

# TEST DATA OF MGW100515

Regulated DC Power Supply  
November 4, 2016

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Takayuki Fukuda Design Manager

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**COSEL CO.,LTD.**

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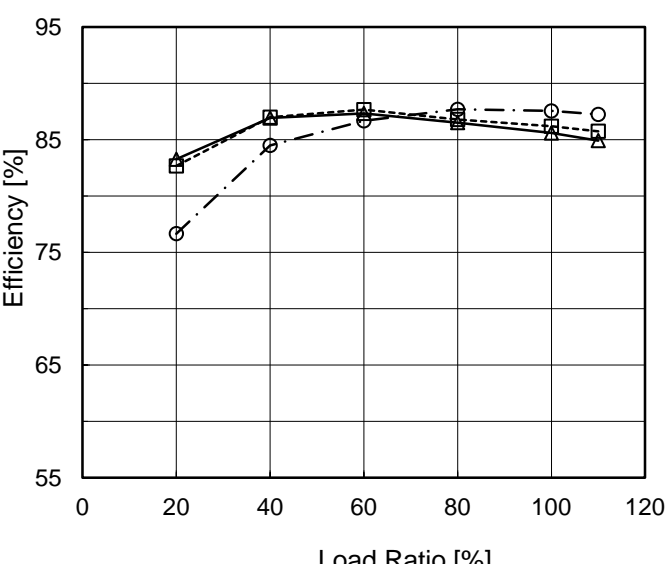


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1.Graph			2.Values																																		
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Input Voltage [V]	Efficiency [%]																																				
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4.4	87.3	85.1																																			
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10.0	85.0	87.1																																			
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Note: Slanted line shows the range of the rated input voltage.																																					



