

32-Bit Microcontrollers

Microcontrollers Transform Society.

Arm® Core-Based 32-Bit Microcontrollers

The TX and TXZ families of Arm core microcontrollers realize the desires of customers and seek to provide solutions in various fields through our proprietary high-precision analog circuitry with low-power-consumption digital logic. By thinking together with customers, Toshiba seeks to continually create a more convenient and comfortable society through microcontrollers.



Creating Microcontroller Solutions with our Customers

TX and TXZ™ Family

Arm Cortex-M0

Arm Cortex-M3

**Arm Cortex-M4
processor with FPU**

Contents

Microcontrollers for Motor Applications	4
General-Purpose Microcontrollers for Home Appliance Applications	8
Microcontrollers for Video Equipment Applications	10
Microcontrollers for Sensor Control Applications	11
Microcontrollers for Digital, Factory, and Office Equipment Applications	12
Microcontrollers for Camera Control Applications	14
Microcontrollers for HEMS and Electricity Meter Applications	15
Microcontrollers for Automotive Control Applications	15
Speech HMI Solutions TZ2100 Series	16
Support for Arm Ecosystem	17
Ecosystem partners for development environments	18

Application Notes and Sample Programs	19
Evaluation Kits and Reference Boards	20
Microcomputer web page	22
Online Distributor	22

Note

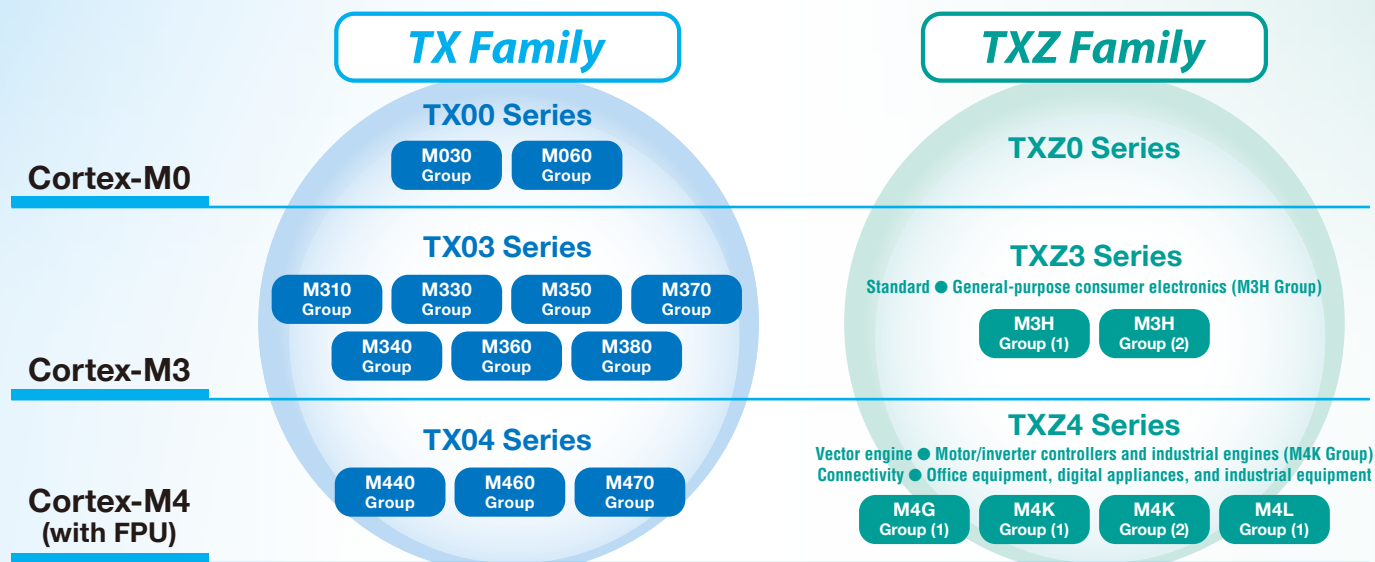
- System block diagrams in this brochure only show the typical application examples.
- Company, product and service names mentioned herein may be trademarks or registered trademarks of respective companies.
- Arm, Cortex, Thumb, Keil and ARM926EJ-S are registered trademarks of Arm Limited (or its subsidiaries) in the US and/or elsewhere.
- ULINK ME is a trademark of Arm Limited (or its subsidiary) in the US and countries elsewhere.
- Bluetooth is a registered trademark of Bluetooth SIG, Inc.
- TransferJet regular typeface and TransferJet logos are trademarks licensed by TransferJet Consortium Incorporated Association.

Product Lineups of the TX and TXZ Families

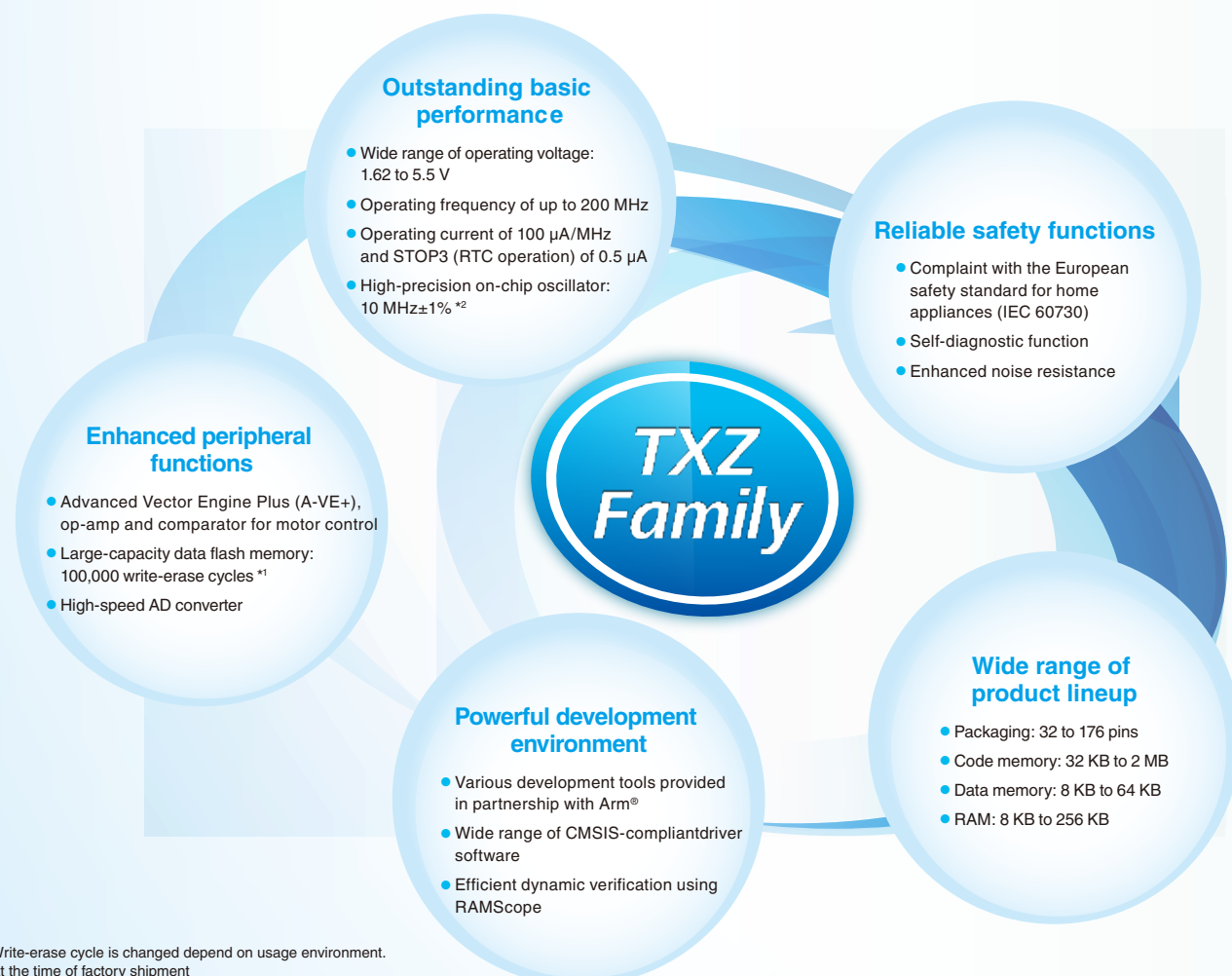
The TX and TXZ families consist of microcontrollers with an Arm Cortex®-M core. These families feature high energy efficiency and are suitable for real-time control applications.

The TXZ family, a new variant of the TX family, provides an enhanced suite of IP cores and flash memories. The TXZ family also features high-precision analog circuitry, higher speed and lower power consumption.

The TX and TXZ families consist of several series named after the integrated Arm core, which are further subdivided into many groups according to their target applications.



Features of the TXZ Family



● Microcontrollers for Motor Applications ●

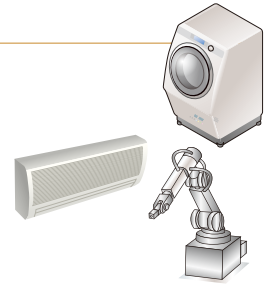
Vector engine for high-efficiency motor control and extensive peripheral functions suitable for various applications

● Features

- High-speed Arm Cortex®-M3 or Cortex®-M4 (with FPU)
- Peripheral functions suitable for motor control
AD converter, programmable motor driver, vector engine, and encoder
- Dynamic RAM analysis
Supports RAMScope and EVRICA.
- 5-V operation suitable for motor control

● Applications

- Air conditioners
- Washing machine
- Refrigerators
- Ventilation fan
- Electric driver



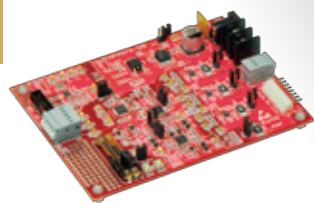
● Product Lineup

ROM Size (Flash)	TX03 Series/M370 Group		TX04 Series/M470 Group		TXZ4 Series/M4K Group(1)(2), M4L Group(1)				**: Under development
512 KB					TMPM4KLFDFG** TMPM4KLFUDUG**	TMPM4KMFDDFG** TMPM4KMFDFG**	TMPM4KNFDDFG** TMPM4KNFDFG** TMPM470FDFG TMPM475FDFG TMPM376FDDFG TMPM376FDFG	TMPM4KPFDDFG**	TMPM4KQFDFG**
384 KB							TMPM470FZFG TMPM475FZFG		
256 KB			TMPM4K1FYAUG	TMPM4K2FYADUG	TMPM4KLFYFG** TMPM4KLFYUG** TMPM4K4FYAUG TMPM4K4FYAFG	TMPM4KMFYDFG** TMPM4KMFYFG**	TMPM4KNFYDFG** TMPM4KNFYFG** TMPM470FYFG TMPM475FYFG TMPM370FYDFG TMPM370FYFG	TMPM4KPFYDFG**	TMPM4KQFYFG**
128 KB			TMPM4K1FWAUG TMPM4L1FWUG TMPM374FWUG	TMPM4K2FWADUG TMPM4L2FWDUG TMPM373FWDUG	TMPM4KLFWFG** TMPM4KLFWUG** TMPM4K4FWAUG TMPM4K4FWAFG TMPM372FWUG	TMPM4KMFWDFG** TMPM4KMFWFG**	TMPM4KNFWDFG** TMPM4KNFWFG**	TMPM4KPFWDFG**	TMPM4KQFWFG**
96 KB			TMPM4K1FUAUG	TMPM4K2FUADUG	TMPM4K4FUAUG TMPM4K4FUAFG				
64 KB	TMPM375FSDMG	TMPM4K0FSADUG TMPM37AFSQG	TMPM4K1FSAUG	TMPM4K2FSADUG	TMPM4K4FSAUG TMPM4K4FSAFG				
	30 pins	32 pins	44 pins	48 pins	64 pins	80 pins	100 pins	128 pins	144 pins Pin Count

