



TEST DATA OF MODULE Q

(RB series)

Regulated DC Power Supply
November 5, 2018

Approved by : Jun Uchida
Jun Uchida Design Manager

Prepared by : Hideaki Douguchi
Hideaki Douguchi Design Engineer



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COSEL																																			
Model	MODULE Q	Temperature	25°C																																
Item	Line Regulation	Testing Circuitry	Figure A																																
Object	+15V0.7A																																		
<p>1.Graph</p> <p style="text-align: right;"> ---□--- Load 50% —△— Load 100% </p>		<p>2.Values</p> <table border="1"> <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>85</td><td>15.700</td><td>15.551</td></tr> <tr><td>90</td><td>15.700</td><td>15.551</td></tr> <tr><td>100</td><td>15.700</td><td>15.551</td></tr> <tr><td>120</td><td>15.700</td><td>15.551</td></tr> <tr><td>200</td><td>15.700</td><td>15.551</td></tr> <tr><td>230</td><td>15.700</td><td>15.551</td></tr> <tr><td>264</td><td>15.700</td><td>15.551</td></tr> <tr><td>280</td><td>15.700</td><td>15.551</td></tr> <tr><td>--</td><td>-</td><td>-</td></tr> </tbody> </table> <p style="text-align: center;">-15V: Rated Load Current</p>		Input Voltage [V]	Output Voltage [V]		Load 50%	Load 100%	85	15.700	15.551	90	15.700	15.551	100	15.700	15.551	120	15.700	15.551	200	15.700	15.551	230	15.700	15.551	264	15.700	15.551	280	15.700	15.551	--	-	-
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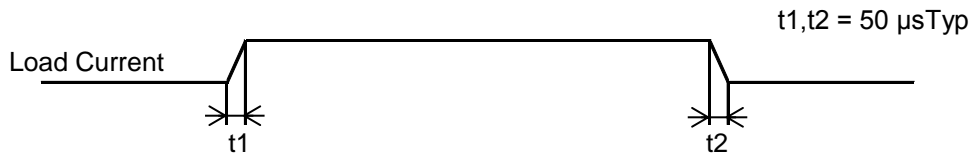


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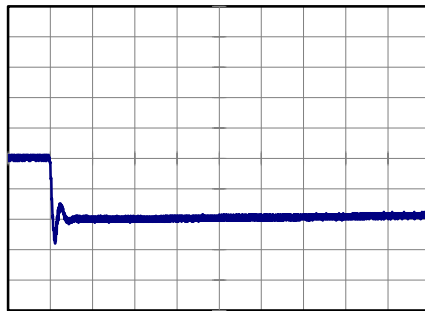
Model	MODULE Q	Temperature	25°C
Item	Dynamic Load Response	Testing Circuitry	Figure A
Object	+15V0.7A		

Input Volt. 100 V
 Other output current rated
 Cycle 1000 ms

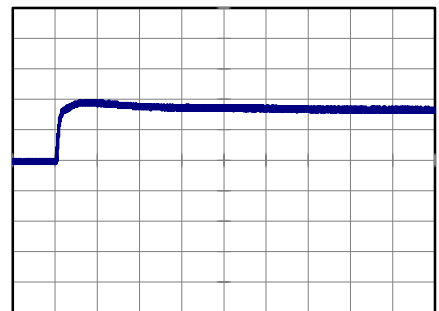


Min. Load (0A) ←→
 Load 100% (0.7A)

200 mV/div



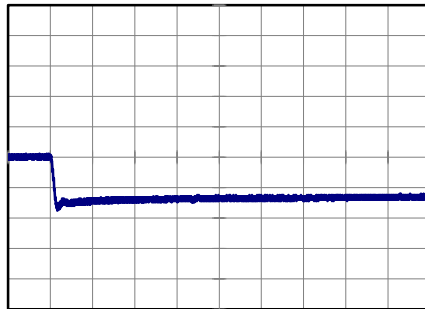
2 ms/div



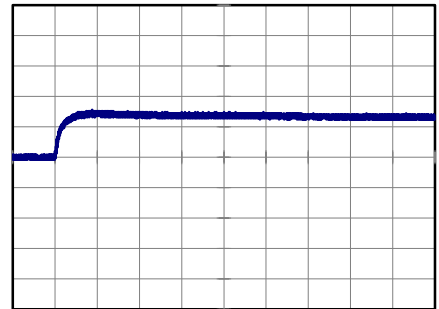
2 ms/div

Min. Load (0A) ←→
 Load 50% (0.35A)

