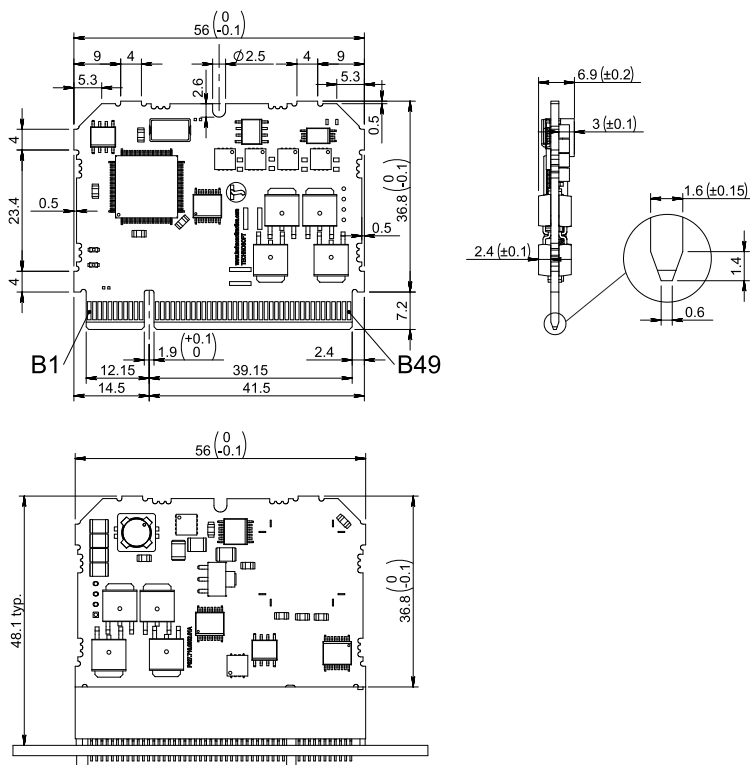
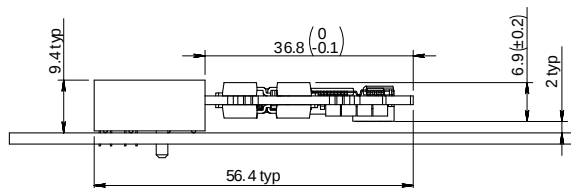



Overall dimensions for vertical mounting

Overall dimensions for horizontal mounting

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

Mating Connector		
Producer	Part No.	Description
Tyco	3-1775801-4	PCIe 8x vertical card edge connector, 1.0mm pitch, 2x49 contacts
Samtec	PCIE-098-02-F-D-TH	
Tyco	1761465-3	PCIe 8x horizontal card edge connector, 1.0 mm pitch, 2x49 contacts
Samtec	PCIE-098-02-F-D-RA	

Features

- Motor supply: 11-50V. Logic supply: 9-36V
- Output current: 8A cont. (BLDC mode); 20A_{PEAK}, up to 100KHz PWM
- Digital Hall sensor interface (single-ended and open collector)
- Incremental encoder interface (single-ended, open collector and differential)
- Linear Hall sensors interface
- Analogue sin/cos encoder interface (differential 1V_{pp})
- 8 digital inputs, 5-36V, NPN: Enable, 2 for limit switches, 5 general-purpose
- 5 digital outputs, 5-36V, 0.5A, NPN O.C.: Ready, Error, 3 general-purpose
- 2 analogue inputs: 12-bit, 0-5V: Reference, Feedback or gen. purpose
- RS-232 serial & CAN-bus 2.0B interfaces with h/w selectable addresses
- TMLCAN and CANopen (CiA 301v4.2 and 402v3.0) protocols
- 2K × 16 SRAM for data acquisition
- 4K × 16 E²ROM to store TML motion programs and data
- Hardware Protections: short-circuit between motor phases and from motor phases to GND, over-voltage, under-voltage and I²t
- Firmware: F508M+ or F523E+

Connector description

Pin	Name	Type	Description
A1	GND	-	Return ground for extension bus
A2-3	reserved	O	Reserved for interface extensions [†]
A4	reserved	I	Reserved for interface extensions [†]
A5	reserved	I/O	Reserved for interface extensions [†]
A6	OUT1	O	5-36V 0.5A digital output, NPN O.C. / TTL pull-up
A7	reserved	I/O	Reserved for interface extensions [†]
A8	Hall 1	I	Digital input Hall 1 sensor
A9	Hall 2	I	Digital input Hall 2 sensor
A10	Hall 3	I	Digital input Hall 3 sensor
A11	+5V _{OUT}	O	5V supply for sensors - internally generated
A12	GND	-	Return ground for sensors supply
A13	A- /Sin-/LH1	I	Incr. encoder A- diff. input, or analogue encoder Sin- diff. input, or linear Hall 1 input
A14	A/A+/Sin+	I	Incr. encoder A single-ended, or A+ diff. input, or analogue encoder Sin+ diff. input
A15	B-/Cos-/LH2	I	Incr. encoder B- diff. input, or analogue encoder Cos- diff. input, or linear Hall 2 input

