

NX48P0407

48 V Type-C CC and SBU protection IC for USB PD EPR

Rev. 1.0 — 27 August 2024

Product short data sheet

1 General description

The NX48P0407 is a CC and SBU protection IC, which can protect the short-to-VBUS damage on Type-C CC and SBU pins by ultrafast response of overvoltage protection detection. USB Type-C allows VBUS voltage to increase up to 48 V through a PD 3.1 protocol. CC1/2 and SBU1/2 pins can be shorted to VBUS of 48 V due to mechanical twisting and sliding of the connector since Type-C connector contact pins are 25 % closer to each other than a micro-USB connector. Moisture or fine dust may also cause the 48 V VBUS pin to be shorted to adjacent pins.

The NX48P0407 integrates IEC 61000-4-2 ESD protection on CON_CC1 and CON_CC2, +/-15 kV air discharge and +/-8 kV contact discharge, which helps to reduce external BOM cost. NX48P0407 CON_CC1/2 and CON_SBU1/2 pins are designed to be surge protected up to +80 V.



2 Features and benefits

- Type-C 48 V short-to-VBUS protection
 - CON_CC1/CON_CC2: up to 60 V_{DC}
 - CON_SBU1/CON_SBU2: up to 60 V_{DC}
- Dead-battery Mode Rd integrated on CON_CCx
- Low RON for OVP FET paths
 - CC OVP switch: 250 mΩ
 - SBU OVP switch: 3.6 Ω
- Robust IEC-61000-4-2 ESD protection
 - Contact discharge +/-8 kV: CON_CCx/CON_SBUx
 - Air discharge +/-15 kV: CON_CCx/CON_SBUx
- Low standby quiescent current of CC path: ~40 μA
- Fast OVP turn off time: 60 ns
- HVQFN16 package

3 Applications

- USB-PD extended power range (EPR) applications
- Laptop, notebook, portable workstation PC

