

TI C2000 Toolbox ePWM

This document describes *ePWM* component from TI C2000 Toolbox library.

Short description

Pulse-Width Modulator is the most important peripheral in many of the power electronic systems. ePWM component enables user to configure the peripheral in order to generate desired gate driving signals. It supports several functionalities, such as:

- Variable carrier frequency,
- Variable carrier phase,
- Configurable dead time,
- Synchronizing multiple ePWM modules,
- ADC start-of-conversion and ePWM interrupt triggering mechanism.

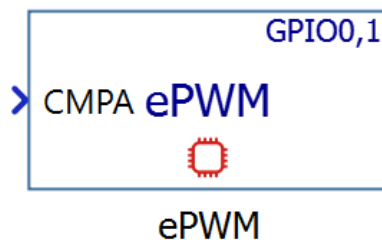


Figure 1. ePWM - component icon.

Detailed overview

NOTE: It is recommended to select *target platform* on [TI C2000 Setup](#) component before configuring the component.

Properties are grouped in tabs named after ePWM submodules.

Component properties:

- Tab **General:**
 - ePWM module – select module of the ePWM peripheral,
 - Execution rate – desired rate at which component inputs will be applied. This value must be compatible with other components of the same subsystem: the value must be a multiple of the fastest execution rate in the circuit. To specify the execution rate, you can use either decimal (e.g. 0.001) or exponential values (e.g. 1e-3) in seconds. Alternatively, you can type in 'inherit' in which case the component will be assigned execution rate based on the execution rate of the components it is receiving input from.

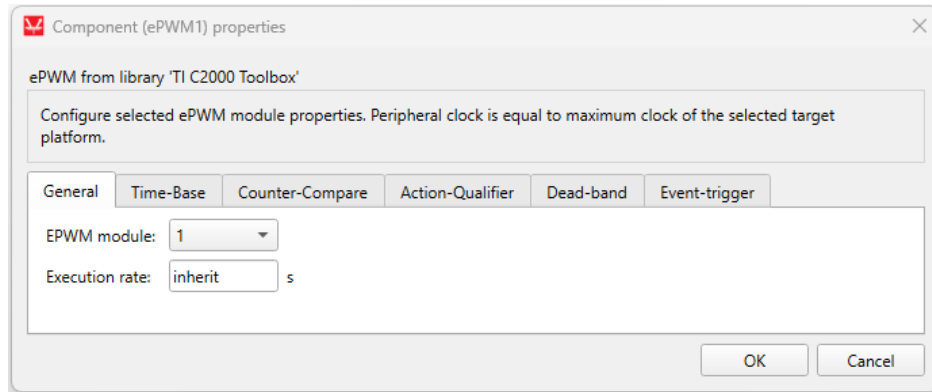


Figure 2. ePWM component dialog - General tab.

- **Tab Time-Base:**

Essential bitfields/registers configuration for generating desired carrier signals and reference values (more details can be found in [TI Technical Reference Manual](#)), subsection *Time-Base (TB) Submodule*.

- CMPA source, TBPRD source, TBPHS source, PHDSIR source properties – ‘external’ in case of variable frequency/phase, ‘property’ if fixed. New inputs are created if ‘external’ is selected.

