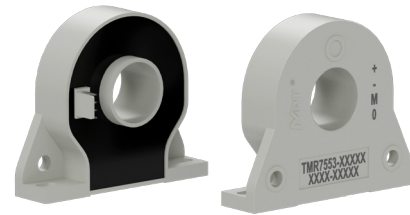


# TMR7553-F

## Unibody Precision Current Sensor

### Description

TMR7553-F is a close 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
- Excellent linearity
- Ultra low temperature drift
- Fast response time
- Galvanic isolation
- High immunity to external interference
- Anti-CAF
- RoHS & REACH compliant

### Applications

- DC motor drives
- Inverter and variable frequency drives (VFD)
- Uninterruptible power supplies (UPS)
- Power supplies for welding application
- Switching power supplies

### Selection Guide

Part Number	Primary Nominal Current	Primary Current Measuring Range
TMR7553-1000F	100 A	±200 A
TMR7553-2000F	200 A	±400 A
TMR7553-3000F	300 A	±600 A

### Insulation and Environmental Characteristics

Parameters	Symbol	Typ.	Unit
Dielectric Strength	$V_D$	5	kV(50 Hz, 1 min)
Insulation Resistance	$R_{IS}$	1000	$M\Omega$
Creepage Distance	$d_{CP}$	20	mm
Clearance	$d_{CL}$	5	mm
Ambient Operating Temperature	$T_A$	-40 to +85	$^{\circ}C$
Ambient Storage Temperature	$T_{STG}$	-40 to +85	$^{\circ}C$
Mass	$m$	78	g

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## 1. Specifications

$T_A = +25\text{ °C}$ ,  $V_{CC} = \pm 15\text{ V}$ ,  $R_M = 5\ \Omega$ , unless otherwise noted

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
General Electrical Data						
Primary Nominal Current	$I_{PN}$	TMR7553-1000F	-	100	-	A
		TMR7553-2000F	-	200	-	
		TMR7553-3000F	-	300	-	
Primary Current Measuring Range	$I_{PM}$	TMR7553-1000F	-200	-	200	A
		TMR7553-2000F	-400	-	400	
		TMR7553-3000F	-600	-	600	
Sensitivity	S	$I_P = 0$ to $\pm I_{PN}$	-	0.5	-	mA/A
Number of Secondary Turns	$N_S$	-	-	2000	-	-
Output Current	$I_{OUT}$	$I_P = 0$ to $\pm I_{PM}$	-	$I_{OE} + S \times I_P$	-	V
Supply Voltage	$V_{CC}$	$\pm 5\%$	$\pm 12$	$\pm 15$	$\pm 20$	V
Current Consumption	$I_C$	$I_P = 0$	-	$\pm 15$	-	mA
Secondary Coil Resistance	$R_S$	$T_A = +25\text{ °C}$	-	-	23	$\Omega$
Measuring Resistance	$R_M$	For maximum measuring resistance value, please refer to Figure 2, 3, 4, 5, 6	0	-	-	$\Omega$
Static Performance Data						
Accuracy	$X_G$	$T_A = +25\text{ °C}$ , $I_P = 0$ to $\pm I_{PN}$	-0.3	$\pm 0.1$	0.3	% $I_{PN}$
		$T_A = -40\text{ °C}$ to $+105\text{ °C}$ , $I_P = 0$ to $\pm I_{PN}$	-0.6	$\pm 0.3$	0.6	
Linearity Error	$\epsilon_L$	$T_A = -40\text{ °C}$ to $+105\text{ °C}$ , $I_P = 0$ to $\pm I_{PN}$	-	$\pm 0.05$	-	% $I_{PN}$
Symmetry	$\epsilon_{SYM}$	$T_A = -40\text{ °C}$ to $+105\text{ °C}$ , $I_P = 0$ to $\pm I_{PN}$	99.8	100	100.2	%
Sensitivity Error	$\epsilon_S$	$T_A = -40\text{ °C}$ to $+105\text{ °C}$ , $I_P = 0$ to $\pm I_{PN}$	-0.2	-	0.5	%
Offset Error	$I_{OE}$	$T_A = +25\text{ °C}$ , $I_P = 0$	-	$\pm 0.3$	-	mA
Hysteresis	$I_{OH}$	$I_P = \pm I_{PN} \rightarrow 0$	-0.1	-	0.1	mA
Dynamic Performance Data						
Response Time	$t_R$	$di/dt > 50\text{ A}/\mu\text{s}$ , 10% to 90% of $I_{PN}$	-	1	-	$\mu\text{s}$
Bandwidth	BW	-3 dB	DC	-	200	kHz

