

# US79 Series

CMOS Power Hall IC

## 1. Features and Benefits

- Built-in Reverse Voltage Protection
- Built-in RFI Filter
- Power Efficient CMOS and Power MOSFET Drivers allow 400mA without overheating
- Built-in Zener Diodes Protect Outputs
- Eliminate all Fan Components
- Eliminate PC Board
- 5V and 12V Operation
- High Sensitivity for switching symmetry
- Locked Rotor Shutdown

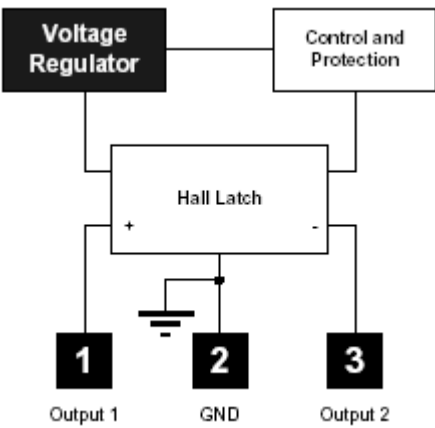
## 2. Applications

- Fan sizes up to 90mm
- Current range up to 400mA

## 3. Ordering information

| Product Code | Temperature Code   | Package Code    | Option Code | Packing Form Code |
|--------------|--------------------|-----------------|-------------|-------------------|
| US79         | K (-40°C to 125°C) | UA (TO-92 flat) | AAA-000     | BU                |
|              |                    |                 |             |                   |

## 4. Functional Diagram



## 5. Description

The US79KUA is the most advanced Smart Fan Control Hall IC. It is designed for 5V and 12V cooling commutation. The chip contains many features to allow survival in a harsh environment. The IC was designed to eliminate all discrete components such as capacitors, resistors, transistors, diodes, PC board and associated labor, replacing US\$0.25 to US\$0.35 in direct cost.

The K rating guarantees proper operation up to an ambient temperature of 125°C. Hall IC circuitry and power FET output provide a low power dissipation cool chip.

Locked Rotor conditions are detected by the IC when there is no motion for one second and will shut off the motor drive for five seconds. Then, the IC will turn on the drive current for one second. This sequence continues indefinitely until the locked rotor condition is fixed. This feature prevents overheating.

## Contents

|                                                                                                                   |    |
|-------------------------------------------------------------------------------------------------------------------|----|
| 1. Features and Benefits.....                                                                                     | 1  |
| 2. Applications .....                                                                                             | 1  |
| 3. Ordering information.....                                                                                      | 1  |
| 4. Functional Diagram.....                                                                                        | 1  |
| 5. Description.....                                                                                               | 1  |
| 6. Glossary of Terms .....                                                                                        | 3  |
| 7. Absolute Maximum Ratings.....                                                                                  | 3  |
| 8. US79 Electrical Specifications .....                                                                           | 3  |
| 9. US79 Magnetic Specifications.....                                                                              | 4  |
| 10. Unique Features.....                                                                                          | 4  |
| 11. Performance Graphs .....                                                                                      | 5  |
| 12. Applications Information.....                                                                                 | 6  |
| 13. Standard information regarding manufacturability of Melexis products with different soldering processes ..... | 7  |
| 14. ESD Precautions.....                                                                                          | 7  |
| 15. UA Package Information.....                                                                                   | 8  |
| 15.1. Hall plate location .....                                                                                   | 8  |
| 15.2. AAA000 Package variant .....                                                                                | 8  |
| 16. Revision history.....                                                                                         | 10 |
| 17. Contact.....                                                                                                  | 10 |
| 18. Disclaimer .....                                                                                              | 10 |

## 6. Glossary of Terms

MilliTesla (mT), Gauss: Units of magnetic flux density; 1 milliTesla = 10 Gauss.

Two-Coil Fan: a fan with two coil windings, current alternates from 1 coil to the other depending on the polarity of the magnetic field.

Two-wire Fan: A fan that has only two connections for the power supply plus and minus.

Locked rotor: The condition of a fan that has stopped spinning due to mechanical blockage .

