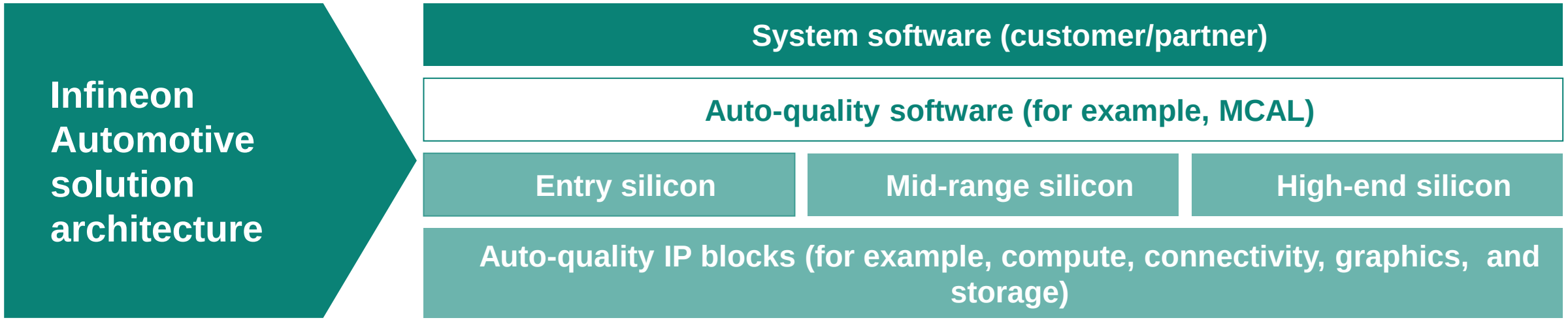
New product introduction
TRAVEO™ T2G Automotive solutions
Cluster

Q2, 2024

TRAVEO™ T2G key features

Infineon scalable platform solutions

- Deliver full range of silicon products per platform
- Enable OEM / Tier 1 SW reuse (consistent across platform, generations)
- Deliver best-in-class, auto-quality solution components
- Reduce risk: Infineon is an established Automotive Semiconductor supplier



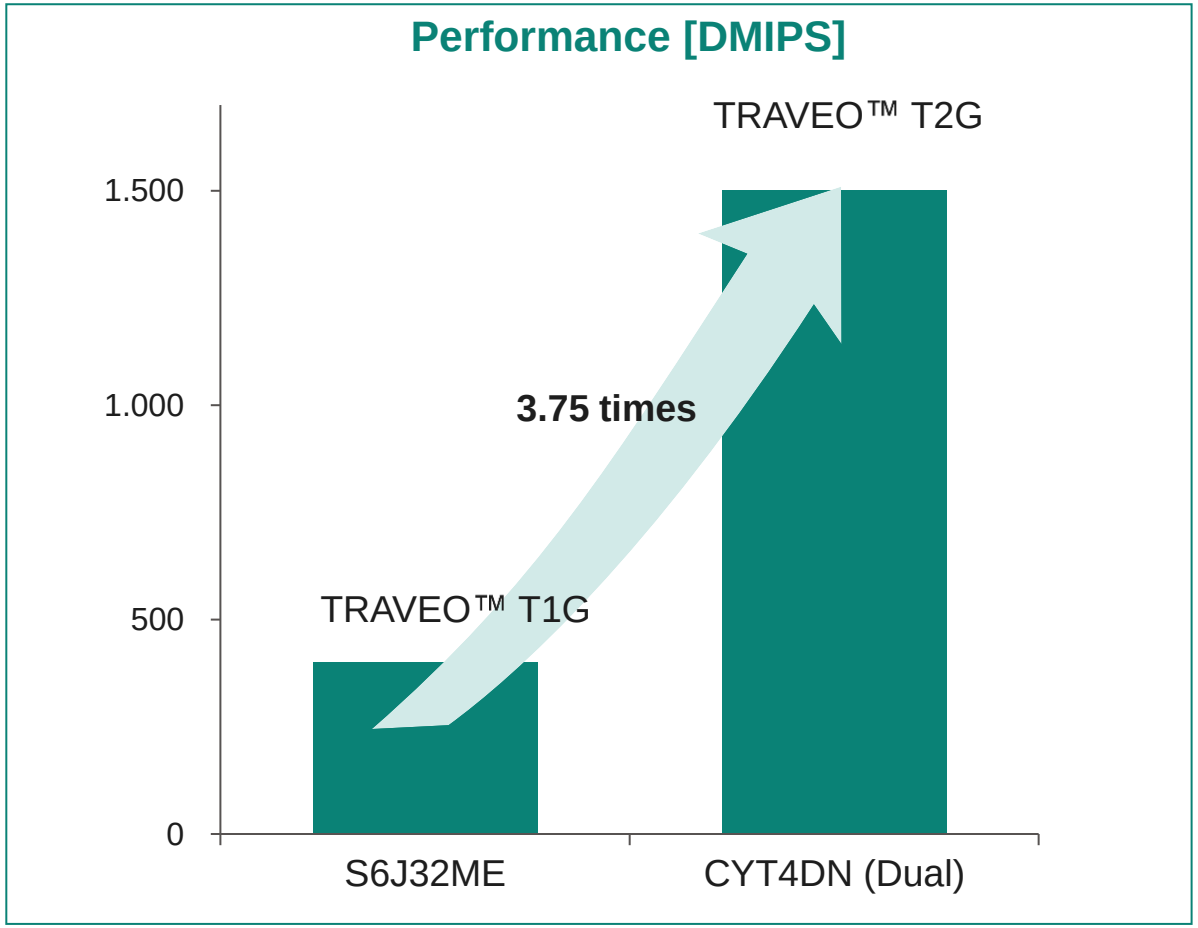
Key features TRAVEO™ T2G Cluster

[1] eSHE: enhanced secure hardware extension
[2] HSM: Hardware security module
[3] FOTA: Firmware update over-the-air
[4] RWW: Read while write
[5] Embedded multimedia card

