



TEST DATA OF LFA15F-24

Regulated DC Power Supply
June 19, 2009

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Yoshiaki Shimizu Design Manager

Prepared by : Yuki Nakamura
Yuki Nakamura Design Engineer

COSEL CO.,LTD.

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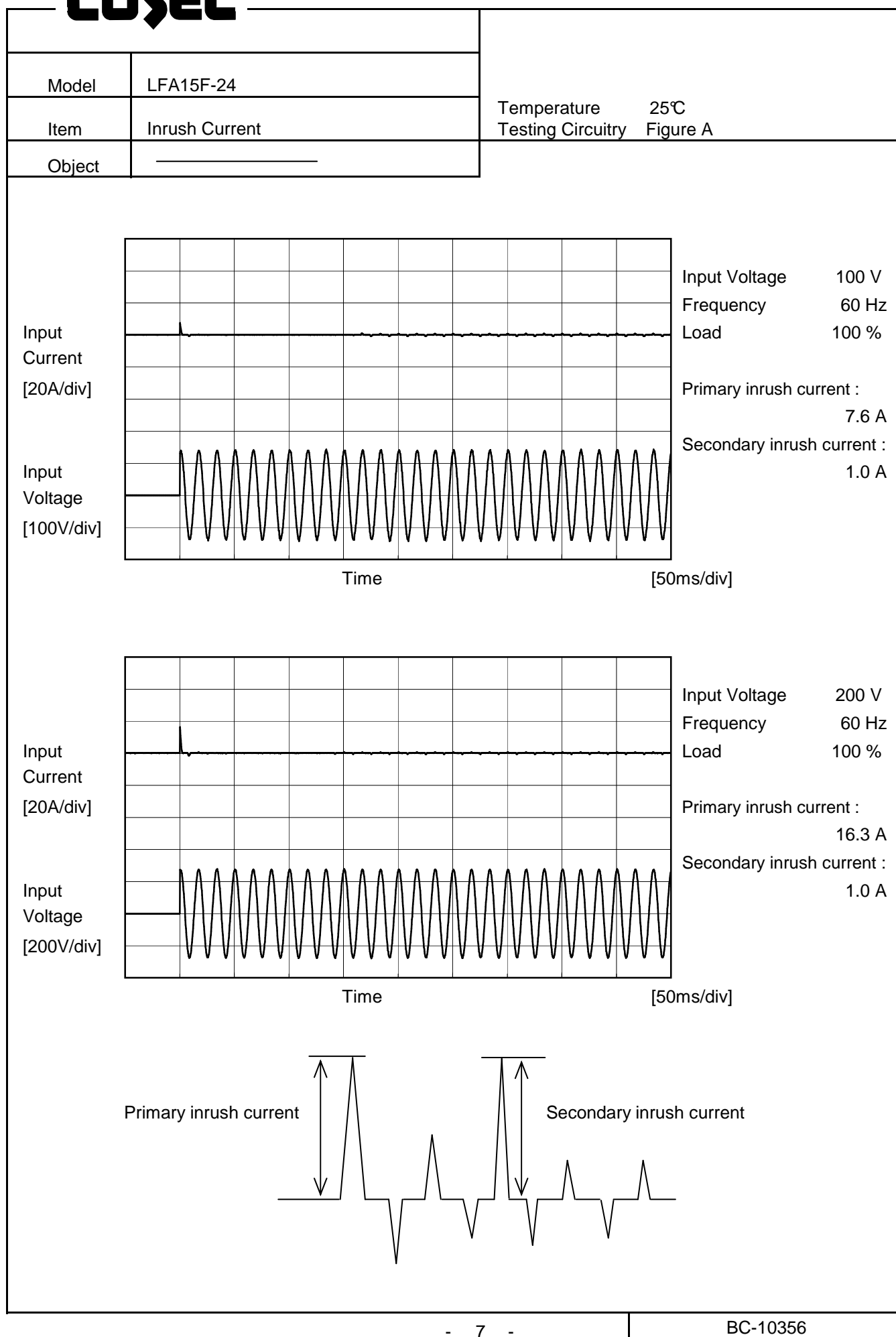
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COSEL





		Temperature 25℃ Testing Circuitry Figure B
Model	LFA15F-24	
Item	Leakage Current	
Object	_____	

1.Results

[mA]

Standards		Input Volt.			Note
		100 [V]	200 [V]	240 [V]	
DEN-AN	Both phases	0.07	0.14	0.16	Operation
	One of phase	0.13	0.27	0.33	stand by
IEC60950-1	Both phases	0.09	0.19	0.20	Operation
	One of phase	0.13	0.28	0.31	stand by

The value for "One phase" 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.

