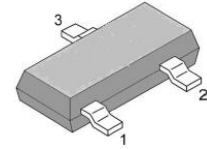
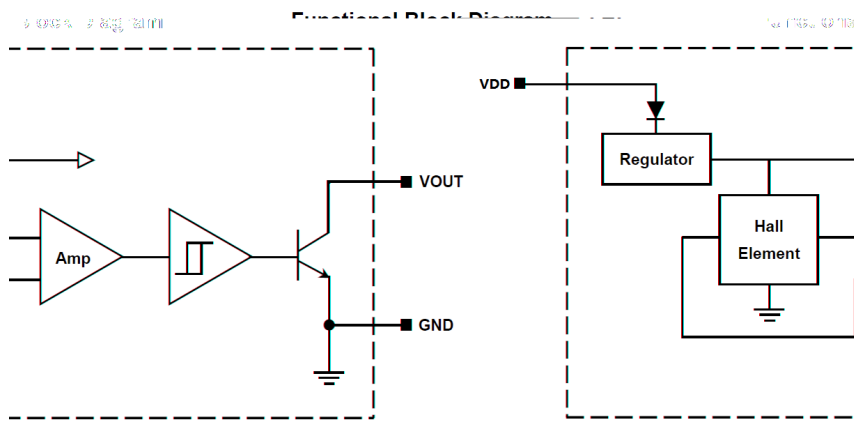
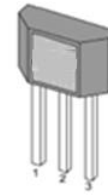


## T R a T R

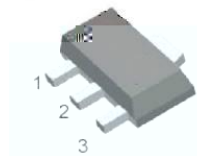
- Bipolar technology
- Reverse battery protection
- 3.5V to 30V Operation voltage
- -40 °C to 150 °C Superior temperature operation
- Open-collector 20 mA output
- Small Size SOT-23, SOT-89 or TO-92S
- Solid-state reliability
- Resistant to physical stress
- Activate with small, commercially available permanent magnets



SOT-23



TO-92



SOT-89

## T

- Brushless DC motor commutation
- Automotive, Consumer and Industrial
- Solid-state switch
- Speed measurement
- Revolution counting
- Angular position detection
- Magnetic Encoder

## R T

The CH411 family is a Hall-effect latch designed in bipolar technology. The Hall IC internally includes an on-chip Hall voltage generator, a voltage regulator for operation with supply voltages of 3.5 to 30V, reverse protection diode, temperature compensation circuitry, small-signal amplifier, Schmitt trigger and an output driver; all in a single package.

It is designed to respond to alternating North and South poles. While the magnetic flux density(B) is larger than operate point (Bop), the output will be turned on (Low), the output is held until the magnetic flux density(B) is lower than release point (Brp), then be turned off (High).

Thanks to its wide operating voltage range 3.5 to 30V and extended temperature range from -40 to +150 , it is quite suitable for use in automotive, industrial and consumer applications.

The device is delivered in variety of packages to customers: SOT-23, SOT-89 for surface mount and TO-92S flat for through-hole mount. Both 3-lead packages are RoHS compliant.

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## ssary T r s

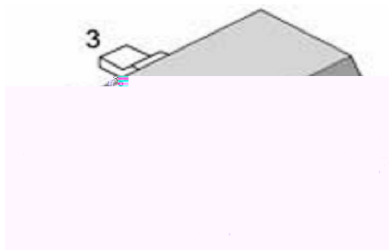
MilliTesla (mT),	Gauss Units of magnetic flux density: 1mT = 10 Gauss
RoHS	Restriction of Hazardous Substances
ESD	Electro-Static Discharge
BLDC	Brush-Less Direct-Current
Operating Point (B <sub>OP</sub> )	Magnetic flux density applied on the branded side of the package which turns the output driver ON (V <sub>OUT</sub> = low)
Release Point (B <sub>RP</sub> )	Magnetic flux density applied on the branded side of the package which turns the output driver OFF (V <sub>OUT</sub> = high)

