参考資料

COSEL

TEST DATA OF TUHS3F05

Regulated DC Power Supply
February 28, 2014

Approved by : Nobuyuki Shiraishi
Nobuyuki Shiraishi Design Manager

Prepared by : Takayuki Yamamoto
Takayuki Yamamoto Design Engineer

COSEL CO.,LTD.

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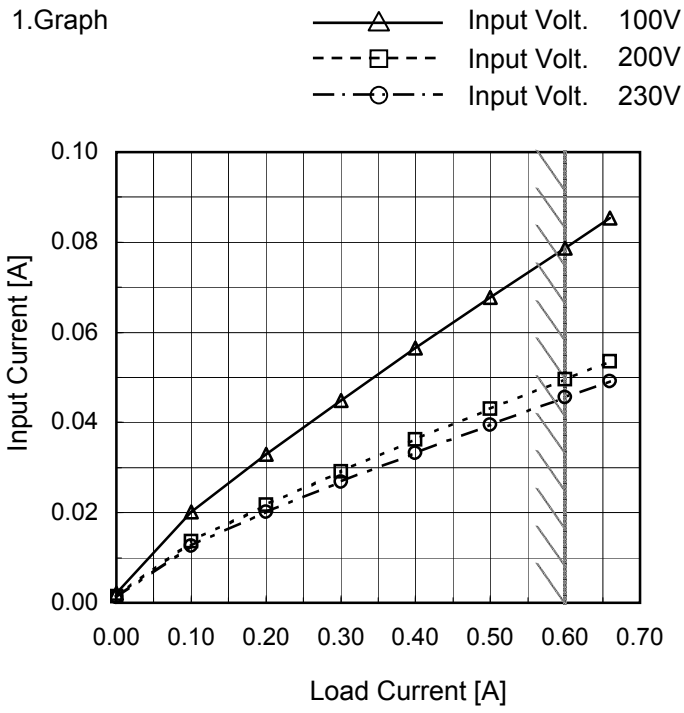
Model	TUHS3F05
Item	Input Current (by Load Current)
Object	————————

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. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]
0.00	0.002	0.001	0.001
0.10	0.020	0.014	0.013
0.20	0.033	0.022	0.020
0.30	0.045	0.029	0.027
0.40	0.057	0.036	0.033
0.50	0.068	0.043	0.040
0.60	0.079	0.050	0.046
0.66	0.085	0.054	0.049
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--	-	-	-
--	-	-	-

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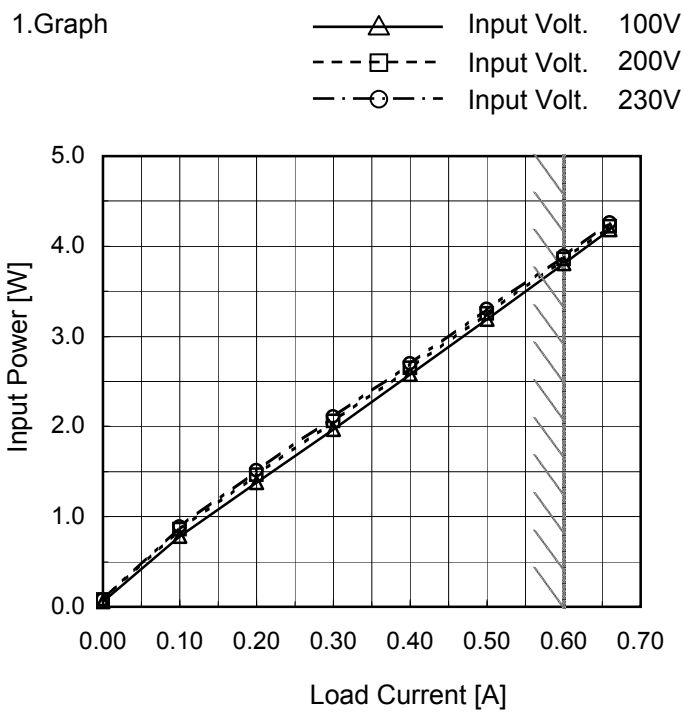
Model	TUHS3F05
Item	Input Power (by Load Current)
Object	————————

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. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]
0.00	0.06	0.08	0.08
0.10	0.78	0.86	0.89
0.20	1.38	1.46	1.51
0.30	1.97	2.06	2.11
0.40	2.58	2.65	2.70
0.50	3.19	3.25	3.30
0.60	3.81	3.86	3.89
0.66	4.18	4.22	4.26
--	-	-	-
--	-	-	-
--	-	-	-

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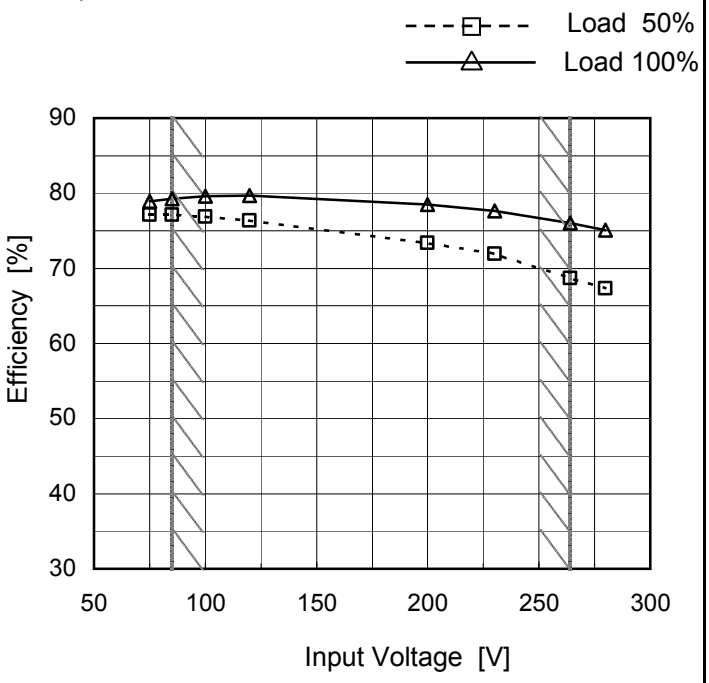
Model	TUHS3F05
Item	Efficiency (by Input Voltage)
Object	————————

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%
75	77.1	78.9
85	77.1	79.3
100	76.9	79.6
120	76.4	79.7
200	73.4	78.5
230	71.9	77.6
264	68.7	76.0
280	67.3	75.1
--	-	-

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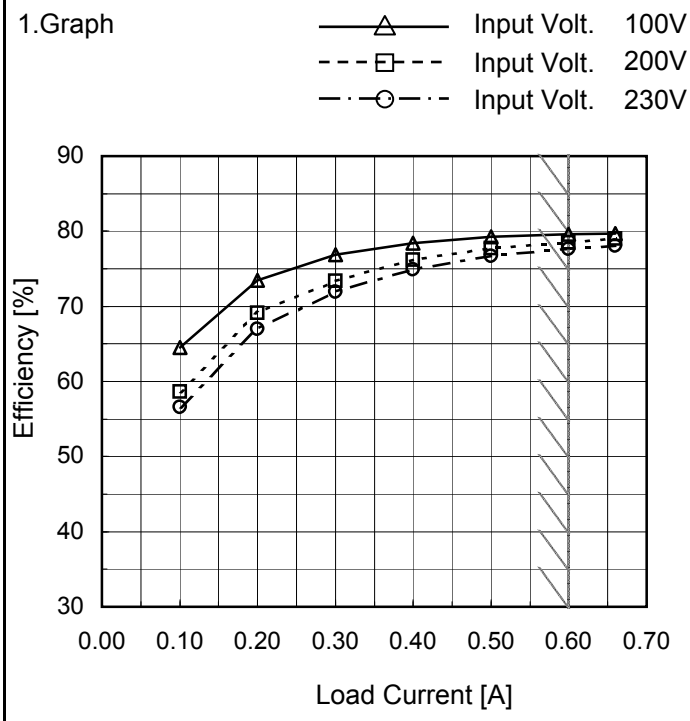
Model	TUHS3F05
Item	Efficiency (by Load Current)
Object	————————

