



# TEST DATA OF R150-9

Regulated DC Power Supply  
Mar 14, 2005

Approved by : K. Shiho Design Manager

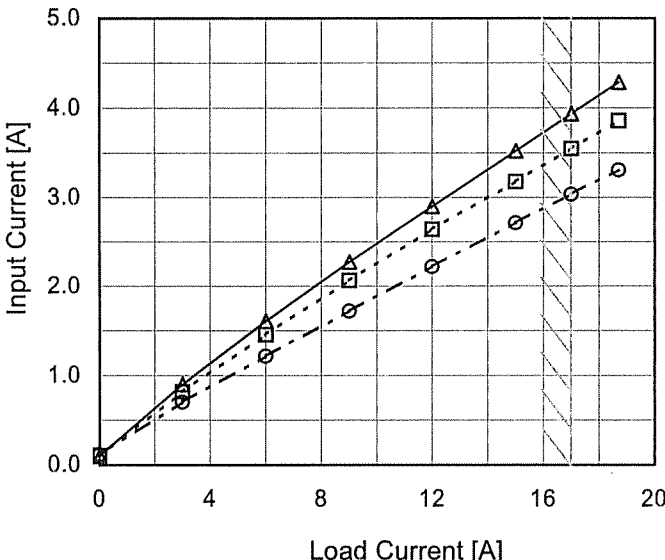
Prepared by : M. Fujii Design Engineer

**COSEL CO.,LTD.**

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|   |  |   |  |
|---|--|---|--|
| Model   |  | R150-9  |  |
| Item  |  | Input Current (by Load Current)   |  |
| Object  |  |   |  |
| 1.Graph   |  | <div><div><div>—△—</div><div>Input Volt.</div><div>85V</div></div><div><div>---□---</div><div>Input Volt.</div><div>100V</div></div><div><div>-·-○-·-</div><div>Input Volt.</div><div>132V</div></div></div>  |  |
| Note: Slanted line shows the range of the rated load current. |  |   |  |

|                   |  |          |  |
|-------------------|--|----------|--|
| Temperature       |  | 25°C     |  |
| Testing Circuitry |  | Figure A |  |

2.Values

| Load Current [A] | Input Current [A] |                    |                    |
|------------------|-------------------|--------------------|--------------------|
|                  | Input Volt. 85[V] | Input Volt. 100[V] | Input Volt. 132[V] |
| 0.0              | 0.101             | 0.105              | 0.115              |
| 3.0              | 0.900             | 0.820              | 0.704              |
| 6.0              | 1.608             | 1.460              | 1.216              |
| 9.0              | 2.274             | 2.064              | 1.722              |
| 12.0             | 2.900             | 2.640              | 2.220              |
| 15.0             | 3.525             | 3.180              | 2.712              |
| 17.0             | 3.940             | 3.549              | 3.036              |
| 18.7             | 4.290             | 3.862              | 3.308              |
| --               | -                 | -                  | -                  |
| --               | -                 | -                  | -                  |
| --               | -                 | -                  | -                  |

