HCPL-4562, HCNW4562

High Bandwidth, Analog/Video Optocouplers
Evaluation Kit Guide

Hardware Manual

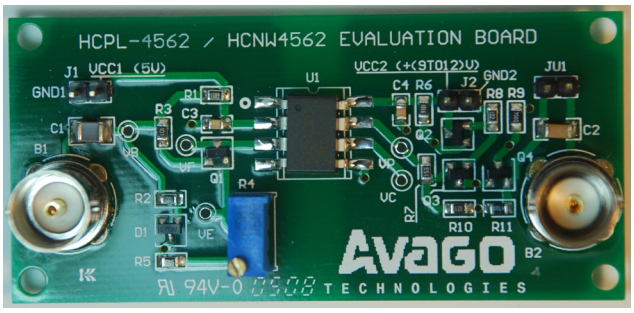
Introduction

The HCPL-4562/HCNW4562 is the highest bandwidth analog isolator in the industry. Avago Evaluation Kit is a fully assembled PC board designed as circuit schematic in Figure1 to provide testing and evaluating tool for wideband analog / video signal isolation with optocoupler HCPL-4562 or HCNW4562. Simply connect input signal to the board via input BNC connector B1, and separately a 5 Volts DC power supply and a 9 Volts DC power supply connect to input and output side of the circuit, then output signal are measured at output BNC connector B2.

The Evaluation Kit is RoHS compatible.

Applications

- Video isolation for the following standards/formats:
- NTSC, PAL, SECAM, S-VHS, Analog RGB
- Low drive current feedback element in switching power supplies, e.g., for ISDN networks
- A/D converter signal isolation
- Analog signal ground isolation
- High voltage insulation



Features

- Wide bandwidth (-3dB):
  17 MHz (HCPL-4562)
  9 MHz (HCNW4562)
- High voltage gain:
  2.0 (HCPL-4562)
  3.0 (HCNW4562)
- Low GV temperature coefficient: -0.3%/°C
- Highly linear at low drive currents
- High-speed AlGaAs emitter
- Safety approval:

  Optocoupler UL Recognized
  3750 V rms for 1 minute (5000 V rms for 1 minute for HCPL-4562#020 and HCNW4562) per UL 1577

  CSA Approved

  IEC/EN/DIN EN 60747-5-2 Approved
  V_{IORM} = 1414 V peak for HCNW4562
- Available in 8-pin DIP and widebody packages

Recommended Equipment

- 5VDC Power Supply
- 9VDC Power Supply
- Functional / Analog Signal Generator
- Measurement Equipments: Oscilloscope, Voltmeter

Quick Start Procedure

The HCPL-4562/HCNW4562 Evaluation Kit is fully assembled and tested. Following procedures guide you to operate this board.

This kit is recommended for optocoupler evaluation and application reference only, Avago Technologies cannot assume responsibility for use of any circuitry other than circuitry entirely embodied in this board. No circuit patent licenses are implied.

1. Verify there should not be any interconnection between input and output side circuits.
2. Verify both 5 VDC and 9 VDC power supply are set right voltage output, do not turn on any power supply before all are connected. The Evaluation Kit both power supplies are recommended within maximum 15 VDC.
3. Connect 5 VDC power supply to input side J1, and 9 VDC power supply to output side J2.
4. Connect input signal from signal generator to B1, and measurement equipment oscilloscope to B2. Don't turn on output of signal generator.
5. Turn on 5 VDC power supply.
6. Measure voltage at point VB and VE, VB is around 1.15 V and VE around 0.5 V.
7. Turn on 9 VDC power supply.
8. Turn on signal generator output, adjust oscilloscope setting to measure output waveform. This circuit is designed for a typical 1 Vp-p input signal.
9. Adjust resistor R4 get desired gain G_V.
10. The Kit is designed AC output signal with C2= 2.2 µF capacitor coupling, when JU1 is shorted with a shunt, the output signal is DC coupled. DC coupling is recommended if it is acceptable in design system. Or user can apply AC coupling via other capacitor with JU1 shorted.

