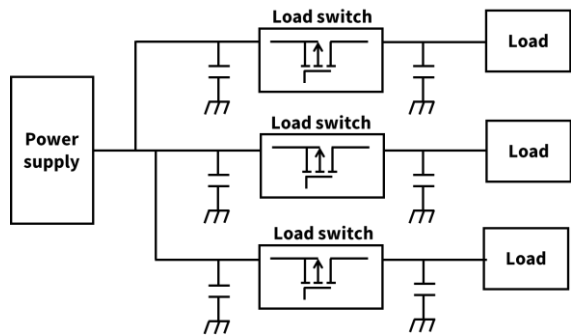


## Introduction to Load Switch ICs

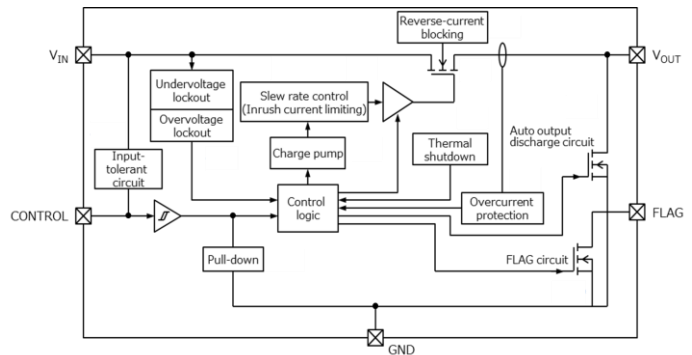
### TOSHIBA Load Switch ICs Contribute to Shorter Design Periods and Higher Equipment Performance

A load switch is a switch (= high-side switch) connected in series between the power supply and the load. It is used to set the power sequence for reliable operation of complex systems in the equipment and to disconnect circuits that are not required for operation for the purpose of reducing power consumption.

The load switch IC is an IC that incorporates a wealth of functions into this load switch. It is compact [Note] compared to a load switch in a discrete configuration, allowing a more reliable system to be constructed. [Note] Comparison with our products



Example of using load switch IC



Example of Load Switch IC Block Diagram

### Lineup of compact products with a variety of additional functions and space-saving capabilities

The load switch IC has a variety of additional functions, such as inrush current reduction, reverse current prevention, overcurrent protection, thermal shutdown, and automatic output discharge, which become complicated in conventional circuit configurations composed of discrete components, in a single chip IC. High performance system is easily realized with small area and low cost.

The lineup of packages is centered on small products of 1mm in size, and we offer products that are ideal for mobile, wearable, IoT equipment, and other applications that require particularly small space.

**Built in Multi-Function In small package**

Overcurrent Protection      Over voltage Lock out

Slew rate control      Thermal Shutdown

Safer and better quality.

**Simplify Design circuit**

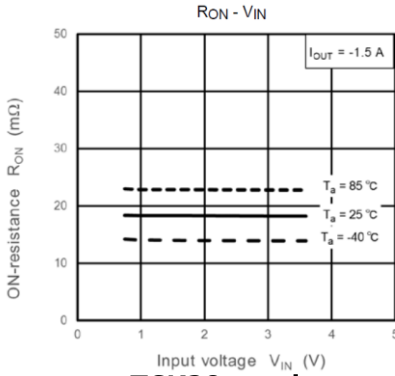
Discrete devices necessary to create a load switch

Output transistor	Driver and discharge transistors
Diode for reverse-current protection	Passive components

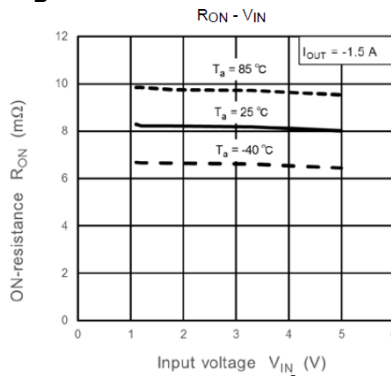
Reduce discrete passive and active components.

## Low Input Voltage Operation/Low On-Resistance Characteristics

The low on-resistance (low  $R_{ON}$ ) type load switch IC realizes low-voltage operation at 0.75V (TCK20x series) and ultra-low  $R_{ON}$  of 8m $\Omega$  (TCK11x series) in a compact package by incorporating a charge pump circuit (step-up circuit) inside. In addition, it has low on-resistance characteristics that are flat against output current and input voltage. Therefore, it is possible to maintain low loss because of low  $R_{ON}$  at all times regardless of changes in operating conditions.