## 7. Absolute Maximum Ratings

|                                    |               |
|------------------------------------|---------------|
| Supply Voltage, $V_{DD}$           | (-0.3 to 18)V |
| Output Current (Fault), $I_{OUT}$  | 500mA         |
| Operating Temperature Range, $T_A$ | -40 to 125°C  |
| Storage Temperature Range, $T_S$   | -55 to 165°C  |
| Maximum Junction Temp, $T_J$       | 150°C         |

Exceeding the absolute maximum ratings may cause permanent damage. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

## 8. US79 Electrical Specifications

DC operating parameters:  $T_A = 25^\circ\text{C}$ ,  $V_{DD} = 12\text{V}$  unless otherwise specified

| Parameter                 | Symbol    | Test Conditions          | Min | Typ | Max  | Units |
|---------------------------|-----------|--------------------------|-----|-----|------|-------|
| Supply Voltage            | $V_{DD}$  | Operating                | 3.5 | -   | 18   | V     |
| Supply Current            | $I_{DD}$  | Operating                |     | 1.4 | 2.0  | mA    |
| Output Saturation voltage | $V_{DSS}$ | $I_{OUT} = 150\text{mA}$ |     | 300 | 600  | mV    |
| Output Saturation voltage | $V_{DSS}$ | $I_{OUT} = 350\text{mA}$ |     | 650 | 1100 | mV    |
| Thermal resistance        | $R_{th}$  | Operating                |     | 190 |      | °C/W  |
| Locked-Rotor Period       | $t_{on}$  |                          |     | 0.8 |      | S     |
| Locked-Rotor period       | $t_{off}$ |                          |     | 5   |      | S     |

## 9. US79 Magnetic Specifications

DC operating parameters:  $T_A = 25^\circ\text{C}$ ,  $V_{DD} = 12\text{V}$  unless otherwise specified.

| Parameter     | Symbol    | Test Conditions | Min  | Typ  | Max | Units |
|---------------|-----------|-----------------|------|------|-----|-------|
| Operate Point | $B_{OP}$  | Operating       |      | 2.5  | 6.0 | mT    |
| Release Point | $B_{RP}$  | Operating       | -6.0 | -2.5 |     | mT    |
| Hysteresis    | $B_{HYS}$ | Operating       | 2.0  | 5.0  | -   | mT    |

