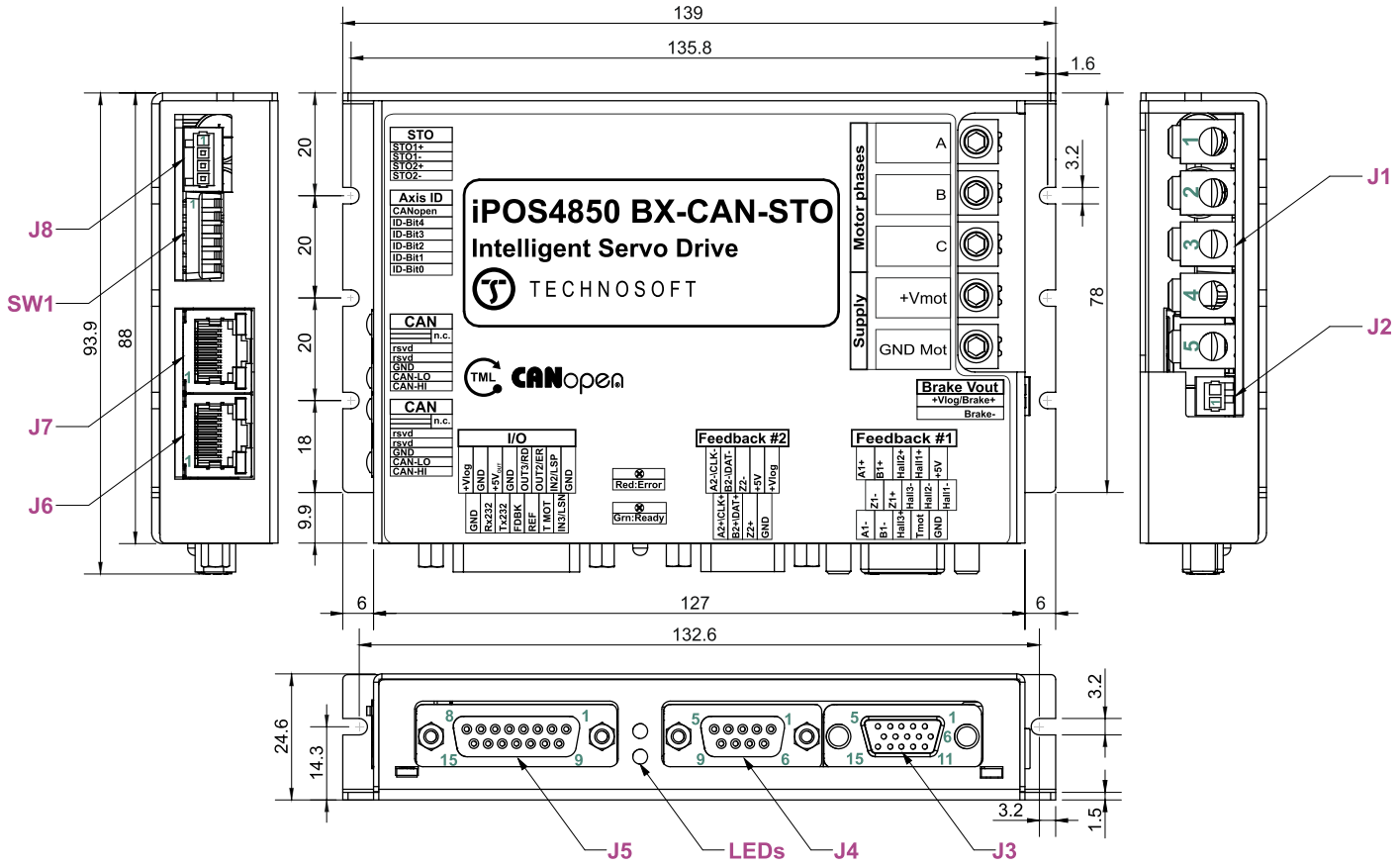


iPOS4850 BX-CAN-STO DATASHEET

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⊕ 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, brushed and 3-phase step motors
▪	PMSM and BLDC motion control capability
▪	Motor supply: 11-60V; Logic SELV/ PELV supply: 9-36V
▪	Output current with external heat sink: 50A cont. (BLDC mode) / 90A _{PEAK}
▪	Thermal Protection: The internal temperature sensor disables the PWM outputs if the measured temperature exceeds 85°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 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 OUT0
▪	3 analogue inputs, 0-5V: (1) Feedback; (2) Reference; (3) Motor Temperature

▪	CAN-bus 2.0B interface (±58V max voltage)
▪	32 h/w addresses selectable by h/w 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
			High AMP wire. 4mm HEX socket. Strip max 12mm, min 8mm. AWG 6-16 wire gauge. Avoid generating metal debris/filings into drive from the wire leads!
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	Wago	733-104	Pluggable terminal block 4-pole Pin spacing 2.5 mm

