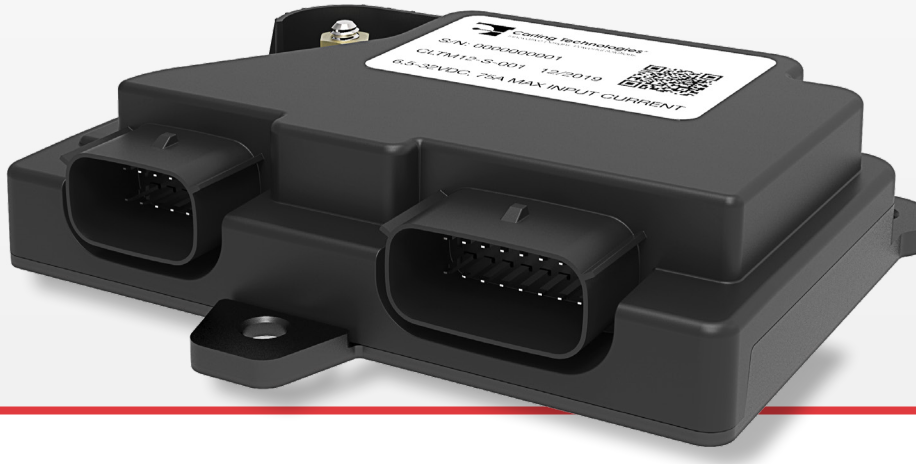
CLTM12-Series

Solid State Load Controller

PRODUCT WEBPAGE

request sample, configure part, watch video



The CLTM12-S is a compact, solid state load controller with 12 high-side outputs, 4 digital inputs, 3 discrete inputs, 2 address lines, and a CAN baud rate select line. It provides fast, low-loss, solid state on/off switching along with short circuit protection for each output, as well as load status and power diagnostics. Relative to electromechanical relays, the CLTM12 electronic control module increases thermal efficiency by providing lower power dissipation and higher power-to-weight densities.

6.5-32
VDC

IP69K Sealing
When Connected

Typical Applications

- On/Off-Highway
- Headlamps and Sidelights
- Directional and Hazard Signals
- Beacon and Alarm Systems
- Site and Work Lights
- Cab Illumination

Tech Specs

Mechanical

Dimensions (L x W x H)	5.7" x 4.2" x 1.33"
Weight (max)	1.25 lbs. (0.567 kg)
Torque Value (voltage input stud)	20 - 25 in-lbs. [2.26 - 2.82 N-m]
J2 Mating connector	Molex P/N 334721201
J1 Mating connector	Molex P/N 0334721601

Electrical

Voltage Input	6.5 to 32VDC
Max Current Capacity	75 Amps
Serial Communication	CAN J1939
8 High Side Outputs	10 Amps each
4 High Side Outputs	5 Amps each
2 Address Lines	Active Low
Baud Rate Select	Connector J1 Pin 3: 250 Kbit/s open; connector J1 Pin 3 to connector J1 Pin 15: 500 Kbit/s
4 Digital Inputs	Active High, Active Low & Open
3 Discrete Inputs	Active High, Active Low & Open
Sleep Mode Current	<3mA
Operating Voltage	SAE J1455, Section 4.13.1
Over Voltage	SAE J1455, Section 4.13.1
Reverse Polarity	SAE J1455, Section 4.13.1
Short Circuit	SAE J1455, Section 4.13.1
Power Up	SAE J1455, Section 4.13.1

Electromagnetic

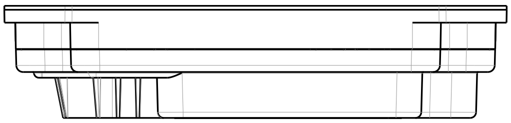
Transient Immunity	ISO 11451-1 & 11452-2
Transient Emissions	ISO 13766, Section 5 Annex D And Annex E
Conducted Transients	ISO 7637-2, Annex A
Electrostatic Discharge (ESD)	ISO 13766 & ISO 10605

