

Superior Lithium Polymer Battery (SLPB)

# KOKAM Li-ion/Polymer Cell

Kokam's SLPB cell has proven its outstanding power, high energy density, longer cycle life and safety. Kokam is a pioneer in supplying small to large format SLPB cells ranging from 2 Ah to 240 Ah.



## "Superior Performance, Proven Quality, Greater Reliability, Increased Safety"

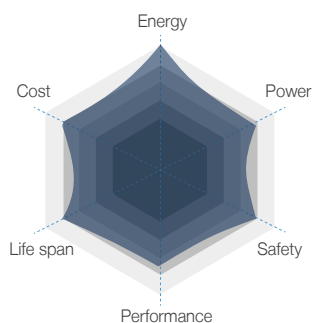
Kokam sets about to solve the limitations associated with conventional lithium-ion technologies, including cycle and calendar life, safety, recharge time, power delivery and ability to operate in extreme temperatures. The technology's performance features surpass other existing battery capabilities in the market place today.

Pouch type has more surface area compared to Prismatic type (High Capacity Cell), therefore more effective in letting out heat



- Exceptionally High Power Performance
- High Energy Density (130 – 260 Wh/kg)
- High Gravimetric and Volumetric Power Density.
- Excellent Power-to-Energy Balance (up to 50C)
- Longer Cycle and Calendar Life
- Low Impedance and Heat Generation
- Light Weight
- No Memory Effect
- High Charge / Discharge Energy Efficiency
- Low Self-Discharge Rates

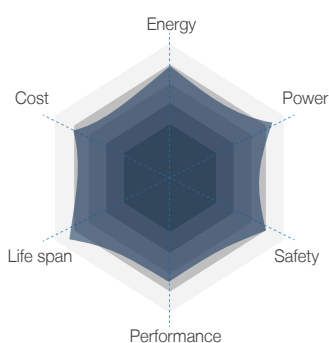
## Cell chemistry



### High Energy NMC (Nickel Manganese Cobalt)

#### Advantages

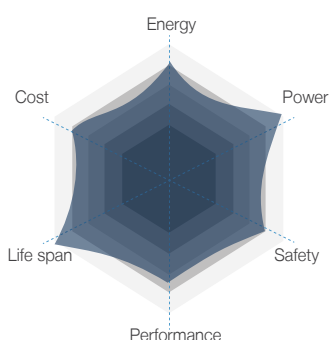
- High energy density (~ 260Wh/kg): Up to 2.8MWh of batteries can be stored in a 40ft container
- More than 96% of high efficiency at 0.5C
- Competitive Price: The NMC cells have a comparative advantage in terms of price, considering it's superior performance, reliability and safety features.



### High Power NMC

#### Advantages

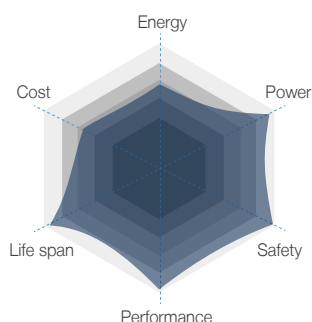
- High C-rate up to 50C-rate level
- High C-rate discharge performance for uses in frequency regulation, UPS, etc.
- Improved performance without safety or cycle life trade off



### Ultra High Power NMC

#### Advantages

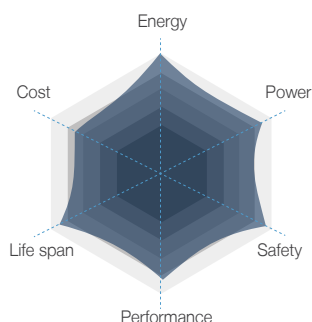
- Improved performance with 4C charge
- Improved high power cycle life up to 10,000 cycles
- Decreased 50% of internal resistance against standard NMC
- Special coating applied to cathode to improve high power performance



### Lithium titanate (LTO)

#### Advantages

- Wide Range of Operation: -30 ~ 60degC.
- High specific power: 4C-rate continuous and 8 C-rate peak charge & discharge operation
- High round trip efficiency (RTE): >95%.
- Long cycle life: 20,000 cycles @ 80% DoD, 1C charge & discharge operating conditions.
- Extremely Safe: A thermal runaway event is significantly less likely to occur in LTO cells. LTO cells can also be re-operated after an event of an over-discharge, unlike conventional graphite based Li-Ion cells. This feature enables the user to operate the battery cells under extreme environmental and operational conditions.
- The advantages of the LTO cells: Originates from the Anode side of the battery cell. Whereas the Anode side of ordinary Li-Ion cells are made up of Graphite, the Anode side of the LTO cell is composed of LTO.



