

MLX92223LUA-AAA

2-Wire Hall Effect Latch with Resistive Output Characteristic

1. Features and Benefits

- Emulates 392Ω resistor
- Wide operating voltage range: from 3.8V to 16V
- Reverse supply voltage protection
- Advanced thermal management with current limit and thermal protection
- Integrated decoupling capacitor for PCB less designs.

2. Application Examples

- Automotive, Consumer and Industrial
- Seat positioning
- Seat Motor

3. Ordering Information

Product Code	Temperature Code	Package Code	Option Code	Packing Form Code
MLX92223	L	UA	AAA-1xx	BU

Legend:

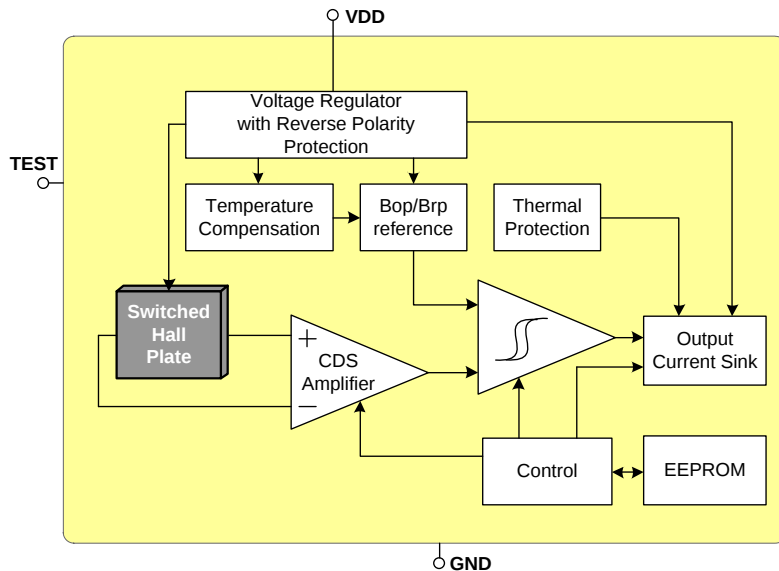
Temperature Code: L (-40°C to 150°C)
Package Code: UA = TO92-3L
Option Code: AAA-1xx = 2 wire hall effect Latch with integrated capacitor

Packing Form: BU = Bulk | RE = Reel | CA = Ammopack delivery
Ordering example: MLX92223LUA-AAA-1xx-BU

MLX92223LUA-AAA

2-Wire Hall Effect Latch with Resistive Output Characteristic

4. Functional Diagram



5. General Description

The Melexis MLX92223 is based on the Melexis Hall-effect switch latest platform, designed in mixed signal submicron CMOS technology.

The device integrates a voltage regulator, Hall sensor, current sink-configured output driver and integrated capacitor all in a single package.

The MLX92223 magnetic core is using an advanced offset cancellation system. In addition a pre-programmable temperature coefficient is implemented to compensate the natural behavior of certain types of magnets becoming weaker at high temperature.

The included voltage regulator operates from 3.8 to 16V, hence covering a wide range of applications. With the built-in reverse voltage protection, a series diode on the supply line is not required so that even remote sensors can be specified for low voltage operation down to 3.8V while being reverse voltage tolerant.

Advanced thermal management with current limit above $V_{DD} = 16.8V$ is implemented. The on-chip thermal protection switches the supply current below I_{PROT} if the junction temperature increases above the protection threshold T_{PROT} . It will automatically recover once the temperature decreases below T_{REL} .

The MLX92223 is delivered in a Green and RoHS compliant Plastic Single-in-Line (TO-92 flat) for through-hole mount and with integrated capacitor for PCB-less design.

