



# TEST DATA OF CHS4004848

Regulated DC Power Supply  
January 25, 2019

Approved by : Takayuki Fukuda Design Manager

Prepared by : Tatsuya Nakagawa Design Engineer

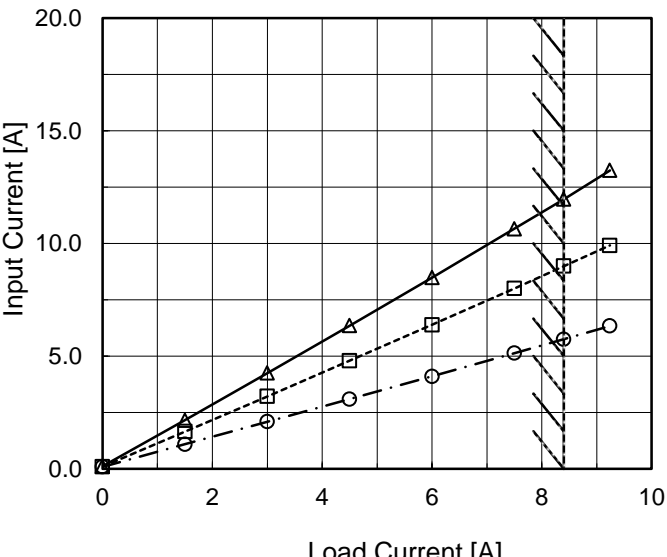
**COSEL CO.,LTD.**

## 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		CHS4004848		Temperature 25°C																																																																																
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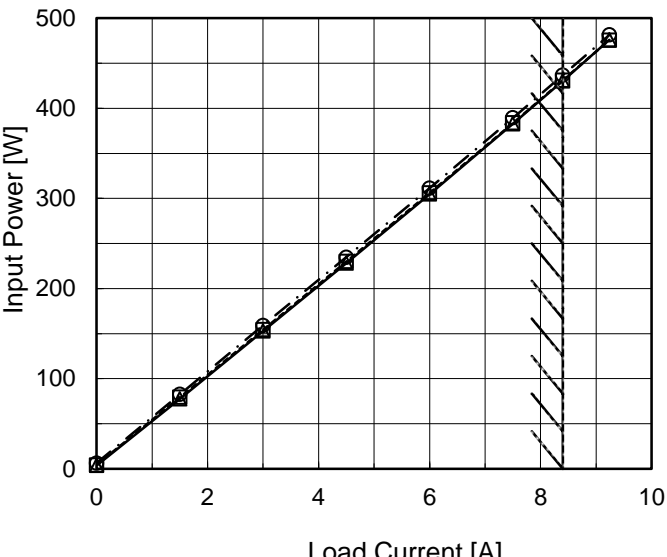
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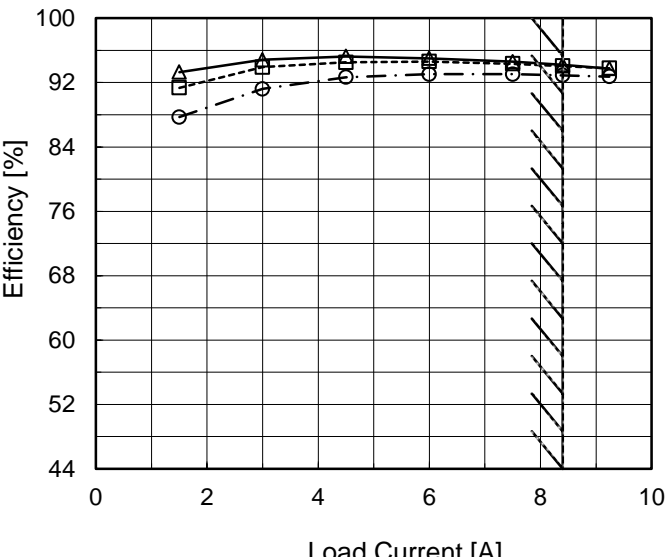
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Model		CHS4004848	Temperature Testing Circuitry	25°C Figure A
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Object		+48V8.4A		
1.Graph			2.Values	
<div><div><div><div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><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><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><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><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><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><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></d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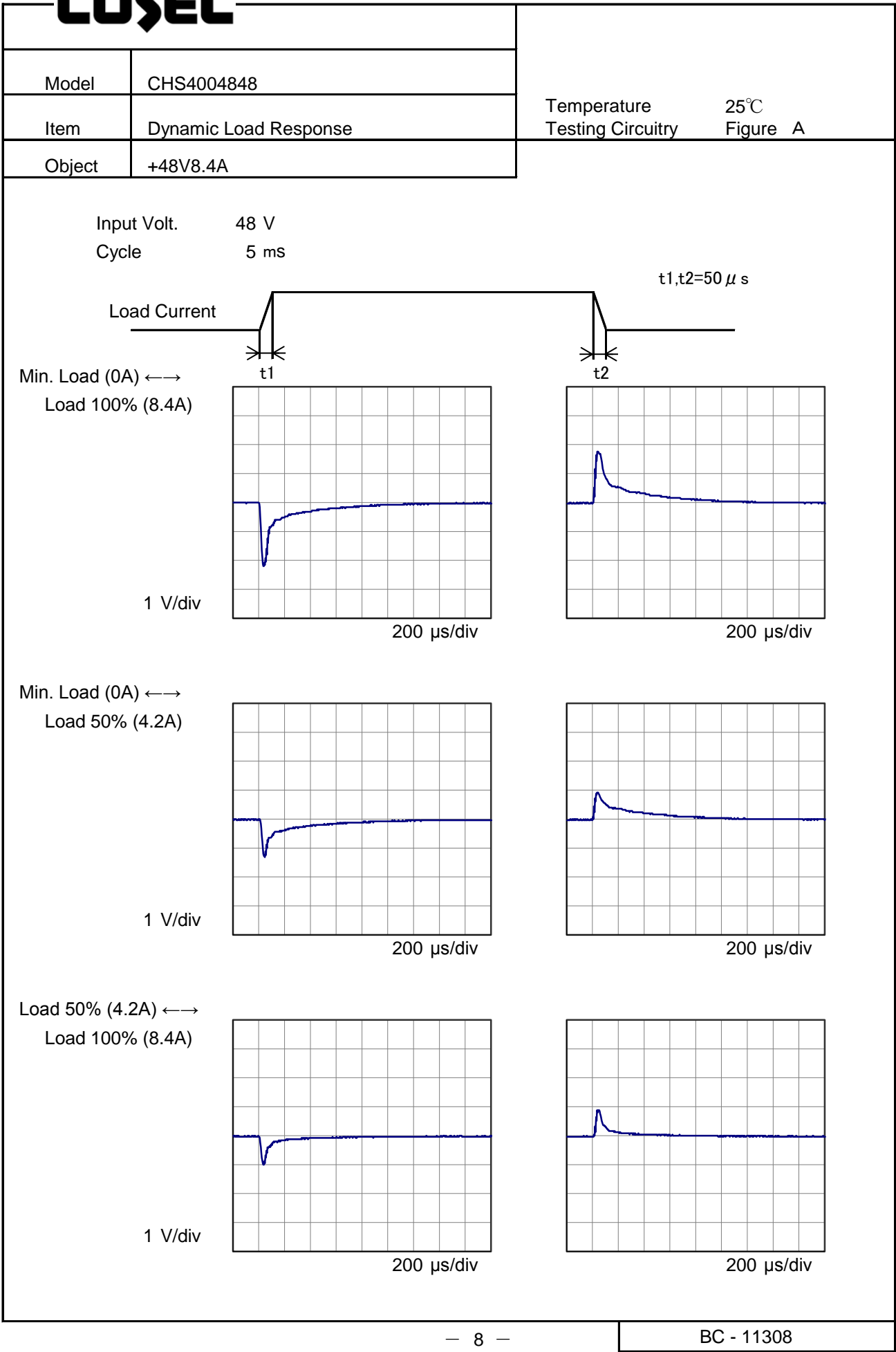
Model		CHS4004848		Temperature 25°C Testing Circuitry Figure A																																																				
Item		Load Regulation																																																						
Object		+48V8.4A																																																						
1.Graph		<div><div><div>—△—</div><div>---□---</div><div>---○---</div></div><div><div>Input Volt.</div><div>Input Volt.</div><div>Input Volt.