

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

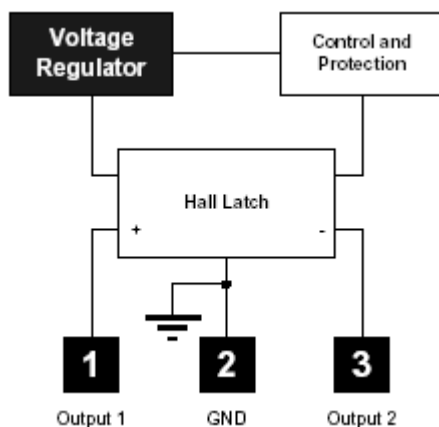
2. Applications

- 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.

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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: $T_A = 25\text{ }^\circ\text{C}$, $V_{DD} = 12\text{V}$ 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		$^\circ\text{C/W}$
Locked-Rotor Period	t_{ON}			0.8		S
Locked-Rotor period	t_{OFF}			5		S

9. US79 Magnetic Specifications

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

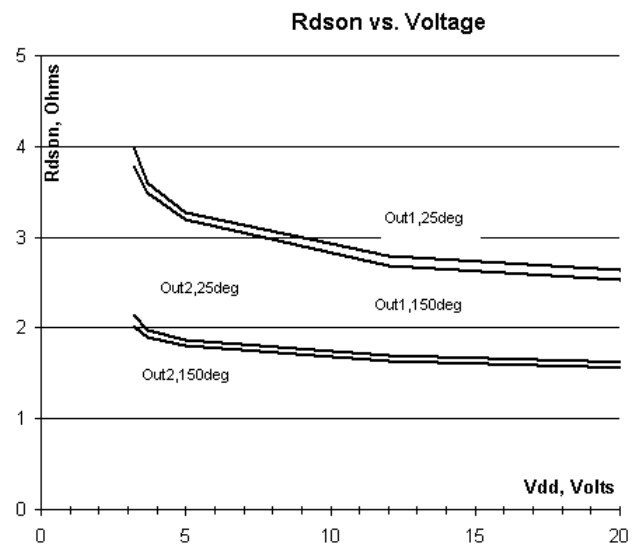
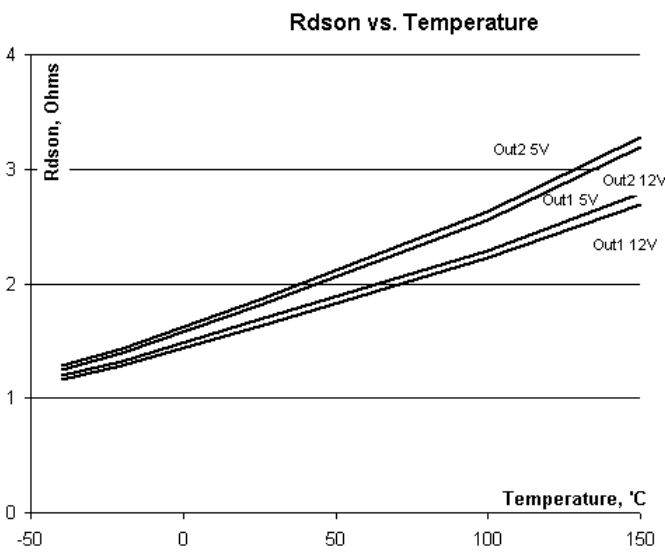
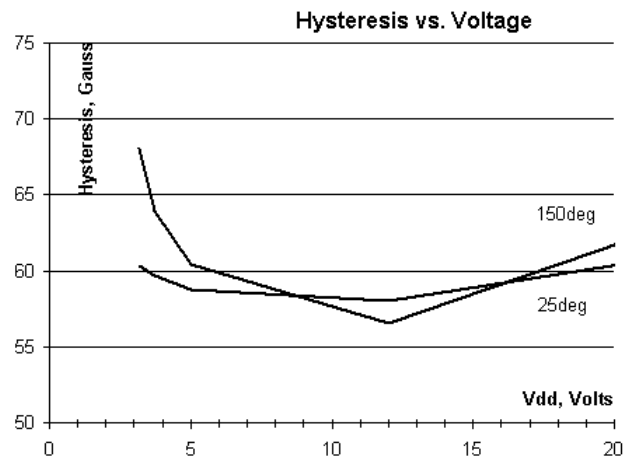
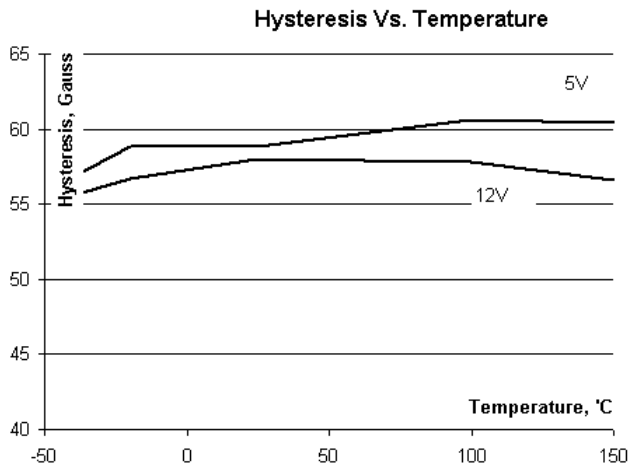
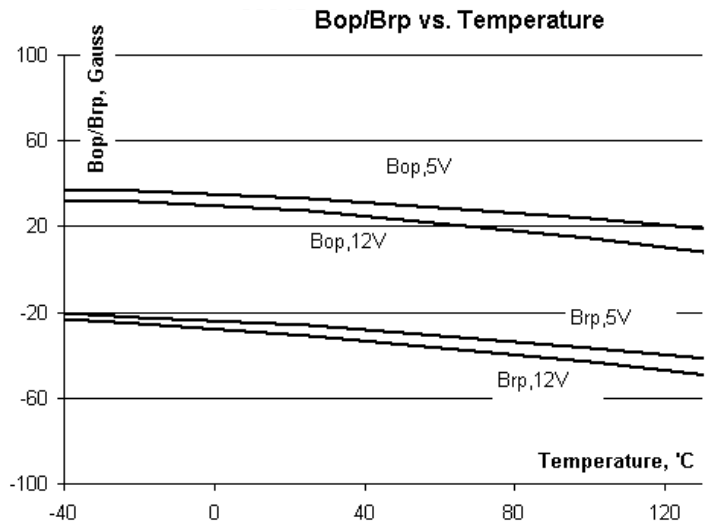
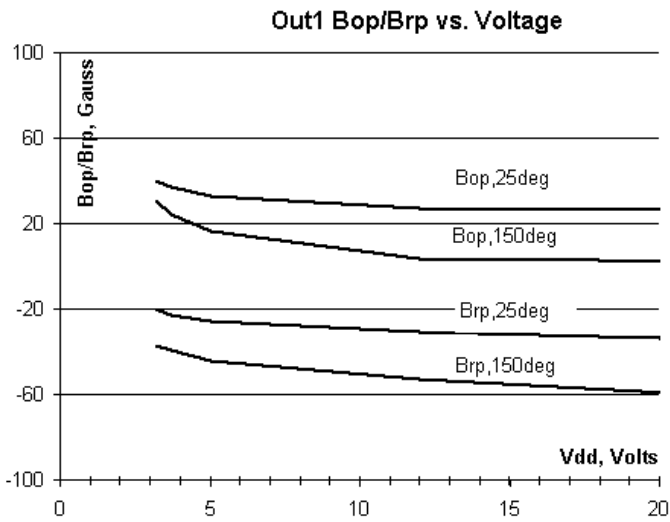
Reverse voltage protection eliminates the need for a diode. Reverse current flows through the coils and the chip. Power dissipation is $(2 * I_{stall}/I_{start} * 0.7\text{V})$.

Table 1 presents max temperature for each current.

