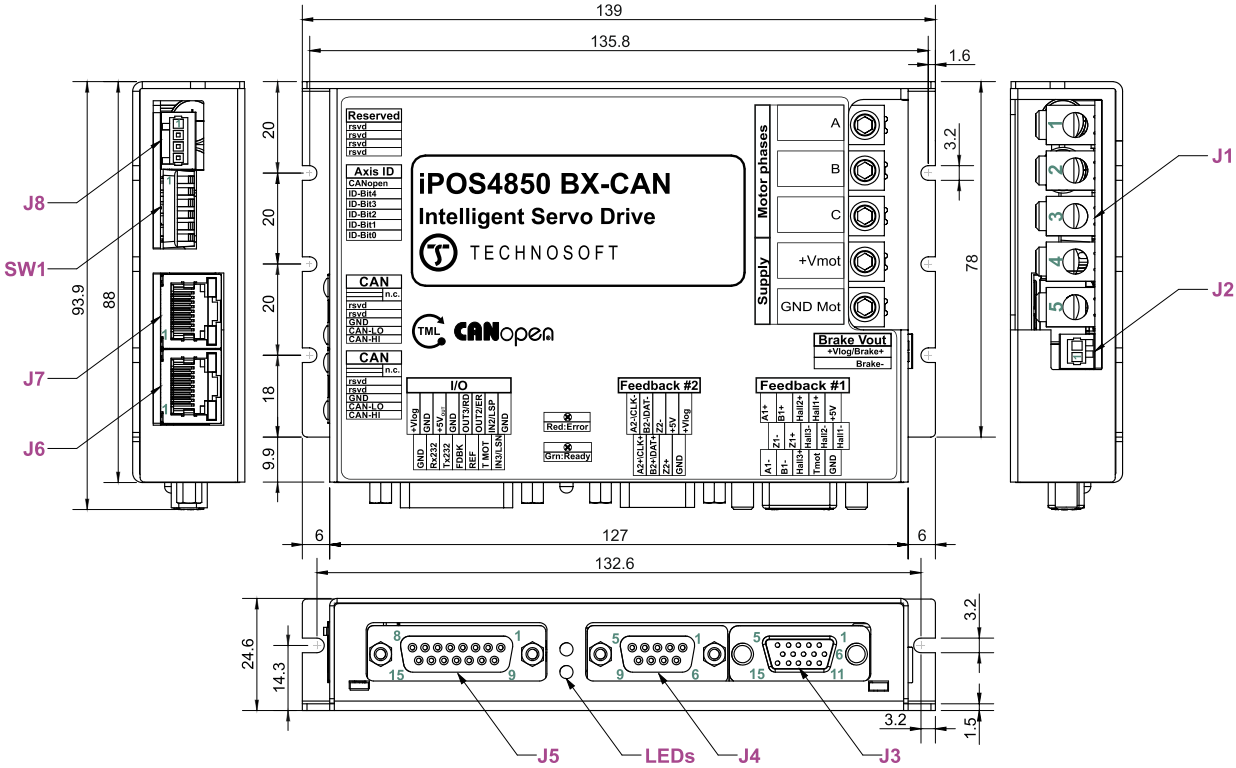
iPOS4850 BX-CAN DATASHEET
P/N: P029.200.E201



Global tolerance [mm]	0.1

All dimensions are in mm. Drawings not to scale.

Features

- Motion controller and drive in a single compact unit based on MotionChip™ technology
- Universal solution for control of rotary and linear brushless and brushed motors
- PMSM and BLDC motion control capability
- Motor supply: 11-60V; Logic supply: 9-36V
- Output current with / without external heat sink:
  - Nominal: 45 / 35.4A_{RMS} (64 / 50A sinusoidal amplitude)
  - Peak: 64A_{RMS} (90A sinusoidal amplitude)
- Thermal Protection: The internal temperature sensor disables the PWM outputs if the measured temperature exceeds 95ºC
- Feedback Devices (dual-loop support)
  - 1st feedback devices supported:
    - Incremental encoder interface (differential)
  - 2nd feedback devices supported:
    - Incremental encoder interface (differential)
    - pulse & direction interface (differential) for external (master) digital reference
    - BiSS / SSI / EnDAT[1] encoder interface
- Digital Hall sensor interface (differential)
- 2 digital PNP inputs, 7-36V: 2 limit switches
- 2 digital outputs, 5-36V, NPN open-collector: Ready, Error 0.5A
- Solenoid driver for motor brake, 2A, commanded by OUT0
- 2 analogue inputs, 12-bit, 0-5V: Reference and Feedback (for Tacho), or general purpose
- CAN-bus 2.0B interface (±58V max voltage)
- 32 h/w addresses selectable by DIN switch
- TMLCAN and CANopen (CiA 301 v4.2, CiA 305 v.2.2.13 and CiA 402 v3.0) protocols selectable by DIN switch
- 16k x 16 SRAM memory for data acquisition
- 16k x 16 E^2ROM to store setup data, TML motion programs, cam tables and other user data