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. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]
0.00	-	-	-
0.10	64.5	58.6	56.6
0.20	73.5	69.1	67.0
0.30	76.9	73.4	71.9
0.40	78.4	76.2	74.9
0.50	79.3	77.7	76.7
0.60	79.6	78.5	77.6
0.66	79.7	79.0	78.1
--	-	-	-
--	-	-	-
--	-	-	-

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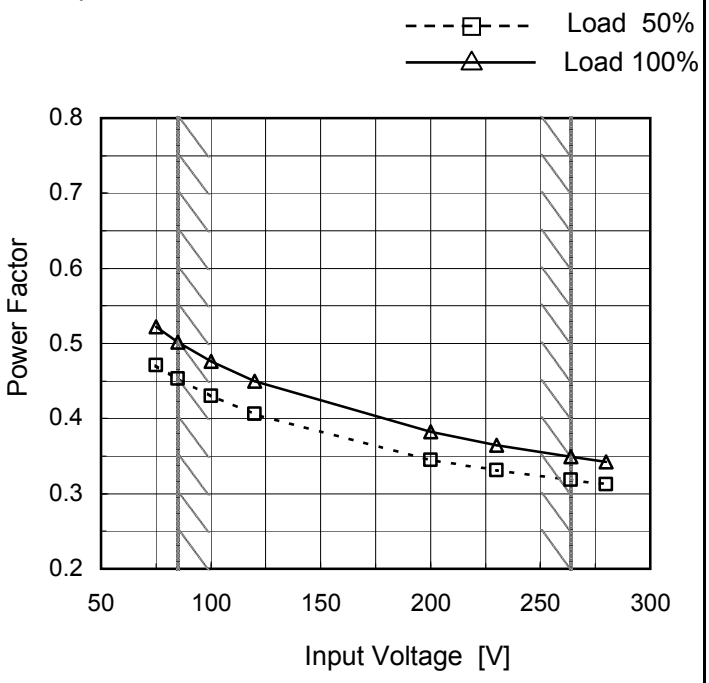
Model	TUHS3F05
Item	Power Factor (by Input Voltage)
Object	————————

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%
75	0.471	0.522
85	0.453	0.501
100	0.430	0.476
120	0.406	0.449
200	0.345	0.382
230	0.331	0.364
264	0.318	0.349
280	0.313	0.343
--	-	-

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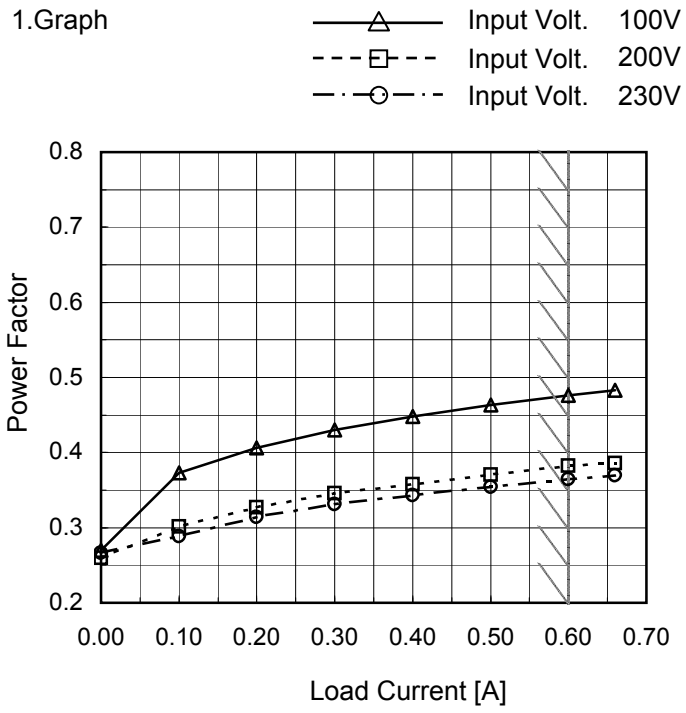
Model	TUHS3F05
Item	Power Factor (by Load Current)
Object	————————

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]	Power Factor		
	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]
0.00	0.270	0.259	0.267
0.10	0.373	0.301	0.289
0.20	0.406	0.327	0.314
0.30	0.430	0.345	0.331
0.40	0.448	0.358	0.343
0.50	0.463	0.370	0.355
0.60	0.476	0.382	0.364
0.66	0.483	0.386	0.370
--	-	-	-
--	-	-	-
--	-	-	-

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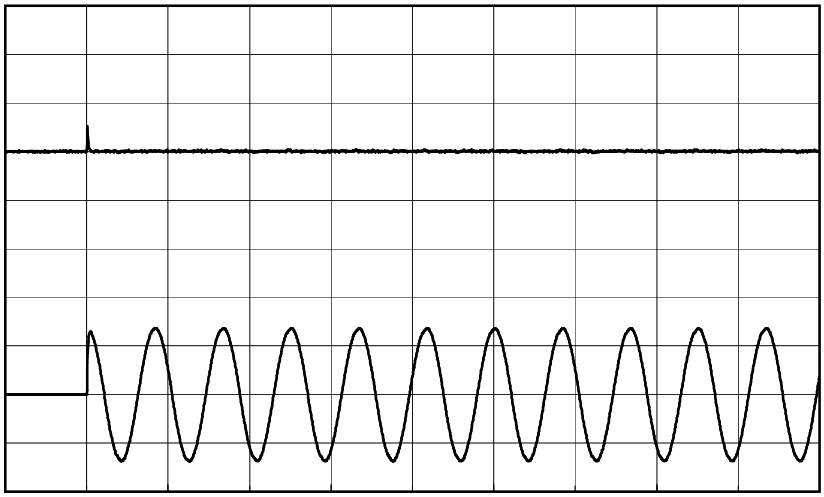
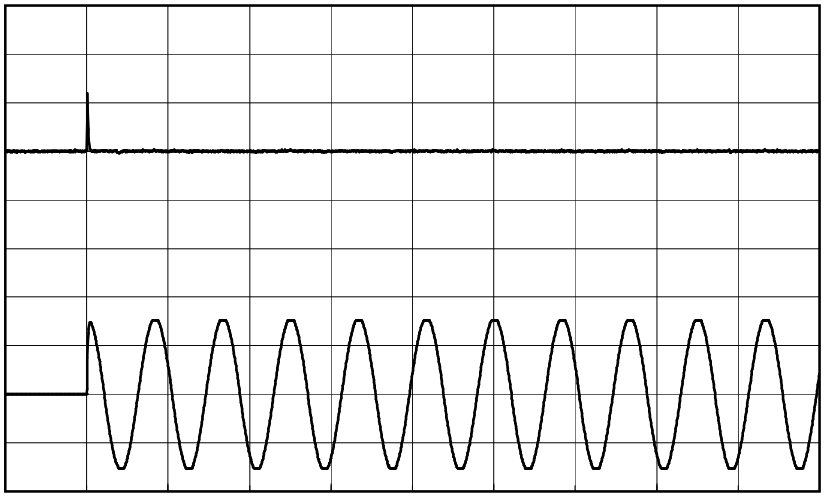
Model	TUHS3F05
Item	Inrush Current
Object	————————

