

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
- Eliminates all Fan Components
- Eliminate PC Board
- 5V and 12V Operation
- High Sensitivity for switching symmetry
- Locked Rotor Shutdown

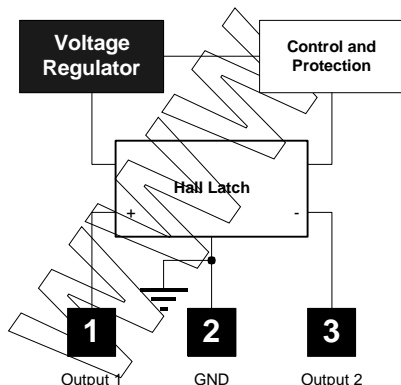
Applications

- Fan Sizes up to 90mm
- Current Range up to 400mA

Ordering Information

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

Functional Diagram



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.

US79 Electrical Specifications

DC operating parameters: $T_A = 25^\circ\text{C}$, $V_{DD} = 5.0$ to 12V unless otherwise specified.

Parameter	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 voltage	V_{OUT}	$B < B_{HYS}$	-	-	34	V
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
Output On resistance	R_{DDSS}			1.84		Ω
Thermal resistance	R_{th}	Operating		190		$^\circ\text{C/Watt}$

US79 Magnetic Specifications

DC operating parameters: $T_A = 25^\circ\text{C}$, $V_{DD} = 5.0$ to 12V unless otherwise specified. $1\text{ mT} = 10\text{ Gauss}$.

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	-	5.0	-	mT

General Description

The US79 eliminates 16 solder joints, protects against ESD, filters RFI emission caused by switching of high currents, protects against voltage surges, protects against locked rotor, operates at a low temperature and is manufactured in an Automotive IC factory.

Unique Features

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



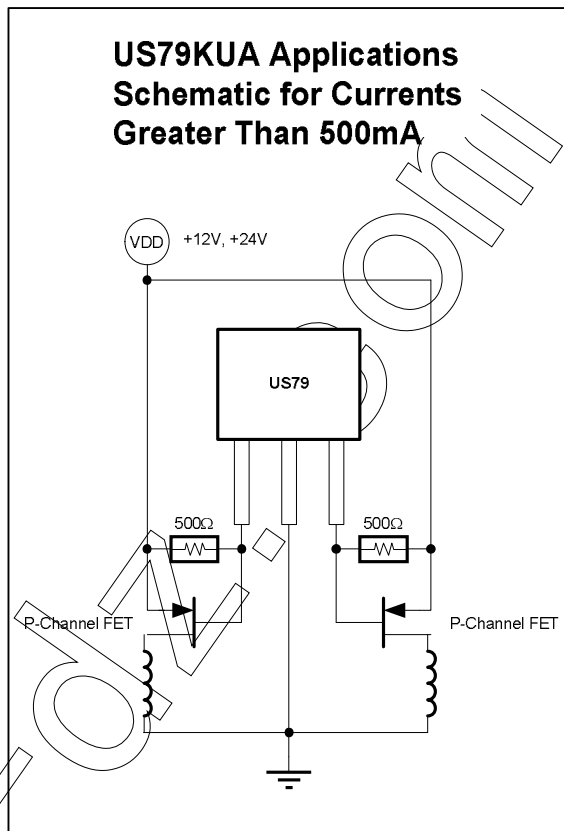
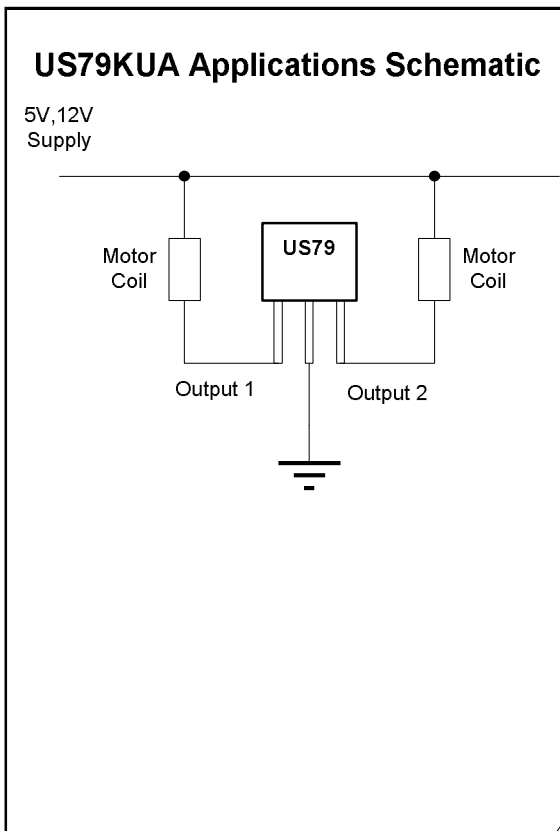
Reverse Voltage protection is provided by the motor windings. The IC contains slew rate control on the output drivers to eliminate RF emissions. 35V Zener diodes clamp the output drivers for overstress protection.

