Next gen embedded WiFi modules for CCTV applications

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Agenda

Company Introduction

Technology Overview, Panasonic Portfolio Overview, Wi-Fi Security

Wi-Fi Security Overview

WPA2 & WPA3

PAN9520

Product Specification, Application Areas, Evaluation Tools

Demo

Hardware, Webcam Demo

Q&A

Company Introduction

Panasonic Industry in Europe

Panasonic Industrial Devices Europe R&D
Lüneburg, Germany

Panasonic Factory
Stara Lubovna, Slovakia

Panasonic Industry Europe
Germany
UK
Italy
France
Russia
Spain
…

Development
Purchasing
Production

Sales
Marketing

Technology and Partners

Low Energy 5.0

Low Energy 5.1

Low Energy & Classic

Bluetooth Mesh

Zigbee

Thread

WiFi 4

WiFi 5

WiFi 6*

NORDIC SEMICONDUCTOR · dialog SEMICONDUCTOR · Texas Instruments · ESPRESSIF · NXP

* Under development

Portfolio Overview

Panasonic INDUSTRY

PAN1740A

Bluetooth® 5.0

- DA14585
- ARM® Cortex®-M0
- 96kB SRAM, 64kB OTP

dialog SEMICONDUCTOR

PAN1780

Bluetooth® 5.1 & 802.15.4

- nRF52840
- ARM® Cortex®-M4F
- 256kB RAM, 1MB Flash

NORDIC SEMICONDUCTOR

PAN1781

Bluetooth® 5.1 & 802.15.4

- nRF52820
- ARM® Cortex®-M4
- 32kB RAM, 256kB Flash

NORDIC SEMICONDUCTOR

PAN4620

802.15.4 & Bluetooth® 4.2

- KW41Z
- ARM® Cortex®-M0+
- 128kB SRAM, 512kB Flash

NXP

PAN1326C2

Bluetooth® 5.1 Dualmode

- BR, EDR, LE 5.1
- CC2564C

Texas Instruments

PAN9026

Wi-Fi® 4 Radio & Bluetooth®

- 802.11 a/b/g/n
- 2.4 & 5.0 GHz
- BR, EDR, LE 5.0
- 88W8977

NXP

PAN9028

Wi-Fi® 5 Radio & Bluetooth®

- 802.11 a/b/g/n/ac
- 2.4 & 5.0 GHz
- BR, EDR, LE 5.1
- 88W8987

NXP

PAN9520

Wi-Fi® 4 Embedded

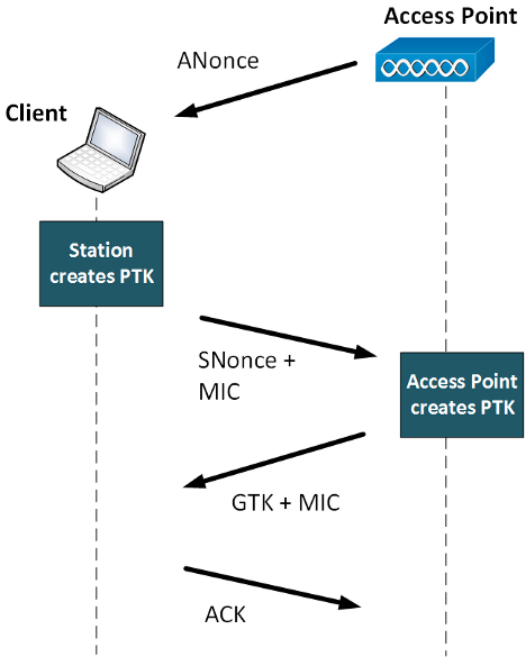
- 802.11 b/g/n
- 2.4 GHz
- ESP32-S2
- Xtensa® LX7 CPU

ESPRESSIF

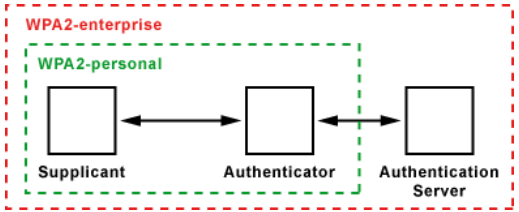
Wi-Fi Security

WPA2 and WPA3

- WPA2 is widely adopted – almost all routers are WPA2 compliant
  - 4-way handshake
  - **K**ey **R**einstallation **A**tta**CK**
- WPA3 – **next generation of Wi-Fi security**
  - Individual data encryption
  - Longer encryption keys
  - Backward Compatible
  - **Suitable for IoT Headless Devices**