4 Block diagram

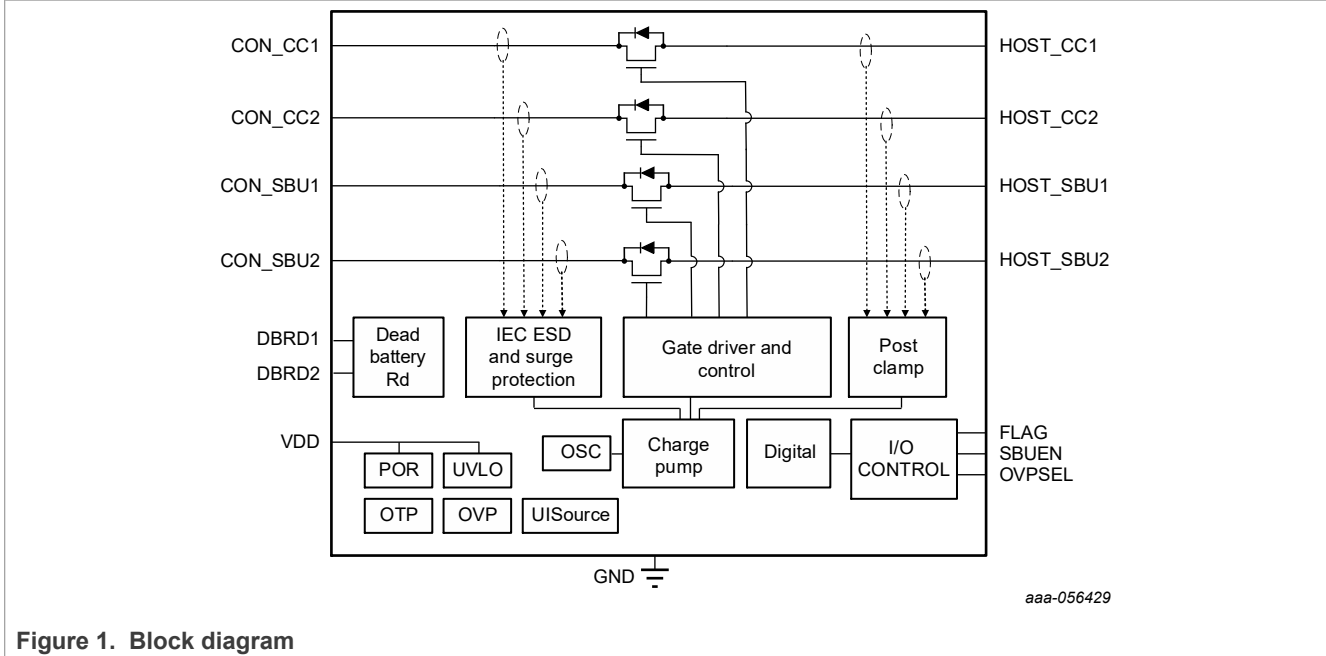


Figure 1. Block diagram

5 Pinning information

5.1 Pinning

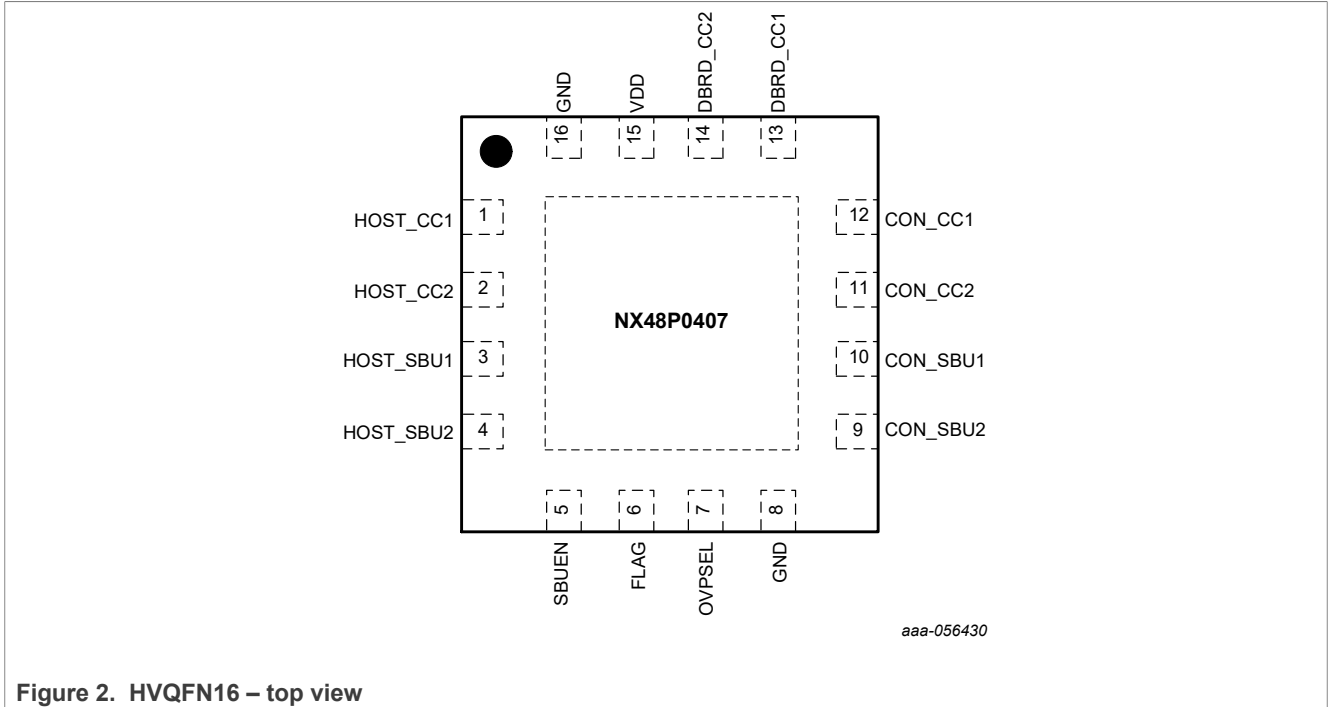


Figure 2. HVQFN16 – top view

5.2 Pin description

Table 1. Pin type definition

Pin type	Description	Pin type	Description	Pin type	Description
PI	Power Input	AO	Analog Output	DIO	Digital Input/ Output
PO	Power output	AIO	Analog Input/Output	AG	Analog Ground
PIO	Power Input/Output	DI	Digital Input	PG	Power Ground
AI	Analog Input	DO	Digital Output		

Table 2. Pin description

Pin name	Pin number	Type	Description
HOST_CC1	1	P/AIO	System side CC1. Connect CC1 of USB CC/PD controller.
HOST_CC2	2	P/AIO	System side CC2. Connect CC2 of USB CC/PD controller.
HOST_SBU1	3	A/DIO	System side SBU1.
HOST_SBU2	4	A/DIO	System side SBU2.
SBUEN	5	DI	SBU switch enable/disable control pin. SBUEN is driven high to enable SBU switch. (1.8 MΩ Internal pull-down resistor)