● Evaluation Kit

ESP Starter Kit for TMPM37A

- Included hardware:
TMPM37A evaluation board
Brushless DC motors



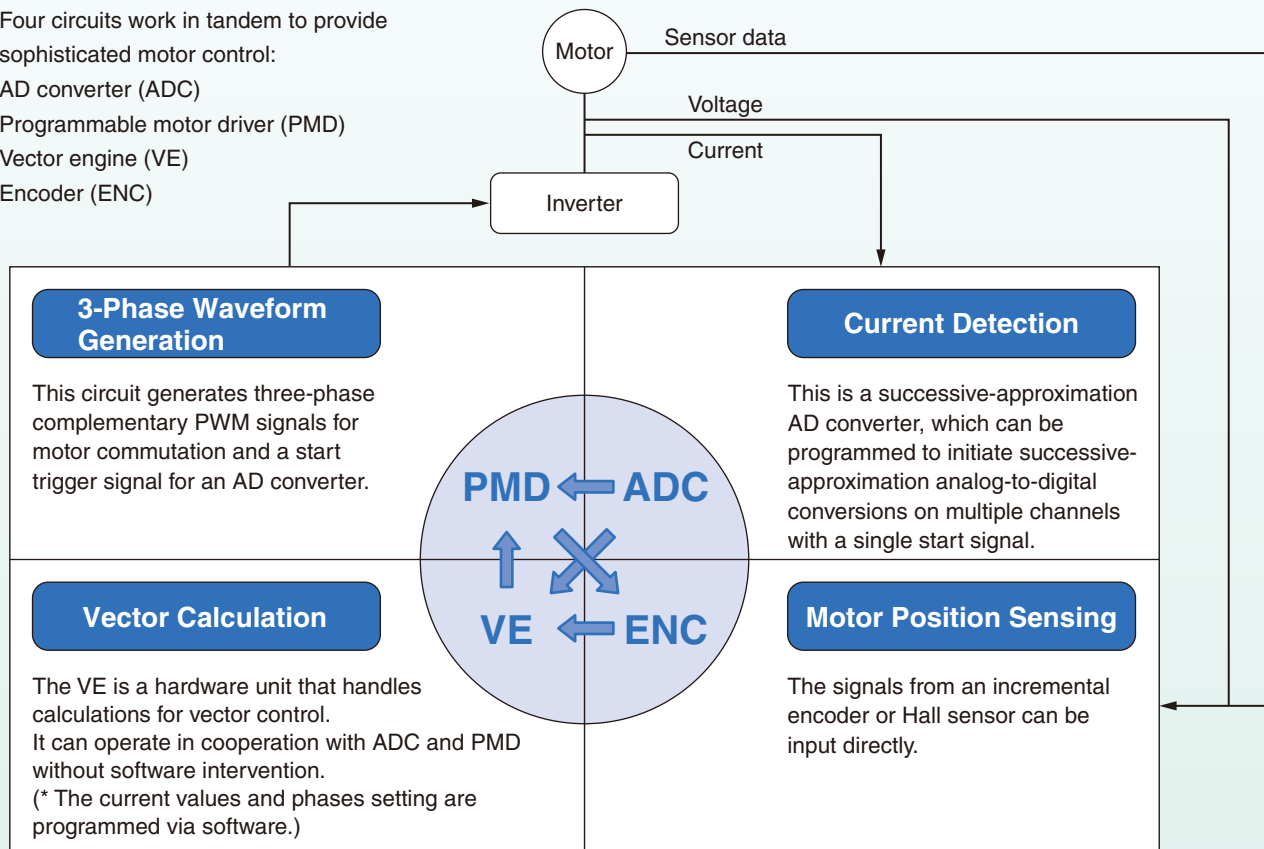
ESP Starter Kit for TMPM475

- Included hardware:
TMPM475 evaluation board
Brushless DC motors



Motor Control Functions

- Four circuits work in tandem to provide sophisticated motor control:
AD converter (ADC)
Programmable motor driver (PMD)
Vector engine (VE)
Encoder (ENC)



The arrows denote communication paths between IP cores.

Debugging

The M4K series provides an interface for a tool such as RAMScope that allows real-time debugging during motor operation. This makes it possible to perform a dynamic analysis necessary to debug motor control programs.

Point Debugging and tuning during motor operation

- Makes it easy to debug and tune the MCU control software while a motor is running

Point No dedicated software

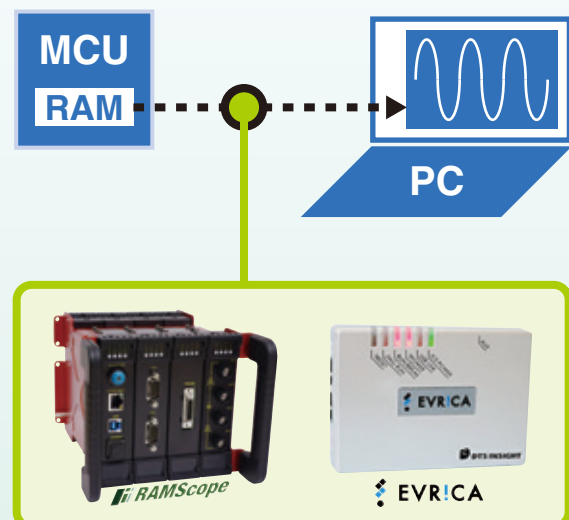
- Eliminates the need for memory-resident software for monitoring and therefore a workload for the design of a control program

Microcontrollers that support RAMScope and EVRICA

	M4K0	M4K1	M4K2	M4K4	M4KL	M4KM	M4KN	M4KP	M4KQ
RAMScope	—	—	—	Y	Y	Y	Y	Y	Y
EVRICA	Y	Y	Y	Y	Y	Y	Y	Y	Y

Note: This table includes microcontrollers being planned and developed and is therefore subject to change without notice.

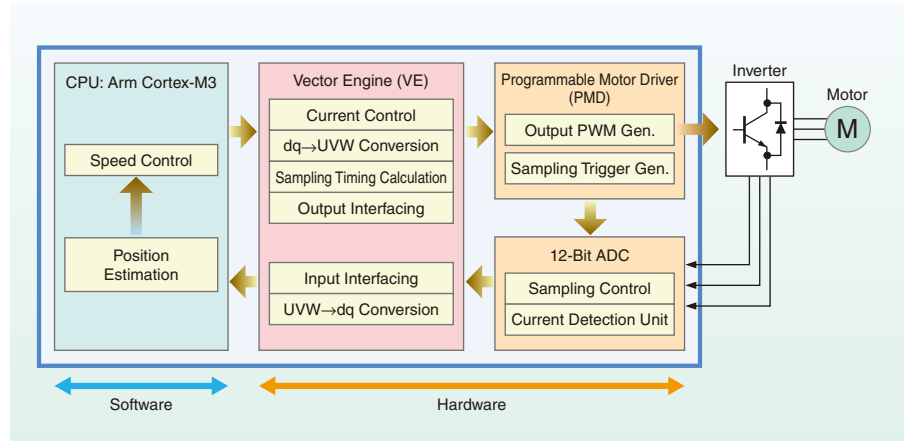
Note: RAMScope is a product from DTS INSIGHT Corporation.



Features of the Vector Engine (VE)

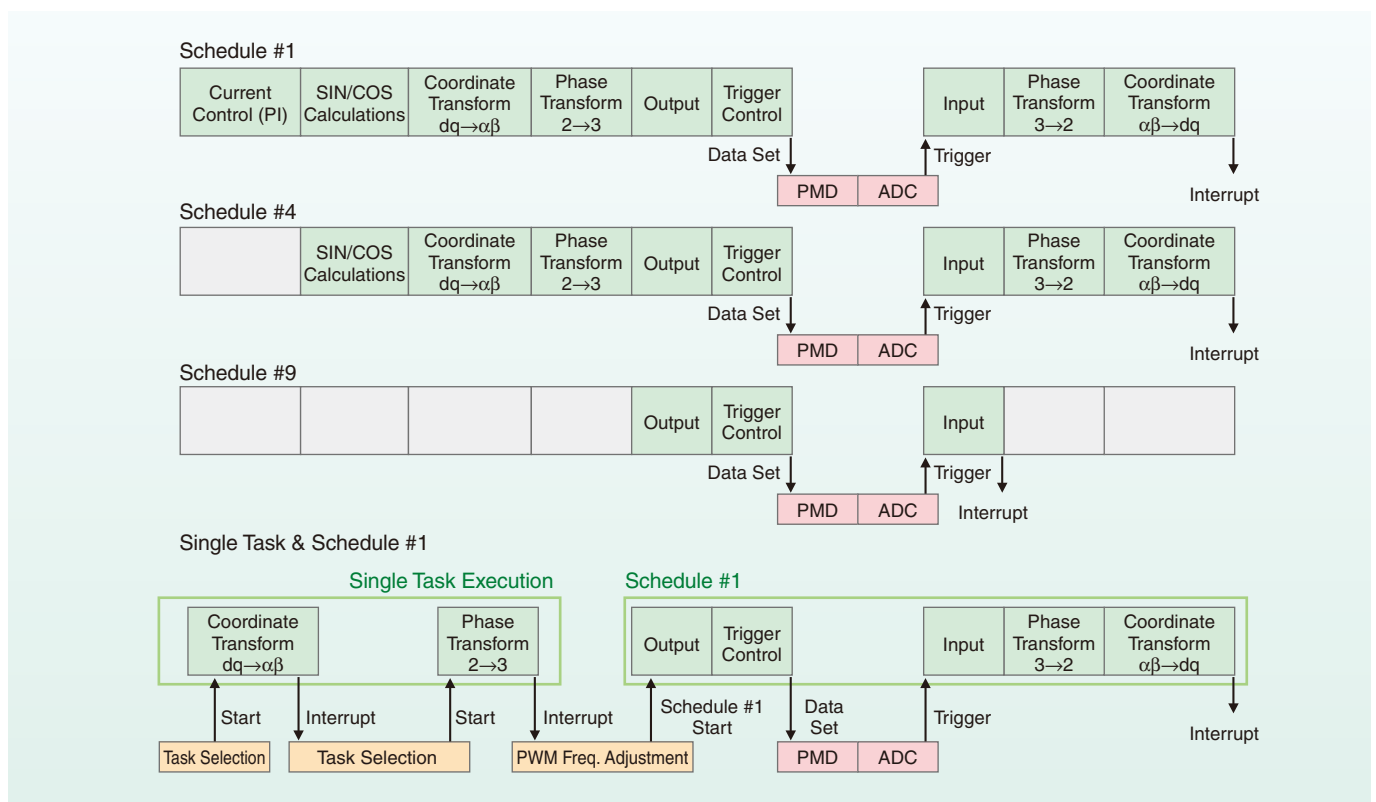
High-efficiency motor control, reducing the CPU workload

The vector engine is a dedicated hardware unit designed to perform various operations for motor vector control. Since the vector engine has the capability for performing basic vector control operations (such as coordinate transformations, phase transformations and sine/cosine calculations), a PI algorithm for current control, and PMD and high-speed ADC interface operations, it helps to reduce the software workload significantly.

