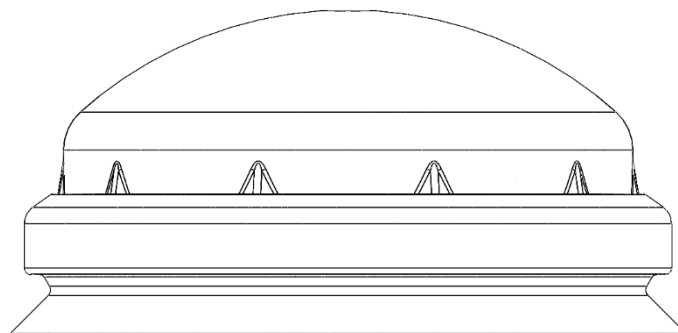


Smart Lighting Node Cellular Zhaga version

NDLM014 Series

Datasheet





NOTE: This document is a “**living document**”, which means that it is constantly maintained and updated by the team at Paradox Engineering.

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<http://www.pdxeng.ch>

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1. List of Acronyms

Acronym	Description
AES	Advanced Encryption Standard
CMS	Central Management System
DALI	Digital Addressable Lighting Interface
DiiA	Digital Illumination Interface Alliance
eSIM	Embedded SIM
GLONASS	Global Navigation Satellite System
GNSS	Global Navigation Satellite System
GFSK	Gaussian Frequency Shift Key
GPS	Global Positioning System
LWM2M	Lightweight Machine to Machine
MCU	Microcontroller Unit
MM	MinebeaMitsumi
MTBF	Mean Time Between Failures
N/A	Not Applicable
NFC	Near Field Communication
OTA	Over-the-Air
PBT	Polybutylene terephthalate
PCB	Printed Circuit Board
PE	Paradox Engineering
RMS	Root Mean Square
RTC	Real Time Clock
SIM	Subscriber Identity Module
UV	Ultra Violet

2. Product Description

The Smart Lighting Node Cellular Zhaga version (hereafter referred to as the “**Cellular Zhaga**”) is a plug-and-play Lighting Controller Unit (LCU) compliant with Zhaga Book 18 standard. Designed for rapid deployment, it connects directly to the Cloud over public mobile networks using its embedded CAT-M1/NB-IoT radio interface. No gateway or complex setup is required.



FIGURE 2: THE CELLULAR ZHAGA

The Cellular Zhaga is suited for LED-based streetlights with DALI-2 or D4i LED drivers. As a plug-and-play luminaire extension module, it can be quickly and easily installed on any Zhaga Book 18-compliant fixture, transforming standard luminaires into intelligent IoT devices for Smart City applications in seconds.

1. Fast Deployment & Plug-and-Play Installation

- Direct installation into any streetlight equipped with a Zhaga Book 18 connector: no tools, rewiring, or on-site programming required
- Automatic detection of connected DALI-2/D4i LED drivers and sensors
- Immediate connection to the Smart CMS via public cellular networks: no gateways needed
- Ideal for city-wide rollouts and upgrades with minimal installation time and labor cost

2. Reduce Energy Consumption

- Fully autonomous and remotely configurable dimming and on/off schedules for each connected LED driver
- Supports schedules based on astronomical clock (dusk/dawn), fixed time, and sensor inputs (motion, light level)
- Day/month/year schedule customization with automatic time zone and daylight saving adjustments

3. Lower Operational Costs

- Automatic localization via GPS and GLONASS
- Access to luminaire asset information and energy data per IEC 62386 Parts 251 and 252
- Luminaire health and diagnostics monitoring (IEC 62386 Part 253)
- Event and alarm logging, including local storage for up to 64 events and 16 measurements
- Tilt & shock sensor for pole monitoring
- Last gasp notifications for power outages
- NFC for local setup and troubleshooting
- OTA firmware upgrades to extend device functionality remotely

4. Secure, Scalable Smart City Integration

- AES 128-bit link-layer encryption for secure data transmission
- Gateway-less architecture enables simplified and scalable deployments
- Native compliance with Lightweight M2M (LwM2M) v1.1 standard for device management and interoperability

3. Technical Specifications

Table 1 – Ratings

Item	Unit	Description
Voltage	VDC	24 (Max range: 21.6 - 26.4)
Current	mA	14 (Max range: 8 - 76)
Appliance class	-	Class II
Power consumption	W	Typical: 0.336 (Max: < 2)