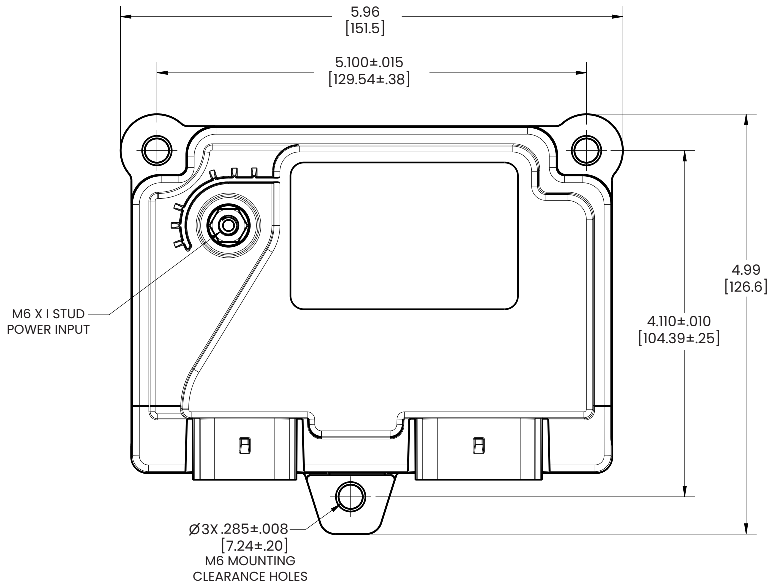
Environmental

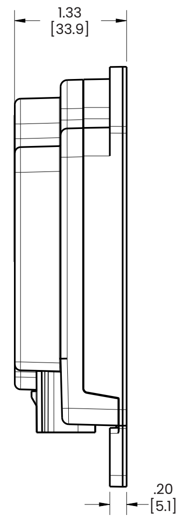
Operating Temp.	-40° to +85°C
Storage Temperature	-40° to +85°C
High Temperature	IEC 60068-2-2, Test Bb
Low Temperature	IEC 60068-2-1, Test Ad
Temp. Cycling (Operational)	IEC 60068-2-14, Test Nb
Temp. Shock (Storage)	IEC 60068-2-14, Test Na
Simulated Solar Radiation	IEC 60068-2-5, Procedure B
Altitude (Transport)	IEC 60068-2-13
Altitude (Operational)	IEC 60068-2-13, Test M: Low air pressure
Humidity (Soak)	IEC 60068-2-78
Humidity (Cyclic)	IEC 60068-2-30
Sealing Protection	IP69k in accordance with DIN 40050-9 and IEC 60529 sections 13.4, 13.6, & 14
Mechanical Shock (Drop Test)	IEC 60068-2-32, Test Ed: Free Fall, Procedure 1.
Mechanical (Shock)	60068-2-27
Mechanical (Bump)	60068-2-29
Vibration (Sine)	IEC 60068-2-6
Vibration (Random)	IEC 60068-2-64, Method 1
Vibration (Resonant Search)	IEC 60068-2-6
Chemical Resistance	IEC 60068-2-74, Test Class B (Engine oil, Diesel, Hydraulic Oil, Ethylene Glycol, Urea Nitrogen, Liquid lime, NPX fertilizer, Ammonia, Calcium chloride)
Salt Spray	IEC 60068-2-52, Test Kb
Ozone	ASTM D1171-99, Method 1

