

# TEST DATA OF CES24050-16

Regulated DC Power Supply  
Aug 10, 2007

Approved by : Tatsuya Mano  
Tatsuya Mano Design Manager

Prepared by : Masahiro Miyake  
Masahiro Miyake Design Engineer

**COSEL CO.,LTD.**

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Model		CES24050-16																																																																																
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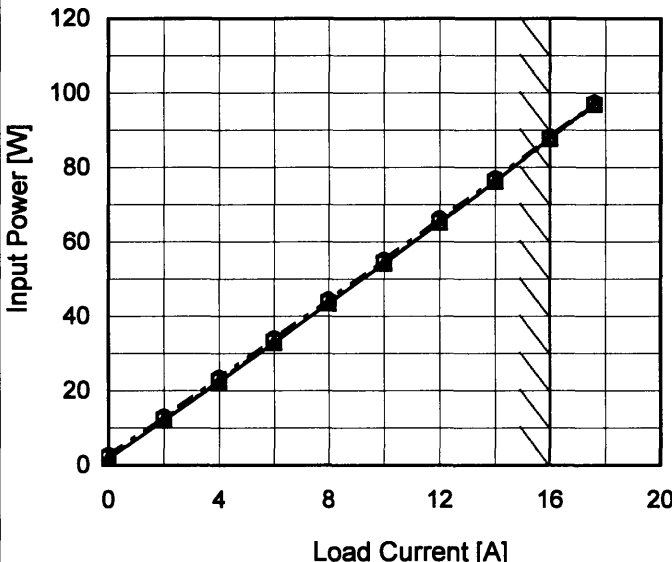
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Model		CES24050-16		Temperature 25°C Testing Circuitry Figure A																																																		
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Object		_____																																																				
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		<table><tr><th rowspan="2">Load Current [A]</th><th colspan="3">Input Power [W]</th></tr><tr><th>Input Volt. 18[V]</th><th>Input Volt. 24[V]</th><th>Input Volt. 36[V]</th></tr><tr><td>0.0</td><td>1.84</td><td>2.09</td><td>2.79</td></tr><tr><td>2.0</td><td>12.07</td><td>12.22</td><td>12.99</td></tr><tr><td>4.0</td><td>22.41</td><td>22.64</td><td>23.53</td></tr><tr><td>6.0</td><td>32.96</td><td>33.17</td><td>34.02</td></tr><tr><td>8.0</td><td>43.50</td><td>43.70</td><td>44.50</td></tr><tr><td>10.0</td><td>54.20</td><td>54.40</td><td>55.20</td></tr><tr><td>12.0</td><td>65.20</td><td>65.30</td><td>66.30</td></tr><tr><td>14.0</td><td>76.30</td><td>76.20</td><td>77.10</td></tr><tr><td>16.0</td><td>87.90</td><td>87.60</td><td>88.30</td></tr><tr><td>17.6</td><td>97.10</td><td>96.80</td><td>97.40</td></tr><tr><td>--</td><td>-</td><td>-</td><td>-</td></tr></table>		Load Current [A]	Input Power [W]			Input Volt. 18[V]	Input Volt. 24[V]	Input Volt. 36[V]	0.0	1.84	2.09	2.79	2.0	12.07	12.22	12.99	4.0	22.41	22.64	23.53	6.0	32.96	33.17	34.02	8.0	43.50	43.70	44.50	10.0	54.20	54.40	55.20	12.0	65.20	65.30	66.30	14.0	76.30	76.20	77.10	16.0	87.90	87.60	88.30	17.6	97.10	96.80	97.40	--	-	-	-
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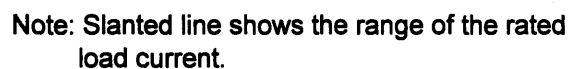
BC-10110

