

TEST DATA OF TUNS50F24

Regulated DC Power Supply
April 6, 2012

Approved by : Takayuki Fukuda
Takayuki Fukuda Design Manager

Prepared by : Ryosuke Nakao
Ryosuke Nakao Design Engineer

COSEL CO.,LTD.

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COSEL

Model

TUNS50F24

Item

Input Current (by Load Current)

Object

1.Graph

—△—

Input Volt.

100V

---□---

Input Volt.

200V

- - -○- -

Input Volt.

230V

1.0

0.8

0.6

0.4

0.2

0.0

Input Current [A]

0.0

0.5

1.0

1.5

2.0

2.5

Load Current [A]

</

Model		TUNS50F24		Temperature Testing Circuitry	25°C Figure A																																																			
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>1.60</td><td>1.46</td><td>1.43</td></tr><tr><td>0.4</td><td>12.84</td><td>12.99</td><td>12.97</td></tr><tr><td>0.8</td><td>24.17</td><td>24.14</td><td>24.23</td></tr><tr><td>1.2</td><td>35.54</td><td>35.22</td><td>35.27</td></tr><tr><td>1.6</td><td>46.94</td><td>46.26</td><td>46.24</td></tr><tr><td>2.0</td><td>54.83</td><td>53.92</td><td>53.91</td></tr><tr><td>2.1</td><td>58.66</td><td>57.51</td><td>57.45</td></tr><tr><td>2.3</td><td>64.42</td><td>63.06</td><td>62.95</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	1.60	1.46	1.43	0.4	12.84	12.99	12.97	0.8	24.17	24.14	24.23	1.2	35.54	35.22	35.27	1.6	46.94	46.26	46.24	2.0	54.83	53.92	53.91	2.1	58.66	57.51	57.45	2.3	64.42	63.06	62.95	--	-	-	-	--	-	-	-	--	-	-	-
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2

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BC-10664

Model		TUNS50F24	
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>Load 50%</div></div><div><div>---</div><div>△</div><div>---</div></div><div>Load 100%</div></div> <div><div><div>Efficiency 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COSEL

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2.1	84.6	86.3	86.4																																																			
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--	-	-	-																																																			
--	-	-	-																																																			
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-4-

BC-10664

COSEL

Model

TUNS50F24

Item

Power Factor (by Input Voltage)