Model	LFA15F-24																																
Item	Line Regulation	Temperature	25℃																														
		Testing Circuitry	Figure A																														
Object	+24V0.7A																																
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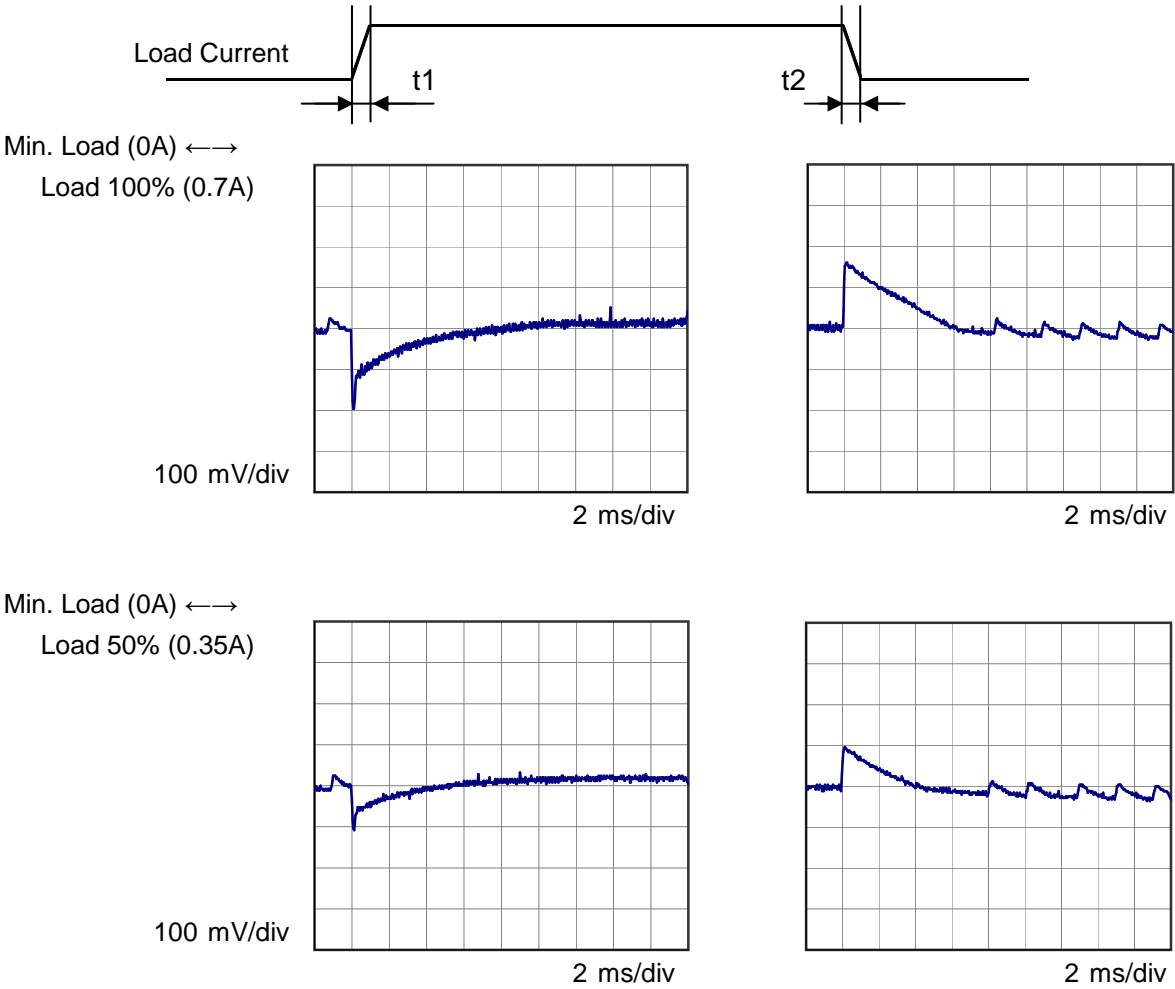
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<div><div><div>—△—</div><div>Input Volt.</div><div>100V</div></div><div><div>---□---</div><div>Input Volt.</div><div>200V</div></div><div><div>-·-○-·-</div><div>Input Volt.</div><div>230V</div></div></div> <p>Note: Slanted line shows the range of the rated load current.</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. 200[V]</th><th>Input Volt. 230[V]</th></tr><tr><td>0.00</td><td>24.189</td><td>24.188</td><td>24.188</td></tr><tr><td>0.10</td><td>24.189</td><td>24.188</td><td>24.188</td></tr><tr><td>0.20</td><td>24.189</td><td>24.188</td><td>24.188</td></tr><tr><td>0.30</td><td>24.188</td><td>24.188</td><td>24.188</td></tr><tr><td>0.40</td><td>24.188</td><td>24.188</td><td>24.187</td></tr><tr><td>0.50</td><td>24.187</td><td>24.187</td><td>24.187</td></tr><tr><td>0.60</td><td>24.187</td><td>24.187</td><td>24.187</td></tr><tr><td>0.70</td><td>24.186</td><td>24.186</td><td>24.186</td></tr><tr><td>0.77</td><td>24.186</td><td>24.186</td><td>24.186</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. 200[V]	Input Volt. 230[V]	0.00	24.189	24.188	24.188	0.10	24.189	24.188	24.188	0.20	24.189	24.188	24.188	0.30	24.188	24.188	24.188	0.40	24.188	24.188	24.187	0.50	24.187	24.187	24.187	0.60	24.187	24.187	24.187	0.70	24.186	24.186	24.186	0.77	24.186	24.186	24.186	--	-	-	-	--	-	-	-
Load Current [A]	Output Voltage [V]																																																					
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Model	LFA15F-24		
Item	Dynamic Load Response	Temperature	25°C
Object	+24V0.7A	Testing Circuitry	Figure A

