

TEST DATA OF TUXS200F50

Regulated DC Power Supply
March 30, 2016

Approved by : Junichi Hatagishi
Junichi Hatagishi Design Manager

Prepared by : Sho Furukawa
Sho Furukawa Design Engineer

COSEL CO.,LTD.

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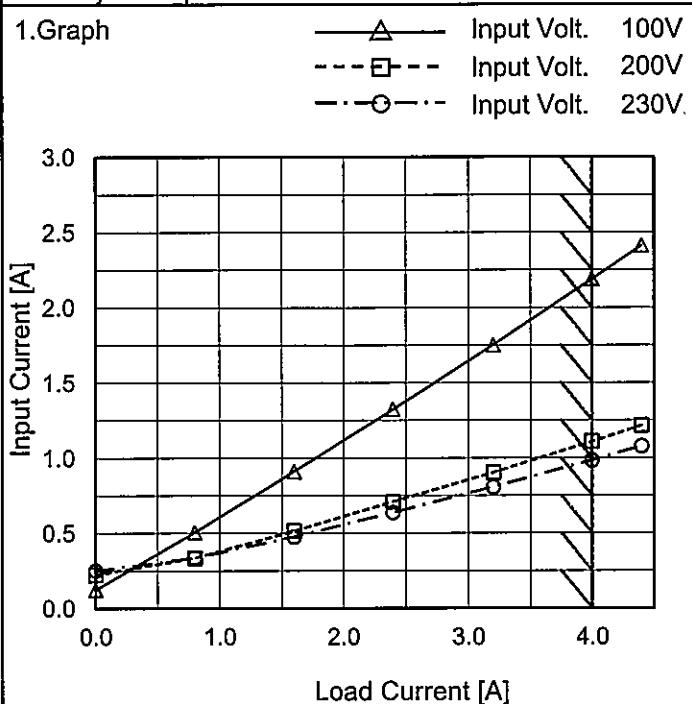
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Model	TUXS200F50
Item	Input Current (by Load Current)
Object	_____

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	0.124	0.223	0.252
0.8	0.507	0.336	0.337
1.6	0.911	0.515	0.477
2.4	1.324	0.709	0.639
3.2	1.751	0.903	0.807
4.0	2.189	1.109	0.984
4.4	2.411	1.215	1.078
--	-	-	-
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--	-	-	-
--	-	-	-

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

COSEL

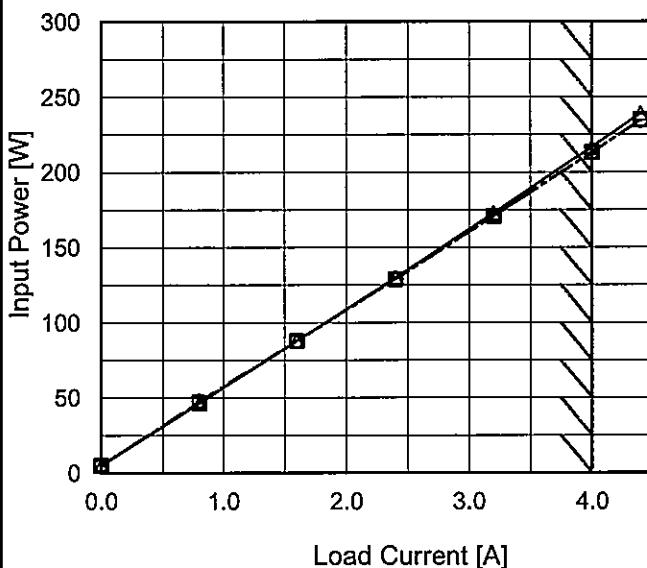
Model TUXS200F50

Item Input Power (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 Power [W]		
	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]
0.0	4.8	5.1	5.1
0.8	46.4	47.0	47.8
1.6	88.0	87.8	88.2
2.4	130.0	128.9	129.1
3.2	172.9	170.8	170.7
4.0	216.7	213.2	213.0
4.4	239.0	234.7	234.4
--	-	-	-
--	-	-	-
--	-	-	-
--	-	-	-

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Model	TUXS200F50	Temperature	25°C																														
Item	Efficiency (by Input Voltage)	Testing Circuitry	Figure A																														
Object	_____																																
1. Graph		2. Values																															
<p>The graph plots Efficiency [%] on the y-axis (50 to 100) against Input Voltage [V] on the 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 efficiency increasing slightly with input voltage. A slanted line indicates the rated input voltage range.</p> <table border="1"> <thead> <tr> <th>Input Voltage [V]</th> <th>Efficiency Load 50% [%]</th> <th>Efficiency Load 100% [%]</th> </tr> </thead> <tbody> <tr><td>80</td><td>91.0</td><td>91.0</td></tr> <tr><td>85</td><td>91.3</td><td>91.5</td></tr> <tr><td>100</td><td>91.7</td><td>92.3</td></tr> <tr><td>120</td><td>92.0</td><td>92.9</td></tr> <tr><td>200</td><td>92.1</td><td>93.8</td></tr> <tr><td>230</td><td>91.9</td><td>93.9</td></tr> <tr><td>264</td><td>91.9</td><td>93.9</td></tr> <tr><td>280</td><td>93.1</td><td>94.2</td></tr> <tr><td>--</td><td>-</td><td>-</td></tr> </tbody> </table>				Input Voltage [V]	Efficiency Load 50% [%]	Efficiency Load 100% [%]	80	91.0	91.0	85	91.3	91.5	100	91.7	92.3	120	92.0	92.9	200	92.1	93.8	230	91.9	93.9	264	91.9	93.9	280	93.1	94.2	--	-	-
Input Voltage [V]	Efficiency Load 50% [%]	Efficiency Load 100% [%]																															
80	91.0	91.0																															
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100	91.7	92.3																															
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230	91.9	93.9																															
264	91.9	93.9																															
280	93.1	94.2																															
--	-	-																															
<p>Note: Slanted line shows the range of the rated input voltage.</p>																																	

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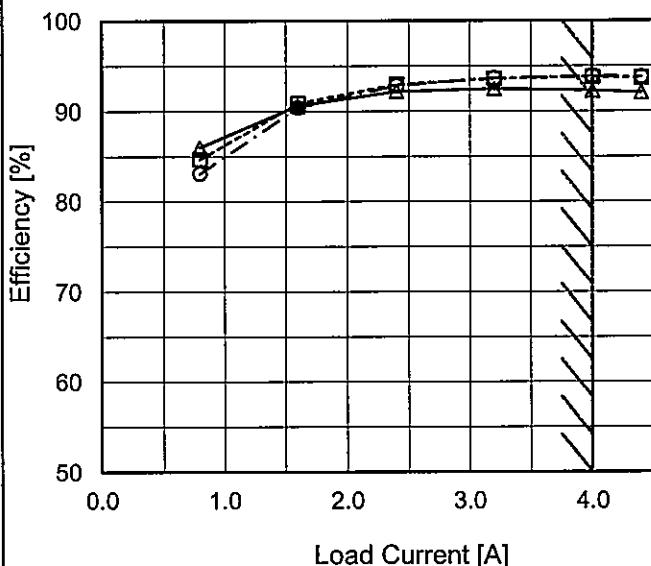
Model TUXS200F50