# COSEL

Model		CES24050-16		Temperature 25°C																																	
Item		Efficiency (by Input Voltage)		Testing Circuitry Figure A																																	
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<div><div><div>---□--- Load 50%</div><div>—△— Load 100%</div></div><p>Efficiency [%]</p><p>Input Voltage [V]</p><p>Note: Slanted line shows the range of the rated input voltage.</p></div>				<table><tr><th rowspan="2">Input Voltage [V]</th><th colspan="2">Efficiency [%]</th></tr><tr><th>Load 50%</th><th>Load 100%</th></tr><tr><td>17</td><td>91.5</td><td>90.4</td></tr><tr><td>18</td><td>91.8</td><td>90.6</td></tr><tr><td>20</td><td>91.7</td><td>90.9</td></tr><tr><td>24</td><td>91.3</td><td>91.0</td></tr><tr><td>30</td><td>90.7</td><td>90.7</td></tr><tr><td>36</td><td>89.7</td><td>90.2</td></tr><tr><td>40</td><td>88.9</td><td>89.8</td></tr><tr><td>--</td><td>-</td><td>-</td></tr><tr><td>--</td><td>-</td><td>-</td></tr></table>		Input Voltage [V]	Efficiency [%]		Load 50%	Load 100%	17	91.5	90.4	18	91.8	90.6	20	91.7	90.9	24	91.3	91.0	30	90.7	90.7	36	89.7	90.2	40	88.9	89.8	--	-	-	--	-	-
Input Voltage [V]	Efficiency [%]																																				
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Temperature	25°C
Testing Circuitry	Figure A

	Input Volt.	18V
	Input Volt.	24V
	Input Volt.	36V

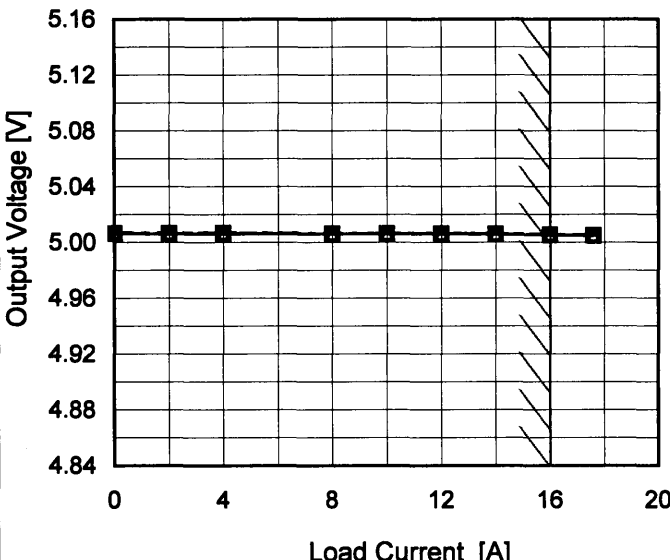


Load Current [A]	Efficiency [%]		
	Input Volt. 18[V]	Input Volt. 24[V]	Input Volt. 36[V]
0.0	-	-	-
2.0	83.3	82.2	77.4
4.0	89.3	88.4	85.0
8.0	91.8	91.3	89.7
10.0	92.0	91.7	90.3
12.0	91.8	91.7	90.3
14.0	91.3	91.5	90.4
16.0	90.6	91.0	90.2
17.6	90.2	90.5	89.9
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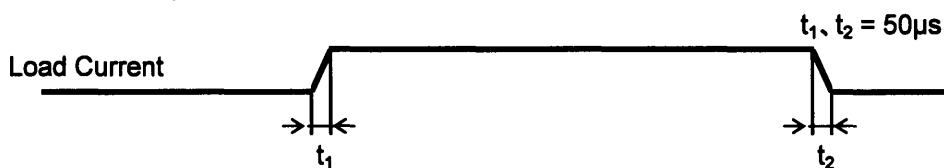
Model	CES24050-16																																
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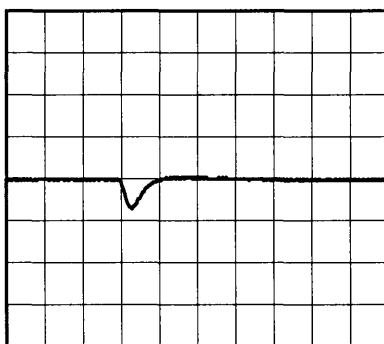
Model	CES24050-16	Temperature	25°C
Item	Dynamic Load Response	Testing Circuitry	Figure A
Object	+5V16A		

