

NXP数字信号处理器

DIGITAL SIGNAL CONTROLLER-DSC

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SECURE CONNECTIONS
FOR A SMARTER WORLD

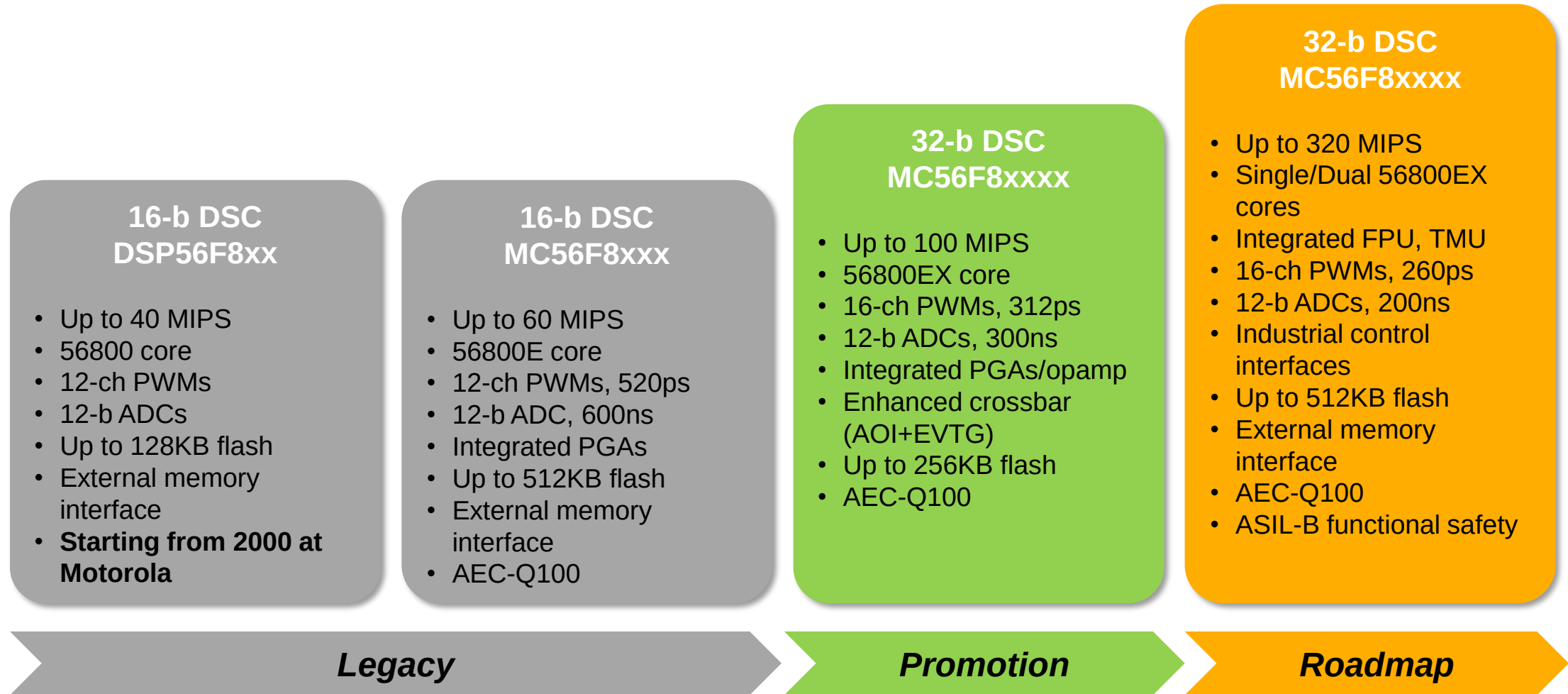
PUBLIC

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NXP DIGITAL SIGNAL CONTROLLER (DSC) 20 YEARS!

... FOCUS ON MOTOR CONTROL AND POWER CONVERSION



Expert of Power and Motor

–for the most efficient digital power conversion and advanced motor control applications.



高性能 DSC 内核

- 56800EX Hawk V3 Core, 100 MHz of performance
- FIR Filter 6x faster than ARM Cortex-M3
- The highest number of operations per cycle of any MCU in its class
- Fractional arithmetic
- Superfast interrupt



超低功耗 DSC (同类产品的50%或更低)

- Less than 0.3mA/MHz at full speed run
- Concurrent operations offer best-in-class execution times and overall low power run rates.



智能外设, 高度集成

- eFlexPWM – Advanced timer with 312ps resolution
- EVTG/Cross-Bar - Directly connecting any input and/or output with logic functions
- High impedance cyclic ADCs to capture events real time.
- 125°C and AEC-Q100 for automotive applications



简便易用的工具链

- CodeWarrior - Highly visual, Eclipse based IDE
- MCUXpresso – IDE, SDK, CFG, SEC
- RTCESL - Run time library for easy development
- FreeMASTER - GUI debug oscilloscope
- Processor Expert & QuickStart - GUI config tools
- Plenty of Reference Designs for power and motor

DIGITAL SIGNAL CONTROLLER – TARGET APPLICATIONS

能源

- Switch-mode power supply and power management
- Power distribution systems
- Circuit Breaker
- Instrumentation
- UPS
- Wireless Charging
- Solar system
- ESS / PCS
- AC-DC
- DC-DC
- DC-AC

汽车

- EV Compressor
- EV Charger
- Power Module
- On Board Charger
- Wireless Charging for Auto

电机

- Home Appliance
- Motor Control (ACIM, BLDC, PMSM, SR, stepper)
- Industrial Motor
- Industrial Control

应用方向：能源转换

集中式

组串式

储能逆变器（离并网）

微逆变

优化器

汇流器

通讯交互

光伏水泵

光伏制氢

光热追日

光伏面板清扫

AC-DC/ DC-DC/ DC-AC

无线充电，充电桩模块，OBC，PCS，ESS，UPS等

应用方向：电机控制

BLDC

FOC风机/ 泵/ 电摩

家电

磁阻式洗衣机，空调户外机

步进

开环/ 闭环/ 多轴

伺服

交流/ 直流/ 行业/ 通用

体积受限产品

小型化，便携化

PMSM

高效电机

低功耗，高效，内置运放，安全启动，快速响应和保护

32-BIT DSC FAMILY

... FOCUS ON MOTOR CONTROL AND POWER CONVERSION

www.nxp.com/dsc

MC56F81xxx

Entry Level

100/50MHz
8ch Hi-Res eFlexPWM
2x 1.6MSPS LP 12-b ADC w/ PGA
12-b DAC, 4x ACMP
2x OPAMP, DSASS
128K Flash
20K RAM
3V I/O
-40~105C / -40~125C

Production

MC56F82xxx

Entry Level

100/50MHz
8ch Hi-Res eFlexPWM
2x 1.25MSPS LP 12-b ADC w/ PGA
2x 12-b DAC, 4x ACMP
CAN
64K Flash
8K RAM
5V-tolerant I/O
-40~105C / -40~125C

Production

MC56F83xxx

Performance

100MHz
16ch Hi-Res eFlexPWM
2x 3MSPS LP 12-b ADC w/ PGA
2x 12-b DAC, 4x ACMP
CAN FD, USB FS+PHY
256K Flash, Dual Bank, ECC
64K RAM
5V-tolerant I/O
-40~105C / -40~125C
AEC-Q100, PPAP

Production

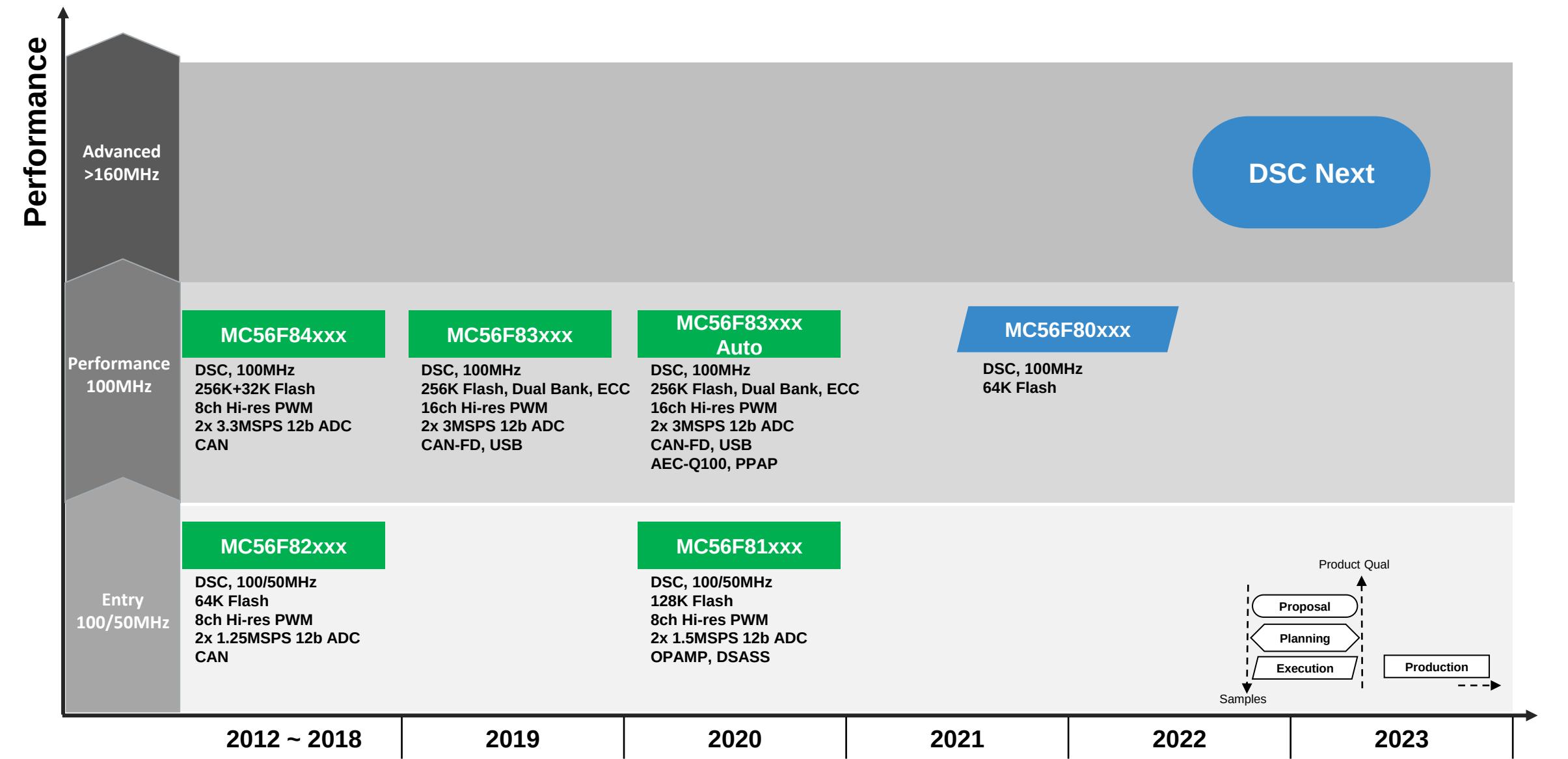
MC56F84xxx

Performance

100MHz
8ch Hi-Res eFlexPWM
2x 3.3MSPS 12-b ADC w/ PGA
12-b DAC, 4x ACMP
CAN, 16-b SAR ADC
256K Flash, 32K FlexMem
32K RAM
5V-tolerant I/O
-40~105C

