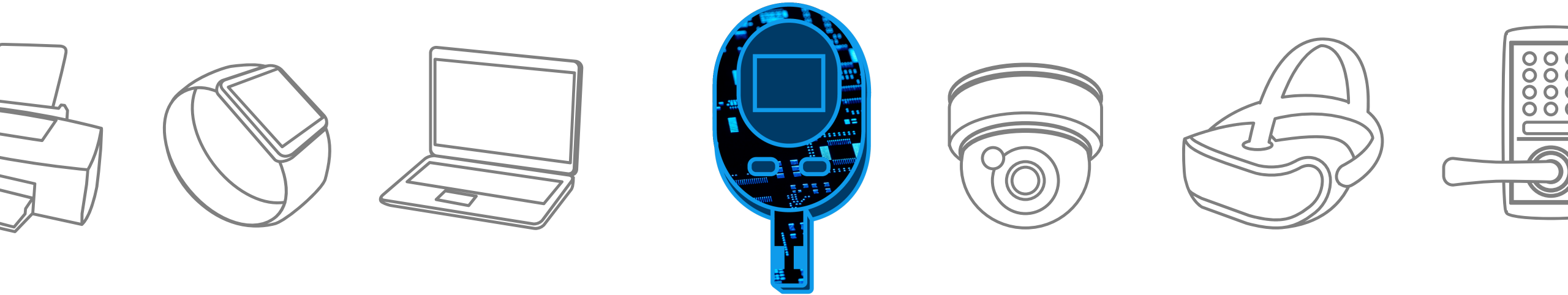
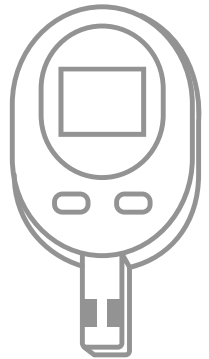
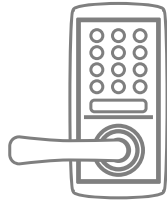
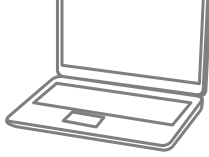


