

PRODUCT GUIDE 2012

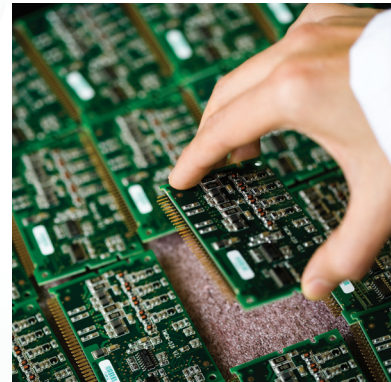
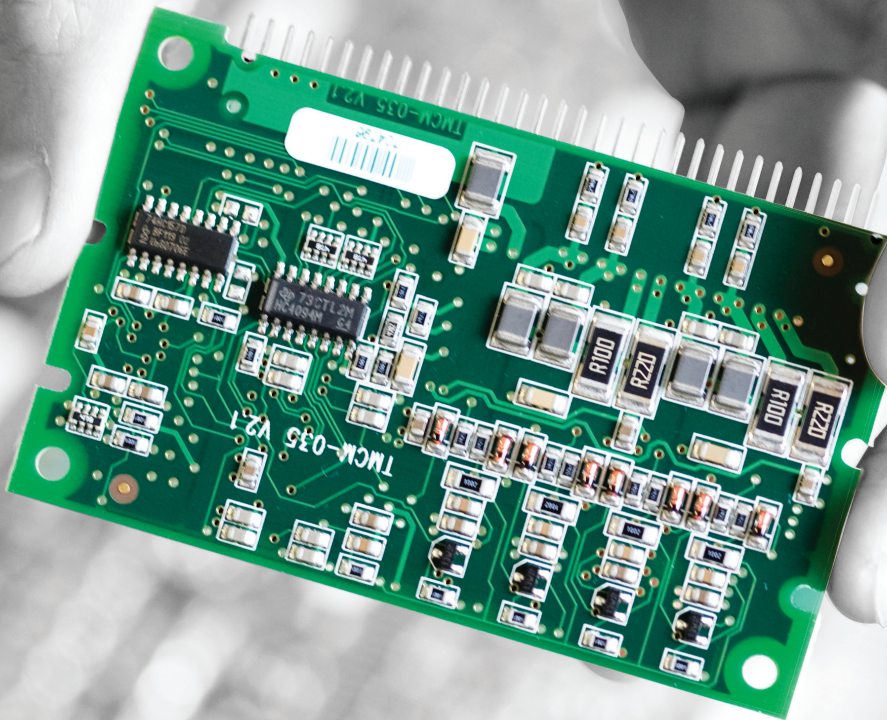


TRINAMIC
MOTION CONTROL

TMC260 Control Reference Design



TRINAMIC – SMART SOLUTIONS FOR MOTION CONTROL



TRINAMIC is a fabless semiconductor company and serves the market with self developed integrated circuits for the control of small electrical motors in a wide variety of applications. TRINAMIC's integrated circuits are manufactured to the highest standards in the world's most advanced manufacturing plants.

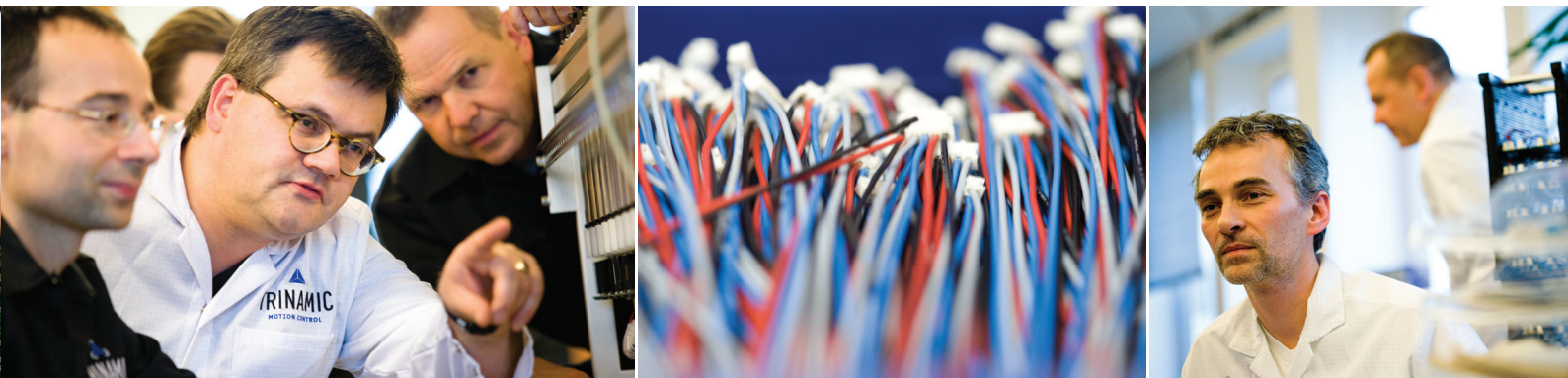
While the competition often comes from semiconductor technology and focuses on it, TRINAMIC is at home in both worlds – the world of motors and the world of IC design.

