Piezo Motors

Electronic Drives

Amplifiers

AB1A- is the standard, heavy duty amplifier, widely used.

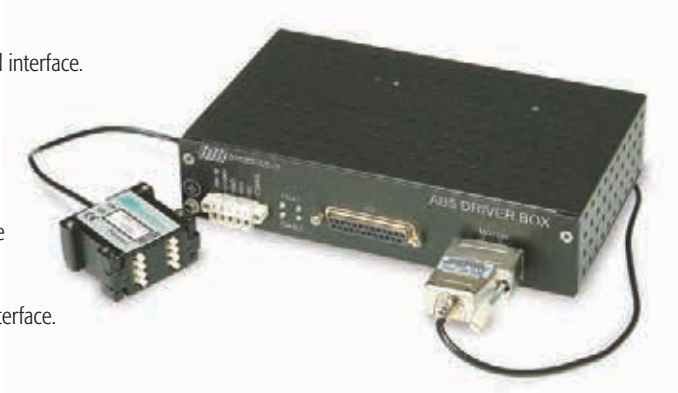
AB1A-3U- a board level AB1A amplifier card, in 3U format for motherboard interface.

AB2- facilitates additional ultra high resolution capabilities (UHR), down to 1 nanometer, using the unique DC mode.

AB4- a compact amplifier, powered by 12V supply.

AB5- the innovative linearized amplifier, yields excellent motion performance with any standard controller firmware.

AB5-3U- a board level AB5 amplifier card, in 3U format for motherboard interface.



unique functionality	**AB1A** nanomotion basic	**AB1A-3U** board level 3U format	**AB2** DC mode for ultra high resolution	**AB4** compact amplifier package	**AB5** linear response, operates with standard servo	**AB5-3U** linear response operates with standard servo
Supply Voltage (Vdc)	48	48	24	12	24	24
Packaging						
	panel mount box	board level 3u format	panel mount box	small panel mount box	panel mount box	board level 3U format
Max # of HR Elements (1)						
	32	32	16	4	32	32
Max Motor Cable Length (3)	15	15	20	20	20	20
Input Signals (2)						
	±10Vdc	±10Vdc	±10Vdc	±10Vdc spi digital	±10Vdc	±10Vdc
Modes of Operation						
	velocity step gate	velocity step gate	velocity step gate	velocity step gate UHR position	velocity step gate	velocity step gate

	AB1A, AB1A-3U		**AB2, AB5, AB5-3U**		**AB4**	
	regular cable	low capacitance cable	regular cable	low capacitance cable	regular cable	low capacitance cable
1HR element	0.5 to 5	0.5 to 8	0.5 to 10	0.5 to 20	0.5 to 10	0.5 to 20
2HR elements	0.5 to 5	0.5 to 8	0.5 to 10	0.5 to 20	0.5 to 10	0.5 to 20
4 HR elements	0.5 to 10	0.5 to 15	0.5 to 10	0.5 to 20	0.5 to 10	0.5 to 20
8 HR elements	0.5 to 10	0.5 to 15	0.5 to 10	0.5 to 20	NA	NA
16 HR elements	0.5 to 10	0.5 to 15	0.5 to 10	0.5 to 20	NA	NA
32 HR elements	0.5 to 10	0.5 to 15	0.5 to 10 (AB5)	0.5 to 20 (AB5)	NA	NA
1 ST element	3	3	NA	0.5 to 10	NA	0.5 to 10m
2 LS elements	0.5 to 5	NA	NA	NA	NA	NA

Piezo Motors

Electronic Drives

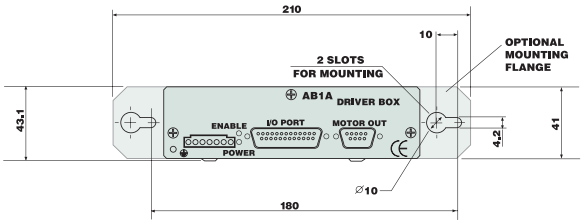
AB1A Amplifier

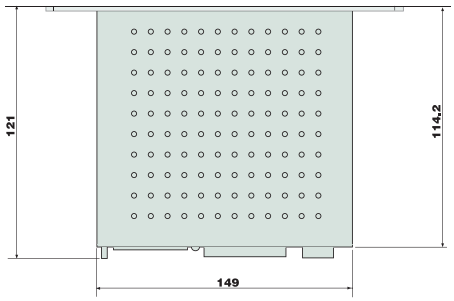
The AB1A amplifier is a single axis digital driver that can run one or multiple Nanomotion motors in parallel. While operating in a closed loop servo system, the driver works as a velocity amplifier, receiving a +/- 10 volt analog command from the controller. The controller signal translates into AC voltage at 39.6 kHz to run the motor. In an open loop mode the amplifier can receive a signal from an external joystick, providing motion in a continuous or stepping mode.

