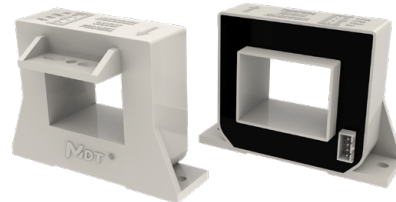


TMR7504-C

Unibody Low Temperature-Drift Current Sensor

Description

TMR7504-C 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 circuit.



Features and Benefits

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

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
TMR7504-2000C	200 A	±600 A
TMR7504-4000C	400 A	±1200 A
TMR7504-5000C	500 A	±1500 A
TMR7504-6000C	600 A	±1800 A
TMR7504-8000C	800 A	±2400 A
TMR7504-1001C	1000 A	±2500 A
TMR7504-1201C	1200 A	±2500 A
TMR7504-1501C	1500 A	±2500 A

Insulation and Environmental Characteristics

Parameters	Symbol	Typical	Unit
Dielectric Strength	V_D	5	kV(50Hz, 1min)
Insulation Resistance	R_{IS}	1000	MΩ
Creepage Distance	d_{CP}	24	mm
Clearance	d_{CL}	7	mm
Ambient Operating Temperature	T_A	-40 to +105	°C
Ambient Storage Temperature	T_{STG}	-40 to +105	°C
Mass	m	320	g

Catalogue

1. Specifications	03
2. Typical Output Characteristics	04
3. Typical Temperature Characteristics	05
4. Parameters Definition And Formula.....	08
5. Application Information	09
6. Dimensions	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	Condition	Min.	Typ.	Max.	Unit	
General Electrical Data							
Primary Nominal Current	I_{PN}	TMR7504-2000C	-	200	-	A	
		TMR7504-4000C	-	400	-		
		TMR7504-5000C	-	500	-		
		TMR7504-6000C	-	600	-		
		TMR7504-8000C	-	800	-		
		TMR7504-1001C	-	1000	-		
		TMR7504-1201C	-	1200	-		
Primary Current Measuring Range	I_{PM}	TMR7504-2000C	-600	-	600	A	
		TMR7504-4000C	-1200	-	1200		
		TMR7504-5000C	-1500	-	1500		
		TMR7504-6000C	-1800	-	1800		
		TMR7504-8000C	-2400	-	2400		
		TMR7504-1001C	-2500	-	2500		
		TMR7504-1201C	-2500	-	2500		
Sensitivity	S	$I_P = 0\text{ to } \pm I_{PN}$	TMR7504-2000C	-	20.00	-	mV/A
			TMR7504-4000C	-	10.00	-	
			TMR7504-5000C	-	8.00	-	
			TMR7504-6000C	-	6.67	-	
			TMR7504-8000C	-	5.00	-	
			TMR7504-1001C	-	4.00	-	
			TMR7504-1201C	-	3.33	-	
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	± 0.5	1	% I_{PN}	
		$T_A = -40\text{ }^\circ\text{C to } +40\text{ }^\circ\text{C}$, $I_P = 0\text{ to } \pm I_{PN}$	-2	± 0.5	2		
		$T_A = +40\text{ }^\circ\text{C to } +85\text{ }^\circ\text{C}$, $I_P = 0\text{ to } \pm I_{PN}$	-3	-	1		
		$T_A = +85\text{ }^\circ\text{C to } +105\text{ }^\circ\text{C}$, $I_P = 0\text{ to } \pm I_{PN}$	-4.5	-	1		
Linearity Error	ϵ_L	$T_A = -40\text{ }^\circ\text{C to } +105\text{ }^\circ\text{C}$, $I_P = 0\text{ to } \pm I_{PN}$	-	± 0.2	-	% 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	100	%	
Sensitivity Error	ϵ_S	$T_A = -40\text{ }^\circ\text{C to } +105\text{ }^\circ\text{C}$, $I_P = 0\text{ to } \pm I_{PN}$	-4	-	1.5	%	
Electric Offset	V_{OE}	$T_A = +25\text{ }^\circ\text{C}$, $I_P = 0$	-20	± 10	20	mV	
		$T_A = -40\text{ }^\circ\text{C to } +85\text{ }^\circ\text{C}$, $I_P = 0$	-35	± 20	35		
		$T_A = +85\text{ }^\circ\text{C to } +105\text{ }^\circ\text{C}$, $I_P = 0$	-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