The products – whether they are ICs, modules or the mechatronic systems (**PANdrive™**) – are in use all over the world and are selected because of their superior price/performance ratio.

Applications are everywhere, where small motors are deployed and the growth of such small drives is increasing rapidly. In growing markets like biotech, medical, lab automation, semiconductor handling, TRINAMIC ICs control complex devices with dozens of axis.

Close to the market, TRINAMIC continuously develops new products with innovative features, driven by the customers need for a higher degree of miniaturization, higher efficiency, diagnostics, and protection to enable the reliability of the complete system.

TRINAMIC customers benefit from our encompassing knowledge about motor physics and from the extensive library of application knowledge which the company has built over the years. For customers, TRINAMICs application driven approach means that they do not need an indepth knowledge about motors, DSPs, or control circuitry in general. Consequently, the design phase saves the labor and costs.



Traditional industries that are undergoing a paradigm change and are replacing complex mechanics by decentralized solutions that are synchronized via bus systems, count on TRINAMIC: Examples are the textile machines and furniture manufacturing equipment.

TRINAMIC also offers complete modules, including hardware and software for specific motor control requirements. The modules combine TRINAMIC's dedicated stepper control and driver ICs with extensive experience in designing custom and off-the-shelf motion control solutions.

TRINAMIC makes the difference!





INNOVATION – MADE BY TRINAMIC

TRINAMIC is an innovative company with over 15 years of experiences in design and marketing of motion control chips, modules, and mechatronic drives.

Within its history, TRINAMIC engineers have been granted many patents including Dual Interface Control, and Automatic Mixed Decay. Our innovations address the needs of the OEM market and provide ideal solutions for our customers' applications.

This significantly reduces project time and cost as well as design risk. An average of 6 months faster time to market compared to an in-house development can be achieved.

- stallGuard™** TRINAMIC's patented sensorless stall detection **stallGuard™** enables customers to detect mechanical overload conditions and stall conditions without external sensors, by measuring the load at a predefined point where a step loss has not yet occurred. Thus, eliminates the need for reference or end switches. This reduces cost and complexity of applications, where a reference point is required. When compared to pure mechanical referencing, stress on the mechanic and noise is reduced.
- stallGuard2™** Improved version of the successful **stallGuard™** feature. **stallGuard2™** is the world's first sensorless high resolution load detection implemented in a standard stepper motor driver. This gives the user easy and cost effective real time feedback of his application. It enables to scan the motion system without additional sensors. This can help to find the right motor and mechanics during development phase or to detect abrasion or mechanical stiffness
- coolStep™** Sensorless load dependent current control using the **stallGuard2™** feature. First time **coolStep™** enables to drive a stepper motor in a energy efficient way. Up to now stepper motors are driven with constant current. The new TMC260, TMC261 and TMC262 stepper motor driver series detects the actual load of the motor and adjusts the current accordingly. This eliminates the security current margin and allow also to boost the motor avoiding stall and step loss to improve the reliability of the entire system.
- spreadCycle™** New patent pending constant Toff chopper scheme. Using the spreadCycle chopper the μ Step current sine wave is always well formed with a smooth zero crossing. Due to this effect the stepper motor can be driven very fast without resonance effects. All the **coolStep™** drivers are using this new technology.
- hallFX™** **hallFX™** generates back EMF based hallsensor like signals for the sensorless commutation of BLDC (also two phase motor when using 2 TMC603 as gate driver) motors. **hallFX™** can be easily integrated into your drive, since it directly emulates hall sensors and does not require complex software components to be added to your controller.
- chopSync™** The patented **chopSync™** feature allows very high velocity operation of stepper motors using the standard TRINAMIC [stepper motor] drivers TMC236, TMC239, TMC246 and TMC249. This is achieved by reducing resonances occurring when operating the motor at velocities where the EMF voltage exceeds the level of the supply voltage. With **chopSync™**, motor velocities of several 1000 RPM can be reached.
- sensOstep™** **sensOstep™** is based on a magnetic angular position encoder system with low to medium resolution for **PANdrive™** mechatronic solutions. It consists of a small magnet positioned at the back end of a stepper motor axis and a Hall-sensor IC with integrated digital signal processing (e.g. for automatic gain control, temperature compensation etc.) placed above the magnet on the back side of a motor mounted printed circuit board. Starting at resolutions of 8 bit (256 steps) per revolution – which is completely sufficient for detecting step losses with standard 1.8° stepper motors – it is currently available with up-to 12bit (4096 steps). This increased resolution is sufficient for regaining position after step-loss for many applications without requiring any additional reference procedure.
- TMCL™** **TMCL™** – the TRINAMIC Motion Control Language – is a programming language dedicated to motion control applications. The software includes commands for moving one or more motor axes at certain velocities or to certain positions and for setting all relevant parameters of the motion controller. It is possible to access additional general purpose digital and analog inputs and outputs. **TMCL™** is available on most TRINAMIC modules with integrated motion controller. Program development is supported by the **TMCL-IDE** – a PC based integrated development environment which is available free of charge.

