Melexis
Microelectronic Integrated Systems

US79 Series

CMOS Power Hall IC

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

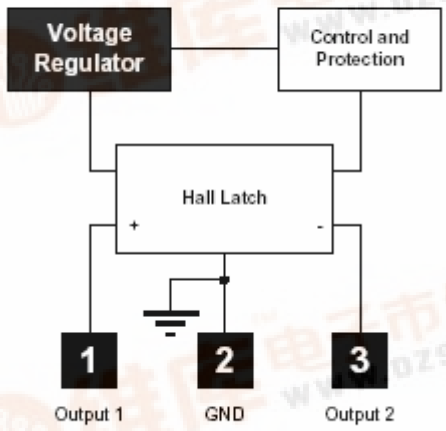
Applications

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

Ordering Information

Part No.	Temperature Suffix	Package Code
US79	K (-40℃ to 125℃)	UA (TO-92 flat)

1. *Functional Diagram*



2. *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℃. 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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3. *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 .

4. *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℃
Storage Temperature Range, T_S	-55 to 165℃
Maximun Junction Temp, T_J	150℃

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

5. *US79 Electrical Specifications*

DC operating parameters: T_A = 25 °C, V_{DD} = 12V 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		2.0	4	mA
Output Saturation voltage	V_{DSS}	I_{OUT} = 150mA		300	600	mV
Output Saturation voltage	V_{DSS}	I_{OUT} = 350mA		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

6. US79 Magnetic Specifications

DC operating parameters: T_A = 25 °C, V_{DD} = 12V 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

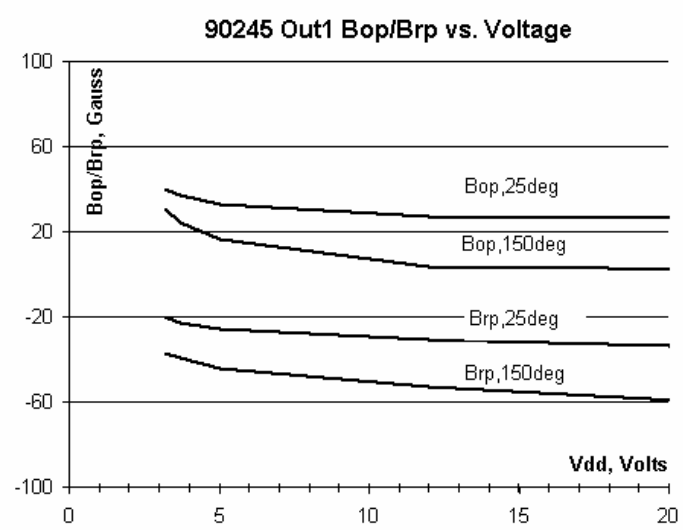
7. *Unique Features*

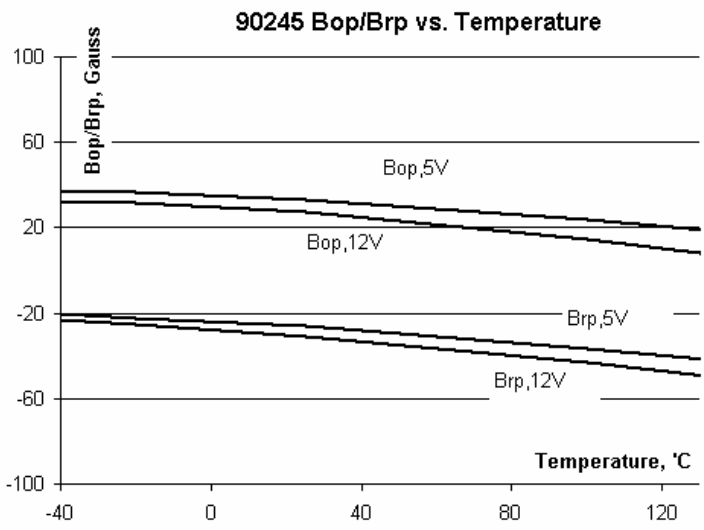
Reverse voltage protection eliminates the need for a diode. Reverse current flows through the coils and the chip. Power dissipation is (2 * Istall/Istart * 0.7V).
Table 1 presents max temperature for each current.

