



TEST DATA OF ZUW60515

(5.0V INPUT)

Regulated DC Power Supply

Date : Sep. 21. 1996

Approved by : T. Sugimori
Design Manager

Prepared by : H. Ise
Design Engineer

コーセル株式会社
COSEL CO., LTD.

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Model		ZUW60515	Temperature		25°C
Item		Line Regulation 静的入力変動	Testing Circuitry		Figure A
Object		+15V0.2A	2. Values		
1. Graph		<div> <div>-----□----- Load 50%</div> <div>-----△----- Load 100%</div> </div>			
Object		-15V0.2A	2. Values		
1. Graph		<div> <div>-----□----- Load 50%</div> <div>-----△----- Load 100%</div> </div>			
Note: Slanted line shows the range of the rated input voltage. (注)斜線は定格入力電圧範囲を示す。					

Input Voltage [V]	Load 50%	Load 100%
	Output Volt. [V]	Output Volt. [V]
4.0	15.217	15.078
4.5	15.203	15.080
5.0	15.194	15.081
6.0	15.184	15.082
7.0	15.176	15.081
8.0	15.170	15.079
9.0	15.165	15.077
9.5	15.162	15.075
—	—	—
—	—	—
—	—	—
—	—	—

Input Voltage [V]	Load 50%	Load 100%
	Output Volt. [V]	Output Volt. [V]
4.0	-15.221	-15.071
4.5	-15.210	-15.078
5.0	-15.204	-15.082
6.0	-15.195	-15.087
7.0	-15.190	-15.089
8.0	-15.184	-15.089
9.0	-15.179	-15.087
9.5	-15.177	-15.086
—	—	—
—	—	—
—	—	—
—	—	—

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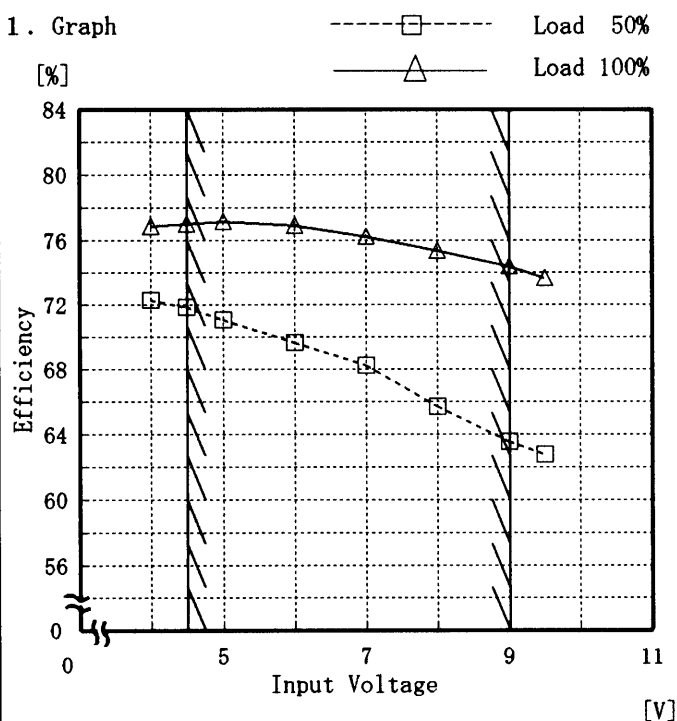
Model ZUW60515