Low-power	– Energy-efficient processing power
Performance	– Dual Arm® Cortex®-M7 – 1500DMIPS
Scalability	– Complete portfolio, – Memory density, – Package lineup and Performance
Safety	– ISO 26262 ASIL-B
Graphics Audio	– 2.5D graphics engine – Sound module, I²S/TDM, PCM-PWM and DAC
Security	– Hardware security module: HSM[2] – Evita full – ISO21434 ready
Connectivity	– LIN. CXPI SMIF – CAN FD – 1 Gb ethernet
Updatability	– FOTA[3] with RWW[4] flash – eMMC[5] – QSPI/HS-SPI

High-performance MCU

- Arm® Cortex®-M cores
  - Single M4 up to Dual M7
  - Dedicated M0+ for security
  - Performance up to 1500 DMIPS
- High-speed embedded flash with prefetch/cache
- Dedicated memory- and peripheral-DMA for CPU offloading
- Gigabit ethernet and CAN-FD for high-speed vehicle communication

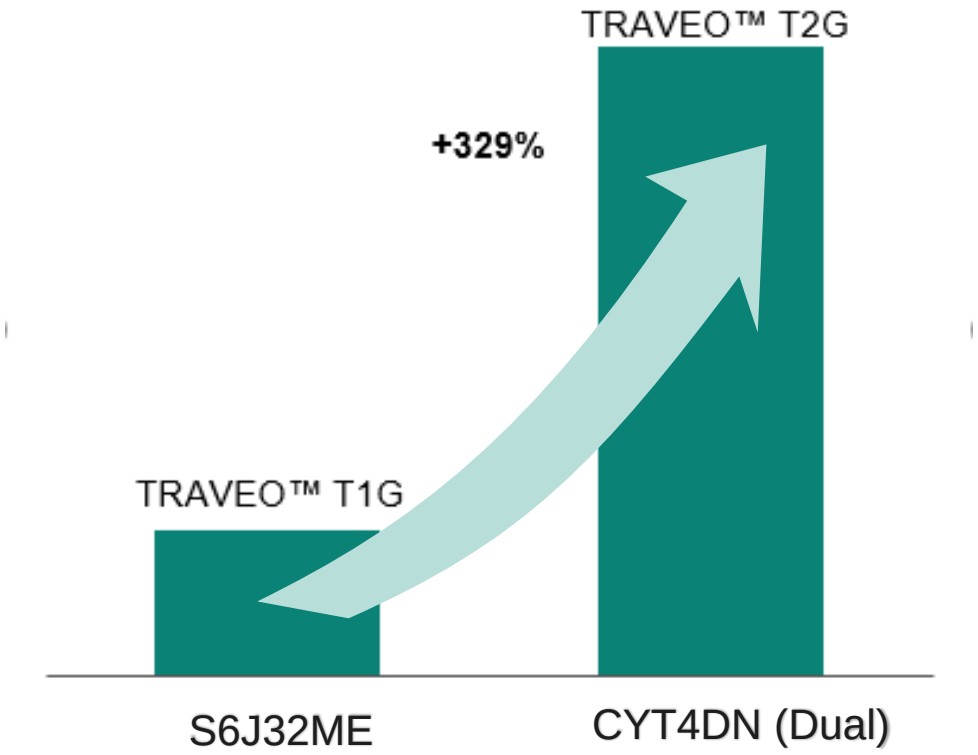


TRAVEO™ T2G provides world-class performance

Power efficiency

- +329% improvement in power efficiency
- More power saving modes
  - Low-power Active
  - Sleep
  - Low-power Sleep
  - Deep Sleep
- Deep Sleep mode as low as 50 µA (typical)

Power efficiency [DMIPS/mW]



TRAVEO™ T2G achieves world-class energy efficiency

CAN, LIN, ethernet – automotive networks

Infineon supports state-of-the-art in-vehicle communication

CAN-FD

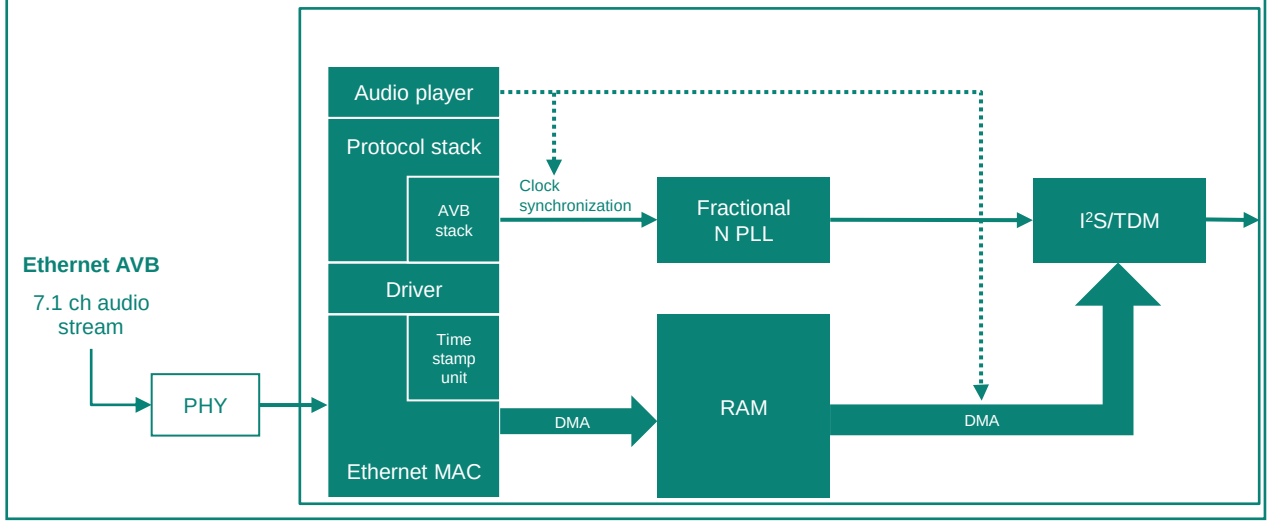
- Proven compliance to ISO11898-1 and ISO 16485
- implements the time-triggered CAN (TTCAN) protocol specified in ISO 11898-4 (TTCAN protocol levels 1 and 2) completely in hardware
- Maximum 8 Mbps supported
- Fully retained in Deep Sleep mode
- Shared message RAM with ECC protection
- DMA access to receive FIFOs