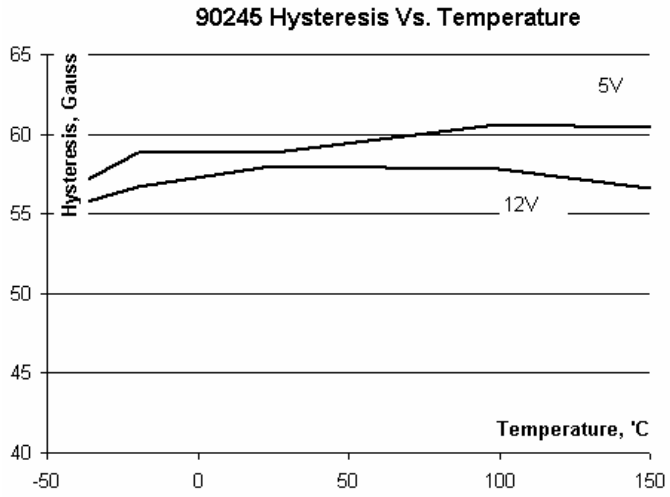
I_{stall}/ I_{start}	T_A Maximum Rev V Test
100mA	125°C
200mA	100°C
300mA	70°C
400mA	40°C

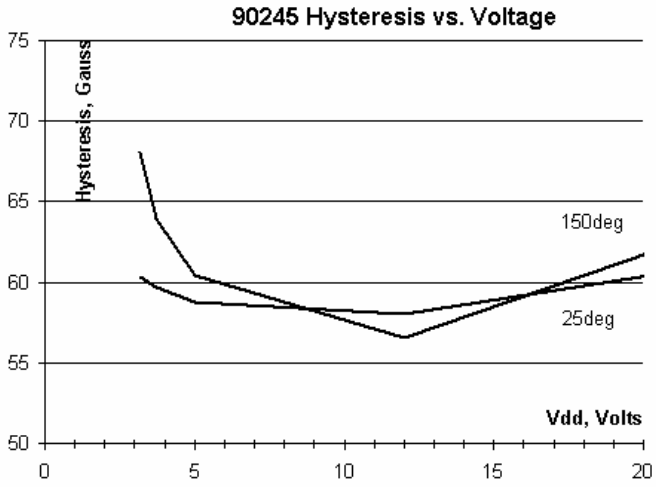
Reverse Voltage protection is provided by the motor windings.
The 35V Zener diodes clamp the output drivers for overstress protection.