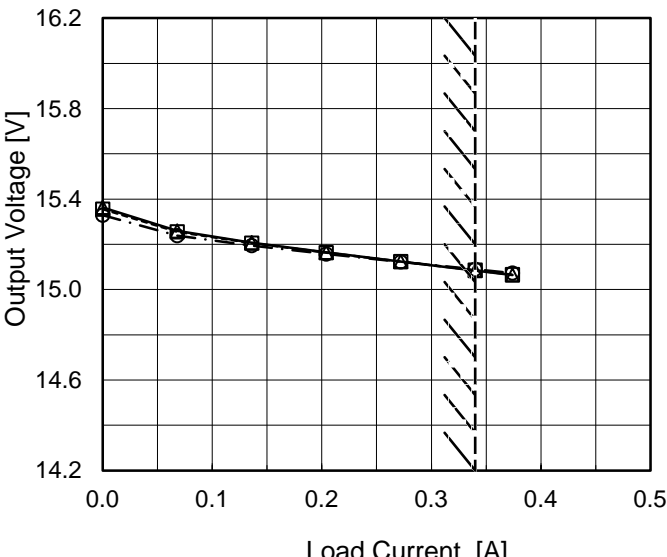
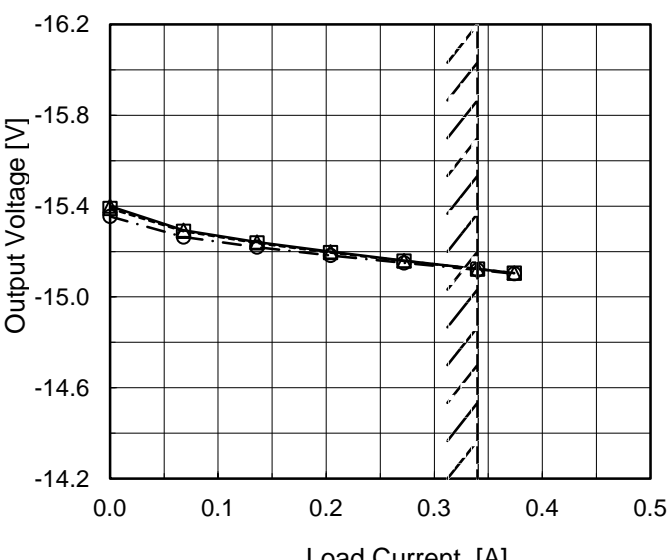
Model		MGW100515		Temperature 25°C																																																	
Item		Efficiency (by Load Ratio)		Testing Circuitry Figure A																																																	
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1.Graph		<div><div><div>—△—</div><div>Input Volt.</div><div>4.5V</div></div><div><div>---□---</div><div>Input Volt.</div><div>5V</div></div><div><div>---○---</div><div>Input Volt.</div><div>9V</div></div></div>  <table><thead><tr><th>Load Ratio [%]</th><th>Input Volt. 4.5[V]</th><th>Input Volt. 5[V]</th><th>Input Volt. 9[V]</th></tr></thead><tbody><tr><td>0</td><td>-</td><td>-</td><td>-</td></tr><tr><td>20</td><td>83.3</td><td>82.7</td><td>76.7</td></tr><tr><td>40</td><td>86.9</td><td>87.0</td><td>84.5</td></tr><tr><td>60</td><td>87.3</td><td>87.7</td><td>86.7</td></tr><tr><td>80</td><td>86.5</td><td>86.8</td><td>87.7</td></tr><tr><td>100</td><td>85.6</td><td>86.2</td><td>87.6</td></tr><tr><td>110</td><td>84.9</td><td>85.8</td><td>87.3</td></tr><tr><td>--</td><td>-</td><td>-</td><td>-</td></tr><tr><td>--</td><td>-</td><td>-</td><td>-</td></tr><tr><td>--</td><td>-</td><td>-</td><td>-</td></tr><tr><td>--</td><td>-</td><td>-</td><td>-</td></tr></tbody></table>		Load Ratio [%]	Input Volt. 4.5[V]	Input Volt. 5[V]	Input Volt. 9[V]	0	-	-	-	20	83.3	82.7	76.7	40	86.9	87.0	84.5	60	87.3	87.7	86.7	80	86.5	86.8	87.7	100	85.6	86.2	87.6	110	84.9	85.8	87.3	--	-	-	-	--	-	-	-	--	-	-	-	--	-	-	-	2.Values	
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Model	MGW100515	Temperature	25°C
Item	Line Regulation	Testing Circuitry	Figure A
Object	+15V0.34A		
1.Graph		2.Values	
<div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></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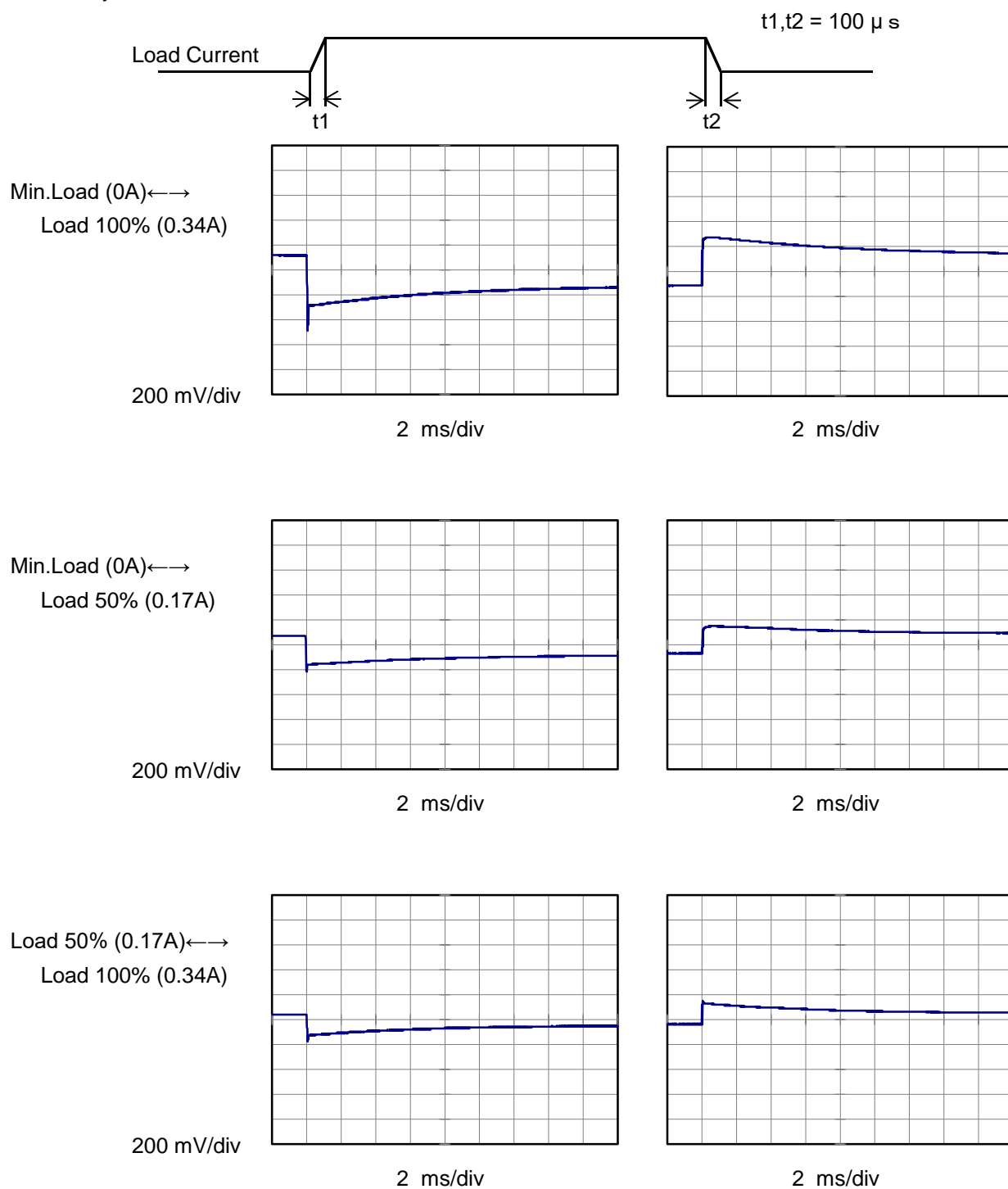
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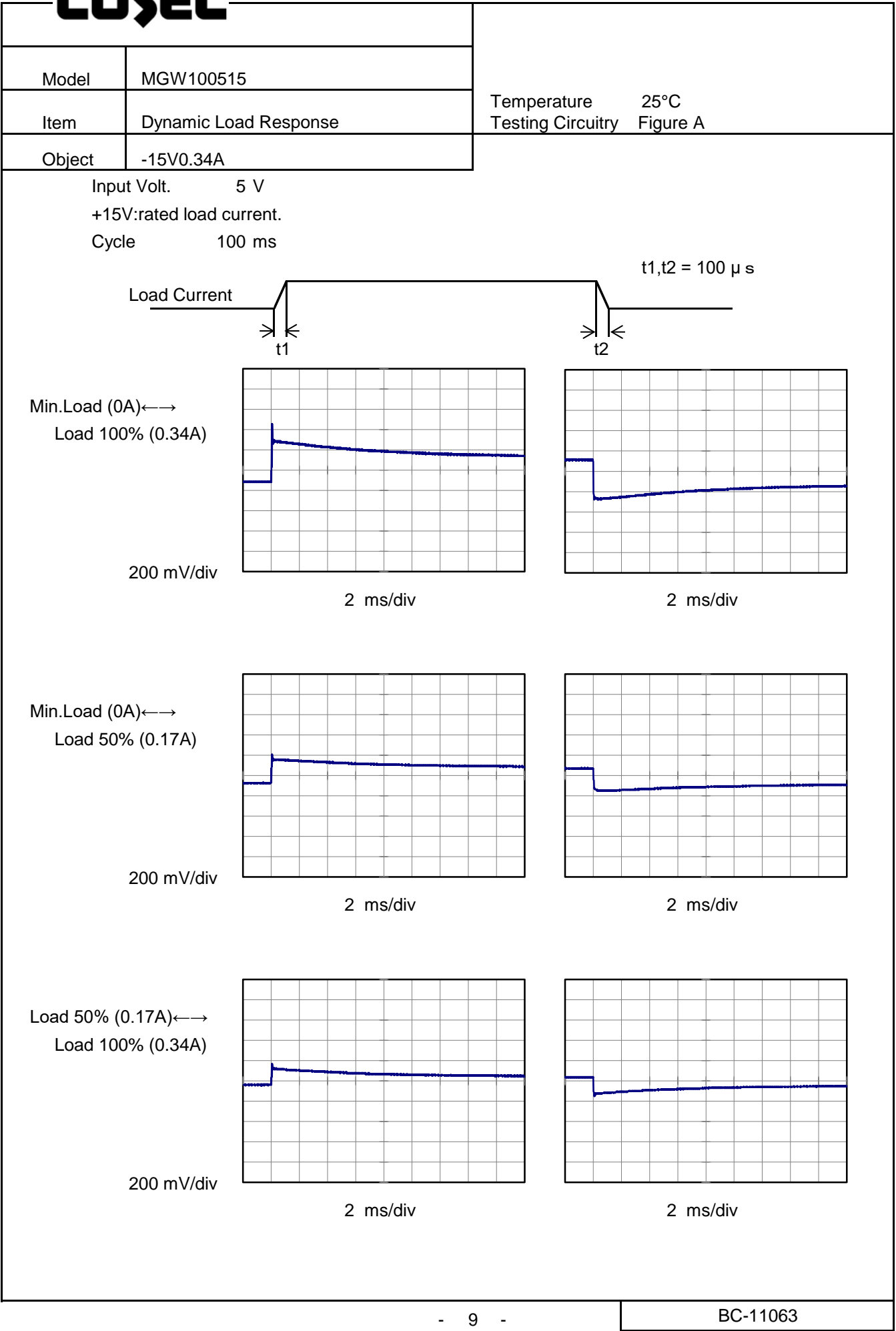
BC-11063



