TOSHIBA
Leading Innovation

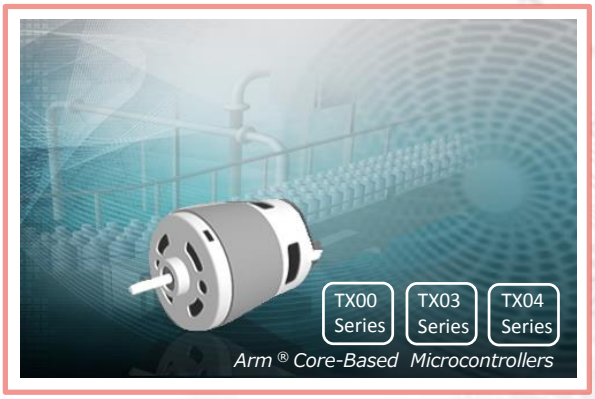
Created in September 2017.

MICROCONTROLLER

VECTOR ENGINE (VE)

Toshiba original motor control technology

In motor control technology, vector control which requires complicated high-speed calculation and high-level software developments is a new trend.
A new Toshiba original vector engine accomplishes easy and low-cost vector control. The vector engine is a coprocessor exclusive for motor control. The vector engine executes the typical calculation including transformation from a three-phase motor current to a two-phase, and transformation/counter transformation of the rotational coordinates. These functions reduce a CPU utilization of the software while user-specified position estimation and speed control, which varies depending on the system configuration and control method, are executed by software.
The task of the vector engine can be selected up to 16 types. With combining the vector engine to users' system, a high level of flexibility in motor control can be achieved.



APPLICATIONS

- Washing machines
- Air conditioners
- Refrigerators
- Pumps
- Industrial motors
- Other rotating devices

FEATURES / ADVANTAGES

FEATURES	ADVANTAGES
Coprocessor exclusive for motor control	Reduction of the CPU overhead. Since the motor process time is reduced, a commanding share of the CPU held by the software is decreased by 72% when two motors are operating. 1) Another process can be handled. 2) High-speed PWM carrier frequency can be used.
Supporting various scheduling	As a coprocessor the vector engine has Toshiba original scheduling function. It select tasks and their combinations.
Many tasks are prepared for various types of calculation	The impact of the difference between development environments can be reduced. Compile options are not susceptible.

BENEFITS

- Since the resources of the CPU can be devoted to PFC*, sensor processing, or communication systems, system performance can be improved.
- With a high speed PWM frequency, quiet and low-vibration operation can be possible.
- Combining with users' software, various operation can be allowed.
- Short development terms can be achieved.

* PFC : Power Factor Correction

PRODUCT LINEUP

Part Number	ROM Size (KB)	RAM Size (KB)	PMD* (ch)	Package	Features
TMPM370FYFG	256	10	2	LQFP100 (14 x 14 mm)	Built-n various analog circuit. System cost can be reduced.
TMPM370FYDFG	256	10	2	QFP100 (14 x 20 mm)	
TMPM372FWUG	128	6	1	LQFP64(10 x 10 mm)	Small scale pin package
TMPM373FWDUG	128	6	1	LQFP48(7 x 7 mm)	
TMPM374FWUG	128	6	1	LQFP44(10 x 10 mm)	
TMPM375FSDMG	64	4	1	SSOP30(5.6 x 9.7 mm)	
TMPM376FDFG	512	32	2	LQFP100 (14 x 14 mm)	Built-in I^2C
TMPM376FDDFG	512	32	2	QFP100 (14 x 20 mm)	
TMPM37AFSQG	64	4	1	VQFN32 (5 x 5 mm)	Pre-driver for 3-phase sine wave drive

Part Number	ROM Size (KB)	RAM Size (KB)	PMD* (ch)	Package	Features
TMPM470FDFG	512	34	2	LQFP100 (14 x 14 mm)	Two units of the vector engine, Built-in CAN controller
TMPM475FDFG	512	34	2		

