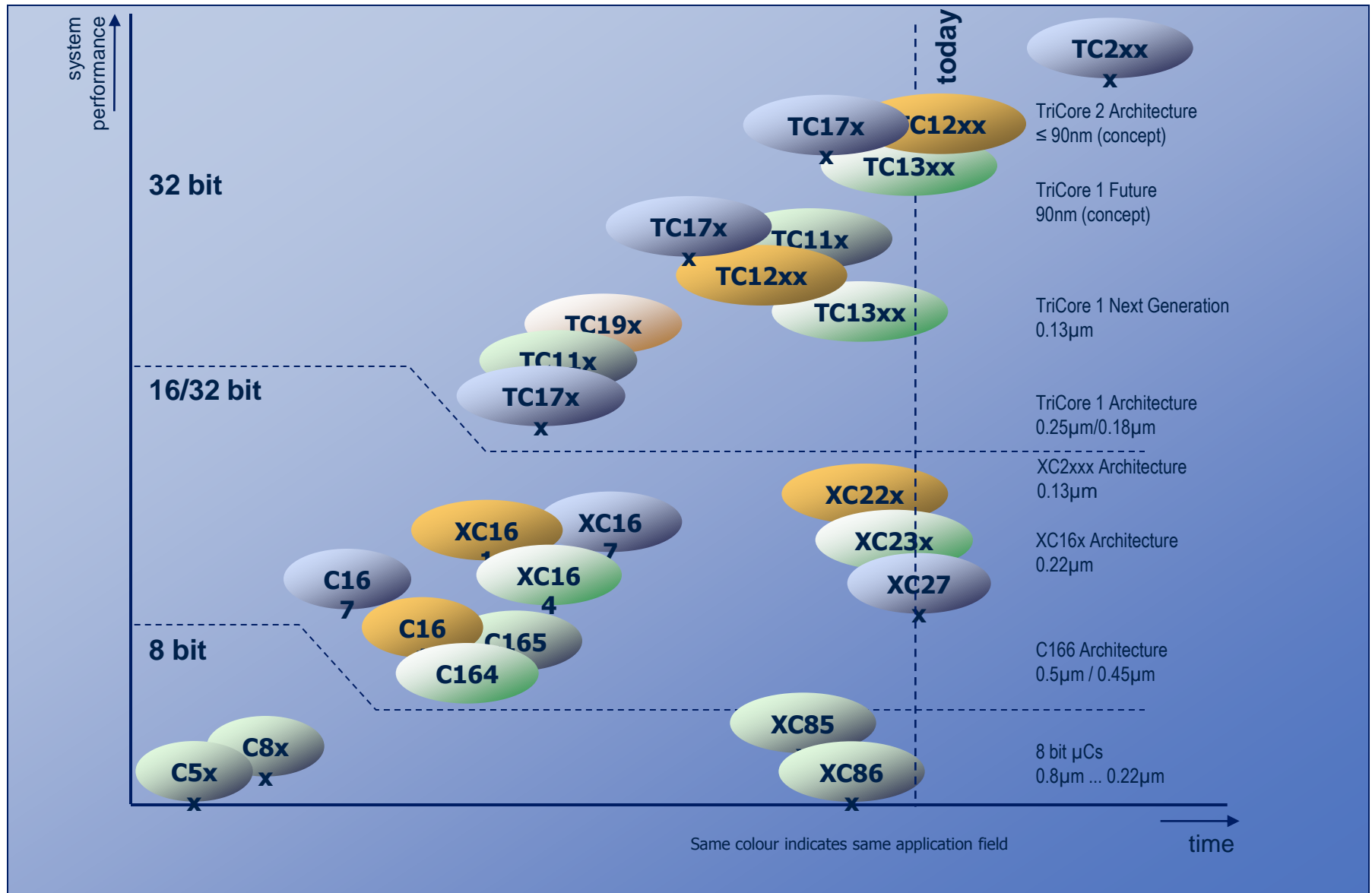




Introduction of Infineon Microcontroller

2010 China ATV Symposium

Infineon Technologies Microcontroller Product Families



XC800 A-Series: Perfect Fit for Automotive Applications



Body

- Motorcycle BCM
- Low-end BCM/HVAC
- Lighting
- Window lift
- Switches
- Sensors
- Power operating systems
- Touch control
- Stepper gauges

Safety

- Low-end airbag
- Low end ABS 1-channel
- EHPS
- Steering angle sensor
- Fail safe controller

Powertrain

- Pumps
- Valve/Throttle control
- Motorcycle Engine Management
- Shift-by-wire
- ebike

How does XC800 differentiate?



XC800 A-Family
Dedicated for Automotive Applications

High Performance

- Powerful and flexible **Capture and Compare Unit (CCU6)** for **PWM** generation,
- Highly accurate and fast **ADC conversion time <1,5µs**

Make The Difference

- IFX offer up to **Ta 150° C**, working on offering even higher temperature
- IFX offer high current pads up to **50mA** to driver stepper gauges

Save System Cost

- **Reduction of external components:**
 - Single power supply
 - High integration (MC + Power + Passive Components) possible due to powerful peripherals) → Cost savings

Be Flexible

- Multifunctional Interface & advanced Networking Capabilities: **UART, SSC (SPI), LIN, CAN** (special features of MultiCAN (LBM, CALM, Gateway), could be used for driver development without additional hardware (LBM), CAN bus analysis (CALM) and automatic gateway-ing e.g. for sensor synchronization)

Best in class

- **CORDIC** (Coordinate Rotation Digital Computer), powerful mathematical co-processor for 16bit trigonometric, hyperbolic and linear functions (e.g. to solve SIN, COS, LOG, EXP, SQRT, ...),
- Fast **MDU** libraries in Boot ROM

Save Programming Time

- **Very fast Flash programming time** via LIN Bootstrap load (BSL) (single wire) Flash download at 115 kBd, 16kB take only about 20 sec , saves a lot of programming time

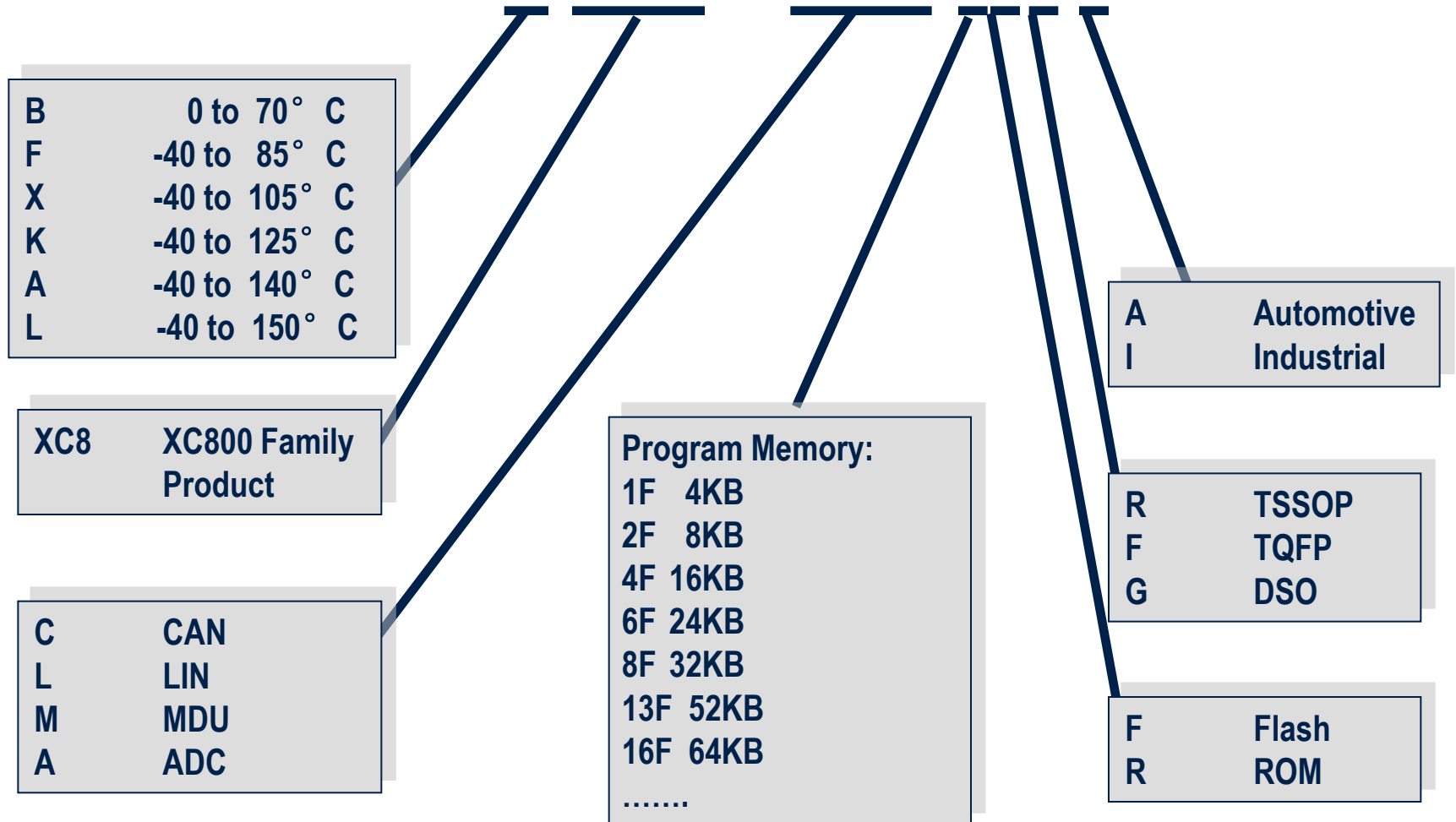
Be Innovative

- **Automotive Touch Control** as **attractive cost down** alternative for mechanical switches (e.g. sun roof @Ford)

XC800 Family Naming Convention



SAF-XC886CLM-8FFA



XC800 Family



	SSOP-24	TSSOP-28	TSSOP-38	QFP-48	QFP-64	
64KB					XC878 26.7MHz	
52KB					XC878 26.7MHz	
32KB				XC886 24MHz ■	XC878 26.7MHz	XC888 24MHz ■
24KB				XC886 24MHz ■	XC878 26.7MHz	XC888 24MHz ■
16KB			XC866 26.7MHz ■			
8KB		XC836 24MHz	XC866 26.7MHz ■			
4KB	XC821 24MHz	XC836 24MHz	XC866 26.7MHz			

■ ROM version available

XC800 A-Series



		7-Series	8-Series	6-Series	3-Series	2-Series
Core	Core	8051	8051	8051	8051	8051
	Frequency	27	24	27	24	24
Flash with ECC	Program	52/64	24-32	4-16	4-8	2-4
	Data Flash	Up to 4	Up to 8	Up to 4	0,128	0,128
ROM	Program		24-32	4-16		
SRAM	Σ SRAM	3328	1792	768	512	512
	RAM	256	256	256	256	256
	XRAM	3072	1536	512	256	256
Touch sense control		-	-	-	yes	yes
High current pads		-	-	-	Yes	-
I2C					yes	yes
FOC	MDU	yes	yes	-	yes	-
UART	LIN	3	2	1	1	1
CAN	Channels	Up to 2	Up to 2	-	-	-
SPI	SSC	1	1	1	1	1
ADC	Channels	8	8	8	4/8	4
Capture compare unit	T2CCU	1	-	-	-	-
	CCU6	1	1	1	1	1
PWM channels		10	4	4	4	4
Package		LQFP64/VQFN 48	TQFP48/LQFP6 4	TSSOP38	TSSOP28	TSSOP16
Temperatur (T_{ambient})		- 40° C to +125° C	- 40° C to +150° C	- 40° C to +150° C	-40° C to +125° C	-40° C to +125° C

XC800 family – Key System Features

- High performance 8051 MCU with two clock per machine cycle architecture
- On chip voltage regulator
- On-chip voltage supervisory circuit
- On-chip oscillator and PLL
- Watchdog timer for fail-safe feature
- Flash Memory for Program and Data with ECC
- BootRom with bootstrap loader & Flash routines
- 14 interrupt vectors with 4 priority levels
- Multiple power saving modes available
- On-chip debug support
- Temperature ranges: -40° C to +85° C/105° C/125° C/140° C/150° C

XC800 family – Key Peripheral Features

- High performance 8 channel 10-bit ADC
- High performance CCU6E with special modes for Motor Control
- Full duplex Serial Interface (UART) with LIN Bootloader support
- High speed SPI compatible synchronous serial interface (SSC)
- Four 16-bit timers
 - Timer 0 and Timer 1 (T0 and T1)
 - Timer 2 and Timer 21 (T2 and T21)
- MultiCAN, (2 nodes, 32 Message objects)
- CORDIC (High speed computation of trigonometric, hyperbolic and linear functions)
- Multiplication/Division Unit (MDU) for high-speed 16- and 32-bit multiplication, division and shift operations
- Timer 2 Capture/compare unit for various digital signal generation (T2CCU)

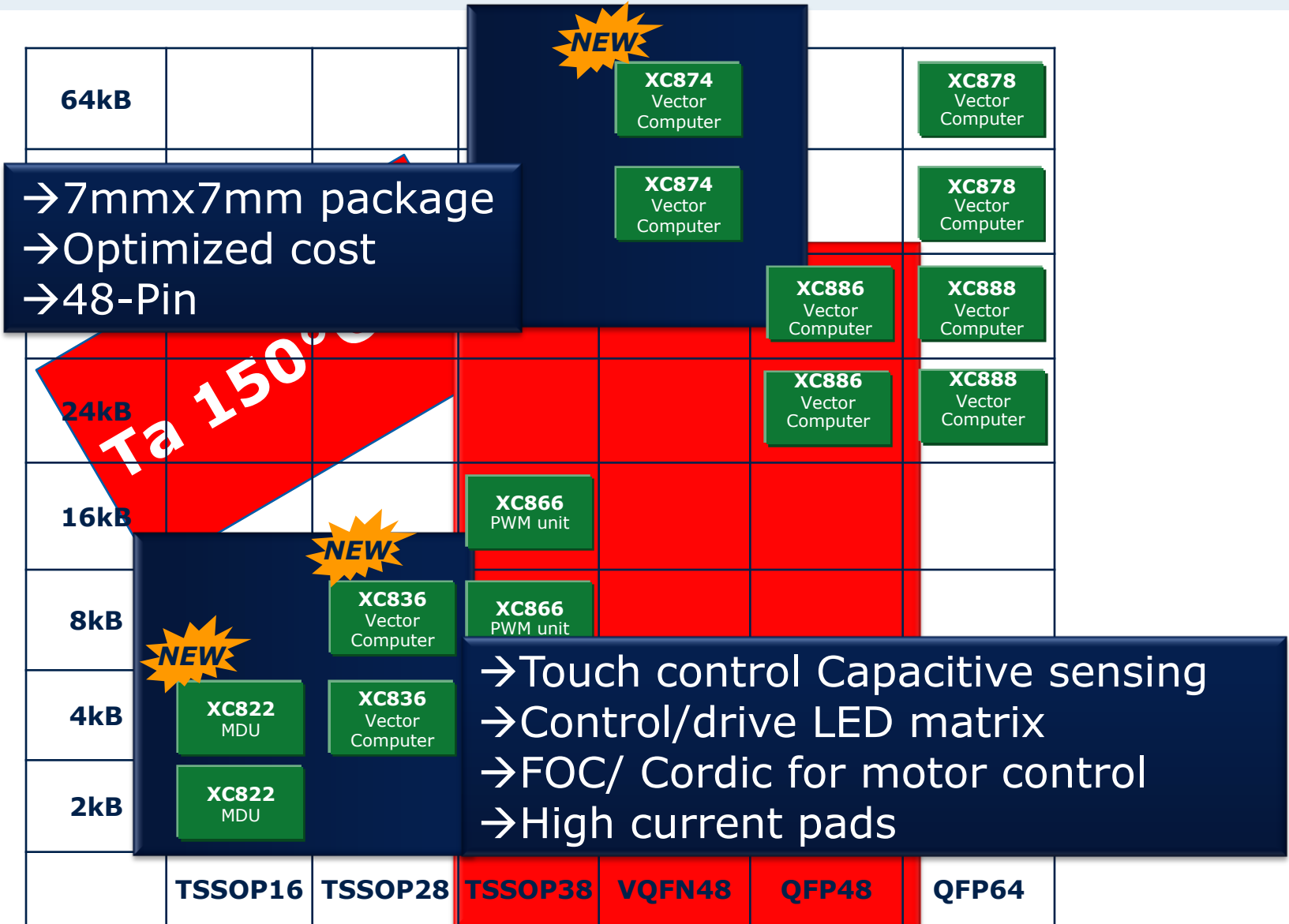
New Peripherals in XC83x and XC82x

- Clock system
 - No PLL, 2 on-chip oscillators : 48MHz OSC and 75kHz OSC
 - Oscillator watchdog available
- Boot and startup
 - Pin-less entry to User mode, OCDS and UART BSL mode
 - Startup firmware depend on BMI value to enter each mode
- Inter-IC Bus (IIC)
 - Operates in master or slave mode
 - Supports multi-master systems
 - Selectable baud rate generation of up to 400 KBaud (fast mode)
- Debug System
 - OCDS debug support via single pin DAP

New Peripherals in XC83x and XC82x

- Real-time Clock
 - Time Keeping mode
 - Periodic wake-up mode
 - Continue to run during power down mode
- High Current Ports
 - Direct drive of motor and LED
 - Overcurrent protection
 - Slew rate control
- LED and Touch-sense Controller
 - LED matrix : up to 8 line and 6 column pins (max 48 LEDs)
 - Time-multiplexed control for LED driving and touchpad sensing on single pin
 - Up to 8 touchpad input turns

XC800 – New Products! New Features!



XC800 Perfect Fit for LED and Touch-Sensing Applications



Replacement of Mechanical Switches with Touch Control/Haptic Control



→ Reduction of cost compared to mechanical switches up to 80%

New Application Kits for Easy Design-in

New motor drive application kit:

NEW Available



Automotive BLDC Motor Drive Kit

[www.infineon.com/bldc]

Key Features

- Scalable 3-phase inverter
- Sample code: FOC & V/f for XC886 and XC2238N
- Integrated protection features for high system reliability
- Complete IDE software packages included
- Easy installation, plug & play

Applications

- Pumps
- Fans

NEW Available

New touch control application kit:



inTouch800 Application Kit

[www.infineon.com/intouch]

Key Features

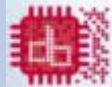
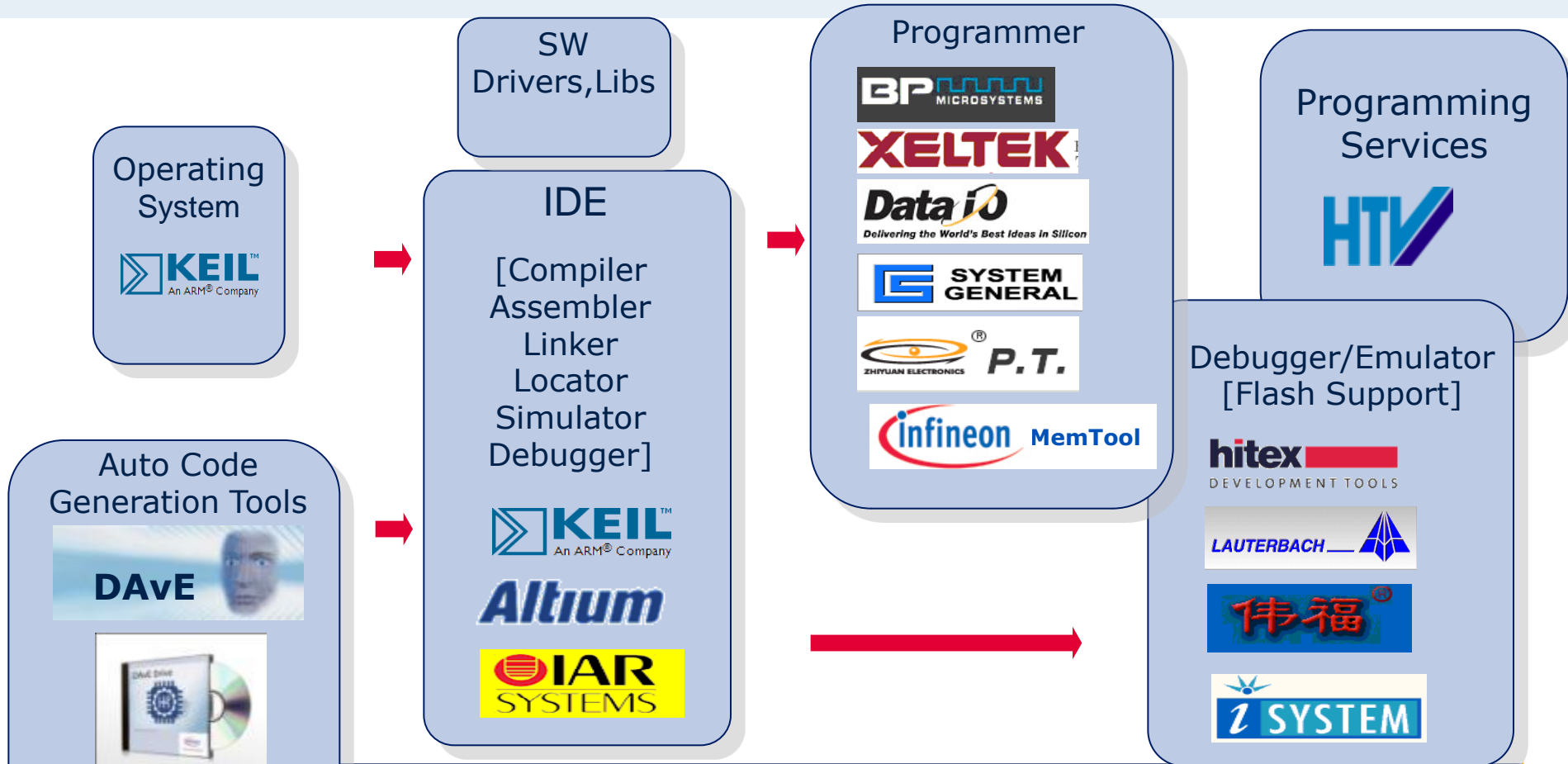
- XC822T-1FRI microcontroller with 4KB flash, communication interfaces UART, SPI, I²C and touch control ROM library
- PCB with embedded touch wheel and RGB LED
- SW solution to control LED color, brightness and saturation with the touch wheel
- USB interface for programming access
- Data sheets and user manuals
- DAVE™ Bench free toolchain
- DAVE™ code generator and DIP-file
- Battery-powered

Application Kits Easy Development Environments



Free, Easy, Powerful

- DAVe Bench Free Toolchain for XC800



DAVe Bench Free, Easy, Powerful!



- DAVe
- DAVe Drive
- Eclipse based IDE tailored to easy to use
 - Project and workspace mgmt
 - Connection to DAVe projects
- SDCC compiler optimized for XC800
- HiTOP Eclipse debugger
- FLOAD: Flash programming SW
- U-SPY: UART terminal plus data visualization



Dave Bench (New Platform for Free Tools and SW)



it's Free, it's Easy, it's Powerful

Easy to use: The Eclipse platform has been tailored for fast success and for ease of use.

Active Project: By defining an active projects miss-operations to build or debug projects are avoided.

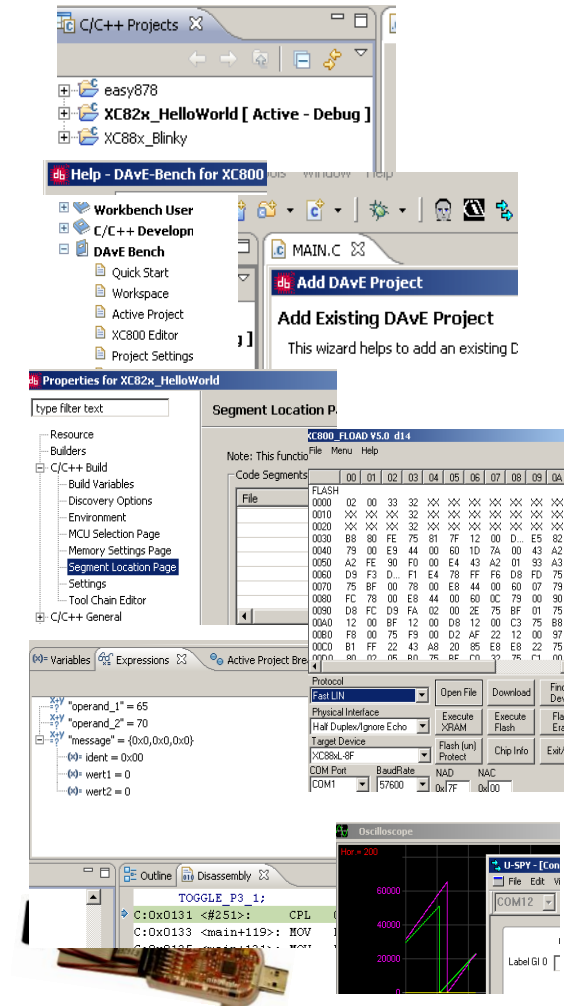
Interface to DAVe: Easy import of coded generated by DAVe and easy switch from DAVe Bench to DAVe.

SDCC Compiler: Optimized for XC800 family with an easy to use build mgmt.

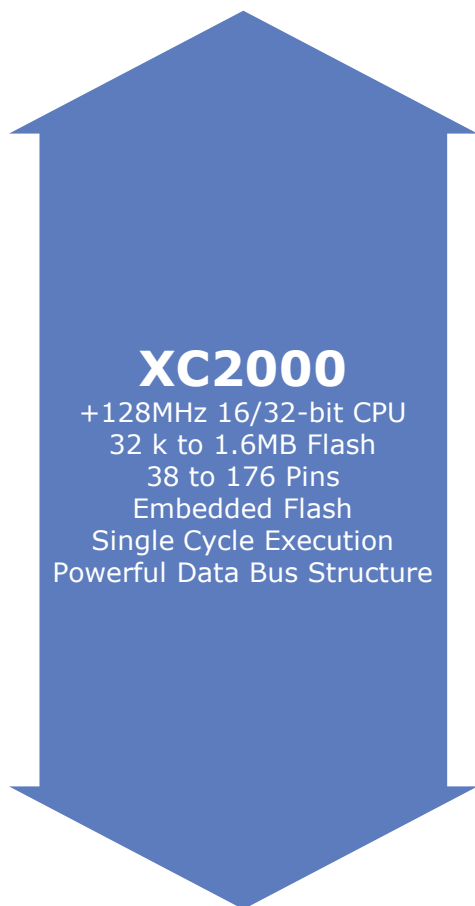
FLOAD: Flash loader to download the hex code to the target via JTAG or UART/LIN BSL.

Hitop Eclipse Debugger: Level one debugger the supports the Infineon Mini Wiggler and Easy kit UAB adapter. It also includes an instruction set simulator.

U-SPY: UART terminal including support to filter and send predefined messages and to visualize received data.

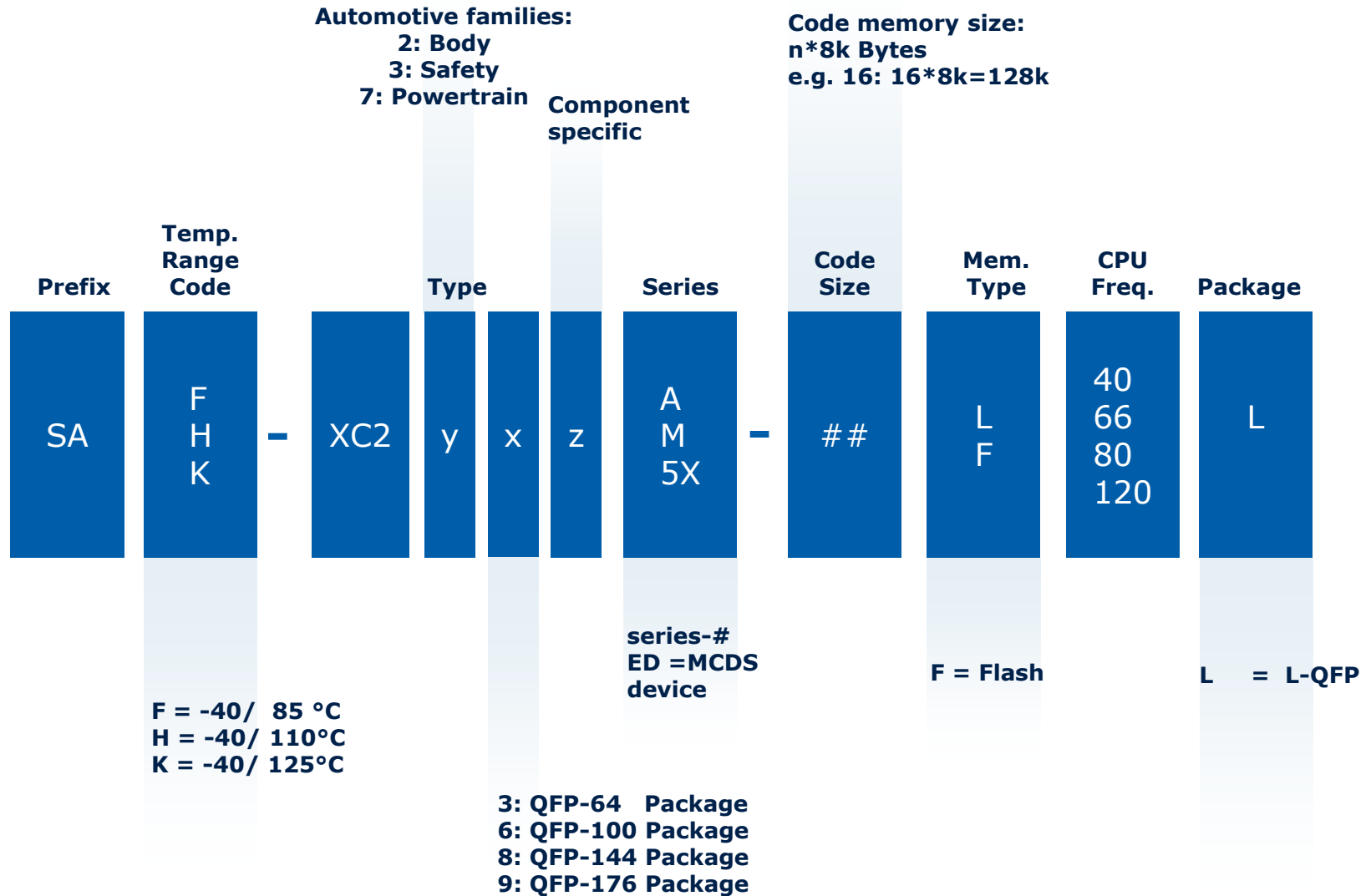


Introducing the **XC2000** Family



<p>XC2200 Several CAN & LIN ports Extensive Low Power Modes</p>	<p>BODY & CONVENIENCE</p> <ul style="list-style-type: none"> □ Central Body Module □ Central Gateway □ HVAC □ Door/Seat Module □ Lighting
<p>XC2300 ECC on all memories Redundant A/D Converters CRC & MPU</p>	<p>SAFETY & CHASSIS</p> <ul style="list-style-type: none"> □ Electrical Power Steering □ Suspension □ Airbag □ Braking □ ESP
<p>XC2700 Dedicated Motor Controller Fast and Accurate A/D</p>	<p>POWERTRAIN</p> <ul style="list-style-type: none"> □ Low end engine control □ Transmission control □ Ventilation □ Pumps

Naming Convention for **XC2000** Family



Feature Overview XC2200



		I-Series	H-Series	M-Series	- Series	N-Series	L-Series	U-Series
Core	Core	C166SV2	C166SV2	C166SV2	C166SV2	C166SV2	C166SV2	C166SV2
	Frequency	128	100 / 80	80/66	80/66	80/66/40	20/40	20/40
Flash	Program Flash	512-1024	1024-1536	384-768	384-704	128-256	32-128	32/64
	Data Flash	64	64	64	64	64	32	
SRAM	Σ SRAM	90	106 / 138	50	82	34	12	8
	<i>Program [PS RAM]</i>	64	112	32	64	16	6	4
	<i>Data Mem [DS RAM]</i>	24	24	16	16	16	4	2
	<i>Dual Port [DPRAM]</i>	2	2	2	2	2	2	2
	Trace Mem for MCDS		4					
SB RAM	Standby	8	8	8	1	8		
CAN	Channels	Up to 6	Up to 6	Up to 6	Up to 5	Up to 6	Up to 2	-
ADC	Channels	24	24 / 30/40	16 / 24	16 / 24	9 / 16	10/19	7/10
Universal Serial Interface [USIC channels]*		Up to 10	Up to 10	Up to 8	Up to 6	Up to 6	4	2
Capture Compare	CCU 1	0	1	0	0	0	0	0
	CCU 2	1	1	1	1	1	1	1
Units [CCU]**	CCU 6	4	4	4	4	2	2	1
FlexRay		Up to 2	Up to 2	-	-	-	-	-
Package		QFP 100 / 144	QFP 144 / 176	QFP 64/100 / 144	QFP 100 / 144	QFP 64 / 100	VQFN48/ QFP 64	TSSOP 38/ VQFN48
Temperatur (T_{ambient})		- 40°C to +125°C	- 40°C to +125°C	- 40°C to +125°C	- 40°C to +125°C	- 40°C to +125°C	- 40°C to +125°C	- 40°C to +125°C

* USIC: can be configured as UART, LIN, SPI/QSPI, IIC, IIS

** CCU: used for PWM, D/A

Feature Overview XC2300



		E-Series	C-Series	A-Series	B-Series	D-Series	S-Series
Core	Core	C166SV2	C166SV2	C166SV2	C166SV2	C166SV2	C166SV2
	Frequency	80-128	80-100	66-80	20-80	20-66 (80)	20-40 (66)
Instruction Cache		Yes (16kByte)	No	No	No	No	No
Flash	Program / Data Flash in KByte	576-1088	832-1088	448-832	192-320	64-160	32-64
SRAM	Σ SRAM in KByte	90	138	50	34	12	8
	Program [PSRAM]		112	32	16	6	4
	Data [DSRAM]		24	16	16	4	2
	Dual Port [DPRAM]		2	2	2	2	2
SB RAM	Standby	8	8	8	8	tbd.	
CAN	Channels	Up to 3	3	Up to 3	Up to 3	Up to 1	-
ADC	Channels	Up to 24	24	Up to 24	Up to 16	9	Up to 9
Universal Serial Interface [USIC channels]		Up to 6	8	Up to 6	Up to 6	4	2
Capture Compare Units [CCU]	CCU 1	0	0	0	0	0	0
	CCU 2	1	1	1	1	1	1
	CCU 6	Up to 4	4	Up to 4	2	2	1
FlexRay		optional	2 channels	-	-	-	-
Package		QFP 100 / 144	QFP 144	QFP 64 / 100 / 144	QFP 64 / 100	VQFN 48 / QFP 64	TSSOP 38/ VQFN 48
Temperature (T_{ambient})		- 40° C to +125° C	- 40° C to +125° C	-40° C to +125° C	- 40° C to +125° C	- 40° C to +125° C	- 40° C to +125° C

Feature Overview XC2700



		8X-Series	7X-Series	6X-Series	5X-Series	4X-Series	3X-Series	2X-Series
Core	Core	C166SV2	C166SV2	C166SV2	C166SV2	C166SV2	C166SV2	C166SV2
	Frequency	128	100	66	80	80	40	40
Flash	Program Flash	1024	1024-1536	704	512 / 768	256	128	64
	Data Flash	64	64	64	64	64	32	
SRAM	Σ SRAM	90	106 / 138	82	50	34	12	8
	<i>Program [PS RAM]</i>	64	112	64	32	16	6	4
	<i>Data Mem [DS RAM]</i>	24	24	16	16	16	4	2
	<i>Dual Port [DPRAM]</i>	2	2	2	2	2	2	2
	Trace Mem for MCDS		4					
	Standby [SB RAM]		8	1	8	8		
CAN	Channels	3	3	2	2	2	1	0
ADC	Channels (10bit, 1.2μs)	24	24 / 30	16 / 24	9 / 16 / 24	9 / 16	8 / 17	7 / 10
Universal Serial Interface [USIC channels]*		6	6	4	6	4	4	2
Capture Compare	CCU 1	0	1	0	0	0	0	0
	CCU 2	1	1	1	1	1	1	1
Units [CCU]**	CCU 6	4	4	4	4	2	2	1
FlexRay		Up to 2	Up to 2	-	-	-	-	-
Pins		100 / 144 / 176	144 / 176	100 / 144	64 / 100 / 144	64 / 100	48/64	38/48
Temperatur (T_{ambient})		- 40°C to +125°C	- 40°C to +125°C	- 40°C to +125°C	-40°C to +125°C (QFP-64 +85°C)	- 40°C to +125°C	- 40°C to +125°C	- 40°C to +125°C

* USIC: can be configured as UART, LIN, SPI/QSPI, IIC, IIS

** CCU: used for PWM, D/A

New Generation 16/32 Bit Microcontroller XC2000 - Key Features (II)



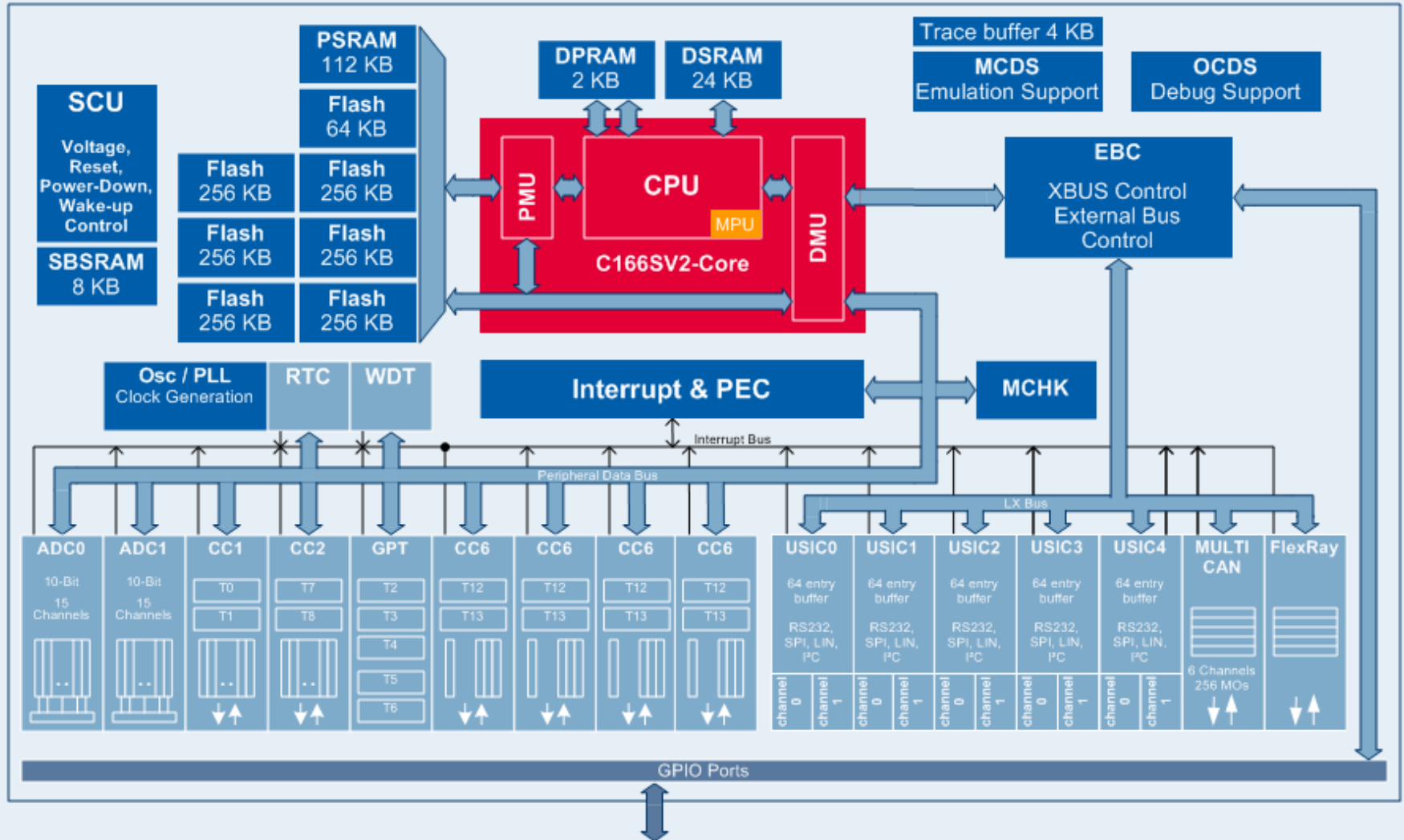
- 130 nm technology (Automotive Excellence)
- Multiple FLASH modules with parallel access for code and data
- 64-bit bus for code fetch
- Large-size of PSRAM offers even more performance
- Higher-level flashing mechanisms supported via highly flexible flash protection system
- 32-bit MAC Unit as a DSP for 32-bit/64-bit data processing
- Multiple buses implemented to ensure optimal performance
- Enhanced Interrupt and PEC Response Time

New Generation 16/32 Bit Microcontroller XC2000 - Key Features (III)



- Enhanced power saving and power management concept easily implemented by utilizing SCU Driver
- Clock generation optional with on-chip oscillator or XTAL
- Selectable bootstrap loader interface:
 - ASC (UART)
 - SSC (LIN)
 - MultiCAN
- Dual A/D converters for parallel sampling
- I/O Port Configurability can reduce EMC and external components
- New and enhanced Peripherals (Universal Serial Interface Channel (USIC), MultiCAN, CAPCOM6 ...)
- Competitive pricing & strong commitment to automotive

XC2000 Block Diagram (umbrella feature set)



XC2000 Microcontroller Family

16-bit MCU with 32-bit Performance



Identifiers of 32-bit MCU

- MAC-unit: 32-bit architecture
- Instruction size: mixed 16/32bit
- RISC architecture: all essential instructions executed in 1 cycle
- Pipeline: 5 stage pipelines
- D-MIPS figures (@80MHz):
 - Code residing in Flash: 66712.9 Dhrystones/s
 - Code residing in PSRAM: 105392.4 Dhrystones/s
 - Better than many 32-bit MCU architecture



16-bit MCU with 32-bit like Performance

- Best in class cost performance ratio
- Best in class code density
- Best in class interrupt response
- Best in class data handling with multiple busses and non load-store architecture

XC2000 Microcontroller Family

Strategies for Efficient Power Saving



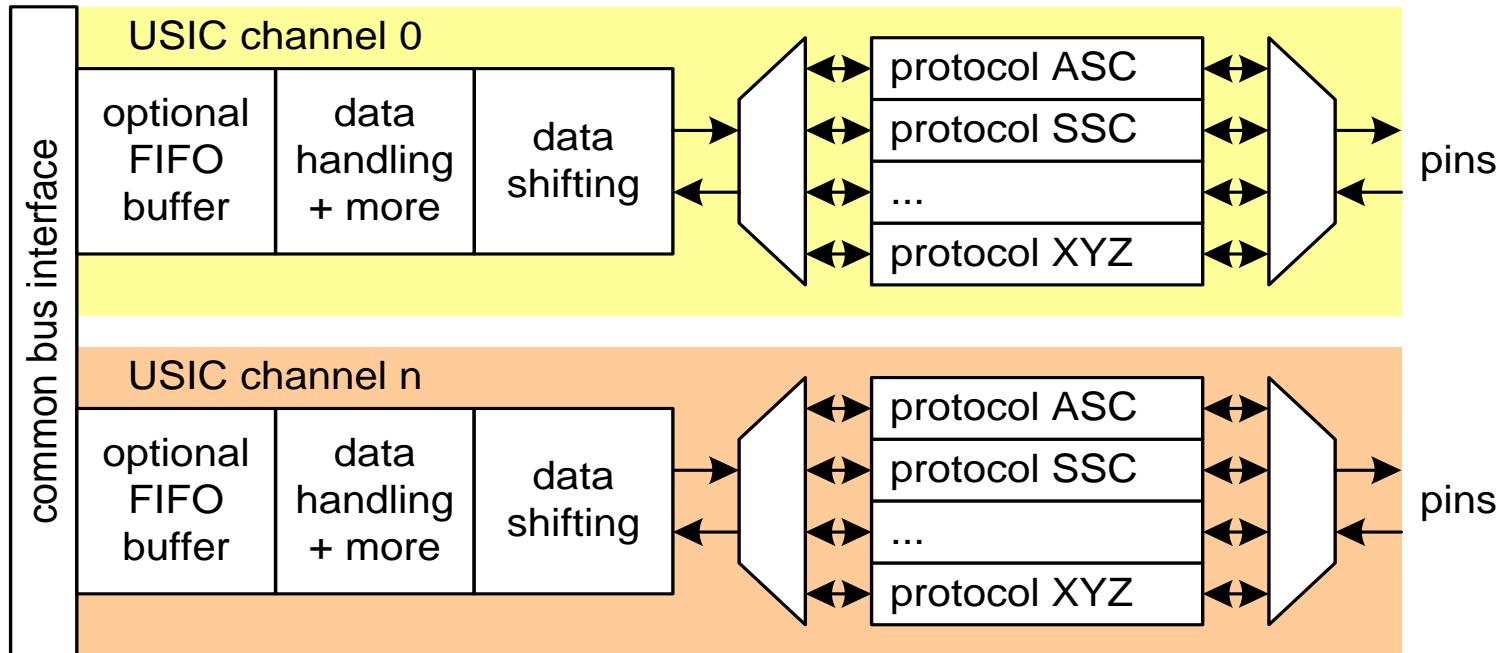
Four strategies for Efficient Power Saving of XC2000 Family through Power Management and Clock Management

1. Supply Voltage Management
2. Various Levels of Power-Saving Modes
3. Clock Generation & Management
4. Peripheral and Analog Module Management

 **Supported by System Control Unit (SCU)!**

XC2000 Microcontroller Family

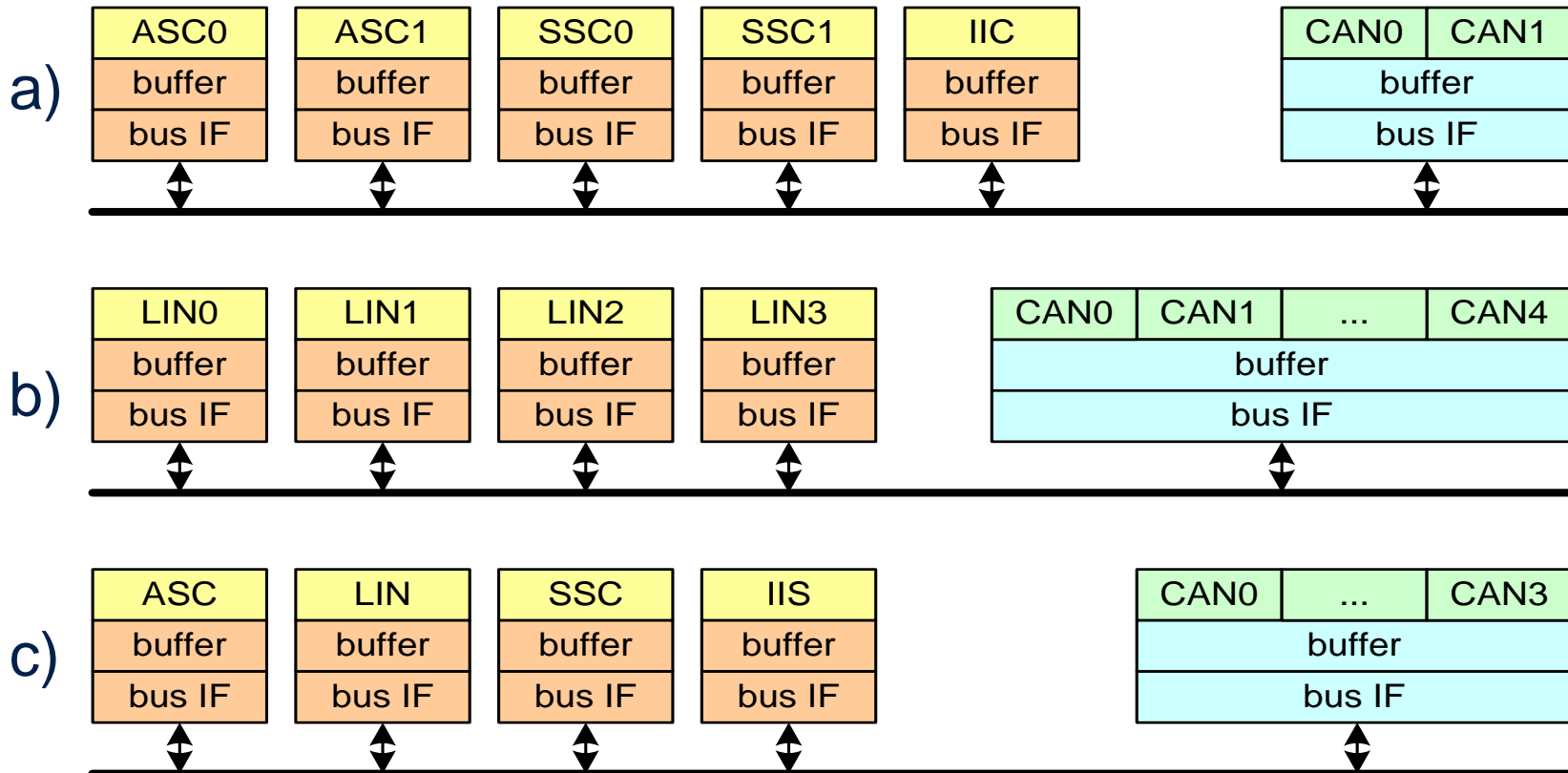
Universal Serial Interface Channel (USIC)



Each USIC channel

- is capable of handling **UART**, **SSC**, **LIN**, **IIC** and **IIS**
- can be **individually configured** (incl. baud rate generation)
- can handle **full duplex data** transfers
- can be **reprogrammed without chip reset**
- A USIC module is a cluster of **2 independent**, identical USICs

Which and how many communication interfaces does the application need?



