



TEST DATA OF CES48050-20P

Regulated DC Power Supply
Nov 13, 2008

Approved by : Tatsuya Mano
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Junichi Hatagishi Design Engineer

COSEL CO.,LTD.

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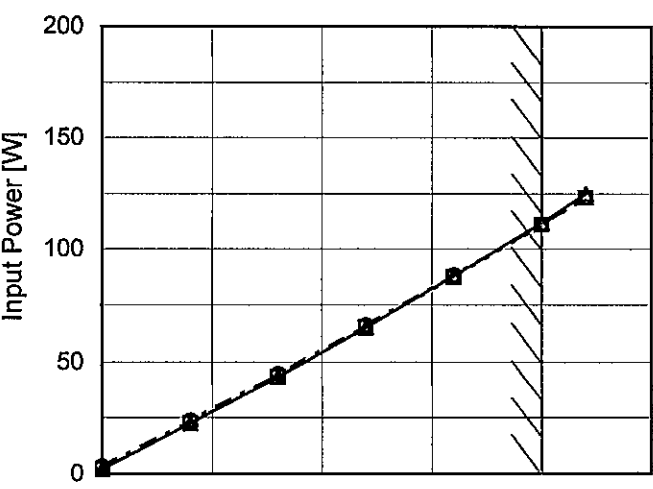
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Model		CES48050-20P		Temperature 25°C																																																																																
Item		Input Current (by Input Voltage)		Testing Circuitry Figure A																																																																																
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1.Graph				2.Values																																																																																
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Model	CES48050-20P																																																					
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Object		Testing Circuitry	Figure A																																																			
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<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>Input Current [A]</p> <p>Load Current [A]</p> <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">Input 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>0</td><td>0.058</td><td>0.045</td><td>0.045</td></tr><tr><td>4</td><td>0.621</td><td>0.469</td><td>0.312</td></tr><tr><td>8</td><td>1.205</td><td>0.905</td><td>0.586</td></tr><tr><td>12</td><td>1.813</td><td>1.357</td><td>0.870</td></tr><tr><td>16</td><td>2.448</td><td>1.822</td><td>1.158</td></tr><tr><td>20</td><td>3.114</td><td>2.312</td><td>1.458</td></tr><tr><td>22</td><td>3.473</td><td>2.571</td><td>1.616</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>		Load Current [A]	Input Current [A]			Input Volt. 36[V]	Input Volt. 48[V]	Input Volt. 76[V]	0	0.058	0.045	0.045	4	0.621	0.469	0.312	8	1.205	0.905	0.586	12	1.813	1.357	0.870	16	2.448	1.822	1.158	20	3.114	2.312	1.458	22	3.473	2.571	1.616	--	-	-	-	--	-	-	-	--	-	-	-	--	-	-	-
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Model		CES48050-20P		
Item		Input Power (by Load Current)		
Object				
1.Graph				
		—△—	Input Volt. 36V	
		---□---	Input Volt. 48V	
		---○---	Input Volt. 76V	
				
Note: Slanted line shows the range of the rated load current.				
2.Values				
Load Current [A]		Input Power [W]		
		Input Volt. 36[V]	Input Volt. 48[V]	Input Volt. 76[V]
0		2.2	2.2	3.5
4		22.4	22.6	23.8
8		43.4	43.5	44.8
12		65.3	65.2	66.2
16		88.0	87.4	88.3
20		111.8	110.9	111.2
22		125.0	123.2	123.1
--		-	-	-
--		-	-	-
--		-	-	-
--		-	-	-