LIN

- LIN protocol support in hardware according to ISO 17987
- Master and slave functionality
- Autonomous header transmission/reception
- Autonomous response transmission and reception
- Message buffer for PID, data, and checksum fields

Ethernet

- 10/100/1000 Mbps ethernet MAC compatible with IEEE 802.3 and IEEE-1588 PTP
- Support of MII, RMII, and RGMII PHYs
- DMA interface
- Supports ethernet AVB and integrates fractional PLL for clock synchronization
- Supports full-duplex data transport using external PHY devices



TRAVEO™ T2G use case: Firmware over-the-air (FOTA) update

Cloud

Ethernet

HTTPS[1]/TLS[2]

External memory interface for storing update image

HSM for OTA client, secure communication, and authentication of the updated image

Gateway, Telematics

CAN-FD

Autosar SecOC[3]

Secure high-speed bulk data transfer

HVAC system

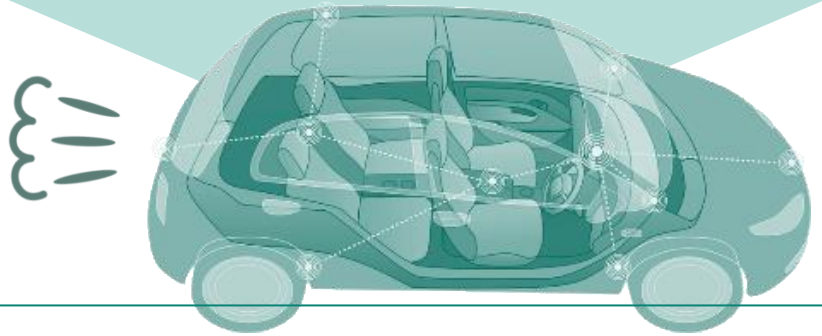
Dual bank flash for storing both the updated image and rollback image with read while write operation

Body control module

HSM for secure communication and flash loader

TRAVEO™ T2G HSM protects FOTA and assures authenticity

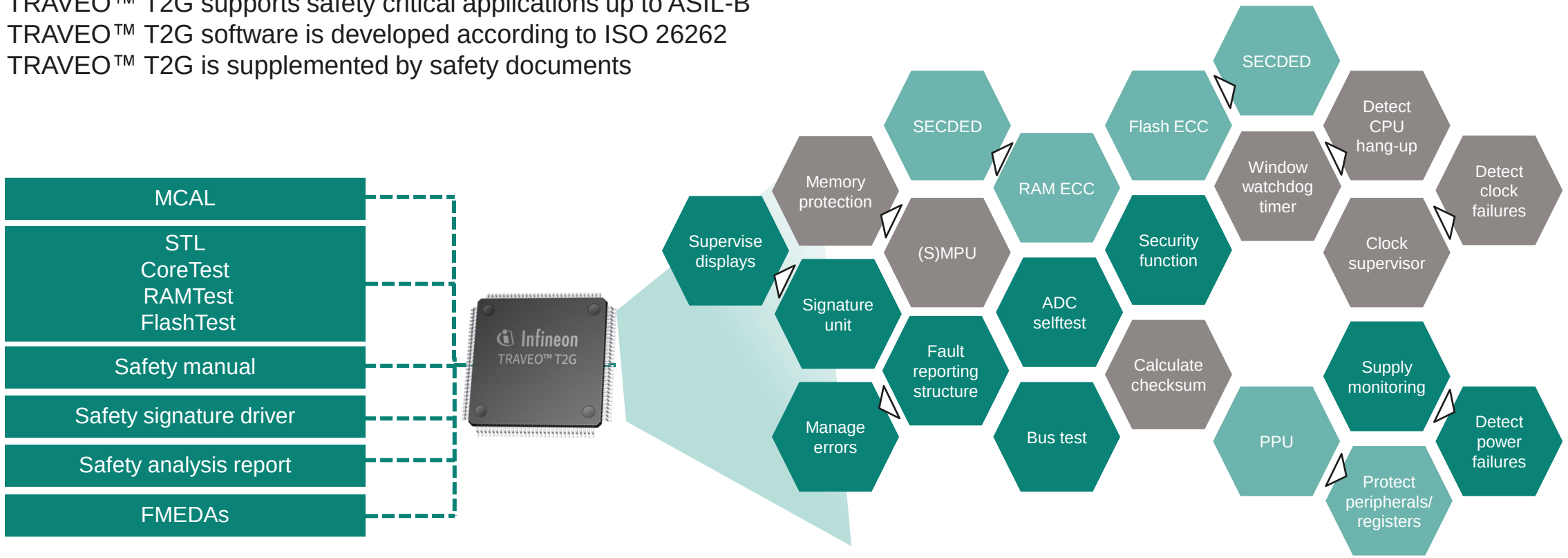
Extra-vehicle/in-vehicle network



[1] HTTPS: Hypertext transfer protocol secure
[2] TLS: Transport layer security
[3] SecOC: Secure onboard communication

