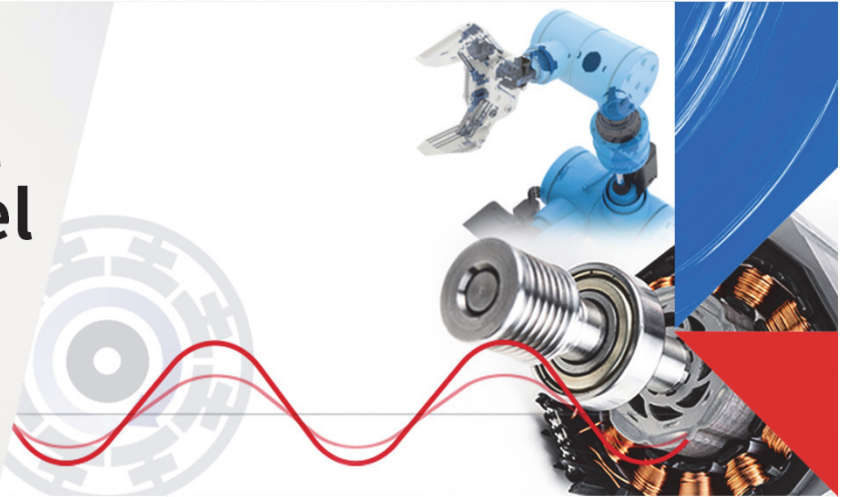


# Servo Drive Reference Model for Multi-Channel Motor Control

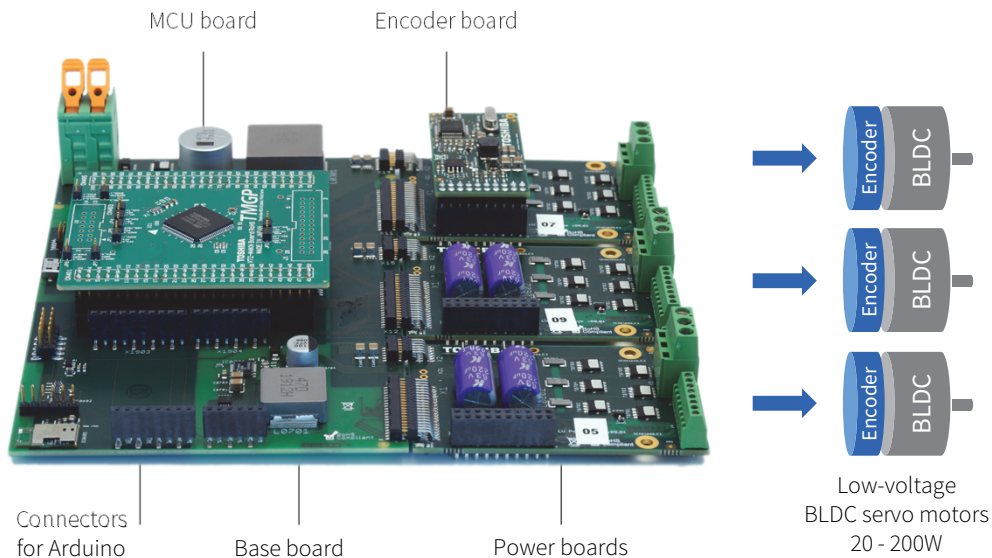


## Modular and Versatile Platform

The Servo Drive Reference Model (RM) combines Toshiba's optimized motor control MCUs with Toshiba's low  $R_{DS(ON)}$  Power MOSFETs providing high efficient control and drive solutions for brushless DC (BLDC) motors. The modular concept offers a high degree of flexibility for Field-Oriented Control (FOC) and closed-loop positioning of up to three BLDC servo motors by a single MCU resulting in reduced system cost. The RM gives a quick start for developers to realize advanced servo motor systems.

### Applications

- BLDC servo motor
- Inverter / Driver
- Robots / Cobot / Scara
- Automated Guided Vehicle (AGV)
- Lawn mower
- 3D printer



### Base Board

- 24/48V supply
- Connectors for 3 power stages
- USB, BT5 and Arduino host interface