Blood Glucose Meter

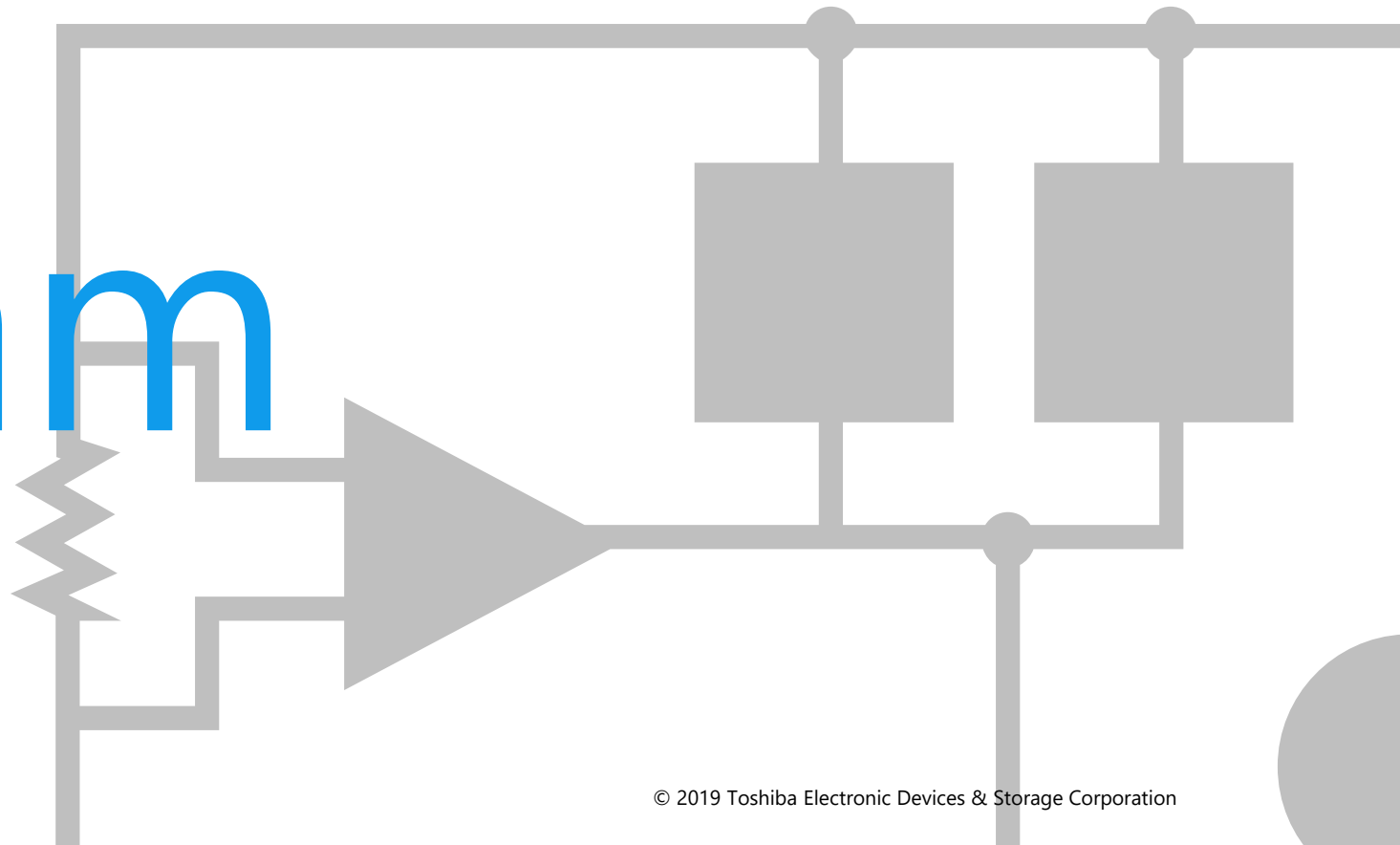
Solution Proposal by Toshiba



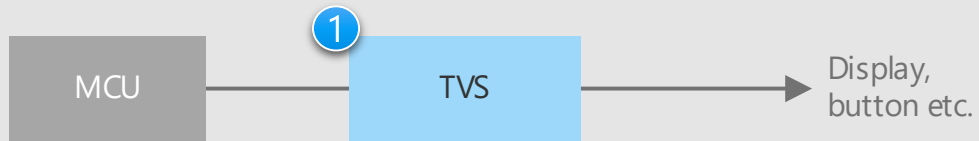


Toshiba Electronic Devices & Storage Corporation provides comprehensive device solutions to customers developing new products by applying its thorough understanding of the systems acquired through the analysis of basic product designs.

