



## US79 Series CMOS Power Hall IC

### Features and Benefits

- ESD Tolerance IC > 7,000V
- ESD Tolerance of Fan > 15,000V
- 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

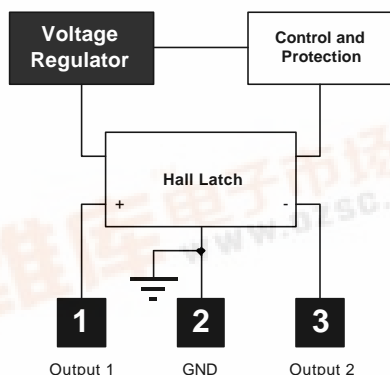
### Applications

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

### Ordering Information

Part No.	Temperature Suffix	Package	Temperature Range
US79	K	UA	-40°C to 125°C
US79	K	8-Pin Narrow SOIC	-40°C to 125°C

### 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. Maximum ambient temperature is determined by driver power dissipation. For instance, at 125°C ambient, driver power cannot exceed 125mW or 250mA. Future versions will offer optional features.



### US79 Electrical Specifications

DC operating parameters:  $T_A = 25$  to  $125^\circ\text{C}$ ,  $V_{DD} = 5.0$  to  $12\text{V}$  unless otherwise specified.

Parameter	Test Conditions	Min	Typ	Max	Units
Supply Voltage	$V_{DD}$ Operating	3.7	-	18	V
Supply Current	$I_{DD}$ Operating	1.2	2.0	4	mA
Output leakage	$I_{LEAK}$ $B < B_{OP}$	-	1	10	$\mu\text{A}$
Output voltage	$V_{OUT}$ $B < B_{HYS}$	-	-	35	V
Output Saturation voltage	$V_{DSS}$ $I_{OUT} = 150\text{mA}$ , $V_{DD} = 12\text{V}$		400	600	mV
Output Saturation voltage	$V_{DSS}$ $I_{OUT} = 350\text{mA}$ , $V_{DD} = 12\text{V}$		800	1100	mV
Output On resistance	$R_{DDSS}$ $V_{DD} = 12\text{V}$		1.34		$\Omega$
Thermal resistance	$R_{th}$ Operating			200	$^\circ\text{C}/\text{Watt}$

### US79 Magnetic Specifications

DC operating parameters:  $T_A = 25$  to  $125^\circ\text{C}$ ,  $V_{DD} = 5.0$  to  $12\text{V}$  unless otherwise specified.  $1\text{ mT} = 10\text{ Gauss}$ .

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Operate Point	$B_{OP}$	Operating		3.0	6.0	mT
Release Point	$B_{RP}$	Operating	-6.0	-3.0		mT
Hysteresis	$B_{HYS}$	Operating	-	6.0	-	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.

Table 1

$I_{stall} / I_{start}$	$T_A$ Maximum Rev V Test
100mA	$125^\circ\text{C}$
200mA	$100^\circ\text{C}$
300mA	$70^\circ\text{C}$
400mA	$40^\circ\text{C}$

The IC tolerates  $>7000\text{V}$  ESD. When installed in the fan, the windings increase the ESD tolerance to  $>15000\text{V}$  eliminating the need for ESD concerns in the finished fan. 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

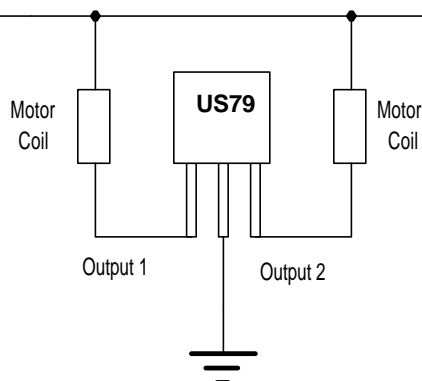
EMC protection is built in. EMC considerations require that the fan assembly should tolerate ESD, reverse voltage, over voltage and not radiate RF noise which may interfere with other electronic equipment. These capabilities are built in to the chip to meet EMC requirements.