Input Volt. 24 V  
Cycle 5 mS

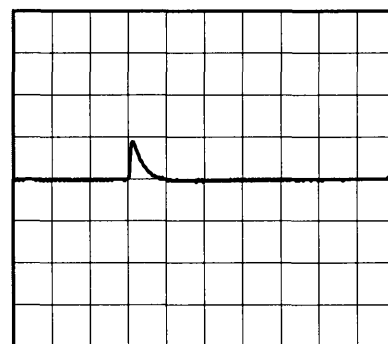


Min. Load (0A)  $\longleftrightarrow$   
Load 100% (16A)

100mV/div



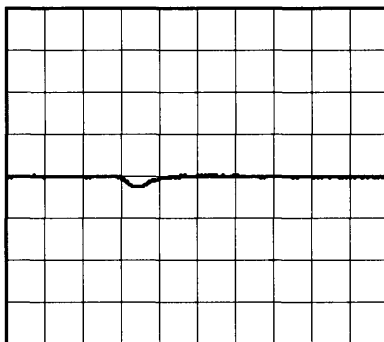
200µs/div



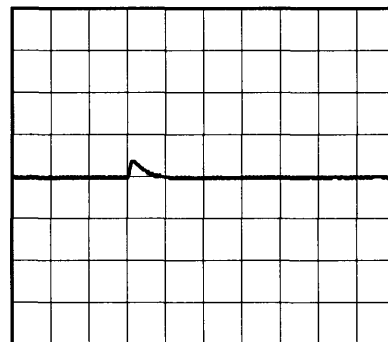
200µs/div

Min. Load (0A)  $\longleftrightarrow$   
Load 50% (8A)

100mV/div



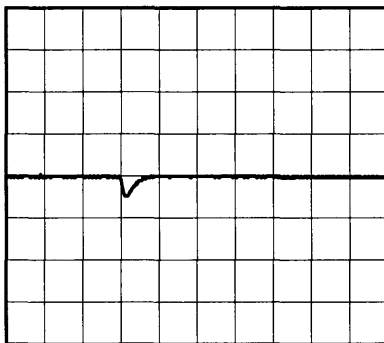
200µs/div



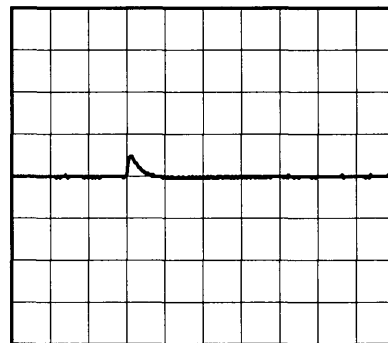
200µs/div

Load 50% (8A)  $\longleftrightarrow$   
Load 100% (16A)