Functional safety: A holistic system-level approach

- TRAVEO™ T2G is an ISO 26262 safety-element-out-of-context product
- TRAVEO™ T2G supports safety critical applications up to ASIL-B
- TRAVEO™ T2G software is developed according to ISO 26262
- TRAVEO™ T2G is supplemented by safety documents



TRAVEO™ T2G offers safety hardware, software, and documents

Functional safety with TRAVEO™ T2G

– Infineon provides the following support for enabling safe applications with TRAVEO™ T2G

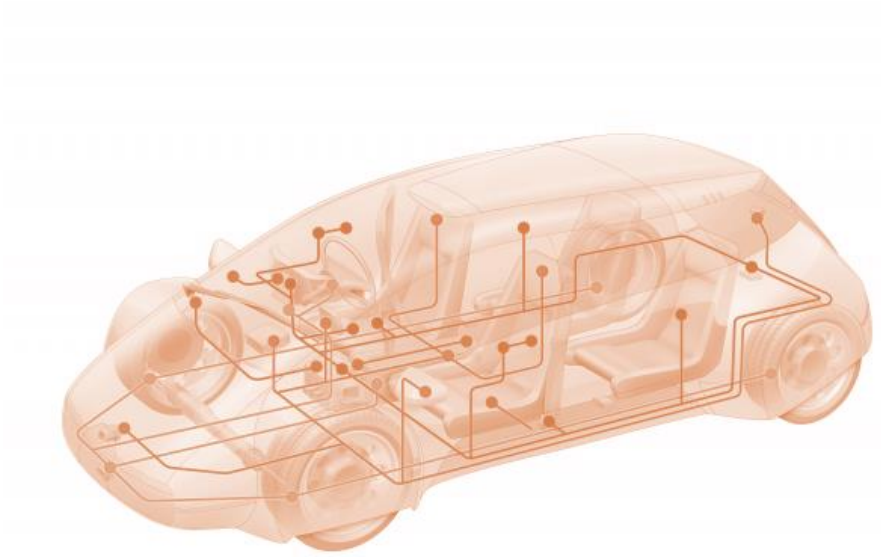
– These documents help to achieve functional safety at the system level
– Requirements have been derived to detect potential failure modes and to achieve the hardware architectural metrics for ASIL-B

Automotive security

ADAS, autonomous driving, and new digital service models require authentication and secure communication
TRAVEO™ T2G integrates HSM to support secure applications

Connected car at security risk

- Wiretapping
- Disguised identity
- Privacy/identity theft
- Unauthorized feature activation
- Unauthorized tuning
- Unlocking speed limit
- Forgery of driving record
- Hardware/property theft
- Manipulation of safety mechanism

