FEATURES

- **High Speed of Interpolation Pulse Output**
- **Linear, Circular, Parabolic, Logarithmic and Exponential Interpolations Are Possible**
- **Reduces Software Design Necessary For Interpolation**
- **Can Be Interfaced Directly With An 8 Bit Microprocessor**
- **Interrupts the Microprocessor At the End of the Move**
- **Incorporates An Automatic Stop Function At the End Point and A Fixed Speed Control Function**
- **24 Bit Data Length**
- **Up to 5 MHz Clock Frequency**
- **28 Pin Plastic Dual In-Line Package**
- **Single +5 V Power Supply**

APPLICATIONS

- **Motion/Numerical Control Systems**
- **Robotics**
- **Drawing Machines**
- **Electrical Discharge Machines**
- **Special Machinery**

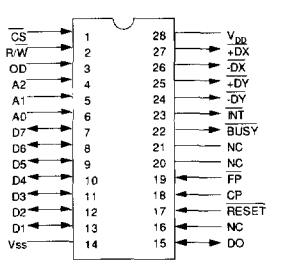
See KM3701AD Operation Manual for further detail.

2

DESCRIPTION

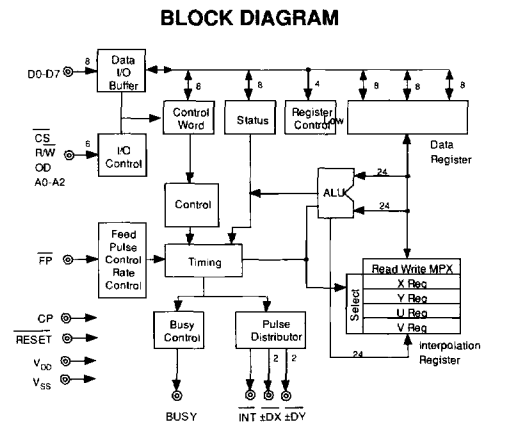
The KM3701AD is a CMOS LSI developed as an interpolation pulse generator for motion/numerical control systems. The KM3701AD incorporates linear and circular as well as parabolic, logarithmic and exponential interpolations. The functions and coordinate values for linear, circular or other interpolations are set by the microprocessor. Internal calculations are performed with the input of Feed Pulses. Interpolation pulses are then distributed to both the X and Y axes. The frequency of the output pulses from the KM3701AD does not depend on the slope of a particular move (when √2 control is enabled). Each KM3701AD generates pulses to interpolate 2 axes. When used with the KM3702AD/AQ (LSI for servo motor control), motion/numerical control systems can be built easily, thus reducing costs and enabling smaller units to be made.

KM3701AD



Signal	Explanation
$\overline{CS}$	Chip Select
R/$\overline{W}$	Read/Write
OD	Output Disable
A0~A2	Address
D0~D7	Data Bus
$\overline{RESET}$	Reset
CP	Clock Pulse
FP	Feed Pulse
BUSY	Busy
$\overline{INT}$	Interrupt
±DX	Output (X)
±DY	Output (Y)
V_{DD}	+5V
V_{SS}	Ground

BLOCK DIAGRAM



ORDERING INFORMATION

TK3701 □ □ □□

- Tape/Reel Code
- Temp. Range
- Package Code

PACKAGE CODE	TEMP. RANGE	TAPE/REEL CODE
D: Plastic Dip	A : -20 to +70 °C	BX: Bulk/Bag MG: Magazine

ABSOLUTE MAXIMUM RATINGS

Supply Voltage ..... V_{SS} -0.3 to V_{SS} + 7.0 V
Input Voltage ..... V_{SS} -0.3 to V_{DD} + 0.3 V
Power Dissipation ..... 1.25 W
Storage Temperature Range ..... -65 to +150 °C
Operating Temperature Range ..... -20 to +75 °C
Lead Soldering Temp. (10 sec.) ..... 300 °C

