

TEST DATA OF DHS50A12

Regulated DC Power Supply
April 9, 2010

Approved by : *Tatsuya Mamo*
Tatsuya Mamo Design Manager

Prepared by : *Tetsuro Hirata*
Tetsuro Hirata Design Engineer

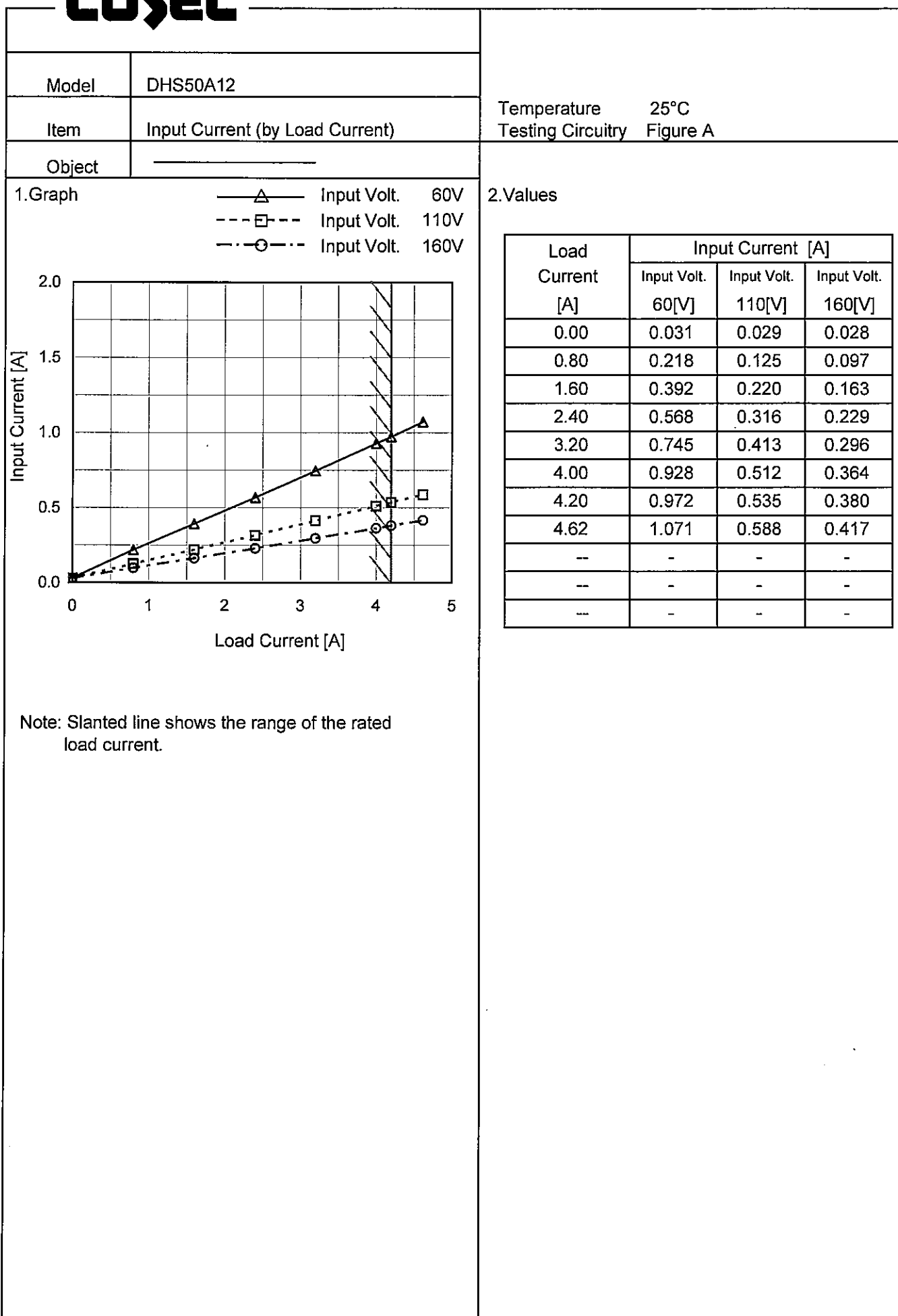
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Model		DHS50A12	Temperature		25°C																																																																														
Item		Input Current (by Input Voltage)	Testing Circuitry		Figure A																																																																														
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<div><div><div>Input Current [A]</div><div>2.0</div><div>1.5</div><div>1.0</div><div>0.5</div><div>0.0</div></div><div><div>0</div><div>20</div><div>40</div><div>60</div><div>80</div><div>100</div><div>120</div><div>140</div><div>160</div><div>180</div></div><div><div>Input Voltage [V]</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>0.002</td><td>0.002</td><td>0.002</td></tr><tr><td>45</td><td>0.002</td><td>0.002</td><td>0.002</td></tr><tr><td>50</td><td>0.033</td><td>0.603</td><td>1.080</td></tr><tr><td>54</td><td>0.032</td><td>0.567</td><td>1.096</td></tr><tr><td>55</td><td>0.032</td><td>0.553</td><td>1.073</td></tr><tr><td>60</td><td>0.031</td><td>0.500</td><td>0.972</td></tr><tr><td>66</td><td>0.030</td><td>0.450</td><td>0.878</td></tr><tr><td>80</td><td>0.029</td><td>0.373</td><td>0.725</td></tr><tr><td>95</td><td>0.029</td><td>0.318</td><td>0.614</td></tr><tr><td>110</td><td>0.029</td><td>0.279</td><td>0.535</td></tr><tr><td>125</td><td>0.028</td><td>0.250</td><td>0.475</td></tr><tr><td>140</td><td>0.028</td><td>0.227</td><td>0.428</td></tr><tr><td>160</td><td>0.028</td><td>0.204</td><td>0.380</td></tr><tr><td>170</td><td>0.028</td><td>0.194</td><td>0.360</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	0.002	0.002	0.002	45	0.002	0.002	0.002	50	0.033	0.603	1.080	54	0.032	0.567	1.096	55	0.032	0.553	1.073	60	0.031	0.500	0.972	66	0.030	0.450	0.878	80	0.029	0.373	0.725	95	0.029	0.318	0.614	110	0.029	0.279	0.535	125	0.028	0.250	0.475	140	0.028	0.227	0.428	160	0.028	0.204	0.380	170	0.028	0.194	0.360	--	-	-	-	--	-	-	-	--	-	-	-
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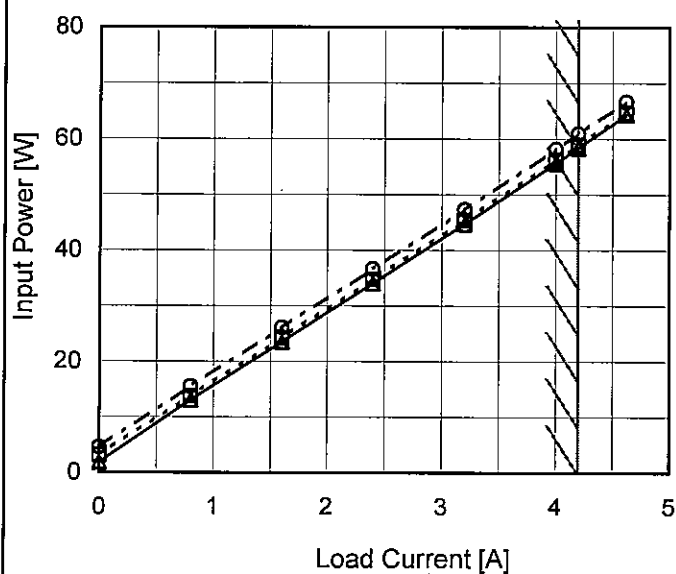
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Model	DHS50A12
Item	Input Power (by Load Current)
Object	

