MATERIAL SAFETY DATA SHEET

Report No.	**BYD20200628MSDS01**
Version:	**V1**
Product Name:	**Li-ion Cylindrical Rechargeable Battery**
Model:	**INR18650-M26-1S1P**
Rating:	**2600mAh / 3.6V**
Issue Date:	**2020.07.08**
Editor:	
Reviewer:	
Approver:	

Revision history

Revision - Date	Description	Reviser	Approval Date
V1 - 2020.07.08,	First issue		2020.07.08

Guangzhou MCM Certification & Testing Co., Ltd.
广州邦禾检测技术有限公司

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

Product Name	Li-ion Cylindrical Rechargeable Battery
Model	INR18650-M26-1S1P
Nominal Capacity/Voltage	2600mAh / 3.6V
Manufacturer	BYD Company Limited
Address	Yan'an Road, Kuichong, Dapeng, Shenzhen, Guangdong, 518119,P.R.China Tel: 86-755-89888888-62113 Fax: 86-755-89773959
Emergency Telephone No.	Tel: 86-755-89888888-62113
Period of Validity	2020-12-31
Description of the Identified Uses	Used in root robot.

SECTION 2: HAZARDS IDENTIFICATION

The product is a sealed Lithium ion battery and is classified as an article and is not considered hazardous by the Regulation (EC) No 1272/2008 (CLP). The hazard is associated with the inner contents of the battery. Under recommended use conditions, the electrode materials and liquid electrolyte are non-reactive provided that the battery integrity remains and the seals remain intact.

The potential for exposure should not exist unless the cell or battery leaks, or being exposed to high temperatures or being mechanically, electrically or physically abused/damaged. If the battery is compromised and starts to leak, based upon the battery ingredients, the contents are classified as Hazardous.

Physical Hazards:	No information is available.
Health Hazards:	No information is available.
Environmental Hazards:	No information is available.
Specific Hazards:	Exposure to contents of an open or damaged battery, contact with this material will cause burns to the skin, eyes and mucous membranes. May cause sensitization by skin contact.
Main Symptoms:	Symptoms include itching, burning, redness and tearing.
Pictograms:	
Signal Word:	**Danger**

Hazards Statement: Below hazards exist when the battery is rupture.

H228 Flammable solid.
H260 In contact with water releases flammable gases which may ignite spontaneously.
H311 Toxic if contact with skin.
H302 Harmful if swallowed.
H332 Harmful if inhaled.
H314 Causes severe skin burns and eye damage.
H315 Causes skin irritation.
H317 May cause an allergic skin reaction.
H319 Cause serious eye irritation.
H335 May cause respiratory irritation.
H350 May cause cancer.
H400 Very toxic to aquatic life.
H410 Very toxic to aquatic life with long lasting effects.
Precautionary Statements (Prevention):
P210 Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P260 Do not breathe dust/fume/gas/mist/vapors/spray.
P262 Do not get in eyes, on skin, or on clothing.
P273 Avoid release to the environment.
P280 Wear protective gloves/protective clothing/eye protection/face protection.
Precautionary Statements (Response):
P370+P380+P375(P378): In case of fire, evacuate area. Fight fire remotely due to the risk of explosion.(use suitable extinguish media to extinguish)
P301+P330+P331: IF SWALLOWED, rinse mouth. Do NOT induce vomiting.
P302+P352: IF ON SKIN, brush off loose particles from skin. Immerse in cool water or wrap in wet bandages.
P303 + P361+P353: IF ON SKIN(or hair),take off immediately all contaminated clothing. Rinse skin with water or shower.
P305+P351+P338: IF IN EYES, rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do . Continue rinsing.
P332+P313: If skin irritation occurs, get medical advice/attention.
P337+P313: If eye irritation persists, get medical advice/attention.
Precautionary Statements (Storage)
P403+P233: Store in well-ventilated place. Keep container tightly closed.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

