

TEST DATA OF TUNS300F28

Regulated DC Power Supply
October 1, 2014

Approved by : Takayuki Fukuda
Takayuki Fukuda Design Manager

Prepared by : Kosuke Takarada
Kosuke Takarada Design Engineer

COSEL CO.,LTD.

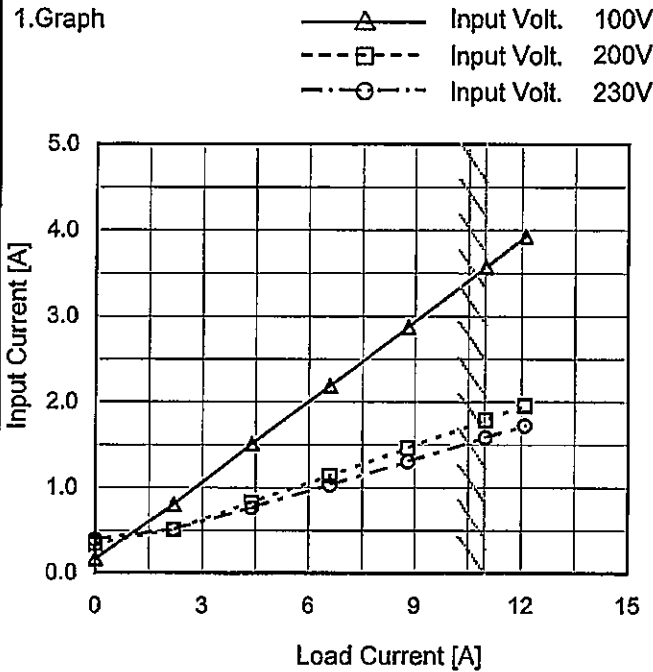
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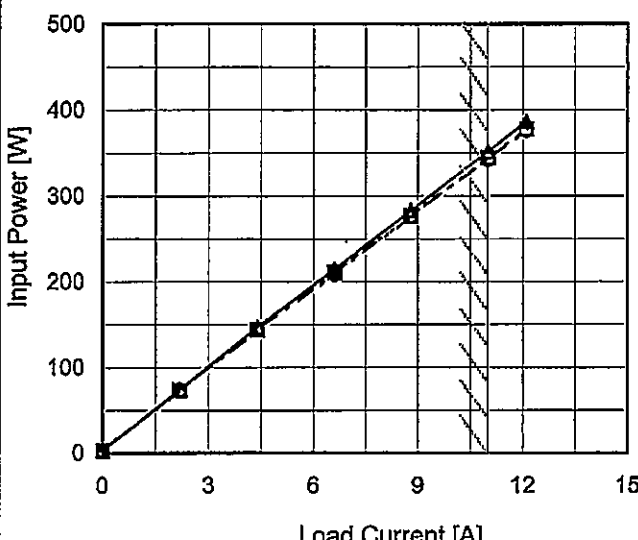
Model	TUNS300F28
Item	Input Current (by Load Current)
Object	

Temperature 25°C
Testing Circuitry Figure A



2.Values

Load Current [A]	Input Current [A]		
	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]
0.0	0.164	0.339	0.391
2.2	0.804	0.509	0.511
4.4	1.513	0.825	0.766
6.6	2.191	1.138	1.029
8.8	2.879	1.462	1.303
11.0	3.576	1.790	1.583
12.1	3.931	1.957	1.725
--	-	-	-
--	-	-	-
--	-	-	-
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Model		TUNS300F28																																																				
Item		Input Power (by Load Current)																																																				
Object																																																						
1.Graph		2.Values																																																				
<div><div><div>—△—</div><div>Input Volt.</div><div>100V</div></div><div><div>---□---</div><div>Input Volt.</div><div>200V</div></div><div><div>---○---</div><div>Input Volt.</div><div>230V</div></div></div>  <p>Input Power [W]</p> <p>Load Current [A]</p> <p>Note: Slanted line shows the range of the rated load current.</p>		<table><tr><th rowspan="2">Load Current [A]</th><th colspan="3">Input Power [W]</th></tr><tr><th>Input Volt. 100[V]</th><th>Input Volt. 200[V]</th><th>Input Volt. 230[V]</th></tr><tr><td>0.0</td><td>3.0</td><td>2.9</td><td>2.9</td></tr><tr><td>2.2</td><td>74.9</td><td>73.3</td><td>73.1</td></tr><tr><td>4.4</td><td>147.2</td><td>144.1</td><td>143.7</td></tr><tr><td>6.6</td><td>214.7</td><td>210.4</td><td>209.5</td></tr><tr><td>8.8</td><td>283.2</td><td>277.1</td><td>276.1</td></tr><tr><td>11.0</td><td>351.7</td><td>344.1</td><td>342.6</td></tr><tr><td>12.1</td><td>386.4</td><td>377.9</td><td>376.1</td></tr><tr><td>--</td><td>-</td><td>-</td><td>-</td></tr><tr><td>--</td><td>-</td><td>-</td><td>-</td></tr><tr><td>--</td><td>-</td><td>-</td><td>-</td></tr><tr><td>--</td><td>-</td><td>-</td><td>-</td></tr></table>		Load Current [A]	Input Power [W]			Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]	0.0	3.0	2.9	2.9	2.2	74.9	73.3	73.1	4.4	147.2	144.1	143.7	6.6	214.7	210.4	209.5	8.8	283.2	277.1	276.1	11.0	351.7	344.1	342.6	12.1	386.4	377.9	376.1	--	-	-	-	--	-	-	-	--	-	-	-	--	-	-	-
Load Current [A]	Input Power [W]																																																					
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		Temperature 25°C Testing Circuitry Figure A																																																				

Model		TUNS300F28	
Item		Efficiency (by Input Voltage)	
Object			

1.Graph

□

Load 50%

—

△

—

Load 100%

Efficiency [%]

100

90

80

70

60

50

50

100

150

200

250

300

Input Voltage [V]

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

2.Values

Input Voltage [V]	Efficiency [%]	
	Load 50%	Load 100%
80	84.6	86.8
85	84.5	87.1
100	85.0	87.7
120	85.5	88.3
200	86.9	89.6
230	87.3	90.1
264	87.7	90.4
280	88.5	91.1
--	-	-

Model

TUNS300F28

Item

Efficiency (by Load Current)

Object

1.Graph

—△—

Input Volt.