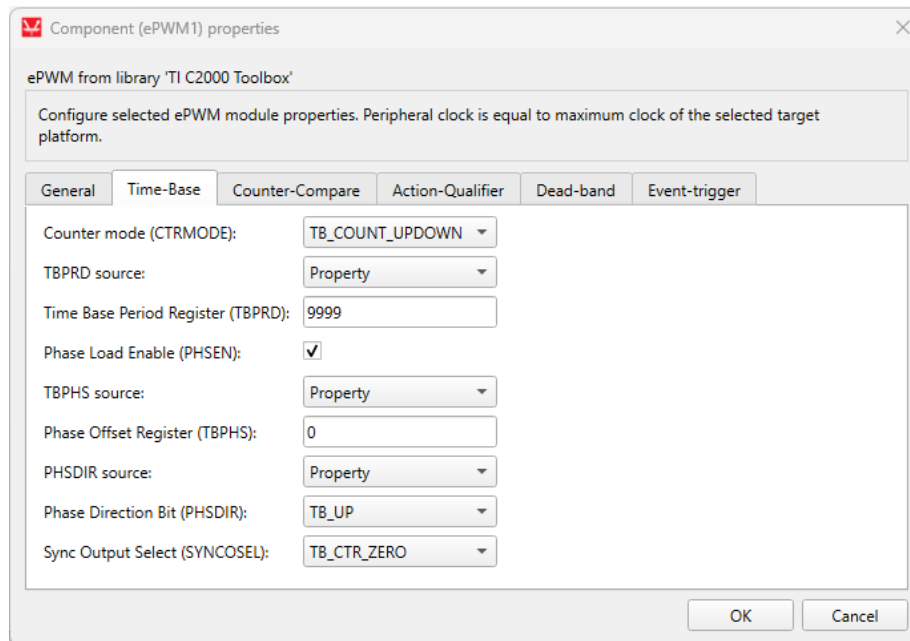


Figure 3. ePWM component dialog - Time-Base tab.

- **Tab Counter-Compare:**

Registers for defining whether the duty cycle value is loaded from shadow registers or directly.

Essential bitfields/registers configuration for generating desired carrier signals and reference values (more details can be found in [TI Technical Reference Manual](#)), subsection *Counter-Compare (CC) Submodule*.

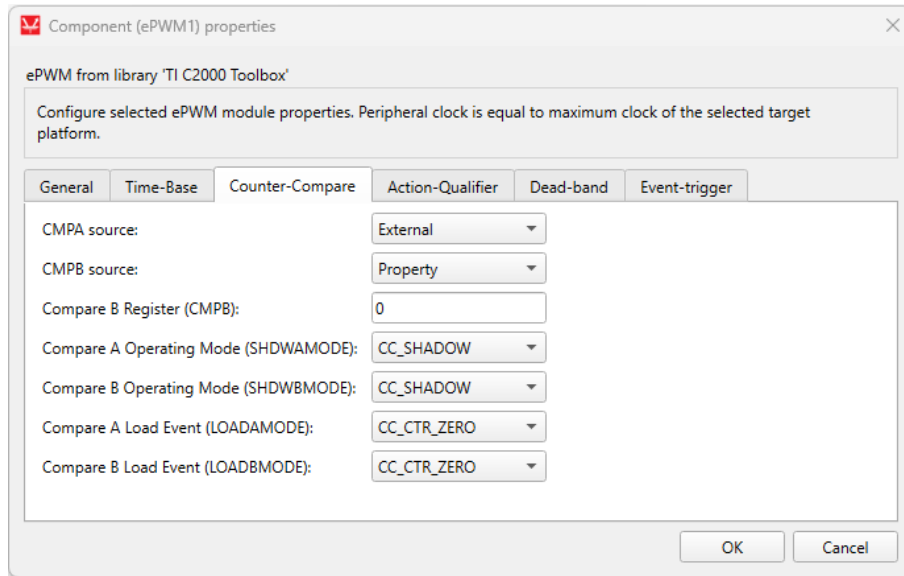


Figure 4. ePWM component dialog - Counter-Compare tab.

- **Tab Action-Qualifier:**

Define type of action when ePWM counter value meets period or zero values, or compare (duty cycle A and B) value when counting up and down – to set/clear/toggle digital output. Values can be provided from property (statically in initialization code) or external input (dynamically in step code at component execution rate), depending on application.

Essential bitfields/registers configuration for generating desired carrier signals and reference values (more details can be found in [TI Technical Reference Manual](#)), subsection *Action-Qualifier (AQ) Submodule*.

