

Batarya Teknolojileri & Batarya Yönetim Sistemleri

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21.11.2018

Sunum İeriđi

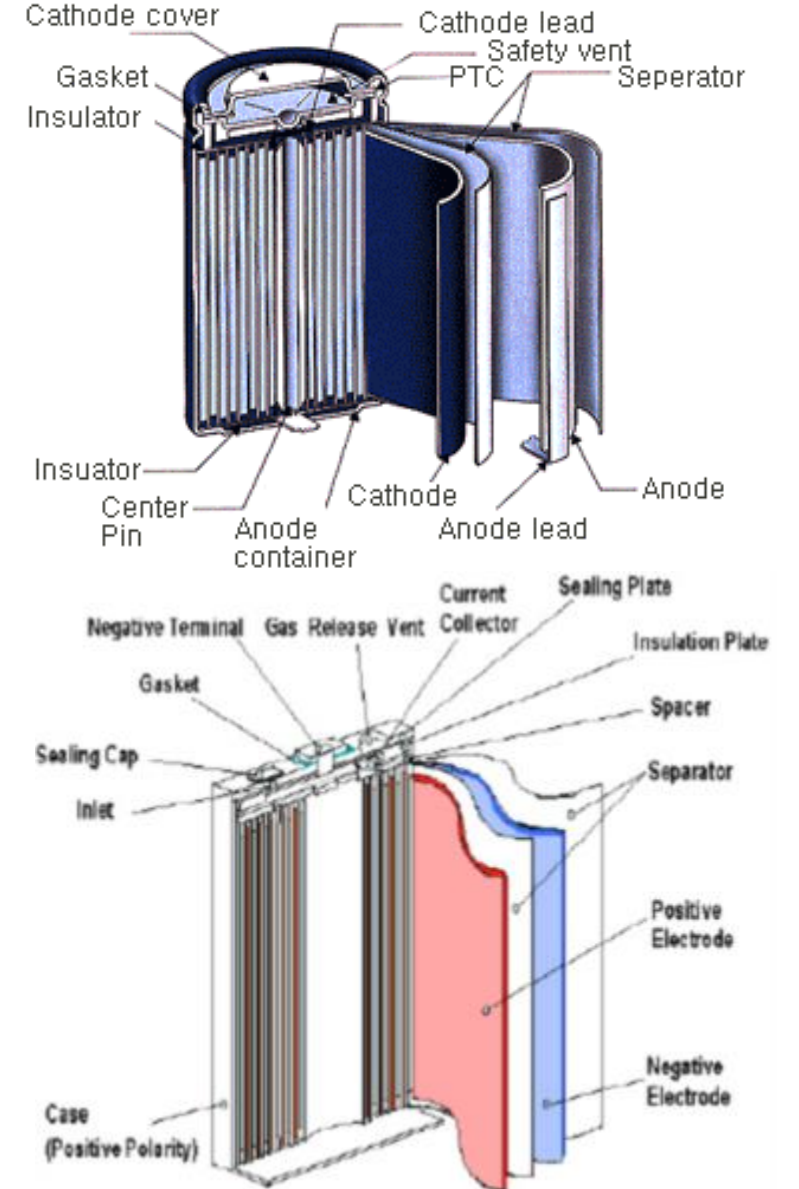
- Lityum bataryaların zellikleri
- Batarya Ynetim Sistemleri
- Hcre Dengeleme topolojileri
 - pasif dengeleyici
 - aktif dengeleyici
- zet



Niçin Lityum batarya kullanıyoruz?

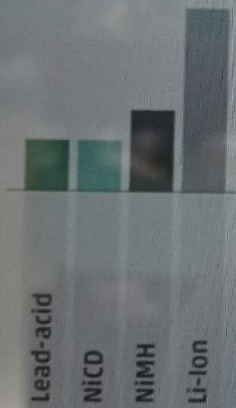
- Yüksek deşarj akımı
- Düşük bekleme deşarjı
- Yüksek Enerji Yoğunluğu (kWh/kg, hWh/m³)
- Uzun Ömür (Çevrim sayısı)
- Derin Deşarj
- Hafıza etkisinin olmaması

Structure of Lithium-ion Battery

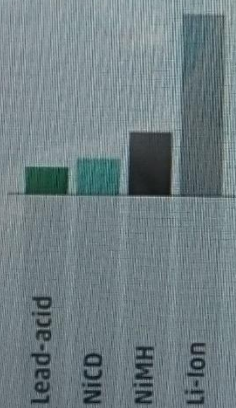


Comparison of technologies

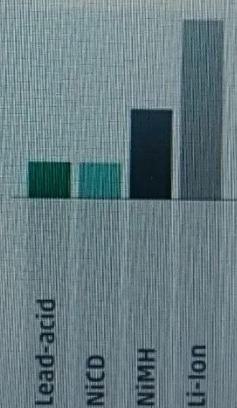
Energy density
(Wh/l)



Energy density
(Wh/kg)



Energy density
(W/kg)



Cycle lifetime
(80% DoD)



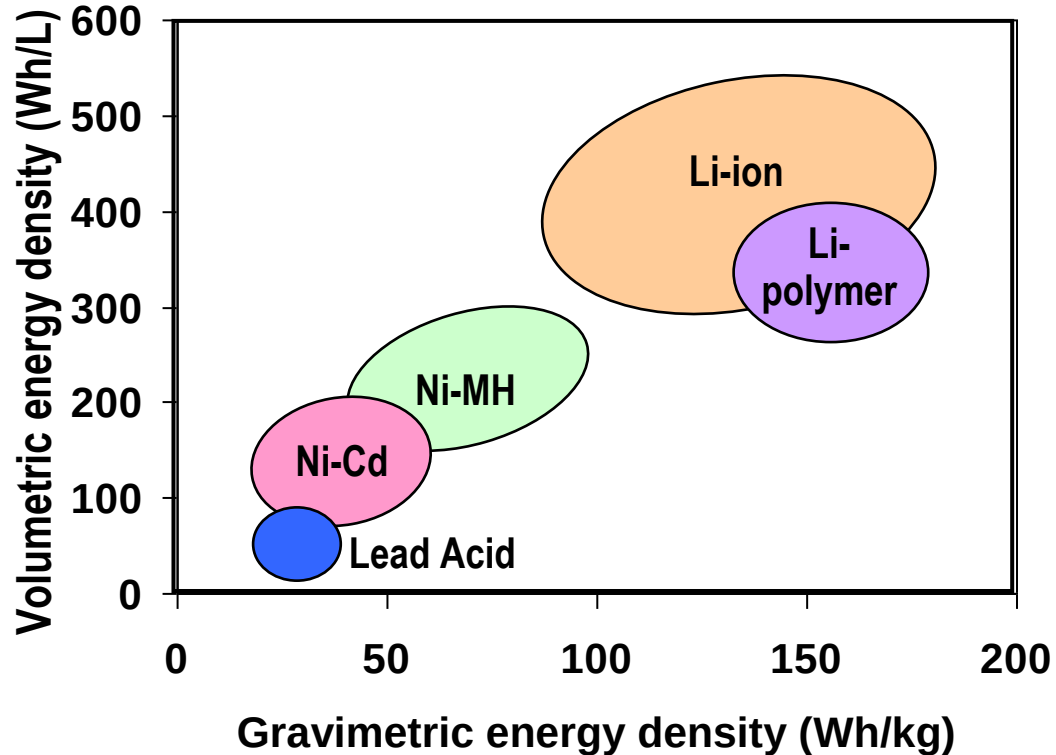
Efficiency
(%)