100V

---□---

Input Volt.

200V

---○---

Input Volt.

230V

Efficiency [%]

Load Current [A]

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

2.Values

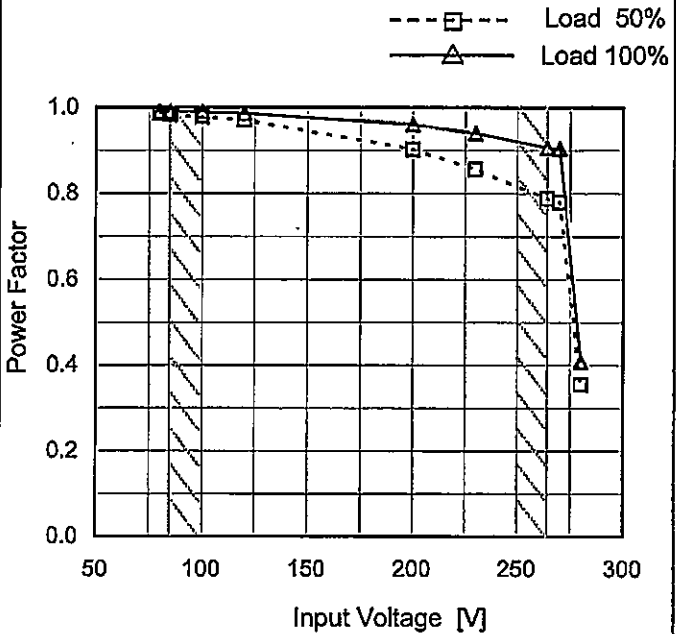
Load Current [A]	Efficiency [%]		
	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]
0.0	-	-	-
2.2	81.8	83.6	83.9
4.4	83.6	85.3	85.6
6.6	86.0	87.9	88.2
8.8	87.1	89.0	89.4
11.0	87.7	89.6	90.1
12.1	87.9	89.8	90.3
--	-	-	-
--	-	-	-
--	-	-	-
--	-	-	-



Model	TUNS300F28
Item	Power Factor (by Input Voltage)
Object	

Temperature 25°C
Testing Circuitry Figure A

1.Graph



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

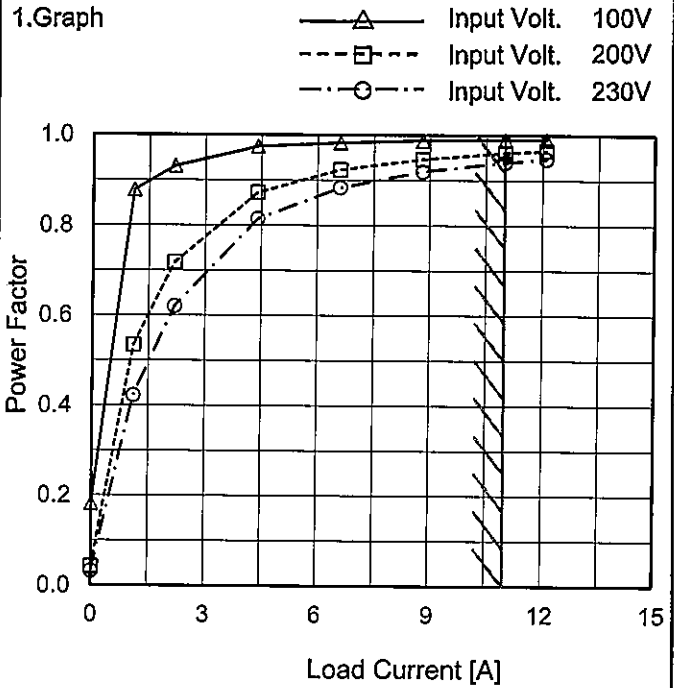
2.Values

Input Voltage [V]	Power Factor	
	Load 50%	Load 100%
80	0.986	0.990
85	0.983	0.990
100	0.979	0.990
120	0.970	0.987
200	0.903	0.961
230	0.856	0.940
264	0.788	0.908
270	0.779	0.904
280	0.355	0.409



