

Digital Input/Output



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A Motorola Low-Level Driver Component

The Digital Input/Output (DIO) driver operates as either a discrete digital input or digital output function. When used as a digital input, the driver has three modes:

- Sample pin on transitions
- Sample pin on request
- Sample pin at a periodic rate

When used as a digital output, the driver sets the pin high or low upon command from the application.

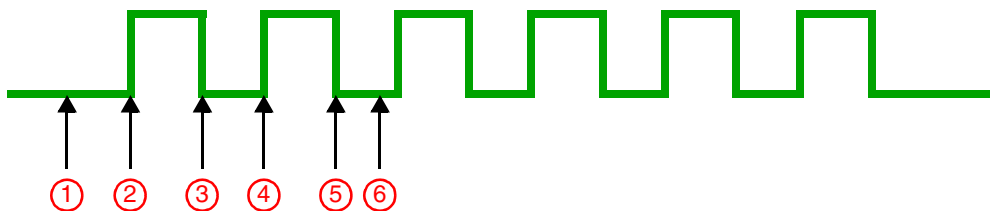
The driver may be configured independently on multiple channels, and is useful in a variety of applications. It basically has the functionality of a simple I/O pin with the exception that it can autonomously store the most recent 16 pin transitions can be automatically configured to sample the pin every time a transition occurs or at a periodic rate.

Example of Driver Operation

The diagram below illustrates an example of how the driver operates when sampling pins on transitions as an input function.

In this example, the driver is initialized to detect both edges of the input signal. The application reads the pin level buffer to read the sense of the most recent 16 transitions. The most significant bit contains the sense of the most recent transition.

Each time the driver detects a transition, it shifts the pin level buffer to the right, writes the current pin level to bit 15, and requests an interrupt. The circled numbers represent actions or events this example illustrates, and are described in the table below the diagram.



Number	Description	Pin level buffer value
①	The application software initializes the driver to detect both rising and falling edges. Since the pin state is 0, the driver shifts a 0 into the pin level buffer.	\$0000
②	At the first edge (rising), the driver shifts a 1 into the pin level buffer.	\$8000
③	At the next edge (falling), the driver shifts a 0 into the pin level buffer.	\$4000
④	At the next edge (rising), the driver shifts a 1 into the pin level buffer.	\$A000
⑤	At the next edge (falling), the driver shifts a 0 into the pin level buffer.	\$5000
⑥	Before the next edge (rising), the application software request the pin level buffer value. The driver returns the current value (\$5000).	\$5000

Digital Input

Sample Pin on Transitions

When initialized in this mode, and each time the driver detects a specified edge, it updates the pin level buffer and requests an interrupt.

Sample Pin on Request

When initialized in this mode, and upon each sample pin function call, it updates the pin level buffer and requests an interrupt.

Sample Pin Periodically

When initialized in this mode, the driver samples the pin level at initialization and every specified sample period, stores the result in the buffer, and requests an interrupt.

Digital Output

The driver may also be initialized as an output function. In this case, the driver's pin level may be set high or low at any time. In addition to driving the pin to the requested state, the driver also updates the pin level buffer and requests an interrupt.

The Low Level Driver System

The Low Level Driver system includes a set of drivers with an API that interfaces to and controls the hardware for a microcontroller unit (such as the Motorola MPC555)

Engine Position

Tracks the angular position in the engine cycle based on input from an automobile's crankshaft and camshaft sensors

Spark & DTS

Generates pulses defined by duration and end angle; can be used to time the firing of spark plugs

Fuel

Generates pulses immediately upon request or defined by duration and end angle; can be used to control fuel injection duration and frequency

Speed Measurement

Determines the speed of a rotating shaft

Synchronous PWM

Synchronizes an output pulse width modulation (PWM) signal to an input PWM signal

Synchronous Output

Transmits a clock signal and serial data, following a specific protocol

Angle Toggle

Toggles an output pin and generates interrupts on selected crank angles

QADC Trigger

Generates pulses defined by a start angle and duration

Knock Window

Generates pulses defined by a start and end angle

Discrete Input/Output (DIO)

Operates as a general-purpose digital input or output pin



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