

DTBC10 – AI-capable on-board computer**Datasheet Rev. 1.2**

1. Introduction

DTBC10 is an AI-capable on-board computer specifically designed for public transportation systems. It provides centralized management and control of on-board systems and functions while significantly reducing the need for multiple dedicated, high-cost devices. In the conventional public transport architecture, the main IT and system-management requirements of an urban transit vehicle typically are addressed using a number of dedicated devices and subsystems, including:

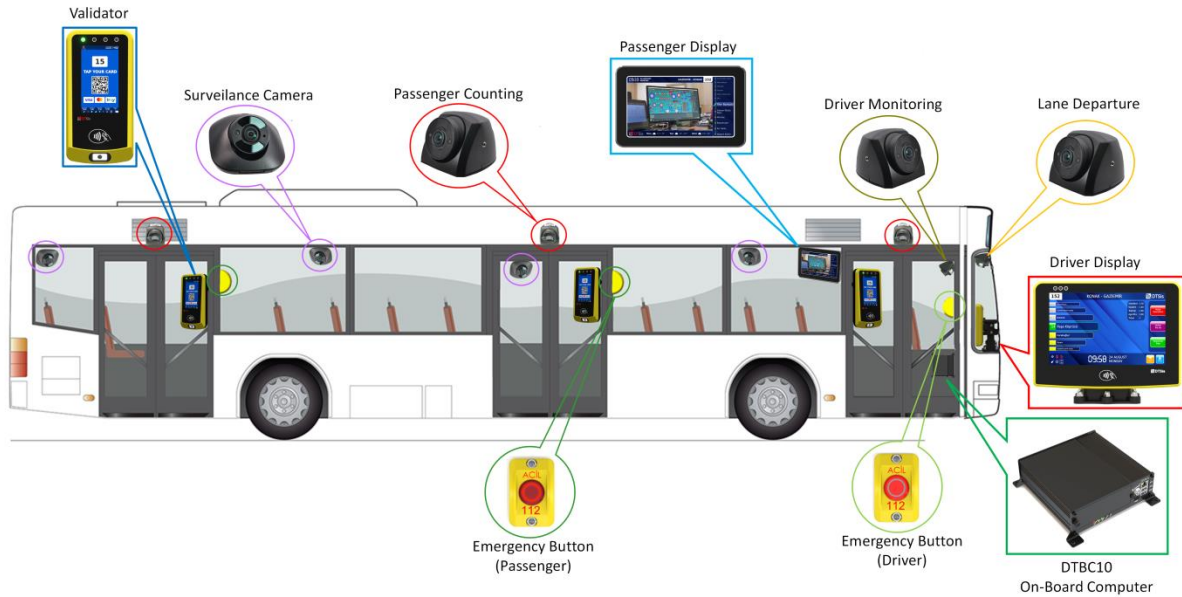
- On-board computer, typically providing:
 - System power management
 - Local communication and remote connectivity for validators and smart cameras
 - AVL (automatic vehicle location) service
 - Distribution of location (GNSS) data to validators and smart cameras
 - Control of passenger information displays/panels
 - Driver HMI through the driver display
- AFC Validators
- Driver display
- Passenger information displays/panels
- Video recording device and surveillance cameras (typically 2–8 cameras)
- Smart driver-monitoring camera (1 unit)
- Smart lane-departure camera (1 unit)
- Smart passenger-counting cameras (typically 2–4 cameras)
- Emergency buttons

DTBC10 introduces a more integrated and cost-effective approach. Thanks to its powerful processing capabilities, AI support, and extensive peripheral interfaces, DTBC10 can simultaneously perform the functions of both an on-board computer and a video recording system. In addition, driver monitoring, lane-departure detection, and passenger counting can be implemented using standard IP and/or analogue cameras, eliminating the need for separate dedicated smart cameras for each application. AI processing can instead be performed centrally by DTBC10.

With the DTBC10, the on-board system architecture can be simplified to:

- Validators
- Touchscreen driver and system-management display (driver display)
- Passenger information display panel(s)
- Standard cameras: driver-facing, road-facing, passenger-counting, and surveillance cameras
- Emergency buttons
- The DTBC10 provides the following functions:
 - System-wide power management
 - Local communication and remote connectivity for the validators
 - AVL (automatic vehicle location) service
 - Distribution of location (GNSS) data to the validators
 - Transmission of emergency-button events to the 112 Emergency system
 - Video recording for up to 16 standard IP/Analogue cameras (4 analogue + 12 IP)
 - Driving of passenger information display(s)/panel(s)
 - Driver HMI via the driver display
 - Lane-departure warning using the road-facing camera
 - Passenger boarding and alighting counting using cameras mounted above vehicle doors
 - Driver monitoring via the driver-facing camera, including:
 - Driver identity verification using facial recognition
 - Detection of driver distraction (eyes off the road)
 - Detection of driver fatigue (yawning, frequent blinking, or head nodding)
 - Detection of seat-belt non-use
 - Detection of mobile-phone use while driving
 - Detection of smoking

This consolidated architecture reduces equipment count, system complexity, installation requirements, and overall cost, while providing a flexible and scalable platform for modern public transportation applications.



These functions are enabled by the DTBC10's high-performance processing and memory architecture:

- CPU : 8 cores - 4 x Cortex-A72 + 4 x Cortex-A53
- NPU : 6 TOPS (INT8)
- GPU : ARM Mali-G52 MC3
- RAM : 2 GB / 4 GB
- Flash : 32 GB / 64 GB
- Codec : 4K @ 60 fps H.264/H.265 encoding and decoding

The DTBC10 supports up to 16 cameras: 4 analogue cameras and 12 IP cameras. Eight IP cameras can be connected through the built-in Ethernet switch, with up to four additional IP cameras connected through an external switch.

