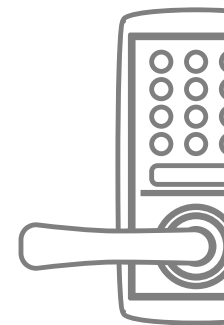
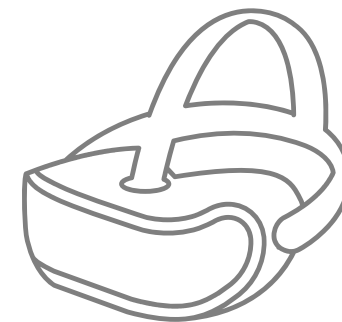
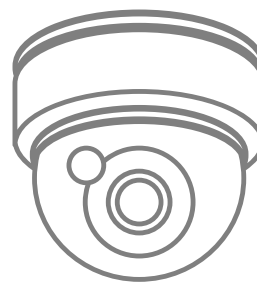
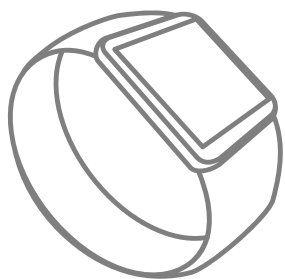
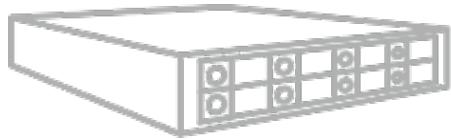
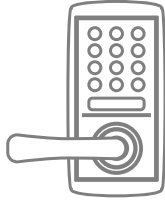
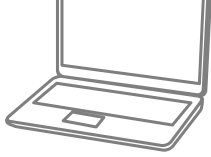


Server

Solution Proposal by Toshiba

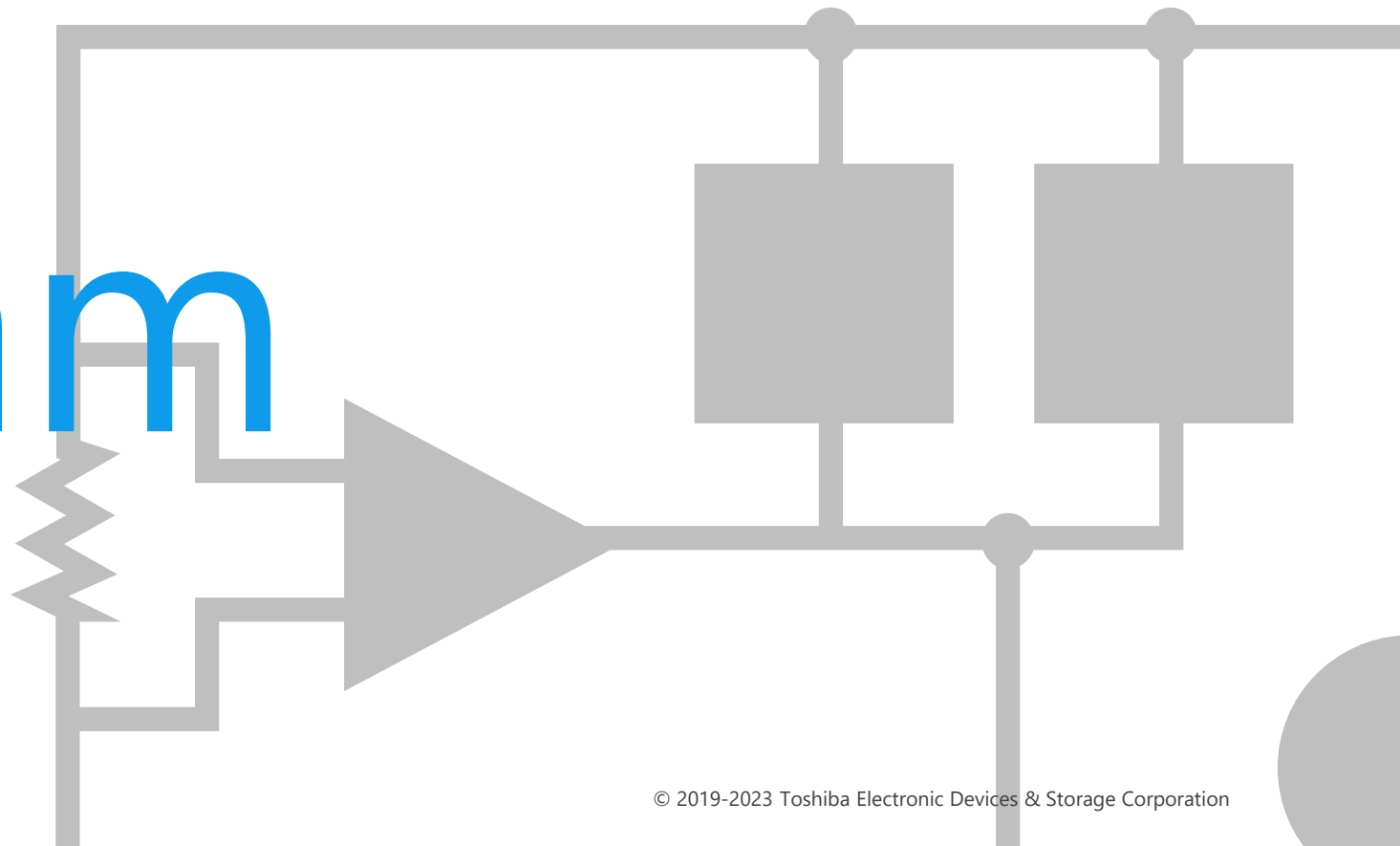




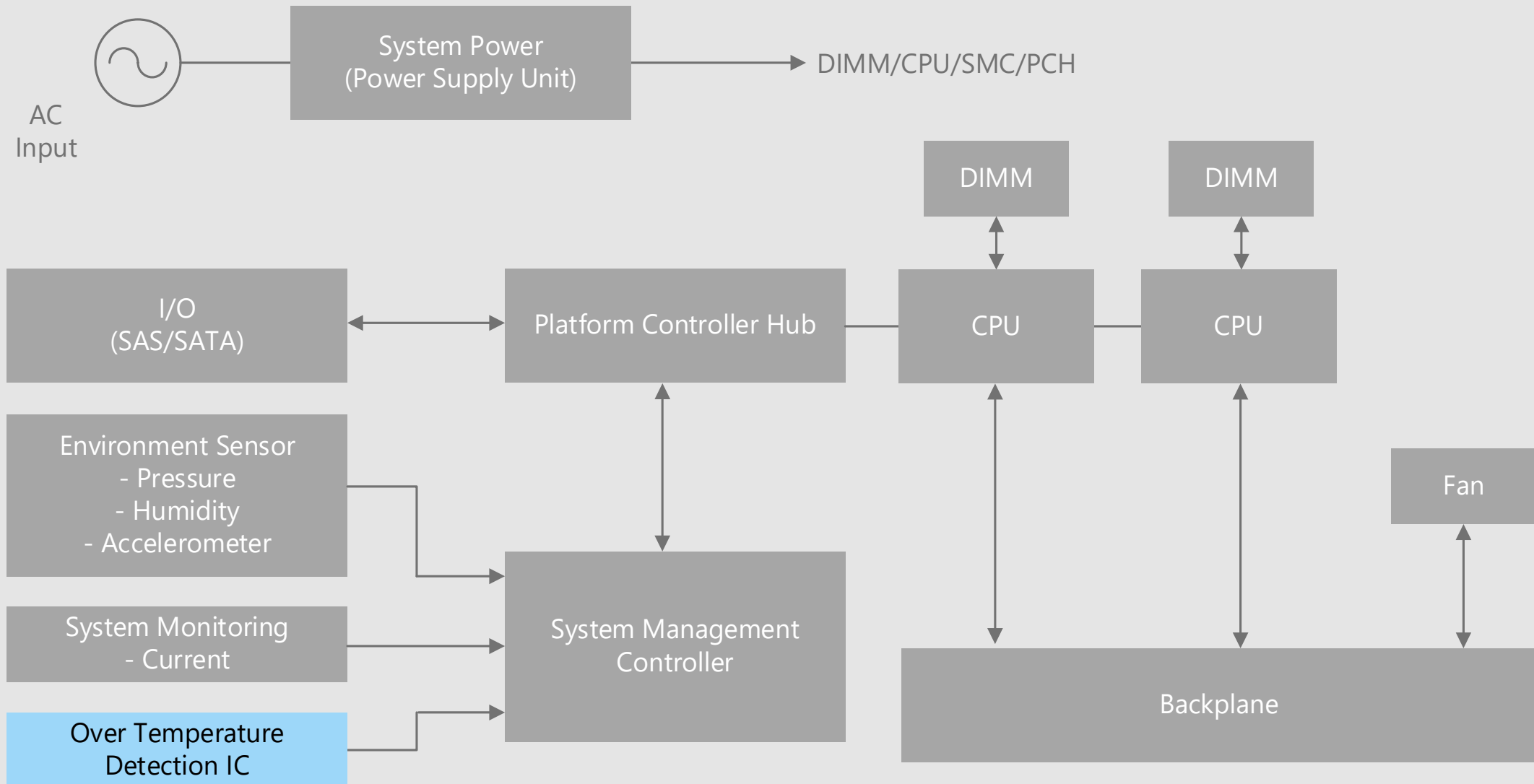
Toshiba Electronic Devices & Storage Corporation provides comprehensive device solutions to customers developing new products by applying its thorough understanding of the systems acquired through the analysis of basic product designs.



