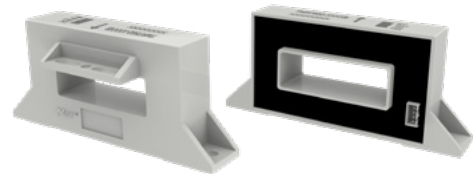


TMR7502-B

Unibody Low Temperature-Drift Current Sensor

Description

TMR7502-B is an open 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

- Low temperature drift
- Galvanic isolation
- High immunity to external interference
- RoHS and 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

Model	Primary Nominal Current	Primary Current Measuring Range
TMR7502-5000B	500 A	±1500 A
TMR7502-6000B	600 A	±1800 A
TMR7502-8500B	850 A	±2550 A
TMR7502-1001B	1000 A	±3000 A
TMR7502-1201B	1200 A	±3600 A
TMR7502-1501B	1500 A	±4500 A
TMR7502-2001B	2000 A	±6000 A
TMR7502-2501B	2500 A	±6000 A
TMR7502-3001B	3000 A	±6000 A

Insulation and Environmental Characteristics

Parameters	Symbol	Typical	Unit
Dielectric Strength	V_D	5	kV(50Hz, 1min)
Insulation Resistance	R_{IS}	1000	$M\Omega$
Creepage Distance	d_{CP}	31	mm
Clearance	d_{CL}	14	mm
Ambient Operating Temperature	T_A	-40 to +105	$^{\circ}C$
Ambient Storage Temperature	T_{STG}	-40 to +105	$^{\circ}C$
Mass for $I_{PN} < 850$ A	m	300	g
Mass for $I_{PN} \geq 850$ A		450	

Catalogue

1. Specifications	03
2. Typical Output Characteristics	04
3. Typical Temperature Characteristics	05
4. Parameters Definition And Formula.....	08
5. Dimensions	09
6. Application Information	10

1. Specifications

$T_A = +25\text{ }^\circ\text{C}$, $V_{CC} = \pm 15\text{ V}$, $R_L = 10\text{ k}\Omega$, unless otherwise noted

