

# TMR Bipolar Switch 17 Gauss 200nA Push Pull Sensor

RoHS



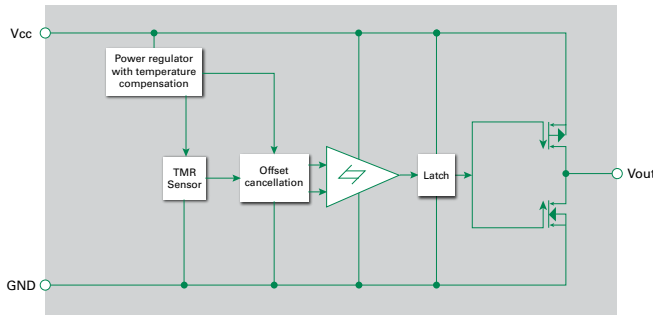
## Description

The LF1115TMR TMR Switch is a digital bipolar magnetic switch that integrates TMR and CMOS technology in order to provide a magnetically triggered digital switch with high sensitivity, high speed, and low power consumption.

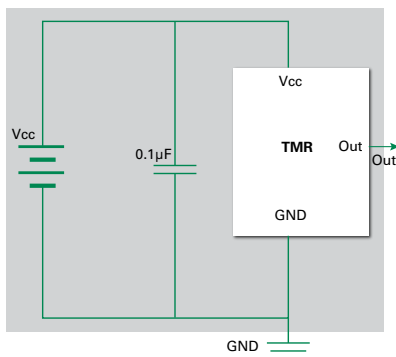
It contains a TMR magnetic sensor and CMOS signal processing circuitry within the same package, including an on-chip TMR voltage generator for precise magnetic sensing, a TMR voltage amplifier and comparator plus a Schmitt trigger to provide switching hysteresis for noise rejection, CMOS push-pull output and X axis sensing direction.

An internal band gap regulator is used to provide a temperature compensated supply voltage for internal circuits, permitting a wide range of supply voltages. It draws only 200nA (see Features below) resulting in low power operation, additionally it has fast response, accurate switching points, excellent thermal stability, and immunity to stray field interference. It is available in the SOT23-3 package. The output of the LF1115TMR switches low (turns on) when the magnetic field parallel to the sensing axis exceeds the operate point threshold,  $B_{OP}$ . When the magnetic field is reduced below the release point  $B_{RP}$  device output switches high (turns off). The difference between the  $B_{OP}$  and the  $B_{RP}$  is the hysteresis  $B_H$  of the device.

## Functional Block Diagram



## TMR Switch Typical Applications Circuit



Note: It is strongly recommended that an external bypass capacitor be connected in-close-proximity to the device between the supply and ground pins to reduce noise. The recommended value for the external bypass capacitor is 0.1µF.

## Features

- Tunneling Magnetoresistance (TMR) technology
- Ultra low power consumption at 200nA
- X axis sensing direction
- High frequency up to 50Hz
- Operation with north and south pole
- 1.8V to 5.5V operating range

## Benefits

- Low switching points for high sensitivity
- Excellent thermal stability
- High tolerance to external magnetic field interference
- Wider airgap capability
- Operates with smaller magnets for cost reduction
- RoHS compliant

## Applications

- Proximity detection
- Utility meters including gas and water meters
- Speed sensing
- Battery powered applications
- Rotary sensing

## Output Behavior Versus Magnetic Pole

Parameter	Test Conditions	Output (volts)
South Pole	$B > B_{OPS}$	Low (On)
North Pole	$0 < B < B_{RPS}$	High (Off)

Note:

The output is "High" when power is turned on under zero magnetic field. When a S Pole approaches the pin 1 side,  $V_{out}$  will transition to Low. When a N Pole approaches the pin 1 side,  $V_{out}$  will transition to High

### Absolute Maximum Ratings (@TA = +25°C, unless otherwise specified)

Symbol	Characteristics	Values	Unit
V <sub>CC</sub>	Supply Voltage	7.0	V
V <sub>RCC</sub>	Reverse Supply Voltage	0.3	V
I <sub>OUTSINK</sub>	Output Current	9.0	mA
B	Magnetic Flux Density	4000	Gauss
V <sub>ESD</sub>	ESD level(HBM)	4	kV
T <sub>A</sub>	Operating Temperature	-40 ~ 125	°C
T <sub>stg</sub>	Storage Temperature	-50 ~ 150	°C

Note: Stresses greater than the 'Absolute Maximum Ratings' specified above may cause permanent damage to the device. These are stress ratings only; functional operation of the device at these or any other conditions exceeding those indicated in this specification is not implied. Device reliability may be affected by exposure to absolute maximum rating conditions for extended periods of time.

