



MotoHawk Control Solutions

GCM-0S12-024-0402-F

General Control Module

(Part No. 1751-6340)

Description

Presenting the GCM-0S12-024-0402-F, the MicroSIM System Integration Module from Woodward's new MotoHawk Control Solutions product line. This rugged embedded controllers are capable of operating in harsh automotive, marine, and off-highway applications. Hundreds of successful industrial applications prove the capability of this module. Based on a proven microprocessor, the MicroSIM is capable of delivering complex control strategies. The CAN 2.0B datalink ensures interoperability with other system components.

The GCM-0S12-024-0402-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.

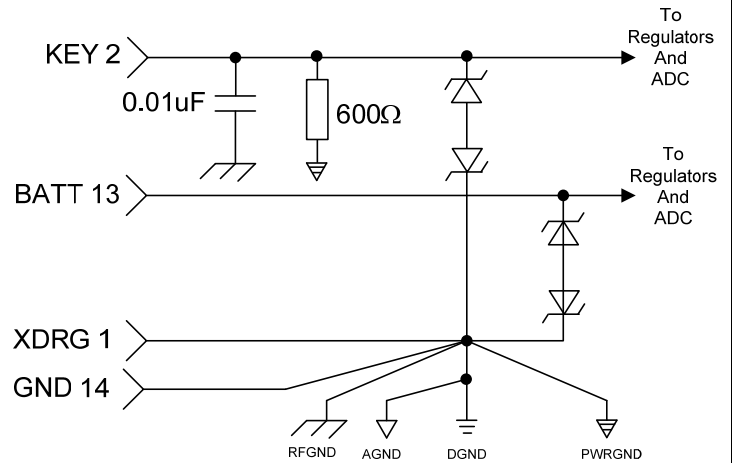
- **Microprocessor:**
Motorola
MC9S12DT128,
24 MHz
- **Memory:**
(MC9S12DT128BMPV)
128K Flash, 8K RAM,
2K EEPROM
- **Operating Voltage:**
8–16 Vdc
- **Operating Temperature:** –40 to
+105 °C
- Sealed connectors
operable to 10 ft (3 m)
submerged
- **Inputs:**
6 Analog
4 Discrete
- **Outputs:**
5x 1.5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

PRELIMINARY

1-Input Signal Conditioning

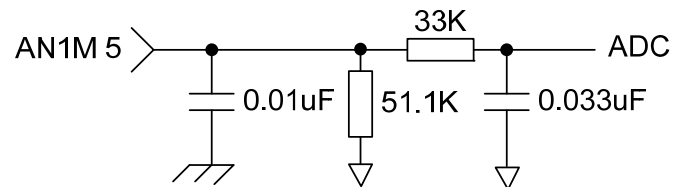
1.1 KEY (2), BATT (13), XDRG (1), GND (14)

The KEY (switch) input wakes the module power supplies. It is monitored by the processor. XDRG is the transducer ground return.



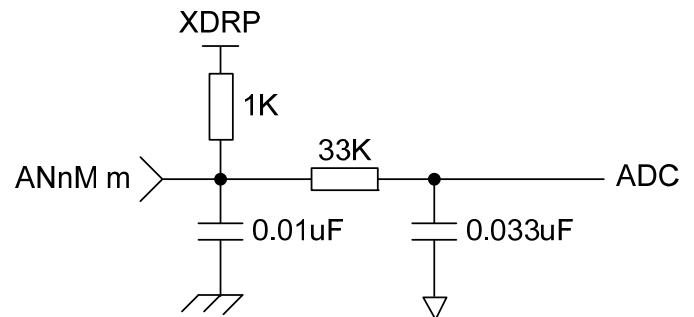
1.2 AN1M (5)

This input is 10 bit 0–5 V ADC, $\tau = 1$ ms.



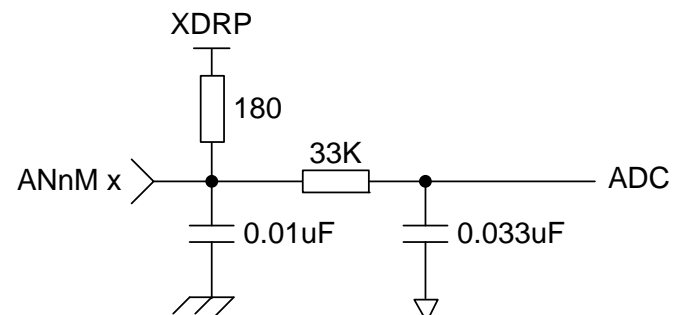
1.3 AN2M, AN6M (17, 15)

This input is 10 bit 0–5 V ADC, $\tau = 1$ ms.