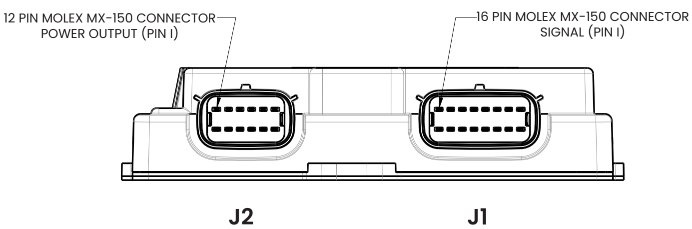
Dimensional Specs

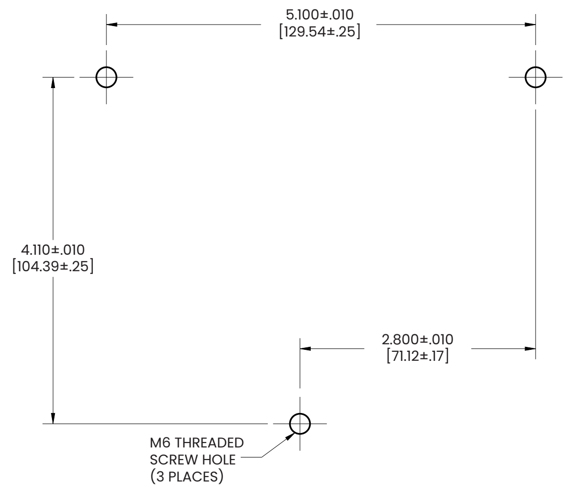
inches [millimeters]











MOUNTING PATTERN

CLA-0165 Rev: D

*Manufacturer reserves the right to change product specification without prior notice.

Configuration

Digital inputs

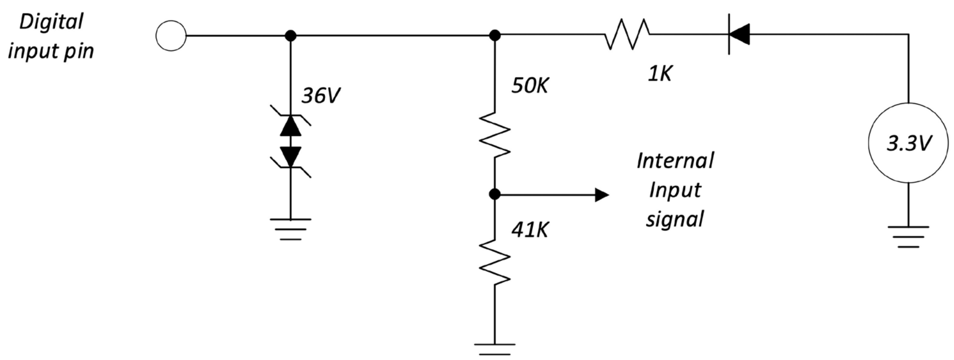
The digital inputs (IND_1, IND_2, IND_3. IND_4_WKE) sense the presence of three voltage level states: "Active High", "Open" and "Active Low" and are compatible with standard 5v logic devices (E.g. when the input is at +5v it will be read as a logic '1' or "High". When the input is at 0v or GND it will be read as logic '0' or "Low".) The unused digital inputs can be left disconnected.

- Absolute limits   -2.3 to 36V
- Input resistance: 1K Ohm
- Input pin voltage open circuit: 2.75V

Thresholds

Low = 0 to 1.08V
Open = 1.58 to 4.28V
High = 4.78V to 6.63V
These thresholds apply when the CLTM12-S is not in sleep mode.
The IND_4_WKE pin is a special case. When the CLTM12-S is in sleep mode this pin serves as a means of waking the CLTM12-S from sleep when a low to high logic transition is detected.
The logic levels associated with this function are:
Logic low for levels no greater than 2.74V
Logic high for levels no less than 3.70 V
In the sleep state the open circuit voltage on this pin is between 3.0 and 3.3V, so it must be pulled high to cross the threshold and wake the CLTM12-S.