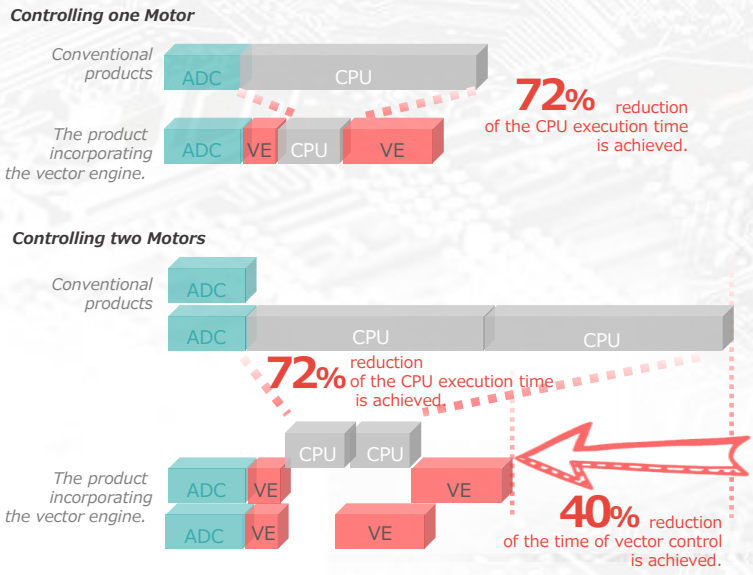
- PMD : Programmable motor driver

RESTRICTIONS ON PRODUCT USE

ADVANTAGE : REMARKABLY SHORTENED MOTOR CONTROL PROCESSING TIME

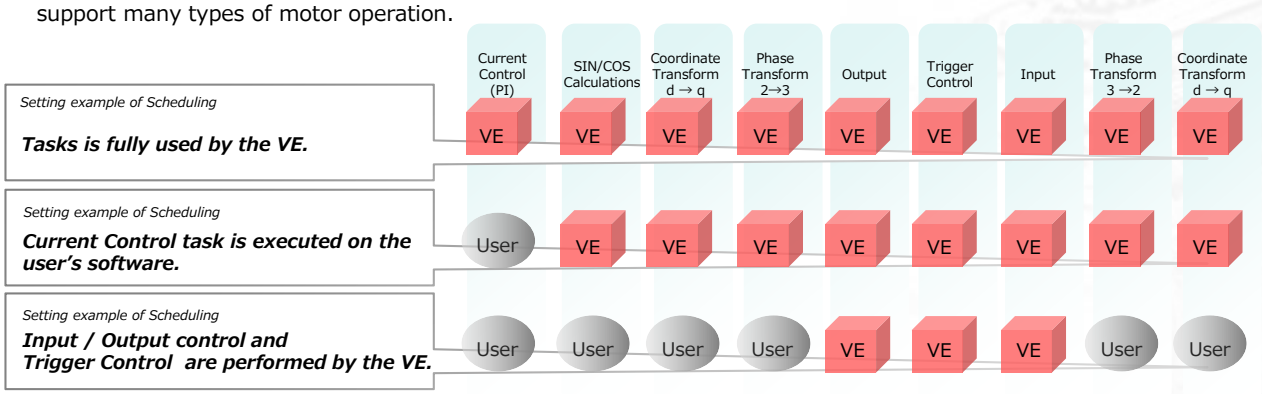
Typical calculation in vector control is handled by the vector engine. Therefore, a CPU utilization of the software can be decreased. This reduction improves users' system performance because the CPU devotes the resources to PFC, sensor processing, or communication systems. In addition, if two motors are controlled, the vector engine remarkably reduces the CPU processing time. When two motors are vector-controlled by software, clock speed of the CPU must be increased for the processing. At this time, a consumption current will increase; therefore the user need to consider the power supply, power dissipation, and EMC. If the vector engine is used together with the CPU, calculation for two channels is performed in parallel. The efficiency of calculation processing for two motors can be improved without a high-speed clock for the CPU.

Note; The above data is not guaranteed value but reference data.



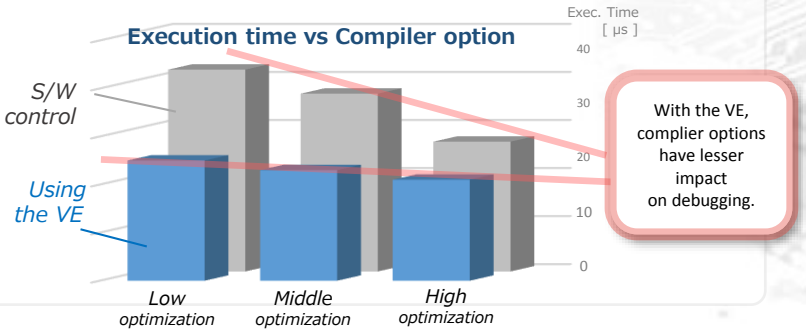
ADVANTAGE : FLEXIBLE SCHEDULING BY THE COPROCESSOR VECTOR ENGINE

Position estimation and speed control, which vary depending on the system configuration and control method, are left to software processing. The vector engine handles the typical calculation including transformation from a three-phase motor current to a two-phase, or transformation/counter transformation of the rotational coordinates. The tasks of the vector engine are configured as a schedule. The combination of the tasks is up to 16 types. These various types of scheduling provide a high level of flexibility in motor control and the vector engine can support many types of motor operation.



Good new for Software developers. Reduction of Developers' load

Since the typical calculation is handled by the vector engine, software programs can be reduced. Therefore, the amount of the program to be complied can be reduced. It means that the impact of the compiler performance or optimization options can be reduced.



Note; The above data is not guaranteed value but reference data.

TOSHIBA ELECTRONIC DEVICES & STORAGE CORPORATION
Website: http://toshiba.semicon-storage.com/