

TEST DATA OF SNDHS200A15

Regulated DC Power Supply
April 10, 2012

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Tadashi Arai Design Engineer

COSEL CO.,LTD.

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(Final Page 19)

Model	SNDHS200A15																																																																																	
Item	Input Current (by Input Voltage)	Temperature	25°C																																																																															
Object	+15V13.4A	Testing Circuitry	Figure A																																																																															
1.Graph		2.Values																																																																																
<div><div><div>—△—</div><div>Load 100%</div></div><div><div>---□---</div><div>Load 50%</div></div><div><div>---○---</div><div>Load 0%</div></div></div> <p>Note: Slanted line shows the range of the rated input voltage.</p>		<table><tr><th rowspan="2">Input Voltage [V]</th><th colspan="3">Input Current [A]</th></tr><tr><th>Load 0%</th><th>Load 50%</th><th>Load 100%</th></tr><tr><td>0</td><td>0.000</td><td>0.000</td><td>0.000</td></tr><tr><td>40</td><td>0.009</td><td>0.008</td><td>0.008</td></tr><tr><td>50</td><td>0.005</td><td>0.005</td><td>0.005</td></tr><tr><td>55</td><td>0.004</td><td>0.004</td><td>0.004</td></tr><tr><td>56</td><td>0.022</td><td>2.056</td><td>4.050</td></tr><tr><td>60</td><td>0.019</td><td>1.900</td><td>3.914</td></tr><tr><td>66</td><td>0.017</td><td>1.715</td><td>3.502</td></tr><tr><td>80</td><td>0.015</td><td>1.421</td><td>2.883</td></tr><tr><td>95</td><td>0.013</td><td>1.201</td><td>2.422</td></tr><tr><td>110</td><td>0.011</td><td>1.043</td><td>2.110</td></tr><tr><td>125</td><td>0.011</td><td>0.923</td><td>1.847</td></tr><tr><td>140</td><td>0.010</td><td>0.829</td><td>1.649</td></tr><tr><td>160</td><td>0.008</td><td>0.733</td><td>1.461</td></tr><tr><td>170</td><td>0.007</td><td>0.694</td><td>1.381</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></table>		Input Voltage [V]	Input Current [A]			Load 0%	Load 50%	Load 100%	0	0.000	0.000	0.000	40	0.009	0.008	0.008	50	0.005	0.005	0.005	55	0.004	0.004	0.004	56	0.022	2.056	4.050	60	0.019	1.900	3.914	66	0.017	1.715	3.502	80	0.015	1.421	2.883	95	0.013	1.201	2.422	110	0.011	1.043	2.110	125	0.011	0.923	1.847	140	0.010	0.829	1.649	160	0.008	0.733	1.461	170	0.007	0.694	1.381	--	-	-	-	--	-	-	-	--	-	-	-	--	-	-	-
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COSEL

Model

SNDHS200A15

Item

Input Current (by Load Current)

