



IEI PUZZLE Series Products

Aiming to The Future with Next Generation Network Appliance

Proprietary Network Appliance

A Proprietary network appliance is a specialized electronic device that plugs into a network that is optimized for one specialized network purpose like switching, routing, protecting in a network environment. Proprietary network appliances include as Router, Load Balance, Bandwidth Management, Gateway security, WAN Optimization, application delivery controller (ADC), Next Generation Firewall (NGFW), Unified Threat Management (UTM), and Intrusion detection system (IDS).

uCPE (Universal Customer Premise Equipment)

uCPE consists of virtual network functions (VNFs) running on a standard operating system hosted on an open server with NFV technology.

Now with NFV technology, we can create several virtual machines and install these VNFs in a x86 or ARM based uCPE. VNFs could include popular software services such as a virtual firewall, virtual load-balancing, or other software-defined wide area network (SD-WAN)service. Besiads with NFV Orchestration, uCPU could be an edge computing system or an AI inference computing system.

Low Power, High Density, High Speed IO and Integrated accelerator

The PUZZLE-IN003 series is a desktop network device that easily places in space limited area, providing an ideal network solution. The PUZZLE-IN003 series comes with Intel® Atom® Processor C3000 series System On Chip (4 core to 16 core and up to 2.2Ghz) which supports up to 128GB Dual-channels DDR4 2400 MHz ECC (UDIMM, or RDIMM), two 10 GbE intergrated Ethernet (by sku), and 32GB Embedded Multi Media Card (eMMC). The PUZZLE-IN003 series also provides one M.2 M-key slot for NVME and one M.2 A key and one PCIe mini with SIM slot for WiFi, 4G, LTE solutions. It also offers extensive software integration functionality, including Intel® QuickAssist Technology (Intel® QAT up to 20Gbps) to accelerate and compress cryptographic workloads.

Key Values of PUZZLE-IN003 Series



High-Density, Low-Power Designs

Performance improvements over previous generations with an integrated/high-density design and low TDP.

High-Speed I/O Configurability

Faster transmission of large data files with two 10Gb (PUZZLE-IN003B sku) Ethernet and configurable I/O lanes using PCIe Gen 3. SATA and USB 3.0.

Multi-Core Scalability

Multiple product configuration options from 4-16 processing cores to scale one design across many use cases.

Integrated Hardware Acceleration

Intel® QuickAssist Technology (Intel® QAT up to 20Gbps) to accelerate and compress cryptographic workloads.

Bypass Function Relay Modes

Hardware or software failure. Hardware Bypass will activate, allowing network traffic to continue. Traffic between the LAN and WAN is allowed without interruption

Intel® Atom® Process C3000

In terms of memory, PUZZLE-IN003 series incorporates double the Layer 2 cache, allowing edge analytics systems to quickly access data. Atom® Processor C3000 series also support the Intelligent Storage Acceleration Library (ISA-L), a software library optimized for applications that require high data throughput and minimal latency. And the Intel® VT-c works with the Intel® Ethernet Controller integrated into the new Intel® Atom® processors to deliver I/O virtualization and quality of service (QoS) features.

Feature	Intel® Atom® Process C2000	Intel® Atom® Process C3000	
Intel Atom CPU	512 KB L2	2MB or 1MB L2	
Process Tech	22 nm	14 nm	
Cores	Up to 8 Up to 16		
Memory	DDR3, DDR 3L with ECC	DDR4 with ECC	
DIMMs	UDIMM, SODIMM	UDIMM, SODIMM, RDIMM	
Intel QuickAssist Technology	Up to 10Gbps bulk crypto	Up to 20 Gbps crypto+ 20 Gbps Compression	
VirtualIzation	VT-x, VT-d		

Integrated 10G Interface

PUZZLE-IN003B Equips with The Intel Atom® C3000-series processors which are designed to meet such requirements with two integrated 10Gb network ports providing high-speed connections to the core network while integrated networking helps contribute to the small form-factor design of the base station.

