

**SILERGY**

SY6288C7/D7

Low Loss Power Distribution Switch

General Description

SY6288C7/D7 is an ultra-low $R_{DS(ON)}$ switch with current limiting function to protect the power source from over current and short circuit conditions.

Ordering Information

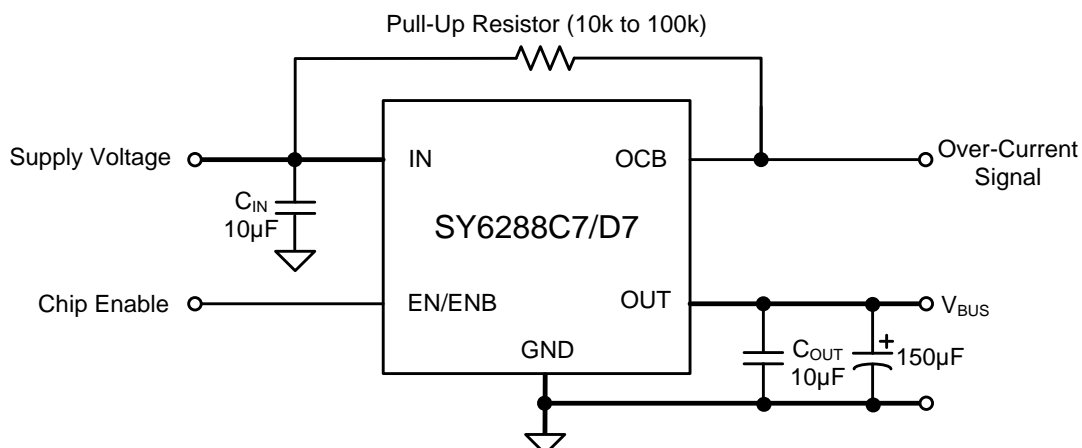
SY6288 □(□□)□
└─┬─┬─┘
 └─┬─┘ Temperature Code
 └─┘ Package Code
 └─┘ Optional Spec Code

Ordering Number	Package Type
SY6288C7AAC	SOT23-5
SY6288D7AAC	SOT23-5

Features

- Distribution Voltages: 2.5V to 5.5V
- Over Temperature Shutdown and Automatic Retry
- Reverse Blocking (No Body Diode)
- At Shutdown, OUT Can be Forced Higher Than IN
- Fault Flag (OCB) Output if Over Current, Thermal Shut Down, Reverse Blocking Happens
- Automatic Output Discharge at Shutdown
- Built-in Soft-start
- 0.4ms Rise Time
- RoHS Compliant and Halogen Free
- Two Enable Polarities
 - ✓ SY6288C7: Active High/2.5A
 - ✓ SY6288D7: Active Low/2.5A
- Compact Packages Minimize Board Space: SOT23-5
- UL Certification NO. E491480

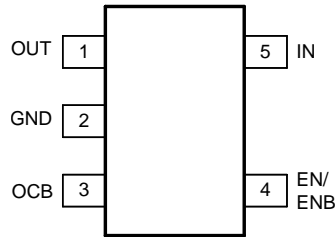
Typical Application Circuit



Note: If 1uF input cap will lead to large V_{in} voltage spike, it is strongly recommended to add additional 10uF ceramic cap.

Note: A low-ESR 150µF aluminum electrolytic or tantalum between OUT and GND is strongly recommended.

Pinout(Top View)



SOT23-5

Part Number	Package type	Top Mark ^①
SY6288C7AAC	SOT23-5	Pt .xyz
SY6288D7AAC	SOT23-5	Pw .xyz

Note ①: x=year code, y=week code, z= lot number code.

Functional Pin Description

Pin Name	Pin Number (SOT23-5)	Pin Description
IN	5	Input pin.
GND	2	Ground pin.
OUT	1	Output pin.
EN- SY6288C7 ENB- SY6288D7	4	ON/OFF control. Do not leave it float. EN: high enable. ENB: low enable.
OCB	3	Open drain fault flag.