TCK20x series



TCK11x series

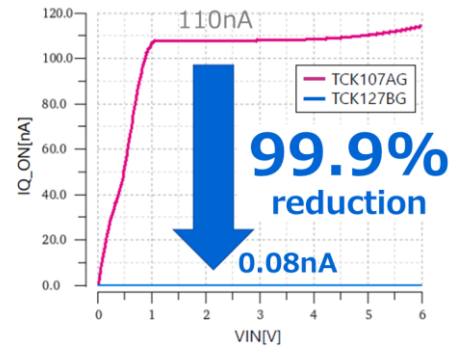
● TCK20x series [Click](#)

● TCK11x series [Click](#)

## Low Current Consumption Characteristics

TCK12xBG series are the latest series featuring 0.08nA (normal) and very low current dissipation. Compared with our conventional product "TCK107AG", it has been significantly reduced by about 99.9%.

The input voltage of this series can be operated from 1.0V to 5.5V. This low current consumption and wide voltage range can be used on the main power lines of mobile and wearable equipment.



Note) The above figure is a design simulation result and is subject to change without notice.

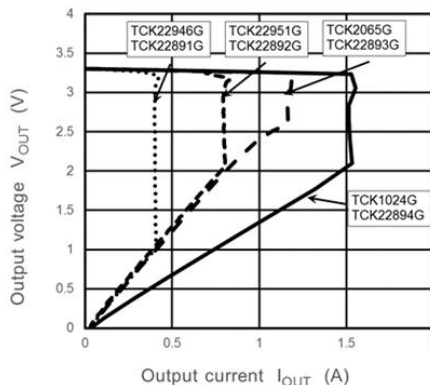
● TCK12xBG series [Click](#)

## Overcurrent protection function

The overcurrent protection function of the load switch IC limits the output current  $I_{OUT}$  by controlling the gate voltage of MOSFET inside the load switch when the output current reaches the internal overcurrent limit. This function is also called the current limit (Current Limit) or OCP (Over Current Protection).

Our load switch ICs use a foldback type of protection circuit (called the "foe" characteristic) control method.

The overcurrent limit value is fixed for each product. The product lineup ranges from a small current value of several hundred mA to a 1.0A or higher.










● Application note [Click](#)

