

NXP® 32-bit Digital Signal Controllers (DSC)

Q2 2019

Digital Signal Controllers (DSC) combine the best features of microcontrollers (MCU) and powerful digital signal processing (DSP) capabilities in one single chip. We offer a range of solutions for digital signal processing and controlling optimized for applications ranging from general embedded markets to motor control and power conversion. This selection guide is a starting point for choosing a specific device. For the latest product information, visit www.nxp.com/DSC.

Digital Signal Controllers

Series	CPU	Memory	Key Features	Applications
MC56F82xxx Entry-level Motor control and smart power	56800EX 32-bit DSC Core 100/50 MHz	32 to 64 KB Flash 6 to 8 KB RAM	High-resolution PWM Dual 12-bit ADC ACMP, 12-bit DAC MSCAN AEC-Q100 -40 to 105C/125C 32 to 64 pins	Switched-mode power supply (SMPS) Uninterruptible power supplies (UPS) Power distribution systems Photovoltaic systems Circuit breaker Smart lighting Motor control Industrial motor Appliance motor
MC56F83xxx Performance-level Motor control and smart power*	56800EX 32-bit DSC Core 100 MHz	128 to 256 KB Flash w/ ECC, dual bank 48 to 64KB RAM 32 KB Boot ROM	High-resolution PWM Dual 12-bit ADC ACMP, 12-bit DAC CAN FD, USB FS OTG AEC-Q100 -40 to 105C/125C 48 to 100 pins	Switched-mode power supply (SMPS) Uninterruptible power supplies (UPS) Power distribution systems Photovoltaic systems Circuit breaker Smart lighting Motor control Industrial motor Appliance motor
MC56F84xxx Performance-level Motor control and smart power	56800EX 32-bit DSC Core 60 to 100 MHz	64 to 256 KB Flash 8 to 32KB RAM 32 KB FlexMem	High-resolution PWM Dual 12-bit ADC 16-bit ADC, ACMP, 12-bit DAC FlexCAN -40 to 105C 48 to 100 pins	Switched-mode power supply (SMPS) Uninterruptible power supplies (UPS) Power distribution systems Photovoltaic systems Circuit breaker Smart lighting Motor control Industrial motor Appliance motor

*MC56F83xxx DSC family is currently in pre-production, with full market availability planned for Q3 2019.



Power and Motor Expertise

Market's best signal-processing microcontroller for efficient digital power conversion and advanced motor control applications.

Key Features

High-Performance DSC Core

High performance 32-bit 56800EX core, up to 100 MHz core speed, 100 MIPS performance; with 2x data bus and 1x instruction bus, able to fetch 2x data per cycle, enable superfast MAC (Multiply and Accumulate) instruction. Extremely suitable for digital power conversion and motor control applications.

The Lowest Power DSC Available in Market

The ultra-low-power 56F82xxx series supports up to 100 MIPS performance and consumes less than 400uA/MHz at full speed run mode. It has built-in concurrent operations offering best-in-class execution times and overall low power run rates.

AEC-Q100 for Automotive Applications

Align with AEC-Q100 stress test, temperature up to 125C. Can be used for automotive applications include EV compressor, EV charger, wireless charging on Auto, etc.

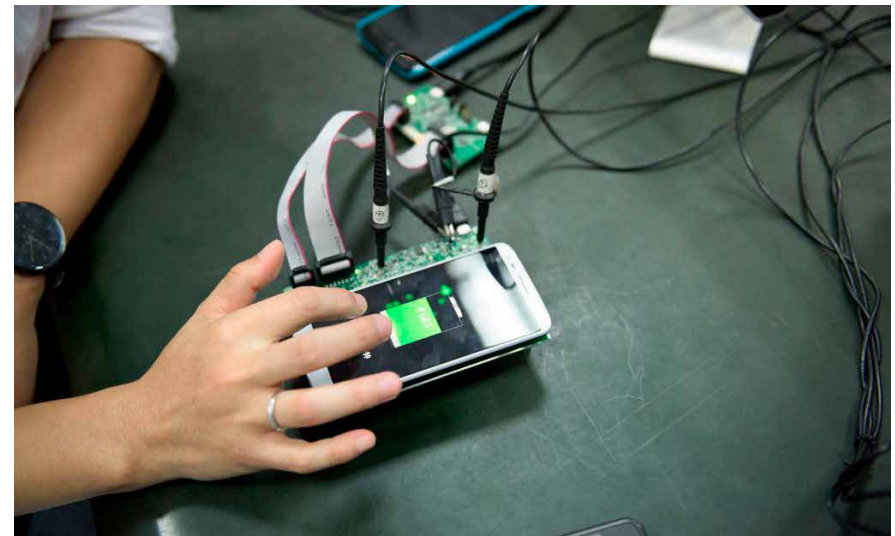
Intelligent Peripherals, Advanced Integration

