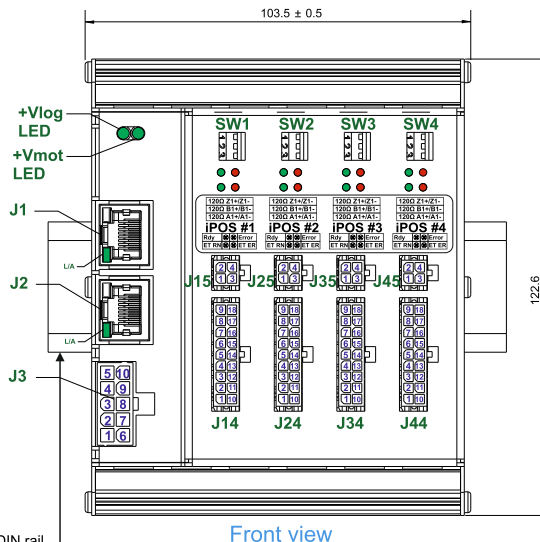
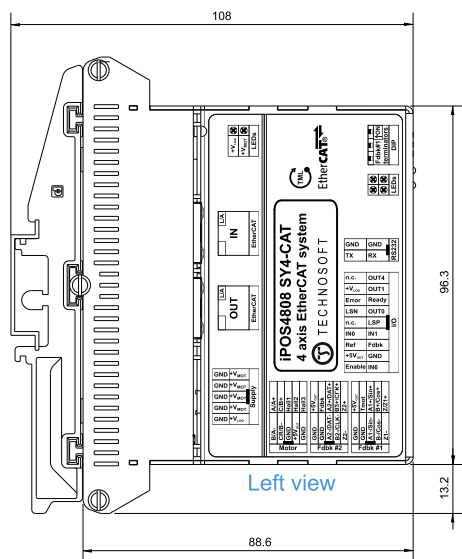


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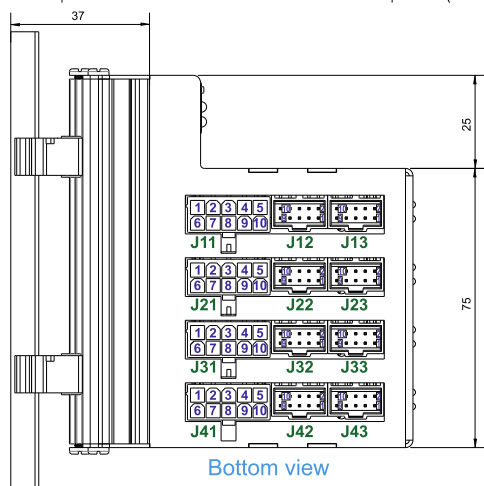
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NS35 DIN rail (not included)

Also compatible with the following DIN rail (IEC60715) types: TS/NS35 x 7.5, TS/NS35 x 15 (top hat "omega" profiles), TS/NS32 x 15 ("G" profile)



Mating Connectors				
Producer	Part No.	Connector	Description	Wire Gauge
MOLEX	39-03-9102	J3, J11, J21, J31, J41	MINIFIT JR. receptacle housing, 2x5 way	AWG 18-20
MOLEX	45750-1111	J3, J11, J21, J31, J41	CRIMP PIN, MINIFIT JR., 13A	AWG 18-20
MOLEX	90142-0010	J12, J22, J32, J42, J13, J23, J33, J43	C-Grid III™ Crimp Housing Dual Row, 10 Circuits, with retention	AWG 22..24
	90143-0010	J12, J22, J32, J42, J13, J23, J33, J43	C-Grid III™ Crimp Housing Dual Row, 10 Circuits, without retention	
MOLEX	90119-0109	J12, J22, J32, J42, J13, J23, J33, J43	C-Grid III™ Crimp Terminal	AWG 22..24
MOLEX	43025-1800	J14, J24, J34, J44	MICROFIT RECEPTACLE HOUSING, 2x9 WAY	AWG 20..24
MOLEX	43025-0400	J15, J25, J35, J45	MICROFIT RECEPTACLE HOUSING, 2x2 WAY	AWG 20..24
MOLEX	43030-0007	J14, J24, J34, J44, J15, J25, J35, J45	CRIMP PIN, MICROFIT, 5A	AWG 20..24
-	-	J1, J2	Standard 8P8C modular jack (RJ-45) male	-