Şarjedilebilir Piller

Kurşun Asit

- ↑ 100 yıllık teknoloji.
- ↓ Ağır, düşük enerji yoğunluğu
- ↓ Toksik atıklar



• NiCd

- ↑ Uzun Ömür
- ↑ Düşük maliyet
- ↓ Toksik ağır metaller
- ↓ Düşük enerji yoğunluğu

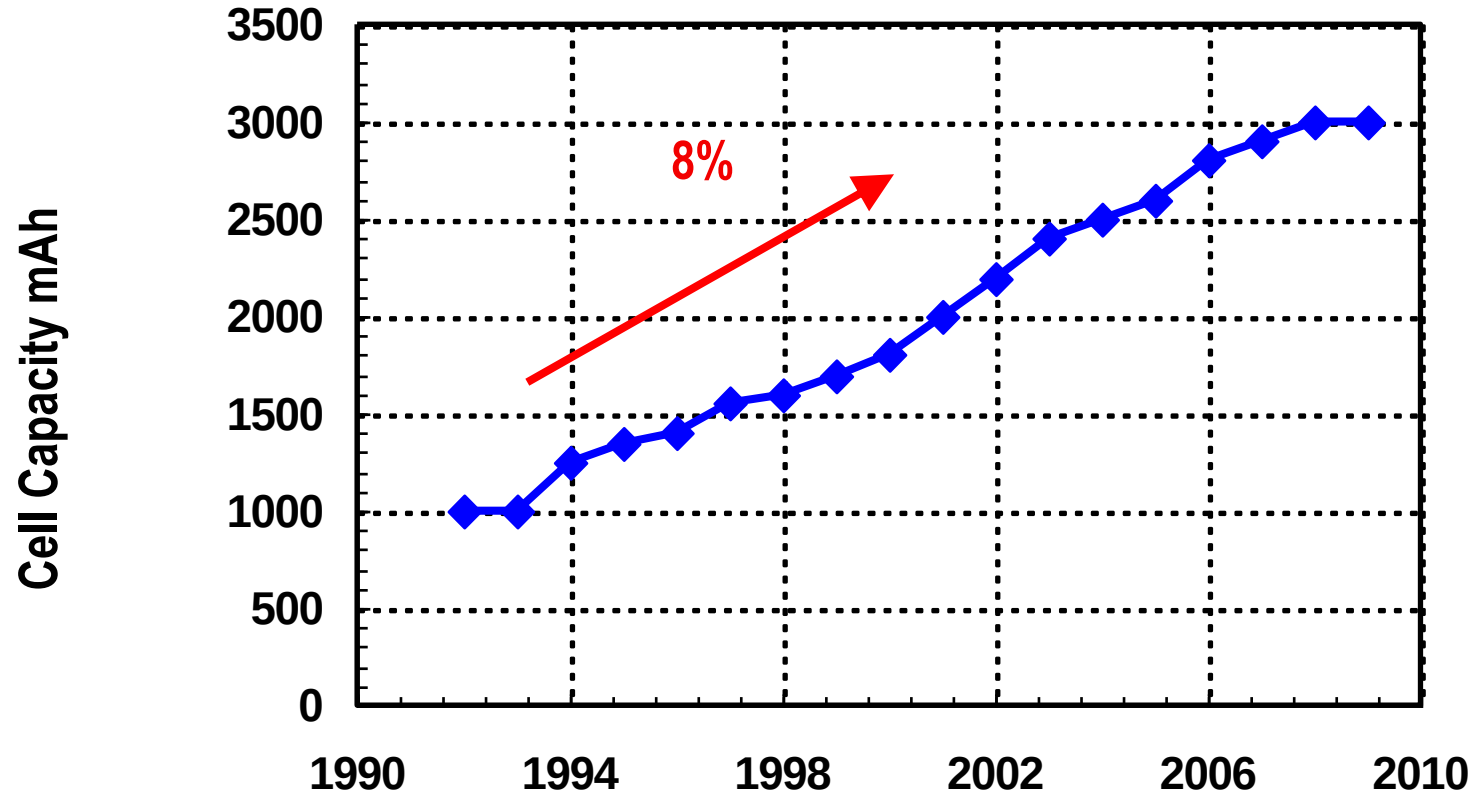
• NiMH

- ↑ NiCd'a göre yüksek kapasite
- ↓ Yüksek bekleme deşarjı

• Lithium Ion / Polymer

- ↑ Yüksek enerji yoğunluğu
- ↑ Düşük bek. deşarjı
- ↓ Yüksek maliyet
- ↓ Güvenli kullanım BMS ile mümkün

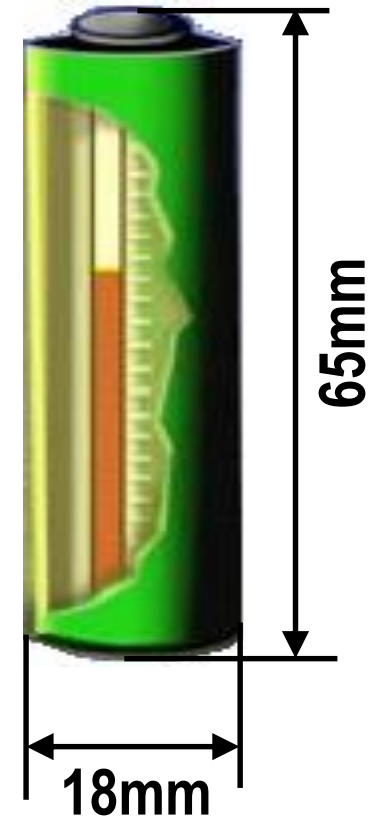
18650 Li-Ion Cell Capacity Development Trend (*)



- 18650: Silindirik, 65mm uzunluk, 18mm ap
- 8% yıllık kapasite artışı (1995-2010)
- Piyasadaki güncel değ erler 3500mAh