NXP's 32-bit DSC integrated enhanced digital and analog peripherals are customized for power and motor applications.

- ▶ **eFlexPWM** – Advanced timer for Digital Power Conversion with 312ps resolution
- ▶ **Cross-Bar** – Directly connecting any input and/or output with logic functions and event generator. Flexible configuration to support all kinds of applications.
- ▶ **ADC** – High speed, high impedance, ultra-low-power cyclic ADCs to capture events real time. 300ns conversion rate.
- ▶ **Quad Timer** – Supports multiple working modes include timer, capture, PWM, decoder, etc.

Flexible and Multi-Functional

FlexMEM supports flexible configuration to work as different functions, including Flash, RAM and EEPROM. On MC56F84789, 32K FlexMEM is integrated and can work as 32KB Flash, or 2KB EEPROM. Take advantage of one design to suite your versatile needs.



Focus on Motor and Power

CodeWarrior Development Studio (IDE)

NXP's CodeWarrior embedded software development studio is a complete integrated development environment (IDE) that provides a highly visual and automated framework to accelerate development of the most complex embedded applications.

Processor Expert: Integrated with CodeWarrior Tool

Processor Expert® technology is a development system to create, configure, optimize, migrate, and deliver software components for our silicon. This technology is integrated into NXP's CodeWarrior® products supporting S08/RS08, S12(X), Coldfire, Coldfire+, Kinetis®, DSC 56800EX, and some Power Architecture processors.

QuickStart: Quick Start Initialization and Development Tool

The QuickStart helps users to accelerate the application development, to become quickly familiar with the target device and to create real-time applications rapidly and efficiently while retaining complete control over each portion of the underlying hardware.

FreeMASTER Run-Time Debugging Tool

FreeMASTER is a user-friendly real-time debug monitor and data visualization tool that you can use for application development and information management. Supports non-intrusive monitoring of variables on a running system.

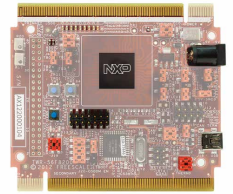
RTCESL: Real Time Control Embedded Software Motor Control and Power Conversion Libraries

This NXP real-time control embedded software libraries is a group of algorithms ranging from basic mathematics operations to advanced transformations and observers, which can be easily incorporated into complex real-time control applications, and used in our motor control reference designs.

Learn more about DSC development tools at www.nxp.com/DSC/developer.

Development Boards

The NXP® TWR-56F8400 and TWR-56F8200 are standalone development boards ideally suited for Motor and Digital Power control applications. It can be used in conjunction with the Tower® System peripheral boards, including the LV3PH motor control kit TWR-MC-LV3PH module.



The MC56F83000-EVK is designed as an ultra-low cost development platform for the MC56F8xxx DSC family allowing rapid prototyping and application development.

NXP provides plenty of reference designs for DSC products, to exceed customers' success in motor control and power conversion applications. Our comprehensive portfolio, tools and expert support enable cost-effective and energy-efficient motor and power applications.

Third-party tools

NXP brings together world-class development platforms, tools, boards, and software from NXP and partners to get you started developing on NXP DSC products in just minutes. With advanced yet low-cost ways to evaluate, develop, and debug with DSC products and a choice of toolchains that support the entire DSC portfolio, the DSC developer ecosystem gives you a familiar set of tools no matter which DSC you choose. Learn more on www.nxp.com/DSC/ecosystem



The 15-year promise: the NXP Product Longevity program

The NXP Product Longevity program ensures a stable supply of microcontrollers for your design. Longevity products are available for a minimum of ten years after product launch, and are supported by our standard end-of-life notification policy. Most products in the DSC categories are covered by the program. Longevity products remain in the program even if the manufacturing site changes. We manufacture through a number of resources, including our own factories and qualified outside vendors. If we transfer a longevity product to another facility, we re-qualify the product to maintain its status in the longevity program. For a complete, up-to-date list of longevity products.

