

TEST DATA OF MMC100B-3

Regulated DC Power Supply
April 7, 2011

Approved by : Naoki Tonami
Naoki Tonami Design Manager

Prepared by : Hironobu Shimizu
Hironobu Shimizu Design Engineer

COSEL CO.,LTD.

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Model	MMC100B-3																																																					
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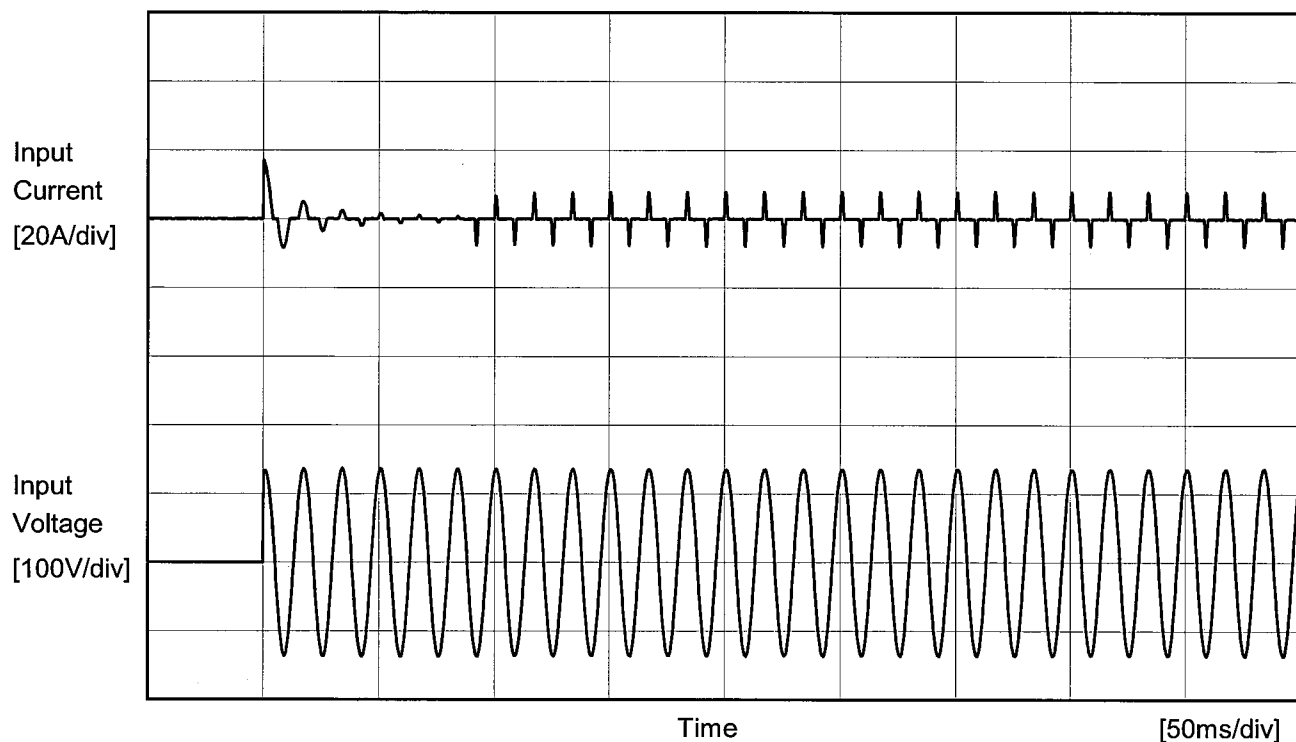
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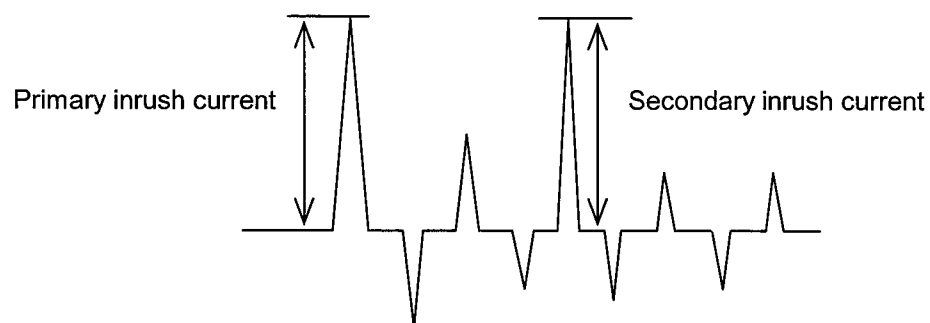


Model		MMC100B-3	
Item		Inrush Current	Temperature 25°C Testing Circuitry Figure A
Object			



Input Voltage 100 V
Frequency 60 Hz
Load 100 %

Primary inrush current 17.2 A
Secondary inrush current 8.1 A





Model		MMC100B-3	
Item		Leakage Current	
Object		Temperature 25°C Testing Circuitry Figure B	

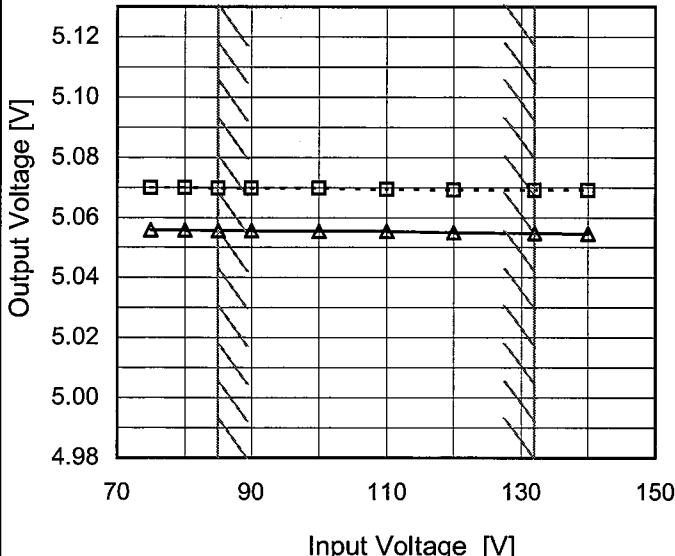
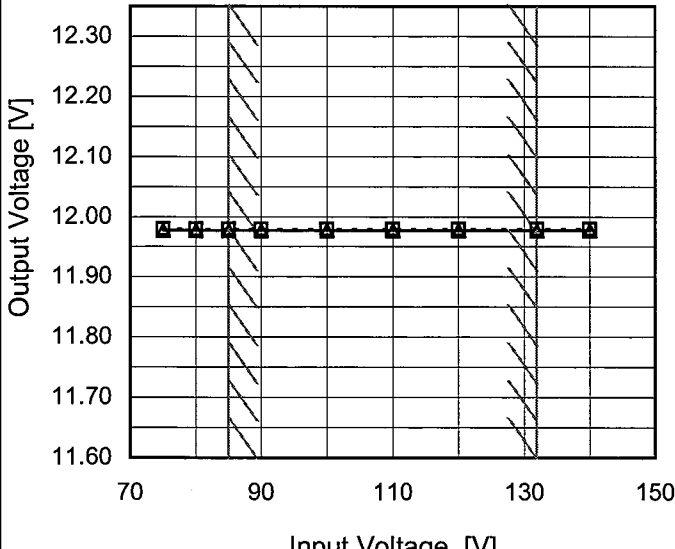
1.Results

Standards	Leakage Current [mA]		
	Input Volt. 85 [V]	Input Volt. 100 [V]	Input Volt. 132 [V]
(A)DEN-AN	0.15	0.18	0.22
(B)IEC60950-1	0.15	0.19	0.25

Standards	Leakage Current [mA]		
	Input Volt. 170 [V]	Input Volt. 230 [V]	Input Volt. 264 [V]
(B)IEC60950-1	-	-	-

2.Condition

Leakage current value is concluded after measuring both phases of AC input and by choosing the larger one.

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120	5.069	5.055																																	
132	5.069	5.055																																	
140	5.069	5.055																																	
Object	+12V2A																																		
1.Graph		2.Values																																	
<div><div>---□--- Load 50%</div><div>—△— Load 100%</div><p>Note: Slanted line shows the range of the rated input voltage.</p></div>		<table><tr><th rowspan="2">Input Voltage [V]</th><th colspan="2">Output Voltage [V]</th></tr><tr><th>Load 50%</th><th>Load 100%</th></tr><tr><td>75</td><td>11.979</td><td>11.977</td></tr><tr><td>80</td><td>11.979</td><td>11.977</td></tr><tr><td>85</td><td>11.979</td><td>11.977</td></tr><tr><td>90</td><td>11.979</td><td>11.977</td></tr><tr><td>100</td><td>11.979</td><td>11.977</td></tr><tr><td>110</td><td>11.979</td><td>11.977</td></tr><tr><td>120</td><td>11.979</td><td>11.977</td></tr><tr><td>132</td><td>11.979</td><td>11.977</td></tr><tr><td>140</td><td>11.979</td><td>11.977</td></tr></table>		Input Voltage [V]	Output Voltage [V]		Load 50%	Load 100%	75	11.979	11.977	80	11.979	11.977	85	11.979	11.977	90	11.979	11.977	100	11.979	11.977	110	11.979	11.977	120	11.979	11.977	132	11.979	11.977	140	11.979	11.977
Input Voltage [V]	Output Voltage [V]																																		
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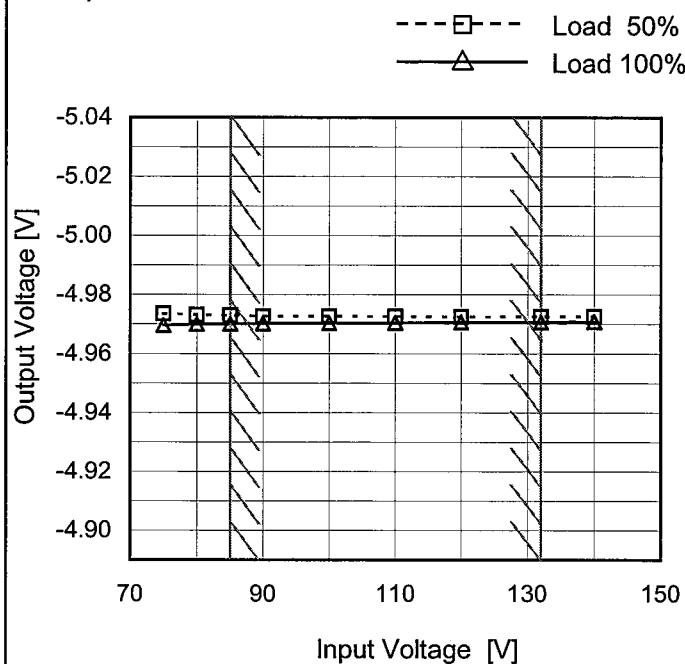
Model MMC100B-3