Production

DIGITAL SIGNAL CONTROLLER ROADMAP



MC56F81系列主要特点

存储空间	高集成度	优化成本
• Up to 128KB Flash, 128 / 64 / 32 KB option • Up to 20KB RAM, running at the same speed as CPU • Added Boot ROM to support code update from UART and I2C	• Integrated two Operational Amplifier • Dual ADC up to 1.6MSPS each • Upgraded I2C to support PMBus • Digital Signature Authentication (DSASS)	• Price reduction on MC56F82xxx • 818xx with DSASS • 817xx for digital power • 816xx for motor control

For cost efficient digital power conversion and motor control applications

MC56F83系列主要特点

存储空间

- Up to 256KB flash with ECC/64KB RAM
- Dual flash bank supports live update
- Added Boot ROM to support code update from UART, I2C and CAN

高集成度

- Up to 16-ch high resolution PWM with 312ps resolution
- Dual low power ADC up to 3MSPS each
- Crossbar with Event Generator (EVTG) integration
- USB 2.0 FS OTG with PHY
- CAN-FD

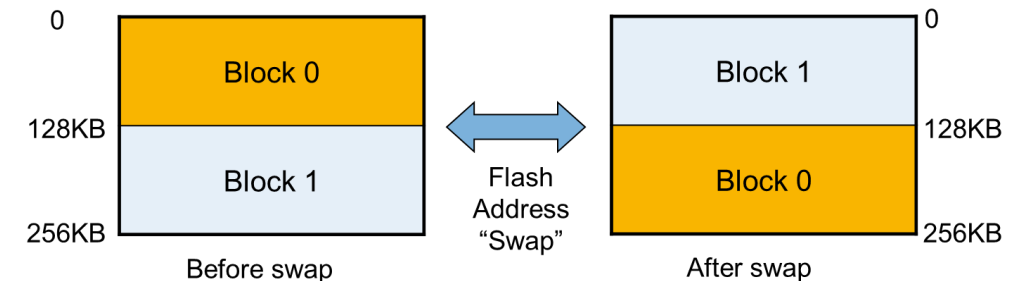
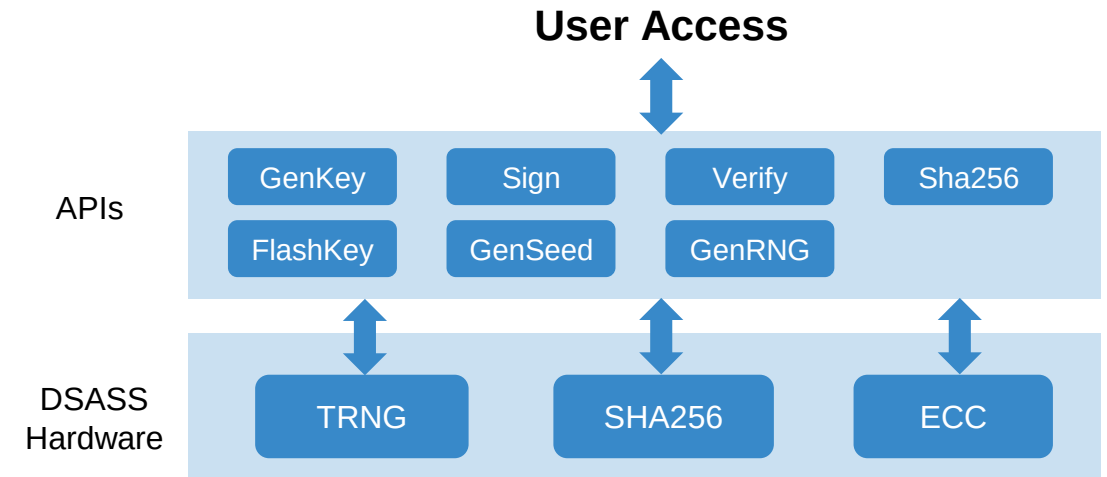
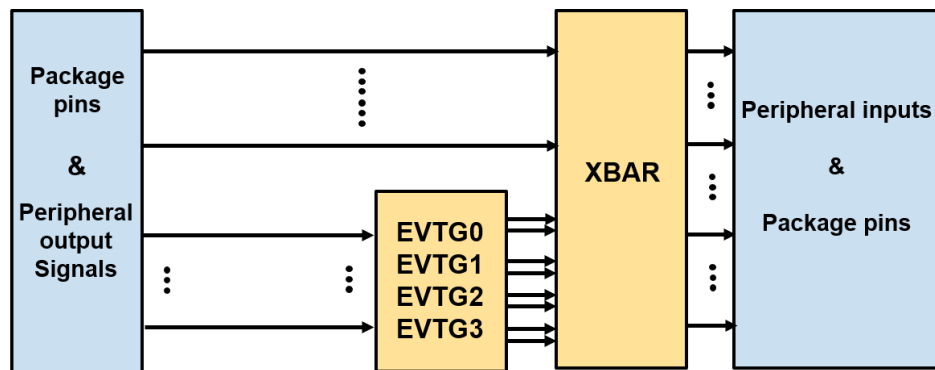
汽车级认证

