

# TEST DATA OF MGFW32412

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.**

## 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)

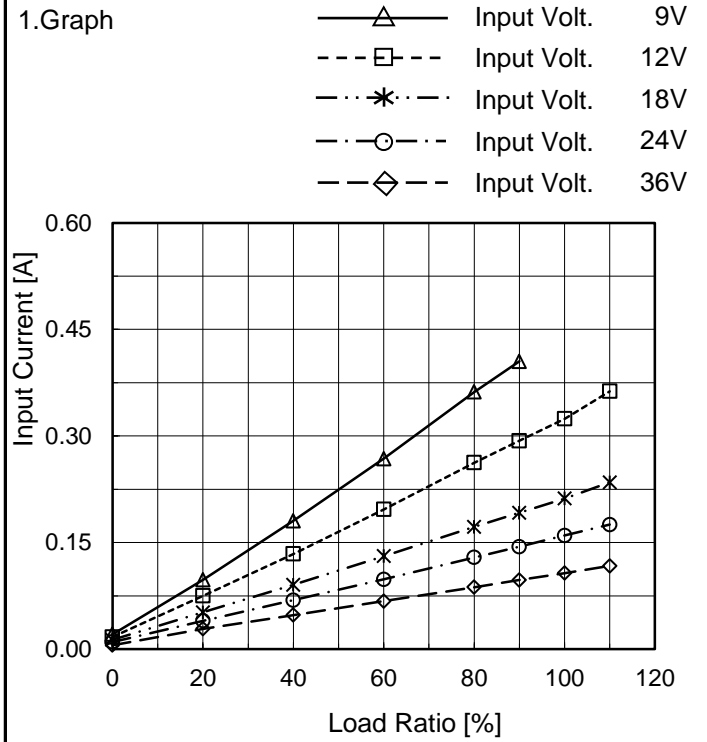


Model		MGFW32412		Temperature 25°C																																																																																
Item		Input Current (by Input Voltage)		Testing Circuitry Figure A																																																																																
Object																																																																																				
1.Graph			2.Values																																																																																	
<p>Legend:          —△— Load 100%          - - - □ - - Load 50%          - · - ○ - · - Load 0%</p>			<table border="1"> <thead> <tr> <th rowspan="2">Input Voltage [V]</th> <th colspan="3">Input Current [A]</th> </tr> <tr> <th>Load 0%</th> <th>Load 50%</th> <th>Load 100%</th> </tr> </thead> <tbody> <tr><td>0.0</td><td>0.000</td><td>0.000</td><td>0.000</td></tr> <tr><td>6.0</td><td>0.003</td><td>0.003</td><td>0.003</td></tr> <tr><td>8.0</td><td>0.004</td><td>0.003</td><td>0.003</td></tr> <tr><td>8.2</td><td>0.003</td><td>0.003</td><td>0.003</td></tr> <tr><td>8.4</td><td>0.003</td><td>0.003</td><td>0.004</td></tr> <tr><td>8.6</td><td>0.022</td><td>0.235</td><td>0.476</td></tr> <tr><td>8.8</td><td>0.022</td><td>0.230</td><td>0.470</td></tr> <tr><td>9.0</td><td>0.021</td><td>0.225</td><td>0.464</td></tr> <tr><td>12.0</td><td>0.017</td><td>0.166</td><td>0.334</td></tr> <tr><td>18.0</td><td>0.013</td><td>0.111</td><td>0.212</td></tr> <tr><td>24.0</td><td>0.010</td><td>0.084</td><td>0.160</td></tr> <tr><td>30.0</td><td>0.007</td><td>0.069</td><td>0.130</td></tr> <tr><td>36.0</td><td>0.006</td><td>0.058</td><td>0.107</td></tr> <tr><td>40.0</td><td>0.005</td><td>0.054</td><td>0.099</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>			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	0.004	0.003	0.003	8.2	0.003	0.003	0.003	8.4	0.003	0.003	0.004	8.6	0.022	0.235	0.476	8.8	0.022	0.230	0.470	9.0	0.021	0.225	0.464	12.0	0.017	0.166	0.334	18.0	0.013	0.111	0.212	24.0	0.010	0.084	0.160	30.0	0.007	0.069	0.130	36.0	0.006	0.058	0.107	40.0	0.005	0.054	0.099	--	-	-	-	--	-	-	-	--	-	-	-	--	-	-	-
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	0.004	0.003	0.003																																																																																	
8.2	0.003	0.003	0.003																																																																																	
8.4	0.003	0.003	0.004																																																																																	
8.6	0.022	0.235	0.476																																																																																	
8.8	0.022	0.230	0.470																																																																																	
9.0	0.021	0.225	0.464																																																																																	
12.0	0.017	0.166	0.334																																																																																	
18.0	0.013	0.111	0.212																																																																																	
24.0	0.010	0.084	0.160																																																																																	
30.0	0.007	0.069	0.130																																																																																	
36.0	0.006	0.058	0.107																																																																																	
40.0	0.005	0.054	0.099																																																																																	
--	-	-	-																																																																																	
--	-	-	-																																																																																	
--	-	-	-																																																																																	
--	-	-	-																																																																																	
<p>Note: Slanted line shows the range of the rated input voltage.</p>																																																																																				



Model	MGFW32412
Item	Input Current (by Load Ratio)
Object	_____

Temperature 25°C  
Testing Circuitry Figure A



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	0.021	0.017	0.013	0.010	0.006
20	0.098	0.075	0.052	0.040	0.029
40	0.181	0.134	0.091	0.069	0.048
60	0.268	0.197	0.131	0.098	0.068
80	0.362	0.262	0.172	0.129	0.087
90	0.405	0.293	0.192	0.144	0.097
100	- ※	0.324	0.212	0.160	0.107
110	- ※	0.363	0.235	0.175	0.117
--	-	-	-	-	-
--	-	-	-	-	-
--	-	-	-	-	-

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



Model		MGFW32412		Temperature 25°C																																																																														
Item		Input Power (by Load Ratio)		Testing Circuitry Figure A																																																																														
Object		_____																																																																																
1.Graph		<p>—△— Input Volt. 9V</p> <p>---□--- Input Volt. 12V</p> <p>-·-·*·-·-·- Input Volt. 18V</p> <p>-·-·○-·-·- Input Volt. 24V</p> <p>---◇--- Input Volt. 36V</p>		2.Values																																																																														
		<table border="1"> <thead> <tr> <th rowspan="2">Load Ratio [%]</th> <th colspan="5">Input Power [W]</th> </tr> <tr> <th>Input Volt. 9[V]</th> <th>Input Volt. 12[V]</th> <th>Input Volt. 18[V]</th> <th>Input Volt. 24[V]</th> <th>Input Volt. 36[V]</th> </tr> </thead> <tbody> <tr><td>0</td><td>0.19</td><td>0.21</td><td>0.23</td><td>0.25</td><td>0.20</td></tr> <tr><td>20</td><td>0.88</td><td>0.90</td><td>0.93</td><td>0.96</td><td>1.03</td></tr> <tr><td>40</td><td>1.61</td><td>1.61</td><td>1.63</td><td>1.65</td><td>1.73</td></tr> <tr><td>60</td><td>2.39</td><td>2.35</td><td>2.35</td><td>2.35</td><td>2.44</td></tr> <tr><td>80</td><td>3.21</td><td>3.13</td><td>3.08</td><td>3.09</td><td>3.14</td></tr> <tr><td>90</td><td>3.64</td><td>3.52</td><td>3.46</td><td>3.46</td><td>3.51</td></tr> <tr><td>100</td><td>- ※</td><td>3.92</td><td>3.83</td><td>3.82</td><td>3.87</td></tr> <tr><td>110</td><td>- ※</td><td>4.35</td><td>4.22</td><td>4.20</td><td>4.22</td></tr> <tr><td>--</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr> <tr><td>--</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr> <tr><td>--</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr> </tbody> </table>		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	0.19	0.21	0.23	0.25	0.20	20	0.88	0.90	0.93	0.96	1.03	40	1.61	1.61	1.63	1.65	1.73	60	2.39	2.35	2.35	2.35	2.44	80	3.21	3.13	3.08	3.09	3.14	90	3.64	3.52	3.46	3.46	3.51	100	- ※	3.92	3.83	3.82	3.87	110	- ※	4.35	4.22	4.20	4.22	--	-	-	-	-	-	--	-	-	-	-	-	--	-	-	-	-	-		
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	0.19	0.21	0.23	0.25	0.20																																																																													
20	0.88	0.90	0.93	0.96	1.03																																																																													
40	1.61	1.61	1.63	1.65	1.73																																																																													
60	2.39	2.35	2.35	2.35	2.44																																																																													
80	3.21	3.13	3.08	3.09	3.14																																																																													
90	3.64	3.52	3.46	3.46	3.51																																																																													
100	- ※	3.92	3.83	3.82	3.87																																																																													
110	- ※	4.35	4.22	4.20	4.22																																																																													
--	-	-	-	-	-																																																																													
--	-	-	-	-	-																																																																													
--	-	-	-	-	-																																																																													
				<p>※ Maximum output current at minimum input Voltage is 80% of rated load current. Refer to instruction manuals for details of input derating.</p>																																																																														