Block Diagram



Server Overall block diagram

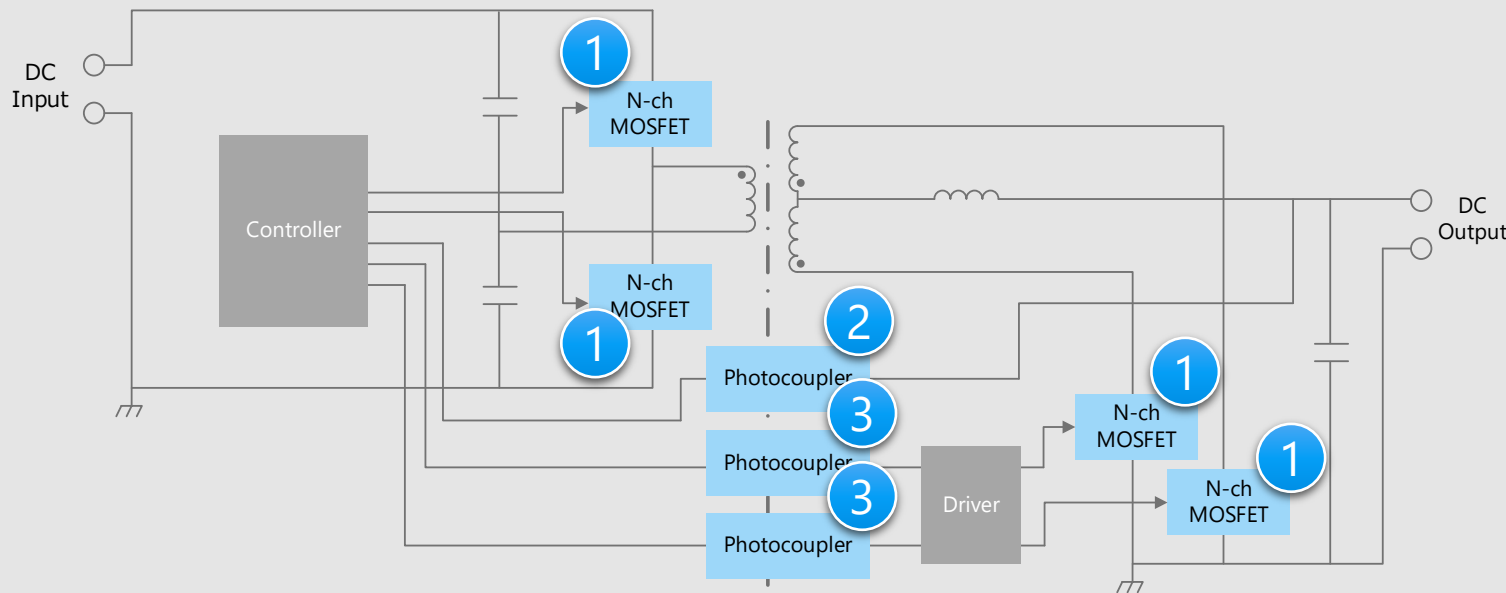


Server Detail of power supply circuit (1)

DC-DC converter for 48 V system

Power supply for 1.2 V and 100 A output isolated DC-DC converters

($V_{IN(DC)} = 40$ to 59.5 V, $V_{OUT} = 1.2$ V, $I_{OUT} = 100$ A)



Reference Design from here →

[Click Here](#)

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

Criteria for device selection

- A MOSFET having a high speed and a low on-resistance is suitable for the DC-DC power supply.
- A transistor output photocoupler is typically used for feeding back voltages to the primary in the DC-DC power supply.
- The IC output photocoupler for high speed communication is used for signal isolation.

Proposals from Toshiba

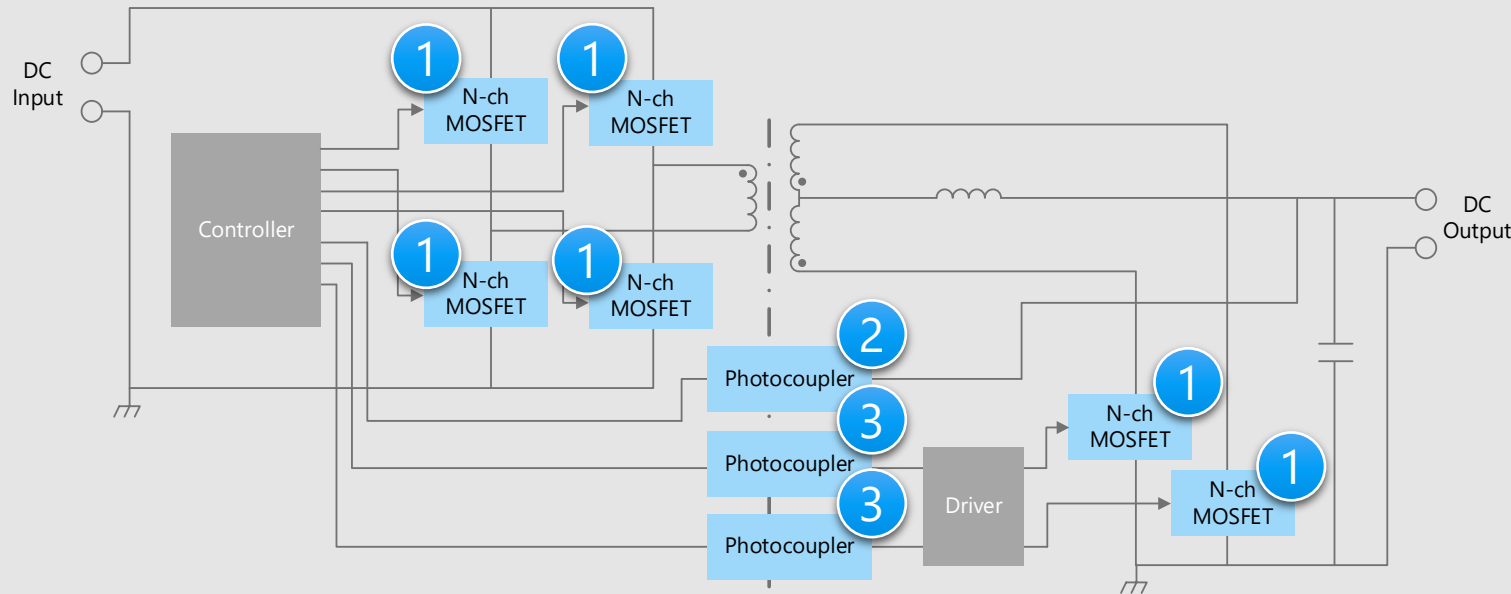
- **Suitable for efficient switching of power supply**
U-MOS Series MOSFET 1
- **Realize high gain and high speed isolated signal transmission**
Transistor output photocoupler 2
IC output photocoupler for high speed communication 3

Server Detail of power supply circuit (2)

DC-DC converter for 48 V system

300 W Isolated DC-DC Converters Power Supply

($V_{IN(DC)} = 36 \text{ to } 75 \text{ V}$, $V_{OUT} = 12.0 \text{ V}$, $I_{OUT} = 25 \text{ A}$)



Reference Design from here →

[Click Here](#)

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

Criteria for device selection

- A MOSFET having a high speed and a low on-resistance is suitable for the DC-DC power supply.
- A transistor output photocoupler is typically used for feeding back voltages to the primary in the DC-DC power supply.
- The IC output photocoupler for high speed communication is used for signal isolation.

