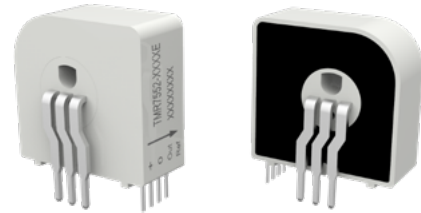


# TMR7552-E

## Unibody Precision Current Sensor

### Description

TMR7552-E is a close loop current sensor based on TMR tunnel magnetoresistance for accurate measurement of DC, AC, pulsed current and arbitrary waveform current with galvanic isolation between primary and secondary circuits.



### Features and Benefits

- Ultra low temperature drift
- High accuracy
- Excellent linearity
- Flexible for multiple current ranges
- Fast response time
- Small size, suitable for high density PCB application
- High stable output at 2.5 V
- RoHS & REACH compliant

### Applications

- Frequency conversion, servo motor traction
- Uninterruptible power supplies (UPS)
- Power supplies for welding application
- Switching power supplies
- Solar combiner box

### Selection Guide

Part Number	Primary Nominal Current	Primary Current Measuring Range
TMR7552-0060E	6 A	±19.2 A
TMR7552-0150E	15 A	±48 A
TMR7552-0250E	25 A	±80 A

### Insulation and Environmental Characteristics

Parameters	Symbol	Typ.	Unit
Dielectric Strength	$V_D$	4.2	kV(50 Hz, 1 min)
Insulation Resistance	$R_{IS}$	1000	MΩ
Creepage Distance	$d_{CP}$	13.9	mm
Clearance	$d_{CL}$	11.5	mm
Ambient Operating Temperature	$T_A$	-40 to +85	°C
Ambient Storage Temperature	$T_{STG}$	-50 to +105	°C
Mass	$m$	8	g

## Catalogue

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## 1. Specifications

$T_A = +25\text{ }^\circ\text{C}$ ,  $V_{CC} = 5\text{ V}$ ,  $R_L = 10\text{ k}\Omega$ , unless otherwise noted

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	
General Electrical Data							
Primary Nominal Current	$I_{PN}$	TMR7552-0060E	-	6	-	A	
		TMR7552-0150E	-	15	-		
		TMR7552-0250E	-	25	-		
Primary Current Measuring Range	$I_{PM}$	TMR7552-0060E	-19.2	-	19.2	A	
		TMR7552-0150E	-48	-	48		
		TMR7552-0250E	-80	-	80		
Sensitivity	S	$I_P = 0\text{ to } \pm I_{PN}$	TMR7552-0060E	-	104.17	-	mV/A
			TMR7552-0150E	-	41.67	-	
			TMR7552-0250E	-	25.00	-	
Supply Voltage	$V_{CC}$	$\pm 5\%$	-	5	-	V	
Reference Output Voltage	$V_{REF}$	-	2.485	2.5	2.515	V	
Offset Voltage	$V_{OFF}$	-	-	2.5	-	V	
Output Voltage	$V_{OUT}$	$I_P = 0\text{ to } \pm I_{PM}$	-	$V_{OFF} + 0.625 \times I_P / I_{PN}$	-	V	
Current Consumption	$I_C$	$I_P = 0$	-	14	-	mA	
Load Resistance	$R_L$	$I_P = 0\text{ to } \pm I_{PN}$	2	10	-	k $\Omega$	
Static Performance Data							
Accuracy	$X_G$	$I_P = 0\text{ to } \pm I_{PN}$	-	$\pm 0.5$	-	% $I_{PN}$	
		$I_P = \pm I_{PN}\text{ to } \pm I_{PM}$	-	$\pm 1$	-		
Linearity Error	$\epsilon_L$	$I_P = 0\text{ to } \pm I_{PN}$	-	$\pm 0.1$	-	% $I_{PN}$	
		$I_P = \pm I_{PN}\text{ to } \pm I_{PM}$	-	$\pm 0.25$	-		
Symmetry	$\epsilon_{SYM}$	$T_A = -40\text{ }^\circ\text{C to } +85\text{ }^\circ\text{C}$ , $I_P = 0\text{ to } \pm I_{PN}$	99	100	101	%	
Offset Error	$V_{OE}$	$T_A = +25\text{ }^\circ\text{C}$ , $I_P = 0$	-	10	-	mV	
		$T_A = -40\text{ }^\circ\text{C to } +85\text{ }^\circ\text{C}$ , $I_P = 0$	-	15	-		
Temperature Drift	$I_{OST}$	$I_P = 0$	-	100	-	PPM/ $^\circ\text{C}$	
Gain Temperature Drift	$I_{ST}$	$I_P = 0\text{ to } \pm I_{PN}$	-	50	-	PPM/ $^\circ\text{C}$	
Hysteresis	$V_{OH}$	$I_P = \pm I_{PN} \rightarrow 0$	-	$\pm 0.4$	-	mV	
		$I_P = \pm 3 \times I_{PN} \rightarrow 0$	-	$\pm 0.5$	-		
		$I_P = \pm 5 \times I_{PN} \rightarrow 0$	-	$\pm 2.0$	-		
Dynamic Performance Data							
Response Time	$t_R$	$di/dt > 50\text{ A}/\mu\text{s}$ , 10% of $I_{PN}$	-	0.5	-	$\mu\text{s}$	
		$di/dt > 50\text{ A}/\mu\text{s}$ , 10% to 90% of $I_{PN}$	-	1	-		
Bandwidth	BW	0 to -0.5 dB	DC	100	-	kHz	
		-0.5 dB to -1 dB		200	-		
Following Accuracy	$di/dt$	-	100	-	-	A/ $\mu\text{s}$	