Detailed Description

Figure 1 shows a schematic circuit for wide-bandwidth analog/video application and an amplifier design. This is an ac input coupled and ac output coupled circuit. The LED input current IF is set at a recommended 6 mA for the HCPL-4562 or 10 mA for the HCNW4562 by selecting an appropriate value for the R4. If the VCC1 on the input side is 5 V the voltage VB established by the resistor divider R1 and R2 at the base of Q1 (neglecting base current drop across R3) is approx. 1.15 V. This establishes the voltage VE at the emitter of Q1 around 0.5 V. Adjust R4 to set the recommended LED current at 6 mA. With 0.5 V at VE the resistor R4 is selected to be approx. 70 Ω for 6 mA of IF.

For isolating a composite video signal, VCC1 is recommended increasing to 9V so that transistor Q1 has higher bias voltage VB, and R4 can have more space to be adjusted.

With a VCC2 supply between 9 to 12 V, the value of R11 is selected to keep the output voltage at midpoint of the supply at approx. 4.25 V with the collector current ICQ4 of Q4 at approx. 9 mA.

$$ICQ4 \approx Vo/R11 \leq 4.25V/470\ \Omega \leq 9\ mA$$

The small signal model of the bipolar transistors can determine the overall voltage gain of the circuit and gain stages involved and is found to be

$$G_V \approx V_{OUT}/V_{IN}$$
$$\approx \partial I_{PB}/\partial I_F\ [R_7\ R_9\ /(R_4\ R_{10})]$$

Where $\partial I_{PB}/\partial I_F$ is the base photo current gain (photo diode current gain) and is indicated as a typical of 0.0032 in the data sheet.

Adjust resistor R_4 to achieve the desired voltage gain.

The voltage gain of the second stage (Q3) is approximately equal to

$$R_9 / R_{10} \bullet / [1 + sR_9\ (C_{CQ3} + 1/(2\pi R_{11'}\ f_{T4}))]$$

Where $R_{11'}$ is the parallel combination of R_{11} and load impedance and f_{T4} is the unity gain frequency Q_4. From this equation one can observe that to maximize the bandwidth one would want to increase the value of $R_{11'}$ or reduce the value of R_9 at a constant ratio of R_9/R_{10}.