Contents

1. Features and Benefits	1
2. Application Examples.....	1
3. Ordering Information.....	1
4. Functional Diagram.....	2
5. General Description	2
6. Glossary of Terms	4
7. Absolute Maximum Ratings	4
8. General Electrical Specifications	5
9. Magnetic Specifications	6
9.1. MLX92223LUA-AAA-100.....	6
10. Magnetic Behavior.....	6
10.1. Latch Sensor	6
11. Application Information	7
11.1. Typical Automotive Application Circuit	7
11.2. Supply Current Diagram	7
11.3. Power Dissipation Derating Curve	8
11.4. Voltage Derating Curve (valid for $R_S=182\Omega$)	8
12. Standard information regarding manufacturability of Melexis products with different soldering processes.....	9
13. ESD Precautions.....	9
14. Package Information.....	10
14.1. UA (TO92 - 3L) with integrated capacitor Package Information	10
15. Contact	11
16. Disclaimer	11

6. Glossary of Terms

Tesla	Units for the magnetic flux density, 1 mT = 10 Gauss
TC	Temperature Coefficient , ppm/°C
NC	Not Connected
POR	Power on Reset

7. Absolute Maximum Ratings

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

Parameter	Symbol	Conditions	Value	Units
Supply Voltage ^(1, 2)	V _{DD}		+28	V
Battery Voltage ^(1, 6)	V _B	1 min, R _S =182Ω±1%, T _A =85°C, B<B _{OP}	+24	V
Battery Voltage ^(1, 6)	V _B	1 min jump-start, R _S =182Ω±1%, T _A =25°C, B<B _{OP}	+26	V
Battery Voltage ^(1, 6)	V _B	0.5s load dump, R _S =182Ω±1%, T _A =25°C, B<B _{OP}	+35	V
Reverse Supply Voltage ^(1, 2)	V _{DDREV}		-24	V
Reverse Supply Voltage ⁽¹⁾	V _{DDREV}	For 500ms	-30	V
Maximum Junction Temperature ⁽³⁾	T _J		+165	°C
ESD Sensitivity – HBM ⁽⁴⁾	-		8	kV
ESD Sensitivity – CDM ⁽⁵⁾	-		1000	V
ESD Sensitivity – System ESD ⁽⁷⁾			8	kV
Magnetic Flux Density	B		Unlimited	mT

Table 1: Absolute maximum ratings

¹ The maximum junction temperature should not be exceeded

² For maximum 1 hour

³ For 1000 hours.

⁴ Human Model according AEC-Q100-002 standard

⁵ Charged Device Model according AEC-Q100-011 standard

⁶ Refer to section "Typical Automotive Application Circuit"

⁷ System level ESD, contact discharge VDD-GND (330Ω, 150pF)

8. General Electrical Specifications

Electrical Operating Parameters, $V_{DD} = 3.8V$ to $16V$, $T_J = -40^{\circ}C$ to $165^{\circ}C$ (unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ ⁽¹⁾	Max	Units
OFF Supply Current	I_{OFF}		4.5	-	7.5	mA
ON Supply Current	I_{ON}		-	$I_{OFF} + I_R$	-	mA
Proportional Supply Current Part	I_R	$V_{DD} = 3.8V$ to $16V$	-10%	$V_{DD}/392\Omega$	+10%	mA
		$V_{DD} > 16.8V$	36	43		mA
Protection Supply Current	I_{PROT}		-	-	1	mA
Reverse Supply Current	I_{DDREV}	$V_{DD} = -16V$	-1	-	-	mA
Supply Current Rise Time ⁽²⁾	$t_{R\,IDD}$	$V_B = 12V$, $R_S \leq 1\Omega$	0.7	1.7	4	μs
Supply Current Fall Time ⁽²⁾	$t_{F\,IDD}$	$V_B = 12V$, $R_S \leq 1\Omega$	0.4	1	2.5	μs
Supply Voltage Rise Time ⁽²⁾	$t_{R\,VDD}$	$V_B = 12V$, $R_S = 182\Omega$, $C_{bypass} = 68nF$	-	27	-	μs
Supply Voltage Fall Time ⁽²⁾	$t_{F\,VDD}$	$V_B = 12V$, $R_S = 182\Omega$, $C_{bypass} = 68nF$	-	19	-	μs
Power-On Time ^(3, 4)	t_{ON}	$V_{DD} = 5V$, $dV_{DD}/dt > 2V/\mu s$, $B < B_{OP} - 1mT$	-	40	70	μs
Chopping Frequency	f_{CHOP}		-	350	-	kHz
Maximum Switching Frequency ⁽²⁾	f_{SW}	Triangular magnetic field with $B_{pk-pk} \geq 10 \times B_{OP}$ $B_{OP} = -B_{RP} = 1mT$	-	50	-	kHz
Integrated bypass capacitor	C_{BP}		-	68	-	nF
Thermal Protection Activation	T_{PROT}		-	190 ⁽⁵⁾	-	$^{\circ}C$
Thermal Protection Release	T_{REL}		-	180 ⁽⁵⁾	-	$^{\circ}C$
UA Package Thermal Resistance	R_{THJA}		-	165	-	$^{\circ}C/W$

