

TEST DATA OF PMA15F-3R3

Regulated DC Power Supply
June 4, 2010

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Katsumi Ishikawa Design Manager

Prepared by : Tsutomu Okano
Tsutomu Okano Design Engineer

COSEL CO.,LTD.



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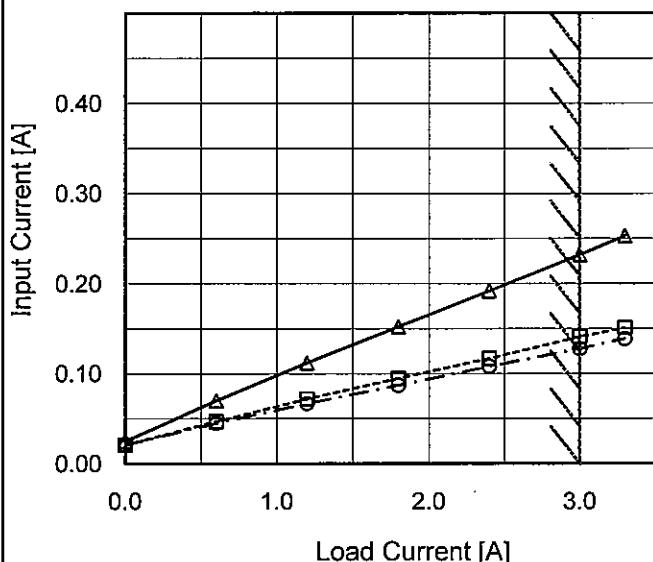
Model PMA15F-3R3

Item Input Current (by Load Current)

Object

1. Graph

—△— Input Volt. 100V
 - -□--- Input Volt. 200V
 - -○--- Input Volt. 230V



Note: Slanted line shows the range of the rated load current.

 Temperature 25°C
 Testing Circuitry Figure A

2. Values

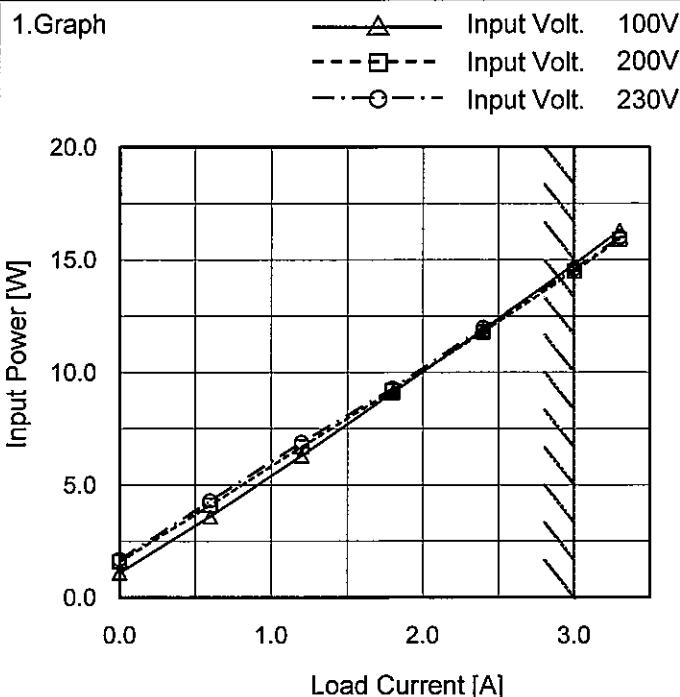
Load Current [A]	Input Current [A]		
	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]
0.0	0.025	0.021	0.021
0.6	0.070	0.047	0.045
1.2	0.112	0.072	0.067
1.8	0.152	0.095	0.087
2.4	0.192	0.117	0.108
3.0	0.232	0.141	0.128
3.3	0.253	0.151	0.139
--	-	-	-
--	-	-	-
--	-	-	-
--	-	-	-

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Model PMA15F-3R3

Item Input Power (by Load Current)

Object _____



Note: Slanted line shows the range of the rated load current.

Temperature 25°C
Testing Circuitry Figure A

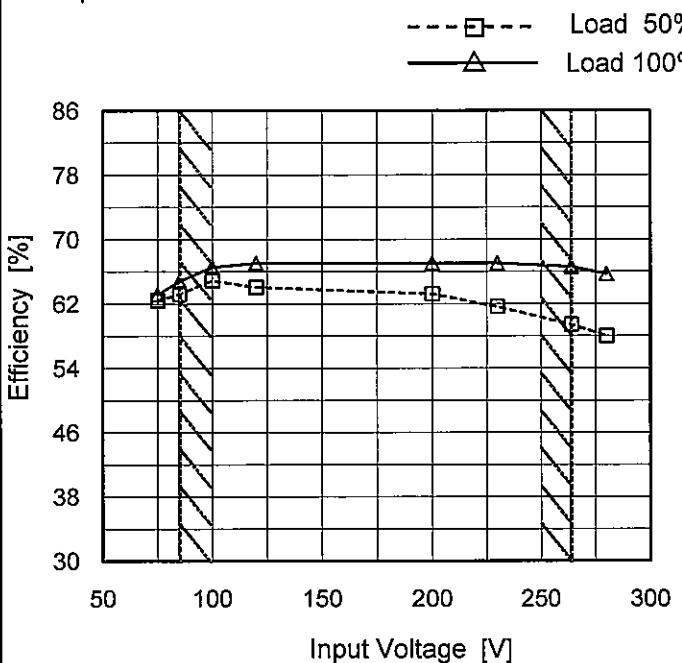
2. Values

Load Current [A]	Input Power [W]		
	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]
0.0	1.10	1.60	1.70
0.6	3.60	4.10	4.30
1.2	6.30	6.70	6.90
1.8	9.10	9.20	9.30
2.4	11.90	11.80	12.00
3.0	14.80	14.50	14.60
3.3	16.30	15.90	16.00
--	-	-	-
--	-	-	-
--	-	-	-
--	-	-	-

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Model	PMA15F-3R3
Item	Efficiency (by Input Voltage)
Object	—