Model	TUNS300F28
Item	Power Factor (by Load Current)
Object	

Temperature 25°C
Testing Circuitry Figure A

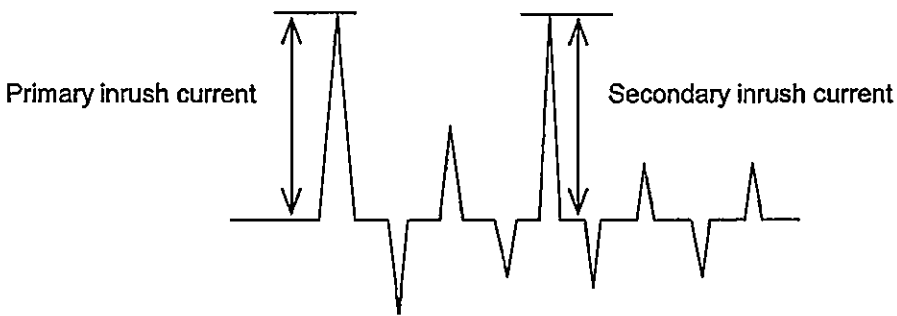
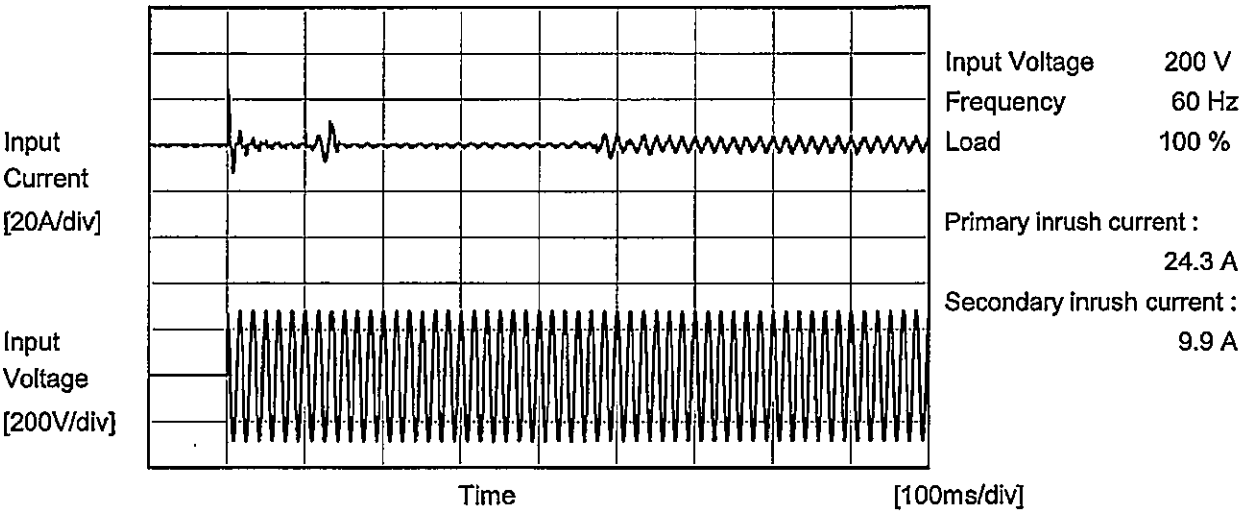
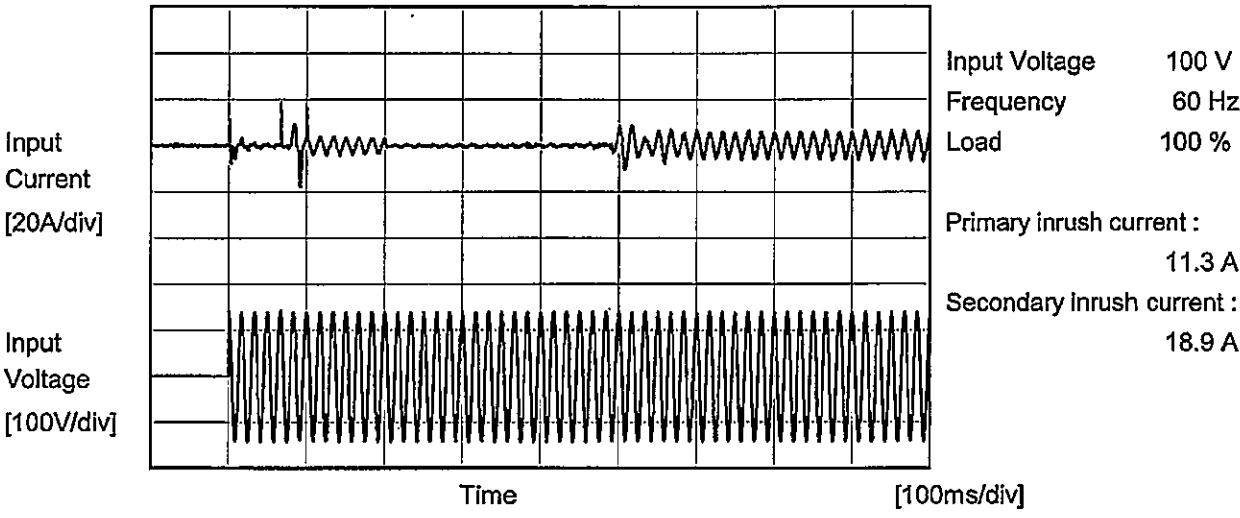


2.Values

Load Current [A]	Power Factor		
	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]
0.0	0.182	0.042	0.032
1.1	0.878	0.534	0.422
2.2	0.932	0.718	0.621
4.4	0.975	0.873	0.814
6.6	0.983	0.923	0.884
8.8	0.989	0.947	0.920
11.0	0.990	0.961	0.940
12.1	0.991	0.966	0.947
--	-	-	-
--	-	-	-
--	-	-	-



Model		TUNS300F28	Temperature 25°C Testing Circuitry Figure A
Item		Inrush Current	
Object			





		Temperature 25°C Testing Circuitry Figure B
Model	TUNS300F28	
Item	Leakage Current	
Object		

1.Results

[mA]

Standards		Input Volt.			Note
		100 [V]	200 [V]	240[V]	
IEC60950-1	Both phases	0.16	0.33	0.40	Operation
	One of phase	0.30	0.63	0.77	stand by

The value for "One phase" is the reference value only.

2.Condition

Leakage current value is concluded after measuring both phases of AC input and by choosing the larger one.

Model

TUNS300F28

Item

Line Regulation

Object

+28V11A

1.Graph

□

Load 50%

△

Load 100%

Output Voltage [V]

28.30

28.20

28.10

28.00

27.90

27.80

27.70

Input Voltage [V]

50

100

150

200

250

300

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

Temperature

25°C

Testing Circuitry

Figure A

2.Values

Input Voltage [V]	Output Voltage [V]	
	Load 50%	Load 100%
80	28.051	28.051
85	28.051	28.051
100	28.051	28.052
120	28.051	28.052
200	28.051	28.052
230	28.051	28.052
264	28.051	28.052
280	28.051	28.052
---	-	-

Model

TUNS300F28

Item

Load Regulation

Object

+28V11A

1.Graph

—△—

Input Volt.

100V

---□---

Input Volt.

200V

-·-○-·-

Input Volt.

