SY205207DXC

Ultra-Low Capacitance TVS Protection

General Description

SY205207DXC is an ultra-low capacitance transient voltage suppressor (TVS) designed to provide electrostatic discharge (ESD) protection for high-speed data interfaces against transient events. The device has a typical capacitance of 0.2pF. It complies with IEC61000-4-2 (ESD) (±20kV air, ±20kV contact discharge), IEC61000-4-5 (surge) (9A, 8/20μs).

Each SY205207DXC device can protect one high-speed data line. The combined features of ultra-low capacitance, ultra-small size and high ESD robustness make SY205207DXC ideal for high-speed data ports and high-frequency lines. The low clamping voltage of the SY205207DXC guarantees minimum stress on the protected IC.

The SY205207DXC is available in a compact DFN 0.6×0.3-2 package.

Features

- Transient protection for high-speed data lines
  - IEC61000-4-2 (ESD) ±20kV (air) ±20kV (contact)
  - IEC61000-4-5 (surge) 9A (8/20μs)
- For 24V and below operating voltage
- Package optimized for high-speed lines
- Ultra-small package (0.6mm×0.3mm×0.3mm)
- Can be used for one data, control or power line
- Ultra-low capacitance: 0.2pF (typical)

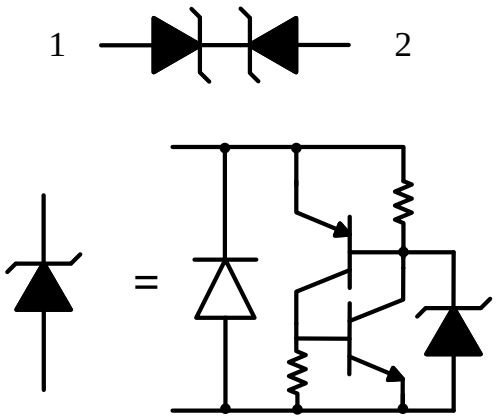
Applications

- USB3.x
- Near Field Communication (NFC) lines
- RF signal lines

Mechanical Characteristics

- DFN 0.6×0.3-2 package
- Marking: device code
- Packaging: tape and reel

Circuit Diagram



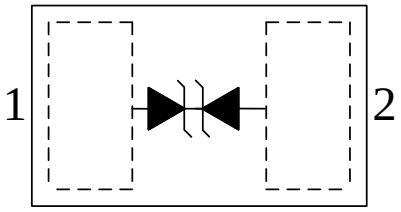
© 2023 Silergy Corp

All Rights Reserved

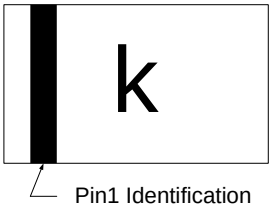
Ordering Information

Part Number	Package Type	Top Mark
SY205207DXC	DFN0.6×0.3-2 RoHS Compliant and Halogen Free	k

Pinout (Top View)



Marking Codes



Note: "k" is device code, fixed.

Absolute Maximum Rating			
Parameter	**Symbol**	**Value**	**Units**
Maximum Peak Pulse Current (8/20μs)	I_{PP}	9	A
Maximum Peak Pulse Power (8/20μs)	P_{PK}	50	W
ESD per IEC 61000-4-2 (Air) ESD per IEC 61000-4-2 (Contact)	V_{ESD}	±20 ±20	kV
Operating Temperature	T_{OPT}	-40/+85	℃
Storage Temperature	T_{STG}	-55/+150	°C

Electrical Characteristics (T_A = 25℃)						
Parameter	**Symbol**	**Test Condition**	**Min**	**Typ**	**Max**	**Unit**
Nominal Reverse Working Voltage	V_{RWM}				24.5	V
Reverse Leakage Current @ V_{RWM}	I_R	V_R = 24V, TA = 25°C		0.01	1	μA
Reverse Triggering Voltage @ I_{t1}	V_{t1}	I_{t1} = 50μA	25.5	30	40	V
Clamping Voltage @ I_{PP}	V_C (1)	I_{PP} = 9A, t_p = 8/20μs Combination Waveform, R_S = 12 Ω		5.5		V
Clamping Voltage @ I_{PP}	V_C(1)	I_{PP} = 16A, t_p = 10/100ns		7		V
Dynamic Resistance	R_{DYN}(1)(2)	t_p = 10/100ns		0.23		Ω
Dynamic Resistance	C_{ESD}(1)	V_R = 0V, f = 1MHz		0.2	0.35	pF

Notes 1: Guaranteed by design and not subject to production test.

