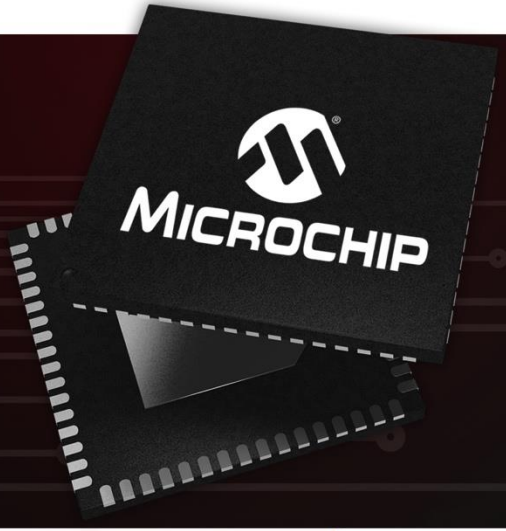
MICROCHIP



A Leading Provider of Smart, Connected and Secure Embedded Control Solutions




Power is Not Simply Black or White, Microchip Highlights Analog/Digital Hybrid Power Supply

Philip Tseng, Embedded Solutions Engineer Manager

October 8, 2019

電源不是只有黑白
類比/數位混合型電源強勢登場

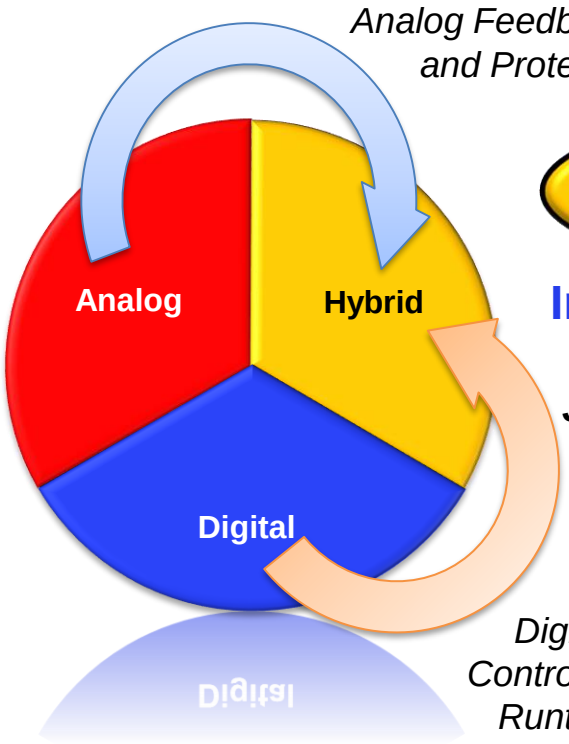
What Defines Intelligent Power?

Sometimes a cow is just a cow…

But sometimes we need something else

Hybrid Control

Bringing the Best of Both Worlds Together



Hybrid Control
(Analog + Digital)

Intelligent Power

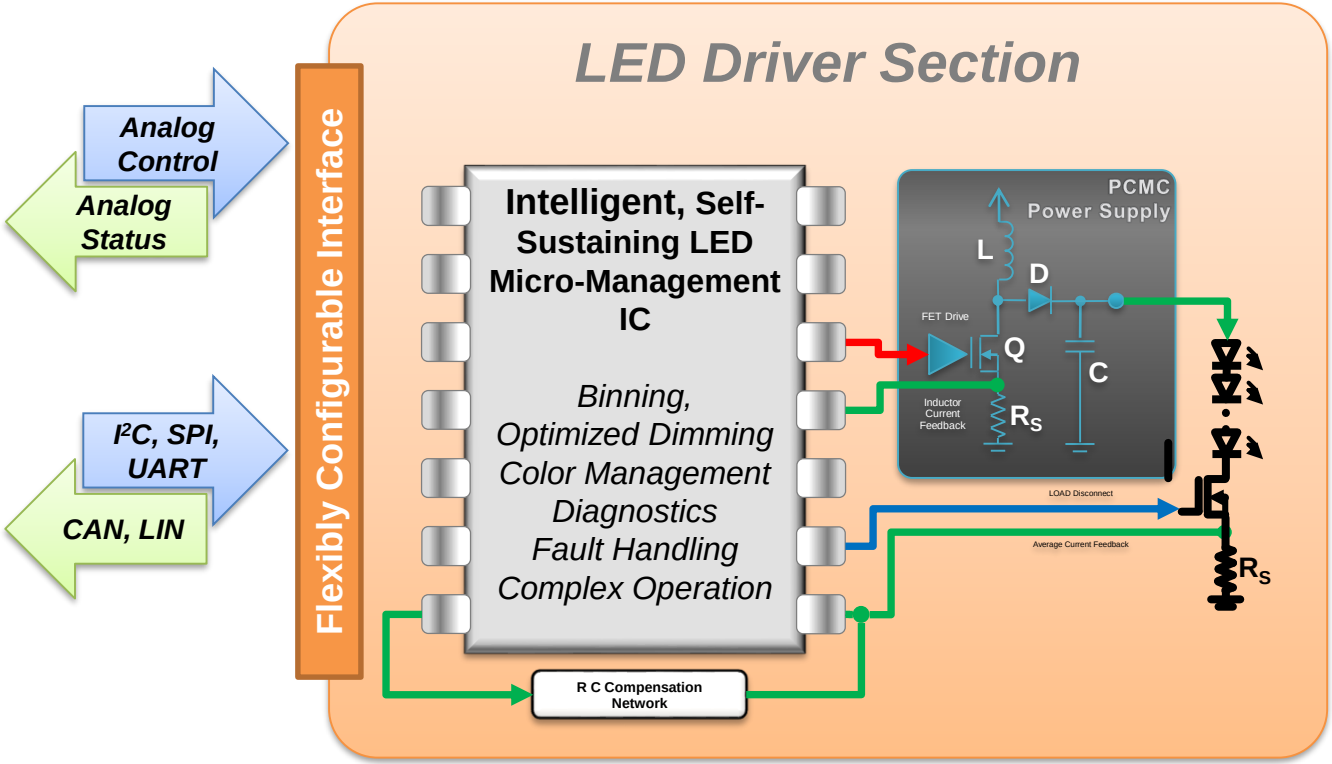
The World isn't Just Black & White

What Defines Intelligent Power?