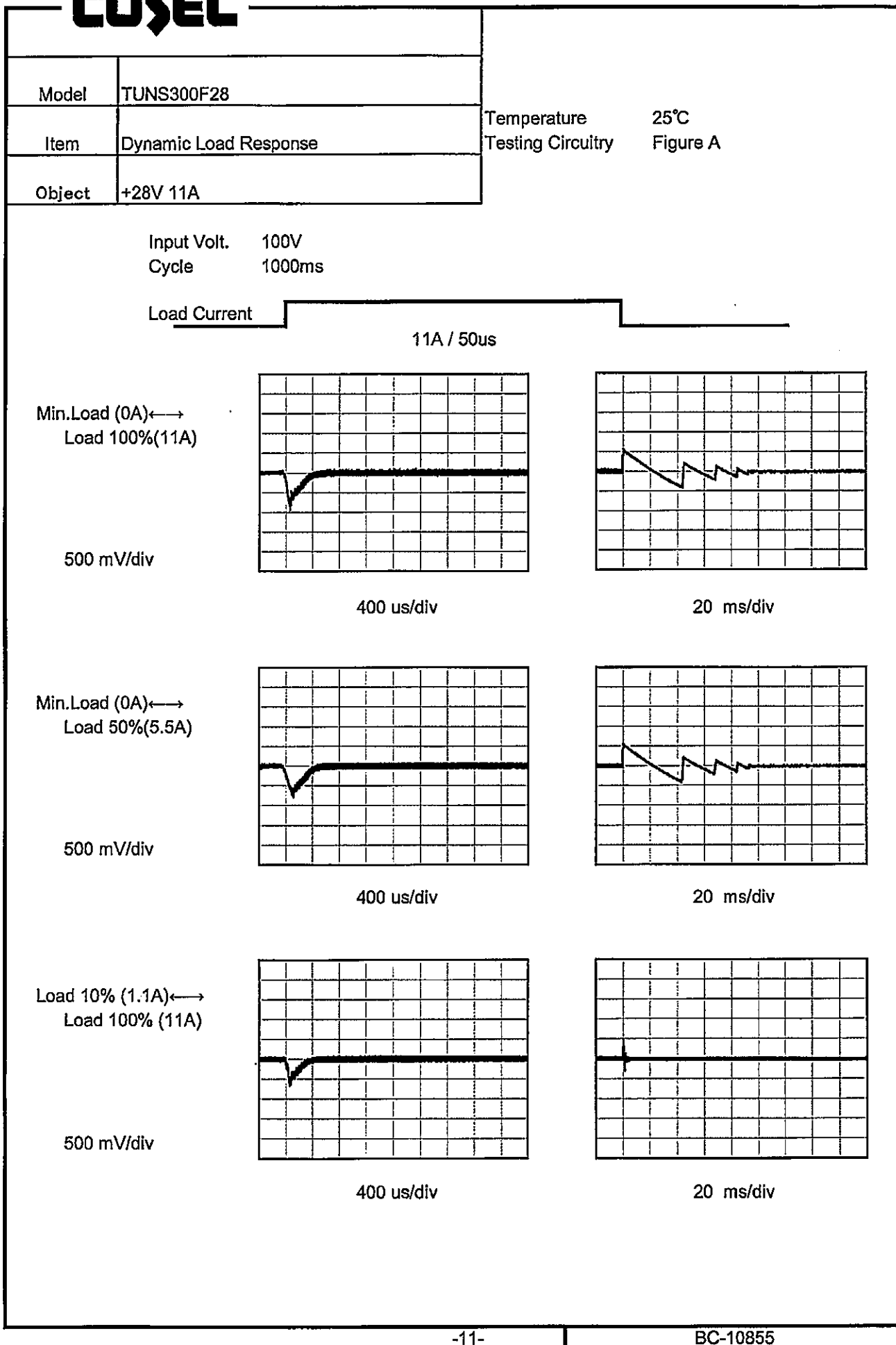
230V

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

2.Values

Load Current [A]	Output Voltage [V]		
	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]
0.0	28.055	28.055	28.055
2.2	28.052	28.052	28.052
4.4	28.051	28.051	28.051
6.6	28.051	28.051	28.051
8.8	28.051	28.051	28.051
11.0	28.052	28.052	28.052
12.1	28.051	28.051	28.051
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--	-	-	-
--	-	-	-

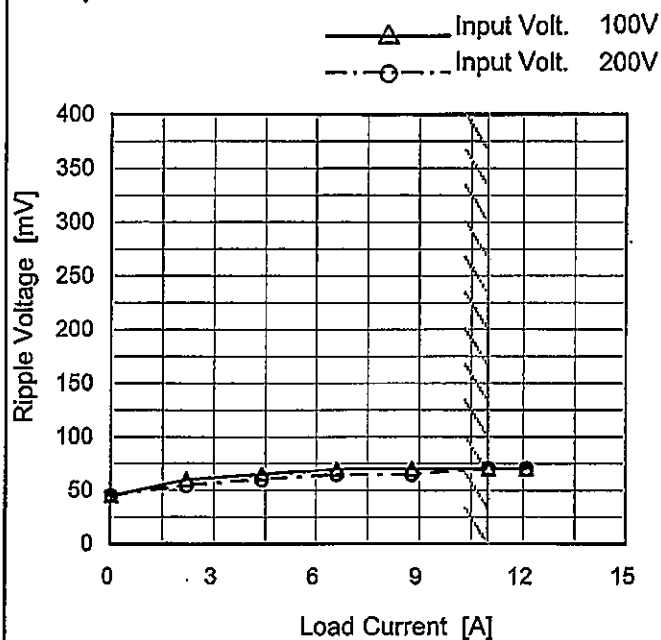
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Model	TUNS300F28
Item	Ripple Voltage (by Load Current)
Object	+28V11A

Temperature 25°C
Testing Circuitry Figure C

1.Graph



2.Values

Load Current [A]	Ripple Voltage [mV]	
	Input Volt. 100 [V]	Input Volt. 200 [V]
0.0	45	45
2.2	60	55
4.4	65	60
6.6	70	65
8.8	70	65
11.0	70	70
12.1	70	70
--	-	-
--	-	-
--	-	-
--	-	-

Ripple Voltage is shown as p-p in the figure below.
Note: Stanted line shows the range of the rated load current.

