MotoHawk Control Solutions

GCM-0S12-024-0401-F

General Control Module

(Part No. 1751-6338)

Description

Presenting the GCM-0S12-024-0401-F, the MicroCHI Control Hardware Interface from Woodward's MotoHawk Control Solutions product line. These rugged, embedded controllers are capable of operating in harsh automotive, marine, and off-highway applications. Hundreds of successful industrial applications prove the capability of these modules. Based on a proven microprocessor, the MicroCHI Control Hardware Interface is capable of delivering complex control strategies. The CAN 2.0B datalink ensures interoperability with other system components.

The GCM-0S12-024-0401-F is part of the ControlCore® family of embedded control systems. MotoHawk Control Solutions' ControlCore operating system, MotoHawk® code-generation product, and MotoHawk's suite of development tools enable rapid development of complex control systems.

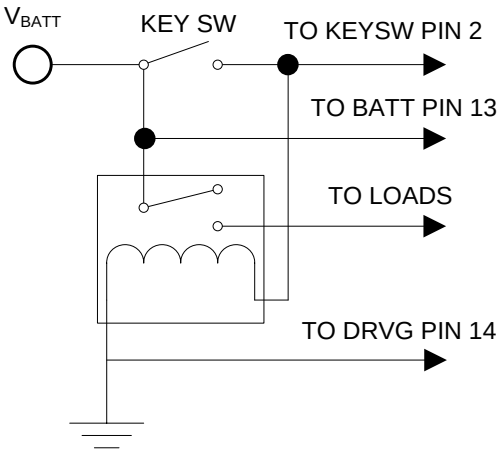
IMPORTANT **Woodward does not warranty this ECM based on information supplied in this datasheet, but only with an express and specific production supply agreement based on customer's operating mode. Information in this datasheet is subject to change without prior notice. Please contact MotoHawk Control Solutions sales for more information.**

- **Microprocessor**: Motorola MC9S12DT128, 24 MHz
- **Memory**: (MC9S12DT128BMPV) 128K Flash, 8K RAM, 2K EEPROM
- **Operating Voltage**: 8–16 Vdc
- **Operating Temperature**: –40 to +105 °C
- **Sealed Connectors:** Operable to 10 ft (3m) submerged
- **Inputs:** 6 Analog 4 Discrete
- **Outputs:** 5x 1.5 A Low Side PWM
- **Datalinks:** 2 CAN 2.0B Channels

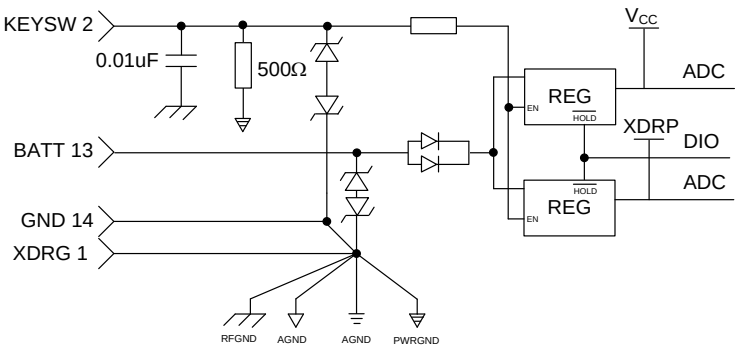
1–Input Signal Conditioning

1.1 KEY (2), BATT (13), GND (14), XDRG (1)

The KEYSW (switch) input wakes the module's voltage regulators. The input is monitored by the processor.

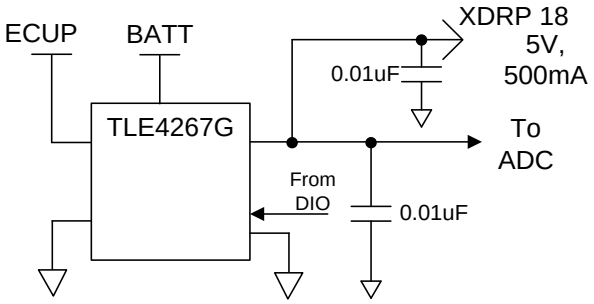


XDRG is the transducer ground return.