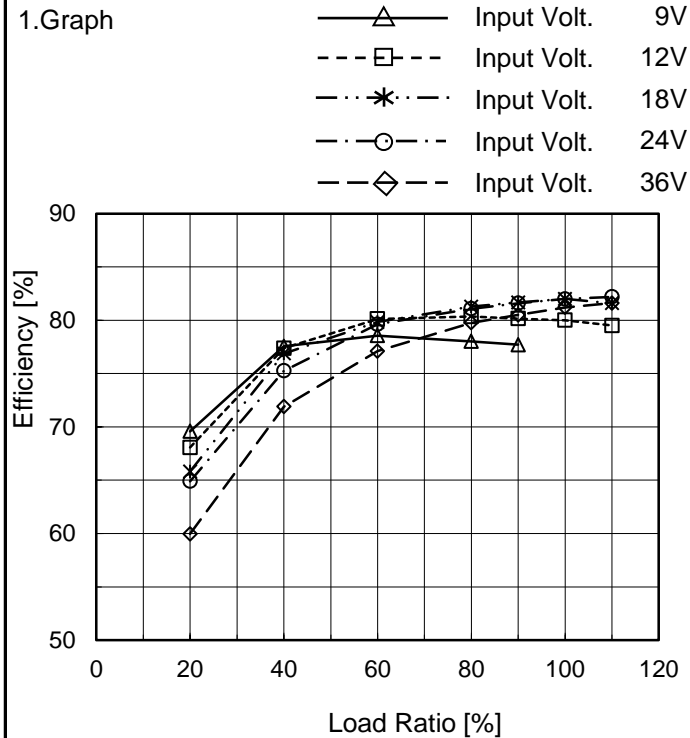


<p>Model MGFW32412</p>		<p>Temperature 25°C Testing Circuitry Figure A</p>																																
<p>Item</p>	<p>Efficiency (by Input Voltage)</p>																																	
<p>Object</p>	<p>_____</p>	<p>2.Values</p> <table border="1"> <thead> <tr> <th rowspan="2">Input Voltage [V]</th> <th colspan="2">Efficiency [%]</th> </tr> <tr> <th>Load 50%</th> <th>Load 100%</th> </tr> </thead> <tbody> <tr> <td>8.6</td> <td>78.4</td> <td>77.8 ※1</td> </tr> <tr> <td>9.0</td> <td>77.9</td> <td>78.0 ※1</td> </tr> <tr> <td>12.0</td> <td>78.8</td> <td>80.0</td> </tr> <tr> <td>15.0</td> <td>79.0</td> <td>81.2</td> </tr> <tr> <td>18.0</td> <td>78.7</td> <td>82.0</td> </tr> <tr> <td>24.0</td> <td>77.7</td> <td>82.0</td> </tr> <tr> <td>30.0</td> <td>76.6</td> <td>81.5</td> </tr> <tr> <td>36.0</td> <td>75.0</td> <td>81.2</td> </tr> <tr> <td>40.0</td> <td>74.3</td> <td>80.9</td> </tr> </tbody> </table> <p>※1: Load 80%</p>	Input Voltage [V]	Efficiency [%]		Load 50%	Load 100%	8.6	78.4	77.8 ※1	9.0	77.9	78.0 ※1	12.0	78.8	80.0	15.0	79.0	81.2	18.0	78.7	82.0	24.0	77.7	82.0	30.0	76.6	81.5	36.0	75.0	81.2	40.0	74.3	80.9
Input Voltage [V]	Efficiency [%]																																	
	Load 50%	Load 100%																																
8.6	78.4	77.8 ※1																																
9.0	77.9	78.0 ※1																																
12.0	78.8	80.0																																
15.0	79.0	81.2																																
18.0	78.7	82.0																																
24.0	77.7	82.0																																
30.0	76.6	81.5																																
36.0	75.0	81.2																																
40.0	74.3	80.9																																
<p>1.Graph</p> <p>---□--- Load 50% —△— Load 100%</p> <p>Efficiency [%]</p> <p>Input Voltage [V]</p> <p>Note: Slanted line shows the range of the rated input voltage.</p>																																		



Model	MGFW32412
Item	Efficiency (by Load Ratio)
Object	_____

Temperature 25°C  
Testing Circuitry Figure A



2.Values

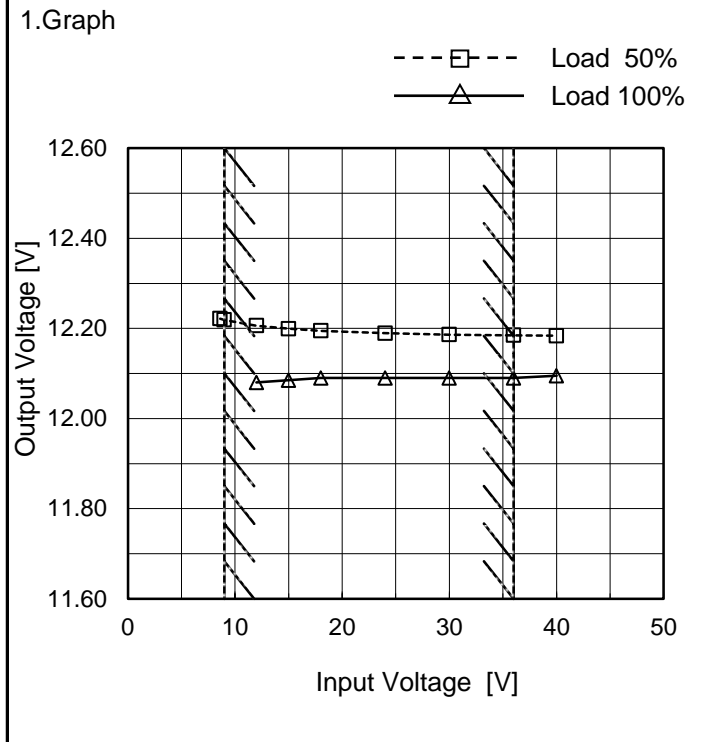
Load Ratio [%]	Efficiency [%]				
	Input Volt. 9[V]	Input Volt. 12[V]	Input Volt. 18[V]	Input Volt. 24[V]	Input Volt. 36[V]
0	-	-	-	-	-
20	69.6	68.1	65.8	64.9	60.0
40	77.5	77.4	76.9	75.3	71.9
60	78.6	80.1	79.8	79.6	77.1
80	78.0	80.3	81.3	81.1	79.8
90	77.7	80.2	81.7	81.6	80.5
100	- ※	80.0	82.0	82.0	81.2
110	- ※	79.5	81.6	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.



Model	MGFW32412
Item	Line Regulation
Object	+12V0.13A

Temperature 25°C  
Testing Circuitry Figure A

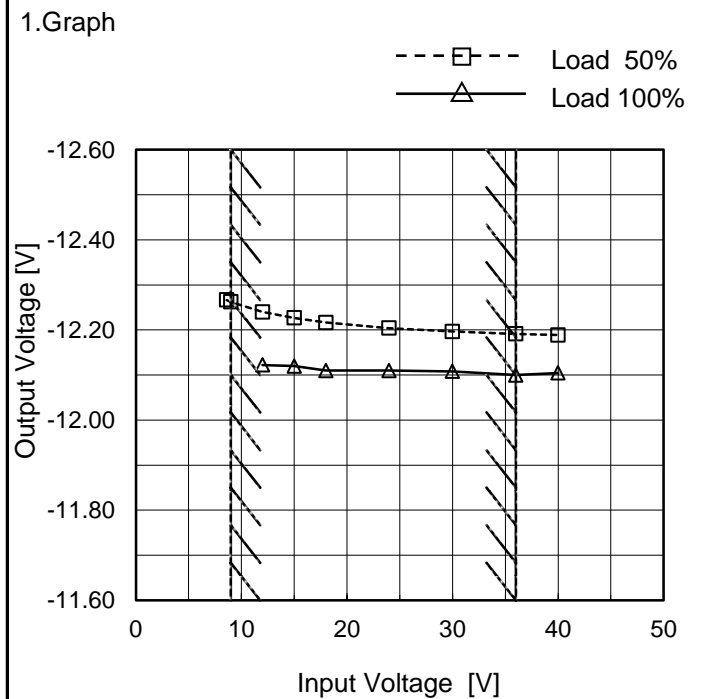


2.Values

Input Voltage [V]	Output Voltage [V]	
	Load 50%	Load 100%
8.6	12.222	- ※
9.0	12.219	- ※
12.0	12.206	12.080
15.0	12.199	12.085
18.0	12.195	12.090
24.0	12.189	12.090
30.0	12.186	12.090
36.0	12.185	12.090
40.0	12.184	12.095

-12V: Rated Load Current

Object	-12V0.13A
--------	-----------



2.Values

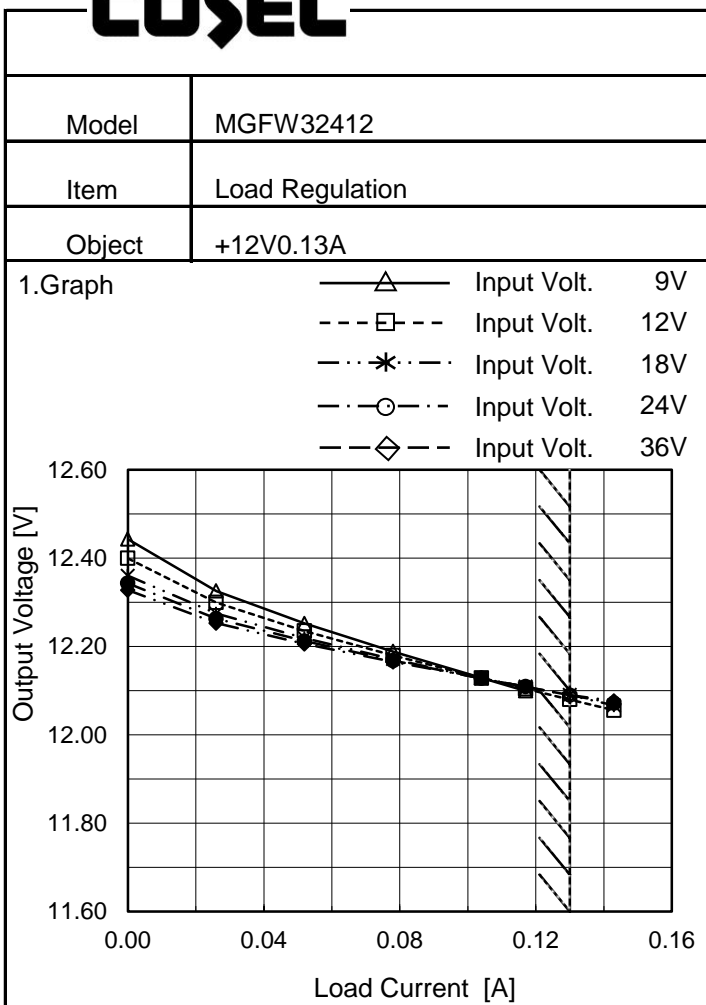
Input Voltage [V]	Output Voltage [V]	
	Load 50%	Load 100%
8.6	-12.266	- ※
9.0	-12.262	- ※
12.0	-12.240	-12.122
15.0	-12.227	-12.120
18.0	-12.217	-12.110
24.0	-12.204	-12.110
30.0	-12.197	-12.108
36.0	-12.191	-12.100
40.0	-12.189	-12.105