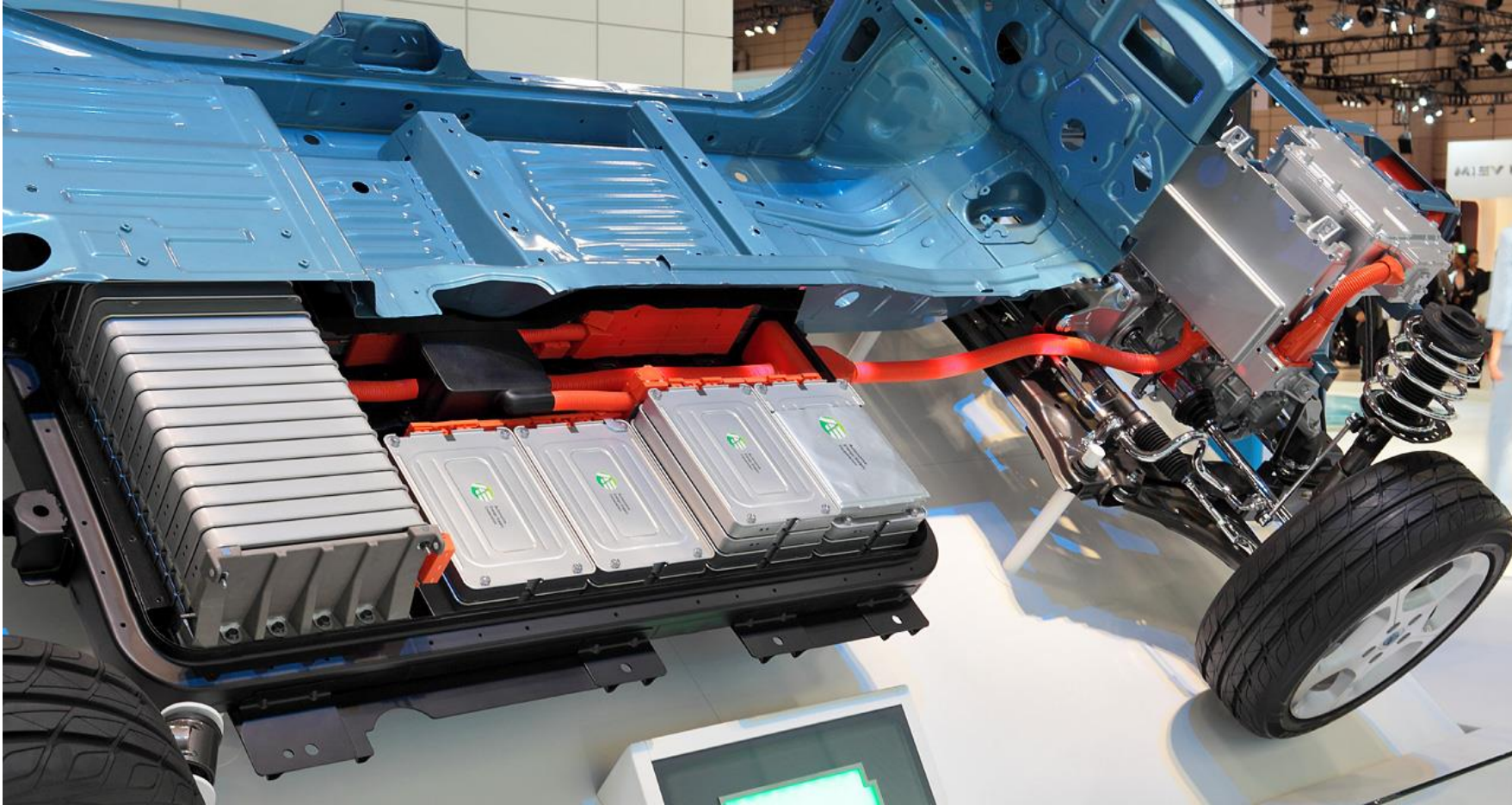
* www.ti.com

18650 Cell



Lityum bataryaları nerede kullanıyoruz?

➤ Elektrikli araçlar



➤Tüketici Elektroniđı



Extensive Field Experience

World-leading Grid-scale ESS supplier with extensive experience and proven reference projects

