

Single output, specially designed for application of intelligent passive transmitter



Patent Protection RoHS

FEATURES

- Applied to the loop to take power occasion
- High efficiency, Low power consumption
- Isolation voltage: 1K VDC
- Excellent temperature performance
- Natural air Cooled
- International standard pin-out
- Anti-flaming Packaging,UL94-V0 Compliant

HK series of products are mainly used in applications of two-wire signal and HART transmission, to solve a series of problems due to the ground potential difference during the transmission application of them caused by different ground loops, such as, the signal transmission errors around 4~20mA, followed by the interruption of HART communication or damage to equipment port device. HK series adopts the loop way to take power, and compensates transmission errors caused by electric potential difference, so as to ensure the accuracy of the communication transmission.

Selection Guide

Part No.	Input Voltage (VDC)	Output		Max. Capacitive Load(μF)
	Nominal(Range)	Output Voltage(VDC)	Output Current (mA)(Max.)	
HK3S03B	3.3	3.3	3.0	10
HK5S03B	5	3.3	3.2	
HK5S05B	5	5	2.0	
HK5S03BV	5	3.3	3.0	
HK8S03B	7.5	3.3	3.5	
HK8SX3B	7.5	3	5.0	
HK8S05B	7.5	5	3.5	

Input Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Input Current (full load / no-load)	3.3V input		--	4-20/1	--	mA
	5V input	HK5S03BV	--	3.5-22/1	--	
		Others	--	4-20/1	--	
	7.5V input		--	4-20/1	--	
Surge Voltage (1sec. max.)	3.3V input		-0.7	--	5	VDC
	5V input		-0.7	--	9	
	7.5V input		-0.7	--	18	
Reflected Ripple Current			--	15	--	mA
Input Filter			Capacitor filter			

Output Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Line Regulation	Input voltage change: ±1%	HK8S05IB	--	--	±0.25	%
		Others	--	--	±1.2	--
Load Regulation	10%-100% load	3VDC output	--	15	--	%
		3.3VDC output	--	15	--	
		HK5S05B	--	12	--	
		HK8S05IB	--	--	±1.5	
Ripple & Noise*	20MHz bandwidth		--	30	--	mVp-p
Temperature Drift Coefficient	100% load		--	--	±0.03	%/℃

Note: * Ripple and noise tested with "parallel cable" method, please see DC-DC Converter Application Notes for specific operation methods.

General Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Isolation Voltage	Input-output, with the test time of 1 minute and the leak current lower than 1mA	HK3S03B	1500	--	--	VDC
		Others	1000	--	--	
Isolation Resistance	Input-output, isolation voltage 500VDC		1000	--	--	MΩ
Operating Temperature	Derating if the temperature ≥85℃(see Fig. 1)		-40	--	85	℃
Storage Temperature			-50	--	125	
Casing Temperature Rise	Ta=25℃		--	25	--	
Pin Welding Resistance Temperature	Welding spot is 1.5mm away from the casing, 10 seconds		--	--	300	
Storage Humidity	Non-condensing		--	--	95	%
Switching Frequency	100% load, nominal input voltage		--	100	300	KHz
MTBF	MIL-HDFK-217F@25℃		3500	--	--	K hours

Physical Specifications

Casing Material	Plastic (UL94-V0)	
Package Dimensions	Refer to Dimensions and Recommended Layout	
Weight	HK5S03BV/Others	2.9g/2.1g (Typ.)
Cooling Method	Free air convection	

Product Characteristic Curve

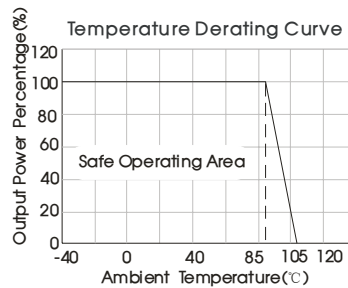


Fig. 1

Design Reference

1. Ground Loop Problem In Signal Transmission And Ground Electric Potential Difference

There are many reasons causing ground loop problem in instrument circuit. When the signal transmission and receiving devices connected to a different location or of different power supplies, it will lead to ground loop, and it is common in long cable transmission. Most of the reason is that the equipment of the metal shell had physical contact with the ground. Ground loop produces electric circuit, and form error sources.

