

# Magellan<sup>®</sup> Family of Motion Control ICs



The **Magellan Family of Motion Control ICs** provide advanced motion control for medical, scientific, automation, industrial, and robotic applications. Available in 1, 2, 3, and 4-axis versions, these flexible, programmable devices control Brushless DC, DC Brush, and step motors.

## A Powerful Motion Controller

Magellan Motion ICs are complete motion controllers requiring only an external bridge circuit or amplifier to be functional. They are driven by a host using either a parallel bus, SPI (Serial Peripheral Interface), CANbus 2.0B, or RS232/485 serial. User selectable profiling modes include S-curve, trapezoidal, velocity contouring and electronic gearing. PID servo loop compensation utilizes a 32-bit position error and includes velocity and acceleration feedforward. High performance FOC (field oriented control) provides high accuracy, ultra-low noise motor operation.

## Easy to Use and Program

All Magellan Motion Control ICs provide a flexible and powerful instruction set to initialize and control motion axes, monitor performance, and synchronize overall machine behavior. Working with Magellan ICs and Pro-Motion<sup>®</sup> development software makes it fast and easy to graph and analyze system performance; while C-Motion<sup>®</sup> language allows you to develop your own application using C/C++.

## Flexible Offering

Magellan ICs are offered in three series:

- Magellan MC58000 Series\*
- Magellan MC55000 Series
- Magellan MC58113 Series

\*Magellan MC58000 and MC55000 Series are packaged in a two-IC 144/100-pin TQFP while the MC58113 Series is a single-IC 100-pin TQFP. All devices operate at 3.3 V.

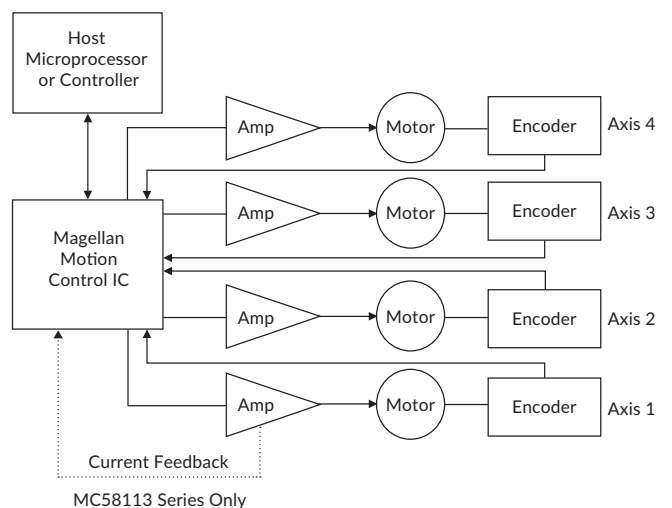
## MEET THE FAMILY

- **MC58000 Series:** Positioning Motion Control ICs for Brushless DC, DC Brush and step motors in a 1 to 4-axis package.
- **MC55000 Series:** Pulse and direction output positioning ICs for step motors in a 1 to 4-axis package.
- **MC58113 Series:** Positioning motion control ICs with integrated current control for Brushless DC, DC Brush and step motors in a single axis package.