Temperature 25°C
Testing Circuitry Figure A

1. Graph

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



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

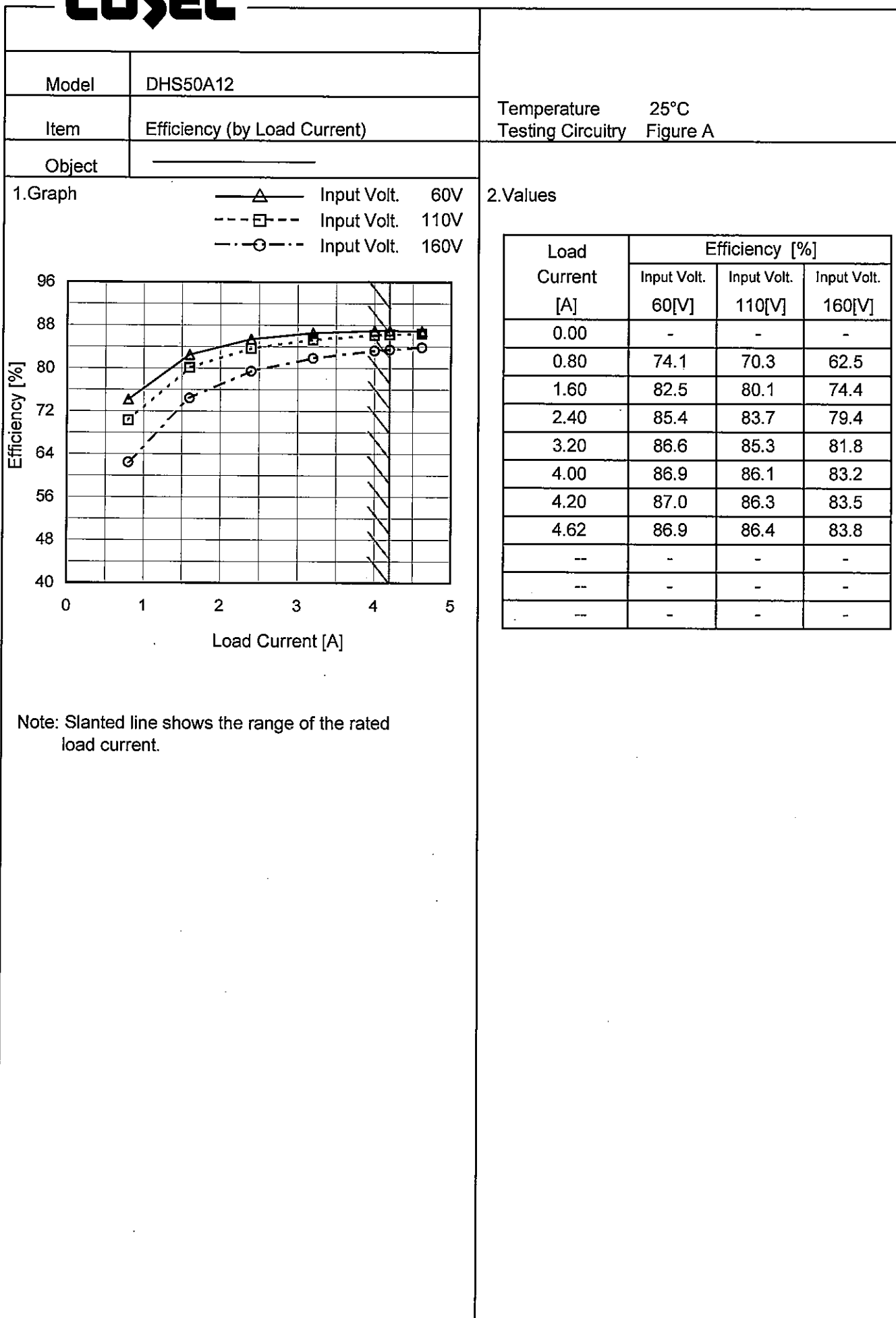
2. Values

Load Current [A]	Input Power [W]		
	Input Volt. 60[V]	Input Volt. 110[V]	Input Volt. 160[V]
0.00	1.85	3.13	4.51
0.80	13.07	13.79	15.51
1.60	23.50	24.22	26.07
2.40	34.04	34.76	36.63
3.20	44.71	45.40	47.32
4.00	55.65	56.21	58.16
4.20	58.41	58.91	60.90
4.62	64.34	64.68	66.69
--	-	-	-
--	-	-	-
--	-	-	-

Model		DHS50A12	
Item		Efficiency (by Input Voltage)	
Object			
1.Graph		2.Values	

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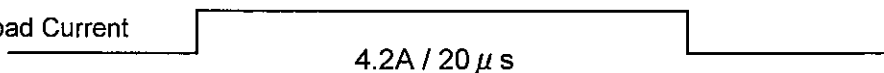
Model	DHS50A12	Temperature 25°C Testing Circuitry Figure A																																	
Item	Line Regulation																																		
Object	+12V4.2A																																		
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<div><div><div>---□--- Load 50% —△— Load 100%</div><p>Output Voltage [V]</p><p>Input Voltage [V]</p></div></div>		<table><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><tr><td>60</td><td>12.101</td><td>12.100</td></tr><tr><td>66</td><td>12.101</td><td>12.100</td></tr><tr><td>80</td><td>12.101</td><td>12.100</td></tr><tr><td>95</td><td>12.101</td><td>12.101</td></tr><tr><td>110</td><td>12.101</td><td>12.101</td></tr><tr><td>125</td><td>12.102</td><td>12.102</td></tr><tr><td>140</td><td>12.102</td><td>12.103</td></tr><tr><td>160</td><td>12.103</td><td>12.103</td></tr><tr><td>170</td><td>12.103</td><td>12.104</td></tr></table>		