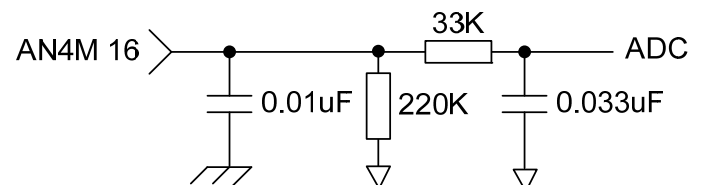
1.4 AN3M, AN5M (4, 3)

This input is 10 bit 0–5 V ADC, $\tau = 1$ ms.



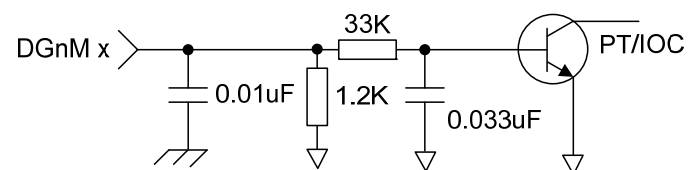
1.5 AN4M (16)

These inputs are 10 bit 0–5 V ADC, $\tau = 1$ ms.



1.6 DG1M, ..., DG4M (11, 10, 20, 19)

These inputs are active high, $\tau = 1$ ms.

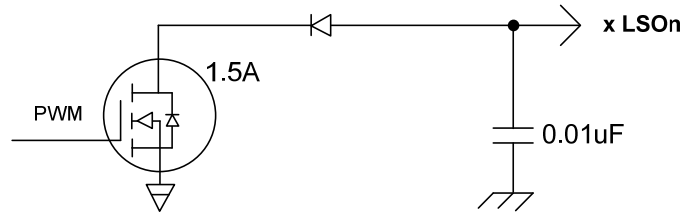


PRELIMINARY

2-Output Signal Conditioning

2.1 LSO1...LSO5 (12, 24, 23, 22, 21)

These outputs are 1.5 A low side drivers.

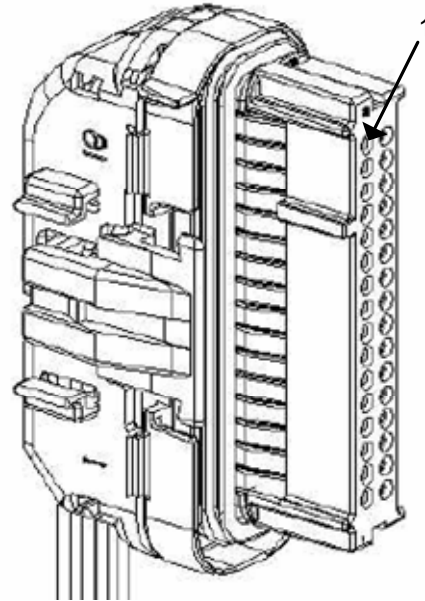
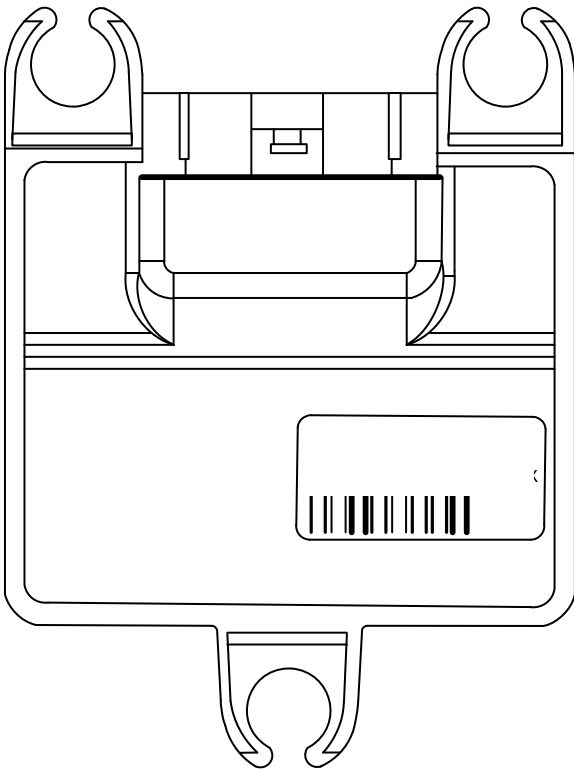