Features

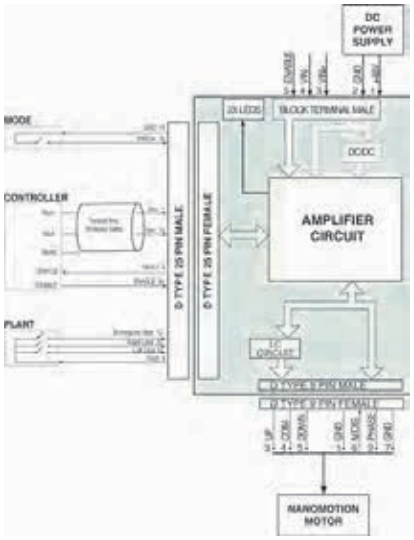
- Digital drive handles up to 32 elements
- +/- 10V input from servo control
- 2 optically isolated limits
- Available in Eurocard 3µ format
- Joystick input for open loop operation
- Card interface is 48 pin 3 row connector

Amplifier Specifications





Driving Capability:	up to 32 elements (4 HR8 motors)
Analog Control Input	
Input Voltage Range:	+/-10V
Input Impedance:	10 KΩ
Input Low Pass Filter:	2.7 KHz
Input Sampling Resolution:	10 bits



Environmental

Operating temperature:	0 to 50˚C
Storage Temperature:	-40˚C to +70˚C
Humidity:	0 to 80%

Electrical

Power Input:	+48Vdc±5%
Max Motor Output:	270 to 280Vrms
Power Consumption w/o Load:	+48Vdc/0.125A
Power Consumption with Max Load:	+48Vdc/6.5Amax

Piezo Motors

Electronic Drives

AB2 Amplifier

The AB2 amplifier combines the normal Velocity mode of the AB1A amplifier, for servo operation, with the DC mode, for Ultra-High resolution positioning. The DC mode treats the motor as a traditional piezo actuator, providing the ability to make discrete moves at the 1 nanometer level.

The DC mode uses the same ±10v analog signal from the controller output and translates it to a ±300 nanometer position move capability, with 1 nanometer resolution. This function can be operated in an open loop or closed loop manner. The switching between the Velocity mode and DC mode is done seamlessly through a discrete input signal.

Features

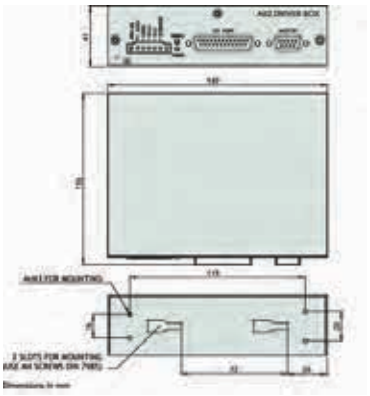
- Ultra high resolution capability using DC mode
- Digital drive handles 16 HR motor elements
- Requires 24Vdc supply input
- Cable length up to 20m
- Over current and over voltage protection

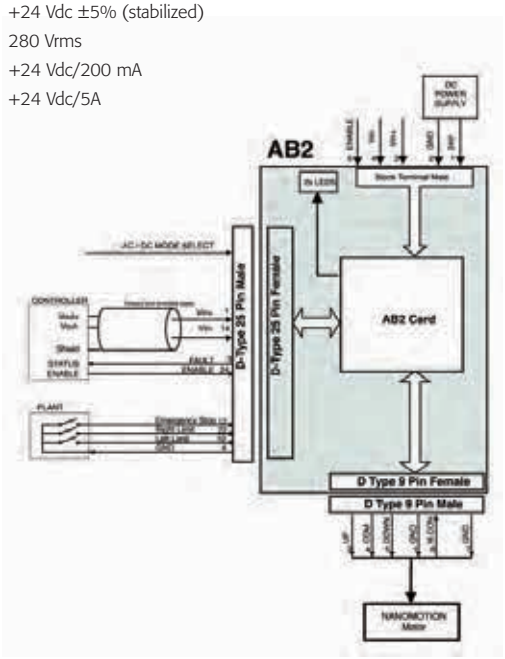
Environmental

Operating Temperature:	0 to 50˚C
Storage:	-40˚C to +70˚C
Humidity:	up to 80%, non condensing

Electrical

Power Supply Input:	+24 Vdc ±5% (stabilized)
Max Motor Output Voltage:	280 Vrms
Power Consumption without Load:	+24 Vdc/200 mA
Power Consumption with Max Load:	+24 Vdc/5A





Piezo Motors

Electronic Drives

AB4 Amplifier

The AB4 amplifier offers the same performance as the AB1A, in a reduced package. The AB4 operates off of 12Vdc supply input and can drive up to 4 HR motor elements total, either (1) 4 element HR motor, or multiple HR motors totaling 4 elements.

The AB4 is the smallest standard motor amplifier and is provided with a 26-pin rear connector (26 pin, two row header). This connector provides access to all functionality (motor, power inputs, limits, and I/O functions), making it easy to integrate. Additional motor and power inputs are available with standard connections on the front.