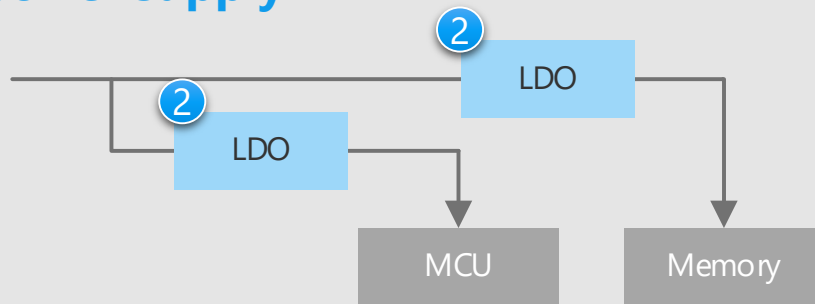
Block Diagram



ESD protection



Control MCU power supply



Criteria for device selection

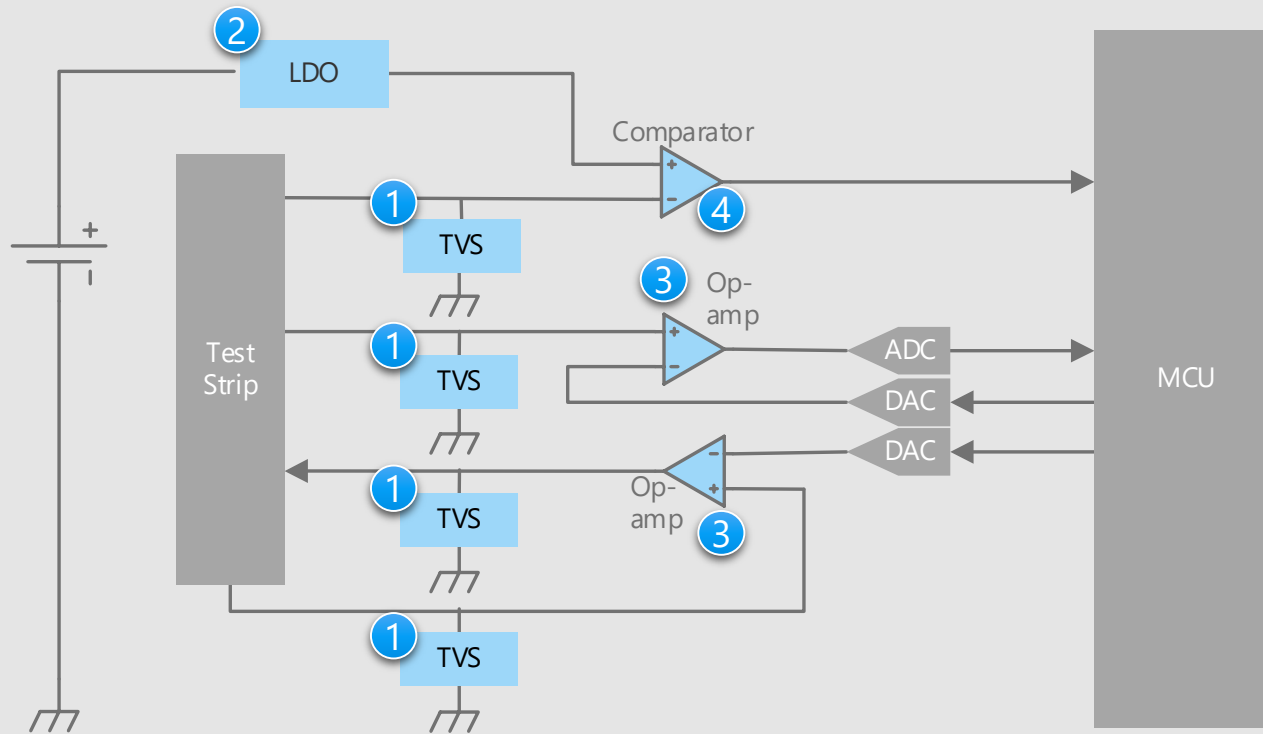
- TVS diode protects signal line from external ESD.
- PSRR is a key characteristic of microcomputer.