Object

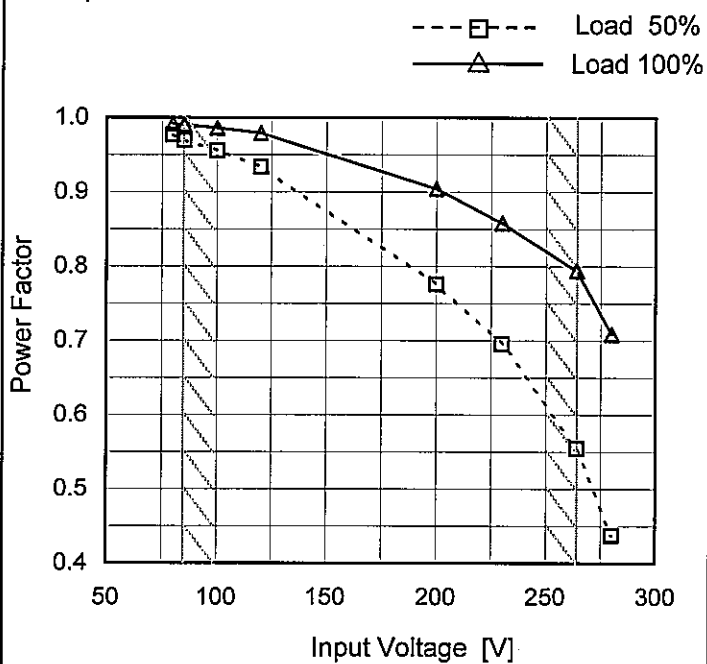
Temperature

25°C

Testing Circuitry

Figure A

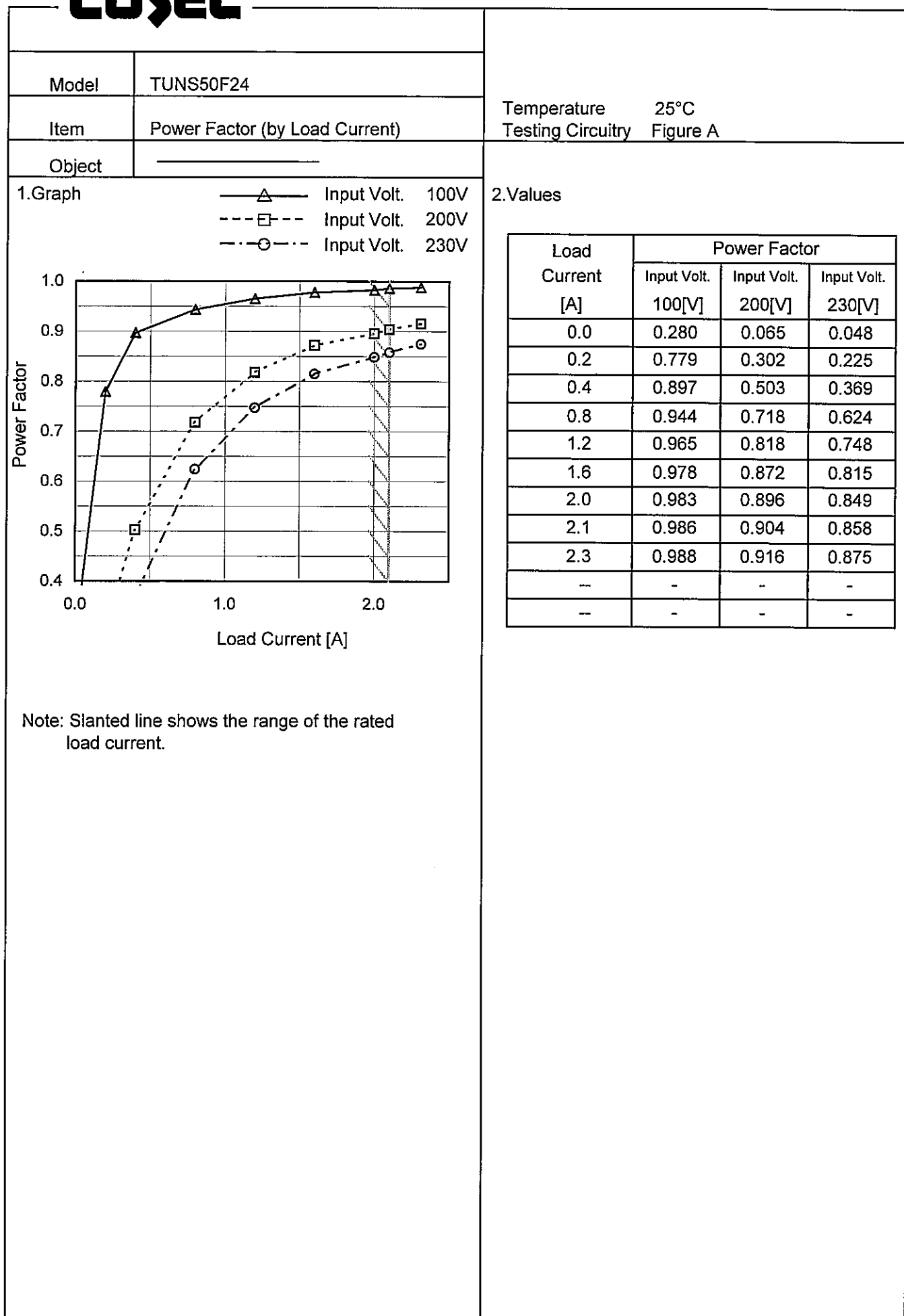
1. Graph



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

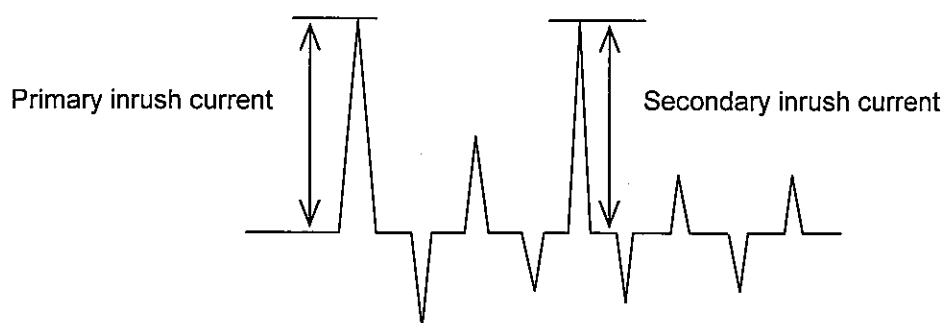
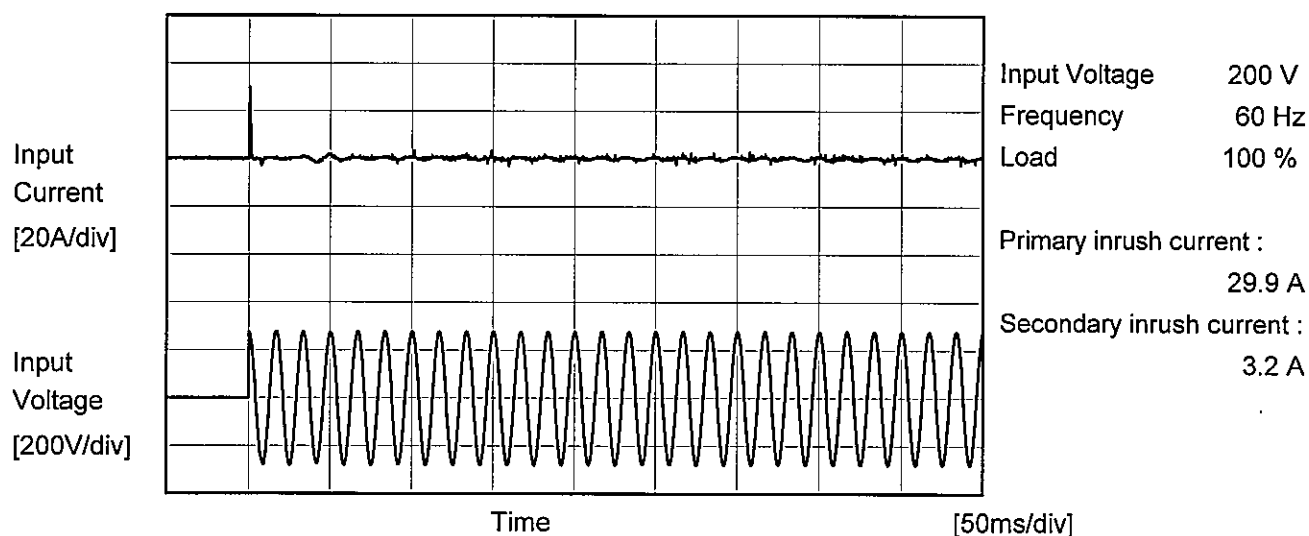
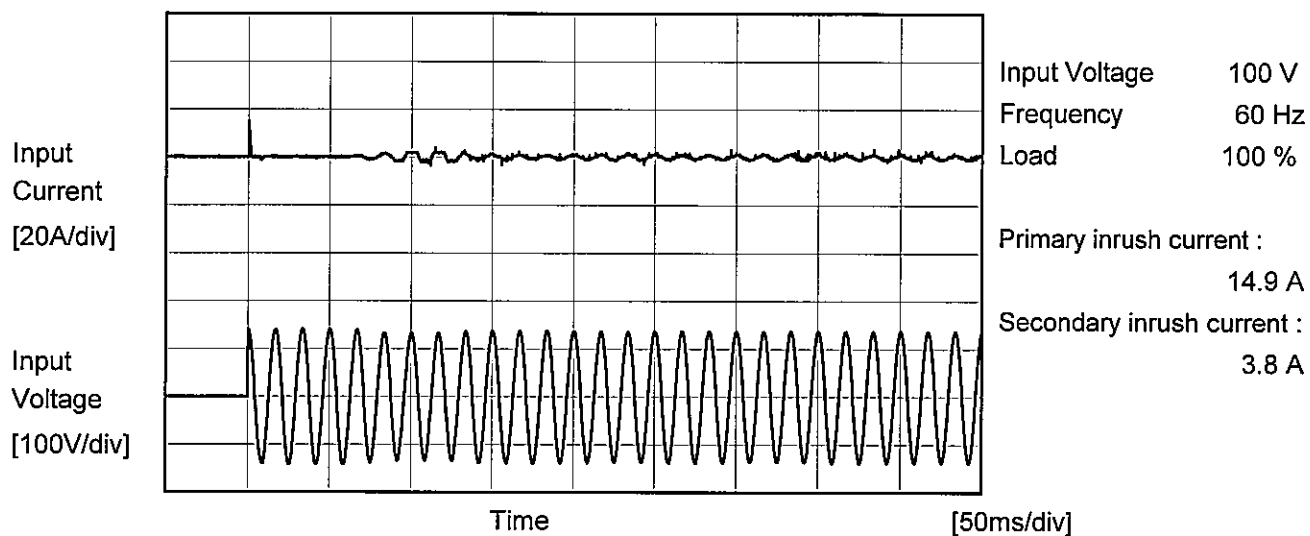
2. Values

