

TEST DATA OF DHS50A15

Regulated DC Power Supply

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Tatsuya Mano Design Manager

Prepared by : Tetsuro Hirata Tetsuro Hirata Design Engineer

COSEL CO.,LTD.

CONTENTS

1. Input Current (by Input Voltage)	1
2. Input Current (by Load Current)	2
3. Input Power (by Load Current)	3
4. Efficiency (by Input Voltage)	4
5. Efficiency (by Load Current)	5
6. Line Regulation	6
7. Load Regulation	7
8. Dynamic Load Response	8
9. Ripple Voltage (by Load Current)	9
10. Ripple-Noise	10
11. Ripple Voltage (by Ambient Temperature)	11
12. Ambient Temperature Drift	12
13. Output Voltage Accuracy	13
14. Time Lapse Drift	14
15. Rise and Fall Time	15
16. Minimum Input Voltage for Regulated Output Voltage	16
17. Overcurrent Protection	17
18. Overvoltage Protection	18
19. Figure of Testing Circuitry	19

(Final Page 19)

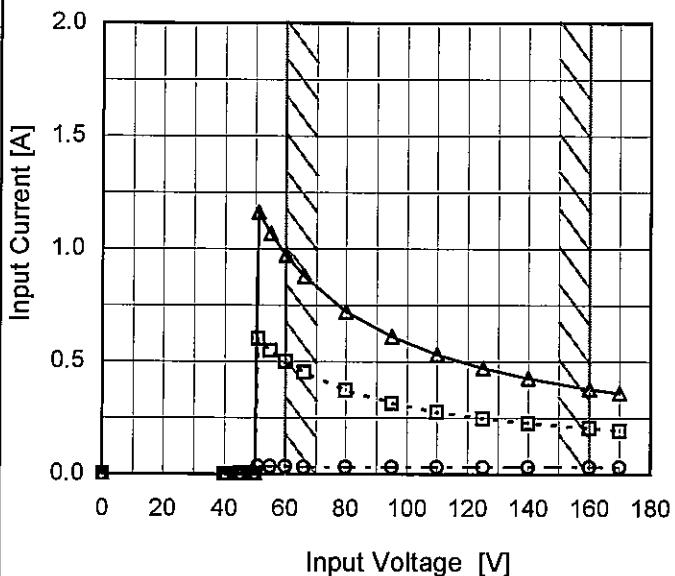
Model DHS50A15

Item Input Current (by Input Voltage)

