

MMD

Motor & Mechatronics Devices

**Driver & Peripheral LSI Marketing & Engineering Dept.
Analog & Peripheral Div.
Toshiba Semiconductor Company**

Motor types

DC Motors

Brush Motor

➔ AV Equipment, Industrial Equipment

Advantage: low price

Disadvantages: electrical noise, commutators wear out

Brushless Motor

➔ AV Equipment, OA Equipment, Industrial Equipment

Advantages: highly reliable, high-speed rotation, easy speed control

Disadvantages: need drive circuit to control rectification

Stepping Motors

➔ OA Equipment, Industrial Equipment

Advantages: open loop control, digital control, easy low-speed drive

Disadvantages: pull out, resonance, limit to high-speed rotation

Linear Motor (Actuator)

➔ OA Equipment, Industrial Equipment

Advantages: Deadbeat variable speed

Disadvantages: servo circuit required

Product Name for Motor ICs

TA72xxP/F/ - -

TA77xxP/F/ - -

TA84xxP/F/ - -
(Including some BiCMOS Products)

TA84xxxP/F/ - -

Bipolar Product

TB65xxP/F/ - -

BiCMOS Product

Some product names do not comply with the above.

Brush Motor Driver IC

Forward/Reverse drive		
Equipment	Product	Application
1ch motor driver	TA7257P	VCR
	TA7267BP	
	TA7291P/S/F	
	TA7354P	
	TA8409S/F	
	TA8482FN	
	TA7733F	Camera
	TA8401F	
	TA8428K/F	FAX PPC Printer
	TA8429H	
	TA8440H	
	TB6549P *	

Forward/Reverse drive		
Equipment	Product	Application
1.5ch motor Driver	TA7288P	VCR
	TA8400P	
	TA8405S	
2ch motor Driver	TA7279P/AP	VCR
	TB6524FN	Camera
	TB6542FL*	CD/Camera
4ch motor Driver	TA2058F	CDP
	TA2092N	

* Under development

Brush Motor Driver IC

Power Operational Amplifier		
Equipment	Product	Application
2ch Power OP. Amp.	TA8102P TA8406P TA8410P/F/K/AK TA7272P TA8407P/F TA8464K TA7256P	CDP Linear motor Actuator
4ch Power OP. Amp.	TA8212F TA8449P	CDP

Brushless Motor Driver IC

3 Phase motor drive		
Equipment	Product	Application
Linear	TA8424F	VCR (Cylinder & Capstan)
	TA8466AF	
	TA8470AF	
	TA8479F	
Linear,PWM	TA8490AF	CD-ROM spindle
	TA8493AF /F/BF	
Switching, PWM	TA7247AP	Air-conditioner, PPC

3 Phase motor drive		
Equipment	Product	Application
Switching	TA7262P/P(LB)F	VCR
	TA7259P/P(LB)F	VCR,Printer
	TA7736P/F	
	TA8423P/F	VCR
	TA7745P/F	VCR,CDP
	TA8416F	VCR,CDP

Brushless Motor Driver IC

3-phase Drive		
Equipment	Product	Application
Controller	TA7712P/F TA7713P	PPC,FA
Sensor-less	TB6520P	Air conditioner
	TA8483CP	
	TB6537P/F	Refrigerator

2-phase Drive		
Equipment	Product	Application
2-phase unipolar	TA8420AF/21AF	Submicro DC FAN
	TA8462F	
	TA8473F	FC FAN (Speed control)

Stepping Motor Driver IC

Constant Voltage Drive		
Equipment	Product	Application
3/4-phase unipolar	TA8415P	PPC,FAX,Printer,Sewing machine
2-phase bipolar	TA7774P/F	Refrigerator,FAX
	TA8430AF	FAX,Printer
Constant Current Drive		
Equipment	Product	Application
2-phase bipolar	TA7289P/F	Printer,FAX,PPC
	TA84002F	Printer,FAX,PPC
	TA8411L	Printer,FAX,PPC
	TB6500AH	FAX
Micro Step Drive		
Equipment	Product	Application
2-phase bipolar	TB6504F	Portable VTR
	TB6512AF	
	TB6526AF	
	TA8435H	Printer,Scanner,PPC,Sewing machine,FA
5-phase Stepper		
Equipment	Product	Application
5-phase unipolar/bipolar	TB6528P	FA