Input Voltage [V]	Power Factor	
	Load 50%	Load 100%
80	0.977	0.992
85	0.969	0.990
100	0.956	0.986
120	0.934	0.980
200	0.776	0.904
230	0.696	0.858
264	0.555	0.794
280	0.437	0.708
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Model	TUNS50F24	Temperature	25°C
Item	Inrush Current	Testing Circuitry	Figure A
Object			



		Temperature 25°C Testing Circuitry Figure B
Model	TUNS50F24	
Item	Leakage Current	
Object	_____	

1.Results

[mA]

Standards		Input Volt.			Note
		100 [V]	200 [V]	264 [V]	
IEC60950-1	Both phases	0.16	0.38	0.48	Operation
	One of phases	0.21	0.46	0.63	Stand by

The value for "One of phases" 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	TUNS50F24																																
Item	Line Regulation	Temperature	25°C																														
		Testing Circuitry	Figure A																														
Object	+24V2.1A																																
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>Input Voltage [V]</th><th>Output Voltage [V] Load 50%</th><th>Output Voltage [V] Load 100%</th></tr></thead><tbody><tr><td>80</td><td>24.092</td><td>24.091</td></tr><tr><td>85</td><td>24.092</td><td>24.091</td></tr><tr><td>100</td><td>24.092</td><td>24.091</td></tr><tr><td>120</td><td>24.092</td><td>24.091</td></tr><tr><td>200</td><td>24.092</td><td>24.091</td></tr><tr><td>230</td><td>24.092</td><td>24.091</td></tr><tr><td>264</td><td>24.093</td><td>24.092</td></tr><tr><td>280</td><td>24.092</td><td>24.091</td></tr><tr><td>--</td><td>-</td><td>-</td></tr></tbody></table>		Input Voltage [V]	Output Voltage [V] Load 50%	Output Voltage [V] Load 100%	80	24.092	24.091	85	24.092	24.091	100	24.092	24.091	120	24.092	24.091	200	24.092	24.091	230	24.092	24.091	264	24.093	24.092	280	24.092	24.091	--	-	-		
Input Voltage [V]	Output Voltage [V] Load 50%	Output Voltage [V] Load 100%																															
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100	24.092	24.091																															
120	24.092	24.091																															
200	24.092	24.091																															
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264	24.093	24.092																															
280	24.092	24.091																															
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Note: Slanted line shows the range of the rated input voltage.																																	

COSEL

Model		TUNS50F24		Temperature 25°C																																																				
Item		Load Regulation		Testing Circuitry Figure A																																																				
Object		+24V2.1A																																																						
1.Graph		<div><div>—△—</div>Input Volt. 100V</div> <div><div>---□---</div>Input Volt. 200V</div> <div><div>-·-○-·-</div>Input Volt. 230V</div>		2.Values																																																				
<div><div>Output Voltage [V]</div><div>Load Current [A]</div></div>		<table><tr><th rowspan="2">Load Current [A]</th><th colspan="3">Output Voltage [V]</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>24.092</td><td>24.093</td><td>24.094</td></tr><tr><td>0.4</td><td>24.092</td><td>24.092</td><td>24.093</td></tr><tr><td>0.8</td><td>24.092</td><td>24.092</td><td>24.093</td></tr><tr><td>1.2</td><td>24.092</td><td>24.092</td><td>24.093</td></tr><tr><td>1.6</td><td>24.092</td><td>24.092</td><td>24.092</td></tr><tr><td>2.0</td><td>24.091</td><td>24.091</td><td>24.091</td></tr><tr><td>2.1</td><td>24.091</td><td>24.091</td><td>24.091</td></tr><tr><td>2.3</td><td>24.091</td><td>24.091</td><td>24.091</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. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]	0.0	24.092	24.093	24.094	0.4	24.092	24.092	24.093	0.8	24.092	24.092	24.093	1.2	24.092	24.092	24.093	1.6	24.092	24.092	24.092	2.0	24.091	24.091	24.091	2.1	24.091	24.091	24.091	2.3	24.091	24.091	24.091	--	-	-	-	--	-	-	-	--	-	-	-		
Load Current [A]	Output Voltage [V]																																																							
	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]																																																					
0.0	24.092	24.093	24.094																																																					
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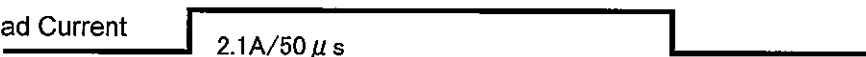
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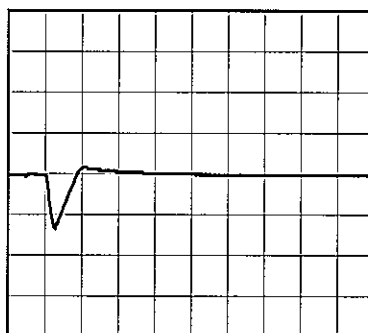
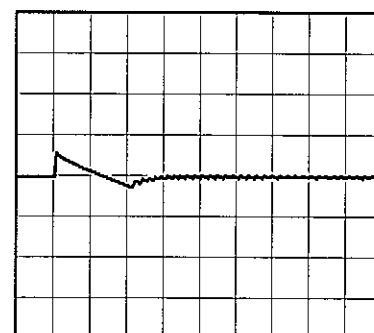
Model	TUNS50F24	Temperature 25°C Testing Circuitry Figure A
Item	Dynamic Load Response	
Object	+24V2.1A	

Input Volt. 100 V
Cycle 1000 mS

Load Current  2.1A/50 μ s

Min. Load (0A) \longleftrightarrow
Load 100% (2.1A)

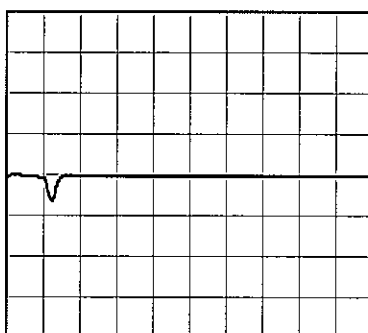
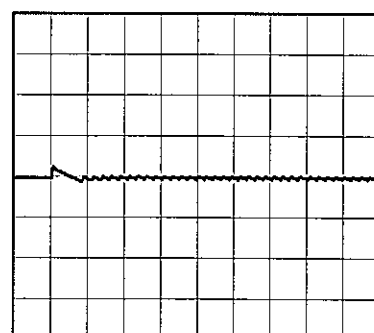
500mV/div

