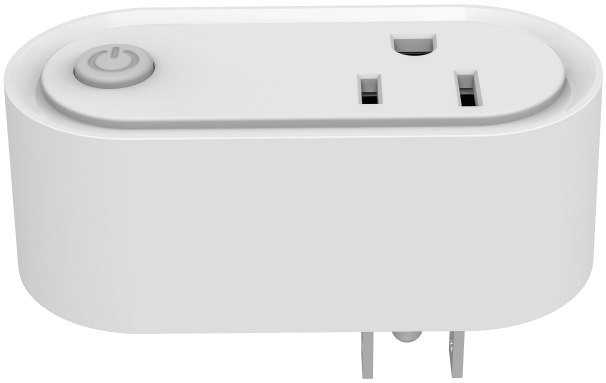
SmartPlug 1Led User Manual

(NAS-WR12Z1U)



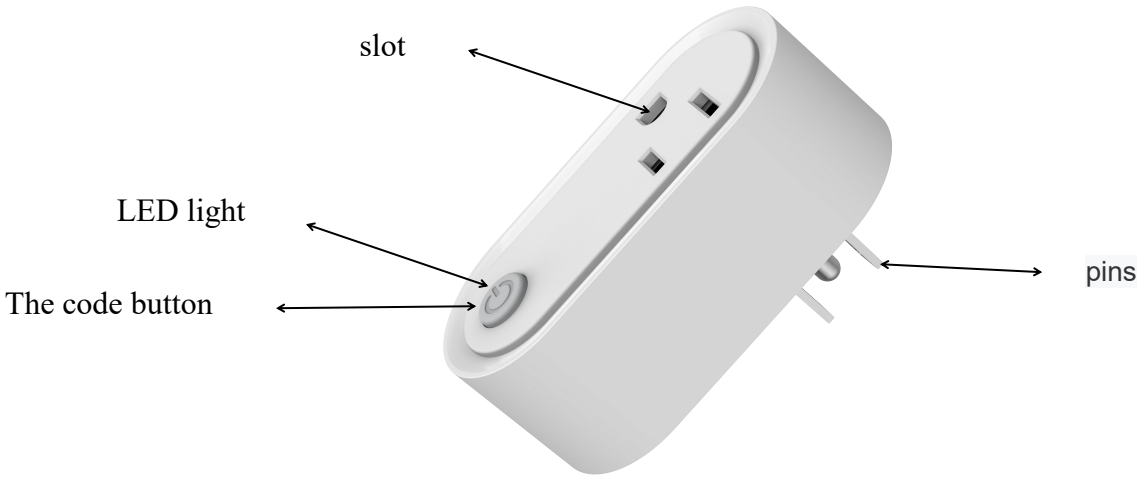
Version	Written By	Date	Change List
1.0	Yongqi	20201022	Initial
1.1	Yongqi	20210116	Fixed Some Error Descriptions.
1.2	Yongqi	20210304	Add Note for OTA Led State

SmartPlug is a universal, Z-Wave™ Plus compatible and relay switch in the form of a socket adapter. The device may be used to operate any device up to 3000w power output. The device features voltage, current, active power and power consumption measuring.

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

This device must be used in conjunction with a Security Enabled Z-Wave Controller in order to fully utilize all implemented functions

Product Configuration



Z-Wave™ Network Inclusion/Exclusion/Reset

There is one button on the side of the device, it can be executed inclusion, exclusion and reset from Z-Wave™ network.

Add[1]	1、 Power up the device. 2、 Set Z-Wave™ Controller into inclusion mode 3、 Press and hold the button for 5s until Blue led lights is on, then release the button before led turn off.	Blue led will blink with 1s interval until inclusion successful.
Remove	1、 Power up the device. 2、 Set Z-Wave™ Controller into exclusion mode 3、 Press and hold the button for 5s until Blue led lights is on, then release the button before led turn off.	Blue led will blink with 0.5s interval until exclusion successful.
Factory Reset[2]	1、 Power up the device. 2、 Press and hold the button for 10s until leds light on, then release the button before led turn off.	
Product Test Mode	1、 Press and hold the button. 2、 Power on the device, device will enter factory product test mode with Blue light flash.	
Send NIF[3]	Press and hold the button for 5s until Blue led lights is on, then release the button before led turn off.	

Notice 1: When device enters into inclusion mode, the device all functionality will be useless. The inclusion mode will be timeout after 30s, user can implement step 3 to terminate inclusion mode.

Notice 2: Factory Reset will clear the device all Z-Wave™ Network data (include home id, node id, etc…) saved in memory, and restore all configuration parameters to factory default. Please use this procedure only when the network primary controller is missing or otherwise inoperable.