Notes 2: R_{DYN} calculated based on I_{PP}=8A to I_{PP}=16A, t_p = 10/100ns.

© 2023 Silergy Corp All Rights Reserved

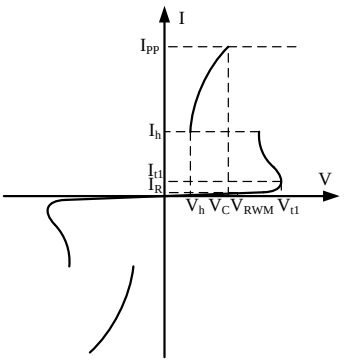
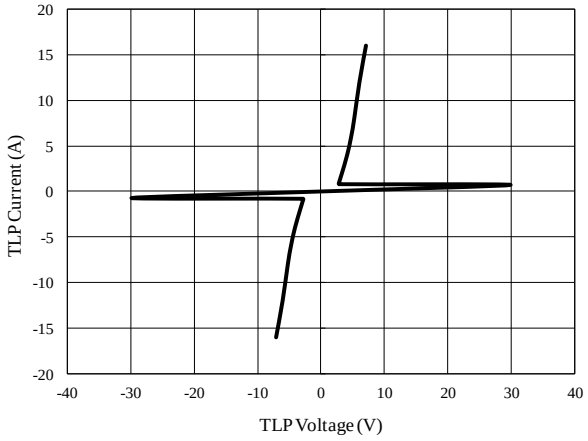


Figure 1. Bi-Directional TVS

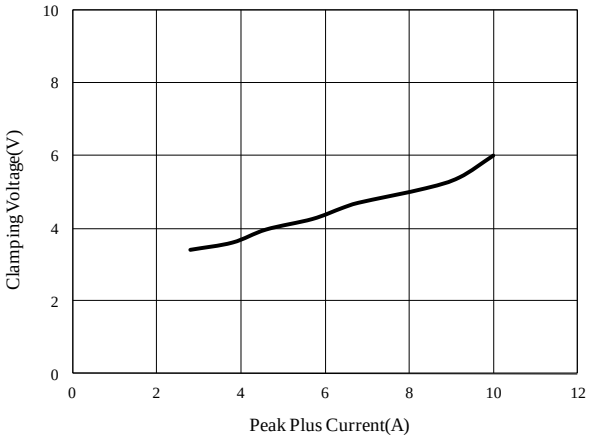
© 2023 Silergy Corp
All Rights Reserved

Typical Characteristics

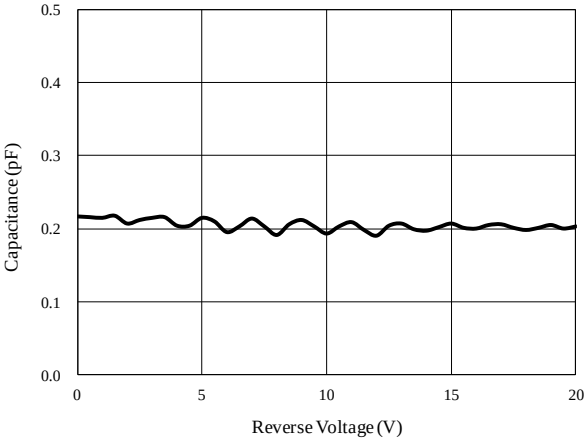
TLP Testing of I/O to I/O



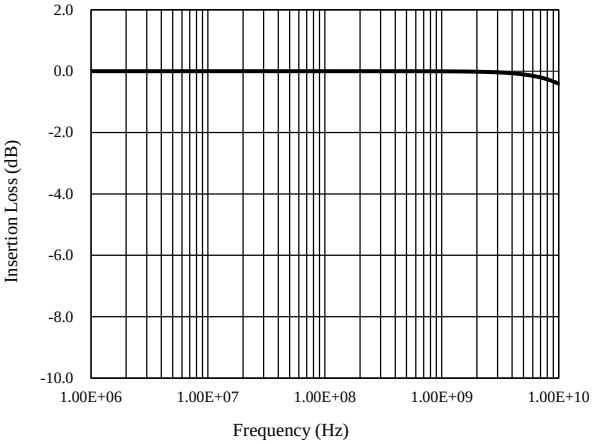
Clamping Voltage vs. Peak Pulse Current (8/20μs)



