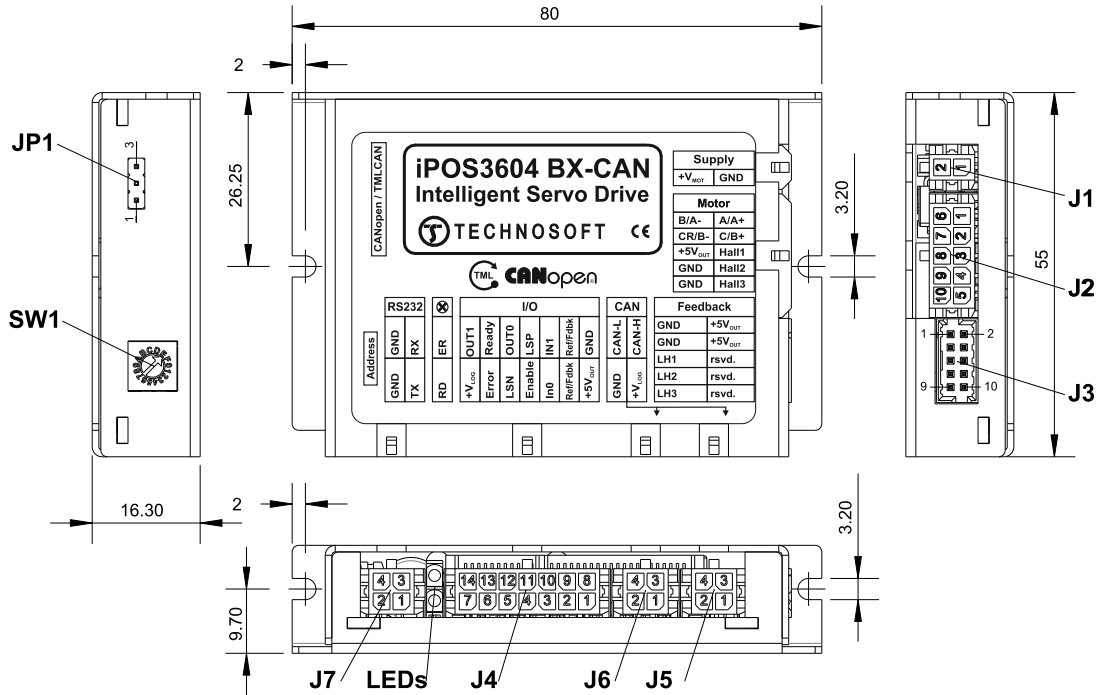




# iPOS3604 BX-CAN Linear Halls

## DATASHEET

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All dimensions are in mm.

Motor – sensor configurations						
Sensor	Motor	PMSM	BLDC	DC BRUSH	STEP (2-ph)	STEP (3-ph)
Linear Halls		Ⓣ				
Tacho				Ⓣ		
Open-loop (no sensor)					Ⓣ	Ⓣ

Mating Connector				
Producer	Part No.	Connector	Description	Wire Gauge
MOLEX	43025-0200	J1	MICROFIT RECEPTACLE HOUSING, 2x1 WAY	AWG 20..24
MOLEX	43025-0400	J5,J6,J7	MICROFIT RECEPTACLE HOUSING, 2x2 WAY	AWG 20..24
MOLEX	43025-1000	J2	MICROFIT RECEPTACLE HOUSING, 2x5 WAY	AWG 20..24
MOLEX	43025-1400	J4	MICROFIT RECEPTACLE HOUSING, 2x7 WAY	AWG 20..24
MOLEX	43030-0007	J1,J2,J4,J5,J6,J7	CRIMP PIN, MICROFIT, 5A	AWG 20..24
MOLEX	51110-1056	J3	MILLIGRID RECEPTACLE HOUSING, 2x5 WAY	AWG 24..30
MOLEX	50394-8400	J3	CRIMP PIN, MILLIGRID	AWG 24..30

