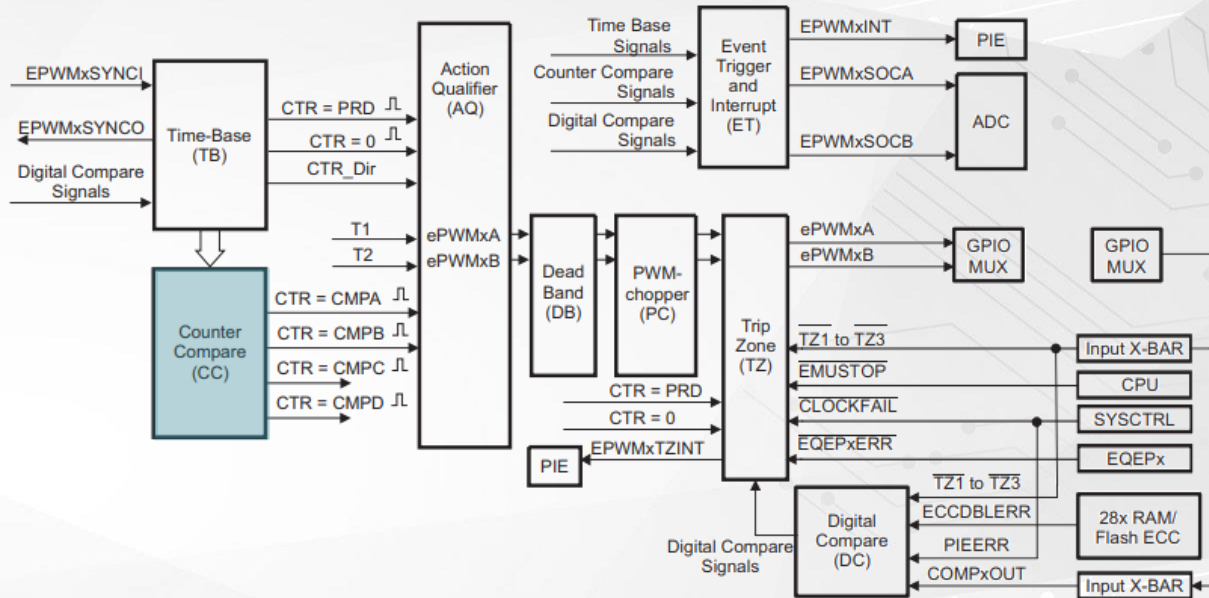


ePWM Counter Compare and Action Qualifier Submodules

C2000 Enhanced Pulse Width Modulator (ePWM) Series

Counter Compare (CC) Submodule

- Generates events based on programmable timestamps using CMPA/CMPB/CMPC/CMPD (CMPx)
- Use in conjunction with Action Qualifier submodule to control duty cycle of EPWMA/EPWMB outputs

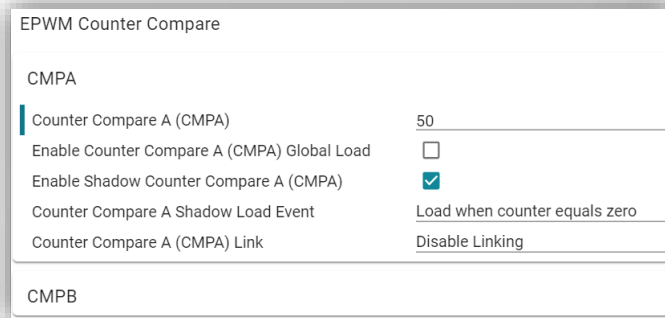


Counter Compare Submodule: Setting CMPx Values

The Counter Compare submodule takes as input the time-base counter value. This value is continuously compared to the CMPx registers. When the time-base counter matches CMPx registers, the Counter Compare unit generates an appropriate event.

