TMR7308-B

Board Mount Precision Current Sensor

Description

TMR7308-B is a closed loop current sensor for accurate measurement of DC, AC, pulsed current and arbitrary waveform current with galvanic isolation between primary and secondary circuits.

Features and Benefits

- High accuracy
- Low temperature coefficient
- Galvanic isolation
- High immunity to external interference
- Excellent linearity
- Light weight design
- RoHS & REACH compliant

Applications

- Computer numerical control system (CNC)
- Inverter
- DC motor drives
- Inverter and variable frequency drives (VFD)
- Uninterruptible power supplies (UPS)
- Telecom power supplies

Selection Guide

Part Number	Primary Nominal Current	Primary Current Measuring Range
TMR7308-0500B	50 A	±150 A
TMR7308-1000B	100 A	±280 A

Insulation and Environmental Characteristics

Parameters	Symbol	Typ.	Unit
Dielectric Strength	V_D	5	kV(50 Hz, 1 min)
Insulation Resistance	R_{IS}	500	MΩ
Creepage Distance	d_{CP}	10.7	mm
Clearance	d_{CL}	10.7	mm
Ambient Operating Temperature	T_A	-40 to +85	°C
Ambient Storage Temperature	T_{STG}	-40 to +85	°C
Mass	m	18	g

Catalogue

1. TMR7308-0500B Specifications

T_A = +25 °C, V_{CC} = ±15 V, R_M = 120 Ω, unless otherwise noted

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
General Electrical Data						
Primary Nominal Current	I_{PN}	TMR7308-0500B	-	50	-	A
Primary Current Measuring Range	I_{PM}	TMR7308-0500B	-150	-	150	A
Sensitivity	S	I_P = 0 to ±I_{PN}	-	0.5	-	mA/A
Number of secondary turns	N_S	-	-	2000	-	-
Output Current	I_{OUT}	I_P = 0 to ±I_{PM}	-	I_{OE} + S × I_P	-	mA
Supply Voltage	V_{CC}	±5 %	-	±15	-	V
Current Consumption	I_C	I_P = 0	-	15	-	mA
Secondary Coil Resistance	R_S	T_A = +25 °C	-	64	-	Ω
Measuring Resistance	R_M	T_A = +85 °C, I_{PM} ≤ 50A	120	-	480	Ω
Static Performance Data						
Accuracy	X_G	T_A = +25 °C, I_P = 0 to ±I_{PN}	-0.5	±0.2	0.5	% I_{PN}
		T_A = -40 °C to +85 °C, I_P = 0 to ±I_{PN}	-1	-	1	
Linearity Error	ε_L	T_A = -40 °C to +85 °C, I_P = 0 to ±I_{PN}	-	0.1	-	% I_{PN}
Symmetry	ε_{SYM}	T_A = -40 °C to +85 °C, I_P = 0 to ±I_{PN}	99.5	100	100.5	%
Sensitivity Error	ε_S	T_A = -40 °C to +85 °C, I_P = 0 to ±I_{PN}	-0.5	-	0.5	%
Offset Error	I_{OE}	T_A = +25 °C, I_P = 0	-0.15	±0.05	0.15	mA
		T_A = -40 °C to +85 °C, I_P = 0	-0.3	-	0.3	mA
Hysteresis	I_{OH}	T_A = -40 °C to +85 °C, I_P = ±I_{PN} → 0	-	±0.2	-	mA
Dynamic Performance Data						
Response Time	t_R	di/dt > 50 A/μs, 10% to 90% of I_{PN}	-	1	-	μs
Bandwidth	BW	-3 dB	DC	200	-	kHz

