

Cosworth's IPS48 Mk2 uses solid state power devices to upgrade and replace traditional DC fuses and circuit breakers, with the benefit of simplified wiring and better control of power consumers.

Designed to drive a wide range of electrical loads, each of the 48 outputs supports PWM control and has individual current and voltage measurement with user-defined trip limits. The monitoring of all outputs is performed by a high speed FPGA resulting in output protection time of ~40us.

Output control strategies are fully configurable via user defined maths from within Cosworth's latest Toolset PC software. Physical inputs and CAN channels can be easily combined to create features such as auto start, light flash patterns, pump control and limp home strategies all without any programming knowledge.

More complex strategies can be developed using Cosworth Autocoding software tools, which enables the use of Simulink models to define control strategies.

Enclosed in a high quality anodised aluminium box, sealed to IP65, there are indicator LED's for all 48 outputs, heartbeat, comms and trip status.

Designed to operate on 12V systems with over voltage and load dump protection; combined with a powerful built in diagnostics logger makes the IPS48 Mk2 a true standalone intelligent power control system.



The IPS48 Mk2 builds upon the successful IPS48 Mk1 with the following features:

- Approximately 3x more bandwidth between CPU and memory.
- Rapid output protection response time (~40us).
- Auto zeroing of current measurements on start-up.
- Synchronous current measurement for accurate peak current measurement.
- 50kHz sampling on all voltage/current measurement
- PWM support for all outputs.

Specifications

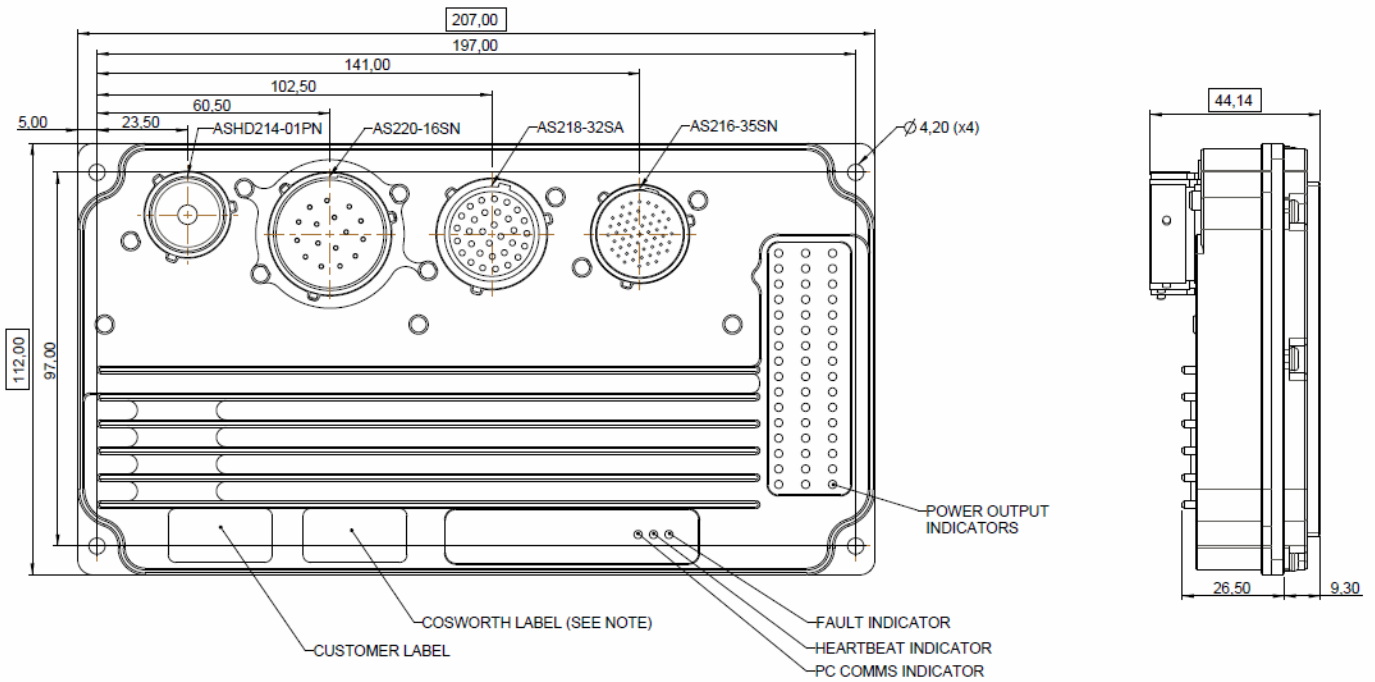
Electrical Data	
Operating voltage	8-25V or 8-33V Set by nominal pin
Nominal Voltage	12 or 24V Set by nominal pin
Load dump protection	100A for 1 second
Power output (peak current)	2 x 75A 488Hz PWM 2 x 50A 31Khz PWM 8 x 25A 488Hz PWM 4 x 15A 488Hz PWM 16 x 7.5A 488Hz PWM
Low side drive outputs	4 x 488Hz @ 0.1A
Digital inputs	6 x Switch inputs (6 x Switch to VBATT or GND)
Analogue inputs	4x 0-5V
Internal sensors	48 x output current & voltage 4 x High Power FET temp 1 x Box CPU temp 1 x Battery voltage
Sensor supplies	2x 5V @ 0.1A
Ethernet ports	1x 100MB/s—PC Comms
CAN ports	2 x Independent CAN ports Max BAUD rate 1MB/s Software selectable 120Ω termination User configurable via Toolset
LIN ports	1x LIN Bus master User configurable via Toolset