+12V: Rated Load Current

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

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



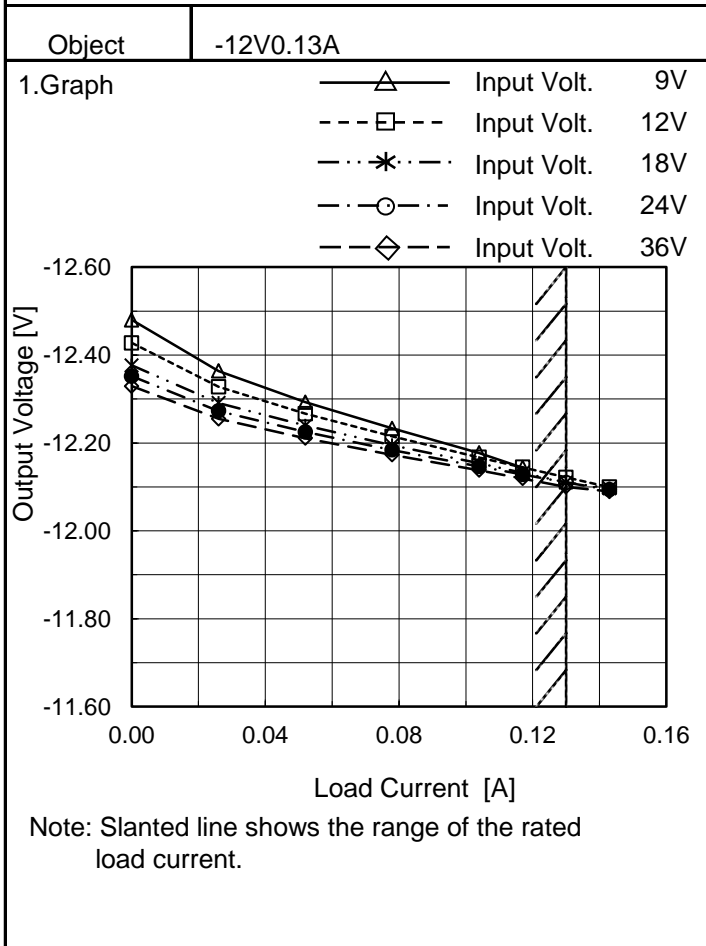


Temperature 25°C  
Testing Circuitry Figure A

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	12.443	12.400	12.360	12.343	12.328
0.026	12.326	12.300	12.275	12.263	12.253
0.052	12.252	12.235	12.219	12.212	12.206
0.078	12.189	12.180	12.172	12.168	12.165
0.104	12.129	12.129	12.128	12.128	12.128
0.117	12.100	12.104	12.109	12.109	12.109
0.130	- ※	12.080	12.090	12.090	12.090
0.143	- ※	12.056	12.067	12.072	12.077
--	-	-	-	-	-
--	-	-	-	-	-
--	-	-	-	-	-

-12V: 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	-12.480	-12.427	-12.376	-12.352	-12.329
0.026	-12.364	-12.328	-12.291	-12.273	-12.255
0.052	-12.293	-12.267	-12.240	-12.225	-12.211
0.078	-12.233	-12.215	-12.195	-12.184	-12.173
0.104	-12.177	-12.167	-12.154	-12.146	-12.138
0.117	-12.144	-12.144	-12.132	-12.128	-12.119
0.130	- ※	-12.122	-12.110	-12.110	-12.100
0.143	- ※	-12.099	-12.097	-12.094	-12.089
--	-	-	-	-	-
--	-	-	-	-	-
--	-	-	-	-	-

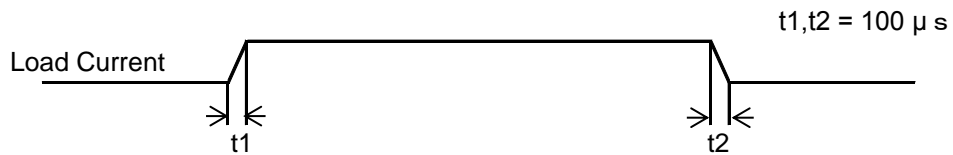
+12V: Rated Load Current

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



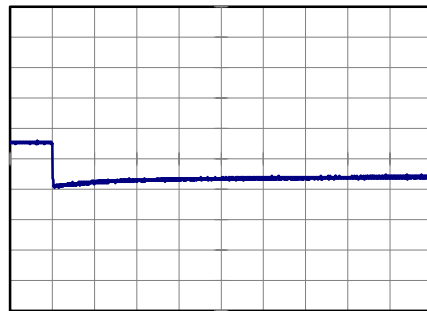
Model		MGFW32412	Temperature 25°C Testing Circuitry Figure A
Item		Dynamic Load Response	
Object		+12V0.13A	

Input Volt. 24 V  
-12V:rated load current.  
Cycle 100 ms

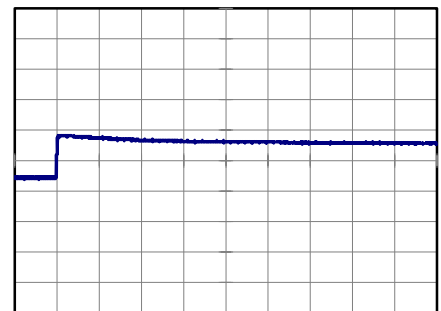


Min.Load (0A) ←→  
Load 100% (0.13A)

200 mV/div



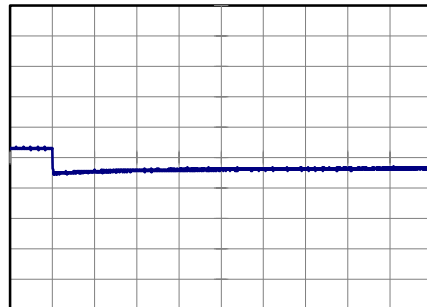
4 ms/div



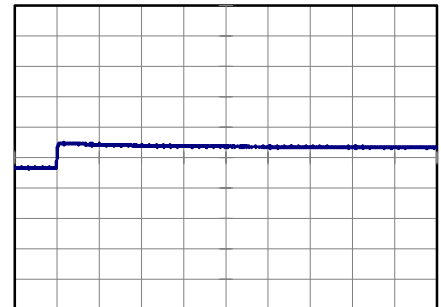
4 ms/div

Min.Load (0A) ←→  
Load 50% (0.065A)

200 mV/div



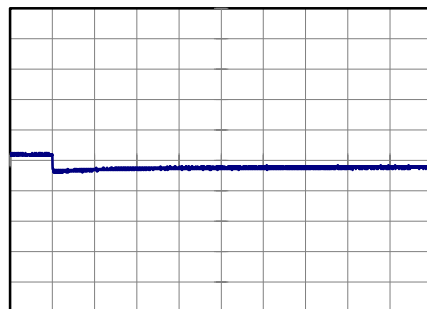
4 ms/div



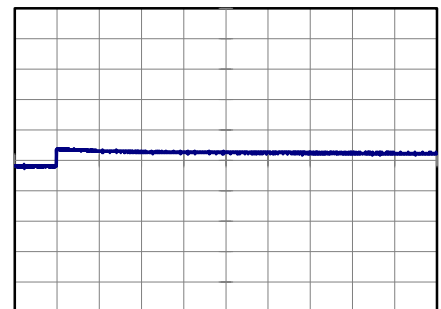
4 ms/div

Load 50% (0.065A) ←→  
Load 100% (0.13A)

200 mV/div



4 ms/div



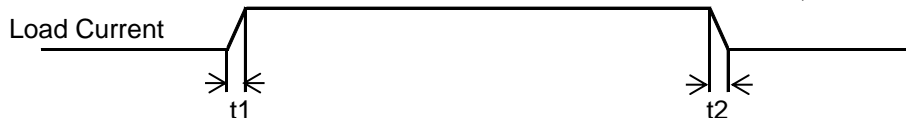
4 ms/div



Model	MGFW32412	Temperature 25°C Testing Circuitry Figure A
Item	Dynamic Load Response	
Object	-12V0.13A	

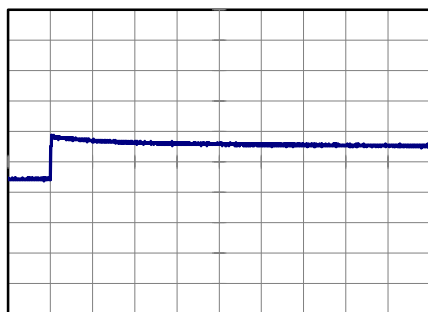
Input Volt. 24 V  
+12V:rated load current.  
Cycle 100 ms

t1,t2 = 100 μs

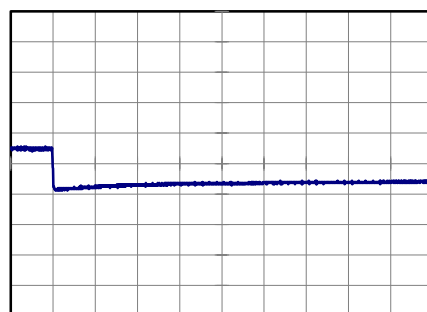


Min.Load (0A) ←→  
Load 100% (0.13A)

200 mV/div



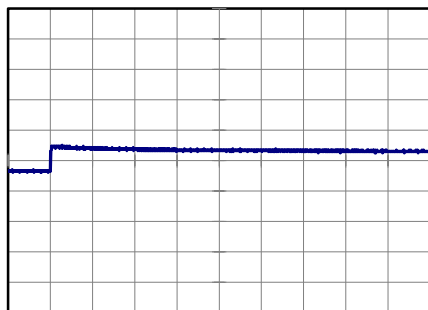
4 ms/div



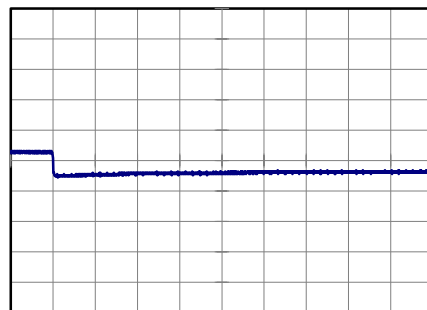
4 ms/div

Min.Load (0A) ←→  
Load 50% (0.065A)

200 mV/div



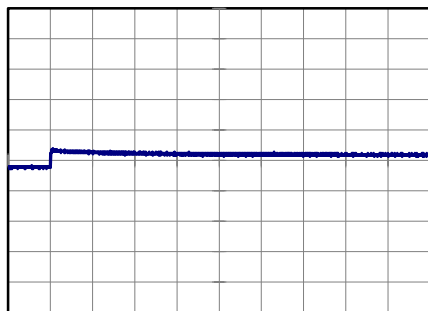
4 ms/div



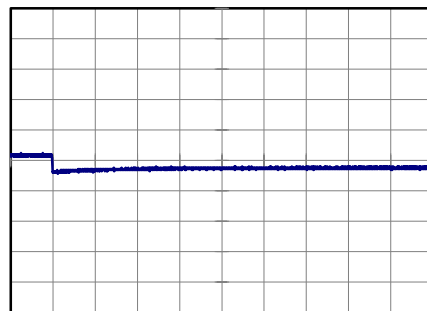
4 ms/div

Load 50% (0.065A) ←→  
Load 100% (0.13A)

