

VM-Series

CAN Bus Rocker Switch
Module

PRODUCT WEBPAGE

request sample, watch video



The sealed VM-Series incorporates the Contura® switches actuator style flexibility with CAN Bus technology to create a multiplexed rocker switch module. Additionally, the VM-Series increases product reliability, while reducing the complexity of wire harnesses and improving assembly efficiencies.

12/24
VDC

250,000
Operations

IP68 Sealing
Above and below panel

Typical Applications

- Commercial Vehicles
- Construction Equipment
- Agricultural Equipment
- Work Trucks

Design Features

IP68 SEALING PROTECTION

Fully sealed above panel and below panel (when connected)



Front View

ROCKERS

Variety of removable V-Series Contura® actuator styles

CUSTOMIZABLE ICONS

Choose from our extensive library of legends, or customize your own.

Back View

VM6



SNAP-IN MOUNTING

For fast, easy assembly.

6 PIN CONNECTOR

Mates to the Deutsch DT-Series Connector.

VM3



4 PIN CONNECTOR

Mates to the Deutsch DT-Series Connector. Can be used to Daisy-chain multiple VM-Series.

Related Products



CLTM12-S-Series >
Load Controller



CKJ-Series >
Jog Switch



CKP-Series >
Customizable Keypad

Tech Specs

Electrical

Operating Voltage		12 or 24VDC systems
Maximum Current		VM3: Operation: 90mA; Sleep mode: 8mA VM6: Operation: 130mA; Sleep mode: 8mA
Electrical Endurance		Minimum 250,000 operations (50,000 cycles at -40°C, 150,000 cycles at room temperature, & 50,000 cycles at 85°C)
Over Voltage	ISO 16750-2	Apply voltage 36VDC for 60 min at 65°C
Short Circuit Protection	ISO 16750-2	All signal inputs and outputs short to ground for 60s
Reverse Polarity Protection	ISO 16750-2	12 VDC systems: -24VDC for 5 minutes 24 VDC systems: -36VDC for 5 minutes
Starting Profile	ISO 16750-2	Class A
Withstand Voltage	ISO 16750-2	500Vrms (50 Hz to 60 Hz) with a duration of 60s
Insulation Resistance	ISO 16750-2	Minimum 10 Mohms at 500 VDC with a duration of 60s
Superimposed Alternating Voltage	ISO 16750-2	Severity 2, Upp of 4V for Un=12V and Un=24V
Slow Decrease and Increase of Supply Voltage	ISO 16750-2	Power supply from 8V to 0V, 0V to 8V, (rate of 0.5 ± 0.1V/min linear)
Momentary Drop in Supply Voltage	ISO 16750-2	Voltage drop from 8V to 4.5V for 12V system, 16V to 9V for 24V system. Dwell time 10ms.

Electromagnetic Compatibility (EMC)

ESD	ISO 10605	±15kV air discharges, ±8kV contact discharges
Absorbed-Lined Chamber	ISO 11452-2	100V/m, 80MHz to 2GHz
Bulk Current Injection	ISO 11452-4	100mA, 20MHz to 400MHz
Conducted Transients	ISO 7637-2	All test pulses according to ISO 7637, Annex table A2 for 24V systems, level 3 minimum
Transient Emissions	ISO 13766	Annex D and E, 30MHz to 1GHz

Environmental

Operating Temperature		-40 °C to + 85°C
Storage Temperature		-40°C to + 85°C
Thermal, Hot Soak	IEC 60068-2-2	Test Bb, 85°C for 96 hours
Thermal, Cold Soak	IEC 60068-2-1	Test Ad, -40°C for 96 hours
Thermal Shock	IEC 60068-2-14	Test Na, -40°C to 85°C, 1 hour per cycle (30 minutes at 40°C, 30 minutes at 85°C) 10 cycles
Thermal Cycling	IEC 60068-2-14	Test Nb, -40°C to 85°C, 2 cycles of 8 hours each
Sealing Protection	IEC 60529	IP68, for above and below panel components of actual switch only (when connected), 1.2m deep water for 60 ± 2 min
Solar Radiation	IEC 60068-2-5	Procedure B, 40°C for 10 days
Humidity, Soak	IEC 60068-2-78	Test Cab, 30°C at 93% RH for 10 days
Humidity, Cyclic	IEC 60068-2-30	Test Db, Method 1, 55°C to 25°C at >90% R.H., 6 cycles of 24 hours each
Salt Spray	IEC 60068-52	Test Kb, severity level 4
Chemical Resistance	ISO 16750-5	Method II for engine oil, hydraulic oil, diesel fuel, grease, and urea at max temperature

Tech Specs

Mechanical

Vibration, Random	IEC 60068-2-64	Test Fh, method 1, random excitation at 10, 150, 220 and 350 Hz breakpoint frequencies, 5 hours in each axis
Vibration, Resonance	IEC 60068-2-6	Sinusoidal from 10-2000 Hz, 5 minutes at resonant points
Vibration, General	IEC 60068-2-6	Swept sine wave from 5 to 500 Hz, $\pm 15\text{mm}$ amplitude, 5g, 20 cycles in each plane
Shock	IEC 60068-2-27	3 shocks in each direction of the 3 axes (18 total shocks) at 500 m/s ² for 11 ms
Bump	IEC 60068-2-27	100 shocks in each direction of the 3 axes (600 total shocks) at 400 m/s ² for 6 ms
Drop Test	IEC 60068-2-31	Test Ec, free fall procedure 1, drop in each direction of the 3 axes (6 total drops) from 500mm

Physical

Switch Functions	2-position maintained, 2-position momentary (top), 2-position momentary (bottom), 3-position maintained, 3-position maintained (top and bottom), 3-position maintained (top), 3-position maintained (bottom)	
Illumination	Single color LED (Red, Green, Amber, Blue, White) (See Table A)	
Soft Lock	Yes	
Mounting	Front panel, removable from a side	
Depth Behind Panel	Depth behind panel 41mm [1.6 in]	
Weight	VM3: ~91 grams [0.2 lb] VM6: ~227 grams [0.5 lb]	
Materials	Housing – Acetal, UV stabilized; Back cover – Acetal, UV stabilized; Rocker – Polycarbonate / Nylon; Mounting clips – Stainless Steel	
RoHS	Yes	
REACH	Yes	
Connector	Deutsch DT-Series 4 and 6 pin (6 pin for VM6 only)	

Software

Communication	Supported Protocols and baud rates: 1. SAE J1939 a. Baud Rates i. 125 Kbps ii. 250 Kbps iii. 500 Kbps 2. NMEA2000 a. 250 Kbps 3. CANopen <Add Profile> a. Baud Rates i. 125 Kbps ii. 250 Kbps iii. 500 Kbps	
Bootloader	Allows in-network update of application software when using qualified CAN diagnostic tools.	
Programming	During manufacture or via CAN	
Sleep Mode	Any switch can be configured to wake the unit, which also activates the switch function.	
Dimming	LED dimming controlled by ECU through CAN bus	

Certification

E-Mark	ECE/R10.05	No.: E11*10R05/01*11680*00
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Tech Specs

Software Interface Integration

Click below on integrating the VM-Series into a

J1939 CAN network: www.carlingtech.com/vm-series_j1939-interface.pdf

CANopen network: www.carlingtech.com/vm-series_CANopen-interface.pdf

Tables

Table A: Illumination Table (for each switch position)

Location	Type	Color	Option
Top LED	Backlight	Red, Green, Amber, Blue or White	Continuous Flashing
	Function	Red, Green, Amber, Blue or White	ON with Switch, ON with Device
Bottom LED	Backlight	Red, Green, Amber, Blue or White	Continuous Flashing
	Function	Red, Green, Amber, Blue or White	ON with Switch, ON with Device

Table B: Connector 1 Pinout for VM3

	Pin	1	2	3	4
Option 1	Signal	VCC	GND	CAN_H	CAN_L

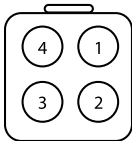


Figure 1:
Connector 1 Pinout

Table C: Connector 1 Pinout for VM6

	Pin	1	2	3	4
Option 1	Signal	VCC	GND	CAN_H	CAN_L
Option 2	Signal	Out 1	Out 2	Out 3	Out 4

Note: Out 1 to Out 4 is to control loads with max output current 0.5A @ 24VDC

Table D: Connector 1 Pinout for VM6

	Pin	1	2	3	4	5	6
Option 1	Signal	CAN_L	CAN_H	NC	NC	GND	VCC

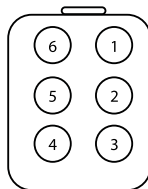


Figure 2:
Connector 2
Pinout

Table E: Operation Current Values

Size Voltage Sleep Current Value (mA) 100% Brightness Operating Current Value (mA) 10% Brightness Operating Current Value (mA)

Size	Voltage	Sleep Current Value (mA)	100% Brightness Operating Current Value (mA)	10% Brightness Operating Current Value (mA)
VM3	12	~7.15	~78.72	~63.55
	24	~6.75	~42.38	~34.61
VM6	12	~22.74	~155.67	~111.61
	24	~14.05	~78.74	~57.94

Ordering Scheme

Part 1: Module and Rocker Style

Sample Part No. **VM 6 - 1 F 1 - 1 000**

Selection 1 2 3 4 5 6 7

1. SERIES

VM V-Series Module System

2. SIZE

3 3 Position
6 6 Position

3. COMMUNICATION PROTOCOL

1 J1939
3 J1939 with Control Relay (6 position size only)
4 CANopen ¹
5 CANopen with Control Relay (6 position size only) ¹

4. ROCKER STYLE ²

A Contura II
B Contura III
E Contura V
F Contura V – Laser Etched
M Contura XIV
N Contura XIV – Laser Etched
R Indicator/Blank Cap ³
Z No Rockers

 [Configure Complete Part Number >](#)

5. ORIENTATION ^{See orientation diagram page for more details}

Mounting Panel Thickness	
1 Orientation 1	0.06 to 0.11 inches [1.6 to 2.8mm]
2 Orientation 2	
3 Orientation 3	
4 Orientation 4	
5 Orientation 5	0.11 to 0.16 inches [2.8 to 4.0mm]
6 Orientation 6	
7 Orientation 7	
8 Orientation 8	

6. NETWORK TYPE

1 250K Baud Rate
2 500K Baud Rate
4 125K Baud Rate

7. SOURCE ADDRESS ⁴

000 A Unique Number (**0-238**)
000 A Unique Number (**0-127**) ¹

Notes:

- When CANopen is selected, the second listed '000' (Part 1, Box 7) must be selected.
- If any code besides Code Z is chosen, please configure all rockers using Part 3 of the ordering scheme (next page).
- Available with stationary Switch Circuit Code 8 only (Part 2, Box 1).
- The Source Address is a unique number (**000-238**) assigned to each node on a CAN network, and is determined based on the specific CAN architecture of each customer application.
- Available with Rocker Style Code R only (Part 1, Box 4).

Part 2: Module Circuit and Lamps

Switch 1 to 3 VM3 and VM6 **1 B 2 A - 2 A 1 0 - 6 0 0 0 -**

Selection 1 2 3 4 1 2 3 4 1 2 3 4

Switch 4 to 6 VM6 Only **1 B 2 A - 2 A 1 0 - 6 0 0 0**

Selection 1 2 3 4 1 2 3 4 1 2 3 4

1. SWITCH CIRCUIT

1 2 Position Maintained
2 2 Position Momentary Top
3 2 Position Momentary Bottom
4 3 Position Momentary Bottom
5 3 Position Maintained
6 3 Position Momentary Top and Bottom
7 3 Position Momentary Top
8 Stationary ⁵

2. LAMP CIRCUIT

A L1 Backlight
B L1, L2 Backlight
C L2 Backlight
D L1 Backlight, L2 Function Light
E L1, L2 Function Light
F L1 Function Light, L2 Backlight
G L1 Function Light
H L2 Function Light
0 No Lamp

3. LAMP 1

1 LED 1, Red
2 LED 1, Green
3 LED 1, Blue
4 LED 1, Amber
5 LED 1, White
0 No LED

4. LAMP 2

A LED 2, Red
B LED 2, Green
C LED 2, Blue
D LED 2, Amber
G LED 2, White
0 No LED

Ordering Scheme

Part 3: Rockers

All Rocker options must match box 4 from part 1. For additional Contura® styles and options, consult factory.

Contura II, III, V and XIV Rockers

Sample
Part No. VV A Z C 00 - 0 00

Selection 1 2 3 4 5 6 7

1. SERIES

VV V-Series Rocker

2. ACTUATOR STYLE

Contura II

A Thick end on top



Contura III

C Thick end on top



Contura V

G Contura V

P Laser-Etched



Contura XIV

FA Contura XIV

FB Laser-Etched



3. LENS

Z - No Lens

Clear White Amber Green Red Blue

1 6 B G M T

2 7 C H N U

3 8 D J P V

4 9 E K R W

5 A F L S Y

5 A N/A N/A N/A N/A

II III V XIV

1 2 3 4

5 6 7 8

9 10 11 12

13 14 15 16

17 18 19 20

21 22 23 24

25 26 27 28

29 30 31 32

33 34 35 36

37 38 39 40

41 42 43 44

45 46 47 48

49 50 51 52

53 54 55 56

57 58 59 60

61 62 63 64

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765 766 767 768

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773 774 775 776

777 778 779 780

781 782 783 784

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789 790 791 792

793 794 795 796

797 798 799 800

801 802 803 804

805 806 807 808

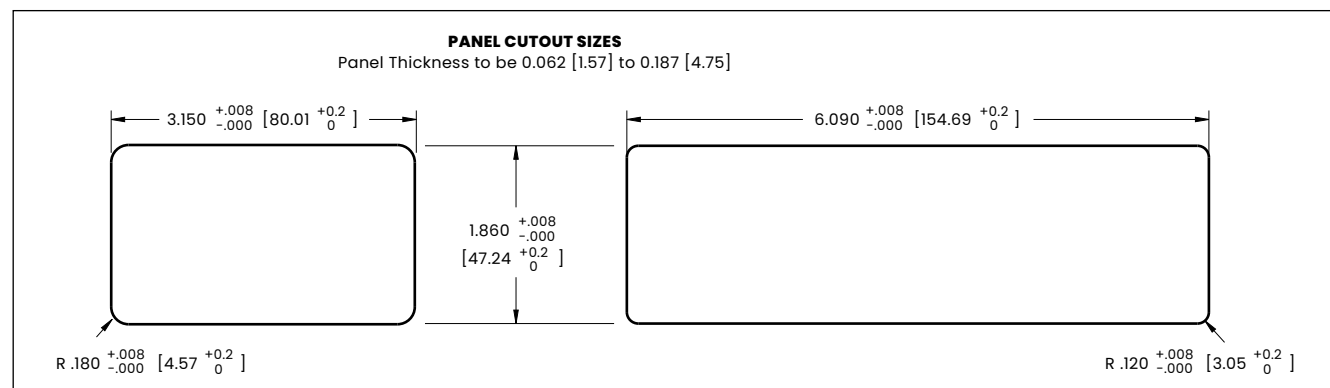
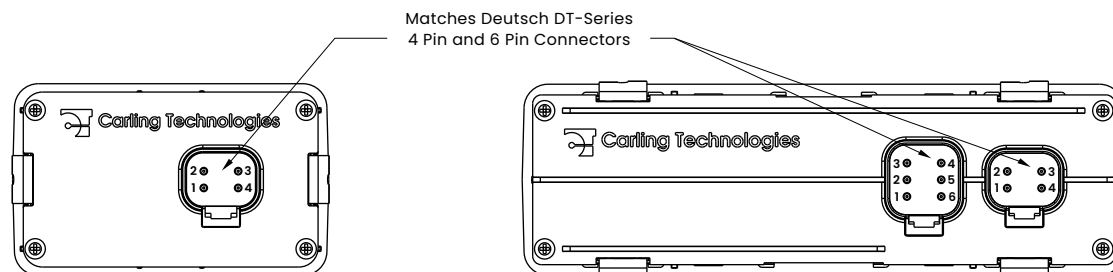
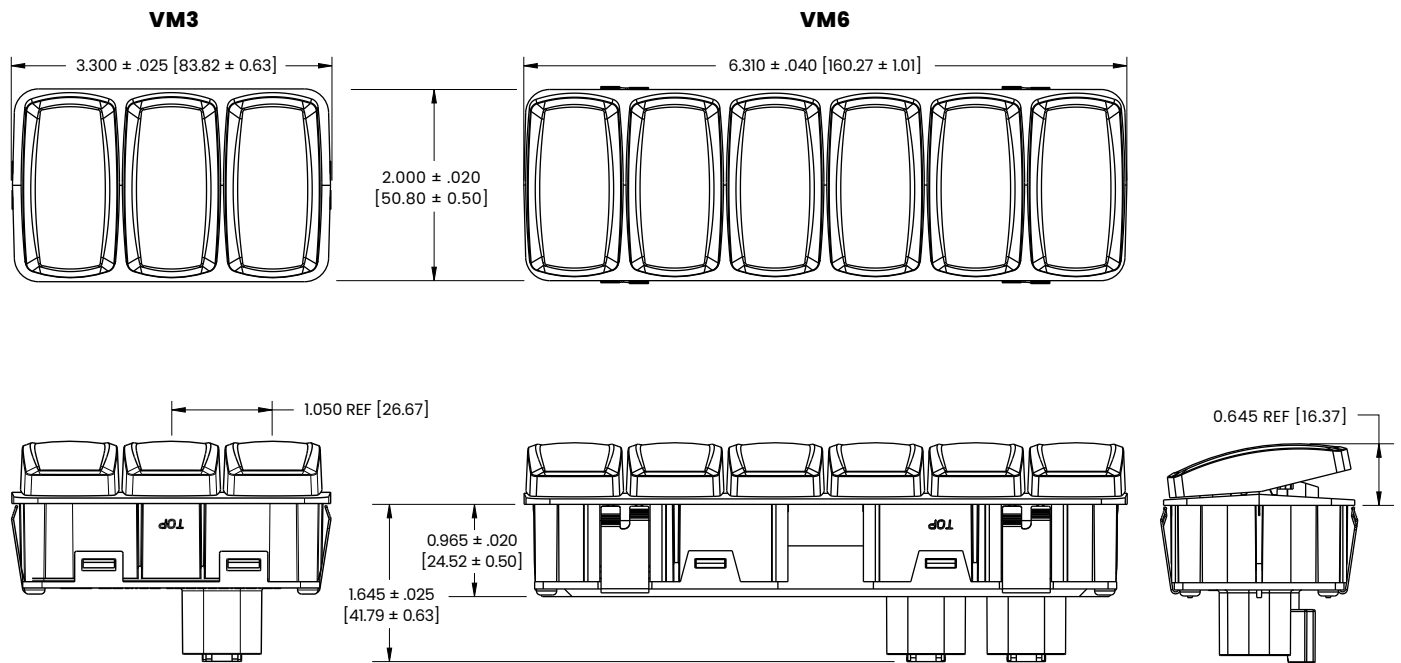
809 810 811 812

813 814 815 816

817

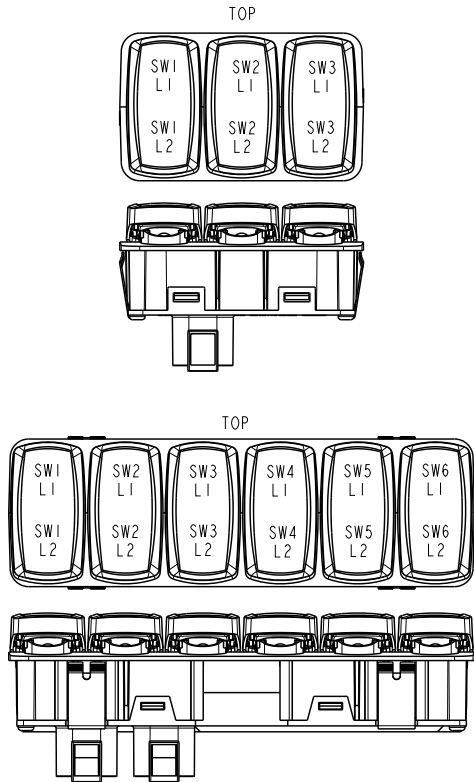
Dimensional Specs

inches [millimeters]