Features

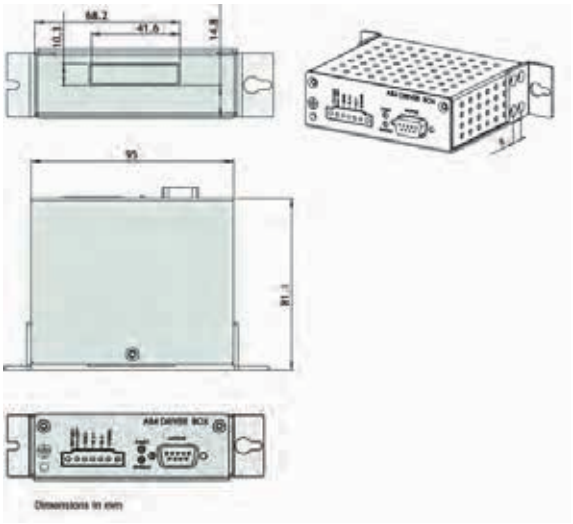
- Exceptionally compact mounting
- 12Vdc supply input
- Drives up to 4 HR motor elements
- Cable length up to 20m
- Over current and over voltage protection

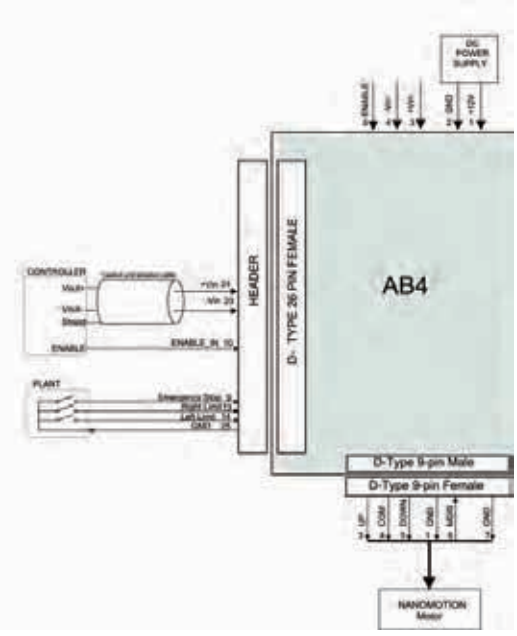
Environmental

Operating Temperature:	0 to 50˚C
Storage:	-40˚C to +70˚C
Humidity:	up to 80%, non condensing

Electrical

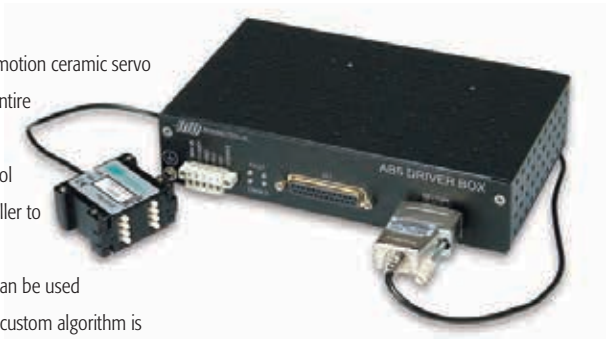
Power Supply Input:	+12 Vdc ±5% (stabilized)
Max Motor Output Voltage:	280 Vrms
Power Consumption without Load:	+12 Vdc/300 mA
Power Consumption with Max Load:	+12 Vdc/3.5A





Piezo Motors

AB5 Amplifier



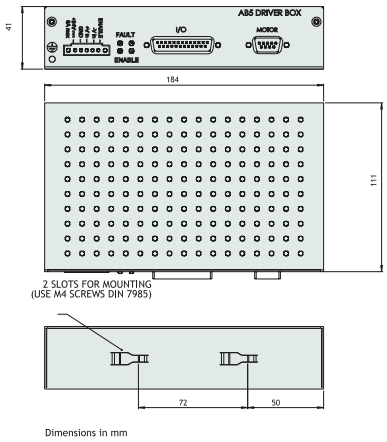
The AB5 amplifier revolutionizes the driving concept for Nanomotion ceramic servo motors, enabling a frictionless and smooth motion throughout the entire velocity range. At stop the inherent brake is activated, maintaining the many advantages of brake at power off. Consequently the control scheme is simplified, facilitating the use of any low cost servo controller to achieve outstanding performance.

As a result the whole range of controllers in the market place can be used with Nanomotion motors, as well as generic control algorithms. No custom algorithm is needed to be used with Nanomotion motors.

In addition, exceptional control performance is achieved at servo systems, showing robust performance at various working conditions.