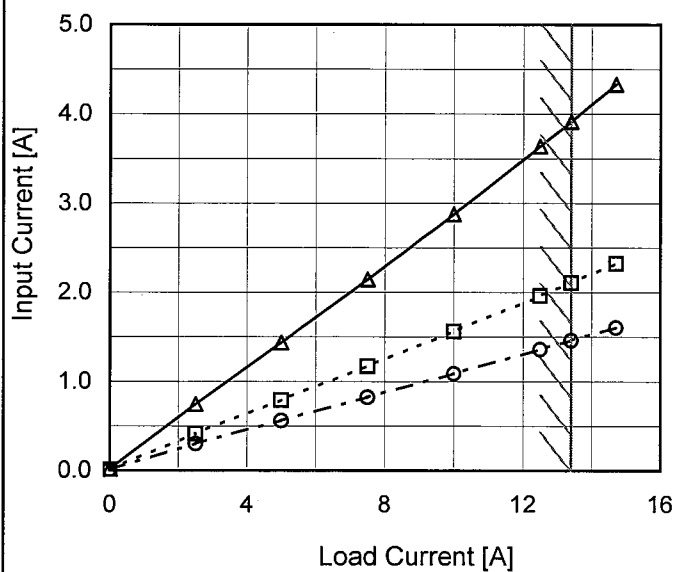
Object

+15V13.4A

Temperature
Testing Circuitry25°C
Figure A

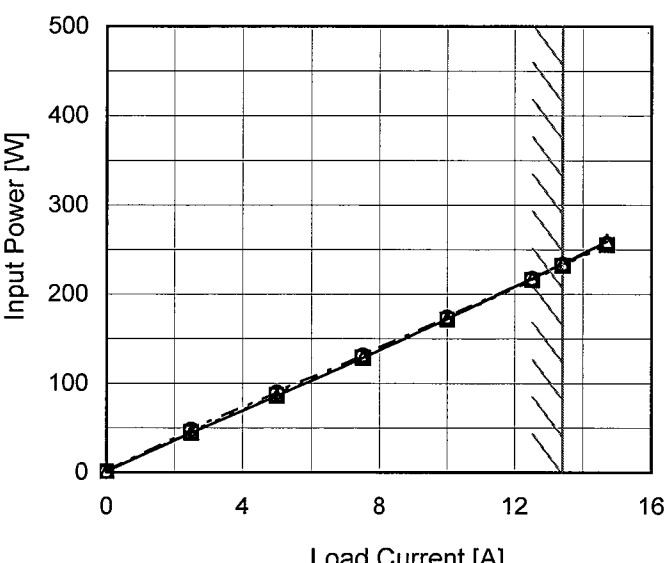
1. Graph

—△— Input Volt. 60V
 ---□--- Input Volt. 110V
 ---○--- Input Volt. 160V



2. Values

Load Current [A]	Input Current [A]		
	Input Volt. 60[V]	Input Volt. 110[V]	Input Volt. 160[V]
0.0	0.019	0.011	0.008
2.5	0.746	0.412	0.300
5.0	1.436	0.790	0.562
7.5	2.146	1.172	0.822
10.0	2.878	1.562	1.089
12.5	3.638	1.962	1.361
13.4	3.914	2.110	1.461
14.7	4.332	2.324	1.606
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Model		SNDHS200A15		Temperature 25°C																																																				
Item		Input Power (by Load Current)		Testing Circuitry Figure A																																																				
Object		+15V13.4A																																																						
1.Graph		<div><div><div>—△—</div><div>Input Volt.</div><div>60V</div></div><div><div>---□---</div><div>Input Volt.</div><div>110V</div></div><div><div>-·-○-·-</div><div>Input Volt.</div><div>160V</div></div></div> <div><p>Input Power [W]</p><p>Load Current [A]</p></div> <div>Note: Slanted line shows the range of the rated load current.</div>		2.Values																																																				
		<table><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><tr><td>0.0</td><td>1.2</td><td>1.2</td><td>1.2</td></tr><tr><td>2.5</td><td>44.7</td><td>45.3</td><td>48.0</td></tr><tr><td>5.0</td><td>86.0</td><td>86.8</td><td>89.8</td></tr><tr><td>7.5</td><td>128.7</td><td>128.8</td><td>131.4</td></tr><tr><td>10.0</td><td>172.5</td><td>171.6</td><td>174.1</td></tr><tr><td>12.5</td><td>217.8</td><td>215.7</td><td>217.7</td></tr><tr><td>13.4</td><td>234.7</td><td>231.9</td><td>233.5</td></tr><tr><td>14.7</td><td>259.5</td><td>255.3</td><td>256.7</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]	Input Power [W]			Input Volt. 60[V]	Input Volt. 110[V]	Input Volt. 160[V]	0.0	1.2	1.2	1.2	2.5	44.7	45.3	48.0	5.0	86.0	86.8	89.8	7.5	128.7	128.8	131.4	10.0	172.5	171.6	174.1	12.5	217.8	215.7	217.7	13.4	234.7	231.9	233.5	14.7	259.5	255.3	256.7	--	-	-	-	--	-	-	-	--	-	-	-
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- 3 -

BC-10646

COSEL

Model

SNDHS200A15

Item

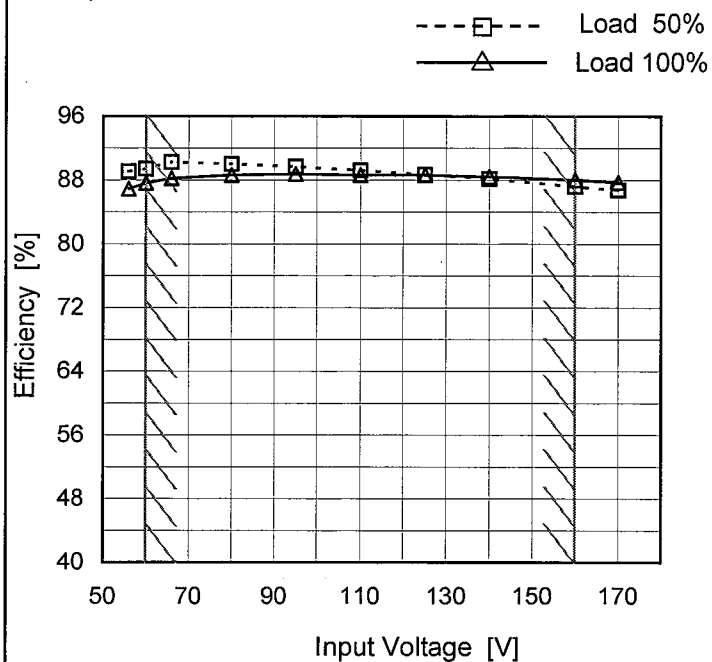
Efficiency (by Input Voltage)

Object

+15V13.4A

Temperature
Testing Circuitry25°C
Figure A

1. Graph



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

2. Values

Input Voltage [V]	Efficiency [%]	
	Load 50%	Load 100%
56	89.1	86.9
66	89.4	87.6
80	90.2	88.2
95	90.0	88.6
110	89.7	88.8
125	89.2	88.6
140	88.7	88.6
160	88.1	88.5
170	87.2	88.0

