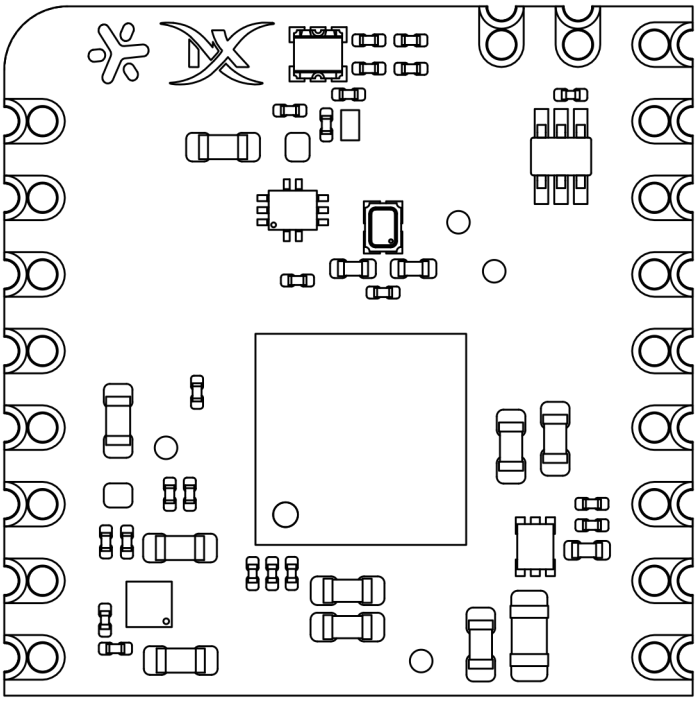

BrainBoard1500 Datasheet

User Manual

SKU: BB15-0001

Description

BrainBoard1500 is a compact AKD1500 neuromorphic AI accelerator module in the Nicla-like form factor. It provides a practical SPI/QSPI evaluation path for sensor-based SNN inference, with onboard model flash, host-level shifting, and integrated power monitoring for real workload profiling. BB15 rev2 is compatible with standard Arduino Nicla stacking hardware and accessories.

Target Areas:

AKD1500 evaluation and bring-up, embedded AI and edge-AI prototyping, MCU-hosted SPI/QSPI accelerator testing, sensor-based SNN evaluation, academic neuromorphic computing, low-volume product integration, power profiling of inference workloads

CONTENTS

1 Application Examples

BrainBoard1500 is designed as a compact AKD1500 evaluation and prototyping module for sensor-driven edge-AI systems. It can be paired with MCU-based reference hosts, Seeed XIAO, OpenMV, Raspberry Pi-class, FPGA, Alif, robotics, and custom embedded host platforms where sensor data needs to be processed locally over SPI/QSPI. Its value is not only SNN execution, but also realis- tic embedded workflow evaluation: model loading, host communication, power profiling, sensor inference, and early product integration.

- **Vision inference:** Person detection, visual wake word, hand gesture recognition, simple object classification, presence detection, and camera-triggered sensing using Nicla Vision, OpenMV, XIAO camera modules, or other camera-enabled hosts.
- **Audio inference:** Keyword spotting, alarm or siren detection, acoustic event classification, machine-sound monitoring, and always-listening low-power audio experiments using microphone-equipped MCU or sensor boards.
- **Motion and IMU sensing:** Fall detection, human activity recognition, gesture recognition, motion-state classification, vibration pattern detection, and wearable or robotic movement analysis using IMU-equipped hosts.
- **Environmental sensing:** Gas or VOC pattern classification, air-quality anomaly monitoring, smell classification, pressure-movement detection, and environmental sensing workflows using Nicla Sense ME or custom environmental nodes.
- **Radar and proximity workflows:** Presence detection, occupancy sensing, near or far classification, approach or leave detection, and range-motion classification where supported by the external radar, ToF, or proximity sensor system.
- **Robotics and autonomous systems:** Compact sensor-side inference for small robots, drones, mobile platforms, industrial inspection devices, and autonomy R&D systems that need local decision-making near the sensor.
- **Industrial edge-AI pilots:** Predictive maintenance, machine condition monitoring, safety alerts, smart-building sensing, factory automation, and low-power sensor-node evaluation.
- **Academic and laboratory research:** Neuromorphic computing education, SNN model evaluation, embedded AI coursework, TinyML comparison, sensor-fusion experiments, and low-cost AKD1500 lab demonstrations.
- **Custom hardware integration:** Early AKD1500 bring-up, SPI/QSPI accelerator testing, power-consumption profiling, model deployment validation, and preparation for future custom carrier boards or product-specific modules.

2 Features

2.1 GeneralSpecificationsOverview

BrainBoard1500 is a compact Akida AKD1500 neuromorphic AI accelerator module in the Arduino Nicla form factor. It provides a practical SPI/QSPI evaluation path for sensor-based SNN inference, combining onboard model flash, host-side level shifting, integrated power monitoring, and bring-up control support in a single embeddable module. Although BB15 rev2 follows a Nicla-like mechanical footprint and power/interface orientation for evaluation convenience, it is compatible with standard Arduino Nicla stacking hardware and accessories.

Feature	Description
Accelerator	BrainChipAkidaAKD1500neuromorphicAIaccelerator.
ModelStorage	Onboardflashsupportisimplementedthroughthereleased BB15 library bridge/S2M flow. Supported profiles in the current release are Renesas AT25SL321 (4 MB) and Winbond W25Q64JW (8 MB).
I/OTranslation	Levelshiftersallow3.3Vhostdevicestocontrolthe1.8V Akida domain.
CurrentMonitoring	INA2227AIYBJRpowermonitorforobservingAkida1.8Vand 0.8 V rail consumption during bring-up and inference profiling.
Bring-upControl	Resetsequencing,BOOT_MODEselection,AKD_SLEEPcontrol, and early Akida control are handled by the current Arduino software flow through the PI4IOE5V6408 expander.
ValidatedReferenceHosts	ArduinoNiclaVision Arduino Nicla Sense ME
Form-FactorPositioning	Nicla-likeevaluationmoduleintendedforhost-sideprototyping and low-volume embedded integration.
MechanicalFormat	Nicla-likefootprintandpinorientationcompatiblewith standard Arduino Nicla stacking hardware.
RevisionCoverage	Currentdocumentcontentreflectsthepresent BB15hardware release and validated software flow.

