MCM112 ECU

HARDWARE TECH NOTE

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OVERVIEW

The MCM112 is a Port Injection ECU that is specifically built to suit various Mercury engines.
This ECU has onboard Lambda control and ignition drivers. This document describes the Inputs and Outputs in detail and provides I/O pin circuit diagrams.

Electrical

- Supply Voltage - Normal Operation: 8 V to 16V
- Supply Voltage - Maximum: 18V
- Typical no-load supply current: 0.19A at 13.8V supply

5V Sensor Voltage Output

- 5V output for sensor supplies.
- Maximum RMS current output 100mA.
    - Max output current rating applies to all devices attached to one 5V supply output.

0V Sensor Voltage Output

- 0V output for sensor supplies.
- 0V outputs are fused to ground.
- Maximum RMS current output 1.5A.
    - Max output current rating applies to all devices attached to one 0V supply output.

    NOTE: Care should be taken in wiring loom design to ensure that no current paths are routed to Sensor Zero Volt pins.

Physical

- Dimensions: 228 x 178.3 x 37.7 mm
- Weight 896.3 g
- Connector Main: 2 x 32 pin + 1 x 48 pin Molex
- Connector Expansion: 1 x 34 pin Tyco

Ingress Protection (IP) Rating

- The device is rated to IP67

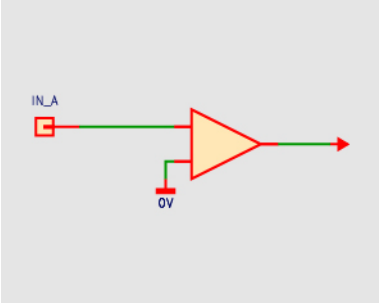
  NOTE: IP rating is dependent upon the user ensuring that the connector entries are waterproof, which, as a minimum, requires all unused wire cavities on the connector to be plugged.

MCM112 INPUTS

Analogue Input (IN_A)

- Typically used with sensors such as throttle position, pressure, etc.
- External inputs which measure absolute voltage.
- 12 bit analogue to digital converters with 0V - 5V input range and a precision internal reference.
- 480Hz bandwidth.
- Continuous no damage input voltage range -30V to +30V.
- Supports absolute measurement.
- 17 IN_A pins per device.

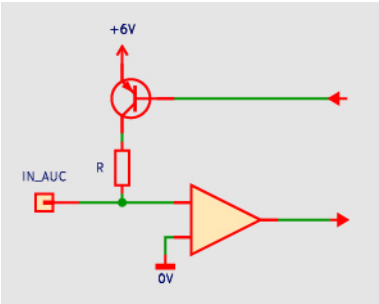
Representative circuit



Analogue Current Pullup (IN_AUC)

- Typically used with Resistive fuel tank level sensors, etc.
- External calibrated, inputs which measure absolute voltage.
- Configurable 20mA pull-up
- 12 bit analogue to digital converters with 0V - 5V input range and a precision internal reference.
- 480Hz bandwidth.
- Continuous no damage input voltage range -30V to +30V.
- Supports absolute measurement.
- 2 IN_AUC pins per device.

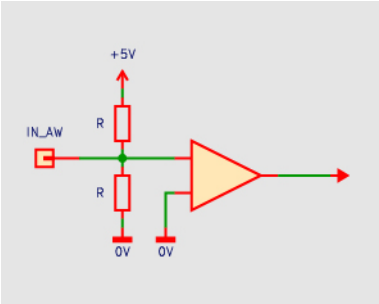
Representative circuit



Wideband Analogue Input (IN_AW)

- Typically used for knock sensors.
- External calibrated, inputs which measure absolute voltage.
- 12 bit analogue to digital converters with 0V - 5V input range and a precision internal reference.
- 80kHz bandwidth.
- Continuous no damage input voltage range -30V to +30V.
- Supports absolute measurement.
- 4 IN_AW pins per device.

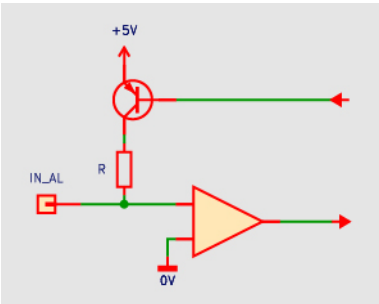
Representative circuit



Analogue Lambda Input (IN_AL)

- Typically used with lambda sensors.
- External calibrated, inputs which measure absolute voltage.
- Includes cell bias and impedance measurement capability.
- 12 bit analogue to digital converters with 0V - 5V input range and a precision internal reference.
- 17kHz bandwidth.
- Continuous no damage input voltage range -30V to +30V.
- 1 IN_AL pin per device.