Model	MGW100515	Temperature 25°C Testing Circuitry Figure A
Item	Dynamic Load Response	
Object	+15V0.34A	

Input Volt. 5 V  
-15V:rated load current.  
Cycle 100 ms





Model		MGW100515																																							
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Object		+15V0.34A																																							
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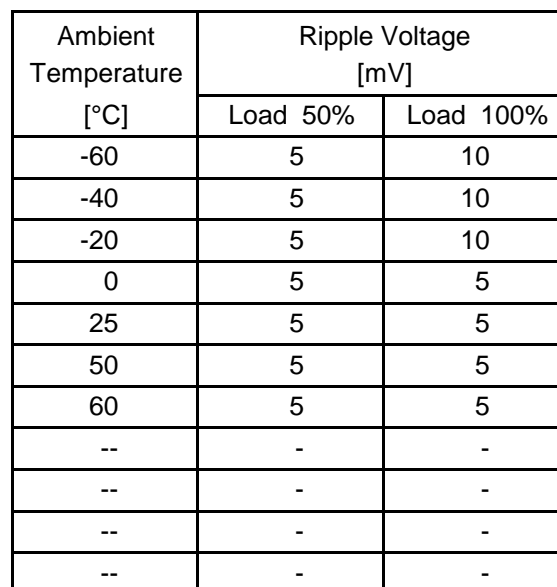
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Model		MGW100515	Temperature		25°C																																						
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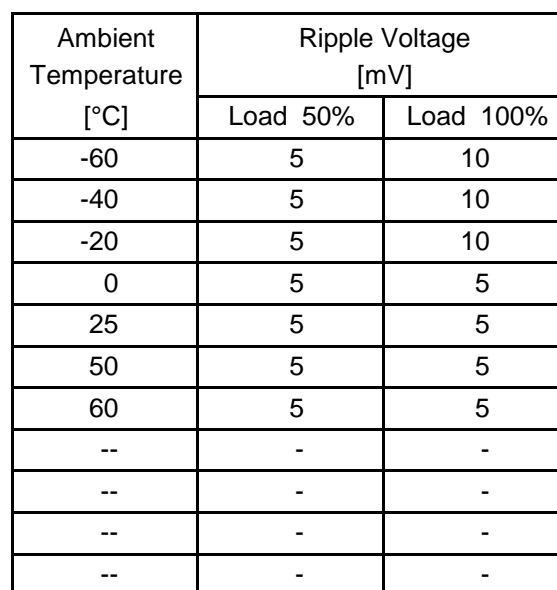
Testing Circuitry Figure B

## 2.Values



Object	-15V0.34A
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## 2.Values



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





Model		MGW100515		Testing Circuitry    Figure A																																																		
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50	-15.125	-15.125	-15.121																																																			
60	-15.126	-15.125	-15.121																																																			
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Note: Slanted line shows the range of the rated ambient temperature.																																																						

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		Testing Circuitry Figure A
Model	MGW100515	
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 - 50°C

Input Voltage : 4.5 - 9V

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

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

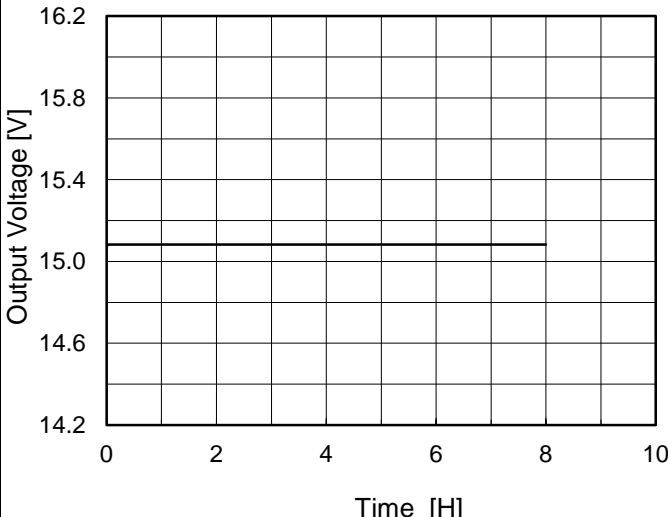
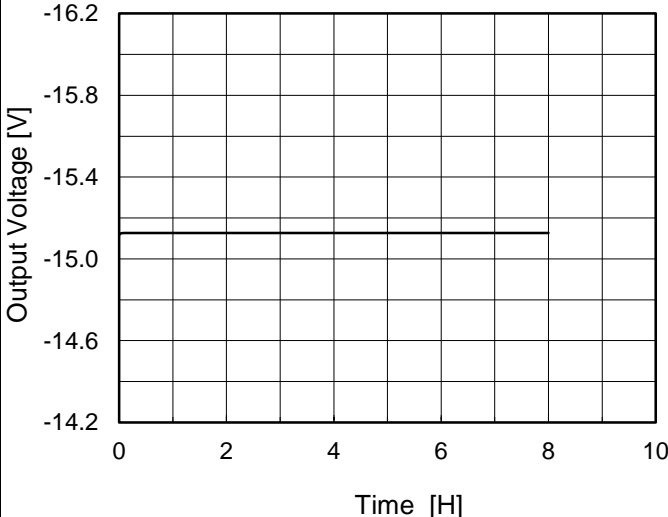
\* Output Voltage Accuracy (Ratio) = 
$$\frac{\text{Output Voltage Accuracy}}{\text{Rated Output Voltage}} \times 100$$