Integrated Intel® QuickAssist Technology

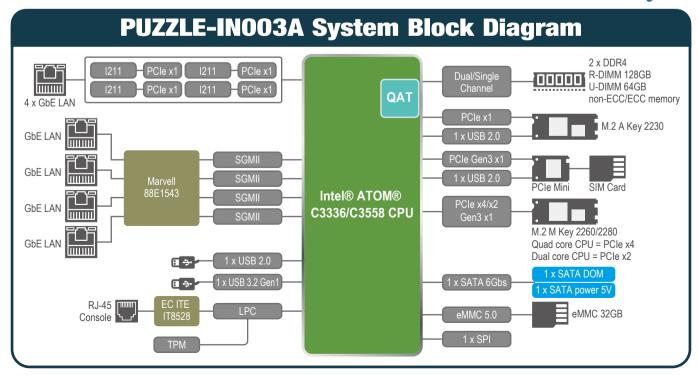
In the 5G network, security is an indispensable requirement. The base station must use air interface security to connect to the user equipment (UE), and an IPsec connection to connect to the core network. The base station must support high-performance crypto algorithms like AES at the IP level and ZUC/Kasumi/Snow3G at the PDCP level.

To support these requirements the Intel Atom® C3000 processor series integrates Intel® QuickAssist Technology providing up to 20 Gbps of crypto performance, ensuring secure data transfer while reserving valuable processor cycles for other tasks.

Intel® Atom® C3000 QuickAssist Technology Performance

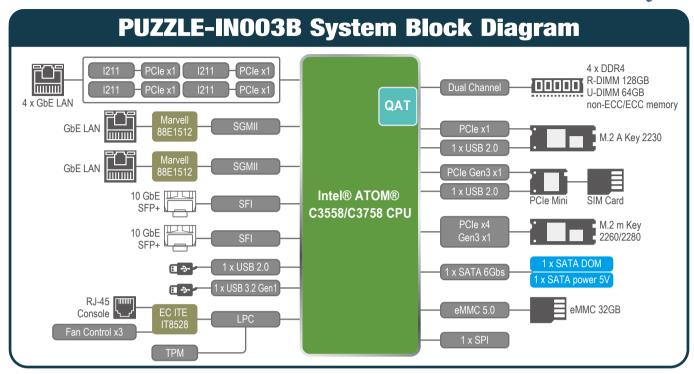
Performance	Single Intel® Atom® C3000-NS Solution
SSL	20 Gbps
Bulk Crypto + Authentication	20 Gbps
RSA Decrypt 1024	92K Ops/sec
RSA Decrypt 2048	20K Ops/sec
ZUC/Snow3G/Kasumi F82	12Gbps

PUZZLE-IN003A Intel® Atom® Processors Family

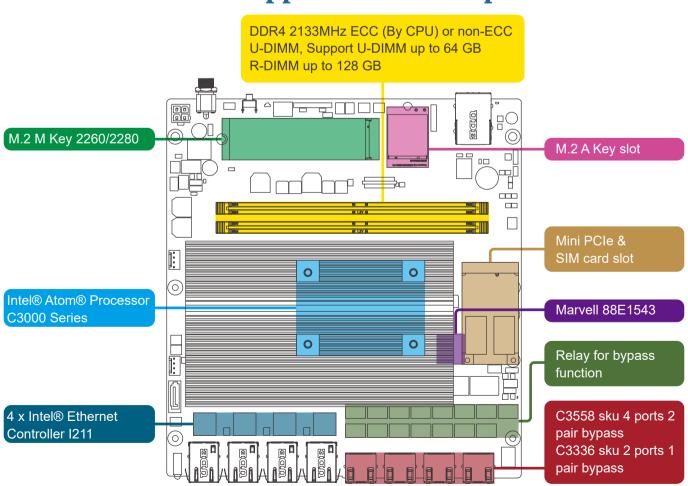




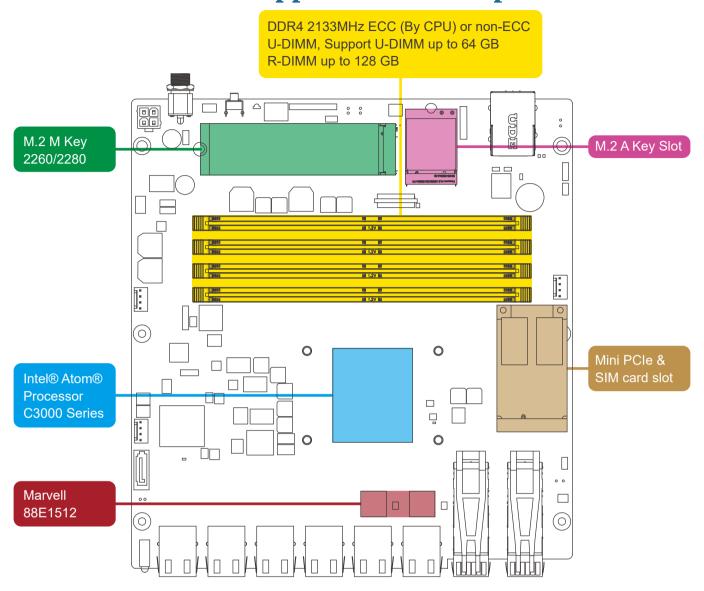
PUZZLE-IN003B Intel® Atom® Processors Family