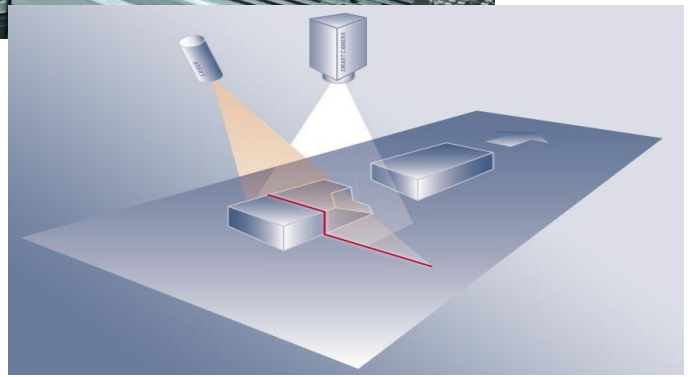
Power supply units which have one or more of the following features and/or characteristics:

- **Product-Level Features**
  - Enhanced features
    - Communication
    - Non-linear operation profiles
  - Auto-adaptive behavior
    - Process synchronization
    - Self-tuning
    - Self-optimization
  - Enhanced diagnostics
    - Failure prediction
    - Self-protection
- **Product Management Aspects**
  - Customization without hardware modification (e.g. programmable parameters)
  - On-site tailoring (e.g. field-programmable operation modes)
  - Field failure troubleshooting (e.g. diagnostics with error logs)

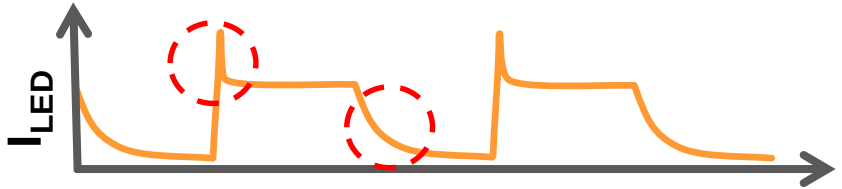
High-Level Product Concept



Professional Lighting Applications



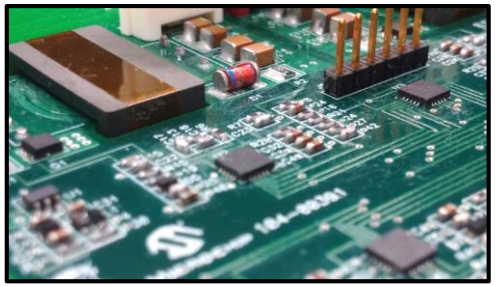
- **Industrial Image Processing**
  - Selectable spectrum (IR, UV, blue, red, green, wide-spectrum white)
  - Camera frame-rate desynchronization
  - Pulsed operation for reduced energy consumption
  - Communication and remote control
  - Long-term stability
  - Long-term availability



Microchip Hybrid PWM Controller Families

Highly Integrated Hybrid PWM Controllers (DEPA)

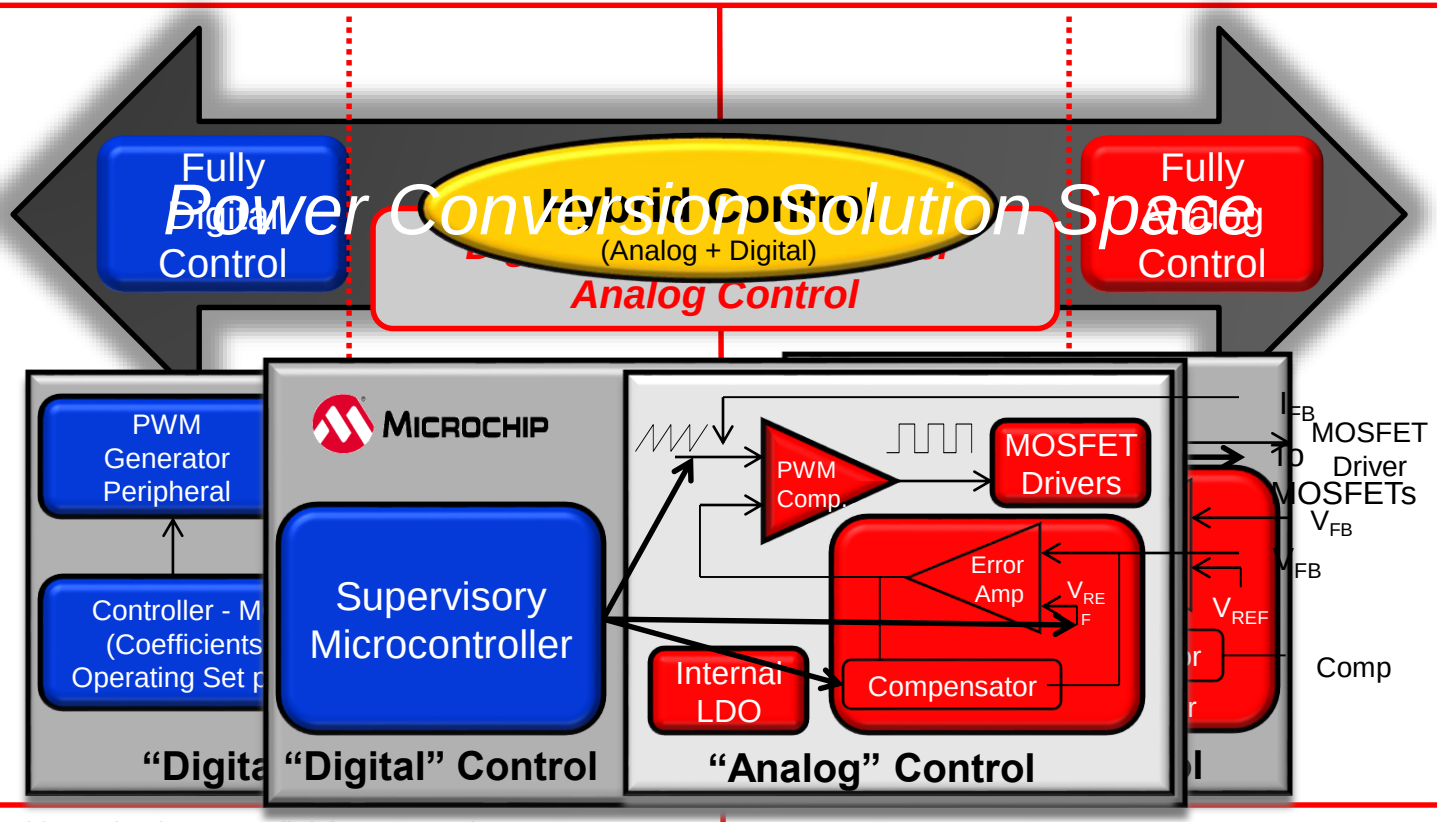
- **Dedicated, vertical applications**
  - DC/DC POL converters
  - USB port power
  - LED driver
  - Battery charger
- **Dedicated topologies**
  - Buck
  - Boost
  - Buck/Boost
  - Flyback, Ćuk, SEPIC



