About the product – CT2D

CT2D is a 2-channel multilevel power socket capable of dimming Incandescent lamps, dimmable LED lights. Both channels/loads operate independently. Two corresponding local switches and potentiometers are available to directly control these channels irrespective of inclusion state. Local switches can be configured to different modes (See Local Switch Modes section for more details).

CT2D Channel #1: TRIAC/FET based edge control dimming. This channel can be operated in two modes LEC/TEC respectively (see CT2D operating modes for more information).

CT2D Channel #2: PWM dimmer. This channel is capable of dimming LED lamps which has PWM dimming capabilities. This needs a PWM enabled LED driver (See wiring diagram for more information).

This product is certified by Z-Wave alliance that means it can be used with any Z-Wave certified device. Please see interoperability section for more information. CT2D can be used out of the box and needs no configuration. However, it supports different configuration parameters that extends its functionality. **CT2D is a Security (S0 & S2) & SmartStart enabled Z-Wave Plus Product**. **It uses S2 UNAUTHENTICATED SECURITY CLASS as its highest level of security**. **Hence a Security Enabled Z-Wave Controller must be used in order to avail security features of the product**. Please read this user manual carefully before installing this product.

Product specification

CT2D specifications and permissible maximum load ratings are given below. Verified at ambient temperature of Ta=25°C.

ELECTRICAL AND POWER LIMITS	
AC Power Input Standard Range	100VAC - 240VAC +/-10%, 50/60Hz
AC Power Input Limits and Robustness	300VAC_max, UPS & AC Generator (1)
Maximum Load – TEC/FET AC dim ch. Maximum Load – LEC/Triac AC dim ch. Maximum Load – TEC+LEC combined Max./Min. Load – PWM LED dim ch.	300W resistive load, 1.2A at 250VAC 300VA inductive or res. load, 1.2A/250V 300W not limited by CT2D
Minimum Load – TEC /LEC, 3-wire Minimum Load – TEC, 2-wire only	0W/3W 40W (or lower with added CTBP)
Maximum number of parallel PWM LED drivers	Given in MeanWell LCM driver specifications
GENERAL	
Power Consumption – 230VAC, 50Hz	0.7W
Operating Ambient Temperature	-10°C to +50°C (2)
Relative Humidity	8 - 80%
RF	865.22MHz for India
Typical Line of Sight Range	Up to 40 meters
Plastic Case Material	Fire retardant ABS
Internal Power Protection	Fusible Resistors, in Phase and Neutral
Internal Surge Voltage Protection	470V_pk, MOV
1) Tested on 300Vrms mains and several UPS and Generator powered installations. 2) Max. load specified at Tamb=25°C. At high Tamb load Pmax must be reduced.	

Interoperability

This product can be operated in any Z-Wave network with other Z-Wave certified devices from other manufacturers. All non-battery-operated nodes within the network will act as repeaters regardless of vendor to increase reliability of the network.

Inclusion into the network

The term "INCLUSION", "ADDING", "PARING" implies to the same meaning. Inclusion is a process by which a new device (or a device which previously got out of Z-Wave network by force reset or exclusion process) can join a new or existing Z-Wave network.

Basically, two steps are involved in inclusion process,

1) Set Gateway/Controller into the inclusion mode (See gateway user manual)
2) Set device into the learn mode

Learn mode can be invoked by one-time short press of NODE_INFO key.

User indication: Blinking of green LED shows successful inclusion.

Exclusion from the network

The term "EXCLUSION", "REMOVING", "UNPARING" implies to the same meaning. Exclusion is a process by which an already included device can be made to leave its existing Z-wave network. Upon exclusion all user configuration parameters are set to their default values.

Exclusion of device can be done in two steps,

1) Set Gateway/Controller into the exclusion mode (See gateway user manual)
2) Set device into the learn mode

Learn mode can be invoked by one-time press of NODE_INFO key.

User indication: Blinking of red LED shows successful exclusion.

Caution: **Exclusion will make device set to default TEC mode. Hence it is recommended to remove all the loads connected on TEC and LEC before performing exclusion and must ensure proper wiring before powering the device. Failing to do so will lead to damaging internal circuitry of the device.**

SmartStart

Z-Wave SmartStart is a feature that removes the need for initiating the end device to start inclusion. With SmartStart Inclusion is initiated automatically on power-ON and repeated at dynamic intervals for as long as the device is not included into a Z-Wave network. As the new device announces itself on power-ON, the protocol will provide notifications, and the gateway can initiate the inclusion process in the background, without the need for user interaction
or any interruption of normal operation. This improvement also removes the possibility of other devices being included, as the SmartStart inclusion process only includes authenticated devices. A gateway supporting SmartStart has a provision list for adding device DSKs. As this device supports S2_UNAUTHENTICATED class of security, DSK or QR code not required for manual inclusion of the device into the network, DSK or QR code is only needed when SmartStart feature is being used.