Features
<ul style="list-style-type: none"> <li>Motor supply: 9-36V. Optional logic supply: 9-36V</li> <li>Output current: 4A cont. (BLDC mode); 10A<sub>PEAK</sub>, up to 100KHz PWM</li> <li>Digital Hall sensor interface (single-ended and open collector)</li> <li>Linear Hall sensors interface               <ul style="list-style-type: none"> <li>5 digital inputs, 5-36V, PNP or NPN software selectable: Enable, 2 for limit switches, 2 general-purpose</li> </ul> </li> <li>4 digital outputs, 5-36V, 0.5A, NPN open-collector: Ready, Error, 2 general-purpose</li> <li>1 analogue input: 12-bit, 0-5V: Reference/Feedback or general purpose</li> <li>RS-232 serial &amp; CAN-bus 2.0B interfaces with H/W selectable addresses</li> <li>TMLCAN and CANopen (CiA 301 v4.2 and CiA 402 v3.0) protocols selectable by jumper</li> <li>2K × 16 SRAM for data acquisition</li> <li>4K × 16 E<sup>2</sup>ROM to store TML motion programs and data</li> <li>Operating ambient temperature: -40 ... 40°C (over 40°C with derating)</li> <li>Hardware Protections: short-circuit between motor phases and from motor phases to GND, over-voltage, under-voltage and I<sup>2</sup>t</li> <li>Firmware: F523E+</li> </ul>

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Connector Description			
Pin	Name	Type	Description
J1	1	GND	- Negative return (ground) of the power supply
	2	+V <sub>MOT</sub>	I Positive terminal of the motor supply: 9 to 36V <sub>DC</sub> / Positive terminal of the logic supply if J4 pin 7 not connected

Pin	Name	Type	Description
J2	1	A/A+	O <b>Phase A</b> for 3-ph motors, A+ for 2-ph steppers, Motor+ for DC brush motors
	2	C/B+	O <b>Phase C</b> for 3-ph motors, B+ for 2-ph steppers
	3	Hall 1	I Digital input Hall 1 sensor
	4	Hall 2	I Digital input Hall 2 sensor
	5	Hall 3	I Digital input Hall 3 sensor
	6	B/A-	O <b>Phase B</b> for 3-ph motors, A- for 2-ph steppers, Motor- for DC brush motors
	7	CR/B-	O <b>Chopping resistor / Phase B-</b> for step motors
	8	+5V <sub>OUT</sub>	O 5V output supply - internally generated
	9	GND	- Negative return (ground) of the motor supply
	10	GND	- Negative return (ground) of the motor supply

Pin	Name	Type	Description
J3	1	GND	- Return ground for sensors supply
	2	+5V <sub>OUT</sub>	O 5V output supply for I/O usage
	3	GND	- Return ground for sensors supply
	4	+5V <sub>OUT</sub>	O 5V output supply for I/O usage
	5	LH1	I Linear Hall 1 input
	6	rsvd.	I Reserved. Do not connect.
	7	LH2	I Linear Hall 2 input
	8	rsvd.	I Reserved. Do not connect.
	9	LH3	I Linear Hall 3 input
	10	rsvd.	I Reserved. Do not connect.

Pin	Name	Type	Description
J4	1	+5V <sub>OUT</sub>	O 5V output supply for I/O usage
	2	Reserved	- Reserved. Do not connect.
	3	IN0	I 5-36V general-purpose digital PNP/NPN input
	4	IN4/Enable	I 5-36V digital PNP input. Drive enable input
	5	IN3/LSN	I 5-36V digital PNP input. Negative limit switch input
	6	OUT2/Error	O 5-36V 0.5A, drive Error output, active low, NPN open-collector/TTL pull-up. Also drives the red LED
	7	+V <sub>LOG</sub>	I Positive terminal of the logic supply: 9 to 36V <sub>DC</sub> / If not connected, the logic supply is automatically routed from J1 pin 2 <sup>1</sup>
	8	GND	- Return ground for I/O pins
	9	REF/FDBK	I Analogue input, 12-bit, 0-5V. Used to read an analogue position/speed reference or feedback, or used as general purpose analogue input
	10	IN1	I 5-36V general-purpose digital PNP/NPN input
	11	IN2/LSP	I 5-36V digital PNP/NPN input. Positive limit switch input
	12	OUT0	O 5-36V 0.5A, general-purpose digital output, NPN open-collector/TTL pull-up
	13	OUT3/Ready	O 5-36V 0.5A, drive Ready output, active low, NPN open-collector/TTL pull-up. Also drives the green LED.
	14	OUT1	O 5-36V 0.5A, general-purpose digital output, NPN open-collector/TTL pull-up