Item Efficiency 効率

Object

Temperature 25°C
Testing Circuitry Figure A

1. Graph



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

(注) 斜線は定格入力電圧範囲を示す。

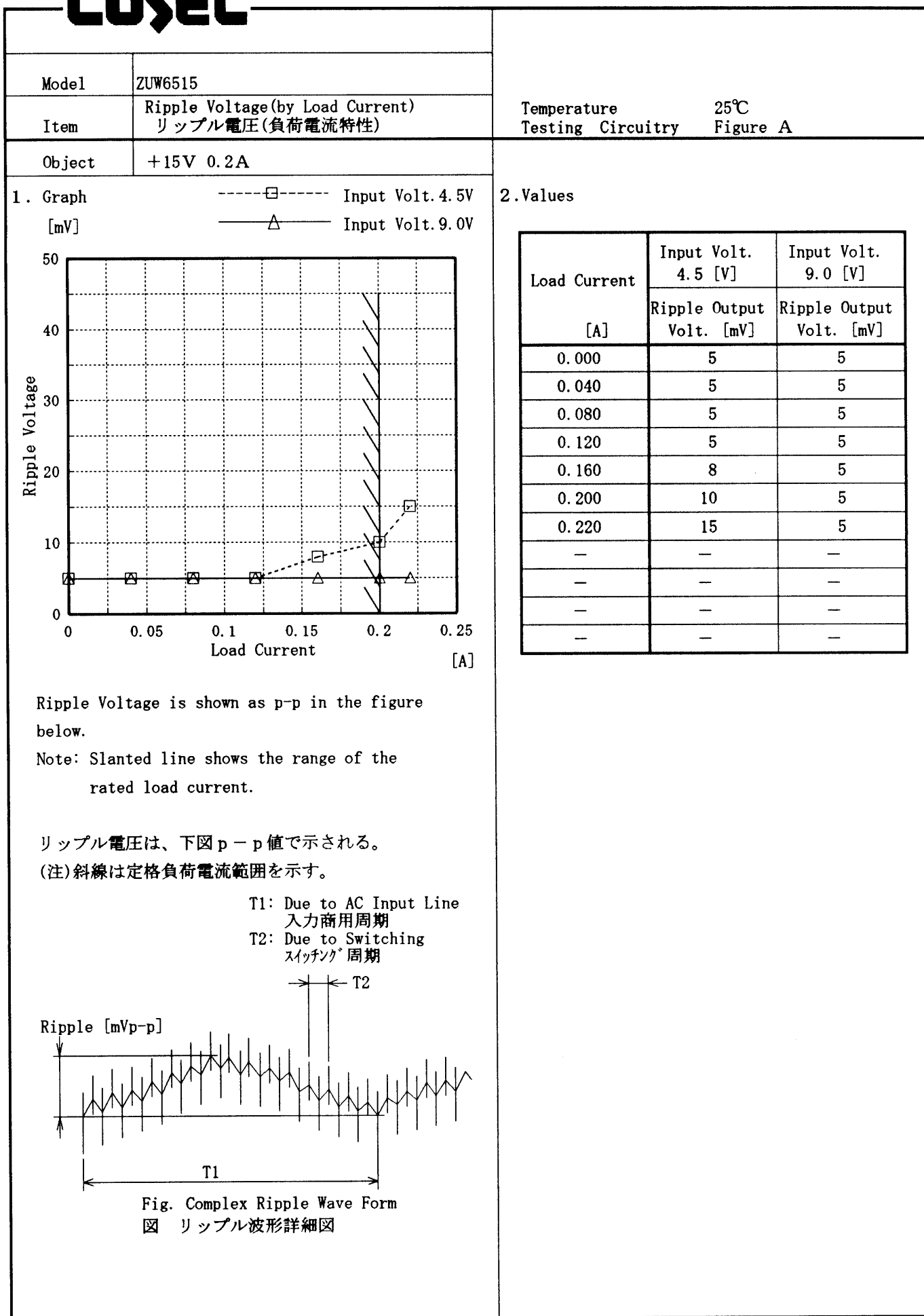
2. Values

Input Voltage [V]	Load 50%	Load 100%
	Efficiency [%]	Efficiency [%]
4.0	72.3	76.9
4.5	71.8	77.0
5.0	71.1	77.1
6.0	69.6	76.9
7.0	68.2	76.2
8.0	65.7	75.4
9.0	63.6	74.4
9.5	62.8	73.7
—	—	—
—	—	—
—	—	—
—	—	—

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Model ZUW60515		Temperature 25°C																																													
Item	Load Regulation 静的負荷変動	Testing Circuitry Figure A																																													
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Model		ZUW60515	
Item		Ripple Voltage(by Load Current) リップル電圧(負荷電流特性)	
Object		-15V 0.2A	

1. Graph

-----□----- Input Volt. 4.5V

-----△----- Input Volt. 9.0V

[mV]

50

40

30

20

10

0

0

0.05

0.1

0.15

0.2

0.25

Ripple Voltage

Load Current

[A]

2. Values

Load Current [A]	Input Volt. 4.5 [V]	Input Volt. 9.0 [V]
	Ripple Output Volt. [mV]	Ripple Output Volt. [mV]
0.000	5	5
0.040	5	5
0.080	5	5
0.120	5	5
0.160	8	5
0.200	10	5
0.220	15	5
—	—	—
—	—	—
—	—	—
—	—	—

Ripple Voltage is shown as p-p in the figure below.

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

リップル電圧は、下図 p-p 値で示される。

(注)斜線は定格負荷電流範囲を示す。

T1: Due to AC Input Line
入力商用周期

T2: Due to Switching
スイッチング周期

→← T2

←→ T1

Ripple [mVp-p]

Fig. Complex Ripple Wave Form

図 リップル波形詳細図

BC-2056

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Model		ZUW60515	Temperature		25℃																																						
Item		Ripple-Noise リップルノイズ	Testing Circuitry		Figure A																																						
Object		-15V0.2A																																									
1. Graph		2. Values																																									
<div><div>-----□-----</div>Input Volt. 4.5V</div> <div><div>-----△-----</div>Input Volt. 9.0V</div> <div><div>[mV]</div><div>80</div><div>60</div><div>40</div><div>20</div><div>0</div></div> <div><div>Ripple-Noise</div><div></div></div> <div><div>0</div><div>0.05</div><div>0.1</div><div>0.15</div><div>0.2</div><div>0.25</div></div> <div><div>Load Current</div><div>[A]</div></div>		<table><tr><th rowspan="2">Load current [A]</th><th>Input Volt. 4.5 [V]</th><th>Input Volt. 9.0 [V]</th></tr><tr><th>Ripple-Noise [mV]</th><th>Ripple-Noise [mV]</th></tr><tr><td>0.000</td><td>10</td><td>10</td></tr><tr><td>0.040</td><td>10</td><td>15</td></tr><tr><td>0.080</td><td>15</td><td>15</td></tr><tr><td>0.120</td><td>15</td><td>15</td></tr><tr><td>0.160</td><td>15</td><td>15</td></tr><tr><td>0.200</td><td>25</td><td>15</td></tr><tr><td>0.220</td><td>25</td><td>20</td></tr><tr><td>—</td><td>—</td><td>—</td></tr><tr><td>—</td><td>—</td><td>—</td></tr><tr><td>—</td><td>—</td><td>—</td></tr><tr><td>—</td><td>—</td><td>—</td></tr></table>				Load current [A]	Input Volt. 4.5 [V]	Input Volt. 9.0 [V]	Ripple-Noise [mV]	Ripple-Noise [mV]	0.000	10	10	0.040	10	15	0.080	15	15	0.120	15	15	0.160	15	15	0.200	25	15	0.220	25	20	—	—	—	—	—	—	—	—	—	—	—	—
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T1: Due to AC Input Line
入力商用周期

T2: Due to Switching
スイッチング周期

T2

Ripple-Noise
[mVp-p]

T1

Fig. Complex Ripple Wave Form

図 リップル波形詳細図

 | | | | || 2. Values | | | Load current
[A] | Input Volt.
4.5 [V] | Input Volt.
9.0 [V] | |---------------------|------------------------|------------------------| | | Ripple-Noise
[mV] | Ripple-Noise
[mV] | | 0.000 | 10 | 10 | | 0.040 | 10 | 15 | | 0.080 | 15 | 15 | | 0.120 | 15 | 15 | | 0.160 | 15 | 15 | | 0.200 | 25 | 15 | | 0.220 | 25 | 20 | | — | — | — | | — | — | — | | — | — | — | | — | — | — | | | | |