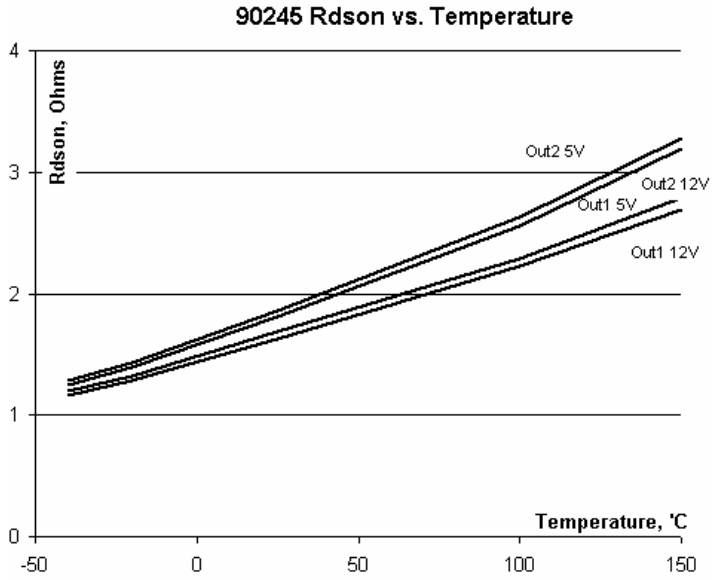
8. *Performance Graphs*

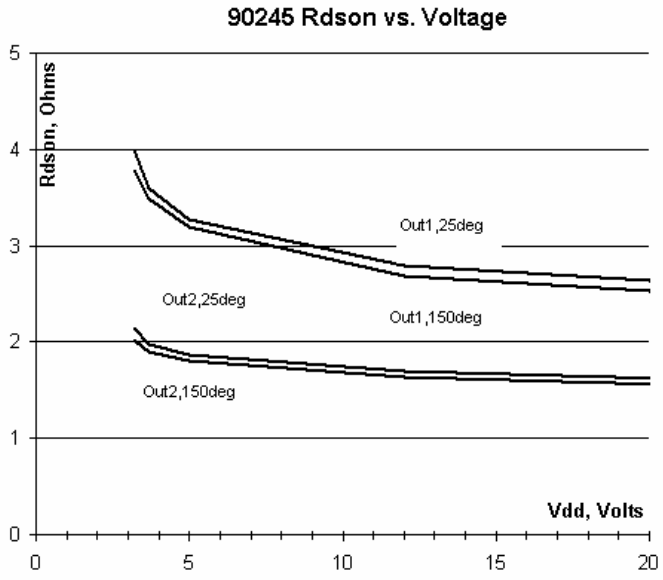




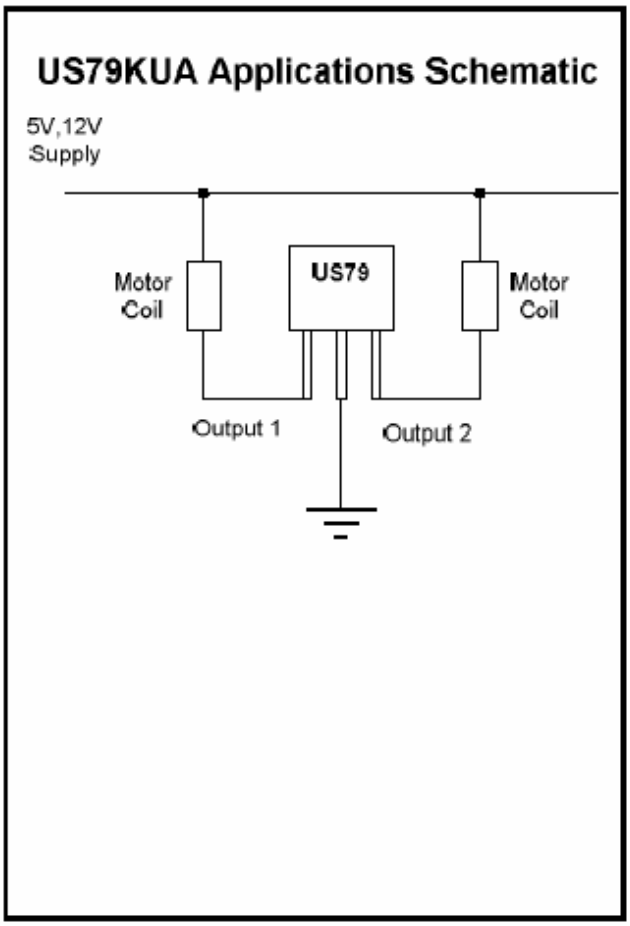

90245 Hysteresis Vs. Temperature
Hysteresis, Gauss
65
60
55
50
45
40
5V
12V
Temperature, 'C
-50
0
50
100
150

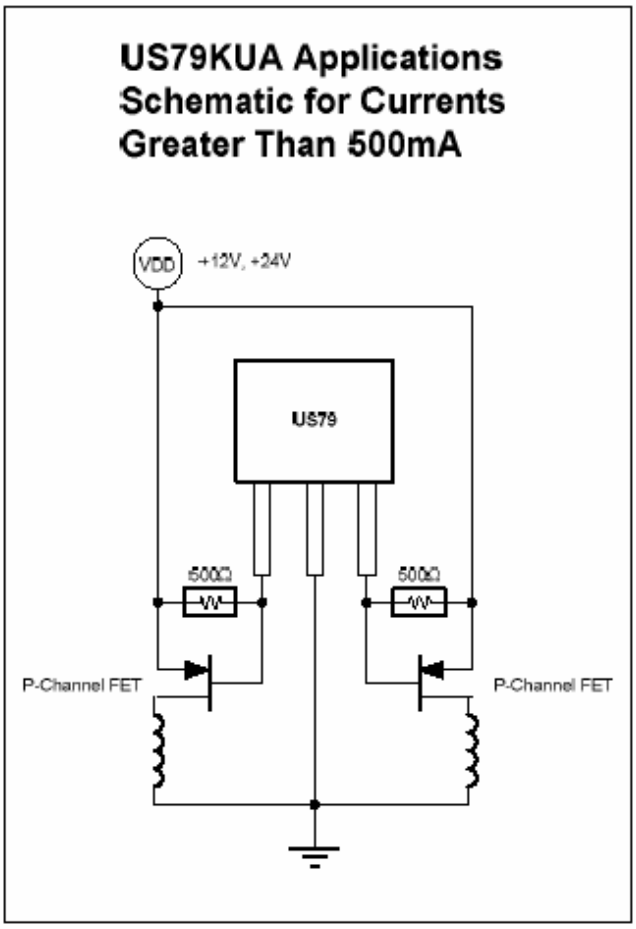

90245 Hysteresis vs. Voltage
Hysteresis, Gauss
75
70
65
60
55
50
150deg
25deg
Vdd, Volts
0
5
10
15
20


90245 Rdson vs. Temperature
Rdson, Ohms
4
3
2
1
0
Out2 5V
Out2 12V
Out1 5V
Out1 12V
Temperature, 'C
-50
0
50
100
150


90245 Rdson vs. Voltage
Rdsbn, Ohms
5
4