Item Line Regulation

Object -5V1A

Temperature 25°C
Testing Circuitry Figure A

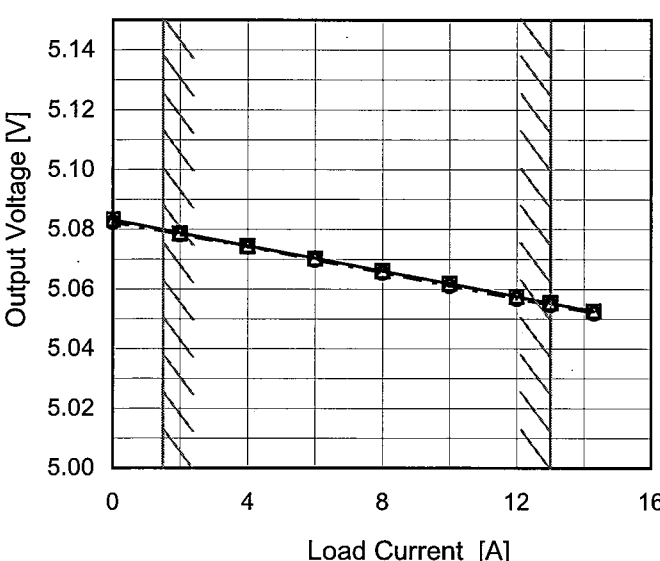
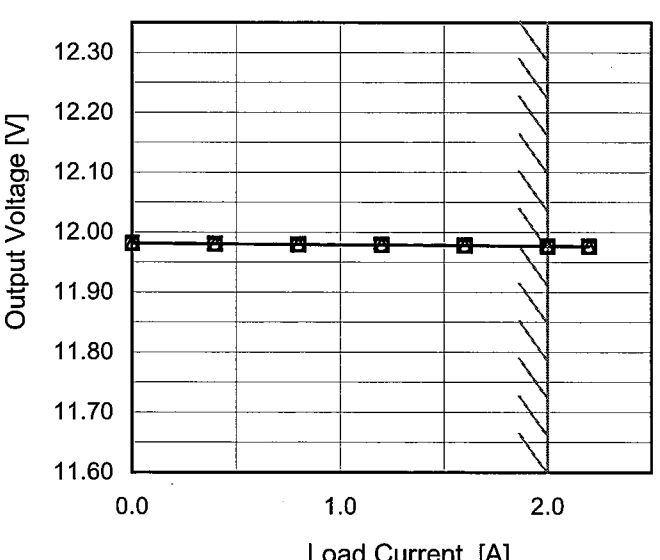
1.Graph



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

2.Values

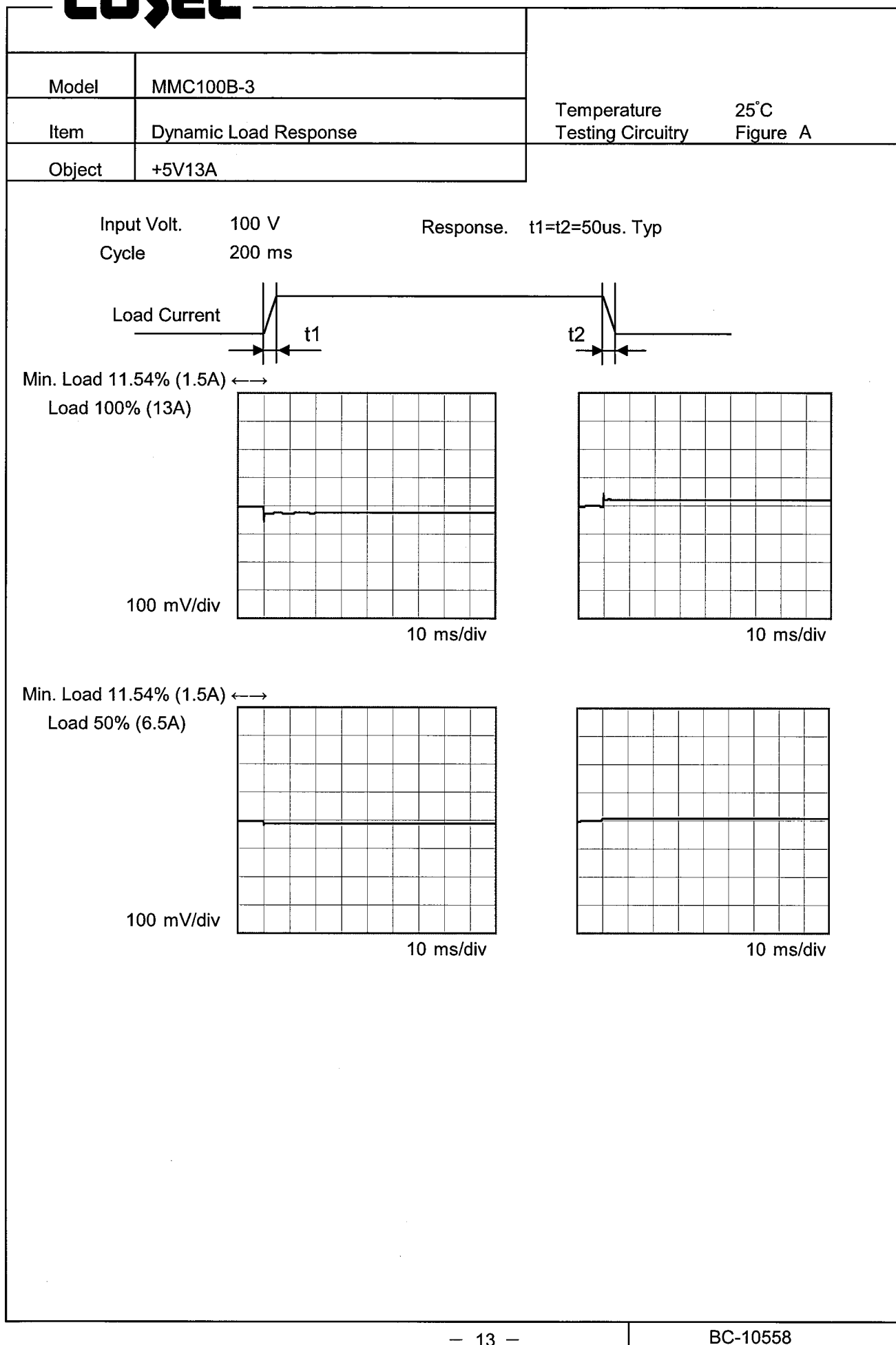
Input Voltage [V]	Output Voltage [V]	
	Load 50%	Load 100%
75	-4.974	-4.970
80	-4.973	-4.970
85	-4.973	-4.970
90	-4.973	-4.970
100	-4.973	-4.970
110	-4.973	-4.971
120	-4.972	-4.971
132	-4.973	-4.971
140	-4.973	-4.971