COSEL

Model ZUW60515		Temperature 25°C																																																					
Item Overcurrent Protection 過電流保護		Testing Circuitry Figure A																																																					
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1.50	0.569	0.539	0.315																																																				
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Note: Slanted line shows the range of the rated load current. (注)斜線は定格負荷電流範囲を示す。																																																							

COSEL

Model	ZUW60515	Temperature 25°C Testing Circuitry Figure A
Item	Dynamic Load Responce 動的負荷変動	
Object	+15V0.2A	

Input Volt. 5.0 V

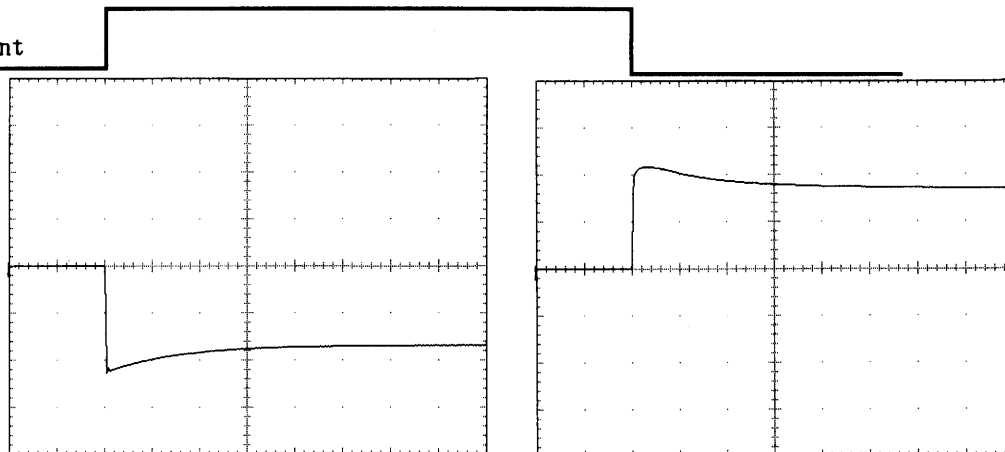
Cycle 100 mS

Load Current

Min. Load ↔

Load 100 %

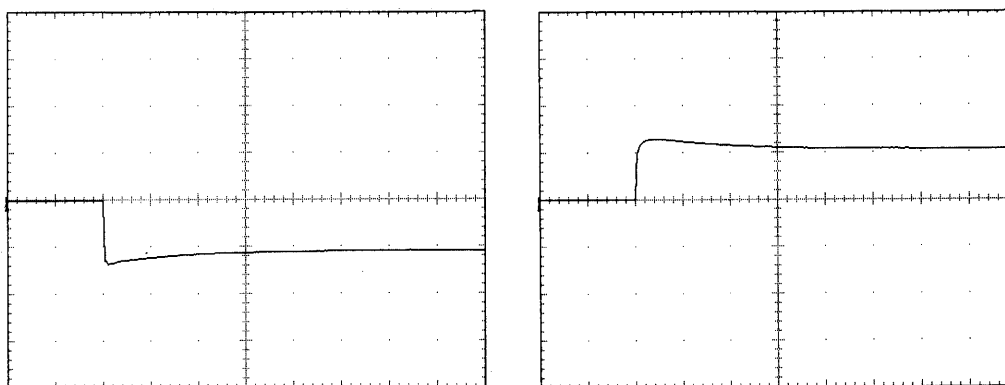
200 mV/div



Min. Load ↔

Load 50 %

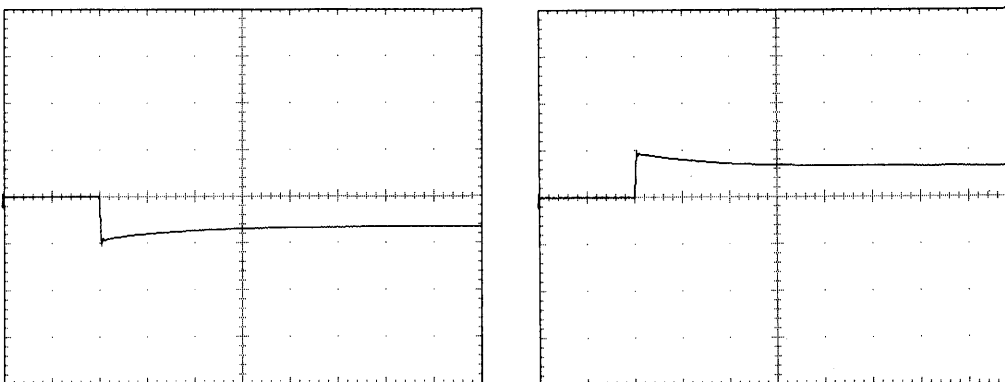
200 mV/div



Load 50% ↔

Load 100 %

200 mV/div



1 mS/div

COSEL

Model	ZUW60515	Temperature 25°C Testing Circuitry Figure A
Item	Dynamic Load Responce 動的負荷変動	
Object	-15V0.2A	