## 10. Unique Features

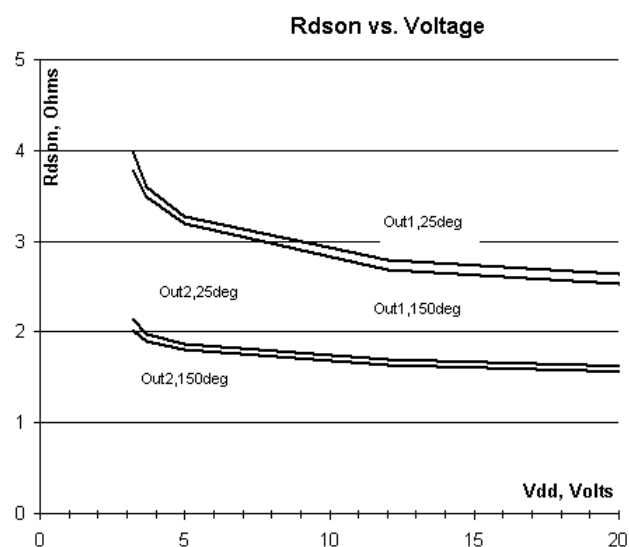
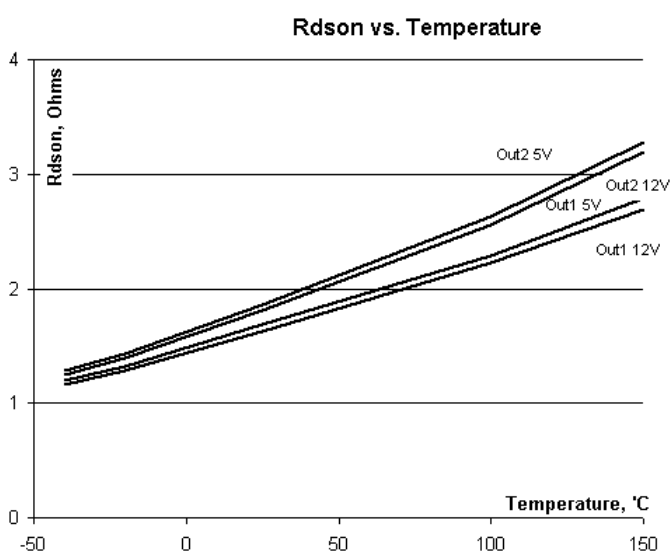
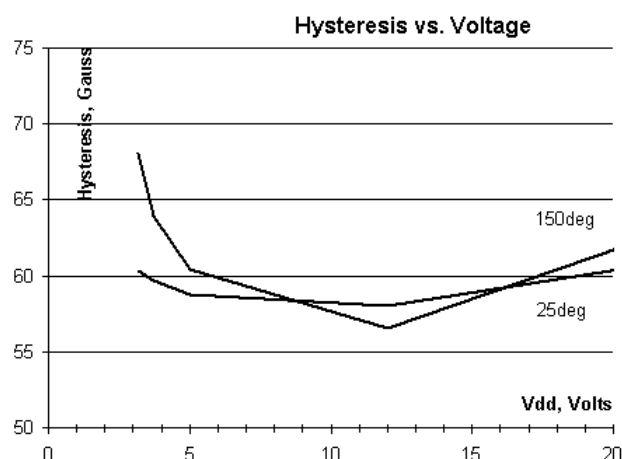
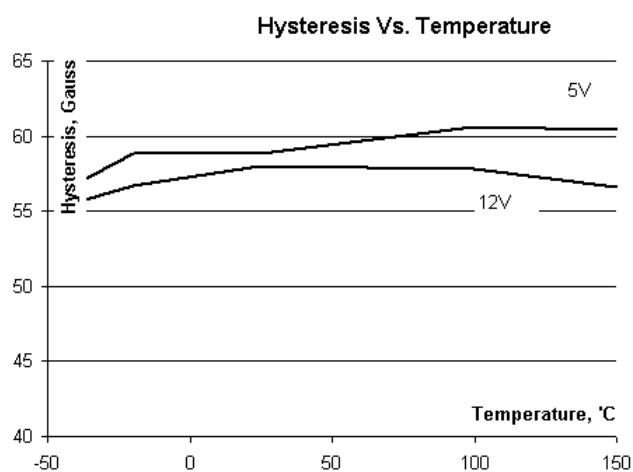
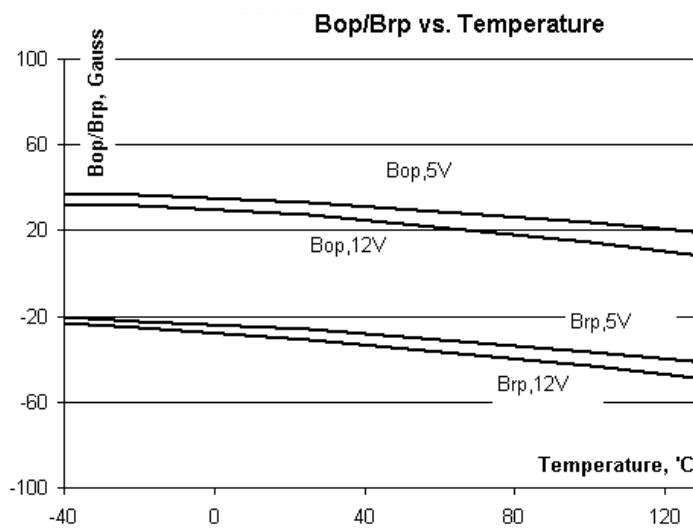
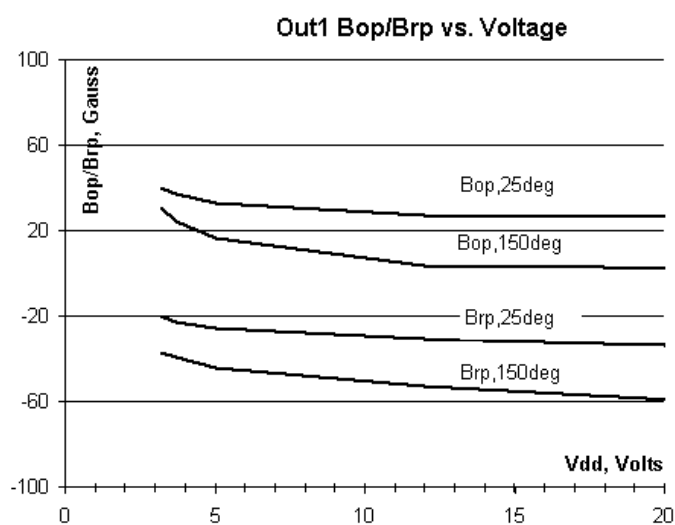
Reverse voltage protection eliminates the need for a diode. Reverse current flows through the coils and the chip. Power dissipation is  $(2 * I_{stall}/I_{start} * 0.7\text{V})$ .