All dimensions are in mm; Drawing not to scale

Motor – sensor configurations					
Sensor \ Motor	PMSM	BLDC	DC BRUSH	STEP (2-ph)	STEP (3-ph)
Incr. Encoder	Ⓢ		Ⓢ	Ⓢ	
Incr. Encoder + Hall	Ⓢ	Ⓢ			
Analog Sin/Cos encoder	Ⓢ	Ⓢ	Ⓢ	Ⓢ	
SSI	Ⓢ	Ⓢ	Ⓢ	Ⓢ	
BiSS-C	Ⓢ	Ⓢ	Ⓢ	Ⓢ	
Linear Halls*	Ⓢ				
Tacho			Ⓢ		
Open-loop (no sensor)				Ⓢ	Ⓢ

*optional, please ask Technosoft for details

Features

- 4 axis compact EtherCAT motion system
- One supply connector; Motor: 12-50V. Logic: 12-36V
- Output current per axis: 8A cont. (BLDC mode); 20A_{PEAK}
- Feedback Devices per axis (dual-loop support)

1s¹ feedback devices supported:

- Incremental encoder interface (single ended or differential)
- pulse & direction interface (single ended)
- Analogue sin/cos encoder interface (differential 1V_{pp})

- Digital Hall sensor interface (single-ended and open collector)

2nd feedback devices supported:

- Incremental encoder interface (differential)
- pulse & direction interface (differential)
- BiSS / SSI encoder interface

- Integrated termination resistors for the 1st feedback connector of each axis, selectable by DIP switches

- TML instruction set for the definition / execution of standalone motion sequences that can be stored in internal E²ROM

- 6 digital inputs per axis, 12-36V, PNP/NPN programmable: 2 for limit switches, Enable, 3 general-purpose

- 5 digital outputs per axis, 5-36V, 0.5A, NPN open-collector: Ready, Error, 3 general-purpose

- 2 analogue inputs per axis: 12-bit, 0-5V: Reference, Feedback or general purpose

- RS-232 serial & dual 100Mbps RJ45 EtherCAT® interfaces

- EtherCAT® with CAN application protocol over EtherCAT (CoE), File over EtherCAT (FoE) and Ethernet over EtherCAT (EoE)

- 16k x 16 SRAM memory for data acquisition

- 16k x 16 E²ROM to store setup data, TML motion programs, cam tables and other user data

- Operating ambient temperature: 0-40°C (over 40°C with derating)

- NTC/PTC analogue Motor Temperature sensor input per axis

- Integrated fan with automatic speed control for thermal protection

- Protection to over-current, short-circuit, earth fault, over- / under-voltage, I2t, control error

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Connectors Description

Port	Name	Type	Description
J1	ECAT IN	I	EtherCAT standard RJ45 Ethernet IN port
J2	ECAT OUT	O	EtherCAT standard RJ45 Ethernet OUT port

Pin	Name	Type	Description
1..5	GND	-	Negative return (ground) of the power supply
6	+V _{LOG}	I	Positive terminal of the logic supply input: 9 to 36V _{DC}
7..10	+V _{MOT}	I	Positive terminal of the motor supply: 11 to 50V _{DC} .