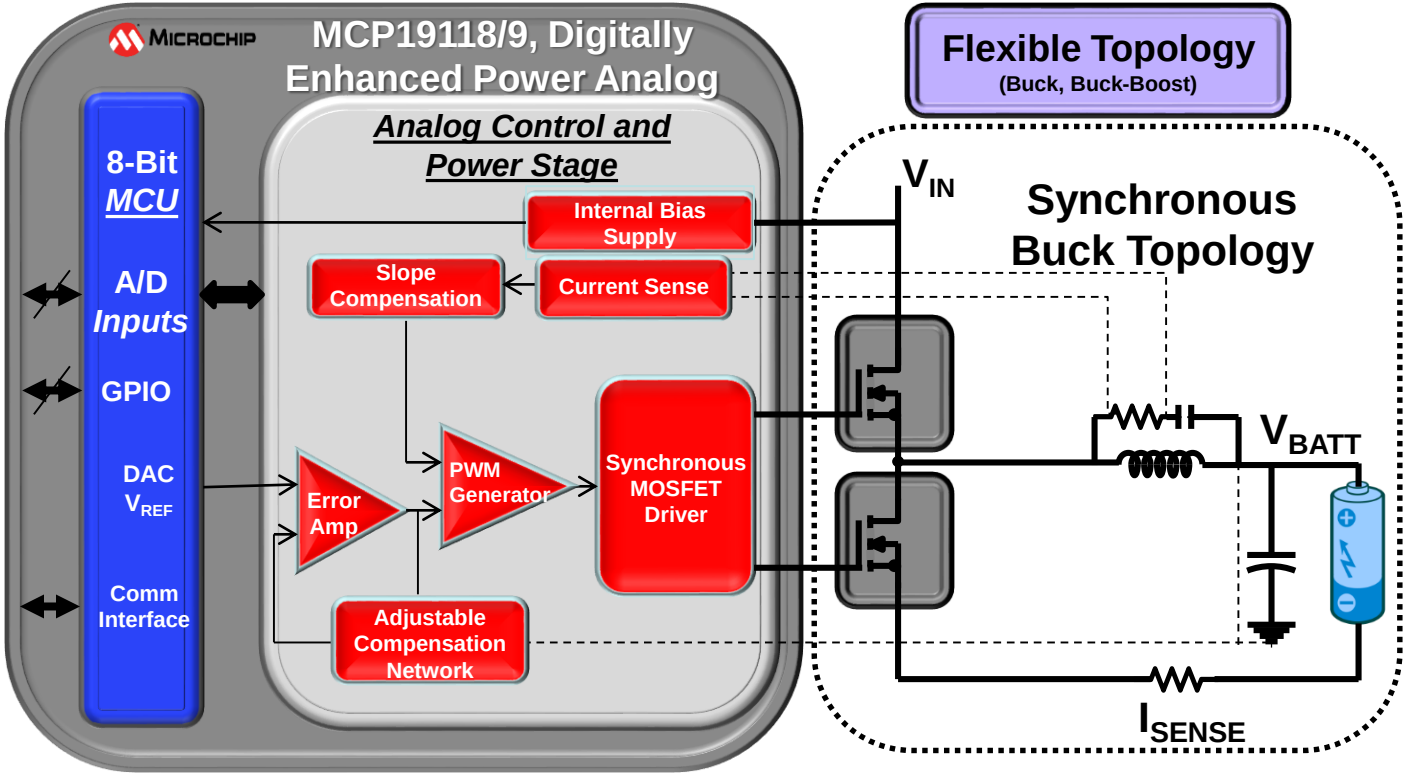
Discrete Hybrid PWM Controllers (CIP Hybrid Power)

- **Maximum design flexibility across all power ranges and topologies**
  - Single stage converters
  - Multi-stage converters
  - Multi-rail converters
  - Multi-phase converters
- **Most flexible PWM configuration**
  - Single-ended, half-bridge, full bridge
  - Push-pull, redundant and phase shifting modes
- **Free configuration of *all* building blocks**

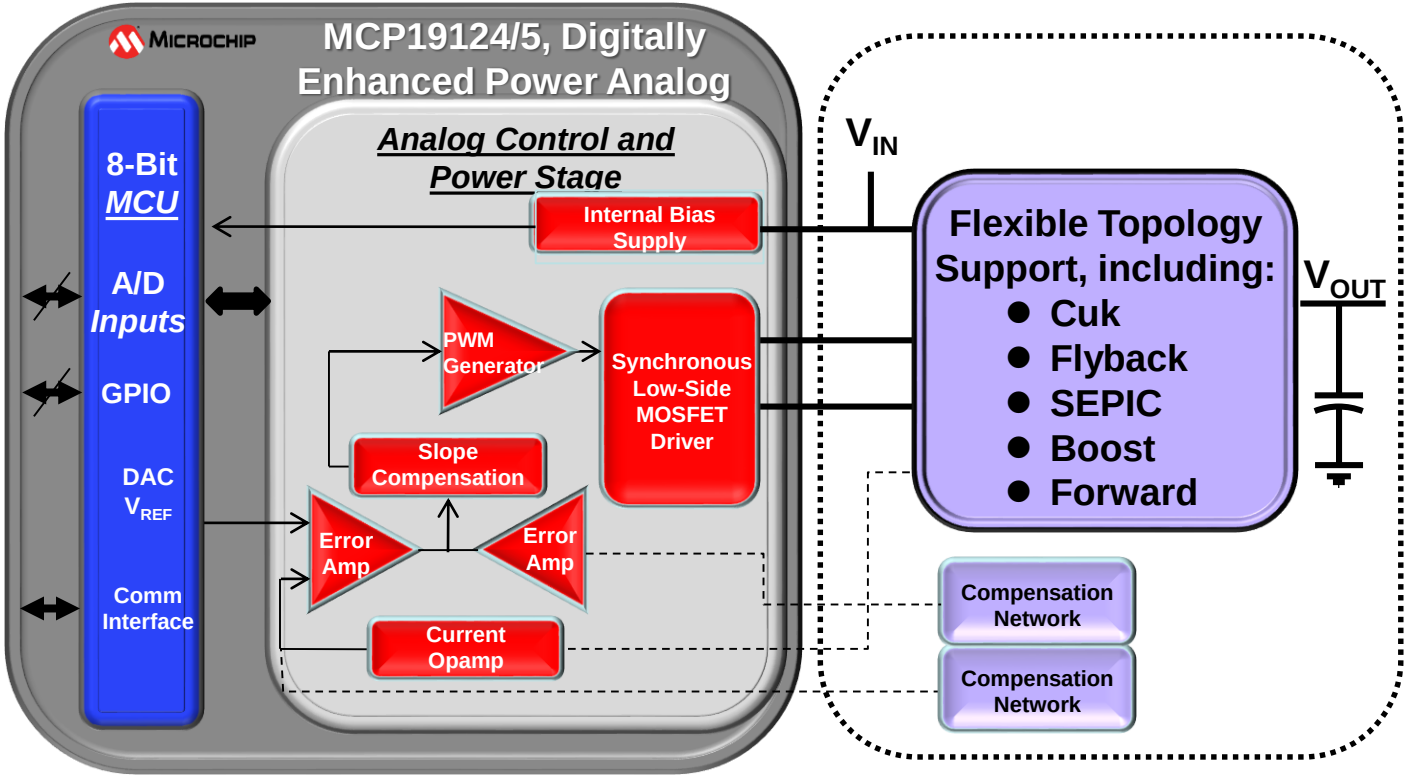
What is DEPA ?
Digitally-Enhanced Power Analog