Features

- Compatible with any servo controller
- Linear velocity response at full command range
- Brake on or brake off upon command
- Drives up to 32 HR motor elements
- 24 Vdc supply input



Motor Performance Specifications

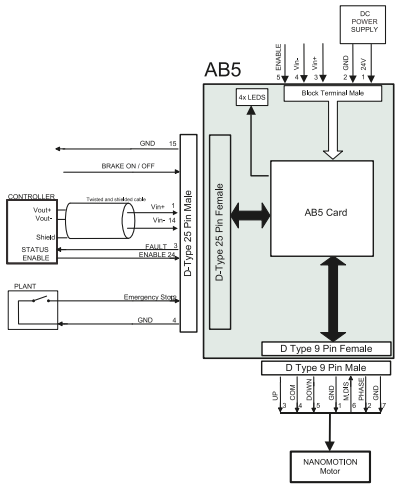
Driving Capability:	up to 32 HR motor elements
Analog Control Input	
Input Voltage Range:	±10V
Input Impedance:	10KΩ
Input Low Pass Filter:	2.7 Khz
Input Sampling Resolution:	10 bits + direction

Environmental

Operating Temperature:	0 to 50˚C
Storage:	-40˚C to +70˚C
Humidity:	up to 80%, non condensing

Electrical

Power Input:	+24 Vdc ±5% (stabilized)
Power Consumption without Load:	24 Vdc/200 mA
Power Consumption with Max Load:	24 Vdc/10A



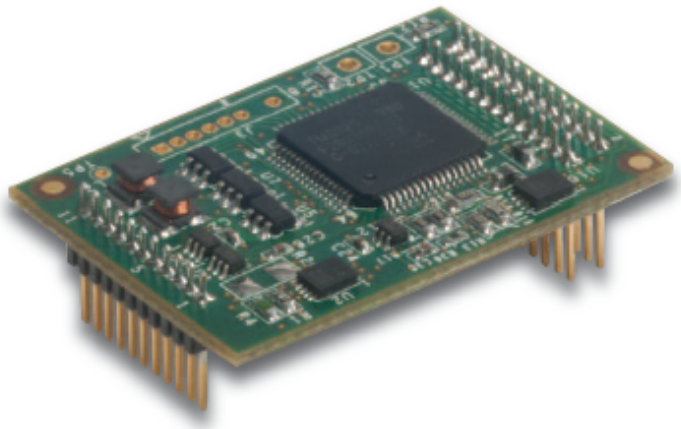
Piezo Motors

Electronic Drives

XCD-EDGE-BD-03 Drive and Control

Application Recommendations

- Auto Focus/Zoom Modules
- Shutter & Aperture Control
- Filter Changers
- Pan and Tilt Modules



ORDERING INFORMATION

Part Number: XCD-EDGE-BD-03
Drive and Control

RELATED PRODUCTS/ ACCESSORIES

Part Number: EM1-S-0
EM1-V-0
EDGE motor

Part Number: XCDE150100-00
XCD EDGE Motherboard Assembly

Product Description

Nanomotion's XCD – Drive & Control redefines the art of miniaturized drive and control electronics with the smallest hardware for operating piezo ceramic servo motors. The XCD provides complete servo control for the OEM market, coupled with the power stage and drive electronics on one board. XCD will have an OEM specific, motherboard for connecting to the motor, position sensor, communication and power.

The XCD for the Edge motor is provided as a single axis board which can operate in the 'AB5' mode with brake on/off, or in the more traditional AB1A mode. The XCD for the Edge motors accepts a single ended encoder signal and is programmed via an IIC interface and the NanoCommander user software.

Piezo Motors

Electronic Drives

XCD-EDGE-BD-03 Drive and Control

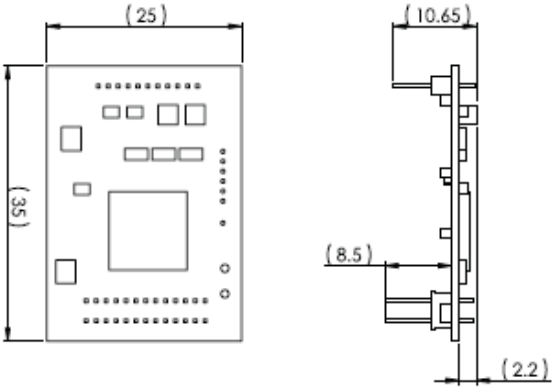
TECHNICAL SPECIFICATIONS

Dimensions:
35.0 x 25.0 x 10.65 mm
Motors supported : EDGE
Input Power: 5 V
Drive Mode AB5
(brake on/off) or AB1A mode
Communication IIC
Operating Temperature:
-40 to 85 °C

ELECTRICAL

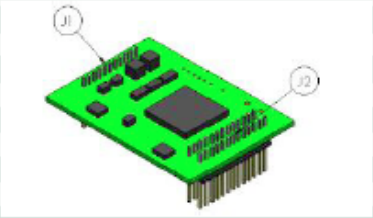
Power Consumption:
500 mW (max)

