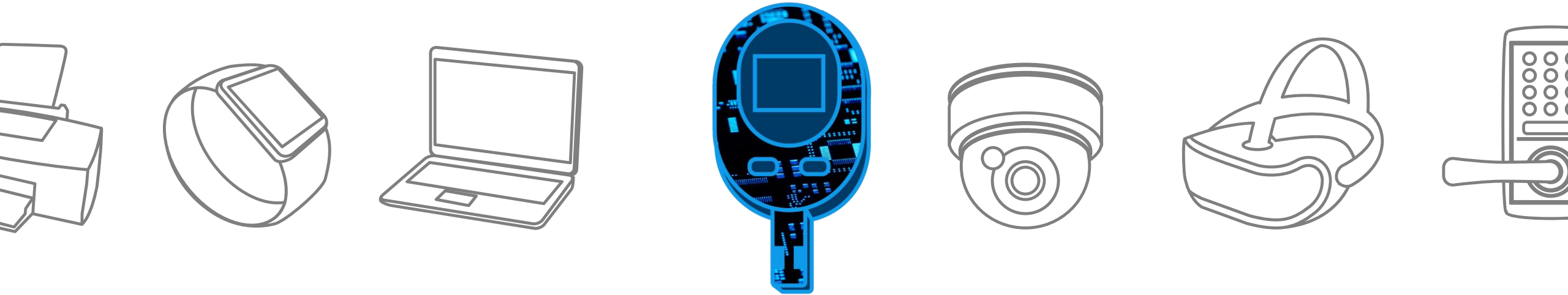
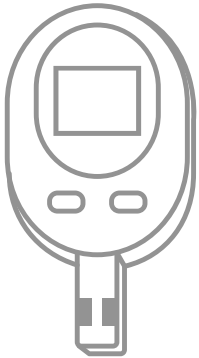
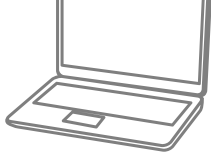