Input Voltage [V]	Output Voltage [V]		Load 50%	Load 100%	60	12.101	12.100	66	12.101	12.100	80	12.101	12.100	95	12.101	12.101	110	12.101	12.101	125	12.102	12.102	140	12.102	12.103	160	12.103	12.103	170	12.103	12.104
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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> <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>0.00</td><td>12.106</td><td>12.105</td><td>12.105</td></tr><tr><td>0.80</td><td>12.101</td><td>12.101</td><td>12.102</td></tr><tr><td>1.60</td><td>12.100</td><td>12.101</td><td>12.102</td></tr><tr><td>2.40</td><td>12.100</td><td>12.101</td><td>12.103</td></tr><tr><td>3.20</td><td>12.100</td><td>12.101</td><td>12.103</td></tr><tr><td>4.00</td><td>12.100</td><td>12.101</td><td>12.103</td></tr><tr><td>4.20</td><td>12.100</td><td>12.101</td><td>12.103</td></tr><tr><td>4.62</td><td>12.100</td><td>12.101</td><td>12.103</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]	0.00	12.106	12.105	12.105	0.80	12.101	12.101	12.102	1.60	12.100	12.101	12.102	2.40	12.100	12.101	12.103	3.20	12.100	12.101	12.103	4.00	12.100	12.101	12.103	4.20	12.100	12.101	12.103	4.62	12.100	12.101	12.103	--	-	-	-	--	-	-	-	--	-	-	-
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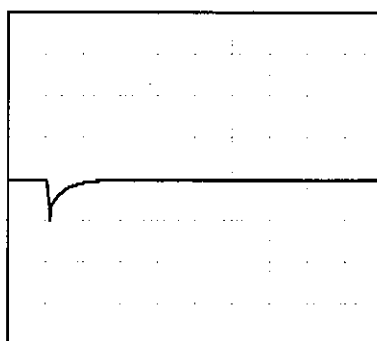
Model	DHS50A12	Temperature	25°C
Item	Dynamic Load Response	Testing Circuitry	Figure A
Object	+12V4.2A		

