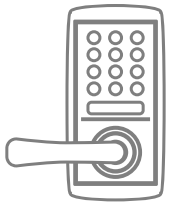
TOSHIBA

R23

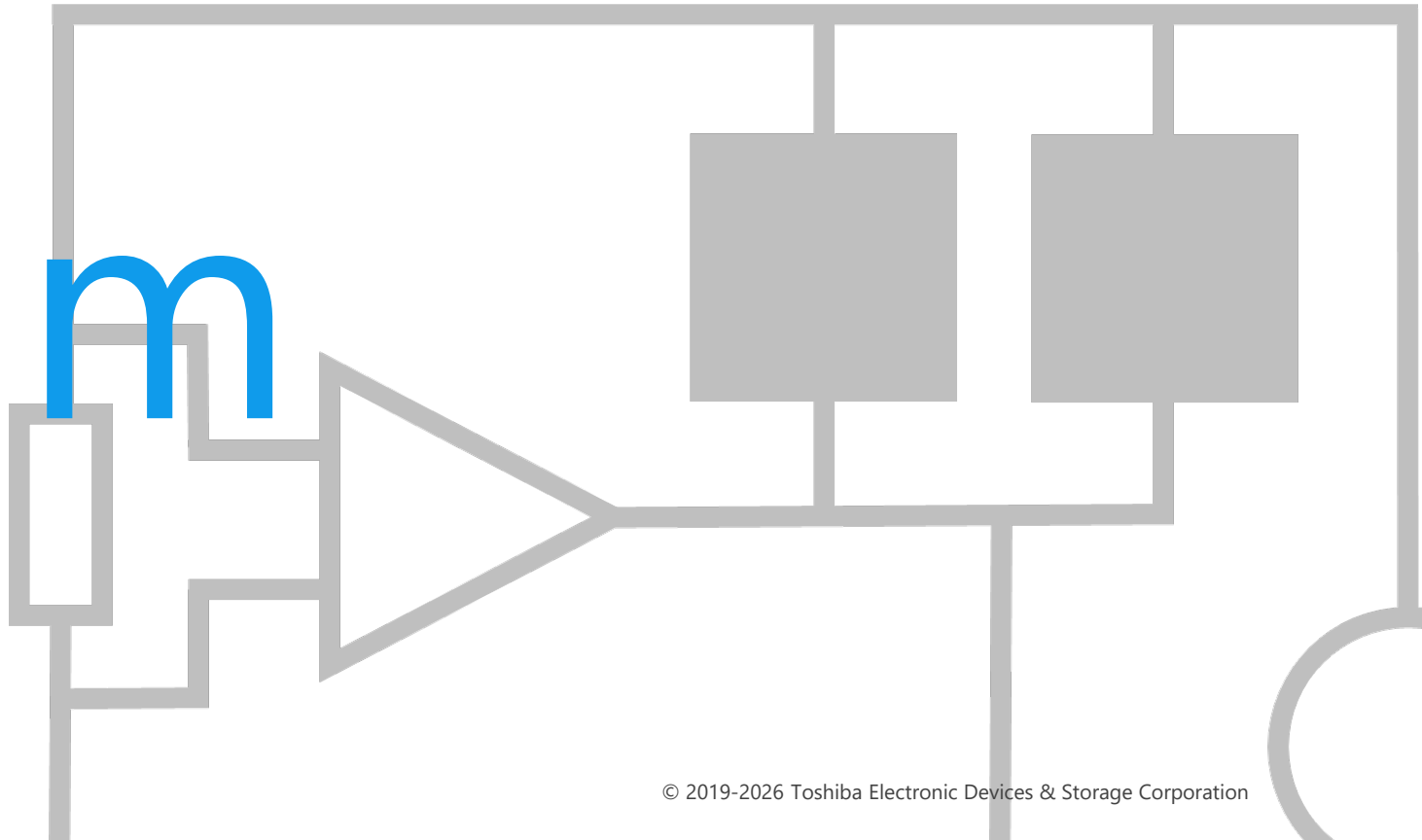
Multi Function Printer

Solution Proposal by Toshiba

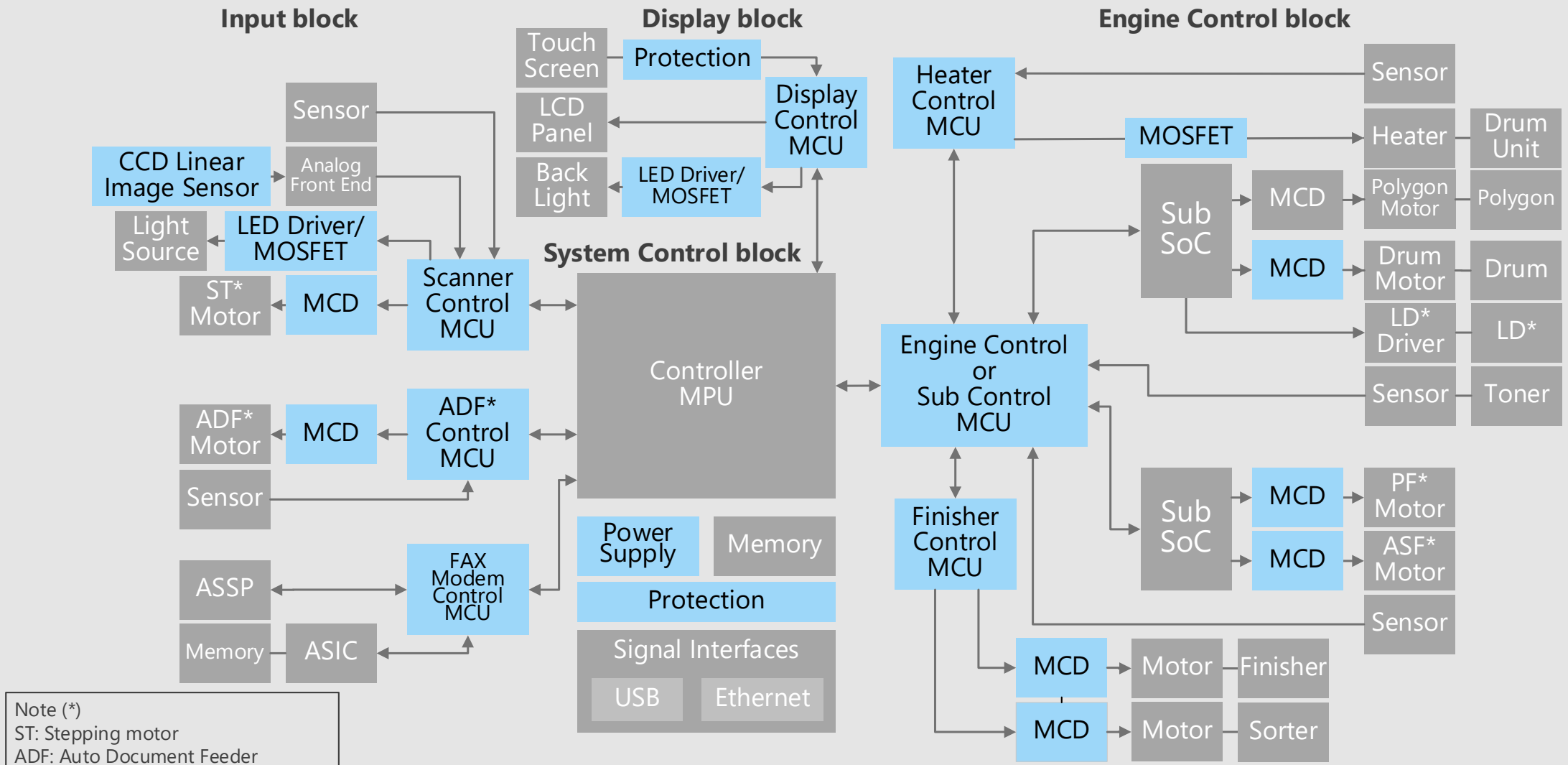


Toshiba Electronic Devices & Storage Corporation provides comprehensive device solutions to customers developing new products by applying its thorough understanding of the systems acquired through the analysis of basic product designs.