Pin	Name	Type	Description
1	A/A+	O	Phase A for 3-ph motors, A+ for 2-ph steppers, Motor+ for DC brush motors
2	C/B+	O	Phase C 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	Phase B for 3-ph motors, A- for 2-ph steppers, Motor- for DC brush motors
7	CR/B-	O	Chopping resistor / Phase B- for step motors
8	GND	-	Negative return (ground) of the motor supply
9	+5V _{OUT}	O	5V output supply - internally generated
10	GND	-	Negative return (ground) of the motor supply

Pin	Name	Type	Description
1	Z1-	I	Incr. encoder1 Z- diff. input
2	Z1+	I	Incr. encoder1 Z single-ended, or Z+ diff. input
3	B1-/Cos-	I	Incr. encoder1 B- diff. input, or analogue encoder Cos- diff. input
4	B1+/Cos+/Dir	I	Incr. encoder1 B single-ended, or B+ diff. input, or Dir, or analogue encoder Cos+ diff. input
5	A1-/Sin-	I	Incr. encoder1 A- diff. input, or analogue encoder Sin- diff. input
6	A1+/Sin+/Pulse	I	Incr. encoder1 A single-ended, or A+ diff. input, or Pulse, or analogue encoder Sin+ diff. input
7	GND	-	Return ground for sensors supply
8	Temp Mot	I	NTC/PTC input. Used to read an analog temperature value
9	GND	-	Return ground for sensors supply
10	+5V _{OUT}	O	5V output supply for I/O usage


Pin	Name	Type	Description
1	Z2-	I	Incr. encoder2 Z- diff. input; has 120Ω resistor between pins 1 and 2
2	Z2+	I	Incr. encoder2 Z+ diff. input ; has 120Ω resistor between pins 1 and 2
3	B2-/Dir-/CLK-/MA-	I/O	Incr. encoder2 B- diff. input, or Dir-, or Clock- for SSI, or Master- for BiSS; has 120Ω resistor between pins 3 and 4
4	B2+/Dir+/C LK+/MA+	I/O	Incr. encoder2 B+ diff. input, or Dir+, or Clock+ for SSI, or Master+ for BiSS; has 120Ω resistor between pins 3 and 4
5	A2-/Pulse-/Data-/SL-	I	Incr. encoder2 A- diff. input, or Pulse-, or Data- for SSI, or Slave- for BiSS; has 120Ω resistor between pins 5 and 6
6	A2+/Pulse+/Data+/SL+	I	Incr. encoder2 A+ diff. input, or Pulse+, or Data+ for SSI, or Slave+ for BiSS; has 120Ω resistor between pins 5 and 6
7	GND	-	Return ground for sensors supply
8	FDBK	I	Analogue input, 12-bit, 0-5V. Used to read an analogue position or speed feedback (as tacho), or used as general purpose analogue input; Also connected to J14/J24/J34/J44 pin12.
9	GND	-	Return ground for sensors supply
10	+5V _{OUT}	O	5V output supply for sensors usage

Pin	Name	Type	Description
1	IN5	I	12-36V general-purpose digital PNP/NPN input
2	+5V _{OUT}	O	5V output supply for I/O usage
3	REF	I	Analogue input, 12-bit, 0-5V. Used to read an analog position, speed or torque reference, or used as general purpose analogue input
4	IN0	I	12-36V general-purpose digital PNP/NPN input
5	n.c.	-	not connected
6	IN3/LSN	I	12-36V digital PNP/NPN input. Negative limit switch input
7	OUT2/Error	O	5-36V 0.5A, drive Error output, active low, NPN open-collector/TTL pull-up. Also drives the red Error LED.
8	+V _{LOG}	I	Positive terminal of the logic supply: 9 to 36V _{DC}
9	n.c.	-	not connected
10	IN6	I	12-36V general-purpose digital PNP/NPN input
11	GND	-	Return ground for I/O pins
12	FDBK	I	Analogue input, 12-bit, 0-5V. Used to read an analogue position or speed feedback (as tacho), or used as general purpose analogue input; Connected also to J4 pin 8.
13	IN1	I	12-36V general-purpose digital PNP/NPN input
14	IN2/LSP	I	12-36V digital PNP/NPN input. Positive limit switch input
15	OUT0	O	5-36V 0.5A, general-purpose digital output, NPN open-collector/TTL pull-up
16	OUT3/Ready	O	5-36V 0.5A, drive Ready output, active low, NPN open-collector/TTL pull-up. Also drives the green Ready LED.
17	OUT1	O	5-36V 0.5A, general-purpose digital output, NPN open-collector/TTL pull-up
18	OUT4	O	5-36V 0.5A, general-purpose digital output, NPN open-collector/TTL pull-up