Sales Items

Type of Motor	Device	Characteristic
Brush Motor	TA8428K	24V / 3.0A(max) ▶ High Voltage & High capacity current
	TA8428F(✓)	24V / 2.5A(max) ▶ High Voltage & High capacity current
	TA8429H	24V / 4.5A(max) ▶ High Voltage & High capacity current
	TA8440H	24V / 1.5A4 High Voltage & PWM Control
	TB6549P (#)	24V / 4.5A(max) 4High Voltage & High capacity current Low ON resistance type (LDMOS)
Stepping Motor	TA8435H	PWM chopper type, Micro step drive
	TA8415P	Controller type
	TA84002F(✓)	PWM chopper type, non SBD

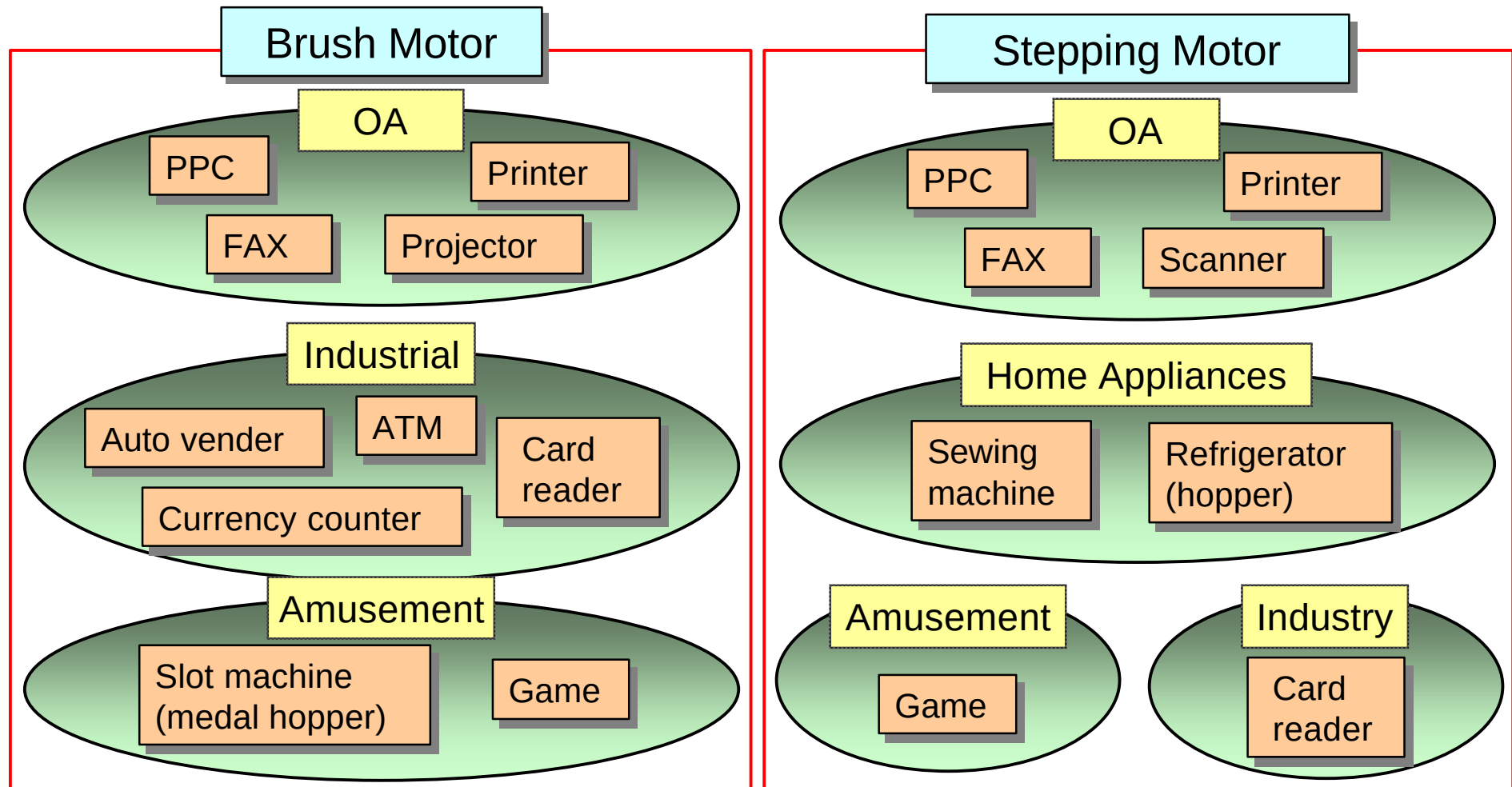
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(1)Generality (2)Actual results (3)Few rivalry companies

