

SAFETY DATA SHEET

Lithium-Ion Rechargeable Battery Pack — 6 × Panasonic NCR18650B (3400 mAh, button top)

Prepared to OSHA 29 CFR 1910.1200 (HazCom 2012) · GHS Rev. 7 · ANSI Z400.1 16-section format

SDS NUMBER	REVISION	DATE OF ISSUE	SUPERSEDES
RFID_E1	[Rev. 1.0]	2026-02-02	Not applicable — initial issue

SECTION 1 — IDENTIFICATION

Product identifier	Lithium-Ion Rechargeable Battery Pack
Product description	Sealed battery pack assembly containing six (6) cylindrical lithium-ion cells, IEC size 18650, button-top (raised positive terminal) configuration
Cell manufacturer / model	Panasonic / Sanyo — NCR18650B , 3400 mAh nominal
Cell chemistry	Lithium nickel cobalt aluminium oxide (NCA) cathode / graphite anode
Cells per unit	6
Pack configuration	6S1P
Recommended use	Portable electronic equipment power source —EchoActive Plus RFID timing unit
Restrictions on use	Not for use outside the equipment for which it was designed. Not for use as a general-purpose or replacement cell.

Supplier

RFID Race Timing Systems
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SECTION 2 — HAZARDS IDENTIFICATION

GHS Classification

Under normal conditions of use this product is a sealed **article** as defined in 29 CFR 1910.1200(c) and is **not classified as hazardous**. The cells are hermetically sealed, hazardous contents are not accessible, and no exposure occurs during normal handling. This SDS is supplied voluntarily for customer information and for emergency-response, transport, and disposal planning.

Classification applicable only if cell contents are released (breach, crush, puncture, fire, or over-temperature):

Hazard Class	Category
Flammable liquid	3
Skin corrosion / irritation	1B
Serious eye damage	1
Specific target organ toxicity, single exposure (respiratory irritation)	3

Label Elements — applicable to released contents only

Pictograms: Flame · Corrosion · Exclamation mark | Signal word: **DANGER**

Hazard statements

- H226 — Flammable liquid and vapour
- H314 — Causes severe skin burns and eye damage
- H335 — May cause respiratory irritation

Precautionary statements

- P210 — Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.

- P260 — Do not breathe vapours or fumes from a damaged cell.
- P280 — Wear protective gloves, protective clothing, and eye / face protection.
- P303+P361+P353 — IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water.
- P305+P351+P338 — IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.
- P310 — Immediately call a POISON CENTER or doctor.
- P501 — Dispose of contents and container in accordance with local, regional, national and international regulations.

Other Hazards

- **Thermal runaway** — short circuit, overcharge, over-discharge, crushing, puncture, immersion, reverse polarity, or exposure above the rated temperature may cause a cell to vent, generate heat, ignite, or rupture.
- **Electrical** — external short circuit of the pack can produce high current, rapid heating, arcing, and burns.
- **Vented gases** — cell venting may release flammable and irritating organic vapours, carbon monoxide, carbon dioxide, and traces of hydrogen fluoride.
- **Delayed reignition** — cells that have entered thermal runaway may reignite after apparent extinguishment.

SECTION 3 — COMPOSITION / INFORMATION ON INGREDIENTS

Substance / mixture: Article containing a mixture. Typical composition of an NCA-chemistry 18650 cell, expressed as nominal weight percent of total cell mass.

Component	CAS No.	Typical wt %
Lithium nickel cobalt aluminium oxide (LiNiCoAlO ₂)	193214-24-3	25 – 40
Graphite / carbon (anode)	7782-42-5	10 – 20
Aluminium (foil, can components)	7429-90-5	3 – 10
Copper (foil)	7440-50-8	5 – 12
Iron / steel (can)	7439-89-6	15 – 25
Nickel (plating, tabs)	7440-02-0	1 – 5
Ethylene carbonate	96-49-1	3 – 8
Diethyl carbonate	105-58-8	2 – 7
Ethyl methyl carbonate	623-53-8	2 – 7
Dimethyl carbonate	616-38-6	0 – 5
Lithium hexafluorophosphate (LiPF ₆)	21324-40-3	1 – 3
Polyvinylidene fluoride (binder)	24937-79-9	1 – 3
Polypropylene / polyethylene (separator, wrap)	9003-07-0 / 9002-88-4	1 – 5

VERIFY

Exact electrode and electrolyte formulation is proprietary to Panasonic. Replace this table with the figures from the Panasonic SDS for the NCR18650B before issuing this document to customers.

