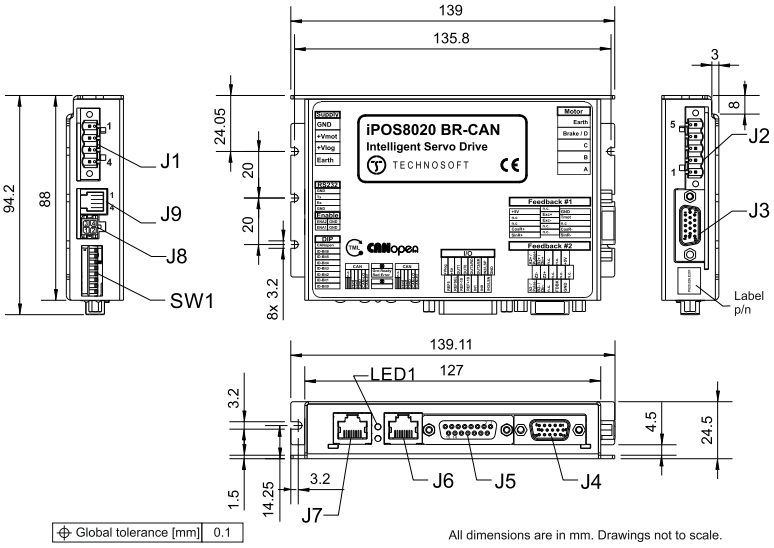


All dimensions are in mm.

Sensor \ Motor	PMSM	DC BRUSH	STEP (2-ph)	STEP (3-ph)
Incr. Encoder	✓	✓	✓	
Resolver	✓			
Tacho		✓		
Open-loop (no sensor)			✓	✓

Mating connectors

Producer	Part No.	Connector	Description
Camden	CTBA9208/4FL	J1	Supply input, 4x5.08 female counter part for cable
Camden	CTBA9208/5FL	J2	Motor power, 5x5.08 female counter part for cable
	generic 15-pin High Density D-Sub male	J3,J4	Feedback #1 & #2
	generic RJ10-4/4 phone plug	J9	RS232
	generic 15-pin D-Sub male, DB15	J5	I/O ; Analog
MOLEX	43025-0400	J8	MICROFIT RECEPTACLE HOUSING, 2x2 WAY
MOLEX	43030-0007	J8	CRIMP PIN, MICROFIT, 5A
-	-	J6, J7	Standard 8P8C modular jack (RJ-45) male

Features

- Motion controller and drive in a single compact unit based on MotionChip ™ technology
- Universal solution for control of rotary and linear brushless, brushed and 2 or 3-phase step motors
- Advanced motion control capabilities (PVT,S-curve, electronic cam)
- Motor supply: 12-80V; Logic supply 12-36V
- Output current: 20A cont. (BLDC mode); $40A_{PEAK}$, up to 125kHz PWM
- Feedback Devices (dual-loop support)

1st feedback device supported:

- Resolver (differential)

2nd feedback devices supported:

- Incremental encoder interface (differential)
- pulse & direction interface (differential) for external (master) digital reference

- Separate ENABLE circuit: connect both ENA1 and ENA2 inputs to +24V, to allow motor PWM output operation
- 4 digital inputs, 5-36V, PNP/NPN programmable: 2 for limit switches, 2 general-purpose
- 4 digital outputs, 5-36V, 0.5A, NPN open-collector: Ready, Error, 2 general-purpose
- 2 analogue inputs: 12-bit, 0-5V: Reference, Feedback or general purpose
- RS-232 serial & dual RJ45 CAN connectors
- TMLCAN and CANopen (CiA 301 v4.2, CiA 305 v.2.2.13 and CiA 402 v3.0) protocols selectable by DIN switch
- 127 h/w addresses selectable by DIP switch
- 16k x 16 SRAM memory for data acquisition
- 16k x16 E^2ROM to store setup data, TML motion programs, cam tables and other user data
- Operating ambient temperature: 0-40°C (over 40°C with derating)
- Programmable protections: short-circuit between motor phases and from motor phases to GND, over/under-voltage, over-current, I^2t, control error

Connector Description

	Pin	Name	Type	Description
J1	1	GND	-	Negative return (ground) of the power supply
	2	$+V_{MOT}$	I	Positive terminal of the motor supply: 9 to $80V_{DC}$.
	3	$+V_{LOG}$	I	Positive terminal of the logic supply input: 9 to $36V_{DC}$
	4	Earth	-	Earth connection