2. TMR7308-1000B Specifications

T_A = +25 °C, V_{CC} = ±15 V, R_M = 60 Ω, unless otherwise noted

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
General Electrical Data						
Primary Nominal Current	I_{PN}	TMR7308-1000B	-	100	-	A
Primary Current Measuring Range	I_{PM}	TMR7308-1000B	-280	-	280	A
Sensitivity	S	I_P = 0 to ±I_{PN}	-	0.5	-	mA/A
Number of secondary turns	N_S	-	-	2000	-	-
Output Current	I_{OUT}	I_P = 0 to ±I_{PM}	-	I_{OE} + S × I_P	-	mA
Supply Voltage	V_{CC}	±5 %	±12	±15	-	V
Current Consumption	I_C	I_P = 0	-	15	-	mA
Secondary Coil Resistance	R_S	T_A = +25 °C	-	42	-	Ω
Measuring Resistance	R_M	T_A = +85 °C, I_{PM} ≤ 50A	60	-	220	Ω
Static Performance Data						
Accuracy	X_G	T_A = +25 °C, I_P = 0 to ±I_{PN}	-0.5	±0.2	0.5	% I_{PN}
		T_A = -40 °C to +85 °C, I_P = 0 to ±I_{PN}	-1	-	1	
Linearity Error	ε_L	T_A = -40 °C to +85 °C, I_P = 0 to ±I_{PN}	-	0.1	-	% I_{PN}
Symmetry	ε_{SYM}	T_A = -40 °C to +85 °C, I_P = 0 to ±I_{PN}	99.5	100	100.5	%
Sensitivity Error	ε_S	T_A = -40 °C to +85 °C, I_P = 0 to ±I_{PN}	-0.5	-	0.5	%
Offset Error	I_{OE}	T_A = +25 °C, I_P = 0	-0.15	±0.05	0.15	mA
		T_A = -40 °C to +85 °C, I_P = 0	-0.3	-	0.3	mA
Hysteresis	I_{OH}	T_A = -40 °C to +85 °C, I_P = ±I_{PN} → 0	-	±0.2	-	mA
Dynamic Performance Data						
Response Time	t_R	di/dt > 50 A/μs, 10% to 90% of I_{PN}	-	1	-	μs
Bandwidth	BW	-3 dB	DC	200	-	kHz