Object _____

1. Graph

—△— Load 100%
 - - -□--- Load 50%
 - - -○--- Load 0%



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

Temperature 25°C
 Testing Circuitry Figure A

2. Values

Input Voltage [V]	Input Current [A]		
	Load 0%	Load 50%	Load 100%
0	0.000	0.000	0.000
40	0.001	0.001	0.001
45	0.002	0.002	0.002
50	0.003	0.003	0.003
51	0.035	0.601	1.163
55	0.034	0.549	1.068
60	0.033	0.500	0.972
66	0.032	0.452	0.879
80	0.031	0.372	0.722
95	0.031	0.316	0.610
110	0.031	0.277	0.531
125	0.030	0.248	0.471
140	0.030	0.226	0.426
160	0.030	0.203	0.379
170	0.030	0.194	0.360
--	-	-	-
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Model	DHS50A15	Temperature	25°C																																																			
Item	Input Current (by Load Current)	Testing Circuitry	Figure A																																																			
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1.Graph	<p>—△— Input Volt. 60V - -□-- Input Volt. 110V - -○-- Input Volt. 160V</p> <table border="1"> <caption>Data points estimated from the graph</caption> <thead> <tr> <th>Load Current [A]</th> <th>Input Volt. 60[V] [A]</th> <th>Input Volt. 110[V] [A]</th> <th>Input Volt. 160[V] [A]</th> </tr> </thead> <tbody> <tr><td>0.00</td><td>0.033</td><td>0.030</td><td>0.030</td></tr> <tr><td>0.60</td><td>0.206</td><td>0.116</td><td>0.091</td></tr> <tr><td>1.20</td><td>0.366</td><td>0.204</td><td>0.153</td></tr> <tr><td>1.80</td><td>0.528</td><td>0.292</td><td>0.214</td></tr> <tr><td>2.40</td><td>0.692</td><td>0.382</td><td>0.276</td></tr> <tr><td>3.00</td><td>0.856</td><td>0.469</td><td>0.337</td></tr> <tr><td>3.40</td><td>0.972</td><td>0.531</td><td>0.379</td></tr> <tr><td>3.74</td><td>1.067</td><td>0.582</td><td>0.414</td></tr> </tbody> </table>			Load Current [A]	Input Volt. 60[V] [A]	Input Volt. 110[V] [A]	Input Volt. 160[V] [A]	0.00	0.033	0.030	0.030	0.60	0.206	0.116	0.091	1.20	0.366	0.204	0.153	1.80	0.528	0.292	0.214	2.40	0.692	0.382	0.276	3.00	0.856	0.469	0.337	3.40	0.972	0.531	0.379	3.74	1.067	0.582	0.414															
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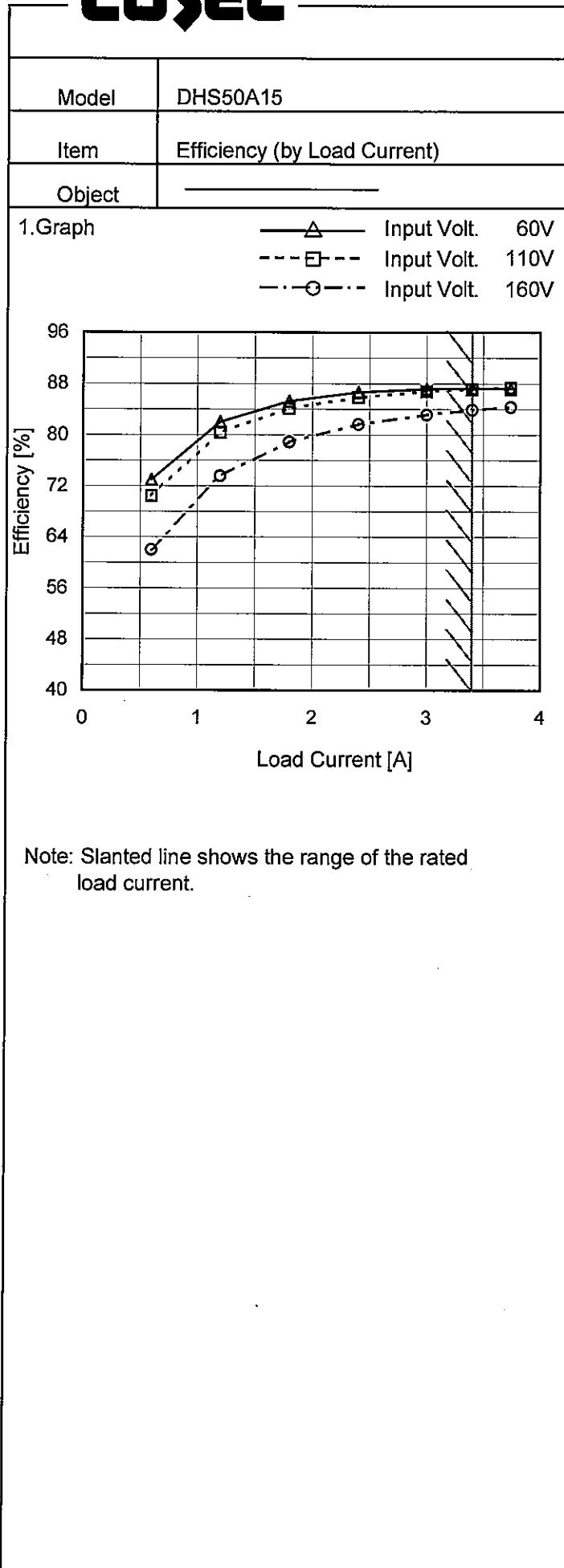
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Model	DHS50A15	Temperature Testing Circuitry	25°C Figure A																																																			
Item	Input Power (by Load Current)																																																					
Object																																																						
1. Graph		2. Values																																																				
<p>Graph showing Input Power [W] vs Load Current [A] for three input voltages: 60V, 110V, and 160V. The x-axis ranges from 0 to 4 A, and the y-axis ranges from 0 to 80 W. Three curves are plotted: a solid line for 60V, a dashed line for 110V, and a dash-dot line for 160V. All curves show a positive linear relationship. A slanted line indicates the rated load current range.</p>		<table border="1"> <thead> <tr> <th rowspan="2">Load Current [A]</th> <th colspan="3">Input Power [W]</th> </tr> <tr> <th>Input Volt. 60[V]</th> <th>Input Volt. 110[V]</th> <th>Input Volt. 160[V]</th> </tr> </thead> <tbody> <tr><td>0.00</td><td>1.96</td><td>3.33</td><td>4.82</td></tr> <tr><td>0.60</td><td>12.32</td><td>12.77</td><td>14.50</td></tr> <tr><td>1.20</td><td>21.95</td><td>22.41</td><td>24.47</td></tr> <tr><td>1.80</td><td>31.66</td><td>32.11</td><td>34.25</td></tr> <tr><td>2.40</td><td>41.53</td><td>41.93</td><td>44.11</td></tr> <tr><td>3.00</td><td>51.35</td><td>51.57</td><td>53.86</td></tr> <tr><td>3.40</td><td>58.13</td><td>58.25</td><td>60.51</td></tr> <tr><td>3.74</td><td>64.01</td><td>63.90</td><td>66.23</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>		Load Current [A]	Input Power [W]			Input Volt. 60[V]	Input Volt. 110[V]	Input Volt. 160[V]	0.00	1.96	3.33	4.82	0.60	12.32	12.77	14.50	1.20	21.95	22.41	24.47	1.80	31.66	32.11	34.25	2.40	41.53	41.93	44.11	3.00	51.35	51.57	53.86	3.40	58.13	58.25	60.51	3.74	64.01	63.90	66.23	--	-	-	-	--	-	-	-	--	-	-	-
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Note: Slanted line shows the range of the rated load current.