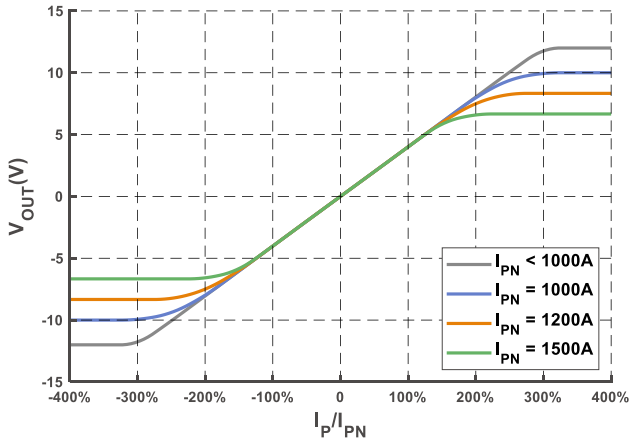


Figure 1. Output Voltage vs Primary Current

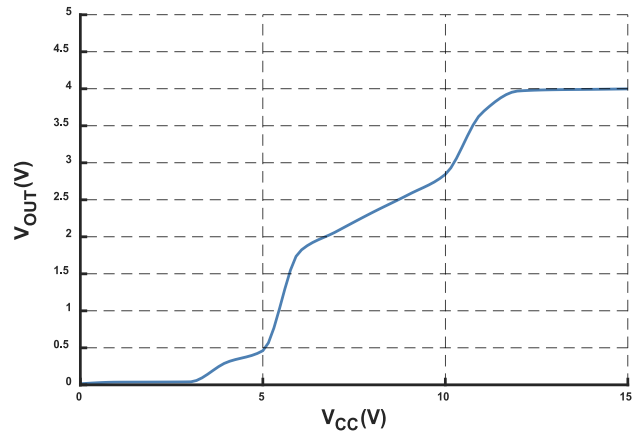


Figure 2. Output Voltage vs Supply Voltage (@ $I_P = I_{PN}$)

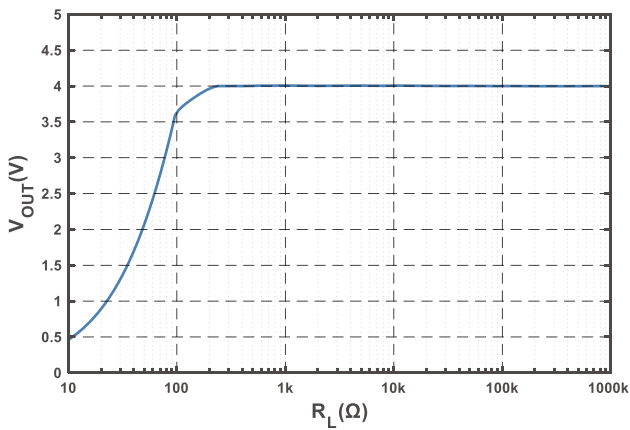


Figure 3. Output Voltage vs Load Resistance
(@ $I_P = I_{PN}$)

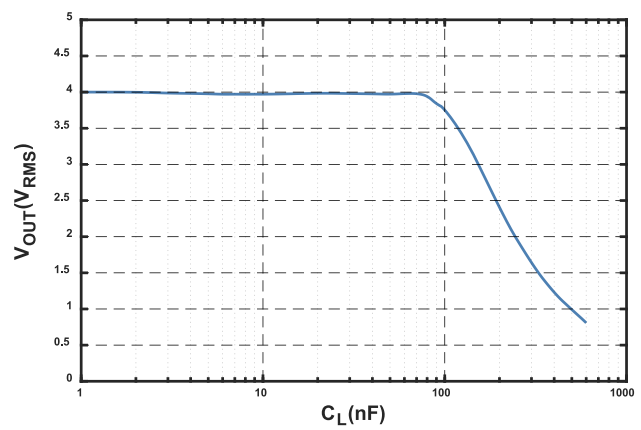


Figure 4. Output Voltage vs Load Capacitance
(@ $I_P = I_{PN}$)