3. Typical Temperature Characteristics

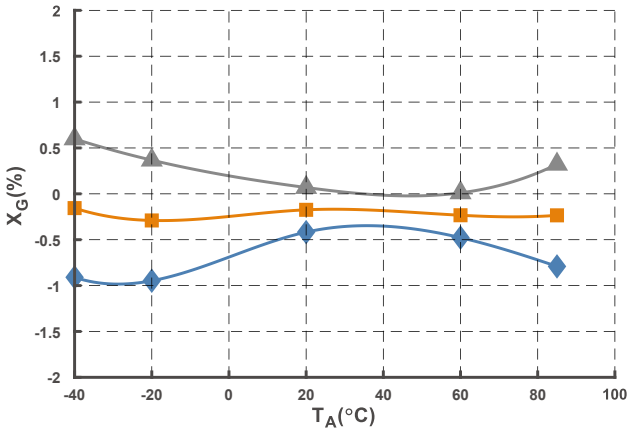

Figure 1. Accuracy

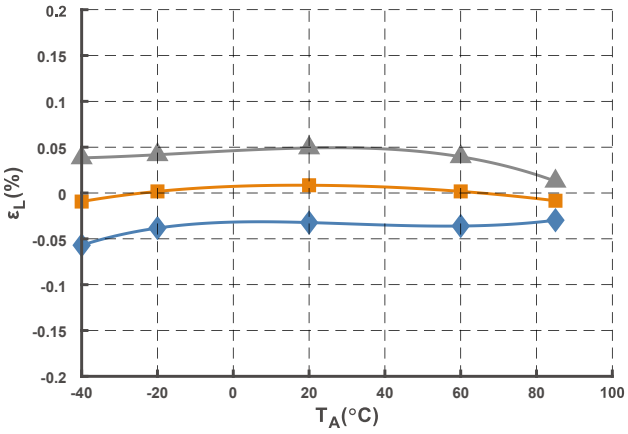

Figure 2. Linearity Error

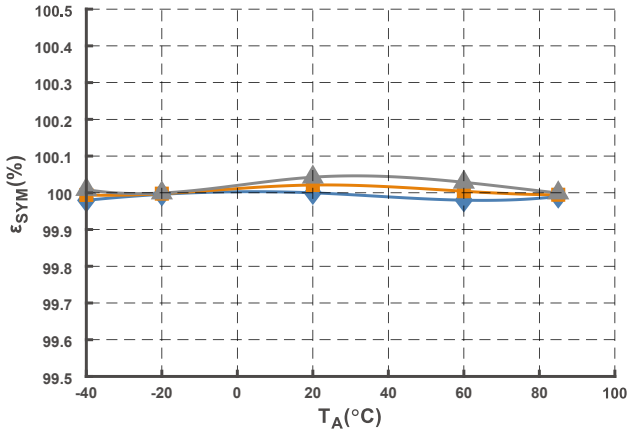

Figure 3. Symmetry

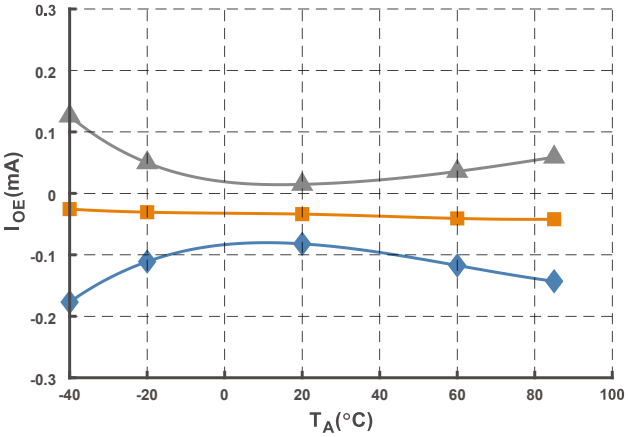

Figure 4. Offset Error

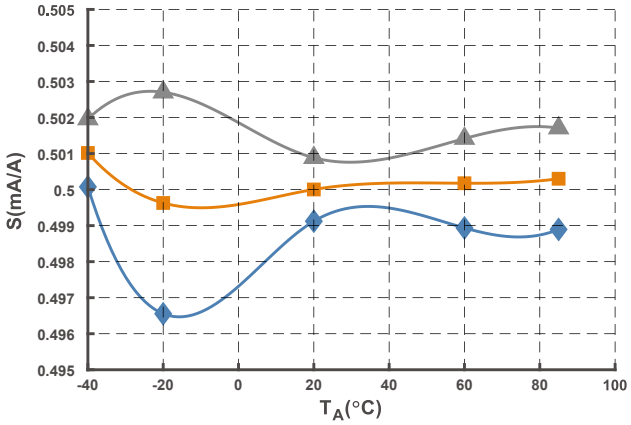

Figure 5. Sensitivity

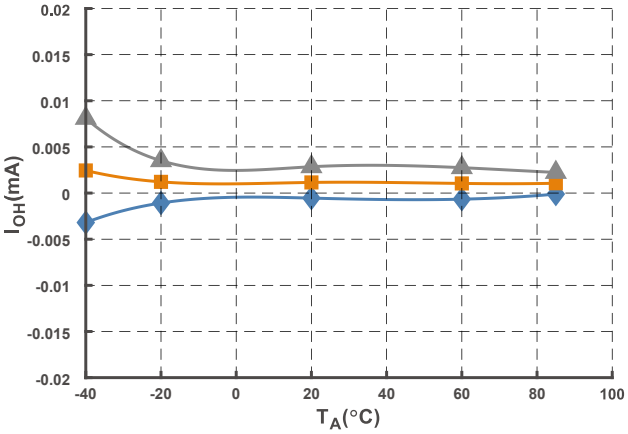

Figure 6. Hysteresis

4. Parameters Definition And Formula

1) Output Current

$$I_{OUT} = I_{OE} + S \times I_P$$

I_{OUT} stands for current sensor output current at given primary current, I_{OE} stands for offset error, S stands for sensitivity, I_P stands for primary current.