Proposals from Toshiba

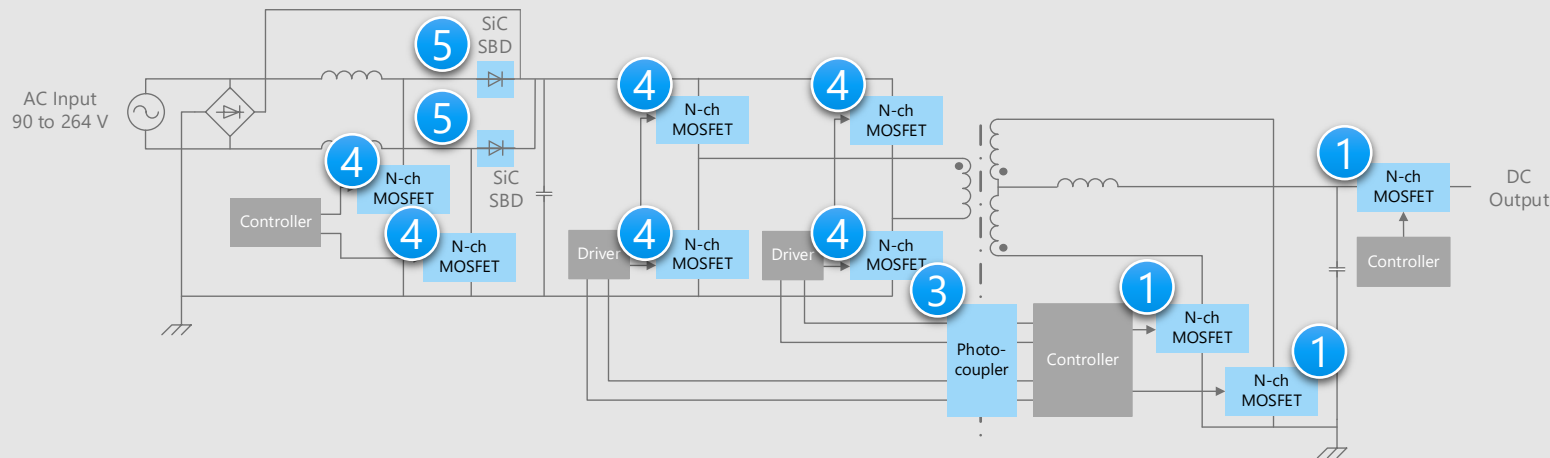
- **Suitable for efficient switching of power supply**
U-MOS Series MOSFET 1
- **Realize high gain and high speed isolated signal transmission**
Transistor output photocoupler 2
IC output photocoupler for high speed communication 3

Server Detail of power supply circuit (3)

AC-DC converter for 12 V system (bridgeless PFC)

1.6 kW power supply

($V_{IN(AC)} = 90 \text{ to } 264 \text{ V}$, $V_{OUT} = 12.0 \text{ V}$, $I_{OUT} = 66.7 \text{ A} / 133 \text{ A}$)



Reference Design of the power supply circuit from here →

[Click Here](#)

Reference Design of PFC circuit from here →

[Click Here](#)

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

Criteria for device selection

- A MOSFET having a high voltage and a low on-resistance is suitable for the PFC circuit of the AC-DC power supply.
- A transistor output photocoupler is typically used for feeding back voltages to the primary in the AC-DC power supply.
- The IC output photocoupler for high speed communication is used for signal isolation.

Proposals from Toshiba

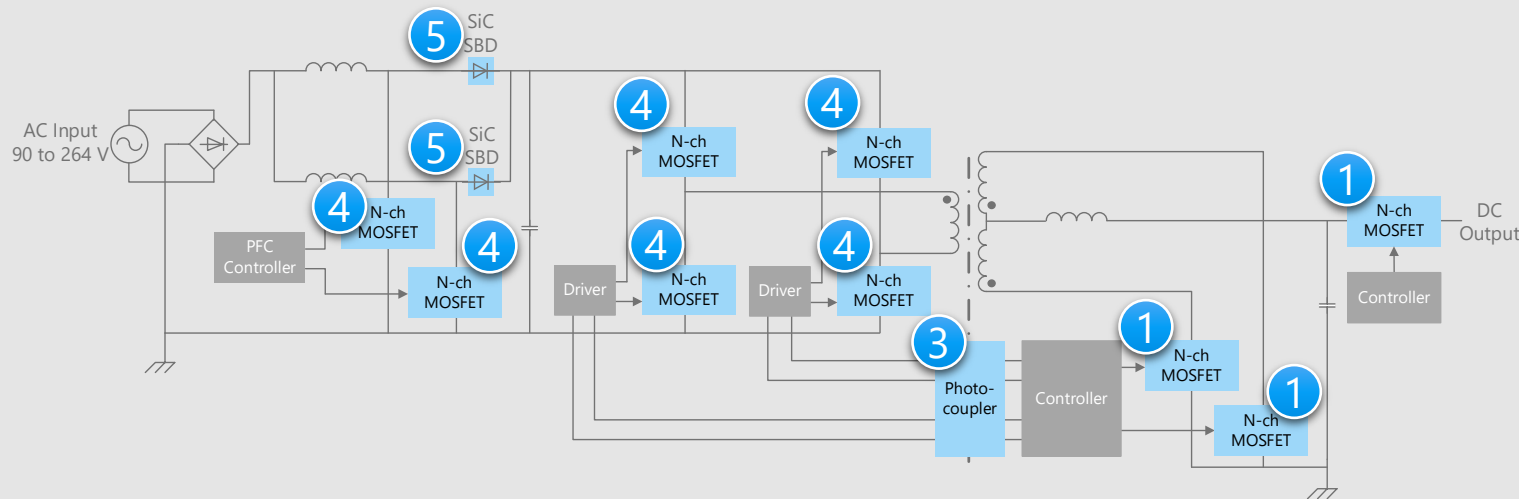
- **Suitable for efficient switching of power supply**
U-MOS Series MOSFET 1
- **Realize high gain and high speed isolated signal transmission**
IC output photocoupler for high speed communication 3
- **Suitable for efficient switching of power supply**
DTMOS Series MOSFET 4
- **Preferred for high efficiency and miniaturization of power supply**
SiC Schottky barrier diode 5

Server Detail of power supply circuit (4)

AC-DC converter for 12 V system (interleaved PFC)

1.6 kW power supply

($V_{IN(AC)} = 90 \text{ to } 264 \text{ V}$, $V_{OUT} = 12.0 \text{ V}$, $I_{OUT} = 66.7 \text{ A} / 133 \text{ A}$)



Reference Design of the power supply circuit from here →

[Click Here](#)

Reference Design of PFC circuit from here →

[Click Here](#)

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

Criteria for device selection

- A MOSFET having a high voltage and a low on-resistance is suitable for the PFC circuit of the AC-DC power supply.
- A transistor output photocoupler is typically used for feeding back voltages to the primary in the AC-DC power supply.
- The IC output photocoupler for high speed communication is used for signal isolation.

Proposals from Toshiba

- **Suitable for efficient switching of power supply**
U-MOS Series MOSFET
- **Realize high gain and high speed isolated signal transmission**
IC output photocoupler
for high speed communication
- **Suitable for efficient switching of power supply**
DTMOS Series MOSFET
- **Preferred for high efficiency and miniaturization of power supply**
SiC Schottky barrier diode

1

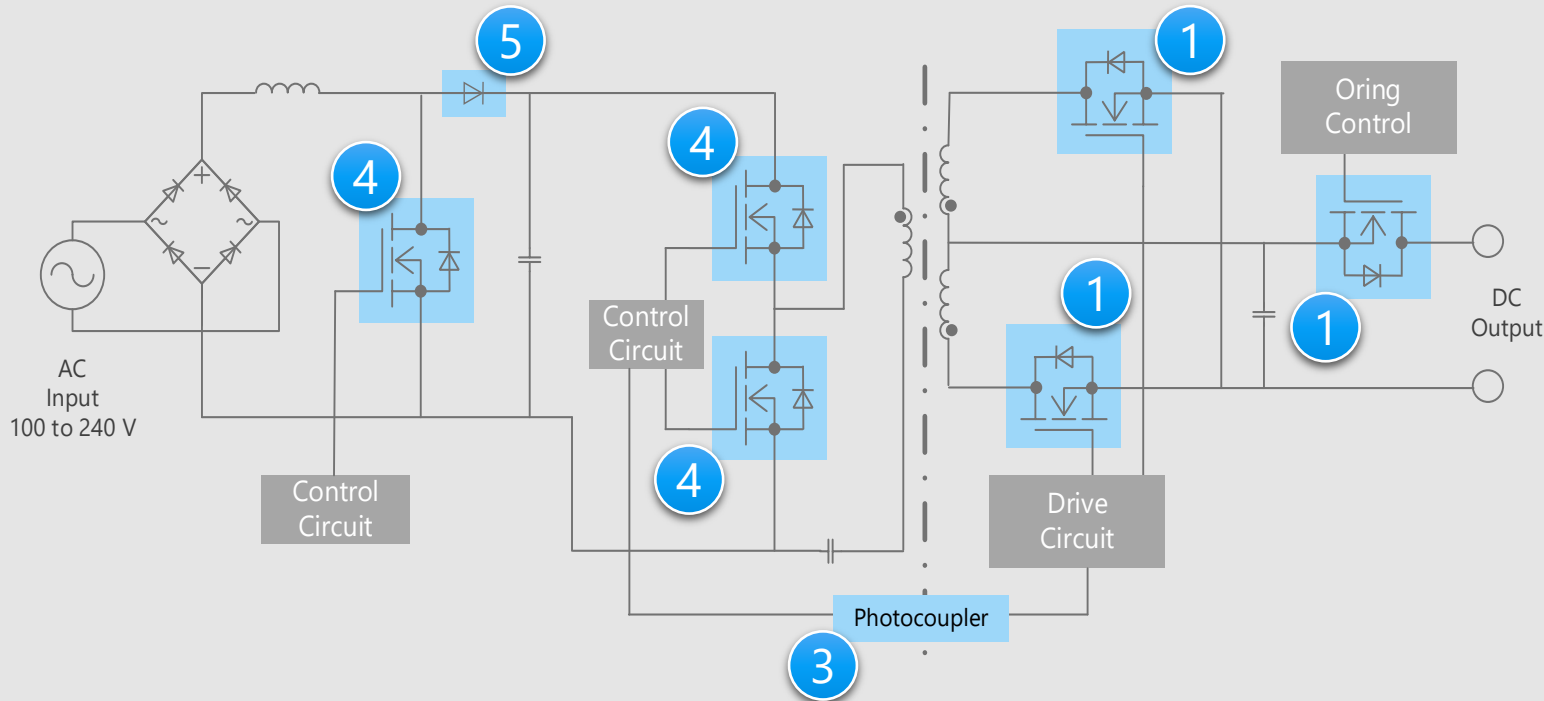
3

4

5

Server Detail of power supply circuit (5)

