参考資料

COSEL

# TEST DATA OF SUS32405

Regulated DC Power Supply
Mar 8, 2005

Approved by : Tetsuo Sugimori
Tetsuo Sugimori Design Manager

Prepared by : Hayato Nakatsubo
Hayato Nakatsubo Design Engineer

**COSEL CO.,LTD.**

COSEL

# CONTENTS


1.Input Current (by Input Voltage) ・・・・・・・・・・・・・・・・・・・・・・・・・ 1
2.Input Current (by Load Current) ・・・・・・・・・・・・・・・・・・・・・・・・ 2
3.Input Power (by Load Current) ・・・・・・・・・・・・・・・・・・・・・・・・・ 3
4.Efficiency (by Input Voltage) ・・・・・・・・・・・・・・・・・・・・・・・・・ 4
5.Efficiency (by Load Current) ・・・・・・・・・・・・・・・・・・・・・・・・・ 5
6.Line Regulation ・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・ 6
7.Load Regulation ・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・ 7
8.Dynamic Load Response ・・・・・・・・・・・・・・・・・・・・・・・・・・・・ 8
9.Ripple Voltage (by Load Current) ・・・・・・・・・・・・・・・・・・・・・・・ 9
10.Ripple-Noise ・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・ 10
11.Ripple Voltage (by Ambient Temperature) ・・・・・・・・・・・・・・・・・・ 11
12.Ambient Temperature Drift ・・・・・・・・・・・・・・・・・・・・・・・・・・ 12
13.Output Voltage Accuracy ・・・・・・・・・・・・・・・・・・・・・・・・・・・ 13
14.Time Lapse Drift ・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・ 14
15.Rise and Fall Time ・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・ 15
16.Minimum Input Voltage for Regulated Output Voltage ・・・・・・・・・・・・ 16
17.Overcurrent Protection ・・・・・・・・・・・・・・・・・・・・・・・・・・・・ 17
18.Figure of Testing Circuitry ・・・・・・・・・・・・・・・・・・・・・・・・・・ 18

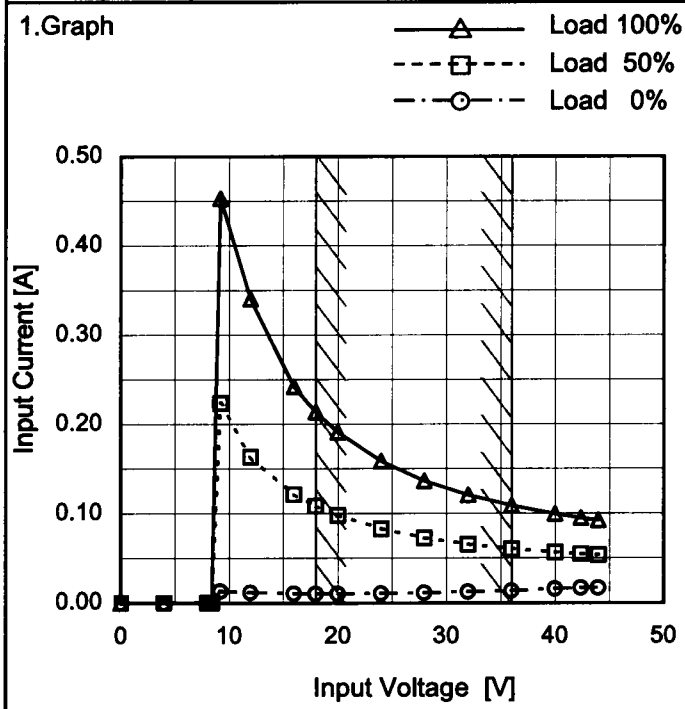

(Final Page 18)

COSEL

| | |
|---|---|
| Model | SUS32405 |
| Item | Input Current (by Input Voltage) |
| Object | ———————— |

Temperature 25°C
Testing Circuitry Figure A

1.Graph




Note: Slanted line shows the range of the rated input voltage.

2.Values

| Input Voltage [V] | Input Current [A] | | |
|---|---|---|---|
| | Load 0% | Load 50% | Load 100% |
| 0.0 | 0.000 | 0.000 | 0.000 |
| 4.0 | 0.000 | 0.000 | 0.000 |
| 8.0 | 0.000 | 0.000 | 0.000 |
| 8.4 | 0.000 | 0.000 | 0.000 |
| 9.2 | 0.013 | 0.224 | 0.453 |
| 12.0 | 0.011 | 0.163 | 0.341 |
| 16.0 | 0.010 | 0.122 | 0.242 |
| 18.0 | 0.010 | 0.109 | 0.214 |
| 20.0 | 0.010 | 0.098 | 0.191 |
| 24.0 | 0.011 | 0.083 | 0.159 |
| 28.0 | 0.011 | 0.073 | 0.137 |
| 32.0 | 0.012 | 0.065 | 0.121 |
| 36.0 | 0.013 | 0.060 | 0.109 |
| 40.0 | 0.015 | 0.056 | 0.099 |
| 42.4 | 0.016 | 0.055 | 0.095 |
| 44.0 | 0.017 | 0.053 | 0.092 |
| -- | - | - | - |
| -- | - | - | - |



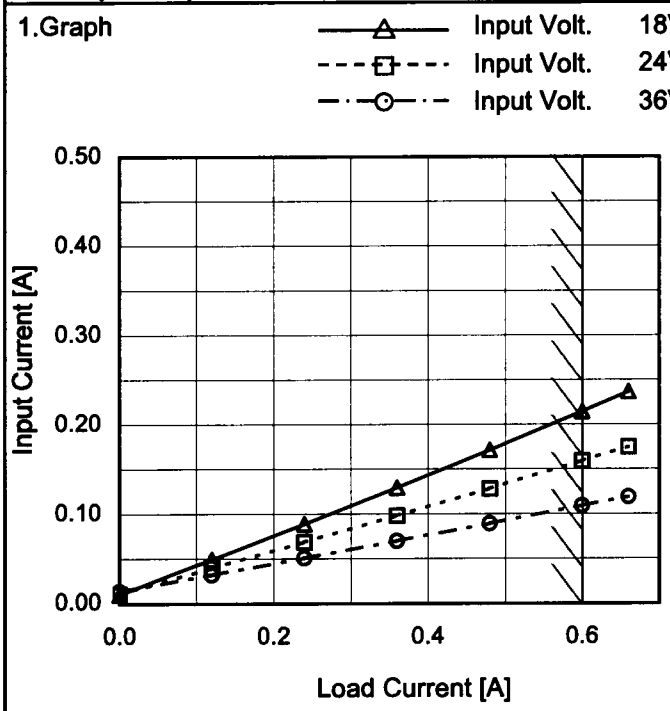
BC-3754

COSEL

| | |
|---|---|
| Model | SUS32405 |
| Item | Input Current (by Load Current) |
| Object | ———————— |