Pin	Name	Type	Description
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

SW1 (iPOS#1), SW2 (iPOS#2), SW3 (iPOS#3), SW4 (iPOS#4) Configuration selection DIP switch

Pin	Position	Description
1	down(ON)	Connect an 120Ω resistor between Z1+ and Z1- feedback pins
2	down(ON)	Connect an 120Ω resistor between B1+ and B1- feedback pins
3	down(ON)	Connect an 120Ω resistor between A1+ and A1- feedback pins

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Electrical characteristics per axis

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

- VLOG = 24 VDC; VMOT = 48VDC
- Supplies start-up / shutdown sequence: -any-
- Load current (sinusoidal amplitude / continuous BLDC, DC, stepper) = 8A

Operating Conditions		Min.	Typ.	Max.	Units
Ambient temperature		0		40 ^{1,3}	°C
Ambient humidity	Non-condensing	0		90	%Rh
Altitude / pressure ²	Altitude (vs. sea level)	-0.1	0 ± 2.5 ²		Km
	Ambient Pressure	0 ²	0.75 ± 1	10.0	atm
Storage Conditions		Min.	Typ.	Max.	Units
Ambient temperature		-40		105	°C
Ambient humidity	Non-condensing	0		100	%Rh
Ambient Pressure		0		10.0	atm
ESD capability (Human body model)	Not powered; applies to any accessible part			±0.5	kV
	Original packaging			±15	kV
Mechanical Mounting		Min.	Typ.	Max.	Units
Airflow		natural convection ³ , closed box			
Environmental Characteristics of the multi axis system					
Size (Length x Width x Height)	Without mating connectors	122.6 x 103.5 x 106.9			mm
	With recommended mating connectors	~4.83 x 4.07 x 4.21			inch
Weight	Without mating connectors	510			g
	With recommended mating connectors	~4.83 x 4.07 x 4.51			inch
Power dissipation	Idle (no load)	13.6			W
	Operating	34			W
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		36	V _{DC}
	Absolute maximum values, drive operating but outside guaranteed parameters	8		40	V _{DC}
	Absolute maximum values, surge (duration ≤ 10ms) [†]	-1		+45	V
Supply current	No Load on Digital Outputs	+V _{LOG} = 9V		1600	mA
		+V _{LOG} = 12V		1200	
		+V _{LOG} = 24V		600	
		+V _{LOG} = 39V		360	
Motor Supply Input (+V _{MOT})		Min.	Typ.	Max.	Units
Supply voltage	Nominal values	11		50	V _{DC}
	Absolute maximum values, drive operating but outside guaranteed parameters	9		52	V _{DC}
	Absolute maximum values, continuous	-0.6		54	V _{DC}
	Absolute maximum values, surge (duration ≤ 10ms) [†]	-1		+57	V
Supply current	Idle		4	20	mA
	Operating	-80	±32	+80	A
	Absolute maximum value, short-circuit condition (duration ≤ 10ms) [†]			100	A
Motor Outputs (A/A+, B/A-, C/B+, BR/B-) per axis		Min.	Typ.	Max.	Units
Nominal output current, continuous ⁴	for DC brushed, steppers and BLDC motors with Hall-based trapezoidal control			8	A
	for PMSM motors with FOC sinusoidal control (sinusoidal amplitude value)			8	
	for PMSM motors with FOC sinusoidal control (sinusoidal effective value)			5.66	
Motor output current, peak	maximum 2.5s	-20		+20	A
Short-circuit protection threshold		±22	±26	±30	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 _{MOT} = 36 V	F _{PWM}			µH
		20 kHz	330		
		40 kHz	150		
	Minimum value, limited by short-circuit protection; +V _{MOT} = 36 V	20 kHz	120		
		40 kHz	40		
		60 kHz	30		
Motor electrical time-constant (L/R)	Recommended value for ±5% current measurement error	80 kHz	15		µs
		100 kHz	8		
		20 kHz	250		
		40 kHz	125		
		60 kHz	100		
		80 kHz	63		
Current measurement	FS = Full Scale accuracy		±4	±8	%FS
Digital Inputs (IN0, IN1, IN2/LSP, IN3/LSN, IN5, IN6) ⁵					
Mode compliance		PNP			
Default state	Input floating (wiring disconnected)	Logic LOW			
Input voltage	Logic "LOW"	-10	0	2.2	V
	Logic "HIGH"	6.3	24	36	
	Hysteresis	1.2	2.4	2.8	
	Floating voltage (not connected)		0		
	Absolute maximum, continuous	-10		+39	
Input current	Absolute maximum, surge (duration ≤ 1s) [†]	-20		+40	mA
	Logic "LOW"; internal 2.7kΩ pull-down to GND		0		
Input frequency	Logic "HIGH"; pulled to +24V		8	10	kHz
Minimum pulse width		0		10	µs
ESD protection	Human body model	±5			kV
Mode compliance		NPN			
Default state	Input floating (wiring disconnected)	Logic HIGH			
Input voltage	Logic "LOW"		0	2.2	V
	Logic "HIGH"	6.3	24	36	
	Hysteresis	1.2	2.4	2.8	
	Floating voltage (not connected)		15		
	Absolute maximum, continuous	-10		+39	
Input current	Absolute maximum, surge (duration ≤ 1s) [†]	-20		+40	mA
	Logic "LOW"; Pulled to GND; V _{LOG} =24V		8	10	
Input frequency	Logic "HIGH"; Internal 2.7kΩ pull-up to +V _{LOG}		0	0	kHz
Minimum pulse width		0		10	µs
ESD protection	Human body model	±5			kV
Supply Output (+5V) per axis					
Output voltage	Current sourced = 250mA	4.8	5.15	5.25	V
Output current		600	650		mA
Short-circuit		Protected; axis resets			
Over-voltage		NOT protected			
ESD protection	Human body model	±15			kV