Model	SNDHS200A15																																																		
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<div><div><div>—△— Input Volt. 60V</div><div>---□--- Input Volt. 110V</div><div>---○--- Input Volt. 160V</div></div><table><thead><tr><th>Load Current [A]</th><th>Input Volt. 60[V]</th><th>Input Volt. 110[V]</th><th>Input Volt. 160[V]</th></tr></thead><tbody><tr><td>0.0</td><td>-</td><td>-</td><td>-</td></tr><tr><td>2.5</td><td>85.8</td><td>84.8</td><td>80.0</td></tr><tr><td>5.0</td><td>89.2</td><td>88.4</td><td>85.5</td></tr><tr><td>7.5</td><td>89.4</td><td>89.3</td><td>87.6</td></tr><tr><td>10.0</td><td>88.9</td><td>89.4</td><td>88.1</td></tr><tr><td>12.5</td><td>88.0</td><td>88.9</td><td>88.0</td></tr><tr><td>13.4</td><td>87.5</td><td>88.6</td><td>88.0</td></tr><tr><td>14.7</td><td>86.9</td><td>88.3</td><td>87.8</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></div>		Load Current [A]	Input Volt. 60[V]	Input Volt. 110[V]	Input Volt. 160[V]	0.0	-	-	-	2.5	85.8	84.8	80.0	5.0	89.2	88.4	85.5	7.5	89.4	89.3	87.6	10.0	88.9	89.4	88.1	12.5	88.0	88.9	88.0	13.4	87.5	88.6	88.0	14.7	86.9	88.3	87.8	--	-	-	-	--	-	-	-	--	-	-	-		
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<div><div><div>—△—</div><div>Input Volt.</div><div>60V</div></div><div><div>---□---</div><div>Input Volt.</div><div>110V</div></div><div><div>---○---</div><div>Input Volt.</div><div>160V</div></div></div> <div>Output Voltage [V]</div> <div>Load Current [A]</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. 60[V]</th><th>Input Volt. 110[V]</th><th>Input Volt. 160[V]</th></tr><tr><td>0.0</td><td>15.329</td><td>15.329</td><td>15.328</td></tr><tr><td>2.5</td><td>15.327</td><td>15.327</td><td>15.327</td></tr><tr><td>5.0</td><td>15.326</td><td>15.326</td><td>15.326</td></tr><tr><td>7.5</td><td>15.325</td><td>15.325</td><td>15.325</td></tr><tr><td>10.0</td><td>15.324</td><td>15.324</td><td>15.324</td></tr><tr><td>12.5</td><td>15.323</td><td>15.324</td><td>15.324</td></tr><tr><td>13.4</td><td>15.324</td><td>15.324</td><td>15.323</td></tr><tr><td>14.7</td><td>15.324</td><td>15.323</td><td>15.324</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. 60[V]	Input Volt. 110[V]	Input Volt. 160[V]	0.0	15.329	15.329	15.328	2.5	15.327	15.327	15.327	5.0	15.326	15.326	15.326	7.5	15.325	15.325	15.325	10.0	15.324	15.324	15.324	12.5	15.323	15.324	15.324	13.4	15.324	15.324	15.323	14.7	15.324	15.323	15.324	--	-	-	-	--	-	-	-	--	-	-	-
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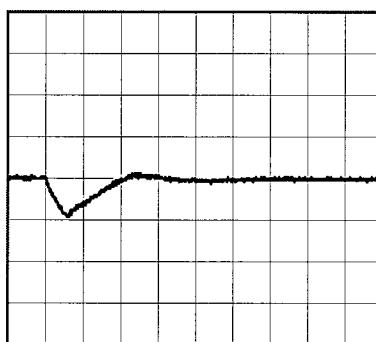
Model	SNDHS200A15	Temperature 25°C Testing Circuitry Figure A
Item	Dynamic Load Response	
Object	+15V/13.4A	

Input Volt. 110 V
Cycle 1000 ms

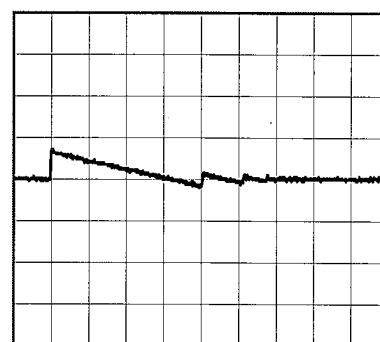
Load Current 13.4A/50 μ s

Min. Load (0A) \longleftrightarrow
Load 100% (13.4A)