Ripple [mVp-p]

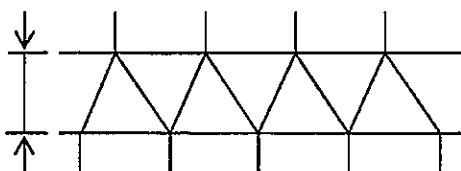


Fig.Complex Ripple Wave Form

LOVEL

参 考

Model	TUNS300F28
Item	Ripple-Noise
Object	+28V11A

Temperature 25°C
Testing Circuitry Figure C

1.Graph

—△— Input Volt. 100V
- - -○- - - Input Volt. 200V

Load Current [A]	100V Input Ripple [mV]	200V Input Ripple [mV]
0.0	55	55
2.2	65	65
4.4	75	70
6.6	75	70
8.8	75	75
11.0	75	75
12.1	75	75

2.Values

Load Current [A]	Ripple-Noise [mV]	
	Input Volt. 100 [V]	Input Volt. 200 [V]
0.0	55	55
2.2	65	65
4.4	75	70
6.6	75	70
8.8	75	75
11.0	75	75
12.1	75	75
--	-	-
--	-	-
--	-	-
--	-	-

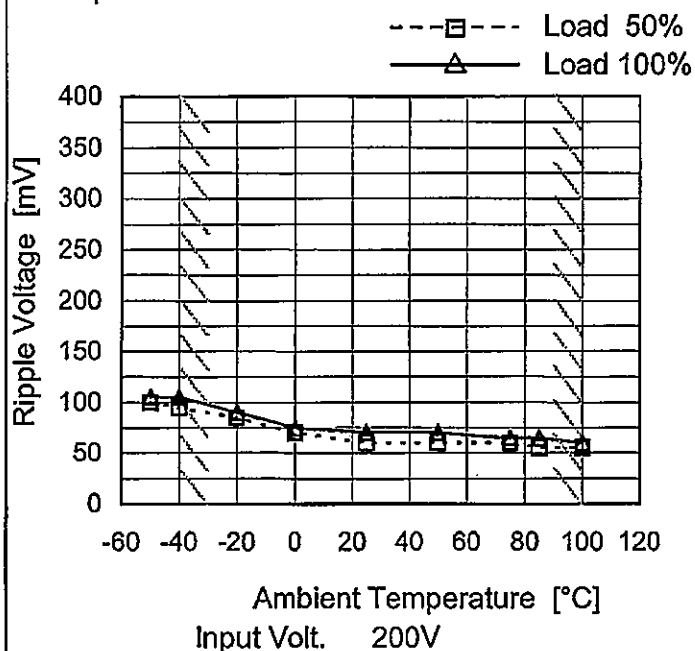
Ripple-Noise is shown as p-p in the figure below.
Note: Slanted line shows the range of the rated load current.

Fig.Complex Ripple Noise Wave Form

Model	TUNS300F28
Item	Ripple Voltage (by Ambient Temp.)
Object	+28V11A

Testing Circuitry Figure C

1. Graph



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%
-50	100	105
-40	95	105
-20	85	90
0	70	75
25	60	70
50	60	70
75	60	65
85	55	65
100	55	60
105	55	60
--	-	-

Model

TUNS300F28

Item

Ambient Temperature Drift

Object

+28V11A

1.Graph

—△—

Input Volt.

100V

---□---

Input Volt.

200V

-·-○-·-

Input Volt.

230V

Output Voltage [V]

Ambient Temperature [°C]

Load 100%

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

2.Values

Ambient Temperature [°C]	Output Voltage [V]		
	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]
-50	27.886	27.886	27.887
-40	27.917	27.918	27.919
-20	27.972	27.972	27.972
0	28.013	28.014	28.014
25	28.052	28.052	28.052
50	28.073	28.073	28.073
75	28.085	28.085	28.085
85	28.088	28.088	28.088
100	28.096	28.096	28.096
105	28.100	28.101	28.100
--	-	-	-

Testing Circuitry

Figure A



Model		TUNS300F28	Testing Circuitry Figure A
Item		Output Voltage Accuracy	
Object		+28V11A	

