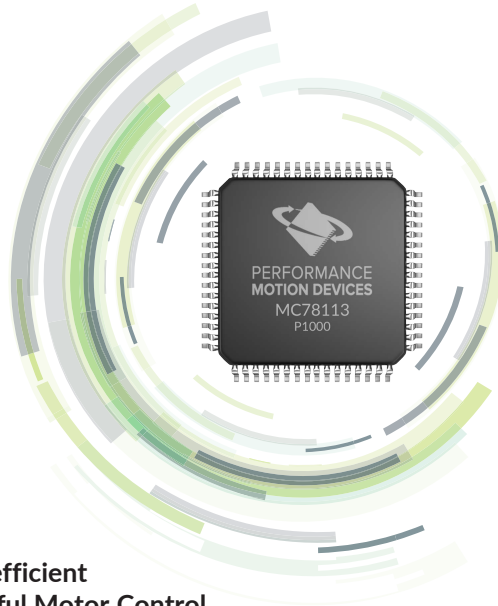


Juno® Family of Velocity & Torque Control ICs



Ultra-efficient Powerful Motor Control In A Compact IC

The Juno MC78113 family of ICs provide high performance IC-based control for medical, scientific, liquid pumping, and industrial applications. The Juno MC78113 ICs are single IC, single axis, programmable devices which provide velocity and torque control for Brushless DC, DC Brush, and Step motors.

Powerful Features

Juno provides four quadrant motor control and directly inputs quadrature encoder, index, and Hall sensor signals. It interfaces to external bridge-type switching amplifiers utilizing Performance Motion Devices' proprietary current- and switch signal-technology for ultra smooth, ultra quiet, motor operation. Juno ICs are commanded directly by analog or digital signals, or through an SPI (Serial Peripheral Interface), serial, or CANbus interface using high-level commands sent by a microprocessor.

System On A Chip

Depending on the type of motor controlled, Juno MC78113 ICs provide commutation, microstep generation, pulse & direction input, and internal profile generation. Juno ICs are equipped with advanced amplifier management features, such as overcurrent, over/under voltage, and overtemperature sense. A special outer control loop allows a wide range of motor-related control applications, including pressure control, flow rate control, and **temperature control**.

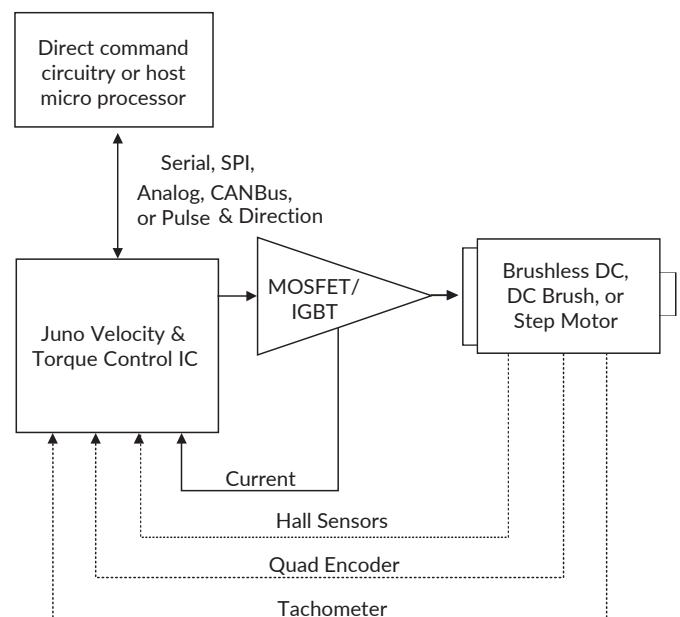
Flexibility

Internal profile generation provides acceleration and deceleration with 32-bit precision. Additional Juno features include performance trace, programmable event actions, FOC (field oriented control), and external shunt resistor control.