## 2. Values

Object		+15V0.34A				
Item	Temperature [°C]	Input Voltage[V]	Output		Output Voltage Accuracy	
			Current[A]	Voltage[V]	Value [mV]	Ratio [%]
Maximum Voltage	50	4.5	0	15.373	±283	±1.9
Minimum Voltage	-40	4.5	0.34	14.808		

Object		-15V0.34A				
Item	Temperature [°C]	Input Voltage[V]	Output		Output Voltage Accuracy	
			Current[A]	Voltage[V]	Value [mV]	Ratio [%]
Maximum Voltage	50	4.5	0	-15.410	±281	±1.9
Minimum Voltage	-40	4.5	0.34	-14.848		



Model	MGW100515																								
Item	Time Lapse Drift	Temperature	25°C																						
Object	+15V0.34A	Testing Circuitry	Figure A																						
1.Graph		2.Values																							
<div><p>Output Voltage [V]</p><p>Time [H]</p><p>Input Volt. 5V</p><p>Load 100%</p></div>		<table><tr><th>Time since start [H]</th><th>Output Voltage [V]</th></tr><tr><td>0.0</td><td>15.076</td></tr><tr><td>0.5</td><td>15.083</td></tr><tr><td>1.0</td><td>15.083</td></tr><tr><td>2.0</td><td>15.083</td></tr><tr><td>3.0</td><td>15.083</td></tr><tr><td>4.0</td><td>15.083</td></tr><tr><td>5.0</td><td>15.083</td></tr><tr><td>6.0</td><td>15.083</td></tr><tr><td>7.0</td><td>15.083</td></tr><tr><td>8.0</td><td>15.083</td></tr></table> <p>-15V: Rated Load Current</p>		Time since start [H]	Output Voltage [V]	0.0	15.076	0.5	15.083	1.0	15.083	2.0	15.083	3.0	15.083	4.0	15.083	5.0	15.083	6.0	15.083	7.0	15.083	8.0	15.083
Time since start [H]	Output Voltage [V]																								
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0.5	15.083																								
1.0	15.083																								
2.0	15.083																								
3.0	15.083																								
4.0	15.083																								
5.0	15.083																								
6.0	15.083																								
7.0	15.083																								
8.0	15.083																								
Object	-15V0.34A																								
1.Graph		2.Values																							
<div><p>Output Voltage [V]</p><p>Time [H]</p><p>Input Volt. 5V</p><p>Load 100%</p></div>		<table><tr><th>Time since start [H]</th><th>Output Voltage [V]</th></tr><tr><td>0.0</td><td>-15.117</td></tr><tr><td>0.5</td><td>-15.127</td></tr><tr><td>1.0</td><td>-15.127</td></tr><tr><td>2.0</td><td>-15.127</td></tr><tr><td>3.0</td><td>-15.127</td></tr><tr><td>4.0</td><td>-15.127</td></tr><tr><td>5.0</td><td>-15.127</td></tr><tr><td>6.0</td><td>-15.127</td></tr><tr><td>7.0</td><td>-15.127</td></tr><tr><td>8.0</td><td>-15.127</td></tr></table> <p>+15V: Rated Load Current</p>		Time since start [H]	Output Voltage [V]	0.0	-15.117	0.5	-15.127	1.0	-15.127	2.0	-15.127	3.0	-15.127	4.0	-15.127	5.0	-15.127	6.0	-15.127	7.0	-15.127	8.0	-15.127
Time since start [H]	Output Voltage [V]																								
0.0	-15.117																								
0.5	-15.127																								
1.0	-15.127																								
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3.0	-15.127																								
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5.0	-15.127																								
6.0	-15.127																								
7.0	-15.127																								
8.0	-15.127																								

