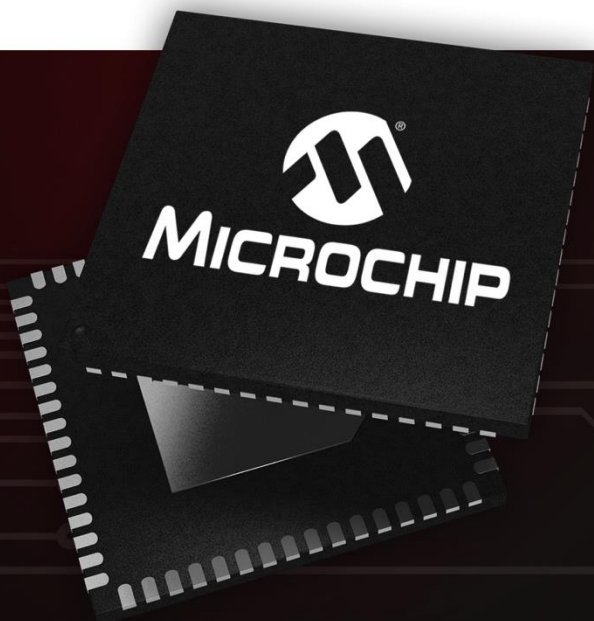




# MICROCHIP



A Leading Provider of Microcontroller,  
Mixed-Signal, Analog & Flash-IP Solutions



**G. China Distributor Sales Conference  
MCU16 Overview**

# Agenda

- Industry Trends and Insights
- 16-bit Product Market Focus
- Hardware and Software Total Development Solution
- Recently Launched and Upcoming Product Releases
- Target Industries / End-Equipment
- Key Sales Takeaways
- How Does the Client Benefit?
- Did you know?
- Summary



# Industry Trends and Insights

- Clients need silicon with highly integrated peripherals and increasing memory to reduce package costs and minimize board size

**System design complexity increasing**



- Clients applications require higher performance, while reducing latency, lowering power consumption, and moving to smaller form-factors

**Performance needs are increasing**



- Clients need hardware tools with an intuitive integrated software development environment including code examples, online documentation and community support

**Complete development environment required**



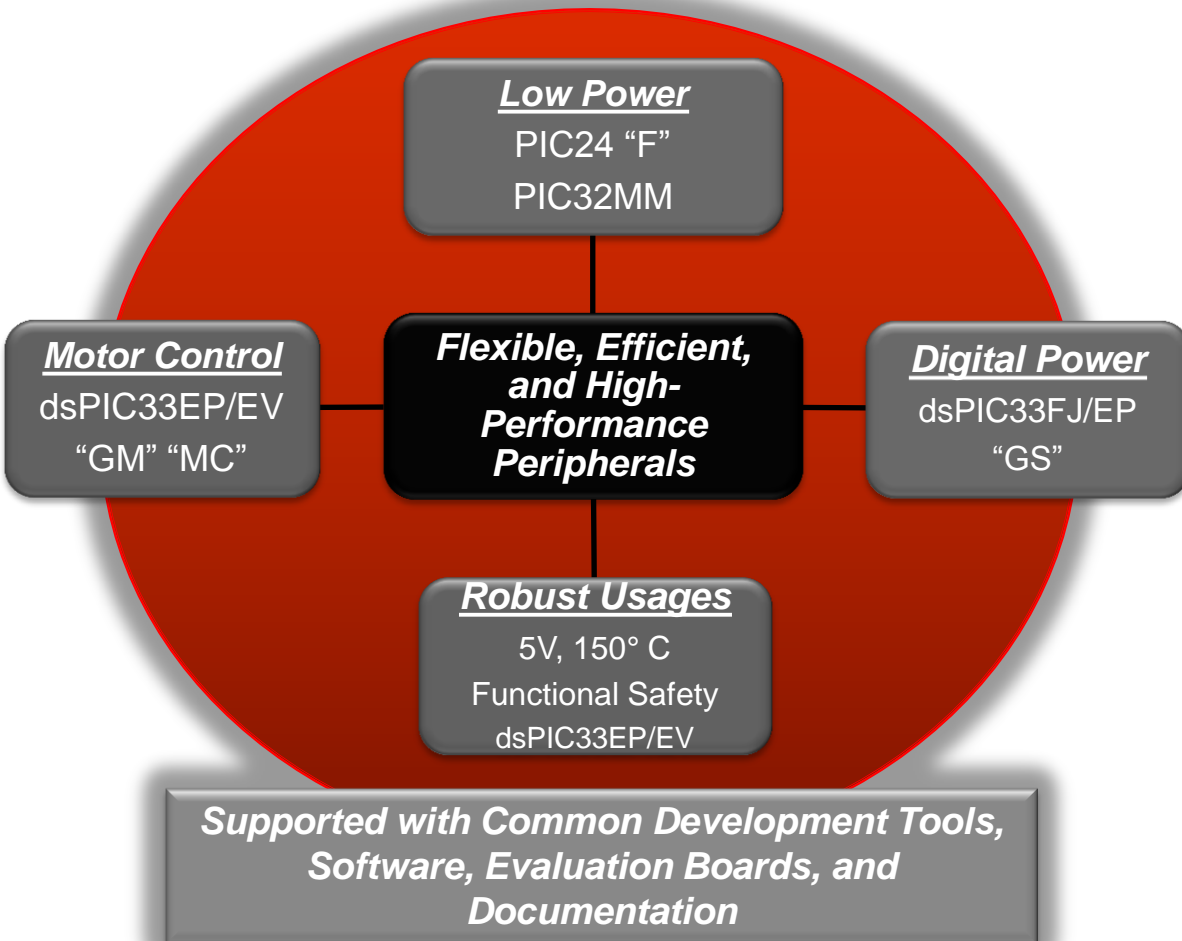
- Clients need to keep up with industry trends and require a supplier who can meet their complex design requirements and help them with shrinking product life cycles

**Choice and flexibility are critical**



***There are some big changes going on in your Client's world!***

# Product Market Focus



## Broad Portfolio

- Pin and code-compatible
- 16 to 70 MIPS, DSP options
- Flexible 4 KB to 1024 KB Flash
- 14 -144 pins
- Packages as small as 4x4mm
- 3V and 5V options
- Easy migration for fastest TTM
- Sleep currents as low as 9 nA
- Core Independent Peripherals

[www.microchip.com/16bit](http://www.microchip.com/16bit)



# Why Consider a 16-bit MCU?

**8-bit designers who run out of Flash or RAM**

**16-bit PIC MCUs have up to 1M dual panel Flash for large programs with constant up-time firmware downloads and up to 96KB RAM for data storage**

**8-bit applications who require faster peripherals**

**16-bit peripherals run at higher speeds, with faster peripherals and communication**

**System requirements demanding more complex software**

**Faster 16-bit core performance addresses more complex applications and numeric resolution including seamless options with DSP instructions for math intensive applications**

**Designers need dedicated peripherals for Motor Control and Digital Power**

**High-performance dsPIC<sup>®</sup> DSCs are designed for streamlined interoperability between PWM, ADC, Op Amps and the Core resulting in precise, high-speed control**

**Familiar users of the MPLAB<sup>®</sup> Xpress IDE or MCC Ecosystem**

**16-bit software development environment is compatible with 8-bit PIC MCUs – making it an easy transition when using MPLAB<sup>®</sup> MCC or Xpress Cloud-based IDE**

# Functional Building Blocks



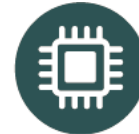
**eXtreme Low Power:** Run longer, save power, battery friendly



**Motor Control:** Specialized peripherals, supporting tools and app notes



**Digital Power:** dsPIC® DSC performance and specialized PWMs and ADCs



**Low Power CIPs:** Smartly interconnected CIPs function with near zero latency



**Easy Connectivity:** Supports wide variety of communication protocols



**System Level Integration:** Memory integrity check, error correction, backup oscillators and fault detection



**Secure Data:** Hardware crypto engine, random number generator for unique key creation



**Displays and Touch:** Devices with low-power LCD or graphical drivers and broad portfolio of Touch solutions

# Functional Enabling Blocks

## Core Independent Peripherals (CIPs)

- Intelligent Analog
- Low Power & Flexibility
- Secure Data
- Waveform Control
- Timing & Measurement
- Communication
- User Interface
- Safety & Monitoring