Mating Connectors

Ref	Producer	Part No.	Description
J2**	Wago	733-102	Pluggable terminal block 2-pole Pin spacing 2.5 mm
J3	generic 15-pin High Density D-Sub male		Feedback #1 + Digital Hall input
J4	generic		9-pin Sub-D male
J5	generic 15-pin D-Sub male, DB15		I/O; Analog; RS232
J6&J7	Standard 8P8C modular jack (RJ-45) male		
J8	-	-	Reserved. Do not connect.
J1*	High AMP wire. 4mm HEX socket. AWG 6-16 wire gauge. Strip: - min 8 mm for cables with isolation diameter less than 6.5 mm; - min 12 mm/ max 15 mm for cables with isolation diameter bigger than 6.5 mm.		
	Avoid generating metal debris/filings into drive from the wire leads! In case of multi-stranded wires, a proper ferrule must be used as wire terminal.		

* For more recommendations about wires and ferrules, check the User Manual of the drive.

** Connector delivered with the drive

Sensor \ Motor	PMSM	BLDC	DC BRUSH
Incr. Encoder	✓		✓
Incr. Encoder + Dig. Hall	✓	✓	
Digital Hall Only	✓		
SSI / BiSS-C / EnDAT[1]	✓	✓	✓
Tacho			✓

[1] Available starting with F514K firmware version

	Pin	Name	Type	Description
J1	1	A/A+	O	Phase A for 3-ph motors, Motor+ for DC brush motors
	2	B/A-	O	Phase B for 3-ph motors, Motor- for DC brush motors
	3	C	O	Phase C for 3-ph motors
	4	$+V_{MOT}$	I	Positive terminal of the motor supply input: 11 to $60V_{DC}$
	5	GND	-	Ground for motor supply

	Pin	Name	Type	Description
J2	1	BRAKE-	O	Negative terminal for the motor brake input; commanded as OUT0
	2	BRAKE+	O	Positive terminal for the motor brake input; connected internally to +Vlog to pin

	Pin	Name	Type	Description
J3	1	$+5V_{OUT}$	O	5V output supply for I/O usage
	2	Hall 1+	I	Digital input Hall 1+ diff. sensor input; has 120Ω resistor between pins 2 and 6
	3	Hall 2+	I	Digital input Hall 2+ diff. sensor input; has 120Ω resistor between pins 3 and 7
	4	B1+	I	Incr. encoder 1 B+ diff. input; has 120Ω resistor between pins 4 and 14
	5	A1+	I	Incr. encoder 1 A+ diff. input; has 120Ω resistor between pins 5 and 15
	6	Hall 1-	I	Digital input Hall 1- diff. sensor input; has 120Ω resistor between pins 2 and 6
	7	Hall 2-	I	Digital input Hall 2- diff. sensor input; has 120Ω resistor between pins 3 and 7
	8	Hall 3-	I	Digital input Hall 3- diff. sensor input; has 120Ω resistor between pins 13 and 8
	9	Z1+	I	Incr. encoder 1 Z+ diff. input; has 120Ω resistor between pins 9 and 10
	10	Z1-	I	Incr. encoder 1 Z- diff. input; has 120Ω resistor between pins 9 and 10
	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	Hall 3+	I	Digital input Hall 3+ diff. sensor input; has 120Ω resistor between pins 13 and 8
	14	B1-	I	Incr. encoder 1 B- diff. input; has 120Ω resistor between pins 4 and 14
	15	A1-	I	Incr. encoder 1 A- diff. input; has 120Ω resistor between pins 5 and 15