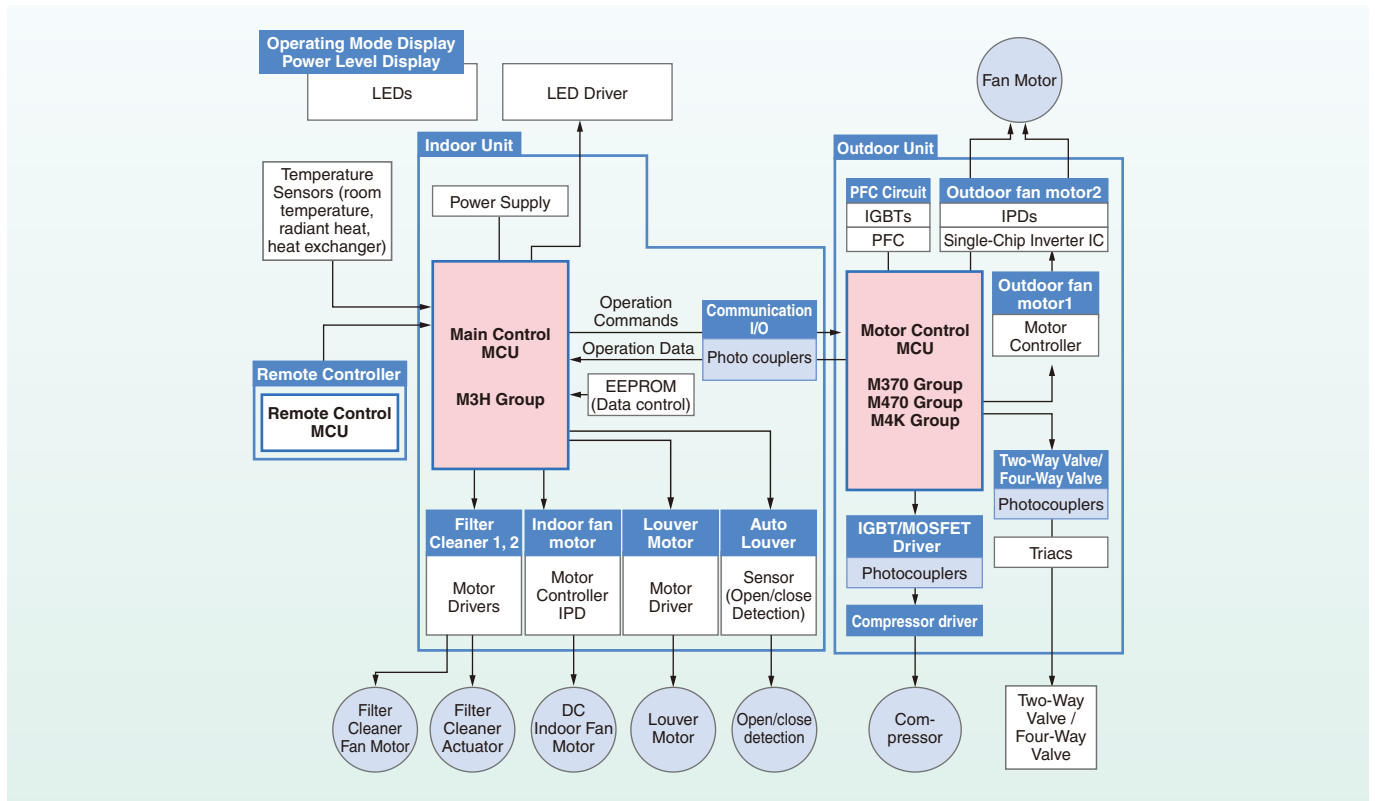


Highly flexible hardware

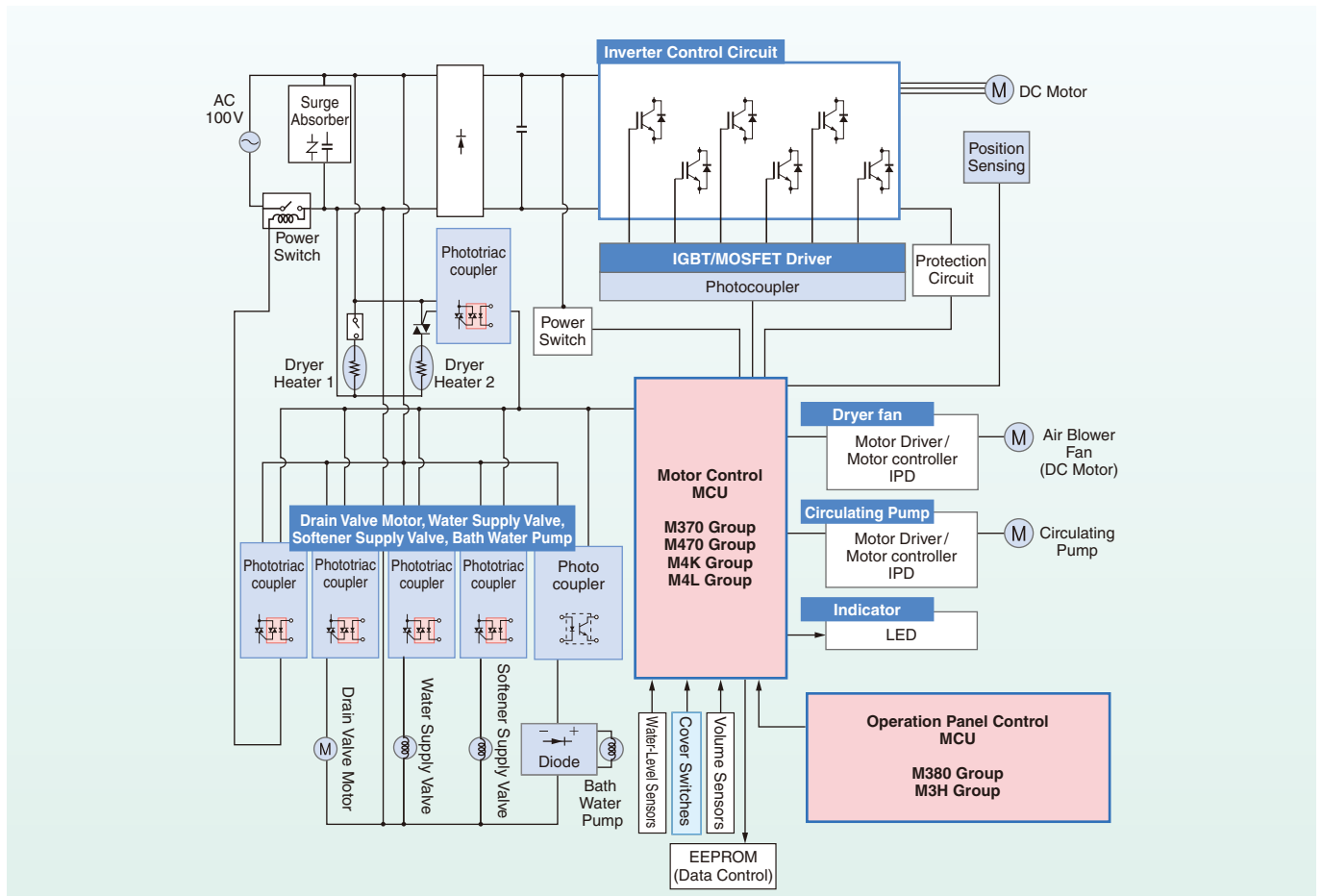
Since the requirements for speed control and position estimation differ greatly among individual applications and users, they can be implemented via software. The vector engine provides great flexibility in allowing you to create various schedules that define a combined sequence of VE and user's software operations to perform. The vector engine supports two operating modes: Scheduled mode that executes a series of operations consecutively and Single Task mode that executes individual tasks one by one. Schedules can select a task that causes the vector engine to start execution.



● System Block Diagram (Air Conditioners)



● System Block Diagram (Washing Machine)



● General-Purpose Microcontrollers for Home Appliance Applications ●

Extensive memory and packaging options to support a wide range of home-appliance and industrial applications

● Features

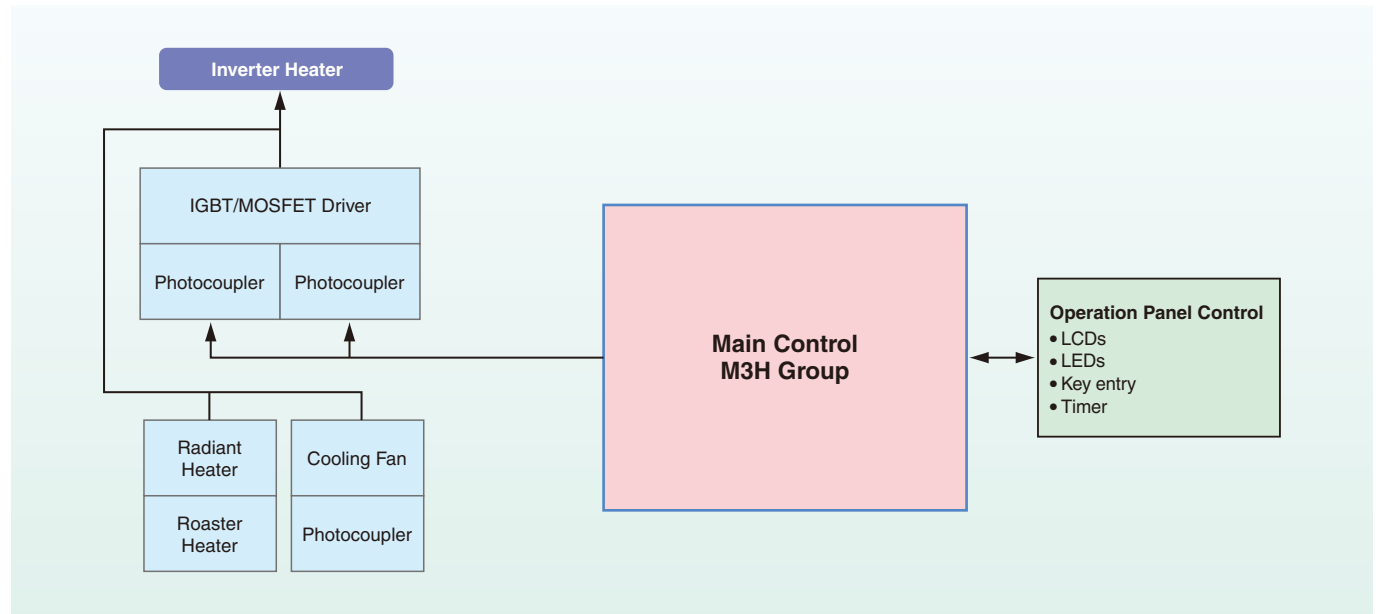
- 5-V single power supply
- Integrated data flash memory

