RHTECP®

BEYOND CONNECTIONS

# APPLICATION NOTE

## USB CONNECTOR

# APPLICATION NOTE

## USB CONNECTORS

Selection, PCB Integration & Application Design Guide



### USB connector family selection

Select by ecosystem, mating interface, data capability and mechanical envelope.

| TYPE-A | TYPE-B | MICRO / MINI | TYPE-C |
|---|---|---|---|
| Legacy host / downstream port; non-reversible | Legacy peripheral-side interface | Compact legacy products; lifecycle review | Reversible interface; CC-based attach and role control |

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# 00 | DOCUMENT CONTROL & SCOPE

Read this guide together with the latest approved drawing and specification for the selected connector part number.

| FIELD | DETAIL |
|---|---|
| Document title | USB Connectors — Selection, PCB Integration & Application Design Guide |
| Document number / revision | RHT-ANE-002 / Rev. A |
| Document status | Application guidance |
| Prepared by | Amy |
| Issue date | 09 November 2026 |
| Product scope | USB connector families and PCB-mounted USB interface implementations |
| Intended readers | Hardware, electrical, PCB layout, mechanical, validation, manufacturing and sourcing engineers |

## Engineering purpose

A practical design-in reference for selecting a compatible USB connector, translating the interface into a manufacturable PCB implementation, preserving power and signal integrity, and verifying the assembled interconnect.

## Scope boundary

This is a family-level engineering guide. It does not assign a universal current rating, voltage rating, data rate, contact resistance, mating-cycle life, material, plating, dimension, ingress rating or certification status to every RHT USB part. Such values are part-number-specific and must be taken from the latest approved RHT drawing, specification and qualification evidence.

**PRODUCT-DATA INTEGRITY** No controlled RHT USB connector part number or product datasheet was included in the supplied source package. This guide therefore defines the engineering workflow and data required for design-in without inventing RHT-specific ratings.

## How to use this guide

# RHT USB CONNECTOR PORTFOLIO

*Product-family orientation for engineering selection and design-in*

RHT's published USB portfolio spans established USB 2.0 interfaces, USB 3.x connector formats, USB Type-C, Micro USB and Mini USB families. The examples below help engineers navigate the catalogue by interface and mounting approach. They are not a substitute for the controlled drawing and specification of the exact orderable part number.

| INTERFACE | MOUNTING | RHT MODEL EXAMPLES | ENGINEERING APPLICATION / REVIEW |
|---|---|---|---|
| **USB Type-A receptacle** | DIP 180° | RHTAY821 / RHTAY830 | Board-edge or panel-facing ports; review shell anchors and enclosure mating axis. |
| **USB Type-A receptacle** | SMD | RHTAY81E / RHTAY827; RHTAY813 | Automated SMT assembly; validate shell hold-downs, paste design and mechanical support. |
| **USB 3.0 Type-A** | 9-position DIP 90° / 180° | RHTAY46 / RHTAY006 / RHTAY021 | High-speed candidate family; verify exact pin map and channel qualification for selected SKU. |
| **USB Type-A receptacle** | Mid-mount SMD | RHTAY816 | Thin enclosure / board-edge integration; coordinate PCB thickness, cut-out and tolerance stack. |
| **Mini USB Type-B, 5P** | Right-angle DIP 90° / 180° | RHTAY29-5FA / 5FC / 5FK | Legacy compact device ports; select orientation from enclosure access and board layout. |
| **Mini USB Type-B, 5P** | SMD / Mid-mount | RHTAY29-5FD / 5FE / 5MA | Compact SMT layouts; review shell retention, board support and reflow compatibility. |
| **USB Type-C** | SMD, 16P / 24P examples | RHTAY416 / RHTAY404 / RHTAY405 | Reversible interface; verify pin population, CC architecture, data lanes and PD system design. |

**Catalogue control:** Model availability and product details can change. Confirm the live product page, latest 2D drawing, 3D model and controlled specification before design release.

## MINI USB B — PART-SPECIFIC DATA EXAMPLE

**RHT product page RHTAY29-5FE publishes the values below.** They apply only to that product-page listing and must be reconfirmed against the latest controlled drawing/specification before use.

| | |
|---|---|
| **Part number** | RHTAY29-5FE |
| **Interface / construction** | 5P Mini USB Type-B, right-angle SMD / mid-mount |
| **Current rating** | 1.5 A / contact terminal |
| **Voltage rating** | 30 V DC |
| **Contact resistance** | 30 mΩ max. |
| **Dielectric withstand** | 500 V AC at sea level |
| **Insulation resistance** | 1,000 MΩ min. |
| **Mating / unmating force** | 3.75 kgf max. / 1.02 kgf min. |
| **Terminal retention** | 1.2 kgf min. |