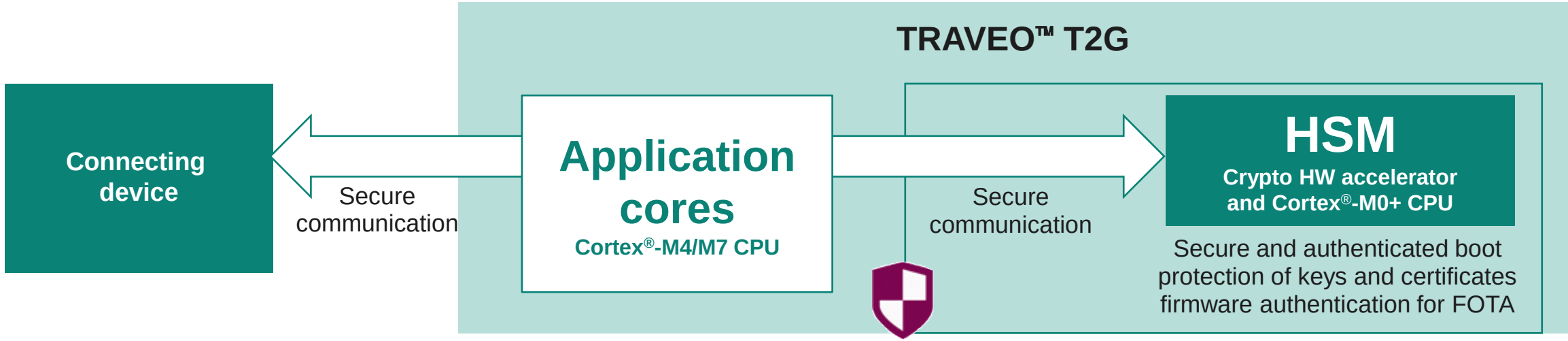


TRAVEO™ T2G keeps connected car secure

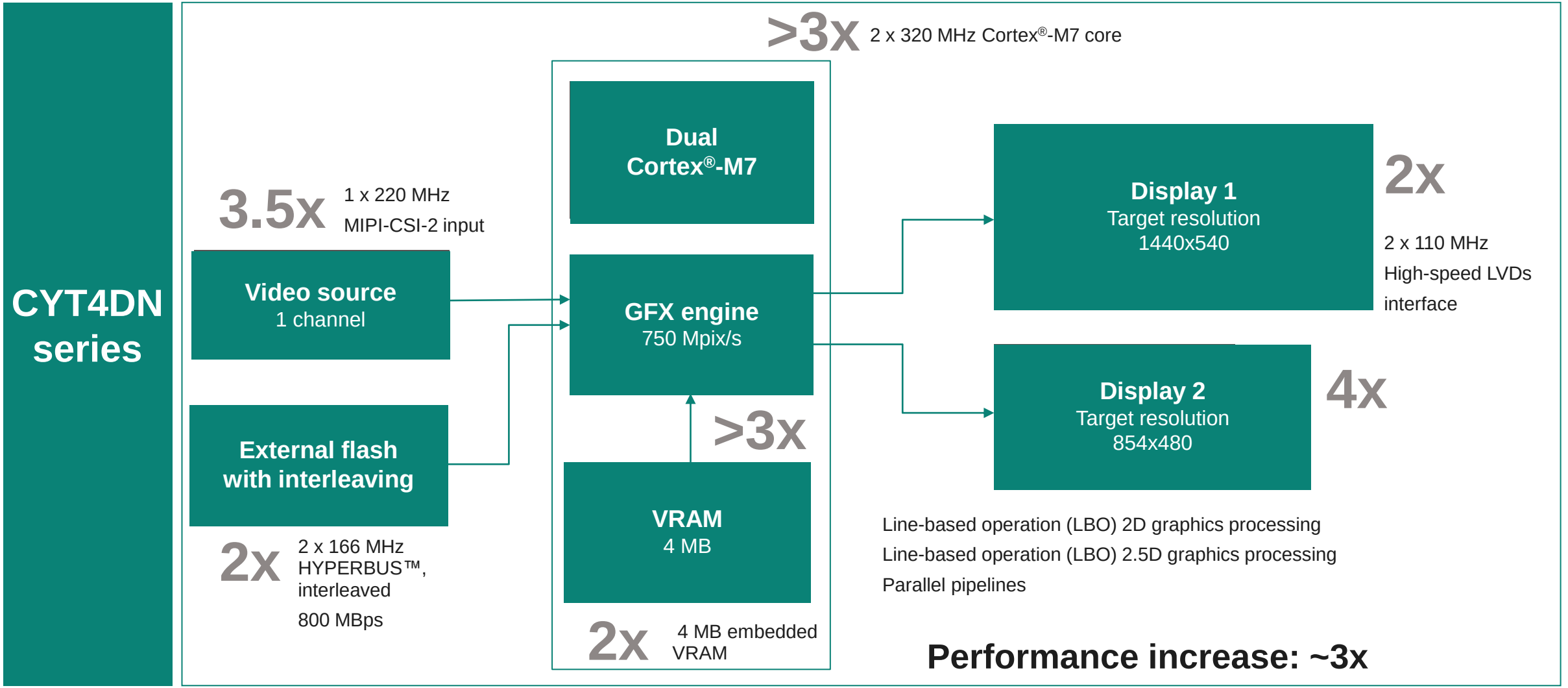
TRAVEO™ T2G HSM for security

- Root-of-trust boot ROM and chain-of-trust boot firmware
  - Ensure establishment of hardware isolation between secure and non-secure applications
  - Enable fast authentication of ECU software during secure boot

- Flexible configuration of secure domain for efficient resource utilization
- Generation and storage of device-unique secret AES keys