	Pin	Name	Type	Description
J4	1	$+V_{LOG}$	I	Positive terminal of the logic supply input: 12 to $36V_{DC}$
	2	$+5V_{OUT}$	O	5V output supply
	3	Z2-	I	Incr. encoder 2 Z- diff. input; has 120Ω resistor between pins 3 and 7
	4	B2-/ Dir-/ Data-/SL-	I	Incr. encoder 2 B- diff. input, or Dir-, or Data- for SSI & EnDAT, or Slave- for BiSS; has 120Ω resistor between pins 4 and 8
	5	A2-/ Pulse-/CLK-/MA-	I	Incr. encoder 2 A- diff. input, or Pulse-, or Clock- for SSI & EnDAT, or Master- for BiSS; has 120Ω resistor between pins 5 and 9
	6	GND	-	Ground
	7	Z2+	I	Incr. encoder 2 Z+ diff. input; has 120Ω resistor between pins 3 and 7
	8	B2+/ Pulse+/ Data+/ SL+	I	Incr. encoder 2 B+ diff. input, or Dir+, or Data+ for SSI & EnDAT, or Slave+ for BiSS; has 120Ω resistor between pins 4 and 8
	9	A2+/ Pulse+/ CLK+/ MA+	I	Incr. encoder 2 A+ diff. input, or Pulse+, or Clock+ for SSI & EnDAT, or Master+ for BiSS; has 120Ω resistor between pins 5 and 9

	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
J8	1 to 4	rsvd	-	Reserved. do not connect.

	Pin	Name	Type	Description
J5	1	GND	-	Ground
	2	IN2/LSP	I	5-36V digital PNP 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	GND	-	Ground
	6	$+5V_{OUT}$	O	5V output supply
	7	GND	-	Ground
	8	$+V_{LOG}$	I	Positive terminal of the logic supply input: 9 to $36V_{DC}$ from SELV/ PELV type power supply
	9	IN3/LSN	I	5-36V digital PNP input. Negative limit switch input
	10	Temp Mot	I	Analogue input, 12-bit, 0-3.3V. Used to read an analog temperature value
	11	REF	I	Analogue input, 12-bit, 0-5V
	12	FDBK	I	Analogue input, 12-bit, 0-5V
	13	232TX	O	RS-232 Data Transmission
	14	232RX	I	RS-232 Data Reception
	15	GND	-	Ground

	Pin	Name	Type	Description
SW1	1	CANopen	-	ON (down): CANopen communication protocol OFF (up): TMLCAN communication protocol
	2	ID-Bit4	-	Hardware AxisID selection switches All ON – AxisID= 31 All OFF – AxisID = 255 in TMLCAN or 127 in CANopen
	3	ID-Bit3	-	
	4	ID-Bit2	-	
	5	ID-Bit1	-	
	6	ID-Bit0	-	

Electrical characteristics

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

- T_{amb} = 24ºC, V_{LOG} = 24 VDC; V_{MOT} = 48VDC
- Supplies start-up / shutdown sequence: any
- Load current (sinusoidal amplitude) = 64A

Operating Conditions		Min.	Typ.	Max.	Units
Ambient temperature		0		+40	ºC
Ambient humidity	Non-condensing	0		90	%Rh
Altitude / pressure[1]	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**
Mounted on heatsink	It is necessary to mount the iPOS4850 BX-CAN on a metallic heatsink using the provided mounting holes. If the integrated internal thermal sensor exceeds 95ºC, the drive outputs turn off.				

[1] iPOS4850 BX-CAN 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.

Environmental Characteristics		Min.	Typ.	Max.	Units
Size (Length x Width x Height)	Without mating connectors	139 x 93.9 x 24.6			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	see theoretical chart			
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	24	36	V_{DC}
	Absolute maximum values, drive operating but outside guaranteed parameters		8	24	40	V_{DC}
	Absolute maximum values, surge (duration ≤ 10ms)†		-1		+45	V
Supply current	No enc. No Load on Digital Outputs	$+V_{LOG}$ = 9V		280		mA
		$+V_{LOG}$ = 12V		200		
		$+V_{LOG}$ = 24V		130		
		$+V_{LOG}$ = 36V		90		

Motor Supply Input ($+V_{MOT}$)		Min.	Typ.	Max.	Units
Supply voltage	Nominal values	12	48	60	V_{DC}
	Absolute maximum values, drive operating but outside guaranteed parameters	11		70	V_{DC}
	Absolute maximum values, surge (duration ≤ 10ms)†	-1		75	V
Supply current	Idle		1	5	mA
	Operating	-50	±10	+50	A
	Absolute maximum value, short circuit condition (duration ≤ 10ms)†			100	A

