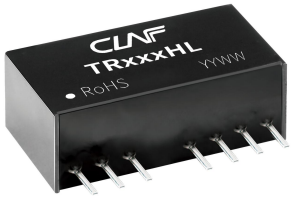
Descriptions

Signal conditioning module



RoHS

CE Report EN62368-1

UKCA Report BS EN62368-1

Features

- Two-wire self-powered signal conditioning module with HART transmitter
- Loop power collection
- High accuracy of 0.1% Full Scale
- High linearity of 0.1% Full Scale
- High isolation test voltage of 2kVAC (60s/1mA)
- Small SIP9 size measuring 26 x 9.5 x 12.5mm
- Extremely low temperature coefficient of 50PPM/℃
- Operating ambient temperature range -40℃ to +85℃
- HART compatible

Applications

- Industrial control
- Instruments
- Communication

Selection Guide

Certification	Part No.	Loop powered voltage (VDC)	Input Signal(VDC)	Output Signal(mA)	Isolated Power Output (VDC)
EN/BS EN	TR797HL	15-24	0-2.5	3.7-22	3.3
	TR747HL	10-24	0-2.5	3.7-22	3.3

Specifications

Product Specifications	Item		Operating Conditions	Value
Input Specifications	POWER INPUT	LOOP POWER SUPPLY		SEE SELECTION GUIDE
		MAX. SUPPLY VOLTAGE		30V (PROLONGED OPERATION WITH 30V UNDER NO-LOAD CONDITION MAY CAUSE
	SIGNAL INPUT	INPUT SIGNAL		SEE SELECTION GUIDE
		INPUT IMPEDANCE		≥10MΩ

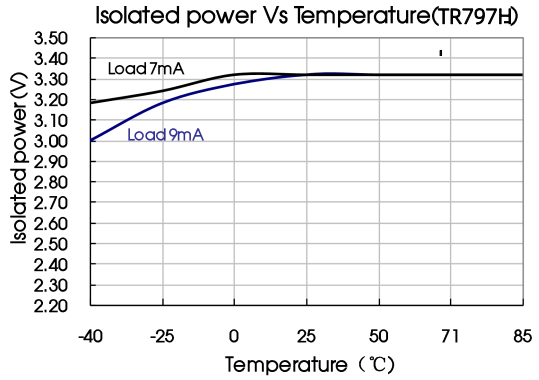
		OVERLOAD			≤5V
Output Specifications	ISOLATED POWER OUTPUT	OUTPUT VOLTAGE			SEE SELECTION GUIDE
		OUTPUT VOLTAGE ACCURACY	TA=25℃		NOMINAL ±3%
		MAX. LOAD CURRENT	TA=25℃, LOOP CURRENT 4MA	TR797HL	9MA
				TR747HL	4MA
		SHORT CIRCUIT PROTECTION			CONTINUOUS, AUTO-RECOVERY
	SIGNAL OUTPUT	OUTPUT SIGNAL			SEE SELECTION GUIDE
		LOAD CAPACITY	TR797HL		RL≤(VIN-15)/0.022Ω, VIN = SUPPLY
			TR747HL		RL≤(VIN-10)/0.022Ω, VIN = SUPPLY
		LOAD REGULATION	24V POWER SUPPLY, 0-250Ω LOAD		≤0.05% FULL SCALE/100Ω
		RIPPLE & NOISE	250Ω/0.01MF LOAD		VP-P ≤30MV @ BANDWIDTH 20MHZ
Transmission Specifications	ZERO OFFSET				0.1% FULL SCALE
	TRANSMISSION ERROR				0.1% FULL SCALE
	TEMPERATURE COEFFICIENT		OPERATING TEMPERATURE RANGE OF -40℃ TO +85℃		≤50PPM/℃
	COMMUNICATION		VPP ≤250MV		SUPPORTS BI-DIRECTIONAL TRANSMISSION OF HART SIGNAL FREQUENCY
	HART SIGNAL TRANSMISSION GAIN		HART ACCEPT THE VOLTAGE GAIN		0.8-1.0
			HART SIGNAL EMISSION CURRENT PEAK-PEAK,		＞1MA
General Specifications	ELECTRIC ISOLATION				TWO-TERMINAL (INPUT TO OUTPUT)
	ISOLATION TEST		ELECTRIC STRENGTH TEST FOR 1 MINUTE WITH A LEAKAGE CURRENT <1MA, HUMIDITY		2.0KVAC
	INSULATION RESISTANCE		AT 500VDC		≥100MΩ
	OPERATING TEMPERATURE				-40℃ TO +85℃
	TRANSPORTATION AND STORAGE TEMPERATURE				-50℃ TO +105℃
	MAXIMUM CASE TEMPERATURE		TA=25℃, 24V POWER SUPPLY, 250Ω LOAD		≤50℃
	SAFETY STANDARD				EN62368-1 (REPORT)
	SAFETY CLASS				CLASS III
	APPLICATION ENVIRONMENT				THE PRESENCE OF DUST, SEVERE VIBRATION, SHOCK AND CORROSIVE GAS MAY CAUSE DAMAGE TO THE PRODUCT.
Mechanical Specifications	CASE MATERIAL		BLACK PLASTIC, FLAME-RETARDANT HEAT- RESISTANT		
	PACKAGE		SIP9		

