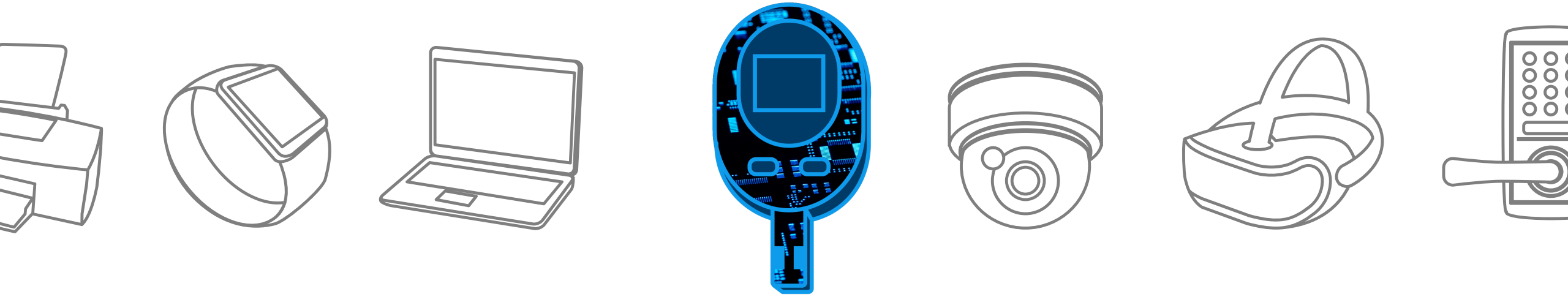
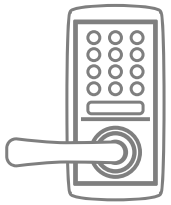
TOSHIBA