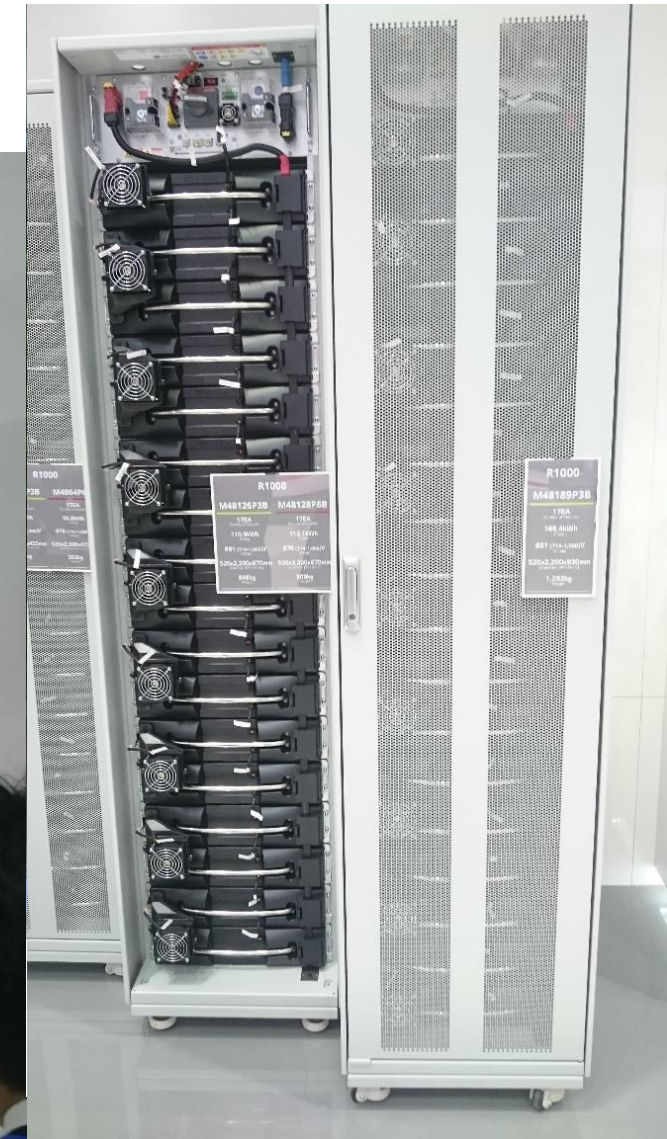
Global Grid References

1.6GWh (As of May, 2016)
Cumulative amount of installed/awarded projects

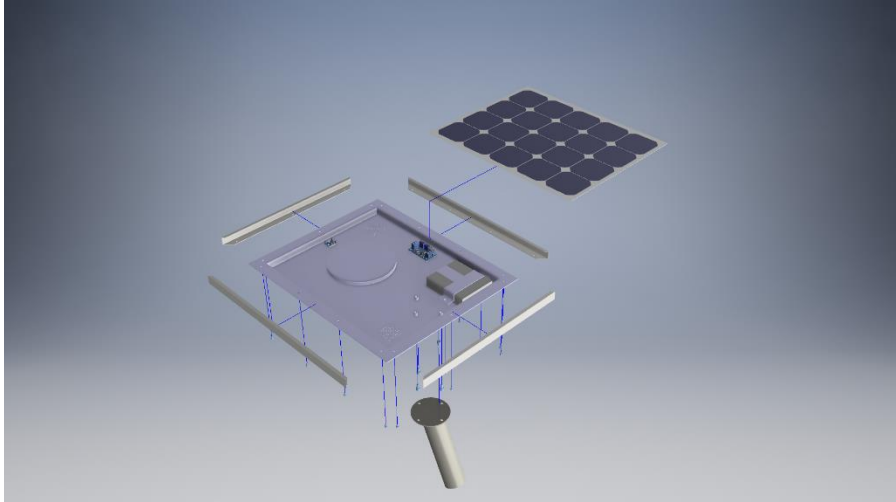
- Peak Shifting / Multi Purpose
- Renewable Integration
- Frequency Regulation

The map displays various global grid reference projects for ESS, categorized by function: Peak Shifting / Multi Purpose (purple triangle), Renewable Integration (yellow triangle), and Frequency Regulation (grey triangle). Projects are marked with these icons and connected to text labels indicating location and capacity.

Location	Capacity (MW/Wh)	Function
NRW/Saarland, Germany	90MW/140MWh	Peak Shifting / Multi Purpose
Reunion & Corsica, France	10MW/20MWh	Renewable Integration
Feldheim, Germany	10MW/11MWh	Frequency Regulation
Yeongyang, Korea	17MW/51MWh	Peak Shifting / Multi Purpose
Iksan & Ochang, Korea	7.5MW/44MWh	Renewable Integration
KEPCO (5 Substations), Korea	132MW/54MWh	Frequency Regulation
Hokkaido, Japan	62MW/31MWh	Peak Shifting / Multi Purpose
Yeongheung, Korea	4MW/16MWh	Renewable Integration
Tehachapi, CA	8MW/32MWh	Peak Shifting / Multi Purpose
Lee Dekalb, IL	20MW/9MWh	Renewable Integration
Meyersdale, PA	18MW/6MWh	Frequency Regulation
Eisenhuettenstadt, Germany	2MW/1MWh	Renewable Integration
Sardinia, Italy	1MW/500kWh	Renewable Integration
Seattle, WA	1MW/500kWh	Renewable Integration
Cedartown, GA	1MW/2MWh	Renewable Integration