Pin	Name	Type	Description
J5, J6	1	+V <sub>LOG</sub>	O Positive terminal of the logic supply: 9 to 36V <sub>DC</sub>
	2	GND	- Return ground for CAN-Bus
	3	Can-Hi	I/O CAN-Bus positive line (dominant high)
	4	Can-Lo	I/O CAN-Bus negative line (dominant low)

Pin	Name	Type	Description
J7	1	232TX	O RS-232 Data Transmission
	2	GND	- Return ground for RS-232 pins
	3	232RX	I RS-232 Data Reception
	4	GND	- Return ground for RS-232 pins

### Electrical characteristics

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

- T<sub>amb</sub> = -40...40°C, V<sub>LOG</sub> = 24 VDC; V<sub>MOT</sub> = 36VDC
- Supplies start-up / shutdown sequence: -any-
- Load current (sinusoidal amplitude / continuous BLDC, DC, stepper) = 4A

Operating Conditions		Min.	Typ.	Max.	Units
Ambient temperature <sup>2</sup>		-40		+40	°C
Ambient humidity	Non-condensing	0		90	%Rh
Altitude / pressure <sup>3</sup>	Altitude (vs. sea level)	-0.1	0 ± 2.5	2	Km
	Ambient Pressure	0 <sup>2</sup>	0.75 ± 1	10.0	atm
Storage Conditions		Min.	Typ.	Max.	Units
Ambient temperature		-40		+85	°C
Ambient humidity	Non-condensing	0		100	%Rh
Ambient Pressure		0		10.0	atm
Mechanical Mounting		Min.	Typ.	Max.	Units
Airflow		natural convection <sup>4</sup> , closed box			
Environmental Characteristics		Min.	Typ.	Max.	Units
Size ( Length x Width x Height )	Without mating connectors	80 x 55 x 16.3			mm
	With recommended mating connectors.	~3.15 x 2.17 x 0.64			inch
Weight	Without mating connectors	70			g
	Power dissipation	Idle (no load)	1		W
Efficiency	Operating	3	5		%
Cleaning agents	Dry cleaning is recommended	Only Water- or Alcohol- based			
Protection degree	According to IEC60529, UL508	IP20			-
Logic Supply Input (+V <sub>LOG</sub> )		Min.	Typ.	Max.	Units
Supply voltage	Nominal values	9		36	V <sub>DC</sub>
	Absolute maximum values, drive operating but outside guaranteed parameters	5.9		39	V <sub>DC</sub>
	Absolute maximum values, continuous	0		39	V <sub>DC</sub>
Supply current	Absolute maximum values, surge (duration ≤ 10ms) <sup>†</sup>	0		+45	V
	No Load on Digital Outputs	+V <sub>LOG</sub> = 9V	125	300	mA
		+V <sub>LOG</sub> = 12V	80	200	
		+V <sub>LOG</sub> = 24V	50	125	
	+V <sub>LOG</sub> = 39V	40	100		
Motor Supply Input (+V <sub>MOT</sub> )		Min.	Typ.	Max.	Units
Supply voltage	Nominal values	9		36	V <sub>DC</sub>
	Absolute maximum values, drive operating but outside guaranteed parameters	8.5		40	V <sub>DC</sub>
	Absolute maximum values, continuous	0		42	V <sub>DC</sub>
	Absolute maximum values, surge (duration ≤ 10ms) <sup>†</sup>	0		+45	V
Supply current	Idle		1	5	mA
	Operating	-10	±4	+10	A
	Absolute maximum value, short-circuit condition (duration ≤ 10ms) <sup>†</sup>			15	A

<sup>1</sup> If +V<sub>LOG</sub> (J4 pin7) is not connected, the digital outputs and inputs will not be operational.

<sup>2</sup> Operating temperature can be extended up to +65°C with reduced current and power ratings.

<sup>3</sup> iPOS360x 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.