Hazardous Ingredients	%	CAS Number
Nickel oxide	0-25	1313-99-1
Manganese dioxide	0-15	1313-13-9
Cobalt oxide	4-45	1307-96-6
2,5-Furandione, polymer with 1,3-butadiene and ethenylbenzene	<1	27288-99-9

Polyvinylidene fluoride	<5	24937-79-9
Aluminum Foil	2-10	7429-90-5
Copper Foil	2-10	7440-50-8
Graphite	10-30	7440-44-0
Electrolyte(Ethylene carbonate)	10-20	96-49-1
Lithium hexafluorophosphate	<5	21324-40-3
Stainless steel, Nickel and inert materials	Remainder	N/A

SECTION 4: FIRST AID MEASURES

The hazardous components of this battery are contained within a sealed unit. The following measures are only applicable if exposure has occurred to components when battery leaks, is exposed to high temperatures or is mechanically, electrically or physically abused/damaged. The hazardous contents are caustic alkaline electrolytes contained in batteries with lithium metal oxide cathodes, graphite and carbon anodes and Polyvinylidenfluoride binders.

General Advice：	**First aid is upon rupture of sealed battery.**
Eye Contact：	Rinse immediately with plenty of water, also under the eyelids. Get medical attention immediately.
Skin Contact：	Wash off immediately with soap and plenty of water for at least 15 minutes. Get medical attention if irritation develops and persists.
Ingestion：	Rinse mouth immediately and drink plenty of water. Do NOT induce vomiting. Call a physician.
Inhalation:	Remove to fresh air. Get medical attention immediately.
Further Treatment	Present this MSDS to physician.

SECTION 5: FIGHTING MEASURES

Suitable Extinguishing Media:	Cold water and dry powder in large amount are applicable. Use metal fire extinction powder or dry sand if only few batteries are involved.
Unsuitable Extinguishing Media:	N/A
Special Hazards Arising:	May form hydrofluoric acid if electrolyte comes into contact with water. In case of fire, the formation of the following flue gases cannot be excluded: Hydrogen fluoride(HF), Carbon monoxide(CO), carbon dioxide(CO_2）.
Protective Equipment and Precautions for Firefighters：	As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.
Additional information：	If possible, remove battery from fire-fighting area. If heated above 125°C, battery can explode/vent. battery is not flammable but internal organic material will burn if the battery is incinerated.

SECTION 6: ACCIDENTAL RELEASE MEASURES	
Personal Precautions, Protective Equipment and Emergency Procedures:	As an immediate precautionary measure, isolate spill or leak area for at least 25 meters (75 feet) in all directions. Keep unauthorized personnel away. Stay upwind. Keep out of low areas. Ventilate closed areas before entering.
Environmental Precautions：	Absorb spilled material with non-reactive absorbent such as vermiculite, clay or earth. Prevent from migration into soil, sewers and natural waterways – inform local authorities if this occurs.
Methods for Cleaning Up：	Evacuate spill area immediately and remove sources of ignition. Do NOT touch spilled material. Cleanup personnel must be trained in the safe handling of this product. Spills may be absorbed on non-reactive absorbents such as vermiculite. Place batteries into individual plastic bags and then place into appropriate containers and close tightly for disposal. Ensure that cleanup procedures do not expose spilled material to any moisture. Immediately transport closed containers outside. Lined steel drums are suitable for storage of damaged batteries until proper disposal can be arranged.

SECTION 7: HANDLING AND STORAGE	
Handling :	1. Do not allow battery terminates to contact each other, or contact with other metals. 2. Do not put the cell or battery into a fire or heat it. Do not solder the cell directly. Do not use or leave the cell or battery in a place near fire or heaters. 3. Do not expose the battery to excessive physical shock or vibration. 4. Do not immerse, throw, and wet a battery in water. 5. Short-circuiting should be avoided. Short circuit will reduces the life of the battery and can lead to ignition of surrounding materials. Physical contact with to short- circuited battery can cause skin burn. 6. The batteries should not be opened, destroyed or incinerate, since they may leak or rupture and release to the environment the ingredients that they contain in the hermetically sealed container. 7. Keep batteries out of the reach of Children. 8. Do not connect the battery directly to an electric outlet or cigarette socket in a car. 9. Be sure to use the specified charger for battery, and follow the charging instructions correctly. 10. Do not mix old and new batteries together, neither with Ni-Cd, dry batteries or another manufacturer batteries or product.
Storage：	1. Batteries should be separated from other materials and stored in a noncombustible, well ventilated, sprinkler-protected structure with sufficient clearance between walls and battery stacks.