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
General Electrical Data							
Primary Nominal Current	I_{PN}	TMR7502-5000B	-	500	-	A	
		TMR7502-6000B	-	600	-		
		TMR7502-8500B	-	850	-		
		TMR7502-1001B	-	1000	-		
		TMR7502-1201B	-	1200	-		
		TMR7502-1501B	-	1500	-		
		TMR7502-2001B	-	2000	-		
		TMR7502-2501B	-	2500	-		
		TMR7502-3001B	-	3000	-		
Primary Current Measuring Range	I_{PM}	TMR7502-5000B	-1500	-	1500	A	
		TMR7502-6000B	-1800	-	1800		
		TMR7502-8500B	-2550	-	2550		
		TMR7502-1001B	-3000	-	3000		
		TMR7502-1201B	-3600	-	3600		
		TMR7502-1501B	-4500	-	4500		
		TMR7502-2001B	-6000	-	6000		
		TMR7502-2501B	-6000	-	6000		
		TMR7502-3001B	-6000	-	6000		
Sensitivity	S	$I_P = 0\text{ to } \pm I_{PN}$	TMR7502-5000B	-	8.00	-	mV/A
			TMR7502-6000B	-	6.67	-	
			TMR7502-8500B	-	4.71	-	
			TMR7502-1001B	-	4.00	-	
			TMR7502-1201B	-	3.33	-	
			TMR7502-1501B	-	2.67	-	
			TMR7502-2001B	-	2.00	-	
			TMR7502-2501B	-	1.60	-	
			TMR7502-3001B	-	1.33	-	
Output Voltage	V_{OUT}	$I_P = 0\text{ to } \pm I_{PM}$	-	$V_{OE} + S \times I_P$	-	V	
Supply Voltage	V_{CC}	$\pm 5\%$	-	± 15	-	V	
Current Consumption	I_C	$I_P = 0$	-	+25/-5	-	mA	
Load Resistance	R_L	$I_P = 0\text{ to } \pm I_{PN}$	1	10	-	k Ω	
Load Capacitance	C_L	$I_P = 0\text{ to } \pm I_{PN}$	-	100	-	pF	
Static Performance Data							
Accuracy	X_G	$T_A = +25\text{ }^\circ\text{C}$, $I_P = 0\text{ to } \pm I_{PN}$	-1.2	± 0.5	1.2	% I_{PN}	
		$T_A = -40\text{ }^\circ\text{C to } +105\text{ }^\circ\text{C}$, $I_P = 0\text{ to } \pm I_{PN}$	-4.5	± 1.5	3.5		
Linearity Error	ϵ_L	$T_A = -40\text{ }^\circ\text{C to } +105\text{ }^\circ\text{C}$, $I_P = 0\text{ to } \pm I_{PN}$	-	± 0.5	-	% I_{PN}	
Symmetry	ϵ_{SYM}	$T_A = -40\text{ }^\circ\text{C to } +105\text{ }^\circ\text{C}$, $I_P = 0\text{ to } \pm I_{PN}$	99	100	101	%	
Sensitivity Error	ϵ_S	$T_A = -40\text{ }^\circ\text{C to } +105\text{ }^\circ\text{C}$, $I_P = 0\text{ to } \pm I_{PN}$	-3	-	3	%	
Offset Error	V_{OE}	$T_A = +25\text{ }^\circ\text{C}$, $I_P = 0$	-25	± 10	25	mV	
		$T_A = -40\text{ }^\circ\text{C to } +105\text{ }^\circ\text{C}$, $I_P = 0$	-40	± 20	40		
Hysteresis	V_{OH}	$I_P = \pm I_{PN} \rightarrow 0$	-10	± 5	10	mV	
Dynamic Performance Data							
Response Time	t_R	$di/dt > 50\text{ A}/\mu\text{s}$, 10% to 90% of I_{PN}	-	5	-	μs	
Bandwidth	BW	-3 dB	DC	25	-	kHz	

2. Typical Output Characteristics

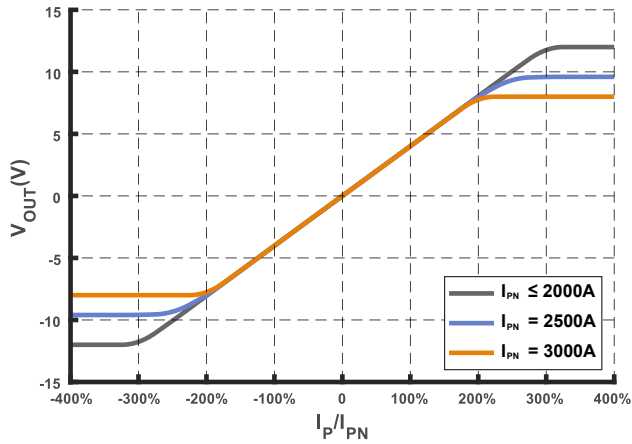


Figure 1. Output Voltage vs Primary Current

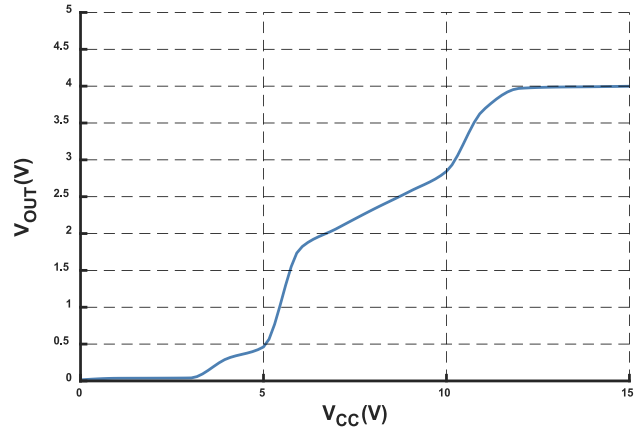


Figure 2. Output Voltage vs Supply Voltage (@ $I_P = I_{PN}$)