1. Graph



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

Temperature 25°C
Testing Circuitry Figure A

2. Values

Input Voltage [V]	Efficiency [%]	
	Load 50%	Load 100%
75	62.4	63.2
85	63.2	64.8
100	64.9	66.6
120	64.1	67.0
200	63.2	67.1
230	61.7	67.1
264	59.4	66.6
280	58.0	65.7
--	-	-



Model	PMA15F-3R3	Temperature	25°C																																																			
Item	Efficiency (by Load Current)	Testing Circuitry	Figure A																																																			
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1.Graph	<p>—△— Input Volt. 100V - - -□-- Input Volt. 200V - - -○-- Input Volt. 230V</p> <table border="1"> <caption>Data points estimated from Graph</caption> <thead> <tr> <th>Load Current [A]</th> <th>Efficiency [100V] (%)</th> <th>Efficiency [200V] (%)</th> <th>Efficiency [230V] (%)</th> </tr> </thead> <tbody> <tr><td>0.6</td><td>54.9</td><td>48.2</td><td>45.9</td></tr> <tr><td>1.2</td><td>62.7</td><td>58.9</td><td>57.2</td></tr> <tr><td>1.8</td><td>65.0</td><td>64.3</td><td>63.6</td></tr> <tr><td>2.4</td><td>66.2</td><td>66.8</td><td>65.7</td></tr> <tr><td>3.0</td><td>66.1</td><td>67.5</td><td>67.1</td></tr> </tbody> </table>			Load Current [A]	Efficiency [100V] (%)	Efficiency [200V] (%)	Efficiency [230V] (%)	0.6	54.9	48.2	45.9	1.2	62.7	58.9	57.2	1.8	65.0	64.3	63.6	2.4	66.2	66.8	65.7	3.0	66.1	67.5	67.1																											
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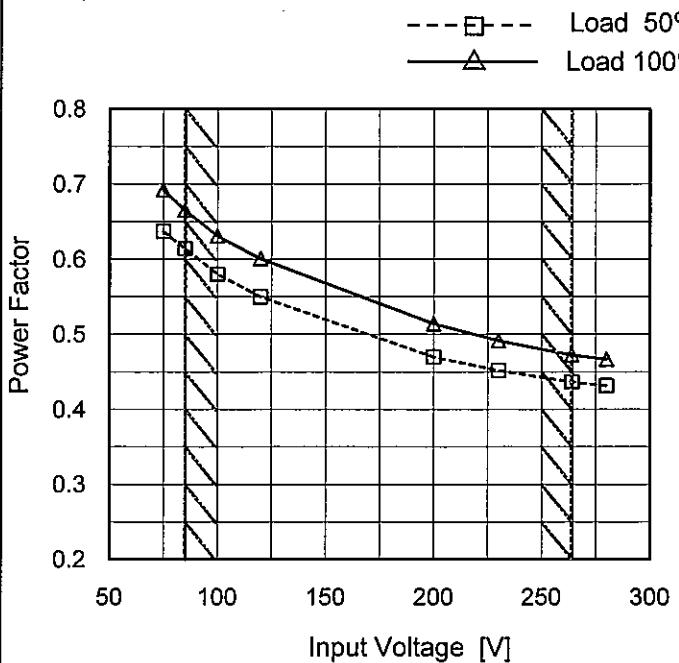
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Model PMA15F-3R3

Item Power Factor (by Input Voltage)

Object _____

1. Graph



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

 Temperature 25°C
 Testing Circuitry Figure A

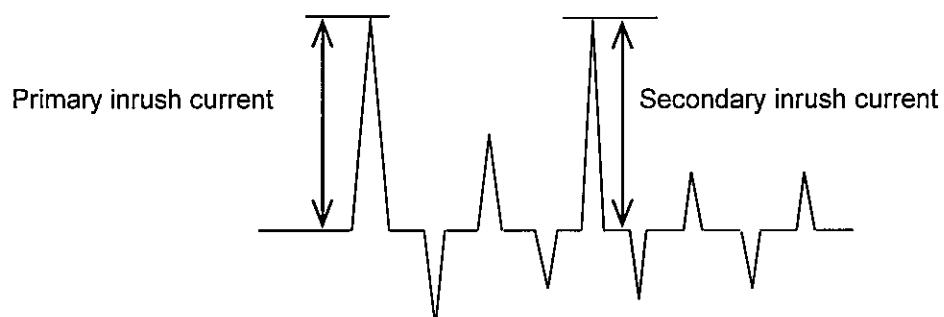
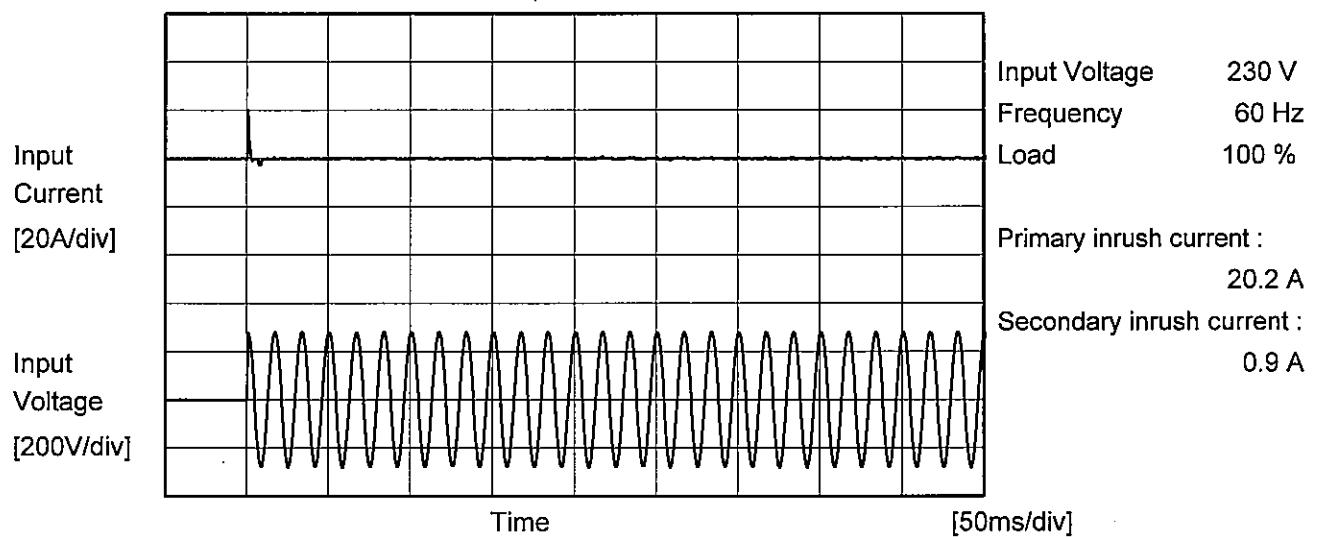
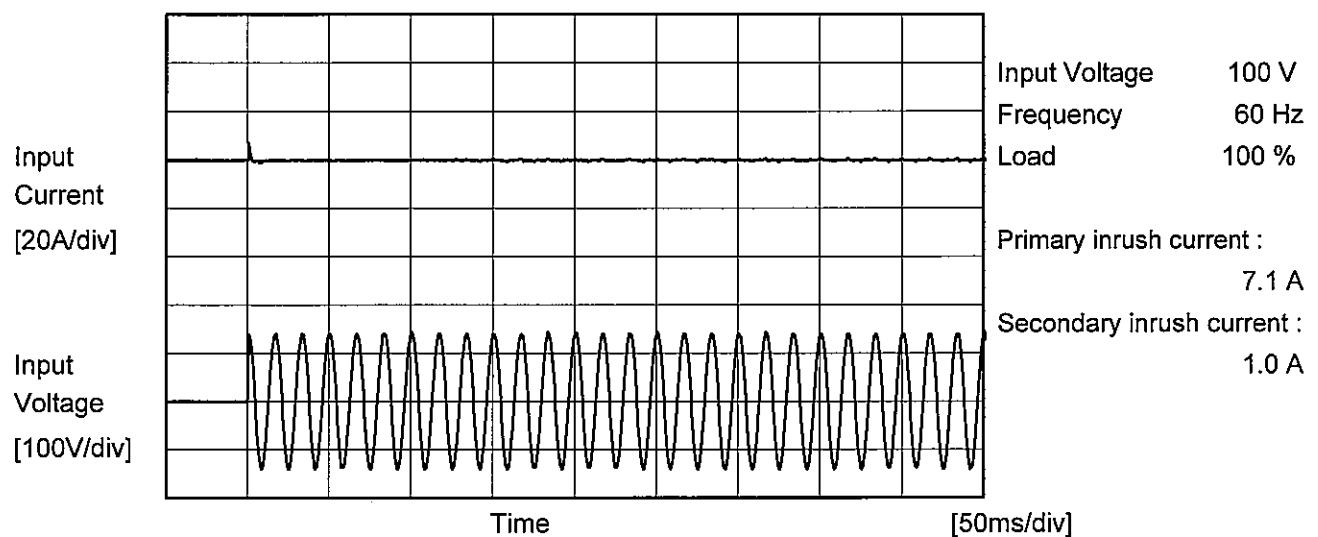
2. Values

Input Voltage [V]	Power Factor	
	Load 50%	Load 100%
75	0.637	0.692
85	0.614	0.665
100	0.580	0.631
120	0.550	0.601
200	0.470	0.514
230	0.452	0.492
264	0.437	0.473
280	0.431	0.467
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Model	PMA15F-3R3																																																					
Item	Power Factor (by Load Current)	Temperature 25°C	Testing Circuitry Figure A																																																			
Object	_____	_____	_____																																																			
1. Graph	<p>Legend:</p> <ul style="list-style-type: none"> Input Volt. 100V Input Volt. 200V Input Volt. 230V 																																																					
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Model	PMA15F-3R3	Temperature	25°C
Item	Inrush Current	Testing Circuitry	Figure A
Object	_____		





Model	PMA15F-3R3	Temperature	25°C
Item	Leakage Current	Testing Circuitry	Figure B
Object	_____		

1. Results

Standards		Input Volt.			Note
		100 [V]	200 [V]	240 [V]	
IEC60601	Both phases	0.02	0.04	0.05	Operation
	One of phases	0.03	0.07	0.08	Stand by

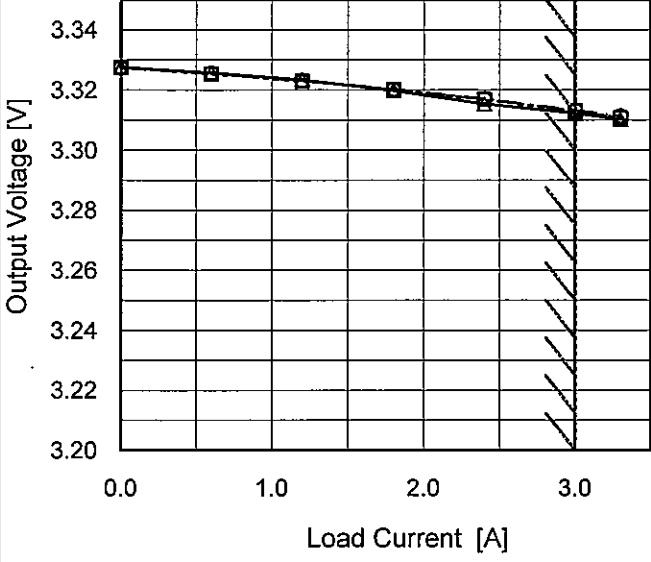
The value for "One of phases" is the reference value only.

