

TEST DATA OF WMA35F-5

Regulated DC Power Supply
November 9, 2020

Approved by : Takashi Kajii
Design Manager

Prepared by : Takeshi Natsuno
Design Engineer

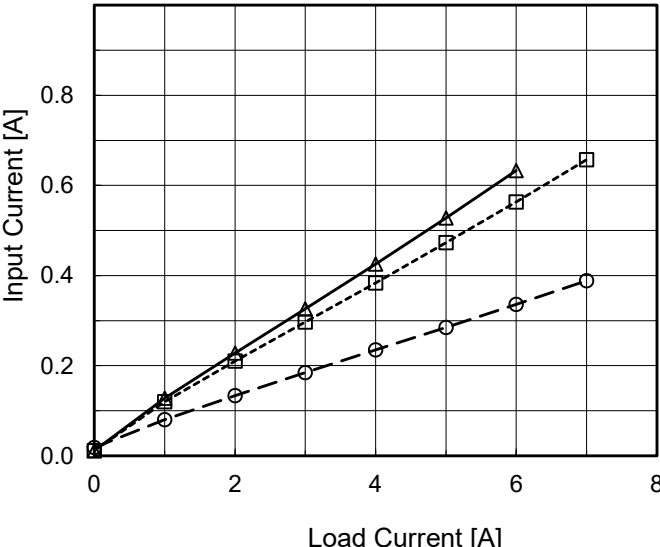
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Model		WMA35F-5		Temperature 25°C																																																				