**Official product page:** RHTAY29-5FE — product details

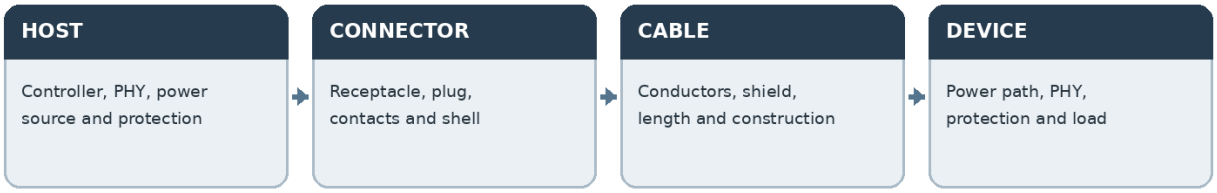
- Define the port role, data capability and power requirements before selecting the connector.
- Confirm the exact mating interface and controlled mechanical drawing.
- Review the footprint, PCB stack-up, protection and enclosure as one integrated design.
- Validate the finished assembly with the appropriate electrical, signal-integrity and mechanical tests.

# 01 | USB INTERCONNECT ENGINEERING OVERVIEW

The connector is one element in a complete power and data channel.

## USB interconnect: system boundary

The connector is one element in a complete power and data channel.




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A USB path commonly includes a host or power source, connector receptacle, plug and cable assembly, device-side connector, protection network, PHY and power-management circuitry. The connector choice affects mechanical fit, contact reliability, power loss, signal discontinuity, shielding and service life.

| CONTROL AREA | DESIGN QUESTION | REQUIRED EVIDENCE |
|---|---|---|
| Interface | Does the plug mate with the selected receptacle and orientation? | Mating-interface drawing; exact part numbers |
| Data | Does the complete channel support the intended USB generation and data rate? | PHY requirements; cable and connector qualification |
| Power | Can the path support negotiated voltage/current and transient load? | Port policy; contact and cable ratings; thermal test |
| PCB | Are differential routing and reference structures continuous? | Stack-up; layout review; SI / compliance results |
| Mechanical | Can the connector withstand insertion, extraction and cable loads? | Drawing; retention and durability evidence |
| Validation | Does the final product pass functional and compliance testing? | Test plan; reports; production acceptance criteria |

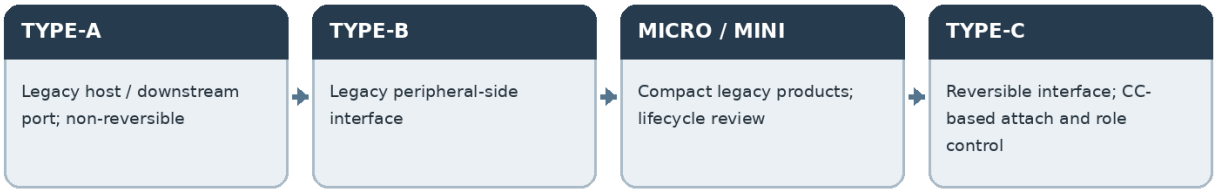
**KEY PRINCIPLE** A connector family label does not guarantee a specific data rate, power capability or system-level USB compliance.

# 02 | USB CONNECTOR FAMILIES & SELECTION

Choose the interface from the product ecosystem, lifecycle and mechanical envelope.

## USB connector family selection

Select by ecosystem, mating interface, data capability and mechanical envelope.




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| FAMILY | COMMON ROLE | DESIGN REVIEW |
|---|---|---|
| USB Standard-A | Legacy host / downstream port | Non-reversible; confirm port role and current ecosystem needs |
| USB Standard-B | Legacy peripheral-side port | Often used on equipment; check enclosure and cable availability |
| Mini-B / Micro-B | Compact legacy devices | Review lifecycle, durability, orientation and service requirements |
| USB Type-C | Modern reversible interface | CC logic, orientation handling, alternate modes and power roles |

### Selection inputs

- Port role: host, device, dual-role port, source, sink or dual-role power.
- Data requirement: USB 2.0 only, SuperSpeed, USB4 capability or a defined subset.
- Power requirement: default USB current, Type-C current advertisement or USB Power Delivery.
- Mechanical requirement: vertical / right-angle, SMT / through-hole, board-edge, mid-mount or panel mounting.
- Operating environment: temperature, vibration, contamination, ingress and expected mating cycles.