Blood Glucose Meter

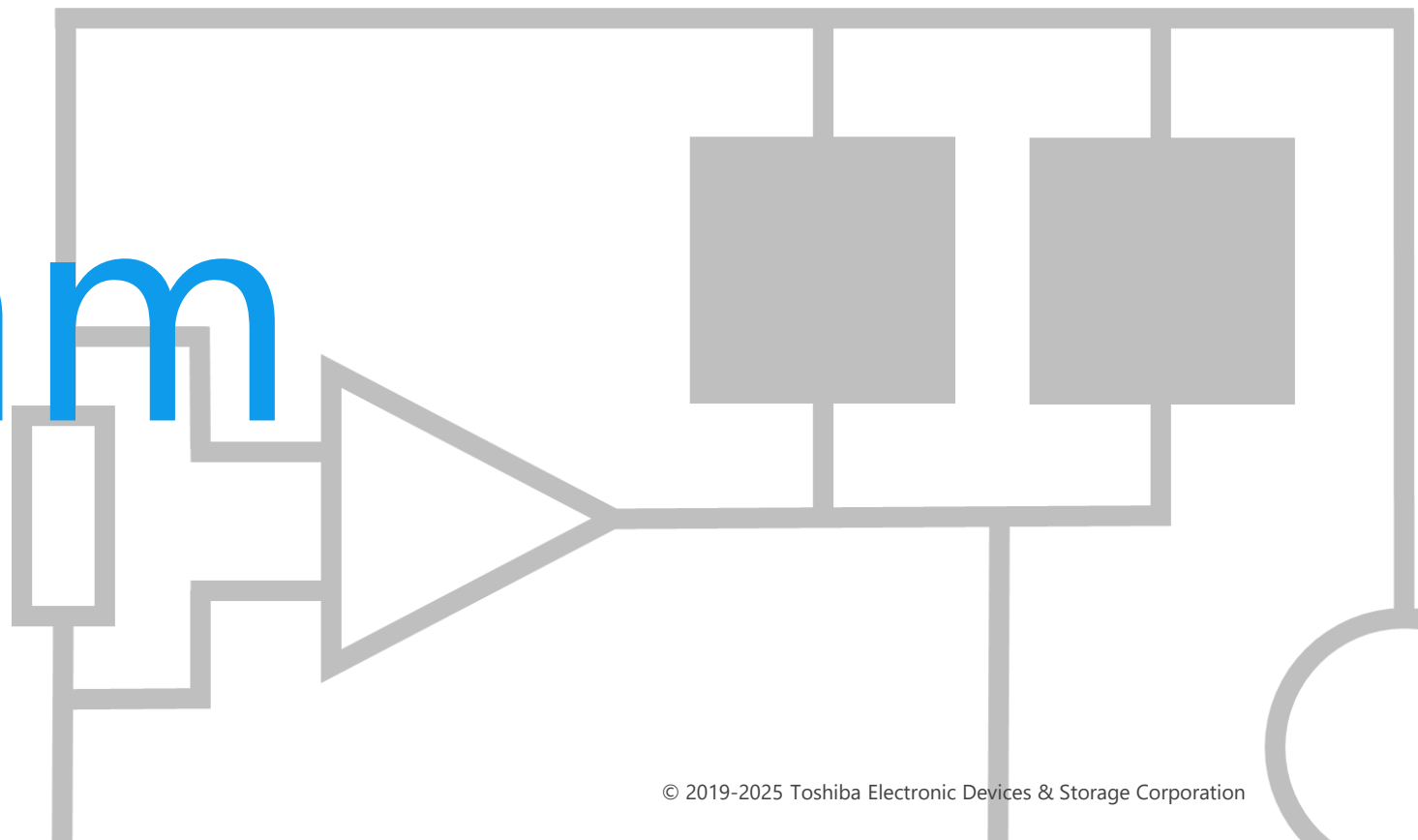
Solution Proposal by Toshiba



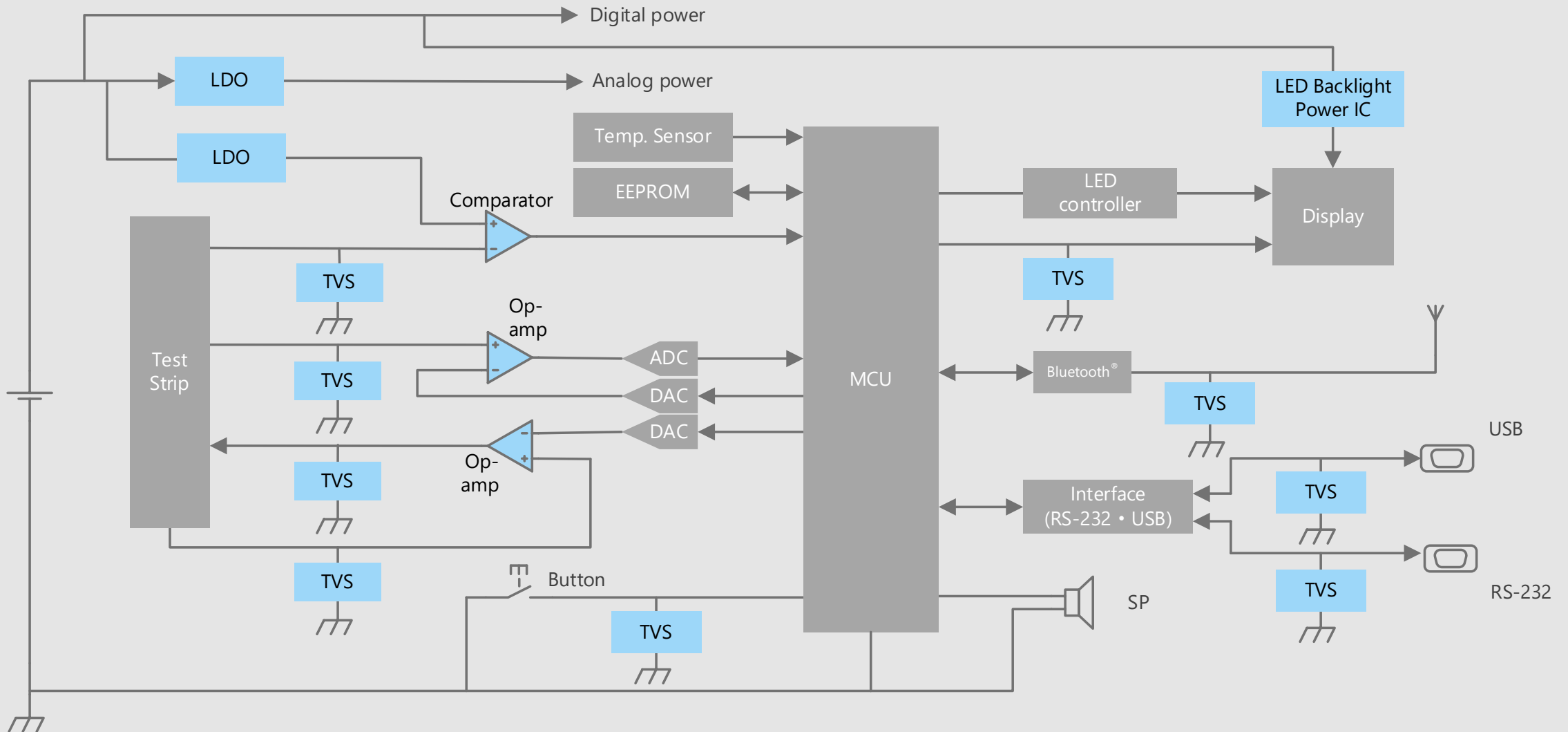


Toshiba Electronic Devices & Storage Corporation provides comprehensive device solutions to customers developing new products by applying its thorough understanding