Our engineering team and customer service offers:

- ▶ High-level specification, -jointly with customer
- ▶ Technical specification and system architecture
- ▶ ICs and PCB in-house design
- ▶ Software development
- ▶ Fast prototyping
- ▶ Testing and qualification
- ▶ Logistic warehouse
- ▶ After sales & technical support
- ▶ Online support forum: www.trinamic.com/ttdg
- ▶ RMA repair

RESPONSIBILITY – PROVIDED BY TRINAMIC

LONG LIFE AVAILABILITY

TRINAMIC offers lifecycles of up to 10 years for almost all of our products, which reduces costs of re-designing, re-qualification and re-certifying for our customers. This does not only save valuable resources but reduces time-to-market.

QUALITY

Today TRINAMIC has strategic alliances with partners to ensure access to the latest technologies and processes.

TRINAMIC is ISO 9001:2000 certified by Germanischer Lloyd and EN ISO 13485 certified for "Medical Components" by Medcert.



TRINAMIC MEMBERSHIPS

TRINAMICs ambitions are to commence different innovation platforms, where various industries and leading suppliers join forces to support, promote and advance the technology.

TRINAMIC is member of the following organizations:



The EtherCAT Technology Group is a global organization in which OEM, End Users and Technology Providers join in order to support and promote the technology development. EtherCAT sets new standards for real-time performance and topology flexibility, whilst meeting or undercutting field bus cost levels.

www.ethercat.org



TRINAMIC GREEN

We refer to the Directive 2002/95/EC of the European Parliament and the Council on the Restriction of the use of certain Hazardous Substances in electrical and electronic equipment.

That means, all electrical and electronic equipment put on the market by TRINAMIC does not contain lead, mercury, cadmium, hexavalent chromium, polybromiated biphenyls (PBB) or polybromiated diphenyl ethers (PBDE) in terms of the RoHS Directive.



INNOMAG is an innovate platform for Magnetic Microsystems that combines the interests and potentials of manufacturers, service providers and users in a network. The target is to develop applications of magnetic Microsystems and nanotechnologies in Germany.

www.innomag.org



CiA is the international users' and manufacturers' group that develops and supports CANopen and other CAN-based higher-layer protocols. The nonprofit group was founded in 1992 to provide CAN-based technical, product and marketing information.

www.can-cia.de

MOTION & INTERFACE CONTROLLER



PRODUCT	TMC429	TMC457	TMC424
Motion controller	✓	✓	-
Interface controller	-	-	✓
Number of axes	3	1	3
Motor type	Stepper	Steper / Piezo	-
CPU interface	SPI	SPI or S/D	SPI
Driver interface	S/D or SPI	SPI or S/D or classic	-
Dyn. range	12 bit * 2 ⁴ bit	32 bit	16 Mcnt/s
Position range	24 bit	32 bit	24 bit
Acceleration ramp	linear	linear + S-shape	-
On the fly target	✓	✓	-
easyPID™	-	✓	-
Sequencer	✓	✓	-
Max microstep resolution	64 (SPI) / 256 (S/D)	2048	-
Encoder interface	-	ABN	3x ABN
chopSync™	-	✓	-
Ref. inputs	3 x 2	2 x 2 virtual	-
Supply voltage DC	3.3 - 5V	3.3 & 1.5V	3.3 & 1.5V
Package	SOP24 QFN32 (5x5) SSOP16	FBGA144	TQFP100

S/D = Step/Direction

INTEGRATED MOTION CONTROLLER AND DRIVER FOR STEPPER MOTORS



PRODUCT	TMC222	TMC223
Stepper type	2 phase	2 phase
Peak current	800mA	800mA
Motor voltage	8 - 29V	8 - 29V
Number of microsteps	16	16
Interface	IIC	IIC
Full protection/diagnostics	✓	✓
Stall detection	-	✓
Dyn. range	16 velocities	16 velocities
Position range	4096 fullsteps	4096 fullsteps
Package	SO20 / QFN32 (7x7)	SO20 / QFN32 (7x7)