Block Diagram



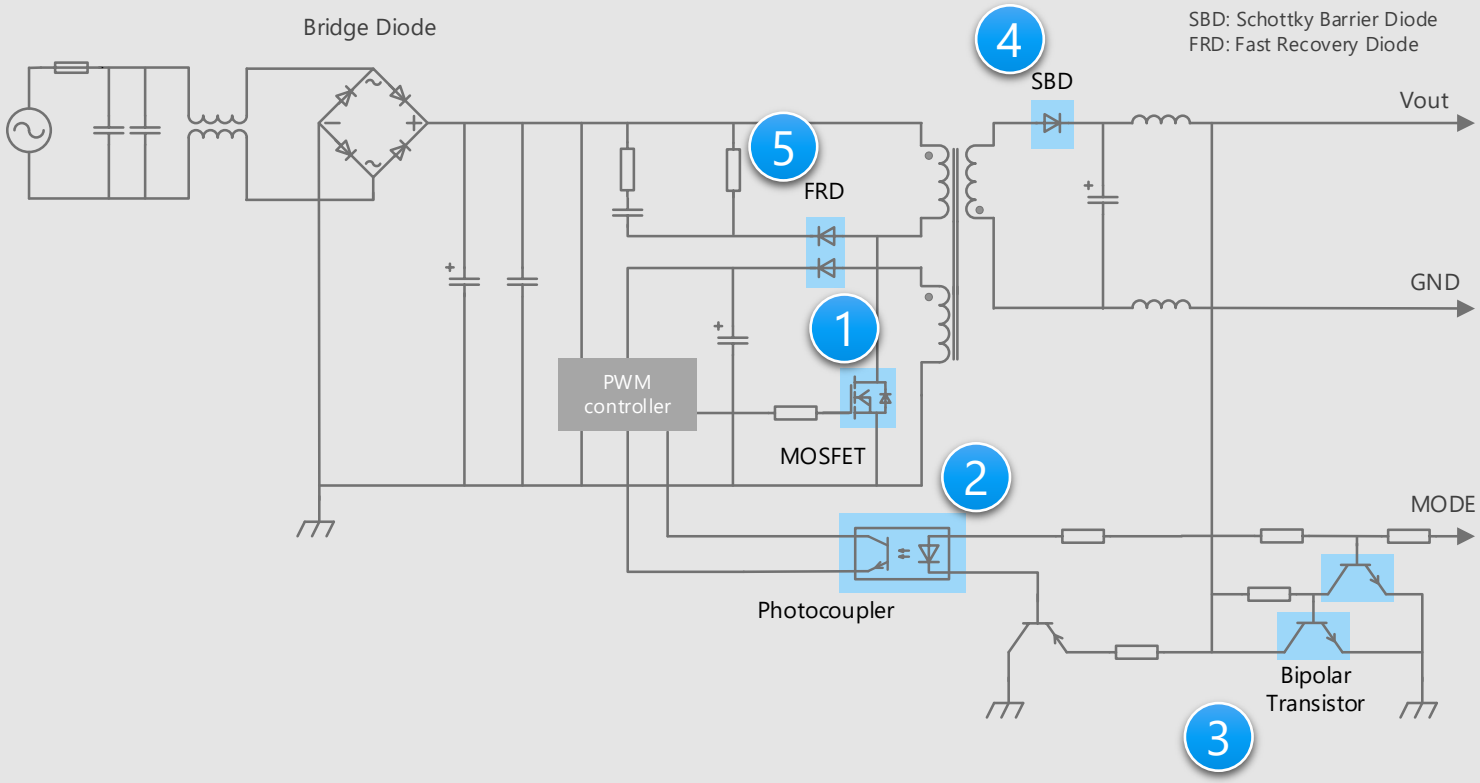
Multi Function Printer　Overall block diagram



Note (*)
ST: Stepping motor
ADF: Auto Document Feeder
LD: Laser Diode
PF: Paper Feed
ASF: Auto Sheet Feeder

Multi Function Printer　Detail of the power supply circuit

Power supply circuit



* Click the number in the circuit diagram to jump to the detailed description page

Criteria for device selection

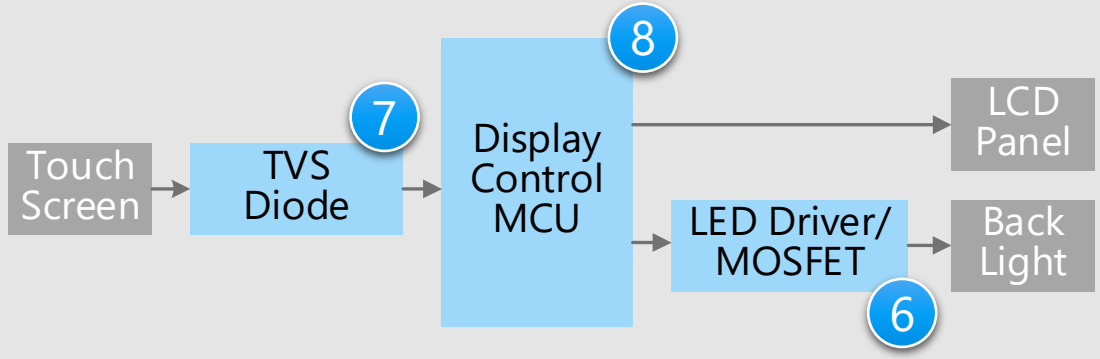
- Transistor output photocoupler is suitable for isolating feedback signals from the secondary side.
- By using a MOSFET with low on-resistance and high heat dissipation efficiency, a set having low heat generation and low power consumption can be realized.
- Small package products contribute to the reduction of circuit board area.

Proposals from Toshiba

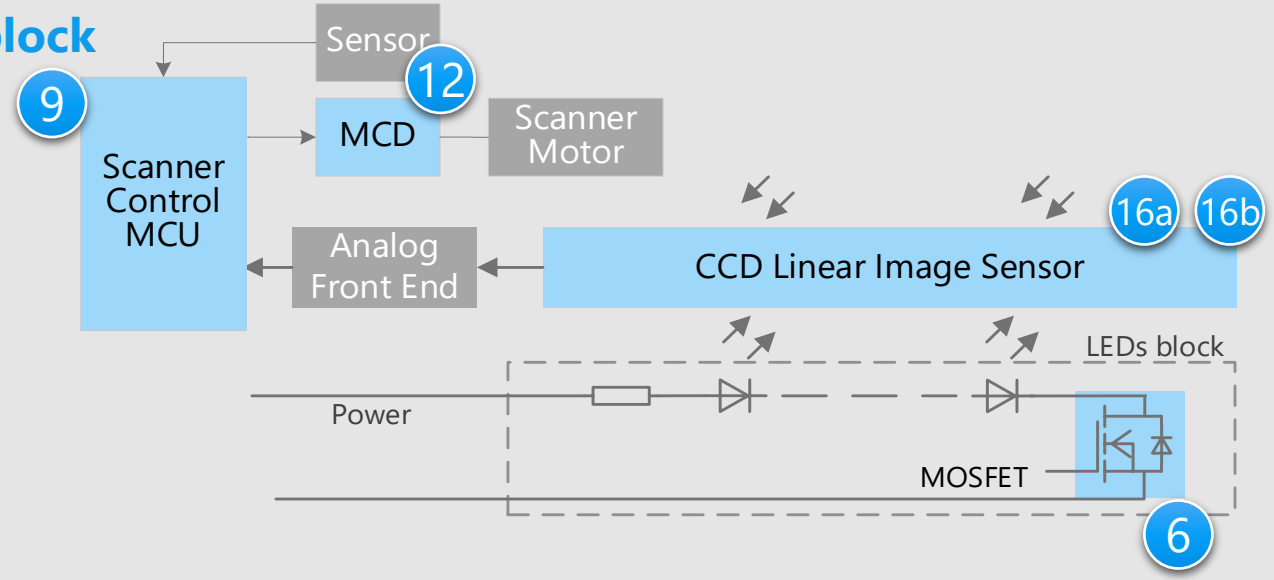
- **Suitable for high efficiency switching mode power supply** 1
  DTMOS Series MOSFET
- **Photocoupler with excellent environmental resistance** 2
  Transistor output photocoupler
- **For high speed switching and compact surface mounting** 3
  Bipolar transistor
- **High speed and low loss** 4
  Schottky barrier diode
- **High reverse voltage and short reverse recovery time** 5
  Fast recovery diode

Multi Function Printer　Details of Display/Scanner block

Display block



Scanner block



<u>* Click the number in the circuit diagram to jump to the detailed description page</u>

Criteria for device selection

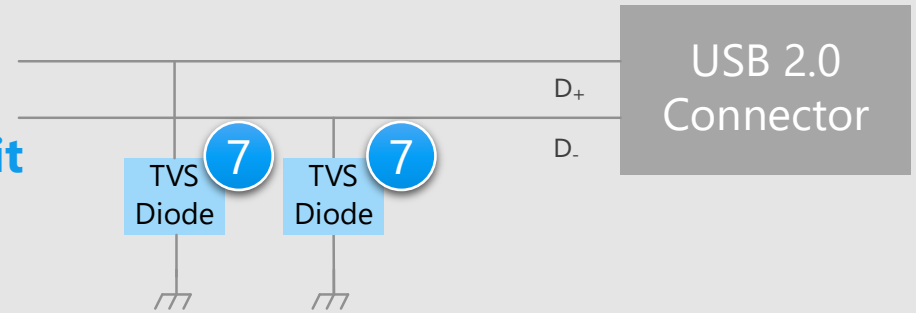
- Small package products contribute to the reduction of circuit board area.
- TVS diodes are suitable for absorbing the static electricity (ESD) from external terminals to prevent circuit malfunction and device breakdown.
- Document scanning requires motor drivers and MCUs capable of fine position control of the light source and the receiving part.

Proposals from Toshiba

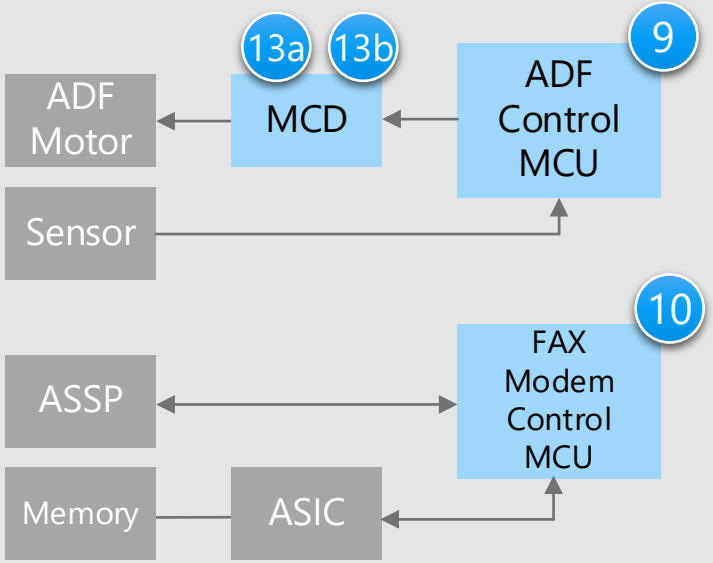
- **MOSFETs with low on-resistance realize low power consumption set**
  Small signal MOSFET　6
- **High speed signal line protection with low capacitance characteristics**
  TVS diode　7
- **All in one chip with a built-in LCD driver**
  MCU TMPM061FWFG　8
- **Built-in high resolution AD converter for getting scanning data**
  MCU M4G/M4N Group / M3H Group / M460 Group　9
- **High precision current control for a scanner**
  Stepping motor driver with a built-in AGC (Active Gain control)　12
- **High speed and high image quality with less color registration**
  Linear image sensor (CCD)　16a　16b