Digital Input Impedance Model

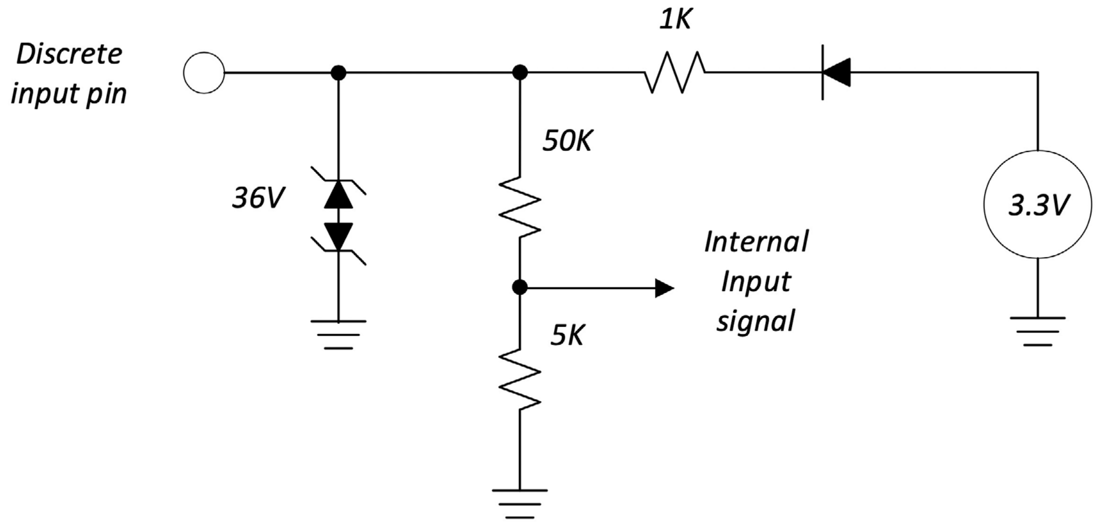


Discrete inputs

The discrete inputs (INA_1, INA_2, INA_3) are similar to the digital inputs in that they respond to three voltage level states "Active High", "Open" and "Active Low" (E.g. when the input is at V-Battery it will be read as a logic '1' or "High". When the input is at 0v or GND it will be read as logic '0' or "Low".) The unused discrete inputs can be left disconnected which results in an "open" state.
Absolute limits: -2.3 to 36V
Input resistance: 1K Ohm
Input voltage, open circuit: 2.75V
Thresholds:
Low = 0 to 1.02V
Open = 1.51 to 4.31V
High = 4.82V to 32.0V
These thresholds apply when the CLTM12-S is not in sleep mode.

Configuration

Discrete Input Impedance Model



Address and Baud Rate select inputs

The address lines (ADD_1, ADD_2 and baud rate select) are active Low inputs that the software uses to identify the application based on the configuration of the wiring harness. These pins recognize two states Low and High.

Address 1	Address 2	J1939 Source Address
Open	Open	49 (0x31)
Ground	Open	50 (0x32)
Open	Ground	51 (0x33)

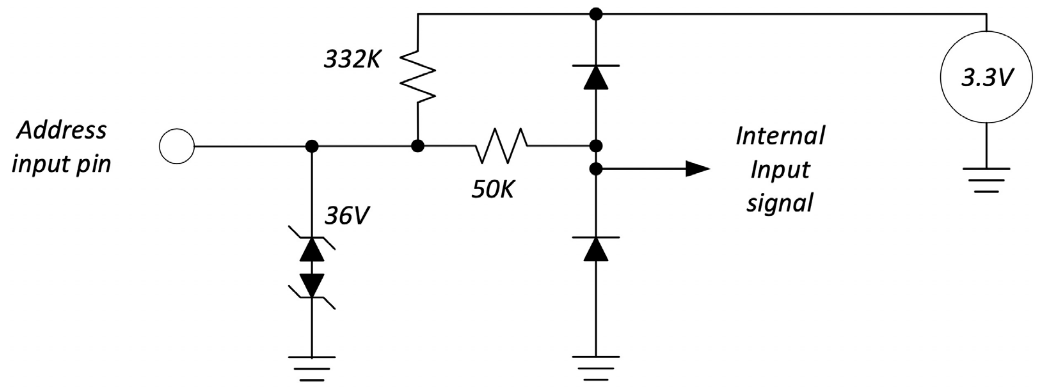
Open circuit voltage = 3.3V
Input resistance > 50K Ohms
Low = below 0.72V
High = above 1.65V

Baud Rate Select input

No connect (J1-3) for 250 Kbits/second select.
Connect (J1-3 to J1-15) for 500 Kbits/second select.
If the CLTM12-S-Series is configured for 500k Baud operation, several CAN errors will be visible on the bus at power-up. This is because the bootloader software is hard-configured for 250k Baud operation and will generate CAN errors as the software transitions from the bootloader to the application.