200 mV/div



2 ms/div

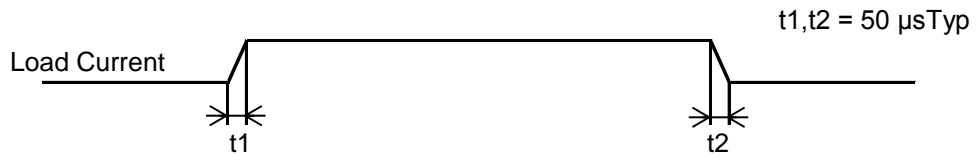


2 ms/div



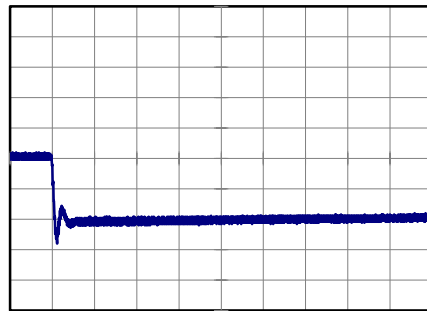
Model		MODULE Q	Temperature 25°C Testing Circuitry Figure A
Item		Dynamic Load Response	
Object		-15V0.7A	
Cycle		1000 ms	

Input Volt. 100 V
Other output current rated
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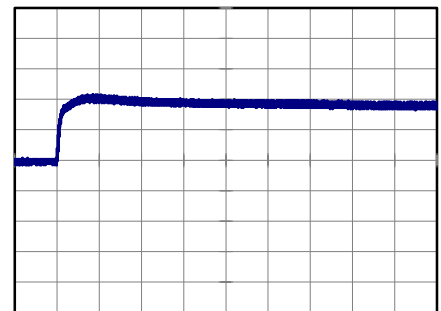


Min. Load (0A) ←→
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200 mV/div



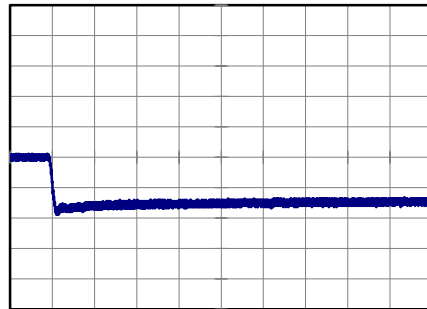
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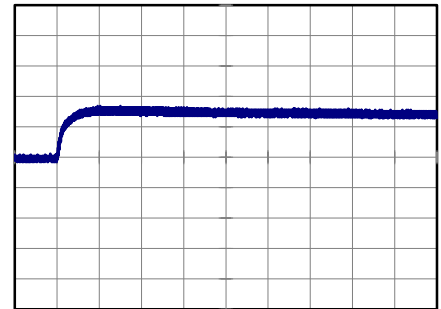
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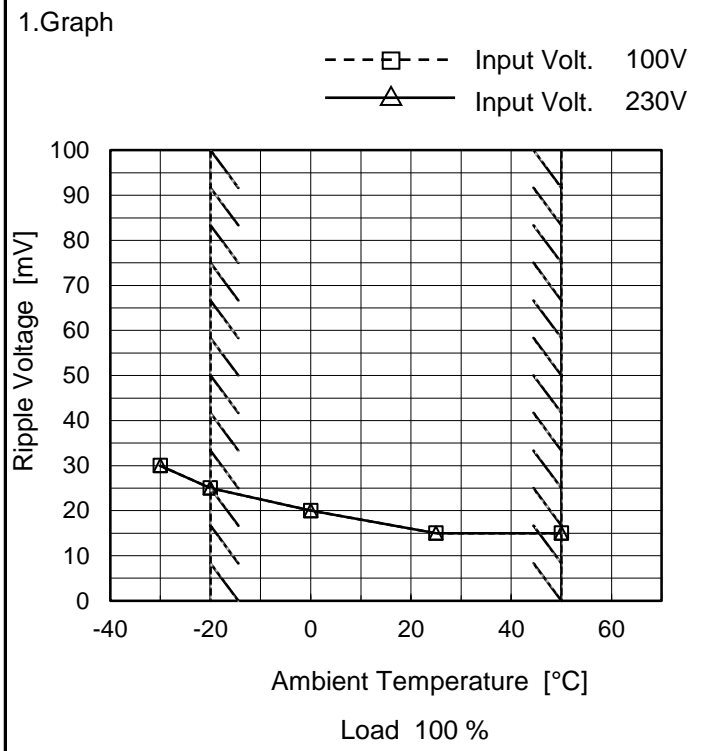


