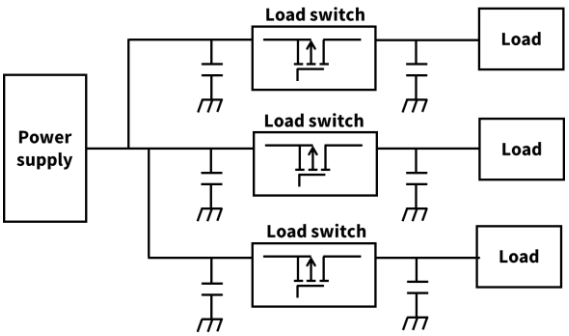
Introduction to Load Switch ICs

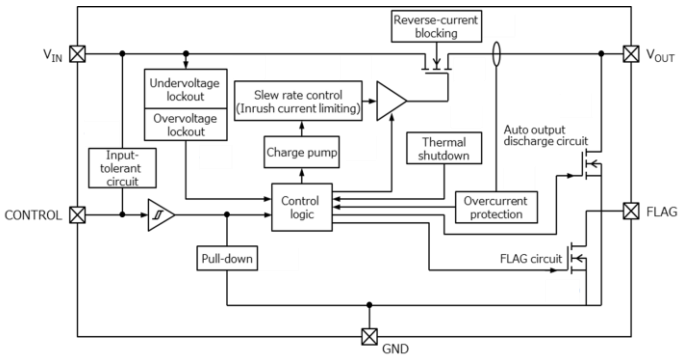
TOSHIBA Load Switch ICs Contribute to Shorter Design Periods and Higher Equipment Performance

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

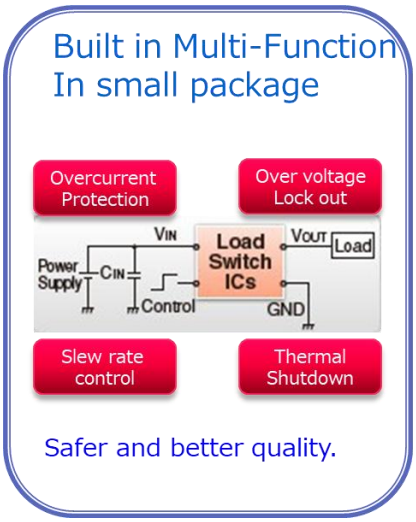


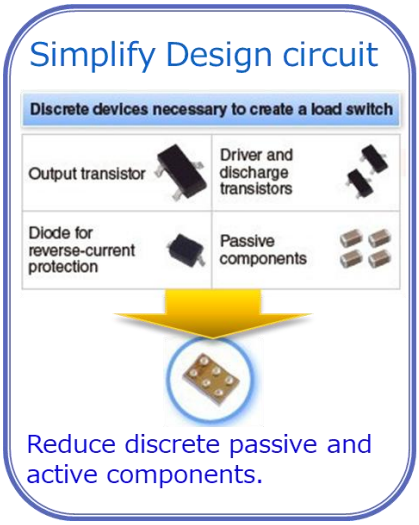
Example of Load Switch IC Block Diagram

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.



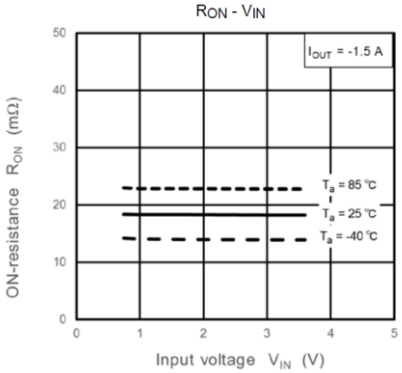


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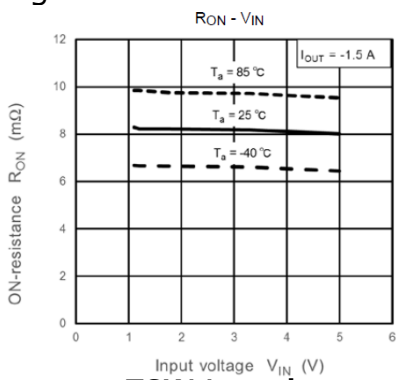
TOSHIBA

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 8mΩ (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**

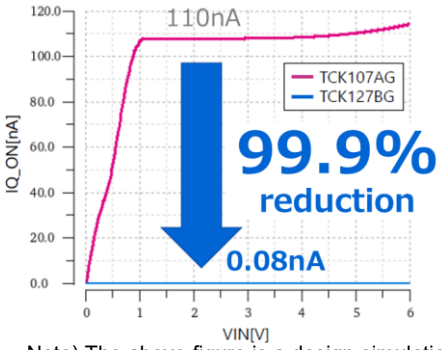
● TCK11x series **Click**

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.