## r u t a y b r s

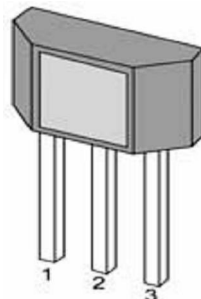
Part Number	Marking ID	Description
CH411SR	C411	Bipolar latching, Hall-effect digital sensor IC, SOT-23-3L package, tape and reel packing (3000 units per reel)
CH411TB	C411	Bipolar latching, Hall-effect digital sensor IC, flat, TO-92S package, bulk packing (1000 units per bag)
CH411ER	C411	Bipolar latching, Hall-effect digital sensor IC, SOT-89-3L package, tape and reel packing (1000 units per reel)

## t s a s r t s

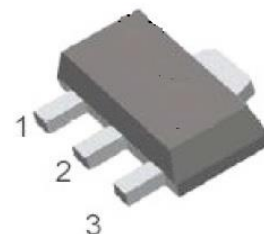
SOT-23 (AT and ET)	TO-92S (A and A-T)	SOT-89 (BT)	Name	Type	Function
1	1	1	VDD	Supply	Supply Voltage pin
2	3	3	OUT	Output	Open Collector Output pin
3	2	2	GND	Ground	Ground pin



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### Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Units
Supply Voltage	VDD	-	40	V
Reverse Voltage	VRDD	-	-40	V
Supply Current	IDD	-	50	mA
Output Voltage	VOUT	-0.3	40	V
Output Current	IOOUT	-	50	mA
Operating Ambient temperature	TA	-40	150	°C
Storage Temperature	TS	-50	150	°C
Junction temperature	TJ		165	°C
Magnetic Flux	No Limit			Gauss

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

### Electrostatic Discharge (ESD) Protection

Parameter	Va u	t
All pins <sup>1)</sup>	+/-2	kV
All pins <sup>2)</sup>	+/-200	V

1) HBM (human body model, 100pF, 1.5 kohm ) according to MIL 883C, Method 3015.7 or EIA/JESD22A114-A

2) acc. Machine Model: C=200pF; R=0

### Switching Characteristics

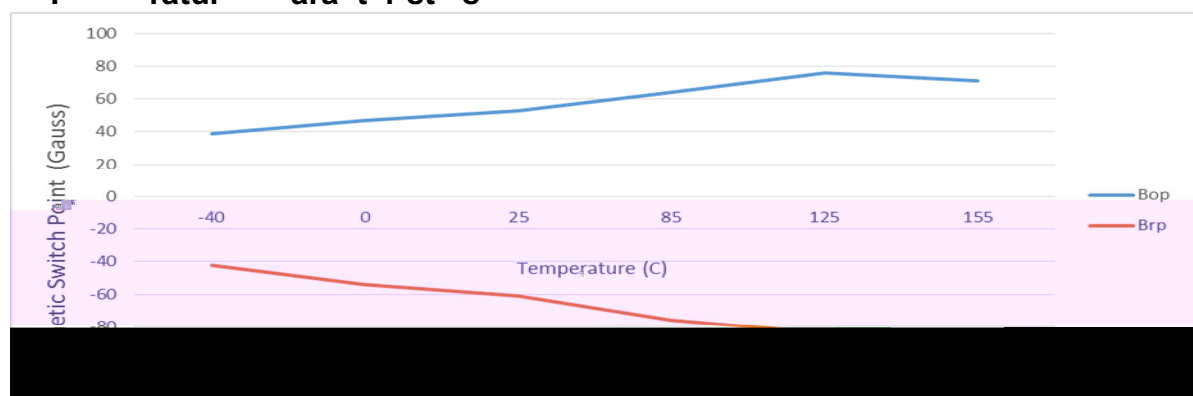
The CH411 exhibits latch magnetic switching characteristics. Therefore, it requires both south and north poles to operate properly.

The device behaves as a latch with symmetric operating and release switching points ( $BOP=|BRP|$ ). This means magnetic fields with equivalent strength and opposite direction drive the output high and low.