Because the accuracy of the signal can not be measured through simple observation in the receiving end of the signal, the land circulation for different ground potential will bring error that can't be detected to signal loop. There is also a signal error problem caused by ground loop in the absence of two-wire signal isolation transmission. Signals like lightning signal and surge signal will load on the signal line along with long wire, and damage modulation and detection devices on the port. In another case, two components of the different potential port may lead to the port voltage exceeding, and damage the device port subsequently.

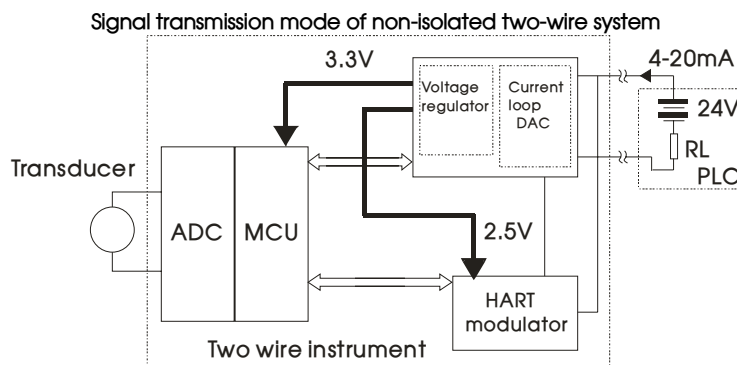


Fig. 2

In the circuit of fig. 2, Sensor signal is converted into digital signals through the ADC, then sent to the current loop DAC and HART modulator through MCU, form 4~20 mA signal output. Current loop DAC takes electricity from the PLC bus of output 4~20 mA, output 3.3 V and 2.5 V through the built-in voltage regulator, supply a small amount of power for MCU and HART modulator.

In the transmission of fig. 2, there are ground electric potential differences between two-wire system instrument and PLC on the far side, introducing the common mode interference. The disturbance causes the transmission error of 4~20 mA, and affects the normal communication HART bus. If the common mode interference is too large (over the voltage range of the components in the common-mode), it may cause damage in the internal instrument of two wire devices.

