

TPI CB-PWM - Helper block

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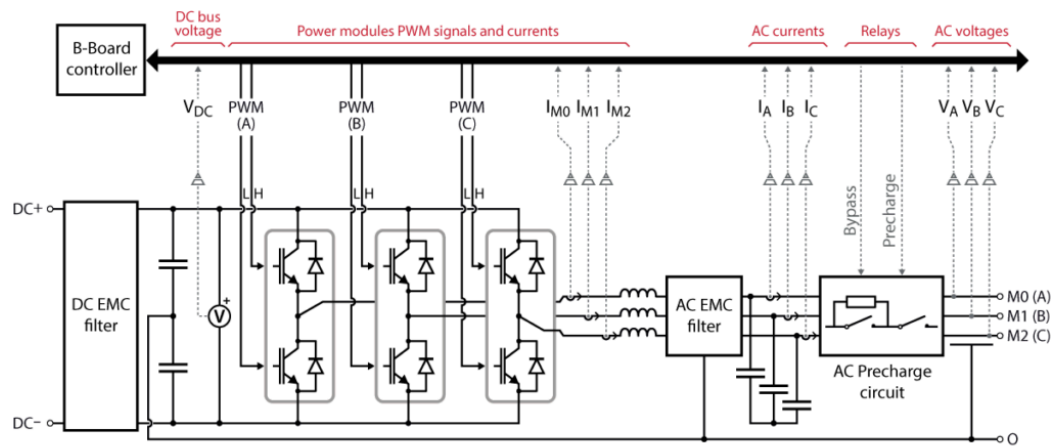
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The TPI CB-PWM helper block is a wrapper that simplifies the use of the [CB-PWM block](#) with the [all-in-one programmable inverter](#) (TPI8032 22kW). Since the topology of the converter is fixed, the channel assignment and part of the modulators' configuration are known beforehand.

The topology of the converter and the connection of the PWM channels are shown below. To prevent short-circuiting the DC bus, the upper and lower switches of a leg always use pseudo-complementary signals with a fixed dead-time of 124 ns. This value was chosen as low as possible to minimize the distortion introduced by the dead-time.



Topology of the TPI8032

PWM channel	PWM lane	Description
0	0	PWM High – Phase A (M0)
	1	PWM Low – Phase A (M0)
1	2	PWM High – Phase B (M1)
	3	PWM Low – Phase B (M1)
2	4	PWM High – Phase C (M2)
	5	PWM Low – Phase C (M2)

PWM channels and lanes assignment

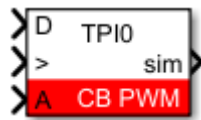
The TPI CB-PWM helper block is available starting from [version 2024.2](#) of the SDK. The TPI8032 is **required** to use this driver.

Simulink CB PWM helper block

Signal specification


- The input signal **D** is a vector of three duty-cycles (0.0 to 1.0), corresponding to phases A, B, and C.
- The input signal **>** is the clock input and must be connected to the [CONFIG block](#) or to an independent [CLK](#).
- The input **A** allows the activation (>0) or deactivation (<=0) of the PWM outputs.
- The **sim** output is a vector corresponding to the six generated PWM signals (phase A high and low, phase B high and low, and phase C high and low). They

are only used in simulation.



Parameters

- **Device ID** selects which TPI to address when used in a multi-device configuration.
- **Carrier shape** selects the type of carrier (TRIANGLE, SAWTOOTH, INVTRIANGLE, or INVSAWTOOTH).
- **Phases(s)** configures the carrier phase-shift of phases A, B and C relative to the CLK. It can be a scalar (same shift for A, B and C) or a 3-dimensionnal vector.
- **Show “activate” input** makes the A input visible. If not checked, the TPI CB-PWM block is active by default.
- **PWM parameters update rate** selects when the duty-cycle parameter is applied.
 - *Single-rate*: it is applied at the end of the carrier period.
 - *Double-rate*: it is applied twice per carrier period: when the carrier reaches its lowest point and when it reaches its highest point. (for TRIANGLE and INVTRIANGLE carriers only)
- **Simulation output type**
 - *PWM signals*: outputs are logic gate signals 0 or 1.
 - *Duty-cycle*: outputs are duty-cycles between 0 and 1. This option is only used with averaged power switch models.
- **Simulate dead-time** toggles the option to simulate the effect of the dead-time.

Block Parameters: TPI CB PWM

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TPI Carrier-Based PWM

Generates complementary carrier-based PWM signals for the three legs of a TPI.