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Pin	Name	Type	Description
A16	B+/Cos+	I	Incr. encoder B single-ended, or B+ diff. input, or analogue encoder Cos+ diff. input
A17	Z- /LH3	I	Incr. encoder Z- diff. input, or linear Hall 3 input
A18	Z+	I	Incr. encoder Z (index) single-ended, or Z+ diff. input
A19	Can-Hi	I/O	CAN-Bus positive line(dominant high)
A20	GND	-	Negative return (ground) of the logic supply
A21-22	reserved	O	Reserved for interface extensions†
A23-26	reserved	I	Reserved for interface extensions†
A27-33	GND	-	Negative return (ground) of the motor supply
A34	reserved	-	Reserved, not connected
A35-41	CR/B-	O	Chopping resistor / Phase B- for 2-ph steppers
A42	reserved	-	Reserved, not connected
A43-49	B/A-	O	Phase B for 3-ph motors, A- for 2-ph steppers, Motor- for DC brush motors

Pin	Name	Type	Description
B1	232TX	O	RS-232 Data Transmission
B2	232RX	I	RS-232 Data Reception
B3	GND	-	Return ground for CAN-Bus and RS-232 pins
B4	OUT0	O	5-36V 0.5A general-purpose digital output, NPN open-collector / TTL pull-up
B5	AxisID 0	I	Axis ID/Address input. 7 states: floating, strap to GND or +5V, resistor 4K7 or 22K to GND or +5V
B6	AxisID 1	I	Axis ID/Address input. 7 states: floating, strap to GND or +5V, resistor 4K7 or 22K to GND or +5V
B7	AxisID 2	I	Axis ID/Address input. 7 states: floating, strap to GND or +5V, resistor 4K7 or 22K to GND or +5V
B8	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
B9	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
B10	+5V _{OUT}	O	5V output supply for I/O usage
B11	OUT2/Error	O	5-36V 0.5A drive error output, active low, NPN open-collector/TTL pull-up. Also drives the red LED
B12	OUT3/Ready	O	5-36V 0.5A drive ready output, active low, NPN open-collector/TTL pull-up. Also drives the green LED.
B13	IN0	I	5-36V digital input General-purpose
B14	IN1	I	5-36V digital input
B15	IN2/LSP	I	5-36V digital input Positive limit switch input
B16	IN3/LSN	I	5-36V digital input. Negative limit switch input

Pin	Name	Type	Description
B17	IN4/Enable	I	5-36V digital input. Drive enable input
B18	Can-Lo	I/O	CAN-Bus negative line (dominant low)
B19	+V _{LOG}	I	Positive terminal of the logic supply: 9 to 36V _{DC}
B20	OUT5	O	5-36V 0.5A digital output, NPN O.C. / TTL pull-up
B21	IN7/Tmot	I	5-36V digital input / analogue 0-3.3V for motor temperature sensor
B22	reserved	-	Do not connect
B23	reserved	I	Reserved for interface extensions†
B24	IN5	I	5-36V digital input General-purpose
B25	IN6	I	5-36V digital input General-purpose
B26	reserved	-	Reserved, not connected
B27-33	+V _{MOT}	I	Positive terminal of the motor supply: 11 to 50V _{DC}
B34	reserved	-	Reserved, not connected
B35-41	C/B+	O	Phase C for 3-ph motors, B+ for 2-ph steppers
B42	reserved	-	Reserved, not connected
B43-49	A/A+	O	Phase A for 3-ph motors, A+ for 2-ph steppers, Motor+ for DC brush motors

† leave unconnected if interface extensions are not used

Electrical characteristics

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	°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		TBD	°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			
Spacing required for vertical mounting	Between adjacent drives	30			mm
	Between drives and nearby walls	30			mm
	Between drives and roof-top	20			mm
Spacing required for horizontal mounting	Between adjacent drives	4			mm
	Between drives and nearby walls	5			mm
	Space needed for drive removal	10			mm
	Between drives and roof-top	15			mm
Insertion force	Using recommended mating connectors		31	55	N
Extraction force		8	16		N
Environmental Characteristics		Min.	Typ.	Max.	Units
Size (Length x Width x Height)	Without mating connector		56 x 44 x 6.9		mm
	With recommended mating vertical connector. Height above PCB surface.		-2.2 x 1.73 x 0.27		inch
			56 x 48.1 x 8.9		mm
	With recommended mating horizontal connector. Height above PCB surface.		-2.2 x 1.89 x 0.35		inch
			56 x 56.4 x 9.4		mm
Weight			16		g