ELECTRICAL CHARACTERISTICS

D. C. CHARACTERISTICS

Test conditions: V_{SS} = 0 V, T_A = -20 to +70 °C

SYMBOL	PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNITS
V_{DD}	Supply Voltage		4.75	5.0	5.25	V
I_{DD}	Supply Current	T_{CYC} = 0.5 µS, No Load			10	mA
Input Signal (Note 1)						
V_{IL}	Low Level Input Voltage	I_{IL} = -10 µA	-0.3		0.6	V
V_{IH}	High Level Input Voltage	I_{IH} = 10 µA	3.0		V_{DD}+0.3	V
Output Signal (Note 2)						
V_{OL}	Low Level Input Voltage	I_{OL} = 2.0 mA			0.4	V
V_{OH}	High Level Input Voltage	I_{OH} = -200 A	2.4			V
I/O Signal (Note 3)						
V_{IL}	Low Level Input Voltage	I_{IL} = -10 µA	-0.3		0.6	V
V_{IH}	High Level Input Voltage	I_{IH} = 10 µA	3.0		V_{DD}+0.3	V
I_{OL}	Low Level Output Current	V_{OL} = 0.4 V	5.5			mA
I_{OH}	High Level Output Current	V_{OH} = V_{DD} - 0.5 V High Impedance			10	µA

Note 1: $\overline{CS}$, R/$\overline{W}$, OD, A_2, A_1, A_0, $\overline{RESET}$, CP, FP, D_7, D_6, D_5, D_4, D_3, D_2, D_1, D_0
Note 2: $\overline{BUSY}$, $\overline{INT}$, +DX, $\overline{-DX}$, +DY, $\overline{-DY}$
Note 3: Open drain output, D_7, D_6, D_5, D_4, D_3, D_2, D_1, D_0

ELECTRICAL CHARACTERISTICS

A. C. CHARACTERISTICS

Test conditions: V_{DD} = 5 V ± 5 %, T_A = -20 to +70 °C

SYMBOL	PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Clock Signal (Note 1)						
T_{CYC}	Clock Pulse Period	Typically 1 MHz	0.2	1	10	µS
T_W	Clock Pulse Width		60		T_{CYC} -60	ns
T_{CR}	Clock Pulse Rise Time				10	ns
T_{CF}	Clock Pulse Fall Time				10	ns
Input Signal (Note 1)						
T_H	Data Hold Time		10			ns
T_{SU}	Data Hold Time		T_W +20			ns
Output Signal (Note 2)						
T_D	Output Delay Time	C_L = 60 pF			100	ns
Output Signal (Note 3)						
T_A	Access Time	C_L = 100 pF, R_{PU} = 1.5 kΩ			120	ns
T_{CO}	CS to Output	C_L = 100 pF			100	ns
T_{CO}	OD to Output	R_{PU} = 1.5 kΩ			100	ns
T_{OW}	Width of OD	C_L = 100 pF	120			ns
T_{RDH}	Data hold time after OD	R_{PU} = 1.5 kΩ	10			ns
T_{CA}	Address valid after Control		0			ns
T_{AC}	Address valid before Control		20			ns
T_{CH}	CS hold after Control		0			ns
T_{CSC}	CS valid before Control		0			ns
T_{CW}	CS to Write		120			ns
T_{CC}	Width of R/$\overline{W}$		120			ns
T_{WDS}	Data set-up time to Write		120			ns
T_{WDN}	Data hold time after R/$\overline{W}$		120			ns

Note 1: $\overline{CS}$, R/$\overline{W}$, OD, A_2, A_1, A_0, $\overline{RESET}$, CP, $\overline{FP}$, D_7, D_6, D_5, D_4, D_3, D_2, D_1, D_0

Note 2: $\overline{BUSY}$, $\overline{INT}$, +DX, $\overline{-DX}$, +DY, $\overline{-DY}$

Note 3: Open drain output, D_7, D_6, D_5, D_4, D_3, D_2, D_1, D_0

Maximum feed pulse and tooling speed for typical step sizes and clock rates.