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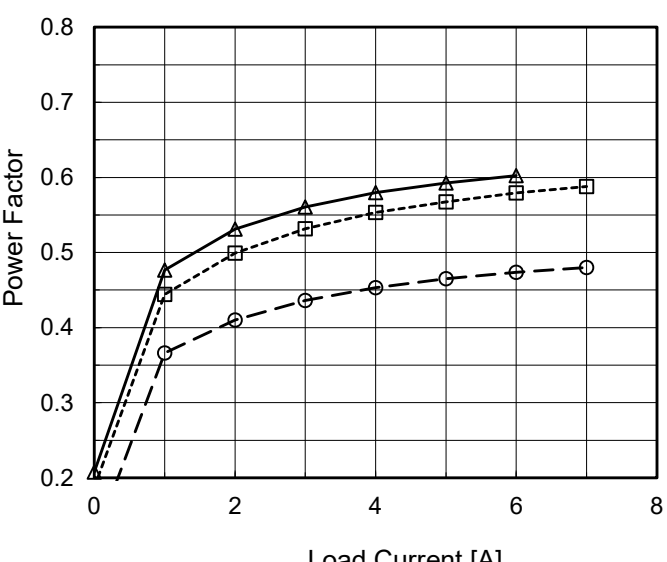
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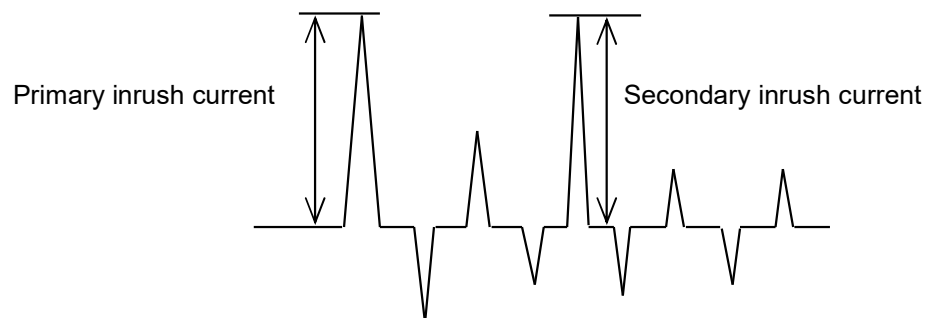
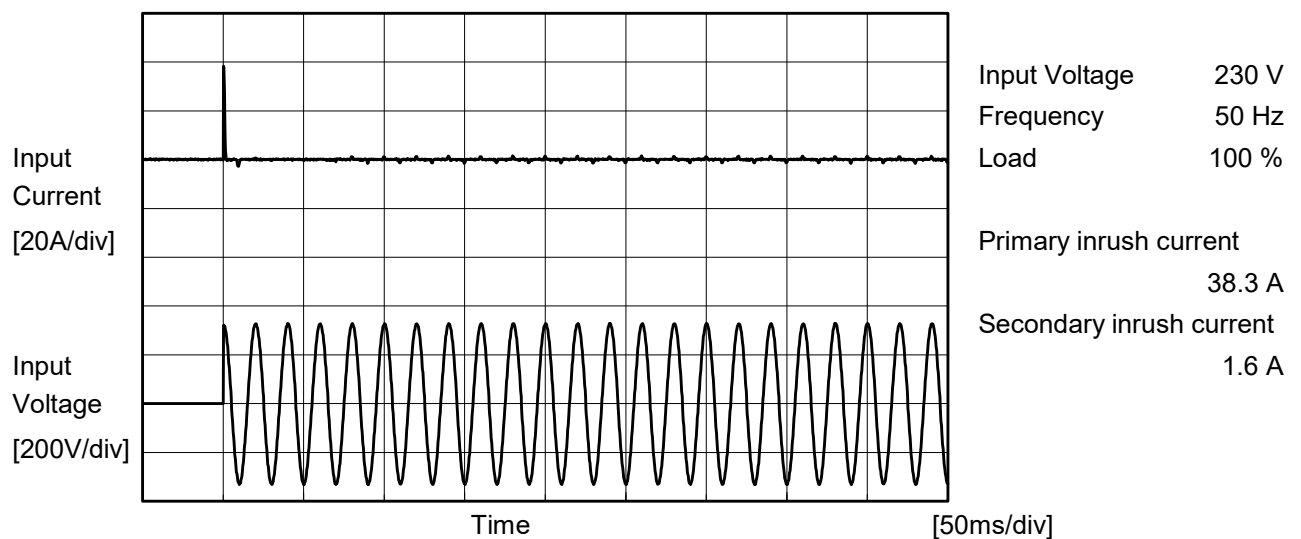
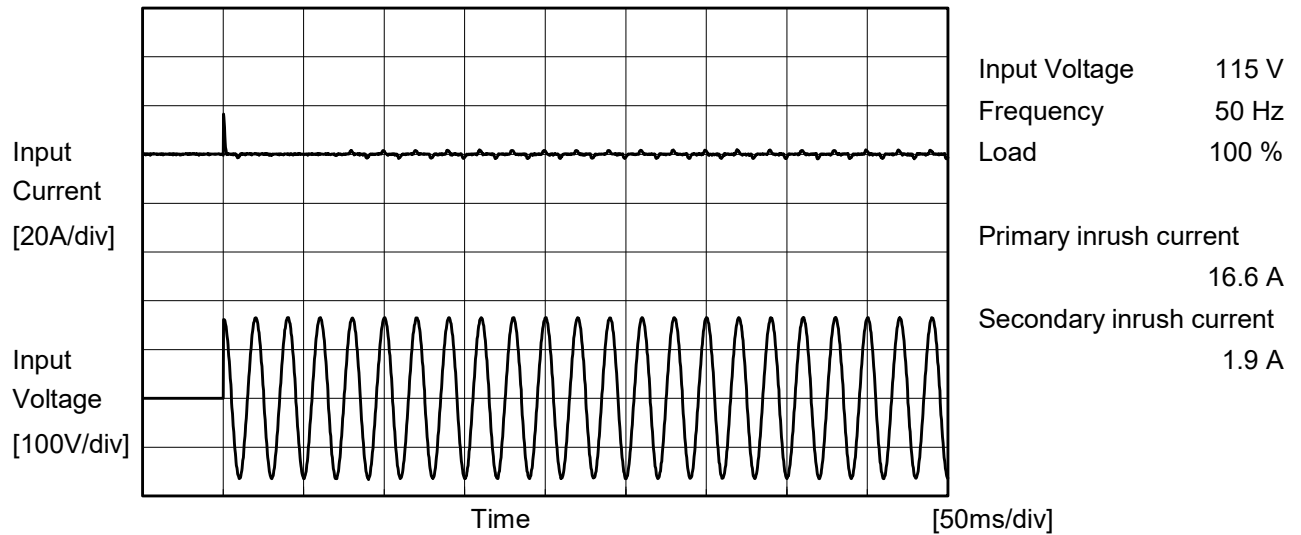
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Model	WMA35F-5	Temperature	25°C
Item	Inrush Current	Testing Circuitry	Figure A
Object	_____		