</div></div><div><div>36V</div><div>48V</div><div>76V</div></div></div> <div><div><div>Output Voltage [V]</div><div><div>48.60</div><div>48.50</div><div>48.40</div><div>48.30</div><div>48.20</div><div>48.10</div><div>48.00</div><div>47.90</div></div><div><div>0</div><div>2</div><div>4</div><div>6</div><div>8</div><div>10</div></div><div>Load Current [A]</div></div></div> <td colspan="2">2.Values</td>		2.Values																																																				
		<table><tr><th rowspan="2">Load Current [A]</th><th colspan="3">Output Voltage [V]</th></tr><tr><th>Input Volt. 36[V]</th><th>Input Volt. 48[V]</th><th>Input Volt. 76[V]</th></tr><tr><td>0.00</td><td>48.324</td><td>48.325</td><td>48.327</td></tr><tr><td>1.50</td><td>48.324</td><td>48.325</td><td>48.327</td></tr><tr><td>3.00</td><td>48.323</td><td>48.324</td><td>48.326</td></tr><tr><td>4.50</td><td>48.323</td><td>48.324</td><td>48.326</td></tr><tr><td>6.00</td><td>48.323</td><td>48.324</td><td>48.326</td></tr><tr><td>7.50</td><td>48.322</td><td>48.323</td><td>48.325</td></tr><tr><td>8.40</td><td>48.322</td><td>48.323</td><td>48.325</td></tr><tr><td>9.24</td><td>48.322</td><td>48.323</td><td>48.325</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. 36[V]	Input Volt. 48[V]	Input Volt. 76[V]	0.00	48.324	48.325	48.327	1.50	48.324	48.325	48.327	3.00	48.323	48.324	48.326	4.50	48.323	48.324	48.326	6.00	48.323	48.324	48.326	7.50	48.322	48.323	48.325	8.40	48.322	48.323	48.325	9.24	48.322	48.323	48.325	--	-	-	-	--	-	-	-	--	-	-	-
Load Current [A]	Output Voltage [V]																																																							
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6.00	48.323	48.324	48.326																																																					
7.50	48.322	48.323	48.325																																																					
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Note: Slanted line shows the range of the rated load current.																																																								

