

# How to Create Pin Compatibility for the CommLink™ HI5X60 and HI5X28 Digital to Analog Converters

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## Abstract

This Technical Brief pertains to the following digital to analog converters offered by Intersil: HI5660, HI5760, HI5860, HI5960, HI5628, HI5728, HI5828, and (HI5928, a future offering).

The Intersil CommLink™ family includes a sub-family of D/A converters. All are available in speeds up to 125MSPS. Some are pin compatible and others are pin similar, depending on the routing of traces and placement of supporting components into the DAC. The intent of this technical brief is to make using, interchanging, and upgrading these DACs as painless as possible. The focus is on decisions that can be made during board layout to allow for upgrade- and downgrade-ability. The discussion is divided into two categories; single and dual channel devices.

## Introduction

The first question that needs to be answered by the user is "Does it make sense to create the board so that the DAC resolution can be changed?" Two auxiliary questions to this are "How many bits do I need now?" And "How many bits might I need later?" Only the user can properly answer these questions. Every board and system will have different capabilities and requirements. If the user determines that they might want to add more or less DAC resolution at a later time, then the rest of this discussion will be found useful. It is suggested that the user obtain data sheets for the devices they are interested in and refer to the pinout and the pin descriptions. For convenience, the pinouts for these devices are provided in an appendix.

## Single Channel DACs

Includes: HI5660, 8-bit; HI5760, 10-bit; HI5860, 12-bit; HI5960, 14-bit.

### 8- and 10-bit Compatibility

#### DIFFERENCES

The HI5660 and HI5760 are the same pinout except for pins 9-14 on the HI5660. They are defined as DCOM (digital ground) on the HI5660. On the HI5760, pins 9 and 10 are the LSBs and pins 11-14 are No Connect (NC).

#### SOLUTION

Bring all 10 bits to the DAC socket as if using the HI5760, but make provisions to disable the 2 LSB traces and to connect pins 9 and 10 to digital ground. A suggestion is zero ohm resistors or solder jumpers (see Figure 1), both in line with the data and from pins 9 and 10 to digital ground. It is okay to connect the NCs (pins 11-14) on the HI5760 to digital ground, making those pins compatible with the HI5660.

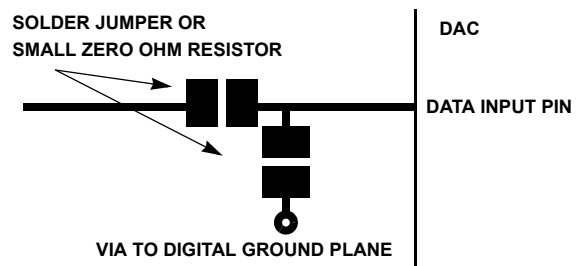


FIGURE 1.

### 12- and 14-bit Compatibility

#### DIFFERENCES

The HI5860 and HI5960 are the same pinout except for the 2 LSBs on the HI5960, pins 13 and 14. They are defined as NC on the HI5860.

#### SOLUTION

Bring all 14 bits to the socket as if using the HI5960, but make provisions to disable the 2 LSB traces by using zero ohm resistors or solder jumpers (see figure 1). The user can choose to bring all 14 bits to the 12-bit device without adding disabling abilities, but it is generally not recommended because the digital switching on pins 13 and 14 might couple into the part. If the user is not concerned about a small amount of possible noise being added into the DAC's analog performance, then this method should be fine.

### 8-, 10-, 12-, and 14-bit Compatibility

#### DIFFERENCES

The HI5660 and HI5760 are the same pinout except for pins 9-14 on the HI5660. They are defined as DCOM (digital ground) on the HI5660. On the HI5760, pins 9 and 10 are the LSBs and pins 11-14 are NC. The HI5860 and HI5960 are similar except for the 2 LSBs on the HI5960, pins 13 and 14. They are defined as NC on the HI5860. Pin 25 is defined as NC on the HI5660 and HI5760, but as ACOM (analog ground) on the HI5860 and HI5960. Pin 23 on the HI5660 and HI5760 is defined as NC. Pin 23 on the HI5860 and HI5960 is defined as COMP2 and described in the pin description table as 'connect to ACOM using a 0.1μF capacitor'.