Notice 3: NIF – Node Information Frame

Association

The device supports 2 association groups, and each group supports max 5 associated nodes.
Group 1, Lifeline – All nodes which associated in group 1(lifeline group) will receive the messages that send by device through lifeline.

Group 2, all nodes which associated in group 2 will be controlled by device through BASIC_SET command. When device detect a over-current event, the device will trigger a OCP Alarm and send a notification report to controller, the meantime device also send a BASIC_SET = 0xFF to the nodes that associated in group 2. And BASIC_SET = 0x00 will be sent after OCP Alarm Event is cleared.

The Command Class supported by each association group is shown in the table below:

Group	Command Class	Command
1 (Lifeline)	COMMAND_CLASS _SWITCH_BINARY	SWITCH_BINARY_REPORT
	COMMAND_CLASS_NOTIFICATION	NOTIFICATION_REPORT
	COMMAND_CLASS_METER	METER_REPORT
	COMMAND_CLASS_INDICATOR	INDICATOR_REPORT
	COMMAND_CLASS_DEVICE_RESET_LOCALLY	DEVICE_RESET_LOCALLY_NOTIFICATION
2 (Control)	COMMAND_CLASS_BASIC	BASIC_SET

Device Functionality and Z-Wave™ Message Report

The SmartPlug has four main functions: Switch On/Off, electrical parameters measurement over-current protection, and timing.

Switch On/Off

There are three ways of controlling the outlet switch:
1) Press the button shortly
2) Operated the device Via Z-Wave™ Controller or Others Devices that associated it by Command Class list as below table.

SmartPlug State	Command Class	Command	Value
ON	COMMAND_CLASS_SWITCH_BINARY	SWITCH_BINARY_SET	0xFF
	COMMAND_CLASS_BASIC	BASIC_SET	0xFF
OFF	COMMAND_CLASS_SWITCH_BINARY	SWITCH_BINARY_SET	0x00
	COMMAND_CLASS_BASIC	BASIC_SET	0x00

Electrical Parameters Measuring

The device provides line voltage (V), loaded current (A), active power (W), and accumulated energy consumed (kWh) measurement; the significant digits of the measured result should be two digits

after the decimal point;
These electrical parameters result will be reported to the Z-Wave™ controller regularly through the Meter Report of Meter Command Class, the interval of which can be configured by the user by means shown in "Configuration: No.11"
The device also provides the function of reporting the measurement results to the Z-Wave™ controller when the load current changes and the user can set the changed quantity of the load current freely by means shown in “Configuration: No.10"
The electric quantity detection result is reported to Command Class

Command Class	Command	Scale	Precision
COMMAND_CLASS_METER	METER_REPORT	kWh	0.01kWh
		Watt	0.01W
		Volt	0.01V
		Ampere	0.01A

The max cumulative energy is 21474836.47kWh, if it is over this value, it will be back to 0kWh automatically.

Reset Cumulative Energy

There have two ways to reset cumulative energy:
1 Z-Wave gateway send METER_RESET command to SmartPlug to reset the cumulative energy value.
2 Execute the factory reset operation to reset the cumulative energy value.

The cumulative energy will not be reset if SmartPlug remove from Z-Wave Network by exclusion operation.

Over-current Protection

The outlet can provide a maximum load current of 16A, and when the load current exceeds 16A, the load power supply will be automatically cut off. And it will inform the host of the overload of the outlet through NOTIFICATION_REPORT of the Notification Command Class, and meanwhile, the LED light of the outlet will flash with an interval of one second; Users can remove the overload alarm by pressing the button or sending SWITCH_BINARY_SET=0xFF, and for safety's sake, before that, users should remove the load from the outlet first.

Users can control the maximum output current of the outlet by setting the maximum output current, the setting method of which is shown in "Configuration: No. 8".

Overload protection communication Command Class

Command Class	COMMAND_CLASS_NOTIFICATION
Command	NOTIFICATION_REPORT
Type	NOTIFICATION_TYPE_POWER_MANAGEMENT (0x08)
Event	NOTIFICATION_EVENT_POWER_MANAGEMENT_OVERLOAD_DETECTED (0x08)

Timer

The device also provides the function of timing, and users can turn off the outlet by opening this function and setting the time cycle, the setting method of which is shown in "Configuration: No.4 and Configuration No 11".

Command Class Configuration

The device supports the controller to configure parameters of the device through Configuration Command Class, and the device has 11 parameters available for users to set according to their different needs:

1) Relay On/Off state Saved Disable
   Sets this configuration to '1', the device will save the current relay state, and after the device is powered down and restarted, it will automatically recover to the relay state before power-down.Set to '0',device won't remember the previous state,default to be ON.