## 2. Parameters Definition And Formula

### 1) Accuracy

$$X_G = \text{MAX}_{I_p \in [-I_{PN}, I_{PN}]} \left( \frac{V_{OUT} - (I_p \times S + V_{OFF})}{I_{PN} \times S} \times 100\% \right)$$

$I_p$  stands for primary current,  $I_{PN}$  stands for nominal primary current,  $V_{OUT}$  stands for current sensor output voltage at given primary current,  $S$  stands for sensitivity,  $V_{OFF}$  stands for offset voltage.

### 2) Sensitivity

$$S = \frac{V_{OUT(@ I_{PN})} - V_{OUT(@ -I_{PN})}}{2 \times I_{PN}}$$

$V_{OUT(@ I_{PN})}$  and  $V_{OUT(@ -I_{PN})}$  stand for the voltage output at  $I_{PN}$ ,  $-I_{PN}$  respectively.

### 3) Linearity

$$\varepsilon_L = \text{MAX}_{I_p \in [-I_{PN}, I_{PN}]} \left( \frac{|V_{OUT} - (I_p \times \bar{S} + \overline{V_{OFF}})|}{I_{PN} \times S} \times 100\% \right)$$

$\bar{S}$ ,  $\overline{V_{OFF}}$  stand for the average values of the sensitivity and offset voltage.

### 4) Offset Error

$$V_{OE} = V_{OUT(@ I_p = 0)} - V_{OFF}$$

### 5) Hysteresis

$$V_{OH} = \text{MAX } \Delta H$$

$\Delta H$  is the maximum residual voltage between full scale positive and negative nominal current.