Table 2: General electrical parameters

¹ Typical values are defined at $T_A = +25^{\circ}C$ and $V_{DD} = 12V$.

² Guaranteed by design and verified by characterization, not production tested.

³ The Power-On Time represents the time from reaching $V_{DD} = 3.8V$ to the first refresh of the supply current state.

⁴ Power-On Slew Rate is not critical for the proper device start-up.

⁵ T_{PROT} and T_{REL} are the corresponding junction temperature values.

9. Magnetic Specifications

9.1. MLX92223LUA-AAA-100

Magnetic Parameters, $V_{DD} = 3.8V$ to $16V$, $T_J = -40^{\circ}C$ to $165^{\circ}C$ (unless otherwise specified)

Test Condition	Operating Point B_{OP} (mT)			Release Point B_{RP} (mT)		
	Min	Typ ⁽¹⁾	Max	Min	Typ ⁽¹⁾	Max
$T_J = -40^{\circ}C$	-16	-10	-6	6	10	16
$T_J = 25^{\circ}C$	-14	-10	-7	7	10	14
$T_J = 150^{\circ}C$	-16	-10	-6	6	10	16

10. Magnetic Behavior

10.1. Latch Sensor

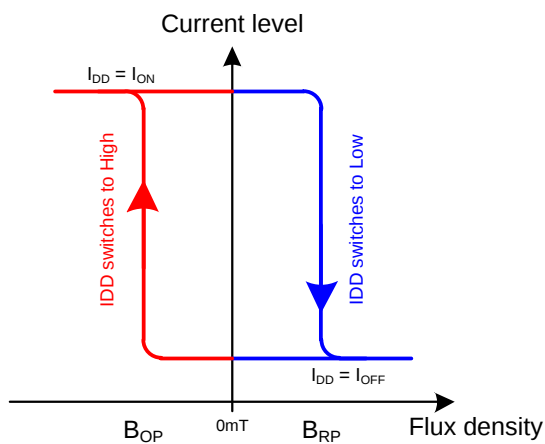
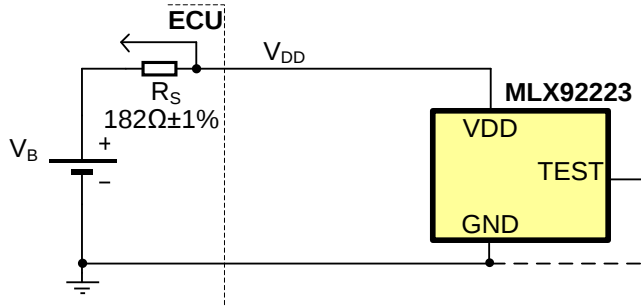


Fig.1 – North Pole Active

¹ Typical values are defined at $T_A = +25^{\circ}C$ and $V_{DD} = 12V$.