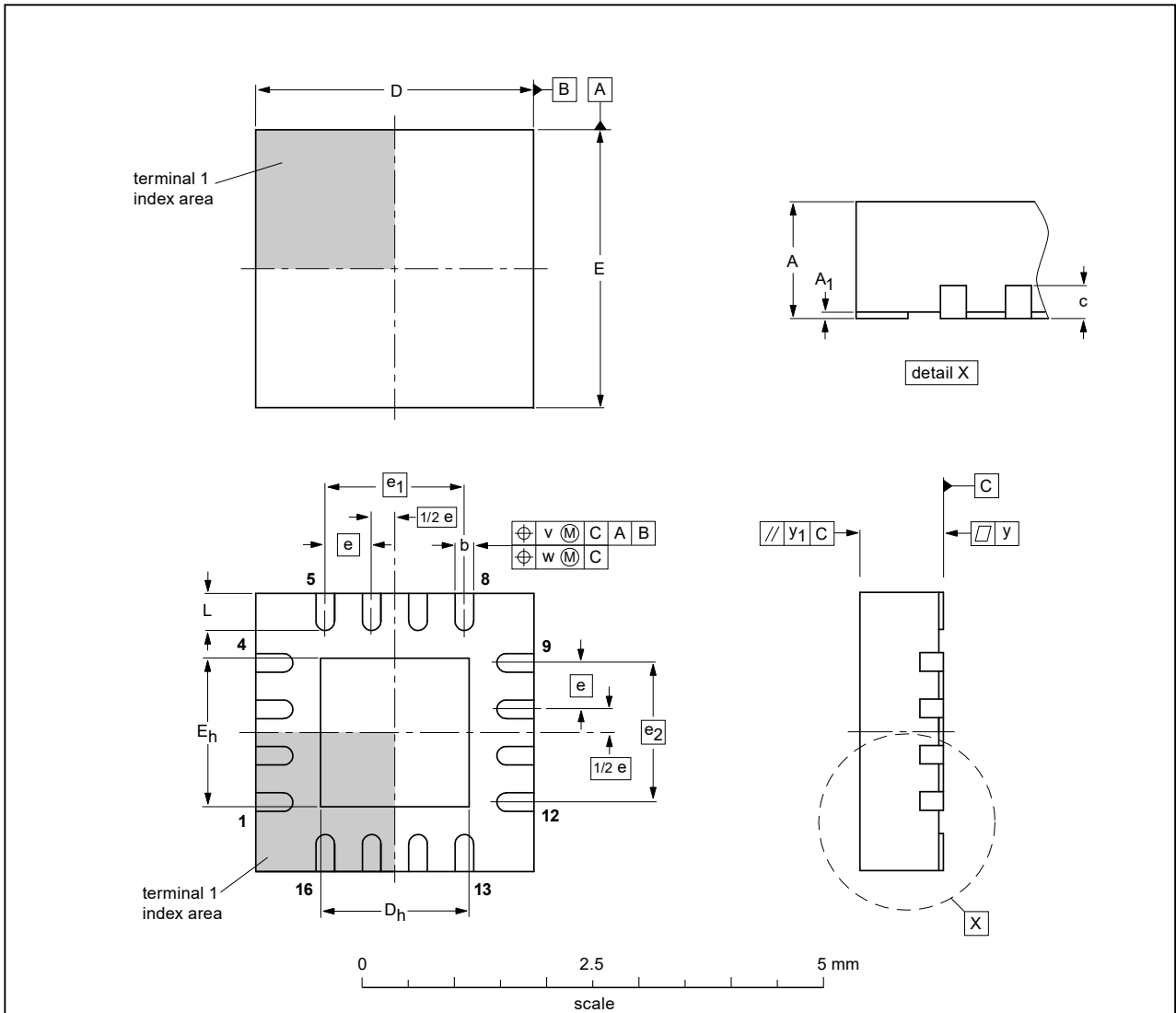
Table 2. Pin description...continued

Pin name	Pin number	Type	Description
FLAG	6	DO	Open-drain output indicating fault condition. Low when Fault condition happens, external pull-up resistor is required.
OVPSEL	7	DI	For SBU OVP SEL of options
GND	8	AG	Ground
CON_SBU2	9	A/DIO	Type-C connector side SBU2. Connect SBU2 of Type-C USB connector.
CON_SBU1	10	A/DIO	Type-C connector side SBU1. Connect SBU2 of Type-C USB connector.
CON_CC2	11	P/AIO	Type-C connector side CC2. Connect CC2 of Type-C USB connector.
CON_CC1	12	P/AIO	Type-C connector side CC1. Connect CC2 of Type-C USB connector.
DBRD_CC1	13	AG	Dead-Battery Mode RD of CC1.
DBRD_CC2	14	AG	Dead-Battery Mode RD of CC2.
V _{DD}	15	PI	Power supply input; connect System voltage and bypass 1 μ F capacitor to GND.
GND	16	AG	Ground.

