Melexis
Microelectronic Integrated Systems

US1881

CMOS Multi-purpose latch

Features and Benefits

- Chopper stabilized amplifier stage
- Optimized for BDC motor applications
- New miniature package / thin, high reliability package
- Operation down to 3.5V
- CMOS for optimum stability, quality and cost

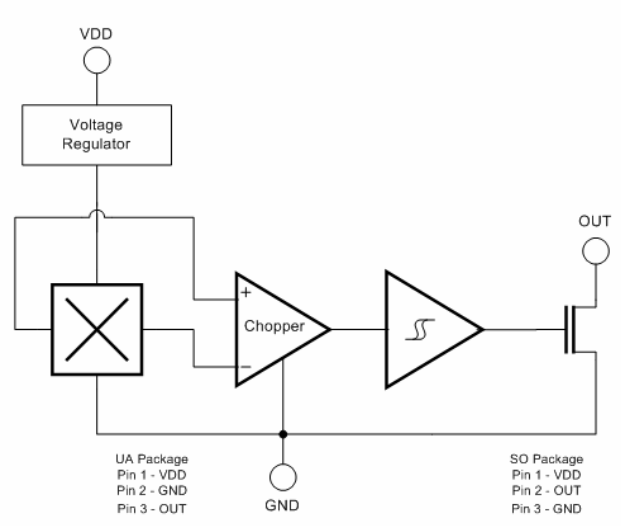
Applications

- Solid state switch
- Brushless DC motor commutation
- Speed sensing
- Linear position sensing
- Angular position sensing
- Current sensing

Ordering Information

Part No.	Temperature Suffix	Package Code
US1881	E (-40℃ to 85℃)	UA (TO – 92) or SO (SOT – 23)
US1881	K (-40℃ to 125℃)	UA (TO – 92) or SO (SOT – 23)
US1881	L (-40℃ to 150℃)	UA (TO – 92) or SO (SOT – 23)

1. Functional Diagram



Note: This is a static-sensitive device. Please observe ESD precautions. Reverse VDD protection is not included. For reverse voltage protection a 100Ohms resistor in series with VDD is recommended.

2. Description

The US1881 is the industry's first Hall integrated circuit in a SOT – 23 package. The US1881 is a bipolar Hall Effect sensor IC fabricated from mixed signal CMOS technology It incorporates advanced chopper stabilization techniques to provide accurate and stable magnetic switch points. There are many applications for this HED in addition to those listed above. The design, specifications and performance have been optimized for commutation applications in 5V and 12V brushless DC motors.

The output transistor will be latched on (B_{OP}) in the presence of a sufficiently strong South pole magnetic field facing the marked side of the package. Similarly, the output will be latched off (B_{RP}) in the presence of a North field.

The SOT – 23 device is reversed from the UA package. The SOT – 23 output transistor will be latched on in the presence of a sufficiently strong North pole magnetic field subjected to the marked face

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3. Glossary of Terms

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

4. Absolute Maximum Ratings

Supply Voltage (Operating), V_{DD}	3.5 to 24V
Supply Current (Fault), I_{DD}	50mA
Output Voltage, V_{OUT}	3.5 to 24V
Output Current (Fault), I_{OUT}	50mA
Power Dissipation, P_D	100mW
Operating Temperature Range, T_A	-40 to 150℃
Storage Temperature Range, T_S	-65 to 150℃
Maximum Junction Temp UA Package, T_{JUA}	175℃
Maximum Junction Temp SOT Package, T_{JSOT}	150℃

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

5. US1881 Electrical Specifications

DC operating parameters: T_A = 25°C, V_{DD} = 12VDC (unless otherwise specified).

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Supply Voltage	VDD	Operating	3.5		24	V
Supply current	I_{DD}	B<B_{OP}	1.1	2.5	5.0	mA
Saturation Voltage	$V_{DS(on)}$	I_{OUT} = 20 mA, B>B_{OP}		0.4	0.5	V
Output Leakage	I_{OFF}	B<B_{RP}, V_{OUT} = 24V		0.01	10.0	uA
Output Rise Time	tr	V_{DD} = 12V, R_L = 1.1K, C_L = 20pF		0.04		us
Output Fall Time	tf	V_{DD} = 12V, R_L = 1.1K, C_L = 20pF		0.18		us

6. US1881 Magnetic Specifications

DC operating parameters: T_A = 25°C, V_{DD} = 12V_{DC} (unless otherwise specified).

