

Features and Benefits

Microelectronic Integrated Sustem

Melex

- □ Chopper stabilized amplifier stage
- Optimized for brushless DC motor applications
- □ Miniature high reliability package
- □ Operation down to 3.5V
- CMOS for optimum stability, quality and cost

Ordering Information

Part No. US5881 US5881 **Temperature Suffix** E (-40 $^{\circ}$ C to 85 $^{\circ}$ C) L (-40 $^{\circ}$ C to 150 $^{\circ}$ C) Package Code SO (SOT-23) or UA(TO-92) SO (SOT-23) or UA(TO-92)

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* Contact factory or sales representative for legacy temperature options

Applications

- Solid state switch
- Limit Switch
- Current Limit
- Current sensing

Pinout:





Functional Diagram

- UA pins

SO pins

UA Package:SO Package:Pin1: VDD - SupplyPin1: VDD - SupplyPin2: GND - GroundPin2: OUT - OutputPin3: OUT - OutputRin3: GND - Ground

Note: Static electricity sensitive device; please observe ESD precautions. Reverse voltage protection is not included. For reverse polarity protection, a 1000hm resistor in series with V_{DD} is recommended.

2 Description

The US5881 is a unipolar Hall Effect sensor IC fabricated from mixed signal CMOS technology It incorporates advanced chopper stabilization techniques to provide accurate and stable magnetic switch points. There are many applications for this sensor in addition to those listed above. The design specifications and performance have been optimized for applications of solid state switches.

The output transistor will be switched on (Bop) in the presence of a sufficiently strong South pole magnetic field facing the marked side of the package. Similarly, the output will be switched off (Brp) in the presence of a weaker South field and remain off with "0" field.

The SOT-23 device is magnetically reversed from the UA package. The SOT-23 output transistor will be switched on (Bop) in the presence of a sufficiently strong North pole magnetic field subjected to the marked side of the package.

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3 Glossary of Terms

MilliTesla (mT), Gauss: Units of magnetic flux density; 1 milliTesla = 10 Gauss.

4 Absolute Maximum Ratings

Parameter	Symbol	Value	Units
Supply Voltage (Operating)	V _{DD}	24	V
Supply Current (Fault)	I _{DD}	50	mA
Output Voltage	V _{OUT}	24	× \
Output Current (Fault)	I _{OUT}	50	mA
Operating Temperature Range "E"	T _A	-40 to 85 ((°C))
Operating Temperature Range "L"	T _A	-40 to 150	C
Power Dissipation, temp. range "E", UA/SO packages	PD	500/278	mW
Power Dissipation, temp. range "L", UA/SO packages	PD	700/389	mW
Maximum Junction Temperature, temp. range "E"	TJ	125 🗘	°C
Maximum Junction Temperature, temp. range "L"		165	°C
Storage Temperature	Ts	-65 to 150	°C

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

5 US5881 Electrical Characteristics

DC operating parameters: $T_A = 25^{\circ}C$, $V_{DD} = 12V$ (unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Тур	Max	Units
Supply Voltage	VDD	Operating	3.5		24	V
Supply current		BXBRP	1.5	2.5	5.0	mA
Saturation Voltage	V _{DS(on)}	$t_{OUT} = 20$ mA, B > B _{op}		0.4	0.5	V
Output Leakage	I _{OFF}	$B < B_{RP}^{(j)}, V_{OUT}=24V$		0.01	10	uA
Output Rise Time	∧ t _r	$V_{DD} = 12V, R_L = 1k, C_L = 20pF$		0.04		us
Output Fall Time		$V_{DD} = 12V, R_L = 1k, C_L = 20pF$		0.18		us

6 US5881 Magnetic Characteristics

DC operating parameters: $T_A = 25^{\circ}$ C, $V_{DD} = 12V$ (unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Тур	Max	Units
Operating Point	BOP	E/LUA, E/LSO, Ta=25,Vdd=12VDC	15.0	25.0	30.0	mT
Release Point	B _{RP}	E/LUA, E/LSO, Ta=25,Vdd=12VDC	9.5	20	-	mT
Hysteresis	B _{HYS}	E/LUA, E/LSO, Ta=25,Vdd=12VDC	2.0	4.3	5.5	mT

Note: 1 mT = 10 Gauss



7 Unique Features

CMOS Hall IC Technology

The chopper stabilized amplifier uses switched capacitor techniques to eliminate the amplifier offset voltage, which, in bipolar devices, is a major source of temperature sensitive drift. CMOS makes this advanced technique possible. The CMOS chip is also much smaller than a bipolar chip, allowing very sophisticated circuitry to be placed in less space. The small chip size also contributes to lower physical stress and less power consumption.

Applications

If reverse supply protection is desired, use a resistor in series with the V_{DD} pin. The resistor will limit the supply current (Fault), I_{DD}, to 50mA .For severe EMC conditions, use the application circuit on page 7.

8 Performance Graphs



8.2 Magnetic Switch Points vs Temperature





8.3 Output Voltage vs Magnetic Flux Den- 8.4 sity (Hysteresis)







Maximal Power Dissipation (MPD) Versus Temperature 8.6

8.6.1 MPD for "E" temperature range



8.6.2 MPD for "L" temperature range



The thermal resistance Θ_{JA} and rated power dissipation are defined in accordance with EIA/JESD51-3 Standard.

Pin Definitions and Descriptions 9

UA	SO	Pin	Туре	Description
Pins	Pins	Name		
1	1	VDD	Supply	Supply
З	2		Output	Hall output (clamped)
2	3	VSS	Ground	Ground
		S	. <u> </u>	







10 Application Information





11 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/MLX/eadfree_statement.pdf

12 ESD Precautions

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



13 Physical Characteristics





Note:

S t3

t2

t1

L1

F

1. Controlling Dimension: mm 2. Tolerance: +/-0.004" unless otherwise

specified 3. Package dimensions exclude molding

45°

5°

1.65

5°

1.75

0.20

-

1.55

0

flash

4. The end flash shall not exceed 0.005" on each side



13.2 SOT23 Package Information



Note:

1.Dimension D does not include mold flash, protrusions or gate burrs. Mold flash , protrusions or gate burrs shall not exceed 0.10mm per side.

Dimension E1 does not include interlead flash or protrusion shall not exceed 0.10mm per side.
 The package top may be smaller than the package bottom. Dimensions D and E1 are determined at the outermost extremes of the plastic body exclusive or mold flash, tie bar burrs, interlead flash and gate burrs, but including any mismatch between the top and bottom of the molded body.

4. The section B-B apply to the flat section of the lead between 0.08mm and 0.15mm from the lead tip.
5. Marking (on top of the chip)

8YXX - First Digit (2) - part number; YXX- date code(Y - last digit of the Year, XX - week)



\frown	-					
Sumbolo	Dimensions in millimeters					
Symbols	min	nom	max			
A	1.05	-	1.35			
A1	0.05	-	0.15			
A2	1.00	1.10	1.20			
b	0.25	-	0.50			
b1	0.25	0.40	0.45			
С	0.08	-	0.20			
c1	0.08	0.11	0.15			
D	2.70	2.90	3.00			
E	2.60	2.80	3.00			
E1	1.50	1.60	1.70			
L	0.35	0.45	0.55			
L1	0.60 REF 0.95 BSC					
е						
e1	1.90 BSC					
t	00	5 ⁰	10 ⁰			
t1	30	5 ⁰	7 ⁰			
t2	60	80	10 ⁰			



14 Disclaimer

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