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Model		CES48050-20P																																	
Item		Efficiency (by Input Voltage)																																	
Object																																			
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>Load 50%</div><div>Load 100%</div></div></div> <table><thead><tr><th rowspan="2">Input Voltage [V]</th><th colspan="2">Efficiency [%]</th></tr><tr><th>Load 50%</th><th>Load 100%</th></tr></thead><tbody><tr><td>33</td><td>91.1</td><td>88.7</td></tr><tr><td>36</td><td>91.5</td><td>89.1</td></tr><tr><td>40</td><td>91.8</td><td>89.6</td></tr><tr><td>48</td><td>91.7</td><td>90.0</td></tr><tr><td>55</td><td>91.3</td><td>90.0</td></tr><tr><td>60</td><td>91.0</td><td>90.2</td></tr><tr><td>70</td><td>90.2</td><td>89.9</td></tr><tr><td>76</td><td>89.7</td><td>89.7</td></tr><tr><td>80</td><td>89.5</td><td>89.7</td></tr></tbody></table> <p>Note: Slanted line shows the range of the rated input voltage.</p>		Input Voltage [V]	Efficiency [%]		Load 50%	Load 100%	33	91.1	88.7	36	91.5	89.1	40	91.8	89.6	48	91.7	90.0	55	91.3	90.0	60	91.0	90.2	70	90.2	89.9	76	89.7	89.7	80	89.5	89.7		
Input Voltage [V]	Efficiency [%]																																		
	Load 50%	Load 100%																																	
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40	91.8	89.6																																	
48	91.7	90.0																																	
55	91.3	90.0																																	
60	91.0	90.2																																	
70	90.2	89.9																																	
76	89.7	89.7																																	
80	89.5	89.7																																	



Model

CES48050-20P

Item

Efficiency (by Load Current)

Object

1.Graph

—△—

Input Volt.

36V

---□---

Input Volt.

48V

---○---

Input Volt.

76V

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

2.Values

Load Current [A]	Efficiency [%]		
	Input Volt. 36[V]	Input Volt. 48[V]	Input Volt. 76[V]
0	-	-	-
4	88.9	88.3	83.8
8	91.6	91.5	88.8
12	91.4	91.5	90.1
16	90.8	91.4	90.5
20	89.4	90.0	89.9
22	88.0	89.3	89.3
--	-	-	-
--	-	-	-
--	-	-	-
--	-	-	-

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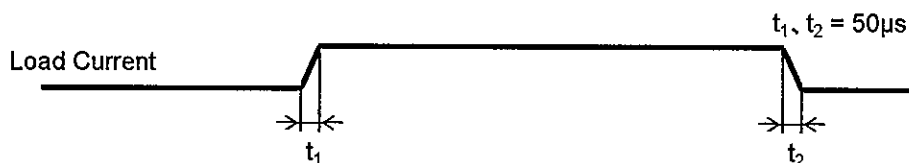
Model	CES48050-20P																																
Item	Line Regulation	Temperature	25°C																														
Object	+5V20A	Testing Circuitry	Figure A																														
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Input Voltage [V]	Output Voltage [V] Load 50%	Output Voltage [V] Load 100%																															
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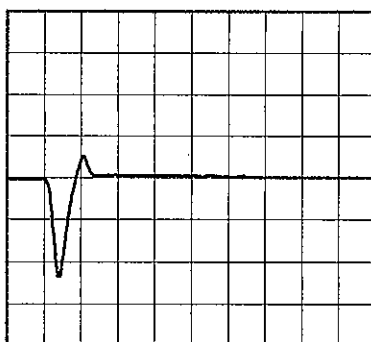
Model	CES48050-20P	Temperature	25°C
Item	Dynamic Load Response	Testing Circuitry	Figure A
Object	+5V20A		

Input Volt. 48 V
Cycle 5 mS

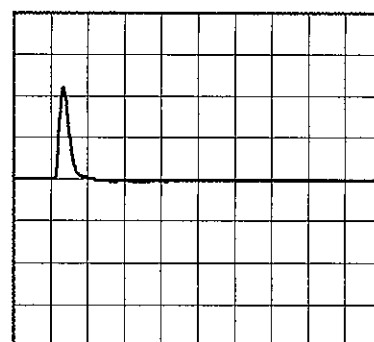


Min. Load (0A) \longleftrightarrow
Load 100% (20A)

200mV/div



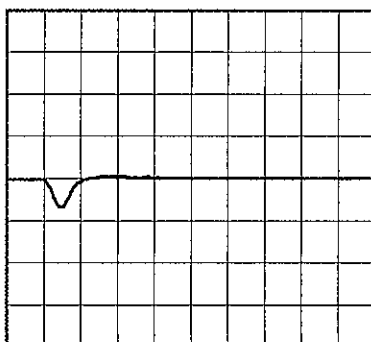
200µs/div



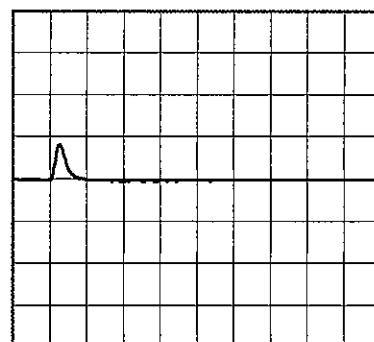
200µs/div

Min. Load (0A) \longleftrightarrow
Load 50% (10A)

