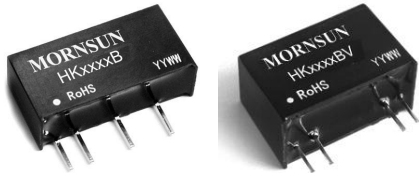


MORNSUN®

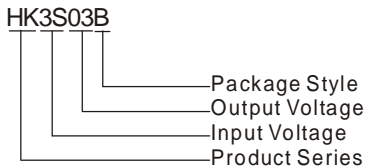
HK SERIES

**SINGLE OUTPUT, SPECIALLY DESIGNED
FOR APPLICATION OF INTELLIGENT
PASSIVE TRANSMITTER**



Patent Protected RoHS

PART NUMBER SYSTEM



FEATURES

- | Applied to the loop to take power occasion
- | High efficiency, Low power consumption
- | 1000VDC isolation
- | Excellent temperature performance
- | Natural air Cooled
- | Industrial standard pin-out
- | Anti-flaming Packaging, UL94-V0 Compliant

APPLICATION

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

Model Number	Input Voltage (VDC)	Output Voltage (VDC)	Output Current (mA)	Input Current (mA)(Typ.)		Reflection Ripple Current (mA, Typ.)	Max. Capacitor Load (µF)
	Nominal			@ Max. load	@ No load		
*HK3S03B	3.3	3.3	3.0	4-20	1	15	10
HK5S03B	5	3.3	3.2	4-20	1	15	10
HK5S05B	5	5	2.0	4-20	1	15	10
HK5S03BV	5	3.3	3.0	3.5-22	1	15	10
HK8S03B	7.5	3.3	3.5	4-20	1	15	10
HK8SX3B	7.5	3	5.0	4-20	1	15	10
HK8S05IB	7.5	5	3.5	4-20	1	15	10

* Designing

INPUT SPECIFICATIONS

Item	Test Conditions	Min.	Typ.	Max.	Unit
Input Surge Voltage (1sec.max.)	3.3VDC input	-0.7	--	5	VDC
	5VDC input	-0.7	--	9	
	7.5VDC input	-0.7	--	18	
Input Filter		Capacitance Filter			

OUTPUT SPECIFICATIONS

Item	Test Conditions	Min.	Typ.	Max.	Unit	
Line Regulation	For Vin change of ±1%	HK8S05IB	--	--	±0.25	%
		Others	--	--	±1.2	
Load Regulation	10% to 100% load	3VDC output	--	15	--	
		3.3VDC output	--	15	--	
		HK5S05B	--	12	--	
		HK8S05IB	--	--	±1.5	
Temperature Drift	100% load	--	--	±0.03	%/°C	

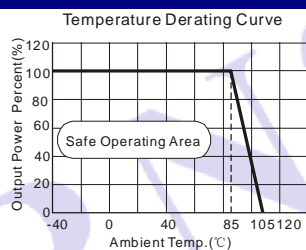
COMMON SPECIFICATIONS

Item	Test Conditions	Min.	Typ.	Max.	Unit
Isolation Voltage	Input-Output, tested for 1 minute and leakage current less than 1 mA	1000	--	--	VDC
Isolation Resistance	Input-Output, test at 500VDC	1000	--	--	MΩ
Switching Frequency	100% load, Input voltage range	--	100	300	KHz
MTBF	MIL-HDFK-217F@25 °C	3500	--	--	K hours
Case Material		Plastic (UL94-V0)			
Weight	HK5S03BV	--	2.9	--	g
	Others	--	2.1	--	