2. Condition

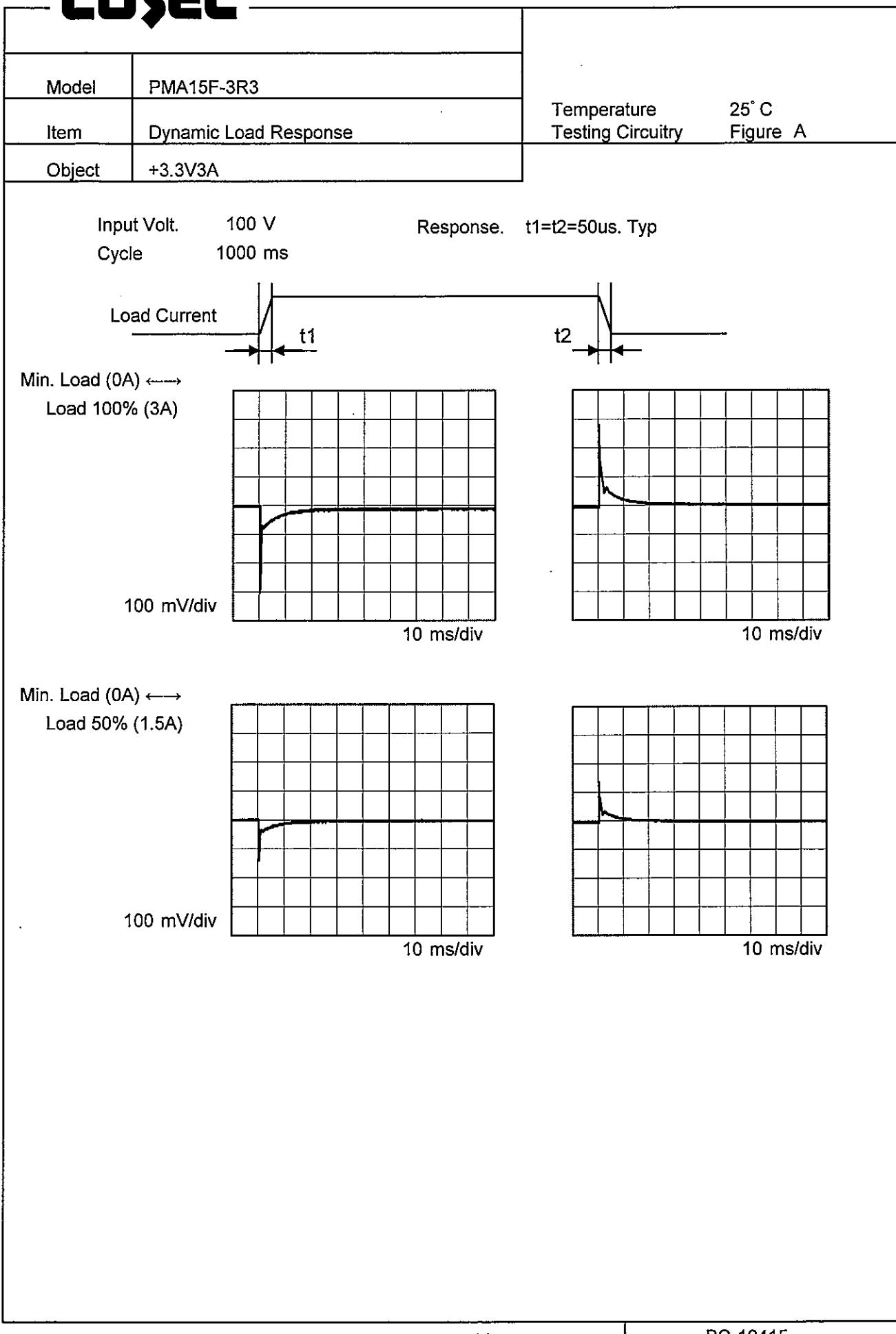
Leakage current value is concluded after measuring both phases of AC input and by choosing the larger one.

Model	PMA15F-3R3	Temperature	25°C																													
Item	Line Regulation	Testing Circuitry	Figure A																													
Object	+3.3V3A																															
1.Graph			2.Values																													
<p>The graph plots Output Voltage [V] on the Y-axis (3.24 to 3.38) against Input Voltage [V] on the X-axis (50 to 300). Two sets of data points are shown: Load 50% (represented by squares) and Load 100% (represented by triangles). A horizontal dashed line is drawn at 3.32V. Two slanted lines indicate the rated input voltage range from approximately 85V to 264V.</p> <table border="1"> <thead> <tr> <th>Input Voltage [V]</th> <th>Output Voltage [V] (Load 50%)</th> <th>Output Voltage [V] (Load 100%)</th> </tr> </thead> <tbody> <tr><td>75</td><td>3.321</td><td>3.313</td></tr> <tr><td>85</td><td>3.321</td><td>3.312</td></tr> <tr><td>100</td><td>3.321</td><td>3.312</td></tr> <tr><td>120</td><td>3.322</td><td>3.312</td></tr> <tr><td>200</td><td>3.322</td><td>3.312</td></tr> <tr><td>230</td><td>3.322</td><td>3.312</td></tr> <tr><td>264</td><td>3.322</td><td>3.312</td></tr> <tr><td>280</td><td>3.322</td><td>3.312</td></tr> <tr><td>--</td><td>-</td><td>-</td></tr> </tbody> </table>			Input Voltage [V]	Output Voltage [V] (Load 50%)	Output Voltage [V] (Load 100%)	75	3.321	3.313	85	3.321	3.312	100	3.321	3.312	120	3.322	3.312	200	3.322	3.312	230	3.322	3.312	264	3.322	3.312	280	3.322	3.312	--	-	-
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Note: Slanted line shows the range of the rated load current.

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Item	Ripple Voltage (by Load Current)	Temperature 25°C Testing Circuitry Figure A																																					
Object	+3.3V3A																																						
1. Graph																																							
<p>Graph showing Ripple Voltage [mV] vs Load Current [A]. The Y-axis ranges from 0 to 100 mV, and the X-axis ranges from 0 to 3 A. Two sets of data points are plotted: Input Volt. 100V (solid triangles) and Input Volt. 200V (open circles). A slanted line indicates the rated load current range.</p> <table border="1"> <thead> <tr> <th>Load Current [A]</th> <th>Ripple Voltage [mV] (Input Volt. 100V)</th> <th>Ripple Voltage [mV] (Input Volt. 200V)</th> </tr> </thead> <tbody> <tr><td>0.0</td><td>10</td><td>10</td></tr> <tr><td>0.6</td><td>15</td><td>15</td></tr> <tr><td>1.2</td><td>15</td><td>15</td></tr> <tr><td>1.8</td><td>20</td><td>15</td></tr> <tr><td>2.4</td><td>20</td><td>15</td></tr> <tr><td>3.0</td><td>20</td><td>15</td></tr> <tr><td>3.3</td><td>20</td><td>15</td></tr> </tbody> </table>		Load Current [A]	Ripple Voltage [mV] (Input Volt. 100V)	Ripple Voltage [mV] (Input Volt. 200V)	0.0	10	10	0.6	15	15	1.2	15	15	1.8	20	15	2.4	20	15	3.0	20	15	3.3	20	15														
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COSEL