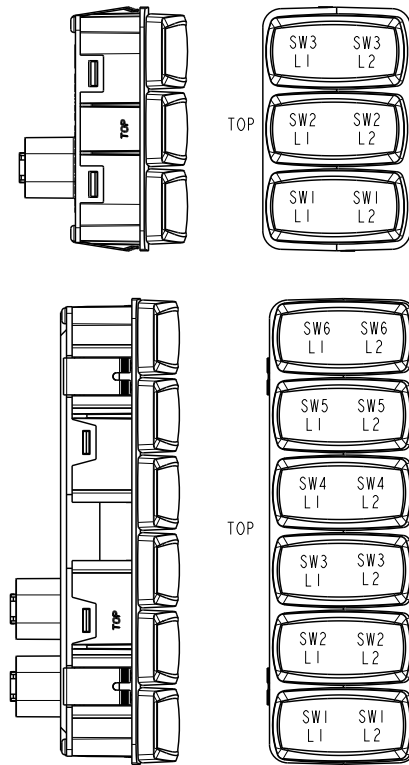


Orientation Diagram

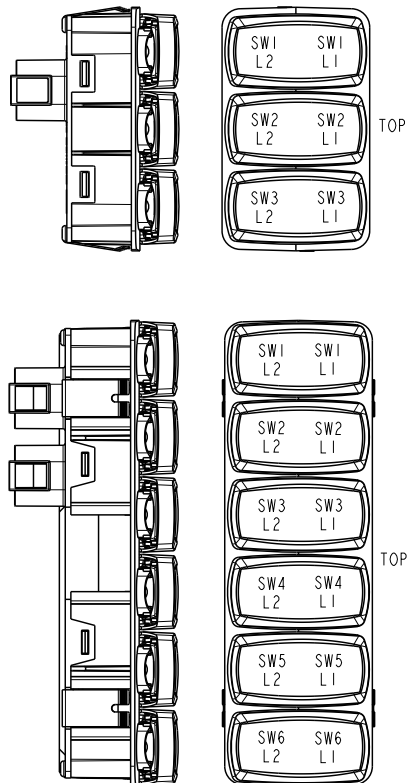
Orientation 1



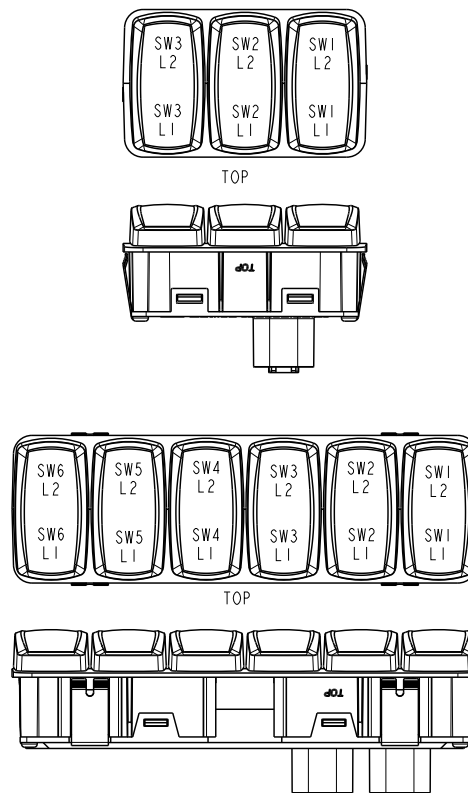
Orientation 2



Orientation 3



Orientation 4



Standard Legend Codes

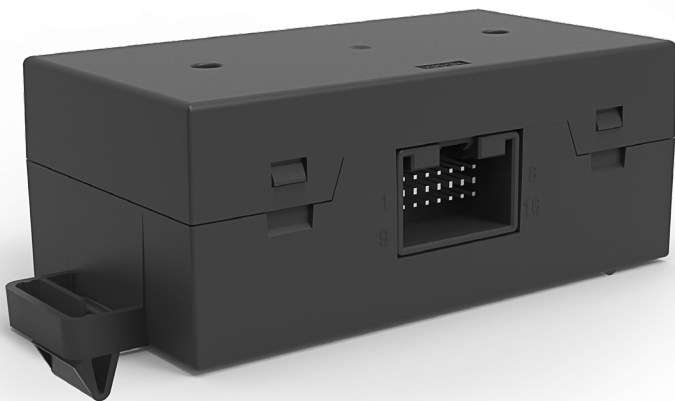
YK	UA	UB	US	UV	UW	UX	UY	MP	MR	PX	MS	MT
VU	MW	NZ	NX	NY	YM	VW	PS	PW	PZ	WG	WM	RN
RP	YG	TX	VD	VE	VF	VG	SH	SM	SN	SP	SR	SY
DIM	BRIGHT	UH	UJ	PD	PE	PF	VC	VJ	UF	UG	MU	TN
NS	PB	SE	VZ	YE	NN	RW	PU	WA	YN	UE	NM	RJ
NR	YD	TL	VR	SL	VA	UC	VN	PK	VY	UZ	RH	NU
NV	RB	RC	RK	RL	MZ	RG	UP	DOWN	UD	UR	WD	TY
PA	UK	WR	UU	UT	YR	PM	VV	WB	TB	TC	TD	TE
MY	PV	TA	TZ	WC	PT	PN	PH	RA	TU	TT	YL	SK
VS	UL	UM	WK	TS	VT	WL	VP	YJ	PJ	RY	UP	NW
NP	RE	RF	PP	PR	TV	PC	YT	YU	PL	WJ	MV	RR
TK	RT	SZ	VX	WF	WH	PG	SJ	YA	YB	RM	TM	RD
RS	UN	TP	TR	NT	MX	YC	TW	TJ	YF	TH	TF	TG
YS	YH	SX	RZ	YP	WN	WP	WW	WX	SA	SB	SC	SD
RAISE	LOWER	HIGH	LOW	FWD	REV	DEPTH	TRIM TAB	ACC	NAV ANCH	WIND LASS UP/DN	LIVE WELL	REAR
ST	SU	WU	WV	SV	SW	VB	VH	VK	VL	VM	WE	SF
PARK	AUTO	RU	RV	RX								
SG	SS											

CM-Series

Multiplexed CAN/LIN Switching System

PRODUCT WEBPAGE

request sample, watch video



The CM-Series system features a LIN Switch Module and a CAN/LIN Controller Module. The switch module includes a carrier that accommodates up to three uniquely identifiable switches and rheostats. The carrier also features two LIN connectors, one that connects to the controller module and one that allows for daisy-chaining to other switch modules. Additionally, the carrier can accommodate a two-pole hardwired switch. The controller module acts as the CAN interface to the system ECU and the LIN switches, and it accommodates up to 3 LIN buses for a total of 45 switch functions in one system.

12/24
VDC

100,000
Operations

up to 45
Switch Functions Controlled

Typical Applications

- Commercial Vehicles
- Construction Equipment
- Agricultural Equipment
- Work Trucks

Design Features

CARRIER

Versatile, 3-compartment Carrier provides easy installation and access.

SWITCH OPTIONS

Uniquely identifiable standard, locking, and rheostat laser etched switches.

ILLUMINATION

Up to 2 backlit icons and 1 center function light.



Above Panel

CONTROLLER MODULE

Accommodates up to 45 switch functions. LIN connection to switches and CAN connection to ECU.



Carling Part Number:
MPU-00000011

Behind Panel

CONNECTIONS

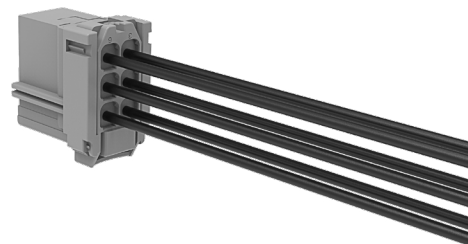
Two LIN connectors: 1 to Controller Module and 1 for Daisy Chaining.



Carling Part Number:
MPU-00000010

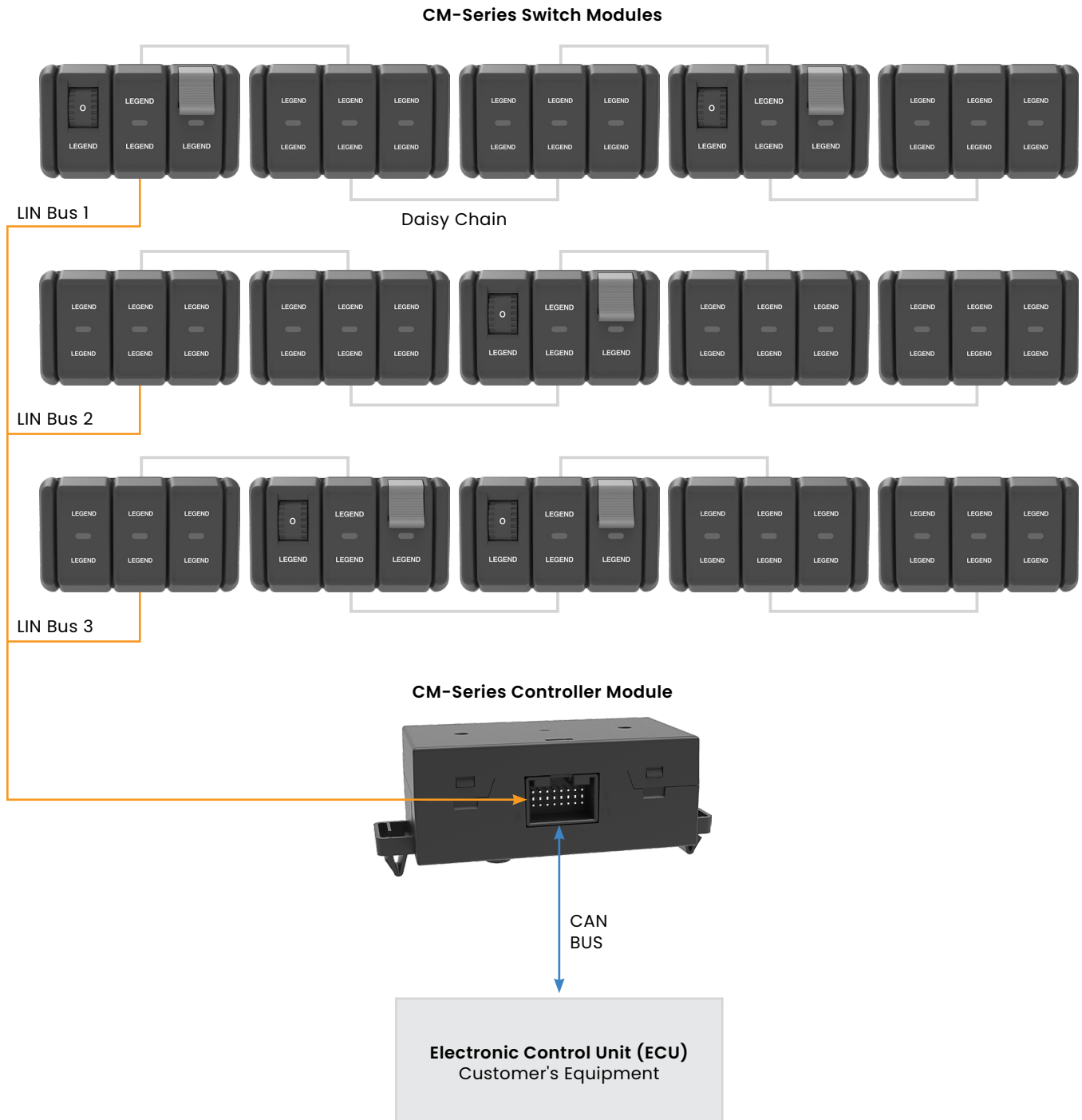
HARDWIRE CONNECTOR

Option to hardwire loads. Status feedback through LIN connection



TE Part Number:
8-968970-2

System Diagram



Tech Specs

Physical

Function	Switch is LIN only, or LIN with hardware (HW). Rheostat is LIN only. Carrier to hold up to 3 switches, rheostats and/or hole plugs. Nodes/carriers must be used with Carling controller module.
Switch Circuits	2-position maintained, 2-position momentary, 3-position maintained, 3-position momentary, 3-position maintained-momentary, 3-position momentary-maintained, locking
Illumination	Switch can have up to 2 backlit laser marked icons. Switch can have 1 center function bar/light. Rheostat has 1 backlit laser marked icon. 5 color choices for backlight and function lights – red, orange/amber, green, blue, white. Backlight and function light illumination control via LIN
Mounting	See dimensional specs for carrier and controller module mounting requirements. Switch and rheostat must be installed in carriers. No fasteners required. Assembly/disassembly of carrier and controller from front side of panel
Connector Interface	Controller module = MQS (Tyco p/n 966870-1). Harness connector is Tyco p/n 1534101-1 and 1534097-1. Carrier module = MQS (Tyco p/n 953698-1). Harness connector is Tyco p/n 953697-1. Switch hardware = MQS (Tyco p/n 8-968970-2).
Actuation Force	Switch rocker actuation force = 4 to 10 Newtons. Switch lock actuation force = 4 to 6 Newtons.
Angular Movement	Switch rocker rotation = 12° from center. Rheostat wheel rotation = 190°, with detent at 67.6°.
LIN Bus	3 LIN buses max, 15 nodes per bus. 5 rheostat limit per system
CAN Interface to Controller	Per CAN SAE J1939/71
CAN Baud Rate	250 kbps

Environmental

Operating Temperature	-40°C to +70°C
Vibration	ISO 16750-3, Test VIII, 32 hours per plane
Mechanical Shock/Drop	ISO 16750-3, free fall 1-meter drop 3 times
Accelerated Aging	IEC 60068-2-2 test Bb, 336 hours at 95°C
Chemical Resistance	IEC 60068-2-74 condition A – gasoline, diesel, denatured alcohol, mineral oil, motor oil, brake fluid, ethylene glycol, Armor All, Windex
Ingress Protection	IP52 rated
High Temperature Test	IEC 60068-2-2 test B, 70°C for 24 hours

Electrical

Operating Voltage	Controller module = 9 to 32VDC HW Switch = 5 to 32VDC
Electrical Rating	HW Switch = 5mA to 10A at 24VDC
Sleep Current	Switch = 90uA per switch Controller module = 550uA
Electrical Endurance	LIN Switch = 80k operations, resistive load 25uA, 24 VDC HW Switch = 80k operations, resistive load 10mA, 24 VDC HW Switch = 80k operations, resistive load 10A, 24VDC HW Switch = 100k operations, inductive load 10A, 24 VDC HW Switch = 100k operations, electronics load 5mA, 24 VDC Rheostat = 10k cycles
Reverse Voltage Test	-16 VDC for 4 hours
ESD	8kV direct, 15kV through air
EMC – Conducted	ISO 7637-2 pulse 1, 2A, 2B, 3A, 3B, starting profile, load dump A, load dump B, super imposed alternating voltage, slow increase/decrease of supply voltage, momentary drop in supply voltage, reset behavior at voltage drop ISO 7637-2 transient immunity on supply lines pulses 1, 2a, 2b, 3a, 3b, 4 ISO 7637-3 transient immunity on signal leads Frequency emission on power supply and signal leads from 0.15 to 108 MHz.
EMC – Radiated	BCI per ISO 11452-4 at 100mA Broadband radiated emissions per ECE-R10 annex 7 Narrowband radiated emissions per ECE-R10 annex 8

Tech Specs continued on next page

Tech Specs

Software Interface Integration

Click below for instructions on integrating the CM-Series:

www.carlingtech.com/sites/default/files/documents/cm-series_interface.pdf

Tables

Table A: Controller Connection Pin Definition

Pin Number	Pin Definition
Pin 1	LIN 3 Ground
Pin 2	LIN 3 Power (+12V)
Pin 3	LIN 3 Bus
Pin 4	LIN 2 Power (+12V)
Pin 5	LIN 2 Bus
Pin 6	LIN 1 Power (+12V)
Pin 7	LIN 1 Bus
Pin 8	VBat Input

Pin Number	Pin Definition
Pin 9	LIN 1 Ground
Pin 10	LIN 2 Ground
Pin 11	CAN Term Connect A
Pin 12	CAN Term Connect B
Pin 13	CAN L
Pin 14	CAN H
Pin 15	CAN Shield
Pin 16	VBat (Vehicle Ground)

Table B: Carrier Connection Pin Definition

Pin Number	Pin Definition
Pin 1	LIN Ground
Pin 2	LIN Bus
Pin 3	LIN Power (+12V)

Ordering Scheme

Standard Switch

Sample Part No. **CM 18 C H C 0 - A 2 1 Z 53 - 1 LV 00 00 A**

Selection 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

1. SERIES

CM Standard Switch

2. CIRCUIT

Terminal connections as viewed from bottom of switch
Single pole uses 1, 2, and 3. Double pole uses 1, 2, 3 and 4, 5, 6
() = momentary. SP = Single Pole. DP = Double Pole.

Position:				1	0	2
SP	SP	Pole	DP	1&2	Connected	2&3
LIN	LIN	1 2	HW	4&5	Terminals	5&6
Only	& HW	Lin HW	& LIN			
16	26			ON	OFF	ON
17	27			ON	OFF	(ON)
18	28			(ON)	OFF	(ON)
Special Circuits						
40	50			OFF	2&3	None
41	51			ON	OFF	None
42	52			(ON)	OFF	None
44	54			ON	2&3	None
48	58			None	OFF	2 & 3
49	59			None	OFF	(ON)
	76			None	4 & 5	2&3, 5&6
	77			None	4 & 5	(2&3, 5&6)
		C4		(1&2, 4&5)	OFF	(2&3, 5&6)

3. ILLUMINATION

Lamp #	Illumination Type	Lamp #	Illumination Type
S	None	E	1 Independent
A	1 Independent	3	Independent
B	3 Independent	F	1 Independent
C	1 Independent	2	Independent
D	2 Independent	3	Independent
	3 Independent		

4,5. LAMP 1 AND/OR LAMP 2 4,7

No Lamp	0
LED	<u>Red</u> <u>Amber</u> <u>Green</u> <u>Blue</u> <u>White</u>
12VDC	A C H 2 6

6. LAMP 3 OR LOCK OPTION 4,7

No Lamp	0
Lock Option	W
LED	<u>Red</u> <u>Amber</u> <u>Green</u> <u>Blue</u> <u>White</u>
12VDC	A C H 2 6

7. ACTUATOR STYLE AND COLOR 3

Style	Black	Red
Rocker - Laser Etched	A	D
Locking Rocker - Laser Etched	P	R

8. IMAGE 1 COLOR 1

Z	No Image	Image Location	1
2	White		2
			3

9. IMAGE 2 COLOR 1

Z	No Image	Image Location	1
1	Clear		2
			3

10. IMAGE 3 COLOR OR LOCK FUNCTION & COLOR 2

Image 3 Color	
Z	No Image
2	White
Actuator Lock Function & Color	
Lock in 0 POS	Lock Color
H	Match Actuator
L	Red
M	Orange

11. LEGEND - IMAGE 1

00 No legend
For standard legends, see "Standard Legend Codes" page.
For additional legends, please consult factory

12. LEGEND ORIENTATION

0	No legend
1	Orientation 1
2	Orientation 2
3	Orientation 3
4	Orientation 4

13. LEGEND - IMAGE 2

00 No legend
LV Function Light - Orientation 1 and 3
LY Function Light - Orientation 2 and 4

14. LEGEND - IMAGE 3

00 No legend
For standard legends, see "Standard Legend Codes" page.
For additional legends, please consult factory

15. SOURCE ADDRESS

The Source Address is a unique two digit code (**01-5F**) assigned to each switch on the CAN network, and is determined based on the specific CAN architecture of each customer application.

16. ILLUMINATION DECISION

	Illumination Group	Wake/No Wake
A	Drive	No Wake
B	Drive	Wake
C	Entry	No Wake
D	Entry	Wake

Notes:

- If LIN switch only, rating is 12VDC Max.
If LIN & hardware, hardware portion of switch rating is 5mA-10A 24VDC.
- Use (0) in lock callout location when creating laser etched locking rocker description.
- Bracket color is black.
- LED voltage to be supplied by the network at 12V.
- Switches **must be** mounted in Carrier & interfaced with Controller Module.
- Hole plug also available. Part number 390-41022-001.
- Non-existing LED combinations cannot be created unless certain commercial requirements are met, factory may contact you to advise of these requirements for setting up new LED combinations or to suggest alternatives.

[Configure Complete Part Number >](#)

Ordering Scheme

Rheostat Switch

Sample Part No. CMR B C A N W - A D A 4L 1 - 81 A

Selection 1 2 3 4 5 6 7 8 9 10 11 12 13

1. SERIES

CMR Rheostat with LIN Termination

2. POTENTIOMETER ROTATION

B 190 Degree Rotation

3. RESISTANCE RANGE

C LIN Signal Controlled

4. RATING

A 12V

5. BACKLIGHTING LED

No Lamp	0					
LED	<u>Red</u>	<u>Amber</u>	<u>Green</u>	<u>Blue</u>	<u>White</u>	
12VDC	C	N	H	A	6	

6. BRACKET COLOR

W White

7. THUMB WHEEL COLOR

A Black

8. THUMB WHEEL DETENTS

D 1 Detent Position at 67.6 Degrees

9. COVER COLOR AND STYLE

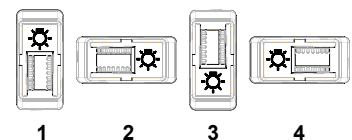
Color	Style
A Black	Painted, Laser-Etched

10. LEGEND

00 No legend
For standard legends, see "Standard Legend Codes" page.
For additional legends, please consult factory

11. LEGEND ORIENTATION

0 No legend
1 Orientation 1
2 Orientation 2
3 Orientation 3
4 Orientation 4



12. SOURCE ADDRESS

The Source Address is a unique two digit code (**81-85**) assigned to each rheostat on the CAN network, and is determined based on the specific CAN architecture of each customer application.

13. ILLUMINATION DECISION

	Illumination Group	Wake/No Wake
A	Drive	No Wake
C	Entry	No Wake

Notes:

- Rheostats **must be** mounted in Carrier & interfaced with Controller Module.
- Thumb wheel marking available. Consult factory.