COSEL																																									
Model	MODULE Q	Temperature	25°C																																						
Item	Ripple-Noise	Testing Circuitry	Figure B																																						
Object	-15V0.7A																																								
<p>1.Graph</p> <div style="text-align: right;"> <p>—△— Input Volt. 100V</p> <p>-·-○-·- Input Volt. 230V</p> </div> <p style="text-align: center;">Load Current [A]</p>		<p>2.Values</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th rowspan="2">Load Current [A]</th> <th colspan="2">Ripple-Noise [mV]</th> </tr> <tr> <th>Input Volt. 100 [V]</th> <th>Input Volt. 230 [V]</th> </tr> </thead> <tbody> <tr><td>0.00</td><td>50</td><td>50</td></tr> <tr><td>0.10</td><td>50</td><td>50</td></tr> <tr><td>0.20</td><td>50</td><td>50</td></tr> <tr><td>0.30</td><td>50</td><td>50</td></tr> <tr><td>0.40</td><td>50</td><td>50</td></tr> <tr><td>0.50</td><td>55</td><td>50</td></tr> <tr><td>0.60</td><td>55</td><td>50</td></tr> <tr><td>0.70</td><td>60</td><td>50</td></tr> <tr><td>0.77</td><td>60</td><td>50</td></tr> <tr><td>--</td><td>-</td><td>-</td></tr> <tr><td>--</td><td>-</td><td>-</td></tr> </tbody> </table> <p style="text-align: center;">+15V: Rated Load Current</p>		Load Current [A]	Ripple-Noise [mV]		Input Volt. 100 [V]	Input Volt. 230 [V]	0.00	50	50	0.10	50	50	0.20	50	50	0.30	50	50	0.40	50	50	0.50	55	50	0.60	55	50	0.70	60	50	0.77	60	50	--	-	-	--	-	-
Load Current [A]	Ripple-Noise [mV]																																								
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<p>Measured by 20 MHz Oscilloscope. Ripple-Noise is shown as p-p in the figure below. Note: Slanted line shows the range of the rated load current.</p>																																									
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<p>Fig. Complex Ripple Wave Form</p>																																									



Model	MODULE Q
Item	Ripple Voltage (by Ambient Temp.)
Object	+15V0.7A

Testing Circuitry Figure B

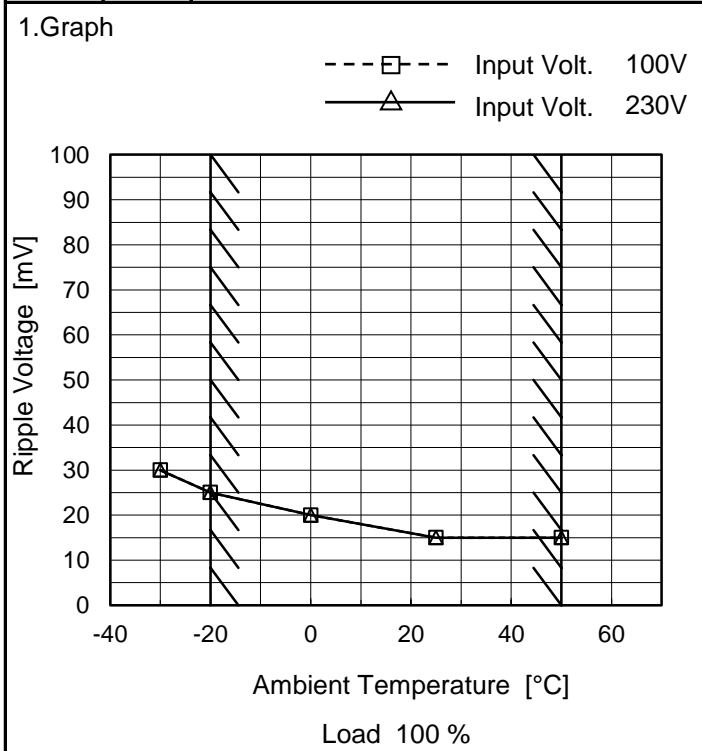


2.Values

Ambient Temperature [°C]	Ripple Voltage [mV]	
	Input Volt. 100 [V]	Input Volt. 230 [V]
-30	30	30
-20	25	25
0	20	20
25	15	15
50	15	15
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-

-15V: Rated Load Current

Object	-15V0.7A
--------	----------



2.Values

Ambient Temperature [°C]	Ripple Voltage [mV]	
	Input Volt. 100 [V]	Input Volt. 230 [V]
-30	30	30
-20	25	25
0	20	20
25	15	15
50	15	15
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-

+15V: Rated Load Current

Measured by 20 MHz Oscilloscope.
Note: Slanted line shows the range of the rated ambient temperature.