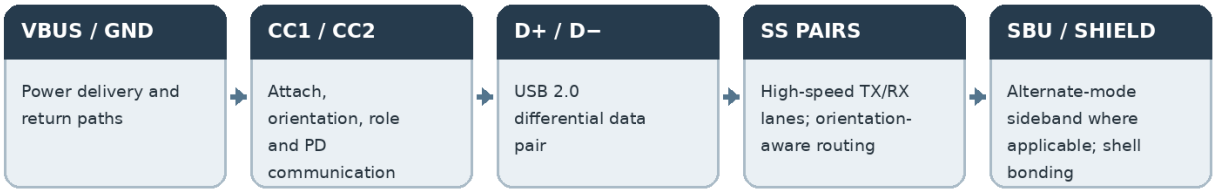
**SELECTION GATE** Do not release the footprint until the exact part number, mating interface, mounting style, board thickness and approved drawing are confirmed.

# 03 | USB TYPE-C INTERFACE ARCHITECTURE

Type-C is a connector system with orientation, configuration and power-role behaviour — not simply a reversible shell.

## USB Type-C functional contact groups

Functional overview only — not a pin-number or footprint drawing.




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| CONTACT GROUP | FUNCTION | DESIGN IMPLICATION |
|---|---|---|
| VBUS / GND | Power delivery and return path | Current path, copper, protection, thermal rise and connector rating |
| CC1 / CC2 | Attach detection, plug orientation, role configuration and PD communication | Correct CC termination / controller architecture; orientation handling |
| D+ / D− | USB 2.0 data pair | Route as a differential pair; account for Type-C orientation connectivity |
| SuperSpeed pairs | High-speed transmit / receive lanes | Mux / orientation handling where needed; channel loss and crosstalk budget |
| SBU1 / SBU2 | Sideband use for supported alternate modes | Only implement where the selected mode and system architecture require it |
| Shield / shell | EMI and mechanical interface | Define chassis / signal-ground bonding strategy |

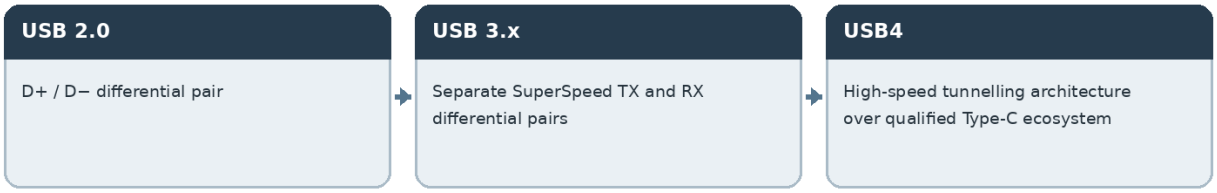
**IMPORTANT** This is a functional contact-group overview, not a pin-number map, footprint or wiring instruction. Use the applicable USB Type-C specification and exact connector drawing for pin numbering and land pattern.

# 04 | USB DATA GENERATIONS & CHANNEL ARCHITECTURE

The connector, cable, PCB and PHY must be designed as one channel.

## USB data architecture at a glance

Connector choice does not establish the negotiated data rate.




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| INTERFACE | SIGNAL ARCHITECTURE | ENGINEERING FOCUS |
|---|---|---|
| USB 2.0 | One D+ / D− differential pair | Differential impedance, pair symmetry, stubs, ESD capacitance and return path |
| USB 3.x | USB 2.0 pair plus separate SuperSpeed TX / RX pairs | Insertion loss, return loss, crosstalk, skew, via transitions and connector launch |
| USB4 | High-speed tunnelling over a qualified Type-C ecosystem | End-to-end channel budget, cable capability, retimers / redrivers where designed, compliance |

Do not infer data capability from the physical connector shape. A Type-C receptacle may implement USB 2.0 only, USB 3.x, USB4 or additional alternate-mode functions depending on the host/device architecture and qualified components.

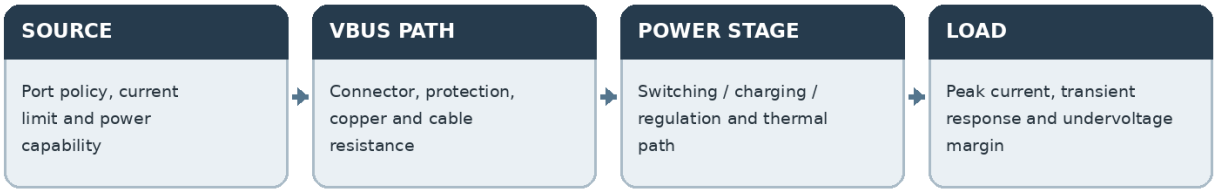
**DESIGN RULE** The lowest-capability element in the end-to-end channel can constrain the usable link. Confirm connector, cable, PHY, routing and firmware capability together.

# 05 | POWER DELIVERY & VBUS DESIGN

Design the full power path from source policy to the load, including cable and thermal effects.

## USB power path: connector to load

Design the full path, not only the connector contact rating.