500 μ s/div

2ms/div

Min. Load (0A) \longleftrightarrow
Load 50% (1.05A)

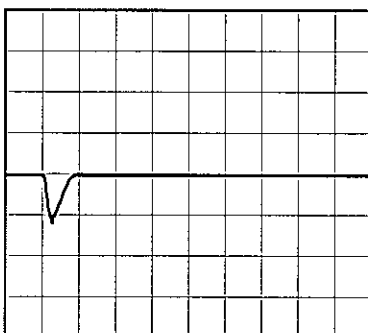
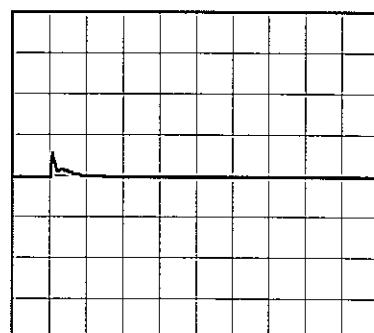
500mV/div

500 μ s/div

2ms/div

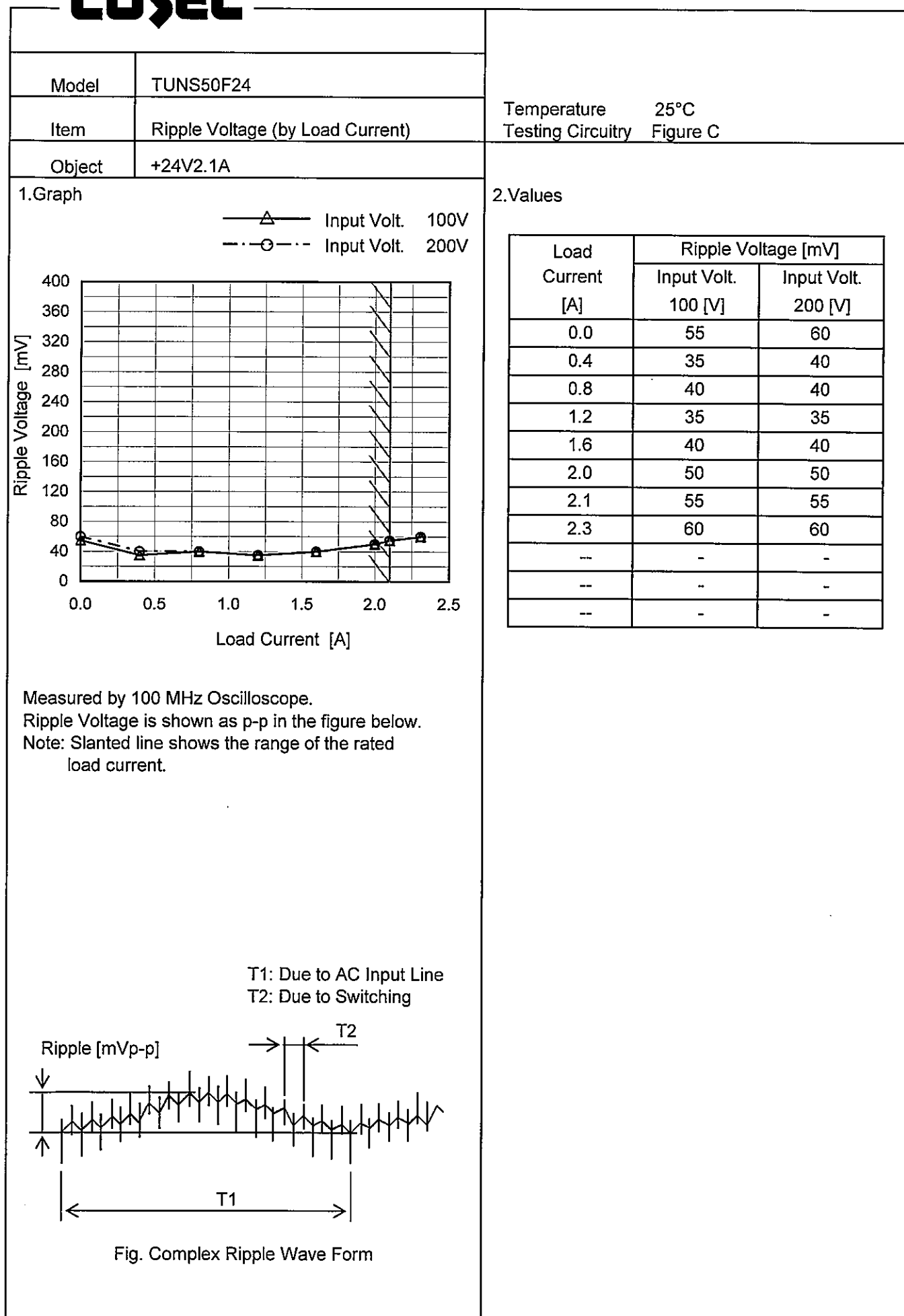
Load 10% (0.21A) \longleftrightarrow
Load 100% (2.1A)