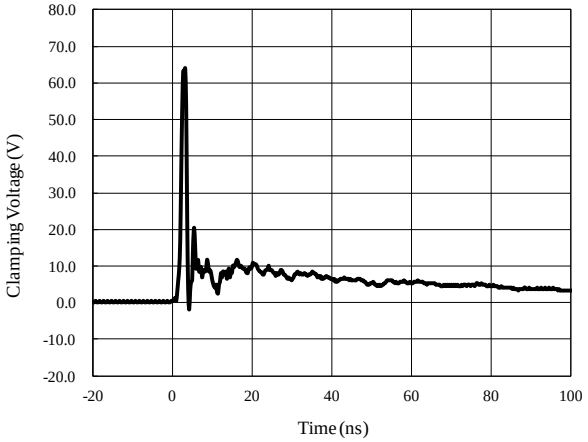
Capacitance vs. Voltage of I/O to I/O



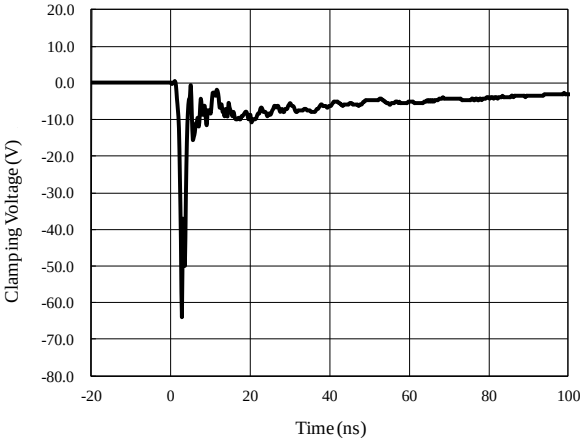
Insertion Loss S21 of I/O to I/O



ESD Clamping of I/O to I/O (+8kV Contact per IEC 61000-4-2)



ESD Clamping of I/O to I/O (-8kV Contact per IEC 61000-4-2)



© 2023 Silergy Corp
All Rights Reserved

Application Information

ESD Protection for USB Type-C

SY205207DXC can be used for ESD protection for USB Type-C. The pin connections are shown in figure 2 below. SY205207DXC must be placed between one data line and GND.