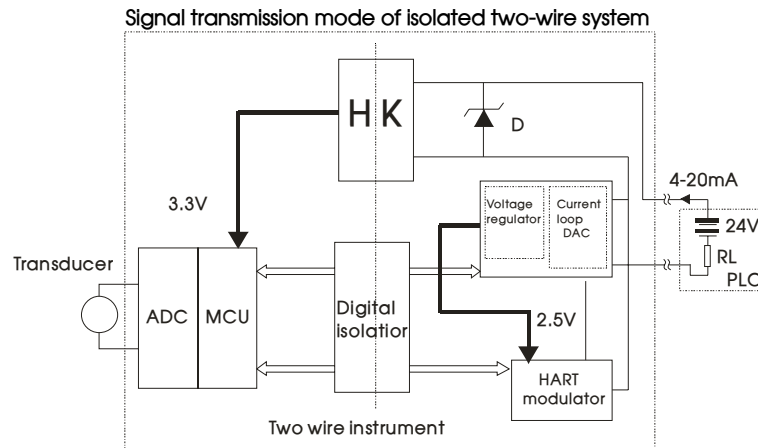


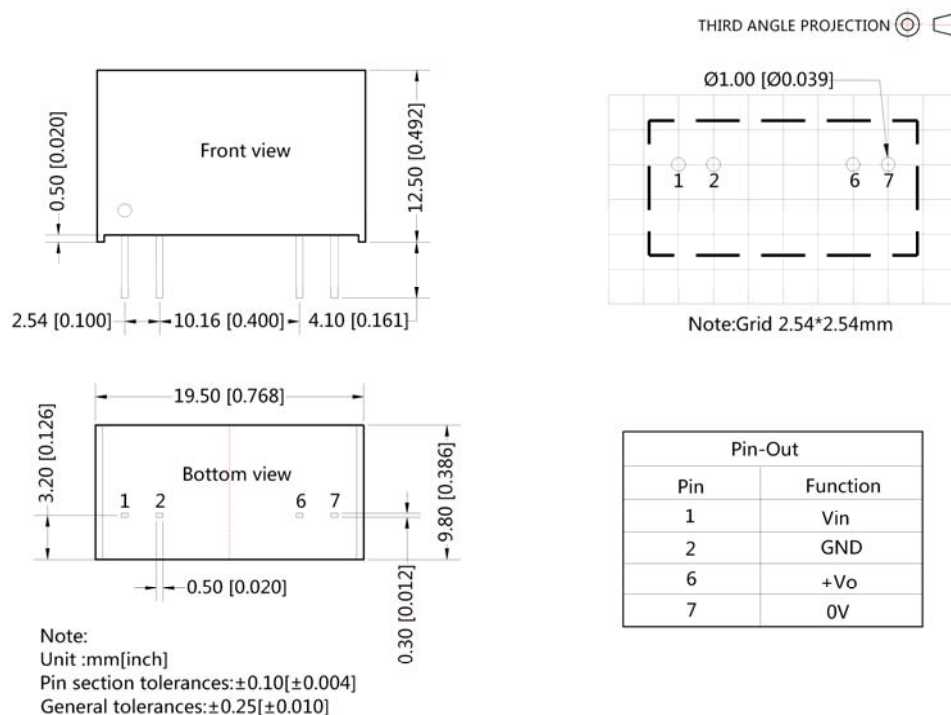
Fig. 3

Due to the potential risks based on the different ground, you can isolate the MCU and the current loop DAC and HART modulator by digital isolation. Current loop DAC and HART modulator is floating form. They make the high impedance formed to two ground potential between two-wire instrument and PLC system, reduce the loop current between the ground wire, and electrical isolation between two devices, so as to eliminate the hidden trouble of common mode interference.

The two-wire instrument goes without additional power supply port. The power supply takes power through the 4-20mA loop. After the isolation mode, 2.5V power of HART modulator is still formed from the built-in voltage regulator of loop DAC regulator, but the power supply for the 3.3V MCU system is a difficult problem. A better solution is to connect with a voltage stabilizing diode in the 4-20mA circuit as shown in Fig.3. Then you can use HK module of MORNSUN to isolated and output 3.3V power to the MCU power system. Using the HK module and digital isolation circuit made by MORNSUN, you can realize the electrical isolation of two-wire instrument and PLC system .It avoids the measuring error of the system and damaging equipment caused by ground potential, and it further enhances the reliability of the system.

4. For more information please find the application notes on www.mornsun-power.com

Dimensions and Recommended Layout(HK5S03BV)



The mechanical drawing shows the Front and Bottom views of the PCB. The Front View shows a rectangular board with a width of 10.16 mm [0.400] and a height of 4.10 mm [0.161]. The Bottom View shows a rectangular board with a width of 19.65 mm [0.774] and a height of 6.00 mm [0.236]. The pin locations are marked with dimensions: 2.54 mm [0.100] between pins 1 and 2, 10.16 mm [0.400] between pins 2 and 4, and 0.90 mm [0.035] between pins 4 and 6. The pin pitch is 2.54 mm [0.100]. The pin diameter is 1.00 mm [0.039].

Note: Grid 2.54*2.54mm

Pin-Out	
Pin	Function
1	Vin
2	GND
4	0V
6	+Vo

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