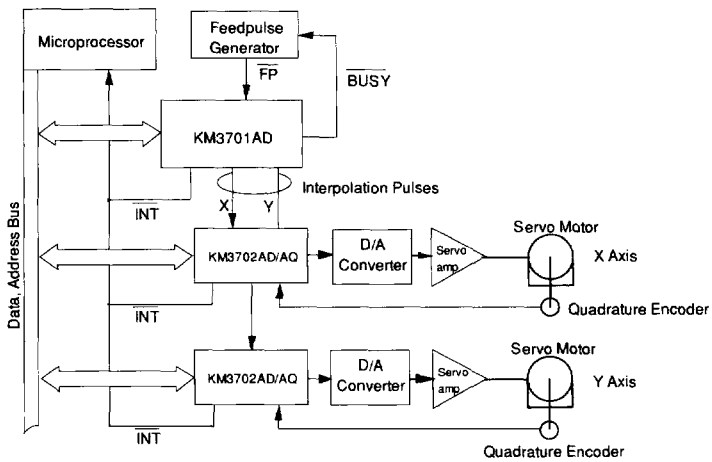
Step size and type of Interpolation	1.5 MHz Clock		5.0 MHz Clock	
	Maximum Pulse Rate	Maximum Tool Speed	Maximum Pulse Rate	Maximum Tool Speed
Unit: .001 mm				
Linear	136.3 K/sec	8.38 m/min	454.5 K/sec	27.3 m/min
All other	71.4 K/sec	4.39 m/min	238.1 K/sec	14.3 m/min
Unit: .0001"				
Linear	136.3 K/sec	838"/min	454.5 K/sec	2727"/min
All other	71.4 K/sec	439"/min	238.1 K/sec	1428"/min

PIN FUNCTION

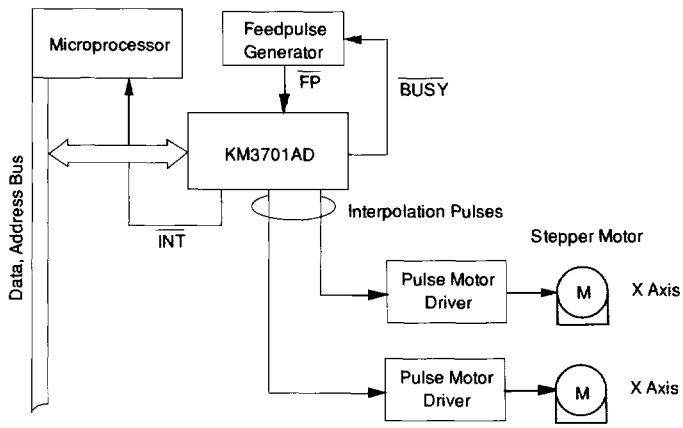
SIGNAL	SYMBOL	PIN NO.	I/O	DESCRIPTION
Power Supply	V_{DD}	28	—	+5 V±5%
Ground	V_{SS}	14	—	Ground
Chip Select	$\overline{CS}$	1	I	Device select signal
Write	R/$\overline{W}$	2	I	Write signal
Output Disable	OD	3	I	Read signal
Address	A2~A0	4~6	I	Address
Data	D7~D0	7~13 15	I/O	Read/Write data I/O common open drain
Clock Pulse	CP	18	I	Clock
Reset	$\overline{RESET}$	17	I	Reset signal
Feed Pulse	$\overline{FP}$	19	I	Interpolation feed pulse
Interpolation Busy	$\overline{BUSY}$	22	O	When active, it shows calculation is being done.
Interrupt	$\overline{INT}$	23	O	Completion of interpolation
+DX output	+$\overline{DX}$	27	O	X axis positive direction interpolation pulse
-DX output	-$\overline{DX}$	26	O	X axis negative direction interpolation pulse
+DY output	+DY	25	O	Y axis positive direction interpolation pulse
-DY output	-DY	24	O	Y axis negative direction interpolation pulse

TYPICAL APPLICATIONS

1. Control of 2 axes can be accomplished by using one KM3701AD and two KM3702AD/AQs.



1. One KM3701AD can control two stepper motors.



INTERPOLATION

The interpolation pulse distribution rate is in accordance with the rate of the clock pulse (CP) and the internal calculation time. The internal calculation requires 11 clocks in the case of linear interpolation and 21 clocks in the case of circular or other interpolations.

Interpolation	Interpolation Pulse Distribution Rate
Linear interpolation	454.4 KPPs
Circular or other	238.1 KPPs

NOTES