SECTION 4 — FIRST-AID MEASURES

Exposure is possible **only** if a cell has been breached, crushed, or has vented. Intact cells present no exposure route.

Inhalation of vented gases or fumes

Remove the person to fresh air immediately. Keep at rest in a position comfortable for breathing. If breathing is difficult, administer oxygen. If breathing has stopped, give artificial respiration. Seek immediate medical attention.

Skin contact with electrolyte

Immediately remove contaminated clothing. Flush the affected area with large amounts of running water for at least 15 minutes. Do not rub. Seek immediate medical attention — electrolyte causes chemical burns, and hydrogen fluoride exposure may not be immediately painful.

Eye contact with electrolyte

Immediately flush with large amounts of running water for at least 15 minutes, holding the eyelids open. Remove contact lenses if present and easy to do. **Do not rub the eyes.** Seek immediate medical attention.

Ingestion

Do not induce vomiting. Rinse mouth with water. Do not give anything by mouth to an unconscious person. Seek immediate medical attention. If a cell has been swallowed, seek emergency medical attention immediately — internal chemical and electrical burns can occur rapidly.

Most important symptoms and effects

Chemical burns, eye and respiratory tract irritation, coughing, shortness of breath. Delayed onset of symptoms is possible following hydrogen fluoride exposure.

Note to physicians

Treat symptomatically. Consider hydrofluoric acid exposure protocols (calcium gluconate) where fluoride exposure is suspected. Thermal burns may coexist with chemical burns.

SECTION 5 — FIRE-FIGHTING MEASURES

Suitable extinguishing media

Large volumes of water are the preferred agent — water cools adjacent cells and limits propagation. Carbon dioxide, dry chemical, foam, or a Class D agent are also acceptable where the fire is small and confined, but copious water is generally more effective for a multi-cell pack.

Unsuitable extinguishing media

None specifically. Note that small quantities of water will not extinguish a cell in thermal runaway and may prolong it — use a large sustained supply, or allow the pack to burn out under control.

Specific hazards arising from the product

Cells may vent, rupture, or explode when heated, and may reignite minutes to hours after apparent extinguishment. Hazardous combustion and decomposition products include carbon monoxide, carbon dioxide, hydrogen fluoride, phosphorus oxides, metal oxide fume, and flammable organic vapours. Vented gases are flammable and may form an explosive atmosphere in a confined space.

Special protective equipment and precautions for firefighters

Wear full protective firefighting gear and self-contained breathing apparatus (SCBA) in positive-pressure mode. Fight the fire from a protected position or at maximum distance. Cool adjacent cells, packs and containers with water spray. Do not enter a confined space where cells have vented without SCBA. After extinguishment, isolate affected packs in a non-combustible container and observe for at least 24 hours.

SECTION 6 — ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Evacuate non-essential personnel. Eliminate all ignition sources. Ventilate the area. Wear chemical-resistant gloves, eye / face protection, and — where vapours are present or the space is confined — respiratory protection. Do not touch damaged cells with bare hands.

Environmental precautions

Prevent released electrolyte from entering drains, sewers, surface water, or soil. Notify authorities if a release reaches the environment.

Methods and materials for containment and cleaning up

Absorb released electrolyte with dry sand, vermiculite, or another inert non-combustible absorbent. Do not use combustible absorbents. Place damaged cells and absorbed material in a non-combustible, non-sealed container — sealing may allow pressure build-up. Isolate the container outdoors or in a ventilated area away from combustibles and observe for delayed thermal events. Dispose of via an approved lithium-battery recycler (Section 13).