BLDC DRIVER WITH BACK-EMF SUPPORT, PROTECTION AND CURRENT MEASUREMENT

* also two phase motor when using 2 TMC603 as gate driver



PRODUCT	TMC603
Motor type*	3 phase
Peak current (depends on NFET type)	20A
Voltage	12V - 50V
Interface	SPI
Current sensing (w/o sense resistor)	✓
Short to GND protection	✓
hallFX Sensorless commutation support	✓
Hardware block commutation	-
Integrated switching regulator	12V
Integrated linear regulator	5V
Internal BBM logic	✓
Slope control	✓
Package	QFN52 (8x8)

POWER DRIVER FOR STEPPER MOTORS



PRODUCT	TMC236	TMC239	TMC246	TMC248	TMC249
Stepper motor type	2 phase bipolar	2 phase bipolar	2 phase bipolar	2 phase bipolar	2 phase bipolar
Peak current	1.5A	up to 6A	1.5 A	up to 6A	up to 6A
Motor supply voltage	7 – 34V	7 - 34 V	7 - 34 V	7 - 34 V	7 - 34 V
Max. microstep resolution	16 / 64	16 / 64	16 / 64	16 / 64	16 / 64
Interface	classic / SPI	classic / SPI	classic / SPI	classic / SPI	classic / SPI
Full protection / diagnosis	classic / SPI	✓	✓	classic / SPI	classic / SPI
Interface voltage	3.3 – 5V	3.3 – 5V	3.3 – 5V	3.3 – 5V	3.3 – 5V
RDSon (Tj=150°C)	0,2/0,37 Ohm	MOSFET dep.	0,2/0,37 Ohm	MOSFET dep.	MOSFET dep.
slope control	resistor	resistor	resistor	resistor	resistor
stallGuard™	-	-	✓	✓	✓
Temperature range	-40 - 125°C	-40 - 125°C	-40 - 125°C	-40 - 125°C	-40 - 125°C
Driver MOSFET type	int.	ext. (N & P)	int.	ext. (N & P)	ext. (N & P)
Package	PQFP44	SO28 / QFN32 (7x7mm)	PQFP44	QFN32 (5x5mm)	SO28 / QFN32 (7x7mm)

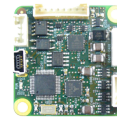
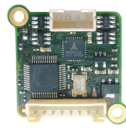
S/D = Step/Direction



PRODUCT	TMC260	TMC261	TMC262	TMC389
Stepper motor type	2 phase bipolar	2 phase bipolar	2 phase bipolar	3 phase bipolar
Peak current	1.7 A	1.7 A	up to 6A	up to 6A
Motor supply voltage	9 - 39 V	9 - 59 V	9 - 59 V	9 - 59 V
Max. microstep resolution	256	256	256	171
Interface	S/D + SPI	S/D + SPI	S/D + SPI	S/D + SPI
Full protection / diagnosis	✓	✓	✓	✓
Interface voltage	3.3 - 5V	3.3 - 5V	3.3 - 5V	3.3 - 5V
RDSon (Tj=150°C)	0,21/0,31 Ohm	0,16/0,33 Ohm	MOSFET dep.	MOSFET dep.
slope control	programmable	programmable	programmable	programmable
stallGuard2™	✓	✓	✓	✓
coolStep™	✓	✓	✓	✓
spreadCycle chopper	✓	✓	✓	✓
microPlyer (µStep multiplier)	16 to 256 µSteps	16 to 256 µSteps	16 to 256 µSteps	16 to 256 µSteps
Temperature range	-40°C - 125°C	-40°C - 125°C	-40°C - 125°C	-40°C - 125°C
Driver MOSFET type	int.	int.	ext. (N & P)	ext. (N & P)
Package	PQFP44	PQFP44	QFN32 (5x5mm)	QFN32 (5x5mm)