<h3 style="text-align: center; background-color: #D3D3D3;">Intelligent Analog</h3> <div style="background-color: #D3D3D3; padding: 2px; text-align: center;">ADC</div> <div style="background-color: #FFD700; padding: 2px; text-align: center;">ADC <span style="float: right;">✔</span></div> <div style="background-color: #D3D3D3; padding: 2px; text-align: center;">ΣΔ ADC</div> <div style="background-color: #D3D3D3; padding: 2px; text-align: center;">DAC</div> <div style="display: flex; justify-content: space-around;"> <div style="background-color: #FFD700; padding: 2px; text-align: center;">DAC</div> <div style="background-color: #FFD700; padding: 2px; text-align: center;">Audio DAC</div> </div> <div style="background-color: #D3D3D3; padding: 2px; text-align: center;">Comparators &amp; OPA</div> <div style="display: flex; justify-content: space-around;"> <div style="background-color: #FFD700; padding: 2px; text-align: center;">Comp. <span style="float: right;">✔</span></div> <div style="background-color: #FFD700; padding: 2px; text-align: center;">OPA / PGA <span style="float: right;">✔</span></div> </div> <div style="background-color: #D3D3D3; padding: 2px; text-align: center;">Int. Ref. Voltage</div> <div style="background-color: #FFD700; padding: 2px; text-align: center;">CVREF</div>	<h3 style="text-align: center; background-color: #D3D3D3;">Waveform Control</h3> <div style="background-color: #D3D3D3; padding: 2px; text-align: center;">Capture/Compare/PWM</div> <div style="display: flex; justify-content: space-around;"> <div style="background-color: #800080; padding: 2px; text-align: center;">CCP</div> <div style="background-color: #800080; padding: 2px; text-align: center;">ECCP</div> </div> <div style="display: flex; justify-content: space-around;"> <div style="background-color: #800080; padding: 2px; text-align: center;">MCCP <span style="float: right;">✔</span></div> <div style="background-color: #800080; padding: 2px; text-align: center;">SCCP <span style="float: right;">✔</span></div> </div> <div style="background-color: #D3D3D3; padding: 2px; text-align: center;">PWM</div> <div style="display: flex; justify-content: space-around;"> <div style="background-color: #800080; padding: 2px; text-align: center;">PWM</div> <div style="background-color: #800080; padding: 2px; text-align: center;">MC PWM</div> </div> <div style="background-color: #800080; padding: 2px; text-align: center;">SMPS PWM</div> <div style="background-color: #D3D3D3; padding: 2px; text-align: center;">Output Compare</div> <div style="background-color: #800080; padding: 2px; text-align: center;">OC <span style="float: right;">✔</span></div> <div style="background-color: #D3D3D3; padding: 2px; text-align: center;">Input Capture</div> <div style="background-color: #800080; padding: 2px; text-align: center;">IC <span style="float: right;">✔</span></div>	<h3 style="text-align: center; background-color: #D3D3D3;">Communication</h3> <div style="background-color: #D3D3D3; padding: 2px; text-align: center;">Wired Communication</div> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="background-color: #FFFF00; padding: 2px; text-align: center;">USB - OTG</td> <td style="background-color: #FFFF00; padding: 2px; text-align: center;">CAN</td> </tr> <tr> <td style="background-color: #FFFF00; padding: 2px; text-align: center;">UART, IrDA</td> <td style="background-color: #FFFF00; padding: 2px; text-align: center;">SENT</td> </tr> <tr> <td style="background-color: #FFFF00; padding: 2px; text-align: center;">LIN</td> <td style="background-color: #FFFF00; padding: 2px; text-align: center;">I<sup>2</sup>C</td> </tr> <tr> <td style="background-color: #FFFF00; padding: 2px; text-align: center;">I<sup>2</sup>S, DCI</td> <td style="background-color: #FFFF00; padding: 2px; text-align: center;">SPI</td> </tr> <tr> <td style="background-color: #FFFF00; padding: 2px; text-align: center;">PMP</td> <td style="background-color: #FFFF00; padding: 2px; text-align: center;">MSSP</td> </tr> </table>	USB - OTG	CAN	UART, IrDA	SENT	LIN	I <sup>2</sup> C	I <sup>2</sup> S, DCI	SPI	PMP	MSSP				
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<h3 style="text-align: center; background-color: #D3D3D3;">Low Power, Flexibility</h3> <div style="background-color: #D3D3D3; padding: 2px; text-align: center;">Flexibility &amp; Performance</div> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="background-color: #90EE90; padding: 2px; text-align: center;">DMA <span style="float: right;">✔</span></td> <td style="background-color: #90EE90; padding: 2px; text-align: center;">CLC <span style="float: right;">✔</span></td> </tr> <tr> <td style="background-color: #90EE90; padding: 2px; text-align: center;">PPS <span style="float: right;">✔</span></td> <td style="background-color: #90EE90; padding: 2px; text-align: center;">PTG <span style="float: right;">✔</span></td> </tr> <tr> <td colspan="2" style="background-color: #90EE90; padding: 2px; text-align: center;">Dual Partition Flash <span style="float: right;">✔</span></td> </tr> </table> <div style="background-color: #D3D3D3; padding: 2px; text-align: center;">Low Power</div> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="background-color: #90EE90; padding: 2px; text-align: center;">XLP</td> <td style="background-color: #90EE90; padding: 2px; text-align: center;">Vbat</td> </tr> </table>	DMA <span style="float: right;">✔</span>	CLC <span style="float: right;">✔</span>	PPS <span style="float: right;">✔</span>	PTG <span style="float: right;">✔</span>	Dual Partition Flash <span style="float: right;">✔</span>		XLP	Vbat	<h3 style="text-align: center; background-color: #D3D3D3;">Timing &amp; Measurement</h3> <div style="background-color: #D3D3D3; padding: 2px; text-align: center;">Timers</div> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="background-color: #6495ED; padding: 2px; text-align: center;">8 bit Timer <span style="float: right;">✔</span></td> <td style="background-color: #6495ED; padding: 2px; text-align: center;">16 bit Timer <span style="float: right;">✔</span></td> </tr> <tr> <td colspan="2" style="background-color: #6495ED; padding: 2px; text-align: center;">32 bit Timer <span style="float: right;">✔</span></td> </tr> </table> <div style="background-color: #D3D3D3; padding: 2px; text-align: center;">RTCC</div> <div style="background-color: #6495ED; padding: 2px; text-align: center;">Hardware RTCC with Vbat <span style="float: right;">✔</span></div> <div style="background-color: #D3D3D3; padding: 2px; text-align: center;">Quadrature Encoding</div> <div style="background-color: #6495ED; padding: 2px; text-align: center;">QE1</div>	8 bit Timer <span style="float: right;">✔</span>	16 bit Timer <span style="float: right;">✔</span>	32 bit Timer <span style="float: right;">✔</span>		<h3 style="text-align: center; background-color: #D3D3D3;">User Interface</h3> <div style="background-color: #D3D3D3; padding: 2px; text-align: center;">Display Controller</div> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="background-color: #808080; padding: 2px; text-align: center;">LCD Driver <span style="float: right;">✔</span></td> <td style="background-color: #808080; padding: 2px; text-align: center;">Graphics</td> </tr> </table> <div style="background-color: #D3D3D3; padding: 2px; text-align: center;">mTouch – Touch Sense</div> <div style="background-color: #808080; padding: 2px; text-align: center;">CTMU <span style="float: right;">✔</span></div>	LCD Driver <span style="float: right;">✔</span>	Graphics
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<h3 style="text-align: center; background-color: #D3D3D3;">Secure Data</h3> <div style="background-color: #D3D3D3; padding: 2px; text-align: center;">Crypto Engine</div> <div style="background-color: #800080; padding: 2px; text-align: center;">Encryption – Decryption RNG &amp; Key Management <span style="float: right;">✔</span></div>	<h3 style="text-align: center; background-color: #D3D3D3;">Safety &amp; Monitoring</h3> <div style="background-color: #D3D3D3; padding: 2px; text-align: center;">Robust Operations</div> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="background-color: #FF4500; padding: 2px; text-align: center;">HLVD <span style="float: right;">✔</span></td> <td style="background-color: #FF4500; padding: 2px; text-align: center;">WDT <span style="float: right;">✔</span></td> </tr> <tr> <td colspan="2" style="background-color: #FF4500; padding: 2px; text-align: center;">DMT <span style="float: right;">✔</span></td> </tr> </table> <div style="background-color: #D3D3D3; padding: 2px; text-align: center;">Class B Safety</div> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="background-color: #FF4500; padding: 2px; text-align: center;">Memory <span style="float: right;">✔</span></td> <td style="background-color: #FF4500; padding: 2px; text-align: center;">Clocking</td> </tr> <tr> <td style="background-color: #FF4500; padding: 2px; text-align: center;">System <span style="float: right;">✔</span></td> <td style="background-color: #FF4500; padding: 2px; text-align: center;">CPU</td> </tr> <tr> <td style="background-color: #FF4500; padding: 2px; text-align: center;">GPIO <span style="float: right;">✔</span></td> <td style="background-color: #FF4500; padding: 2px; text-align: center;">Analog <span style="float: right;">✔</span></td> </tr> </table>	HLVD <span style="float: right;">✔</span>	WDT <span style="float: right;">✔</span>	DMT <span style="float: right;">✔</span>		Memory <span style="float: right;">✔</span>	Clocking	System <span style="float: right;">✔</span>	CPU	GPIO <span style="float: right;">✔</span>	Analog <span style="float: right;">✔</span>					
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# Recent and Upcoming Product Releases