Item Efficiency (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

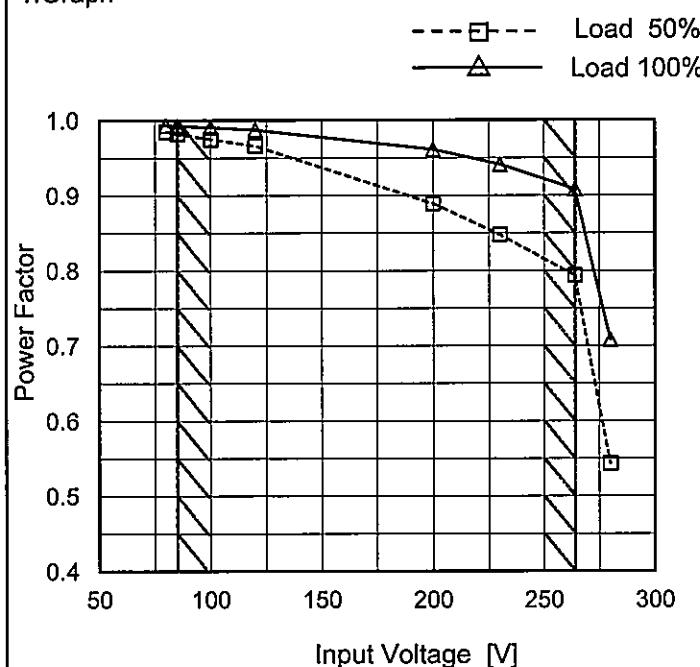
Load Current [A]	Efficiency [%]		
	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]
0.0	-	-	-
0.8	86.0	84.7	83.1
1.6	90.6	90.9	90.4
2.4	92.2	93.0	92.8
3.2	92.5	93.6	93.7
4.0	92.3	93.8	93.9
4.4	92.1	93.7	93.8
--	-	-	-
--	-	-	-
--	-	-	-
--	-	-	-

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Model	TUXS200F50
Item	Power Factor (by Input Voltage)
Object	_____

Temperature 25°C
Testing Circuitry Figure A

1.Graph



2.Values

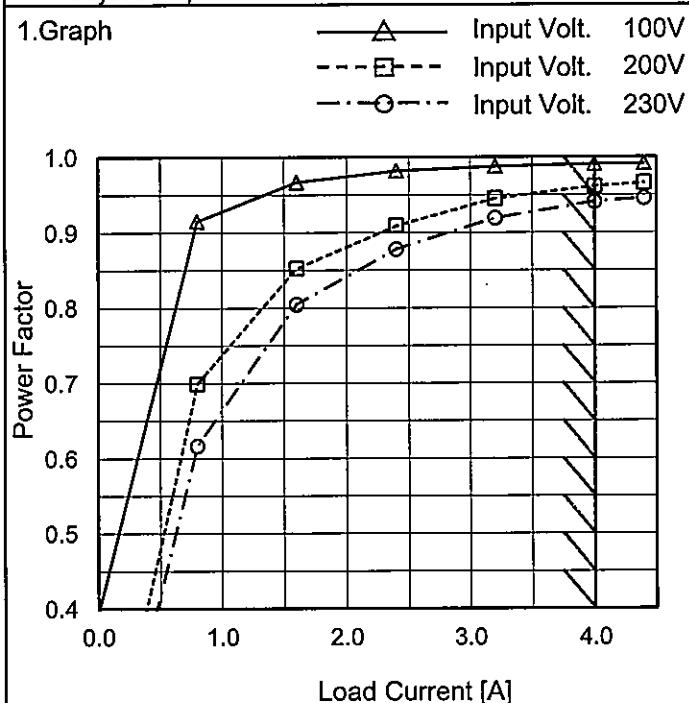
Input Voltage [V]	Power Factor	
	Load 50%	Load 100%
80	0.985	0.993
85	0.982	0.993
100	0.975	0.991
120	0.966	0.988
200	0.889	0.961
230	0.848	0.941
264	0.794	0.908
280	0.543	0.708
--	-	-

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

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Model	TUXS200F50
Item	Power Factor (by Load Current)
Object	—

Temperature 25°C
Testing Circuitry Figure A



2.Values

Load Current [A]	Power Factor		
	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]
0.0	0.392	0.114	0.088
0.8	0.915	0.699	0.617
1.6	0.967	0.852	0.805
2.4	0.982	0.909	0.878
3.2	0.988	0.945	0.919
4.0	0.991	0.961	0.941
4.4	0.992	0.966	0.946
--	-	-	-
--	-	-	-
--	-	-	-
--	-	-	-

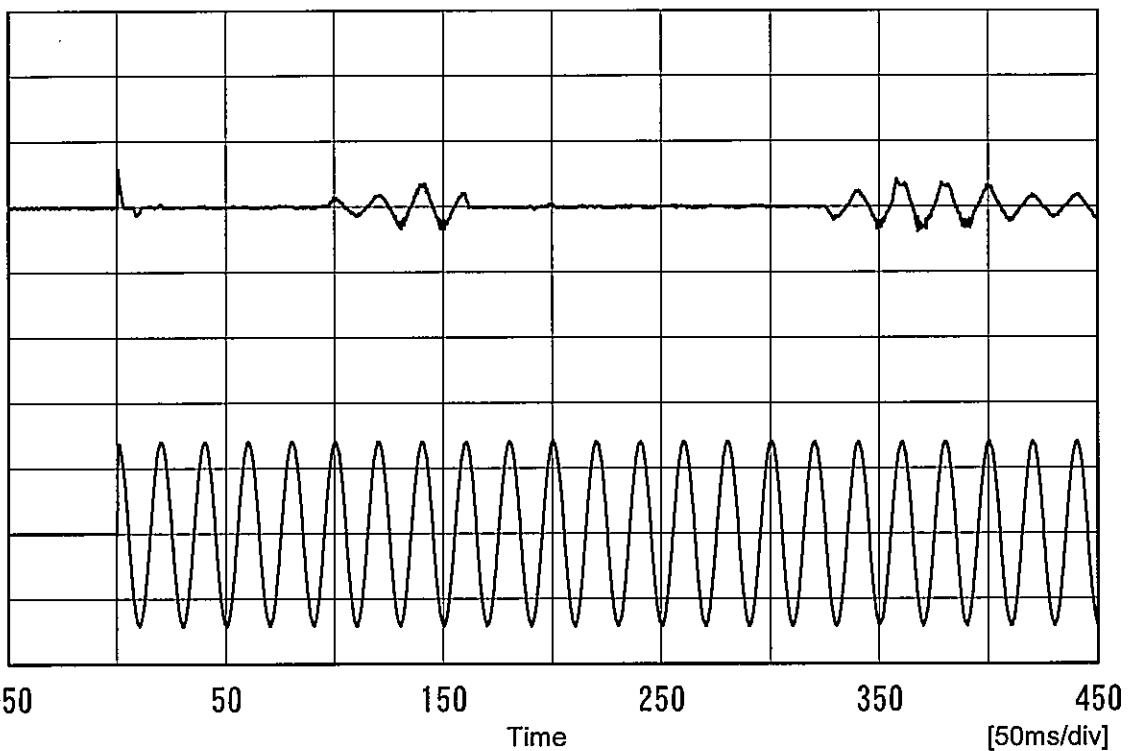
Note: Slanted line shows the range of the rated load current.