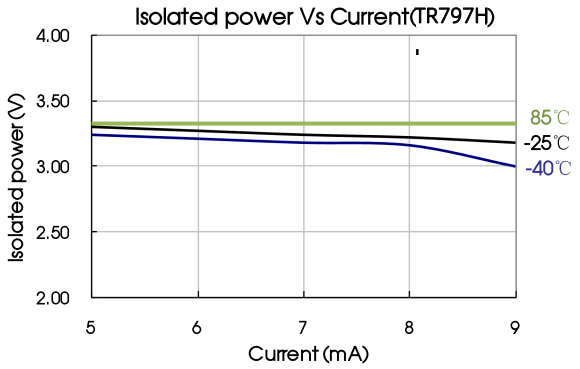
	WEIGHT	8.0G(TYP.)
	COOLING	FREE CONVECTION

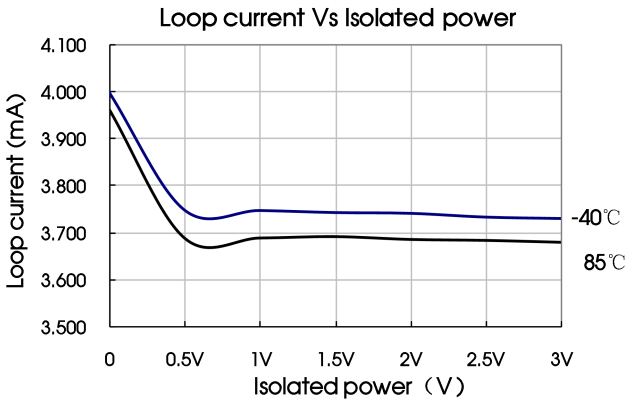
Electromagnetic Compatibility (EMC)

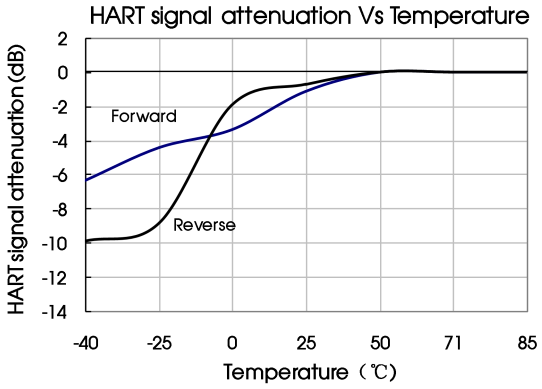
Immunity	ESD	IEC/EN61000-4-2	CONTACT ±4KV	PERF. CRITERIA B
	RS	IEC/EN61000-4-3	3V/M	PERF. CRITERIA A
	EFT	IEC/EN61000-4-4	TWO-WIRE LOOP PORT ±2KV (SEE FIG. 5 FOR RECOMMENDED	PERF. CRITERIA B
	SURGE	IEC/EN61000-4-5	TWO-WIRE LOOP PORT ±1KV (SEE FIG. 5 FOR RECOMMENDED	PERF. CRITERIA B
	CS	IEC/EN61000-4-6	3 VR.M.S	PERF. CRITERIA A

Characteristic Curve









Note: ①The all test results is typical curves, and tested under the 4mA loop current;
②Forward: Two-wire loop to device direction; Reverse: Device to Two-wire loop direction.

Application Precautions

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

After-sales service

1. 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;
2. 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.