Multi Function Printer　Details of USB 2.0/ADF/FAX modem block

USB 2.0 circuit



ADF block
FAX modem block



* Click the number in the circuit diagram to jump to the detailed description page

Criteria for device selection

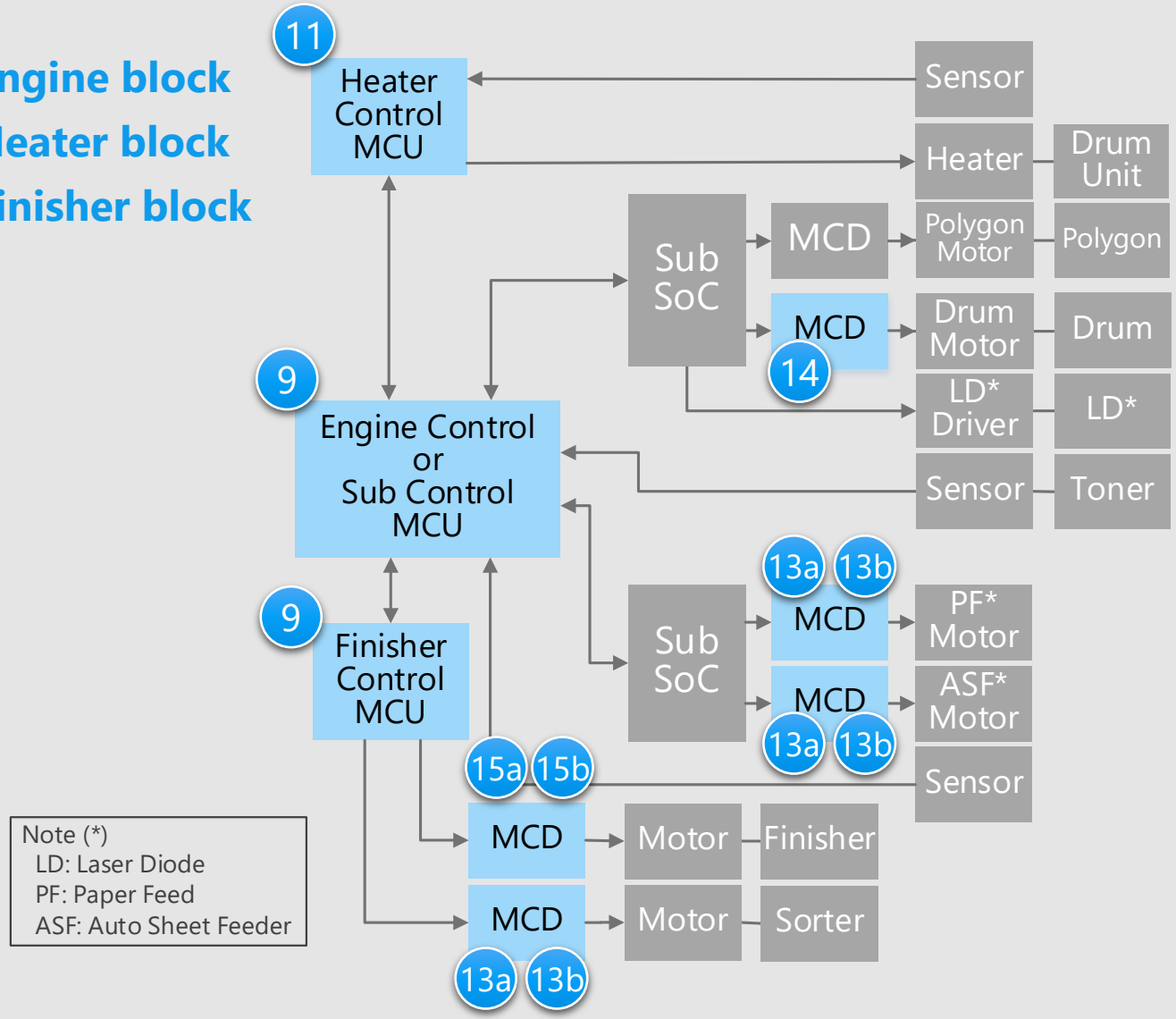
- Small package products contribute to the reduction of circuit board area.
- TVS diodes are suitable for absorbing the static electricity (ESD) from external terminals to prevent circuit malfunction and device breakdown.
- Document feeding requires motor drivers and MCUs capable of fine position control.

Proposals from Toshiba

- **High speed signal line protection with low capacitance characteristics**
  TVS diode 7
- **Built-in AD converter, High processing performance for ADF sensor output**
  MCU M4G/M4N Group / M3H Group / M460 Group 9
- **High precision motor current control for ADF**
  Stepping motor driver 13a 13b
- **Efficient execution of the higher level protocol of FAX**
  MCU TMPM036FWFG / TMPM037FWUG 10

Multi Function Printer　Details of Engine/Heater/Finisher block

Engine block
Heater block
Finisher block



* Click the number in the circuit diagram to jump to the detailed description page

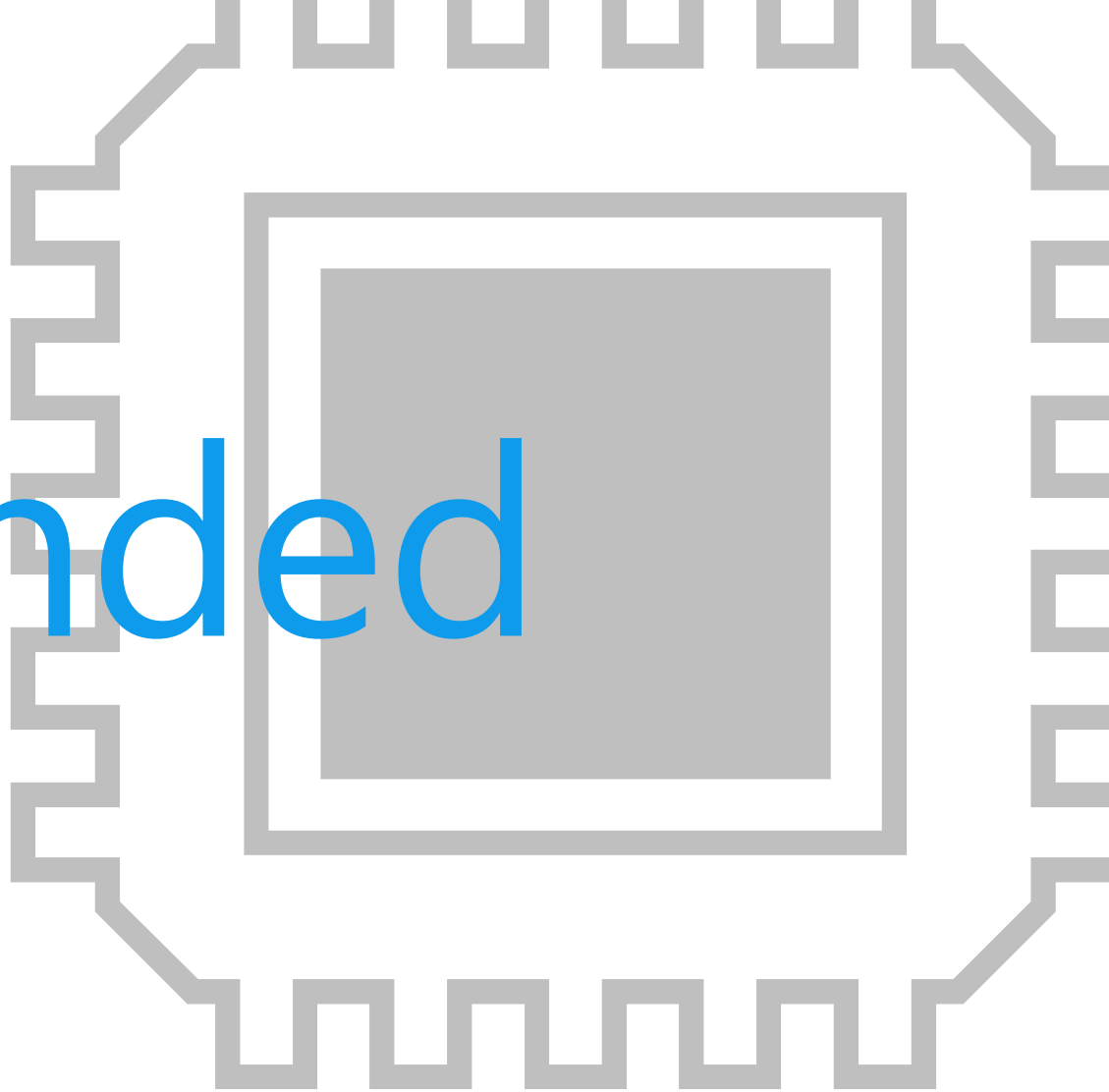
Criteria for device selection

- An engine control MCU works closely with each sub system and high processing performance is required.
- Document and print paper feeding requires motor drivers and MCUs capable of fine position control.