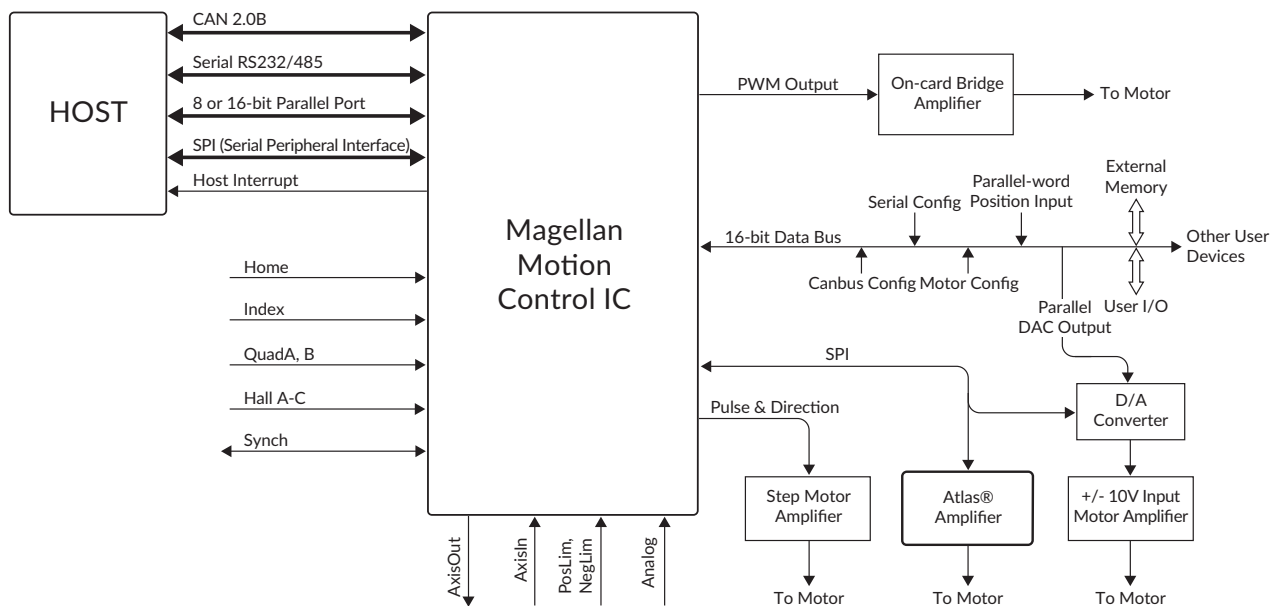
## FEATURES

- S-curve, trapezoidal, velocity contouring, and electronic gearing profiles
- Serial RS232/485, Parallel, CANbus, and SPI (Serial Peripheral Interface) communications
- Advanced PID filter with velocity and acceleration feedforward
- High performance current control & PWM signal generation
- Velocity, position and acceleration changes on-the-fly
- Field oriented control
- High speed (up to 5 Mpulses/sec) pulse & direction output
- Incremental encoder quadrature input (up to 25 Mcounts/sec)
- Programmable loop time to 50  $\mu$ sec
- Dedicated motion trace function for performance optimization
- Overcurrent, overvoltage, and overtemperature monitoring
- Two directional limit switches, index input, and home indicator per axis
- Axis settled indicator, tracking window and automatic motion error detection
- Programmable dual biquad filters
- Programmable acceleration and deceleration values
- Dual loop encoder input
- 3.3 V operation, packaged in 144- or 100-pin TQFP

## CONFIGURATION



## TECHNICAL OVERVIEW



## MAGELLAN SPECIFICATIONS

Parameters	Value
<b>Motors supported</b>	Brushless DC, DC Brush, Step motor
<b>Host communication options</b>	Serial RS232/485 CANbus 2.0B Parallel bus (8 or 16 bits) (MC5X000 only) SPI (Serial Peripheral Interface)
<b>Position range</b>	-2,147,483,648 to +2,147,483,647 counts
<b>Velocity range</b>	0 to 32,767 counts/sample
<b>Acceleration and deceleration range</b>	0 to 32,767 counts/sample <sup>2</sup>
<b>Jerk range</b>	0 to 1/2 counts/sample <sup>3</sup>
<b>Servo loop range</b>	50 µsec to 1.1 sec
<b>Position error resolution</b>	32 bits
<b>Commutation rate</b>	20 kHz
<b>Signals per axis</b>	QuadA/B, Index, Home, Hall A/B/C AxisIn, Pos/NegLimit, AxisOut, FaultOut
<b>Max encoder rate</b>	Incremental: Up to 25 Mcounts/sec Parallel-word: Up to 160 Mcounts/sec
<b>Operating temperature (Ta)</b>	-40° C to 85° C
<b>Supply voltage operating range (Vcc)</b>	3.0 V to 3.6 V
<b>Dimensions, MC5XX20</b>	CP: 20 x 20 mm, IO: 14 x 14 mm
<b>Dimensions, MC58113</b>	14 x 14 mm