MECHANICAL DRAWINGS AND INTERFACE



ELECTRICAL INTERFACE

pin number	J2 Main Connector pin name	J2 Main Connector pin description	J1 Motor and Encoder Connector pin name	J1 Motor and Encoder Connector pin description
1	+5v	5vdc pc:mer input	+5v	5vdc pow er out
2	+5v	5vdc pc:mer input	a	encoder inc rem ental signals
3	spi clk	spiclock	b	encoder inc rem ental signals
4	spi en	spi enable	index	encoder reference mark
5	miso	master in slave out	gnd	system ground
6	mosi	master out slavein	urn it sw right	limit switc h right
7	n.c.	nc(conected	lim sw len	limit sw itch len
8	n.c.	not conected	gnd	svstem ground
9	rxd	rs232 receive	p1	mc(or phase 1
10	txd	rs232 transmit	com	mc(or common
11	sda	12c serial data	p2	mc(or phase 2
12	scl	12c serial clock		
13	gpi01	ppw		
14	gpi02	n/a		
15	gpi03	general purpose digital output 3		
16	gpi04	general purpose digital output 4		
17	an2	analog input 1		
18	an1	analog input 2		
19	emergency	emeroencv stop		
20	an3	analoo input 3		
21	anig out2	analog 0uput 2		
22	anig out1	analog 0uput 1		
23	n.c.	n/a		
24	pwm out	keep alive		
25	gnd	system ground		
26	gnd	svstem oround		



Piezo Motors

Electronic Drives

XCD-HRx-BD-03 Drive and Control

Application Recommendations

- Auto Focus/Zoom Modules
- Shutter & Aperture Control
- Filter Changers
- Pan and Tilt Modules
- OEM stages

ORDERING INFORMATION

Part Number: XCD-HR1-BD-03
XCD-HR2-BD-03
XCD-HR4-BD-03

RELATED PRODUCTS/ ACCESSORIES

Part Number: HR1-1, HR2-1, HR4-1 Motors

Part Number: XCDH150100-00 XCD HR Motherboard Assembly

Product Description

Nanomotion's XCD – Drive & Control redefines the art of miniaturized drive and control electronics with the smallest hardware for operating piezo ceramic servo motors. The XCD provides complete servo control for the OEM market, coupled with the power stage and drive electronics on one board. XCD will have an OEM specific, motherboard for connecting to the motor, position sensor, communication and power.

The XCD for ST/HR motors is provided as a single axis board which can drive the ST, HR1, HR2, or HR4motor. The XCD can operate in the 'AB5' mode with brake on/off, or in the more traditional AB1A mode. The XCD for ST/HR motors accepts a differential quadrature encoder signal and is programmed via an IIC interface and the Nano-Commander user software.

Piezo Motors

Electronic Drives

XCD-HRx-BD-03 Drive and Control

TECHNICAL SPECIFICATIONS

Mechanical
Dimensions: 52mm x 72mm x 26.4mm

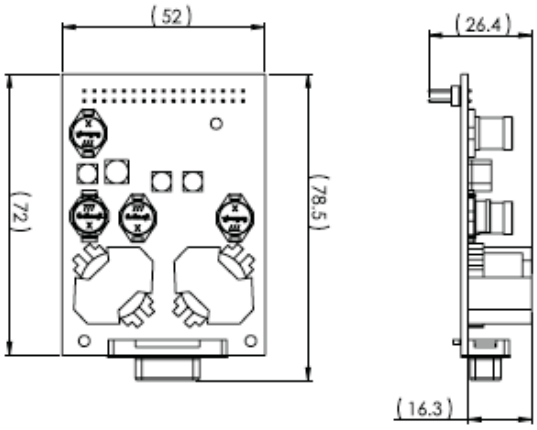
PERFORMANCE

- Motors supported: HR1, HR2, HR4
- Drive mode : AB5 , AB1
- Support AQB sensor (Differential Single ended 5V)
- Communication: SPI slave, Uart (LVTTL)
- Safety : Limit switches , motor interlock, Emergency
- 2 x input TTL (5v/3.3v)
- 2 x output LVTTL (3.3v)
- 3 x Analog input: NTC , Joystick , Potentiometer (Ain range: 0V to 3.3V)
- 2 x Analog out (pwm)

ELECTRICAL

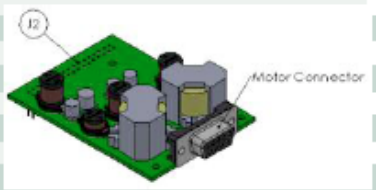
Drive voltage: 12V
Power consumption: 13W

MECHANICAL DRAWINGS AND INTERFACE



ELECTRICAL INTERFACE

pin number	Main Connector pin name	Main Connector pin description	Motor Connector pin name	Motor Connector pin description
1	+12v	12vdc power input	gnd	system ground
2	+12v	12vdc power input	n.c.	not connected
3	spi_clk	spi clock	motor_up	high voltage output
4	spi_en	spi enable	motor_common	high voltage output
5	miso	master in slave out	motor_down	high voltage output
6	mosi	master out slave in	motor_connected	input
7	rxd	rs232 receive	shield	inner shield
8	txd	rs232 transmit	n.c.	not connected
9	gnd	system ground	n.c.	not connected
10	gnd	system ground		
11	sda	I2c serial data		
12	scl	I2c serial clock		
13	gpio1	general purpose digital input 1		
14	gpio2	n/a		
15	gpio3	general purpose digital output 3		
16	gpio4	general purpose digital output 4		
17	an1	analog input 1		
18	an2	analog input 2		
19	anlg_out1	analog ouput 1		
20	an3	analog input 3		
21	anlg_out2	analog ouput 2		
22	emergency	emergency stop		
23	+5v	5vdc power out		
24	pwm_out	keep alive		
25	a+	incremental signals		
26	limit_sw_left	limit switch left		
27	a-	encoder incremental signals		
28	limit_sw_right	limit switch right		
29	b+	encoder incremental signals		
30	index+	encoder reference mark/positive signal		
31	b-	incremental signals		
32	index-	encoder reference mark/negative signal		
33	gnd	system ground		
34	gnd	system ground		



