University of Colorado
Boulder

Photovoltaic Power Electronics
ECEA 5716 Open-Loop Photovoltaic Power Electronics Laboratory
Software Tools and Pulse-Width Modulator
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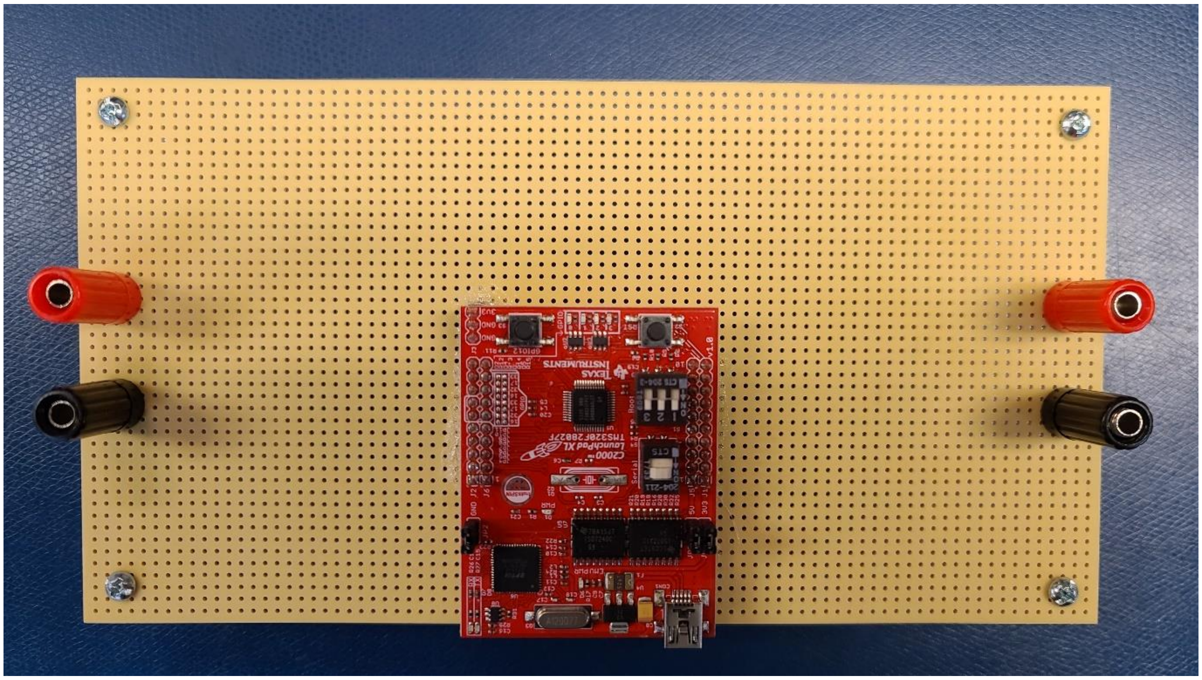