Table 2 – LTE Interface

Country	Supported FDD Bands	LTE Channel Bandwidth (MHz)	LTE Category
EU	B1 (2100) B3 (1800) B8 (900)	1.4 (Cat M1)	Cat M1 (588 kbps Downlink, 1119 kbps Uplink)
	B20 (800) B28 (700)	0.2 (Cat NB2)	Cat NB2 (127 kbps Downlink, 158 kbps Uplink)



NOTE: Contact Paradox Engineering's customer support for the list of international roaming partners and the FDD bands used

Table 3– Bluetooth Capabilities (*)

Item	Description
Standard	BLE 5.4
Max RF conducted output power	10.32 dBm
Bluetooth Profiles	GAP, ATT/GATT, SM, L2CAP
Link layer	AES 128-bit encryption

(*) Future functionality

Smart Lighting Node Cellular Zhaga version

Table 4 – NFC Interface

Item	Unit	Description
Standard	-	ISO/IEC 15693
Forum Type	-	5
Frequency	MHz	13.56
Reader/Writer	-	Short Range / Long Range

Table 5 – GPS / GNSS Capabilities

Item	Unit	Description
Integrated receiver	-	Support for GPS and GLONASS operation
Position accuracy	m	< 2m (CEP-50)
Time to first fix	sec	Cold starts: < 30s Warm starts: < 29s Hot starts: < 3s

Table 6 – Input Controls / Sensors

Item	Description
Digital input (LSI)	N/A
Temperature sensor	Embedded – Temperature range (-40 to +85) °C with 2°C tolerance
Light sensor	Embedded - Ambient Luminance detection, LUX level range 0-83000, with automatic adjustable LUX resolution
Tilt/Shock sensor	Embedded - Impacts detection, tilt angle changes
DALI 2 sensor	N/A

Table 7 – Output Controls

Item	Description
Dimming control	Up to 4 DALI-2/D4i Control Gear
Power Metering Capability	DiiA Specification Parts 252/253 Compliance



Table 8 – Mechanical and Environmental Specifications

Item	Description
Housing Top Part	Polycarbonate, UV stabilized f1 rated, Smoke Gray Low
Rain skirt	Silicon rubber
Housing Bottom Part	PBT
Housing Protection	IP66, IK09
Diameter	79.7 mm (without Rain skirt)
Height	38.4 mm (without Rain skirt)
Weight	72.5g (without Rain skirt)
Operating temperature range	-40°C to 70°C
Storage temperature range	-40°C to 85°C
Tc point	72 °C
Humidity	0-93% +/-3% without condensing
Antennas	GPS/GNSS PCB antenna LTE chip antenna NFC PCB antenna Bluetooth chip antenna
Connector	ZHAGA Book 18
MTBF	>500,000 hours at operating temperature up to 25° according to MIL-HDBK-217F Ground Fixed environment

Table 9 – Other Information

Item	Description
RTC offline time retention	72h at 25 °C ambient temperature
RTC offline accuracy	< 5s per day at 25 °C ambient temperature
Security	DTLS secured connection

Smart Lighting Node Cellular Zhaga version

3.1 DEVICE DIMENSIONS

Mechanical dimensions of the Cellular Zhaga are pictured in the figure below.

