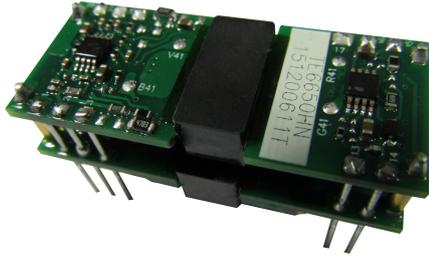


Active high precision isolated transmitter



RoHS

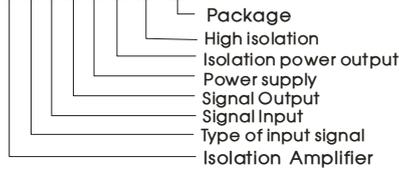


## FEATURES

- Two-port isolation (signal input and signal output)
- Isolation test voltage 4kVAC for 60s
- High accuracy of 0.1% Full Scale
- High linearity of 0.1% Full Scale
- Low ripple & noise:  $\leq 35\text{mVpp}$ , 20MHz
- Extremely low temperature coefficient of  $\leq 50\text{PPM}/^\circ\text{C}$  over entire  $-40^\circ\text{C}$  to  $+85^\circ\text{C}$  range

## PART NUMBER SYSTEM

TExxxxHN



TExxxxHN series are analog signal isolation modules with incoming positive signal input and transformed positive signal output. They are equipped with an efficient built-in micro-power source that supplies additionally power to the internal input signal circuitry. The adopted electromagnetic isolation technology has a better performance, a much higher accuracy and a lower temperature drift in comparison with photo/opto-coupler isolators. This type of product has in addition to low temperature drift and high linearity, a low power consumption and low ripple & noise. They have a two-terminal isolation from signal input to signal output/power input.

## Selection Guide

Model	Power Supply Input Typ. (VDC)	Input Signal	Output Signal	Isolated Power Output (VDC)
TE6650HN	12V	0-5V	0-5V	None

## Input Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit	
Power Input	Input Voltage	Typ.-5%	Typ.	Typ.+5%	VDC	
	Input Power	Isolation signal power at full load	--	--	2.0	W
	Power Supply Protection		Input reverse polarity protection			
Signal Input	Input Signal	See selection guide				
	Input Impedance	In case of max. input	10	--	--	$\text{M}\Omega$
	Overrange		--	--	30	V

## Output Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Isolation Power Output	Output Voltage	Typ.-10%	Typ.	Typ.+10%	VDC
	Output Current	--	--	5	mA
Signal Output	Output Signal	See selection guide			
	Load Capacity	2	--	--	$\text{k}\Omega$
	Ripple & Noise	Bandwidth 20MHz	--	15	35

## Transmission Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Signal Precision	$T_a=25^\circ\text{C}$	-0.1%FS.	--	+0.1%FS.	--
Temperature Coefficient	Operating temperature range from $-40$ to $+85^\circ\text{C}$	--	--	50	$\text{PPM}/^\circ\text{C}$
Bandwidth		3	--	--	kHz
Response Time		--	--	1	ms

General Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Electric Isolation		Isolated between the signal input and the signal output.			
Isolation Test	Electric strength test for 1 minute with a leakage current <1mA, humidity <70%RH	4	--	--	KVAC
Isolation Resistance	At 500VDC	100	--	--	MΩ
Operating Temperature		-40	--	+85	°C
Transportation and Storage Temperature		-50	--	+105	°C
Max. Operating Temperature for case	Ta=25°C	--	--	50	°C
Application Environment		The presence of dust, severe vibration, shock and corrosive gas may cause damage to the product.			