200 mV/div



4 ms/div



4 ms/div



<p>Model MGFW32412</p> <p>Item Ripple Voltage (by Load Current)</p> <p>Object +12V0.13A</p>		<p>Temperature 25°C</p> <p>Testing Circuitry Figure B</p>																																						
<p>1.Graph</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>—△— Input Volt. 12V</p> <p>-·-○-·- Input Volt. 36V</p> </div> </div> <p>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.</p> <p>Ripple [mVp-p]</p> <p>Fig.Complex Ripple Wave Form</p>		<p>2.Values</p> <table border="1"> <thead> <tr> <th rowspan="2">Load Current [A]</th> <th colspan="2">Ripple Voltage [mV]</th> </tr> <tr> <th>Input Volt. 12 [V]</th> <th>Input Volt. 36 [V]</th> </tr> </thead> <tbody> <tr><td>0.000</td><td>10</td><td>10</td></tr> <tr><td>0.026</td><td>15</td><td>15</td></tr> <tr><td>0.052</td><td>30</td><td>20</td></tr> <tr><td>0.078</td><td>45</td><td>20</td></tr> <tr><td>0.104</td><td>65</td><td>20</td></tr> <tr><td>0.117</td><td>70</td><td>25</td></tr> <tr><td>0.130</td><td>75</td><td>30</td></tr> <tr><td>0.143</td><td>90</td><td>35</td></tr> <tr><td>--</td><td>-</td><td>-</td></tr> <tr><td>--</td><td>-</td><td>-</td></tr> <tr><td>--</td><td>-</td><td>-</td></tr> </tbody> </table> <p style="text-align: center;">-12V: Rated Load Current</p>	Load Current [A]	Ripple Voltage [mV]		Input Volt. 12 [V]	Input Volt. 36 [V]	0.000	10	10	0.026	15	15	0.052	30	20	0.078	45	20	0.104	65	20	0.117	70	25	0.130	75	30	0.143	90	35	--	-	-	--	-	-	--	-	-
Load Current [A]	Ripple Voltage [mV]																																							
	Input Volt. 12 [V]	Input Volt. 36 [V]																																						
0.000	10	10																																						
0.026	15	15																																						
0.052	30	20																																						
0.078	45	20																																						
0.104	65	20																																						
0.117	70	25																																						
0.130	75	30																																						
0.143	90	35																																						
--	-	-																																						
--	-	-																																						
--	-	-																																						



<p>Model MGFW32412</p>		<p>Temperature 25°C Testing Circuitry Figure B</p>																																						
Item	Ripple Voltage (by Load Current)																																							
Object	-12V0.13A																																							
<p>1.Graph</p> <p>             —△— Input Volt. 12V              - - ○ - - Input Volt. 36V         </p>		<p>2.Values</p> <table border="1"> <thead> <tr> <th rowspan="2">Load Current [A]</th> <th colspan="2">Ripple Voltage [mV]</th> </tr> <tr> <th>Input Volt. 12 [V]</th> <th>Input Volt. 36 [V]</th> </tr> </thead> <tbody> <tr><td>0.000</td><td>10</td><td>10</td></tr> <tr><td>0.026</td><td>15</td><td>15</td></tr> <tr><td>0.052</td><td>30</td><td>20</td></tr> <tr><td>0.078</td><td>45</td><td>20</td></tr> <tr><td>0.104</td><td>65</td><td>20</td></tr> <tr><td>0.117</td><td>70</td><td>25</td></tr> <tr><td>0.130</td><td>75</td><td>30</td></tr> <tr><td>0.143</td><td>90</td><td>35</td></tr> <tr><td>--</td><td>-</td><td>-</td></tr> <tr><td>--</td><td>-</td><td>-</td></tr> <tr><td>--</td><td>-</td><td>-</td></tr> </tbody> </table> <p>+12V: Rated Load Current</p>	Load Current [A]	Ripple Voltage [mV]		Input Volt. 12 [V]	Input Volt. 36 [V]	0.000	10	10	0.026	15	15	0.052	30	20	0.078	45	20	0.104	65	20	0.117	70	25	0.130	75	30	0.143	90	35	--	-	-	--	-	-	--	-	-
Load Current [A]	Ripple Voltage [mV]																																							
	Input Volt. 12 [V]	Input Volt. 36 [V]																																						
0.000	10	10																																						
0.026	15	15																																						
0.052	30	20																																						
0.078	45	20																																						
0.104	65	20																																						
0.117	70	25																																						
0.130	75	30																																						
0.143	90	35																																						
--	-	-																																						
--	-	-																																						
--	-	-																																						
<p>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.</p>																																								
<p>Ripple [mVp-p]</p> <p>Fig.Complex Ripple Wave Form</p>																																								

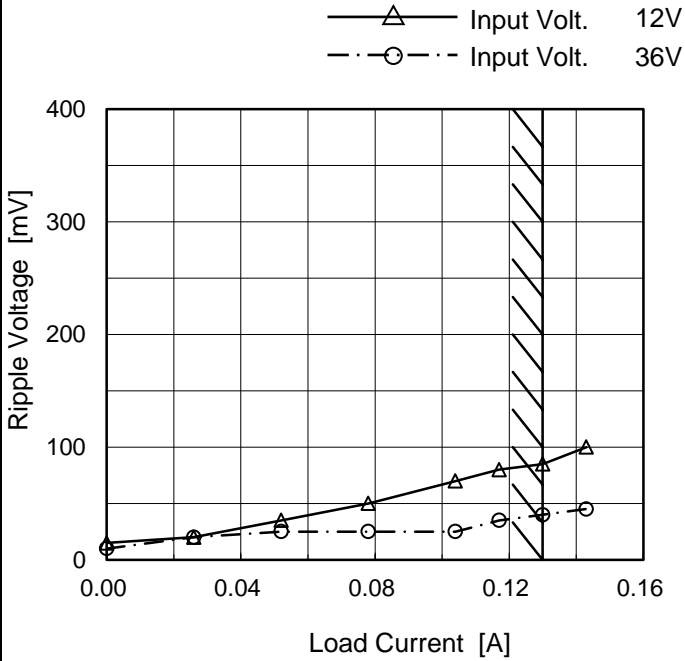


<p>Model MGFW32412</p> <p>Item Ripple-Noise</p> <p>Object +12V0.13A</p>		<p>Temperature 25°C</p> <p>Testing Circuitry Figure B</p>																																						
<p>1.Graph</p> <div style="display: flex; align-items: center;"> <div style="margin-right: 20px;"> <p>—△— Input Volt. 12V</p> <p>-·-○-·- Input Volt. 36V</p> </div> </div>		<p>2.Values</p> <table border="1"> <thead> <tr> <th rowspan="2">Load Current [A]</th> <th colspan="2">Ripple-Noise [mV]</th> </tr> <tr> <th>Input Volt. 12 [V]</th> <th>Input Volt. 36 [V]</th> </tr> </thead> <tbody> <tr><td>0.000</td><td>15</td><td>10</td></tr> <tr><td>0.026</td><td>20</td><td>20</td></tr> <tr><td>0.052</td><td>35</td><td>25</td></tr> <tr><td>0.078</td><td>50</td><td>25</td></tr> <tr><td>0.104</td><td>70</td><td>25</td></tr> <tr><td>0.117</td><td>80</td><td>35</td></tr> <tr><td>0.130</td><td>85</td><td>40</td></tr> <tr><td>0.143</td><td>100</td><td>45</td></tr> <tr><td>--</td><td>-</td><td>-</td></tr> <tr><td>--</td><td>-</td><td>-</td></tr> <tr><td>--</td><td>-</td><td>-</td></tr> </tbody> </table> <p style="text-align: center;">-12V: Rated Load Current</p>	Load Current [A]	Ripple-Noise [mV]		Input Volt. 12 [V]	Input Volt. 36 [V]	0.000	15	10	0.026	20	20	0.052	35	25	0.078	50	25	0.104	70	25	0.117	80	35	0.130	85	40	0.143	100	45	--	-	-	--	-	-	--	-	-
Load Current [A]	Ripple-Noise [mV]																																							
	Input Volt. 12 [V]	Input Volt. 36 [V]																																						
0.000	15	10																																						
0.026	20	20																																						
0.052	35	25																																						
0.078	50	25																																						
0.104	70	25																																						
0.117	80	35																																						
0.130	85	40																																						
0.143	100	45																																						
--	-	-																																						
--	-	-																																						
--	-	-																																						
<p>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.</p>																																								
<p>Ripple Noise[mVp-p]</p>																																								
<p>Fig.Complex Ripple Noise Wave Form</p>																																								



Model	MGFW32412	Temperature	25°C
Item	Ripple-Noise	Testing Circuitry	Figure B
Object	-12V0.13A		

1.Graph



2.Values

Load Current [A]	Ripple-Noise [mV]	
	Input Volt. 12 [V]	Input Volt. 36 [V]
0.000	15	10
0.026	20	20
0.052	35	25
0.078	50	25
0.104	70	25
0.117	80	35
0.130	85	40
0.143	100	45
--	-	-
--	-	-
--	-	-

+12V: 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]

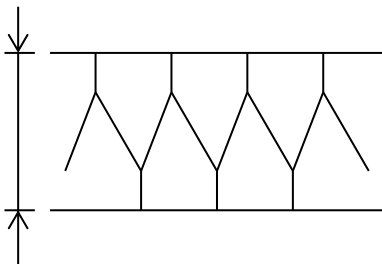
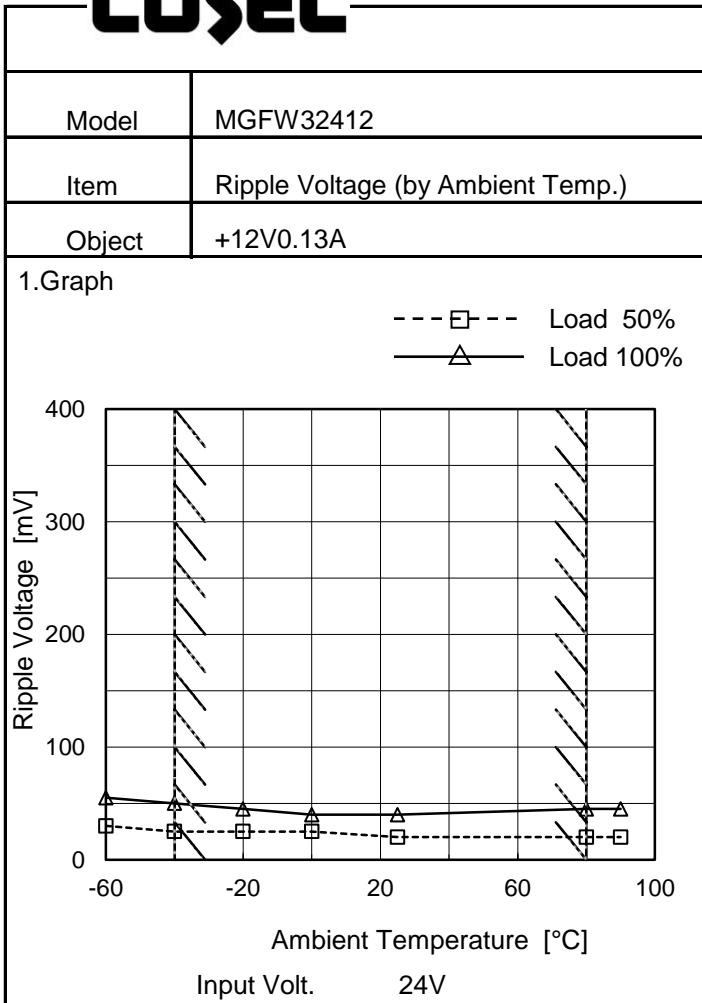