- The input signal 'D' is a vector of 3 duty-cycles to apply to the modules M0, M1 and M2 (phases A, B, and C).
- The input signal '>' is the clock input.
- The input signal 'A' allows the activation (1) or deactivation (0) of the PWM output(s).

Addressing

Device ID (default=0)

Modulation parameters

Complementary signal parameters

Carrier shape

Phase(s) (0 to 1)

☐ Show "activate" input

PWM parameters update rate

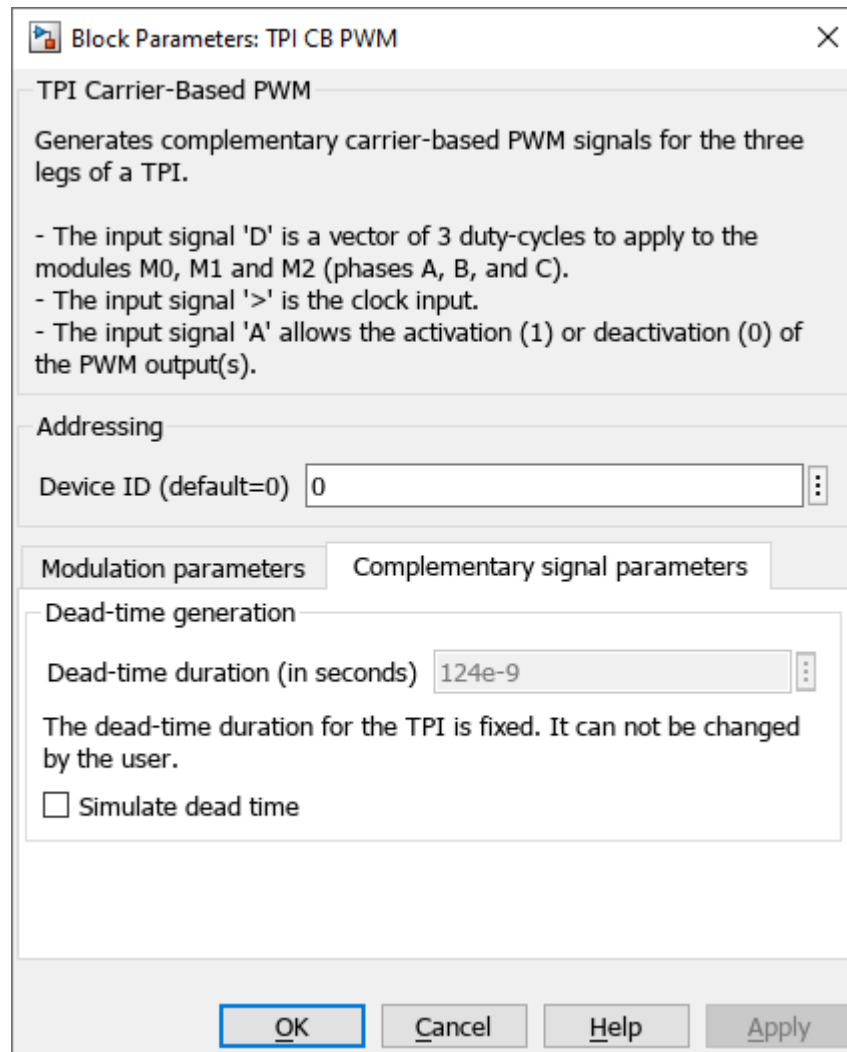
Simulation output type

OK

Cancel

Help

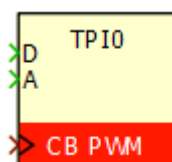
Apply



PLECS CB PWM helper block


Signal specification

- The input signal **D** is a vector of three duty-cycles (0.0 to 1.0), corresponding to phases A, B, and C.
- The input signal **>** is the clock input and must be connected to the [CONFIG block](#) or to an independent [CLK](#).
- The input **A** allows the activation (>0) or deactivation (≤ 0) of the PWM outputs.
- The target output port (only visible at the atomic subsystem level) is a vector corresponding to the six generated PWM signals (phase A high and low, phase B high and low, and phase C high and low). They are only used in simulation.