COSEL		Temperature 25°C Testing Circuitry Figure B
Model	WMA35F-5	
Item	Leakage Current	
Object	_____	

1.Results

[mA]

Standards	Measuring Method	Input Volt.			Note
		100 [V]	115 [V]	230 [V]	
IEC60601-1	Both phases	0.12	0.14	0.31	Operation
	One of phases	0.23	0.26	0.59	Stand by

The value for "One of phases" is the reference value only.

2.Condition

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

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Model		WMA35F-5	Temperature25°C Testing CircuitryFigure A	
Item		Line Regulation		
Object		+5V7A		
1.Graph			2.Values	
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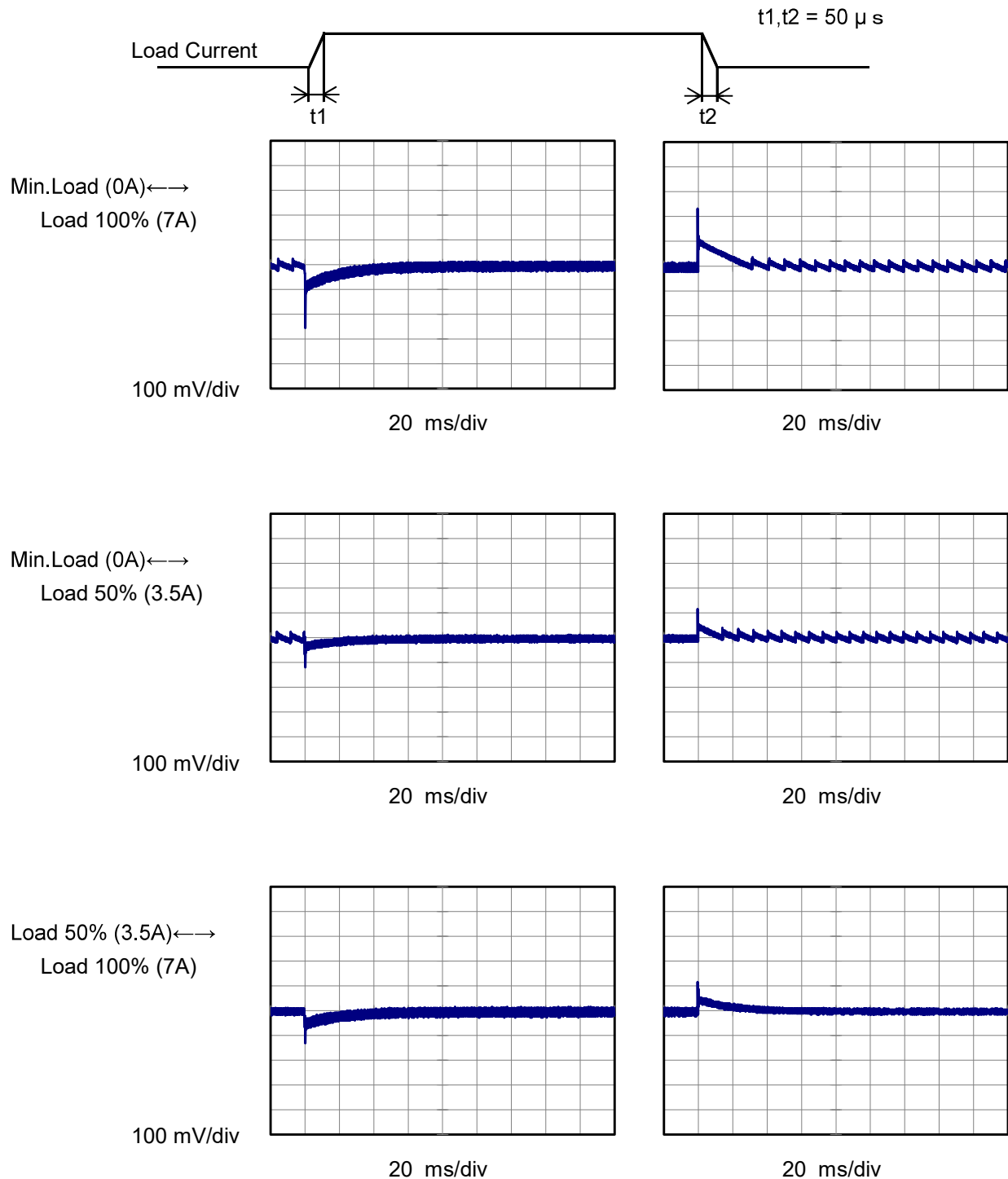
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Model		WMA35F-5																																																				
Item		Load Regulation																																																				
Object		+5V7A																																																				
1.Graph		2.Values																																																				
<div><div><div>—△—</div><div>Input Volt.</div><div>100V</div></div><div><div>---□---</div><div>Input Volt.</div><div>115V</div></div><div><div>---⊖---</div><div>Input Volt.</div><div>230V</div></div></div> <p>Output Voltage [V]</p> <p>Load Current [A]</p>		<table><tr><th rowspan="2">Load Current [A]</th><th colspan="3">Output Voltage [V]</th></tr><tr><th>Input Volt. 100[V]</th><th>Input Volt. 115[V]</th><th>Input Volt. 230[V]</th></tr><tr><td>0</td><td>5.020</td><td>5.019</td><td>5.020</td></tr><tr><td>1</td><td>5.018</td><td>5.018</td><td>5.019</td></tr><tr><td>2</td><td>5.017</td><td>5.017</td><td>5.017</td></tr><tr><td>3</td><td>5.016</td><td>5.016</td><td>5.016</td></tr><tr><td>4</td><td>5.015</td><td>5.015</td><td>5.015</td></tr><tr><td>5</td><td>5.014</td><td>5.014</td><td>5.014</td></tr><tr><td>6</td><td>5.013</td><td>5.013</td><td>5.013</td></tr><tr><td>7</td><td>-</td><td>5.012</td><td>5.012</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]	Output Voltage [V]			Input Volt. 100[V]	Input Volt. 115[V]	Input Volt. 230[V]	0	5.020	5.019	5.020	1	5.018	5.018	5.019	2	5.017	5.017	5.017	3	5.016	5.016	5.016	4	5.015	5.015	5.015	5	5.014	5.014	5.014	6	5.013	5.013	5.013	7	-	5.012	5.012	--	-	-	-	--	-	-	-	--	-	-	-
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Model	WMA35F-5	Temperature 25°C Testing Circuitry Figure A
Item	Dynamic Load Response	
Object	+5V7A	