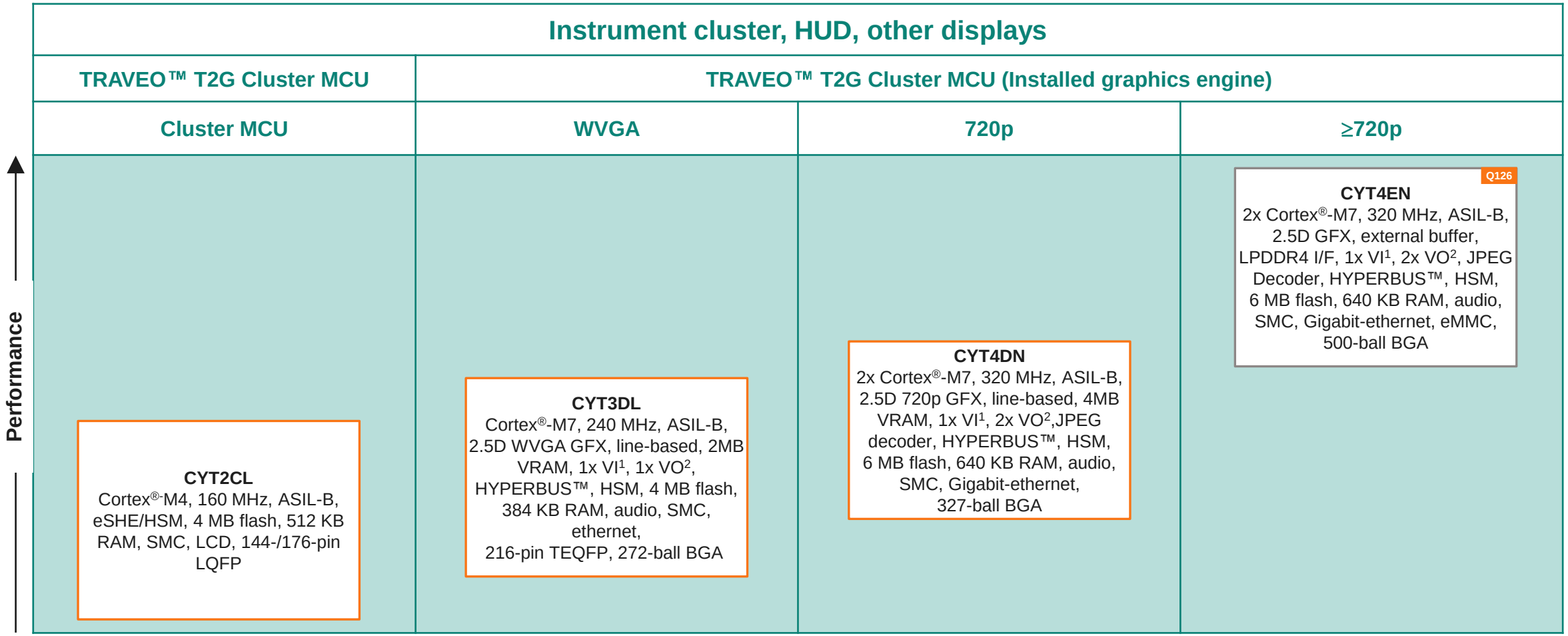


TRAVEO™ T2G graphic performance vs. TRAVEO™ T1G



TRAVEO™ T2G product lineup

TRAVEO™ T2G cluster MCU portfolio



[1] VI = Video input
[2] VO = Video output

Automotive: Concept | Development | Sampling | Production
Availability: QQYY | QQYY

TRAVEO™ T2G Cluster portfolio scalability

Family	Flash memory Size	Pin count: LQFP/TQFP 144-pin	LQFP/TQFP 176-pin	LQFP/TQFP 216-pin	BGA 272-ball	BGA 327-ball	BGA 500-ball
CYT4EN	6 MB DDR	High-end with graphics					640 KB*
CYT4DN	6 MB					640 KB* 4 MB**	
CYT3DL	4 MB			384 KB* 2 MB**	384 KB* 2 MB**		
CYT2CL	4 MB	512 KB* -	512 KB* -				Entry

Legend: * RAM
** VRAM

Common SW

Software offering

- MCAL[1]
- STL[2]
- FEE[3]

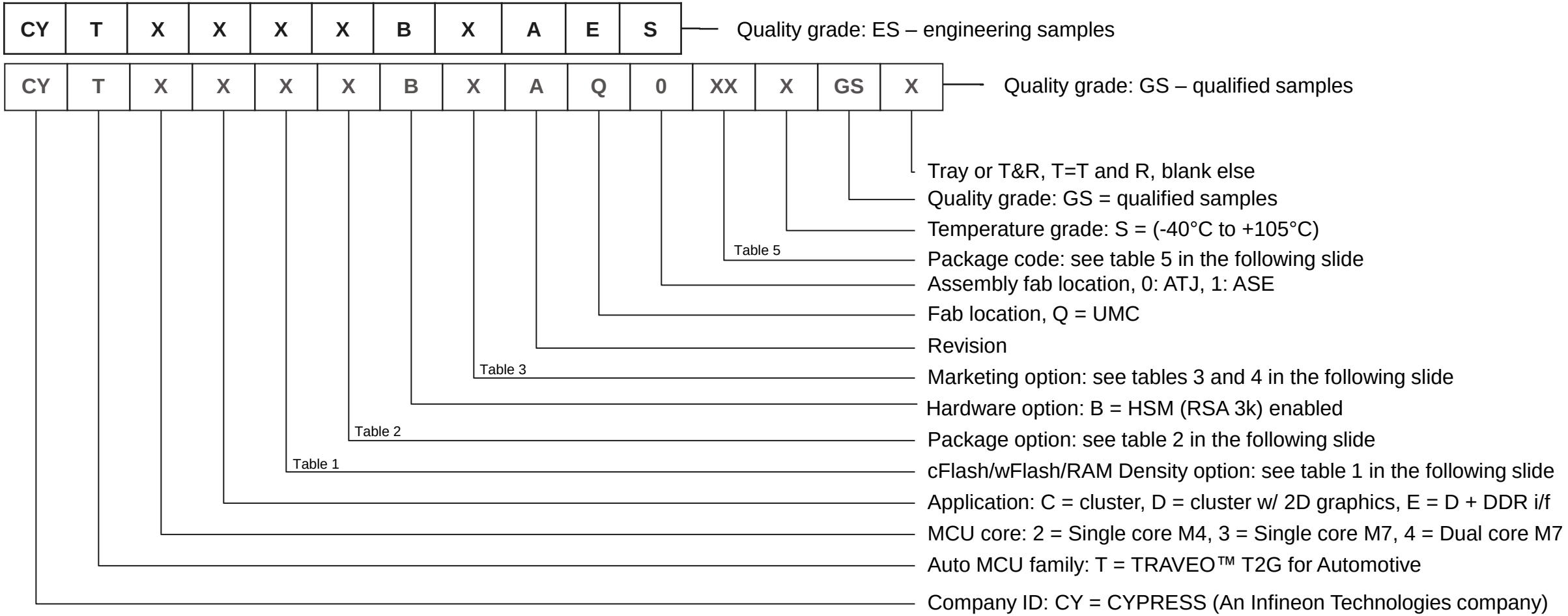
Additional:

Graphics driver

[1] MCAL: microcontroller abstraction layer
[2] STL: Self-test library
[3] FEE: Flash EEPROM emulation

TRAVEO™ T2G on-the-fly and line-based graphics reduces memory footprint

TRAVEO™ T2G cluster MCU ordering code decoder



Note: Not all combinations listed in the above decoder will be available. A list of orderable part numbers will be defined later and documented in the related datasheets.