AC-DC converter for 48 V system



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

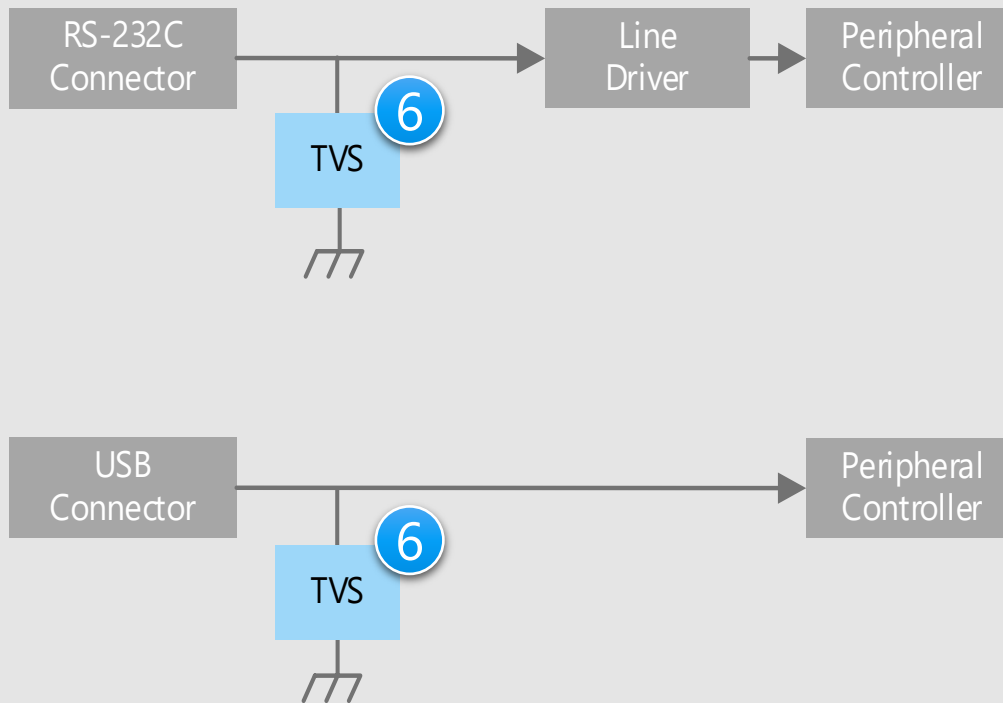
Criteria for device selection

- A MOSFET having a high voltage and a low on-resistance is suitable for the PFC circuit of the AC-DC power supply.
- A transistor output photocoupler is typically used for transmitting control signals to the secondary side in the AC-DC power supply.
- The IC output photocoupler for high speed communication is used for signal isolation.

Proposals from Toshiba

- **Suitable for efficient switching of power supply**
U-MOS Series MOSFET ①
- **Realize high gain and high speed isolated signal transmission**
IC output photocoupler for high speed communication ③
- **Suitable for efficient switching of power supply**
DTMOS Series MOSFET ④
- **Preferred for high efficiency and miniaturization of power supply**
SiC Schottky barrier diode ⑤

Peripheral interface circuits



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

Criteria for device selection

- To improve the reliability of the set, ESD protection is required for connectors that may come into contact with the human body.
- Small, low- C_t TVS diodes are suitable for ESD protection.

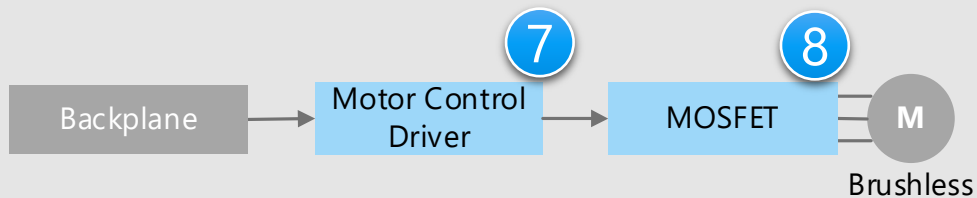
Proposals from Toshiba

- **Absorb static electricity from external terminals to prevent malfunction of the circuit.**

TVS diode

6

Fan drive circuit



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

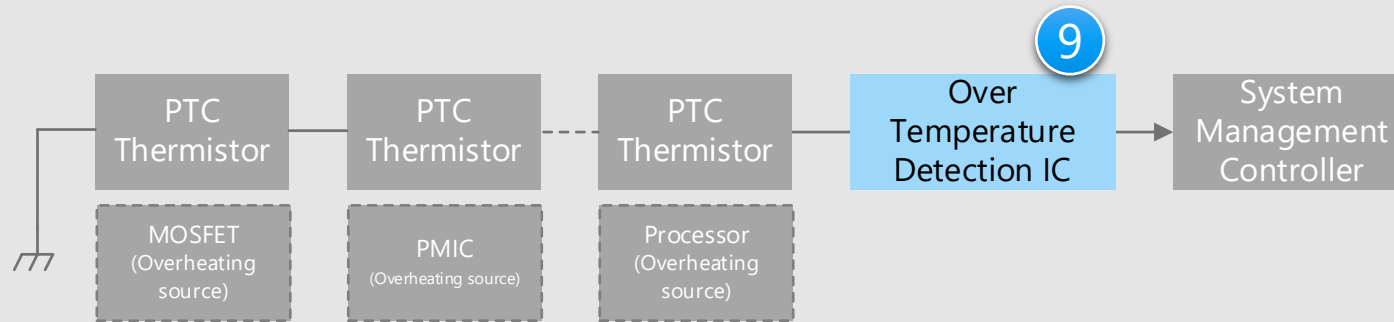
Criteria for device selection

- Using brushless DC motor drivers, three-phase brushless DC motors can be easily controlled

Proposals from Toshiba

- **Very easy control of motors**
Three-phase brushless DC motor driver IC
- **Suitable for high efficiency switching**

Over temperature monitoring circuit



Criteria for device selection

- Over temperature monitoring is required at multiple points on the circuit board such as MOSFET, PMIC and Processor.
- Low power dissipation of set can be realized by using the over temperature detection IC with low current consumption.
- Small package products contribute to the reduction of circuit board area.