Input Volt. 5.0 V

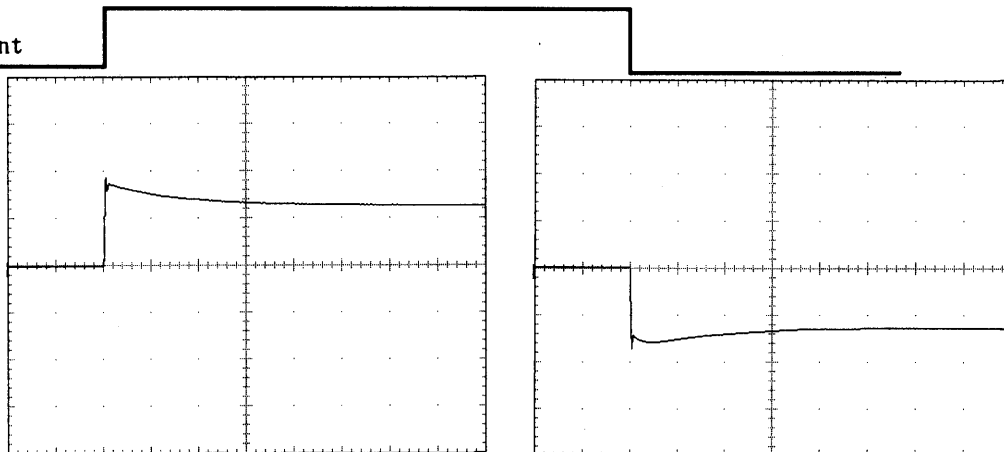
Cycle 100 mS

Load Current

Min. Load ↔

Load 100 %

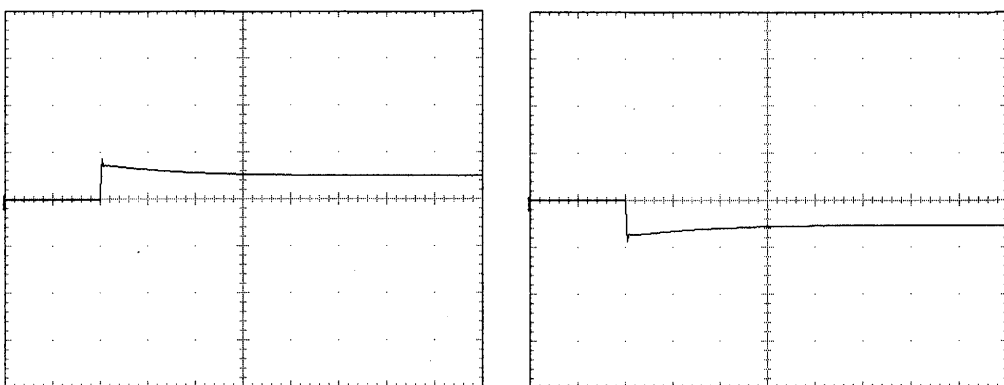
200 mV/div



Min. Load ↔

Load 50 %

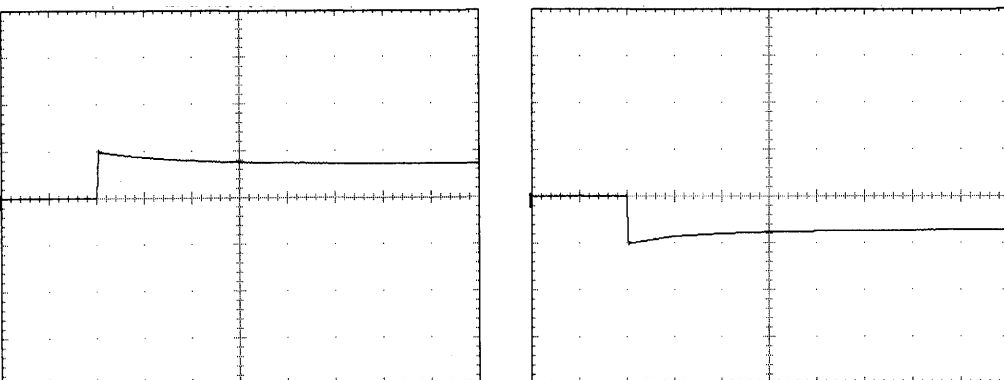
200 mV/div



Load 50% ↔

Load 100 %

200 mV/div



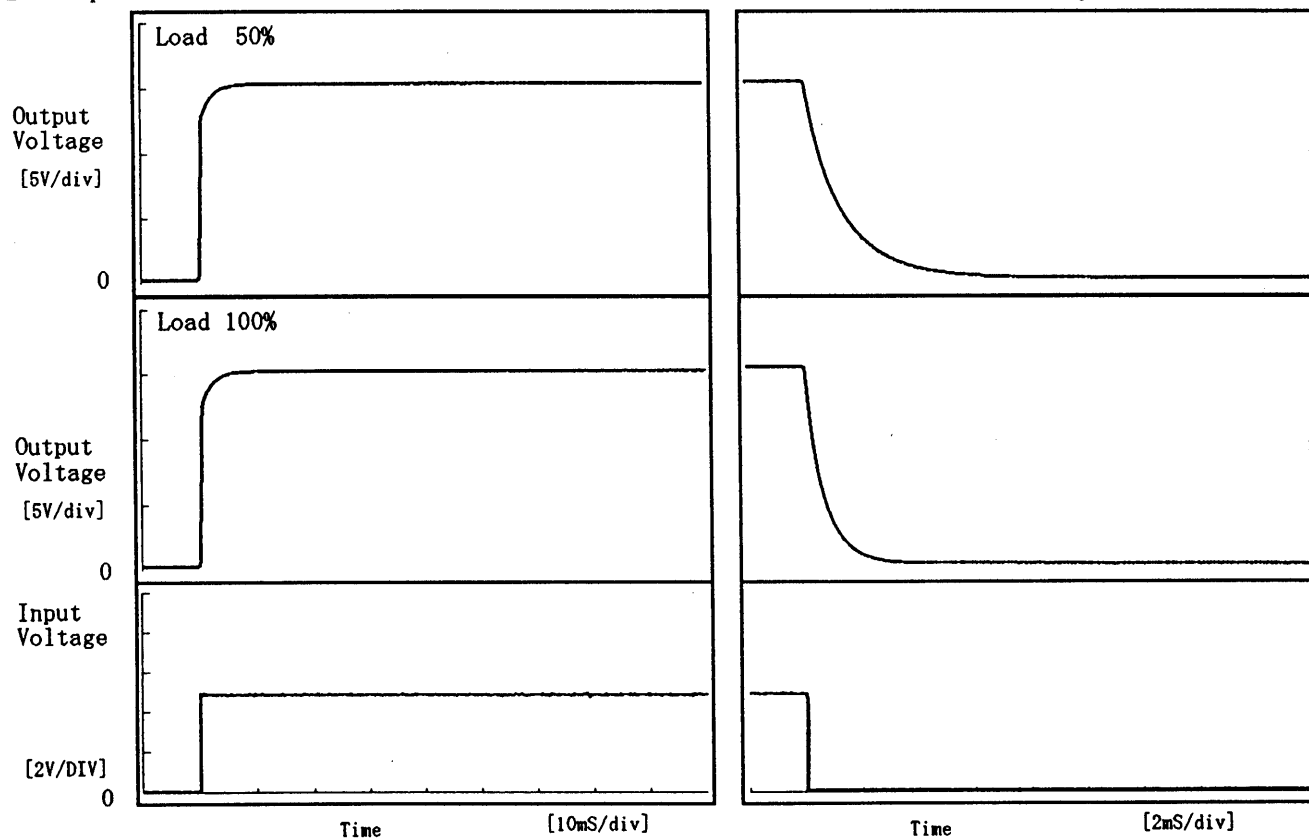
1 mS/div

COSEL

Model	ZUW60515	Temperature	25°C