TRAVEO™ T2G Cluster MCU ordering code device options

Table 1: Code flash/work flash/RAM density option

Item	Density for cFlash/wFlash/RAM
L	4MB/128KB/512KB (CYT2CL series)
L	4MB/128KB/384KB (CYT3DL series)
N	6MB/128KB/640KB

Table 2: Package codes

Code	Package type
AE	TEQFP
AZ	LQFP
BZ	BGA

Table 3: Package options*

Item	Package
5	100 pins, 0.5 mm pitch
7	144 pins, 0.5 mm pitch
8	176 pins, 0.5 mm pitch
A	216 pins, 0.4 mm pitch
B	272 balls, 0.8 mm pitch
D	500 balls, 0.8 mm pitch
H	144 pins, 0.4 mm pitch
J	327 balls, 0.8 mm pitch

*: Not all package options are available for all devices

TRAVEO™ T2G Cluster MCU ordering code device options

Table 4: Marketing option**

Marketing options	JPG decoder	DAC	MIPI	Device option (Table 5)	CYT2C	CYT3D	CYT4D	CYT4E
A	no	no	no	no	X	X	X	X
B	no	no	no	yes		X	X	
C	no	no	yes	no		X	X	X
D	no	no	yes	yes		X	X	
E	no	yes	no	no		X	X	X
F	no	yes	no	yes		X	X	
G	no	yes	yes	no		X	X	X
H	no	yes	yes	yes		X	X	
J	yes	no	no	no			X	X
K	yes	no	no	yes			X	
L	yes	no	yes	no			X	X
M	yes	no	yes	yes			X	
N	yes	yes	no	no			X	X
P	yes	yes	no	yes			X	
Q	yes	yes	yes	no			X	X
R	yes	yes	yes	yes			X	

Table 5: Device options

	Allowed device options	
Device	Option no	Option yes
CYT2CLxxx	No device options	
CYT3DLxxx	1 x Video-out	2 x Video-out
CYT4DNxxx	1x SMIF	2 x SMIF
CYT4ENxxx	No device options	

** All options shown here may not be available on the packages. Contact your Infineon sales representative for details on specific packages.

TRAVEO™ T2G ecosystem

Comprehensive tools, kits, and software

Software

- Header files and sample driver libraries (SDL)
- AUTOSAR MCAL 4.2.x
- Self test libraries
- Graphics software

Third-party software IDEs

- Green Hills Multi and IAR Embedded Workbench
- iSYSTEM debug and test environment und DTS development environment

Third-party debug hardware

- Green Hills and SuperTrace probe
- IAR I-jet debugging for Arm® Cortex®-M
- Lauterbach

Hardware

- Evaluation board
- Lite KIT

Functional safety

- Safety manual
- FMEDAs

Evaluation board

- Third-party HMI tools
- Third-party HSM software

Other support from Infineon

- SPICE-verified software services and JTAG flash programming
- Auto Flash Utility

Extensive Infineon and partner development resources simplify system integration

TRAVEO™ extensive Kit ecosystem
Something for every design adventure and budget!

TRAVEO™ T2G Cluster Entry

- Develop and test the key functionalities provided by TRAVEO™ T2G Cluster entry such as User **Switch**, User **LED**, and **UART** communication

› CYTVII-C-E-4M-176-CPU

TRAVEO™ T2G Cluster High

- Design and Debug easily the T2G-C 2D devicese
- **Graphics** Driver
- **MJPEG**, **Ethernet**, **Audio** interface, **Display** interface, HyperFlas/RAM
- Purchasable as **SET** or independently

› CYTVII-C-2D-4M-216-CPU
› CYTVII-C-2D-4M-216-SET
› CYTVII-C-2D-6M-327-CPU
› CYTVII-C-2D-6M-327-SET
› CYTVII-C-2D-6M-DDR-CPU
› CYTVII-C-2D-6M-DDR-SET

TRAVEO™ T2G Cluster Low cost kits

- **Low-cost**
- **Easy to use** evaluation board based on the TRAVEO™ T2G body **Entry/High** families **Ethernet**, **Arduino, mikroBUS.**
- Supported by our **Certified HMI tool partners** (only for the high)

› KIT_T2G_C-2D-4M_LITE ***new***
› KIT_T2G_C-2D-6M_LITE ***new***

TRAVEO™ T2G Lite kits supported by ModusToolbox™

TRAVEO™ T2G Lite kits

KIT_T2G_C-2D-4M_LITE

Fully supported by ModusToolbox™
Supported by our HMI tool partners

KIT_T2G_C-2D-6M_LITE

Fully supported by ModusToolbox™
Supported by our HMI tool partners

ModusToolbox™ in 3Q 2024

ModusToolbox™ Software is a modern, extensible development ecosystem supporting a wide range of Infineon microcontroller devices, including **PSoC™ Arm® Cortex® Microcontrollers**, **TRAVEO™ T2G Arm® Cortex® Microcontroller**. Provided as a collection of development tools, libraries, and embedded runtime assets, ModusToolbox™ Software is architected to provide a flexible and comprehensive development experience

- User Manual
- Getting Started
- ModusToolbox™ Product Presentation
- GitHub
- Community Support

TRAVEO™ T2G Preferred Design Houses

TRAVEO™ T2G preferred design houses

Our TRAVEO™ T2G preferred design houses is a trusted partners' ecosystem that extends the support force by tailoring their know-how to meet your specific needs.

By partnering with one of our qualified preferred design houses, you can be assured that you'll receive expert advice and customized support to help you achieve your goals. Our team of professionals brings added value to customer service, working together to optimize your design and help you succeed in your business objectives.

We understand that every customer is unique, which is why we offer tailored solutions to meet your specific needs. From product-specific support to application-specific advice, our preferred design house is fully trained to use TRAVEO™ T2G and provides a wealth of knowledge and expertise to help you succeed.