S/D = Step/Direction

STEPPER MOTOR DRIVER + CONTROLLER WITH COOLSTEP™



PRODUCT	TMCM-1021	TMCM-1140	TMCM-1141	TMCM-1160
Number of axes	1	1	1	1
Max. phase current RMS [A]	0.7	2	1.1	2.8
Supply voltage typical DC [V]	24	24	24	48
Supply voltage range DC [V]	9 - 28	9 - 28	9 - 28	9 - 51
Max. microstep resolution	256	256	256	256
TMCL controller	✓	✓	✓	✓
TMCL program memory [commands]	876	2048	2048	2048
Motion Controller in hardware	-	✓	✓	✓
Acceleration ramps	linear	linear	linear	linear
Interface: RS-232	-	-	-	-
Interface: RS-485	✓	✓	✓	✓
Interface: CAN	(✓)	✓	-	✓
Interface: USB	-	✓	✓	✓
CANopen ready	-	✓	-	✓
S/D Driver interface	(GP IN)	-	opto isolated	opto isolated
Encoder interface	-	(ABN)	-	ABN
senOstep™ encoder resolution [ppr]	1024	1024	1024	1024
Ref./End switch inputs	(3x 24V)	(3x 24V)	(3x 24V)	2x (5/24V)
Shutdown input	-	-	-	✓
GP IN (digital)	(2x 5/24V)	(3x 5/24V)	(3x 5/24V)	(5x 5/24V)
GP OUT (digital)	-	1x 5V, 1x OD, Vdd	(2x OD, Vdd)	(2x OD, 24V)
GP IN/OUT	(2x OD, Vdd)	-	-	-
GP IN (analog)	(1x 0-6.6V)	1x 0-10V	1x 0-10V	(2x 0-10V)
Board Size [mm]	28 x 28	37 x 37	37 x 37	60 x 60
Connector type	JST	JST	JST	JST
Protection type	open frame	open frame	open frame	open frame
stallGuard2™	✓	✓	✓	✓
coolStep™	✓	✓	✓	✓
spreadCycle™ Chopper	✓	✓	✓	✓
microPlyer [µSteps]	16 to 256	-	16 to 256	16 to 256
Motor mountable	NEMA 11	NEMA 17	NEMA 17	NEMA 23/24
Related Cable Loom	TMCM-1021-CABLE	TMCM-1140-CABLE	TMCM-1141-CABLE	TMCM-1160-CABLE
Replacement for	TMCM-108-28	TMCM-140-42	TMCM-110-42	TMCM-1060 TMCM-109-57

0 = optional function

STEPPER MOTOR DRIVER + CONTROLLER WITH COOLSTEP™



TMCM-1161	TMCM-1180	TMCM-1110	TMCM-6110	PRODUCT
1	1	1	6	Number of axes
2.8	5.5	1.0 / 2.8	1.1	Max. phase current RMS [A]
24	48	24	24	Supply voltage typical DC [V]
10 - 30	18 - 55	10 - 30	9 - 28	Supply voltage range DC [V]
256	256	256	256	Max. microstep resolution
✓	✓	3-axis	6-axis	TMCL controller
2048	2048	2048	2048	TMCL program memory [commands]
✓	✓	✓	✓	Motion Controller in hardware
linear	linear	linear	linear	Acceleration ramps
✓	✓	-	-	Interface: RS-232
✓	✓	✓	✓	Interface: RS-485
-	✓	-	✓	Interface: CAN
✓	✓	✓	✓	Interface: USB
-	✓	-	✓	CANopen ready
(GP IN)	opto isolated	1x IN, 2x OUT TTL	-	S/D Driver interface
-	ABN	(ABN TTL)	-	Encoder interface
1024	256			senOstep™ encoder resolution [ppr]
(3x 24V)	3x 24V	6x TTL	12x 5/24V	Ref./End switch inputs
-	✓	-	-	Shutdown input
(3x 5/24V)	(5x 5/24V)	(3x TTL)	6x 5/24V	GP IN (digital)
2x OD, Vdd	(2x OC, 24V)	2x OD, 100mA	6x OD, 100mA + 2x OD, 1A	GP OUT (digital)
-	-	6x TTL	-	GP IN/OUT
1x 0-10V	(2x 0-10V)	1x 0-10V, 12bit	2x 0-10V, 12bit	GP IN (analog)
60 x 60	86 x 86	55 x 85	100 x 130	Board Size [mm]
JST	JST	pluggable screw + header	JST, D-SUB,	Connector type
open frame	open frame	open frame	open frame	Protection type
✓	✓	✓	✓	stallGuard2™
✓	✓	✓	✓	coolStep™
✓	✓	✓	✓	spreadCycle™ Chopper
16 to 256	16 to 256	16 to 256	-	microPlyer™ [μSteps]
NEMA 23/24	NEMA 34	-	-	Motor mountable
TMCM-1161-CABLE	TMCM-1180-CABLE		TMCM-6110-CABLE	Related Cable Loom
TMCM-113-60	-	-	TMCM-310 TMCM-610	Replacement for
		lowest cost	8X GP DIP SWITCH	Remarks

