PIC16F1769 Dual Independent Channel Power Supply Demonstration

Summary
The PIC16F1769 Dual Independent Channel Power Supply Demonstration Board showcases the flexible intelligence of Microchip’s newest family of PIC® MCUs. The on-chip peripherals can be used to create multiple independent, closed-loop power supply channels. In the demonstration, the PIC16F1769 implements two independent boost power supplies with independent dimming engines. The interconnection of these hardware-based solutions reduces latency, increases system performance, eliminates discrete components and frees the CPU to perform the task of driving the LED array.

Product Highlights
PIC16F1769
- Two op amps
- Programmable Ramp Generator (PRG)
  - Slope compensation
  - Ramp generation
- Four fast comparators
- Digital-to-Analog Converters (DAC)
  - Two 5-bit and two 10-bit DACs
- 10-bit Analog-to-Digital Converter (ADC)
  - Up to 12 channels
- Two Complementary Output Generators (COG)
- Two Data Signal Modules (DSM)
- Three Configurable Logic Cell (CLC)
- Pulse Width Modulations (PWMs): two 10-bit and two 16-bit
- Two high-current drive I/Os: 100 mA capacity
- Zero Cross Detect (ZCD)
- Fixed voltage reference

Buttons
- Right (SW1): Up scroll, increases LED intensity
- Center (SW2): Press/hold for two seconds to change the mode
- Left (SW3): Down scroll, decreases LED intensity

Modes
- Mode 0: Off (center button) – Press button to turn on/off. Hold for two seconds to change to Mode 1.
- Mode 1: Auto Cycle – Automatically ramps the dimming of the independent channels of LED strings
  - Right Button – Press to change to Mode 2
  - Center Button – Press/hold for two seconds to turn off
  - Left Button – Press to change to Mode 3
- Mode 2: Control/Adjust Channel 1 – Adjust dimming of channel 1 of LED strings
  - Right Button – Press to increase intensity
  - Center Button – Press to change to Mode 3; hold for two seconds to change to Mode 1
  - Left Button – Press to decrease intensity
- Mode 3: Control/Adjust Channel 2 – Adjust dimming of channel 2 of LED strings
  - Right Button – Press to increase intensity
  - Center Button – Press to change to Mode 2; hold for two seconds to change to Mode 1
  - Left Button – Press to decrease intensity

About the Demonstration
The demonstration utilizes the powerful 20-pin PIC16F1769 MCU to enable all required functions necessary to create two independent closed-loop boost SMPS channels to drive two different LED strings with minimal-to-zero interaction with the CPU. The three modes of operation showcase this capability, highlighting cost-effective solution and a flexible platform for creating a variety of power supply and LED lighting applications.

The MCU drives two independent channels of LED strings, which are controlled by three push buttons.
Major Components of the Demonstration

- PIC16F1769 MCU with the following peripherals:
  - Programmable Ramp Generator (PRG)
  - Intelligent Analog: DACs, ADCs, op amps and comparators
  - High-current I/Os: 100 mA
  - Digital peripherals: 10-bit PWM, Complementary Output Generator (COG)
  - Data signal modulator
  - Fixed voltage reference (±4%)

- Discrete boost converter
- Independent Channel #1
  - Three white LEDs (3.3 V, 20 mA)
- Independent Channel #2
  - Three blue LEDs (3.3 V, 20 mA)
- Powered by three AA batteries (4.5V)

Function Enablement: Precision LED Dimming Engine Block Diagram

<table>
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<th>PIC16(L)F176X Product Family</th>
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| Device | Program Memory (KB) | Program Flash Memory (KW) | High-Endurance Flash (B) | Data SRAM (Bytes) | I/O Pins | 8-bit with HLT Timer | 16-bit Timer | Comparator | 10-bit ADC (ch) | 6-/10-bit DAC | Capture/Compare/PWM | 10-/16-bit PWM | COG | Op Amp | ZOB | PRG | High-CURRENT I/O (200 mA) | Peripheral Pin Select | EUSART | PC/PSI/ 
| PIC16(L)F1764 | 7 | 4096 | 128 | 512 | 12 | 1/3 | 3 | 2 | 8 | 1/1 | 1 | 1/1 | 1 | 1 | 1 | 1 | 1 |
| PIC16(L)F1765 | 14 | 8192 | 128 | 1024 | 12 | 1/3 | 3 | 2 | 8 | 1/1 | 1 | 1/1 | 1 | 3 | 1 | 1 | 1 | 1 |
| PIC16(L)F1768 | 7 | 4096 | 128 | 512 | 18 | 1/3 | 3 | 4 | 12 | 2/2 | 2 | 2/2 | 2 | 3 | 2 | 1 | 2 | 2 | ✓ | 1 | 1 | 1 |
| PIC16(L)F1769 | 14 | 8192 | 128 | 1024 | 18 | 1/3 | 3 | 4 | 12 | 2/2 | 2 | 2/2 | 2 | 3 | 2 | 1 | 2 | 2 | ✓ | 1 | 1 | 1 |

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