Top view; Pins facing downward; All dimensions are in mm; Header pitch is 2.54 mm. Drawing not to scale.

Motor – sensor configurations

Sensor \ Motor	PMSM	BLDC	DC BRUSH	STEP (2-ph)	STEP[2] (3-ph)
Incr. Encoder			T	T	T
Incr. Encoder + Hall	T	T			
Analog Sin/Cos encoder	T	T	T	T	T
SSI	T	T	T	T	T
BiSS-C	T	T	T	T	T
EnDAT[1]	T	T	T	T	T
Linear Halls	T				
Tacho			T		
Open-loop (no sensor)				T	T

[1] Available starting with F514K firmware version

[2] Sensor used only for step loss detection

Mating Connector

Ref	Producer	Part No.	Description
J1	Samtec	SSQ-112-01-G-S	High-current socket 2.54mm-pitch accepting 0.635mm square pin
J2	FCI	87606-305LF	2x5 contacts, socket, 2.54mm-pitch accepting 0.635mm square pin
J2	TE Connectivity	534206-5	2x5 contacts, socket, 2.54mm-pitch accepting 0.635mm square pin
J4	Samtec	SSQ-116-01-G-D	High-current socket 2.54mm-pitch accepting 0.635mm square pin
J5	Samtec	SSQ-108-01-G-S	High-current socket 2.54mm-pitch accepting 0.635mm square pin

Features

- Motion controller and drive in a single compact unit based on MotionChip [TM] technology
- Universal solution for control of rotary and linear brushless, brushed and 2 or 3-phase step motors
- Advanced motion control capabilities (PVT, S-curve, electronic cam)
- Motor supply: 11-50V. Logic supply: 9-36V
- Output current: 8A cont. (BLDC mode); $20A_{PEAK}$, up to 100KHz PWM
- Feedback Devices (dual-loop support)
  - 1st feedback devices supported:
    - Incremental encoder interface (single ended or differential)
    - pulse & direction interface (single ended) for external (master) digital reference
    - Analogue sin/cos encoder interface (differential $1V_{pp}$)
    - Digital Hall sensor interface (single-ended and open collector)
    - Linear Hall sensors interface
  - 2nd feedback devices supported:
    - Incremental encoder interface (differential)
    - pulse & direction interface (differential) for external (master) digital reference
    - BiSS-C / SSI / EnDAT[1] encoder interface
- 6 digital inputs, 12-36V, PNP/NPN programmable: 2 for limit switches, Enable, 3 general-purpose
- 5 digital outputs, 5-36V, 0.5A, NPN open-collector: Ready, Error, 3 general-purpose
- 2 analogue inputs: 12-bit, 0-5V: Reference, Feedback or general purpose
- RS-232 serial & CAN-bus 2.0B interfaces
- 128 h/w addresses selectable by h/w pins configuration
- TMLCAN and CANopen (CiA 301v4.2 and 402v3.0) protocols selectable by h/w pin
- 16k x 16 SRAM memory for data acquisition
- 16k x16 E^2ROM 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

J1

Pin	Name	Type	Description
1	GND	-	Return ground
2	TMLCAN / CANopen	I	Connect to GND to enable CANopen protocol Leave disconnected for TMLCAN protocol
3	Axis ID Bit6	I	
4	Axis ID Bit5	I	
5	Axis ID Bit4	I	8 bit H/W Axis ID register.
6	Axis ID Bit3	I	Connect pin to GND to set bit to 1.
7	Axis ID Bit2	I	Up to 127 H/W axis ID combinations.
8	Axis ID Bit1	I	
9	Axis ID Bit0	I	
10	reserved	-	Reserved for interface extensions†
11	reserved	-	Reserved for interface extensions†
12	reserved	-	Reserved for interface extensions†

J2

Pin	Name	Type	Description
1	LH1	I	Linear Hall 1 input
2	LH2	I	Linear Hall 2 input
3	IN4	I	12-36V general-purpose digital PNP/NPN input
4	IN5/ Enable	I	12-36V general-purpose digital PNP/NPN input; Drive enable input
5	OUT0	O	5-36V 0.5A, general-purpose digital output, NPN open-collector/TTL pull-up
6	OUT3/Ready	O	5-36V 0.5A, drive Ready output, active low, NPN open-collector/TTL pull-up. Also drives the green LED.
7	OUT1	O	5-36V 0.5A, general-purpose digital output, NPN open-collector/TTL pull-up
8	OUT2/Error	O	5-36V 0.5A, drive Error output, active low, NPN open-collector/TTL pull-up. Also drives the red LED
9	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
10	FDBK / LH3	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 / or Linear Hall 3 input

