



PSOC™ Control C3 MCU (PSC3M3x, PSC3P2x, PSC3M5x, and PSC3P5x) technical overview

Customer training workshop (CTW)

December 2025



Table of contents

1	Introduction to PSOC™ Control C3 MCU	3
2	PSOC™ Control C3 key features	8
3	PSOC™ Control C3 architecture and features	13
4	Security and safety	21
5	Ecosystem, Tools, and hardware kits	24
6	Resources	32
7	Revision history	36

Table of contents

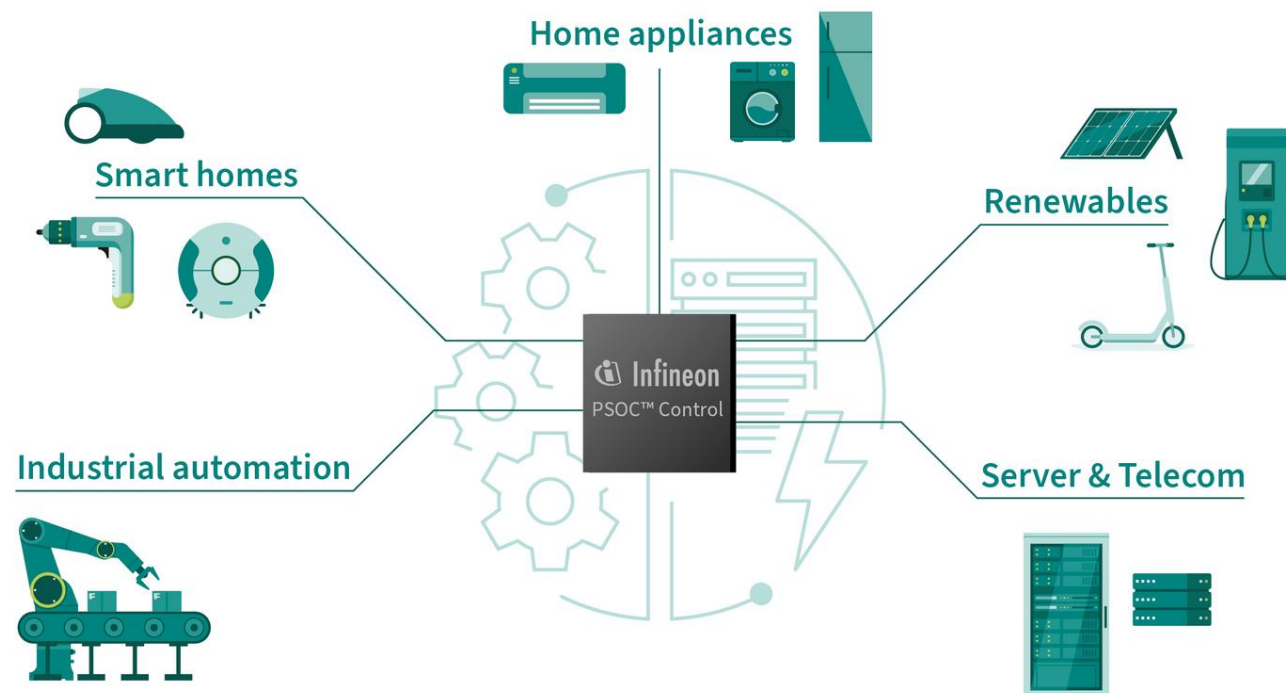
1	Introduction to PSOC™ Control C3 MCU	3
2	PSOC™ Control C3 key features	8
3	PSOC™ Control C3 architecture and features	13
4	Security and safety	21
5	Ecosystem, Tools, and hardware kits	24
6	Resources	32
7	Revision history	36

Introduction to PSOC™ Control C3

Real-time control with advanced peripherals

Features

- **Arm® Cortex®-M33** based microcontrollers with up to 180 MHz
- **Real-time control** for motor and power conversion solutions
- **Scalable and compatible portfolio** in features, packages, pinouts, memory and performance
- **Differentiating control peripherals**, ready for Wide-bandgap solutions
- **PSA L2 / EPC2 security**
- **Class B / SIL 2 compliant**
Safety libraries



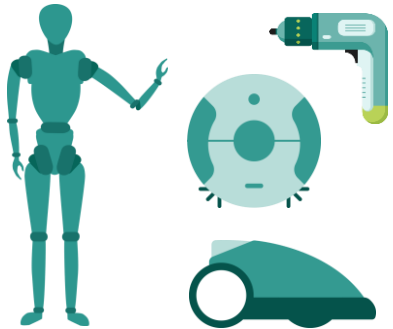
Secure, high-performance motor control and power systems

	Customer and system benefits	Features
 Real-time control	Enable high-performance systems to respond to real-time events with minimal delay and low utilization – Systems combining dual-motor control and high-frequency multi-phase PFC – Very high RPM motor control systems with full dynamic control range	– Fast analog and digital peripherals, for example, 12 MSPS ADC with 16 parallel S&H channels, 240MHz timers – HW Accelerators (DSP, FPU, CORDIC) for boosted task execution – Trigger Matrix with direct interconnects between ADC, timer, and ACOMP for minimal control latency
 System efficiency	WBG-ready with fast, precise analog processing and digital control to improve control loop accuracy and system efficiency – Power conversion systems in power supply units (PSUs) – FOC for motor systems Low standby power for battery-powered applications	– High sample rate, autonomous analog with full control flexibility and digital IPs – Versatile timers with 80ps high-resolution option for finest control – Flexible topology coverage for increased efficiency
 Ease-of-use for developers	Quick time-to-market with ModusToolbox™ as a unified and comprehensive software and ecosystem platform for developers	– Turnkey solution for complete development flow – Motor and power suite with multi-functional GUI as well as dedicated tools, advanced libraries, etc.
 Advanced security	Enable secure on-site and cloud-based systems with secure over-the-air (OTA) updates, software IP protection, and secure key storage	– PSA L2 certified with CRYPTO accelerator, TrustZone, key management, secure storage for various security options

Secure, High-performance motor control and power systems for Industrial and Consumer applications



Smart home



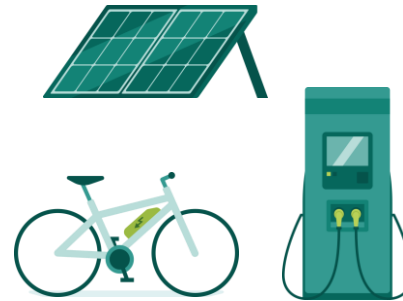
- Power/gardening tools
- Lawn mower robots
- Home robots

Home appliances



- Residential aircon ODU
- Large and medium Home appliances Drives

Renewables



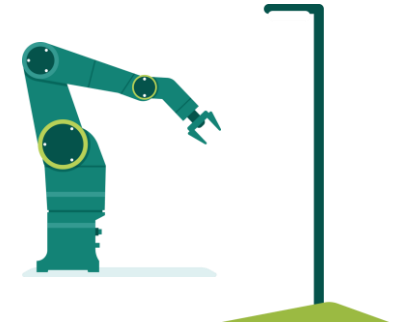
- PV inverters
- LEV
- EV charging

Server and Telecom (SMPS)



- Telecom PSUs
- Server PSUs
- Workstation PSUs

Industrial



- General-purpose drives
- LED Lighting
- Servo Drives
- Commercial aircons



Motor control



Power conversion



Communication



Wide-bandgap
(WBG) ready



System solution
offering with other
Infineon products

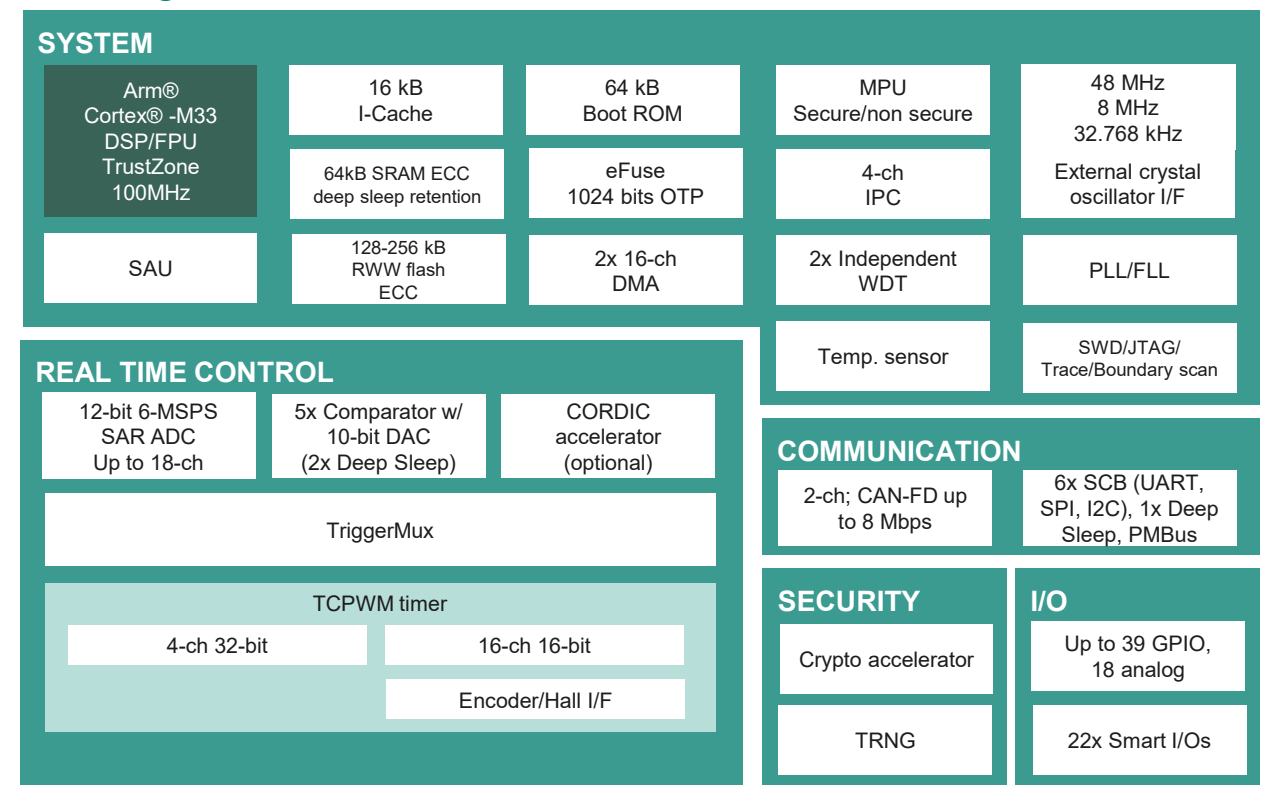
Table of contents

1	Introduction to PSOC™ Control C3 MCU	3
2	PSOC™ Control C3 key features	8
3	PSOC™ Control C3 architecture and features	13
4	Security and safety	21
5	Ecosystem, Tools, and hardware kits	24
6	Resources	32
7	Revision history	36

PSOC™ Control C3 key features

Entry line family- C3P2 and C3M3

Block diagram



Status/availability

- In production
- Datasheet, EVK and qualified samples: available

Packages

- QFP-48 (7 x 7 mm, 0.5 mm)
- QFN-48 (6 x 6 mm, 0.4 mm)
- QFP-64 (10 x 10 mm, 0.5 mm)
- QFN-64 (8 x 8 mm, 0.4 mm)

Applications

- **Industrial ready**
 - Single and dual motor control, or PFC
 - PFC, power and gardening tools, MHA and Aircon drives and compressors, LEV drives, SPMS

Product features

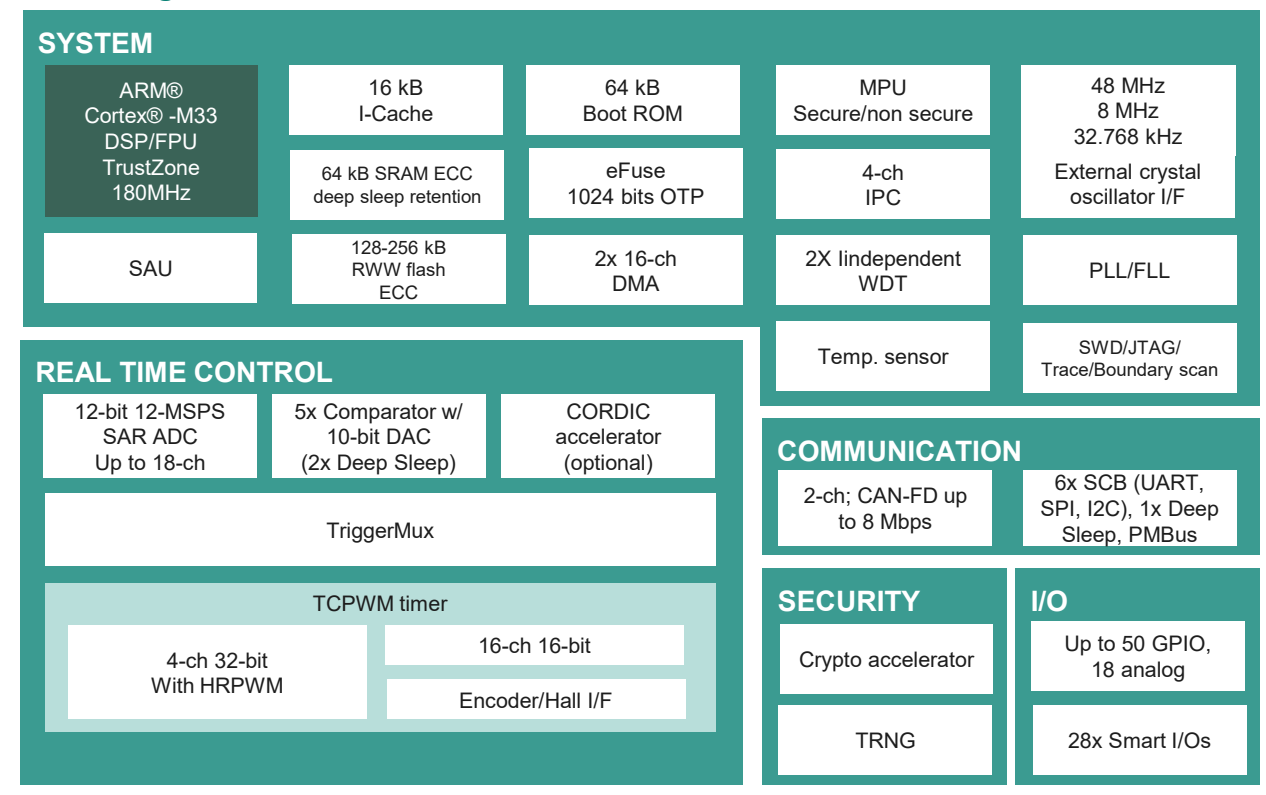
- **Low power modes:** Deep Sleep (<10 µA), Sleep, and Hibernate (<1 µA)
- **Idle sampling ADC**
 - Low jitter and high-performance, obsoleting external buffer caps
 - 6 MSPS, 16 ch sync. sampling, 16-bit oversampling, in-built gain
- **Comparators:** < 10ns in-built 10-bit DAC and slope generator
- Ten clock-cycles CORDIC accelerator
- **Timer/Counter/PWM (TCPWM)**
 - Complementary output/ch, multi-channel control, shadow update, input glitch filter, and PRNG dithering
- **TriggerMux:** < 1ns latency programmable peripheral interconnects
- **Memory**
 - 128-256 kB RWW flash, ECC on flash and RAM
 - 16 kB instruction cache
- **Security:** PSA L2 certified, Configurable flash partitioning/protection
- **Safety:** Class B and SIL 2 compliant

Operating range

- 1.71 V to 3.6 V
- <1 to 10 µA Low-power modes
- -40 to 115°C Ta

Main line family- C3P5 and C3M5

Block diagram



Status/availability

- In production
- Datasheet, EVK, and qualified samples available

Packages

- QFP-48 (7 x 7 mm, 0.5 mm)
- QFN-48 (6 x 6 mm, 0.4 mm)
- QFP-64 (10 x 10 mm, 0.5 mm)
- QFN-64 (8 x 8 mm, 0.4 mm)
- QFP-80 (12x12 mm, 0.5 mm)

Applications

- **Industrial ready**
 - Single and dual motor control, and PFC
 - PFC, Power and Gardening tools, MHA and Aircon drives and compressors, LEV drives, SPMS

Product Highlights

- **Low power modes:** Deep Sleep (<10 µA), Sleep, and Hibernate (<1 µA)
- **Idle sampling ADC**
 - Low jitter and high-performance, and obsoleting external buffer caps
 - 12 MSPS, 16 ch sync. sampling, 16-bit oversampling, in-built gain
- **Comparators:** < 10ns in-built 10-bit DAC and slope generator
 - Ten clock-cycles CORDIC accelerator
- **Timer/Counter/PWM (TCPWM):**
 - Complementary output/ch, multi-channel control, shadow update, input glitch filter, and PRNG dithering
 - < 80 ps high resolution PWM (HRPWM) for period, duty and dead time
- **TriggerMux:** < 1 ns latency programmable peripheral interconnects
- **Memory:**
 - 128-256 kB RWW flash, ECC on flash and RAM
 - 16 kB instruction cache
- **Security:** PSA L2 certified, configurable flash partitioning/protection
- **Safety:** Class B and SIL 2 compliant

Operating range

- 1.71 V to 3.6 V
- <1 to 10 µA Low-power modes
- -40 to 115°C Ta

PSOC™ Control C3 – Key electrical parameters at glance

Absolute max ratings	Device-level specifications	Analog and digital peripherals	Memory	System resources
– VDD: -0.5 V to 4 V – Current per GPIO max : - 25 mA to +25 mA – Junction temp max: 125°C - ESD HBM : 2.2 KV min	– VDDD range: 1.7 V- 3.6 V – Analog VDDA:1.7 V-3.6 V – GPIO supply: 1.7 V-3.6 V – Core voltage (ULP,MF, LP ,OD): 0.9 V-1 V-1.1 V-1.2 V – Deep Sleep mode: 7 µA – Hibernate mode: 300 nA – Active mode max:45 mA – Hibernate to Active:2 ms – GPIO Fout max: 100 MHz – Slew rate Tr and Tf : 2.5 ns – CPU clk max: 180 MHz	– SAR ADC resolution: 12-bit – S/H single ended: 16 – TUE : +/- 4.5 LSB – VREF_EXT = VDDA – Sample rate: 12 Msps @240Mhz – Temperature sensor: +/- 1°C – HRPWM res: <80ps – TCPWM max freq: 240 MHz – Timer resolution:4.16 ns – Fast SPI max freq: 50 MHz	– Flash voltage:1.71 V to 3.6 V – Flash endurance: 100K cycles – Flash retention @55C: 20 yr – Bulk erase 256 KB: 11 ms – Row (Block) 512-byte program:5 ms – Full device programming time: 2.6 s – Wait states @180 MHz: 9	– Ext XTAL: 4 to 35 MHz – Ext direct clk max: 80 MHz – IMO @8MHz : +/-2% – IHO @48MHz : +/-1% – ILO@32KHz : 10% – BOD trip voltage: 1.54 V min

Table of contents

1	Introduction to PSOC™ Control C3 MCU	3
2	PSOC™ Control C3 key features	8
3	PSOC™ Control C3 architecture and features	13
4	Security and safety	21
5	Ecosystem, Tools, and hardware kits	24
6	Resources	32
7	Revision history	36

PSOC™ Control C3 architecture and features

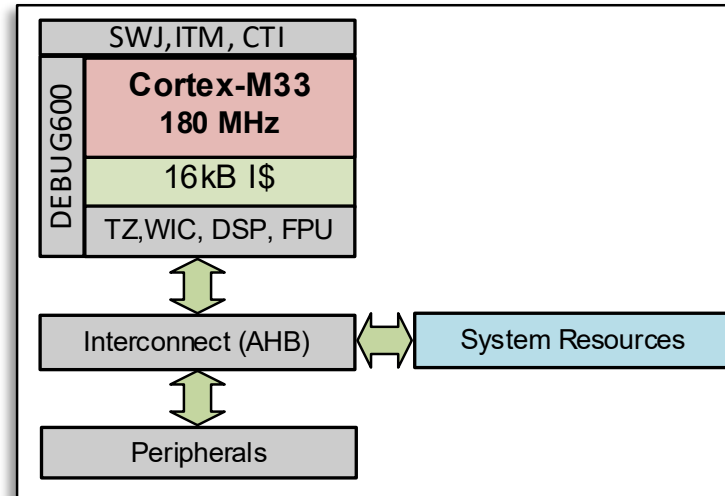
CPU subsystem (CPUSS)

Key features

- Sleep modes with integrated wait for interrupt (WFI) and Wait For Event (WFE), plus sleep on exit capability
- Trustzone-M memory mapping for secure/non-secure aliasing based on programmable secure arbitration unit (SAU) and fixed implementation-defined attribution unit
- Memory protection unit (MPU)
- Secure programming environment (SPE) for handling of secure and non-secure application SW
- Built-in instruction cache

Customer benefits

- Industry standard core with sophisticated low-power capabilities and wake up mechanisms resulting in less interrupts and faster response times.
- Enhanced security features integrated in the MCU core
- Improved real-time performance by reducing instruction access latency for time-critical blocks of code



Highlights

High-performance Arm® Cortex®-M33 core with FPU and DSP, with Trustzone running at 180 MHz, targeting real-time applications with enhanced security. MCU core is enhanced with:

- Integrated NVIC supporting 15 system exceptions and 139 physical interrupts, 30 available in Deep Sleep mode
- 16 kB Instruction cache
- Wake-up interrupt controller (WIC), memory protection unit (MPU) and interprocessor communication (IPC)

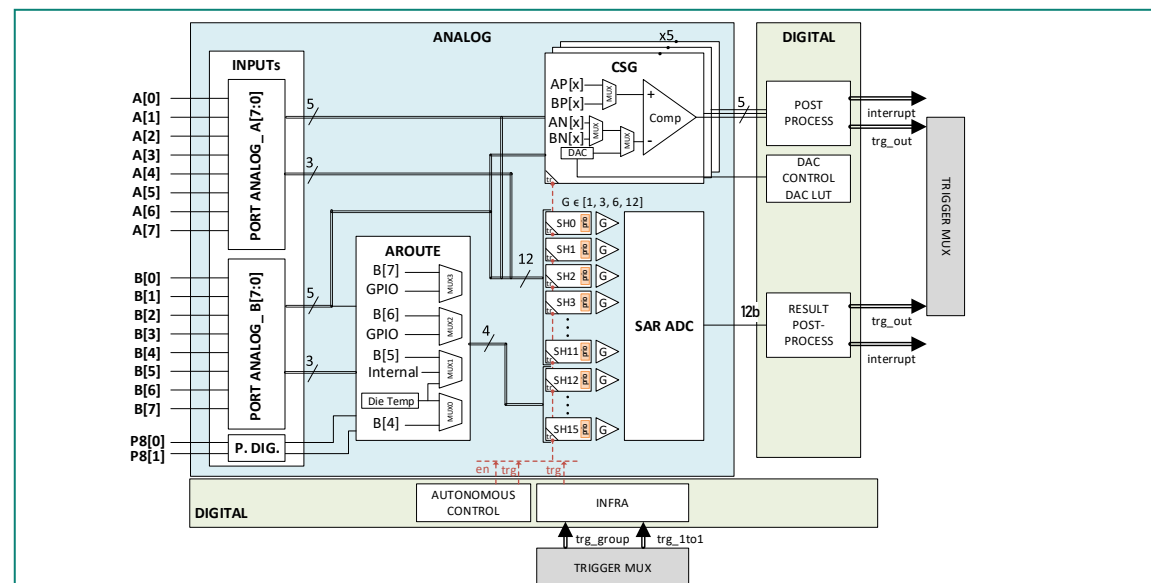
High performance programmable analog subsystem (HPPASS)

Key features

- 12b SAR ADC up to 12 Msps with idle sampling and autonomous control
- 12x direct S and H for single ended direct channels and four S and H for multiplexed channels: analog signals from PAD, internal signals as temperature sensor or up to 2 pins from digital domain, resulting in total 18 channels.
- Up to 32 words queued in FIFO together with channel identifier.
- Each S and H provided with programmable gain (1, 3, 6 or 12)
- Digital processing as averaging, ranging and filtering is available
- Comparator and slope generator (CSG) including: five 10-bit internal DAC and five high-speed comparators with <10 ns latency

Customer benefits

- The AC unit allows for avoiding any CPU intervention during ADC operations
- Fast ADC with 16 parallel sampling channels. Sequencer supports a two-level priority configuration, multiple interrupt generation and HW triggers (both as input to HPPASS and output from HPPASS) to support real-time applications.
- Shortening ADC timing chain with Idle sampling by removing the sampling phase and reducing BOM cost by removing the buffer capacitor
- Integrated comparators and 10-bit DACs for slope generation decrease the BOM content. It can also enable cycle-by-cycle current control (an A/D converter response for similar behaviour would be too slow)



Highlights

- HPPASS is a programmable analog subsystem of PSoC™ Control C3 Main/Entry product. It supports very high-speed and flexible analog conversions and analog comparisons. Conversions can be triggered in multiple ways, by leveraging SW triggers, by defining HW triggers from other peripherals or by programming a local autonomous controller (AC) unit
- A dedicated post-processing logic can also store the processed decision/data and autonomously stream the data to the Host.
- Comparator allows to work with a single input channel and internal DAC, or with external channels only. DAC control generates fixed, linear or arbitrary waveforms as per user need

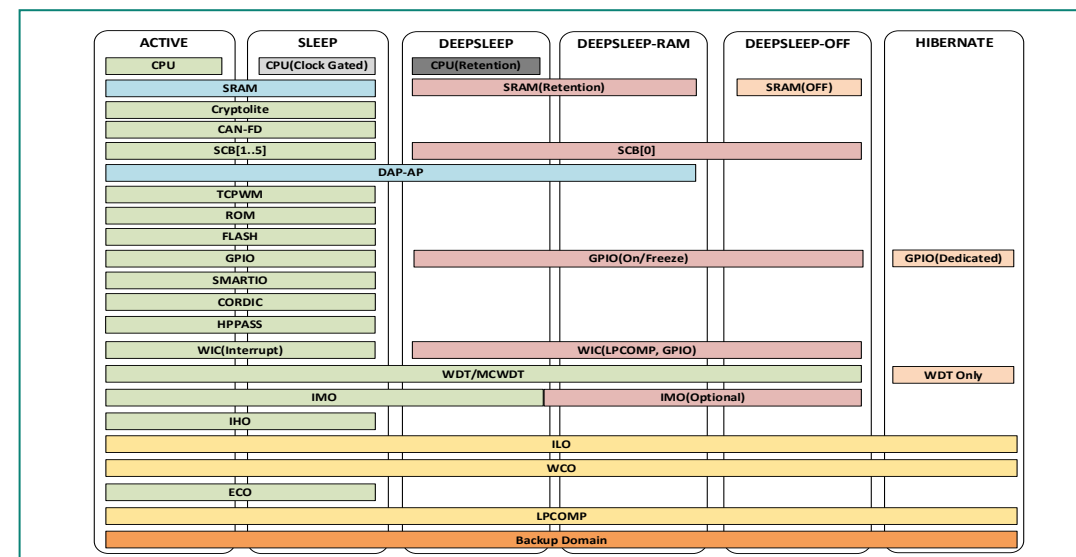
Power modes

Key features

- Six different low-power modes with different features, performance and wake-up options
- Four different active mode options with different max clock speeds
- LP comparator available in Deep Sleep/Hibernate mode
- Single instance SCB[5] in Deep Sleep mode to provide wake-up functionality
- Deep Sleep mode current with 3.3 V external supply and internal voltage regulator with 64-KB SRAM retention, LPComp, and Deep Sleep SCB with a current of 11 μ A
- Hibernate mode current with RTC and LPComp of up to 800 nA

Customer benefits

- Various low-power modes for fine-granularity power management to achieve the best balance between required functionality and performance, low-power consumption, short start-up time, and available wake-up sources
- Beneficial for hand-held/battery-powered applications where the system can be put to a lower power state to conserve power and wake up on request



Highlights

- Six different power modes (Active, Sleep, Deep Sleep, Deep Sleep off, Deep Sleep SRAM, and Hibernate)
- Dynamic voltage scaling to optimise power consumption in ACTIVE mode
 - OverDrive (OD) (1.2 V): Frequency up to 180 MHz
 - LowPower (LP)(1.1 V): Frequency up to 150 MHz
 - MidVoltage (MV) (1.0 V): Frequency up to 100 MHz
 - Ultra Low Power (ULP) (0.9 V): Frequency up to 50 MHz
- SCB[5] available for wake-up in Deep Sleep mode

Coordinate rotation digital computer (CORDIC)

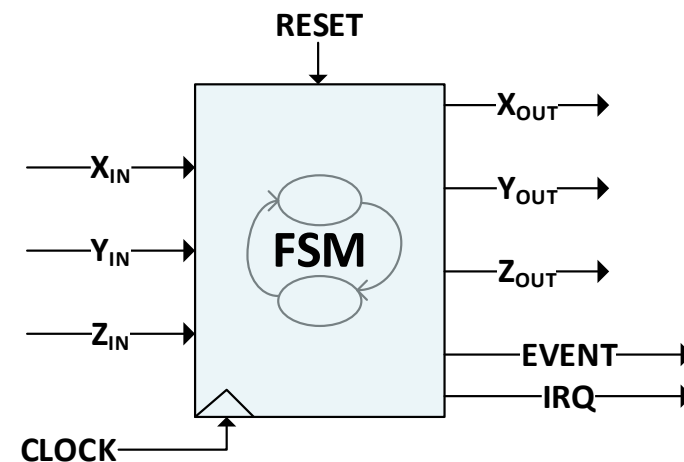
Key features

- Supports CORDIC operating modes for solving circular (trigon.), linear (multiply-add, divide-add) and hyperbolic functions
- 24-bit data width from 32-bit X, Y, Z data. Interrupt interface signals for completing the calculation or an error during execution
- DMA(DW) interface signals for automatic loading and reading the calculation results without host CPU intervention when completing the calculation
- 7 clk cycles (4 iterations per cycle) per calculation + 4 from start to end flag*

Customer benefits

- Off-loading CPU and reducing processing time
- Increase of computational power for real-time critical tasks
- Field-oriented motor control algorithms are implemented with high resolution

* MMIO Write/Read clk cycles not accounted



Highlights

- CORDIC is a peripheral module to support the CPU with hardware calculations for trigonometric-, linear-, hyperbolic-, complex number- and related functions.
- CPU can access CORDIC via the peripheral AHB bus. Completion of the operation is signalled via status bits, via an interrupt request line or via a trigger done line.

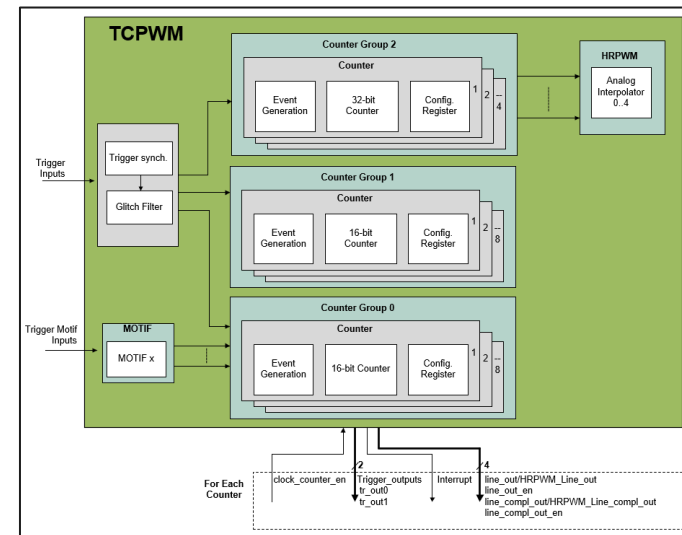
Timer/Counter /Pulse Width Modulator (TCPWM)

Key features

- Flexible and versatile timer peripherals -Timer/Counter, Capture, PWM, PWM Deadtime, Kill
- Integrated advanced motion interface (MOTIF): Quadrature decoder control, Hall sensor control and Multi-channel mode.
- High resolution PWM generation (HRPWM)
- Glitch filter and advanced dithering functions

Customer benefits

- Flexibility to generate PWM for various motor and power control topologies and driving schemes
- Hardware-based states for sensed BLDC motor control using MOTIF
- Higher resolution of <100ps for period, duty and dead time support clean waveform generation with high fsw scalability
- Configurable wider depth supported with an HW glitch filter to avoid input noise on signals, reducing SW efforts. Dithering support to minimise the impact of EMI/EMC.



Highlights

TCPWM is a multifunctional and advanced timer component that supports several functional modes

- Multi-Phase PWM generation with versatile, flexible timer structure
- 16-bit counter group for motor control with MOTIF interface and dead time support
- HRPWM feature for period, duty and deadtime support
- Comparator-based triggering of Kill Signals to switch off the PWM

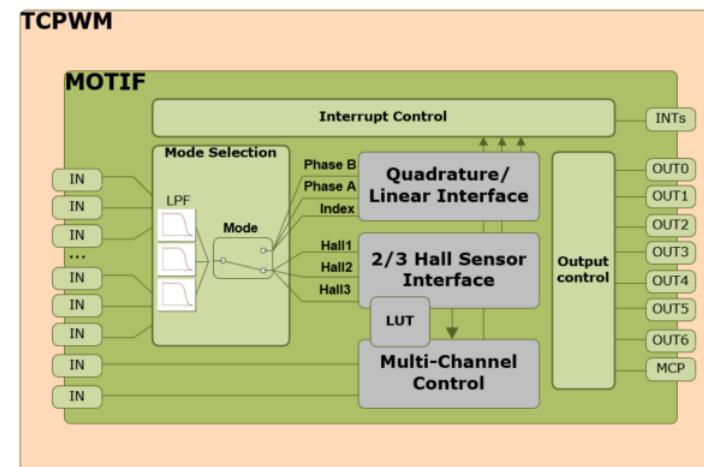
TCPWM - motion interface (MOTIF)

Key features

- Interface for linear or quadrature rotary encoder
- Hall sensors Interface mode
- Standalone multi-channel control
- Look up Table (LUT) support with Hall sensor and standalone multi-channel control

Customer benefits

- Application-tailored motor position and velocity measurement
- Hall Interface for direct connection to Hall sensors
- Simple built-in mode for brushless DC motor control
- Perform multi-level modulation for PWM
- Flexibility to develop complex modulation schemes
- HW look-up table (LUT) for advanced motor control feedback loop operation
- Input and output look-up table for automatic modulation control, reduces the SW complexity and CPU load



Highlights

Motion Interface (MOTIF) is an ideal solution for motor control applications. It is a flexible and powerful component integrated in TCPWM that enables Incremental Encoder or Hall sensors as motor control feedback input.

- MOTIF can be configured by user to support any of 3 available operation modes :
 - Quadrature Encoder
 - HALL interface
 - Stand-alone Multi Channel
- Each MOTIF module connected to a dedicated channel counter group

Table of contents

1	Introduction to PSOC™ Control C3 MCU	3
2	PSOC™ Control C3 key features	8
3	PSOC™ Control C3 architecture and features	13
4	Security and safety	21
5	Ecosystem, Tools, and hardware kits	24
6	Resources	32
7	Revision history	36

Security and safety

Safety and security

Security software

- Secure Boot Firmware
- Secure Firmware update
- Edge Protect bootloader based on MCUBoot
- Secure debug
- Trusted Firmware-M
 - Supporting PSA Level 2 certification (*in progress*)
 - With PSA Firmware update API
- Security code examples and application template

Safety software

- Class B and SIL 2 self-test libraries, certification

Third-party ‘Multi-Tenant’ firmware support

- Supports confidentiality of pre-installed software IP

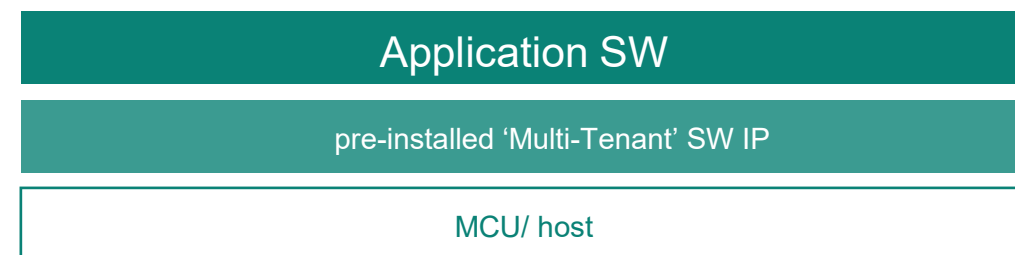
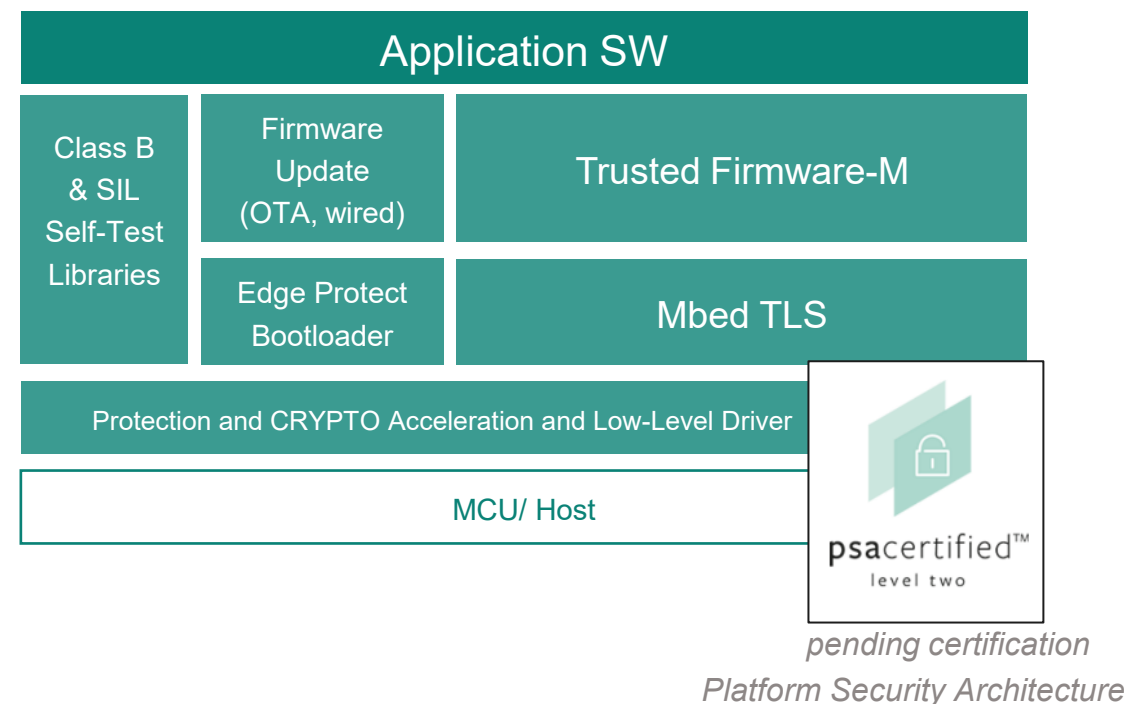


Table of contents

1	Introduction to PSOC™ Control C3 MCU	3
2	PSOC™ Control C3 key features	8
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Ecosystem, tools, and hardware kits

ModusToolbox™: Unified ecosystem for end-to-end development



Embedded software

- Application-specific embedded SW
- Core libraries (function blocks)
- Generic embedded SW



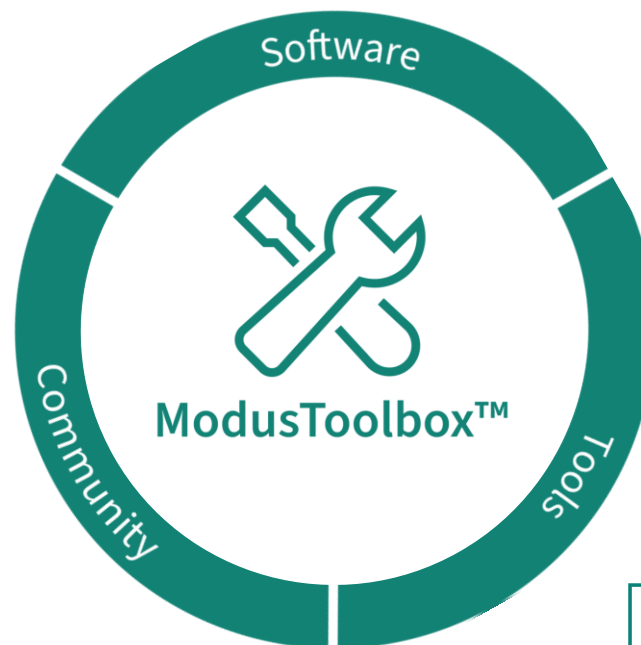
Graphical User Interfaces (GUIs)

- Quick start GUI
- Advanced configuration GUI
- Application design tool
- Memory and performance tools

Services



- Ticketing and reporting system
- Testbench
- Deployment platform
- Fleet management
- Over the air updates



Tools

- Model-based design
- IDE
- Debugger
- Tracebox

Hardware



- Reference designs
- Control demo boards
- Power stage demo board



Documents

- Datasheets
- User guides
- Application notes

Evaluation kits

Kit name	Purpose	MPN	Availability
PSOC™ Control C3M5 Evaluation Kit	Device functional evaluation	KIT_PSC3M5_EVK	Now
PSOC™ Control C3M5 Complete System Motor Control Kit	Evaluate motor control capabilities using a stand-alone kit including motor	KIT_PSC3M5_MC1	Now
PSOC™ Control C3M5 Motor Drive Control Card	Motor control card and adapter board to connect to customer's own power board and motor	KIT_PSC3M5_CC2	Now
PSOC™ Control C3M5 Complete System Dual Buck Evaluation Kit	Evaluate power conversion performance running 24V to 5V Dual Buck system board	KIT_PSC3M5_DP1	Now
PSOC™ Control C3M5 Digital Power Control Card	Enables power conversion evaluation while using customer's own power board	KIT_PSC3M5_CC1	Now
PSOC™ Control C3M3 Compact Kit	Powered by USB connection to PC, an easy to use and fast demonstration on the go. Easy to carry and easy to install	KIT_PSC3M5_2GO	Now
PSOC™ Control C3 Standalone Dual Buck Board	Dual Buck System stand alone board to be swappable with the same Digital Power Control Card	KIT_PSC3_DB1	Now

Evaluation kit: KIT_PSC3M5_EVK

Kit content

- EVK board
- USB-C to USB-A cable
- Quick start guide (QSG)

Nominal operation specification

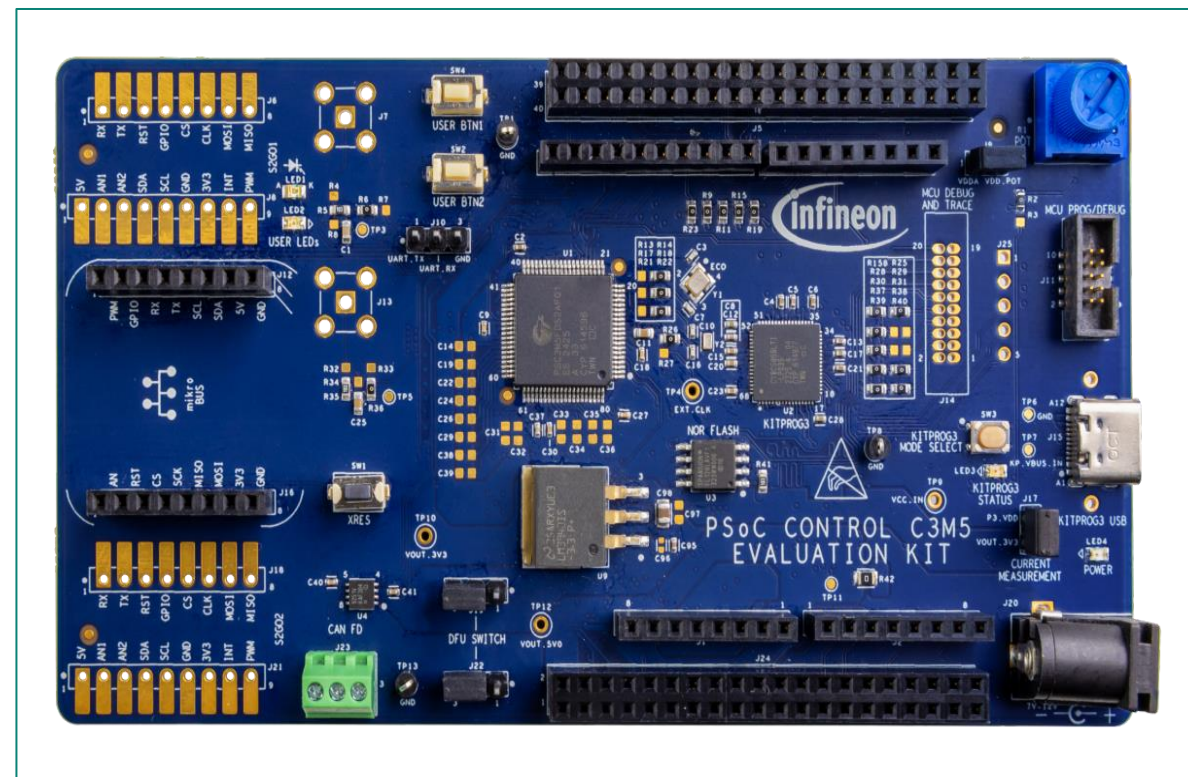
- Typical 5 V @0.5 A
- 12 V @1A using the DC adaptor
- 12 V @ expansion header for Motor control lite kit
- No control scheme, as it's a generic kit for evaluating the MCU

Protection features

- Input overvoltage protection, ESD protection for IOs
- Reverse voltage protection
- Input reverse polarity

Featured components

- PSC3M5FDS2AFQ1 (80-pin)
- CY8C5868LTI-LP039 (Kitprog-3)
- TLE9251VLEXUMA1 (CAN FD)



Kit status

- **Available**
- Order P/N: KIT_PSC3M5_EVK

Evaluation kit: KIT_PSC3M5_CC1

Kit content

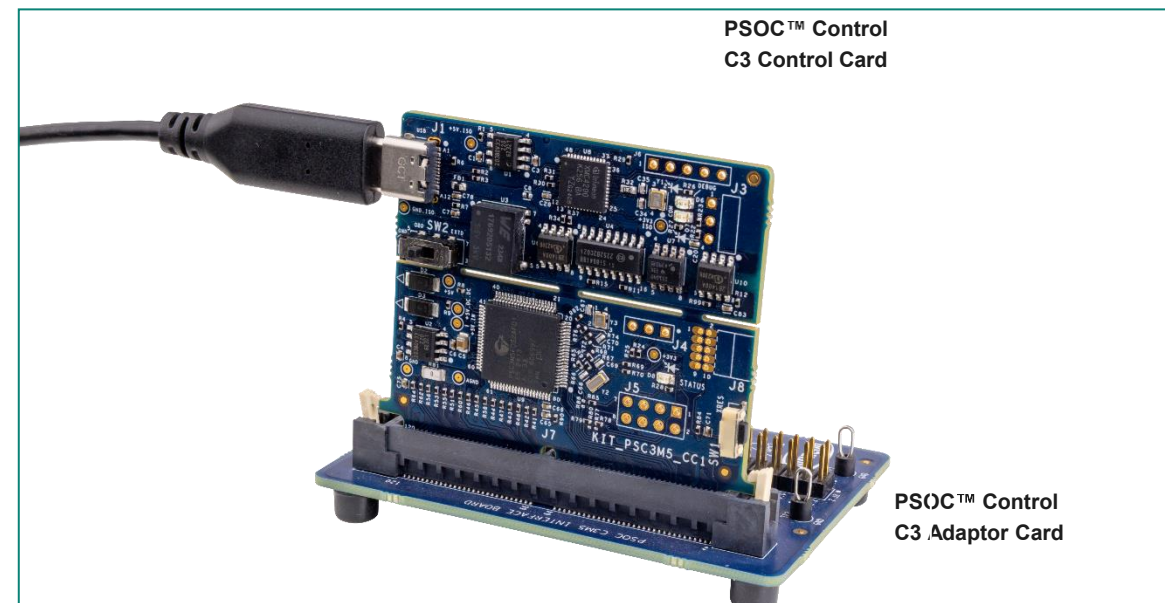
- PSOC™ Control C3 Control card
- PSOC™ Control C3 Adaptor card
- USB-C to USB-A cable

Nominal operation specification

- PSOC™ Control C3 Control card can be powered standalone through a USB port or can be powered through the Expansion board
- Adaptor card is just an interface board that enables easy access of PSOC™ Control C3 Control card IO pins through standard header connectors

Control scheme

- PSOC™ Control C3 Control card has on board isolated JLINK debugger through XMC4200 which can be separated from PSOC™ Control C3 board if in case needed
- There is an isolated PMBUS connector
- Optional 10-pin non-isolated JTAG/SWD header to connect with PSOC™ Control C3M5



Featured components

- PSC3M5FDS2AFQ1(80 pin)
- CY8C5868LTI-LP039(Kitprog-3)
- TLE9251VLEXUMA1(CAN FD)

Kit status

- **Available**
- Order P/N: KIT_PSC3M5_CC1

C3M5 Complete System Dual Buck evaluation kit

KIT_PSC3M5_DP1

Kit content

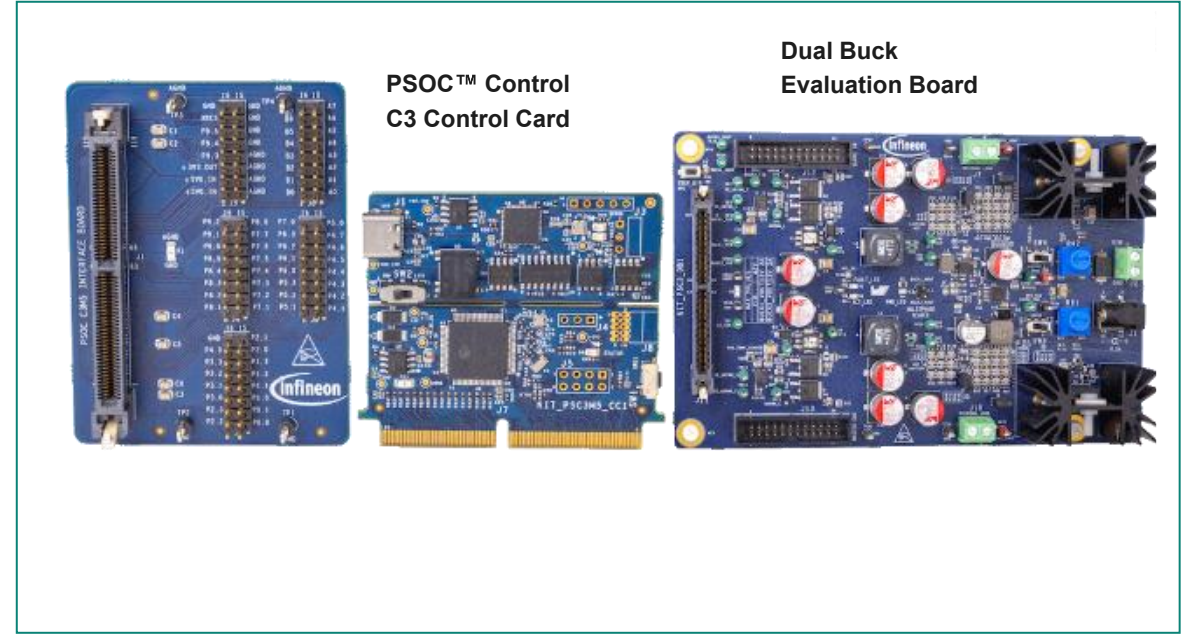
- PSOC™ Control C3 Control card
- Dual Buck Expansion board
- AC-DC 24 V Power adaptor
- USB-C to USB-A cable
- Daisy chain cable
- Quick start guide (QSG)

Nominal operation specification

- Out of the box configuration 24 V input 5 V output @ 2A lout on two buck circuits
- Board can support max 42V input 12V output @ 2A lout on each buck circuit
- PSOC™ Control C3 control card gets power from the Expansion board when no USB cable is connected to it

Control scheme

- Default code in PSOC™ Control C3 control is flashed with voltage control mode (VCM) Multi multi-instance
- Board support VCM, PCM, Multi-instance instance and Multiphase control methods
- Expansion board has 24-pin Daisy chain connectors for controlling up to 2 Expansion boards with a single Control card