WPA3 Security in Panasonic Modules



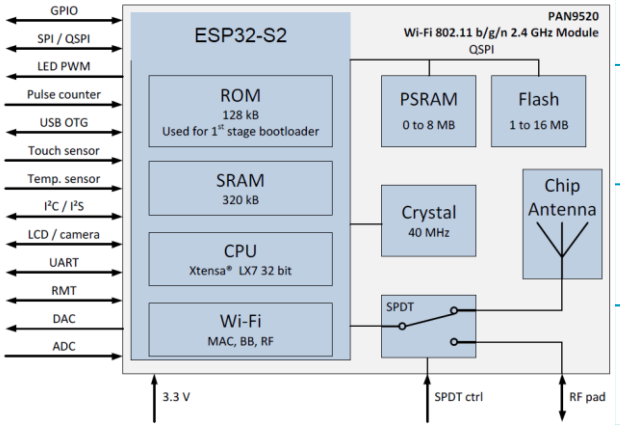
	PAN9026	PAN9028 NEW	PAN9520 NEW
			
WPA3 Personal	Supported	Supported	Supported
WPA3 Enterprise	Not Supported	Supported	Not supported

PAN9520

PAN9520 WiFi 4 Embedded

Features

- Embedded 2.4 GHz WiFi 802.11 b/g/n module with high output power amplifier
- Includes the Xtensa® 32-bit LX7 CPU
- Integrated crystal to ensure connection performance over full temperature range and lifetime
- **Variants with different RAM and external Memories:**
  - **2 MB RAM, 4 MB Flash**
  - **NO RAM, 1 MB Flash**
- Parallel support of access point and station mode
- Simultaneous support for Infrastructure Station, SoftAP and Promiscuous modes
- 802.11mc Fine Time Measurement (FTM)
- Up to 43 programmable GPIOs
- LGA package type



ESPRESSIF ESP32-S2	
Host, Standalone *mode*	ESP-IDF *SW Tool*
UART, I2S, USB, LCD, … *interfaces*	
320kB *SRAM*	128kB *ROM*
+19.5 dBm *output power*	-97 dBm *sensitivity*
Chip *antenna*	FCC, CE RED, ISED *certifications*
24.0 x 13.0 x 3 [mm] *size*	

Customer specific module variants are possible on short term. For further details, as well as mandatory conditions, please contact your sales team: wireless.connectivity@eu.panasonic.com.

PAN9520 – WiFi 4 Embedded Module

Panasonic INDUSTRY

Flexibility in Memory

2 Variants
- 1MB Flash, 0 MB RAM
- 4MB Flash, 2 MB RAM

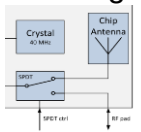
More available on request.

European Product

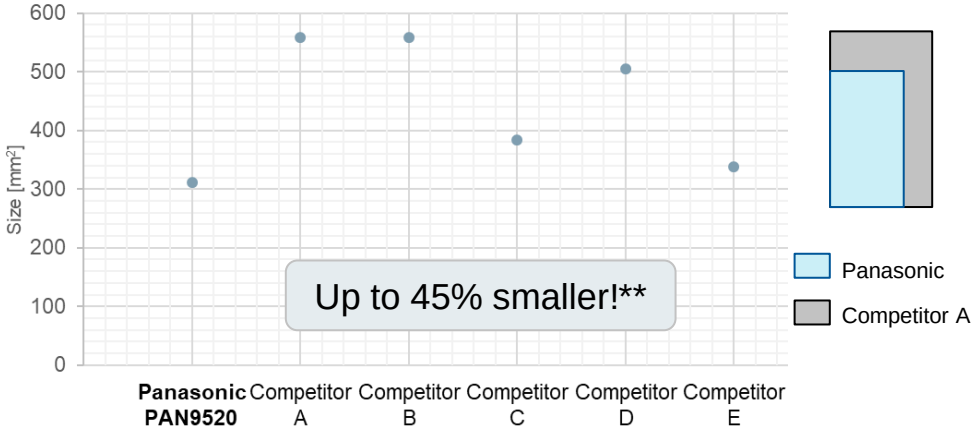
- Engineered in Germany
- 25 years of RF experience
- Produced in Slovakia
- IATF16949 certified production

Flexibility in Antenna Design

Possibility to connect external antenna via bottom pad through SPDT switch



Attractive in Size



Long Durability assured with additional crystal

The integrated crystal ensures connection performance over full temperature range and lifetime.