● TCK12xBG series **Click**



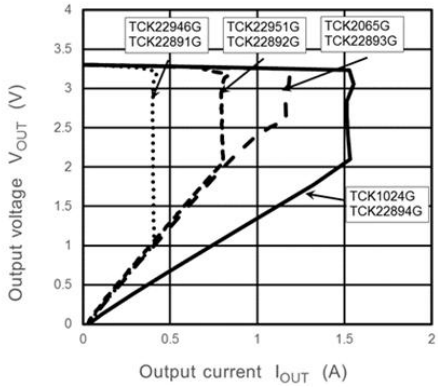
Note) The above figure is a design simulation result and is subject to change without notice.

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.



Overcurrent protection characteristics

● Application note **Click**

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・Load switch IC selection table

				Electrical Characteristics/Switching Characteristics							Additional function							
Product name	Package	Size (mm)	Structure	Vin /V (Min)	Vin /V (Max)	Iout /A (DC)	RON /mΩ (typ) @1.2V	RON /mΩ (typ) @ 5.0V	Iq /uA (typ)	Slew Rate /μs (typ)	Control Active	Control Connection	OAD	RCB	OVP	OCP	TSD	Purchase
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	Buy Online
TCK22922G	WCSP6E	0.8x1.2	PMOS	1.1	5.5	>2	104	25	1.4	666	High	Pull down	Y	Y	N	N	N	Buy Online
TCK22923G	WCSP6E	0.8x1.2	PMOS	1.1	5.5	>2	104	25	1.4	1364	High	Pull down	Y	Y	N	N	N	Buy Online
TCK22925G	WCSP6E	0.8x1.2	PMOS	1.1	5.5	>2	104	25	1.4	3380	High	Pull down	Y	Y	N	N	N	Buy Online
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	Buy Online
TCK22972G	WCSP6E	0.8x1.2	PMOS	1.1	5.5	>2	104	25	1.4	666	High	Pull down	N	Y	N	N	N	Buy Online
TCK22973G	WCSP6E	0.8x1.2	PMOS	1.1	5.5	>2	104	25	1.4	1364	High	Pull down	N	Y	N	N	N	Buy Online
TCK22974G	WCSP6E	0.8x1.2	PMOS	1.1	5.5	>2	104	25	1.4	3380	High	Pull down	N	Y	N	N	N	Buy Online
TCK22975G	WCSP6E	0.8x1.2	PMOS	1.1	5.5	>2	104	25	1.4	666	Low	Open	N	Y	N	N	N	Buy Online
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	Buy Online
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	Buy Online
TCK22911G	WCSP6E	0.8x1.2	PMOS	1.1	5.5	>2	141	31	11	1000	Low	Open	Y	Y (On/Off)	N	N	Y	Buy Online
TCK22910G	WCSP6E	0.8x1.2	PMOS	1.1	5.5	>2	141	31	11	1000	Low	Open	N	Y (On/Off)	N	N	Y	Buy Online
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	Buy Online
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	Buy Online
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	Buy Online
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	Buy Online
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	Buy Online
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	Buy Online
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	Buy Online
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	Buy Online
TCK106AG	WCSP4D	0.8x0.8	PMOS	1.1	5.5	1	139	34	0.11	130	High	Pull down	N	N	N	N	N	Buy Online
TCK107AG	WCSP4D	0.8x0.8	PMOS	1.1	5.5	1	139	34	0.11	130	High	Pull down	Y	N	N	N	N	Buy Online
TCK108AG	WCSP4D	0.8x0.8	PMOS	1.1	5.5	1	139	34	0.11	130	Low	Open	Y	N	N	N	N	Buy Online
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	Buy Online
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	Buy Online
TCK108AF	SOT-25	2.8x2.9	PMOS	1.1	5.5	1	175	63	0.11	130	Low	Open	Y	N	N	N	N	Buy Online
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	Buy Online
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	Buy Online
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	Buy Online
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	Buy Online
TCK208G	WCSP4C	0.9x0.9	NMOS	0.75	3.6	2	18.2	N/A	22	240	Low	Open	Y	Y	N	N	N	Buy Online
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	Buy Online
TCK126BG	WCSP4G	0.645*0.645	PMOS	1.0	5.5	1	210	46	0.08nA	363	High	Open	N	N	N	N	N	Buy Online
TCK127BG	WCSP4G	0.645*0.645	PMOS	1.0	5.5	1	210	46	0.08nA	363	High	Open	Y	N	N	N	N	Buy Online
TCK128BG	WCSP4G	0.645*0.645	PMOS	1.0	5.5	1	210	46	0.08nA	363	Low	Open	Y	N	N	N	N	Buy Online

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 	Bottom View 		Bottom View 	Bottom View 	Bottom View 	Bottom View 
0.79 x 0.79	0.9 x 0.9	2.9 x 2.8	1.5 x 1.0	1.2 x 0.8	1.2 x 1.2	0.645 x 0.645

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・Load switch IC selection table(Power Multiplexer ICs)

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

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.

WCSP9	WCSP16C
Bottom View  1.5 x 1.5	Bottom View  1.9 x 1.9

Related LINK

- Introduction to Load Switch IC Products — Click
- Application note — Click
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