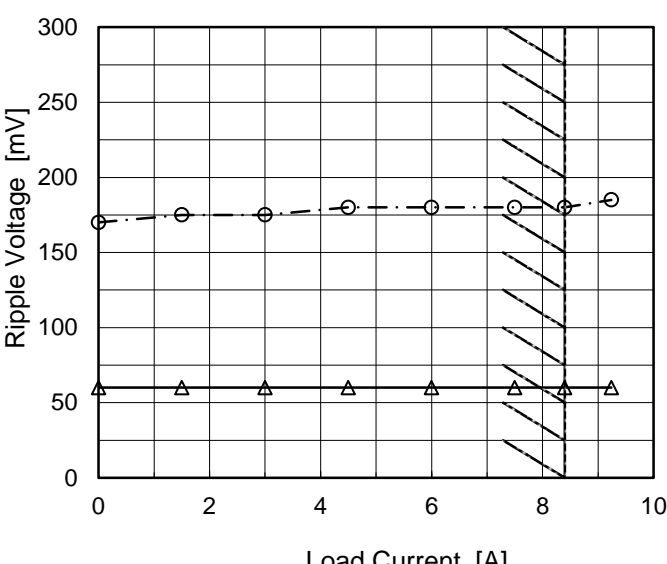
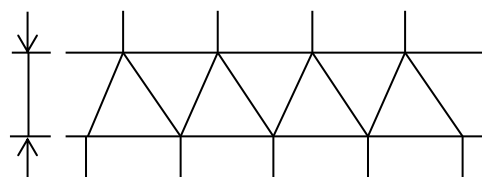
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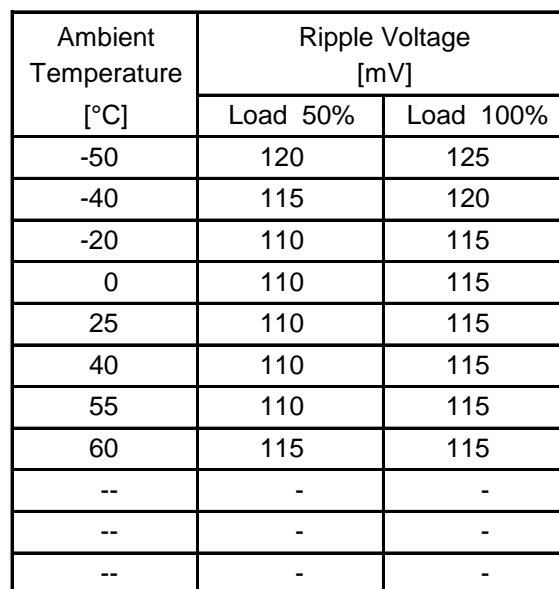


