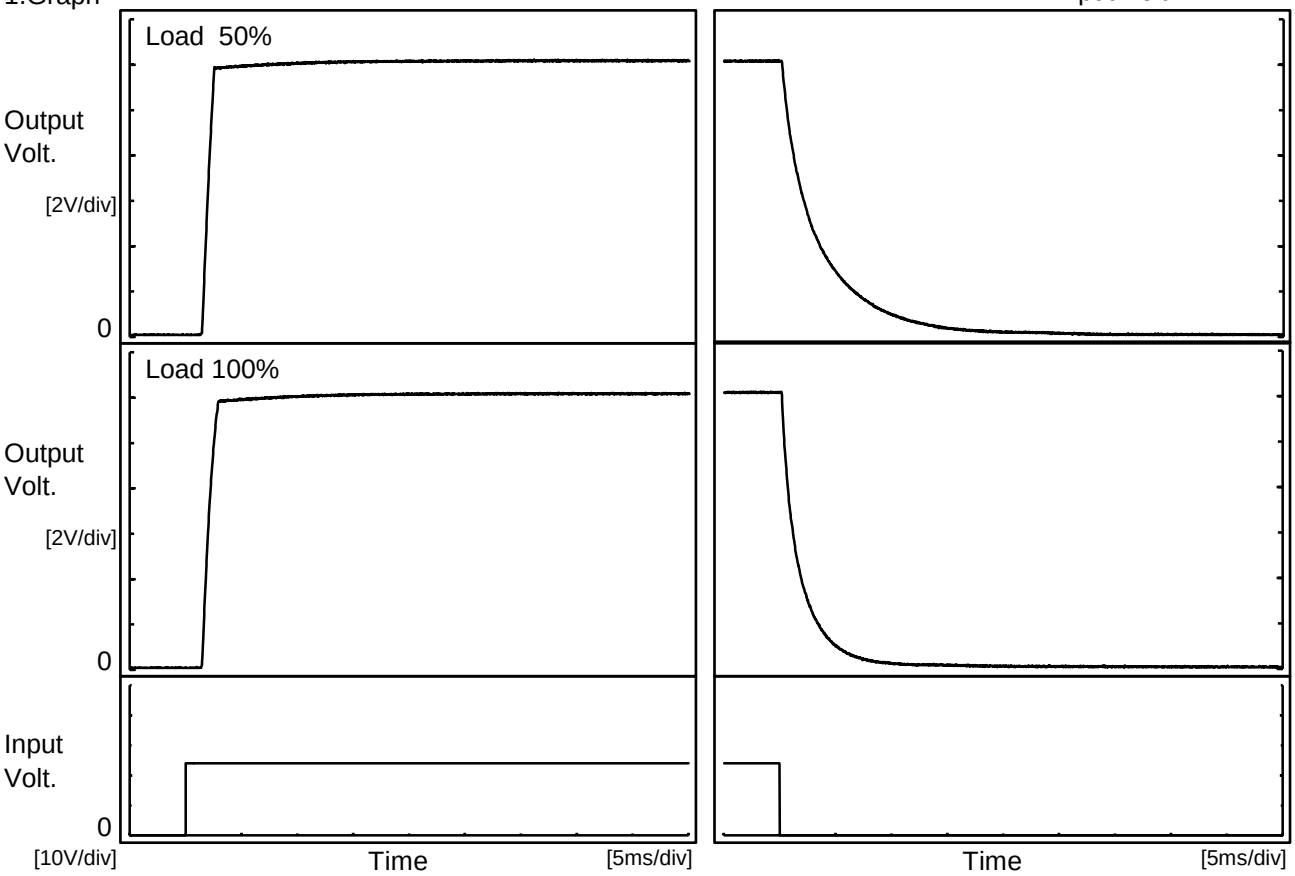
COSEL

Model	MGFW1R52412
Item	Rise and Fall Time
Object	-12V0.065A

Temperature 25°C
Testing Circuitry Figure A

1.Graph

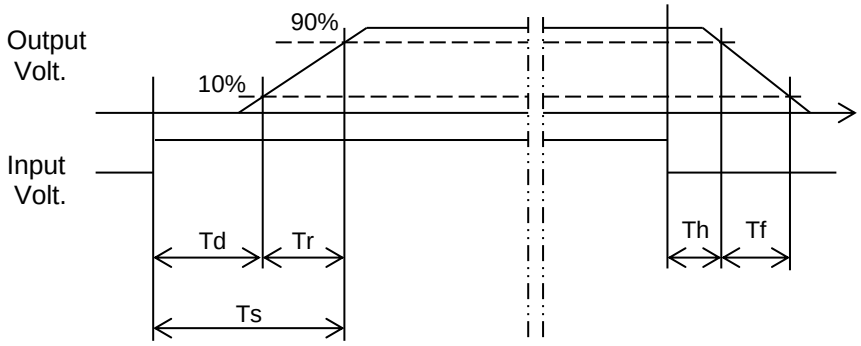
Input Volt. 24 V



2.Values

[ms]

Load \ Time	Td	Tr	Ts	Th	Tf
50 %	1.6	0.9	2.5	0.4	8.3
100 %	1.6	1.1	2.7	0.3	4.2



BC-10970

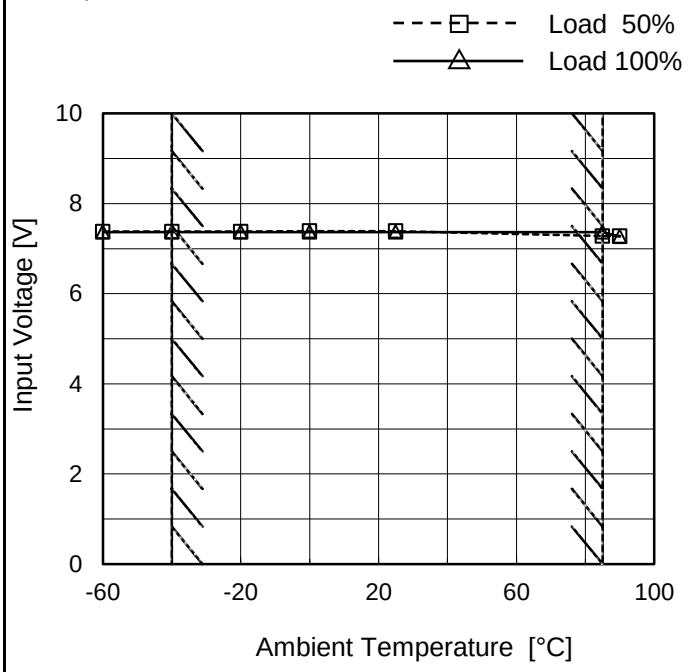