5. Electrical Specifications

	Parameters	SYM.	Electrical Spec.				Notes
			min	typ	max	Units	
1	Nominal frequency	f_{nom}		40.000		MHz	
2	Overtone order	-		Fundamental		-	
3	Frequency tolerance(Overall)	-	-25	-	+25	$\times 10^{-6}$	at -40~+85°C ・Include 5 years aging
4	Frequency Aging(at +25°C)	-	-5	-	+5	$\times 10^{-6}$	5 years
5	Equivalent resistance	-	-	-	80	Ω	IEC Pi-network/Series
6	Load capacitance	C_L	-	8	-	pF	IEC Pi-network

** The PAN9520 is the only module based on ESP32-S2 IC which is not made by Espressif itself. Competitor modules with similar feature sets.

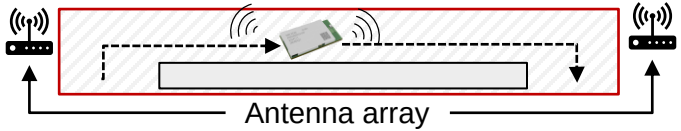
PAN9520 – Applications example

Smart Home

Easy integration into an existing WLAN network at home, where data can be accessed via a webinterface.

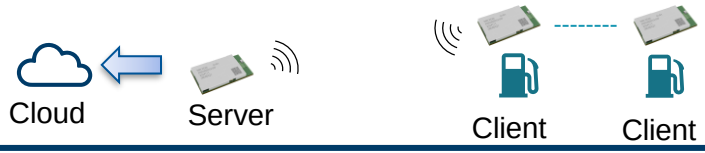
Industrial Automation

PAN9520 initiates a fine time measurement (FTM) with the fixed antenna array. This makes it possible to develop real time location systems for indoor mapping use cases.



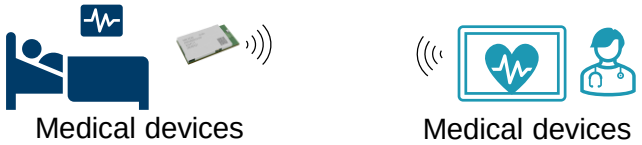
EV Charging

PAN9520 clients send various data to a central PAN9520 module acting as a server. These data can be uploaded to a cloud where it can be used in a dedicated backend for visualization purposes.