Temperature 25°C
Testing Circuitry Figure A



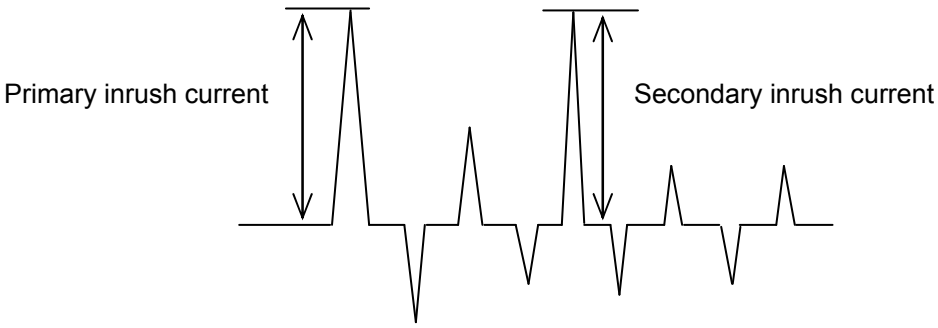
Input Voltage 100 V
Frequency 60 Hz
Load 100 %

Primary inrush current :
10.4 A
Secondary inrush current :
0.7 A



Input Voltage 230 V
Frequency 60 Hz
Load 100 %

Primary inrush current :
24.0 A
Secondary inrush current :
0.6 A



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Model	TUHS3F05	
Item	Leakage Current	Temperature 25°C Testing Circuitry Figure B
Object	――――――――――	

1.Results

[mA]

Standards		Input Volt.			Note
		100 [V]	200 [V]	230 [V]	
DEN-AN	Both phases	0.003	0.004	0.004	Operation
	One of phases	0.003	0.005	0.006	Stand by
IEC60950-1	Both phases	0.002	0.005	0.005	Operation
	One of phases	0.003	0.005	0.005	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.
There is no FG in TUHS series and it is a reinforced insulation power supply of the class 2.

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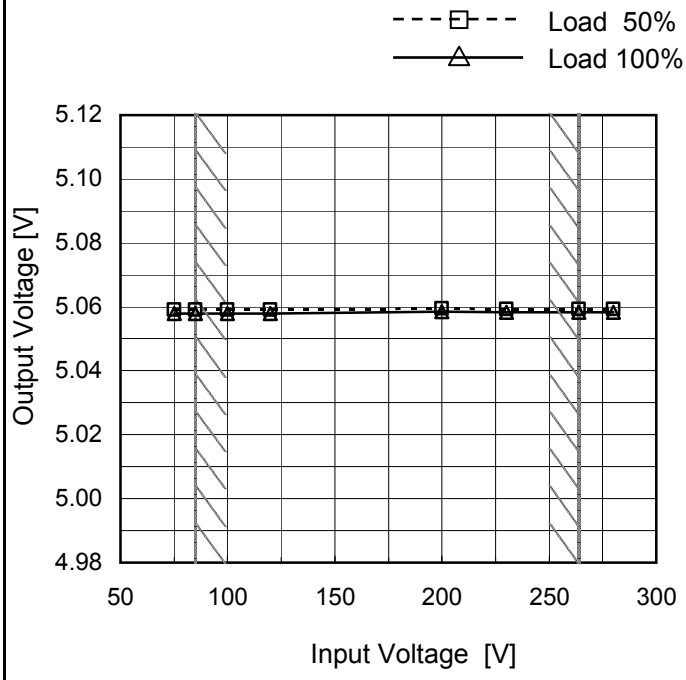
Model	TUHS3F05
Item	Line Regulation
Object	+5V0.6A

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%
75	5.059	5.058
85	5.059	5.058
100	5.059	5.058
120	5.059	5.058
200	5.060	5.059
230	5.059	5.058
264	5.059	5.058
280	5.059	5.058
--	-	-

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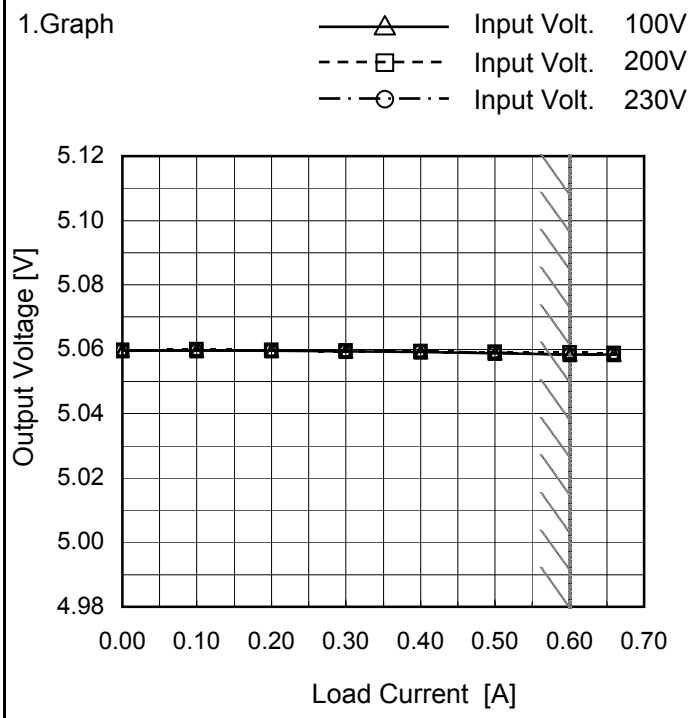
Model	TUHS3F05
Item	Load Regulation
Object	+5V0.6A

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. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]
0.00	5.060	5.060	5.060
0.10	5.060	5.060	5.060
0.20	5.060	5.060	5.060
0.30	5.059	5.060	5.059
0.40	5.059	5.059	5.059
0.50	5.059	5.059	5.059
0.60	5.058	5.059	5.058
0.66	5.058	5.059	5.058
--	-	-	-
--	-	-	-
--	-	-	-

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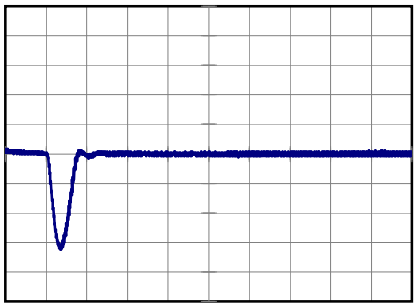
Model	TUHS3F05		
Item	Dynamic Load Response	Temperature Testing Circuitry	25℃ Figure A
Object	+5V 0.6A		

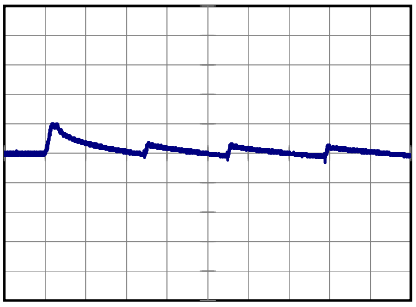
Input Volt. 230V
Cycle 500ms

Load Current

0.6A / 100us

Min.Load (0A)←→
Load 100%(0.6A)