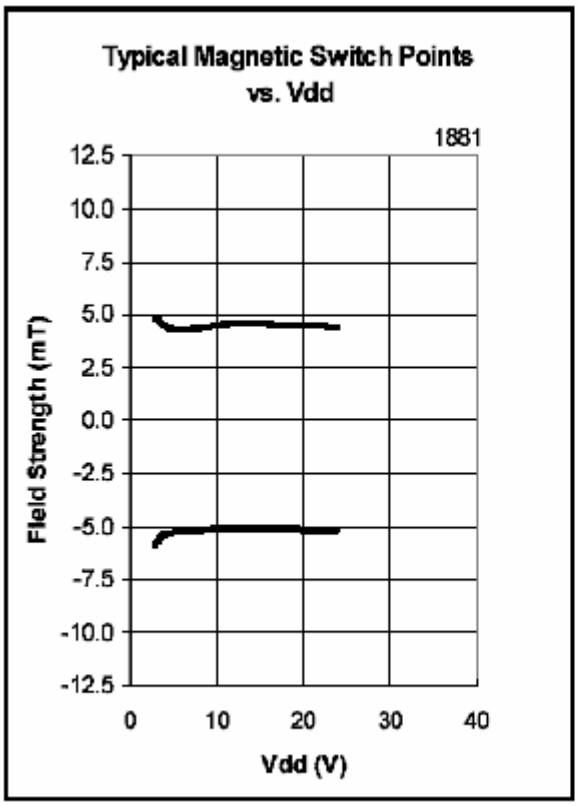
Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Operating Point	B_{OP}	EUA,ESO, LUA, LSO 25 ℃, Vdd=3.5 & 24V DC	1.0	5.0	9.0	mT
Release Point	B_{RP}	EUA,ESO, LUA, LSO 25 ℃, Vdd=3.5 & 24V DC	-9.0	-5.0	-1.0	mT
Hysteresis	B_{HYS}	EUA,ESO, LUA, LSO 25 ℃, Vdd=3.5 & 24V DC	7	10.0	12.0	mT
Operating Point	B_{OP}	EUA,ESO 85 ℃, Vdd=3.5 & 24V DC	0.5	5.0	9.5	mT
Release Point	B_{RP}	EUA,ESO 85 ℃, Vdd=3.5 & 24V DC	-9.5	-5.0	-0.5	mT
Hysteresis	B_{HYS}	EUA,ESO 85 ℃, Vdd=3.5 & 24V DC	7.0	10.0	12.0	mT
Operating Point	B_{OP}	LUA, LSO 150 ℃, Vdd=3.5 & 24V DC	0.5	5.0	9.5	mT
Release Point	B_{RP}	LUA, LSO 150 ℃, Vdd=3.5 & 24V DC	-9.5	-5.0	-0.5	mT
Hysteresis	B_{HYS}	LUA, LSO 150 ℃, Vdd=3.5 & 24V DC	6.0	10.0	12.5	mT