<sup>4</sup> It is recommended to mount the iPOS3604 BX-CAN on a metallic support using the provided mounting holes, for better reliability and reduced de-rating due to heat dissipation

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# iPOS3604 BX-CAN Linear Halls

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Motor Outputs (A/A+, B/A-, C/B+, CR/B-)		Min.	Typ.	Max.	Units
Nominal output current, continuous	for DC brushed, steppers and BLDC motors with Hall-based trapezoidal control			4	A
	for PMSM motors with FOC sinusoidal control (sinusoidal amplitude value)			4	
	for PMSM motors with FOC sinusoidal control (sinusoidal effective value)			2.82	
Motor output current, peak	maximum 2.5s	-10		+10	A
Short-circuit protection threshold	measurement range		±13	±15	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 <sub>MOT</sub> = 36 V	F <sub>PWM</sub>			µH
		20 kHz	250		
		40 kHz	120		
		60 kHz	100		
		80 kHz	60		
	Minimum value, limited by short-circuit protection; +V <sub>MOT</sub> = 36 V	20 kHz	75		µH
		40 kHz	25		
		60 kHz	20		
		80 kHz	10		
		100 kHz	5		
Motor electrical time-constant (L/R)	Recommended value for ±5% current measurement error	20 kHz	250		µs
		40 kHz	125		
		60 kHz	100		
		80 kHz	63		
		100 kHz	50		
Current measurement	FS = Full Scale accuracy		±4	±8	%FS
Digital Inputs (IN0, IN1, IN2/LSP, IN3/LSN, IN4/Enable)		Min.	Typ.	Max.	Units
Mode compliance		PNP			
Default state	Input floating (wiring disconnected)	Logic LOW			
Input voltage	Logic "LOW"		0	1.6	V
	Logic "HIGH"	1.8	24	39	
	Floating voltage (not connected)		0		
	Absolute maximum, continuous	-10		+39	
	Absolute maximum, surge (duration ≤ 1s) <sup>†</sup>	-20		+40	
Input current	Logic "LOW"; pulled to GND		0	0	mA
	Logic "HIGH"		2.9	3.4	
Mode compliance		NPN / TTL / CMOS / LVTTTL (3.3V) / Open-collector			
Default state	Input floating (wiring disconnected)	Logic HIGH			
Input voltage	Logic "LOW"	2	5+24		V
	Logic "HIGH"		3		
	Floating voltage (not connected)	-10		+30	
	Absolute maximum, continuous	-20		+40	
	Absolute maximum, surge (duration ≤ 1s) <sup>†</sup>	2	5+24		
Input current	Logic "LOW"; Pulled to GND		0.6	1	mA
	Logic "HIGH"; Internal 4.7KΩ pull-up to +3.3	0	0	0	
	Logic "HIGH"; Pulled to +5V		0.15	0.2	
	Logic "HIGH"; Pulled to +24V		2	2.5	
Input frequency		0		150	kHz
Minimum pulse		3.3			µs
ESD protection	Human body model	±5			kV

Digital Outputs (OUT0, OUT1, OUT2/Error, OUT3/ Ready)		Min.	Typ.	Max.	Units	
Mode compliance	All outputs (OUT0, OUT1, OUT2/Error, OUT3/Ready)	TTL / CMOS / Open-collector / NPN 24V				
Default state	Not supplied (+V <sub>LOG</sub> 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 OUT3/Ready		Logic "HIGH"		
Output voltage	Logic "LOW"; output current = 0.5A		0.2	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 <sub>LOG</sub>		V <sub>LOG</sub>			
	Absolute maximum, continuous	-0.5		V <sub>LOG</sub> +0.5		
	Absolute maximum, surge (duration ≤ 1s) <sup>†</sup>	-1		V <sub>LOG</sub> +1		
Output current	Logic "LOW", sink current, continuous			0.5	A	
	Logic "LOW", sink current, pulse ≤ 5 sec.			1	A	
	Logic "HIGH", source current; external load to GND; V <sub>OUT</sub> ≥ 2.0V	OUT2/Error, OUT3/ Ready			2	mA
		OUT0, OUT1			4	mA
	Logic "HIGH", leakage current; external load to +V <sub>LOG</sub> ; V <sub>OUT</sub> = V <sub>LOG</sub> max = 40V		0.1	0.2	mA	
	Minimum pulse width		2		µs	
ESD protection	Human body model	±15			kV	
Linear Hall Inputs (LH1, LH2, LH3)		Min.	Typ.	Max.	Units	
Mode compliance		TTL / CMOS / Open-collector				
Default state	Input floating (wiring disconnected)	Logic HIGH				
Input voltage	Logic "LOW"		0	0.8	V	
	Logic "HIGH"	2	5			
	Floating voltage (not connected)		4.4			
	Absolute maximum, surge (duration ≤ 1s) <sup>†</sup>	-10		+15		
	Logic "LOW"; Pull to GND			1.2		
Input current	Logic "HIGH"; Internal 4.7KΩ pull-up to +5	0	0	0	mA	
	Logic "LOW"; Pull to GND			1.2		
Minimum pulse width		2		µs		
ESD protection	Human body model	±5			kV	
Analog Input (REF/FDBK)		Min.	Typ.	Max.	Units	
Input voltage	Operational range	0	0.5+4.5	4.9	V	
	Absolute maximum values, continuous	-7		+7		
	Absolute maximum, surge (duration ≤ 1s) <sup>†</sup>	-11		+14		
Input current	Input voltage 0...+5V	-1	±0.9	+1	mA	
Interpolation Resolution	Depending on software settings			11	bits	
Frequency		0		1	KHz	
ESD protection	Human body model	±1			kV	
Input impedance	To GND		30		kΩ	
Resolution			12		bits	
Integral linearity				±2	bits	
Offset error				±2	bits	
Gain error				±1%	% FS <sup>1</sup>	
Bandwidth (-3dB)	Software selectable	0		1	kHz	
ESD protection	Human body model	±5			kV	