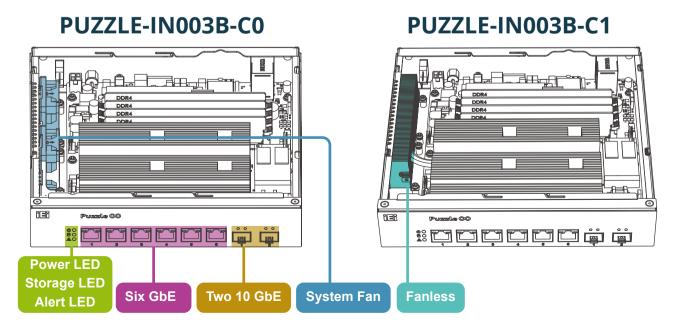


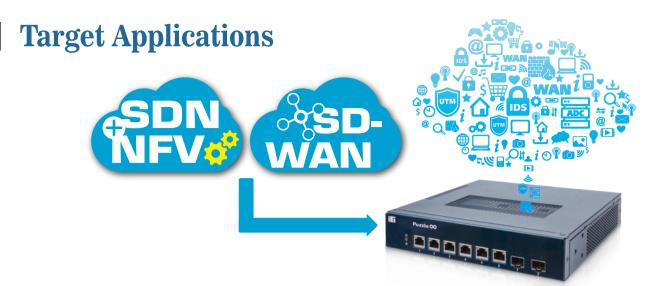
PUZZLE-IN003A Support Various Expansion Card



PUZZLE-IN003B Support Various Expansion Card







PUZZLE-IN003 series enable advanced NFV and SDN capabilities for service providers' next-generation networking infrastructure, spanning from the enterprise to the data center.

uCPE (Universal Customer Premise Equipment)

Highly parallelized CPU ideal for Network Function Virtualization (NFV) and Software Defined Network (SDN)

Unified Threat Management (UTM)



Unified threat management or UTM is a single network appliance for all-inclusive security functions, such as network firewall, intrusion detection/prevention system (IDS/ IPS), anti-virus gateway, anti-spam

gateway, VPN, content filtering, load balancing, data loss prevention and appliance monitoring.

UTM appliances offer cost-effective, all-in-one security ideal for small/medium businesses, remote offices and retail networks.

Next Generation Firewall (NGFW)



Both NGFW and traditional firewalls aim to serve the same purpose of protecting an organization's network and data assets, but the most important differences between traditional and next-generation

firewalls is that NGFW offer a deep-packet inspection function that goes beyond simple port and protocol inspection by inspecting the data carried in network packets.

Proprietary Network Appliance

- · Security for business critical network data
- · HW encrypted multi-tenant security
- High I/O for network connectivity
- · Memory capacity for large traffic datasets

Intrusion Detection System (IDS)



An intrusion detection system (IDS) is a device that monitors a network or systems for malicious activity or policy violations. Any malicious activity or violation is typically reported either to an

administrator or collected centrally using a security information and event management (SIEM) system. A SIEM system combines outputs from multiple sources, and uses alarm filtering techniques to distinguish malicious activity from false alarms.

Application Delivery Controller



An application delivery controller (ADC) is a computer network device to improve the performance of web applications in a data center and it also could be a part of an application delivery

network (ADN). In order to deal with the increasing demands of Internet traffic, application delivery controllers (ADC) also provide load balancing, and support multi-tenancy for deployment in data centers and a large number of sessions with a fast transaction rate.