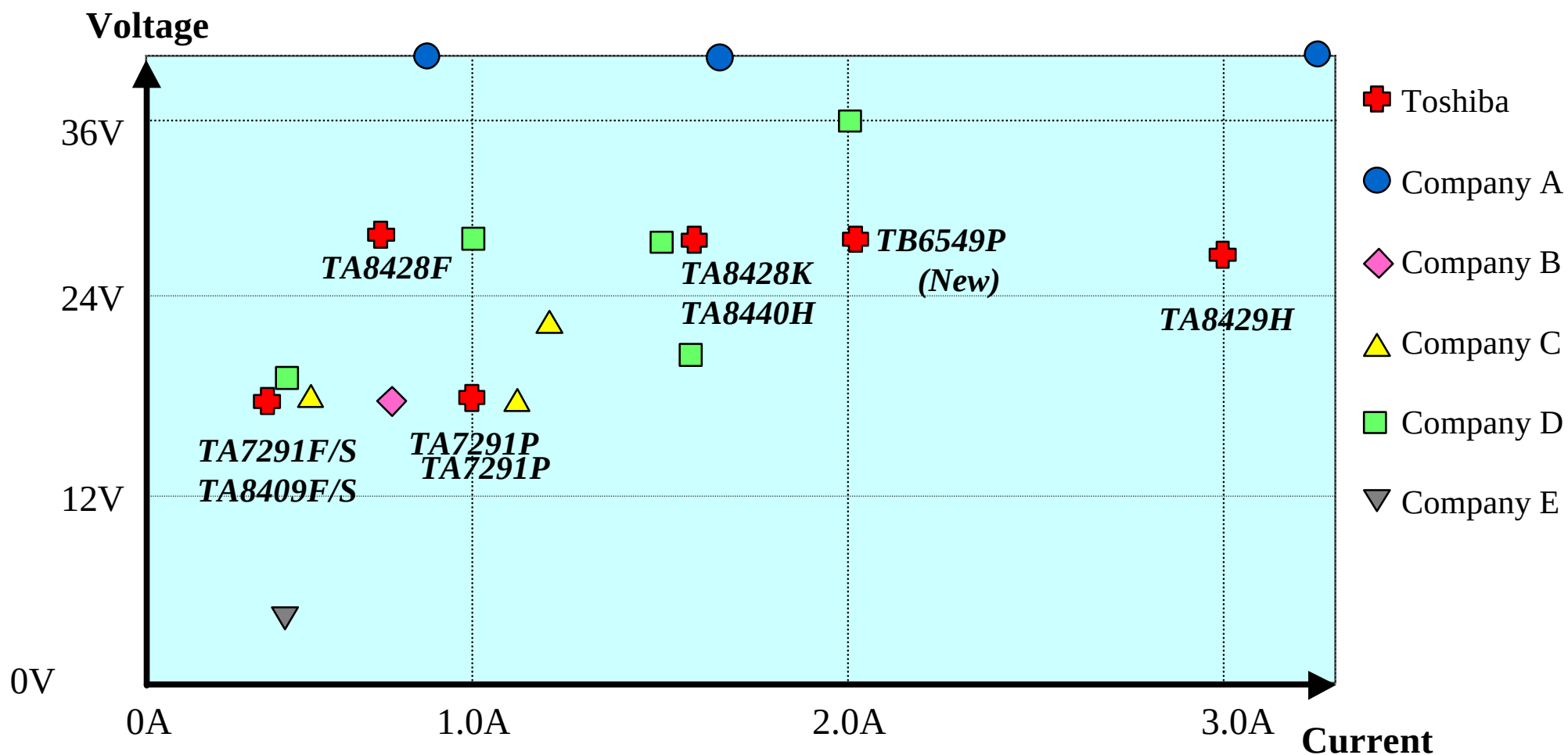
✓ New product

Under development

Target Market (Actual Results)



Brush Motor Driver Performance Map



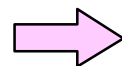
Brush Motor Driver TA8428K/F, TA8429H, TA8440H, TB6549P

Spec. Product	Voltage	Current	Package	PWM	Advantages
TA8428K	27 V	1.5A(ave) 3.0A(peak)	HSIP7	-	High Voltage & High current capacity
TA8428F	27 V	0.8A(ave) 2.4A(peak)	HSOP20	-	High Voltage & High current capacity, Surface Mount