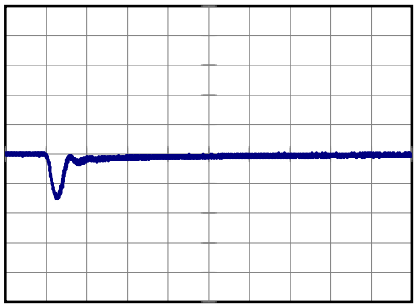


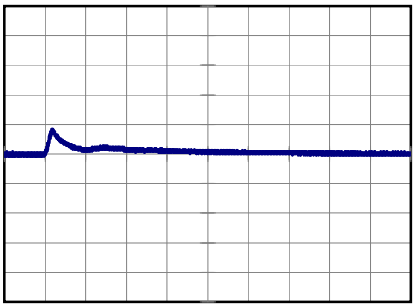
200 mV/div

200 us/div

200 us/div

Load 20% (0.12A)←→
Load 100%(0.6A)



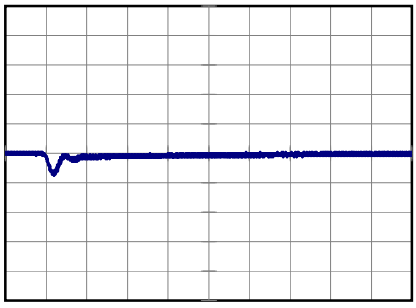


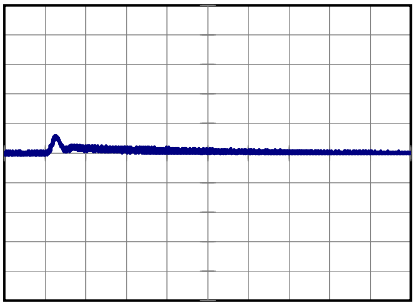
200 mV/div

200 us/div

200 us/div

Load 50% (0.3A)←→
Load 100% (0.6A)





200 mV/div

200 us/div

200 us/div

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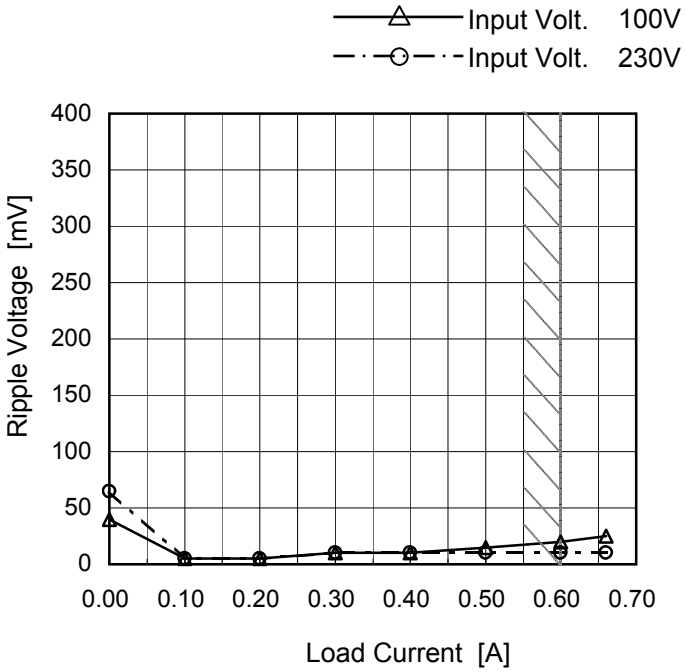
Model	TUHS3F05
Item	Ripple Voltage (by Load Current)
Object	+5V0.6A

Temperature 25°C
Testing Circuitry Figure C

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.

T1: Due to AC Input Line
T2: Due to Switching

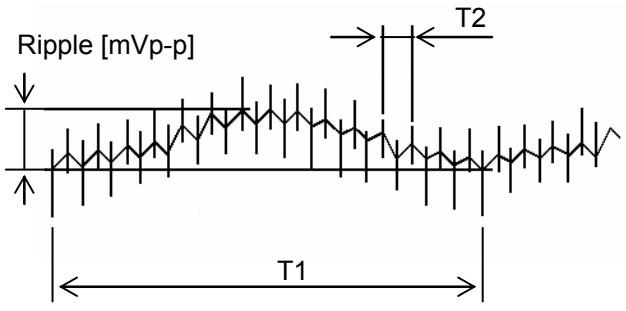


Fig. Complex Ripple Wave Form

2.Values

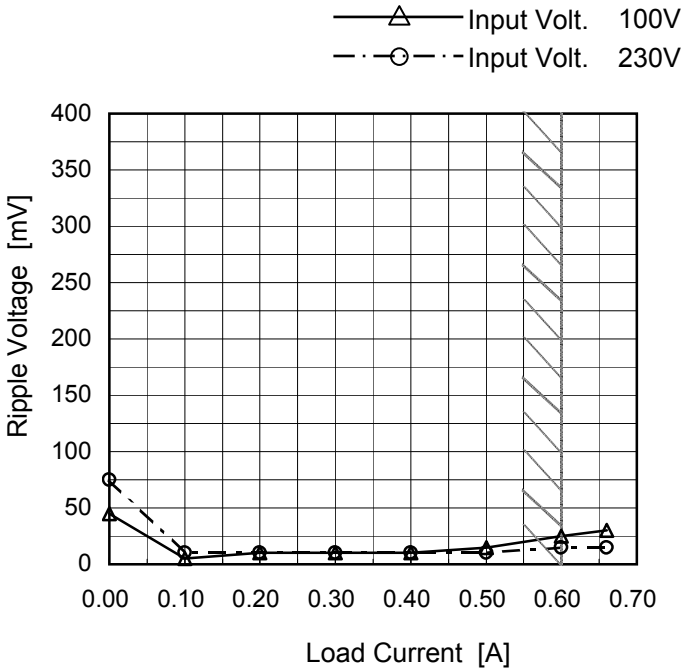
Load Current [A]	Ripple Voltage [mV]	
	Input Volt. 100 [V]	Input Volt. 230 [V]
0.00	40	65
0.10	5	5
0.20	5	5
0.30	10	10
0.40	10	10
0.50	15	10
0.60	20	10
0.66	25	10
--	-	-
--	-	-
--	-	-

COSEL

Model	TUHS3F05
Item	Ripple-Noise
Object	+5V0.6A

Temperature 25°C
Testing Circuitry Figure C

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.

