

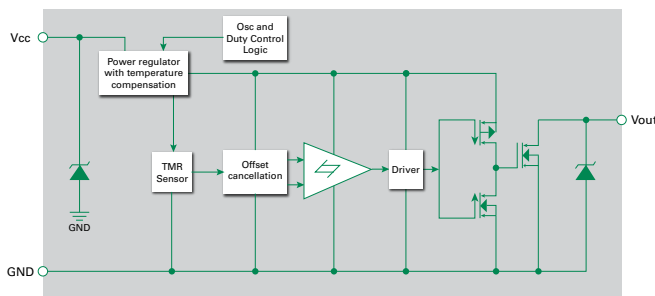
# LF22214TMR

## TMR Omni-polar Switch 14 Gauss 1.5uA Open Drain Sensor

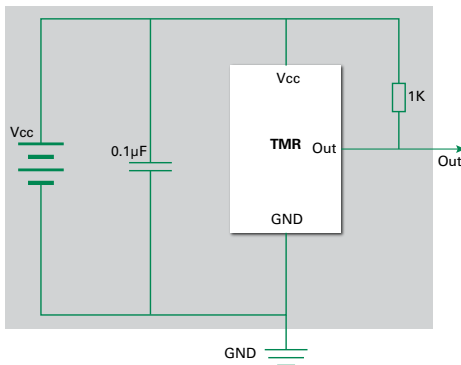
RoHS



### 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.

### Description

The LF22214TMR TMR Switch is a digital omni-polar 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 1.5µA (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 LF22214TMR switches low (turns on) when the magnetic field parallel to the sensing axis exceeds the operate point threshold, BOP. When the magnetic field is reduced below the release point BRP device output switches high (turns off). The difference between the BOP and the BRP is the hysteresis BH of the device.

### Features and Benefits

- Tunneling Magnetoresistance (TMR) technology
- Low power consumption at 1.5µA
- X axis sensing direction
- High frequency up to 1kHz
- Operation with north or south Pole
- 1.8V to 5.5V operating range
- 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, water, electric and heat meters
- High speed sensing
- Low power 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)     |
| North Pole | $B < B_{OPN}$     | Low (On)       |
|            | $0 > B > B_{RPN}$ | High (Off)     |

**Note:** When power is turned on under Zero magnetic field, the output is "High".

**LF22214TMR****TMR Omni-polar Switch 14 Gauss 1.5uA Open Drain Sensor****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         | 20        | 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, Vcc = 3.0V)**

| Symbol                      | Characteristics            | Min.                  | Typ. | Max.            | Unit | Conditions                                                  |
|-----------------------------|----------------------------|-----------------------|------|-----------------|------|-------------------------------------------------------------|
| V <sub>CC</sub>             | Supply Voltage             | 1.8                   | 3.0  | 5.5             | V    | Operating                                                   |
| V <sub>stress</sub>         | Output Stress Voltage      |                       |      | 5.5             | V    |                                                             |
| I <sub>leak</sub> (average) | Output leak current        |                       |      | 1               | μA   | Output = High, V <sub>cc</sub> = 3V, V <sub>out</sub> = 3V  |
| V <sub>OH</sub>             | Output High Voltage        | V <sub>cc</sub> - 0.2 |      | V <sub>cc</sub> | V    | Pull-up Resistance = 1Kohm                                  |
| R <sub>off</sub>            | Output turn-off Resistance |                       | 10   |                 | MΩ   | Output = High                                               |
| R <sub>on</sub>             | Output turn-on Resistance  |                       |      | 10              | Ω    | Output = Low                                                |
| V <sub>OL</sub>             | Output Low Voltage         | 0                     |      | 0.1             | V    | Output = Low, V <sub>cc</sub> = 3V, I <sub>sink</sub> = 3mA |
| I <sub>CC</sub>             | Supply Current             |                       | 1.5  |                 | μA   | Output Open                                                 |
| Freq                        | Response Frequency         |                       | 1.0  |                 | kHz  |                                                             |

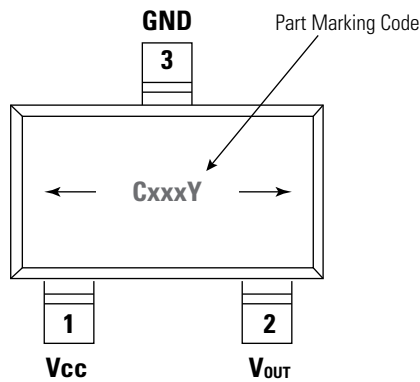
**Magnetic Characteristics (@TA = +25°C, Vcc = 3.0V)**

| Symbol           | Characteristics | Min. | Typ. | Max. | Unit  |
|------------------|-----------------|------|------|------|-------|
| B <sub>OPS</sub> | Operation Point | 10   | 14   | 25   | Gauss |
| B <sub>OPN</sub> |                 | -25  | -14  | -10  | Gauss |
| B <sub>RPS</sub> | Release Point   | 5    | 10   | 20   | Gauss |
| B <sub>RPN</sub> |                 | -20  | -10  | -5   | Gauss |
| B <sub>H</sub>   | Hysteresis      | —    | 4    | —    | Gauss |