TA8429H	27 V	3.0A(ave) 4.5A(peak)	HZIP12	-	High Voltage & High current capacity
TA8440H	27 V	1.5A(ave) 3.0A(peak)	HZIP12	✓	High Voltage & High current capacity, Efficient drive by PWM
TB6549P	27 V	2.0A(ave) 4.5A(peak)	DIP16	-	High Voltage & High current capacity, Low Ron (Power MOS)

TA8440H Features

Direct PWM

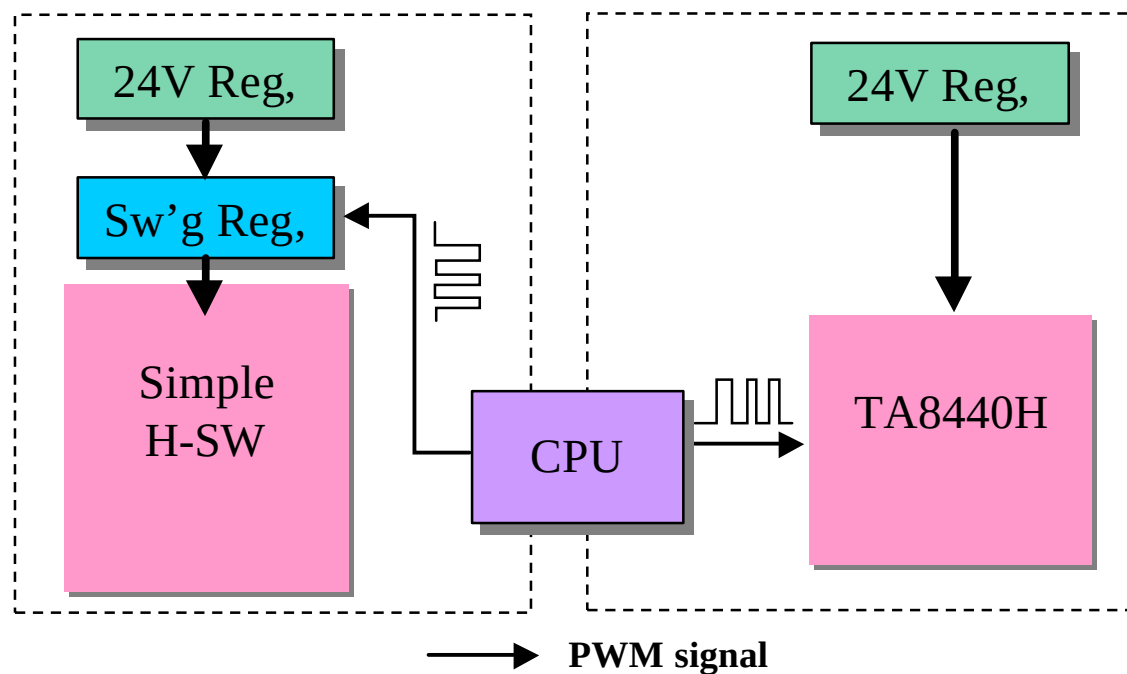
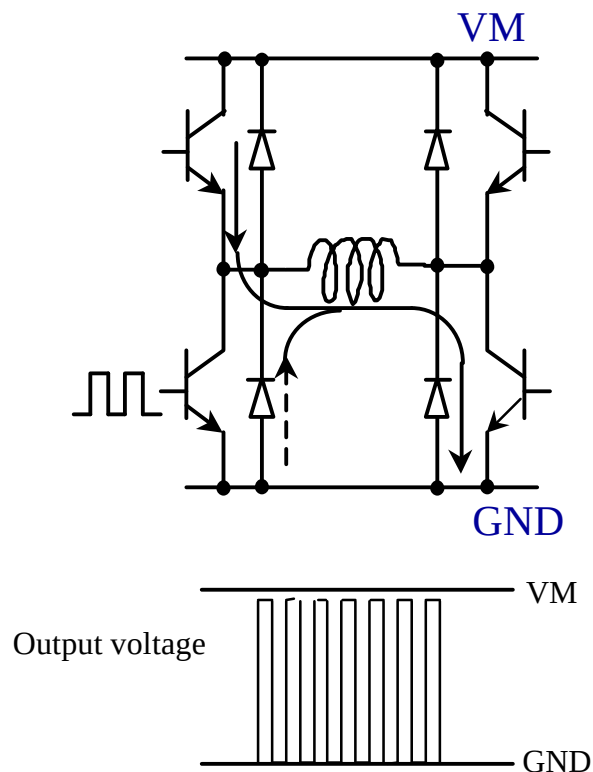
(1) Low Power consumption