Model		CHS4004848		Temperature 25°C																																							
Item		Ripple Voltage (by Load Current)		Testing Circuitry Figure B																																							
Object		+48V8.4A																																									
1.Graph				2.Values																																							
<div><div><div><div><div></div><div>—△—</div><div>Input Volt.</div><div>36V</div></div><div><div>-·-○-·-</div><div>Input Volt.</div><div>76V</div></div></div><div></div></div></div>				<table><tr><th rowspan="2">Load Current [A]</th><th colspan="2">Ripple Voltage [mV]</th></tr><tr><th>Input Volt. 36 [V]</th><th>Input Volt. 76 [V]</th></tr><tr><td>0.00</td><td>60</td><td>170</td></tr><tr><td>1.50</td><td>60</td><td>175</td></tr><tr><td>3.00</td><td>60</td><td>175</td></tr><tr><td>4.50</td><td>60</td><td>180</td></tr><tr><td>6.00</td><td>60</td><td>180</td></tr><tr><td>7.50</td><td>60</td><td>180</td></tr><tr><td>8.40</td><td>60</td><td>180</td></tr><tr><td>9.24</td><td>60</td><td>185</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 Voltage [mV]		Input Volt. 36 [V]	Input Volt. 76 [V]	0.00	60	170	1.50	60	175	3.00	60	175	4.50	60	180	6.00	60	180	7.50	60	180	8.40	60	180	9.24	60	185	--	-	-	--	-	-	--	-	-
Load Current [A]	Ripple Voltage [mV]																																										
	Input Volt. 36 [V]	Input Volt. 76 [V]																																									
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1.50	60	175																																									
3.00	60	175																																									
4.50	60	180																																									
6.00	60	180																																									
7.50	60	180																																									
8.40	60	180																																									
9.24	60	185																																									
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<div>Measured by 100 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>Ripple [mVp-p]</div><div></div></div> <div>Fig.Complex Ripple Wave Form</div>																																											

Model		CHS4004848																																							
Item		Ripple-Noise																																							
Object		+48V8.4A																																							
1.Graph		2.Values																																							
<div><div><div><div><div></div><div></div></div><div>Input Volt.</div><div>36V</div></div><div><div><div></div><div></div></div><div>Input Volt.</div><div>76V</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. 36 [V]</th><th>Input Volt. 76 [V]</th></tr><tr><td>0.00</td><td>85</td><td>190</td></tr><tr><td>1.50</td><td>90</td><td>190</td></tr><tr><td>3.00</td><td>90</td><td>195</td></tr><tr><td>4.50</td><td>95</td><td>200</td></tr><tr><td>6.00</td><td>95</td><td>200</td></tr><tr><td>7.50</td><td>95</td><td>200</td></tr><tr><td>8.40</td><td>95</td><td>200</td></tr><tr><td>9.24</td><td>100</td><td>205</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. 36 [V]	Input Volt. 76 [V]	0.00	85	190	1.50	90	190	3.00	90	195	4.50	95	200	6.00	95	200	7.50	95	200	8.40	95	200	9.24	100	205	--	-	-	--	-	-	--	-	-
Load Current [A]	Ripple-Noise [mV]																																								
	Input Volt. 36 [V]	Input Volt. 76 [V]																																							
0.00	85	190																																							
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<div><div><div><div></div><div></div></div><div>Ripple Noise[mVp-p]</div></div><div></div></div> <div>Fig.Complex Ripple Noise Wave Form</div>																																									