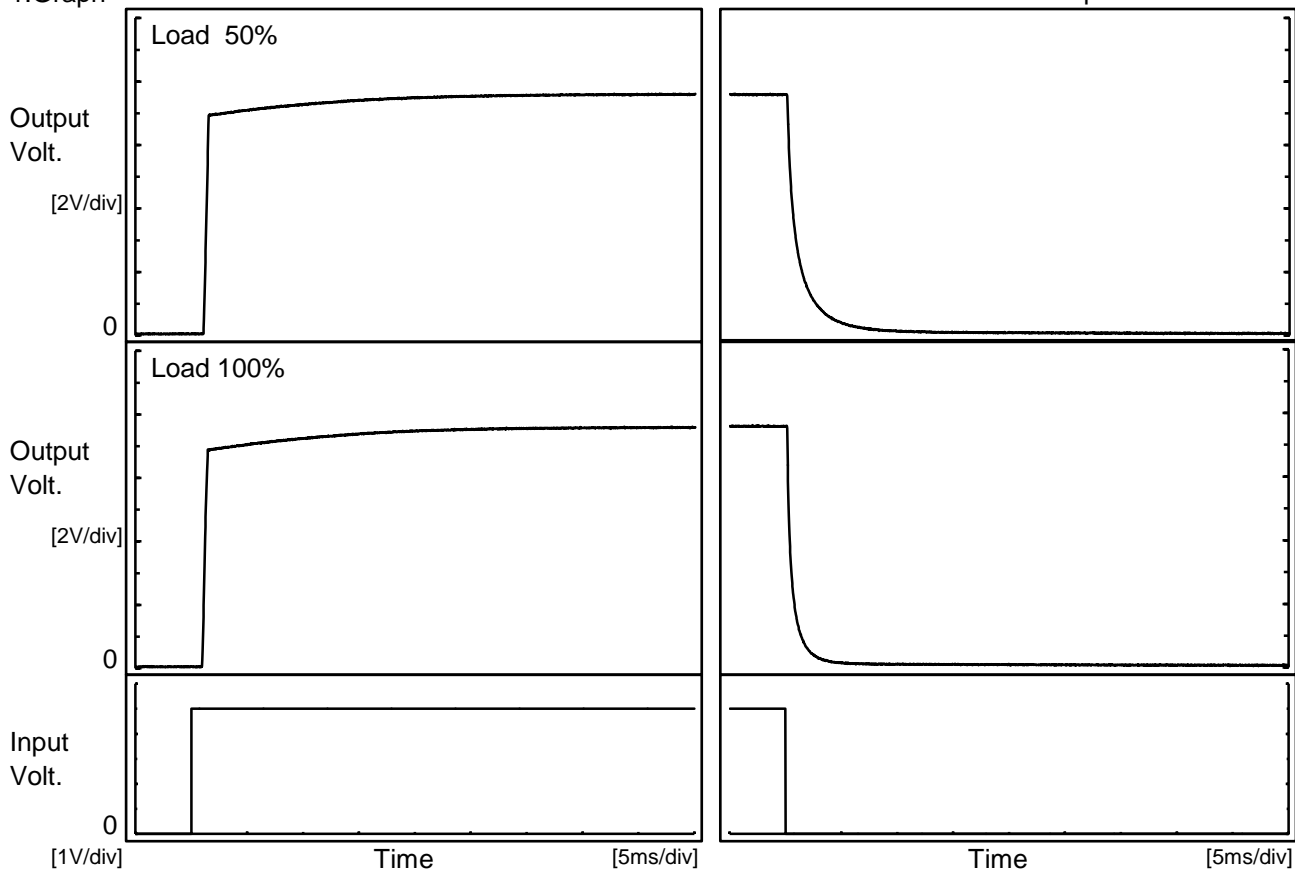
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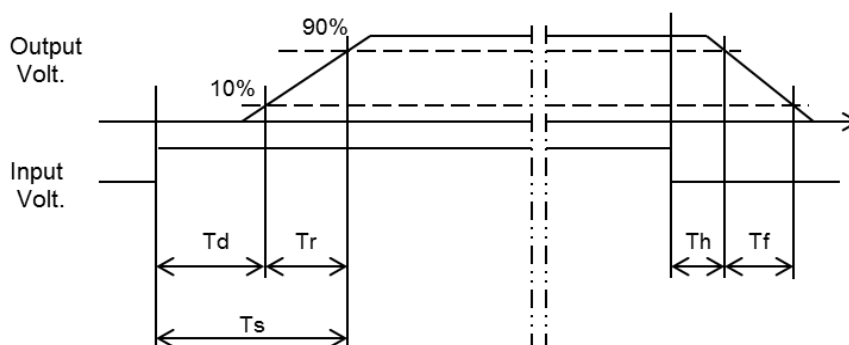
Model	MGW100515	Temperature	25°C
Item	Rise and Fall Time	Testing Circuitry	Figure A
Object	+15V0.34A		

# 1.Graph



# 2.Values

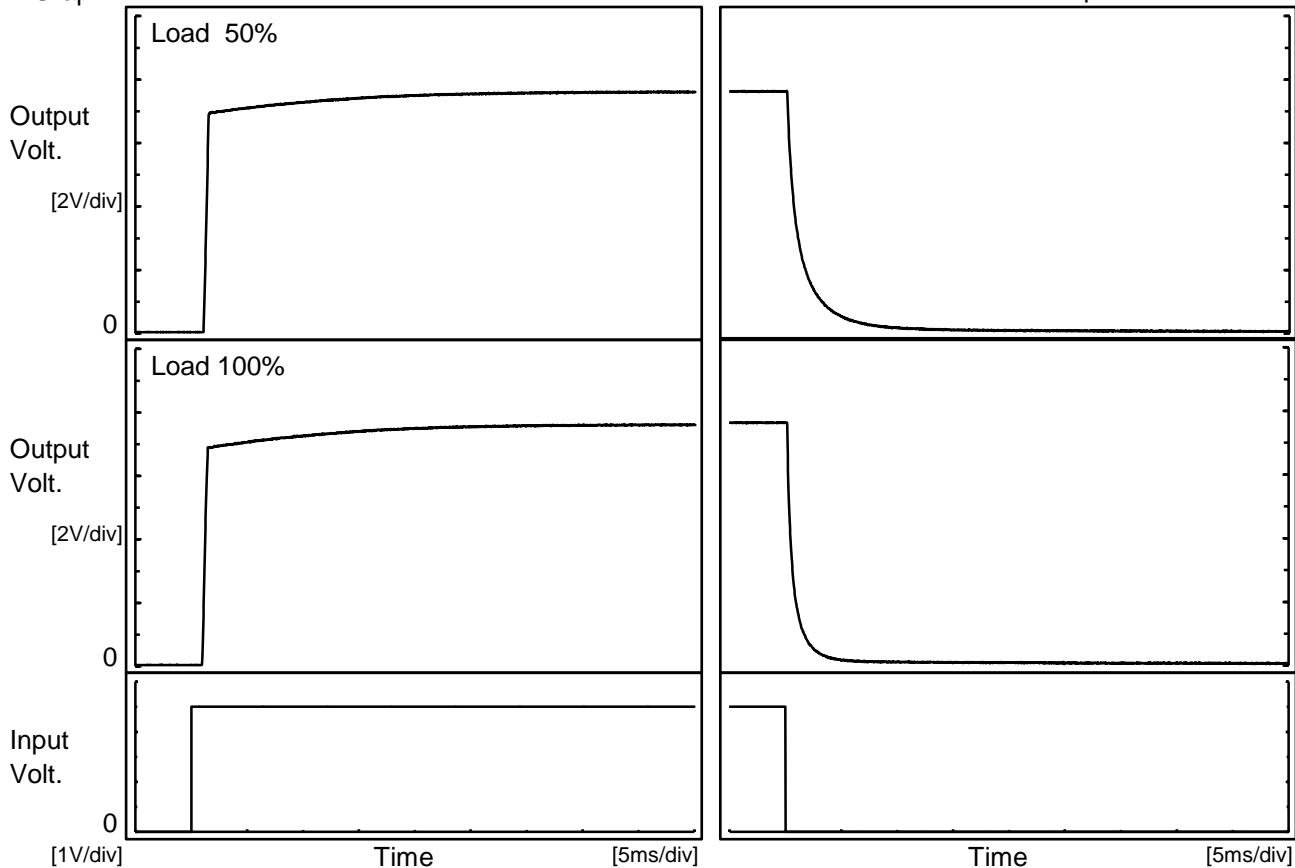
		[ms]				
Load	Time	Td	Tr	Ts	Th	Tf
50 %		1.2	0.4	1.6	0.2	3.0
100 %		1.0	0.5	1.5	0.2	1.5