Lityum bataryalar



➤ Savunma Sanayi & Uzay Uygulamaları



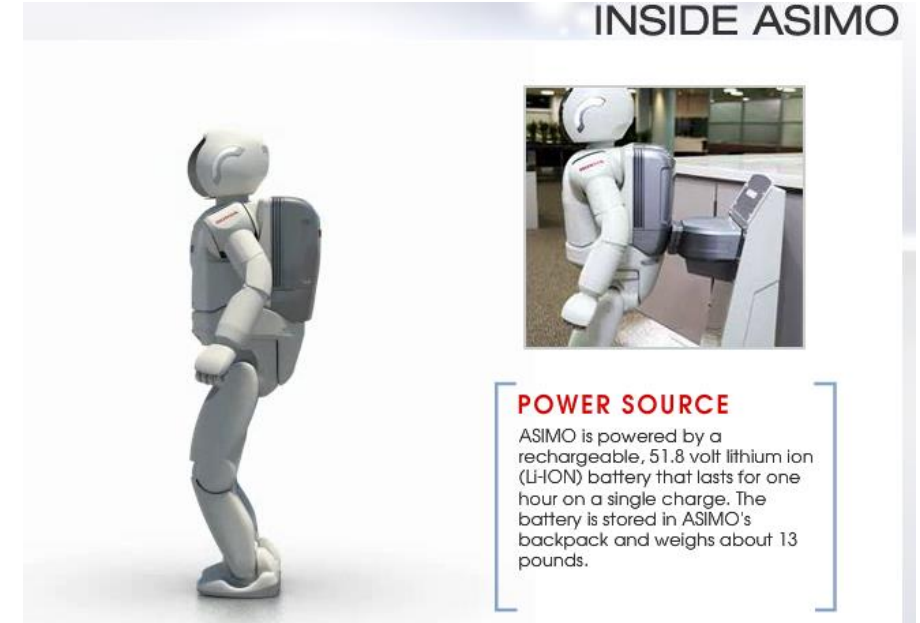
➤ Endüstriyel kullanım



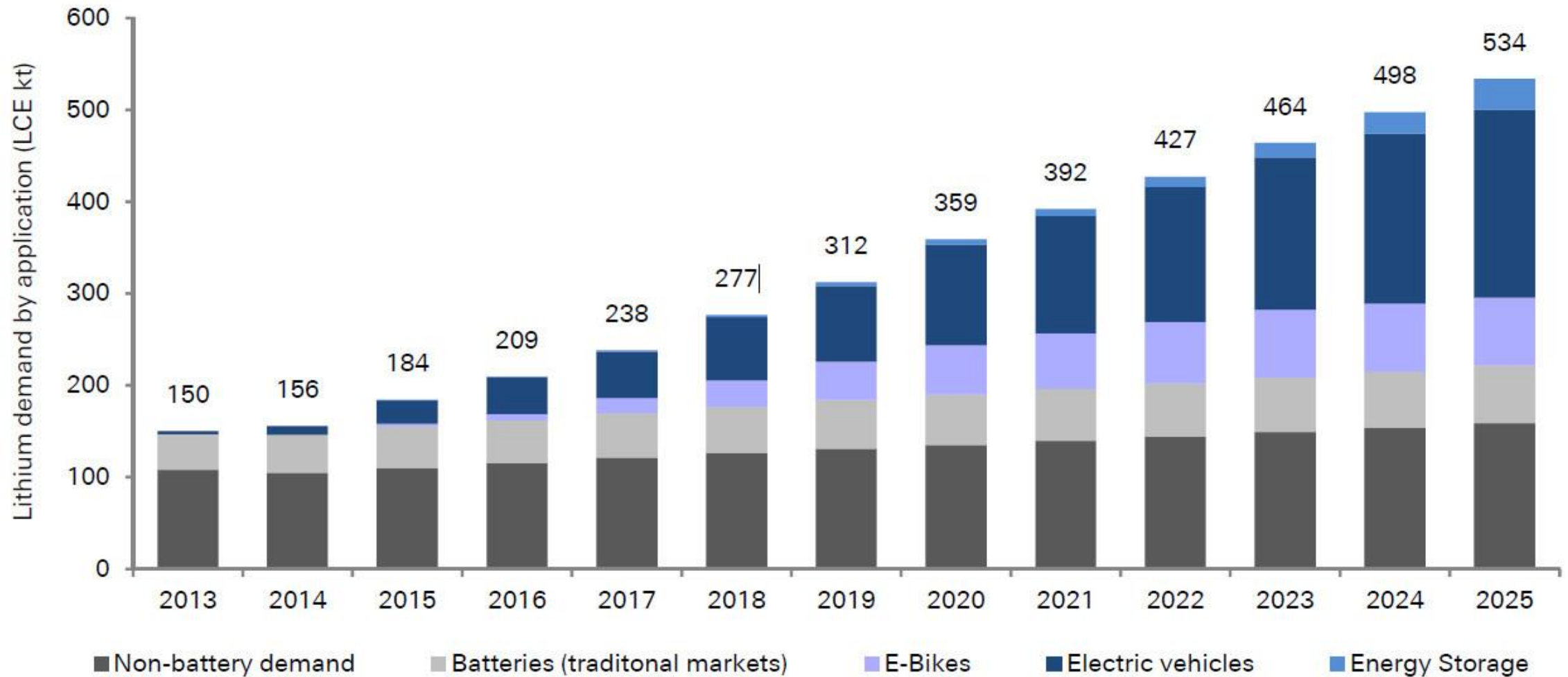
➤ Medikal



➤ Robotik



Lithium demand by end applications (2013-25)

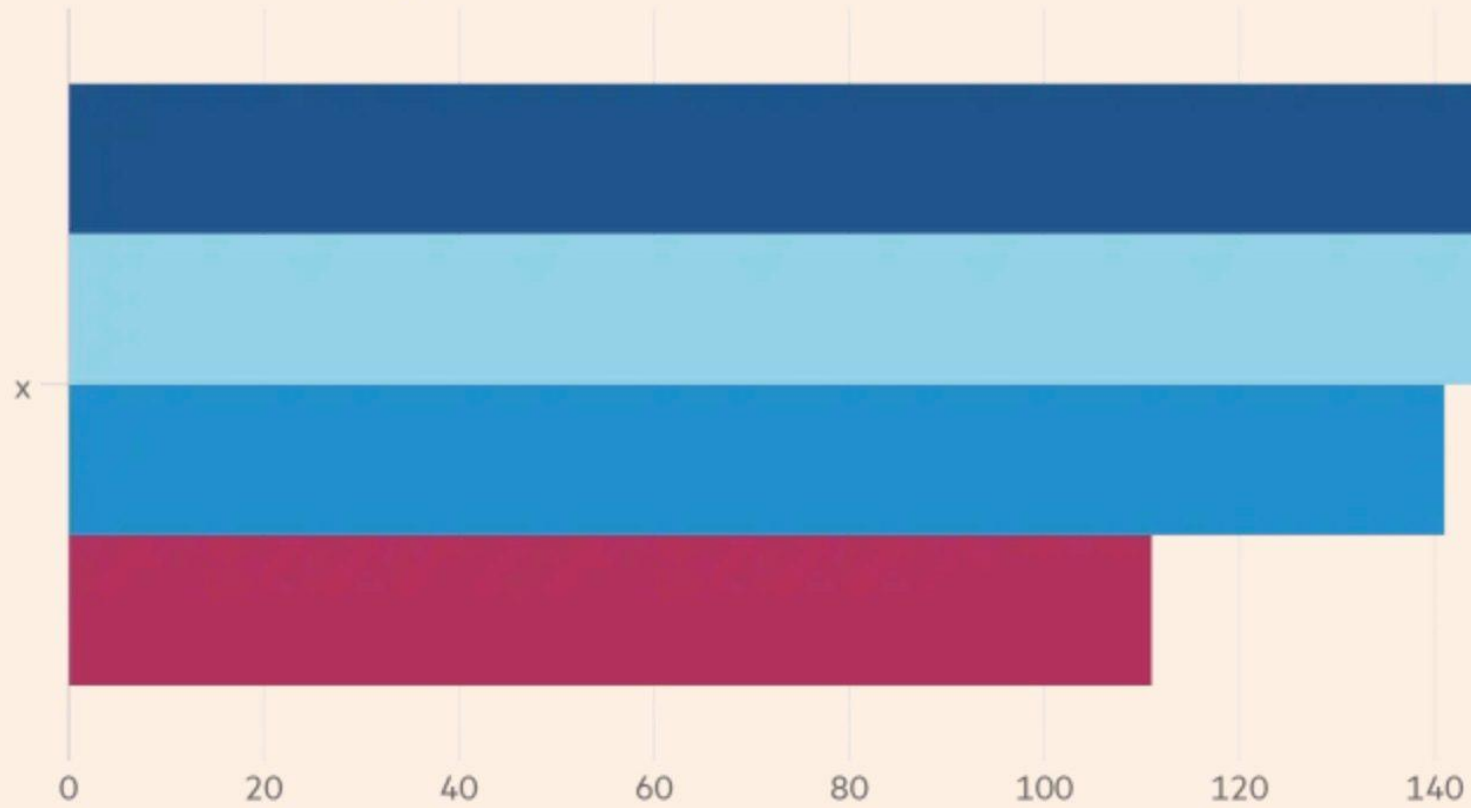


Source: Deutsche Bank; Industry data

EV battery costs

\$ per kWh

CATL Samsung SDI LG Chem Panasonic/Tesla



Source: UBS

© FT

!! Sınırlar !!