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Model	DHS50A15	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 (40 to 96) against Input Voltage [V] on the x-axis (50 to 170). Two data series are shown: Load 50% (dashed line with square markers) and Load 100% (solid line with triangle markers). Both series show a general downward trend as input voltage increases. A slanted line on the graph 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>60</td><td>84.9</td><td>87.3</td></tr> <tr><td>66</td><td>85.3</td><td>87.6</td></tr> <tr><td>80</td><td>85.6</td><td>88.1</td></tr> <tr><td>95</td><td>85.0</td><td>87.8</td></tr> <tr><td>110</td><td>83.6</td><td>87.1</td></tr> <tr><td>125</td><td>82.1</td><td>86.3</td></tr> <tr><td>140</td><td>80.4</td><td>85.3</td></tr> <tr><td>160</td><td>78.2</td><td>83.9</td></tr> <tr><td>170</td><td>77.0</td><td>83.2</td></tr> </tbody> </table>		Input Voltage [V]	Efficiency Load 50% [%]	Efficiency Load 100% [%]	60	84.9	87.3	66	85.3	87.6	80	85.6	88.1	95	85.0	87.8	110	83.6	87.1	125	82.1	86.3	140	80.4	85.3	160	78.2	83.9	170	77.0	83.2
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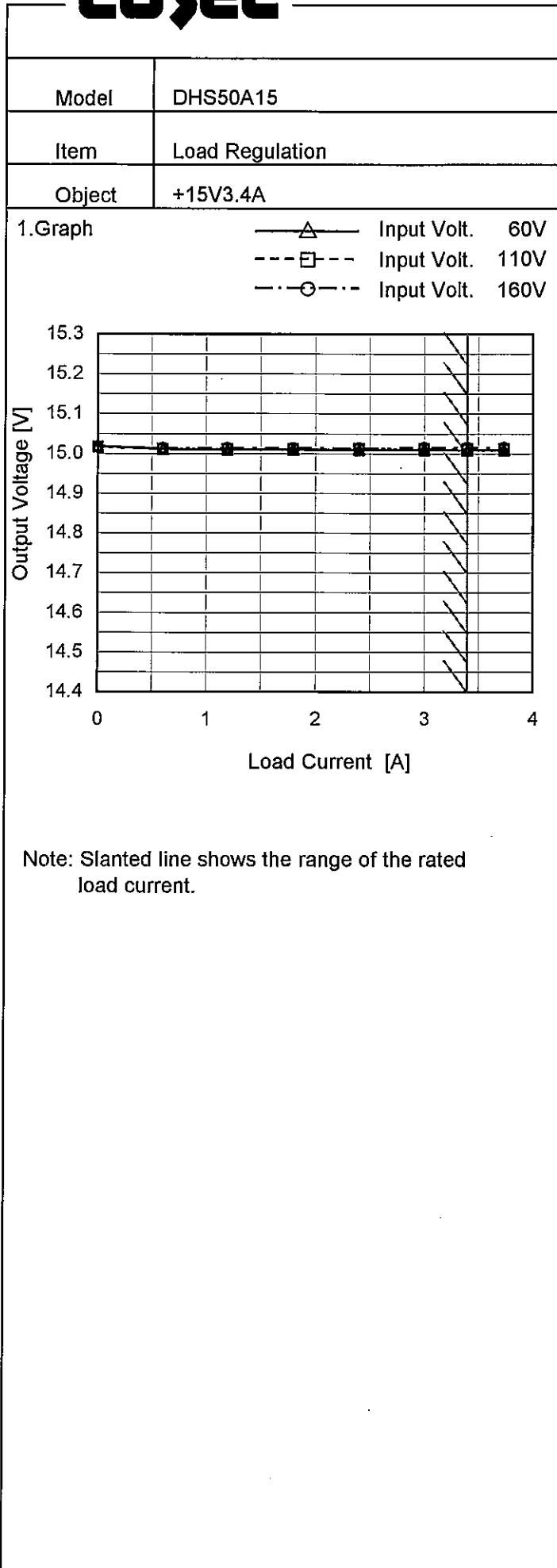
Temperature 25°C
Testing Circuitry Figure A

2. Values

Load Current [A]	Efficiency [%]		
	Input Volt. 60[V]	Input Volt. 110[V]	Input Volt. 160[V]
0.00	-	-	-
0.60	73.0	70.5	62.0
1.20	82.0	80.3	73.6
1.80	85.3	84.1	78.9
2.40	86.7	85.9	81.6
3.00	87.2	86.8	83.1
3.40	87.3	87.1	83.9
3.74	87.2	87.4	84.3
--	-	-	-
--	-	-	-
--	-	-	-

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Model	DHS50A15	Temperature	25°C																																
Item	Line Regulation	Testing Circuitry	Figure A																																
Object	+15V3.4A																																		
1. Graph																																			
<p>The graph plots Output Voltage [V] on the y-axis (14.4 to 15.3) against Input Voltage [V] on the x-axis (50 to 170). Two horizontal lines are drawn at 15.0V, one for Load 50% and one for Load 100%. Slanted lines on either side of the 15.0V lines indicate the input voltage range.</p>																																			
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<table border="1"> <thead> <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> </thead> <tbody> <tr><td>60</td><td>15.011</td><td>15.009</td></tr> <tr><td>66</td><td>15.011</td><td>15.010</td></tr> <tr><td>80</td><td>15.011</td><td>15.010</td></tr> <tr><td>95</td><td>15.011</td><td>15.011</td></tr> <tr><td>110</td><td>15.012</td><td>15.012</td></tr> <tr><td>125</td><td>15.013</td><td>15.012</td></tr> <tr><td>140</td><td>15.013</td><td>15.014</td></tr> <tr><td>160</td><td>15.014</td><td>15.014</td></tr> <tr><td>170</td><td>15.015</td><td>15.015</td></tr> </tbody> </table>				Input Voltage [V]	Output Voltage [V]		Load 50%	Load 100%	60	15.011	15.009	66	15.011	15.010	80	15.011	15.010	95	15.011	15.011	110	15.012	15.012	125	15.013	15.012	140	15.013	15.014	160	15.014	15.014	170	15.015	15.015
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<p>Note: Slanted line shows the range of the rated input voltage.</p>																																			

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Temperature 25°C
Testing Circuitry Figure A

2. Values

Load Current [A]	Output Voltage [V]		
	Input Volt. 60[V]	Input Volt. 110[V]	Input Volt. 160[V]
0.00	15.019	15.016	15.017
0.60	15.011	15.011	15.013
1.20	15.010	15.012	15.013
1.80	15.010	15.012	15.014
2.40	15.009	15.012	15.014
3.00	15.009	15.012	15.014
3.40	15.009	15.012	15.014
3.74	15.009	15.012	15.015
--	-	-	-
--	-	-	-
--	-	-	-