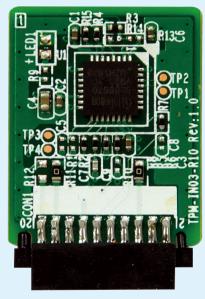
Protecting Integrity and Authenticity of PUZZLE-IN003 series

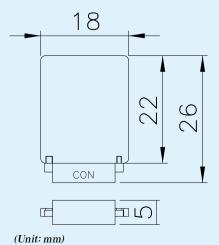
PUZZLE-IN003 series support TPM (Trusted Platform Module) which offers a broad portfolio of standardized security controllers to protect the integrity and authenticity of systems. With a secured key store and support for a variety of encryption algorithms, TPM security chips provide robust protection for critical data and processes through their rich functionality.

What is a TPM?

Trusted Platform Module (TPM) is an international standard for a secure cryptoprocessors that can securely store critical data such as passwords, certificates and encryption keys. TPM is a dedicated microcontroller designed to secure hardware by integrating cryptographic keys into devices and is used for secured crypto processes within computing devices as well as for secured storage of critical data. TPMs are typically used in business laptops, routers and embedded and IoT devices. The technical TPM specification was written by an industry consortium called Trusted Computing Group (TCG).







Specifications

- ◆ Interface SPI interface
- ♦ Solution Infineon SPI TPM 2.0 with SLB9670VQ2.0 FW7.85
- ◆ Management Tool Function
 - 1. TPM management
 - 2. File & Folder En/De-cryption
 - 3. Personal secure drive
 - 4. Secure email
 - 5. Key transferring
 - 6. Security policy configuration
 - 7. SPI interface
- ◆ Market Segment Complete TPM 2.0 function
- ♦ OS Support: Windows® & Linux
- ◆ Operating Temperature: 0°C ~ 60°C
- ◆ Storage Temperature: -20°C ~ 70°C
- ◆ Operating Humidity: 5% ~ 95%, non-condensing
- ◆ Dimensions (LxW): 26mm x 18mm

Packing List

1 x 20-pin TPM module

Ordering Information

Part No.	Description
TPM-IN03-R10	20-Pin Infineon SPI TPM 2.0 module with SLB9670VQ2.0, software management tool, firmware v7.85.



PUZZLE Series Technology

Virtualization is the process of creating a software-based, or virtual, representation of something, such as virtual applications, servers, storage and networks. Network functions virtualization or NFV is a network architecture concept that uses the technologies of IT virtualization to virtualize entire classes of network node functions into building blocks that may connect, or chain together, to create communication services.

User Space

FD.io, OPNFV, OpenFastPath, OvS, DPDK, **OpenDataPlane**

Kernel Space

ubuntu, OpenWrt, Linux KVM, docker

Hardware

Intel, MARVELL, BROADCOM, CAVIUM, AQUANTIA, Mellanox, NXP

PUZZLE Series Ecosystem

PUZZLE is about the uCPE consisting of software virtual network functions (VNFs) running on a standard operating system hosted on an open server. An ideal uCPE deployment supports a multi-vendor multicomponent construction and enables rapid development as well as open multi-vendor systems.



PUZZLE Series is Ready for Next Generation Network

The following picture completely shows the components of the PUZZLE series. Choose the right components from CPU, NIC, software, manufacturing side, and fit them together. You will create a perfect network appliance.

Software/Application

On the left hand side, it shows the S/W support from IEI. IEI will help customers to get device driver. application, other NFV basic software, DPDK, OvS, VPP, OpenDaylight and OpenStack. IEI will also help customers to deploy and install all of the software and build up their own NFV solutions.







DPDK Device Driver Application











NIC & Bandwidth

On the upper side, it shows the network connection ability of the PUZZLE series. IEI provides four brands of NIC from Aguantia. Intel, Broadcom, Mellanox, and with 1G, 2.5G, 5G, 10G or 25G different kinds of speed.





10/100Mb, 1G, 2.5G, 5G, 10G 25G, 100G

System Integration

On the right hand side, it shows the computing ability of the PUZZLE series.

IEI implements 5 major CPU brands, including Intel, AMD, Marvell, NXP, Cavium, and 3 kinds of accelerator cards for edge computing or Al computing.











Designing & Manufacture

On the bottom side, it shows ARMOR Link cross IEI cross QNAP.

Most of network appliances are about network security. Some of the customers care about where the network appliance is designed and made. Therefore, we provide you two choices, designed and manufactured in Taiwan or in China. QNAP factory is in New Taipei City, Taiwan, and ARMOR Link factory is located in Shanghai, China.