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## Recently Launched

- PIC24FJ256GA705 Family
- dsPIC33EP128GS808 Family
- PIC32MM Curiosity Dev Board  
PIC32MM0256GPM064 Family
- PIC24F “GA7” Curiosity Dev Board
- PIC32MM USB Curiosity Dev Board

## Upcoming Launches\*

- dsPIC33EDV64MC205 (Integrated FET) DSC (CQ4'17)
- dsPIC33CH128MP508 (Dual-Core) DSC (CQ4'17)

*\* **NOTE:** These are target release dates and are subject to change. Consult with your Microchip CDM for the most recent product release information.*





# PIC24FJ256GA705 Family

**MICROCHIP** Enables Higher Memory, Space-Constrained Designs

## Features:

- **Large Memories**
  - 256KB ECC Flash and 16KB RAM
- **Low Power Modes**
  - Run: 190 uA/MHz @ 3V
  - Sleep: 3.2 uA @ 25C
  - Retention Sleep: 190nA @25C

## Packaging:

- 28-pin: SPDIP, SOIC, SSOP, QFN , uQFN(4x4)
- 44-pin: TQFP
- 48-pin: TQFP (7x7), QFN (7x7)

## Hardware Development Tools:

- Explorer 16/32 Development Board ([DM240001-2](#))
- PIC24F256GA705 Plug-In Module ([MA240039](#))

## Software Development Tools:

- MPLAB X IDE, MPLAB Xpress Cloud Based IDE
- XC16 Compiler
- MPLAB Code Configurator (MCC)

## 10Ku Pricing:

- Starting at \$0.80

## Product Info:

- [www.microchip.com/pic24fj256ga705](http://www.microchip.com/pic24fj256ga705)

## Example Applications:



Medical Instruments



Environmental Monitoring



Test and Measurements



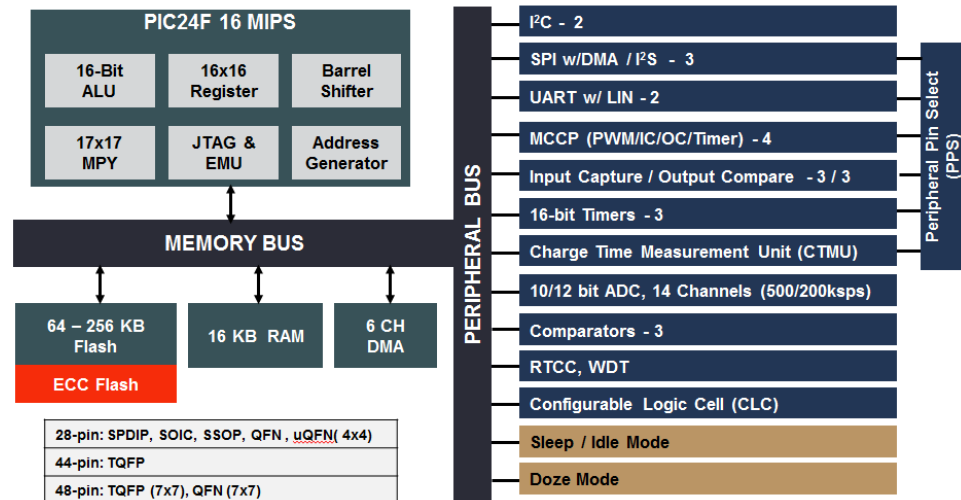
Wearable/Handhelds



Countertop Appliances



Home Automation





# dsPIC33EP128GS808 Family

## Optimized for Digital Power Apps

### Features:

- **Higher Performance**
  - Advanced algorithms to improve efficiency and responsiveness
  - Enables higher switching frequencies
- **New Feature - Live Update!**
  - Update firmware in an operating power supply while maintaining continuous regulation
  - Tightly Integrated High Performance Peripherals
- **Bigger memory**
  - External Memory elimination with more available on-chip Flash

### Packaging:

- 28-pin SOIC, QFN, and uQFN
- 44-pin QFN, TQFP and 48-pin TQFP
- 64-pin TQFP and 80-pin TQFP

### Development Tools:

- MPLAB® Starter Kit for Digital Power ([DM330017-2](#))
- Digital Power Design Suite (DPDS)

### 10Ku Pricing:

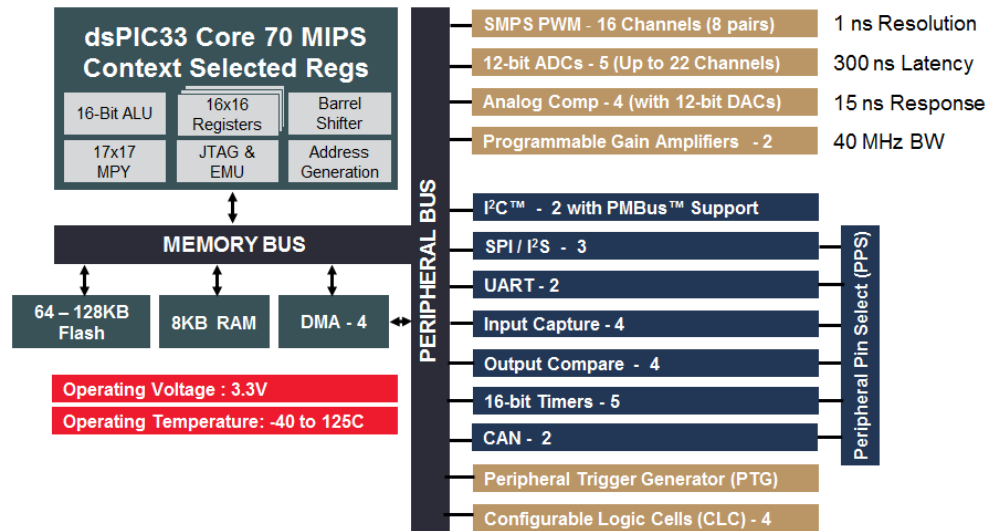
- Starting at \$3.31

### Product Info:

- [www.microchip.com/dsPIC33EP128GS808](http://www.microchip.com/dsPIC33EP128GS808)

### Example Applications:

- **AC/DC Power Supplies**
  - Primary side: Power Factor Correction
  - Secondary side: Regulated DC/DC
- **DC/DC Power Supplies**
  - ¼ Brick and other small form factors
  - Automotive DC/DC converters
- **LED & HID Lighting**
  - Automotive headlights
  - Projectors
  - Industrial & commercial lighting
- **Broad Range of Applications**
  - Solar inverters
  - Battery chargers
  - Welders
  - Uninterruptible Power Supplies (UPS)





# PIC32MM0256GPM Family

## Low Power, USB, Scalable to 256K Memory

### Features:

- **Low Power Modes**
  - Retention Sleep Mode < 1 uA
- **Core Independent Peripherals**
- **Communication**
  - USB OTG 2.0 Device, Host, OTG
  - I<sup>2</sup>C, UART, SPI with I<sup>2</sup>S
  - 4-Channel Hardware DMA
- **Analog**
  - 12-bit ADC
  - 5-bit DAC
- **Low Pin Packages**
  - As small as 4x4 mm (uQFN) package
  - Available in 28,36,40,48 and 64 pin packages

### Hardware Development Tools:

- Explorer 16/32 Development Board ([DM240001-2](#))
- PIC32MM0256GPM064 Plug-In Module (MA320023)