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

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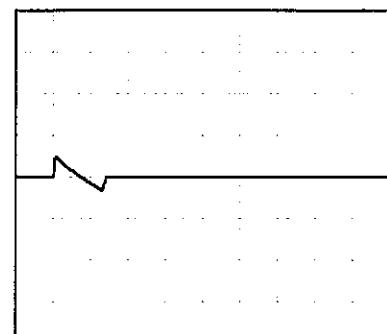
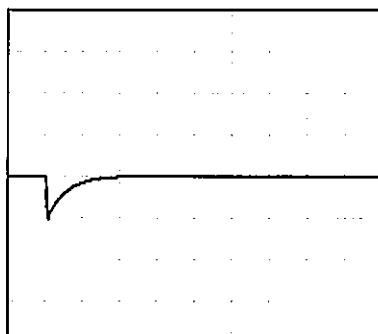
Model	DHS50A15
Item	Dynamic Load Response
Object	+15V3.4A

Temperature 25°C
Testing Circuitry Figure AInput Volt. 110 V
Cycle 1000 ms

Load Current

3.4A / 20 μ sMin. Load (0A) \longleftrightarrow
Load 100% (3.4A)

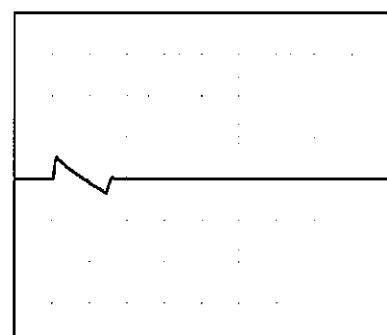
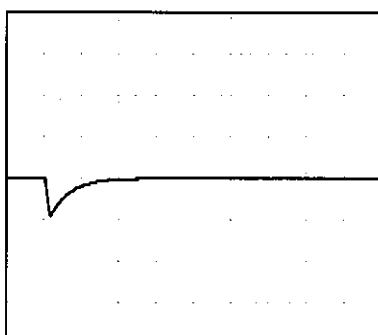
500mV/div

500 μ s/div

10 ms/div

Min. Load (0A) \longleftrightarrow
Load 50% (1.7A)

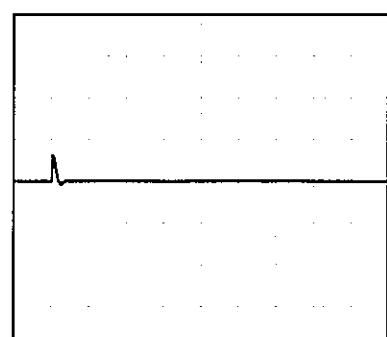
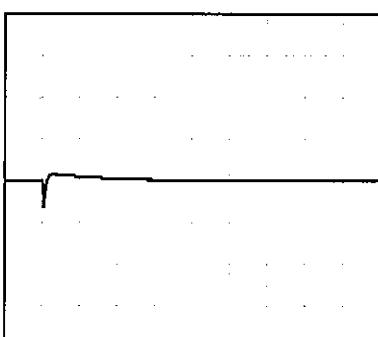
500mV/div

500 μ s/div

10 ms/div

Load 10% (0.34A) \longleftrightarrow
Load 100% (3.4A)

100mV/div

500 μ s/div

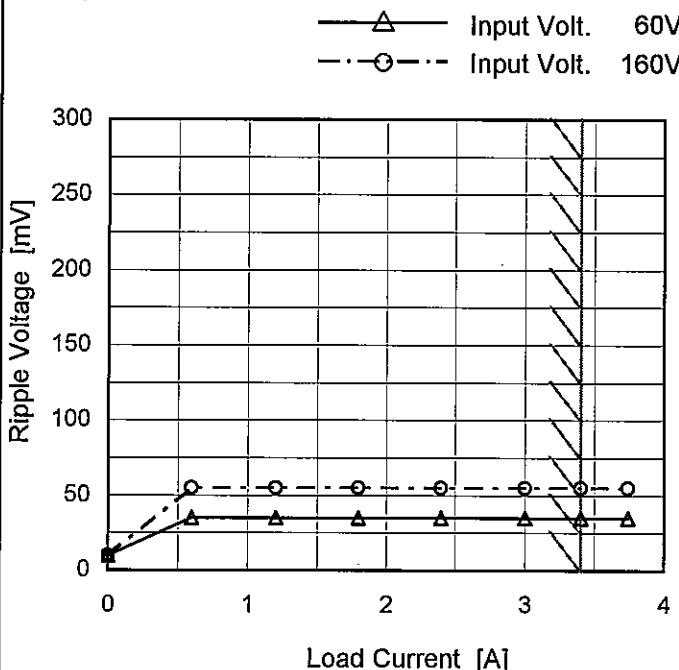
10 ms/div

Model DHS50A15

Item Ripple Voltage (by Load Current)

Object +15V3.4A

1. Graph



Measured by 500 MHz Oscilloscope.