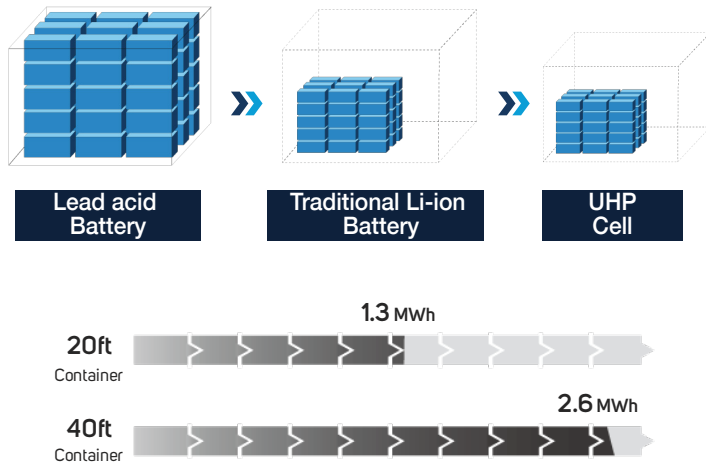
### NMC + LFP+LTO (NANO)

#### Advantages

- Specially designed for defense & aerospace application
- This hybrid type cell has incorporated the advantages of NMC, LFP and LTO cells in one cell. It is suitable for extremely volatile and dynamic operational conditions. The high power, energy and safety features allow the NANO cells to be flexibly applied in various applications.

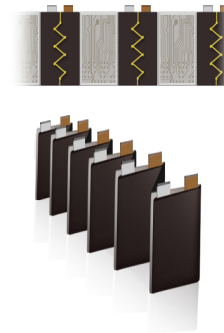
# Ultra High Power NMC Characteristic

## [HIGH ENERGY]



## [Z-FOLDING Technology]

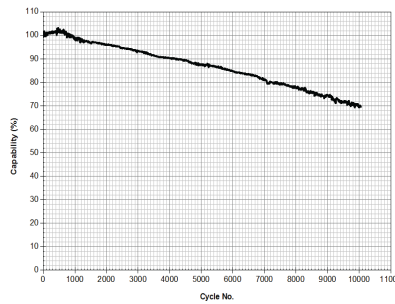
### Low Internal Resistance, High Efficiency



- Internal Resistance  
**Kokam UHP: 0.3~0.35mΩ**  
 (Competitor NMC : 0.5~0.7mΩ)  
 50% lower Internal Resistance compared to other battery manufacturers
- Z-fold stacking and special coating method significantly **reduces internal resistance** and **increases efficiency, power, and cycle life.**

## [Increased cycle life]

- 90% DOD, 1C/1C **10,000 cycle**
- 100% DOD, 4C/4C **over 4,000 cycle**



## [Tab fuse]

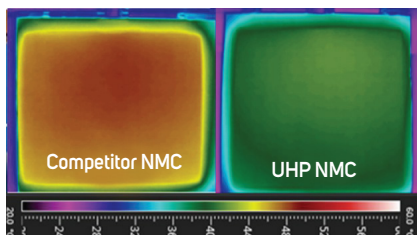
- In order to prevent the cell from being shorted, the cathode tab is fused



## [Increased cycle life]



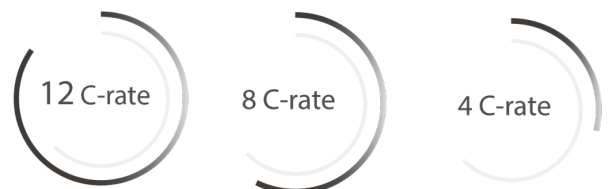
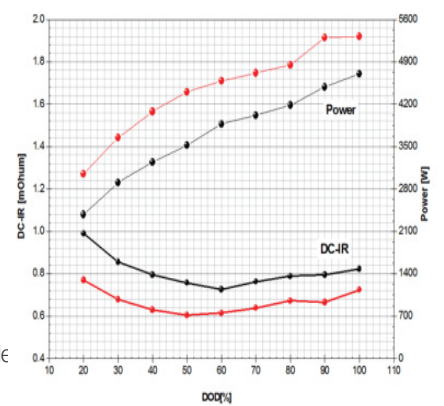
- Pouch type has more surface area compared to Prismatic type (High Capacity Cell), therefore more effective in letting out heat.
- 1.6x of heat dissipation** → 19.1cm<sup>2</sup>/Ah:11.6 cm<sup>2</sup>/Ah
- 3.5x of dissipation surface** → 650 mm<sup>2</sup>/6.5t:216 mm<sup>2</sup>/22.5t