Mechanical Specifications

Package	DIP28
Weight	10.8g(typ.)
Cooling Method	Free air convection

Electromagnetic Compatibility (EMC)

Immunity	ESD	IEC/EN61000-4-2	Contact ±4kV	perf. Criteria B
	RS	IEC/EN61000-4-3	3V/m	perf. Criteria A
	EFT	IEC/EN61000-4-4	Power port ±2kV (see Fig. 7-① for recommended circuit)	perf. Criteria B
	Surge	IEC/EN61000-4-5	Power port ±1kV (Line to Line) (see Fig. 7-① for recommended circuit)	perf. Criteria B
	CS	IEC/EN61000-4-6	3 Vr.m.s	perf. Criteria A

Application Precautions

- Carefully read and follow the instructions before use; contact our technical support if you have any question;
- Do not use the product in hazardous areas;
- Use only DC power supply source for this product. 220VAC power supply is prohibited;
- It is strictly forbidden to disassemble the product privately in order to avoid product failure or malfunction;

After-sales service

- Factory inspection and quality control are strictly enforced before shipping any product; please contact your local representative or our technical support if you experience any abnormal operation or possible failure of the module;
- The products have a 3-year warranty period, from the date of shipment. The product will be repaired or exchanged free of charge within the warranty period for any quality problem that occurs under normal use.

Applied circuit

Please refer to Isolated Transmitter Application Notes.

Design Reference

1. Typical application

1) Schematic diagram

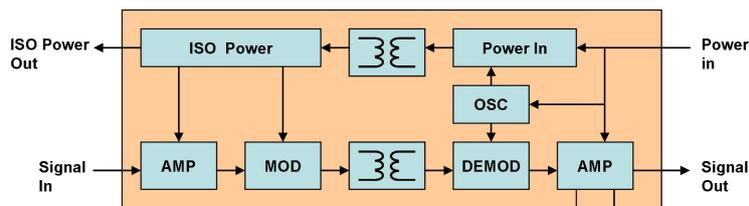


Fig. 1

2) Wiring diagram for product application

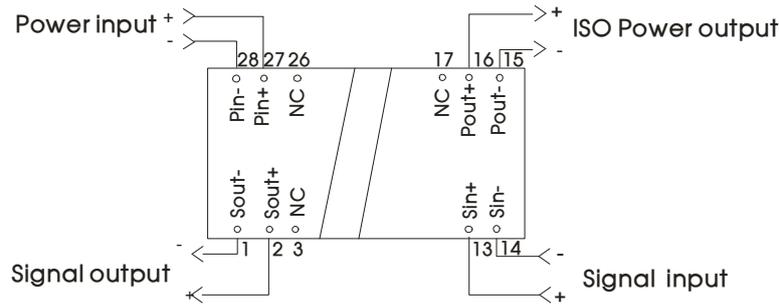


Fig. 2

Note: Pin 15,16 can not have any electrical connection.

3) Typical application of the product without isolated power output

Typical application 1—common application

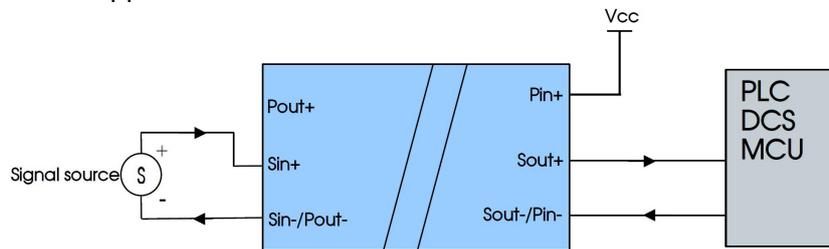


Fig. 3 application circuit for common application

Function

In Figure 3, the output voltage signal which is 4000VAC isolated and signal converted through from the signal conditioning module TExxxHN, then transfer to the control system.

Typical application 2—high voltage signal collecting

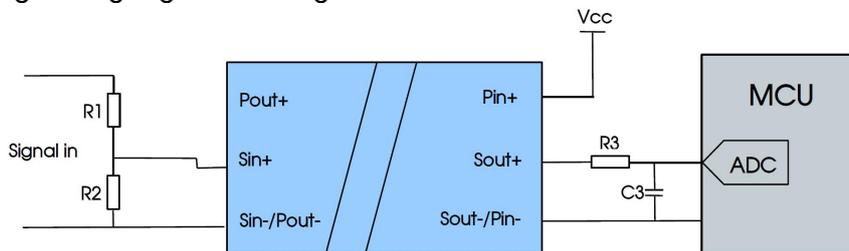


Fig. 4 application circuit for high voltage signal collecting

Functional Description

In Figure 4, Signal in is the detected high voltage signal, after divided by the resistors R1,R2 then converted into a low voltage signal that can be collected by TExxxHN, which is isolated and transmitted to the ADC of the backend control system and converted into a digital signal to complete the MCU's detection of Signal in. The signal input and output of TExxxHN are electrically isolated, so that the common interference loop from the detection terminal to the control system is blocked, thereby protecting the control system.