of the systems acquired through the analysis of basic product designs.

Block Diagram

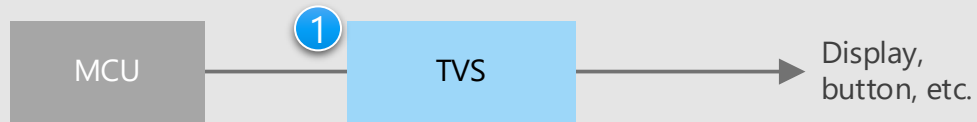


Blood Glucose Meter Overall block diagram

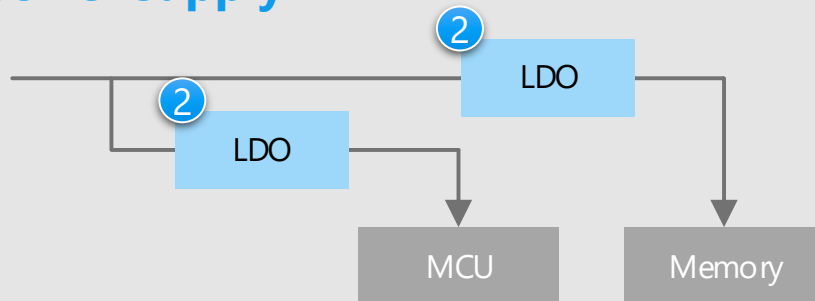


Blood Glucose Meter Detail of power supply unit

ESD protection



Control MCU power supply