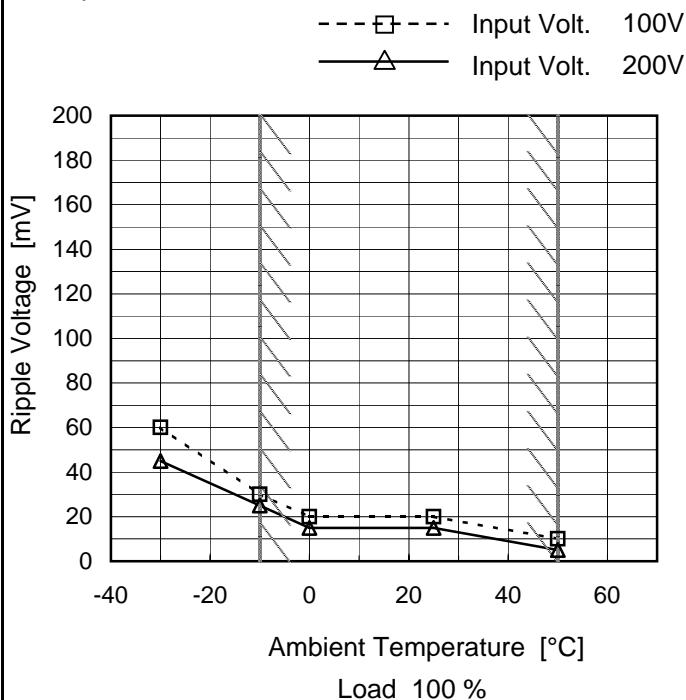
Model	PMA15F-3R3																																							
Item	Ripple-Noise	Temperature 25°C Testing Circuitry Figure A																																						
Object	+3.3V3A																																							
1. Graph																																								
<p>Graph showing Ripple-Noise [mV] vs Load Current [A]. The Y-axis ranges from 0 to 100 mV, and the X-axis ranges from 0 to 3 A. Two curves are plotted: one for Input Volt. 100V (solid line with triangles) and one for Input Volt. 200V (dashed line with circles). Both curves show an increase in ripple noise as load current increases. A slanted line indicates the rated load current range.</p> <table border="1"> <thead> <tr> <th>Load Current [A]</th> <th>Ripple-Noise [mV] (Input Volt. 100V)</th> <th>Ripple-Noise [mV] (Input Volt. 200V)</th> </tr> </thead> <tbody> <tr><td>0.0</td><td>25</td><td>25</td></tr> <tr><td>0.6</td><td>30</td><td>25</td></tr> <tr><td>1.2</td><td>35</td><td>25</td></tr> <tr><td>1.8</td><td>40</td><td>35</td></tr> <tr><td>2.4</td><td>45</td><td>35</td></tr> <tr><td>3.0</td><td>50</td><td>40</td></tr> <tr><td>3.3</td><td>55</td><td>45</td></tr> </tbody> </table>			Load Current [A]	Ripple-Noise [mV] (Input Volt. 100V)	Ripple-Noise [mV] (Input Volt. 200V)	0.0	25	25	0.6	30	25	1.2	35	25	1.8	40	35	2.4	45	35	3.0	50	40	3.3	55	45														
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<p>Measured by 20 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>Fig. Complex Ripple Wave Form</p>																																								

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Model	PMA15F-3R3
Item	Ripple Voltage (by Ambient Temp.)
Object	+3.3V3A

Testing Circuitry Figure A

1. Graph

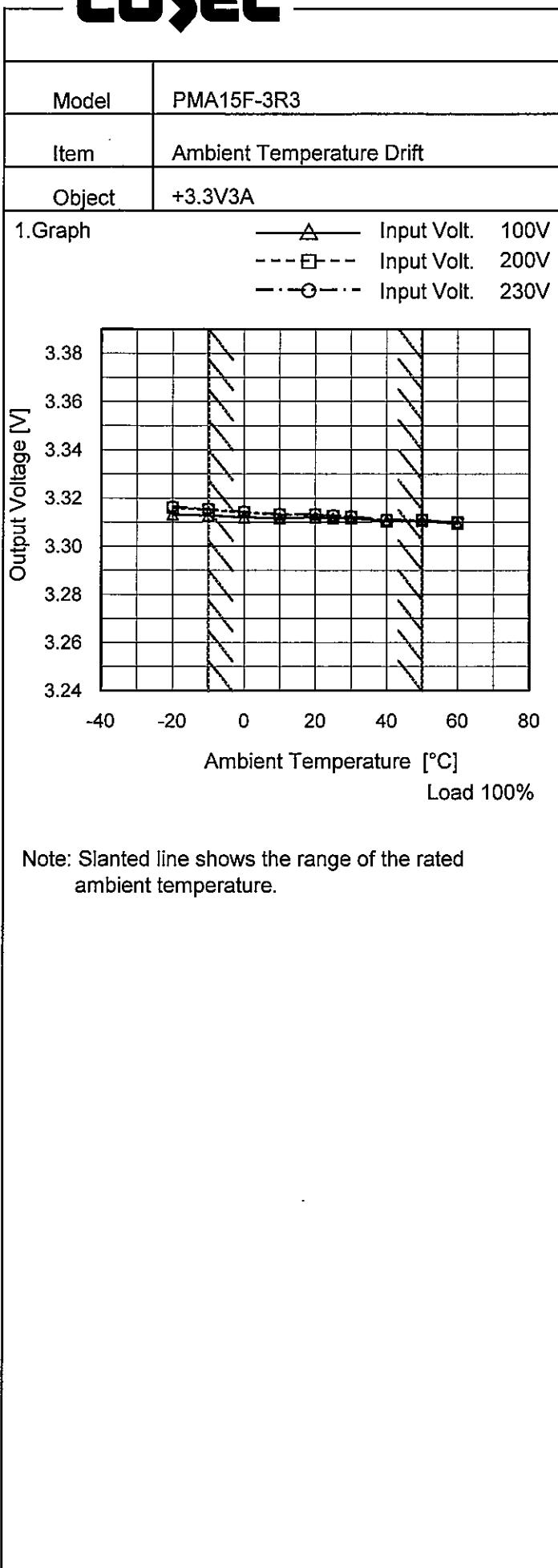


2. Values

Ambient Temperature [°C]	Ripple Voltage [mV]	
	Input Volt. 100 [V]	Input Volt. 200 [V]
-30	60	45
-10	30	25
0	20	15
25	20	15
50	10	5
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-

Measured by 20 MHz Oscilloscope.