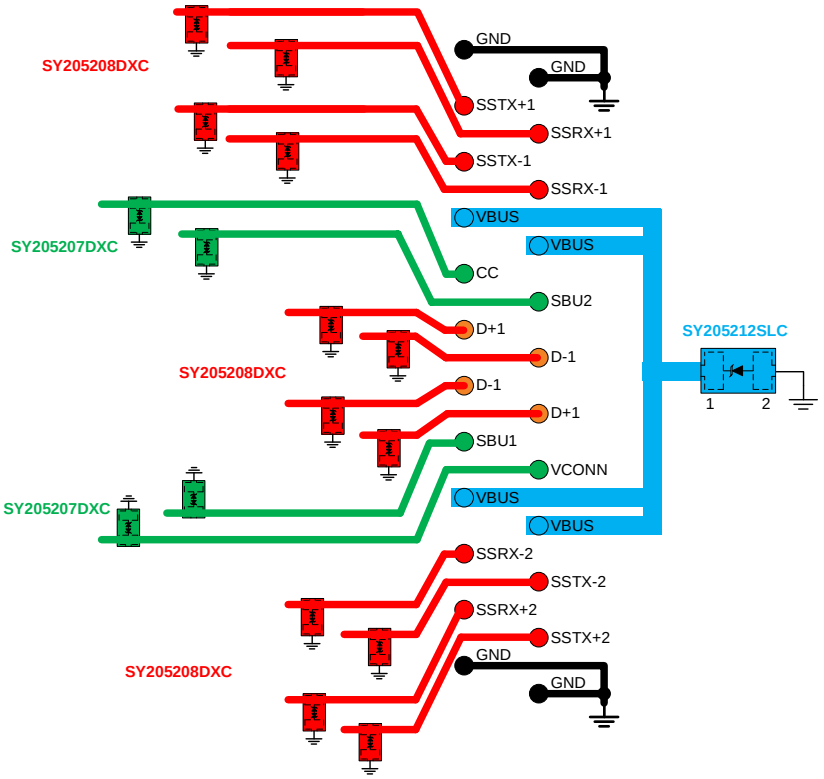


Figure 2. Typical ESD Protection for USB Type-C

ESD Protection for NFC Interface

SY205207DXC can also be used for Near Field Communication (NFC) antenna ESD protection. The high operating voltage (24V) does not clip the NFC signal and the small capacitance can avoid harmonic distortion of the RF signal. The typical application circuit is shown in figure 3.