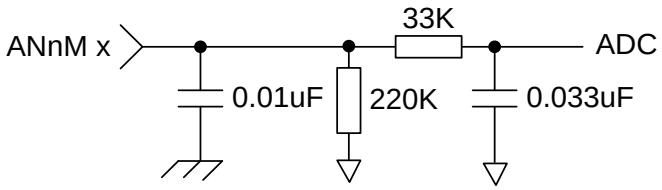
1.2 XDRP (18)

This pin is the transducer power source, 5 V, 500 mA. It is monitored by the processor.



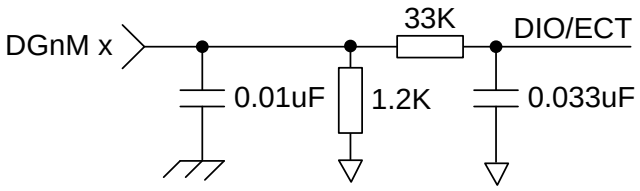
1.3 AN1M...AN6M (5)

This input is 10 bit 0–5 V ADC, τ = 1 ms.



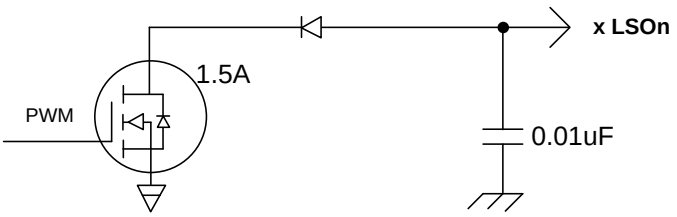
1.4 DG1M…DG4M (11, 10, 20, 19)

These are discrete inputs V_{IL} < 4.0 V > 4.5 V, τ = 1 ms.
Note: These inputs may be switched to 12 V/



2–Output Signal Conditioning

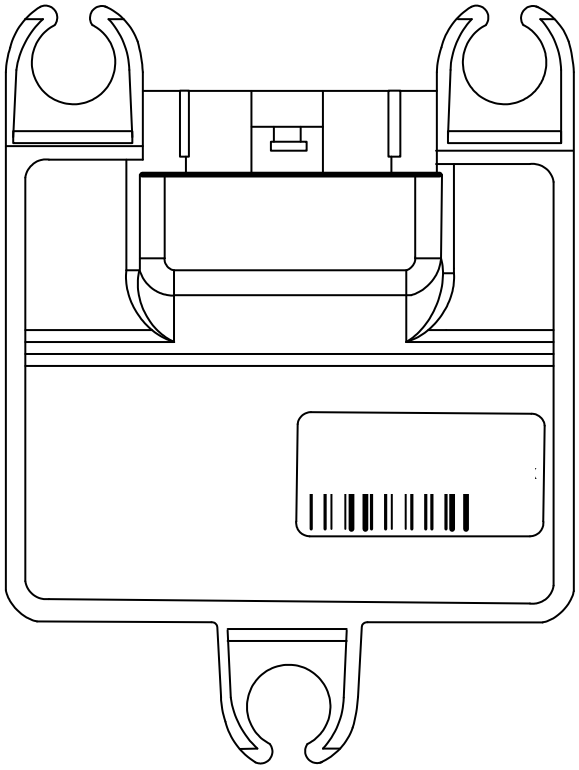
2.1 LSO1...LSO5 (12, 24, 23, 22, 21)
These outputs are 1.5 A low side drivers.