### Qualification Test Results

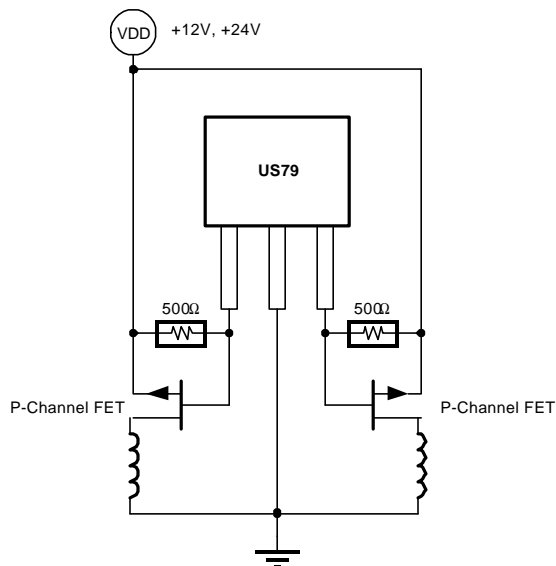
SOA (Safe Operating Area) tests to verify inductive switching of  $500\text{mA}$  @  $20\text{V}$ . 1000 pieces tested 100 cycles each. Operating Life Test at  $T_A = 150^\circ\text{C}$  for 4000 hrs. 100pc. "0" failures. Package qualified to QS900 automotive PPAP specifications.

### US79KA Applications Schematic

5V,12V  
Supply



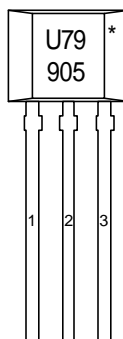
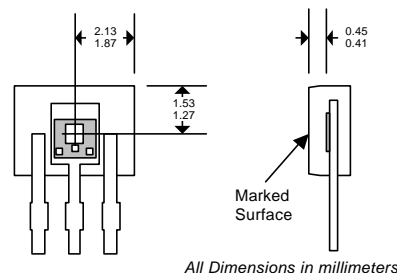
### US79KA Applications Schematic for Currents Greater Than 500mA



### 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
Maximum Junction Temp, $T_J$	150°C
ESD Sensitivity	+/- 7KV

### US79 Hall Plate / Chip Location

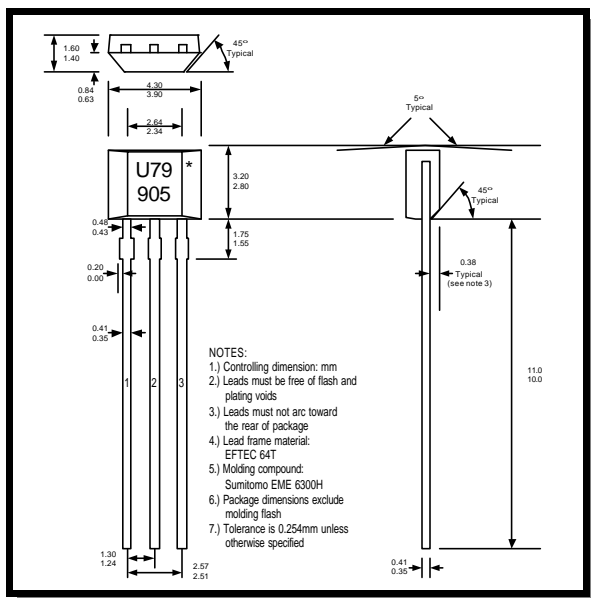


\* MARKING:  
Line 1:  
1st digit (U) = Supplier (Melexis)  
2nd and 3rd digits (79) = Series (79xx)  
  
Line 2:  
1st digit (9) = Year (1999)  
2nd and 3rd digits (05) = Week of Year

PINOUT:  
Pin 1 Output 1  
Pin 2 GND  
Pin 3 Output 2

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### UA Package Dimensions



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### 8-Pin Narrow SOIC Package Dimensions