200mV/div



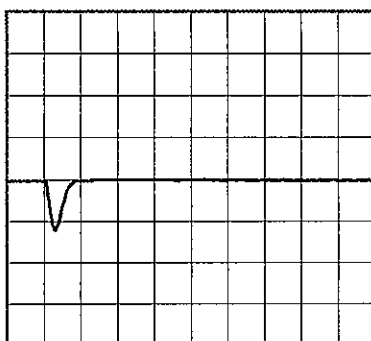
200µs/div



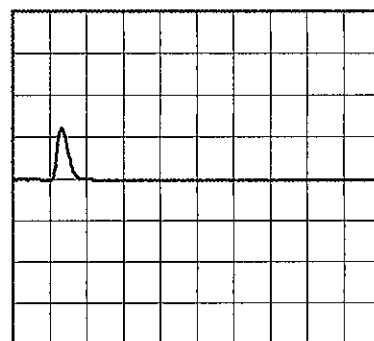
200µs/div

Load 50% (10A) \longleftrightarrow
Load 100% (20A)

200mV/div



200µs/div



200µs/div

Model		CES48050-20P		Temperature 25°C																																							
Item		Ripple Voltage (by Load Current)		Testing Circuitry Figure B																																							
Object		+5V20A																																									
1.Graph				2.Values																																							
<div><div><div>—△— Input Volt. 36V</div><div>--○-- Input Volt. 76V</div></div><p>Ripple Voltage [mV]</p><p>Load Current [A]</p></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</td><td>5</td><td>10</td></tr><tr><td>4</td><td>5</td><td>10</td></tr><tr><td>8</td><td>5</td><td>10</td></tr><tr><td>12</td><td>5</td><td>10</td></tr><tr><td>16</td><td>5</td><td>10</td></tr><tr><td>20</td><td>5</td><td>10</td></tr><tr><td>22</td><td>5</td><td>10</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>		Load Current [A]	Ripple Voltage [mV]		Input Volt. 36 [V]	Input Volt. 76 [V]	0	5	10	4	5	10	8	5	10	12	5	10	16	5	10	20	5	10	22	5	10	--	-	-	--	-	-	--	-	-	--	-	-
Load Current [A]	Ripple Voltage [mV]																																										
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<p>Measured by 100 MHz Oscilloscope.</p> <p>Ripple Voltage is shown as p-p in the figure below.</p> <p>Note: Slanted line shows the range of the rated load current.</p>																																											
<div><div><p>Ripple [mVp-p]</p></div><p>Fig.Complex Ripple Wave Form</p></div>																																											

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Model		CES48050-20P	
Item		Ripple-Noise	
Object		+5V20A	
1.Graph		2.Values	

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Model	CES48050-20P																																																					
Item	Ambient Temperature Drift	Testing Circuitry Figure A																																																				
Object	+5V20A																																																					
1.Graph		2.Values																																																				
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Ambient Temperature [°C]	Output Voltage [V]																																																					
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-20	4.984	4.982	4.982																																																			
0	4.981	4.980	4.979																																																			
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Note: Slanted line shows the range of the rated ambient temperature.																																																						



		Testing Circuitry Figure A
Model	CES48050-20P	
Item	Output Voltage Accuracy	
Object	+5V20A	

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 - 50°C

Input Voltage : 36 - 76V

Load Current : 0 - 20A

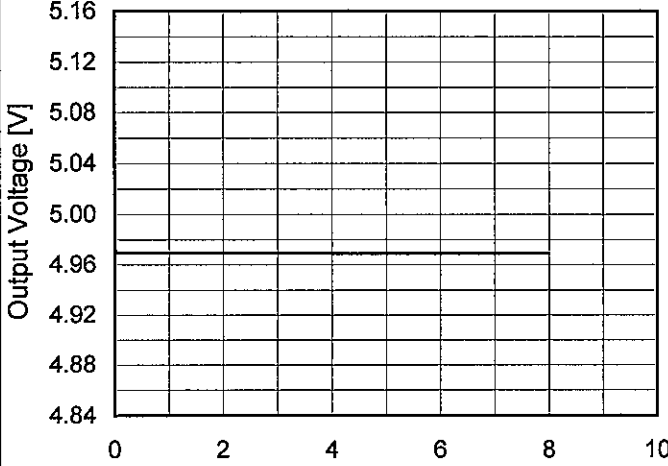
* Output Voltage Accuracy = $\pm(\text{Maximum of Output Voltage} - \text{Minimum of Output Voltage}) / 2$

