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VDD2670 VME DUAL 18 BIT DAC

USERS MANUAL

For Issue 2 PCB with Xilinx Firmware Version 2670V203

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Revision History

The following table shows the revision history for this document.

Date	Version	Change Notes
023/06/1999	2.0	Preliminary
11/09/2015	2.1	Add AM codes. Change: If 32 address data is being used, simply read/write to 0xE010. If 16 bit address is being used, two read/writes need to be performed; To: If 32 bit data is being used, simply read/write to 0xE010. If 16 bit data is being used, two read/writes need to be performed;
18/09/2015	2.2	Firmware change to allow A16 D16. Writing D16 values to DAC registers the DAC output is changed when writing to lower DAC register. Counter function removed in this version of the firmware.

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Contents

1. INTRODUCTION

The VDD2670 is a VMEbus precision dual 18 bit optically isolated digital to analogue converter (DAC). The analogue circuitry is optically isolated from the digital circuits, and each of the analogue circuits are isolated from each other.

Due to the precision nature of this module, an external power supply should be used.

The DAC voltage is set via VME, with either a A16 D16 or A16 D32 bit transfer, Each DAC register may also be read back over VME.

Each DAC has four range settings:-

0 to 10 Volts
-5 to +5 Volts
0 to 5 Volts
-10 to +10 Volts

The output is buffered and can deliver 100mA max., there is also the option, of having straight-through connection from the DAC without any buffering.

The VME interface supports short I/O access A16: D32:D16 (EO).
AM29 Short (A16) non-privileged.
AM2D Short (A16) supervisory.

2. SPECIFICATION

ANALOGUE OUTPUT

Full 4 wire sense circuit

Mode A	J1,2 set across pins 1,2	+/- 100mA max. all ranges
Mode B	J1,2 set across pins 2,3	+/- 0.5mA all ranges

The sense wires should always be used

Settling time

Full scale	40uS to 0.00019%
LSB change	6uS to 0.00019%

Temperature Coefficients

Gain	+/- 5 ppm of FSR /degrees C (5C to 40C)
Offset	+/- 1 ppm of FSR /degrees C (5C to 40C)

Isolation voltage

+/- 500 Volts peak to peak max. Normal working voltage +/- 250V peak to peak

NOTE: Due to the packing density used in the module it is not to be used to isolated mains voltages etc. If the module is used in a high voltage system always put it at the low voltage end of the circuit, taking all safety precautions.

3. DESCRIPTION

3.1.DAC OUTPUT CONNECTORS

25-WAY D-TYPE PLUG

There are two 25way connectors for each channel with the following pinout:-

Pin 3	Isolated analogue 5V output.
Pin 4	Isolated analogue 5V GND.
Pin 17	+21 volts isolated input power.
Pin 16	Isolated GND input.
Pin 18	-21 volts isolated input power.
Pin 14	+ve DAC output sense.
Pin 1	+ve DAC output.
Pin 15	DAC GND sense
Pin 2	DAC GND
Pin 5	Isolated GND
Pin 8	DAC ready signal (non- isolated output)
Pin 7	Not used
Pin 20	Not used
Pin 13	Digital GND
Pin 25	Digital GND

Pins 17,16,18	+/-21V and GND are provided by the external power supply, and power the DAC chips.
Pins 1,2	DAC outputs, we recommend that the 4 pin lemo is used instead.
pins 14,15	Output sense wires, provides feedback to the DAC.
Pin 8	DAC ready signal, this provides a logic level '1', when the DAC has settled, it is a nominal delay, after an instruction has been sent.
Pins 13,25	These provide Digital GND for TTL signal ground return.

3.2. OUTPUT LEMO (DAC A/B)

Each channel has two four pin Lemo connectors.

The output Lemos are marked DAC A, and DAC B, and have the following pinouts:-

Pin 3	+ve output
Pin 2	+ve sense
Pin 1	Return
Pin 4	Return sense

4. SENSE CONNECTIONS

The sense outputs form the feedback, which compensates for changes in load, and volts being dropped in the cables. The +ve sense should be connected to the +ve output, and the return sense should be connected to the return. It is important that the sense wires are connected at the point where the voltage is required, if this is not done, the voltage will not be accurate.

To improve the noise immunity the output and return should be a twisted pair, and the two sense wires should also be twisted together.

The output is buffered and capable of delivering 100 mA max (when J1 and J2 are set with the jumper between pins 1 and 2). It is possible to get the output directly from the DAC by inserting the jumper between pins 2 and 3, in this mode no more than +/-0.5mA can be taken, in this mode extra care must be taken to ensure that this current is not exceeded.

5. POWER OUT LEMO (A/B)

These are the two middle lemos with black inserts, and are used to bring The VME power to the front panel. The pinouts are as follows.

Pin 1	-12 Volts
Pin 2	+12 Volts
Pin 3	+5 Volts
Pin 4	GND

It is unlikely that these outputs will be required, they have been provided in case the user wishes to connect an external power supply powered from the VME supplies.

6. OPERATION

6.1. ADDRESSING STRUCTURE

It is possible to read and write to each DAC channel, using the following addresses;

Module range select	Base address + 40
DAC A counting register	Base address + 20
DAC B counting register	Base address + 10

The base address is set on jumpers J6 to J11, as follows

A15	Set high always	
A14	Set high always	
A13	Set on J6 (Insert jumper to make logic '0')	
A12	Set on J7 (Insert jumper to make logic '0')	
A11	Set on J8 (Insert jumper to make logic '0')	
A10	Set on J9	Ditto
A9	Set on J10	Ditto
A8	Set on J11	Ditto

The module as shipped is currently set to base address 0xE000 i.e.
Jumper J6 = A13 not inserted (logic '1'), jumpers J7,8,9,10,11 all inserted (sets A12,11,10,9,8) all logic '0'. A15 and A14 always high, hence;

base address = 11100000 00000000 = 0xE000

Therefore with the current base address, the DAC B register is located at 0xE010.

In 32 bit data mode simply read/write to 0xE010.

In 16 bit data mode two read/writes need to be performed;

0xE010	read/write the top most significant 2 bits here.
0xE012	read/write the bottom 16 bits here.

Writing D16 values to DAC registers the DAC output is changed only when writing the top 2 bits of the DAC value in the lower DAC register.

All ranges use standard binary coding on unipolar ranges, and offset binary on the bipolar ranges e.g. 0n the +/-10V range, writing '000000 will give -10V, '400000 (0x20000) will give 0V, and writing '777777 (0x3ffff) will give +10V.

6.2. RANGE SELECT

The range is set up by writing a two bit code to the address 0xE040 as follows;

		D3	D2	D1	D0
DAC B	0 to 10V	0	0	0	0
DAC B	-10 to +10V	0	0	0	1
DAC B	0 to 5V	0	0	1	0
DAC B	-5 to +5V	0	0	1	1
DAC A	0 to 10V	0	0	0	0
DAC A	-10 to +10	0	1	0	0
DAC A	0 to 5V	1	0	0	0
DAC A	-5 to +5V	1	1	0	0

Therefore if you wanted to set DAC B to 0 to 5V, and DAC A to -5 to +5v, the following value should be written to 0xE040: 1110

6.3.RANGE CALIBRATION

The gain and offset for each range may be adjusted on the potential dividers, as marked on the board. The nominal voltages that the module is currently calibrated to are as follows;

0 to 10V	0.00000V to +9.99996V
0 to 5V	0.00000V to +4.99998V
-10 to +10V	-10.00000V to +9.999924V
-5 to +5V	-5.00000V to +4.999962V

These values have been chosen so that a one bit change will give a whole number change in the number of microvolts.