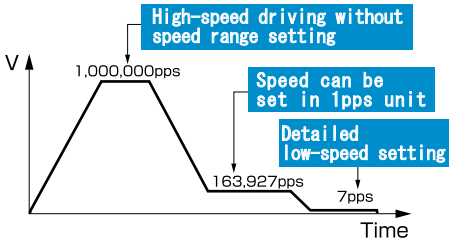
MCX514

4-axis Motion Control IC with high functions

MCX514 is 4-axis Motion Control IC which connects to CPU with 8/16-bit or I²C serial interface bus and can control either a stepper motor driver or pulse type servo driver for position and speed.

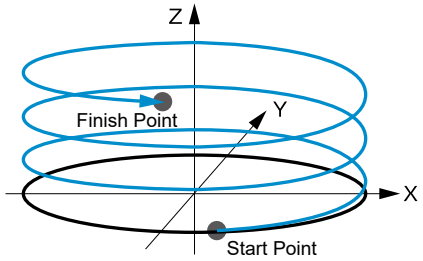
- Multiple interpolation driving
  (2/3/4-axis linear, Bit pattern, CW/CCW circular, Helical)
- Parabolic s-curve/trapezoidal acc./dec. driving
- Automatic deceleration in non-symmetrical trapezoidal acc./dec.
- Synchronous action 4sets for each axis.
- Automatic home search
- Drive speed 1pps ～ 8Mpps (When CLK＝20MHz : Max.10,000,000pps)
- 144 pin plastic QFP Dimension:20×20×1.4 mm
- Power voltage: 3.3V±10%

■Speed Range Free



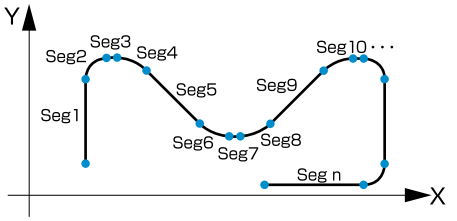
MCX514 has no speed multiple, speed can be set 1pps unit.
This IC can change the speed directly from low speed, 1pps, 2pps to high speed pulse like 1Mpps during driving.

■Helical Interpolation



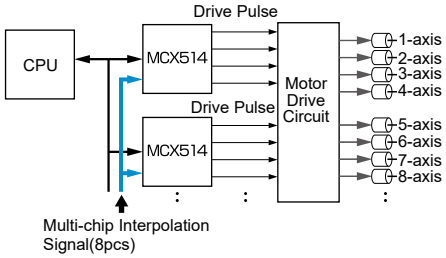
In addition to linear and circular, helical interpolation can be executed which drives another axis synchronous with circular interpolation on X,Y surface. Example of multiple rotation of helical interpolation in the above figure.

■Pre-Buffer Register (8 steps)



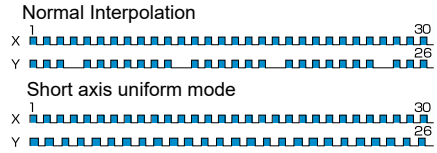
8 steps pre-buffer registers are equipped to execute high speed continuous interpolation driving. Continuous interpolation can be executed if there is short segment like Seg.3 in the above figure, when average drive time of 8 segments is longer than position data set time of next segment.

■Linear Interpolation with Multi-chip



Multi-axis linear interpolation with 5 or more axes can be executed by connecting multiple MCX514.

■Short axis pulse uniform mode of interpolation.



In 2-axis linear interpolation driving, axis which drives longer (long axis) keeps to output pulses continuously. Meanwhile, axis which drives shorter (short axis) sometimes outputs pulses by interpolation calculation result and sometimes does not. MCX514 has short axis pulse uniform function. For short axis, drive pulses are output making pulse interval uniform as much as possible.