0 = optional function

STEPPER MOTOR CONTROLLER/DRIVER



PRODUCT	TMCM-102	TMCM-142	TMCM-342	TMCM-343	TMCM-351
Number of axes	1	1	3	3	3
Max. phase current [A] (RMS)	3.5	5.0	-	1.1	2.8
Supply voltage DC [V]	18 - 55	18 - 75	-	7 - 34	7 - 28.5
External logic voltage DC [V]	-	-	5	5	-
Max. microstep resolution	64	1024	-	64	64
TMCL controller	✓	✓	✓	✓	✓
TMCL program memory [commands]	2048	2048	2048	2048	2048
Acceleration ramps	linear	linear & S-shape	linear	linear	linear
Interface: RS-232	✓	✓	-	-	✓
Interface: RS-485	✓	✓	-	-	✓
Interface: UART (RS232/485)	-	-	✓	✓	-
Interface: IIC	-	-	-	-	-
Interface: CAN	✓	✓	✓	✓	✓
Interface: USB	✓	✓	-	-	✓
CANopen ready	-	✓	✓	✓	✓
Driver interface	-	-	S/D	-	-
Encoder interface	ABN	ABN	*1)	*1)	3x ABN
Ref./End switch inputs	1+2 (5V)	1+2 (5V)	3 x 2 (5V)	3 x 2 (5V)	3 x 2
Shutdown input	-	-	-	-	✓
GP inputs (digital / analog)	2 d+a (5V)	2 d+a (5V)	8 d+a (5V)	8 d+a (5V)	8d (24V) + 4a (3.3/10V)
GP outputs (digital)	3 (OC)	3 (OC)	8	8	8 (OC)
Size [mm]	76 x 70 x 33	76 x 70 x 33	50 x 80	50 x 80	100 x 160
Connector type	push/screw	push/screw	68 pin	68 pin	JST + screw
Protection type	open frame	open frame	open frame	open frame	open frame
stallGuard™	✓	-	-	✓	✓
chopSync™	-	-	-	-	-
Remarks	RS-422, IMS-commands	RS-422, IMS-commands			additional SPI interface

S/D = Step/Direction

*1) optional with additional TMCM-323

*2) General Purpose

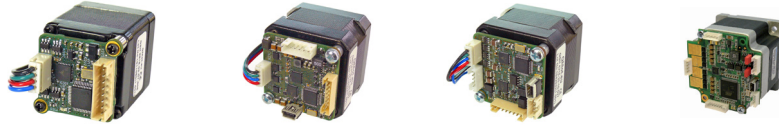
BL DC MOTOR CONTROLLER/DRIVER



TCMC-1630-2C	TCMC-1630-4U	TCMC-1640	TCMC-1631	TCMC-1632	PRODUCT
1	1	1	1	1	Number of axes
10	10	5	5	5	Rated motor current [A]
12-48	12-48	12-28,5	12-48	12-28.5	Supply voltage [V]
✓	✓	✓	✓	✓	Block commutation with hall sensors
✓	✓	✓	✓	✓	Sine commutation with incremental encoders
✓	✓	✓	✓	✓	Sensorless block commutation w. hallFX™
✓	✓	✓	✓	✓	TMCL controller
2048	2048	2048	2048	2048	TMCL programm memory [commands]
-	-	-	✓	✓	Interface: UART (RS232/RS485)
✓	-	-	-	-	Interface: RS-232
-	✓	✓	-	-	Interface: RS-485
✓	-	-	-	-	Interface: CAN
-	✓	✓	-	-	Interface: USB
-	-	-	✓	✓	Interface: EtherCAT - E-Bus
-	-	-	-	-	Driver interface
-	✓	-	-	-	CANopen ready
ABN	ABN	ABN	ABN	ABN	Encoder interface
2 d (24V) + 2 a (10V)	2 d (24V) + 2 a (10V)	2 d (24V), 1 a (10V)	2 + 2 d (48V)	2 + 2 d (24V)	General purpose input (digital+analog)
3 (OD Vdd)	3 (OD Vdd)	2	2 (OD Vdd)	2 (OD Vdd)	General purpose output (digital)
✓	✓	✓	-	-	stand alone operation with analog input
50*92	50*92	42*42	42*64	42*72	Size [mm]
2*26pin	2*26pin	JST/Tyco	16+32pin	16+32pin	connector type
open frame	open frame	open frame	open frame	open frame	Protection type
BB-1630	BB-1630	-	on request	on request	Related baseboard
		motor mountable NEMA 17	on demand product	on demand product	Remarks

