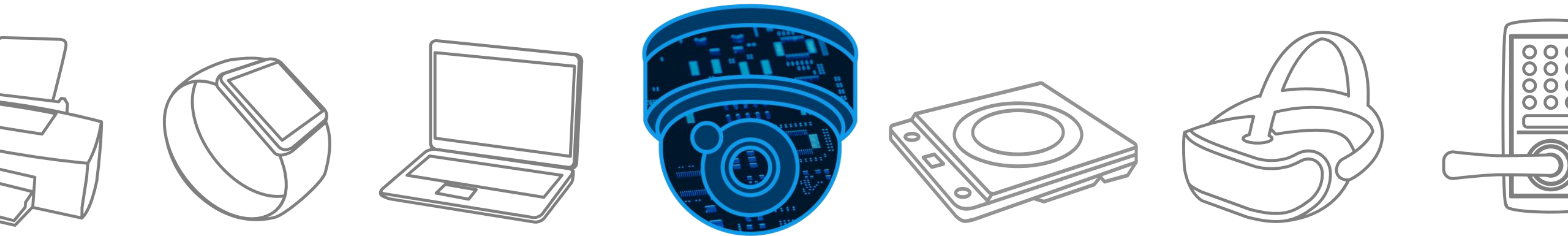
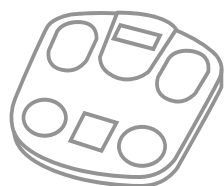
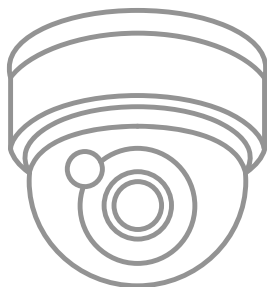


