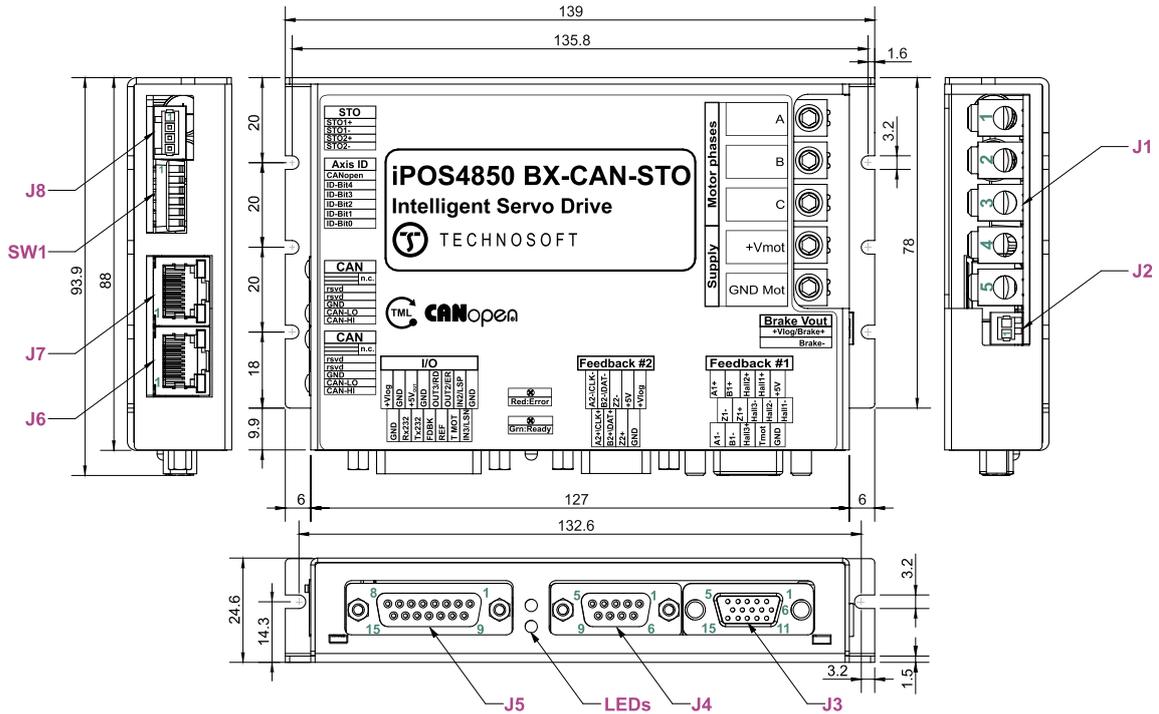




iPOS4850 BX-CAN-STO DATASHEET

P/N: P029.300.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: <ul style="list-style-type: none"> ▪ 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 95°C	
▪ Feedback Devices (dual-loop support)	
1 st feedback devices supported:	
▪ Incremental encoder interface (differential)	
2 nd feedback devices supported:	
▪ Incremental encoder interface (differential)	
▪ pulse & direction interface (differential) for external (master) digital reference	
▪ BiSS / SSI / EnDAT ¹ encoder interface	
▪ *STO: 2 safe torque-off inputs, 18-36V, safety integrity level (SIL3/Cat3/PLe) acc. to EN61800-5-1;-2/ EN61508-3;-4/ EN ISO 13849-1.	
▪ 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 OUTH0	
▪ 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 ² ROM to store setup data, TML motion programs, cam tables and other user data	

*The STO circuit must be supplied with minimum 18V to enable PWM output

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	9-pin Sub-D male		Feedback #2
J5	generic	15-pin D-Sub male, DB15	I/O; Analog; RS232
J6&J7	-	-	Standard 8P8C modular jack (RJ-45) male
J8**	Wago	733-104	Pluggable terminal block 4-pole Pin spacing 2.5 mm
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.		<p>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.</p>