Temperature 25°C
Testing Circuitry Figure A

1.Graph




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

2.Values

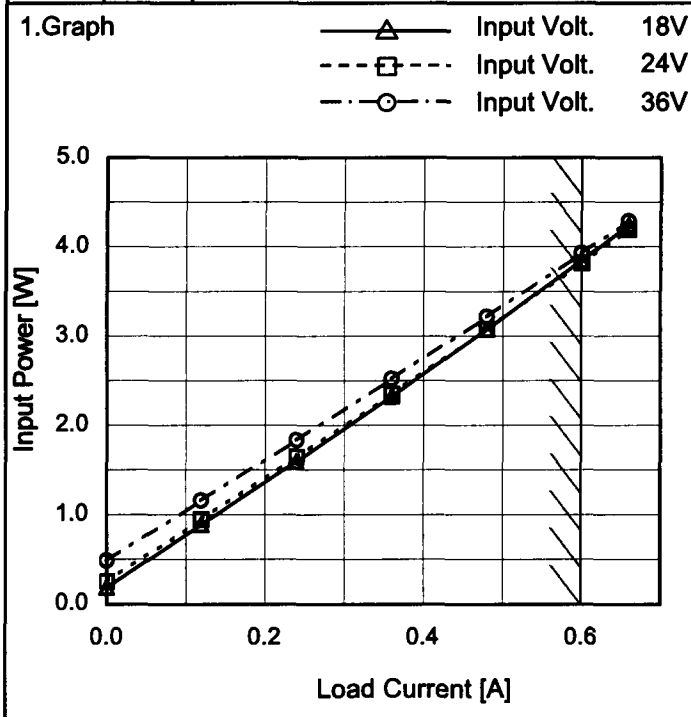
| Load Current [A] | Input Current [A] | | |
|---|---|---|---|
| | Input Volt. 18[V] | Input Volt. 24[V] | Input Volt. 36[V] |
| 0.00 | 0.010 | 0.011 | 0.013 |
| 0.12 | 0.049 | 0.039 | 0.032 |
| 0.24 | 0.089 | 0.069 | 0.051 |
| 0.36 | 0.129 | 0.098 | 0.070 |
| 0.48 | 0.171 | 0.128 | 0.089 |
| 0.60 | 0.215 | 0.159 | 0.109 |
| 0.66 | 0.237 | 0.175 | 0.119 |
| -- | - | - | - |
| -- | - | - | - |
| -- | - | - | - |
| -- | - | - | - |

COSEL

| | |
|---|---|
| Model | SUS32405 |
| Item | Input Power (by Load Current) |
| Object | ———————— |

Temperature 25°C
Testing Circuitry Figure A

1.Graph




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

2.Values

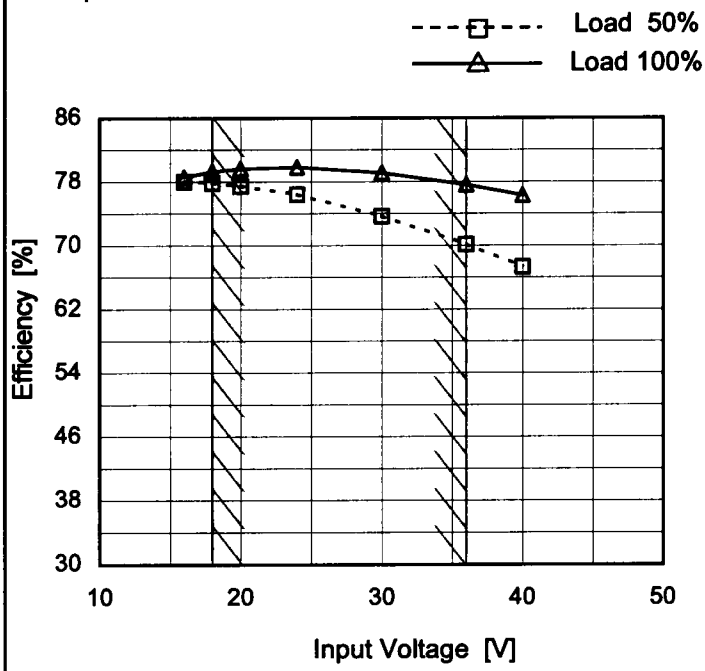
| Load Current [A] | Input Power [W] | | |
|---|---|---|---|
| | Input Volt. 18[V] | Input Volt. 24[V] | Input Volt. 36[V] |
| 0.00 | 0.18 | 0.25 | 0.49 |
| 0.12 | 0.89 | 0.95 | 1.16 |
| 0.24 | 1.60 | 1.64 | 1.84 |
| 0.36 | 2.32 | 2.35 | 2.52 |
| 0.48 | 3.07 | 3.08 | 3.22 |
| 0.60 | 3.85 | 3.82 | 3.93 |
| 0.66 | 4.24 | 4.20 | 4.29 |
| -- | - | - | - |
| -- | - | - | - |
| -- | - | - | - |
| -- | - | - | - |

COSEL

| | |
|---|---|
| Model | SUS32405 |
| Item | Efficiency (by Input Voltage) |
| Object | ——————— |

Temperature 25°C
Testing Circuitry Figure A

1.Graph




Note: Slanted line shows the range of the rated input voltage.