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Model TUXS200F50

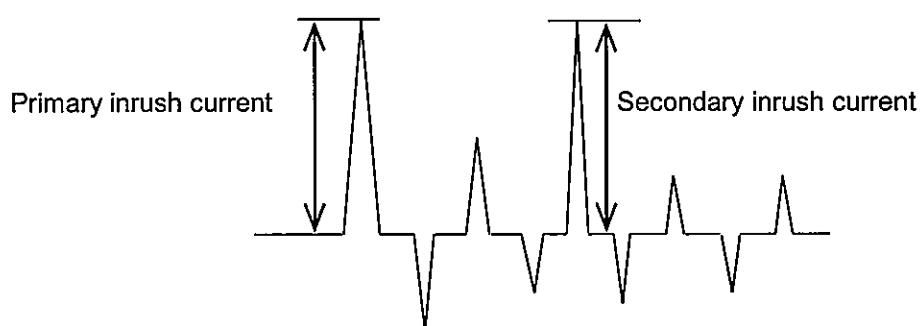
Item Inrush Current

Object _____

Temperature 25°C
Testing Circuitry Figure AInput
Current
[20A/div]

Input Voltage	100 V
Frequency	50 Hz
Load	100 %

Primary inrush current	11.6 A
Secondary inrush current	8.4 A





Model	TUXS200F50	Temperature	25°C
Item	Leakage Current	Testing Circuitry	Figure B
Object	_____		

1. Results

Standards		Input Volt.			Note
		100 [V]	200 [V]	240 [V]	
DEN-AN	Both phases	0.17	0.34	0.41	Operation
	One of phases	0.27	0.54	0.65	Stand by
IEC60950-1	Both phases	0.14	0.29	0.36	Operation
	One of phases	0.28	0.56	0.68	Stand by

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

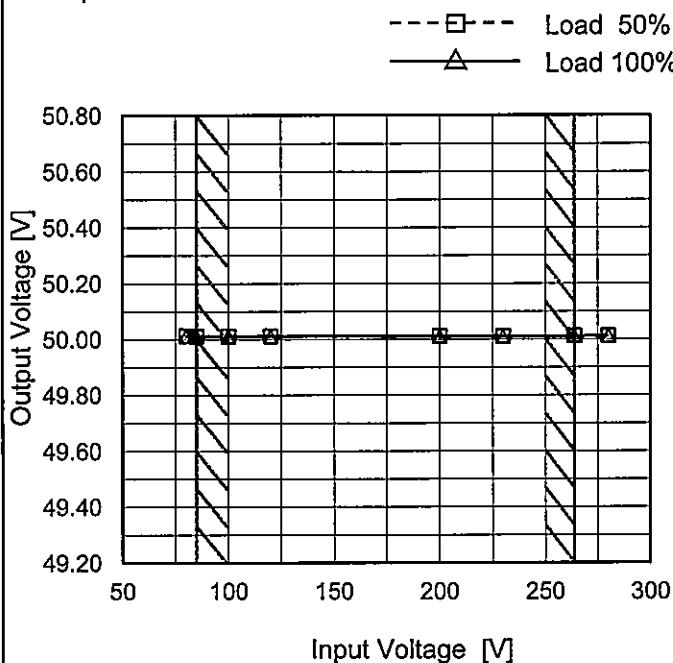
2. Condition

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



Model	TUXS200F50
Item	Line Regulation
Object	+50V4A

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]	Output Voltage [V]	
	Load 50%	Load 100%
80	50.013	50.013
85	50.013	50.012
100	50.012	50.012
120	50.012	50.012
200	50.012	50.011
230	50.011	50.010
264	50.012	50.012
280	50.012	50.012
--	-	-

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Model	TUXS200F50	Temperature Testing Circuitry	25°C Figure A																																																			
Item	Load Regulation																																																					
Object	+50V4A																																																					
1.Graph	<p>—△— Input Volt. 100V - - -□- - Input Volt. 200V - - -○- - Input Volt. 230V</p> <p>Output Voltage [V]</p> <p>Load Current [A]</p>	2.Values																																																				
			<table border="1"> <thead> <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> </thead> <tbody> <tr> <td>0.0</td> <td>50.016</td> <td>50.017</td> <td>50.017</td> </tr> <tr> <td>0.8</td> <td>50.013</td> <td>50.015</td> <td>50.014</td> </tr> <tr> <td>1.6</td> <td>50.012</td> <td>50.012</td> <td>50.011</td> </tr> <tr> <td>2.4</td> <td>50.010</td> <td>50.011</td> <td>50.010</td> </tr> <tr> <td>3.2</td> <td>50.010</td> <td>50.011</td> <td>50.011</td> </tr> <tr> <td>4.0</td> <td>50.012</td> <td>50.011</td> <td>50.010</td> </tr> <tr> <td>4.4</td> <td>50.013</td> <td>50.012</td> <td>50.011</td> </tr> <tr> <td>--</td> <td>-</td> <td>-</td> <td>-</td> </tr> </tbody> </table>	Load Current [A]	Output Voltage [V]			Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]	0.0	50.016	50.017	50.017	0.8	50.013	50.015	50.014	1.6	50.012	50.012	50.011	2.4	50.010	50.011	50.010	3.2	50.010	50.011	50.011	4.0	50.012	50.011	50.010	4.4	50.013	50.012	50.011	--	-	-	-	--	-	-	-	--	-	-	-	--	-	-	-
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Note: Slanted line shows the range of the rated load current.

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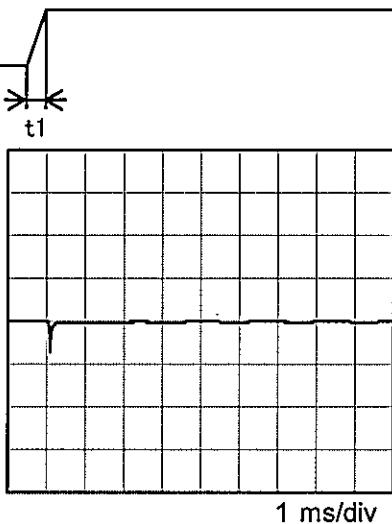
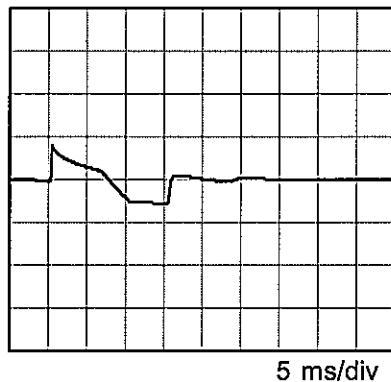
Model TUXS200F50

Item Dynamic Load Response

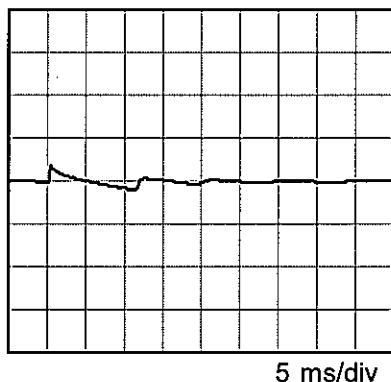
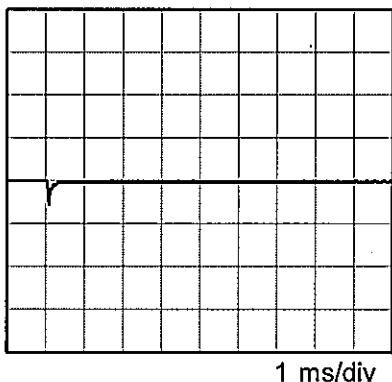
Object +50V4A