Criteria for device selection

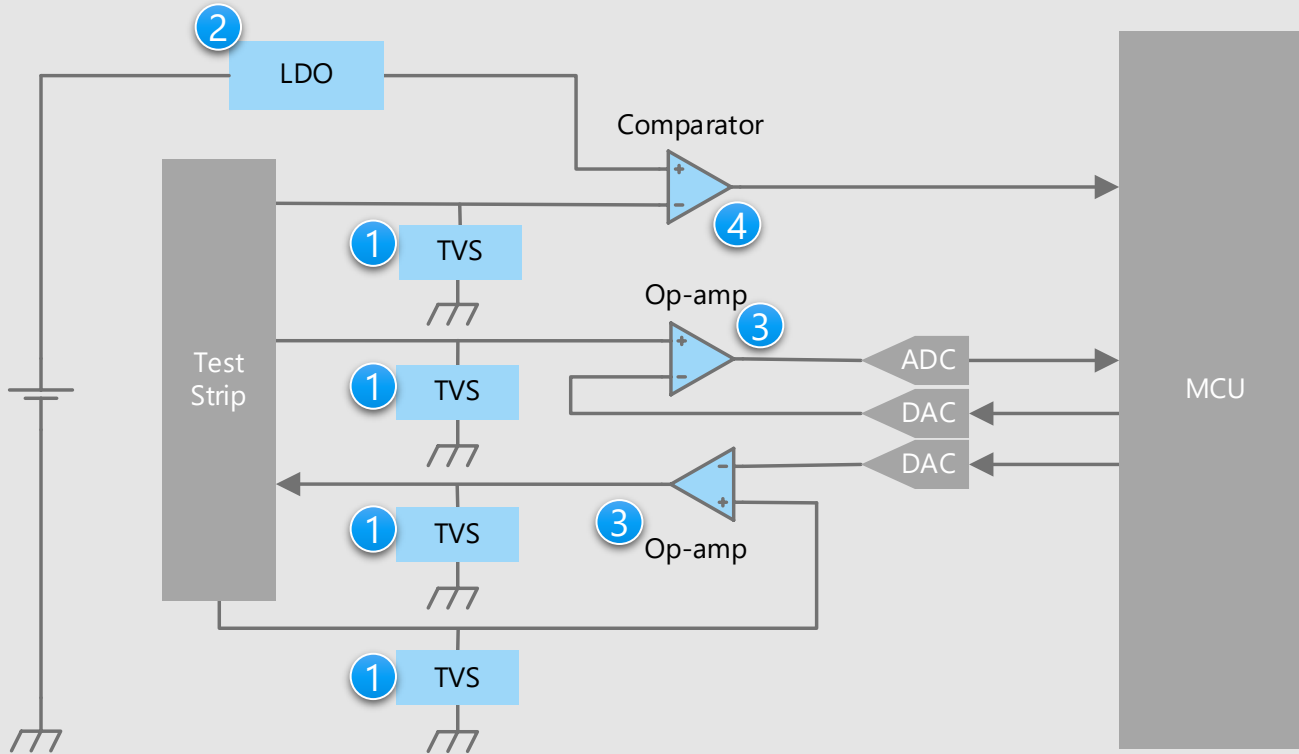
- It is necessary to protect devices against surge voltage such as Electrostatic Discharge (ESD) from external terminals.
- PSRR (Power Supply Rejection Ratio) is a key characteristic for power supply of microcontroller.