Proposals from Toshiba

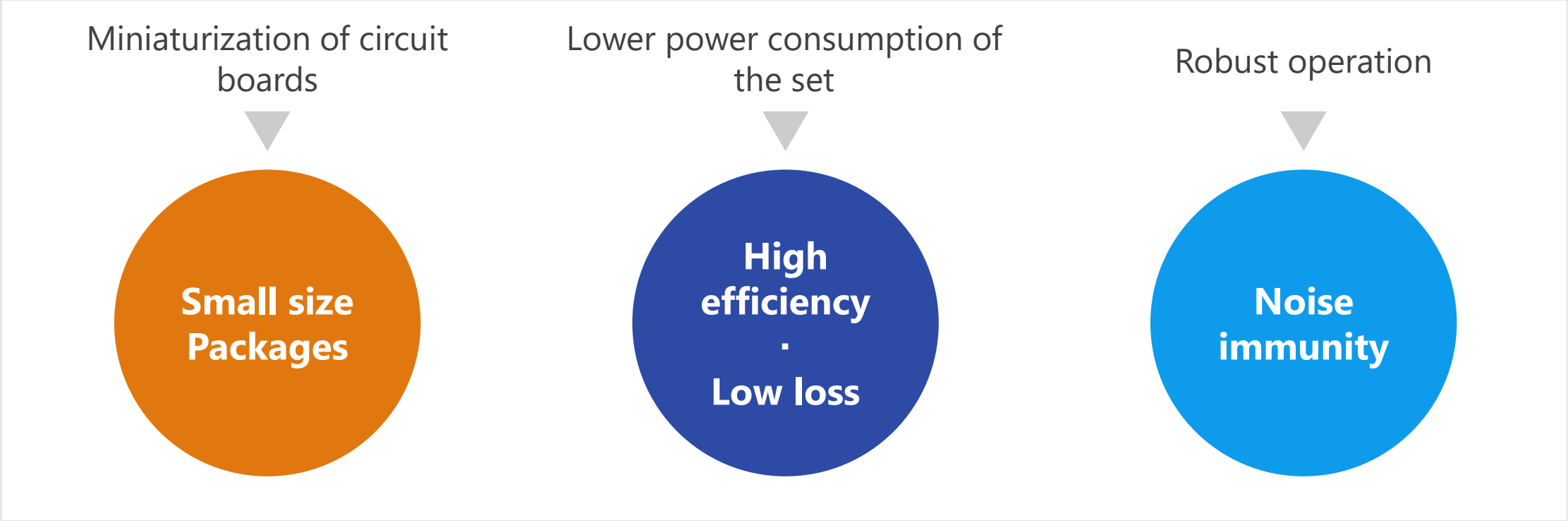
- **Analyze various sensor outputs and control the system with high efficiency**
  MCU M4G/M4N Group / M3H Group / M460 Group　9
- **High efficient finisher control**
  MCU M4G/M4N Group / M3H Group / M460 Group　9
- **High precision setting location for sort, PF and ASF**
  Stepping motor driver　13a 13b
- **Built-in PWM output for heater control**
  MCU M3H Group　11
- **High durability and suitable for a drum rotation**
  Three-phase brushless DC motor driver　14
- **High output current for a finisher**
  Brushed DC motor driver　15a 15b

Recommended Devices

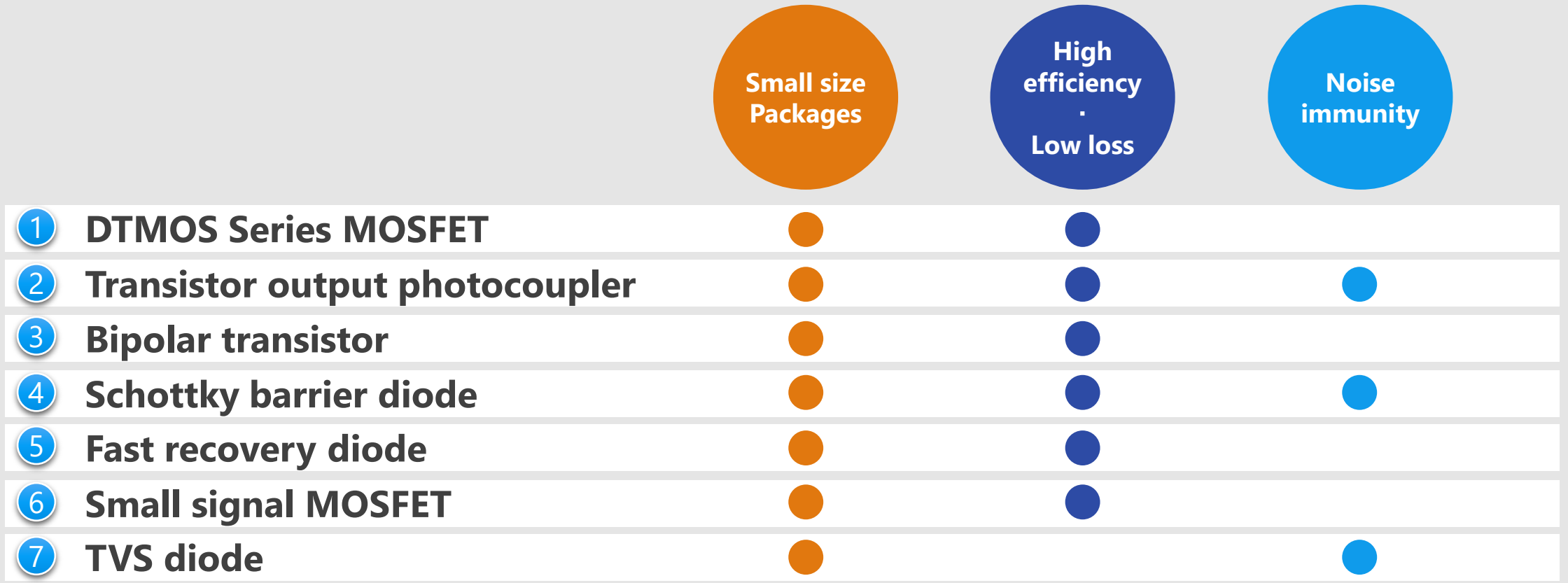


Device solutions to address customer needs

As described above, in the design of Multi Function Printer, **"Miniaturization of circuit boards"**, **"Low power consumption of the set"** and **"Robust operation"** are important factors. Toshiba's proposals are based on these three solution perspectives.



Device solutions to address customer needs



Device solutions to address customer needs

	Small size Packages	High efficiency · Low loss	Noise immunity
8 MCU TMPM061FWFG	●	●	
9 MCU M4G/M4N Group / M3H Group / M460 Group	●	●	
10 MCU TMPM036FWFG / TMPM037FWUG	●	●	
11 MCU M3H Group	●	●	
12 Stepping motor driver with a built-in AGC	●	●	
13a 13b Stepping motor driver	●	●	
14 Three-phase brushless DC motor driver	●	●	
15a 15b Brushed DC motor driver	●	●	
16a 16b Linear image sensor (CCD)		●	

1 DTMOS Series MOSFET

TK090E65Z / TK090U65Z / TK090A65Z / TK090N65Z

Small size Packages | High efficiency · Low loss | Noise immunity

Value provided

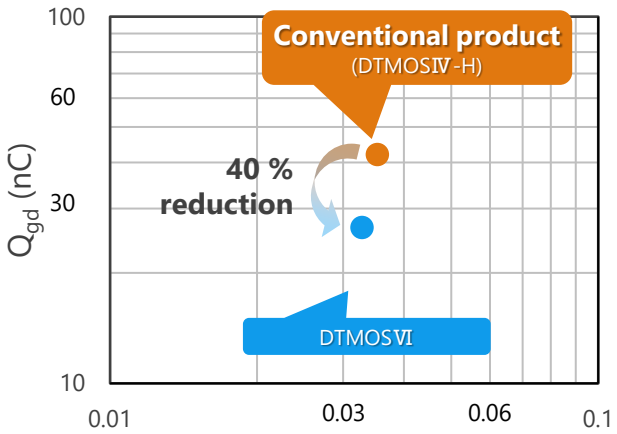
The $R_{DS(ON)}$ x Q_{gd} is reduced by 40 % (compared with Toshiba's conventional products) to improve power efficiency, and contributing to miniaturization of the set.

1 $R_{DS(ON)}$ x Q_{gd} 40 % reduction

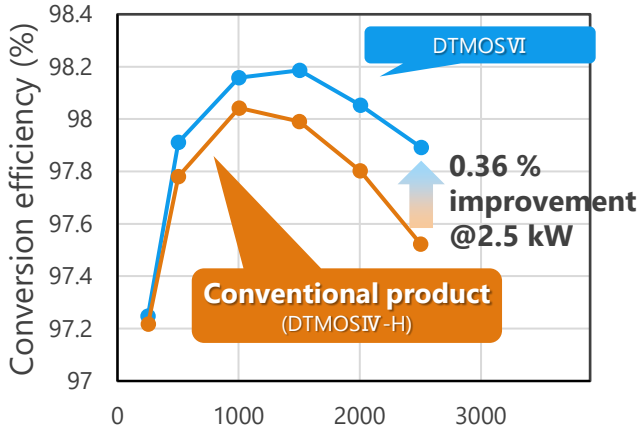
The $R_{DS(ON)}$ x Q_{gd} figure of merit has been reduced by 40 % with gate design and process optimization.
(Comparison of DTMOSⅣ-H Products: Toshiba internal comparison)

2 Various package lineup

Various package types such as TO-220, TO-220SIS, TO-247 and TOLL, etc. are available.



(Note) Toshiba internal comparison



(Note) Toshiba internal comparison

Lineup

Part number		TK090E65Z	TK090U65Z	TK090A65Z	TK090N65Z
Package		TO-220	TOLL	TO-220SIS	TO-247
V_{DSS} [V]		650	650	650	650
I_D [A]		30	30	30	30
$R_{DS(ON)}$ [Ω] @V_{GS} = 10 V	Typ.	0.075	0.07	0.075	0.075
	Max	0.09	0.09	0.09	0.09
Polarity		N-ch	N-ch	N-ch	N-ch
Generation		DTMOSVI	DTMOSVI	DTMOSVI	DTMOSVI

◆Return to Block Diagram TOP

2 Transistor output photocoupler

TLP383 / TLP385 / TLP387 / TLP388

Small size Packages | High efficiency · Low loss | Noise immunity

Value provided

Reduction in required circuit board area and improving reliability enabling maintenance-free operation.