Absolute Maximum Ratings (Note 1)

IN, OUT, OCB----- -0.3V to 6V
 EN/ENB----- -0.3V to $V_{IN}+0.3V$
 Power Dissipation, P_d @ $T_A = 25^{\circ}C$ SOT23-5----- 0.6W
 Package Thermal Resistance (Note 2)
 SOT23-5, θ_{JA} -----100 $^{\circ}C/W$
 SOT23-5, θ_{JC} -----30 $^{\circ}C/W$
 Junction Temperature Range ----- -40 $^{\circ}C$ to 150 $^{\circ}C$
 Lead Temperature (Soldering, 10 sec.) -----260 $^{\circ}C$
 Storage Temperature Range ----- -65 $^{\circ}C$ to 150 $^{\circ}C$

Recommended Operating Conditions (Note 3)

IN----- 2.5V to 5.5V
 EN/ENB ----- 0V to V_{IN}
 OUT, OCB ----- 0 to 5.5V
 Junction Temperature Range ----- -40 $^{\circ}C$ to 125 $^{\circ}C$
 Ambient Temperature Range ----- -40 $^{\circ}C$ to 85 $^{\circ}C$

Electrical Characteristics

($V_{IN} = 5V$, $C_L = 1\mu F$, per channel, $T_A = 25^\circ C$ unless otherwise specified)

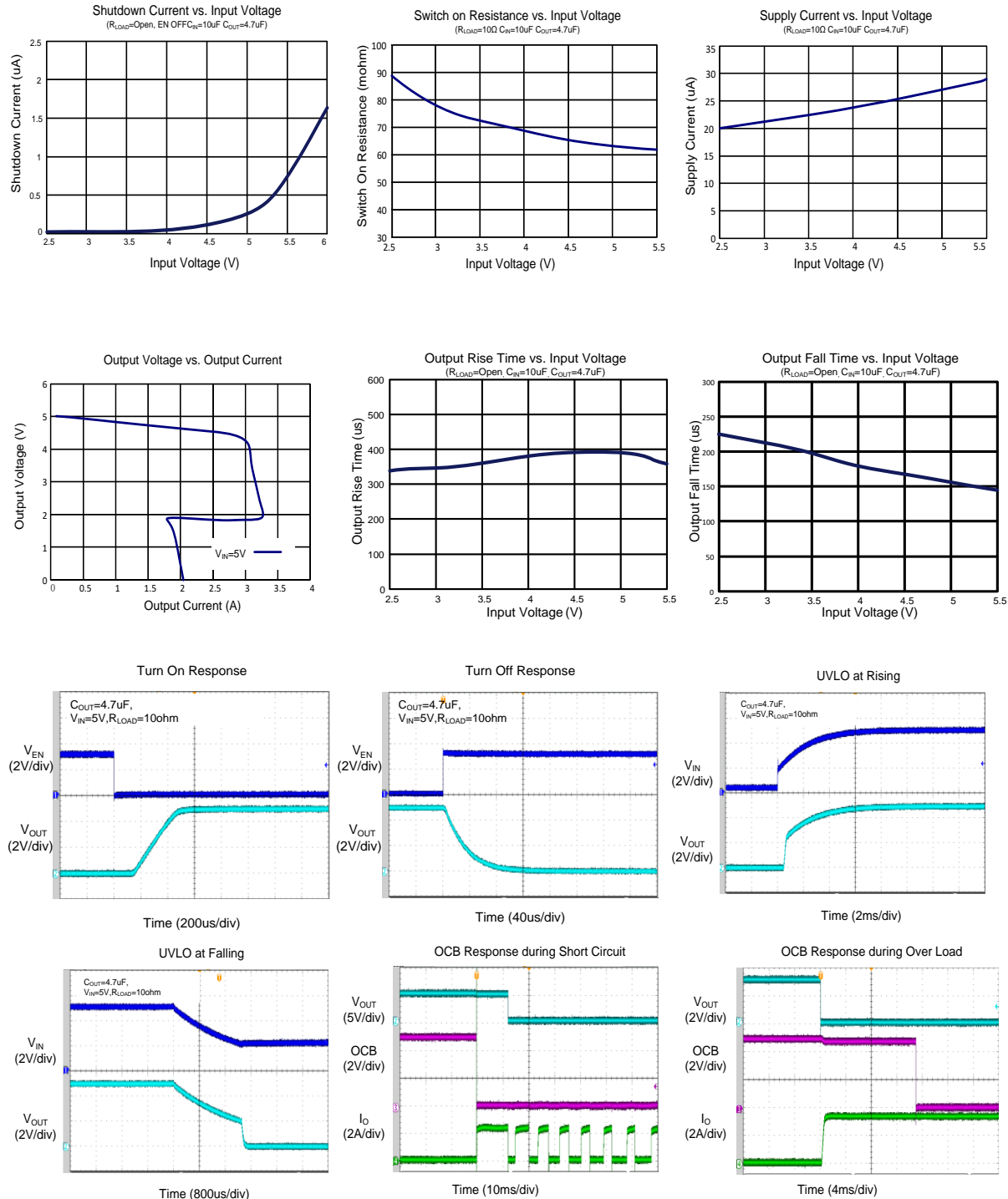
Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Input Voltage Range	V_{IN}		2.5		5.5	V
Shutdown Input Current	I_{SHDN}	Open load, switch off		0.1	1	μA
		Output grounded, switch off		0.1	1	μA
Quiescent Supply Current	I_Q	Open load, switch on		32		μA
FET RON	$R_{DS(ON)}$		50	63	75	m Ω
Current Limit	I_{LIM}		2.7	3.55	4.4	A
Short Circuit Output Current	I_{OS}	SY6288C7/D7, OUT connected to GND device enabled	1.2	1.8	2.4	A
EN/ \overline{EN} Threshold	Logic-Low Voltage	V_{IL}			0.8	V
	Logic-High Voltage	V_{IH}	1.75			V
IN UVLO Threshold	$V_{IN,UVLO}$				2.4	V
IN UVLO Hysteresis	$V_{IN,HYS}$			0.1		V
Turn-ON Time	t_{ON}	$R_L = 5\Omega$, $C_L = 1\mu F$		400		μs
OCB Low Resistance	R_{OCB}			10		Ω
OCB Delay Time	t_{OCB_Delay}			10		ms
OUT Shutdown Discharge Resistance	R_{DIS}			10		Ω
Thermal Shutdown Temperature	T_{SD}			150		$^\circ C$
Thermal Shutdown Hysteresis				20		$^\circ C$