Proposals from Toshiba

- **Absorb ESD from external terminals to prevent circuit malfunction and device breakdown**
TVS diode 1
- **Supply the power with low noise**
Small surface mount LDO regulator 2

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

Sensor circuit



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

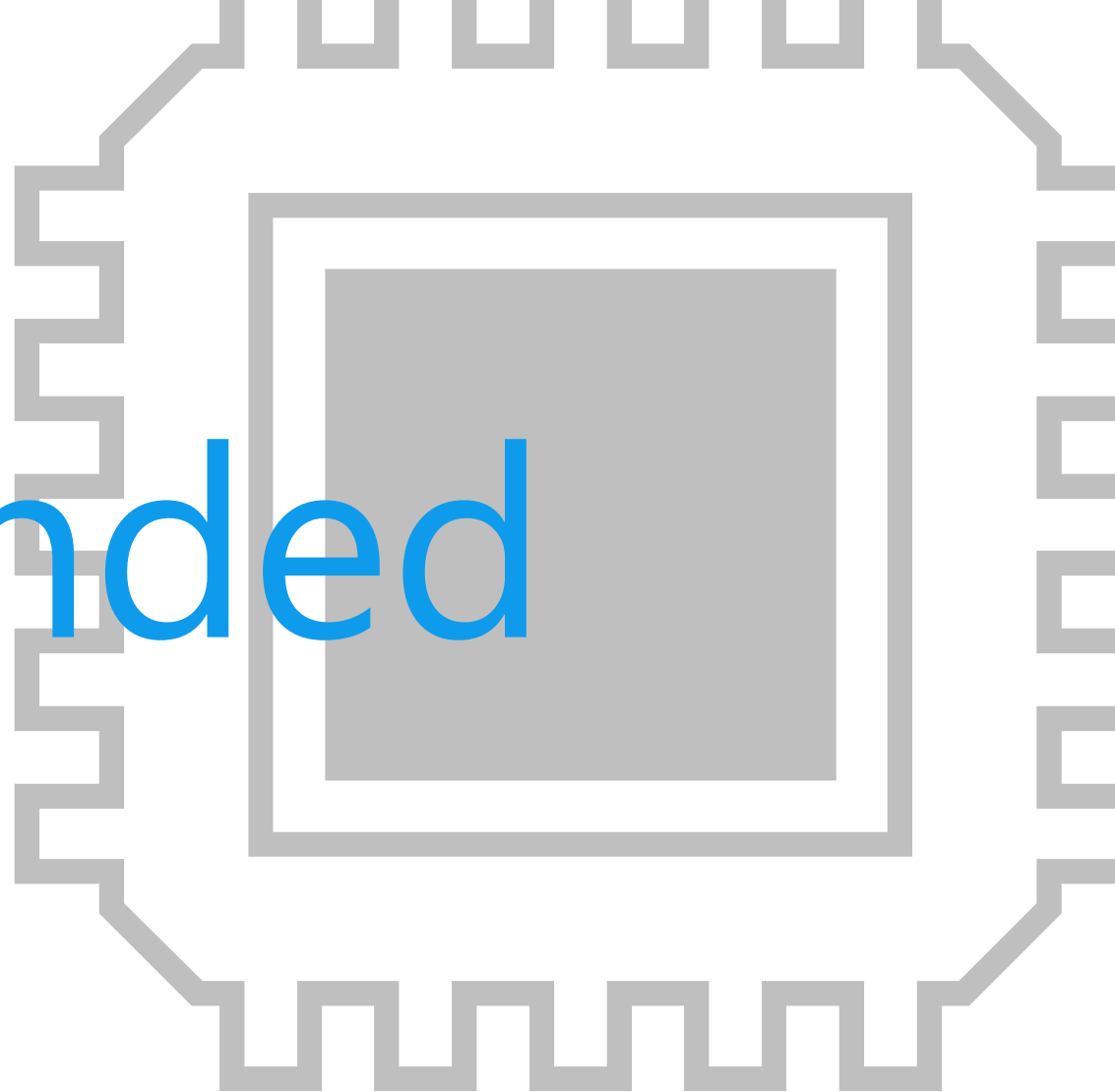
Criteria for device selection

- It is necessary to protect devices against surge voltage such as ESD from external terminals.
- PSRR is a key characteristic for power supply of sensor circuit.
- Low noise operational amplifiers are required to improve measurement accuracy.

Proposals from Toshiba

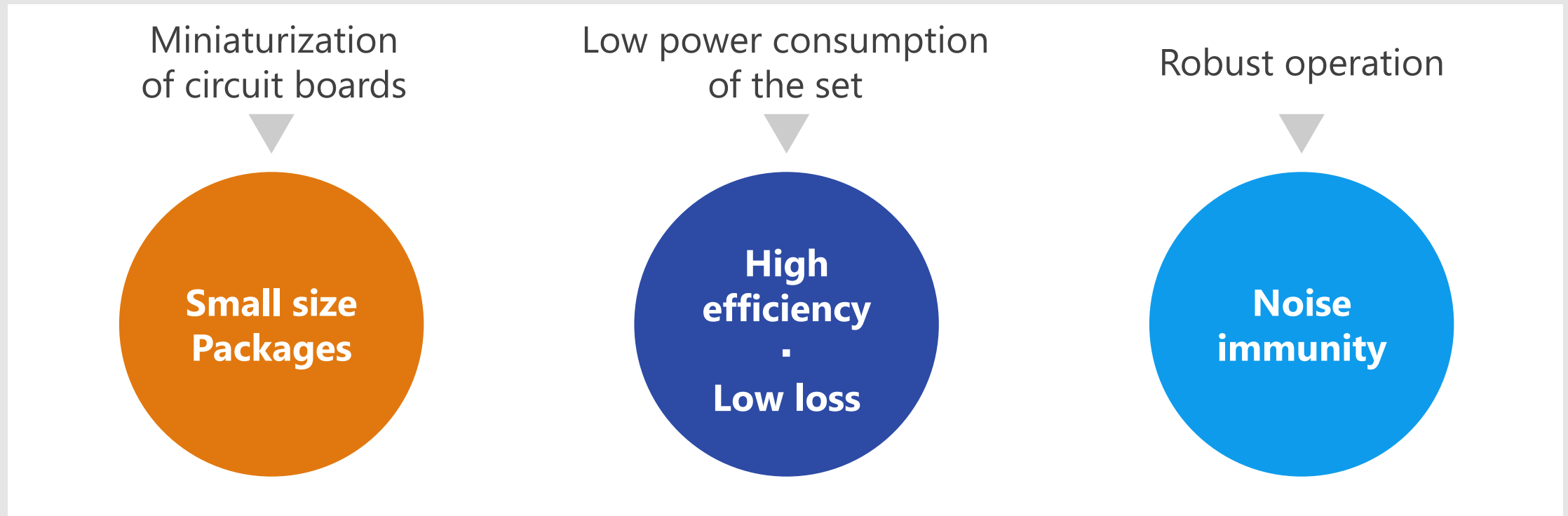
- **Absorb ESD from external terminals to prevent circuit malfunction and device breakdown**
TVS diode
- **Supply the power with low noise**
Small surface mount LDO regulator
- **Amplify the detected small signal with low noise**
Low noise operational amplifier
- **Low supply current and I/O full range type**
Comparator