Additional Part Numbers

Hole Plug

390-41022-001

Hole Plugs are inserts that can be mounted in Carriers populated with less than 3 switches, to occupy the vacant space.



Carrier

MPU - 00000010

Switches, Rheostats and Hole Plugs must be mounted in a Carrier. Each Carrier has three slots.



Controller Module

MPU - 00000011

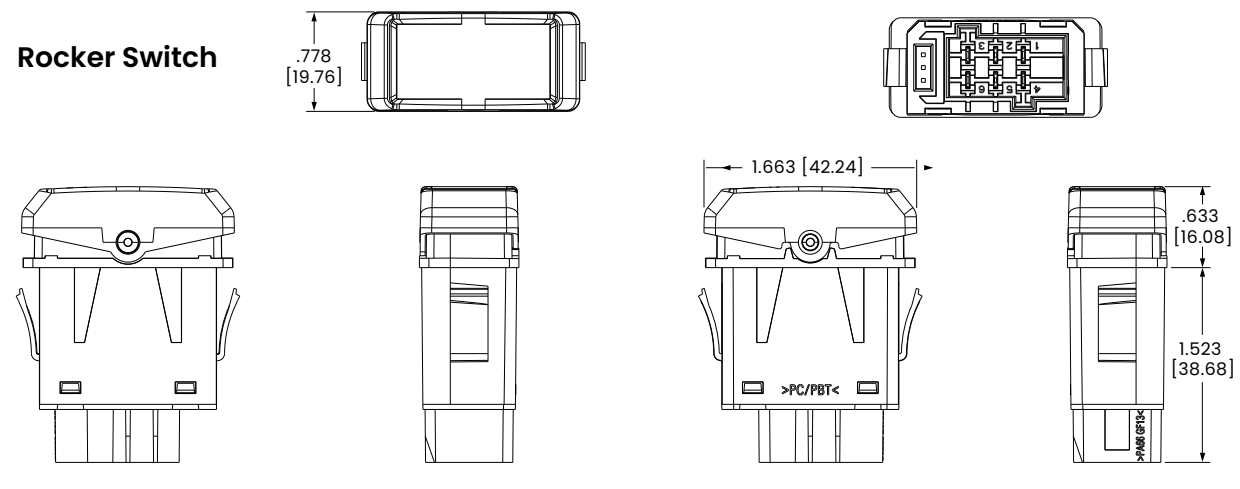
The Controller Module translates the LIN to CAN for communication with the rest of the vehicle's system.



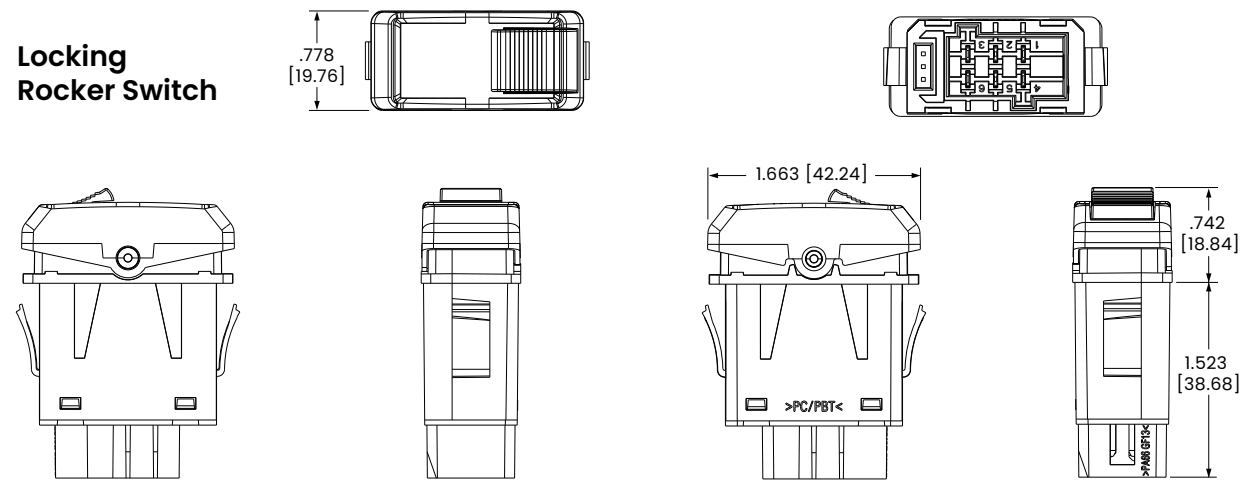
Dimensional Specs

inches [millimeters]

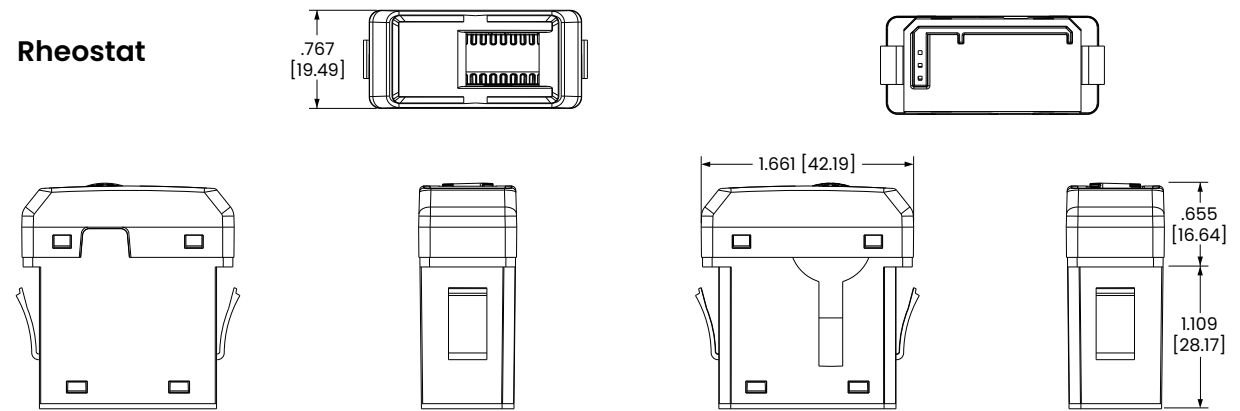
Rocker Switch



Locking Rocker Switch



Rheostat



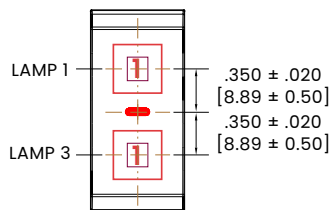
Legend Marking Area

	MARKING AREA
X	.375 [9.53]
Y	.375 [9.53]

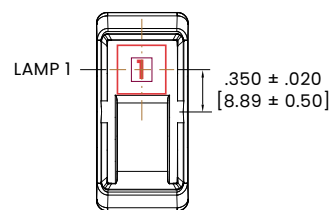


Icon marking area and location
Unless otherwise specified, icon size and location
should follow this drawing and is applicable to all
4 orientations

Rocker Switch



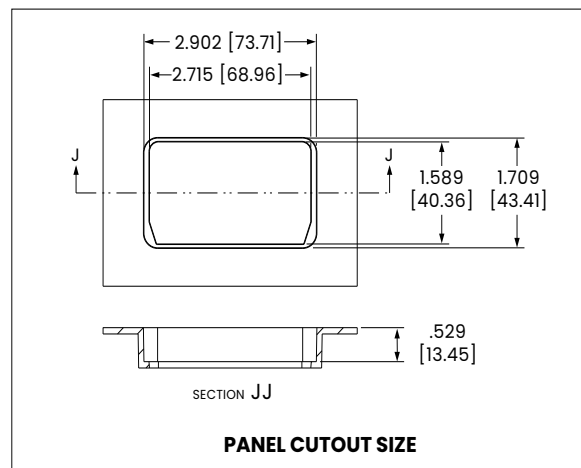
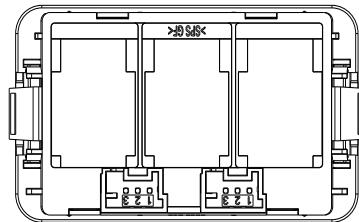
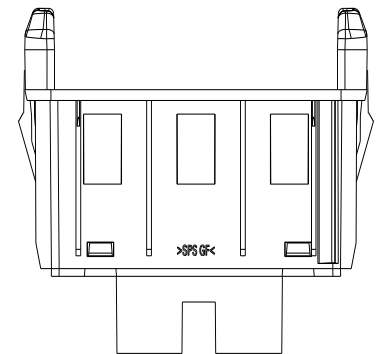
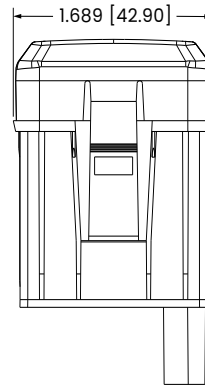
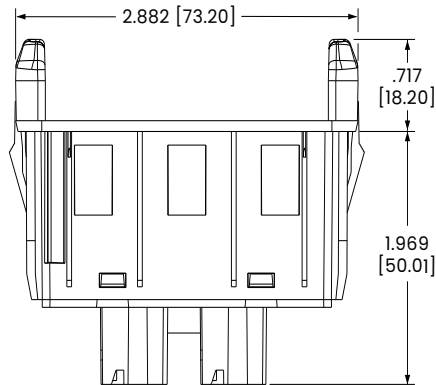
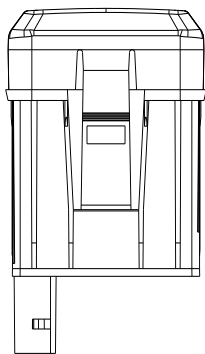
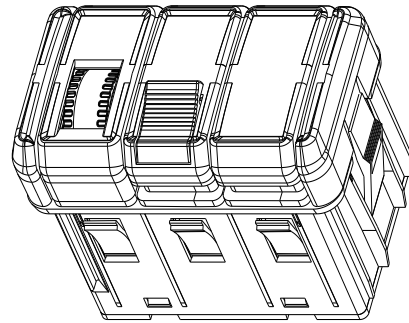
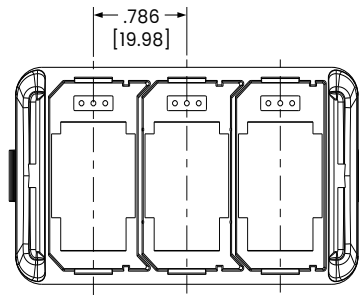
Locking Rocker Switch



Dimensional Specs

inches [millimeters]

Carrier



inches [millimeters]

Technical drawings of the 16-pin D-sub connector showing front, top, side, and rear views with dimensions in inches and millimeters.

Front View Dimensions:

- Overall Width: 4.923 [125.05]
- Pin Header Width: 3.937 [100.00]
- Overall Height: 2.165 [55.00]

Top View Dimensions:

- Pin Header Width: 3.937 [100.00]
- Pin Header Height: 0.700 [17.78]
- Pin Header Pin Spacing: 0.402 ± .002 [10.21 ± 0.05]
- Pin Header Pin Count: 16

Side View Dimensions:

- Pin Header Height: 0.195 [4.95]
- Pin Header Pin Spacing: 0.402 ± .002 [10.21 ± 0.05]
- Pin Header Pin Count: 16

Rear View Dimensions:

- Pin Header Height: 1.57 ± .030 [39.88 ± .076]

PANEL CUTOUT SIZE

Circuit Diagrams

Circuit Code	CIRCUIT DIAGRAM
16	
17	
18	
26	
27	
28	
40	
41	
42	

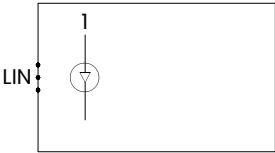
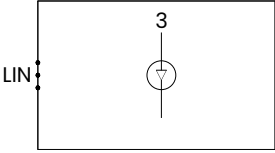
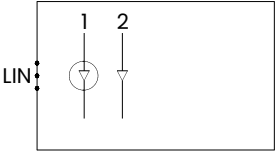
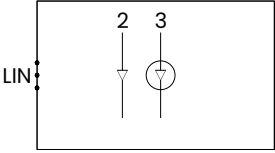
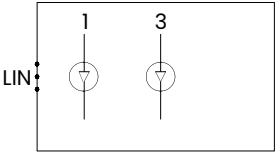
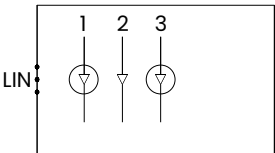
Circuit Code	CIRCUIT DIAGRAM
43	
44	
45	
46	
47	
48	
49	
50	
51	

Circuit Diagrams

Circuit Code	CIRCUIT DIAGRAM
52	
53	
54	
55	
56	
57	
58	

Circuit Code	CIRCUIT DIAGRAM
59	
71	
72	
76	
77	
78	
C4	

Illumination Diagrams

Illumination Code	ILLUMINATION DIAGRAM
A	
B	
C	
D	
E	
F	

Standard Legend Codes

YK	UA	UB	US	UV	UW	UX	UY	MP	MR	PX	MS	MT
VU	MW	NZ	NX	NY	YM	VW	PS	PW	PZ	WG	WM	RN
			NAV LIGHTS	COURT LIGHTS	PANEL LIGHTS	ANCH LIGHTS	HEAD LIGHTS	FOG LIGHTS	DASH LIGHTS	DOCK LIGHTS	BEACON	LIGHT
RP	YG	TX	VD	VE	VF	VG	SH	SM	SN	SP	SR	SY
DIM	BRIGHT						BILGE PUMP	BILGE				
WY	WZ	UH	UJ	PD	PE	PF	VC	VJ	UF	UG	MU	TN
		WIPER										
NS	PB	SE	VZ	YE	NN	RW	PU	WA	YN	UE	NM	RJ
				ENG FAN	BLWR					HORN		
NR	YD	TL	VR	SL	VA	UC	VN	PK	VY	UZ	RH	NU
							UP	DOWN				
NV	RB	RC	RK	RL	MZ	RG	WS	WT	UD	UR	WD	TY
		WATER PUMP			ANCHOR							
PA	UK	WR	UU	UT	YR	PM	VV	WB	TB	TC	TD	TE
											ENG HATCH	ENG BRAKE
MY	PV	TA	TZ	WC	PT	PN	PH	RA	TU	TT	YL	SK
VS	UL	UM	WK	TS	VT	WL	VP	YJ	PJ	RY	UP	NW
NP	RE	RF	PP	PR	TV	PC	YT	YU	PL	WJ	MV	RR
		SEAT					CRUISE					
TK	RT	SZ	VX	WF	WH	PG	SJ	YA	YB	RM	TM	RD
RS	UN	TP	TR	NT	MX	YC	TW	TJ	YF	TH	TF	TG
		AUX	ON OFF	OFF ON	I O	O I	OFF ON	ON	OFF	I	O	II
YS	YH	SX	RZ	YP	WN	WP	WW	WX	SA	SB	SC	SD
RAISE	LOWER	HIGH	LOW	FWD	REV	DEPTH	TRIM TAB	ACC	NAV ANCH	WIND LASS UP/DN	LIVE WELL	REAR
ST	SU	WU	WV	SV	SW	VB	VH	VK	VL	VM	WE	SF
PARK	AUTO											
SG	SS	RU	RV	RX								

CKP-Series

J1939 Customizable Keypads

PRODUCT WEBPAGE

request sample, configure part, watch video



Compliant with SAE J1939 CAN standards, the CKP-Series is a customizable membrane keypad featuring laser etched legends and up to three dimmable LED function lights per button, which also offer diagnostic feedback by blinking if there is a fault. With above and below panel sealing protection, the CKP-Series can be installed inside or outside the cab.

12/24 VDC **1,000,000** Operations **IP6K9K Sealing**
 for above panel components

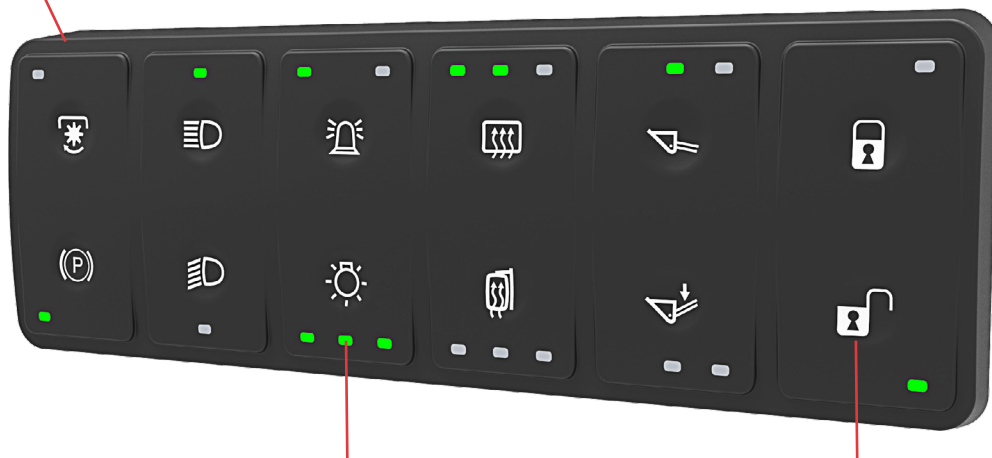
Typical Applications

• Commercial Vehicles • Construction • Mining • Agricultural • Military

Design Features

LOW PROFILE DESIGN

0.57 inch [14.48 mm] thickness (see dimensional specs for more detail)



Front View

SEALING PROTECTION

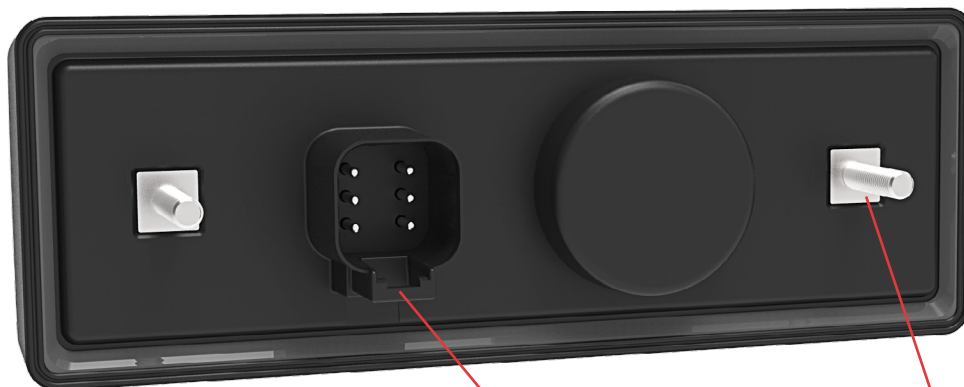
Fully sealed IP6K9K above panel

LED FUNCTION LIGHTS

One, two, or three LED Function Lights per button. Colors include Amber, Green, Red or Blue

CUSTOMIZABLE ICONS

Choose from our standard library of icons or use custom icons



Back View

SEALING PROTECTION

Fully sealed IP6K8 below panel when connected

CONNECTOR

Mates to the Deutsch DT-Series Connector

MOUNTING STUDS OR WINGS

10-32 Mounting Studs (2x4, 2x5, 2x6)
Mounting Wings (2x2, 2x3)

Related Products



CLTM12-S-Series >
Load Controller



CKJ-Series >
Jog Switch



VM-Series >
Operator Control Module

Tech Specs

General

Illumination	LED backlit icons and function lights. Up to 3 function lights per button. Dimmable illumination, controlled by CAN messages
Connection / Wiring	Deutsch DT-Series connector (See Dimensional Specs)

Electrical

Operating Voltage	Designed for 12/24 Volt systems Minimum 8 VDC Maximum 32VDC
Sleep Mode	Low current sleep mode draws less than 1.5 mA throughout the supply voltage range, and wakes on keypress or CAN message
Supply Voltage Ratings	The keypad passes SAE J1455 section 4.13.1 for power up, operating voltage, over voltage, reverse polarity, and short circuit
EMC	Transient immunity: ISO 11452-2, 100 V/m, 20 MHz to 2,000 MHz, Class A per ISO 11451-1 Conducted Transient immunity: ISO 7637-2:2004, Annex A Table A2 (for 24V systems), Class A ESD immunity: ISO 10605:2001, Test level IV (8 kV direct discharge, 15 kV air discharge) Transient Emission: ISO 13766, Broadband: Annex D, Narrow band: Annex E, 30-1000 MHz

Mechanical

Overall Dimensions	See Dimensional Specs
Panel Cutout	See Dimensional Specs
Endurance	Each button functions for at least 1,000,000 total actuations (100,000 actuations at -40°C, 100,000 actuations at +85°C, and 800,000 actuations at +25°C)