Note 1: Stresses beyond the “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only. Functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Note 2: θ_{JA} is measured in the natural convection at $T_A = 25^\circ C$ on Silergy evaluation board.

Note 3: The device is not guaranteed to function outside its operating conditions.

Typical Operating Characteristics



Operation

The SY6288C7/D7 is a current limited P-channel MOSFET power switch designed for high-side load-switching applications. There is no parasitic body diode between drain and source of the MOSFET, so the SY6288C7/D7 prevents current flow from out to input when out being externally forced to a higher voltage than input when chip is disabled.

Over Current Protection

When the over current condition is sensed, the gate of the pass switch is modulated to achieve constant output current. Under output short circuit conditions, the normal current limit is folded back to 50%. If the over current condition persists for a long enough time, the junction temperature may exceed 150°C, and over temperature protection will shut down the IC. Once the chip temperature drops below 130°C, the IC will restart.

Short Circuit

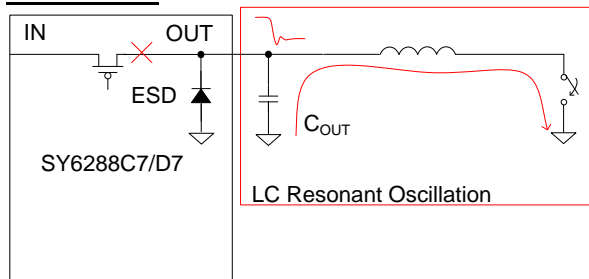


Figure1. Equivalent Circuit

During short circuit, the parasitic inductor of the short wire and output capacitor will cause LC resonant oscillation thus cause negative voltage on OUT pin and current will flow through the ESD diode on OUT pin. This ESD diode can handle 600mA maximum forward current.