## 2. Typical Output Characteristics

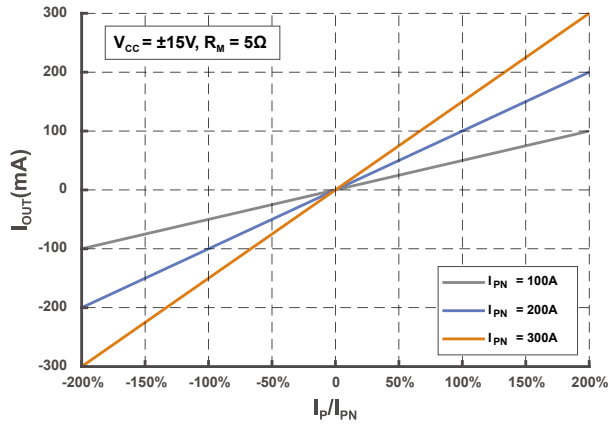


Figure 1. Output Voltage vs Primary Current

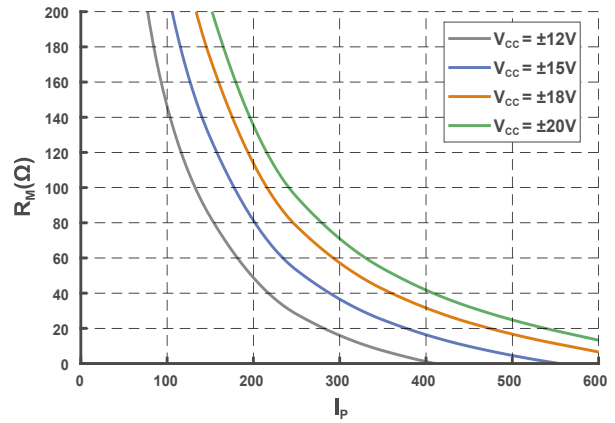


Figure 2. Measuring Resistance (@ $T_A = 105\text{ }^\circ\text{C}$ )

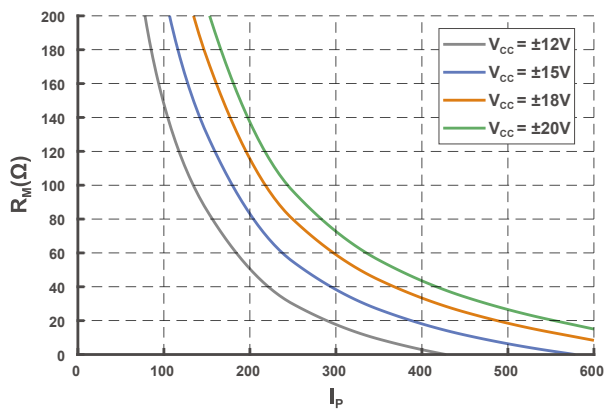


Figure 3. Measuring Resistance (@ $T_A = 85\text{ }^\circ\text{C}$ )

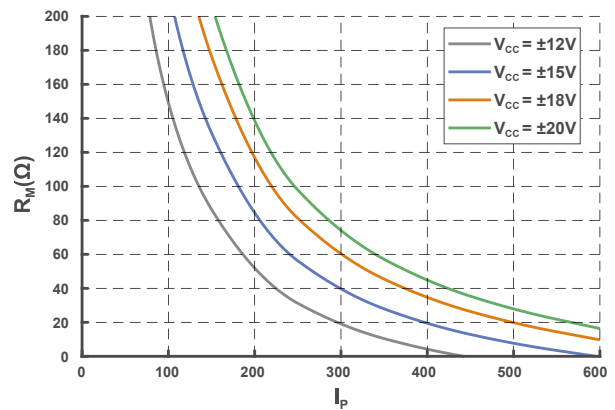


Figure 4. Measuring Resistance (@ $T_A = 70\text{ }^\circ\text{C}$ )