Fig.Complex Ripple Noise Wave Form

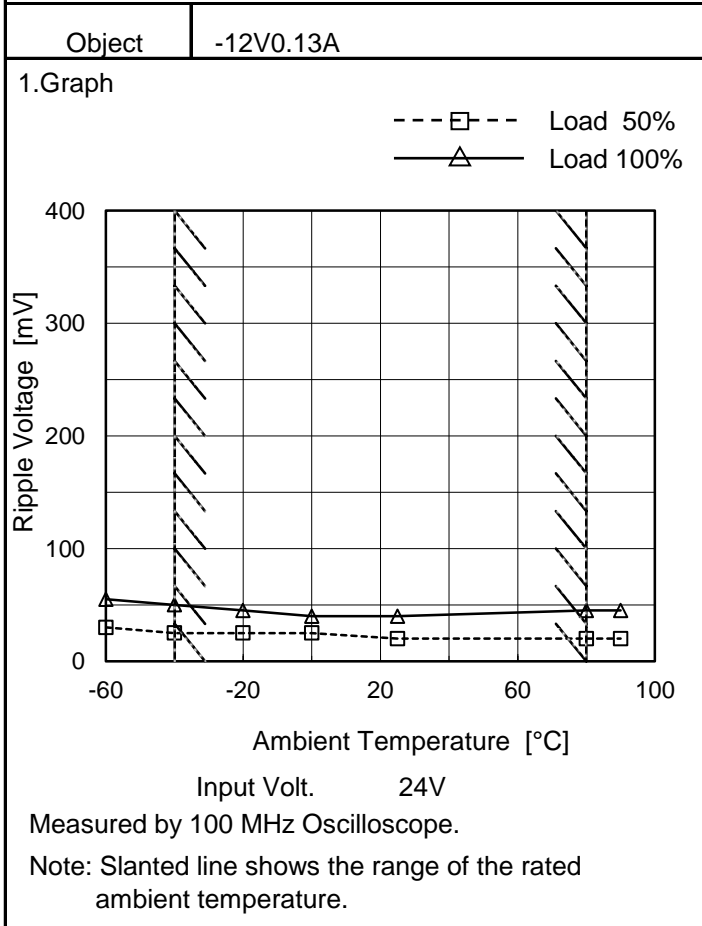


Testing Circuitry Figure B

2.Values

Ambient Temperature [°C]	Ripple Voltage [mV]	
	Load 50%	Load 100%
-60	30	55
-40	25	50
-20	25	45
0	25	40
25	20	40
80	20	45
90	20	45
--	-	-
--	-	-
--	-	-
--	-	-

-12V: Rated Load Current



2.Values

Ambient Temperature [°C]	Ripple Voltage [mV]	
	Load 50%	Load 100%
-60	30	55
-40	25	50
-20	25	45
0	25	40
25	20	40
80	20	45
90	20	45
--	-	-
--	-	-
--	-	-
--	-	-

+12V: Rated Load Current





<b>COSEL</b>																																																																															
Model	MGFW32412																																																																														
Item	Ambient Temperature Drift	Testing Circuitry Figure A																																																																													
Object	+12V0.13A																																																																														
1.Graph	<p>                     —△— Input Volt. 9V                      - - - □ - - - Input Volt. 12V                      - · · * · · - · - Input Volt. 18V                      - · · ○ · · - · - Input Volt. 24V                      - - ◇ - - Input Volt. 36V                 </p>	2.Values																																																																													
		<table border="1"> <thead> <tr> <th rowspan="2">Ambient Temperature [°C]</th> <th colspan="5">Output Voltage [V]</th> </tr> <tr> <th>Input Volt. 9[V]</th> <th>Input Volt. 12[V]</th> <th>Input Volt. 18[V]</th> <th>Input Volt. 24[V]</th> <th>Input Volt. 36[V]</th> </tr> </thead> <tbody> <tr><td>-60</td><td>12.025</td><td>12.023</td><td>12.027</td><td>12.029</td><td>12.033</td></tr> <tr><td>-40</td><td>12.045</td><td>12.043</td><td>12.047</td><td>12.050</td><td>12.054</td></tr> <tr><td>-20</td><td>12.061</td><td>12.059</td><td>12.064</td><td>12.067</td><td>12.071</td></tr> <tr><td>0</td><td>12.073</td><td>12.070</td><td>12.076</td><td>12.079</td><td>12.082</td></tr> <tr><td>25</td><td>12.085</td><td>12.080</td><td>12.090</td><td>12.090</td><td>12.090</td></tr> <tr><td>80</td><td>12.084</td><td>12.080</td><td>12.088</td><td>12.092</td><td>12.095</td></tr> <tr><td>90</td><td>12.083</td><td>12.079</td><td>12.088</td><td>12.091</td><td>12.095</td></tr> <tr><td>--</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr> <tr><td>--</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr> <tr><td>--</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr> <tr><td>--</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr> </tbody> </table> <p style="text-align: center;">-12V: Rated Load Current</p>	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	12.025	12.023	12.027	12.029	12.033	-40	12.045	12.043	12.047	12.050	12.054	-20	12.061	12.059	12.064	12.067	12.071	0	12.073	12.070	12.076	12.079	12.082	25	12.085	12.080	12.090	12.090	12.090	80	12.084	12.080	12.088	12.092	12.095	90	12.083	12.079	12.088	12.091	12.095	--	-	-	-	-	-	--	-	-	-	-	-	--	-	-	-	-	-	--	-	-	-	-	-
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	12.025	12.023	12.027	12.029	12.033																																																																										
-40	12.045	12.043	12.047	12.050	12.054																																																																										
-20	12.061	12.059	12.064	12.067	12.071																																																																										
0	12.073	12.070	12.076	12.079	12.082																																																																										
25	12.085	12.080	12.090	12.090	12.090																																																																										
80	12.084	12.080	12.088	12.092	12.095																																																																										
90	12.083	12.079	12.088	12.091	12.095																																																																										
--	-	-	-	-	-																																																																										
--	-	-	-	-	-																																																																										
--	-	-	-	-	-																																																																										
--	-	-	-	-	-																																																																										
Object	-12V0.13A																																																																														
1.Graph	<p>                     —△— Input Volt. 9V                      - - - □ - - - Input Volt. 12V                      - · · * · · - · - Input Volt. 18V                      - · · ○ · · - · - Input Volt. 24V                      - - ◇ - - Input Volt. 36V                 </p>	2.Values																																																																													
		<table border="1"> <thead> <tr> <th rowspan="2">Ambient Temperature [°C]</th> <th colspan="5">Output Voltage [V]</th> </tr> <tr> <th>Input Volt. 9[V]</th> <th>Input Volt. 12[V]</th> <th>Input Volt. 18[V]</th> <th>Input Volt. 24[V]</th> <th>Input Volt. 36[V]</th> </tr> </thead> <tbody> <tr><td>-60</td><td>-12.064</td><td>-12.066</td><td>-12.063</td><td>-12.059</td><td>-12.052</td></tr> <tr><td>-40</td><td>-12.083</td><td>-12.084</td><td>-12.081</td><td>-12.077</td><td>-12.070</td></tr> <tr><td>-20</td><td>-12.097</td><td>-12.100</td><td>-12.095</td><td>-12.091</td><td>-12.084</td></tr> <tr><td>0</td><td>-12.108</td><td>-12.110</td><td>-12.105</td><td>-12.100</td><td>-12.094</td></tr> <tr><td>25</td><td>-12.110</td><td>-12.118</td><td>-12.110</td><td>-12.110</td><td>-12.100</td></tr> <tr><td>80</td><td>-12.118</td><td>-12.121</td><td>-12.114</td><td>-12.110</td><td>-12.105</td></tr> <tr><td>90</td><td>-12.117</td><td>-12.121</td><td>-12.114</td><td>-12.110</td><td>-12.105</td></tr> <tr><td>--</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr> <tr><td>--</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr> <tr><td>--</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr> <tr><td>--</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr> </tbody> </table> <p style="text-align: center;">+12V: Rated Load Current</p>	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	-12.064	-12.066	-12.063	-12.059	-12.052	-40	-12.083	-12.084	-12.081	-12.077	-12.070	-20	-12.097	-12.100	-12.095	-12.091	-12.084	0	-12.108	-12.110	-12.105	-12.100	-12.094	25	-12.110	-12.118	-12.110	-12.110	-12.100	80	-12.118	-12.121	-12.114	-12.110	-12.105	90	-12.117	-12.121	-12.114	-12.110	-12.105	--	-	-	-	-	-	--	-	-	-	-	-	--	-	-	-	-	-	--	-	-	-	-	-
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	-12.064	-12.066	-12.063	-12.059	-12.052																																																																										
-40	-12.083	-12.084	-12.081	-12.077	-12.070																																																																										
-20	-12.097	-12.100	-12.095	-12.091	-12.084																																																																										
0	-12.108	-12.110	-12.105	-12.100	-12.094																																																																										
25	-12.110	-12.118	-12.110	-12.110	-12.100																																																																										
80	-12.118	-12.121	-12.114	-12.110	-12.105																																																																										
90	-12.117	-12.121	-12.114	-12.110	-12.105																																																																										
--	-	-	-	-	-																																																																										
--	-	-	-	-	-																																																																										
--	-	-	-	-	-																																																																										
--	-	-	-	-	-																																																																										
<p>Note: Slanted line shows the range of the rated ambient temperature.</p>		<p>Note: In case of Input Volt. 9V, Load 80%. Other case Load 100%.</p>																																																																													