100mV/div



200µs/div



200µs/div

# COSEL

Model		CES24050-16		Temperature 25°C																																							
Item		Ripple Voltage (by Load Current)		Testing Circuitry Figure B																																							
Object		+5V16A																																									
1.Graph				2.Values																																							
<div><div><div><div><div></div><div>—△—</div><div>Input Volt.</div><div>18V</div></div><div><div>---○---</div><div>Input Volt.</div><div>36V</div></div></div><div><p>Ripple Voltage [mV]</p><p>Load Current [A]</p></div></div><div><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><div><p>Ripple [mVp-p]</p><p>Fig.Complex Ripple Wave Form</p></div></div></div>				<table><tr><th rowspan="2">Load Current [A]</th><th colspan="2">Ripple Voltage [mV]</th></tr><tr><th>Input Volt. 18 [V]</th><th>Input Volt. 36 [V]</th></tr><tr><td>0.0</td><td>5</td><td>5</td></tr><tr><td>2.0</td><td>5</td><td>5</td></tr><tr><td>4.0</td><td>5</td><td>5</td></tr><tr><td>6.0</td><td>5</td><td>5</td></tr><tr><td>8.0</td><td>5</td><td>5</td></tr><tr><td>10.0</td><td>5</td><td>5</td></tr><tr><td>12.0</td><td>5</td><td>5</td></tr><tr><td>14.0</td><td>5</td><td>5</td></tr><tr><td>16.0</td><td>5</td><td>5</td></tr><tr><td>17.6</td><td>5</td><td>5</td></tr><tr><td>--</td><td>-</td><td>-</td></tr></table>		Load Current [A]	Ripple Voltage [mV]		Input Volt. 18 [V]	Input Volt. 36 [V]	0.0	5	5	2.0	5	5	4.0	5	5	6.0	5	5	8.0	5	5	10.0	5	5	12.0	5	5	14.0	5	5	16.0	5	5	17.6	5	5	--	-	-
Load Current [A]	Ripple Voltage [mV]																																										
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14.0	5	5																																									
16.0	5	5																																									
17.6	5	5																																									
--	-	-																																									

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BC-10110

Model		CES24050-16																																							
Item		Ripple-Noise																																							
Object		+5V16A																																							
1.Graph		2.Values																																							
<div><div><div><div><div></div><div>—△—</div><div>Input Volt.</div><div>18V</div></div><div><div>-·-○-·-</div><div>Input Volt.</div><div>36V</div></div></div><div><p>Ripple-Noise [mV]</p><p>Load Current [A]</p></div></div><div><p>Measured by 100 MHz Oscilloscope.</p><p>Ripple-Noise 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><div><div><div></div><div>↓</div></div><div><p>Ripple Noise[mVp-p]</p></div><div><div></div><div>↑</div></div></div><div></div><div><p>Fig.Complex Ripple Noise Wave Form</p></div></div></div>		<table><tr><th rowspan="2">Load Current [A]</th><th colspan="2">Ripple-Noise [mV]</th></tr><tr><th>Input Volt. 18 [V]</th><th>Input Volt. 36 [V]</th></tr><tr><td>0.0</td><td>10</td><td>15</td></tr><tr><td>2.0</td><td>10</td><td>15</td></tr><tr><td>4.0</td><td>10</td><td>15</td></tr><tr><td>6.0</td><td>10</td><td>15</td></tr><tr><td>8.0</td><td>15</td><td>20</td></tr><tr><td>10.0</td><td>25</td><td>30</td></tr><tr><td>12.0</td><td>30</td><td>35</td></tr><tr><td>14.0</td><td>35</td><td>40</td></tr><tr><td>16.0</td><td>40</td><td>45</td></tr><tr><td>17.6</td><td>40</td><td>45</td></tr><tr><td>—</td><td>-</td><td>-</td></tr></table>		Load Current [A]	Ripple-Noise [mV]		Input Volt. 18 [V]	Input Volt. 36 [V]	0.0	10	15	2.0	10	15	4.0	10	15	6.0	10	15	8.0	15	20	10.0	25	30	12.0	30	35	14.0	35	40	16.0	40	45	17.6	40	45	—	-	-
Load Current [A]	Ripple-Noise [mV]																																								
	Input Volt. 18 [V]	Input Volt. 36 [V]																																							
0.0	10	15																																							
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8.0	15	20																																							
10.0	25	30																																							
12.0	30	35																																							
14.0	35	40																																							
16.0	40	45																																							
17.6	40	45																																							
—	-	-																																							

# COSEL

Model		CES24050-16
Item		Ripple Voltage (by Ambient Temp.)
Object		+5V16A

1.Graph

---□---

Load 50%

—△—

Load 100%

100

90

80

70

60

50

40

30

20

10

0

Ripple Voltage [mV]

-60

-20

20

60

100

Ambient Temperature [°C]

Input Volt. 24V

Measured by 100 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%
-40	5	5
-20	5	5
0	5	5
25	5	5
40	5	5
60	5	5
85	5	5
--	-	-
--	-	-
--	-	-
--	-	-