Do not remove the "Z-Wave DSK" label from the product and from the box. write the following details on back the card and here:

Force resetting the device

The device has a provision to RESET itself. Once the device resets, it will no longer be a part of Z-Wave network and all the user configuration parameters are set to their default values. Controller will be informed about this event via COMMAND_CLASS_DEVICE_RESET_LOCALLY command.

Device Reset can be invoked by press & hold NODE_INFO key for more than 10 seconds.

User indication: Blinking of red LED shows successful reset.

Note: RED led also flash after 5 seconds for mode change. Continue to hold NODE_INFO key for 10 seconds to reset the device. Please use this procedure only when the network primary controller is missing or otherwise inoperable.

Caution: **Reset will make device set to default TEC mode. Hence it is recommended to remove all the loads connected on TEC and LEC before performing reset and must ensure proper wiring before powering the device. Failing to do so will lead to damaging internal circuitry of the device.**

Device's basic functionality

Basic operations are available to the nodes who wants to control this device. CT2D implemented with the support of Basic Command Class and below is the mapping shown,

Basic Set = 255 maps to Multilevel Switch Set = 255
Basic Set = 0 maps to Multilevel Switch Set = 0
Basic Set = 1-99 maps to Multilevel Switch Set = 1-99
Basic Get/Report maps to Multilevel Switch Get/Report

Associations Group Mapping

No endpoint supports association group.

Associations

This device supports association command class with one group as a LIFELINE. This group is automatically configured to gateway during inclusion process. Lifeline link is established to ensure device updates the gateway about basic events such as DEVICE_RESET_LOCALLY_NOTIFICATION upon applying forced reset.

Group ID: 01
Group name: Lifeline
Max. device can be added to this group: 03 (one utilized by gateway, other two are available to the user)

Device Classification

Generic Device Class - GENERIC_TYPE_SWITCH_MULTILEVEL
Specific Device Class - SPECIFIC_TYPE_POWER_SWITCH_MULTILEVEL

Endpoint Classification

- All Endpoints are identical
Generic Device Class - GENERIC_TYPE_SWITCH_MULTILEVEL
Specific Device Class - SPECIFIC_TYPE_POWER_SWITCH_MULTILEVEL

Over The Air (OTA)

CT2D supports firmware upgrade Over-The-Air. Whenever OEM releases a new firmware, this feature can be used to upgrade the existing device to the latest available firmware. Controller must support this feature to upgrade device firmware over the air. This functionality is recommended to be performed by the installers only. Firmware upgrade steps are described in installer's manual.

Command Classes

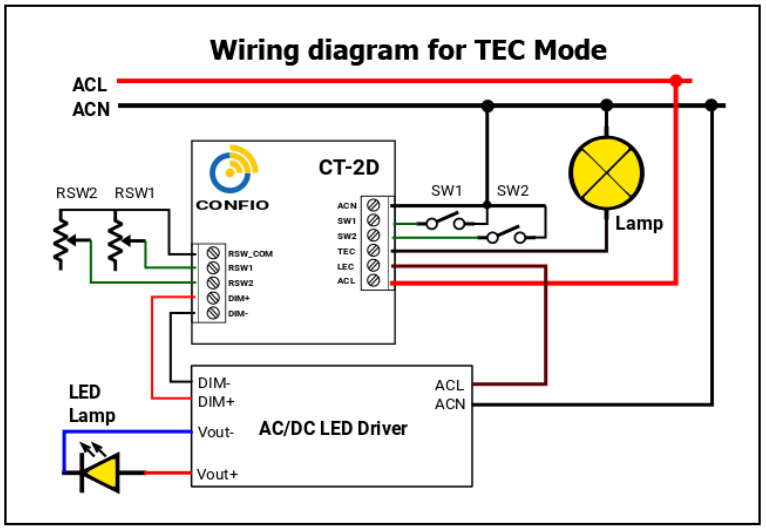
Non-Secure
COMMAND_CLASS_ZWAVEPLUS_INFO
COMMAND_CLASS_SUPERVISION
COMMAND_CLASS_TRANSPORT_SERVICE
COMMAND_CLASS_SECURITY
COMMAND_CLASS_SECURITY_2
Secure
COMMAND_CLASS_SWITCH_MULTILEVEL
COMMAND_CLASS_ASSOCIATION_V2
COMMAND_CLASS_MULTI_CHANNEL_ASSOCIATION_V3
COMMAND_CLASS_ASSOCIATION_GRP_INFO
COMMAND_CLASS_VERSION_V3
COMMAND_CLASS_MANUFACTURER_SPECIFIC_V2
COMMAND_CLASS_DEVICE_RESET_LOCALLY
COMMAND_CLASS_POWERLEVEL
COMMAND_CLASS_MULTI_CHANNEL_V4
COMMAND_CLASS_CONFIGURATION
COMMAND_CLASS_FIRMWARE_UPDATE_MD_V4