Piezo Motors

Electronic Drives

IC000028XCD Component

Application Recommendations

- Auto Focus/Zoom Modules
- Shutter & Aperture Control
- Filter Changers
- Pan and Tilt Modules
- OEM Stages

ORDERING INFORMATION

Part Number: IC000028
NM XCD BLANK

Part Number: XCD-XX-03
XCD SW/VER:1.4.0.7

RELATED PRODUCTS/ ACCESSORIES

All Nanomotion motors

EDGE motor
ER-15-4 motor
HR Motors

Product Description

Nanomotion's XCD drive & control is a miniature closed loop servo control with the smallest hardware for operating piezo ceramic servo motors. The XCD provides complete servo control for Security market applications with a built in motor driver.

The XCD component is provided on a chip level and can be integrated into user electronics with the addition of a motor power stage. The component level product will accept single ended or differential encoder input (motor size dependent) and is programmed via an IIC interface and our NanoCommander user software.

Piezo Motors

Electronic Drives

IC000028XCD Component

TECHNICAL SPECIFICATIONS

Mechanical:
Dimensions: 12mm x 12mm
height : 1.2 mm

Functional:
Motors supported:
All Nanomotion motors
Drive mode : AB5 , AB1
Support AQB sensor
(Single ended 5V/3.3V)
Communication: IIC, SPI (slave, master), Uart (LVTTL).
Limit switch: left limit, right limit
Emergency (optional)
2 x input TTL (5v/3.3v)
2 x Input/Output LVTTL (3.3v)
3 x Analog input: NTC, Joystick, Potentiometer
(Vin range: 0V to 3.3V)
2 x Analog out (pwm)