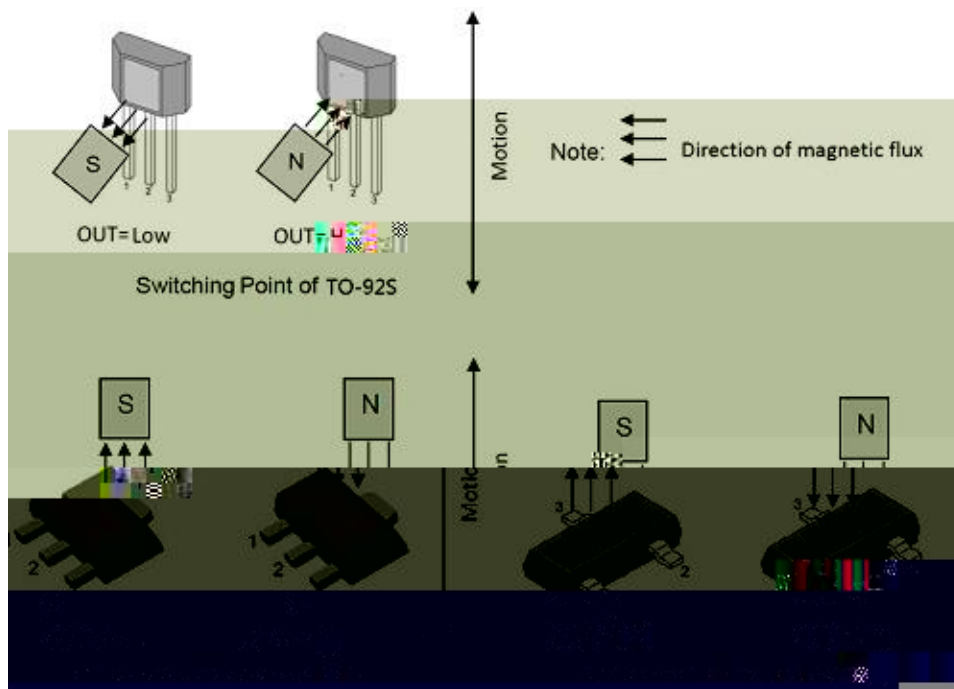
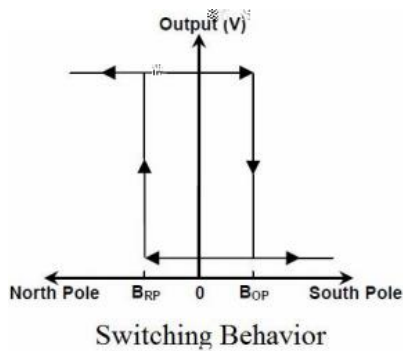
Removing the magnetic field ( $B = 0$ ) keeps the output in its previous state. This latching property defines the device as a magnetic memory.

A magnetic hysteresis BHYST keeps BOP and BRP separated by a minimal value. This hysteresis prevents output oscillation near the switching point.

### Temperature Characteristics



# 8 t w t u t



## ara t rs at

The voltages are referred to GND.

3.5V < VDD < 30V; TJ = -40 to 150°C, unless otherwise specified.

Symbol	Parameter	Test Conditions	Typical	Max	Min	Units
VDD	Supply voltage	Operating	3.5	5	30	V
IDD	Supply Current	B < BRP		4.0	9	mA
VDSon	Output saturation voltage	Iout=15mA, B > BOP			0.4	V
Ioff	Output Leakage Current	B < BRP, VOUT=30V			10	uA
TR	Output rise time	RL=1Kohm, CL=20pF			1.5	uS
TF	Output fall time	RL=1Kohm, CL=20pF			1.5	uS
FSW	Maximum Switching Frequency				100	KHz
BOP	Magnetic operating point	TA=25°C	5	50	100	Gauss
BRP	Magnetic release point	TA=25°C	-100	-50	-5	Gauss
BHYST	Magnetic hysteresis window	TA=25°C  BOP-BRP	60	100	140	Gauss

# Tests

Note : DUT = Device Under Test

### Supply Current

Note 1 - The supply current  $I_{DD}$  represents the static supply current. OUT is left open during measurement.

Note 2 - The device is put under magnetic field with  $B < B_{RP}$ .

### Output Saturation Voltage

Note 1 - The output saturation voltage  $V_{DSon}$  is measured at  $V_{DD} = 3.5V$  and  $V_{DD} = 24V$ .