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| DESIGN ITEM | ENGINEERING REVIEW |
|---|---|
| Port power policy | Identify source / sink role, default current advertisement and whether USB PD negotiation is implemented. |
| VBUS switching | Select load switch / power-path controller with suitable voltage, current, inrush and reverse-current behaviour. |
| Protection | Assess OVP, OCP, short-circuit response, discharge and fault isolation requirements. |
| Copper and contacts | Calculate path resistance and voltage drop; verify connector, cable, vias and PCB copper limits. |
| Thermal | Measure temperature rise under sustained and worst-case operating conditions. |
| Transient response | Test plug-in, load steps, hot-plug and simultaneous-port loading where applicable. |

**USB PD BOUNDARY** USB Power Delivery capability is negotiated system behaviour. A Type-C connector alone does not create a PD source, sink or programmable power supply.

For USB-C products, verify the applicable Type-C and USB PD specification revision and test requirements. Do not apply a power level unless the source, sink, cable, connector and protection design all support it.

# 06 | SCHEMATIC DESIGN & CONFIGURATION LOGIC

A correct connector symbol is only the start: the port controller and protection topology define behaviour.

| FUNCTION | SCHEMATIC REVIEW | COMMON DESIGN ERROR |
|---|---|---|
| CC network | Use the correct Type-C port controller or defined Rd / Rp implementation for the port role. | Treating CC1 / CC2 as generic GPIOs or omitting attach detection |
| USB 2.0 | Connect D+ / D− to the correct PHY pins with the required topology. | Swapped pair, long stub or unintended branch |
| SuperSpeed | Route TX / RX through the correct lane mapping and orientation architecture. | Incorrect lane polarity / direction or missing mux handling |
| VBUS | Implement sensing, switching and protection consistent with power role. | Directly connecting a power source without fault protection |
| Shield | Define shell bonding to chassis / ground according to EMC strategy. | Leaving shell floating unintentionally or creating uncontrolled return paths |
| Unused pins | Follow specification and controller guidance for unused contacts. | Arbitrary ties or unsupported alternate-mode assumptions |

## Before schematic release

- Confirm receptacle pin numbering from the manufacturer drawing, viewed from the correct side.
- Review plug orientation and CC behaviour for both orientations.
- Check power-role transitions, discharge and backfeed conditions.
- Review ESD current paths and ensure protection is placed at the connector entry.

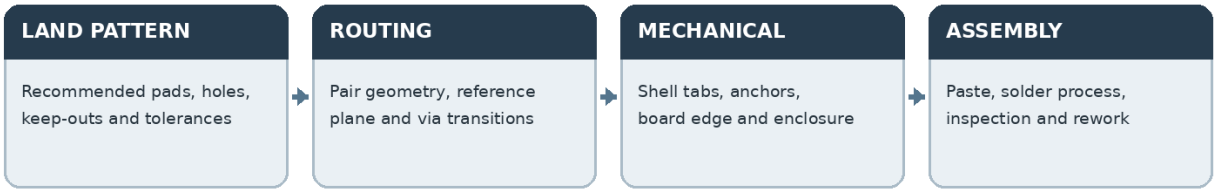
**REVIEW NOTE** Never create a production schematic from a generic Type-C symbol without cross-checking the exact connector drawing and controller reference design.

# 07 | PCB FOOTPRINT & LAND-PATTERN INTEGRATION

The mechanical drawing and recommended land pattern govern the PCB interface.

## PCB integration: keep the interface continuous

A manufacturable footprint must reflect the exact connector drawing.




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| FOOTPRINT ITEM | REVIEW POINT |
|---|---|
| Pad geometry | Pad size, pitch, mask opening, paste aperture and copper definition match the exact part drawing. |
| Through-hole features | Hole diameter, finished plating, drill tolerance and solder fill meet drawing requirements. |
| Shell tabs / anchors | Mechanical pads and stakes have adequate copper, solder and board support. |
| Board thickness | Confirm connector support range and any mid-mount / edge constraints. |
| Keep-out | Check connector body, mating plug, cable boot, enclosure and assembly-tool access. |
| Fabrication tolerance | Review PCB edge, hole position, pad registration and component placement tolerance stack. |

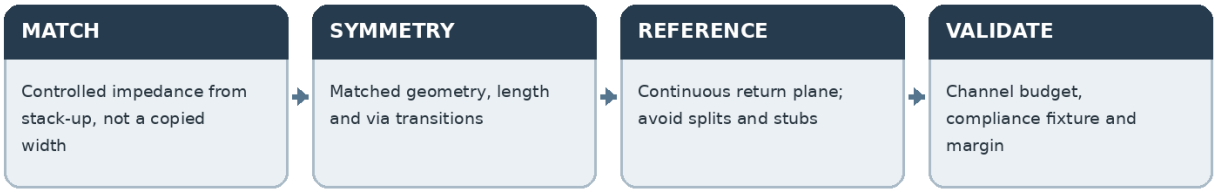
**DO NOT COPY FOOTPRINTS** A footprint from a visually similar connector may differ in contact geometry, shell anchors, board thickness or solder process. Use the approved drawing for the exact orderable part number.