2.2 Accessories

- Shipped with 2.54 mm Swiss-machined solderable socket headers
- Shipped with 2.54 mm Swiss-machined solderable pin headers
- Shipped with 2.54 mm Dupont-style solderable socket headers
- Shipped with 2.54 mm regular pin headers

2.3Related Products

- Arduino Nicla boards.
- BB15 Nicla convenience board
- OpenMV A3 adapter board
- Seeed Studio Seeeduino adapter board

3 Functional Overview

3.1 BB15 Pinout

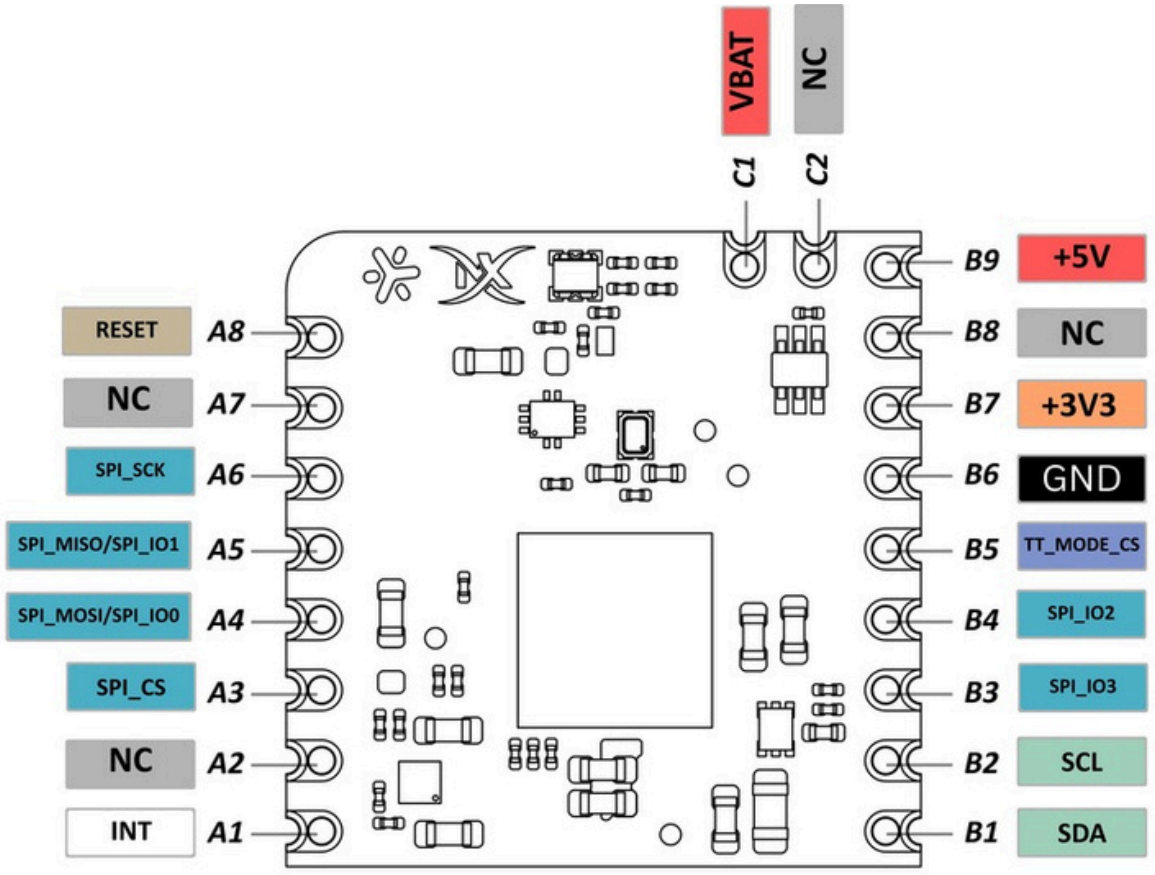

Figure 3-1. BB15 revision 2 pinout.

Compatibility Note

BB15 rev2 uses a Nicla-like footprint and pin orientation for evaluation convenience and is compatible with Arduino Nicla stacking hardware that follows the standard connector and mechanical envelope.

3.1.1 BB15Pinfunctionaldescription

Physical Pin	FunctionalName	Function
A1	INT	Hostinterruptinput;theapplicationselectsthe interrupt edge. Current BB15 examples use the falling edge.
A2	NC	No-connectpin;leaveunconnected
A3	AKIDA_CS	Active-lowdirectAkidaSPIchip-select;heldhigh when idle
A4	SPI_MOSI/SPI_IO0	ManagerOutSubordinateInforsingleSPI operation; QSPI bit 0 for QSPI operation
A5	SPI_MISO/SPI_IO1	ManagerInSubordinateOutforsingleSPI operation; QSPI bit 1 for QSPI operation
A6	SPI_SCK	SPIclockpin
A7	NC	No-connectpin;leaveunconnected
A8	RESET	Connectorresetinputlabelretainedforboard-level hardware reference; not used by the standard BB15 reference-library bring-up path
B1	SDA	I2Cserialdatapin
B2	SCL	I2Cserialclockpin
B3	SPI_IO3	QSPIbit3forQSPIoperation
B4	SPI_IO2	QSPIbit2forQSPIoperation
B5	TT_MODE_CS/bridge CS	Active-lowbridgechip-selectusedforonboardflash accessthroughtheAkidasubordinate-to-manager bridge path; held high when idle. Driving this pin LOW illuminates the onboard Blue LED indicator.
B6	GND	Devicegroundpin
B7	+3V3	3.3Vpowerinputpin
B8	NC	No-connectpin;leaveunconnected
B9	+5V	Mainpower-supplyinputpin
C1	VBAT	Batterypowerconnectorpin
C2	NC	No-connectpin;leaveunconnected

3.1.2 Referencehostmapping

BB15signal	Connector pin	Nicla Sense ME	Nicla Vision	Reference idle/default state
INT	A1	**D5**	**D0**	Host input; interrupt setup is example-specific.
AKIDA_CS	A3	**D6**	**D7**	Output, high when idle.
SPI_MOSI / SPI_IO0	A4	**Hardware SPI MOSI**	**Hardware SPI MOSI**	SPI bus.
SPI_MISO / SPI_IO1	A5	**Hardware SPI MISO**	**Hardware SPI MISO**	SPI bus.
SPI_SCK	A6	**Hardware SPI SCK**	**Hardware SPI SCK**	SPI bus.
RESET	A8	**Not used**	**Not used**	Board-level reset input; separate from AKD_RST.
TT_MODE_CS / bridge CS	B5	**D0**	**D3**	Output, high when idle.
SDA	B1	**Wire SDA**	**Wire SDA**	I2C to expander.
SCL	B2	**Wire SCL**	**Wire SCL**	I2C to expander.

Connector Signal Usage

AKIDA_CS is the normal direct Akida SPI chip-select. TT_MODE_CS / bridge CS is held high during direct Akida access and is used for onboard flash operations after the bridge path is enabled internally. Applications do not manually toggle these signals during normal flash, model-load, or inference flows.

