Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of “Quality Parts,Customers Priority,Honest Operation,and Considerate Service”,our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!


# Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832
Email & Skype: info@chipsmall.com Web: www.chipsmall.com
Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China

## Basic Characteristics Data

| Model | Circuit method | Switching frequency [kHz] | Input current [A] *1 | Inrush current protection circuit | PCB/Pattern | | | Series/Parallel operation availability | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Material | Single sided | Double sided | Series operation | Parallel operation |
| TUXS150F | Active filter | 80-600 | 1.70 | Thermistor | Aluminum | Yes | | Yes | *2 |
| | LLC resonant converter | 100-300 | | | | | | | |
| TUXS200F | Active filter | 80-600 | 2.20 | Thermistor | Aluminum | Yes | | Yes | *2 |
| | LLC resonant converter | 100-300 | | | | | | | |

*1 The value of input current is at ACIN 100V and rated load.
*2 Refer to instruction manual.

# 1 Pin Connection

● TUXS

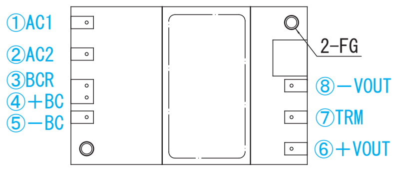



Fig.1.1 Pin connection (bottom view)

Table 1.1 Pin connection and function

| No. | Pin Connection | Function |
|---|---|---|
| ① | AC1 | AC input |
| ② | AC2 | |
| ③ | BCR | +BC output |
| ④ | +BC | +BC output |
| ⑤ | -BC | -BC output |
| ⑥ | +VOUT | +DC output |
| ⑦ | TRM | Adjustment of output voltage |
| ⑧ | -VOUT | -DC output |
| - | FG | Mounting hole (FG) |

# 2 Connection for Standard Use

■To use TUXS series, connection shown in Fig.2.1 and external components are required.

■This product uses conduction cooling method (e.g. heat radiation from the aluminum base plate to the attached heat sink).
Reference: 6.5 "Derating"

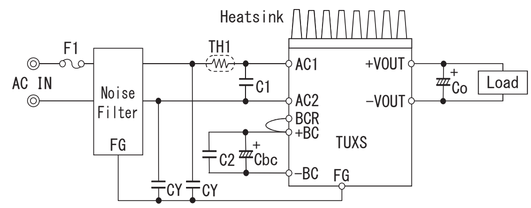



Fig.2.1 Connection for standard use

Table 2.1 External components

| No. | Symbol | Components | Reference |
|---|---|---|---|
| 1 | F1 | Input fuse | 3.1 "Wiring input pin (1)" |
| 2 | C1 | Input Capacitor | 3.1 "Wiring input pin (2)" |
| 3 | – | Noise Filter | 3.1 "Wiring input pin (3)" |
| 4 | CY | Y capacitor | |
| 5 | TH1 | Inrush current protection thermistor | 3.1 "Wiring input pin (4)" |
| 6 | Co | Output capacitor | 3.2 "Wiring output pin (1)" |
| 7 | Cbc | Smoothing Capacitor for boost voltage | 3.3 "Wiring +BC/-BC pins (1)" |
| 8 | C2 | Capacitor for boost voltage | 3.3 "Wiring +BC/-BC pins (2)" |

# 3 Wiring Input/Output Pin

## 3.1 Wiring input pin

(1) F1 : External fuse

■Fuse is not built-in on input side. In order to protect the unit, install the slow-blow type fuse on input side (as shown in Table 3.1).

Table 3.1 Recommended fuse (Slow-blow type)

| No. | Model | Rated current |
|---|---|---|
| 1 | TUXS150F | 5A |
| 2 | TUXS200F | 6.3A |

(2) C1 : External Capacitor for input side

■Install a film capacitor as input capacitor C1 of which the capacitance and ripple current capability are above the values shown in Table 3.2.
■Use a safety approved capacitor with 250V ac rated voltage.
■If C1 is not connected, it may cause the failure of the power supply or external components.