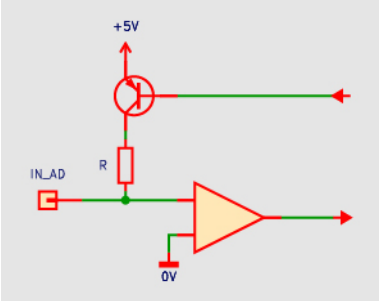
Representative circuit



Analogue Digital Input (IN_AD)

- Typically used for temperature sensors.
- External calibrated, inputs which measure absolute voltage.
- Can also be used as a digital input channel.
- Configurable 3.3k pullup resistor
- 12 bit analogue to digital converters with 0V – 15.5V input range and a precision internal reference.
- 50kHz bandwidth.
- Continuous no damage input voltage range -30V to +30V.
- Supports absolute measurement.
- 2 IN_AD pins per device.

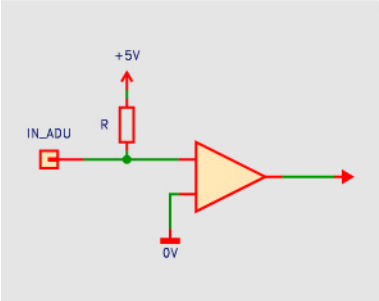
Representative circuit



Analogue Digital Pullup (IN_ADU)

- External calibrated, inputs which measure absolute voltage.
- Can also be used as a digital input channel.
- Fixed 3.3k pullup resistor
- 12 bit analogue to digital converters with 0V – 5V input range and a precision internal reference.
- 160kHz bandwidth.
- Continuous no damage input voltage range -30V to +30V.
- Supports absolute and periodic measurement, etc.
- 10 IN_ADU pins per device.

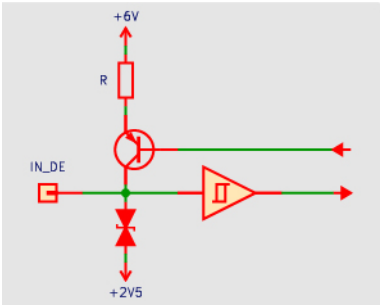
Representative circuit



Enhanced Digital Input (IN_DE)

- Typically used for rotational speed and position sensors.
  Such as crank position, cam position, wheel speed, turbo speed etc.
- Input waveform capture (12bit) range -150V to 150V.
- Increased resolution in range –20V to 20V.
- Programmable trigger levels +/-10V.
- Programmable hysteresis levels 0.1V to 6.0V.
- 13kHz bandwidth.
- Programmable digital filtering.
- Suitable for hall/optical and magnetic sensors.
- Switchable pullup resistor – 1k via diode to +6V supply.
- Diagnostics: Threshold Noise, Hysteresis Noise, Rejected Pulse and Small Pulse.
- Peak voltage 200V.
- 8 IN_DE pins per device.

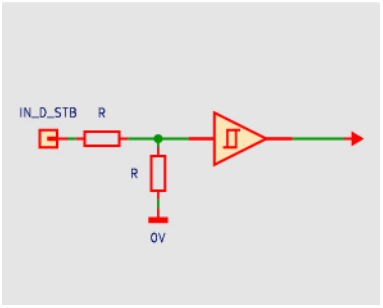
Representative circuit



Standby Digital Input (IN_D_STB)

- Digital input only.
- Input remains active when ECU is in low power mode.
- Typical input voltage range 0V to 15V.
- Programmable trigger level 0V to 15V.
- Programmable hysteresis 0V to 0.77V.
- 50kHz bandwidth.
- 3 IN_D_STB pins per device.

Representative circuit

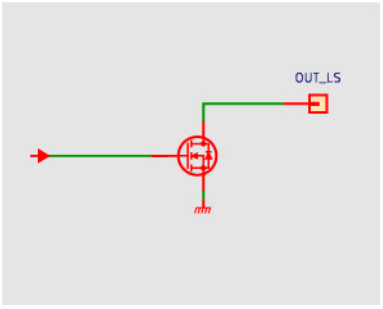


MCM112 OUTPUTS

Low Side Output (OUT_LS)

- Open drain outputs, switched to BAT_NEG.
- Pin voltage monitored by 12-bit ADC.
- Max voltage 40V.
- Peak current limit 3.5A.
- Max PWM output frequency 20kHz.
- No internal recirculation circuitry. Cam solenoids require external recirculation diode.
- 11 OUT_LS pins per device.

