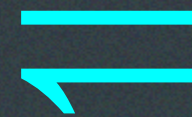


PWM Drawer Project



Description



PWM drawer works as a mini oscilloscope that is responsible for printing the frequency and the waveform of the generated PWM signal.

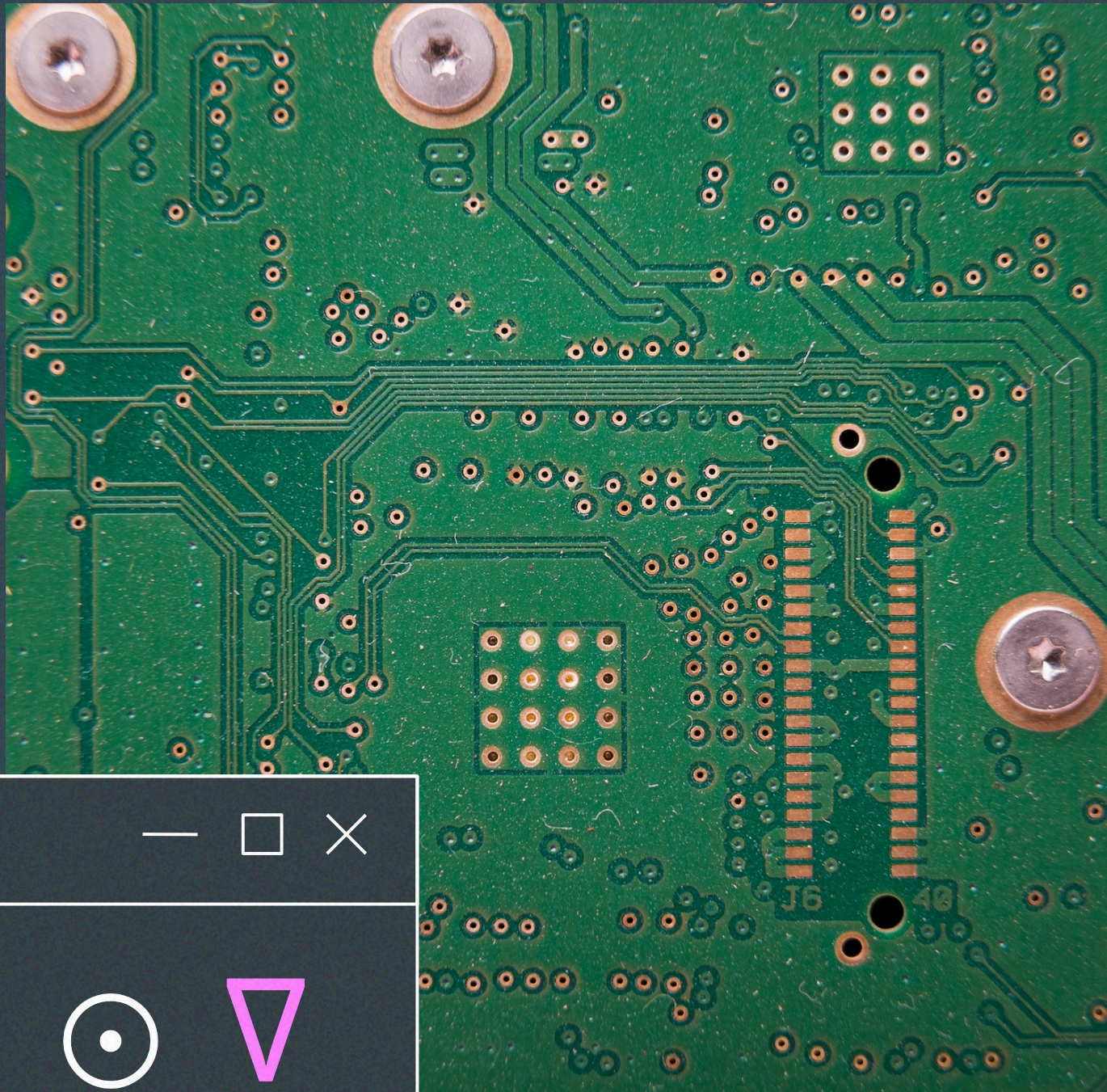
Components Used

1. Atmega32
2. Graphical LCD



Layered Architecture

#Includes



APP

PWMDrawer

HAL

GLCD

MCAL

DIO

ICU

TIMERS

GIE

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Main Flow Chart

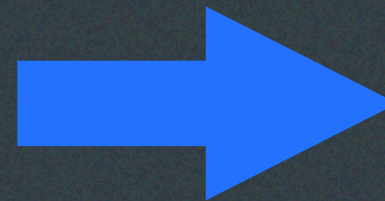
Variables Initializations

- f32 f32Duty = 0;
- f32 f32Freq = 0;
- f32 f32Periodic_Time = 0;
- f32 f32HighTime = 0;
- f32 f32Low_time = 0;



Peripherals Initializations

- TIMERO_VoidInit();
- TIMER1_VoidInit();
- ICU_VoidTimer1Init();
- TIMER2_VoidInit();
- GIE_Enable();
- GLCD_VoidInit();



Signal Drawing

PWMDrawer_VoidDrawSignal

Draws the Signal ,
and Outputs the Calculations done
on a Graphical LCD .



Parameters Calculation

ICU_VoidTimer1SignalCapture

Preforms the Calculations Required :

- Duty Cycle(%)
- Periodic Time (mS)
- Frequency (KHz)
- High Time (mS)
- Low Time (mS)



ICU Interrupt

ICU_VoidTimer1SignalCapture

- Setting up the Interrupt functions using the Call-Back function
