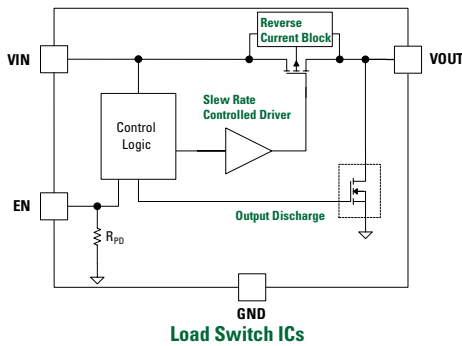# Load Switch ICs Overview

Overview

The integrated Load Switch ICs incorporate cutting-edge technology that achieves industry-leading performance in ultra-low power consumption (low I_Q, I_{SD} and RDS(on)) empowering designers to curtail parasitic leakage current, enhance system efficiency, and extend battery lifespan.

Figure 1. Function Block Diagram Example

Load Switch ICs

Benefits

Ultra Low Power Consumption
Improved system efficiency helps designers reduce parasitic leakage current, reducing the total energy consumption and prolonging battery life.

The Load Switch ICs industry-leading low RDS(on) and low I_Q performance in operation mode ensures substantial power savings. (See Figure 2 below.)

Figure 2. Power Dissipation Equation

$$P_D = V_{IN} \times I_Q + I_{Load}^2 \times RDS(on)$$

Meanwhile, in standby mode, the superb low I_{SD} value affirms low current leakage and hence delivers significant low power loss.

Integration in the Miniaturized Packages
The Load Switch ICs provide integrated features such as soft start, reverse current blocking, and quick output discharge in tiny chip-scale packages.

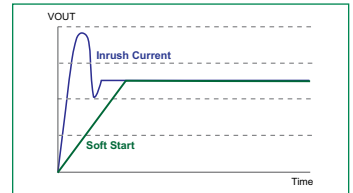**Direct Drop-in Compatibility and Great Performance**
The Load Switch ICs accelerate a new product's time to market by enabling quick pin-to-pin replacement across existing industry-popular solutions, easy assembly, and component savings during the design-in phase.
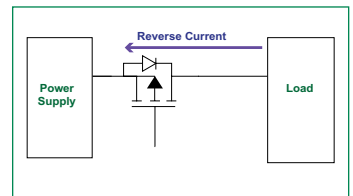
Features

Slew Rate Control/Soft Start
The Load Switch ICs can control the output voltage slew rate that can limit the inrush current.

Reverse Current Blocking
Detects when there is a higher system output voltage than the system input voltage, blocking backward current flow through the system.

Quick Output Discharge
When the load switch IC turns off, it may be necessary for the output capacitor to discharge quickly to prevent unpredictable behavior of the downstream devices due to slow capacitor discharge.

Figure 3. Illustration Diagrams
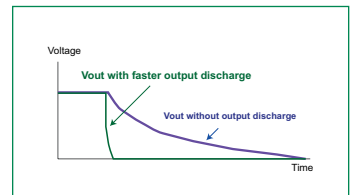
Table 1. Discrete Solutions vs. Load Switch ICs By Features

Features	Discrete Solutions	Load Switch ICs
Low Power Leakage (I_Q/I_{SD})	>> 1 µA	nA Rating
Power Consumption RDS(on)	2-3x	Under 50 mΩ
Solution Size	> Several mm² include FETs + Passive	Chip Scale Packages
Functional Integrations	Needs extra external components as FETs, OP, Passive, etc.	Slew Rate Control Output Discharge Reverse Current Blocking Low RDS(on)