Temperature
Testing Circuitry
25°C
Figure AInput Volt. 100 V
Cycle 1000 msLoad Current
Min. Load (0A) ↔
Load 100% (4A)

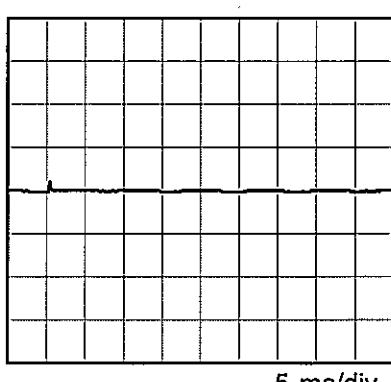
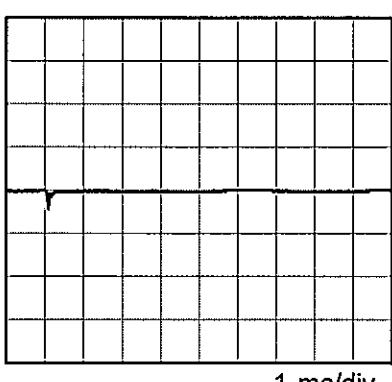
500 mV/div

 $t_1, t_2 = 10 \mu\text{s}$ Min. Load (0A) ↔
Load 50% (2A)

500 mV/div

Load 50% (2A) ↔
Load 100% (4A)

500 mV/div



Model	TUXS200F50	Temperature Testing Circuitry 25°C Figure A																																						
Item	Ripple Voltage (by Load Current)																																							
Object	+50V4A																																							
1.Graph		2.Values																																						
<p>Graph showing Ripple Voltage [mV] vs Load Current [A]. The Y-axis ranges from 0 to 300 mV, and the X-axis ranges from 0 to 4 A. Two curves are plotted: Input Volt. 100V (solid line with triangles) and Input Volt. 200V (dashed line with circles). Both curves show a slight increase in ripple voltage as load current increases. A slanted line indicates the rated load current range.</p>		<table border="1"> <thead> <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> </thead> <tbody> <tr><td>0.0</td><td>28</td><td>21</td></tr> <tr><td>0.4</td><td>49</td><td>46</td></tr> <tr><td>0.8</td><td>65</td><td>66</td></tr> <tr><td>1.6</td><td>68</td><td>65</td></tr> <tr><td>2.4</td><td>70</td><td>68</td></tr> <tr><td>3.2</td><td>70</td><td>70</td></tr> <tr><td>4.0</td><td>71</td><td>73</td></tr> <tr><td>4.4</td><td>85</td><td>80</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 Voltage [mV]		Input Volt. 100 [V]	Input Volt. 200 [V]	0.0	28	21	0.4	49	46	0.8	65	66	1.6	68	65	2.4	70	68	3.2	70	70	4.0	71	73	4.4	85	80	--	-	-	--	-	-	--	-	-
Load Current [A]	Ripple Voltage [mV]																																							
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3.2	70	70																																						
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4.4	85	80																																						
--	-	-																																						
--	-	-																																						
--	-	-																																						
<p>Measured by 100 MHz Oscilloscope. Ripple Voltage is shown as p-p in the figure below. Note: Slanted line shows the range of the rated load current.</p>																																								
<p>Diagram illustrating the measurement of Ripple [mVp-p]. The diagram shows a waveform with two time intervals marked: T1 (the full width of the waveform) and T2 (the width of a single sharp peak).</p>																																								
<p>Fig. Complex Ripple Wave Form</p>																																								

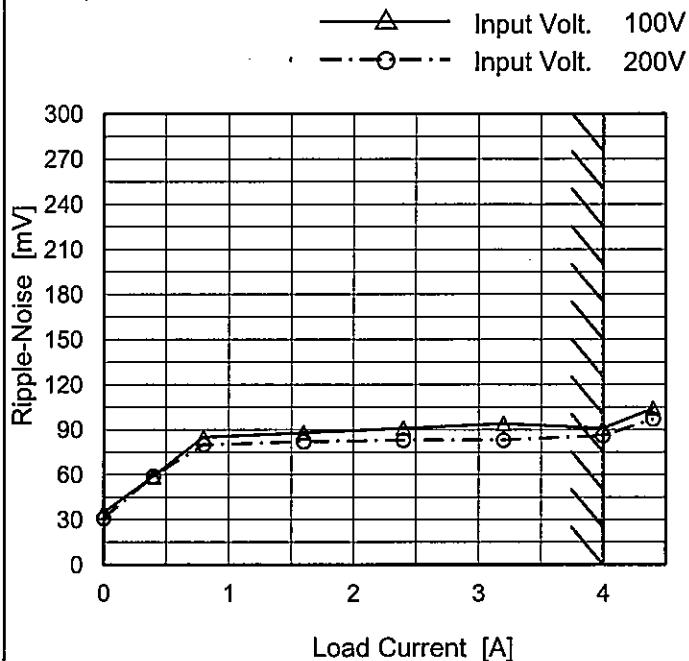
Model TUXS200F50

Item Ripple-Noise

Object +50V4A

Temperature 25°C
Testing Circuitry Figure A

1. Graph



Measured by 100 MHz Oscilloscope.

Ripple-Noise is shown as p-p in the figure below.

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

2. Values

Load Current [A]	Ripple-Noise [mV]	
	Input Volt. 100 [V]	Input Volt. 200 [V]
0.0	35	31
0.4	59	59
0.8	85	80
1.6	88	82
2.4	91	83
3.2	94	83
4.0	91	86
4.4	104	97
--	-	-
--	-	-
--	-	-

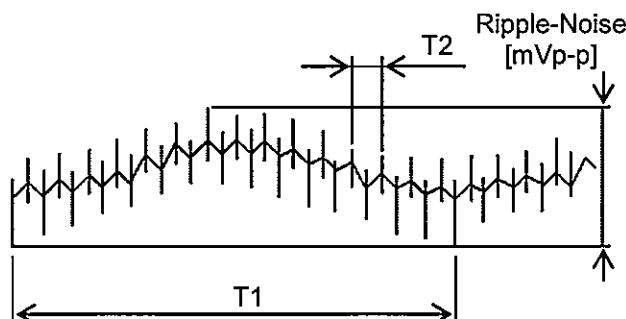
T1: Due to AC Input Line
T2: Due to Switching

Fig. Complex Ripple Wave Form

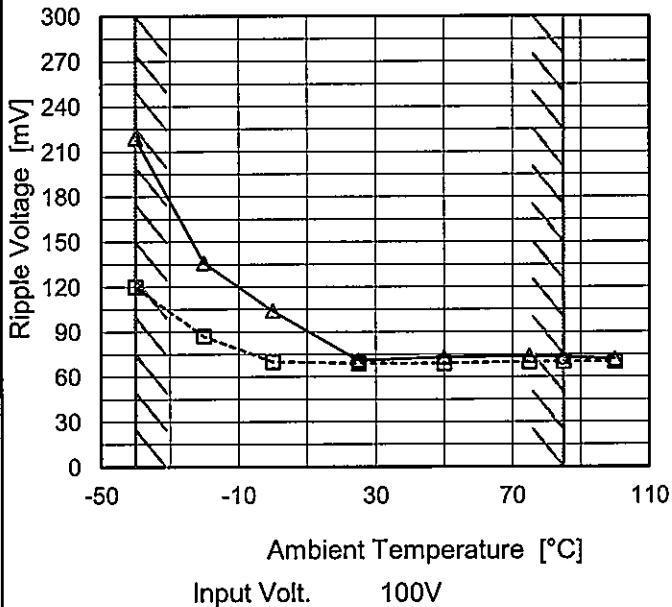
Model TUXS200F50

Item Ripple Voltage (by Ambient Temp.)