T1: Due to AC Input Line
T2: Due to Switching

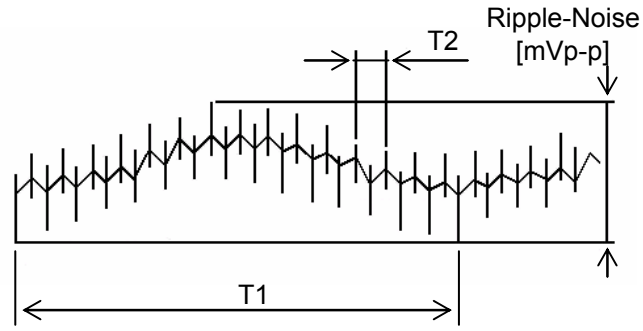


Fig. Complex Ripple Wave Form

2.Values

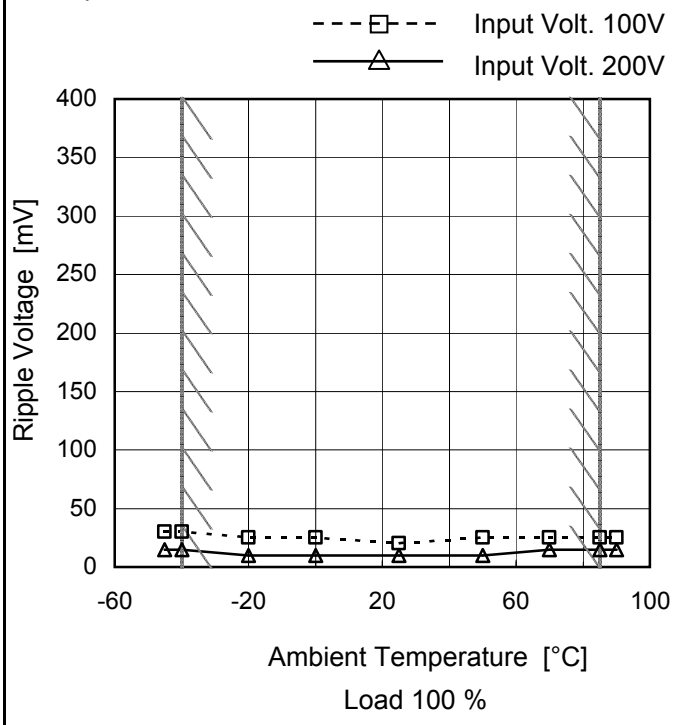
Load Current [A]	Ripple-Noise [mV]	
	Input Volt. 100 [V]	Input Volt. 230 [V]
0.00	45	75
0.10	5	10
0.20	10	10
0.30	10	10
0.40	10	10
0.50	15	10
0.60	25	15
0.66	30	15
--	-	-
--	-	-
--	-	-

COSEL

Model	TUHS3F05
Item	Ripple Voltage (by Ambient Temp.)
Object	+5V0.6A

Testing Circuitry Figure C

1.Graph



Load 100 %

Measured by 100 MHz Oscilloscope.
Note: Slanted line shows the range of the rated ambient temperature.

2.Values

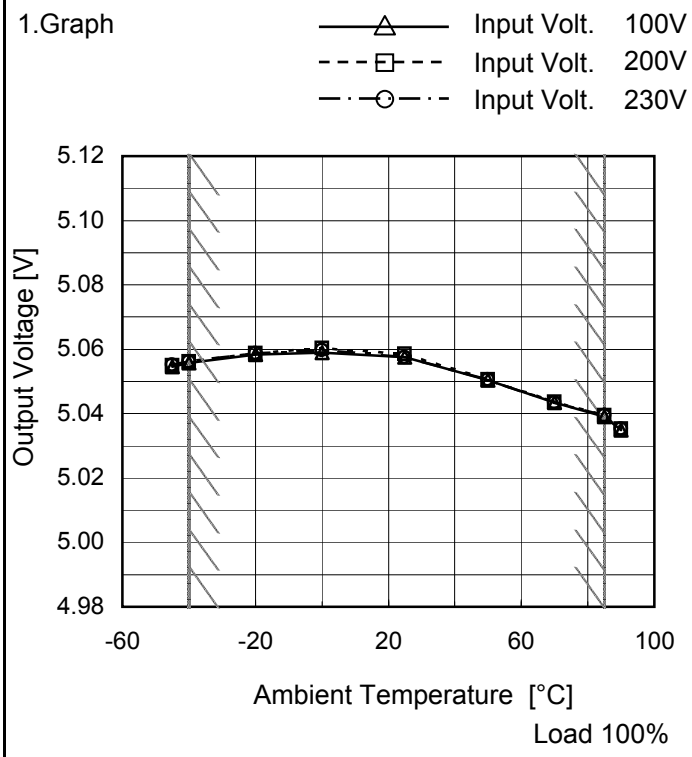
Ambient Temperature [°C]	Ripple Voltage [mV]	
	Input Volt. 100V	Input Volt. 230V
-45	30	15
-40	30	15
-20	25	10
0	25	10
25	20	10
50	25	10
70	25	15
85	25	15
90	25	15
--	-	-
--	-	-

COSEL

Model	TUHS3F05
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. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]
-45	5.055	5.055	5.055
-40	5.056	5.056	5.056
-20	5.058	5.059	5.059
0	5.059	5.060	5.060
25	5.058	5.059	5.058
50	5.050	5.051	5.051
70	5.043	5.044	5.044
85	5.039	5.039	5.039
90	5.035	5.035	5.035
--	-	-	-
--	-	-	-

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Model	TUHS3F05	
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 - 85°C
Input Voltage : 85 - 264V
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	0	200	0	5.060	±11	±0.2
Minimum Voltage	85	264	0.6	5.039		

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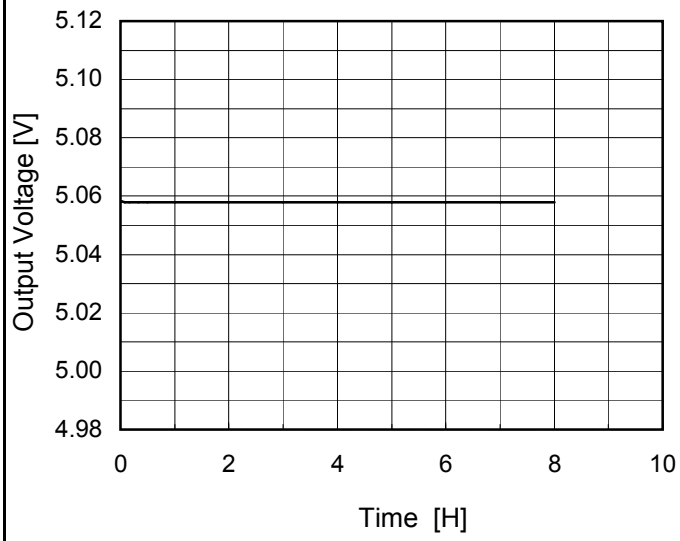
Model	TUHS3F05
Item	Time Lapse Drift
Object	+5V0.6A

Temperature 25°C
Testing Circuitry Figure A

1.Graph



Input Volt. 100V
Load 100%

* The characteristic of AC230V is equal.