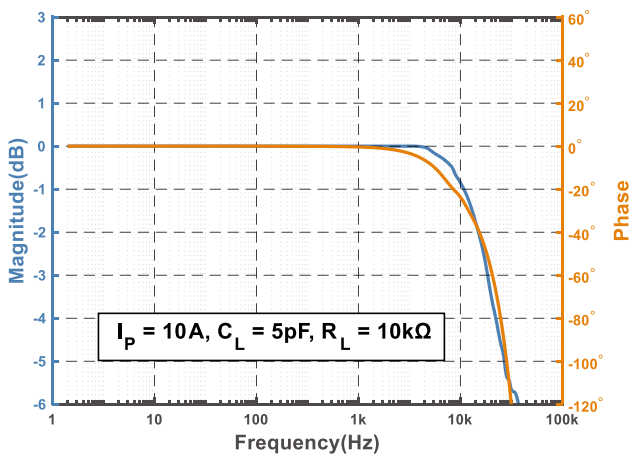


Figure 5. Bode Plot

3. Typical Temperature Characteristics

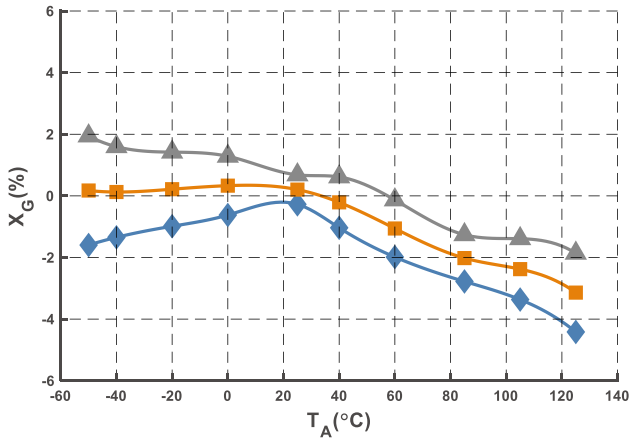


Figure 6. Accuracy

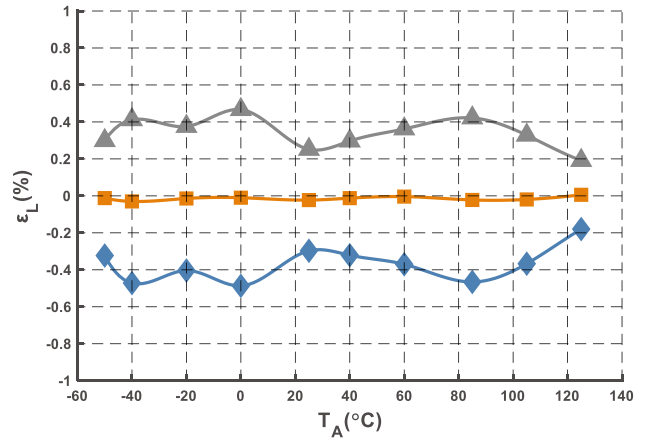


Figure 7. Linearity Error

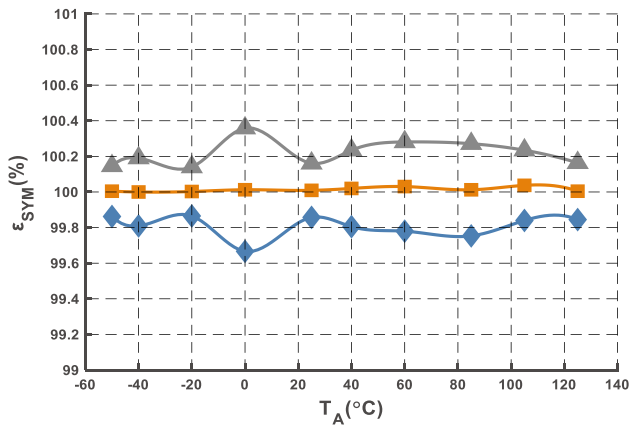


Figure 8. Symmetry

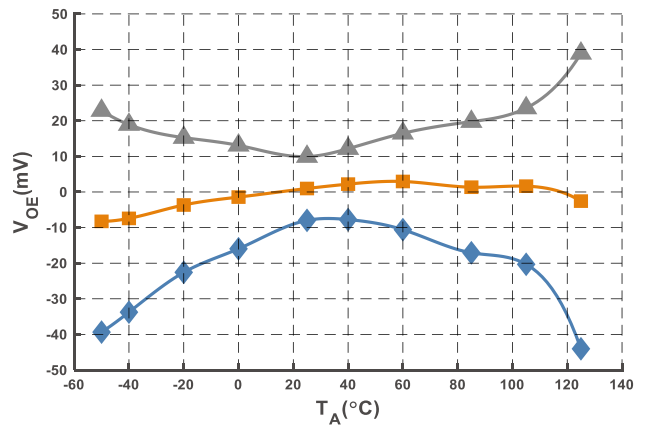


Figure 9. Electric Offset

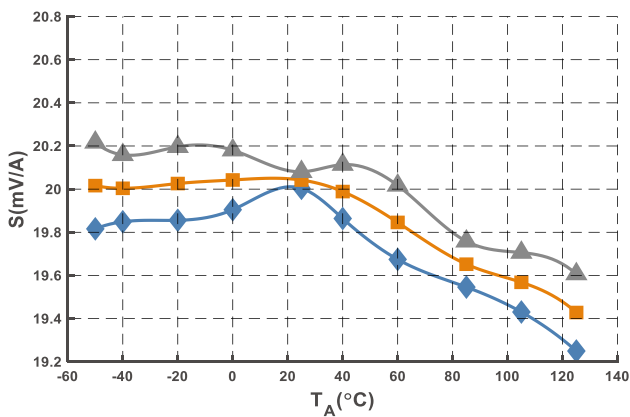


Figure 10. Sensitivity (@ $I_{PN} = 200$ A)