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

** Connector delivered with the drive

	Motor	PMSM	BLDC	DC BRUSH
Sensor				
Incr. Encoder	Ⓢ	Ⓢ		Ⓢ
Incr. Encoder + Dig. Hall	Ⓢ	Ⓢ	Ⓢ	
Digital Hall Only	Ⓢ			
SSI / BiSS-C	Ⓢ	Ⓢ		Ⓢ
Tacho				Ⓢ

¹ Available starting with F514K firmware version

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Pin	Name	Type	Description
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
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 +V _{log} to pin

Pin	Name	Type	Description
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
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
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
1	STO1+	I	Safe Torque Off input 1, positive input (opto-isolated, 18+36V)
2	STO1-	I	Safe Torque Off input 1, negative return (opto-isolated, 0V)
3	STO2+	I	Safe Torque Off input 2, positive input (opto-isolated, 18+36V)
4	STO2-	I	Safe Torque Off input 2, negative return (opto-isolated, 0V)

Apply between both STO1+, STO2+ and STO1-, STO2- 24V DC from SELV/ PELV power supply for motor PWM output operation

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

Electrical characteristics

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

- T_{amb} = 24°C, 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 ¹		0		+40	°C	
Ambient humidity		Non-condensing		0	90	%Rh
Altitude / pressure ²		Altitude (vs. sea level)		-0.1	0 + 2	km
		Ambient Pressure		0 ²	0.75 + 1	10.0
Storage Conditions		Min.	Typ.	Max.	Units	
Ambient temperature		-40		+85	°C	
Ambient humidity		Non-condensing		0	100	%Rh
Ambient Pressure		0		10.0	atm	

¹ For extended temperature range, down to -30°C, a special execution is required.

² 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.

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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 95°C, the drive outputs turn off.				
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} = 48V	F _{PWM}			µH
		20 kHz	330		
		40 kHz	150		
		60 kHz	120		
	Minimum value, limited by short-circuit protection; +V _{MOT} = 48V	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			
	Logic "LOW"	-10	0	3.3	V
Logic "HIGH"	6.7		36		
Floating voltage (not connected)	0				
Absolute maximum, continuous	-10				
Absolute maximum, surge (duration ≤ 1s) †	-20				
Input current	Logic "LOW"; pulled to GND	0			
	Logic "HIGH"	V _{LOG} =24V	9.15		
		V _{LOG} =36V	13.7		
Input frequency		0		150	kHz
Minimum pulse		3.3			µs
ESD protection	Human body model 0.1nF 1.5 kΩ	±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, OUT3/Ready		Logic "HIGH"	
Output voltage	Logic "LOW"; output current = 0.5A			0.8	V
	Logic "HIGH"; output current = 0, no load	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			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
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 ⁴
Bandwidth (-3dB)	Software selectable	0		1	kHz
ESD protection	Human body model	±2			kV

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

⁴ "FS" stands for "Full Scale"