Input Volt. 230 V
Cycle 1000 ms



COSEL

Model		WMA35F-5	Temperature Testing Circuitry	25°C Figure C																																				
Item		Ripple-Noise (by Load Current)																																						
Object		+5V7A																																						
1.Graph			2.Values																																					
<div><div><div>—△— Input Volt. 115V</div><div>- - ⊖ - - Input Volt. 230V</div></div><table><thead><tr><th>Load Current [A]</th><th>Input Volt. 115 [V]</th><th>Input Volt. 230 [V]</th></tr></thead><tbody><tr><td>0.0</td><td>36</td><td>53</td></tr><tr><td>1.4</td><td>23</td><td>24</td></tr><tr><td>2.8</td><td>24</td><td>25</td></tr><tr><td>4.2</td><td>24</td><td>24</td></tr><tr><td>5.6</td><td>26</td><td>23</td></tr><tr><td>7.0</td><td>30</td><td>24</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><tr><td>--</td><td>-</td><td>-</td></tr></tbody></table></div>			Load Current [A]	Input Volt. 115 [V]	Input Volt. 230 [V]	0.0	36	53	1.4	23	24	2.8	24	25	4.2	24	24	5.6	26	23	7.0	30	24	--	-	-	--	-	-	--	-	-	--	-	-	--	-	-		
Load Current [A]	Input Volt. 115 [V]	Input Volt. 230 [V]																																						
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1.4	23	24																																						
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<p>Measured by 20 MHz Oscilloscope. Ripple Noise is shown as p-p in the figure below.</p> <div><div><div>T1: Due to AC Input Line</div><div>T2: Due to Switching</div></div><p>Ripple-Noise [mVp-p]</p><p>T1</p><p>T2</p></div>																																								
Fig. Complex Ripple Wave Form																																								

COSEL

Model

WMA35F-5

Item

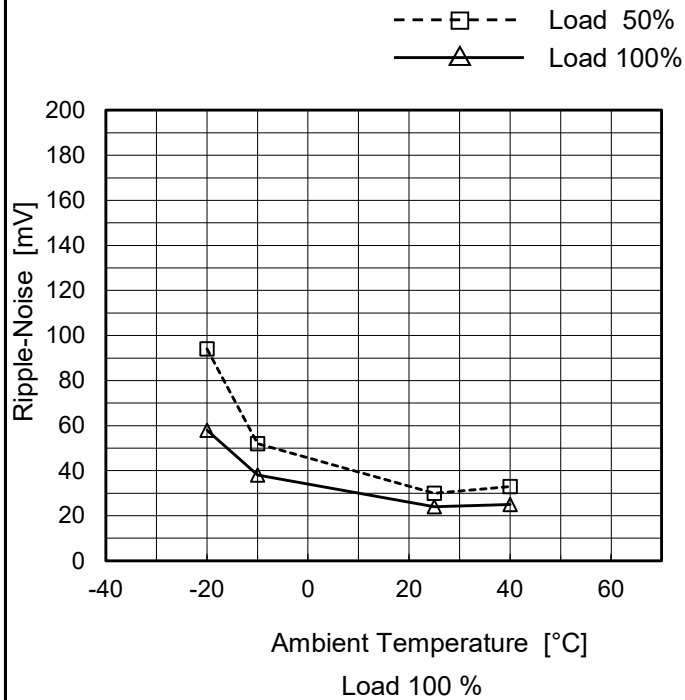
Ripple-Nise (by Ambient Temp.)

Object

+5V7A

Testing Circuitry Figure C

1.Graph



Measured by 20 MHz Oscilloscope.

2.Values

Ambient Temperature [°C]	Ripple-Noise [mV]	
	115 [V]	230[V]
-20	94	58
-10	52	38
25	30	24
40	33	25
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-

COSEL

Model		WMA35F-5		Testing Circuitry Figure A																																																					
Item		Ambient Temperature Drift																																																							
Object		+5V7A																																																							
1.Graph		<div><div><div>—△—</div><div>Input Volt. 100V</div></div><div><div>---□---</div><div>Input Volt. 115V</div></div><div><div>---○---</div><div>Input Volt. 230V</div></div></div> <table><thead><tr><th>Ambient Temperature [°C]</th><th>100[V]</th><th>115[V]</th><th>230[V]</th></tr></thead><tbody><tr><td>-20</td><td>-</td><td>4.991</td><td>4.991</td></tr><tr><td>-10</td><td>-</td><td>4.998</td><td>4.997</td></tr><tr><td>0</td><td>-</td><td>5.002</td><td>5.002</td></tr><tr><td>25</td><td>-</td><td>5.011</td><td>5.011</td></tr><tr><td>40</td><td>-</td><td>5.015</td><td>5.015</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><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> <p>Output Voltage [V]</p> <p>Ambient Temperature [°C]</p> <p>Load 100%</p>		Ambient Temperature [°C]	100[V]	115[V]	230[V]	-20	-	4.991	4.991	-10	-	4.998	4.997	0	-	5.002	5.002	25	-	5.011	5.011	40	-	5.015	5.015	--	-	-	-	--	-	-	-	--	-	-	-	--	-	-	-	--	-	-	-	--	-	-	-	--	-	-	-	2.Values	
Ambient Temperature [°C]	100[V]	115[V]	230[V]																																																						
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Model		WMA35F-5	Testing Circuitry Figure A
Item		Output Voltage Accuracy	
Object		+5V7A	