## AMPLIFIER CONNECTION OPTIONS

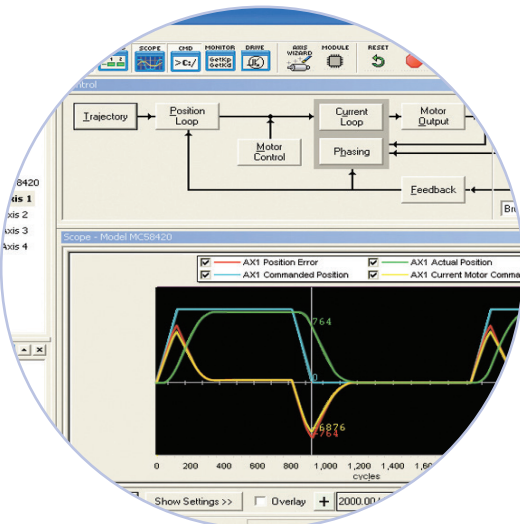
On-board PWM amplifier circuitry		
<b>PWM output rate</b>	20, 40, or 80 kHz	
<b>Current control modes (MC58113 only)</b>	FOC (field oriented control), A/B, third leg floating	
<b>Current loop rate</b>	20 kHz	
<b>PWM output modes</b>	High/Low, Sign/Magnitude, 50/50	
External +/- 10V input amplifier		
<b>Amplifier SPI bus serial DAC</b>	16 bits	
Pulse & direction input amplifier		
<b>Pulse and direction output rate</b>	up to 1.0 Mpulses/sec	
ATLAS® Digital Amplifiers		
ATLAS® Digital amplifiers are compact single-axis amplifiers that provide high performance torque control of DC brush, brushless DC, and step motors. They are packaged in a Compact or Ultra Compact solderable module and utilize standard through-hole pins for all connections.		
<b>Voltage Input</b>	12-56 VDC	
<b>Microstepping resolution</b>	256	
<b>PWM frequency</b>	20, 40, 80 kHz	
<b>Current Loop rate</b>	20 kHz	
<b>Power rating options</b>	75W, 250W, 500W	
<b>Mechanical Dimensions</b>	Ultra Compact size: 1.05" x 1.05" x .53" (27mm x 27mm x 13mm)  Compact size: 1.52" x 1.52" x .60" (39mm x 39mm x 15mm)	

# Development Tools

## 1 EASY START-UP Developers Kit

### INCLUDES

- MC58420, MC55420, or MC58113 Developer Kit boards
- Pro-Motion software
- Software Development Kit (SDK) with C-Motion
- Complete manual set
- Complete cable & prototyping connector set



## 2 TUNE & OPTIMIZE Pro-Motion® GUI

Pro-Motion is a sophisticated, easy-to-use Windows-based exerciser program for use with PMD motion control ICs, modules, and boards.

### FEATURES

- Motion oscilloscope graphically displays processor parameters in real-time
- Autotuning
- Ability to save and load settings
- Advanced Bode analysis for frequency machine response
- Axis wizard
- Axis shuttle performs programmable motion between two positions
- Distance and time units conversion
- Motor-specific parameter setup
- Communications monitor echoes all commands sent by Pro-Motion to the board

## 3 BUILD THE APP C-Motion®

C-Motion is a complete, easy-to-use, motion programming language that includes a source library containing all the code required for communicating with PMD motion ICs, boards, and modules.