	2. Keep the sample in the cool, dry and well-ventilated place (temperature: -20~30 ºC, humidity: 45~85%). Do not exposure to direct sunlight for long periods. Keep away from fire and heating sources. Don't keep the samples with oxidizer and acid. 3. Equip with relevant types and quantities of the extinguishment instruments. The storage place should be equipped with suitable shelter materials for divulgence handling. 4. For rechargeable battery, charge the battery every 6 months to the amount specified by the manufacture, even if the battery is not used.

SECTION 8: EXPOSURE CONTROLS & PERSONAL PROTECTION

Control Parameters

Exposure limits

Chemical Name	TLV (Threshold Limit value)	PEL(Permissible Exposrue Limits)	IDLH(Immediately Dangerous to Life or Health)
Lithium hexafluorophosphate 21324-40-3	TWA:2.5mg/m^{3}F	TWA: 2.5mg/m^{3}F TWA:2.5mg/m^3 dust(vacated) TWA: 2.5mg/m^3	-
Copper 7440-50-8	TWA: 0.2 mg/m3 fume TWA: 1mg/m3 Cu dust and mist	TWA: 0.1 mg/m3 fume TWA: 1 mg/m3 dust and mist (vacated) TWA: 0.1 mg/m3 Cu dust, fume, mist	IDLH: 100 mg/m3 dust, fume and mist TWA: 1 mg/m3 dust and mist TWA: 0.1 mg/m3 fume
Aluminum 7429-90-5	TWA:1mg/m^3	TWA：15mg/m^3 total dust TWA: 5mg/m^3 respirable fraction (vacated) TWA:15mg/m^{3}total dust(vacated) TWA:5mg/m^{3}respirable fraction (vacated)TWA:5mg/m^{3}Al Aluminum	IDLH:10mg/m^3 Total dust TWA:5mg/m^3 Respirable dust

Respiratory Protection:	During routine operation, a respirator is not required. However, if dealing with an electrolyte leakage and irritating vapors are generated, an approved half face inorganic vapor and gas/acid/particulate respirator is required.
Engineering Controls:	Special ventilation is not required when using these products in normal use scenarios. Ventilation is required if there is leakage from the battery.
Skin (Hand) Protection:	Hand protection is not required when handling the battery during normal use. PVC gloves are recommended when dealing with a leaking or ruptured battery.
Skin (Clothing) Protection:	Skin protection is not required when handling the battery during normal use. Wear long sleeved clothing to avoid skin contact if handling a leaking or ruptured battery. Soiled clothing should be washed with detergent prior to re-use.
Eye and Face Protection:	Eye protection is not required when handling batteries during normal use. Wear safety glasses/goggles if handling a leaking or ruptured battery.
Other Protective Equipment:	Have a safety shower or eye wash station readily available
Hygiene Measures:	Do not eat, drink or smoke in work areas. Avoid storing food, drink or tobacco near the product. Practice and maintain good housekeeping.
Environmental	Avoid release to the environment.