Item	Rise and Fall Time 立上り、立下り時間	Testing Circuitry	Figure A
Object	+15V0.2A		

1. Graph

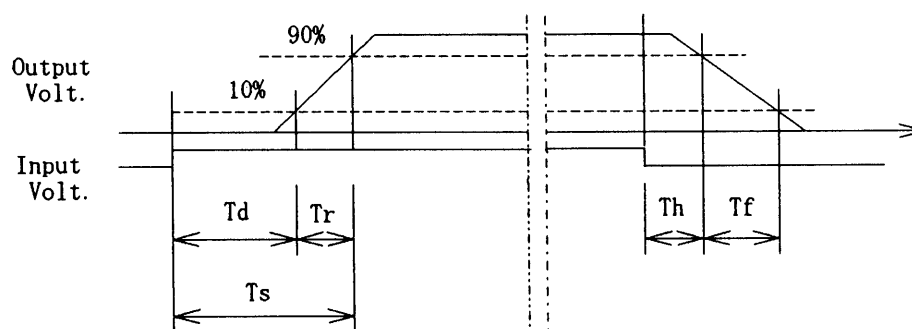
Input Volt. 4.5 V



2. Values

[mS]

Load \ Time	T d	T r	T s	T h	T f
50 %	0.15	1.30	1.45	0.19	3.17
100 %	0.10	1.50	1.60	0.11	1.54

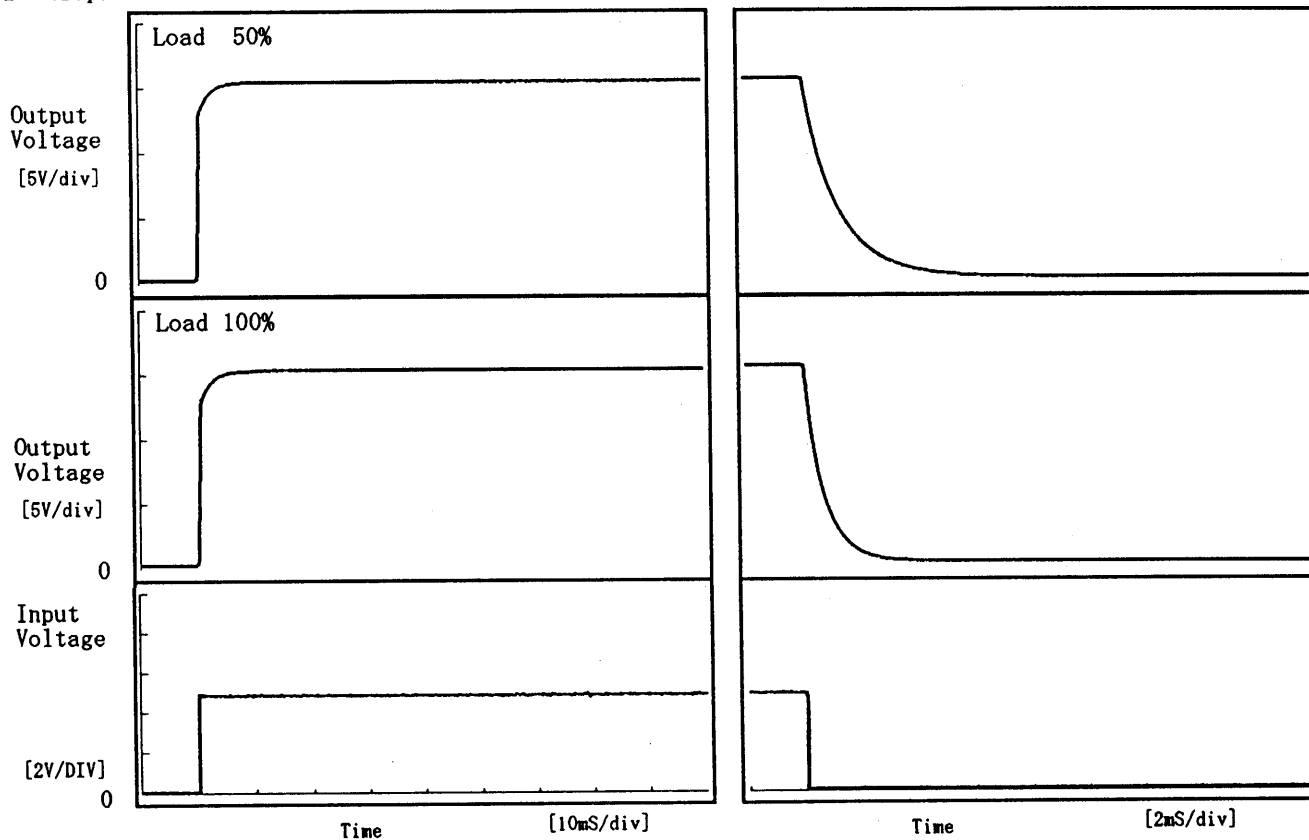


COSEL

Model	ZUW60515	Temperature	25°C
Item	Rise and Fall Time 立上り、立下り時間	Testing Circuitry	Figure A
Object	-15V 0.2A		