3
2
1
0
Out1,25deg
Out2,25deg
Out1,150deg
Out2,150deg
Vdd, Volts
0
5
10
15
20

9. *Applications Information*





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.

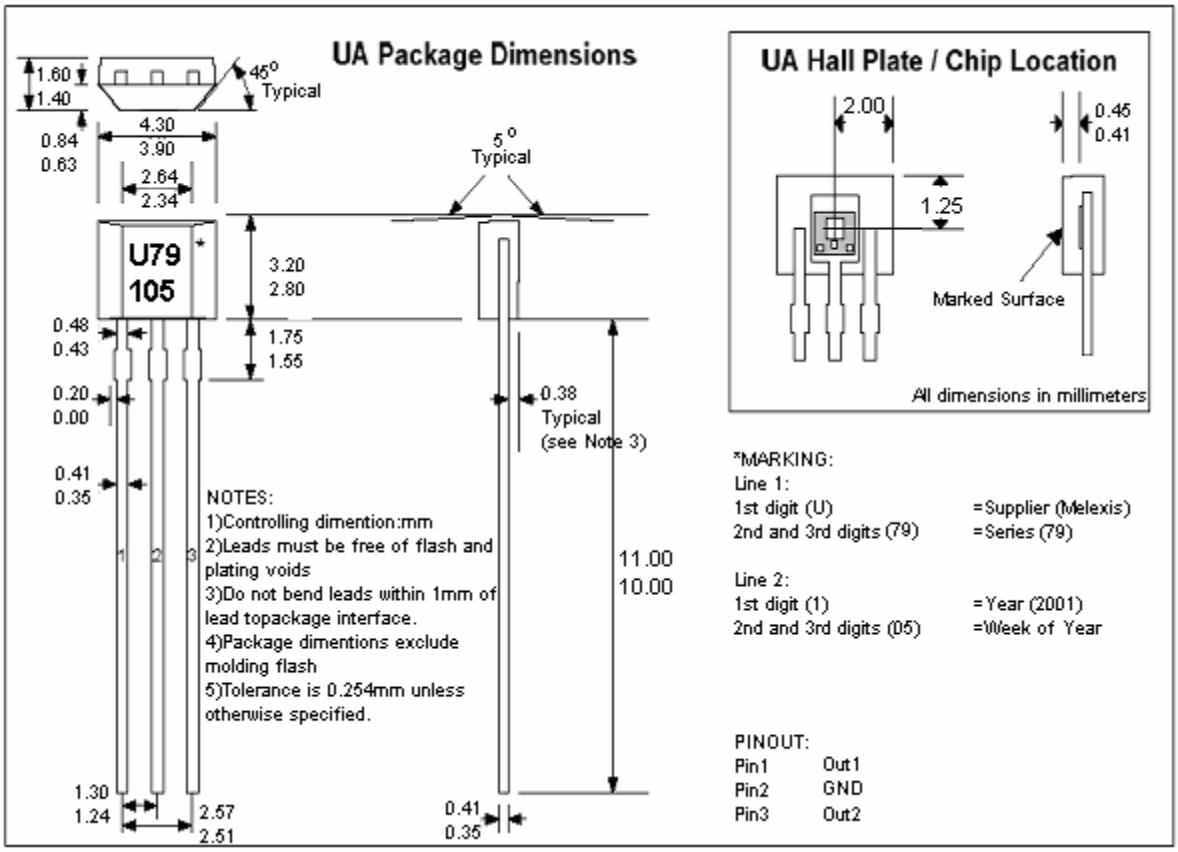
Based on Melexis commitment to environmental responsibility, European legislation (Directive on the Restriction of the Use of Certain Hazardous substances, RoHS) and customer requests, Melexis has installed a Roadmap to qualify their package families for lead free processes also.
Various lead free generic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