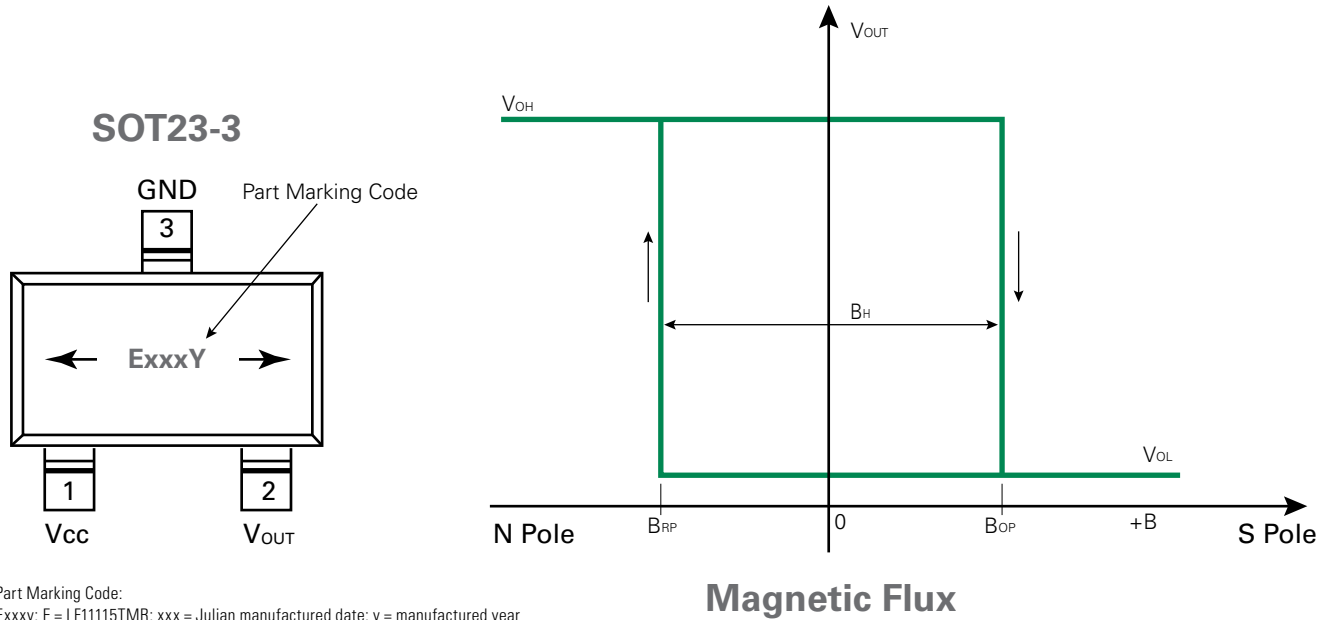
### Electrical Characteristics (@TA = +25°C, V<sub>CC</sub> = 3.0V)

Symbol	Characteristics	Min.	Typ.	Max.	Unit	Conditions
V <sub>CC</sub>	Supply Voltage	1.8	3	5.5	V	Operating
V <sub>OH</sub>	Output High Voltage	V <sub>CC</sub> - 0.3			V	
V <sub>OL</sub>	Output Low Voltage			0.2	V	
I <sub>CC</sub>	Supply Current		200		nA	Output Open
Freq	Response Frequency		50		Hz	

### Magnetic Characteristics (@TA = +25°C, V<sub>CC</sub> = 3.0V)

Symbol	Characteristics	Min.	Typ.	Max.	Unit
B <sub>OP</sub>	Operation Point	9	17	25	Gauss
B <sub>RP</sub>	Release Point	-25	-17	-9	Gauss
B <sub>H</sub>	Hysteresis		34		Gauss