1 V/div



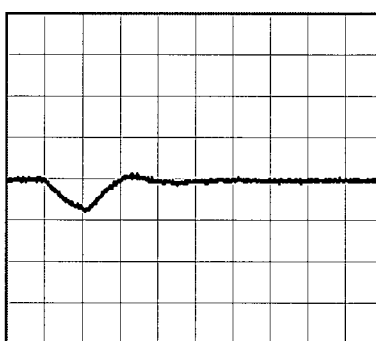
400 μ s/div



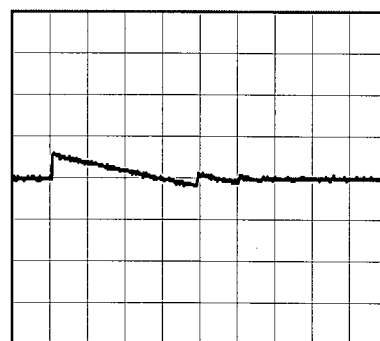
40ms/div

Min. Load (0A) \longleftrightarrow
Load 50% (6.7A)

1 V/div



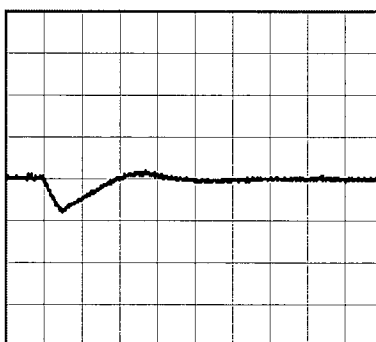
400 μ s/div



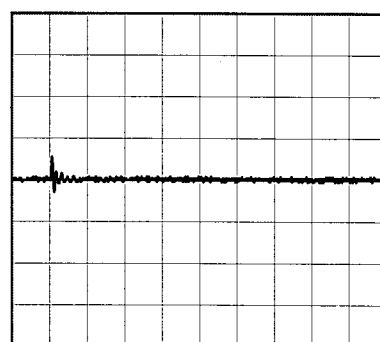
40ms/div

Load 10% (1.34A) \longleftrightarrow
Load 100% (13.4A)

1 V/div



400 μ s/div

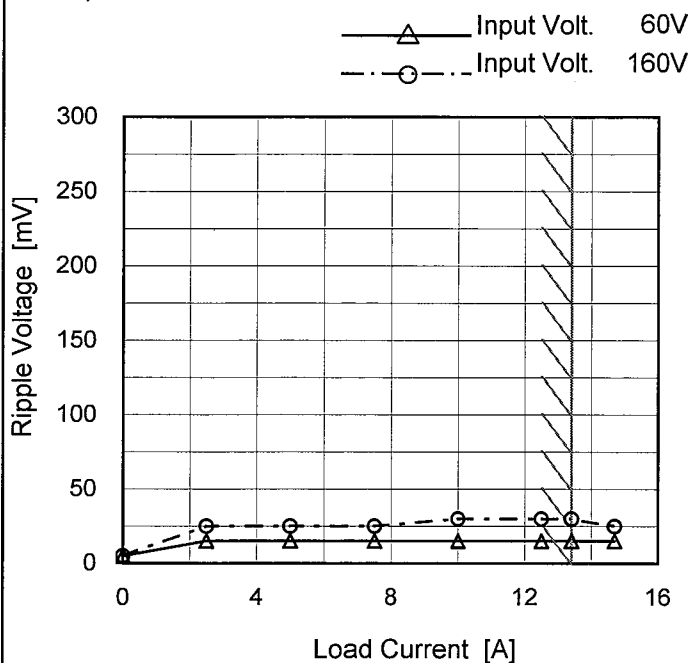


40ms/div

Model	SNDHS200A15
Item	Ripple Voltage (by Load Current)
Object	+15V13.4A

Temperature 25°C
Testing Circuitry Figure B

1.Graph



2.Values

Load Current [A]	Ripple Voltage [mV]	
	Input Volt. 60 [V]	Input Volt. 160 [V]
0.0	5	5
2.5	15	25
5.0	15	25
7.5	15	25
10.0	15	30
12.5	15	30
13.4	15	30
14.7	15	25
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--	-	-
--	-	-

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.

Ripple [mVp-p]