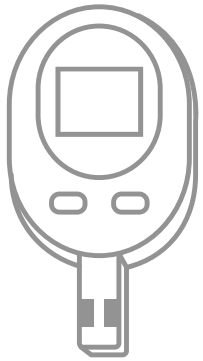
R20

Blood Glucose Meter

Solution Proposal by Toshiba







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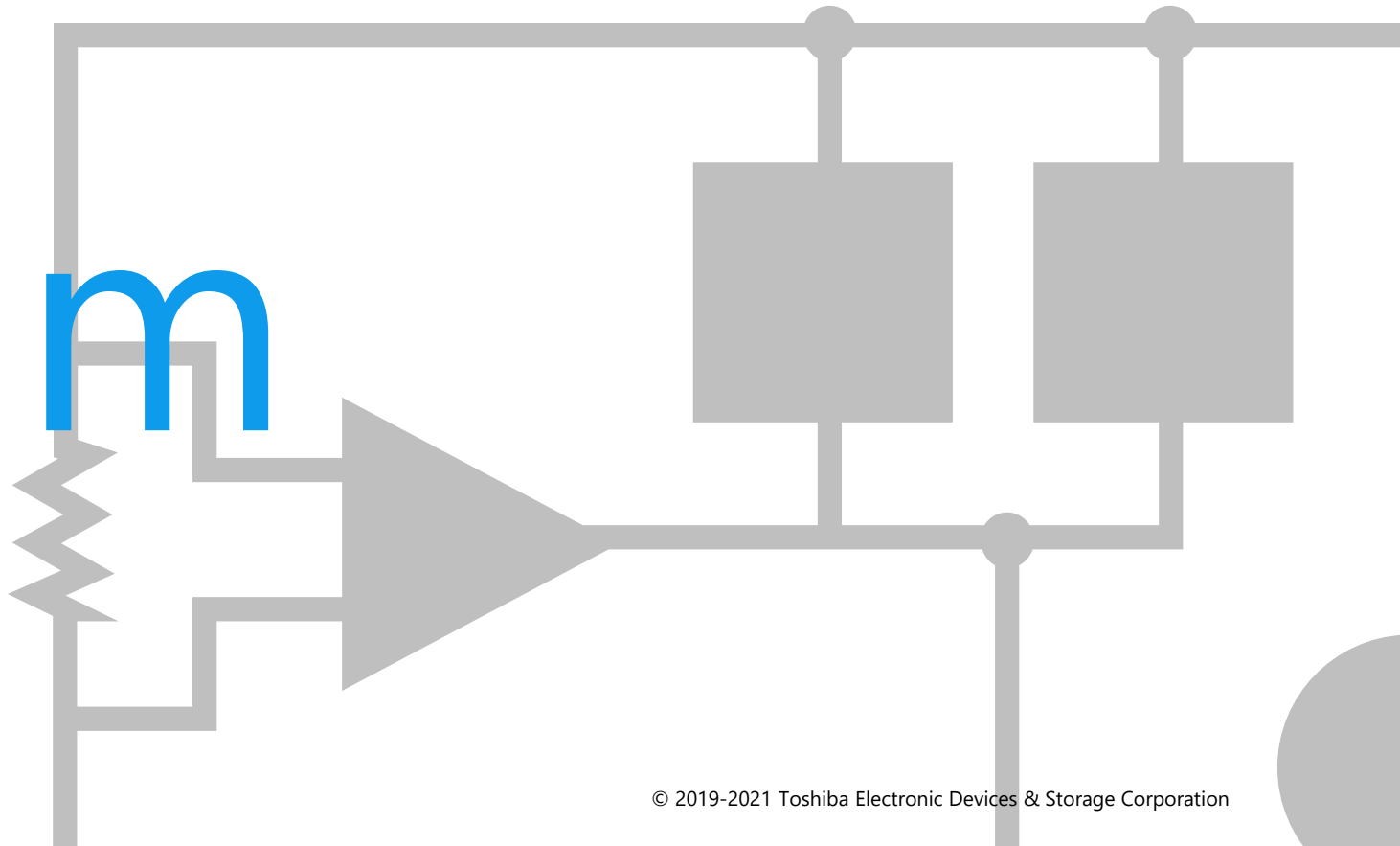
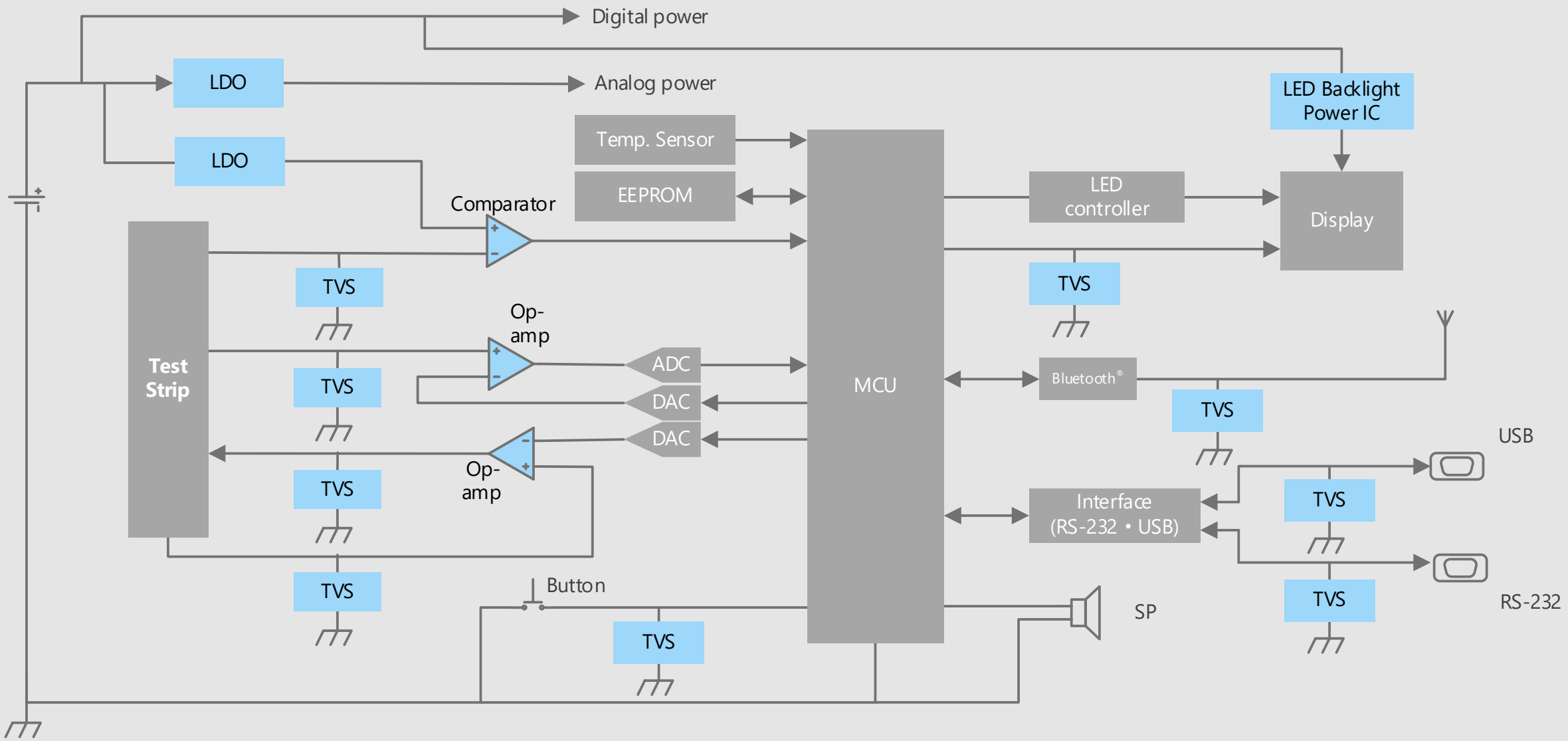
Block Diagram