56F826xx Series | Entry-level, Motor Control

100/50 MHz 56800EX Core, 32 to 64 KB Flash, dual 12-bit ADC, motor control PWM, 32-48 pins LQFP package.

Part no.	Processor			Memory				Control							Communication				Quad Decoder	16-b Timers	PIT	Maximum GPIO	Qualification				
	DSC Core	Frequency (MHz)	Performance (MIPS)	Flash (KB)	RAM (KB)	FlexNVM/EEPROM	DMA	312ps High Resolution PWM	Total PWM	12-b ADC with PGA	12-b ADC Conversion Time	16-b ADC	Analog Comparator (+6-bit DAC)	12-b DAC	UART (QSCI)	SPI (QSPI)	I ² C	CAN					-40 °C to +105 °C	-40 °C to +125 °C	AEC-Q100	Operation Voltage	Package
56F82623	32-b	100/50	100	32	8	-	4-ch	-	6-ch	2x 3-ch	800ns	-	3	-	1	-	-	-	-	4	2	26	Y	-	-	2.7-3.6V	32LQFP
56F82643	32-b	100/50	100	64	8	-	4-ch	-	6-ch	2x 3-ch	800ns	-	3	-	1	-	-	-	-	4	2	26	Y	-	-	2.7-3.6V	32LQFP
56F82646	32-b	100/50	100	64	8	-	4-ch	-	6-ch	2x 5-ch	800ns	-	4	-	2	-	-	-	-	4	2	39	Y	-	-	2.7-3.6V	48LQFP

56F836xx Series | Performance-level, Motor Control

100 MHz 56800EX Core, 256 KB Flash, dual 12-bit ADC, motor control PWM, boot ROM, USB FS OTG, 64-100 pins LQFP package.

Part no.	Processor			Memory				Control							Communication				Quad Decoder	16-b Timers	PIT	Maximum GPIO	Qualification				Package	
	DSC Core	Frequency (MHz)	Performance (MIPS)	Flash (KB)	RAM (KB)	Boot ROM (KB)	DMA	312ps High Resolution PWM	Total PWM	12-b ADC with PGA	12-b ADC Conversion Time	16-b ADC	Analog Comparator (+8-bit DAC)	12-b DAC	UART (QSCI)	SPI (QSPI)	I ² C	USB FS OTG					CAN FD	-40 °C to +105 °C	-40 °C to +125 °C	AEC-Q100		Operation Voltage
56F83683	32-b	100	100	256	64	32	4-ch	-	16-ch	2x 8-ch	320ns	-	4	-	2	1	2	-	1	-	4	2	54	Y	-	-	2.7-3.6V	64LQFP
56F83686	32-b	100	100	256	64	32	4-ch	-	16-ch	2x 8-ch	320ns	-	4	-	3	2	2	-	1	-	4	2	68	Y	-	-	2.7-3.6V	80LQFP
56F83689	32-b	100	100	256	64	32	4-ch	-	16-ch	2x 8-ch	320ns	-	4	-	3	2	2	1	1	-	4	2	82	Y	-	-	2.7-3.6V	100LQFP