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BC-10110

# COSEL

**Model** CES24050-16

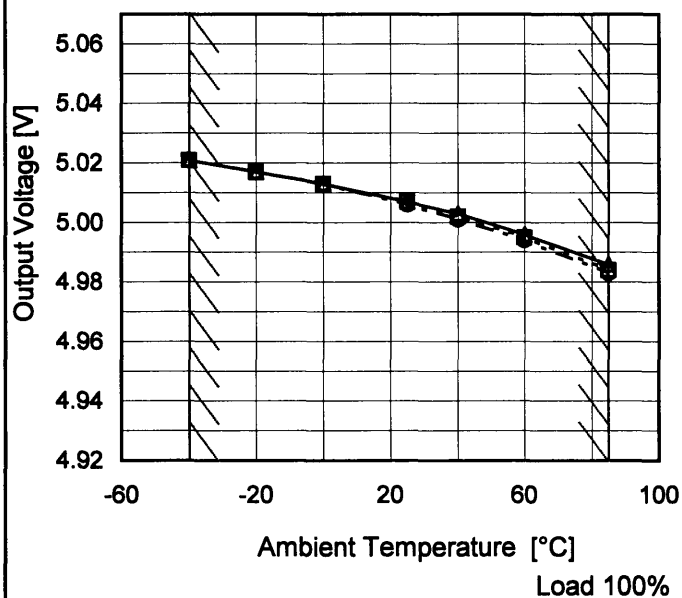
**Item** Ambient Temperature Drift

**Object** +5V16A

**Testing Circuitry** Figure A

**1. Graph**

—△— Input Volt. 18V  
 ---□--- Input Volt. 24V  
 -·-○-·- Input Volt. 36V



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

**2. Values**

Ambient Temperature [°C]	Output Voltage [V]		
	Input Volt. 18[V]	Input Volt. 24[V]	Input Volt. 36[V]
-40	5.021	5.021	5.021
-20	5.017	5.017	5.017
0	5.013	5.013	5.013
25	5.007	5.007	5.006
40	5.003	5.002	5.001
60	4.996	4.995	4.994
85	4.986	4.984	4.983
--	-	-	-
--	-	-	-
--	-	-	-
--	-	-	-

**COSEL**

		Testing Circuitry Figure A
Model	CES24050-16	
Item	Output Voltage Accuracy	
Object	+5V16A	

### 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 - 85°C

Input Voltage : 18 - 36V

Load Current : 0 - 16A

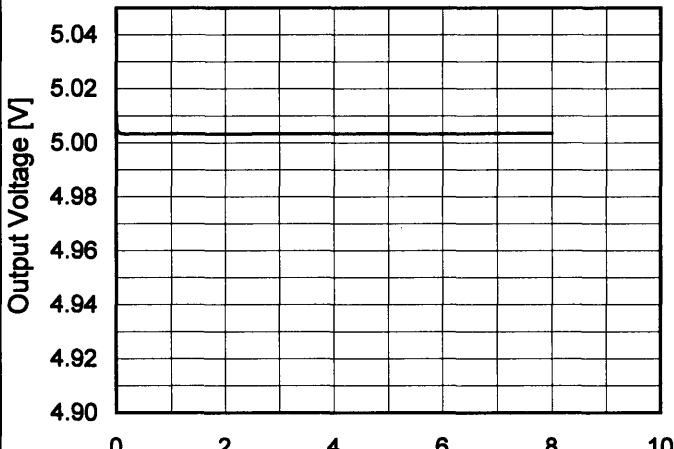
\* Output Voltage Accuracy =  $\pm(\text{Maximum of Output Voltage} - \text{Minimum of Output Voltage}) / 2$

\* 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	36	0	5.021	±19	±0.4
Minimum Voltage	85	36	16	4.983		

