TOSHIBA

R24

Multi Function Printer

Solution Proposal by Toshiba

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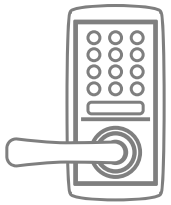

Toshiba Electronic Devices & Storage Corporation provides comprehensive device solutions to customers developing new products by applying its thorough understanding of the systems acquired through the analysis of basic product designs.

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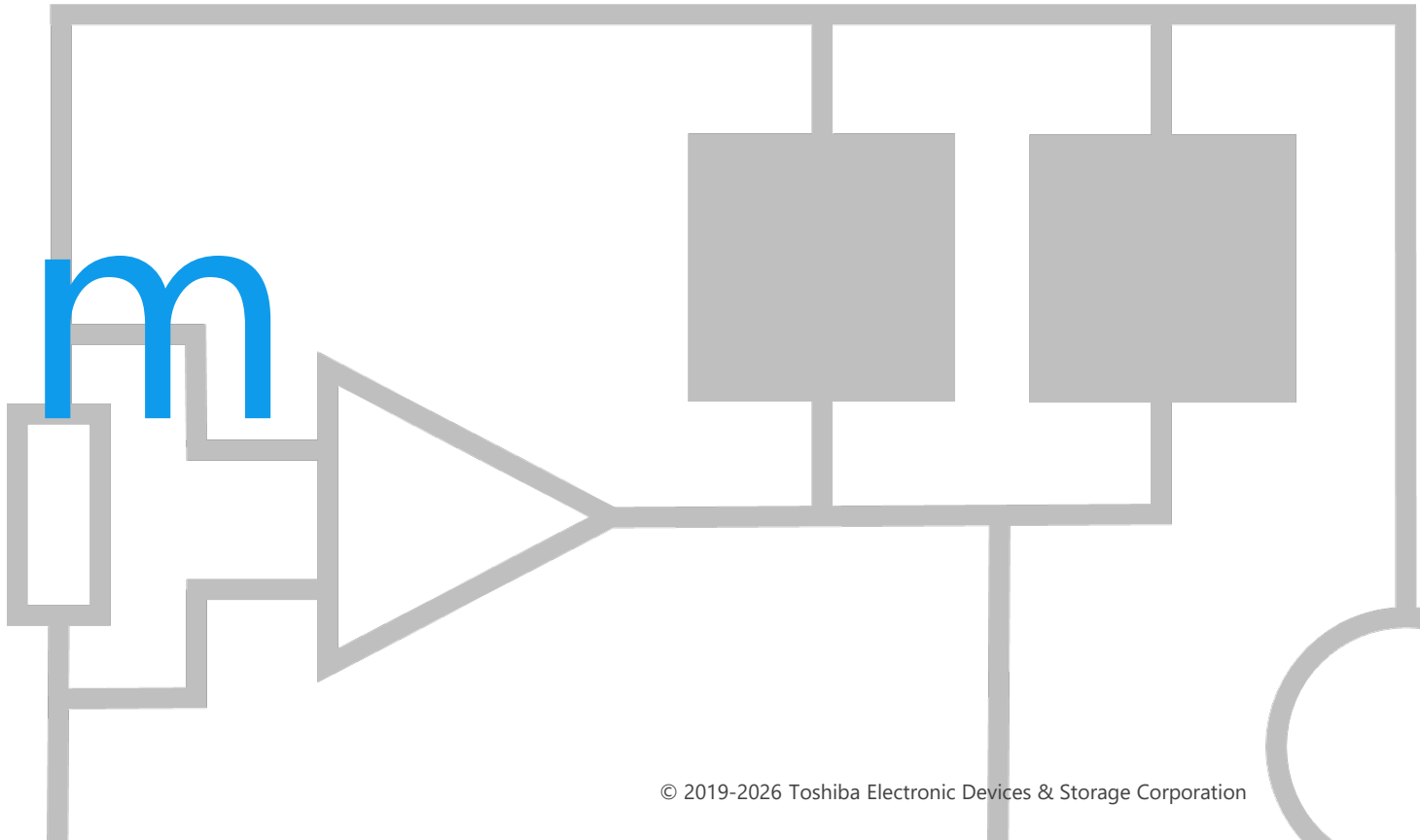
Block Diagram



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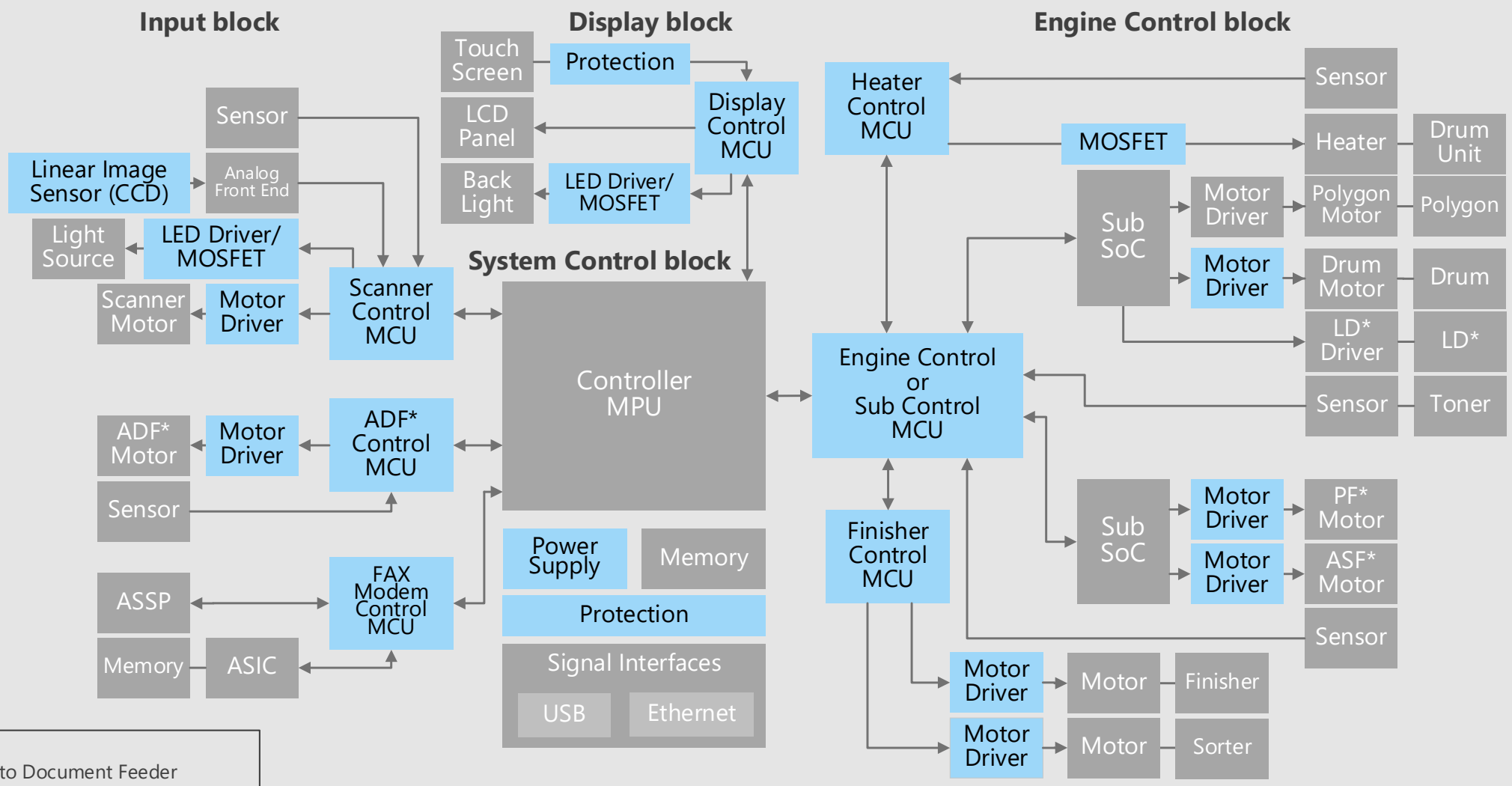
Multi Function Printer　Overall block diagram