Parameter Number	Size (Byte)	Available Settings	Default value
1	1	0, 1	1

2) Button Switch Function Disable
   Setting this configuration as '0' will be disabling to turn on and off the relay by pressed button.

Parameter Number	Size (Byte)	Available Settings	Default value
2	1	0, 1	1

3) LED indication Disable
   Setting this configuration as '0' will disable led light on when turn on the device. This setting is invalid during device power-up.

Parameter Number	Size (Byte)	Available Settings	Default value
3	1	0, 1	1

4) Countdown Timer Enable
   Setting this configuration as '1' will start the timing function of the plug, and the length of time is determined by the setting of "Configuration: No.7".
   This function can only provide the time to turn off device function when the device is open.

Parameter Number	Size (Byte)	Available Settings	Default value
4	1	0, 1	0

5) Meter Enable
   This configuration sets the meter Monitoring function enabled or disabled.
   '0' – Disable meter measuring Function.
   '1' – Enable meter measuring Function.

Note: If this configuration is set to '0', all the functions of "Configuration No. 6, 8, 9, 10, 11" are invalid. And No Current, Voltage, Active Power and Accumulated Power monitored and reported any more.

Parameter Number	Size (Byte)	Available Settings	Default value
5	1	0, 1	1

6) Meter Report Enable

This configuration sets the meter report function enabled or disabled.

'0' – Disable meter report function.

'1' – Enable meter report function with time interval defined by "Configuration No. 11".

When device is detected an OCP event or the relay turned on or turned off, device still will report all meter values once if this value be set to '0'.

Parameter Number	Size (Byte)	Available Settings	Default value
6	1	0, 1	1

7) Countdown Time Setting

This configuration sets the time length for turning off the device. This configuration is only valid when "Configuration No.4" is set to '1'. Unit: minute.

Parameter Number	Size (Byte)	Available Settings	Default value (min)
5	2	0 ~ 30000	120

8) Maximum output current setting

This configuration sets the maximum output current that the device can provide. When the current consumed by the load is greater than the setting value, the device will automatically cut off the power of the load and send out alarm information, and the led will light on 1.5s with 2s interval. Unit: 0.01A (Ampere).

This value must be great than the alarm value defined by Configuration No. 9.

Parameter Number	Size (Byte)	Available Settings	Default value
8	2	0 ~ 1600	1600

9) Output Current Alarm

This configuration sets the alarm value of the load current (volatility). When the load current is large than this value, the led will light on 0.5s with 2s interval. Unit: 0.01A (Ampere).

This value must be less than the max. output value defined by Configuration No. 8.

Parameter Number	Size (Byte)	Available Settings	Default value
9	2	0 ~ 1550	1500

10) Current Change Ratio

This configuration sets the changed value of the load current (volatility). When the differential between two measurements of current consumed by the load exceeds the value set by this configuration, the device will report the last measured results automatically to the controller.

The changed value = [Value] × 0.01A.

Parameter Number	Size (Byte)	Available Settings	Default value
10	2	0 ~ 1000	50

11) Interval of meter reporting setting
This configuration sets the interval of reporting electric quantity detection result. This parameter is only valid when Parameter 6 is set as '1'. Unit: Second.

Parameter Number	Size (Byte)	Available Settings	Default value
11	2	0 ~ 30000	300

- To Simulate Over Current Protection Function, First User Must Turn on SmartPlug And Then Write 1 Byte Data 0xFF(255) to Parameter Number 99. SmartPlug will Be Turned Off And Report Alarm Messages to Hubs. Meantime Blue Led Will Blink with 1s Interval. This must set "Configuration No. 5" to '1'.

Command Class Basic

The Basic Command Class is mapped to Switch Binary Command Class as Follow:
1) Basic Set = 255 maps to Binary Switch Set = 255
2) Basic Set = 0 maps to Binary Switch Set = 0
3) Basic Set = 1 ~ 99 maps to Binary Switch Set = 255
4) Basic Get/Report maps to Binary Switch Get/Report

SmartStart

SmartStart enabled products can be added into a Z-Wave network by scanning the Z-Wave QR Code present on the product with a controller providing SmartStart inclusion. No further action is required and the SmartStart product will be added automatically within 10 minutes of being switched on in the network vicinity.

This device supports SmartStart function. QR code is printed on the label that pasted on on surface of product and the outside of packing box. And the full DSK code is printed can be found on the packing box.

