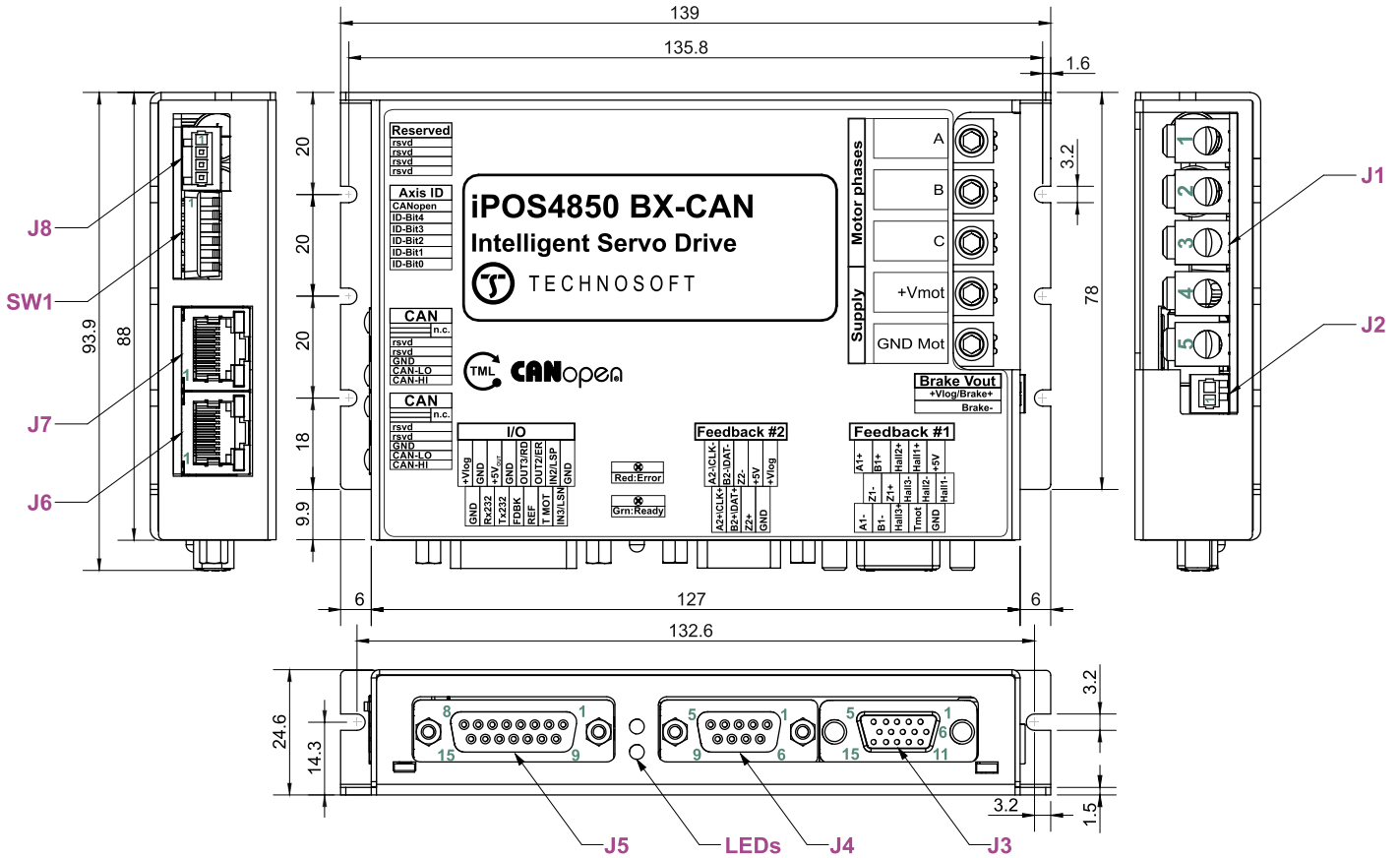


# iPOS4850 BX-CAN DATASHEET

## 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, brushed and 3-phase step motors
- PMSM and BLDC motion control capability
- Motor supply: 11-60V; Logic supply: 9-36V
- Output current with external heat sink: 50A cont. (BLDC mode) / 90A<sub>PEAK</sub>
- Thermal Protection: The internal temperature sensor disables the PWM outputs if the measured temperature exceeds 85°C
- Feedback Devices (dual-loop support)
  - 1<sup>st</sup> feedback devices supported:
    - Incremental encoder interface (differential)
  - 2<sup>nd</sup> feedback devices supported:
    - Incremental encoder interface (differential)
    - pulse & direction interface (differential) for external (master) digital reference
    - BiSS / SSI 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
- 3 analogue inputs, 12-bit, 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<sup>2</sup>ROM to store setup data, TML motion programs, cam tables and other user data

### Mating Connectors

Ref	Producer	Part No.	Description
			High AMP wire. 4mm HEX socket. Strip max 12mm, min 8mm. AWG 6-16 wire gauge. <b>Avoid generating metal debris/filings into drive from the wire leads!</b>
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.