ENVIRONMENTAL SPECIFICATIONS

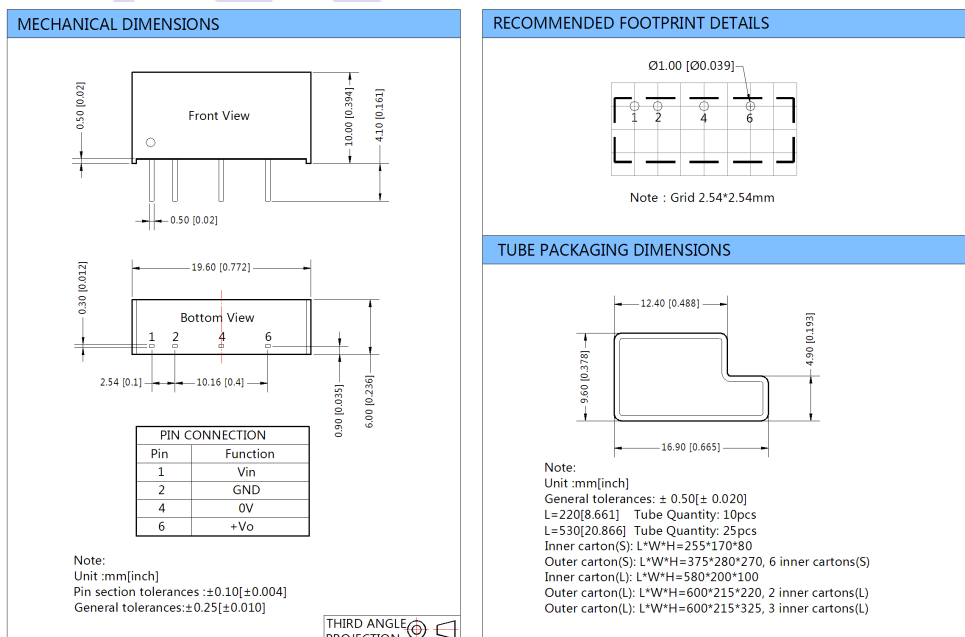
Item	Test Conditions	Min.	Typ.	Max.	Unit
Item	Non condensing	--	--	95	%
Storage Humidity		-40	--	85	°C
Operating Temperature		-50	--	125	
Storage Temperature	Ta=25 °C	--	25	--	
Temp. rise at full load	1.5mm from case for 10 seconds	--	--	300	
Lead Temperature		Free air convection			