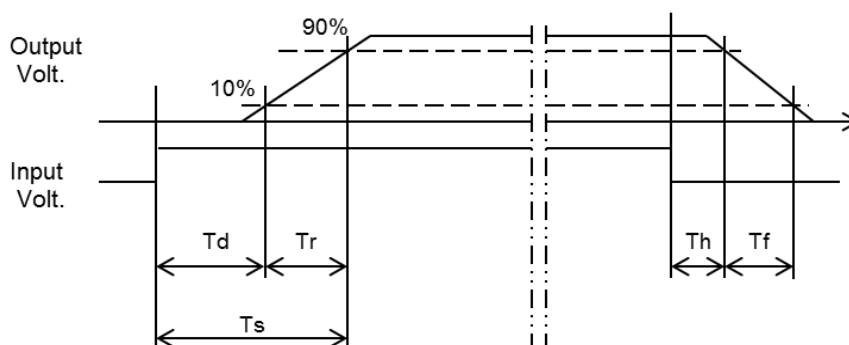
Model	MGW100515	Temperature	25°C
Item	Rise and Fall Time	Testing Circuitry	Figure A
Object	-15V0.34A		


# 1.Graph



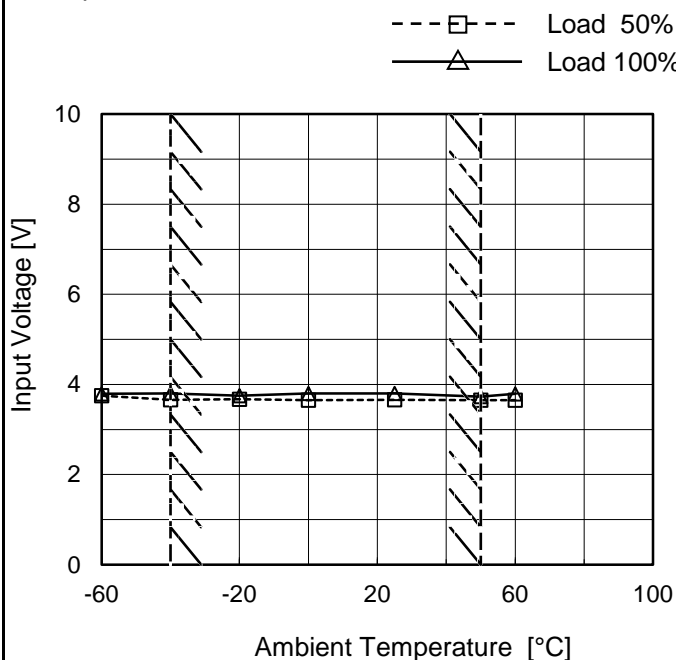
# 2.Values

Load \ Time	Td	Tr	Ts	Th	Tf
50 %	1.2	0.4	1.6	0.2	3.6
100 %	1.0	0.5	1.5	0.2	1.7



	
Model	MGW100515
Item	Minimum Input Voltage for Regulated Output Voltage
Object	+15V0.34A

## 1.Graph



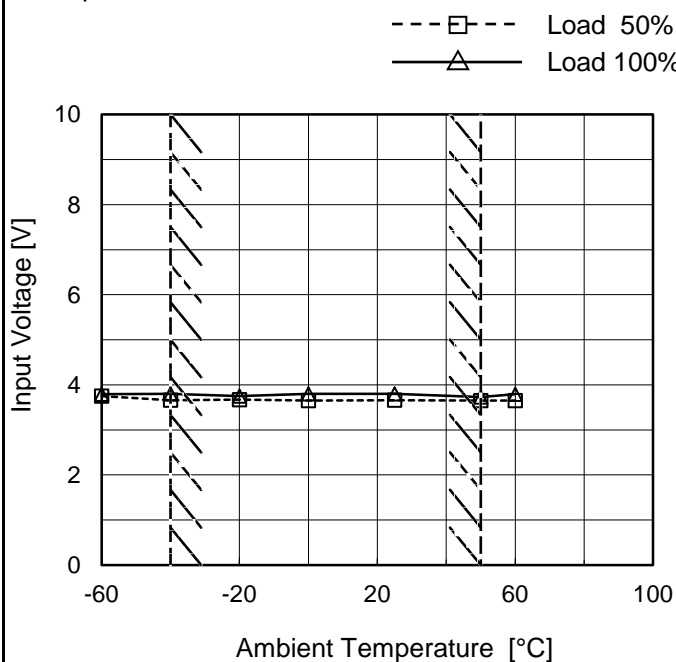
Testing Circuitry Figure A

## 2.Values

Ambient Temperature [°C]	Input Voltage [V]	
	Load 50%	Load 100%
-60	3.8	3.8
-40	3.7	3.8
-20	3.7	3.8
0	3.7	3.8
25	3.7	3.8
50	3.7	3.8
60	3.7	3.8
--	-	-
--	-	-
--	-	-
--	-	-