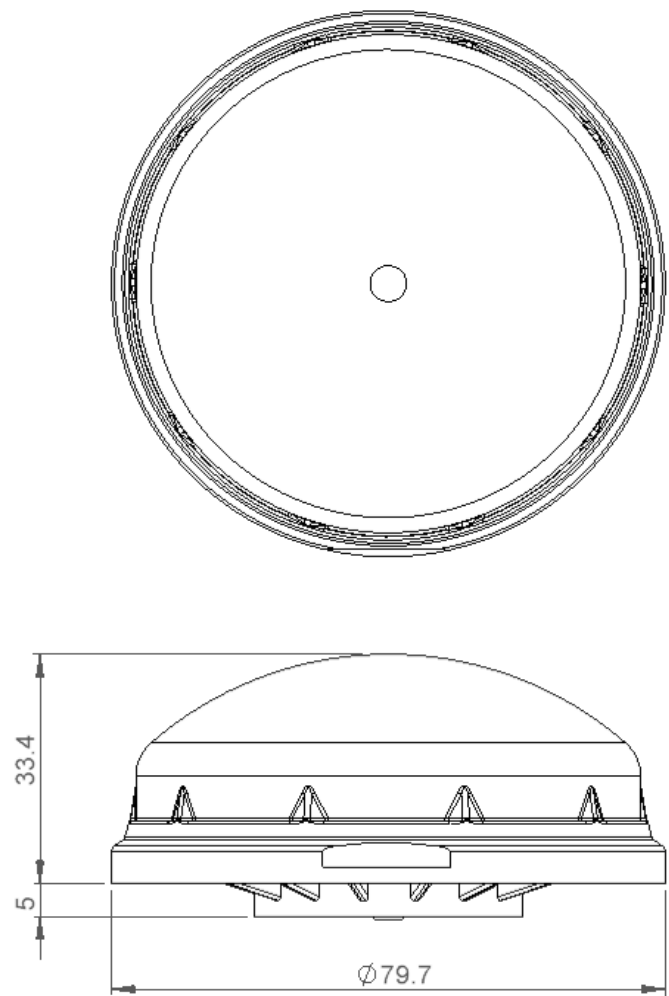


FIGURE 3: DIMENSIONS OF THE CELLULAR ZHAGA IN MM



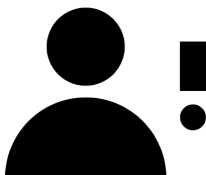
Smart Lighting Node Cellular Zhaga version

3.2 ZHAGA CONNECTOR PINOUT

The connector of the Cellular Zhaga is pictured in the figure below. On the left side is the bottom view of the Cellular Zhaga connector itself. On the right side is the top view of a standard luminaire Zhaga socket.



FIGURE 4: CELLULAR ZHAGA CONNECTOR (LEFT) AND LUMINAIRE ZHAGA SOCKET (RIGHT)



NOTE: It is important to be sure that the Zhaga socket mounted on the luminaire respects the Zhaga Book 18 specification and the pinout reported in the table below.

Table 10 – Zhaga Connector	
Pole	Assignment
1	+24V AUX power supply
2	Negative for the [DALI] bus Ground for +24V AUX power supply (contact 1)
3	Positive for the [DALI] bus
4	Not connected



Smart Lighting Node Cellular Zhaga version

3.3 RAIN SKIRT

The Cellular Zhaga is equipped with a rain skirt to enhance protection against harsh outdoor conditions such as rain, dust, and insects.

A representative illustration of the rain skirt assembly is pictured in the figure below.

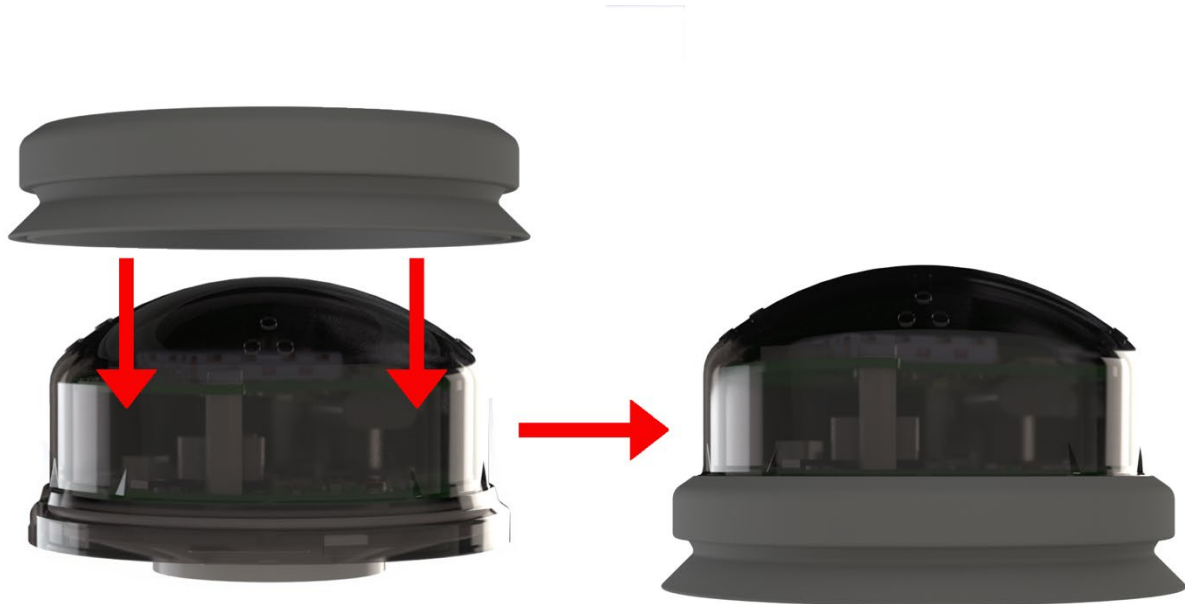


FIGURE 5: RAIN SKIRT ASSEMBLY

A typical installation is pictured below.