Note 2 - The device is put under magnetic field with  $B > B_{OP}$ .

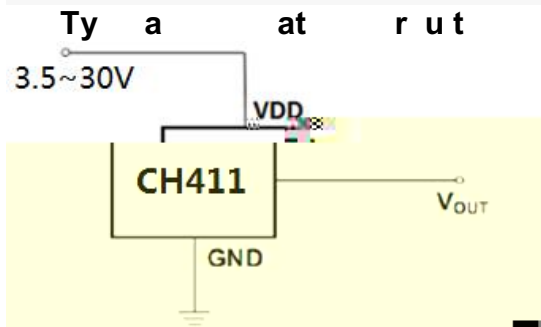
### Output Leakage Current

Note 1 - The device is put under magnetic field with  $B < B_{RP}$ .

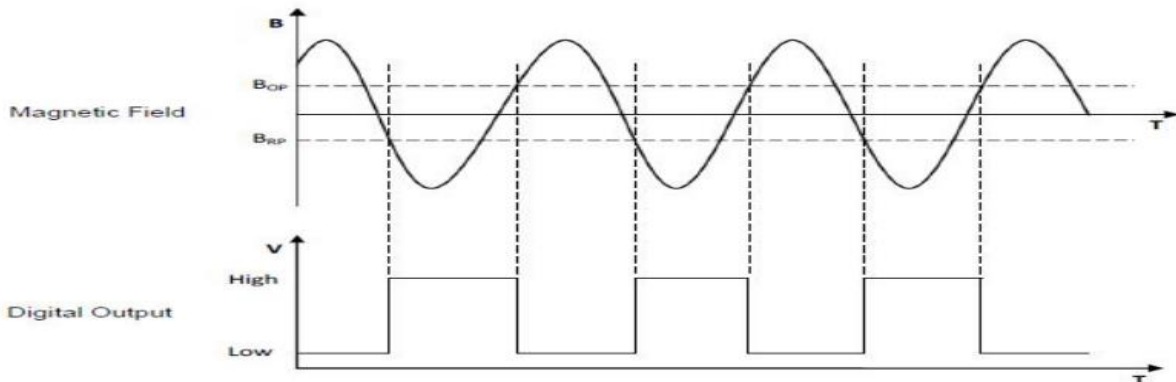
### Magnetic Thresholds

Note 1 -  $B_{OP}$  is determined by putting the device under magnetic field up to  $B_{OPmax}$  until the output is switched on.

Note 2 -  $B_{RP}$  is determined by putting the device under magnetic field down to  $B_{RPmin}$  until the output is switched off.



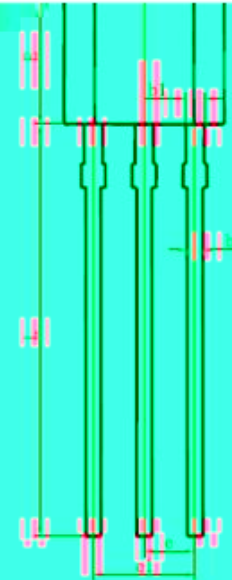
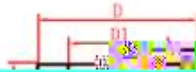
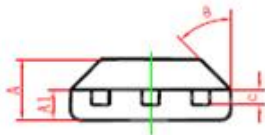
## Typical Output Characteristics (Typical Output Characteristics)



**a a r at**

Symbol	Parameter	Typical	Max.	Units
RTH	SOT-23 Package Thermal Resistance	301		°C/W
	TO-92S Package Thermal Resistance	230		°C/W
	SOT-89 Package Thermal Resistance	230		°C/W