	Pin	Name	Type	Description
J2	1	A/A+	O	**Phase A** for 3-ph motors, A+ for 2-ph steppers, Motor+ for DC brush motors
	2	B/A-	O	**Phase B** for 3-ph motors, A- for 2-ph steppers, Motor- for DC brush motors
	3	C/B+	O	**Phase C** for 3-ph motors, B+ for 2-ph steppers
	4	CR / B-	O	**Chopping Resistor output/ Phase B**- for step motors
	5	Earth	-	Earth connection

	Pin	Name	Type	Description
J6, J7	1	Can-Hi	I/O	CAN-Bus positive line (dominant high)
	2	Can-Lo	I/O	CAN-Bus negative line (dominant low)
	3	GND	-	Return ground for CAN-Bus
	4, 5	-	-	Reserved. Do not use.
	6..8	n.c.	-	Not connected

	Pin	Name	Type	Description
J3	1	+5V$_{OUT}$	O	5V output supply for I/O usage
	2, 3	n.c.		Not connected
	4	CosR+	I	Positive Cosine input from the resolver
	5	SinR+	I	Positive Sine input from the resolver
	6	n.c.		Not connected
	7	Exc+	O	Positive excitation output for the resolver
	8	Exc-	O	Negative excitation output for the resolver
	9, 10	n.c.		Not connected
	11	GND	-	Return ground for sensors supply
	12	Temp Mot	I	Analogue input, 12-bit, 0-3.3V. Used to read an analog temperature value
	13	n.c.		Not connected
	14	CosR-	I	Negative Cosine input from the resolver
	15	SinR-	I	Negative Sine input from the resolver

	Pin	Name	Type	Description
J4	1	+5V$_{OUT}$	O	5V output supply for I/O usage
	2..3	n.c.		Not connected
	4	B2+/Dir+	I	Incr. encoder2 B+ diff. input, or Dir+
	5	A2+/Pulse+	I	Incr. encoder2 A+ diff. input
	6..8	n.c.		Not connected
	9	Z2+/PWM+	I	Incr. encoder2 Z+ diff. input
	10	Z2-/PWM-	I	Incr. encoder2 Z- diff. input
	11	GND	-	Return ground for sensors supply
	12	FDBK	I	Analogue input, 12-bit, 0-5V. Used to read an analogue position or speed feedback (as tacho), or used as general purpose analogue input
	13	n.c.		Not connected
	14	B2-/Dir-	I	Incr. encoder2 B- diff. input, or Dir-
	15	A2- /Pulse-	I	Incr. encoder2 A- diff. input, or Pulse-

	Pin	Name	Type	Description
J5	1	GND	-	Return ground for I/O pins
	2	IN2/LSP	I	5-36V digital PNP/NPN input. Positive limit switch input
	3	OUT2/Error	O	5-36V 0.5A, drive Error output, active low, NPN open-collector/TTL pull-up. Also drives the red LED
	4	OUT3/Ready	O	5-36V 0.5A, drive Ready output, active low, NPN open-collector/TTL pull-up. Also drives the green LED.
	5	OUT0	O	5-36V 0.5A, general-purpose digital output, NPN open-collector/TTL pull-up
	6	OUT1	O	5-36V 0.5A, general-purpose digital output, NPN open-collector/TTL pull-up
	7	+5V$_{OUT}$	O	5V output supply for I/O usage
	8	+V$_{LOG}$	I	Positive terminal of the logic supply input: 9 to 36V$_{DC}$
	9	IN3/LSN	I	5-36V digital PNP/NPN input. Negative limit switch input
	10	IN0	I	5-36V general-purpose digital PNP/NPN input
	11	IN1	I	5-36V general-purpose digital PNP/NPN input
	12	REF10+	I	Analogue input, 11-bit, positive +/-10V input. Used to read an analog position, speed or torque reference.
	13	REF10-	I	Analogue input, 11-bit, negative +/-10V input. Used to read an analog position, speed or torque reference. Connected to GND when REF5 is used.
	14	REFSEL	I	Analogue selection, floating for +/-10V input, GND connected when REF5+ is used.
	15	REF5	I	Analogue input, 12-bit, 0-5V input. Used to read an analog position, speed or torque reference.