3-Communications

3.1 CAN1+, CAN1-, CAN2+, CAN2- (9, 8, 7, 6)

CAN 2.0B, Standard or Extended ID, up to 1 MBd

4-Connector Definitions



PRELIMINARY

4.1 Block Diagram

GCM-0S12-024-0401-F

13	BATT	(1.5A) LSO1	12
2	KEY (600 GND)	(1.5A) LSO2	24
18	XDRP (5V)	(1.5A) LSO3	23
1	XDRG	(1.5A) LSO4	22
		(1.5A) LSO5	22
5	AN1 (51K GND)		
17	AN2 (1K Vcc)		
4	AN3 (180 Vcc)		
16	AN4 (220K GND)		
3	AN5 (180 Vcc)		
15	AN6 (1K GND)		
11	DG1 (1K2 GND)		
10	DG2 (1K2 GND)		
20	DG3 (1K2 GND)		
19	DG4 (1K2 GND)		
9	CAN1+		
8	CAN1-		
7	CAN2+		
6	CAN2-		
14	GND		

PRELIMINARY

4.2 Resource by Connector Pin

Pin #	ControlCore	Function	Notes	Wire
μ SIM	Resource Name	Name		Color
1	XDRG	Transducer Ground	Ground	black/orange
2	KEYSW	Signal to wake module.	600 Ω Pull Down	white/black
3	AN5M	Analog Input	180 Ω Pull Up	white/brown
4	AN3M	Analog Input	180 Ω Pull Up	white/dark blue
5	AN1M	Analog Input	51K 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	1.2K Pull Down	white
11	DG1M	Digital Input	1.2K Pull Down	gray/dark blue
12	LSO1	Low Side Driver	1.5A Max./ 3K Pull Up	brown
13	BATT	Module Power	Power to Module	purple/white
14	GND	Power Ground	Connect to Battery Ground	black
15	AN6M	Analog Input	1K Pull Down	white/light blue
16	AN4M	Analog Input	220K Pull Down	white/orange
17	AN2M	Analog Input	1K Pull Up	white/yellow
18	XDRP	Transducer Power	5V, 500mA	purple/yellow
19	DG4M	Digital Input	1.2K Pull Down	dark blue
20	DG3M	Digital Input	1.2K Pull Down	green/blue
21	LSO5	Low Side Driver	1.5A Max./ Switch to Ground	brown/white
22	LSO4	Low Side Driver	1.5A Max.	brown/yellow
23	LSO3	Low Side Driver	1.5A Max.	dark brown
24	LSO2	Low Side Driver	1.5A Max.	brown/pink

PRELIMINARY

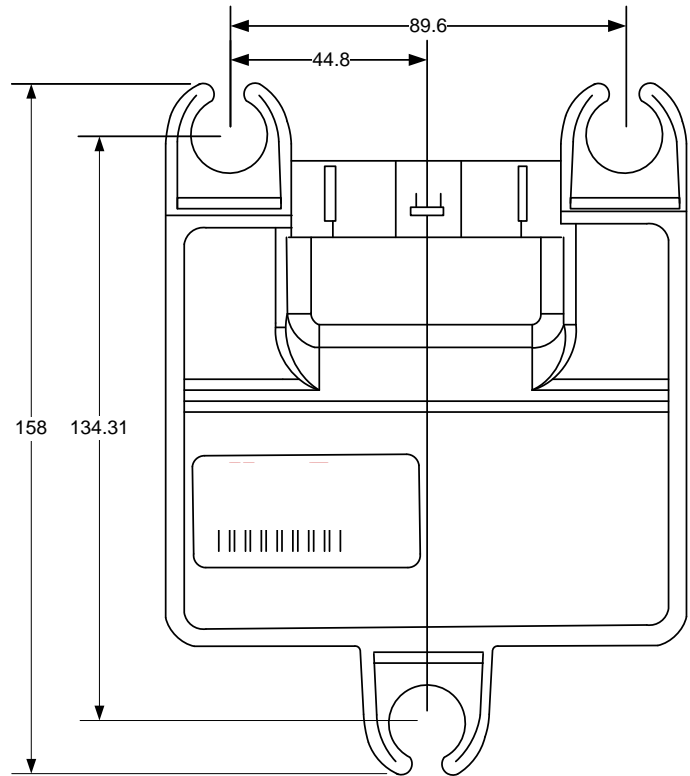
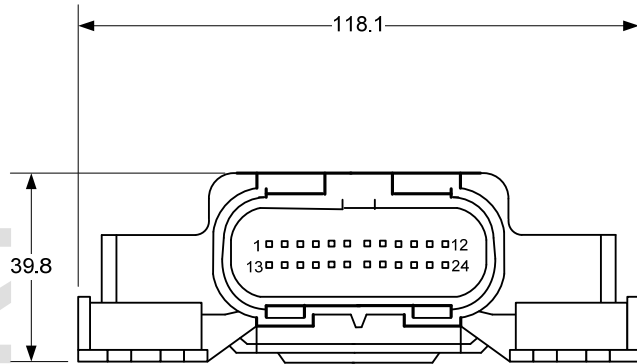
4.3 Resource by Name