56F844xx Series | Performance-level, Motor Control

60 MHz 56800EX Core, 64 to 128 KB Flash, dual 12-bit ADC, motor control PWM, 48-64 pins LQFP package.

Part no.	Processor			Memory				Control							Communication				Quad Decoder	16-b Timers	PIT	Maximum GPIO	Qualification				
	DSC Core	Frequency (MHz)	Performance (MIPS)	Flash (KB)	RAM (KB)	FlexNVM/EEPROM	DMA	312ps High Resolution PWM	Total PWM	12-b ADC with PGA	12-b ADC Conversion Time	16-b ADC	Analog Comparator (+6-bit DAC)	12-b DAC	UART (QSCI)	SPI (QSPI)	I ² C	CAN					-40 °C to +105 °C	-40 °C to +125 °C	AEC-Q100	Operation Voltage	Package
56F84441	32-b	60	60	64	8	32/2	4-ch	-	6-ch	2x 5-ch	600ns	-	3	-	2	1	2	-	1	8	2	39	Y	-	-	2.7-3.6V	48LQFP
56F84442	32-b	60	60	64	8	32/2	4-ch	-	9-ch	2x 8-ch	600ns	1x 8-ch	4	-	2	1	2	-	1	8	2	54	Y	-	-	2.7-3.6V	64LQFP
56F84451	32-b	60	60	96	16	32/2	4-ch	-	6-ch	2x 5-ch	600ns	-	3	-	2	1	2	1	1	8	2	39	Y	-	-	2.7-3.6V	48LQFP
56F84452	32-b	60	60	96	16	32/2	4-ch	-	9-ch	2x 8-ch	600ns	1x 8-ch	4	-	2	1	2	1	1	8	2	54	Y	-	-	2.7-3.6V	64LQFP
56F84462	32-b	60	60	128	24	32/2	4-ch	-	9-ch	2x 8-ch	600ns	-	4	1	2	1	2	1	1	8	2	54	Y	-	-	2.7-3.6V	64LQFP

56F8458x/6x Series | Performance-level, Motor Control

80 MHz 56800EX Core, 128 to 256 KB Flash, dual 12-bit ADC, motor control PWM, 80-100 pins LQFP package.

Part no.	Processor			Memory				Control						Communication				Quad Decoder	16-b Timers	PIT	Maximum GPIO	Qualification					
	DSC Core	Frequency (MHz)	Performance (MIPS)	Flash (KB)	RAM (KB)	FlexNVM/EEPROM	DMA	312ps High Resolution PWM	Total PWM	12-b ADC with PGA	12-b ADC Conversion Time	16-b ADC	Analog Comparator (+6-bit DAC)	12-b DAC	UART (QSCI)	SPI (QSPI)	I2C					CAN	-40 °C to +105 °C	-40 °C to +125 °C	AEC-Q100	Operation Voltage	Package
56F84565	32-b	80	80	128	24	32/2	4-ch	-	21-ch	2x 8-ch	600ns	1x 10-ch	4	-	3	2	2	1	1	8	2	68	Y	-	-	2.7-3.6V	80LQFP
56F84567	32-b	80	80	128	24	32/2	4-ch	-	24-ch	2x 8-ch	600ns	1x 16-ch	4	-	3	3	2	1	1	8	2	86	Y	-	-	2.7-3.6V	100LQFP
56F84585	32-b	80	80	256	32	32/2	4-ch	-	21-ch	2x 8-ch	600ns	1x 10-ch	4	1	3	2	2	1	1	8	2	68	Y	-	-	2.7-3.6V	80LQFP
56F84587	32-b	80	80	256	32	32/2	4-ch	-	24-ch	2x 8-ch	600ns	1x 16-ch	4	1	3	3	2	1	1	8	2	86	Y	-	-	2.7-3.6V	100LQFP

56F827xx Series | Entry-level, Smart Power

100/50 MHz 56800EX Core, 32 to 64 KB Flash, dual 12-bit ADC, high-resolution PWM, 32-48 pins LQFP/QFN package, 125C, qualification align to AEC-Q100.