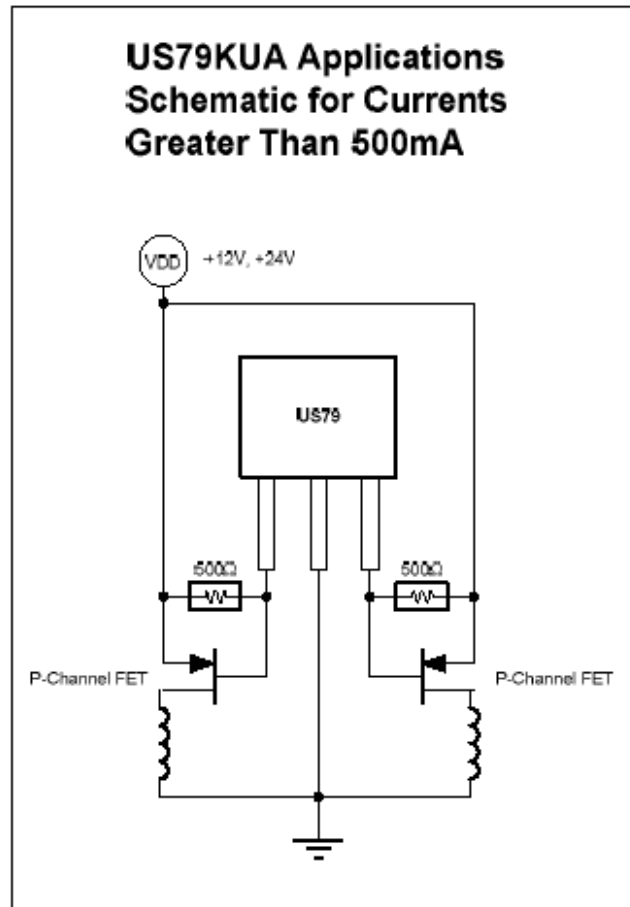
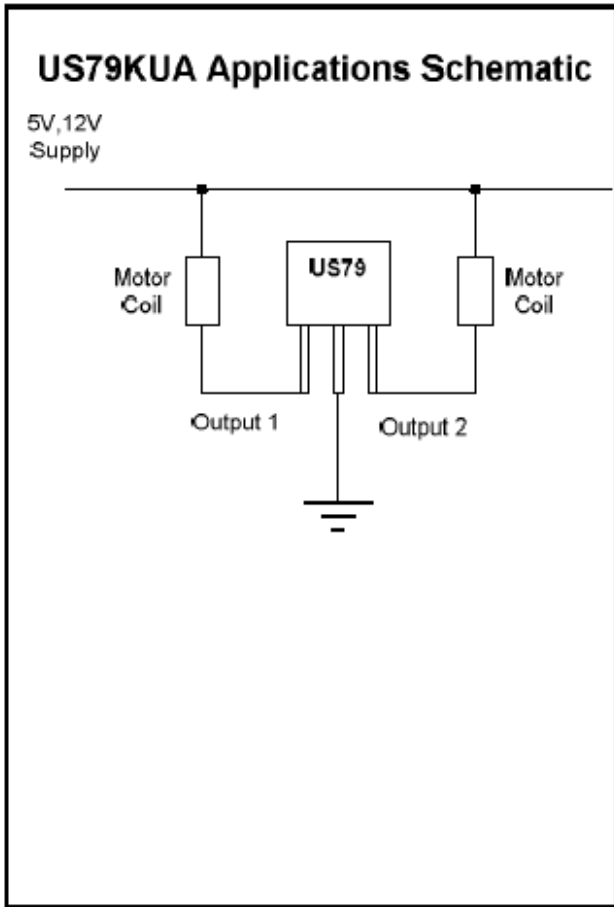
I_{stall}/ I_{start}	T_A Maximum Rev V Test
100mA	125°C
200mA	100°C
300mA	70°C
400mA	40°C

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) as well as [trim&form recommendations](http://www.melexis.com/lead-forming) (www.melexis.com/lead-forming)