**COSEL**

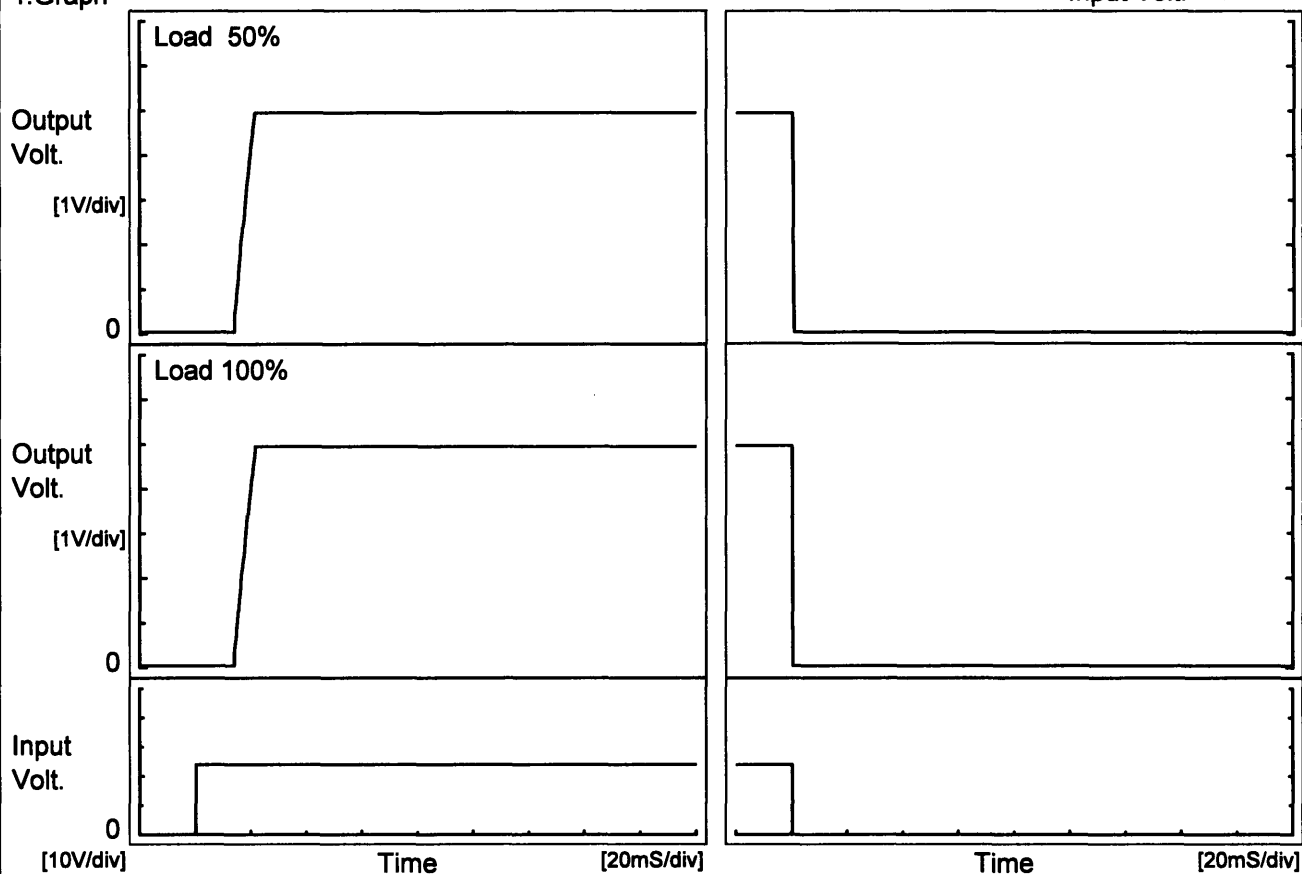
Model	CES24050-16																								
Item	Time Lapse Drift	Temperature	25°C																						
Object	+5V16A	Testing Circuitry	Figure A																						
1.Graph		2.Values																							
<div><p>Output Voltage [V]</p><p>Time [H]</p><p>Input Volt. 24V</p><p>Load 100%</p></div>		<table><thead><tr><th>Time since start [H]</th><th>Output Voltage [V]</th></tr></thead><tbody><tr><td>0.0</td><td>5.009</td></tr><tr><td>0.5</td><td>5.003</td></tr><tr><td>1.0</td><td>5.003</td></tr><tr><td>2.0</td><td>5.003</td></tr><tr><td>3.0</td><td>5.003</td></tr><tr><td>4.0</td><td>5.003</td></tr><tr><td>5.0</td><td>5.003</td></tr><tr><td>6.0</td><td>5.003</td></tr><tr><td>7.0</td><td>5.004</td></tr><tr><td>8.0</td><td>5.004</td></tr></tbody></table>		Time since start [H]	Output Voltage [V]	0.0	5.009	0.5	5.003	1.0	5.003	2.0	5.003	3.0	5.003	4.0	5.003	5.0	5.003	6.0	5.003	7.0	5.004	8.0	5.004
Time since start [H]	Output Voltage [V]																								
0.0	5.009																								
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6.0	5.003																								
7.0	5.004																								
8.0	5.004																								