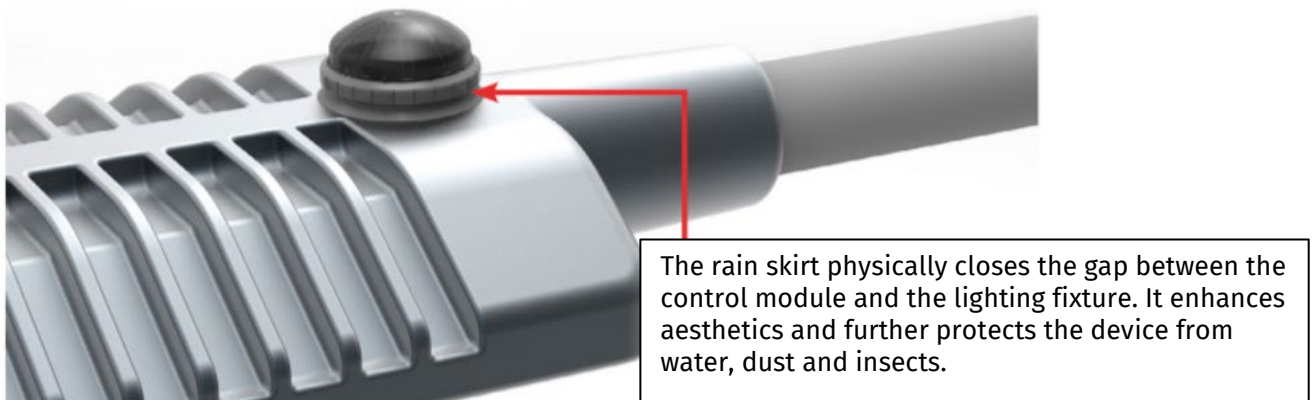


FIGURE 6: TYPICAL INSTALLATION OF THE RAIN SKIRT

4. Labels

4.1 NDLM014EU

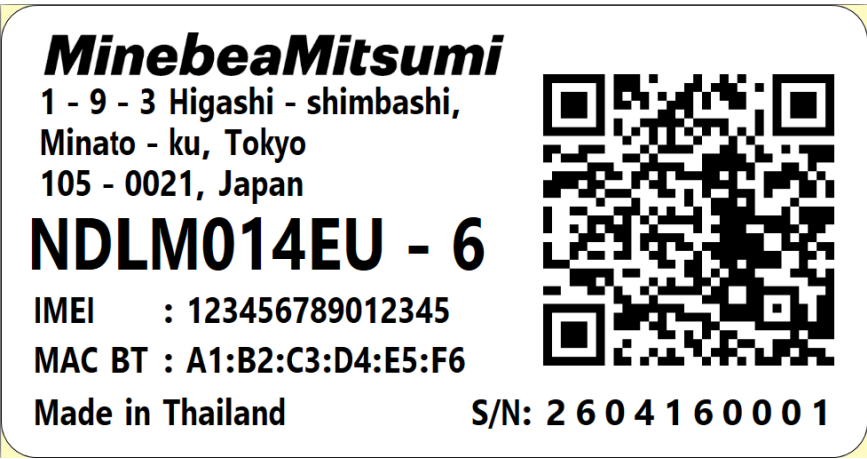


FIGURE 9: CELLULAR ZHAGA – EU MARKET

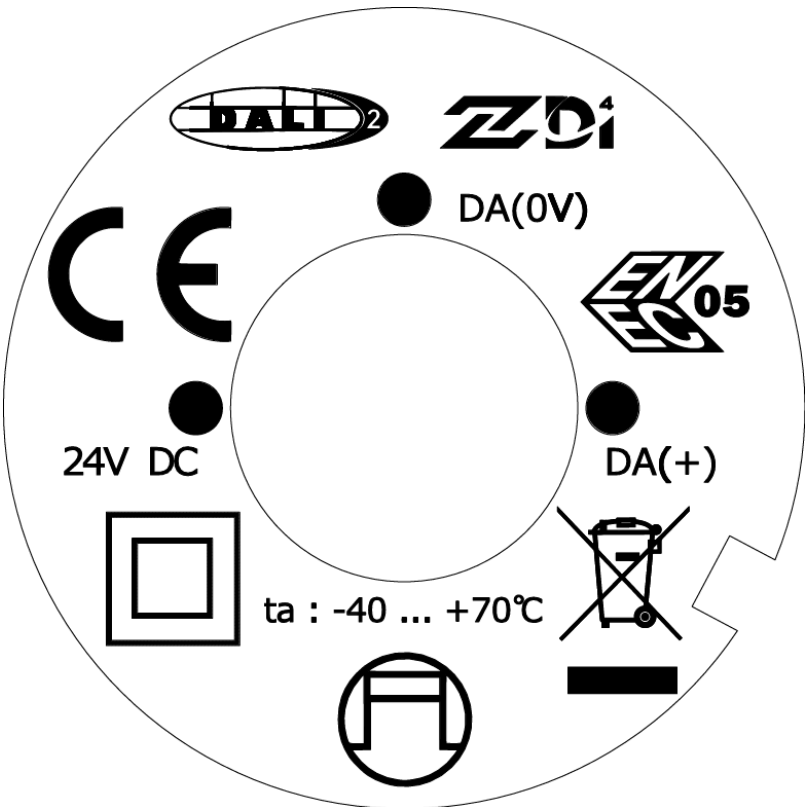


FIGURE 10: ROUNDED LABEL WITH CERTIFICATION MARKINGS AND LOCATIONS



5. Certifications

Table 11 – EU - Europe

Directive	Title
2014/53/EU	Directive on the harmonization of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC
2011/65/EU	DIRECTIVE 2011/65/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment
2015/863/EU	Commission delegated directive amending Annex II to Directive 2011/65/EU of the European Parliament and of the Council as regards the list of restricted substances
2017 No. 1206	The Radio Equipment Regulations 2017

Reference Standards

EN 62311:2020

EN IEC 55015:2019 + A11:2020

EN 61547:2009

ETSI EN 301 489-1 V2.2.3

ETSI EN 301 489-17 V3.3.1

ETSI EN 301 489-19 V2.2.1

ETSI EN 301 489-52 V1.2.1

ETSI EN 300 328 V2.2.2

ETSI EN 301 908-1 V15.2.1

ETSI EN 301 908-13 V13.3.1

ETSI EN 303 413 V1.2.1

IEC EN 61347-1:2024

IEC EN 61347-2-11:2024

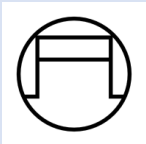
EN IEC 63000:2018

5.1 SYMBOLS AND APPROVAL MARKS

Table 12 – Approval Marks

Approval	Issued by	Certificate No.