¹Operating 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 spacing requirements may drop substantially down to zero as long as the ambient temperature is kept below the maximum operating limit

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Cleaning agents	Dry cleaning is recommended		Only Water- or Alcohol- based		
Protection degree	According to IEC60529, UL508		IP00		-
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, continuous	-0.6		42	V _{DC}
	Absolute maximum values, surge (duration ≤ 10ms) [†]	-1		+45	V
Supply current	+V _{LOG} = 7V		125	320	mA
	+V _{LOG} = 12V		85	220	
	+V _{LOG} = 24V		50	145	
	+V _{LOG} = 40V		40	120	
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		TBD	V
Supply current	Idle		1	5	mA
	Operating	-20	±8	+20	
	Absolute maximum value, short-circuit condition (duration ≤ 10ms) [†]			26	
Motor Outputs (A/A+, B/A-, C/B+, BR/B-)		Min.	Typ.	Max.	Units
Nominal output current, continuous	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)			TBD	
Motor output current, peak	maximum 2.5s	-20		+20	A
Short-circuit protection threshold	measurement range		±26	TBD	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		
		60 kHz	120		
		80 kHz	80		
	Minimum value, limited by short-circuit protection; +V _{MOT} = 36 V	100 kHz	60		µH
		20 kHz	120		
		40 kHz	40		
		60 kHz	30		
		80 kHz	15		
Motor electrical time-constant (L/R)	Recommended value for ±5% current measurement error	100 kHz	8		µs
		20 kHz	250		
		40 kHz	125		
		60 kHz	100		
Current measurement	FS = Full Scale accuracy	80 kHz	63		%FS
		100 kHz	50		

Digital Inputs (IN0, IN1, IN2/LSP, IN3/LSN, IN4/Enable)			Min.	Typ.	Max.	Units
Mode compliance			TTL / CMOS / LVTTTL (3.3V) / Open-collector / NPN / 24V outputs			
Default state	Input floating (wiring disconnected)		Logic HIGH			
Input voltage	Logic "LOW"			0	0.8	V
	Logic "HIGH"		2	5÷24		
	Floating voltage (not connected)			3		
	Absolute maximum, continuous		-10		+30	
	Absolute maximum, surge (duration ≤ 1S) [†]		-20		+40	
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			
	Ready, Error		Same as above + LVTTTL (3.3V)			
Default state	Not supplied (+V _{LOG} floating or to GND)		High-Z (floating)			
	Immediately after power-up	OUT0, OUT1	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			0.2	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 _{LOG}			V _{LOG}		V
	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				0.5	A
	Logic "LOW", sink current, pulse ≤ 5 sec.				1	A
	Logic "HIGH", source current; external load to GND; V _{OUT} ≥ 2.0V	OUT2/Error , OUT3/ Ready			2	mA
		OUT0, OUT1			4	mA
	Logic "HIGH", leakage current; external load to +V _{LOG} ; V _{OUT} = V _{LOG} max = 40V			0.1	0.2	mA
Minimum pulse width			TBD			μs
ESD protection	Human body model		±5			kV
Digital Hall Inputs (Hall1, Hall2, Hall3)			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				1.2	mA
	Logic "HIGH"; Internal 4.7KΩ pull-up to +5		0	0	0	
Minimum pulse width			2			μs
ESD protection	Human body model		±5			kV

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Encoder Inputs (A/A+, A-, B/B+, B-, Z/Z+, Z)		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)		4.5		
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		2.5	3	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	A+ to A-, B+ to B-	4.2	4.7		kΩ
	Z+ to Z-	6.1	7.2		
Input frequency	Single-ended mode, Open-collector / NPN	0		500	kHz
	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
Linear Hall Inputs (LH1, LH2, LH3)		Min.	Typ.	Max.	Units
Input voltage	Operational range	0	0.5÷4.5	4.9	V
Input voltage	Absolute maximum values, continuous	-7		+7	V
	Absolute maximum, surge (duration ≤ 1S) [†]	-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
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		kΩ
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	MHz
ESD protection	Human body model	±1			kV