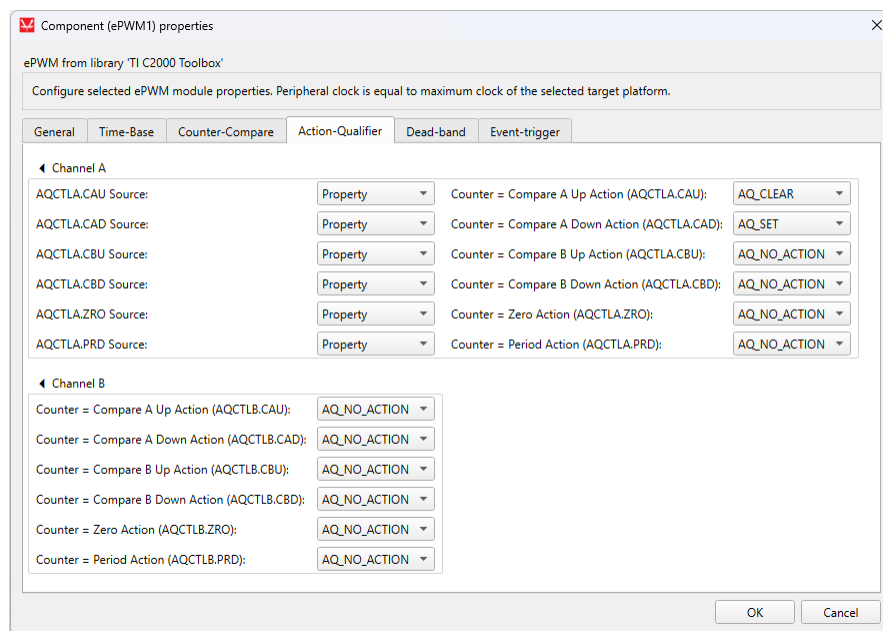


Figure 5. ePWM component dialog - Action-Qualifier tab.

- **Tab Dead-Band:**

Configuring dead time generation:

- Bitfields that define channel A and B signal routing through dead-band submodule,
- RED: raising edge delay in clocks,
- FED: falling edge delay in clocks.

Essential bitfields/registers configuration for generating desired carrier signals and reference values (more details can be found in [TI Technical Reference Manual](#)), subsection *Dead-Band Generator (DB) Submodule*.

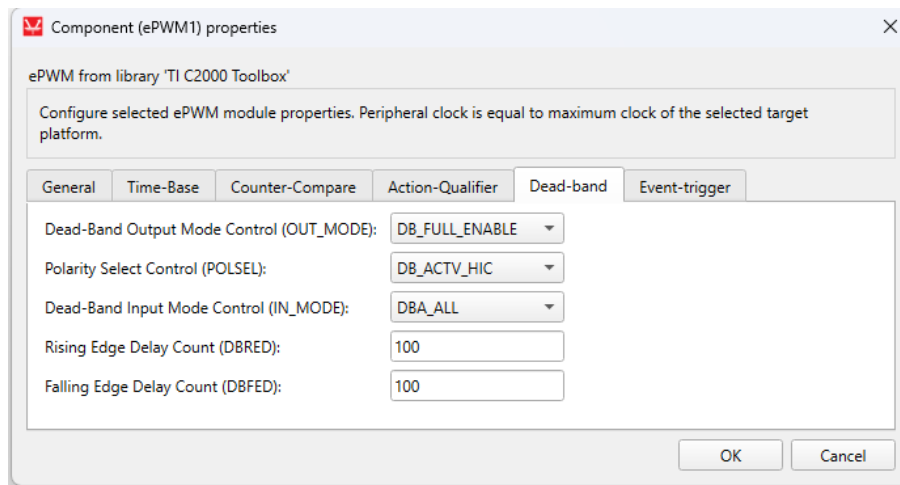


Figure 6. ePWM component dialog - Dead-Band tab.