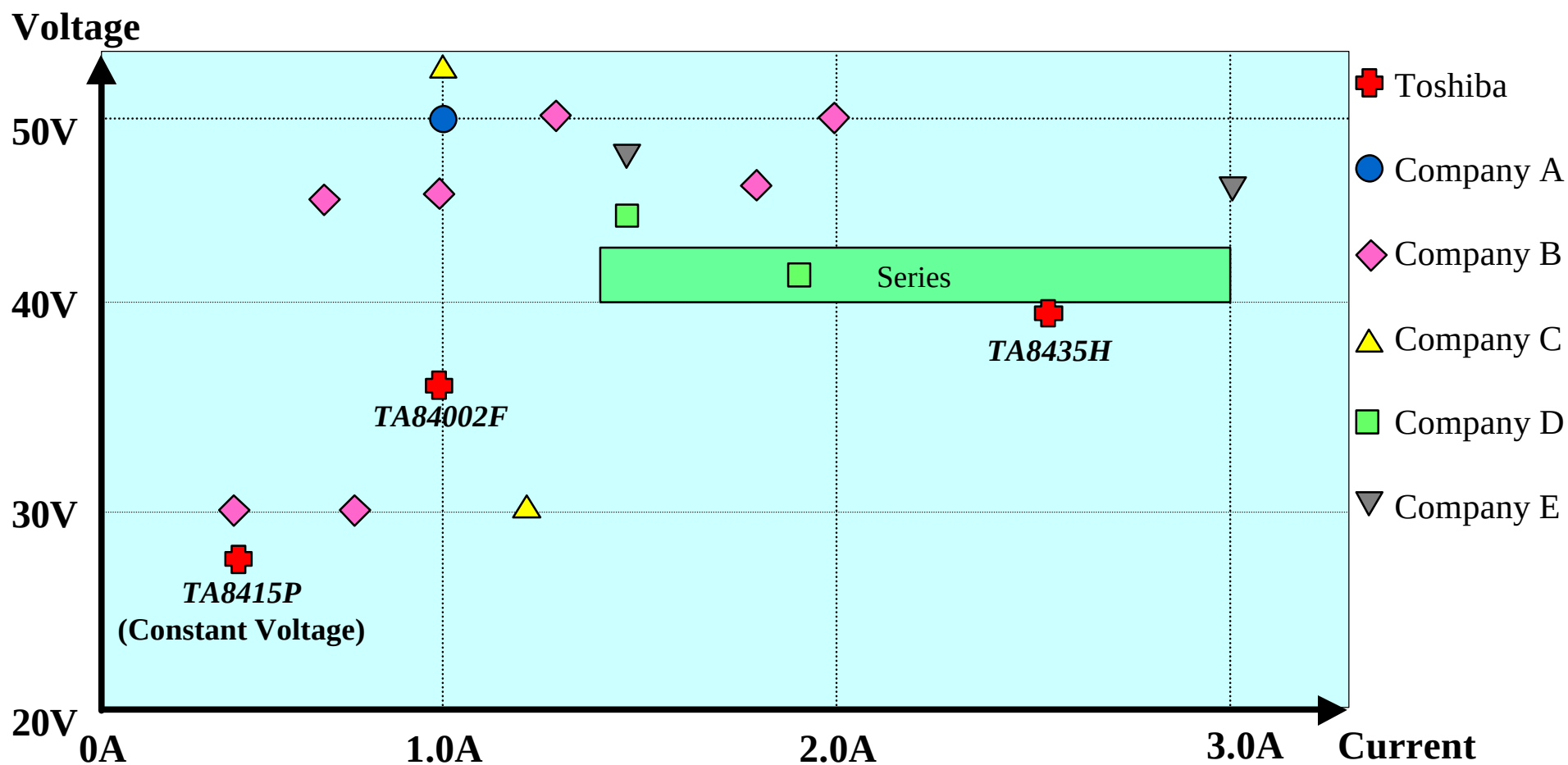
Few Competitors “H-SW+direct PWM”