Application Comments

EMC protection is built in. EMC considerations require that the fan assembly should tolerate ESD, reverse voltage, over voltage and not radiate RF noise which may interfere with other electronic equipment. These capabilities are built in to the chip to meet EMC requirements.

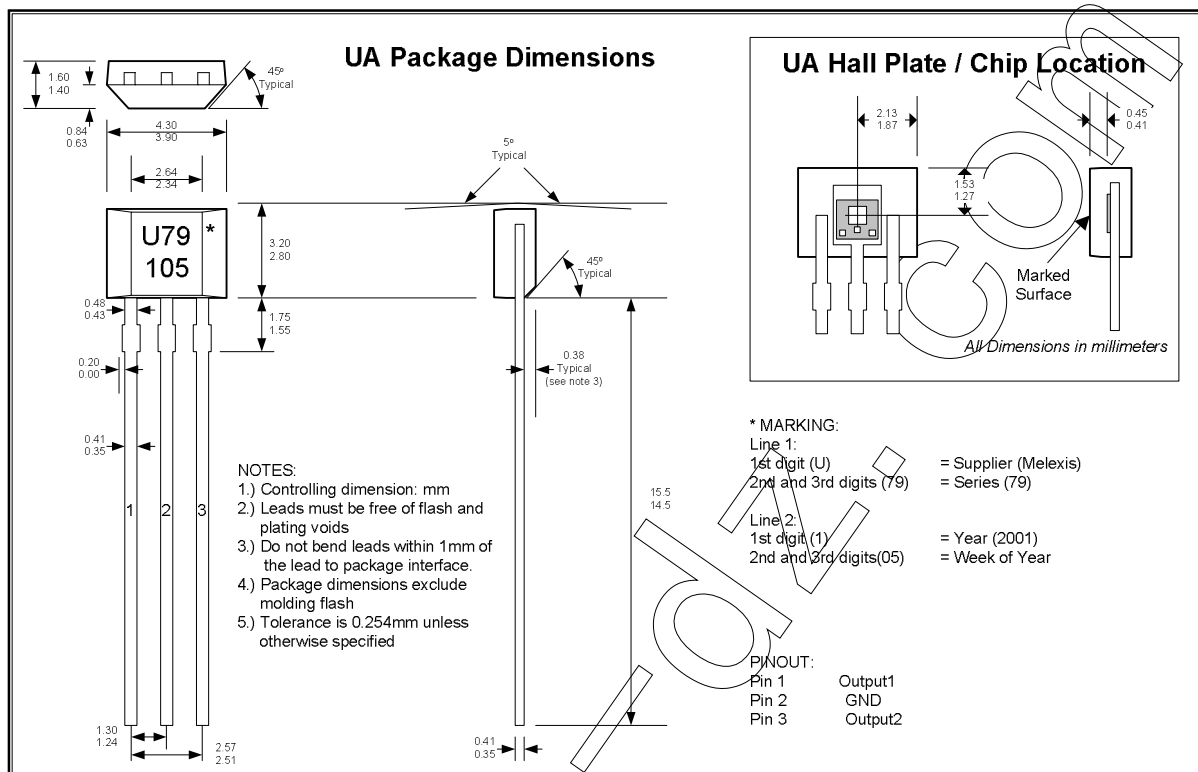
Qualification Test Results

SOA (Safe Operating Area) tests to verify inductive switching of 500mA @ 20V. 1000 pieces tested 100 cycles each. Operating Life Test at $T_A = 150^\circ\text{C}$ for 4000 hrs. 100pc. "0" failures. Package qualified to QS900 automotive specifications.



Absolute Maximum Ratings

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



Reliability information

Melexis devices are classified and qualified regarding suitability for infrared, vapor phase and wave soldering with usual (63/37 SnPb-) solder (melting point at 183degC).
The following test methods are applied:

IPC/JEDEC J-STD-020A (issue April 1999)

Moisture/Reflow Sensitivity Classification For Nonhermetic Solid State Surface Mount Devices

CECC00802 (issue 1994)

Standard Method For The Specification of Surface Mounting Components (SMDs) of Assessed Quality

MIL 883 Method 2003 / JEDEC-STD-22 Test Method 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.

ESD Precautions

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

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