	Pin	Name	Type	Description
J8	1	ENA1	I	Enable circuit input1; connect ENA1&ENA2 to +24V to activate motor operation
	2	GND	-	Return ground
	3	ENA2	I	Enable circuit input2; connect ENA1&ENA2 to +24V to activate motor operation
	4	GND	-	Return ground

	Pin	Name	Type	Description
J9	1	GND	-	Return ground for RS-232 pins
	2	232TX	O	RS-232 Data Transmission
	3	232RX	I	RS-232 Data Reception
	4	GND	-	Return ground for RS-232 pins

	Pin	Name	Type	Description
SW1	1	CANopen	-	ON: CANopen communication protocol OFF: TMLCAN communication protocol
	2	ID-Bit6	-	Hardware AxisID selection switches They represent the first 7 bits of an 8 bit Axis ID number.
	3	ID-Bit5	-	
	4	ID-Bit4	-	
	5	ID-Bit3	-	
	6	ID-Bit2	-	
	7	ID-Bit1	-	
	8	ID-Bit0	-	

Electrical characteristics

All parameters measured under the following conditions (unless otherwise specified):

- Tamb = 0…40ºC, VLOG = 24 VDC; VMOT = 80VDC
- Supplies start-up / shutdown sequence: -any-
- Load current (sinusoidal amplitude / continuous BLDC, DC, stepper) = 20A

Operating Conditions		**Min.**	**Typ.**	**Max.**	**Units**
Ambient temperature[1]		0		+40	ºC
Ambient humidity	Non-condensing	0		90	%Rh
Altitude / pressure[2]	Altitude (vs. sea level)	-0.1	0 ÷ 2	2	Km
	Ambient Pressure	0 [2]	0.75 ÷ 1	10.0	atm
Storage Conditions		**Min.**	**Typ.**	**Max.**	**Units**
Ambient temperature		-40		+85	ºC
Ambient humidity	Non-condensing	0		100	%Rh
Ambient Pressure		0		10.0	atm
Mechanical Mounting		**Min.**	**Typ.**	**Max.**	**Units**
Airflow		natural convection[3], closed box			
Environmental Characteristics		**Min.**	**Typ.**	**Max.**	**Units**
Size (Length x Width x Height)	Without mating connectors	139 x 94.2 x 24.5			mm
		~5.47 x 3.7 x 0.97			inch
Weight	Without mating connectors	240			g
Power dissipation	Idle (no load)		3.6		W
	Operating		11		
Efficiency			98		%
Cleaning agents	Dry cleaning is recommended	Only Water- or Alcohol- based			
Protection degree	According to IEC60529, UL508	IP20			-
Logic Supply Input (+V$_{LOG}$)		**Min.**	**Typ.**	**Max.**	**Units**
Supply voltage	Nominal values	9		36	V$_{DC}$
	Absolute maximum values, drive operating but outside guaranteed parameters	8		40	V$_{DC}$
	Absolute maximum values, surge (duration ≤ 10ms) [↑]	-1		+45	V

[1] Operating temperature can be extended up to **+65ºC** with reduced current and power ratings.
[2] iPOS8010 can be operated in vacuum (no altitude restriction), but at altitudes over 2,500m, current and power rating are reduced due to thermal dissipation efficiency.
[3] It is recommended to mount the iPOS8010 BR-CAN on a metallic support using the provided mounting holes, for better reliability and reduced de-rating due to heat dissipation