Input Volt. 100 V
Cycle 1000 ms

Response. $t_1=t_2=50\mu\text{s}$. Typ



Model	LFA15F-24																																								
Item	Ripple Voltage (by Load Current)	Temperature	25℃																																						
Object	+24V0.7A	Testing Circuitry	Figure C																																						
1.Graph		2.Values																																							
<div><div><div>—△— Input Volt. 100V</div><div>-·-○-·- Input Volt. 200V</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. 100 [V]</th><th>Input Volt. 200 [V]</th></tr><tr><td>0.00</td><td>50</td><td>25</td></tr><tr><td>0.10</td><td>15</td><td>85</td></tr><tr><td>0.20</td><td>15</td><td>15</td></tr><tr><td>0.30</td><td>15</td><td>15</td></tr><tr><td>0.40</td><td>20</td><td>15</td></tr><tr><td>0.50</td><td>25</td><td>20</td></tr><tr><td>0.60</td><td>25</td><td>20</td></tr><tr><td>0.70</td><td>30</td><td>20</td></tr><tr><td>0.77</td><td>35</td><td>20</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. 100 [V]	Input Volt. 200 [V]	0.00	50	25	0.10	15	85	0.20	15	15	0.30	15	15	0.40	20	15	0.50	25	20	0.60	25	20	0.70	30	20	0.77	35	20	--	-	-	--	-	-
Load Current [A]	Ripple Voltage [mV]																																								
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<div>Measured by 20 MHz Oscilloscope.</div> <div>Ripple Voltage is shown as p-p in the figure below.</div> <div>Note: Slanted line shows the range of the rated load current.</div>																																									
<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																																									

Model	LFA15F-24																																								
Item	Ripple-Noise	Temperature	25℃																																						
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Load Current [A]	Ripple-Noise [mV]																																								
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Model		LFA15F-24	Testing Circuitry Figure C
Item		Ripple Voltage (by Ambient Temp.)	
Object		+24V0.7A	
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> 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Model	LFA15F-24																																																					
Item	Ambient Temperature Drift	Testing Circuitry Figure A																																																				
Object	+24V0.7A																																																					
1.Graph		2.Values																																																				
<div><div><div>—△—</div><div>Input Volt.</div><div>100V</div></div><div><div>---□---</div><div>Input Volt.</div><div>200V</div></div><div><div>---○---</div><div>Input Volt.</div><div>230V</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>		<table><tr><th rowspan="2">Ambient Temperature [°C]</th><th colspan="3">Output Voltage [V]</th></tr><tr><th>Input Volt. 100[V]</th><th>Input Volt. 200[V]</th><th>Input Volt. 230[V]</th></tr><tr><td>-20</td><td>24.207</td><td>24.207</td><td>24.207</td></tr><tr><td>-10</td><td>24.203</td><td>24.203</td><td>24.202</td></tr><tr><td>0</td><td>24.198</td><td>24.198</td><td>24.198</td></tr><tr><td>10</td><td>24.194</td><td>24.194</td><td>24.194</td></tr><tr><td>20</td><td>24.191</td><td>24.190</td><td>24.190</td></tr><tr><td>25</td><td>24.189</td><td>24.189</td><td>24.189</td></tr><tr><td>30</td><td>24.187</td><td>24.186</td><td>24.186</td></tr><tr><td>40</td><td>24.180</td><td>24.180</td><td>24.180</td></tr><tr><td>50</td><td>24.168</td><td>24.167</td><td>24.167</td></tr><tr><td>60</td><td>24.153</td><td>24.153</td><td>24.153</td></tr><tr><td>--</td><td>-</td><td>-</td><td>-</td></tr></table>		Ambient Temperature [°C]	Output Voltage [V]			Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]	-20	24.207	24.207	24.207	-10	24.203	24.203	24.202	0	24.198	24.198	24.198	10	24.194	24.194	24.194	20	24.191	24.190	24.190	25	24.189	24.189	24.189	30	24.187	24.186	24.186	40	24.180	24.180	24.180	50	24.168	24.167	24.167	60	24.153	24.153	24.153	--	-	-	-
Ambient Temperature [°C]	Output Voltage [V]																																																					
	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]																																																			
-20	24.207	24.207	24.207																																																			
-10	24.203	24.203	24.202																																																			
0	24.198	24.198	24.198																																																			
10	24.194	24.194	24.194																																																			
20	24.191	24.190	24.190																																																			
25	24.189	24.189	24.189																																																			
30	24.187	24.186	24.186																																																			
40	24.180	24.180	24.180																																																			
50	24.168	24.167	24.167																																																			
60	24.153	24.153	24.153																																																			
--	-	-	-																																																			