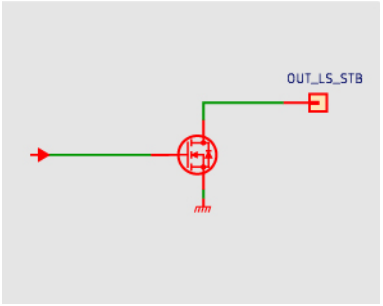
Representative circuit



Standby Low Side Output (OUT_LS_STB)

- Open drain outputs, switched to BAT_NEG.
- Output remains active when ECU is in low power mode.
- Output can be driven by either the corresponding standby input or the ECU firmware.
- Suitable for driving loads such as power relays with or without ECU control.
- Pin voltage monitored by 12-bit ADC.
- Max voltage 40V.
- Peak current limit 3.5A.
- Max PWM output frequency 20kHz.
- No internal recirculation circuitry.
- 3 OUT_LS_STB per device.

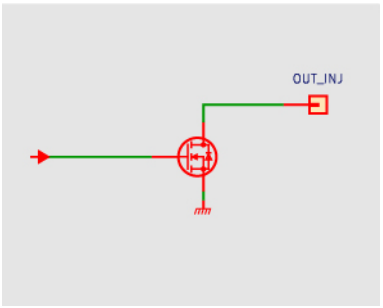
Representative circuit



Injector Output (OUT_INJ)

- Open drain outputs, switched to BAT_NEG.
- Suitable for driving port injectors (High impedance).
- Pin voltage monitored by 12-bit ADC.
- Max voltage 40V.
- Peak current limit 3.5A.
- Max PWM output frequency 20kHz.
- No internal recirculation circuitry.
- 16 OUT_INJ per device; 8 of these are available through the expansion connector.

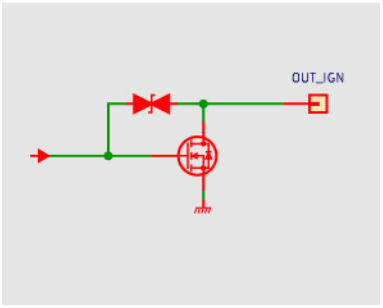
Representative circuit



Ignition Output (OUT_IGN)

- Open drain outputs, switched to BAT_NEG.
- Pin voltage and current monitored by 12-bit ADC.
- Internal diode clamps pin voltage below 450V.
- Max voltage 600V.
- Peak current limit 10A.
- 4 OUT_IGN pins per device.

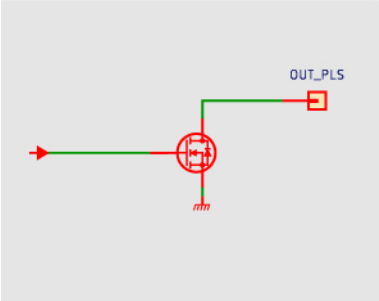
Representative circuit



Power Low Side Output (OUT_PLS)

- Typically used for Solenoids, Lambda Sensor Heater.
- Open drain outputs, switched to BAT_NEG.
- Pin voltage monitored by 12-bit ADC.
- Max voltage 40V.
- Peak current limit 12A.
- Max PWM output frequency 20kHz.
- No internal recirculation circuitry. Cam solenoids require external recirculation diode.
- 2 OUT_PLS pins per device.

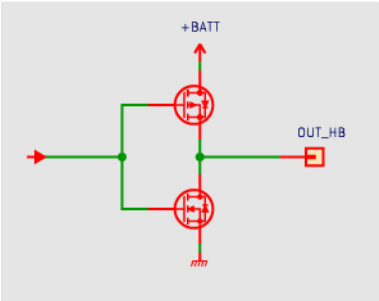
Representative circuit



Half Bridge Output (OUT_HB)

- 12 Amp low side driver and 9 Amp high side driver.
- Recirculation via internal high side FET. Cam solenoids may be wired without external recirculation diode.
- Both high and low side drivers can be PWM.
- Pin voltage monitored by 12 bit A/D converter (per output).
- 24bit timers 0.25usec resolution.
- Suitable for servo throttle (Drive by Wire) (2 outputs required).
- Suitable for general purpose DC servo drive.
- Max current LS 12 Amps.
- Max current HS 9 Amps.
- Maximum output frequency in PWM modes: low side drive 20KHz, high side drive 1KHz.
- Loads must be connected to either ECU BAT_POS or ECU BAT_NEG in a full bridge configuration.
- 4 OUT_HB pins per device.