2.Values

Time since start [H]	Output Voltage [V]
0.0	5.058
0.5	5.058
1.0	5.058
2.0	5.058
3.0	5.058
4.0	5.058
5.0	5.058
6.0	5.058
7.0	5.058
8.0	5.058

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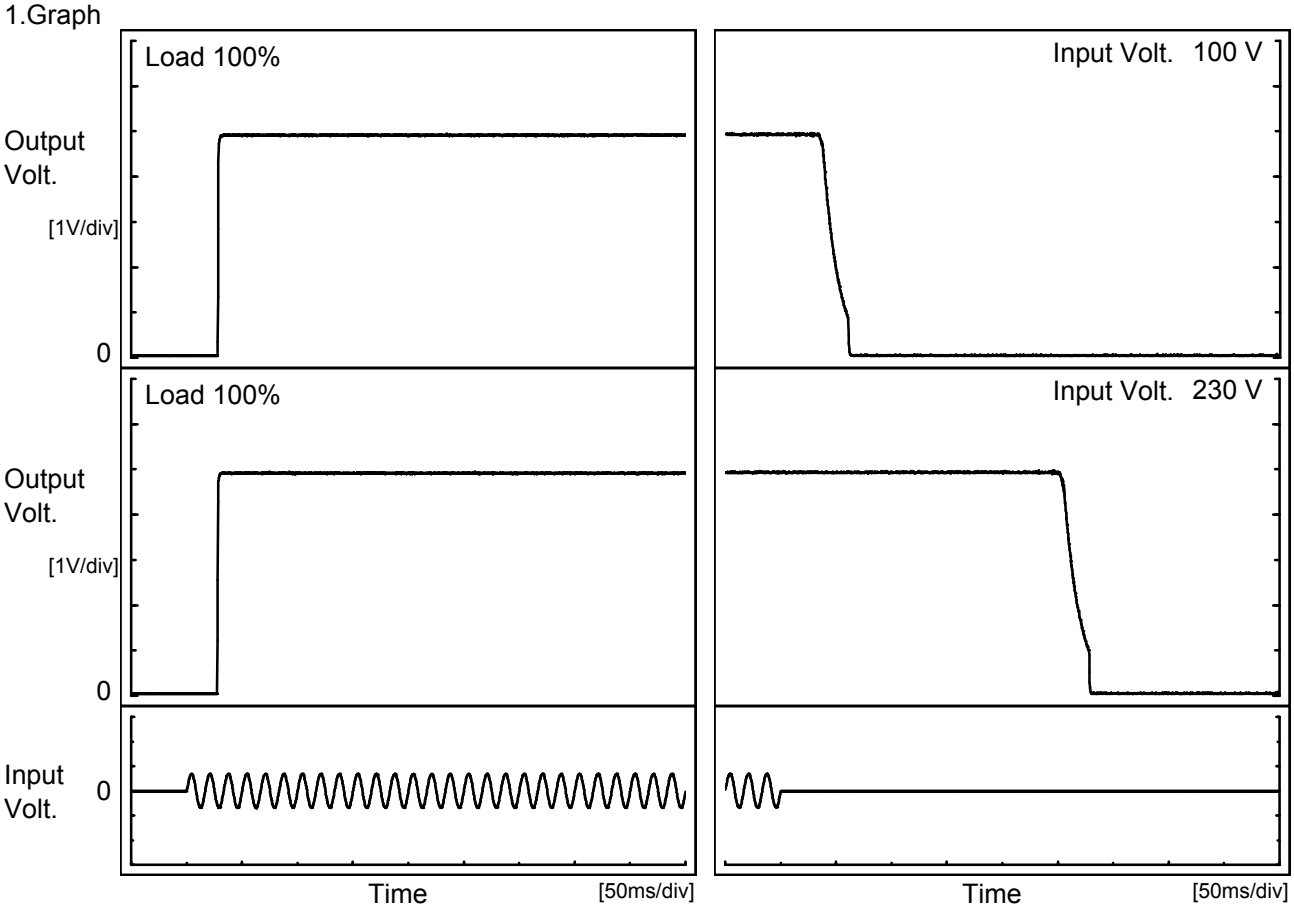
Model	TUHS3F05	
Item	Rise and Fall Time	Temperature 25°C Testing Circuitry Figure A
Object	+5V0.6A	

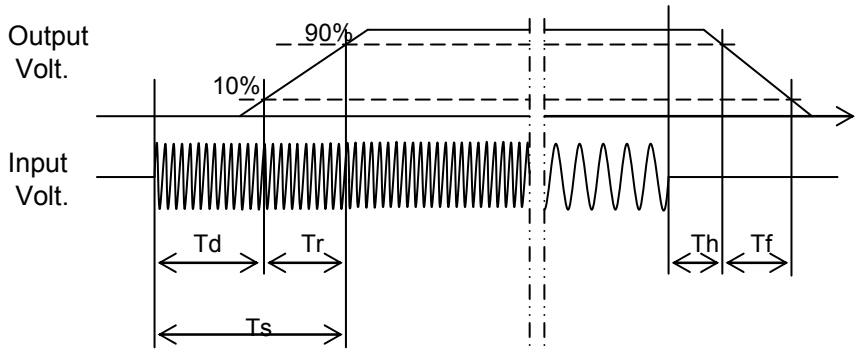
1.Graph



2.Values

[ms]

Input Volt. \ Time	Td	Tr	Ts	Th	Tf
100 V	28.3	0.8	29.1	35.8	22.8
230 V	27.8	0.8	28.6	254.4	22.8



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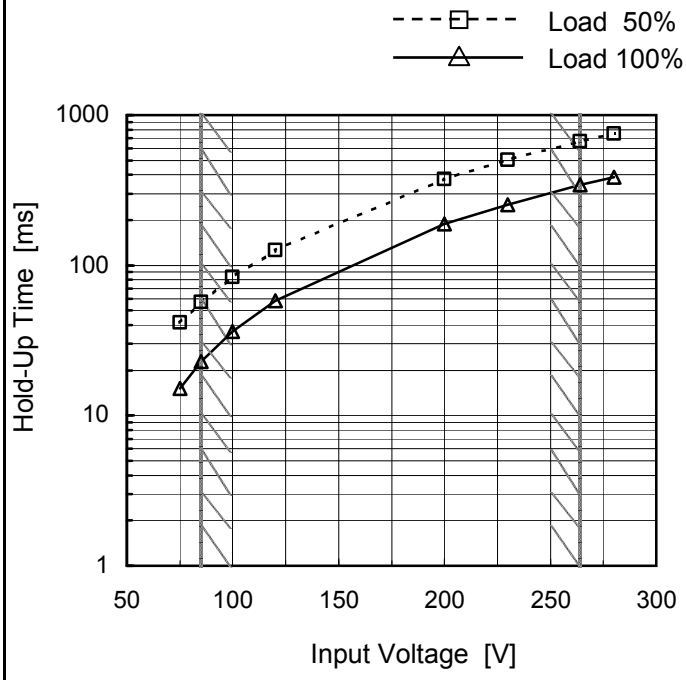
Model	TUHS3F05
Item	Hold-Up Time
Object	+5V0.6A

Temperature 25°C
Testing Circuitry Figure A

1.Graph



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.