Input Volt. 110 V
Cycle 1000 ms

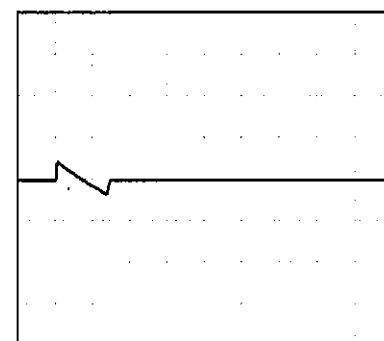
Load Current  4.2A / 20 μ s

Min. Load (0A) \longleftrightarrow
Load 100% (4.2A)

500mV/div



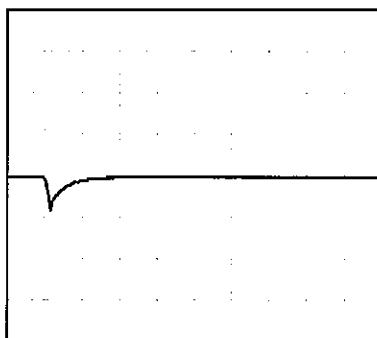
500 μ s/div



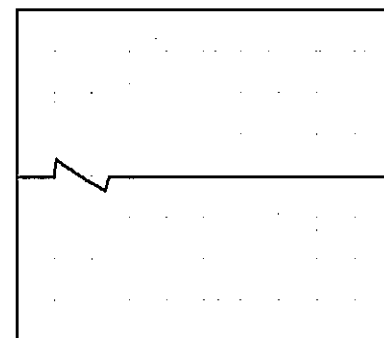
10 ms/div

Min. Load (0A) \longleftrightarrow
Load 50% (2.1A)

500mV/div



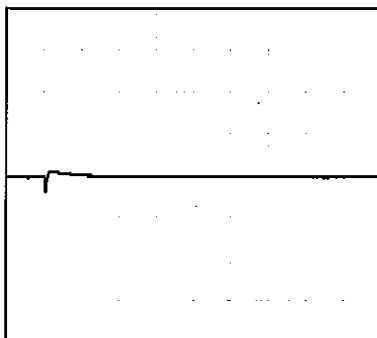
500 μ s/div



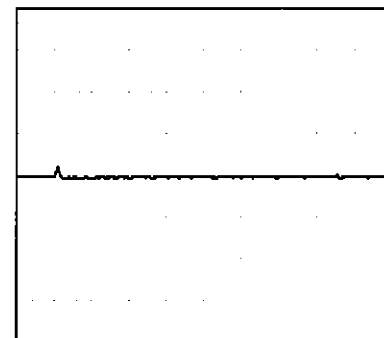
10 ms/div

Load 10% (0.42A) \longleftrightarrow
Load 100% (4.2A)