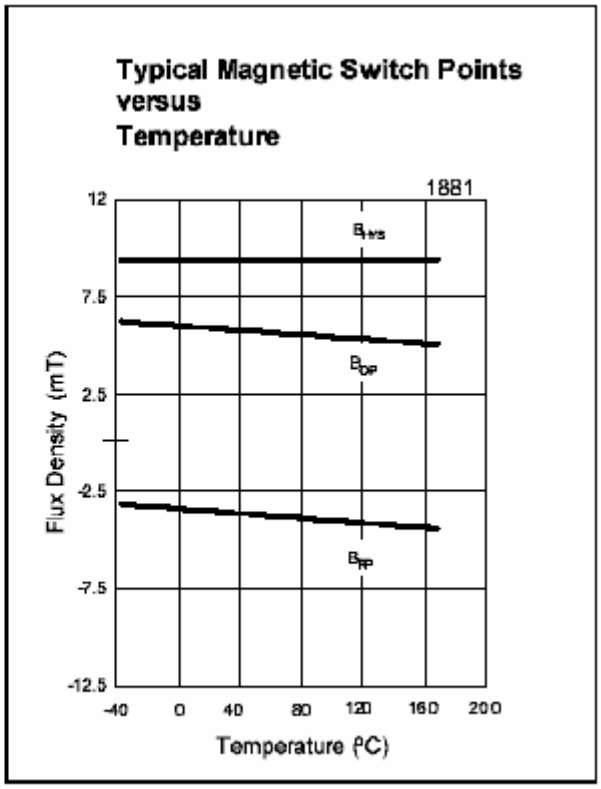
7. Unique Features

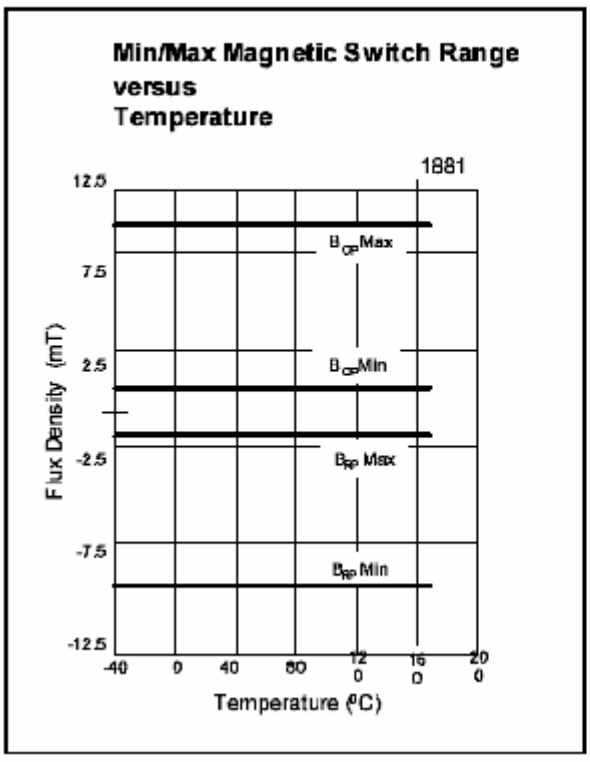
CMOS Hall IC Technology

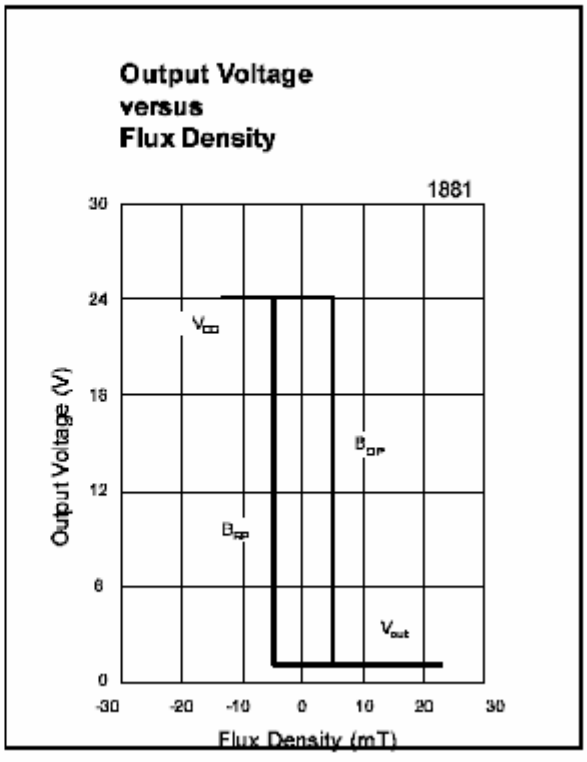
The chopper stabilized amplifier uses switched capacitor techniques to eliminate the amplifier offset voltage, which, in bipolar devices, is a major source of temperature sensitive drift. CMOS makes this advanced technique possible. The CMOS chip is also much smaller than a bipolar chip, allowing very sophisticated circuitry to be placed in less space. The small chip size also contributes to lower physical stress and less power consumption.