11. Application Information

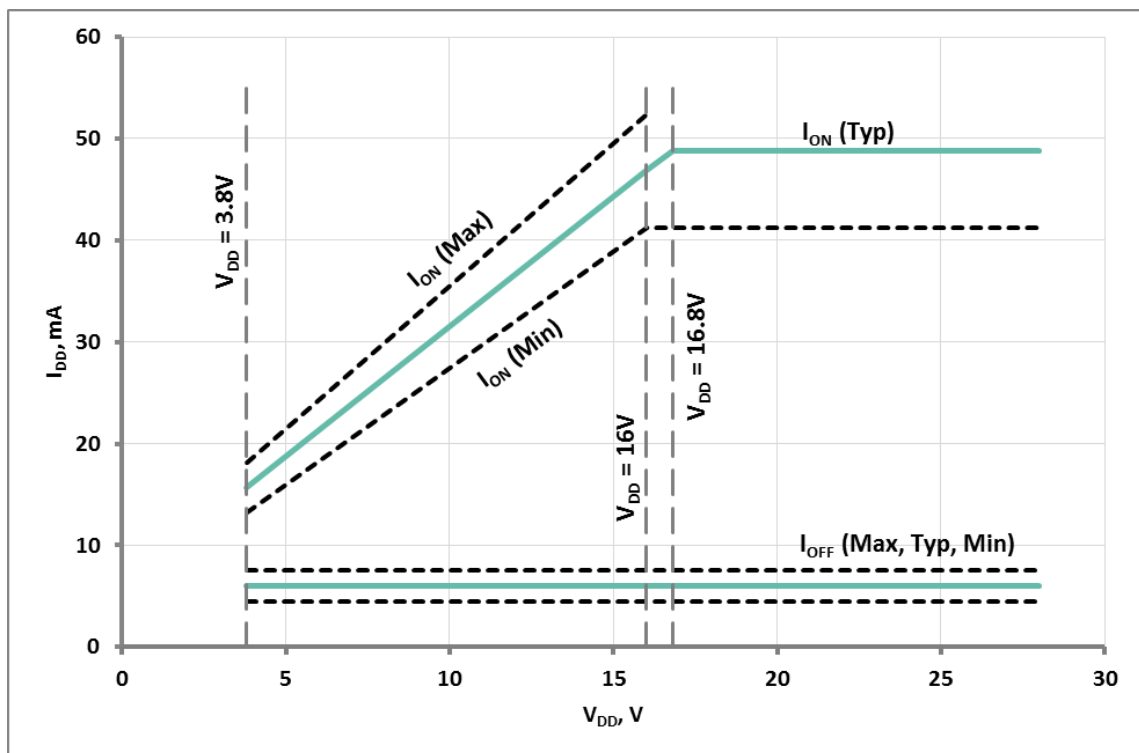
11.1. Typical Automotive Application Circuit



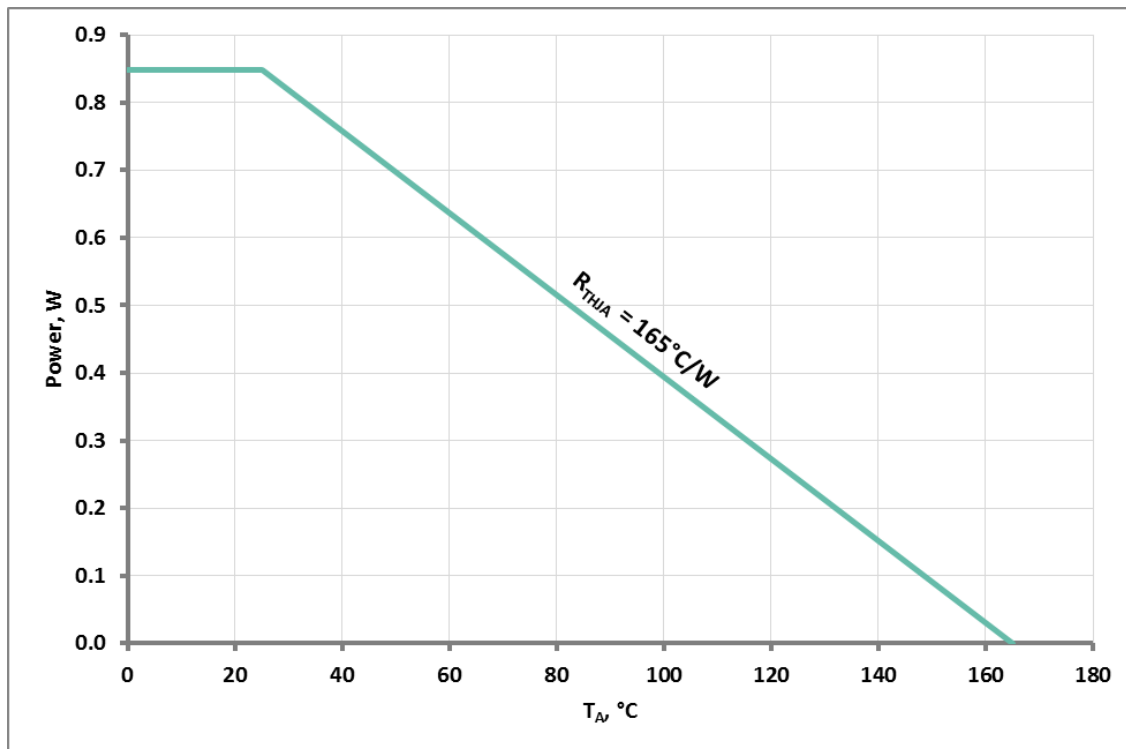
Notes:

1. For proper operation R_S should be equal or higher than 50Ω.
2. The TEST pin is to be connected to GND or left open.

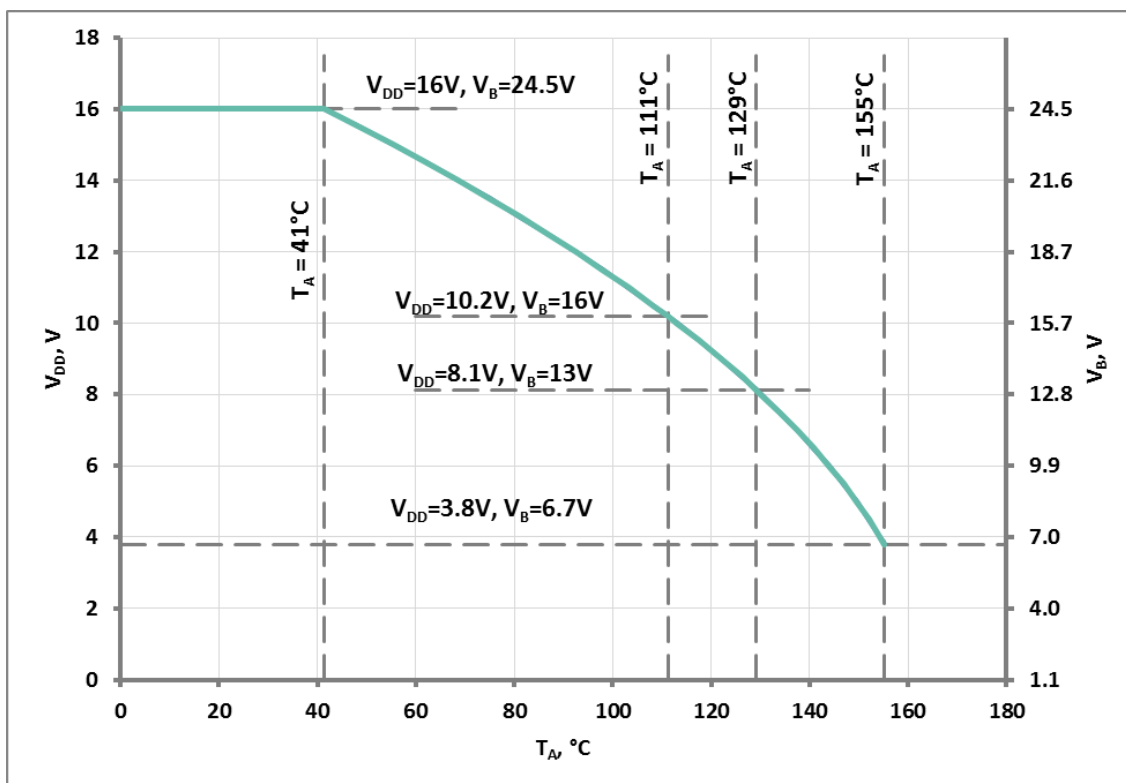
11.2. Supply Current Diagram



11.3. Power Dissipation Derating Curve



11.4. Voltage Derating Curve (valid for $R_S=182\Omega$)



12. 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 Device)s

- 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 Device)s and THD's (Through Hole Device)s