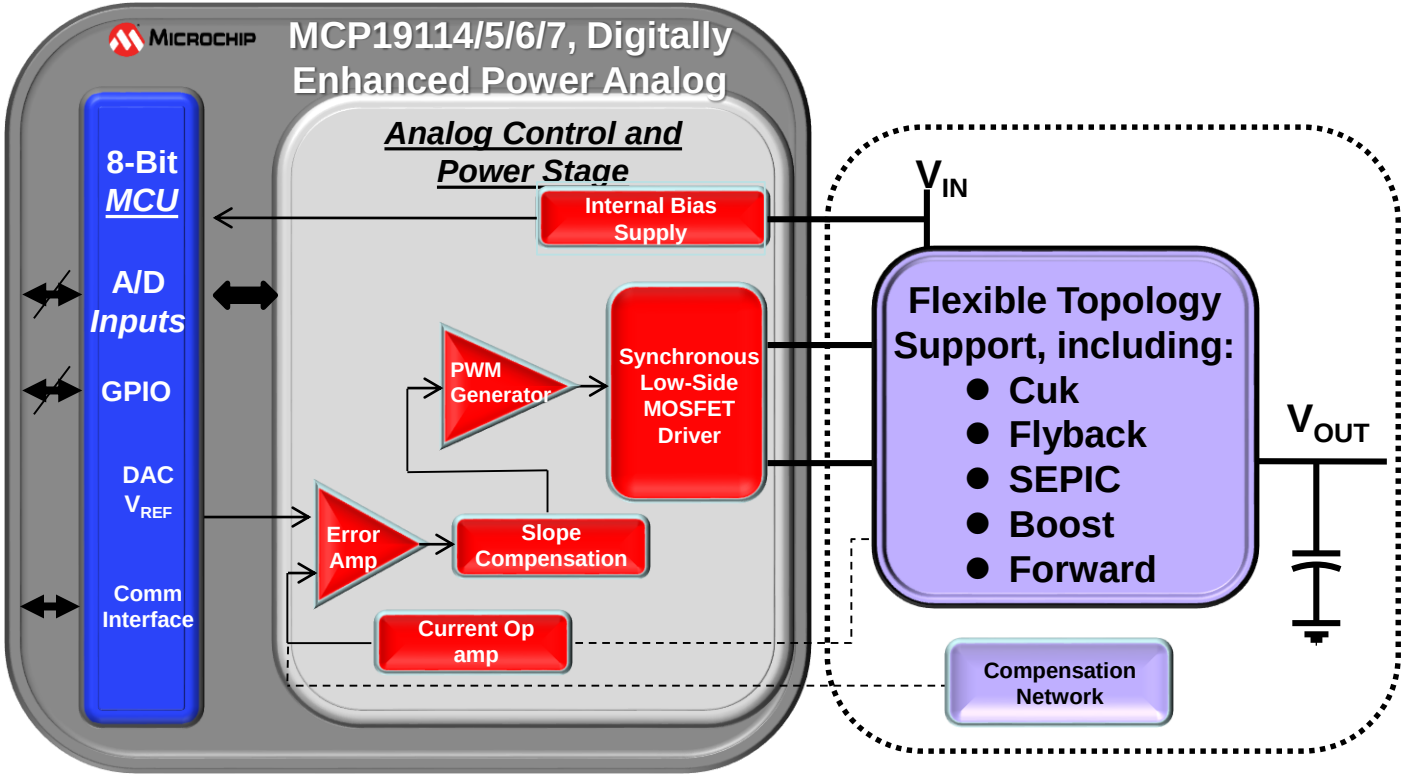
DEPA Introduction MCP19118/19/22/23



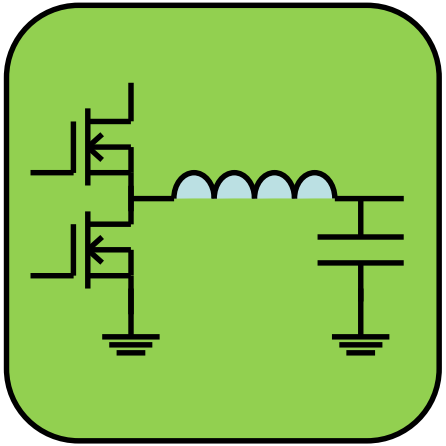
DEPA Introduction MCP19124/19125



DEPA Introduction MCP19116/19117



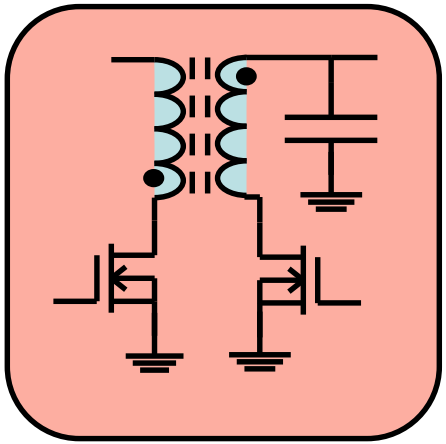
DEPA Topology Introduction



High and Low Side

MCP19118/9

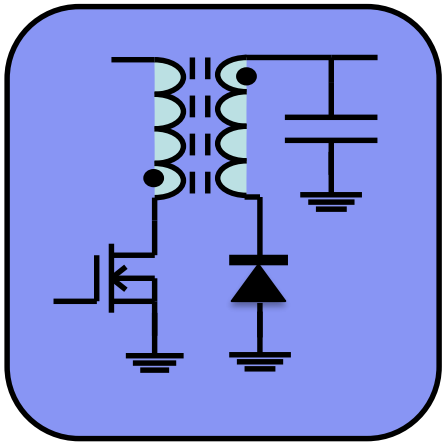
MCP19122/3



Low Side
(with synchronous rectification support)

MCP19116/7

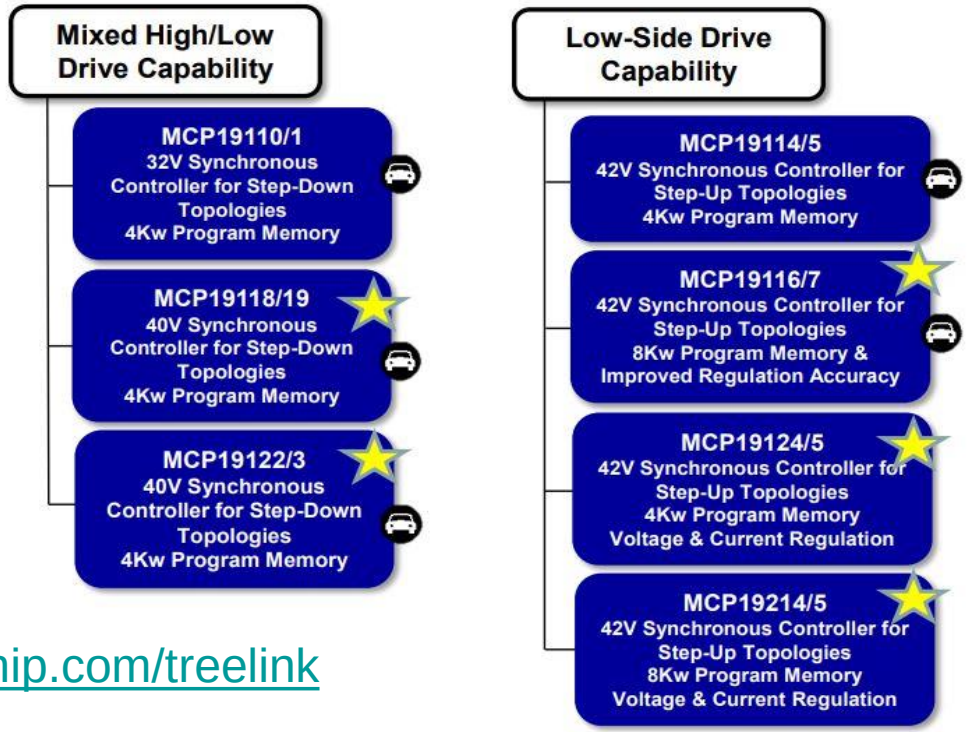
MCP19124/5



Low Side
(asynchronous rectification support)