● Applications

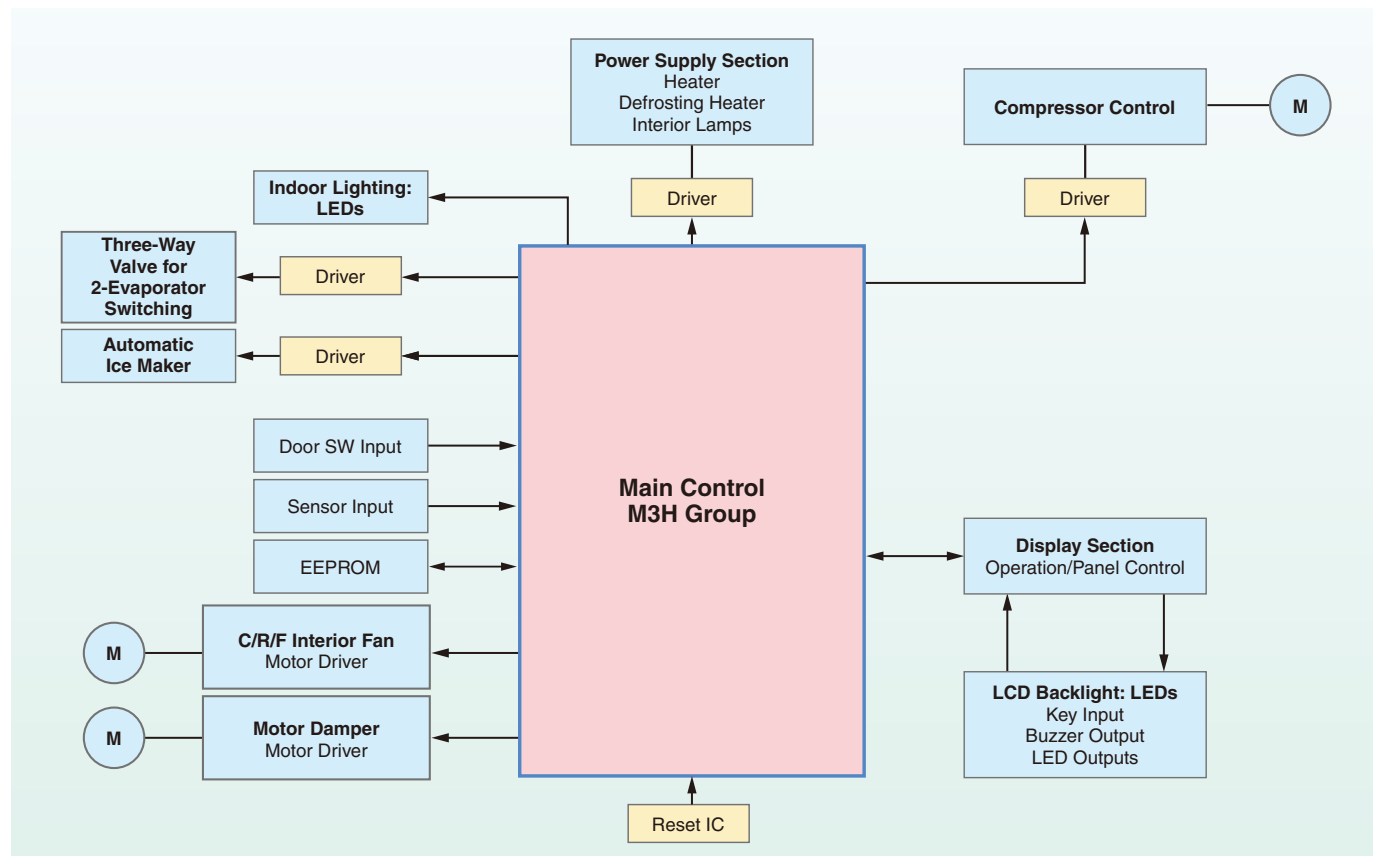
- Induction cooktops
- Water heaters
- Microwave ovens
- Toilet seats with integrated bidet
- Refrigerators



● System Block Diagram (Induction Cooktops)



● System Block Diagram (Refrigerators)



Key points

Extensive lineup of standard microcontrollers featuring low power consumption and high functionality.

The microcontrollers shown below incorporate AD converters, DA converters, UART, timers, I²C, SPI/SIO and motor controllers, making them suitable for a wide range of commercial and industrial applications.

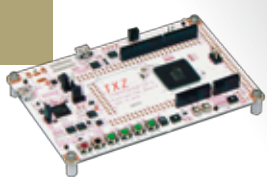
Product Lineup

ROM Size (Flash)	TX03 Series/M380 Group				TXZ3 Series/M3H Group (1)(2)				**: Under development
512 KB					TMPM3LFDUG	TMPM3HMFDFG	TMPM3HNFDFG	TMPM3HPFDFG	TMPM3HQFDFG
							TMPM3HNFDDFG		TMPM384FDFG
							TMPM380FDFG		
384 KB					TMPM3LFZUG	TMPM3HMFZFG	TMPM3HNFZFG	TMPM3HPFZFG	TMPM3HQFZFG
							TMPM3HNFZDFG		
256 KB					TMPM3LFYUG	TMPM3HMFYFG	TMPM3HNFYFG	TMPM3HPFYFG	TMPM3HQFYFG
							TMPM3HNFYDFG		
							TMPM380FYFG		
							TMPM380FYDFG		
128 KB		TMPM3H1FWUG**	TMPM3H2FWDUG	TMPM3H3FWUG**	TMPM3H4FWUG	TMPM3H5FWFG	TMPM3H6FWFG		
			TMPM3H2FWQG		TMPM3H4FWFG**	TMPM3H5FWDFG	TMPM3H6FWDFG		
					TMPM383FWUG		TMPM380FWFG		
					TMPM383FWEFG		TMPM380FWDFG		
							TMPM381FWFG		
							TMPM381FWDFG		
96 KB		TMPM3H1FUUG**	TMPM3H2FUDUG	TMPM3H3FUUG**	TMPM3H4FUUG	TMPM3H5FUFG	TMPM3H6FUFG		
			TMPM3H2FUQG		TMPM3H4FUFG**	TMPM3H5FUDFG	TMPM3H6FUDFG		
64 KB	TMPM3H0FSDUG**	TMPM3H1FSUG**	TMPM3H2FSDUG	TMPM3H3FSUG**	TMPM3H4FSUG	TMPM3H5FSFG	TMPM3H6FSFG		
			TMPM3H2FSQG		TMPM3H4FSFG**	TMPM3H5FSDFG	TMPM3H6FSDFG		
					TMPM383FSUG				
					TMPM383FSEFG				
48 KB		TMPM3H1FPUG**							
32 KB	TMPM3H0FMDUG**								
	32 pins	44 pins	48 pins	52 pins	64 pins	80 pins	100 pins	128 pins	144 pins Pin Count

Evaluation Kit

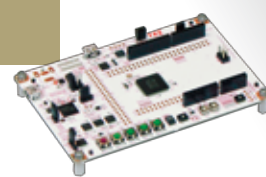
Chip One Stop, Inc. Online Shop Starter Kit for TMPM3HQ

- Included hardware:
TMPM3HQ evaluation board
USB cable



Chip One Stop, Inc. Online Shop Starter Kit for TMPM3H6

- Included hardware:
TMPM3H6 evaluation board
USB cable



● Microcontrollers for Video Equipment Applications ●

Incorporating a dedicated HDMI-CEC circuit and a remote control preprocessor to reduce system power consumption

● Features

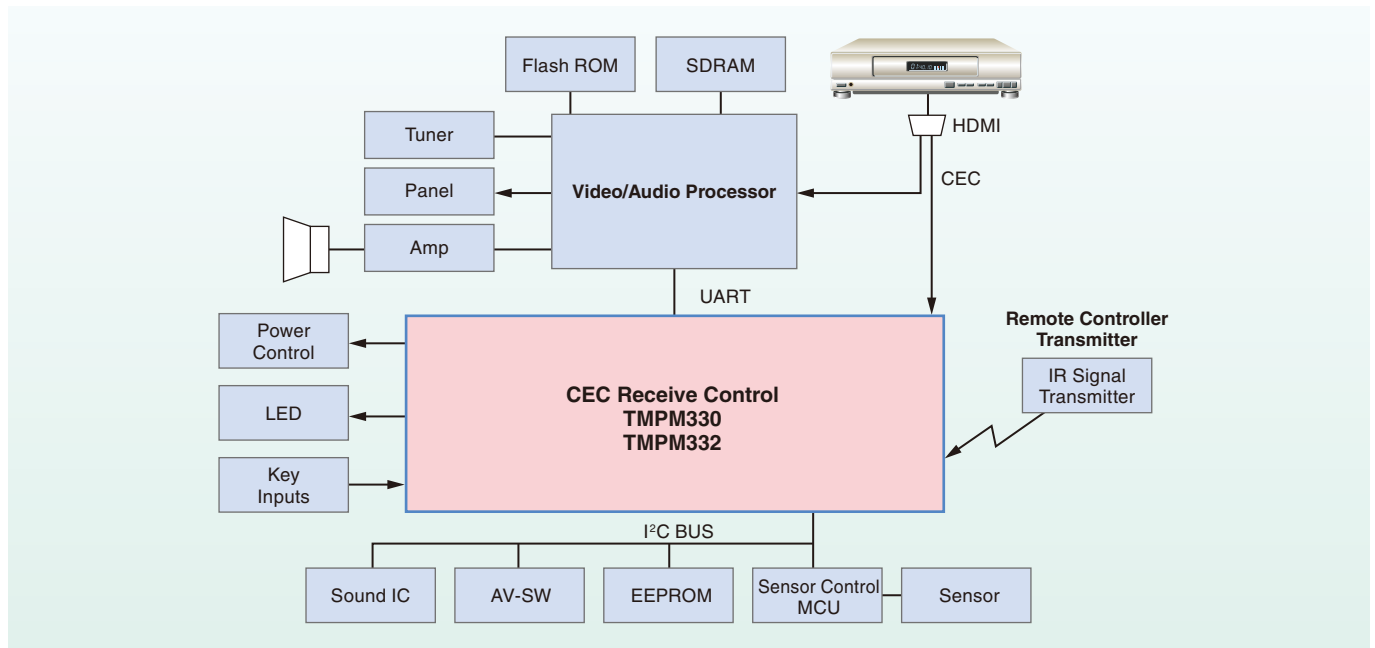
- High efficiency operation
- Integrated dedicated HDMI 1.3a (CEC) circuit (TMPM330/TMPM332)
- Remote control preprocessor essential for digital applications (TMPM330/TMPM332)

● Applications

- Televisions
- Printers
- Base stations



● System Block Diagram (Digital TV)



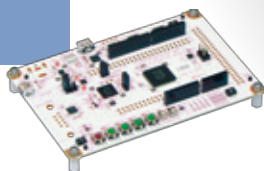
● Product Lineup

ROM Size (Flash)		TX00 Series/M030 Group		TX03 Series/M330 Group
512 KB		TMPM333FDFG	TMPM330FDFG	TMPM330FDWFG
256 KB		TMPM333FYFG	TMPM330FYWFG	TMPM330FYFG
128 KB	TMPM332FWUG	TMPM330FWFG	TMPM333FWFG	
	TMPM037FWUG	TMPM036FWFG		
64 pins		100 pins		Pin Count

● Evaluation Kit

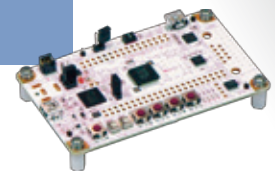
Chip One Stop, Inc. Online Shop Starter Kit for TMPM036