### C-MOTION FEATURES INCLUDE:

- Extensive library of commands for virtually all motion design needs
- Develop embeddable C/C++ applications
- Complete, functional examples
- Supports PC104, serial, CAN, Ethernet, and SPI communications

```
...code for executing a profile and trace...
...captured in this example could be used for tuning the Pro-Motion...

PMDTraceMode(hAxis1, PMDTraceOneTime);

// set the processor variables that we want to capture
PMDTraceVariable(hAxis1, PMDTraceVariable1, PMDAxis1);
PMDTraceVariable(hAxis1, PMDTraceVariable2, PMDAxis1);
PMDTraceVariable(hAxis1, PMDTraceVariable3, PMDAxis1);

// set the trace to begin when we issue the next update command
PMDTraceStart(hAxis1, PMDTraceConditionNextUpdate);

// set the trace to stop when the MotionComplete event occurs
PMDTraceStop(hAxis1, PMDTraceConditionEventStatus,
PMDEventMotionCompleteBit, PMDTraceStateHigh);
PMDTraceProfileMode(hAxis1, PMDTrapezoidalProfile);

// set the profile parameters
PMDTracePosition(hAxis1, 200000);
PMDTraceVelocity(hAxis1, 0x200000);
PMDTraceAcceleration(hAxis1, 0x1000);
PMDTraceDeceleration(hAxis1, 0x1000);

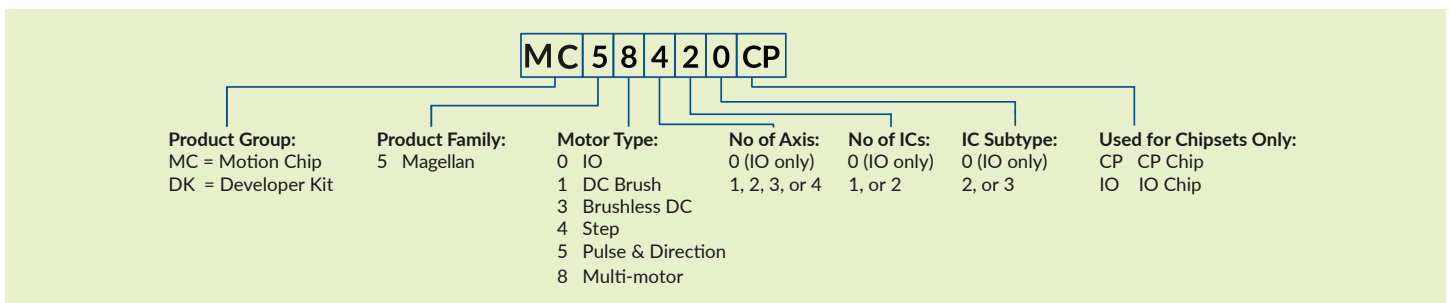
PMDTraceStart(hAxis1);
```