- 1 -

BC-1000

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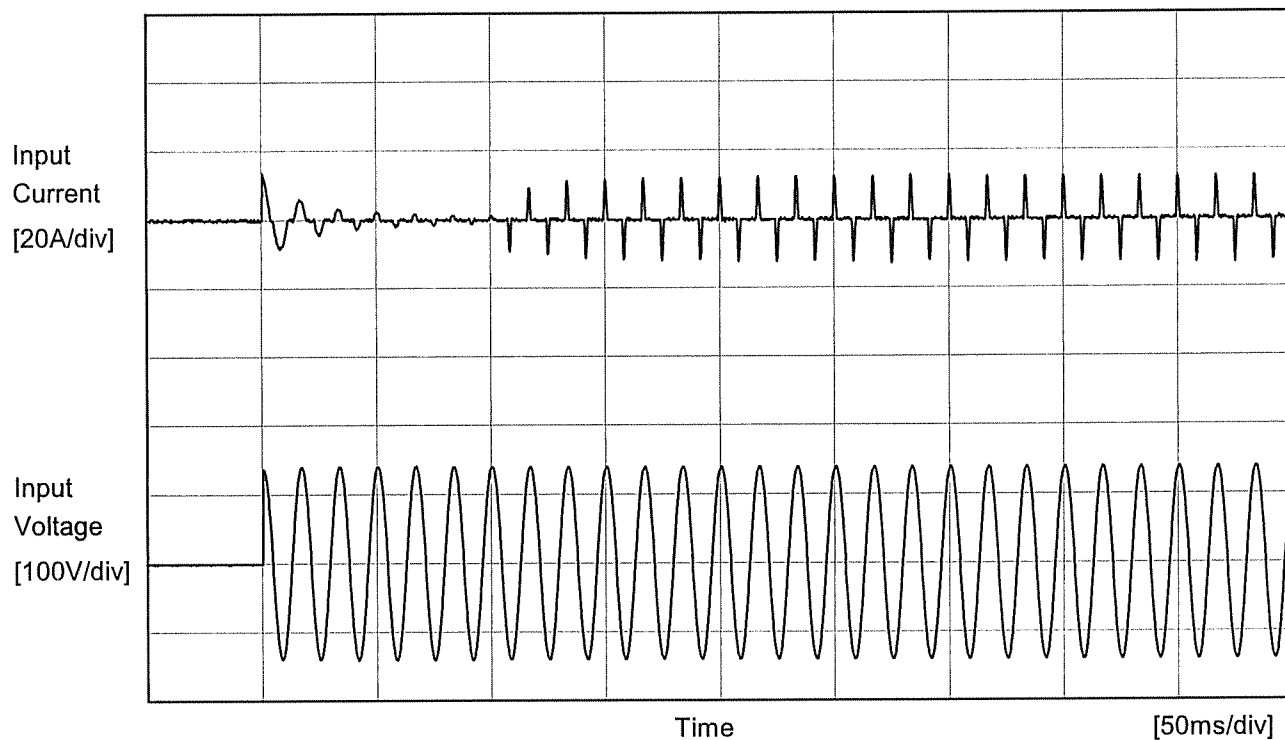
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| Model  |                         | R150-9                        |                         |                          |    |      |      |    |      |      |    |      |      |    |      |      |     |      |      |     |      |      |     |      |      |     |      |      |     |      |      |  |  |                   |                |  |          |           |    |      |      |    |      |      |    |      |      |    |      |      |     |      |      |     |      |      |     |      |      |     |      |      |     |      |      |
|--|-------------------------|-------------------------------|-------------------------|--------------------------|----|------|------|----|------|------|----|------|------|----|------|------|-----|------|------|-----|------|------|-----|------|------|-----|------|------|-----|------|------|--|--|-------------------|----------------|--|----------|-----------|----|------|------|----|------|------|----|------|------|----|------|------|-----|------|------|-----|------|------|-----|------|------|-----|------|------|-----|------|------|
| 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></div></div><div>Load 50%</div><div>Load 100%</div></div> <table><thead><tr><th>Input Voltage [V]</th><th>Load 50% Efficiency [%]</th><th>Load 100% Efficiency [%]</th></tr></thead><tbody><tr><td>75</td><td>83.2</td><td>81.2</td></tr><tr><td>80</td><td>83.4</td><td>81.8</td></tr><tr><td>85</td><td>83.2</td><td>82.2</td></tr><tr><td>90</td><td>83.2</td><td>82.5</td></tr><tr><td>100</td><td>82.9</td><td>82.9</td></tr><tr><td>110</td><td>83.3</td><td>83.2</td></tr><tr><td>120</td><td>82.7</td><td>83.2</td></tr><tr><td>132</td><td>82.2</td><td>83.2</td></tr><tr><td>140</td><td>81.7</td><td>83.0</td></tr></tbody></table> |                         | Input Voltage [V]             | Load 50% Efficiency [%] | Load 100% Efficiency [%] | 75 | 83.2 | 81.2 | 80 | 83.4 | 81.8 | 85 | 83.2 | 82.2 | 90 | 83.2 | 82.5 | 100 | 82.9 | 82.9 | 110 | 83.3 | 83.2 | 120 | 82.7 | 83.2 | 132 | 82.2 | 83.2 | 140 | 81.7 | 83.0 | <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>75</td><td>83.2</td><td>81.2</td></tr><tr><td>80</td><td>83.4</td><td>81.8</td></tr><tr><td>85</td><td>83.2</td><td>82.2</td></tr><tr><td>90</td><td>83.2</td><td>82.5</td></tr><tr><td>100</td><td>82.9</td><td>82.9</td></tr><tr><td>110</td><td>83.3</td><td>83.2</td></tr><tr><td>120</td><td>82.7</td><td>83.2</td></tr><tr><td>132</td><td>82.2</td><td>83.2</td></tr><tr><td>140</td><td>81.7</td><td>83.0</td></tr></tbody></table> |  | Input Voltage [V] | Efficiency [%] |  | Load 50% | Load 100% | 75 | 83.2 | 81.2 | 80 | 83.4 | 81.8 | 85 | 83.2 | 82.2 | 90 | 83.2 | 82.5 | 100 | 82.9 | 82.9 | 110 | 83.3 | 83.2 | 120 | 82.7 | 83.2 | 132 | 82.2 | 83.2 | 140 | 81.7 | 83.0 |
| Input Voltage [V]  | Load 50% Efficiency [%] | Load 100% Efficiency [%]      |                         |                          |    |      |      |    |      |      |    |      |      |    |      |      |     |      |      |     |      |      |     |      |      |     |      |      |     |      |      |  |  |                   |                |  |          |           |    |      |      |    |      |      |    |      |      |    |      |      |     |      |      |     |      |      |     |      |      |     |      |      |     |      |      |
| 75   | 83.2                    | 81.2                          |                         |                          |    |      |      |    |      |      |    |      |      |    |      |      |     |      |      |     |      |      |     |      |      |     |      |      |     |      |      |  |  |                   |                |  |          |           |    |      |      |    |      |      |    |      |      |    |      |      |     |      |      |     |      |      |     |      |      |     |      |      |     |      |      |
| 80   | 83.4                    | 81.8                          |                         |                          |    |      |      |    |      |      |    |      |      |    |      |      |     |      |      |     |      |      |     |      |      |     |      |      |     |      |      |  |  |                   |                |  |          |           |    |      |      |    |      |      |    |      |      |    |      |      |     |      |      |     |      |      |     |      |      |     |      |      |     |      |      |
| 85   | 83.2                    | 82.2                          |                         |                          |    |      |      |    |      |      |    |      |      |    |      |      |     |      |      |     |      |      |     |      |      |     |      |      |     |      |      |  |  |                   |                |  |          |           |    |      |      |    |      |      |    |      |      |    |      |      |     |      |      |     |      |      |     |      |      |     |      |      |     |      |      |
| 90   | 83.2                    | 82.5                          |                         |                          |    |      |      |    |      |      |    |      |      |    |      |      |     |      |      |     |      |      |     |      |      |     |      |      |     |      |      |  |  |                   |                |  |          |           |    |      |      |    |      |      |    |      |      |    |      |      |     |      |      |     |      |      |     |      |      |     |      |      |     |      |      |
| 100  | 82.9                    | 82.9                          |                         |                          |    |      |      |    |      |      |    |      |      |    |      |      |     |      |      |     |      |      |     |      |      |     |      |      |     |      |      |  |  |                   |                |  |          |           |    |      |      |    |      |      |    |      |      |    |      |      |     |      |      |     |      |      |     |      |      |     |      |      |     |      |      |
| 110  | 83.3                    | 83.2                          |                         |                          |    |      |      |    |      |      |    |      |      |    |      |      |     |      |      |     |      |      |     |      |      |     |      |      |     |      |      |  |  |                   |                |  |          |           |    |      |      |    |      |      |    |      |      |    |      |      |     |      |      |     |      |      |     |      |      |     |      |      |     |      |      |
| 120  | 82.7                    | 83.2                          |                         |                          |    |      |      |    |      |      |    |      |      |    |      |      |     |      |      |     |      |      |     |      |      |     |      |      |     |      |      |  |  |                   |                |  |          |           |    |      |      |    |      |      |    |      |      |    |      |      |     |      |      |     |      |      |     |      |      |     |      |      |     |      |      |
| 132  | 82.2                    | 83.2                          |                         |                          |    |      |      |    |      |      |    |      |      |    |      |      |     |      |      |     |      |      |     |      |      |     |      |      |     |      |      |  |  |                   |                |  |          |           |    |      |      |    |      |      |    |      |      |    |      |      |     |      |      |     |      |      |     |      |      |     |      |      |     |      |      |
| 140  | 81.7                    | 83.0                          |                         |                          |    |      |      |    |      |      |    |      |      |    |      |      |     |      |      |     |      |      |     |      |      |     |      |      |     |      |      |  |  |                   |                |  |          |           |    |      |      |    |      |      |    |      |      |    |      |      |     |      |      |     |      |      |     |      |      |     |      |      |     |      |      |
| Input Voltage [V]  | Efficiency [%]          |                               |                         |                          |    |      |      |    |      |      |    |      |      |    |      |      |     |      |      |     |      |      |     |      |      |     |      |      |     |      |      |  |  |                   |                |  |          |           |    |      |      |    |      |      |    |      |      |    |      |      |     |      |      |     |      |      |     |      |      |     |      |      |     |      |      |
|  | Load 50%                | Load 100%                     |                         |                          |    |      |      |    |      |      |    |      |      |    |      |      |     |      |      |     |      |      |     |      |      |     |      |      |     |      |      |  |  |                   |                |  |          |           |    |      |      |    |      |      |    |      |      |    |      |      |     |      |      |     |      |      |     |      |      |     |      |      |     |      |      |
| 75   | 83.2                    | 81.2                          |                         |                          |    |      |      |    |      |      |    |      |      |    |      |      |     |      |      |     |      |      |     |      |      |     |      |      |     |      |      |  |  |                   |                |  |          |           |    |      |      |    |      |      |    |      |      |    |      |      |     |      |      |     |      |      |     |      |      |     |      |      |     |      |      |
| 80   | 83.4                    | 81.8                          |                         |                          |    |      |      |    |      |      |    |      |      |    |      |      |     |      |      |     |      |      |     |      |      |     |      |      |     |      |      |  |  |                   |                |  |          |           |    |      |      |    |      |      |    |      |      |    |      |      |     |      |      |     |      |      |     |      |      |     |      |      |     |      |      |
| 85   | 83.2                    | 82.2                          |                         |                          |    |      |      |    |      |      |    |      |      |    |      |      |     |      |      |     |      |      |     |      |      |     |      |      |     |      |      |  |  |                   |                |  |          |           |    |      |      |    |      |      |    |      |      |    |      |      |     |      |      |     |      |      |     |      |      |     |      |      |     |      |      |
| 90   | 83.2                    | 82.5                          |                         |                          |    |      |      |    |      |      |    |      |      |    |      |      |     |      |      |     |      |      |     |      |      |     |      |      |     |      |      |  |  |                   |                |  |          |           |    |      |      |    |      |      |    |      |      |    |      |      |     |      |      |     |      |      |     |      |      |     |      |      |     |      |      |
| 100  | 82.9                    | 82.9                          |                         |                          |    |      |      |    |      |      |    |      |      |    |      |      |     |      |      |     |      |      |     |      |      |     |      |      |     |      |      |  |  |                   |                |  |          |           |    |      |      |    |      |      |    |      |      |    |      |      |     |      |      |     |      |      |     |      |      |     |      |      |     |      |      |
| 110  | 83.3                    | 83.2                          |                         |                          |    |      |      |    |      |      |    |      |      |    |      |      |     |      |      |     |      |      |     |      |      |     |      |      |     |      |      |  |  |                   |                |  |          |           |    |      |      |    |      |      |    |      |      |    |      |      |     |      |      |     |      |      |     |      |      |     |      |      |     |      |      |
| 120  | 82.7                    | 83.2                          |                         |                          |    |      |      |    |      |      |    |      |      |    |      |      |     |      |      |     |      |      |     |      |      |     |      |      |     |      |      |  |  |                   |                |  |          |           |    |      |      |    |      |      |    |      |      |    |      |      |     |      |      |     |      |      |     |      |      |     |      |      |     |      |      |
| 132  | 82.2                    | 83.2                          |                         |                          |    |      |      |    |      |      |    |      |      |    |      |      |     |      |      |     |      |      |     |      |      |     |      |      |     |      |      |  |  |                   |                |  |          |           |    |      |      |    |      |      |    |      |      |    |      |      |     |      |      |     |      |      |     |      |      |     |      |      |     |      |      |
| 140  | 81.7                    | 83.0                          |                         |                          |    |      |      |    |      |      |    |      |      |    |      |      |     |      |      |     |      |      |     |      |      |     |      |      |     |      |      |  |  |                   |                |  |          |           |    |      |      |    |      |      |    |      |      |    |      |      |     |      |      |     |      |      |     |      |      |     |      |      |     |      |      |
| Note: Slanted line shows the range of the rated input voltage.   |                         |                               |                         |                          |    |      |      |    |      |      |    |      |      |    |      |      |     |      |      |     |      |      |     |      |      |     |      |      |     |      |      |  |  |                   |                |  |          |           |    |      |      |    |      |      |    |      |      |    |      |      |     |      |      |     |      |      |     |      |      |     |      |      |     |      |      |