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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 <sub>MOT</sub>	I Positive terminal of the motor supply input: 11 to 60V <sub>DC</sub>
	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 +V <sub>log</sub> to pin

Pin	Name	Type	Description
J3	1	+5V <sub>OUT</sub>	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
J4	1	+V <sub>Log</sub>	I Positive terminal of the logic supply input: 12 to 36V <sub>DC</sub>
	2	+5V <sub>OUT</sub>	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
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 <sub>OUT</sub>	O 5V output supply
	7	GND	- Ground
	8	+V <sub>Log</sub>	I Positive terminal of the logic supply input: 9 to 36V <sub>DC</sub> 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	-
	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<sub>amb</sub> = 24°C, V<sub>LOG</sub> = 24 VDC; V<sub>MOT</sub> = 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 <sup>1</sup>	Altitude (vs. sea level)	-0.1	0 ± 2	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

<sup>1</sup> 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
	With mating connectors	~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 <sub>LOG</sub> )		Min.	Typ.	Max.	Units
Supply voltage	Nominal values	9	24	36	V <sub>DC</sub>
	Absolute maximum values, drive operating but outside guaranteed parameters	8	24	40	V <sub>DC</sub>
	Absolute maximum values, surge (duration ≤ 10ms) <sup>†</sup>	-1		+45	V
Supply current	No enc. No Load on Digital Outputs	+V <sub>LOG</sub> = 9V		280	mA
		+V <sub>LOG</sub> = 12V		200	
		+V <sub>LOG</sub> = 24V		130	
		+V <sub>LOG</sub> = 36V		90	
Motor Supply Input (+V <sub>MOT</sub> )		Min.	Typ.	Max.	Units
Supply voltage	Nominal values	12	48	60	V <sub>DC</sub>
	Absolute maximum values, drive operating but outside guaranteed parameters	11		70	V <sub>DC</sub>
	Absolute maximum values, surge (duration ≤ 10ms) <sup>†</sup>	-1		75	V
Supply current	Idle		1	5	mA
	Operating	-50	±10	+50	A
	Absolute maximum value, short-circuit condition (duration ≤ 10ms) <sup>†</sup>			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 <sup>1</sup>			50	A
	for PMSM motors with FOC sinusoidal control (sinusoidal amplitude value) <sup>1</sup>			50	A
	for PMSM motors with FOC sinusoidal control (sinusoidal effective value) <sup>1</sup>			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 <sub>MOT</sub> = 48 V	F <sub>PWM</sub>			µH
		20 kHz	330		
		40 kHz	150		
	Minimum value, limited by short-circuit protection; +V <sub>MOT</sub> = 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) <sup>†</sup>	-20		+40		
Input current	Logic "LOW"; pulled to GND		0		mA	
	Logic "HIGH"	V <sub>LOG</sub> =24V	9.15			
		V <sub>LOG</sub> =36V	13.7			
Input frequency		0		150	kHz	
Minimum pulse width		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 <sub>LOG</sub> floating or to GND)	High-Z (floating)				
	Immediately after power-up	OUT2/Error, OUT3/Ready		Logic "LOW"		
	Normal operation	OUT2/Error		Logic "HIGH"		
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
	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, OUT2/Error, OUT3/Ready			0.5	A	
	Logic "HIGH", source current; external load to GND; V <sub>OUT</sub> ≥ 2.0V			2	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	
Digital Hall Inputs (Hall1+, Hall1-, Hall2+, Hall2-, Hall3+, Hall3-) <sup>2</sup>		Min.	Typ.	Max.	Units	
Differential mode compliance	For full RS422 compliance, see <sup>1</sup>	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	

<sup>1</sup> With adequate thermal heat sink; V<sub>mot</sub> IN and V<sub>mot</sub> OUT wires must be 6 AWG

<sup>2</sup> All differential input pins have internal 120Ω termination resistors connected across

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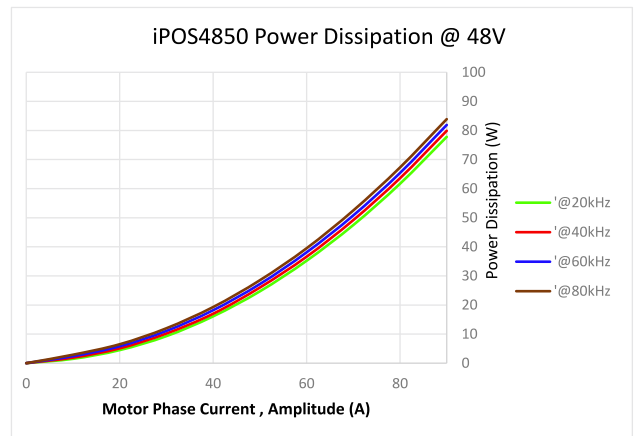
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Encoder Inputs (A1+, A1-, B1+, B1-, Z1+, Z1-, A2+, A2-, B2+, B2-, Z2+, Z2-) <sup>1</sup>		Min.	Typ.	Max.	Units
Differential mode compliance	For full RS422 compliance, see <sup>1</sup>	TIA/EIA-422-A			
Input voltage	Hysteresis	±0.06	±0.1	±0.2	V
	Differential 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) <sup>1</sup>	For full RS422 compliance, see <sup>1</sup>	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) <sup>†</sup>	-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) <sup>†</sup>			±36	
Input impedance	To GND		14.7		kΩ
Resolution		12			bits
Integral linearity			±2	±10	bits
Offset error			±2	±10	bits
Gain error			±1%	±3%	% FS <sup>2</sup>
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 <sub>LOG</sub> 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 <sub>LOG</sub> ; V <sub>OUT</sub> = V <sub>LOS</sub> 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 1.5kΩ	±2			kV
Operating temperature		Min.	Typ.	Max.	Units
Ambient Temperature	Non condensing	0			°C
		40			
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)			

<sup>†</sup> 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> All differential input pins have internal 120Ω termination resistors connected across

<sup>2</sup> "FS" stands for "Full Scale"

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