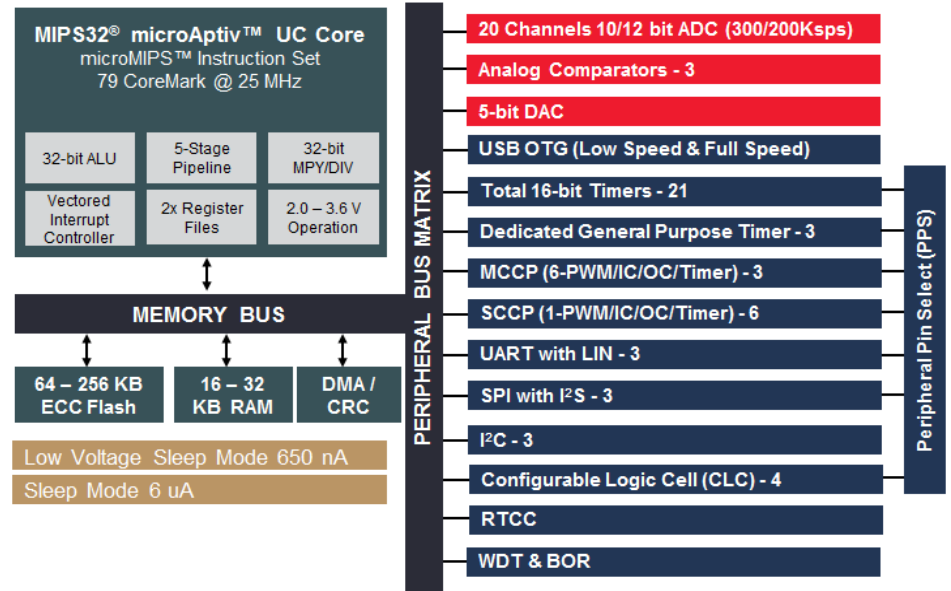
### Software Development Tools:

- MPLAB X IDE
- MPLAB Code Configurator (MCC)

### 10Ku Pricing:

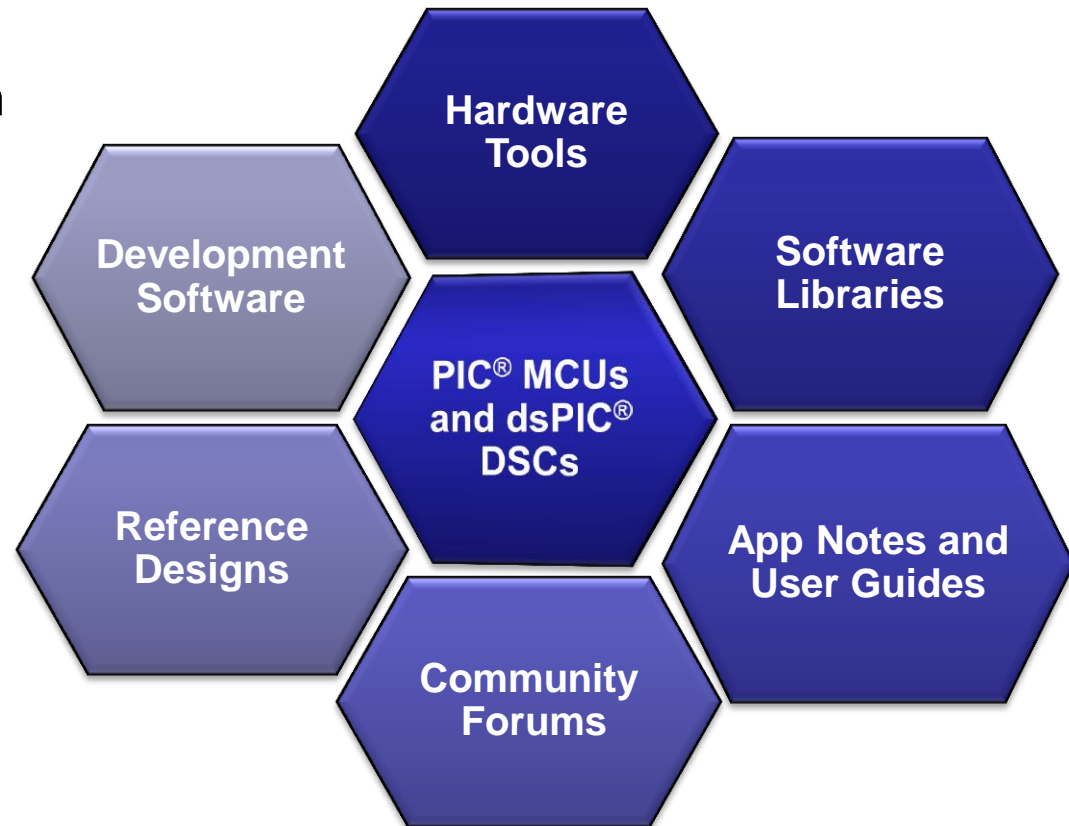
- Prices starting at \$0.97

### Example Applications:



## Microchip provides:

- Highly Integrated tools with Intuitive User Interface
- Code Examples, Drivers, and Reference Designs
- Motor Control and Digital Power - Libraries, Models, Algorithms, App Notes
- Community of Experts







## Resulting in:

- Easier design process
- Faster proof of concept
- Quicker time to market

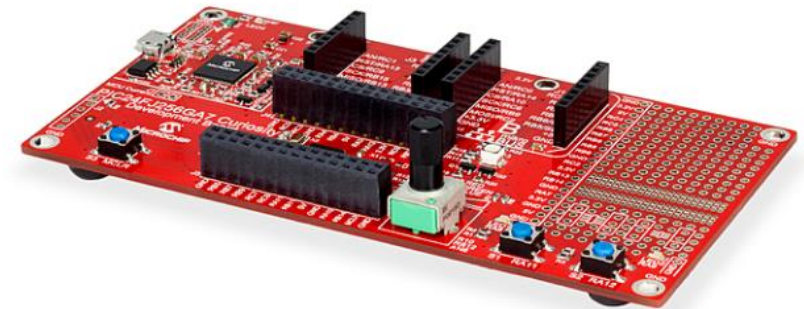


# MCU16 Curiosity Dev Boards

Features	PIC24F Curiosity (DM240004)	PIC32MM Curiosity (DM320101)	PIC24FJ256GA7 Curiosity (DM240016)	PIC32MM USB Curiosity (DM320107)
Board				
PIC® Microcontroller	PIC24FJ128GA204	PIC32MM0064GPL036	PIC24FJ256GA705	PIC32MM0256GPM064
Integrated Programmer/Debugger	✓	✓	✓	✓
User interface options	<ul style="list-style-type: none"> <li>• Potentiometer</li> <li>• Physical switches</li> <li>• Indicator LEDs</li> <li>• RGB LED</li> </ul>	<ul style="list-style-type: none"> <li>• Potentiometer</li> <li>• Physical switches</li> <li>• Indicator LEDs</li> <li>• RGB LED</li> </ul>	<ul style="list-style-type: none"> <li>• Potentiometer</li> <li>• Physical switches</li> <li>• Indicator LEDs</li> <li>• RGB LED</li> </ul>	<ul style="list-style-type: none"> <li>• Potentiometer</li> <li>• Physical switches</li> <li>• Indicator LEDs</li> <li>• RGB LED</li> </ul>
Interfaces and Expansion Headers	<ul style="list-style-type: none"> <li>• mikroBUS™ interface</li> </ul>	<ul style="list-style-type: none"> <li>• mikroBUS™ interface</li> </ul>	<ul style="list-style-type: none"> <li>• 2x mikroBUS™ interfaces</li> </ul>	<ul style="list-style-type: none"> <li>• 2x mikroBUS™ interfaces</li> <li>• 2x X32 interfaces (including audio codec boards)</li> </ul>
Connectivity	<ul style="list-style-type: none"> <li>• BM71 BLE module footprint</li> <li>• Wireless / Wired Connectivity Click boards™</li> </ul>	<ul style="list-style-type: none"> <li>• BM71 BLE module footprint</li> <li>• Wireless / Wired Connectivity Click boards™</li> </ul>	<ul style="list-style-type: none"> <li>• Wireless / Wired Connectivity Click boards™</li> </ul>	<ul style="list-style-type: none"> <li>• USB connectivity</li> <li>• Wireless / Wired Connectivity Click boards™</li> </ul>
Availability	Now	Now	Now	Now

## Description:

The PIC24FJ256GA7 Curiosity Board is a low-cost platform with an integrated programmer and debugger and easy expandability with two mikroBUS™ interfaces to utilize MikroElektronika click boards™ for customizing your application



## Key Features:

- This board features the 16-bit PIC24FJ256GA705 eXtreme Low Power (XLP) MCU
- It's easy to get started using the PIC24FJ "GA7" Curiosity Board, with no additional hardware required and integrated demo code