MCP19214/5

DEPA Controller Families



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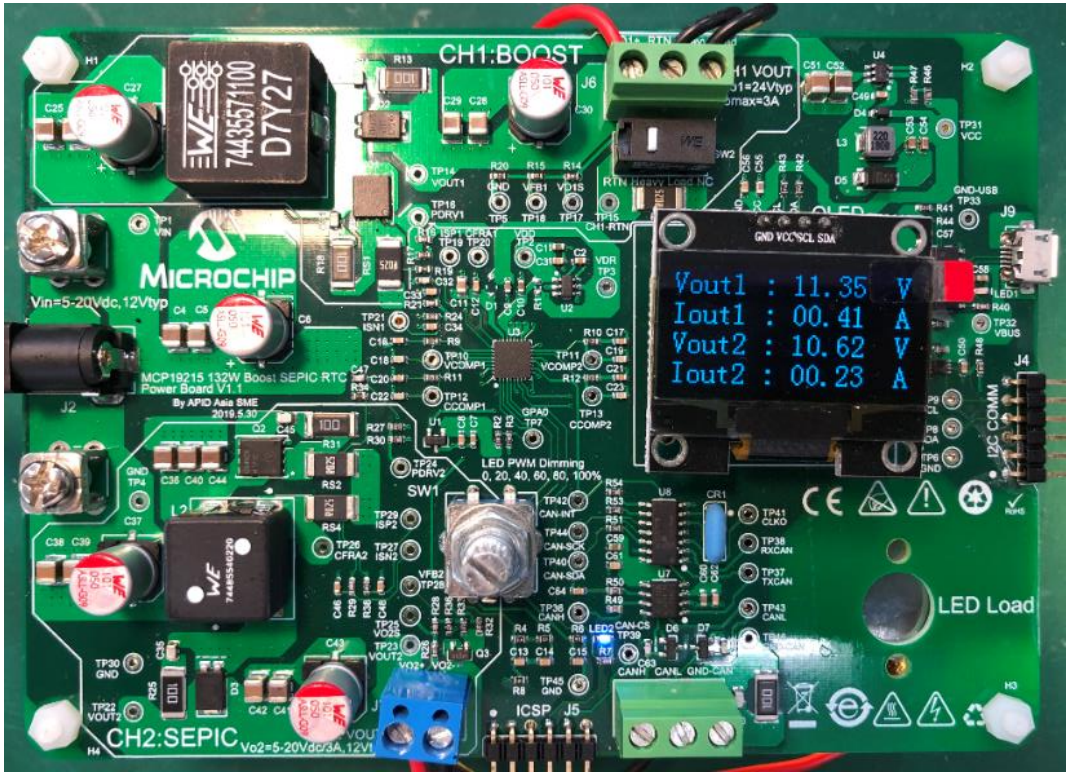
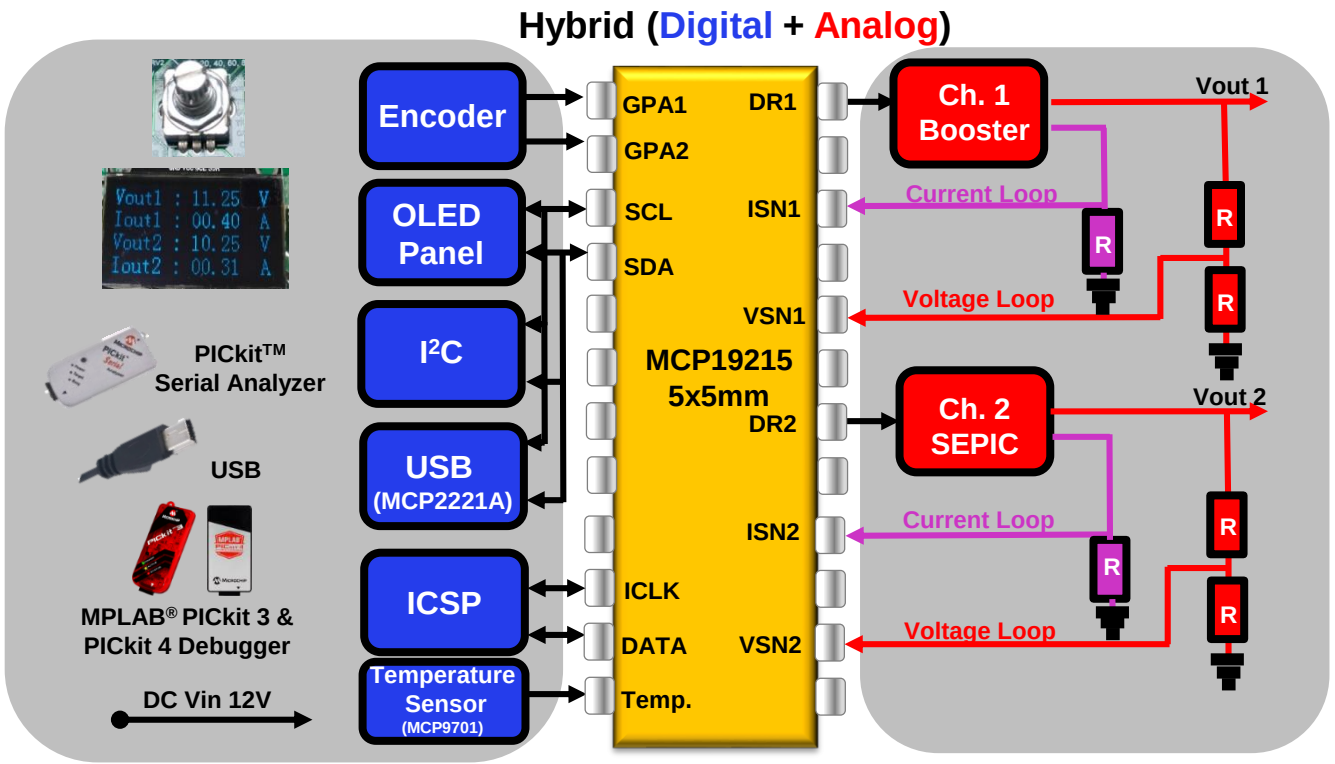
MCP19215 Demo Board



W 100mm
L 140mm

Demo Board Block Diagram MCP19215



Hybrid PWM Controllers Tools Ecosystem

1. **Demonstration and Evaluation Board MCP19xxx**
2. **Evaluation Board Schematic and Source Code**
3. **Design and Simulation Tools**

MPLAB® MINDI™ ANALOG SIMULATOR

MPLAB® XC COMPILER

MPLAB® X IDE

MPLAB® CODE CONFIGURATOR

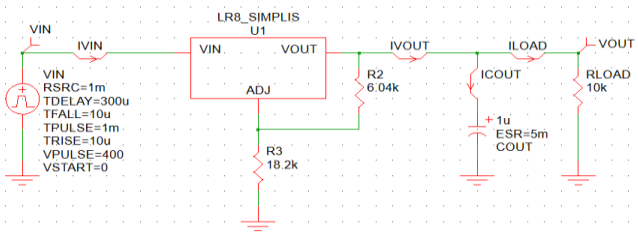
MPLAB® Harmony Graphics Suite (MHGS)