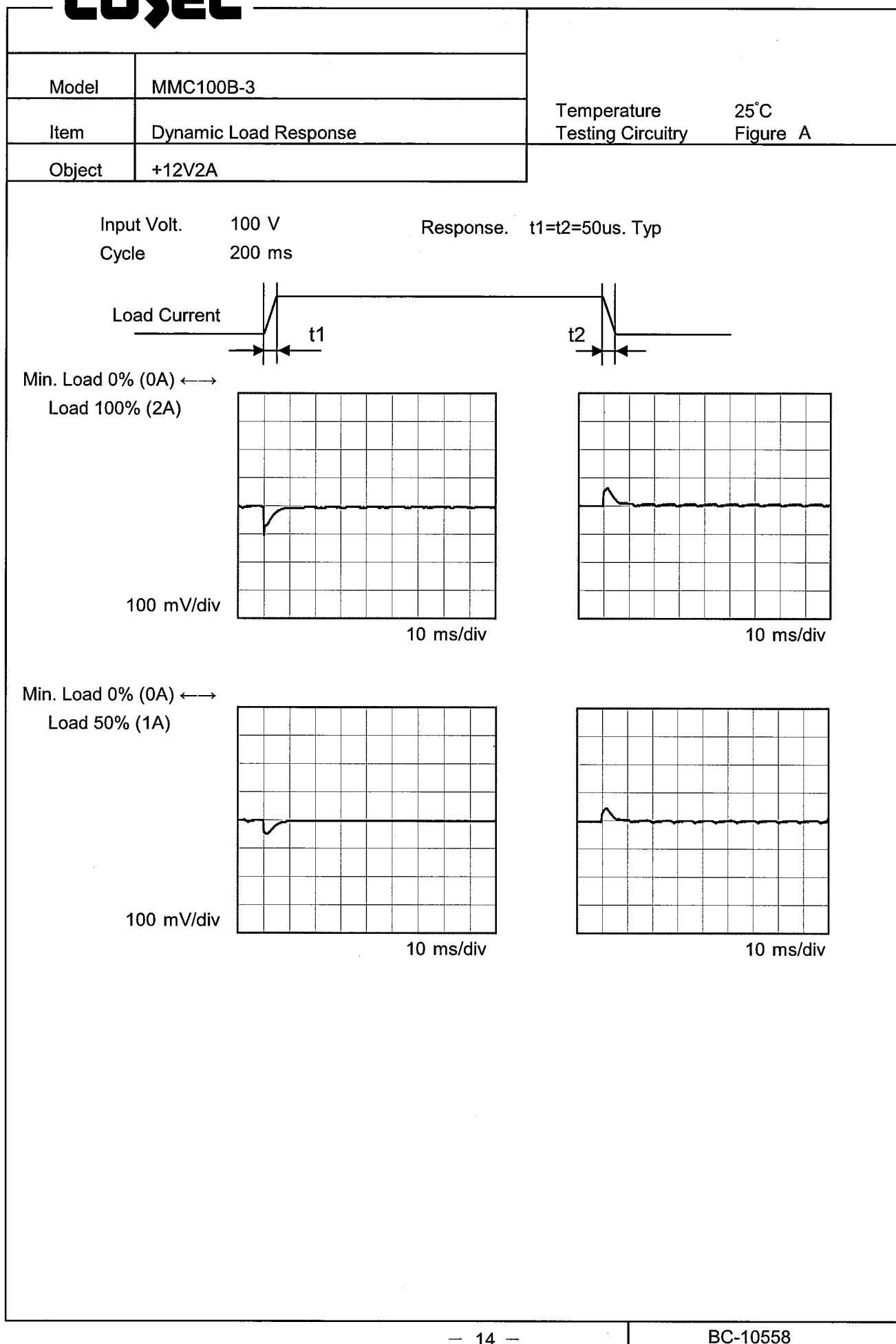
Model	MMC100B-3																																																					
Item	Load Regulation	Temperature	25°C																																																			
Object	+5V13A	Testing Circuitry	Figure A																																																			
1.Graph		2.Values																																																				
<div><div><div>—△—</div><div>Input Volt.</div><div>85V</div></div><div><div>---□---</div><div>Input Volt.</div><div>100V</div></div><div><div>---○---</div><div>Input Volt.</div><div>132V</div></div></div> 		<table><tr><th rowspan="2">Load Current [A]</th><th colspan="3">Output Voltage [V]</th></tr><tr><th>Input Volt. 85[V]</th><th>Input Volt. 100[V]</th><th>Input Volt. 132[V]</th></tr><tr><td>0.0</td><td>5.083</td><td>5.083</td><td>5.082</td></tr><tr><td>2.0</td><td>5.079</td><td>5.079</td><td>5.078</td></tr><tr><td>4.0</td><td>5.075</td><td>5.074</td><td>5.074</td></tr><tr><td>6.0</td><td>5.070</td><td>5.070</td><td>5.070</td></tr><tr><td>8.0</td><td>5.066</td><td>5.066</td><td>5.065</td></tr><tr><td>10.0</td><td>5.062</td><td>5.062</td><td>5.061</td></tr><tr><td>12.0</td><td>5.058</td><td>5.057</td><td>5.057</td></tr><tr><td>13.0</td><td>5.055</td><td>5.055</td><td>5.055</td></tr><tr><td>14.3</td><td>5.053</td><td>5.053</td><td>5.052</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]	Output Voltage [V]			Input Volt. 85[V]	Input Volt. 100[V]	Input Volt. 132[V]	0.0	5.083	5.083	5.082	2.0	5.079	5.079	5.078	4.0	5.075	5.074	5.074	6.0	5.070	5.070	5.070	8.0	5.066	5.066	5.065	10.0	5.062	5.062	5.061	12.0	5.058	5.057	5.057	13.0	5.055	5.055	5.055	14.3	5.053	5.053	5.052	--	-	-	-	--	-	-	-
Load Current [A]	Output Voltage [V]																																																					
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Load Current [A]	Output Voltage [V]																																																					
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1.2	11.979	11.979	11.979																																																			
1.6	11.978	11.978	11.978																																																			
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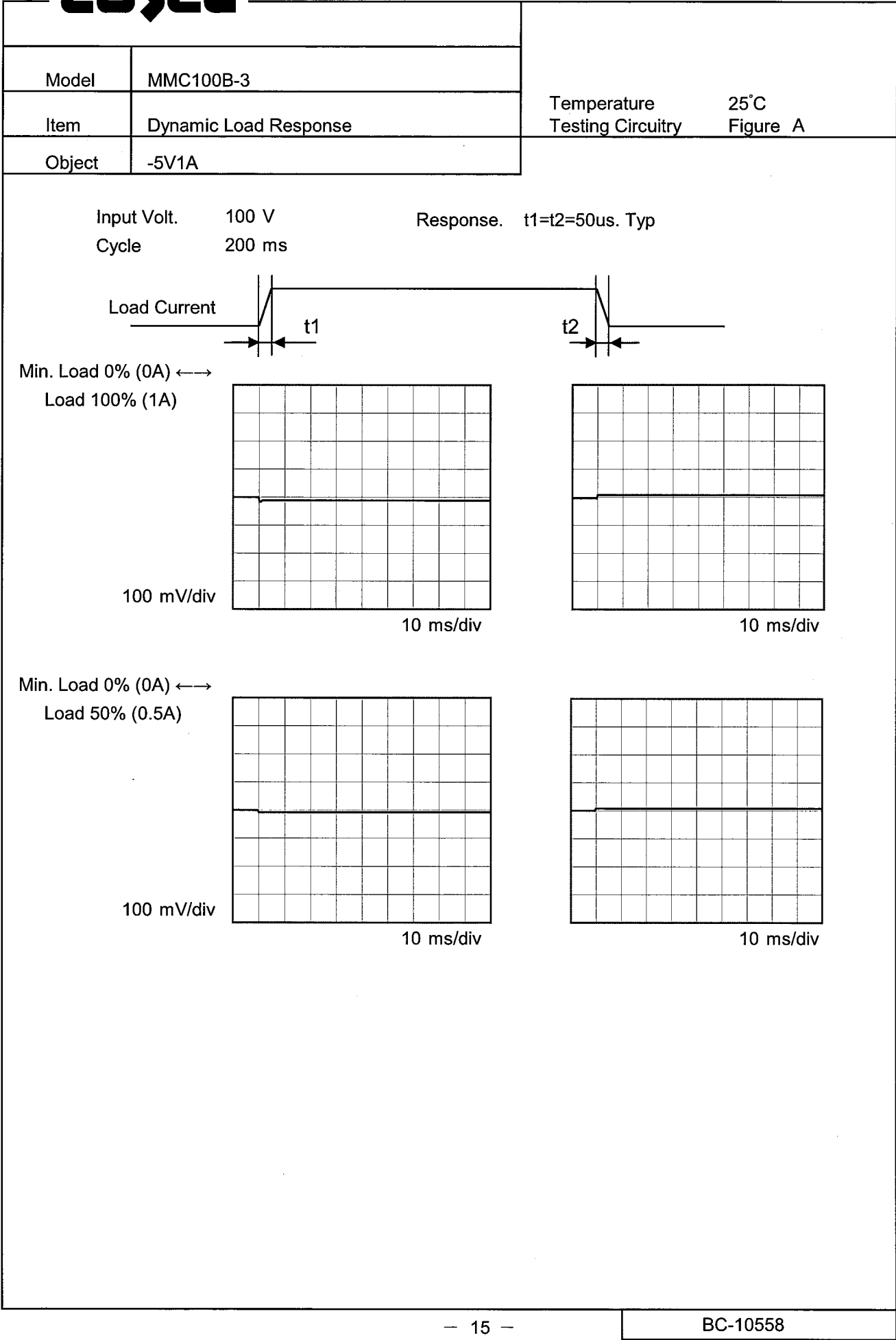
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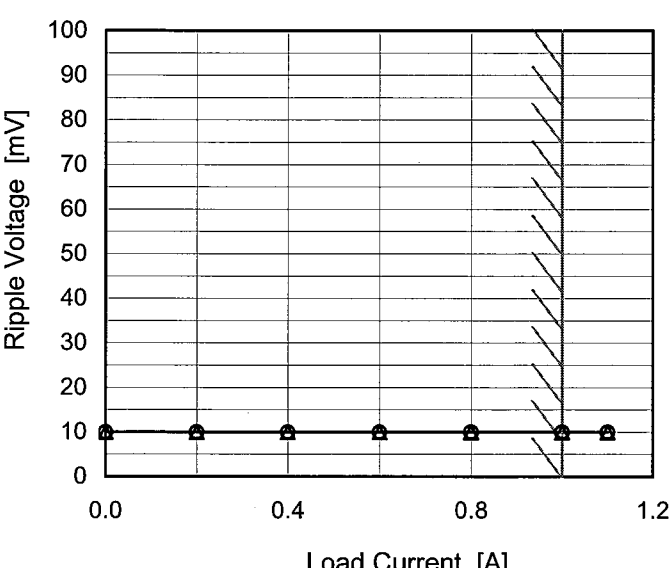
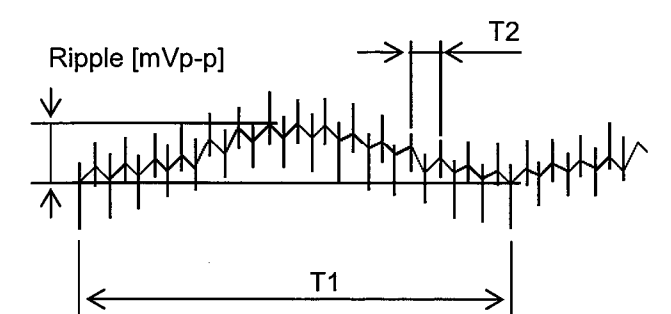
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Model	MMC100B-3																																								
Item	Ripple Voltage (by Load Current)	Temperature	25°C																																						
Object	+5V13A	Testing Circuitry	Figure A																																						
1.Graph		2.Values																																							
<div><div><div>—△— Input Volt. 85V</div><div>-·-○-·- Input Volt. 132V</div></div><div>Ripple Voltage [mV]</div><div>Load Current [A]</div></div>		<table><tr><th rowspan="2">Load Current [A]</th><th colspan="2">Ripple Voltage [mV]</th></tr><tr><th>Input Volt. 85 [V]</th><th>Input Volt. 132 [V]</th></tr><tr><td>0.0</td><td>10</td><td>10</td></tr><tr><td>2.6</td><td>15</td><td>20</td></tr><tr><td>5.2</td><td>15</td><td>20</td></tr><tr><td>7.8</td><td>15</td><td>20</td></tr><tr><td>10.4</td><td>15</td><td>20</td></tr><tr><td>13.0</td><td>15</td><td>20</td></tr><tr><td>14.3</td><td>15</td><td>20</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><tr><td>--</td><td>-</td><td>-</td></tr></table>		Load Current [A]	Ripple Voltage [mV]		Input Volt. 85 [V]	Input Volt. 132 [V]	0.0	10	10	2.6	15	20	5.2	15	20	7.8	15	20	10.4	15	20	13.0	15	20	14.3	15	20	--	-	-	--	-	-	--	-	-	--	-	-
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<div><div>T1: Due to AC Input Line</div><div>T2: Due to Switching</div><div>Ripple [mVp-p]</div><div>T1</div><div>T2</div></div>																																									
Fig. Complex Ripple Wave Form																																									