S/D = Step/Direction

PANdrives™ WITH STEPPER MOTOR



PRODUCT	PD28-1021	PD42-1140	PD42-1141	PD57-1160
Motor flange size [mm]	28 * 28	42 * 42	42 * 42	57 * 57
Motor flange size NEMA	11	17	17	23
Supply voltage typical DC [V]	24	24	24	48
Supply voltage range DC [V]	9 - 28	9 - 28	9 - 28	9 - 51
Max. resolution [μ Step/rev]	51200	51200	51200	51200
Fullstep Angle	1.8°	1.8 °	1.8°	1.8°
TMCL controller	✓	✓	✓	✓
TMCL program memory [commands]	876	2048	2048	2048
Motion Controller in hardware	-	✓	✓	✓
Acceleration ramps	linear	linear	linear	linear
Interface: RS-232	-	-	-	-
Interface: RS-485	✓	✓	✓	✓
Interface: CAN	(✓)	✓	-	✓
Interface: USB	-	✓	✓	✓
CANopen ready	-	✓	-	-
S/D Driver interface	(GP IN)	-	opto isolated	opto isolated
Encoder interface	-	(ABN)	-	ABN
senOstep™ encoder resolution [ppr]	1024	1024	1024	1024
Ref./End switch inputs	(3x 24V)	(3x 24V)	(3x 24V)	2x (5/24V)
Shutdown input	-	-	-	✓
GP IN (digital)	(2x 5/24V)	(3x 5/24V)	(3x 5/24V)	(5x 5/24V)
GP OUT (digital)	-	1x 5V, 1x OD, Vdd	(2x OD, Vdd)	(2x OD, 24V)
GP IN/OUT	(2x OD, Vdd)	-	-	-
GP IN (analog)	(1x 0-6.6V)	1x 0-10V	1x 0-10V	(2x 0-10V)
Connector type	JST	JST	JST	JST
Protection type	open frame	open frame	open frame	open frame
stallGuard2™	✓	✓	✓	✓
coolStep™	✓	✓	✓	✓
spreadCycle™ Chopper	✓	✓	✓	✓
microPlyer™ [μ Steps]	16 to 256	16 to 256	16 to 256	16 to 256
PD...-1... torque [Nm]/[oz in]	0.06 / 8.5	0.22 / 31	0.27 / 38	0.55 / 78
PD...-2... torque [Nm]/[oz in]	-	0.36 / 50	0.35 / 50	1.01 / 143
PD...-3... torque [Nm]/[oz in]	0.12 / 17	0.44 / 62	0.49 / 69	-
PD...-4... torque [Nm]/[oz in]	-	0.7 / 99	-	-
Related Cable Loom	TMCM-1021-CABLE	TMCM-1140-CABLE	TMCM-1141-CABLE	TMCM-1160-CABLE
Replacement for	PD-108-28	PD-140-42	PD-110-42 PD-013-42	PD-1060 PD-109-57

S/D = Step/Direction

PANdrives™ WITH STEPPER MOTOR



PD57-1161



PD60-1160



PD60-1161



PD146-60-SE



PD86-1180

PD57-1161	PD60-1160	PD60-1161	PD146-60-SE	PD86-1180	PRODUCT
57 * 57	60 * 60	60 * 60	60 * 60	86 * 86	Motor flange size [mm]
23	24	24	24	34	Motor flange size NEMA
24	48	24	24	48	Supply voltage typical DC [V]
10 - 30	9 - 51	10 - 30	7 - 34	18 - 55	Supply voltage range DC [V]
51200	51200	51200	204800	51200	Max. resolution [μStep/rev]
1.8°	1.8°	1.8°	1.8°	1.8°	Fullstep Angle
✓	✓	✓	✓	✓	TMCL controller
2048	2048	2048	2048	2048	TMCL program memory [commands]
✓	✓	✓	✓	✓	Motion Controller in hardware
linear	linear	linear	linear & S-shape	linear	Acceleration ramps
✓	-	✓	✓	✓	Interface: RS-232
✓	✓	✓	✓	✓	Interface: RS-485
-	✓	-	✓	✓	Interface: CAN
✓	✓	✓	-	✓	Interface: USB
-	-	-	✓	✓	CANopen ready
(GP IN)	opto isolated	(GP IN)	-	opto isolated	S/D Driver interface
-	ABN	-	ABN	ABN	Encoder interface
1024	1024	1024	4096	256	senOstep™ encoder resolution [ppr]
(3X 24V)	2x (5/24V)	(3x 24V)	3X 24V	3x 24V	Ref./End switch inputs
✓	✓	✓	✓	✓	Shutdown input
(3X 5/24V)	(5x 5/24V)	(3x 5/24V)	2X 5/24V	(5x 5/24V)	GP IN (digital)
2X OD, VDD	(2x OD, 24V)	2x OD, Vdd	3X OD, 24V	(2x OC, 24V)	GP OUT (digital)
-	-	-	-	-	GP IN/OUT
1X 0-10V	(2x 0-10V)	1x 0-10V	(2X 0-10V)	(2x 0-10V)	GP IN (analog)
JST	JST	JST	D-SUB 9+15	JST	Connector type
open frame	open frame	open frame	IP10, PLASTIC	IP10, light cover	Protection type
✓	✓	✓	-	✓	stallGuard2™
✓	✓	✓	-	✓	coolStep™
✓	✓	✓	-	✓	spreadCycle™ Chopper
16 to 256	16 to 256	16 to 256	-	16 to 256	microPlyer™ [μSteps]
0.06 / 8.5	-	-	1.10 / 156	-	PD...-1... torque [Nm]/[oz in]
1.01 / 143	-	-	1.65 / 234	-	PD...-2... torque [Nm]/[oz in]
-	2.10 / 297	2.10 / 297	2.10 / 297	7.0 / 991	PD...-3... torque [Nm]/[oz in]
-	3.10 / 439	3.10 / 439	3.10 / 439	-	PD...-4... torque [Nm]/[oz in]
TMCM-1161-CABLE	TMCM-1160-CABLE	TMCM-1161-CABLE	-	TMCM-1180-CABLE	Related Cable Loom
PD-113-60	PD-1060 PD-109-57	PD-113-60	-	-	Replacement for