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

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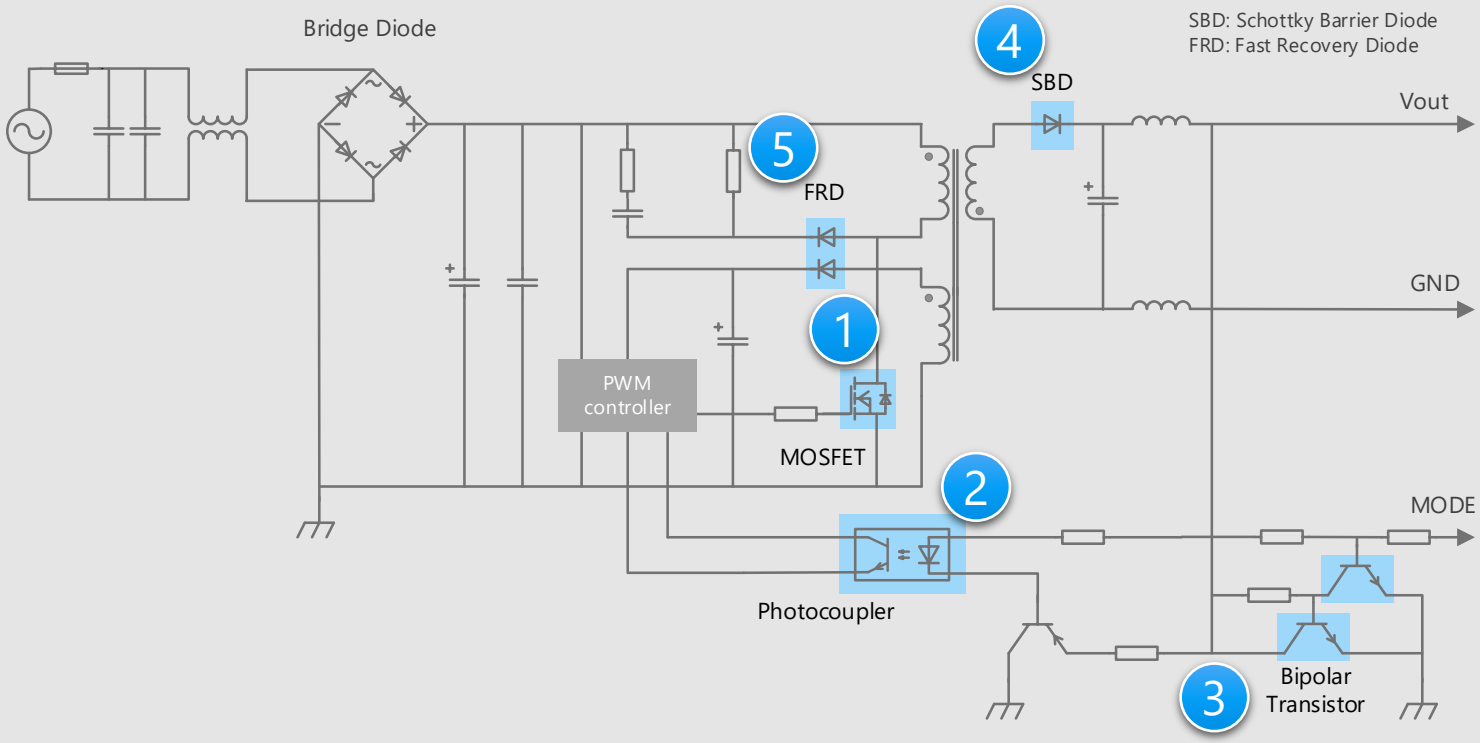
Multi Function Printer　Detail of the power supply circuit

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 size 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