# 08 | DIFFERENTIAL ROUTING & SIGNAL INTEGRITY

High-speed performance depends on the complete channel, not only the connector.

## Differential pair routing review

Maintain symmetry and a continuous reference structure through the connector escape.




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| ROUTING CONTROL | PRACTICAL REVIEW |
|---|---|
| Impedance | Set the target from the applicable USB specification and PHY / channel requirements; calculate from the actual stack-up. |
| Pair symmetry | Maintain consistent geometry, spacing and transition structure; minimise intra-pair skew. |
| Reference plane | Keep a continuous reference plane under the route; avoid splits, voids and plane changes without return vias. |
| Via transitions | Minimise unnecessary vias and stubs; use back-drilling or other methods only where justified by channel analysis. |
| Crosstalk | Maintain spacing from aggressors and review parallel run length, layer assignment and connector pin-field coupling. |
| Channel budget | Account for connector, PCB, cable, package and any active components across the required frequency range. |

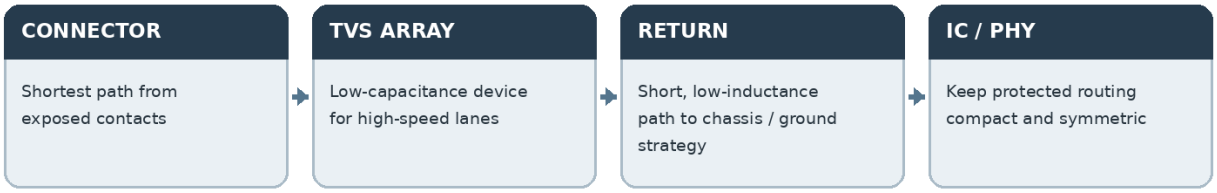
**STACK-UP DISCIPLINE** A generic trace width is not transferable between boards. Obtain the fabricator-controlled stack-up and use a field solver or validated impedance calculation.

# 09 | ESD, EMI & GROUNDING STRATEGY

Protection must preserve the signal path while providing a controlled discharge route.

## Protection placement: protect at the entry point

Choose a protection device compatible with the interface bandwidth and capacitance budget.




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| TOPIC | ENGINEERING PRACTICE |
|---|---|
| ESD device | Select working voltage, clamping behaviour and capacitance compatible with the interface and data rate. |
| Placement | Place protection close to the connector; minimise exposed trace length before the device. |
| Return path | Provide a short, low-inductance discharge path to the intended ground / chassis reference. |
| Shield bonding | Define shell-to-chassis and shell-to-signal-ground strategy; verify with EMC testing. |
| Common-mode noise | Review connector shell, cable shield, common-mode paths and nearby switching circuitry. |
| Validation | Test the assembled product using the applicable ESD / EMC standards and defined operating state. |

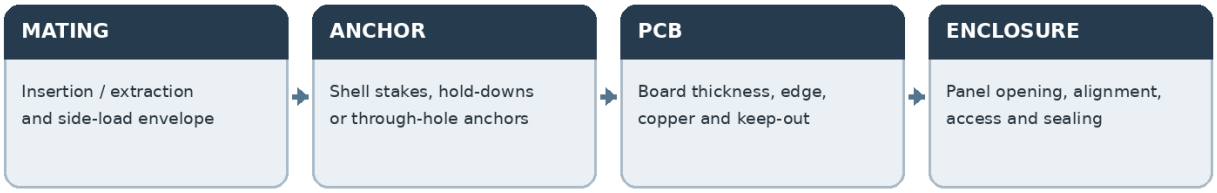
**LAYOUT CAUTION** A TVS device placed far from the connector or connected through a long narrow ground trace may provide poor protection despite a suitable datasheet rating.

# 10 | MECHANICAL INTEGRATION & ENCLOSURE

Mating force and cable loads must be transferred through the connector retention structure into the product.

## Mechanical integration and load path

Mating force and cable loads must not be carried by fragile signal pads.




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| MECHANICAL ITEM | DESIGN REVIEW |
|---|---|
| Mating envelope | Plug insertion depth, access, orientation, adjacent components and cable boot clearance. |
| Retention | Shell stakes, hold-downs, through-hole anchors and solder-joint load path. |
| Board support | PCB thickness, edge position, mounting support and local reinforcement. |
| Enclosure | Panel opening, connector alignment, tolerance stack, sealing and user access. |
| Cable loading | Cable bend radius, pull, torsion and strain relief; avoid loading signal contacts. |
| Service life | Expected mating cycles, maintenance access and replacement strategy. |

**MECHANICAL PRINCIPLE** Do not rely on signal pads alone to withstand repeated insertion, extraction, side load or cable leverage. Use the connector's designed retention features and validate the complete assembly.