#### SOLUTION

Bring all 14 bits to the converter, leaving provisions on the last 6 LSBs, pins 9-14, to be connected to ground via zero ohm resistors or solder jumpers and to be disabled by the removal of either zero ohm series resistors or solder jumpers (see Figure 1). Place these in-line connections and/or shorts to ground according to the pin description for the part in use. For Pin 25, connect it to analog ground. This will satisfy the ACOM designation of the HI5860 and HI5960, and will not

affect the use of the NC designation of the HI5660 and HI5760 pin 25. For Pin 23, place a 0.1μF capacitor to analog ground. This is necessary for the HI5860 and HI5960 and will not hurt pin 23 of the HI5660 and HI5760 (the capacitor for pin 23 does not need to be populated for the HI5660 and HI5760, saving some cost).

### **Dual Channel DACs**

Includes: HI5628, 2x8-bit; HI5728, 2x10-bit; HI5828, 2x12-bit; HI5928, 2x14-bit (future offering).

### **Dual 8- and 10-bit Compatibility**

#### **DIFFERENCES**

The HI5628 and HI5728 are the same pinout except for pins 6, 7, 30, and 31 on the HI5628. They are defined as DGND (digital ground) on the HI5628. On the HI5728, these four pins are the two LSBs of each 10-bit channel.

#### **SOLUTION**

Bring all 10 bits of each channel to the device as if using the HI5728, but make provisions to disable the two LSB traces on each 10-bit channel and to connect pins 6, 7, 30, and 31 to digital ground. A suggestion is zero ohm resistors or solder jumpers (see Figure 1), both in line with the data and from pins 6, 7, 30, and 31 to digital ground.

### **Dual 8-, 10-, 12-, and 14-bit Compatibility**

#### **DIFFERENCES**

The 12- and future 14-bit devices are pin-compatible, but do not share the same pinout as the 8- and 10-bit duals. The HI5828 (12-bit) was created using a different pinout than the HI5628 and HI5728. The HI5828 was created with the option to add two more bits to each channel when a dual 14-bit device (tentatively referred to as the HI5928) is developed.

#### **SOLUTION**

Refer to the 'Dual 8- and 10-bit Compatibility' discussion for 8- and 10-bit possibilities. For the HI5828 12-bit, it is recommended that all 14 bits be brought to the device if the need to upgrade the resolution is foreseen. The user can leave the provision to jumper in the last two LSBs (see Figure 1) of the 14-bit word to the NC pins (7, 8, 41, 42) of the HI5828 (which will be defined as the two LSBs on each channel of the dual 14-bit, HI5928; see the appendix for a pinout reference).

#### **DISCLAIMER**

There are no guarantees that the HI5928, dual 14-bit DAC will be developed.

NOTE: If the need to step between 8-, 10-, 12-, and maybe 14-bit DUAL devices is seen by the user, it is recommended that they contact Intersil and present this desire. The creation of 8- and 10-bit devices that would fit the HI5828 pinout would be considered.

### **Other General Hints When Using the CommLink Family of D/A Converters**

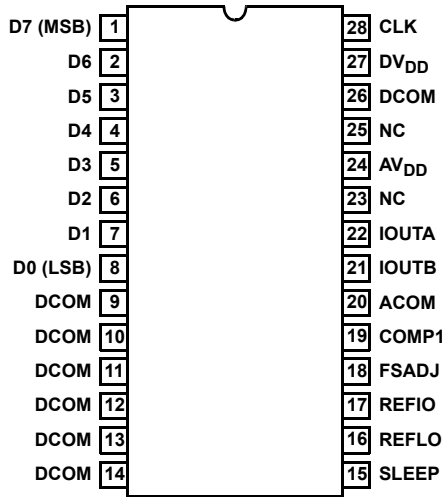
All of the following have been observed to improve the spectral performance of these D/A converters:

- Higher power supply voltage (5V rather than 3V), especially on the digital supply
- In some cases, a reduction in the amount of output current (by increasing the R<sub>SET</sub> resistor)
- In some cases, a decrease from full scale in the amplitude of the digital signal
- The use of a transformer in a differential to single ended mode driving a 12.5Ω effective resistance can improve harmonic performance

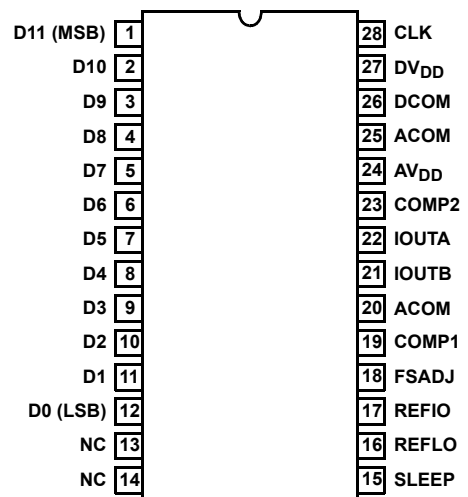
See the data sheets or evaluation board manuals for details on the transformer circuit. Evaluation boards do or will exist for each of these devices, many times sharing the same printed circuit board (PCB). The HI5660eval and HI5760eval use the same PCB. The HI5860eval and HI5960eval use the same PCB, and can be used to evaluate the HI5660 and HI5760. The HI5628eval and HI5728eval use the same PCB. The HI5828eval is laid out for dual 14-bits, so when the HI5928 is created, it will share this PCB.