PUZZLE-IN003A

Desktop Network Appliance with Intel® Atom® Processor C3000 Processor, up to 8 x 1 GbE on Board with 2 (by sku) bypass segments, 1 x eMMC 32GB



Features

- Intel® Atom® processor C3558 8M Cache, up to 2.20 GHz
- Support 4 x 1 GbE NIC via Intel® I211, 4 x 1 GbE PHY via Marvell 88E1543
- Support bypass function (by sku)

1 x Power LED, 1 x Storage LED, 1 x Alert LED

- DDR4 2133MHz ECC (by CPU) or non-ECC UDIMM/R-DIMM Up to 128GB
- 1 x M.2 A key (USB 2.0, PCle x1), 1 x miniPCle (USB 2.0, PCle x1) with SIM card slot, 1 x eMMC 32GB

PUZZLE-IN003A-C3 PUZZLE-IN003A-C1 Form Factor Desktop Intel® Atom® processor C3558 8M cache, Intel® Atom® Processor C3336 4M Cache, CPII **Platform** up to 2.20 GHz 1.50 GHz Chipset Integrated in CPU DDR4 2133MHz ECC (By CPU) or non-ECC UDIMM, Support DDR4 RDIMM **Memory Technology** UDIMM up to 64GB / RDIMM up to 128GB Memory **Memory Capacity Memory Socket** 2 x 288-pin DIMM 1 x 288-pin DIMM • Intel® AES New Instructions Intel® Virtualization Technology for Directed • Intel® Software Guard Extensions (Intel® I/O (VT-d) **Network Acceleration and** SGX) Intel® Virtualization Technology (VT-x) Network and **Security Function** Intel® Virtualization Technology for Directed Intel® QuickAssist Technology (Intel® QAT) Security I/O (VT-d) • Intel® QuickAssist Technology (Intel® QAT) TPM 1 x TPM 2.0 pin header 1 GbE NIC: Intel® i211-AT **Ethernet IC** 1 GbE PHY: Marvell 88E1543 4 x GbE from Intel® i211-AT 4 x GbE from Intel® i211-AT **Ethernet Port** Networking 4 x GbE from Marvell 88E1543 2 x GbE from Marvell 88E1543 **Bypass** Yes, 2 bypass segments Yes, 1 bypass segments **Network Module Slot** N/A **PCIe Slot** N/A Expansion **PCIe Mini Card Slot** 1 x PCle Mini card (PCle 3.0, USB 2.0) with SIM slot Slot 1 x M.2 A key (PCle 3.0 & USB 2.0) M.2 1 x SATA 3.0 + 1 x 5V power connector (for SATA DOM) Storage 1 x M.2 M key 2260/2280 Support PCle 3.0 x4 nVME Storage eMMC 1 x eMMC 32GB SD Card N/A 1 x USB 2.0 **USB** External I/O 1 x USB 3.2 Gen 1 Console 1 x RJ-45 **HDMI** N/A Internal I/O USB N/A **Power Switch** 1 x Power switch **Reset Button** 1 x Reset button **Power Input** 1 x DC jack Power and Type/Watt 12 V DC-in. 60W Mechanical **Processor Cooling** Passive CPU heatsink System Cooling **Fanless** Antenna Hole 2 x Antenna hole Storage Temperature -20°C ~ 75°C (-4°F ~ 167°F) **Operating Temperature** 0°C ~ 40°C (32°F ~ 104°F) Physical and **Operating Humidity** 5% ~ 90% non-condensing Environmental Dimensions (W x L x H) (mm) 225 x 206 x 44.2 2 kg Certification CE / FCC OS and Linux Ubuntu 18.04.04 Certifications CentOS 7 / Red Hat / Fedora EPEL **Operating System** Microsoft Windows 10 LCM

Indicators

LED

PUZZLE-IN003B ▶



Desktop Network Appliance with Intel® Atom® Processor C3000 Processor support up to 6 x 1 GbE, 2 x 10 GbE & 2 x M.2 slots, 1 x PCle Mini, 1 x eMMC 32GB