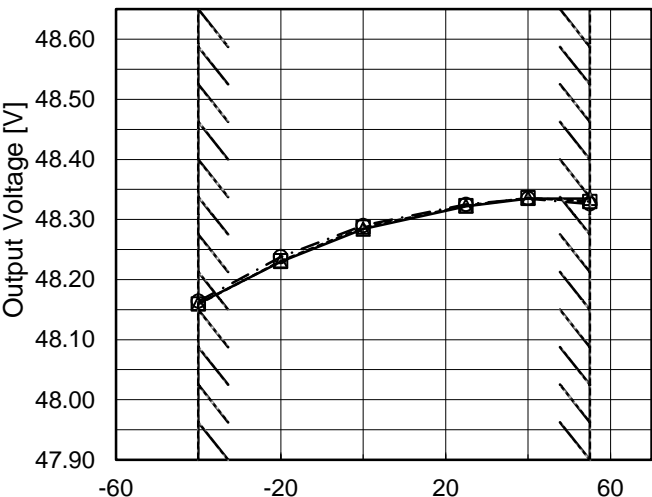
Testing Circuitry Figure B

## 2.Values



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

Fig.Complex Ripple Wave Form

Model		CHS4004848		Testing Circuitry    Figure A																																																		
Item		Ambient Temperature Drift																																																				
Object		+48V8.4A																																																				
1.Graph		<div><div><div>—△—</div><div>Input Volt.</div><div>36V</div></div><div><div>---□---</div><div>Input Volt.</div><div>48V</div></div><div><div>-·-○-·-</div><div>Input Volt.</div><div>76V</div></div></div>  <p>Output Voltage [V]</p> <p>Ambient Temperature [°C]</p> <p>Load 100%</p>		2.Values																																																		
		<table><tr><th rowspan="2">Ambient Temperature [°C]</th><th colspan="3">Output Voltage [V]</th></tr><tr><th>Input Volt. 36[V]</th><th>Input Volt. 48[V]</th><th>Input Volt. 76[V]</th></tr><tr><td>-40</td><td>48.160</td><td>48.159</td><td>48.164</td></tr><tr><td>-20</td><td>48.230</td><td>48.231</td><td>48.238</td></tr><tr><td>0</td><td>48.284</td><td>48.287</td><td>48.290</td></tr><tr><td>25</td><td>48.322</td><td>48.323</td><td>48.325</td></tr><tr><td>40</td><td>48.335</td><td>48.336</td><td>48.335</td></tr><tr><td>55</td><td>48.335</td><td>48.330</td><td>48.326</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>		Ambient Temperature [°C]	Output Voltage [V]			Input Volt. 36[V]	Input Volt. 48[V]	Input Volt. 76[V]	-40	48.160	48.159	48.164	-20	48.230	48.231	48.238	0	48.284	48.287	48.290	25	48.322	48.323	48.325	40	48.335	48.336	48.335	55	48.335	48.330	48.326	--	-	-	-	--	-	-	-	--	-	-	-	--	-	-	-	--	-	-	-
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**COSEL**

		Testing Circuitry Figure A
Model	CHS4004848	
Item	Output Voltage Accuracy	
Object	+48V8.4A	

### 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 - 55°C

Input Voltage : 36 - 76V

Load Current : 0 - 8.4A

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

\* 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	40	48	0	48.338	±90	±0.2
Minimum Voltage	-40	48	8.4	48.159		

