

Intelligent Phase Control



Eliminates Phase Shift

Intelligent Phase Control technology (InPAC) 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.

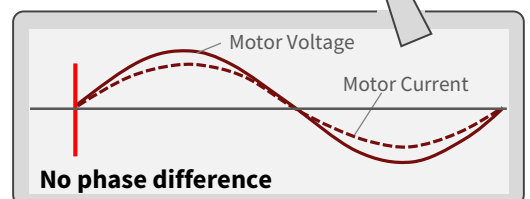
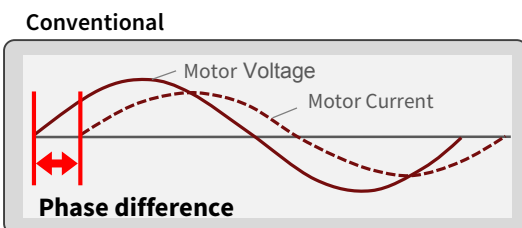
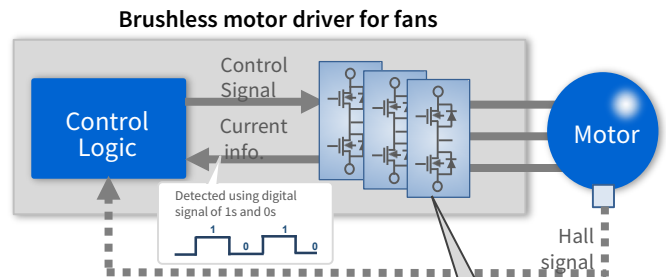
Applications

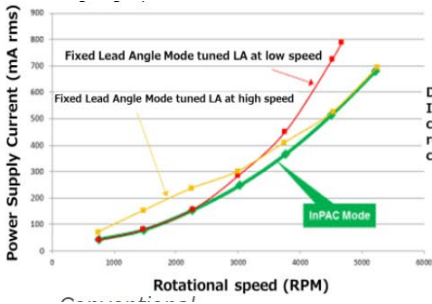
- Cooling fans for servers and industrial motors
- Fans for home appliances (air cleaners, hot water supply machines, ventilation fans, electrical fans)

Features	Advantages	Benefits
<ul style="list-style-type: none"> • Auto lead angle control 	<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • Eliminating adjustment and evaluation procedure • Achieving highly efficient drive • Contributing to motor-operation noise and vibration lower than for square-wave drive

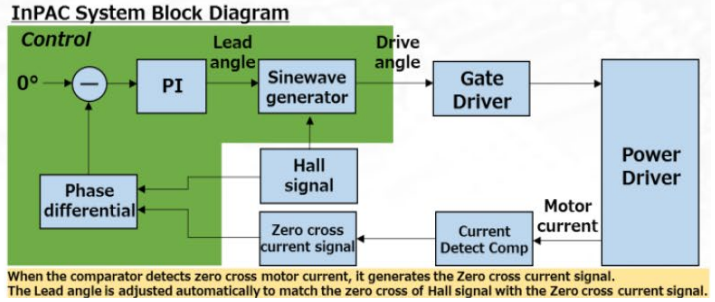
Realizing highly efficient drive

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





Depends on RPM, In general InPAC reduces supply current significantly with respect to Fixed lead angle control mode approaches

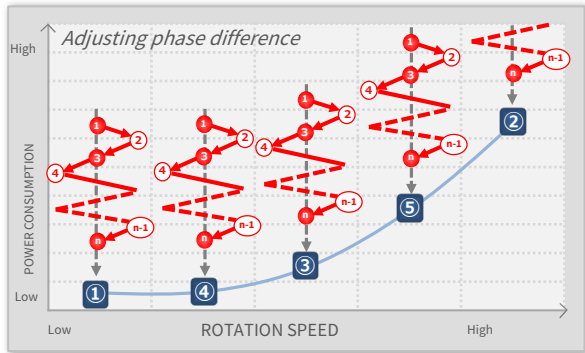


Reducing development burden

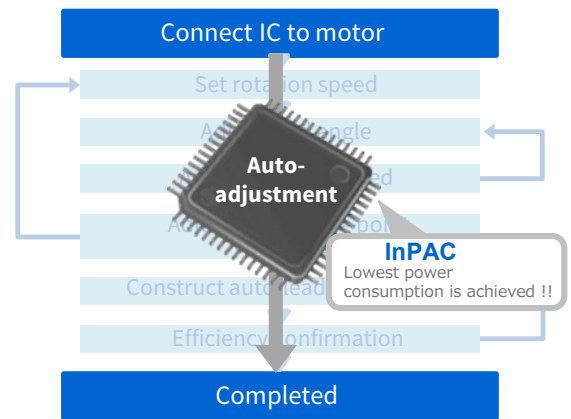
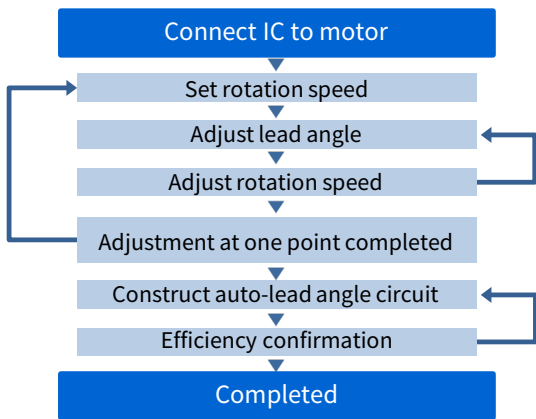
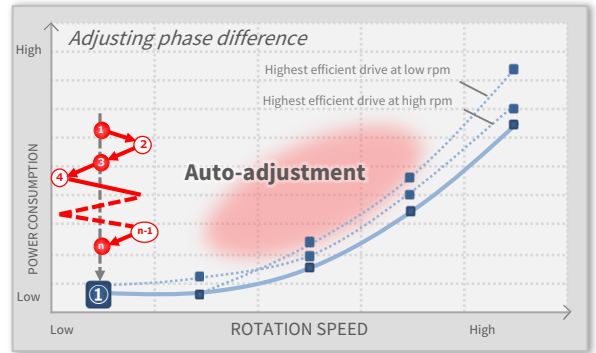
With conventional technology, repeated adjustments of differences between motor voltage and motor current for optimization are required in the rotation range to achieve the optimal efficient characteristics. Therefore, customers have been burdened with a complicated development process. Toshiba's InPAC 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.

Conventional

Repeated adjustment at each point for optimization



Optimization through automatic phase difference adjustment simply by initial setting



- Low except at adjusted point	Efficiency	+ Optimized automatically
- Necessary many times	Need for adjustment	+ Unnecessary

Product lineup

Product number	Supply voltage range	Output current	Drive method	Package	Other features
TC78B016FTG	6~30V	3.0 A	Sine-wave drive	WQFN36 (5x5 mm)	Auto lead angle (voltage and current: optimized phase control) Support for hall devices and hall ICs. Speed control inputs: PWM inputs or analog voltage Inputs. Abnormal detection functions: Thermal shutdown, overcurrent detection, motor lock detection.
TC78B025FTG	5.5~16V	3.5 A	Sine-wave drive	VQFN24 (4x4 mm)	
TC78B027FTG	6~16.5V	0.1/0.2A	Sine-wave drive	VQFN24 (4x4 mm)	
TC78B041FNG	6~16.5V	n/a	Sine-wave drive	SSOP30	
TC78B042FTG	6-16.5V	n/a	Sine-wave drive	VQFN32	