# 11 | MATERIALS, PLATING & ENVIRONMENTAL SELECTION

Contact material and finish affect resistance stability, wear and corrosion behaviour.

| ATTRIBUTE | WHY IT MATTERS | REQUIRED EVIDENCE |
|---|---|---|
| Contact base material | Conductivity, spring properties and stress relaxation. | Controlled material specification |
| Contact plating | Wear, corrosion resistance and contact stability. | Plating system, thickness and test evidence |
| Insulator | Electrical isolation, temperature capability and dimensional stability. | Material designation and thermal data |
| Shell / shield | Mechanical strength, shielding and corrosion performance. | Material / finish specification |
| Operating temperature | May affect contact force, polymer properties and solder joint reliability. | Rated operating and storage range |
| Ingress / contamination | Dust, moisture, fluids and cleaning agents may affect contact reliability. | IP claim / test report where applicable |
| Durability | Repeated mating can wear contacts and retention features. | Mating-cycle rating and post-test limits |

## Application environment checklist

- Indoor office / consumer environment versus industrial enclosure.
- Vibration, shock, cable movement and transport conditions.
- Humidity, condensation, salt mist, dust and chemical exposure.
- Cleaning process, flux residues and conformal-coating compatibility.

**DATA INTEGRITY** Do not infer plating thickness, material grade, IP rating or mating-cycle life from product appearance. Confirm the controlled part specification and qualification report.

# 12 | ASSEMBLY, SOLDERING & INSPECTION

The process must be compatible with connector construction and the selected mounting technology.

| PROCESS STAGE | CONTROL / ACCEPTANCE EVIDENCE |
|---|---|
| Incoming inspection | Part number, revision, interface, plating / finish, dimensions, packaging and damage check. |
| PCB preparation | Board thickness, hole / pad quality, solder-mask registration and cleanliness. |
| Placement | Connector seating, alignment, coplanarity, board-edge position and shell-tab engagement. |
| Soldering | Approved reflow / selective / wave / hand-solder process compatible with materials and thermal mass. |
| Visual inspection | Contact wetting, shell joints, solder bridges, voids, lifted pads, contamination and distortion. |
| Mechanical inspection | No movement, cracked laminate, damaged retention features or enclosure interference. |
| Electrical inspection | Continuity, isolation, VBUS short check and functional link / charging test. |
| Traceability | Record supplier lot, connector P/N, PCB revision, process profile, date and test results. |

## Process qualification

Do not apply a generic soldering temperature profile to all USB connectors. Use the connector supplier's process guidance and qualify the actual PCB assembly, including thermal exposure, solderability, coplanarity and rework limits.

**INSPECTION CAUTION** A visually acceptable solder joint does not prove high-speed channel performance or power capability. Combine visual, mechanical, electrical and system-level evidence.

# 13 | ELECTRICAL & FUNCTIONAL VALIDATION

Define test conditions and acceptance criteria before building the qualification sample.

| TEST | WHAT IT VERIFIES | RECORD |
|---|---|---|
| Continuity / shorts | Correct contact mapping, open circuits and unintended shorts. | Pin map, resistance / isolation results |
| Contact resistance | Contact path stability under the specified method. | Test current, fixture, limit and measured values |
| Voltage drop | Power-path loss at defined current and temperature. | VBUS at source / load, current and temperature |
| Thermal rise | Connector, PCB and cable temperature under load. | Ambient, duration, load profile and peak temperature |
| Data function | Enumeration, link speed, orientation and interoperability. | Host / device, OS / firmware, cable and negotiated mode |
| Signal integrity | Channel margin and compliance to the relevant interface requirements. | Fixture, calibration, plots and compliance report |
| ESD / EMC | System immunity and emissions in intended configuration. | Standard, level, setup, operating state and result |
| Mechanical durability | Mating cycles, retention and post-test function. | Cycle profile, force, inspection and electrical result |

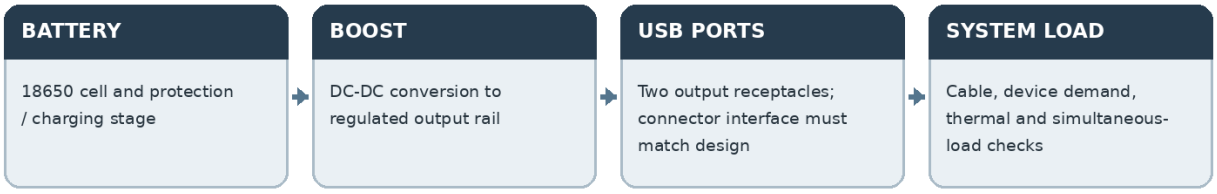
**ACCEPTANCE CRITERIA** Use the applicable USB-IF compliance procedures and the exact product specification. This guide does not define universal pass / fail limits.