J5

Pin	Name	Type	Description
1,2	A/A+	O	Phase A for 3-ph motors, A+ for 2-ph steppers, Motor+ for DC brush motors
3,4	B/A-	O	Phase B for 3-ph motors, A- for 2-ph steppers, Motor- for DC brush motors
5,6	C/B+	O	Phase C for 3-ph motors, B+ for 2-ph steppers
7,8	Cr/B-	O	Chopping resistor / Phase B- for 2-ph steppers

J4

Pin	Name	Type	Description
1	IN0	I	12-36V general-purpose digital PNP/NPN input
2	IN1	I	12-36V general-purpose digital PNP/NPN input
3	IN2/LSP	I	12-36V digital PNP/NPN input. Positive limit switch input
4	IN3/LSN	I	12-36V digital PNP/NPN input. Negative limit switch input
5	B2-/Dir-/CLK-/MA-	I/O	Incr. encoder2 B- diff. input, or Dir--, or Clock- for SSI & EnDAT, or Master- for BiSS; has 120Ω resistor between pins 5 and 7
6	B1-/Cos-	I	Incr. encoder1 B- diff. input, or analogue encoder Cos- diff. input
7	B2+/Dir+/CLK+/MA+	I/O	Incr. encoder2 B+ diff. input, or Dir+-, or Clock+ for SSI & EnDAT, or Master+ for BiSS; has 120Ω resistor between pins 5 and 7
8	B1+/Cos+	I	Incr. encoder1 B single-ended, or B+ diff. input, or analogue encoder Cos+ diff. input
9	A2+/Pulse+/Data+/SL+	I	Incr. encoder2 A+ diff. input, or Pulse+, or Data+ for SSI & EnDAT, or Slave+ for BiSS; has 120Ω resistor between pins 9 and 11
10	A1+/Sin+	I	Incr. encoder1 A single-ended, or A+ diff. input, or analogue encoder Sin+ diff. input
11	A2- /Pulse-/Data-/SL-	I	Incr. encoder2 A- diff. input, or Pulse-, or Data- for SSI & EnDAT, or Slave- for BiSS; has 120Ω resistor between pins 9 and 11
12	A1- /Sin-	I	Incr. encoder1 A- diff. input, or analogue encoder Sin- diff. input
13	Z2+	I	Incr. encoder2 Z+ diff. input ; has 120Ω resistor between pins 13 and 15
14	Z1+	I	Incr. encoder1 Z single-ended, or Z+ diff. input,
15	Z2-	I	Incr. encoder2 Z- diff. input; has 120Ω resistor between pins 13 and 15
16	Z1-	I	Incr. encoder1 Z- diff. input
17	Hall 1	I	Digital input Hall 1 sensor
18	CAN Hi	I/O	CAN-Bus positive line(dominant high)
19	Hall 2	I	Digital input Hall 2 sensor
20	CAN Lo	I/O	CAN-Bus negative line (dominant low)
21	Hall 3	I	Digital input Hall 3 sensor
22	232TX	O	RS-232 Data Transmission
23	+5V_OUT	O	5V output supply for I/O usage
24	232RX	I	RS-232 Data Reception
25	Temp Mot	I	NTC/PTC input. Used to read an analog temperature value
26	Reserved	-	Reserved. Do not connect.
27	+V_LOG	I	Positive terminal of the logic supply input: 9 to 36V_DC
28	OUT4	O	5-36V 0.5A, general-purpose digital output, NPN open-collector/TTL pull-up
29	+V_MOT	I	Positive terminal of the motor supply: 11 to 48V_DC.
30	+V_MOT	I	Positive terminal of the motor supply: 11 to 48V_DC.
31	GND	-	Negative return (ground) of the power supply
32	GND	-	Negative return (ground) of the power supply

† 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]	ºC
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		100	ºC
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		TBD	TBD	N
Extraction force		TBD	TBD		N