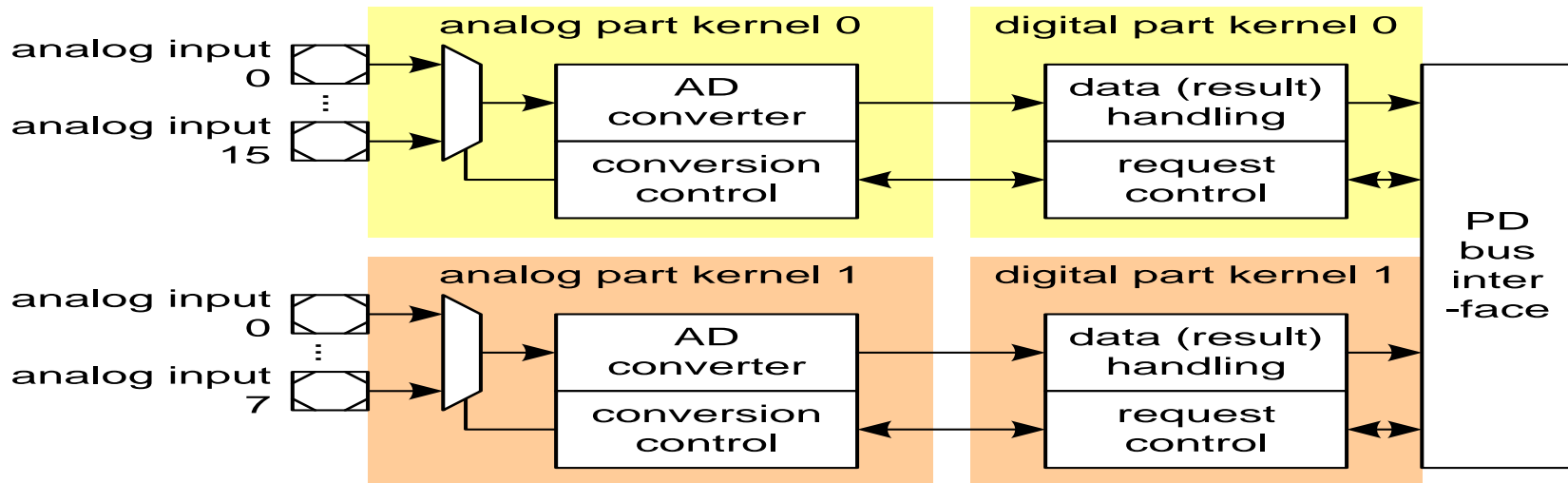
Solution: Highly flexible configuration !!!

XC2000 Microcontroller Family

Analog to Digital Converter (ADC)



- 2 independent ADC modules
- Synchronized conversions (e.g. parallel sampling of phase currents)
- Supply voltage from 3,3V to 5V
- Conversion time less than $1.2\mu\text{s}$
- 10-bit resolution (12-bit one for new series)
- Conversion trigger by PWM signals, pins, timers
- Flexible result handling
- External 8-to-1 analog multiplexer control support
 - control pins located in ADC supply domain
 - automatic sample time adjustment

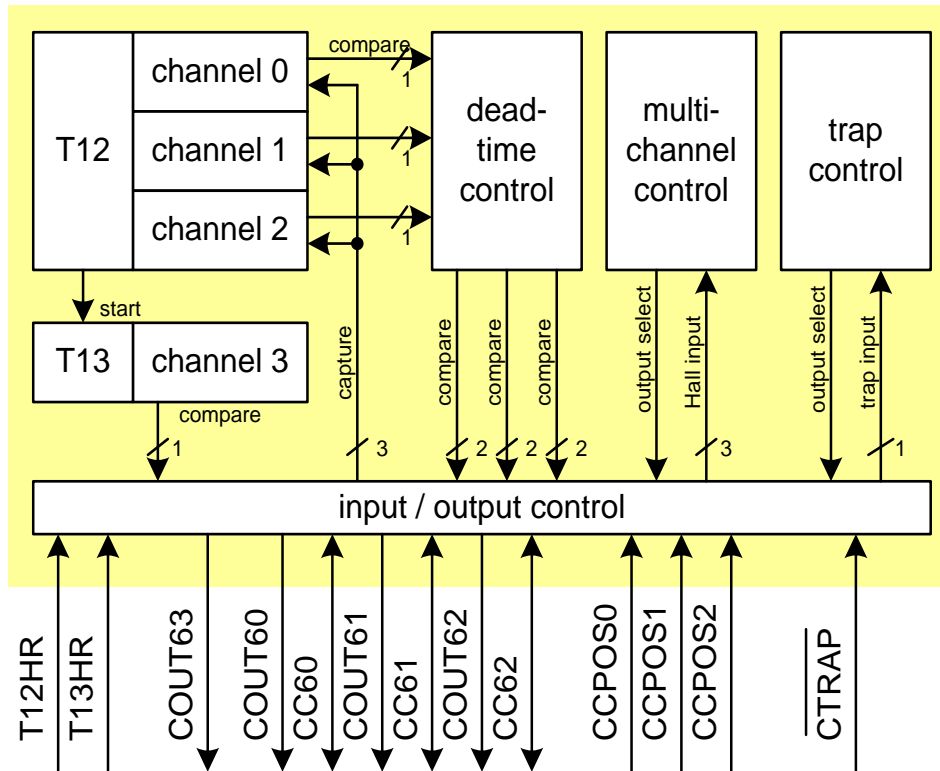


XC2000 Microcontroller Family Capture/Compare Unit CCU6



Module features:

- high-resolution capture and compare
- **synchronized PWM** channels
- 3 + 3 + 1 PWM outputs
- powerful capture modes
- optimized modes for **electric drive** control from low- to high-end
- complete **shadow buffer**
- start-stop control
- **counting inputs**
- capability to **trigger ADC**
- **emergency stop** input
- digital **dead-time** control for power inverters

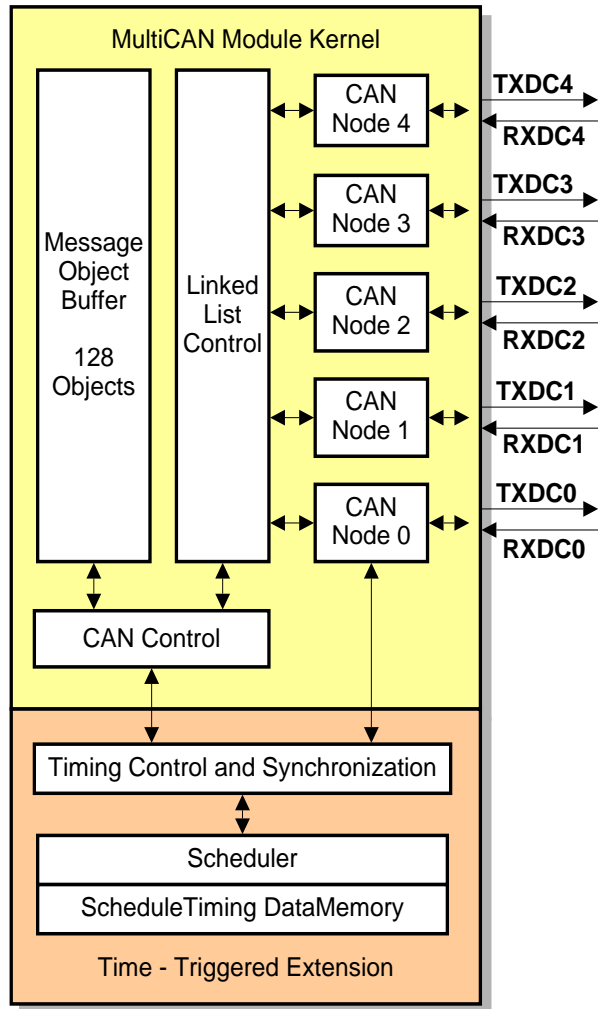


Device options:

- up to 4 CCU6 modules
- synchronous start for all timers

XC2000 Microcontroller Family

MultiCAN module



MultiCAN features:

- Full-CAN with CAN 2.0B active (11898 certificated)
- up to 6 independent CAN nodes
- up to 256 shared message objects
- programmable acceptance filtering
- powerful analyses capability
- FIFO data handling support
- automatic gateway support
- flexible interrupt handling

Development Tool Chain Overview for XC2000 Microcontrollers



System Level Simulation and Modeling



Matlab Simulink

Auto Code Generation Tools



DAVe



Realtime Workshop



Target Link

Operating System & SW



DSP-Lib

Compiler and Debugger IDE



Classic C166 and Viper VX166



μ-Vision IDE

Programmer / Programming SW



MEMTool



Debugger/Emulator



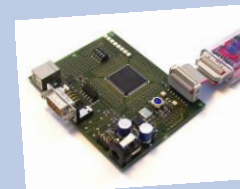
LAUTERBACH



Simulation Tools

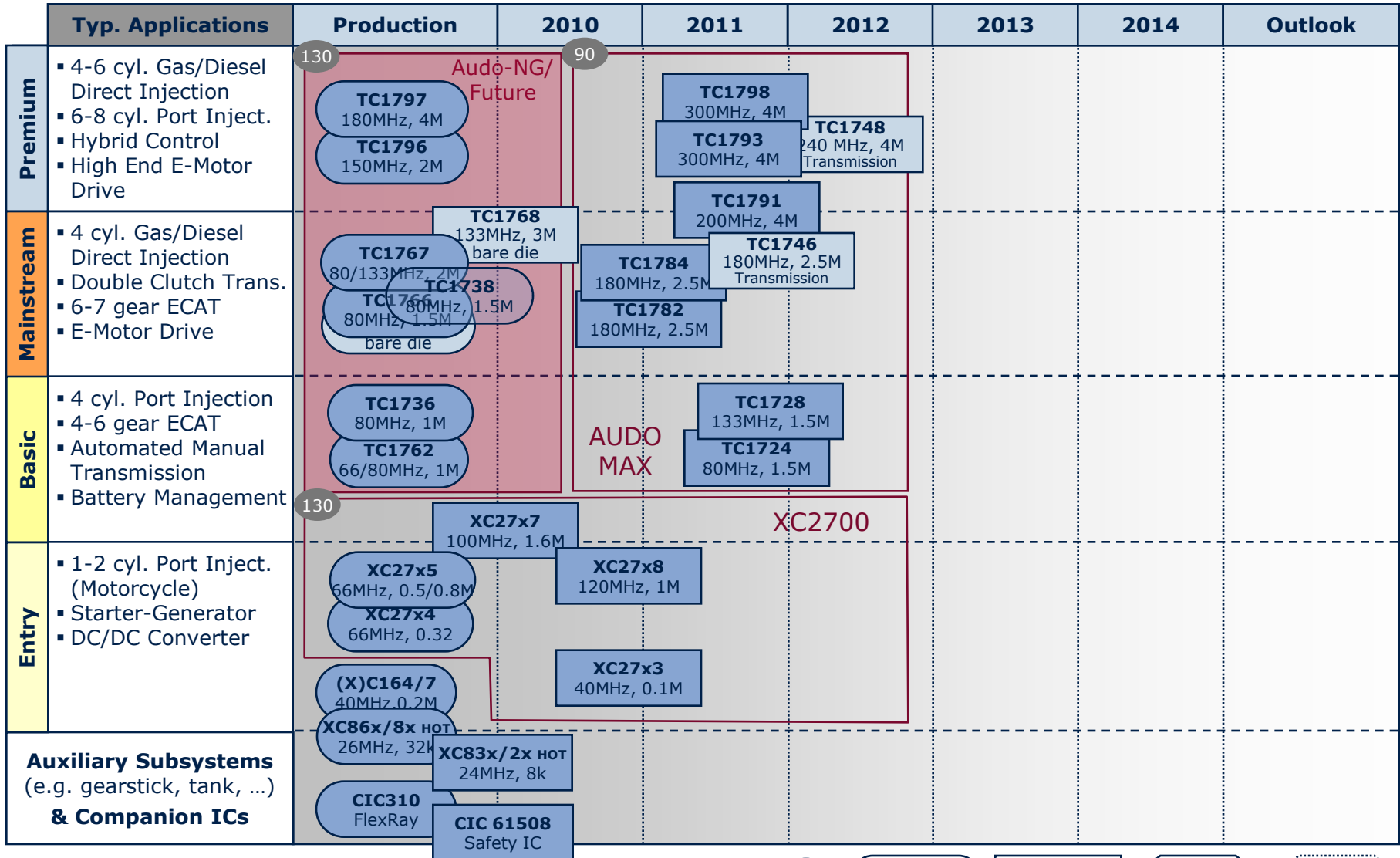
Instruction Set Simulator
Included in Altium and Keil IDE