500mV/div

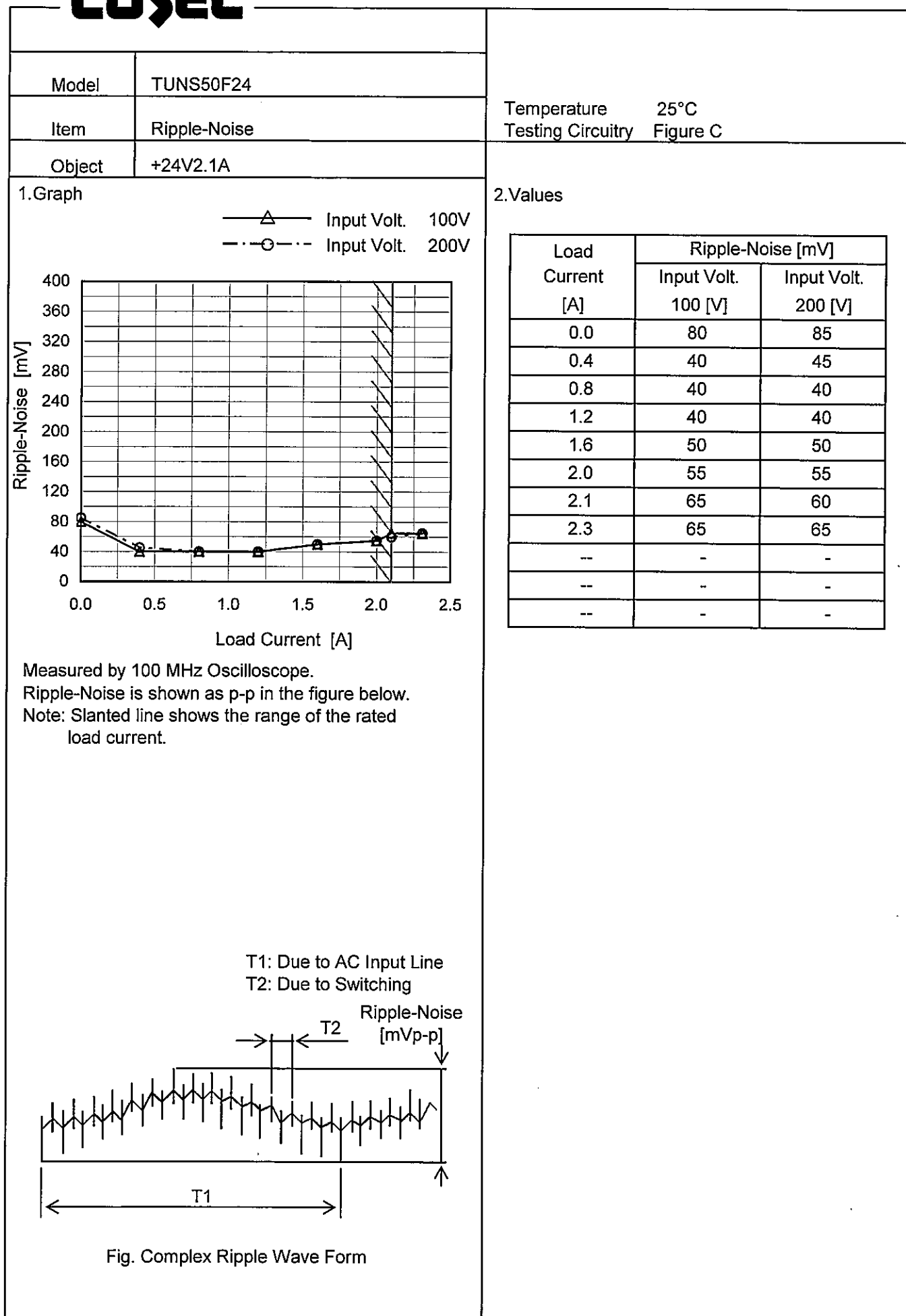
500 μ s/div

2ms/div

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Model		TUNS50F24	
Item		Ripple Voltage (by Ambient Temp.)	
Object		+24V2.1A	
1.Graph		2.Values	

□

Input Volt. 100V

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Input Volt. 200V

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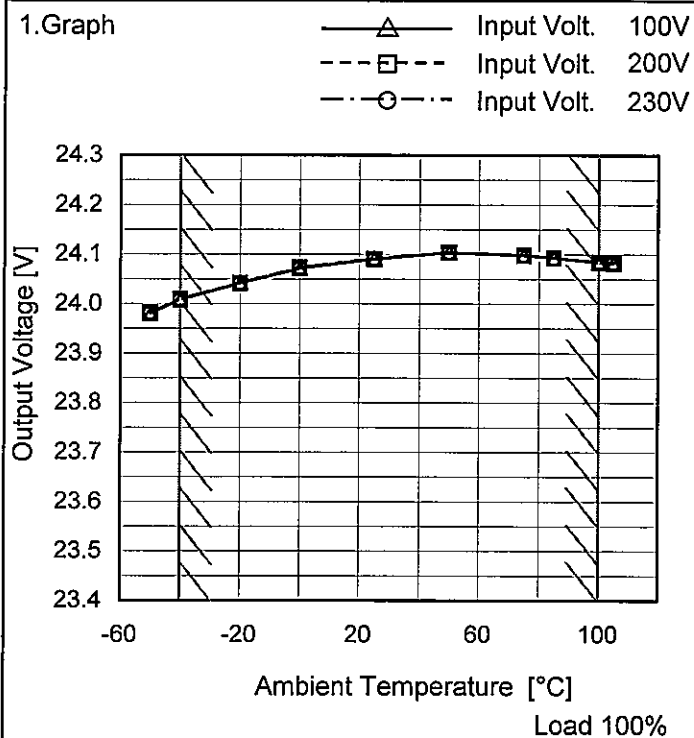
Model TUNS50F24

Item Ambient Temperature Drift

Object +24V2.1A

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. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]
-50	23.981	23.982	23.982
-40	24.009	24.009	24.009
-20	24.041	24.041	24.042
0	24.072	24.073	24.072
25	24.091	24.091	24.091
50	24.104	24.104	24.104
75	24.098	24.098	24.098
85	24.093	24.093	24.093
100	24.085	24.085	24.084
105	24.083	24.083	24.083
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		Testing Circuitry Figure A
Model	TUNS50F24	
Item	Output Voltage Accuracy	
Object	+24V2.1A	

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 - 2.1A

* 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	50	200	0	24.108	±50	±0.2
Minimum Voltage	-40	264	0	24.008		