Together with our partners, we offer optimized customer support for systems using our products. Our preferred design houses are committed to delivering exceptional service and support to ensure your success

	Supported Products		Supported Region(s)					
PDH	TRAVEO™ Body	TRAVEO™ Cluster	Global	EMEA	AMR	JP	GC	AP
Altia		x	x					
Avin Systems		x		x				x
Candera		x	x					
Embedded Office	x	x		x				
Embien Technologies		x						x
Elektrobit Automotive GmbH	x	x	x					
G-pulse							x	
Hightec	x	x	x	x				
Hitex	x	x	x	x				
L4B software		x		x				
Macnica	x	x				x		
Neutron Controls	x	x			x			
QT		x	x					
Revotech	x	x						x
Siili Auto		x		x				
Techrein	x	x						x
Tekall							x	

TRAVEO™ T2G software offering overview

AUTOSAR 4.2.2 SW (ASIL-B)

- MCAL[1]: MCU[2], ADC[3], ICU[4], GPT[5], PWM[6], WDG[7], OCU[8], CAN[9], LIN[10], SPI[11], FLS[12], DIO[13], and PORT
- STL (Self-test libraries): core test, flash test, and RAM test
- FEE (EEPROM emulation)
- Complex device drivers for I^2C, UART, program flash
- Multi-Core extension for MCAL, offering ASR 4.4 type II multi-core support for selected modules

Graphics software

- Graphics driver, JPEG driver, safety signature driver, “ResourceGenerator.exe”
- TRAVEO™ T2G tool suite (warping calibrator), dynamic warping library

Sample driver library (SDL)

Software services/customization

- Infineon SW teams have leading expertise in the fields: AUTOSAR, graphics, functional safety, and security
- Customized SW modules available upon request

[1] MCAL: Microcontroller abstraction layer
[2] MCU: Microcontroller
[3] ADC: Analog digital converter
[4] ICU: Input capture unit
[5] GPT: General purpose timer
[6] PWM: Pulse width modulation
[7] WDG: Watchdog
[8] OCU: Output compare unit
[9] CAN: Controller area network
[10] LIN: Local interconnected network
[11] SPI: Serial peripheral interface
[12] FLS: flash
[13] DIO: Digital input/output

Compiler/programmer/debugger/probes for TRAVEO™ T2G

Vendor	SW tool	Compiler	Programmer	Debugger	ETM trace via SWD/JTAG[1])	Trace via TPIU (4 pins)	Debugger I/F
IAR	IAR Embedded Workbench	Yes		I-jet		No	SWD/JTAG
IAR	IAR Embedded Workbench	Yes		I-jet trace			SWD/JTAG/TPIU
Lauterbach	PowerView	No[2]		µTrace			SWD/JTAG/TPIU
Lauterbach	PowerView	No[2]		PowerDebug USB 3 + Cortex®-M debug cable		combined with CombiProbe	SWD/JTAG/TPIU
Lauterbach	PowerView	No[2]		PowerDebug Pro + Cortex®-M debug cable		combined with CombiProbe	SWD/JTAG/TPIU
Green Hills Software	Multi	Yes		Green Hills Probe		No	SWD/JTAG
Green Hills Software	Multi	Yes		Green Hills SuperTrace Probe			SWD/JTAG/TPIU
iSYSTEM	WinIDEA	No[2]		iC5000			SWD/JTAG/TPIU
iSYSTEM	WinIDEA	No[2]		iC5700			SWD/JTAG/TPIU
Dts Insight	microVIEW-PLUS	Arm® DS MDK-ARM	adviceXross NETIMPRES	adviceXross			SWD/JTAG/TPIU

[1] Check with the tool vendor for the exact trace support feature and the latest status of handling of TVT2G MCUs
[2] Vendor does not offer own compiler

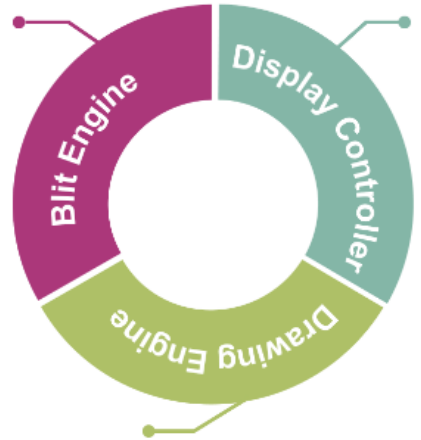
Infineon's HMI tool certification program

- Infineon defined a list of key features the tool partner must support within its HMI tool. The requirements demand hardware-based rendering – software-based rendering does not take place
- By implementing the reference HMI, our partners have shown that they support the hardware capabilities of our MCU in their HMI tool in the best possible way
- The program requires the implementation of two demos. A full virtual dashboard demo (1920*720) and a dual-display head-up solution demo (2x 800*480)

OTF: "On-the-fly" (Line-based operation to display)

Line & Frame based rendering

- Blending
- Rotation
- Blitting
- Scaling
- Decompression
- Warping



Text rendering

Vector rendering

Dual display support

- Warping (HUD)

Layer composition

- OTF rendering
- Decompression
- Blending

Scaling

myInfineon collaboration platform for TRAVEO™ T2G

Access to additional technical documentation:

By registering in the myInfineon collaboration platform (MyICP), you can get access to add-on technical documentation, trainings, tools, and much more for all TRAVEO™ T2G devices.

How to get access:

If not already available, please create a myInfineon account on www.infineon.com. Please contact traveo@infineon.com and request access to TRAVEO™ T2G myICP.

Link to TRAVEO™ T2G MyICP


Infineon