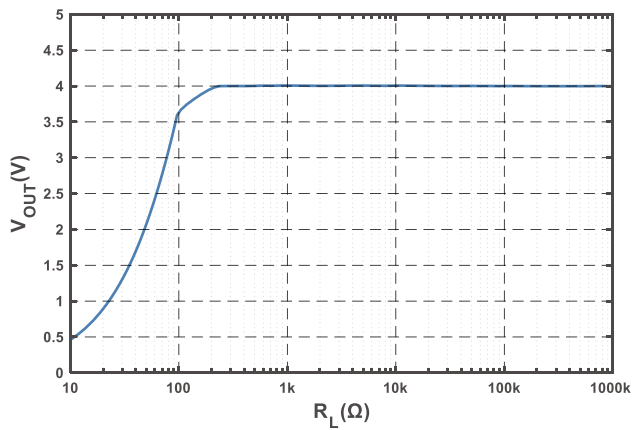


Figure 3. Output Voltage vs Load Resistance
(@ $I_P = I_{PN}$)

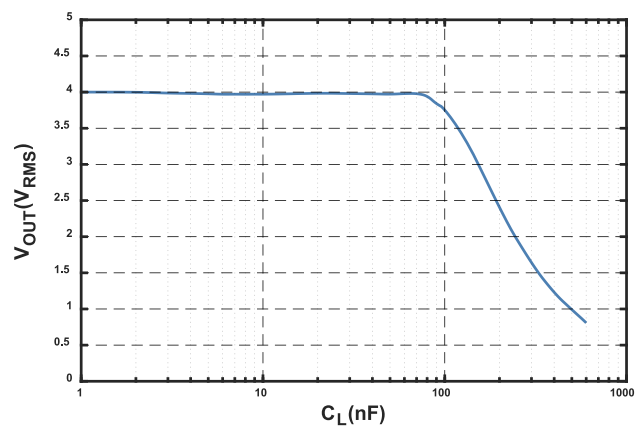


Figure 4. Output Voltage vs Load Capacitance
(@ $I_P = I_{PN}$)