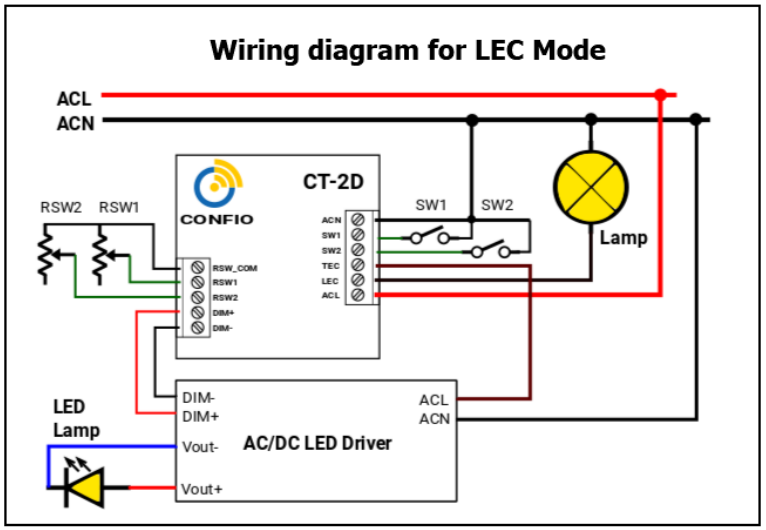
Multichannel implementation

This device implements Z-Wave multichannel specifications. This specification allows to have more that one functional channel/endpoint within a device. CT2D has implemented with two fixed channels/endpoints. All the endpoints are identical. i.e. uses same device type and supported command classed. This product does not support dynamic endpoints and controlled command classes.

Generic Device Class used by all endpoints (1/2) - GENERIC_TYPE_SWITCH_MULTILEVEL
Specific Device Class used by all endpoints (1/2) - SPECIFIC_TYPE_POWER_SWITCH_MULTILEVEL
Supported command classes by all endpoints (1/2),
Non-Secure
- COMMAND_CLASS_ZWAVEPLUS_INFO
- COMMAND_CLASS_SUPERVISION
- COMMAND_CLASS_SECURITY
- COMMAND_CLASS_SECURITY_2
Secure
- COMMAND_CLASS_SWITCH_MULTILEVEL
- COMMAND_CLASS_ASSOCIATION_V2
- COMMAND_CLASS_ASSOCIATION_GRP_INFO
- COMMAND_CLASS_MULTI_CHANNEL_ASSOCIATION_V3

CT2D Wiring diagram





CT2D operating modes

CT2D channel #1 operates in two modes Trailing Edge Control (TEC) and Leading Edge Control (LEC). By default, TEC mode will be selected. Modes can be interchanged with the help of Node information switch (NODE_INFO pin hole switch). Press & Hold NODE_INFO switch for 5 seconds will interchange between TEC/LEC.

Note: RED LED flashes once after 5 seconds and NODE_INFO switch must be release for CT2D to change its mode. If NODE_INFO switch is kept hold for more than 10 seconds, it leads to force reset of the device.

Caution: **It is recommended to remove all the loads connected on TEC and LEC before performing mode change and must ensure proper wiring before powering the device (See wiring diagrams section for this). Failing to do so will lead to damaging internal circuitry of the device. Current mode of the device will be indicated by LEDs (See LED indication section for more information)**

Product Configuration settings

Configuration Parameters

The product is factory set to default values so that it can operate normally without the need of any additional parameter setting. Below is the description of parameters supported by this product to further enhance its functionality.

Parameter 01: Power ON status of TEC/LEC load
Size: 1 Byte | Range: 0 to 1 (0: Switch SW1, 1: Memory) | Default: 1 Memory
Description: This parameter decides the power ON state (when module is powered ON) of Load connected on TEC or LEC channel. This parameter provides two options either power ON to memory (previous state as it was before power OFF) or present switch position.