SECTION 7 — HANDLING AND STORAGE

Precautions for safe handling

- Do not disassemble, crush, puncture, deform, incinerate, or immerse the pack.
- Do not short-circuit the terminals. Keep away from loose metal objects, conductive tools, and unshielded wiring.
- Do not charge outside the specified voltage, current and temperature limits, and do not charge with a non-approved charger.
- Do not reverse polarity, over-discharge, or force-discharge.
- Do not solder directly to a cell body — use spot-welded tabs.
- Do not mix cells of different manufacture, chemistry, capacity, age, or state of charge within a pack.
- Do not expose to heat sources, direct sunlight, or temperatures outside the rated range.
- Remove a pack from service immediately if it swells, leaks, discolours, emits odour, becomes hot in normal use, or has been dropped or physically damaged.
- Wash hands after handling a damaged cell.

Conditions for safe storage, including incompatibilities

- Store in a cool, dry, well-ventilated area away from direct sunlight, heat, and combustible materials.
- Recommended long-term storage: 10 °C to 25 °C at approximately 30–50 % state of charge.
- Do not store fully charged or fully discharged for extended periods. Recharge to the storage state of charge at least every 6–12 months.
- Store away from strong oxidisers, strong acids and bases, and water.
- Keep out of reach of children.
- Store in original packaging, or with terminals protected against short circuit.
- Segregate damaged, defective or recalled (DDR) cells from serviceable stock in a fire-resistant container.

SECTION 8 — EXPOSURE CONTROLS / PERSONAL PROTECTION

Occupational exposure limits. No exposure occurs from an intact sealed cell. The following apply to internal components only if released.

Component	OSHA PEL (TWA)	ACGIH TLV (TWA)
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Component	OSHA PEL (TWA)	ACGIH TLV (TWA)
Graphite (respirable)	15 mppcf	2 mg/m ³
Aluminium (dust)	15 mg/m ³ (total)	1 mg/m ³ (respirable)
Copper (dust / mist)	1 mg/m ³	1 mg/m ³
Nickel (metal)	1 mg/m ³	1.5 mg/m ³ (inhalable)
Cobalt compounds (as Co)	0.1 mg/m ³	0.02 mg/m ³
Hydrogen fluoride (as F)	3 ppm	0.5 ppm TWA, 2 ppm ceiling
Ethylene carbonate	Not established	Not established
Diethyl carbonate	Not established	Not established

Appropriate engineering controls

General ventilation is adequate for normal handling of intact packs. Provide local exhaust ventilation where cells are opened, damaged, tested to failure, or where venting is possible. Provide eyewash stations and safety showers in areas where cells may be breached.

Eye / face protection	Safety glasses with side shields for routine handling. Chemical splash goggles or a face shield when handling damaged or leaking cells.
Skin protection	Not required for intact cells. Chemical-resistant gloves (nitrile or neoprene) and protective clothing when handling damaged cells or electrolyte.
Respiratory protection	Not required under normal conditions. NIOSH-approved organic vapour / acid gas respirator, or SCBA in fire or confined-space conditions.
Thermal protection	Heat-resistant gloves where cells may be hot.

SECTION 9 — PHYSICAL AND CHEMICAL PROPERTIES

General properties

Appearance	Cylindrical metal cells, polymer-wrapped, assembled into a pack
Cell format	18650 cylindrical, button top (raised positive terminal)
Cell dimensions	Ø 18.5 mm max × 65.3 mm max as manufactured (flat top); approx. 66–69 mm with an added button-top cap
Cell mass	Approx. 47.5 g — six cells approx. 285 g, excluding pack hardware
Odour	Odourless; sweet or ethereal solvent odour if vented
pH	Not applicable
Melting / freezing point	Not applicable (article)
Initial boiling point	Not applicable; electrolyte solvents approx. 90–248 °C
Flash point	Not applicable; electrolyte solvents approx. 18–33 °C closed cup
Flammability	Article is not flammable; electrolyte is a flammable liquid
Vapour pressure / vapour density	Not applicable
Relative density	Approx. 2.0 (cell)
Solubility in water	Insoluble (article); electrolyte solvents partially miscible
Auto-ignition temperature	Not applicable
Decomposition temperature	Cell venting typically initiates above approx. 130–150 °C
Viscosity	Not applicable