PRODUCT TYPICAL CURVE

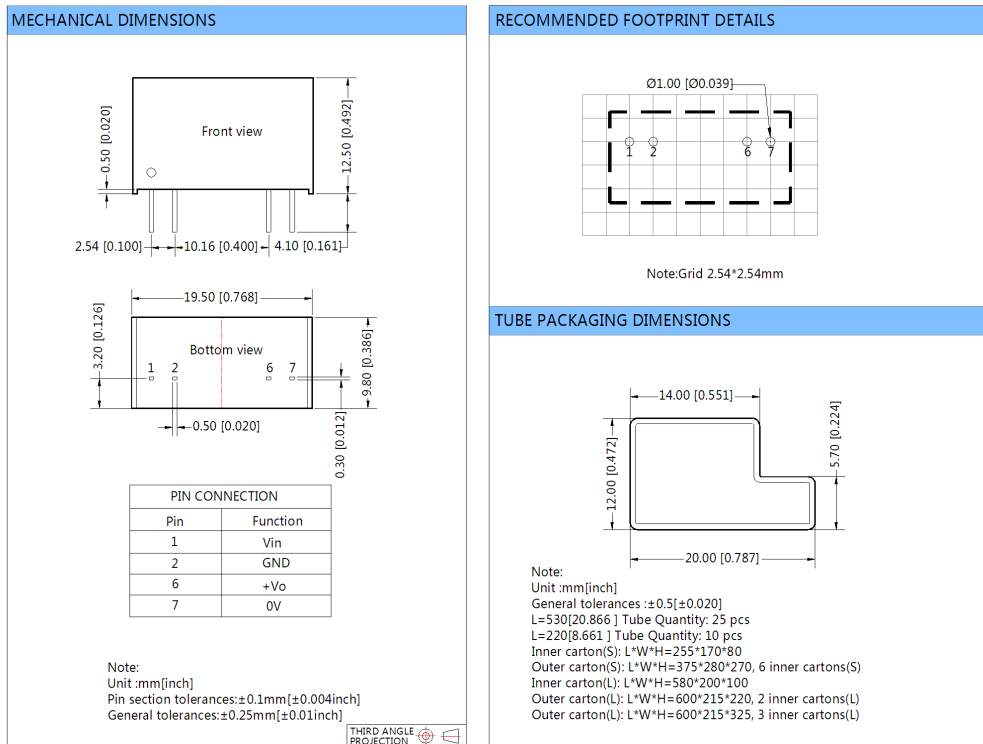


(Figure 1)

DIMENSIONS, RECOMMENDED FOOTPRINT & PACKAGING



(Figure 2)



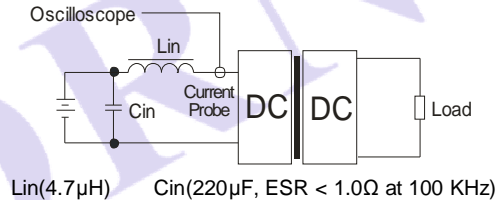
(Figure 3)

Note: 1. Figure 2 applies to HK5S03B, HK5S05B, HK8S03B, HK8SX3B, HK8S05IB, HK3S03B;
2. Figure 3 applies to HK5S03BV.

TEST CONFIGURATIONS

Input Reflected-Ripple Current Test Setup

Input reflected-ripple current is measured with an inductor L_{in} and Capacitor C_{in} to simulate source impedance.



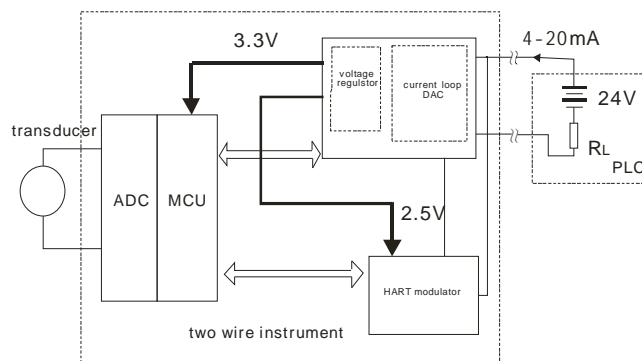
DESIGN REFERENCE

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.

Signal transmission mode of non-isolated two-wire system

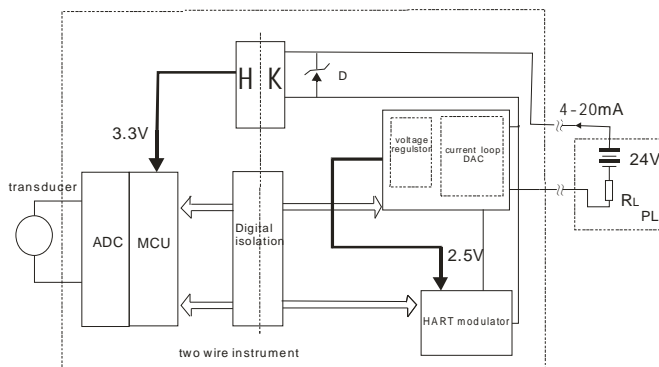


(Figure 4)

In the circuit of figure 4, 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 figure 4, 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.

Signal transmission mode of isolated two-wire system



(Figure 5)

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 Figure 5. 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.

Note:

1. Operation under minimum load will not damage the converter; However, they may not meet all specifications.
2. Max. Capacitive Load is tested at nominal input voltage and full load.
3. Unless otherwise noted, All specifications are measured at Ta=25°C, humidity<75%, nominal input voltage and rated output load.
4. In this datasheet, all test methods are based on our corporate standards.
5. All characteristics are for listed models, and non-standard models may perform differently. Please contact our technical support for more detail.
6. Please contact our technical support for any specific requirement.
7. Specifications of this product are subject to changes without prior notice.

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