2.Values

Input Voltage [V]	Hold-Up Time [ms]	
	Load 50%	Load 100%
75	42	15
85	57	23
100	83	36
120	126	58
200	376	188
230	503	254
264	668	342
280	753	387
--	-	-

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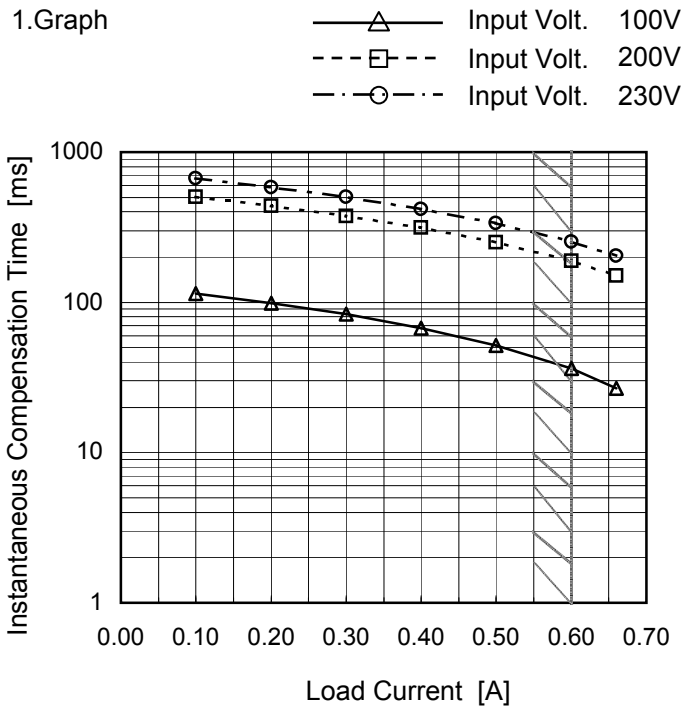
Model	TUHS3F05
Item	Instantaneous Interruption Compensation
Object	+5V0.6A

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]	Time [ms] Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]
0.00	-	-	-
0.10	115	501	668
0.20	99	438	585
0.30	83	376	503
0.40	68	313	420
0.50	52	250	337
0.60	36	188	254
0.66	27	150	204
--	-	-	-
--	-	-	-
--	-	-	-

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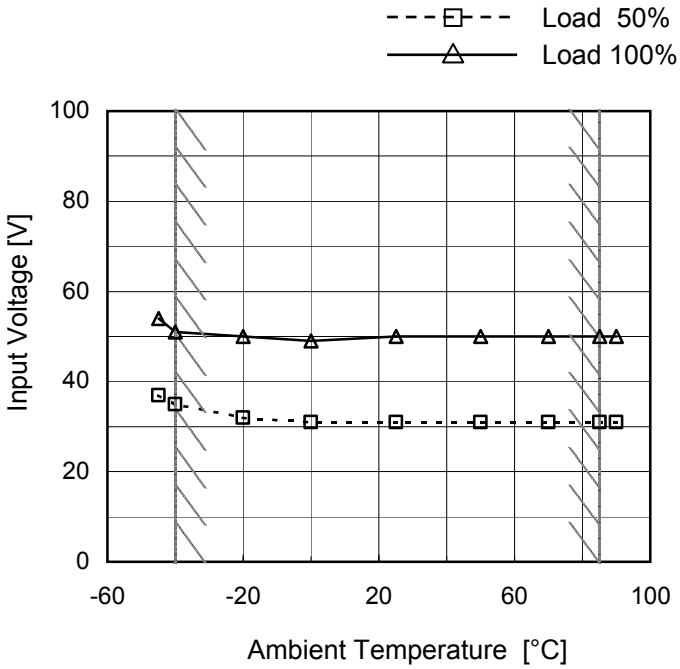
COSEL

Model	TUHS3F05
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

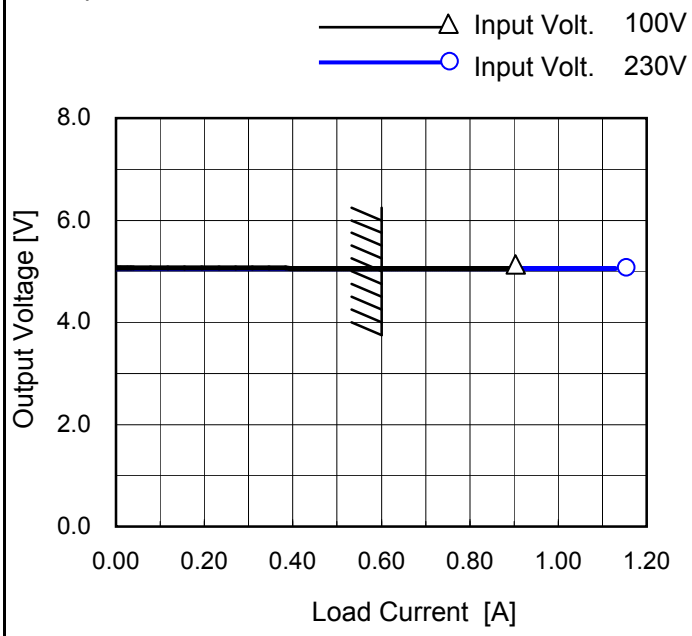
Ambient Temperature [°C]	Input Voltage [V]	
	Load 50%	Load 100%
-45	37	54
-40	35	51
-20	32	50
0	31	50
25	31	50
50	31	50
70	31	50
85	31	50
90	31	50
--	-	-
--	-	-

COSEL

Model	TUHS3F05
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. 100[V]	Input Volt. 230[V]
5.0	0.90	1.13
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-

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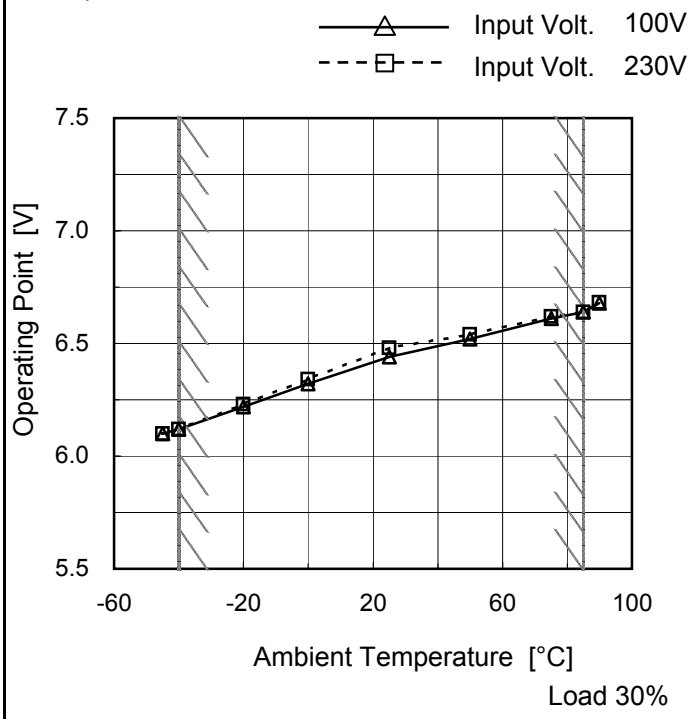
COSEL

Model	TUHS3F05
Item	Overvoltage Protection
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]	Operating Point [V]	
	Input Volt. 100[V]	Input Volt. 230[V]
-45	6.10	6.10
-40	6.12	6.12
-20	6.22	6.23
0	6.32	6.34
25	6.44	6.48
50	6.52	6.54
75	6.61	6.62
85	6.64	6.64
90	6.68	6.68
--	-	-
--	-	-