2) Accuracy

$$X_G = \underset{I_P \in [-I_{PN},\, I_{PN}]}{MAX} \left(\frac{I_{OUT} - (S \times I_P)}{S \times I_{PN}} \times 100\% \right)$$

I_{PN} stands for nominal primary current

3) Sensitivity

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

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

4) Linearity

$$\varepsilon_L = \underset{I_P \in [-I_{PN},\, I_{PN}]}{MAX} \left(\frac{I_{OUT} - (\bar{I}_{OE} + \bar{S} \times I_P)}{S \times I_{PN}} \times 100\% \right)$$

$\bar{S}$ and $\bar{I}_{OE}$ stand for the average values of the sensitivity and offset error.

5) Symmetry

$$\varepsilon_{SYM} = \left| \frac{I_{OUT(@\, I_{PN})} - \bar{I}_{OE}}{I_{OUT(@\, -I_{PN})} - \bar{I}_{OE}} \right| \times 100\%$$

6) Hysteresis

$$I_{OH} = MAX\ \Delta H$$

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

5. Application Information

5.1 Electrical Connection

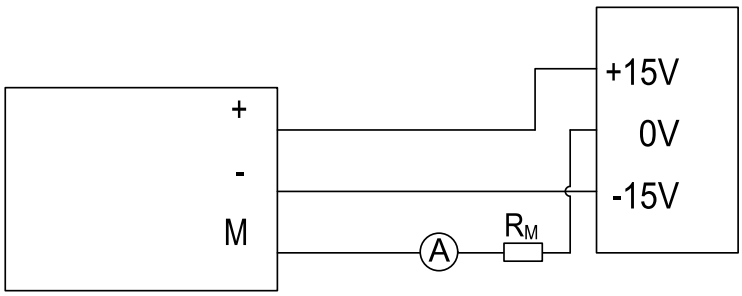

Figure 7. Electrical Connection

5.2 Mounting Recommendation

1. Mounting method: PCB through hole mount
2. Primary pin dimensions: 6 pins 1.4 mm × 1 mm
3. Primary through hole dimensions: Hole diameter 2 mm
4. Secondary pin dimensions: 3 pins 0.64 mm × 0.64 mm
5. Secondary through hole dimensions: Hole diameter 1.2 mm

5.3 Remarks

1. Wave soldering profile max temperature should be set no higher than 260 °C for 10 s.
2. Temperature of the primary busbar should not exceed 100 °C.
3. I_{OUT} is positive when the primary current (I_P) is in the same direction as the arrow indication on the label and vice versa.
4. Improper connection may result in permanent damage of the sensor.
5. Power must be disconnected when installing the current sensor, and any other components should be avoid in shaded area.
6. Sensor is customizable upon request.