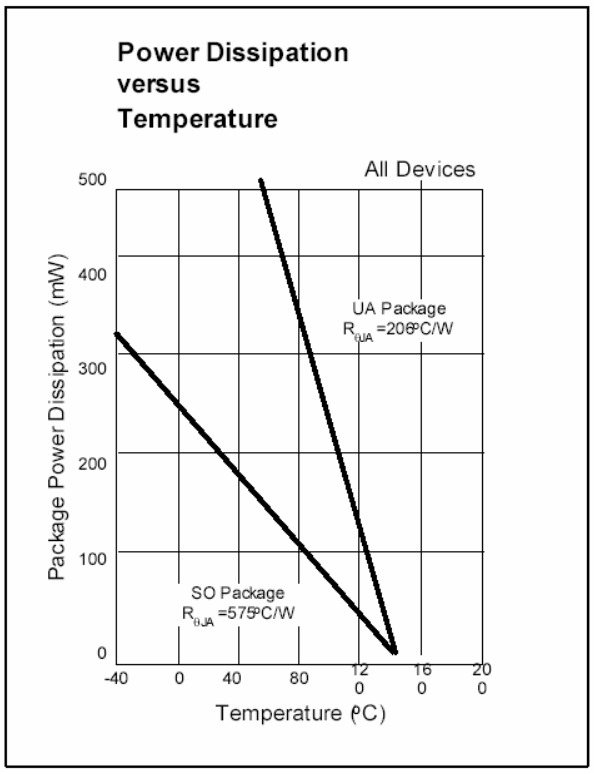
8. Performance Graphs

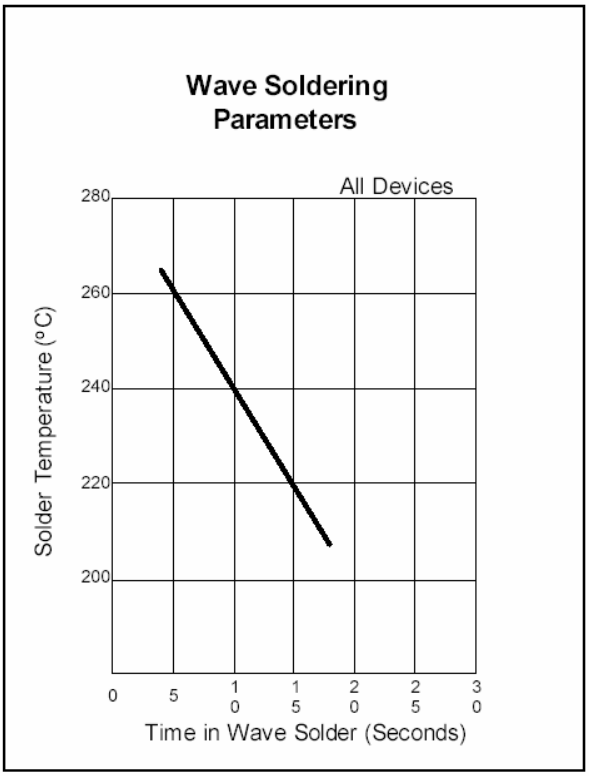




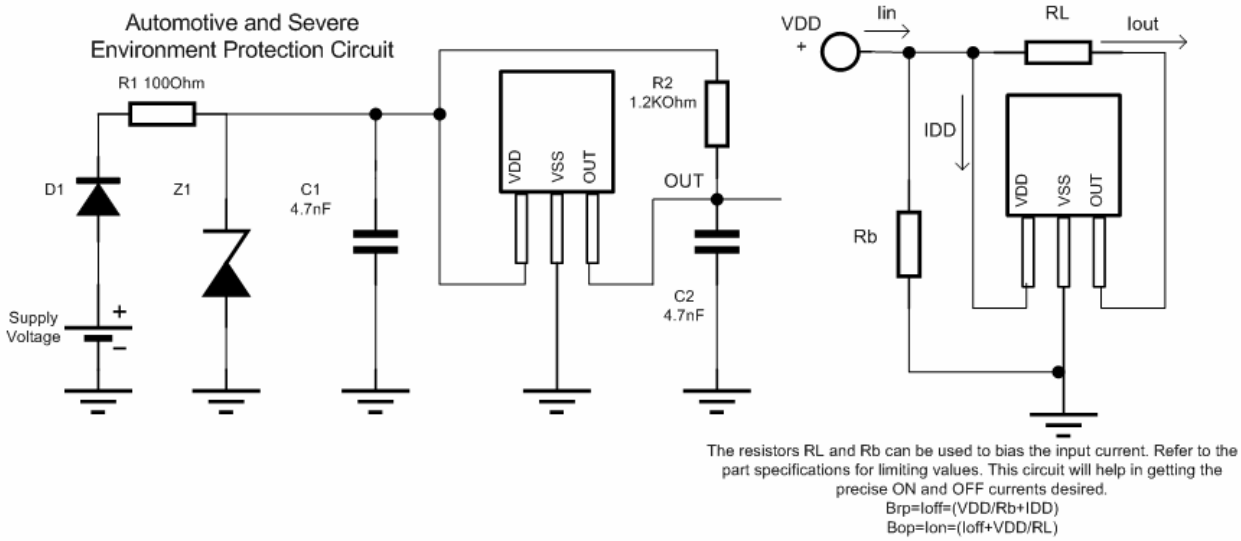








9. Applications Information



If reverse supply protection is desired, use a resistor in series with the V_{DD} pin. The resistor will limit the supply current (Fault), I_{DD}, to 50 mA. For severe EMC conditions, use the application circuit on this page.

10. Reliability Information

This Melexis device is classified and qualified regarding soldering technology, solderability and moisture sensitivity level, as defined in this specification, according to following test methods:

- 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)
- CECC00802