1 High isolation voltage is realized even using small and thin package

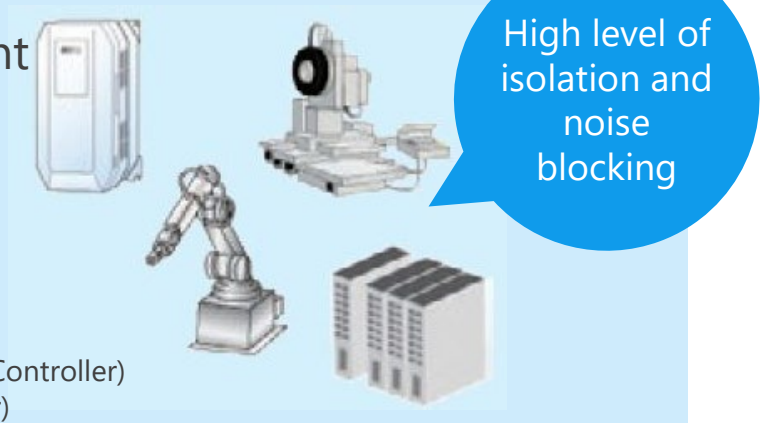
It is a highly isolated photocoupler that phototransistors and infrared light emitting diodes are optically coupled, and achieved a high isolation voltage of 5000 Vrms. In addition, since the SO6L package is smaller and thinner than Toshiba standard DIP package, high density mounting is possible.

2 Operating temperature is expanded to 110 °C or 125 °C

It is designed to operate even under severe ambient temperature conditions.

Industrial equipment

- General purpose inverter
- Servo amplifier
- Robot
- Machine Tool
- High output power supply
- Security equipment
- Semiconductor tester
- PLC (Programmable Logic Controller)
- MFP (Multi Function Printer)



Lineup

Part number	TLP383	TLP385	TLP387	TLP388
Package	4pin SO6L 			
V_{CEO} [V]	80	80	300	350
BV_S [Vrms]	5000	5000	5000	5000
T_{opr} [°C]	-55 to 125	-55 to 110	-55 to 110	-55 to 125

◆Return to Block Diagram TOP

3 Bipolar transistor
TMBT3904

Small size Packages | High efficiency · Low loss | Noise immunity

Value provided

It is suitable for low frequency and low noise applications and covers a wide range of applications.

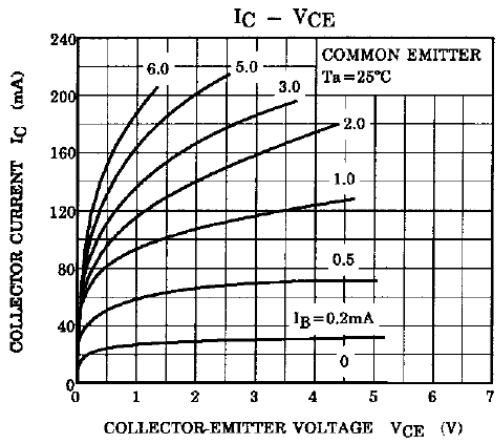
1 High voltage

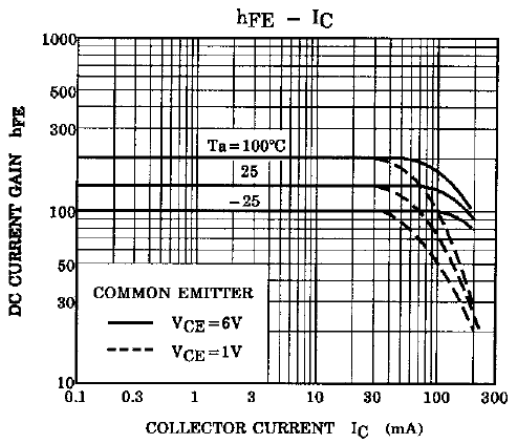
High voltage allows for large loads and instantaneous voltage changes.

2 Large current (rated collector current)

It covers a wide range of applications, from low frequency applications to power supply applications.

TMBT3904
Characteristics chart





Lineup

Part number	TMBT3904
Package	SOT23 
V_{CEO} [V]	50
I_C [mA]	200
$V_{CE(sat)}$ (Max) [V]	0.3 @I_C = 50 mA, I_B = 5 mA
h_{FE}	100 to 300 @V_{CE} = 1 V, I_C = 10 mA
Polarity	NPN

◆Return to Block Diagram TOP

4 Schottky barrier diode

CMS15 / CUHS20F60

Small size Packages | High efficiency · Low loss | Noise immunity

Value provided

It is suitable for high frequency rectification of switching power supplies and contributes to miniaturization.

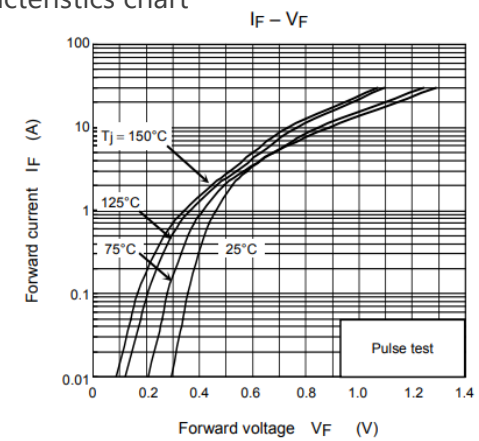
1 High speed switching

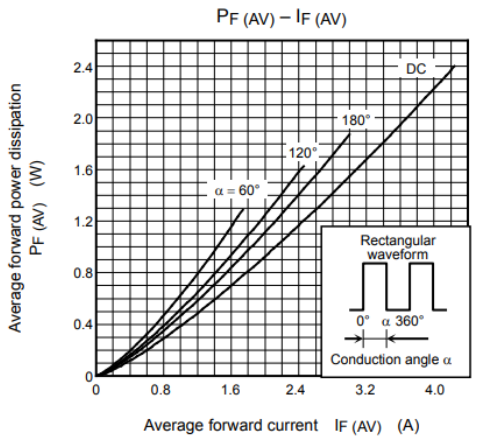
It is suitable for high speed switching applications.

2 Small package

This small package is suitable for high density mounting.

CMS15
Characteristics chart





Lineup

Part number	CMS15	CUHS20F60
Package	M-FLAT™ 	US2H 
V_{RRM} / V_R [V]	60	60
$I_{F(AV)}$ / I_O [A]	3.0	2.0
V_{FM} / V_F (Max) [V]	0.58 @I_{FM} = 3.0 A	0.59 @I_F = 2.0 A
C_j (Typ.) [pF]	102	300

◆Return to Block Diagram TOP

5 Fast recovery diode
CRF03A

Small size Packages | High efficiency · Low loss | Noise immunity

Value provided

This is a silicon diffused junction type high frequency rectifier diode. Contributes to high efficiency and miniaturization of power supplies.

1 High reverse voltage

Repetitive peak reverse voltage (V_{RRM}) is high.
(CRF03A: Rated 600 V)

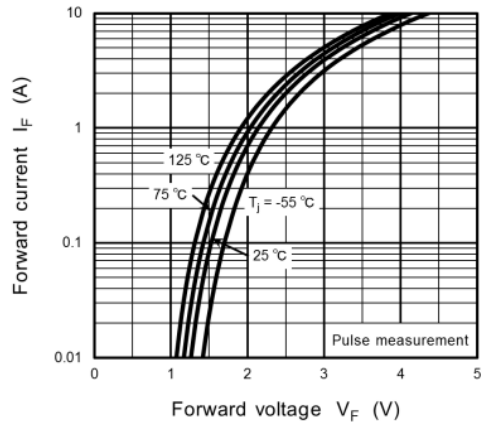
2 Fast reverse recovery time

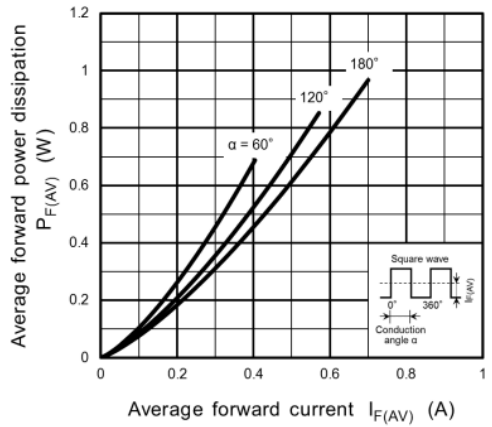
The reverse recovery time (t_{rr}) is fast and is suitable for high speed operation.
(CRF03A: Up to 100 ns)

3 Small package

This small package is suitable for high density mounting.

CRF03A
Characteristics chart





Lineup

Part number	CRF03A
Package	S-FLAT™
V_{RRM} [V]	600
$I_{F(AV)}$ [A]	0.7
V_{FM} (Max) [V]	2.0 @I_{FM} = 0.7 A
I_{RRM} (Max) [μA]	50

◆Return to Block Diagram TOP

6 Small signal MOSFET

SSM3K35FS / SSM3K35AFS / SSM3J35FS / SSM3J35AFS

Small size Packages | High efficiency · Low loss | Noise immunity

Value provided

It is suitable for high speed switches and contributes to miniaturization.

1 Low voltage operation

Operate down to $|V_{GS}|$ = 1.2 V.