Electrical characteristics — Panasonic NCR18650B

Nominal cell voltage	3.6 V
Nominal cell capacity	3400 mAh (as specified). Panasonic datasheet states 3350 mAh typical / 3200 mAh minimum
Nominal cell energy	12.24 Wh at 3400 mAh × 3.6 V (12.06 Wh at 3350 mAh)
Cells per unit	6
Pack configuration	6S1P
Pack nominal voltage	series count × 3.6 V
Pack total energy	73.4 Wh (6 × 12.24 Wh); 72.4 Wh if rated at 3350 mAh
Charge voltage (per cell)	4.20 V ± 0.03 V, constant current / constant voltage
Standard charge current	1625 mA (approx. 0.5C), approx. 4 h to full

Discharge cut-off (per cell)	2.50 V
Max. continuous discharge current	Approx. 4.87 A per cell
Operating temperature	Charge 10 °C to 45 °C · Discharge –20 °C to 60 °C · Storage –20 °C to 50 °C

THE 100 WH THRESHOLD

At **73.4 Wh** this pack sits below the 100 Wh limit that separates Section I from Section II lithium-ion consignments, which is the more favourable side for shipping (Section 14). The margin is comfortable but not large: adding a seventh cell (85.7 Wh) still clears it, an eighth (97.9 Wh) is marginal, and a ninth crosses it. Recheck this calculation if the cell count or cell model ever changes.

SECTION 10 — STABILITY AND REACTIVITY

Reactivity	Not reactive under normal conditions of use and storage.
Chemical stability	Stable under recommended storage and handling conditions.
Possibility of hazardous reactions	Hazardous reactions occur only on cell abuse. Thermal runaway may result from overcharge, over-discharge, external or internal short circuit, mechanical damage, or exposure to excessive heat.
Conditions to avoid	Heat above the rated temperature range, open flame, direct sunlight, mechanical shock, crushing, puncturing, disassembly, immersion in water or other liquids, external short circuit, charging outside specified limits, reverse polarity connection.
Incompatible materials	Strong oxidising agents, strong acids, strong bases, water (with breached cells), and conductive materials that may bridge the terminals.
Hazardous decomposition products	Carbon monoxide, carbon dioxide, hydrogen fluoride, phosphorus pentafluoride, phosphorus oxides, organic vapours, and metal oxide fume.

SECTION 11 — TOXICOLOGICAL INFORMATION

Likely routes of exposure: none under normal conditions, as the cell is sealed. If breached: inhalation, skin contact, eye contact, ingestion.

Symptoms related to physical, chemical and toxicological characteristics

Inhalation	Irritation of the nose, throat and respiratory tract; coughing; shortness of breath. High concentrations may cause pulmonary oedema with delayed onset.
Skin	Chemical burns, redness, pain, blistering.
Eyes	Severe irritation, chemical burns, possible permanent damage.
Ingestion	Burns to the mouth, throat, oesophagus and stomach. An ingested cell may cause severe internal injury from both chemical and electrical effects.