Features

- Intel® Atom® processor C3558 8M Cache, up to 2.20 GHz
- Support 4 x 1 GbE NIC via Intel® C3558, 2 x 1 GbE PHY via Marvell 88E1512, 2 x 10 GbE SFP+ via intel C3558
- DDR4 2133MHz ECC (by CPU) or non-ECC UDIMM/R-DIMM Up to 128GB
- 1 x M.2 A key (USB 2.0, PCle x1), 1 x miniPCle (USB 2.0, PCle x1) with SIM card slot, 1 x eMMC 32GB

		PUZZLE-IN003B-C0	PUZZLE-IN003B-C1	
	Form Factor	Desktop		
Platform	CPU	Intel® Atom® processor C3758 16M cache, up to 2.20 GHz	Intel® Atom® processor C3558 8M cache, up to 2.20 GHz	
	Chipset	Integrated in CPU		
	Memory Technology	DDR4 2133MHz ECC (By CPU) or non-ECC UDIMM, Support DDR4 RDIMM		
Memory	Memory Capacity	UDIMM up to 64GB / RDIMM up to 128GB		
	Memory Socket	4 x 288-pin DIMM		
Network and Security	Network Acceleration and Security Function	I/O (VT-d) • Intel® QuickAssist Technology (Intel® QAT)	 Intel® AES New Instructions Intel® Software Guard Extensions (Intel® SGX) Intel® Virtualization Technology for Directed I/O (VT-d) Intel® QuickAssist Technology (Intel® QAT) 	
	TPM) pin header	
1 GbE NIC: Intel® i211-AT Ethernet IC 1 GbE PHY: Marvell 88E1512 10 GbE: Intel® X553 integrated in CPU		arvell 88E1512 3 integrated in CPU		
Networking	Ethernet Port	4 x 1GbE from Intel® i211-AT 2 x 1GbE from Marvell 88E1512 2 x 10 GbE SFP+		
	Network Module Slot		/A	
Evnancion	PCIe Slot	N/A		
Expansion Slot	PCIe Mini Card Slot	1 x PCle Mini card (PCle 3.0, USB 2.0) with SIM slot		
0.00	M.2		Cle 3.0& USB 2.0)	
Cto no no	Storage	1 x SATA 3.0 + 1 x 5V power connector (for SATA DOM) 1 x M.2 M key 2260/2280 Support PCIe 3.0 x4 nVME		
Storage	eMMC	1 x eMMC 32GB		
	SD Card	N/A		
External I/O	USB	1 x USB 2.0 1 x USB 3.2 Gen 1		
	Console	1 x F	RJ-45	
Internal I/O	HDMI	N	/A	
internal I/O	USB	N/A		
	Power Switch	1 x Pow	er switch	
	Reset Button	1 x Reset button		
Power and	Power Input		C jack	
Mechanical	Type/Watt	12 V DC-in, 60W		
	Processor Cooling	Passive CPU heatsink		
	System Cooling	Two system fans	Fanless	
	Antenna Hole		nna hole	
	Storage Temperature	-20°C ~ 75°C (-4°F ~ 167°F)		
Physical and Environmental	Operating Temperature	0°C ~ 40°C (32°F ~ 104°F)		
	Operating Humidity	5% ~ 90% non-condensing		
	Dimensions (W x L x H) (mm)	225 x 206 x 44.2		
	Weight	2 kg		
00 and	Certification	CE/FCC		
OS and Certifications	Operating System	Linux Ubuntu 18.04.04 CentOS 7 / Red Hat / Fedora EPEL Microsoft Windows 10		
Indicators	LCM	N	/A	
Indicators	LED	1 x Power LED, 1 x Storage LED, 1 x Alert LED		