Motor Outputs (A/A+, B/A-, C)			Min.	Typ.	Max.	Units
Nominal current	Sinusoidal RMS [1]				45	A_{RMS}
	Sinusoidal RMS [2]				35.4	
	Sinusoidal amplitude [1]				64	A
	Sinusoidal amplitude [2]				50	
Peak current	maximum 13s with 6 AWG wires, external heatsink		-90		+90	A
Short-circuit protection threshold					±100	A
Short-circuit protection delay			5	10		µs
Off-state leakage current				±0.5	±1	mA
Motor inductance (phase-to-phase)	Recommended value, for current ripple max. ±5% of full range; $+V_{MOT}$ = 48 V	F_{PWM}				µH
		20 kHz	330			
		40 kHz	150			
		60 kHz	120			
	Minimum value, limited by short-circuit protection; $+V_{MOT}$ = 48 V	20 kHz	120			µH
		40 kHz	40			
		60 kHz	30			
Motor electrical time-constant (L/R)	Recommended value for ±5% current measurement error	20 kHz	250			µs
		40 kHz	125			
		60 kHz	100			
Current measurement	FS = Full Scale accuracy			±5	±8	%FS

Digital Inputs (IN2/LSP, IN3/LSN)			Min.	Typ.	Max.	Units
Mode compliance			PNP			
Default state	Input floating (wiring disconnected)		Logic LOW			
Input voltage	Logic "LOW"		-10	0	3.3	V
	Logic "HIGH"		6.7		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"	Vlog=24V		9.15		
		Vlog=36V		13.7		
Input frequency			0		150	kHz
Minimum pulse			3.3			µs
ESD protection	Human body model 0.1nF 1.5kΩ		±1			kV

Digital Outputs (OUT2/Error, OUT3/Ready)			Min.	Typ.	Max.	Units
Mode compliance	All outputs (OUT2/Error, OUT3/Ready)		NPN 24V			
Default state	Not supplied ($+V_{LOG}$ floating or to GND)		High-Z (floating)			
	Immediately after power-up	OUT2/Error, OUT3/Ready	Logic "LOW"			
	Normal operation	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	
	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, OUT2/Error, OUT3/Ready				0.5	A
	Logic "HIGH", source current; external load to GND; V_{OUT} >= 2.0V	OUT2/Error, OUT3/ Ready			2	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

Digital Hall Inputs (Hall1+, Hall1-, Hall2+, Hall2-, Hall3+, Hall3-)[3]		Min.	Typ.	Max.	Units
Differential mode compliance	For full RS422 compliance, see[3]	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	A1+/A1-, B1+/B1-, Z1+/Z1-, A2+/A2-, B2+/B2-, Z2+/Z2-		120		Ω
Input frequency	Differential mode	0		10	MHz
Minimum pulse width	Differential mode	50			ns

Encoder Inputs (A1+, A1-, B1+, B1-, Z1+, Z1-, A2+, A2-, B2+, B2-, Z2+, Z2-)[3]		Min.	Typ.	Max.	Units
Differential mode compliance	For full RS422 compliance, see[3]	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	A1+/A1-, B1+/B1-, Z1+/Z1-, A2+/A2-, B2+/B2-, Z2+/Z2-		120		Ω
Input frequency	Differential mode	0		10	MHz
Minimum pulse width	Differential mode	50			ns

[1] With adequate thermal heat sink
[2] No thermal heat sink (worst case scenario)
[3] All differential input pins have internal 120Ω termination resistors connected across

BiSS/SSI Encoder Interface		Min.	Typ.	Max.	Units
Differential mode (CLOCK, DATA)	For full RS422 compliance, see [1]	TIA/EIA-422			
CLOCK Output voltage	Differential; 50Ω differential load	2.0	2.5	5.0	V
	Common-mode, referenced to GND	2.3	2.5	2.7	
CLOCK frequency	Software selectable	1000, 2000, 3000			kHz
DATA Input hysteresis	Differential mode	±0.1	±0.2	±0.5	V
Data input impedance	Termination resistor on-board		120		Ω
DATA Input common mode range	Referenced to GND	-7		+12	
	Absolute maximum, surge (duration≤1s) †	-25		+25	
DATA format	Software selectable	Binary / Gray			
		Single-turn / Multi-turn			
		Counting direction			
DATA resolution	Single-turn			56	Bits
	Multi-turn and single-turn			56	
	If total resolution >31 bits, some bits must be ignored by software setting to achieve a max 31 bits resolution				

Analog 0…5V Inputs (REF,FDBK)		Min.	Typ.	Max.	Units
Input voltage	Operational range	0		5	V
	Absolute maximum values, continuous	-12		+18	
	Absolute maximum, surge (duration ≤ 1s) †			±36	
Input impedance	To GND		14.7		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