ControlCore	Function	Notes	Wire	Pin #
Resource Name	Name		Color	μ SIM
AN1	Analog Input	51K Pull Down	white/green	5
AN2	Analog Input	1K Pull Up	white/yellow	17
AN3	Analog Input	180 Ω Pull Up	white/dark blue	4
AN4	Analog Input	220K Pull Up	white/orange	16
AN5	Analog Input	180 Ω Pull Up	white/brown	3
AN6	Analog Input	1K 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	1.2K Pull Down	gray/dark blue	11
DG2M	Digital Input	1.2K Pull Down	white	10
DG3M	Digital Input	1.2K Pull Down	green/blue	20
DG4M	Digital Input	1.2K Pull Down	dark blue	19
GND	System Ground	Connect to Battery Ground	black	14
LSO1	Low Side Driver	1.5A Max.	brown	12
LSO2	Low Side Driver	1.5A Max.	brown/pink	24
LSO3	Low Side Driver	1.5A Max.	dark brown	23
LSO4	Low Side Driver	1.5A Max.	brown/yellow	22
LSO5	Low Side Driver	1.5A Max.	brown/white	21
KEYSW	Module Power	Power to Module (via Key Switch)	white/black	2
XDRG	Transducer Ground	Ground	black/orange	1
XDRP	Transducer Power	5V, 500mA	purple/yellow	18

PRELIMINARY

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.

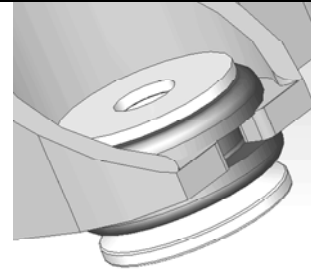
It is the responsibility of the application engineer to assure that the application does not exceed the demonstrated capabilities of the unit; vibration or thermal. It may be necessary to perform additional tests to validate the unit in the application.

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

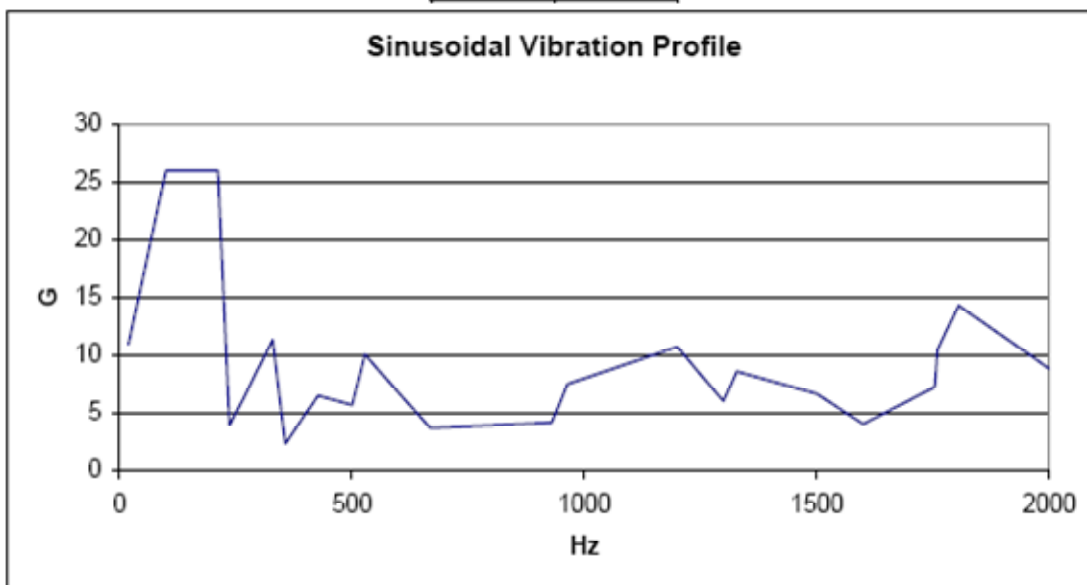
6.10 Vibration:

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

PRELIMINARY

PRELIMINARY



PO Box 1519, Fort Collins CO, USA 80522-1519
1000 East Drake Road, Fort Collins CO 80525
Tel.: +1 (970) 482-5811 ♦ Fax: +1 (970) 498-3058
mcsinfo@woodward.com ♦ mcs.woodward.com
www.woodward.com

Distributors & Service

Woodward has an international network of distributors and service facilities. For your nearest representative, call the Fort Collins plant or see the Worldwide Directory on our website.

This document is distributed for informational purposes only. It is not to be construed as creating or becoming part of any Woodward Governor Company contractual or warranty obligation unless expressly stated in a written sales contract.

For more information contact: