# UNLOCK YOUR DESIGN POTENTIAL WITH THE NEW HIGH PERFORMANCE AM273X MCU

## New Product Update

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## **Agenda**

- Sitara AM2x high performance MCU platform overview
- Key capabilities of the AM2732
  - -Spec
  - -Strengths and target application overview
  - -Family scalability, compatibility, migration options
  - -Getting started

### **AM2x** Tl's portfolio of scalable high-performance MCUs

AM2x combines



- MPU performance: single-core 400MHz up to multi-core 800Hz MCUs
- MCU ease-of-use/flexibility with large & fast integrated RAM with dedicated flash interfaces
- System-level integration (Networking, Signal Processing, Real-time Control, Power conversion IP, Safety, Security, AUTOSAR)

AM2x scalability



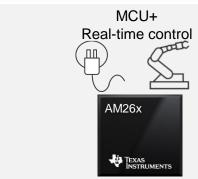
- Unified platform with industrial and automotive grade qualification
- Broad range of applications supported with optimized derivatives per market
- **SW-compatible** scalability in AM2x portfolio **and** to TI industrial and automotive processor MPUs

#### MCU+ Networking

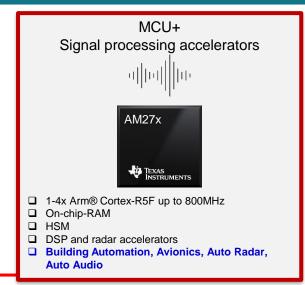




- ☐ 1-4x Arm® Cortex-R5F up to 800MHz
- ☐ On-chip-RAM & DDR option
- ☐ HSM & crypto
- Pre-integrated industrial protocols, Ethernet switch, CAN-FD, LIN, PCIe
- ☐ Factory Automation & Control, Robotics, Networking Hubs

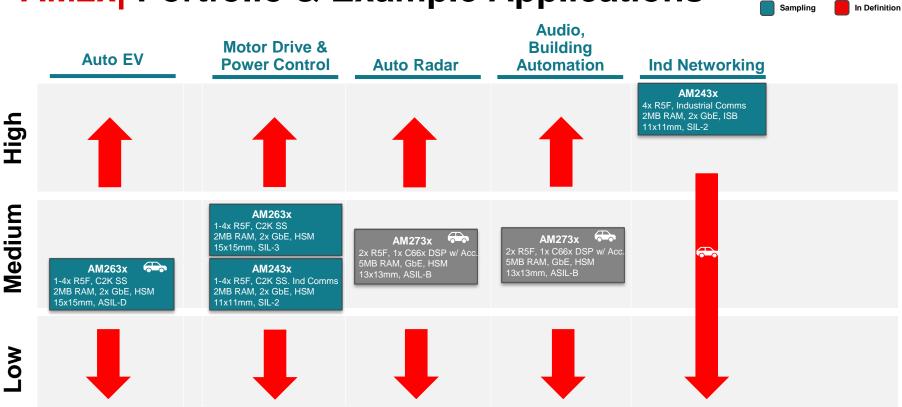


- ☐ 1-4x Arm® Cortex-R5F up to 400 MHz
- On-chip-RAM
- ☐ HSM & crypto
- Pre-integrated industrial protocols, leading real-time control integration
- Motor Control, Robotics, Grid Infr, Traction Inv + Host. Powertrain





## **AM2x** Portfolio & Example Applications



Development

Production

### AM2732 C66x DSP+ARM with Security

#### Cores & Memory

- 1x C66x DSP up to 450 MHz 32K L1P, 32K L1D, 384K L2
- 1x ARM Cortex R5F lock-step up to 400 MHz, 16K I-Cache, 16K D-Cache, 64K TCM, 960KB L2
- 3.5625 MB L3 w/ ECC

#### Peripheral/IO Highlight

- 3x McASP
- Audio Tracking Logic (ATL)
- 2x CAN-FD, 4x UART, 3x I2C, 4x SPI, 3xEPWM, 1x ECAP, 2xCSI-2 4L
- 10/100 EMAC
- 1x QSPI 80MHz SDR
- 1x 8Ch ADC

#### Security

 Hardware Security Module (HSM) supporting Secure Boot, Crypto Hardware Accelerators, RNG

#### Power Management

- Typical Power: 1.5 2W
- Simplified power management
- Dual voltage digital IO support (1.8V and 3.3V)

#### Temperature Range

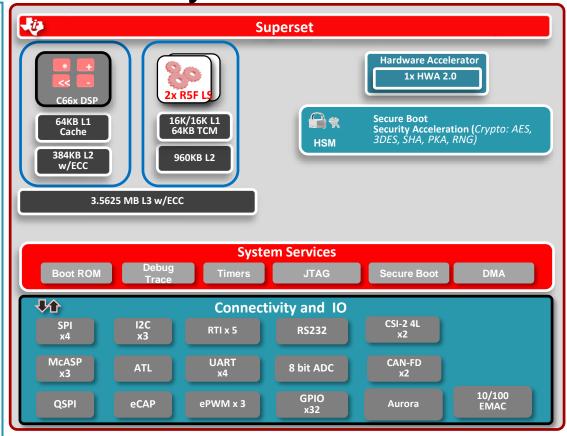
- Tj: -40 to 140C Automotive -
- Tj: -40 to 105C Industrial
- Enhanced temperature variant in development

#### Package

- 13x13 mm\* or 15x15mm, 0.8mm (BGA)

#### Availability

- In Production





## AM2732 | Example Applications Note: just some key EEs, not limited to this list

#### **INDUSTRIAL**

#### **AUTOMOTIVE**





**Building Automation/ Occupancy Detection** 



Low End Machine Vision



Robotics

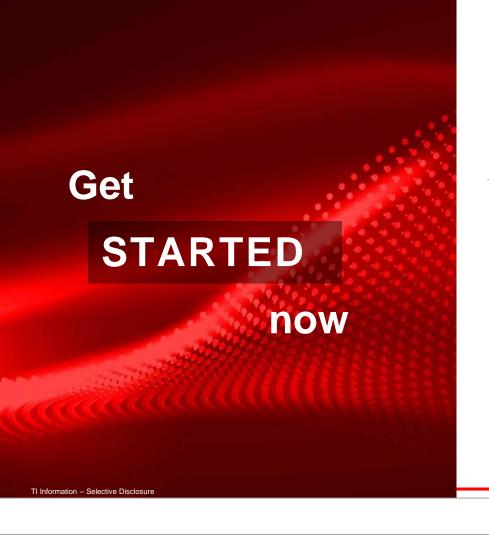




**Premium Audio Amplifier** 



Auto Radar





MCU+ <u>SDK</u> is available NOW on ti.com

Resource Explorer support

MCU+ Academy support



**TMDS273GPEVM** available now!

**EVM schematic and layout** available **NOW** 



AM2732 samples available NOW

TEXAS INSTRUMENTS

## MCU+ SDK | Benefits for the end user

















#### MCU Simplicity

- Simple drivers with GUI configuration tool
- 110+ examples to run and debug with CCS
- Multi-Core Bootloader examples included



#### MCU Optimized

- Low Latency Drivers
- Low Memory Usage
- •No-OS or FreeRTOS



#### Tools

- SysConfig Tool
- •MCU+ Academy
- •TI Resource Explorer
- •TI Arm CLANG compiler
- •CCS + FreeRTOS live debugging
- Board flashing tools



#### Libraries

- •TinyUSB, LwIP, TSN
- Industrial Networking Stacks Integrated
- Motor Position Encoders and Control Algorithms
- •Inter-Processor Communication (IPC)



#### Security & Safety

- Secure Boot
- Crypto Acceleration
- IPSec and TLS
- AutoSAR ready
- Pre-Integrated SafeRTOS (3P)
- •SDL Safety Diagnostics Library

## Tools | MCU+ Academy

Easy-to-use training modules for Sitara MCU developers

- AM273x EVM Quick Start Guide
- SDK Setup Guide with LED Blink Example
- Lean MCU+ SDK Fundamentals
  - Projects and files structure
  - SysConfig Tool
  - Adding Drivers
  - Linker file, Multicore example
  - Debugging, Flashing tools
- Learn Advanced Topics
  - Benchmarking (CMSIS with Cycle Counter)
  - Multicore communication
  - Direct Memory Access

MCU+ Academy

The MCU+ Academy is a great resource for developers to learn about the Sitara™ MCU Platform

### Sitara MCU | Debug and trace tools

- Code composer studio from TI (free download)
  - Eclipse based IDE
  - C6x, R5F, M4F debug and trace via JTAG
    - single step, breakpoint, watch point, disassembly
  - FreeRTOS aware (Real-time Object View ROV)
  - Powerful scripting via Debug Server Scripting (DSS)
  - Access to system memory and peripheral registers through Debug Access Port
  - Multicore debugging
  - Multiprocessor debugging

- Support C6x, ARMv7 (R5F, M4F)

