Enhanced Li-Ion battery protection with Littelfuse PolySwitch devices

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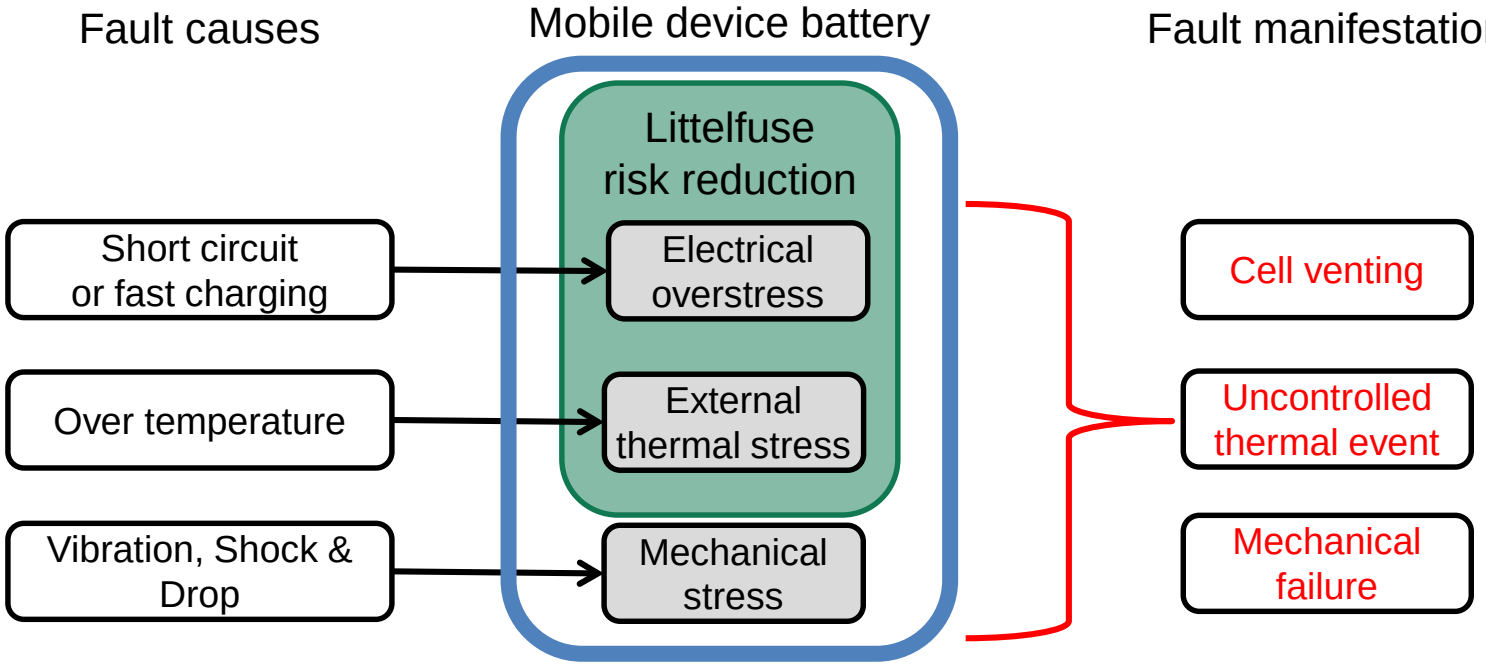
Expertise Applied | Answers Delivered

(20160912)

Over 35 Billion PolySwitch devices shipped for battery over-temp & over-current protection

- Virtually all mobile devices today use Lithium ion batteries. To minimize risk of injury it is important to implement ‘conservative’ safety solutions that can help protect against various failure modes
- Generally batteries are expected to meet minimum safety standards in UL2054 and IEC60950
- Fault modes can fall in several categories that can result in uncontrolled thermal events:
  - User induced mechanical damage
  - Operating or charging in high ambient temperature
  - Difficult to detect manufacturing defects
- Market trends to larger batteries and faster charging can further increase the risks
- Over 35 Billion PolySwitch battery protection devices shipped over past 25 years:
  (thermal + overcurrent) protection that can help reduce risk to users of mobile & wearable devices

Several failure modes need to be considered when implementing battery safety circuitry

