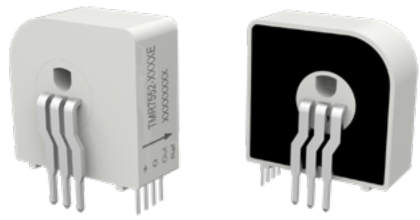
TMR7552-E

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

1. Specifications

T_A = +25 °C, V_{CC} = 5 V, R_L = 10 kΩ, 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 to $\pm I_{PN}$	TMR7552-0060E	-	104.17	-	mV/A
			TMR7552-0150E	-	41.67	-	
			TMR7552-0250E	-	25.00	-	
Supply Voltage	V_{CC}	±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 to $\pm I_{PM}$		-	V_{OFF} + 0.625 × I_P/I_{PN}	-	V
Current Consumption	I_C	I_P = 0		-	14	-	mA
Load Resistance	R_L	I_P = 0 to $\pm I_{PN}$		2	10	-	kΩ
Static Performance Data							
Accuracy	X_G	I_P = 0 to $\pm I_{PN}$		-	±0.5	-	% I_{PN}
		I_P = $\pm I_{PN}$ to $\pm I_{PM}$		-	±1	-	
Linearity Error	ε_L	I_P = 0 to $\pm I_{PN}$		-	±0.1	-	% I_{PN}
		I_P = $\pm I_{PN}$ to $\pm I_{PM}$		-	±0.25	-	
Symmetry	ε_{SYM}	T_A = -40 °C to +85 °C, I_P = 0 to $\pm I_{PN}$		99	100	101	%
Offset Error	V_{OE}	T_A = +25 °C, I_P = 0		-	10	-	mV
		T_A = -40 °C to +85 °C, I_P = 0		-	15	-	
Temperature Drift	I_{OST}	I_P = 0		-	100	-	PPM/°C
Gain Temperature Drift	I_{ST}	I_P = 0 to $\pm I_{PN}$		-	50	-	PPM/°C
Hysteresis	V_{OH}	I_P = $\pm I_{PN}$ → 0		-	±0.4	-	mV
		I_P = ±3 × I_{PN} → 0		-	±0.5	-	
		I_P = ±5 × I_{PN} → 0		-	±2.0	-	
Dynamic Performance Data							
Response Time	t_R	di/dt > 50 A/μs, 10% of I_{PN}		-	0.5	-	μs
		di/dt > 50 A/μs, 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/μs

2. Parameters Definition And Formula

1) Accuracy

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

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

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

$\overline{S}$, $\overline{V_{OFF}}$ 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

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

ΔH is the maximum residual voltage between full scale positive and negative nominal current.

3. Dimensions

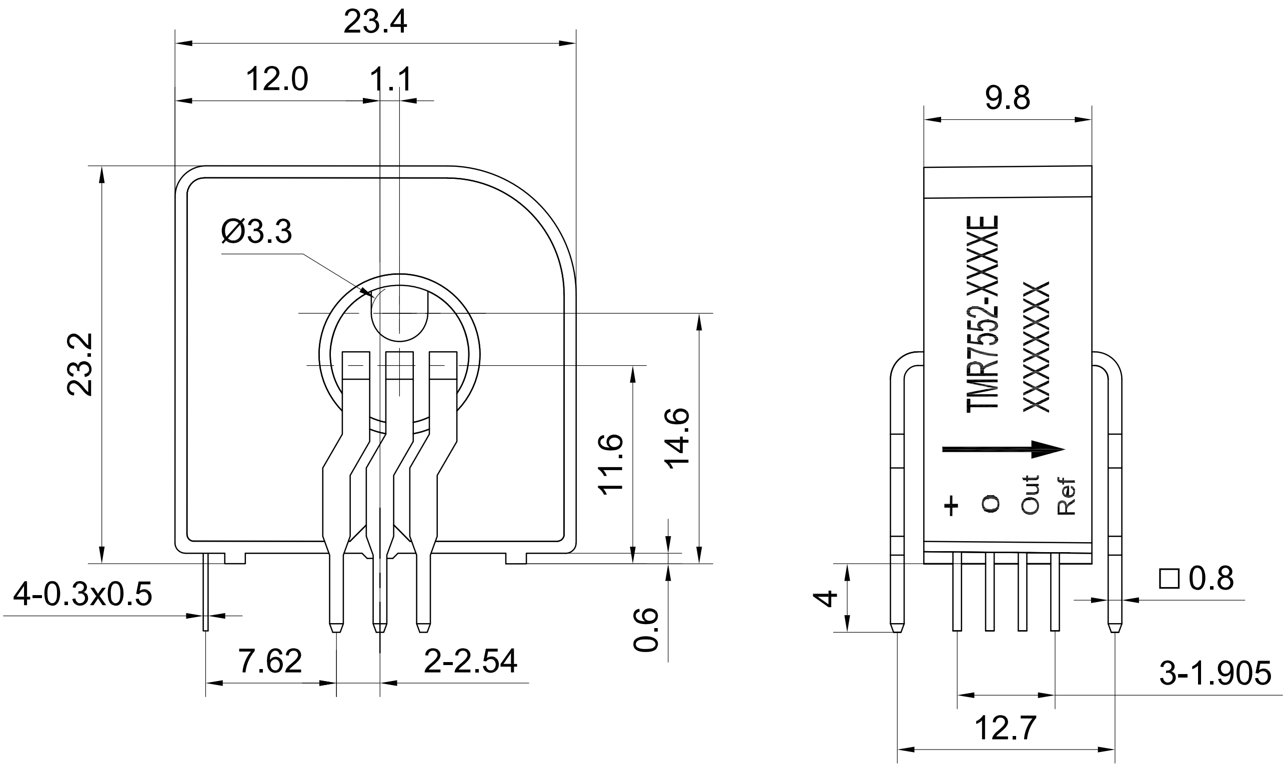
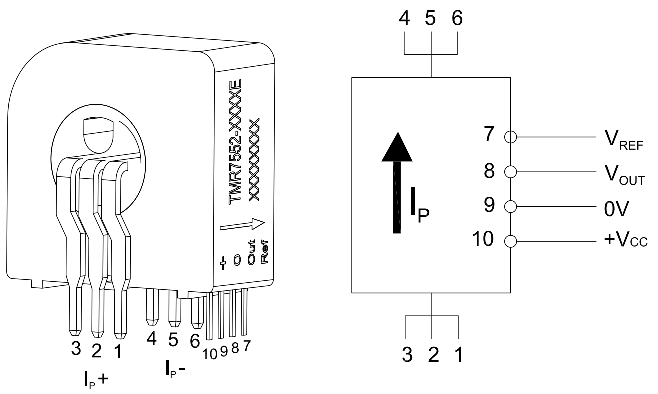


Figure 1. Dimension (unit: mm, tolerances for unmarked scales ±1 mm)

4. Pin Configuration and Wiring Diagram



Pin Number	Name	Function
1 to 3	I_P+	Primary Current (positive)
4 to 6	I_P-	Primary Current (negative)
7	V_{REF}	Reference Voltage Output
8	V_{OUT}	Voltage Output
9	0	Ground
10	+	Power Supply

Figure 2. Pin configuration and wiring Diagram

Primary Turns	Primary Nominal Current	Norminal Output Voltage	Primary Coil Internal Resistance	Recomanded Layout
1	±6 A	2.5±0.625 V	0.2 mΩ	6 5 4 OUT IN 1 2 3
2	±3 A	2.5±0.625 V	0.8 mΩ	6 5 4 OUT IN 1 2 3
3	±2 A	2.5±0.625 V	1.6 mΩ	6 5 4 OUT IN 1 2 3

5. Recommended PCB Layout

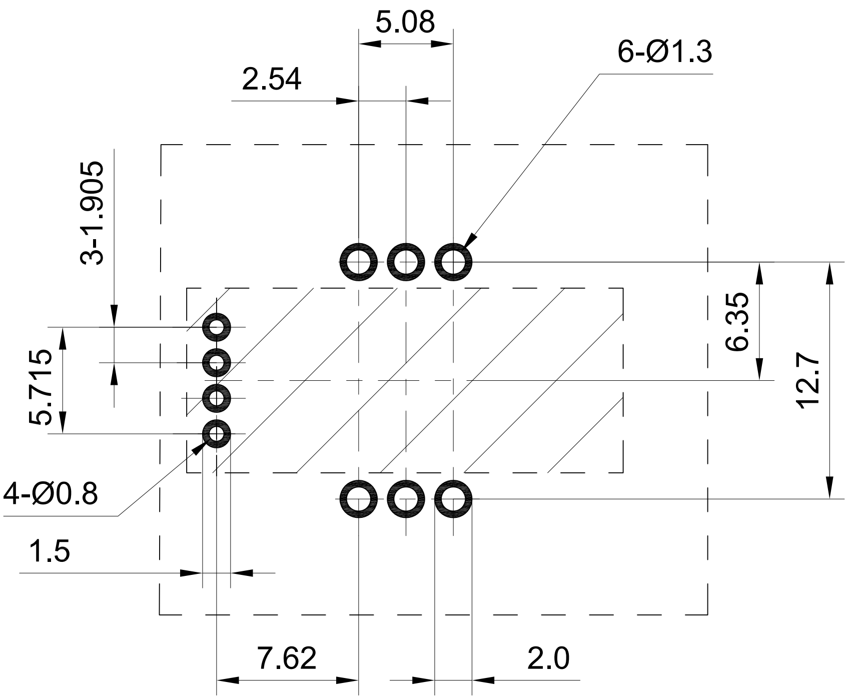


Figure 3. PCB layout

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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Recycling

The product(s) in this document need to be handed over to a qualified solid waste management services company for recycling in accordance with relevant regulations on waste classification after the end of the product(s) life.

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