Part no.	Processor			Memory				Control						Communication				Quad Decoder	16-b Timers	PIT	Maximum GPIO	Qualification					
	DSC Core	Frequency (MHz)	Performance (MIPS)	Flash (KB)	RAM (KB)	FlexNVM/EEPROM	DMA	312ps High Resolution PWM	Total PWM	12-b ADC with PGA	12-b ADC Conversion Time	16-b ADC	Analog Comparator (+6-bit DAC)	12-b DAC	UART (QSCI)	SPI (QSPI)	I2C					CAN	-40 °C to +105 °C	-40 °C to +125 °C	AEC-Q100	Operation Voltage	Package
56F82723	32-b	100/50	100	32	6	-	4-ch	6-ch	6-ch	2x 3-ch	800ns	-	3	2	1	1	1	-	-	4	2	26	Y	-	-	2.7-3.6V	32LQFP, 32QFN
56F82726	32-b	100/50	100	32	6	-	4-ch	6-ch	6-ch	2x 5-ch	800ns	-	4	2	2	1	1	1	-	4	2	39	Y	-	Y	2.7-3.6V	48LQFP
56F82728	32-b	100/50	100	32	6	-	4-ch	8-ch	12-ch	2x 8-ch	800ns	-	4	2	2	2	1	1	-	4	2	54	Y	-	Y	2.7-3.6V	64LQFP
56F82733	32-b	100/50	100	48	8	-	4-ch	6-ch	6-ch	2x 3-ch	800ns	-	3	2	1	1	1	-	-	4	2	26	Y	Y	-	2.7-3.6V	32LQFP, 32QFN
56F82736	32-b	100/50	100	48	8	-	4-ch	6-ch	6-ch	2x 5-ch	800ns	-	4	2	2	1	1	1	-	4	2	39	Y	-	Y	2.7-3.6V	48LQFP
56F82738	32-b	100/50	100	48	8	-	4-ch	8-ch	12-ch	2x 8-ch	800ns	-	4	2	2	2	1	1	-	4	2	54	Y	-	Y	2.7-3.6V	64LQFP
56F82743	32-b	100/50	100	64	8	-	4-ch	6-ch	6-ch	2x 3-ch	800ns	-	3	2	1	1	1	-	-	4	2	26	Y	-	-	2.7-3.6V	32LQFP, 32QFN
56F82746	32-b	100/50	100	64	8	-	4-ch	6-ch	6-ch	2x 5-ch	800ns	-	4	2	2	1	1	1	-	4	2	39	Y	Y	Y	2.7-3.6V	48LQFP
56F82748	32-b	100/50	100	64	8	-	4-ch	8-ch	12-ch	2x 8-ch	800ns	-	4	2	2	2	1	1	-	4	2	54	Y	-	Y	2.7-3.6V	64LQFP

56F837xx Series | Performance-level, Smart Power

100 MHz 56800EX Core, 256 KB Flash, dual 12-bit ADC, high-resolution PWM, boot ROM, USB FS OTG, 64-100 pins LQFP package.

Part no.	Processor			Memory				Control							Communication					Quad Decoder	16-b Timers	PIT	Maximum GPIO	Qualification				Package
	DSC Core	Frequency (MHz)	Performance (MIPS)	Flash (KB)	RAM (KB)	Boot ROM (KB)	DMA	312ps High Resolution PWM	Total PWM	12-b ADC with PGA	12-b ADC Conversion Time	16-b ADC	Analog Comparator (+8-bit DAC)	12-b DAC	UART (QSCI)	SPI (QSPI)	I ² C	USB FS OTG	CAN FD					-40 °C to +105 °C	-40 °C to +125 °C	AEC-Q100	Operation Voltage	
56F83763	32-b	100	100	128	48	32	4-ch	16-ch	16-ch	2x 8-ch	320ns	-	4	2	2	1	2	-	1	-	4	2	54	Y	Y	Y	2.7-3.6V	64LQFP
56F83766	32-b	100	100	128	48	32	4-ch	16-ch	16-ch	2x 8-ch	320ns	-	4	2	3	2	2	-	1	-	4	2	68	Y	Y	-	2.7-3.6V	80LQFP
56F83769	32-b	100	100	128	48	32	4-ch	16-ch	16-ch	2x 8-ch	320ns	-	4	2	3	2	2	1	1	-	4	2	82	Y	Y	-	2.7-3.6V	100LQFP
56F83783	32-b	100	100	256	64	32	4-ch	16-ch	16-ch	2x 8-ch	320ns	-	4	2	2	1	2	-	1	-	4	2	54	Y	Y	Y	2.7-3.6V	64LQFP
56F83786	32-b	100	100	256	64	32	4-ch	16-ch	16-ch	2x 8-ch	320ns	-	4	2	3	2	2	-	1	-	4	2	68	Y	Y	-	2.7-3.6V	80LQFP
56F83789	32-b	100	100	256	64	32	4-ch	16-ch	16-ch	2x 8-ch	320ns	-	4	2	3	2	2	1	1	-	4	2	82	Y	Y	-	2.7-3.6V	100LQFP