¹ Operating temperature at higher temperatures is possible with reduced current and power ratings

² iPOS4808 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.

³ In case of forced cooling (conduction or ventilation) the maximum ambient temperature can be increased substantially.

⁴ @20KHz F_{PWM}

⁵ The digital inputs are software selectable as PNP or NPN

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Digital Hall Inputs (Hall1, Hall2, Hall3) per axis		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) [†]	-10		+15	
Input current	Logic "LOW"; Pull to GND			5	mA
	Logic "HIGH"; Internal 1KΩ pull-up to +5	0	0	0	
Minimum pulse width		2			μs
ESD protection	Human body model	±5			kV
Encoder2 Inputs (A2+/Data+, A2-/Data-, B2+/Clk+, B2-/Clk-, Z2+, Z2-)		Min.	Typ.	Max.	Units
Differential mode compliance		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	A2+, B2+, Z2+ A2-, B2-, Z2-		120		Ω
Input frequency	Differential mode	0		10	MHz
Minimum pulse width	Differential mode	50			ns
Digital Outputs (OUT0, OUT1, OUT2/Error, OUT3/ Ready, OUT4)		Min.	Typ.	Max.	Units
Mode compliance	All outputs (OUT0, OUT1, OUT2/Error, OUT3/Ready)	TTL / open-collector / NPN 24V			
Default state	Not supplied (+V _{LOG} floating or to GND)	High-Z (floating)			
	Immediately after power-up	OUT0, OUT1, OUT4		Logic "HIGH"	
		OUT2/Error, OUT3/ Ready		Logic "LOW"	
Normal operation		OUT0, OUT1, 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}	4	4.5	5	
	Absolute maximum, continuous	-0.5		V _{LOG} +0.5	
	Absolute maximum, surge (duration ≤ 1s) [†]	-1		V _{LOG} +1	
Output current	Logic "LOW", sink current			0.5	A
	Logic "LOW", sink current, pulse ≤ 5 sec.			1	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