- Checks if the Done flag is Raised, then it starts calculating the required parameters
- then it returns it in a given (f32) pointer of each parameter

• Equations

- $\text{Duty Cycle(\%)} = (\text{on ticks} / \text{Total Ticks}) * 100$
- $\text{Tick Time} = \text{Prescaler} / \text{System Frequency}$
- $\text{Periodic Time(mS)} = \text{Total ticks} * \text{Tick Time} * 1000$
- $\text{Frequency(KHz)} = 1 / \text{Periodic Time}$
- $\text{High Time (mS)} = \text{On Ticks} * \text{Tick Time}$
- $\text{Low Time(mS)} = (\text{Total Ticks} - \text{On Ticks}) * \text{Tick Time}$

ICU_VoidTimer1ICUInterrupt

This is the Interrupt Function Called whenever there is a captured Event(Falling Edge / Rising Edge). It measures how many tick it took the signal in high time, and how many ticks in low time and in total period, by Adding the value from ICR1 to the (OVF_counter * 2^Resolution) of the Timer1, then raises a flag after capturing the values, signaling the end of the capture process, for the signal_capture function to calculate the needed parameter through the equations given.

ICU_VoidTimer1OVFInterrupt

Increments the static global counter OVF_Counter with each Overflow of the TCNT1 Register of Timer1