2.Values

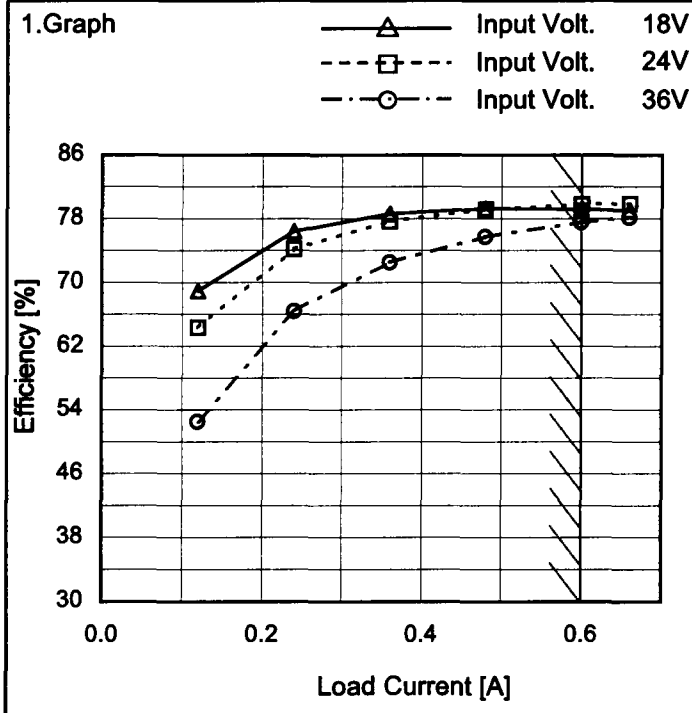
| Input Voltage [V] | Efficiency [%] | |
|---|---|---|
| | Load 50% | Load 100% |
| 16 | 78.0 | 78.6 |
| 18 | 77.9 | 79.3 |
| 20 | 77.5 | 79.6 |
| 24 | 76.4 | 79.8 |
| 30 | 73.7 | 79.1 |
| 36 | 70.2 | 77.6 |
| 40 | 67.3 | 76.3 |
| -- | - | - |
| -- | - | - |

COSEL

| | |
|---|---|
| Model | SUS32405 |
| Item | Efficiency (by Load Current) |
| Object | ——————— |

Temperature 25°C
Testing Circuitry Figure A

1.Graph




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

2.Values

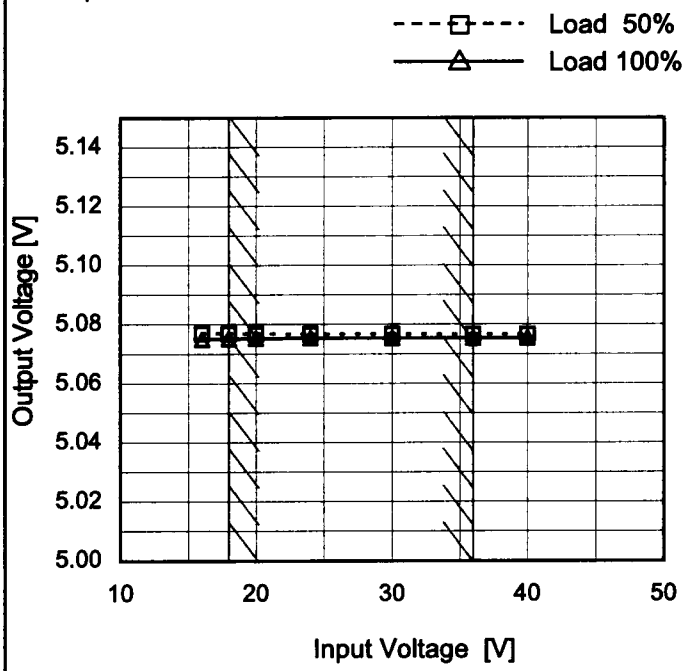
| Load Current [A] | Efficiency [%] | | |
|---|---|---|---|
| | Input Volt. 18[V] | Input Volt. 24[V] | Input Volt. 36[V] |
| 0.00 | - | - | - |
| 0.12 | 68.9 | 64.4 | 52.5 |
| 0.24 | 76.4 | 74.2 | 66.4 |
| 0.36 | 78.6 | 77.7 | 72.5 |
| 0.48 | 79.3 | 79.2 | 75.7 |
| 0.60 | 79.2 | 79.8 | 77.5 |
| 0.66 | 79.0 | 79.9 | 78.1 |
| -- | - | - | - |
| -- | - | - | - |
| -- | - | - | - |
| -- | - | - | - |

COSEL

| | |
|---|---|
| Model | SUS32405 |
| Item | Line Regulation |
| Object | +5V0.6A |

Temperature 25°C
Testing Circuitry Figure A

1.Graph




Note: Slanted line shows the range of the rated input voltage.

2.Values

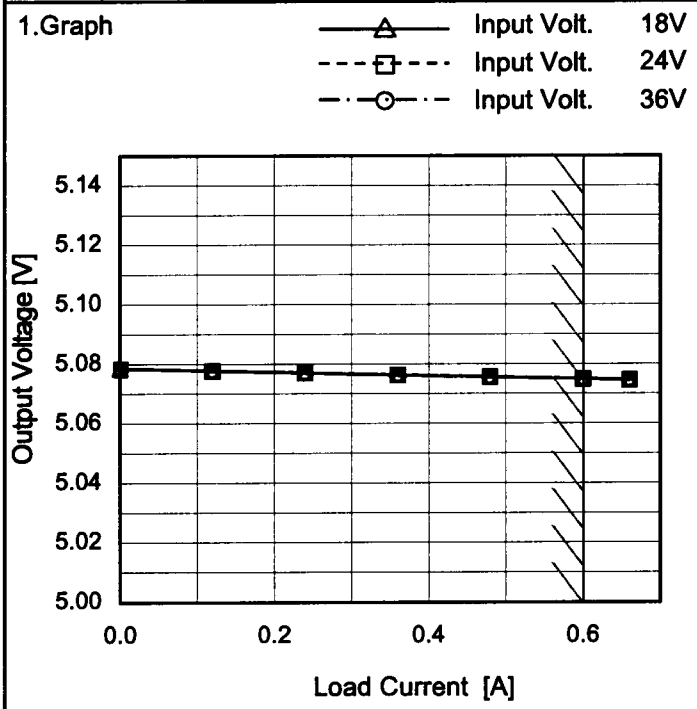
| Input Voltage [V] | Output Voltage [V] | |
|---|---|---|
| | Load 50% | Load 100% |
| 16 | 5.077 | 5.075 |
| 18 | 5.077 | 5.075 |
| 20 | 5.077 | 5.075 |
| 24 | 5.077 | 5.075 |
| 30 | 5.077 | 5.075 |
| 36 | 5.077 | 5.075 |
| 40 | 5.077 | 5.075 |
| -- | - | - |
| -- | - | - |

COSEL

| | |
|---|---|
| Model | SUS32405 |
| Item | Load Regulation |
| Object | +5V0.6A |