Object +50V4A

1. Graph

--- □ --- Load 50%
 —△— Load 100%



Measured by 100 MHz Oscilloscope.

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

Testing Circuitry Figure A

2. Values

Ambient Temperature [°C]	Ripple Voltage [mV]	
	Load 50%	Load 100%
-40	120	219
-20	87	136
0	70	104
25	69	71
50	69	73
75	70	74
85	70	73
100	70	72
--	-	-
--	-	-
--	-	-

T1: Due to AC Input Line
 T2: Due to Switching

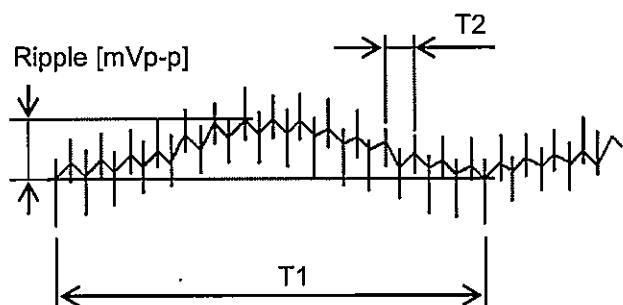
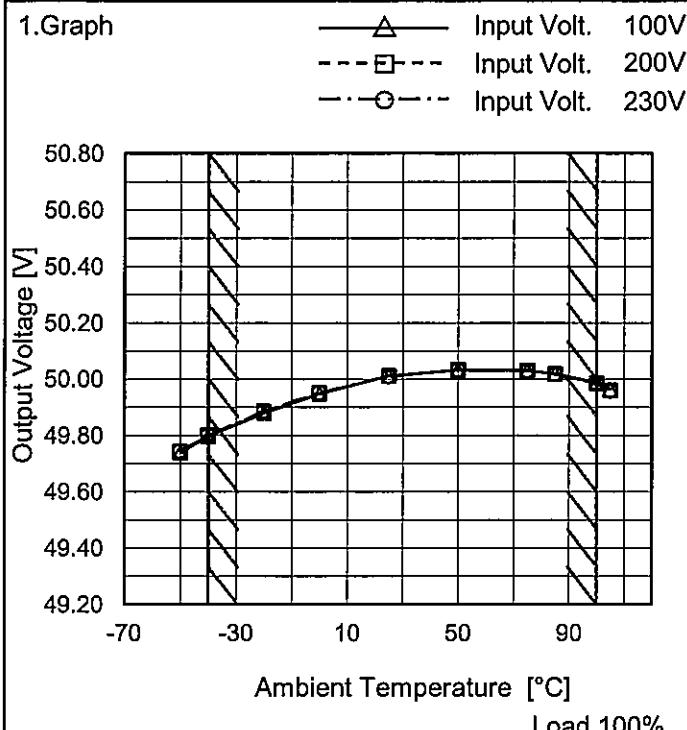


Fig. Complex Ripple Wave Form

COSEL

Model	TUXS200F50
Item	Ambient Temperature Drift
Object	+50V4A



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

Testing Circuitry Figure A

2. Values

Ambient Temperature [°C]	Output Voltage [V]		
	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]
-50	49.739	49.743	49.745
-40	49.797	49.801	49.802
-20	49.880	49.885	49.886
0	49.948	49.952	49.953
25	50.012	50.011	50.010
50	50.032	50.034	50.034
75	50.031	50.031	50.030
85	50.020	50.019	50.018
100	49.988	49.985	49.983
105	49.964	49.960	49.959
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Model	TUXS200F50
Item	Output Voltage Accuracy
Object	+50V4A

Testing Circuitry Figure A

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 ~ 85°C

Input Voltage : 85 ~ 264V

Load Current : 0 ~ 4A

* Output Voltage Accuracy = \pm (Maximum of Output Voltage - Minimum of Output Voltage) / 2

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

2. Values

Item	Temperature [°C]	Input Voltage[V]	Output		Output Voltage Accuracy	
			Current[A]	Voltage[V]	Value [mV]	Ratio [%]
Maximum Voltage	85	264	4	50.001	± 120	± 0.2
Minimum Voltage	-40	85	0	49.761		

COSEL

Model	TUXS200F50	Temperature	25°C																						
Item	Time Lapse Drift	Testing Circuitry	Figure A																						
Object	+50V4A																								
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>49.897</td></tr> <tr><td>0.5</td><td>49.923</td></tr> <tr><td>1.0</td><td>49.923</td></tr> <tr><td>2.0</td><td>49.923</td></tr> <tr><td>3.0</td><td>49.923</td></tr> <tr><td>4.0</td><td>49.923</td></tr> <tr><td>5.0</td><td>49.923</td></tr> <tr><td>6.0</td><td>49.923</td></tr> <tr><td>7.0</td><td>49.923</td></tr> <tr><td>8.0</td><td>49.923</td></tr> </tbody> </table>	Time since start [H]	Output Voltage [V]	0.0	49.897	0.5	49.923	1.0	49.923	2.0	49.923	3.0	49.923	4.0	49.923	5.0	49.923	6.0	49.923	7.0	49.923	8.0	49.923
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7.0	49.923																								
8.0	49.923																								