Parameter 02: Power ON status of PWM LED load
Size: 1 Byte | Range: 0 to 1 (0: Switch SW2, 1: Memory) | Default: 1 Memory
Description: This parameter decides the power ON state (when module is powered ON) of Load connected on DIM+/- channel. This parameter provides two options either power ON to memory (previous state as it was before power OFF) or present switch position.

Parameter 03: Dimming preference for TEC/LEC load
Size: 1 Byte | Range: 0 to 1 (0: Instant, 1: Smooth) | Default: 1 Smooth
Description: this parameter switch between the dimming preference Smooth dimming or Instant dimming for the load connected on TEC/LEC channel

Parameter 04: Dimming preference for PWM LED load
Size: 1 Byte | Range: 0 to 1 (0: Instant, 1: Smooth) | Default: 1 Smooth
Description: this parameter switch between the dimming preference Smooth dimming or Instant dimming for the load connected on DIM+/- channel

Parameter 05: Dimming speed for TEC/LEC load
Size: 1 Byte | Range: 1 to 5 (1: Very fast, 2: Fast, 3: Medium, 4: Slow, 5: Very Slow) | Default: 3: Medium
Description: this parameter sets the dimming speed of load connected on TEC/LEC channel.

Parameter 06: Dimming speed for PWM LED load
Size: 1 Byte | Range: 1 to 5 (1: Very fast, 2: Fast, 3: Medium, 4: Slow, 5: Very Slow) | Default: 3: Medium
Description: this parameter sets the dimming speed of load connected on PWM LED channel.

Parameter 07: Potentiometer Status (RSW1 & RSW2)
Size: 1 Byte | Range: 0 to 3 (0: RSW1 & RSW2 Disable, 1: RSW1 Enable, 2: RSW2 Enable, 3: RSW1 & RSW2 Enable)
Description: This parameter enable/disable potentiometer service for both TEC/LEC and PWM LED loads

Parameter 08: SW1 Functionality
Size: 1 Byte | Range: 1 to 2 (0: Position switch ON-to-ON and OFF-to-OFF, 1: Toggle switch, 2: Bell switch) | Default: 2 Bell switch
Description: this parameter switch between the switch functionality for SW1 i.e. Position switch OR toggle switch OR Bell switch dimming

Parameter 09: SW2 Functionality
Size: 1 Byte | Range: 1 to 2 (0: Position switch ON-to-ON and OFF-to-OFF, 1: Toggle switch, 2: Bell switch) | Default: 2 Bell switch
Description: this parameter switch between the switch functionality for SW2 i.e. Position switch OR toggle switch OR Bell switch dimming

Parameter 10: On board LED enable/disable
Size: 1 Byte | Range: 0 to 1 (0: Disable, 1: Enable) | Default: 1: Enable
Description: this parameter enables or disables on board LEDs.

NODE_INFO switch

A pin hole switch can be found at the back of the device. Multiple functions associated with this key are described below,

	Action	Description
Short press	Press & Release after 500ms (approx)	Transmits node information frame
Long press	Press & Release after 5+ seconds	Interchange device modes TEC/LEC
Very Long press	Press & Release after 10+ seconds	Force reset the device

Local Switch (SW1 & SW2) Modes

Local switches correspond to channel 1 & 2 can be operated in three different modes, and these modes can be configured via configuration parameters (See Product Configuration Settings section for more information).

1) Bell switch mode: this is default mode in which a bell switch is connected at SW1 & SW2.	
Momentary press & release	Toggles the corresponding load
Press & Hold	Dimming level set. Load dim-up & dim-down continues

2) Toggle switch mode: In this mode normal toggle switch is connected at SW1 & SW2.which toggles the corresponding load irrespective of switch position	
ON position	Toggles the corresponding load
OFF position	Toggles the corresponding load
Press & Hold	No Effect

3) Position switch mode: In this mode normal toggle switch is connected at SW1 & SW2.which toggles the corresponding load with respective to its position	
ON position	Turns ON the corresponding load
OFF position	Turns OFF the corresponding load
Press & Hold	No Effect