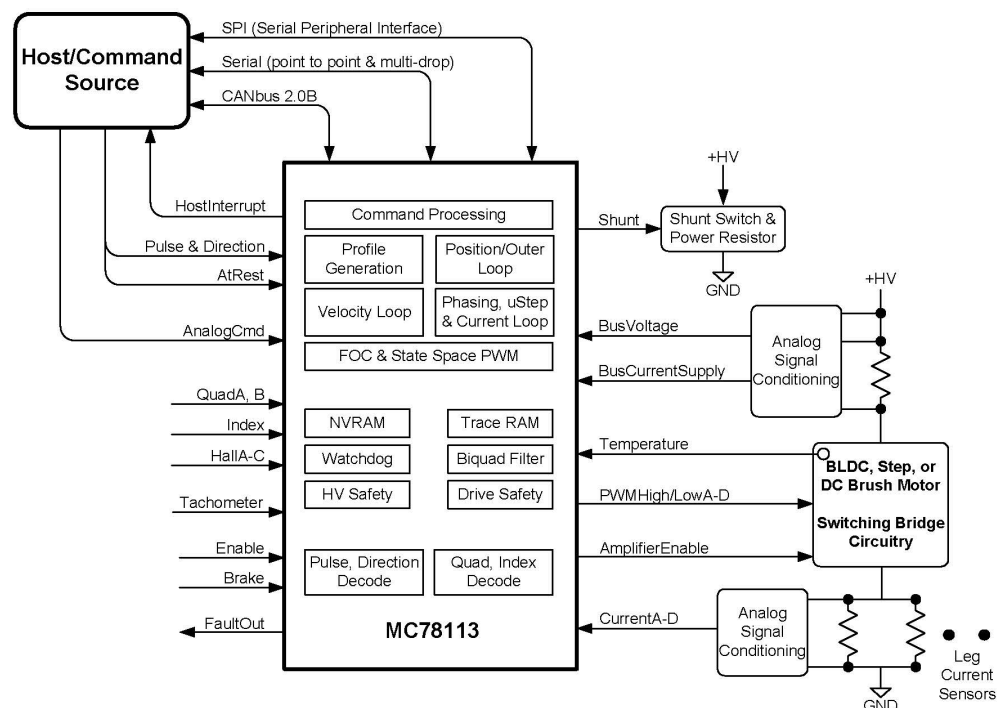
> FEATURES

- Controls 3-phase brushless DC, DC Brush or Step motors
- High performance digital current control
- Velocity loop with encoder or tachometer feedback
- Internal profile generator and estimator
- Sinusoidal or 6-step commutation
- Field oriented control and state space PWM
- Hall sensor input
- 8-signal PWM output with shoot-through protection
- Direct analog signal input
- Point-to-point and multidrop Serial up to 416 kBaud
- Quadrature encoder input up to 40 Mcounts/sec
- CANbus 2.0B
- Onboard NVRAM for custom configuration
- High speed index input & capture
- SPI (Serial Peripheral Interface) command input
- Brake input
- 10 kHz velocity loop
- 20 kHz commutation rate
- 20, 40, 80, or 120 kHz PWM selectable output rate
- 64-pin (TQFP), or 56-pin (VQFN) package options
- i²t current feedback protection
- Over and under-voltage protection; Over current protection
- Over temperature sensor
- Pulse and direction input position command
- Shunt control output
- Outer loop capability allows control of pressure, temperature, liquid levels