- Included hardware:
TMPM036 evaluation board
USB cable



Chip One Stop, Inc. Online Shop Starter Kit for TMPM037

- Included hardware:
TMPM037 evaluation board
USB cable



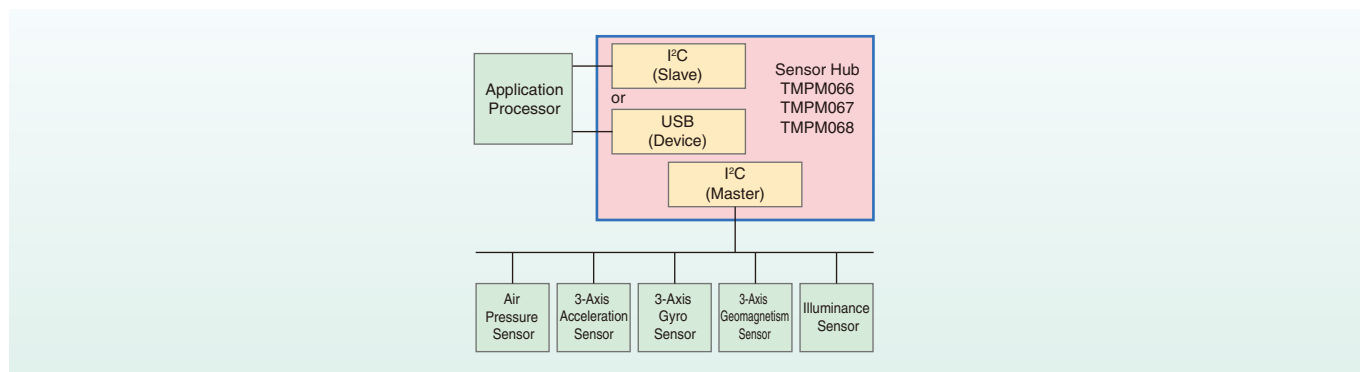
● Microcontrollers for Sensor Control Applications ●

Incorporating a high-performance calibration function through proprietary sensor fusion

● Features

- Incorporates functions that enable a multi-connection hub
USB, USB Embedded Host, CAN and EtherMAC
- Multi-purpose timer

● System Block Diagram (Sensor Hub)



● Key points

In addition to USB (Full-Speed), the microcontrollers shown below incorporate various serial interfaces such as SPI*¹ and I²C*² (supporting Fast-Mode Plus*³). These microcontrollers can be used as a sensor hub that controls multiple sensors.

*1: SPI: Serial Peripheral Interface

*2: I²C: Inter-Integrated Circuit

*3: Fast-mode Plus

● Product Lineup

ROM Size (Flash)				TX00 Series/M060 Group		TX03 Series/M360 Group		
512 KB				TMPM368FDFG TMPM367FDFG		TMPM368FDXBG TMPM367FDXBG	TMPM369FDFG	TMPM369FDXBG
256 KB					TMPM365FYXBG			
128 KB	TMPM067FWQG	TMPM068FWXBG	TMPM066FWUG					
	48 pins	57 pins	64 pins	100 pins	105 pins	109 pins	144 pins	177 pins Pin Count

● Evaluation Kit

Chip One Stop, Inc. Online Shop
Starter Kit for TMPM066

- Included hardware:
TMPM036 evaluation board
USB cable

● Microcontrollers for Digital, Factory, and Office Equipment Applications ●

High-speed CPU to obtain the best performance from extensive serial interfaces and three DMAC units for efficient data transfers

● Features

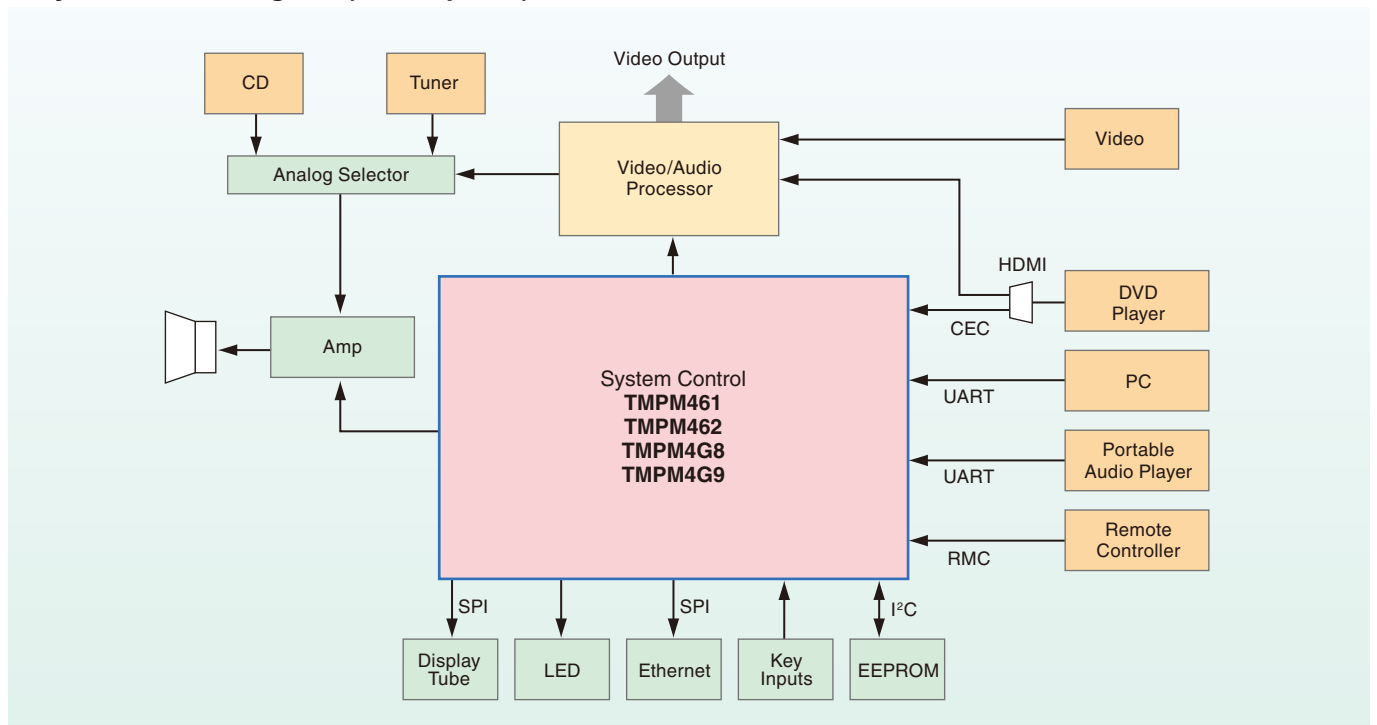
- Supports various communication interfaces
- Embedded high-capacity flash memory
- Integrated dedicated HDMI 1.3a (CEC) circuit
- External bus interface that can be connected to SoCs and external extended memory
- CEC interface and remote control signal preprocessor that remain active even in Low power consumption mode

● Applications

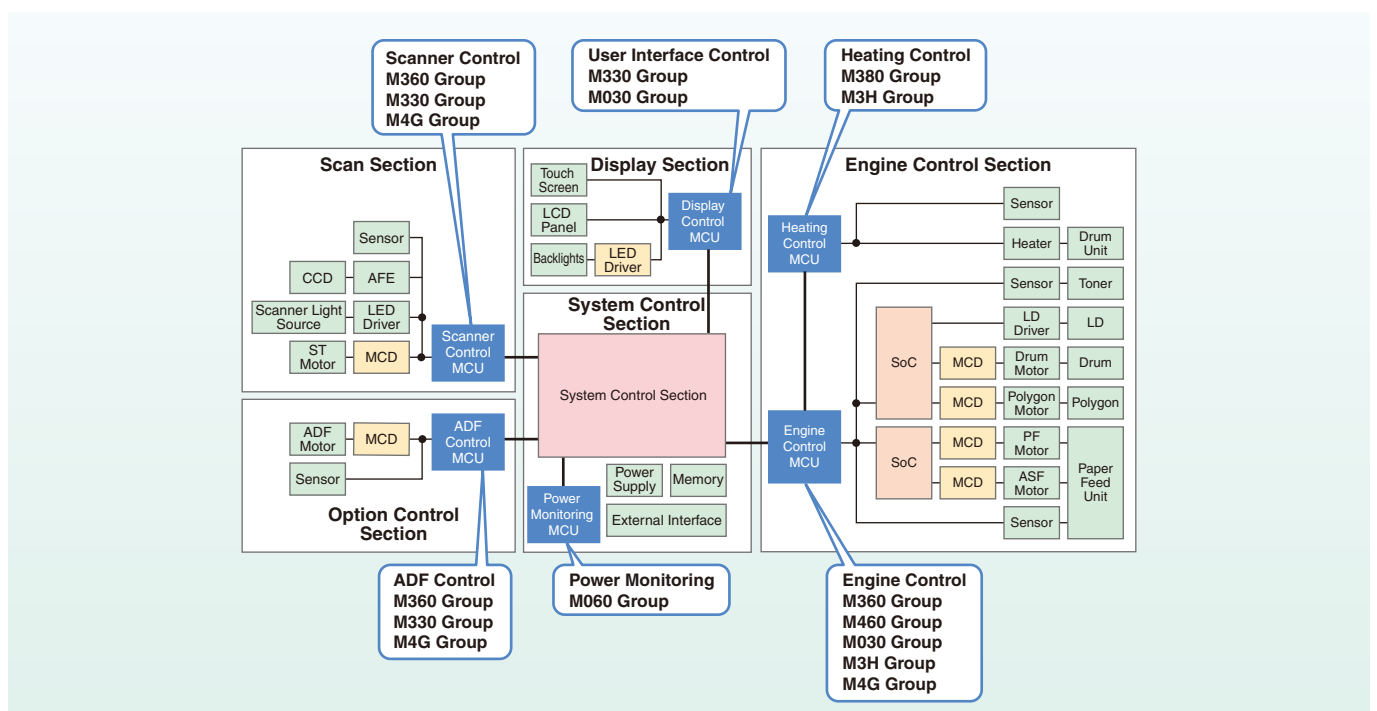
- Printers
- Copiers
- Air conditioners
- Audio systems
- Wireless equipment
- Barcode readers



● System Block Diagram (AV Amplifier)



● System Block Diagram (Printer)



Product Lineup

ROM Size (Flash)	TX03 Series/M360 Group		TX04 Series/M460 Group		TXZ4 Series/M4G Group (1)		**: Under development
1.5 MB				TMPM4G8F15FG** TMPM461F15FG	TMPM4G8F15XBG**	TMPM4G9F15FG TMPM462F15FG	TMPM4G9F15XBG**
1 MB	TMPM4G6F10FG TMPM46BF10FG TMPM36BF10FG		TMPM4G7F10FG**	TMPM4G8F10FG TMPM461F10FG	TMPM4G8F10XBG**	TMPM4G9F10FG TMPM462F10FG	TMPM4G9F10XBG**
768 KB	TMPM4G6FEFG		TMPM4G7FEFG**	TMPM4G8FEFG	TMPM4G8FEXBG**	TMPM4G9FEFG	TMPM4G9FEXBG**
512 KB	TMPM4G6FDFG TMPM368FDFG TMPM367FDFG	TMPM368FDXBG TMPM367FDXBG	TMPM4G7FDFG**	TMPM4G8FDFG TMPM369FDFG	TMPM4G8FDFXBG**	TMPM4G9FDFG	TMPM4G9FDFXBG** TMPM369FDXBG
256 KB	TMPM36BFYFG	TMPM365FYXBG					
	100 pins	105/109 pins	128 pins	144 pins	145 pins	176 pins	177 pins Pin Count

Key points

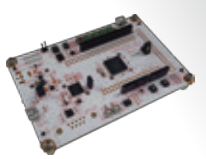
The TMPM462 and TMPM4G9 incorporate up to 20 and 22 channels of serial interfaces, respectively.

