Application of Optocoupler Module 6N135

Huibin Fu [a], Wenbei Liu [b] and Xiangmei Du [c]

School of Shandong University of Science and Technology, Shandong 266000, China.

[a]imasmallfish@163.com, [b]1273179928@qq.com, [c]879864874@qq.com

Abstract

This article describes the performance and principles of high-speed opto-isolated 6N135, as well as their drive circuits and considerations during operation.

Keywords

Optocoupler module,6n135 , hardware.

1. Introduction

Opts-isolator is a kind of device that separates voltage impact and electromagnetic interference in SCM application system. It integrates light-emitting device and photo-sensing device to realize coupling through light, and constitutes a device that converts electricity to light and electricity. Because of the input of photoelectric isolator the connection between John and John is achieved through the "light" link, which can achieve better electrical isolation. 6N135 is a speed-shifting optoelectronic isolator, suitable for applications requiring high data transmission speeds.

The main components of the optocoupler are the light emitting device and the photosensitive device. The light emitting device is generally an IRLED, and the light receiving device includes a photodiode, a phototransistor, a Darlington tube, and an optical integrated circuit. In a high frequency switching power supply, the light is the response speed of the coupling is required to be very high, so the high-speed type with faster response as shown in the figure is generally used, and the delay time is within 500nS. For the transmission of analog signals or DC signals, linear opt couplers should be used to reduce distortion, and when digital switching signals are transmitted, their linearity requirements are less stringent.

2. Advantages and Disadvantages

2.1 Advantages

1) Duty cycle adjustable;

2) High isolation pressure;

3) strong anti-interference ability, the current with a static shielding optocoupler is easy to buy, strong and weak electricity between the isolation performance is very good, in addition, the optocoupler is a current-type device, the voltage noise can be effectively suppressed;

4) The transmission signal ranges from DC to several MHz, where the linear optocoupler is especially suitable for signal feedback.

2.2 Disadvantages

1) In a full-bridge topology, there are four switching devices and 3-4 optocouplers. Each optocoupler needs an independent power supply, which increases the complexity of the circuit, increases the cost, and reduces the reliability.

2) Due to the large delay of optocoupler transmission, in order to ensure the accuracy of turn-on and turn-off of the switching device, the structural parameters of each channel must be consistent, so that the delay of each channel is consistent, and this is often difficult to do well;

3) The optocoupler's switching speed is slower, which causes greater delays on the leading and trailing edges of the driving pulse, which affects the control accuracy.

Features

2.3 Features

1) High speed-1 MBit/s
2) Superior CMR-10 kV/μs
3) Dual-Channel HCPL-2530/HCPL-2531
4) Double working voltage-480V RMS
5) CTR guaranteed 0-70°C
6) U.L. recognized (File # E90700)

2.4 Description

The HCPL-4502/HCPL-2503, 6N135/6 and HCPL-2530/HCPL-2531 optocouplers consist of an AlGaAs LED optically coupled to a high speed photodetector transistor.

A separate connection for the bias of the photodiode improves the speed by several orders of magnitude over conventional phototransistor optocouplers by reducing the base-collector capacitance of the input transistor.

An internal noise shield provides superior common mode rejection of 10kV/μs. An improved package allows superior insulation permitting a 480 V working voltage compared to industry standard of 220 V.

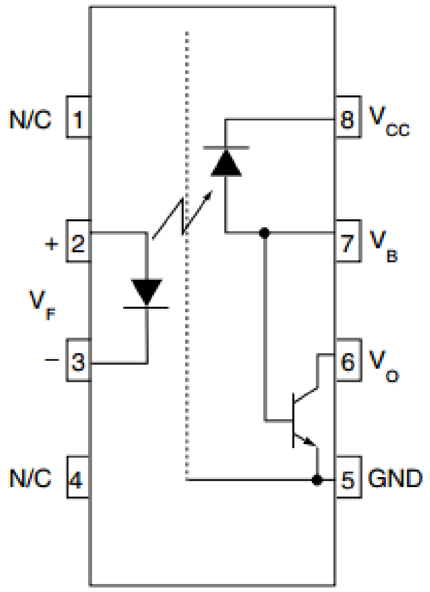

Figure 1. 6N135 structural schematic

6N135 structure of the schematic diagram shown in Figure3.l, the signal from the feet 2 feet 3 Han, light-emitting diodes are lit, from the on-chip light channel to the output side of the photodiode, reverse biased photodiode conduction, the current one After the voltage conversion, it is sent to the base of the triode and the triode is turned on. After the triode is reversed, the optoisolator outputs low level, and vice versa. Triodes in opto-isolators function as amplification and output.