Evaluation / Easy Kits



Powertrain Microcontroller Roadmap

February 2010



Technology (xx)

Production

Development

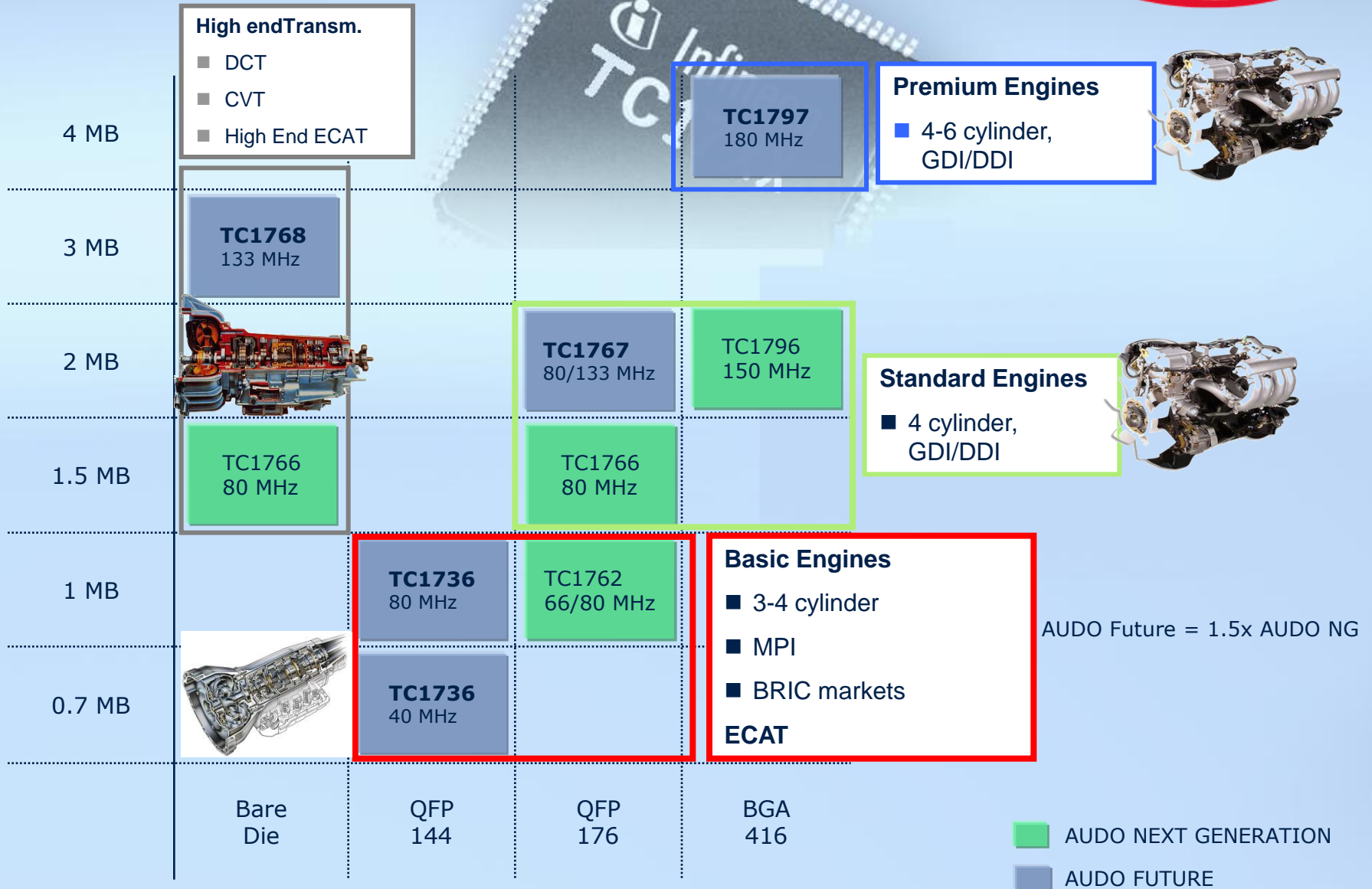
Concept

Idea

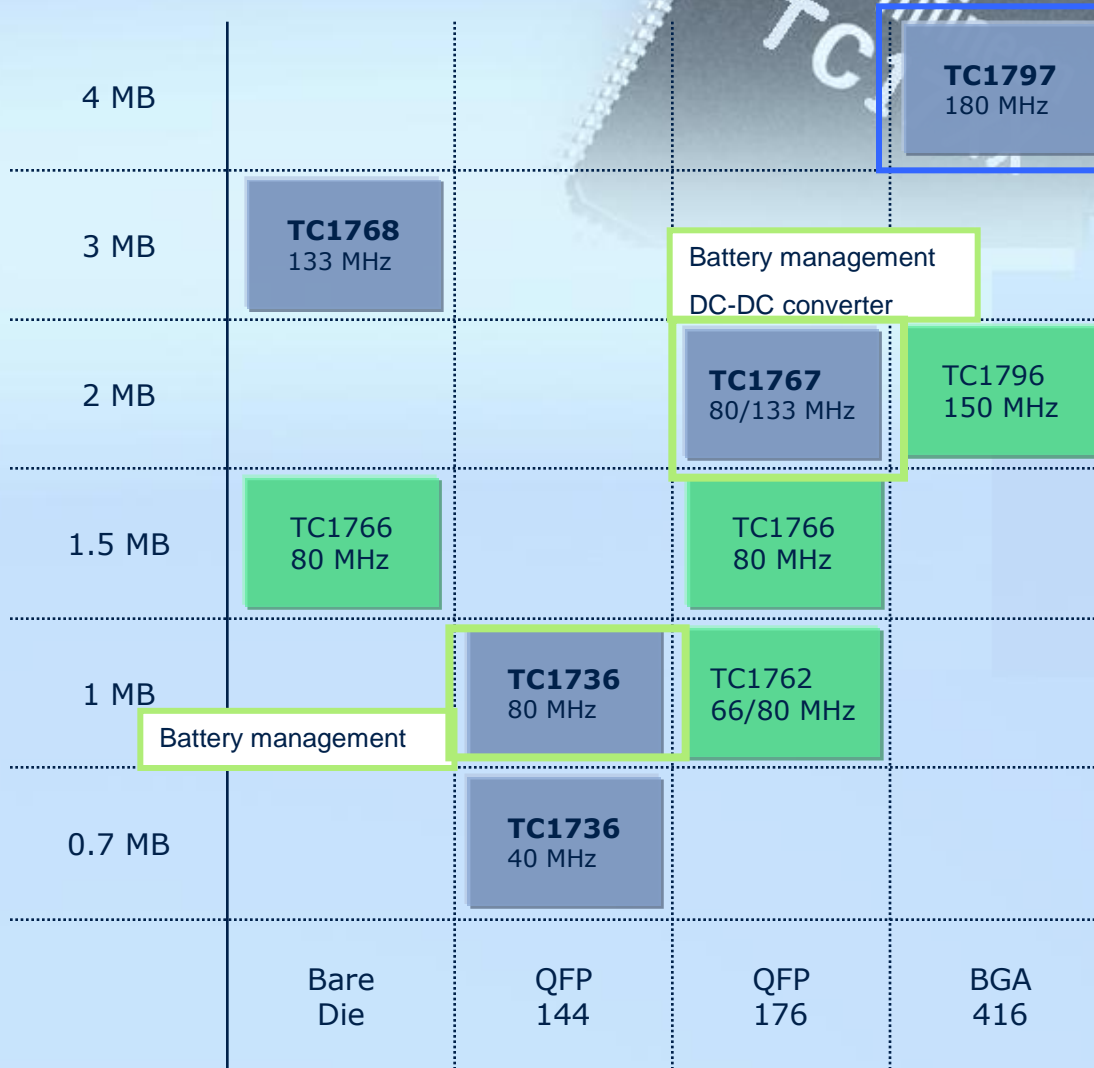
AUDO-NG/Future Family

Overview

Classic Powertrain



AUDO-NG/Future Family, Hybrid Proposal



E-Motor drive
Hybrid control



AUDO Future = 1.5x AUDIO NG

- AUDIO NEXT GENERATION
- AUDIO FUTURE

TC1797

High End Powertrain Microcontroller

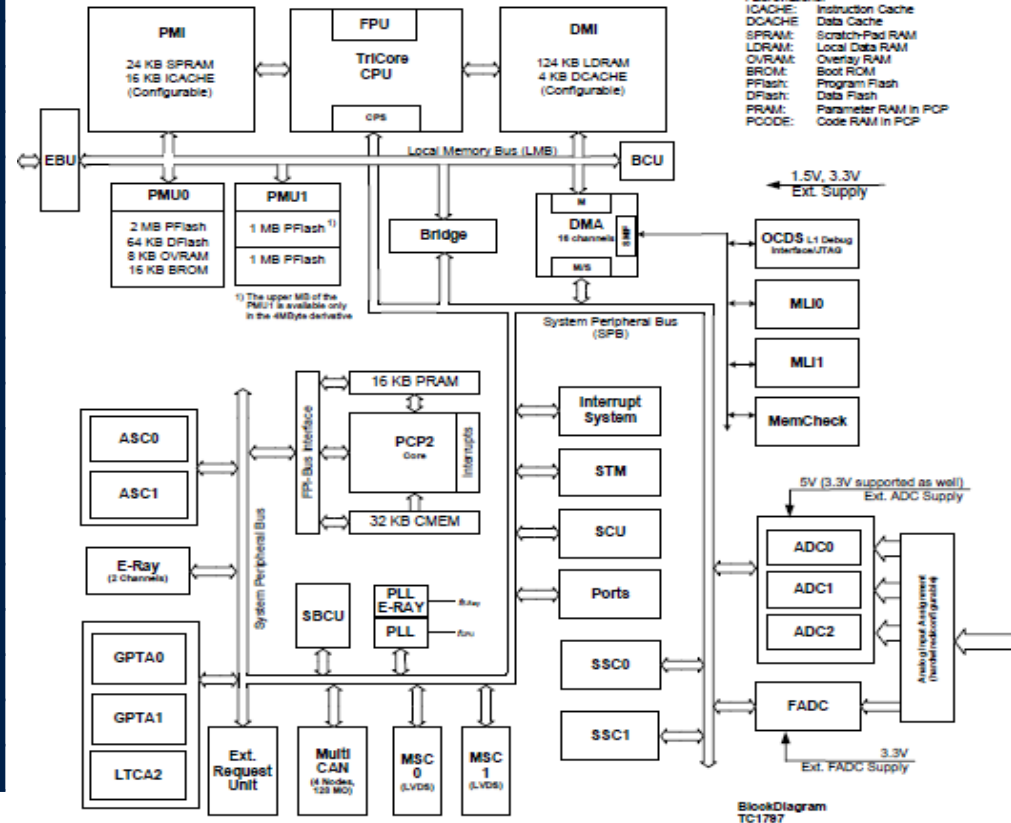


		TC1797
Core	TC version	1.3.1
	Frequency	180 MHz
Flash	Program Flash	4 MB
	Data Flash (w/e cycles)	64 KB (30k)
SRAM	Σ (w/o PCP, Cache)	176 KB
	PMI	40 KB
	DMI	128 KB
	Overlay	8 KB
PCP (max. frequency)		180MHz
DMA	Channels	16
ADC	Σ Analog Inputs	44
	ADC Channels	3 x 16
	FADC Channels	4
Timer	Σ Timed IO	Up to 126
	GPTA®	2 GPTA®
	LTC	1 LTC
Inter- faces	Flexray	2 channels
	CAN	4 / 128
	SSC / ASC	2 / 2
	MLI / MSC	2 / 2
	SENT	-
	EBU	32-bit
Package		BGA 416
Temperatur (T_{ambient}) packaged		- 40° C to +125° C