Environmental Characteristics		Min.	Typ.	Max.	Units
Size (Length x Width x Height)	Global size		60 x 43.6 x 12.4		mm
			~2.36 x 1.72 x 0.49		inch
Weight			22		g
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} = 12V		130		mA
	+V_{LOG} = 24V		90	280	
	+V_{LOG} = 40V		85		

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		1	5	mA
	Operating	-20	±8	+20	A
	Absolute maximum value, short-circuit condition (duration ≤ 10ms)[†]			26	A

Motor Outputs (A/A+, B/A-, C/B+, CR/B-)			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			
		60 kHz	120			
		80 kHz	80			
		100 kHz	60			
	Minimum value, limited by short-circuit protection; +V_{MOT} = 36 V	20 kHz	120			µH
		60 kHz	40			
		40 kHz	30			
		80 kHz	15			
		100 kHz	8			
Motor electrical time-constant (L/R)	Recommended value for ±5% current measure-ment error	20 kHz	250			µs
		40 kHz	125			
		60 kHz	100			
		80 kHz	63			
		100 kHz	50			
Current measurement	FS = Full Scale accuracy			±4	±8	%FS

Digital Inputs (IN0, IN1, IN2/LSP, IN3/LSN, IN4, IN5)[5]			Min.	Typ.	Max.	Units
Mode compliance			PNP			
Default state	Input floating (wiring disconnected)		Logic LOW			
Input voltage	Logic "LOW"		-10	0	2.2	V
	Logic "HIGH"		6.3		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"			1.3	2	
Mode compliance			NPN			
Default state	Input floating (wiring disconnected)		Logic HIGH			
Input voltage	Logic "LOW"		-10		2.2	V
	Logic "HIGH"		6.3		36	
	Floating voltage (not connected)			Vlog		
	Absolute maximum, continuous		-10		+36	
	Absolute maximum, surge (duration ≤ 1s)[†]		-20		+40	
Input current	Logic "LOW"; Pulled to GND		-1.6	0.6	1	mA
	Logic "HIGH"; Pulled to +24V				0.3	
Input frequency			0		150	kHz
Minimum pulse			3.3			µs
ESD protection	Human body model		±2			kV

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[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 spacing requirements may drop substantially down to zero as long as the ambient temperature is kept below the maximum operating limit
[4] @20Khz F_{PWM}
[5] The digital inputs are software selectable as PNP or NPN

Digital Outputs (OUT0, OUT1, OUT2/Error, OUT3/ Ready, OUT4)			Min.	Typ.	Max.	Units
Mode compliance	All outputs (OUT0, OUT1, OUT2/Error, OUT3/Ready)		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	
	Logic "HIGH"; output current = 0, no load	OUT2/Error, OUT3/ Ready	2.9	3	3.3	V
		OUT0, OUT1, OUT4	4	4.5	5	
	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				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, OUT4			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				2		µs
ESD protection	Human body model		±15			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		V
	Floating voltage (not connected)		4.4		V
	Absolute maximum, surge (duration ≤ 1S)†	-10		+15	V
Input current	Logic "LOW"; Pull to GND			1.2	mA
	Logic "HIGH"; Internal 4.7KΩ pull-up to +5	0	0	0	mA
Minimum pulse width			2		µs
ESD protection	Human body model	±5			kV

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			V
	Floating voltage (not connected)		3.3		V
Input voltage, single-ended mode Z/Z+	Logic "LOW"			1.2	V
	Logic "HIGH"	1.4			V
	Floating voltage (not connected)		4.7		V
	Logic "LOW"; Pull to GND		5.5	6	mA
Input current, single-ended mode A/A+, B/B+, Z/Z+	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	V
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	MHz
Minimum pulse width	Single-ended mode, Open-collector / NPN	1			µs
	Differential mode, or Single-ended driven by push-pull (TTL / CMOS)	50			ns
Input voltage, any pin to GND	Absolute maximum values, continuous	-7		+7	V
	Absolute maximum, surge (duration ≤ 1S)†	-11		+14	V
ESD protection	Human body model	±1			kV

Encoder2 Inputs (A2+/Data+, A2-/Data-, B2+/Clk+, B2-/Clk-, Z2+, Z2-)[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	V
	Common-mode range (A+ to GND, etc.)	-11		+14	V
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