PWM Drawer

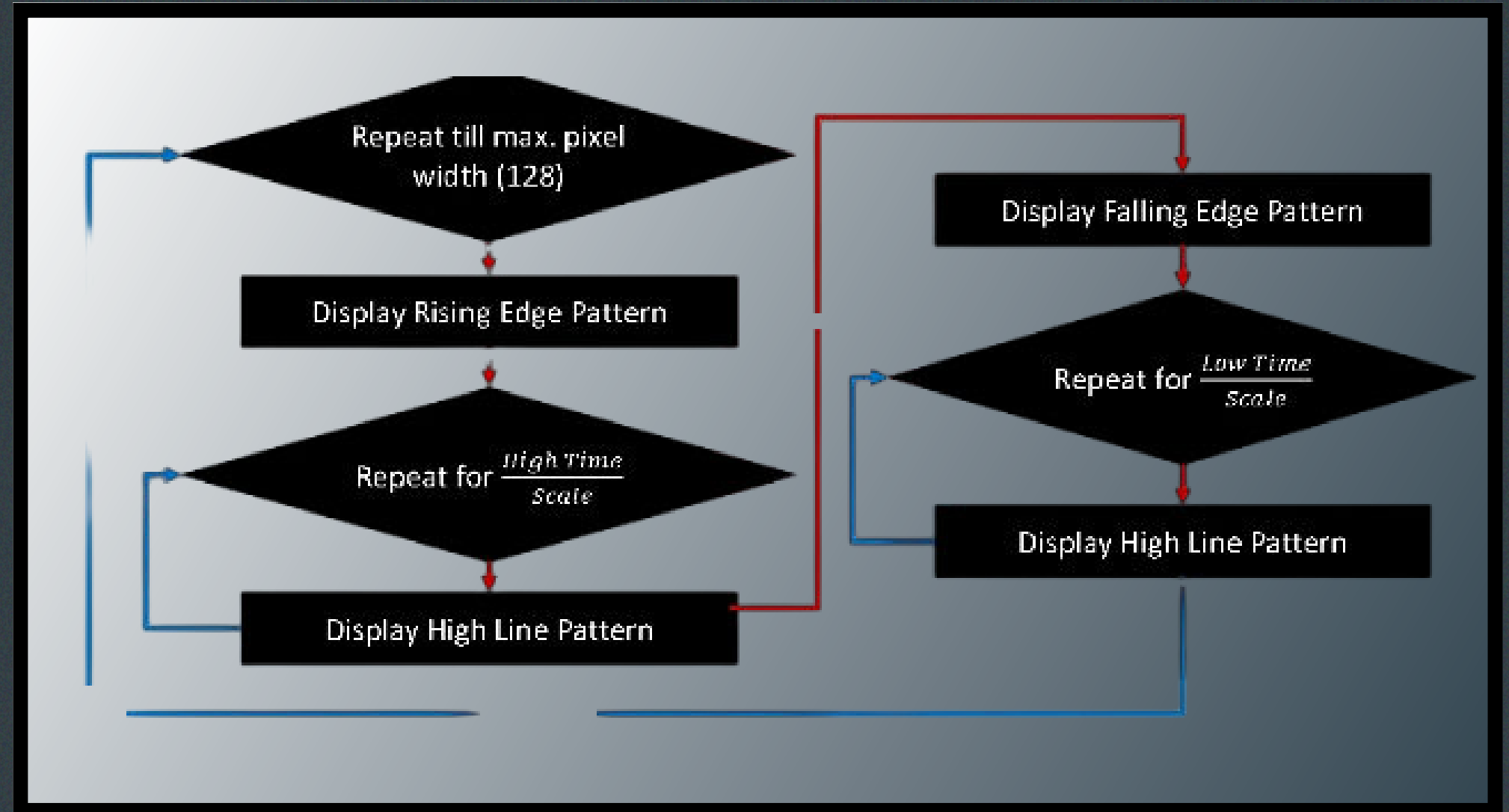
Display Frequency in KHz

Display Duty in %

Display Periodic Time in mSec

Display Arrow on the First Cycle