3. Instructions

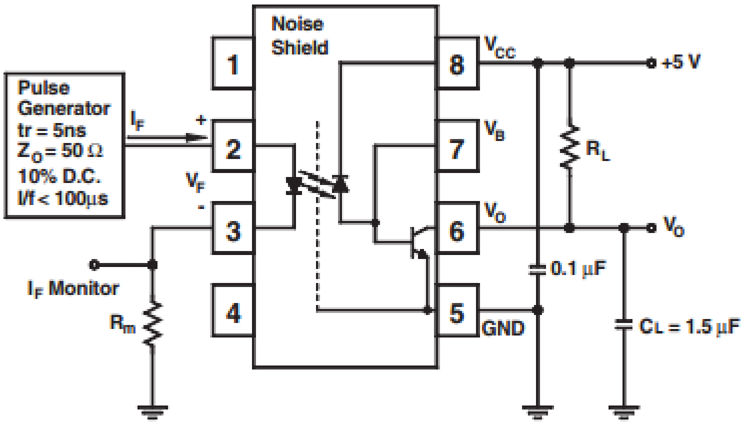

Figure 2. Test Circuit for 6N135

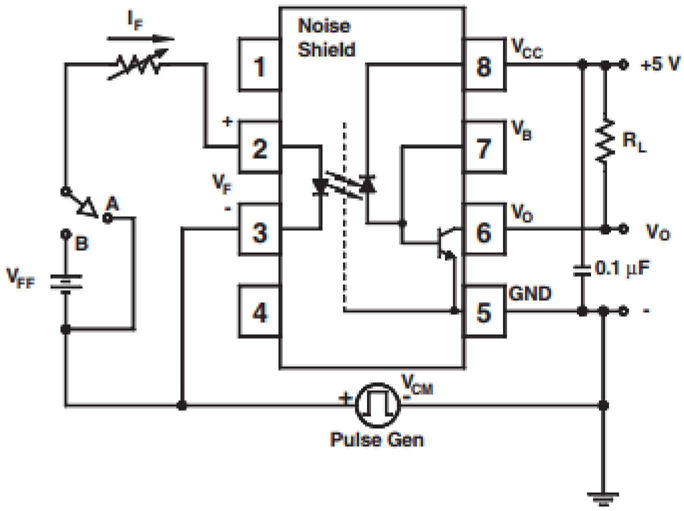

Figure 3. Test circuit for 6N135

The use of the isolator is shown in Figure 4.1. It is assumed that the input belongs to module 1 and the output belongs to module 2. Inputs are A, B two kinds of connection, respectively, reversed or in-phase logic transmission, where R is a current limiting resistor. The forward current of the light emitting diode O is 250μA, and the photodiode is not conductive; the forward voltage drop of the light emitting diode is 1.2-1.7V, the forward current is 6.5-15mA, and the photodiode is turned on. If connected by B method, TTL level input, when V is 5V, R can be selected around 500Ω. If the current limiting resistor or resistance is small, 6N137 can still work, but the light-emitting diode conduction current is very large, and it has a greater impact on V, especially when the digital waveform is steep, the spectrum of rising and falling edges is very wide. It will cause considerable spike noise, and usually the printed circuit board's distributed inductance will not absorb this noise from the ground. Its peak value can reach more than 100mV, enough to make the analog circuit self-excitation, A/D can not work properly. So, if possible, R should be as large as possible. The output is powered by module 2. V=4.6 to 5.5V. A 0.1μF capacitor with good high-frequency characteristics, such as porcelain dielectric or tantalum capacitor, must be connected between Vcc (pin 8) and ground (pin 5), and should be placed near feet 5 and 8 as much as possible. This capacitor can absorb the ripple on the power line, and it can also reduce the impact on the power supply when the photoelectric isolator receives the switch operation. Pin 7 is the enable terminal. When it is at 0-0.8V, it allows the receiver to work. When it is at 2.0V-Vcc, the output is forced high. Pin 6 is an open-collector output, usually with a pull-up resistor RL. Although the output current can sink up to 13mA, it should be selected according to the needs of the input circuit of the subsequent stage. Because the resistance is too small, the power consumption of the 6N135 will increase, increasing the impact on the power supply, making it impossible for the bypass capacitor to absorb, and disturbing the power supply of the entire module, even bringing the spike noise to the ground. Generally optional 4.3kΩ. C is the equivalent capacitance of the output load. It and RL affect the device response time. When RL = 350 ohms and CL = 15 PF, the response delay is 48-75sn. Note: 6N135 should not use too much, because its input capacitance has 60pF, if too much use will reduce the high-speed circuit performance. When conditions permit, consider serializing data transmitted in parallel and transmitting it by an opto-isolator.

4. Conclusion

In the experiment, it was found that 6N135 has a shaping effect on the inbound signal. After the input square wave signal is output via the 6N135, the rising and falling edges of the input signal's original waveform are improved. It does not need to be like an ordinary photoelectric isolator. The end should add a leveling circuit. The delay time of 6N135 is close to the given delay time in the actual circuit, which can meet the requirements of the control system.

References

[1] Han Antai, Liu Yufei, Huang Hai. Principle of DSP Controller and Its Application in Motion Control System Tsinghua University Press, 2003: 388391. (In Chinese).

[2] H. R. Bolton, YD. Liu, N. M. Mallison, Investigation into a Class of Brushless DC Motor with Quasisquare Voltages and Currents, IEE Proc.,vo1.133, pt.B, no.2, March 1986, pp.103-111.

[3] IPM PSS30S_IPMdatasheet,p. 8.

[4] Chang Gyun Kim, Joong Hui Lee. A commutation torque minimization method for brushless DC motors with ezoidal electromotive force. ICPE’98, vol, 1. pp. 476~481. Oct26~31, 1998.Seoul, Korea.

[5] YS. Chen, Z. Q. Zhu, D. Howe. Slotless Brushless Permanent Magnet Machines: Influence Design Parameter[J], IEEE. Transaction Energy Loversion, 1999, 14(3), 686~691.