Table 1 presents max temperature for each current.

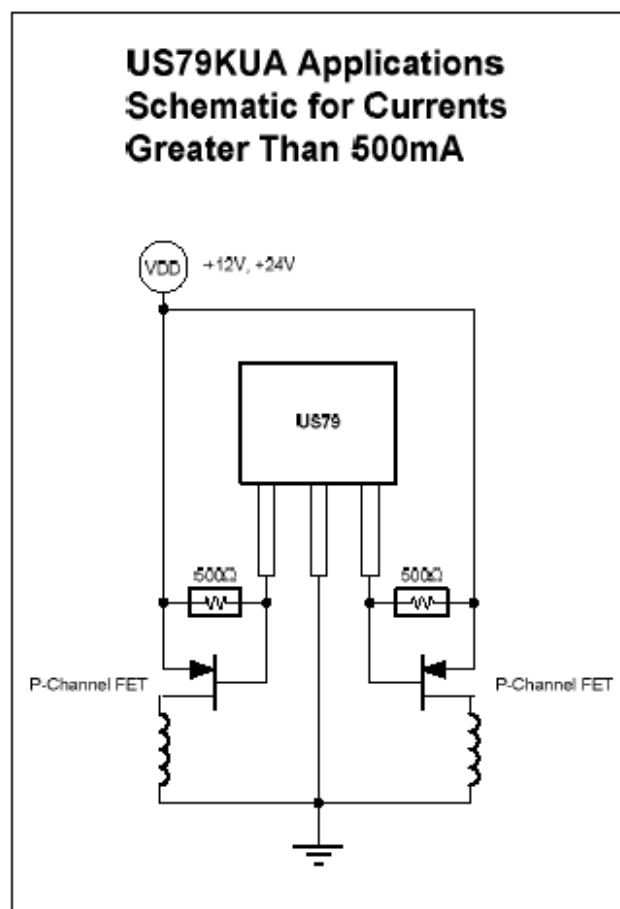
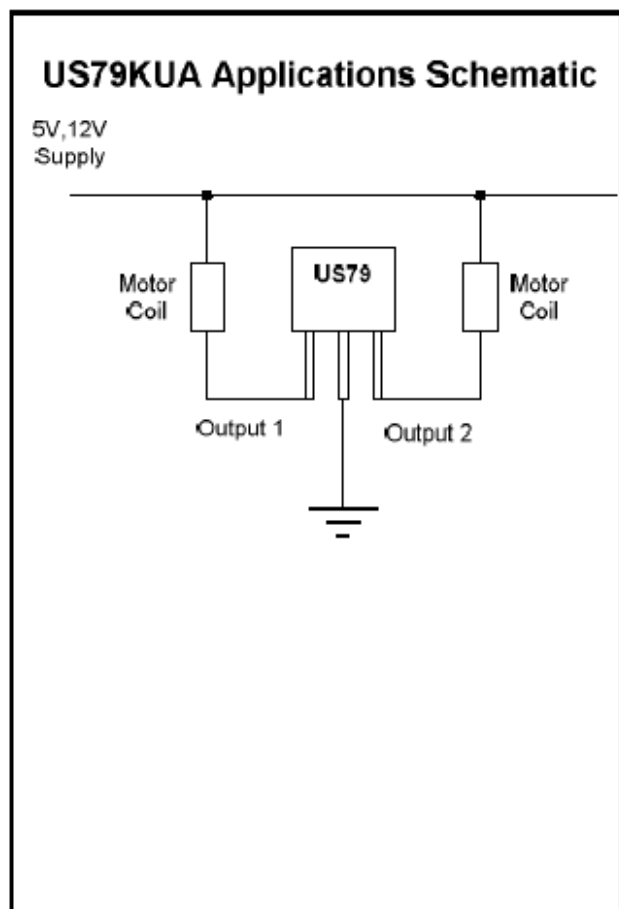
| $I_{stall}/I_{start}$ | $T_A$ Maximum Rev V Test |
|-----------------------|--------------------------|
| 100mA                 | 125°C                    |
| 200mA                 | 100°C                    |
| 300mA                 | 70°C                     |
| 400mA                 | 40°C                     |