Software

CAN Protocol	CAN 2.0b type interface as defined by SAE J1939
--------------	---

Environmental

Thermal	-40°C to +85°C IEC60068-2-1 Cold Soak IEC60068-2-2 Heat Soak IEC60068-2-14 Cycling/Shock
Solar Radiation	IEC 60068-2-5, procedure B, 10 cycles, Total irradiation per cycle = 22.4 kWh/m ²
Low Pressure	IEC 60068-2-13
Humidity	Soak: IEC 60068-2-78, 93% RH (±3%), 10 day cycle IEC 60068-2-30, test Db: Damp Heat cycle (12 hr. cycles for each variant) 6 cycles total
Ingress Protection	ISO 20653, IP6K9K, for above panel components of actual switch only. IP6K8, for below panel components of actual switch only. (when connected)
Shock and Bump	IEC 60068-2-27, Shock 500 m/s ² 11 milliseconds, Bump 400 m/s ² 6 milliseconds 600 cycles
Drop Test	IEC 60068-2-31, Free fall, Procedure 1, 1000 mm height, drop on all 3 axes in both directions
Vibration	IEC 60068-2-6, Swept sine wave section 8.2, 5 - 500 Hz 20 cycles 5g acceleration. IEC 60068-2-6, Vibration sinusoidal, section 8.1, 10 - 2000 Hz, 5g acceleration. IEC 60068-2-64, Method 1, random excitation, 10 - 350 Hz, 5 hours in each axis
Chemical Resistance	IEC 60068-2-74, Class B, Engine Oil, Diesel, Hydraulic Oil, Ethylene Glycol, Urea Nitrogen, Liquid Lime, NPK Fertilizer, Ammonia, Calcium Chloride, Brake fluid
Corrosion Resistance	IEC 60068-2-52, Test Kb, Severity level 4
Weathering/Cracking Resistance	ASTM D1171-99, method A, 72 hours
Abrasion/Wear Resistance	ASTM F2357; 40 cycles with .25" paper at 175g force

Physical

Operating Force	10 ± 3 N [2.25 ± .67 lbs]
Mounting	Clips or studs (See Dimensional Specs), Vertically or horizontally
RoHS	Compliant
REACH	Compliant
Connector	Deutsch DT-Series 6 pin

Tech Specs continued on next page

Tech Specs

Software Interface Integration

Click below on integrating the CKP-Series into J1939 CAN network:

www.carlingtech.com/sites/default/files/documents/ckp-series_interface.pdf

Tables

Table A: Standard Illumination

Type	Red	Green	Amber	Blue	White
Backlight	---	---	---	---	Yes
Function	Yes	Yes	Yes	Yes	---

Table B: Operation Current Values

	2x2	2x3	2x4	2x5	2x6
12V, 10% Luminance	---	---	---	---	---
Sleep (mA) Max	.9	.9	.9	.9	.9
Operate (mA) Max	16	19	29	30	40
24V, 10% Luminance	---	---	---	---	---
Sleep (mA) Max	.7	.7	.7	.7	1
Operate (mA) Max	9	10	15	16	35

Ordering Scheme

Part 1: Keypad

Sample Part No. **CKP 1 - 1 A 1 - A B - A - J 000 /**

Selection 1 2 3 4 5 6 7 8 9 10

1. SERIES

CKP CKP-Series Keypad

2. KEYPAD STYLING

1 Standard

3. BUTTON LAYOUT

- 1** Two by Six
- 2** Two by Five
- 3** Two by Four
- 4** Two by Three (1.6~2.8mm Panel Thickness)
- 5** Two by Two (1.6~2.8mm Panel Thickness)
- 6** Two by Three (2.8~4.0mm Panel Thickness)
- 7** Two by Two (2.8~4.0mm Panel Thickness)

4. KEYPAD ORIENTATION

A Landscape **C** Reverse Landscape
B Portrait **D** Reverse Portrait

See Orientation Diagrams page

[Configure Complete Part Number >](#)

5. KEYPAD COLOR

1 Black

6. BACKLIGHT

A White

7. FUNCTION LIGHT COLOR

B Amber **D** Red
C Green **E** Blue

8. NON-ILLUMINATED IMAGE COLOR

A White

9. NETWORK TYPE

J J1939 (250K BAUD Rate) **K** J1939 (500K BAUD Rate)

10. SOURCE ADDRESS

The Source Address is a unique number (**000-248**) assigned to each node on a CAN network, and is determined based on the specific CAN architecture of each customer application.

Part 2: Icon Artwork (Select 12 buttons for 2x6, 10 buttons for 2x5, 8 buttons for 2x4, 6 buttons for 2x3, and 4 buttons for 2x2.)

Button 1

3 **RS**
Function Icon Code

Button 2

3 **RA**
Function Icon Code

Button 3

3 **UV**
Function Icon Code

Button 4

3 **UW**
Function Icon Code

Button 5

3 **MT**
Function Icon Code

Button 6

8 **UB**
Function Icon Code

Button 7

8 **NN**
Function Icon Code

Button 8

8 **PU**
Function Icon Code

Button 9

3 **PR**
Function Icon Code

Button 10

3 **PP**
Function Icon Code

Button 11

3 **RH**
Function Icon Code

Button 12

3 **NU**
Function Icon Code

FUNCTION LIGHT CODE

	Landscape	Portrait	Reverse Landscape	Reverse Portrait
1¹ No Function Light				
3 Closed-Open-Closed				
8 Open-Open-Open				

ICON CODE

00 For standard icons, see Standard Legends Code page. For additional icons, please consult factory.

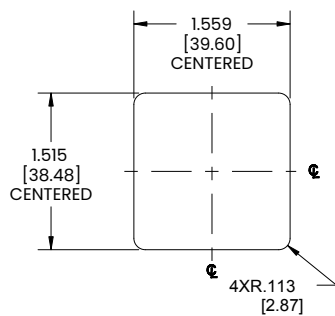
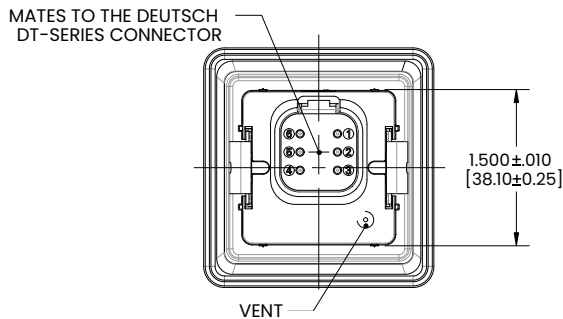
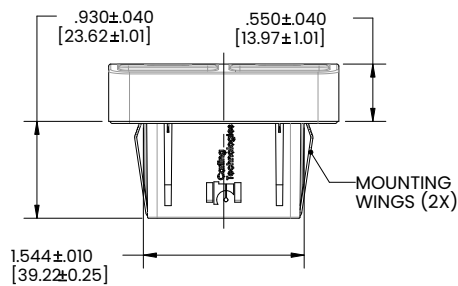
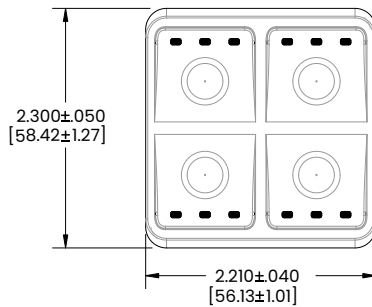
Note:

¹ Non-noted Function Light Codes cannot be used unless certain commercial requirements are met, please contact factory to provide information regarding your business opportunity.

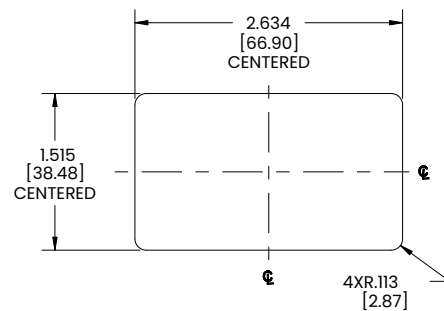
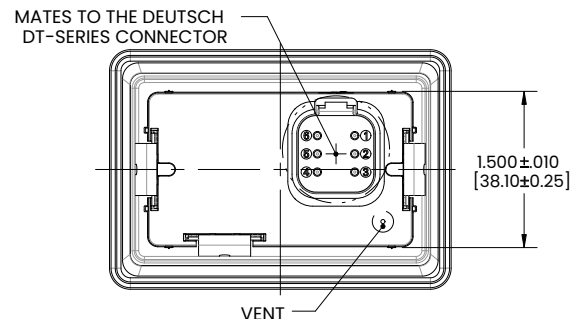
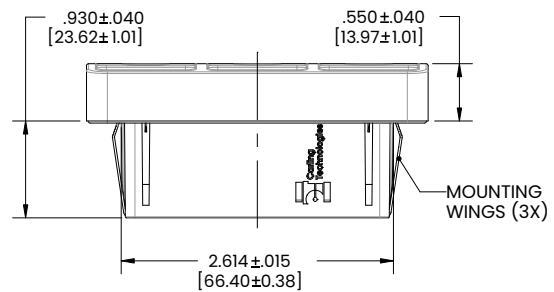
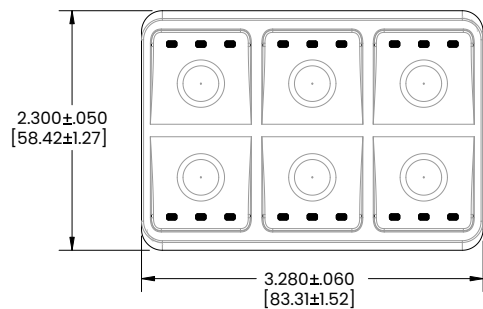
Dimensional Specs

inches [millimeters]

2x2 and 2x3 Configurations



PANEL CUTOUT TOLERANCE .005[0.13],
PANEL THICKNESS TO BE .080[2.03] MIN AND .130[3.30] MAX.



PANEL CUTOUT TOLERANCE .005[0.13],
PANEL THICKNESS TO BE .080[2.03] MIN AND .130[3.30] MAX.

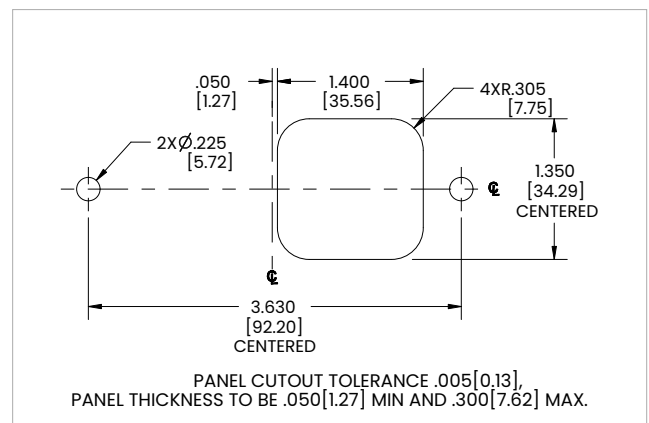
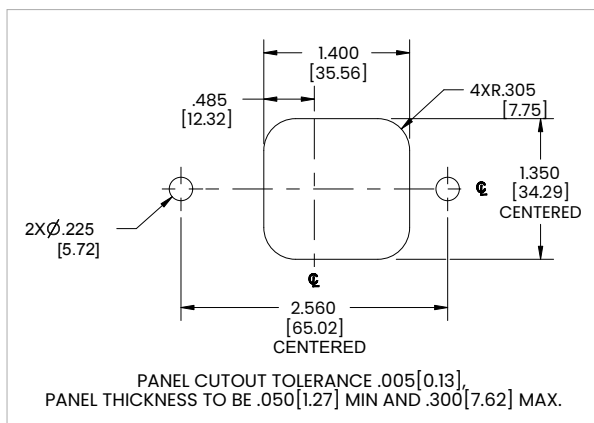
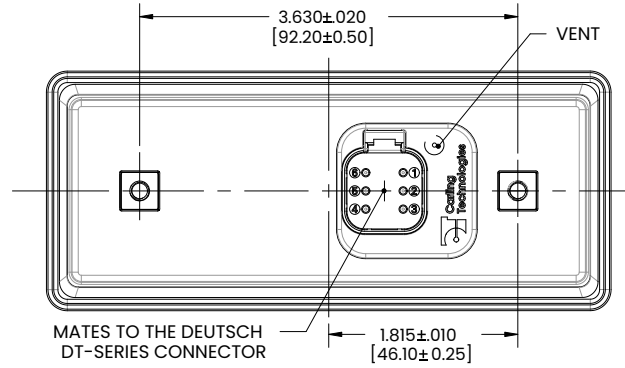
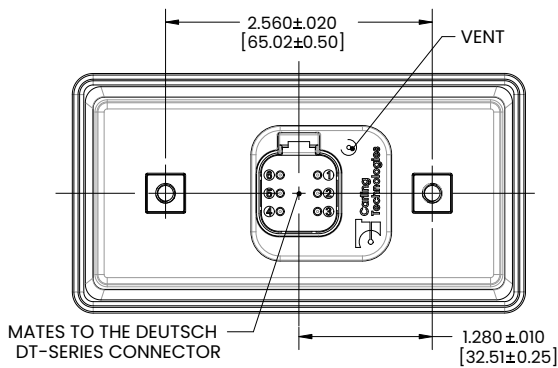
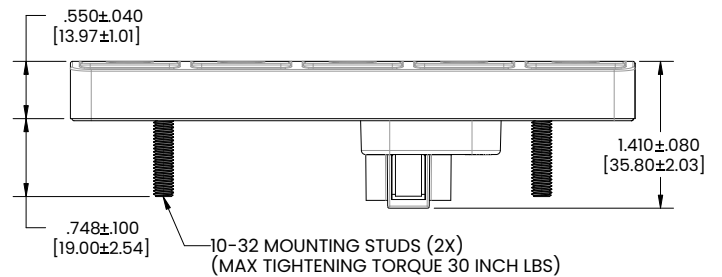
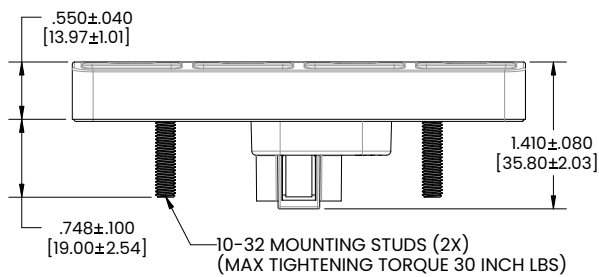
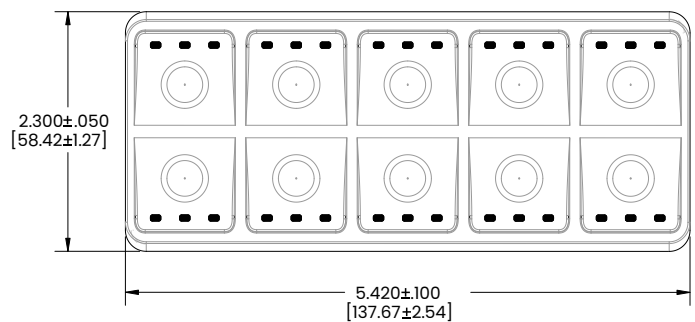
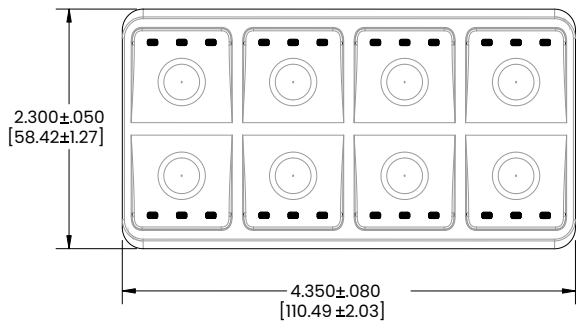
Notes:

1. Do not puncture or plug the vent

Dimensional Specs

inches [millimeters]

2x4 and 2x5 Configurations



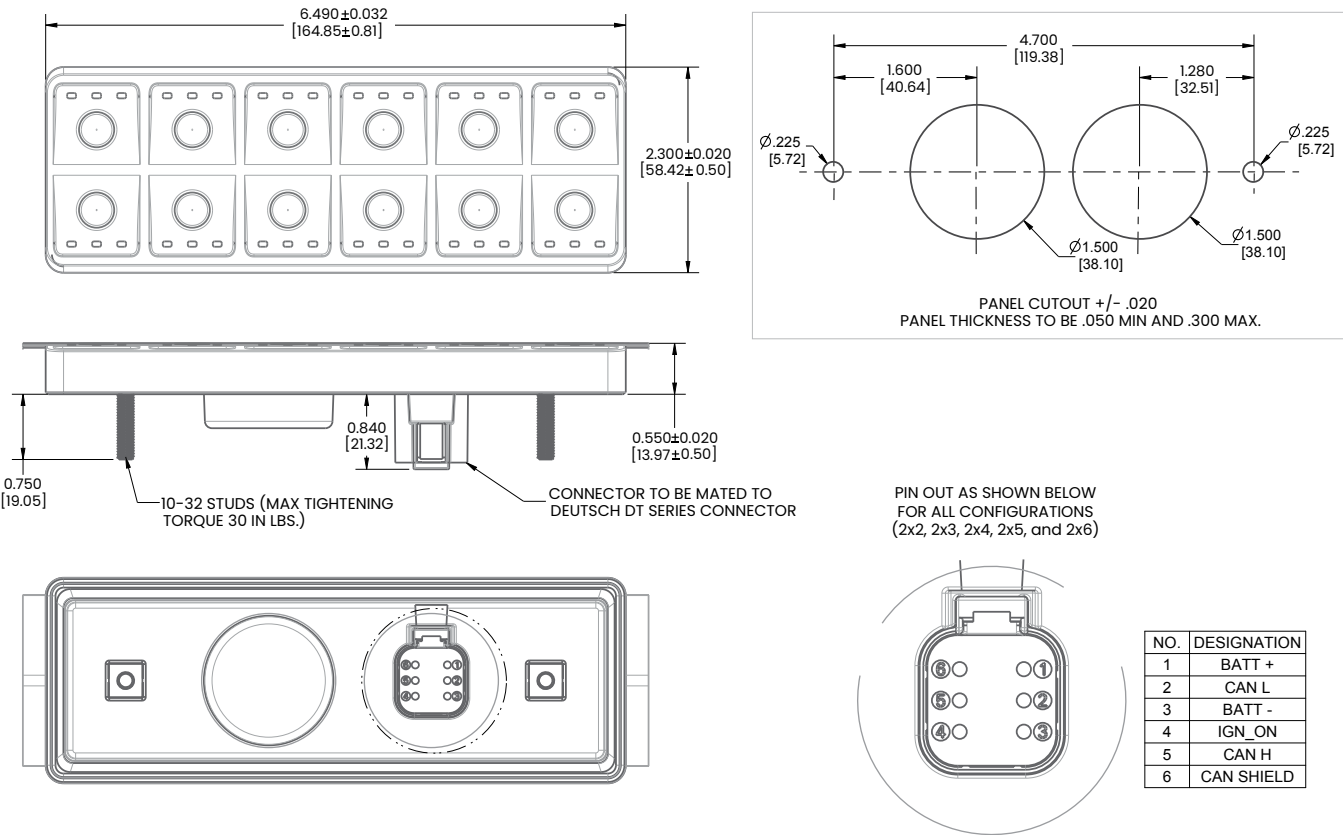
Notes:

- Do not puncture or plug the vent

Dimensional Specs

inches [millimeters]

2x6 Configuration



Orientation Diagrams

Icon Artwork Button Number Layout

A: Landscape



B: Portrait



D: Reverse Portrait



C: Reverse Landscape



Standard Legend Codes

YK	UA	UB	US	UV	UW	UX	UY	MP	MR	PX	MS	MT
VU	MW	NZ	NX	NY	YM	VW	PS	PW	PZ	WG	WM	RN
			NAV LIGHTS	COURT LIGHTS	PANEL LIGHTS	ANCH LIGHTS	HEAD LIGHTS	FOG LIGHTS	DASH LIGHTS	DOCK LIGHTS	BEACON	LIGHT
RP	YG	TX	VD	VE	VF	VG	SH	SM	SN	SP	SR	SY
DIM	BRIGHT						BILGE PUMP	BILGE				
WY	WZ	UH	UJ	PD	PE	PF	VC	VJ	UF	UG	MU	TN
		WIPER										
NS	PB	SE	VZ	YE	NN	RW	PU	WA	YN	UE	NM	RJ
				ENG FAN	BLWR					HORN		
NR	YD	TL	VR	SL	VA	UC	VN	PK	VY	UZ	RH	NU
							UP	DOWN				
NV	RB	RC	RK	RL	MZ	RG	WS	WT	UD	UR	WD	TY
		WATER PUMP			ANCHOR							
PA	UK	WR	UU	UT	YR	PM	VV	WB	TB	TC	TD	TE
											ENG HATCH	ENG BRAKE
MY	PV	TA	TZ	WC	PT	PN	PH	RA	TU	TT	YL	SK
VS	UL	UM	WK	TS	VT	WL	VP	YJ	PJ	RY	UP	NW
NP	RE	RF	PP	PR	TV	PC	YT	YU	PL	WJ	MV	RR
		SEAT					CRUISE					
TK	RT	SZ	VX	WF	WH	PG	SJ	YA	YB	RM	TM	RD
RS	UN	TP	TR	NT	MX	YC	TW	TJ	YF	TH	TF	TG
		AUX	ON OFF	OFF ON	I O	O I	OFF ON	ON	OFF	I	O	II
YS	YH	SX	RZ	YP	WN	WP	WW	WX	SA	SB	SC	SD
RAISE	LOWER	HIGH	LOW	FWD	REV	DEPTH	TRIM TAB	ACC	NAV ANCH	WIND LASS UP/DN	LIVE WELL	REAR
ST	SU	WU	WV	SV	SW	VB	VH	VK	VL	VM	WE	SF
PARK	AUTO											
SG	SS	RU	RV	RX								

UKP-Series

J1939 Universal Keypads

PRODUCT WEBPAGE

request sample, configure part, watch video



The UKP-Series is a universal, customizable membrane keypad that is compliant with SAE J1939 CAN standards. With above and below sealing protection, the UKP-series can be installed inside or outside the cab. Each button features laser etched legends, up to three dimmable LED function lights, and tactile/audible feedback when pressed.