▶ I/O Interface

PUZZLE-IN003A-C1



PUZZLE-IN003A-C3



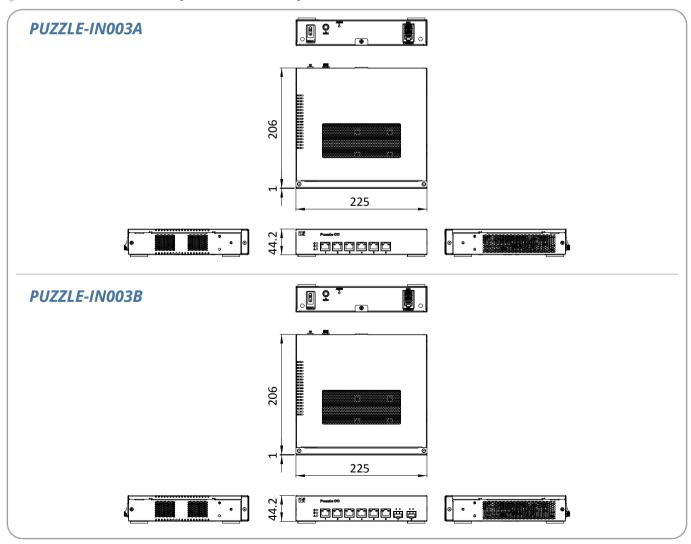
PUZZLE-IN003B



PUZZLE-IN003 Series Rear view



Dimensions (Unit: mm)





Packing List

	PUZZLE-IN003A- C1-R10	PUZZLE-IN003A- C1/8G-R10	PUZZLE-IN003A- C3-R10	PUZZLE-IN003A- C3/8G-R10	PUZZLE-IN003B- C0/8G-R10	PUZZLE-IN003B- C1/8G-R10
Power cord	1	1	1	1	1	1
Power adapter	1	1	1	1	1	1
Rack mounting ears	Option	Option	Option	Option	2	2
Screws for rack mounting ears	Option	Option	Option	6	6	6
USB to console cable	Option	1	option	1	1	1
RS-232 to console cable	1	Option	1	Option	Option	Option

Ordering Information

Part No.	Description
PUZZLE-IN003A-C1-R10	Desktop network appliance with Intel® ATOM® C3558 processor, 8 x 1GbE on Board with up to 2 bypass segments, eMMC 32GB & 2 x M.2 slot, RoHS
PUZZLE-IN003A-C1/8G-R10	Desktop network appliance with Intel® ATOM® C3558 processor, 8 x 1GbE on Board with up to 2 bypass segments, 8GB DDR4, eMMC 32GB & 2 x M.2 slot, RoHS
PUZZLE-IN003A-C3-R10	Desktop network appliance with Intel® ATOM® C3336 processor, 6 x 1GbE on Board with up to 1 bypass segments, eMMC 32GB & 2 x M.2 slot, RoHS
PUZZLE-IN003A-C3/8G-R10	Desktop network appliance with Intel® ATOM® C3336 processor, 6 x 1GbE on Board with up to 1 bypass segments, 8GB DDR4, eMMC 32GB & 2 x M.2 slot, RoHS
PUZZLE-IN003B-C0-R10	Desktop network appliance with Intel® ATOM® C3758 processor, 4 x DDR4 slots, 6 x 1GbE, 2 x 10 GbE & 2 x M.2 slots, 1 x PCIe Mini slot, 1 x eMMC 32GB, RoHS
PUZZLE-IN003B-C0/8G-R10	Desktop network appliance with Intel® ATOM® C3758 processor, one 8GB DDR4, 6 x 1GbE, 2 x 10 GbE & 2 x M.2 slots, 1 x PCIe Mini slot, 1 x eMMC 32GB, RoHS
PUZZLE-IN003B-C1-R10	Desktop network appliance with Intel® ATOM® C3558 processor, 4 x DDR4 slots, 6 x 1GbE, 2 x 10 GbE & 2 x M.2 slots, 1 x PCIe Mini slot, 1 x eMMC 32GB, RoHS
PUZZLE-IN003B-C1/8G-R10	Desktop network appliance with Intel® ATOM® C3558 processor, one 8GB DDR4, 6 x 1GbE, 2 x 10 GbE & 2 x M.2 slots, 1 x PCle Mini slot, 1 x eMMC 32GB, RoHS

Options

Item	Part No.	Description
USB to console cable	32013-004000-100-RS	Round cable, LAN cable, FTDI console cable, 2, 1800MM, (A) USB A TYPE 4P MALE+PCB:FTDI_FT232RL, (B) RJ-45 8P8C, RoHS
RS-232 to console cable	32005-005100-100-RS	Round cable, RS-232/422/485, PUZZLE RS-232 cable, 2, 500MM, 24AWG, (A) D-SUB 9P MALE+#4-40 screw, (B) RJ-45 PLUG 8P8C, ONE PCS PKG, TC&C, RoHS
Rack ear mounting kit	19B00-000417-00-RS	Accessory module: PUZZLE-IN003 series rack ear mounting kit

^{*}Specifications are subject to change without prior notice.

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