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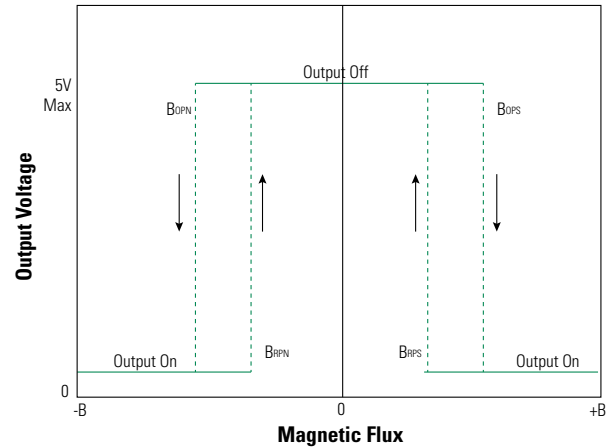
### Pin Configuration and Sensing Direction of Magnetic Field



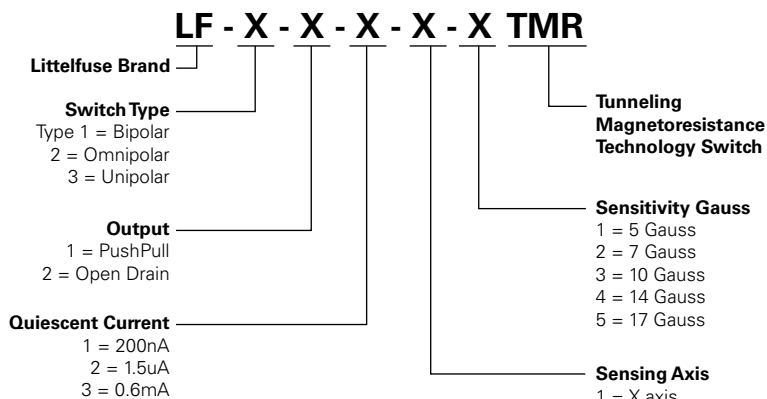
Part Marking Code:  
 CxxxY: C = LF22214TMR; xxx = Julian manufactured date; y = manufactured year