Status

■ In production



TC1767

Mid-range Powertrain Microcontroller

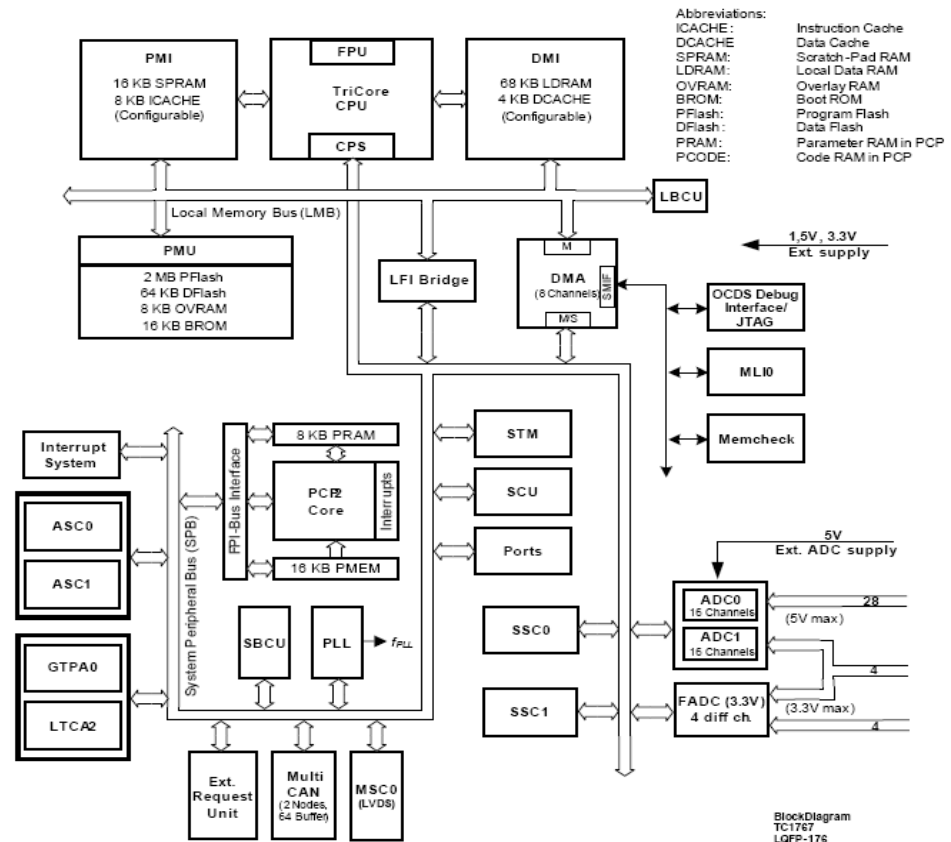


		TC1767
Core	TC version	1.3.1
	Frequency	80 / 133 MHz
Flash	Program Flash	2 MB
	Data Flash (w/e cycles)	64 KB (30k)
SRAM	Σ (w/o PCP, Cache)	104 KB
	PMI	24 KB
	DMI	72 KB
	Overlay	8 KB
PCP (max. frequency)		80 / 130MHz
DMA	Channels	8
ADC	Σ Analog Inputs	36
	ADC Channels	2 x 16
	FADC Channels	4
Timer	Σ Timed IO	Up to 80
	GPTA®	1 GPTA®
	LTC	1 LTC
Interfaces	Flexray	-
	CAN	2 / 64
	SSC / ASC	2 / 2
	MLI / MSC	1 / 1
	SENT	-
	EBU	-
Package		QFP 176
Temperatur (T_{ambient}) packaged		- 40° C to +125° C
Max. Temperatur (T_{junction}) Bare Die		-



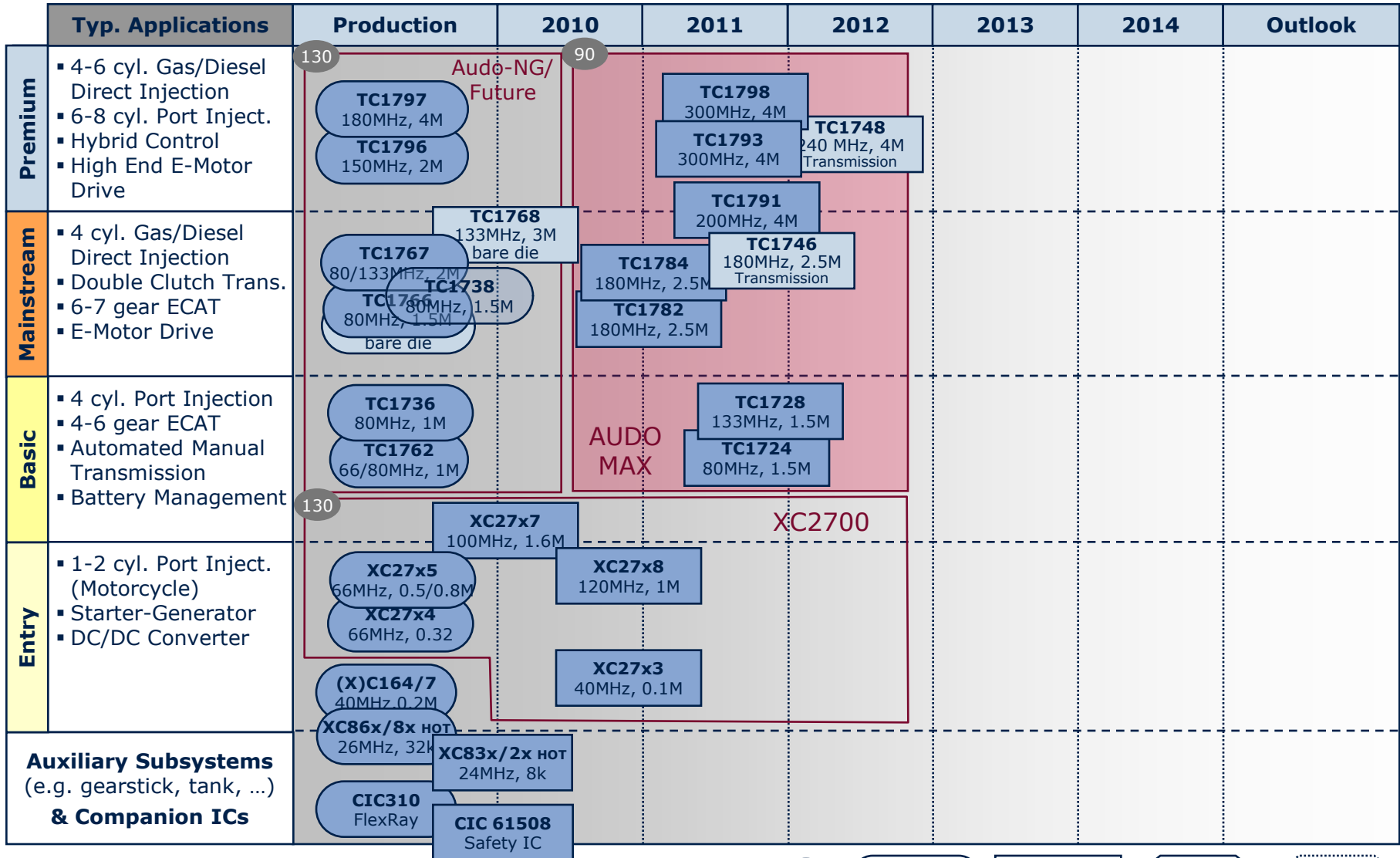
Status

■ In production



Powertrain Microcontroller Roadmap

February 2010



Technology (xx)

Production

Development

Concept

Idea

AUDO MAX Overview

January 16, 2009



Classic Powertrain

- Premium Engines**
- 4-6 cylinder, GDI/DDI
 - EU6 equivalent
- Large Engines**
- 6-8 cylinder, MPI
 - EU6 equivalent

- High End Engines**
- 6-8 cylinder
 - GDI/DDI
 - EU6 equivalent
 - TC1798: best performance on the market, 2.3x as audioNG**

Standard Engines

- 4 cylinder, GDI/DDI
- EU6 equivalent

TC1791
200 MHz

TC1793
260 MHz

DTC1798
300 MHz

TC1798
300 MHz

TC1748
240 MHz

TC1782
180 MHz

TC1784/83
180 MHz

TC1746
180 MHz

TC1724
130 MHz

TC1728
130 MHz

- Basic Engines**
- 3/4 cylinder, MPI
 - EU4-5 equivalent
 - BRIC markets
- Eco Engines**
- 3 cylinder, GDI
 - EU6 equivalent
- Basic Transmission**
- ECAT

- High End Transm.**
- DCT
 - CVT
 - High End ECAT
 - Up to 170 degree**

- Simple Engines (Motorcycles)**
- 1-2 cylinders, MPI
 - EU3/4 equivalent (BRIC)



6 MB			
4 MB			
2.5 MB			
1.5 MB			
512 KB	TC1712 40 MHz		

LQFP 100

LQFP 144

LQFP 176

LFBGA 516

Bare Die

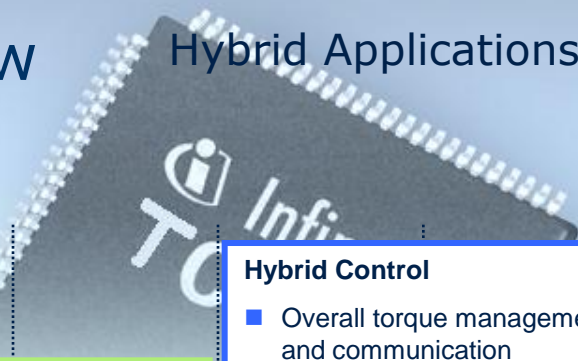
- In Development
- Under Evaluation

*Frequency and Flash size are maximum values.
Customer specific variants with lower values possible.*

AUDO MAX Overview

11 Nov. 2009

Hybrid Applications



6 MB				Hybrid Control ■ Overall torque management and communication		DTC1798 300 MHz	
4 MB		E-Motor Drive ■ E.g. 3-phase Permanent Magnet Stator Motor (PMSM)		TC1791 200 MHz	TC1793 260 MHz	TC1798 300 MHz	TC1748 240 MHz
2.5 MB			TC1782 180 MHz	TC1784/83 180 MHz			TC1746 180 MHz
1.5 MB		TC1724 130 MHz	TC1728 130 MHz				
512 KB	TC1712 40 MHz	DC/DC Converter ■ High voltage supply for E-Motor					
	LQFP 100	LQFP 144	LQFP 176	LFBGA 292	LBGA 416	LFBGA 516	Bare Die

Integrated Hybrid Control

- Torque management & communication
- 3-phase control for up to 4 electrical motors

Battery Management

- Overall charging/discharging control of battery cells/packs (active balancing)



- In Development
- Under Evaluation

*Frequency and Flash size are maximum values.
Customer specific variants with lower values possible.*