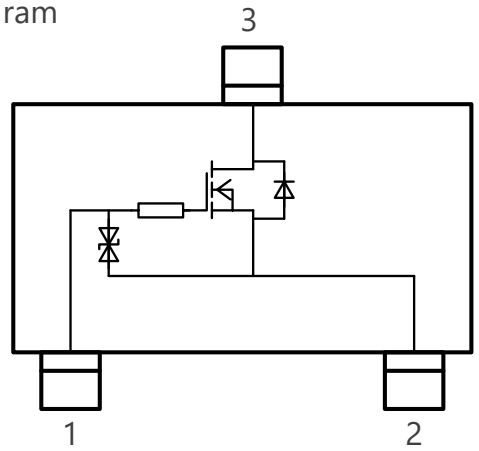
2 Low on-resistance

The drain-source on-resistance is low, as a result heat generation and power consumption can be kept low.

3 Wide package lineup

In addition to SSM packages, we have CST3C packages, VESM packages, ES6 packages and US6 packages.

SSM3K35FS
Internal connection diagram



Lineup

Part number		SSM3K35FS	SSM3K35AFS	SSM3J35FS	SSM3J35AFS
Package		SSM 			
V_{DSS} [V]		20	20	-20	-20
I_D [A]		0.18	0.25	-0.1	-0.25
$R_{DS(ON)}$ [Ω] @$\|V_{GS}\|$ = 2.5 V	Typ.	2	1.1	5.6	1.5
	Max	4	1.6	11	2.1
Polarity		N-ch	N-ch	P-ch	P-ch

◆Return to Block Diagram TOP

7 TVS diode

DF2B5M4ASL / DF2B6M4ASL / DF2B6USL / DF6D6UFE / DF2B6M4BSL

Small size Packages | High efficiency · Low loss | Noise immunity

Value provided

This absorbs static electricity (ESD) from external terminals, prevents circuit malfunction and protects devices.

1 Improved ESD pulse absorption

Improved ESD absorption compared to Toshiba's existing products. (50 % reduction in operating resistance)
For some products, both low operating resistance and low capacitance are realized and ensures high signal protection performance and signal quality.

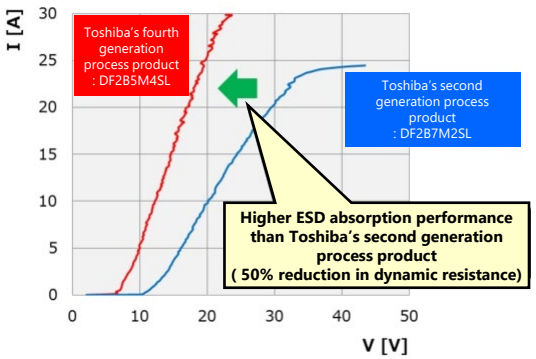
2 Suppress ESD energy by low clamp voltage

Protect the connected circuits and devices using Toshiba own technology.

3 Suitable for high density mounting

A variety of small packages are available.

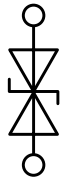
ESD Pulse Absorption Performance
(Toshiba internal comparison)



Unidirectional

Suitable for paths such as logic signals. There are lineups of 1in1, 2in1, 4in1, 5in1, 7in1.

Bidirectional



Suitable for paths with both polar signals such as audio signals.

Lineup

Part number	DF2B5M4ASL	DF2B6M4ASL	DF2B6USL	DF6D6UFE	DF2B6M4BSL
Package	SL2	 Top view  Bottom view		ES6 	SL2 
V_{ESD} [kV]	±16	±15	±10	±10	±8
V_{RWM} (Max) [V]	3.6	5.5	5.5	5.5	5.5
C_t (Typ.) [pF]	0.15	0.15	1.5	1.5	0.12
R_{DYN} (Typ.) [Ω]	0.7	0.7	0.25	0.25	1.05

(NOTE) This product is an ESD protection diode and cannot be used for purposes other than ESD protection.

◆Return to Block Diagram TOP

Small size Packages | High efficiency · Low loss | Noise immunity

Value provided

It contributes to system cost down, high efficiency system and development efficiency improvement.

1 Built-in Arm® Cortex®-M0 CPU core

Built-in Arm Cortex-M0 core with Thumb instruction set improves energy efficiency. Various development tools and their partners allow users many options.

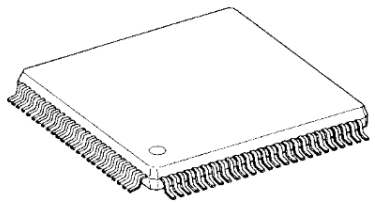
2 Suitable for sensing analog signal

Built-in multichannel AD converter and CPU system execute sensing data processing efficiently at low cost.

3 Small package and low power consumption

Cortex-M0 and Toshiba's original NANO FLASH™ technology enable the small package and low power consumption. They contribute to reducing circuit board area and power consumption.

TMPM061FWFG



Package: LQFP100-P-1414-0.50G

Lineup

Part number	TMPM061FWFG
Maximum operation frequency	16 MHz
Instruction ROM	128 KB
RAM	8 KB
Timer	9ch
UART / SIO	4ch
AD converter	2ch (10bit), 3ch (24bit)
LCDD	40 seg x 4 com

◆Return to Block Diagram TOP

9 MCU

TXZ+™4A Series M4G/M4N Group / TXZ+™3A Series M3H Group / TX04 Series M460 Group

Small size Packages | High efficiency · Low loss | Noise immunity

Value provided

These MCUs integrate multiple channels of AD converter and timer and are equipped with various communication interfaces to perform sensor monitoring with low power consumption.

1 Built-in Arm® Cortex®-M3/M4 CPU core

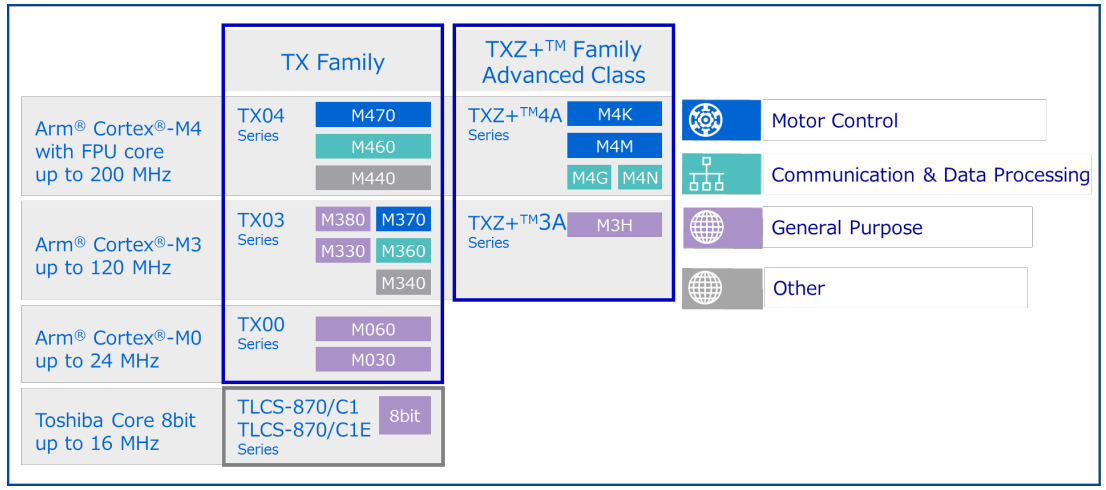
The product lineup is equipped with Arm Cortex-M3/M4 cores. It is suitable for processing sensor data at real time. Various development tool and their partners allow users many options.

2 System cost down and development efficiency improvement

These execute sensing data monitoring and processing efficiently by combining built-in analog function such as AD converter and CPU system. In addition, M4G Group products have a lineup of 20 products to provide the best products for the set.

3 Various communication interfaces

These devices supports major communication interfaces such as UART, FUART, SPI, I²C and External bus. User can construct a communication system easily with a cloud.



Lineup

Series	Group	Function
TXZ+™4A Series	M4G / M4N Group	Arm® Cortex®-M4, 200 MHz operation frequency (Max).
TXZ+™3A Series	M3H Group	Arm® Cortex®-M3, 120 MHz operation frequency (Max).
TX04 Series	M460 Group	Arm® Cortex®-M4, 120 MHz operation frequency (Max).

◆Return to Block Diagram TOP

Value provided

It contributes to system cost down, high efficiency system and development efficiency improvement.

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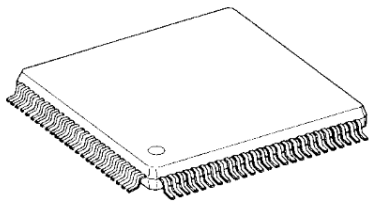
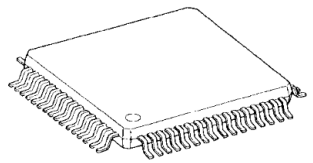
TMPM036FWFG



Package: LQFP100-P-1414-0.50H

TMPM037FWUG



Package: LQFP64-P-1010-0.50E

Lineup

Part number	TMPM036FWFG	TMPM037FWUG
Maximum operation frequency	20 MHz	20 MHz
Instruction ROM	128 KB	128 KB
RAM	16 KB	16 KB
Timer	14ch	10ch
UART / SIO	6ch	5ch
I^2C	2ch	1ch
AD converter	8ch (10bit)	8ch (10bit)

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Value provided

These MCUs include AD converters, timers, and three-phase PWM output. These can control low power system control.

1 Built-in Arm® Cortex®-M3 CPU core

These implement Arm Cortex-M3 core with 120 MHz maximum operation frequency.
Various development tool and their partners allow users many options.