TRACE32 from Lauterbach

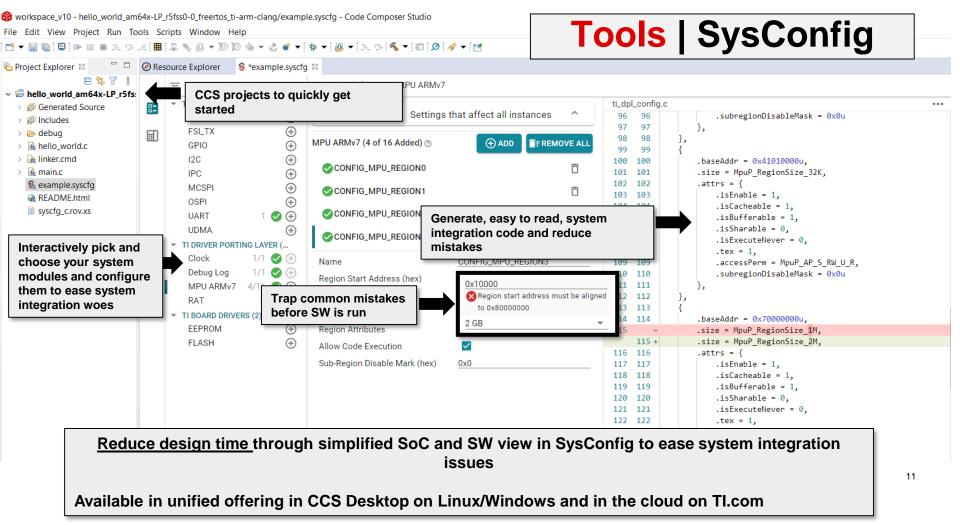
- OS aware debugging FreeRTOS, AutoSAR
- Powerful script language
- Easy high-level and assembler debugging
- Support for CoreSight components like Debug Access Port, Trace Funnel, Trace Port Interface Unit, Embedded Trace Buffer, Cross Trigger Interface, Cross Trigger Matrix, System Trace Port, Trace Memory Controller
- Real-time access to system memory and peripheral registers through Debug Access Port without halting the core
- Multicore debugging
- Multiprocessor debugging
- Safety tool kit and certifications making them useable for ISO 26262 and DO-178C

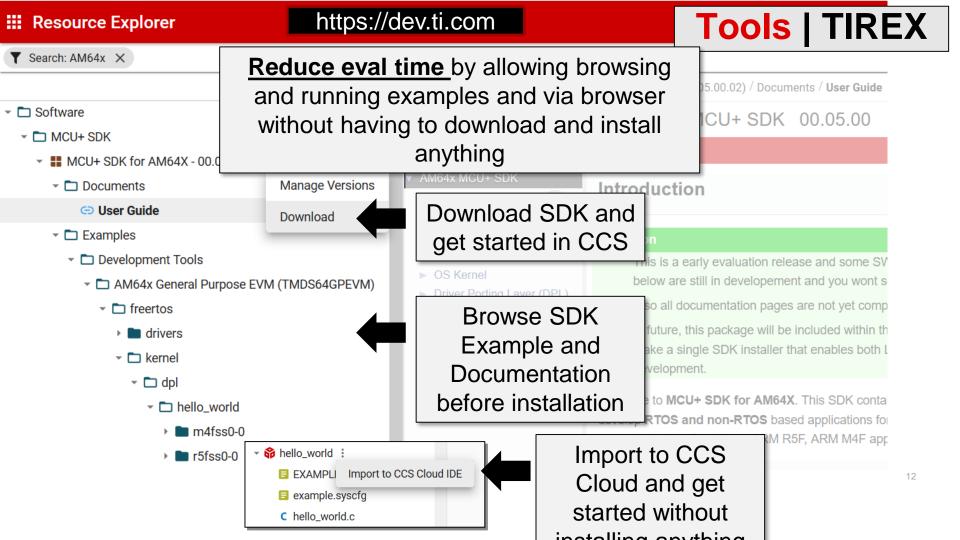




http://www.ti.com/tool/download/CCSTUDIO

www.lauterbach.com/ Search for CHIP = TI





### **AM2732** Key Strengths

#### High Performance MIPS Processing

- 2x 400MHz Cortex R5F (up to 1.6K DMIPS)
- 1x C66x DSP (14.4 GMACs)
- Efficient RAM Architecture
- External flash → memory flexibility

#### Connectivity

- 10/100 ENET, CSI-2, Aurora (debug)
- CAN-FD for automotive and industrial
- McASP (I2S) for Audio

#### Safety

- ECC memory, Redundancy, HW BIST, Watchdog, Temp/Voltage/Freq monitors etc.
- ASIL-B safety
- Compliance Support Package,
   Software Diagnostic Library, Safety
   Manual, FMEDA support....



#### Strong Software Support

- No NRE/License fees for software delivered by TI
- MCU+ SDK on ti.com
- TI Resource Explorer for a one-stop development location
- MCU+ Academy easy-to-use training modules ranging from the basics of getting started to advanced development topics
- Free MCAL drivers for AUTOSAR support

#### Robust Security

- HSM supporting Secure Boot, Run-time security (encryption/decryption), IP protection & validation, FOTA support
- AES (up to 256 but) and PKA (RSA up to 4096 bit / ECC up to 521 bit) HW acceleration
- SHA (hash) support
- TRNG

#### Scalability

- Different feature set configurations available
- Pin compatible

#### Supply Reliability

- Supply chain diversity
- Dual sourced across mfg flow wafer fab, test, packaging
- Continued investment in wafer fab, test facilities



## **AM2732** Memory Architecture

Subsystem	L1	L2	L3
C66x DSP	64 KB	384 KB	3648 KB Bank#0 – Bank#2: 1024 KB each Bank#3 – 576 KB
R5F MCU	32 KB Cache 64 KB TCM	960 KB	
HSM	64 KB ROM 192 KB RAM 10 KB Secure RAM		

## Visit <u>www.ti.com/npu</u>

For more information on the New Product Update series, calendar and archived recordings



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