[†] 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.

Encoder1 Inputs (A1/A1+, A1-, B1/B1+, B1-, Z1/Z1+, Z1-)		Min.	Typ.	Max.	Units
Single-ended mode compliance	Leave negative inputs disconnected	TTL / CMOS / Open-collector			
Input voltage, single-ended mode A/A+, B/B+	Logic "LOW"			1.6	V
	Logic "HIGH"	1.8			
	Floating voltage (not connected)		3.3		
Input voltage, single-ended mode Z/Z+	Logic "LOW"			1.2	V
	Logic "HIGH"	1.4			
	Floating voltage (not connected)		4.7		
Input current, single-ended mode A/A+, B/B+, Z/Z+	Logic "LOW"; Pull to GND		5.5	6	mA
	Logic "HIGH"; Internal 2.2KΩ pull-up to +5	0	0	0	
Differential mode compliance	For full RS422 compliance, see ¹	TIA/EIA-422-A			
Input voltage, differential mode	Hysteresis	±0.06	±0.1	±0.2	V
	Common-mode range (A+ to GND, etc.)	-7		+7	
Input impedance, differential	A1+ to A1-, B1+ to B1-, Z1+ to Z1-		1		kΩ
Input frequency	Single-ended mode, Open-collector / NPN	0		5	MHz
	Differential mode, or Single-ended driven by push-pull (TTL / CMOS)	0		10	
Minimum pulse width	Single-ended mode, Open-collector / NPN	1			μs
	Differential mode, or Single-ended driven by push-pull (TTL / CMOS)	50			
Input voltage, any pin to GND	Absolute maximum values, continuous	-7		+7	V
	Absolute maximum, surge (duration ≤ 1s) [†]	-11		+14	
ESD protection	Human body model	±1			kV
Sin-Cos Encoder Inputs (Sin+, Sin-, Cos+, Cos-)		Min.	Typ.	Max.	Units
Input voltage, differential	Sin+ to Sin-, Cos+ to Cos-		1	1.25	V _{PP}
Input voltage, any pin to GND	Operational range	-1	2.5	4	V
	Absolute maximum values, continuous	-7		+7	
	Absolute maximum, surge (duration ≤ 1s) [†]	-11		+14	
Input impedance	Differential, Sin+ to Sin-, Cos+ to Cos- ²	4.2	4.7		kΩ
	Common-mode, to GND		2.2		
Resolution with interpolation	Software selectable, for one sine/cosine period	2		10	bits
Frequency	Sin-Cos interpolation	0		450	kHz
	Quadrature, no interpolation	0		10	
ESD protection	Human body model	±1			kV
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		28		kΩ
Resolution			12		bits
Integral linearity				±2.5	mV
Offset error				±37	mV
Gain error				±1%	% FS ³
Bandwidth (-3Db)	Software selectable	0		1	kHz
ESD protection	Human body model	±5			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

¹ For full RS-422 compliance, 120Ω termination resistors must be connected across the differential pairs, set SW1/2/3/4 pins 1,2 and 3 to ON.

² For many applications, a 120Ω termination resistor should be connected across SIN+ to SIN-, and across COS+ to COS- (set SW1/2/3/4 pins 2 and 3 to ON). Please consult the feedback device datasheet for confirmation.

³ "FS" stands for "Full Scale"

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