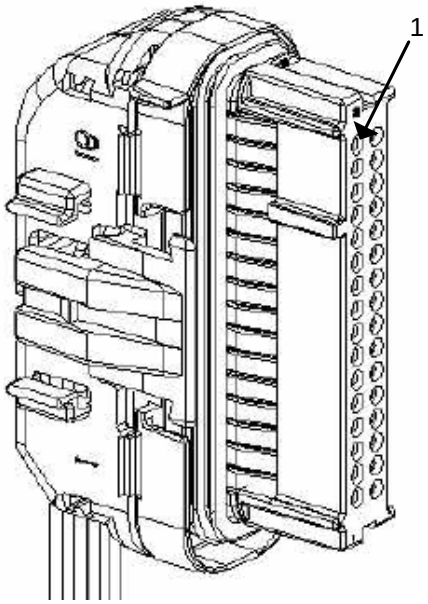


3–Communications

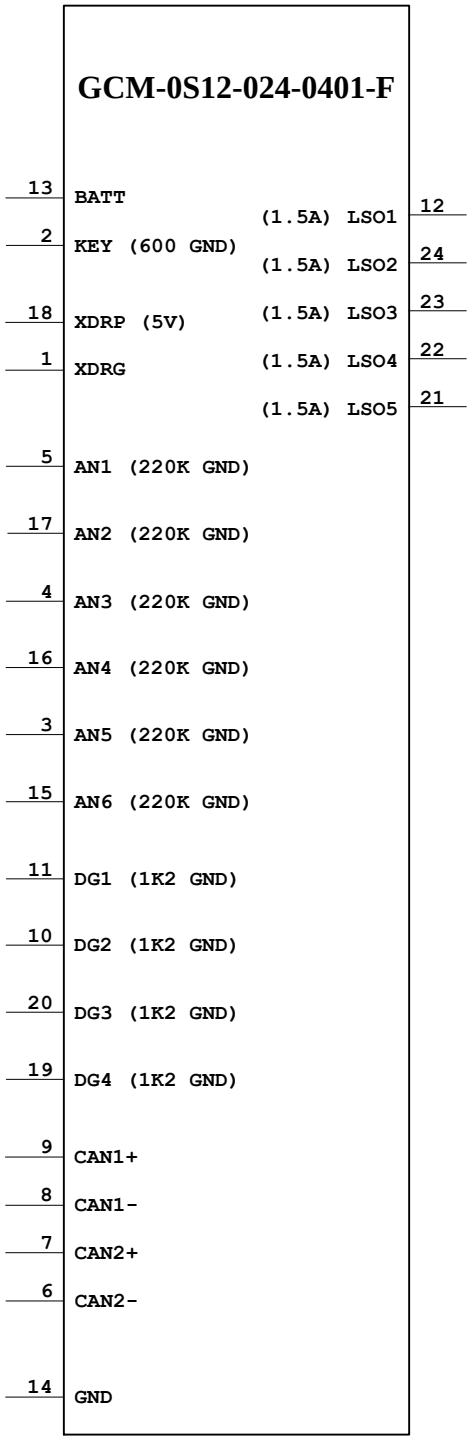
3.1 CAN1+, CAN1-, CAN2+, CAN2- (9, 8, 7, 6)	CAN 2.0B, Standard or Extended ID, up to 1 MBd

4–Connector Definitions



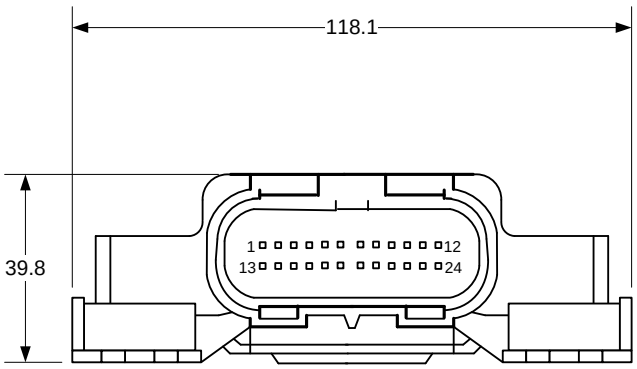
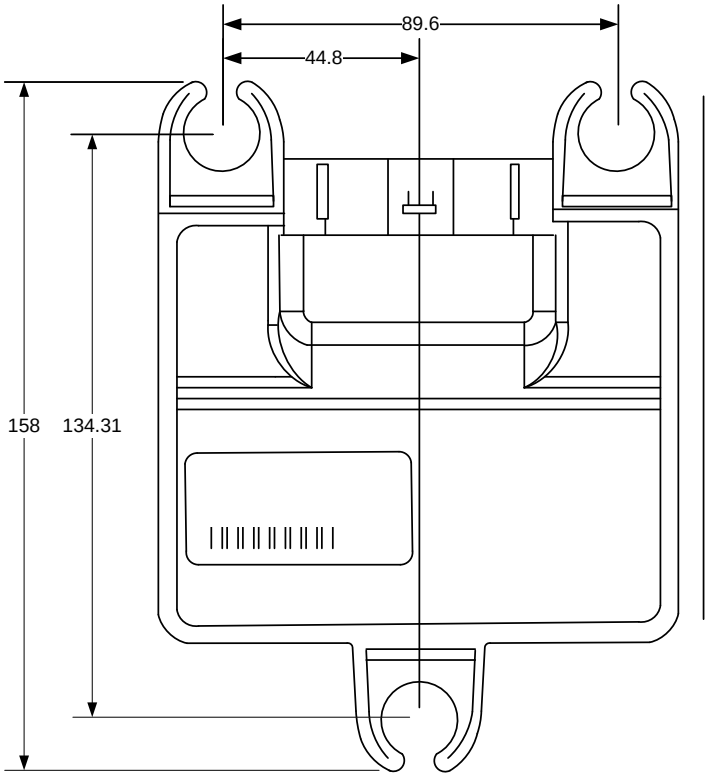