Recommended Devices



Device solutions to address customer needs

As described above, in the design of a blood glucose meter, **“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

	Small size Packages	High efficiency · Low loss	Noise immunity
① TVS diode	●		●
② Small surface mount LDO regulator	●	●	●
③ Low noise operational amplifier	●	●	
④ Comparator	●	●	●

Value provided

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

1 Improved ESD absorption

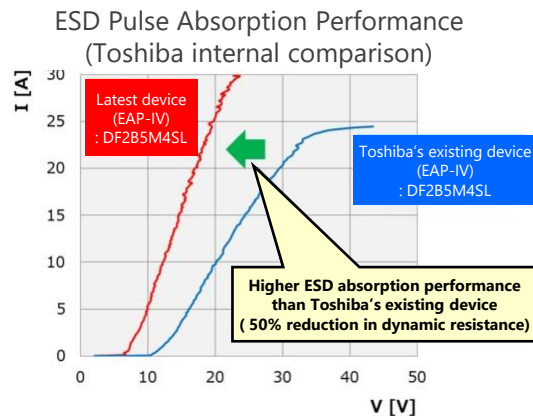
Improved ESD absorption compared to Toshiba's existing products. (50 % reduction in operating resistance)
For some products, both low operating resistance and low capacitance are realized and ensures high signal protection performance and signal quality.

2 Suppress ESD energy by low clamp voltage

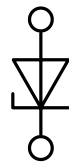
Protect the connected circuits and devices using Toshiba own technology.

3 Suitable for high-density mounting

A variety of compact 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	DF2B7ASL	DF2B5PCT	DF2B7PCT	DF2B7AFU
Package	SL2 	CST2 		USC 
V_{ESD} [kV]	±30	±30	±30	±30
V_{RWM} (Max) [V]	5.5	3.6	5.5	5.5
C_t (Typ.) [pF]	8.5	41	45	8.5
R_{DYN} (Typ.) [Ω]	0.2	0.1	0.1	0.2

[◆Return to Block Diagram TOP](#)

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

Value provided

Wide lineup 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 the latest generation process significantly improved the dropout voltage characteristics.

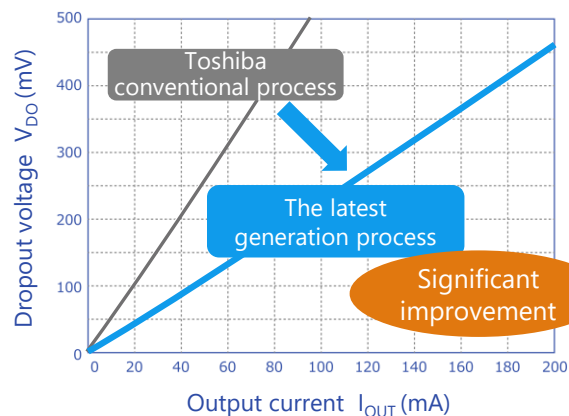
2 High PSRR Low output noise voltage

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

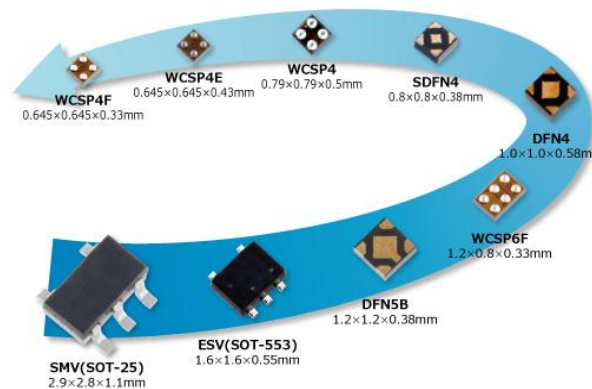
0.34 μA of $I_{B(ON)}$ is realized by utilizing CMOS process and unique circuit technology.
(TCR3U Series)

Low dropout voltage



(Note) Toshiba internal comparison

Rich package lineup



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

[Return to Block Diagram TOP](#)