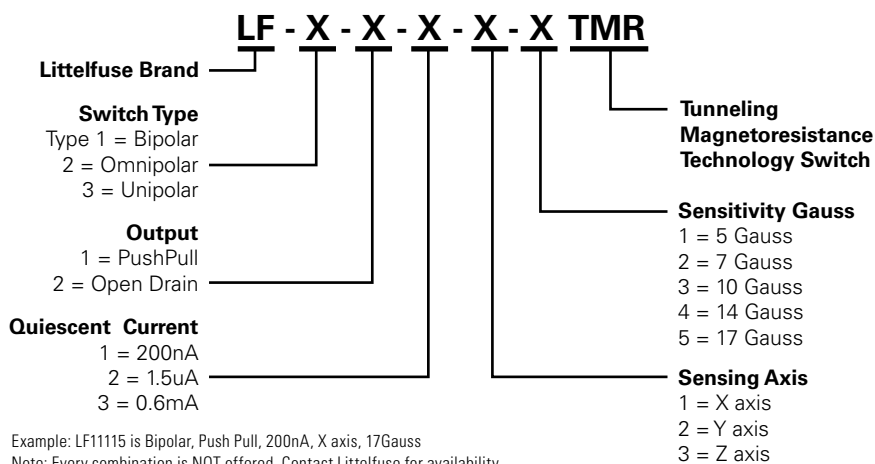
### Pin Configuration and Sensing Direction of Magnetic Field



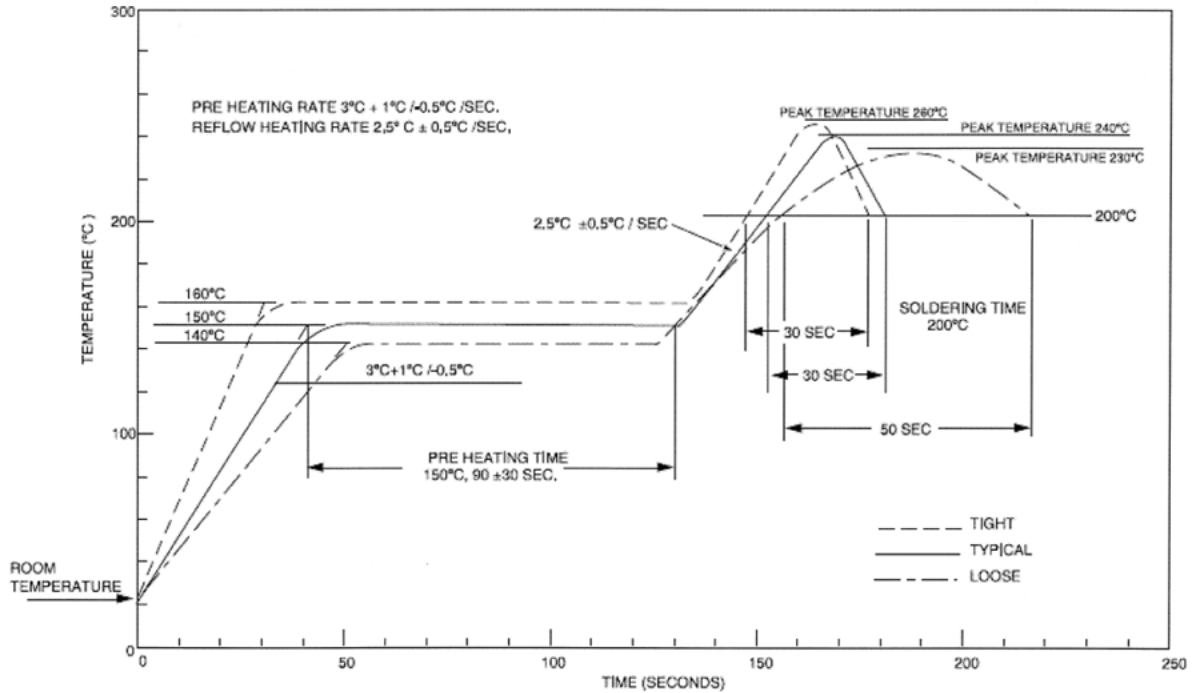
Part Marking Code:  
ExxxY: E = LF11115TMR; xxx = Julian manufactured date; y = manufactured year  
Moisture Sensitivity Level: Rating is 3  
Pick and Place Nozzle: Samsung CN140 or equivalent

Pin Name	Pin No. SOT23-3	Pin Function
V <sub>OUT</sub>	2	Output
GND	3	Ground
V <sub>CC</sub>	1	Supply Voltage