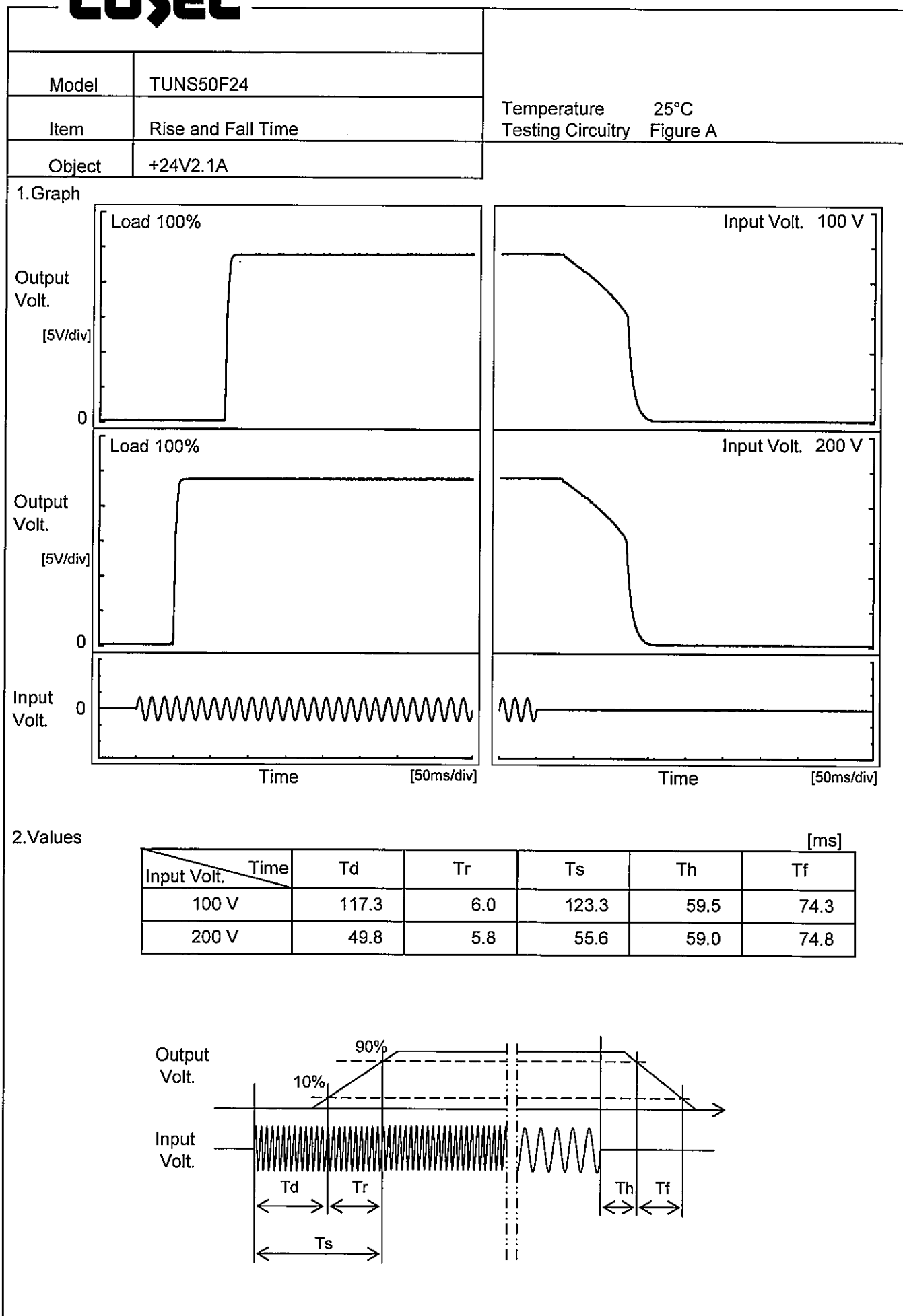
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Model	TUNS50F24																								
Item	Time Lapse Drift	Temperature	25°C																						
Object	+24V2.1A	Testing Circuitry	Figure A																						
1.Graph		2.Values																							
<div><div><div>24.3</div><div>24.2</div><div>24.1</div><div>24.0</div><div>23.9</div><div>23.8</div><div>23.7</div><div>23.6</div><div>23.5</div><div>23.4</div></div><div><div>0.0</div><div>2.0</div><div>4.0</div><div>6.0</div><div>8.0</div><div>10.0</div></div><div><div>Output Voltage [V]</div><div>Time [H]</div></div><div><div>Input Volt.</div><div>100V</div></div><div><div>Load</div><div>100%</div></div></div>		<table><tr><th>Time since start [H]</th><th>Output Voltage [V]</th></tr><tr><td>0.0</td><td>24.089</td></tr><tr><td>0.5</td><td>24.094</td></tr><tr><td>1.0</td><td>24.093</td></tr><tr><td>2.0</td><td>24.093</td></tr><tr><td>3.0</td><td>24.093</td></tr><tr><td>4.0</td><td>24.093</td></tr><tr><td>5.0</td><td>24.093</td></tr><tr><td>6.0</td><td>24.093</td></tr><tr><td>7.0</td><td>24.093</td></tr><tr><td>8.0</td><td>24.093</td></tr></table>		Time since start [H]	Output Voltage [V]	0.0	24.089	0.5	24.094	1.0	24.093	2.0	24.093	3.0	24.093	4.0	24.093	5.0	24.093	6.0	24.093	7.0	24.093	8.0	24.093
Time since start [H]	Output Voltage [V]																								
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1.0	24.093																								
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4.0	24.093																								
5.0	24.093																								
6.0	24.093																								
7.0	24.093																								
8.0	24.093																								
* The characteristic of AC200V is equal.																									

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Model	TUNS50F24
Item	Hold-Up Time
Object	+24V2.1A

Temperature	25°C
Testing Circuitry	Figure A

1.Graph

The graph shows Hold-Up Time [ms] on a logarithmic y-axis (1 to 1000) versus Input Voltage [V] on a linear x-axis (50 to 300). Two data series are plotted: Load 50% (dashed line with square markers) and Load 100% (solid line with triangle markers). Both series show a constant hold-up time of approximately 177 ms for Load 50% and 34 ms for Load 100% across the input voltage range. A slanted line indicates the range of the rated input voltage.

Input Voltage [V]	Load 50% Hold-Up Time [ms]	Load 100% Hold-Up Time [ms]
80	177	34
85	177	34
100	177	34
120	177	34
200	177	34
230	177	34
264	177	34
280	177	34

2.Values

Input Voltage [V]	Hold-Up Time [ms]	
	Load 50%	Load 100%
80	177	34
85	177	34
100	177	34
120	177	34
200	177	34
230	177	34
264	177	34
280	177	34
--	-	-

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.