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		Testing Circuitry Figure A
Model	LFA15F-24	
Item	Output Voltage Accuracy	
Object	+24V0.7A	

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 : -10 - 50℃

Input Voltage : 85 - 264V

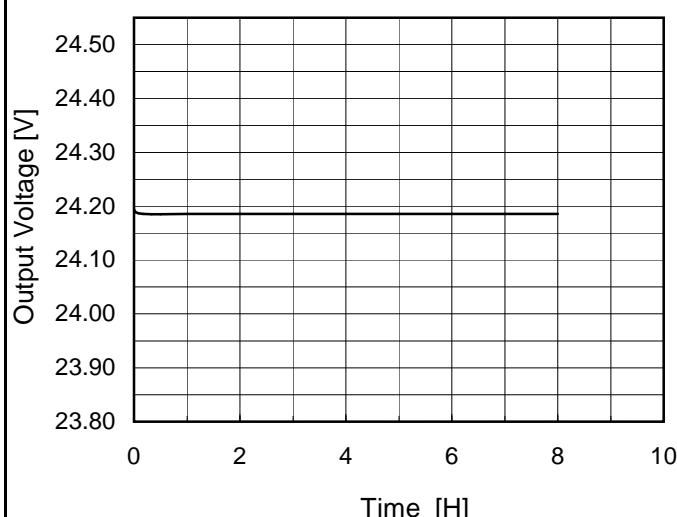
Load Current : 0 - 0.7A

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

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

2. Values

Item	Temperature [℃]	Input Voltage[V]	Output		Output Voltage Accuracy	
			Current[A]	Voltage[V]	Value [mV]	Ration [%]
Maximum Voltage	-10	85	0	24.207	±20	±0.1
Minimum Voltage	50	264	0.7	24.167		

Model	LFA15F-24																								
Item	Time Lapse Drift	Temperature	25℃																						
		Testing Circuitry	Figure A																						
Object	+24V0.7A																								
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>24.194</td></tr><tr><td>0.5</td><td>24.185</td></tr><tr><td>1.0</td><td>24.185</td></tr><tr><td>2.0</td><td>24.185</td></tr><tr><td>3.0</td><td>24.185</td></tr><tr><td>4.0</td><td>24.186</td></tr><tr><td>5.0</td><td>24.186</td></tr><tr><td>6.0</td><td>24.186</td></tr><tr><td>7.0</td><td>24.186</td></tr><tr><td>8.0</td><td>24.186</td></tr></table>		Time since start [H]	Output Voltage [V]	0.0	24.194	0.5	24.185	1.0	24.185	2.0	24.185	3.0	24.185	4.0	24.186	5.0	24.186	6.0	24.186	7.0	24.186	8.0	24.186
Time since start [H]	Output Voltage [V]																								
0.0	24.194																								
0.5	24.185																								
1.0	24.185																								
2.0	24.185																								
3.0	24.185																								
4.0	24.186																								
5.0	24.186																								
6.0	24.186																								
7.0	24.186																								
8.0	24.186																								
* The characteristic of AC200V is equal.																									