Temperature 25°C
Testing Circuitry Figure A

1.Graph




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

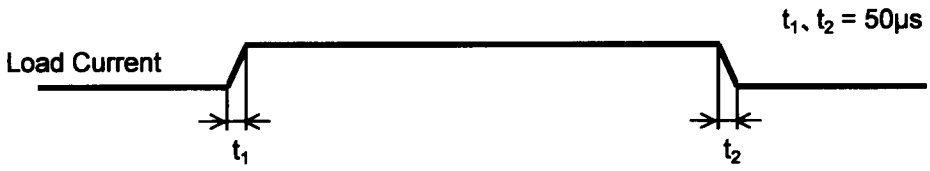
2.Values

| Load Current [A] | Output Voltage [V] Input Volt. 18[V] | Input Volt. 24[V] | Input Volt. 36[V] |
|---|---|---|---|
| 0.00 | 5.079 | 5.078 | 5.079 |
| 0.12 | 5.078 | 5.078 | 5.078 |
| 0.24 | 5.077 | 5.077 | 5.077 |
| 0.36 | 5.076 | 5.076 | 5.076 |
| 0.48 | 5.076 | 5.076 | 5.076 |
| 0.60 | 5.075 | 5.075 | 5.075 |
| 0.66 | 5.075 | 5.075 | 5.075 |
| -- | - | - | - |
| -- | - | - | - |
| -- | - | - | - |
| -- | - | - | - |

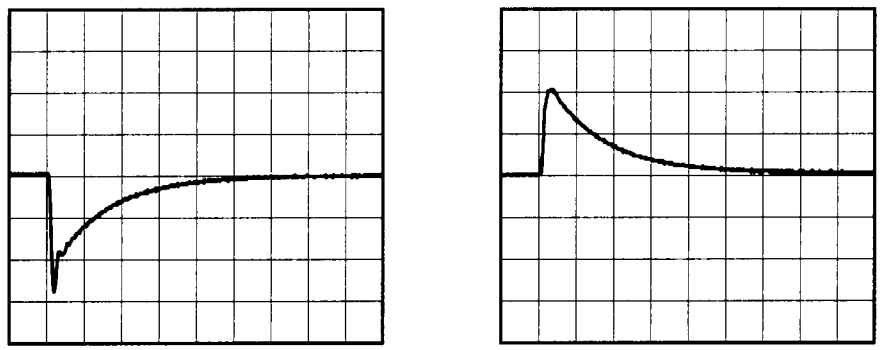
COSEL

| | | | |
|---|---|---|---|
| Model | SUS32405 | | |
| Item | Dynamic Load Response | Temperature | 25°C |
| Object | +5V0.6A | Testing Circuitry | Figure A |

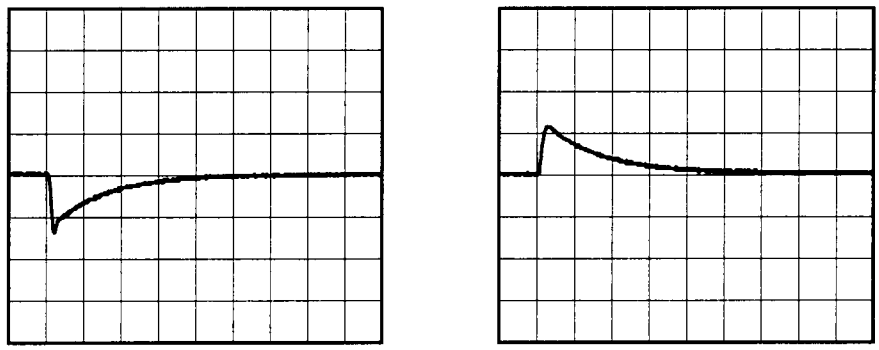
Input Volt. 24 V
Cycle 100 mS



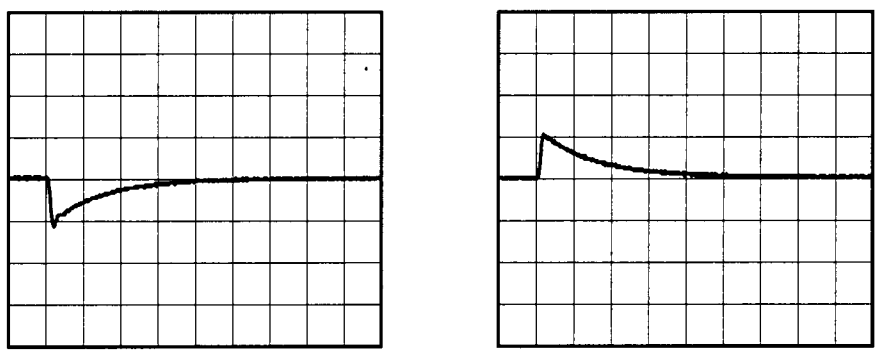

Min. Load (0A) ⟷ Load 100% (0.6A)




Min. Load (0A) ⟷ Load 50% (0.3A)




Load 50% (0.3A) ⟷ Load 100% (0.6A)

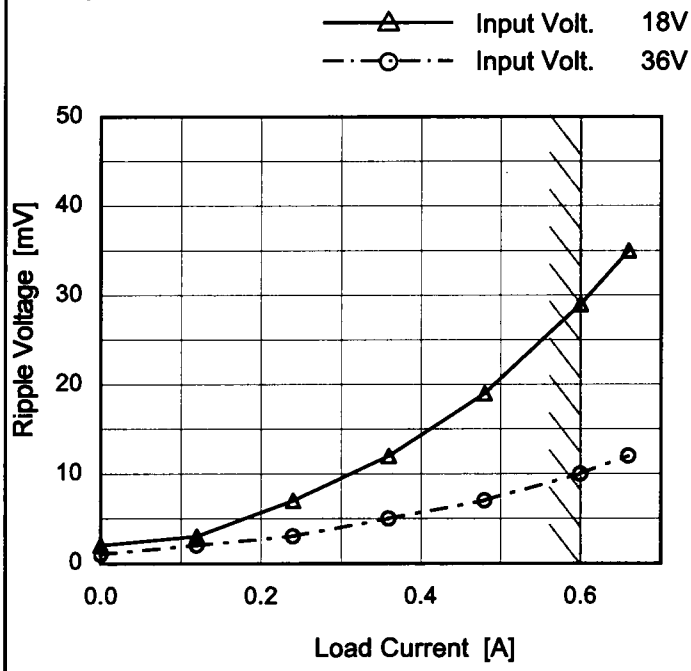


COSEL

| | |
|---|---|
| Model | SUS32405 |
| Item | Ripple Voltage (by Load Current) |
| Object | +5V0.6A |

Temperature 25°C
Testing Circuitry Figure B

1.Graph




Measured by 100 MHz Oscilloscope.
Ripple Voltage is shown as p-p in the figure below.
Note: Slanted line shows the range of the rated load current.