Object	-15V0.34A
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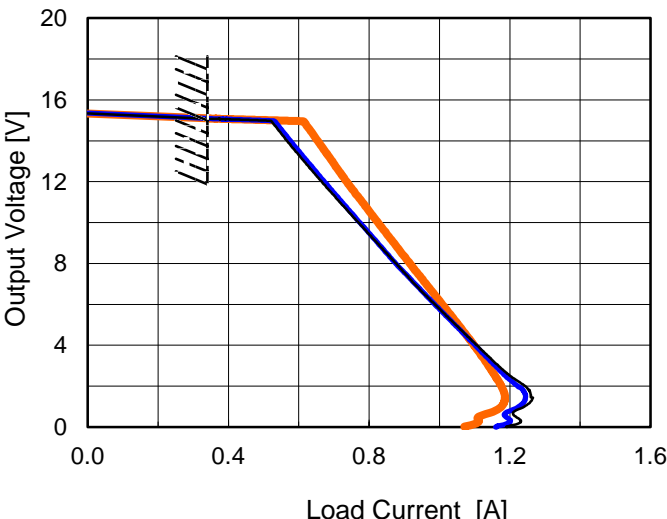
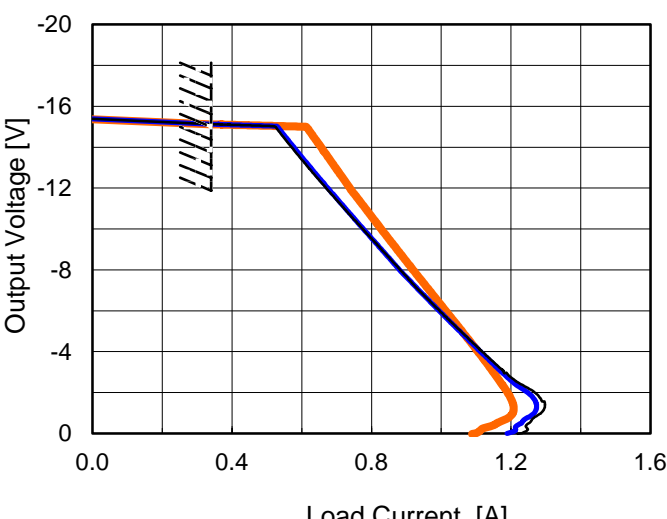
## 1.Graph



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

## 2.Values

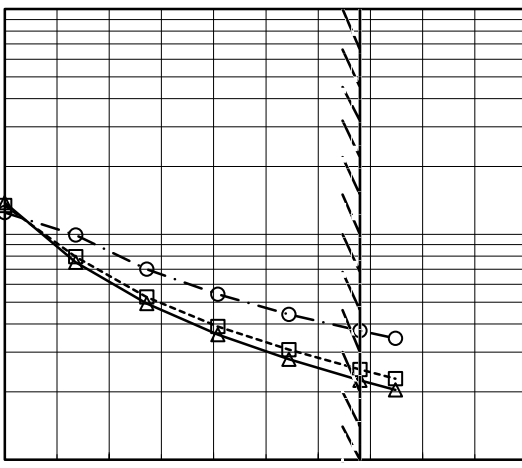
Ambient Temperature [°C]	Input Voltage [V]	
	Load 50%	Load 100%
-60	3.8	3.8
-40	3.7	3.8
-20	3.7	3.8
0	3.7	3.8
25	3.7	3.8
50	3.7	3.8
60	3.7	3.8
--	-	-
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<div>COLCEL</div>																																																										
Model	MGW100515	Temperature	25°C																																																							
Item	Overcurrent Protection	Testing Circuitry	Figure A																																																							
Object	+15V0.34A																																																									
1.Graph <div><div><div></div>Input Volt. 4.5V</div><div><div></div>Input Volt. 5V</div><div><div></div>Input Volt. 9V</div></div> 		2.Values <table><tr><th rowspan="2">Output Voltage [V]</th><th colspan="3">Load Current [A]</th></tr><tr><th>Input Volt. 4.5[V]</th><th>Input Volt. 5[V]</th><th>Input Volt. 9[V]</th></tr><tr><td>14.25</td><td>0.56</td><td>0.56</td><td>0.64</td></tr><tr><td>13.50</td><td>0.59</td><td>0.60</td><td>0.67</td></tr><tr><td>12.00</td><td>0.66</td><td>0.67</td><td>0.74</td></tr><tr><td>10.50</td><td>0.74</td><td>0.75</td><td>0.80</td></tr><tr><td>9.00</td><td>0.82</td><td>0.82</td><td>0.87</td></tr><tr><td>7.50</td><td>0.90</td><td>0.90</td><td>0.94</td></tr><tr><td>6.00</td><td>0.99</td><td>0.99</td><td>1.01</td></tr><tr><td>4.50</td><td>1.07</td><td>1.07</td><td>1.08</td></tr><tr><td>3.00</td><td>1.17</td><td>1.16</td><td>1.14</td></tr><tr><td>1.50</td><td>1.26</td><td>1.24</td><td>1.19</td></tr><tr><td>0.00</td><td>1.19</td><td>1.16</td><td>1.07</td></tr><tr><td>--</td><td>-</td><td>-</td><td>-</td></tr></table> -15V: Rated Load Current		Output Voltage [V]	Load Current [A]			Input Volt. 4.5[V]	Input Volt. 5[V]	Input Volt. 9[V]	14.25	0.56	0.56	0.64	13.50	0.59	0.60	0.67	12.00	0.66	0.67	0.74	10.50	0.74	0.75	0.80	9.00	0.82	0.82	0.87	7.50	0.90	0.90	0.94	6.00	0.99	0.99	1.01	4.50	1.07	1.07	1.08	3.00	1.17	1.16	1.14	1.50	1.26	1.24	1.19	0.00	1.19	1.16	1.07	--	-	-	-
Output Voltage [V]	Load Current [A]																																																									
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Model		MGW100515		Temperature 25°C																																																				
Item		Switching Frequency (by Load Current)		Testing Circuitry Figure A																																																				
Object		+/-15V0.34A																																																						
1.Graph		<div><div><div>—△—</div><div>—□—</div><div>—○—</div></div><div><div>Input Volt. 4.5V</div><div>Input Volt. 5V</div><div>Input Volt. 9V</div></div></div> <div><div>10000</div><div>1000</div><div>100</div><div>0.0</div><div>0.1</div><div>0.2</div><div>0.3</div><div>0.4</div><div>0.5</div><div>Switching Frequency [kHz]</div><div>Load Current [A]</div></div> <div><div>Note: Slanted line shows the range of the rated load current.</div><div>When load current is low, MG operates intermittently, so switching frequency would not become constant.</div></div>		2.Values																																																				
		<table><tr><th rowspan="2">Load Current [A]</th><th colspan="3">Frequency [kHz]</th></tr><tr><th>Input Volt. 4.5[V]</th><th>Input Volt. 5[V]</th><th>Input Volt. 9[V]</th></tr><tr><td>0.000</td><td>1383</td><td>1344</td><td>1250</td></tr><tr><td>0.068</td><td>752</td><td>796</td><td>994</td></tr><tr><td>0.136</td><td>493</td><td>528</td><td>701</td></tr><tr><td>0.204</td><td>359</td><td>390</td><td>543</td></tr><tr><td>0.272</td><td>279</td><td>308</td><td>442</td></tr><tr><td>0.340</td><td>225</td><td>251</td><td>374</td></tr><tr><td>0.374</td><td>204</td><td>229</td><td>346</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></table>				Load Current [A]	Frequency [kHz]			Input Volt. 4.5[V]	Input Volt. 5[V]	Input Volt. 9[V]	0.000	1383	1344	1250	0.068	752	796	994	0.136	493	528	701	0.204	359	390	543	0.272	279	308	442	0.340	225	251	374	0.374	204	229	346	--	-	-	-	--	-	-	-	--	-	-	-	--	-	-	-
Load Current [A]	Frequency [kHz]																																																							
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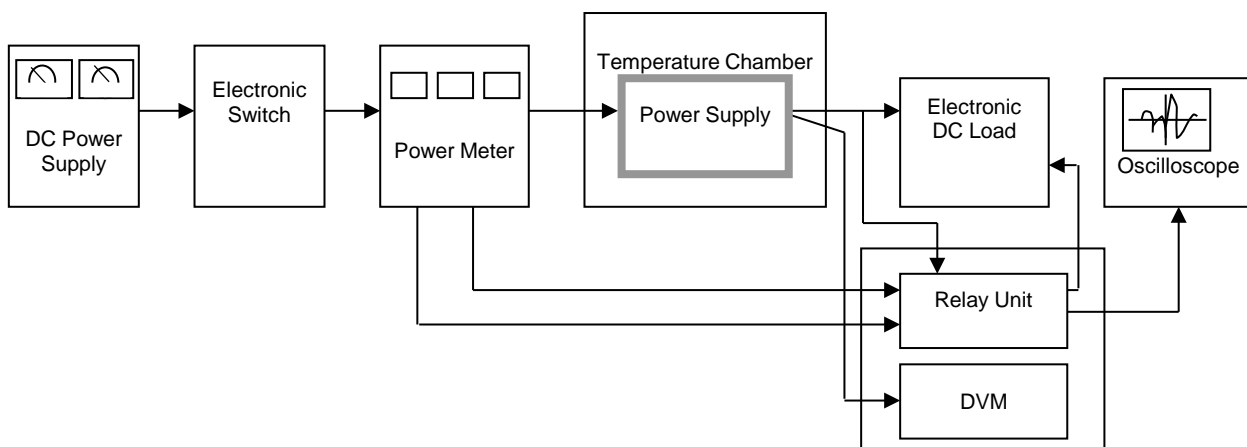