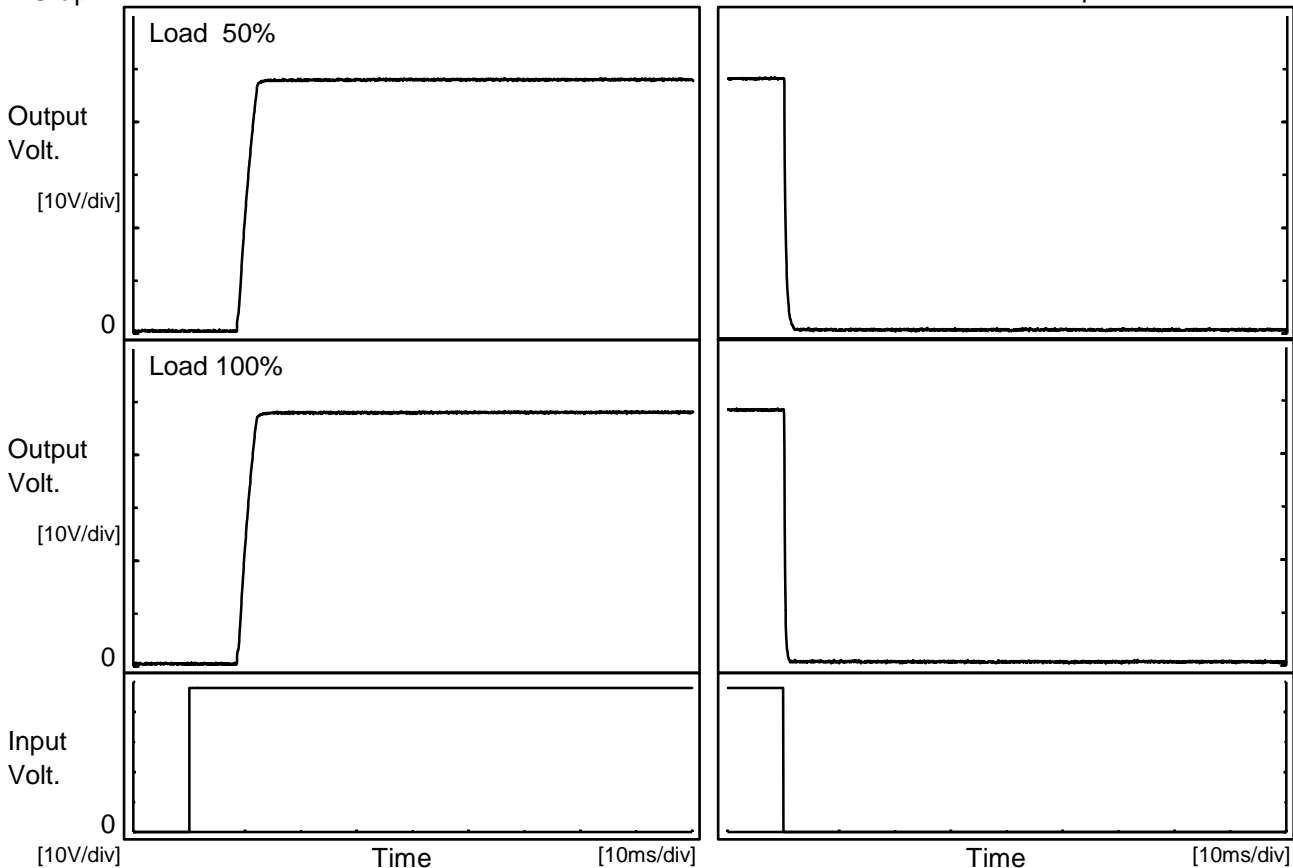


COSEL																									
Model	CHS4004848																								
Item	Time Lapse Drift	Temperature	25°C																						
Object	+48V8.4A	Testing Circuitry	Figure A																						
1.Graph		2.Values																							
<div><div><div><div>48.60</div><div>48.50</div><div>48.40</div><div>48.30</div><div>48.20</div><div>48.10</div><div>48.00</div><div>47.90</div></div><div><div>0</div><div>2</div><div>4</div><div>6</div><div>8</div><div>10</div></div></div><div><div>Output Voltage [V]</div><div>Time [H]</div></div><div><div>Input Volt.</div><div>48V</div></div><div><div>Load</div><div>100%</div></div></div>		<table><tr><th>Time since start [H]</th><th>Output Voltage [V]</th></tr><tr><td>0.0</td><td>48.340</td></tr><tr><td>0.5</td><td>48.340</td></tr><tr><td>1.0</td><td>48.340</td></tr><tr><td>2.0</td><td>48.340</td></tr><tr><td>3.0</td><td>48.340</td></tr><tr><td>4.0</td><td>48.340</td></tr><tr><td>5.0</td><td>48.340</td></tr><tr><td>6.0</td><td>48.340</td></tr><tr><td>7.0</td><td>48.340</td></tr><tr><td>8.0</td><td>48.340</td></tr></table>		Time since start [H]	Output Voltage [V]	0.0	48.340	0.5	48.340	1.0	48.340	2.0	48.340	3.0	48.340	4.0	48.340	5.0	48.340	6.0	48.340	7.0	48.340	8.0	48.340
Time since start [H]	Output Voltage [V]																								
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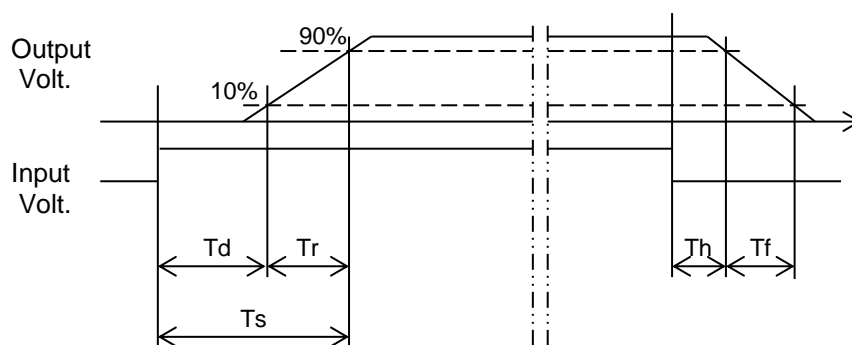
Model	CHS4004848	Temperature	25°C
Item	Rise and Fall Time	Testing Circuitry	Figure A
Object	+48V8.4A		