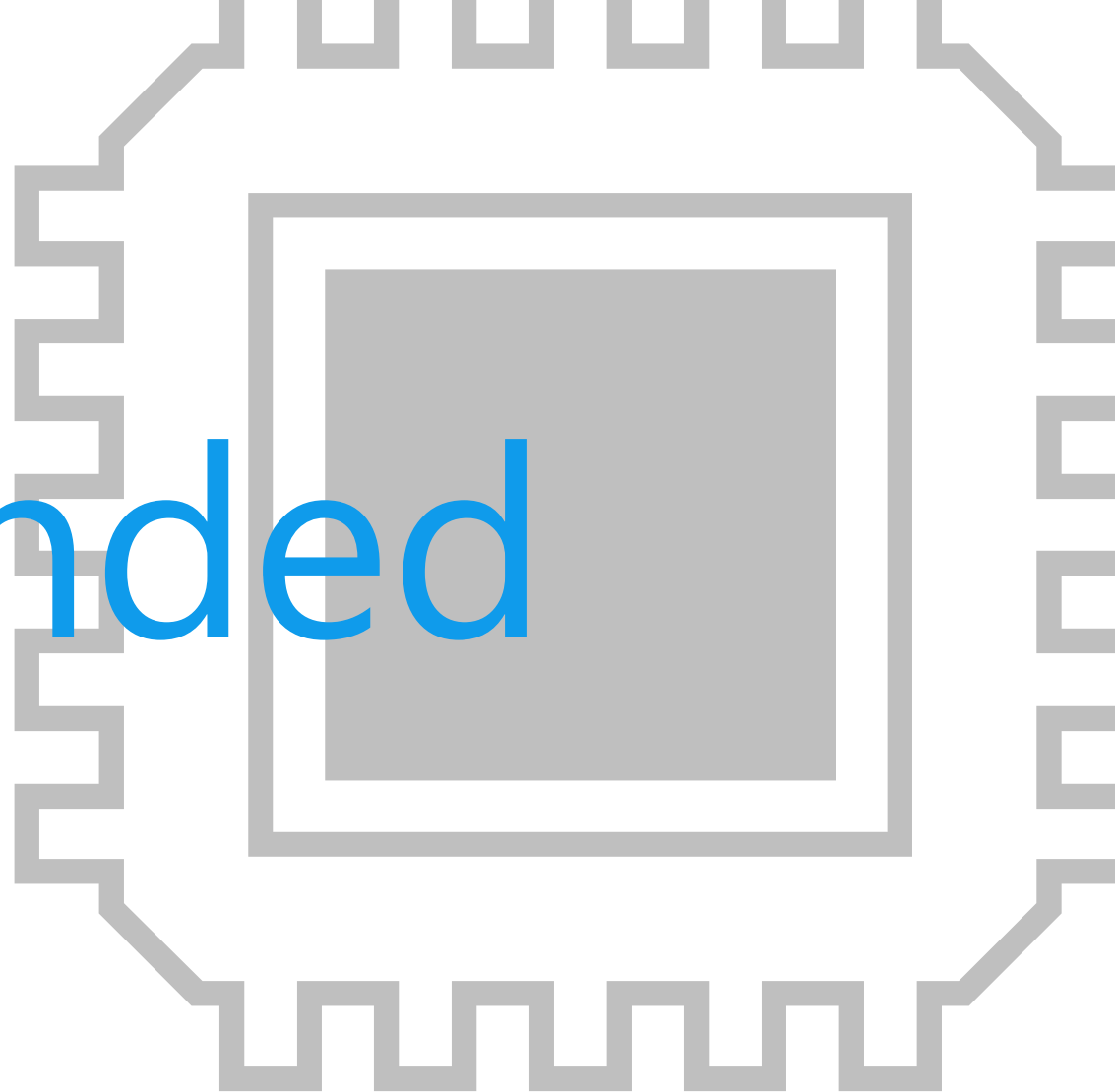
Proposal from Toshiba

- **Monitor temperature at multiple points with small package and low current consumption**

Over temperature detection IC
(Thermoflagger™)

* 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 the server system, "**Low power consumption and low heat generation**", "**Improved set reliability**" and "**Miniaturization of circuit boards**" are important factors. Toshiba's proposals are based on these three solution perspectives.



Device solutions to address customer needs

Low power consumption
Low heat generation
High heat dissipation efficiency

Noise immunity

Small size packages

①	U-MOS Series MOSFET	●		●
②	Transistor output photocoupler		●	●
③	IC output photocoupler for high speed communication		●	●
④	DTMOS Series MOSFET	●		●
⑤	SiC Schottky barrier diode	●		●
⑥	TVS diode		●	●
⑦	Three-phase brushless DC motor driver IC	●		●
⑧	Semi-power MOSFET	●		●
⑨	Over temperature detection IC (Thermoflagger™)	●		●

Value provided

Low $R_{DS(ON)}$ and high heat dissipation characteristics reduce the temperature of application.

1 Low on-resistance

Low $R_{DS(ON)}$ characteristics makes heat generation and power consumption small.

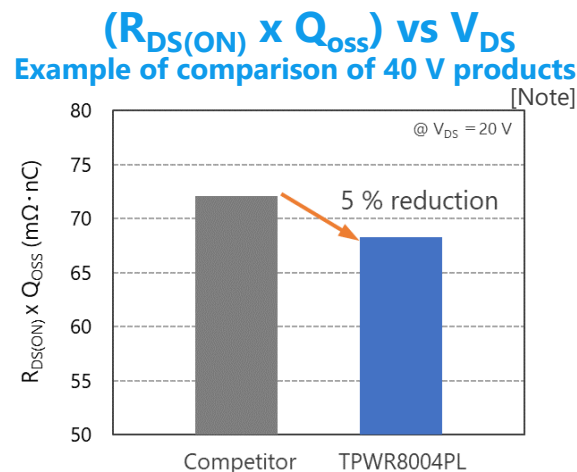
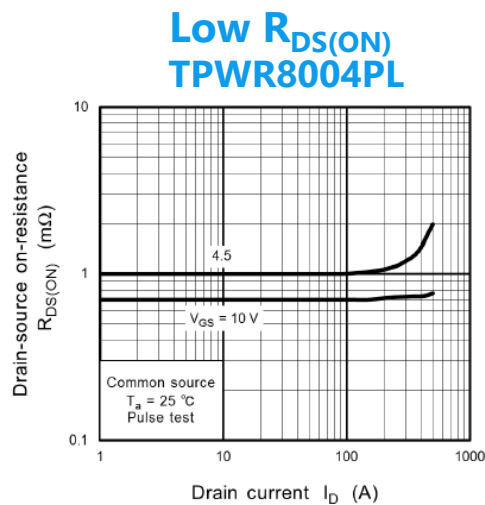
2 Small output charge Q_{oss}

The Q_{oss} is small and contributes to the reduction of power loss. The $R_{DS(ON)} \times Q_{oss}$ has been reduced by 5 % compared to that of the latest competitor's 40 V products. [Note]

3 Wide variety of packages

Toshiba have a lineup of double-sided cooling package (DSOP Advance) with same land pattern as SOP Advance. Wide package lineup for many kinds of applications.

[Note] Comparison with competitor's product with equivalent ratings. As of March, 2023. Based on Toshiba's measurement data.



Lineup

Part number	TPWR8004PL	TPHR7404PU	TPH1R306PL	TPH3R70APL
Package	DSOP Advance 	SOP Advance 	SOP Advance(N) 	
V_{DS} [V]	40	40	60	100
I_D [A]	150 (340*)	150 (400*)	100 (260*)	90 (150*)
$R_{DS(ON)}$ [mΩ] @ $V_{GS} = 10\text{ V}$	Typ.	0.65	0.51	1.0
	Max	0.80	0.74	1.34
Polarity	N-ch	N-ch	N-ch	N-ch
Generation	U-MOSIX-H	U-MOSIX-H	U-MOSIX-H	U-MOSIX-H

*: Silicon limit

[Return to Block Diagram TOP](#)

Value provided

Low $R_{DS(ON)}$ and high heat dissipation characteristics reduce the temperature of application.

1 Low on-resistance

Low $R_{DS(ON)}$ characteristics makes heat generation and power consumption small.

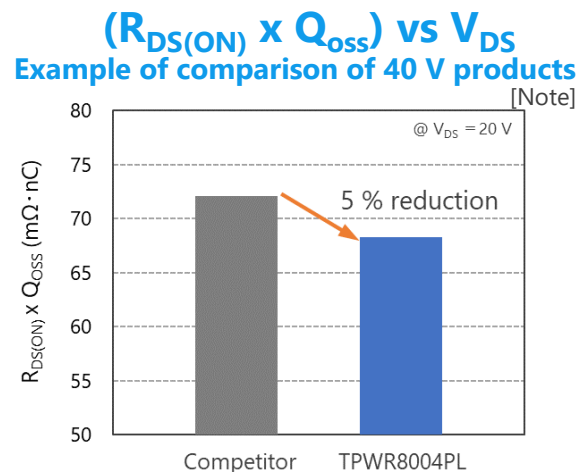
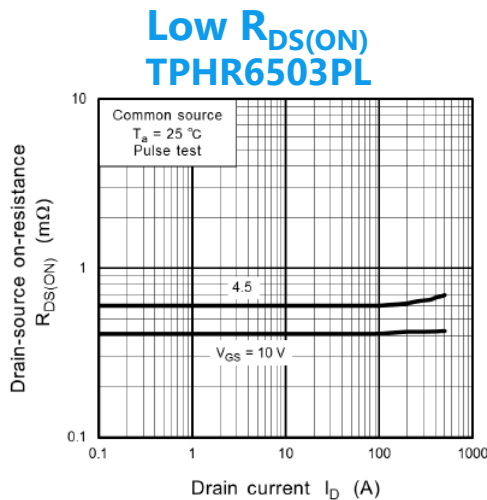
2 Small output charge Q_{OSS}

The Q_{OSS} is small and contributes to the reduction of power loss. The $R_{DS(ON)} \times Q_{OSS}$ has been reduced by 5 % compared to that of the latest competitor's 40 V products. [Note]

3 Wide variety of packages

Toshiba have a lineup of SOP Advance(N) with same land pattern as SOP Advance. Wide package lineup for many kinds of applications.

[Note] Comparison with competitor's product with equivalent ratings. As of March, 2023. Based on Toshiba's measurement data.



Lineup

Part number	TPHR6503PL	TPHR9203PL	TPHR9003NC
Package	SOP Advance(N) 	SOP Advance 	
V_{DS} [V]	30	30	30
I_D [A]	150 (393*)	150 (280*)	60 (220*)
$R_{DS(ON)}$ [mΩ] @ $V_{GS} = 10\text{ V}$	Typ.	0.41	0.61
	Max	0.65	0.92
Polarity	N-ch	N-ch	N-ch
Generation	U-MOSⅨ-H	U-MOSⅨ-H	U-MOSⅧ

*: Silicon limit

[Return to Block Diagram TOP](#)

Value provided

Low $R_{DS(ON)}$ and high heat dissipation characteristics reduce the temperature of application.

1 Low on-resistance

Low $R_{DS(ON)}$ characteristics makes heat generation and power consumption small.