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

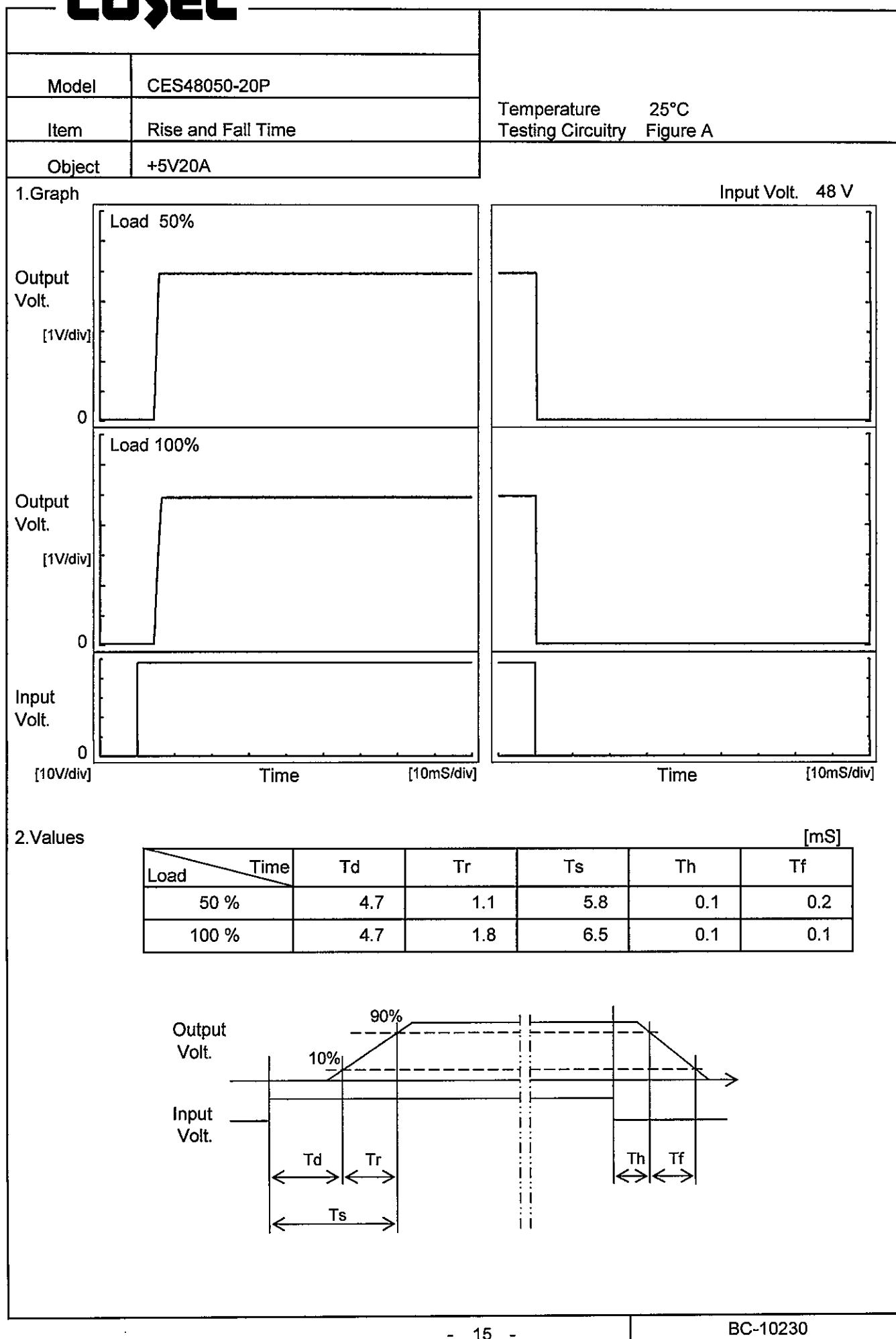
2. Values

Item	Temperature [°C]	Input Voltage[V]	Output		Output Voltage Accuracy	
			Current[A]	Voltage[V]	Value [mV]	Ration [%]
Maximum Voltage	-40	76	0	4.985	±10	±0.2
Minimum Voltage	50	76	20	4.965		