COSEL

Model	MGFW1R52412
Item	Minimum Input Voltage for Regulated Output Voltage

Testing Circuitry Figure A

Object: +12V0.065A

1.Graph

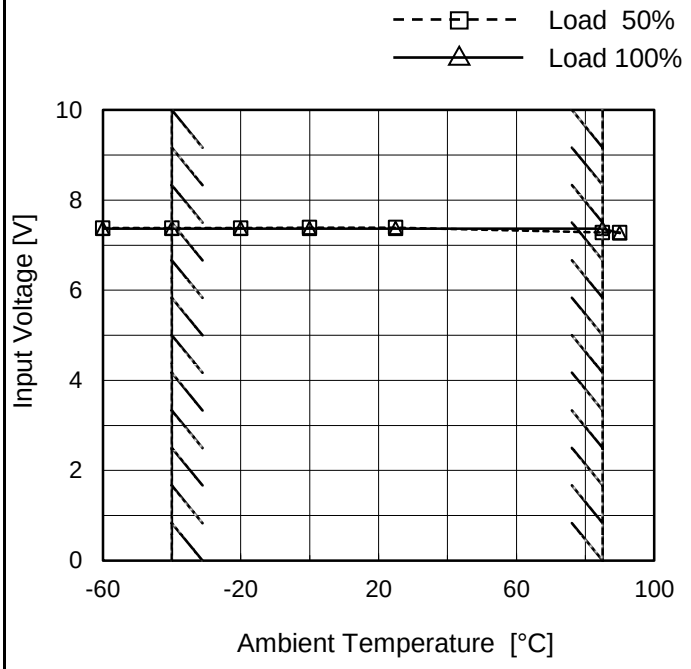


2.Values

Ambient Temperature [°C]	Input Voltage [V]	
	Load 50%	Load 100%
-60	7.4	7.4
-40	7.4	7.4
-20	7.4	7.4
0	7.4	7.4
25	7.4	7.4
85	7.3	7.4
90	7.3	7.3
--	-	-
--	-	-
--	-	-
--	-	-