Surveillance Camera

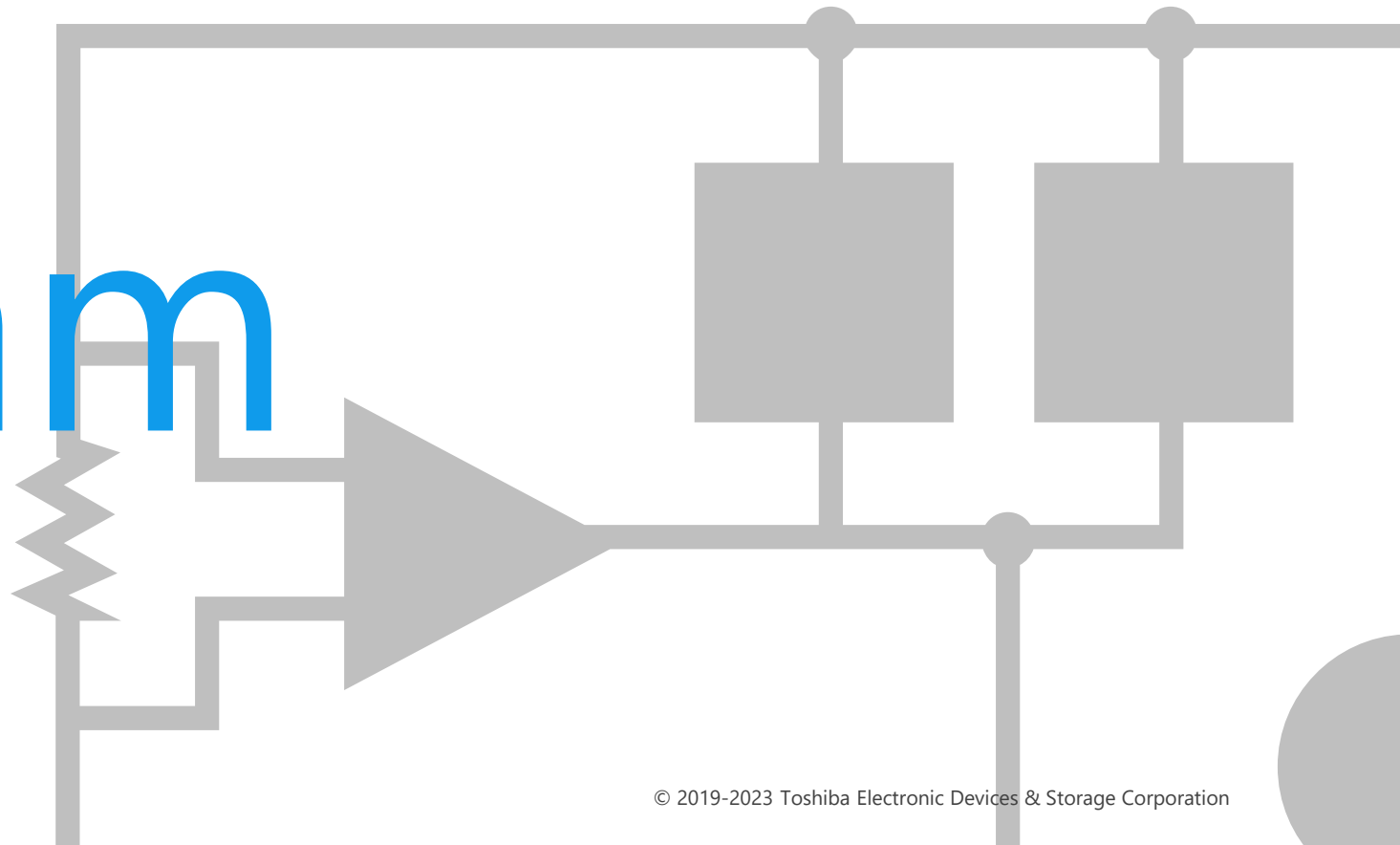
Solution Proposal by Toshiba



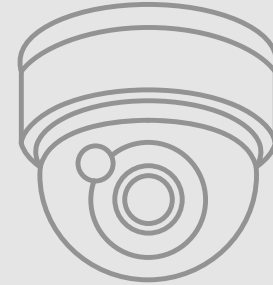
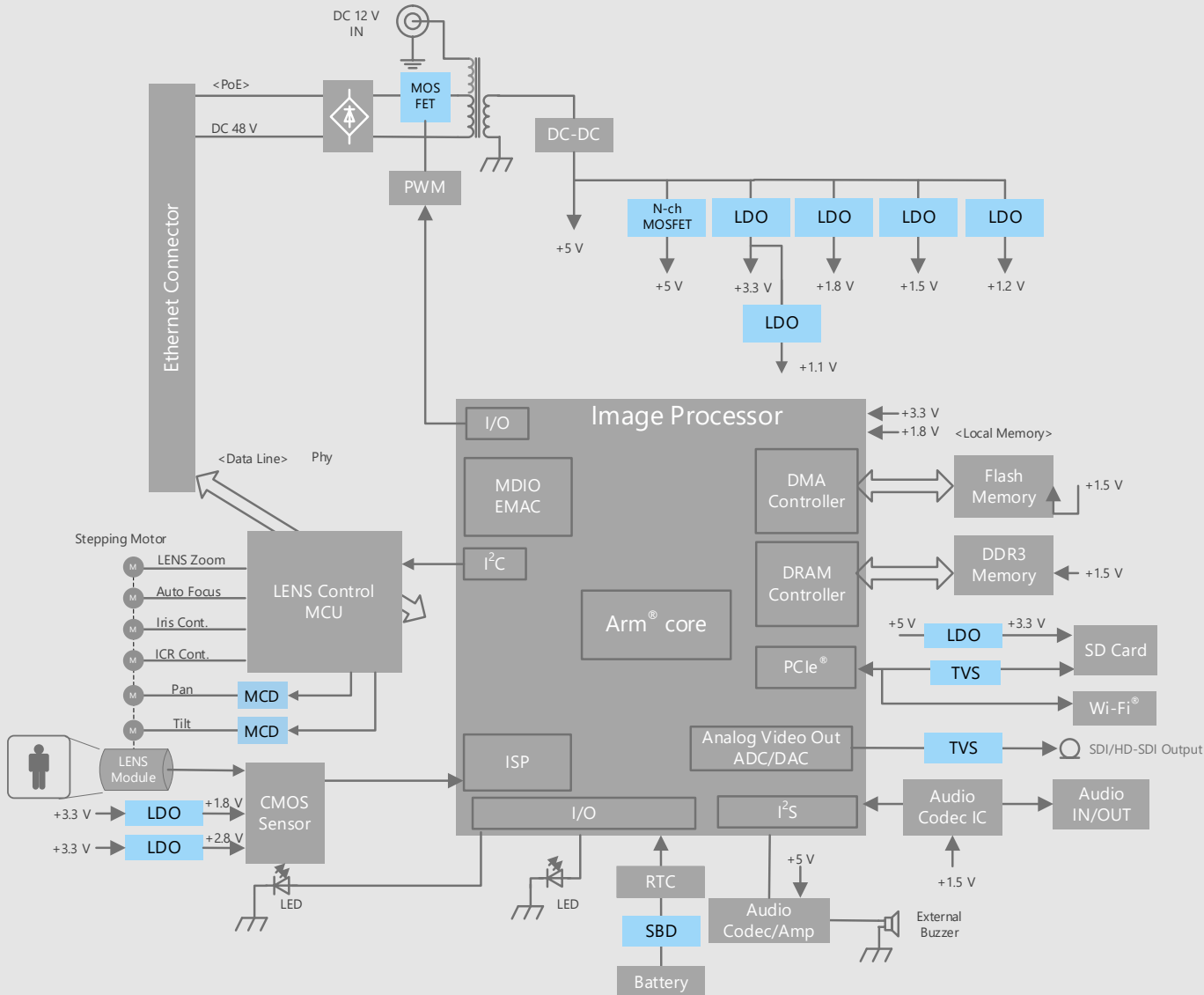


Toshiba Electronic Devices & Storage Corporation provides comprehensive device solutions to customers developing new products by applying its thorough understanding of the systems acquired through the analysis of basic product designs.

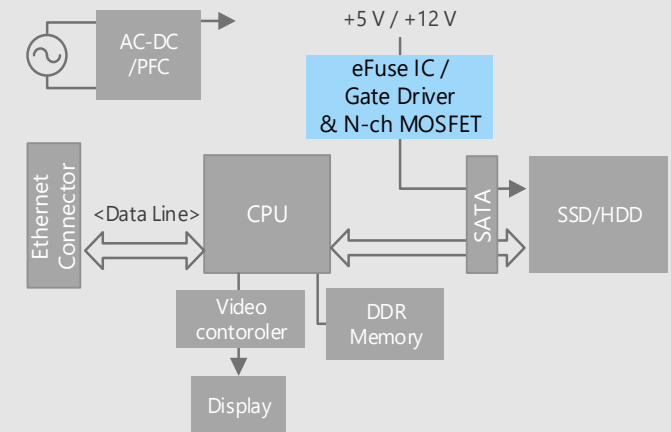
Block Diagram



Surveillance Camera Overall block diagram

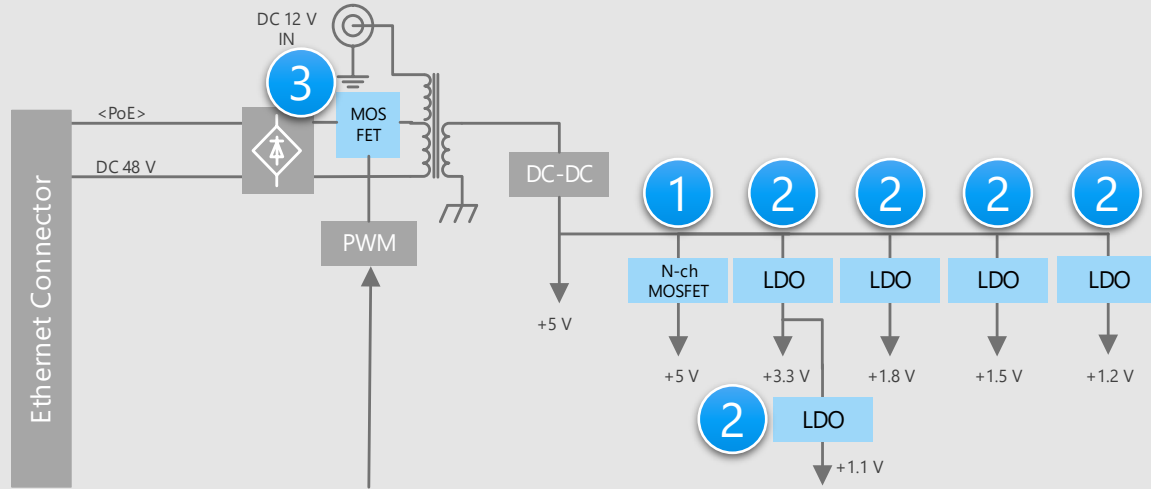


Recorder unit

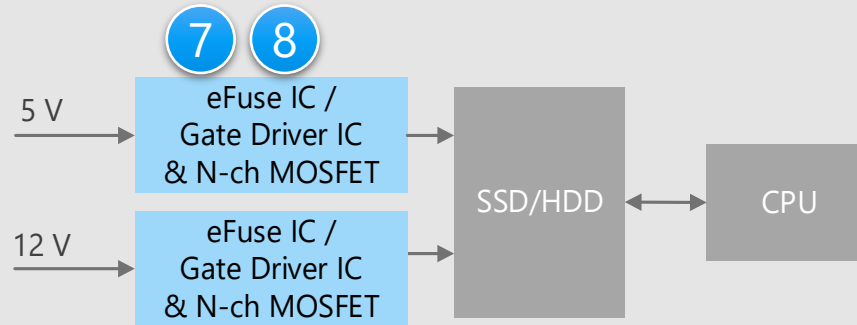


Surveillance Camera Detail of power supply section (1)