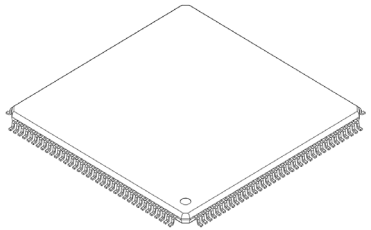
2 System cost down and development efficiency improvement

These execute sensing data monitoring and motor control efficiently by multiple built-in AD converters and timers. It also has a built-in FLASH memory that can be rewritten 0.1 million times. The product with 1 MB ROM can rewrite the codes while the microcomputer continues operation.

3 Small package and low power consumption

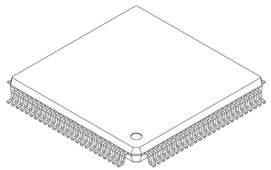
These support low power consumption library and stand by function and contribute to reduce power consumption. The packages lineup includes small LQFP64 to LQFP144.

TMPM3HQF10BFG
TMPM3HQFDAFG



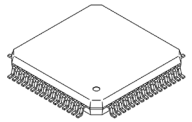
Package
P-LQFP144-2020-0.50-002

TMPM3HNF10BFG
TMPM3HNFDAFG



Package
P-LQFP100-1414-0.50-002

TMPM3HLF10BUG
TMPM3HLFDAUG



Package
P-LQFP64-1010-0.50-003

Lineup

Part number	M3H (2)	TMPM3HQF10BFG	TMPM3HNF10BFG	TMPM3HLF10BUG
	M3H (1)	TMPM3HQFD/Z/YAFG	TMPM3HNFD/Z/YAFG	TMPM3HLFD/Z/YAUG
Max. operation frequency		120 MHz		
ROM (Flash)	M3H (2)	1024 KB		
	M3H (1)	512 / 384 / 256 KB		
RAM	M3H (2)	130 KB (with parity)		
	M3H (1)	66 KB (with parity)		
Timer		32bit x 8ch (16bit x 16ch)		
AD converter		21ch (12bit)	17ch (12bit)	12ch (12bit)
Serial communication		UART: 8ch, I^2C: 4ch, TSPI: 5ch	UART: 8ch, I^2C: 3ch, TSPI: 4ch	UART: 7ch, I^2C: 2ch, TSPI: 1ch
Package		P-LQFP144-2020-0.50-002	P-LQFP100-1414-0.50-002	P-LQFP64-1010-0.50-003

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12 Stepping motor driver with a built-in AGC

TB67S128FTG / TB67S289FTG

Small size Packages | High efficiency · Low loss | Noise immunity

Value provided

Motor current is optimized in real time by using built-in AGC (Active Gain Control).

1 High voltage (50 V)

The maximum rated voltage of these products is 50 V.
It can be used in a supply of 12 to 36 V with sufficient margin.

2 Step-out prevention and high efficiency control using AGC

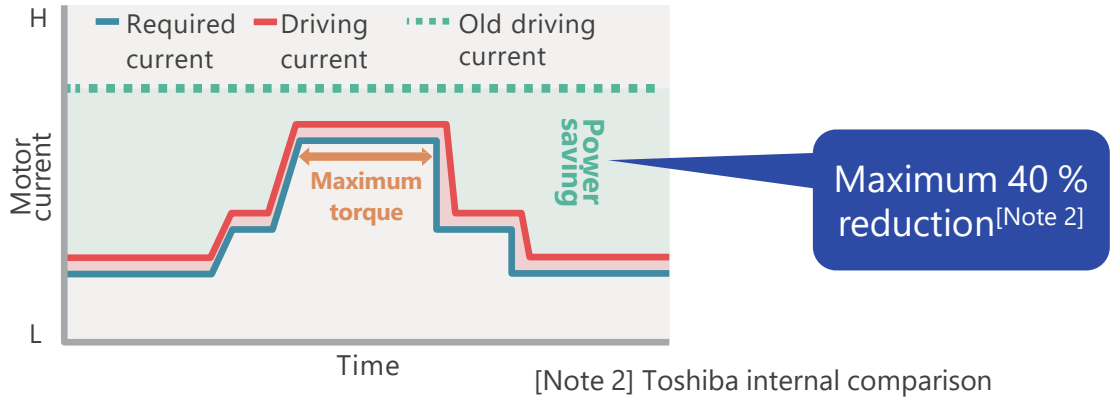
By detecting the motor load torque with just the driver IC and automatically optimizing the current according to the drive condition, step-out avoidance and highly efficient motor control are possible.

3 ADMD (Advanced Dynamic Mixed Decay) realizes high-efficiency operation at high rotation rate

Toshiba's original ADMD technology tracks input current more closely than the conventional mixed decay mode [Note 1], making highly efficient motor control possible at high rotation rate.

[Note 1] Comparison with our products

■Active Gain Control



[Note 2] Toshiba internal comparison

Lineup

Part number		TB67S128FTG	TB67S289FTG
Absolute maximum ratings	Output voltage [V]	50	
	Output current [A]	5.0	3.0
Output ON-resistance (H+L) (Typ.) [Ω]		0.25	0.4
Control interface		Clock / Serial	Clock
Step		1/1, 1/2, 1/4, 1/8, 1/16, 1/32, 1/64, 1/128	1/1, 1/2, 1/4, 1/8, 1/16, 1/32
Features		ADMD (high efficiency control), ACDS (without current sense resistor)	
Error detection function		Thermal shutdown (TSD), over current detection (ISD), power-on-reset (POR), motor load open (OPD)	
Package		P-VQFN64-0909-0.50-006	P-VQFN48-0707-0.50-004

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13a Stepping motor driver

TB67S511FTAG / TB67S512FTAG / TB67S521FTAG / TB67S522FTAG

Small size Packages | High efficiency · Low loss | Noise immunity

Value provided

The maximum voltage rating is 40 V. Standard stepping motor drivers with a small package.

1 High voltage and current

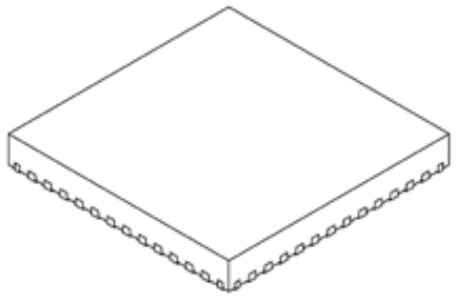
The maximum rated voltage of these products is 40 V, and the maximum rated current is 2 or 2.8 A. Low on-resistance contributes low power consumption and low heat.

2 Small size and high heat dissipation

A QFN package is used. By connecting the E-pad on the bottom to the board GND, heat dissipation is improved. This also contributes to reducing the required board area.

3 Error detection functions

Over current detection (ISD), thermal shutdown (TSD) and power on reset (POR) are available for safe motor driving.



Package: P-WQFN36-0606-0.50-002
(6 x 6 mm)

Lineup

Part number		TB67S511FTAG	TB67S512FTAG	TB67S521FTAG	TB67S522FTAG
Absolute maximum ratings	Output voltage [V]	40			
	Output current [A]	2.0		2.8	
Output ON-resistance (H+L) (Typ.) [Ω]		0.8		0.53	
Driving type		PWM constant current drive			
Excitation mode		full, half and quarter step resolutions			
Control interface		Phase	Clock	Phase	Clock
Error detection function		Thermal shut down (TSD), over current (ISD), power on reset (POR)			
Package		P-WQFN36-0606-0.50-002			

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13b Stepping motor driver

TB67S539FTG / TB67S549FTG / TB67S579FTG

Small size Packages | High efficiency · Low loss | Noise immunity

Value provided

The maximum voltage rating is 40 V. Standard stepping motor drivers with a small package.

1 High voltage and current

The maximum rated voltage of these products is 40 V, and the maximum rated current is 2 or 1.5 A. Low on-resistance contributes low power consumption and low heat.

2 Small size and high heat dissipation

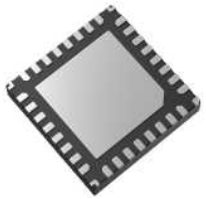
A QFN package is used. By connecting the E-pad on the bottom to the board GND, heat dissipation is improved. This also contributes to reducing the required board area.

3 Error detection functions

Over current detection (ISD), thermal shut down (TSD) and under voltage lockout (UVLO) are available.
In addition to these features, the TB67S579FTG incorporates open-load detection (OPD) and stall detection.

TB67S539FTG

Top view

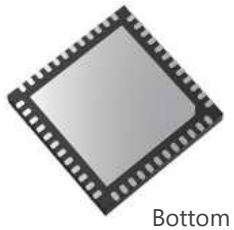


Bottom view

Package: P-VQFN32-0505-0.50-004
(5.0 x 5.0 mm)

TB67S579FTG

Top view



Bottom view

Package: P-VQFN48-0707-0.50-006
(7.0 x 7.0 mm)

Lineup

Part number		TB67S539FTG	TB67S549FTG	TB67S579FTG
Absolute maximum ratings	Output voltage [V]	40		
	Output current [A]	2.0	1.5	2.0
Output ON-resistance (H+L) (Typ.) [Ω]		0.8	1.2	0.6
Driving type		PWM constant current drive		
Excitation mode		full, half, quarter, 1/8, 1/16 and 1/32 step resolutions		
Control interface		Clock input type		
Error detection function		TSD, ISD, UVLO		TSD, ISD, UVLO, OPD, Stall detection
Package		P-VQFN32-0505-0.50-004	P-VQFN24-0404-0.50-004	P-VQFN48-0707-0.50-006

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14 Three-phase brushless DC motor driver

TC78B004AFTG

Small size Packages | High efficiency · Low loss | Noise immunity

Value provided

The motor can be driven with high efficiency and low noise by built-in speed control function and two-phase modulation system based on PWM sine wave drive.

1 Motor speed control function

Built-in FLL + PLL [Note1] circuit controls motor speed high efficiently.