- UHP Cell creates less heat than standard NMC cells, allowing for more vigorous operations

## [Tab fuse]

- 4C-rate Continuous Charge**
- 8C-rate Continuous Discharge**
- 15C-rate Instant discharge possible**







## Technology Specifications

### SLPB Small Cell

Type	Model	Capacity (Ah)	Dimension(mm)			AC-IR (mΩ)	Weight (g)	Discharge Rate		Energy Density (Wh/kg)	Chemistry
			W	L	T			C-rate(C)			
								Continuous	Pulse		
3~5Ah	SLPB8043128H	3.2	43	128	4.7	5	84	20	40	141	NMC (HP)
	SLPB526495	3.3	64.5	95.5	5.4	15	67	2	3	182	NMC (HE)
	SLPB8643128H5	3.6	43	129	8.8	3	101	30	50	132	NMC (HP)
	SLPB11543140H5	5	43	142.5	11.7	3	132	30	50	140	NMC (HP)
	SLPB050106100	5	107	102	5.9	5	120	2	5	154	NMC (HE)
	SLPB50106100	5	107	102	5.9	5	140	5	8	151	NMC (HE)
5~10 Ah	SLPB776495	5.3	64.5	95.5	7.8	8	102	2	3	192	NMC (HE)
	SLPB75106100	7.5	107	102	7.9	4	165	5	8	173	NMC (HE)
	SLPB68106100	8	107	102	7.25	3.6	160	2	3	185	NMC (HE)
	SLPB7570180	9.6	82	183	7.6	3.5	215	2	3	165	NMC (HE)
10~20Ah	SLPB98106100	10	107	102	10	4	210	2	3	176	NMC (HE)
	SLPB55205130H	11	207	137	5.6	1.6	280	8	10	145	NMC (HP)
	SLPB7570270	15	82	272	7.7	2.5	317	2	3	175	NMC (HE)
	SLPB75106205	16	107	209	7.8	3.8	340	5	8	174	NMC (HE)
	SLPB78205130H	16	207	137	7.8	1.1	406	8	15	146	NMC (HP)

### SLPB Large Cell

Type	Model	Capacity (Ah)	Dimension(mm)			AC-IR (mΩ)	Weight (kg)	Discharge Rate		Energy Density (Wh/kg)	Chemistry
			W	L	T			C-rate(C)			
								Continuous	Pulse		
20~50Ah	SLPB60216216	25	226	227	6.3	1.20	0.600	5	8	154	NMC (HE)
	SLPB98188216P	30	198	220	9.9	1.00	0.870	20	30	128	NMC (UHP)
	SLPB78216216H	31	226	227	7.8	0.90	0.720	8	15	158	NMC (HP)
	SLPB100216216H	40	226	227	10.0	0.80	0.990	8	15	160	NMC (HP)
	SLPB120216216HR2	46	226	227	12.5	0.80	1.270	12	15	135	NANO
50~100 Ah	SLPB120216216	53	226	227	12.0	0.90	1.160	5	8	169	NMC (HE)
	SLPB110255255H	63	268	265	11.0	0.60	1.520	8	15	153	NMC (HP)
	SLPB130255255N	65	268	265	13.5	0.50	1.850	4	8	77	LTO
	SLPB60460330H	70	462	327	5.7	0.60	1.740	5	6	149	NMC (HP)
	SLPB120255255	75	268	265	11.6	0.60	1.580	3	5	175	NMC (HE)
	SLPB125255255H	75	268	265	13.0	0.55	1.780	8	15	156	NMC (HP)
	SLPB130255255P	75	268	265	13.5	0.40	1.810	4	8	153	NMC (UHP)
	SLPB70460330H	80	462	327	6.3	0.60	1.920	5	6	154	NMC (HP)
	SLPB125255255	87	268	265	13.0	0.65	1.780	2	3	181	NMC (HE)
100Ah~	SLPB70460330	100	462	327	7.0	0.65	2.070	2	3	179	NMC (HE)
	SLPB80460330H	100	462	327	7.8	0.55	2.380	5	6	155	NMC (HP)
	SLPB120460330	150	462	327	10.5	0.50	3.210	2	3	173	NMC (HE)
	SLPB140460330	200	462	327	13.9	0.50	4.180	2	3	177	NMC (HE)
	SLPB160460330H	200	462	327	14.8	0.50	4.580	2	3	162	NMC (HP)
	SLPB160460330	240	462	327	15.8	0.50	4.780	2	3	186	NMC (HE)



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