Model	CES48050-20P																								
Item	Time Lapse Drift	Temperature	25°C																						
Object	+5V20A	Testing Circuitry	Figure A																						
1.Graph		2.Values																							
<div><div><div>5.16</div><div>5.12</div><div>5.08</div><div>5.04</div><div>5.00</div><div>4.96</div><div>4.92</div><div>4.88</div><div>4.84</div></div><div></div><div>Time [H]</div><div>Input Volt. 48V</div><div>Load 100%</div></div>		<table><tr><th>Time since start [H]</th><th>Output Voltage [V]</th></tr><tr><td>0.0</td><td>4.975</td></tr><tr><td>0.5</td><td>4.969</td></tr><tr><td>1.0</td><td>4.969</td></tr><tr><td>2.0</td><td>4.969</td></tr><tr><td>3.0</td><td>4.969</td></tr><tr><td>4.0</td><td>4.969</td></tr><tr><td>5.0</td><td>4.969</td></tr><tr><td>6.0</td><td>4.969</td></tr><tr><td>7.0</td><td>4.969</td></tr><tr><td>8.0</td><td>4.969</td></tr></table>		Time since start [H]	Output Voltage [V]	0.0	4.975	0.5	4.969	1.0	4.969	2.0	4.969	3.0	4.969	4.0	4.969	5.0	4.969	6.0	4.969	7.0	4.969	8.0	4.969
Time since start [H]	Output Voltage [V]																								
0.0	4.975																								
0.5	4.969																								
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2.0	4.969																								
3.0	4.969																								
4.0	4.969																								
5.0	4.969																								
6.0	4.969																								
7.0	4.969																								
8.0	4.969																								

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Model		CES48050-20P		Testing Circuitry Figure A
Item		Minimum Input Voltage for Regulated Output Voltage		
Object		+5V20A		
1.Graph				
<div><div><div><div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></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	CES48050-20P																																																									
Item	Overcurrent Protection	Temperature	25°C																																																							
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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>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 3.2V to 0V.</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>5.00</td><td>22.44</td><td>23.43</td><td>23.23</td></tr><tr><td>4.75</td><td>22.34</td><td>23.43</td><td>23.06</td></tr><tr><td>4.50</td><td>22.23</td><td>23.16</td><td>22.81</td></tr><tr><td>4.00</td><td>22.12</td><td>22.78</td><td>22.42</td></tr><tr><td>3.50</td><td>22.05</td><td>22.52</td><td>22.02</td></tr><tr><td>3.20</td><td>22.07</td><td>22.48</td><td>21.85</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]	5.00	22.44	23.43	23.23	4.75	22.34	23.43	23.06	4.50	22.23	23.16	22.81	4.00	22.12	22.78	22.42	3.50	22.05	22.52	22.02	3.20	22.07	22.48	21.85	--	-	-	-	--	-	-	-	--	-	-	-	--	-	-	-	--	-	-	-	--	-	-	-
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<div><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>Operating Point [V]</p><p>Ambient Temperature [°C]</p><p>Load 0%</p><p>Note: Slanted line shows the range of the rated ambient temperature.</p></div>		<table><tr><th rowspan="2">Ambient Temperature [°C]</th><th colspan="3">Operating Point [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>6.85</td><td>6.79</td><td>6.71</td></tr><tr><td>-20</td><td>6.85</td><td>6.79</td><td>6.71</td></tr><tr><td>0</td><td>6.85</td><td>6.79</td><td>6.71</td></tr><tr><td>25</td><td>6.85</td><td>6.79</td><td>6.71</td></tr><tr><td>40</td><td>6.85</td><td>6.79</td><td>6.71</td></tr><tr><td>50</td><td>6.85</td><td>6.79</td><td>6.71</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]	Operating Point [V]			Input Volt. 36[V]	Input Volt. 48[V]	Input Volt. 76[V]	-40	6.85	6.79	6.71	-20	6.85	6.79	6.71	0	6.85	6.79	6.71	25	6.85	6.79	6.71	40	6.85	6.79	6.71	50	6.85	6.79	6.71	--	-	-	-	--	-	-	-	--	-	-	-	--	-	-	-	--	-	-	-
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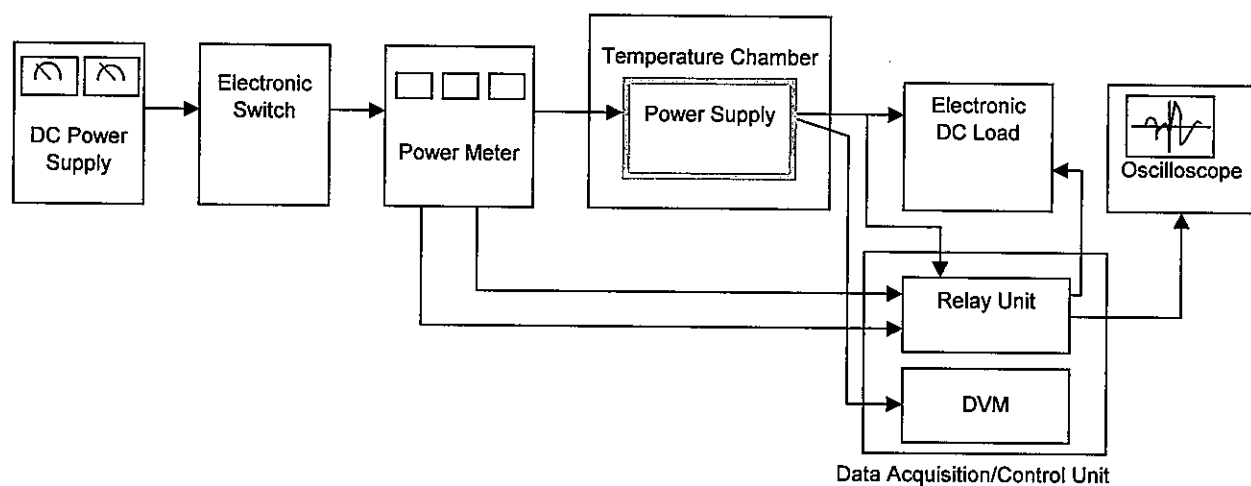