## Software Development Tools:

- MPLAB® Xpress Cloud-based IDE
- MPLAB® X IDE
- MPLAB® Code Configurator

## Supports:

PIC24FJ256GA705 MCU



## Pricing:

\$25 (DM240016)

## Product Info:

[www.microchip.com/pic24fj256ga7curiosity](http://www.microchip.com/pic24fj256ga7curiosity)



## Description:

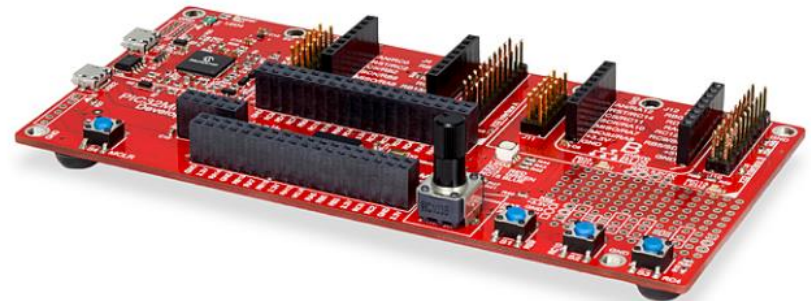
The PIC32MM USB Curiosity Development Board features 2 MikroElektronika mikroBUS™ expansion interfaces that gives the user access to over 300+ add-on click boards™, USB micro B connector and two X32 Interfaces that facilitates access to the PIC32 Audio Codec Daughter Card making this an ideal evaluation board for Audio noise cancellation, USB headphones, Hi-Resolution audio, Bluetooth audio and other general purpose applications.

## Key Features:

- PIC32MM0256GPM064 eXtreme Low Power (XLP) MCU
- Easy to get started, integrated programmer / debugger
- Integrated demo code (USB audio headset and RGB color mixing)

## Software Development Tools:

- MPLAB® Code Configurator (MCC)
- MPLAB® Xpress Cloud-based IDE



## Supports:

PIC32MM0256GPM064 MCU



- Sleep Mode with RAM retention < 650nA

## Pricing:

\$27.99 (DM320107)

## Product Info:

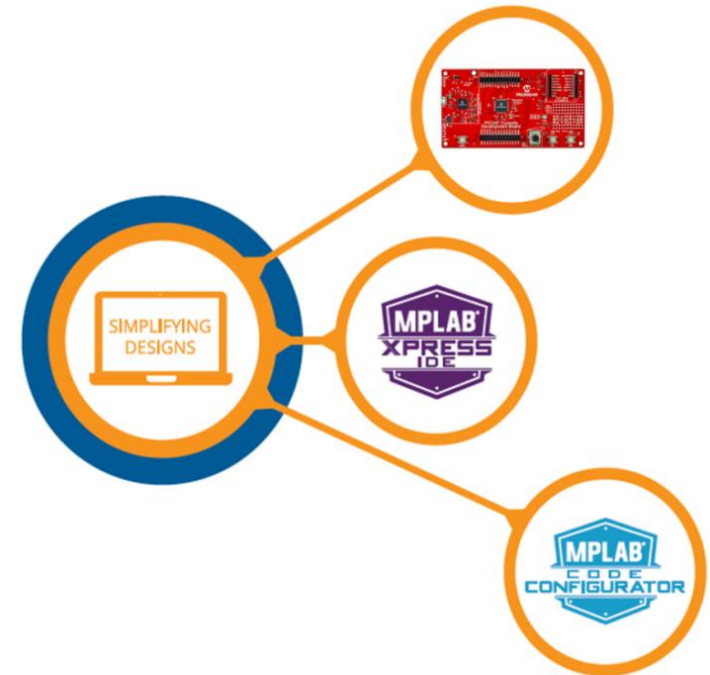
[www.microchip.com/pic32mmusbcuriosity](http://www.microchip.com/pic32mmusbcuriosity)



# Simplifying 16-bit PIC<sup>®</sup> Microcontroller Designs

## Getting Started is Made Easier with an Ecosystem Including

- **PIC24F Curiosity Board (\$25)**
  - Integrated programmer/debugger
  - PIC24FJ128GA204 XLP MCU
  - Click board™ ecosystem
- **MPLAB<sup>®</sup> Xpress**
  - Cloud based IDE
  - Easy to get started with 16-bit PIC MCUs and dsPIC DSCs
- **MPLAB Code Configurator**
  - Graphical programming tool
  - Generates easy-to-read code
  - 250+ PIC24 and dsPIC33 devices supported



To learn more, visit: [www.microchip.com/simplifying16bit](http://www.microchip.com/simplifying16bit)



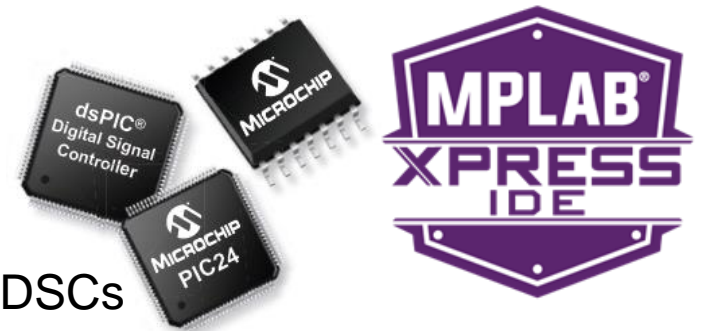
# MPLAB<sup>®</sup> Xpress IDE

## Cloud Based Development Platform

The easiest way to get started with 16-bit PIC<sup>®</sup> MCUs

Industry's most comprehensive online development platform

- **FREE** Cloud based platform
- Most popular features of the award winning MPLAB X IDE
- Now supporting 16-bit PIC MCUs and dsPIC DSCs
- MPLAB Code Configurator (MCC) – GUI based code generation, not available on any other cloud based tool
- Library of Microchip-validated code examples to get started right away!
- Integrated MPLAB XC16 compiler
- MPLAB Xpress Community to share code, ideas, and knowledge



To learn more, visit: [www.microchip.com/Xpress](http://www.microchip.com/Xpress)

## Description:

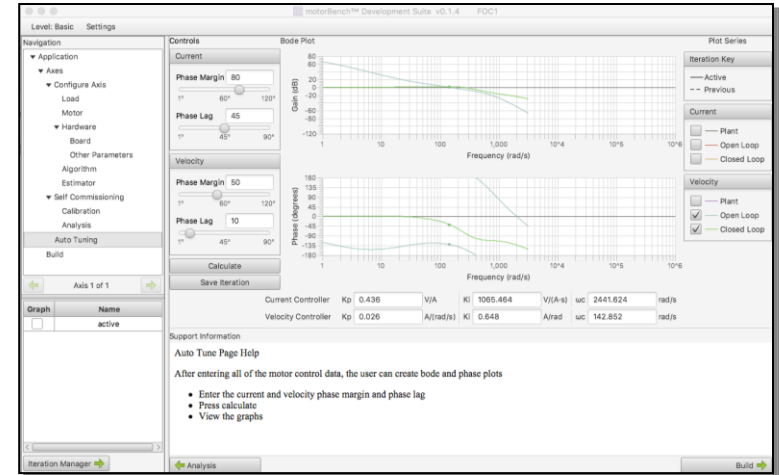
motorBench™ Development Suite is a GUI-based software development tool for motor control, capable of performing accurate measurement of critical motor parameters and automatic tuning of feedback control gains for dsPIC33EP Digital Signal Controllers.