■2-axis high accuracy constant vector speed mode

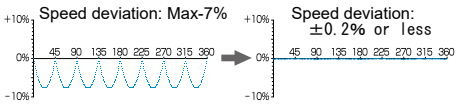
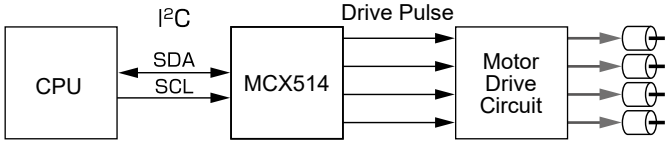


Fig.1 Existing constant vector speed mode

Fig.2 2-axis high-accracy constant vector speed mode

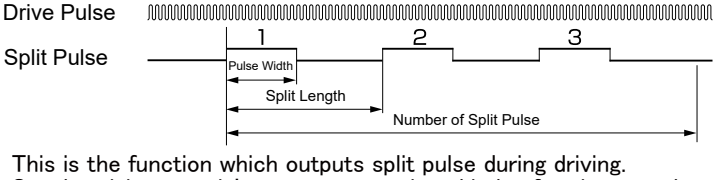
Besides existing constant vector speed mode, MCX514 has 2-axis high accuracy constant vector speed mode which is significantly improved constant vector speed mode. Short axis pulse uniform mode and 2-axis high accuracy constant vector speed mode are used together in 2-axis linear interpolation, circular interpolation and helical interpolation, speed deviation of vector speed is ±0.2% or less. Drastic accuracy improvement of speed in interpolation driving is expected.

■I²C Interface Bus



In addition to 8/16bit data bus, MCX514 can connect to the master CPU with I²C serial interface bus. Max 8pcs of MCX514 can be connected to one interface bus.

■Split Pulse



This is the function which outputs split pulse during driving. Synchronizing an axis's movement, various kinds of actions can be performed in specified intervals. By combining the split pulse output and the synchronous action, start/stop split pulse from a specified position and split length and pulse width can be changed by external signal input.