3.1.3 Expander-controlledsignals

Expander pin	BB15signal	Electrical behavior in normal operation
P0	SPI_MODE_SEL / BOOT_MODE	Active-low boot strap. Low selects external-flash boot mode.Default state is determined by strap resistor ”SEL” (SingleSPI).
P1	INA_EN	Energy-monitor enable signal.
P2	AKD_INT	Akida completion-interrupt route to the host connector INT signal.
P3	AKD_SLEEP	Active-high sleep with default high state. Low means awake; high places Akida in sleep.
P4	AKD_RST	Active-low Akida reset. Low asserts reset; high releases reset.

Reset Distinction

Connector pin A8 (RESET) is a board-level reset input and is not used by the reference host mappings. It is separate from the active-low Akida-only reset, AKD_RST, on expander pin P4. Expander pin P3 independently provides the active-high AKD_SLEEP control.

3.2 BB15 Test pads

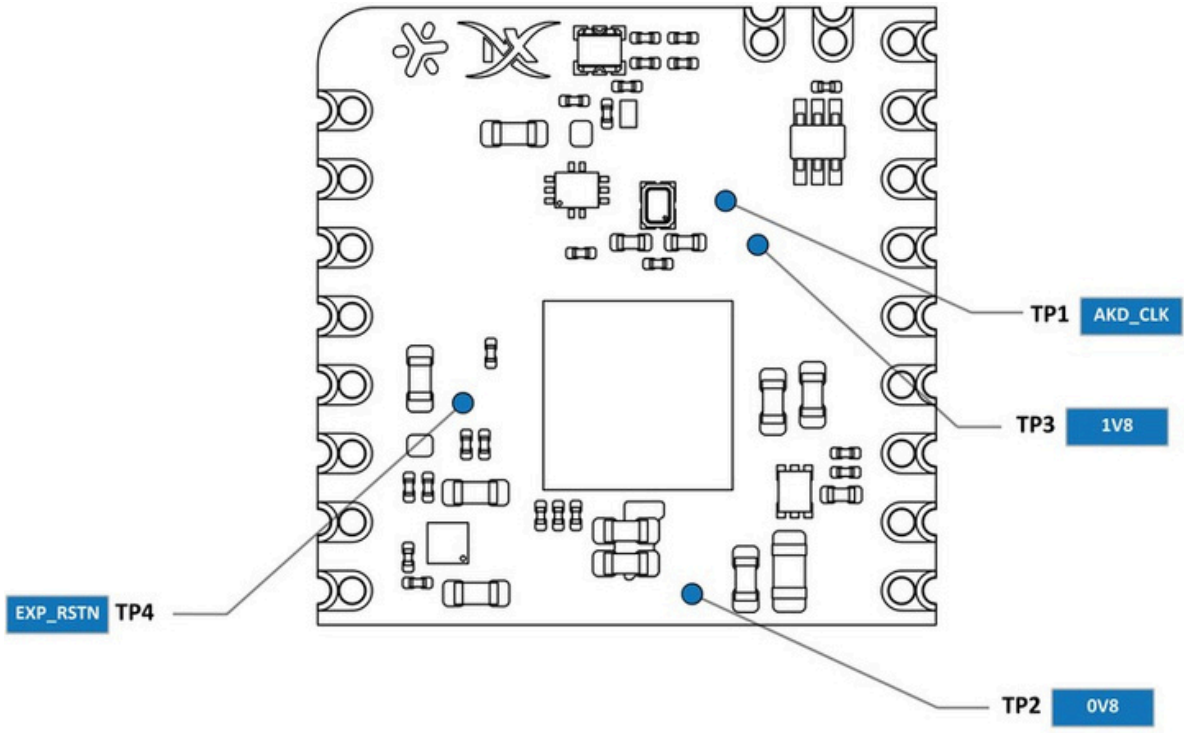

Figure 3-2. BB15 test pad layout.

3.2.1 BB15Testpadfunctionaldescription

TestPad	FunctionalName	Function
TP1	AKD_CLK	25MHzreferenceclocksignalfortheinternalAKD PLL
TP2	0V8 1V8	0.8Vrailtestpointformeasurementandprobing
TP3	EXP_RSTN	1.8Vrailtestpointformeasurementandprobing
TP4		Active-lowexpanderresettestpointfor measurement and probing

3.2.2 Additionalnotes

The board has pass-through test pads on both sides.