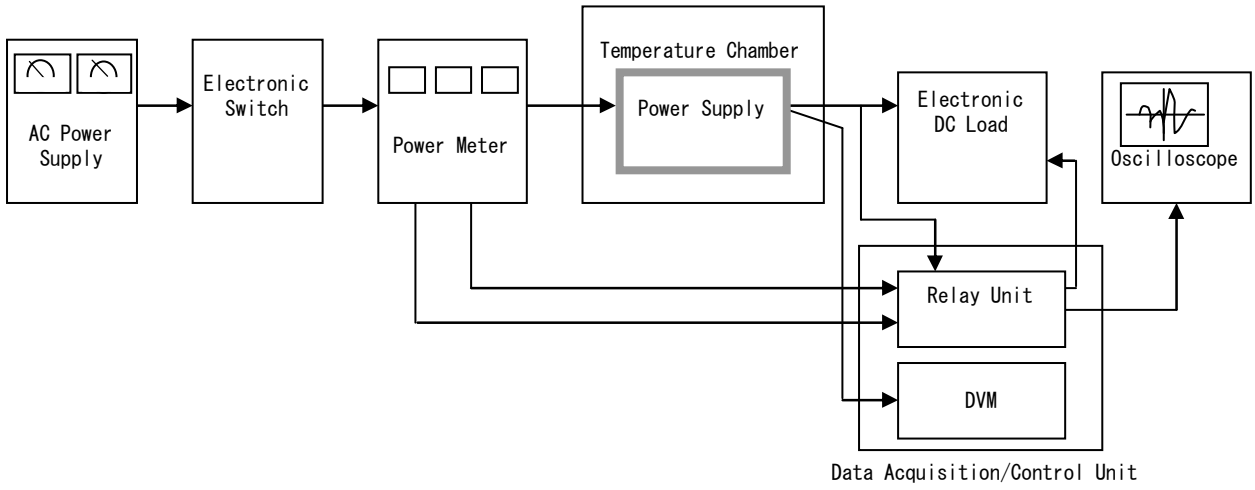


Figure A

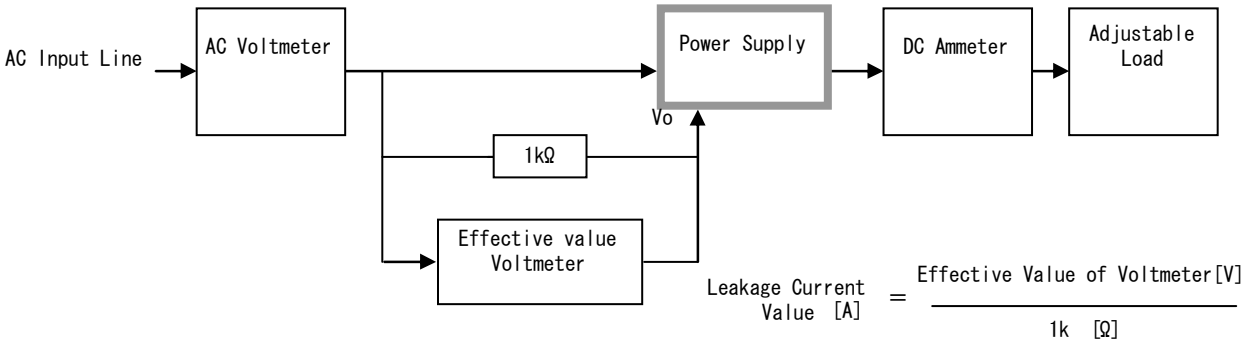


Figure B (DEN-AN)

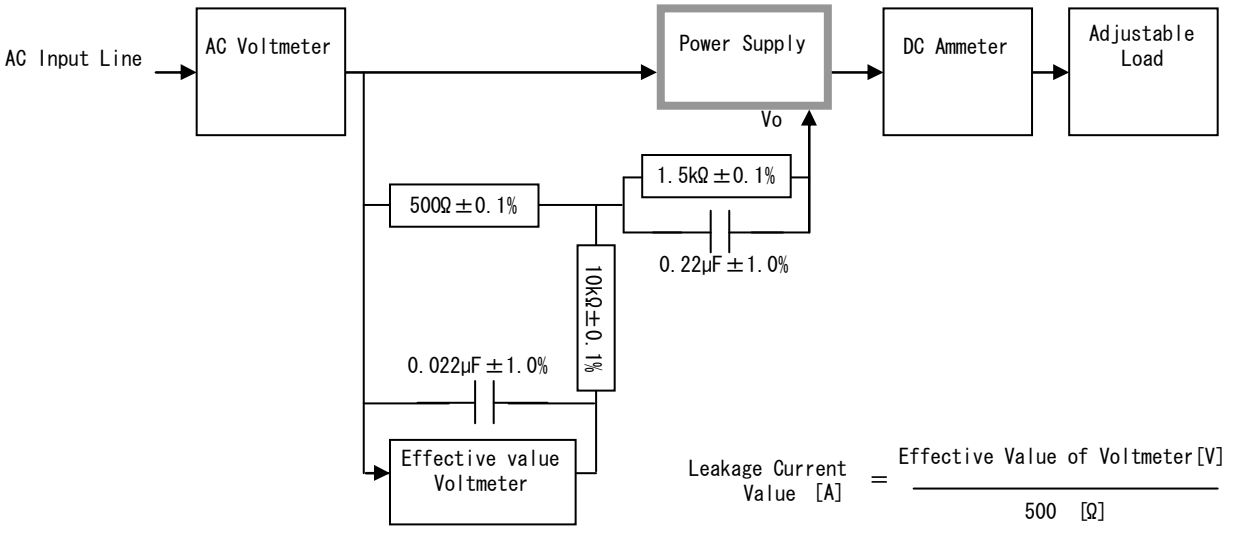
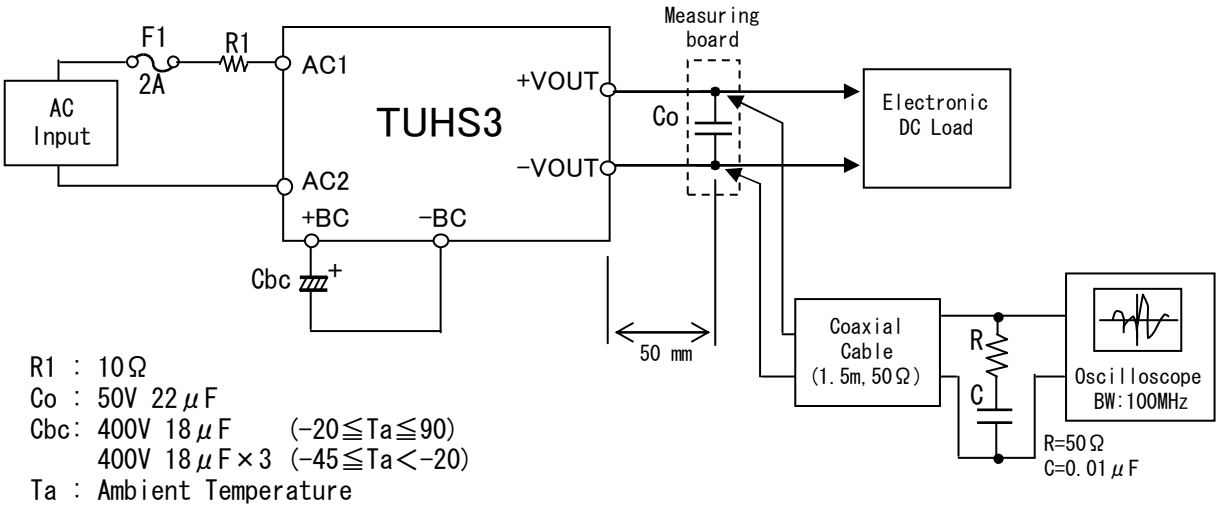


Figure B (IEC60950-1)



R1 : 10Ω
Co : 50V 22μF
Cbc: 400V 18μF (-20≦Ta≦90)
400V 18μF×3 (-45≦Ta<-20)
Ta : Ambient Temperature

Figure C