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 : -20 - 40°C

Input Voltage : 100 - 230V

Load Current : 0 - 7A

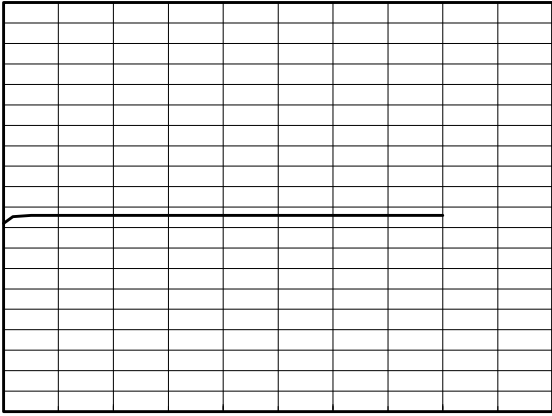
* Output Voltage Accuracy = $\pm(\text{Maximum of Output Voltage} - \text{Minimum of Output Voltage}) / 2$

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

2. Values

Item	Temperature [°C]	Input Voltage[V]	Output		Output Voltage Accuracy	
			Current[A]	Voltage[V]	Value [mV]	Ratio [%]
Maximum Voltage	40	230	0	5.024	±17	±0.3
Minimum Voltage	-20	100	7	4.990		