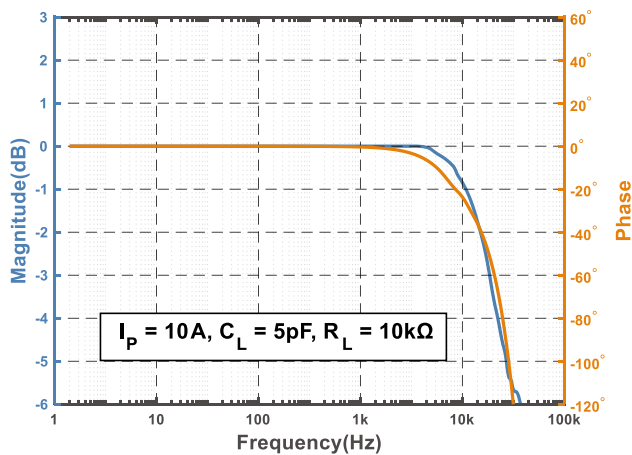


Figure 5. Bode Plot

3. Typical Temperature Characteristics

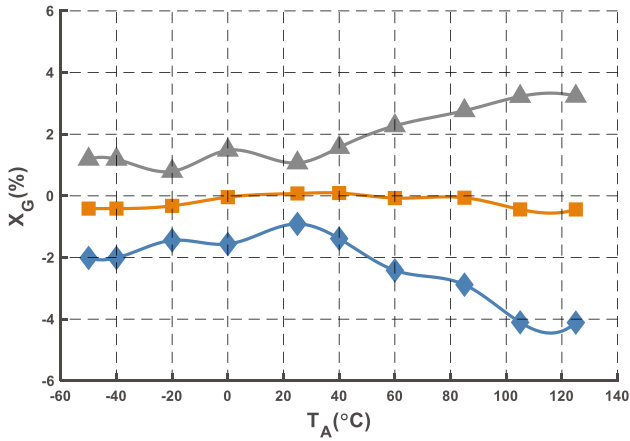


Figure 6. Accuracy

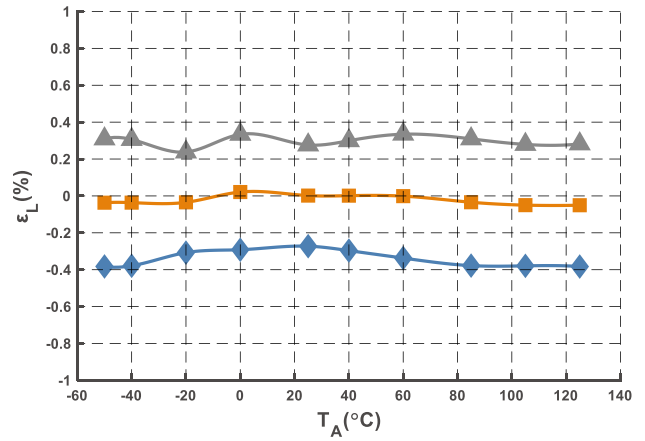


Figure 7. Linearity Error

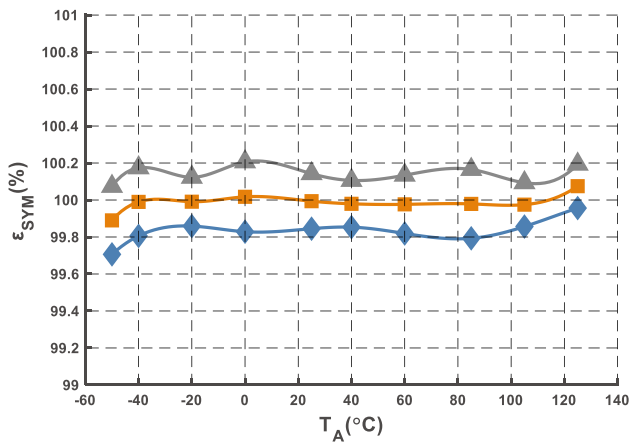


Figure 8. Symmetry

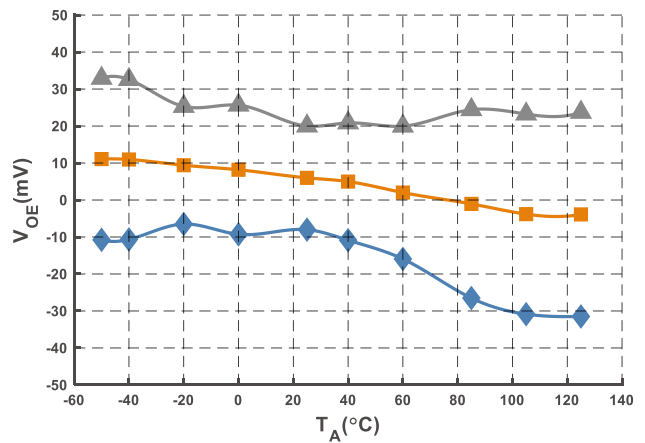


Figure 9. Offset Error

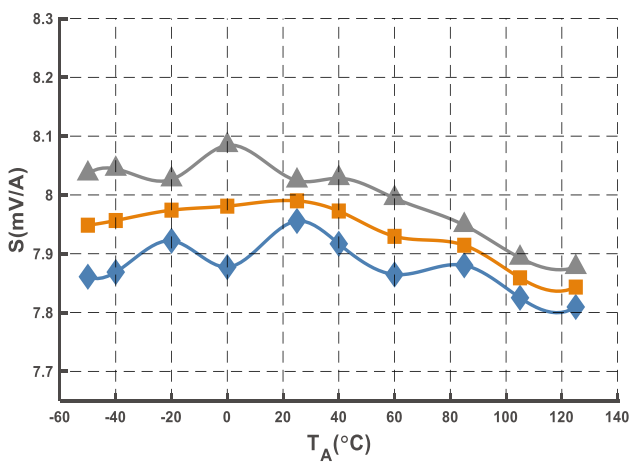


Figure 10. Sensitivity (@ $I_{PN} = 500$ A)