Figure A

Data Acquisition/Control Unit

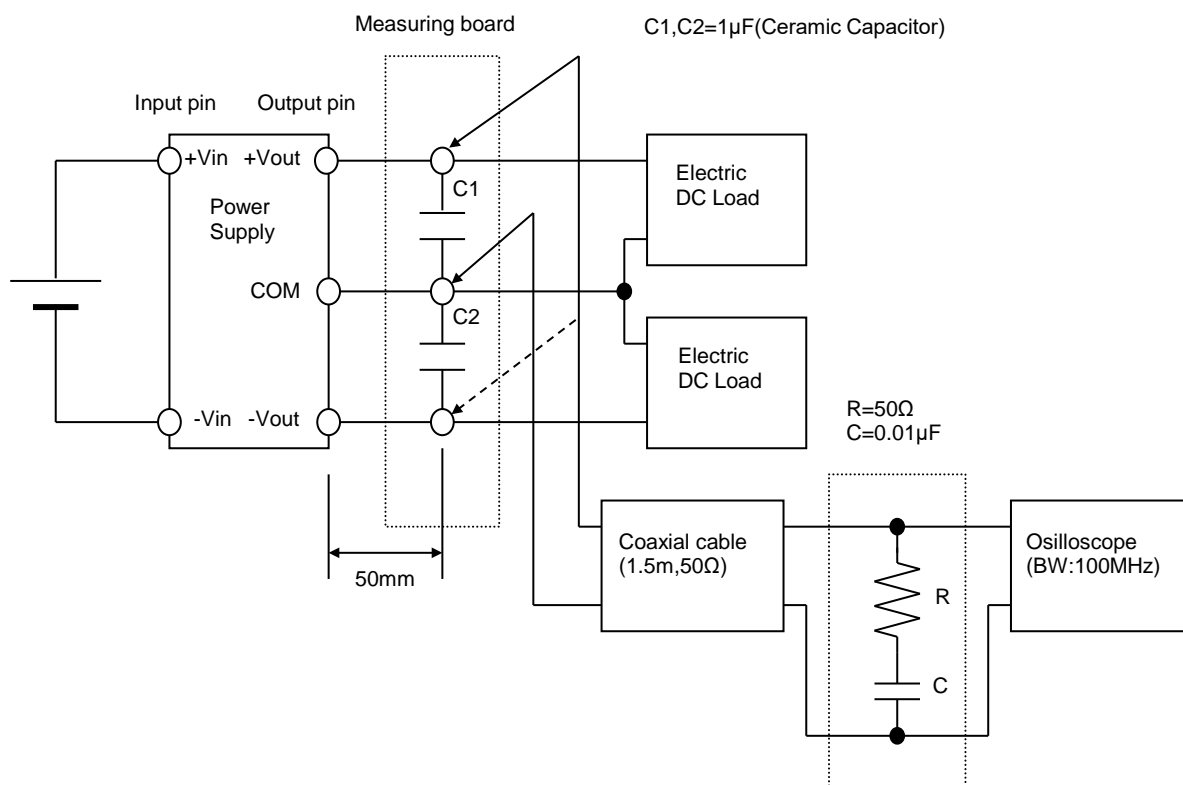


Figure B (Ripple and Ripple noise Characteristic)