Configuration

Address & Baud Rate select Input Impedance Model



Output Channels

The 12 High side output channels are switched with MOSFETs connected in a back-to-back arrangement so that back-feeding is not possible when the channel is turned off.

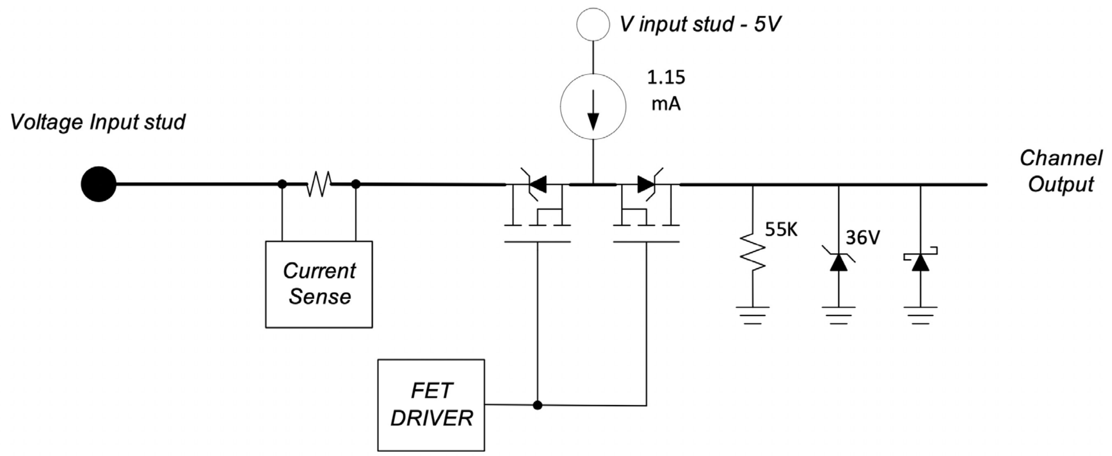
5A	Channels 3 (J2 pin 11), 6 (J2 pin 9), 9 (J2 pin 8) and 12 (J2 pin 10)
10A	Channels 1 (J2 pin 6), 2 (J2 pin 4), 4 (J2 pin 2), 5 (J2 pin 1), 7 (J2 pin 7), 8 (J2 pin 3), 10 (J2 pin 5), 11 (J2 pin 12)

The total current supplied by the CLTM12-S is limited to 75A.

All channels employ the following:

- Load Presence Detection
- Latched shutdown overcurrent detection with reset.
- Overcurrent surge allowance that prevents overcurrent latch tripping when starting high surge loads such as
  incandescent lamps.

Output Channel Schematic



Configuration

Output Channel Schematic (continued)

When a channel is off, a current source supplies 1.15 mA to the load so that the channel output voltage can be used to determine its status. The real-time monitoring functions for the faults: “Open circuit” and “ON when commanded OFF” are implemented by comparing channel voltage to input voltage. “Open circuit” is asserted when the channel is OFF and the difference between the Input voltage and the Channel voltage is between 1.5V and 6.0 volts. If the difference between the Input and Channel voltages is between 0 and 1.5V when the channel is OFF, the “ON when commanded OFF” fault is asserted.

The OFF when commanded ON fault is asserted when a channel is ON and the channel voltage is 1.5V or less.