1. Graph

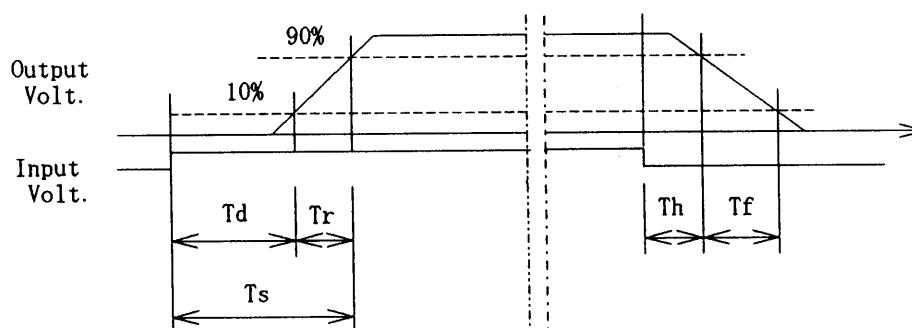
Input Volt. 4.5 V



2. Values

[mS]

Load \ Time	T d	T r	T s	T h	T f
50 %	0.10	1.20	1.30	0.19	2.88
100 %	0.10	1.35	1.45	0.11	1.56



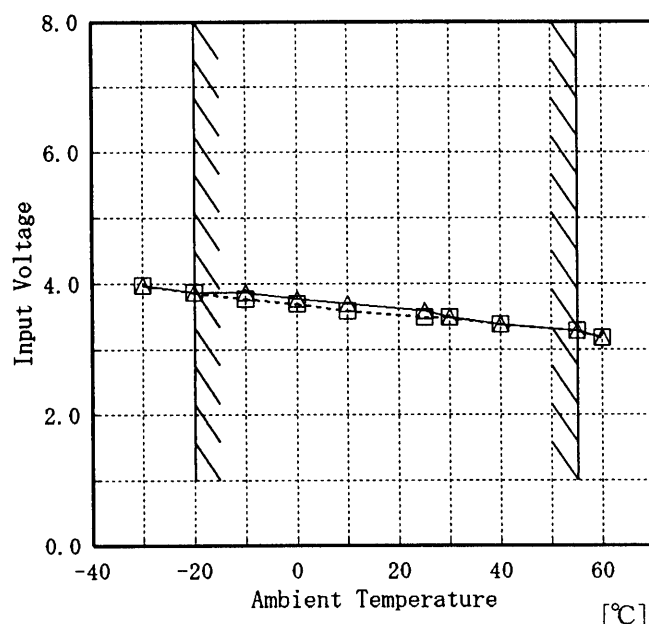
COSEL

Model		ZUW60515																																																					
Item		Ambient Temperature Drift 周囲温度変動																																																					
Object		+15V0.2A																																																					
1. Graph		2. Values																																																					
<div><div><div>—△—</div><div>Input Volt. 4.5V</div></div><div><div>- -□- -</div><div>Input Volt. 5.0V</div></div><div><div>- -○- -</div><div>Input Volt. 9.0V</div></div></div> <div>Output Voltage [V]</div> <div>Ambient Temperature [°C]</div> <div>Load 100%</div>		<table><tr><th>Temperature</th><th>Input Volt. 4.5[V]</th><th>Input Volt. 5.0[V]</th><th>Input Volt. 9.0[V]</th></tr><tr><th>[°C]</th><th>Output Volt. [V]</th><th>Output Volt. [V]</th><th>Output Volt. [V]</th></tr><tr><td>-30</td><td>15.125</td><td>15.122</td><td>15.113</td></tr><tr><td>-20</td><td>15.115</td><td>15.112</td><td>15.105</td></tr><tr><td>-10</td><td>15.106</td><td>15.104</td><td>15.098</td></tr><tr><td>0</td><td>15.098</td><td>15.097</td><td>15.092</td></tr><tr><td>10</td><td>15.092</td><td>15.092</td><td>15.087</td></tr><tr><td>25</td><td>15.084</td><td>15.084</td><td>15.080</td></tr><tr><td>30</td><td>15.081</td><td>15.082</td><td>15.078</td></tr><tr><td>40</td><td>15.078</td><td>15.079</td><td>15.075</td></tr><tr><td>55</td><td>15.073</td><td>15.075</td><td>15.072</td></tr><tr><td>60</td><td>15.071</td><td>15.073</td><td>15.070</td></tr><tr><td>—</td><td>—</td><td>—</td><td>—</td></tr></table>		Temperature	Input Volt. 4.5[V]	Input Volt. 5.0[V]	Input Volt. 9.0[V]	[°C]	Output Volt. [V]	Output Volt. [V]	Output Volt. [V]	-30	15.125	15.122	15.113	-20	15.115	15.112	15.105	-10	15.106	15.104	15.098	0	15.098	15.097	15.092	10	15.092	15.092	15.087	25	15.084	15.084	15.080	30	15.081	15.082	15.078	40	15.078	15.079	15.075	55	15.073	15.075	15.072	60	15.071	15.073	15.070	—	—	—	—
Temperature	Input Volt. 4.5[V]	Input Volt. 5.0[V]	Input Volt. 9.0[V]																																																				
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10	15.092	15.092	15.087																																																				
25	15.084	15.084	15.080																																																				
30	15.081	15.082	15.078																																																				
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Temperature	Input Volt. 4.5[V]	Input Volt. 5.0[V]	Input Volt. 9.0[V]																																																				
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Note: Slanted line shows the range of the rated ambient temperature. (注)斜線は定格周囲温度範囲を示す。																																																							