Table 3.2 Input Capacitor C1

| No. | Model | Voltage | Capacitance | Rated ripple current |
|---|---|---|---|---|
| 1 | TUXS | AC250V | 1μF or more | 1A or more |

(3) CY : Noise filter/Decoupling capacitor

■The product doesn't have noise filter internally.
Please connect external noise filter and primary decoupling capacitor CY for low line noise and stable operation of the power supply.
■The operation of the power supply may be unstable due to the resonance of the filter or inductance.
■Install a correspondence filter, if it is required to meet a noise standard or if the surge voltage may be applied to the unit.
■When the total capacitance of the primary decoupling capacitor is more than 8800pF, the nominal value in the specification may not be met by the Hi-Pot test between input and output. A capacitor should be installed between output and FG.

(4) TH1 : Inrush current limiting thermistor

■It has a possibility that internal components fail by inrush current, so please use power thermistor or inrush current limiting circuit to keep input current below 60A.
■If you use power thermistor and turn the power ON/OFF repeatedly within a short period of time, please have enough intervals so that a power supply cools down before being turned on. And appropriate intervals should be set even if inrush current limiting circuit except power thermistor is used.
■The output voltage may become unstable at low temperature due to the ESR of power thermistor. In this case, increase the capacitance of Cbc more than recommended value or connect same capacitors in parallel. Please evaluate before use.

## 3.2 Wiring output pin

(1) Co : Output capacitor

■Install an external capacitor Co between +VOUT and -VOUT pins for stable operation of the power supply (Fig.2.1).
Recommended capacitance of Co is shown in Table 3.3.
■Select the high frequency type capacitor. Output ripple and start-up waveform may be influenced by ESR-ESL of the capacitor and the wiring impedance.
■Install a capacitor Co near the output pins (within 50mm from the pins).
■When the power supply is used under 0℃ ambient temperature, outpit ripple voltage increases. In this case, use the capacitor Co connected in parallel to reduce the ESR, or use the good low-temperature properties of electrolytic capacitor.

Table 3.3 Recommended capacitance Co[μF]

| No. | Model | Cbc | Maximum capacitance |
|---|---|---|---|
| 1 | TUXS150F50 | 220 | 2200 |
| 2 | TUXS200F50 | 220 | 2200 |
| 3 | TUXS200F42 | 330 | 3300 |
| 4 | TUXS200F32 | 470 | 4700 |
| 5 | TUXS200F28 | 560 | 5600 |
| 6 | TUXS200F24 | 560 | 5600 |

The specified ripple and ripple noise are measured by the method introduced in Fig.3.1.

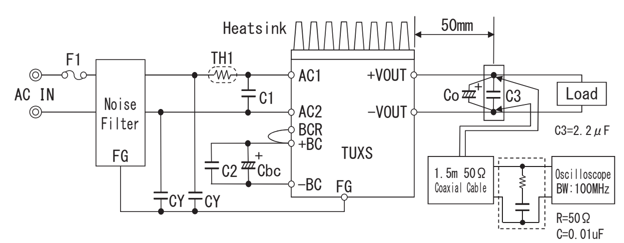



Fig.3.1 Method of Measuring Output Ripple and Ripple Noise

## 3.3 Wiring +BC/-BC pins

(1) Cbc : Smoothing capacitor for boost voltage

■In order to smooth boost voltage, connect Cbc between +BC and -BC. Recommended capacitance of Cbc is shown in Table 3.4.
■Note that +BC and -BC terminals have high voltage (DC385V typ).
■Keep the capacitance within the allowable external capacitance.
■Select a capacitor of which the boost voltage ripple voltage does not exceed 30Vp-p.
■When the power supply is operated under -20℃, it may make the boost voltage unstable due to the characteristic of equivalent series resistor. Please choose the capacitor which has more than recommended capacitance.
■Wire between BCR and +BC as short as possible in width.

Table 3.4 Recommended capacitance Cbc

| No. | Model | Voltage |
|---|---|---|
| 1 | TUXS150F | DC420V or more |
| 2 | TUXS200F | |

(2) C2 : Capacitor for boost voltage

■Install external capacitors C2 with capacitance shown in table 3.5.
■If capacitors C2 are not installed, it may cause the failure of the power supply or external components.

Table 3.5 Recommended capacitance C2

| No. | Model | Voltage | Capacitance | Rated ripple current |
|---|---|---|---|---|
| 1 | TUXS150F | DC450V | 0.47μF or more | 1A or more |
| 2 | TUXS200F | | 1.0μF or more | |

# 4 Function

## 4.1 Input voltage range

■The input voltage range is from 85 VAC to 264 VAC.
■In cases that conform with safety standard, input voltage range is AC100-AC240V(50/60Hz).
■Be aware that use of voltages other than those listed above may result in the unit not operating according to specifications, or may cause damage. Avoid square waveform input voltage, commonly used in UPS units and inverters.

