

Synchronous PWM



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A Motorola Low-Level Driver Component

The Synchronous PWM (pulse width modulation) driver can pass information to and from an external device by means of a bi-directional transmission of pulse width modulation signals.

The external device transmits a nominal PWM signal to the TPU via the input PWM channel, which transmits a similar signal back to the external device via the output PWM channel.

The external device establishes the exact frequency of communication. The TPU transmits a control signal back to the device and optionally matches its transmitted frequency to the input frequency.

An example application is a smart alternator system, in which case the application software reads the electrical load information from the PWM regulator signal and transmits a control signal back to the regulator.

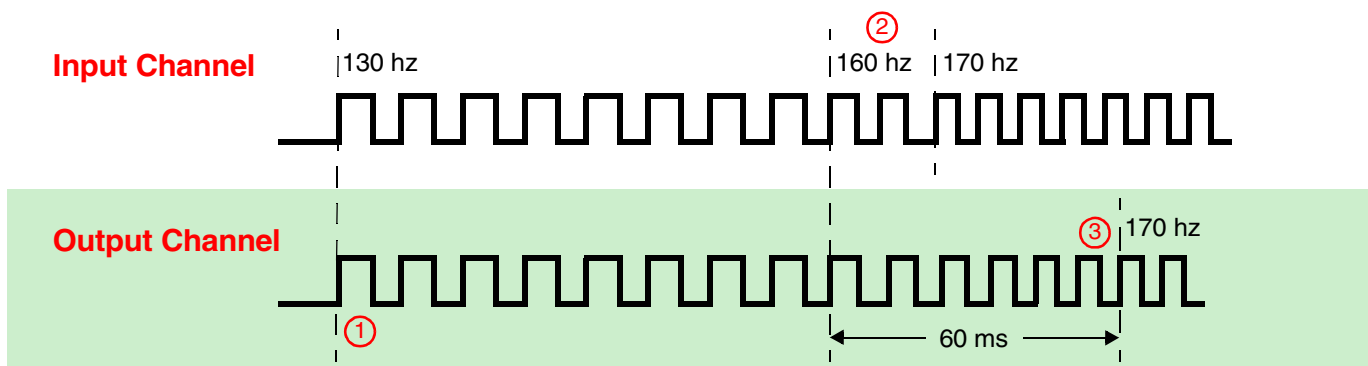
The Synchronous PWM driver uses the TPU to provide all of the timing to control the output signal. When initialized, the driver begins an output signal on one TPU pin with the frequency and duty cycle provided by the application soft-

ware during the initialization call. Meanwhile, the function sets up to receive an input PWM signal on another TPU pin.

When initialized in synchronous mode, the input channel controls the frequency of the output channel. However, the two signals are not necessarily phase-synchronized, and the output channel may have a different duty cycle than the input signal.

The Synchronous PWM driver uses two channels of the TPU. The driver initializes both channels, which then work together. It is not possible to initialize only one channel: for every SyncPWM input channel, there must be a corresponding output channel and vice versa. However, it is possible to initialize multiple channel pairs running independently of other channel pairs.

The diagram below illustrates the normal operation for the Synchronous PWM driver. This diagram shows how the output channel tracks the frequency of the input channel. When the input channel changes frequency quickly, there will be some delay before the output channel catches up.



Synchronous PWM Control Options

The SyncPWM driver provides a set of C function calls that the application software uses to control output signal modulation and frequency and input/output channel synchronization. The application may update the duty cycle and frequency of the output signal during operation. Updates to the frequency will take effect immediately (unless the output channel is synchronized to the input channel, in which case they will be ignored), while updates to the duty cycle are buffered until the beginning of the next period. For the output function, a duty cycle of 0% is supported, while 100% is not.

The application may also read the measured duty cycle of the input channel. The input function will return an error if the input frequency is outside of the desired operating range and will also return an error if the duty cycle is 0% or 100%.

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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