Reverse Voltage protection is provided by the motor windings.  
The 35V Zener diodes clamp the output drivers for overstress protection.

## 11. Performance Graphs



## 12. Applications Information



## 13. Standard information regarding manufacturability of Melexis products with different soldering processes

Our products are classified and qualified regarding soldering technology, solderability and moisture sensitivity level according to following test methods:

### Reflow Soldering SMD's (Surface Mount Devices)

- IPC/JEDEC J-STD-020  
Moisture/Reflow Sensitivity Classification for Nonhermetic Solid State Surface Mount Devices (classification reflow profiles according to table 5-2)
- EIA/JEDEC JESD22-A113  
Preconditioning of Nonhermetic Surface Mount Devices Prior to Reliability Testing (reflow profiles according to table 2)

### Wave Soldering SMD's (Surface Mount Devices) and THD's (Through Hole Devices)

- EN60749-20  
Resistance of plastic- encapsulated SMD's to combined effect of moisture and soldering heat
- EIA/JEDEC JESD22-B106 and EN60749-15  
Resistance to soldering temperature for through-hole mounted devices

### Iron Soldering THD's (Through Hole Devices)

- EN60749-15  
Resistance to soldering temperature for through-hole mounted devices

### Solderability SMD's (Surface Mount Devices) and THD's (Through Hole Devices)

- EIA/JEDEC JESD22-B102 and EN60749-21  
Solderability

For all soldering technologies deviating from above mentioned standard conditions (regarding peak temperature, temperature gradient, temperature profile etc) additional classification and qualification tests have to be agreed upon with Melexis.

The application of Wave Soldering for SMD's is allowed only after consulting Melexis regarding assurance of adhesive strength between device and board.

Melexis recommends reviewing on our web site the General Guidelines [soldering recommendation](http://www.melexis.com/soldering-and-welding) ([www.melexis.com/soldering-and-welding](http://www.melexis.com/soldering-and-welding)) as well as [trim&form recommendations](http://www.melexis.com/lead-forming) ([www.melexis.com/lead-forming](http://www.melexis.com/lead-forming))

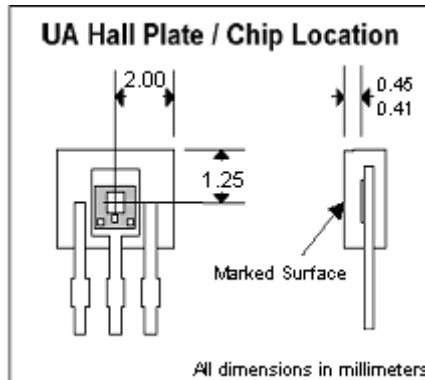
Melexis is contributing to global environmental conservation by promoting **lead free** solutions. For more information on qualifications of **RoHS** compliant products (RoHS = European directive on the Restriction Of the use of certain Hazardous Substances) please visit the quality page on our website: <https://www.melexis.com/environmental-forms-and-declarations>