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

COSEL


Testing Circuitry Figure A

2. Values

Ambient Temperature [°C]	Output Voltage [V]		
	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]
-20	3.313	3.316	3.317
-10	3.313	3.315	3.316
0	3.312	3.314	3.314
10	3.312	3.313	3.313
20	3.312	3.313	3.313
25	3.312	3.313	3.313
30	3.312	3.312	3.313
40	3.311	3.311	3.311
50	3.311	3.311	3.311
60	3.309	3.310	3.310
--	-	-	-



Model	PMA15F-3R3	Testing Circuitry Figure A
Item	Output Voltage Accuracy	
Object	+3.3V3A	

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°C

Input Voltage : 85 - 264V

Load Current : 0 - 3A

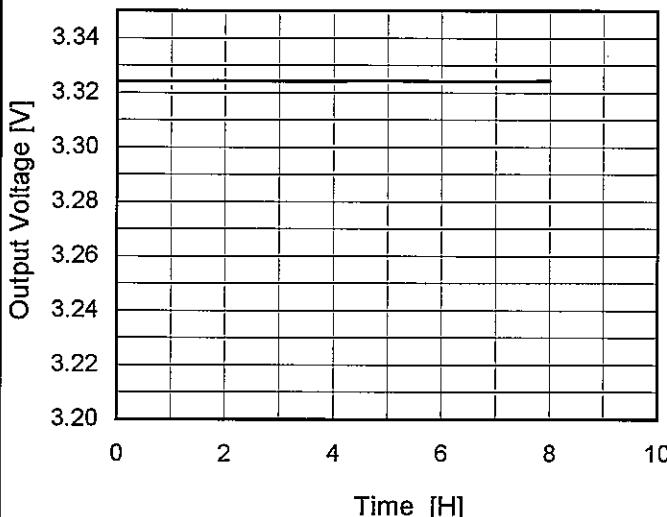
* Output Voltage Accuracy = $\pm(\text{Maximum of Output Voltage} - \text{Minimum of Output Voltage}) / 2$

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

2. Values

Item	Temperature [°C]	Input Voltage[V]	Output		Output Voltage Accuracy	
			Current[A]	Voltage[V]	Value [mV]	Ration [%]
Maximum Voltage	-10	264	0	3.329	± 9	± 0.3
Minimum Voltage	50	264	3	3.311		

COSEL

Model	PMA15F-3R3	Temperature Testing Circuitry 25°C Figure A																						
Item	Time Lapse Drift																							
Object	+3.3V3A																							
1. Graph		2. Values																						
 <p>Output Voltage [V]</p> <p>Time [H]</p> <p>Input Volt. 100V Load 100%</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>3.325</td></tr> <tr><td>0.5</td><td>3.324</td></tr> <tr><td>1.0</td><td>3.324</td></tr> <tr><td>2.0</td><td>3.324</td></tr> <tr><td>3.0</td><td>3.324</td></tr> <tr><td>4.0</td><td>3.324</td></tr> <tr><td>5.0</td><td>3.324</td></tr> <tr><td>6.0</td><td>3.324</td></tr> <tr><td>7.0</td><td>3.324</td></tr> <tr><td>8.0</td><td>3.324</td></tr> </tbody> </table>	Time since start [H]	Output Voltage [V]	0.0	3.325	0.5	3.324	1.0	3.324	2.0	3.324	3.0	3.324	4.0	3.324	5.0	3.324	6.0	3.324	7.0	3.324	8.0	3.324
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6.0	3.324																							
7.0	3.324																							
8.0	3.324																							
* The characteristic of AC200V is equal.																								