<b>COSEL</b>		Testing Circuitry Figure A
Model	MGFW32412	
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 - 80°C

Input Voltage : 12 - 36V

Load Current (AVR 1) : 0 - 0.13A (AVR 2) : 0 - 0.13A

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

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

2. Values

Object		+12V0.13A				
Item	Temperature [°C]	Input Voltage[V]	Output		Output Voltage Accuracy	
			Current[A]	Voltage[V]	Value [mV]	Ratio [%]
Maximum Voltage	80	12	0	12.412	±324	±2.7
Minimum Voltage	-40	12	0.13	11.765		

Object		-12V0.13A				
Item	Temperature [°C]	Input Voltage[V]	Output		Output Voltage Accuracy	
			Current[A]	Voltage[V]	Value [mV]	Ratio [%]
Maximum Voltage	80	12	0	-12.436	±321	±2.7
Minimum Voltage	-40	12	0.13	-11.795		

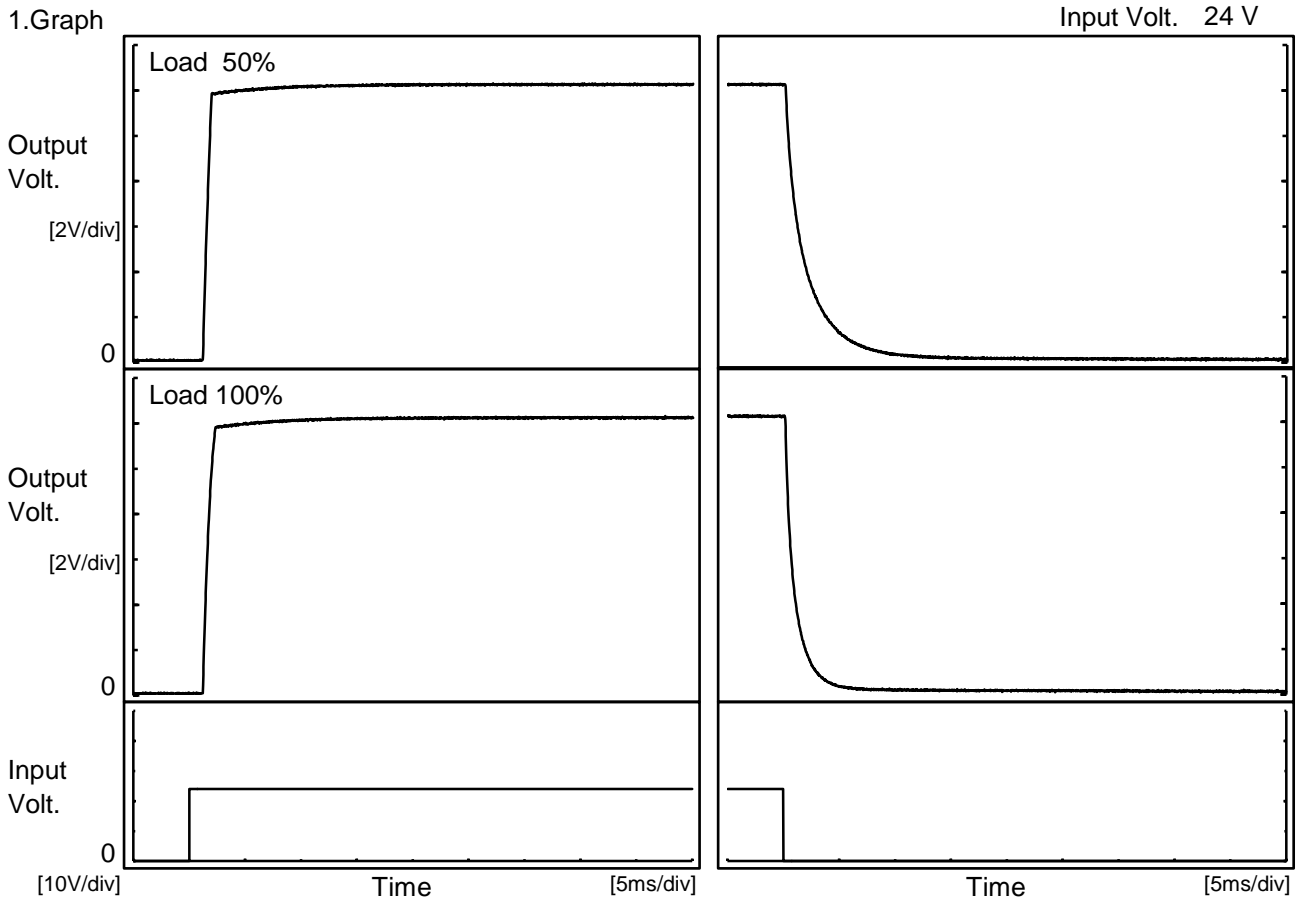


<b>COSEL</b>																									
Model	MGFW32412	Temperature 25°C Testing Circuitry Figure A																							
Item	Time Lapse Drift																								
Object	+12V0.13A																								
<p>1.Graph</p> <p style="text-align: center;">Time [H]</p> <p>Input Volt. 24V Load 100%</p>		<p>2.Values</p> <table border="1"> <thead> <tr> <th>Time since start [H]</th> <th>Output Voltage [V]</th> </tr> </thead> <tbody> <tr><td>0.0</td><td>12.083</td></tr> <tr><td>0.5</td><td>12.084</td></tr> <tr><td>1.0</td><td>12.084</td></tr> <tr><td>2.0</td><td>12.083</td></tr> <tr><td>3.0</td><td>12.083</td></tr> <tr><td>4.0</td><td>12.083</td></tr> <tr><td>5.0</td><td>12.083</td></tr> <tr><td>6.0</td><td>12.082</td></tr> <tr><td>7.0</td><td>12.082</td></tr> <tr><td>8.0</td><td>12.082</td></tr> </tbody> </table> <p style="text-align: center;">-12V: Rated Load Current</p>	Time since start [H]	Output Voltage [V]	0.0	12.083	0.5	12.084	1.0	12.084	2.0	12.083	3.0	12.083	4.0	12.083	5.0	12.083	6.0	12.082	7.0	12.082	8.0	12.082	
Time since start [H]	Output Voltage [V]																								
0.0	12.083																								
0.5	12.084																								
1.0	12.084																								
2.0	12.083																								
3.0	12.083																								
4.0	12.083																								
5.0	12.083																								
6.0	12.082																								
7.0	12.082																								
8.0	12.082																								
Object	-12V0.13A	Temperature 25°C Testing Circuitry Figure A																							
<p>1.Graph</p> <p style="text-align: center;">Time [H]</p> <p>Input Volt. 24V Load 100%</p>			<p>2.Values</p> <table border="1"> <thead> <tr> <th>Time since start [H]</th> <th>Output Voltage [V]</th> </tr> </thead> <tbody> <tr><td>0.0</td><td>-12.111</td></tr> <tr><td>0.5</td><td>-12.113</td></tr> <tr><td>1.0</td><td>-12.113</td></tr> <tr><td>2.0</td><td>-12.113</td></tr> <tr><td>3.0</td><td>-12.113</td></tr> <tr><td>4.0</td><td>-12.113</td></tr> <tr><td>5.0</td><td>-12.113</td></tr> <tr><td>6.0</td><td>-12.113</td></tr> <tr><td>7.0</td><td>-12.113</td></tr> <tr><td>8.0</td><td>-12.113</td></tr> </tbody> </table> <p style="text-align: center;">+12V: Rated Load Current</p>	Time since start [H]	Output Voltage [V]	0.0	-12.111	0.5	-12.113	1.0	-12.113	2.0	-12.113	3.0	-12.113	4.0	-12.113	5.0	-12.113	6.0	-12.113	7.0	-12.113	8.0	-12.113
Time since start [H]	Output Voltage [V]																								
0.0	-12.111																								
0.5	-12.113																								
1.0	-12.113																								
2.0	-12.113																								
3.0	-12.113																								
4.0	-12.113																								
5.0	-12.113																								
6.0	-12.113																								
7.0	-12.113																								
8.0	-12.113																								



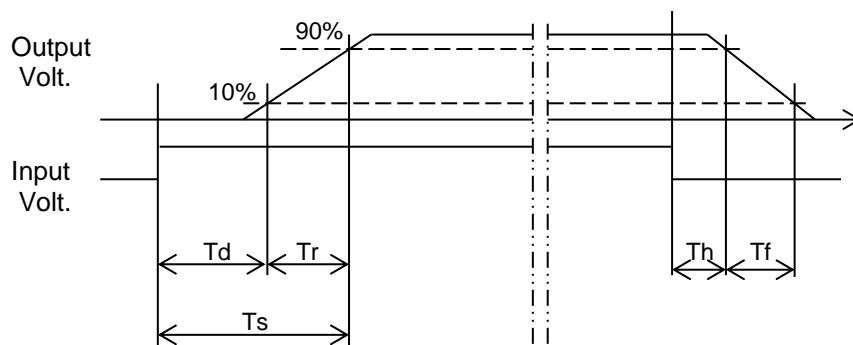
Model	MGFW32412	Temperature	25°C
Item	Rise and Fall Time	Testing Circuitry	Figure A
Object	+12V0.13A		