- **Tab Event-Trigger:**

- ADC Start of Conversion A enabled (SOCAEN) – determines whether start-of-conversion (SOC) trigger A is enabled,
- EPWMxSOCA Event Timing (SOCASEL) – defines moment when SOC trigger pulse A will be generated. Visible if *ADC Start of Conversion A Enabled* is enabled.
- EPWMxSOCA Event Period (SOCAPRD) – determines number of events specified in previous property required to occur before generating the SOC A pulse. Visible if *ADC Start of Conversion A Enabled* is enabled.
- ADC Start of Conversion B enabled (SOCBEN) – determines whether start-of-conversion (SOC) trigger B is enabled,
- EPWMxSOCB Event Timing (SOCBSEL) – defines moment when SOC trigger pulse B will be generated. Visible if *ADC Start of Conversion B Enabled* is enabled.
- EPWMxSOCB Event Period (SOCBPRD) – determines number of events specified in previous property required to occur before generating the SOC B pulse. Visible if *ADC Start of Conversion B Enabled* is enabled.
- ePWM Interrupt enabled (INTEN) - determines whether ePWM interrupt is enabled.

- ePWM Interrupt Timing (INTSEL) – defines moment when interrupt pulse will be generated. Visible if ePWM Interrupt *Enabled* is enabled.
- ePWM Interrupt Period (INTPRD) – determines number of events specified in previous property required to occur before generating the interrupt pulse. Visible if ePWM Interrupt *Enabled* is enabled.

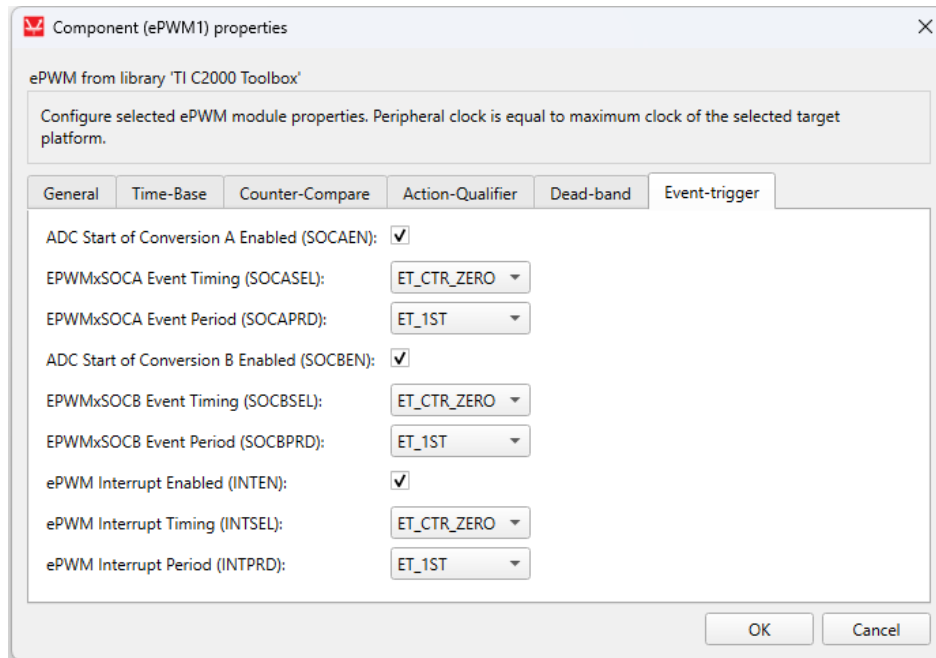


Figure 7. ePWM component dialog - Event-Trigger tab.

Component inputs:

- CMPA – duty cycle relative to TBPRD value, visible if *CMPA source* is 'external',
- CMPB – duty cycle relative to TBPRD value, visible if *CMPB source* is 'external',
- TBPHS – phase offset register, visible when *TBPHS source* is 'external',
- TBPRD – time-base period, visible when *TBPRD source* is 'external',
- PHSDIR – phase direction bit, visible when *PHSDIR source* is 'external',
- CAU/CAD/CBU/CBD/ZRO/PRD – action to perform on ePWM output channels when corresponding action-qualifier event happens, visible when source is 'external'.

For **ALL** inputs:

- Supported types: uint
- Vector support: no

NOTE: At least **one** input must be enabled (source set to 'external')!