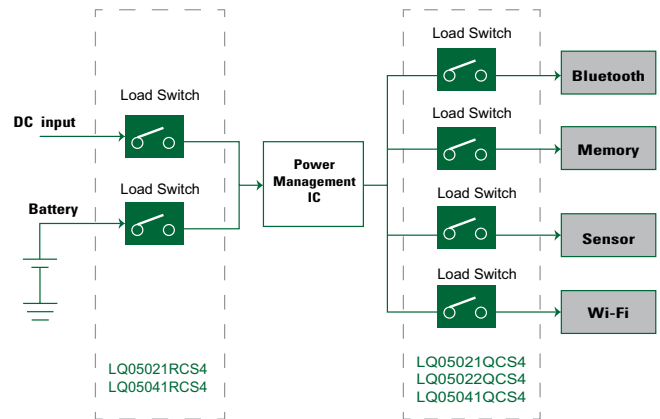**Figure 4.** Enable Simple Design With Integration
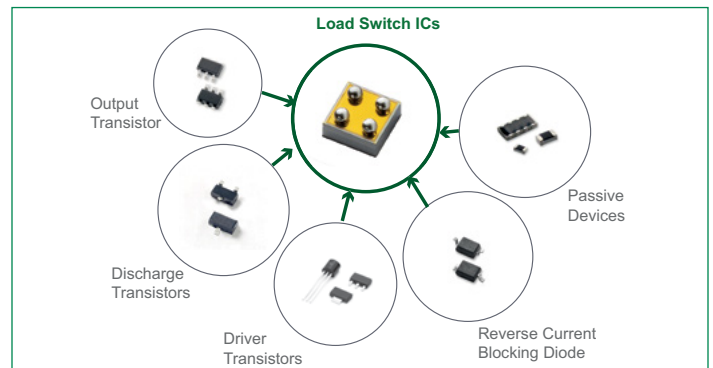
Applications

The Load Switch ICs are ideal for battery-charged device power saving, power sequence control and power MUX (PMUX) application. Below is a list of the examples.

- Bluetooth Headset
- Computing Electronics
- Data Storage, SSD
- Doorbell
- Door Lock
- IoT (Internet of Things) Devices
- Smart Tag
- Smart Meter (Gas/Water)
- Tablet/POS
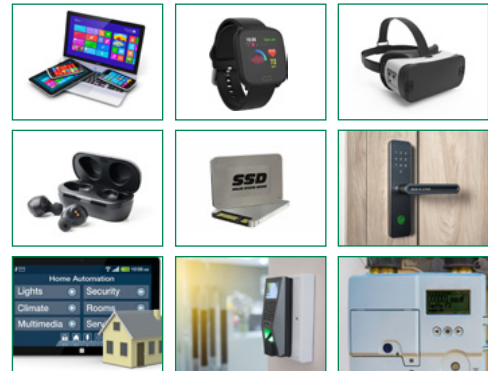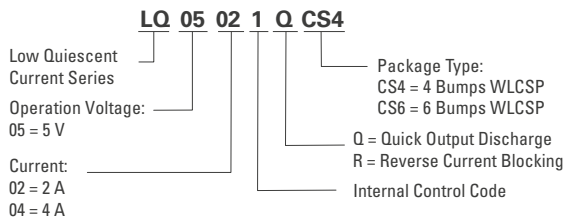- Virtual Reality (VR) Headset
- Wearable/Smart Watch

Part System Classification

The easy-to-use part number system helps define the product's specifications, such as operation voltage, current, package types, and key functions.

Figure 5. Part Number System

LQ 05 02 1 Q CS4

Low Quiescent Current Series

Operation Voltage:
05 = 5 V

Current:
02 = 2 A
04 = 4 A

Package Type:
CS4 = 4 Bumps WLCSP
CS6 = 6 Bumps WLCSP

Q = Quick Output Discharge
R = Reverse Current Blocking

Internal Control Code

Figure 6. Load Switch ICs Applications and Diagram

Available Parts

Table 2. Parts List

Part Number	Voltage Range	Vmax	Current	RDS(on)	I_Q	I_{SD}	Rise Time (Soft Start)	Reverse Current-Blocking (RCB)	Control Active	Quick Output Discharge	Package	Image
	(V)	(V)	(A)	(mΩ)	(nA)	(nA)	(µs)			(Ω)	(mm)	
LQ05021QCS4	1.1-5.5	6	2	34	1 (520*)	19	430	No	High	85	CSP4 (0.77x0.77x0.46)	
LQ05021RCS4	1.1-5.5	6	2	37	450	20	570	Yes	High	85	CSP4 (0.77x0.77x0.46)	
LQ05022QCS4**	1.1-5.5	6	2	31	7 (570*)	23	335	No	High	85	CSP4 (0.97x0.97x0.55)**	
LQ05041QCS6	1.1-5.5	6	4	15	3 (540*)	50	400	No	High	85	CSP6 (0.97x1.47x0.55)	
LQ05041RCS6	1.1-5.5	6	4	14	1300	40	730	Yes	High	No	CSP6 (0.97x1.47x0.55)	

Notes:
*This device includes the Enable pin leakage.
** This is an alternative version of CSP4 package.