6 Package outline

HVQFN16: plastic thermal enhanced very thin quad flat package; no leads;
16 terminals; body 3 x 3 x 0.85 mm

SOT758-1



DIMENSIONS (mm are the original dimensions)

UNIT	A ⁽¹⁾ max.	A ₁	b	c	D ⁽¹⁾	D _h	E ⁽¹⁾	E _h	e	e ₁	e ₂	L	v	w	y	y ₁
mm	1	0.05 0.00	0.30 0.18	0.2	3.1 2.9	1.75 1.45	3.1 2.9	1.75 1.45	0.5	1.5	1.5	0.5 0.3	0.1	0.05	0.05	0.1

Note

1. Plastic or metal protrusions of 0.075 mm maximum per side are not included.
2. Terminal 1 feature shape, size and location may vary.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT758-1	---	MO-220	---			-02-10-21- 24-05-24

Figure 3. Package outline SOT758-1 (HVQFN16)

7 Revision history

Table 3. Revision history

Document ID	Release date	Description
NX48P0407_SDS v.1.0	27 August 2024	• Initial version

Legal information

Data sheet status

Document status ^{[1][2]}	Product status ^[3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL <https://www.nxp.com>.

Definitions

Draft — A draft status on a document indicates that the content is still under internal review and subject to formal approval, which may result in modifications or additions. NXP Semiconductors does not give any representations or warranties as to the accuracy or completeness of information included in a draft version of a document and shall have no liability for the consequences of use of such information.

Short data sheet — A short data sheet is an extract from a full data sheet with the same product type number(s) and title. A short data sheet is intended for quick reference only and should not be relied upon to contain detailed and full information. For detailed and full information see the relevant full data sheet, which is available on request via the local NXP Semiconductors sales office. In case of any inconsistency or conflict with the short data sheet, the full data sheet shall prevail.

Product specification — The information and data provided in a Product data sheet shall define the specification of the product as agreed between NXP Semiconductors and its customer, unless NXP Semiconductors and customer have explicitly agreed otherwise in writing. In no event however, shall an agreement be valid in which the NXP Semiconductors product is deemed to offer functions and qualities beyond those described in the Product data sheet.

Disclaimers

Limited warranty and liability — Information in this document is believed to be accurate and reliable. However, NXP Semiconductors does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information. NXP Semiconductors takes no responsibility for the content in this document if provided by an information source outside of NXP Semiconductors.

In no event shall NXP Semiconductors be liable for any indirect, incidental, punitive, special or consequential damages (including - without limitation - lost profits, lost savings, business interruption, costs related to the removal or replacement of any products or rework charges) whether or not such damages are based on tort (including negligence), warranty, breach of contract or any other legal theory.

Notwithstanding any damages that customer might incur for any reason whatsoever, NXP Semiconductors' aggregate and cumulative liability towards customer for the products described herein shall be limited in accordance with the Terms and conditions of commercial sale of NXP Semiconductors.

Right to make changes — NXP Semiconductors reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.

Suitability for use — NXP Semiconductors products are not designed, authorized or warranted to be suitable for use in life support, life-critical or safety-critical systems or equipment, nor in applications where failure or malfunction of an NXP Semiconductors product can reasonably be expected to result in personal injury, death or severe property or environmental damage. NXP Semiconductors and its suppliers accept no liability for inclusion and/or use of NXP Semiconductors products in such equipment or applications and therefore such inclusion and/or use is at the customer's own risk.

Applications — Applications that are described herein for any of these products are for illustrative purposes only. NXP Semiconductors makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

Customers are responsible for the design and operation of their applications and products using NXP Semiconductors products, and NXP Semiconductors accepts no liability for any assistance with applications or customer product design. It is customer's sole responsibility to determine whether the NXP Semiconductors product is suitable and fit for the customer's applications and products planned, as well as for the planned application and use of customer's third party customer(s). Customers should provide appropriate design and operating safeguards to minimize the risks associated with their applications and products.