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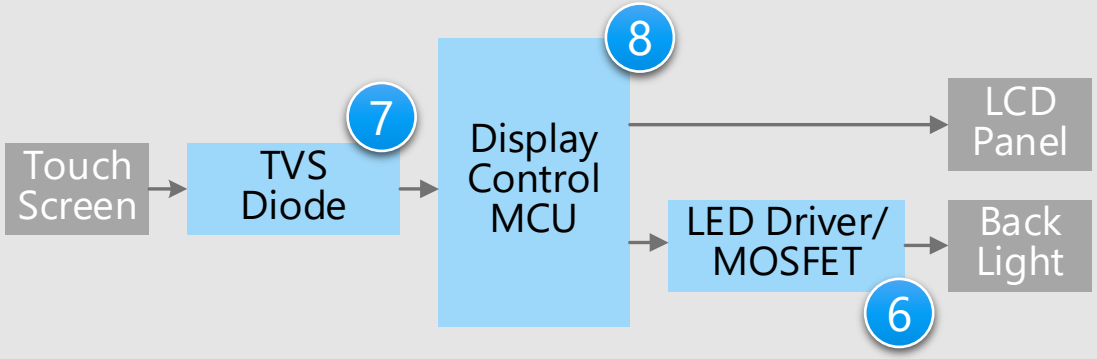
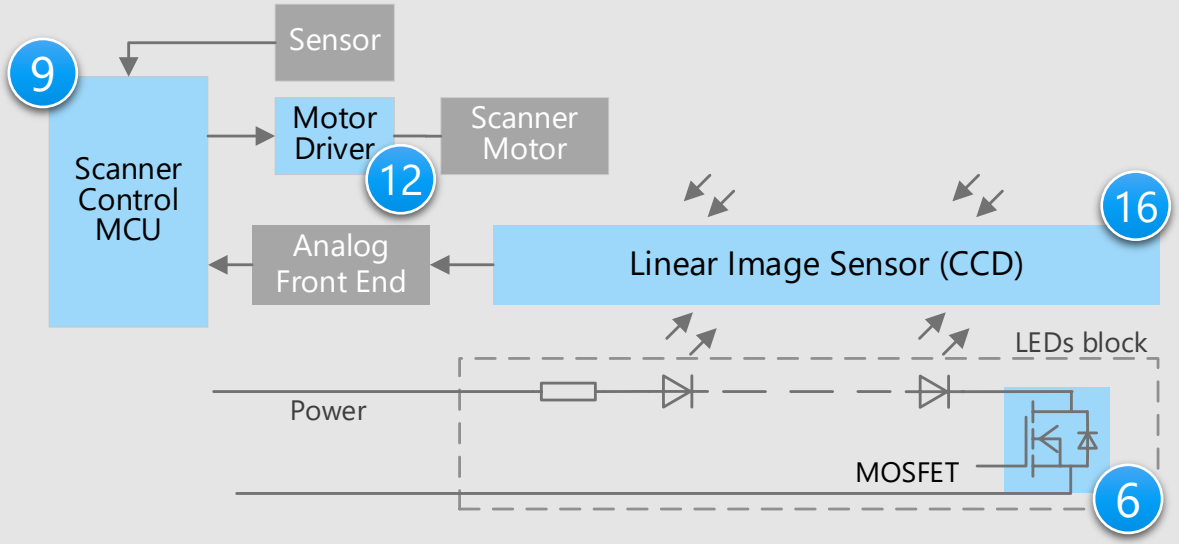
Multi Function Printer　Details of Display/Scanner block

Display block



Scanner block



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

Criteria for device selection

- Small size 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
- **Equipped with a timing generator for easy PCB design**
  Linear image sensor (CCD)　16

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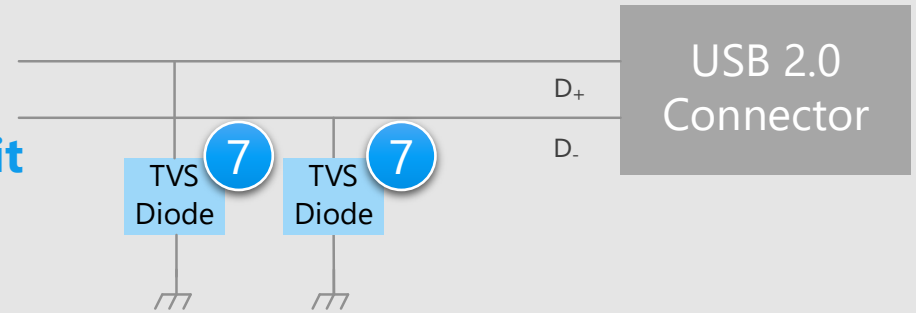
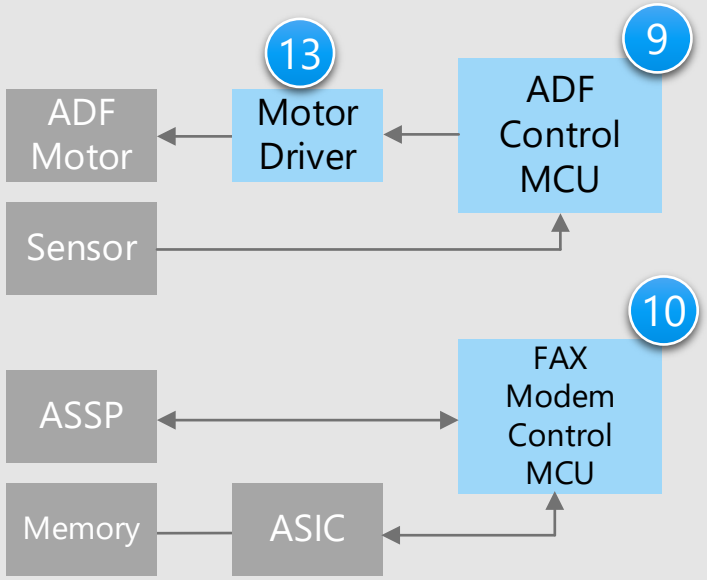
Multi Function Printer　Details of USB 2.0/ADF/FAX modem block

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 size 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
- **Efficient execution of the higher level protocol of FAX**
  MCU TMPM036FWFG / TMPM037FWUG　10
- **High precision motor current control for ADF**
  Stepping motor driver　13

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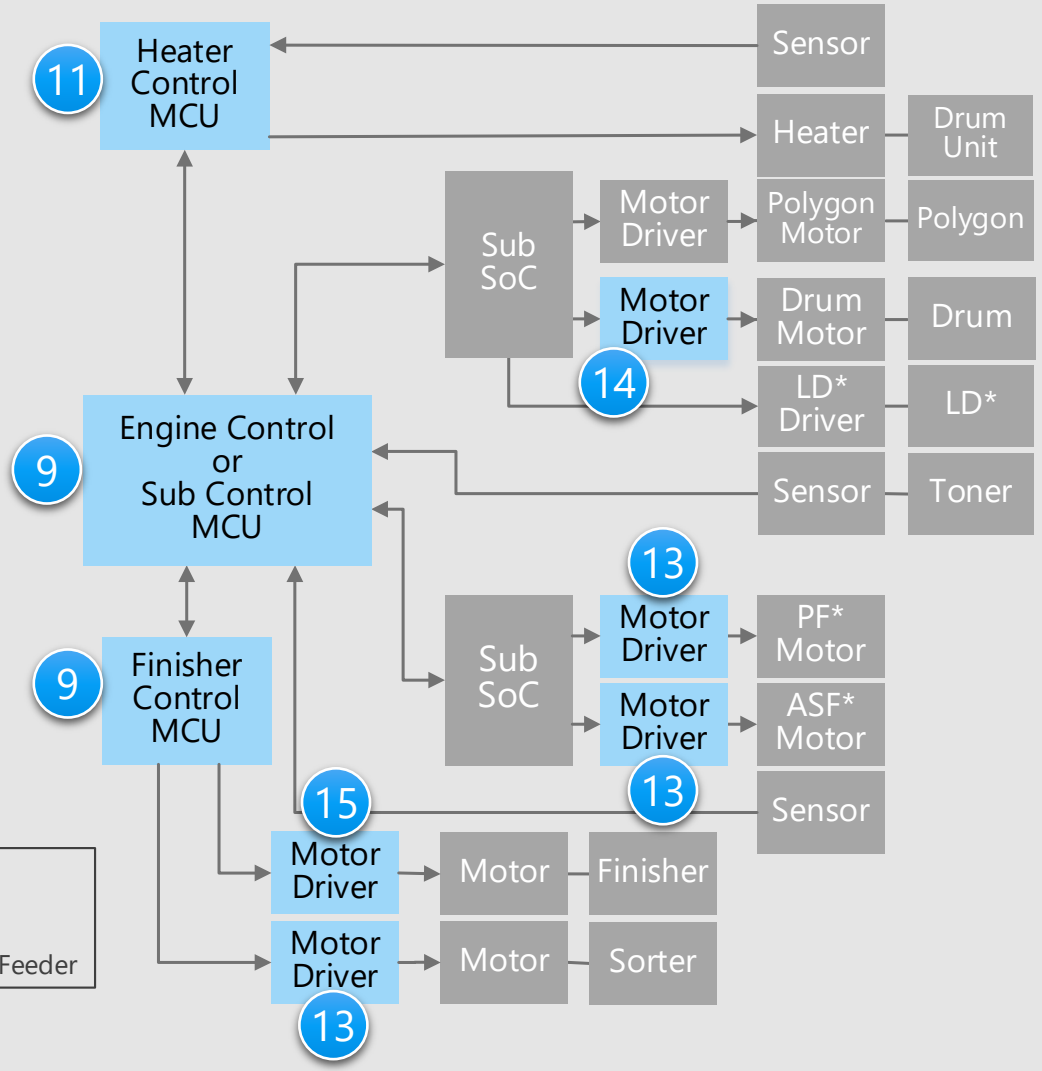
Multi Function Printer　Details of Engine/Heater/Finisher block