## 14. ESD Precautions

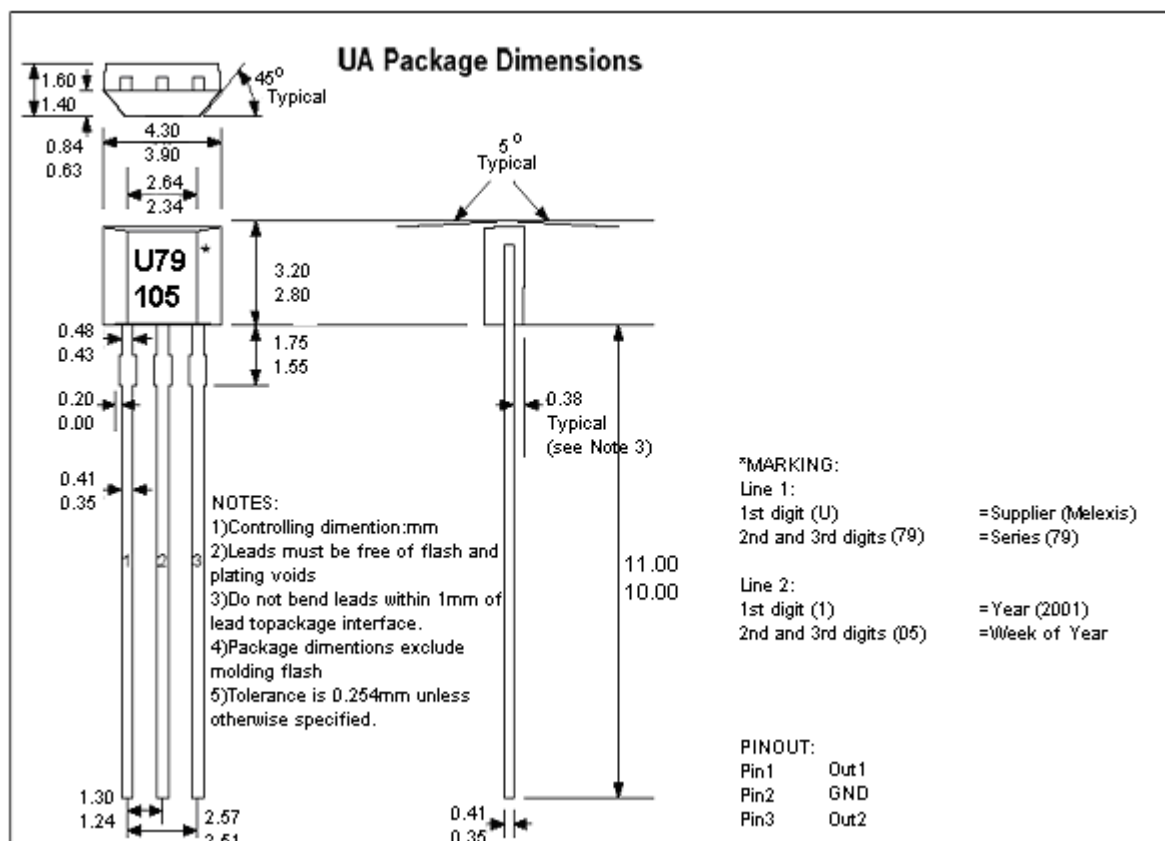
Electronic semiconductor products are sensitive to Electro Static Discharge (ESD).  
Always observe Electro Static Discharge control procedures whenever handling semiconductor products.

## 15. UA Package Information

### 15.1. Hall plate location



### 15.2. AAA000 Package variant



age 8 of 10



## 16. Revision history

| Rev | Date      | Author | Comment                                                                                                                                                                                     |
|-----|-----------|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 009 | 6-Jun-17  | DLM    | <ul style="list-style-type: none"><li>• New template</li><li>• Reduced IDD MAX specification to 2.0mA</li><li>• Updated solderability guidelines</li></ul>                                  |
| 010 | 15-Sep-21 | CEL    | <ul style="list-style-type: none"><li>• Removed the variant US79KUA-AAA-001-BU</li><li>• Chapter 13: links updated</li><li>• Contact section updated</li><li>• Disclaimer updated</li></ul> |

## 17. Contact

For the latest version of this document, go to our website at [www.melexis.com](http://www.melexis.com).