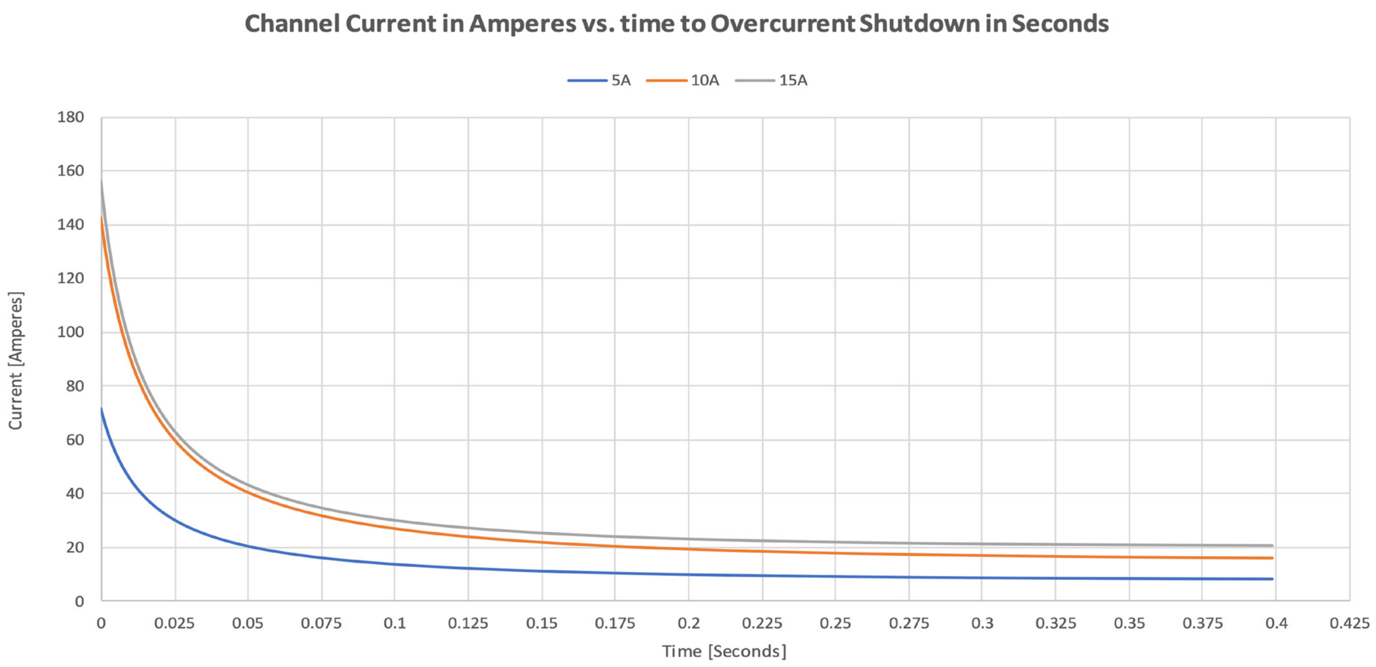
When an overcurrent condition is detected the hardware will latch the channel off and prevent it from being turned back on for the remainder of the continuously powered interval. The channel will be available again after a power cycle.

The surge allowance function is also implemented in hardware. Constant over-current levels are allowed for a time that is inversely proportional to the magnitude of overcurrent according to the following curve.

Most real loads have current draws that vary continuously with time for an interval of time. An incandescent lamp filament is an example where the instantaneous start current is a high peak that exponentially decays to the steady state level within a short time (100mS).

The surge allowance function does have a hard-peak limit that is not time dependent. The channel shuts down immediately when this limit is exceeded. The hard peak is greater than nine times (9x) the continuous current limit.