<sup>1</sup> "FS" stands for "Full Scale"

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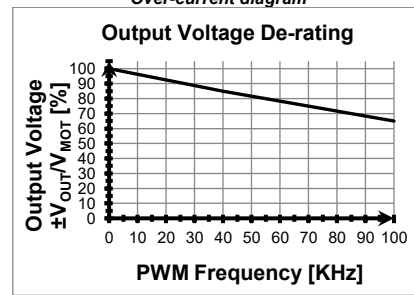
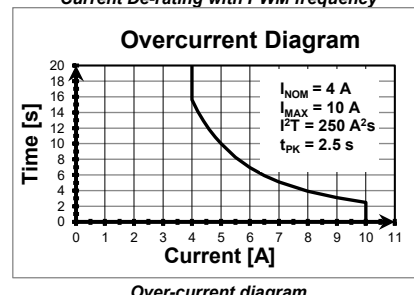
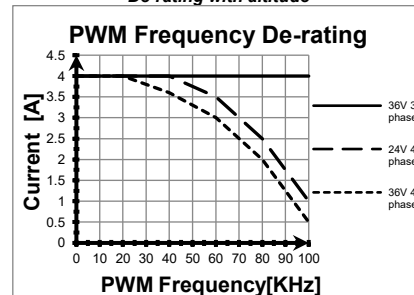
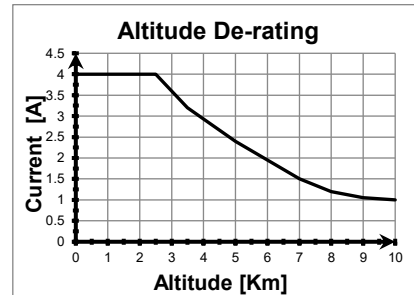
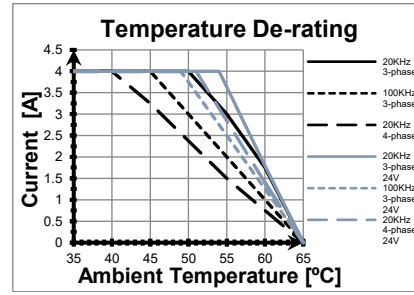
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RS-232		Min.	Typ.	Max.	Units
Compliance		TIA/EIA-232-C			
Bit rate	Software selectable	9600		115200	Baud
Short-circuit	232TX short to GND	Guaranteed			
ESD protection	Human body model	±2			kV
CAN-Bus		Min.	Typ.	Max.	Units
Compliance		ISO11898, CiA-301v4.2, 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 ÷ 15 & 255			
	Software	1 ÷ 127; 255 (CANopen); 1- 255 (TLMCAN)			
ESD protection	Human body model	±15			kV
Supply Output (+5V)		Min.	Typ.	Max.	Units
Output voltage	Current sourced = 350mA	4.8	5	5.2	V
Output current		250	350		mA
Short-circuit		Yes / Drive resets at event			
Over-voltage		NOT protected			
ESD protection	Human body model	±1			kV
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.



<sup>1</sup>  $V_{OUT}$  – the output voltage,  $V_{MOT}$  – the motor supply voltage

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