LED Indications

The device with the help of on-board LEDs reflects the following states,

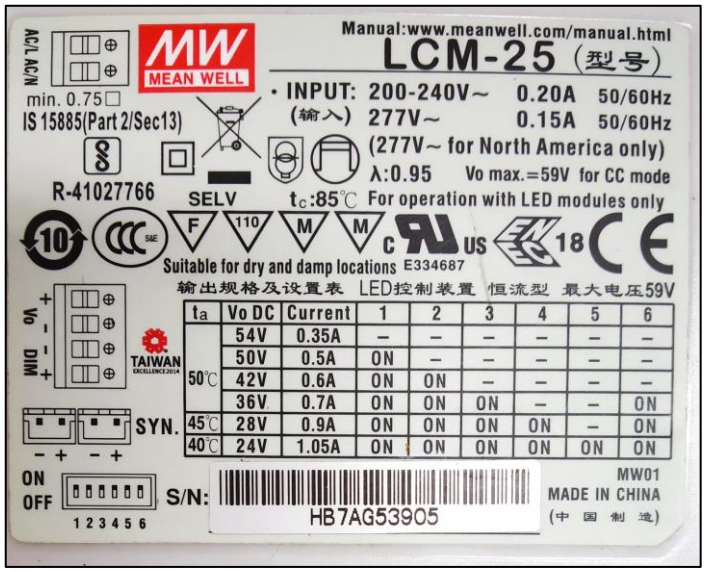
Action	Meaning
Red led continues blinks (700ms duration)	Node is not included into the network
Green led continues blinks (700ms duration)	Node is included into the network
Fast toggle both red & green led	OTA is in progress
Red & Green flash once at device power ON	Device in TEC mode
Red & Green flash twice at device power ON	Device in LEC mode
Red led flash once after holding NODE_INFO switch for 5+ seconds	Mode interchange TEC/LEC
Red led flash once after holding NODE_INFO switch for 10+ seconds	Force reset of device

Note: A configuration parameter is included to disable these LEDs and to keep them OFF (See Product Configuration Settings for more information).

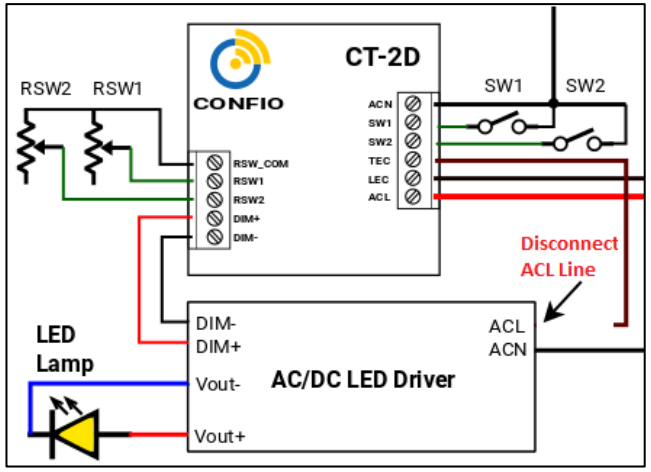
Back Panel Controls & Indicators

Recommendations

1) PWM LED channel of CT2D has been tested using Meanwell LED driver (LCM-25). Hence we recommend LCM-25 or similar specification for LED driver shown below,



We recommend the following procedure for Mode change, Exclusion, and Force reset.



1) Power OFF the device
2) Disconnect ACL line of LED driver
3) Power ON the device
4) Perform Mode change or Exclusion, or Force reset operation
5) Check device mode for TEC/LEC (See LED Indications)
6) Power OFF the device
7) Ensure correct wiring for TEC/LEC (See CT2D wiring diagram), here reconnect ACL line back
8) Power ON the device

Device Name: _____

Location in home: _____

Purchase date: _____

24 Months GUARANTEE

- The Manufacturer is responsible for equipment malfunction resulting from physical defects (manufacturing or material) of the Device for 24 months from the date of purchase.
- During the Guarantee period, the Manufacturer shall remove any defects, free of charge, by replacing with a new or regenerated one, which shall be free of any defects and its condition shall not be worse than the original device owned by the Customer.
- Costs of delivering the faulty device shall be borne by the Customer.
- The Manufacturer shall not be liable for damages to property caused by defective device. The Manufacturer shall not be liable for indirect, incidental, special, consequential or punitive damages, or for any damages, including, inter alia, loss of profits, savings, data, loss of benefits, claims by third parties and any property damage or personal injuries arising from or related to the use of the Device.

The guarantee shall not cover:

- Mechanical damages caused by impact, falling or dropping the device or their object, improper use or not observing the operating manual);
- Damages resulting from external causes, e.g.: flood, storm, fire, lightning, natural disasters, earthquakes, war, civil disturbance, force majeure, unforeseen accidents, theft, water damage, liquid leakage, battery spill, weather conditions, sunlight, sand, moisture, high or low temperature, air pollution;
- Damages resulting from: surges in the power and/or telecommunication network, improper connection to the grid in a manner inconsistent with the operating manual, or from connecting other devices not recommended by the Manufacturer.
- Damages resulting from the use of spurious spare parts or accessories improper for given model, repairing and introducing alterations by unauthorized persons;
- Defects caused by operating faulty Device or accessories.

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