## Key Features:

- Free MPLAB X plug-in
- Quickly get stable control loop gains for velocity and torque
- See how the control loop gains affect the system through Bode plots
- Generate source code for MPLAB® X project

## Development Tools:

- [dsPICDEM™ MCLV-2 Development Board](#)
- [dsPIC33EP256MC506 External OpAmp Motor Control PIM](#)
- [Hurst 24V 3-Phase Brushless DC Motor with Encoder](#)



## Supports:

dsPIC33E Product Families  
Sensorless Field Oriented Control (FOC)

## Pricing:

Free with registration

## Product Info:

Initial Offering – Available March '17

**Additional motors, algorithms, boards – Q4'17**

# General Purpose / XLP Target Industries / End-Equipment

## Internet of Things

- Remote Controls
- Security Systems
- Portable Meters
- Wireless Sensors
- Electronic Locks
- Asset Tracking

## Wearables

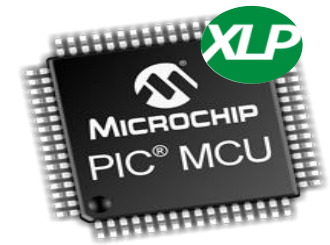
- Fitness Monitors
- Wearable Sensors
- BT Audio Headsets

## Smart Energy

- Energy Meters
- Flow Meters
- Smart Plugs
- Energy Management

## Connected Home

- BT Smart™ Devices
- Security
- Thermostats
- Smoke Detectors



## Energy Harvesting

- Solar Harvesting
- RF Powered Devices

## Medical

- Glucose Meters
- Blood Pressure Monitors
- Patient Monitor
- Pulse Oximeter



# General Purpose Development Board Options

	General Purpose	XLP / Low Power	Intelligent Analog	Crypto	Display and Touch	5V / CAN
Curiosity	PIC24F PIC32MM			PIC24F Curiosity		
Starter Kit			IASK			CLSK USBSK
Development Board / Kit	Explorer 16/32	E16/32			XLP LCD	
		XLP LCD			Graphics	
Demo	mPOS	Low Power IOT Crypto	Portable Weather Station	Low Power IOT Crypto		

PIC24F	
PIC32MM	
dsPIC33E	

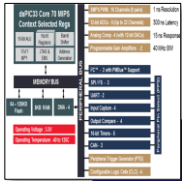
PIC24F	Explorer 16/32 Development Board / Kit PIC24F and PIC32MM Curiosity Development Boards
PIC32MM	
dsPIC33E	

**IASK** – Intelligent Analog PIC24 Starter Kit (DM240015)  
**CLSK** – dsPIC33EV 5V CAN-LIN Starter Kit (DM330018)  
**USBSK** – dsPIC33E USB Starter Kit (DM330012)

**Curiosity** – PIC24F (DM240004), PIC32MM (DM320101)  
**E16/32** – Explorer 16/32 Development Board/Kit (DM240001-2/3)  
**XLP LCD** - LCD Explorer XLP Dev Board (DM240314)

# 16-bit General Purpose / XLP MCU

## Key Sales Takeaways



### Product Insights

- **Very low power** MCUs for applications with tight power budgets
- **Core Independent Peripherals (CIPs)** allow CPU to sleep and save more power
- **Integrated Analog** for continuously varying non-digital inputs (sound, light, temperature, pressure, position, fluid level)
- **Hardware Crypto Engine** for applications requiring secure keys, 256 AES/DES



### Their Words

- “Low power operation”
- “Sleeping most of the time”
- “USB Bootloader support”
- “Ability to migrate when requirements change”
- “Large pgm. memory”
- “Glue logic”
- “Remote upgrades”
- “Meets space constraints”
- “Security protecting application data”



### Client Impact

- Integrated peripherals reduce BOM cost and board size resulting in a more cost effective system for smaller form-factor designs
- Battery friendly features extend battery lifetime and reduce maintenance costs
- More I/O available for increased on-chip functionality and reduced latency
- Secure data management and communication for low power embedded apps

To learn more, visit: [www.microchip.com/xlp](http://www.microchip.com/xlp)



# Motor Control

## Target Industries / End-Equipment

### Appliance

- Air Conditioner
- Washing Machines
- Dishwashers
- Refrigerator Compressors
- Range Hoods
- Control Panels



### Industrial

- Power Tools
- Lathes
- Commercial Sewing Machines
- CNC Machines
- HVAC Systems
- Building Controls
- Heating system Circulation Pumps
- Actuators



### Automotive

- Cooling fans
- Fuel Pumps
- Water Pumps
- Sensors
- User Interface

### Consumer

- Drone Gimbal
- Drone Propeller





# Motor Control Development Board Options

	BLDC	PMSM	ACIM	Stepper
Starter Kit	MCSK			
Low Voltage	MCLV-2 LVMCB			MCSM
High Voltage	MCHV-2/3			
Dual Motor	LVMCB			
dsPIC33E	MCLV-2 LVMCB MCHV-2/3	MCLV-2 LVMCB MCHV-2/3	MCHV-2/3	
dsPIC33F	MCSK	MCLV-2	MCHV-2	MCSM

dsPIC33E	
dsPIC33F	

**MCSK** -- Motor Control Starter Kit (DM330015)  
**MCLV-2** – dsPICDEM Motor Control Low Voltage (DM330021-2)  
**LVMCB** – Low Voltage Motor Control Dev. Bundle (DMDV330100)

**MCHV-2** – dsPICDEM Motor Control High Voltage (DM330023-2)  
**MCHV-3** – dsPICDEM Motor Control High Voltage (DM330023-3)  
**MCSM** – dsPICDEM Motor Control Stepper Motor (AC300024)

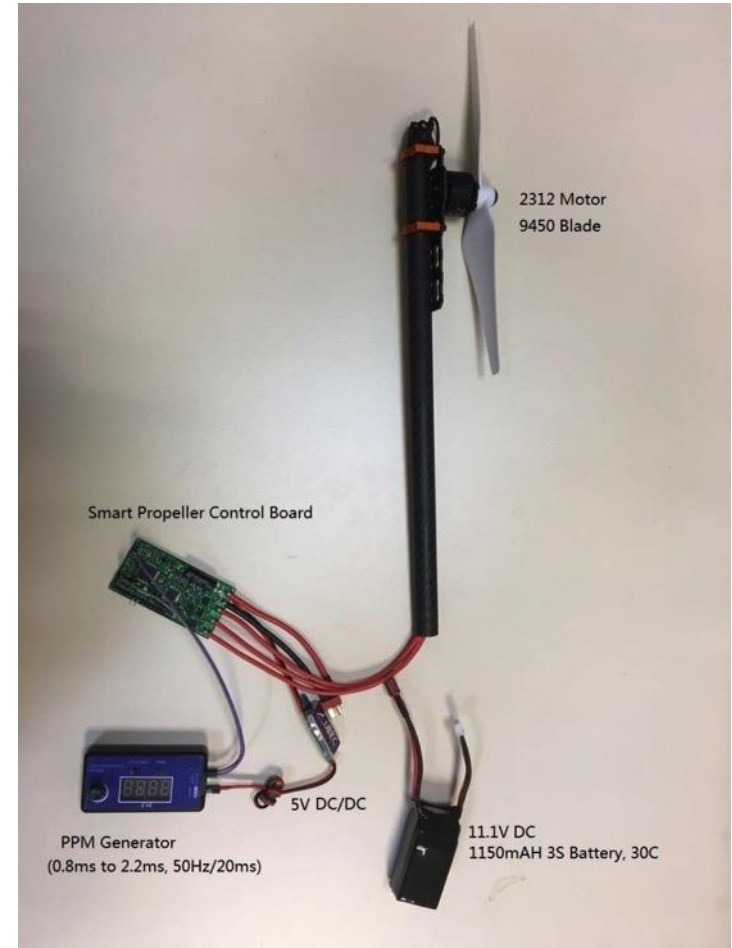
# Drone Propeller Demo

- **Out-of-Box**

- Control Board
- Handheld Set
- PPM generator
- Battery
- 5V DC/DC power supply

- **Highlight**

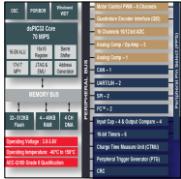
<b>Motor</b>	DJI E310, 2312, 960KV/CW, 12N14P
<b>Blade</b>	9450
<b>Battery</b>	11.1V (3S LIPO)
<b>Current</b>	10A RMS
<b>Speed</b>	Max. 8136RPM
<b>Startup time</b>	Around 200ms
<b>Control Algorithm</b>	Sensorless FOC, SMO
<b>Speed Control</b>	PPM (Pulse Position Modulation) Bus



*Limited availability – Contact Shridhar Channagiri to discuss your opportunity*

# 16-bit Motor Control Key Sales Takeaways

## Product Insights



- **High-performance dsPIC® DSC Cores** supporting variable speed with constant torque and sensorless Field oriented control (FOC) for greater efficiency
- **Optimized peripherals** for flexible, high resolution PWMs, Intelligent high-speed ADC and Integrated op-amps and comparators
- **Functional Safety peripherals / functions** supporting harsh environments and Class B safety requirements
- **Software Tools** for rapid prototype development

## Their Words



- “Dual motor control capability for 2-Axis camera control”
- “FOC Motor Control algorithm”
- “Class B support for IEC 60730 compliance”
- “Integrated Op-Amps”
- “SENT for Automotive sensors”
- “Dual CAN support”
- “Extended temp support for under-hood or harsh applications”
- “Small form-factor QFN package”
- “Product recommended by the end-customer”