— Specifications —

Item	Sub item	Contents
Control axis		4-axis
CPU prallel bus		16bit/8bit selectable
CPU serial bus		I2C serial interface bus
Interpolation	Commands	2/3/4-axis linear interpolation, CW/CCW circular interpolation, 2/3/4-axis bit pattern interpolation, Helical interpolation
	Range	Each axis −2,147,483,646 ～ 2,147,483,646 drive pulse
	Speed	1 pps ～ 8,000,000 pps
	Position accuracy	±0.5LSB or less(Linear interpolation) ±1LSB or less(Circular interpolation)
	Other functions	Any axis selectable, Short axis pulse uniform, Constant vector speed(2/3-axis easy mode or 2-axis high-accuracy mode selectable) Continuous interpolation, 8-step pre-buffer register, Interpolation single step, Multi-chip interpolation, Interruption for interpolation
Drive pulse output	Drive speed range	1 pps ～ 8,000,000 pps (When CLK＝20MHz:Max10,000,000pps)
	Output speed accuracy	±0.1% or less (According to the setting speed)
	Acceleration/deceleration speed	1 pps/sec ～ 536,870,911pps/sec
	Jerk	1 pps/sec^2 ～ 1.073×10^9 pps/sec^2
	Acceleration/deceleration curve	Constant speed, symmetrical/asymmetrical trapezoidal/s-curve acceleration/deceleration
	Drive pulse range	・Relative position drive : −2,147,483,648 ～ 2,147,483,647 drive pulse ・Absolute position drive : −2,147,483,648 ～ 2,147,483,647 drive pulse
	Position drive decelerating stop mode	Automatic decelerating stop/manual decelerating stop
	Override	Output pulse number and drive speed during driving are changeable.
	Kinds of drive command	Relative/absolute position, +direction/−direction continuous
	Triangle form prevention	For both trapezoidal and s-curve acceleration/deceleration
	Drive pulse output type	Independent 2-pulse, 1-pulse directional, 2-phase with quad/double edge evaluation are selectable
	Drive pulse output logic	Active High/active Low are selectable
	Drive pulse output terminal	Terminals can be replaced.
Encoder input	Input pulse type	2-phase with quad/double/single edge evaluation and Up/down pulse selectable
	Input pulse terminal	Terminals can be replaced
Position counter	Logical position counter	Count range −2,147,483,648 ～ +2,147,483,647
	Real position counter	Count range −2,147,483,648 ～ +2,147,483,647
	Viriable ring	Possible to set the count maximum value of each counter
Software limit	Settigng range	−2,147,483,647 ～ +2,147,483,647
	Stop mode	Decelerating / Instant stop selectable
Multipurpose register	Bit length・number	32-bit ・4pcs. per axis
	Usage	Comparison of position, speed and timer, register of position and speed, saving real position, values of speed and timer.
Timer	Number of timer	1pce. per axis
	Setting range	1 ～ 2,147,483,647 μsec(When CLK=16Mhz, set 1 μsec unit)
Split pulse	Number of signal	1set per axis
	Split length	2 ～ 65,535 drive pulse
	Split pulse width	1 ～ 65,534 drive pulse
	Split pulse number	1 ～ 65,535 drive pulse or unlimited
Automatic home search	Sequence	・High-speed near home search → low-speed home search → encoder Z-phase search → offset driving ・Valid/invalid for each step, detective signal and detective directions are selectable.
	Deviation counter clear output	Clear pulse width is selectable from 10 μ ～20msec. Logical level is selectable.
	Interval step timer	Selectable from 1msec ～ 1,000msec
Synchronous action	Number of sets	4 sets per axis
	Provocative	The passing of the specified position, the starting/stopping of driving, rising/falling of an input signal, a time ends by timer, etc.
	Action	Starting/stopping of driving, saving a position counter value, writing of a drive speed, and so on
Interrupt	Interrupt factor	At the time of when an axis starts/stops driving at the drive speed during acceleration/deceleration, at the time of when the value of a position counter becomes larger/smaller than that of the multipurpose registers and so on.
	Valid/invalid	Valid/invalid is selectable for each interrupt factor.
Drive control by external signal		・ Relative position drive, continuous drive by EXPP, EXPM signals. ・ Manual pulse generator (encoder input : 2-phase with single edge evaluation)
External stop signal	Number of signal	3points(STOP0 ～ 2) per axis
	Valid/invalid	Valid/invalid for stop signal function is selectable
	Logical level	Low active/Hi active is selectable
	Stop mode	When active, drive decelerating stop. (When drive speed is same or slower than initial speed, driving stops immediately.)
Input/Output signals for servo motor	Kinds of signals	ALARM(Alarm), INPOS(positioning completed), DCC(Deviation counter clear)
	Valid/invalid	Valid/invalid is selectable for the signals.
	Logical level	Low active/Hi active is selectable.
General purpose Input/Output signals	Number of Input/output	8 points per axis ・Terminal for synchronous input and external drive input signal is commonly used. ・Terminal for synchronous action output, multipurpose register comparison output and drive status output signals is commonly used
Drive status output signal	Kinds of signals	・Driving, error, accelerating, constant speed, decelerating, acceleration/deceleration-increasing, continuing, decreasing ・Drive status can be also read out by status register
Over run limit signal	Number of signals	2 points(one point each for +direction and −direction)
	Valid/invalid	Valid/invalid is selectable for Limit function.
	Logical level	Low active/Hi active is selectable.
	Stop mode	When active, sudden stop/decelerating stop is selectable.
	Input pulse terminal	Terminal can be replaced.
Emergency stop signal		EMGN 1 point per axis. Drive pulse output stops at Low level(Logical level setting is disable.)
Built-in integral filter	Input signal filter	An integral type filter in the input step of each input signal
	Filter time constant	Selectable from 16 types(500n, 1 μ, 2 μ, 4 μ, 8 μ, 16 μ, 32 μ, 64 μ, 128 μ, 256 μ, 512 μ, 1m, 2 m, 4 m, 8 m, 16 m[sec])
	Valid/invalid	Valid/invalid is selectable for filter function.
Electrical character	Temperature range for driving	−40℃～+85℃
	Power voltage for driving	+3.3V ±10%
	Comsumption current	150mA (Average), 204mA(Maximum) When CLK=16MHz
	Input clock frequency	16MHz(Standard), 200MHz(Maximum)
	Input signal level	LVTTL level(5V torelant)
	Output signal level	3.3V CMOS Level(only TTL can be connected for 5V type)
Package		・144 pin plastic QFP 0.5mm pin-pitch RoHS compliant ・Package size 20×20×1.4 mm

The Specifications are subject to change without notice due to the technical improvement. 2019.4

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