BC-1000

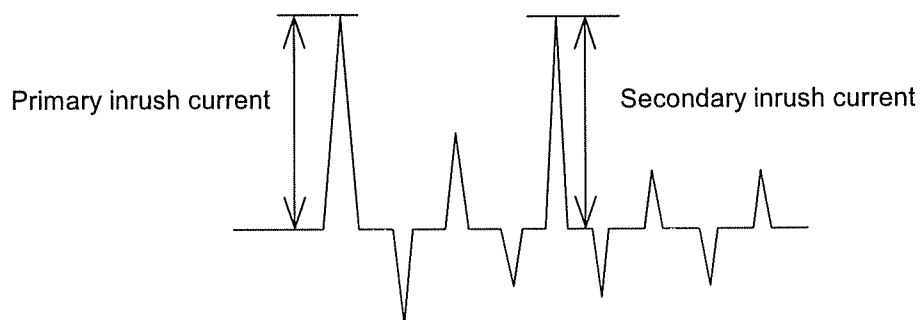
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|        |                |                   |          |
|--------|----------------|-------------------|----------|
| Model  | R150-9         | Temperature       | 25°C     |
| Item   | Inrush Current | Testing Circuitry | Figure A |
| Object | _____          |                   |          |



Input Voltage      100 V  
 Frequency          60 Hz  
 Load                100 %

Primary inrush current    13.5 A  
 Secondary inrush current 12.9 A



| Model  | R150-9             | Temperature 25°C<br>Testing Circuitry Figure A |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|--|--------------------|--|--------------------|--|----------|-----------|----|-------|-------|----|-------|-------|----|-------|-------|----|-------|-------|----|-------|-------|-----|-------|-------|-----|-------|-------|-----|-------|-------|-----|-------|-------|-----|-------|-------|-----|-------|-------|-----|-------|-------|-----|-------|-------|-----|-------|-------|-----|-------|-------|--|--|
| Item   | Line Regulation    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
| Object   | +9V17A             |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
| 1.Graph  |                    | 2.Values                                       |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
| <div><div><div>---□---</div><div>Load 50%</div></div><div><div>—△—</div><div>Load 100%</div></div></div> <table><thead><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></thead><tbody><tr><td>75</td><td>9.068</td><td>9.054</td></tr><tr><td>80</td><td>9.068</td><td>9.054</td></tr><tr><td>85</td><td>9.068</td><td>9.054</td></tr><tr><td>90</td><td>9.068</td><td>9.054</td></tr><tr><td>95</td><td>9.068</td><td>9.054</td></tr><tr><td>100</td><td>9.068</td><td>9.054</td></tr><tr><td>105</td><td>9.068</td><td>9.054</td></tr><tr><td>110</td><td>9.068</td><td>9.054</td></tr><tr><td>115</td><td>9.068</td><td>9.054</td></tr><tr><td>120</td><td>9.068</td><td>9.054</td></tr><tr><td>125</td><td>9.068</td><td>9.054</td></tr><tr><td>130</td><td>9.068</td><td>9.054</td></tr><tr><td>132</td><td>9.068</td><td>9.054</td></tr><tr><td>135</td><td>9.068</td><td>9.054</td></tr><tr><td>140</td><td>9.068</td><td>9.054</td></tr></tbody></table> |                    | Input Voltage [V]                              | Output Voltage [V] |  | Load 50% | Load 100% | 75 | 9.068 | 9.054 | 80 | 9.068 | 9.054 | 85 | 9.068 | 9.054 | 90 | 9.068 | 9.054 | 95 | 9.068 | 9.054 | 100 | 9.068 | 9.054 | 105 | 9.068 | 9.054 | 110 | 9.068 | 9.054 | 115 | 9.068 | 9.054 | 120 | 9.068 | 9.054 | 125 | 9.068 | 9.054 | 130 | 9.068 | 9.054 | 132 | 9.068 | 9.054 | 135 | 9.068 | 9.054 | 140 | 9.068 | 9.054 |  |  |
| Input Voltage [V]  | Output Voltage [V] |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  | Load 50%           | Load 100%                                      |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
| 75   | 9.068              | 9.054  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
| 80   | 9.068              | 9.054  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
| 85   | 9.068              | 9.054  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
| 90   | 9.068              | 9.054  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
| 95   | 9.068              | 9.054  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
| 100  | 9.068              | 9.054  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
| 105  | 9.068              | 9.054  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
| 110  | 9.068              | 9.054  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
| 115  | 9.068              | 9.054  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
| 120  | 9.068              | 9.054  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
| 125  | 9.068              | 9.054  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
| 130  | 9.068              | 9.054  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
| 132  | 9.068              | 9.054  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
| 135  | 9.068              | 9.054  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
| 140  | 9.068              | 9.054  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
| Note: Slanted line shows the range of the rated input voltage.   |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
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|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
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|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
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|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
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|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |
|  |                    |  |                    |  |          |           |    |       |       |    |       |       |    |       |       |    |       |       |    |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |     |       |       |  |  |