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

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

Ripple [mVp-p]

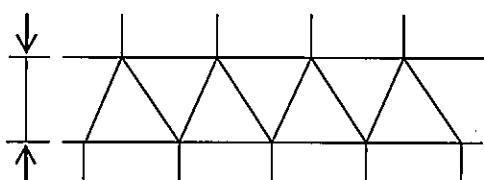


Fig.Complex Ripple Wave Form

Temperature 25°C
Testing Circuitry Figure B

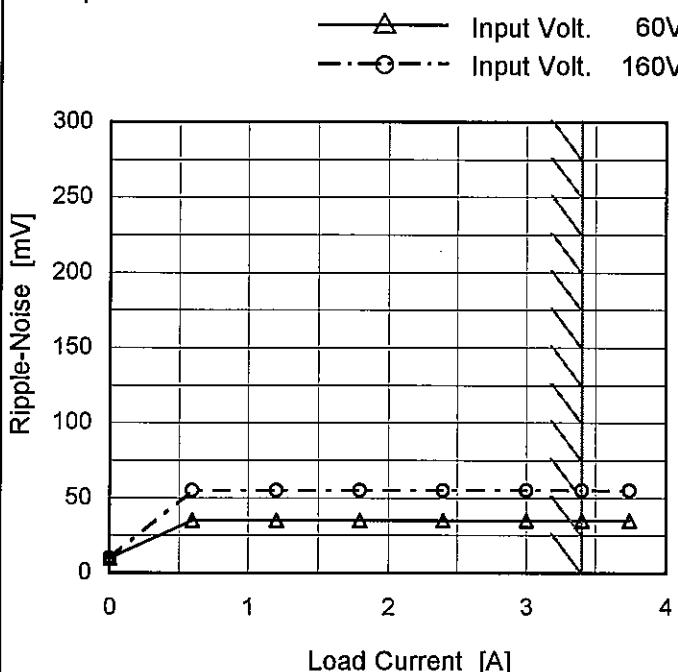
2. Values

Load Current [A]	Ripple Voltage [mV]	
	Input Volt. 60 [V]	Input Volt. 160 [V]
0.00	10	10
0.60	35	55
1.20	35	55
1.80	35	55
2.40	35	55
3.00	35	55
3.40	35	55
3.74	35	55
--	-	-
--	-	-
--	-	-

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Model	DHS50A15
Item	Ripple-Noise
Object	+15V3.4A

1.Graph



Measured by 500 MHz Oscilloscope.

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

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

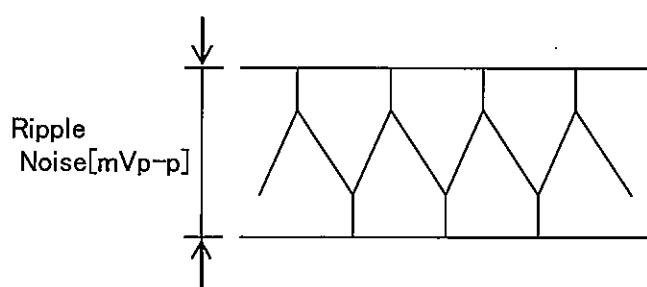


Fig.Complex Ripple Noise Wave Form

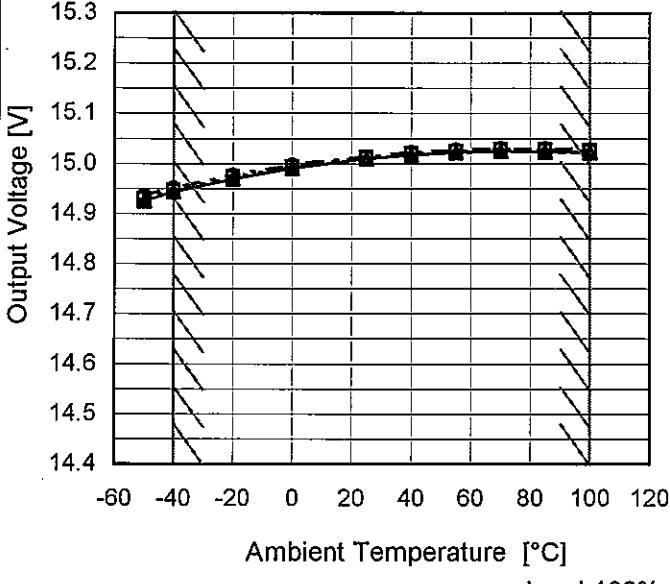
Temperature 25°C
Testing Circuitry Figure B

2.Values

Load Current [A]	Ripple-Noise [mV]	
	Input Volt. 60 [V]	Input Volt. 160 [V]
0.00	10	10
0.60	35	55
1.20	35	55
1.80	35	55
2.40	35	55
3.00	35	55
3.40	35	55
3.74	35	55
--	-	-
--	-	-
--	-	-

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<p>Model DHS50A15</p> <p>Item Ripple Voltage (by Ambient Temp.)</p> <p>Object +15V3.4A</p>	Testing Circuitry Figure B																																						
	1. Graph	2. Values																																					
	<p style="text-align: center;">--- □ --- Load 50% — △ — Load 100%</p> <p>Ripple Voltage [mV]</p> <p>Ambient Temperature [°C]</p> <p>Input Volt. 110V</p>																																						
		<table border="1"> <thead> <tr> <th rowspan="2">Ambient Temperature [°C]</th> <th colspan="2">Ripple Voltage [mV]</th> </tr> <tr> <th>Load 50%</th> <th>Load 100%</th> </tr> </thead> <tbody> <tr><td>-50</td><td>100</td><td>100</td></tr> <tr><td>-40</td><td>80</td><td>80</td></tr> <tr><td>-20</td><td>60</td><td>60</td></tr> <tr><td>0</td><td>60</td><td>60</td></tr> <tr><td>25</td><td>50</td><td>50</td></tr> <tr><td>40</td><td>50</td><td>50</td></tr> <tr><td>55</td><td>50</td><td>50</td></tr> <tr><td>70</td><td>50</td><td>50</td></tr> <tr><td>85</td><td>50</td><td>50</td></tr> <tr><td>100</td><td>50</td><td>50</td></tr> <tr><td>--</td><td>-</td><td>-</td></tr> </tbody> </table>	Ambient Temperature [°C]	Ripple Voltage [mV]		Load 50%	Load 100%	-50	100	100	-40	80	80	-20	60	60	0	60	60	25	50	50	40	50	50	55	50	50	70	50	50	85	50	50	100	50	50	--	-
Ambient Temperature [°C]	Ripple Voltage [mV]																																						
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70	50	50																																					
85	50	50																																					
100	50	50																																					
--	-	-																																					
<p>Measured by 500 MHz Oscilloscope. Note: Slanted line shows the range of the rated ambient temperature.</p>																																							
<p>Ripple [mVp-p]</p>																																							
<p>Fig.Complex Ripple Wave Form</p>																																							