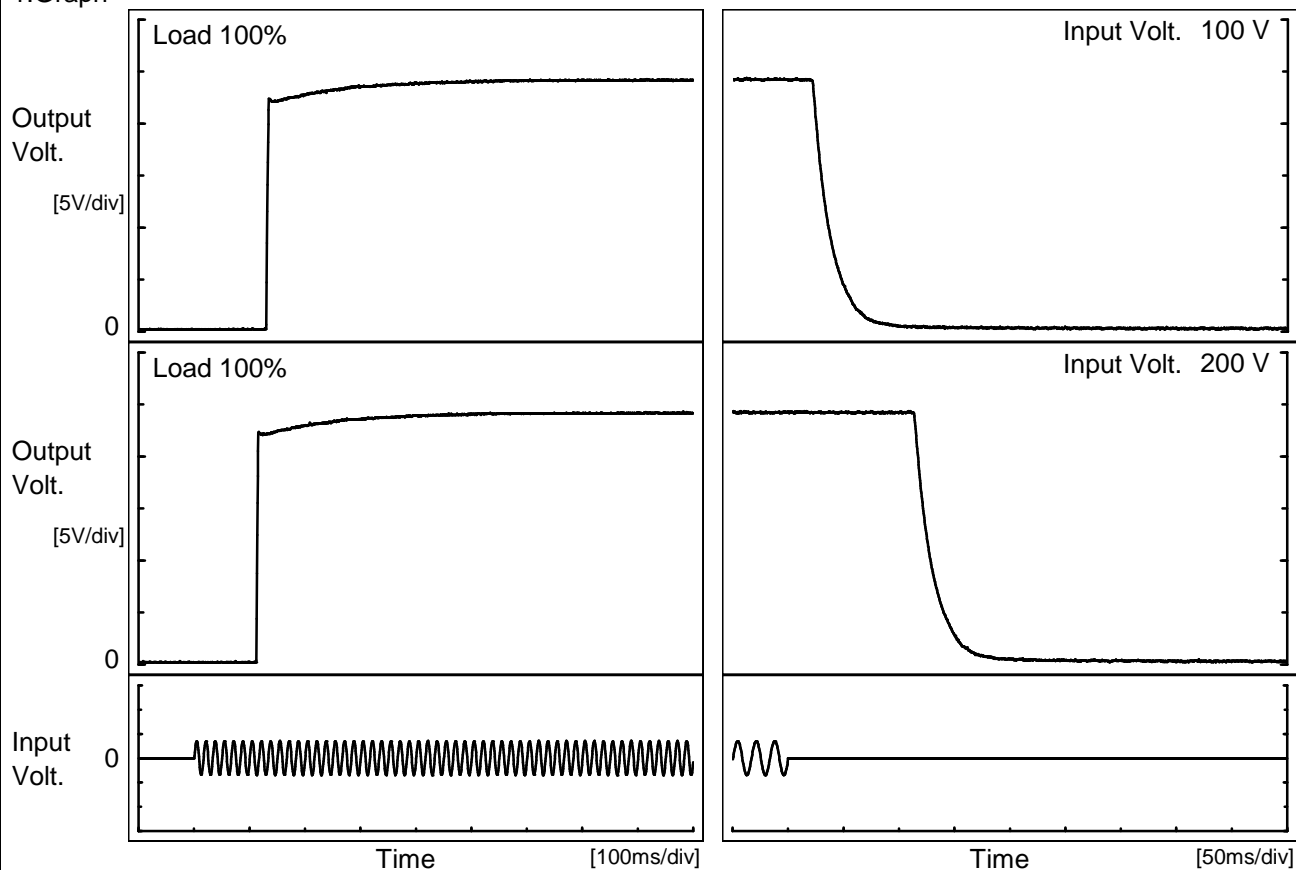
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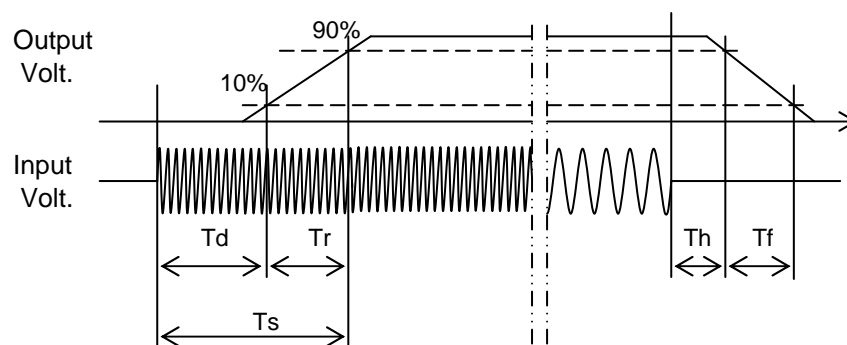
Model	LFA15F-24	Temperature	25°C
Item	Rise and Fall Time	Testing Circuitry	Figure A
Object	+24V0.7A		

1. Graph



2. Values

Input Volt. \ Time	Td	Tr	Ts	Th	Tf
100 V	131.0	4.0	135.0	23.5	35.0
200 V	113.0	3.0	116.0	115.5	35.8