12/24 VDC **1,000,000 Operations** **IP67 Sealing**
 for above panel components

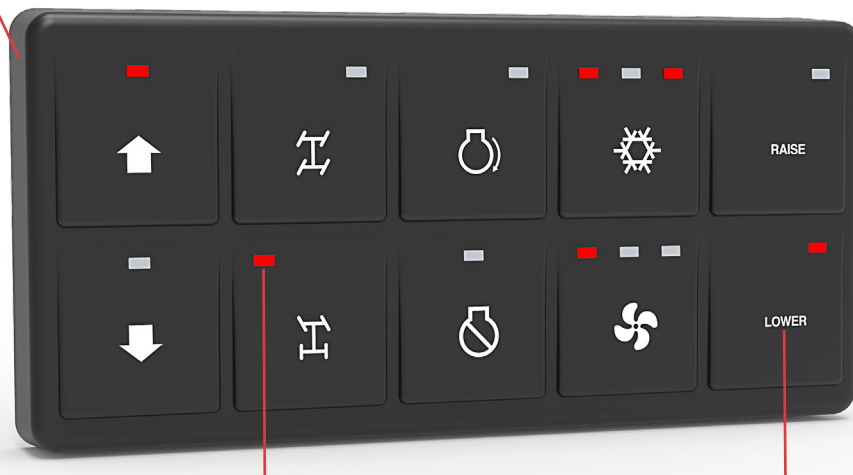
Typical Applications

• Truck • Bus • Construction • Mining • Agricultural

Design Features

LOW PROFILE DESIGN

0.62 inch [15.92 mm] thickness (see dimensional specs for more detail)



Front View

SEALING PROTECTION

IP67 above panel and below panel (when connected)

LED FUNCTION LIGHTS

One, two, or three LED Function Lights per button. Colors include Amber, Green, Red or Blue

CUSTOMIZABLE ICONS

Choose from our standard library of icons or use custom icons



Back View

CONNECTOR

Mates to the Deutsch DT-Series Connector

MOUNTING STUDS OR WINGS

M5 x 0.8mm Mounting Studs (2x3, 2x4, 2x5, 2x6)
Mounting Wings (2x2)

Related Products



CLTM12-S-Series >
Load Controller



CKJ-Series >
Jog Switch



VM-Series >
Operator Control Module

Tech Specs

General

CAN Protocol	CAN 2.0b type interface as defined by SAE J1939
Illumination	LED backlit icons and function lights. Up to 3 function lights per button. Dimmable illumination, controlled by CAN messages
Connection/Wiring	Deutsch DT-Series 4 Pin connector
Operating Force	7 ± 3 N
Mounting	Clips or studs (See Dimensional Specs), Vertically or horizontally
Panel Cutout/Dimensions	See Dimensional Specs

Electrical

Operating Voltage	Designed for 12/24 Volt systems Minimum 8VDC Maximum 32VDC
Sleep Mode	Defined as the state after a pre-defined time of non-activity to reduce current draw on the system, and wakes on keypress or CAN message
ESD	ISO 10605, ±15kV air discharge (x2), ±8kV contact discharge (x2)
Radiated Immunity-ALSE	ISO 11452-2, Absorbed-lined chamber enclosure field strength 100V/m, frequency from 80MHz to 2GHz, Class A
Bulk Current Injection	ISO 11452-4, Level 100mA, frequency from 1MHz to 400MHz, linear step, Class A
Conducted Transients	ISO 7637-2, All test pulses in Annex A Table A1 and A2, 2a/3a/3b/5a/5b-Class A
Radiation Emission	ISO 13766-1, Broadband and Narrowband for ESA, range 30-1000MHz
Over Voltage	ISO 16750-2, Power up with 36VDC for 60 min at 65 °C.
Short Circuit Protection	ISO 16750-2, All output terminal short to ground for 60s.
Reverse Polarity Protection	ISO 16750-2, 28V for 60s
Starting Profile	ISO 16750-2, Level IV $U_{s6}=6V$ (12V) class B. Level I $U_{s6}=10V$ (24V) class A
Withstand Voltage	ISO 16750-2, Apply 500VAC 60Hz for 60s
Insulation Resistance	ISO 16750-2, 500VDC for 60s, > 100MΩ
Superimposed Alternating Voltage	ISO 16750-2, UPP of 4 V for 120s, total 5 cycles
Slow Decrease and Increase of Supply Voltage	ISO 16750-2, Increase the supply voltage from 0V to U_{smin} , then decrease it from U_{smin} to 0V, applying a change rate of 0.5 V/min linear.
Momentary Drop in Supply Voltage	ISO 16750-2, Voltage drop from 8V to 4.5V, duration ≤ 100 ms.
EU Commission Directive	2004/104/EC Compliant (E-Marked)

Environmental

Operating Temperature	-40°C to +85°C
Storage Temperature	-40°C to +85°C
Thermal	-40°C to +85°C IEC 60068-2-1: Cold Soak IEC 60068-2-2: Heat Soak IEC 60068-2-14: Cycling/Shock
Solar Radiation	IEC 60068-2-5, procedure B, Irradiation: 1120W/m ² , Total Period: 15 day. Light: 20h, 70°C BST, 30%RH, 40°C CHT. Dark: 4h, 25°C BST, 93%RH, 25°C CHT
Low Pressure	IEC 60068-2-13
Humidity	Soak: IEC 60068-2-78, Soak at 40°C at 93% RH for 10 days Cyclic: IEC 60068-2-30, Method 1, Temp range from 25°C to 55°C, cycling change with 93±3% RH, 10 cycles for 240 hrs.
Ingress Protection	ISO 20653, IP67, for above panel components of actual switch only.
Salt Spray	IEC 60068-2-52, Salt mist for 2h at 35°C, dry for 4h at 35°C RH≤30%, and humid for 2h at 50°C RH≥95%. Repeat 12 cycles, total 96h.
Chemical Loads	ISO 16750-5, brushing engine oil, hydraulic oil, diesel fuel, Grease, Urea at 85°C for 22hrs. Dipping battery fluid for 22hrs and alcohol for 10min at 25°C.
Resistance for Rubbing	RCA Abrasion, 400 sweeps, 175g

Mechanical

Endurance	1,000,000 cycles per key (20% at -40°C, 20% at +85°C, 60% at +25°C)
Vibration	Resonance Vibration: IEC 60068-2-6, 20Hz~500Hz per axis with amplitude of 19.6m/s ² . Apply 90m/s ² at resonance point for 1h at Z axis and 0.5h at X/Y axis. Sinusoidal Vibration: IEC 60068-2-6, 5Hz~200Hz with amplitude 100m/s ² for 4h at Z axis and 2h at X/Y axis. Random vibration: IEC 60068-2-64, 10-2000Hz. Acceleration 5.825Grms, 8h per axial
Shock and Bump	IEC 60068-2-27, Shock 500 m/s ² 11 milliseconds. IEC 60068-2-29, Bump 400 m/s ² 6 milliseconds 600 cycles
Drop Test	IEC 60068-2-31, Free fall, Procedure 1, 1000 mm height, drop on all 3 axes in both directions

Tech Specs

Software Interface Integration

Click below to integrate the UKP-Series into J1939 CAN network:

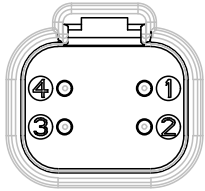
www.carlingtech.com/sites/default/files/documents/ukp-series_interface.pdf

Tables

Table A: Standard Illumination

Type	Red	Green	Amber	Blue	White
Backlight	---	---	---	---	Yes
Function	Yes	Yes	Yes	Yes	---

Connection: 4 pin Deutsch DT Connector. Power with 8V to 32V vehicle type input



No.	Destination
1	Power
2	Ground
3	CAN H
4	CAN L

Table B: Operation Current Values

Size	Voltage	Sleep Current Value (mA)
2x2	12	~4.63
	24	~3.18
2x3	12	~6.67
	24	~4.27
2x4	12	~9.11
	24	~5.55
2x5	12	~8.84
	24	~5.40
2x6	12	~11.54
	24	~6.95

Ordering Scheme

Part 1: Keypad

Sample
Part No. UKP 1 - 5 1 - A B - A - J 128 /

Selection 1 2 3 4 5 6 7 8 9

1. SERIES

UKP UKP-Series Keypad

2. KEYPAD STYLING

1 Standard

3. BUTTON LAYOUT

1 Two by Two (1.6-2.8mm Panel Thickness)	6 Three by Two
2 Two by Three	7 Four by Two
3 Two by Four	8 Five by Two
4 Two by Five	9 Six by Two
5 Two by Six	A Two by Two (2.8-4.0mm Panel Thickness)

4. KEYPAD COLOR

1 Black

5. BACKLIGHT

A White

6. FUNCTION LIGHT COLOR

B Amber	D Red
C Green	E Blue

7. NON-ILLUMINATED IMAGE COLOR

A White

8. NETWORK TYPE

J J1939 (250K Baud Rate)
K J1939 (500K Baud Rate)

9. SOURCE ADDRESS ¹

The Source Address is a unique number (**000-248**) assigned to each node on a CAN network, and is determined based upon the specific CAN architecture of each customer application.

Notes:

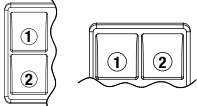
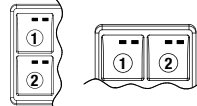
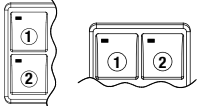
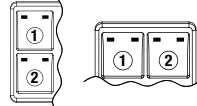
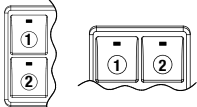
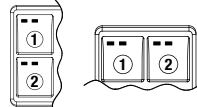
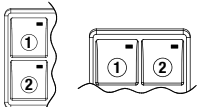
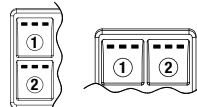
- ¹ Default Source Address is 128.
- ² Source Address to be defined as the Decimal Value in the Ordering Scheme, unit will be programmed with Source Address as a Hexadecimal value when delivered.

[Configure Complete Part Number >](#)

Part 2: Icon Artwork (Select 12 buttons for 2x6, 10 buttons for 2x5, 8 buttons for 2x4, 6 buttons for 2x3, and 4 buttons for 2x2.)

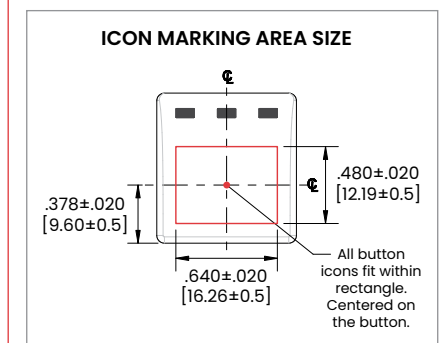
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Button 7 <u>8</u> <u>NN</u> Function Icon Code	Button 8 <u>8</u> <u>PU</u> Function Icon Code	Button 9 <u>5</u> <u>PR</u> Function Icon Code	Button 10 <u>5</u> <u>PP</u> Function Icon Code	Button 11 <u>4</u> <u>RH</u> Function Icon Code	Button 12 <u>4</u> <u>NU</u> Function Icon Code

FUNCTION LIGHT CODE

1 No Function Light 	5 Closed- Open- Open 
2 Open- Closed- Closed 	6 Open- Closed- Open 
3 Closed- Open- Closed 	7 Open- Open- Closed 
4 Closed- Closed- Open 	8 Open- Open- Open 

ICON CODE

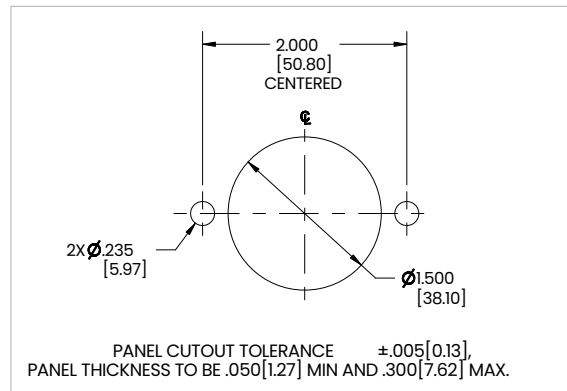
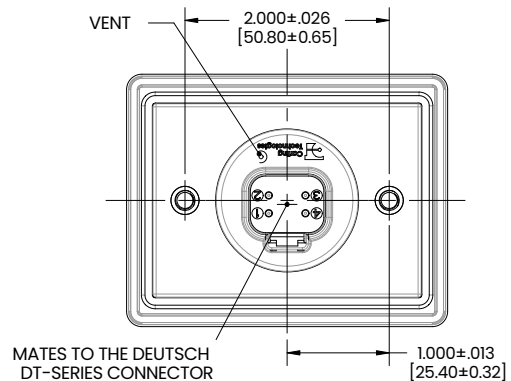
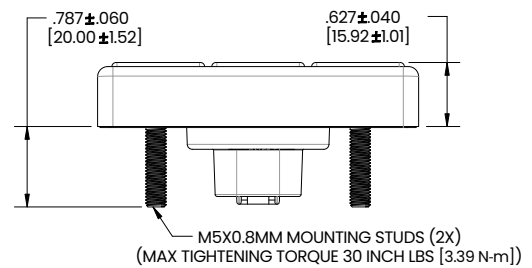
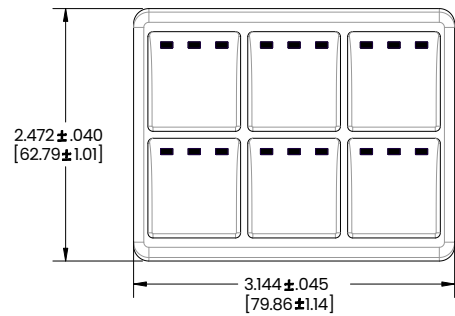
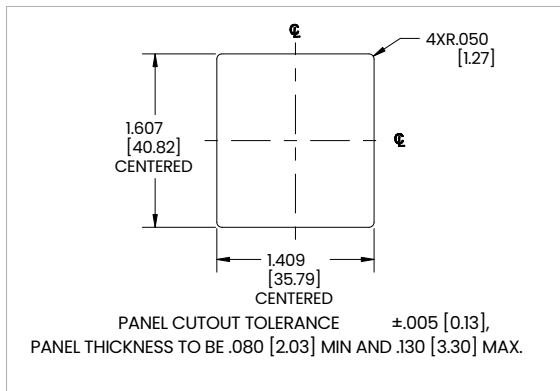
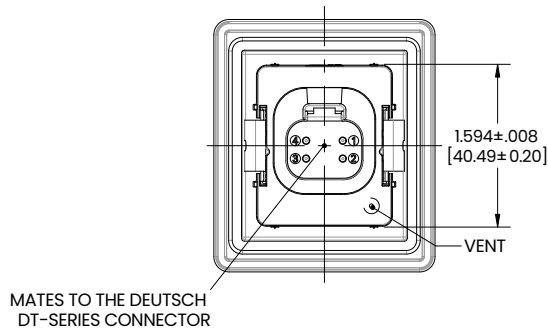
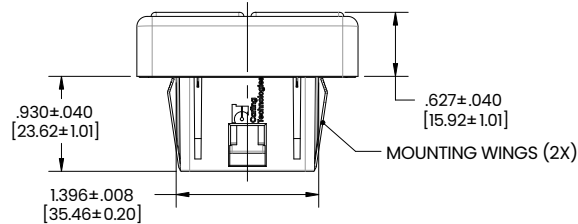
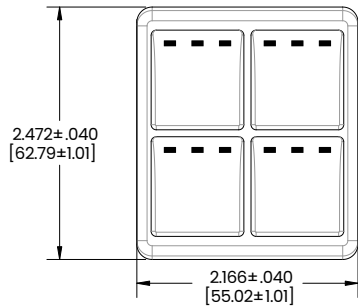
00 For standard icons, see Standard Legends Code page.
For additional icons, please consult factory.



Dimensional Specs

inches [millimeters]

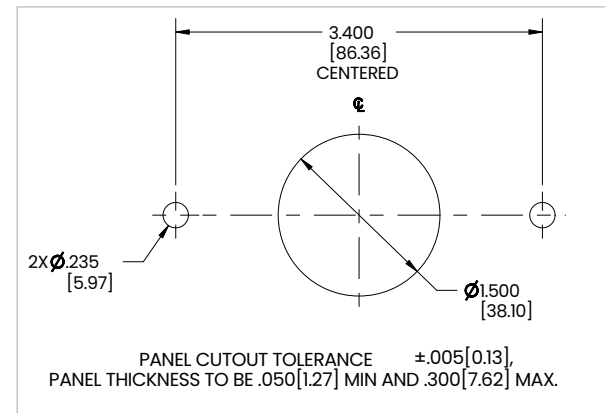
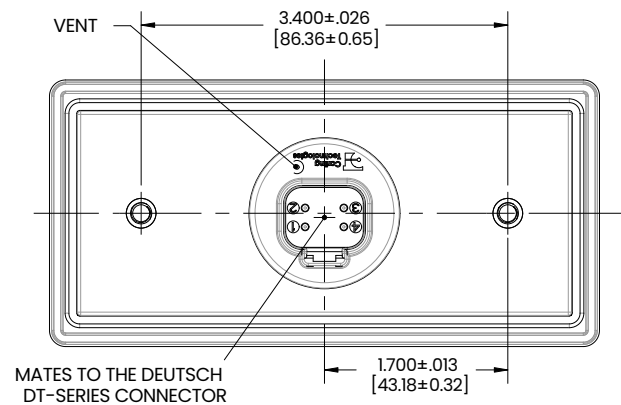
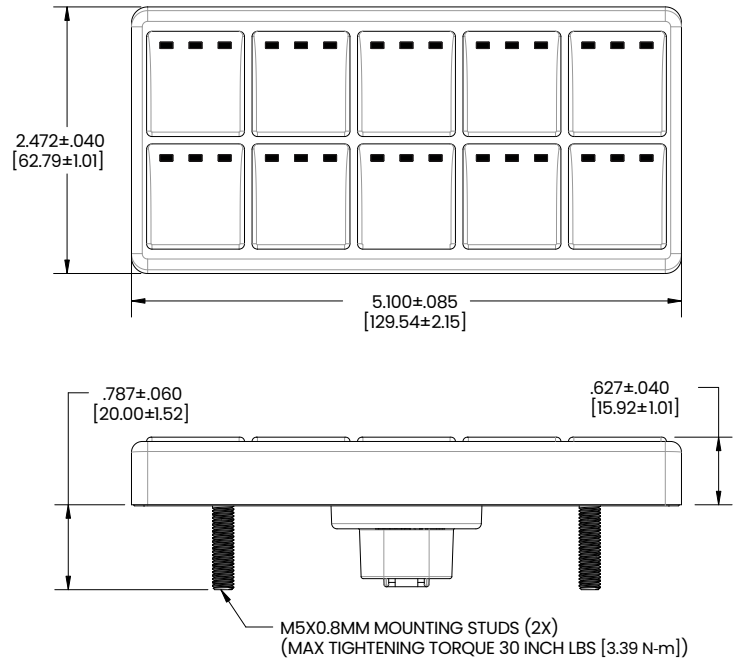
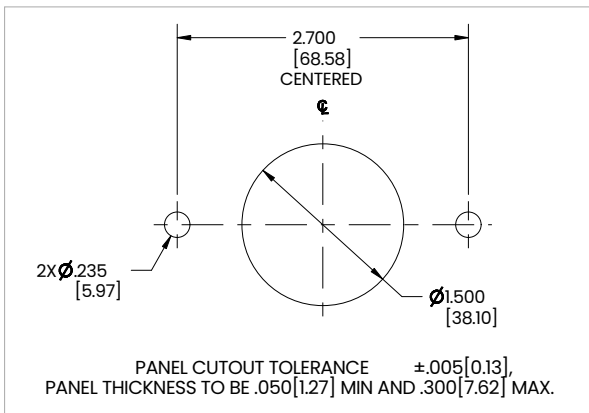
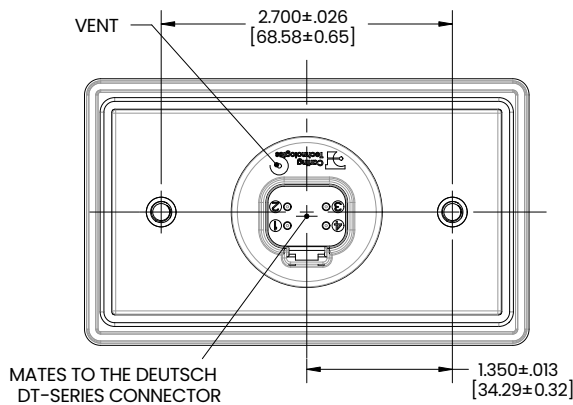
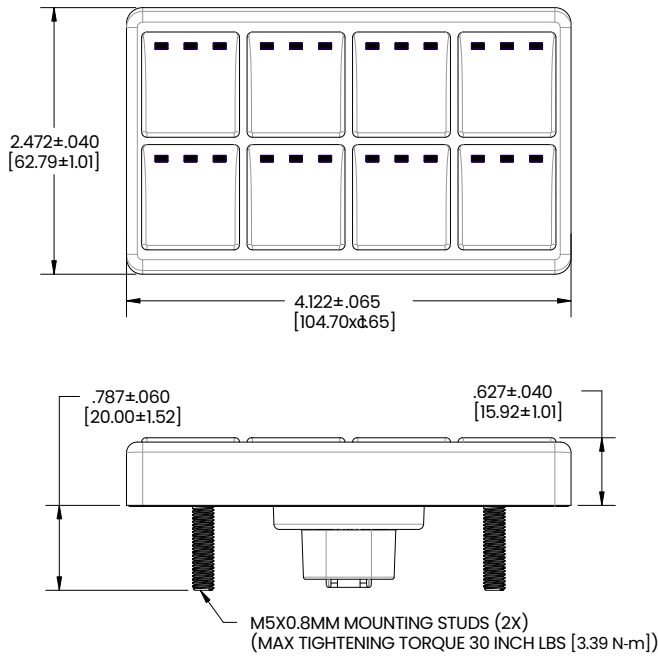
2x2 and 2x3 Configurations