Proposals from Toshiba

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

※ 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

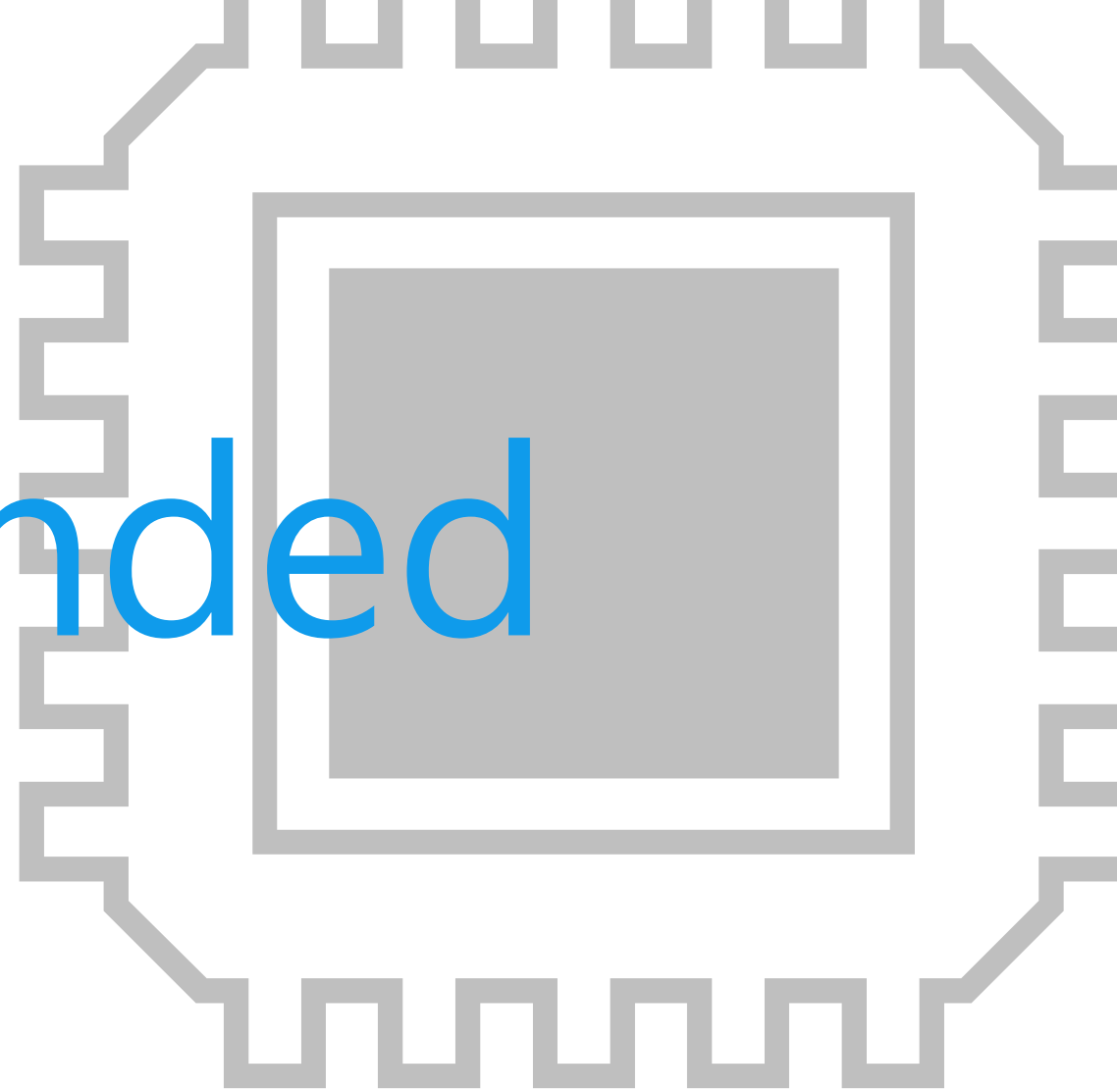
Criteria for device selection

- It is necessary to protect 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

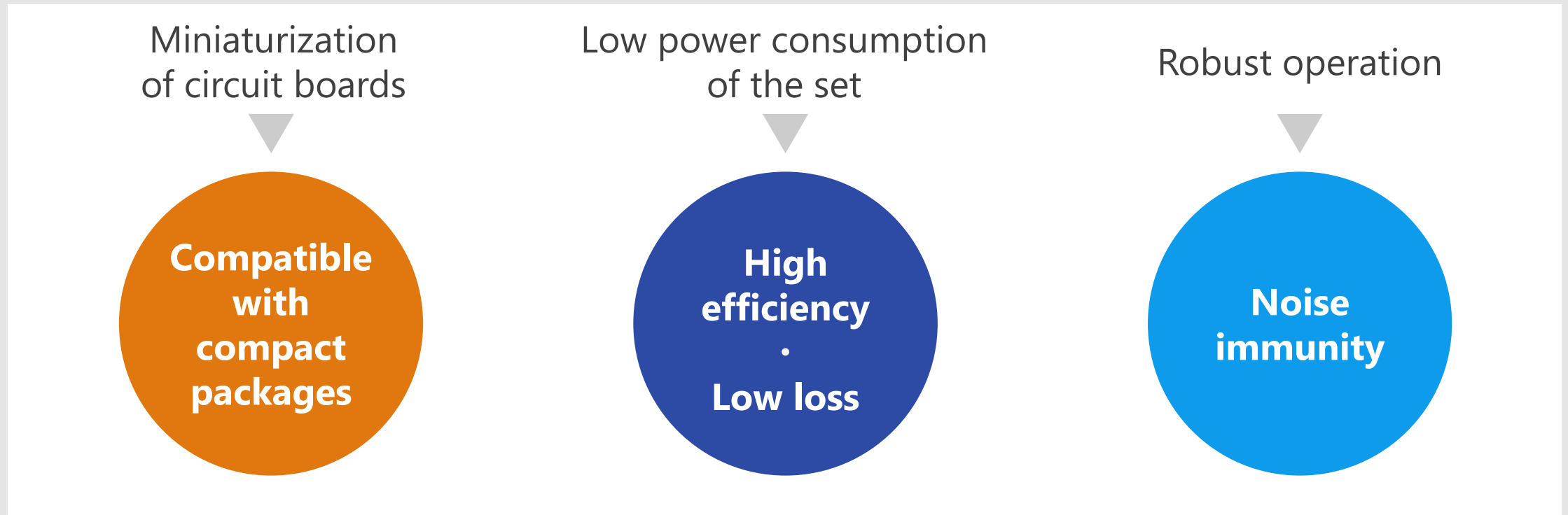
- **Static electricity (ESD) from external terminals is absorbed to prevent circuit malfunction and device breakdown.** 1
TVS diode
- **Optimum power supply for environments with high power supply noise** 2
Small surface mount LDO regulator
- **Amplify the detected small signal with low noise** 3
Small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