Shadow Registers

The shadow register buffers (provides a temporary holding location) for the active register. At a strategic point in time, the shadow register's content is transferred to the active register. This prevents corruption (spurious operation) in cases where the register is asynchronously modified by software. Shadow Loading events can be TBCTR = (ZRO), TBCTR = (PRD), TBCTR = (ZRO | PRD), or a sync pulse.*



EPWM Counter Compare

CMPA

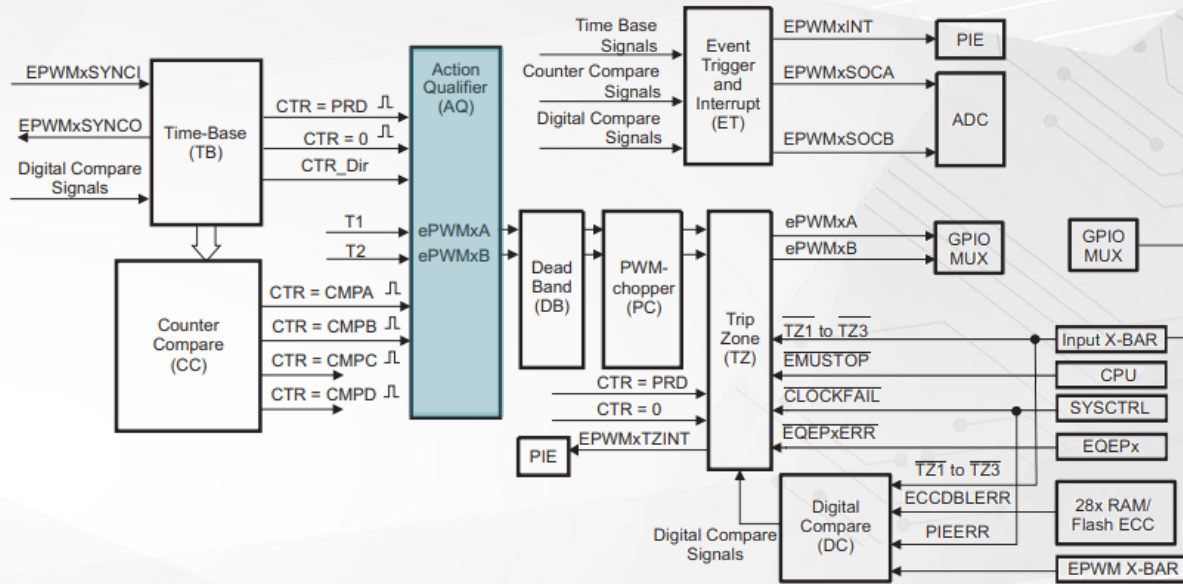
Counter Compare A (CMPA)	50
Enable Counter Compare A (CMPA) Global Load	<input type="checkbox"/>
Enable Shadow Counter Compare A (CMPA)	<input checked="" type="checkbox"/>
Counter Compare A Shadow Load Event	Load when counter equals zero
Counter Compare A (CMPA) Link	Disable Linking

CMPB

*By default, shadow loading is enabled for CMPA/CMPB since they control the duty cycle.

Action Qualifier (AQ) Submodule

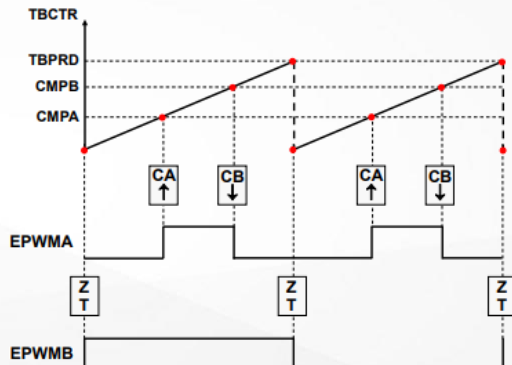
- Specify the type of action taken when a time base, CC, TZ, or comparator event occurs
- Handle priority when events occur simultaneously