Engine block

Heater block

Finisher block



Note (*)
LD: Laser Diode
PF: Paper Feed
ASF: Auto Sheet Feeder

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

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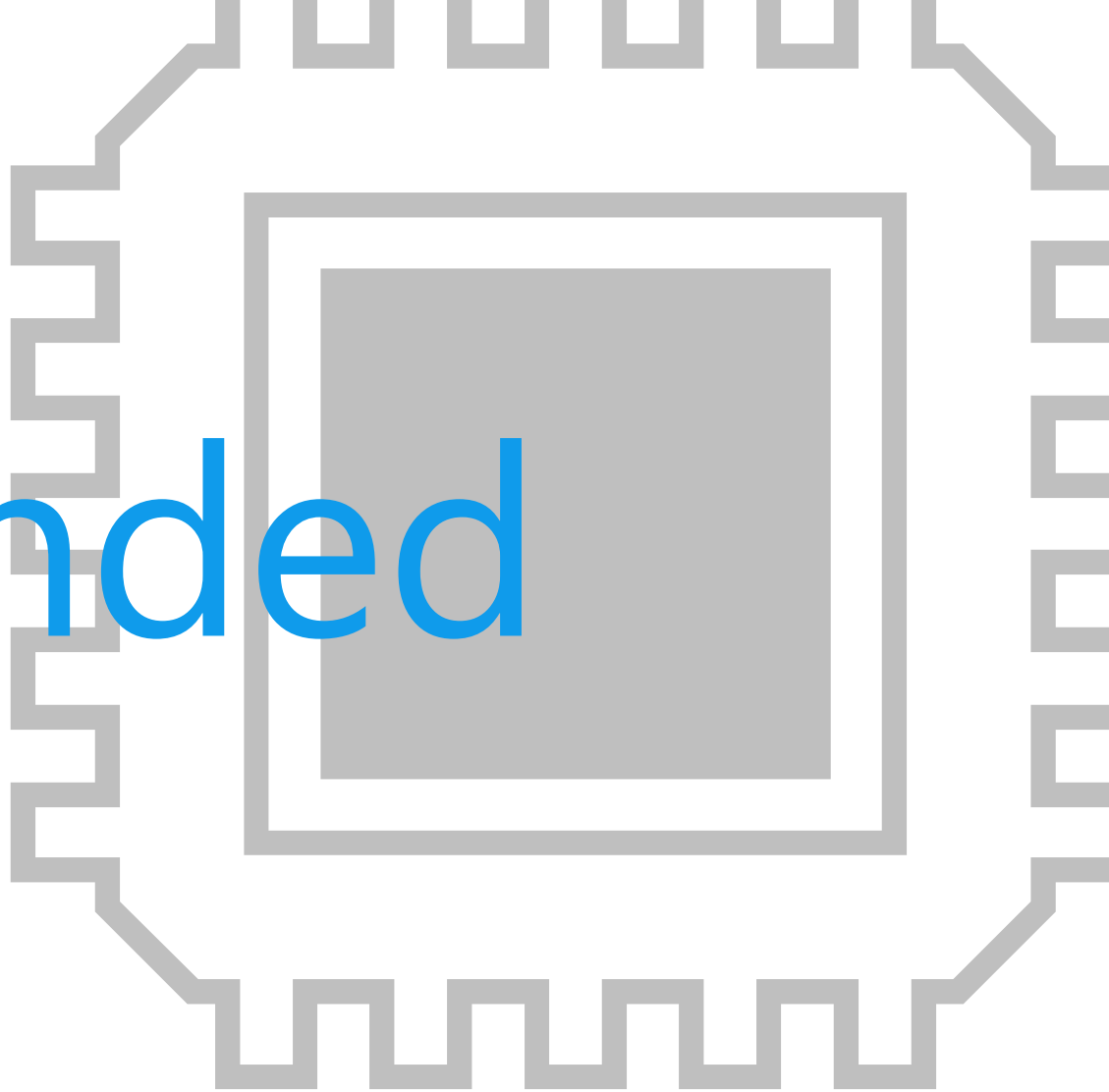
Recommended Devices



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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.

Miniaturization of circuit boards

Small size Packages

Lower power consumption of the set

High efficiency · Low loss

Robust operation

Noise immunity

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Device solutions to address customer needs

	Small size Packages	High efficiency · Low loss	Noise immunity
1 DTMOS Series MOSFET	●	●	
2 Transistor output photocoupler	●	●	●
3 Bipolar transistor	●	●	
4 Schottky barrier diode	●	●	●
5 Fast recovery diode	●	●	
6 Small signal MOSFET	●	●	
7 TVS diode	●		●

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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	●	●	
13 Stepping motor driver	●	●	
14 Three-phase brushless DC motor driver	●	●	
15 Brushed DC motor driver	●	●	
16 Linear image sensor (CCD)		●	

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1 DTMOS Series MOSFET

TK090E65Z / TK090U65Z / TK090A65Z / TK090N65Z

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

Value provided

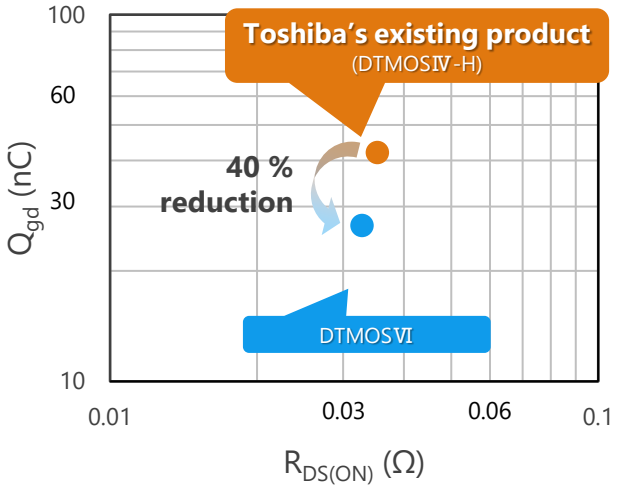
The $R_{DS(ON)}$ x Q_{gd} is reduced by 40 % (compared with Toshiba's existing products) to improve power efficiency, and contributing to miniaturization of the set.