4.1 Block Diagram



4.2 Resource by Connector Pin				
Pin # µX	**ControlCore Resource Name**	**Function Name**	**Notes**	**Wire Color**
1	XDRG	Transducer Ground	Ground	black/orange
2	KEYSW	Signal to Wake Module	600 ς Pull Down	white/black
3	AN5M	Analog Input	220 kς Pull Down	white/brown
4	AN3M	Analog Input	220 kς Pull Down	white/dark blue
5	AN1M	Analog Input	220 kς Pull Down	white/green
6	CAN2–	CAN	Terminating Resistance Required	white
7	CAN2+			green/black
8	CAN1–	CAN	Terminating Resistance Required	green/brown
9	CAN1+			red
10	DG2M	Digital Input	1.2 kς Pull Down	white
11	DG1M	Digital Input	1.2 kς Pull Down	gray/dark blue
12	LSO1	Low Side Driver	1.5 A Max	brown
13	BATT	Module Power	Power to Module	purple/white
14	GND	Power Ground	Connect to Battery Ground	black
15	AN6M	Analog Input	220 kς Pull Down	white/light blue
16	AN4M	Analog Input	220 kς Pull Down	white/orange
17	AN2M	Analog Input	220 kς Pull Down	white/yellow
18	XDRP	Transducer Power	5 V, 500 mA	purple/yellow
19	DG4M	Digital Input	1.2 kς Pull Down	dark blue
20	DG3M	Digital Input	1.2 kς Pull Down	green/blue
21	LSO5	Low Side Driver	1.5 A Max	brown/white
22	LSO4	Low Side Driver	1.5 A Max	brown/yellow
23	LSO3	Low Side Driver	1.5 A Max	dark brown
24	LSO2	Low Side Driver	1.5 A Max	brown/pink

4.3 Resource by Name				
ControlCore Resource Name	**Function Name**	**Notes**	**Wire Color**	**Pin # µX**
AN1M	Analog Input	220 kς Pull Down	white/green	5
AN2M	Analog Input	220 kς Pull Down	white/yellow	17
AN3M	Analog Input	220 kς Pull Down	white/dark blue	4
AN4M	Analog Input	220 kς Pull Down	white/orange	16
AN5M	Analog Input	220 kς Pull Down	white/brown	3
AN6M	Analog Input	220 kς Pull Down	white/light blue	15
BATT	Module Power	Power to Module	purple/white	13
CAN1–	CAN	Terminating Resistance Required	green/brown	8
CAN1+	CAN	Terminating Resistance Required	red	9
CAN2–	CAN	Terminating Resistance Required	white	6
CAN2+	CAN	Terminating Resistance Required	green/black	7
DG1M	Digital Input	1.2 kς Pull Down	gray/dark blue	11
DG2M	Digital Input	1.2 kς Pull Down	white	10
DG3M	Digital Input	1.2 kς Pull Down	green/blue	20
DG4M	Digital Input	1.2 kς Pull Down	dark blue	19
GND	Power Ground	Connect to Battery Ground	black	14
KEYSW	Signal to Wake Module	600 ς Pull Down	white/black	2
LSO1	Low Side Driver	1.5 A Max	brown	12
LSO2	Low Side Driver	1.5 A Max	brown/pink	24
LSO3	Low Side Driver	1.5 A Max	dark brown	23
LSO4	Low Side Driver	1.5 A Max	brown/yellow	22
LSO5	Low Side Driver	1.5 A Max	brown/white	21
XDRG	Transducer Ground	Ground	black/orange	1
XDRP	Transducer Power	5 V, 500 mA	purple/yellow	18

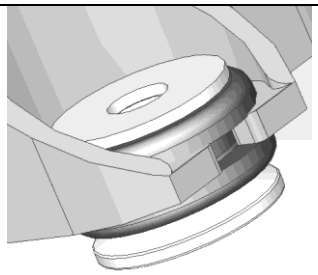
5–Physical Dimensions	All dimensions are in millimeters.
	