Model	LFA15F-24																																		
Item	Hold-Up Time	Temperature	25℃																																
		Testing Circuitry	Figure A																																
Object	+24V0.7A																																		
1.Graph		2.Values																																	
<div><div>---□--- Load 50%</div><div>—△— Load 100%</div><div><p>Hold-Up Time [ms]</p><p>Input Voltage [V]</p></div></div>		<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>22</td><td>9</td></tr><tr><td>85</td><td>31</td><td>13</td></tr><tr><td>100</td><td>47</td><td>22</td></tr><tr><td>120</td><td>73</td><td>34</td></tr><tr><td>200</td><td>228</td><td>115</td></tr><tr><td>230</td><td>308</td><td>158</td></tr><tr><td>264</td><td>414</td><td>209</td></tr><tr><td>280</td><td>471</td><td>238</td></tr><tr><td>--</td><td>-</td><td>-</td></tr></table>		Input Voltage [V]	Hold-Up Time [ms]		Load 50%	Load 100%	75	22	9	85	31	13	100	47	22	120	73	34	200	228	115	230	308	158	264	414	209	280	471	238	--	-	-
Input Voltage [V]	Hold-Up Time [ms]																																		
	Load 50%	Load 100%																																	
75	22	9																																	
85	31	13																																	
100	47	22																																	
120	73	34																																	
200	228	115																																	
230	308	158																																	
264	414	209																																	
280	471	238																																	
--	-	-																																	
<p>This duration covers from Shut-off of input voltage to the moment when output voltage descends to the rated range of voltage accuracy.</p> <p>Note: Slanted line shows the range of the rated input voltage.</p>																																			

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Model	LFA15F-24																																																					
Item	Instantaneous Interruption Compensation	Temperature	25℃																																																			
		Testing Circuitry	Figure A																																																			
Object	+24V0.7A																																																					
1.Graph		2.Values																																																				
<div><div><div>—△— Input Volt. 100V</div><div>---□--- Input Volt. 200V</div><div>-·-○-·- Input Volt. 230V</div></div><div>Instantaneous Compensation Time [ms]</div><div>Load Current [A]</div></div> <p>Note: Slanted line shows the range of the rated load current.</p>		<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. 200[V]</th><th>Input Volt. 230[V]</th></tr><tr><td>0.00</td><td>-</td><td>-</td><td>-</td></tr><tr><td>0.10</td><td>161</td><td>721</td><td>965</td></tr><tr><td>0.20</td><td>87</td><td>394</td><td>524</td></tr><tr><td>0.30</td><td>57</td><td>272</td><td>367</td></tr><tr><td>0.40</td><td>44</td><td>207</td><td>280</td></tr><tr><td>0.50</td><td>32</td><td>165</td><td>224</td></tr><tr><td>0.60</td><td>28</td><td>137</td><td>186</td></tr><tr><td>0.70</td><td>22</td><td>115</td><td>157</td></tr><tr><td>0.77</td><td>20</td><td>105</td><td>142</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. 200[V]	Input Volt. 230[V]	0.00	-	-	-	0.10	161	721	965	0.20	87	394	524	0.30	57	272	367	0.40	44	207	280	0.50	32	165	224	0.60	28	137	186	0.70	22	115	157	0.77	20	105	142	--	-	-	-	--	-	-	-
Load Current [A]	Time [ms]																																																					
	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]																																																			
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0.50	32	165	224																																																			
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0.77	20	105	142																																																			
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[illegible]

Model	LFA15F-24																																											
Item	Overcurrent Protection	Temperature	25℃																																									
Object	+24V0.7A	Testing Circuitry	Figure A																																									
1.Graph		2.Values																																										
<div><div><div>△</div><div>Input Volt. 100V</div></div><div><div>○</div><div>Input Volt. 200V</div></div></div> <p>Note: Slanted line shows the range of the rated load current.</p> <p>Intermittent operation occurs when the output voltage is less than rated output voltage.</p>		<table><tr><th rowspan="2">Output Voltage [V]</th><th colspan="2">Load Current [A]</th></tr><tr><th>Input Volt. 100[V]</th><th>Input Volt. 200[V]</th></tr><tr><td>24.0</td><td>1.45</td><td>1.96</td></tr><tr><td>22.8</td><td>-</td><td>-</td></tr><tr><td>21.6</td><td>-</td><td>-</td></tr><tr><td>19.2</td><td>-</td><td>-</td></tr><tr><td>16.8</td><td>-</td><td>-</td></tr><tr><td>14.4</td><td>-</td><td>-</td></tr><tr><td>12.0</td><td>-</td><td>-</td></tr><tr><td>9.6</td><td>-</td><td>-</td></tr><tr><td>7.2</td><td>-</td><td>-</td></tr><tr><td>4.8</td><td>-</td><td>-</td></tr><tr><td>2.4</td><td>-</td><td>-</td></tr><tr><td>0.0</td><td>-</td><td>-</td></tr></table>		Output Voltage [V]	Load Current [A]		Input Volt. 100[V]	Input Volt. 200[V]	24.0	1.45	1.96	22.8	-	-	21.6	-	-	19.2	-	-	16.8	-	-	14.4	-	-	12.0	-	-	9.6	-	-	7.2	-	-	4.8	-	-	2.4	-	-	0.0	-	-
Output Voltage [V]	Load Current [A]																																											
	Input Volt. 100[V]	Input Volt. 200[V]																																										
24.0	1.45	1.96																																										
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14.4	-	-																																										
12.0	-	-																																										
9.6	-	-																																										
7.2	-	-																																										
4.8	-	-																																										
2.4	-	-																																										
0.0	-	-																																										