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	V
	Absolute maximum, surge (duration ≤ 1S)†	-11		+14	V
Input impedance	Differential, Sin+ to Sin-, Cos+ to Cos- [3]	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		5	V
	Absolute maximum values, continuous	-12		+18	V
	Absolute maximum, surge (duration ≤ 1S)†			±36	V
Input impedance	To GND		28		kΩ
Resolution			12		bits
Integral linearity				±2	bits
Offset error			±24	±37	mV
Gain error			±1%	±3%	% FS[4]
Bandwidth (-3dB)	Software selectable	0		1	kHz
ESD protection	Human body model	±5			kV

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ALN	March 24, 2021		May 24, 2022	AN

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Title of document
iPOS4808 MY-CAN PRODUCT DATA SHEET

N° document
P027.414.E101.DSH.10D

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
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	0		0.2	mA
Interpolation Resolution	Depending on software settings			11	bits
Frequency		0		1	KHz
ESD protection	Human body model	±1			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
	500Kbps			100	
	≤ 250Kbps			250	
Resistor	Between CAN-Hi, CAN-Lo		none on-board		
Node addressing	Strapping option (AxisID Bit0..6)	1 ÷ 127 ; 255 (all bits 0)			-
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

[†] 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.
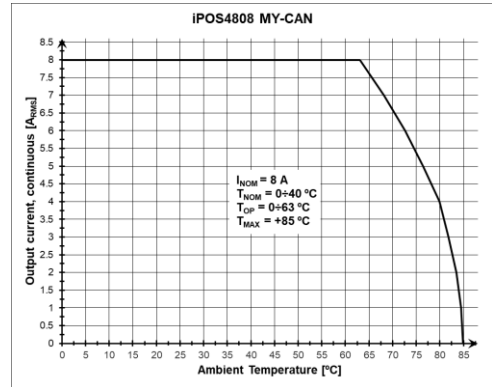

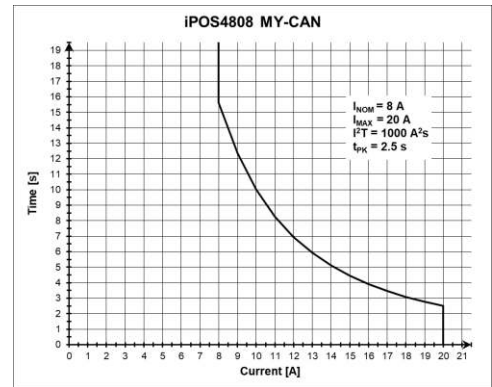**Figure 1.** *iPOS4808 MY-CAN De-rating with ambient temperature[1]*
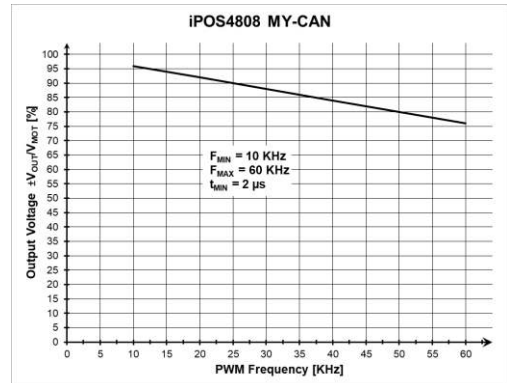

Figure 2. *iPOS4808 MY-CAN Over-current diagram[10]*

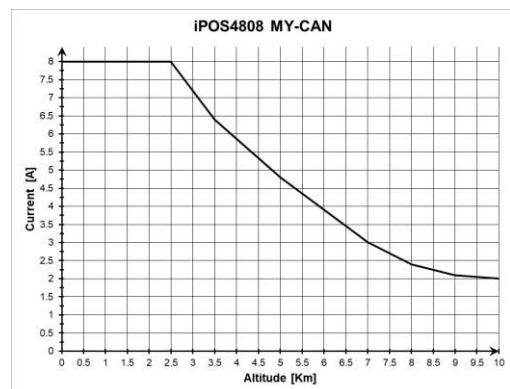**Figure 3.** iPOS4808 MY-CAN *Output Voltage De-rating with PWM frequency[10]*

Figure 4. iPOS4808 MY-CAN *De-rating with altitude[10]*

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TECHNOSOFT		Title of document	N° document	
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