Supply current	No Load on Digital Outputs	$+V_{LOG}$ = 9V		200		mA
		$+V_{LOG}$ = 12V		180		
		$+V_{LOG}$ = 24V		130		
		$+V_{LOG}$ = 36V		110		
Motor Supply Input ($+V_{MOT}$)			**Min.**	**Typ.**	**Max.**	**Units**
Supply voltage	Nominal values		12	80	90	V_{DC}
	Absolute maximum values, drive operating but outside guaranteed parameters		11		94	V_{DC}
	Absolute maximum values, surge (duration ≤ 10ms)†		-1		95	V
Supply current	Idle			1	5	mA
	Operating		-40	±20	+40	A
	Absolute maximum value, short-circuit condition (duration ≤ 10ms)†				45	A
Motor Outputs (A/A+, B/A-, C/B+, BR/B-)			**Min.**	**Typ.**	**Max.**	**Units**
Nominal output current, continuous	for DC brushed, steppers and BLDC motors with Hall-based trapezoidal control				20	A
	for PMSM motors with FOC sinusoidal control (sinusoidal amplitude value)				20	
	for PMSM motors with FOC sinusoidal control (sinusoidal effective value)				14.2	
Motor output current, peak	maximum 3.6s		-40		+40	A
Short-circuit protection threshold	measurement range				±45	A
Short-circuit protection delay			5	10		µs
On-state voltage drop	Nominal output current; including typical mating connector contact resistance			±0.3	±0.5	V
Off-state leakage current				±0.5	±1	mA
Motor inductance (phase-to-phase)	Recommended value, for current ripple max. ±5% of full range; $+V_{MOT}$ = 80 V	F_{PWM}				µH
		20 kHz	330			
		40 kHz	150			
		60 kHz	120			
		80 kHz	80			
		100 kHz	60			
	Minimum value, limited by short-circuit protection; $+V_{MOT}$ = 80 V	20 kHz	120			µH
		40 kHz	40			
		60 kHz	30			
		80 kHz	15			
		100 kHz	8			
Motor electrical time-constant (L/R)	Recommended value for ±5% current measure-ment error	20 kHz	250			µs
		40 kHz	125			
		60 kHz	100			
		80 kHz	63			
		100 kHz	50			
Current measurement	FS = Full Scale accuracy			±5	±8	%FS
Resolver Interface			**Min.**	**Typ.**	**Max.**	**Units**
Excitation frequency	Software selectable		3	6	12	kHz
Excitation votlage	Software selectable		1.4	1.6 - 7.2	8	V_{PP}
Excitation current					50	mA_{RMS}
Resolver coupling ratio			1:2		2:1	-
Sin / Cos Input voltage			2.3	3.15	4	V_{PP}
Sin / Cos Input impedance				60		kΩ
Position Resolution				14		

Digital Inputs (IN0, IN1, IN2/LSP, IN3/LSN,)[1]			**Min.**	**Typ.**	**Max.**	**Units**
Mode compliance			PNP			
Default state	Input floating (wiring disconnected)		Logic LOW			
Input voltage	Logic “LOW”		-10	0	2.2	V
	Logic “HIGH”		6.3		36	
	Floating voltage (not connected)			0		
	Absolute maximum, continuous		-10		+39	
	Absolute maximum, surge (duration ≤ 1S)†		-20		+40	
Input current	Logic “LOW”; pulled to GND			0		mA
	Logic “HIGH”			1.3	2	

Mode compliance			NPN			
Default state	Input floating (wiring disconnected)		Logic HIGH			
Input voltage	Logic “LOW”		-10		2.2	V
	Logic “HIGH”		6.3		36	
	Floating voltage (not connected)			3		
	Absolute maximum, continuous		-10		+36	
	Absolute maximum, surge (duration ≤ 1S)†		-20		+40	
Input current	Logic “LOW”; Pulled to GND		-1.6	0.6	1	mA
	Logic “HIGH”; Pulled to +24V				0.3	

Input frequency			0		150	kHz
Minimum pulse			3.3			µs
ESD protection	Human body model		±2			kV
Digital Outputs (OUT0, OUT1, OUT2/Error, OUT3/ Ready)			**Min.**	**Typ.**	**Max.**	**Units**
Mode compliance	All outputs (OUT0, OUT1, OUT2/Error, OUT3/Ready)		NPN 24V			
Default state	Not supplied ($+V_{LOG}$ floating or to GND)		High-Z (floating)			
	Immediately after power-up	OUT0, OUT1 OUT2/Error, OUT3/ Ready	Logic “HIGH”			
	Normal operation	OUT0, OUT1, OUT2/Error	Logic “HIGH”			
		OUT3/Ready	Logic “LOW”			
Output voltage	Logic “LOW”; output current = 0.5A				0.8	V
	Logic “HIGH”; output current = 0, no load	OUT2/Error, OUT3/ Ready	2.9	3	3.3	
		OUT0, OUT1	4	4.5	5	
	Logic “HIGH”, external load to $+V_{LOG}$			V_{LOG}		
	Absolute maximum, continuous		-0.5		V_{LOG}+0.5	
	Absolute maximum, surge (duration ≤ 1S)†		-1		V_{LOG}+1	
Output current	Logic “LOW”, sink current, continuous OUT0=2A				0.5	A
	Logic “LOW”, sink current, pulse ≤ 5 sec. OUT0=3A				1	A
	Logic “HIGH”, source current; external load to GND; V_{OUT} >= 2.0V	OUT2/Error, OUT3/ Ready			2	mA
		OUT0, OUT1			4	mA
	Logic “HIGH”, leakage current; external load to $+V_{LOG}$; V_{OUT} = V_{LOG} max = 40V			0.1	0.2	mA
Minimum pulse width			2			µs
ESD protection	Human body model		±15			kV