  Standard Method For The Specification of Surface Mounting Components (SMDs) of Assessed Quality
- EIA/JEDEC JESD22-B106
  Resistance to soldering temperature for through-hole mounted devices
- EN60749-15
  Resistance to soldering temperature for through-hole mounted devices
- MIL 883 Method 2003 / EIA/JEDEC JESD22-B102
  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.

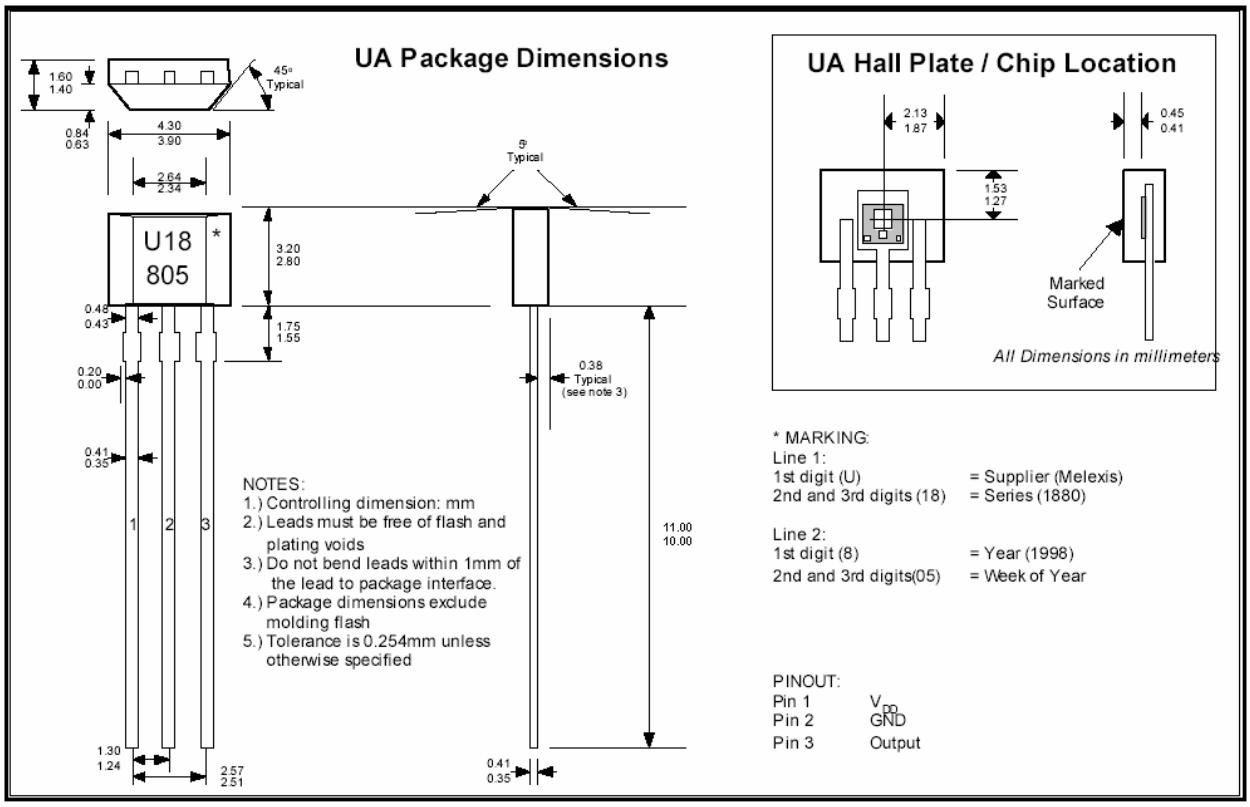
Based on Melexis commitment to environmental responsibility, European legislation (Directive on the Restriction of the Use of Certain Hazardous substances, RoHS) and customer requests, Melexis has installed a Roadmap to qualify their package families for lead free processes also.
Various lead free generic qualifications are running, current results on request.