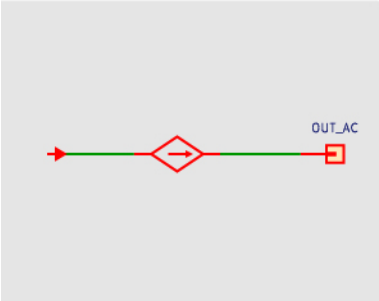
Representative circuit



Analogue Current Output (OUT_AC)

- Controllable +/-10mA analogue current source.
- Provides both current and voltage outputs.
- Typically used for driving reference currents for lambda sensors.

Representative circuit



MCM112 COMMUNICATIONS

CAN

- 4 CAN buses
  - Definable CAN speeds, timeouts, transmit, and receive messaging.
  - CAN messaging is implemented in the CanComms libraries which are incorporated into scripts by the application developer.

Ethernet

A 10/100 Ethernet port is available through the expansion connector.

MCM112 PINOUT

MCM112 Connector A - BK (Black)

Pin Number	Designation	Full Name
BK_A1	OUT_LS1	Low Side Output 1
BK_A2	OUT_LS_STB1	Standby Low Side Output 1
BK_A3	OUT_LS_STB2	Standby Low Side Output 2
BK_A4	OUT_LS2	Low Side Output 2
BK_B1	OUT_INJ8	Injector Output 8
BK_B4	OUT_LS3	Low Side Output 3
BK_C1	OUT_INJ7	Injector Output 7
BK_C4	IN_DE1	Enhanced Digital Input 1
BK_D1	OUT_INJ2	Injector Output 2
BK_D3	IN_AD1	Analogue Digital Input 1
BK_D4	SEN_0V_D	Sensor 0V D
BK_E1	OUT_INJ5	Injector Output 5
BK_E2	OUT_LS4	Low Side Output 4
BK_F1	OUT_INJ4	Injector Output 4
BK_F2	OUT_INJ6	Injector Output 6
BK_F3	OUT_INJ1	Injector Output 1
BK_F4	OUT_INJ3	Injector Output 3
BK_G1	OUT_LS5	Low Side Output 5
BK_G2	IN_DE2	Enhanced Digital Input 2
BK_G3	GND	Ground
BK_G4	OUT_LS6	Low Side Output 6
BK_H1	OUT_IGN1	Ignition Output 1
BK_H2	OUT_IGN2	Ignition Output 2
BK_H3	OUT_IGN3	Ignition Output 3
BK_H4	OUT_IGN4	Ignition Output 4

MCM112 Connector B - BN (Brown)

Pin Number	Designation	Full Name
BN_B1	OUT_AC1_C	Analogue Current Output 1.Current
BN_B2	OUT_AC1_V	Analogue Current Output 1.Voltage
BN_B3	SEN_0V_E	Sensor 0V E
BN_C1	IN_A1	Analogue Input 1
BN_C2	IN_A2	Analogue Input 2
BN_C3	IN_AL1	Analogue Lambda Input 1
BN_D1	IN_A3	Analogue Input 3
BN_D2	IN_ADU5	Analogue Digital Pullup 5
BN_D3	IN_A4	Analogue Input 4
BN_D4	IN_ADU2	Analogue Digital Pullup 2
BN_E1	IN_ADU4	Analogue Digital Pullup 4
BN_E2	IN_ADU3	Analogue Digital Pullup 3
BN_E3	OUT_LS7	Low Side Output 7
BN_E4	IN_DE3	Enhanced Digital Input 3
BN_F1	CAN1_LO	CAN Bus 1 Low
BN_F2	CAN1_HI	CAN Bus 1 High
BN_G1	CAN2_LO	CAN Bus 2 Low
BN_G2	CAN2_HI	CAN Bus 2 High
BN_G3	IN_DE4	Enhanced Digital Input 4
BN_H1	CAN3_LO	CAN Bus 3 Low
BN_H2	CAN3_HI	CAN Bus 3 High
BN_H4	IN_A5	Analogue Input 5
BN_J1	IN_A6	Analogue Input 6
BN_J2	IN_A7	Analogue Input 7
BN_J4	IN_A8	Analogue Input 8
BN_K1	IN_A9	Analogue Input 9
BN_K2	IN_A10	Analogue Input 10
BN_K3	IN_A11	Analogue Input 11
BN_K4	IN_DE5	Enhanced Digital Input 5
BN_L1	OUT_PLS2	Power Low Side Output 2
BN_L2	IN_ADU1	Analogue Digital Pullup 1
BN_L3	OUT_LS8	Low Side Output 8
BN_M4	OUT_LS_STB3	Standby Low Side Output 3