## PMD PRODUCT FAMILY OVERVIEW

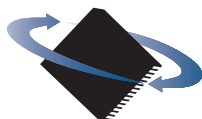
	# Axes	Motor Types	Format	Voltage	Communication	Features
<b>JUNO® VELOCITY &amp; TORQUE CONTROL ICs</b> 	1	<ul style="list-style-type: none"> <li>Brushless DC</li> <li>DC Brush</li> <li>Step Motor</li> </ul>	<ul style="list-style-type: none"> <li>64-pin TQFP</li> <li>56-pin VQFN</li> </ul>	3.3 V	<ul style="list-style-type: none"> <li>RS232/485</li> <li>CANbus</li> <li>SPI</li> </ul>	<ul style="list-style-type: none"> <li>Velocity control</li> <li>Current control</li> <li>Field oriented control</li> </ul>
<b>MAGELLAN® MOTION CONTROL ICs</b> 	1,2,3,4	<ul style="list-style-type: none"> <li>Brushless DC</li> <li>DC Brush</li> <li>Step Motor</li> </ul>	<ul style="list-style-type: none"> <li>144-pin TQFP</li> <li>100-pin TQF</li> </ul>	3.3 V	<ul style="list-style-type: none"> <li>RS232/485</li> <li>CANbus</li> <li>SPI</li> <li>Parallel</li> </ul>	<ul style="list-style-type: none"> <li>Position control</li> <li>Torque/current control</li> <li>Field oriented control</li> <li>Profile generation</li> </ul>
<b>ATLAS® DIGITAL AMPLIFIERS</b> 	1	<ul style="list-style-type: none"> <li>Brushless DC</li> <li>DC Brush</li> <li>Step Motor</li> </ul>	<ul style="list-style-type: none"> <li>20-pin solderable module</li> </ul>	12-56 V	<ul style="list-style-type: none"> <li>SPI</li> <li>Pulse and direction</li> </ul>	<ul style="list-style-type: none"> <li>Torque/current control</li> <li>Field oriented control</li> <li>MOSFET amplifier</li> </ul>
<b>ION®/CME N-SERIES DIGITAL DRIVES</b> 	1	<ul style="list-style-type: none"> <li>Brushless DC</li> <li>DC Brush</li> <li>Step Motor</li> </ul>	<ul style="list-style-type: none"> <li>Fully enclosed PCB-mounted module</li> </ul>	12-56 V	<ul style="list-style-type: none"> <li>Ethernet</li> <li>RS232/485</li> <li>CAN FD</li> <li>SPI</li> </ul>	<ul style="list-style-type: none"> <li>Position control</li> <li>Torque/current control</li> <li>Field oriented control</li> <li>Profile generation</li> <li>MOSFET amplifier</li> <li>Downloadable user code</li> </ul>
<b>ION® 500 &amp; 3000 DIGITAL DRIVES</b> 	1	<ul style="list-style-type: none"> <li>Brushless DC</li> <li>DC Brush</li> <li>Step Motor</li> </ul>	<ul style="list-style-type: none"> <li>Fully enclosed cable-connected module</li> </ul>	12-56 V 20-195 V	<ul style="list-style-type: none"> <li>Ethernet</li> <li>RS232/485</li> <li>CANbus</li> </ul>	<ul style="list-style-type: none"> <li>Position control</li> <li>Torque/current control</li> <li>Field oriented control</li> <li>Profile generation</li> <li>MOSFET amplifier</li> <li>Downloadable user code</li> </ul>
<b>PRODIGY® MOTION BOARDS</b> 	1,2,3,4	<ul style="list-style-type: none"> <li>Brushless DC</li> <li>DC Brush</li> <li>Step Motor</li> </ul>	<ul style="list-style-type: none"> <li>Machine Controller</li> <li>PC/104</li> <li>Standalone</li> </ul>	<ul style="list-style-type: none"> <li>5 V: PC/104 and Standalone</li> <li>12-56 V: Machine Controller</li> </ul>	<ul style="list-style-type: none"> <li>Ethernet</li> <li>RS232/485</li> <li>CANbus</li> <li>PC/104 bus</li> </ul>	<ul style="list-style-type: none"> <li>Position control</li> <li>Torque/current control</li> <li>Field oriented control</li> <li>Profile generation</li> <li>Downloadable user code</li> </ul>

C-Motion® is the common motion language for all Performance Motion Devices products.

## FOR ORDERING



To place an order email [purchaseorders@pmdcorp.com](mailto:purchaseorders@pmdcorp.com). For questions email [support@pmdcorp.com](mailto:support@pmdcorp.com)



**PERFORMANCE  
MOTION DEVICES**  
MOTION CONTROL AT ITS CORE

### About Performance Motion Devices

Performance Motion Devices (PMD) is a worldwide leader in motion control ICs, boards and modules. Dedicated to providing cost-effective, high performance motion systems to OEM customers, PMD utilizes extensive in-house expertise to minimize time-to-market and maximize customer satisfaction.

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