## 4.2 Overcurrent protection

■Overcurrent protection is built-in and comes into effect at over 105% of the rated current.
Overcurrent protection prevents the unit from short circuit and overcurrent condition. The unit automatically recovers when the fault condition is cleared.
■When the output voltage drops at overcurrent, the average output current is reduced by intermittent operation of power supply.

## 4.3 Overvoltage protection

■Overvoltage protection circuit is built-in. If the overvoltage protection circuit is activated, shut down the input voltage, wait more than 3 minutes and turn on the AC input again to recover the output voltage. Recovery time varies depending on such factors as input voltage value at the time of the operation.

Remarks:
Please note that devices inside the power supply might fail when voltage of more than rated output voltage is applied to output terminal of the power supply. This could happen when the customer tests the overvoltage performance of the unit.
To check the function of overvoltage protection, adjust the output voltage by changing TRM voltage. Please contact us for details.

## 4.4 Thermal protection

■When the power supply temperature is kept above 100℃, the thermal protection will be activated and simultaneously shut down the output.
When the thermal protection is activated, shut off the input voltage and eliminate all the overheating conditions. To recover the output voltage, keep enough time to cool down the power supply before turning on the input voltage again.

### ● -N

■Option ”-N” means the output voltage of the power module will be recovered automatically when the fault condition (such as OVP or OTP) is corrected.

## 4.5 Remote sensing

■Remote sensing is not built-in.

## 4.6 Adjustable voltage range

(1) Output voltage adjusting
■Output voltage is adjustable by the external potentiometer.
■When the output voltage adjustment is used, note that the over voltage protection circuit operates when the output voltage sets too high.
■If the output voltage drops under the output voltage adjustment range, note that the Low voltage protection operates.
■By connecting the external potentiometer (VR1)and resistors (R1,R2),output voltage becomes adjustable, as shown in Fig.4.1, recommended external parts are shown in Table 4.1.
■The wiring to the potentiometer should be as short as possible.
The temperature coefficient becomes worse, depending on the type of a resistor and potentiometer. Following parts are recommended for the power supply.
Resistor············Metal film type, coefficient of less than ±100ppm/℃
Potentiometer····Cermet type, coefficient of less than ±300ppm/℃
■When the output voltage adjustment is not used, open the TRM pin respectively.

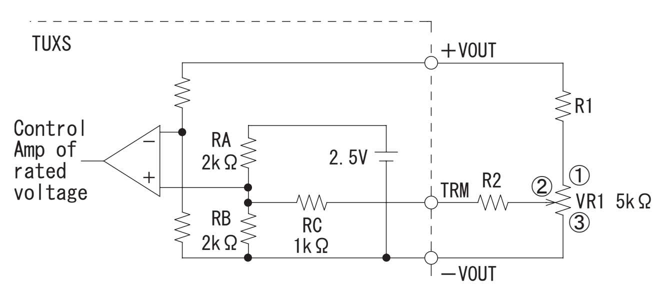



Fig. 4.1 Output voltage control circuit

Table 4.1 Recommended Values of External Resistors

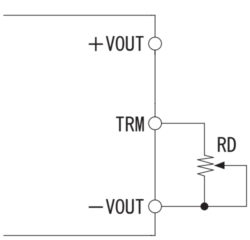
| No. | Model | Adjustable range | | | |
|---|---|---|---|---|---|
| | | VOUT±5% | | VOUT±10% | |
| | | R1 | R2 | R1 | R2 |
| 1 | TUXS150F50 | 82kΩ | | 82kΩ | |
| 2 | TUXS200F50 | 82kΩ | | 82kΩ | |
| 3 | TUXS200F42 | 62kΩ | 11kΩ | 62kΩ | 6.2kΩ |
| 4 | TUXS200F32 | 47kΩ | | 47kΩ | |
| 5 | TUXS200F28 | 39kΩ | | 39kΩ | |
| 6 | TUXS200F24 | 33kΩ | | 33kΩ | |

(2) Output voltage decreasing

■By connecting the external resistor(RD), output voltage becomes adjustable to decrease.
The external resistor(RD) is calculated the following equation.

