INTELLIGENT PHASE CONTROL
Eliminates Phase Shift

Toshiba has developed Intelligent Phase Control technology (InPAC), the latest Toshiba control technology, that automatically adjusts phases of motor voltage and motor current. Using automatic phase adjustment, the optimal efficiency is achieved simply by initial setting in the used rotation range. The adjustment burden for optimization is reduced, which normally incurs at every rotation speed with the conventional technology. Accordingly customers’ development time can be shortened.

APPLICATIONS

- Cooling fans for servers and industrial motors
- Fans for home appliances (air cleaners, hot water supply machines, ventilation fans, electrical fans)

FEATURES

- Auto lead angle control

ADVANTAGES

- Automatically adjusting brushless motors’ current and voltage phases by comparing them
- Eliminating consumption current generated from the phase difference that depends on the rotation speed and the current value

BENEFITS

- Eliminating adjustment and evaluation procedure
- Achieving highly efficient drive
- Contributing to motor-operation noise and vibration lower than for square-wave drive

REALIZING HIGHLY EFFICIENT DRIVE

A conventional brushless DC motor driver feeds back and controls the rotor position by hall signal. Phase difference is generated between motor voltage and motor current since motor speed changes because of motor impedance etc. Phase difference decreases driving efficiency. Adjustment is required to eliminate the difference and increase the efficiency.

Toshiba’s InPAC technology compares phase of motor current (current information) and phase of motor voltage (hall signal) and the result is fed back to motor current control (control signal). Phase difference between motor voltage and motor current is adjusted automatically. This is the optimal system for achieving highly efficient drive.

Conventional

Motor Voltage
Motor Current

Phase difference

Brushless motor driver for fans

Motor Voltage
Motor Current

No phase difference
InPAC technology automatically adjusts current and voltage phases.

Depending on RPM, InPAC reduces motor current significantly when comparing the approach of using a fixed lead angle control mode.

**REDUCING DEVELOPMENT BURDEN**

With conventional technology, repeated adjustments of differences between motor voltage and motor current for optimization are required in the rotation range to achieve the optimal efficient characteristics. Therefore, customers have been burdened with a complicated development process. Toshiba’s InPAC technology allows optimization throughout the rotation range simply by initial setting, because phase difference between motor voltage and motor current is adjusted automatically. It reduces customers’ development burdens.

**PRODUCT LINEUP**

<table>
<thead>
<tr>
<th>Product number</th>
<th>Supply voltage range</th>
<th>Output current</th>
<th>Drive method</th>
<th>Package</th>
<th>Other features</th>
</tr>
</thead>
<tbody>
<tr>
<td>TC78B016FTG</td>
<td>6~30 V</td>
<td>3.0 A</td>
<td>Sine-wave drive</td>
<td>WQFN36 (5x5 mm)</td>
<td>Auto lead angle (voltage and current: optimized phase control)</td>
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<td>Speed control inputs: PWM inputs or analog voltage inputs</td>
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<td>Abnormal detection functions: Thermal shutdown, overcurrent detection, motor lock detection</td>
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<tr>
<td>TC78B025FTG</td>
<td>5.5~16V</td>
<td>3.5 A</td>
<td>Sine-wave drive</td>
<td>VQFN24 (4x4 mm)</td>
<td>Support for hall devices and hall ICs</td>
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