- Tam kapasite şarj sınırını aşma

→ yüksek gerilim koruması

- Yüksek sıcaklıklarda çalışma

→ yüksek sıcaklık koruması

- Batarya terminallerini kısa devre etme

→ yüksek akım koruması

- Derin Deşarj etmeyin

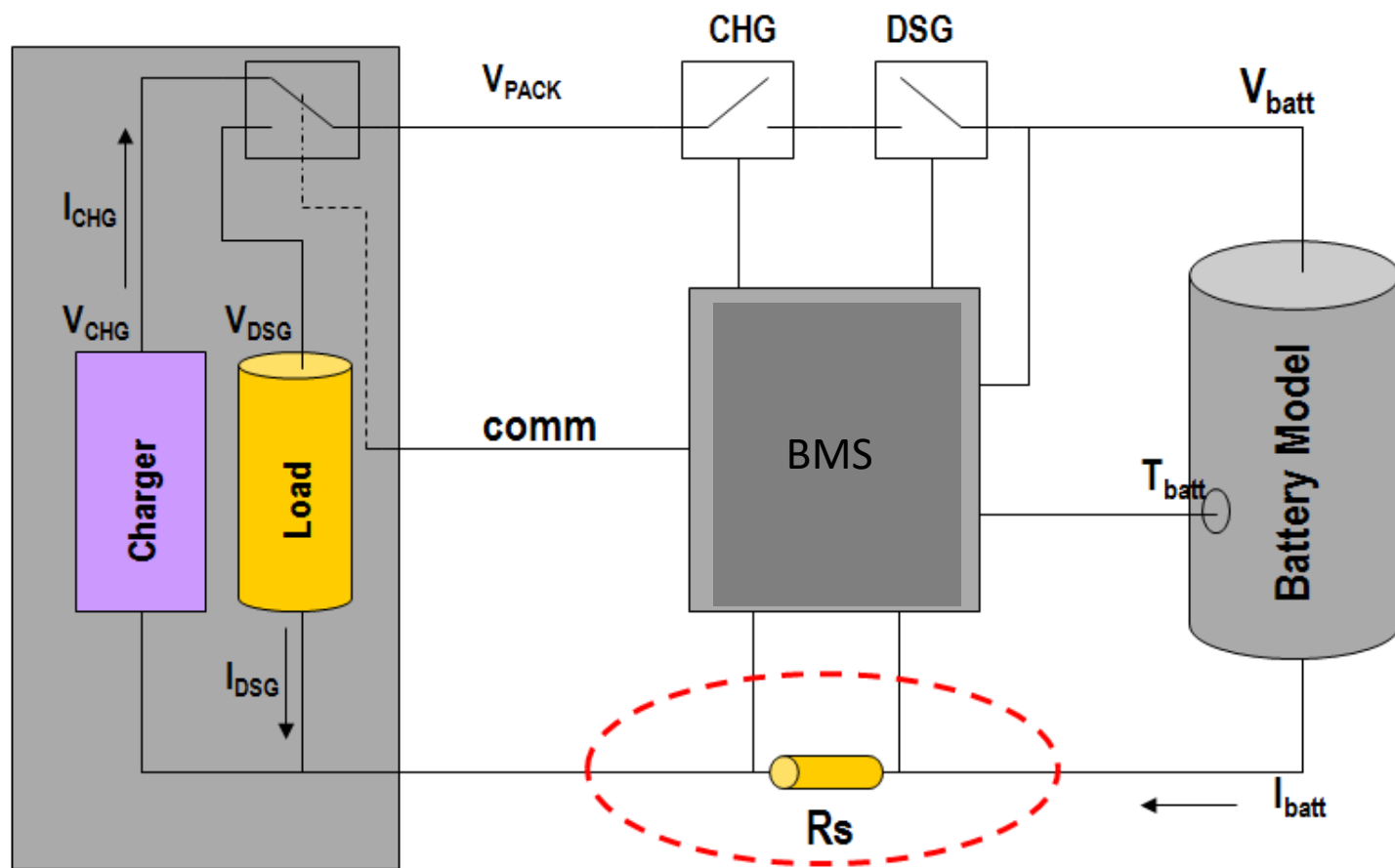
→ düşük gerilim koruması



Batarya Yönetim Sistemleri (BMS)

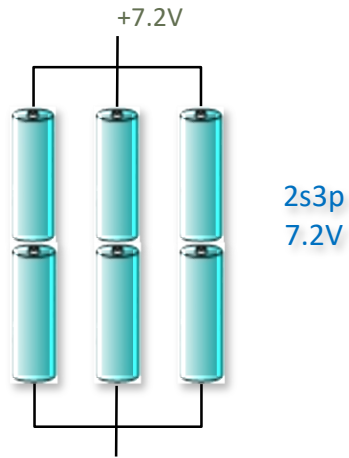
- Hücrelerin operasyonel şartlarını korur.
- Hücreleri dengeler
- Kullanıcıyı bilgilendirir.



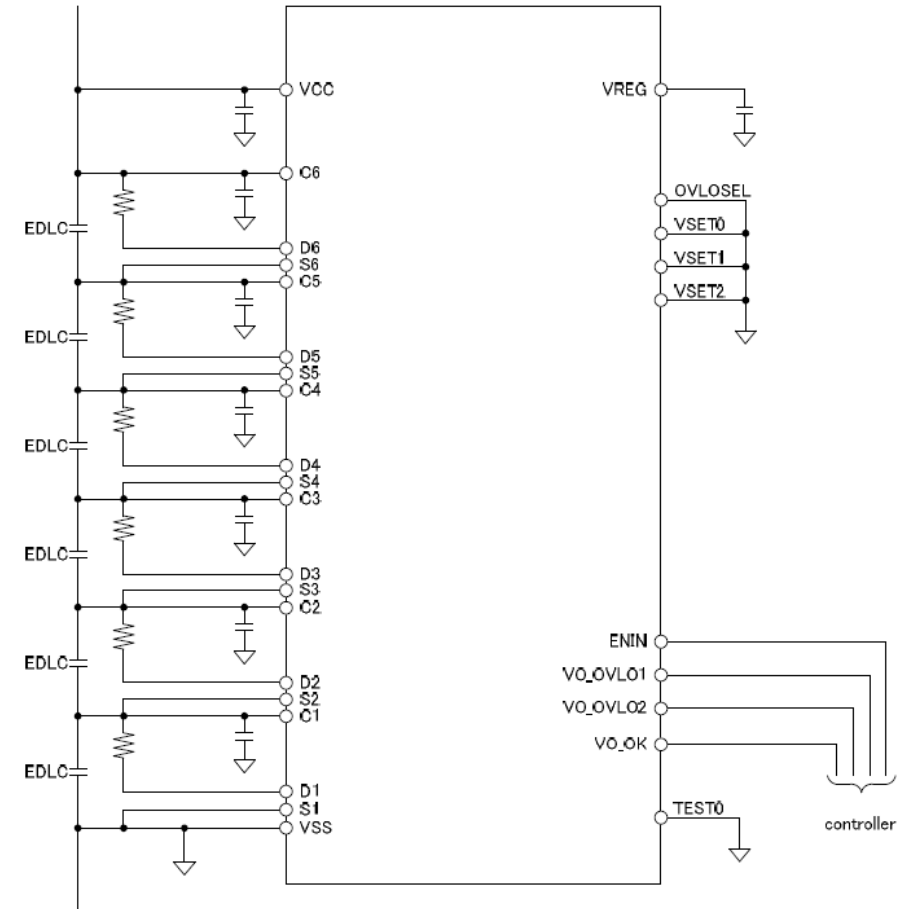
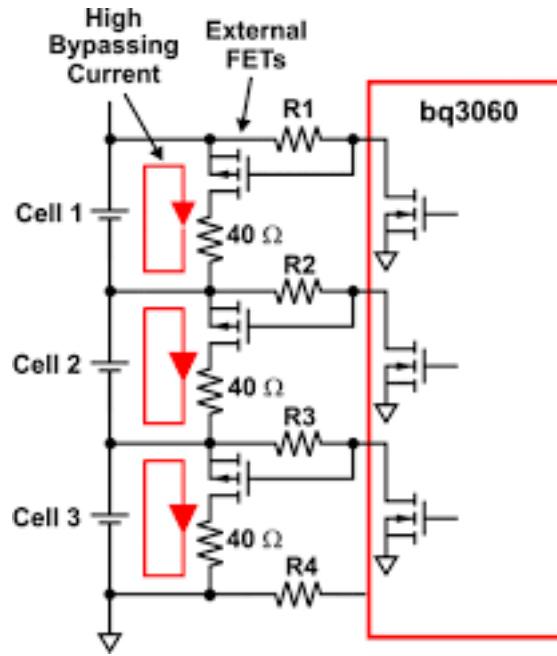
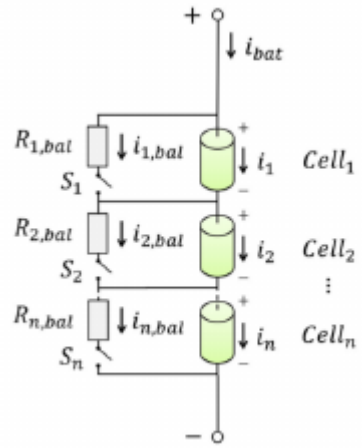