- Temperature range: -40~105C (V-grade), -40~125C (M-grade)
- AEC-Q100 qualification, PPAP

Target applications: Onboard Charger (OBC), DC/DC, HVAC, Inverter, Charging Pile, LSEV etc.

NXP DSC PERIPHERALS

- 312ps High Resolution PWM
- High Speed Cyclic ADC (low power)
- Multi-mode OPAMP
- Dual bank Flash, support live update
- Event Generator (EVTG)
- Security – DSASS (**D**igital **S**ignature **A**lgorithm **S**ecurity **S**ubsystem)



REFERENCE PLATFORMS

MC56F81000-EVK
/MC56F83000-EVK



FRDM-MC-LVBLDC
FRDM-MC-LVPMSM



FRDM-MC-LVMTR



Low-Voltage, 3-Phase
Motor Control for BLDC
and PMSM design

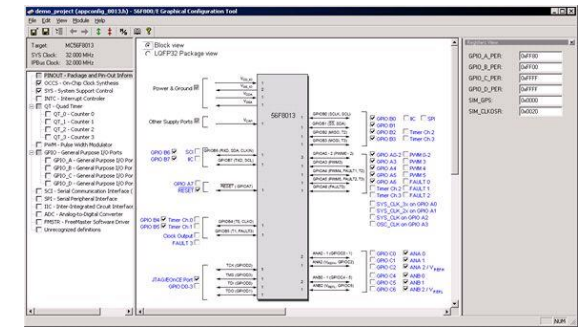


Enables 3-phase PMSM,
BLDC and ACIM motor
control and PFC solutions

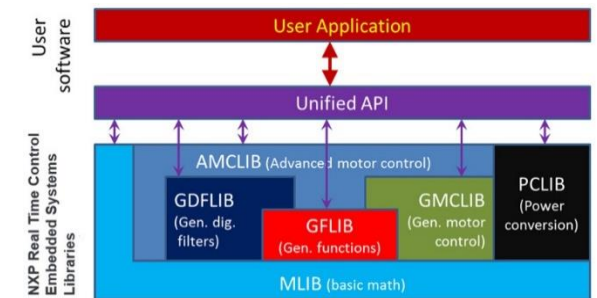
HVP-MC3PH高压驱动板, 和HVP-56F81768控制子卡

SW TOOLS – ALL FREE FOR 32-BIT DSC!