Object: -12V0.065A

1.Graph



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

2.Values

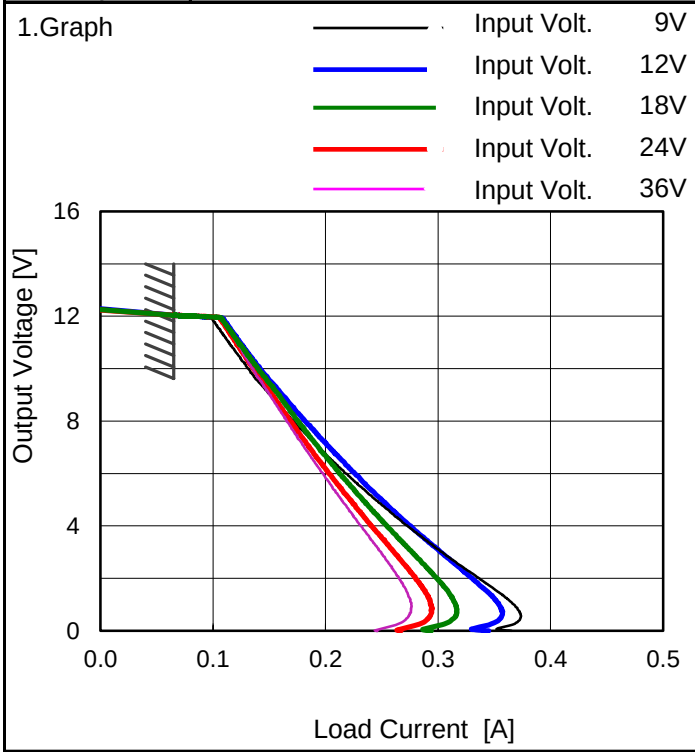
Ambient Temperature [°C]	Input Voltage [V]	
	Load 50%	Load 100%
-60	7.4	7.4
-40	7.4	7.4
-20	7.4	7.4
0	7.4	7.4
25	7.4	7.4
85	7.3	7.4
90	7.3	7.3
--	-	-
--	-	-
--	-	-
--	-	-

COSEL

Model	MGFW1R52412
Item	Overcurrent Protection
Object	+12V0.065A

Temperature 25°C
Testing Circuitry Figure A

1.Graph



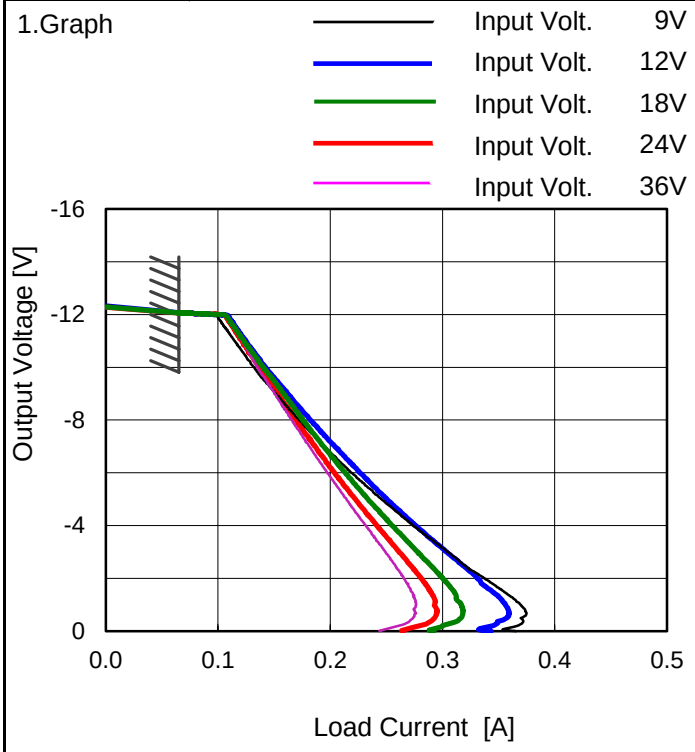
2.Values

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]
11.4	0.107	0.117	0.116	0.114	0.116
10.8	0.117	0.127	0.126	0.124	0.124
9.6	0.138	0.149	0.147	0.143	0.141
8.4	0.163	0.173	0.168	0.162	0.159
7.2	0.189	0.199	0.190	0.182	0.178
6.0	0.218	0.226	0.212	0.203	0.197
4.8	0.250	0.255	0.237	0.226	0.218
3.6	0.284	0.285	0.263	0.249	0.239
2.4	0.323	0.319	0.290	0.273	0.259
1.2	0.361	0.350	0.313	0.293	0.275
0.0	0.365	0.345	0.294	0.267	0.246
--	-	-	-	-	-