CAN-Bus		Min.	Typ.	Max	Units
Compliance		ISO11898			
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 DIN switches	1-31 & 255			TMLCAN
		1-31 & 255(LSS inactive)			CANopen
	Software	1- 255 (TMLCAN); 1-127 (CANopen)			
Voltage, CAN-Hi or CAN-Lo to GND		-58		58	V
ESD protection	Human body model	±8			kV

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

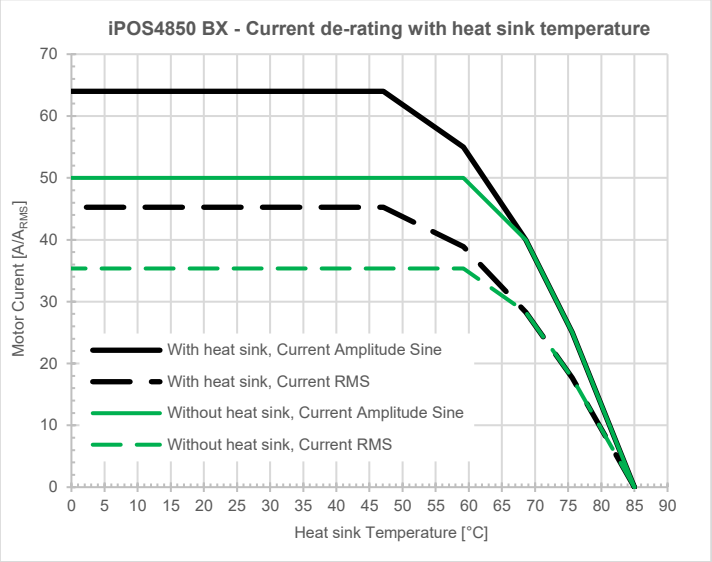
Solenoid Driver (OUT0/Brake)			Min.	Typ.	Max.	Units
Brake+/Brake-: solenoid driver, 2A, overcurrent protected (Brake+ connected internally to +Vlog). Current flows into solenoid from Brake+ to Brake-; commanded by OUT0 digital output						
Default state	Not supplied (+V_{LOG} floating or to GND)		High-Z (floating)			
	Immediately after power-up	Brake-	High-Z (floating)			
	Normal operation	Brake-	High-Z (floating)			
Output voltage	Logic "LOW" (Brake-)				0.2	V
	Logic "HIGH"; load present			+Vlog		
	Logic "HIGH", no load present			+5V		
	Absolute maximum, continuous		-0.5		55	
Output current	Logic "LOW", sink current, continuous, Brake-				2	A
	Logic "HIGH", leakage current; external load to +V_{LOG}; V_{OUT} = V_{LOG} max = 55V				0.2	mA

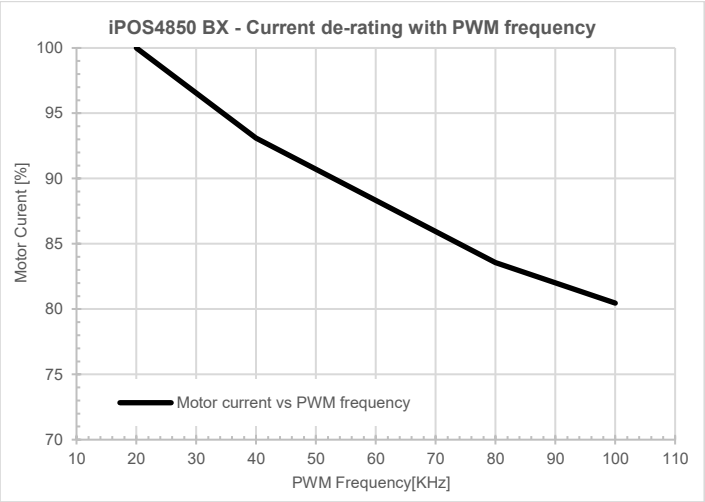
Supply Output (+5V)		Min.	Typ.	Max	Units
Output voltage	Current sourced = 500mA	4.8	5	5.2	V
Output current				450	mA
Short-circuit		protected			
Over-voltage		NOT protected			
ESD protection	Human body model 0.1nF 1.5 kΩ	±2			kV

Operating temperature		Min.	Typ.	Max	Units
Ambient Temperature	Non condensing	0		40	°C
		Ambient temperature can exceed 40ºC if the internal emperature sensor measures less than 95ºC			

Conformity		Min.	Typ.	Max.	Units
EU Declaration	2014/30/EU (EMC), 2014/35/EU (LVD), 2011/65/EU (RoHS), 1907/2006/EC (REACH), 93/68/EEC (CE Marking Directive), EC 428/2009 (non dual-use item, output frequency limited to 590Hz)				

† 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"