[Note1] FLL: Frequency locked loop, PLL: Phase locked loop

2 Low noise, low vibration motor control

Sine wave PWM drive with smooth current waveforms contributes to lower motor noise and vibration compared to conventional rectangular wave drive. [Note2]

[Note2] Comparison with Toshiba's products

3 Small package

Adopted QFN40 contributes to reduce 25 % mounting area compared with our previous product such as TB6604AFTG with QFN48.

Package: P-WQFN40-0606-0.50-001
(6.0 x 6.0 x 0.8 mm)

Lineup

Part number	TC78B004AFTG
Power supply voltage (Operating range) [V]	10 to 28
Output voltage (Max.rating) [V]	-0.3 to 40 (upper side drive), 15 (lower side drive)
Drive system	Sine wave PWM drive system
Features	Lead angle control: Automatic lead angle correction function Sensor input: Hall element Speed control: External clock input, FLL + PLL speed control circuit Lock protection function

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15a 1ch brushed DC motor driver

TB67H450AFNG / TB67H451AFNG

Small size Packages | High efficiency · Low loss | Noise immunity

Value provided

High voltage, high current and low power consumption with BiCD process. Simple single channel version.

1 High voltage (50 V)/ High current

Maximum rating of the output voltage is improved from 40 to 50 V to allow margin for air discharge test, etc.

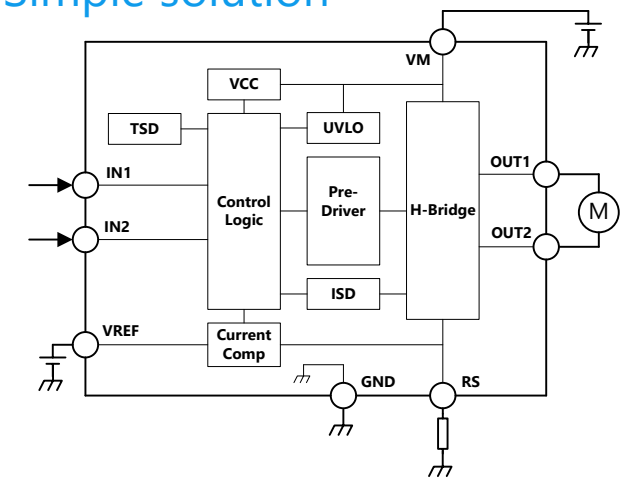
2 Wide operation voltage range

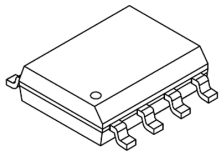
Wide power supply voltage range from 4.5 to 44 V supports battery driven applications.

3 Mature package

Adopting HSOP8 package compatible with competitor's products or Toshiba conventional products.

■Simple solution





P-HSOP8-0405-1.27-002
(4.9 x 6.0 mm)

Lineup

Part number		TB67H450AFNG	TB67H451AFNG
Motor type		Brushed DC motor	
Absolute maximum ratings	Output voltage [V]	50	
	Output current [A]	3.5	
Output ON-resistance (H+L) (Typ.) [Ω]		0.6	
Output circuit		1ch	
Error detection function		Thermal shut down (TSD), over current (ISD), low voltage (UVLO)	
Package		P-HSOP8-0405-1.27-002	

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15b 2ch brushed DC motor driver

TB67H400AFTG / TB67H410FTG / TB67H420FTG

Small size Packages | High efficiency · Low loss | Noise immunity

Value provided

High voltage, high current with BiCD process. Mode selection supports higher current driving.

1 High voltage (50 V)/ High current

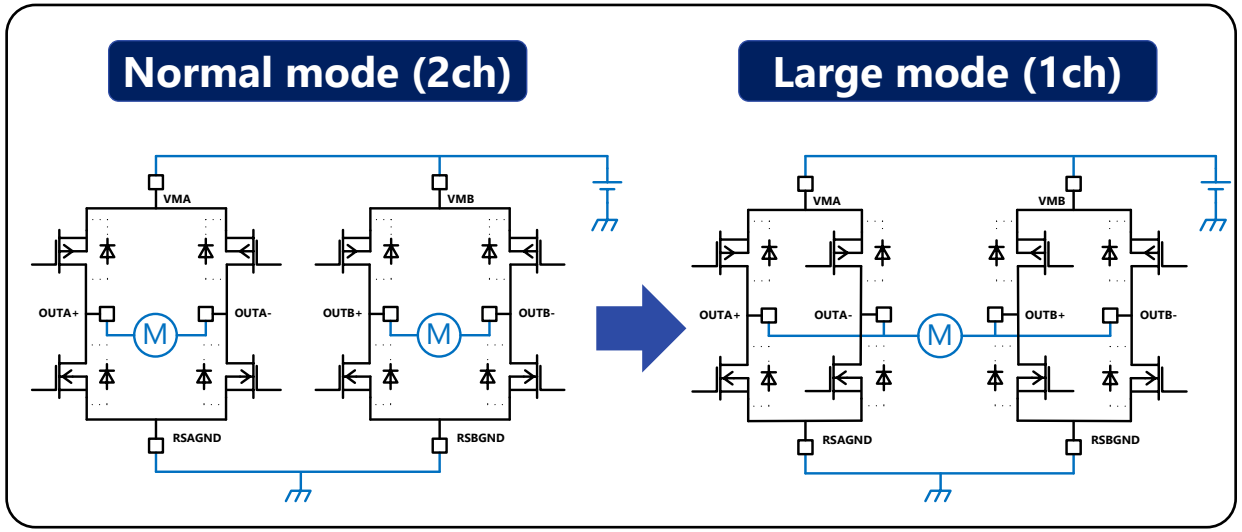
Maximum rating of the output voltage is improved from 40 to 50 V to allow margin for air discharge test, etc.

2 Wide operation voltage range

Wide operation voltage range from 10 to 47 V supports battery driven applications.

3 High current drive

Built-in 2ch of H-bridge circuit can drive two brushed DC motors or a single brushed motor by using large mode which obtains two times current.



Lineup

Part number		TB67H400AFTG	TB67H410FTG	TB67H420FTG
Motor type		Brushed DC motor		
Absolute maximum ratings	Output voltage [V]	50		
	Output current (Normal) [A]	4.0	2.5	4.5
	Output current (Large) [A]	8.0	5.0	9.0
Output ON-resistance (Normal) (H+L) [Ω]		0.49	0.8	0.33
Error detection function		TSD, ISD, POR*		TSD, ISD, POR, OPD*
Package		P-WQFN48-0707-0.50-003		P-VQFN48-0707-0.50-004

* Thermal shutdown (TSD), Over current detection (ISD), Power-on-reset (POR), Motor load open (OPD)

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Linear image sensor (CCD)

TCD2569BFG

Small size Packages | High efficiency · Low loss | Noise immunity

Value provided

Image quality is improved by less color registration and blooming [Note].

[Note] saturation of the CCD shift register by over exposed pixels

1 High image quality

2 line spacing (10.5 µm) between pixel arrays (red-green, green-blue) offers high image quality with less color registration.

2 Capable of high speed sampling

A built-in sample and hold circuit lengthens the video output signal period and offers stable video output signal sampling at high speed operation.

3 Performance improvement in high reflectance object scanning

The built-in output voltage clip function suppresses the maximum output voltage to 1.8 V or less, and the saturated output voltage of the CCD shift register is 4 V or more. This reduces blooming caused by scanning high reflectance objects.

TCD2569BFG

・22pin-CLCC (Ceramic Leadless Chip Carrier)
・SMT (Surface Mount Technology)

Lineup

Pixel size	5.25 µm x 5.25 µm
Line spacing (Line distance)	2 line spacing (10.5 µm)
Effective pixel number	5340 pixels x 3 lines
Sensitivity (A light source + CM500S) (Typ.)	Red: 13.2 (V/lx·s); Green: 15.0 (V/lx·s); Blue: 5.9 (V/lx·s)
Maximum clock pulse frequency	35 MHz
Power supply voltage (Operating range)	9.5 to 10.5 V
Maximum output voltage (Max)	1.8 V
Saturation output voltage of CCD shift register (Min)	4.0 V
Features	Sample and hold circuit; clipping function; clamp circuit

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Linear image sensor (CCD)

TCD2726DG

Small size Packages | High efficiency · Low loss | Noise immunity

Value provided

High speed operation at a data rate of 100 MHz (50 MHz x 2ch) and installation of a timing generator are realized.

1 High speed CCD linear image sensor

100 MHz (50 MHz x 2ch) data rate.

2 Built-in Timing Generator circuit

The built-in timing generator circuit reduces the number of CCD drive pin. This reduces EMI [Note1] and timing-adjustment and the number of peripheral parts.

[Note1] electromagnetic interference

3 Low power consumption

10 V power supply voltage for amplifier circuit lowered to 3.3 V. [Note2]

[Note2] 10 V power supply is used partially. Dual power supply of 3.3 V and 10 V.

TCD2726DG

・32pin-CERDIP (Ceramic Dual In-line Package)
・DIP (Dual In-line Package)

Lineup

Pixel size		4.7 µm x 4.7 µm
Line spacing (Line distance)		2 line spacing (9.4 µm)
Effective pixel number		7500 pixels x 3 lines
Sensitivity (A light source + CM500S) (Typ.)		Red: 11.1 (V/lx·s); Green: 14.9 (V/lx·s); Blue: 5.2 (V/lx·s)
Maximum clock pulse frequency		100 MHz (50 MHz x 2ch)
Power supply voltage (Operating range)	3.3 V (Digital)	3.1 to 3.5 V
	3.3 V (Analog)	3.1 to 3.5 V
	10 V	9.5 to 10.5 V
Features		Timing generator circuit, CCD driver

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