Power supply



Power supply circuit of storage



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

Criteria for device selection

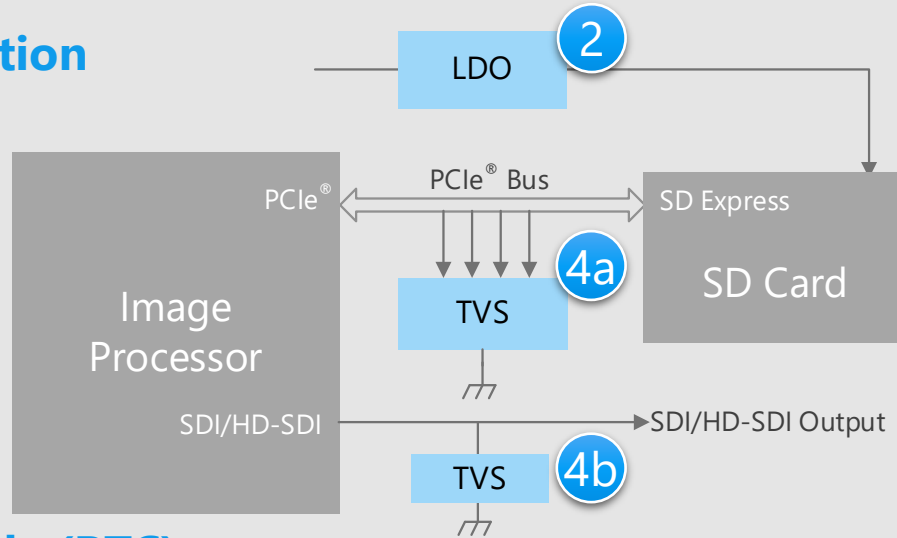
- MOSFETs with high speed and low on-resistance are suitable for the primary side of switching power supplies.
- MOSFETs with low on-resistance are suitable for load switches.

Proposals from Toshiba

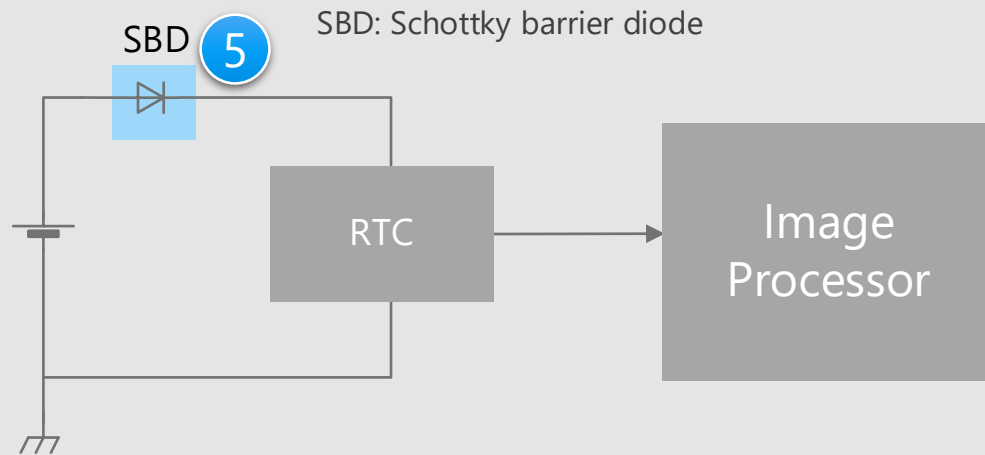
- **Realize the set with low power consumption by low on-resistance** 1
Small signal MOSFET
- **Supply the power with low noise** 2
Small surface mount LDO regulator
- **Suitable for high efficiency power supply switching** 3
U-MOS Series N-ch MOSFET
- **Built-in protection function against short circuit, over current, over voltage, etc.** 7
Electronic fuse (eFuse IC)
- **Small package and built-in over voltage protection function** 8
N-ch MOSFET gate driver IC

Surveillance Camera Detail of power supply section (2)

SD card section



Power supply (RTC)



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

Criteria for device selection

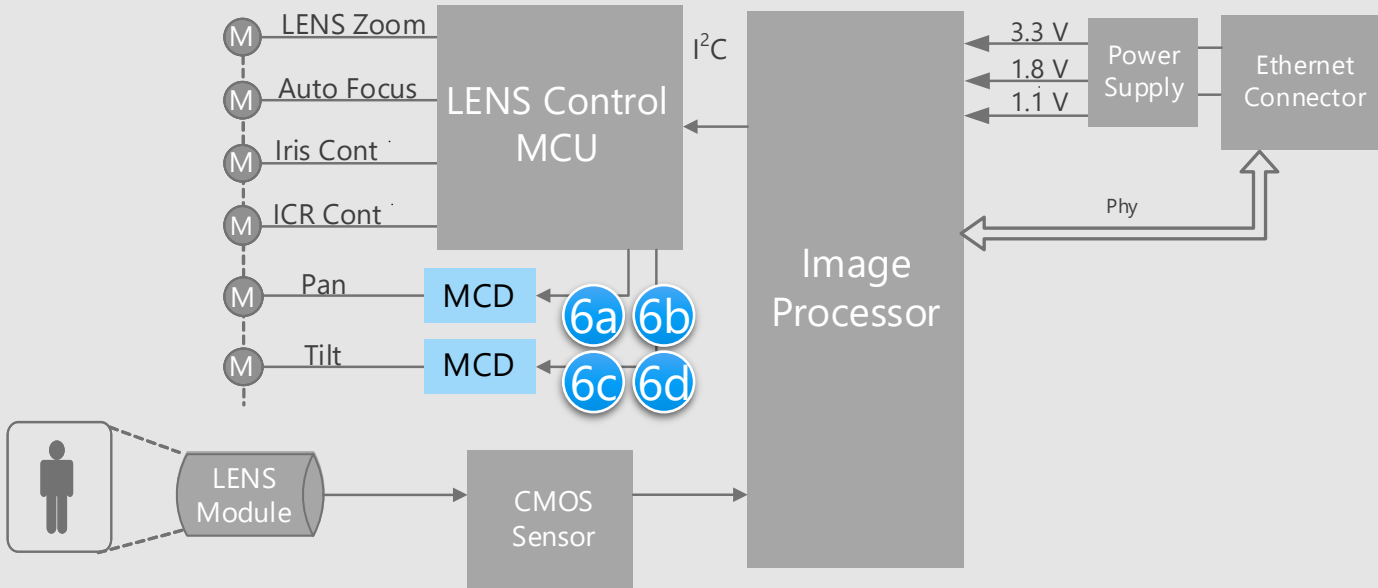
- The PSRR (Power Supply Rejection Ratio) of LDO regulator is important for SD memory card I/F.
- TVS diodes are suitable for protecting high speed signal lines.
- Schottky barrier diodes with low loss are suitable for preventing current backflow.