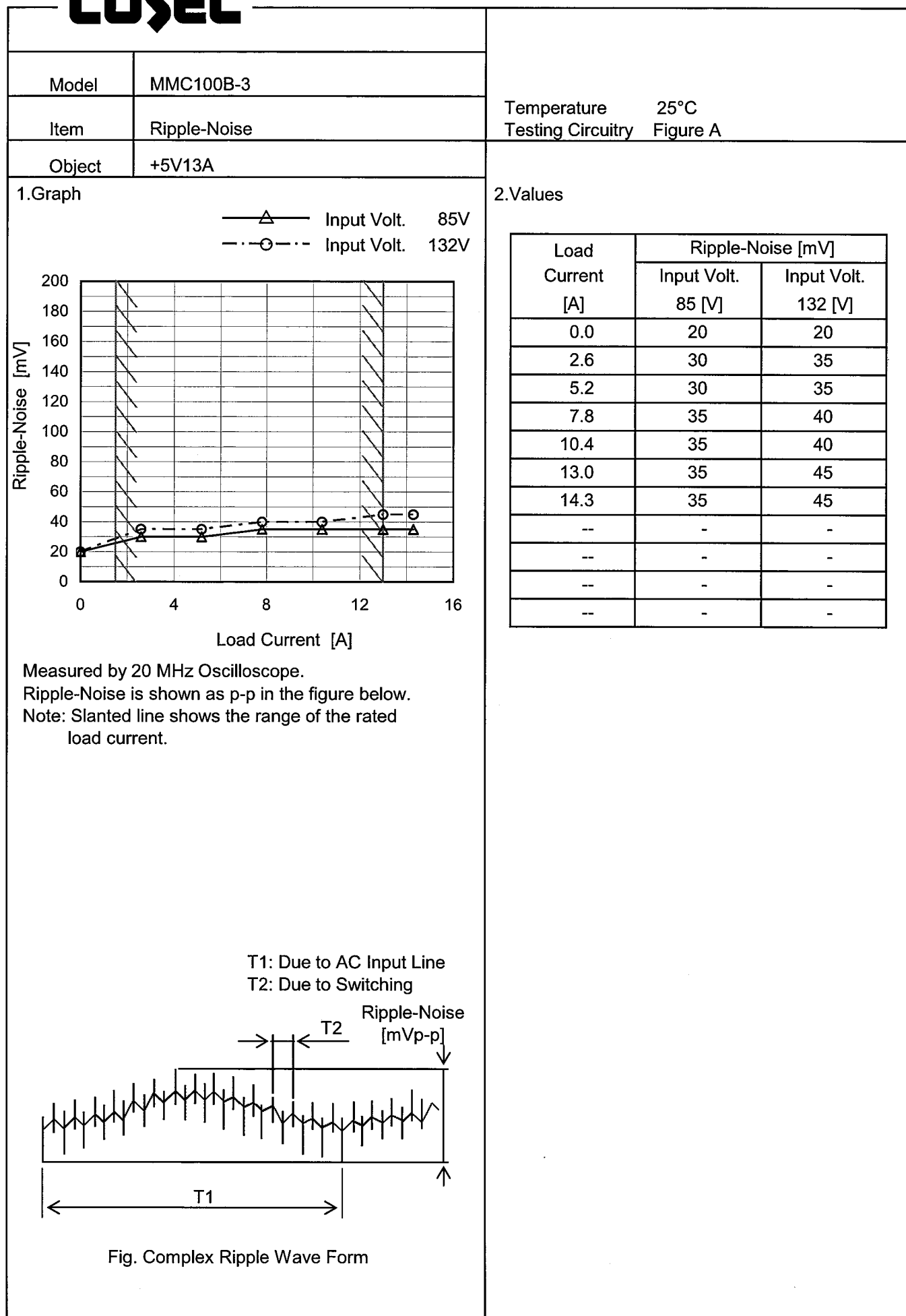
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Model		MMC100B-3																																							
Item		Ripple Voltage (by Load Current)																																							
Object		+12V2A																																							
1.Graph		2.Values																																							
<div><div><div>—△— Input Volt. 85V</div><div>-·-○-·- Input Volt. 132V</div></div><div>Ripple Voltage [mV]</div><div>Load Current [A]</div></div>		<table><tr><th rowspan="2">Load Current [A]</th><th colspan="2">Ripple Voltage [mV]</th></tr><tr><th>Input Volt. 85 [V]</th><th>Input Volt. 132 [V]</th></tr><tr><td>0.0</td><td>10</td><td>10</td></tr><tr><td>0.4</td><td>15</td><td>20</td></tr><tr><td>0.8</td><td>15</td><td>20</td></tr><tr><td>1.2</td><td>20</td><td>20</td></tr><tr><td>1.6</td><td>20</td><td>20</td></tr><tr><td>2.0</td><td>20</td><td>20</td></tr><tr><td>2.2</td><td>20</td><td>20</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><tr><td>--</td><td>-</td><td>-</td></tr></table>		Load Current [A]	Ripple Voltage [mV]		Input Volt. 85 [V]	Input Volt. 132 [V]	0.0	10	10	0.4	15	20	0.8	15	20	1.2	20	20	1.6	20	20	2.0	20	20	2.2	20	20	--	-	-	--	-	-	--	-	-	--	-	-
Load Current [A]	Ripple Voltage [mV]																																								
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Fig. Complex Ripple Wave Form																																									

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Model		MMC100B-3		Temperature 25°C																																							
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<div><div><div>—△— Input Volt. 85V</div><div>-·-○-·- Input Volt. 132V</div></div></div>				<table><tr><th rowspan="2">Load Current [A]</th><th colspan="2">Ripple Voltage [mV]</th></tr><tr><th>Input Volt. 85 [V]</th><th>Input Volt. 132 [V]</th></tr><tr><td>0.0</td><td>10</td><td>10</td></tr><tr><td>0.2</td><td>10</td><td>10</td></tr><tr><td>0.4</td><td>10</td><td>10</td></tr><tr><td>0.6</td><td>10</td><td>10</td></tr><tr><td>0.8</td><td>10</td><td>10</td></tr><tr><td>1.0</td><td>10</td><td>10</td></tr><tr><td>1.1</td><td>10</td><td>10</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><tr><td>--</td><td>-</td><td>-</td></tr></table>		Load Current [A]	Ripple Voltage [mV]		Input Volt. 85 [V]	Input Volt. 132 [V]	0.0	10	10	0.2	10	10	0.4	10	10	0.6	10	10	0.8	10	10	1.0	10	10	1.1	10	10	--	-	-	--	-	-	--	-	-	--	-	-
Load Current [A]	Ripple Voltage [mV]																																										
	Input Volt. 85 [V]	Input Volt. 132 [V]																																									
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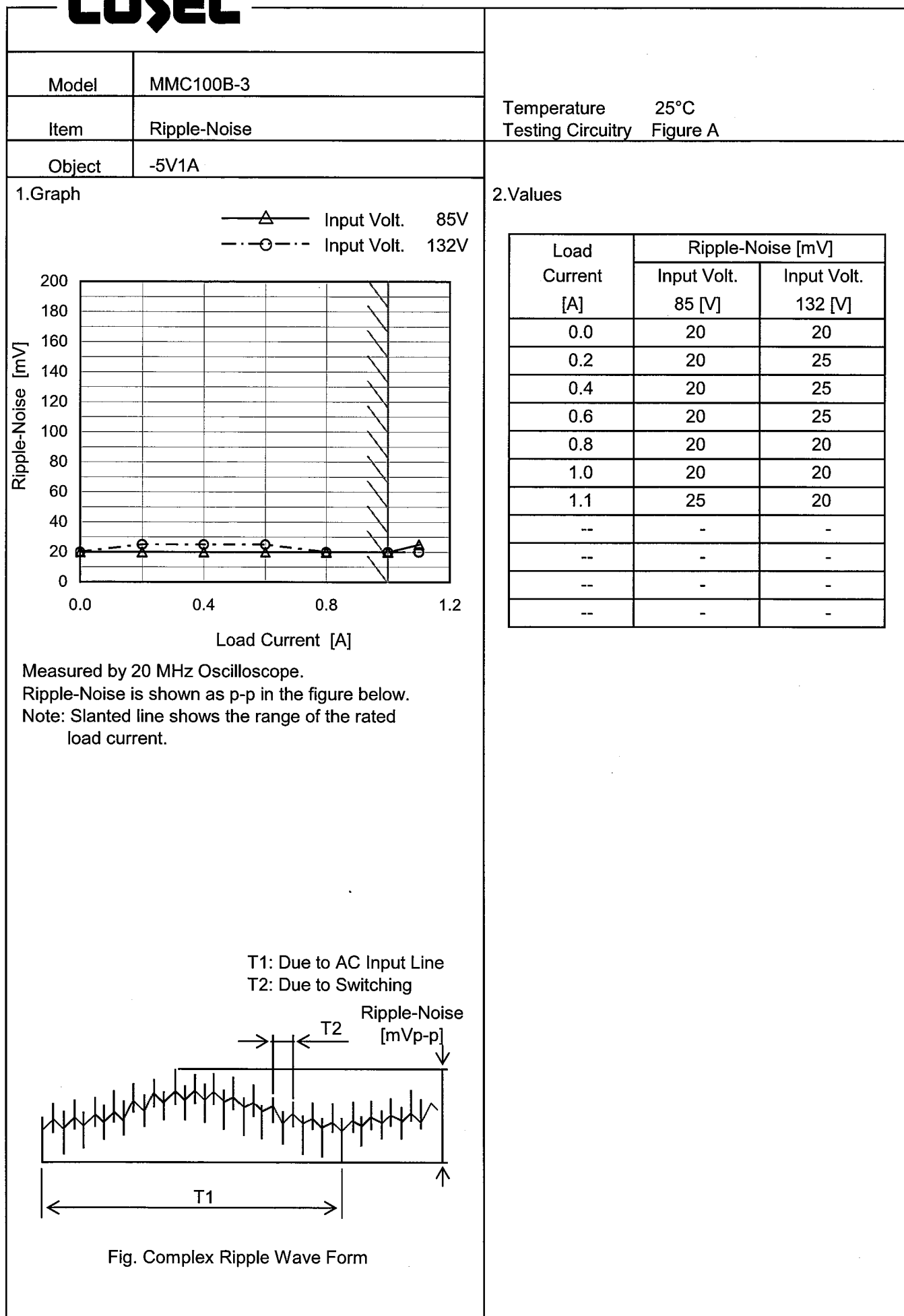
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Model		MMC100B-3																																																																											
Item		Ripple-Noise																																																																											
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<div><div><div>—△— Input Volt. 85V</div><div>- - -○- - - Input Volt. 132V</div></div><table><thead><tr><th>Load Current [A]</th><th>Input Volt. 85 [V]</th><th>Input Volt. 132 [V]</th></tr></thead><tbody><tr><td>0.0</td><td>15</td><td>30</td></tr><tr><td>0.4</td><td>25</td><td>35</td></tr><tr><td>0.8</td><td>30</td><td>35</td></tr><tr><td>1.2</td><td>30</td><td>35</td></tr><tr><td>1.6</td><td>30</td><td>35</td></tr><tr><td>2.0</td><td>35</td><td>40</td></tr><tr><td>2.2</td><td>35</td><td>40</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><tr><td>--</td><td>-</td><td>-</td></tr></tbody></table></div>		Load Current [A]	Input Volt. 85 [V]	Input Volt. 132 [V]	0.0	15	30	0.4	25	35	0.8	30	35	1.2	30	35	1.6	30	35	2.0	35	40	2.2	35	40	--	-	-	--	-	-	--	-	-	--	-	-	<table><thead><tr><th rowspan="2">Load Current [A]</th><th colspan="2">Ripple-Noise [mV]</th></tr><tr><th>Input Volt. 85 [V]</th><th>Input Volt. 132 [V]</th></tr></thead><tbody><tr><td>0.0</td><td>15</td><td>30</td></tr><tr><td>0.4</td><td>25</td><td>35</td></tr><tr><td>0.8</td><td>30</td><td>35</td></tr><tr><td>1.2</td><td>30</td><td>35</td></tr><tr><td>1.6</td><td>30</td><td>35</td></tr><tr><td>2.0</td><td>35</td><td>40</td></tr><tr><td>2.2</td><td>35</td><td>40</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><tr><td>--</td><td>-</td><td>-</td></tr></tbody></table>		Load Current [A]	Ripple-Noise [mV]		Input Volt. 85 [V]	Input Volt. 132 [V]	0.0	15	30	0.4	25	35	0.8	30	35	1.2	30	35	1.6	30	35	2.0	35	40	2.2	35	40	--	-	-	--	-	-	--	-	-	--	-	-
Load Current [A]	Input Volt. 85 [V]	Input Volt. 132 [V]																																																																											
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<div><div><div>T1: Due to AC Input Line</div><div>T2: Due to Switching</div></div><p>Fig. Complex Ripple Wave Form</p></div>																																																																													