- 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 Device)s

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

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

- 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/Quality_soldering.aspx) as well as trim&form recommendations (<http://www.melexis.com/Assets/Trim-and-form-recommendations-5565.aspx>).

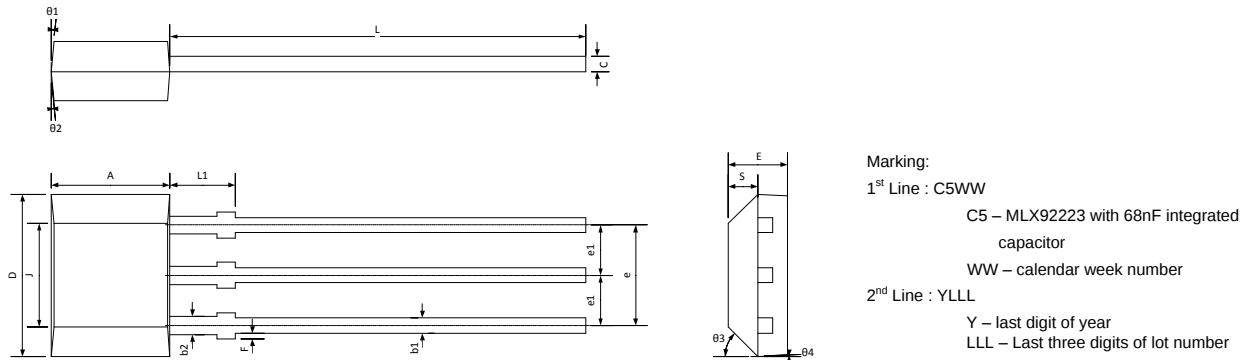
Melexis is contributing to global environmental conservation by promoting **lead free** solutions. For more information on qualifications of **RoHS** compliant products (RoHS = European directive on the Restriction Of the use of certain Hazardous Substances) please visit the quality page on our website: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

13. ESD Precautions

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

14. Package Information

14.1. UA (TO92 - 3L) with integrated capacitor Package Information

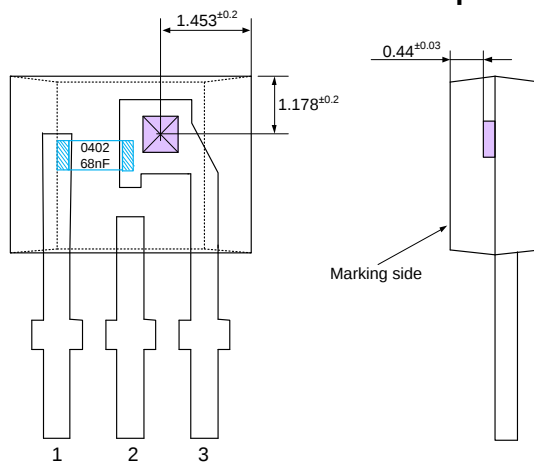


	A	D	E	F	J	L	L1	S	b1	b2	c	e	e1
min	2.80	3.90	1.40	0.00	2.51	14.0	0.90	0.63	0.35	0.43	0.35	2.51	1.24
max	3.20	4.30	1.60	0.20	2.72	15.0	1.10	0.84	0.44	0.52	0.44	2.57	1.30
	θ1	θ2	θ3	θ4									
min	7° REF	7° REF	45° REF	7° REF									
max													

Notes:

1. All dimensions are in millimeters.
2. Mold flashes and protrusion are not included.
3. Gate burrs shall not exceed 0.127mm on the top side.