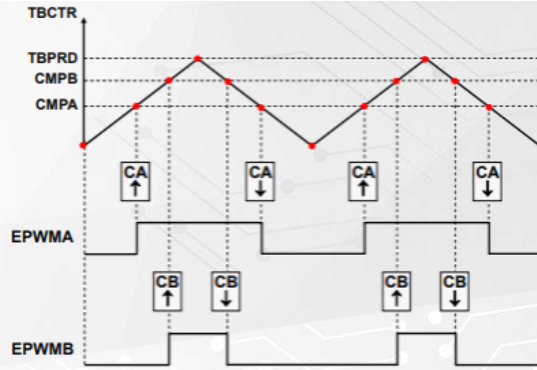
Action Qualifier Submodule: Types of Actions

The following input signals can be configured to have one of the actions in the table below:
ZRO, PRD, CMPA, CMPB, T1, T2

Action	Description
Set High	Set output EPWMxA or EPWMxB to a high level
Clear Low	Set output EPWMxA or EPWMxB to a low level
Toggle	If EPWMxA or EPWMxB is currently pulled high, then pull the output low. If EPWMxA or EPWMxB is currently pulled low, then pull the output high.
Do Nothing	Keep outputs EPWMxA and EPWMxB at same level as currently set.



Up Count Mode Example



Up and Down Count Mode Example

Action Qualifier Submodule: Setting a Duty Cycle Value

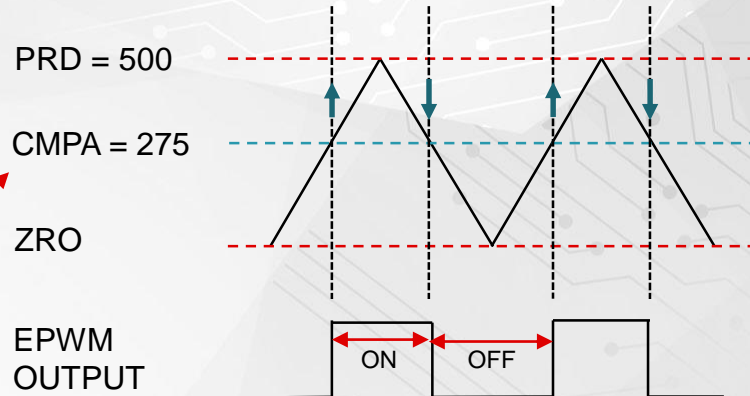
Example: Using Up-and-Down-Count with a TBPRD of 500, how do I achieve a 45% duty cycle?

$$\text{Duty Cycle} = \frac{\text{On Time}}{\text{On Time} + \text{Off Time}}$$

$$\text{Duty Cycle} = 100 - \frac{\text{CMPX}}{\text{TBPRD}}$$

$$\text{CMPX} = (100\% - \text{Duty Cycle}) * \text{TBPRD}$$

$$\text{CMPX} = (1 - .45) * 500 = 275$$



ePWMxA Event Output Configuration

ePWMxA Time base counter equals zero

No change in the output pins

ePWMxA Time base counter equals period

No change in the output pins

ePWMxA Time base counter up equals COMPA

Set output pins to High

ePWMxA Time base counter down equals COMPA

Set output pins to low

Additional ePWM Resources

- [C2000 Academy](#) with Hands-on Labs
- [TI Precision Labs: PWM Basics Overview](#)
- [TI Precision Labs: Motor Interfaces and PWM Frequencies](#)

- ePWM Application Reports
 - [Flexible PWMs Enable Multi-Axis Drives, Multi-Level Inverters](#)
 - [Using PWM Output as a Digital-to-Analog Converter](#)
 - [Using the ePWM Module for 0% - 100% Duty Cycle Control](#)
 - [Leverage New Type ePWM Features for Multiple Phase Control](#)

Check Video Description for Additional Resources