1. Graph



2. Values

Load \ Time	Td	Tr	Ts	Th	Tf
50 %	1.3	0.6	1.9	0.3	4.8
100 %	1.3	0.9	2.2	0.3	2.3

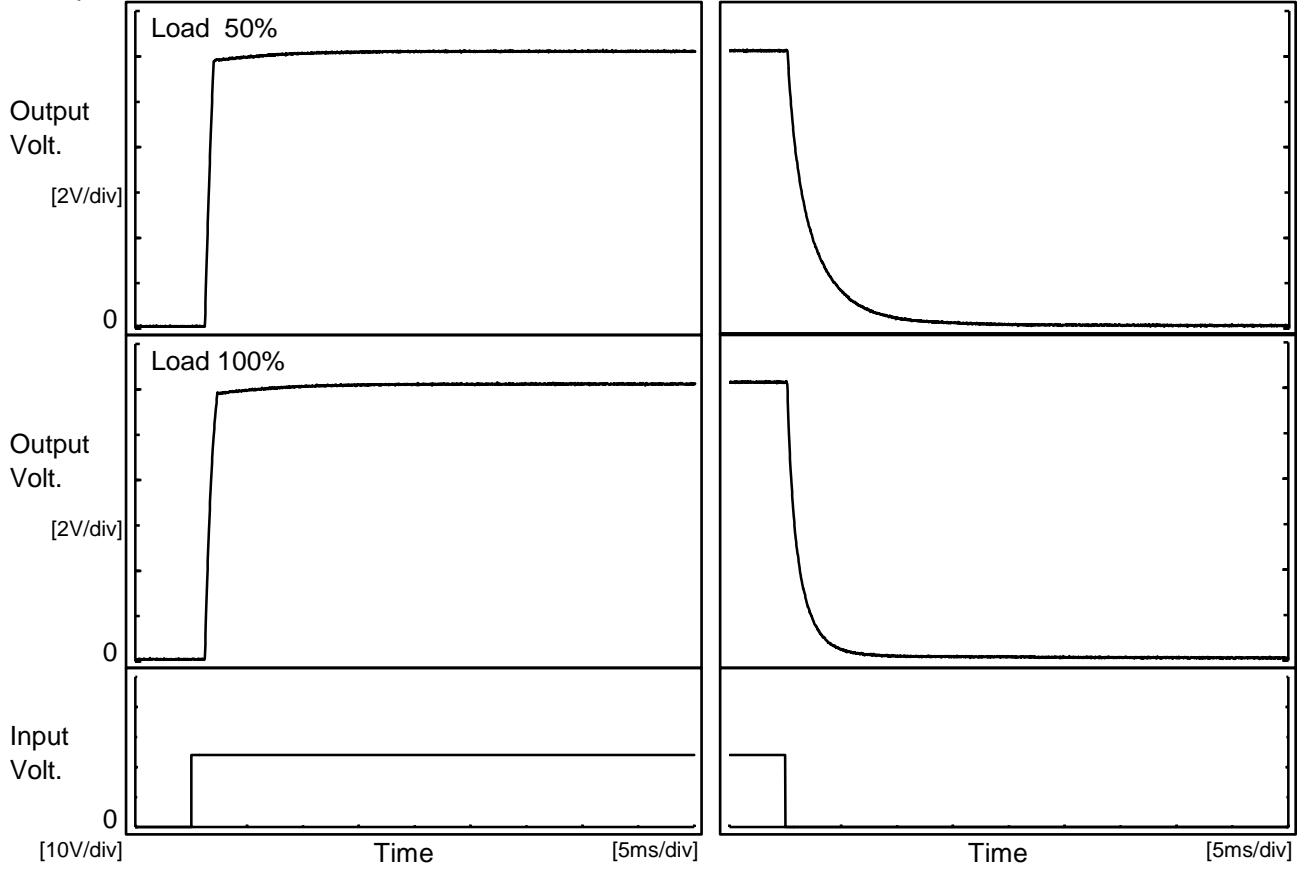




Model	MGFW32412	Temperature	25°C
Item	Rise and Fall Time	Testing Circuitry	Figure A
Object	-12V0.13A		

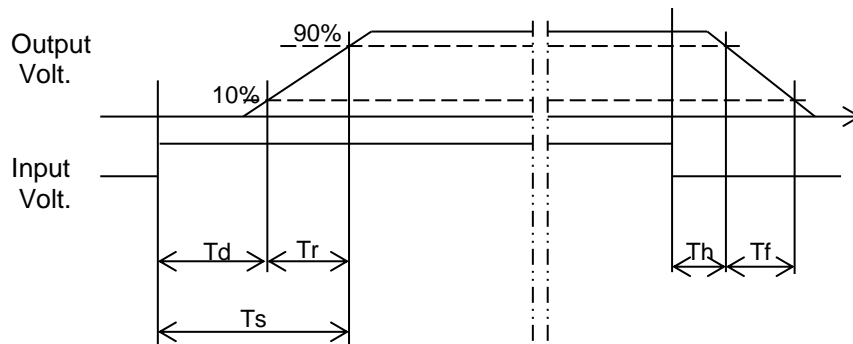
1. Graph

Input Volt. 24 V



2. Values

		[ms]				
Load \ Time	Td	Tr	Ts	Th	Tf	
50 %	1.3	0.6	1.9	0.3	5.5	
100 %	1.3	0.9	2.2	0.3	2.8	

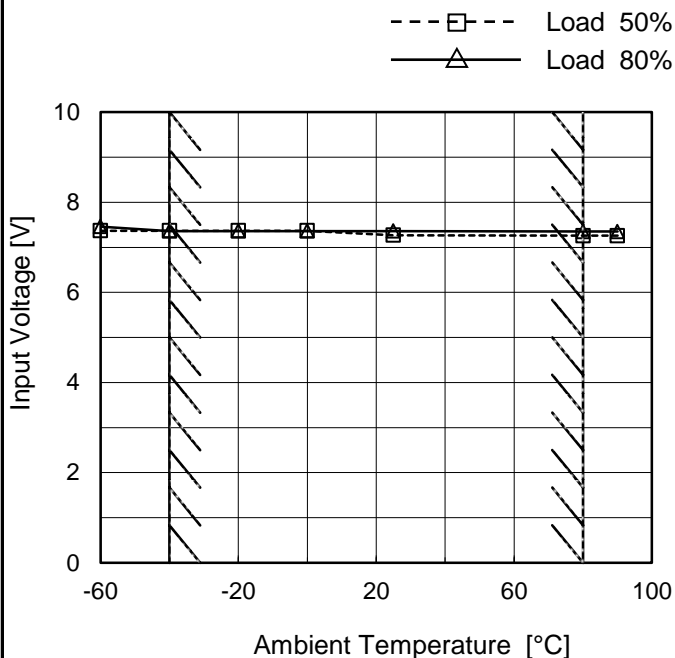




Model	MGFW32412
Item	Minimum Input Voltage for Regulated Output Voltage
Object	+12V0.13A

Testing Circuitry Figure A

1.Graph

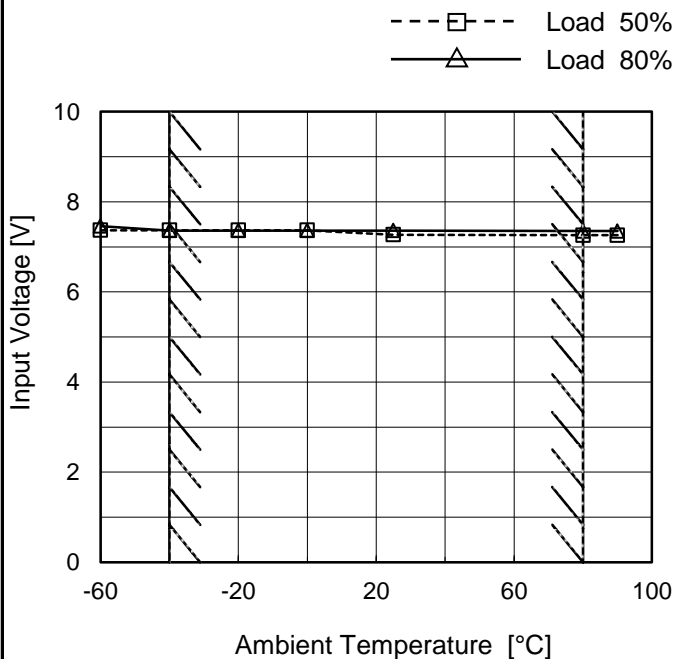


2.Values

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	-12V0.13A
--------	-----------

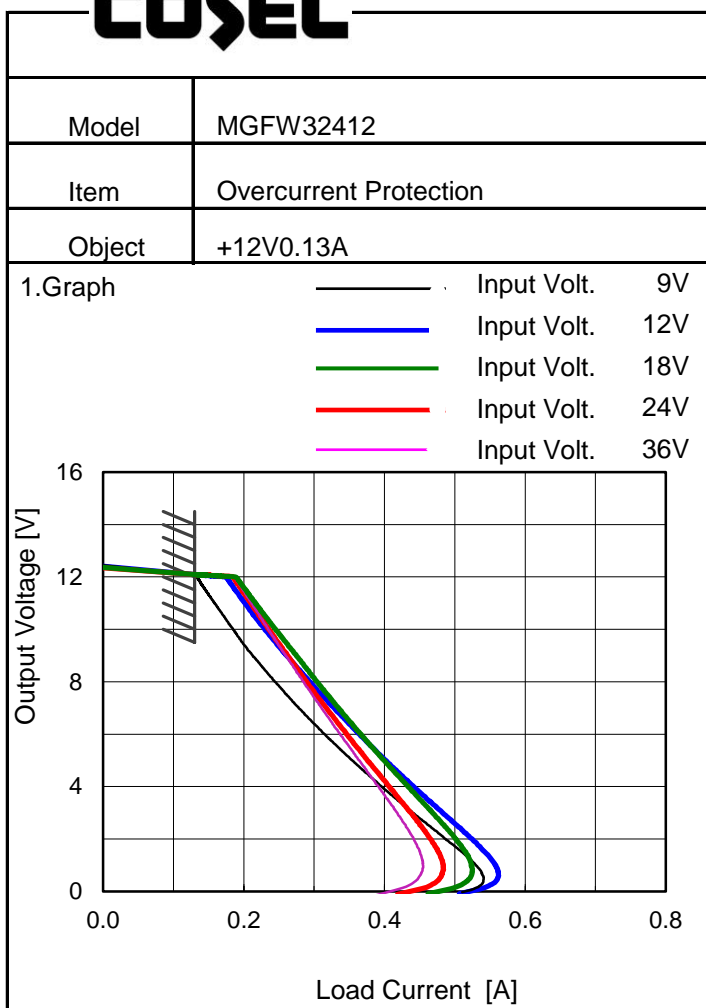
1.Graph



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
--	-	-
--	-	-
--	-	-
--	-	-