Proposals from Toshiba

- **Supply the power with low noise**
Small surface mount LDO regulator (2)
- **Prevent circuit malfunctions by absorbing static electricity from external terminals**
TVS diode (4a, 4b)
- **High speed, low loss, small surface mounting**
Schottky barrier diode (5)

Surveillance Camera Detail of camera motion section

Detail of camera motion section



Criteria for device selection

- Small package products contribute to the reduction of circuit board area.

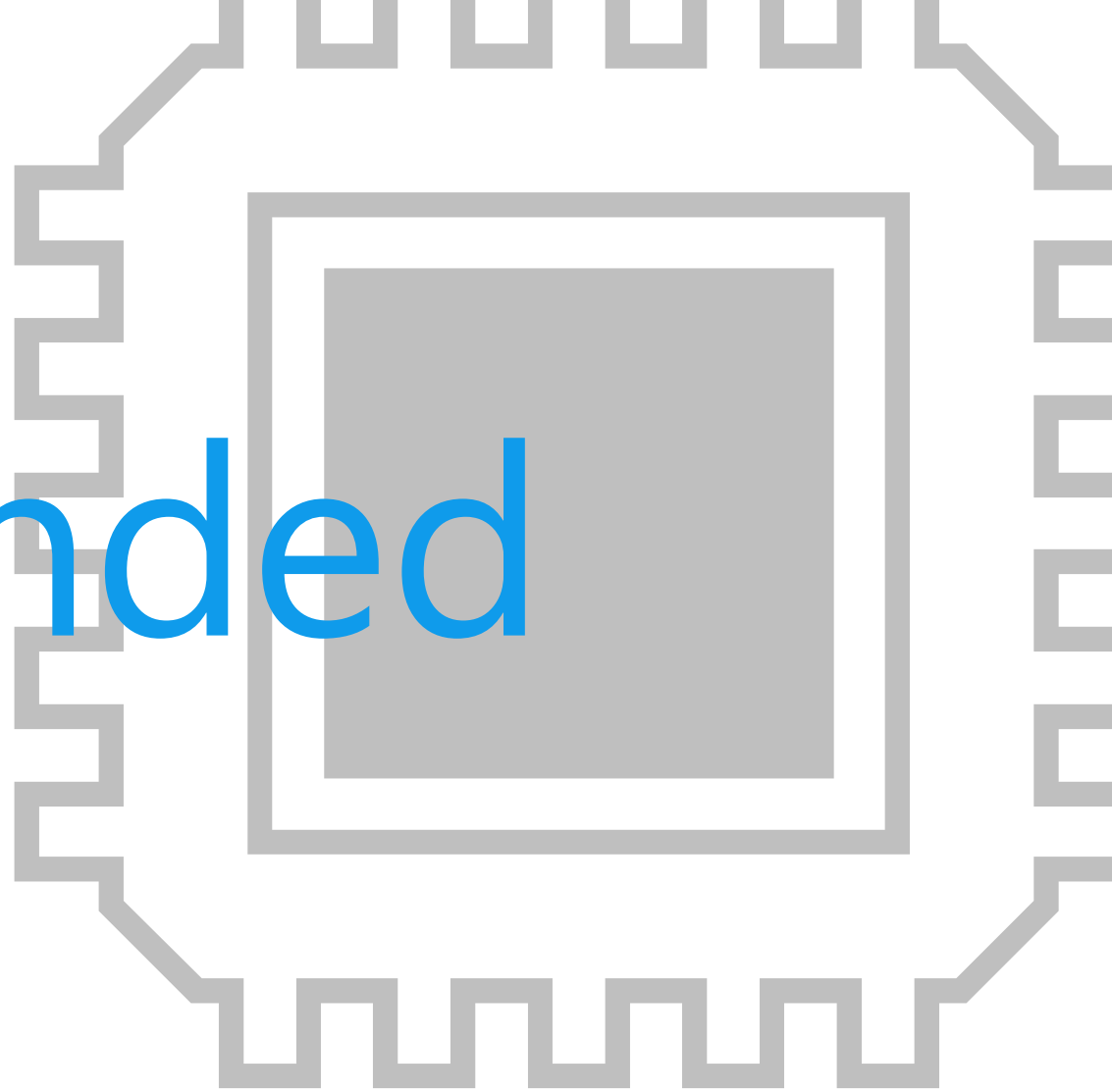
Proposals from Toshiba

- **Low on-resistance and high efficient stepping motor control**
Motor control driver



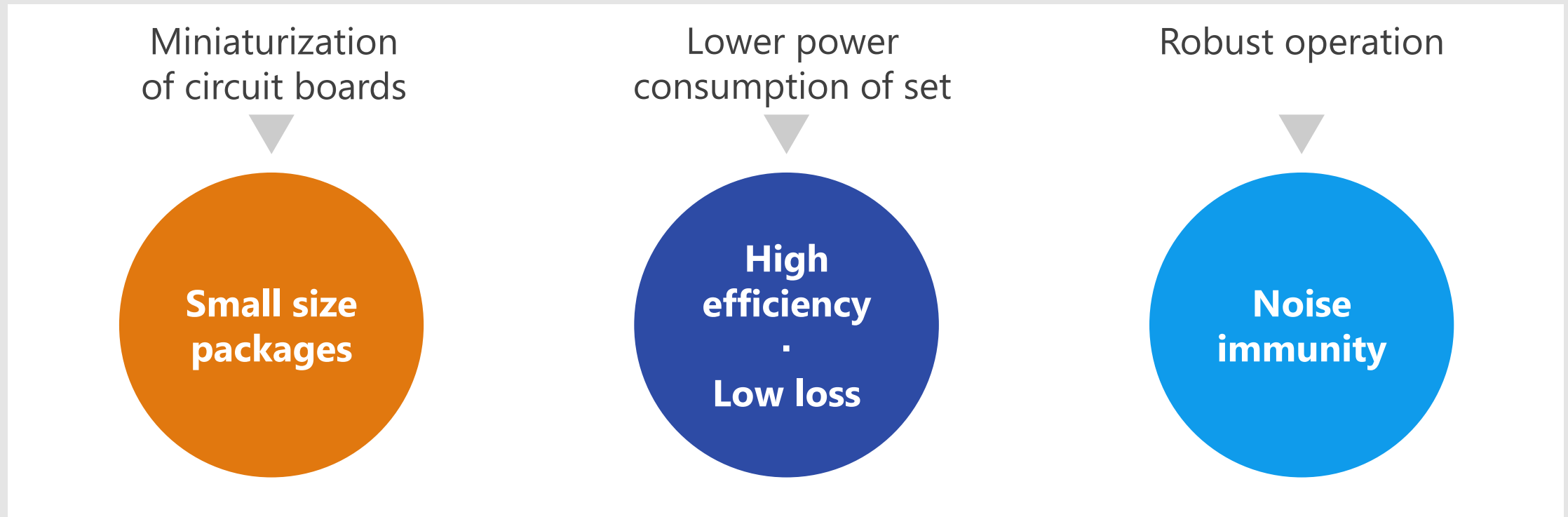
* [Click the number in the circuit diagram to jump to the detailed description page](#)