Dimensional Specs

inches [millimeters]

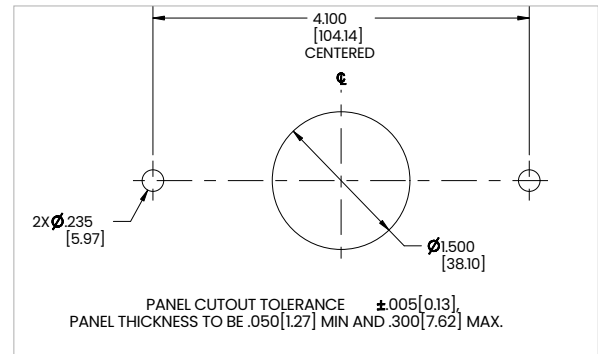
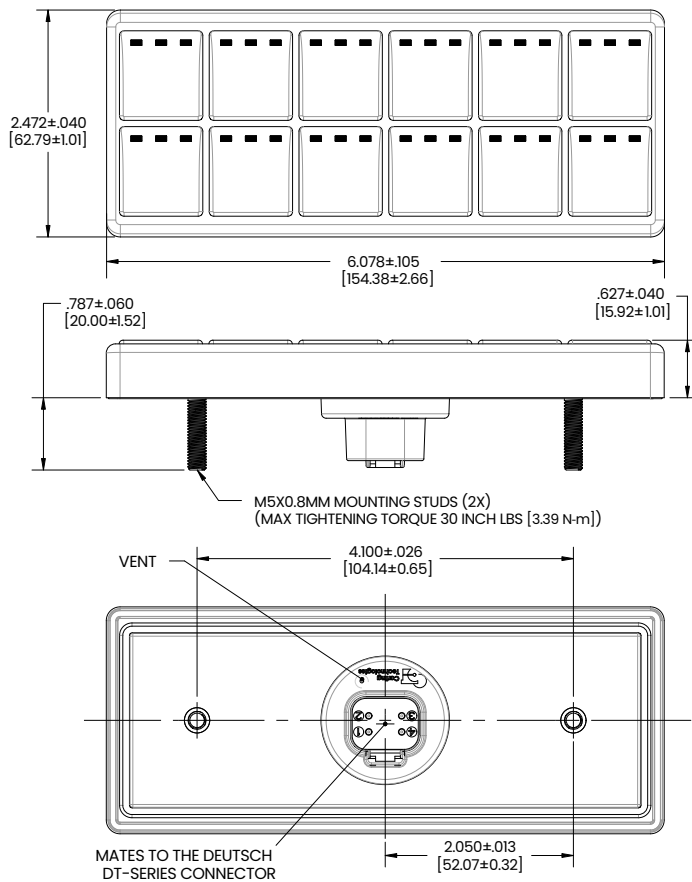
2x4 and 2x5 Configurations



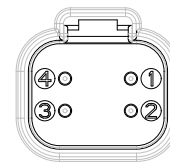
Dimensional Specs

inches [millimeters]

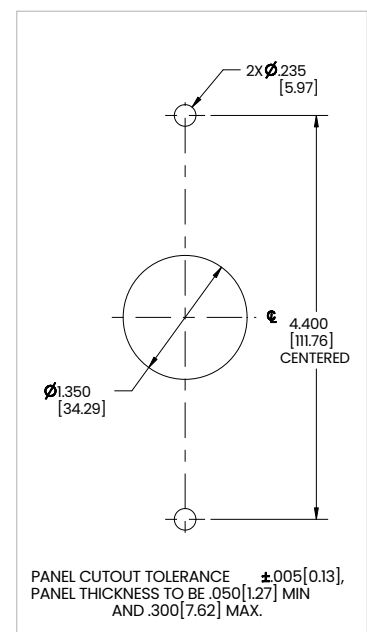
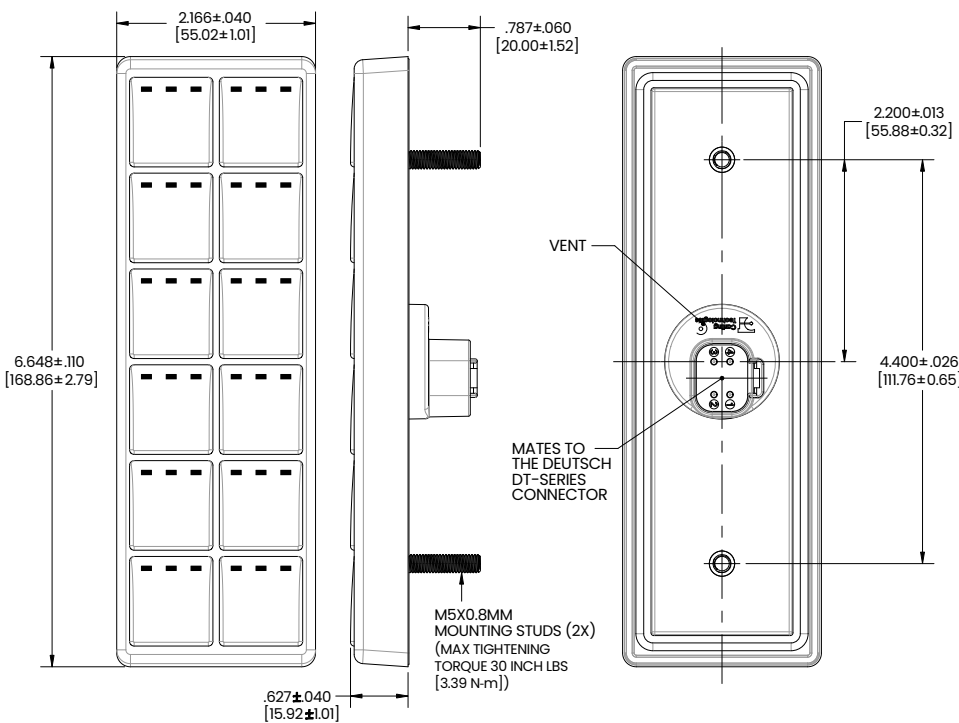
2x6 and 6x2 Configurations



PIN OUT AS SHOWN BELOW



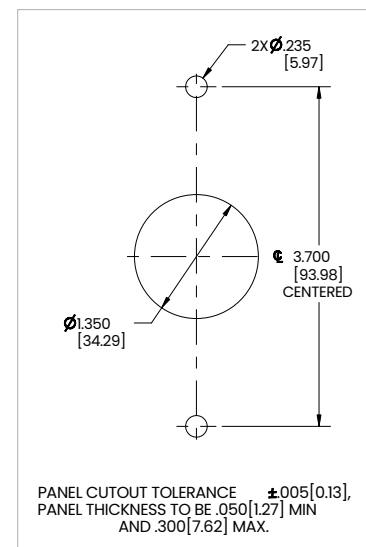
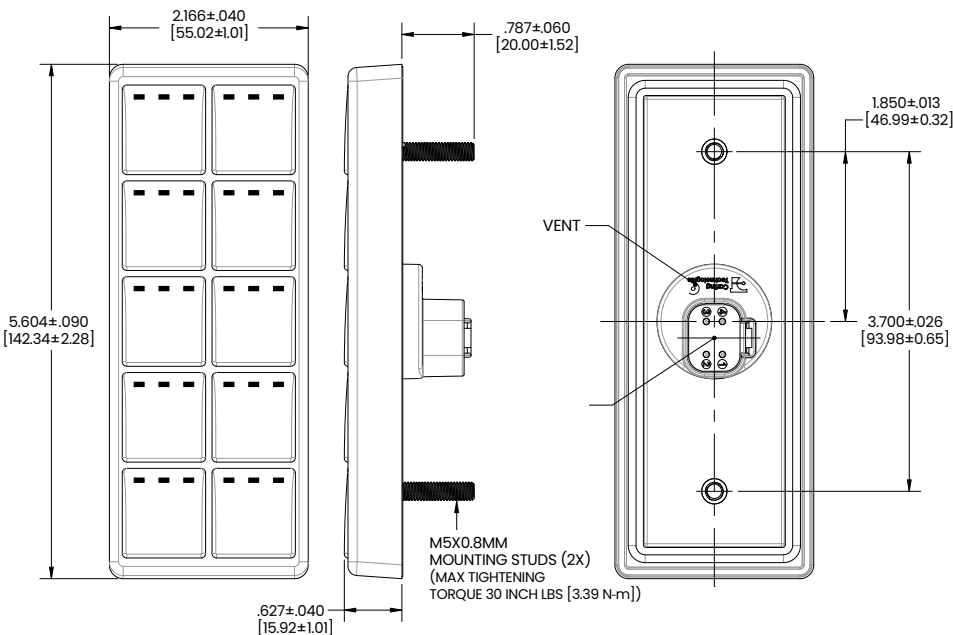
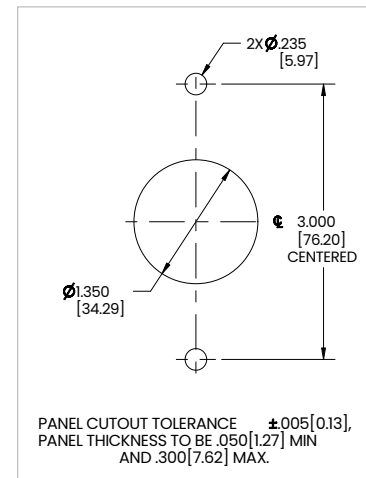
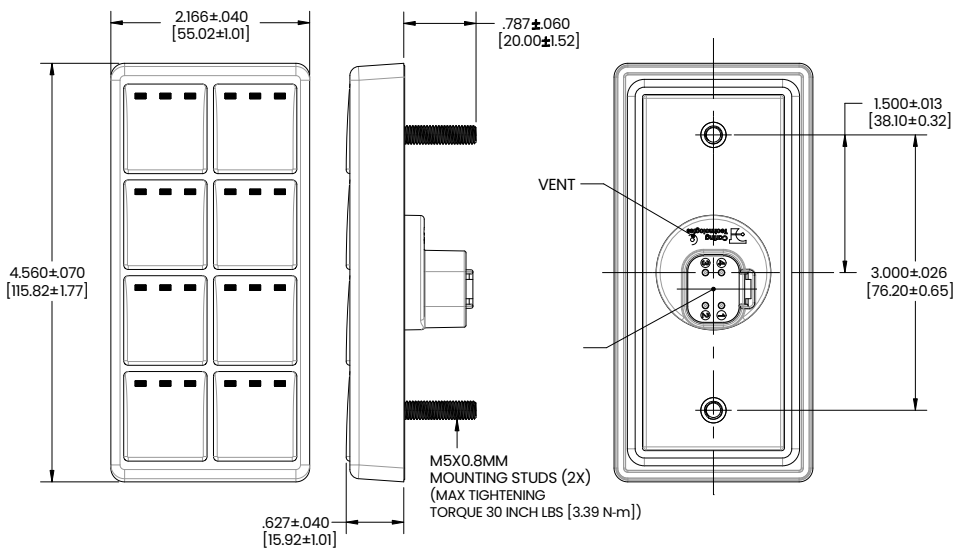
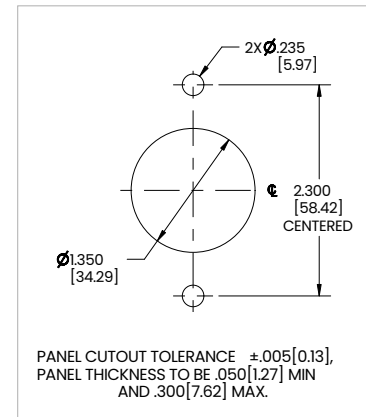
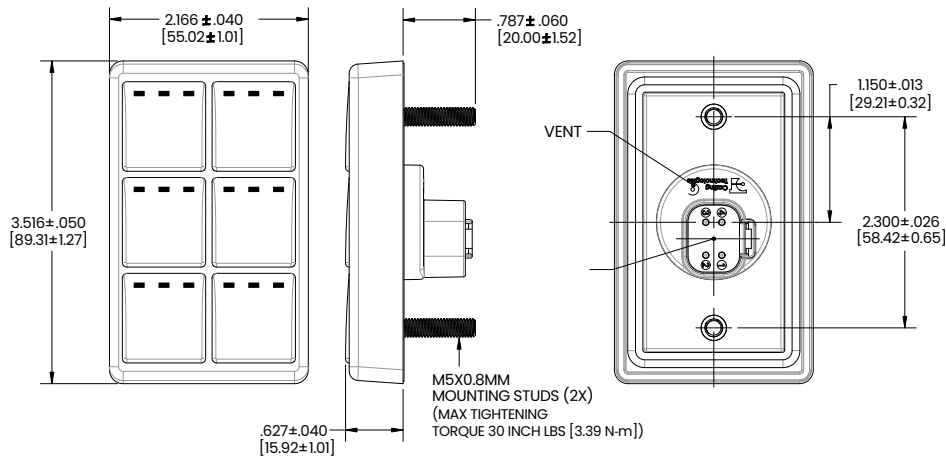
NO.	DESIGNATION
1	POWER
2	GROUND
3	CAN H
4	CAN L



Dimensional Specs

inches [millimeters]

3x2, 4x2 and 5x2 Configurations



Standard Legend Codes

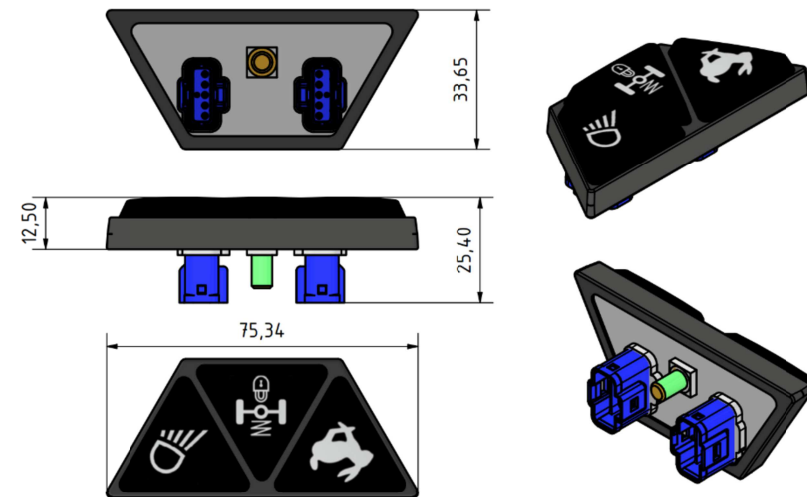
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VU	MW	NZ	NX	NY	YM	VW	PS	PW	PZ	WG	WM	RN
			NAV LIGHTS	COURT LIGHTS	PANEL LIGHTS	ANCH LIGHTS	HEAD LIGHTS	FOG LIGHTS	DASH LIGHTS	DOCK LIGHTS	BEACON	LIGHT
RP	YG	TX	VD	VE	VF	VG	SH	SM	SN	SP	SR	SY
DIM	BRIGHT						BILGE PUMP	BILGE				
WY	WZ	UH	UJ	PD	PE	PF	VC	VJ	UF	UG	MU	TN
		WIPER										
NS	PB	SE	VZ	YE	NN	RW	PU	WA	YN	UE	NM	RJ
				ENG FAN	BLWR					HORN		
NR	YD	TL	VR	SL	VA	UC	VN	PK	VY	UZ	RH	NU
							UP	DOWN				
NV	RB	RC	RK	RL	MZ	RG	WS	WT	UD	UR	WD	TY
		WATER PUMP			ANCHOR							
PA	UK	WR	UU	UT	YR	PM	VV	WB	TB	TC	TD	TE
											ENG HATCH	ENG BRAKE
MY	PV	TA	TZ	WC	PT	PN	PH	RA	TU	TT	YL	SK
VS	UL	UM	WK	TS	VT	WL	VP	YJ	PJ	RY	UP	NW
NP	RE	RF	PP	PR	TV	PC	YT	YU	PL	WJ	MV	RR
		SEAT					CRUISE					
TK	RT	SZ	VX	WF	WH	PG	SJ	YA	YB	RM	TM	RD
RS	UN	TP	TR	NT	MX	YC	TW	TJ	YF	TH	TF	TG
		AUX	ON OFF	OFF ON	I O	O I	OFF ON	ON	OFF	I	O	II
YS	YH	SX	RZ	YP	WN	WP	WW	WX	SA	SB	SC	SD
RAISE	LOWER	HIGH	LOW	FWD	REV	DEPTH	TRIM TAB	ACC	NAV ANCH	WIND LASS UP/DN	LIVE WELL	REAR
ST	SU	WU	WV	SV	SW	VB	VH	VK	VL	VM	WE	SF
PARK	AUTO											
SG	SS	RU	RV	RX								

Datasheet CVEP HexSwitch Keypad

Description:

Intelligent and robust Keypad with CAN connectivity. Because of the triangular shape of the buttons, a more ergonomic arrangement is possible. Each module has a white background illumination and one RGB status LED. It also has at least one CAN input connector and one IO pin. As an option a second connector is available with internally connected CAN and power lines for "daisy-chain" and a second IO. The IO(s) can measure the voltage from 0-10V and if it is used as Output it is capable to drive loads up to 1.2A. The Output(s) are short circuit protected and the input(s) are overvoltage protected. Every button has internally a "normal open" and a "normal closed" contact which is monitored by the microcontroller. So not only the switch state is detected, it is also possible to make a plausibility check.

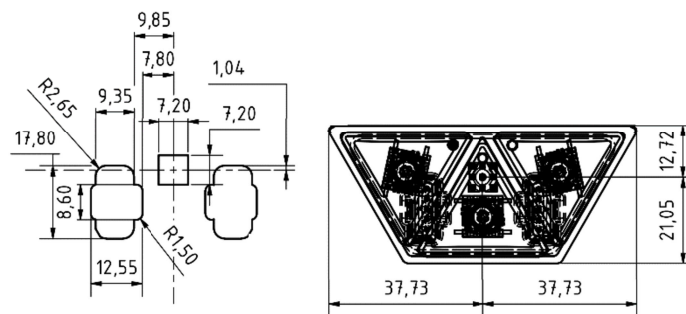
Dimensions:



Pinout

pin	function
1-1	+ VCC
1-2	IO1 analog input or digital out
1-3	GND
1-4	CAN-L
1-5	CAN-H
optional second connector	
2-1	+ VCC
2-2	IO2 analog input or digital out
2-3	GND
2-4	CAN-L
2-5	CAN-H

Panel cutout:



Supply voltage	9-30V
CAN	125, 250, 500, 1000 kBit
Quiescent current	<1mA
Key material	Silicone based
Temperaturbereich	-40°C bis +85°C
Gewicht	ca. 60g
Connector	EDAC 560-005-000-210
Schutzgrad	IP65
Abmessungen	76x34x26mm
Programmable in „C“	yes
Outputs	1x (2x)Highside 1,2A

preliminary

Create:	B.Brett	Date:	28.03.2022
Check:		Version:	0.1



CVEP HexSwitch

No.: HSW220101



Littelfuse®



Carling Technologies®

A Littelfuse® Brand

CKJ-Series

A CAN J1939, sealed, jog switch feature a rotary and push knob.

PRODUCT WEBPAGE

request sample, configure part, watch video



The CKJ-Series jog switch features a joystick rotary encoder* with push-to-select button and 5 customizable function buttons with dimmable lighting. This CAN J1939 compatible display controller is sealed to IP67 standards and can be configured in a variety of orientations providing simple installation and connectivity.