NXP Semiconductors does not accept any liability related to any default, damage, costs or problem which is based on any weakness or default in the customer's applications or products, or the application or use by customer's third party customer(s). Customer is responsible for doing all necessary testing for the customer's applications and products using NXP Semiconductors products in order to avoid a default of the applications and the products or of the application or use by customer's third party customer(s). NXP does not accept any liability in this respect.

Limiting values — Stress above one or more limiting values (as defined in the Absolute Maximum Ratings System of IEC 60134) will cause permanent damage to the device. Limiting values are stress ratings only and (proper) operation of the device at these or any other conditions above those given in the Recommended operating conditions section (if present) or the Characteristics sections of this document is not warranted. Constant or repeated exposure to limiting values will permanently and irreversibly affect the quality and reliability of the device.

Terms and conditions of commercial sale — NXP Semiconductors products are sold subject to the general terms and conditions of commercial sale, as published at <https://www.nxp.com/profile/terms>, unless otherwise agreed in a valid written individual agreement. In case an individual agreement is concluded only the terms and conditions of the respective agreement shall apply. NXP Semiconductors hereby expressly objects to applying the customer's general terms and conditions with regard to the purchase of NXP Semiconductors products by customer.

No offer to sell or license — Nothing in this document may be interpreted or construed as an offer to sell products that is open for acceptance or the grant, conveyance or implication of any license under any copyrights, patents or other industrial or intellectual property rights.

Quick reference data — The Quick reference data is an extract of the product data given in the Limiting values and Characteristics sections of this document, and as such is not complete, exhaustive or legally binding.

Export control — This document as well as the item(s) described herein may be subject to export control regulations. Export might require a prior authorization from competent authorities.

Suitability for use in non-automotive qualified products — Unless this document expressly states that this specific NXP Semiconductors product is automotive qualified, the product is not suitable for automotive use. It is neither qualified nor tested in accordance with automotive testing or application requirements. NXP Semiconductors accepts no liability for inclusion and/or use of non-automotive qualified products in automotive equipment or applications.

In the event that customer uses the product for design-in and use in automotive applications to automotive specifications and standards, customer (a) shall use the product without NXP Semiconductors' warranty of the product for such automotive applications, use and specifications, and (b) whenever customer uses the product for automotive applications beyond NXP Semiconductors' specifications such use shall be solely at customer's own risk, and (c) customer fully indemnifies NXP Semiconductors for any liability, damages or failed product claims resulting from customer design and use of the product for automotive applications beyond NXP Semiconductors' standard warranty and NXP Semiconductors' product specifications.

HTML publications — An HTML version, if available, of this document is provided as a courtesy. Definitive information is contained in the applicable document in PDF format. If there is a discrepancy between the HTML document and the PDF document, the PDF document has priority.

Translations — A non-English (translated) version of a document, including the legal information in that document, is for reference only. The English version shall prevail in case of any discrepancy between the translated and English versions.

Security — Customer understands that all NXP products may be subject to unidentified vulnerabilities or may support established security standards or specifications with known limitations. Customer is responsible for the design and operation of its applications and products throughout their lifecycles to reduce the effect of these vulnerabilities on customer's applications and products. Customer's responsibility also extends to other open and/or proprietary technologies supported by NXP products for use in customer's applications. NXP accepts no liability for any vulnerability. Customer should regularly check security updates from NXP and follow up appropriately. Customer shall select products with security features that best meet rules, regulations, and standards of the intended application and make the ultimate design decisions regarding its products and is solely responsible for compliance with all legal, regulatory, and security related requirements concerning its products, regardless of any information or support that may be provided by NXP.

NXP has a Product Security Incident Response Team (PSIRT) (reachable at PSIRT@nxp.com) that manages the investigation, reporting, and solution release to security vulnerabilities of NXP products.

NXP B.V. — NXP B.V. is not an operating company and it does not distribute or sell products.

Trademarks

Notice: All referenced brands, product names, service names, and trademarks are the property of their respective owners.

NXP — wordmark and logo are trademarks of NXP B.V.

Tables

Tab. 1.	Pin type definition	5	Tab. 3.	Revision history	8
Tab. 2.	Pin description	5			

Figures

Fig. 1. Block diagram 4 Fig. 3. Package outline SOT758-1 (HVQFN16) 7
Fig. 2. HVQFN16 – top view 5

Contents

1	General description	1
2	Features and benefits	2
3	Applications	3
4	Block diagram	4
5	Pinning information	5
5.1	Pinning	5
5.2	Pin description	5
6	Package outline	7
7	Revision history	8
	Legal information	9

Please be aware that important notices concerning this document and the product(s) described herein, have been included in section 'Legal information'.