Ripple [mVp-p]

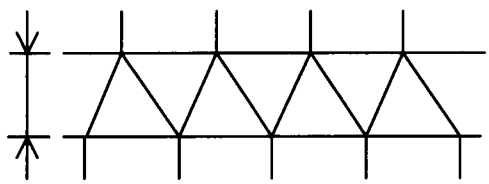


Fig.Complex Ripple Wave Form

2.Values

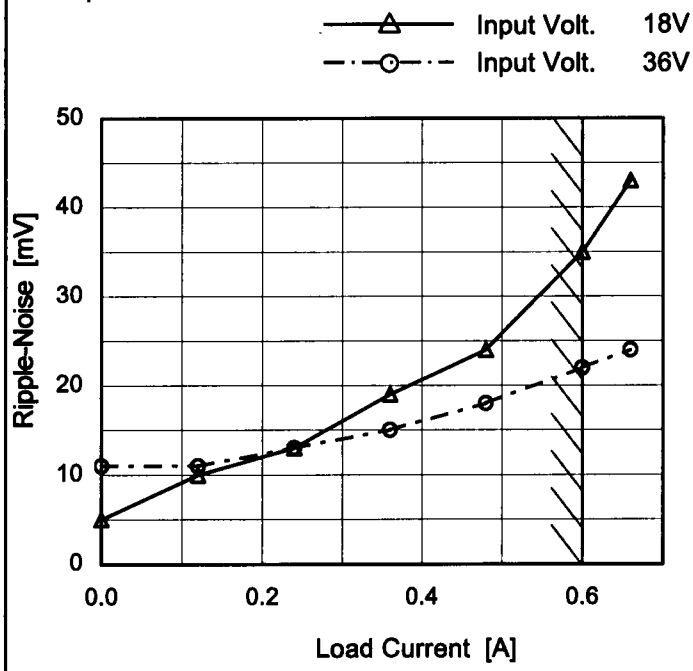
| Load Current [A] | Ripple Voltage [mV] | |
|---|---|---|
| | Input Volt. 18 [V] | Input Volt. 36 [V] |
| 0.00 | 2 | 1 |
| 0.12 | 3 | 2 |
| 0.24 | 7 | 3 |
| 0.36 | 12 | 5 |
| 0.48 | 19 | 7 |
| 0.60 | 29 | 10 |
| 0.66 | 35 | 12 |
| -- | - | - |
| -- | - | - |
| -- | - | - |
| -- | - | - |

COSEL

| | |
|---|---|
| Model | SUS32405 |
| Item | Ripple-Noise |
| Object | +5V0.6A |

Temperature 25°C
Testing Circuitry Figure B

1.Graph




Measured by 100 MHz Oscilloscope.
Ripple-Noise is shown as p-p in the figure below.
Note: Slanted line shows the range of the rated load current.

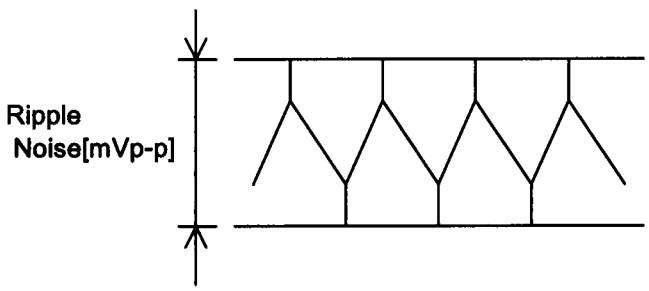



Fig.Complex Ripple Noise Wave Form

2.Values

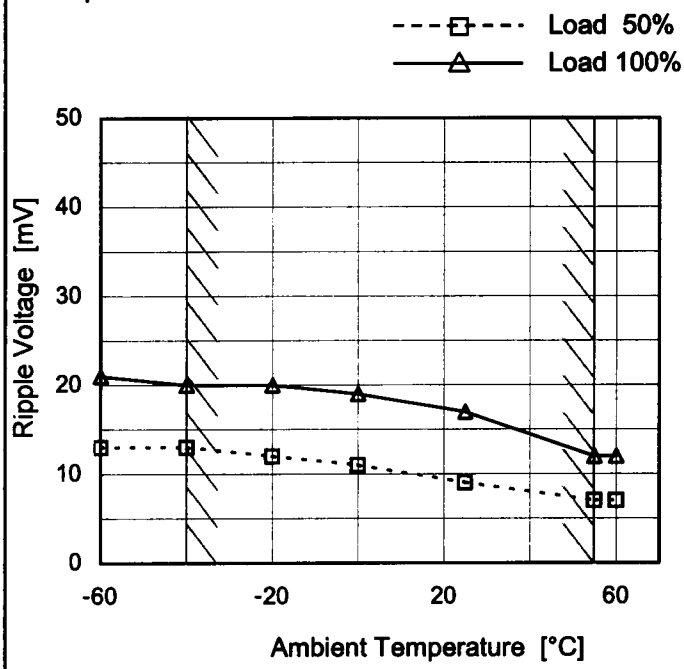
| Load Current [A] | Ripple-Noise [mV] Input Volt. 18 [V] | Ripple-Noise [mV] Input Volt. 36 [V] |
|---|---|---|
| 0.00 | 5 | 11 |
| 0.12 | 10 | 11 |
| 0.24 | 13 | 13 |
| 0.36 | 19 | 15 |
| 0.48 | 24 | 18 |
| 0.60 | 35 | 22 |
| 0.66 | 43 | 24 |
| -- | - | - |
| -- | - | - |
| -- | - | - |
| -- | - | - |

COSEL

| Model | SUS32405 |
|---|---|
| Item | Ripple Voltage (by Ambient Temp.) |
| Object | +5V0.6A |

Testing Circuitry Figure B

1.Graph




Input Volt. 24V

Measured by 100 MHz Oscilloscope.