COSEL

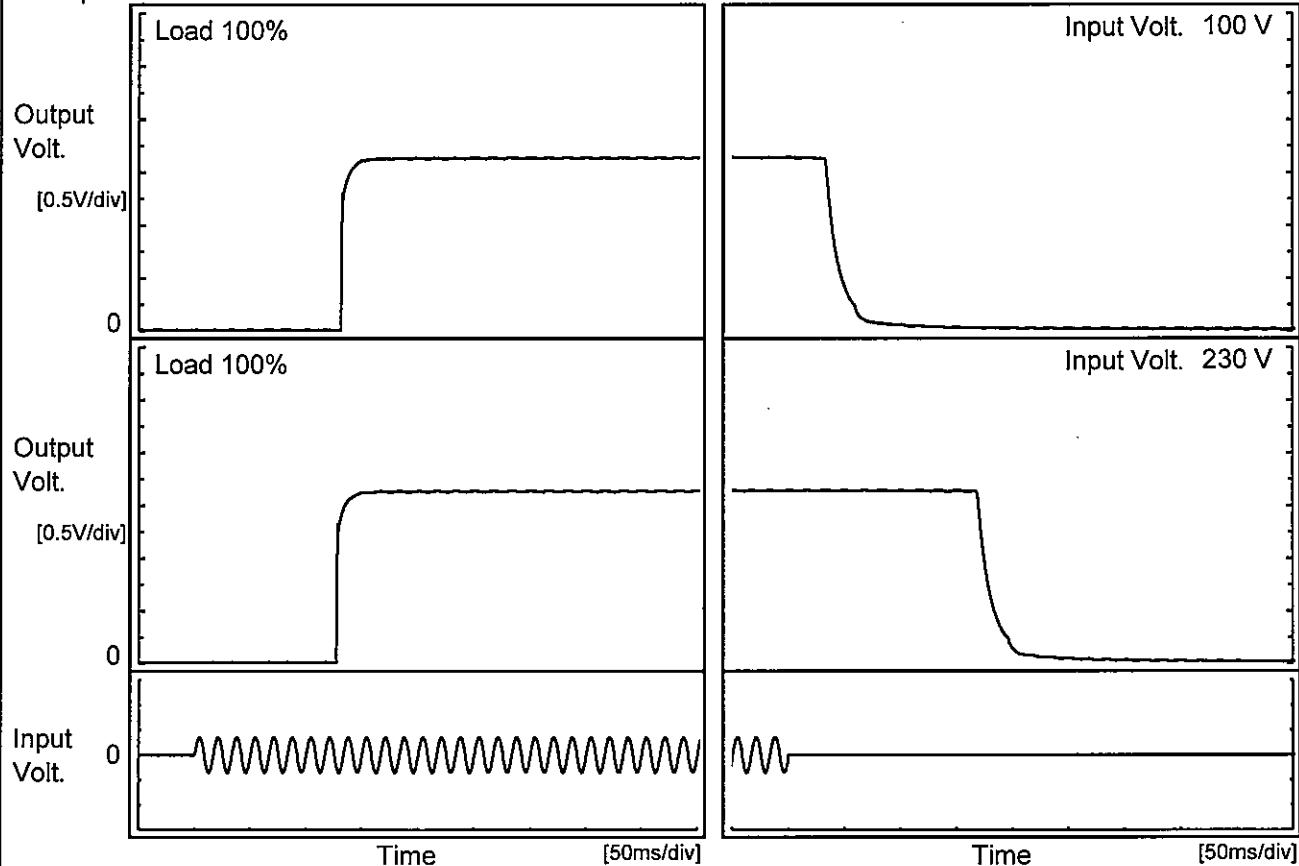
Model PMA15F-3R3

Item Rise and Fall Time

Object +3.3V3A

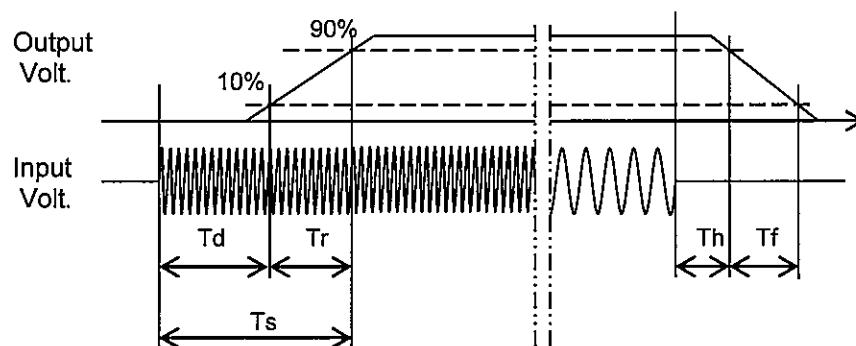
Temperature 25°C
Testing Circuitry Figure A

1. Graph



2. Values

Input Volt.	Time	Td	Tr	Ts	Th	Tf	[ms]
100 V		132.0	8.0	140.0	34.0	27.0	
230 V		128.0	7.0	135.0	169.5	28.5	



COSEL

Model	PMA15F-3R3
Item	Hold-Up Time
Object	+3.3V3A

1. Graph

2. Values

Input Voltage [V]	Hold-Up Time [ms]	
	Load 50%	Load 100%
75	33	14
85	46	21
100	70	33
120	107	52
200	328	168
230	440	228
264	585	307
280	660	348
--	-	-

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.

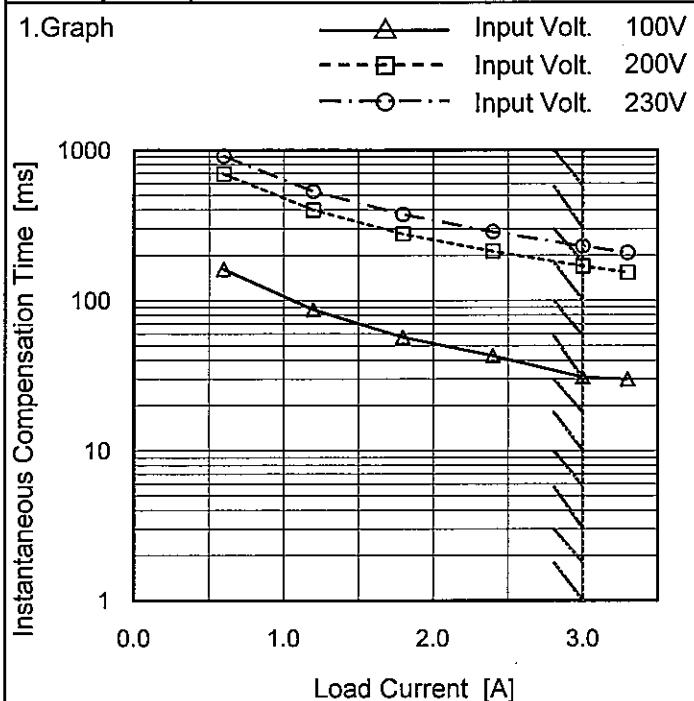
Temperature 25°C
Testing Circuitry Figure A

2.Values

Input Voltage [V]	Hold-Up Time [ms]	
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75	33	14
85	46	21
100	70	33
120	107	52
200	328	168
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280	660	348
--	-	-

COSEL

Model	PMA15F-3R3
Item	Instantaneous Interruption Compensation
Object	+3.3V3A



Note: Slanted line shows the range of the rated load current.

