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Embedded - Microcontrollers - Application Specific: Tailored Solutions for Precision and Performance

Embedded - Microcontrollers - Application Specific represents a category of microcontrollers designed with unique features and capabilities tailored to specific application needs. Unlike general-purpose microcontrollers, application-specific microcontrollers are optimized for particular tasks, offering enhanced performance, efficiency, and functionality to meet the demands of specialized applications.

What Are Embedded - Microcontrollers - Application Specific?

Application-specific microcontrollers are engineered to

Details	
Product Status	Active
Applications	Graphics Processor
Core Processor	EVE
Program Memory Type	FLASH (192kB)
Controller Series	-
RAM Size	32K x 8
Interface	I²C, LCD, OLED, SD, SPI, TFT, TTL
Number of I/O	16
Voltage - Supply	3V ~ 3.6V
Operating Temperature	-40°C ~ 80°C
Mounting Type	Surface Mount
Package / Case	64-TQFP
Supplier Device Package	64-TQFP (10x10)
Purchase URL	https://www.e-xfl.com/product-detail/4d-systems/diablo16

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5.14. Quadrature In

There are two Quadrature Input channels available on the DIABLO16 processor, which requires 2 GPIO pins each.

Please refer to the table on the previous page for details on which GPIO can be configured for Quadrature Input.
Quadrature Input allows a quadrature encoder to be connected, and the position counter and delta counter can be read at any time.

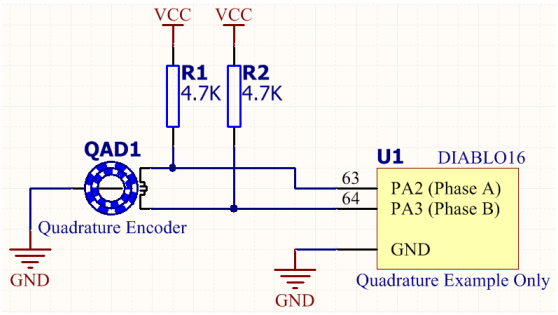
To enable the Quadrature Input function on a set of GPIO pins (2 pins required), the following 4DGL function is used:

Qencoderx(PHApin, PHBpin, mode);

Where 'Qencoderx' is substituted for Quencoder1 or Quencoder2 accordingly, 'PHApin' is the pin connected to the A Phase of the Encoder, 'PHBpin' is the pin connected to the B Phase of the Encoder, and 'mode' is not currently used so is to be set to zero (0).

Example Connection Diagram
This illustrates Quadrature input being configured on GPIO PA2 and PA3, and is used to read pulses from a quadrature encoder.

Note: This example is an illustration of a quadrature input connection to the Diablo16 processor. It is not the complete circuit nor illustrates best practice.



Please refer to the separate document titled '***DIABLO16-4DGL-Internal-Functions.pdf***' for more information on how to use the Quadrature Input functions.

5.15. Analog Inputs

Please refer to the table in section 5.6 for details on which GPIO can be configured to be analog inputs.

The analog inputs on the DIABLO16 have a range of 0 to 3.3V, each with a max resolution of 12-bits.

The analog inputs can be read using three modes, standard mode, averaged mode or high speed mode.

Standard Mode results in a sample being immediately read. Standard Mode can read over 15000 values per second. Operates at 12-bit.

Averaged Mode results in a 16 sample being immediately read and their average returned. Averaged Mode can read approximately 3000 values per second. Operates at 12-bit.

Highspeed Mode collects a user specified number of samples at a user specified rate/frequency and can execute a user function when complete. The updated value updates approximately 250000 times across 1-4 channels. Operates at 10-bit.

Note: The various analog modes can interfere with the operation of the touch screen if their functions are called too frequently. It is recommended to limit the calls of the analog functions to a maximum of once every millisecond. Please refer to the Internal Functions documentation for further information on this topic. Not relevant if an external touch IC (or no touch) is used.

To enable a GPIO to be used as an Analog Input for Standard or Averaged modes, the following 4DGL function is used to set the pin:

pin_Set(mode, pin);

Where 'mode' is the desired mode defined above, either Standard or Averaged, and 'pin' is the GPIO compatible with this function which is to become an Analog Input.

For highspeed mode, the following 4DGL function is used to set the pin and define the parameters:

ana_HS(rate, samples, 1buf, 2buf, 3buf, 4buf, func);

Where 'rate' is the number of samples per second, 'samples' is the number of samples to collect per channel, '1buf' → '4buf' are the buffer addresses

7. 4DGL - Software Language

The DIABLO16 processor belongs to a family of processors powered by a highly optimised soft core virtual engine, EVE (Extensible Virtual Engine).

EVE is a proprietary, high performance virtual-machine with an extensive byte-code instruction set optimised to execute compiled 4DGL programs. 4DGL (4D Graphics Language) was specifically developed from ground up for the EVE engine core. It is a high level language which is easy to learn and simple to understand yet powerful enough to tackle many embedded graphics applications.

4DGL is a graphics oriented language allowing rapid application development, and the syntax structure was designed using elements of popular languages such as C, Basic, Pascal and others.

Programmers familiar with these languages will feel right at home with 4DGL. It includes many familiar instructions such as IF..ELSE..ENDIF, WHILE..WEND, REPEAT..UNTIL, GOSUB..ENDSUB, GOTO, PRINT as well as some specialised instructions SERIN, SEROUT, GFX_LINE, GFX_CIRCLE and many more.

For detailed information pertaining to the 4DGL language, please refer to the following documents:
"4DGL-Programmers-Reference-Manual.pdf"
"DIABLO16-4DGL-Internal-Functions.pdf"

To assist with the development of 4DGL applications, the Workshop 4 IDE combines a full-featured editor, a compiler, a linker and a downloader into a single PC-based application. It's all you need to code, test and run your applications.

8. In Circuit Serial Programming ICSP

The DIABLO16 processor is a custom graphics processor. All functionality including the high level commands are built into the chip. This chip level configuration is available as a PmmC (Personality-module-micro-Code) file, which can be likened to traditional Firmware. There is also a Display Driver file, which separates specific display settings from the PmmC, unlike on the PICASO processor where everything is combined.

A PmmC file contains all of the low level micro-code information (analogy of that of a soft silicon) which define the characteristics and functionality of the device. The ability of programming the device with a PmmC file provides an extremely flexible method of customising as well as upgrading it with future enhancements.

The Display Driver contains the initialisation and parameters associated with the particular display that is to be connected to the DIABLO16 processor.

The PmmC file and Display Driver file can only be programmed into the device via the COM0 serial port and an access to this must be provided for on the target application board. This is referred to as In Circuit Serial Programming (ICSP).

The PmmC file and Display Driver file are programmed into the device with the aid of Workshop 4, the 4D Systems IDE software (See Section 12). To provide a link between the PC and the ICSP interface, a specific 4D Programming Cable or adaptor is required and is available from 4D Systems.

Using a non-4D programming interface could damage your processor, and **void your Warranty.**

Note: The DIABLO16 processor is shipped blank and it must be programmed with both the PmmC configuration and Display Driver files.