COSEL																																																						
Model	MODULE Q																																																					
Item	Ambient Temperature Drift	Testing Circuitry Figure A																																																				
Object	+15V0.7A																																																					
1.Graph	<p>—△— Input Volt. 100V</p> <p>---□--- Input Volt. 200V</p> <p>---○--- Input Volt. 230V</p> <p>Output Voltage [V]</p> <p>Ambient Temperature [°C]</p> <p>Load 100%</p>	2.Values	<table border="1"> <thead> <tr> <th rowspan="2">Ambient Temperature [°C]</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> </thead> <tbody> <tr><td>-30</td><td>15.522</td><td>15.522</td><td>15.522</td></tr> <tr><td>-20</td><td>15.528</td><td>15.528</td><td>15.528</td></tr> <tr><td>-10</td><td>15.535</td><td>15.535</td><td>15.535</td></tr> <tr><td>0</td><td>15.537</td><td>15.537</td><td>15.537</td></tr> <tr><td>10</td><td>15.541</td><td>15.541</td><td>15.541</td></tr> <tr><td>25</td><td>15.551</td><td>15.551</td><td>15.551</td></tr> <tr><td>30</td><td>15.548</td><td>15.548</td><td>15.548</td></tr> <tr><td>40</td><td>15.544</td><td>15.544</td><td>15.544</td></tr> <tr><td>50</td><td>15.540</td><td>15.540</td><td>15.540</td></tr> <tr><td>60</td><td>15.536</td><td>15.536</td><td>15.536</td></tr> <tr><td>--</td><td>-</td><td>-</td><td>-</td></tr> </tbody> </table> <p>-15V: Rated Load Current</p>	Ambient Temperature [°C]	Output Voltage [V]			Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]	-30	15.522	15.522	15.522	-20	15.528	15.528	15.528	-10	15.535	15.535	15.535	0	15.537	15.537	15.537	10	15.541	15.541	15.541	25	15.551	15.551	15.551	30	15.548	15.548	15.548	40	15.544	15.544	15.544	50	15.540	15.540	15.540	60	15.536	15.536	15.536	--	-	-	-
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<p>Note: Slanted line shows the range of the rated ambient temperature.</p>																																																						



COSEL		Testing Circuitry Figure A
Model	MODULE Q	
Item	Output Voltage Accuracy	

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 : -20 - 50°C

Input Voltage : 85 - 264V

Load Current (AVR 1) : 0 - 0.7A (AVR 2) : 0 - 0.7A

* 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

Object		+15V0.7A				
Item	Temperature [°C]	Input Voltage[V]	Output		Output Voltage Accuracy	
			Current[A]	Voltage[V]	Value [mV]	Ratio [%]
Maximum Voltage	50	200	0	15.991	±460	±3.1
Minimum Voltage	50	85	0.7	15.072		

Object		-15V0.7A				
Item	Temperature [°C]	Input Voltage[V]	Output		Output Voltage Accuracy	
			Current[A]	Voltage[V]	Value [mV]	Ratio [%]
Maximum Voltage	50	264	0	-15.997	±459	±3.1
Minimum Voltage	50	264	0.7	-15.079		



COSEL																									
Model	MODULE Q	Temperature	25°C																						
Item	Time Lapse Drift	Testing Circuitry	Figure A																						
Object	+15V0.7A																								
<p>1.Graph</p> <p style="text-align: center;">Time [H]</p> <p>Input Volt. 100V Load 100%</p>		<p>2.Values</p> <table border="1"> <thead> <tr> <th>Time since start [H]</th> <th>Output Voltage [V]</th> </tr> </thead> <tbody> <tr><td>0.0</td><td>15.545</td></tr> <tr><td>0.5</td><td>15.538</td></tr> <tr><td>1.0</td><td>15.536</td></tr> <tr><td>2.0</td><td>15.537</td></tr> <tr><td>3.0</td><td>15.537</td></tr> <tr><td>4.0</td><td>15.536</td></tr> <tr><td>5.0</td><td>15.535</td></tr> <tr><td>6.0</td><td>15.535</td></tr> <tr><td>7.0</td><td>15.535</td></tr> <tr><td>8.0</td><td>15.535</td></tr> </tbody> </table>		Time since start [H]	Output Voltage [V]	0.0	15.545	0.5	15.538	1.0	15.536	2.0	15.537	3.0	15.537	4.0	15.536	5.0	15.535	6.0	15.535	7.0	15.535	8.0	15.535
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<p>* The characteristic of AC230V is equal.</p>																									