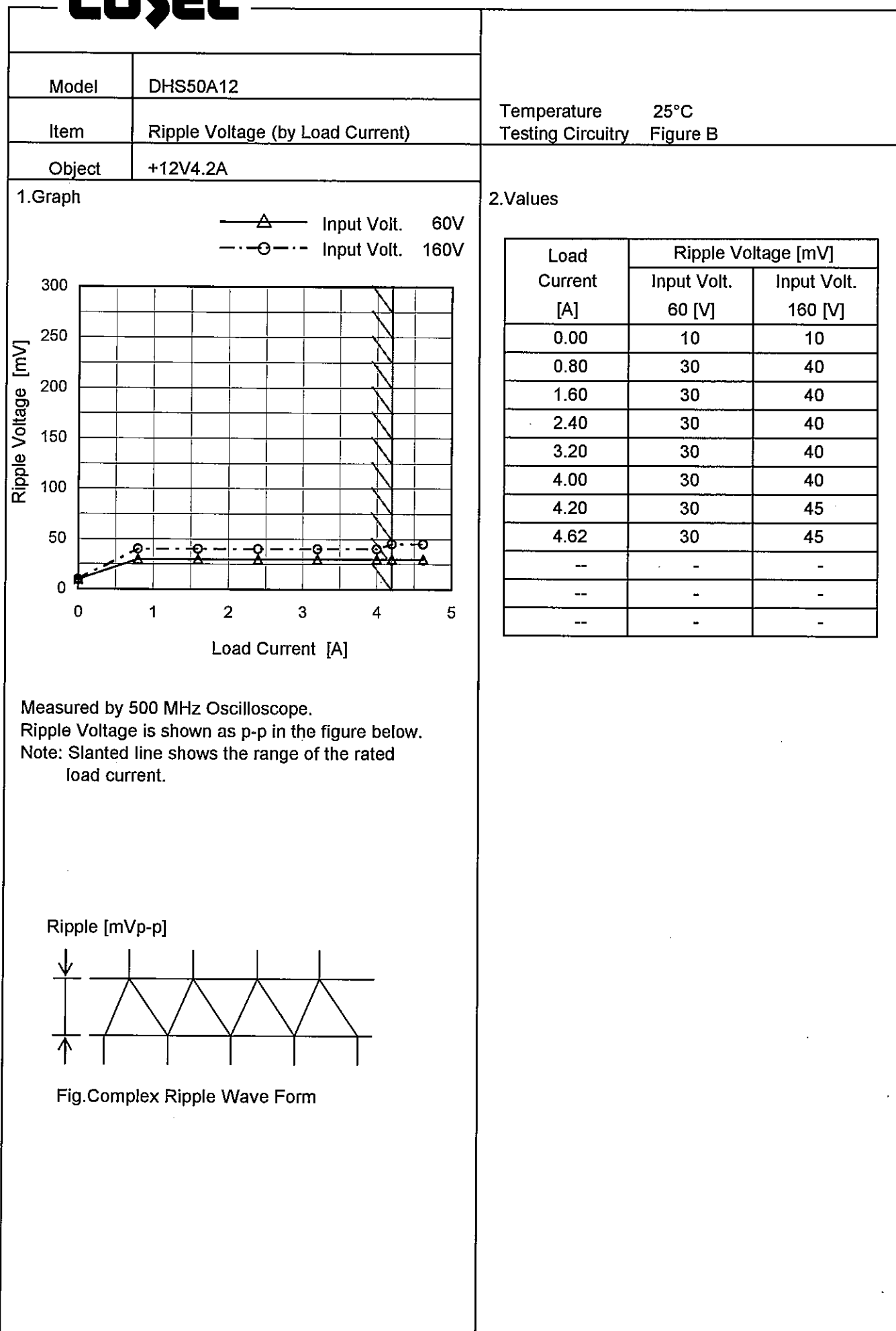
100mV/div



500 μ s/div



10 ms/div



Model	DHS50A12																																								
Item	Ripple-Noise	Temperature	25°C																																						
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Object	+12V4.2A																																								
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<div><div><div>—△— Input Volt. 60V</div><div>- - -○- - - Input Volt. 160V</div></div><div>Ripple-Noise [mV]</div><div>Load Current [A]</div></div> <div><div>Measured by 500 MHz Oscilloscope.</div><div>Ripple-Noise 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><div><div>Ripple Noise[mVp-p]</div></div><div>Fig.Complex Ripple Noise Wave Form</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>0.00</td><td>10</td><td>10</td></tr><tr><td>0.80</td><td>30</td><td>40</td></tr><tr><td>1.60</td><td>30</td><td>40</td></tr><tr><td>2.40</td><td>30</td><td>40</td></tr><tr><td>3.20</td><td>30</td><td>40</td></tr><tr><td>4.00</td><td>30</td><td>40</td></tr><tr><td>4.20</td><td>30</td><td>45</td></tr><tr><td>4.62</td><td>30</td><td>45</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]	0.00	10	10	0.80	30	40	1.60	30	40	2.40	30	40	3.20	30	40	4.00	30	40	4.20	30	45	4.62	30	45	--	-	-	--	-	-	--	-	-
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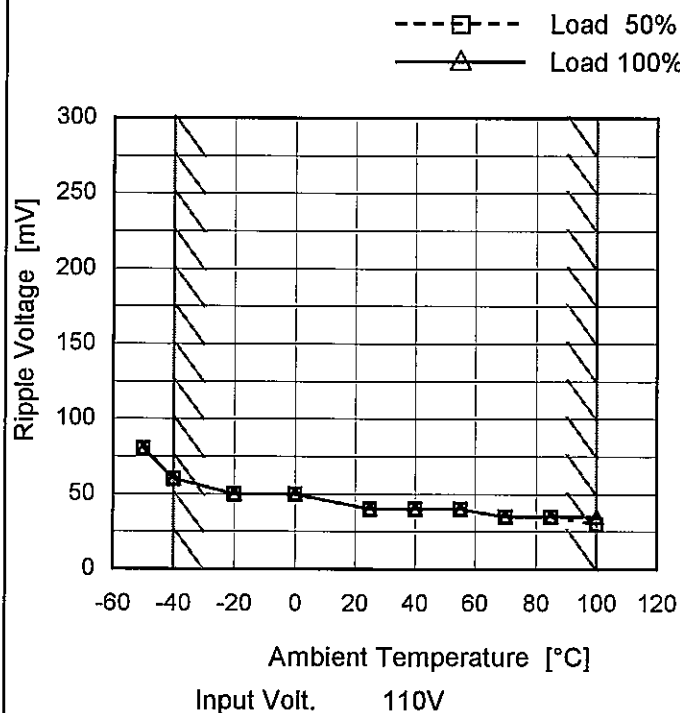
Model DHS50A12

Item Ripple Voltage (by Ambient Temp.)