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

2.Values

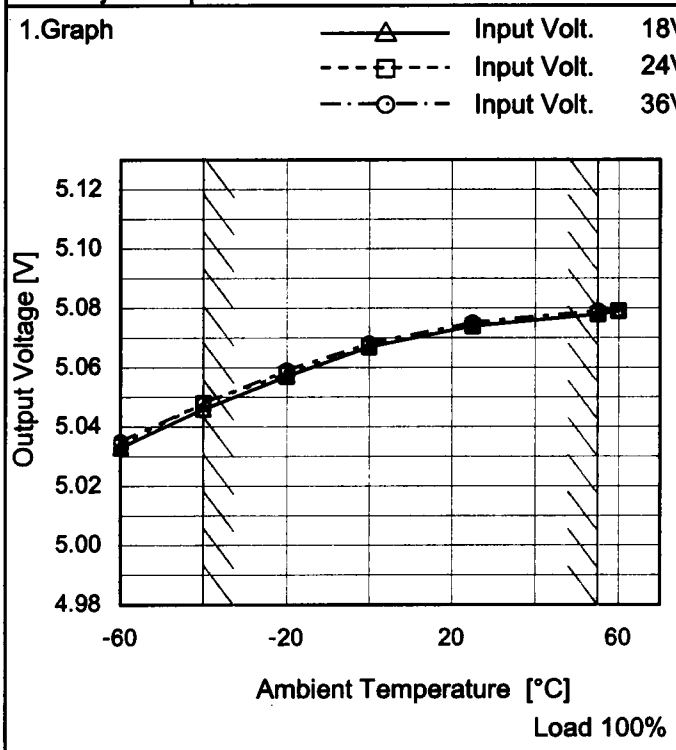
| Ambient Temperature [°C] | Ripple Voltage [mV] | |
|---|---|---|
| | Load 50% | Load 100% |
| -60 | 13 | 21 |
| -40 | 13 | 20 |
| -20 | 12 | 20 |
| 0 | 11 | 19 |
| 25 | 9 | 17 |
| 55 | 7 | 12 |
| 60 | 7 | 12 |
| -- | - | - |
| -- | - | - |
| -- | - | - |
| -- | - | - |

COSEL

| Model | SUS32405 |
|---|---|
| Item | Ambient Temperature Drift |
| Object | +5V0.6A |

Testing Circuitry Figure A

1.Graph




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

2.Values

| Ambient Temperature [°C] | Output Voltage [V] | | |
|---|---|---|---|
| | Input Volt. 18[V] | Input Volt. 24[V] | Input Volt. 36[V] |
| -60 | 5.033 | 5.034 | 5.035 |
| -40 | 5.046 | 5.048 | 5.048 |
| -20 | 5.057 | 5.058 | 5.059 |
| 0 | 5.067 | 5.067 | 5.068 |
| 25 | 5.074 | 5.074 | 5.075 |
| 55 | 5.078 | 5.078 | 5.079 |
| 60 | 5.079 | 5.079 | 5.079 |
| -- | - | - | - |
| -- | - | - | - |
| -- | - | - | - |
| -- | - | - | - |

COSEL

| | | |
|---|---|---|
| Model | SUS32405 | |
| Item | Output Voltage Accuracy | Testing Circuitry Figure A |
| Object | +5V0.6A | |

1.Output Voltage Accuracy

This is defined as the value of the output voltage, regulation load, ambient temperature and input voltage varied at random in the range as specified below.

Temperature : -40 - 55°C
Input Voltage : 18 - 36V
Load Current : 0 - 0.6A

* Output Voltage Accuracy = ±(Maximum of Output Voltage - Minimum of Output Voltage) / 2

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

2.Values

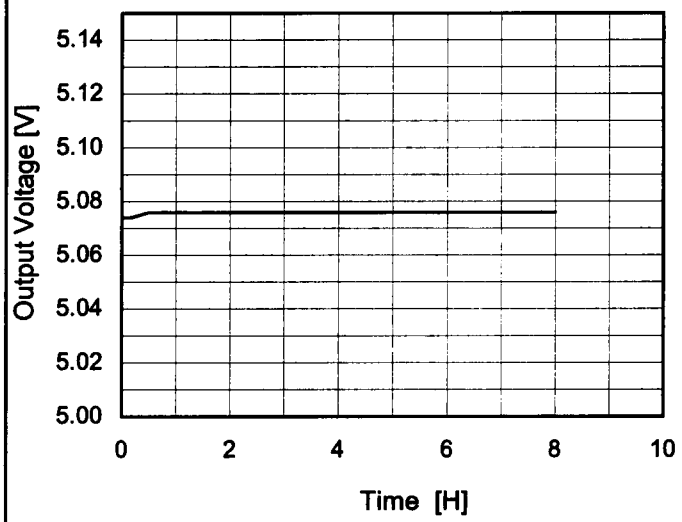
| Item | Temperature [°C] | Input Voltage[V] | Output | | Output Voltage Accuracy | |
|---|---|---|---|---|---|---|
| | | | Current[A] | Voltage[V] | Value [mV] | Ration [%] |
| Maximum Voltage | 55 | 18 | 0 | 5.082 | ±18 | ±0.4 |
| Minimum Voltage | -40 | 18 | 0.6 | 5.046 | | |

COSEL

| | |
|---|---|
| Model | SUS32405 |
| Item | Time Lapse Drift |
| Object | +5V0.6A |

Temperature 25°C
Testing Circuitry Figure A

1.Graph




Input Volt. 24V
Load 100%

2.Values

| Time since start [H] | Output Voltage [V] |
|---|---|
| 0.0 | 5.073 |
| 0.5 | 5.076 |
| 1.0 | 5.076 |
| 2.0 | 5.076 |
| 3.0 | 5.076 |
| 4.0 | 5.076 |
| 5.0 | 5.076 |
| 6.0 | 5.076 |
| 7.0 | 5.076 |
| 8.0 | 5.076 |