Model	DHS50A15	Testing Circuitry Figure A		
Item	Ambient Temperature Drift			
Object	+15V3.4A			
1.Graph	<p>—▲— Input Volt. 60V - - - □ - - Input Volt. 110V - - - ○ - - Input Volt. 160V</p>  <p>Output Voltage [V]</p> <p>Ambient Temperature [°C]</p> <p>Load 100%</p>	2.Values		
		Ambient Temperature [°C]	Output Voltage [V]	
			Input Volt. 60[V]	Input Volt. 110[V]
		-50	14.926	14.930
		-40	14.943	14.946
		-20	14.969	14.972
		0	14.991	14.993
		25	15.009	15.012
		40	15.018	15.020
		55	15.023	15.026
		70	15.025	15.028
		85	15.025	15.028
		100	15.022	15.026
		--	-	-

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



Model	DHS50A15	Testing Circuitry Figure A
Item	Output Voltage Accuracy	
Object	+15V3.4A	

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 - 100°C

Input Voltage : 60 - 160V

Load Current : 0 - 3.4A

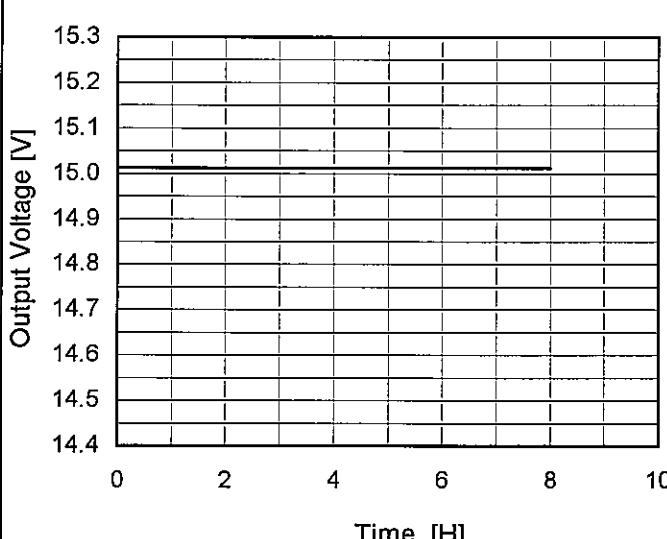
* Output Voltage Accuracy = $\pm(\text{Maximum of Output Voltage} - \text{Minimum of Output Voltage}) / 2$

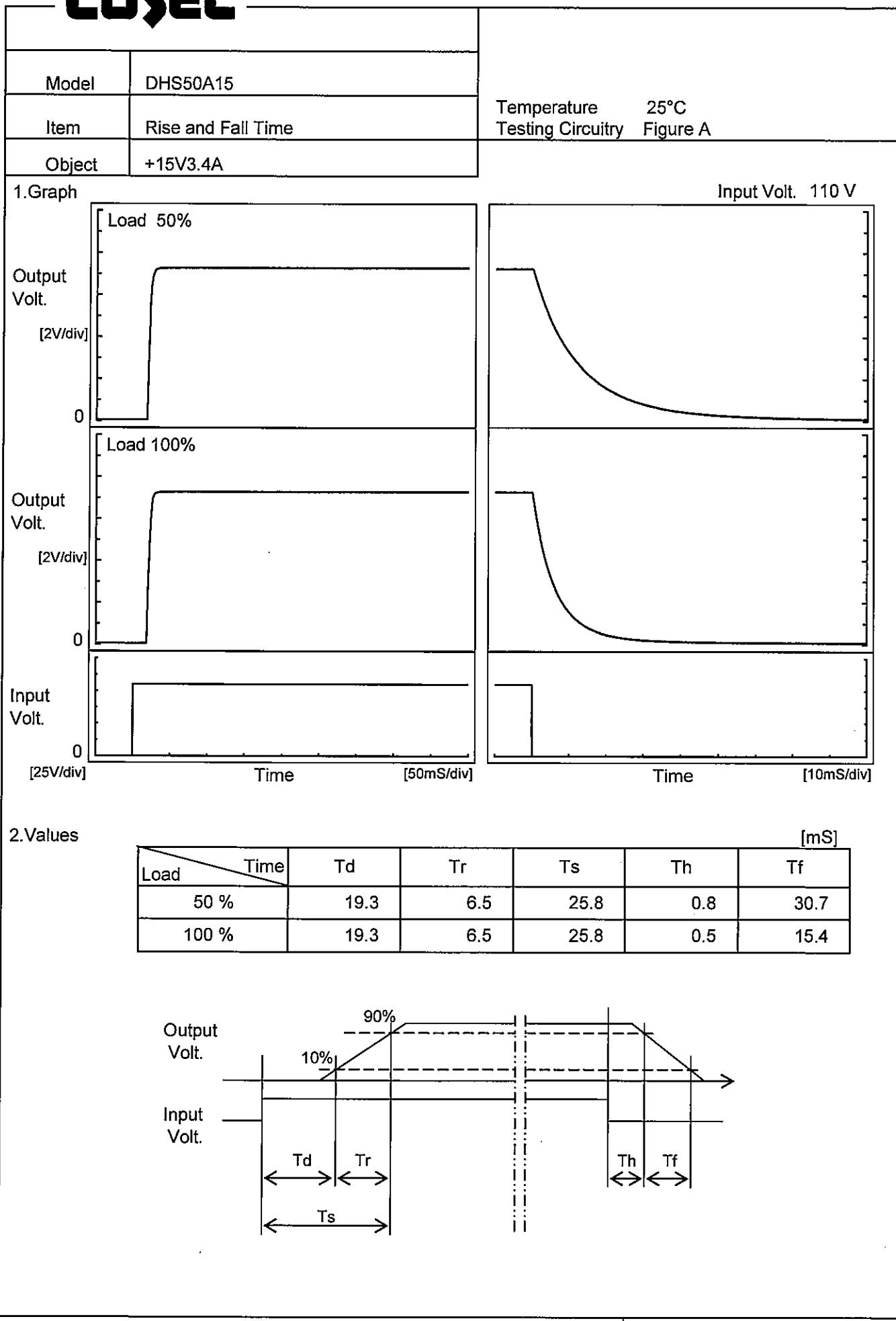
$$\text{* Output Voltage Accuracy (Ration)} = \frac{\text{Output Voltage Accuracy}}{\text{Rated Output Voltage}} \times 100$$