(2) Simple speed control circuit

Motor speed control by PWM duty ▶ no switching regulator



Stepping Motor Driver (Constant current type) Performance Map



Stepping Motor Driver TA8415P, TA8435H, TA84002F

input Type	Phase input	CLK input	Advantages
Constant Voltage Drive	Tr. array H-SW (x2)	TA8415P	Low cost, General use
Constant Current Drive	TA84002F	-	High speed, Low consumption
Micro Step Drive	-	TA8435H	Low vibration, High resolution



General

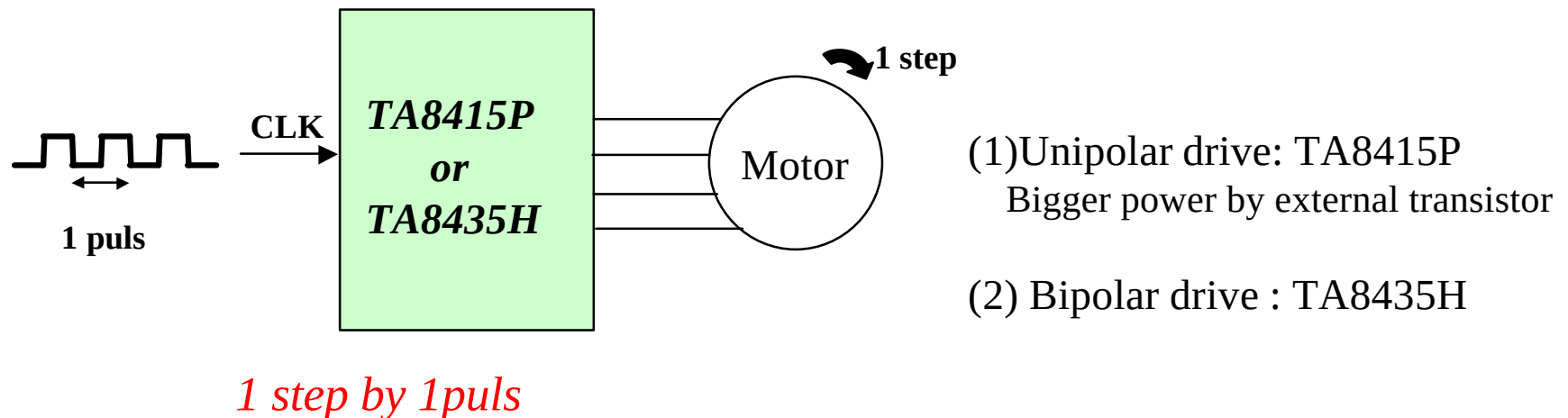


Easy input

Features of TA8415P, TA8435H

Clock Input Drive

Easy drive by only clock signal ▶ ▶ ▶ No CPU needed



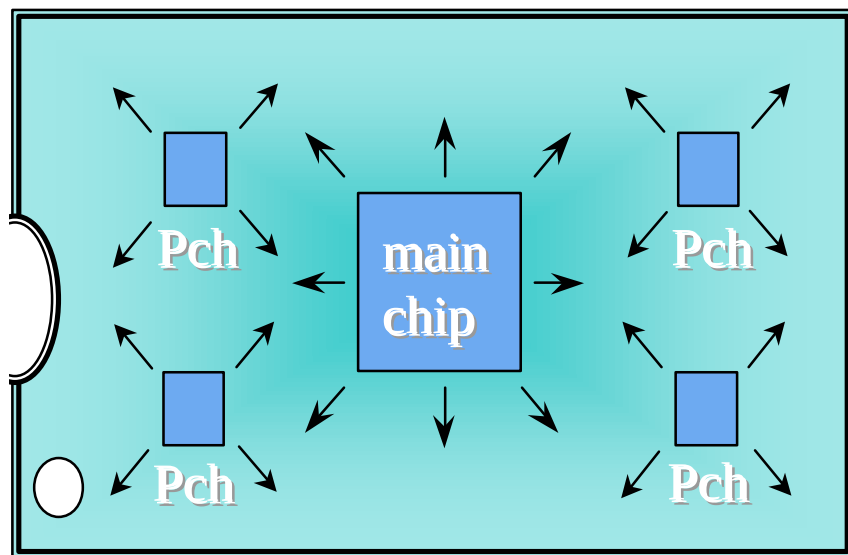
Micro Step Drive (TA8435H)

Lower motor noise, vibration