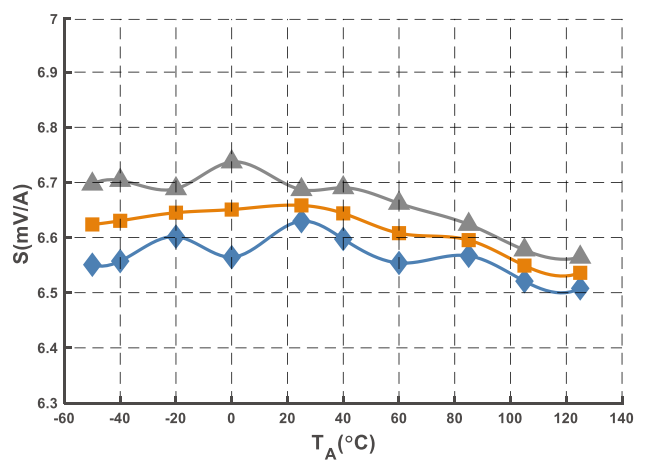


Figure 11. Sensitivity (@ $I_{PN} = 600$ A)

Typical Temperature Characteristics

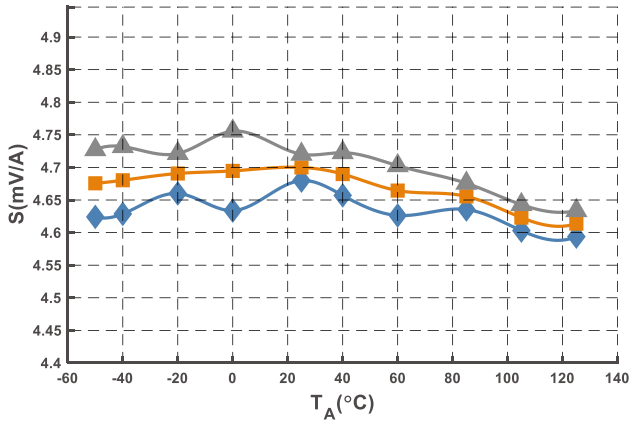


Figure 12. Sensitivity (@I_{PN} = 850 A)

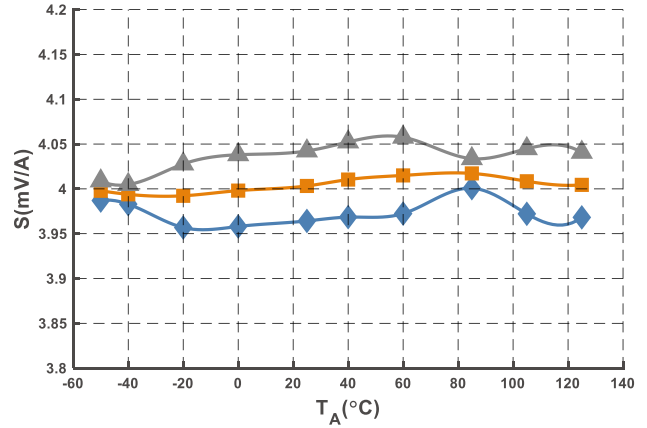


Figure 13. Sensitivity (@I_{PN} = 1000 A)