$$q_k = q_0 + \Delta t \cdot \sum_k I_k$$

Hücreleri Dengelemek nedir?



<http://liionbms.com/balance/index.html>

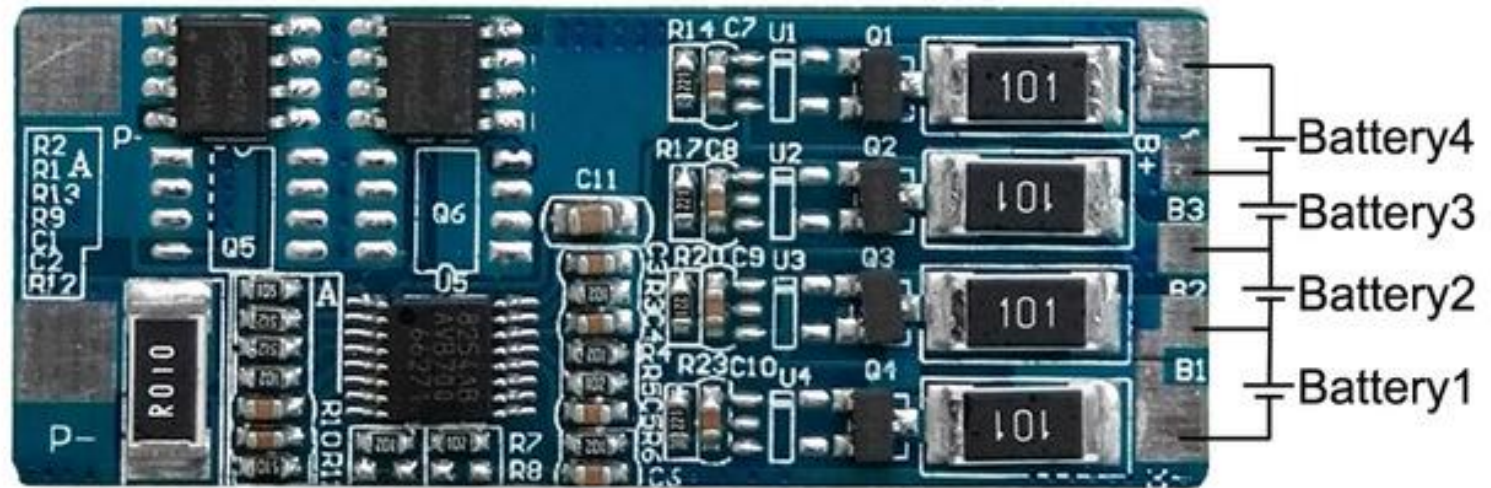


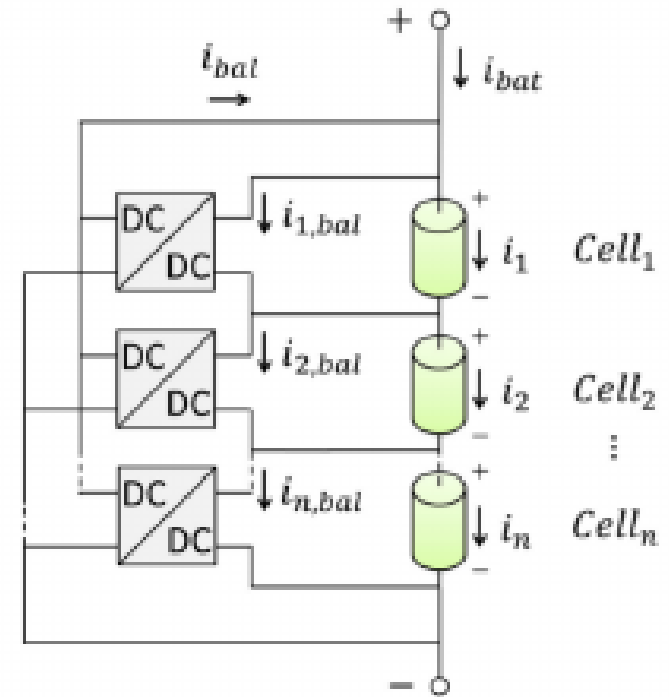
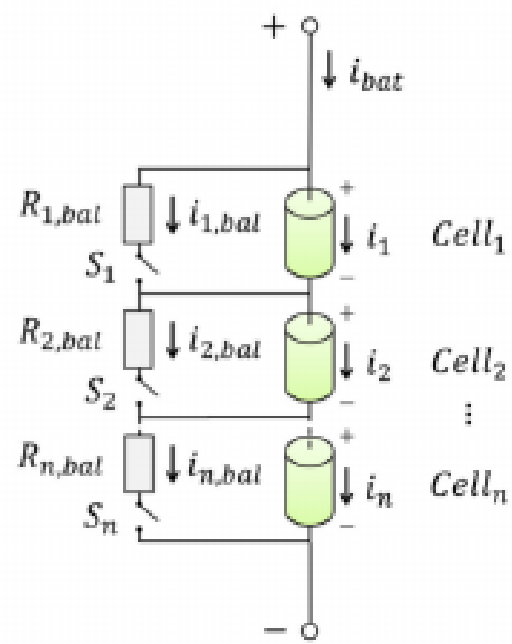