Object +12V4.2A

Testing Circuitry Figure B

1. Graph



Measured by 500 MHz Oscilloscope.

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

2. Values

Ambient Temperature [°C]	Ripple Voltage [mV]	
	Load 50%	Load 100%
-50	80	80
-40	60	60
-20	50	50
0	50	50
25	40	40
40	40	40
55	40	40
70	35	35
85	35	35
100	30	35
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Model		DHS50A12																																																			
Item		Ambient Temperature Drift																																																			
Object		+12V4.2A																																																			
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<div>Note: Slanted line shows the range of the rated ambient temperature.</div>																																																					

Model		DHS50A12	Testing Circuitry Figure A
Item		Output Voltage Accuracy	
Object		+12V4.2A	

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 - 4.2A

* 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	100	110	0	12.124	±47	±0.4
Minimum Voltage	-40	60	4.2	12.030		

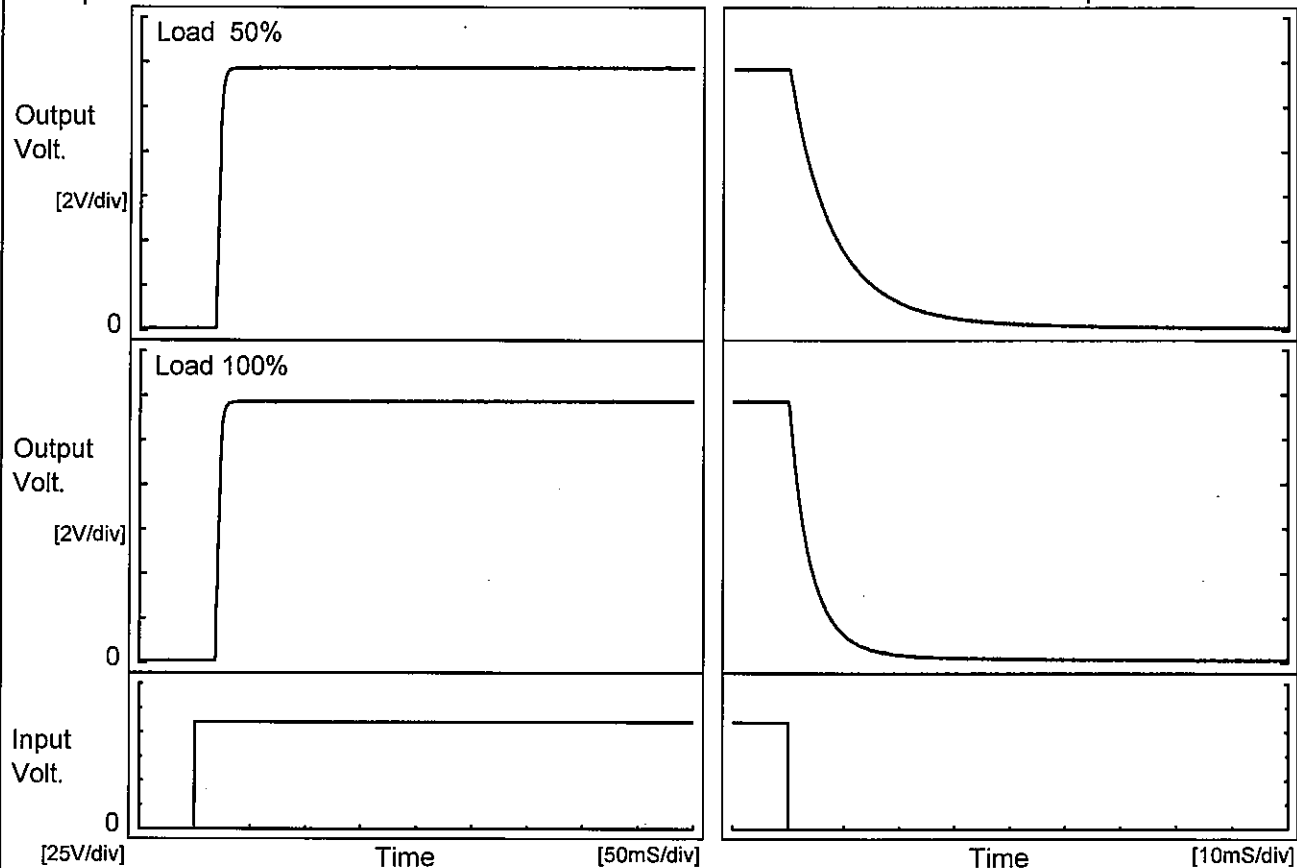
COSEL

Model	DHS50A12		
Item	Time Lapse Drift	Temperature	25°C
		Testing Circuitry	Figure A
Object	+12V4.2A		
1.Graph		2.Values	
<div><div><div>Output Voltage [V]</div><div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><di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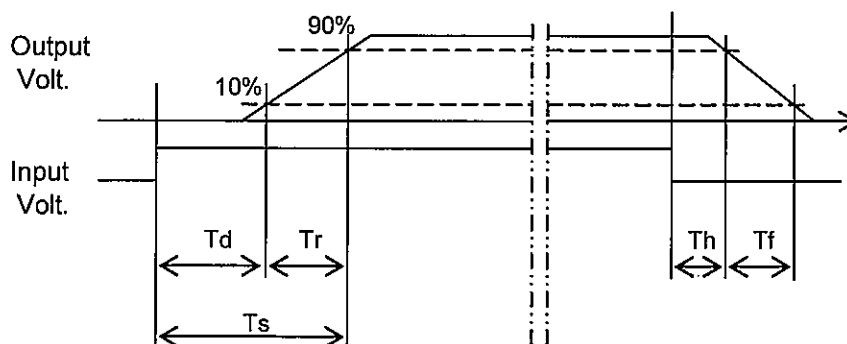
Model	DHS50A12	Temperature	25°C
Item	Rise and Fall Time	Testing Circuitry	Figure A
Object	+12V4.2A		

1. Graph



2. Values

Load \ Time	Td	Tr	Ts	Th	Tf
50 %	18.8	6.0	24.8	0.6	20.2
100 %	18.8	6.0	24.8	0.4	10.0