# COSEL

| Model   | R150-9             |   |                    |                  |                    |  |  |                   |                    |                    |     |       |       |       |     |       |       |       |     |       |       |       |     |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |    |   |   |   |    |   |   |   |    |   |   |   |
|---|--------------------|---|--------------------|------------------|--------------------|--|--|-------------------|--------------------|--------------------|-----|-------|-------|-------|-----|-------|-------|-------|-----|-------|-------|-------|-----|-------|-------|-------|------|-------|-------|-------|------|-------|-------|-------|------|-------|-------|-------|------|-------|-------|-------|----|---|---|---|----|---|---|---|----|---|---|---|
| Item  | Load Regulation    | Temperature   | 25°C               |                  |                    |  |  |                   |                    |                    |     |       |       |       |     |       |       |       |     |       |       |       |     |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |    |   |   |   |    |   |   |   |    |   |   |   |
| Object  | +9V17A             | Testing Circuitry   | Figure A           |                  |                    |  |  |                   |                    |                    |     |       |       |       |     |       |       |       |     |       |       |       |     |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |    |   |   |   |    |   |   |   |    |   |   |   |
| 1.Graph   |                    | 2.Values  |                    |                  |                    |  |  |                   |                    |                    |     |       |       |       |     |       |       |       |     |       |       |       |     |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |    |   |   |   |    |   |   |   |    |   |   |   |
| <div><div><div>—△—</div><div>Input Volt.</div><div>85V</div></div><div><div>---□---</div><div>Input Volt.</div><div>100V</div></div><div><div>---○---</div><div>Input Volt.</div><div>132V</div></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> |                    | <table><tr><th rowspan="2">Load Current [A]</th><th colspan="3">Output Voltage [V]</th></tr><tr><th>Input Volt. 85[V]</th><th>Input Volt. 100[V]</th><th>Input Volt. 132[V]</th></tr><tr><td>0.0</td><td>9.082</td><td>9.082</td><td>9.082</td></tr><tr><td>3.0</td><td>9.077</td><td>9.077</td><td>9.077</td></tr><tr><td>6.0</td><td>9.072</td><td>9.072</td><td>9.072</td></tr><tr><td>9.0</td><td>9.067</td><td>9.067</td><td>9.067</td></tr><tr><td>12.0</td><td>9.062</td><td>9.062</td><td>9.062</td></tr><tr><td>15.0</td><td>9.057</td><td>9.057</td><td>9.057</td></tr><tr><td>17.0</td><td>9.054</td><td>9.054</td><td>9.054</td></tr><tr><td>18.7</td><td>9.051</td><td>9.051</td><td>9.051</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. 85[V] | Input Volt. 100[V] | Input Volt. 132[V] | 0.0 | 9.082 | 9.082 | 9.082 | 3.0 | 9.077 | 9.077 | 9.077 | 6.0 | 9.072 | 9.072 | 9.072 | 9.0 | 9.067 | 9.067 | 9.067 | 12.0 | 9.062 | 9.062 | 9.062 | 15.0 | 9.057 | 9.057 | 9.057 | 17.0 | 9.054 | 9.054 | 9.054 | 18.7 | 9.051 | 9.051 | 9.051 | -- | - | - | - | -- | - | - | - | -- | - | - | - |
| Load Current [A]  | Output Voltage [V] |   |                    |                  |                    |  |  |                   |                    |                    |     |       |       |       |     |       |       |       |     |       |       |       |     |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |    |   |   |   |    |   |   |   |    |   |   |   |
|   | Input Volt. 85[V]  | Input Volt. 100[V]  | Input Volt. 132[V] |                  |                    |  |  |                   |                    |                    |     |       |       |       |     |       |       |       |     |       |       |       |     |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |    |   |   |   |    |   |   |   |    |   |   |   |
| 0.0   | 9.082              | 9.082   | 9.082              |                  |                    |  |  |                   |                    |                    |     |       |       |       |     |       |       |       |     |       |       |       |     |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |    |   |   |   |    |   |   |   |    |   |   |   |
| 3.0   | 9.077              | 9.077   | 9.077              |                  |                    |  |  |                   |                    |                    |     |       |       |       |     |       |       |       |     |       |       |       |     |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |    |   |   |   |    |   |   |   |    |   |   |   |
| 6.0   | 9.072              | 9.072   | 9.072              |                  |                    |  |  |                   |                    |                    |     |       |       |       |     |       |       |       |     |       |       |       |     |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |    |   |   |   |    |   |   |   |    |   |   |   |
| 9.0   | 9.067              | 9.067   | 9.067              |                  |                    |  |  |                   |                    |                    |     |       |       |       |     |       |       |       |     |       |       |       |     |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |    |   |   |   |    |   |   |   |    |   |   |   |
| 12.0  | 9.062              | 9.062   | 9.062              |                  |                    |  |  |                   |                    |                    |     |       |       |       |     |       |       |       |     |       |       |       |     |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |    |   |   |   |    |   |   |   |    |   |   |   |
| 15.0  | 9.057              | 9.057   | 9.057              |                  |                    |  |  |                   |                    |                    |     |       |       |       |     |       |       |       |     |       |       |       |     |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |    |   |   |   |    |   |   |   |    |   |   |   |
| 17.0  | 9.054              | 9.054   | 9.054              |                  |                    |  |  |                   |                    |                    |     |       |       |       |     |       |       |       |     |       |       |       |     |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |    |   |   |   |    |   |   |   |    |   |   |   |
| 18.7  | 9.051              | 9.051   | 9.051              |                  |                    |  |  |                   |                    |                    |     |       |       |       |     |       |       |       |     |       |       |       |     |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |    |   |   |   |    |   |   |   |    |   |   |   |
| --  | -                  | -   | -                  |                  |                    |  |  |                   |                    |                    |     |       |       |       |     |       |       |       |     |       |       |       |     |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |    |   |   |   |    |   |   |   |    |   |   |   |
| --  | -                  | -   | -                  |                  |                    |  |  |                   |                    |                    |     |       |       |       |     |       |       |       |     |       |       |       |     |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |    |   |   |   |    |   |   |   |    |   |   |   |
| --  | -                  | -   | -                  |                  |                    |  |  |                   |                    |                    |     |       |       |       |     |       |       |       |     |       |       |       |     |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |    |   |   |   |    |   |   |   |    |   |   |   |

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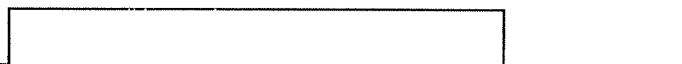
BC-1000



|        |                       |                   |          |
|--------|-----------------------|-------------------|----------|
| Model  | R150-9                | Temperature       | 25°C     |
| Item   | Dynamic Load Response | Testing Circuitry | Figure A |
| Object | +9V17A                |                   |          |

Input Volt. 100 V  
Cycle 1000 ms

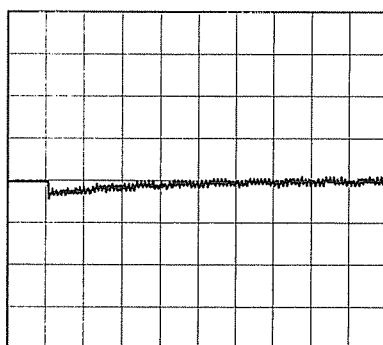
Load Current



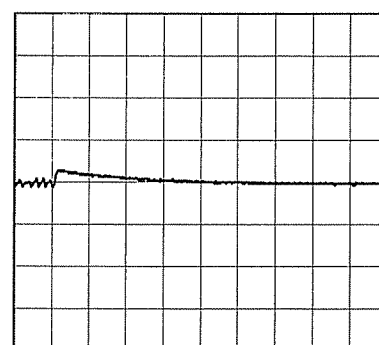
Min. Load (0A) ←→

Load 100% (17A)

200 mV/div



10 ms/div

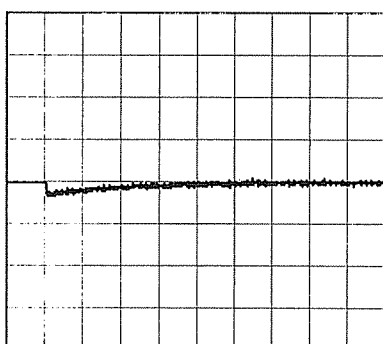


10 ms/div

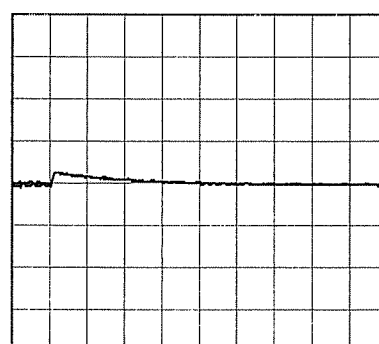
Min. Load (0A) ←→

Load 50% (8.5A)