* Rotary switch only (CRS-Series) is available separately

12/24
VDC

500,000
Cycles

IP67 Sealing
for above-panel components

Typical Applications

- Commercial Vehicles
- Construction Equipment
- Agricultural Equipment
- Work Trucks

Design Features

BUTTONS

Five customizable functions for quick access



KNOB (Joystick, Rotary & Push)

Easy menu scrolling, push-button selection and joystick navigation

Rotary switch only (CRS-Series) is available separately



CONNECTOR

Deutsch 4 Pin DT-Series

Related Products



CLTM12-S-Series >
Load Controller



CKP-Series >
Customizable Keypad



VM-Series >
Operator Control Module

Tech Specs

Electrical

Operating Voltage	Designed for 12/24 VDC systems (8 minimum, 32 VDC maximum)
Electrical Endurance	Keypad Buttons: Up to 500,000 cycles Knob Push: Up to 500,000 cycles Knob Directional Joystick: Up to 500,000 cycles in each of four directions Knob Rotation: Up to 500,000 cycles, one cycle is 360°
Over Voltage	ISO 16750-2; 36 VDC for 60 minutes
Short Circuit Protection	ISO 16750-2; All outputs to ground for 60s
Reverse Polarity Protection	ISO 16750-2; 28 VDC for 60s
Starting Profile	ISO 16750-2; Class A
Withstand Voltage	ISO 16750-2; 500 Vrms with a duration of 60s
Insulation Resistance	ISO 16750-2; 500 VDC with a duration of 60s
Superimposed Alternating Voltage	ISO 16750-2; 4.4 Superimposed alternating voltage: UPP, of 4 VDC
Slow Decrease and Increase of Supply Voltage	ISO 16750-2; Increase the supply voltage from 0 VDC to 8 VDC, then decrease it from 8 VDC to 0 VDC, applying a change rate of 0.5 VDC/min linear
Momentary Drop in Supply Voltage	Test pulse applied in accordance with ISO 16750-2

Electromagnetic Compatibility

ESD	ISO 10605; +/- 15kV air discharges, +/-8kV contact discharges
Absorbed-Lined Chamber	ISO 11452-2; Absorbed-lined chamber 100V/m, 80MHz to 2 GHz Class A
Bulk Current Injection	ISO 11452-4; 100mA, 20MHz to 400MHz Class A
Conducted Transients	ISO 7637-2:2004; All test pulse in Annex A table A1 for 12V system and Table A2 for 24V system, Level 4, pulse 2a/3a/3b/4/5a -Class A
Transient Emission	ISO 13766; 64dB to 54dB, 30MHz-75MHz (linearly decreases); 54dB to 65dB, 75MHz-400MHz (linearly increases); 65dB, 400MHz - 1000MHz

Physical

Switch functions	5 keypad button, knob push, 4 directions knob joystick (optional), continuous rotary knob (20 detents per rotation)
Illumination	LED backlit icon, dimmable illumination, controlled by CAN messages
Mounting	M5 back screw mounting
Mounting Torque	2.26-2.82 nm [20~25 in-lbs]
Weight	196 grams [.43 lbs]

Environmental

Sealing	IP67, for above-panel components of actual switch only
Operating Temperature	-40°C to +85°C
Storage Temperature	-40°C to +85°C
Thermal, Hot Soak	IEC 60068-2-2; Test Bb, +85°C for 96 hours
Thermal, Cold Soak	IEC 60068-2-1; Test Ab, -40°C for 96 hours
Thermal Shock	IEC 60068-2-14; Test Na -40°C to +85°C, 10 cycles for 10 hours
Solar Radiation	IEC 60068-2-5; Procedure B, 24h per cycle, 20h irradiation and 4h darkness, total irradiation of 22.4kWh/m2 per diurnal cycle. 15 cycles
Humidity, Soak	IEC 60068-2-78; Test Cab, 30°C at 93% RH for 10 days
Humidity, Cyclic	IEC 60068-2-30; Test Db Method 1, 55 to 25 at 90% RH 6 cycles of 24 hours each
Salt Spray	IEC 60068-52; Test Kb, severity level 4
Chemical resistance (Resistance to Solvents)	ISO 16750-5; Method II (Brushing) for Engine oil, hydraulic oil, diesel fuel, grease and urea at room temperature for 24 hours
Thermal Cycling	IEC 60068-2-14; Test Nb, -40°C to +85°C, dwell: 3 hours; transfer rate:(3±0.6°C)/min, 2 cycles

Mechanical

Vibration, Random	MIL-STD-202G; Method 214A Test condition A, 5.35Grms, from 50Hz to 2000Hz, each plane 8 h, total 24h
Vibration, Sinusoidal	IEC 60068-2-6; Sweep sine wave form 10 to 60.1Hz with 0.35mm amplitude, 60.1Hz to 2000Hz with 50m/s2, each plane 20 cycles (5h) total 60 cycles (15h)
Vibration, Resonance	IEC 60068-2-6; Sinusoidal from 10 to 2000Hz, 5 minutes at resonant point
Shock and Bump	IEC 60068-2-27; 3 shocks in each direction of the 3 axis (18 total shocks) at 500 m/s2 for 11 ms. 100 shocks in each direction of the 3 axis (600 total shocks) at 400 m/s2 for 6 ms
Drop test	IEC 60068-2-31; Test Ec Free Fall - Procedure 1 drop in each direction of the 3 axis (6 total drops) from 1000mm

Software Interface Integration

Click below for instructions on integrating the CKJ-Series:
www.carlingtech.com/sites/default/files/documents/ckj-series_interface.pdf

Ordering Scheme

Sample Part No. **CKJ - 1 A 1 - 1 1 1 - C - J 129 / 00 - 00 - 00 - 00 - 00**

Selection 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

1. SERIES

CKJ Customizable Jog Switch

2. KNOB INPUT TYPE AND FUNCTION

- 1 Directional, Rotary and Push
- 2 Rotary and Push
- 3 Rotary Only

3. BUTTON LAYOUT

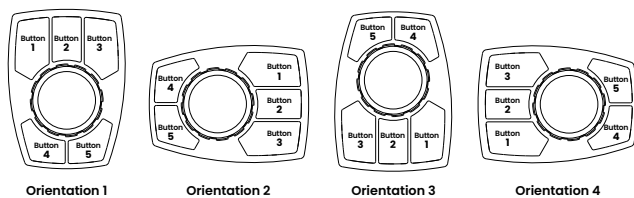
A 5 Buttons

4. KNOB COLOR AND STYLE

1 Standard

5. ORIENTATION

- 1 Orientation 1
- 2 Orientation 2
- 3 Orientation 3
- 4 Orientation 4



6. KEYPAD COLOR

1 Black

7. CONNECTOR

1 Deutsch 4 Pin DT-Series

8. ILLUMINATION ¹

- | | |
|----------------|-----------------|
| 0 None | C Yellow |
| A White | D Blue |
| B Green | E Red |

9. COMMUNICATION PROTOCOL

- J** J1939, 250K Baud Rate
- L** J1939, 500K Baud Rate

10. SOURCE ADDRESS ²

000 A Unique Number from 000 to 248

11, 12, 13, 14, 15. LEGENDS - BUTTONS 1 TO 5 ^{3, 4}

- 00** No legend
- G1** Numeric icons for orientation 1
- G2** Numeric icons for orientation 2
- G3** Numeric icons for orientation 3
- G4** Numeric icons for orientation 4

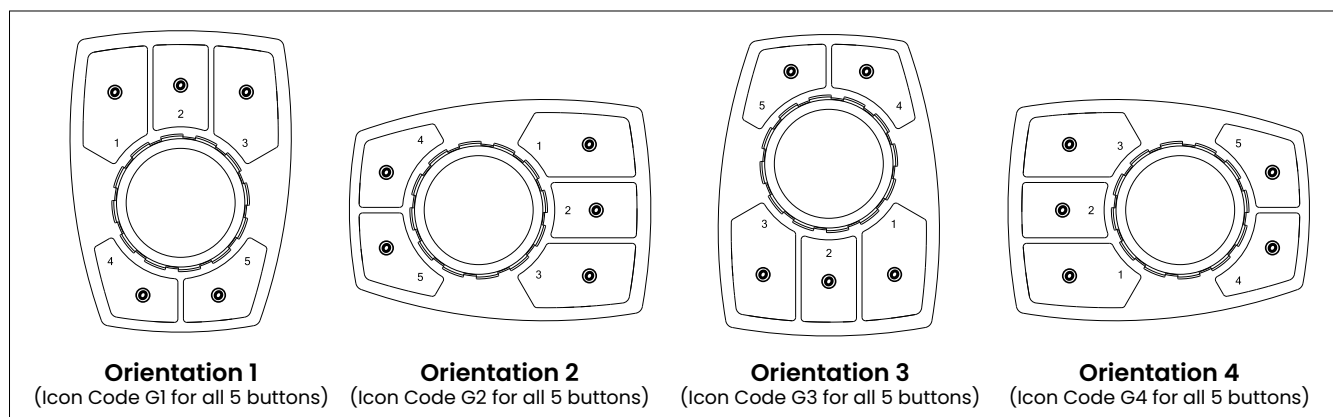
For additional legends, please consult factory

Notes:

1. Standard backlight color is white.
2. Default source address is 129.
3. Icon code G1 indicates a set of icons on all 5 buttons. Use icon code G1 for each button. For example, CKJ-1A1-111-A-1100/G1-G1-G1-G1-G1. Same case for icon codes G2, G3, and G4.
4. Orientation must match option chosen in box 5

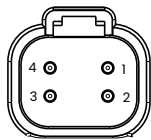
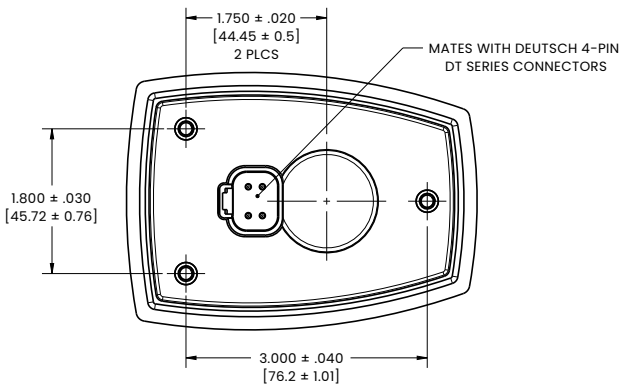
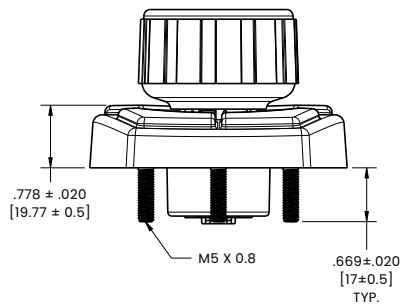
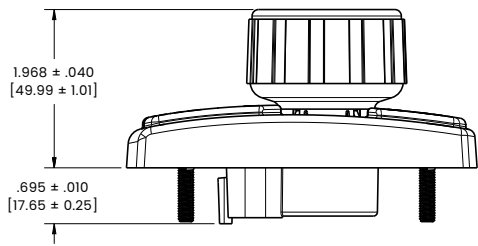
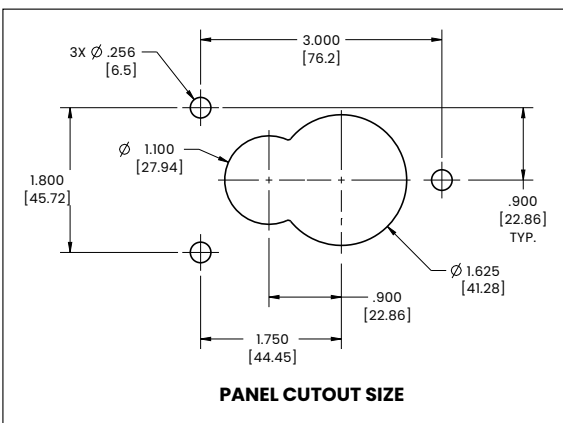
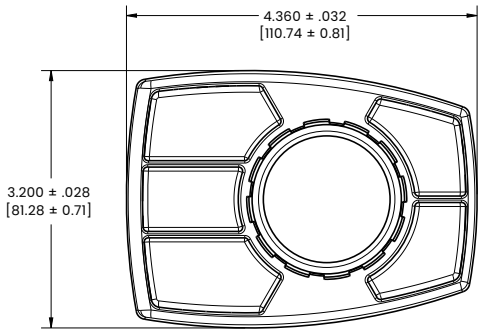
[Configure Complete Part Number >](#)

Legend/Button Orientation



Dimensional Specs

inches [millimeters]

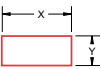


PIN OUT AS SHOWN

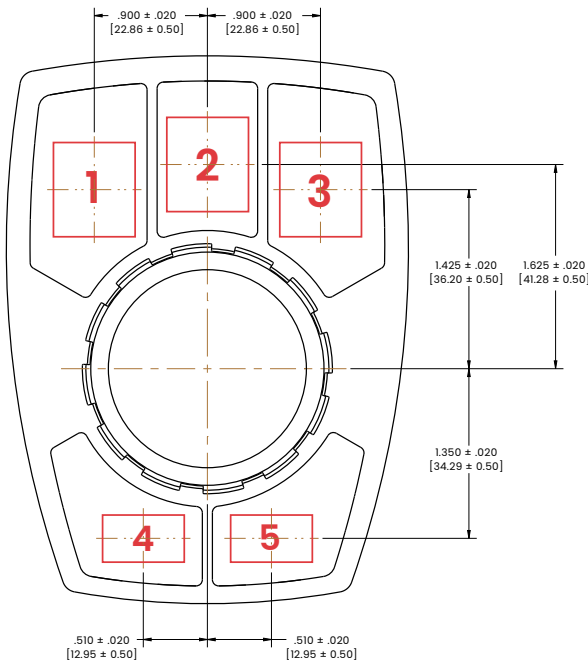
PIN NO.	DESIGNATION
1	POWER
2	GND
3	CAN H
4	CAN L

Legend Marking Area

MARKING AREA					
	1	2	3	4	5
X	.650 [16.51]	.650 [16.51]	.650 [16.51]	.650 [16.51]	.650 [16.51]
Y	.750 [19.05]	.750 [19.05]	.750 [19.05]	.380 [9.65]	.380 [9.65]



Icon marking area and location
Unless otherwise specified, icon size and location should follow this drawing and is applicable to all 4 orientations



Standard Legend Codes

YK	UA	UB	US	UV	UW	UX	UY	MP	MR	PX	MS	MT
VU	MW	NZ	NX	NY	YM	VW	PS	PW	PZ	WG	WM	RN
RP	YG	TX	VD	VE	VF	VG	SH	SM	SN	SP	SR	SY
DIM	BRIGHT	UH	UJ	PD	PE	PF	VC	VJ	UF	UG	MU	TN
NS	PB	SE	VZ	YE	NN	RW	PU	WA	YN	UE	NM	RJ
NR	YD	TL	VR	SL	VA	UC	VN	PK	VY	UZ	RH	NU
NV	RB	RC	RK	RL	MZ	RG	UP	DOWN	UD	UR	WD	TY
PA	UK	WR	UU	UT	YR	PM	VV	WB	TB	TC	TD	TE
MY	PV	TA	TZ	WC	PT	PN	PH	RA	TU	TT	YL	SK
VS	UL	UM	WK	TS	VT	WL	VP	YJ	PJ	RY	UP	NW
NP	RE	RF	PP	PR	TV	PC	YT	YU	PL	WJ	MV	RR
TK	RT	SZ	VX	WF	WH	PG	SJ	YA	YB	RM	TM	RD
RS	UN	TP	TR	NT	MX	YC	TW	TJ	YF	TH	TF	TG
YS	YH	SX	RZ	YP	WN	WP	WW	WX	SA	SB	SC	SD
RAISE	LOWER	HIGH	LOW	FWD	REV	DEPTH	TRIM TAB	ACC	NAV ANCH	WIND LASS UP/DN	LIVE WELL	REAR
ST	SU	WU	WV	SV	SW	VB	VH	VK	VL	VM	WE	SF
PARK	AUTO	RU	RV	RX								
SG	SS											

ePad-II Series Keypad

Product Features



High Reliability

Intelligent keypads designed for harsh environment and can be operated ranging from $-30^{\circ}\text{C}\sim+70^{\circ}\text{C}$, anti-vibration, anti-impact and other features, adapt to the application of extremely harsh environment, and the icon of each key can be changed quickly.



Strong Sense of Maneuvering

LED light status indication; with backlight control, adjustable brightness, key icon and function can be customized according to customer's requirement; save controller I/O port; 30-gear knob with gimbaled directional rocker and press confirmation function.



Wide Applicability

ePad-II includes 6-key, 8-key and 12-key specifications, among which the 6-key is equipped with a knob, supports CAN bus output, standard frame and extended frame, patterns can be customized according to customer requirement, each key can be configured with 3 indicator lights.



Streamlined Wiring

Replacing traditional buttons and rocker switches, the wiring harness is simplified and optimized for cab layout, saving space and cost, high-grade and exquisite.



Icons can be quickly replaced



wear-resistant



CANbus



$-30^{\circ}\text{C}\sim+70^{\circ}\text{C}$



Night vision function

Technical Parameters

Electrical Parameters	
Operating Voltage	9~32V DC
Power Consumption	$\leq 2\text{W}$
Interface	
Number of Keys	6/8/12
Key Lifespan	> 300,000 cycles (1,000,000 optional)
Key Icons	Customizable
Indicator Light	Each button can be configured with up to 3 indicators
Knob	1 turn and 30 gears, lifespan 100,000 turns
Indicator Light	Each key can be configured with 3 indicator lights
Indicator Light	White, adjustable backlight brightness

Communication	
Communication Method	1 CAN, CAN2.0B interface standard, supports standard and extended frames
Environmental Parameters	
Working Temperature	$-30^{\circ}\text{C}\sim+70^{\circ}\text{C}$
Storage Temperature	$-40^{\circ}\text{C}\sim+85^{\circ}\text{C}$
Physical Parameters	
Mounting Method	Panel mounting
Shell Material	Silicone front shell, engineered plastic back shell
※The product is constantly being upgraded. If there are any changes to the parameters, please refer to the latest information.	

Connectors

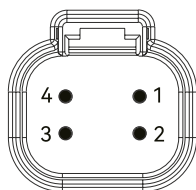
ePad-II-06R

Pin 1: Power supply 9~32V DC

Pin2: Ground

Pin3: CAN-H

Pin4: CAN-L



Harness End Connector Model: DT06-4S

ePad-II-08H/ePad-II-12

Pin1: DC+ Power Positive

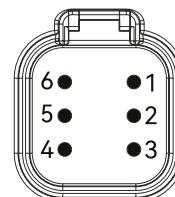
Pin2: GND-Power Negative

Pin3: Empty

Pin4: Empty

Pin5: CAN-H

Pin6: CAN-L

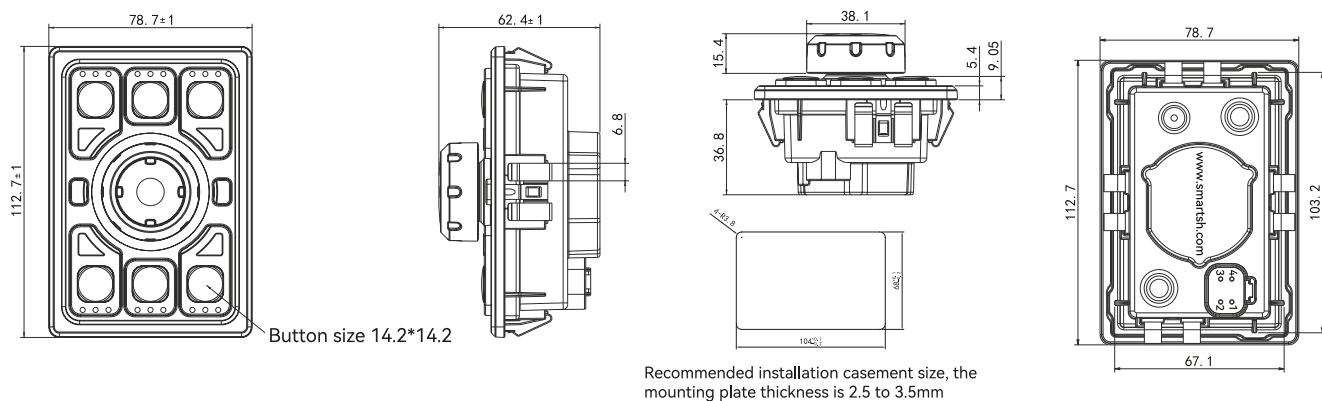


Harness End Connector Model: DT06-6S

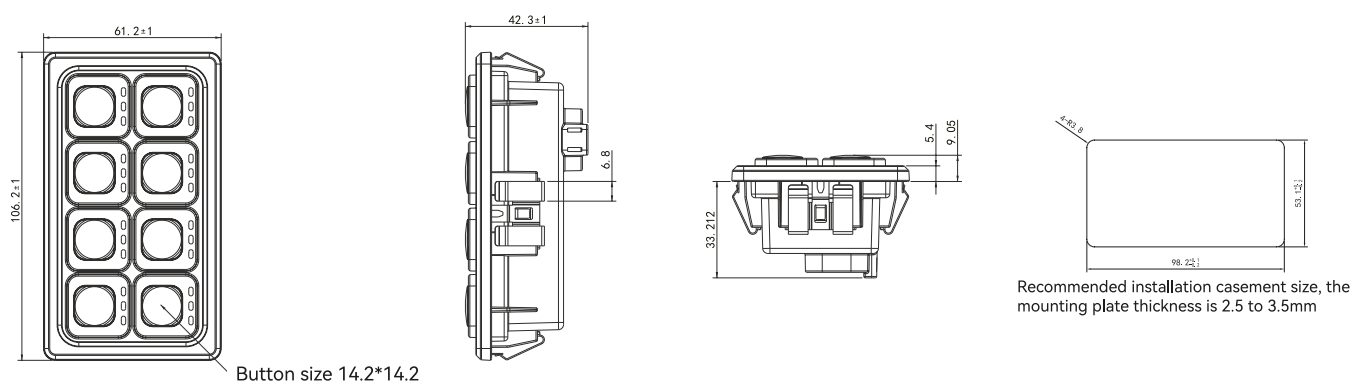
ePad- II Series Keypad

Product Dimensions

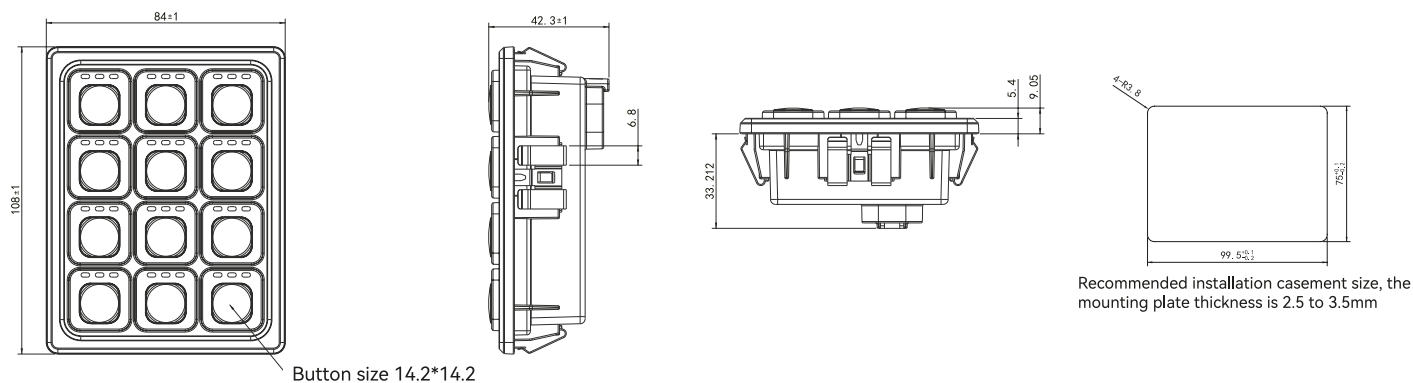
ePad-II-06R



ePad-II-08H



ePad-II-12



Selection Information

Models	Number of Keys	Layout Specifications	Key Material	I/O Quantity	Rotary Knob	Connector	Communication	Backlight	Indicator Light	Number of Indicator Lights	IP Level
ePad-II-06R	6	2*3	Rigid + Silicone	0	Yes	DT06-4S	CANbus	White	Amber Color	3	IP54
ePad-II-08H	8	2*4	Rigid + Silicone	0	No	DT06-6S	CANbus	White	Amber Color	3	IP65
ePad-II-12	12	4*3	Rigid + Silicone	0	No	DT06-6S	CANbus	White	Amber Color	3	IP65

