



Pilot™ Motion Processor For Stepping Motion Control MC3510

Features

- Available in 1-axis configuration.
- Pulse and direction output (up to 50 kpulses/sec).
- Motion profiles include S-curve, trapezoidal, velocity contouring and user-defined.
- Asymmetric acceleration and deceleration to custom program a trapezoidal motion profile.
- Velocity and acceleration changes on-the-fly for trapezoidal and velocity contouring profiles.
- Incremental encoder quadrature input and parallel input for absolute encoder or resolver for on-the-fly motor stall detection.
- Parallel and Serial (point-to-point or multi-drop) communications interface.
- Trace capabilities for system performance checks, maintenance, and diagnostics.
- Encoder rate of 5.0 Mcounts/sec allows use of fine resolution feedback devices for reading motor position.
- Advanced breakpoint capability allows precise sequencing of events.
- PLC-style programmable inputs and outputs, including a per-axis programmable input and output.
- 256 16-bit word I/O locations for user-defined peripherals.
- 8 general-purpose 10-bit analog inputs.
- Two directional limit switches, index input, home and at-rest indicator.
- Axis settled indicator and tracking window in addition to automatic motion error detection.
- Packaged in a 132-pin device (surface mount CMOS technology).
- Available in commercial and industrial temperature versions.



General Description

The Pilot MC3510 single-axis, single chip motion processor for step motor control is ideal for embedded systems in industrial control, automation and robotic applications. The chip is a 132-pin device, surface mount CMOS technology and powered by 5 volts. The motion processor is driven by a host microprocessor through an asynchronous bi-directional serial port or through a 16-bit micro-processor-style parallel interface, giving users the ability to offload resource intensive motion control functions from the application's host.

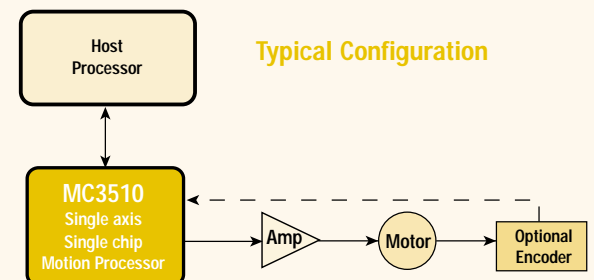
The MC3510 offers high performance, programmable pulse and direction output at up to 50 Kpulses/sec. The chip operates in an open loop mode where the motor command is driven from the output of the trajectory generator. Optional encoder feedback provides on-the-fly motor stall detection and allows the chip to detect when the step motor has lost steps during a motion. Trace capabilities provide on-the-fly data storage for analyzing system performance and performing maintenance and diagnostics.

With over 120 commands, PMD's instructions set offers flexibility and versatility to board designers and software application programmers. Instructions are used

to initialize and control the motion processor. User-selectable profiling modes supported by the motion processor include S-curve, trapezoidal, velocity contouring and user-defined. The MC3510 accepts input parameters such as position, velocity and acceleration from the host and generates a corresponding trajectory.

The motion processor accepts feedback from an incremental encoder, up to 5 megacounts per second or from an absolute encoder or resolver, up to 160 megacounts per second, to read the current position.

Multiple breakpoints offer precise sequencing and control of events by the application program. PLC-style instructions are provided, which operate on inputs and set outputs. The instructions use Event, Activity and Signal registers. Input signals include two limit switches (one for each direction of travel), home indicator and a general-purpose programmable input. An at-rest output signal is provided, along with one general-purpose programmable output signal. Eight general-purpose analog (0-5 V) and 256 (16-bit wide) general-purpose discrete inputs/outputs are available.



Technical Specifications

Available configurations	1 axis
Operating modes	Open loop (motor command is driven from output of trajectory generator, encoder input used for stall detection)
Position range	-2,147,483,648 to +2,147,483,647 counts
Velocity range	-32,768 to +32,767 counts/sample with a resolution of 1/65,536 counts/sample
Acceleration and deceleration ranges	-32,768 to +32,767 counts/sample ² with a resolution of 1/65,536 counts/sample ²
Jerk range	0 to 1 counts/sample ³ , with a resolution of 1/ 4,294,967,296 counts/sample ³
Profile mode	S-curve point-to-point (Velocity, acceleration, jerk and position parameters) Trapezoidal point-to-point (Velocity, acceleration, deceleration and position parameters) Velocity-contouring (Velocity, acceleration and deceleration parameters) User-defined (Velocity, acceleration, jerk, time and position parameters)
Motor output modes	Pulse and direction output up to 50 Kpulses/sec
Maximum encoder rate	Incremental: 5 Mcounts/sec Parallel-word: 160.0 Mcounts/sec
Parallel encoder word size	16 bits
Parallel encoder read rate	20 kHz (reads axis every 50 µsec)
Profile calculation timing range	100 µsec to 3,355 msec
Minimum profile calculation time	100 µsec nominal (exact time is 102.4 µsec)
Limit switches	2; one for each direction of travel
Position-capture triggers	2; index and home signals
Capture trigger latency	50 nsec
Analog input	8 10-bit analog inputs
At-rest indicator	One per axis
User-defined discrete I/O	256 16-bit wide user-defined I/O
Number of host instructions	124



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MC3510DS2.0-1202

Environmental and Electrical Ratings

Storage Temperature (T_S)	-55° C to 150° C
Operating Temperature (T_A)	0° C to 70° C*
Power Dissipation (P_d)	400 mW
Nominal Clock Frequency (F_{CLK})	20.0 MHz
Supply Voltage Limits (V_{CC})	-0.3 V to +7.0 V
Supply Voltage Operating Range (V_{CC})	4.75 V to 5.25 V

* An industrial version with an operating range of -40° C to 85° C is also available. Please contact PMD for more information.