COSEL

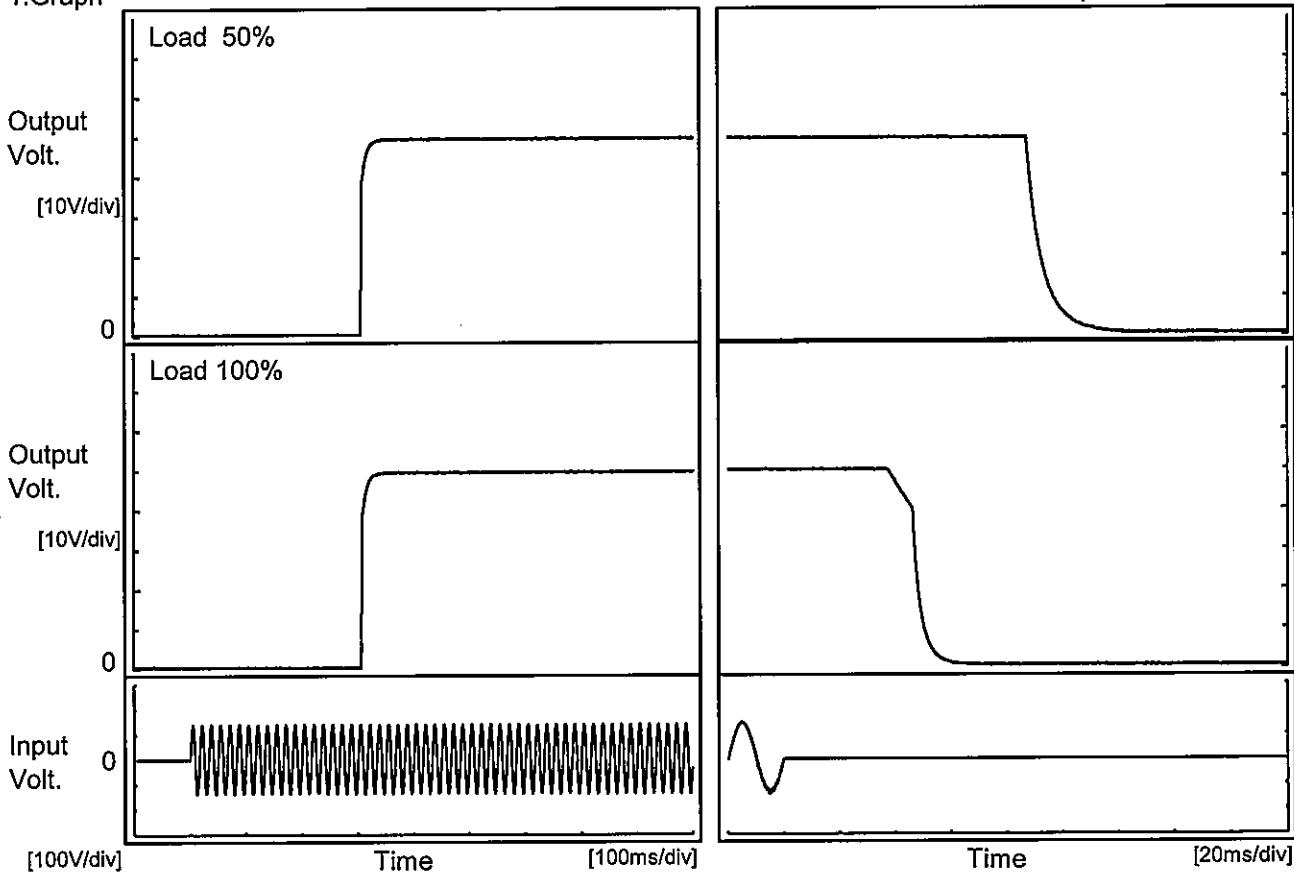
Model TUXS200F50

Item Rise and Fall Time

Object +50V4A

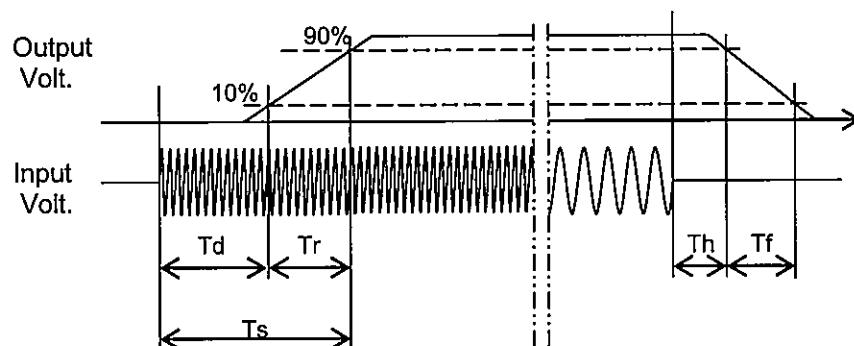
Temperature 25°C
Testing Circuitry Figure A

1. Graph



2. Values

Load	Time	Td	Tr	Ts	Th	Tf	[ms]
50 %		306.0	10.0	316.0	88.0	13.2	
100 %		306.0	9.5	315.5	38.0	11.5	



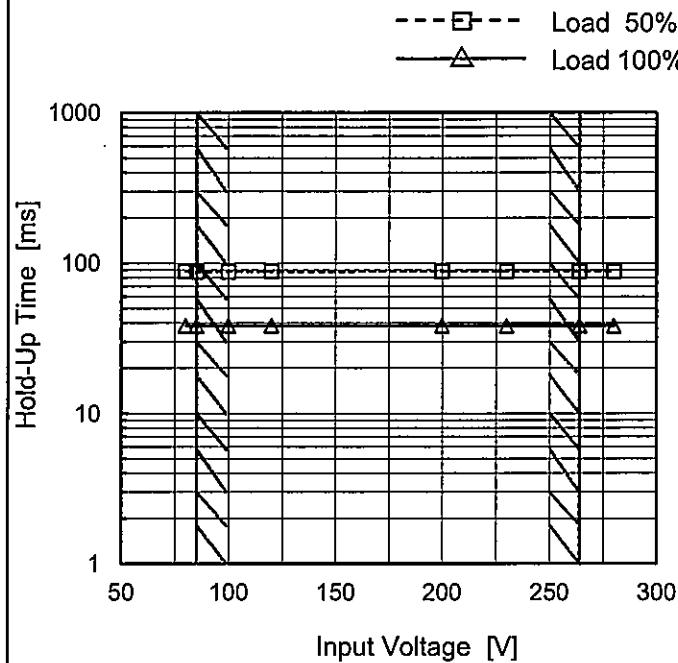
COSEL

Model TUXS200F50

Item Hold-Up Time

Object +50V4A

1.Graph



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.

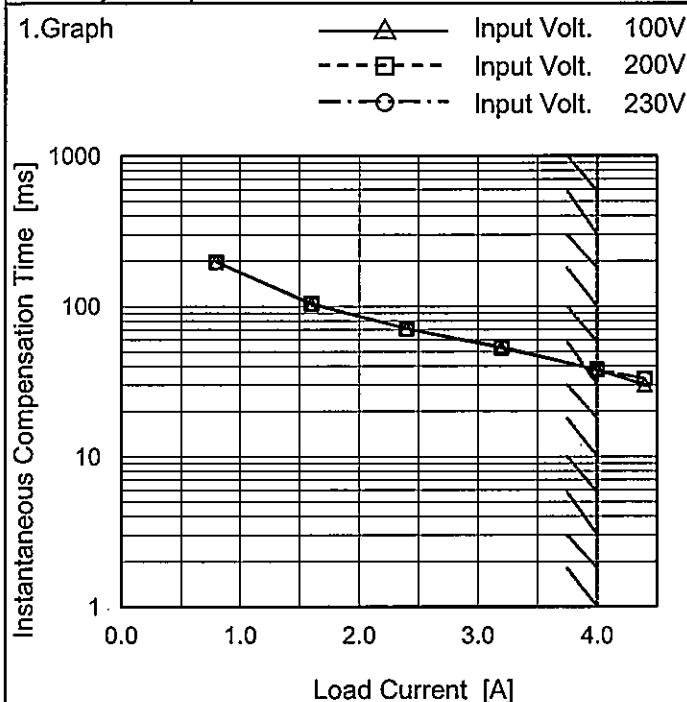
Temperature 25°C
Testing Circuitry Figure A