GUIs MCP19xxx

MPLAB PICkit™ 3 & PICkit 4 In-Circuit Debugger

MPLAB ICD 3 & ICD 4 In-Circuit Debugger

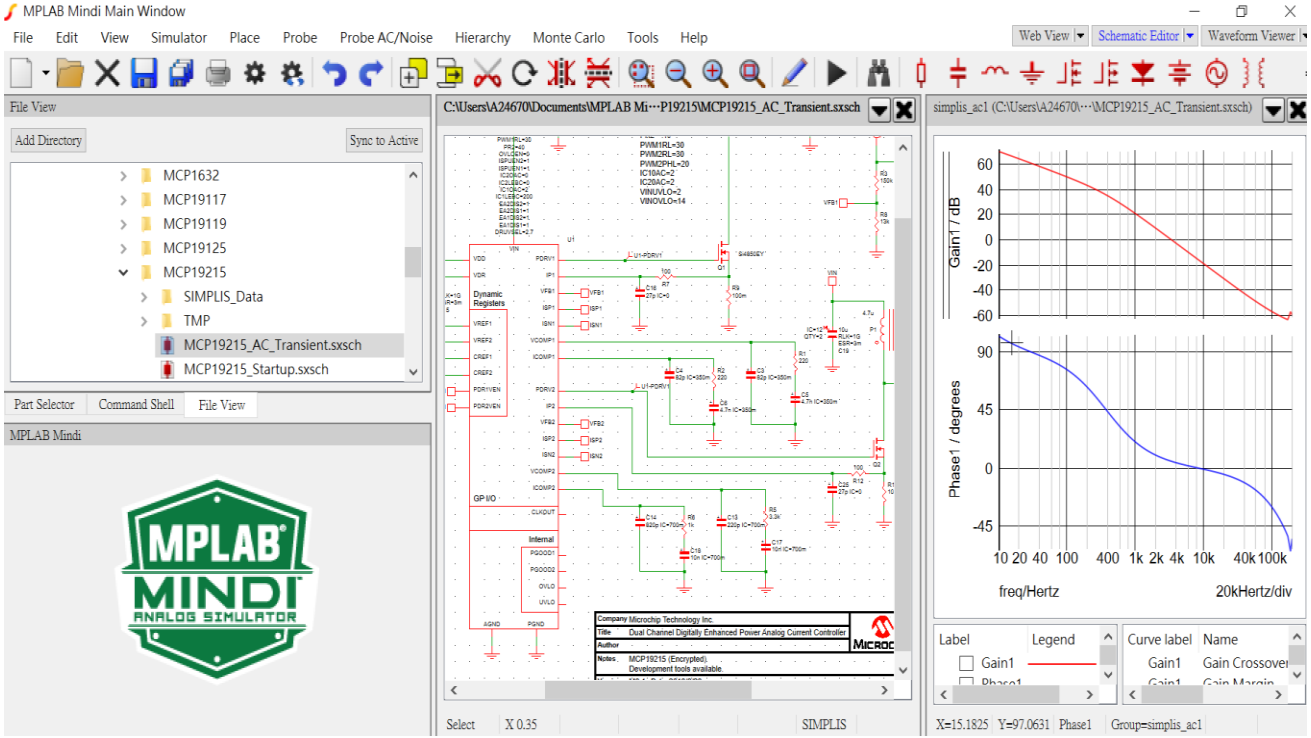
MPLAB® Mindi™ Analog Simulator



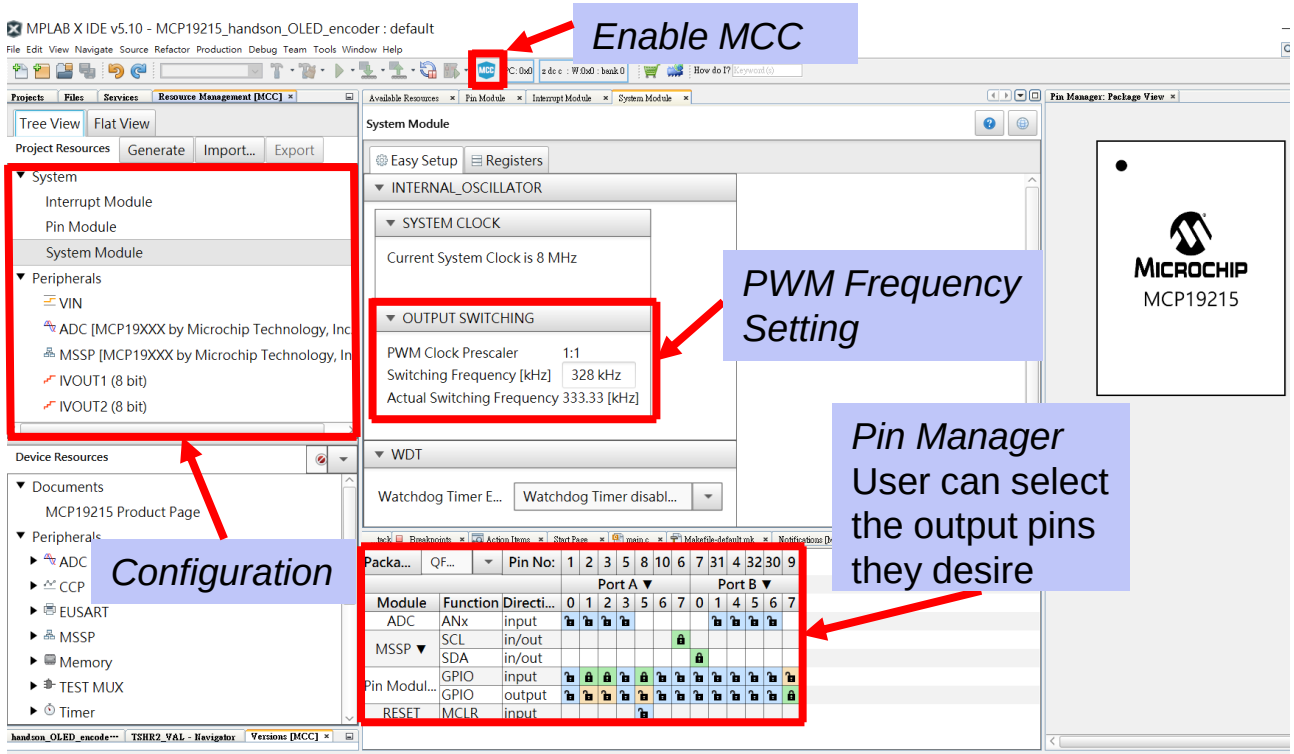
- **Enable analog circuit design with Microchip**
  - Engineers can test ideas, changes or tradeoffs in simulation prior to creating hardware
  - Problems can be found in simulation, saving time and effort from hardware fixes
  - Hardware bugs can be compared to analog simulation results to help troubleshoot development problems