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
- Directional and Hazard Signals
- Site and Work Lights
- Headlamps and Sidelights
- Beacon and Alarm Systems
- 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 & Open
3 Discrete Inputs	Active High & 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

Software Interface Integration

Click below on integrating the VM-Series into J1939 CAN network:

www.carlingtech.com/sites/default/files/documents/cltm12-s-series_interface.pdf

Ordering Scheme

Sample Part No. CLTM 12 - S STANDARD

Selection 1 2 3 4

1. SERIES

CLTM Control Module

2. OUTPUT

12 12 Outputs

3. SYSTEM

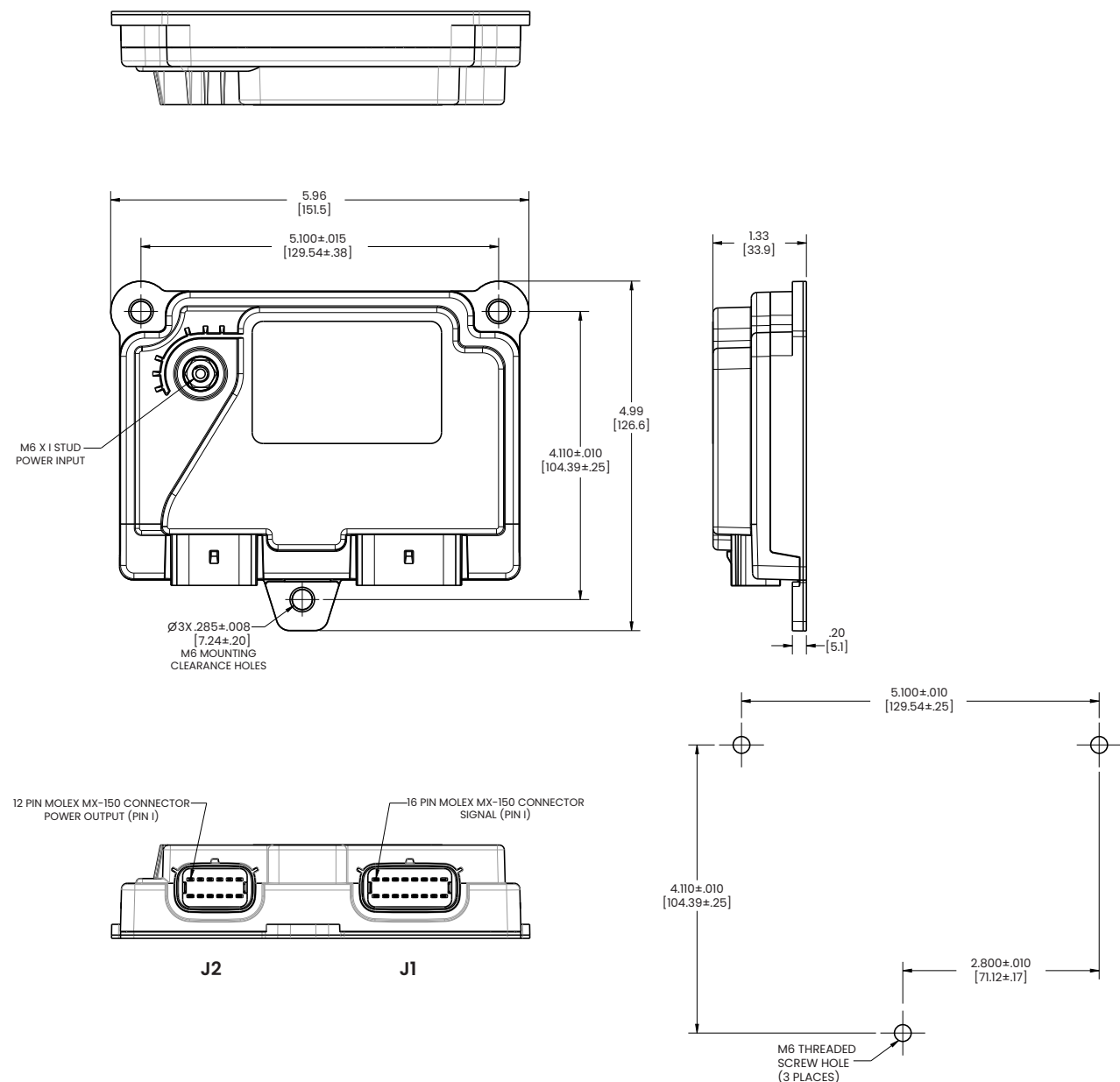
S Secondary

4. TYPE

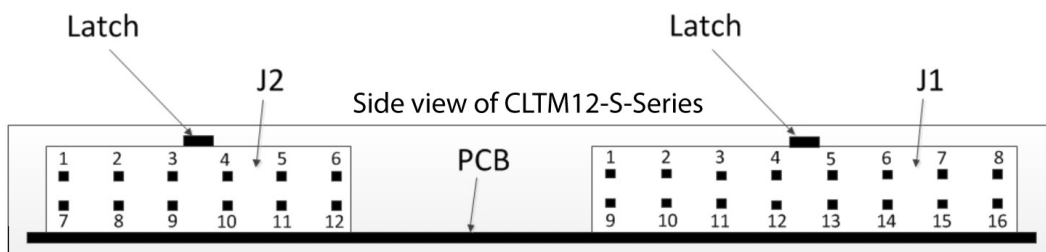
Standard Off-the-Shelf Hardware

Dimensional Specs

inches [millimeters]



Connector Pin Out



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

Configuration

Digital inputs

The digital inputs (IND_1, IND_2, IND_3, IND_4_WKE) sense the presence of two voltage level states: "Active High", and "Open" 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') 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

Configuration

Thresholds

Open = 1.58 to 4.28V

High = 4.78V to 6.63V

These thresholds apply when the CLTM12-S is not in sleep mode.

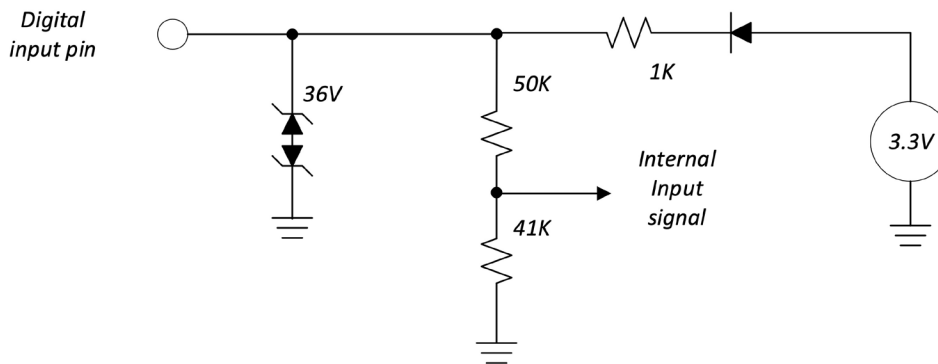
The IND_4_WKE pin is a special case. When the CLTM12-S is in sleep mode this pin serves as a means of waking the CLTM12-S from sleep when a low to high logic transition is detected.

The logic levels associated with this function are:

Logic 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 two voltage level states "Active High", and "Open" (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') 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:

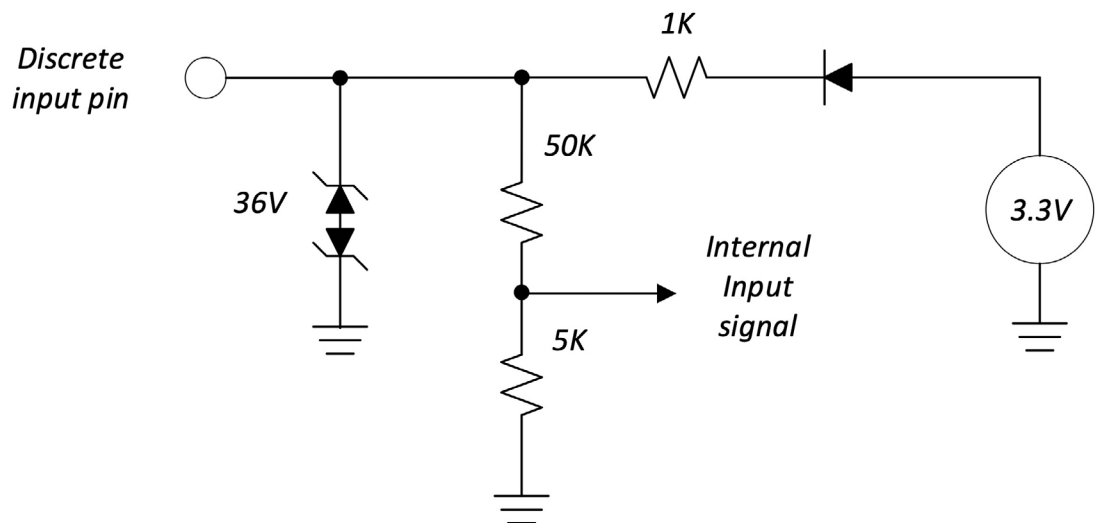
Open = 1.51 to 4.31V

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)

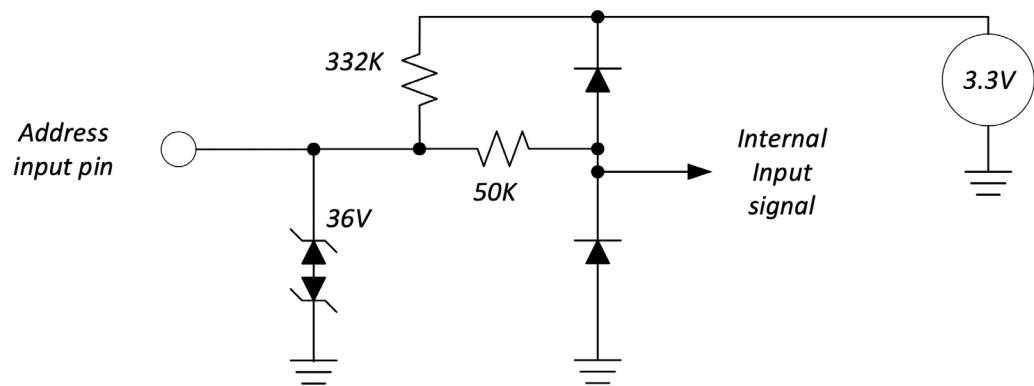
Open circuit voltage = 3.3V
Input resistance > 50K Ohms
Low = below 0.72V
High = above 1.65V

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.

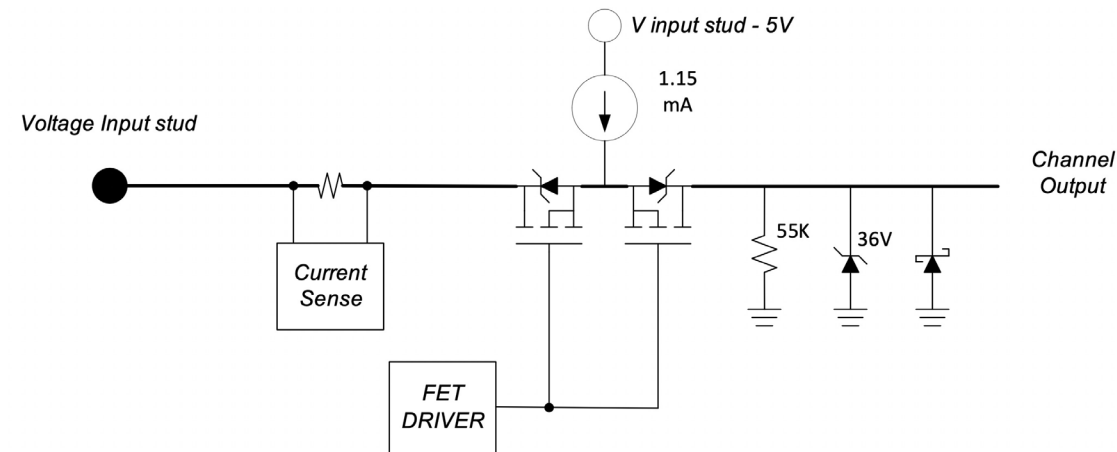
5A	Channels 3 (J2 pin 11), 6 (J2 pin 9), 9 (J2 pin 8) and 12 (J2 pin 10)
10A	Channels 1 (J2 pin 6), 2 (J2 pin 4), 4 (J2 pin 2), 5 (J2 pin 1), 7 (J2 pin 7), 8 (J2 pin 3), 10 (J2 pin 5), 11 (J2 pin 12)

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.

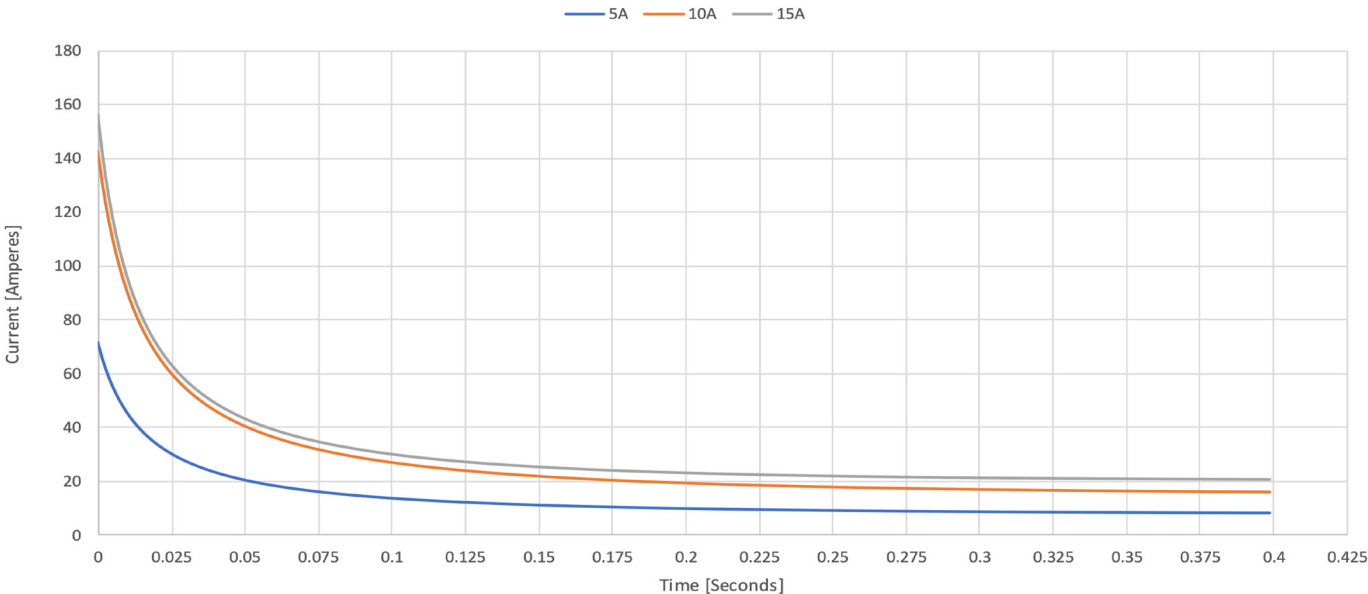
The surge allowance function is also implemented in hardware. Constant over-current levels are allowed for a time that is inversely proportional to the magnitude of overcurrent according to the following curve.

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

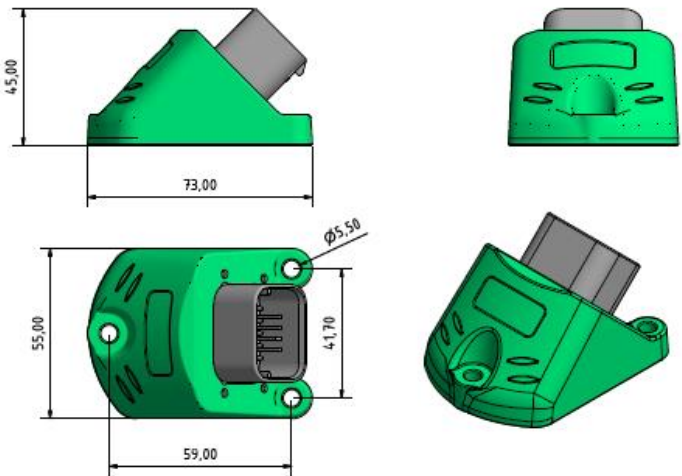
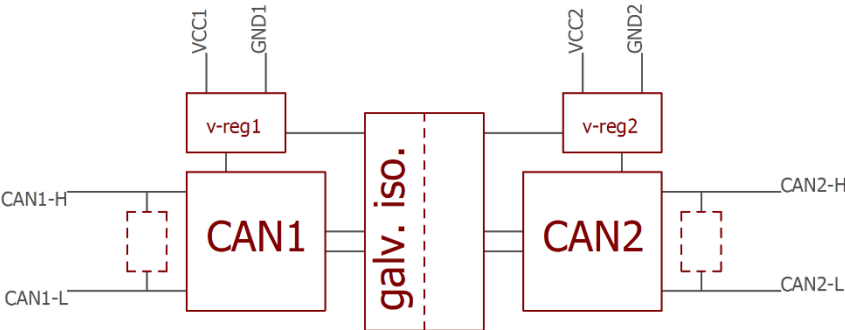
Channel Current in Amperes vs. time to Overcurrent Shutdown in Seconds



Datenblatt CAN Repeater

Ansicht:

Schaltbild:



Pin	Beschreibung
1	CAN1-H
2	GND1
3	CAN2-L
4	VCC1 9-50V
5	VCC2 9-50V
6	CAN1-L
7	GND2
8	CAN2-H

Betriebsspannung	9-50V
Nennspannung	12V / 24V /48V
Ruhestrom	ca. 4 mA bei 12V
Maximale Baudrate	1 Mbit/s
Temperaturbereich	-40°C bis +85°C
Gewicht	ca. 100g
Anschluss	AMPSEAL 16 8-Polig
Schutzgrad	IP69
Abmessungen	55x73x45mm
Gehäuse	CVEP grün PC 20% glass
Abschlusswiderstände	Optional integriert
Vergussmasse	Polyurethan

Technische Änderungen Vorbehalten!

Create:	B.Brett	Date:	01.06.2021
Check:		Version:	0.1



Artikelbezeichnung CAN Repeater	Artikelnummer: CAN052021.ISO
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