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Model	MMC100B-3																																								
Item	Ripple Voltage (by Ambient Temp.)	Testing Circuitry Figure A																																							
Object	+5V13A																																								
1.Graph		2.Values																																							
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Model		MMC100B-3																																																				
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Object		+12V2A																																																				
1.Graph		<div><div><div>—△—</div>Input Volt. 85V</div><div><div>---□---</div>Input Volt. 100V</div><div><div>-·-○-·-</div>Input Volt. 132V</div></div> <p>Output Voltage [V]</p> <p>Ambient Temperature [°C]</p> <p>Load 100%</p>																																																				
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Model		MMC100B-3																																																				
Item		Ambient Temperature Drift																																																				
Object		-5V1A																																																				
1.Graph		<div><div><div>—△—</div><div>Input Volt.</div><div>85V</div></div><div><div>---□---</div><div>Input Volt.</div><div>100V</div></div><div><div>-·-○-·-</div><div>Input Volt.</div><div>132V</div></div></div> <p>Output Voltage [V]</p> <p>Ambient Temperature [°C]</p> <p>Load 100%</p> <p>Note: Slanted line shows the range of the rated ambient temperature.</p>																																																				
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60	-4.979	-4.980	-4.980																																																			
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		Testing Circuitry Figure A
Model	MMC100B-3	
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 : 0 - 50°C

Input Voltage : 85 - 132V

Load Current (AVR 1) : 1.5 - 13A (AVR 2) : 0 - 2A (AVR 3) : 0 - 1A

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

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

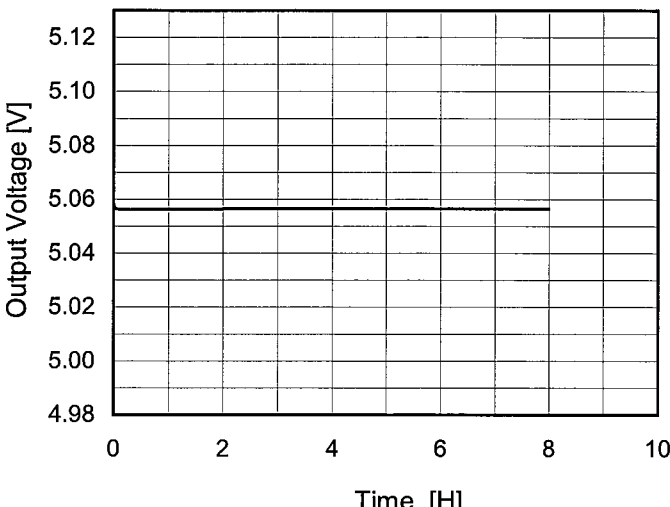
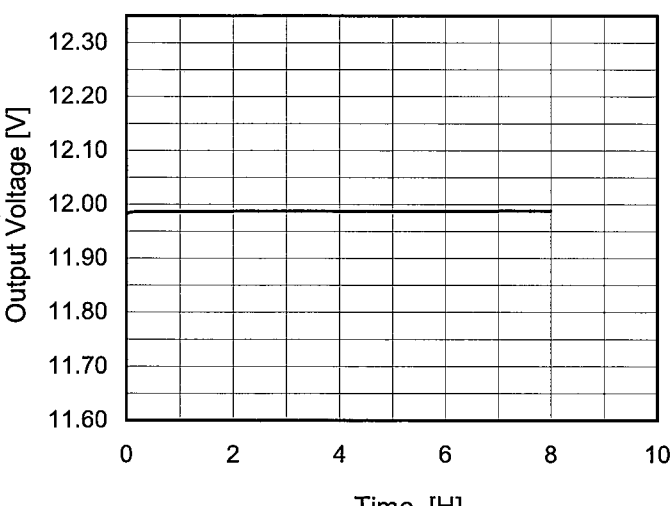
2. Values

Object	+5V13A					
Item	Temperature [°C]	Input Voltage[V]	Output		Output Voltage Accuracy	
			Current[A]	Voltage[V]	Value [mV]	Ration [%]
Maximum Voltage	40	132	1.5	5.082	±14	±0.3
Minimum Voltage	50	132	13	5.054		

Object	+12V2A					
Item	Temperature [°C]	Input Voltage[V]	Output		Output Voltage Accuracy	
			Current[A]	Voltage[V]	Value [mV]	Ration [%]
Maximum Voltage	50	85	0	11.999	±22	±0.2
Minimum Voltage	0	85	2	11.955		

Object	-5V1A					
Item	Temperature [°C]	Input Voltage[V]	Output		Output Voltage Accuracy	
			Current[A]	Voltage[V]	Value [mV]	Ration [%]
Maximum Voltage	50	85	0	-4.988	±20	±0.4
Minimum Voltage	0	85	1	-4.948		