Recommended Devices



Device solutions to address customer needs

As described above, in the design of surveillance cameras, “**Miniaturization of circuit boards**”, “**Low power consumption of set**” and “**Robust operation**” are important factors. Toshiba’s proposals are based on these three solution perspectives.



Device solutions to address customer needs

Small size packages

High efficiency
·
Low loss

Noise immunity

1	Small signal MOSFET	●	●	
2	Small surface mount LDO regulator	●	●	●
3	U-MOS Series N-ch MOSFET	●	●	●
4	TVS diode	●	●	●
5	Schottky barrier diode	●	●	
6	Motor control driver	●	●	
7	Electronic fuse (eFuse IC)	●	●	
8	N-ch MOSFET gate driver IC	●	●	

1 Small signal MOSFET

SSM3K376R

Small size packages

High efficiency
·
Low loss

Noise immunity

Value provided

Suitable for power management switches and contributes to miniaturization.

1 Low voltage operation

Operates down to $V_{GS} = 1.8\text{ V}$

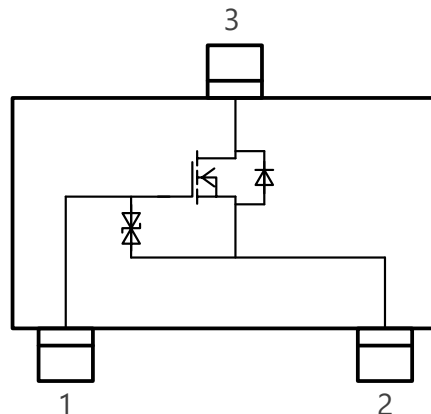
2 Low on-resistance

By reducing on-resistance between the drain and source, heat generation and power consumption can be kept low.


3 Small package

Sealed in SOT-23F package.

SSM3K376R
Internal connection diagram



Lineup

Part number	SSM3K376R
Package	SOT-23F 
Polarity	N-ch
V_{DSS} [V]	30
I_D [A]	4
P_D [W]	1
$R_{DS(ON)}$ (Max) [$m\Omega$] @ $V_{GS} = 4.5\text{ V}$	56

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Value provided

Wide line up from general purpose type to small package type are provided. Contribute to realize a stable power supply not affected by fluctuation of battery.

1 Low dropout voltage

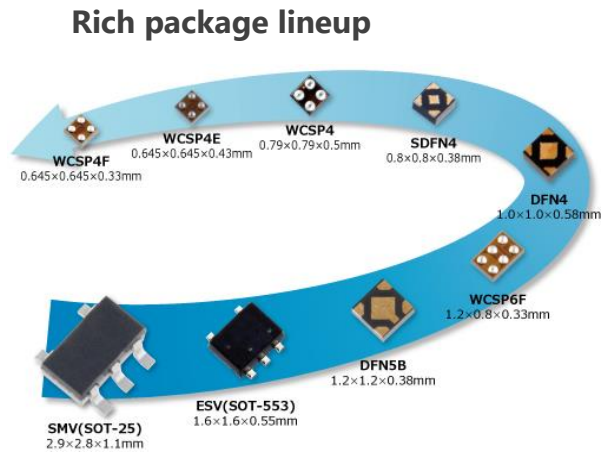
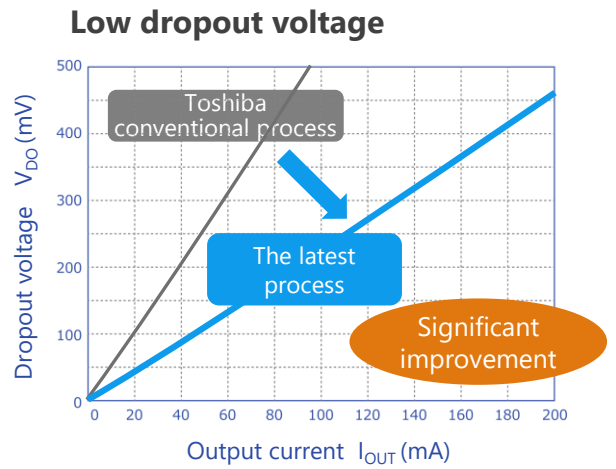
The originally developed latest process significantly improved the dropout voltage characteristics.

2 High PSRR Low output noise voltage

Many product series that realize both high PSRR (Power Supply Rejection Ratio) and low output noise voltage characteristics are provided. They are suitable for stable power supply for analog circuit.

3 Low current consumption

0.34 μA of $I_{B(ON)}$ is realized by utilizing CMOS process and unique circuit technology. (TCR3U Series)



Lineup

Part number	TCR15AG Series	TCR13AG Series	TCR8BM Series	TCR5BM Series	TCR5RG Series	TCR3RM Series	TCR3U Series	TCR2L Series	TAR5 Series
Features	Low dropout voltage High PSRR				High PSRR Low noise Low current consumption		Low current consumption		15 V Input voltage Bipolar type
I_{OUT} (Max) [A]	1.5	1.3	0.8	0.5	0.3		0.2		
PSRR (Typ.) [dB] @f = 1 kHz	95	90	98	98	100	100	70	-	70
I_B (Typ.) [μA]	25	56	20	19	7	7	0.34	1	170

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(Note) Toshiba internal comparison with TCR3U series.

Value provided

Suitable for switching regulators and contributes to miniaturization.

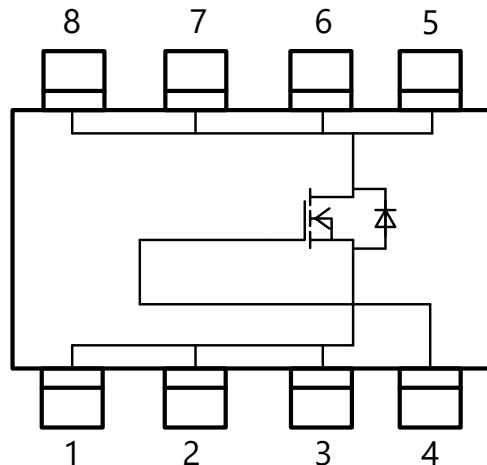
1 Fast switching speed

t_{on} (Typ.) = 14 [ns]
 t_{off} (Typ.) = 19 [ns]


2 Low on-resistance

By reducing on-resistance between the drain and source, heat generation and power consumption can be kept low.