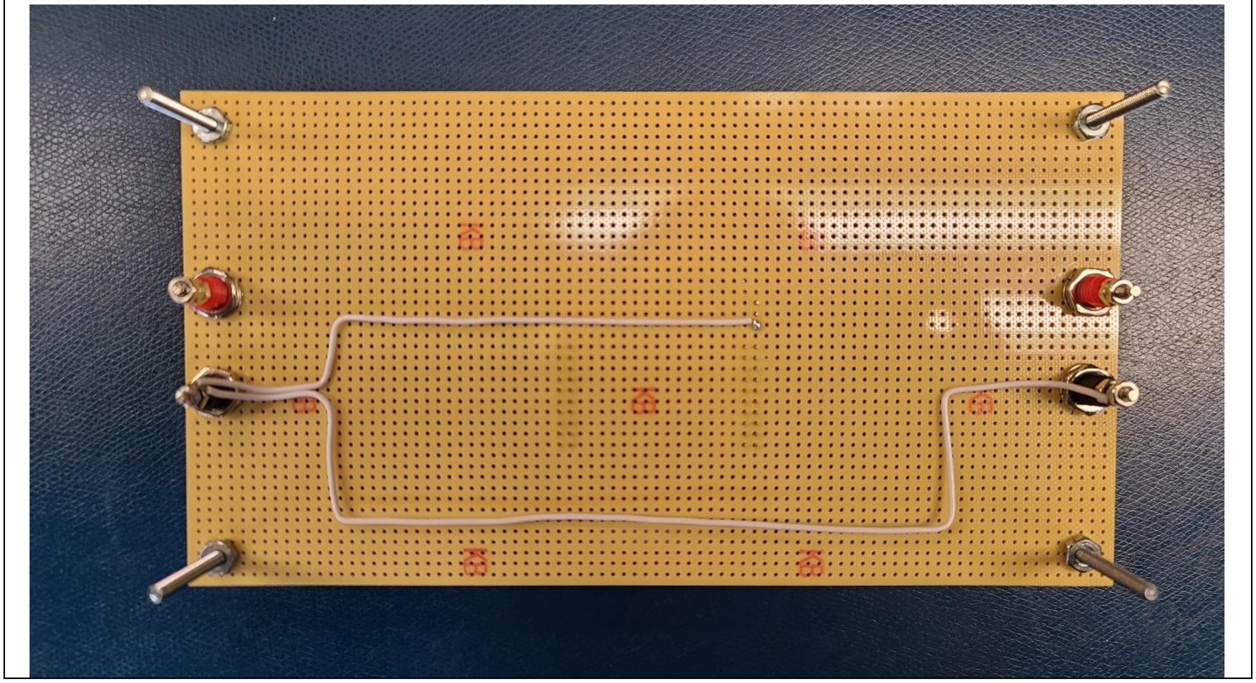
1. Photographs of the top side and bottom side of perfboard show that binding posts and standoff legs have been installed, LaunchPad XL board has been mounted, and wires soldered to connect grounds of input, output, and LaunchPad.