Mechanical Data	
Size without connectors	207 x 112 x 44 mm
Weight	855 grams
Environmental	IP65
Operating temperature	-20°C to +70°C
Storage temperature	-40°C to +80°C
Construction	6082-T2 Aluminium anodized
Vibration	Cosworth DV-V(c)

Ordering Information

Part Number	
Cosworth IPS48 Mk2	01I-6100084
Anti-vibration mounting kit (4x male / male M4)	13A-609001
Anti-vibration mounting kit (4x male / female M4)	13A-609002

Dimensions



All dimensions shown in mm

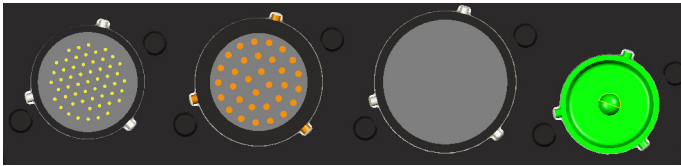
Installation

When installing the IPS48 Mk2 Module:

- Ensure unit is protected against severe vibrations by mounting using M4 anti vibration mounts such as those in the Cosworth AV mounting kits (see "Ordering Information"). Also ensure unit is not fouling other structures which may experience severe vibrations.
- Ensure unit is positioned in an area with an ambient temperature of less than 50°C or with sufficient cooling air flow to prevent over heating.
- Ensure unit is mounted away from sources of electrical interference.
- Ensure unit is mounted in position where unit will not come into contact with water.
- Return power grounds separately back to battery.
- Do not ground case.
- Do not exceed pin rating of main power pin connector A.
- Calculate the power consumption accurately, it is possible to overload connector A.
- Some high capacitance loads require a much higher surge rating.
- Some cooling fans demonstrate a high initial starting current.
- Continually resetting an output may lead to overheating of the remote device.
- Install so the output LED's can be observed for operation.
- De-rate input capacity if used in high ambient temperatures.
- Monitor main FET temperature channels to ensure the FET's are not above operational temperature.
- Do not continuously use the load dump feature.
- All Ethernet wiring must use **Category 5 cable (Cat 5)** suitable for 100BASE-Tx. Cosworth recommend the following cable type and design practices:
 - Use TE CEC-RWC-20116 cable.
 - Keep the number of interconnections to a minimum.
 - Avoiding the use of service loops in any non RJ45 connectors.
 - Tx and Rx pairs should be on the outer ring of terminals when using multi pin circular connectors such as Deutsch AS type connectors.

Connector Information

A- Main Power In

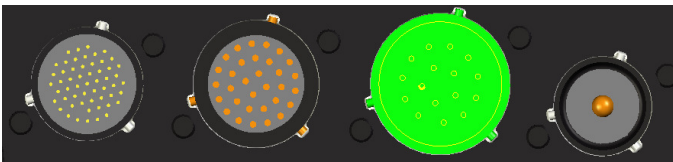


Connector	Mating connector
ASHD214-1PN	ASHD614-1SN

Connector Pinout

Pin	Function	Signal Description	Notes
1	Battt +	Main Battery +	120A continuous, 200A for 2minutes

B- Output (High power)



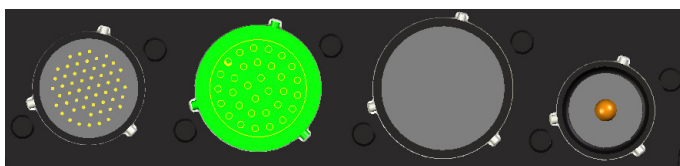
Connector	Mating connector
AS220-16SN	AS620-16PN