$$RD=\left(\frac{100\%}{\Delta\%}-2\right)[k\Omega]$$

$$\Delta\%=\frac{V_{OR}-V_{OD}}{V_{OR}}\times 100$$




$V_{OR}$ :Rated output voltage[V]
$V_{OD}$ :Output voltage needed to set up[V]

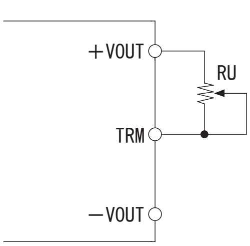
Fig. 4.2 Connection for output voltage decreasing

(3) Output voltage increasing

■By connecting the external resistor (RU), output voltage becomes adjustable to increase.
The external resistor (RU) is calculated the following equation.

$$RU=\left\{\frac{V_{OR}\times(100\%+\Delta\%)}{1.225\times\Delta\%}-\frac{(100\%+2\times\Delta\%)}{\Delta\%}\right\}[k\Omega]$$

$$\Delta\%=\frac{V_{OU}-V_{OR}}{V_{OR}}\times 100$$




$V_{OR}$ :Rated output voltage[V]
$V_{OU}$ :Output voltage needed to set up[V]

Fig. 4.3 Connection for output voltage increasing

## 4.7 Withstanding Voltage / Isolation Voltage

■When testing the withstanding voltage, make sure the voltage is increased gradually. When turning off, reduce the voltage gradually by using the dial of the hi-pot tester. Do not use a voltage tester with a timer as it may generate voltage several times as large as the applied voltage.

# 5 Series and Parallel Operation

## 5.1 Series operation

■Series operation is available by connecting the outputs of two or more power supplies as shown below. Output current in series connection should be lower than the lowest rated current in each unit.

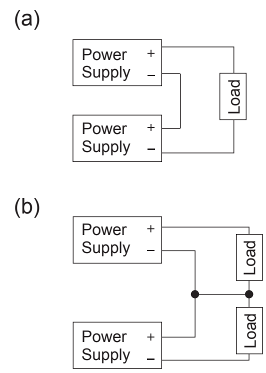



Fig. 5.1 Examples of series operation

## 5.2 Parallel operation

■Parallel operation is not possible.

■Redundancy operation is available by wiring as shown below.

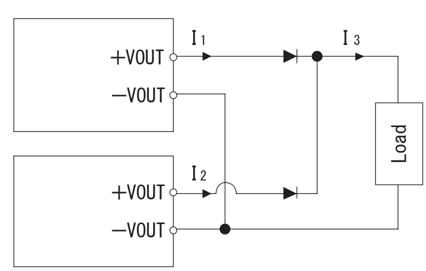



Fig. 5.2 Example of Redundancy Operation

■Even a slight difference in output voltage can affect the balance between the values of $I_1$ and $I_2$.
Please make sure that the value of $I_3$ does not exceed the rated current of a power supply.

$I_3 \leqq$ the rated current value

# 6 Implementation · Mounting Method

## 6.1 Mounting method

■The unit can be mounted in any direction. When two or more power supplies are used side by side, position them with proper intervals to allow enough air ventilation. Aluminum base plate temperature of each power supply should not exceed the temperature range shown in derating curve.

■Avoid placing the AC input line pattern layout underneath the unit. It will increase the line conducted noise. Make sure to leave an ample distance between the line pattern layout and the unit. Also avoid placing the DC output line pattern underneath the unit because it may increase the output noise. Lay out the pattern away from the unit.

■Avoid placing the signal line pattern layout underneath the unit because the power supply might become unstable. Lay out the pattern away from the unit.

■High-frequency noise radiates directly from the unit to the atmosphere. Therefore, design the shield pattern on the printed circuit board and connect it to FG.
The shield pattern prevents noise radiation.

■When a heat sink cannot be fixed on the base plate side, order the power module with "-T" option. A heat sink can be mounted by affixing a M3 tap on the heat sink.
Please make sure a mounting hole will be connected to a grounding capacitor $C_Y$.

Table 6.1 Mounting Hole Configuration

| | Mounting hole |
|---|---|
| Standard | M3 tapped |
| Optional : -T | ϕ3.4 thru |

## 6.2 Stress to the pins

■When too much stress is applied to the pins may damage internal connections. Avoid applying stress in excess of that shown in Fig. 6.1.