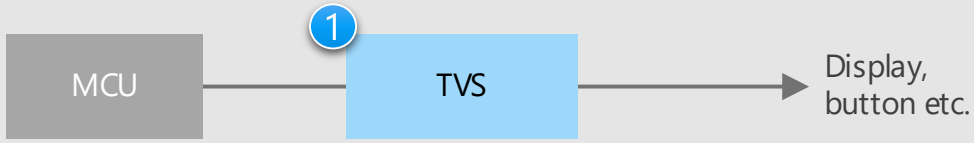


Blood Glucose Meter　Overall block diagram

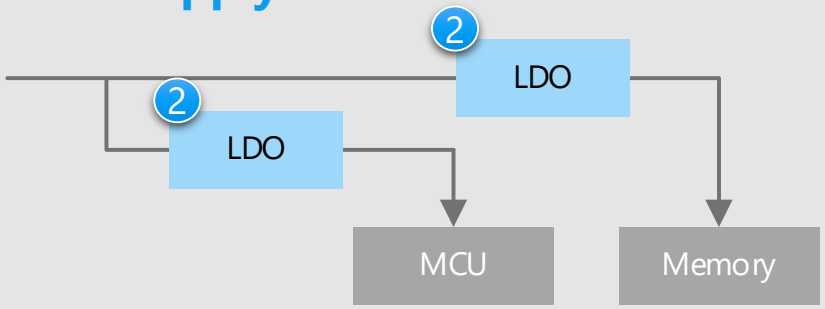


Blood Glucose Meter　Detail of power supply unit

ESD protection



Control MCU power supply



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

Criteria for device selection

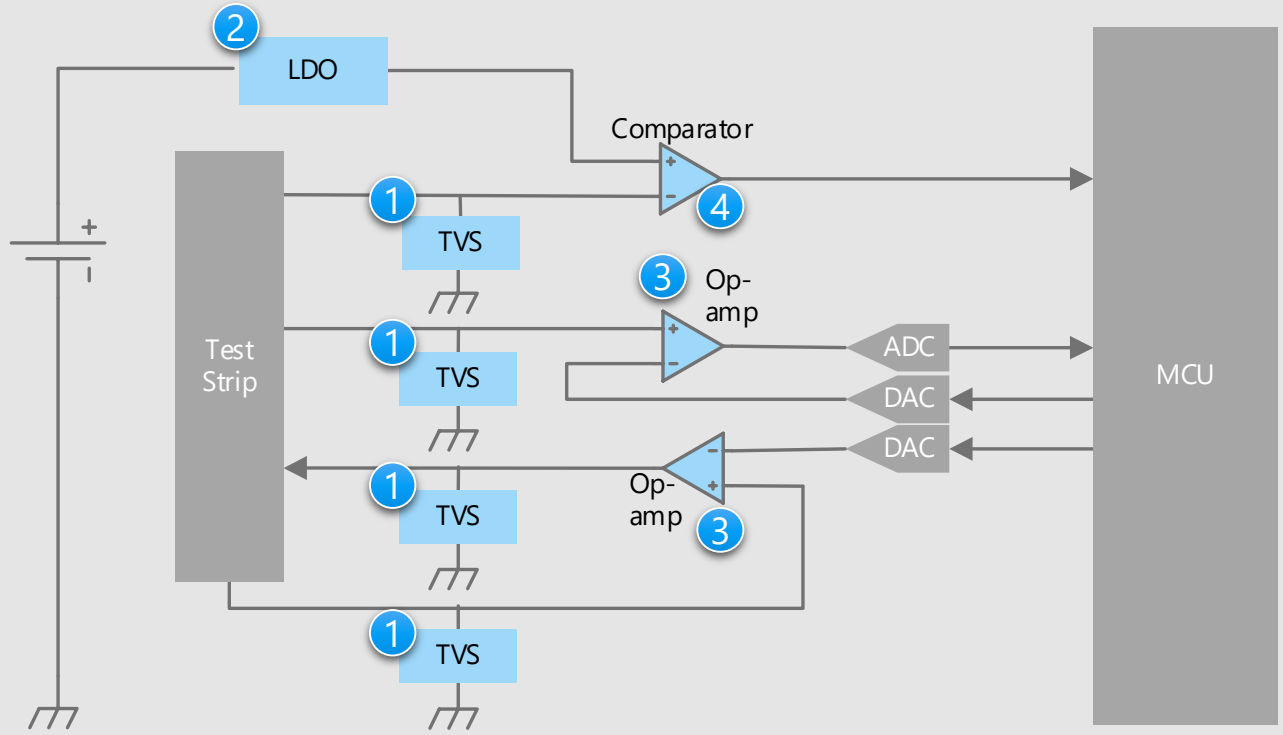
- TVS diode protects signal line from external ESD.
- PSRR is a key characteristic of microcomputer.

Proposals from Toshiba

- **Static electricity (ESD) from external terminals is absorbed to prevent circuit malfunction and device breakdown.**
  TVS diode 1
- **Optimum power supply for environments with high power supply noise**
  Small surface mount LDO regulator 2