-12V: Rated Load Current

Object	-12V0.065A

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]
-11.4	0.108	0.118	0.116	0.115	0.116
-10.8	0.118	0.128	0.127	0.124	0.124
-9.6	0.139	0.150	0.147	0.143	0.141
-8.4	0.163	0.174	0.169	0.163	0.159
-7.2	0.190	0.199	0.190	0.182	0.178
-6.0	0.218	0.226	0.213	0.203	0.197
-4.8	0.251	0.255	0.238	0.226	0.217
-3.6	0.286	0.287	0.264	0.249	0.238
-2.4	0.322	0.320	0.291	0.273	0.259
-1.2	0.364	0.352	0.312	0.293	0.275
0.0	0.366	0.343	0.292	0.265	0.245
--	-	-	-	-	-

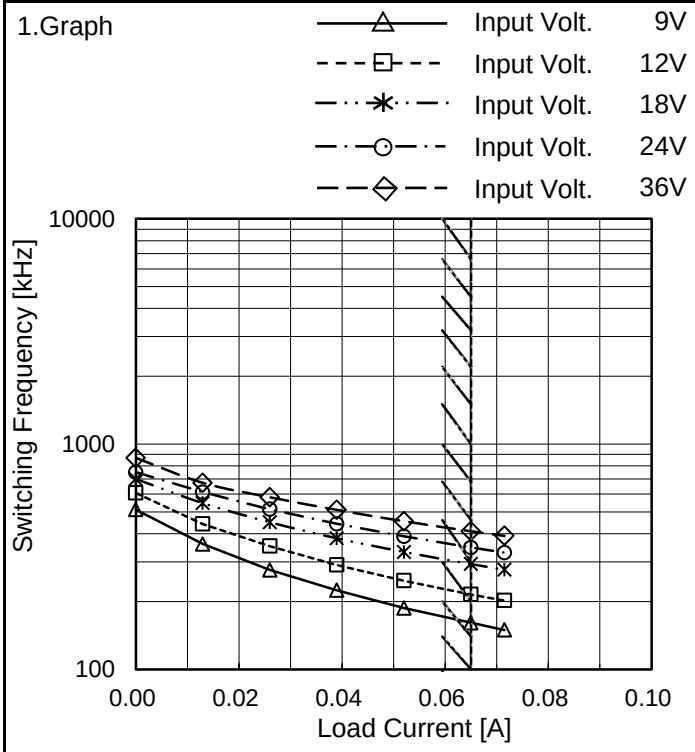
+12V: Rated Load Current

COSEL

Model	MGFW1R52412
Item	Switching frequency (by Load Current)
Object	+/-12V0.065A

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]
0.000	512	607	700	750	869
0.013	360	442	547	612	673
0.026	277	353	450	514	581
0.039	224	291	382	443	511
0.052	187	248	332	389	455
0.065	161	215	293	347	410
0.072	150	202	277	330	391
--	-	-	-	-	-
--	-	-	-	-	-
--	-	-	-	-	-
--	-	-	-	-	-