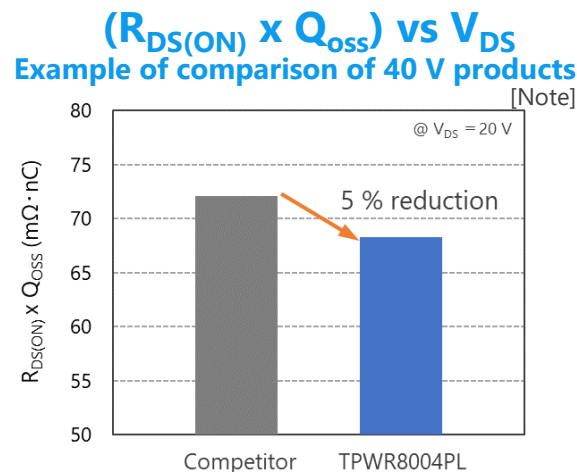
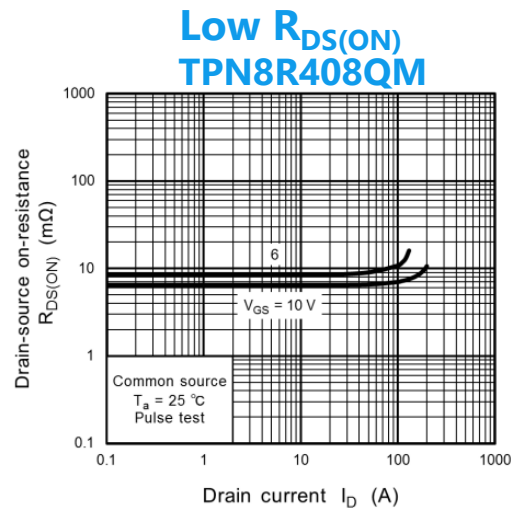
2 Small output charge Q_{oss}

The Q_{oss} is small and contributes to the reduction of power loss. The $R_{DS(ON)} \times Q_{oss}$ has been reduced by 5 % compared to that of the latest competitor's 40 V products. [Note]

3 Wide variety of packages

Toshiba have a lineup of DPAK package in addition to TSON Advance package. Wide package lineup for many kinds of applications.

[Note] Comparison with competitor's product with equivalent ratings. As of March, 2023. Based on Toshiba's measurement data.



Lineup

Part number	TPN8R408QM	TPN12008QM	TPN19008QM	TK5R1P08QM	TK6R9P08QM
Package	TSON Advance 			DPAK 	
V_{DS} [V]	80	80	80	80	80
I_D [A]	32 (77*)	26 (60*)	34 (38*)	84 (105*)	62 (83*)
$R_{DS(ON)}$ [mΩ] @ $V_{GS} = 10\text{ V}$	Typ.	6.5	9.6	14.7	4.2
	Max	8.4	12.3	19	5.1
Polarity	N-ch	N-ch	N-ch	N-ch	N-ch
Generation	U-MOSX-H	U-MOSX-H	U-MOSX-H	U-MOSX-H	U-MOSX-H

*: Silicon limit

[Return to Block Diagram TOP](#)

Value provided

Low $R_{DS(ON)}$ and high heat dissipation characteristics reduce the temperature of application.

1 Low on-resistance

Low $R_{DS(ON)}$ characteristics makes heat generation and power consumption small.

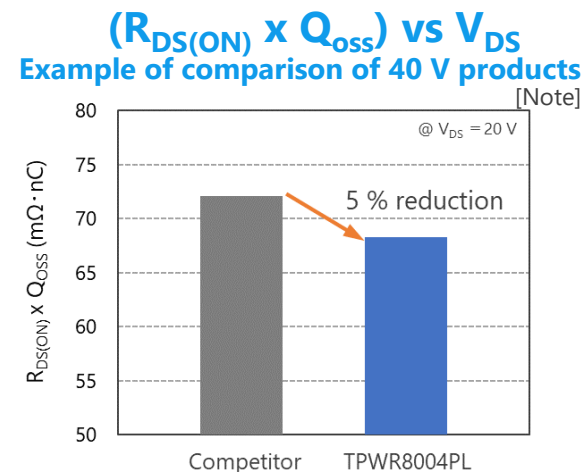
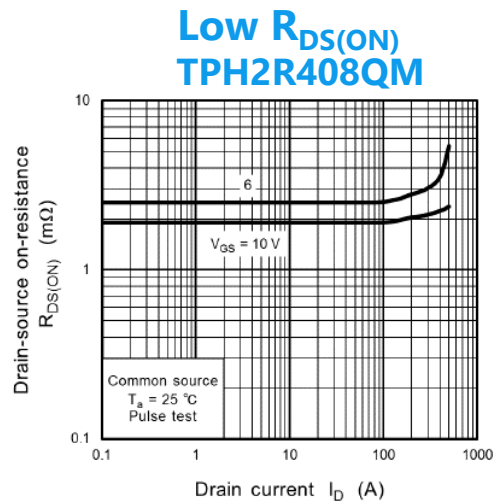
2 Small output charge Q_{oss}

The Q_{oss} is small and contributes to the reduction of power loss. The $R_{DS(ON)} \times Q_{oss}$ has been reduced by 5 % compared to that of the latest competitor's 40 V products. [Note]

3 Wide variety of packages

Toshiba have a lineup of SOP Advance(N) package. Wide package lineup for many kinds of applications.

[Note] Comparison with competitor's product with equivalent ratings. As of March, 2023. Based on Toshiba's measurement data.



Lineup

Part number	TPH2R408QM	TPH4R008QM	TPH9R00CQ5
Package	SOP Advance(N)		
V_{DS} [V]	80	80	150
I_D [A]	120 (200*)	86 (140*)	64 (108*)
$R_{DS(ON)}$ [mΩ] @ $V_{GS} = 10\text{ V}$	Typ.	1.9	3.1
	Max	2.43	4
Polarity	N-ch	N-ch	N-ch
Generation	U-MOSX-H	U-MOSX-H	U-MOSX-H

*: Silicon limit

[Return to Block Diagram TOP](#)

Value provided

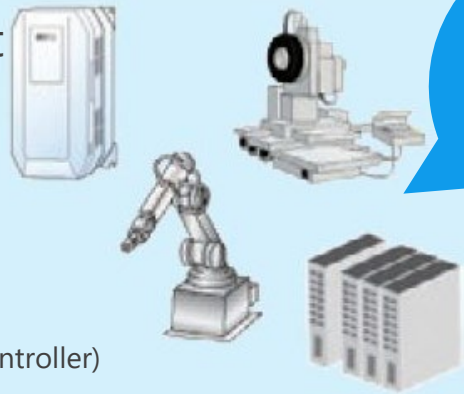
Contribute to the elimination of equipment maintenance by improving reliability and the reduction of the board footprint area.

1 High current transfer ratio

These are photo couplers of high isolation type that consists of a phototransistor optically coupled to an infrared LED. It achieves high current transfer ratio.

Industrial equipment

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



High level of
isolation and
noise
blocking

2 Wide operating temperature range

It is designed to operate even under severe ambient temperature conditions, such as inverters, robots, machinery, and high output power supplies.

Lineup

Part number	TLP383	TLP291(SE)
Package	4pin SO6L 	SO4 
BV_S [Vrms]	5000	3750
T_{opr} [°C]	-55 to 125	-55 to 110

[◆Return to Block Diagram TOP](#)

Value provided

Photocoupler that consists of an infrared light-emitting diode and an integrated photodetector with high gain and high speed.

1 High speed

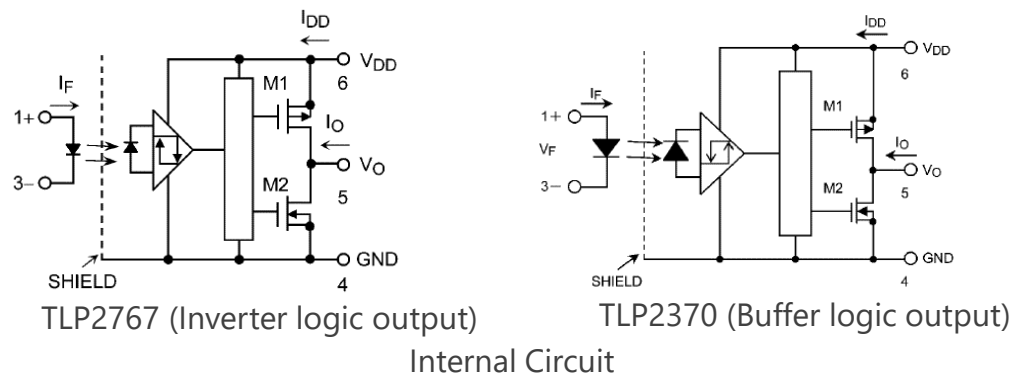
The propagation delay is 20 ns (Max) for TLP2767 and 60 ns (Max) for TLP2370. Margin design becomes easier than general phototransistor couplers.

2 Operating temperature is expanded to 125 °C

It is designed to operate even under severe ambient temperature conditions, such as inverters, robots, machinery, and high output power supplies.

3 Wide range of power supply voltages 2.7 to 5.5 V

The products can be used even in systems in which 3.3 V and 5.0 V are mixed, thereby possible to standardize components.