TPH5900CNH
Internal connection diagram



Lineup

Part number	TPH5900CNH
Package	SOP Advance 
Polarity	N-ch
V_{DSS} [V]	150
I_D [A]	9
P_D [W]	42
$R_{DS(ON)}$ (Max) [mΩ] @ $V_{GS} = 10$ V	59

[Return to Block Diagram TOP](#)

Value provided

TVS diode absorbs static electricity from external terminals, prevents circuit malfunction and protects devices.

1 Improved ESD pulse absorption

Improved ESD absorption to our conventional products. (50 % reduction in operating resistance)
Both low operating resistance and low capacitance are realized and ensures high signal protection performance and signal quality.

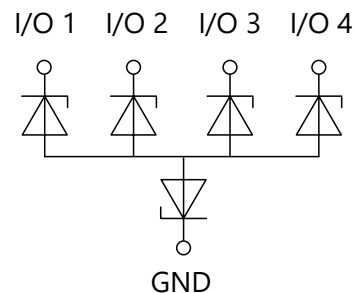
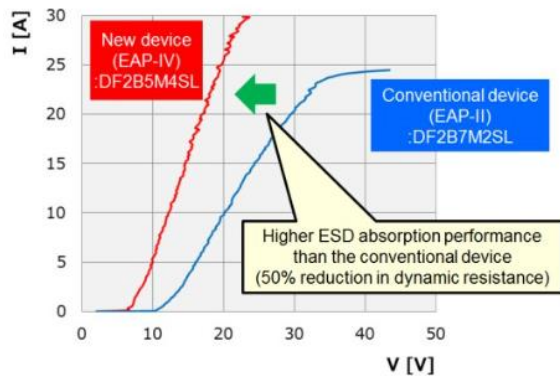
2 Suppress ESD energy by low clamp voltage

Protection of connected circuits/devices was realized by using proprietary technology.



3 Suitable for high density mounting

A variety of small packages are available.

ESD Pulse Absorption Performance
Toshiba internal comparison



Lineup

Part number	DF10G5M4N	DF10G6M4N
Package	DFN10 	DFN10 
V_{ESD} [kV]	±20	±20
V_{RWM} (Max) [V]	3.6	5.5
C_t (Typ.) [pF]	0.2	0.2
R_{DYN} (Typ.) [Ω]	0.5	0.5

(Note) This product is designed for ESD protection purpose and cannot be used for purposes other than ESD protection.

[Return to Block Diagram TOP](#)

Value provided

TVS diode absorbs static electricity from external terminals, prevents circuit malfunction and protects devices.

1 Improved ESD pulse absorption

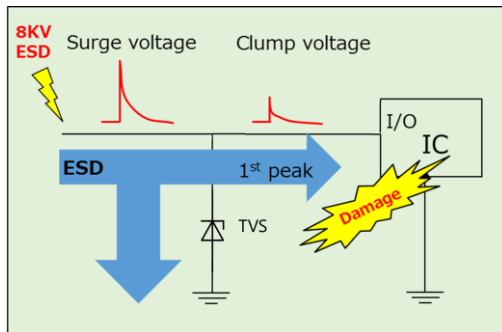
Improved ESD absorption to our conventional products. Both low operating resistance and low capacitance can realize and ensure high signal protection performance and signal quality.

2 Suppress ESD energy by low clamp voltage

Protection of connected circuits/devices was realized by using proprietary technology.

3 Suitable for high density mounting

A variety of small packages are available.



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	SL2 		
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 designed for ESD protection purpose and cannot be used for purposes other than ESD protection.

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5 Schottky barrier diode

CUS10F30 / CTS05F40

Small size packages

High efficiency
·
Low loss

Noise immunity

Value provided

Can be applied to various applications which requires high speed and low loss, and contributes to miniaturization.

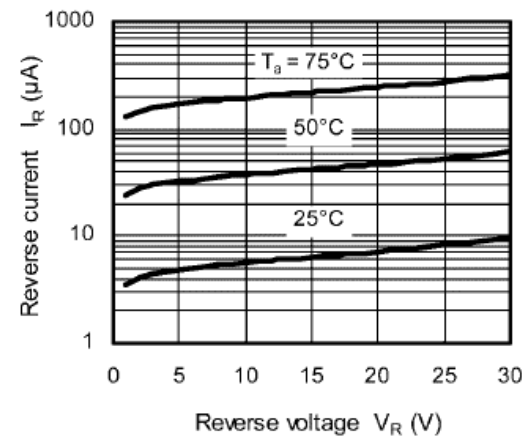
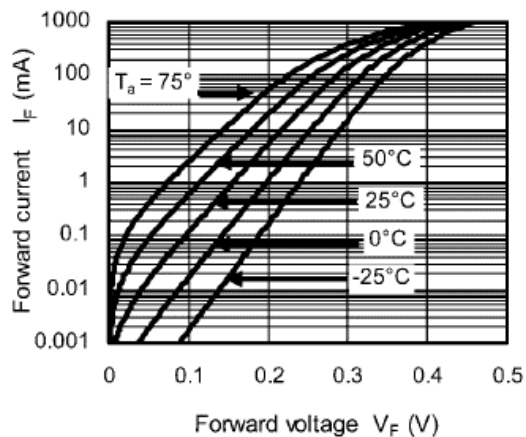
1 Fast switching

Suitable for fast switching applications.



2 Small package

Sealed in USC/CST2 package.

CUS10F30 Characteristics



Lineup

Part number	CUS10F30	CTS05F40
Package	USC 	CST2 
I_O [A]	1.0	0.5
V_R [V]	30	40
V_F (Typ.) [V] @ $I_F = 0.1$ A	0.28	0.40
I_R (Max) [μ A] @ $V_R = 10$ V	50	15

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Value provided

It is possible to drive two stepping motors or four brushed DC motors.

1 Four products lineup

There are two control types, clock input and phase signal input as the I/F. Also, there are two package types, SSOP and QFN, respectively.