> CONFIGURATION



TechnicalOverview



> SPECIFICATIONS

Parameter	Value	Parameter	Value
Motors supported	3-phase Brushless DC, DC Brush, 2-phase Step motor	Position command options	Pulse & direction signals (with AtRest signal) Digital SPI (16-bit resolution)
Operating modes	Standalone: direct command input via external circuitry (on-board NVRAM holds configuration) Host command: microprocessor command input via SPI, serial, or CANbus 2.0	Velocity & torque command options	Analog signal (12-bit A/D resolution) Digital SPI (16-bit resolution) Host command via microprocessor
Control loops	Position/outer loop, velocity loop, current loop	Control/status signals	Enable, FaultOut, HostInterrupt, Brake
Commutation modes	6-step (using Hall sensors) Sinusoidal (with quadrature encoder input)	Motor drive signals	PWM High/LowA-D, Amplifier Enable, Current A-D
Current control modes	FOC (Field Oriented Control) Third Leg Floating Single Phase Voltage mode (no current control)	DC Bus safety signals	Shunt, BusVoltage, BusCurrentSupply, Temperature
Motor output modes	Individual high/low PWM Sign/Magnitude PWM	Motor feedback signals	QuadA, QuadB, Index, HallA-C, Tachometer
Microstep per full step	Programmable up to 256 microsteps per second	Max. quadrature rate (A, B, Index)	40 Mcounts/sec
Profile generator parameters	Velocity, Acceleration, Deceleration	Quadrature capture sources	Index signal
Serial communication modes	Point-to-point asynchronous Multi-drop asynchronous	Temperature signal input format	Analog
Serial baud rate range	1,200 to 416,667 baud	Max. SPI input rate	10 MHz
CANbus baud rate range	10,000 to 1,000,000 baud	Position/outer loop rate	Programmable up to 10 kHz
Internal trace RAM	6,144 16-bit words	Velocity loop rate	Programmable up to 10 kHz
Internal NVRAM	1,024 1-bit words	Current loop rate	20 kHz
Velocity feedback options	Quadrature encoder, Hall sensors, Analog tachometer signal (12-bit A/D resolution)	Commutation rate	20, 40, 80, 120 kHz

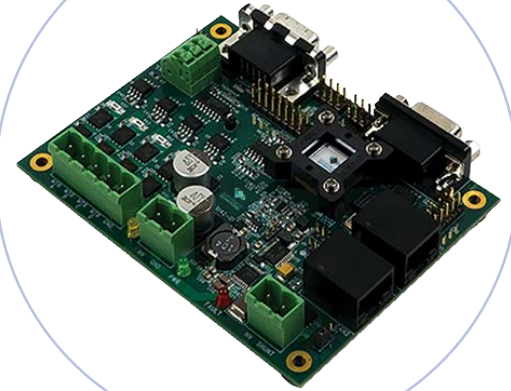
Development Tools

1 EASY START-UP

Developers Kits

Includes

- DK78113 Velocity & Torque Control IC Developer's Kit board or DK74113 Step Control IC Developer's Kit board (step motors only)
- Pro-Motion® Axis Set-up Wizard and User's Guide
- Development software with C-Motion and VB-Motion software
- Complete manual set
- 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 Performance Motion Devices' ICs, modules, and cards.

Features

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

3 BUILD THE APP

C-Motion® Language Library

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, cards, 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 serial, CAN, Ethernet, and SPI communications

```
// code for executing a profile and tracing
// captured in this example could be used for tuning the PMD

// set trace buffer wrap mode to a one time trace
PMDTraceMode(hAxis1, PMDTraceOneTime);

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

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

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

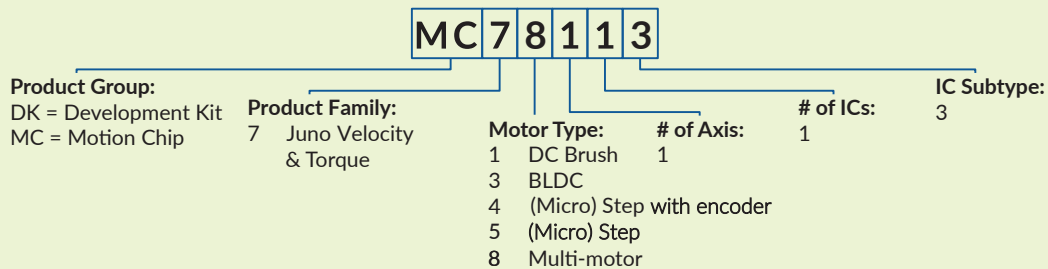
// set the profile parameters
PMDSetPosition(hAxis1, 200000);
PMDSetVelocity(hAxis1, 0x200000);
PMDSetAcceleration(hAxis1, 0x1000);
PMDSetDeceleration(hAxis1, 0x1000);

// execute the motion
PMDExecuteMotion(hAxis1);
```