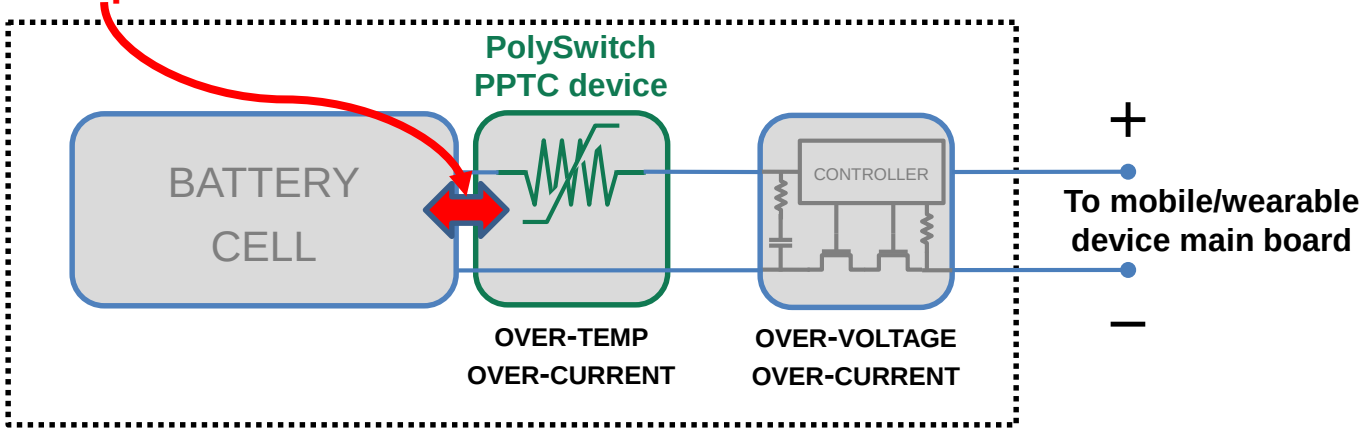


Internal battery cell defects can amplify any & all battery stress factors

Note: In some cases it can be very difficult to identify manufacturing defects as part of standard quality control processes.

Littelfuse PolySwitch devices can help reduce risks from thermal & overcurrent fault events

Thermal coupling between battery cell and PolySwitch PPTC protection device



Two different technologies should be used to reduce in battery protection solutions:

- Primary protection: discharge & charging control + over-current protection
- Secondary protection: over-temperature + over-current protection

Littelfuse PolySwitch protection solutions: passive thermal and over-current protection

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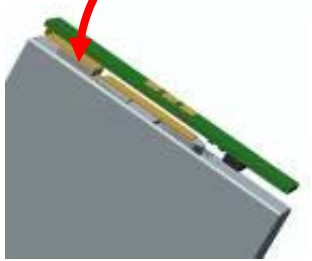
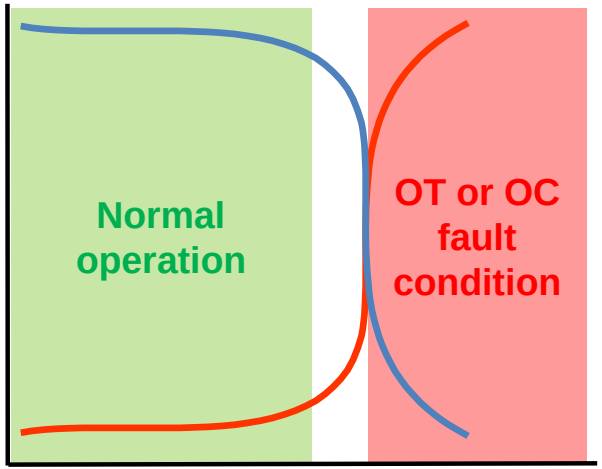


Operating current during over-temp fault



Protection can be activated by: over-temperature or over-current events

Littelfuse PolySwitch protection solutions: >35 B batteries protected over past 25 years

Rick category	Traditional solution	Semiconductor-only
	(PPTC + FET) protection	FETs-only protection
Overcurrent protection	Yes	Yes
Over temperature protection	Yes	No
Overvoltage protection	Yes	Yes
ESD & transient resilient	Yes	No
Independent failure modes	Yes	No
Operating mode	Passive + Active	Active-only
UL safety standards compliant	Yes	Configuration dependent

Littelfuse continuing to develop new products for battery thermal protection