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 - 100°C

Input Voltage : 85 - 264V

Load Current : 0 - 11A

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

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

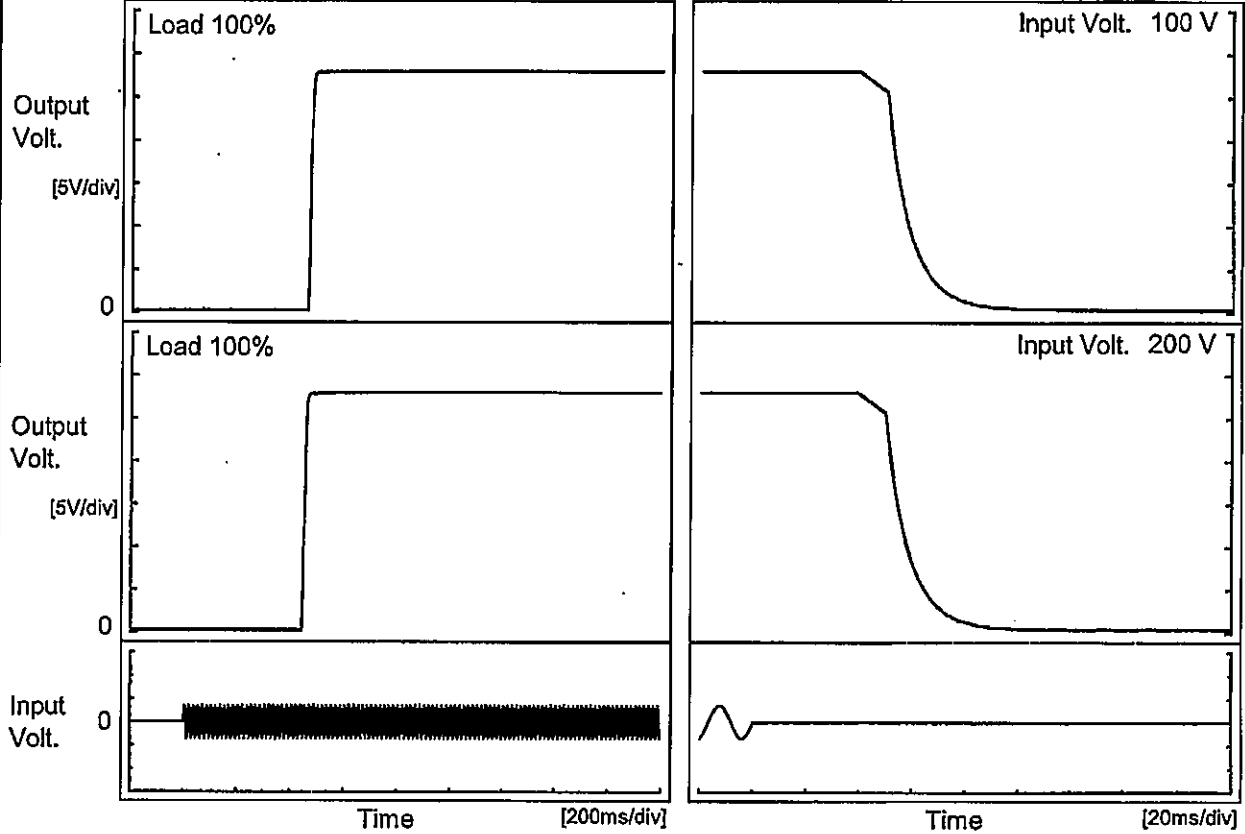
2. Values

Item	Temperature [°C]	Input Voltage[V]	Output		Output Voltage Accuracy	
			Current[A]	Voltage[V]	Value [mV]	Ratio [%]
Maximum Voltage	100	85	0	28.102	±93	±0.3
Minimum Voltage	-40	85	11	27.917		

Model	TUNS300F28
Item	Rise and Fall Time
Object	+28V11A

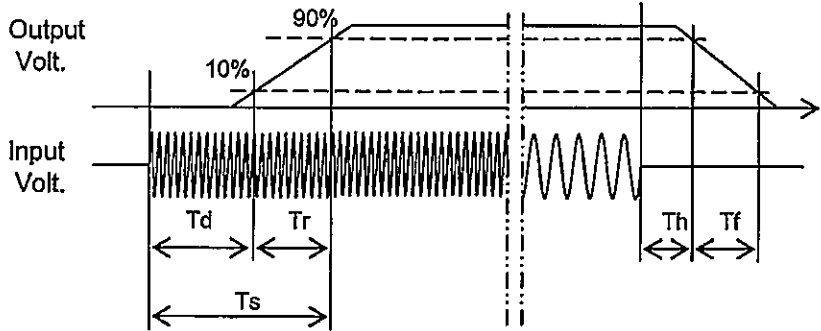
Temperature 25°C
Testing Circuitry Figure A

1.Graph



2.Values

		[ms]				
Input Volt.	Time	Td	Tr	Ts	Th	Tf
100 V		465.0	15.0	480.0	50.2	19.9
200 V		445.0	16.0	461.0	50.1	19.9



Model		TUNS300F28	
Item		Hold-Up Time	
Object		+28V11A	

1.Graph

□

Load 50%

△

Load 100%

Hold-Up Time [ms]

1000

100

10

1

50

100

150

200

250

300

Input Voltage [V]

This duration covers from Shut-off of input voltage to the moment when output voltage descends to the rated range of voltage accuracy.

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

Input Voltage [V]	Hold-Up Time [ms]	
	Load 50%	Load 100%
80	84	41
85	84	41
100	84	41
120	84	41
200	84	41
230	84	41
264	84	41
280	90	41
--	-	-

2.Values

Model	TUNS300F28																																																					
Item	Instantaneous Interruption Compensation	Temperature	25°C																																																			
Object	+28V11A	Testing Circuitry	Figure A																																																			
1.Graph		2.Values																																																				
<div><div><div>—△—</div><div>Input Volt. 100V</div></div><div><div>---□---</div><div>Input Volt. 200V</div></div><div><div>---○---</div><div>Input Volt. 230V</div></div></div> <p>Instantaneous Compensation Time [ms]</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">Time [ms]</th></tr><tr><th>Input Volt. 100[V]</th><th>Input Volt. 200[V]</th><th>Input Volt. 230[V]</th></tr><tr><td>0.0</td><td>-</td><td>-</td><td>-</td></tr><tr><td>2.2</td><td>206</td><td>206</td><td>206</td></tr><tr><td>4.4</td><td>105</td><td>105</td><td>105</td></tr><tr><td>6.6</td><td>70</td><td>70</td><td>70</td></tr><tr><td>8.8</td><td>52</td><td>52</td><td>52</td></tr><tr><td>11.0</td><td>41</td><td>41</td><td>41</td></tr><tr><td>12.1</td><td>37</td><td>37</td><td>37</td></tr><tr><td>--</td><td>-</td><td>-</td><td>-</td></tr><tr><td>--</td><td>-</td><td>-</td><td>-</td></tr><tr><td>--</td><td>-</td><td>-</td><td>-</td></tr><tr><td>--</td><td>-</td><td>-</td><td>-</td></tr></table>		Load Current [A]	Time [ms]			Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]	0.0	-	-	-	2.2	206	206	206	4.4	105	105	105	6.6	70	70	70	8.8	52	52	52	11.0	41	41	41	12.1	37	37	37	--	-	-	-	--	-	-	-	--	-	-	-	--	-	-	-
Load Current [A]	Time [ms]																																																					
	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]																																																			
0.0	-	-	-																																																			
2.2	206	206	206																																																			
4.4	105	105	105																																																			
6.6	70	70	70																																																			
8.8	52	52	52																																																			
11.0	41	41	41																																																			
12.1	37	37	37																																																			
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Model	TUNS300F28	
Item	Minimum Input Voltage for Regulated Output Voltage	Testing Circuitry Figure A
Object	+28V11A	

1.Graph

---□--- Load 50%
 ---△--- Load 100%

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

2.Values

Ambient Temperature [°C]	Input Voltage [V]	
	Load 50%	Load 100%
-50	72	71
-40	71	71
-20	71	72
0	71	72
25	72	72
50	72	72
75	72	73
85	72	72
100	72	72
105	72	73
--	-	-

Model

TUNS300F28

Item

Overcurrent Protection

Object

+28V11A

Temperature

25°C

Testing Circuitry

Figure A

1.Graph

— Input Volt. 100V

— Input Volt. 230V

Output Voltage [V]