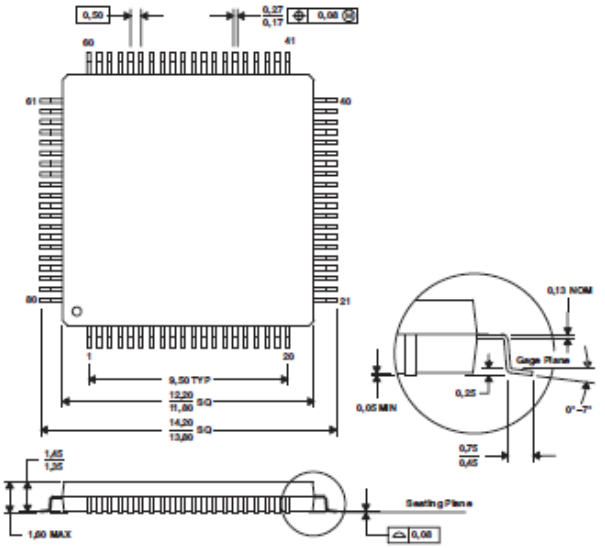
ELECTRICAL

Main power: 5V

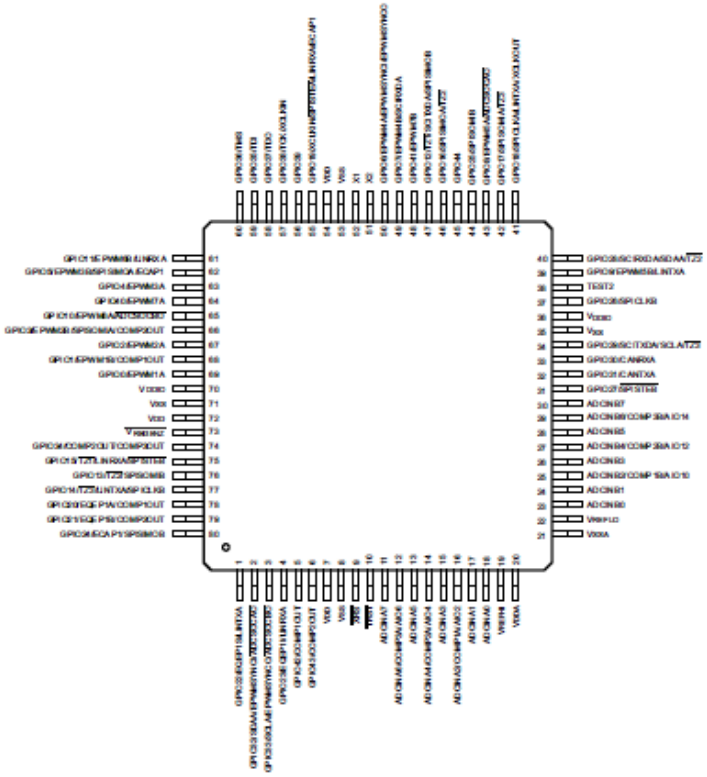
ENVIRONMENTAL

Operating Temperature :
-40°C– 85°C

MECHANICAL DRAWINGS AND INTERFACE



ELECTRICAL INTERFACE



Piezo Motors

Electronic Drives

FlexDC Motion Controller

Technical Specifications

Dimensions 2U Enclosure	123mm H x 361mm W x 308mmD
Weight	5.2 kg (depending on configuration)
Up to 2 axes integrated	AB1A or AB5 driver cards, up to 16 elements per axis
Servo Rate	8kHz
DAC Output	+/- 10V, 16 bit
A quad B Encoder Input	One per axis
Sin/Cos Encoder with on board 8192 resolution interpolators	Optional (one per axis)
Discrete Inputs	One per axis

I/O

8 x Digital Isolated Inputs

2 x Digital Isolated Outputs

2 x Digital Fast Inputs

2 x Digital Fast Outputs

Communications

RS232, CAN-open, Ethernet	ASCII Based RS232 Communication protocol
Full Binary, high baud rate, CAN Bus communication protocol	

Environmental

Ambient Operating Temperature	0°C to 45°C
Storage Temperature	Up to 70°C
Operating Humidity	Up to 80% non-condensing

Power

Universal Input Voltage	100-240VAC 50-60 Hz
Power Consumptions	130VA max

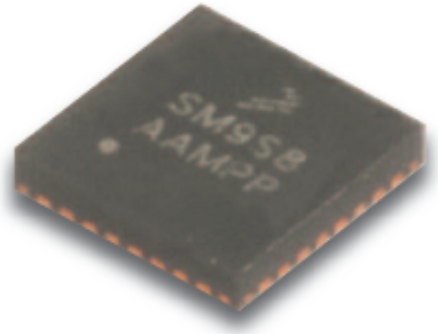
Piezo Motors

Electronic Drives

ASIC-1E-00 ASIC Component

Application Recommendations

- Auto Focus/Zoom Modules
- Shutter & Aperture Control
- Filter Changers
- Pan and Tilt Modules



ORDERING INFORMATION

Part Number: ASIC-1E-00
ASIC Driver For 1 EDGE Motor

Part Number: ASIC-1E-01
ASIC Controller Driver For S787 Shutter

Part Number: ASIC-E2-00
ASIC Driver For 2 Axis EDGE Motors

RELATED PRODUCTS/ ACCESSORIES

Part Number: EM1-S-0
EM1-V-0

Product Description

Nanomotion's ASIC controller/driver component can support the Edge motor and Edge based modules working in either the traditional AB1A mode or in AB5 mode (linear voltage to velocity profile). The AB1A mode supports up to two motors in parallel, doubling the force output.

The ASIC component can be provided for integration in customer electronics and supports open loop operation, as a driver only or closed loop operation based on Nanomotion's proprietary analog position sensor.

The ASIC driver board is configured for open loop, driver operation only.

Piezo Motors

Electronic Drives

ASIC-1E-00 ASIC Component

TECHNICAL SPECIFICATIONS

Mechanical
Package: 32-pin QFN,
5mm x 5mm height 1.2mm

Functional:
Controller/Driver, or driver only
Motors supported: up to 2 EDGE motors
Drive mode : AB5 , AB1
IIC interface at max 100 KHz
3 OPAMPs inputs
2 A/D inputs

ELECTRICAL

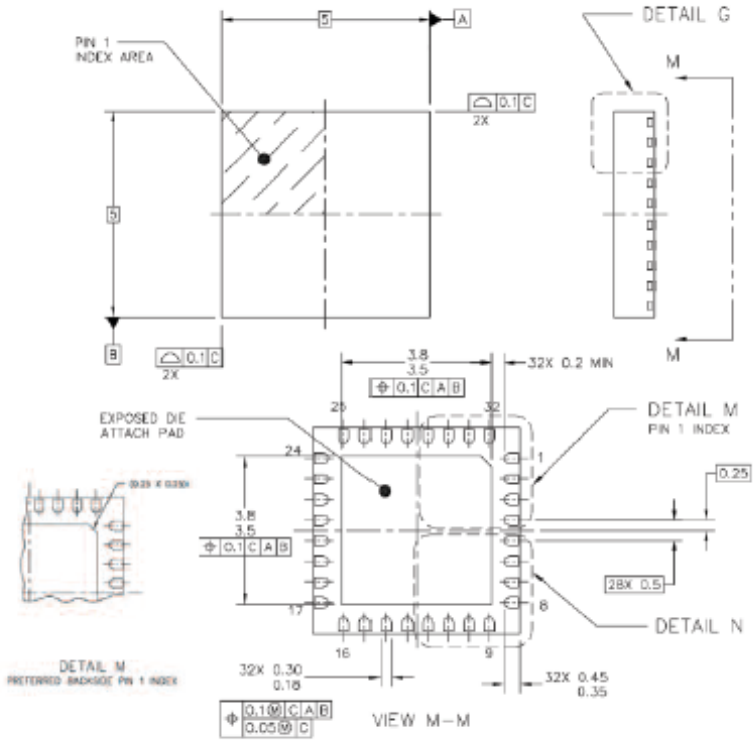
Supply voltage:
2.7V to 4.2V
25ua leakage current at sleep mode (at 3.7V)