Model		TUNS50F24		Temperature 25°C Testing Circuitry Figure A																																																			
Item		Instantaneous Interruption Compensation																																																					
Object		+24V2.1A																																																					
1.Graph																																																							
		<div><div>—△—</div>Input Volt. 100V</div> <div><div>---□---</div>Input Volt. 200V</div> <div><div>-·-○-·-</div>Input Volt. 230V</div>																																																					
<div><div>Instantaneous Compensation Time [ms]</div><div><table><thead><tr><th>Load Current [A]</th><th>100V [ms]</th><th>200V [ms]</th><th>230V [ms]</th></tr></thead><tbody><tr><td>0.0</td><td>-</td><td>-</td><td>-</td></tr><tr><td>0.4</td><td>447</td><td>443</td><td>443</td></tr><tr><td>0.8</td><td>230</td><td>232</td><td>228</td></tr><tr><td>1.2</td><td>128</td><td>150</td><td>150</td></tr><tr><td>1.6</td><td>89</td><td>89</td><td>89</td></tr><tr><td>2.0</td><td>38</td><td>39</td><td>44</td></tr><tr><td>2.1</td><td>35</td><td>35</td><td>35</td></tr><tr><td>2.3</td><td>30</td><td>31</td><td>31</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></tbody></table><div>Load Current [A]</div></div></div>					Load Current [A]	100V [ms]	200V [ms]	230V [ms]	0.0	-	-	-	0.4	447	443	443	0.8	230	232	228	1.2	128	150	150	1.6	89	89	89	2.0	38	39	44	2.1	35	35	35	2.3	30	31	31	--	-	-	-	--	-	-	-	--	-	-	-			
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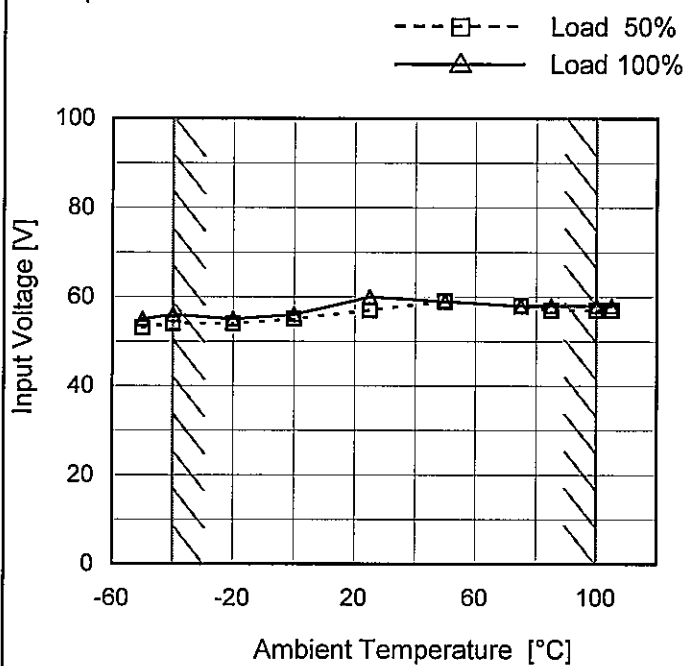
Model TUNS50F24

Item Minimum Input Voltage
for Regulated Output Voltage

Object +24V2.1A

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%
-50	53	55
-40	54	56
-20	54	55
0	55	56
25	57	60
50	59	59
75	58	58
85	57	58
100	57	58
105	57	58
--	-	-

Model

TUNS50F24

Item

Overcurrent Protection

Object

+24V2.1A

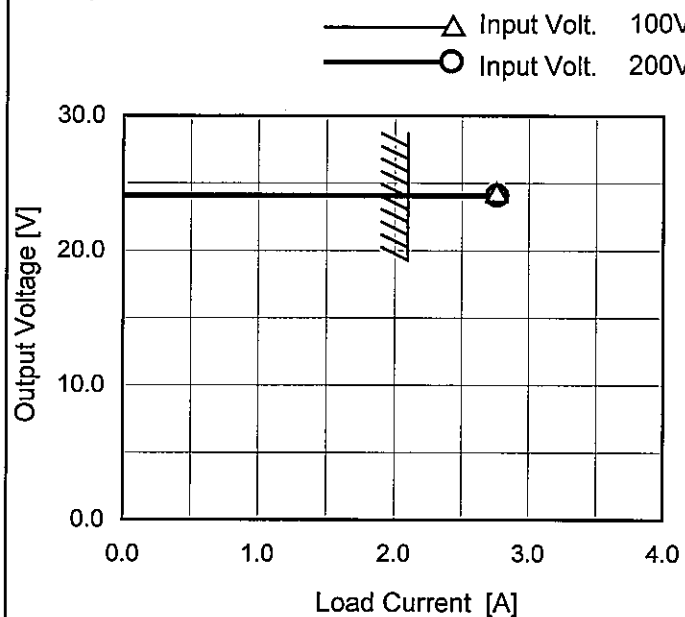
Temperature

25°C

Testing Circuitry

Figure A

1. Graph



2. Values

Output Voltage [V]	Load Current [A]	
	Input Volt. 100[V]	Input Volt. 200[V]
24.0	2.71	2.71
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-