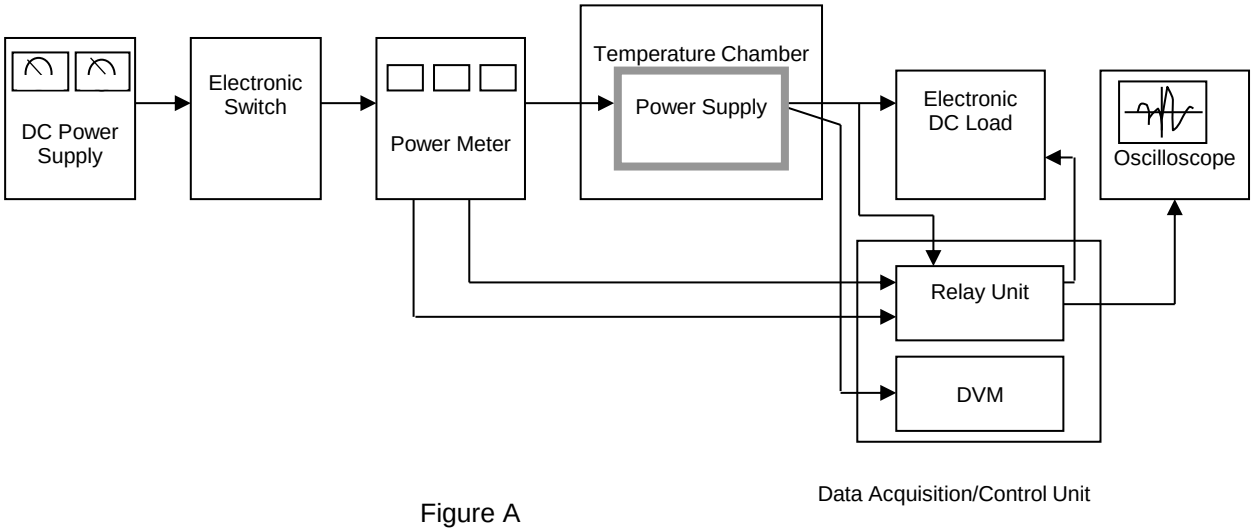


Figure A

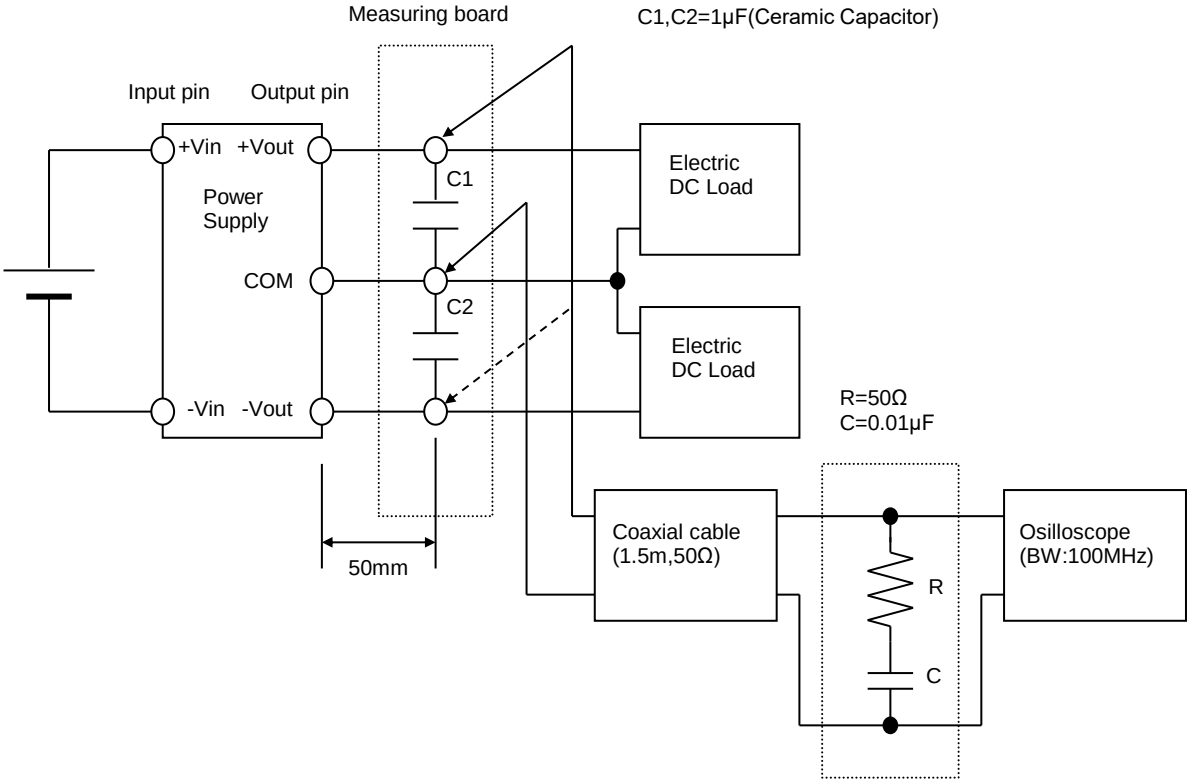


Figure B（Ripple and Ripple noise Characteristic）