2.Values

Input Voltage [V]	Hold-Up Time [ms]	
	Load 50%	Load 100%
80	88	38
85	88	38
100	88	38
120	88	38
200	88	38
230	88	38
264	88	38
280	88	38
--	-	-

COSEL

Model	TUXS200F50
Item	Instantaneous Interruption Compensation
Object	+50V4A

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	-	-	-
0.8	198	198	198
1.6	104	105	105
2.4	71	71	71
3.2	53	54	54
4.0	38	38	38
4.4	30	33	33
--	-	-	-
--	-	-	-
--	-	-	-
--	-	-	-

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

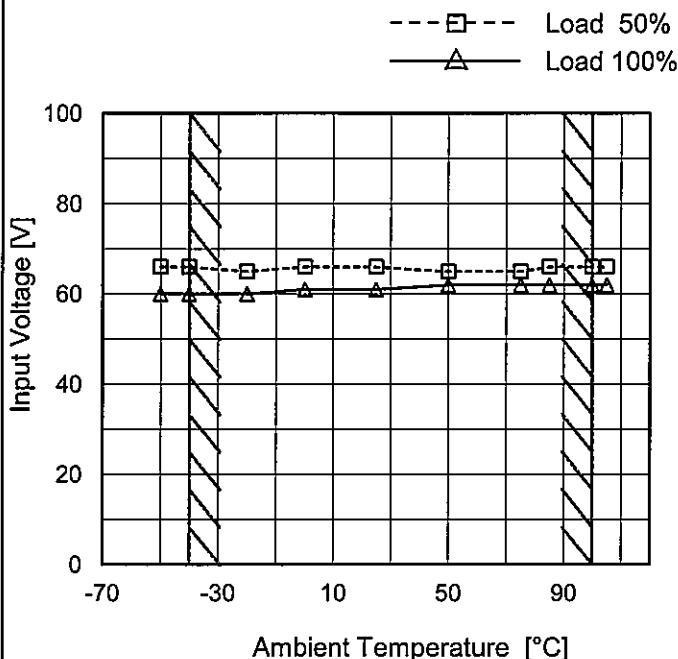
COSEL

Model TUXS200F50

Item Minimum Input Voltage
for Regulated Output Voltage

Object +50V4A

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%
-50	66	60
-40	66	60
-20	65	60
0	66	61
25	66	61
50	65	62
75	65	62
85	66	62
100	66	62
105	66	62
..	-	-

COSEL

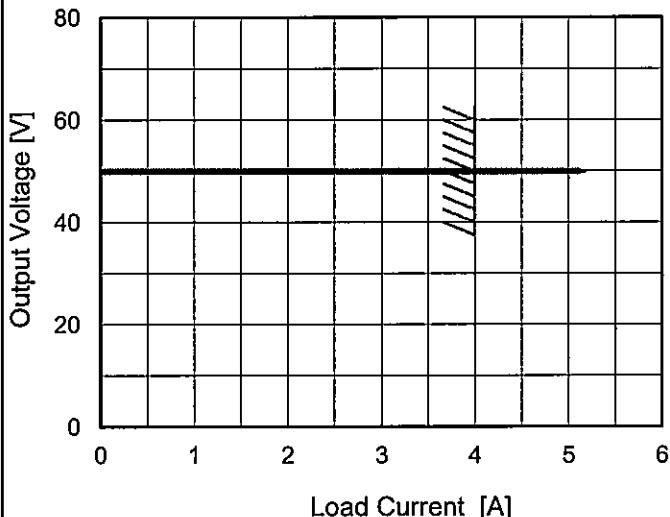
Model TUXS200F50

Item Overcurrent Protection

Object +50V4A

1. Graph

— Input Volt. 100V
 — Input Volt. 200V
 - - - Input Volt. 230V



Load Current [A]

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

 Temperature 25°C
 Testing Circuitry Figure A

2. Values

Output Voltage [V]	Load Current [A]		
	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]
50.0	5.12	5.11	5.11
47.5	5.14	5.11	5.11
45.0	0.00	0.00	0.00
40.0	0.00	0.00	0.00
35.0	0.00	0.00	0.00
30.0	0.00	0.00	0.00
25.0	0.00	0.00	0.00
20.0	0.00	0.00	0.00
15.0	0.00	0.00	0.00
10.0	0.00	0.00	0.00
5.0	0.00	0.00	0.00
0.0	0.00	0.00	0.00

Model	TUXS200F50	Testing Circuitry Figure A																																						
Item	Overvoltage Protection																																							
Object	+50V4A																																							
1.Graph		2.Values																																						
<p>Operating Point [V]</p> <p>Ambient Temperature [°C]</p> <p>Load 0%</p> <p>Input Volt. 100V</p> <p>Input Volt. 230V</p>		<table border="1"> <thead> <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. 230[V]</th> </tr> </thead> <tbody> <tr><td>-50</td><td>57.62</td><td>57.62</td></tr> <tr><td>-40</td><td>57.74</td><td>57.74</td></tr> <tr><td>-20</td><td>57.94</td><td>57.94</td></tr> <tr><td>0</td><td>58.10</td><td>58.10</td></tr> <tr><td>25</td><td>58.26</td><td>58.26</td></tr> <tr><td>50</td><td>58.40</td><td>58.40</td></tr> <tr><td>75</td><td>58.44</td><td>58.44</td></tr> <tr><td>85</td><td>58.46</td><td>58.46</td></tr> <tr><td>100</td><td>58.46</td><td>58.46</td></tr> <tr><td>105</td><td>58.46</td><td>58.46</td></tr> <tr><td>--</td><td>-</td><td>-</td></tr> </tbody> </table>	Ambient Temperature [°C]	Operating Point [V]		Input Volt. 100[V]	Input Volt. 230[V]	-50	57.62	57.62	-40	57.74	57.74	-20	57.94	57.94	0	58.10	58.10	25	58.26	58.26	50	58.40	58.40	75	58.44	58.44	85	58.46	58.46	100	58.46	58.46	105	58.46	58.46	--	-	-
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100	58.46	58.46																																						
105	58.46	58.46																																						
--	-	-																																						

