

### 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 Code

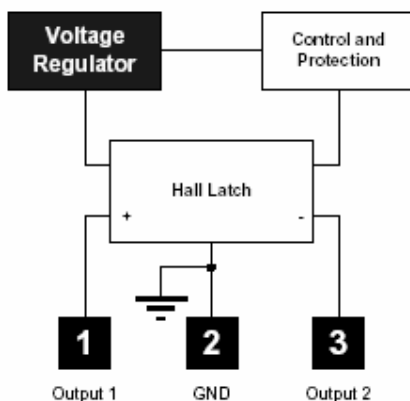
<b>Product Code</b>	<b>Temperature Code</b>	<b>Package Code</b>	<b>Option Code</b>	<b>Packing Form Code</b>
US79	K	UA	AAA-000	BU

**Legend:**

Temperature Code:	K for Temperature Range -40°C to 125°C
Package Code:	UA for TO-92(flat)
Option Code:	xxx-000: Standard version
Packing Form:	BU for Bulk

Ordering example: US79KUA-AAA-000-BU

## 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°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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### 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 °C
Storage Temperature Range, $T_s$	-55 to 165 °C
Maximun 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.

### 5. US79 Electrical Specifications

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

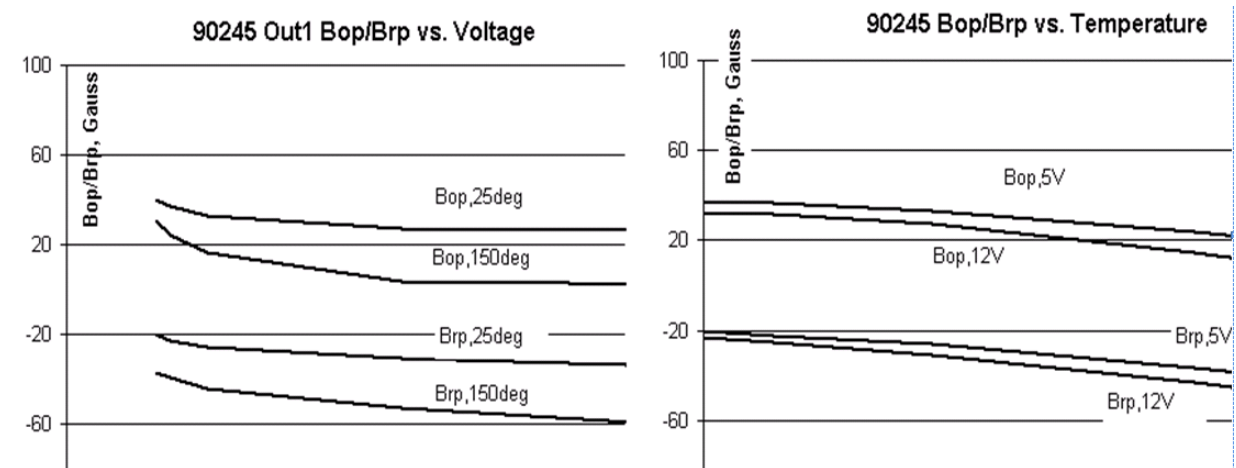
Reverse voltage protection eliminates the need for a diode. Reverse current flows through the coils and the chip. Power dissipation is  $(2 * I_{stall}/I_{start} * 0.7V)$ .