## Overcurrent protection characteristics

## •Load switch IC selection table

Product name	Package	Size (mm)	Structure	Electrical Characteristics/Switching Characteristics							Additional function							Purchase
				Vin /V (Min)	Vin /V (Max)	Iout /A (DC)	RON /mΩ (typ) @1.2V	RON /mΩ (typ) @ 5.0V	Iq /μA (typ)	Slew Rate /μs (typ)	Control Active	Control Connection	OAD	RCB	OVP	OCP	TSD	
TCK22921G	WCSP6E	0.8x1.2	PMOS	1.1	5.5	>2	104	25	0.1	4.5	High	Pull down	Y	Y	N	N	N	<a href="#">Buy Online</a>
TCK22922G	WCSP6E	0.8x1.2	PMOS	1.1	5.5	>2	104	25	1.4	666	High	Pull down	Y	Y	N	N	N	<a href="#">Buy Online</a>
TCK22923G	WCSP6E	0.8x1.2	PMOS	1.1	5.5	>2	104	25	1.4	1364	High	Pull down	Y	Y	N	N	N	<a href="#">Buy Online</a>
TCK22925G	WCSP6E	0.8x1.2	PMOS	1.1	5.5	>2	104	25	1.4	3380	High	Pull down	Y	Y	N	N	N	<a href="#">Buy Online</a>
TCK22971G	WCSP6E	0.8x1.2	PMOS	1.1	5.5	>2	104	25	0.1	4.5	High	Pull down	N	Y	N	N	N	<a href="#">Buy Online</a>
TCK22972G	WCSP6E	0.8x1.2	PMOS	1.1	5.5	>2	104	25	1.4	666	High	Pull down	N	Y	N	N	N	<a href="#">Buy Online</a>
TCK22973G	WCSP6E	0.8x1.2	PMOS	1.1	5.5	>2	104	25	1.4	1364	High	Pull down	N	Y	N	N	N	<a href="#">Buy Online</a>
TCK22974G	WCSP6E	0.8x1.2	PMOS	1.1	5.5	>2	104	25	1.4	3380	High	Pull down	N	Y	N	N	N	<a href="#">Buy Online</a>
TCK22975G	WCSP6E	0.8x1.2	PMOS	1.1	5.5	>2	104	25	1.4	666	Low	Open	N	Y	N	N	N	<a href="#">Buy Online</a>
TCK22913G	WCSP6E	0.8x1.2	PMOS	1.1	5.5	>2	141	31	11	1000	High	Pull down	Y	Y (On/Off)	N	N	Y	<a href="#">Buy Online</a>
TCK22912G	WCSP6E	0.8x1.2	PMOS	1.1	5.5	>2	141	31	11	1000	High	Pull down	N	Y (On/Off)	N	N	Y	<a href="#">Buy Online</a>
TCK22911G	WCSP6E	0.8x1.2	PMOS	1.1	5.5	>2	141	31	11	1000	Low	Open	Y	Y (On/Off)	N	N	Y	<a href="#">Buy Online</a>
TCK22910G	WCSP6E	0.8x1.2	PMOS	1.1	5.5	>2	141	31	11	1000	Low	Open	N	Y (On/Off)	N	N	Y	<a href="#">Buy Online</a>
TCK22946G	WCSP6E	0.8x1.2	PMOS	1.1	5.5	>2	141	31	25	50	High	Pull down	Y	Y (On/Off)	N	Y (0.4A)	Y	<a href="#">Buy Online</a>
TCK22951G	WCSP6E	0.8x1.2	PMOS	1.4	5.5	>2	141	31	25	50	High	Pull down	Y	Y (On/Off)	N	Y (0.74A)	Y	<a href="#">Buy Online</a>
TCK2065G	WCSP6E	0.8x1.2	PMOS	1.4	5.5	>2	141	31	25	50	High	Pull down	Y	Y (On/Off)	N	Y (1.11A)	Y	<a href="#">Buy Online</a>
TCK1024G	WCSP6E	0.8x1.2	PMOS	1.4	5.5	>2	141	31	25	50	High	Pull down	Y	Y (On/Off)	N	Y (1.54A)	Y	<a href="#">Buy Online</a>
TCK22891G	WCSP6E	0.8x1.2	PMOS	1.1	5.5	>2	141	31	25	50	High	Pull down	Y	N	N	Y (0.4A)	Y	<a href="#">Buy Online</a>
TCK22892G	WCSP6E	0.8x1.2	PMOS	1.4	5.5	>2	141	31	25	50	High	Pull down	Y	N	N	Y (0.74A)	Y	<a href="#">Buy Online</a>
TCK22893G	WCSP6E	0.8x1.2	PMOS	1.4	5.5	>2	141	31	25	50	High	Pull down	Y	N	N	Y (1.11A)	Y	<a href="#">Buy Online</a>
TCK22894G	WCSP6E	0.8x1.2	PMOS	1.4	5.5	>2	141	31	25	50	High	Pull down	Y	N	N	Y (1.54A)	Y	<a href="#">Buy Online</a>
TCK1064G	WCSP4D	0.8x0.8	PMOS	1.1	5.5	1	139	34	0.11	130	High	Pull down	N	N	N	N	N	<a href="#">Buy Online</a>
TCK107AG	WCSP4D	0.8x0.8	PMOS	1.1	5.5	1	139	34	0.11	130	High	Pull down	Y	N	N	N	N	<a href="#">Buy Online</a>
TCK108AG	WCSP4D	0.8x0.8	PMOS	1.1	5.5	1	139	34	0.11	130	Low	Open	Y	N	N	N	N	<a href="#">Buy Online</a>
TCK106AF	SOT-25	2.8x2.9	PMOS	1.1	5.5	1	175	63	0.11	130	High	Pull down	N	N	N	N	N	<a href="#">Buy Online</a>
TCK107AF	SOT-25	2.8x2.9	PMOS	1.1	5.5	1	175	63	0.11	130	High	Pull down	Y	N	N	N	N	<a href="#">Buy Online</a>
TCK108AF	SOT-25	2.8x2.9	PMOS	1.1	5.5	1	175	63	0.11	130	Low	Open	Y	N	N	N	N	<a href="#">Buy Online</a>
TCK111G	WCSP6C	1.0x1.5	NMOS	1.1	5.5	3	8.4	8.3	65	500	High	Pull down	N	Y (On/Off)	N	N	Y	<a href="#">Buy Online</a>
TCK112G	WCSP6C	1.0x1.5	NMOS	1.1	5.5	3	8.4	8.3	65	500	High	Pull down	Y	Y (On/Off)	N	N	Y	<a href="#">Buy Online</a>
TCK206G	WCSP4C	0.9x0.9	NMOS	0.75	3.6	2	18.2	N/A	22	240	High	Pull down	N	Y	N	N	N	<a href="#">Buy Online</a>
TCK207G	WCSP4C	0.9x0.9	NMOS	0.75	3.6	2	18.2	N/A	22	240	High	Pull down	Y	Y	N	N	N	<a href="#">Buy Online</a>
TCK208G	WCSP4C	0.9x0.9	NMOS	0.75	3.6	2	18.2	N/A	22	240	Low	Open	Y	Y	N	N	N	<a href="#">Buy Online</a>
TCK207AN	DFN4A	1.2x1.2	NMOS	0.75	3.6	2	21.5	N/A	22	240	High	Pull down	Y	Y	N	N	N	<a href="#">Buy Online</a>
TCK126BG	WCSP4G	0.645*0.645	PMOS	1.0	5.5	1	210	46	0.08nA	363	High	Open	N	N	N	N	N	<a href="#">Buy Online</a>
TCK127BG	WCSP4G	0.645*0.645	PMOS	1.0	5.5	1	210	46	0.08nA	363	High	Open	Y	N	N	N	N	<a href="#">Buy Online</a>
TCK128BG	WCSP4G	0.645*0.645	PMOS	1.0	5.5	1	210	46	0.08nA	363	Low	Open	Y	N	N	N	N	<a href="#">Buy Online</a>