Design Reference

1. Typical application

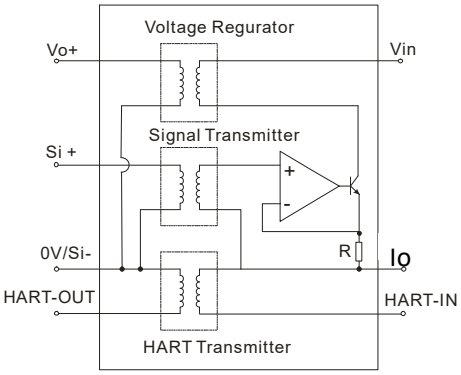


Fig. 1 signal conditioning module functional diagram

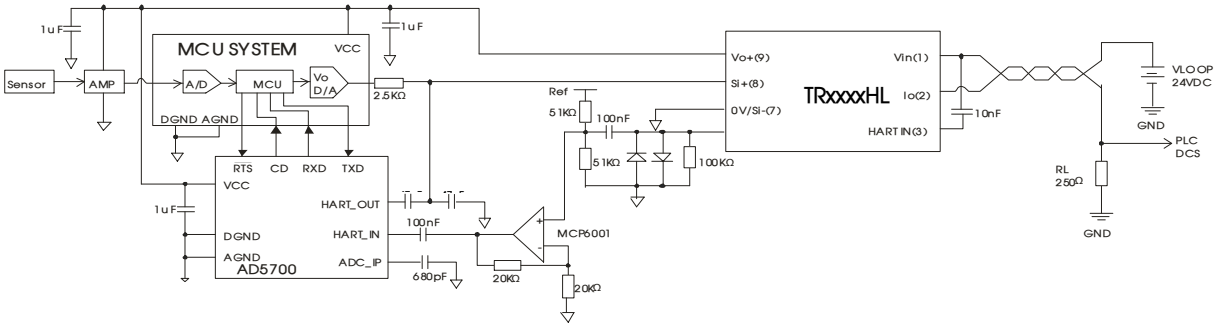


Fig. 2 field area HART communication application

Functional Description

Figure 2 shows a typical application of the TRxxxxHL Signal conditioning module. MCU system, HART modem IC AD5700 and the Signal conditioning module TRxxxxHL work together to establish the communication between smart field devices and control systems.

How it Works

As figure 2, the signal conditioning module taking energy from the output current Loop to supply its internal dissipation, at the same time, it could provide one isolated power Vo+, for the MCU system and the other smart field devices. The Analog signal comes from sensor, after the AMP module, it is received by the MCU system, when the signal is output from the MCU system, it should be a voltage signal that match with the Signal conditioning module TRxxxxHL at the range of voltage, at last, the voltage signal is converted to standard 3.7-22mA signal within the two-wire current loop.

HART send: the signal conditioning module TRxxxxHL didn't provides a single channel for HART signal transmitting from field area to control systems, but a common channel with analog signal. With a few external components, the signal which come from MCU, is modulated and added into the analog signal, and they will be send to control systems together. The peak voltage of HART signal must be consider before communication, the peak voltage of the Hart Signal that output by AD5700 is too high to match the range of TRxxxxHL(500mV typically, see the datasheet of AD5700 for details), two external capacities of 47nF and a resistance of 2.5K is recommended to drop Voltage.

HART detect: Working with a external 10μF capacity, TRxxxxHL can detect HART signal which is contained in the two-wire loop-circuit by the HART_IN PIN(PIN 3). After the condition of TRxxxxHL, HART signa has been Transmitted to field area, at last, HART signal is demodulated by IC AD5700, for the reading of MCU. By the way, HART signal could not be demodulated by IC AD5700 if its amplitude is lower then the value of specification (100mV typically, see the datasheet of AD5700 for details). In this condition, the peak voltage of HART signal which is send by control system should be upgraded.

The hole system which shown in Fig.2, provides a solution for the Transmitting of the sensor signal to the 3.7-22mA standard current signal and the HART communicating between smart field devices and control systems, what's more, all the connections between field area and control area are only two analog wires, therefore, lower cost for systems is possible. In the control systems, a resistor RL should be concluded for the detecting of common instruments. If the function of HART communicating is not necessary, please remove the HART modem IC A5700 in the system, and do not connect the HART_IN PIN and HART_OUT PIN of TRxxxxHL into any circuits.