To obtain the best performance from many serial interfaces, these microcontrollers efficiently handle various modes of communication using three DMAC units at a maximum CPU operating frequency of 120 and 160 MHz, respectively.

Evaluation Kit

Chip One Stop, Inc. Online Shop Starter Kit for TMPM46B

- Included hardware:
TMPM46B evaluation board
USB cable



● Microcontrollers for Camera Control Applications ●

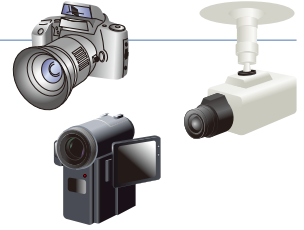
Small packages with a high-resolution PPG output suitable for high-precision analog-controlled equipment

● Features

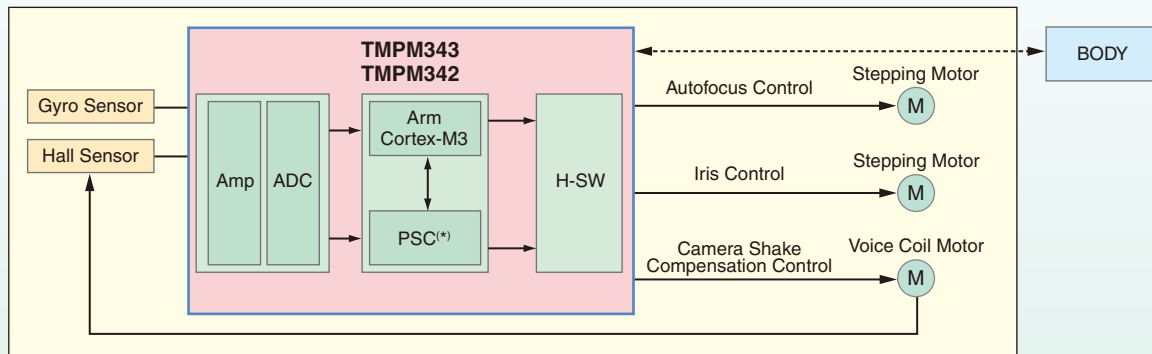
- Up to 4 programmable servo/sequence controller (PSC) units
(Suitable for servo computation, motor control and communication sequencing for camera shake compensation)
- High-resolution PPG for ultrasound control
- Various timers and serial interfaces

● Applications

- Surveillance cameras
- Camera lens
- Digital video cameras



● System Block Diagram (Camera Lens)



* The TMPM343 contains four PSC units.
The TMPM342 contains one PSC unit.

Key points

Programmable Servo/Sequence Controllers (PSCs) makes it possible to reduce the operating frequency.

● Product Lineup

ROM Size (Flash)	TX03 Series/M340 Group	TX04 Series/M440 Group
1024 KB	TMPM343F10XBG	TMPM440F10XBG
768 KB		TMPM440FEXBG
512 KB	TMPM343FDXBG	
256 KB	TMPM342FYXBG	
	142 pins	162 pins
		289 pins
		Pin Count

● Evaluation Kit

IAR Systems Starter Kit for TMPM440

- Included hardware:
 - TMPM440 evaluation board
 - IAR i-Jet Lite
 - USB cable
 - IAR Embedded Workbench for ARM KickStart edition



● Microcontrollers for HEMS and Electricity Meter Applications ●

24-bit sigma-delta AD converter and Toshiba's unique power calculation engine to achieve accurate electricity measurement

Features

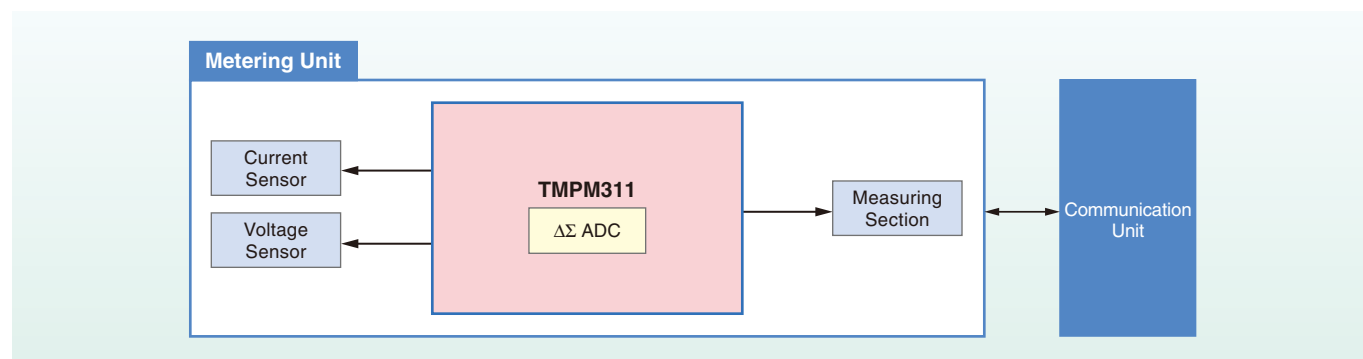
- Power calculation engine (TMPM061)
- Temperature sensor (TMPM311)

Applications

- Smart meters
- Healthcare



● System Block Diagram (Smart meters: Metering Unit)



Key points

The microcontrollers shown below combine a 24-bit sigma-delta AD converter and Toshiba's unique power calculation engine (PCE) to achieve accurate power measurement.

These microcontrollers are suitable for smart meter and other HEMS applications as well as office equipment applications requiring power measurement.

● Product Lineup

ROM Size (Flash)	TX00 Series/M060 Group	TX03 Series/M310 Group
128 KB		TMPM061FWFG
ROM less	TMPM311CHDUG	
	48 pins	100 pins Pin Count

● Microcontrollers for Automotive Control Applications ●

Compliant with ISO 26262, a functional safety standard suitable for motor and battery monitoring and other control applications

● Product Lineup

Part Number	ROM (Flash) Size	RAM Size	Package	Features
TMPM351F10TFG	1 MB	64 KB	LQFP100 (14 x 14 mm)	Arm Cortex-M3 plus Toshiba-original Advanced Programmable Motor Driver (A-PMD) 2-channel CAN controller and 2 units of AD Converter Functional safety: Optimized tightly coupled fault supervisors 144-MHz operation (max), and high temperature operation (Ta: up to 105°C max) The CAN controllers and the blocks that implement functional safety contain logic specifically designed for automotive applications, making the TMPM351F10TFG suitable for motor applications in safety-related systems such as electronic power steering (EPS).
TMPM354F10TAFG	1 MB	64 KB	HQFP144 (20 x 20 mm)	Arm Cortex-M3 plus Toshiba-original Advanced Programmable Motor Driver (A-PMD) 3-channel CAN controller and 4 units of AD Converter Vector engine Functional safety: Optimized tightly coupled fault supervisors Reduced part count and improved noise immunity due to Toshiba-original RDC 96-MHz operation (max), and high temperature operation (Ta: up to 125°C max) Ideal for motor control applications in HEVs and EVs owing to enhanced motor controllers, angle sensor computation, in-vehicle networking, etc.
TMPM358FDTFG	512 KB	80 KB	LQFP100 (14 x 14 mm)	A sleep mode is provided in Arm Cortex-M3 allowing RAM backup (16 KB) 3-channel CAN controller and 2 units of AD Converter, 80-KB RAM including a backup RAM for 16 KB Functional safety: Optimized tightly coupled fault supervisors 40-MHz operation (max), and high temperature operation (Ta: up to 105°C max) The CAN controllers and the blocks that implement functional safety contain logic specifically designed for automotive applications, making the TMPM358FDTFG suitable for control applications such as battery power monitoring.

● Speech HMI Solutions ●

TZ2100 Series

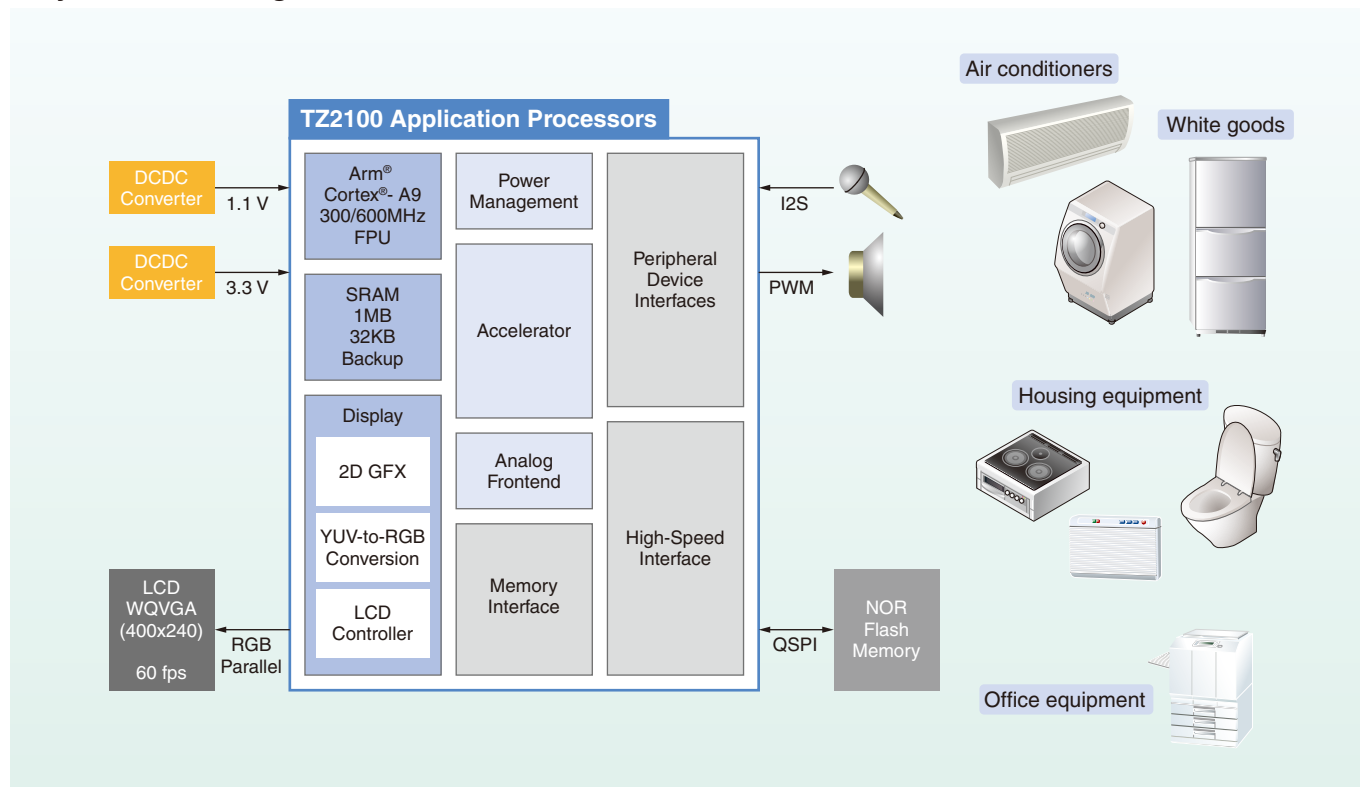
Features

- Incorporates 300-MHz or 600-MHz Arm® Cortex®-A9
- Voice command and voice synthesis middleware for RTOS and Linux®
- Extensive interfaces

Applications

- Air conditioners
- White goods
- Housing equipment
- Office equipment

System Block Diagram



Attractive Middleware for RTOS and Linux

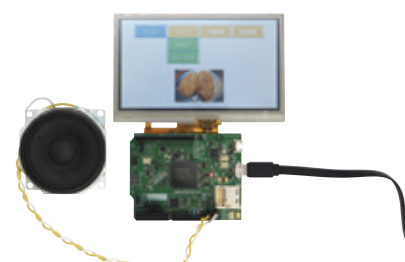
Toshiba offers voice command middleware for the TZ2100 series, which allows hands-free operation of equipment. The TZ2100 series also supports the ToSpeak voice synthesis middleware from Toshiba Digital Solutions Corporation that is popular for application to car navigation systems.