2. Values

Item	Temperature [°C]	Input Voltage[V]	Output		Output Voltage Accuracy	
			Current[A]	Voltage[V]	Value [mV]	Ration [%]
Maximum Voltage	70	60	0	15.034	±46	±0.3
Minimum Voltage	-40	60	3.4	14.943		

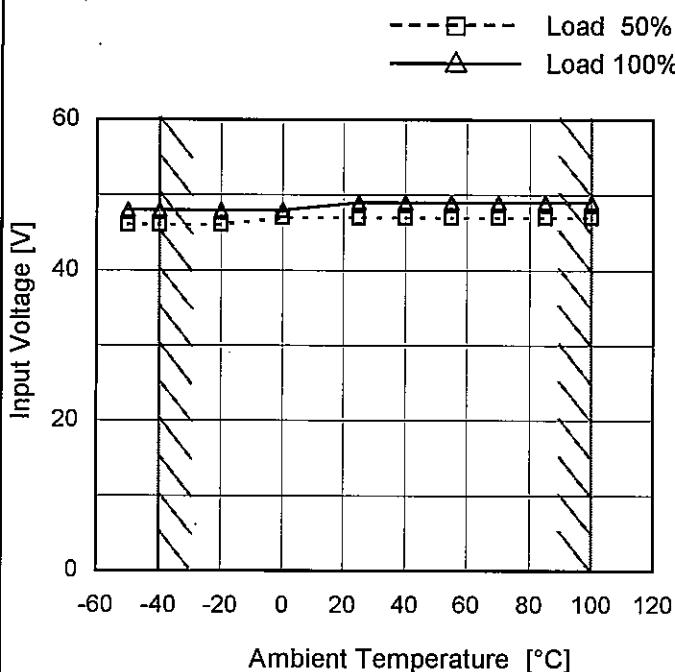
COSEL

Model	DHS50A15	Temperature	25°C																						
Item	Time Lapse Drift	Testing Circuitry	Figure A																						
Object	+15V3.4A																								
1. Graph			2. Values																						
 <p>Output Voltage [V]</p> <p>Time [H]</p> <p>Input Volt. 110V 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>15.012</td></tr> <tr><td>0.5</td><td>15.012</td></tr> <tr><td>1.0</td><td>15.012</td></tr> <tr><td>2.0</td><td>15.012</td></tr> <tr><td>3.0</td><td>15.012</td></tr> <tr><td>4.0</td><td>15.012</td></tr> <tr><td>5.0</td><td>15.012</td></tr> <tr><td>6.0</td><td>15.012</td></tr> <tr><td>7.0</td><td>15.012</td></tr> <tr><td>8.0</td><td>15.012</td></tr> </tbody> </table>	Time since start [H]	Output Voltage [V]	0.0	15.012	0.5	15.012	1.0	15.012	2.0	15.012	3.0	15.012	4.0	15.012	5.0	15.012	6.0	15.012	7.0	15.012	8.0	15.012
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7.0	15.012																								
8.0	15.012																								

COSEL

Model	DHS50A15
Item	Minimum Input Voltage for Regulated Output Voltage
Object	+15V3.4A

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	46	48
-40	46	48
-20	46	48
0	47	48
25	47	49
40	47	49
55	47	49
70	47	49
85	47	49
100	47	49
--	-	-

Model	DHS50A15	Temperature	25°C																																																											
Item	Overcurrent Protection	Testing Circuitry	Figure A																																																											
Object	+15V3.4A																																																													
1.Graph	<p>Input Volt. 60V Input Volt. 110V Input Volt. 160V</p>																																																													
	<p>2.Values</p> <table border="1"> <thead> <tr> <th rowspan="2">Output Voltage [V]</th> <th colspan="3">Load Current [A]</th> </tr> <tr> <th>Input Volt. 60[V]</th> <th>Input Volt. 110[V]</th> <th>Input Volt. 160[V]</th> </tr> </thead> <tbody> <tr><td>15.0</td><td>3.42</td><td>3.42</td><td>3.42</td></tr> <tr><td>14.3</td><td>4.36</td><td>4.56</td><td>4.66</td></tr> <tr><td>13.5</td><td>4.38</td><td>4.57</td><td>4.67</td></tr> <tr><td>12.0</td><td>4.43</td><td>4.58</td><td>4.67</td></tr> <tr><td>10.5</td><td>4.46</td><td>4.70</td><td>4.62</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> <tr><td>--</td><td>-</td><td>-</td><td>-</td></tr> </tbody> </table>			Output Voltage [V]	Load Current [A]			Input Volt. 60[V]	Input Volt. 110[V]	Input Volt. 160[V]	15.0	3.42	3.42	3.42	14.3	4.36	4.56	4.66	13.5	4.38	4.57	4.67	12.0	4.43	4.58	4.67	10.5	4.46	4.70	4.62	--	-	-	-	--	-	-	-	--	-	-	-	--	-	-	-	--	-	-	-	--	-	-	-	--	-	-	-	--	-	-	-
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	<p>Note: Slanted line shows the range of the rated load current.</p> <p>Intermittent operation occurs when the output voltage is from 10V to 0V.</p>																																																													

