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1 Features

The TRINAMIC IDX is a small and rugged step / direction stepper motor driver system with a supply voltage of up to 50V and up to 3.5A RMS motor coil current (up to 75V and up to 5A RMS for IDX 7505). It can be controlled via an RS-485 interface. Up to 256 micro steps are supported for either high accuracy or high speed. An update of the firmware is possible via the serial interface. The system features sensorless stall detection (StallGuard™) and full protection. The module is fully protected and comes with a stand-alone reference search feature.

The motor, switches and power supply can be connected easily with screw terminal connectors.
The housing is based on a thick aluminum plate which is used as a heatsink.

Applications

- Step-/ Direction stepper driver for industrial applications
- Robotics
- Remote diagnostics / feedback allows for high-reliability drives
- Centralized motor driver mounted in switchboard
- Decentralized motor driver mounted near motor

Motor type

- Coil current from 500mA to 3.5A RMS (5A peak) (IDX)
  Coil current from 500mA to 5.0A RMS (7A peak) (IDX 7505)
- 12V to 50V nominal supply voltage (or any value in between) (IDX)
  12V to 75V nominal supply voltage (or any value in between) (IDX 7505)

Highlights

- Remote controlled diagnostics and parameterization (RS485)
- Reference move and turn CW / CCW via RS485
- Stand-alone operation, adjusted via RS485
- Fully protected drive
- Digital selection of motor current and standby current
- Local reference move using sensorless StallGuard feature or reference switch
- All setup parameters are stored in internal EEPROM, no bus system required in end application
- Micro step resolution can be changed to get high accuracy or high speed with the possibility to combine both
- Different chopper modes allow best adaptation to application / motor
- Many adjustment possibilities make this module the solution for a great field of demands

Order code	Description
IDX	48V, 3.5A IDX module
IDX 7505	75V, 5A IDX module

Table 1.1: Order codes

2 Life support policy

TRINAMIC Motion Control GmbH & Co. KG does not authorize or warrant any of its products for use in life support systems, without the specific written consent of TRINAMIC Motion Control GmbH & Co. KG.

Life support systems are equipment intended to support or sustain life, and whose failure to perform, when properly used in accordance with instructions provided, can be reasonably expected to result in personal injury or death.

3 Electrical and Mechanical Interfacing

3.1 Pinning

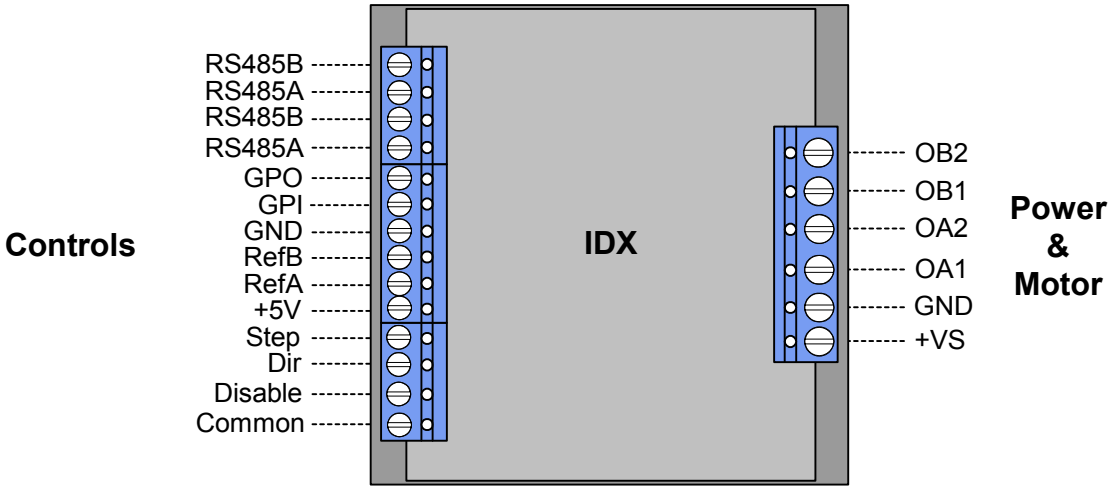

Figure 3.1: Pinning of IDX

Pin	Number	Function
OB1, OB2	1, 2	Connections for motor coil B
OA1, OA2	3, 4	Connections for motor coil A
GND	5	GND, power
+VS	6	Positive power supply voltage

Table 3.1: Power and Motor Pinning

Pin	Number	Function
RS485 -	1, 3	RS485 remote control access -, TTL input
RS485 +	2, 4	RS485 remote control access +, TTL input
GPO	5	General Purpose Output, for wiring scheme see Figure 5.7
GPI	6	General Purpose Input, for wiring scheme see Figure 5.12
GND	7	GND reference
REF B	8	Reference signal B (integrated 3.9 K pull up resistor to +5V)
REF A	9	Reference signal A (integrated 3.9 K pull up resistor to +5V)
+5V	10	Constant +5V output, reference
Step	11	Opto-decoupled input (negative terminal): Each impulse causes one motor microstep
Direction	12	Opto-decoupled input (negative terminal): Polarity determines motor direction
Disable	13	Opto-decoupled input (negative terminal): Tie to opto-coupler negative supply voltage to disable motor driver
Common	14	5…24V, Opto-coupler positive supply voltage