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Model		LFA15F-24	Testing Circuitry Figure A																																						
Item		Overvoltage Protection																																							
Object		+24V0.7A																																							
1.Graph			2.Values																																						
<div><div><div><div><div>—△—</div><div>Input Volt. 100V</div></div><div><div>---□---</div><div>Input Volt. 200V</div></div></div><div><p>Operating Point [V]</p><p>Ambient Temperature [°C]</p><p>Load 0%</p></div><p>Note: Slanted line shows the range of the rated ambient temperature.</p></div></div>			<table><tr><th rowspan="2">Ambient Temperature [°C]</th><th colspan="2">Operating Point [V]</th></tr><tr><th>Input Volt. 100[V]</th><th>Input Volt. 200[V]</th></tr><tr><td>-20</td><td>30.24</td><td>30.10</td></tr><tr><td>-10</td><td>30.45</td><td>30.45</td></tr><tr><td>0</td><td>30.74</td><td>30.67</td></tr><tr><td>10</td><td>30.95</td><td>30.95</td></tr><tr><td>20</td><td>31.23</td><td>31.23</td></tr><tr><td>25</td><td>31.37</td><td>31.30</td></tr><tr><td>30</td><td>31.44</td><td>31.44</td></tr><tr><td>40</td><td>31.73</td><td>31.73</td></tr><tr><td>50</td><td>31.94</td><td>31.94</td></tr><tr><td>60</td><td>32.22</td><td>32.15</td></tr><tr><td>--</td><td>-</td><td>-</td></tr></table>	Ambient Temperature [°C]	Operating Point [V]		Input Volt. 100[V]	Input Volt. 200[V]	-20	30.24	30.10	-10	30.45	30.45	0	30.74	30.67	10	30.95	30.95	20	31.23	31.23	25	31.37	31.30	30	31.44	31.44	40	31.73	31.73	50	31.94	31.94	60	32.22	32.15	--	-	-
Ambient Temperature [°C]	Operating Point [V]																																								
	Input Volt. 100[V]	Input Volt. 200[V]																																							
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50	31.94	31.94																																							
60	32.22	32.15																																							
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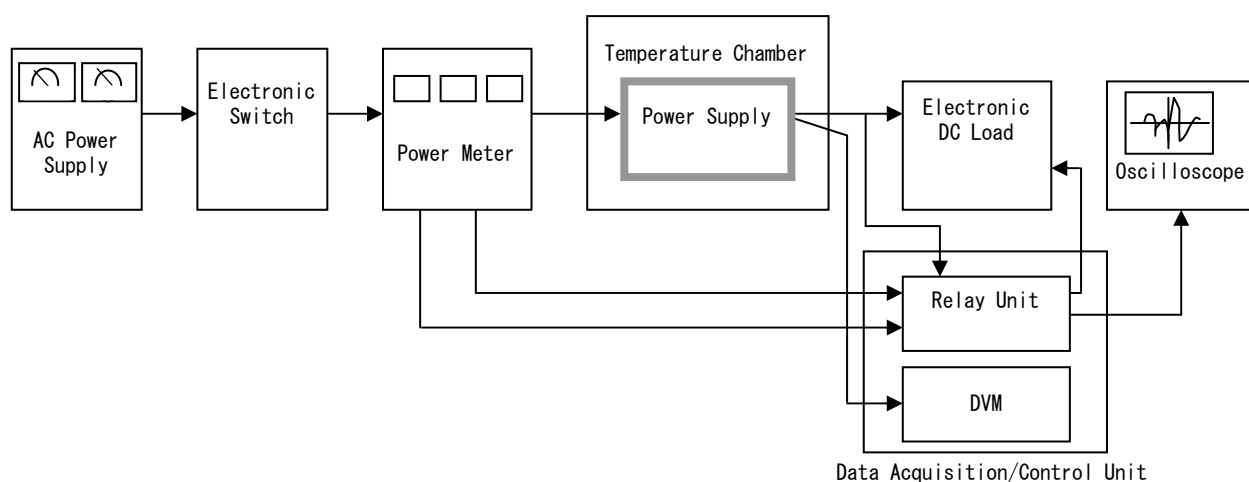