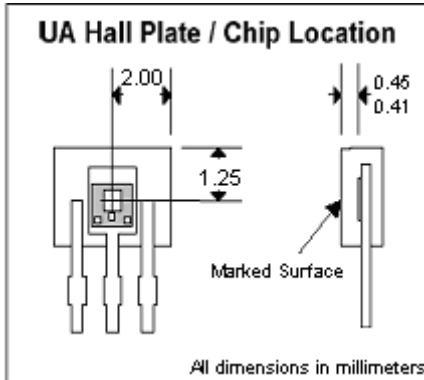
Melexis is contributing to global environmental conservation by promoting **lead free** solutions. For more information on qualifications of **RoHS** compliant products (RoHS = European directive on the Restriction Of the use of certain Hazardous Substances) please visit the quality page on our website: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

14. ESD Precautions

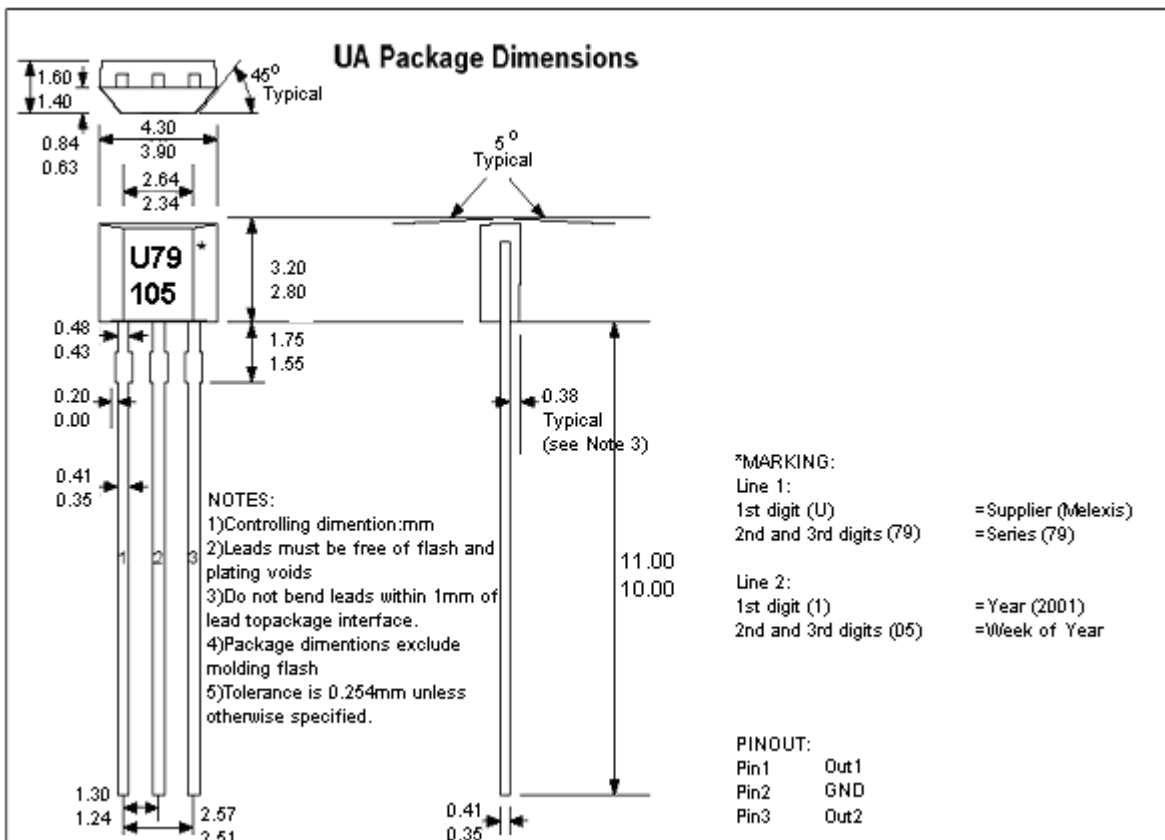
Electronic semiconductor products are sensitive to Electro Static Discharge (ESD). Always observe Electro Static Discharge control procedures whenever handling semiconductor products.

15. UA Package Information

15.1. Hall plate location



15.2. AAA000 Package variant



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16. Revision history

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

17. Contact

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