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

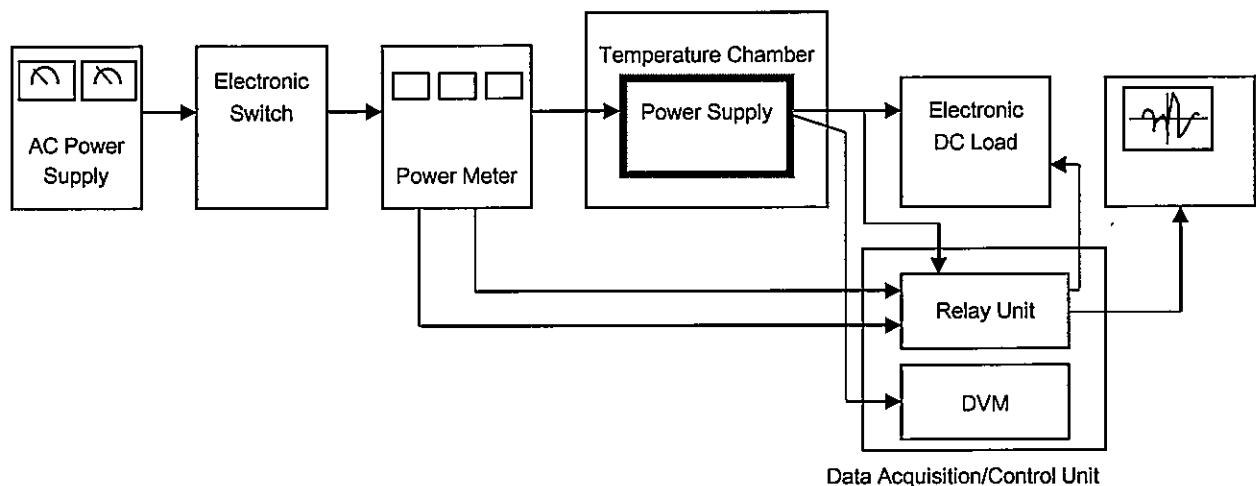


Figure A

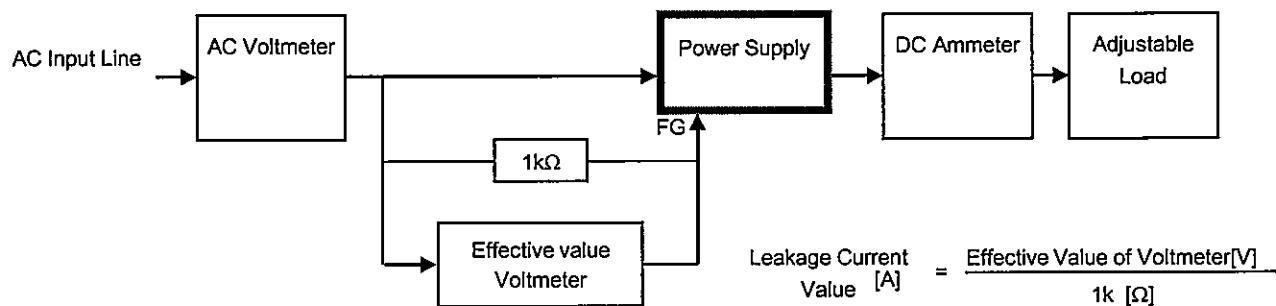


Figure B (DEN-AN)

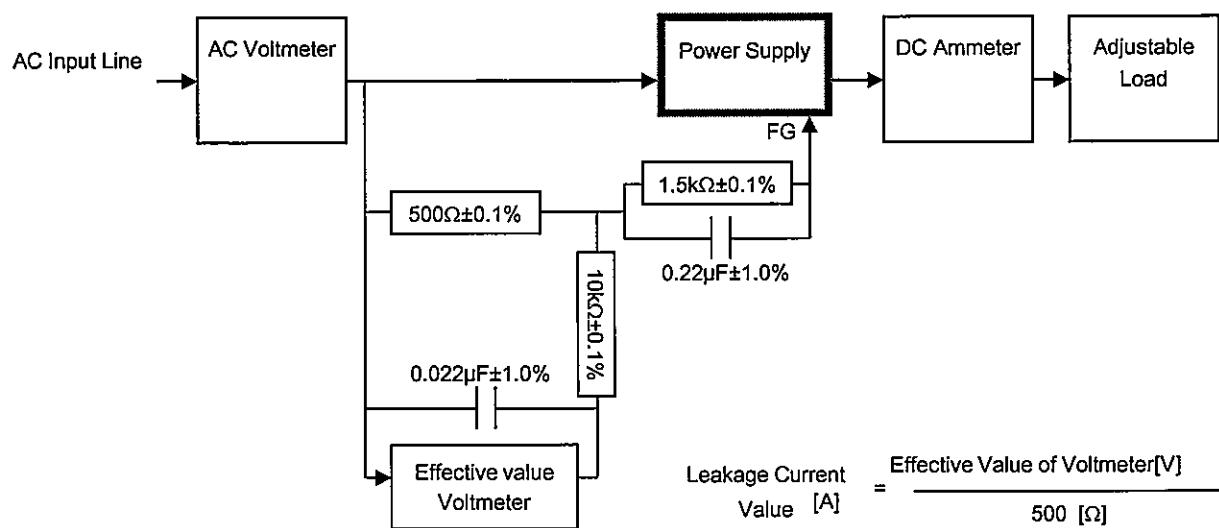
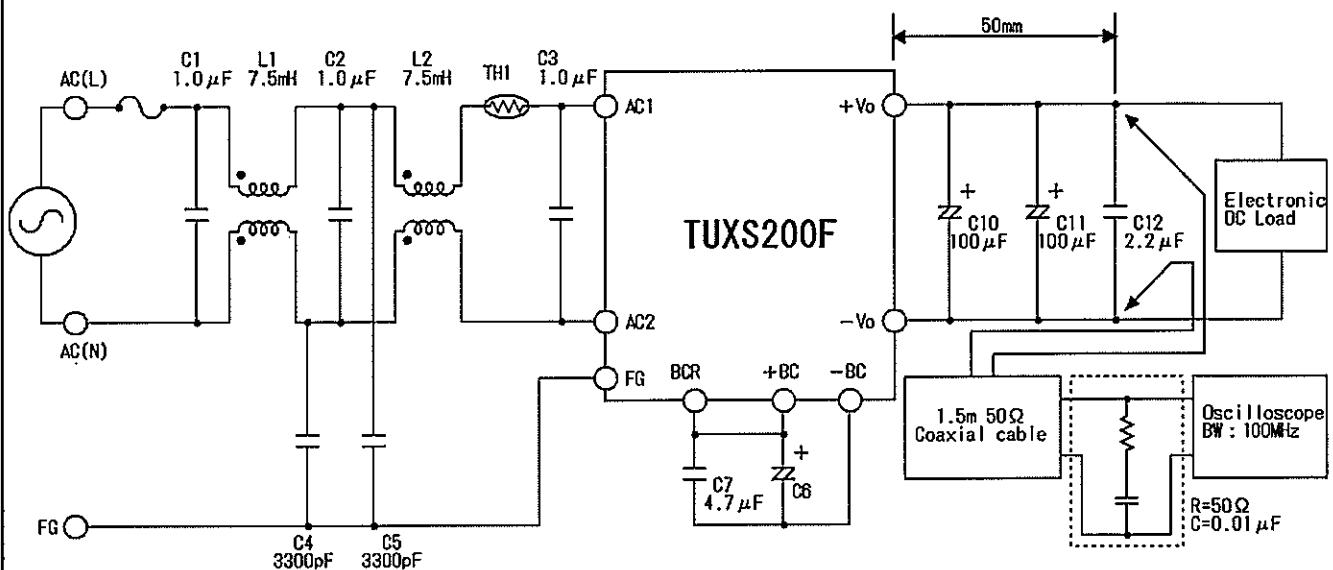


Figure B (IEC60950-1)



L1,L2 : SCR22-060-1R0A075J(NEC TOKIN)
 TH1 : 12D2-15LCS(SEMITEC)
 C1,C2,C3 : LE105-MX(OKAYA)
 C4,C5 : DE1E3KX332M(MURATA)
 C6 : EKXJ421ELL151MM50S(Nippon Chemi-Con)
 C7 : AFS450V474K(OKAYA)
 C10,C11 : PCR1J101MCL1GS(NICHICON)
 C12 : GRM31CR72A225K(MURATA)

Figure C