S/D = Step/Direction

BIPOLAR HYBRID STEPPER MOTORS



PRODUCT FAMILY

QSH2818

QSH4218

QSH5718

Product extension	32-07-006	51-07-012	35-10-027	41-10-035	51-10-049	41-28-055	51-28-101	56-28-126	76-28-189
Flange size [mm]	28*28		42*42			57*57			
NEMA size	11		17			23			
Phases	2		2			2			
Step angle	1.8°		1.8°			1.8°			
Steps / rev.	200		200			200			
Max. phase current [A]	0.7		1.0			2.8			
Max. voltage [V]	40		40			75			
No. of leads	4		4			4			
Holding torque [Nm]	0.060	0.120	0.27	0.35	0.49	0.55	1.01	1.26	1.89
Holding torque [oz in]	8.50	17	38	50	69	78	143	178	268
Motor length [mm]	32	51	35	41	51	41	51	56	76
Shaft diameter [mm]	5.0		5.0			6.35			
Shaft length [mm]	20		24			20.6			
Shaft characteristic	D-cut		D-cut			D-cut			
Weight (Mass) [Kg]	0.11	0.2	0.22	0.28	0.35	0.45	0.65	0.7	1.0

BIPOLAR HYBRID STEPPER MOTORS



QSH6018



QSH4218



QSH8618

PRODUCT FAMILY

45-28-110	56-28-165	65-28-210	86-28-310	35-10-027	41-10-035	51-10-049	65-59-340	80-55-460	96-55-700	118-60-870	156-62-1280	Product extension				
60*60				42*42				86*86				Flange size [mm]				
24				17				32				NEMA size				
2				2				2				Phases				
1.8°				1.8°				1.8°				Step angle				
200				200				200				Steps / rev.				
2.8				1.0		5.9		5.5		5.5		6.2		6.9		Max. phase current [A]
75				40				100		140		140		160		Max. voltage [V]
4				4				8		4		4		4		No. of leads
1.10	1.65	2.10	3.10	0.27	0.35	0.49	3.40	4.60	7.00	8.70	12.80	Holding torque [Nm]				
156	234	297	439	38	50	69	481	651	991	1232	1813	Holding torque [oz in]				
45	56	65	86	35	41	51	65	80	96	118	156	Motor length [mm]				
8.0				5.0				12.0		12.7		12.7		15.875		Shaft diameter [mm]
24				24				31.75						Shaft length [mm]		
D-cut				D-cut				D-cut		D-cut		key & slot		key & slot		Shaft characteristic
0.6	0.77	1.2	1.4	0.22	0.28	0.35	1.7	2.3	2.8	3.8	5.4	Weight (Mass) [Kg]				

BRUSHLESS DC MOTOR WITH INTEGRATED HALL SENSORS



QBL4208



QBL5704

PRODUCT	QBL4208			QBL5704		
Product extension	41-04-006	61-04-013	81-04-019	100-04-025	94-04-032	116-04-042
Flange size [mm]	42*42			d = 57		
NEMA size	17					
No. of phases	3			3		
No. of poles	8			4		
Rated speed [rpm]	4000			4000		
Rated current [A]	1,79	3,47	5,14	6,95	5,08	6,67
Max. peak current [A]	5,4	10,6	15,5	20	16,5	20,5
Rated motor voltage DC [V]	24			36		
Max. motor voltage DC [V]	48			60		
Rated torque [Nm]	0,063	0,125	0,185	0,250	0,32	0,42
Rated torque [oz in]	9	18	26	35	45	59
Max. peak torque [Nm]	0,190	0,380	0,560	0,750	0,98	1,30
Max. peak torque [oz in]	27	54	79	106	139	184
Torque constant [Nm/A]	0,036			0,063		
Hall sensor supply DC [V]	5 - 24			5 - 24		
Motor length [mm]	41	61	81	100	94	116
Shaft diameter [mm]	5			8 + 6		
Shaft length [mm]	19			25 + 17		
Shaft characteristic				double		
Weight (Mass) [Kg]	0,3	0,45	0,65	0,8	1,0	1,25

PIEZO MOTOR DRIVER



PRODUCT TMC204

Number of axes	1
Supply voltage DC [V]	48
External logic voltage DC [V]	5
Max. microstep resolution	2048
Driver interface	S/D + SPI
size [mm]	50 x 80
Connector type	68 pin
Protection type	open frame
Remarks	for Piezo-LEGS motors

S/D = Step/Direction
 *1) optional with additional TMC204-323
 *2) General Purpose



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