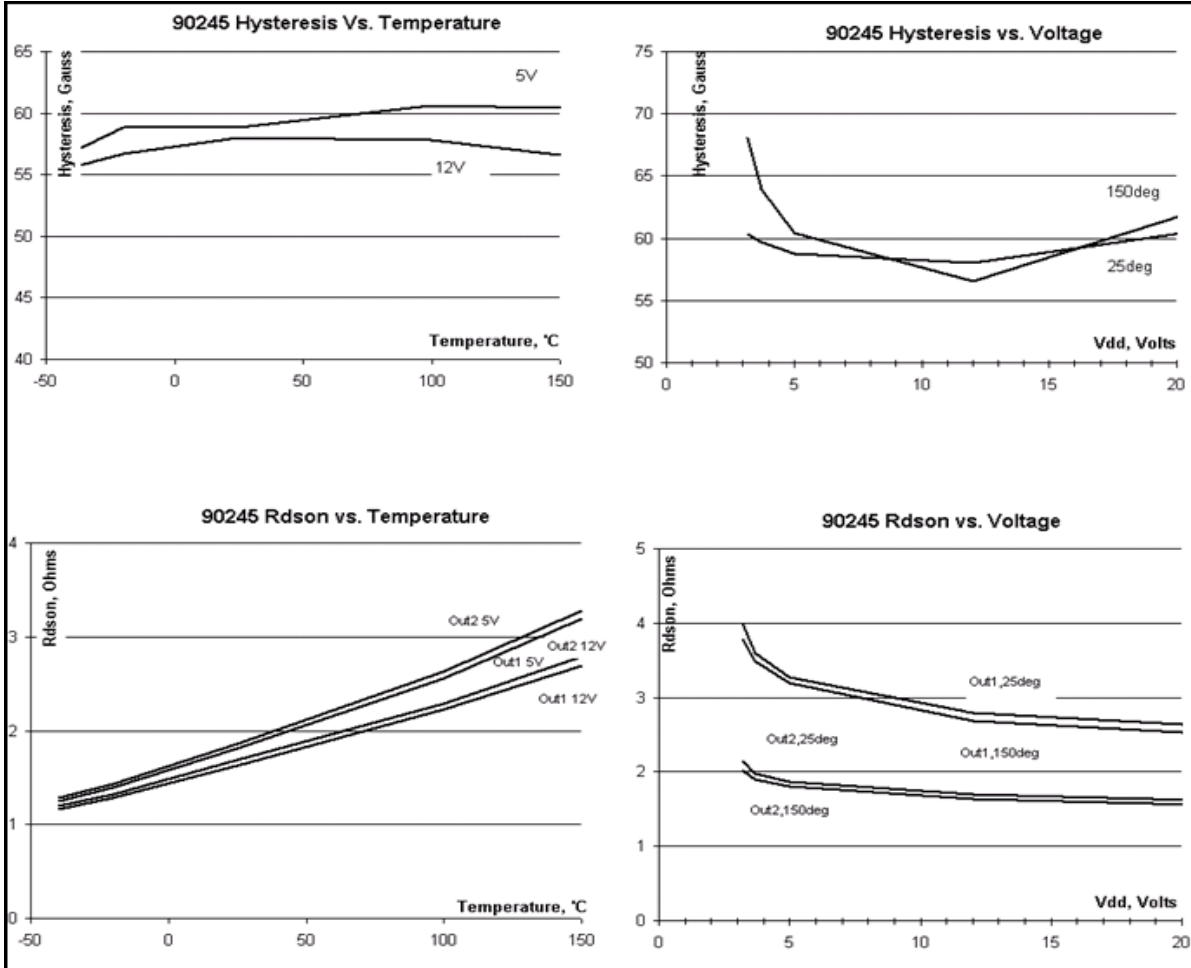
Table 1 presents max temperature for each current.

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

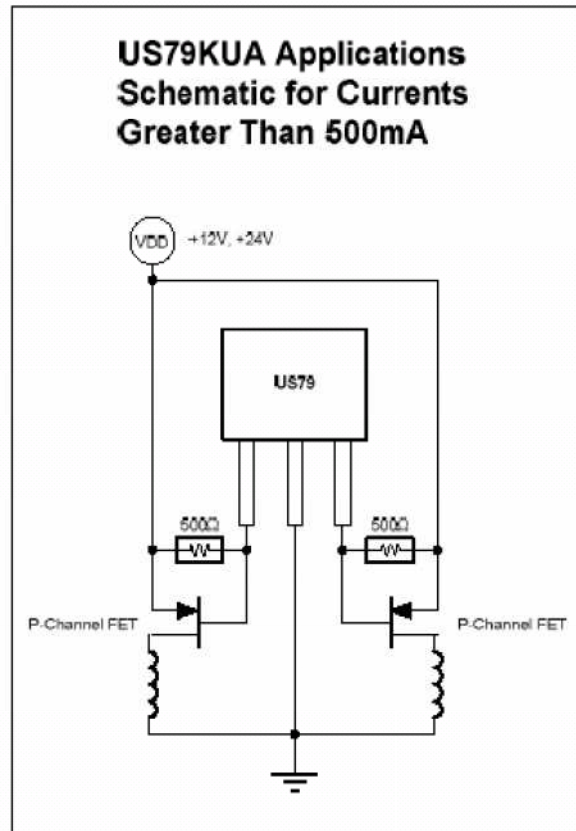
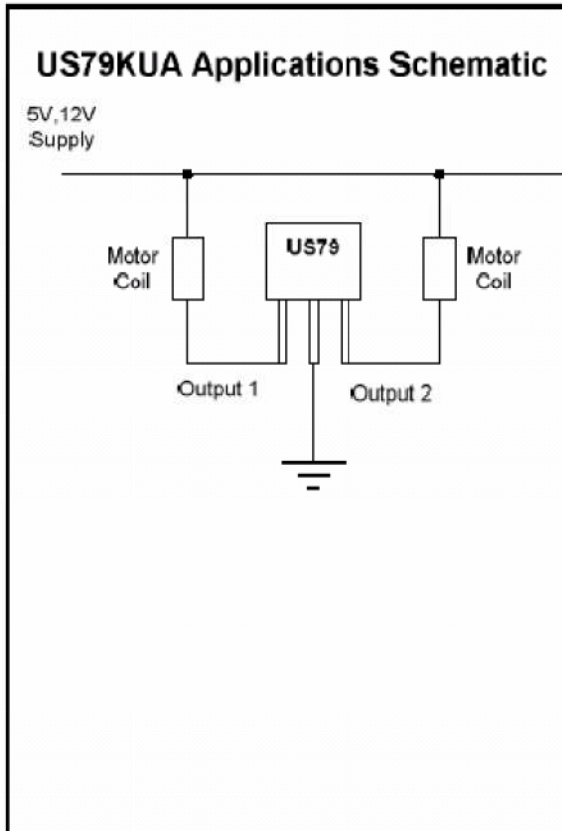
Reverse Voltage protection is provided by the motor windings.  
The 35V Zener diodes clamp the output drivers for overstress protection.