### 3. Dimensions

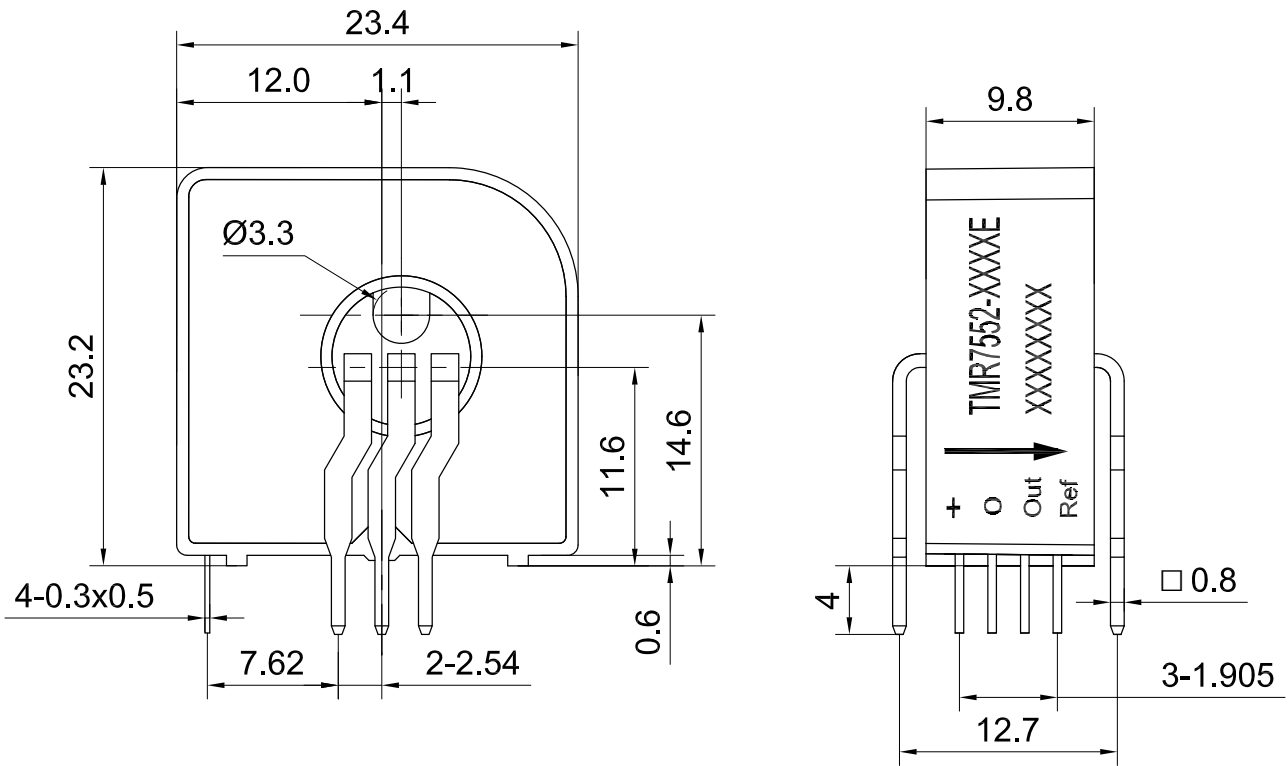


Figure 1. Dimension (unit: mm, tolerances for unmarked scales  $\pm 1$  mm)