Acute toxicity	No data available for the article as supplied. Individual electrolyte components are irritants and corrosives; LiPF ₆ hydrolyses in moisture to form hydrofluoric acid.
Skin corrosion / irritation	Corrosive (released electrolyte)
Serious eye damage / irritation	Causes serious eye damage (released electrolyte)
Respiratory or skin sensitisation	Nickel and cobalt compounds are known skin and respiratory sensitisers. Exposure is not expected from an intact cell.
Germ cell mutagenicity	No data available for the product
Reproductive toxicity	No data available for the product
STOT — single exposure	May cause respiratory irritation (Category 3)
STOT — repeated exposure	No data available for the product
Aspiration hazard	No data available

Carcinogenicity

Component	NTP	IARC	OSHA
Nickel compounds	Known / reasonably anticipated	Group 1 (nickel compounds); Group 2B (metallic nickel)	Not listed
Cobalt and cobalt compounds	Reasonably anticipated	Group 2B (Group 2A with tungsten carbide)	Not listed
Lithium nickel cobalt aluminium oxide	Not listed as such	Not listed as such	Not listed

Carcinogenic components are bound within the sealed cell and are not bioavailable during normal use.

SECTION 12 — ECOLOGICAL INFORMATION

Ecotoxicity	No data available for the product as supplied. Released electrolyte and heavy metal components (nickel, cobalt, copper) may be harmful to aquatic organisms.
Persistence and degradability	Metal components are not biodegradable. Organic carbonate solvents are expected to biodegrade.
Bioaccumulative potential	Heavy metals may bioaccumulate in aquatic organisms.
Mobility in soil	Released electrolyte is mobile in soil. Metallic components have low mobility.
Other adverse effects	Do not allow the product or its contents to enter drains, sewers, surface water, groundwater or soil. Improper landfill disposal may result in leaching of heavy metals.

SECTION 13 — DISPOSAL CONSIDERATIONS

Waste treatment methods

- Do not dispose of in household or general commercial waste, and do not incinerate.
- Recycle through a licensed lithium-battery recycler or a recognised take-back programme (for example Call2Recycle in the US and Canada).
- Discharge the pack, or insulate the terminals with non-conductive tape, before storage or transport for recycling, to prevent short circuits.
- Damaged, defective or recalled cells require segregated handling and must be declared to the recycler — most recyclers will not accept them in standard packaging.
- Under US EPA rules, spent lithium-ion batteries are generally managed as **Universal Waste** under 40 CFR Part 273. Verify state requirements, which may be more stringent.
- In the EU, disposal is governed by the Batteries Regulation (EU) 2023/1542.

Contaminated packaging: dispose of in accordance with local, regional and national regulations. Comply with all applicable federal, state / provincial and local requirements.

SECTION 14 — TRANSPORT INFORMATION

Lithium-ion batteries are **Class 9 — Miscellaneous dangerous goods**.

Mode / configuration	UN No.	Proper shipping name
Contained in equipment	UN 3481	Lithium ion batteries contained in equipment
Packed with equipment	UN 3481	Lithium ion batteries packed with equipment
Battery pack shipped alone	UN 3480	Lithium ion batteries

Hazard class	9
Packing group	Not applicable
Label / mark	Class 9 lithium battery label, or the lithium battery mark where applicable
ERG guide number	147
Watt-hour rating (marking)	73.4 Wh — must be marked on the battery pack per 49 CFR 173.185 / IATA DGR

Packing instructions

Mode	Regulation	Packing instruction
Air	IATA DGR / ICAO TI	PI 966 (packed with equipment), PI 967 (contained in equipment), PI 965 (alone)
Sea	IMDG Code	SP 188 / SP 384
Road and rail (US)	49 CFR	§ 173.185
Road and rail (EU)	ADR / RID	SP 188 / SP 376 / SP 636

Section II and excepted provisions

At 73.4 Wh the pack is under the 100 Wh threshold and may qualify for Section II or excepted handling, subject to the cell and battery count limits, packaging, and marking requirements of the applicable packing instruction. **This does not make the shipment unregulated** — marking, packaging, drop-test and documentation requirements still apply.

Requirements applicable to all shipments

- Cells and packs must be protected against short circuit and against movement within the package.
- Packages must bear the lithium battery mark and a telephone number for additional information where the applicable packing instruction requires it.
- Damaged, defective or recalled batteries are **forbidden for air transport** and require special packaging (P908 / LP904) for other modes.
- Do not ship packs that are swollen, leaking, damaged, or of unknown state of charge.