Figure A

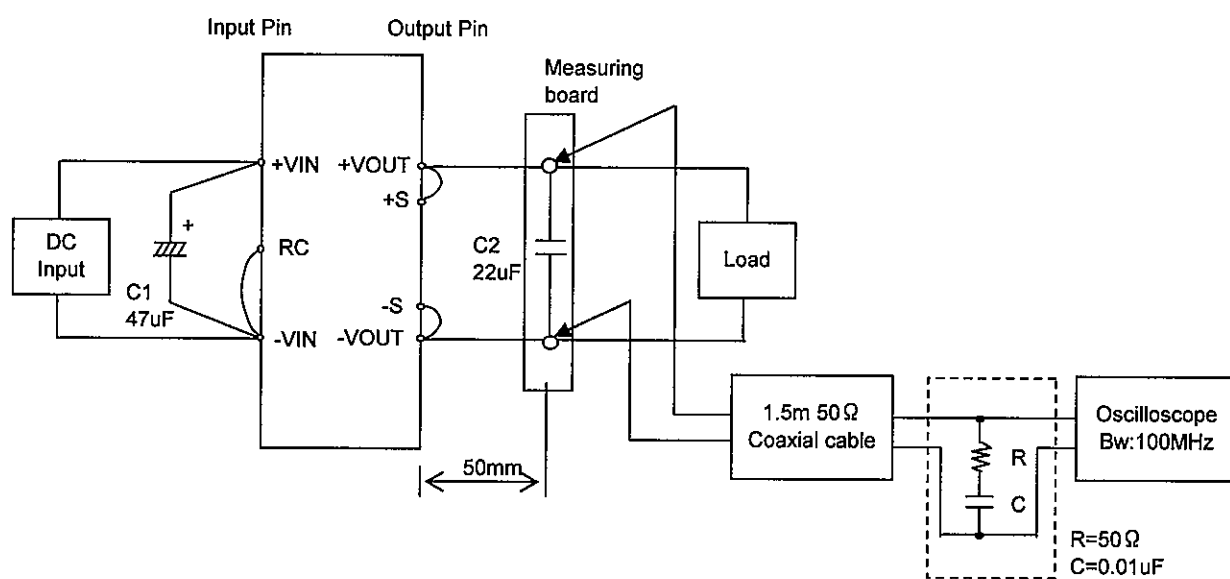


Figure B