Hall plate location



Notes:

1. All dimensions are in millimeters
2. Mold flashes and protrusion are not included.

Pin №	Name	Type	Function
1	VDD	Supply	Supply Voltage pin
2	TEST	I/O	For Melexis use only
3	GND	Ground	Ground pin

15. Contact

For the latest version of this document, go to our website at www.melexis.com.

For additional information, please contact our Direct Sales team and get help for your specific needs:

Europe, Africa	Telephone: +32 13 67 04 95
	Email : sales_europe@melexis.com
Americas	Telephone: +1 603 223 2362
	Email : sales_usa@melexis.com
Asia	Email : sales_asia@melexis.com

16. Disclaimer

The information furnished by Melexis herein ("Information") is believed to be correct and accurate. Melexis disclaims (i) any and all liability in connection with or arising out of the furnishing, performance or use of the technical data or use of the product(s) as described herein ("Product") (ii) any and all liability, including without limitation, special, consequential or incidental damages, and (iii) any and all warranties, express, statutory, implied, or by description, including warranties of fitness for particular purpose, non-infringement and merchantability. No obligation or liability shall arise or flow out of Melexis' rendering of technical or other services.

The Information is provided "as is" and Melexis reserves the right to change the Information at any time and without notice. Therefore, before placing orders and/or prior to designing the Product into a system, users or any third party should obtain the latest version of the relevant information to verify that the information being relied upon is current.

Users or any third party must further determine the suitability of the Product for its application, including the level of reliability required and determine whether it is fit for a particular purpose.

The Information is proprietary and/or confidential information of Melexis and the use thereof or anything described by the Information does not grant, explicitly or implicitly, to any party any patent rights, licenses, or any other intellectual property rights.

This document as well as the Product(s) may be subject to export control regulations. Please be aware that export might require a prior authorization from competent authorities.

The Product(s) are intended for use in normal commercial applications. Unless otherwise agreed upon in writing, the Product(s) are 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 are specifically not recommended by Melexis.

The Product(s) 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.

The Products sold by Melexis are subject to the terms and conditions as specified in the Terms of Sale, which can be found at <https://www.melexis.com/en/legal/terms-and-conditions>.

This document supersedes and replaces all prior information regarding the Product(s) and/or previous versions of this document.

Melexis NV © - No part of this document may be reproduced without the prior written consent of Melexis. (2016)

ISO/TS 16949 and ISO14001 Certified

Компания «Life Electronics» занимается поставками электронных компонентов импортного и отечественного производства от производителей и со складов крупных дистрибьюторов Европы, Америки и Азии.

С конца 2013 года компания активно расширяет линейку поставок компонентов по направлению коаксиальный кабель, кварцевые генераторы и конденсаторы (керамические, пленочные, электролитические), за счёт заключения дистрибьюторских договоров

Мы предлагаем:

- Конкурентоспособные цены и скидки постоянным клиентам.
- Специальные условия для постоянных клиентов.
- Подбор аналогов.
- Поставку компонентов в любых объемах, удовлетворяющих вашим потребностям.
- Приемлемые сроки поставки, возможна ускоренная поставка.
- Доставку товара в любую точку России и стран СНГ.
- Комплексную поставку.
- Работу по проектам и поставку образцов.
- Формирование склада под заказчика.
- Сертификаты соответствия на поставляемую продукцию (по желанию клиента).
- Тестирование поставляемой продукции.
- Поставку компонентов, требующих военную и космическую приемку.
- Входной контроль качества.
- Наличие сертификата ISO.

В составе нашей компании организован Конструкторский отдел, призванный помогать разработчикам, и инженерам.

Конструкторский отдел помогает осуществить:

- Регистрацию проекта у производителя компонентов.
- Техническую поддержку проекта.
- Защиту от снятия компонента с производства.
- Оценку стоимости проекта по компонентам.
- Изготовление тестовой платы монтаж и пусконаладочные работы.



Тел: +7 (812) 336 43 04 (многоканальный)

Email: org@lifeelectronics.ru

www.lifeelectronics.ru