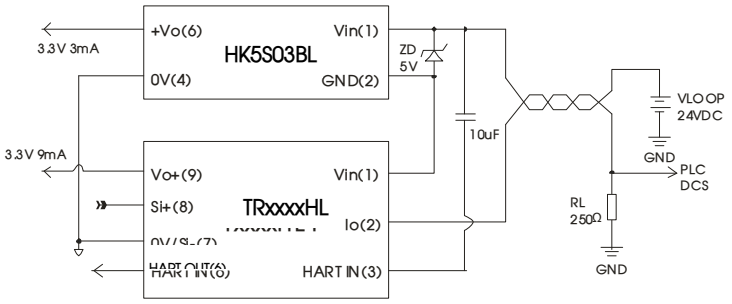


Fig. 3 Power capacity expansion program of field area

Functional Description

Figure 3 shows another typical application of a TRxxxxHL module for expanding power supply to field area, a power module HK5S03BL is being added into the system. The TRxxxxHL's power supply capacity of 3mA is being extended to 12mA just by adding the HK5S03BL module.

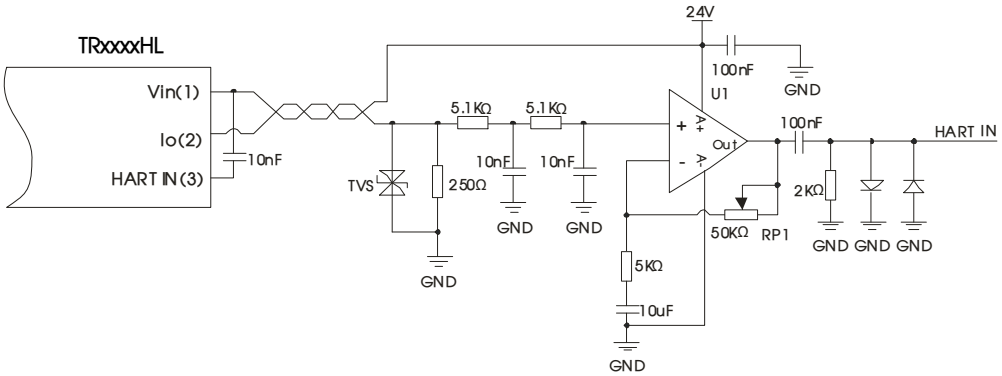


Fig. 4 HART signal amplification method

Functional Description

Figure HART host communication signal amplification circuit, is designed to solve the problem of HART signal attenuation in long cable transmission application.

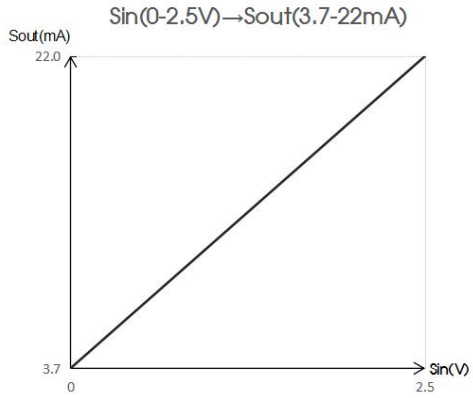
How it Works

The analog signal conversion: the use of a 250Ω resistor current signal into a voltage signal. TVS protection port, recommend using 12V or 15V TVS.

HART receives the signal filtering, amplification and limiting: HART current signal in the 250Ω resistor is converted to voltage signal , through low pass filter, the filter cut-off frequency is about 2.5KHz, filter the high frequency noise, keep the analog signal as a DC offset signal

amplification. After filtering, HART signal through AC amplifying circuit, the AC gain can be adjusted by adjusting the RP1, the adjusting range is 1-11 times. Next, through a high pass filter, filter out the DC offset and low frequency interference, the cut-off frequency is about 800Hz. Finally the two diodes and achieve the limit, the voltage limit at ±0.7V, protect AD5700 port.