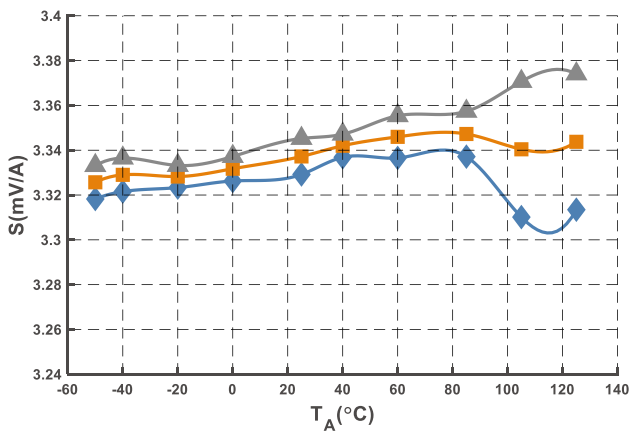


Figure 14. Sensitivity (@I_{PN} = 1200 A)

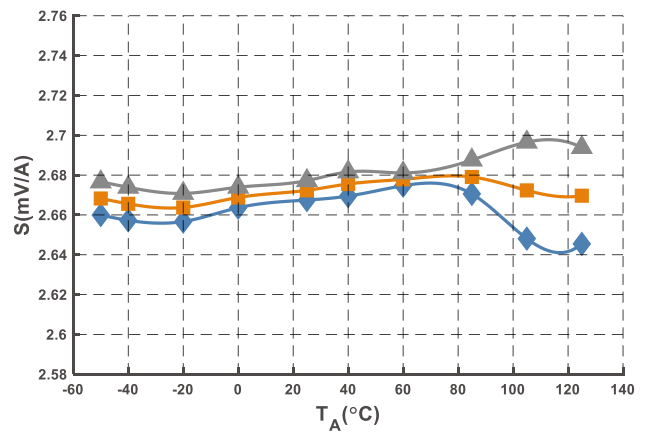


Figure 15. Sensitivity (@I_{PN} = 1500 A)

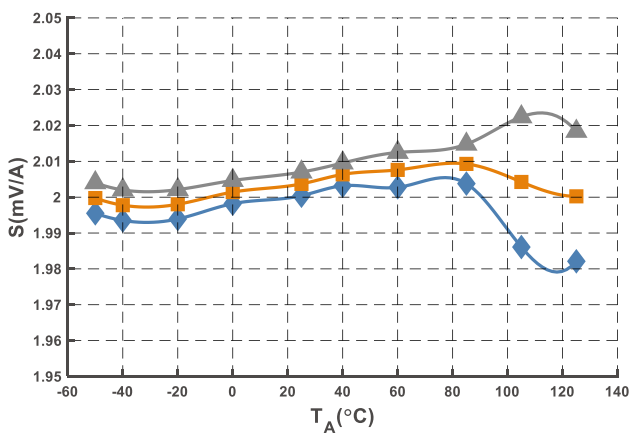


Figure 16. Sensitivity (@I_{PN} = 2000 A)

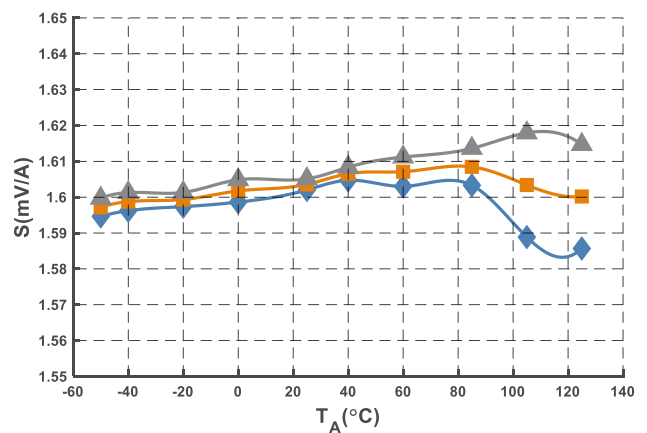


Figure 17. Sensitivity (@I_{PN} = 2500 A)