2. From *Code Composer Studio*, screen capture that includes the lines of C code used to set the PWM duty cycle to 40% and the switching period to 14 µsec.

- **PWM_setPeriod(myPwm, *value*)**, // The *value* sets the Periods.
- Where value = 1 = 1/60MHz = 16.6667nS
- In-order to achieve 14 µS.

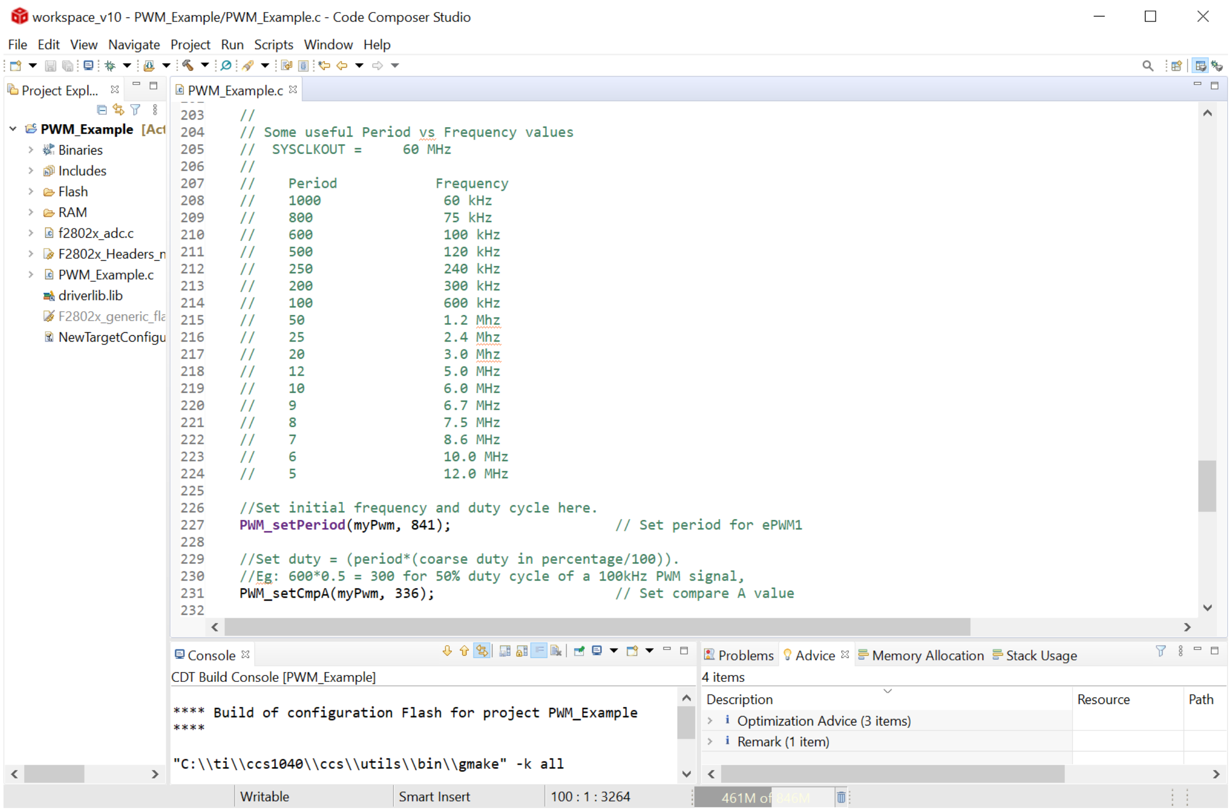
$$\frac{14\mu s}{16.6667ns} = 840$$

-
- I set the value to **841** in-order to achieve the accuracy ±0.1 µS.

```
PWM_setPeriod(myPwm, 841);
```

- **PWM_setCmpA(myPwm, *value*)**, // The *value* sets the Positive Duty.
- Therefore 40% of 840 = **336**

```
PWM_setCmpA(myPwm, 336);
```



```
//
// Some useful Period vs Frequency values
//  SYSCLKOUT =     60 MHz
//
//    Period              Frequency
//    1000                 60 kHz
//    800                  75 kHz
//    600                  100 kHz
//    500                  120 kHz
//    250                  240 kHz
//    200                  300 kHz
//    100                  600 kHz
//    50                   1.2 Mhz
//    25                   2.4 Mhz
//    20                   3.0 Mhz
//    12                   5.0 MHz
//    10                   6.0 MHz
//    9                    6.7 MHz
//    8                    7.5 MHz
//    7                    8.6 MHz
//    6                    10.0 MHz
//    5                    12.0 MHz

//Set initial frequency and duty cycle here.
PWM_setPeriod(myPwm, 841);                      // Set period for ePWM1

//Set duty = (period*(coarse duty in percentage/100)).
//Eg: 600*0.5 = 300 for 50% duty cycle of a 100kHz PWM signal,
PWM_setCmpA(myPwm, 336);                        // Set compare A value
```

CDT Build Console [PWM_Example]