	Compatible with compact packages	High efficiency · Low loss	Noise immunity
① TVS diode	●		●
② Small surface mount LDO regulator	●	●	●
③ Ultra-low noise operational amplifier	●	●	●
④ Comparator	●	●	●

Value provided

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

1 Improved ESD pulse absorption

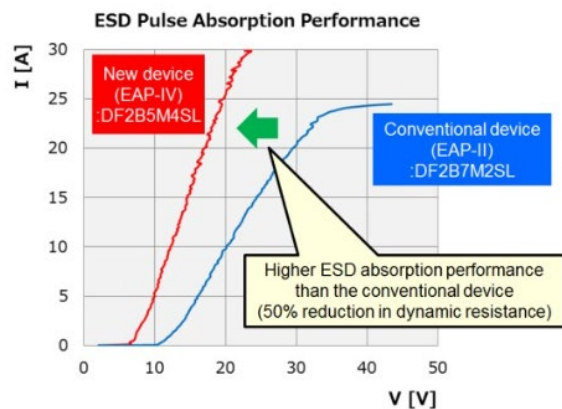
Both low operating resistance and low capacitance are realized and ensures high signal protection performance and signal quality.

2 Suppress ESD energy by low clamp voltage

Steadily protect the connected circuits/devices using proprietary technology.

3 Optimal for high-density mounting

A wide range of packages (single to multi flow through) are available.



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	DF2B7AFU	DF2B20M4SL	DF2S14P2CTC
Package	SL2 	USC 	SL2 	CST2 
V_{ESD} (Max) [kV]	±30	±30	±15	±30
V_{RWM} (Max) [V]	5.5	5.5	18.5	13
C_t (Typ.) [pF]	8.5	8.5	0.2	270
R_{DYN} (Typ.) [Ω]	0.2	0.2	0.2	0.23

(NOTE) : This product is an ESD protection diode and cannot be used for purposes other than ESD protection (including but not limited to voltage regulation diode applications).

[◆Return to Block Diagram TOP](#)

2 Small current LDO regulator

TCR3UG / TCR3UM series

Compatible with compact packages

High efficiency
Low loss

Noise immunity

Value provided

This ideal LDO eliminates switching noise and realizes power saving and long-life operation with low output voltage fluctuation.

1 High ripple rejection

This LDO regulator has a high ripple rejection and realizes stable power supply by eliminating switching noise generated in the power supply circuit.