OAD: Output auto-discharge, Y (On/Off): "True backflow prevention function", RCB: Reverse flow prevention, OVP: Overvoltage protection (shutdown), OCP: Overcurrent protection (shutdown), TSD: Heat protection

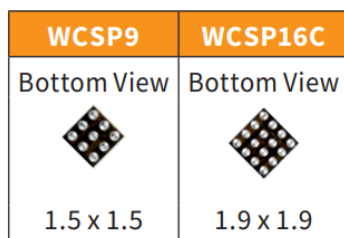
WCSP4D	WCSP4C	SMV (SOT-25)	WCSP6C	WCSP6E	DFN4A	WCSP4G
Bottom View  0.79 x 0.79	Bottom View  0.9 x 0.9	 2.9 x 2.8	Bottom View  1.5 x 1.0	Bottom View  1.2 x 0.8	Bottom View  1.2 x 1.2	Bottom View  0.645 x 0.645

## •Load switch IC selection table(Power Multiplexer ICs)

品名	パッケージ	サイズ (mm)	構造	Electrical Characteristics/Switching Characteristics							Additional function					Purchase	
				Vin /V (Min)	Vin /V (Max)	Iout /A (DC)	RON /mΩ (typ) @ 4.5V, -1.0A	Iq /μA (typ)	Slew rate /ms (typ)	Control Active	Control connection	OAD	RCB	OVP	OCP		TSD
<a href="#">TCK301G</a>	WCSP9	1.5x1.5	NMOS	2.3	28	3	73	130	2	(Note1)	Pull up	N	Y	Y(6.6V)	N	Y	<a href="#">Buy Online</a>
<a href="#">TCK302G</a>	WCSP9	1.5x1.5	NMOS	2.3	28	3	73	130	2	(Note1)	Pull up	N	Y	Y(10.5V)	N	Y	<a href="#">Buy Online</a>
<a href="#">TCK303G</a>	WCSP9	1.5x1.5	NMOS	2.3	28	3	73	130	2	(Note1)	Pull up	N	Y	Y(15.5V)	N	Y	<a href="#">Buy Online</a>
<a href="#">TCK304G</a>	WCSP9	1.5x1.5	NMOS	2.3	28	3	73	130	2	(Note1)	Pull down	N	Y	Y(6.6V)	N	Y	<a href="#">Buy Online</a>
<a href="#">TCK305G</a>	WCSP9	1.5x1.5	NMOS	2.3	28	3	73	130	2	(Note1)	Pull down	N	Y	Y(10.5V)	N	Y	<a href="#">Buy Online</a>
<a href="#">TCK321G</a>	WCSP16C	1.9x1.9	NMOS	2.3	36	2	98	140	2	(Note1)	Pull down	N	Y	Y(12.0V)	N	Y	<a href="#">Buy Online</a>
<a href="#">TCK322G</a>	WCSP16C	1.9x1.9	NMOS	2.3	36	2	98	140	2	(Note1)	Pull down	N	Y	Y(15.0V)	N	Y	<a href="#">Buy Online</a>
<a href="#">TCK323G</a>	WCSP16C	1.9x1.9	NMOS	2.3	36	2	98	140	2	(Note1)	Pull down	N	Y	Y(15.0V)	N	Y	<a href="#">Buy Online</a>

OAD: Output auto-discharge, Y (On/Off): "True backflow prevention function", RCB: Reverse flow prevention, OVP: Overvoltage protection (shutdown), OCP: Overcurrent protection (shutdown), TSD: Heat protection

Note1 : Please refer to the data sheet of each product.



### Related LINK

- [Introduction to Load Switch IC Products](#)
- [Application note](#)
- [Frequently Asked Queries for Load Switch ICs \(FAQ\)](#)
- [Online distributor purchase, inventory search page](#)
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