Medical

Body worn sensors which forwards data to central viewer



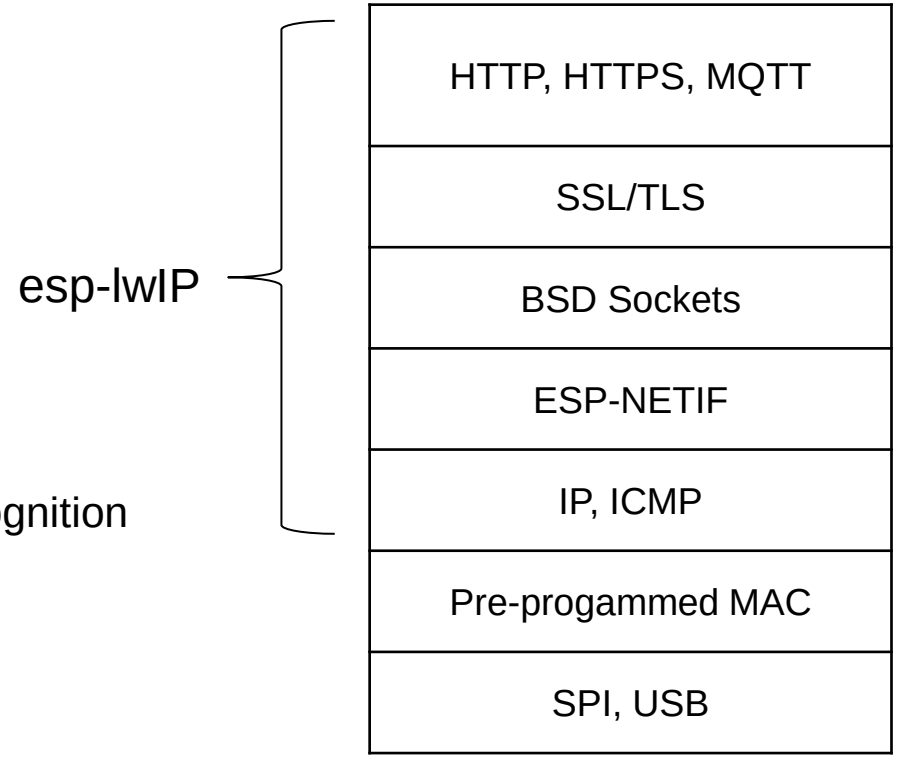
PAN9520 Protocols and Libraries

Application Protocols

- ESP-MQTT
- ESP-TLS
- HTTP/HTTPS

Libraries and Frameworks

- ESP - ADF for Audio
- ESP - Wi-Fi Mesh
- ESP - WHO – for face detection and recognition
- ESP – AIOT – for AI based development



PAN9520 Embedded Solution

Features	PAN9520	ESP32
CPU	Xtensa 32-bit LX7	Xtensa 32-bit LX6
Deep Sleep	19mA	68mA
BLE	No	Yes
Interfaces	LCD, Camera, USB	No LCD, Camera, USB
Fine Time Measurement	Supported	Not Supported

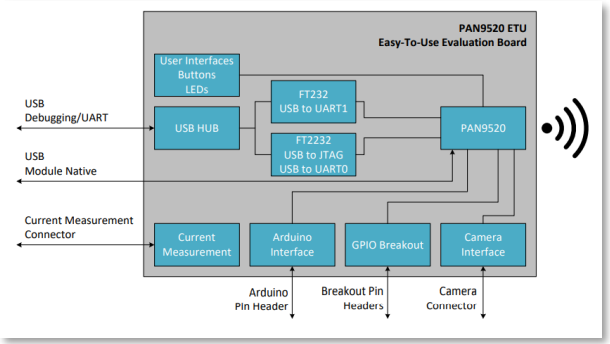
Evaluation Tools

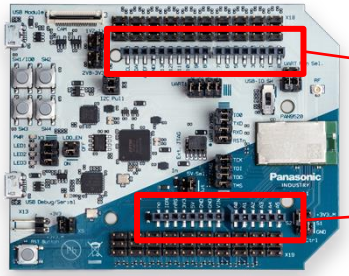
PAN9520 **Evaluation tools**

	Espressif SDK	Arduino
Hardware	ENW49D01AZKF (here)	ENW49D01AZKF (here)
Software	ESP-IDF (here)	Arduino ESP32 (here)
IDE	• Visual Studio Code / PlatformIO • Eclipse	• Arduino DIE • Visual Studio/Platform IO (Arduino Framework)
Quick Start	Getting Started	Getting Started

PAN9520 EVB

- Arduino Interface as Shield or Board
- All GPIO breakouts for faster prototyping
- Native USB Interface
- Camera Interface
- Interconnectivity with shields on mass market





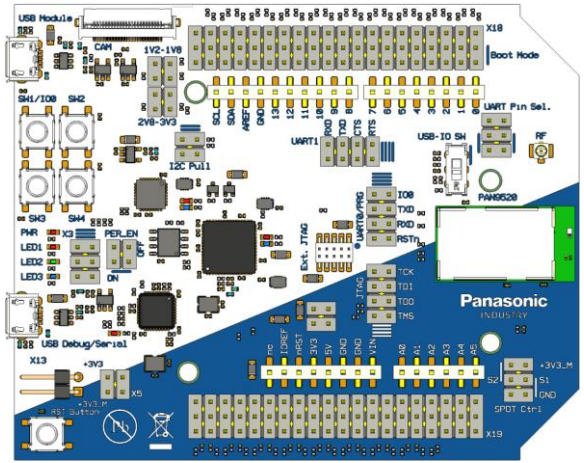
Arduino Footprint

Mass market shields

Demo Time

PAN9520 Webcam Demo

Hardware setup:



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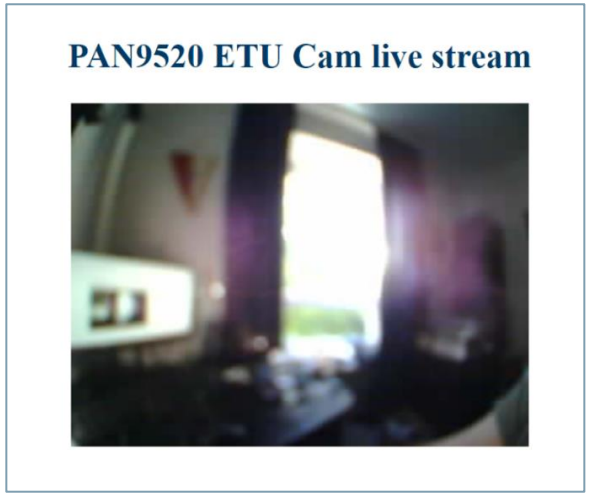


PAN9520 EVB
with FPC connector

OV2640 Camera

Webcam Demo

PAN9520 Webcam Demo

Concept:

1. After startup process the module (PAN9520) will open an access point
2. Connect to the access point
3. Open a browser
4. Use module IP address as url (192.168.4.1)
5. The module will send the camera stream HTML code via webserver to the browser
6. HTML code requests the picture stream
7. The module will start to take pictures and send it as stream back to the browser via webserver
8. Camera stream is visible in the browser

PAN9520 Webcam Demo

Toolchain:

Visual Studio Code

Famous opensource code editor from Microsoft.

- Extensions capabilities
- Support for nearly every programming language
- Syntax highlighting

PlatformIO

IDE for programming embedded devices.

- 48 Development Platforms
- 26 Frameworks
- 1035 Boards
- 222 Examples
- 11677 Libraries

ESP-IDF

Espressifs IoT Development Framework

- Build tools for esp32 series
- Low level driver libraries

PAN9520 Webcam Demo

Toolchain Setup:

1. Install Visual Studio Code (VS Code) https://code.visualstudio.com/
2. Open VS Code
3. Open the "Extensions" menu - using the icon in the left vertical menu bar
4. Search and start installation of the "PlatformIO IDE" extension.
5. Wait for the installation to finish. This takes a while. Visual Studio Code must be restarted for the installation to take effect.
6. Clone the project from Github: git clone --recursive https://github.com/panasonic-industry-europe/pan9520-etu-camera-stream-web-server.git
7. Use "File" -> "Open Folder" and select the project folder containing this application
8. Wait for all dependencies to be downloaded and installed automatically. This takes a while.

PAN9520 Webcam Demo

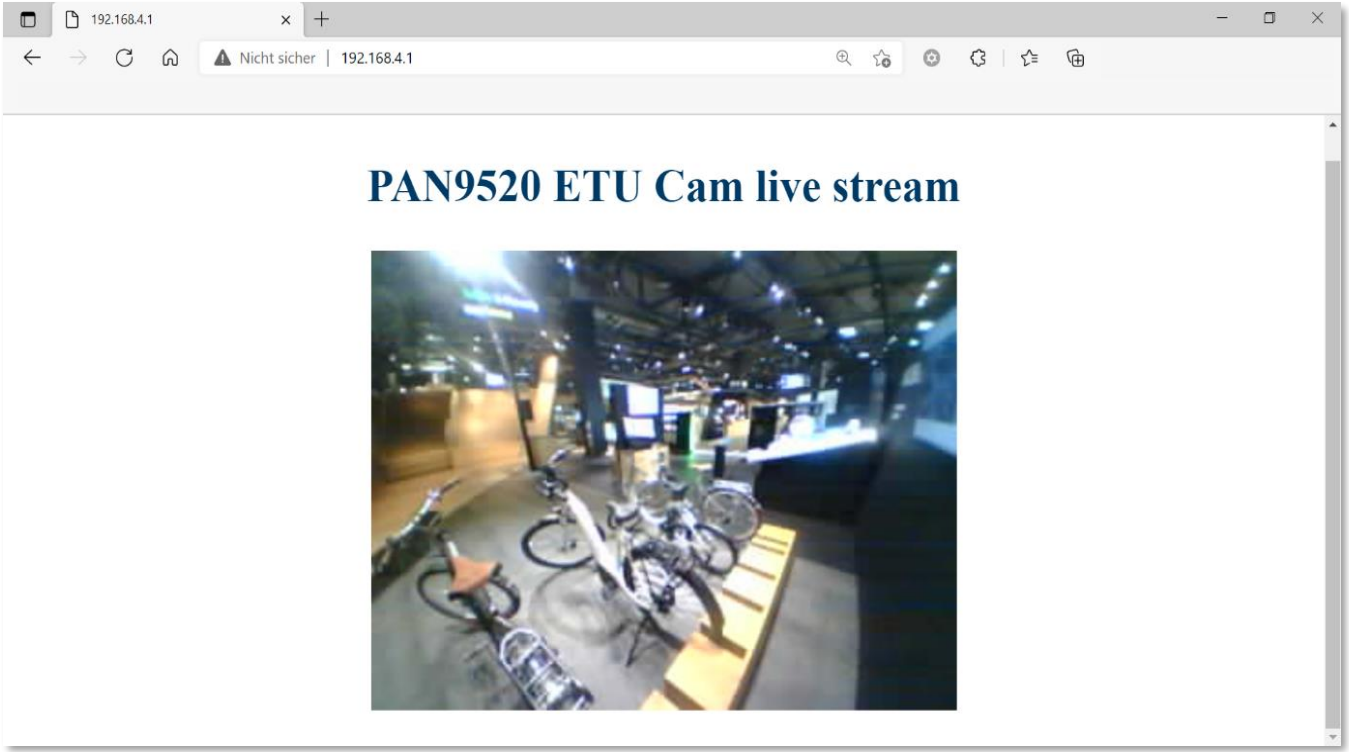
Flashing and running the demo:

1. Open VS Code
2. Click on the project task menu (Alien Head) and choose: esp32-s2-kaluga-1
3. Click on General and then Build.
4. Press reset while holding pressed down the SW1 Button. This will activate the download mode.
5. Click on General and then Upload.

After the upload you will see an error message in the terminal. This is because the task can't reset the Board itself. You have to reset the Board by pressing the reset Button.

6. A Wi-Fi Access Point will occur with the SSID you named above
7. Connect to that AP with the password you set
8. After the connection has been established open a browser and type the set IP address into the URL field
9. Enjoy the livestream!

PAN9520 Webcam Demo



Where to get?

ENW49D01AZKF

Evaluation Board, PAN9520, ESP32-S2, WiFi 4, Wireless Connectivity, Wi-Fi

NEW

Add to compare

Image is for illustrative purposes only. Please refer to product description.

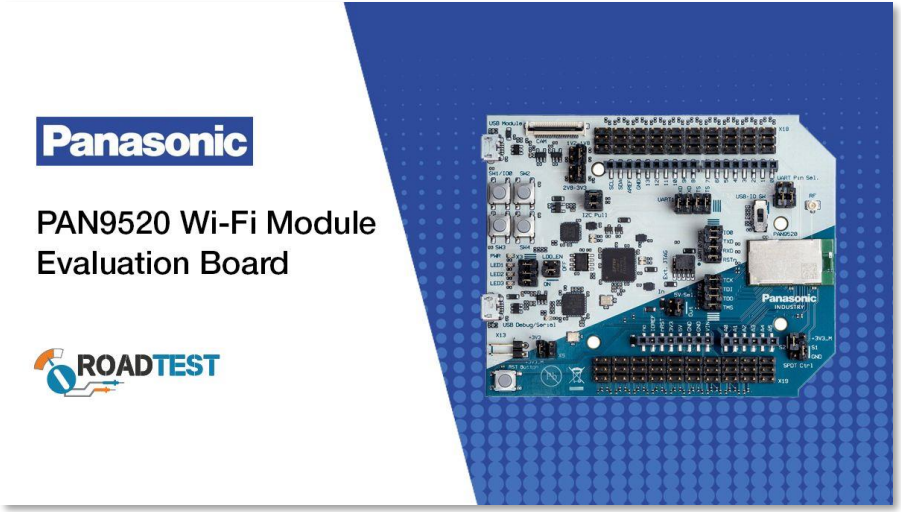
Panasonic

Manufacturer:	PANASONIC ELECTRONIC COMPONENTS
Manufacturer Part No:	ENW49D01AZKF
Order Code:	3771707
Product Range	PAN9520 Series
Technical Datasheet:	ENW49D01AZKF Datasheet
	See all Technical Docs

Buy on Newark

Buy on Farnell

On a side note…



Register here: [PAN9520 Wi-Fi Module Evaluation Board | element14 |]

Questions & Answers