Product Lineup

Part Number	CPU Core	Operating Frequency	SRAM	Differentiating Features
TZ2100XBG	Arm® Cortex® -A9	300 MHz	1 MByte +32 Kbyte (Back-up)	• Incorporates an LCD panel interface, a camera interface, encryption functions and various networking functions • Provides ToSpeak™, speech synthesis middleware suitable for voice guidance applications • Incorporates a general-purpose parallel interface to which various peripheral ICs can be connected • Achieves rich and smooth rendering with a 2D graphics accelerator
TZ2102XBG		600 MHz		

TZ2100 Speech HMI Solution Development Starter Kit

Toshiba provides a startup development environment that allows its voice trigger middleware to be used on the TZ2100 to realize voice commands in the local environment. Because the starter kit does not require many external components, it helps reduce the bill-of-materials (BOM) costs, simplify board layout, and reduce the application size.



● Support for Arm Ecosystem ●

Arm Ecosystem-based support and maintenance, encompassing everything from the selection of an MCU to mass production

Toshiba collaborates with Arm ecosystem partners to provide various tools and development environments, as well as technical information, services and sales support. Tools support designers from conception to completion, ranging from microcontroller selection to mass production.

Technical support for MCUs

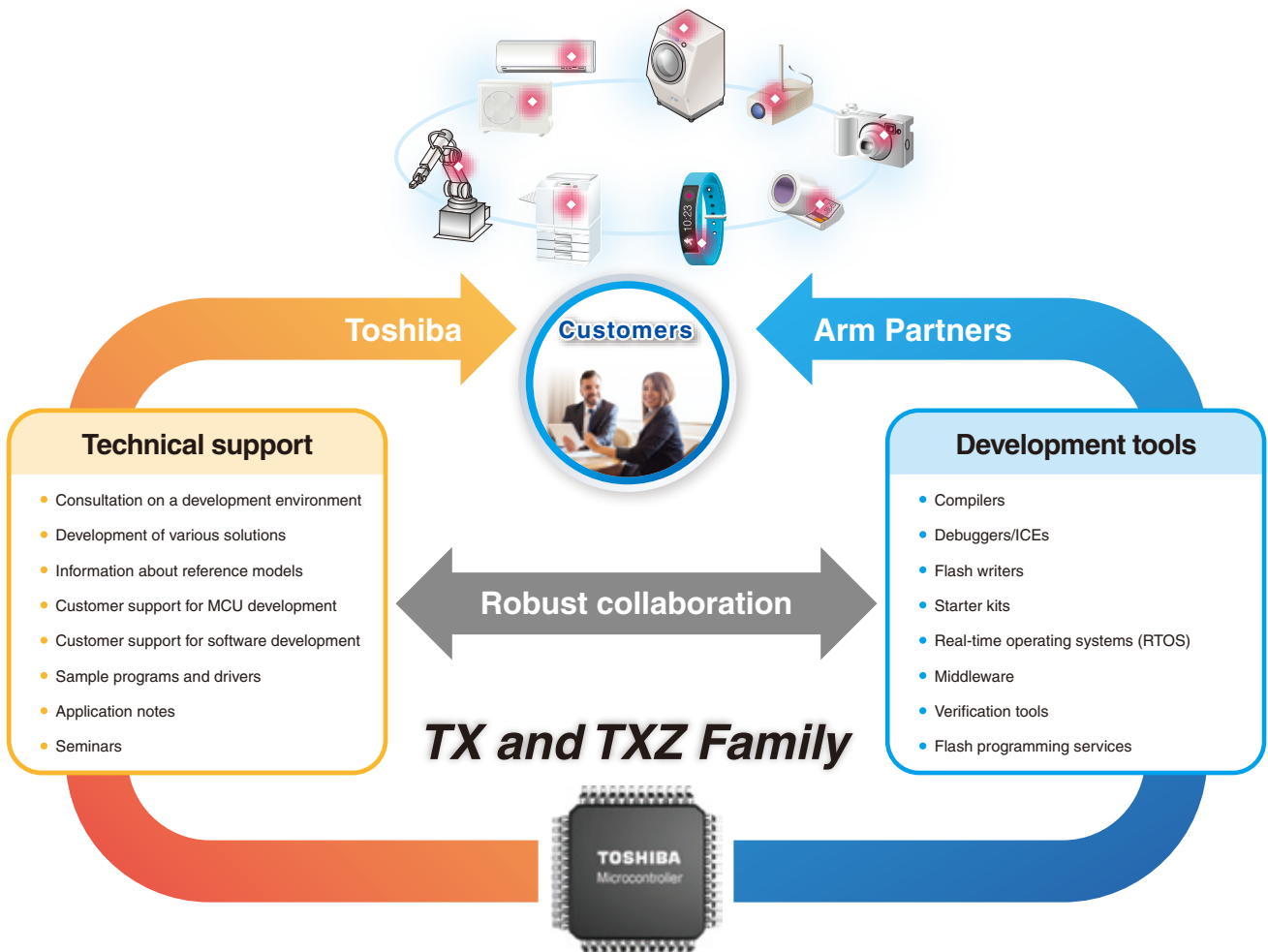
- Selection of an MCU and detailed product specifications
- Various types of benchmarking
- Support for technical studies (hardware and software)

Consultation on the selection of a development environment

Toshiba provides information on various development environments, tools and partners necessary for system development and mass production of your MCU.

Ecosystem partnership

Toshiba offers support services in cooperation with Arm Ecosystem partners according to your specific needs.



● Ecosystem partners for development environments ●

You can choose among a wide range of development tool partners for Arm-based microcontroller development systems. Choose the best development tools and partners that suit your needs.

	IDE/Compiler	Debugger	Simulator	OS	Middleware	Software development/SI	Board/Evaluation kit	FLASH programmer/Writer*	FLASH programming service	Teaching Materials /Seminar	Functional Safety
	*FLASH programmer/Writer ON: ON board Writing OFF: OFF board Writing										
Andor System Support Co., Ltd.						●		ON	●	●	
Arm Ltd.	●	●	●	●	●		●				
BITRAN CORPORATION		●						ON			
Computex Co.,Ltd.	●	●					●	ON			
Dediprog Technology Co., Ltd								ON OFF			
DTS INSIGHT CORPORATION (formerly Yokogawa Digital Computer Corporation)	●	●				●	●	ON		●	
eForce Co., Ltd.				●	●						
Elnec s.r.o								OFF			
ESP Co., Ltd				●		●	●			●	
Falcon Denshi K.K.								OFF	●		
GAIO TECHNOLOGY CO.,LTD.	●	●	●			●				●	●
GRAPE SYSTEMS INC.				●	●						
Green Hills Software/Advanced Data Controls Corp.	●	●	●	●							
HI-LO SYSTEMS RESEARCH CO.,LTD								OFF			
IAR Systems AB	●	●	●	●	●		●			●	
iFORCOM KYOEI Co.,Ltd.								ON			
Kyoto Microcomputer Co.,Ltd.	●	●									
Lauterbach Japan Ltd.		●									
MICROTEK Inc.									●		
MINATO HOLDINGS INC.								OFF	●		
P&E Microcomputer Systems, Inc.		●						ON			
SEGGER Microcontroller GmbH & Co. KG		●		●	●			ON			
Sohwa & Sophia Technologies Co.,Ltd.	●	●						ON			
SORD CORPORATION						●	●				
Techno Mathematical Co.,Ltd.					●	●	●				
TOA ELECTRONICS Inc. Flash Support Group Company.								ON OFF	●		
TOSHIBA INFORMATION SYSTEMES (JAPAN) CORPORATION				●	●	●	●				
Ubiquitous AI Corporation				●	●						
Ubiquitous Computing Technology Corporation				●							
VAMOS									●		
Xeltek Inc.								OFF			
ZLG	●	●						ON OFF			

Visit the websites of ecosystem partners for details of their products and services.

Website of Toshiba Electronic Devices & Storage Corporation:

<https://toshiba.semicon-storage.com/ap-en/product/microcomputer/designsupport/partner-list.html>

Semiconductor & Storage Products Home > Products > Microcomputer > Design / Support > Partner Information

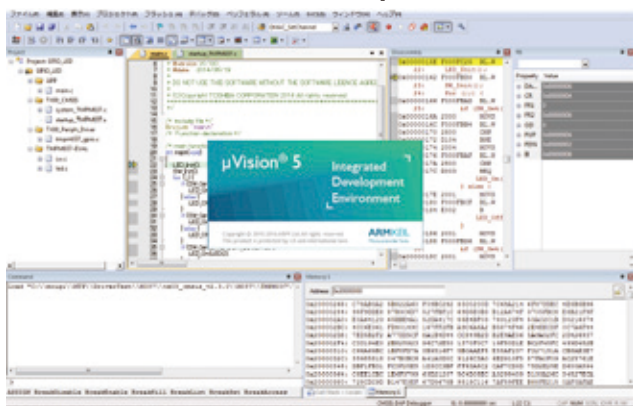
● Application Notes and Sample Programs ●

Our website provides application notes and sample programs that customers can use as a reference to evaluate the functionality of our microcontrollers and develop applications.

● Sample Programs

- Driver source code : Setup program containing sequences for operating various IP cores.
Synonymous with peripheral driver and MCU hardware abstraction layer (MCU HAL).
- Sample drivers : Sample embedded programs for operating the HAL and IP cores.
Sample drivers can run on starter kits and other boards for each microcontroller.
- Sample projects : Genuine MDK-Arm software development environment and IAR Systems' EWARM project.
You can verify operation with a development environment and a starter kit.

■ Genuine MDK-Arm development environment



● Features

- Incorporates a genuine Arm compiler
- MDK-TOSHIBA dedicated to Toshiba's microcontrollers
One-year license, low cost, and full versions are also available.

■ IAR Systems' EWARM development environment



● Features

- Development environment from a compiler vendor
- Available under various licensing schemes, including a free evaluation edition
- Support for ICE, static analysis and other tools

Application notes and sample programs are available for download at:

<https://toshiba.semicon-storage.com/ap-en/product/microcomputer/designsupport/applicationnote-read-me.html>

Semiconductor & Storage Products Home > Products > Microcomputer > Design / Support > Application Notes / Sample Programs

● Evaluation Kits and Reference Boards ●

Evaluation Kits

In order to evaluate whether to use Toshiba's microcontroller, it is advisable to use an entry-level evaluation kit (such as a starter kit) to start software development. Starter kits are available from development environment and evaluation kit vendors.