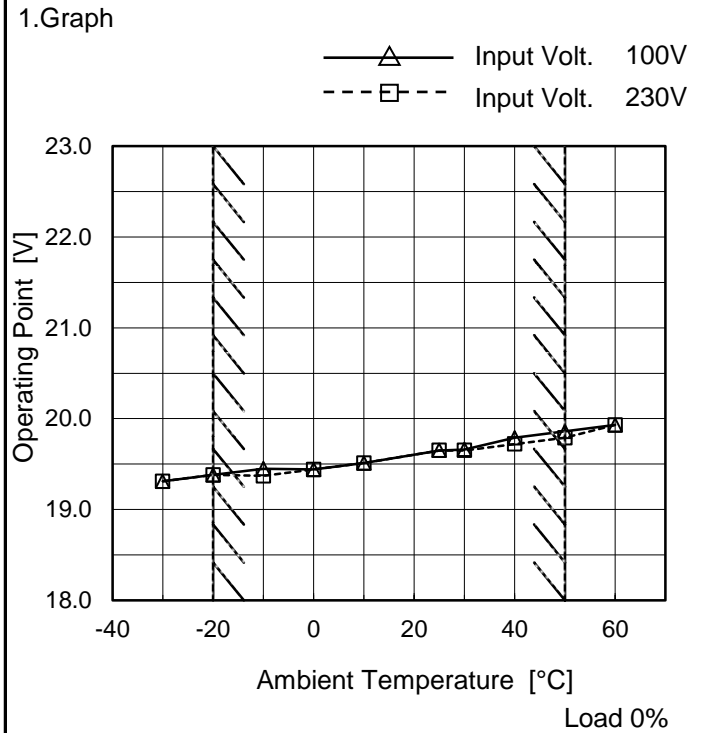


COSEL																																																																		
Model	MODULE Q	Temperature	25°C																																																															
Item	Overcurrent Protection	Testing Circuitry	Figure A																																																															
Object	+15V0.7A																																																																	
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Model	MODULE Q
Item	Oversvoltage Protection
Object	+15V0.7A

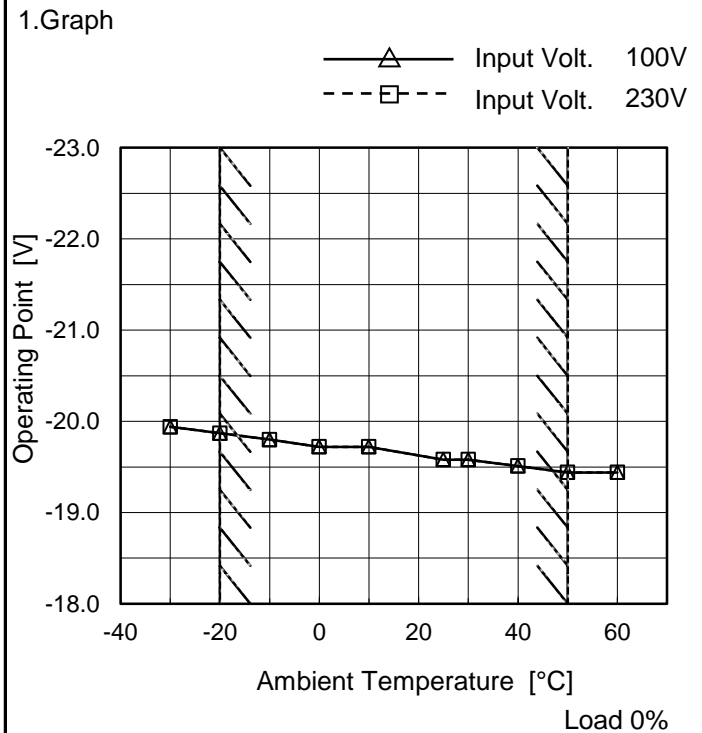
Testing Circuitry Figure A



2.Values

Ambient Temperature [°C]	Operating Point [V]	
	Input Volt. 100[V]	Input Volt. 230[V]
-30	19.31	19.31
-20	19.38	19.38
-10	19.45	19.37
0	19.44	19.44
10	19.51	19.51
25	19.65	19.65
30	19.66	19.65
40	19.79	19.72
50	19.86	19.79
60	19.93	19.93
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Object	-15V0.7A
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2.Values