Exposure Controls:	

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES	
Physical State:	Solid
Colour:	Blue
Odour:	If leaking, gives off pungent corrosive odor.
Melting point/Freezing point:	No information available.
Boiling point or initial boiling point and boiling range:	No information available. Unless individual components exposed.
Flammability:	Nonflammable, unless battery leaks.
Lower and upper explosion limit:	No information available. Unless individual components exposed.
Flash point:	No information available.
Auto-ignition temperature:	No information available, unless individual components exposed.
Decomposition temperature:	More than 170°C
pH:	No information available, unless individual components exposed.
Kinematic viscosity:	No information available
Solubility:	Insoluble
Partition coefficient n-octanol/water (log value):	No information available
Vapour pressure:	No information available
Density and/or relative density:	No information available
Relative vapour density:	No information available
Particle characteristics:	70±0.7*45±5*18.7 ± 0.5mm (L*W*H)

SECTION 10: STABILITY AND REACTIVITY	
Reactivity:	N/A. Hazardous contents inside would react only if the cell or battery leaks or being exposed to high temperatures or being mechanically, electrically or physically abused/damaged.
Chemical Stability:	Stable under normal conditions.
Possibility of Hazardous Reactions:	Not possible. Unless with mechanical or electrical abuse.
Conditions to Avoid:	Keep away from open flames, hot surfaces and sources of ignition. Do not puncture, crush or incinerate.
Incompatible Materials:	Explosives, in-flammables, strong oxidants and corrosives.
Hazardous Decomposition Products:	In case of open cells, there is the possibility of hydrofluoric acid and carbon monoxide release.

SECTION 11: TOXICOLOGICAL INFORMATION

The hazardous components of the battery are contained within a sealed unit. Under recommended use conditions, the electrode materials and liquid electrolyte are non-reactive provided that the battery integrity remains and the seals remain intact. The potential for exposure should not exist unless the battery leaks, is exposed to high temperature or is mechanically, electrically or physically abused/damaged. The following toxicology data is in respect to if a person comes into contact with the electrolyte.	
Ingestion	The electrolyte contained within the battery is a corrosive liquid. Ingestion of this electrolyte would be harmful. Swallowing may result in nausea, vomiting, diarrhea, abdominal pain and chemical burns to the gastrointestinal tract. During normal usage ingestion should not be a means of exposure.
Serious eye damage/irritation	The electrolyte contained within the battery is a corrosive liquid and it is expected that it would cause irreversible damage to the eyes. Contact may cause corneal burns. Effects may be slow to heal after eye contact. Correct handling procedures incorporating appropriate eye protection should minimize the risk of eye irritation.
Respiratory or Skin Sensitization	The electrolyte contained within the battery is a corrosive liquid and it is expected that it would cause skin burns or severe irritation to the skin if not washed off immediately. Correct handling procedures should minimize the risk of skin irritation. People with pre-existing skin conditions, such as dermatitis, should take extreme care so as not to exacerbate the condition.
Inhalation	Inhalation of vapors from a leaking battery is expected to cause severe irritation of the mouth and upper respiratory tract with a burning sensation, pain, burns and inflammation in the nose and throat; there may also be coughing or difficulty breathing.
Germ Cell Mutagenicity	The electrolyte contained within the battery is not expected to be mutagenic according to test such as OECD tests 471, 475, 476, 478 and 479, based on the available data and the known hazards of the components.
Carcinogenicity	Helectrolyte contained within the battery is not expected to be a carcinogen. The cathode contains Cobalt and Nickel components. These components are classified as IARC 2B – possibly carcinogenic to humans, however they do not pose a threat when contained in or battery sealed unit.
Reproductive Toxicity	The electrolyte contained within the cell or battery is not expected to be a reproductive hazard according to test such as OECD tests 414 and 421, based on the available data and the known hazards of the components
Specific Target Organ Toxicity (STOT) – Single Exposure	The electrolyte components contained within the battery is corrosive and is expect to cause respiratory irritation by inhalation. Inhalation of vapors may lead to severe irritation of the mouth and upper respiratory tract with a burning sensation, pain, burns and inflammation in the nose and throat; there may also be coughing or difficulty breathing.
Specific Target Organ Toxicity (STOT) – Repeated Exposure	The batteries are not expected to cause organ damage from repeated exposure according to tests such as OECD tests 410 and 412, based on the available data and the known hazards of the components.