Model	DHS50A12																																								
Item	Minimum Input Voltage for Regulated Output Voltage	Testing Circuitry Figure A																																							
Object	+12V4.2A																																								
1.Graph		2.Values																																							
<div><div><div>---□---</div><div>Load 50%</div></div><div><div>—△—</div><div>Load 100%</div></div></div> <p>Note: Slanted line shows the range of the rated ambient temperature.</p>		<table><tr><th rowspan="2">Ambient Temperature [°C]</th><th colspan="2">Input Voltage [V]</th></tr><tr><th>Load 50%</th><th>Load 100%</th></tr><tr><td>-50</td><td>49</td><td>50</td></tr><tr><td>-40</td><td>50</td><td>50</td></tr><tr><td>-20</td><td>50</td><td>51</td></tr><tr><td>0</td><td>50</td><td>51</td></tr><tr><td>25</td><td>50</td><td>52</td></tr><tr><td>40</td><td>50</td><td>52</td></tr><tr><td>55</td><td>50</td><td>52</td></tr><tr><td>70</td><td>50</td><td>52</td></tr><tr><td>85</td><td>50</td><td>52</td></tr><tr><td>100</td><td>51</td><td>52</td></tr><tr><td>--</td><td>-</td><td>-</td></tr></table>		Ambient Temperature [°C]	Input Voltage [V]		Load 50%	Load 100%	-50	49	50	-40	50	50	-20	50	51	0	50	51	25	50	52	40	50	52	55	50	52	70	50	52	85	50	52	100	51	52	--	-	-
Ambient Temperature [°C]	Input Voltage [V]																																								
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Model	DHS50A12																																																									
Item	Overcurrent Protection	Temperature	25°C																																																							
Object	+12V4.2A	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>Output Voltage [V]</p> <p>Load Current [A]</p> <p>Note: Slanted line shows the range of the rated load current.</p> <p>Intermittent operation occurs when the output voltage is from 7V 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>12.0</td><td>4.21</td><td>4.20</td><td>4.21</td></tr><tr><td>11.4</td><td>5.19</td><td>5.33</td><td>5.48</td></tr><tr><td>10.8</td><td>5.22</td><td>5.37</td><td>5.49</td></tr><tr><td>9.6</td><td>5.27</td><td>5.45</td><td>5.66</td></tr><tr><td>8.4</td><td>5.31</td><td>5.54</td><td>5.63</td></tr><tr><td>7.2</td><td>5.35</td><td>5.56</td><td>5.61</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]	12.0	4.21	4.20	4.21	11.4	5.19	5.33	5.48	10.8	5.22	5.37	5.49	9.6	5.27	5.45	5.66	8.4	5.31	5.54	5.63	7.2	5.35	5.56	5.61	--	-	-	-	--	-	-	-	--	-	-	-	--	-	-	-	--	-	-	-	--	-	-	-