Blood Glucose Meter　Detail of sensor unit

Sensor circuit



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

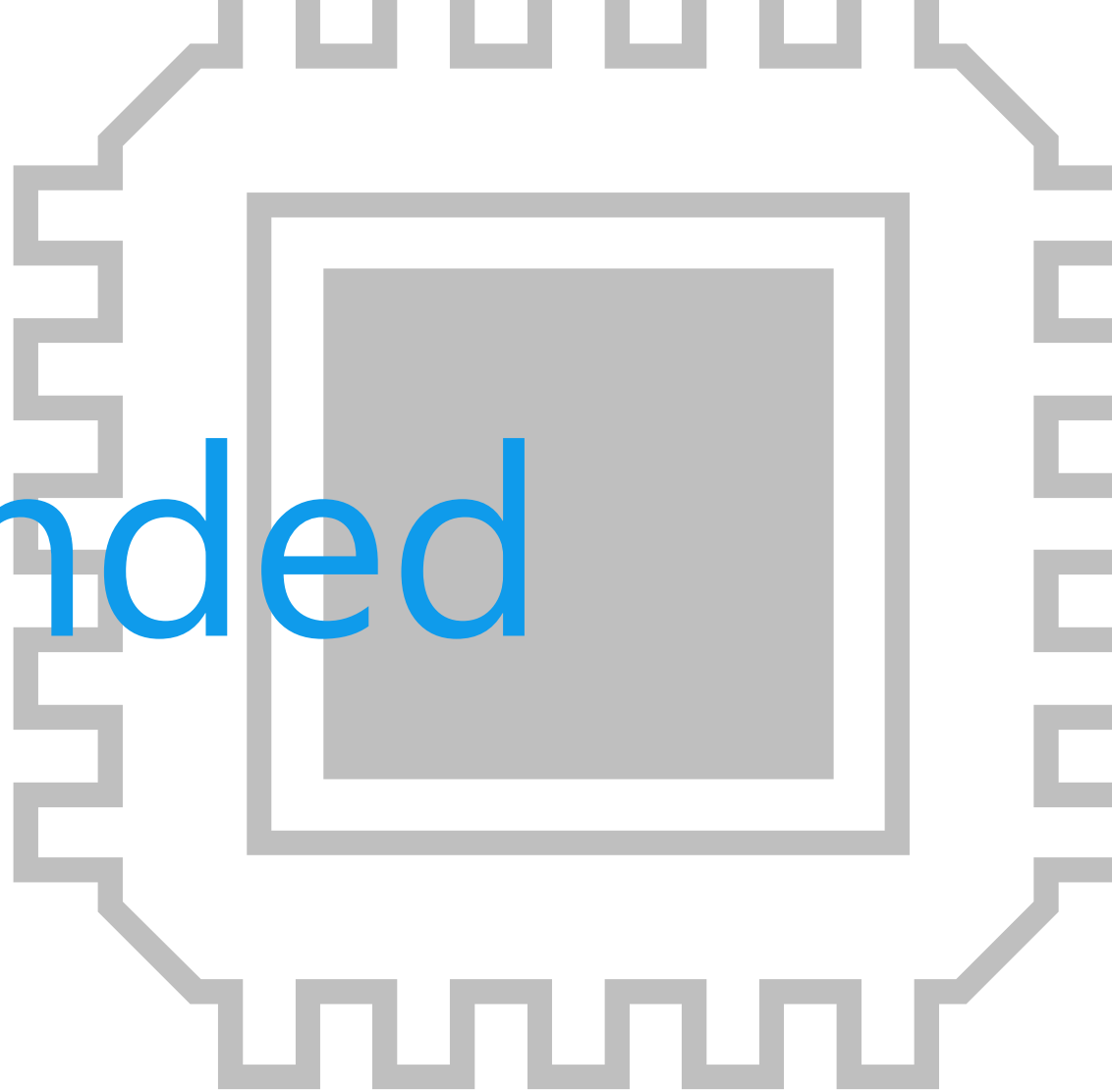
Criteria for device selection

- It is necessary to protect against surge voltage such a 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