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

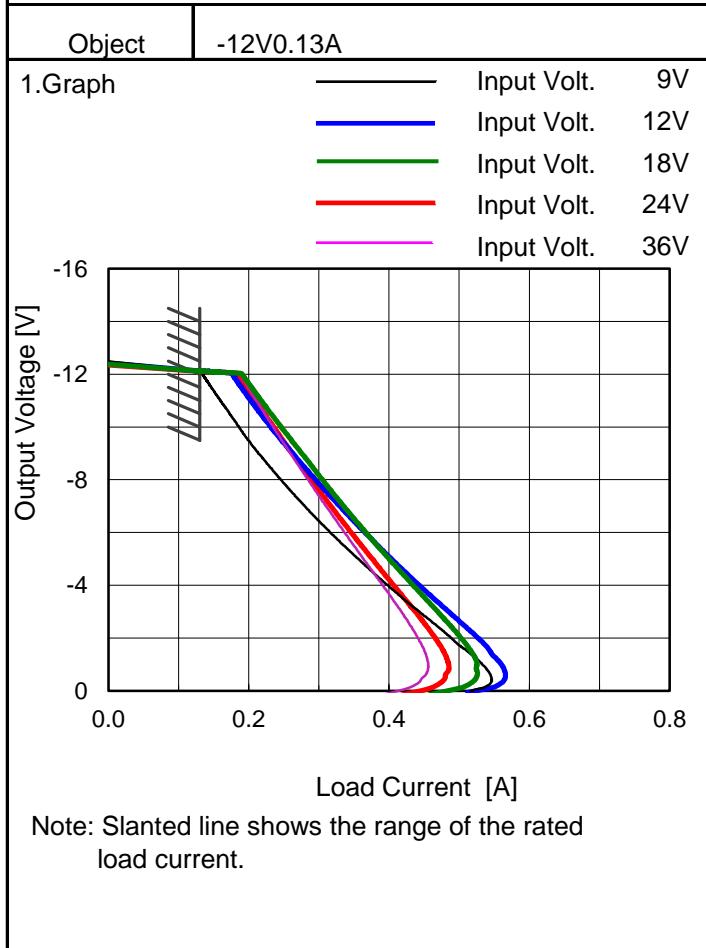


Temperature 25°C  
Testing Circuitry Figure A

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	0.148	0.191	0.205	0.200	0.202
10.8	0.163	0.207	0.222	0.214	0.215
9.6	0.195	0.241	0.256	0.246	0.244
8.4	0.231	0.280	0.292	0.278	0.274
7.2	0.272	0.320	0.328	0.311	0.305
6.0	0.314	0.364	0.365	0.346	0.337
4.8	0.361	0.409	0.406	0.382	0.369
3.6	0.414	0.457	0.446	0.419	0.402
2.4	0.468	0.508	0.488	0.454	0.433
1.2	0.523	0.552	0.521	0.481	0.454
0.0	0.511	0.506	0.462	0.419	0.388
--	-	-	-	-	-

-12V: 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	0.149	0.192	0.207	0.200	0.201
-10.8	0.165	0.208	0.224	0.214	0.216
-9.6	0.196	0.243	0.257	0.245	0.244
-8.4	0.233	0.281	0.293	0.278	0.274
-7.2	0.273	0.322	0.329	0.311	0.304
-6.0	0.316	0.365	0.366	0.345	0.336
-4.8	0.363	0.411	0.407	0.381	0.369
-3.6	0.415	0.459	0.447	0.418	0.401
-2.4	0.471	0.510	0.490	0.454	0.433
-1.2	0.525	0.553	0.523	0.483	0.455
0.0	0.517	0.512	0.458	0.418	0.390
--	-	-	-	-	-

+12V: 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.



<b>COSEL</b>																																																																																			
Model	MGFW32412	Temperature 25°C Testing Circuitry Figure A																																																																																	
Item	Switching frequency (by Load Current)																																																																																		
Object	+/-12V0.13A																																																																																		
1.Graph	<p>—△— Input Volt. 9V</p> <p>---□--- Input Volt. 12V</p> <p>-·*·-·- Input Volt. 18V</p> <p>-·○-·- Input Volt. 24V</p> <p>---◇--- Input Volt. 36V</p>	2.Values																																																																																	
		<table border="1"> <thead> <tr> <th rowspan="2">Load Current [A]</th> <th colspan="5">Input Current [A]</th> </tr> <tr> <th>Input Volt. 9[V]</th> <th>Input Volt. 12[V]</th> <th>Input Volt. 18[V]</th> <th>Input Volt. 24[V]</th> <th>Input Volt. 36[V]</th> </tr> </thead> <tbody> <tr><td>0.000</td><td>665</td><td>760</td><td>880</td><td>960</td><td>1010</td></tr> <tr><td>0.026</td><td>392</td><td>488</td><td>616</td><td>696</td><td>778</td></tr> <tr><td>0.052</td><td>275</td><td>358</td><td>473</td><td>547</td><td>631</td></tr> <tr><td>0.078</td><td>209</td><td>282</td><td>382</td><td>451</td><td>532</td></tr> <tr><td>0.104</td><td>167</td><td>230</td><td>321</td><td>384</td><td>460</td></tr> <tr><td>0.117</td><td>153</td><td>212</td><td>298</td><td>359</td><td>432</td></tr> <tr><td>0.130</td><td>- ※</td><td>194</td><td>276</td><td>334</td><td>405</td></tr> <tr><td>0.143</td><td>- ※</td><td>179</td><td>258</td><td>313</td><td>383</td></tr> <tr><td>--</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr> <tr><td>--</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr> <tr><td>--</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr> </tbody> </table>					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	665	760	880	960	1010	0.026	392	488	616	696	778	0.052	275	358	473	547	631	0.078	209	282	382	451	532	0.104	167	230	321	384	460	0.117	153	212	298	359	432	0.130	- ※	194	276	334	405	0.143	- ※	179	258	313	383	--	-	-	-	-	-	--	-	-	-	-	-	--	-	-	-	-	-
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	665	760	880	960	1010																																																																														
0.026	392	488	616	696	778																																																																														
0.052	275	358	473	547	631																																																																														
0.078	209	282	382	451	532																																																																														
0.104	167	230	321	384	460																																																																														
0.117	153	212	298	359	432																																																																														
0.130	- ※	194	276	334	405																																																																														
0.143	- ※	179	258	313	383																																																																														
--	-	-	-	-	-																																																																														
--	-	-	-	-	-																																																																														
--	-	-	-	-	-																																																																														
	<p>Note: Slanted line shows the range of the rated load current.</p> <p>When load current is low, MG operates intermittently, so switching frequency would not become constant.</p>	<p>※ Maximum output current at minimum input Voltage is 80% of rated load current. Refer to instruction manuals for details of input derating.</p>																																																																																	



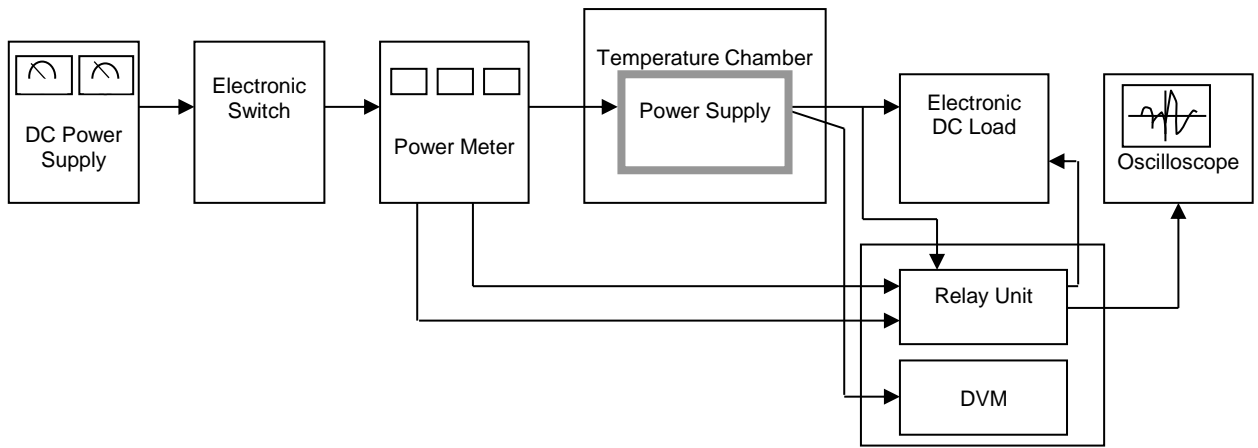


Figure A

Data Acquisition/Control Unit

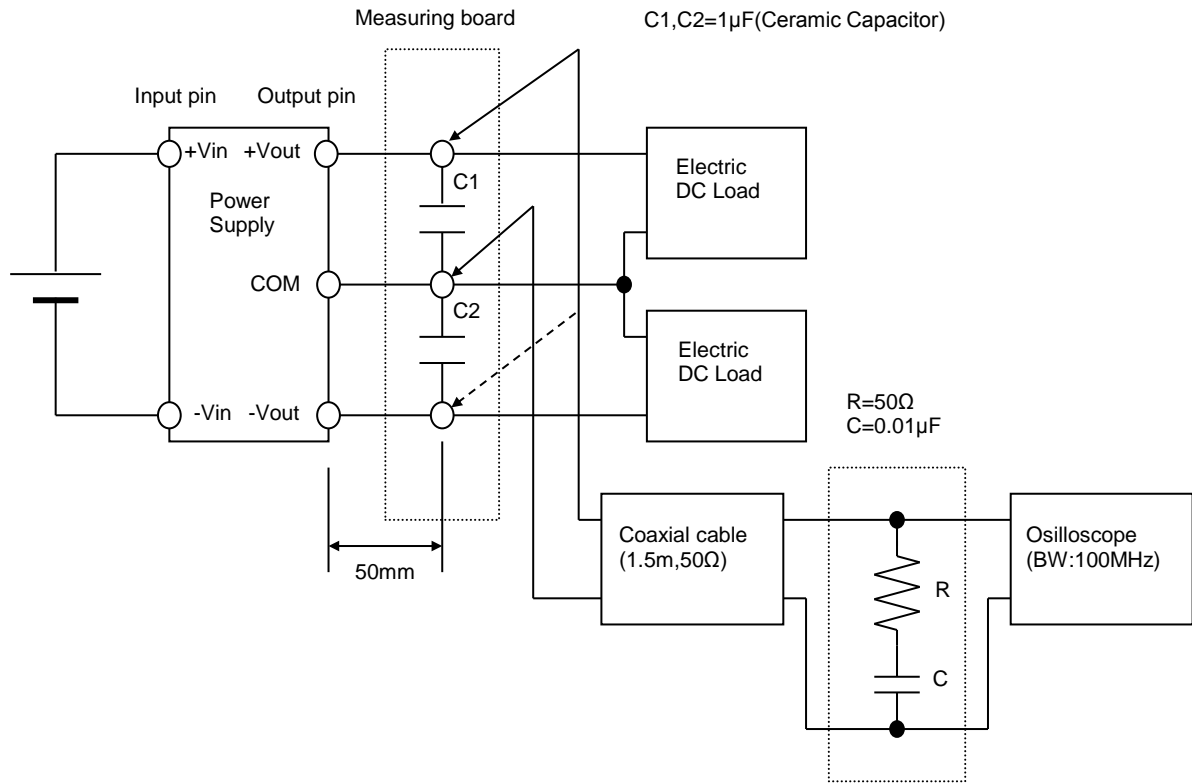


Figure B (Ripple and Ripple noise Characteristic)