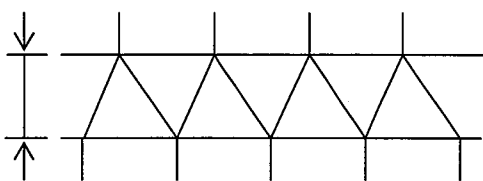


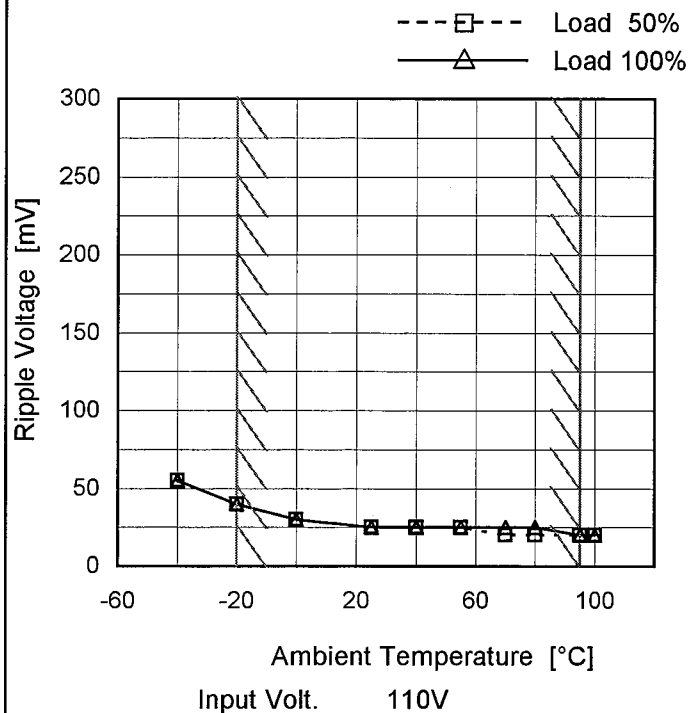
Fig.Complex Ripple Wave Form

Model		SNDHS200A15		Temperature		25°C																																							
Item		Ripple-Noise		Testing Circuitry		Figure B																																							
Object		+15V13.4A																																											
1.Graph				2.Values																																									
<div><div><div><div><div></div><div>△</div></div><div>Input Volt.</div><div>60V</div></div><div><div><div></div><div>○</div></div><div>Input Volt.</div><div>160V</div></div></div><div><p>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.</p></div></div>				<table><tr><th rowspan="2">Load Current [A]</th><th colspan="2">Ripple-Noise [mV]</th></tr><tr><th>Input Volt. 60 [V]</th><th>Input Volt. 160 [V]</th></tr><tr><td>0.0</td><td>5</td><td>15</td></tr><tr><td>2.5</td><td>15</td><td>30</td></tr><tr><td>5.0</td><td>20</td><td>35</td></tr><tr><td>7.5</td><td>20</td><td>35</td></tr><tr><td>10.0</td><td>20</td><td>35</td></tr><tr><td>12.5</td><td>20</td><td>35</td></tr><tr><td>13.4</td><td>20</td><td>35</td></tr><tr><td>14.7</td><td>20</td><td>35</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></table>				Load Current [A]	Ripple-Noise [mV]		Input Volt. 60 [V]	Input Volt. 160 [V]	0.0	5	15	2.5	15	30	5.0	20	35	7.5	20	35	10.0	20	35	12.5	20	35	13.4	20	35	14.7	20	35	--	-	-	--	-	-	--	-	-
Load Current [A]	Ripple-Noise [mV]																																												
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14.7	20	35																																											
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<div><div><div><div></div><div>↓</div></div><div>Ripple Noise[mVp-p]</div><div><div></div><div>↑</div></div><div></div></div><div>Fig.Complex Ripple Noise Wave Form</div></div>																																													

Model	SNDHS200A15
Item	Ripple Voltage (by Ambient Temp.)
Object	+15V13.4A

Testing Circuitry Figure B

1. Graph



Measured by 100 MHz Oscilloscope.

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

Ripple [mVp-p]

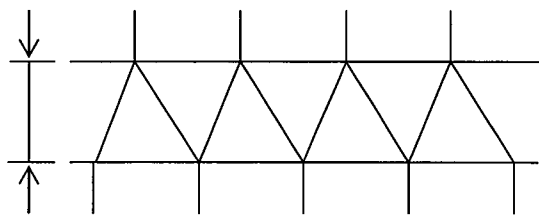


Fig. Complex Ripple Wave Form

2. Values

Ambient Temperature [°C]	Ripple Voltage [mV]	
	Load 50%	Load 100%
-40	55	55
-20	40	40
0	30	30
25	25	25
40	25	25
55	25	25
70	20	25
80	20	25
95	20	20
100	20	20
--	-	-

Model		SNDHS200A15																																																				
Item		Ambient Temperature Drift																																																				
Object		+15V13.4A																																																				
1.Graph		2.Values																																																				
<div><div><div>—△—</div><div>Input Volt.</div><div>60V</div></div><div><div>---□---</div><div>Input Volt.</div><div>110V</div></div><div><div>---○---</div><div>Input Volt.</div><div>160V</div></div></div> <div><p>Output Voltage [V]</p><p>Ambient Temperature [°C]</p><p>Load 100%</p></div>		<table><tr><th rowspan="2">Ambient Temperature [°C]</th><th colspan="3">Output Voltage [V]</th></tr><tr><th>Input Volt. 60[V]</th><th>Input Volt. 110[V]</th><th>Input Volt. 160[V]</th></tr><tr><td>-40</td><td>15.253</td><td>15.254</td><td>15.255</td></tr><tr><td>-20</td><td>15.281</td><td>15.281</td><td>15.282</td></tr><tr><td>0</td><td>15.300</td><td>15.301</td><td>15.301</td></tr><tr><td>25</td><td>15.314</td><td>15.314</td><td>15.314</td></tr><tr><td>40</td><td>15.318</td><td>15.319</td><td>15.318</td></tr><tr><td>55</td><td>15.321</td><td>15.321</td><td>15.321</td></tr><tr><td>70</td><td>15.324</td><td>15.324</td><td>15.324</td></tr><tr><td>80</td><td>15.326</td><td>15.326</td><td>15.326</td></tr><tr><td>95</td><td>15.328</td><td>15.328</td><td>15.328</td></tr><tr><td>100</td><td>15.331</td><td>15.331</td><td>15.331</td></tr><tr><td>--</td><td>-</td><td>-</td><td>-</td></tr></table>		Ambient Temperature [°C]	Output Voltage [V]			Input Volt. 60[V]	Input Volt. 110[V]	Input Volt. 160[V]	-40	15.253	15.254	15.255	-20	15.281	15.281	15.282	0	15.300	15.301	15.301	25	15.314	15.314	15.314	40	15.318	15.319	15.318	55	15.321	15.321	15.321	70	15.324	15.324	15.324	80	15.326	15.326	15.326	95	15.328	15.328	15.328	100	15.331	15.331	15.331	--	-	-	-
Ambient Temperature [°C]	Output Voltage [V]																																																					
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Note: Slanted line shows the range of the rated ambient temperature.																																																						