## Appendix

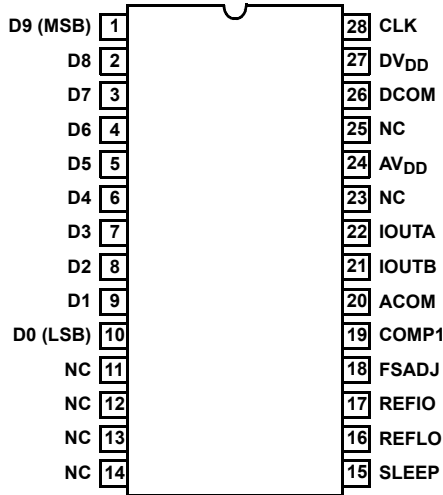
HI5660  
8-BIT SINGLE



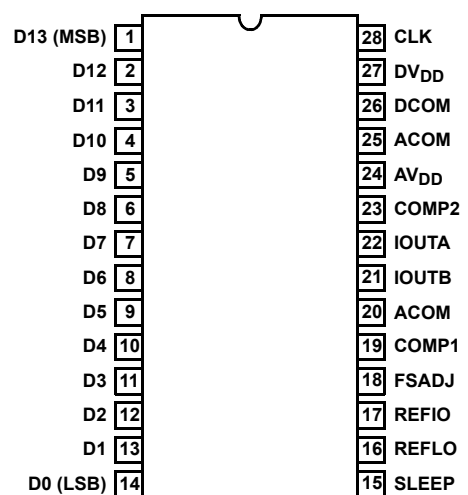
HI5860  
12-BIT SINGLE



HI5760  
10-BIT SINGLE

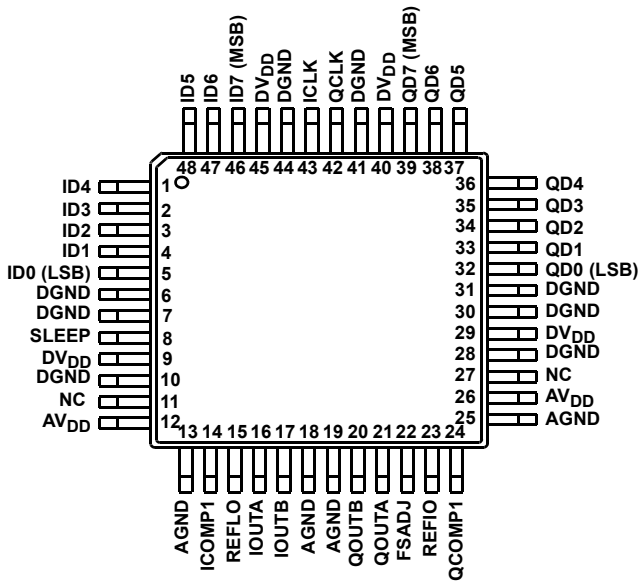


HI5960  
14-BIT SINGLE

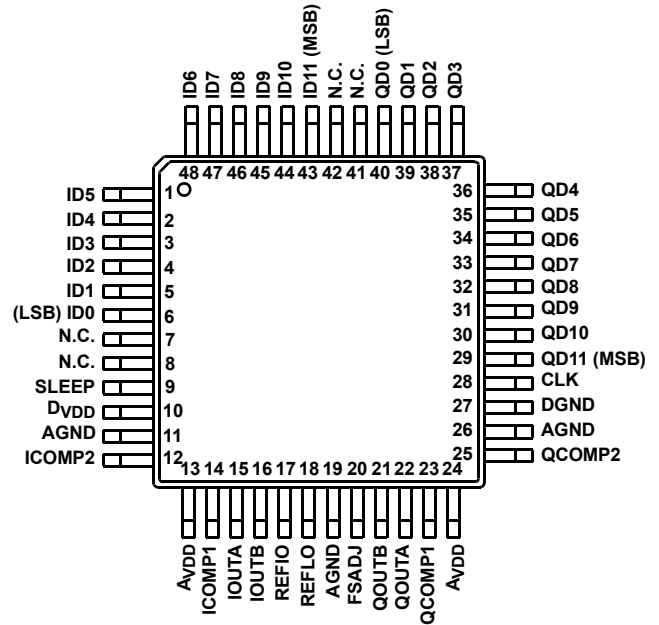


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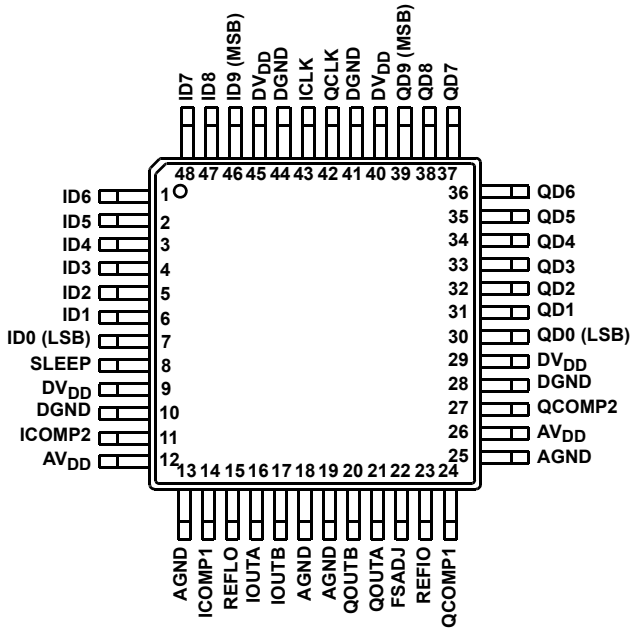
HI5628  
8-BIT DUAL



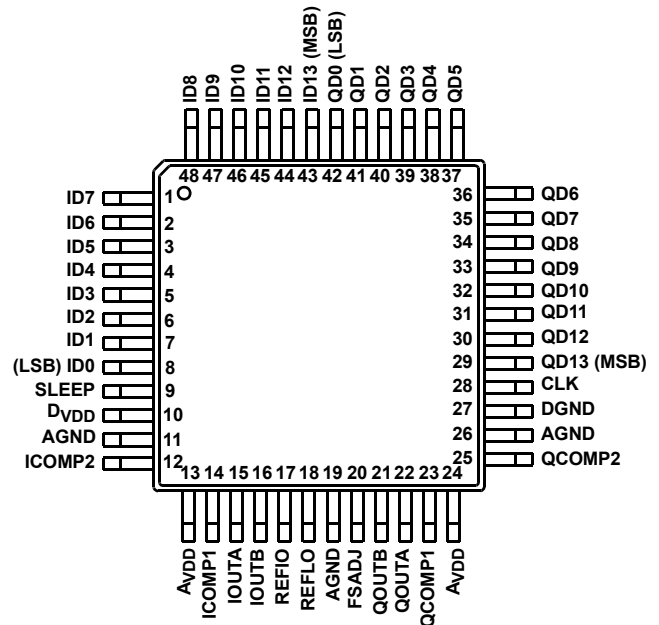
HI5828  
12-BIT DUAL



HI5728  
10-BIT DUAL



HI5928  
(PROPOSED)  
14-BIT DUAL



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Tel: +44-1628-651-700, Fax: +44-1628-651-804

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Arcadiastrasse 10, 40472 Düsseldorf, Germany  
Tel: +49-211-6503-0, Fax: +49-211-6503-1327

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Room 1709 Quantum Plaza, No.27 ZhichunLu, Haidian District, Beijing, 100191 P. R. China  
Tel: +86-10-8235-1155, Fax: +86-10-8235-7679

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Unit 301, Tower A, Central Towers, 555 Langao Road, Putuo District, Shanghai, 200333 P. R. China  
Tel: +86-21-2226-0888, Fax: +86-21-2226-0999

**Renesas Electronics Hong Kong Limited**  
Unit 1601-1611, 16/F., Tower 2, Grand Century Place, 193 Prince Edward Road West, Mongkok, Kowloon, Hong Kong  
Tel: +852-2265-6688, Fax: +852-2886-9022

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13F, No. 363, Fu Shing North Road, Taipei 10543, Taiwan  
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Tel: +60-3-7955-9390, Fax: +60-3-7955-9510

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No.777C, 100 Feet Road, HAL 2nd Stage, Indiranagar, Bangalore 560 038, India  
Tel: +91-80-67208700, Fax: +91-80-67208777

**Renesas Electronics Korea Co., Ltd.**  
17F, KAMCO Yangjae Tower, 262, Gangnam-daero, Gangnam-gu, Seoul, 06265 Korea  
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