Ambient Temperature [°C]	Operating Point [V]	
	Input Volt. 100[V]	Input Volt. 230[V]
-30	-19.94	-19.94
-20	-19.87	-19.87
-10	-19.80	-19.80
0	-19.72	-19.72
10	-19.72	-19.72
25	-19.58	-19.58
30	-19.58	-19.58
40	-19.51	-19.51
50	-19.44	-19.44
60	-19.44	-19.44
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Note: Slanted line shows the range of the rated ambient temperature.

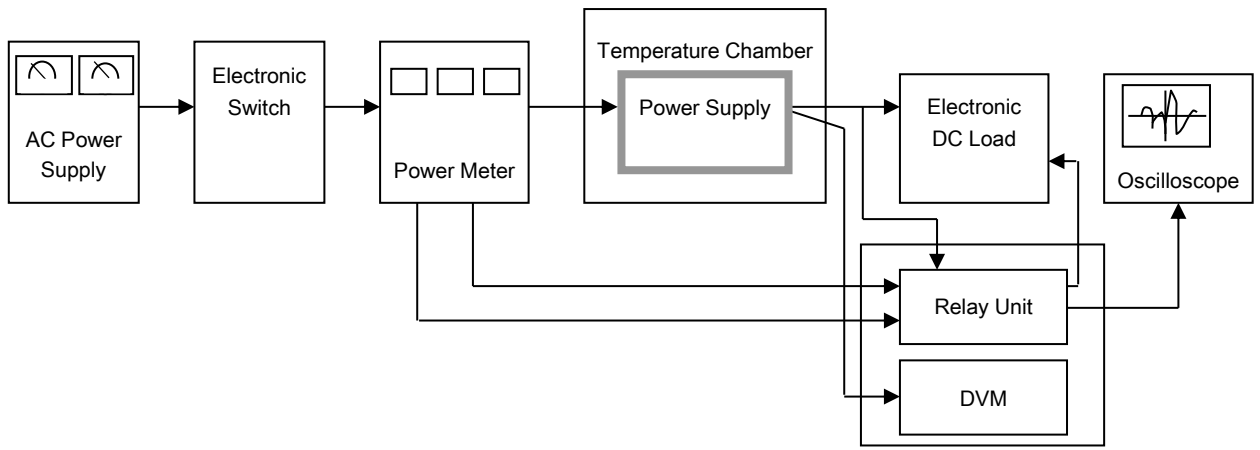


Figure A

Data Acquisition/Control Unit

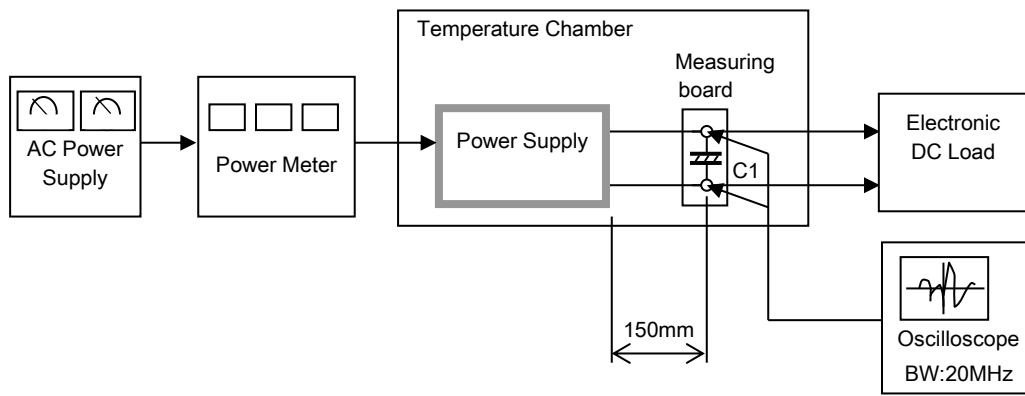


Figure B

C1= 22 μ F
(Electrolytic capacitor)