### MCU Board

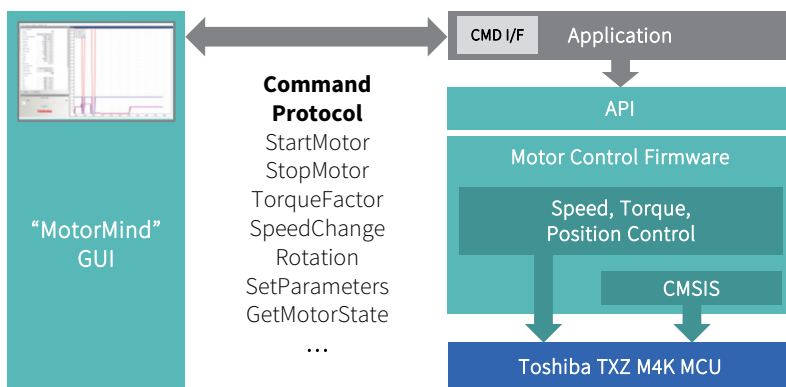
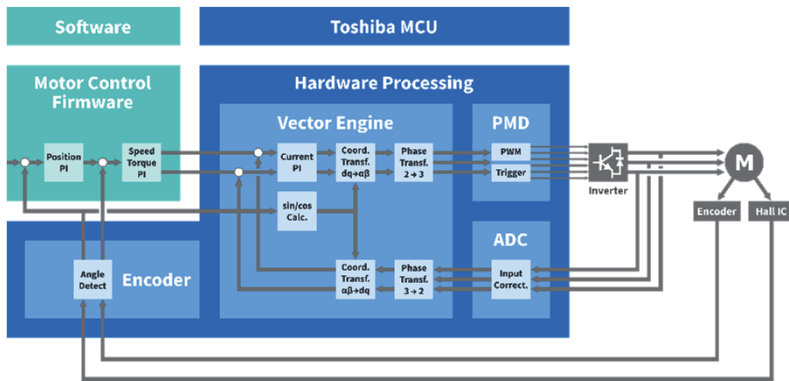
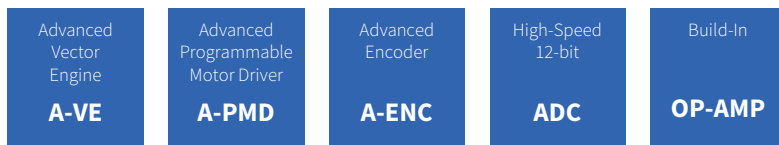
- Toshiba Arm® Cortex®-M4 with FPU (160 MHz)
- Vector Engine
- 3 channel Programmable Motor Driver (PMD)

### Power Board

- 3-phase inverter
- 100V/150A MOSFETs
- 20-200W motor class
- Over current protection

### Encoder Board

- Adopts resolver, encoder and hall sensors to the encoder block of the MCU



## Vector control of up to 3 BLDC servo motors by a single MCU

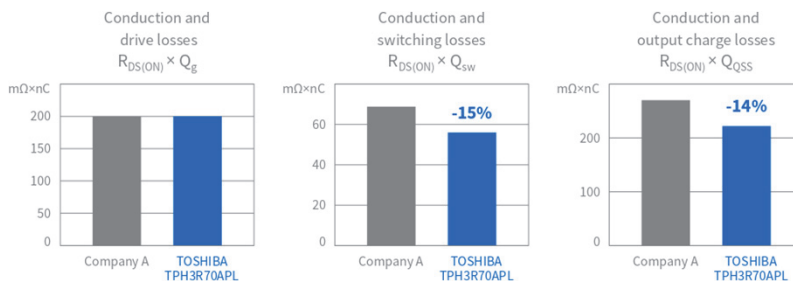
Toshiba's Arm® Cortex®-M4F core-based microcontroller is dedicated to Field-Orientated motor control. The built-in Vector Engine (VE) takes care for the complex vector control calculations and feeds the Programmable Motor Drive (PMD) block to generate the PWM waveforms and perform other necessary functions such as dead-time control.

## Motor control firmware

The firmware API provides a simple and straight forward interface to configure and control the motor. Beside speed, torque and position control there are functions for current measurement, over/under voltage protection, or stall detection. All APIs can be accessed from remote via a command protocol.

## 200W power stage / 3-phase inverter

The 3-phase inverter design is based on the 100V / 150A TPW3R70APL low-voltage MOSFET from the latest U-MOS IX process technology which provides industry leading performance. With max.  $R_{DS(ON)}$  of just 3.7mΩ, the drive, switching and output charge losses are reduced significantly enabling efficient driving of 48V BLDC motors up to 200W.



Part number	Description
TMPM4KNDFDG	MCU, Arm®* Cortex®*-M4F, 160 MHz, 100-pin
TPW3R70APL	N-channel MOSFET, 100V/150A, DSOP adv.
PAN1762	Bluetooth®* 5 module with Toshiba TC35680
TC7QPB9307FK	Level shifter
TCR3DM33	Low drop-out linear voltage regulator (LDO)
TLP2370	High-speed and low-power photocoupler
SSM3K16CTC	Small signal MOSFET
TC7SZ34FU / TC7SZ07FU	Single gate buffers
TC75W58FU	Comparator

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