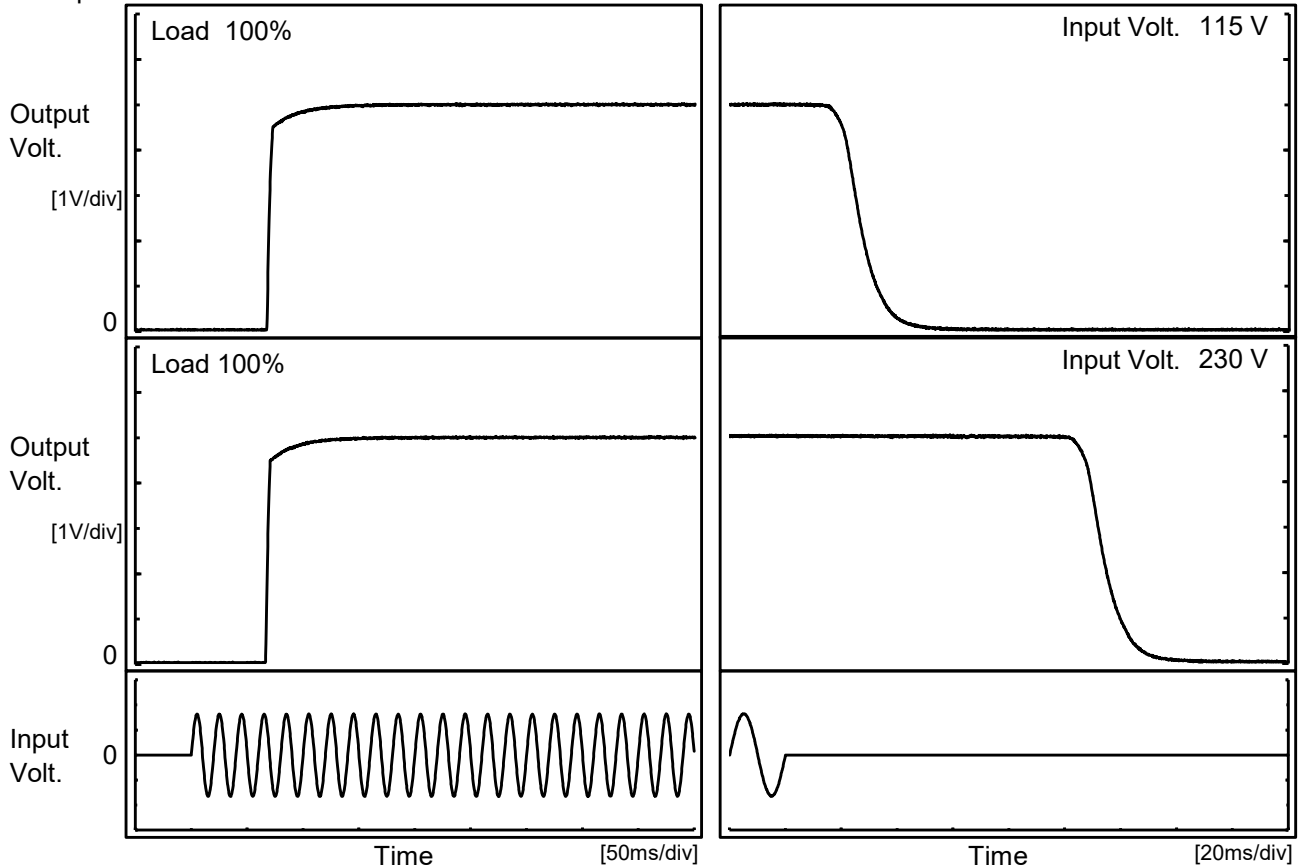
COSEL

Model		WMA35F-5	Temperature25°C Testing CircuitryFigure A																						
Item		Time Lapse Drift																							
Object		+5V7A																							
1.Graph			2.Values																						
<div><div><div>5.15</div><div>5.12</div><div>5.09</div><div>5.06</div><div>5.03</div><div>5.00</div><div>4.97</div><div>4.94</div><div>4.91</div><div>4.88</div><div>4.85</div></div><div></div><div><div>0</div><div>2</div><div>4</div><div>6</div><div>8</div><div>10</div></div><div><div>Time [H]</div><div>Input Volt.115V</div><div>Load100%</div></div></div>			<table><tr><th>Time since start [H]</th><th>Output Voltage [V]</th></tr><tr><td>0.0</td><td>4.988</td></tr><tr><td>0.2</td><td>4.993</td></tr><tr><td>0.5</td><td>4.994</td></tr><tr><td>1.0</td><td>4.994</td></tr><tr><td>2.0</td><td>4.994</td></tr><tr><td>3.0</td><td>4.994</td></tr><tr><td>4.0</td><td>4.994</td></tr><tr><td>8.0</td><td>4.994</td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table>	Time since start [H]	Output Voltage [V]	0.0	4.988	0.2	4.993	0.5	4.994	1.0	4.994	2.0	4.994	3.0	4.994	4.0	4.994	8.0	4.994				
Time since start [H]	Output Voltage [V]																								
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2.0	4.994																								
3.0	4.994																								
4.0	4.994																								
8.0	4.994																								

COSEL

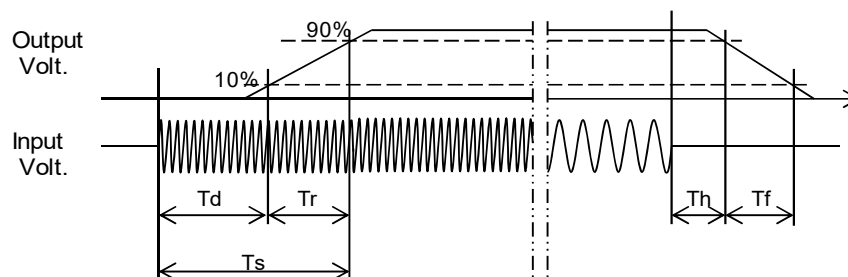
Model	WMA35F-5	Temperature 25°C Testing Circuitry Figure A
Item	Rise and Fall Time	
Object	+5V7A	

1.Graph



2.Values

		[ms]				
Input Volt	Time	Td	Tr	Ts	Th	Tf
115 V		68.0	6.3	74.3	20.1	16.3
230 V		67.0	6.3	73.3	106.9	16.9



COSEL

Model		WMA35F-5	Temperature		25°C																														
Item		Hold-Up Time	Testing Circuitry		Figure A																														
Object		+5V7A																																	
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>Load 50%</div><div>Load 100%</div></div> <p>The graph plots Hold-Up Time [ms] on a logarithmic y-axis (1 to 1000) against Input Voltage [V] on a linear x-axis (50 to 300). Two data series are shown: Load 50% (dashed line with square markers) and Load 100% (solid line with triangle markers). Both series show an increasing trend of hold-up time with increasing input voltage.</p> <table border="1"><thead><tr><th>Input Voltage [V]</th><th>Load 50% [ms]</th><th>Load 100% [ms]</th></tr></thead><tbody><tr><td>85</td><td>23</td><td>-</td></tr><tr><td>100</td><td>35</td><td>-</td></tr><tr><td>115</td><td>49</td><td>18</td></tr><tr><td>200</td><td>169</td><td>76</td></tr><tr><td>230</td><td>228</td><td>105</td></tr><tr><td>240</td><td>249</td><td>116</td></tr><tr><td>264</td><td>305</td><td>144</td></tr><tr><td>--</td><td>-</td><td>-</td></tr><tr><td>--</td><td>-</td><td>-</td></tr></tbody></table>			Input Voltage [V]	Load 50% [ms]	Load 100% [ms]	85	23	-	100	35	-	115	49	18	200	169	76	230	228	105	240	249	116	264	305	144	--	-	-	--	-	-			
Input Voltage [V]	Load 50% [ms]	Load 100% [ms]																																	
85	23	-																																	
100	35	-																																	
115	49	18																																	
200	169	76																																	
230	228	105																																	
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--	-	-																																	
--	-	-																																	
This duration covers from Shut-off of input voltage to the moment when output voltage descends to the rated range of voltage accuracy.																																			