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

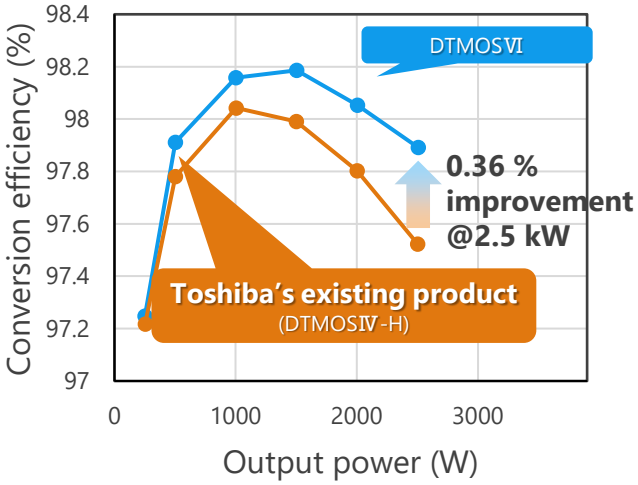
The $R_{DS(ON)}$ x Q_{gd} figure of merit has been reduced by 40 % with gate design and process optimization.
(Comparison of DTMOSⅣ-H Products: Toshiba internal comparison)

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

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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

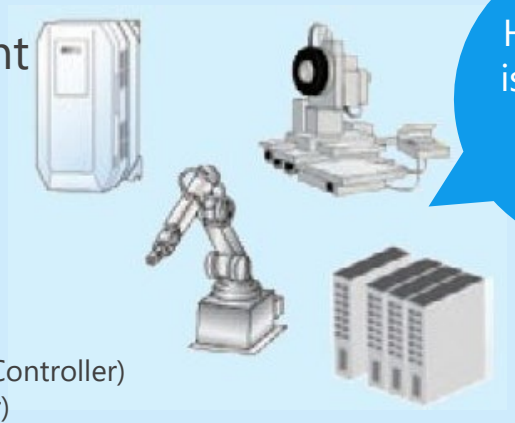
It is a highly isolated photocoupler that phototransistors and infrared light emitting diodes are optically coupled, and achieved a high isolation voltage of 5000 Vrms. In addition, since the SO6L package is smaller and thinner than Toshiba standard DIP package, high density mounting is possible.

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)



High level of isolation and noise blocking

Lineup

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

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3 Bipolar transistor
TMBT3904

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

Value provided

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

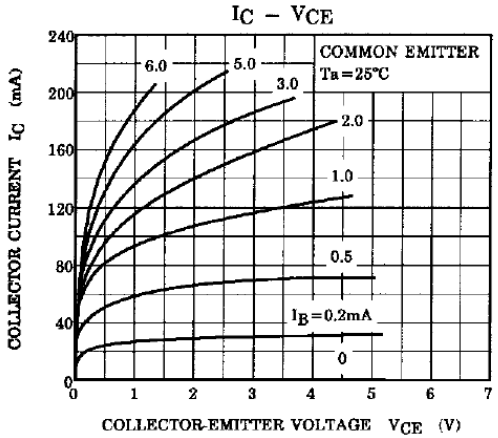
1 High voltage

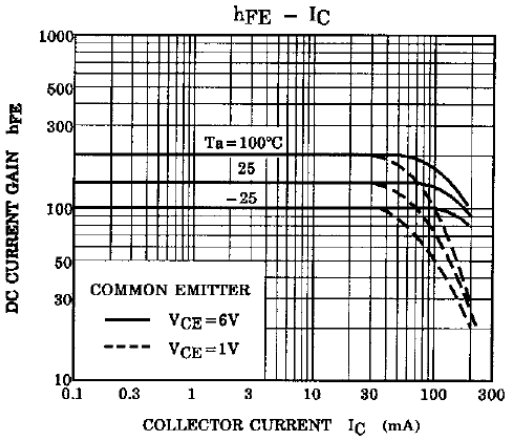
High voltage allows for large loads and instantaneous voltage changes.

2 Large current (rated collector current)

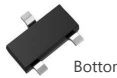
It covers a wide range of applications, from low frequency applications to power supply applications.

TMBT3904
Characteristics chart





Lineup

Part number	TMBT3904
Package	SOT-23 (SOT23) Top view  Bottom view
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

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4 Schottky barrier diode

CMS15 / CUHS20F60

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

Value provided

Schottky barrier diode is suitable for high frequency rectification of switching power supplies and contributes to miniaturization.

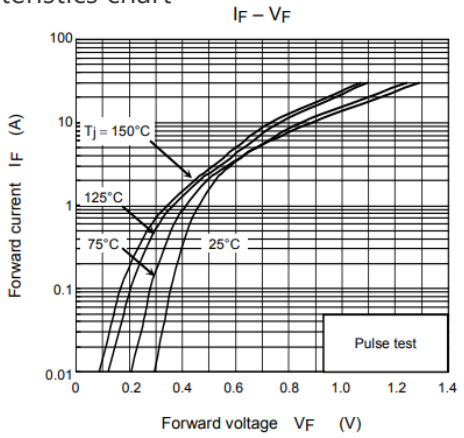
1 High speed switching

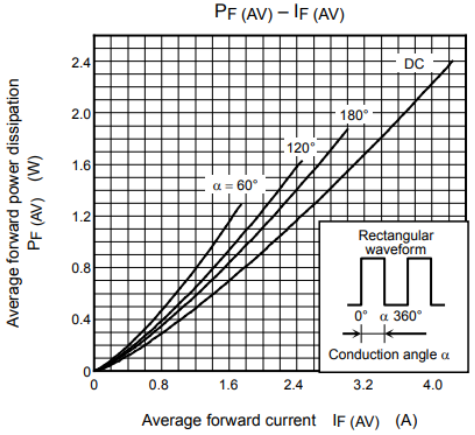
Schottky barrier diode is suitable for high speed switching applications.