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Model	MMC100B-3																								
Item	Time Lapse Drift		Temperature 25°C																						
Object	+5V13A		Testing Circuitry Figure A																						
1.Graph		2.Values																							
<div><p>Output Voltage [V]</p><p>Time [H]</p><p>Input Volt. 100V</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>5.058</td></tr><tr><td>0.5</td><td>5.056</td></tr><tr><td>1.0</td><td>5.056</td></tr><tr><td>2.0</td><td>5.057</td></tr><tr><td>3.0</td><td>5.057</td></tr><tr><td>4.0</td><td>5.057</td></tr><tr><td>5.0</td><td>5.057</td></tr><tr><td>6.0</td><td>5.057</td></tr><tr><td>7.0</td><td>5.057</td></tr><tr><td>8.0</td><td>5.057</td></tr></table>		Time since start [H]	Output Voltage [V]	0.0	5.058	0.5	5.056	1.0	5.056	2.0	5.057	3.0	5.057	4.0	5.057	5.0	5.057	6.0	5.057	7.0	5.057	8.0	5.057
Time since start [H]	Output Voltage [V]																								
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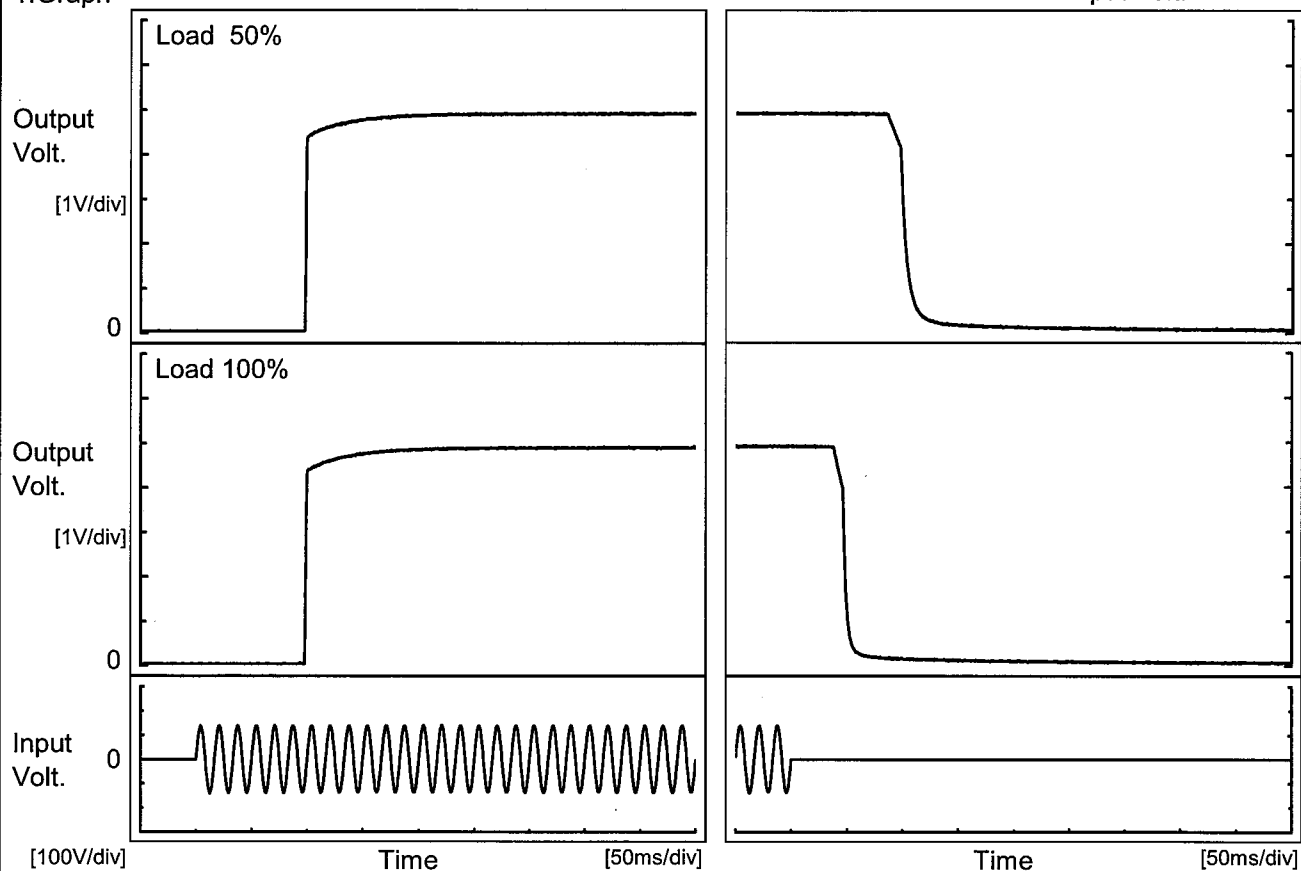
Model	MMC100B-3	Temperature 25°C Testing Circuitry Figure A		
Item	Time Lapse Drift			
Object	-5V1A			
1.Graph		2.Values		
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COSEL

Model	MMC100B-3	Temperature	25°C
Item	Rise and Fall Time	Testing Circuitry	Figure A
Object	+5V13A		

1.Graph

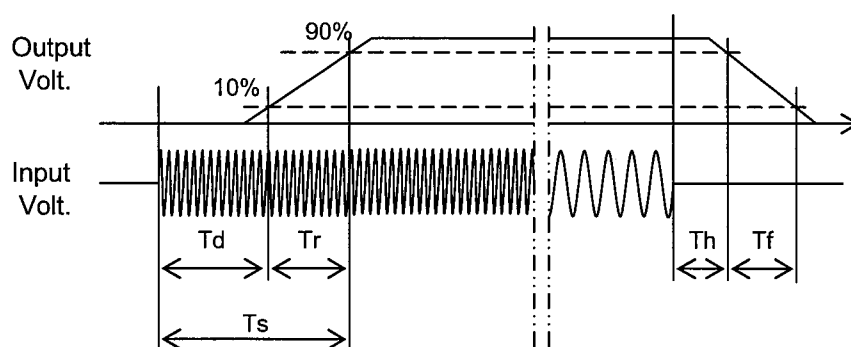
Input Volt. 100 V



2.Values

[ms]

Load \ Time	Td	Tr	Ts	Th	Tf
50 %	98.3	11.5	109.8	91.5	21.5
100 %	98.3	14.3	112.6	40.8	12.8

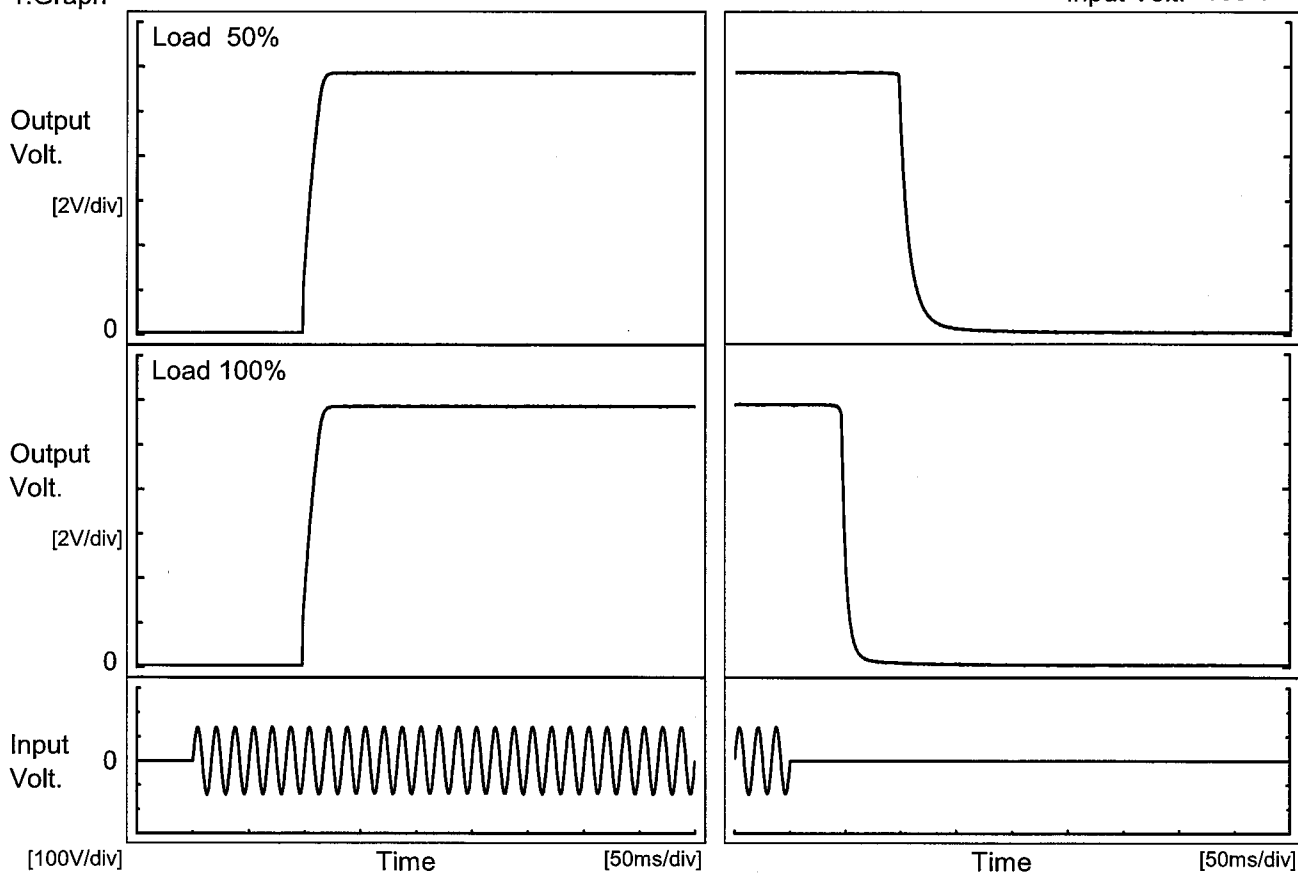


COSEL

Model	MMC100B-3	Temperature	25°C
Item	Rise and Fall Time	Testing Circuitry	Figure A
Object	+12V2A		

1. Graph

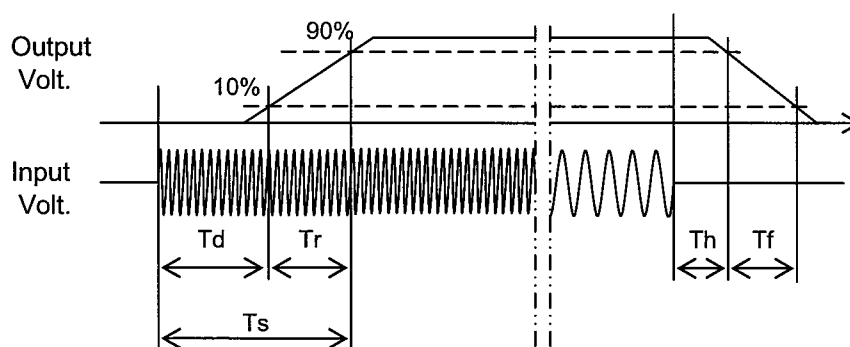
Input Volt. 100 V



2. Values

[ms]

Load \ Time	Td	Tr	Ts	Th	Tf
50 %	98.3	15.8	114.1	98.5	20.5
100 %	98.3	15.5	113.8	46.5	10.5