Features of TA84002F

MCP (Multi Chip Package)

Main Chip + 4 x Pch MOS



Low power consumption

- Low $R_{on}=0.6$ ohm by high side Pch MOS Tr
- Good Power dissipation by heat dispersion

No external Diode

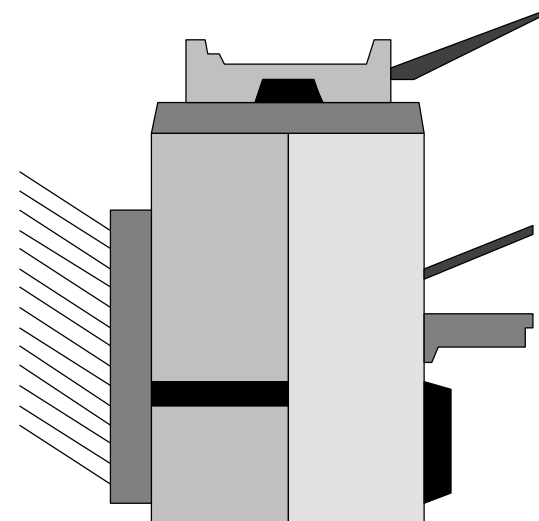
- Use PN Diode of Pch MOS Tr in Chop off
- Discrete Pch MOS Tr --- ▶ No parasitic Tr

Application (1) PPC

- Mirror Scanning Lens Drive (Stepping Motor Driver)
- Paper Feed Motor Drive (Brush Motor Driver, Stepping Motor Driver)

Product table

Application	Product	Motor type
Scan Lens, Mirror, Paper feeder	TA8415P	Unipolar Stepping Motor
	TA8435H	Bipolar Stepping Motor
Paper feeder Toner hopper	TA8428K/F	Brush Motor
	TA8429H	Brush Motor
	TA8440H	Brush Motor
	TB6549P	Brush Motor