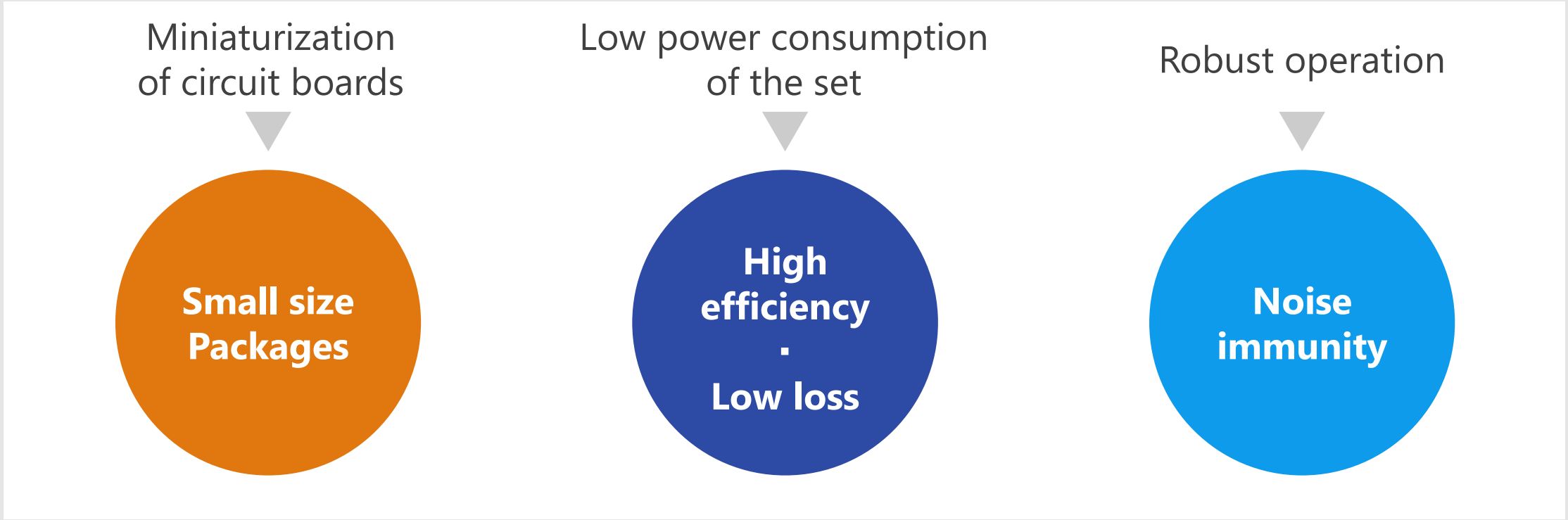
- **Static electricity (ESD) from external terminals is absorbed to prevent circuit malfunction and device breakdown.**
  TVS diode　1
- **Optimum power supply for environments with high power supply noise**
  Small surface mount LDO regulator　2
- **Amplify the detected small signal with low noise**
  Low noise operational amplifier　3
- **Low supply current and I/O full range type**
  Comparator　4

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	●	●	●

1 TVS diode

DF2B7ASL / DF2B5PCT / DF2B7PCT / DF2B7AFU

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

Value provided

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

1 Improved ESD pulse absorption

Improved ESD absorption compared to our 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.

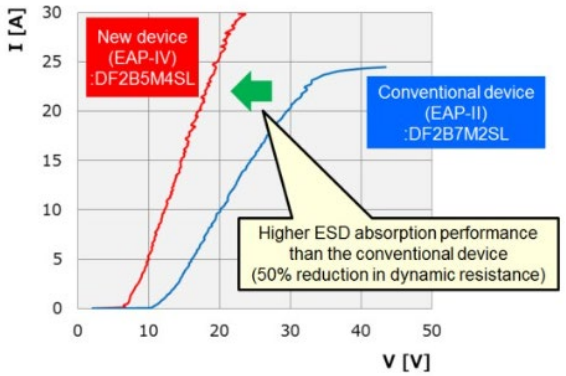
2 Suppress ESD energy by low clamp voltage

Steadily protect the connected circuits/devices using proprietary technology.

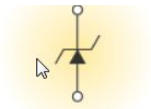
3 Suitable for high-density mounting

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

Line up

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

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

◆Return to Block Diagram TOP

2 Small surface mount LDO regulator

TCR15AG / TCR13AG / TCR8BM / TCR5BM / TCR5RG / TCR3RM / TCR3U / TCR2L / TAR5 Series

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

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 newly developed new generation process significantly improved the dropout voltage characteristics.