Typical Temperature Characteristics

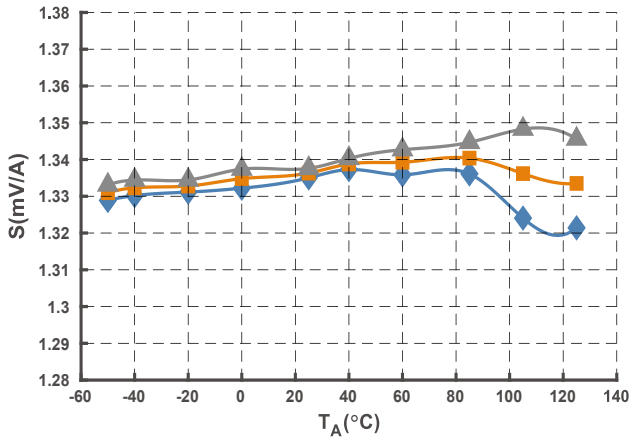


Figure 18. Sensitivity (@I_{PN} = 3000 A)

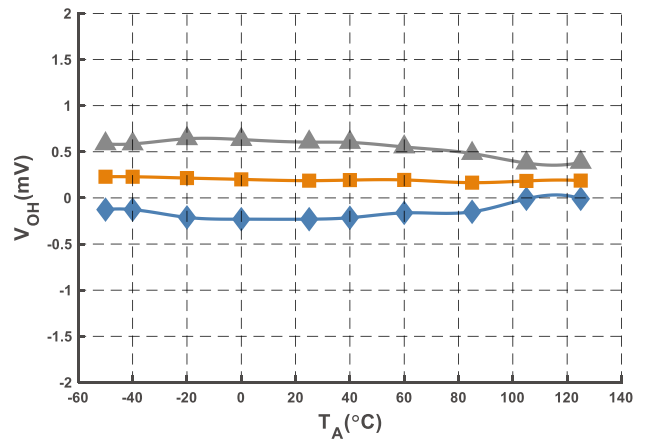


Figure 19. Hysteresis

4. Parameters Definition And Formula

1) Output Voltage

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

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

2) Accuracy

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

I_{PN} stands for nominal primary current

3) 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} and $-I_{PN}$ respectively.