- Air shipments of standalone lithium-ion batteries (UN 3480) are restricted to cargo aircraft only and to a state of charge not exceeding 30 %.
- Transport regulations are revised annually. Verify against the edition of IATA DGR, IMDG and 49 CFR in force on the date of shipment.*

SECTION 15 — REGULATORY INFORMATION

United States

OSHA HazCom (29 CFR 1910.1200)	Product is an article; an SDS is not strictly required but is supplied voluntarily.
TSCA	All components are listed on, or exempt from, the TSCA inventory.
SARA 302 (EHS)	None present above threshold.
SARA 311 / 312	Not applicable to articles.
SARA 313 (TRI)	Contains nickel (7440-02-0), cobalt compounds, and copper (7440-50-8) — reportable if the article exemption at 40 CFR 372.38(b) does not apply to your operations.
CERCLA	No reportable quantities in the article as supplied.
RCRA	Spent batteries typically managed as Universal Waste (40 CFR Part 273).
DOT	Regulated — see Section 14.

CALIFORNIA PROPOSITION 65

This product contains nickel and cobalt compounds, chemicals known to the State of California to cause cancer.

Canada

WHMIS 2015	Classified as a manufactured article; SDS supplied voluntarily.
DSL	Components are listed or exempt.

European Union and United Kingdom

REACH (EC 1907/2006)	As an article, registration is not required. Article 33 notification applies if an SVHC is present above 0.1 % w/w — verify SVHC status with Panasonic and note the SCIP database notification obligation.
RoHS (2011/65/EU)	Batteries fall outside the scope of RoHS; the Batteries Regulation applies instead.
Batteries Regulation (EU) 2023/1542	Applies to placing on the EU market — marking, carbon footprint, due diligence, and producer responsibility. Several obligations phase in through 2027; check your compliance timeline.
UK REACH / UK Batteries Regulations	Equivalent obligations apply for GB placement.

International standards

IEC 62133-2	Safety requirements for portable sealed secondary lithium cells and batteries.
UN Manual of Tests and Criteria, Part III, sub-section 38.3	Required — see Section 14.

SECTION 16 — OTHER INFORMATION

Abbreviations used

ACGIH — American Conference of Governmental Industrial Hygienists · ADR — European Agreement concerning the International Carriage of Dangerous Goods by Road · CAS — Chemical Abstracts Service · DDR — Damaged, Defective or Recalled · GHS — Globally Harmonized System · IARC — International Agency for Research on Cancer · IATA DGR — International Air Transport Association Dangerous Goods Regulations · IMDG — International Maritime Dangerous Goods Code · NCA — Nickel Cobalt Aluminium · NTP — National Toxicology Program · OSHA — Occupational Safety and Health Administration · PEL — Permissible Exposure Limit · PI — Packing Instruction · SCBA — Self-Contained Breathing Apparatus · STOT — Specific Target Organ Toxicity · SVHC — Substance of Very High Concern · TLV — Threshold Limit Value · TWA — Time-Weighted Average · UN — United Nations

Key references

- Panasonic safety data sheet for cell model NCR18650B
- Panasonic NCR18650B cell specification / datasheet
- UN Manual of Tests and Criteria, Part III, sub-section 38.3
- IATA Dangerous Goods Regulations, current edition
- 49 CFR Parts 171–180
- OSHA 29 CFR 1910.1200

Prepared by	Andrew Peterson
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DISCLAIMER

The information in this Safety Data Sheet is provided in good faith and is believed to be accurate as of the date of issue. It is compiled from cell-manufacturer data and published regulatory sources and relates only to the specific product identified in Section 1. It does not constitute a warranty, express or implied, of any kind. The user is responsible for determining the suitability of this information for their own purposes and for compliance with all applicable laws and regulations. RFID Race Timing Systems assumes no liability for damage or injury resulting from use of this product or reliance on this document.

This document must be reviewed against Panasonic's current SDS for the NCR18650B and against the transport regulations in force before it is issued to customers or relied upon for regulatory purposes.