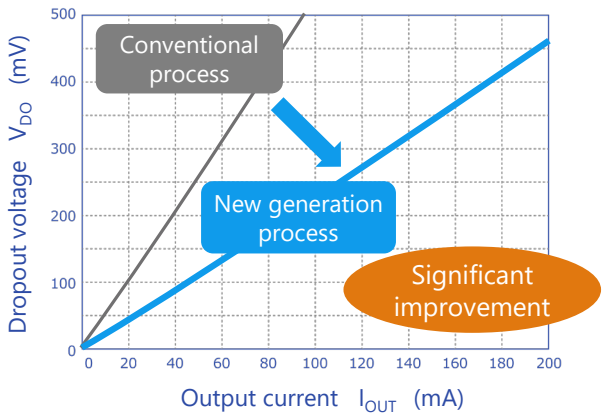
2 High PSRR Low output noise voltage

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

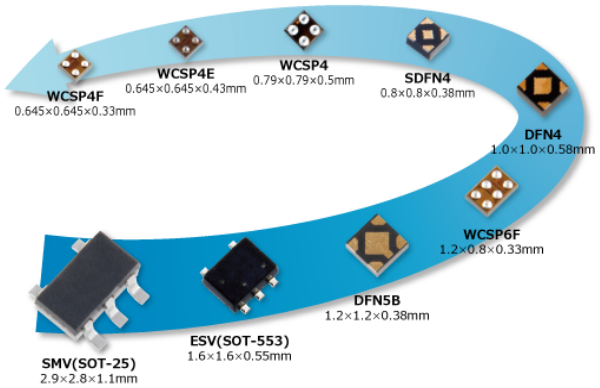
0.34 μA of $I_{B(ON)}$ is realized by utilizing CMOS process and unique circuit technology.

Low dropout voltage



Note: Toshiba internal comparison

Rich package line up



Line up

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		15V 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	52	20	19	7	7	0.34	1	170

◆Return to Block Diagram TOP

3 Low noise operational amplifier

TC75S67TU

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

Value provided

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

1 Low noise
V_{NI} = 6.0 [nV/√Hz] (Typ.)
@f=1 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 one of the industry's lowest [Note 2] input equivalent noise voltage.

2 Low supply current
I_{DD} = 430 [μA] (Typ.)

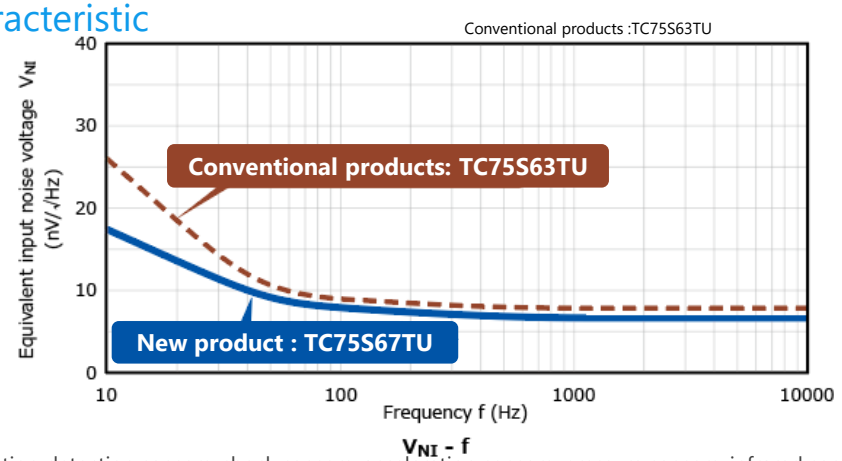
The low current consumption characteristics of CMOS processing contributes to the extension of battery life of the compact IoT devices.

3 Enhancement type

It is easy to handle because it is an enhancement type in which no drain current flows when no gate voltage is applied.

Low noise characteristic

(Toshiba internal Comparison)



V_{NI} - f

Line up

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

[Note 1] Various sensors: vibration detection sensors, shock sensors, acceleration sensors, pressure sensors, infrared sensors, and temperature sensors, etc.
[Note 2] Based on our survey (as of May 2017).

◆Return to Block Diagram TOP

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 V to 5.5 V.

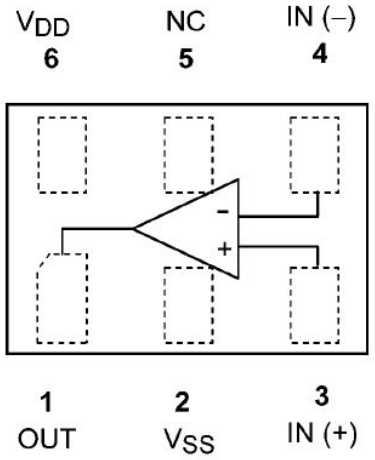
2 Low supply current I_{DD} = 18 [µA] (Typ.)

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

3 Low input offset voltage V_{IO} = ±1.0 [mV] (Typ.)

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

TC75S70L6X
Internal connection



Line up

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

◆Return to Block Diagram TOP

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