3.3 BB15 user strap resistor selectors

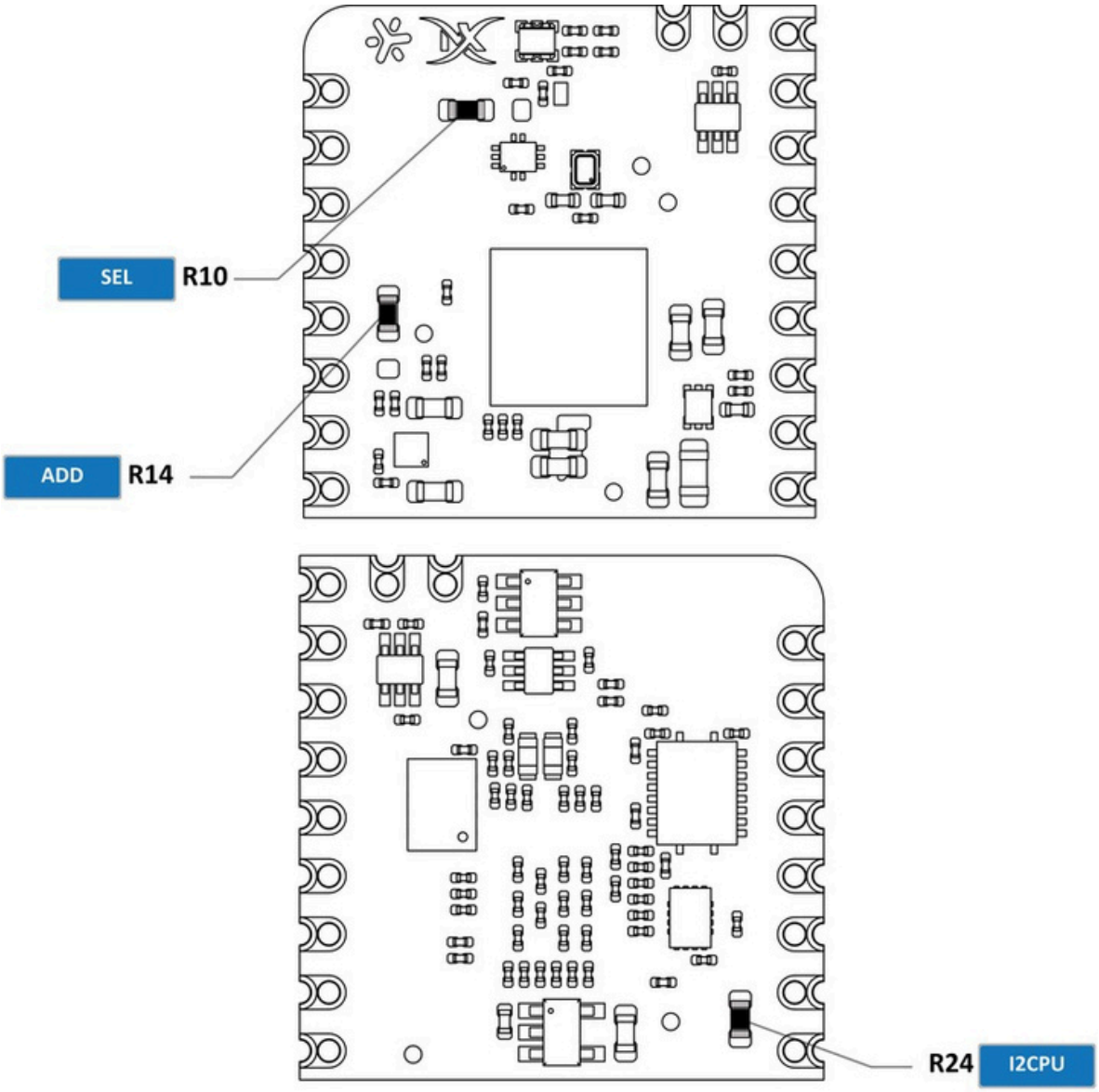

Figure 3-3. BB15 strap resistor selector layout.

3.3.1 StrapresistorselectorFunctionaldescription

Selector	FunctionalName	Function
R10	SEL	SelectstheAkidaSPImodeatthehardwarelevel. Do not assume alternate modes are supported by the released public library unless they have been separately validated.
R14	ADD	SelectsthePI4IOE5V6408I2Caddress.The standard address is 0x43; boards with a changed strap require a host configuration that uses the matching address.
R24	I2CPU	Enablesthel2Cpull-upresistorswhenpopulated; removing it disables the pull-ups. The reference software assumes the I2C bus has valid pull-ups.

3.3.2 Userstrapresistorresoldering

> **Rework Warning**
> Manual replacement of strap resistors is an advanced rework operation and voids product warranty. Only attempt this procedure if you have suitable tools and experience with fine-pitch PCB rework.

The user strap resistors are 0603 components. When changing these resistors by hand, approach the operation as a localized rework step rather than a general touch-up.

- The current assembly uses RoHS high-temperature solder paste, so adding a small amount of bismuth-bearing solder wire to the existing joints will help lower the effective melting point and make part removal easier.
- Use generous solder flux before heating or lifting the resistor. Flux is required both to improve heat transfer and to reduce the chance of pad damage during removal and replacement.
- MaskthesurroundingareawithKaptontapebeforereworksonearbypassiveparts,connectors, and plastic features are protected from hot air, solder splash, and accidental tool contact.
- Removeandreplaceonlyonestrapresistoratatime,theninspectthepadsforbridges,lifted copper, and incomplete wetting before powering the board again.

3.4 Block Diagram

At a high level the module integrates the Akida AKD1500 accelerator, onboard flash for external model storage, level shifting between common host logic and the Akida domain, a PI4IOE5V6408ZTAEX I2C GPIO expander used during bring-up, rail generation, and integrated power monitoring through the Nicla-form-factor host interface.

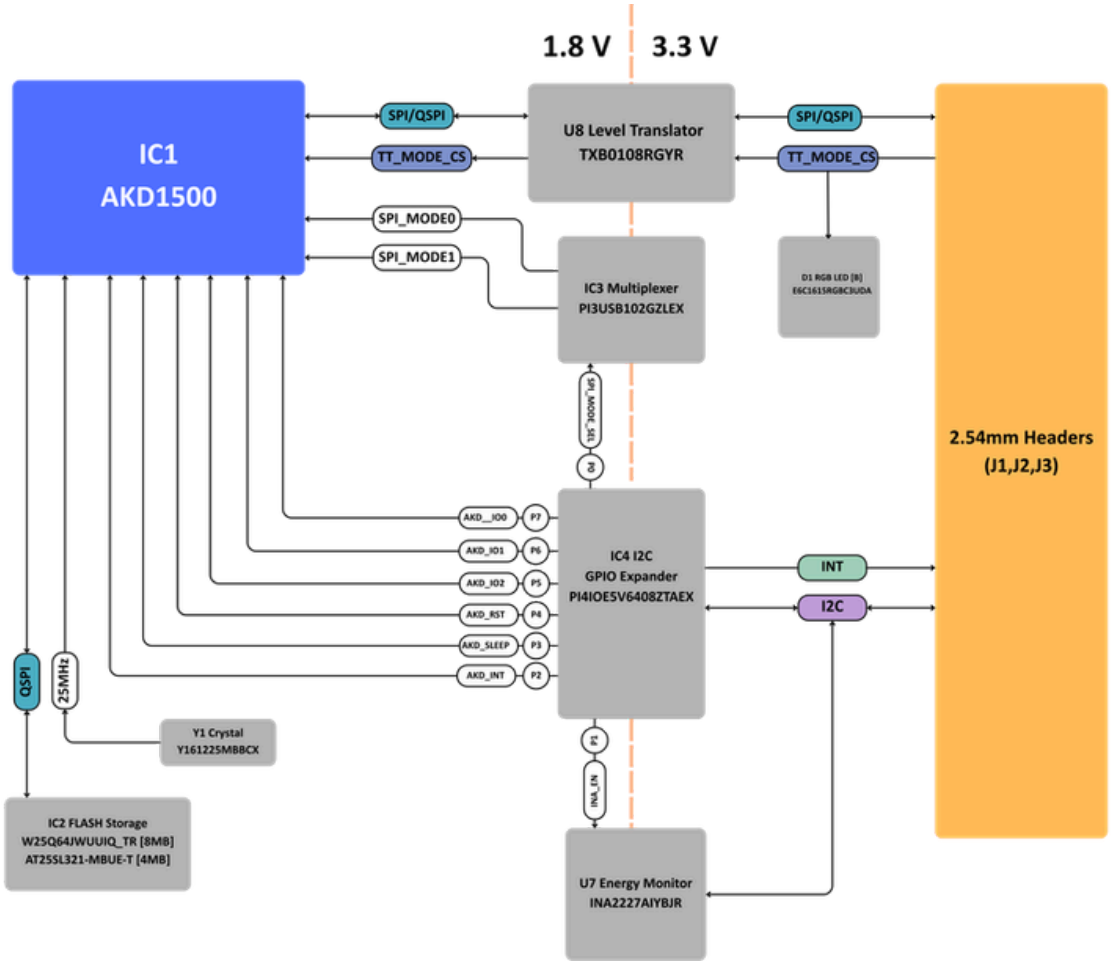

Figure 3-4. BB15 functional block diagram.

