TOSHIBA
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Motor Drivers

AGC(Active Gain Control) architecture

Stable control is a basic operating requirement for motors used in printers, office appliances, and industrial equipment etc. Stepping motors, because of their stable and precision controls, are suitable for these applications. However, the highest priority of the stepper motors is to avoid stalls (*1). Therefore, an ample of current margin is needed at all time to prevent sudden heavy torque changes and to achieve the stable operation.
Reduction of the additional current for the torque margin is highly desirable for improving efficiency and suppressing heat generation. And then, complicated current adjustment is required by real-time monitoring of motor torque and current feedback, using additional sensors and microcontrollers. To solve these problems, we have developed AGC architecture. AGC automatically optimizes the motor current depending on the torque needed. It prevents motor from stalling and provides the optimum efficient motor control that cannot be achieved by conventional motor control drivers.

(*1) Stall: A stepping motor rotates synchronizing with pulses. However, its synchronization is lost when overload or a rapid speed change occurs, the motor stops but is still running at peak current. This phenomenon is called 'Stall'.

APPLICATIONS

- Office appliances (printers and others)
- Industrial machine (vending machine, CNC machine, dispensing machine and others)
- Banking terminals (ATM, cash dispensers, etc.)
- Amusement equipment

FEATURES	ADVANTAGES
Efficiency improvement	Additional current for torque margin can be significantly reduced.
Anti-stall	Current control is optimized depending on load torque.

BENEFITS

- Significantly reduce heat generation
- Simplifying optimum current control system without microcontrollers, ADC, and sensors

PRODUCT LINEUP

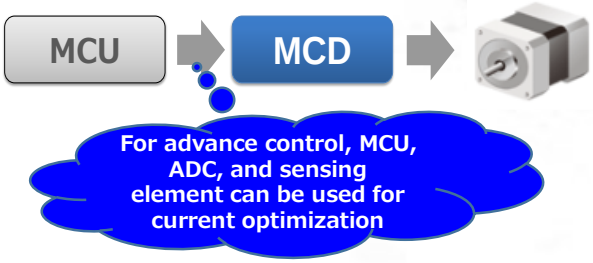
Product number	Output withstand voltage (V)	Output current (A)	Control I/F	Package	Other features
TB67S279FTG	50	2.0	Clock	WQFN48 (7x7mm)	・AGC; optimized current control method for motor operation ・ACDS; a current control method which does not require sense resistor ・Built-in error detection functions (thermal shutdown, over current protection, under voltage lockout, and motor load open detection) ・Built-in output function of error detection flag
TB67S289FTG	50	3.0	Clock	VQFN48 (7x7mm)	
TB67S285FTG	50	3.0	Serial	VQFN48 (7x7mm)	
TB67S249FTG	50	4.5	Clock	WQFN48 (7x7mm)	

> ADVANTAGE : Optimize operating current in real-time

System control difference between conventional and AGC architectures

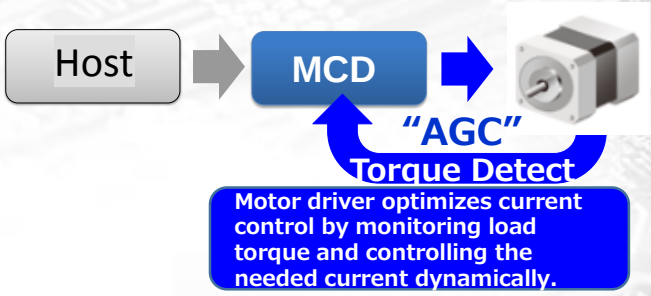
● Conventional

Maximum current, which has a margin for peak current, is set to prevent motor stalling from the maximum load. This current is controlled to a constant value under any circumstances. Therefore, when the load torque is small, the margin translates to a wasted power consumption.



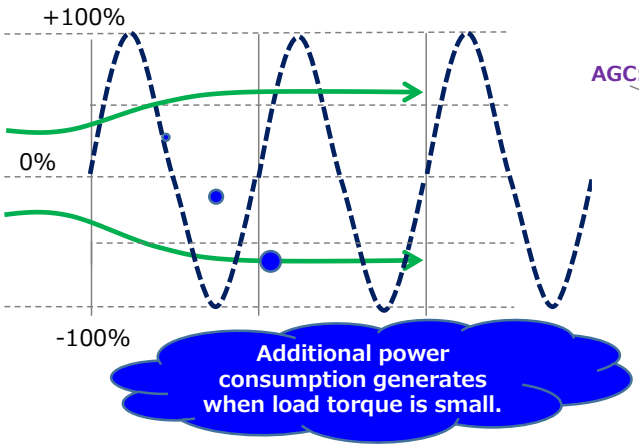
● New (AGC)

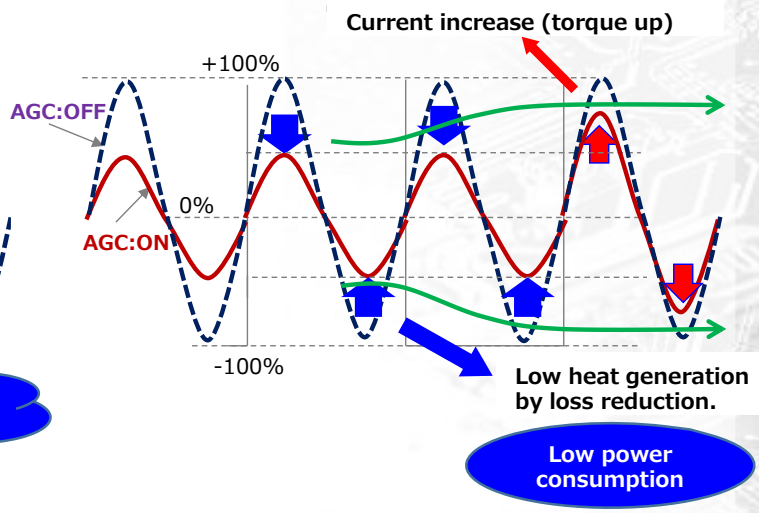
AGC optimizes the motor current dynamically depending on the load torque. Efficient operation is realized by eliminating the additional current needed while keeping a minimum margin to operate efficiently



● Torque control and motor operation current for stepping motors

When some sort of loads are applied during motor rotation, load torque increases and its volume changes depending on the usage circumstances. Required current for the motor operation also changes by following the load change.





For advance control, measurement for heat generation is necessary. Suppressing the torque margin, while securing its required value, is necessary. Both add complexity and cost to the system

Measurement for heat generation is unnecessary. Load from Host control can be also reduced.

> ADVANTAGE : Significantly reduce system power consumption

As described above, AGC adjusts the motor current depending on the torque needed and contributes to suppression of heat generation for whole system.
Moreover, adjustment with devices such as microcontrollers can be omitted because the motor current can be controlled by the motor driver.

Conventional		AGC
× Excessive power is consumed as waste at the small torque because the motor current is controlled to a constant value under any circumstances.	Heat generation	○ Motor current is controlled depending on the torque needed. A minimum required current can be controlled even when the torque is small.
× Whenever the torque changes, signals from a microcontroller need to be adjusted to control the motor current.	Need for adjustment	○ Unnecessary