# 14 | PRACTICAL APPLICATION — DUAL USB OUTPUT MODULE

Illustrative application based on the supplied third-party 18650 boost-module example.

## Example: dual-output 18650 boost module

Illustrative third-party module use case supplied for context — not an RHT connector specification.




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The supplied example describes an 18650 lithium-cell digital-display boost module with two USB outputs and supplier-advertised output options. It is useful as a system-level illustration of how USB receptacles are integrated into a battery-powered product. It is not an RHT connector product and the supplied one-page description does not establish a controlled electrical specification.



*Figure 14-1. Dual-USB battery module — front and rear PCB views.*

*Figure 14-2. Close-up view of the assembled USB output module.*



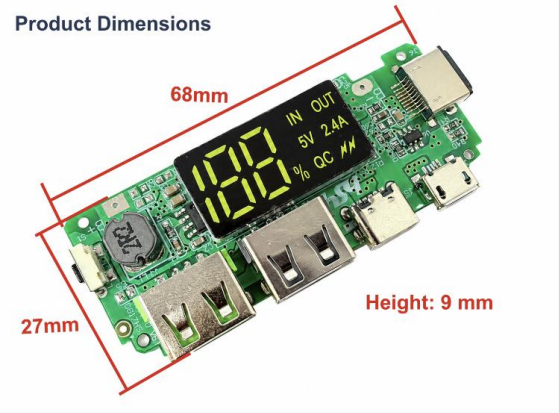



*Figure 14-3. Supplier-provided module dimensional illustration; verify all mechanical dimensions against the controlled product drawing.*

### APPLICATION IMAGE NOTE

The images illustrate a third-party battery-powered module and its USB receptacles. They are not RHT product photographs, approved connector drawings, dimensional controls, electrical ratings or qualification evidence. Select and validate the actual RHT connector using its controlled part-number documentation.

| SYSTEM ELEMENT | DESIGN-IN ACTION |
|---|---|
| 18650 cell | Confirm cell specification, protection strategy, charge / discharge limits and thermal design. |
| Boost converter | Verify regulated output under load steps, low battery and simultaneous-port operation. |
| USB receptacles | Identify exact connector family, mounting, contact rating, footprint and mating cable. |
| VBUS path | Check switch / protection, copper width, voltage drop, current sharing and short-circuit response. |
| Enclosure | Provide port alignment, plug access, retention and strain relief. |
| System verification | Test each port separately and simultaneously with representative cables and loads. |

**EXAMPLE LIMITATION** The source example lists advertised output labels, but does not provide enough controlled detail to validate connector current rating, simultaneous output capability, USB data functionality or USB PD compliance. Do not treat those labels as connector ratings.

# 15 | COMMON DESIGN FAILURES & TROUBLESHOOTING

Diagnose the complete interconnect before changing the connector.

| SYMPTOM | POSSIBLE CAUSES | DIAGNOSTIC ACTION |
|---|---|---|
| No enumeration | Incorrect pin map, solder open, cable fault, PHY / firmware issue. | Check continuity, cable, orientation and host / device logs. |
| Intermittent connection | Worn contacts, poor retention, contamination or solder fatigue. | Inspect mating faces, measure contact path and perform controlled movement test. |
| Unexpected voltage drop | High contact resistance, thin copper, cable loss or poor solder joint. | Measure voltage at source and load under defined current. |
| Connector overheating | Overcurrent, high resistance, inadequate thermal path or damaged contact. | Measure current and temperature; inspect contact and solder interfaces. |
| High-speed link fallback | Channel loss, crosstalk, wrong lane mapping or cable limitation. | Check negotiated rate, cable capability and SI / compliance data. |
| ESD reset / damage | Poor protection placement, return path or shield strategy. | Review discharge path and test with protection / grounding configuration. |
| Mechanical looseness | Insufficient anchors, board support or enclosure alignment. | Inspect shell retention, solder joints and tolerance stack. |
| Orientation-dependent fault | CC / mux / lane mapping or D+ / D− connectivity issue. | Test both plug orientations and review controller configuration. |

## Fault-isolation order

- Confirm the exact connector P/N, cable and intended port role.
- Inspect connector, shell, contacts and solder joints.
- Check pin mapping, continuity, isolation and VBUS behaviour.
- Test both Type-C plug orientations and a known-good cable.
- Review controller logs, negotiated mode and signal-integrity evidence.
- Repeat with a controlled fixture and record the PCB / connector lot.