Analog 0...5V Inputs (REF, FDBK)		Min.	Typ.	Max.	Units
Input voltage	Operational range	0		4.95	V
	Absolute maximum values, continuous	-12		+18	
	Absolute maximum, surge (duration ≤ 1S) [†]			±36	
Input impedance	To GND		30		kΩ
Resolution		12			bits
Integral linearity				±2	bits
Offset error			±2	±10	bits
Gain error			±1%	±3%	% FS ³
Bandwidth (-3dB)	Software selectable	0		1	kHz
ESD protection	Human body model	±5			kV
Axis ID Inputs (AxisID 0, AxisID 1, AxisID 2)		Min.	Typ.	Max.	Units
External connections	7 levels	Not connected; Strap to GND; Strap to +5V; 4.7kΩ to GND; 4.7kΩ to +5V; 22kΩ to GND; 22kΩ to +5V;			
Pin current	Use to size PCB tracks			±0.5	mA
4.7kΩ/22kΩ resistor	Power rating	3			mW
	Tolerance			±5	%
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
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
	800Kbps			50	
	500Kbps			100	
	≤ 250Kbps			250	
Resistor	Between CAN-Hi, CAN-Lo	none on-board			
Node addressing	Strapping option (AxisID0,1,2)	1 ÷ 127 (CANopen); 1-195 & 255 (TLMCAN)			
ESD protection	Human body model	±15			kV
Supply Output (+5V)		Min.	Typ.	Max.	Units
Output voltage	Current sourced = 250mA	4.8	5	5.2	V
Output current		600	650		mA
Short-circuit		NOT protected			
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)			

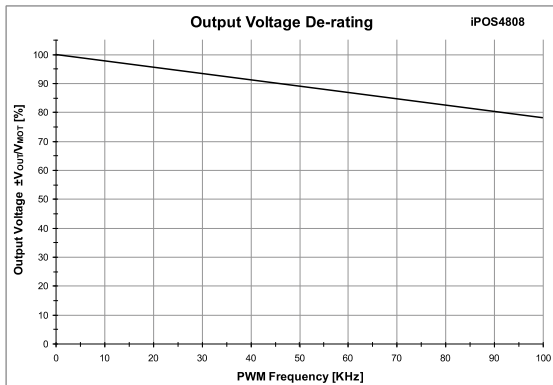
[†] Stresses beyond values listed under "absolute maximum ratings" may cause permanent damage to the device. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

¹ For full RS-422 compliance, 120 Ω termination resistors must be connected across the differential pairs, as close as possible to the drive input pins.

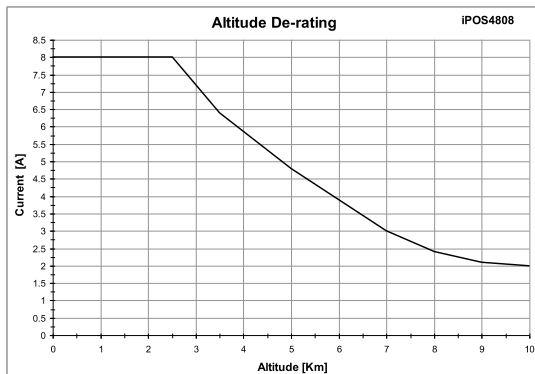
² For many applications, an 120 Ω termination resistor should be connected across SIN+ to SIN-, and across COS+ to COS-. Please consult the feedback device datasheet for confirmation.

³ "FS" stands for "Full Scale"

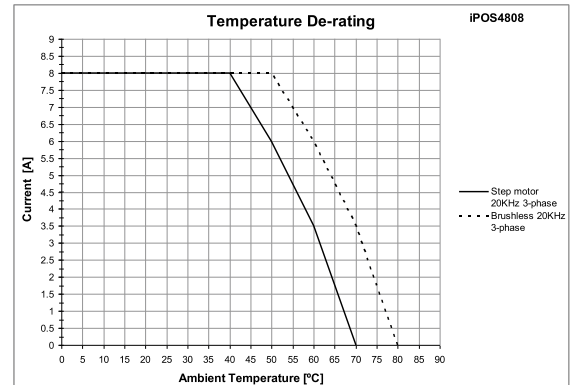
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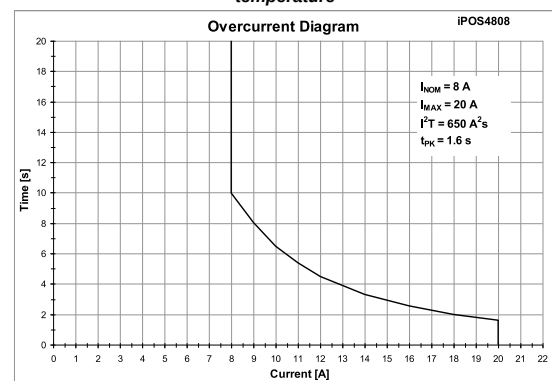
Output Voltage De-rating with PWM frequency



De-rating with altitude



De-rating with ambient temperature



Over-current diagram

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