ENVIRONMENTAL

Operating Temperature:
-40°C – 85°C

MECHANICAL DRAWINGS AND INTERFACE

ELECTRICAL INTERFACE



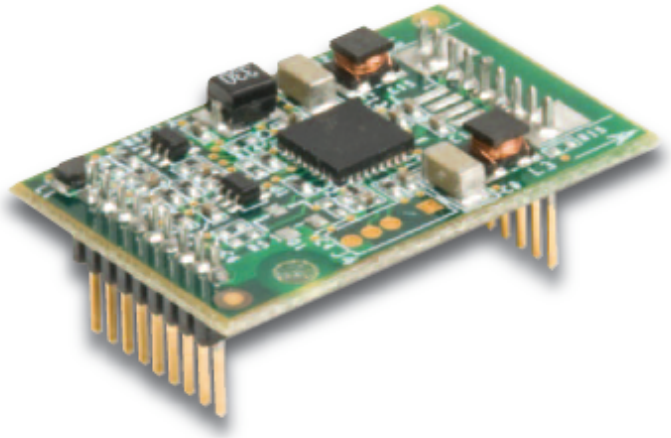
Piezo Motors

Electronic Drives

ASIC-1E-BD-00 Driver

Application Recommendations

- Auto Focus/Zoom Modules
- Shutter & Aperture Control
- Filter Changers
- Pan and Tilt Modules



ORDERING INFORMATION

Part Number: ASIC-E1-BD-00

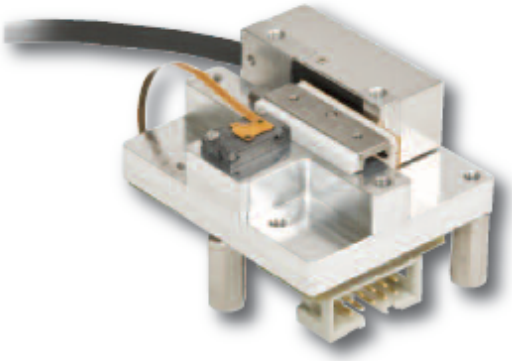
RELATED PRODUCTS/ ACCESSORIES

Part Number: EM1-S-0
EM1-V-0

Product Description

ASIC-1E-BD-XX is a driver designated to drive single EDGE motor, as a driver only. Open loop operation can be controlled via an IIC interface and the use of limit switches. The board can also be incorporated onto an interface board that will support a ±10 analog input to the drive, from an external closed loop control system.

Modified versions of the ASIC-E1-BD-00 board have been configured to drive dual Edge motors in parallel or two discrete axes. Please contact Nanomotion for further details.



Example of ASIC-1E-BD-XX

Piezo Motors

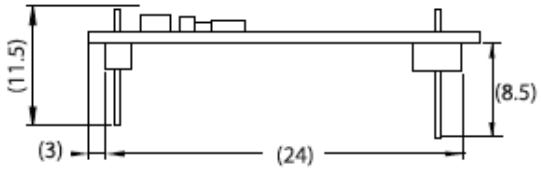
Electronic Drives

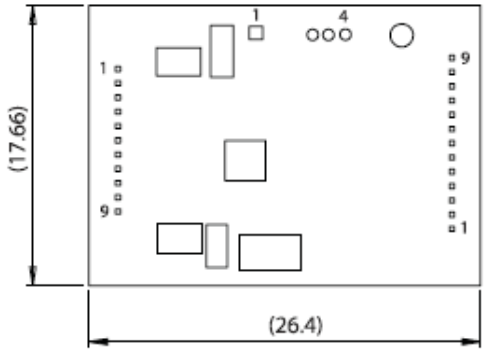
ASIC-1E-BD-00 Driver

TECHNICAL SPECIFICATIONS

Dimensions: Dimensions:
28.4 x 17.9 x 11.5 mm
Motors supported :
EDGE Drive Mode AB5 (brake on/off) or AB1A mode
Input Power: 4.2 V
Power Consumption:
500 mW (max)
Communication:
IIC / Analog
Operating Temperature:
0 °C to 50 °C

MECHANICAL DRAWINGS AND INTERFACE





ELECTRICAL INTERFACE

pin type	J1 9pin 50mil str tms series	J2 9pin 50mil str tms series	J4
1	Vcc	Code	VIN
2	SDATA	Code	–
3	SCLK	Code	BKgd
4	Fault	Com	Reset
5	+Vin	Com	–
6	-Vin	PR	–
7	UHR	PL	–
8	Enable	–	–
9	GND	–	–