Temperature 25°C
Testing Circuitry Figure A

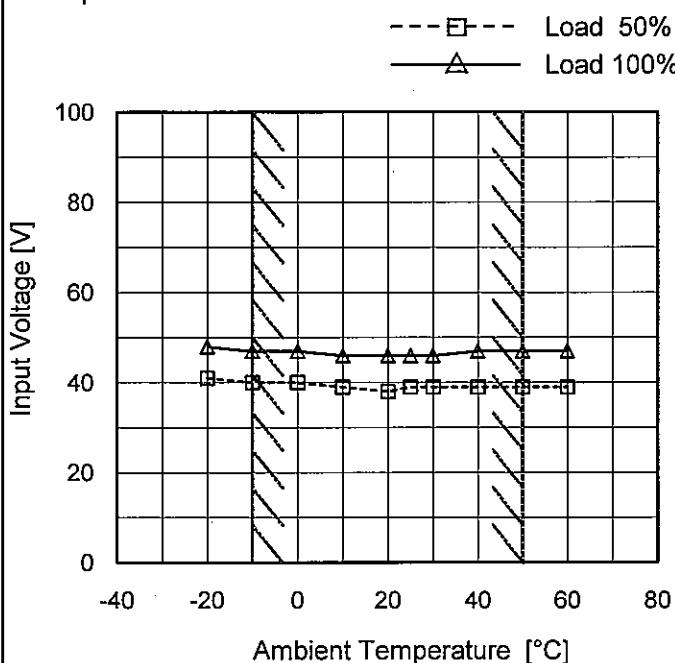
2. Values

Load Current [A]	Time [ms]		
	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]
0.0	-	-	-
0.6	162	694	913
1.2	87	400	532
1.8	57	278	374
2.4	43	213	287
3.0	31	170	230
3.3	30	154	209
--	-	-	-
--	-	-	-
--	-	-	-
--	-	-	-



Model	PMA15F-3R3
Item	Minimum Input Voltage for Regulated Output Voltage
Object	+3.3V3A

1. Graph



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

Testing Circuitry Figure A

2. Values

Ambient Temperature [°C]	Input Voltage [V]	
	Load 50%	Load 100%
-20	41	48
-10	40	47
0	40	47
10	39	46
20	38	46
25	39	46
30	39	46
40	39	47
50	39	47
60	39	47
--	-	-

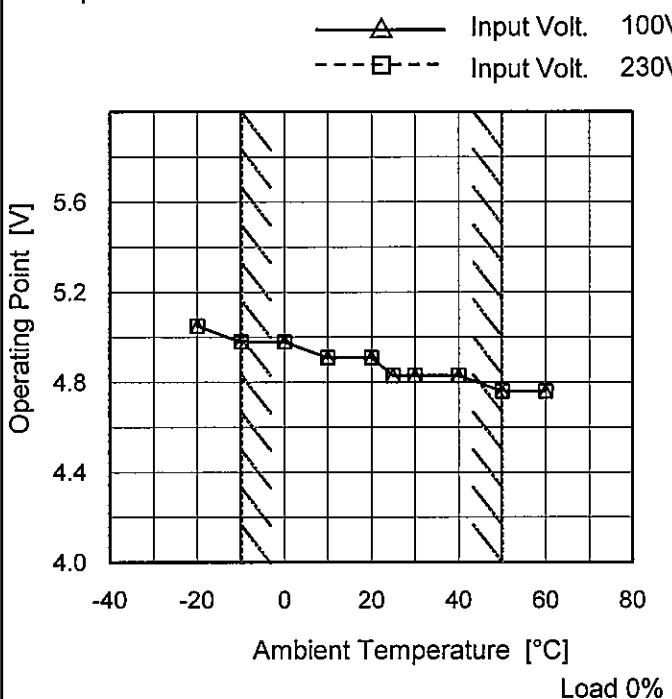


Model	PMA15F-3R3	Temperature 25°C Testing Circuitry Figure A																																										
Item	Overcurrent Protection																																											
Object	+3.3V3A																																											
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Note: Slanted line shows the range of the rated load current.

Model	PMA15F-3R3
Item	Oversupply Protection
Object	+3.3V3A

1. Graph



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

Testing Circuitry Figure A

2. Values

Ambient Temperature [°C]	Operating Point [V]	
	Input Volt. 100[V]	Input Volt. 230[V]
-20	5.05	5.05
-10	4.98	4.98
0	4.98	4.98
10	4.91	4.91
20	4.91	4.91
25	4.83	4.83
30	4.83	4.83
40	4.83	4.83
50	4.76	4.76
60	4.76	4.76
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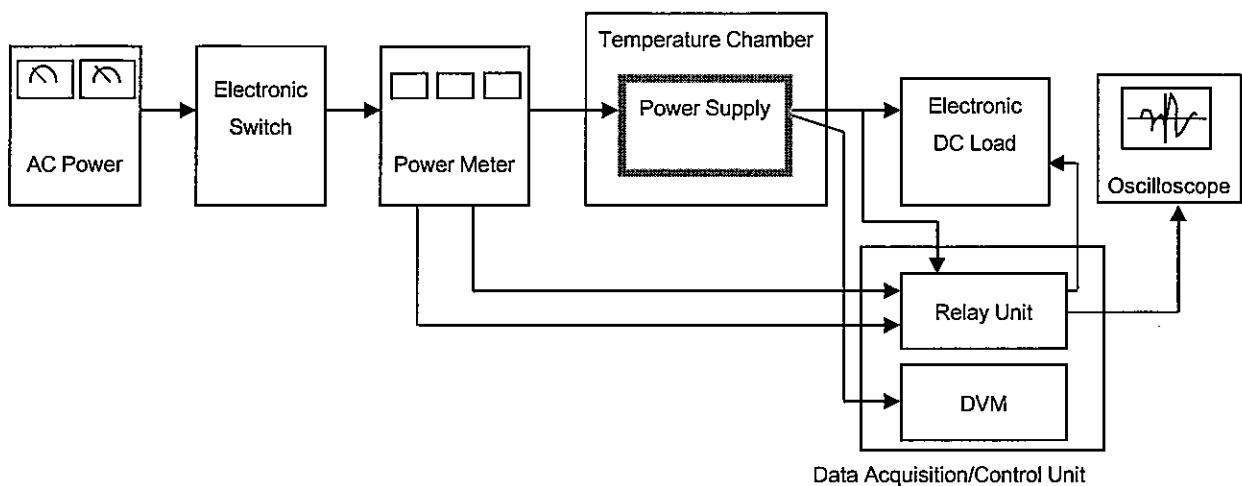


Figure A