How it Works

Supposing the detected signal ranges from 0 to 1000V, after the voltage divided by resistors R1/R2, the input signal becomes range from 0 to 5V. Choose TExxxHN transmitter with 0~5V input and 0~5V output. The module output signal is filtered by a circuit composed of R3 and C3 and then to the control system.

Component Dimensioning

The signal input impedance of the TExxxHN transmitter is  $>10M\ \Omega$ , and the typical value of R2 is  $10k\ \Omega$ . The resistance of R1 can be determined according to the amplitude of the input high voltage signal. The selection of R1 also needs to consider its power consumption and withstand voltage. To reduce the power consumption and withstand voltage requirements of the divider resistor R1, R1 can be composed of multiple resistors in series. R3 and C3 form a filter circuit, which filters the output signal of the module and can be valued according to the design requirements of the cut-off bandwidth. The typical value R3 is  $2k\ \Omega$ , and C3 is  $10nF$ .

4) Typical application of the product with ISO power output (Need to customize product with ISO power output)  
Typical application 3 — Isolated transmission for electrical signals

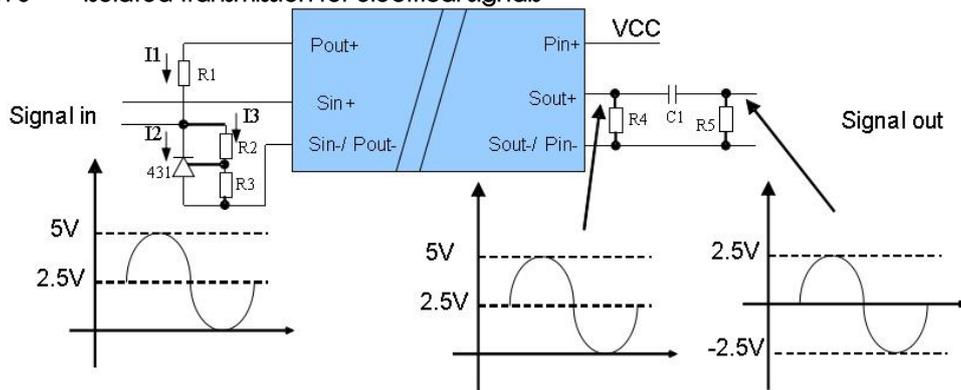


Fig. 5 Isolated transmission for electrical signals application

Functional Description

Per figure 5, "Signal in" (Sin+, Sin-) is detecting the electrical signal and "Signal out" (Sout+, Sout-) sends and transmits the now isolated electrical signal to the control system. VCC is the isolated power supply source provided from the control system. The typical power signal is a sine wave signal with positive and negative amplitude. Reference 431 combined with R1, R2 and R3 form the voltage stabilizing circuit of the system, which can realize the zero adjustment of the input signal. The amplifier of TExxxHN series module does the signal transmission function and the power supply function of voltage stabilizing circuit. Resistor network R4 and R5 with C1 are filtering the DC output signal.

How it Works

Supposing the detected signal is a 2.5V sine wave signal: When the input signal is passed through the stabilizing circuit which is composed of 431, R1, R2 and R3 network, the input signal of TExxxHN transmitter becomes a 0-5V sine wave signal. If the amplifier has 0-5V input and 0-5V output, the TExxxHN module transmitter output would be 0-5V sine wave signal at this time as well. After passing through the filter circuit that is realized by R4, R5 and C1, the DC component of 0-5V sine wave signal is filtered, and the resulting output is now a ±2.5V sine wave signal.