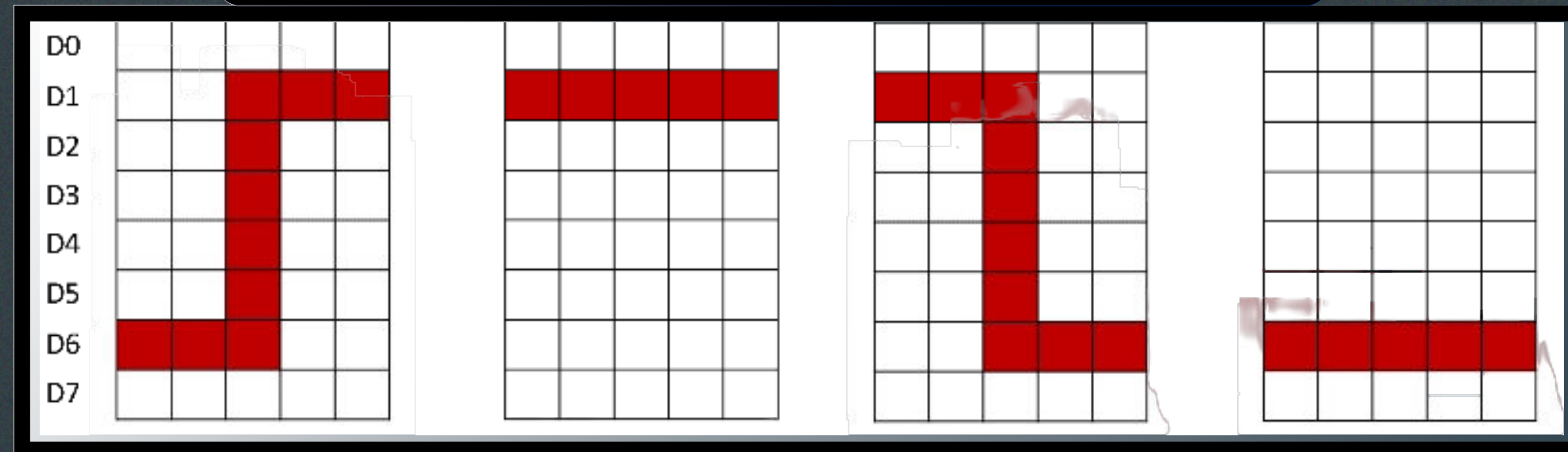
Display PWM Signal Shape



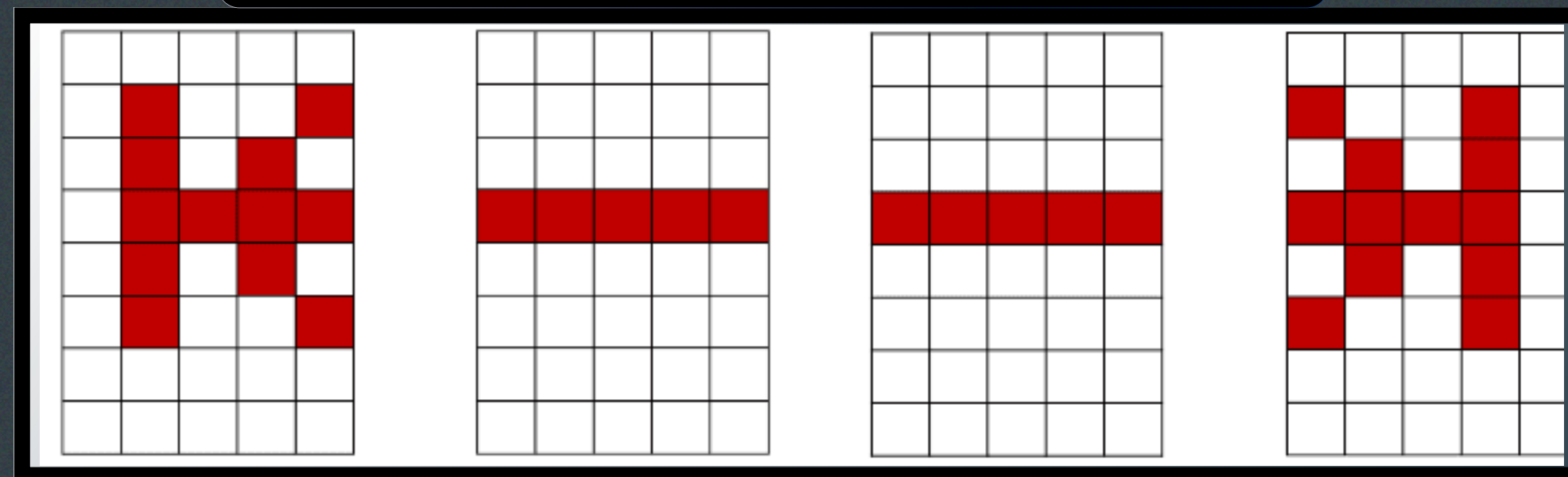
Special GLCD Patterns



PWM Signal Components



Periodic Time Arrow





Thanks !