Load Current [A]

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

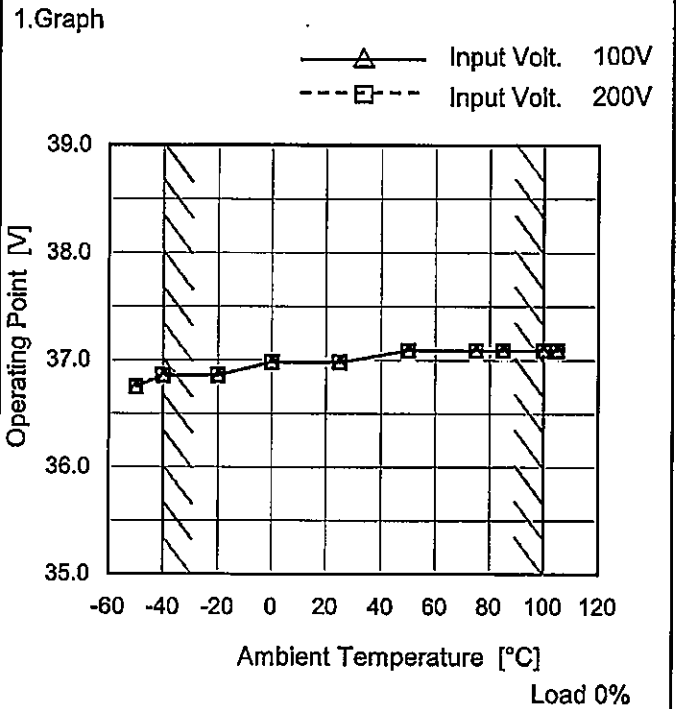
Intermittent operation occurs when the output voltage is from 14V to 0V.

2.Values

Output Voltage [V]	Load Current [A]	
	Input Volt. 100[V]	Input Volt. 230[V]
28.0	11.06	11.07
26.6	15.05	15.05
25.2	15.38	15.35
22.4	16.03	16.01
19.6	16.47	16.54
16.8	17.15	17.22
14.0	17.62	17.70
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--	-	-
--	-	-
--	-	-
--	-	-

Model	TUNS300F28
Item	Overvoltage Protection
Object	+28V11A

Testing Circuitry Figure A



2.Values

Ambient Temperature [°C]	Operating Point [V]	
	Input Volt. 100[V]	Input Volt. 200[V]
-50	36.75	36.75
-40	36.86	36.86
-20	36.86	36.86
0	36.98	36.98
25	36.98	36.98
50	37.09	37.09
75	37.09	37.09
85	37.09	37.09
100	37.09	37.09
105	37.09	37.09
--	-	-

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

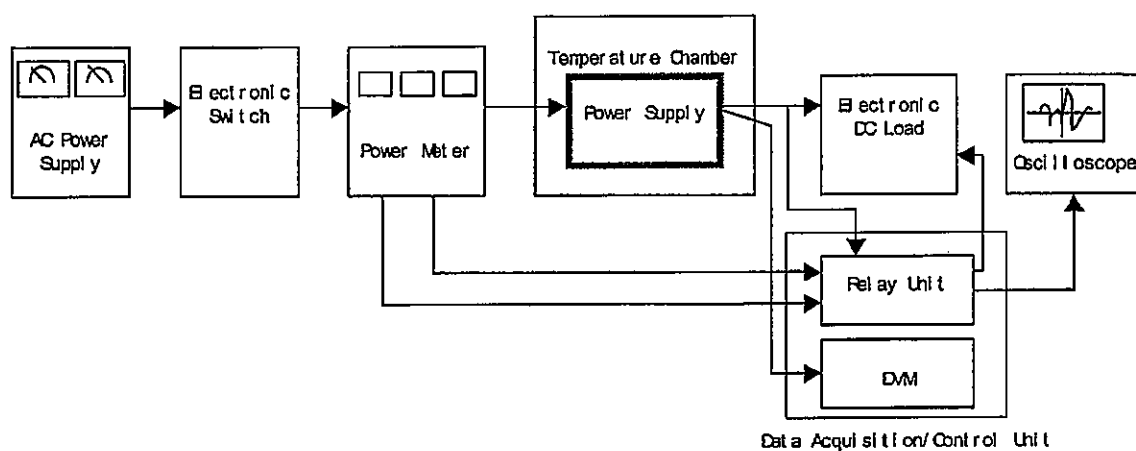


Figure A

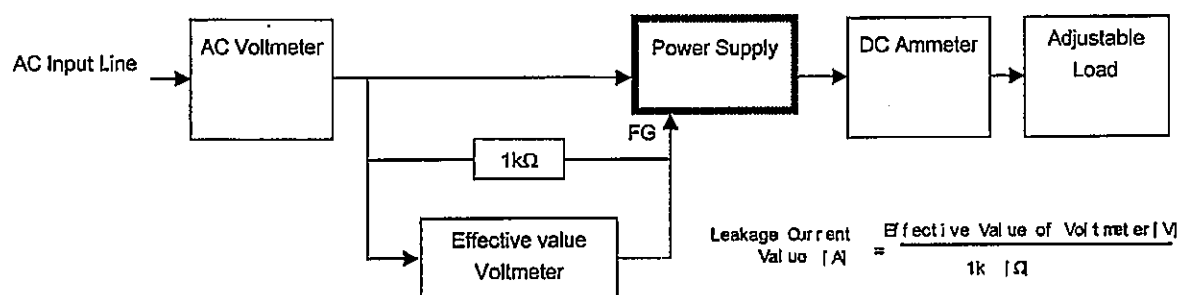


Figure B (DEN-AN)