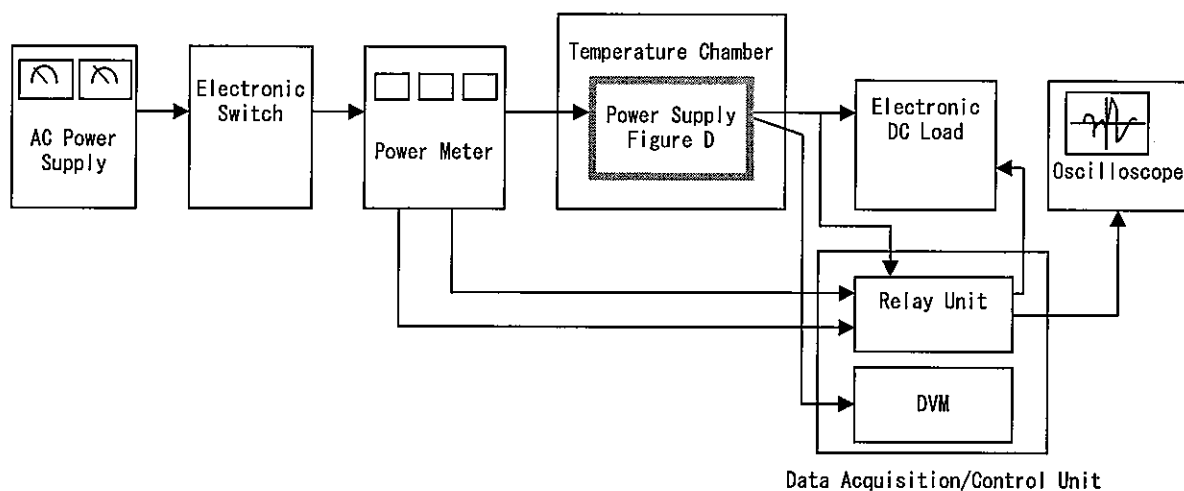


Figure A

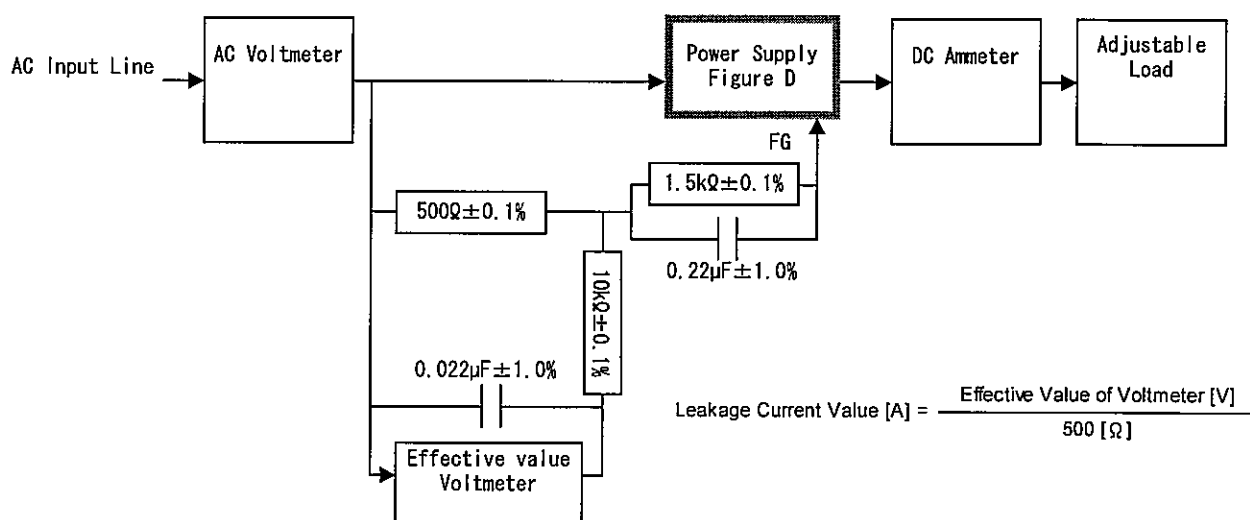


Figure B (IEC60950-1)

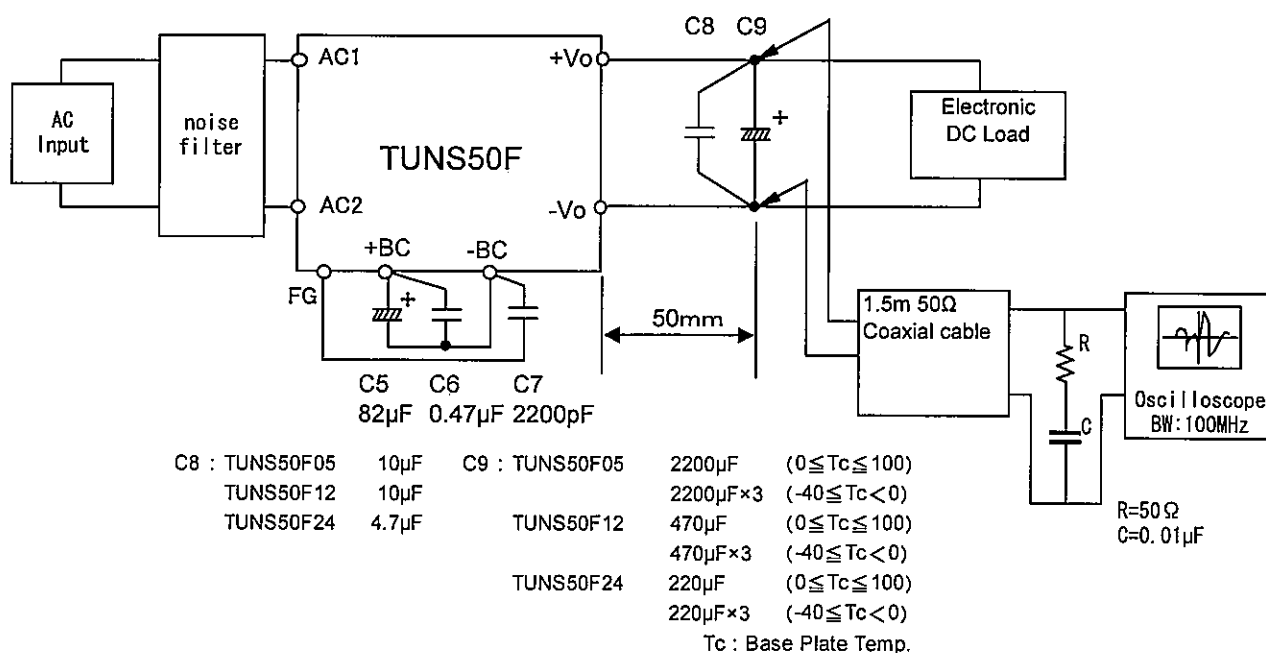
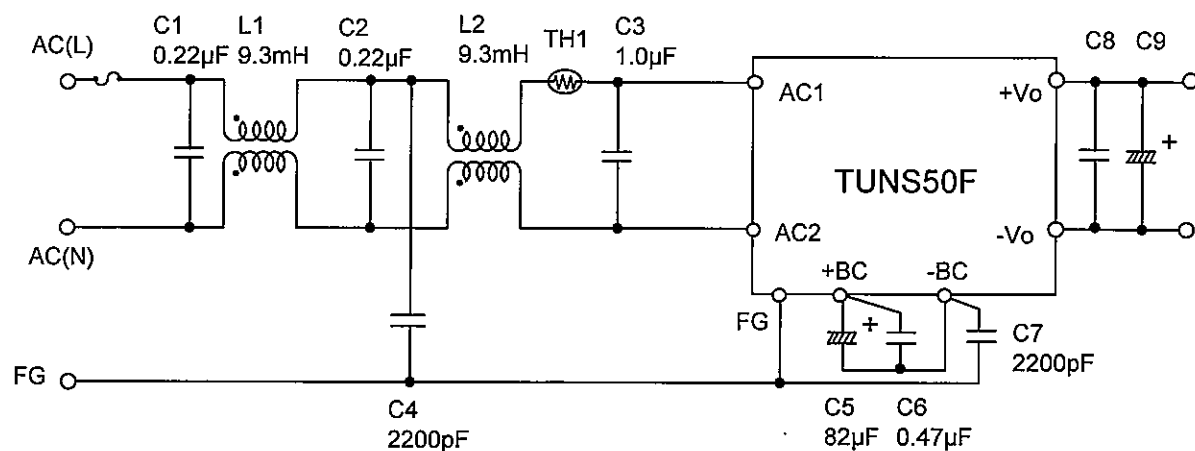


Figure C

COSEL



L1,L2 : SS11VL-R10093(NEC TOKIN)	C9 : TUNS50F05	2200μF	(0≤Tc≤100)
TH1 : 5D2-08(SEMITEC)		2200μF×3	(-40≤Tc<0)
C8 : TUNS50F05	10μF	TUNS50F12	470μF (0≤Tc≤100)
TUNS50F12	10μF		470μF×3 (-40≤Tc<0)
TUNS50F24	4.7μF	TUNS50F24	220μF (0≤Tc≤100)
			220μF×3 (-40≤Tc<0)
Tc : Base Plate Temp.			

T_c : Base Plate Temp.

Figure D