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BC-10646



		Testing Circuitry Figure A
Model	SNDHS200A15	
Item	Output Voltage Accuracy	
Object	+15V13.4A	

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 : -20 - 95°C

Input Voltage : 60 - 160V

Load Current : 0 - 13.4A

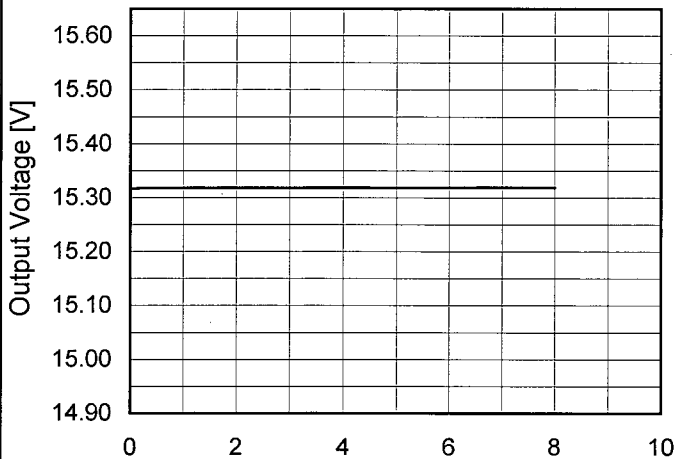
* Output Voltage Accuracy = $\pm(\text{Maximum of Output Voltage} - \text{Minimum of Output Voltage}) / 2$

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

2. Values

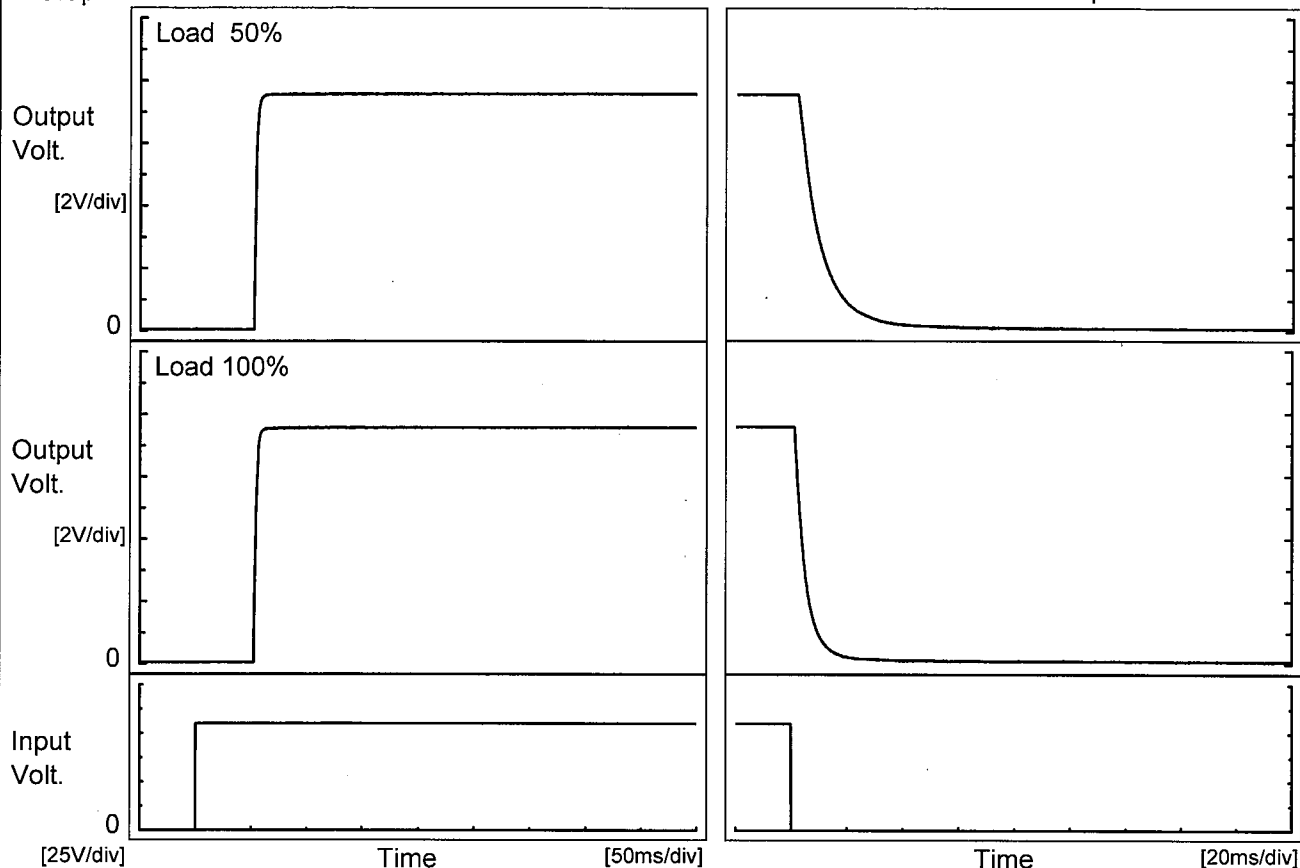
Item	Temperature [°C]	Input Voltage[V]	Output		Output Voltage Accuracy	
			Current[A]	Voltage[V]	Value [mV]	Ration [%]
Maximum Voltage	95	60	0	15.339	±29	±0.2
Minimum Voltage	-20	60	13.4	15.281		