3.5 Power Supply

At a high level, the power architecture derives the local operational voltage domains (0V8 and 1V8) from either the main +5V or +3V3 input pins through ideal diodes.

Driving connector pin A8 (RESET) HIGH enables the power sequence generator, initiating rail stabilization and visual LED diagnostics.

3.5.1 PowerRailandLEDSequencing

The onboard RGB LED (D1) provides visual hardware feedback during the power-up sequence and operational mode transitions.

Time/Trigger	LEDState	Hardware/PowerCondition
A8(RESET)=HIGH (0–10ms)	Red+GreenON (Amber)	Loadswitchenabled;powerrail initializationsequencestarted.
20ms	RedOFF,GreenON	**0V8RailReady**:0.8Vcoreregulator stable; 1.8 V rail initializing.
30ms	Red+GreenOFF	**PowerDomainsReady**:0V8and1V8rails successfully generated and stable.

Figure 3-5. BB15 power supply diagram.

4 Ratings

4.1 Recommended Operating Conditions

The table below defines the recommended electrical and environmental operating conditions for BB15 integration.

Parameter	Symbol	Min	Typ	Max	Unit
+5VPinInputVoltage	V_{5V}	3.3	5.0	5.5	V
+3.3VPinInputVoltage	V_{3V3}	3.1	3.3	3.6	V
Digitalpinvoltage	V_D	3.1	3.3	3.5	V
OperatingTemperature	T_{OP}	-40	20	85	°C

Power Tip

The reference software flow assumes the host provides the specified Nicla-side power and logic environment.

4.2 Typical Power Consumption

Power consumption measurements were captured with a 5.0 V main supply (V_{5V}) and 3.3 V host logic supply ($V_{3V\ 3}$) operating at room temperature (25 °C). The reported input current (I_{IN}) represents the total combined draw across both the V_{5V} and $V_{3V\ 3}$ rails.

4.2.1 WorkloadProfileandBenchmarkConditions

Parameter	Value/Configuration
InputTensorShape	96×96×1
InputQuantization	8-bitunsigned
OutputTensorShape	1 × 1 × 2
ModelLayerCount	6layers
HostSPIInterface	SingleSPImode@25MHz(25Mbpstransferrate)
FlashSPIClock	2MHz

4.2.2 OperatingCurrentandPower

OperatingMode	I_{IN}(typ/max)	P_{TOT}(max)	TestCondition/HardwareState
Inference	21mA	100mW	Continuous96 ×96×1SNN inference over Single SPI @ 25 MHz.
Sleep*	6mA	30mW	ExpanderpinP3settoHi-Z;onboard pull-up resistor drives AKD_SLEEP HIGH.
RESETstate	40µA	200µW	PinA8(RESET)controlreleased; onboard pull-down resistor holds RESET LOW.

* Measured using default sleep parameters without clocking down the AKD core.

4.3 Integration & Power Sequencing Notes

Integrator & Hardware Notes

- **INAMonitor&FlashUnavailableinRESET:**DrivingpinA8(RESET)LOWdisablesinternal 0V8 and 1V8 regulators. As a result, both the INA2227 power monitor and the onboard SPI Flash (IC2) are fully powered down and inaccessible.
- **Host SPI Bus Isolation:** The TXB0108 level translator's OE pin is referenced to 1V8 with an onboard pull-down resistor. When in RESET state, the translator automatically enters High-Impedance (Hi-Z) mode, preventing host 3.3 V signals from back-feeding current into the powered-down Akida chip.

5 Device Operation

5.1 GettingStarted

The released Arduino package supports Arduino Nicla Vision and Arduino Nicla Sense ME. The public package metadata declares architectures=mbed_nicla, and the released examples are specifically board-matched to those two hosts.

5.1.1 Bring-upsequence

Bring the board up through the following hardware sequence:

1. StartthеI2Cbusat100kHzandprobethePI4IOE5V6408expanderatI2Caddress0x43.
2. Ensure expander pin P4 is released. Its pull-up deasserts active-low AKD_RST.
3. Configuretheexpanderdefaultoutputstate.
4. ConfigureAKIDA_CSandTT_MODE_CS / bridge CSasoutputsanddrivebothhigh.
5. Assert active-low AKD_RST by driving expander pin P4 low.
6. Holdresetassertedfor5ms.
7. ConfigureP3AKD_SLEEPasanoutputanddriveitlowtoensureAkidaisawake.
8. ReleaseP4soitspull-updeassertsAKD_RST.
9. Wait 10 ms after reset release.
10. Initializethelow-levelSPIboarddriver.
11. ReadtheAkidaIPversion.
12. Treat the link as valid only when the IP version equals 0xBCA10309.
13. Before starting the inference runtime, allow a further 50 ms settling interval, repeat the link validation, and allow 50 ms more settling time before loading a model.

Bring-up Completion

Validate the initial SPI link after reset release. A second link validation following a 50 ms settling interval, plus a further 50 ms delay before model loading, provides the reference runtime stabilization sequence.

5.1.2 Referencebring-upvalues

Setting	Value
AkidaSPIclock	**25MHz**
Bridge-flashSPIclock	**2MHz**
I2Cclock	**100kHz**
Defaultexpanderaddress	**0x43**
ExpectedAkidaIPversion	**0xBCA1030**
Defaultexternalmodeladdress	**9**
Resetassertionhold	**0x80000000**
Board-levelreset-releasesettle	**5ms**
Runtimepre-linksettle	**10ms 50ms**
Runtimepost-linksettle	**50ms**
Sleep-entrysettle	**1ms**
Sleep-exitsettle	**10ms**

5.1.3 Flashsupportandworkflow

The released library automatically detects and configures supported onboard flash profiles. Supported profiles in the current release are:

- RenesasAT25SL321,JEDEC1F:42:16,4MB.
- Winbond W25Q64JW, JEDEC EF:60:17, 8 MB.

The reference flash clock is 2 MHz. Model data is programmed and verified through the library's bridge/S2M flash flow, not through direct host-to-flash SPI transactions. The default external model address is 0x80000000.

5.1.4 Resetandsleepcontrolbehavior

Controlstate	Hardwareaction	Result
Resetasserted	Driveactive-lowAKD_RSTlowon Akidaexpanderpin P4.	Akidaisheldinreset;reinitialize beforeinference.
Resetreleased	ReleaseP4;itspull-updeasserts AKD_RST.Wait10ms.	Akidaleavesreset;completethe bring-upsequencebefore inference.
Sleep requested	ReleaseP3;itspull-upasserts AKD_SLEEP.Wait1ms.	Akidaentersitssleep-control state;reinitializebeforeinference.
Wake requested	DriveAKD_SLEEPlowonP3and wait10ms.	Akidawakes;completethe bring-upsequencebefore inference.

Pull-up Control

P4 asserts reset only when actively driven low. P3 keeps Akida awake when actively driven low. To release reset or request sleep, stop pulling the respective line low and allow its onboard pull-up to establish the high level.