Parameters

- **Device ID** selects which TPI to address when used in a multi-device configuration.
- **Carrier shape** selects the type of carrier (TRIANGLE, SAWTOOTH, INVTRIANGLE, or INVSAWTOOTH).
- **Show “activate” input** makes the A input visible. If not checked, the TPI CB-PWM block is active by default.
- **PWM parameters update rate** selects when the duty-cycle parameter is applied.
 - *Single-rate*: it is applied at the end of the carrier period.
 - *Double-rate*: it is applied twice per carrier period: when the carrier reaches its lowest point and when it reaches its highest point. (for TRIANGLE and INVTRIANGLE carriers only)
- **Phase-shift(s)** configures the carrier phase-shift of phases A, B and C relative to the CLK. It can be a scalar (same shift for A, B and C) or a 3-dimensionnal vector.
- **Simulation output type**
 - *PWM signals*: outputs are logic gate signals 0 or 1.
 - *Duty-cycle*: outputs are duty-cycles between 0 and 1. This option is only used with averaged power switch models.
- **Simulate dead-time** toggles the option to simulate the effect of the dead-time.

 Block Parameters: Central_PV_Inverter_v2/Controller/TPI CB PWM ✕

TPI CB-PWM - Carrier-based PWM (mask) [\(link\)](#)


Generates complementary carrier-based PWM signals for the three legs of a TPI.

- The input signal 'D' is a vector of 3 duty-cycles to apply to the modules M0, M1 and M2 (phases A, B, and C).
- The input signal '>' is the clock input.
- The input signal 'A' allows the activation (1) or deactivation (0) of the PWM output(s).

Addressing Modulation parameters Complementary signal parameters

Device ID [default=0]:

☐

 Block Parameters: Central_PV_Inverter_v2/Controller/TPI CB PWM ✕

TPI CB-PWM - Carrier-based PWM (mask) [\(link\)](#)

Generates complementary carrier-based PWM signals for the three legs of a TPI.

- The input signal 'D' is a vector of 3 duty-cycles to apply to the modules M0, M1 and M2 (phases A, B, and C).
- The input signal '>' is the clock input.
- The input signal 'A' allows the activation (1) or deactivation (0) of the PWM output(s).

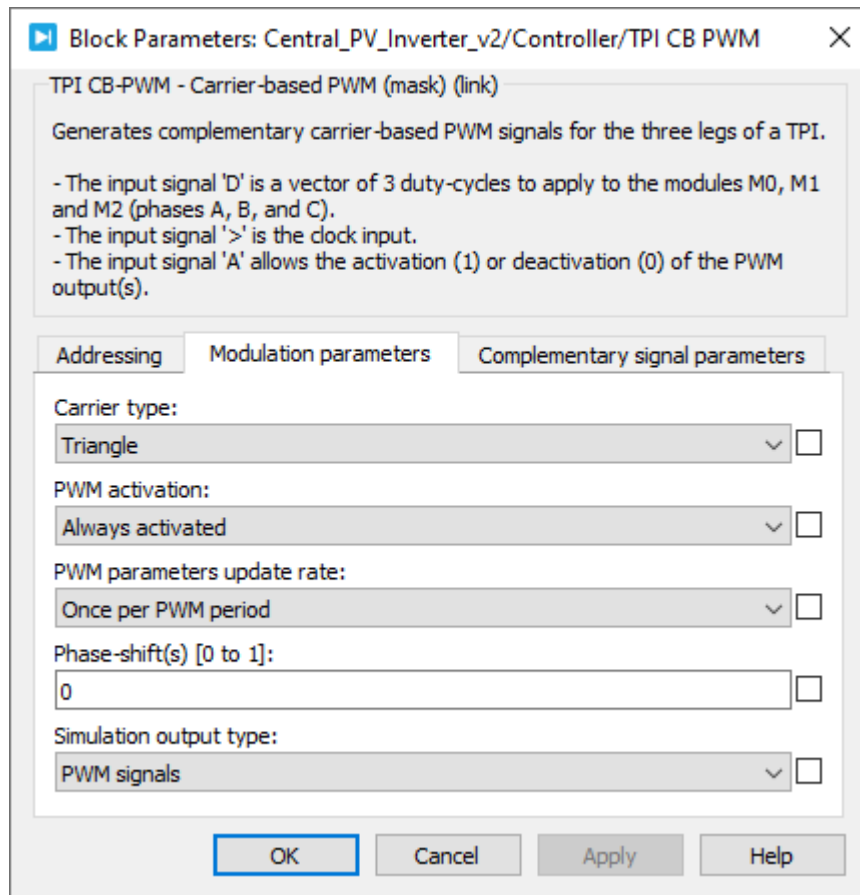
Addressing Modulation parameters Complementary signal parameters

Dead-time duration [in seconds]:

☐

Dead-time simulation:

☐



C++ functions

There are no C++ helper functions for the TPI. Please refer to the [generic CB-PWM functions](#).