Fault Flag (OCB)

The OCB output is asserted (active low) when an over temperature shutdown condition or over current condition persists for 15ms. The output remains asserted until the over current or over temperature condition is removed. Connecting a heavy capacitive load to an enabled device can cause a momentary over

current condition; however, no false reporting on OCB occurs due to the 15ms deglitch circuit.

Supply Filter Capacitor

In order to prevent the input voltage drooping during hot plug events, a 1μF ceramic capacitor from IN to GND is strongly recommended. However, higher capacitor values could reduce the voltage droop on the input further. Furthermore, an output short will cause ringing on the input without the input capacitor. It could destroy the internal circuitry when the input transient exceeds 6V which is the absolute maximum supply voltage even for a short duration.

Output Filter Capacitor

Between OUT and GND, a low-ESR 150μF aluminum electrolytic or tantalum capacitor is strongly recommended to meet the 330mV maximum droop requirement. Standard bypass methods should be used to minimize inductance and resistance between the bypass capacitor and the downstream connector. This will reduce EMI and improve the transient performance.

PCB Layout Guide

For best performance of the SY6288C7/D7, the following guidelines must be strictly followed:

- 1) Keep all V_{BUS} traces as short and wide as possible and use at least 2 ounce copper for all V_{BUS} traces.
- 2) Place a ground plane under all circuitry to lower both resistance and inductance and improve DC and transient performance.
- 3) Locate the output capacitor as close to the connectors as possible to lower impedance (mainly inductance) between the port and the capacitor and improve transient performance.
- 4) Input and output capacitors should be placed closed to the IC and connected to ground plane to reduce noise coupling.
- 5) Locate the ceramic bypass capacitors as close as possible to the IN pins and OUT pins of SY6288C7/D7.

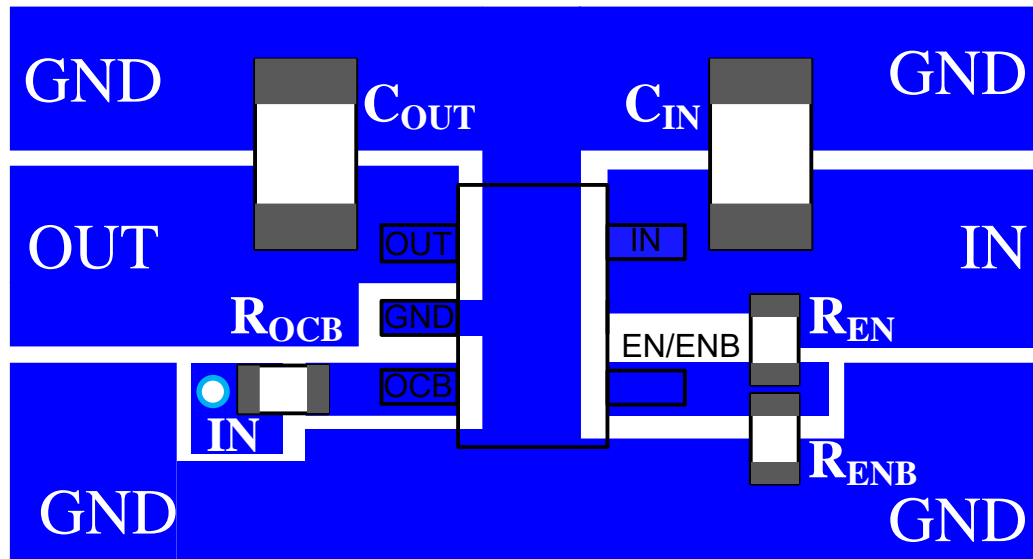
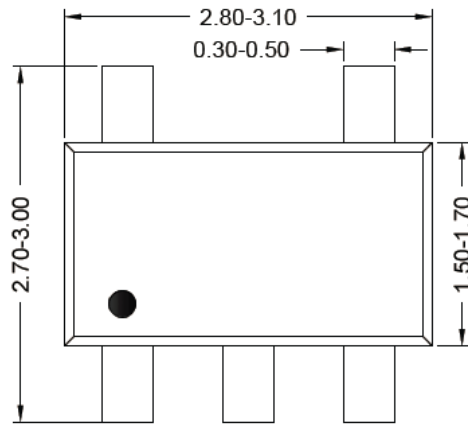
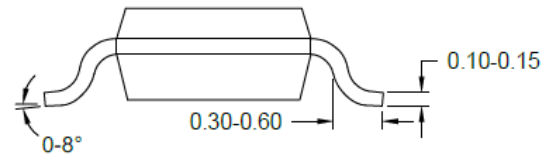