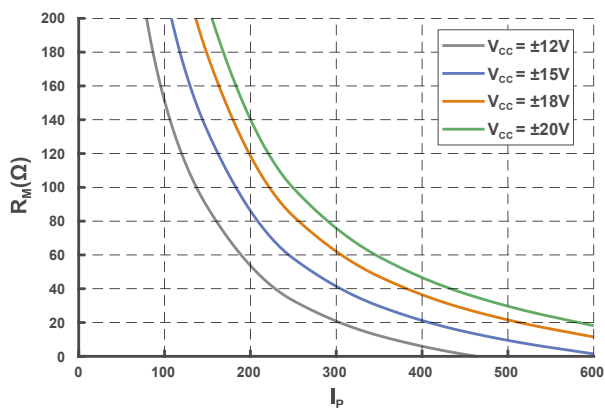


Figure 5. Measuring Resistance (@ $T_A = 50\text{ }^\circ\text{C}$ )

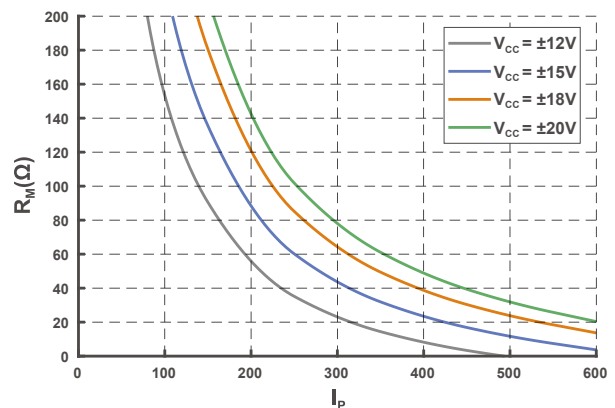


Figure 6. Measuring Resistance (@ $T_A = 25\text{ }^\circ\text{C}$ )

### 3. 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

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

$I_{PN}$  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

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

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

#### 5) Symmetry

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

#### 6) Hysteresis

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

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

#### 7) Measuring Resistance

$$R_{M \text{ MAX}} = N_S \times \frac{V_{CC} - 3.7V}{I_P} - 4 - R_S \times \frac{234.5 + T_A}{234.5 + 25}$$

$R_{M \text{ MAX}}$  is the maximum measuring resistance,  $N_S$  is the number of turns of the secondary coil winding and  $T_A$  stands for ambient operating temperature.

## 4. Application Information

### Electrical Connection

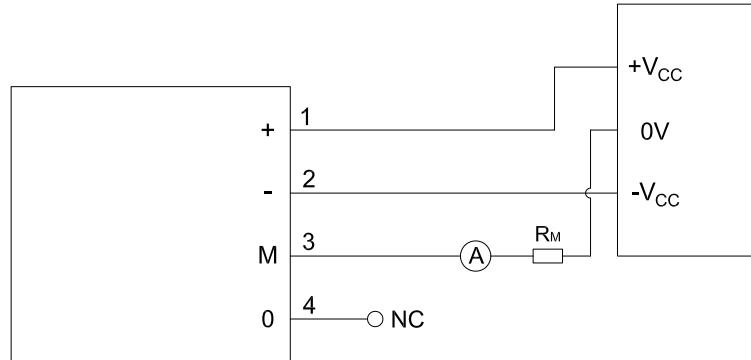


Figure 7. Electrical Connection

### Mounting Recommendation

1. Mounting method:
  - 1 ×  $\Phi$  4.2 mm hole and 1 ×  $\Phi$  4.2 mm slotted hole
  - 2 × M4 copper or SS304 screws (Recommended torque 1.2 N·m)
  - Or
  - 2 ×  $\Phi$  5.4 mm hole
  - 2 × M5 copper or SS304 screws (Recommended torque 1.2 N·m)
2. Primary through hole dimensions:  $\Phi$  20 mm
3. Secondary electrical connection:
  - Molex 22041041 (Molex 5045-04A)
  - Crimp Housing: Molex 22011042
  - Crimping Terminal: Molex 08500113