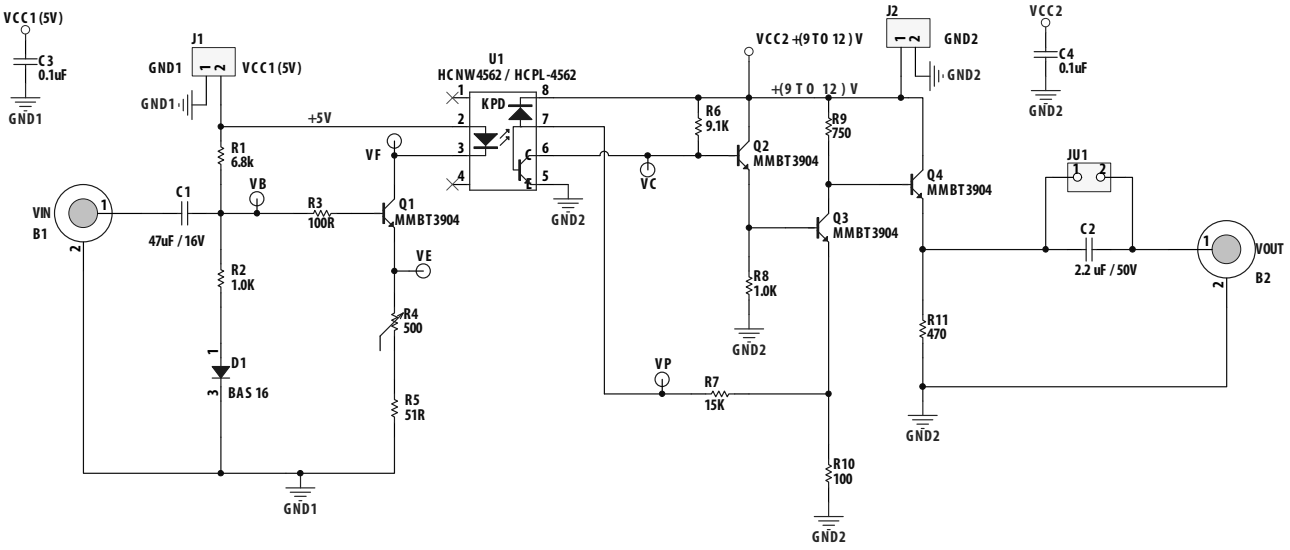


Figure 1. HCPL-4562 / HCNW4562 Evaluation Circuit Schematic

Table 1. Component List

Designator	Part Type	Description
R2,R8	1K	Resistor
R6	9.1K	Resistor
R7	15K	Resistor
R9	750	Resistor
C3,C4	0.1µF	Chip Capacitor
D1	BAS16	Switching Diode, NXP
Q1,Q2, Q3,Q4	MMBT3904	NPN Transistor, On Semi
C1	47µF/16V	Ceramic Capacitor
C2	2.2µF/50V	Ceramic Capacitor
R4	51R	Resistor
R1	6.8K	Resistor
R11	470R	Resistor
B1 B2	75Ω	Connector BNC Jack
R3, R10	100R	Resistor
VR1	500R	Variable Resistor
U1	HCPL-4562 / HCNW4562	Optocoupler, Avago Technologies
J1, J2, JU1	2-Pin Header	2.54 Pitch SIL

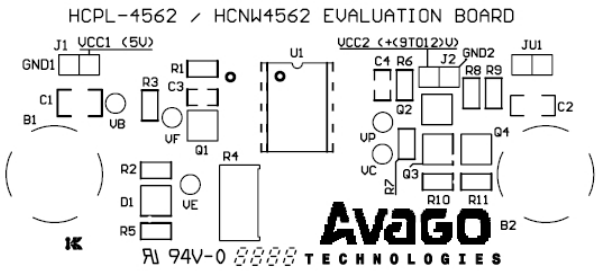


Figure 2. HCPL-4562 / HCNW4562 Evaluation Kit PCB Silkscreen

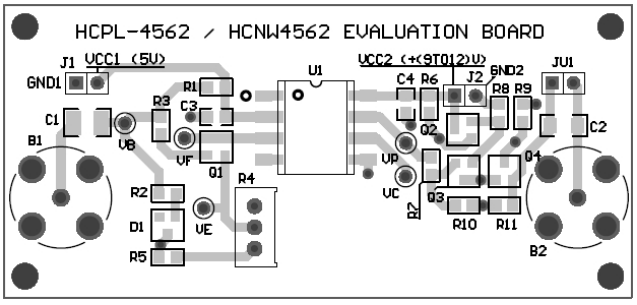


Figure 3. HCPL-4562 / HCNW4562 Evaluation Kit PCB Top Overlay

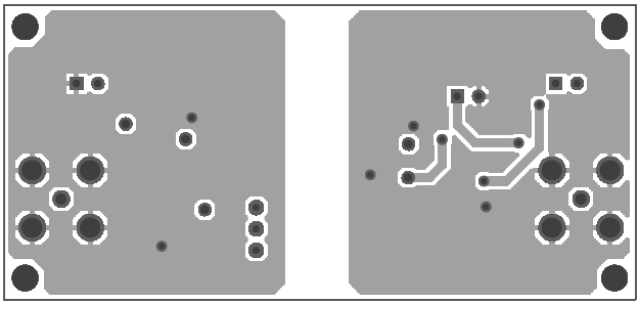


Figure 4. HCPL-4562 / HCNW4562 Evaluation Kit PCB Bottom Overlay

For product information and a complete list of distributors, please go to our web site: **www.avagotech.com**

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