## Client Impact



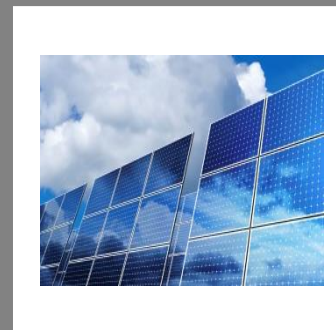
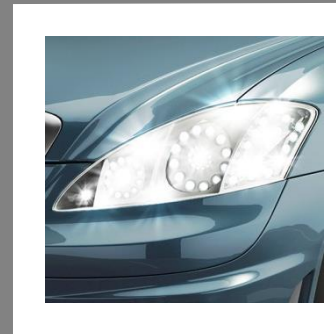
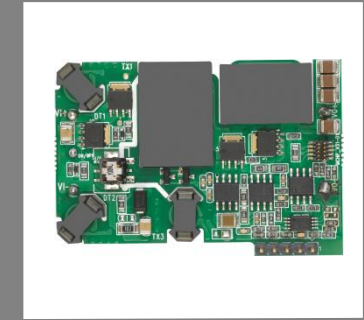
- Tools to create motor self commissioning and auto-tuning of control loop gains saving time and resources
- Enables 100% coverage of the standard certification requirements (both UL and VDE), enabling 1st pass success and faster TTM
- Support for up to 150°C and 5V operation
- Smaller application board footprint possible due to small device form factors

To learn more, visit: [www.microchip.com/motor](http://www.microchip.com/motor)



# MICROCHIP Digital Power Target Industries / End-Equipment

- **AC/DC Power Supplies**
  - Primary side: Power Factor Correction
  - Secondary side: Regulated DC/DC
- **DC/DC Power Supplies**
  - ¼ Brick and other small form factors
  - Automotive DC/DC converters
- **LED and HID Lighting**
  - Automotive headlights
  - Projectors
  - Industrial & commercial lighting
- **Broad Range of Applications**
  - Solar inverters
  - Battery chargers
  - Welders
  - Uninterruptible Power Supplies (UPS)





# Digital Power

## Reference Design / Dev Board Options

	AC/DC	DC/DC	PFC	UPS	Solar	LED
<b>Starter Kit</b>		<b>DPSK</b>				
<b>Reference Designs / Dev Kit</b>	Platinum Rated 720W	Quarter Brick LLC Resonant Converter	Digital Power Interleaved PFC	Digital Pure Sign Wave UPS	Grid Connected Solar Micro Inverter	LLDK
<b>dsPIC33E</b>		<b>DPSK</b>				
<b>dsPIC33F</b>	Platinum	Quarter Brick	Interleaved PFC	Pure Sign Wave UPS	Solar Micro Inverter	LLDK

dsPIC33E

dsPIC33F

**LLDK** – LED Lighting Development Kit  
**DPSK** – Digital Power Starter Kit

# Qi™ Charging Customer Engagement Board

- Qi (1.2) Customer Engagement Board (15W max power):



- 12V input, Single coil transmitter
- dsPIC33 CPU with High speed ADCs/PGAs
- Digital Demodulation
- Foreign object detection
- LED Tx/Rx status indicators
- LED power level indicators
- Provides the required flexibility to optimize Tx/Rx solution
- Reduces external component count and improves demodulation accuracy

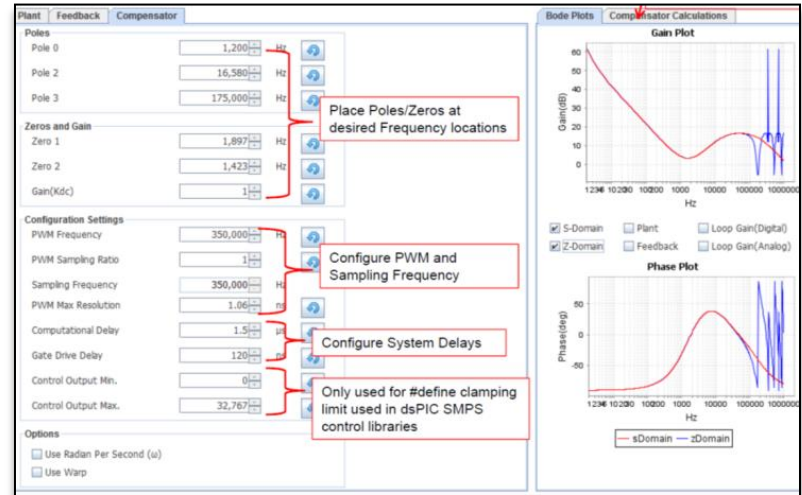
*Limited availability – Contact  
Shridhar Channagiri to discuss  
your opportunity*

## Description:

Ease the design of digital power solutions with Microchip written and optimized algorithms, simple system analysis tools, and comprehensive design examples

## Key Elements:

- [SMPS Control Libraries](#) are an application framework for realizing an efficient and flexible way of implementing the control of an SMPS application
- [Digital Compensator Design Tool](#) simplifies the overall process of determining the digital compensator coefficients and analyzes the control system performance
- [Reference Designs](#) available today with complete firmware and theory of operation
- [MPLAB Code Configurator](#) (MCC), Application Notes, and sample code
- Digital Power Training covering all of the theories necessary to design and implement digital power supplies



## Supports:

dsPIC33 "GS" Product Families

## Pricing:

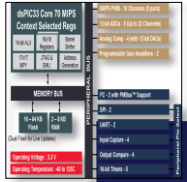
Free

## Product Info:

[www.microchip.com/power](http://www.microchip.com/power)



# 16-bit Digital Power Key Sales Takeaways



## Product Insights

- **Optimize efficiency** over widely varying load or environmental conditions
- **Compensation loops** implemented in software for flexibility
- **Streamlined interoperation** between PWM, ADC and Core
- **Live Update capability** with non-stop operation
- **Complete** Reference Designs and Algorithms



## Their Words

- “12-bit ADC, CAN and large Flash on low pin count device”
- “Support with semi-bridgeless PFC [reference] design”
- “DSP engine to implement FIR filter”
- “Support for die business”
- “Flexibility of PWM and ADC modules”
- “Superior performance and rich hardware modules”



## Client Impact

- Designers can differentiate their product in a number of different dimensions: energy efficiency, fault handling, increased functionality
- Digital Power Design Suite eases the complex task of designing a DP solution
- Firmware updates for 100% uptime Power supplies for high availability systems

To learn more, visit: [www.microchip.com/power](http://www.microchip.com/power)

**16-bit PIC<sup>®</sup> Microcontrollers**







<< Welcome to 16-bit PIC24 MCUs and dsPIC DSCs >>

This page is a great place to find information on our upcoming products, new initiatives, latest presentations and sales collateral. This page is frequently updated, so please make sure to visit it again soon.

Microchip's 16-bit, PIC24 MCUs and dsPIC<sup>®</sup> Digital Signal Controllers provide designers broad product line includes everything from eXtreme Low Power microcontrollers to high performance digital signal controllers. Combined with hardware and free software, these 16-bit products are ideal for designs including high efficiency Motor Control, platinum-rated Digital Power Supplies, and Low Power for longer battery life in portable applications.

**MCU16 Portfolio**

- 16-bit PIC MCU and dsPIC DSC Functional Safety Features - Dec 2016 [\[93\]](#)
- PIC24, dsPIC33, and PIC32MM - Total Development Solution - Sept 2016 [\[93\]](#)
- PIC24F Curiosity Development Board - November 2016
- Extending Functionality of the PIC MCU and dsPIC DSC using CLC and PTG - Sept 2016
- MCU16 Update CQ3-2016 Distribution Version [\[93\]](#)

**General Purpose / eXtreme Low Power**

- PIC32MM Overview - June 2016 [\[93\]](#)
- PIC24F Curiosity Development Board - November 2016
- PIC32MM Family Features and Key Peripherals DFAE Training - July 2016
- XLP Customer Presentation April 2016 [\[93\]](#)
- Low Power 16-bit PIC MCUs with Hardware Security - April 2016 [\[93\]](#)
- PIC24GB810 16-bit MCU Overview - January 2016
- Class B Hardware Support and Software Libraries for PIC MCUs - Customer Presentation
- Microchip Code Configurator Explained [\[93\]](#)
- PIC24FJ128GB204 Customer Presentation
- PIC24FJ128GC010 Simple Portable Analog Family

**Motor Control**

- 32-bit PIC32MM powered Cost effective Motor Control
- Motor Control Simplified - May 2016 [\[93\]](#)
- 16-bit Motor Control Update - Oct 2015
- dsPIC33EV256GM108 Customer Presentation
- dsPIC33EP512GM710 Customer Presentation