COSEL

Model	SNDHS200A15																								
Item	Time Lapse Drift	Temperature	25°C																						
Object	+15V13.4A	Testing Circuitry	Figure A																						
1.Graph		2.Values																							
<div><p>Output Voltage [V]</p><p>Time [H]</p><p>Input Volt. 110V</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>15.317</td></tr><tr><td>0.5</td><td>15.318</td></tr><tr><td>1.0</td><td>15.318</td></tr><tr><td>2.0</td><td>15.319</td></tr><tr><td>3.0</td><td>15.318</td></tr><tr><td>4.0</td><td>15.319</td></tr><tr><td>5.0</td><td>15.319</td></tr><tr><td>6.0</td><td>15.319</td></tr><tr><td>7.0</td><td>15.319</td></tr><tr><td>8.0</td><td>15.319</td></tr></table>		Time since start [H]	Output Voltage [V]	0.0	15.317	0.5	15.318	1.0	15.318	2.0	15.319	3.0	15.318	4.0	15.319	5.0	15.319	6.0	15.319	7.0	15.319	8.0	15.319
Time since start [H]	Output Voltage [V]																								
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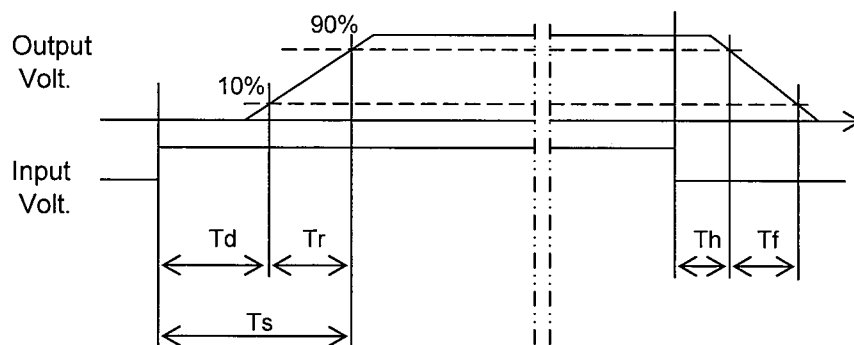
Model	SNDHS200A15	Temperature	25°C
Item	Rise and Fall Time	Testing Circuitry	Figure A
Object	+15V13.4A		

1. Graph



2. Values

Load \ Time	Td	Tr	Ts	Th	Tf
50 %	52.5	3.3	55.8	3.3	18.8
100 %	52.5	3.8	56.3	1.6	9.6



Model		SNDHS200A15	
Item		Minimum Input Voltage for Regulated Output Voltage	
Object		+15V13.4A	
1.Graph		2.Values	