**PACKAGE DESIGNATOR  
TO-92S**

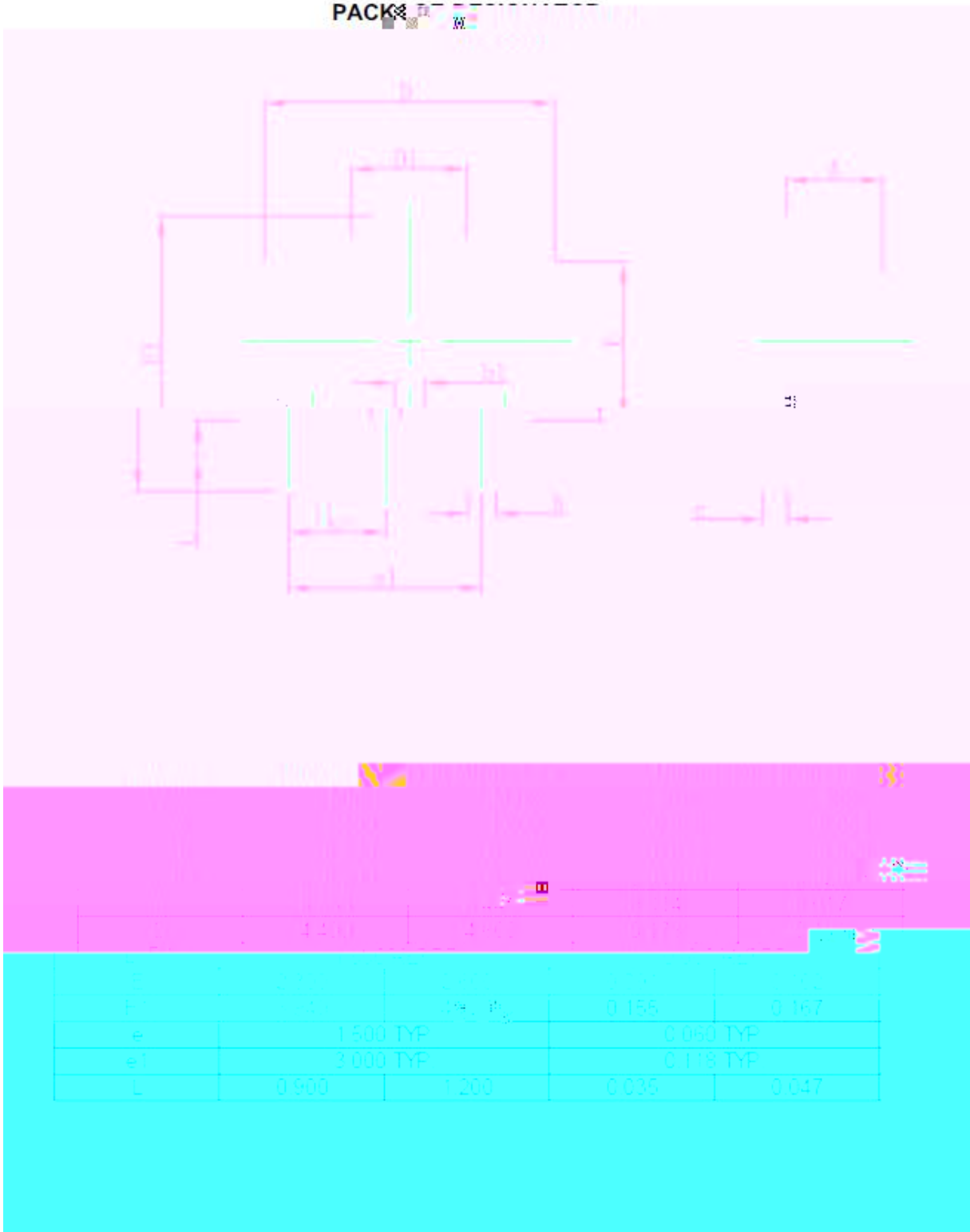


In	Millimeter	Dimensions In Inches		Symbol	Dimension
		Min.	Max.		Min.
				A	1.420
				A1	0.660
				b	0.350
				b1	0.400
				c	0.350
				D	3.900
				D1	2.280
				E	3.050
				e	1.270
				e1	2.440
				L	15.100
				theta	

In	Millimeter	Min.	Max.
		0.056	0.064
		0.026	0.034
		0.014	0.019
		0.016	0.022
		0.014	0.020
		0.154	0.161
		0.090	0.106
		0.120	0.128
		0.050 TYP.	
		0.096	0.104
		0.594	0.610
		45° TYP.	

PACK





PAC 10