**Sales Tools / Demos**

- 16-bit PIC<sup>®</sup> Peripheral Quick Reference Guide
- 16-Bit Embedded Control Solutions Brochure
- nanoWatt XLP eXtreme Low Power PIC MCUs
- Motor Control and Drive Design Solutions
- Intelligent Power Sall Sheet
- Portable Weather Station Demo
- PIC24 XLP Bluetooth LE toT Demo
- Magnetic Card Reader Demo

**Development Tools**

- Development Tools / Kits / Plug-in Modules
- MPLAB Code Configurator
- Microchip Libraries for Applications

**Helpful Links**

- Parametric Search Tool
- Microchip Advanced Parts Selector (MAPS)
- Developer Help
- YouTube: MCHP-16-bit Channel
- 16-bit Microcontroller and DSC Forum

**Videos / Media**

- Explorer 18/32 Development Platform
- USB Clock Setup Using MPLAB<sup>®</sup> Code Configurator
- PIC32MM Family of MCUs
- PIC24FJ256GB412 Low Power Crypto MCUs
- 16-bit Peripherals Overview Video
- Microchip's Portable Weather Station Demonstration
- XLP PIC24 w/ Crypto and RN4020 BT LE Module
- PIC24 Weather Station Board Brainshark

**Design Centers**

- 16-bit PIC24 MCUs and dsPIC(R) DSCs
- eXtreme Low Power
- Motor Control

- **Disti focused product and application slides and training on:**
  - 16-bit Portfolio
  - General Purpose/XLP
  - Motor Control
  - Digital Power
- **Links to:**
  - Sales Tools / Demos
  - Video / Media
  - Design Centers

*Your one-stop shop for*  
**16-bit Distri related content**

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# How Does the Client Benefit with 16-bit PIC24 and dsPIC33?

## Grow Revenue

- Faster TTM with tools like MCC and Xpress, system models, software, app libraries
- Clients can differentiate their end designs by scaling with innovative CIPs and Core
- High performance peripherals for precision Motor Control and Digital Power

## Reduce Costs

- Highly integrated peripherals reduce board size, component count, and BOM cost
- Large memory in low pin count packages
- Outstanding technical support with online Wiki help, community, videos, and training
- Reduced development costs and faster prototyping through motorBench™ Development Suite, Digital Power Design Suite, and complete reference designs

## Manage Risk

- Cost effective and flexible hardware development platforms like Explorer 16/32, Curiosity, and hundreds of MikroElektronika Click® boards for an expand Ecosystem
- Continuous R&D investment to meet evolving market needs with innovative products
- Dependable delivery, quality, and long product lifecycles with no risk of EOL



# Did You Know? Some 16-bit Trivia

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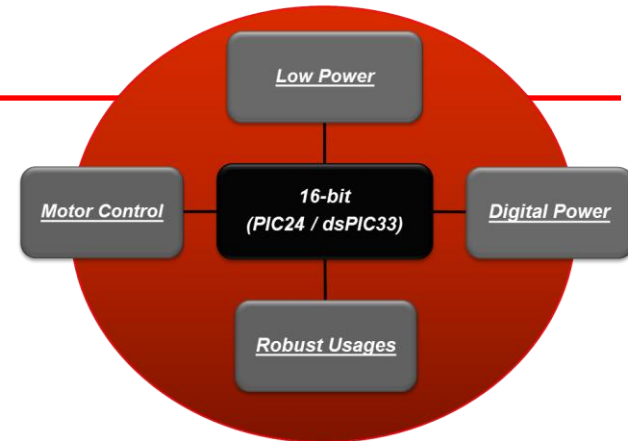
- 1. First in the industry to do real-time program memory updates through Live Update**
- 2. We grew faster than all other 16-bit competitors in the market**
- 3. 16-bit devices can be accessed through the cloud with MPLAB® Xpress IDE**
- 4. Currently over 450+ 16-bit devices in production**
- 5. Smallest 16-bit device is 4x4mm**
- 6. Largest memory on 16-bit device is 1MB dual panel Flash**
- 7. 16-bit XLP devices are so low power they reach 9nA sleep**
- 8. Single Bootloader supports all PIC24 and dsPIC33 devices**
- 9. The dsPIC33 featured in many German cars and drone designs**
- 10. Our functional safety ensures your home appliances don't become a hazard**

# Summary

- **Four Areas of Focus**

- Low Power
- Motor Control
- Digital Power
- Robust Usages (5V, 150° C, Functional Safety)

- **Solid pipeline of 16-bit PIC<sup>®</sup> MCUs, dsPIC<sup>®</sup> DSCs, and tools recently launched and planned, providing Client value**
- **Intuitive and integrated hardware tools and software development environments speed time to revenue**
- **Code samples, app notes, Wiki help and online community to socialize designs and gain insight**



*Microchip is the right supplier to help your Clients grow revenue, reduce costs, and manage risk*



**MICROCHIP**

***Thank You!***



# General Purpose / XLP Resources

- **Brochures**
  - [16-bit Embedded Control Solutions](#)
  - [eXtreme Low Power \(XLP\) PIC<sup>®</sup> Microcontrollers](#)
  - [Focus Product Selector Guide](#)
  - [Peripheral Integration Reference Guide](#)
- **Data Sheets**
  - [Family Reference Manual](#)
- **Migration Documents**
  - [Migrating to the PIC32MM Microcontroller Family](#)
  - [Migrating to the New PIC24F Pipeline and Sigma-Delta ADCs](#)
- **Programming Specifications**
  - [16-bit MCU and DSC Programmer's Reference Manual](#)
- **Software Libraries**
  - [Easy Bootloader for PIC24 and dsPIC33](#)
  - [Microchip Libraries for Applications \(MLA\)](#)
- **Video**
  - [16-bit Peripherals Overview](#)
  - [PIC32MM Family of MCUs](#)
  - [PIC24FJ256GB412 Low Power Crypto MCUs](#)

*There is a rich library of **16-bit** documentation, development tools, software, and videos designed to provide insight and training to your Clients*

- **Brochures**
  - [Motor Control and Drive](#)
  - [16-bit Embedded Control Solutions](#)
- **Data Sheets**
  - [dsPIC33EP128GM710](#)
  - [dsPIC33EV256GM106](#)
- **Errata**
  - [dsPIC33EVXXXGM00X/10X](#)
- **Migration Document**
  - [dsPIC33F/PIC24H to dsPIC33E/PIC24E Migration and Performance Enhancement Guide](#)
- **Programming Specifications**
  - [16-bit MCU and DSC Programmer's Reference Manual](#)
  - [dsPIC33EVXXXGM00X/10X Families Flash Programming Specification](#)
- **Software Libraries**
  - [Motor Control Library Blockset](#)
  - [MPLAB 16-bit Device Blocks for Simulink](#)
  - [PMSM Simulink® Motor Model](#)
- **Video**
  - [YouTube Motor Control and Drive Channel](#)

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- **Brochures**
  - [Intelligent Power Supply Design Solutions](#)
  - [16-bit Embedded Control Solutions](#)
- **Data Sheets**
  - [dsPIC33EP64GS506](#)
  - [dsPIC33EP32GS202](#)
  - [dsPIC33FJ64GS610](#)
- **Migration/Enhancement Guides**
  - [dsPIC33F/PIC24H to dsPIC33E/PIC24E Migration and Performance Enhancement Guide](#)
  - [dsPIC33FJ\(06/16\)GSXXX to dsPIC33EPXXGS50X Migration and Performance Enhancement Guide](#)
- **Programming Specifications**
  - [dsPIC33/PIC24 Family Reference Manual, dsPIC33E Enhanced CPU](#)
  - [dsPIC33EPXXGS50X Family Flash Programming Specification](#)
- **Software Libraries**
  - [Buck/Boost Converter PICtail™ Plus Daughter Board Source Code](#)
  - [Standard Mode PWM using dsPIC® DC SMPS](#)
  - [dsPIC® DSC SMPS ADC Triggered by PWM](#)
- **Webinars**
  - [Introduction to the dsPIC® SMPS \(part 1\)](#)
  - [Introduction to the dsPIC® SMPS \(part 2\)](#)

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- [16-bit PIC24 MCUs and dsPIC™ DSCs](#)
- [16-bit PIC® Microcontroller Peripheral Integration Quick Reference Guide](#)
- [Development Tools](#)
- [Application Design Center](#)
- [Training](#)
- [Support](#)
- [Webinars](#)

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