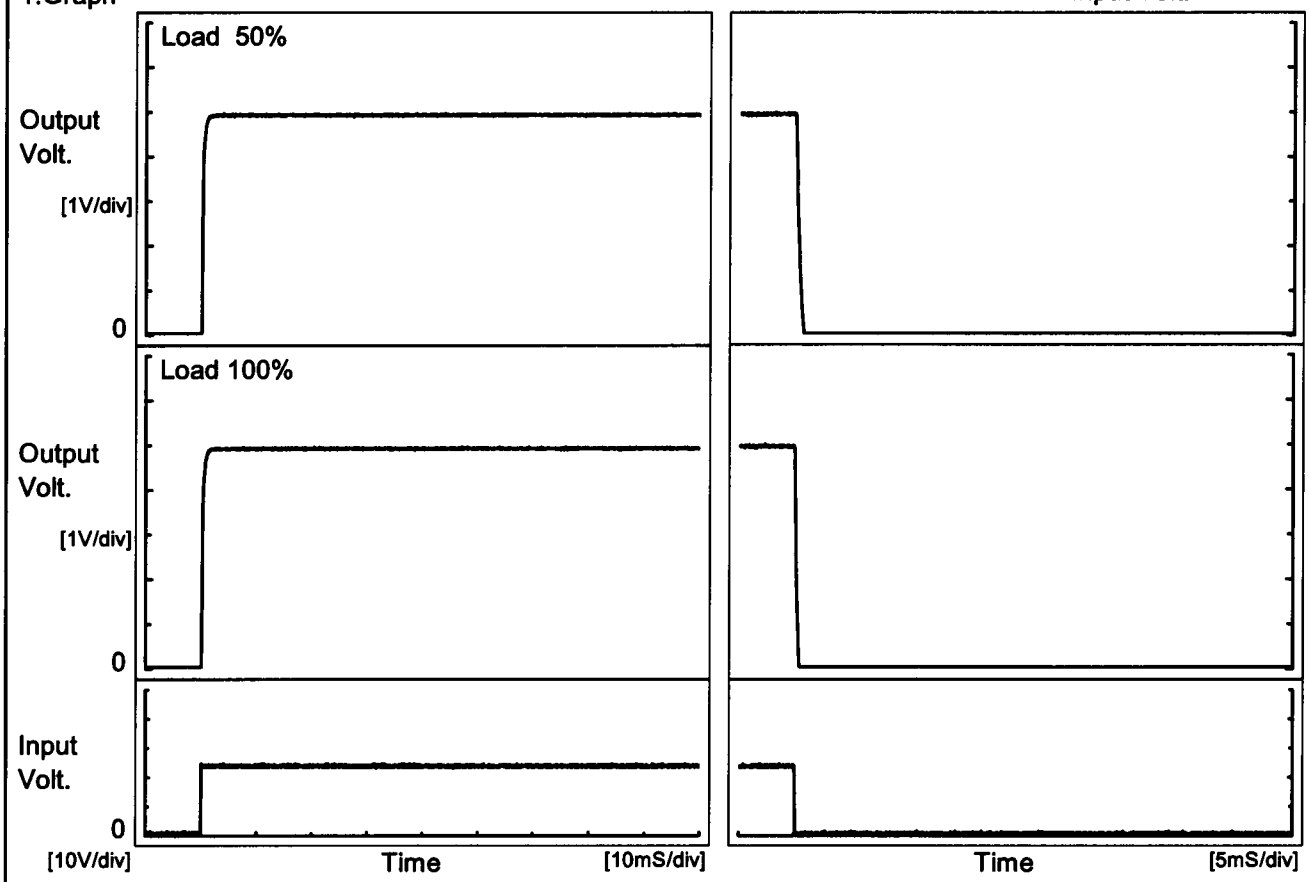
COSEL

| | |
|---|---|
| Model | SUS32405 |
| Item | Rise and Fall Time |
| Object | +5V0.6A |

Temperature 25°C
Testing Circuitry Figure A

1.Graph

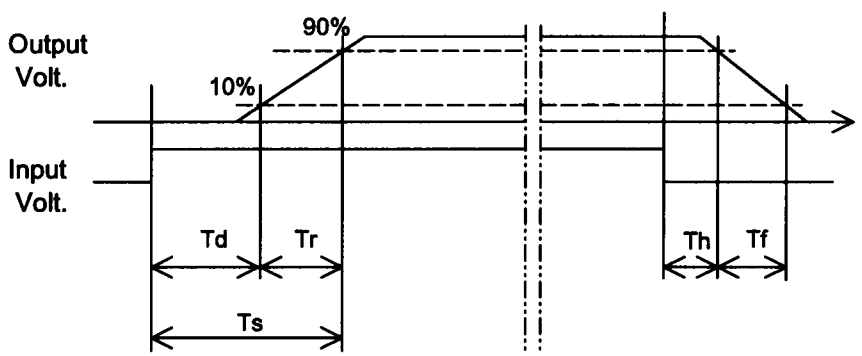
Input Volt. 24 V




2.Values

[mS]

| Load \ Time | Td | Tr | Ts | Th | Tf |
|---|---|---|---|---|---|
| 50 % | 0.1 | 0.6 | 0.7 | 0.1 | 0.6 |
| 100 % | 0.1 | 0.7 | 0.8 | 0.1 | 0.3 |

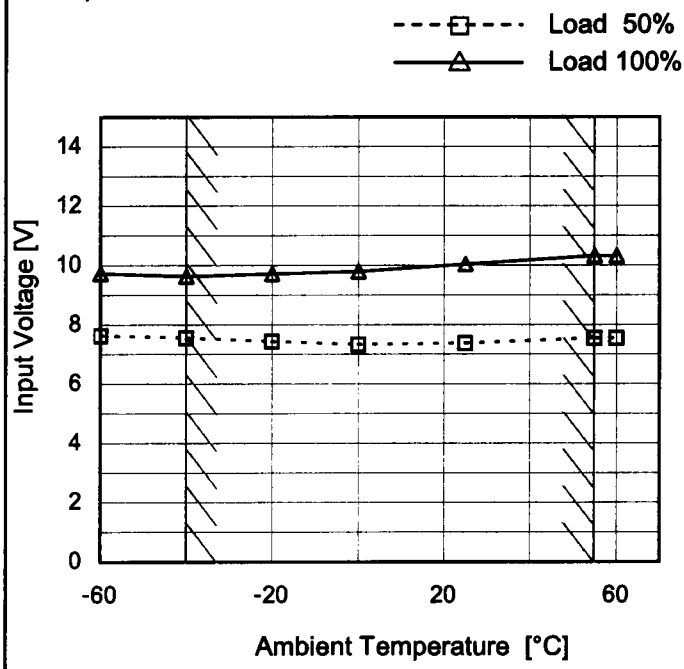


COSEL

| Model | SUS32405 |
|---|---|
| Item | Minimum Input Voltage for Regulated Output Voltage |
| Object | +5V0.6A |

Testing Circuitry Figure A

1.Graph




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

2.Values

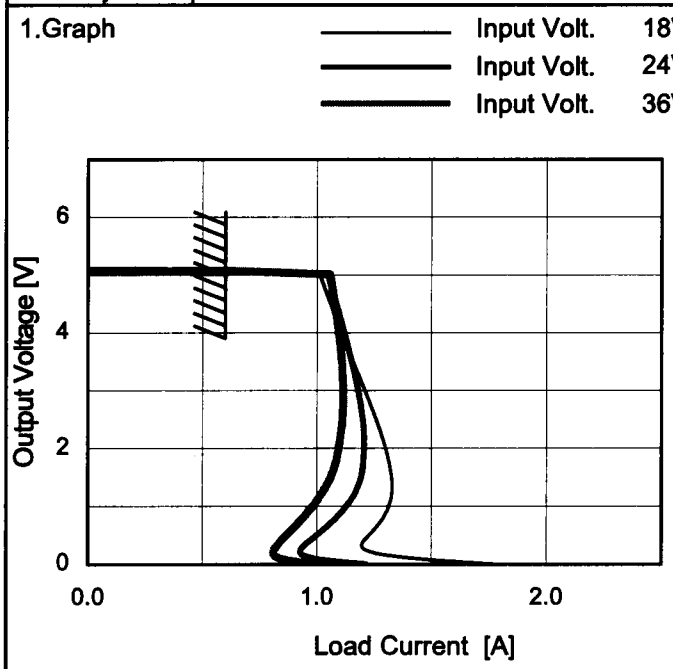
| Ambient Temperature [°C] | Input Voltage [V] | |
|---|---|---|
| | Load 50% | Load 100% |
| -60 | 7.7 | 9.8 |
| -40 | 7.6 | 9.7 |
| -20 | 7.5 | 9.8 |
| 0 | 7.4 | 9.8 |
| 25 | 7.4 | 10.1 |
| 55 | 7.6 | 10.4 |
| 60 | 7.6 | 10.4 |
| -- | - | - |
| -- | - | - |
| -- | - | - |
| -- | - | - |