Various evaluation kits are available, ranging from the kits that are bundled with an IDE and an emulator to those that are compliant with an on-board emulator standard called CMSIS-DAP.

Moreover, feature-rich solution packages incorporating peripheral functions are also available. For detailed information, contact a partner listed in the "Boards/Evaluation Kits" column of the "Evaluation Environment Ecosystems" table on the previous page.

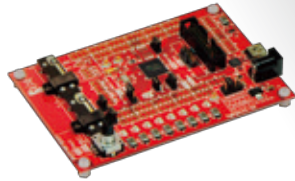
For evaluation kits supported by each microcontroller, see the pages that describe individual microcontrollers.

The following photographs were taken for inclusion in this brochure and may differ from actual products.

For the contents and details of evaluation boards, please contact tool vendors.

IAR Systems Starter Kit for TMPM440

- Included hardware:
 - TMPM440 evaluation board
 - IAR i-Jet Lite
 - USB cable
 - IAR Embedded Workbench for ARM KickStart edition



- Key features
 - USB/UART serial converter
 - 2 potentiometer input analog signals
 - Reset switch
 - Power LED
 - 2-phase encoder
 - 8 push switches
 - 8 user LEDs
 - DC power jack

ESP Starter Kit for TMPM475

- Included hardware: TMPM475 evaluation board
- Brushless DC motors



- Key features
 - Sensorless 3-shunt and 1-shunt resistor circuits
 - SIO/UART
 - CAN (isolation)
 - External amp
 - 12-bit DAC x 4
 - 4 tactile switches
 - On-board CMSIS-DAP
 - DAC (SIO) for communication connection
 - USB (isolation: CP2102)
 - Analog (slide volume resistor input)
 - External op-amp
 - 1 reset switch
 - LED
 - 20-pin JTAG half-pitch socket

ESP Starter Kit for TMPM37A

- Included hardware:
 - TMPM37A evaluation board
 - Brushless DC motors



- Key features
 - Selectable from 3-shunt resistor circuitry (external amp only) and 1-shunt resistor circuitry (that allows either an internal or an external amp to be selected)
 - 12-bit DAC x 4
 - Analog (slide volume resistor input)
 - 1 reset switch
 - 1 tactile switch
 - LED (for DAC monitoring)
 - 20-pin JTAG half-pitch socket (only for SWD connection)

Chip One Stop, Inc. Online Shop Starter Kit for TMPM3HQ

- Included hardware:
TMPM3HQ evaluation board
USB cable



- Key features
 - mbed
 - Arduino-compatible connector
 - USB-UART
 - AD converter
 - Thermistor
 - 6-axis sensor
 - Reset switch
 - Selectable power supply (DC jack input, USB-to-UART input or DAP USB input)
- CMSIS-DAP debugger
- UART
- DA converter
- Remote control receiver
- Push switch
- Pin header for boot-mode control

Chip One Stop, Inc. Online Shop Starter Kit for TMPM3H6

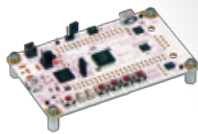
- Included hardware:
TMPM3H6 evaluation board
USB cable



- Key features
 - mbed
 - Arduino-compatible connector
 - USB-UART
 - DA converter
 - Remote control receiver
 - Reset switch
 - Selectable power supply (DC jack input, USB-to-UART input or DAP USB input)
- CMSIS-DAP debugger
- UART
- AD converter
- Thermistor
- Push switch
- Pin header for boot-mode control

Chip One Stop, Inc. Online Shop Starter Kit for TMPM037

- Included hardware:
TMPM037 evaluation board
USB cable



- Key features
 - CMSIS-DAP debugger
 - USB-UART
 - Volume
 - Push switch
 - Reset switch
 - Pin header for boot-mode control
 - Selectable power supply (DC jack input, USB-to-UART input or DAP USB input)

Chip One Stop, Inc. Online Shop Starter Kit for TMPM036

- Included hardware: TMPM036 evaluation board
USB cable



- Key features
 - Arduino-compatible connector
 - CMSIS-DAP debugger
 - USB-UART
 - UART
 - Volume
 - Push switch
 - Reset switch
 - Pin header for boot-mode control
 - Selectable power supply (DC jack input, USB-to-UART input or DAP USB input)

Chip One Stop, Inc. Online Shop Starter Kit for TMPM066

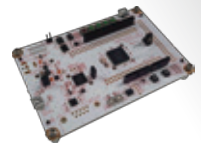
- Included hardware:
TMPM066 evaluation board
USB cable



- Key features
 - mbed
 - Arduino-compatible connector
 - CMSIS-DAP debugger
 - USB-UART
 - Selectable power supply (DC jack input, USB-to-UART input or DAP USB input)
- UART
- Push switch
- Reset switch
- Pin header for boot-mode control

Chip One Stop, Inc. Online Shop Starter Kit for TMPM46B

- Included hardware:
TMPM46B evaluation board
USB cable



- Key features
 - mbed
 - Arduino-compatible connector
 - CMSIS-DAP debugger
 - NAND Flash
 - Remote control receiver
 - USB-UART
 - Selectable power supply (DC jack input, USB-to-UART input or DAP USB input)
- UART
- Push switch
- Thermistor
- Reset switch
- Pin header for boot-mode control

● Microcomputer web page ●

The Toshiba Microcomputer web page provides the latest information on our products.

Convenient search functions allow you to find various types of information you need!

- ✓ Datasheets
- ✓ Evaluation Kits
- ✓ Partner Information
- ✓ Videoclips
- ✓ Reference Boards
- ✓ Application Notes
- ✓ Purchase/Sample
- ✓ Facebook

Website of Toshiba Electronic Devices & Storage Corporation:
<https://toshiba.semicon-storage.com/ap-en/product/microcomputer.html>

 Toshiba microcontroller



● Online Distributor ●



Chip One stop, Inc



Digi-Key Corporation



Mouser Electronics

RESTRICTIONS ON PRODUCT USE

Toshiba Corporation and its subsidiaries and affiliates are collectively referred to as "TOSHIBA".
Hardware, software and systems described in this document are collectively referred to as "Product".

- ▶ TOSHIBA reserves the right to make changes to the information in this document and related Product without notice.
- ▶ This document and any information herein may not be reproduced without prior written permission from TOSHIBA. Even with TOSHIBA's written permission, reproduction is permissible only if reproduction is without alteration/omission.
- ▶ Though TOSHIBA works continually to improve Product's quality and reliability, Product can malfunction or fail. Customers are responsible for complying with safety standards and for providing adequate designs and safeguards for their hardware, software and systems which minimize risk and avoid situations in which a malfunction or failure of Product could cause loss of human life, bodily injury or damage to property, including data loss or corruption. Before customers use the Product, create designs including the Product, or incorporate the Product into their own applications, customers must also refer to and comply with (a) the latest versions of all relevant TOSHIBA information, including without limitation, this document, the specifications, the data sheets and application notes for Product and the precautions and conditions set forth in the "TOSHIBA Semiconductor Reliability Handbook" and (b) the instructions for the application with which the Product will be used with or for. Customers are solely responsible for all aspects of their own product design or applications, including but not limited to (a) determining the appropriateness of the use of this Product in such design or applications; (b) evaluating and determining the applicability of any information contained in this document, or in charts, diagrams, programs, algorithms, sample application circuits, or any other referenced documents; and (c) validating all operating parameters for such designs and applications. **TOSHIBA ASSUMES NO LIABILITY FOR CUSTOMERS' PRODUCT DESIGN OR APPLICATIONS.**
- ▶ **PRODUCT IS NEITHER INTENDED NOR WARRANTED FOR USE IN EQUIPMENTS OR SYSTEMS THAT REQUIRE EXTRAORDINARILY HIGH LEVELS OF QUALITY AND/OR RELIABILITY, AND/OR A MALFUNCTION OR FAILURE OF WHICH MAY CAUSE LOSS OF HUMAN LIFE, BODILY INJURY, SERIOUS PROPERTY DAMAGE AND/OR SERIOUS PUBLIC IMPACT ("UNINTENDED USE").** Except for specific applications as expressly stated in this document, Unintended Use includes, without limitation, equipment used in nuclear facilities, equipment used in the aerospace industry, lifesaving and/or life supporting medical equipment, equipment used for automobiles, trains, ships and other transportation, traffic signaling equipment, equipment used to control combustions or explosions, safety devices, elevators and escalators, and devices related to power plant. **IF YOU USE PRODUCT FOR UNINTENDED USE, TOSHIBA ASSUMES NO LIABILITY FOR PRODUCT.** For details, please contact your TOSHIBA sales representative or contact us via our website.
- ▶ Do not disassemble, analyze, reverse-engineer, alter, modify, translate or copy Product, whether in whole or in part.
- ▶ Product shall not be used for or incorporated into any products or systems whose manufacture, use, or sale is prohibited under any applicable laws or regulations.
- ▶ The information contained herein is presented only as guidance for Product use. No responsibility is assumed by TOSHIBA for any infringement of patents or any other intellectual property rights of third parties that may result from the use of Product. No license to any intellectual property right is granted by this document, whether express or implied, by estoppel or otherwise.
- ▶ **ABSENT A WRITTEN SIGNED AGREEMENT, EXCEPT AS PROVIDED IN THE RELEVANT TERMS AND CONDITIONS OF SALE FOR PRODUCT, AND TO THE MAXIMUM EXTENT ALLOWABLE BY LAW, TOSHIBA (1) ASSUMES NO LIABILITY WHATSOEVER, INCLUDING WITHOUT LIMITATION, INDIRECT, CONSEQUENTIAL, SPECIAL, OR INCIDENTAL DAMAGES OR LOSS, INCLUDING WITHOUT LIMITATION, LOSS OF PROFITS, LOSS OF OPPORTUNITIES, BUSINESS INTERRUPTION AND LOSS OF DATA, AND (2) DISCLAIMS ANY AND ALL EXPRESS OR IMPLIED WARRANTIES AND CONDITIONS RELATED TO SALE, USE OF PRODUCT, OR INFORMATION, INCLUDING WARRANTIES OR CONDITIONS OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, ACCURACY OF INFORMATION, OR NONINFRINGEMENT.**
- ▶ Do not use or otherwise make available Product or related software or technology for any military purposes, including without limitation, for the design, development, use, stockpiling or manufacturing of nuclear, chemical, or biological weapons or missile technology products (mass destruction weapons). Product and related software and technology may be controlled under the applicable export laws and regulations including, without limitation, the Japanese Foreign Exchange and Foreign Trade Law and the U.S. Export Administration Regulations. Export and re-export of Product or related software or technology are strictly prohibited except in compliance with all applicable export laws and regulations.
- ▶ Product may include products subject to foreign exchange and foreign trade control laws.
- ▶ Please contact your TOSHIBA sales representative for details as to environmental matters such as the RoHS compatibility of Product. Please use Product in compliance with all applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive. **TOSHIBA ASSUMES NO LIABILITY FOR DAMAGES OR LOSSES OCCURRING AS A RESULT OF NONCOMPLIANCE WITH APPLICABLE LAWS AND REGULATIONS.**

Apr. 2019

BCE0085I

32-Bit Microcontrollers

TOSHIBA

Toshiba Electronic Devices & Storage Corporation

Website: <https://toshiba.semicon-storage.com/>