2 Small size package

Small size packages are suitable for high density mounting.

CMS15
Characteristics chart





Lineup

Part number	CMS15	CUHS20F60
Package	M-FLAT™ Top view Bottom view	SOD-323HE (US2H) Top view Bottom view
V_{RRM} / V_R [V]	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

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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 switching power supplies.

1 High reverse voltage

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

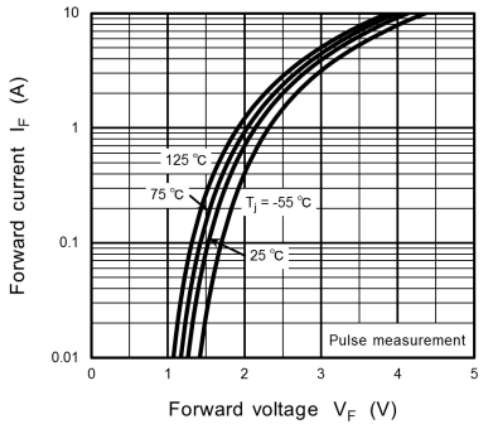
2 Fast reverse recovery time

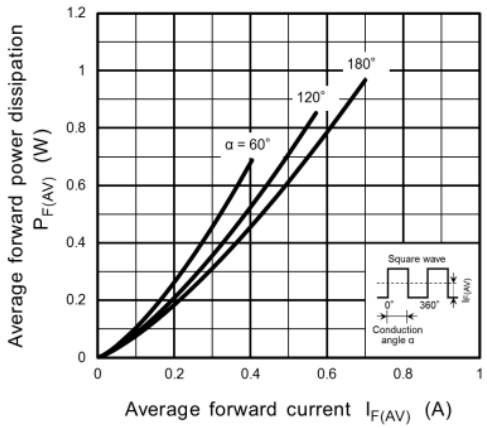
The reverse recovery time (t_{rr}) is fast and is suitable for high speed operation.
(CRF03A: Up to 100 ns)

3 Small size package

This small size package is suitable for high density mounting.

CRF03A
Characteristics chart





Lineup

Part number	CRF03A
Package	S-FLAT™ Top view Bottom view
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

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6 Small signal MOSFET

SSM3K35AFS / SSM3J35AFS

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

Value provided

Small signal MOSFET is suitable for high speed switches and contributes to miniaturization.

1 Low voltage operation

This MOSFET operates at a low voltage of $|V_{GS}| = 1.2$ V.

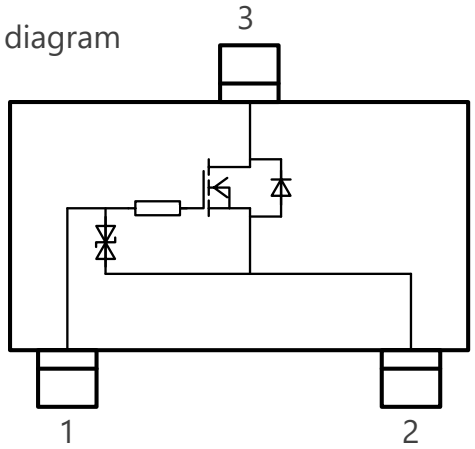
2 Low on-resistance

The drain-source on-resistance is low. Heat generation and power consumption can be kept low.

3 Wide lineup of small size package

In addition to SOT-416 (SSM) package, CST3C, SOT-723 (VESM), SOT-563 (ES6), and SOT-363 (US6) small size packages are available for small signal MOSFETs.

SSM3K35AFS
Internal connection diagram



1: Gate
2: Source
3: Drain

Lineup

Part number		SSM3K35AFS	SSM3J35AFS
Package		SOT-416 (SSM) Top view	Bottom view
V_{DSS} [V]		20	-20
I_D [A]		0.25	-0.25
$R_{DS(ON)}$ [Ω] @$\|V_{GS}\|$ = 2.5 V	Typ.	1.1	1.5
	Max	1.6	2.1
Polarity		N-ch	P-ch

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7 TVS diode

DF2B5M4ASL / DF2B6M4ASL / DF2B6M4BSL

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

Value provided

TVS diode 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.

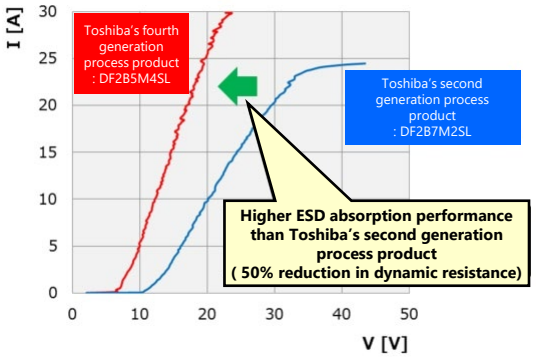
2 Suppress ESD energy by low clamp voltage

Protect the connected circuits and devices using Toshiba own technology.

3 Suitable for high density mounting

A variety of small size 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	DF2B6M4BSL
Package	SOD-962 (SL2)	Top view Bottom view	
V_{ESD} [kV]	±16	±15	±8
V_{RWM} (Max) [V]	3.6	5.5	5.5
C_t (Typ.) [pF]	0.15	0.15	0.12
R_{DYN} (Typ.) [Ω]	0.7	0.7	1.05

[Note] This product is an ESD protection diode and cannot be used for purposes other than ESD protection.

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Value provided

This MCU 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 Arm® Thumb® instruction set improves energy efficiency. Various development tools and their partners allow users many options.

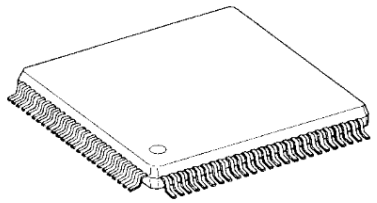
2 Suitable for sensing analog signal

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

3 Small size package and low power consumption

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

TMPM061FWFG



Package
LQFP100-P-1414-0.50G
(16.0 x 16.0 mm)

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)
LCD driver/controller	40 seg x 4 com

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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