Table 3.2: Controls Pinning

3.2 Dimensions

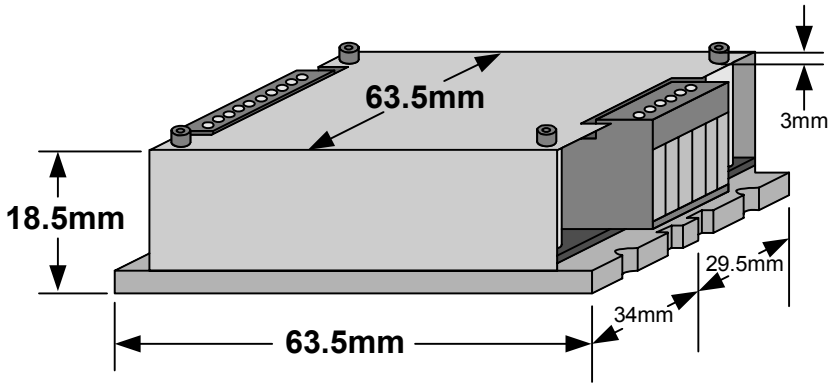

Figure 3.2: Dimensions

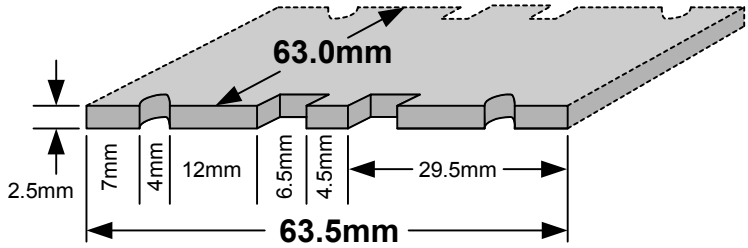

Figure 3.3: Base Plate Dimensions

3.3 Connectors

Both connectors are RIA connectors.
Power and motor: 6 pin connector RM 5.0 (07_06_RM5)
Control: Two 4 pin and one 6 pin connectors RM 3.5, (2x 166_04_RM3.5, 1x 166_06_RM35)

4 Operational Ratings

The operational ratings show the intended / the characteristic range for the values and should be used as design values. In no case shall the maximum values be exceeded.

Symbol	Parameter	Min	Typ	Max	Unit
V_S	Power supply voltage (IDX)		12 ... 48	58.5	V
V_S	Power supply voltage (IDX 7505)		12 ... 75	78.5	V
I_{COIL}	Motor coil current for sine wave peak (chopper reg., software adjustable) (IDX)		0.7 ... 4.3	5	A
I_{COIL}	Motor peak coil current (IDX 7505)		0.7 ... 6.4	7.1	A
I_{MC}	Nominal RMS motor current (IDX)		0.5 ... 3	3.5	A
I_{MC}	Nominal motor current (IDX 7505)		0.5 ... 4.5	5	A
f_{CHOP}	Motor chopper frequency (actual frequency depends on operation mode)		20 or 36		kHz
t_{SLP}	Coil output slope		300		ns
I_S	Power supply current		<< I_{COIL}	1.4 * I_{COIL}	A
V_{ISO}	Isolation voltage of optocoupler		± 42	±100	V
V_{COM}	Supply voltage for step, direction and disable; (inputs have negative logic)		5 ... 24	30	V
V_{OPTON}	Signal active voltage at disable, step and direction input (optocoupler on, measured from U_{COM} to input)	3.5	4.5 .. 24	30	V
V_{OPTOFF}	Signal inactive voltage at disable, step and direction input (optocoupler off, measured from U_{COM} to input)	-5.5	0	2	V
I_{OPT}	Optocoupler current (internally regulated)		4	8	mA
t_{STEPLO}	Step impulse low time (optocoupler on)	0.7			µs
t_{STEPHI}	Step impulse high time (optocoupler off)	2.0			µs
$t_{DIRSETUP}$	Direction setup time to rising edge of step input	0			µs
$t_{DIRHOLD}$	Direction hold time after rising edge of step input	3.0			µs
V_{REF}	Input low voltage on REFA / REFB	-2	0	0.8	V
V_{REF}	Input high voltage on REFA / REFB	2.4	5	30	V
V_{GPI}	Input voltage on GPI	-2	0 ... 5	30	V
V_{GPO}	Output voltage on GPO (open collector)	-1		100	V
I_{GPO}	Output current on GPO (open collector)			-150	mA
T_{ENV}	Environment temperature	-25		70	°C
T_C	Temperature of case back (cooling plate)	-25		85	°C

Table 4.1: Operational Ratings (Orange: Different values for IDX 7505)

4.1 Practical maximum motor current ratings

The IDX 7505 (IDX) uses eight high power 80V (60V) transistors with low internal on resistance of only 15mOhm (24mOhm) to drive the motor. Due to this, power loss is just a few watts at maximum current. In order to avoid EMV problems and to keep electromagnetic emission low, the transistors are switched smoothly on and off with 300ns transitions. On the other hand, this produces dynamic losses and thus additional power dissipation. The resulting power dissipation has to be cooled away by air convection and via the metal base plate, in order to keep transistor and board temperature well below 125°C (Integrated thermal limit). This especially becomes a limiting point for the IDX7505, because of its high voltage capability. The following table gives some examples for the current capability in a typical mounting situation, where the module is mounted to a metal base plate (heat sink with fins, overall dimensions 100*50*15mm³). In this situation the base plate was always kept at maximum 60°C. However, the actual motor type and velocity setting also influences power dissipation of the module.

Chopper mode	Supply voltage	Maximum I_{COIL} RMS for continuous operation	Maximum duty cycle for full current
0, 1	75V	3.5A	50%
0, 1	70V	4A	60%
0, 1	60V	4.5A	80%
0, 1	≤50V	5A	100%
2	15V ... 75V	4A *)	n/a

Table 4.2.1: Practical motor current limitations for IDX 7505

*) This limit is due to the higher current ripple in chopper mode 2, which allows a maximum of 75% to 90% of the maximum current setting. It is not a thermal limit.