# 1.Graph



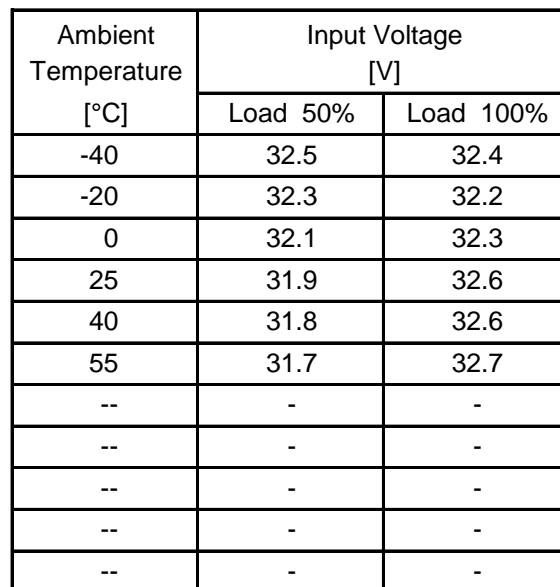
# 2.Values

Load \ Time	Td	Tr	Ts	Th	Tf
50 %	8.9	2.9	11.8	0.2	0.7
100 %	9.0	2.7	11.7	0.2	0.4



Testing Circuitry Figure A

## 2.Values



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



Model	CHS4004848																																																													
Item	Overcurrent Protection	Temperature	25°C																																																											
Object	+48V8.4A	Testing Circuitry	Figure A																																																											
1.Graph		2.Values																																																												
<div><div><div></div>Input Volt.36V</div><div><div></div>Input Volt.48V</div><div><div></div>Input Volt.76V</div></div> <p>Note: Slanted line shows the range of the rated load current.</p>		<table><tr><th rowspan="2">Output Voltage [V]</th><th colspan="3">Load Current [A]</th></tr><tr><th>Input Volt. 36[V]</th><th>Input Volt. 48[V]</th><th>Input Volt. 76[V]</th></tr><tr><td>45.6</td><td>9.77</td><td>9.76</td><td>9.67</td></tr><tr><td>43.2</td><td>9.75</td><td>9.74</td><td>9.67</td></tr><tr><td>38.4</td><td>9.75</td><td>9.73</td><td>9.70</td></tr><tr><td>33.6</td><td>9.74</td><td>9.74</td><td>9.70</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><tr><td>--</td><td>-</td><td>-</td><td>-</td></tr></table>		Output Voltage [V]	Load Current [A]			Input Volt. 36[V]	Input Volt. 48[V]	Input Volt. 76[V]	45.6	9.77	9.76	9.67	43.2	9.75	9.74	9.67	38.4	9.75	9.73	9.70	33.6	9.74	9.74	9.70	--	-	-	-	--	-	-	-	--	-	-	-	--	-	-	-	--	-	-	-	--	-	-	-	--	-	-	-	--	-	-	-	--	-	-	-
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<div><div><div>---□---</div><div>Input Volt.    48V</div></div><div><div>---○---</div><div>Input Volt.    76V</div></div></div> <div>Operating Point [V]</div> <div>Ambient Temperature [°C]</div> <div>Load 0%</div> <div>Note: Slanted line shows the range of the rated ambient temperature.</div>		<table><tr><th rowspan="2">Ambient Temperature [°C]</th><th colspan="2">Operating Point [V]</th></tr><tr><th>Input Volt. 48[V]</th><th>Input Volt. 76[V]</th></tr><tr><td>-40</td><td>55.86</td><td>55.81</td></tr><tr><td>-20</td><td>55.94</td><td>55.89</td></tr><tr><td>0</td><td>56.03</td><td>55.98</td></tr><tr><td>25</td><td>56.19</td><td>56.14</td></tr><tr><td>40</td><td>56.25</td><td>56.20</td></tr><tr><td>55</td><td>56.33</td><td>56.28</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><tr><td>--</td><td>-</td><td>-</td></tr><tr><td>--</td><td>-</td><td>-</td></tr></table>	Ambient Temperature [°C]	Operating Point [V]		Input Volt. 48[V]	Input Volt. 76[V]	-40	55.86	55.81	-20	55.94	55.89	0	56.03	55.98	25	56.19	56.14	40	56.25	56.20	55	56.33	56.28	--	-	-	--	-	-	--	-	-	--	-	-	--	-	-
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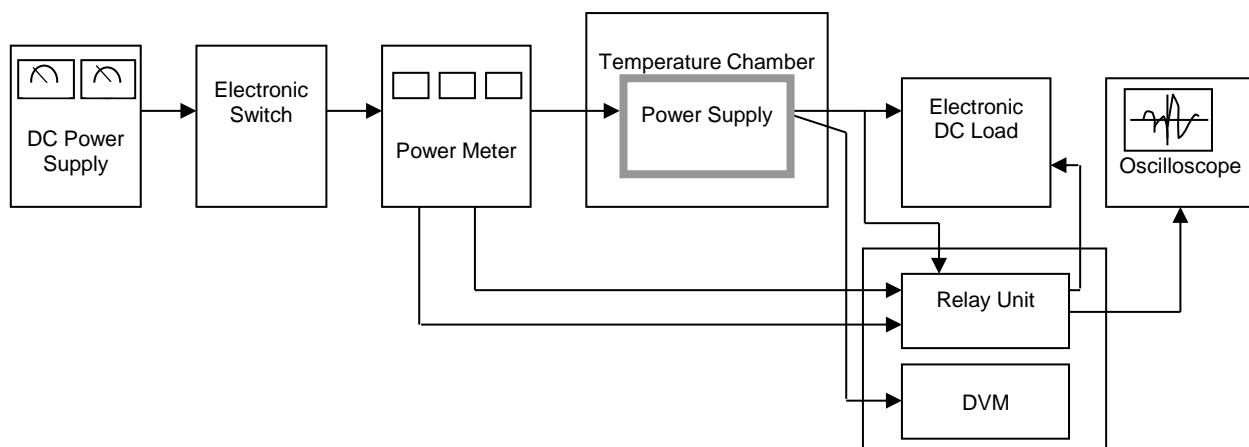