6–Environmental	
6 Environmental Ratings	The MicroCHI is designed to meet automotive industry standard under hood environmental requirements for 12/24 volt systems, and also meets marine industry environmental requirements. Validation tests include extreme operating temperatures (–40 to +105 °C), thermal shock, humidity, salt spray, salt fog, immersion, fluid resistance, mechanical shock, vibration, steam pressure wash, and EMC. It is the responsibility of the application engineer to assure that the application does not exceed the demonstrated capabilities of the unit; vibration or thermal. It may be necessary to perform additional tests to validate the unit in the application.
6.1 Storage Temperature	–50 to +125 °C
6.2 Operating Temperature	–40 to +105 °C
6.3 Thermal Shock	450 cycles, –40 to +125 °C
6.4 Fluid Resistance	4-Stroke Motor Oil, 2-Stroke Motor Oil, Unleaded Gasoline, ASTM Reference Fuel C, Anti-freeze (ref.: J1455)
6.5 Humidity Resistance	98% humidity at 38 °C (ref.: J1455)
6.6 Salt Fog Resistance	500 hours of operation, 5% salt fog, 35 °C
6.7 Immersion	Submersible in 8% salt water solution to 10 ft (3 m)
6.8 Mechanical Shock	50 g's, 11 ms, 1/2 sine wave, 4 shocks each axis in each direction (+ & –)
6.9 Drop	Drop tests on concrete from 1 meter, 6 surfaces

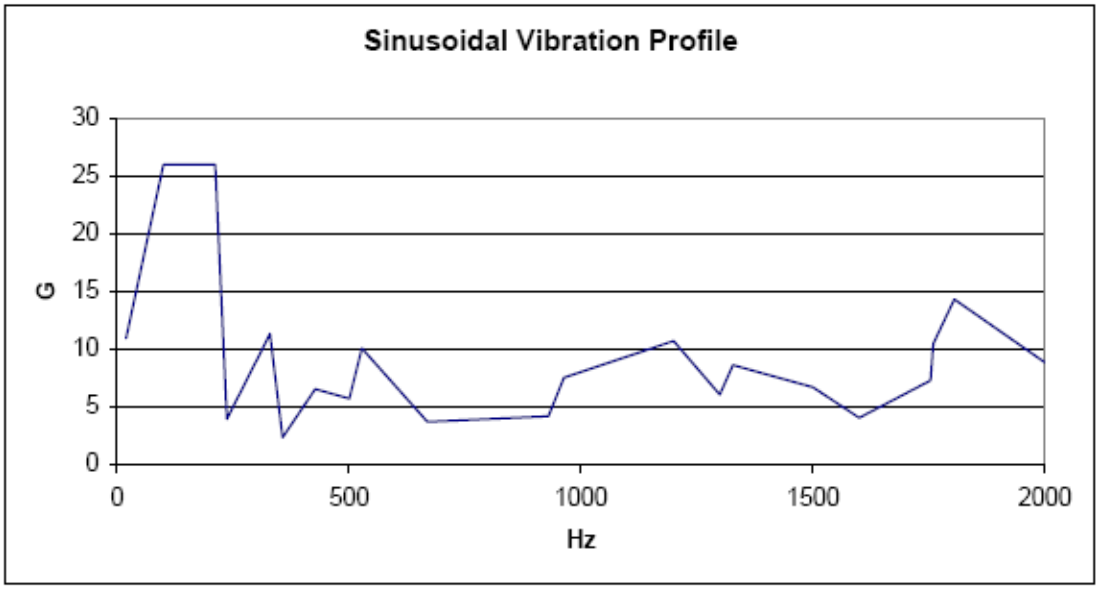
6.10 Vibration

Engine mountable and designed to high-performance levels, the MicroCHI has been tested according to the schedule shown below.

Electrical and mechanical isolation is via a bushing, grommet, and washer, as shown at right.



HZ	G'S
20	10.96
100	26
153	26
212	26
237	3.93
330	11.31
357	2.34
428	6.53
501	5.7
528	10.08
669	3.7
930	4.18
964	7.53
1200	10.71
1300	6.05
1328	8.62
1500	6.69
1600	4.03
1754	7.28
1760	10.46
1805	14.31
2000	8.85



6.11 Abnormal Supply Voltage Resistance

Condition	Supplied Voltage	Time
Reverse Battery	–12 Vdc	5 minutes
Double Battery	24 Vdc	5 minutes
Minimum Battery	8 Vdc	Indefinitely
Low Battery Condition	6.3 Vdc	Indefinitely

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