Figure A

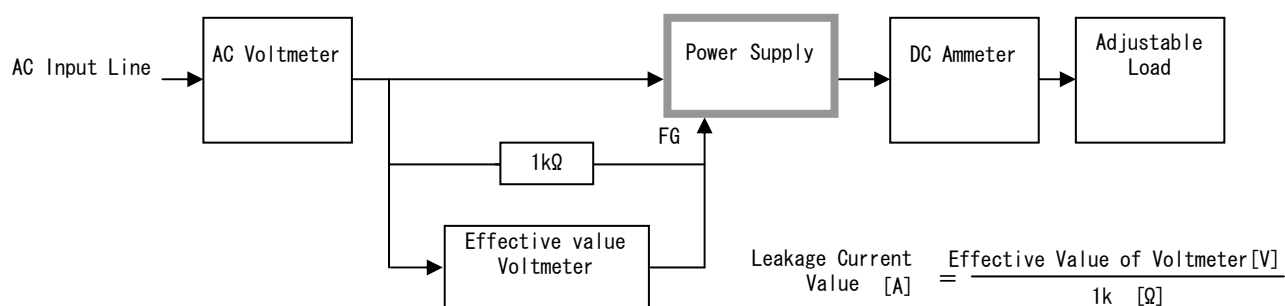


Figure B (DEN-AN)

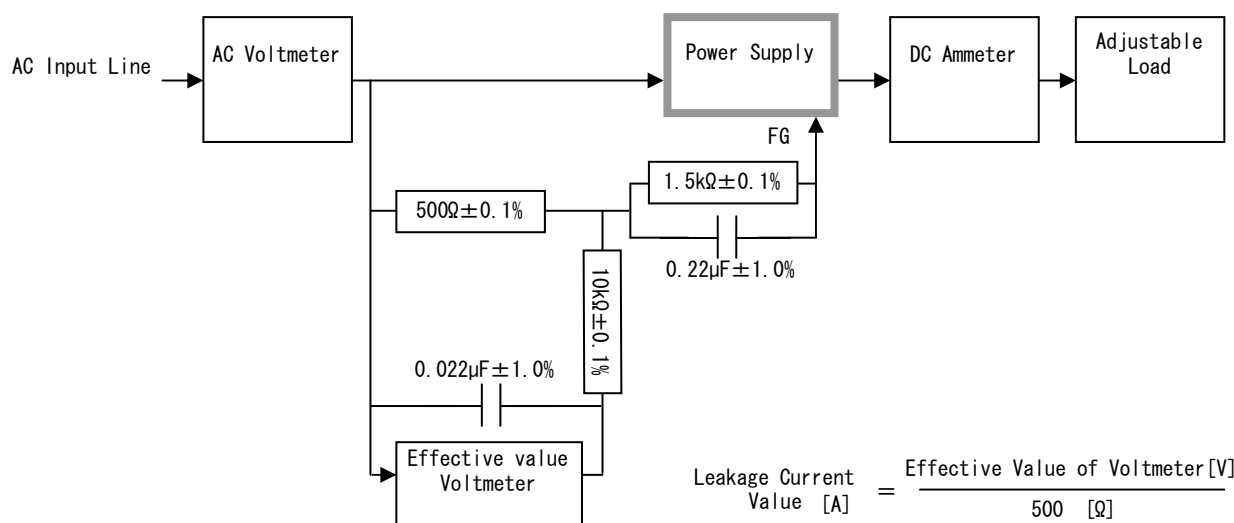


Figure B (IEC60950-1)

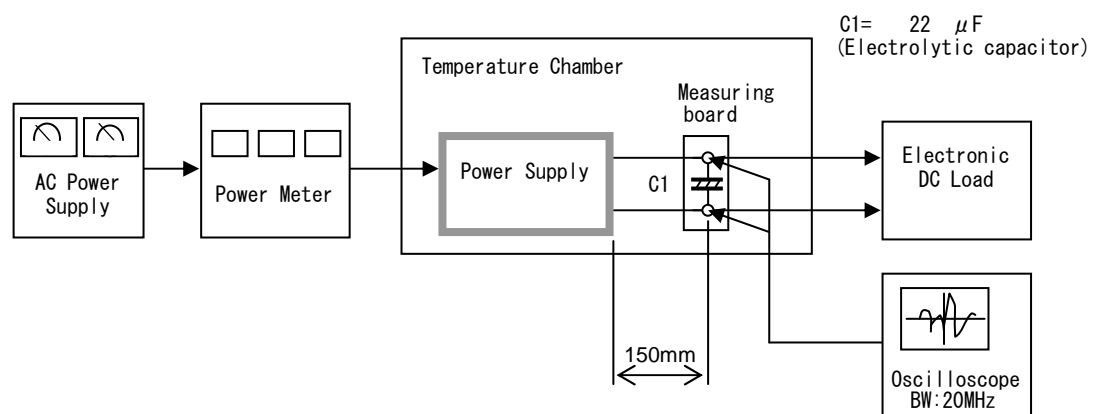


Figure C