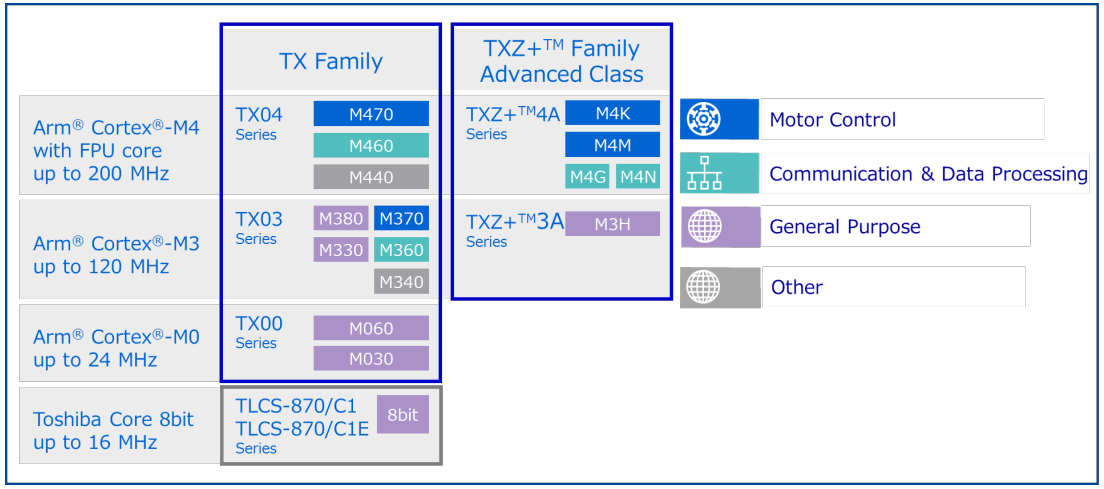
The product lineup is equipped with Arm Cortex-M3/M4 cores. It is suitable for processing sensor data at real time. Various development tools and their partners allow users many options.

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 suitable products for the set.

3 Various communication interfaces

These devices support 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).

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Value provided

These MCUs contribute 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 Arm® Thumb® instruction set improves energy efficiency. Various development tools and their partners allow users many options.

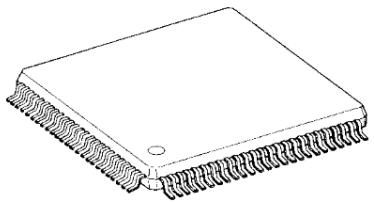
2 Suitable for sensing analog signal

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

3 Small size package and low power consumption

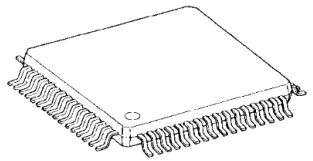
Cortex-M0 and Toshiba's original NANO FLASH™ technology enable the small size package and low power consumption. They contribute to reducing circuit board area and power consumption.

TMPM036FWFG



Package
LQFP100-P-1414-0.50H
(16.0 x 16.0 mm)

TMPM037FWUG



Package
LQFP64-P-1010-0.50E
(12.0 x 12.0 mm)

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.

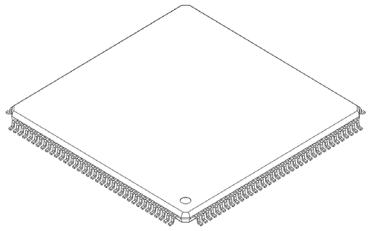
2 System cost down and development efficiency improvement

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 size package and low power consumption

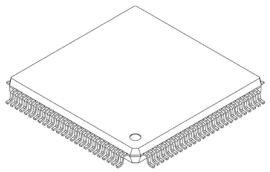
These support low power consumption library and stand by function and contribute to reduce power consumption. The packages lineup includes small LQFP64 to LQFP144.

TMPM3HQF10BFG
TMPM3HQFD/Z/Y/AFG



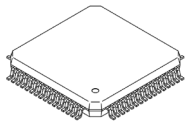
Package
P-LQFP144-2020-0.50-002
(22.0 x 22.0 mm)

TMPM3HNF10BFG
TMPM3HNFD/Z/Y/AFG



Package
P-LQFP100-1414-0.50-002
(16.0 x 16.0 mm)

TMPM3HLF10BUG
TMPM3HLFD/Z/Y/AUG



Package
P-LQFP64-1010-0.50-003
(12.0 x 12.0 mm)

Lineup

Part number	M3H (2)	TMPM3HQF10BFG	TMPM3HNF10BFG	TMPM3HLF10BUG
	M3H (1)	TMPM3HQFD/Z/Y/AFG	TMPM3HNFD/Z/Y/AFG	TMPM3HLFD/Z/Y/AUG
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 / TB67S579FTG

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 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

2 Micro-stepping realizes low vibration and low noise

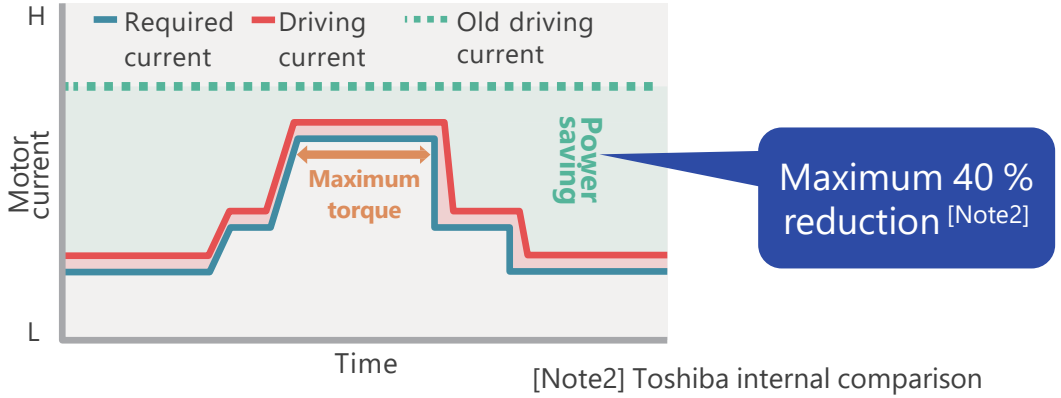
The TB67S128FTG supports 1/128 micro-stepping and the TB67S579FTG supports 1/32 micro-stepping, achieving low vibration and low noise operation of stepping motors.

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 [Note1], making highly efficient motor control possible at high rotation rate.

[Note1] Comparison with Toshiba's products

■Active Gain Control



[Note2] Toshiba internal comparison

Lineup

Part number		TB67S128FTG	TB67S579FTG
Absolute maximum ratings	Output voltage [V]	50	40
	Output current [A]	5.0	2.0
Output on-resistance (H+L) (Typ.) [Ω]		0.25	0.6
Control interface		Clock / Serial	Clock
Step mode		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-VQFN48-0707-0.50-006

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13 Stepping motor driver

TB67S531FTG / 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 size 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.

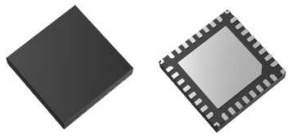
2 Small size and high heat dissipation

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.