Lineup

Part number	TLP2767	TLP2370
Package	SO6L 	5pin SO6 
V_{DD} [V]	2.7 to 5.5	2.7 to 5.5
I_{DD} (Max) [mA]	2.5	0.4
t_{pd} (Max) [ns]	20	60
BV_S [Vrms]	5000	3750
T_{opr} [°C]	-40 to 125	-40 to 125

[◆Return to Block Diagram TOP](#)

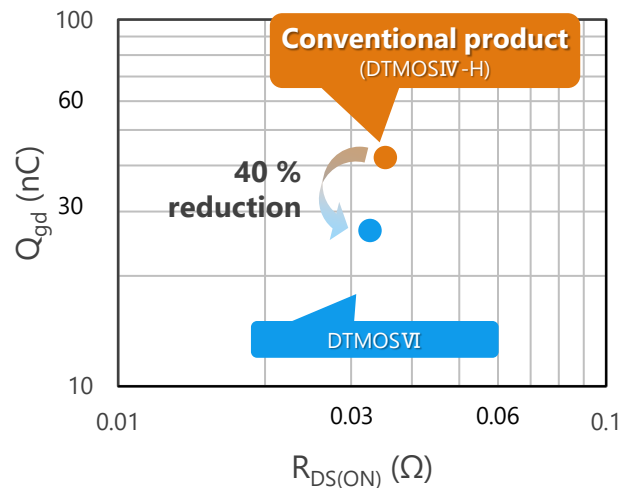
Value provided

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

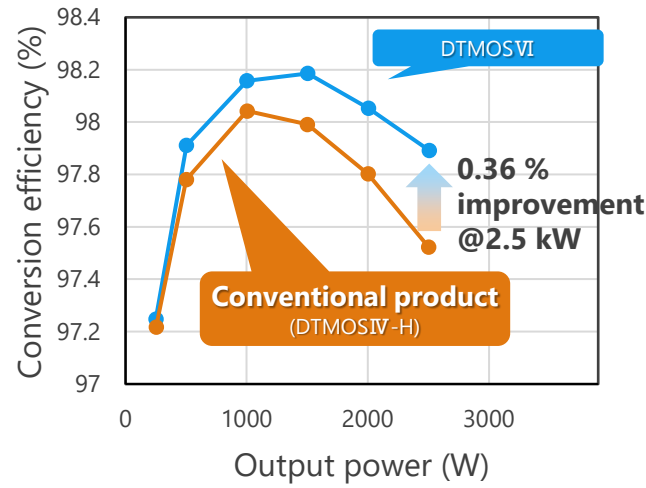
1 $R_{DS(ON)} \times Q_{gd}$ 40 % reduction

The $R_{DS(ON)} \times Q_{gd}$ of figure of merit has been reduced by 40 % with gate design and process optimization.

(Comparison of DTMOSIV-H Products: Toshiba internal comparison)



(Note) Toshiba internal comparison



(Note) Toshiba internal comparison

2 Various package lineup

Various package lineup from the TO-247-4L package with Kelvin terminal to thin surface mount type package (DFN8x8) with package thickness 0.85 mm.

Lineup

Part number	TK040N65Z	TK040Z65Z	TK090A65Z	TK099V65Z	TK090U65Z
Package	TO-247 	TO-247-4L 	TO-220SIS 	DFN8x8 	TOLL 
V_{DS} [V]	650	650	650	650	650
I_D [A]	57	57	30	30	30
$R_{DS(ON)}$ [Ω] @ $V_{GS} = 10$ V	Typ.	0.033	0.033	0.075	0.080
	Max	0.040	0.040	0.090	0.099
Polarity	N-ch	N-ch	N-ch	N-ch	N-ch
Generation	DTMOSVI	DTMOSVI	DTMOSVI	DTMOSVI	DTMOSVI

[Return to Block Diagram TOP](#)

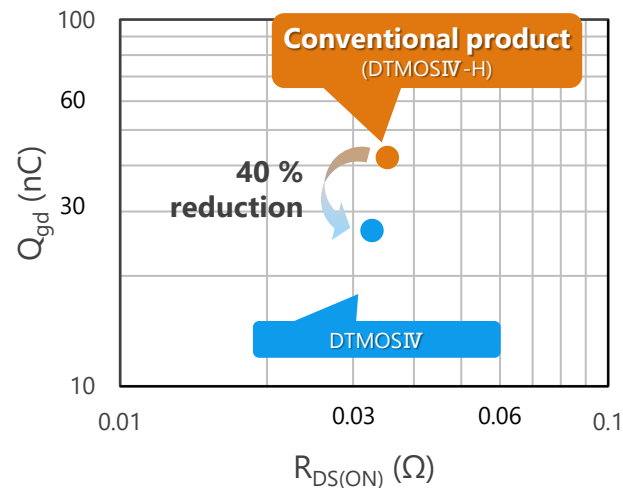
Value provided

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

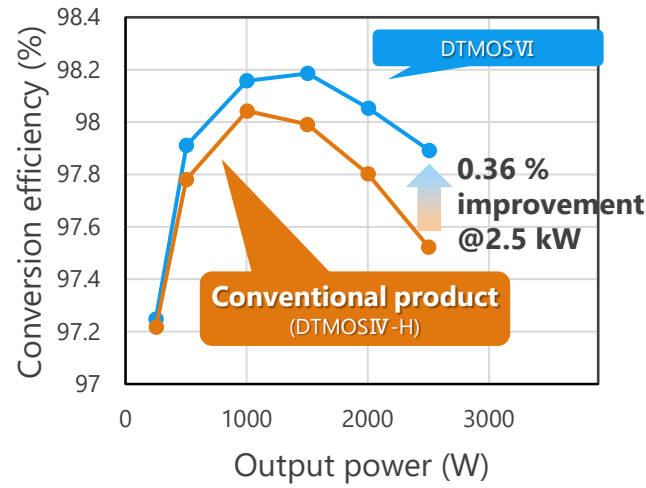
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(Comparison of DTMOSIV-H Products: Toshiba internal comparison)



(Note) Toshiba internal comparison



(Note) Toshiba internal comparison

2 Various package lineup

Various package lineup from the TO-247-4L package with Kelvin terminal to thin surface mount type package (DFN8x8) with package thickness 0.85 mm.

Lineup

Part number	TK110N65Z	TK110Z65Z	TK110A65Z	TK125V65Z	TK110U65Z	TK155U65Z
Package	TO-247	TO-247-4L	TO-220SIS	DFN8x8	TOLL	
V_{DS} [V]	650	650	650	650	650	650
I_D [A]	24	24	24	24	24	18
$R_{DS(ON)}$ [Ω]	Typ. 0.092 Max 0.11	0.092	0.092	0.105	0.086	0.122
@ $V_{GS} = 10$ V						
Polarity	N-ch	N-ch	N-ch	N-ch	N-ch	N-ch
Generation	DTMOSVI	DTMOSVI	DTMOSVI	DTMOSVI	DTMOSVI	DTMOSVI

[Return to Block Diagram TOP](#)

Value provided

Can be applied to power factor correction circuits and a wide range of power supply control applications, and contributes to miniaturization of set.

1 High surge current tolerance

The non-repetitive peak forward surge current I_{FSM} = 97 A (Max) (TRS12E65F).

Surge current is increased around 2 times by using improved JBS (Junction Barrier controlled Schottky) structure incorporating the concept of the Merged PiN Schottky (MPS) structure.

(Comparison with Toshiba's first generation products)

2 Second generation chip design

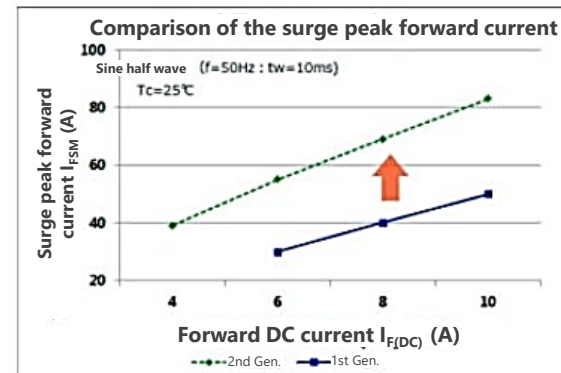
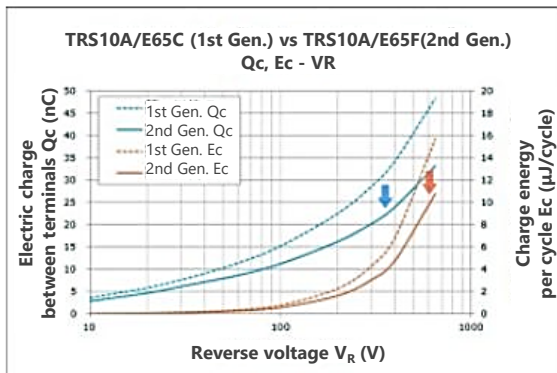
The figure of merit ($V_F \times Q_C$) [Note] is improved by 30 % and the non-repetitive peak forward surge current (I_{FSM}) is improved, thereby contributing to higher efficiency of the power supply.
(Comparison with Toshiba's first generation products)

3 High heat radiation package

Provided in TO-220 and TO-247 through hole type packages.