COSEL

Model	SNDHS200A15																																																													
Item	Overcurrent Protection	Temperature	25°C																																																											
Object	+15V13.4A	Testing Circuitry	Figure A																																																											
1.Graph		2.Values																																																												
<div><div><div></div>Input Volt. 60V</div><div><div></div>Input Volt. 110V</div><div><div></div>Input Volt. 160V</div></div> <p>Note: Slanted line shows the range of the rated load current.</p> <p>Intermittent operation occurs when overcurrent protection is activated.</p> <p>Intermittent operation occurs when the output voltage is from 9V to 0V.</p>		<table><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><tr><td>14.3</td><td>16.71</td><td>16.82</td><td>17.12</td></tr><tr><td>13.5</td><td>16.67</td><td>17.34</td><td>17.21</td></tr><tr><td>12.0</td><td>16.99</td><td>17.91</td><td>17.67</td></tr><tr><td>10.5</td><td>17.68</td><td>17.72</td><td>18.35</td></tr><tr><td>9.0</td><td>17.88</td><td>18.82</td><td>18.86</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></table>		Output Voltage [V]	Load Current [A]			Input Volt. 60[V]	Input Volt. 110[V]	Input Volt. 160[V]	14.3	16.71	16.82	17.12	13.5	16.67	17.34	17.21	12.0	16.99	17.91	17.67	10.5	17.68	17.72	18.35	9.0	17.88	18.82	18.86	--	-	-	-	--	-	-	-	--	-	-	-	--	-	-	-	--	-	-	-	--	-	-	-	--	-	-	-	--	-	-	-
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Model		SNDHS200A15	
Item		Overvoltage Protection	
Object		+15V13.4A	
1.Graph		2.Values	

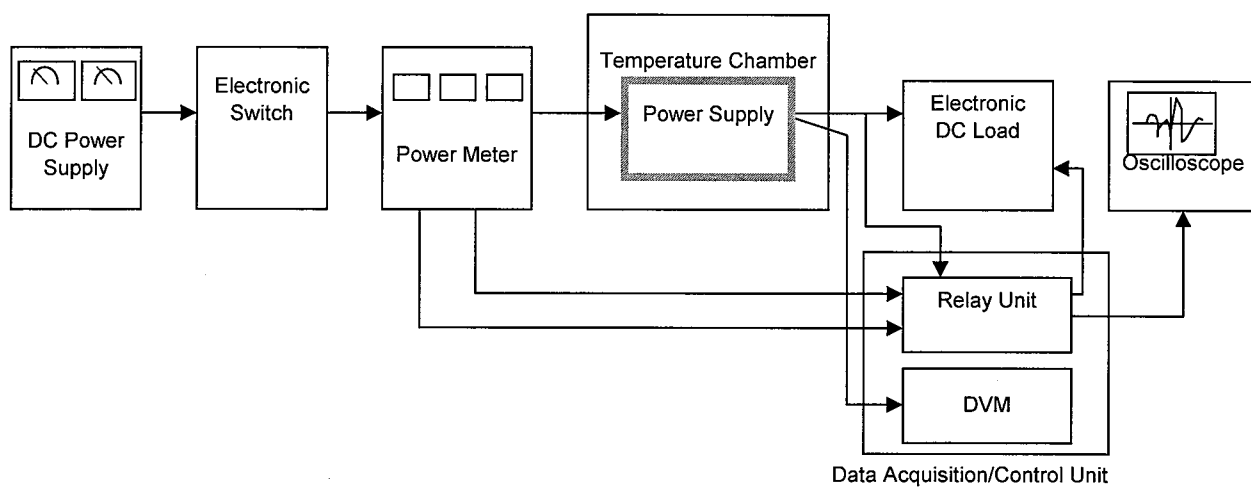


Figure A

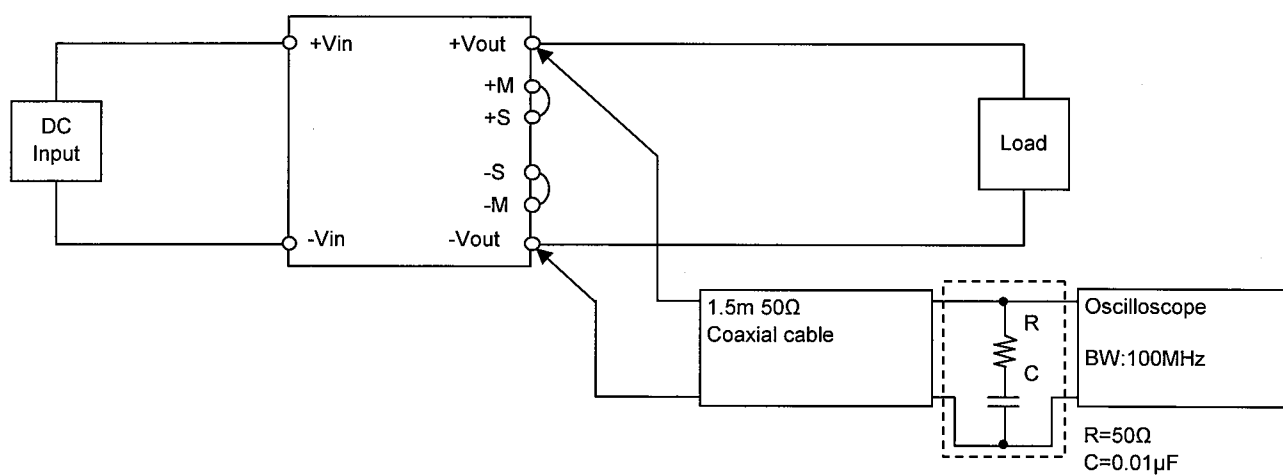


Figure B (Ripple and Ripple noise Characteristic)