200 mV/div

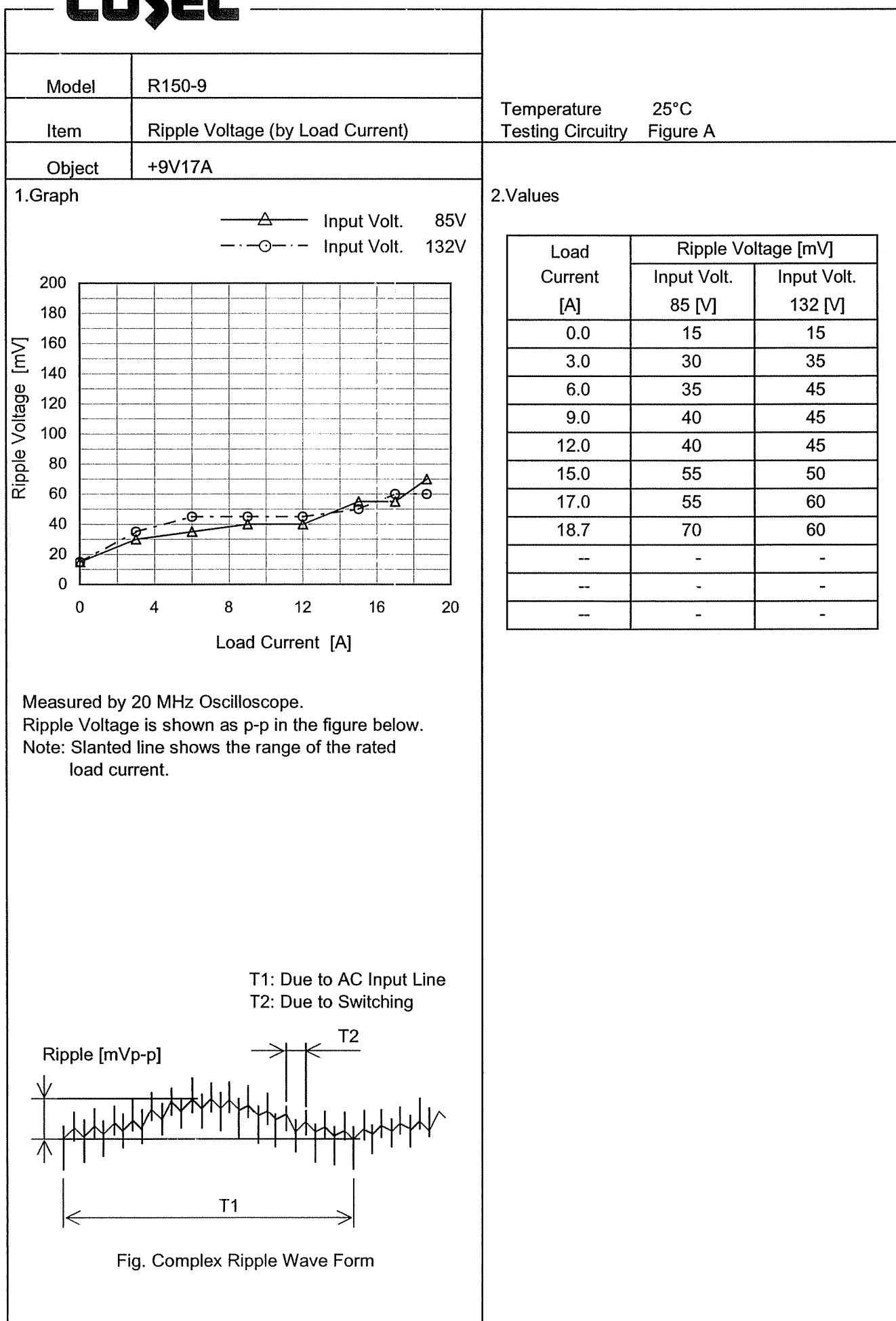


10 ms/div



10 ms/div

# COSEL



# COSEL

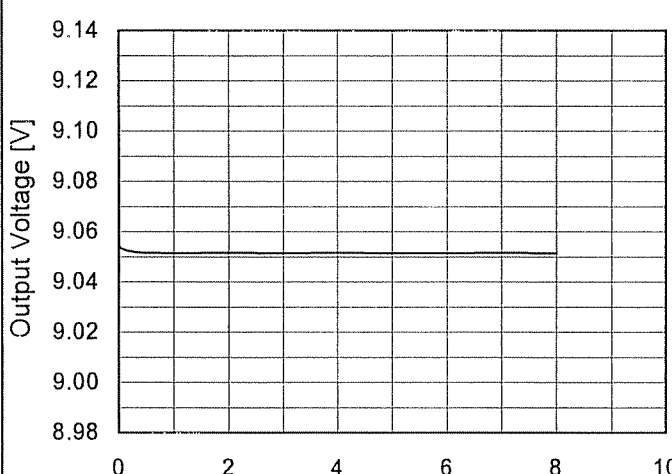
| Model  | R150-9             | Temperature 25°C<br>Testing Circuitry Figure A  |  |                  |                   |  |                    |                     |     |    |    |     |    |    |     |    |    |     |    |    |      |    |    |      |    |    |      |    |    |      |    |    |    |   |   |    |   |   |    |   |   |
|--|--------------------|---|--|------------------|-------------------|--|--------------------|---------------------|-----|----|----|-----|----|----|-----|----|----|-----|----|----|------|----|----|------|----|----|------|----|----|------|----|----|----|---|---|----|---|---|----|---|---|
| Item   | Ripple-Noise       |   |  |                  |                   |  |                    |                     |     |    |    |     |    |    |     |    |    |     |    |    |      |    |    |      |    |    |      |    |    |      |    |    |    |   |   |    |   |   |    |   |   |
| Object   | +9V17A             |   |  |                  |                   |  |                    |                     |     |    |    |     |    |    |     |    |    |     |    |    |      |    |    |      |    |    |      |    |    |      |    |    |    |   |   |    |   |   |    |   |   |
| 1.Graph  |                    | 2.Values  |  |                  |                   |  |                    |                     |     |    |    |     |    |    |     |    |    |     |    |    |      |    |    |      |    |    |      |    |    |      |    |    |    |   |   |    |   |   |    |   |   |
| <div><div><div>—△— Input Volt. 85V</div><div>- - -○- - - Input Volt. 132V</div></div><div>Ripple-Noise [mV]</div><div>Load Current [A]</div></div> <div>Measured by 20 MHz Oscilloscope.<br/>Ripple-Noise is shown as p-p in the figure below.<br/>Note: Slanted line shows the range of the rated load current.</div> |                    | <table><tr><th rowspan="2">Load Current [A]</th><th colspan="2">Ripple-Noise [mV]</th></tr><tr><th>Input Volt. 85 [V]</th><th>Input Volt. 132 [V]</th></tr><tr><td>0.0</td><td>30</td><td>30</td></tr><tr><td>3.0</td><td>40</td><td>50</td></tr><tr><td>6.0</td><td>45</td><td>55</td></tr><tr><td>9.0</td><td>50</td><td>55</td></tr><tr><td>12.0</td><td>60</td><td>60</td></tr><tr><td>15.0</td><td>65</td><td>65</td></tr><tr><td>17.0</td><td>65</td><td>65</td></tr><tr><td>18.7</td><td>75</td><td>65</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. 85 [V] | Input Volt. 132 [V] | 0.0 | 30 | 30 | 3.0 | 40 | 50 | 6.0 | 45 | 55 | 9.0 | 50 | 55 | 12.0 | 60 | 60 | 15.0 | 65 | 65 | 17.0 | 65 | 65 | 18.7 | 75 | 65 | -- | - | - | -- | - | - | -- | - | - |
| Load Current [A]   | Ripple-Noise [mV]  |   |  |                  |                   |  |                    |                     |     |    |    |     |    |    |     |    |    |     |    |    |      |    |    |      |    |    |      |    |    |      |    |    |    |   |   |    |   |   |    |   |   |
|  | Input Volt. 85 [V] | Input Volt. 132 [V]   |  |                  |                   |  |                    |                     |     |    |    |     |    |    |     |    |    |     |    |    |      |    |    |      |    |    |      |    |    |      |    |    |    |   |   |    |   |   |    |   |   |
| 0.0  | 30                 | 30  |  |                  |                   |  |                    |                     |     |    |    |     |    |    |     |    |    |     |    |    |      |    |    |      |    |    |      |    |    |      |    |    |    |   |   |    |   |   |    |   |   |
| 3.0  | 40                 | 50  |  |                  |                   |  |                    |                     |     |    |    |     |    |    |     |    |    |     |    |    |      |    |    |      |    |    |      |    |    |      |    |    |    |   |   |    |   |   |    |   |   |
| 6.0  | 45                 | 55  |  |                  |                   |  |                    |                     |     |    |    |     |    |    |     |    |    |     |    |    |      |    |    |      |    |    |      |    |    |      |    |    |    |   |   |    |   |   |    |   |   |
| 9.0  | 50                 | 55  |  |                  |                   |  |                    |                     |     |    |    |     |    |    |     |    |    |     |    |    |      |    |    |      |    |    |      |    |    |      |    |    |    |   |   |    |   |   |    |   |   |
| 12.0   | 60                 | 60  |  |                  |                   |  |                    |                     |     |    |    |     |    |    |     |    |    |     |    |    |      |    |    |      |    |    |      |    |    |      |    |    |    |   |   |    |   |   |    |   |   |
| 15.0   | 65                 | 65  |  |                  |                   |  |                    |                     |     |    |    |     |    |    |     |    |    |     |    |    |      |    |    |      |    |    |      |    |    |      |    |    |    |   |   |    |   |   |    |   |   |
| 17.0   | 65                 | 65  |  |                  |                   |  |                    |                     |     |    |    |     |    |    |     |    |    |     |    |    |      |    |    |      |    |    |      |    |    |      |    |    |    |   |   |    |   |   |    |   |   |
| 18.7   | 75                 | 65  |  |                  |                   |  |                    |                     |     |    |    |     |    |    |     |    |    |     |    |    |      |    |    |      |    |    |      |    |    |      |    |    |    |   |   |    |   |   |    |   |   |
| --   | -                  | -   |  |                  |                   |  |                    |                     |     |    |    |     |    |    |     |    |    |     |    |    |      |    |    |      |    |    |      |    |    |      |    |    |    |   |   |    |   |   |    |   |   |
| --   | -                  | -   |  |                  |                   |  |                    |                     |     |    |    |     |    |    |     |    |    |     |    |    |      |    |    |      |    |    |      |    |    |      |    |    |    |   |   |    |   |   |    |   |   |
| --   | -                  | -   |  |                  |                   |  |                    |                     |     |    |    |     |    |    |     |    |    |     |    |    |      |    |    |      |    |    |      |    |    |      |    |    |    |   |   |    |   |   |    |   |   |
| <div><div><div>T1: Due to AC Input Line</div><div>T2: Due to Switching</div></div><div>Ripple-Noise [mVp-p]</div><div>T1</div><div>T2</div></div> <div>Fig. Complex Ripple Wave Form</div>   |                    |   |  |                  |                   |  |                    |                     |     |    |    |     |    |    |     |    |    |     |    |    |      |    |    |      |    |    |      |    |    |      |    |    |    |   |   |    |   |   |    |   |   |