The device will enter SmartStart if the device is not included in network after power up. And then
2nd SmartStart time delay approximately 16s
3rd SmartStart time delay approximately 32s
4th SmartStart time delay approximately 64s
5th SmartStart time delay approximately 128s
6th SmartStart time delay approximately 256s
7th SmartStart time delay approximately 512s

Afterwards, the Smartstart mode will be auto running with 512 second interval until device is included successfully.

Security Network

The device supports the security function with and S2 + SmartStart encrypted communication. The device will auto switch to the security mode when the device included with a security controller. In the security mode, the follow commands must use security or security_2 command class wrapped to communicate, otherwise the device will not response any commands.

Security Keys

This device supports security levels are listed in below table:

Security Levels	Support (Yes/No)
SECURITY_KEY_S0	Yes
SECURITY_KEY_S2_UNAUTHENTICATED	Yes
SECURITY_KEY_S2_AUTHENTICATED	Yes
SECURITY_KEY_S2_ACCESS	No

All Supports Command Class in Each NIF Lists

Command Class	Version	Not Included	Non-secure Included	S0 Included		S2 Included	
				Non-Secure	Secure	Non-Secure	Secure
COMMAND_CLASS_ZWAVEPLUS_INFO	2	●	●	●		●	
COMMAND_CLASS_SECURITY	1	●	●	●		●	
COMMAND_CLASS_SECURITY_2	1	●	●	●		●	
COMMAND_CLASS_TRANSPORT_SERVICE	2	●	●	●		●	
COMMAND_CLASS_VERSION	3	●	●		●		●
COMMAND_CLASS_POWERLEVEL	1	●	●		●		●
COMMAND_CLASS_ASSOCIATION	2	●	●		●		●
COMMAND_CLASS_MULTI_CHANNEL_ASSOCIATION	3	●	●		●		●
COMMAND_CLASS_ASSOCIATION_GRP_INFO	1	●	●		●		●
COMMAND_CLASS_MANUFACTURER_SPECIFIC	2	●	●	●			●
COMMAND_CLASS_DEVICE_RESET_LOCALLY	1	●	●		●		●
COMMAND_CLASS_SWITCH_BINARY	2	●	●		●		●
COMMAND_CLASS_NOTIFICATION	8	●	●		●		●
COMMAND_CLASS_METER	5	●	●		●		●
COMMAND_CLASS_INDICATOR	3	●	●		●		●
COMMAND_CLASS_CONFIGURATION	4	●	●		●		●

COMMAND_CLASS_SUPERVISION	1	●	●	●		●	
COMMAND_CLASS_FIRMWARE_UPDATE_MD	5	●	●		●		●

Notice 1: When device is included with S0 level, COMMAND_CLASS_MANUFACTURER_SPECIFIC is supported non-securely. And when device is included with S2 level, COMMAND_CLASS_MANUFACTURER_SPECIFIC is supported securely only.

Notice 2: "●" – Indicates the corresponding command class is supported in NIF, Blank means the command class is not supported.

Led Color Indicator

Led Color	Action	Description
Blue	Blink with 1s Interval When Power On	Not Add in Z-Wave Network
	Light On 1s When Power On	Add in Z-Wave in Network Already
	Blink With 2s Interval	Over Current Detected, SmartPlug Turn Off.
	Light On 2s	Press And Hold Button 10s, Off at 12th Second
		Press And Hold Button 5s, Off at 7th Second
	Light On Always	SmartPlug Turn On
	Blink with 500ms Interval	Remove from Z-Wave Network/Send NIF
	Blink with 1s Interval	Add to Z-Wave Network
	Blink with 300ms Interval [1]	OTA is Running

Note 1: The LED State is Not Changed when Led Is Busy (On or Blink, Such as Relay on, Over Current Detected). If Led Is Idle, the OTA Led State Will Be Running, And then the LED state is not changed until OTA is finished.

Specifications

Power Supply	110 – 230V AC, ±10%, 50/60Hz
Power Consumption	Up to 0.8W
Operational Temperature	0 - 70℃
Communication frequency	868.40MHz, 869.85MHz (EU) 908.40MHz, 916.00MHz(US)
Range	Up to 45m indoors (depending on the building structure), and 80m for outdoor open fields. Up to 80m outdoors.

FCC STATEMENT :
This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
This device may not cause harmful interference, and
This device must accept any interference received, including interference that may cause undesired operation.
Warning: Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

Reorient or relocate the receiving antenna.

Increase the separation between the equipment and receiver.

Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

Consult the dealer or an experienced radio/TV technician for help.

FCC Radiation Exposure Statement:
This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.