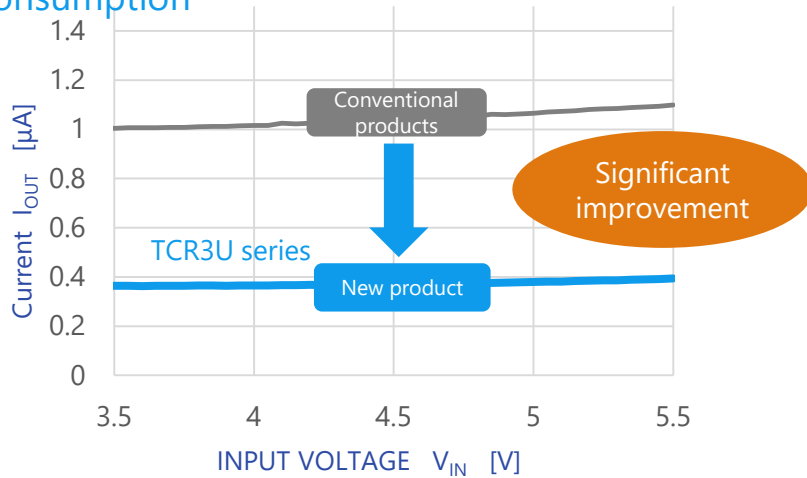
2 Low loss (low quiescent current)

This LDO regulator can minimize current consumption and maximize operating time with limited battery.



3 Optimal for high-density mounting

Various type of small packages are available.

Low current consumption



Line up

Part number	TCR3UG series	TCR3UM series
Package	WCSP4F 	DFN4 
I_{OUT} (Max) [mA]	300	300
V_{DO} (Typ.) [mV] @ $I_{OUT} = 300$ mA	140	196
R.R. (Typ.) [dB]	70	70
$I_{B(ON1)}$ (Typ.) [μ A]	0.34	0.34

[Return to Block Diagram TOP](#)

3 Ultra-low noise operational amplifier

TC75S67TU

Compatible with compact packages

High efficiency
Low loss

Noise immunity

Value provided

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

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

Very small signals detected by various sensors [Note 1] can be amplified with low noise using CMOS Op-amp by optimizing the processing. We achieved one of the industry's lowest [Note 2] input equivalent noise voltage.

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

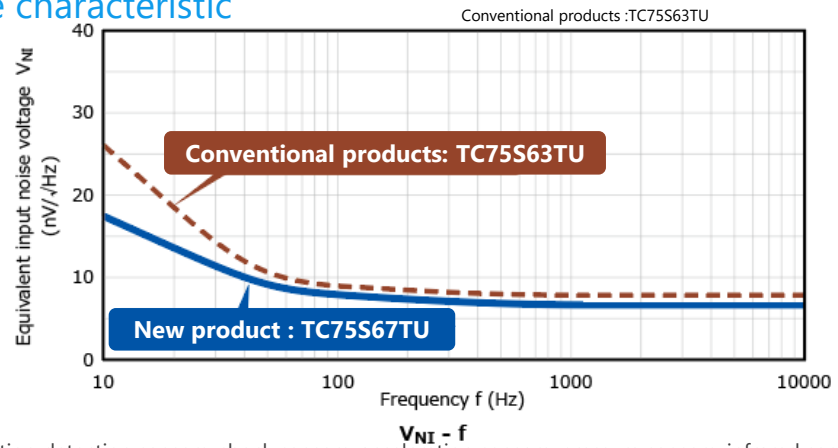
The low current consumption characteristics of CMOS processing contributes to the extension of battery life of the compact IoT devices [Note 3].

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.

Ultra-low noise characteristic

(Company Comparison)



Line up

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

[Note 1] Various sensors: vibration detection sensors, shock sensors, acceleration sensors, pressure sensors, infrared sensors, and temperature sensors
 [Note 2] Based on our survey (as of May 2017). [Note 3] Comparison with our bipolar process operational amplifier

[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

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

2 Low supply current

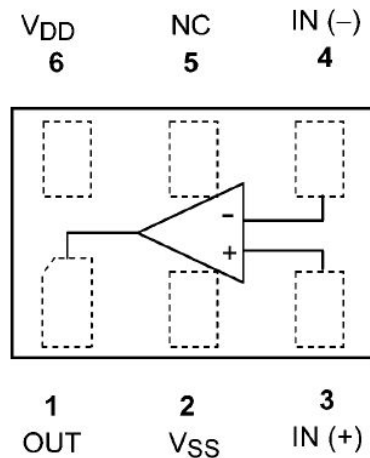
$I_{DD} (\text{Typ.}) = 18 [\mu\text{A}]$


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

3 $V_{IO} (\text{Typ.}) = \pm 1.0 [\text{mV}]$

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

TC75S70L6X
Internal connection



Line up	
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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