SECTION 12: ECOLOGICAL INFORMATION

Ecotoxicity

Copper inside the battery would be slightly hazardous to aquatic life if the battery is rupture.

Chemical name	Toxicity to Aglae	Toxicity to Fish	Daphnia Magna (Water Flea)
Copper 7440-50-8	96h EC50:0.31-0.045mg/l (pseudokirchneriella subcapitata) 72h EC50:0.426-0.0535mg/l (pseudokirchneriella subcapitata)	96h LC50:0.068-0.0156mg/L (pimephales promelas) 96h LC50:=0.112mg/L(Poecilia reticulate) 96h LC50=0.3mg/L(Cyprinus marpio) 96h LC50=0.8mg/L((Cyprinus marpio) 96h LC50=1.25mg/L(Lepomis macrochirus) 96h LC50=0.052mg/L(Oncorhynchus mykiss) 96h LC50=0.2mg/L(Pimephales promelas) 96h LC50: < 0.3mg/L(Pimephales promelas)	48h EC50:=0.03mg/l

Persistence and degradability	No information available.
Bioaccumulative potential	No information available.
Mobility in soil	No information available.
Results of PBT and vPvB assesement	No information available.
Endocrine disrupting properties	No information available.
Other adverse effects	No information available.

Ecological injuries are not known or expected under normal use. Do not flush into surface water or sanitary sewer system.

SECTION 13: DISPOSAL CONSIDERATIONS

Advice on disposal:	For recycling consult manufacturer.
Waste from residues and Contaminated packaging:	Disposal should be in according with applicable regional, national and local laws and regulations.

SECTION 14: TRANSPORT INFORMATION

Lithium batteries are classified to Lithium ion batteries (including lithium ion polymer batteries) and Lithium metal batteries (including lithium alloy batteries).

Lithium batteries shipped as "Lithium batteries", "Lithium batteries packed with equipment", or "Lithium batteries contained in equipment" may not be classified as "Dangerous Goods" when shipped in accordance with "PI965-970 section II of IATA-DGR" or "special provision 188 of IMO-IMDG Code".

ADR/RID

UN number+ Proper shipping name	UN3480 LITHIUM ION BATTERIES UN3481 LITHIUM ION BATTERIES PACKED WITH EQUIPMENT UN3481 LITHIUM ION BATTERIES CONTAINED IN EQUIPMENT
Hazard Class	None

Packing group	Customary packing. According to Special provision188, the goods are classified as Non-restricted Goods.
IMDG CODE	
UN number+ Proper shipping name	UN3480 LITHIUM ION BATTERIES UN3481 LITHIUM ION BATTERIES PACKED WITH EQUIPMENT UN3481 LITHIUM ION BATTERIES CONTAINED IN EQUIPMENT
Hazard Class	None
Packing group	Customary packing. According to Special provision188, the goods are classified as Non-restricted Goods.
Marine pollutant(Sea)	Non-hazardous if seal good.
Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code	N/A
IATA	
UN number+ Proper shipping name	UN3480 LITHIUM ION BATTERIES
Hazard Class	Class 9
Packing group	Customary packing. The goods are in accordance to PACKING INSTRUCTION 965 of SECTION IB, and the batteries must be offered for transport at a state of charge (SoC) not exceeding 30% of their rated design capacity.
Environmentally Hazardous Substance	Non-hazardous if seal good.
IATA	
UN number+ Proper shipping name	UN3481 LITHIUM ION BATTERIES PACKED WITH EQUIPMENT UN3481 LITHIUM ION BATTERIES CONTAINED IN EQUIPMENT
Hazard Class	None
Packing group	Customary packing. The goods are in accordance to PACKING INSTRUCTION 966-967 of section II.
Environmentally Hazardous Substance	Non-hazardous if seal good.