Model	DHS50A15
Item	Overvoltage Protection
Object	+15V3.4A

1. Graph

Ambient Temperature [°C]	Input Volt. 60[V]	Input Volt. 160[V]
-50	18.34	18.34
-40	18.41	18.48
-20	18.69	18.69
0	18.97	18.97
25	19.25	19.32
40	19.46	19.46
55	19.67	19.67
70	19.88	19.88
85	20.02	20.02
100	20.23	20.23
--	-	-

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. 60[V]	Input Volt. 160[V]
-50	18.34	18.34
-40	18.41	18.48
-20	18.69	18.69
0	18.97	18.97
25	19.25	19.32
40	19.46	19.46
55	19.67	19.67
70	19.88	19.88
85	20.02	20.02
100	20.23	20.23
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COSEL

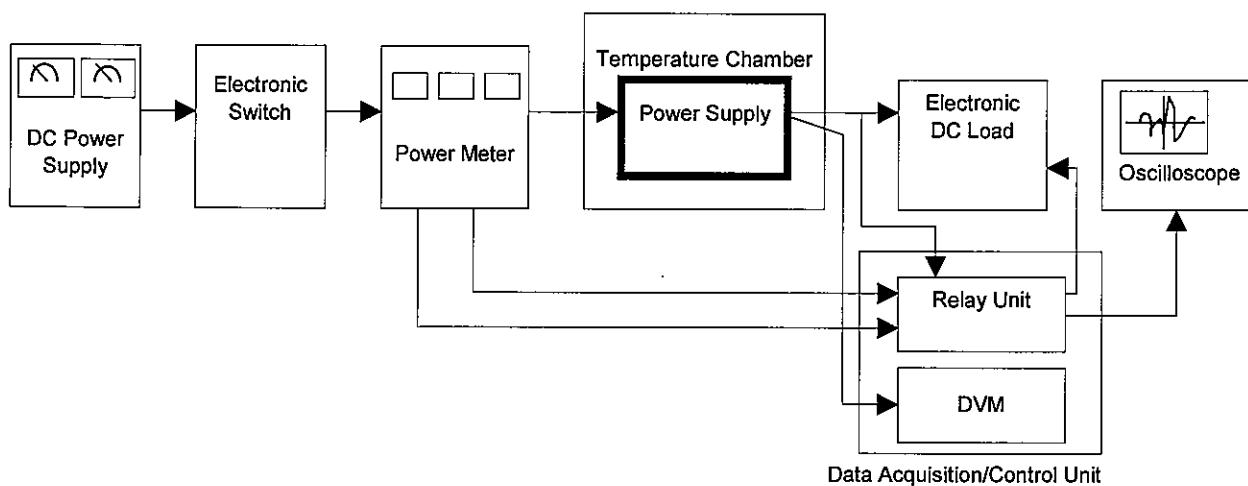
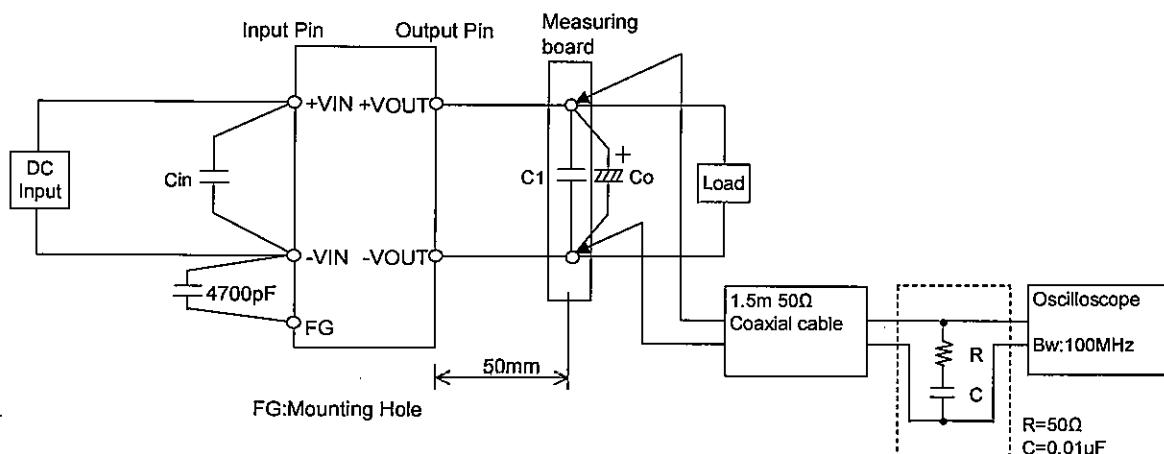


Figure A



C1 : DHS50A24 4.7 μF
 Others 10 μF
 Co : DHS50A05 2200 μF
 DHS50A12 470 μF
 DHS50A15 470 μF
 DHS50A24 220 μF

Figure B