4) Linearity

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

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

5) Symmetry

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

6) Hysteresis

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

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

5. Dimensions

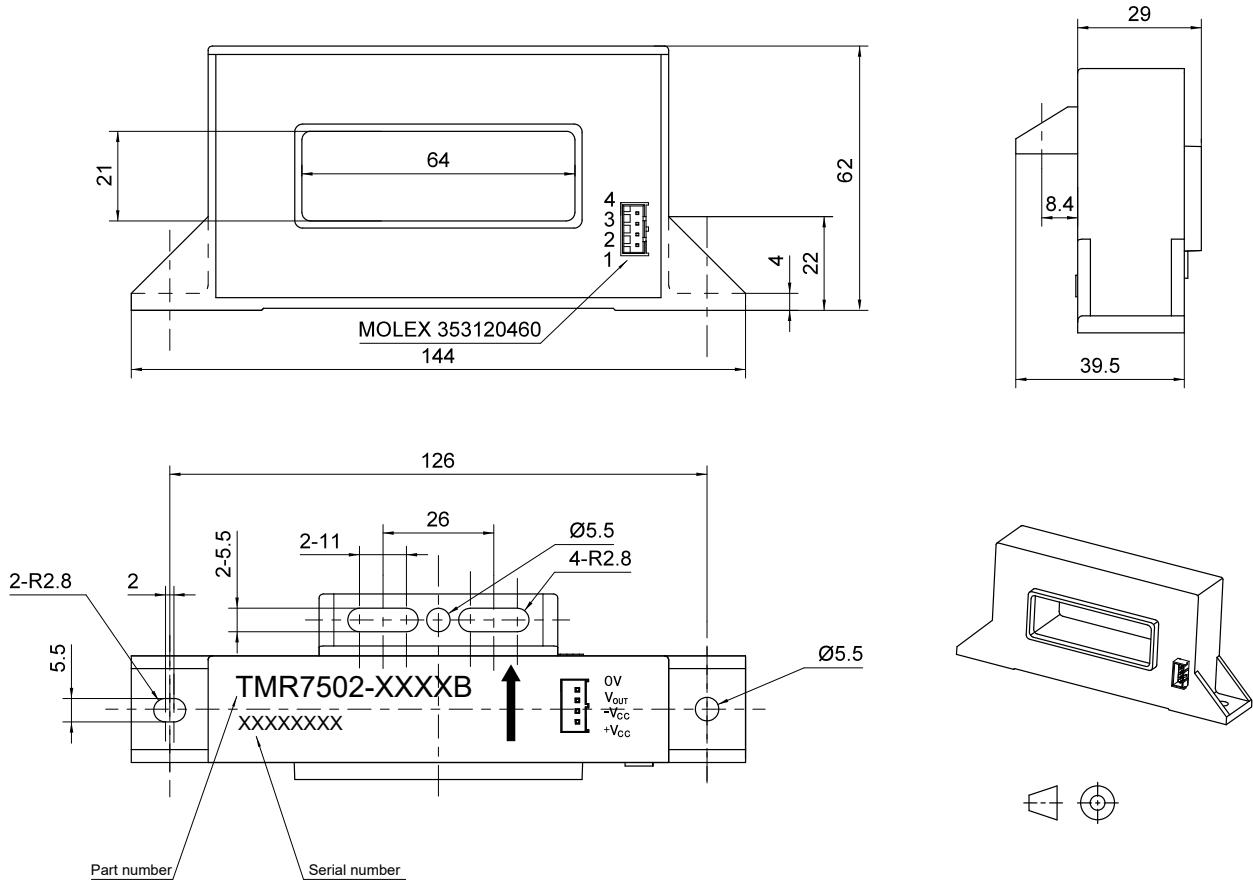


Figure 20. Dimension (unit: mm, tolerances for unmarked scales ± 1 mm)

6. Application Information

Electrical Connection

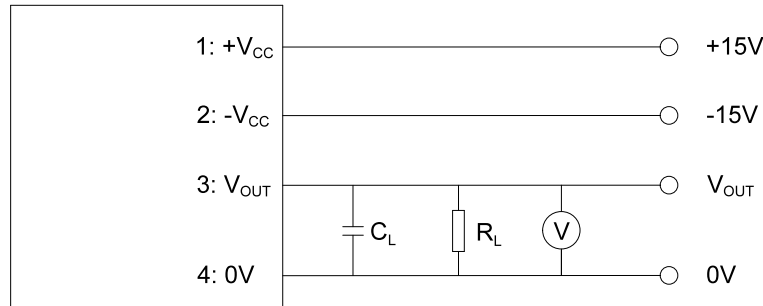


Figure 21. Electrical Connection

Mounting Recommendation

1. Mounting method:
 - 1 × Φ 5.5 mm hole and 1 × Φ 5.5 mm slotted hole
 - 2 × M5 copper or SS304 screws (Recommended torque 2.5 N·m)
 - Or
 - 1 × Φ 5.5 mm hole and 2 × Φ 5.5 mm slotted holes (Fixed to the busbar)
 - 3 × M5 copper or SS304 screws (Recommended torque 2.5 N·m)
2. Primary through hole dimensions: 64 mm × 21 mm
3. Secondary electrical connection: Molex 353120460
 - Crimp Housing: Molex 351550400
 - Crimping Terminal: Molex 08700056

Remarks

1. 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.
2. Improper connection may result in permanent damage of the sensor.
3. Excessive capacitive load may result in distortion of output signals when measuring high frequency primary signal. Please refer to Output Voltage vs Load Capacitance Curve.
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.

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