## 4. Pin Configuration and Wiring Diagram

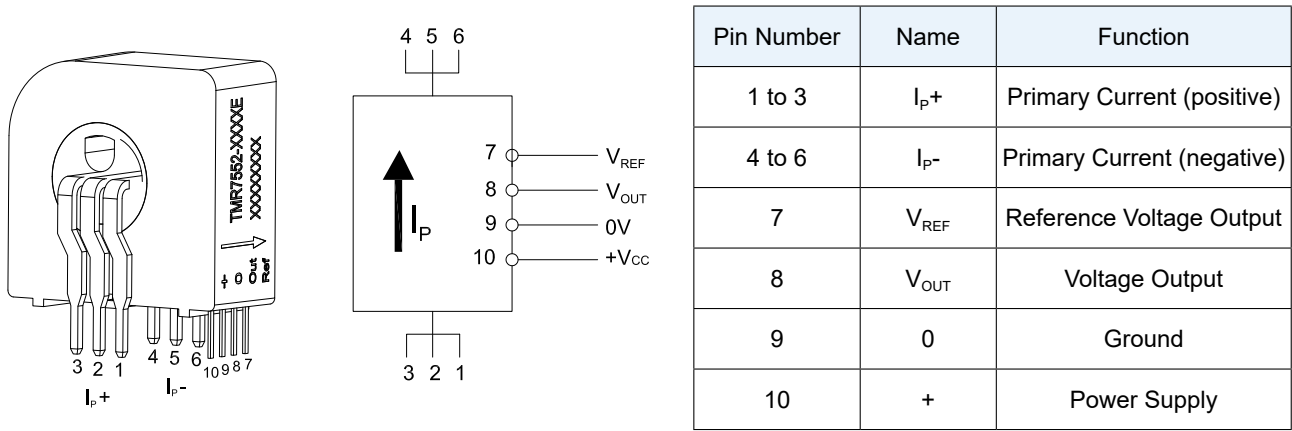


Figure 2. Pin configuration and wiring Diagram

Primary Turns	Primary Nominal Current	Normal Output Voltage	Primary Coil Internal Resistance	Recomanded Layout
1	$\pm 6$ A	$2.5 \pm 0.625$ V	0.2 m $\Omega$	<pre> 6 5 4 OUT ○ ○ ○       IN 1 2 3                     </pre>
2	$\pm 3$ A	$2.5 \pm 0.625$ V	0.8 m $\Omega$	<pre> 6 5 4 OUT ○ ○ ○       IN 1 2 3                     </pre>
3	$\pm 2$ A	$2.5 \pm 0.625$ V	1.6 m $\Omega$	<pre> 6 5 4 OUT ○ ○ ○       IN 1 2 3                     </pre>

## 5. Recommended PCB Layout

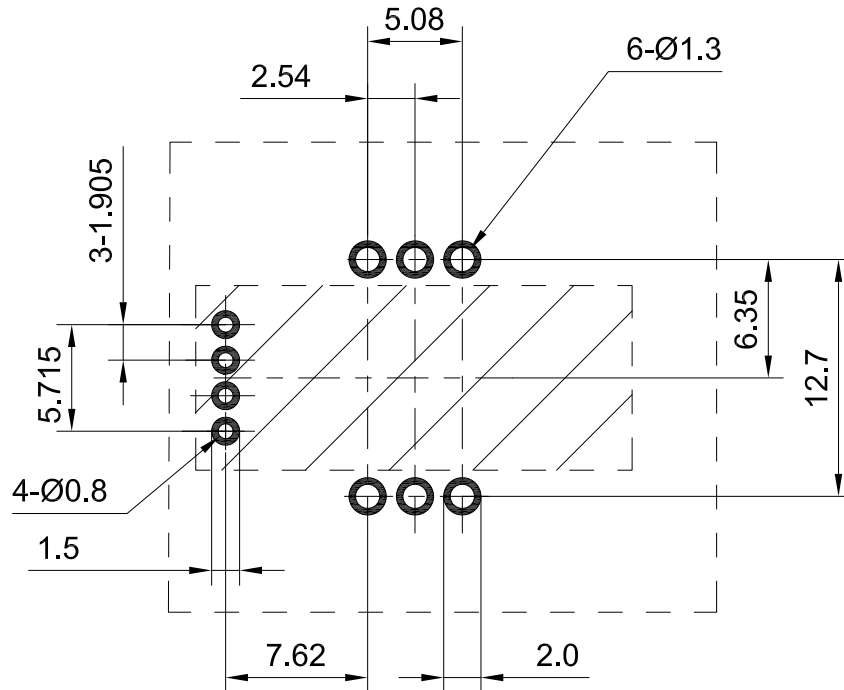


Figure 3. PCB layout

## 6. Remarks

1. Wave Soldering Profile: Maximum Temperature 260 °C for 10 s.
2.  $V_{OUT}$  is positive when the primary current ( $I_p$ ) is in the same direction as the arrow indication on the label and vice versa.
3. Improper connection may result in permanent damage of the sensor.
4. The current sensor must be disconnected from the power supply during installation. No other devices are allowed in the projection area under the sensor.
5. Sensor is customizable upon request.

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