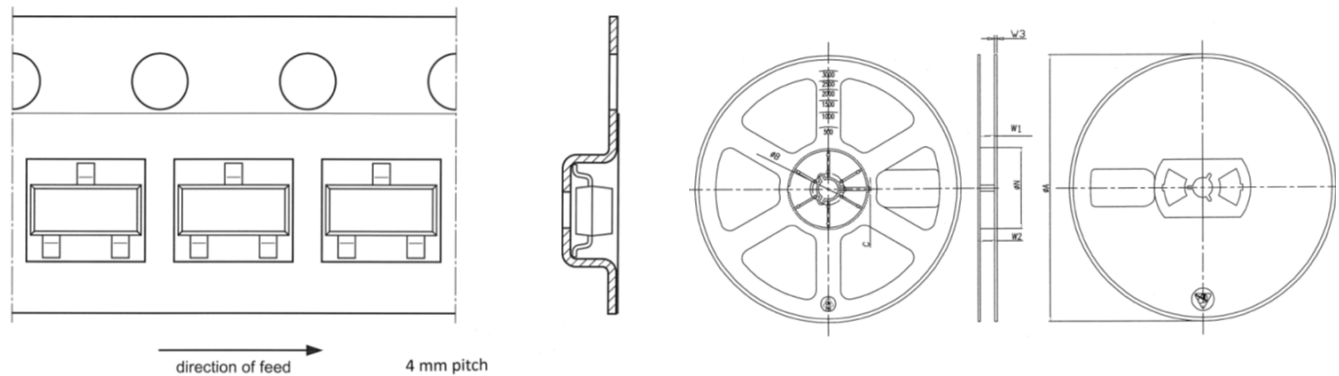
### Part Numbering System



### Soldering Profile for Lead-free packages

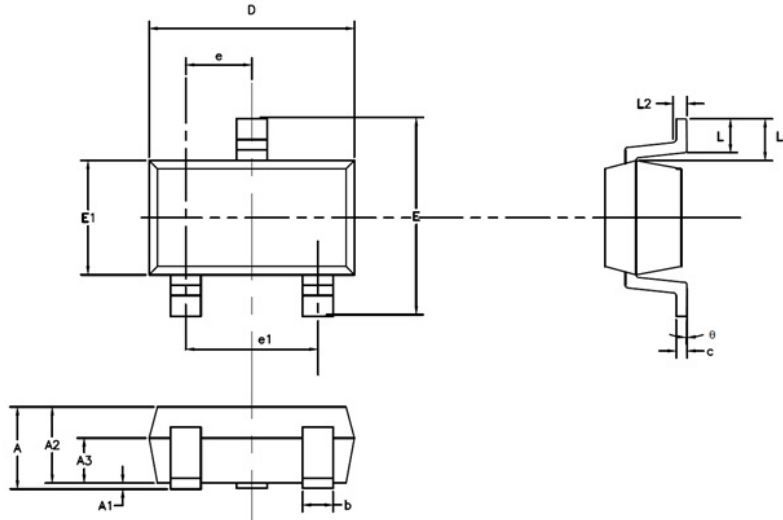


### Tape and Reel



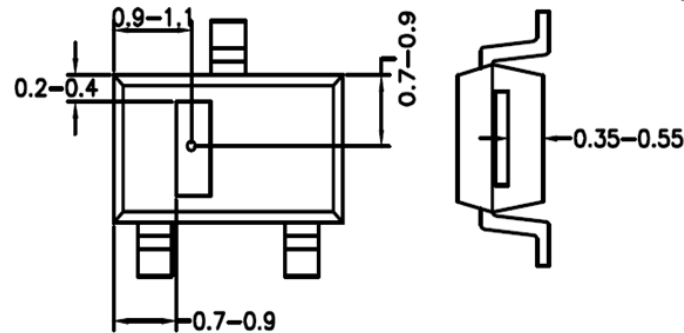
ØA	ØN	ØB	C	W1	W2	W3
178±2	54±2	13.2±0.3	2.2±0.3	8.4±1.5/0.0	12 MAX	1.4±0.4

**SOT23-3 Package Information**



Symbol	Dimensions in Millimeters			Dimensions in Inches		
	Min	Nom	Max	Min	Nom	Max
A	-	-	1.45	-	-	0.057
A1	0.00	-	0.15	0.000	-	0.006
A2	0.90	1.10	1.30	0.035	0.043	0.051
A3	0.60	0.65	0.70	0.024	0.026	0.028
b	0.39	-	0.49	0.015	-	0.019
c	0.12	-	0.19	0.005	-	0.007
D	2.85	2.95	3.05	0.112	0.116	0.120
E	2.60	2.80	3.00	0.102	0.110	0.118
E1	1.55	1.65	1.75	0.061	0.065	0.069
e	0.85	0.95	1.05	0.033	0.037	0.041
e1	1.80	1.90	2.00	0.071	0.075	0.079
L	0.35	0.45	0.60	0.014	0.018	0.024
L1	0.59REF			0.023REF		
L2	0.25BSC			0.01BSC		
Ø	0 <sup>0</sup>	-	8 <sup>0</sup>	0 <sup>0</sup>	-	8 <sup>0</sup>

## TMR Sensor Position (SOT23-3 Elements)



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