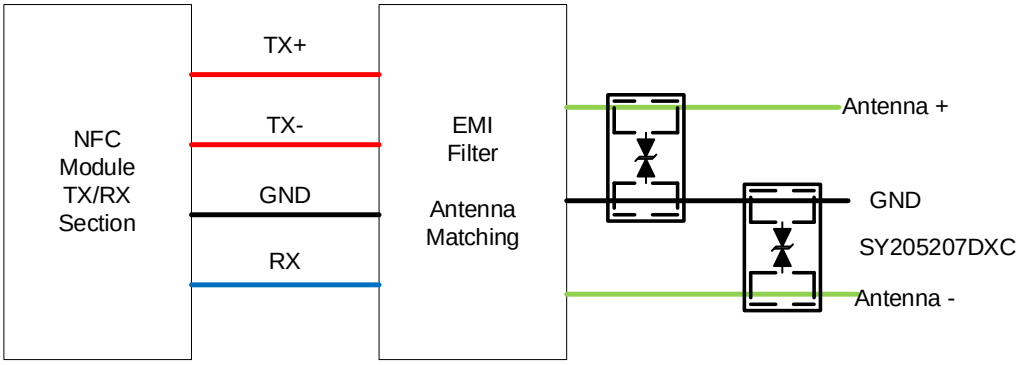


Figure 3. Typical ESD Protection for NFC Antenna

© 2023 Silergy Corp
All Rights Reserved

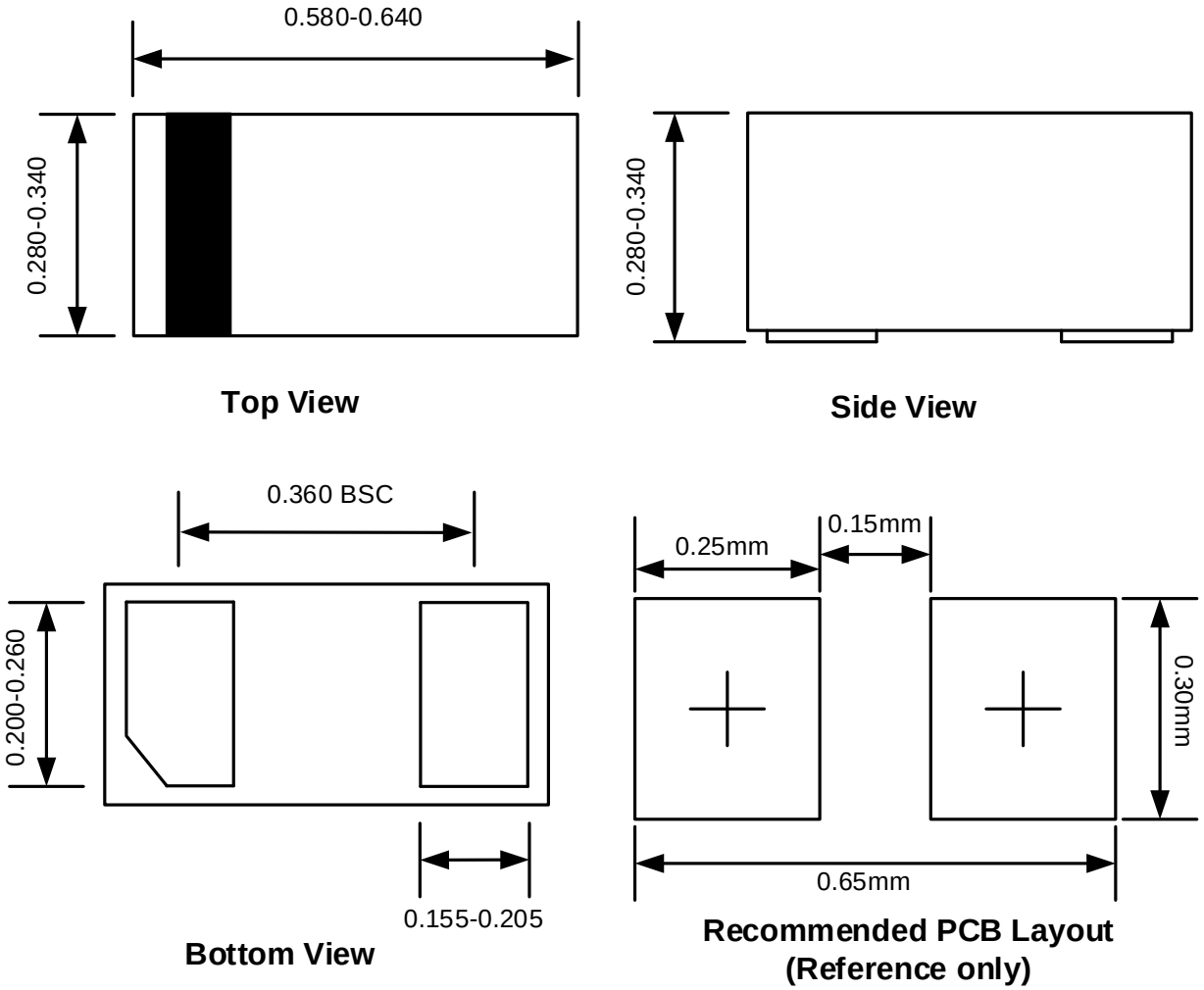
PCB Layout Guidelines

For optimum ESD protection and circuit performance, the following PCB layout guidelines are recommended:

- The distance between the SY205207DXC pin to the GND reference path should be as short as possible.
- Use a large via to connect SY205207DXC pin to the ground.
- Place SY205207DXC as close to the connector port as possible to reduce parasitic inductance and prevent ESD coupling into adjacent traces.
- Avoid running critical signals near board edges.