56F8455x/4x Series | Performance-level, Smart Power

80 MHz 56800EX Core, 64 to 96 KB Flash, dual high speed 12-bit ADC, high-resolution PWM, 48-64 pins LQFP package.

Part no.	Processor			Memory				Control							Communication				Quad Decoder	16-b Timers	PIT	Maximum GPIO	Qualification				Package	
	DSC Core	Frequency (MHz)	Performance (MIPS)	Flash (KB)	RAM (KB)	FlexNVM/EEPROM	DMA	312ps High Resolution PWM	Total PWM	12-b ADC with PGA	12-b ADC Conversion Time	16-b ADC	Analog Comparator (+6-bit DAC)	12-b DAC	UART (QSCI)	SPI (QSPI)	I ² C	CAN					-40 °C to +105 °C	-40 °C to +125 °C	AEC-Q100	Operation Voltage		
56F84540	32-b	80	80	64	8	32/2	4-ch	6-ch	6-ch	2x 5-ch	300ns	-	3	1	2	1	2	1	1	1	8	2	39	Y	-	-	2.7-3.6V	48LQFP
56F84543	32-b	80	80	64	8	32/2	4-ch	8-ch	9-ch	2x 8-ch	300ns	1x 8-ch	4	1	2	1	2	1	1	1	8	2	54	Y	-	-	2.7-3.6V	64LQFP
56F84550	32-b	80	80	96	16	32/2	4-ch	6-ch	6-ch	2x 5-ch	300ns	-	3	1	2	1	2	1	1	1	8	2	39	Y	-	-	2.7-3.6V	48LQFP
56F84553	32-b	80	80	96	16	32/2	4-ch	8-ch	9-ch	2x 8-ch	300ns	1x 8-ch	4	1	2	1	2	1	1	1	8	2	54	Y	-	-	2.7-3.6V	64LQFP

56F847xx Series | Performance-level, Smart Power

100 MHz 56800EX Core, 128 to 256 KB Flash, dual high speed 12-bit ADC, high-resolution PWM, 64-100 pins LQFP package.

Part no.	Processor			Memory				Control							Communication				Quad Decoder	16-b Timers	PIT	Maximum GPIO	Qualification				Package	
	DSC Core	Frequency (MHz)	Performance (MIPS)	Flash (KB)	RAM (KB)	FlexNVM/EEPROM	DMA	312ps High Resolution PWM	Total PWM	12-b ADC with PGA	12-b ADC Conversion Time	16-b ADC	Analog Comparator (+6-bit DAC)	12-b DAC	UART (QSCI)	SPI (QSPI)	I ² C	CAN					-40 °C to +105 °C	-40 °C to +125 °C	AEC-Q100	Operation Voltage		
56F84763	32-b	100	100	128	24	32/2	4-ch	8-ch	9-ch	2x 8-ch	300ns	1x 8-ch	4	1	2	1	2	1	1	1	8	2	54	Y	-	-	2.7-3.6V	64LQFP
56F84766	32-b	100	100	128	24	32/2	4-ch	8-ch	18-ch	2x 8-ch	300ns	1x 10-ch	4	1	3	2	2	1	1	1	8	2	68	Y	-	-	2.7-3.6V	80LQFP
56F84769	32-b	100	100	128	24	32/2	4-ch	8-ch	24-ch	2x 8-ch	300ns	1x 16-ch	4	1	3	3	2	1	1	1	8	2	86	Y	-	-	2.7-3.6V	100LQFP
56F84786	32-b	100	100	256	32	32/2	4-ch	8-ch	18-ch	2x 8-ch	300ns	1x 10-ch	4	1	3	2	2	1	1	1	8	2	68	Y	-	-	2.7-3.6V	80LQFP
56F84789	32-b	100	100	256	32	32/2	4-ch	8-ch	24-ch	2x 8-ch	300ns	1x 16-ch	4	1	3	3	2	1	1	1	8	2	86	Y	-	-	2.7-3.6V	100LQFP

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