# COSEL

Model	CES24050-16	Temperature	25°C
Item	Rise and Fall Time	Testing Circuitry	Figure A
Object	+5V16A		

## 1. Graph

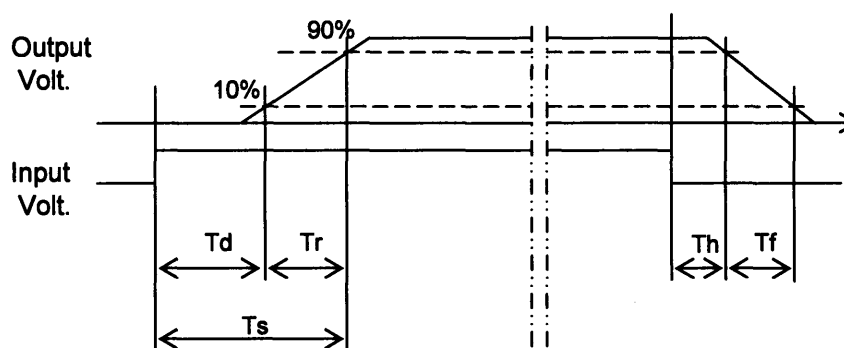
Input Volt. 24 V



## 2. Values

[mS]

Load \ Time	Td	Tr	Ts	Th	Tf
50 %	14.3	6.6	20.9	0.2	0.3
100 %	14.3	6.8	21.1	0.2	0.1



# COSEL

		Testing Circuitry    Figure A																																						
Model	CES24050-16																																							
Item	Minimum Input Voltage for Regulated Output Voltage																																							
Object	+5V16A																																							
1.Graph		2.Values																																						
<div><div>---□---</div><div>Load 50%</div><div>—△—</div><div>Load 100%</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>-40</td><td>15.7</td><td>15.8</td></tr><tr><td>-20</td><td>15.7</td><td>15.8</td></tr><tr><td>0</td><td>15.7</td><td>15.7</td></tr><tr><td>25</td><td>15.7</td><td>15.7</td></tr><tr><td>40</td><td>15.7</td><td>15.7</td></tr><tr><td>60</td><td>15.7</td><td>15.7</td></tr><tr><td>85</td><td>15.7</td><td>15.7</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]	Input Voltage [V]		Load 50%	Load 100%	-40	15.7	15.8	-20	15.7	15.8	0	15.7	15.7	25	15.7	15.7	40	15.7	15.7	60	15.7	15.7	85	15.7	15.7	--	-	-	--	-	-	--	-	-	--	-	-
Ambient Temperature [°C]	Input Voltage [V]																																							
	Load 50%	Load 100%																																						
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85	15.7	15.7																																						
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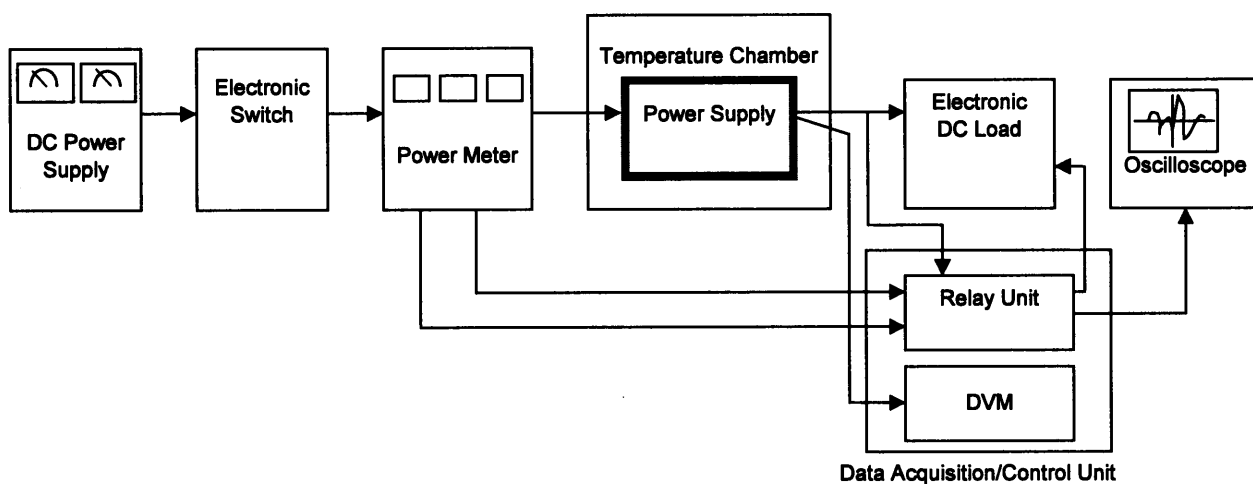