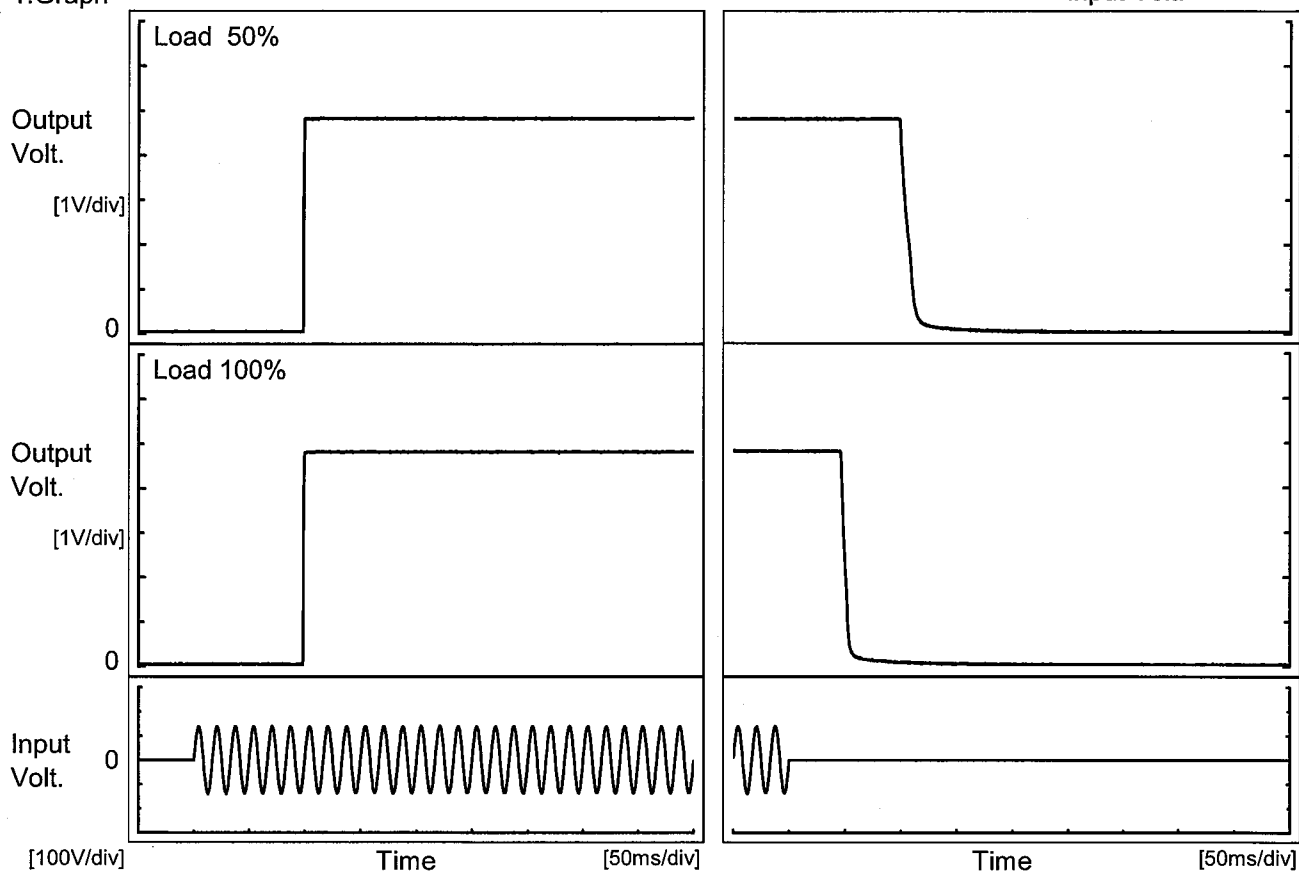


COSEL

Model	MMC100B-3	Temperature	25°C
Item	Rise and Fall Time	Testing Circuitry	Figure A
Object	-5V1A		

1.Graph

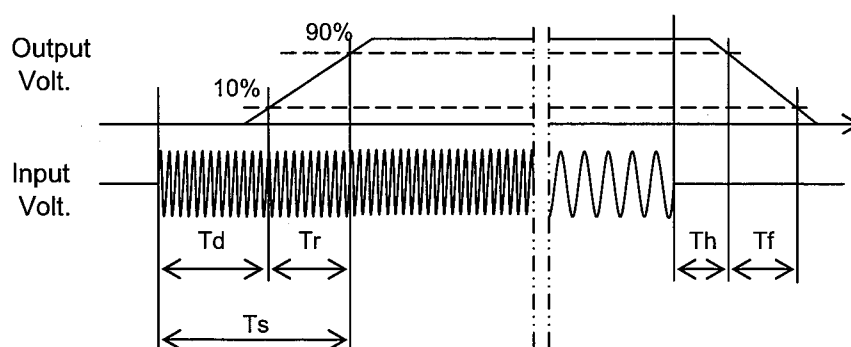
Input Volt. 100 V



2.Values

[ms]

Load \ Time	Td	Tr	Ts	Th	Tf
50 %	98.8	1.0	99.8	99.0	13.5
100 %	98.8	1.0	99.8	46.8	7.0



Model	MMC100B-3																																		
Item	Hold-Up Time	Temperature	25°C																																
		Testing Circuitry	Figure A																																
Object	+5V13A																																		
1.Graph		2.Values																																	
<div><div>---□--- Load 50%</div><div>—△— Load 100%</div></div> <div>Hold-Up Time [ms]</div> <div>Input Voltage [V]</div> <p>This duration covers from Shut-off of input voltage to the moment when output voltage descends to the rated range of voltage accuracy. Note: Slanted line shows the range of the rated input voltage.</p>		<table><tr><th rowspan="2">Input Voltage [V]</th><th colspan="2">Hold-Up Time [ms]</th></tr><tr><th>Load 50%</th><th>Load 100%</th></tr><tr><td>75</td><td>30</td><td>10</td></tr><tr><td>80</td><td>40</td><td>15</td></tr><tr><td>85</td><td>51</td><td>21</td></tr><tr><td>90</td><td>63</td><td>26</td></tr><tr><td>100</td><td>88</td><td>39</td></tr><tr><td>110</td><td>116</td><td>53</td></tr><tr><td>120</td><td>147</td><td>68</td></tr><tr><td>132</td><td>189</td><td>89</td></tr><tr><td>140</td><td>218</td><td>104</td></tr></table>		Input Voltage [V]	Hold-Up Time [ms]		Load 50%	Load 100%	75	30	10	80	40	15	85	51	21	90	63	26	100	88	39	110	116	53	120	147	68	132	189	89	140	218	104
Input Voltage [V]	Hold-Up Time [ms]																																		
	Load 50%	Load 100%																																	
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80	40	15																																	
85	51	21																																	
90	63	26																																	
100	88	39																																	
110	116	53																																	
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132	189	89																																	
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Input Voltage [V]	Hold-Up Time [ms]																																		
	Load 50%	Load 100%																																	
75	41	16																																	
80	51	21																																	
85	62	26																																	
90	74	32																																	
100	99	45																																	
110	128	59																																	
120	159	74																																	
132	200	95																																	
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Input Voltage [V]	Hold-Up Time [ms]																																		
	Load 50%	Load 100%																																	
75	42	18																																	
80	52	23																																	
85	63	29																																	
90	75	35																																	
100	100	47																																	
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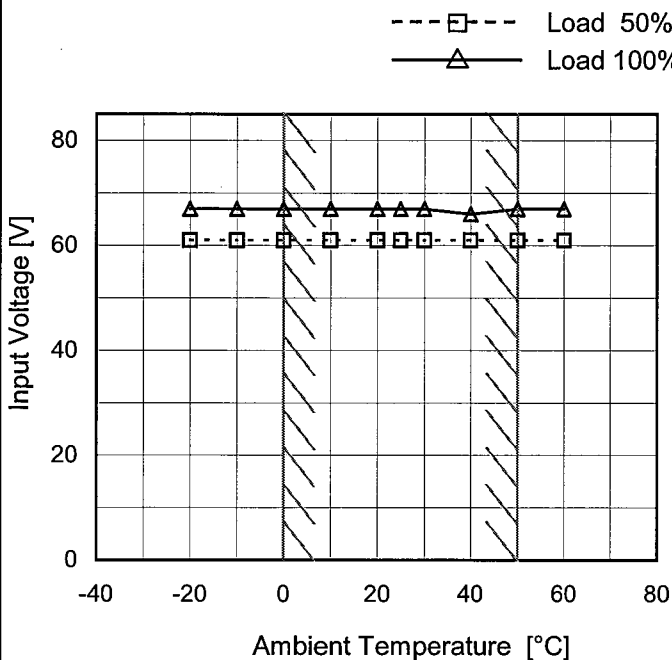
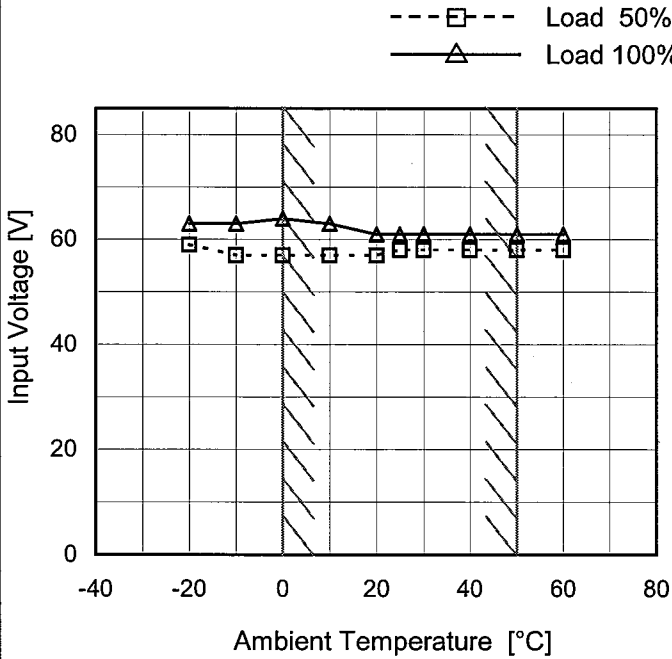
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Model	MMC100B-3																																																					
Item	Instantaneous Interruption Compensation	Temperature	25°C																																																			
Object	+5V13A	Testing Circuitry	Figure A																																																			
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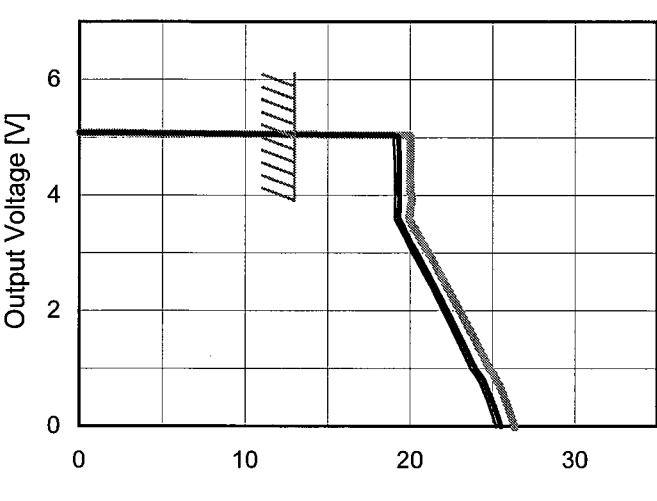
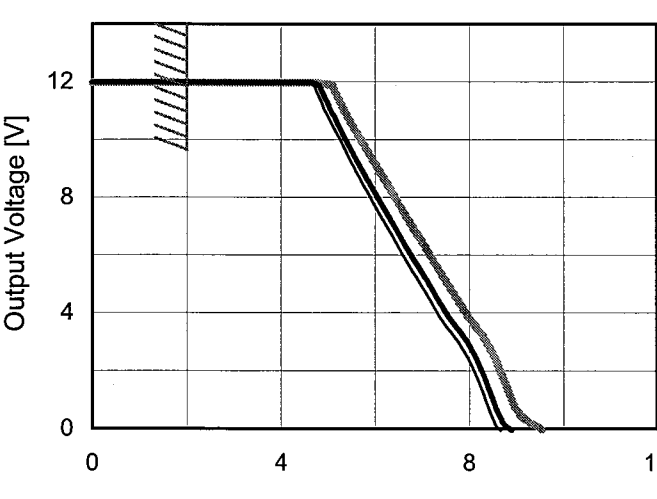
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<div><div></div>Input Volt. 85V</div> <div><div></div>Input Volt. 100V</div> <div><div></div>Input Volt. 132V</div> <p>Note: Slanted line shows the range of the rated load current.</p>																																																										
		<table><tr><th rowspan="2">Output Voltage [V]</th><th colspan="3">Load Current [A]</th></tr><tr><th>Input Volt. 85[V]</th><th>Input Volt. 100[V]</th><th>Input Volt. 132[V]</th></tr><tr><td>-4.75</td><td>3.26</td><td>3.26</td><td>3.29</td></tr><tr><td>-4.50</td><td>3.51</td><td>3.37</td><td>3.41</td></tr><tr><td>-4.00</td><td>3.41</td><td>3.29</td><td>3.31</td></tr><tr><td>-3.50</td><td>3.28</td><td>3.18</td><td>3.19</td></tr><tr><td>-3.00</td><td>3.14</td><td>3.07</td><td>3.08</td></tr><tr><td>-2.50</td><td>3.05</td><td>2.98</td><td>2.99</td></tr><tr><td>-2.00</td><td>2.95</td><td>2.90</td><td>2.90</td></tr><tr><td>-1.50</td><td>2.87</td><td>2.82</td><td>2.82</td></tr><tr><td>-1.00</td><td>2.79</td><td>2.75</td><td>2.75</td></tr><tr><td>-0.50</td><td>2.72</td><td>2.68</td><td>2.68</td></tr><tr><td>0.00</td><td>2.65</td><td>2.62</td><td>2.62</td></tr><tr><td>--</td><td>-</td><td>-</td><td>-</td></tr></table>		Output Voltage [V]	Load Current [A]			Input Volt. 85[V]	Input Volt. 100[V]	Input Volt. 132[V]	-4.75	3.26	3.26	3.29	-4.50	3.51	3.37	3.41	-4.00	3.41	3.29	3.31	-3.50	3.28	3.18	3.19	-3.00	3.14	3.07	3.08	-2.50	3.05	2.98	2.99	-2.00	2.95	2.90	2.90	-1.50	2.87	2.82	2.82	-1.00	2.79	2.75	2.75	-0.50	2.72	2.68	2.68	0.00	2.65	2.62	2.62	--	-	-	-
Output Voltage [V]	Load Current [A]																																																									
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Model		MMC100B-3	
Item		Overvoltage Protection	
Object		+5V13A	
1.Graph		2.Values	