COSEL

Model		WMA35F-5	Temperature25°C																																																				
Item		Instantaneous Interruption Compensation	Testing CircuitryFigure A																																																				
Object		+5V7A																																																					
1.Graph			2.Values																																																				
<div><div><div><div><div>—△—</div><div>Input Volt.</div><div>100V</div></div><div><div>---□---</div><div>Input Volt.</div><div>115V</div></div><div><div>---○---</div><div>Input Volt.</div><div>230V</div></div></div><div><p>Instantaneous Compensation Time [ms]</p><p>Load Current [A]</p></div></div></div>			<table><tr><th rowspan="2">Load Current [A]</th><th colspan="3">Time [ms]</th></tr><tr><th>Input Volt. 100[V]</th><th>Input Volt. 115[V]</th><th>Input Volt. 230[V]</th></tr><tr><td>0</td><td>-</td><td>-</td><td>-</td></tr><tr><td>1</td><td>144</td><td>193</td><td>789</td></tr><tr><td>2</td><td>69</td><td>95</td><td>406</td></tr><tr><td>3</td><td>44</td><td>61</td><td>269</td></tr><tr><td>4</td><td>31</td><td>44</td><td>202</td></tr><tr><td>5</td><td>24</td><td>33</td><td>159</td></tr><tr><td>6</td><td>17</td><td>26</td><td>129</td></tr><tr><td>7</td><td>-</td><td>17</td><td>107</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]	Time [ms]			Input Volt. 100[V]	Input Volt. 115[V]	Input Volt. 230[V]	0	-	-	-	1	144	193	789	2	69	95	406	3	44	61	269	4	31	44	202	5	24	33	159	6	17	26	129	7	-	17	107	--	-	-	-	--	-	-	-	--	-	-	-
Load Current [A]	Time [ms]																																																						
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--	-	-	-																																																				
--	-	-	-																																																				
--	-	-	-																																																				

COSEL

Model

WMA35F-5

Item

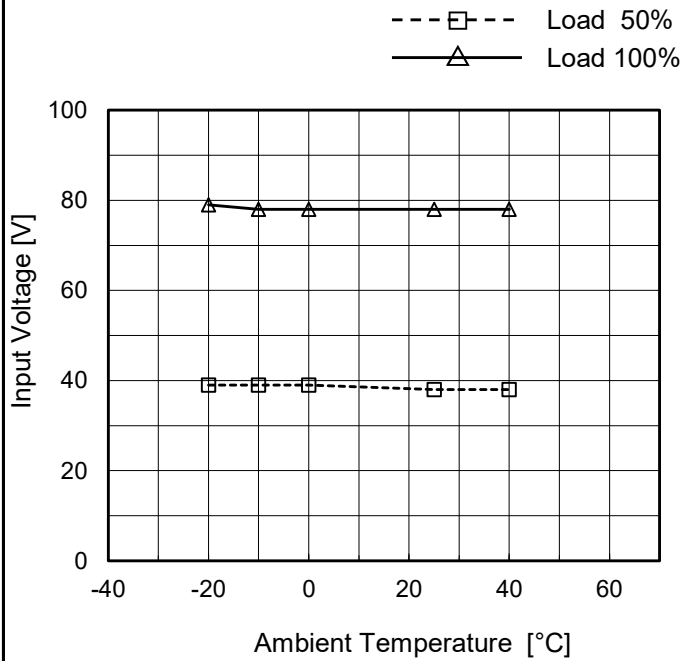
Minimum Input Voltage
for Regulated Output Voltage

Object

+5V7A

Testing Circuitry Figure A

1.Graph



2.Values

Ambient Temperature [°C]	Input Voltage [V]	
	Load 50%	Load 100%
-20	39	79
-10	39	78
0	39	78
25	38	78
40	38	78
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-

BC-11645

COSEL

Model		WMA35F-5
Item		Overvoltage Protection
Object		+5V7A

1.Graph

△

Input Volt. 115V

□

Input Volt. 230V

Operating Point [V]

8.0

7.0

6.0

5.0

-40

-20

0

20

40

60

Ambient Temperature [°C]