BC-1000

| Model   |                    | R150-9   |                    |                          |                    |  |  |                   |                    |                    |     |       |       |       |     |       |       |       |   |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |   |   |   |
|---|--------------------|--|--------------------|--------------------------|--------------------|--|--|-------------------|--------------------|--------------------|-----|-------|-------|-------|-----|-------|-------|-------|---|-------|-------|-------|----|-------|-------|-------|----|-------|-------|-------|----|-------|-------|-------|----|-------|-------|-------|----|-------|-------|-------|----|-------|-------|-------|----|-------|-------|-------|----|---|---|---|
| Item  |                    | Ambient Temperature Drift  |                    |                          |                    |  |  |                   |                    |                    |     |       |       |       |     |       |       |       |   |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |   |   |   |
| Object  |                    | +9V17A   |                    |                          |                    |  |  |                   |                    |                    |     |       |       |       |     |       |       |       |   |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |   |   |   |
| 1.Graph   |                    | 2.Values   |                    |                          |                    |  |  |                   |                    |                    |     |       |       |       |     |       |       |       |   |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |   |   |   |
| <div><div><div><div><div>—△—</div><div>Input Volt. 85V</div></div><div><div>---□---</div><div>Input Volt. 100V</div></div><div><div>---○---</div><div>Input Volt. 132V</div></div></div><div>Output Voltage [V]</div><div>Ambient Temperature [°C]</div><div>Load 100%</div></div><div>Note: Slanted line shows the range of the rated ambient temperature.</div></div> |                    | <table><tr><th rowspan="2">Ambient Temperature [°C]</th><th colspan="3">Output Voltage [V]</th></tr><tr><th>Input Volt. 85[V]</th><th>Input Volt. 100[V]</th><th>Input Volt. 132[V]</th></tr><tr><td>-20</td><td>9.056</td><td>9.056</td><td>9.056</td></tr><tr><td>-10</td><td>9.057</td><td>9.057</td><td>9.057</td></tr><tr><td>0</td><td>9.057</td><td>9.057</td><td>9.057</td></tr><tr><td>10</td><td>9.056</td><td>9.056</td><td>9.056</td></tr><tr><td>20</td><td>9.055</td><td>9.055</td><td>9.055</td></tr><tr><td>25</td><td>9.053</td><td>9.054</td><td>9.054</td></tr><tr><td>30</td><td>9.052</td><td>9.052</td><td>9.052</td></tr><tr><td>40</td><td>9.050</td><td>9.050</td><td>9.050</td></tr><tr><td>50</td><td>9.045</td><td>9.045</td><td>9.045</td></tr><tr><td>60</td><td>9.042</td><td>9.042</td><td>9.042</td></tr><tr><td>--</td><td>-</td><td>-</td><td>-</td></tr></table> |                    | Ambient Temperature [°C] | Output Voltage [V] |  |  | Input Volt. 85[V] | Input Volt. 100[V] | Input Volt. 132[V] | -20 | 9.056 | 9.056 | 9.056 | -10 | 9.057 | 9.057 | 9.057 | 0 | 9.057 | 9.057 | 9.057 | 10 | 9.056 | 9.056 | 9.056 | 20 | 9.055 | 9.055 | 9.055 | 25 | 9.053 | 9.054 | 9.054 | 30 | 9.052 | 9.052 | 9.052 | 40 | 9.050 | 9.050 | 9.050 | 50 | 9.045 | 9.045 | 9.045 | 60 | 9.042 | 9.042 | 9.042 | -- | - | - | - |
| Ambient Temperature [°C]  | Output Voltage [V] |  |                    |                          |                    |  |  |                   |                    |                    |     |       |       |       |     |       |       |       |   |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |   |   |   |
|   | Input Volt. 85[V]  | Input Volt. 100[V]   | Input Volt. 132[V] |                          |                    |  |  |                   |                    |                    |     |       |       |       |     |       |       |       |   |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |   |   |   |
| -20   | 9.056              | 9.056  | 9.056              |                          |                    |  |  |                   |                    |                    |     |       |       |       |     |       |       |       |   |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |   |   |   |
| -10   | 9.057              | 9.057  | 9.057              |                          |                    |  |  |                   |                    |                    |     |       |       |       |     |       |       |       |   |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |   |   |   |
| 0   | 9.057              | 9.057  | 9.057              |                          |                    |  |  |                   |                    |                    |     |       |       |       |     |       |       |       |   |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |   |   |   |
| 10  | 9.056              | 9.056  | 9.056              |                          |                    |  |  |                   |                    |                    |     |       |       |       |     |       |       |       |   |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |   |   |   |
| 20  | 9.055              | 9.055  | 9.055              |                          |                    |  |  |                   |                    |                    |     |       |       |       |     |       |       |       |   |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |   |   |   |
| 25  | 9.053              | 9.054  | 9.054              |                          |                    |  |  |                   |                    |                    |     |       |       |       |     |       |       |       |   |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |   |   |   |
| 30  | 9.052              | 9.052  | 9.052              |                          |                    |  |  |                   |                    |                    |     |       |       |       |     |       |       |       |   |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |   |   |   |
| 40  | 9.050              | 9.050  | 9.050              |                          |                    |  |  |                   |                    |                    |     |       |       |       |     |       |       |       |   |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |   |   |   |
| 50  | 9.045              | 9.045  | 9.045              |                          |                    |  |  |                   |                    |                    |     |       |       |       |     |       |       |       |   |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |   |   |   |
| 60  | 9.042              | 9.042  | 9.042              |                          |                    |  |  |                   |                    |                    |     |       |       |       |     |       |       |       |   |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |   |   |   |
| --  | -                  | -  | -                  |                          |                    |  |  |                   |                    |                    |     |       |       |       |     |       |       |       |   |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |       |       |       |    |   |   |   |





| Model   | R150-9             |  |          |                      |                    |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |
|---|--------------------|--|----------|----------------------|--------------------|-----|-------|-----|-------|-----|-------|-----|-------|-----|-------|-----|-------|-----|-------|-----|-------|-----|-------|-----|-------|
| Item  | Time Lapse Drift   | Temperature  | 25°C     |                      |                    |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |
| Object  | +9V17A             | Testing Circuitry  | Figure A |                      |                    |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |
| 1.Graph   |                    | 2.Values   |          |                      |                    |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |
| <div><div><div>9.14</div><div>9.12</div><div>9.10</div><div>9.08</div><div>9.06</div><div>9.04</div><div>9.02</div><div>9.00</div><div>8.98</div></div><div></div><div>Output Voltage [V]</div><div>Time [H]</div><div>Input Volt. 100V</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>9.055</td></tr><tr><td>0.5</td><td>9.052</td></tr><tr><td>1.0</td><td>9.052</td></tr><tr><td>2.0</td><td>9.052</td></tr><tr><td>3.0</td><td>9.052</td></tr><tr><td>4.0</td><td>9.052</td></tr><tr><td>5.0</td><td>9.052</td></tr><tr><td>6.0</td><td>9.052</td></tr><tr><td>7.0</td><td>9.052</td></tr><tr><td>8.0</td><td>9.052</td></tr></table> |          | Time since start [H] | Output Voltage [V] | 0.0 | 9.055 | 0.5 | 9.052 | 1.0 | 9.052 | 2.0 | 9.052 | 3.0 | 9.052 | 4.0 | 9.052 | 5.0 | 9.052 | 6.0 | 9.052 | 7.0 | 9.052 | 8.0 | 9.052 |
| Time since start [H]  | Output Voltage [V] |  |          |                      |                    |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |
| 0.0   | 9.055              |  |          |                      |                    |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |
| 0.5   | 9.052              |  |          |                      |                    |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |
| 1.0   | 9.052              |  |          |                      |                    |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |
| 2.0   | 9.052              |  |          |                      |                    |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |
| 3.0   | 9.052              |  |          |                      |                    |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |
| 4.0   | 9.052              |  |          |                      |                    |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |
| 5.0   | 9.052              |  |          |                      |                    |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |
| 6.0   | 9.052              |  |          |                      |                    |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |
| 7.0   | 9.052              |  |          |                      |                    |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |
| 8.0   | 9.052              |  |          |                      |                    |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |

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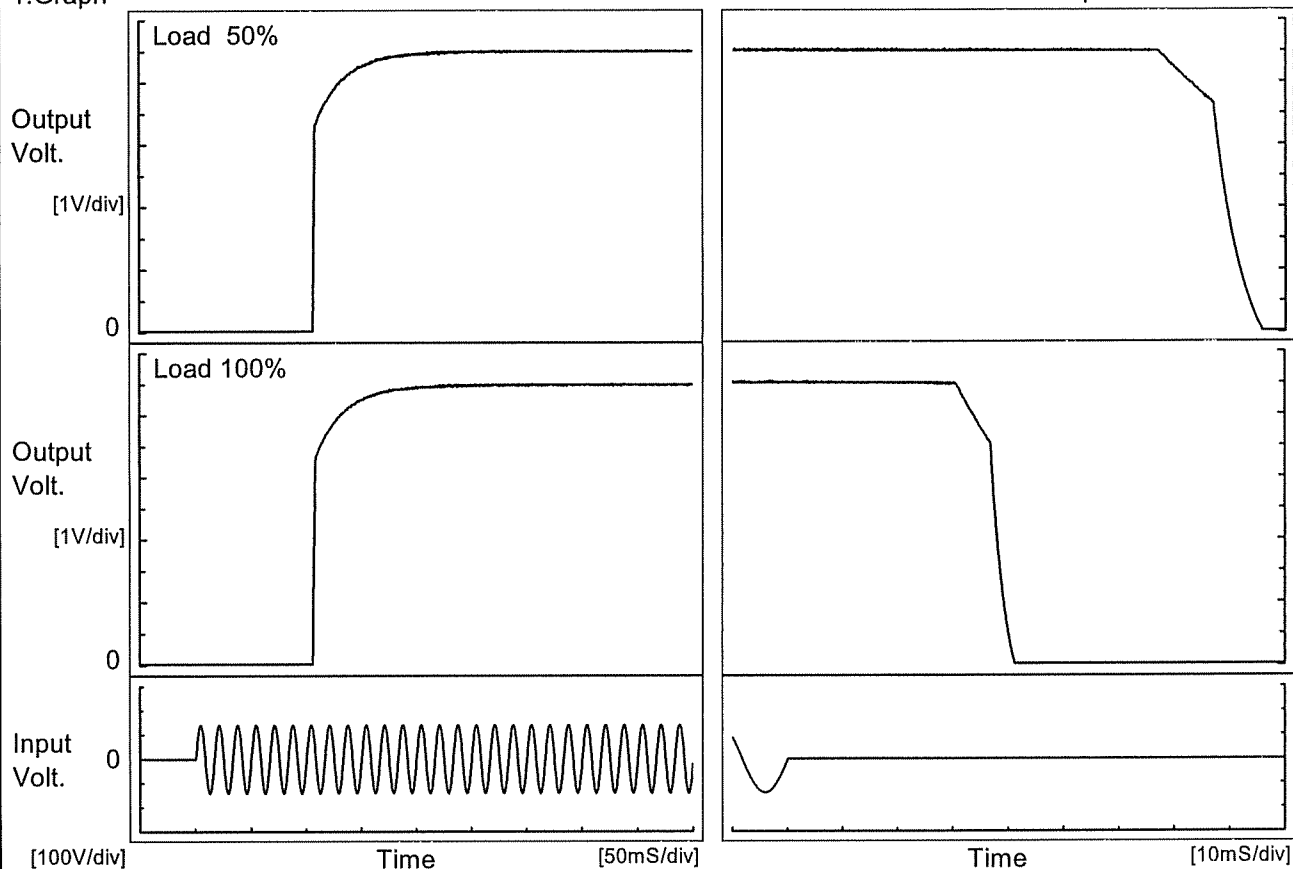


# COSEL

|        |                    |                   |          |
|--------|--------------------|-------------------|----------|
| Model  | R150-9             | Temperature       | 25°C     |
| Item   | Rise and Fall Time | Testing Circuitry | Figure A |
| Object | +9V17A             |                   |          |

## 1. Graph

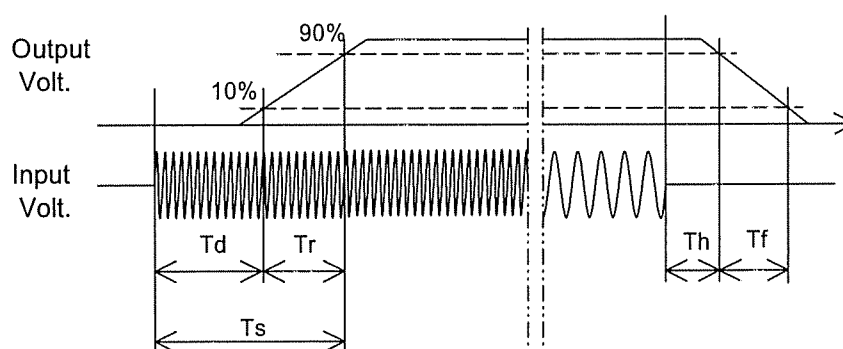
Input Volt. 100 V



## 2. Values

[mS]

| Load \ Time | Td    | Tr   | Ts    | Th   | Tf   |
|-------------|-------|------|-------|------|------|
| 50 %        | 106.5 | 28.8 | 135.3 | 71.7 | 12.0 |
| 100 %       | 106.3 | 29.3 | 135.6 | 33.1 | 7.1  |



# COSEL

|   |  |              |  |
|---|--|--------------|--|
| Model   |  | R150-9       | Temperature25°C<br>Testing CircuitryFigure A |
| Item  |  | Hold-Up Time |  |
| Object  |  | +9V17A       |  |
| 1.Graph   |  | 2.Values     |  |
| <div><div><div>Hold-Up Time [ms]</div><div><div><div></div><div></div></div><div><div></div><div></div></div></div><div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><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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v></div><div></div><div></div><div></div></div></div></div> |  |              |  |

# COSEL

|  |   |  |  |  |
|--|---|--|--|--|
|  |   |  |  |  |
| Model  | R150-9                                  | Temperature 25°C<br>Testing Circuitry Figure A |  |  |
| Item   | Instantaneous Interruption Compensation |  |  |  |
| Object   | +9V17A                                  |  |  |  |
| 1.Graph  |   | 2.Values                                       |  |  |
| <div><div><div>—△—</div><div>Input Volt. 85V</div></div><div><div>---□---</div><div>Input Volt. 100V</div></div><div><div>---○---</div><div>Input Volt. 132V</div></div></div> <p>Instantaneous Compensation Time [ms]</p> <p>Load Current [A]</p> |   |  |  |  |
| Note: Slanted line shows the range of the rated load current.  |   |  |  |  |

