Tecate Group
Power, Performance, Solutions

Alkaline Battery Life Extension

Extend Alkaline Battery Life by up to 100% in Pulse-Power Applications

Standard alkaline batteries are high capacity but can experience rapid capacity decay and early end of life when subjected to high current pulses. By combining a lithium-ion capacitor (LIC) in parallel with alkaline batteries, the alkaline battery life can be extended by 100% or more (individual results may vary) depending on the frequency and amplitude of the high-current pulse.

The Problem: Short Battery Life

High-current pulses significantly degarde alkaline battery performance:

- Voltage sag: High-current pulses trigger an instant voltage drop, causing the battery to reach the minimum voltage level while the battery still has a significant amount of energy trapped inside.
- Gas buildup: High currents can trigger side reactions that will generate gas and build pressure inside the alkaline battery cell.
- Chemical choking: Rapid-discharge events “choke” the internal chemistry, permanently increasing resistance and reducing efficiency.
- Heat and leakage: Wasted energy turns into internal heat, which degardes the electrolyte and increases the risk of battery leakage.

The Solution: Lithium-Ion Capacitors in Parallel With the Battery

Tecate LIC cells and modules are designed to connect directly to the battery rail to handle peak loads and protect the battery:

- Ultra-low leakage: LIC cells have near-zero self-discharge, which ensures your batteries don’t drain during sleep modes.
- High power delivery: The LIC cells provide high current delivery due to low internal resistance (ESR).

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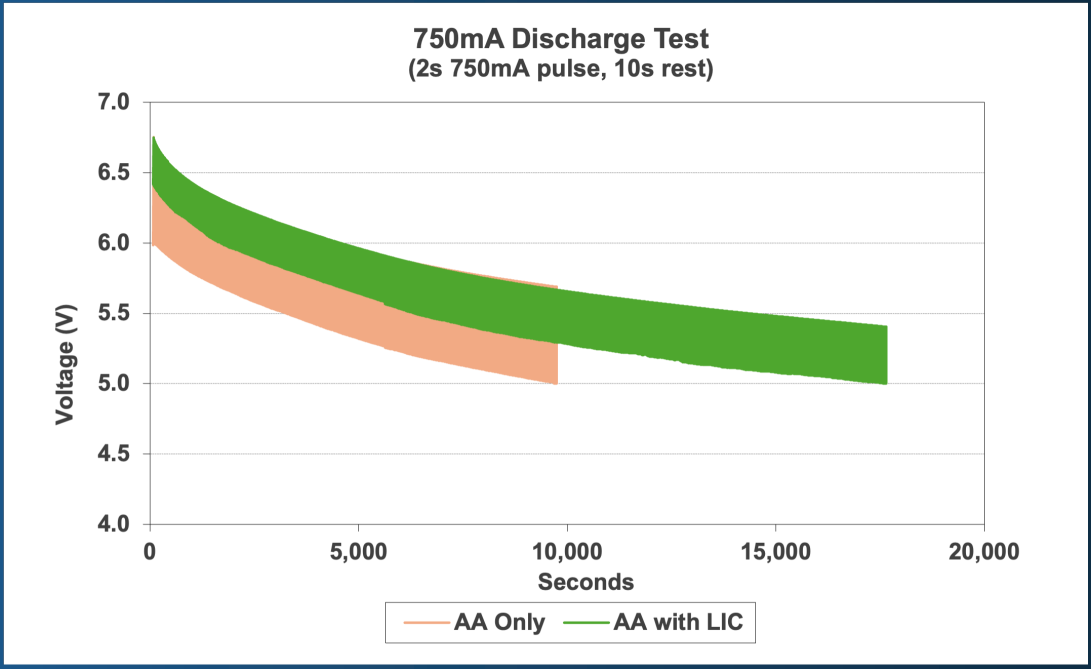
Proven Results: 750mA Discharge Test

To prove our solution, we tested one pack of four AA alkaline batteries in series by themselves and a second pack of four AA alkaline batteries in series with LIC cells in parallel. These packs were repeatedly charged to 6.8V and subjected to a two-second 750mA pulse followed by a 10-second rest until the system cutoff voltage of 5V was reached.

Power Configuration	Runtime to 5V Cutoff	Total Life Extension
AA batteries only	~10,000 seconds	Baseline
AA batteries with LIC cells	~18,000 seconds	80% increase

As shown in the chart below, the green curve (AA batteries plus LIC cells) remains above the 5V threshold for a much longer duration, maximizing energy extraction by allowing the LICs to absorb the 750mA peak load. The LIC pack has a very long life, so it does not need to be replaced when the alkaline batteries die. The same LIC cell pack can be used over and over again, with multiple alkaline battery replacements. Please contact Tecate Group for more information.



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