		Declaration of Conformity
		Declaration of Conformity
		CB certificate: NL-126311 CB certificate: NL-126310
		ENEC certificate: 81-176629
		N/A

Table 13 – Symbols

Approval	Description
	Appliance class II equipment
	DALI 2 / D4i compliant
	Zhaga-D4i certified
	RoHS compliant
	WEEE Directive compliant
	Independent lighting auxiliary



6. Ordering Codes

Table 14 – Ordering Codes

Part No.	Region	Manufacturer	LTE Category	LSI pin	Last Gasp Tilt/Shock	Supported LED driver	Certification
NDLM014EU-6	Europe	Thailand	Cat M1 Cat NB2	No	Yes	DALI-2/D4i	CE / CB / ENEC / DALI 2 / D4i / Zhaga D4i

Table 15 – Related Documents

Document Number	Document Title/Description
5855-A - NDLM014 series	Smart Lighting Node Cellular Zhaga version Installation Manual
on-line	Smart Lighting Node Cellular Zhaga version User manual

7. Revision History

Document No.	Revision date	Created by	Approved by	Description
5854-A MM ID: {UF3PG-E0001914-A}	14.08.2026	L. Fontana	C. Bernocco	First document release

8. Contact Information

Manufacturer:
MinebeaMitsumi Inc., 1-9-3 Higashi-shimbashi, Minato-ku, Tokyo 105-0021, Japan

EU Authorized Representative:
MinebeaMitsumi Sales Europe GmbH, Siemensstrasse 5A, 63263 Neu-Isenburg, Germany

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