Parameter

In the application, the typical value of R2 and R3 is 5.1kΩ, and the reference voltage of 431 is 1.24V. The stable voltage of the composition is 2.5V (can be realized by parallel resistors beside R2 and R3), and the voltage accuracy can achieve various high-precision application requirements according to the accuracy of the resistance value. The value of R1 is determined by Pout and the regulated voltage circuit. It is necessary to ensure that the current I2 flowing through 431 is greater than the minimum operating current of 431. The current I1 flowing through R1 is not greater than the maximum output current (5mA) of the isolated output power supply. Typical value according to the formula  $\frac{P_{out} - 2.5V}{0.002A}$ . The typical resistor value range of R4 is between 2kΩ and 5kΩ. Because of the signal output voltage

being positive and negative, there will be a transmitter output signal reverse current phenomenon when the voltage signal output is negative. Therefore the value of R4 should be chosen as small as possible in order to reduce the influence of the reverse current, and C1 should have a low ESR (equivalent series resistor). Because C1 only passes through the AC and not the DC component of the signal, a ceramic capacitor with value of about 10uF or slightly more will normally suite the application. Capacitors with large a resistance and a small capacitance may distort the AC signal. The recommended value for R5 should be higher than 100kΩ, and it implements a DC signal to zero in the circuit. Increasing the value of R5 can make the time of the DC signal to zero longer, which also increases the startup time.

Note

Because the transmitter of TExxxHN series cannot be used with negative input voltage signals, the narrow signal voltage amplitude needs specific attention in order to have the necessary design margin. This way the signal distortion is minimized and the circuit can be working normally.

Typical application 4—Multi-channel voltage signal acquisition block diagram

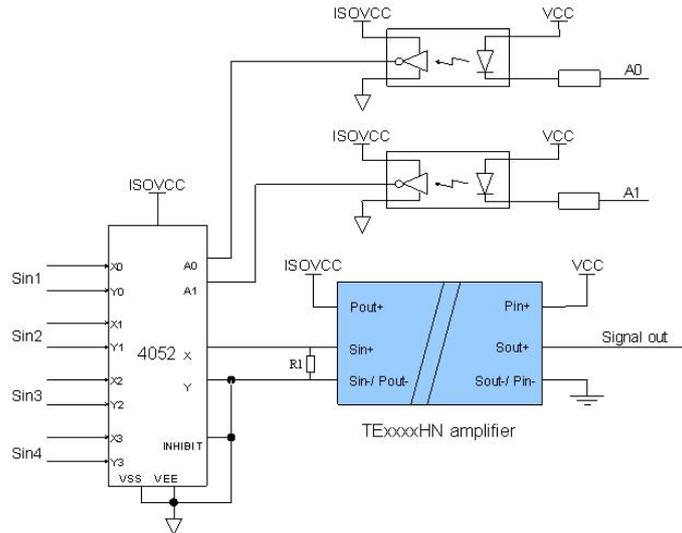


Fig. 6: Multi-channel signal acquisition circuit

Functional Description

In figure 6, "Sin1" to "Sin4" are external input voltage signals, "A0" and "A1" are strobe signals and signal out is an isolated, external input signal sent to the control system. The optocouplers in the circuit realize the isolated transmission of the strobe signals. The TExxxHN series amplifier isolates the transmitted signals as well as the power supplement from the 4052 multi-channel strobe chip, which carries out the selective transmission of multiplex signals.

How it Works

The control system sends out the strobe signal A0-A1. Optocouplers transfer isolated strobe signal to the multi-channel 4052 strobe chip, and control the chip's corresponding channels with the external Sin1-Sin4 signal input of the multi-channel 4052 strobe chip. After each strobe, the chip transfers the corresponding signal to the signal input of TExxxHN transmitter. TExxxHN transmitter outputs the isolated input signal to the control system, thus implementing the control system and the external signal isolation circuit. Input power to the TExxxHN transmitter and the input Vcc of strobe signal transmission circuit are both provided by the control system. Once the strobe signal is isolated, the transmission circuit and the multi-channel 4052 strobe chip power ports ISOVCC, both receive their power source from the power distribution output Pout+.

Note

When the input signal port is open circuit, if the output signal value need near 0, please connect a resistor R1 (R1 < 100k Ω ) in parallel at the signal input port of the model.