[1] The digital inputs are software selectable as PNP or NPN

Encoder Inputs (A2+, A2-, B2+, B2-, Z2+, Z2-)[1]		**Min.**	**Typ.**	**Max.**	**Units**
Differential mode compliance	For full RS422 compliance, see [1]	TIA/EIA-422-A			
Input voltage	Hysteresis	±0.06	±0.1	±0.2	V
	Differential mode	-14		14	
	Common-mode range (A+ to GND, etc.)	-11		+14	
Input impedance, differential	A2+, B2+, Z2+		2.2		kΩ
	A2-, B2-, Z2-		1.6		
Analog 0…5V Inputs (REF, FDBK)		**Min.**	**Typ.**	**Max.**	**Units**
Input voltage	Operational range	0		4.95	V
	Absolute maximum values, continuous	-12		+18	
	Absolute maximum, surge (duration ≤ 1S) †			±36	
Input impedance	To GND		8		kΩ
Resolution			12		bits
Integral linearity				±2	bits
Offset error			±2	±10	bits
Gain error			±1%	±3%	% FS[2]
Bandwidth (-3dB)	Software selectable	0		1	kHz
ESD protection	Human body model	±2			kV
Analog ±10V Input (Ref)		**Min.**	**Typ.**	**Max.**	**Units**
Differential voltage range			±10		V
Common-mode voltage range	Referenced to GND	-12	0…10	+50	V
Input impedance	Differential		40		kΩ
Common-mode impedance	Referenced to GND		20		kΩ
Resolution			12		bits
Integral linearity				0.036	%FS[2]
Offset error	Common-mode voltage = 0…10 V		±0.2	±0.5	%FS[2]
Gain error	Common-mode voltage = 0…10 V		±10	±12	%FS[2]
Bandwidth (-3dB)	Depending on software settings		1.5		kHz

RS-232		**Min.**	**Typ.**	**Max.**	**Units**
Compliance		TIA/EIA-232-C			
Bit rate	Software selectable	9600		115200	Baud
Short-circuit	232TX short to GND	Guaranteed			
ESD protection	Human body model	±2			kV
CAN-Bus		**Min.**	**Typ.**	**Max.**	**Units**
Compliance		ISO11898, CiA-301v4.2, CiA 305 v2.2.13, 402v3.0			
Bit rate	Software selectable	125		1000	Kbps
Bus length	1Mbps			25	m
	500Kbps			100	
	≤ 250Kbps			250	
Resistor	Between CAN-Hi, CAN-Lo	none on-board			
Node addressing	Hardware: by Hex switch	1 ÷ 127 & LSS non-configured (CANopen); 1-127 & 255 (TMLCAN)			
	Software	1 ÷ 127 (CANopen); 1- 255 (TMLCAN)			
Voltage, CAN-Hi or CAN-Lo to GND		-26		26	V
ESD protection	Human body model	±15			kV
Enable circuit (ENA1, ENA2)		**Min.**	**Typ.**	**Max.**	**Units**
Enable function		Disables motor power when either ENA1 or ENA2 is disconnected from the power source			
Mode compliance		PNP			
Default state	Input floating (wiring disconnected)	Logic LOW			
Input voltage	Logic “LOW”	-10		2.2	V
	Logic “HIGH”	6.3		36	
	Absolute maximum, continuous	-10		+39	
Input current	Logic “LOW”; pulled to GND		0		mA
	Logic “HIGH”, pulled to +Vlog		9	13	
Pulse duration	Ignored low-high-low			1	ms
	Ignored high-low-high			1.5	
	Accepted pulse	tbd			
Fault reaction time	From internal fault detection to register DER bit 14 =1 and OUT2/Error high-to-low			tbd	ms
ESD protection	Human body model	±2			kV
Supply Output (+5V)		**Min.**	**Typ.**	**Max.**	**Units**
Output voltage	Current sourced = 500mA	4.8	5	5.2	V
Output current		600	650		mA
Short-circuit		NOT protected			
Over-voltage		NOT protected			
ESD protection	Human body model	±2			kV

† Stresses beyond values listed under “absolute maximum ratings” may cause permanent damage to the device. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

[1] All differential input pins have internal 120Ω termination resistors connected across

[2] “FS” stands for “Full Scale”