AKD_SLEEP is an Akida sleep-control path, not a complete board power-off sequence.

5.1.5 Interruptbehavior

BB15 routes Akida completion signalling through expander pin P2 to connector pin A1 (INT). The host mapping differs by supported board: Nicla Sense ME uses D5 and Nicla Vision uses D0. The application selects the interrupt edge and wait policy. Bounded polling or fetch fallback may be used when that better matches the application interrupt policy.

5.2 Libraries and Firmware

Currently, BB15 is accompanied by an Arduino library intended to support users running power-efficient inference on Arduino boards.

5.2.1 Embeddedinference

To get started with running embedded applications on the BB15 device, visit the public BB15 Arduino repository: https://github.com/Neuromorphyx/BrainBoard1500_arduino_library

The concise reference workflow is:

1. Installthelibrary.
2. SelecttheNiclaSenseMEorNiclaVisionexamplepair.
3. Uploadthematchingmodelflasher.
4. Confirmflash,verify,andmodel-loadsuccess.
5. Uploadthematchinginferenceexample.

For more advanced interactions with the Akida device itself, users should consult the official BrainChip Akida technical documentation.

5.2.2 Akidamodeltraining

To get started with training quantized SNN models using CNN2SNN and BrainChip MetaTF, visit the BrainChip developer hub.

6 MechanicalInformation

6.1 Board Dimensions

BB15 rev2 uses a Nicla-like footprint and connector orientation and is mechanically compatible with the Arduino Nicla family. Board thickness is 1.0 mm, with a maximum component height of 1.3 mm on both the top and bottom sides.

MechanicalItem	Specification
FormFactor	Nicla-likefootprintandconnectororientation;compatible with Arduino Nicla boards
BoardThickness	1.0mm
MaxTop-SideHeight	1.3mm
MaxBottom-SideHeight	1.3mm
OrientationNote	LEDshouldbeonthetopwhenviewingtop-down

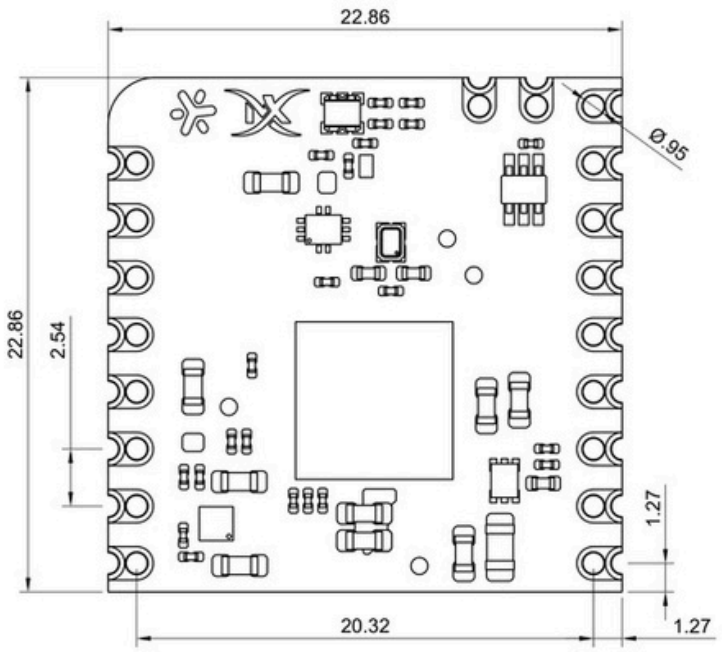

Figure 6-1. Top-view mechanical dimensions.

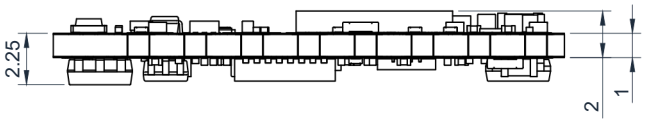

Figure 6-2. Side-view mechanical dimensions.

7 Legal

1.ProductScopeandVariantApplicability

This document applies to the BrainBoard1500 product family supplied by Neuromorphyx, including configurations based on the BrainChip AKD1500 accelerator and associated host-interface, power, and support circuitry.

The term BrainBoard1500 refers to the common board-level product, electrical interface, evaluation workflow, software support model, handling requirements, and integration process. Product-specific parameters such as firmware configuration, supported host flow, fitted components, availability, deployment and price may vary by hardware revision or sales configuration.

Unless a specific hardware revision or sales configuration is expressly identified, all legal, handling, safety, regulatory, warranty, software, export-control, and integration terms in this datasheet apply equally to all BrainBoard1500 variants.

2. Document Status

This datasheet is provided for technical evaluation, customer integration planning, and B2B engineering review only. It does not constitute a binding production specification, certification statement, safety approval, regulatory approval, warranty extension, lifecycle commitment, or obligation to supply unless expressly incorporated into a signed quotation, purchase agreement, statement of work, or separate written agreement issued by Neuromorphyx.

Specifications, drawings, images, dimensions, electrical values, software descriptions, mechanical information, and availability information may change without notice. The customer is responsible for confirming the applicable product revision, firmware revision, software package, interface configuration, and support scope before integration or purchase.

3. Engineering Evaluation Product Notice

BrainBoard1500 is supplied as a B2B engineering evaluation product for research, development, prototyping, feasibility testing, integration testing, algorithm development, and system bring-up.

BrainBoard1500 is not supplied as a finished consumer product. It is not certified as a standalone end-user device unless expressly stated in a product-specific declaration issued by Neuromorphyx. BrainBoard1500 may require additional hardware, cables, adapters, enclosures, power supplies, software drivers, firmware configuration, thermal management, regulatory assessment, and application-specific validation before use in any final system.

4. Intended Use

BrainBoard1500 is intended for controlled laboratory, engineering, research, development, and prototyping environments.

Permitted uses include embedded AI evaluation, AKD1500 characterization, edge-AI development, robotics prototyping, FPGA and processor integration, host-interface testing, software driver development, and early product feasibility assessment.

Any use outside the intended evaluation scope requires the prior written approval of Neuromorphyx. The customer is responsible for determining whether BrainBoard1500 is suitable for its specific application, including but not limited to compliance with applicable laws, standards, certifications, tests, filings, marks, declarations, import approvals, labeling, documentation, user instructions, warnings, and records required for the customer's final product, host system, enclosure, power supply, cable configuration, software stack, deployment environment, and target market.

Regulatory behavior may change materially depending on host board, cable length, flex cable routing, enclosure, shielding, power supply, grounding, firmware settings, operating mode, clocking, thermal behavior, and final system architecture.