6. Recommended PCB Layout

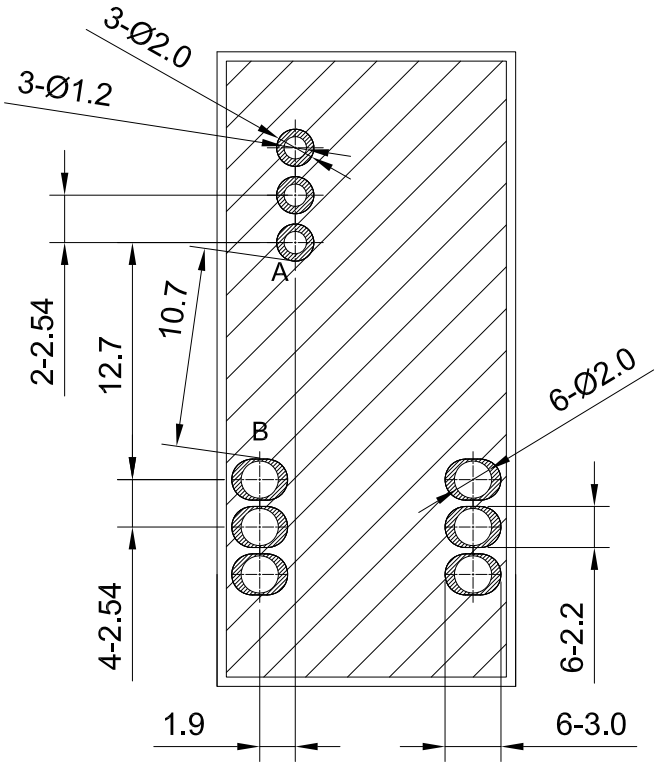

Figure 8. TMR7308-B PCB layout

7. Dimensions

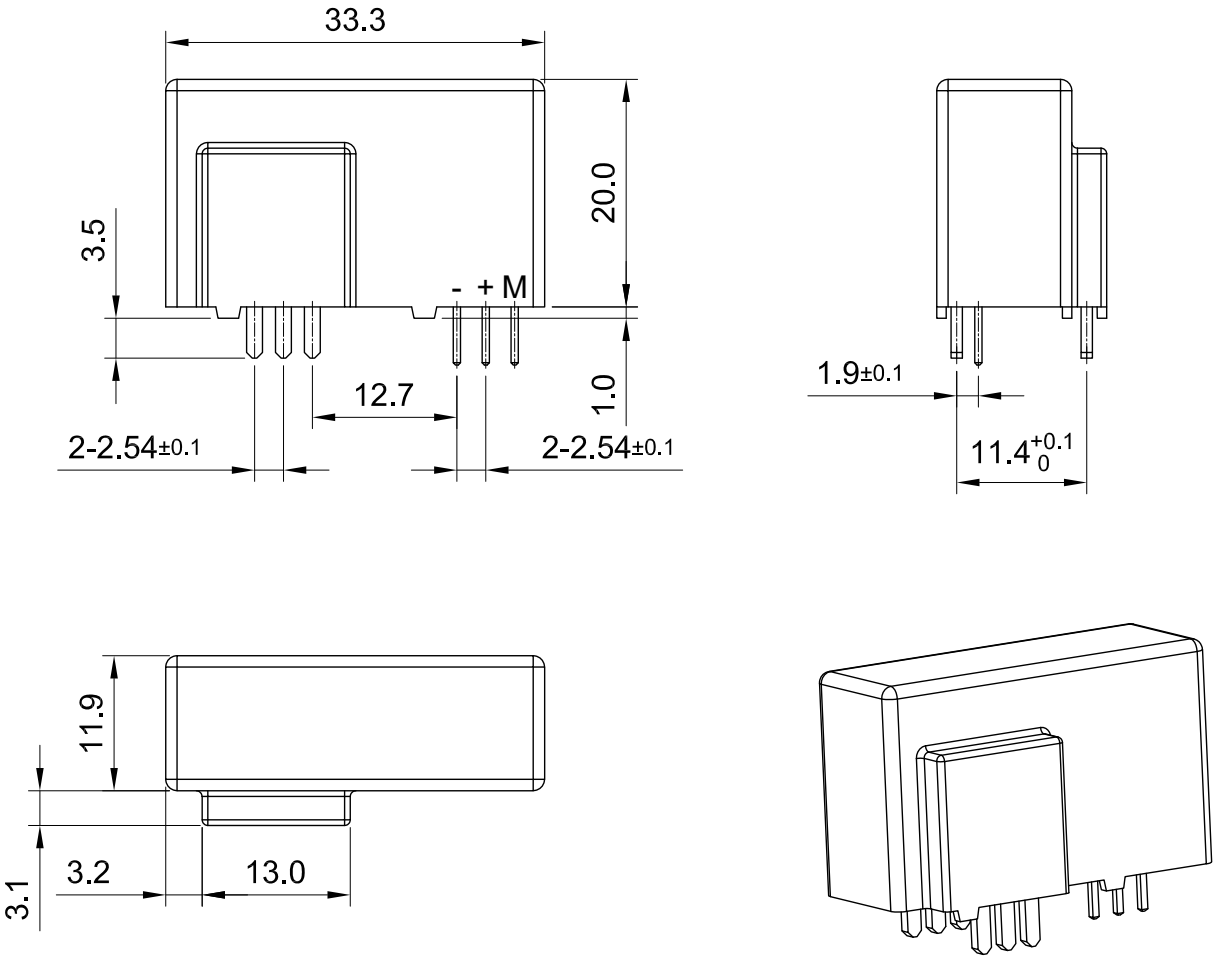

Figure 9. TMR7308-B Dimension (unit: mm, tolerances for unmarked scales ±1 mm)

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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