© 2023 Silergy Corp All Rights Reserved

DFN0.6×0.3-2 Package Outline

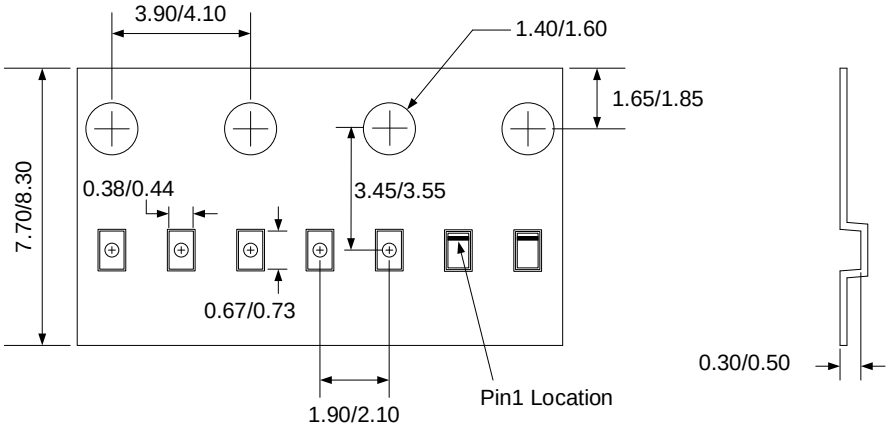


Notes: All dimension in millimeter and exclude mold flash & metal burr

© 2023 Silergy Corp
All Rights Reserved

Tape and Reel Specification

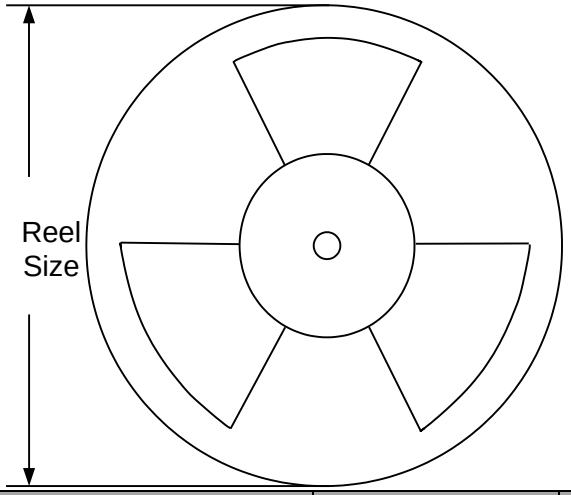
DFN0.6×0.3-2 Taping Orientation



Dimensions In mm

Feeding direction ⟶

Carrier Tape & Reel Specification for Packages



Package Types	Tape Width (mm)	Pocket Pitch(mm)	Reel Size (Inch)	Qty per Reel (pcs)
DFN0.6×0.3-2	8	2	7"	10000

© 2023 Silergy Corp
All Rights Reserved

Revision History

Revision Number	Revision Date	Description	Pages changed
0.9	04/23/2021	Initial Release	
1.0	04/23/2022	Production Release	

Revision history is for reference only and may not be comprehensive or complete.

© 2023 Silergy Corp All Rights Reserved

IMPORTANT NOTICE

1. **Right to make changes.** Silergy and its subsidiaries (hereafter Silergy) reserve the right to change any information published in this document, including but not limited to circuitry, specification and/or product design, manufacturing or descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products are sold subject to Silergy's standard terms and conditions of sale.

2. Applications. Application examples that are described herein for any of these products are for illustrative purposes only. Silergy makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification. Buyers are responsible for the design and operation of their applications and products using Silergy products. Silergy or its subsidiaries assume no liability for any application assistance or designs of customer products. It is customer's sole responsibility to determine whether the Silergy product is suitable and fit for the customer's applications and products planned. To minimize the risks associated with customer's products and applications, customer should provide adequate design and operating safeguards. Customer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm and take appropriate remedial actions. Silergy assumes no liability related to any default, damage, costs or problem in the customer's applications or products, or the application or use by customer's third-party buyers. Customer will fully indemnify Silergy, its subsidiaries, and their representatives against any damages arising out of the use of any Silergy components in safety-critical applications. It is also buyers' sole responsibility to warrant and guarantee that any intellectual property rights of a third party are not infringed upon when integrating Silergy products into any application. Silergy assumes no responsibility for any said applications or for any use of any circuitry other than circuitry entirely embodied in a Silergy product.

3. **Limited warranty and liability.** Information furnished by Silergy in this document is believed to be accurate and reliable. However, Silergy makes no representation or warranty, 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. In no event shall Silergy be liable for any indirect, incidental, punitive, special or consequential damages, including but not limited to 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 or negligence, warranty, breach of contract or any other legal theory. Notwithstanding any damages that customer might incur for any reason whatsoever, Silergy' aggregate and cumulative liability towards customer for the products described herein shall be limited in accordance with the Standard Terms and Conditions of Sale of Silergy.

4. **Suitability for use.** Customer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of Silergy components in its applications, notwithstanding any applications-related information or support that may be provided by Silergy. Silergy 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 Silergy product can reasonably be expected to result in personal injury, death or severe property or environmental damage. Silergy assumes no liability for inclusion and/or use of Silergy products in such equipment or applications and therefore such inclusion and/or use is at the customer's own risk.

5. **Terms and conditions of commercial sale**. Silergy products are sold subject to the standard terms and conditions of commercial sale, as published at http://www.silergy.com/stdterms, unless otherwise agreed in a valid written individual agreement specifically agreed to in writing by an authorized officer of Silergy. In case an individual agreement is concluded only the terms and conditions of the respective agreement shall apply. Silergy hereby expressly objects to and denies the application of any customer's general terms and conditions with regard to the purchase of Silergy products by the customer.

6. **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. Silergy makes no representation or warranty that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right. Information published by Silergy regarding third-party products or services does not constitute a license to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from Silergy under the patents or other intellectual property of Silergy.

For more information, please visit: www.silergy.com

© 2023 Silergy Corp. **All Rights Reserved.**

© 2023 Silergy Corp All Rights Reserved