Channel current rating	5A	10A
Peak Current Limit	70A	140A
Continuous Current Limit	7.5A	15A



Configuration

CAN Interface

CLTM12-S Command Message (Received)		
PGN	65374 (0xFF5E)	
Priority	6	
Periodicity	1000 mS, or on change	
Start	**Description**	**Available States**
1.1	Output 01 Cmd	00b = OP commanded OFF
1.3	Output 02 Cmd	01b = OP commanded ON
1.5	Output 03 Cmd	10b = Unused
1.7	Output 04 Cmd	11b = N/A
2.1	Output 05 Cmd	
2.3	Output 06 Cmd	
2.5	Output 07 Cmd	
2.7	Output 08 Cmd	
3.1	Output 09 Cmd	
3.3	Output 10 Cmd	
3.5	Output 11 Cmd	
3.7	Output 12 Cmd	
4.1	Operating Mode	00 = Sleep, 01 = Run
4.3	Reserved	111111b
5.1	Slave Source Address	0x31, 0x32, 0x33

CLTM12-S Output State Message (Transmitted)		
PGN	65375 (0xFF5F)	
Priority	6	
Periodicity	1000 mS, or on change	
Start	**Description**	**Available States**
1.1	Output 01 State	0000b = Output OFF
1.5	Output 02 State	0001b = Output ON
2.1	Output 03 State	0010b = ON when OFF fault
2.5	Output 04 State	0011b = OFF when ON fault
3.1	Output 05 State	0100b = Short Circuit fault
3.5	Output 06 State	0101b = Open Circuit fault
4.1	Output 07 State	
4.5	Output 08 State	
5.1	Output 09 State	
5.5	Output 10 State	
6.1	Output 11 State	
6.5	Output 12 State	
7.1	Reserved	0xFF
8.1	Reserved	0xFF

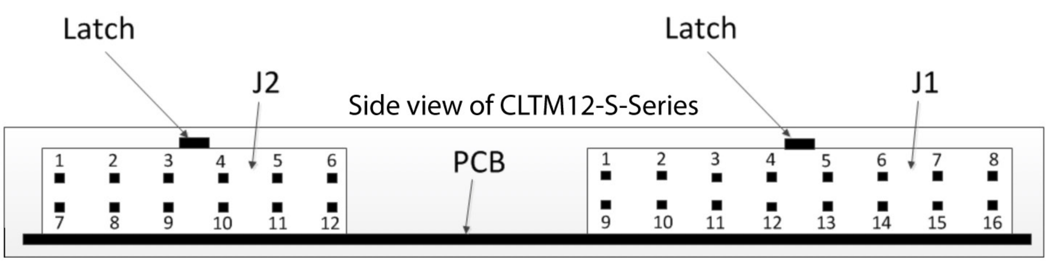
Configuration

CAN Interface (continued)

CLTM12-S Input State Message (Transmitted)		
PGN	65422 (0xFF8E)	
Priority	6	
Periodicity	100 mS, or on change	
Start	**Description**	**Available States**
1.1	Input 01 State	00b = Input OFF
1.3	Input 02 State	01b = Input ON
1.5	Input 03 State	10b = Error
1.7	Input 04 State	11b = N/A
2.1	Input 05 State	
2.3	Input 06 State	
2.5	Input 07 State	
2.7	Reserved	11b

Addr-1	Addr-2	J1939 Source Address
Open	Input 01 State	00b = Input OFF
Gnd	Input 02 State	01b = Input ON
Open	Reserved	11b

Connector interface



J2 Connector Pin No.	Description	Output Rating in AMPS
1	Output 5	10
2	Output 4	10
3	Output 8	10
4	Output 2	10
5	Output 10	10
6	Output 1	10
7	Output 7	10
8	Output 9	5
9	Output 6	5
10	Output 12	5
11	Output 3	5
12	Output 11	10

J1 Connector Pin No.	Description
1	CAN High
2	System Ground
3	Baud Rate Select
4	Address #1 (active low)
5	Digital Input #3 (active high / open / low)
6	Digital Input #1 (active high / open / low)
7	Discrete Input #3 (active high / open / low)
8	Discrete Input #1 (active high / open / low)
9	CAN Low
10	CAN Shield
11	No connect
12	Address #2 (active low)
13	Digital Input #4 (active high / low) / Ignition Wake (active high)
14	Digital Input #2 (active high / open / low)
15	Pull-Down to Ground (for configuration address daisy-chain)
16	Discrete Input #2 (active high / open / low)

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