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 |

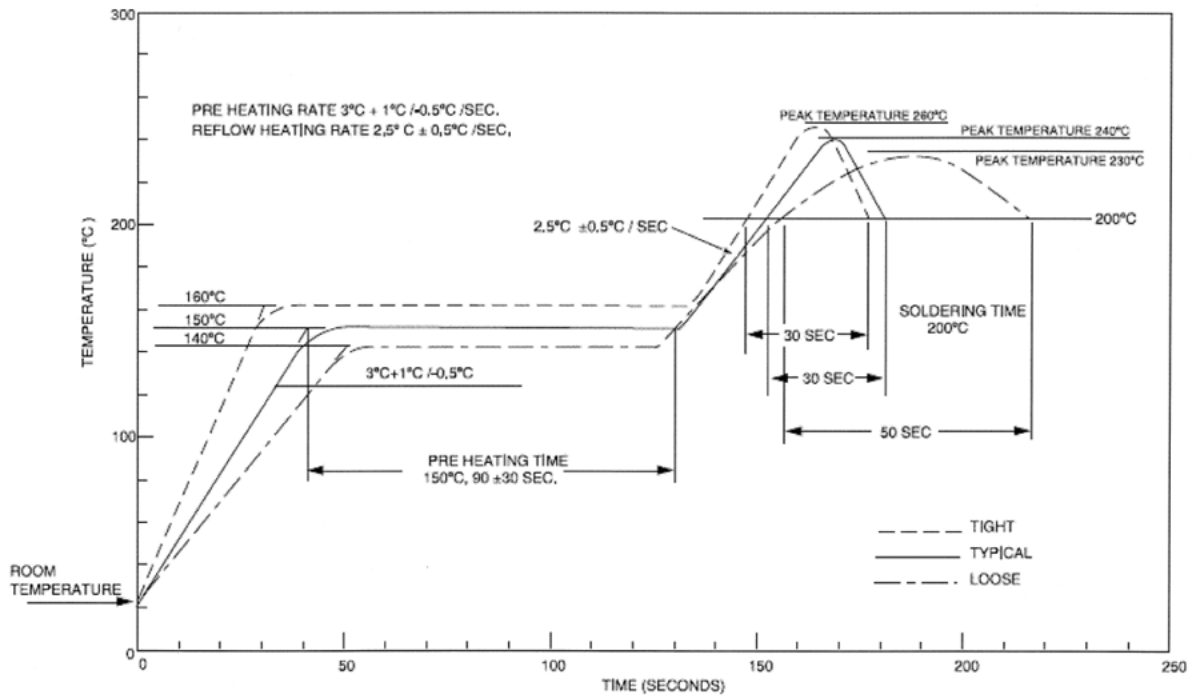
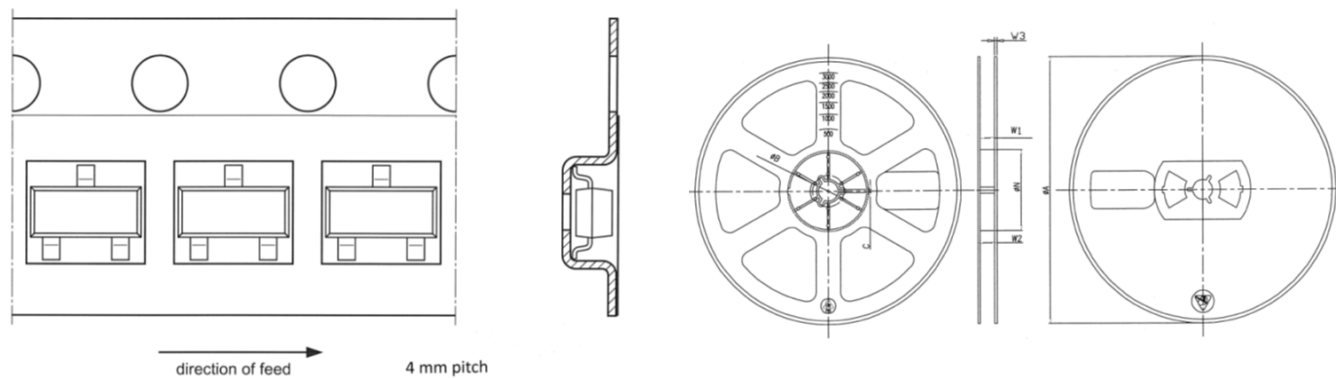


### Part Numbering System

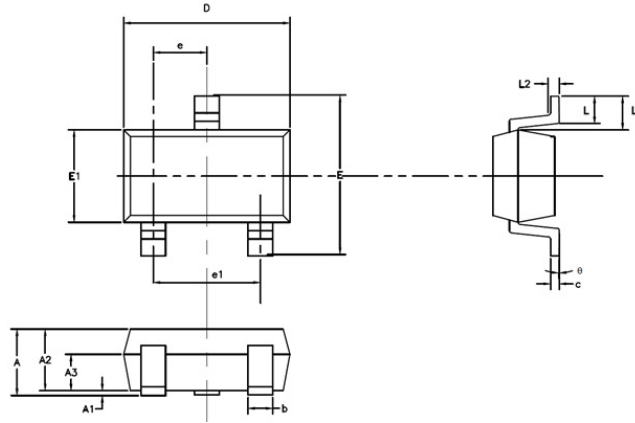


**Example:** LF11115 is Bipolar, Push Pull, 200 nA, X axis, 17 Gauss

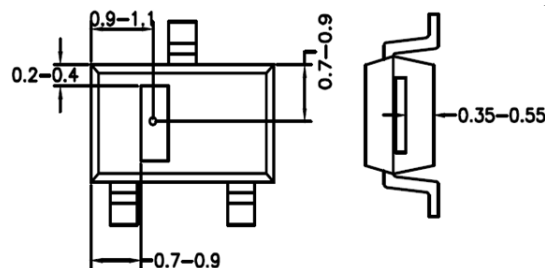
**Note:** Every combination is NOT offered. Contact Littelfuse for availability.

**LF22214TMR****TMR Omni-polar Switch 14 Gauss 1.5uA Open Drain Sensor****Soldering Profile for Lead-free packages****Tape and Reel**

| ØA          | ØN         | ØB             | C             | W1                | W2     | W3            |
|-------------|------------|----------------|---------------|-------------------|--------|---------------|
| 178 $\pm$ 2 | 54 $\pm$ 2 | 13.2 $\pm$ 0.3 | 2.2 $\pm$ 0.3 | 8.4 $\pm$ 1.5/0.0 | 12 MAX | 1.4 $\pm$ 0.4 |

**LF22214TMR****TMR Omni-polar Switch 14 Gauss 1.5uA Open Drain Sensor****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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