Figure A

Data Acquisition/Control Unit

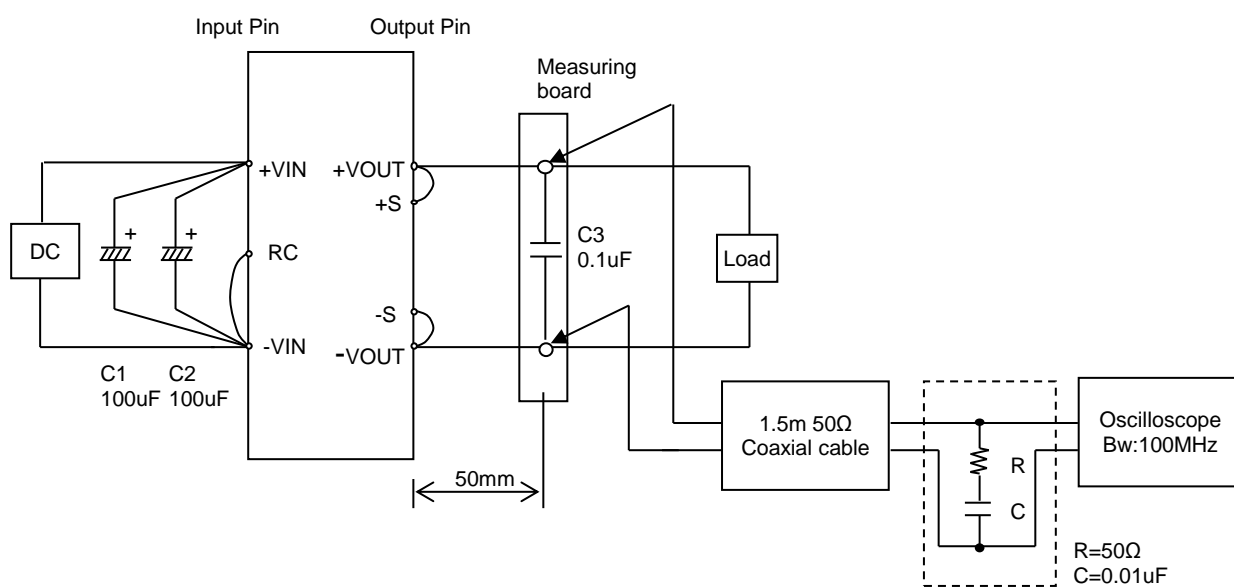


Figure B