Figure A

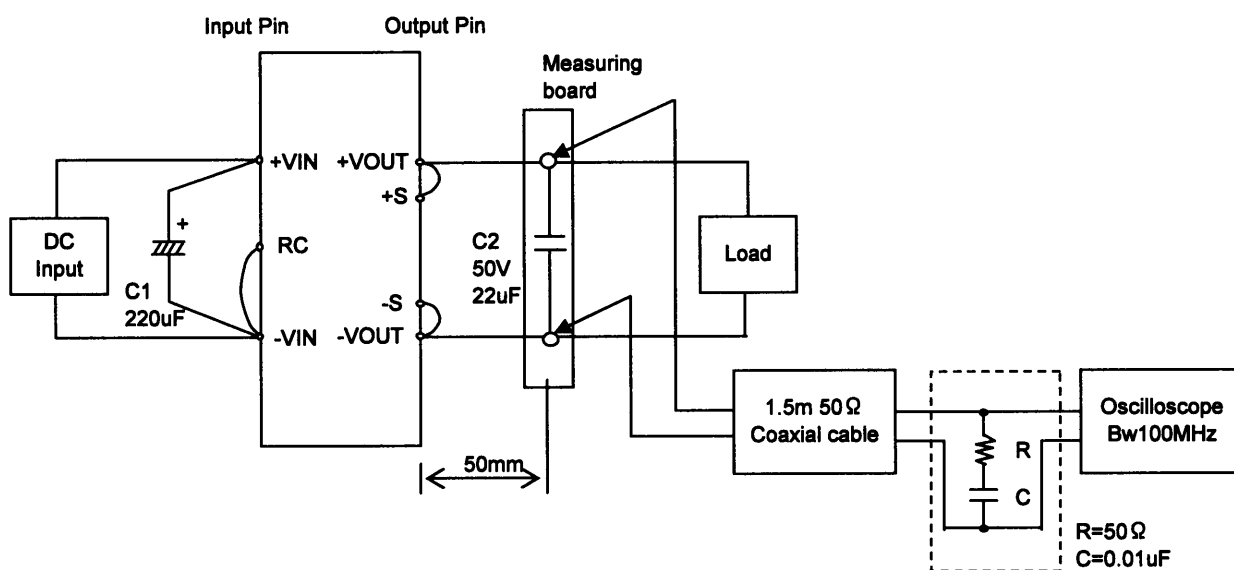


Figure B