

# TMR Unipolar Switch 17 Gauss 200nA Open Drain Sensor

RoHS



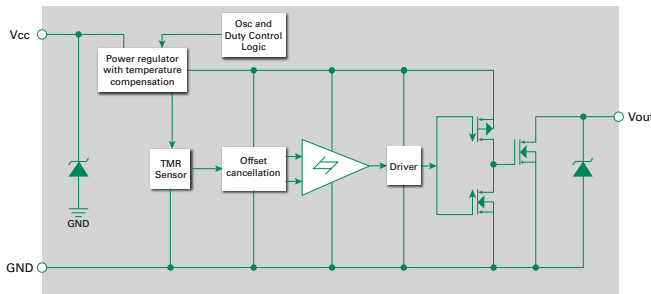
## Description

The LF32115TMR TMR Switch is a digital unipolar 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.

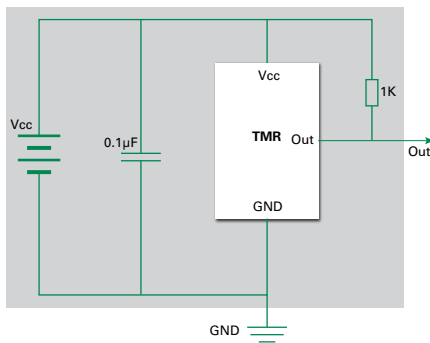
It contains a TMR magnetic sensor and CMOS signal processing circuitry within the same package, including an on-chip TMR voltage generator for precise magnetic sensing, a TMR voltage amplifier and comparator plus a Schmitt trigger to provide switching hysteresis for noise rejection, CMOS open drain output 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 LF32115TMR 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
- Low power consumption at 200nA
- X axis sensing direction
- High frequency up to 50Hz
- Operation with north or 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)
	$0 < B < B_{RPS}$	High (Off)

Note:

1. When power is turned on under zero magnetic field, the output is "High".
2. The power-on settling time of the device is 3ms, and the output latches to high level after this settling time. When a S-pole approaches the pin 1 side, Vout will transition to Low. The correct state will be obtained after first excursion of the magnetic field beyond BOP or BRP.
3. The device circuitry is activated for a short period of time as awake state, and deactivated the remainder of the period as sleep state. The device in sleep state will retain the output status of the last sampled state.

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

Symbol	Characteristics	Values	Unit
$V_{CC}$	Supply Voltage	7.0	V
$V_{RCC}$	Reverse Supply Voltage	0.3	V
$I_{OUTSINK}$	Output Current	20	mA
B	Magnetic Flux Density	4000	Gauss
$V_{ESD}$	ESD level(HBM)	4	kV
$T_A$	Operating Temperature	-40 ~ 125	°C
$T_{stg}$	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.

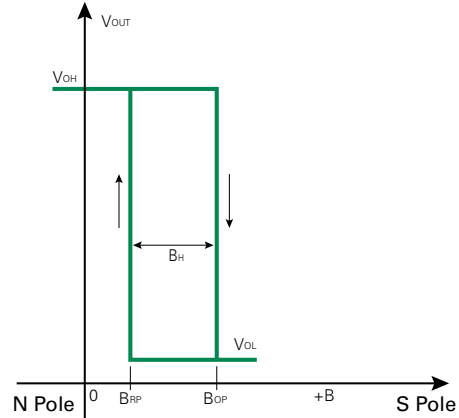
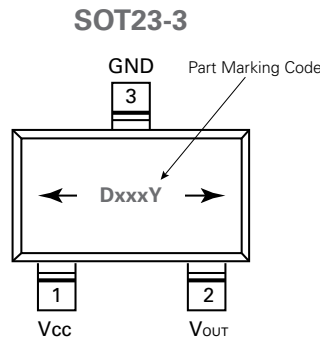
### Electrical Characteristics (@TA = +25°C, Vcc = 3.0V)

Symbol	Characteristics	Min.	Typ.	Max.	Unit	Conditions
$V_{CC}$	Supply Voltage	1.8	3	5.5	V	Operating
$V_{stress}$	Output Stress Voltage			5.5	V	
$I_{leak}$ (average)	Output leak current			1	μA	Output = High, $V_{cc} = 3V$ , $V_{out} = 3V$
$V_{OH}$	Output High Voltage	$V_{cc} - 0.2$			V	Pull-up Resistance = 1Kohm
$R_{off}$	Output turn-off Resistance		10		MΩ	Output = High
$R_{on}$	Output turn-on Resistance			10	Ω	Output = Low
$V_{OL}$	Output Low Voltage			0.1	V	Output = Low, $V_{cc} = 3V$ , $I_{sink} = 3mA$
$I_{CC}$	Supply Current		200		nA	Output Open
Freq	Response Frequency		50		Hz	