5. Restricted Applications

BrainBoard1500 is not intended, qualified, certified, or approved for direct use as a safety-critical component, automotive safety component, aviation component, railway component, medical device, life-support system, nuclear system, emergency-response system, access-control system, biometric identification system, law-enforcement system, weapons system, targeting system, or any system where failure, misuse, incorrect sensing, incorrect processing, incorrect integration, or incorrect interpretation may cause death, personal injury, property damage, unlawful surveillance, unlawful discrimination, or material regulatory exposure.

The customer shall not use BrainBoard1500 in any restricted application unless Neuromorphyx has expressly approved the specific use in writing and the customer has completed all required application-specific safety, legal, compliance, export-control, and regulatory assessments.

6. Non-Arms and Prohibited End-Use Position

Unless expressly approved in writing by Neuromorphyx and permitted by all applicable supplier, export-control, sanction, and end-use restrictions, BrainBoard1500 shall not be used, integrated, resold, transferred, modified, or supplied for weapons systems, targeting systems, autonomous lethal systems, explosive systems, missile systems, military combat systems, military surveillance systems, restricted defense end use, or any application prohibited by applicable law or by Neuromorphyx supplier obligations.

The customer is responsible for ensuring that its use, resale, export, re-export, transfer, integration, and downstream deployment of BrainBoard1500 complies with all applicable end-use restrictions and contractual obligations.

7. Regulatory Status

Unless expressly stated in a product-specific Declaration of Conformity issued by Neuromorphyx, BrainBoard1500 is not supplied as a CE-marked finished product, FCC-authorized standalone product, or certified end-user device.

The customer is responsible for determining and obtaining any regulatory approvals, conformity assessments, certifications, or declarations required for its final product, host system, or intended market.

8. CE, EMC, FCC, RoHS, REACH, and Product Compliance

Any reference to CE, EMC, FCC, RoHS, REACH, UKCA, safety, environmental, or other compliance status applies only where expressly stated in Neuromorphyx-controlled documentation for the specific product revision and sales configuration.

A module-level assessment does not automatically certify ior, and continuous operating mode may materially affect the customer's final product. The customer remains respon- performance and reliability.
sible for final-system compliance, including electromagnetic compatibility, electrical safety, thermal safety, radio-frequency behavior, enclosure safety, labeling, documentation, environmental requirements, import requirements, market-specific obligations, and any required declarations of conformity.

Where RoHS, REACH, or material compliance information is provided, such information is based on supplier declarations, bill-of-material review, manufacturing records, or other available documentation at the time of issue. The customer is responsible for confirming whether the pro- tion examples supplied with BrainBoard1500 are provided vided compliance information is sufficient for its own final for evaluation and integration support.
product, market, and regulatory obligations.

9.IntegrationResponsibility

The customer is solely responsible for the design, validation, testing, certification, approval, safety, cybersecurity, privacy, reliability, manufacturability, and lawful deployment of any systemthatintegratesBrainBoard1500.

Use of BrainBoard1500 in a customer product does not transfer any regulatory approval, conformity assessment, certification, safety approval, quality approval, supplier approval, or production qualification from Neuromorphyx to thecustomer'sfinalproduct.

The customer shall validate the final system under all intended operating conditions, including electrical, thermal, mechanical, environmental, software, firmware, cybersecurity,data-protection,anduser-safetyconditions.

10.Final-SystemValidation

Performance values in this datasheet are provided for engineering evaluation and may depend on hardware revision, firmware version, host platform, interface speed, cable length, temperature, power quality, software configuration, Support does not include customer product development,
workload,clocking,andmeasurementmethod.

The customer shall not rely on typical values, reference results, laboratory results, demonstration results, or example configurations as guaranteed performance in the customer's final system.

The customer must independently validate latency, power consumption, bandwidth, compute throughput, interface be- All intellectual property, know-how, design files, schematics, havior, thermal behavior, mechanical robustness, software firmware, software, drivers, mechanical designs, documenstability, EMC behavior, and long-term reliability in the target tation, test methods, calibration methods, manufacturing
processes, inspection methods, and technical materials supplied or disclosed by Neuromorphyx remain the property of Neuromorphyx or its licensors.

11. Electrical, Thermal, Mechanical, and Optical Handling BrainBoard1500 shall be handled only in an ESD-controlled
environment. The customer shall use appropriate grounding, packaging, tools, handling procedures, and inspection methods.
No ownership right, license, sublicense, manufacturing right, distribution right, resale right, source-code right, design-file right, trademark right, patent right, or other intellectual property right is granted except the limited right to use the purchased product and related documentation for the agreed evaluation or integration purpose.
The customer shall not exceed specified voltage, current, temperature, humidity, mechanical, cable, connector, or interface limits. Incorrect power sequencing, hot-plugging, reversed connectors, excessive cable length, mechanical stress, electrostatic discharge, contamination, or improper The customer shall not reverse engineer, decompile, disashandlingmaypermanentlydamagetheproduct.

The customer is responsible for validating thermal behavior in the final enclosure. Host-board heating, enclosure design, ambient temperature, airflow, power supply behav-

The customer is responsible for validating connector retention, signal integrity, mechanical fit, and enclosure interaction in the final configuration. Cable routing, host attachment, vibration, contamination, and mechanical alignment may materially affect system behavior and downstream processing.

12. Software, Firmware, Drivers, and Reference Code

Any software, firmware, drivers, scripts, SDK examples, reference code, configuration files, documentation, or integra-

Unless expressly agreed in writing, such materials are not suppliedascertifiedproductionsoftware,safetysoftware, cybersecurity-certified software, medical software, automotive software, aviation software, or software qualified for any regulated application.
Thecustomerisresponsibleforsoftwarevalidation, firmware validation, cybersecurity review, dependency re- view, license review, update management, version control, vulnerability management, host-platform compatibility, and safe operation in the final system.

Open-sourcecomponents,ifany,areprovidedundertheir respective licenses. The customer is responsible for review-
ing and complying with all applicable open-source license obligations.

13.SupportScope

Unlessexpresslyagreedinwriting,supportprovidedbyNeuromorphyx is limited to reasonable engineering assistance for product evaluation, basic bring-up, interface clarification,
and module-level troubleshooting.

certificationwork,applicationengineeringforproductiondeployment, full algorithm development, model training, safety validation, regulatory filings, long-term maintenance, field deployment support, or debugging of customer-specific systems unless covered by a separate written agreement.

14. Intellectual Property

15. No Reverse Engineering

semble,copy,clone,reproduce,benchmarkforcompetitive product development, extract design information from, pho- tograph for replication, scan, chemically analyze, publish, modify, or create derivative works from BrainBoard1500, re- lated software, firmware, documentation, mechanical files,

test data, or support materials except where expressly permittedinwritingbyNeuromorphyx.

Notwithstanding the foregoing, the customer may use designated and documented test pads solely for measurement, signal monitoring, and diagnostic purposes as described in this datasheet, and may remove, alter, or replace designated user strap resistors solely in accordance with the documented configuration and rework guidance provided in this datasheet. No other probing, rework, or modification is permitted without prior written approval from Neuromorphyx.