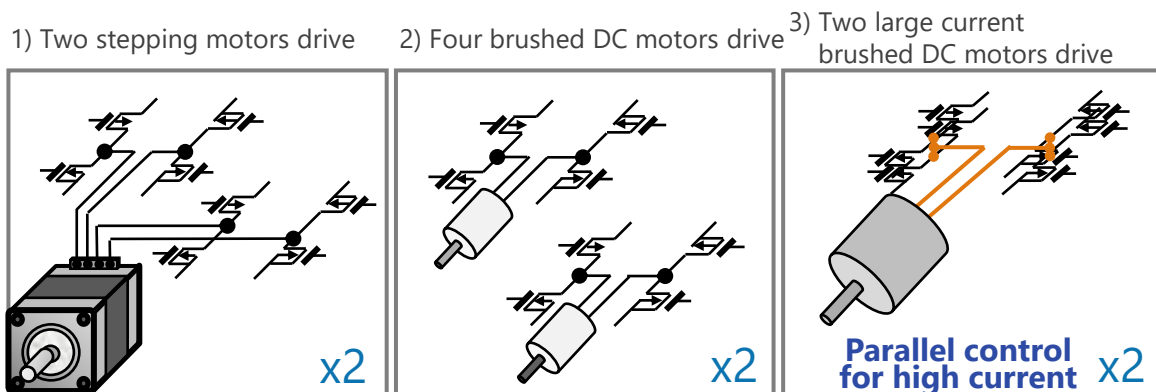
2 Error detection

It is equipped with various error detection functions such as over current detection (ISD), thermal shutdown (TSD) and power on reset (POR).

3 Three selectable drive modes

Three selectable H bridge combination according to motor type and required current as follows: 1) two stepping motors drive, 2) four brushed DC motors drive, 3) two large current brushed DC motors drive

■ Three selectable drive modes



Lineup

Part number	TC78S121FNG/FTG	TC78S122FNG/FTG
Package	HTSSOP48-P-300-0.50 / QFN48-P-0707-0.50	
Package size	12.5 x 8.1 x 1.2 mm / 7 x 7 x 0.9 mm	
Absolute maximum ratings	40 V / 2.0 A	
Output ON-resistance (H+L) (Typ.)	0.6 Ω	
Functions	<ul style="list-style-type: none"> Over current detection, over heat detection and power on reset Two lineups support clock input for stepping motor control and phase input Single power supply without external 5 V input 	

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Value provided

Support for low voltage motor driving (2.5 V (Min)) with low power consumption.**1 Low voltage operation**

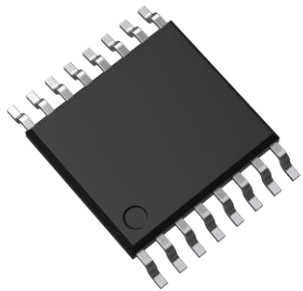
Motor driving voltage is 2.5 V (Min) for low voltage applications such as battery operation devices.

2 Low current consumption

Standby current is below 2 μ A (IC total) for power saving of devices.

3 Error detection functions

Over current detection (ISD), thermal shutdown (TSD) and under voltage lockout (UVLO) are available.



P-TSSOP16-0505-0.65-001 package
(5.0 × 6.4 × 1.2 mm)



P-VQFN16-0303-0.50-001 package
(3.0 × 3.0 × 0.9 mm)

Lineup

Part number	TC78H670FTG	TC78H660FNG	TC78H660FTG
V_M [V]	18	18	18
I_{out} [A]	2.0	2.0	2.0
$R_{on(upper\ and\ lower\ sum)}$ (Typ.) [Ω]	0.48	0.48	0.48
Control interface	MODE inputs	IN/PHASE inputs	IN/PHASE inputs
Step	2phase/1-2phase excitation	2phase/1-2phase excitation	2phase/1-2phase excitation
Motor driving voltage	2.5 V (Min) RS resistor less	2.5 V (Min) RS resistor less	2.5 V (Min) RS resistor less
Error detection function	Thermal shutdown, over current, under voltage lockout, load open	Thermal shutdown, over current, under voltage lockout	Thermal shutdown, over current, under voltage lockout
Package	P-VQFN16-0303-0.50-001	P-TSSOP16-0505-0.65-001	P-VQFN16-0303-0.50-001

[Return to Block Diagram TOP](#)

Value provided

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

1 High voltage and high current

Supports a maximum rated voltage of 40 V and a maximum rated current of 2 A. The low output on-resistance realizes low power consumption, which reduces heat generation.

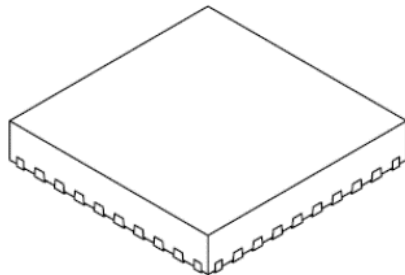
2 Small size and high heat dissipation

The package uses a high heat dissipation QFN with an E-Pad on the bottom. Heat is dissipated by connecting the E-Pad part to the board GND. It also contributes to the reduction of board area.

3 Error detection functions

Over current detection (ISD), thermal shutdown (TSD) and under voltage lockout (UVLO) are available.

Package



VQFN32-0505-0.50-004 package
(5 x 5 mm)

Lineup

	Part number	TB67S539FTG
Absolute maximum ratings	Output voltage [V]	40
	Output current [A]	2.0
	Output ON-resistance (H+L) (Typ.) [Ω]	0.8
	Driving type	PWM constant current drive
	Excitation mode	full, half, quarter, 1/8, 1/16 and 1/32 step resolutions
	Feature	Clock type
	Error detection function	TSD, ISD, UVLO
	Package	VQFN32-0505-0.50-004

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Value provided

It is possible to drive one stepping motor or two brushed DC motors.

1 Small package

The VQFN16 package contributes to reduce foot print areas.

2 Protection and error detection

It is equipped with a through current prevention function and various error detection functions such as over current detection (ISD), thermal shutdown (TSD) and under voltage lockout (UVLO).

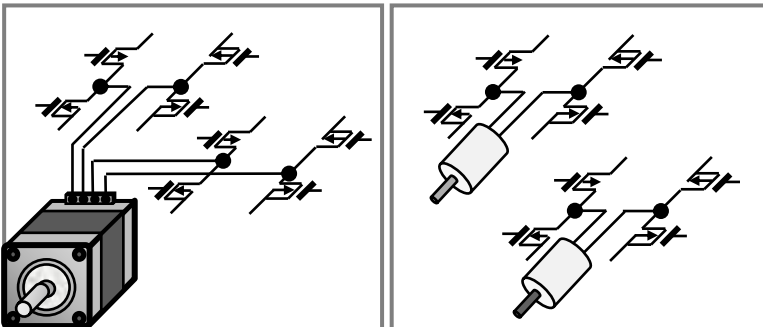
3 Two selectable drive modes

Two selectable H bridge combination according to motor type and required current as follows:

- 1) one stepping motor drive
- 2) two brushed DC motors drive

Two selectable drive modes

1) One stepping motor drive 2) Two brushed DC motors drive



Lineup

Part number	TC78H653FTG
Package	P-VQFN16-0303-0.50-001
Package size	3.0 x 3.0 x 0.9 mm
Absolute maximum ratings	8 V / 4.0 A
Output ON-resistance (H+L) (Typ.)	0.22 Ω
Functions	<ul style="list-style-type: none"> • Through current preventing function • Over current detection (ISD), thermal shutdown (TSD) and under voltage lockout (UVLO)

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Value provided

Electronic fuse (eFuse IC) can be used repeatedly to protect circuits from abnormal conditions such as overcurrent and overvoltage.