# 16 | DESIGN-IN RELEASE CHECKLIST

Use this checklist at schematic, layout, fabrication, qualification and production release.

- ☐ Exact RHT USB connector part number and latest approved drawing / specification obtained.
- ☐ USB family, plug / receptacle, orientation and port role confirmed.
- ☐ Data capability and required USB generation documented.
- ☐ Power role, current / voltage requirements and PD implementation documented where applicable.
- ☐ Pin numbering and schematic symbol checked against the manufacturer drawing.
- ☐ PCB land pattern, mounting holes, shell tabs and keep-outs verified.
- ☐ Stack-up, impedance target, pair routing and reference plane reviewed.
- ☐ ESD / EMI protection and shield bonding strategy reviewed.
- ☐ Enclosure opening, mating access, cable bend radius and strain relief checked.
- ☐ Assembly process, solder inspection and rework limits qualified.
- ☐ Continuity, isolation, voltage drop, thermal and functional tests defined.
- ☐ USB-IF compliance applicability and certification responsibilities determined.
- ☐ Representative samples tested with production-intent cables, host / device and enclosure.
- ☐ Test reports, connector lot, PCB revision and change-control records retained.

**RELEASE RULE** Do not release the design based only on a connector outline or a generic Type-C symbol. The controlled drawing, electrical architecture, PCB implementation and measured assembly must agree.

# 17 | PART-SPECIFIC DATA REQUIRED FOR AN RHT DESIGN-IN

Complete this engineering data set for the exact selected RHT item. Use the RHT catalogue to identify candidates, then obtain the latest controlled drawing, recommended footprint, 3D model and specification from RHT before approval.

| DATA FIELD | REQUIRED CONTROLLED INFORMATION |
|---|---|
| RHT part number / revision | Exact orderable P/N, drawing number and revision |
| USB interface | Type-A / Type-B / Mini / Micro / Type-C; plug / receptacle |
| Mounting construction | SMT / through-hole / mid-mount / vertical / right-angle / panel |
| Pin definition | Contact numbering, function, orientation and approved mating interface |
| Electrical ratings | Voltage, current, contact resistance and test conditions |
| Data capability | Supported USB generation / channel qualification evidence where applicable |
| Materials / finish | Contact base material, plating system and shell / insulator materials |
| Mechanical ratings | Mating cycles, retention / insertion force and supported board thickness |
| Environmental ratings | Operating / storage temperature, vibration, corrosion and ingress evidence |
| Compliance | Applicable RoHS / REACH declarations and USB-IF status where claimed |
| Qualification evidence | Dimensional report, electrical test, durability, solderability and reliability records |
| Change control | Approved drawing status, PCN process and traceability requirements |

**RHT DESIGN-IN PACKAGE** For customer release, provide the exact connector drawing, recommended footprint, 3D model where available, electrical specification, material / compliance declarations and qualification evidence.

# 18 | REFERENCES & TECHNICAL NOTES

Use current editions and the exact part manufacturer's controlled documents.

1. USB Implementers Forum (USB-IF). USB Type-C® Cable and Connector Specification, Release 2.5 (2026).
https://usb.org/usb-type-cr-cable-and-connector-specification

2. USB Implementers Forum (USB-IF). USB Power Delivery Specification, Revision 3.3, Version 1.0 (released 05 November 2026).
https://www.usb.org/documents

3. USB Implementers Forum (USB-IF). USB 2.0 Specification and USB 3.2 Specification document library.
https://www.usb.org/documents

4. USB Implementers Forum (USB-IF). Compliance Updates — Cables and Connectors; Type-C contact-current clarification.
https://compliance.usb.org/index.asp?Format=Standard&UpdateFile=Cables+and+Connectors

5. IEC 62680-1-2:2026. Universal Serial Bus interfaces for data and power — USB Power Delivery specification.
https://webstore.iec.ch/en/publication/106823

6. Applicable USB-IF electrical, functional and compliance test specifications for the product capability under development.
https://www.usb.org/documents

**7. RHT. USB Connectors product catalogue and model pages (accessed 10 November 2026):** RHT USB Connector Catalogue

## Engineering assumptions and limitations

Diagrams in this note are conceptual engineering illustrations. They are not manufacturing drawings, recommended footprints, pin-number maps, simulation results or compliance evidence. Any design values must be taken from the selected RHT connector drawing, applicable USB specifications, component datasheets and validated system measurements.

Where this guide conflicts with the latest approved RHT product drawing or specification, the controlled product document takes precedence. USB-IF specifications and compliance requirements may be revised; verify the current release before design freeze or certification.

## Document identification

| DOCUMENT | REVISION | ISSUE DATE | PREPARED BY |
|---|---|---|---|
| RHT-ANE-002 | A | 09 November 2026 | Amy |

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