### Magnetic Characteristics (@TA = +25°C, Vcc = 3.0V)

Symbol	Characteristics	Min.	Typ.	Max.	Unit
$B_{OP}$	Operation Point	9	17	25	Gauss
$B_{RP}$	Release Point	5	13	20	Gauss
$B_H$	Hysteresis	–	4	–	Gauss

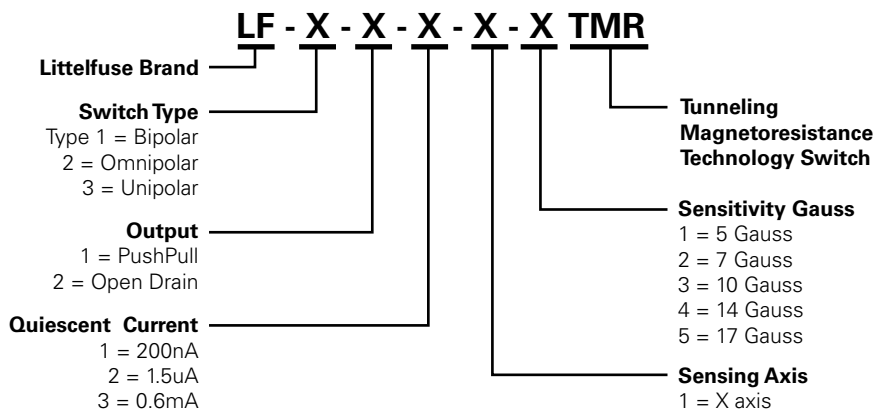
### Pin Configuration and Sensing Direction of Magnetic Field



Part Marking Code:  
Dxxx: D = LF32115TMR; xxx = Julian manufactured date; y = manufactured year  
Moisture Sensitivity Level: Rating is 3  
Pick and Place Nozzle: Samsung CN140 or equivalent

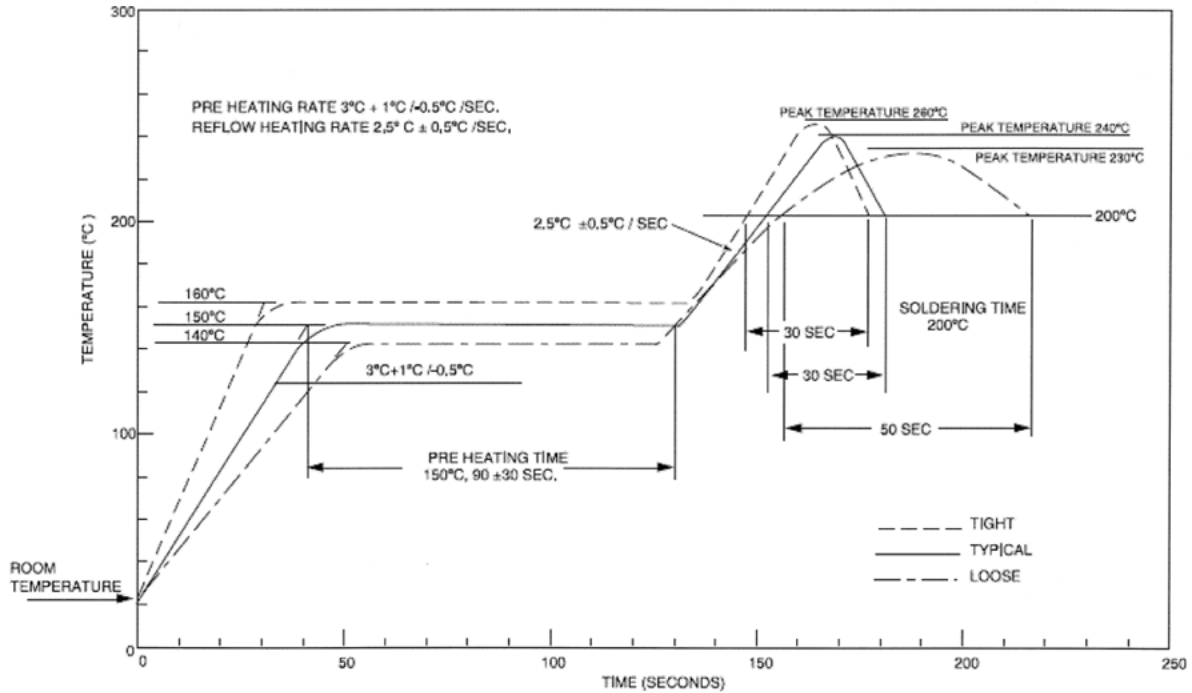
Pin Name	Pin No. SOT23-3	Pin Function
V <sub>OUT</sub>	2	Output
GND	3	Ground
V <sub>CC</sub>	1	Supply Voltage