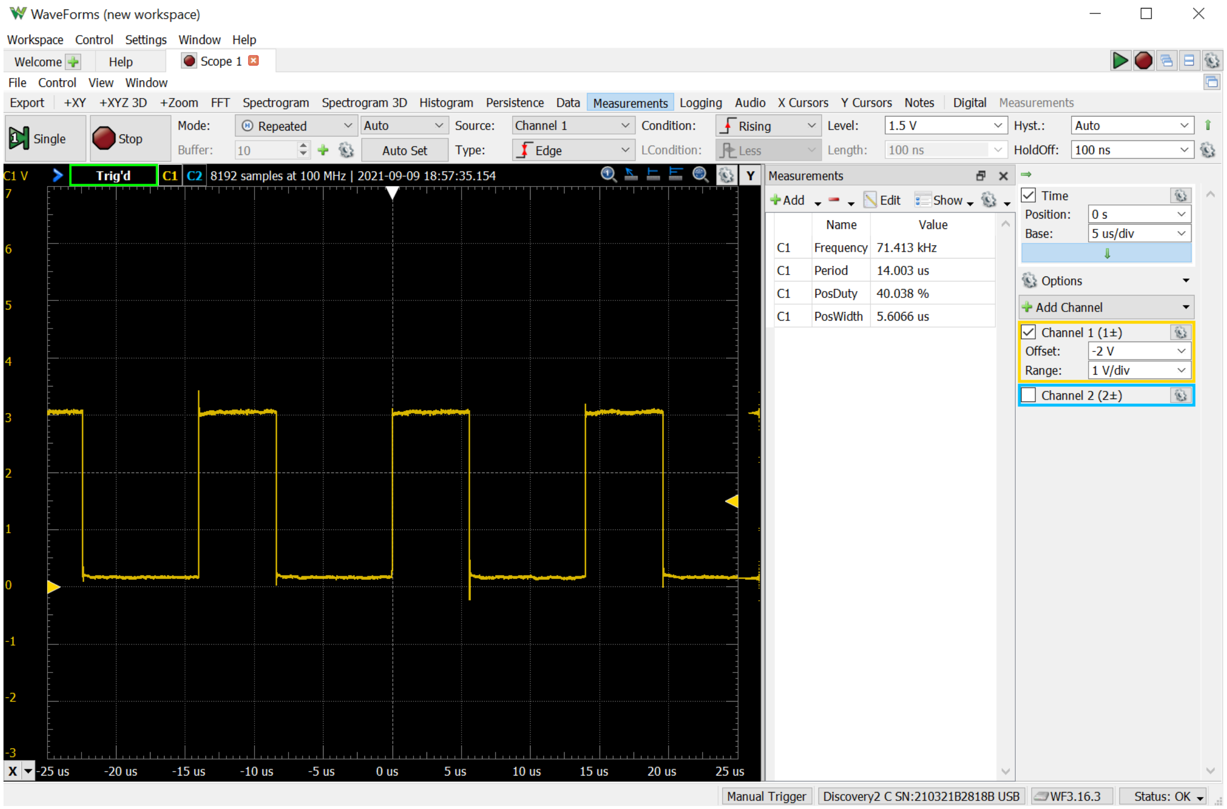
```
**** Build of configuration Flash for project PWM_Example
****

"C:\\ti\\ccs1040\\ccs\\utils\\bin\\gmake" -k all
```

4 items

Description	Resource	Path
Optimization Advice (3 items)		
Remark (1 item)		

3. From *Waveforms*, screen capture of oscilloscope waveform showing PWM output on header J2 pin 1, with switching period of 14 µsec and duty cycle of 40%.


WaveForms (new workspace)
Workspace Control Settings Window Help
Welcome Help Scope 1
File Control View Window
Export +XY +XYZ 3D +Zoom FFT Spectrogram Spectrogram 3D Histogram Persistence Data Measurements Logging Audio X Cursors Y Cursors Notes Digital Measurements
Single
Stop
Auto Set
C1 V
7
6
5
4
3
2
1
0
-1
-2
-3
X
-25 us
-20 us
-15 us
-10 us
-5 us
0 us
5 us
10 us
15 us
20 us
25 us
Measurements
Add
Edit
Show
Options
Add Channel

Mode: Repeated, Auto
Buffer: 10
Source: Channel 1
Type: Edge
Condition: Rising
LCondition: Less
Level: 1.5 V
Length: 100 ns
Hyst.: Auto
HoldOff: 100 ns

Trig'd C1 C2 8192 samples at 100 MHz | 2021-09-09 18:57:35.154

	Name	Value
C1	Frequency	71.413 kHz
C1	Period	14.003 us
C1	PosDuty	40.038 %
C1	PosWidth	5.6066 us

☑ Time
Position: 0 s
Base: 5 us/div

☑ Channel 1 (1±)
Offset: -2 V
Range: 1 V/div

☐ Channel 2 (2±)

Manual Trigger | Discovery2 C SN:210321B2818B USB | WF3.16.3 | Status: OK