To enhance passenger safety and security, the DTBC10 provides high-frame-rate video recording and high-capacity storage of up to 4TB on an M.2 SSD. Support for up to 16 cameras enables comprehensive, high-quality monitoring of both the vehicle interior and its surroundings.

Support for both H.264 and H.265 video codecs reduces transmission bandwidth and improves storage efficiency. The DTBC10 can record up to 16 camera streams in real time at 1080p/25 fps. GNSS position, vehicle speed, and other critical vehicle data can also be overlaid directly on the recorded video.

The DTBC10 provides ten digital inputs. One input is dedicated to the vehicle ignition signal for power management. The remaining inputs can be assigned to alarm buttons, reverse-gear signals, vehicle door switches, or other vehicle signals. When configured, changes on these inputs can automatically trigger alarm recordings and/or event logs.

For fleet management, the DTBC10 supports remote real-time video monitoring using LTE Cat 4 connectivity and a multi-constellation GNSS receiver, enabling continuous operational visibility. It also interfaces with vehicle data and diagnostic systems via CAN bus.

The DTBC10 provides two independent video outputs. DisplayPort v1.4 over USB Type-C is intended for the driver display, while HDMI v2.1 can be used for the passenger information display.

The DTBC10 operates in conjunction with a server-based Video Management System (VMS), which provides desktop and web-based graphical user interfaces for management, monitoring, and reporting. The DTBC10 sends alarm and location data to the VMS, enabling rapid event reporting and fleet-wide supervision. Authorised operators can create video-wall views that combine live camera feeds with vehicle locations on a map. Live streams associated with predefined alarm events can be brought automatically to the foreground so that critical incidents receive immediate attention. The web interface also allows users to review historical video together with the corresponding vehicle location data.

With its 6 TOPS NPU, the DTBC10 can perform AI-based video analytics locally and generate real-time warnings and alarms for public-transport operations, including:

- Using a driver-facing camera:
 - Driver identification using facial recognition
 - Detection of driver distraction (eyes off the road)
 - Detection of driver fatigue (yawning, frequent blinking, or head nodding)
 - Detection of seat-belt non-use
 - Detection of mobile-phone use while driving
 - Detection of smoking
- Using cameras mounted above vehicle doors:
 - Bidirectional passenger counting (boarding and alighting)
- Using cameras monitoring the passenger area:
 - Detection of occupied and vacant seats
 - Identification of boarding and alighting passengers using facial-recognition technology
- Using a road-facing camera:
 - Lane-departure detection

The DTBC10 is designed for harsh public-transport environments and reliable operation under demanding electromagnetic and mechanical conditions:

- Automotive-grade connectors with secure locking mechanisms prevent accidental disconnection.
- Carefully selected automotive-grade components support a wide operating-temperature range.
- High-efficiency DC-DC converters provide stable power under fluctuating vehicle supply voltages while minimising heat dissipation.
- Integrated high-capacity supercapacitors maintain operation for up to 10 seconds after a sudden loss of power, helping protect critical recordings.
- A dedicated system and ignition-control MCU - a high-speed, deterministic microcontroller - handles time-critical hardware events independently of the main CPU.

For enhanced system reliability, the DTBC10 incorporates the following protection features:

- Reverse-polarity protection on the power input
- Overvoltage protection
- Overcurrent protection
- Transient-voltage suppression (TVS)
- ESD protection on all connectors and signal lines
- Overtemperature protection

2. Technical Specifications

Modül / Bileşen	Açıklama
OS	: Linux
CPU	: 8 cores - 4 x Cortex-A72 + 4 x Cortex-A53
NPU	: 6TOP/sec INT8
GPU	: ARM Mali-G52 MC3
Memories	: 2GB/4 GB LPDDR4 RAM : SD flash slot : 32GB/64GB e-MMC flash
System control MCU	: ARM Cortex M4F, 192MHz
Communication	: 10 x 100 Mbps Ethernet ports, 8 for IP cameras, one WAN, one for switch connection : 1 x USB Type-C, 3 x USB2.0 Type-A : 5G RedCap/LTE Cat.4/3G/GPRS/EDGE : 2 x RS-232 Ports : RS-485 : 2 x Can 2.0B ports : Wi-Fi 802.11b/g/n (optional I) : Bluetooth BT4.0 (optional)
Video encoder/decoder	: 4K @ 60 fps H.264/H.265 encoding and decoding
Video inputs	: 8 x IP cameras (1080p@30fps) : 4 x analogue camera (AHD, 1080p@30fps) : 4 x IP cameras over an external Ethernet switch (optional)
Video outputs	: HDMI v2.1, 4K/120fps : DP v1.2 over TypeC, 4K/120fps
Video storage	: M.2 NVME (PCIe) SSD (up to 4TB), with security lock protection
IR receiver	: 1 x IR remote control support
Indicators	: 6 x LED, : 1 buzzer
Audio output	: 1 x Audio Line Out
Digital inputs	: 1 optically isolated IGNITION input, : 10 optically isolated digital inputs
Digital outputs	: 3 x MOSFET outputs
Sensors	: GNSS receiver, GPS + GLONASS + BDS + Galileo + QZSS : temperature sensor, measure in-cabin temperature : 3D acceleration and Gyro sensor
Real Time Clock	: Lithium battery (CR1220)
Power supply	: Operating voltage: 9 ~ 33V DC : Super capacitor power support (measure against sudden power disrupts)
Consumption	: < 12 Watt
Operating t°	: -30C° ~ + 70C°
Storage t°	: -35C° ~ +80C°
Enclosure	Dimensions (mm): 190 x 193 x 59,3 Ağırlık (kg): 1,6 Material: Aluminium Anodic Oxidation Coating