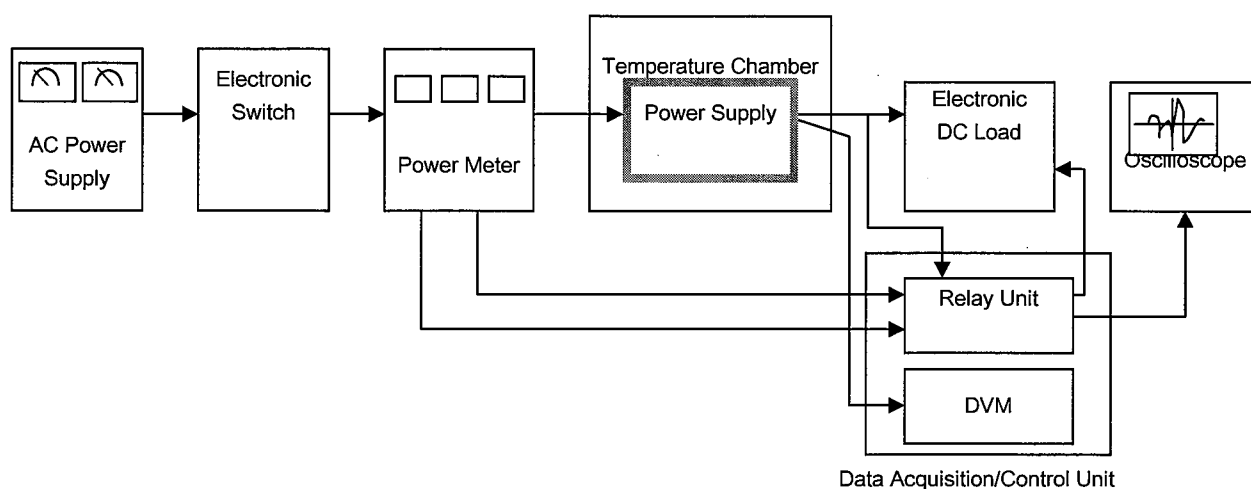


Figure A

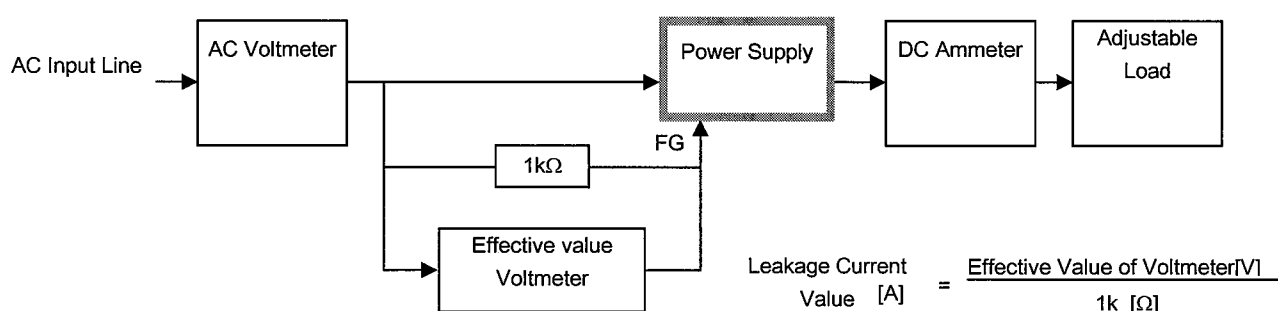


Figure B (DEN-AN)

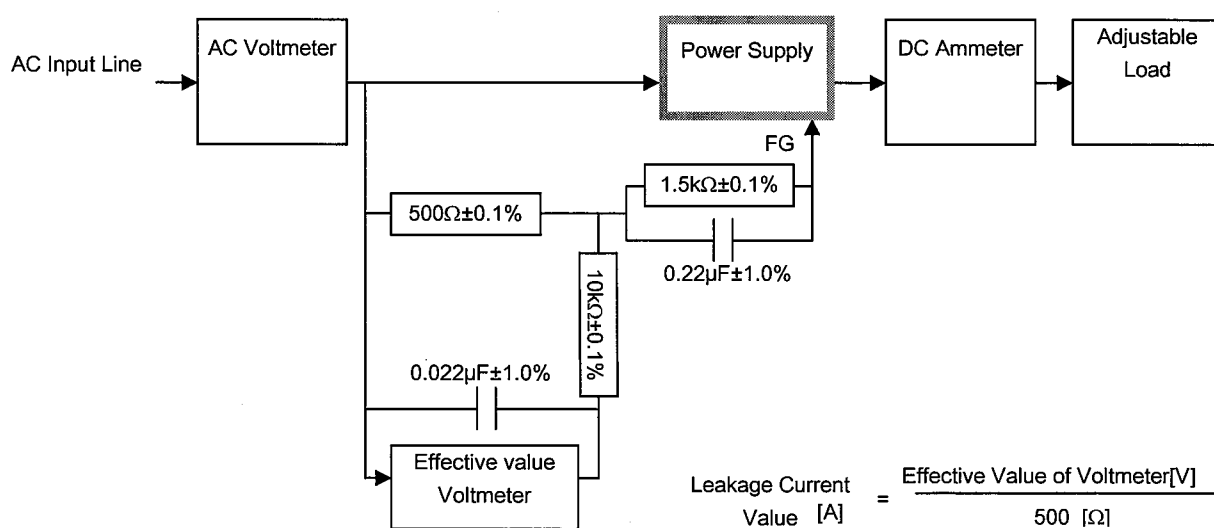


Figure B (IEC60950-1)