The customer shall not remove, obscure, alter, or bypass product markings, serial numbers, watermarks, confidentiality markings, access controls, software restrictions, firmware restrictions, or other technical or contractual protectionmeasures.

16. Third-Party Components, Names, and Trademarks

BrainBoard1500 may incorporate third-party components, integrated circuits, software, connectors, materials, or technologies.

Third-party names, product references, component references, trademarks, and logos are the property of their respective owners. Reference to a third-party component does not imply endorsement, certification, partnership, approval, warranty, or support by such third party unless expresslystatedinwritingbytherelevantthirdparty.

The customer shall comply with all applicable third-party supplier restrictions, end-use restrictions, export-control obligations, software licenses, and documentation associated with third-party components or product materials.

17.Confidentiality

If this datasheet or related material is marked Confidential, Partner Controlled, Evaluation Controlled, Private, NDA Required, or with any similar restriction, the recipient may use it only for evaluation of Neuromorphyx products and for or make it available to any third party without priorwrittenapprovalfromNeuromorphyx.

The recipient shall protect confidential materials with at least the same degree of care used to protect its own confidential information and in no event less than reasonable care.

The recipient shall promptly notify Neuromorphyx of any unauthorized access, disclosure, distribution, loss, or suspected compromise of confidential materials.

18.AISystems,DataIngestion,andExternalPlatforms

The recipient shall not upload this datasheet, related documentation, software, design files, support materials, confidential technical content, source code, firmware, images, test data, or supplier information to public AI systems, external model-training systems, shared third-party knowledge bases, external document-processing platforms, or any system where the content may be retained, reused, indexed, mined, trained on, or disclosed to third parties, unless expressly approved in writing by Neuromorphyx.

Internal use of this document shall remain limited to employees, contractors, and advisors who have a legitimate need to know and who are bound by confidentiality obligations no less protective than those applicable to the recipient.

19. Privacy, Data Protection, and Lawful Deployment

BrainBoard1500 may be used to process, transmit, derive, store, or analyze application data, model data, telemetry, metadata, or host-system data.

The customer is solely responsible for ensuring that collection, processing, storage, transmission, retention, analysis, sharing, and use of such data complies with all applicable privacy,data-protection,employment,surveillance,biometric, cybersecurity, sector-specific, and local laws.

The customer is responsible for all notices, consents, lawful bases,data-protectionimpactassessments,retention policies, access controls, security measures, data-subject rights,anddeploymentrestrictionsrequiredforitsfinalapplication.

20. Export Control, Sanctions, and Import Compliance

The customer shall not export, re-export, transfer, resell, integrate,oruseBrainBoard1500,relatedsoftware,technical data, documentation, or support materials in violation of applicable export-control, sanctions, embargo, customs, import, or restricted end-use laws.

The customer is responsible for obtaining any required export, re-export, transfer, import, end-use, or government authorization.

The customer shall not supply BrainBoard1500 to sanctioned parties, embargoed destinations, prohibited end users, restricted end uses, or any party that may use the product in violation of applicable law, supplier restrictions, orNeuromorphyxcontractualobligations.

21.SpecificationChangesandProductRevisions

Neuromorphyx may modify product specifications, hardware revision coverage, PCB revision, component selection, firmware, software, connectors, cables, mechanical design, packaging, documentation, inspection process, test criteria, manufacturing process to improve performance, reliability, manufacturability, compliance, supportability, or supply availability.

The customer shall verify the applicable product revision, documentation revision, and integration requirements before each purchase, integration milestone, pilot run, or production decision.

22. Engineering Samples, Pilot Units, and Pre-Production Units

Early units, pilot units, engineering samples, pre-production modules,andlimited-batchproductsmaydifferfromfuture production versions.

Such units are supplied for evaluation and may not represent final yield, long-term availability, production repeatability, environmental robustness, calibration stability, lifecycle support, or production-level qualification.

The customer shall not use engineering samples, pilot units, or pre-production units for field deployment, safety-critical deployment, certified product release, or production shipment unless expressly approved in writing by Neuromorphyx.

23. Warranty Limitation

Unless otherwise agreed in writing, BrainBoard1500 is supplied with a limited inspection period for defects in materials andworkmanship.

Neuromorphyx does not warrant uninterrupted operation, error-free operation, compatibility with all host systems, suitability for a particular application, regulatory approval of the customer's system, long-term availability, production yield, field reliability, or fitness for safety-critical, regulated, or restricted deployment.

Any warranty is void for damage or failure caused by misuse, improper handling, improper storage, electrostatic discharge, incorrect wiring, incorrect power supply, incorrect connector orientation, hot-plugging, modification, unauthorized repair, excessive mechanical stress, contamination, liquid exposure, thermal abuse, software misuse, host-system fault, or operation outside specified limits.

24. Limitation of Liability

To the maximum extent permitted by applicable law, Neuromorphyx shall not be liable for indirect, incidental, consequential, special, punitive, or exemplary damages, including loss of revenue, loss of profit, loss of data, loss of business opportunity, system downtime, product recall, regulatory enforcement, third-party claims, field failures, customer product delays, certification delays, or costs arising from customer integration, deployment, modification, resale, misuse, unlawful use, or failure to validate the final system.

Neuromorphyx liability, if any, shall be limited to the amount paid by the customer for the specific BrainBoard1500 unit or related documentation.

25. Purchase Terms and Contract Priority

Customer purchases are subject to the applicable Neuromorphyx quotation, invoice, purchase terms, evaluation product terms, end-use restrictions, and any signed agreement between Neuromorphyx and the customer.

In the event of conflict between this datasheet and a signed written agreement, the signed written agreement controls. In the event of conflict between this datasheet and a purchase order issued by the customer, this datasheet and Neuromorphyx-issued terms control unless Neuromorphyx expressly accepts the conflicting purchase order term in writing.

26. Authenticity and Controlled Versions

The latest controlled version of this datasheet is available only through Neuromorphyx-authorized channels.

Printed, forwarded, downloaded, extracted, copied, or unofficial versions may be outdated, incomplete, modified, or uncontrolled. In case of conflict, the latest version issued directly by Neuromorphyx controls.

The recipient shall not remove watermarks, document identifiers, confidentiality markings, revision identifiers, access-control notices, or authenticity markers from this datasheet or related documentation.

8 Document Revision History

Date	Revision	Changes	
17/06/2026	rev0	Initial document release.	Request
28/07/2026	rev1	Updated rev1 pinout, control-signal descriptions, and device-operation details.	Request
25/08/2026	rev2	Updated supported-host scope, corrected expander signal mapping, aligned bring-up and runtime sequencing to the released Arduino library, and removed public drafting placeholders.	