www.microchip.com/Mindi

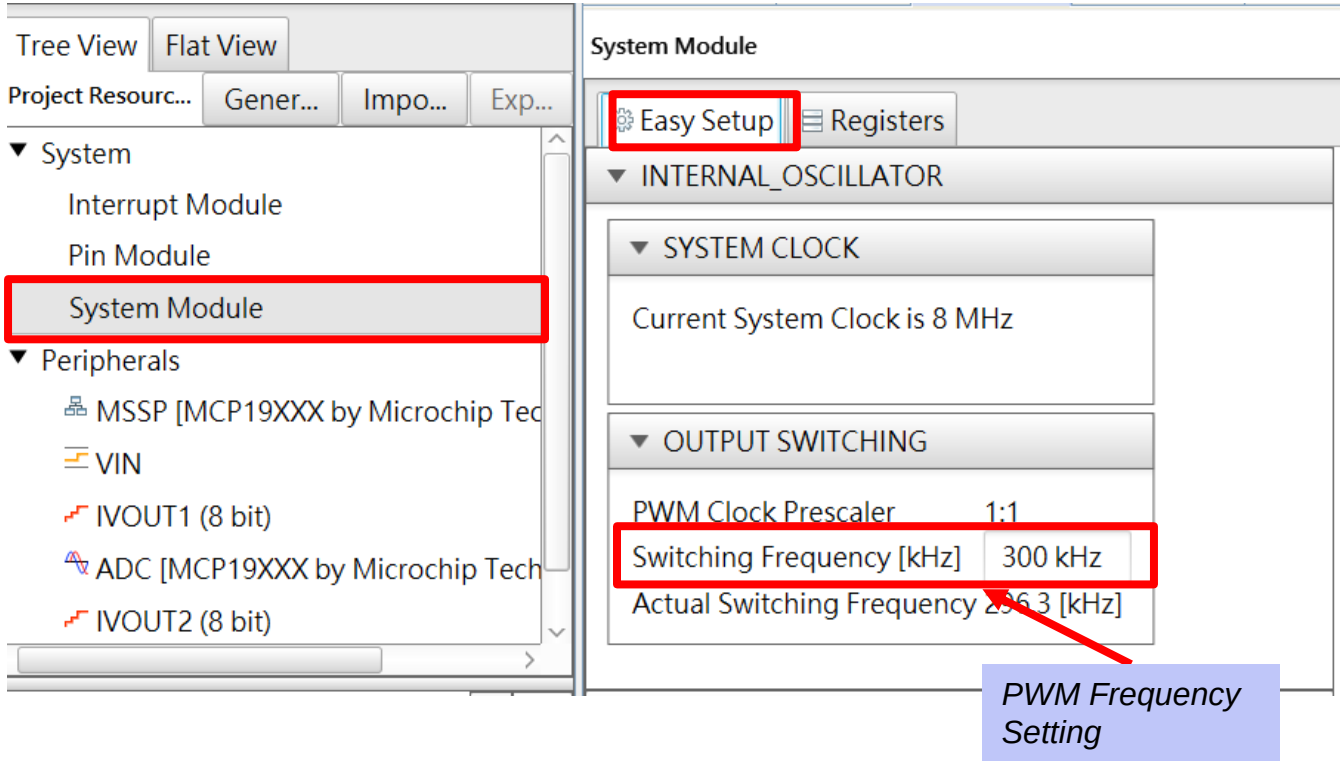
MPLAB® Mindi™ Analog Simulator



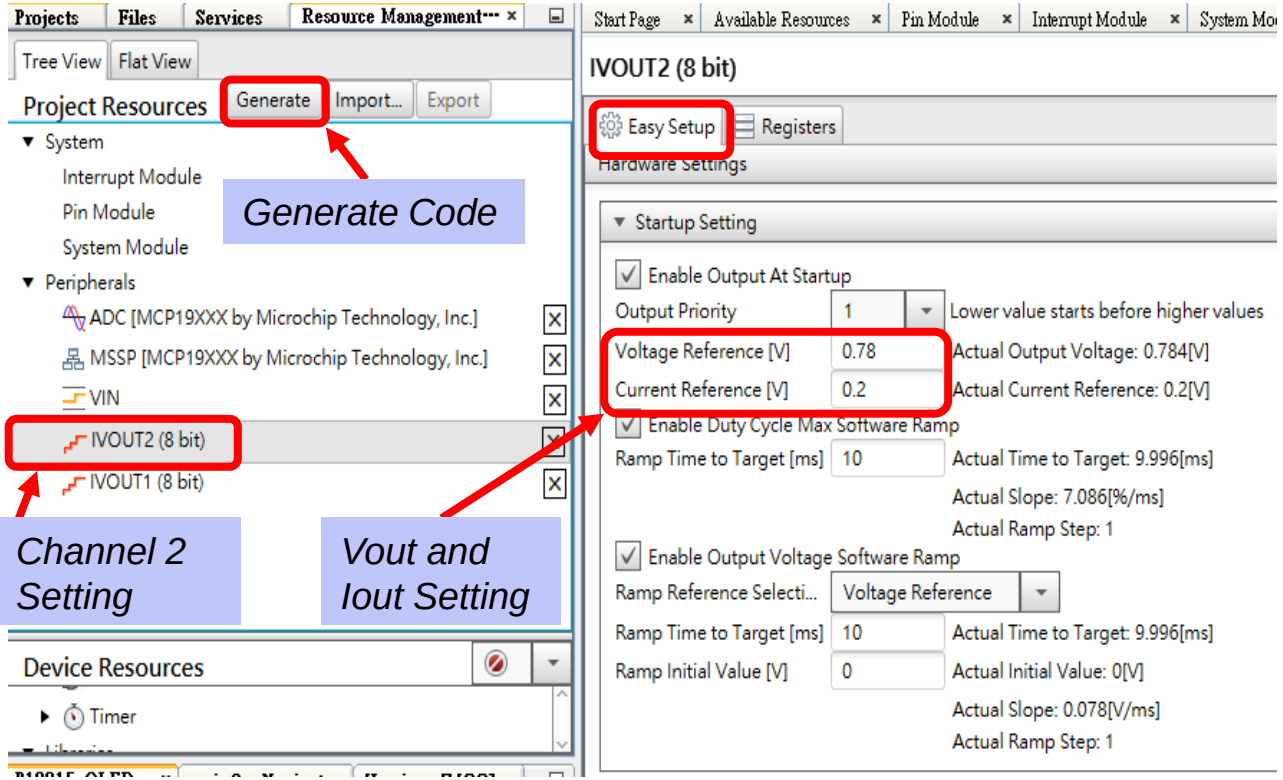
MPLAB® Code Configurator MCP19215



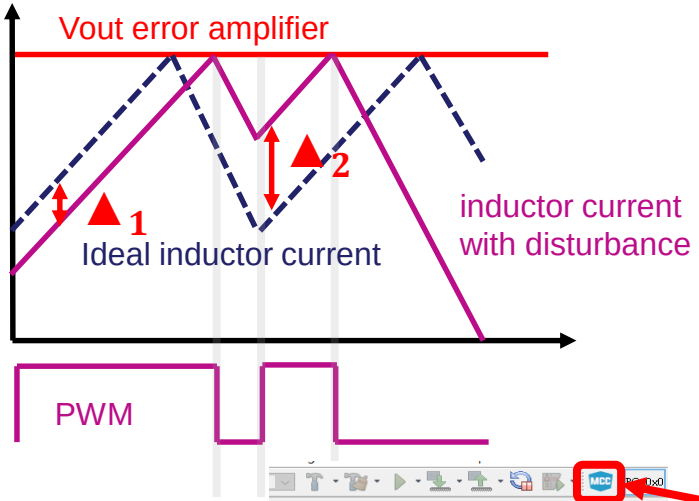
MPLAB® Code Configurator PWM Frequency Setting