MCM112 Connector C - GY (Grey)

Pin Number	Designation	Full Name
GY_A1	IN_A12	Analogue Input 12
GY_A2	IN_AD2	Analogue Digital Input 2
GY_A3	OUT_LS9	Low Side Output 9
GY_A4	PWR_STB	Standby Power
GY_B1	IN_ADU6	Analogue Digital Pullup 6
GY_B2	IN_AUC2	Analogue Current Pullup 2
GY_B3	IN_A13	Analogue Input 13
GY_B4	IN_A14	Analogue Input 14
GY_C1	IN_D_STB1	Standby Digital Input 1
GY_C2	IN_D_STB2	Standby Digital Input 2
GY_C3	IN_D_STB3	Standby Digital Input 3
GY_C4	IN_AUC1	Analogue Current Pullup 1
GY_D1	OUT_LS10	Low Side Output 10
GY_D2	IN_A15	Analogue Input 15
GY_E1	SEN_0V_A	Sensor 0V A
GY_E2	SEN_0V_C	Sensor 0V C
GY_E3	SEN_0V_B	Sensor 0V B
GY_E4	SEN_5V_B	Sensor 5V B
GY_F1	SEN_5V_A	Sensor 5V A
GY_F2	SEN_5V_C	Sensor 5V C
GY_F3	OUT_LS11	Low Side Output 11
GY_F4	OUT_PLS1	Power Low Side Output 1
GY_G1	GND	Ground
GY_G2	GND	Ground
GY_G3	PWR	Power
GY_G4	PWR	Power
GY_H1	OUT_HB1	Half Bridge Output 1
GY_H2	OUT_HB2	Half Bridge Output 2
GY_H3	OUT_HB3	Half Bridge Output 3
GY_H4	OUT_HB4	Half Bridge Output 4

MCM122 Connector X — Expansion

Pin Number	Designation	Full Name
X_1	SEN_0V_F	Sensor 0V F
X_2	OUT_INJ9	Injector Output 9
X_3	OUT_INJ10	Injector Output 10
X_4	OUT_INJ11	Injector Output 11
X_5	OUT_INJ12	Injector Output 12
X_6	OUT_INJ13	Injector Output 13
X_7	OUT_INJ14	Injector Output 14
X_8	OUT_INJ15	Injector Output 15
X_9	OUT_INJ16	Injector Output 16
X_10	IO_PWR	Power In Out
X_11	IN_A16	Analogue Input 16
X_12	IN_A17	Analogue Input 17
X_13	IN_ADU7	Analogue Digital Pullup 7
X_14	IN_ADU8	Analogue Digital Pullup 8
X_15	IN_AW2	Wideband Analogue Input 2
X_16	IN_AW3	Wideband Analogue Input 3
X_17	IN_AW4	Wideband Analogue Input 4
X_18	IN_ADU9	Analogue Digital Pullup 9
X_19	IN_ADU10	Analogue Digital Pullup 10
X_20	SEN_0V_G	Sensor 0V G
X_21	SEN_0V_H	Sensor 0V H
X_22	SEN_5V_D	Sensor 5V D
X_23	IN_AW1	Wideband Analogue Input 1
X_24	CAN4_HI	CAN Bus 4 High
X_25	CAN4_LO	CAN Bus 4 Low
X_26	IN_DE6	Enhanced Digital Input 6
X_27	IN_DE7	Enhanced Digital Input 7
X_28	IN_DE8	Enhanced Digital Input 8
X_29	Not connected	
X_30	Not connected	
X_31	ETH_TX+	Ethernet Transmit+
X_32	ETH_TX-	Ethernet Transmit-
X_33	ETH_RX+	Ethernet Receive+
X_34	ETH_RX-	Ethernet Receive -

MCM112 DIMENSIONS

This product provides lugs for mounting, the ECU must only be mounted using appropriate grommets and bushings.