2. Signal input and output correspondence diagram(Ideal state)



3. EMC compliance, recommended circuit

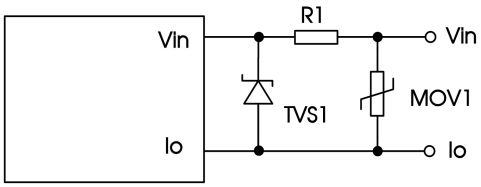
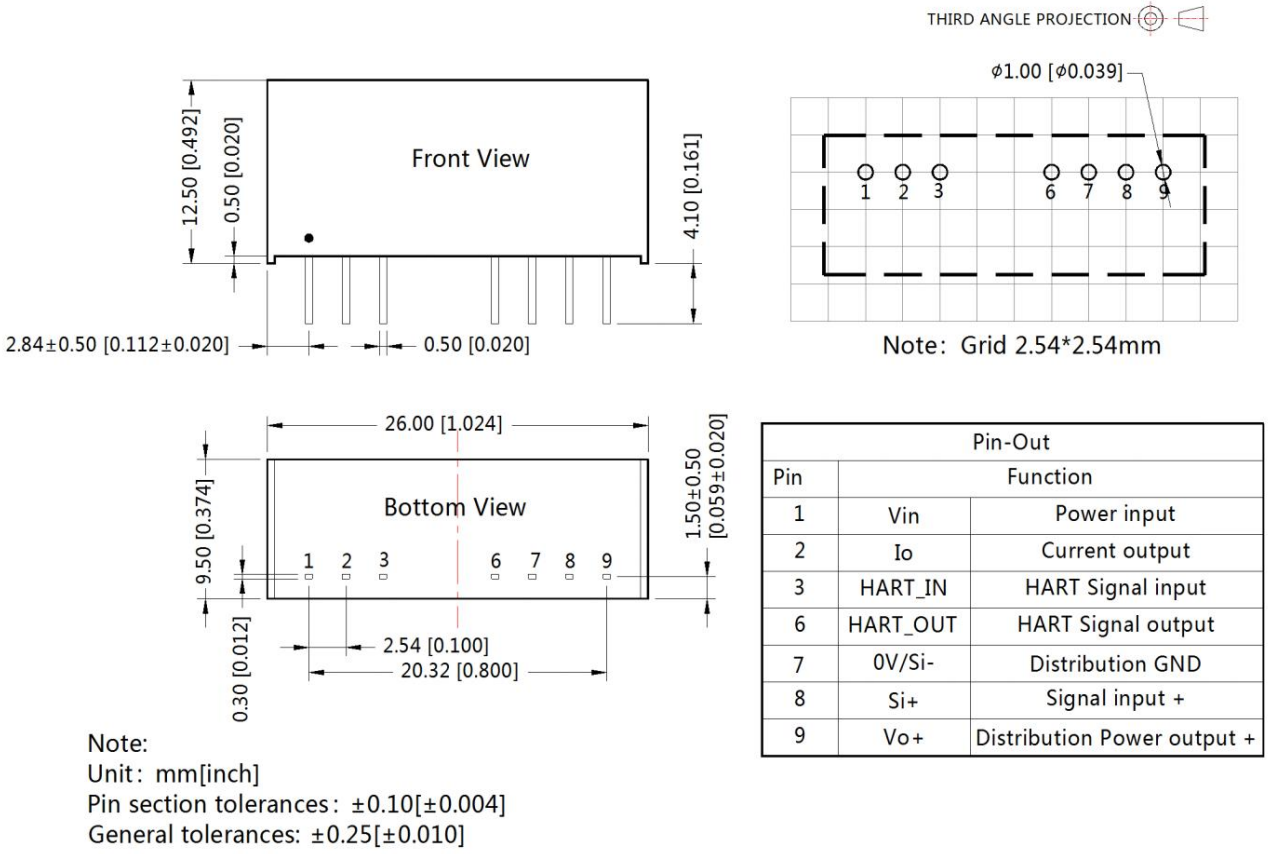


Fig. 5

Component	Recommended part, value
MOV1	7D470k
R1	12Ω/2W
TVS1	SMCJ30A

Dimensions and Recommended Layout



Pin-Out		
Pin	Function	
1	Vin	Power input
2	Io	Current output
3	HART_IN	HART Signal input
6	HART_OUT	HART Signal output
7	0V/Si-	Distribution GND
8	Si+	Signal input +
9	Vo+	Distribution Power output +

Note:
Unit: mm[inch]
Pin section tolerances: ±0.10[±0.004]
General tolerances: ±0.25[±0.010]

Notes:

1. Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta=25℃, humidity<75%RH with nominal input voltage and rated output load;
2. All index testing methods in this datasheet are based on company corporate standards;
3. 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;
4. Products are related to laws and regulations: see "Features" and "EMC";
5. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.