Load 0%

COSEL

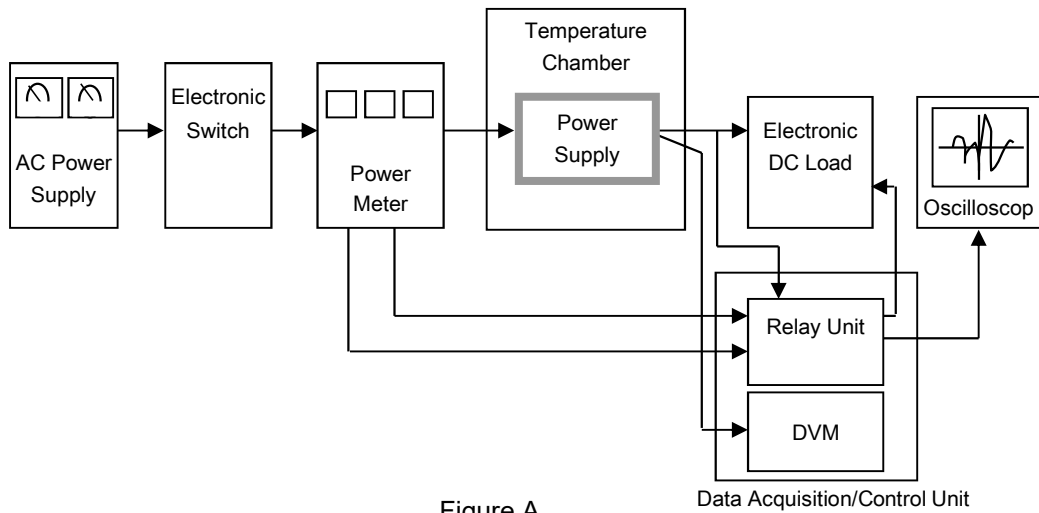


Figure A

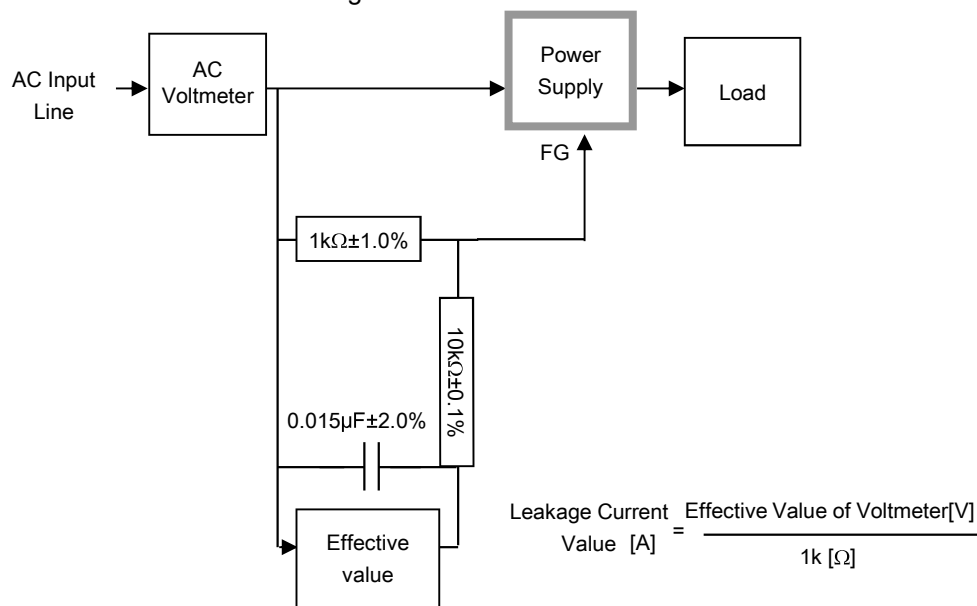


Figure B (IEC60601-1)

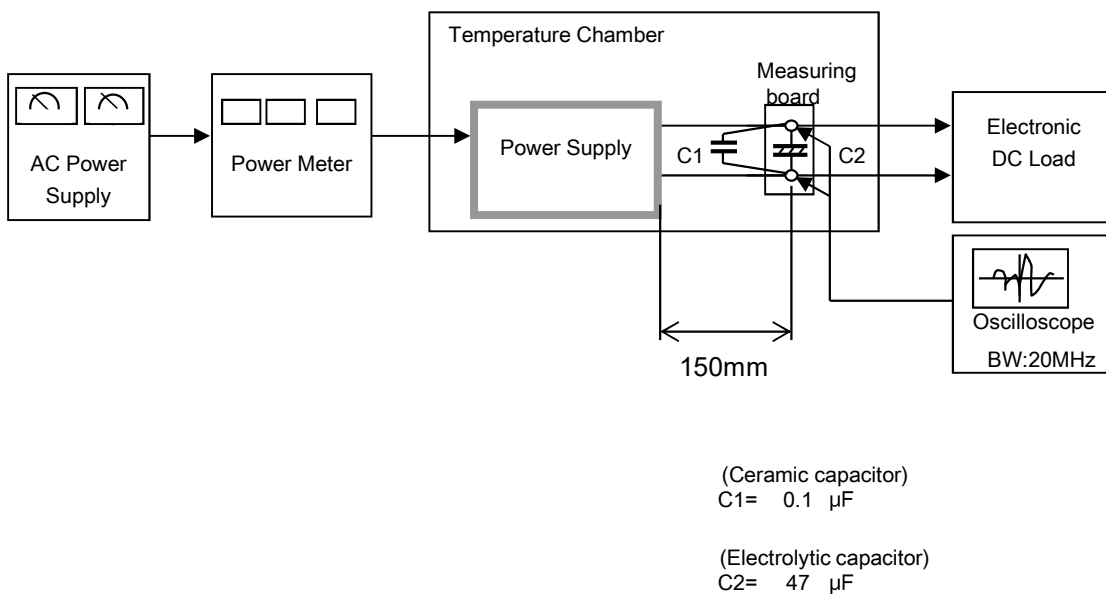


Figure C