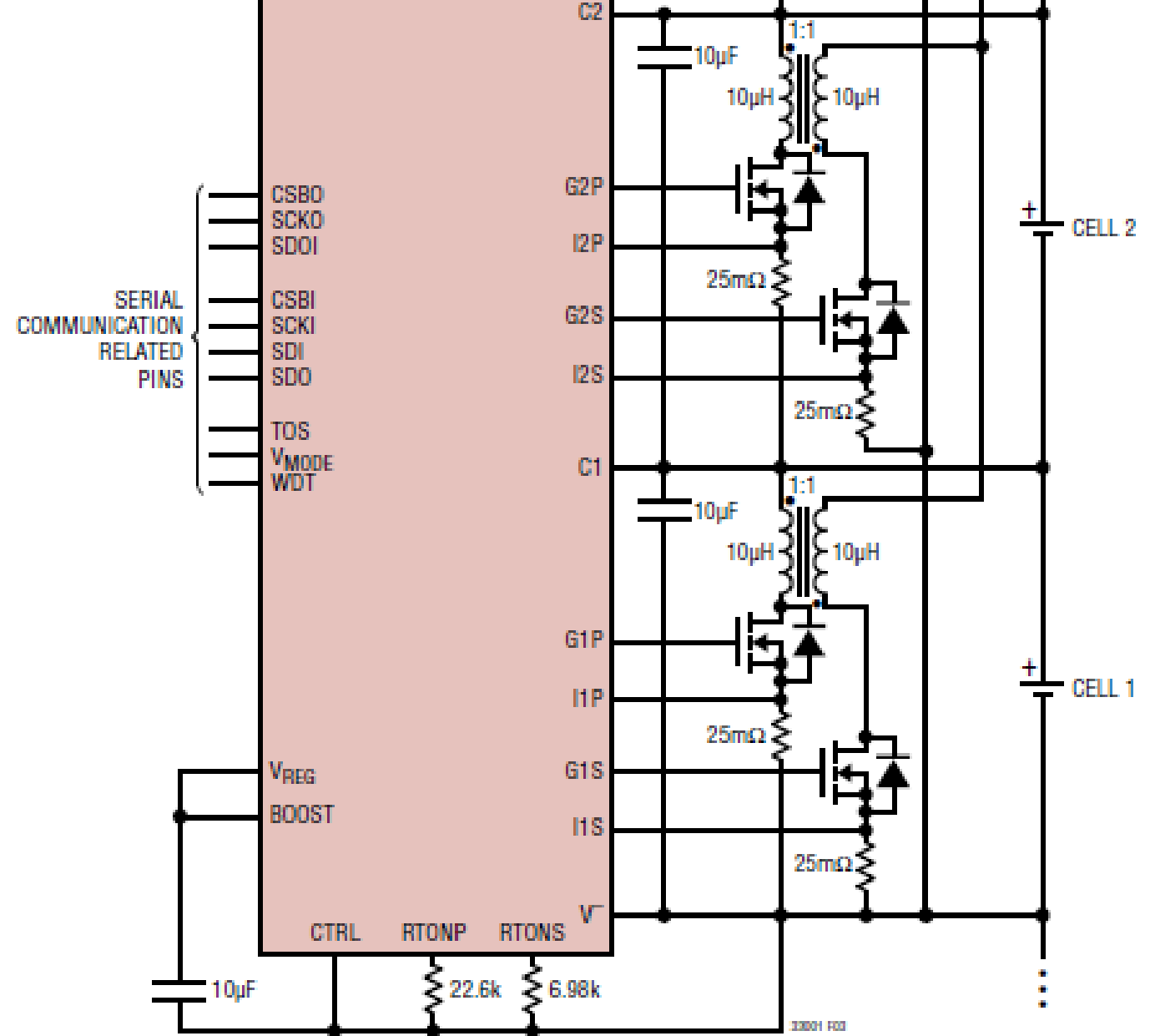
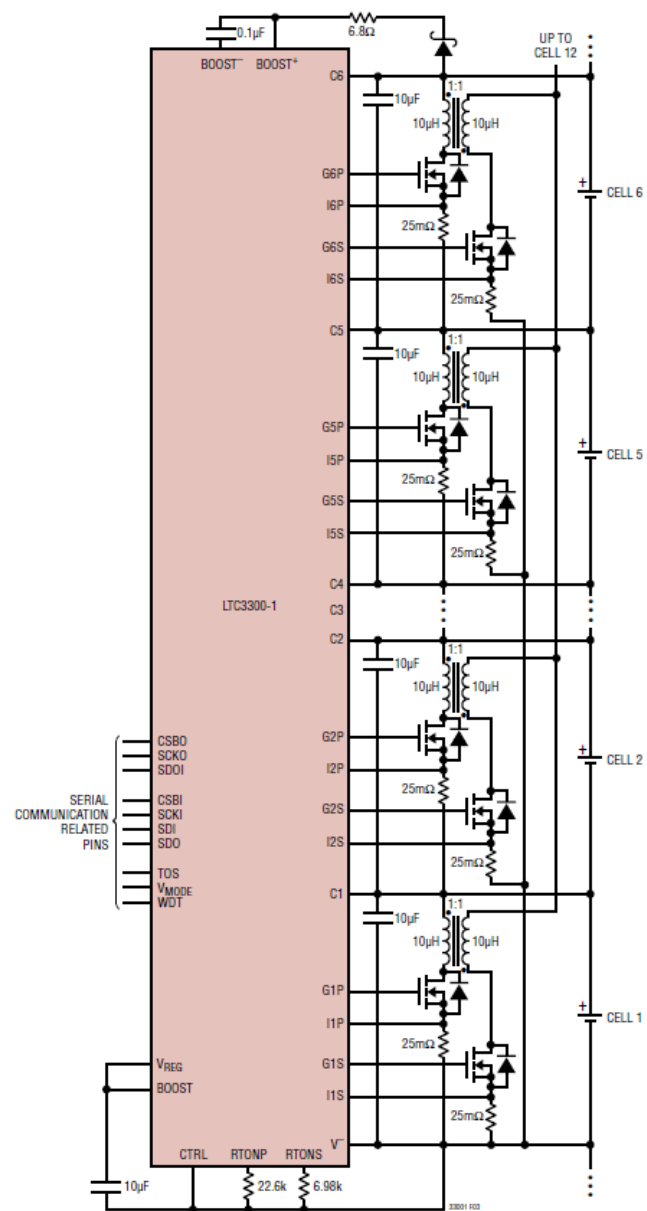
P+=Charge+/Discharge+

P-=Charge-/Discharge-

Size:L50*W20*T3mm







Active Balancer Circuits

Özet

- Lityum pillerin kullanımları yaygınlaşmaktadır.
- Bu trend Batarya yönetim sistemlerini ön plana çıkarmaktadır.
- Aktif dengeleme sistemleri bu uygulamalarda sundukları enerji verimliliği ile önemli bir yer tutuyor.

Teşekkürler,
Sorular?