SECTION 15: REGULATORY INFORMATION

Canadian Federal Regulations	These products have been classified in accordance with the hazard criteria of the Controlled Products Regulations and the S DS contains all the information required by the Controlled Products Regulations. WHMIS Classification: Not Controlled, manufactured article. New Substance Notification Regulations: Lithium hexafluorophosphate is listed on the Non-Domestic Substance List (NDSL). All other ingredients in the product are listed, as required, on Canada's Domestic Substances List (DSL).

	National Pollutant Release Inventory (NPRI) Substances: These products do not contain any NPRI chemicals.
US Federal and State Regulations	TSCA Status: All ingredients in these products are listed on the TSCA inventory. OSHA: These products do not meet criteria as per Part 1910.1200, manufactured article.
Australia	SUSMP: Not applicable AICS: All ingredients are on the AICS list.
New Zealand	HSNO Approval Number: Not applicable HSNO Group Title: Not applicable NOHSC: 10008 Risk Phrases: R34 -Causes Burns. NOHSC:1008 Safety Phrases S1 – Keep locked up S2 – Keep out of reach of children. S23 – Do not breathe vapor. S24/25 – Avoid contact with skin and eyes. S26 –In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S27/28 – After contact with skin, take off immediately all contaminated clothing and wash immediately with plenty of water. S36/37/39 – Wear suitable protective clothing, gloves and eye/face protection. S56 – Dispose of this material and its container at hazardous waste or special waste collection point. S62 –If swallowed, DO NOT induce vomiting: seek medical advice immediately and show this container or label. S64 –If swallowed, rinse mouth with water (Only if the person is conscious).
EC Classification	These products are not classified as hazardous according to Regulation (EC) No. 1272/2008.Keep out of the reach of children.
EU Restriction on Use	Regulation (EC) No. 1907/2006, REACH Annex II. REACH Annex XVII Substances subject to restriction on marketing and use as amended: Aluminium (CAS 7429-90-5).
Other EU Regulations	This Material Safety Data Sheet complies with the requirements of Regulation (EC) No. 1907/2006.
Japanese Regulations	Japanese Industrial Standards (JIS) JIS Z 7253:2019 GHS-based chemical hazard information transfer method - labeling, workplace marking and safety data sheet (SDS)
Taiwanese Regulations	Regulation of Labelling and Hazard Communication of Dangerous and Harmful Materials: Labeling requirements and other relevant provision of chemicals, this product is not classified as dangerous goods. Toxic Chemicals Substance Control Law: Not Listed. CNS1030016 Safety of primary and secondary lithium cells and batteries during transport.
Chinese Regulations	General Rule for Classification and Hazard Communication of Chemicals (GB13690-2009): Specifies the classification, labeling and hazard communication of chemicals in compliance with the GHS standard for chemical production sites and labeling of consumer goods.

	General Rule for Preparation of Precautionary Labels for Chemicals (GB 15258-2009): Specifies the relevant application methods of precautionary labels for chemicals. Material Safety Data Sheet for Chemical Products Content and Order of sections (GB/T 16483-2008).

SECTION 16: OTHER INFORMATION

According standards:

ISO 11014:2009(E) Safety data sheet for chemical products – Content and order of sections

Regulation (EC) No 1272/2008 (CLP)

Commission Regulation (EU) 2020/878

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Edited Department:

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Other Information:

Data of sections 4 to 8, as well as 10 to 12, do not necessarily refer to the use and the regular handling of the product (in this sense consult package leaflet and expert information), but to release of major amounts in case of accidents and irregularities. The information describes exclusively the safety requirements for the product (s) and is based on the present level of our knowledge. This data does not constitute a guarantee for the characteristics of the product(s) as defined by the legal warranty regulations. "(n.a. = not applicable; n.d. = not determined)". The data for the hazardous ingredients were taken respectively from the last version of the sub-contractor's material safety data sheet. The information provided in this Material Safety Data Sheet is correct and reliable. Any parts or all information used by anyone should depends on special demands of users, Users assume all risks resulting from its use. The supplier may not be responsible for any direct, indirect, accident or inevitable loss or damage, and also make no warrantee to any patent infringement caused by using this MSDS.