### Remarks

1.  $I_{OUT}$  is positive when the primary current ( $I_P$ ) is in the same direction as the arrow indication on the label and vice versa.
2. Improper connection may result in permanent damage of the sensor.
3. Sensor secondary circuitry must be powered prior primary current is being added and when depowering secondary circuitry, primary current must be close to 0A. Improper procedure may result in worse accuracy or result in permanent damage of the sensor.
4. Dynamic performances ( $di/dt$  and response time) are best with a single busbar completely filling the primary through hole.
5. Sensor is customizable upon request.

## 5. Dimensions

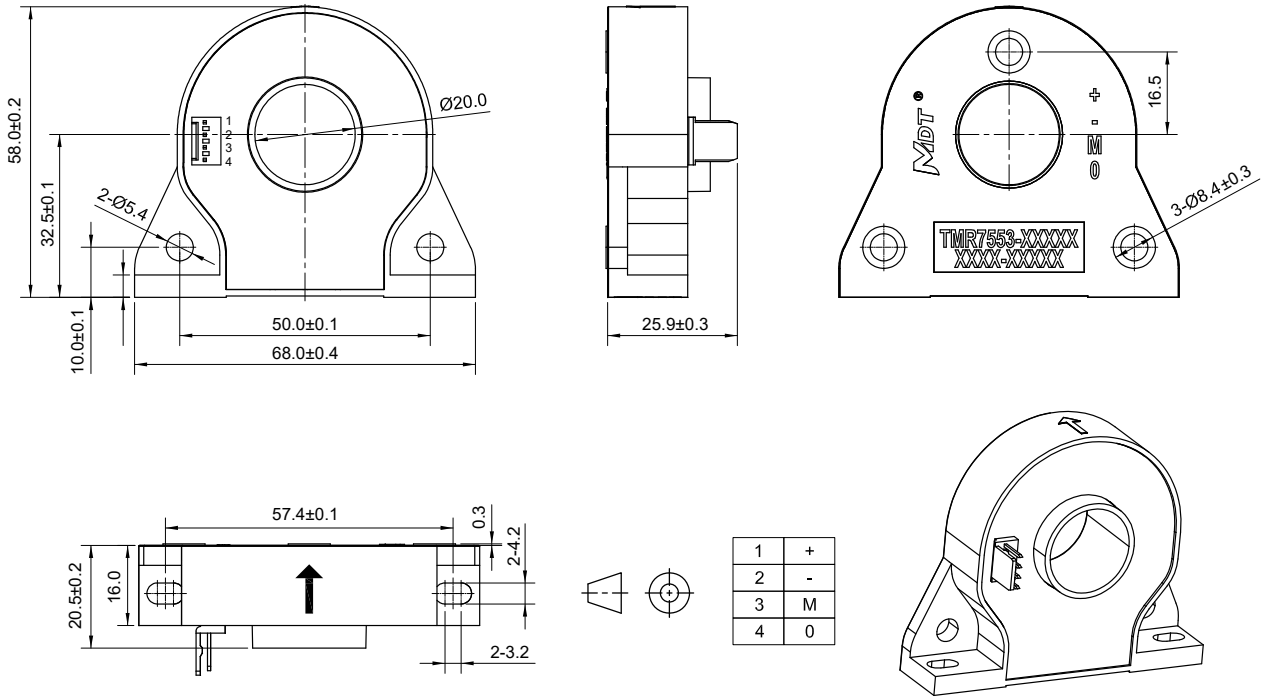


Figure 8. Dimension (unit: mm, tolerances for unmarked scales  $\pm 1$  mm)

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