Connector Pinout

Pin	Channel	Channel Current	Pin Current	Surge Current		Notes
				10us	1ms	
L	Output 23	25A	25A	400A	35A	488Hz PWM min 5% duty and high surge ¹
K	Output 24	25A	25A	120A	35A	488Hz PWM min 5% duty
J	Output 25	25A	25A	120A	35A	488Hz PWM min 5% duty
H	Output 26	25A	25A	120A	35A	488Hz PWM min 5% duty
G	Output 27	25A	25A	120A	35A	488Hz PWM min 5% duty
F	Output 28	25A	25A	120A	35A	488Hz PWM min 5% duty
C	Output 29	50A	25A	400A	120A	31kHz PWM min 30% duty
D			25A			
B	Output 30	50A	25A	400A	120A	31kHz PWM min 30% duty
N			25A			
A	Output 31	75A	25A	400A	120A	488Hz PWM min 5% duty
M			25A			
S			25A			
E	Output 32	75A	25A	400A	120A	488Hz PWM min 5% duty
P			25A			
R			25A			

¹ High surge to cope with high capacitance loads eg. 10000uF

C- Output (Low power)



Connector	Mating connector
AS218-32SA	AS618-32PA

Connector Pinout

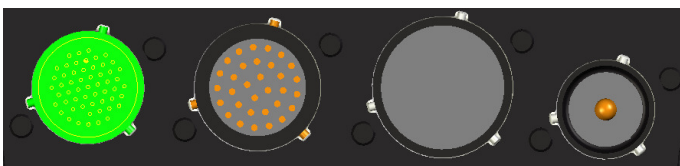
Pin	Channel	Channel Current	Pin Current	Surge Current		Notes
				10us	1ms	
B	Output 1	7.5A	7.5A	75A	35A	Slow wiper with freewheel ² and park ³ 488Hz PWM Min 12% duty
T	Output 2	7.5A	7.5A	75A	35A	Fast wiper with freewheel ² 488Hz PWM min 12% duty
C	Output 3	7.5A	7.5A	75A	35A	488Hz PWM min 12% duty
D	Output 4	7.5A	7.5A	75A	35A	488Hz PWM min 12% duty
E	Output 5	7.5A	7.5A	75A	35A	488Hz PWM min 12% duty
F	Output 6	7.5A	7.5A	75A	35A	488Hz PWM min 12% duty
G	Output 7	7.5A	7.5A	75A	35A	488Hz PWM min 12% duty
H	Output 8	7.5A	7.5A	75A	35A	488Hz PWM min 12% duty
J	Output 9	7.5A	7.5A	75A	35A	488Hz PWM min 12% duty
K	Output 10	7.5A	7.5A	75A	35A	488Hz PWM min 12% duty
L	Output 11	7.5A	7.5A	75A	35A	488Hz PWM min 12% duty
M	Output 12	7.5A	7.5A	75A	35A	488Hz PWM min 12% duty
N	Output 13	7.5A	7.5A	75A	35A	488Hz PWM min 12% duty
P	Output 14	7.5A	7.5A	75A	35A	488Hz PWM min 12% duty
R	Output 15	7.5A	7.5A	75A	35A	488Hz PWM min 12% duty
S	Output 16	7.5A	7.5A	75A	35A	488Hz PWM min 12% duty
X	Output 17	15A	7.5A	120A	35A	Slow wiper with freewheel ² and park ³ 488Hz PWM min 10% duty
Y			7.5A			
(a)	Output 18	15A	7.5A	120A	35A	Fast wiper with freewheel ² 488Hz PWM min 10% duty
(b)			7.5A			
Z	Output 19	15A	7.5A	120A	35A	488Hz PWM min 10% duty
(h)			7.5A			
(c)	Output 20	15A	7.5A	120A	35A	488Hz PWM min 10% duty
(j)			7.5A			

² When using this output for direct connection wiper motors this output will disconnect or Freewheel the output when the paired winding is being driven.

³ When using this output for direct connection wiper motors this output will connect the output temporarily to ground to park the wiper motor.

Pin	Channel	Channel Current	Pin Current	Surge Current		Notes
				10us	1ms	
(d)	Output 21	25A	7.5A	120A	35A	488Hz PWM min 10% duty
(e)			7.5A			
(f)			7.5A			
(g)			7.5A			
A	Output 22	25A	7.5A	75A	35A	488Hz PWM min 10% duty
U			7.5A			
V			7.5A			
W			7.5A			

D- System



Connector	Mating connector
AS216-35SN	AS616-35PN

Connector Pinout

Pin	Name	Function	Pin Current	Notes
1	VBatt	Fused Batt+	2A ⁴	For Switch and Bench use only
2	Gnd	Ground ⁵		For switch use
3	Switch 1	Switch input		Switch to GND or VBATT
4	Switch 2	Switch input		Switch to GND or VBATT
5	Switch 3	Switch input		Switch to GND or VBATT
6	Switch 4	Switch input		Switch to GND or VBATT
7	Switch 5	Switch input		Switch to GND or VBATT
8	Switch 6	Switch input		Switch to GND or VBATT
9	Output 48	Output 48	2.5A	488Hz PWM min 5% duty
10	Output 45	Output 45	2.5A	488Hz PWM min 5% duty
11	Output 38	Output 38	2.5A	488Hz PWM min 5% duty
12	Output 41	Output 41	2.5A	488Hz PWM min 5% duty
13	Output 43	Output 43	2.5A	488Hz PWM min 5% duty
14	Output 46	Output 46	2.5A	488Hz PWM min 5% duty

⁴ Pins 1 and 25 connected together and share 2 Amps total. This is a low power connection to allow bench use only and should not be used to power the main outputs.