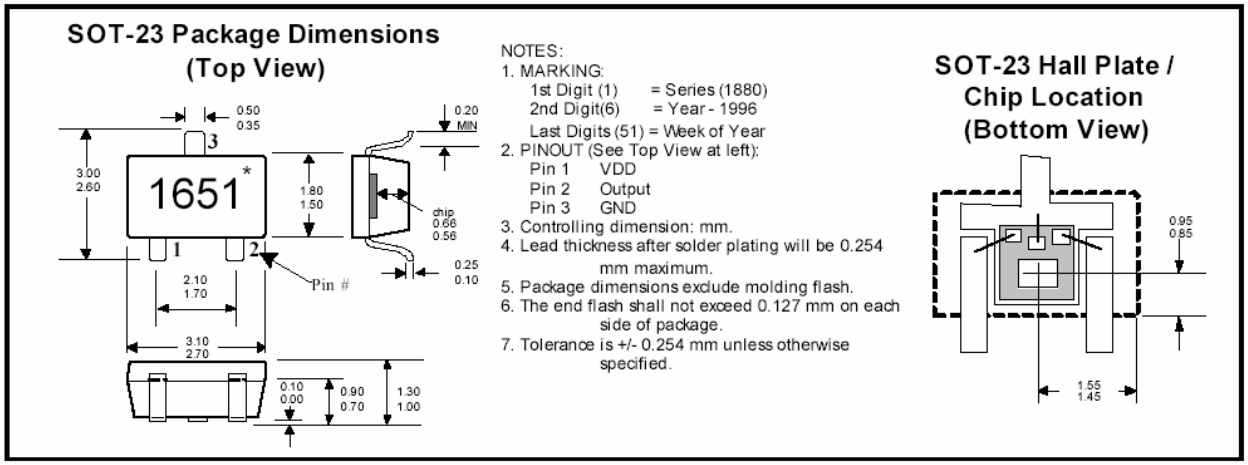
For more information on manufacturability/solderability see quality page at our website:
http://www.melexis.com/html/pdf/MLXleadfree-statement.pdf

11. ESD Precautions

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

12. Package Information





13. Disclaimer

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Or for additional information contact Melexis Direct:

Europe and Japan:
Phone: +32 13 67 04 95
E-mail: sales_europe@melexis.com

All other locations:
Phone: +1 603 223 2362
E-mail: sales_usa@melexis.com

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