### Part Numbering System

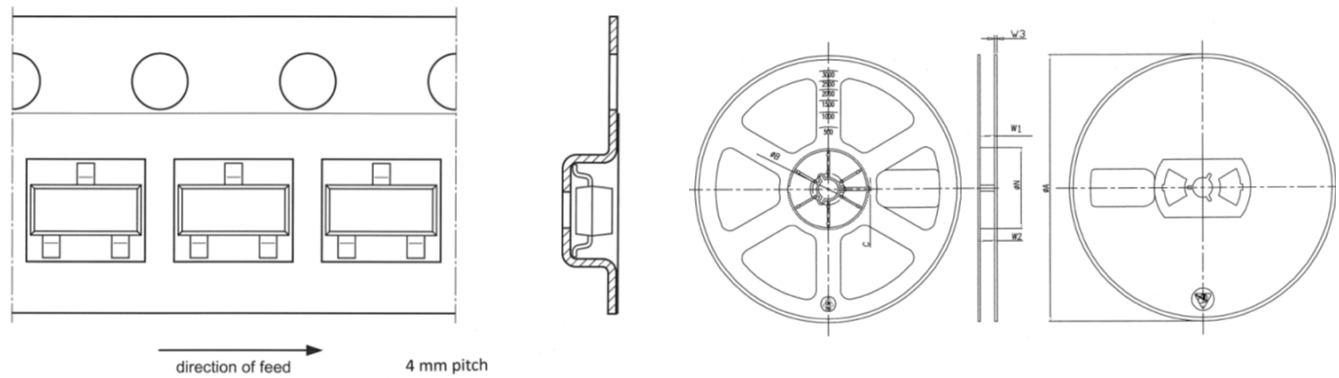


Example: LF11115 is Bipolar, Push Pull, 200 nA, X axis, 17 Gauss  
Note: Every combination is NOT offered. Contact Littelfuse for availability.

### Soldering Profile for Lead-free packages

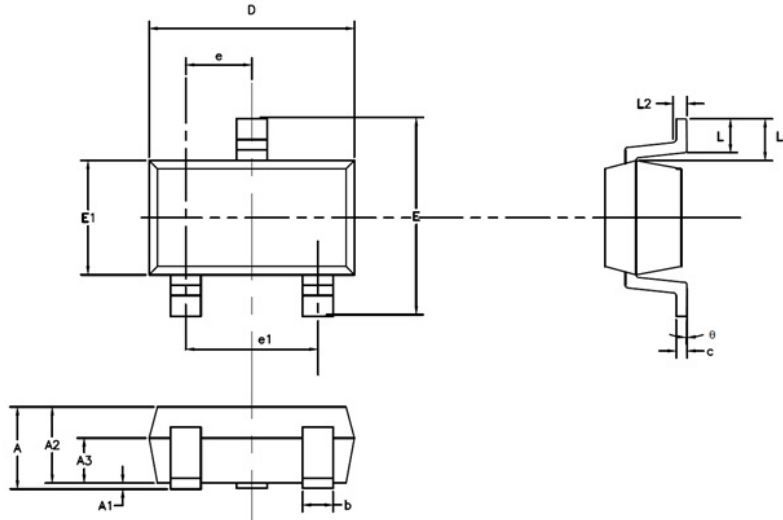


### Tape and Reel



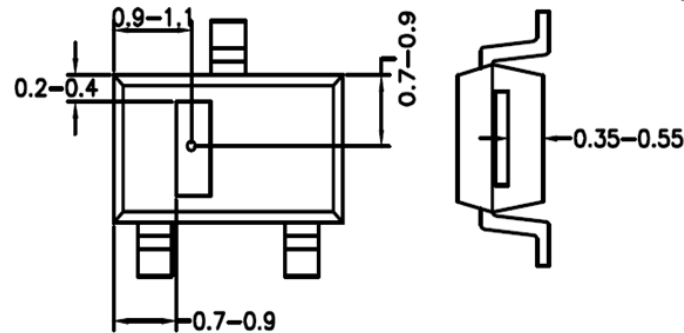
ØA	ØN	ØB	C	W1	W2	W3
178±2	54±2	13.2±0.3	2.2±0.3	8.4±1.5/0.0	12 MAX	1.4±0.4

**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°	-	8°	0°	-	8°

## TMR Sensor Position (SOT23-3 Elements)



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