BC-1000

# COSEL

| Model   | R150-9                 | Temperature25°C<br>Testing CircuitryFigure A  |                    |                    |                  |  |  |                   |                    |                    |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |    |   |   |   |  |
|---|------------------------|---|--------------------|--------------------|------------------|--|--|-------------------|--------------------|--------------------|------|-------|-------|-------|------|-------|-------|-------|------|-------|-------|-------|------|-------|-------|-------|------|-------|-------|-------|------|-------|-------|-------|------|-------|-------|-------|------|-------|-------|-------|------|-------|-------|-------|------|-------|-------|-------|------|-------|-------|-------|----|---|---|---|--|
| Item  | Overcurrent Protection |   |                    |                    |                  |  |  |                   |                    |                    |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |    |   |   |   |  |
| Object  | +9V17A                 |   |                    |                    |                  |  |  |                   |                    |                    |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |    |   |   |   |  |
| 1.Graph   |                        | 2.Values  |                    |                    |                  |  |  |                   |                    |                    |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |    |   |   |   |  |
| <div><div></div>Input Volt.85V<br/><div></div>Input Volt.100V<br/><div></div>Input Volt.132V</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. 85[V]</th><th>Input Volt. 100[V]</th><th>Input Volt. 132[V]</th></tr><tr><td>9.00</td><td>17.87</td><td>19.23</td><td>18.02</td></tr><tr><td>8.55</td><td>21.12</td><td>20.82</td><td>20.46</td></tr><tr><td>8.10</td><td>21.12</td><td>20.77</td><td>20.47</td></tr><tr><td>7.20</td><td>21.06</td><td>20.76</td><td>20.49</td></tr><tr><td>6.30</td><td>21.05</td><td>20.76</td><td>20.51</td></tr><tr><td>5.40</td><td>21.05</td><td>20.76</td><td>20.49</td></tr><tr><td>4.50</td><td>21.04</td><td>20.72</td><td>20.18</td></tr><tr><td>3.60</td><td>20.95</td><td>20.62</td><td>20.35</td></tr><tr><td>2.70</td><td>20.87</td><td>20.53</td><td>20.30</td></tr><tr><td>1.80</td><td>20.78</td><td>20.37</td><td>19.92</td></tr><tr><td>0.90</td><td>20.28</td><td>19.83</td><td>19.42</td></tr><tr><td>--</td><td>-</td><td>-</td><td>-</td></tr></table> |                    | Output Voltage [V] | Load Current [A] |  |  | Input Volt. 85[V] | Input Volt. 100[V] | Input Volt. 132[V] | 9.00 | 17.87 | 19.23 | 18.02 | 8.55 | 21.12 | 20.82 | 20.46 | 8.10 | 21.12 | 20.77 | 20.47 | 7.20 | 21.06 | 20.76 | 20.49 | 6.30 | 21.05 | 20.76 | 20.51 | 5.40 | 21.05 | 20.76 | 20.49 | 4.50 | 21.04 | 20.72 | 20.18 | 3.60 | 20.95 | 20.62 | 20.35 | 2.70 | 20.87 | 20.53 | 20.30 | 1.80 | 20.78 | 20.37 | 19.92 | 0.90 | 20.28 | 19.83 | 19.42 | -- | - | - | - |  |
| Output Voltage [V]  | Load Current [A]       |   |                    |                    |                  |  |  |                   |                    |                    |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |    |   |   |   |  |
|   | Input Volt. 85[V]      | Input Volt. 100[V]  | Input Volt. 132[V] |                    |                  |  |  |                   |                    |                    |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |    |   |   |   |  |
| 9.00  | 17.87                  | 19.23   | 18.02              |                    |                  |  |  |                   |                    |                    |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |    |   |   |   |  |
| 8.55  | 21.12                  | 20.82   | 20.46              |                    |                  |  |  |                   |                    |                    |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |    |   |   |   |  |
| 8.10  | 21.12                  | 20.77   | 20.47              |                    |                  |  |  |                   |                    |                    |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |    |   |   |   |  |
| 7.20  | 21.06                  | 20.76   | 20.49              |                    |                  |  |  |                   |                    |                    |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |    |   |   |   |  |
| 6.30  | 21.05                  | 20.76   | 20.51              |                    |                  |  |  |                   |                    |                    |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |    |   |   |   |  |
| 5.40  | 21.05                  | 20.76   | 20.49              |                    |                  |  |  |                   |                    |                    |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |    |   |   |   |  |
| 4.50  | 21.04                  | 20.72   | 20.18              |                    |                  |  |  |                   |                    |                    |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |    |   |   |   |  |
| 3.60  | 20.95                  | 20.62   | 20.35              |                    |                  |  |  |                   |                    |                    |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |    |   |   |   |  |
| 2.70  | 20.87                  | 20.53   | 20.30              |                    |                  |  |  |                   |                    |                    |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |    |   |   |   |  |
| 1.80  | 20.78                  | 20.37   | 19.92              |                    |                  |  |  |                   |                    |                    |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |    |   |   |   |  |
| 0.90  | 20.28                  | 19.83   | 19.42              |                    |                  |  |  |                   |                    |                    |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |    |   |   |   |  |
| --  | -                      | -   | -                  |                    |                  |  |  |                   |                    |                    |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |      |       |       |       |    |   |   |   |  |

BC-1000

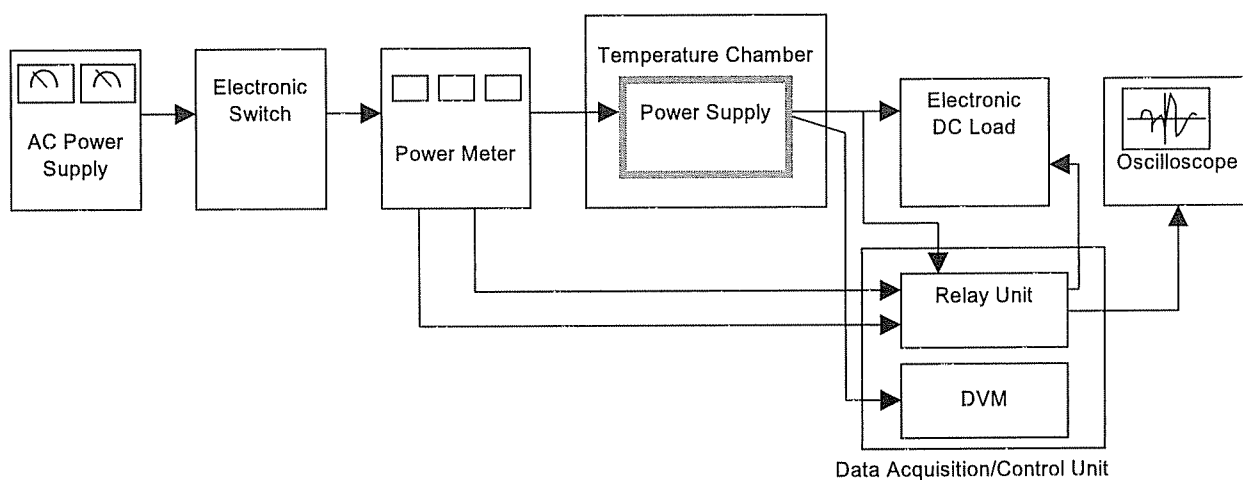


Figure A

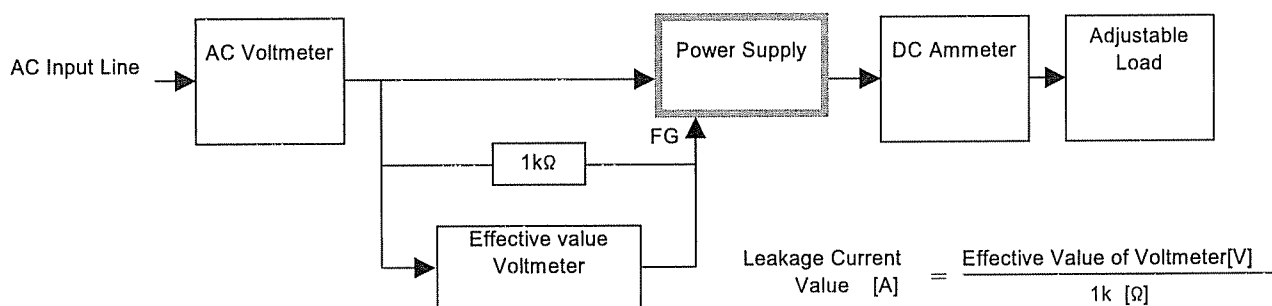


Figure B ( DEN-AN )

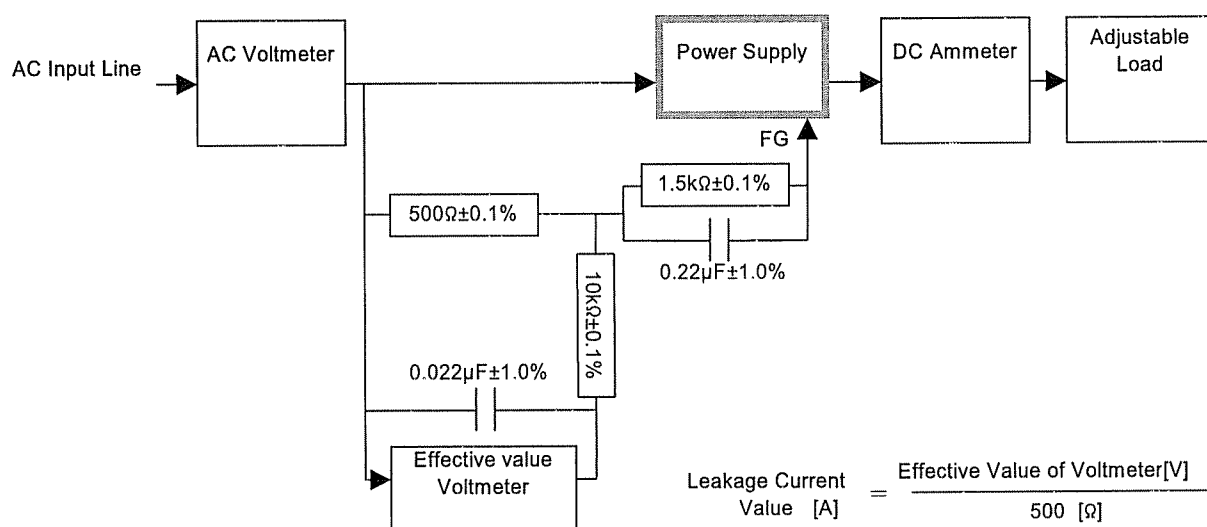


Figure B ( IEC60950 )