⁵ All Grounds are common and connected to the case.

Pin	Name	Function	Pin Current	Notes
15	Output 33	Output 33	2.5A	488Hz PWM min 5% duty
16	Output 37	Output 37	2.5A	488Hz PWM min 5% duty
17	Output 36	Output 36	2.5A	488Hz PWM min 5% duty
18	Output 34	Output 34	2.5A	488Hz PWM min 5% duty
19	Output 35	Output 35	2.5A	488Hz PWM min 5% duty
20	Output 39	Output 39	2.5A	488Hz PWM min 5% duty
21	Output 42	Output 42	2.5A	488Hz PWM min 5% duty
22	Output 44	Output 44	2.5A	488Hz PWM min 5% duty
23	Output 47	Output 47	2.5A	488Hz PWM min 5% duty
24	Output 40	Output 40	2.5A	488Hz PWM min 5% duty
25	VBatt	Fused Batt+	2A ⁴	For Switch and Bench use only
26	Gnd	Ground ⁵		For switch or analogue input use
27	AN1	Analogue input		0 to 5V
28	AN2	Analogue input		0 to 5V
29	AN3	Analogue input		0 to 5V
30	AN4	Analogue input		0 to 5V
31	PWMout1	PWM LSD control	100mA	Low side drive 400Hz PWM output
32	CAN1-L	CAN 1 Low		1MB/s CAN Bus
33	CAN1-H	CAN 1 High		1MB/s CAN Bus
34	+5V	5V sensor supply	100mA	Sensor supply 1
35	+5V	5V sensor supply	100mA	Sensor supply 2
36	Normal Pin	Select the normal 12V or 24V operation		Unconnected = 12V Connected to GND = 24V Systems
37	GND	Ground ⁵		Ground
38	PWMout2	PWM LSD output	100mA	Low side drive 400Hz PWM output
39	PWMout3	PWM LSD control	100mA	Low side drive 400Hz PWM output
40	CAN2-L	CAN 2 Low		1MB/s CAN Bus
41	CAN2-H	CAN 2 High		1MB/s CAN Bus
42	LIN	LIN bus		19k2 LIN bus, Bosch WDA ready
43	GND	Ground ⁵		LIN ground
44	N/C	Reserved for future use		
45	N/C	Reserved for future use		
46	PWMout4	PWM LSD control	100mA	Low side drive 400Hz PWM output
47	GND	Ground ⁵		IPS48 main ground

⁴ Pins 1 and 25 connected together and share 2 Amps total. This is a low power connection to allow bench use only and should not be used to power the main outputs.

⁵ All Grounds are common and connected to the case.

Pin	Name	Function	Pin Current	Notes
48	100T Rx+	Ethernet Comms Rx+		Ethernet White + Green
49	100T Rx-	Ethernet Comms Rx-		Ethernet Green ⁷
50	N/C	Reserved for future use		
51	100T Tx+	Ethernet Comms Tx+		Ethernet White + Orange ⁷
52	100T Tx-	Ethernet Comms Tx-		Ethernet Orange ⁷
53	RS232DEB-RX	Programming Comms		From PC
54	N/C	Reserved for future use		
55	RS232DEB-TX	Programming Comms		To PC

Recycling and Environmental Protection

Cosworth Electronics is committed to conducting its business in an environmentally responsible manner and to strive for high environmental standards.

- **Manufacture**

Cosworth products comply with the appropriate requirements of the Restriction of Hazardous Substances (RoHS) directive (where applicable).

- **Disposal**

Electronic equipment should be disposed of in accordance with regulations in force and in particular in accordance with the Waste in Electrical and Electronic Equipment directive (WEEE).

- **Battery**

This equipment contains a rechargeable battery. (Lithium Vanadium Pentoxide).

The equipment may be returned to Cosworth Electronics for a replacement battery. (A charge will be made for this service).

Removal of the battery by the user may void any warranty on the equipment.

To remove the battery for recycling:

- Remove the case cover(s).
- Remove the printed circuit boards from the case.
- Remove the battery from the printed circuit board.

Dispose of the battery in accordance with regulations in force.