TC1782

Middle-range Powertrain Microcontroller

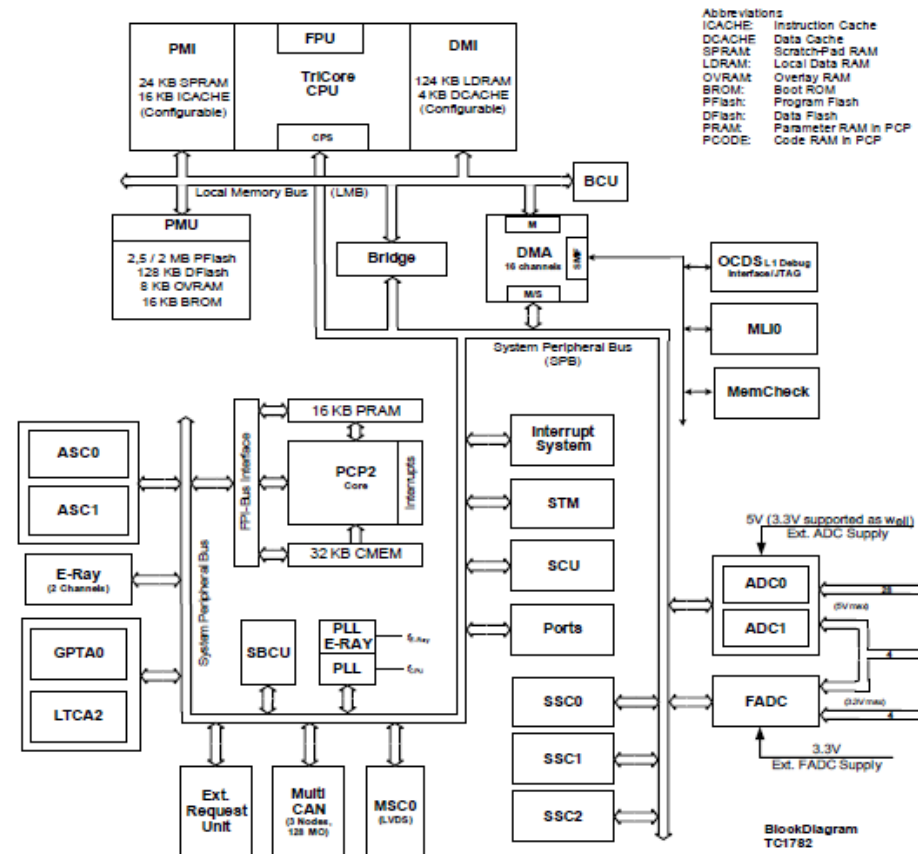


		TC1782
Core	TC version	1.3.1
	Frequency	180MHz
Flash	Program Flash	2.5 MB
	Data Flash (w/e cycles)	128 KB (up to 60k)
SRAM	Σ (w/o PCP, Cache)	176 KB
	PMI	40 KB
	DMI	128 KB
	Overlay	8 KB
PCP (max. frequency)		180 MHz
DMA	Channels	16
ADC	Σ Analog Inputs	36
	ADC Channels	2 x 16
	FADC Channels	4
Timer	Σ Timed IO	Up to 80
	GPTA®	1 GPTA®
	LTC	1 LTC
Inter-faces	Flexray	2 channels (optional)
	CAN	3 / 128
	SSC / ASC	3 / 2
	MLI / MSC	1 / 1
	SENT	-
	EBU	-
Package		LQFP 176, ePAD
Temperatur (T_{ambient}) packaged		- 40° C to +125° C / 150° C



Status

- Qualified samples available



TC1728

Middle-Low end Powertrain Microcontroller

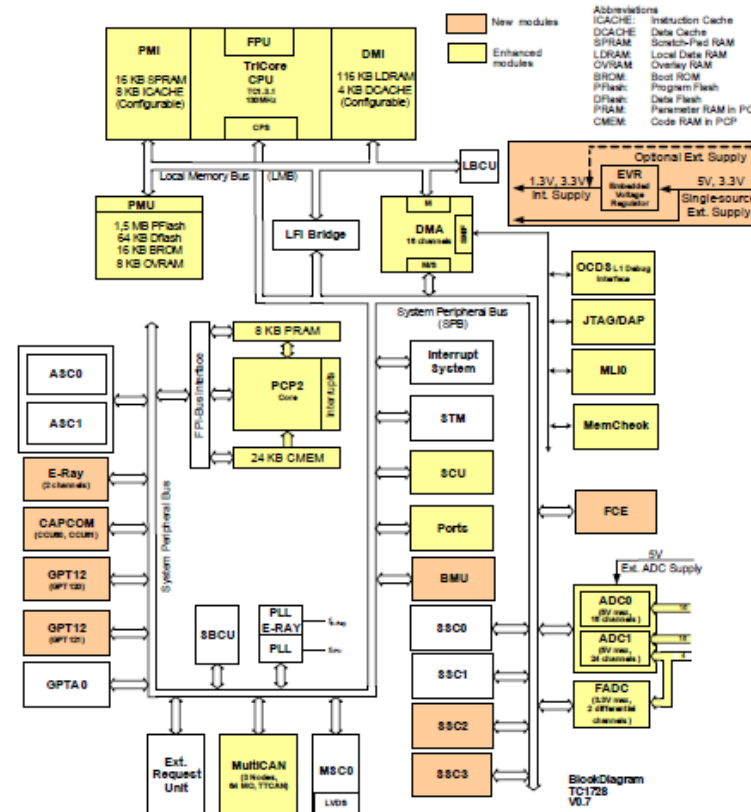


		TC1728
Core	TC version	1.3.1
	Frequency	133 MHz
Flash	Program Flash	1.5 MB
	Data Flash (w/e cyc.)	64 KB (up to 60k)
SRAM	Σ (w/o PCP, Cache)	140 KB
	PMI	16 KB
	DMI	116 KB
	Overlay	8 KB
PCP (max. frequency)		133 MHz
DMA	Channels	16
ADC	Σ Analog Inputs	36
	ADC Channels	16 + 20
	FADC Channels	2 differential
Timer	GPTA® / LTC	1 / -
	CCU6 / GPT12	2 / 2
Inter-faces	Flexray (nodes/channels)	1
	CAN (nodes / objects)	3 / 64
	SSC / ASC / SENT	4 / 2 / -
	MLI / MSC / EBU	1 / 1 / -
Safety	HW support	degree 3
Security	SHE / Tuning Protection	- / yes
Package		LQFP 176, ePAD
Temperatur (T_{ambient})		- 40° C to +125° C
EVR		Yes



Status

■ Qualified samples available in 2011/07



TC1782 EEMBC Benchmark

TC1782 - 180MHz " out of the box "	Iter. /sec	Code size (byte)	Data size (byte)
Angle to Time Conversion	275 477	3 900	2 317
Basic Integer and Floating Point	159 066	1 822	8 489
Bit Manipulation	3 440	4 912	3 313
Cache Buster	585 785 (*)	3 146	1 311
Response to Remote Request (CAN)	942 446	2 648	6 189
FFT (Auto/Indus version)	431	4 028	43 381
FIR Filter (Auto/Indus version)	53 229	2 852	4 945
IIR Filter	37 302	5 060	4 641
Inverse Discrete Cosine Transform	5 983	5 454	10 133
IFFT (Auto/Indus version)	465	3 820	59 749
Matrix arithmetic	792	4 862	14 036
Pointer Chasing	4 770	2 050	5 693
PWM	548 068	2 536	10 005
Road Speed Calculation	640 100	1 920	2 257
Table Lookup and Interpolation	82 612	2 160	12 501
Tooth to Spark	29 565	5 558	50 018

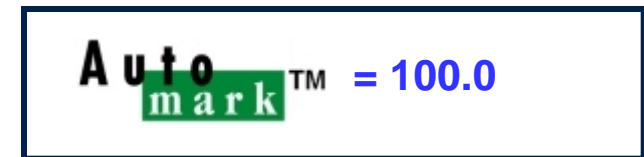
(*) heap located in external memory

TC1782 has been certified by EEMBC, in conjunction with Tasking VX Tool-set for TriCore (v2.1).



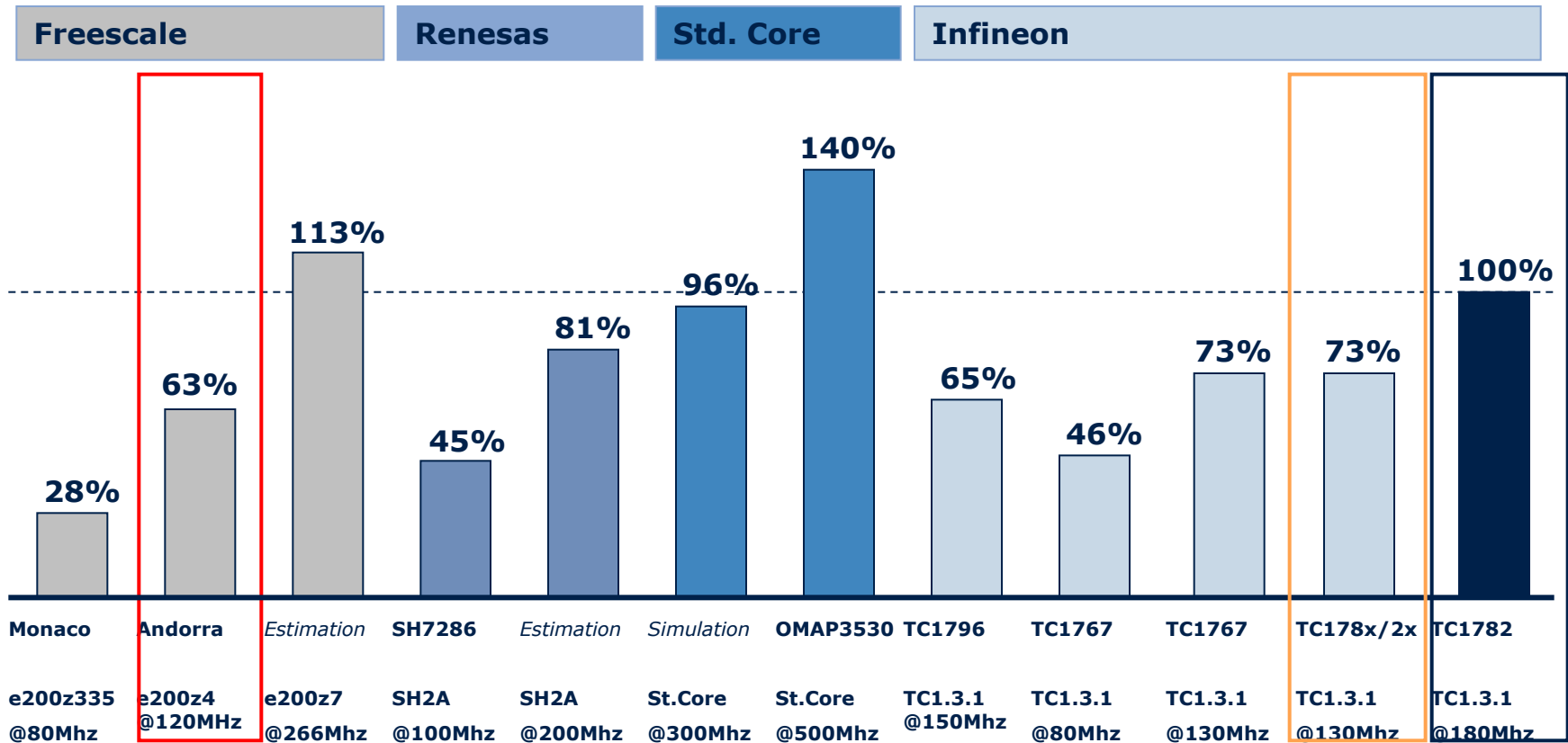
The "Out of The Box" certification has been performed with the test suite AutoBench™ v1.1

More information under:
www.eembc.org



$$(\text{Automark}^{\text{TM}} = \sqrt[16]{\frac{A \times B \times C \times \dots}{\text{CONSTANT}}})$$

Application Benchmark Results



How it works

- The benchmark is based on a real EMS application.
- The benchmark determines the execution speed, reflecting core performance and memory architectures.
- The application code is a typical mix of tasks which execute on a time basis and tasks which occur on a particular angle of the wheel.
- Dummy data forces the benchmark software to take the same execution path as the original application software.
- For comparability: normal compiler settings (O2 nonline), no modification of C-Code
- Measured on silicon (if available)

Development Tools for Tricore

Complete Tool Chain Support with Global Partners
 More development tools information available at
www.infineon.com/mc-tools

Embedded Software



Training/ Support, Services



Integrated Compiler Environments



Auto Code Generation Tools



Operating Systems



Programmer/ Flash Tools



Emulators/Debugger Development Systems



Starter Kits and Evaluation Boards



Simulation/ Modelling