COSEL

Model	ZUW60515
Item	Minimum Input Voltage for Regulated Output Voltage 最低レギュレーション電圧
Object	+15V0.2A

1. Graph
- Load 50%
 -----△----- Load 100%

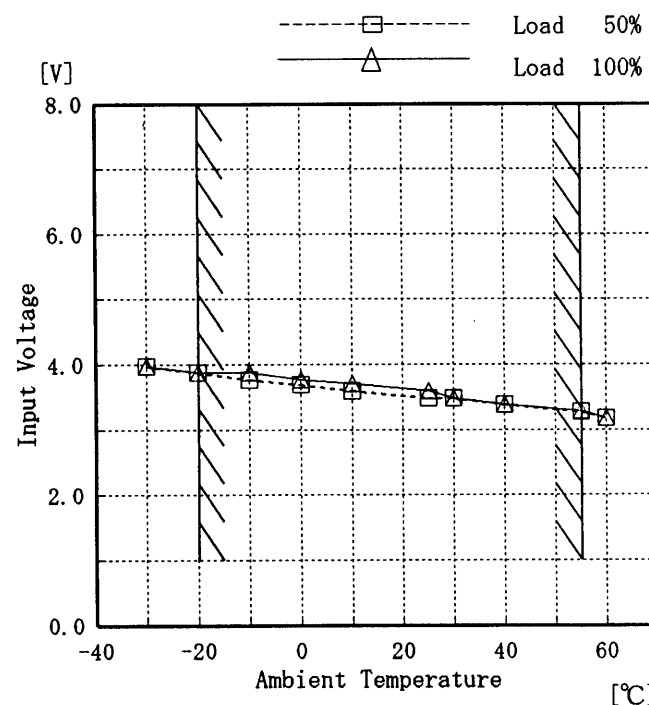


Testing Circuitry Figure A

2. Values

Ambient Temp. [°C]	Load 50% Input Volt. [V]	Load 100% Input Volt. [V]
-30	4.0	4.0
-20	3.9	3.9
-10	3.8	3.9
0	3.7	3.8
10	3.6	3.7
25	3.5	3.6
30	3.5	3.5
40	3.4	3.4
55	3.3	3.3
60	3.2	3.2
—	—	—

Object	-15V0.2A
--------	----------



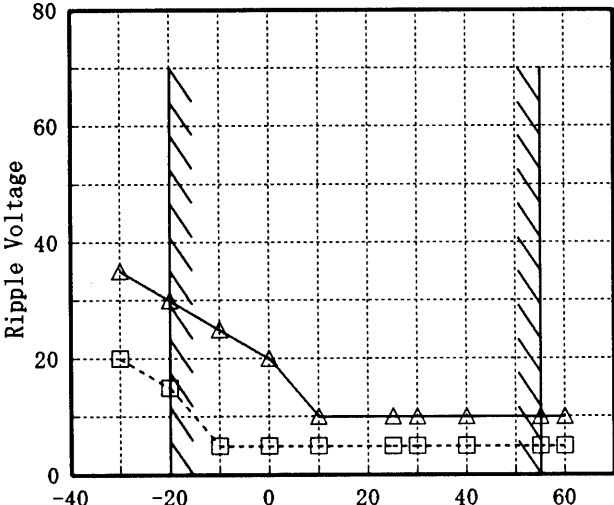
2. Values

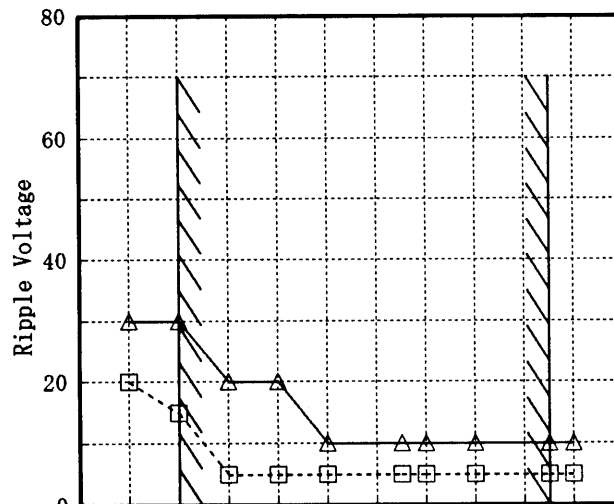
Ambient Temp. [°C]	Load 50% Input Volt. [V]	Load 100% Input Volt. [V]
-30	4.0	4.0
-20	3.9	3.9
-10	3.8	3.9
0	3.7	3.8
10	3.6	3.7
25	3.5	3.6
30	3.5	3.5
40	3.4	3.4
55	3.3	3.3
60	3.2	3.2
—	—	—

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

(注) 斜線は定格周囲温度範囲を示す。

COSEL

Model		ZUW60515																																					
Item		Ripple Voltage (by Ambient Temp.) リップル電圧 (周囲温度特性)																																					
Object		+15V0.2A																																					
1. Graph		-----□----- Load 50% -----△----- Load 100%																																					
[mV]																																							
																																							