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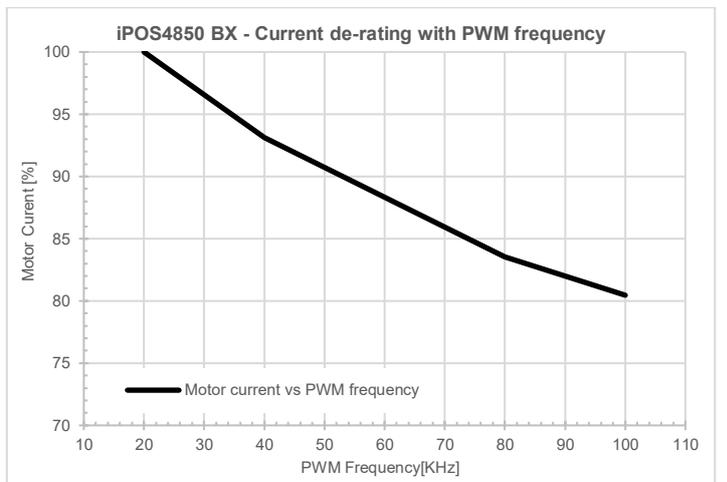
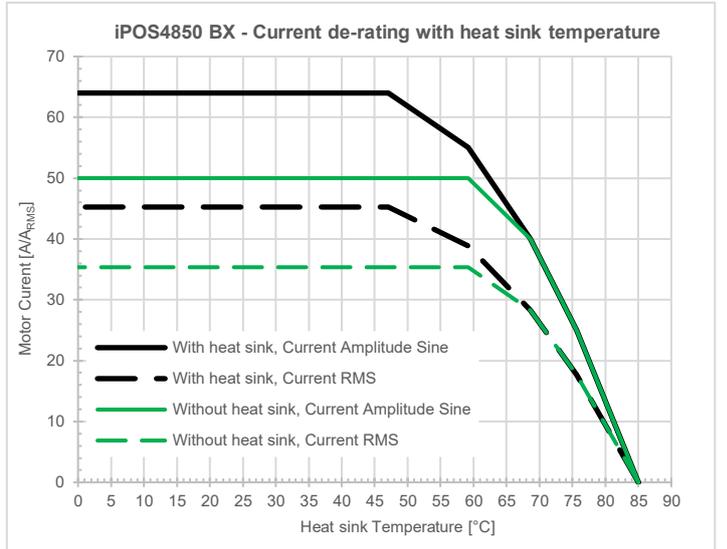
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BISS/SSI Encoder Interface		Min.	Typ.	Max.	Units
Differential mode (CLOCK, DATA)	For full RS422 compliance, see ¹	TIA/EIA-422			
CLOCK Output voltage	Differential; 50Ω differential load	2.0	2.5	5.0	V
	Common-mode, referenced to GND	2.3	2.5	2.7	
CLOCK 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			
DATA resolution	Single-turn	Counting direction			Bits
		Multi-turn and single-turn			
		If total resolution >31 bits, some bits must be ignored by software setting to achieve a max 31 bits resolution			
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
Default state	Not supplied (+V _{LOG} floating or to GND)	High-Z (floating)			
Output voltage	Immediately after power-up	Brake-			V
	Normal operation	Brake-			
	Logic "LOW" (Brake-)			0.2	
Output current	Logic "HIGH", load present		+V _{LOG}		A
	Logic "HIGH", no load present		+5V		
	Absolute maximum, continuous	-0.5		55	
Output current	Logic "LOW", sink current, continuous, Brake-			2	mA
	Logic "HIGH", leakage current; external load to +V _{LOG} ; V _{OUT} = V _{LOG} max = 55V			0.2	
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			°C
		Ambient temperature can exceed 40°C if the internal temperature sensor measures less than 95°C			
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)				
Reliability data		Min.	Typ.	Max.	Units
MTBF	MIL-HDBK-217F, Notice 2, TEMP = 25°C, ENV: GB		37.11		years

Safe torque OFF (STO1+, STO1-, STO2+, STO2+)		Min	Typ	Max.	Units
Safety function	According to EN61800-5-2	STO (Safe Torque OFF)			
EN 61800-5-1/-2 and EN 61508-5-3/-4 Classification	Safety Integrity Level	safety integrity level 3 (SIL3)			
EN13849-1 Classification	PFHd (Probability of Failures per Hour - dangerous)	8*10 ⁻¹⁰		hour ⁻¹ (0.8 FIT)	
	Performance Level	Cat3/PLe			
Mode compliance	MTTFd (meantime to dangerous failure)	377		years	
Default state	Input floating (wiring disconnected)	Logic LOW			
Input voltage	Logic "LOW" (PWM operation disabled)	-20		5.6	V
	Logic "HIGH" (PWM operation enabled)	18		36	
	Absolute maximum, continuous	-20		+40	
Input current	Logic "LOW"; pulled to GND	0			mA
	Logic "HIGH", pulled to +V _{LOG}	5	13		
Repetitive test pulses (High-low-high)	Ignored high-low-high		5		ms
				20	Hz
Fault reaction time	From internal fault detection to register DER bit 14 = 1 and OUT2/Error high-to-low			30	ms
PWM operation delay	From external STO low-high transition to PWM operation enabled			30	ms
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

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