COSEL

| | |
|---|---|
| Model | SUS32405 |
| Item | Overcurrent Protection |
| Object | +5V0.6A |

Temperature 25°C
Testing Circuitry Figure A

1.Graph




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

2.Values

| Output Voltage [V] | Load Current [A] | | |
|---|---|---|---|
| | Input Volt. 18[V] | Input Volt. 24[V] | Input Volt. 36[V] |
| 5.00 | 0.60 | 0.60 | 0.60 |
| 4.75 | 1.03 | 1.06 | 1.07 |
| 4.50 | 1.06 | 1.09 | 1.08 |
| 4.00 | 1.11 | 1.12 | 1.10 |
| 3.50 | 1.16 | 1.15 | 1.11 |
| 3.00 | 1.21 | 1.18 | 1.11 |
| 2.50 | 1.26 | 1.20 | 1.11 |
| 2.00 | 1.30 | 1.21 | 1.09 |
| 1.50 | 1.33 | 1.19 | 1.06 |
| 1.00 | 1.32 | 1.13 | 0.99 |
| 0.50 | 1.23 | 1.01 | 0.85 |
| 0.00 | 1.79 | 1.22 | 1.01 |

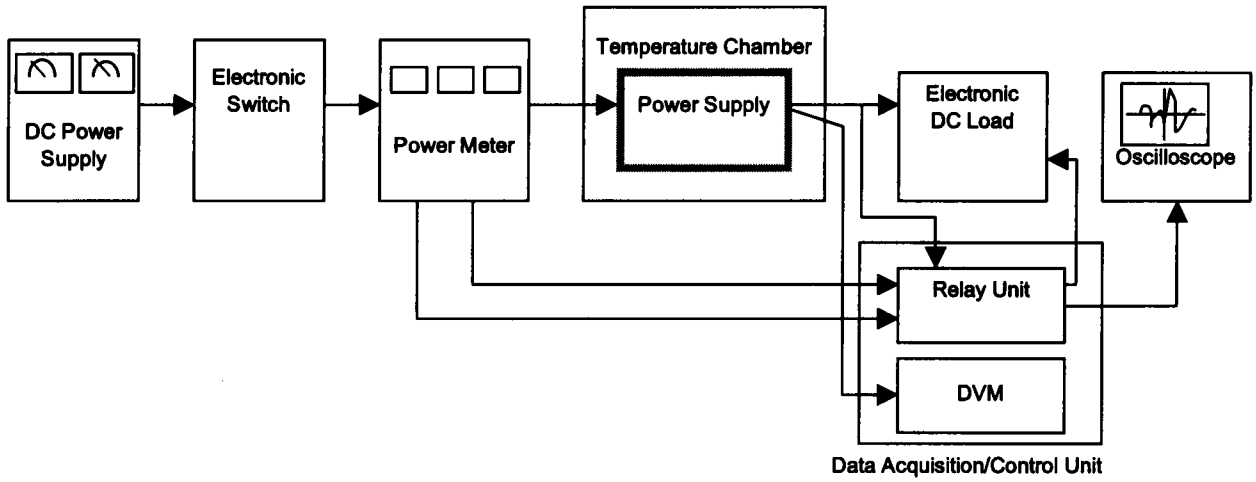



Figure A

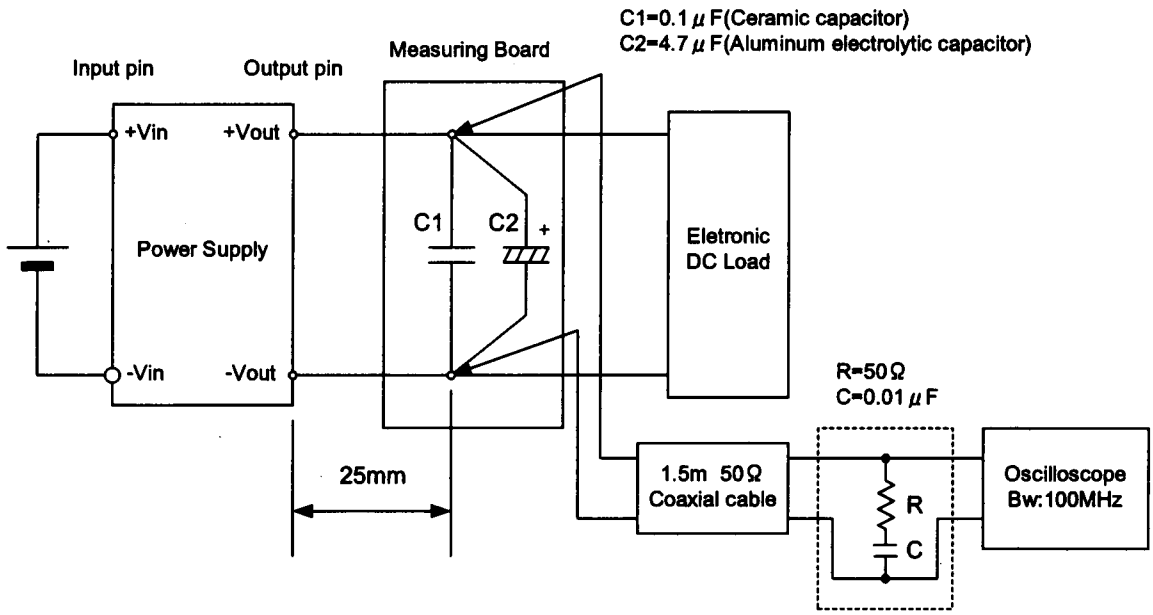



Figure B (Ripple and Ripple noise Characteristic)