Featured components

- | | |
|------------------|---------------------|
| – PSC3M5FDS2AFQ1 | – IPP12CN10LGXKSA1 |
| – 2EDL8023GXUMA1 | – IPD122N10N3GATMA1 |
| – TLE8366EVXUMA1 | |

Kit status

- **Available**
- Order P/N: KIT_PSC3M5_DP1

M5 Complete System Motor Control Evaluation kit

KIT_PSC3M5_MC1

Kit content

- PSOC™ Control C3 motor drive card
- Adapter board (HD100 to MADK)
- KITMOTORDC250W24VTOBO1 power board (24 V 250W)
- Nanotec DB42S03 BLDC motor with hall sensors (24 V 26W)
- AC-DC 24 V/1 A power adaptor
- USB-C to USB-A cable
- Quick start guide (QSG)

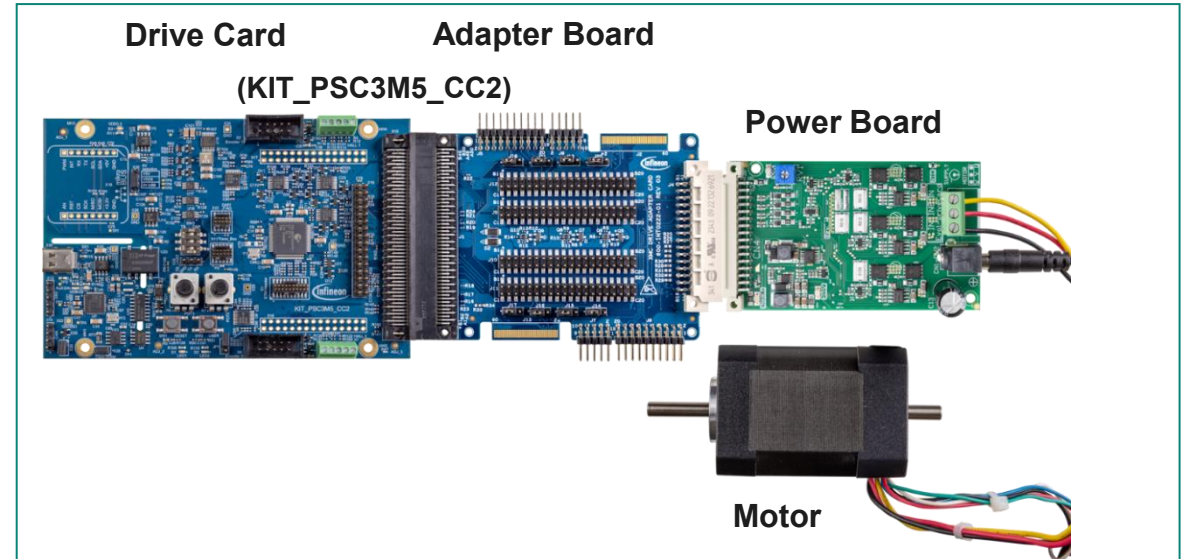
Nominal operation specification

- Out-of-the-box configuration demonstrates the Nanotec motor running in FOC Sensorless three-shunt mode
- Kit can support two motors in sensor/sensorless mode (with additional power board and motor)
- KIT_PSC3M5_MC1 drive card gets power from the Expansion board when no USB cable is connected to it

Control scheme

Kit is designed to support the following control schemes:

- Sensorless FOC in three-shunt and single-shunt mode
- Sensor-based FOC with Hall/Encoder (three-shunt/single-shunt)
- 6-step block commutation with Hall sensors
- Sensorless 6-step block commutation



Featured components

- PSC3M5FDS2AFQ1
- XMC4200Q48K256BA
- BSC014N06N
- 2DIB0400F
- 4DIR2400H

Kit status

- **Available**
- Order P/N: KIT_PSC3M5_MC1

Table of contents

1	Introduction to PSOC™ Control C3 MCU	3
2	PSOC™ Control C3 key features	8
3	PSOC™ Control C3 architecture and features	13
4	Security and safety	21
5	Ecosystem, Tools, and hardware kits	24
6	Resources	32
7	Revision history	36

Resources

Resources



Web pages

- [PSOC™ Control MCUs](#)
- [PSOC™ Control C3P - Power Conversion](#)
- [PSOC™ Control C3M - Motor Control](#)

Development kits, Module partners, and software

- [Evaluation Kits \(PSC3M5 EVK, KIT_PSC3M5_CC2, KIT_PSC3M5_MC1\)](#)
- [ModusToolbox™ Motor Suite](#)

Sales enablement collateral

- [Collateral documents](#) (login to myInfineon)
 - [Short Form](#) (login to myInfineon)
 - [Long Form](#) (login to myInfineon)
 - [Fight Guide](#) (login to myInfineon)
- [Product Briefs \(Entry Line / Main Line\)](#)

Developer Community (For technical support)

- [PSOC™ forum](#)

Other

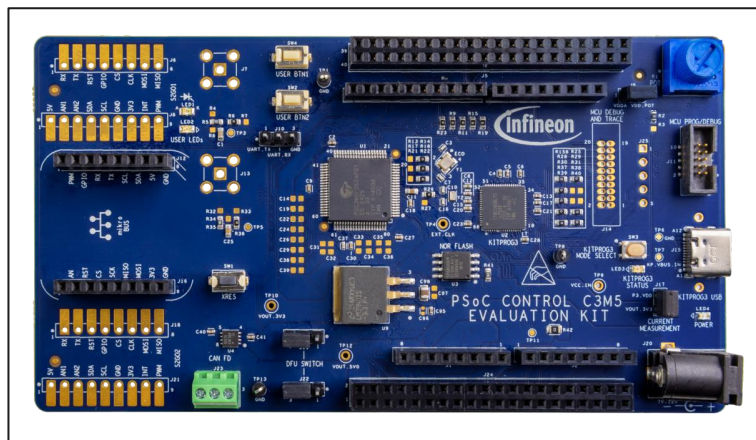
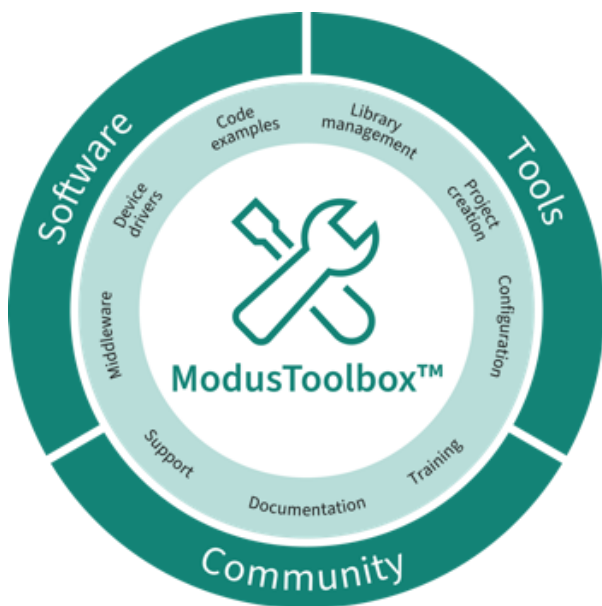
- [Datasheet: Entry Line and Main Line](#)
- [Whitepapers](#)
- [Application notes](#)

Call to action

1. Download **ModusToolbox™**
Motor Control Suite

2. Purchase a
PSOC™ Control kit

3. Watch the **ModusToolbox™**
training series



Easy as 1-2-3!

Table of contents

1	Introduction to PSOC™ Control C3 MCU	3
2	PSOC™ Control C3 key features	8
3	PSOC™ Control C3 architecture and features	13
4	Security and safety	21
5	Ecosystem, Tools, and hardware kits	24
6	Resources	32
7	Revision history	36

Revision history

Document revision	Date	Description of change
**	2025-12-23	Initial release