### 8. Performance Graphs





## 9. Applications Information



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## **10. 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.

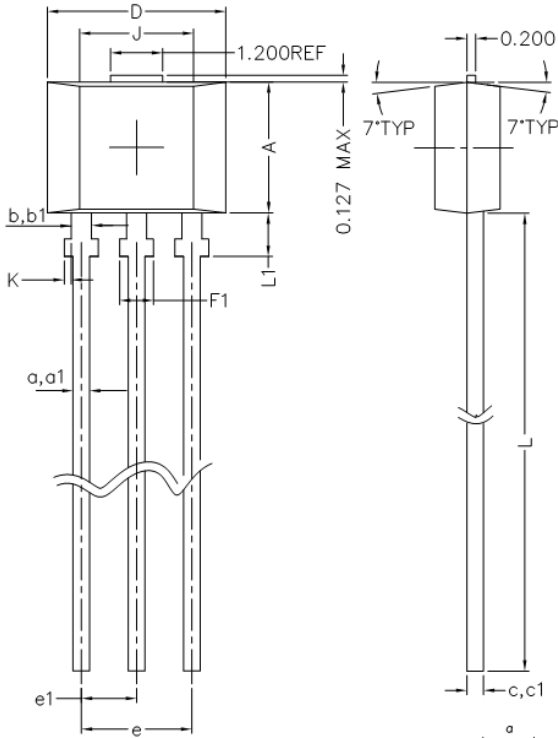
The application of Wave Soldering for SMD's is allowed only after consulting Melexis regarding assurance of adhesive strength between device and board.

Melexis 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: <http://www.melexis.com/quality.aspx>

## **11. ESD Precautions**

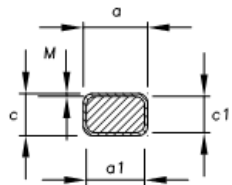
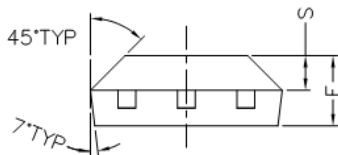
Electronic semiconductor products are sensitive to Electro Static Discharge (ESD).  
Always observe Electro Static Discharge control procedures whenever handling semiconductor products.

### 12. Package Information



SYMBOL	DIMENSIONS [MM/INCH]		
	MIN	NOM	MAX
A	2.80	3.00	3.20
	.110	.118	.126
a1	0.35	-	0.41
	.014	-	.016
a	0.35	-	0.44
	.014	-	.017
b1	0.43	-	0.49
	.017	-	.019
b	0.43	-	0.52
	.017	-	.020
c1	0.35	-	0.41
	.014	-	.016
c	0.35	-	0.44
	.014	-	.017
F1	0.45	-	0.66
	.018	-	.026
K	0.00	-	0.15
	.000	-	.006
D	3.90	4.10	4.30
	0.153	.161	.169

SYMBOL	DIMENSIONS [MM/INCH]		
	MIN	NOM	MAX
e1	1.24	1.27	1.30
	.049	.050	.051
E	1.40	1.50	1.60
	.055	.059	.063
J	2.51	2.62	2.72
	.099	0.103	.107
L	14.00	14.50	15.00
	.551	.5709	.5906
	10.00	10.5	11.00
	.3937	.4134	.4331
L1	0.90	1.0	1.10
	.035	.039	0.43
S	0.63	0.74	0.84
	.025	.029	.033
e	2.51	2.54	2.57
	.099	.100	.101
M	-	-	0.0152
	-	-	.0006



NOTES :

1. DIMENSIONS A AND D DO NOT INCLUDE MOLD GATE AND SIDE FLASH (PROTUSION) ALLOWABLE IS 0.127 [.005] PER SIDE. A AND D ARE MAXIMUM PLASTIC BODY SIZE DIMENSIONS INCLUDING MOLD MISMATCH.

2. CONTROLLING DIMENSION IN MM.

3. a1, b1, c1 ARE DIM FOR BARE LEAD FRAMES

4. a, b, c ARE DIM FOR PLATED LEAD FRAMES.



### **13. Disclaimer**

Devices sold by Melexis are covered by the warranty and patent indemnification provisions appearing in its Term of Sale. Melexis makes no warranty, express, statutory, implied, or by description regarding the information set forth herein or regarding the freedom of the described devices from patent infringement. Melexis reserves the right to change specifications and prices at any time and without notice. Therefore, prior to designing this product into a system, it is necessary to check with Melexis for current information. This product is intended for use in normal commercial applications. Applications requiring extended temperature range, unusual environmental requirements, or high reliability applications, such as military, medical life-support or life-sustaining equipment are specifically not recommended without additional processing by Melexis for each application.

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