For additional information, please contact our [Direct Sales team](#) and get help for your specific needs:

|                |                                  |
|----------------|----------------------------------|
| Europe, Africa | Email : sales_europe@melexis.com |
| Americas       | Email : sales_usa@melexis.com    |
| Asia           | Email : sales_asia@melexis.com   |

## 18. Disclaimer

*The content of this document is believed to be correct and accurate. However, the content of this document is furnished "as is" for informational use only and no representation, nor warranty is provided by Melexis about its accuracy, nor about the results of its implementation. Melexis assumes no responsibility or liability for any errors or inaccuracies that may appear in this document. Customer will follow the practices contained in this document under its sole responsibility. This documentation is in fact provided without warranty, term, or condition of any kind, either implied or expressed, including but not limited to warranties of merchantability, satisfactory quality, non-infringement, and fitness for purpose. Melexis, its employees and agents and its affiliates' and their employees and agents will not be responsible for any loss, however arising, from the use of, or reliance on this document. Notwithstanding the foregoing, contractual obligations expressly undertaken in writing by Melexis prevail over this disclaimer.*

*This document is subject to change without notice, and should not be construed as a commitment by Melexis. Therefore, before placing orders or prior to designing the product into a system, users or any third party should obtain the latest version of the relevant information.*

*Users or any third party must determine the suitability of the product described in this document for its application, including the level of reliability required and determine whether it is fit for a particular purpose.*

*This document as well as the product here described may be subject to export control regulations. Be aware that export might require a prior authorization from competent authorities. The product is not designed, authorized or warranted to be suitable in applications requiring extended temperature range and/or unusual environmental requirements. High reliability applications, such as medical life-support or life-sustaining equipment or avionics application are specifically excluded by Melexis. The product may not be used for the following applications subject to export control regulations: the development, production, processing, operation, maintenance, storage, recognition or proliferation of:*

- 1. chemical, biological or nuclear weapons, or for the development, production, maintenance or storage of missiles for such weapons;*
- 2. civil firearms, including spare parts or ammunition for such arms;*
- 3. defense related products, or other material for military use or for law enforcement;*
- 4. any applications that, alone or in combination with other goods, substances or organisms could cause serious harm to persons or goods and that can be used as a means of violence in an armed conflict or any similar violent situation.*

*No license nor any other right or interest is granted to any of Melexis' or third party's intellectual property rights.*

*If this document is marked "restricted" or with similar words, or if in any case the content of this document is to be reasonably understood as being confidential, the recipient of this document shall not communicate, nor disclose to any third party, any part of the document without Melexis' express written consent. The recipient shall take all necessary measures to apply and preserve the confidential character of the document. In particular, the recipient shall (i) hold document in confidence with at least the same degree of care by which it maintains the confidentiality of its own proprietary and confidential information, but no less than reasonable care; (ii) restrict the disclosure of the document solely to its employees for the purpose for which this document was received, on a strictly need to know basis and providing that such persons to whom the document is disclosed are bound by confidentiality terms substantially similar to those in this disclaimer; (iii) use the document only in connection with the purpose for which this document was received, and reproduce document only to the extent necessary for such purposes; (iv) not use the document for commercial purposes or to the detriment of Melexis or its customers. The confidentiality obligations set forth in this disclaimer will have indefinite duration and in any case they will be effective for no less than 10 years from the receipt of this document.*

*This disclaimer will be governed by and construed in accordance with Belgian law and any disputes relating to this disclaimer will be subject to the exclusive jurisdiction of the courts of Brussels, Belgium.*

*The invalidity or ineffectiveness of any of the provisions of this disclaimer does not affect the validity or effectiveness of the other provisions.*

*The previous versions of this document are repealed.*

*Melexis © - No part of this document may be reproduced without the prior written consent of Melexis. (2021)*

*IATF 16949 and ISO 14001 Certified*