Ambient Temperature [°C]																																							
Input Volt. 4.5 V																																							
2. Values																																							
<table><tr><th>Ambient Temp. [°C]</th><th>Load 50% Ripple Output Volt. [mV]</th><th>Load 100% Ripple Output Volt. [mV]</th></tr><tr><td>-30</td><td>20</td><td>35</td></tr><tr><td>-20</td><td>15</td><td>30</td></tr><tr><td>-10</td><td>5</td><td>25</td></tr><tr><td>0</td><td>5</td><td>20</td></tr><tr><td>10</td><td>5</td><td>10</td></tr><tr><td>25</td><td>5</td><td>10</td></tr><tr><td>30</td><td>5</td><td>10</td></tr><tr><td>40</td><td>5</td><td>10</td></tr><tr><td>55</td><td>5</td><td>10</td></tr><tr><td>60</td><td>5</td><td>10</td></tr><tr><td>—</td><td>—</td><td>—</td></tr></table>		Ambient Temp. [°C]	Load 50% Ripple Output Volt. [mV]	Load 100% Ripple Output Volt. [mV]	-30	20	35	-20	15	30	-10	5	25	0	5	20	10	5	10	25	5	10	30	5	10	40	5	10	55	5	10	60	5	10	—	—	—		
Ambient Temp. [°C]	Load 50% Ripple Output Volt. [mV]	Load 100% Ripple Output Volt. [mV]																																					
-30	20	35																																					
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-10	5	25																																					
0	5	20																																					
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Object		-15V0.2A																																					
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Ambient Temp. [°C]	Load 50% Ripple Output Volt. [mV]	Load 100% Ripple Output Volt. [mV]																																					
-30	20	30																																					
-20	15	30																																					
-10	5	20																																					
0	5	20																																					
10	5	10																																					
25	5	10																																					
30	5	10																																					
40	5	10																																					
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60	5	10																																					
—	—	—																																					

Note: Slanted line shows the range of the rated ambient temperature.	
(注)斜線は定格周囲温度範囲を示す。	

COSEL

COSEL	
Model	ZUW60515
Item	Time Lapse Drift 経時ドリフト
Object	+15V0.2A
1. Graph	
<div><div><div>Output Voltage</div><div>[V]</div><div><div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><d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COSEL

COLL

Model	ZUW60515	Testing Circuitry Figure A
Item	Output Voltage Accuracy 定電圧精度	

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 : -20~55 ℃

Input Voltage : 4.5~9.0 V

Load Current (AVR 1) : 0.0~0.2 A

 (AVR 2) : 0.0~0.2 A

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

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

定電圧精度

周囲温度、入力電圧、負荷を下記仕様内で、任意に変動させたときの出力電圧の変動をいう。

周囲温度 -20~55 ℃

入力電圧 4.5~9.0 V

負荷電流 (AVR 1) 0.0~0.2 A

 (AVR 2) 0.0~0.2 A

* 定電圧精度 (変動値) = ± (出力電圧の最高値 - 出力電圧の最低値) / 2

* 定電圧精度 (変動率) = $\frac{\text{変動値}}{\text{定格出力電圧}} \times 100$

Object	+15V0.2A
--------	----------

Item	Temperature [℃]	Input Voltage [V]	Output Current [A]	Output Voltage [V]	Output Voltage Accuracy [mV]	Output Voltage Accuracy (Ration) [%]
Maximum Voltage	-20	4.5	0.2	15.106	±219	±1.5
Minimum Voltage	55	9.0	0.0	14.669		

Object	-15V0.2A
--------	----------

Item	Temperature [℃]	Input Voltage [V]	Output Current [A]	Output Voltage [V]	Output Voltage Accuracy [mV]	Output Voltage Accuracy (Ration) [%]
Maximum Voltage	-20	5.0	0.2	-15.103	±140	±1.0
Minimum Voltage	55	9.0	0.0	-14.824		

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BC-2056

COSEL

LOGEL

Model	ZUW60515
Item	Condensation 結露特性
Object	+15V 0.2A

Testing Circuitry Figure A

1. Condensation test

Testing procedure is as follows.

- ① Keeping and cooling the unit in a tank at -10°C for an hour with the input off.
- ② Taking it out of the tank and dewing itself in a room where the temperature is 26°C and the humidity is 40%RH.
- ③ Testing electrical characteristics of the unit to confirm there be no fault.
- ④ Repeating ①, ② and ③ three times.

1. 結露特性試験

入力を切った状態で、恒温槽で -10°C に冷却しておき、約1時間後に恒温槽から取り出し、室温 26°C 、湿度40%RHの状態におき結露させ、その電気的特性の測定を3度行い、異常のないことを確認する。

2. Values

	Times	Output Voltage [V]	Ripple Voltage [mV]	Ripple Noise [mV]
Load 50 %	1	15.207	5	15
	2	15.208	5	15
	3	15.209	5	15
Load 100 %	1	15.099	15	30
	2	15.101	15	25
	3	15.108	15	25

Input Volt. 5.0 V

COSEL

Model		ZUW60515	Testing Circuitry Figure A
Item		Condensation 結露特性	
Object		-15V 0.2A	

1. Condensation test

Testing procedure is as follows.

- ① Keeping and cooling the unit in a tank at -10℃ for an hour with the input off.
- ② Taking it out of the tank and dewing itself in a room where the temperature is 26℃ and the humidity is 40%RH.
- ③ Testing electrical characteristics of the unit to confirm there be no fault.
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1. 結露特性試験

入力を切った状態で、恒温槽で-10℃に冷却しておき、約1時間後に恒温槽から取り出し、室温26℃、湿度40%RHの状態におき結露させ、その電気的特性の測定を3度行い、異常のないことを確認する。

2. Values

	Times	Output Voltage [V]	Ripple Voltage [mV]	Ripple Noise [mV]
Load 50 %	1	-15.214	5	25
	2	-15.218	5	15
	3	-15.217	5	15
Load 100 %	1	-15.090	15	30
	2	-15.089	15	25
	3	-15.078	15	25

Input Volt. 5.0 V

COSEL