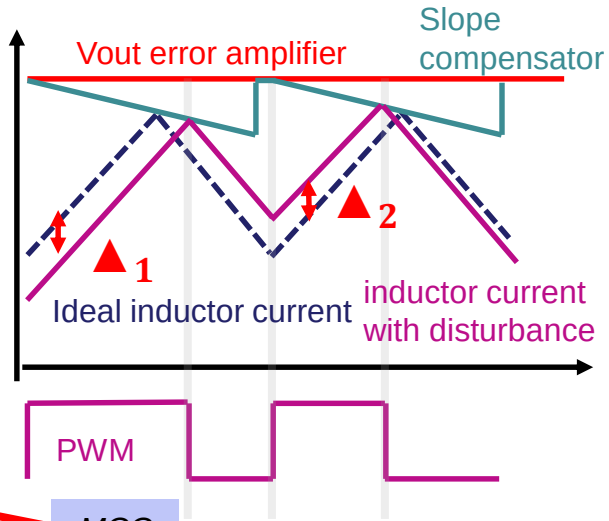


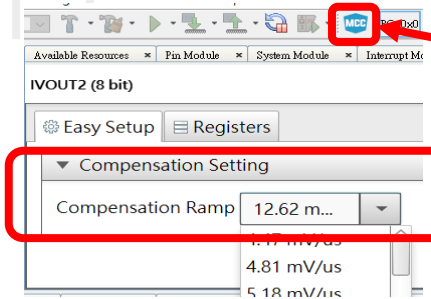
MPLAB® Code Configurator Vout / Iout Setting



PRG Slope Compensator Sub-Harmonic Oscillation





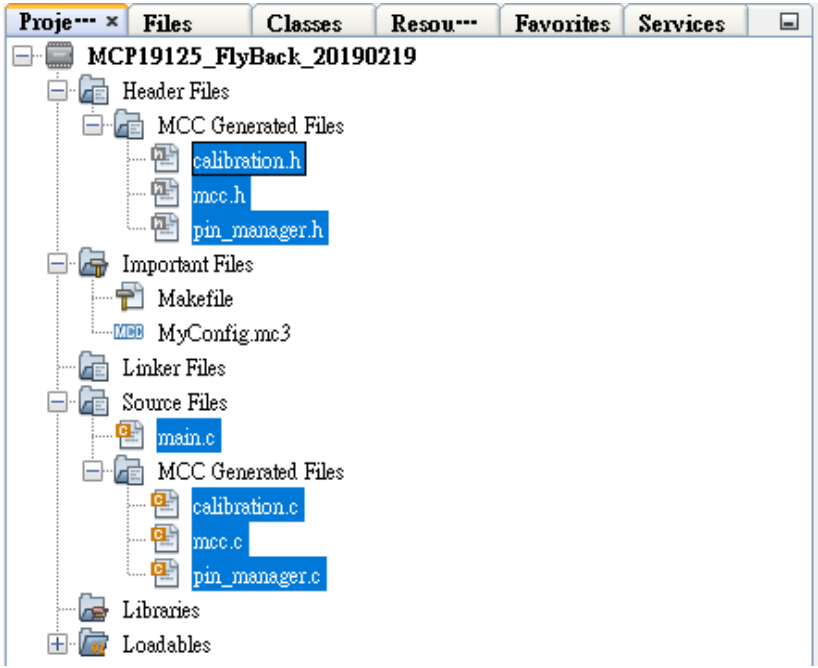


MCC

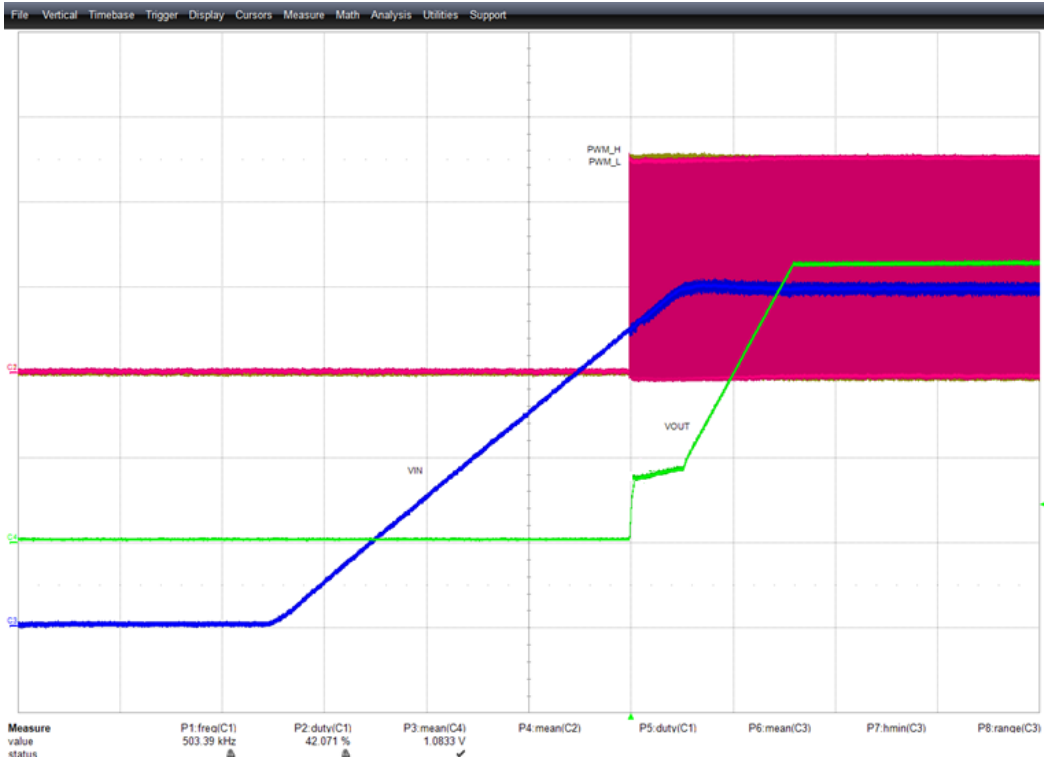
Slope Compensation
4.47~478.33 mv/us

The Files Generated

- **main.c**
- **MCC generate files:**
  - mcc.c
  - mcc.h
  - Pin_manager.c
  - Pin_manager.h



Measurement / Start Up Signal



Summary

- Power is not simply black or white
- Hybrid power controller advantages
- How to implement hybrid power system
- Microchip hybrid power solutions update
- Design tools introduction

Thank you!