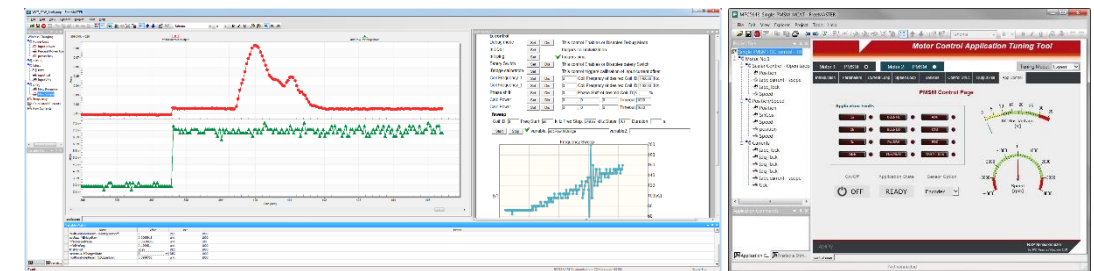
- **IDE - [CodeWarrior](#) Development Studio for DSC v11.x** (Compiler optimization ongoing!)
 - License free for DSC, Eclipse Front End for industry standard interface
- **Software Development Kit – [MCUXpresso SDK](#)**
 - Production-grade software
 - Includes driver for each peripheral, transactional APIs, peripheral driver usage examples, application demos, etc
- **Config GUI - [MCUXpresso Config Tools](#)**
 - Pins, Clocks, and Peripherals tools generate initialization for custom board support.
 - Much easier to config low level intricacies without having to know everything about hardware
- **Config GUI - [Processor Expert](#) / [QuickStart](#)**
 - Processor Expert is integrated with CodeWarrior, GUI operation
 - Quick Start has standalone software package.
 - Much easier to config low level intricacies without having to know everything about hardware
- **Run Time Control Embedded Software Library – [RTCESL](#)**
 - For motor control and power conversion common APIs
 - Include Math / General Function / General Motor Control / General Digital Filter / Advanced Motor Control / Power Control library
- **Run-time Debugging Tool – [FreeMASTER](#)**
 - Non-intrusive monitoring of variables on a running system
 - Oscilloscope-like display
- **PMSM/BLDC Tuning Wizard - [MCAT](#)**
 - FreeMASTER plugin
 - Tuning PI control parameters for sensorless PMSM motor
- **IEC60730 Safety Library**
 - IEC60730 Class B safety: to prevent unsafe operation of the controlled equipment



QuickStart GUI



RTCESL



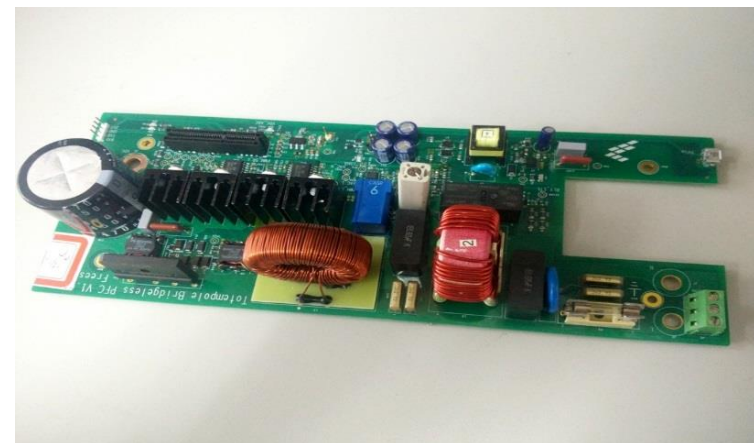
FreeMASTER + MCAT

DSC IDE & CONFIG TOOLS ROADMAP

 NEW	MCUXpresso Config Tools	Coming Soon	Coming Soon	Yes	Yes
 NEW	MCUXpresso SDK	Coming Soon	Coming Soon	Yes	Yes
	Quick Start	Yes	Yes	Yes	
	Processor Expert	Yes	Yes		
	CodeWarrior IDE	Yes	Yes	Yes	Yes
		56F84xxx	56F82xxx	56F83xxx	56F81xxx

参考设计

- Totem-Pole Bridgeless PFC Converter [Link!](#)
- LLC Resonant Converter with Sync Rectifier [Link!](#)
- 3in1 Air-Conditioner Outdoor Unit [Link!](#)
- Refrigerator Compressor [Link!](#)
- Simple Servo Motor Control Solution [Link!](#)
- Micro-Step Stepper Motor Control Solution [Link!](#)
- Sensorless FOC Washing Machine [Contact NXP](#)
- 访问 www.nxp.com/dsc, 找到更多开发资源



Totem-Pole PFC



LLC



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