1 Can be used repeatedly

When overcurrent flows through the electronic fuse (eFuse IC), the internal detection circuit operates and switches off the internal MOSFET. It is not destroyed by a single overcurrent and can be used repeatedly.

2 IEC 62368-1 certified

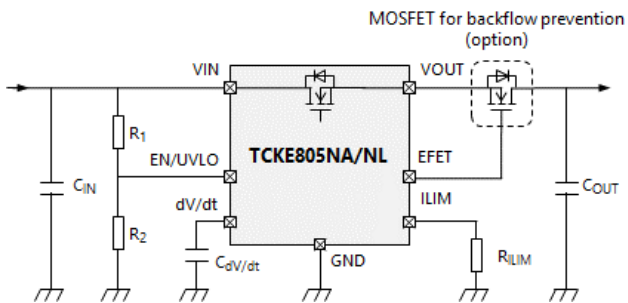
Toshiba's eFuse ICs are certified to the international safety standard IEC 62368-1 (G9: Integrated circuit (IC) current limiters) and contribute to robust protection and simplification of circuit design.

3 Rich protection functions

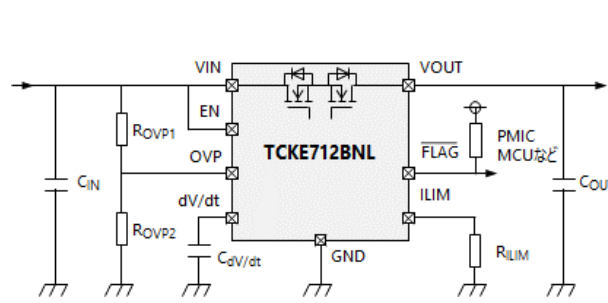
TCKE8 Series: short-circuit protection, overcurrent protection, overcurrent clamp function, overvoltage clamp function, thermal shut down, inrush current suppression, backflow prevention (optional), etc.

TCKE7 Series: short-circuit protection, overcurrent protection, overvoltage protection, thermal shut down, FLAG signal output, backflow prevention (built-in), etc.

Reference circuit example of TCKE8 Series



Reference circuit example of TCKE7 Series



Line up

Part number	TCKE800NA/NL	TCKE805NA/NL	TCKE812NA/NL	TCKE712BNL
Package	WSO10B 3.0 x 3.0 x 0.75 mm			WSO10 3.0 x 3.0 x 0.75 mm
V _{IN} [V]	4.4 to 18			4.4 to 13.2
R _{ON} (Typ.) [mΩ]	28			53
Return function	NA: Automatic return NL: Latch type (external signal control)			Latch type (external signal control)
V _{OVC} (Typ.) [V]	-	6.04	15.1	Adjustable

[Return to Block Diagram TOP](#)

8 N-ch MOSFET gate driver IC

TCK4xx Series

Small size packages

High efficiency
·
Low loss

Noise immunity

Value provided

It is N-ch MOSFET gate driver IC with OVP [Note 1] function. It contributes to reduction of power consumption and miniaturization of load switch circuit.

[Note 1] OVP: Over Voltage Protection

1 Three types of N-ch MOSFET can be driven

The following types of MOSFET can be driven:
 TCK40xG: Single high side connection
 Common source connection
 TCK42xG: Single high side connection
 Common drain connection

2 Wide operating voltage range and various OVLO [Note 2] threshold voltage

Operating voltage V_{opr} : 2.7 to 28 V
 Maximum input voltage: 40 V
 V_{IN_OVLO} [Note 3] lineups suitable for 5 to 24 V power supply line.

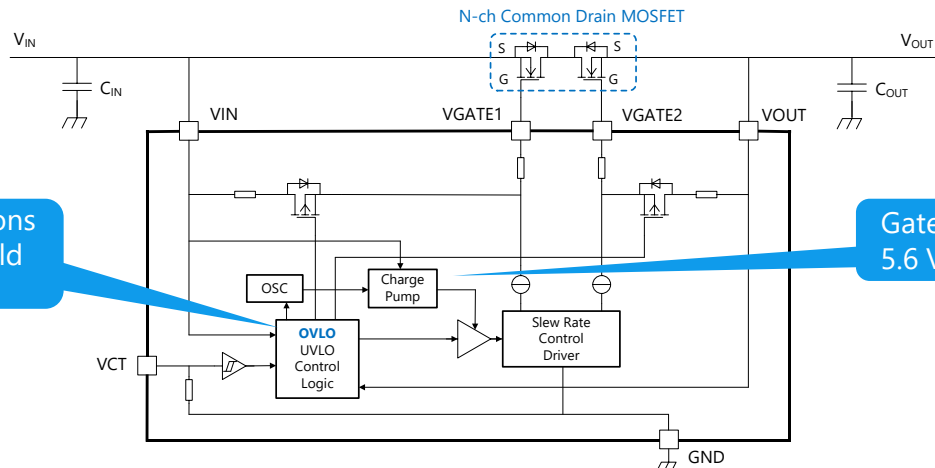
[Note 2] OVLO: Over Voltage Lock Out
 [Note 3] V_{IN_OVLO} : V_{IN} OVLO threshold

3 Small packages



It contributes to reduction of the mounting area and miniaturization of the circuit board:

WCSP6E: 1.2 x 0.8 mm, t: 0.55 mm
 WCSP6G: 1.2 x 0.8 mm, t: 0.35 mm

Circuit example of TCK42xG with N-ch common drain connection MOSFET



Lineup

Part number	V_{IN_OVLO} Min / Max [V]	V_{GS} Typ. / Max [V]	N-ch MOSFET type can be driven	Package
TCK401G	Over 28	Max 10 ($V_{IN} \geq 12$ V)	Single high side	WCSP6E 
TCK402G			Common Source	
TCK420G	26.50 / 28.50	10 / 11 ($V_{IN} \geq 5$ V)	Single high side Common Drain	WCSP6G 
TCK421G	22.34 / 24.05			
TCK422G	13.61 / 14.91			
TCK423G	13.61 / 14.91	5.6 / 6.3		
TCK424G	10.35 / 11.47			
TCK425G	5.76 / 6.87			

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If you are interested in these products and have questions or comments about any of them, please do not hesitate to contact us below:

Contact address: <https://toshiba.semicon-storage.com/ap-en/contact.html>



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