2. EMC compliance circuit

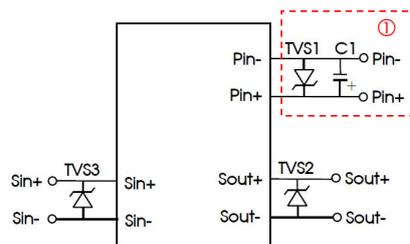


Fig. 7

Component	Recommended part, value
TVS1	SMCJ30A
C1	220uF/35V
TVS2	SMBJ6.5A
TVS3	SMBJ6.5A

3. Schematic diagram of signal input and signal output(Ideal state)

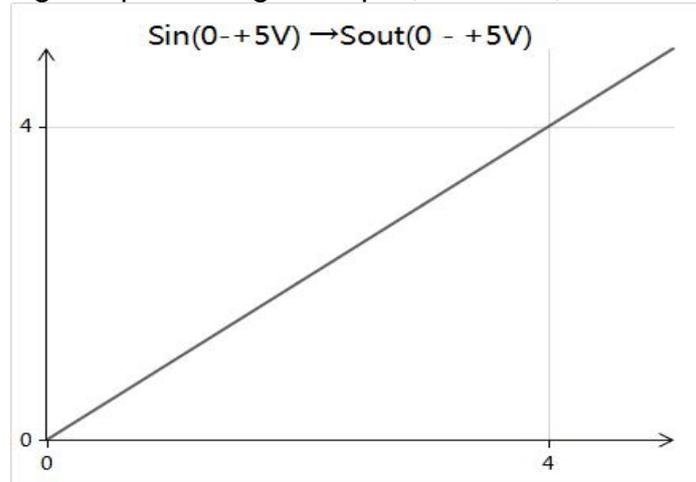
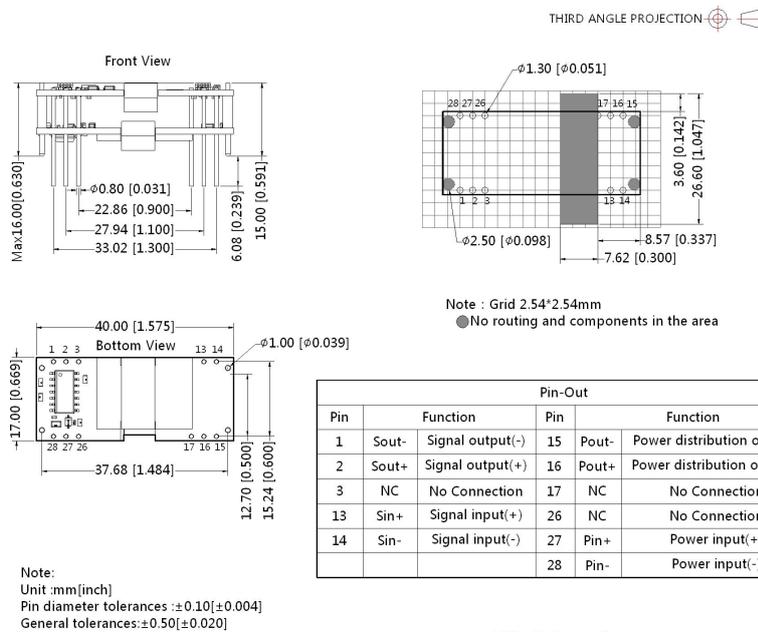


Fig. 8

4. For additional information please find the application notes on [www.mornsun-power.com](http://www.mornsun-power.com)

Dimensions and Recommended Layout



Notes:

1. For additional information on Product Packaging please refer to [www.mornsun-power.com](http://www.mornsun-power.com). The Packaging bag number: 58220005;
2. Unless otherwise specified, parameters in this datasheet were measured under the conditions of  $T_a=25^{\circ}\text{C}$ , humidity<75%RH with nominal input voltage and rated output load.
3. All index testing methods in this datasheet are based on company corporate standards;
4. The above are the performance indicators of the product models listed in this datasheet. Some indicators of non-standard models will exceed the above requirements. For details, please contact our technical staff;
5. Different product of the same model has different location of adjustment resistor;
6. The width of product based on the edge of PCB or magnetic core;
7. We can provide product customization service, please contact our technicians directly for specific information;
8. Products are related to laws and regulations: see "Features" and "EMC";
9. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.

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