■The pins are soldered onto the internal PCB.
Therefore, Do not bend or pull the leads with excessive force.

■Mounting hole diameter of PCB should be 3.5mm to reduce the stress to the pins.

■Fix the unit on PCB (fixing fittings) by screws to reduce the stress to the pins. Be sure to mount the unit first, then solder the unit.

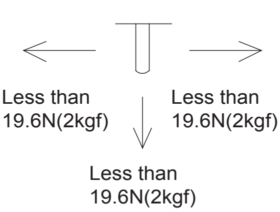



Fig. 6.1 Stress to the pins

## 6.3 Cleaning

■Clean the product with a brush. Prevent liquid from getting into the product.
Do not soak the product into liquid.

■Do not stick solvent to a name plate or a resin case.
(If solvent sticks to a name plate or a resin case, it will cause to change the color of the case or to fade letters on name plate away.)

■After cleaning, dry them enough.

## 6.4 Soldering temperature

■Flow soldering: 260℃ for up to 15 seconds.

■Soldering iron (26W): 450℃ for up to 5 seconds.

## 6.5 Derating

(1) Output voltage derating curve

■Use the power modules with conduction cooling (e.g. heat dissipation from the aluminum base plate to the attached heat sink).
Fig. 6.3 shows the derating curves with respect to the aluminum base plate temperature. Note that operation within the hatched areas will cause a significant level of ripple and ripple noise.

■Please measure the temperature on the aluminum base plate edge side when you cannot measure the temperature of the center part of the aluminum base plate.
In this case, please take 5deg temperature margin from the derating characteristics shown in Fig.6.3.
Please reduce the temperature fluctuation range as much as possible when the up and down of the temperature are frequently generated.
Contact us for more information on cooling methods.

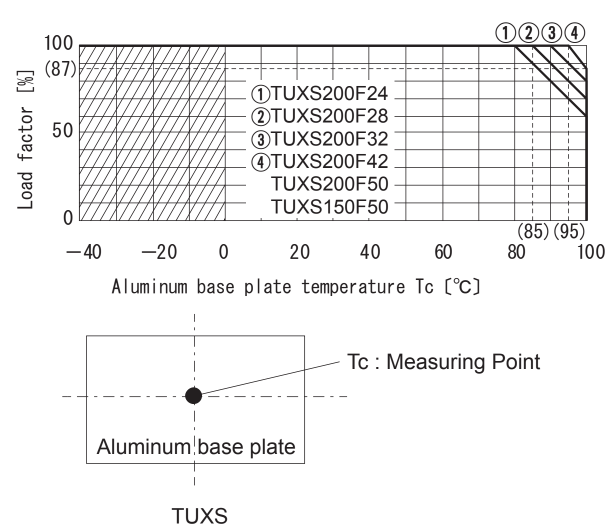



Fig.6.2 Derating curve

# 7 Lifetime expectancy depends on stress by temperature difference

■Regarding lifetime expectancy design of solder joint, following contents must be considered.
It must be careful that the soldering joint is stressed by temperature rise and down which is occurred by self-heating and ambient temperature change.
The stress is accelerated by thermal-cycling, therefore the temperature difference should be minimized as much as possible if temperature rise and down is occurred frequently.

■Product lifetime expectancy depends on the aluminum base plate central temperature difference ( Δ Tc) and number of cycling in a day is shown in Fig.7.1.
If the aluminum base plate center part temperature changes frequently by changing output load factor etc., the above the lifetime expectancy design should be applied as well.

Please contact us for details.

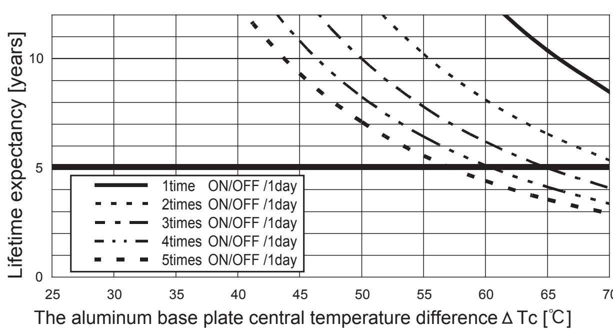



Fig.7.1 Lifetime expectancy against rise/fall temperature difference

Application manuals available at our website.
Recommended external components are also introduced for your reference.