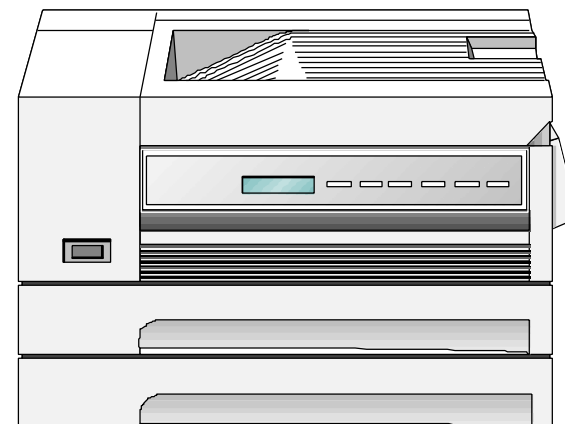


Application (2) Printer

- Carriage Motor Drive (Stepping Motor Driver)
- Feed Motor Drive (Stepping Motor Driver, Brush Motor)

Product table

Application	Product	Motor type
Carriage Motor Feed Motor (Paper, Ink ribbon)	TA8415P	Unipolar Stepping Motor
	TA8435H	Bipolar Stepping Motor
	TA8440H	Brush Motor
	TB6549P	Brush Motor

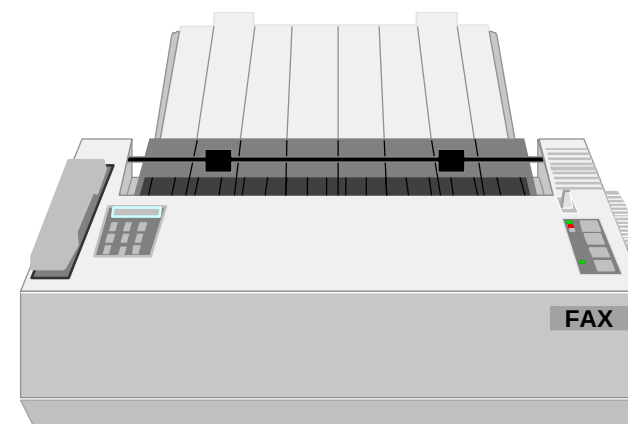


Application (3) FAX

- Feed Motor Drive (Stepping Motor Driver)
- Cutter Motor Drive (Brush Motor Driver)

Product table

Application	Product	Motor type
Feed	TA8415P	Unipolar Stepping Motor
	TA8435H	Bipolar Stepping Motor
Cutter	TA8428K/F	Brush Motor
	TA8429H	Brush Motor
	TA8440H	Brush Motor
	TB6549P	Brush Motor



New Products !

Product	Features	Package	Sample
TB6542FL	5V/0.5A , for DC Motor 2ch.Bridge Driver (PWM)	QON-16	ES: '00/7
TA84002F	30V/1A ,Constant Current 2phase Bipolar Stepping Motor Driver	HSOP-20	TS: '00/6 ES: '00/9
TB6549P	30V/4A Full Bridge Driver (Low Ron Power MOS Output) i.e.TA8428/29 Power MOS version	DIP-16	TS: '00/8 ES: '01/1
TB65**P	TB6549P+Direct PWM (Low Ron Power MOS Output) i.e.TA8440H Power MOS version	DIP-16	TS: '01/2Q ES: '01/3Q

New Products : TB6549P

Outline

Application: H-SW driver

Feature: MOS process allows ▶ ▶ Low Ron / Low Pd

High performance version
of TA8428K/F, 29H

Development plan

Step1 : Chip for auto + DIP-16

Step2 : New chip



#1 (PKG : DIP-16(normal frame))

#2 (PKG : DIP-16(H-frame))

Development schedule

	00/A	00/B		
DIP-16 + chip for Auto	7/E #1 P-Pack			
DIP-16(H-frame) + new chip		11/E #2	1/E ES	2/E CS