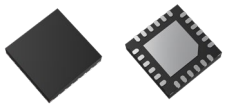
TB67S531FTG
TB67S539FTG



Top view Bottom view

Package
P-VQFN32-0505-0.50-008
P-VQFN32-0505-0.50-004
(5.0 x 5.0 mm)

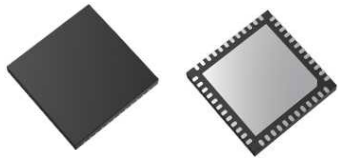
TB67S549FTG



Top view Bottom view

Package
P-VQFN24-0404-0.50-004
(4.0 x 4.0 mm)

TB67S579FTG



Top view Bottom view

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

Lineup

Part number		TB67S531FTG	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			
Step mode		Full, Half, 1/4 step	Full, Half, 1/4, 1/8, 1/16, 1/32 step		
Control interface		Phase input type	Clock input type		
Error detection function		TSD, ISD, UVLO			TSD, ISD, UVLO, OPD, Stall detection

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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 size 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 mm)

Lineup

Part number	TC78B004AFTG
Power supply voltage (Operating range) [V]	10 to 28
Output voltage (Maximum 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 Over current limitation function, Lock protection function

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15a 1ch brushed DC motor driver

TB67H450AFTG / 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.

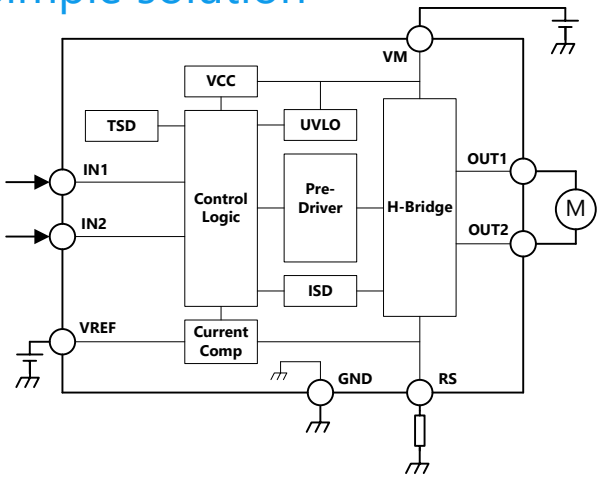
2 Wide operation voltage range

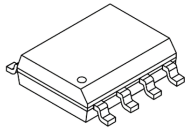
Wide power supply voltage range from 4.5 to 44 V supports battery driven applications.

3 Mature package

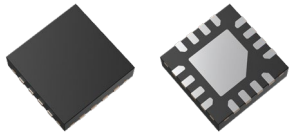
For TB67H450AFNG and TB67H451AFNG, adopting HSOP8 package compatible with competitor's products or Toshiba's existing products.

■Simple solution





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



Package
P-VQFN16-0303-0.50-001
(3.0 x 3.0 mm)

Lineup

Part number		TB67H450AFTG	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		
Error detection function		Thermal shut down (TSD), over current (ISD), low voltage (UVLO)		
Package		P-VQFN16-0303-0.50-001	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

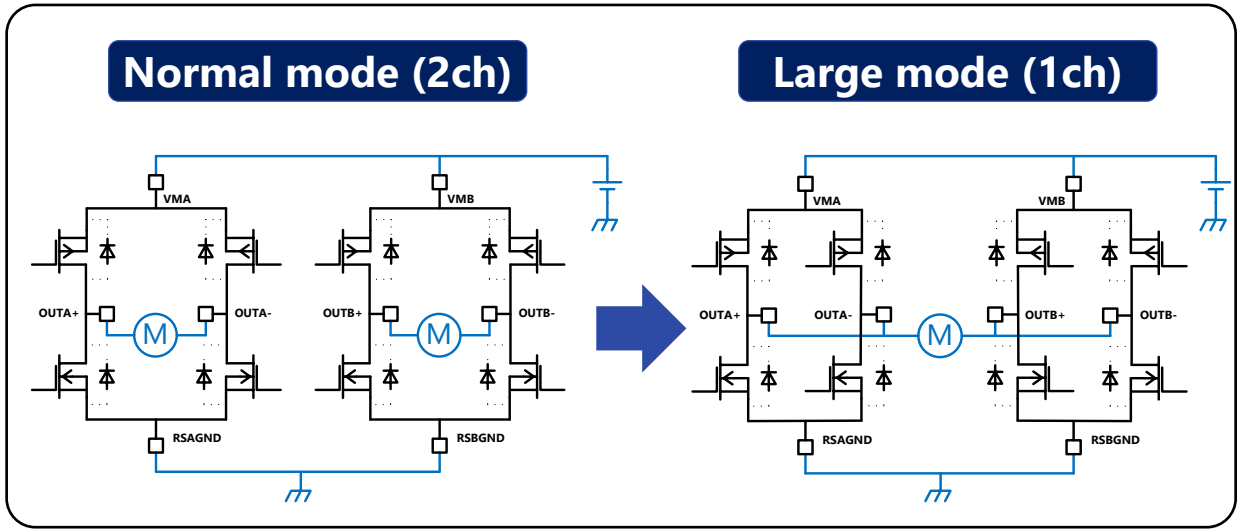
Maximum rating of the output voltage is improved from 40 to 50 V to allow margin for air discharge test, etc.

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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16 Linear image sensor (CCD)

TCD2726DG / TCD2728DG

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

Value provided

Equipped with a timing generator circuit, contributing to reduced PCB design workload.

1 Built-in timing generator circuit

The built-in timing generator circuit reduces the number of CCD drive pin. This reduces EMI (electromagnetic interference), timing-adjustment and the number of peripheral parts.

2 Low power consumption

The power supply voltage of Toshiba's existing products for photocopiers was 10 V, but by changing the main power supply to 3.3 V, these products contribute to lower power consumption. (Since some circuits use 10 V, a dual power supply configuration of 3.3 V and 10 V is used.)

3 Expanded lineup enables selection according to application

Product lineup has expanded featuring high sensitivity and random noise reduction. This allows to choose suitable product according to application.

Package

WDIP32-G-400-2.54
32pin-CERDIP (Ceramic Dual In-line Package)
53.6 x 9.65 mm

Lineup

Part number		TCD2726DG	TCD2728DG
Pixel size [μm]		4.7 x 4.7	
Distance between Photodiode Array [μm]		9.4 (2-line spacing: B array - G array, G array - R array)	
Effective pixel number		7500 pixels x 3 lines	
Sensitivity (A light source + CM500S) (Typ.) [V/(lx·s)]		Red: 11.1, Green: 14.9, Blue: 5.2	Red: 6.7, Green: 8.5, Blue: 3.1
Random noise (Typ.) [mV]		3.2	1.9
Data rate (Max) [MHz]		100 (50 MHz x 2ch)	
Power supply voltage (Operating range) [V]	For 3.3 V	3.1 to 3.5	
	For 10 V	9.5 to 10.5	
Features		Timing generator circuit, CCD driver	

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