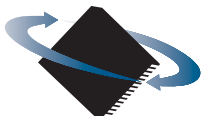
> PMD PRODUCT OVERVIEW

	JUNO® VELOCITY & TORQUE CONTROL ICs 	MAGELLAN® MOTION CONTROL ICs 	ATLAS® DIGITAL AMPLIFIERS 	PRODIGY® MOTION BOARDS 	ION® DIGITAL DRIVES 
No. Axes	1	1, 2, 3, 4	1	1, 2, 3, 4	1
Format	<ul style="list-style-type: none"> • 64-pin TQFP • 56-pin VQFN (Step Motor Version) 	<ul style="list-style-type: none"> • 144-pin TQFP • 100-pin TQFP 	<ul style="list-style-type: none"> • Compact: 20-pin solderable module • Ultra Compact: 19-pin solderable module 	<ul style="list-style-type: none"> • PCI • PC/104 • Standalone • Machine Controller 	<ul style="list-style-type: none"> • Fully enclosed module
Voltage	3.3 V	3.3 V	12 - 56 V	PCI, PC/104, Standalone: 5 V Machine Controller: 12 - 56 V	12 - 56 V / 20 - 195 V
Features	<ul style="list-style-type: none"> • Velocity control • Commutation • Torque/current control • Field-oriented control • Multi-motor support • Trace buffer • NVRAM 	<ul style="list-style-type: none"> • Position control • Commutation • Network communications • Torque/current control • Field oriented control • Profile generation • Multi-motor support 	<ul style="list-style-type: none"> • Torque/current control • Field oriented control • Trace buffer • Pulse & direction input • Multi-motor support • SPI Interface • MOSFET amplifier 	<ul style="list-style-type: none"> • Position control • Commutation • Network communications • Torque/current control • Field oriented control • Profile generation • Multi-motor support • PWM output • Analog output • Trace buffer • Programmable • Signal conditioning • General purpose user I/Os 	<ul style="list-style-type: none"> • Position control • Commutation • Network communications • Torque/current control • Field oriented control • Profile generation • Trace buffer • MOSFET amplifier • Pulse & direction input • Programmable (ION/CME only) • General purpose user I/Os (ION/CME only)
Motor Types	<ul style="list-style-type: none"> • DC Brush • Brushless DC • Step motor 	<ul style="list-style-type: none"> • DC Brush • Brushless DC • Step Motor 	<ul style="list-style-type: none"> • DC Brush • Brushless DC • Step Motor 	<ul style="list-style-type: none"> • DC Brush • Brushless DC • Step Motor 	<ul style="list-style-type: none"> • DC Brush • Brushless DC • Step Motor
Communication	<ul style="list-style-type: none"> • Standalone (Analog) • RS232/485 • CANbus • SPI 	<ul style="list-style-type: none"> • Parallel • RS232/485 • CANbus • SPI 	<ul style="list-style-type: none"> • SPI 	<ul style="list-style-type: none"> • Ethernet • RS232/485 • CANbus • PCI and PC/104 bus 	<ul style="list-style-type: none"> • Ethernet • RS232/485 • CANbus
Loop Rate	20 kHz – current 10 kHz – velocity	50 – 75 µsec/axis	20 kHz – current	50 – 150 µsec/axis	20 kHz – current 10 kHz – position

> FOR ORDERING VELOCITY & TORQUE CONTROL ICs



To place an order or for additional information and questions, contact PMD customer support



**PERFORMANCE
MOTION DEVICES**

MOTION CONTROL AT ITS CORE

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1 Technology Park Dr, Westford, MA 01886

Phone: 978.266.1210 Fax: 978.266.1211 Email: info@pmdcorp.com

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