Figure2. PCB Layout Suggestion

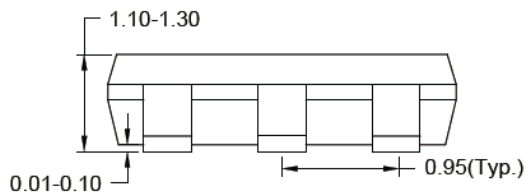
SOT23-5 Package Outline & PCB Layout



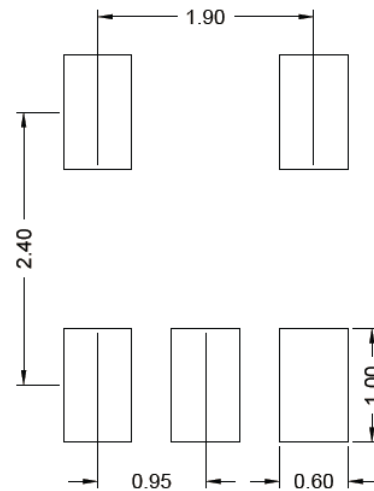
Top view



Side view



Front view



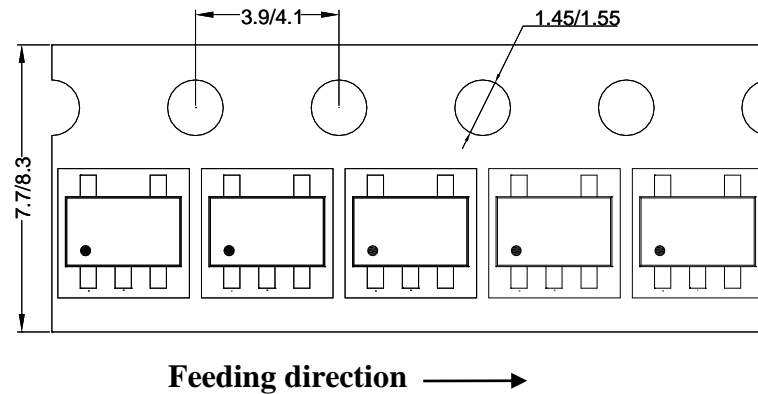
Recommended Pad Layout

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

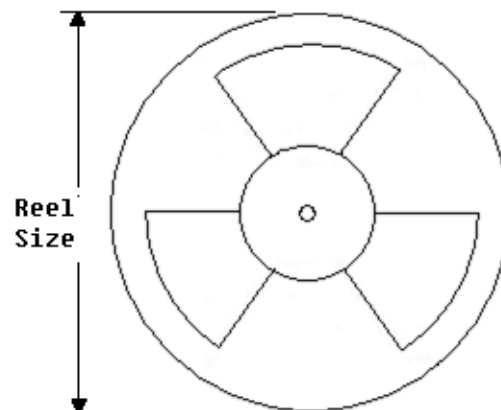
Taping & Reel Specification

1. Taping Orientation

SOT23-5



2. Carrier Tape & Reel Specification for Packages



Package types	Tape width (mm)	Pocket pitch(mm)	Reel size (Inch)	Trailer length(mm)	Leader length (mm)	Qty per reel
SOT23-5	8	4	7"	280	160	3000

3. Others: NA

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's 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

© 2018 Silergy Corp.

All Rights Reserved.