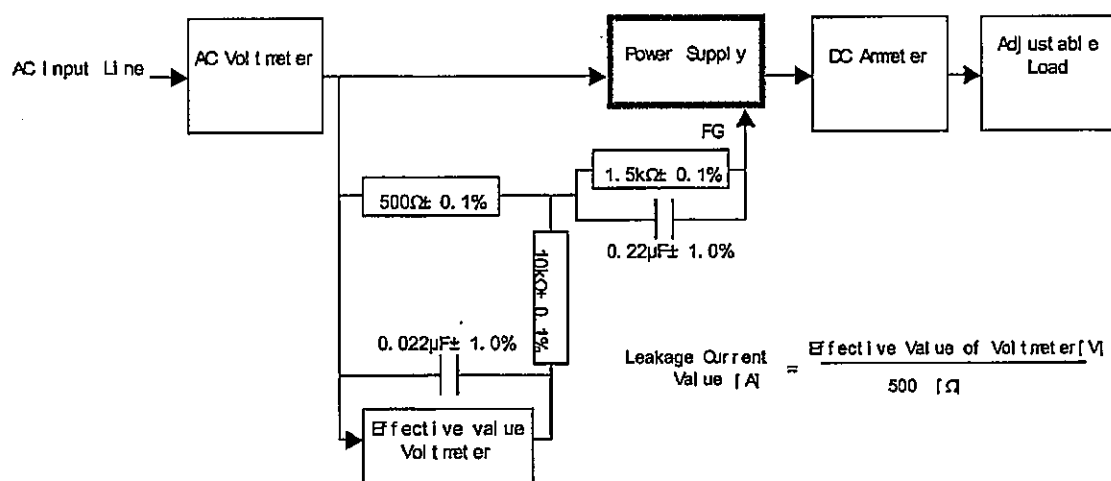
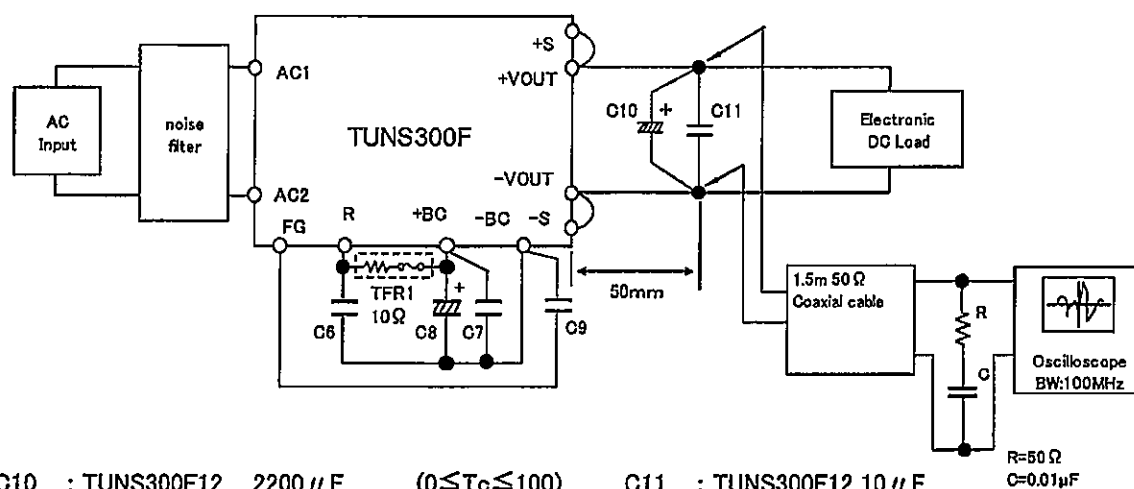


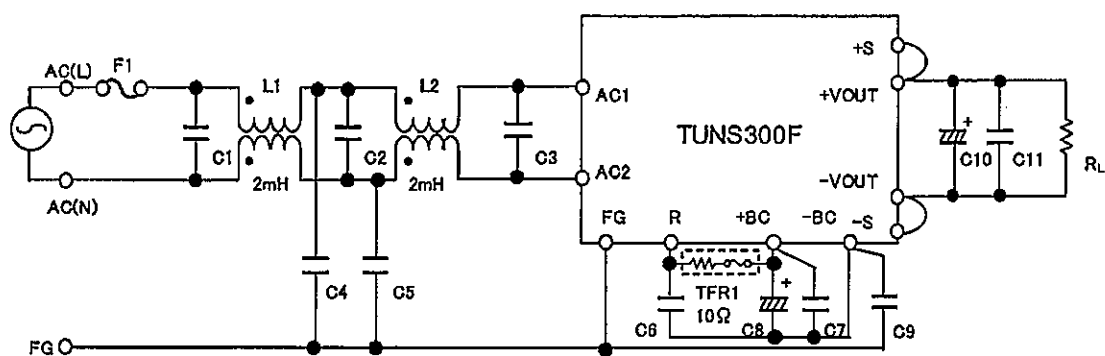
Figure B (IEC60950-1)



C10	: TUNS300F12	2200 μF	($0 \leq T_c \leq 100$)	C11	: TUNS300F12	10 μF
		2200 $\mu F \times 3$	($-40 \leq T_c < 0$)		TUNS300F28	4.7 μF
	TUNS300F28	1000 μF	($0 \leq T_c \leq 100$)		TUNS300F48	2.2 μF
		1000 $\mu F \times 3$	($-40 \leq T_c < 0$)			
	TUNS300F48	470 μF	($0 \leq T_c \leq 100$)			
		470 $\mu F \times 3$	($-40 \leq T_c < 0$)			

T_c:Base Plate Temp.

Figure C



L1,L2	: SC-15-200(NEC TOKIN)	C11	: TUNS300F12 10 μ F Ceramic Capacitor
C1,C2	: 0.68 μ F 310V Film Capacitor \times 2		TUNS300F28 4.7 μ F Ceramic Capacitor
C3	: 1.0 μ F 310V Film Capacitor \times 2		TUNS300F48 2.2 μ F Ceramic Capacitor
C4,C5,C9	: 2200pF Ceramic Capacitor		
C6,C7	: 0.68 μ F 450V Film Capacitor \times 2		
C8	: 470 μ F 450V Electrolytic Capacitor		
C10	: TUNS300F12 2200 μ F 25V Electrolytic Capacitor		
	TUNS300F28 1000 μ F 50V Electrolytic Capacitor		
	TUNS300F48 470 μ F 63V Electrolytic Capacitor		

Figure D