Output Voltage [V]	Load Current [A]																																																									
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Model	DHS50A12																																								
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1.Graph		2.Values																																							
<div><div><div>—△— Input Volt. 60V</div><div>---□--- Input Volt. 160V</div></div><div>Ambient Temperature [°C]</div><div>Load 0%</div></div>		<table><tr><th rowspan="2">Ambient Temperature [°C]</th><th colspan="2">Operating Point [V]</th></tr><tr><th>Input Volt. 60[V]</th><th>Input Volt. 160[V]</th></tr><tr><td>-50</td><td>15.06</td><td>15.06</td></tr><tr><td>-40</td><td>15.06</td><td>15.06</td></tr><tr><td>-20</td><td>15.06</td><td>15.06</td></tr><tr><td>0</td><td>15.06</td><td>15.06</td></tr><tr><td>25</td><td>15.13</td><td>15.13</td></tr><tr><td>40</td><td>15.13</td><td>15.13</td></tr><tr><td>55</td><td>15.20</td><td>15.13</td></tr><tr><td>70</td><td>15.20</td><td>15.20</td></tr><tr><td>85</td><td>15.20</td><td>15.20</td></tr><tr><td>100</td><td>15.20</td><td>15.20</td></tr><tr><td>--</td><td>-</td><td>-</td></tr></table>		Ambient Temperature [°C]	Operating Point [V]		Input Volt. 60[V]	Input Volt. 160[V]	-50	15.06	15.06	-40	15.06	15.06	-20	15.06	15.06	0	15.06	15.06	25	15.13	15.13	40	15.13	15.13	55	15.20	15.13	70	15.20	15.20	85	15.20	15.20	100	15.20	15.20	--	-	-
Ambient Temperature [°C]	Operating Point [V]																																								
	Input Volt. 60[V]	Input Volt. 160[V]																																							
-50	15.06	15.06																																							
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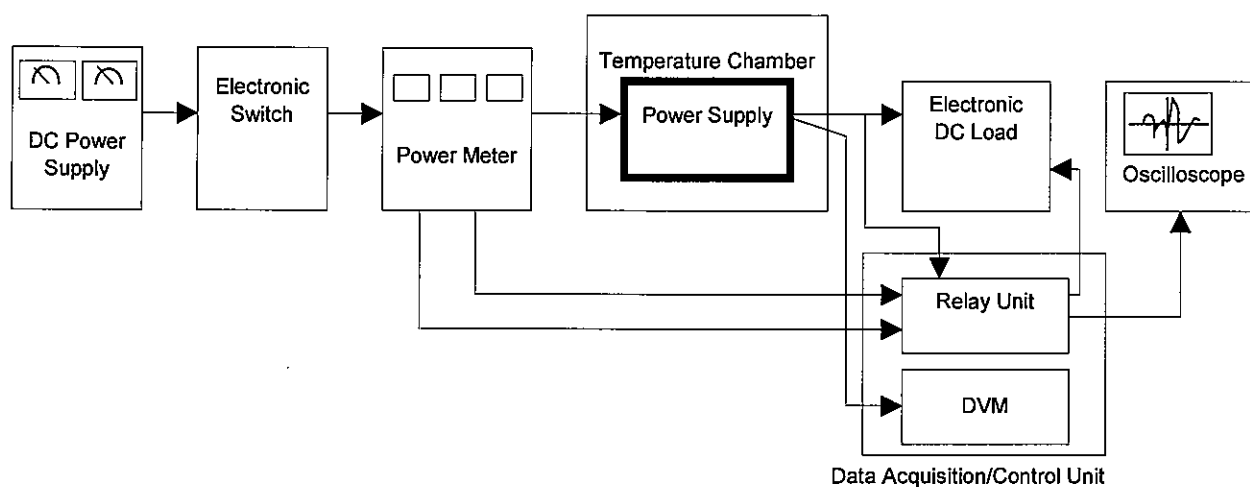
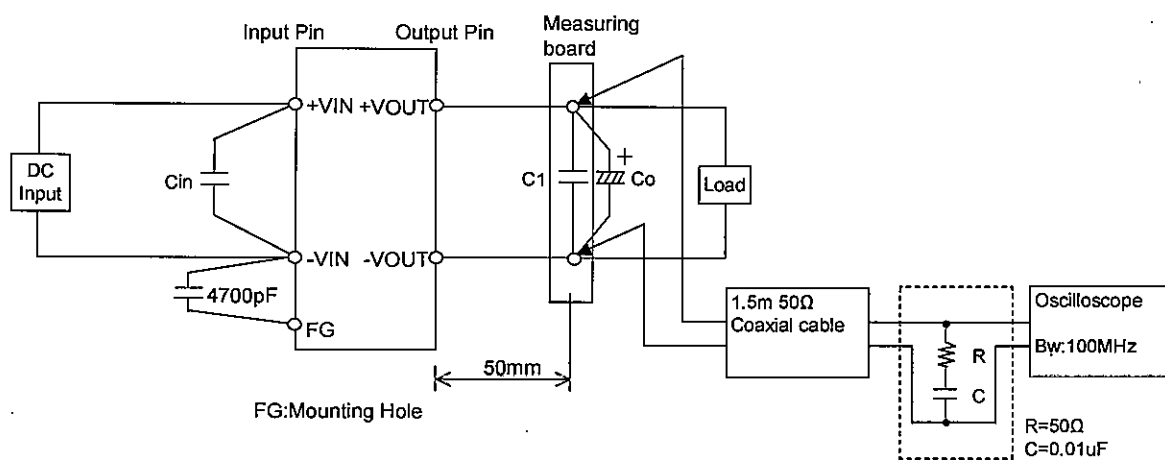


Figure A



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

Figure B