Value provided

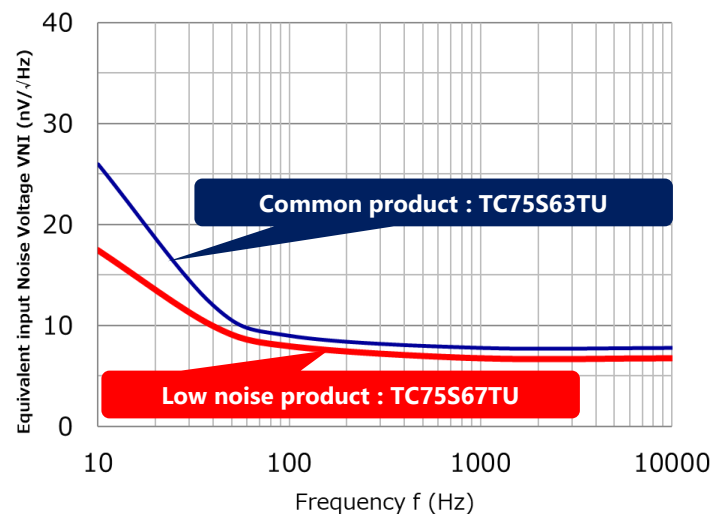
Very small signals detected by various sensors can be amplified with very low noise.

1 Low noise $V_{NI} = 6.0 \text{ [nV}/\sqrt{\text{Hz}}] \text{ (Typ.) @ } f = 1 \text{ kHz}$

Very small signals detected by various sensors [Note 1] can be amplify with low noise using CMOS operational amplifier by optimizing the processing. We achieved low input equivalent noise voltage.

[Note 1] Sensor types: vibration detection sensor, shock sensor, accelerometer, pressure sensor, infrared sensor, and temperature sensor, etc.

Noise
characteristics
(Toshiba internal comparison)




2 Low current consumption $I_{DD} = 430 \text{ [}\mu\text{A]} \text{ (Typ.)}$

The low current consumption characteristics of CMOS processing contributes to the extension of battery life of the compact IoT devices [Note 2].

[Note 2] Compared with Toshiba's operational amplifier using bipolar processing.

Lineup

Part number	TC75S67TU
Package	UFV 
$V_{DD,SS} \text{ (Max) [V]}$	± 2.75
$V_{DD,SS} \text{ (Min) [V]}$	± 1.1
$I_{DD} \text{ (Max) [}\mu\text{A]}$	700
$V_{NI} \text{ (Typ.) [nV}/\sqrt{\text{Hz}}] \text{ @ } f = 1 \text{ kHz}$	6

[◆Return to Block Diagram TOP](#)

4 Comparator

TC75S70L6X

Small size
Packages

High
efficiency
·
Low loss

Noise
immunity

Value provided

This full-range input/output comparator uses CMOS processes that operate at low power supply voltages with low current consumption.

1 Low power supply voltage operation

$V_{DD} = 1.3 \text{ V to } 5.5 \text{ V}$.

2 Low supply current

$I_{DD} = 18 \text{ } [\mu\text{A}] \text{ (Typ.)}$

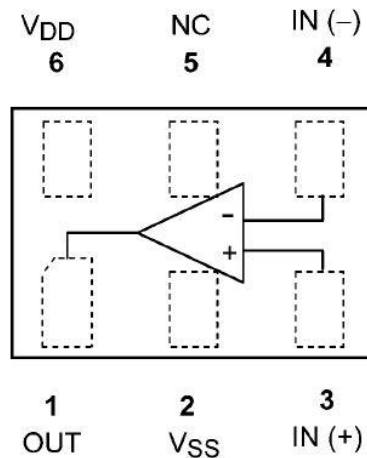
Can be used for wide applications because of its low supply current characteristic.

3 Low input offset voltage


$V_{IO} = \pm 1.0 \text{ } [\text{mV}] \text{ (Typ.)}$

Since the input offset voltage is low, the accuracy of the comparison result can be improved.

TC75S70L6X
Internal connection



Lineup

Part number	TC75S70L6X
Package	MP6C 
$V_{CC, EE} \text{ (Max) } [\text{V}]$	± 2.75
$V_{CC, EE} \text{ (Min) } [\text{V}]$	± 0.65
$I_{DD} \text{ (Max) } [\mu\text{A}]$	35
$V_{IO} \text{ (Max) } [\text{mV}]$	± 6

[Return to Block Diagram TOP](#)

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