[Note] The $V_F \times Q_C$: (product of forward voltage and total charge) is an index representing the loss performance of the SiC SBD.
When comparing the products with the same current rating, the smaller the index, the lower the loss.

Comparison between Toshiba's 1st and 2nd generation products



Lineup

Part number	TRS8E65F	TRS12E65F	TRS12N65FB	TRS16N65FB	TRS20N65FB	TRS24N65FB
Package	TO-220-2L	TO-247 (Center tap)				
V_{RRM} [V]	650	650	650	650	650	650
$I_{F(DC)}$ [A]	8	12	6 / 12 *	8 / 16 *	10 / 20 *	12 / 24 *
I_{FSM} [A]	69	97	52 / 104 *	65 / 130 *	79 / 158 *	92 / 184 *
V_F (Typ.) [V]	1.45 @ $I_F = 8$ A	1.45 @ $I_F = 12$ A	1.45 @ $I_F = 6$ A	1.45 @ $I_F = 8$ A	1.45 @ $I_F = 10$ A	1.45 @ $I_F = 12$ A

*: Per Leg / Both Legs

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Value provided

Absorbs static electricity from external terminals, prevents circuit malfunction, and protects devices.

1 Improved ESD absorption

Improved ESD absorption compared to conventional 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.

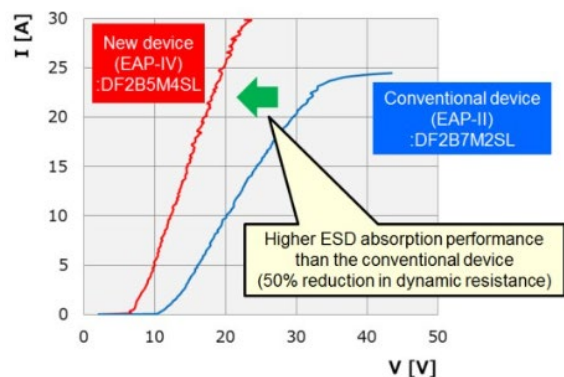
2 Suppress ESD energy by low clamp voltage

Steadily protect the connected circuits and devices using proprietary technology.

3 Suitable for high density mounting

A variety of compact packages are available.

ESD Pulse Absorption Performance
Toshiba internal comparison



Unidirectional



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

Bidirectional



Suitable for paths with both polar signals such as audio signals

Lineup

Part number	DF2B7ASL	DF2B5M4SL	DF2B6M4SL
Package	SL2 		
V_{ESD} [kV]	± 30	± 20	± 20
V_{RWM} (Max) [V]	5.5	3.6	5.5
C_t (Typ.) [pF]	8.5	0.2	0.2
R_{DYN} (Typ.) [Ω]	0.2	0.5	0.5
Purpose	Power line protection	Signal line protection	

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

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Value provided

One hall sine wave PWM control driver for three-phase brushless DC motor. It is suitable for controlling server fans.

1 Built-in one hall phase difference detection circuit

Monitoring one hall element output voltage and controlling a motor. Possible to reduce motor unit BOM.

2 Built-in closed loop speed control

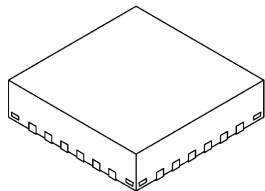
NVM ^[Note] is implemented. It realizes closed loop speed control function without an external MCU. It contributes to reduce system cost.

[Note] No-volatile memory

3 Small package

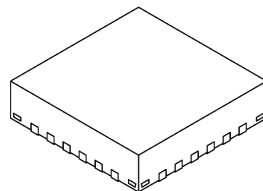
VQFN24 and WQFN36 are suitable for mounting limited space.

TC78B025FTG / TC78B027FTG



VQFN24
(4 x 4 x 0.9 mm)

TC78B009FTG



WQFN36
(5 x 5 x 0.8 mm)

Lineup

Part number	TC78B025FTG	TC78B027FTG	TC78B009FTG
Operation voltage [V]	4.5 to 16	5 to 16	5.5 to 27
Drive type	Sine wave PWM drive		PWM drive
Others	1 hole element input position detection		Sensorless
	Closed loop speed control function, Configurable speed curve		
	Stand by mode		
	Soft start		
	Built-in driver (3.5 A (Max))	Built-in pre driver for N-ch MOSFET drive	
Package	P-VQFN24-0404-002	P-VQFN24-0404-003	P-WQFN36-0505-0.50-001

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Value provided

Low on-resistance, small and high power dissipation packages contribute to miniaturization and low power consumption of the systems.

1 Low loss (reduced chip resistance)

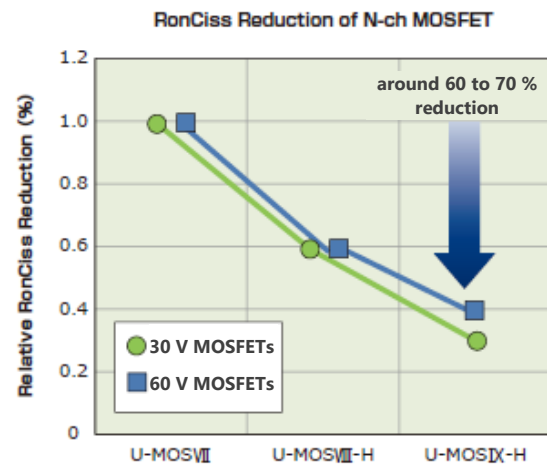
Using low chip resistance technology to contribute to reduced power consumption systems.

2 Small and high heat dissipating package

Small and high heat dissipating packages (UDFN6B, SOT-23F) contribute to space saving during mounting.

3 Low voltage drive

Power consumption of the set can be reduced by low voltage drive.



(Note) Toshiba internal comparison

Lineup

Part number		SSM6K341NU	SSM3K341R
Package		UDFN6B 	SOT-23F 
V_{DS} [V]		60	60
I_D [A]		6	6
$R_{DS(ON)}$ [mΩ] @ $V_{GS} = 4.5$ V	Typ.	36	36
	Max	51	51
Polarity		N-ch	N-ch

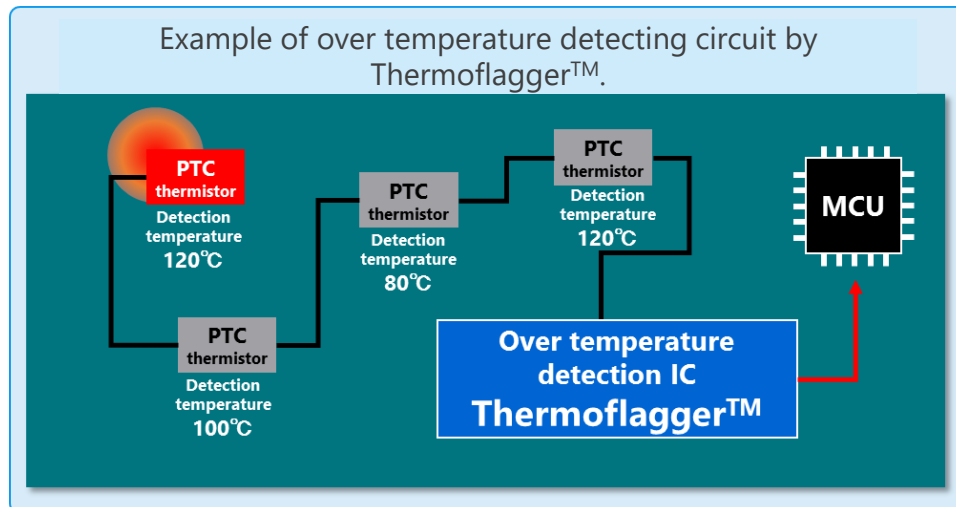
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Value provided

TCTH Series can detect temperature rise at multiple points on the circuit board.

1 Temperature rise can be detected at multiple points

TCTH Series detect an increase in resistance during over temperature by supplying a constant current (1 μ A or 10 μ A) to PTC (Positive Temperature Coefficient) thermistors. Multiple PTC thermistors connected in series enable to detect over temperature at multiple points on the circuit board.



2 Low current consumption and small package

TCTH01 Series has $I_{DD} = 1.8 \mu\text{A}$ (Typ.) and TCTH02 Series has $I_{DD} = 11.3 \mu\text{A}$ (Typ.). These packages are small size ESV type.

Lineup

Part number	TCTH011AE TCTH011BE	TCTH012AE TCTH012BE	TCTH021AE TCTH021BE	TCTH022AE TCTH022BE
Package	ESV 1.6 x 1.6 x 0.55 mm 			
V_{IN} [V]	1.7 to 5.5			
I_{DD} (Typ.) [μ A]	1.8		11.3	
PTCO Output current (Typ.) [μ A]	1	1	10	10
Abnormal latch function	-	Yes	-	Yes
Output circuit type	AE: push pull, BE: open drain			

(Note 1) TCTH021BE/TCTH022BE are in mass production. Other products are scheduled to begin mass production in September 2023.

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(Note 2) Specifications are subject to change without notice.

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

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