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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. encoder1 B+ diff. input; has 120Ω resistor between pins 4 and 14
5	A1+	I	Incr. encoder1 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. encoder1 Z+ diff. input; has 120Ω resistor between pins 9 and 10
10	Z1-	I	Incr. encoder1 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. encoder1 B- diff. input; has 120Ω resistor between pins 4 and 14
15	A1-	I	Incr. encoder1 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. encoder2 Z- diff. input; has 120Ω resistor between pins 3 and 7
4	B2-/ Dir-/ Data-/SL-	I	Incr. encoder2 B- diff. input, or Dir-, or Data- for SSI, or Slave- for BiSS; has 120Ω resistor between pins 4 and 8
5	A2-/ Pulse-/CLK-/MA-	I	Incr. encoder2 A- diff. input, or Pulse-, or Clock- for SSI, or Master- for BiSS; has 120Ω resistor between pins 5 and 9
6	GND	-	Ground
7	Z2+	I	Incr. encoder2 Z+ diff. input; has 120Ω resistor between pins 3 and 7
8	B2+/ Pulse+/ Data+/SL+	I	Incr. encoder2 B+ diff. input, or Dir+, or Data+ for SSI, or Slave+ for BiSS; has 120Ω resistor between pins 4 and 8
9	A2+/ Pulse+/CLK+/MA+	I	Incr. encoder2 A+ diff. input, or Pulse+, or Clock+ for SSI, 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	-	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} = 24°C, V_{LOG} = 24 VDC; V_{MOT} = 48VDC
- Supplies start-up / shutdown sequence: any
- Load current (sinusoidal amplitude / continuous BLDC, DC, stepper) = 50A

Operating Conditions	Min.	Typ.	Max.	Units
Ambient temperature	0		+40	°C
Ambient humidity	Non-condensing	0	90	%Rh
Altitude / pressure ¹	Altitude (vs. sea level)	-0.1	0 ÷ 2	km
	Ambient Pressure	0 ²	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

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.

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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 85°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 output current, continuous	for DC brushed, steppers and BLDC motors with Hall-based trapezoidal control ¹			50	A
	for PMSM motors with FOC sinusoidal control (sinusoidal amplitude value) ¹			50	A
	for PMSM motors with FOC sinusoidal control (sinusoidal effective value) ¹			35.3	Arms
Motor output current, peak	maximum 10s 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		
	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"	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	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	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-) ²		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	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; V_{MOT} IN and V_{MOT} OUT wires must be 6 AWG

² All differential input pins have internal 120Ω termination resistors connected across

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Encoder Inputs (A1+, A1-, B1+, B1-, Z1+, Z1-, 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	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
BiSS/SSI Encoder Interface		Min.	Typ.	Max.	Units
Differential mode (CLOCK, DATA) ¹	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 (+Vlog 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 +Vlog; V _{OUT} = V _{LOG} max = 55V			0.2	mA
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 61508-3/-4 Classification	Safety Integrity Level	safety integrity level 3 (SIL3)			
	PFHd (Probability of Failures per Hour - dangerous)	8*10 ⁻¹⁰		hour ⁻¹ (0.8 FIT)	
EN13849-1 Classification	Performance Level	Cat3/PLe			
	MTTFd (meantime to dangerous failure)	377			years
Mode compliance		PNP			
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 +Vlog		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
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

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

² "FS" stands for "Full Scale"

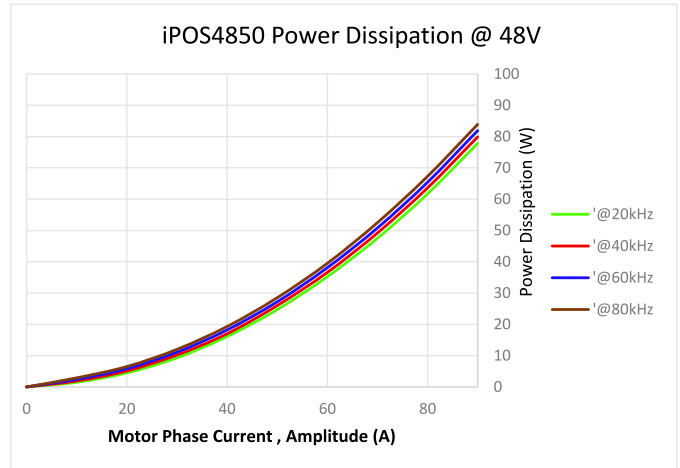
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Operating temperature		Min.	Typ.	Max	Units
Ambient Temperature	Non condensing	0		40	°C
		Ambient temperature can exceed 40 °C if the internal temperature sensor measures less than 85 °C			
Conformity		Min.	Typ.	Max.	Units
EU Declaration		2014/30/EU (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)			

† 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.



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