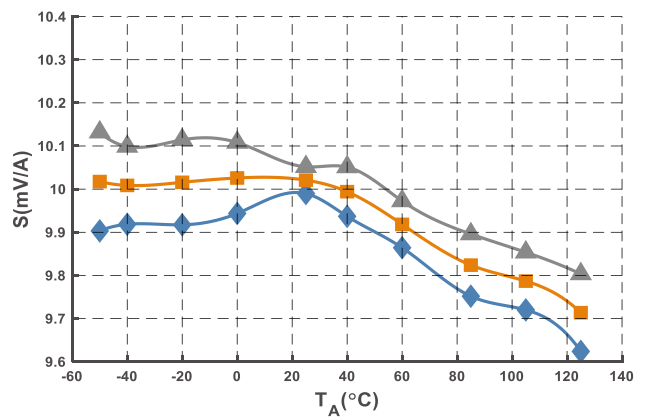


Figure 11. Sensitivity (@ $I_{PN} = 400$ A)

Typical Temperature Characteristics

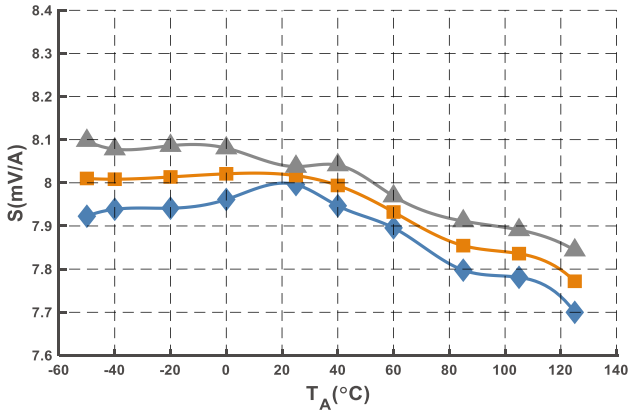


Figure 12. Sensitivity (@I_{PN} = 500 A)

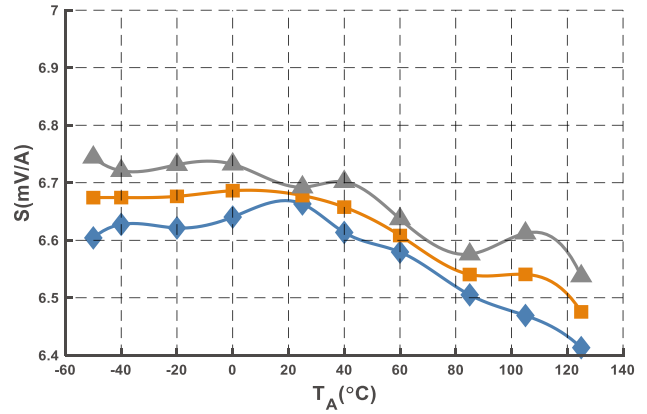


Figure 13. Sensitivity (@I_{PN} = 600 A)

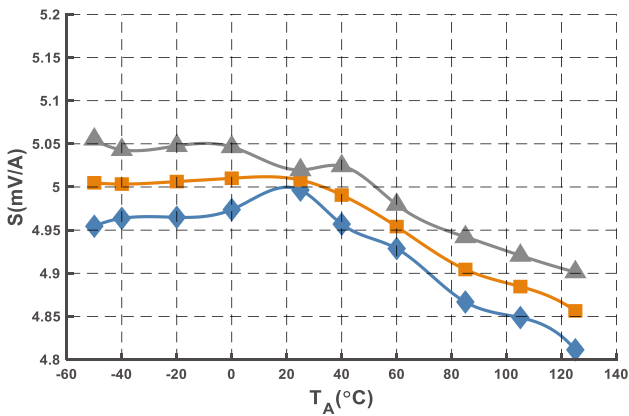


Figure 14. Sensitivity (@I_{PN} = 800 A)

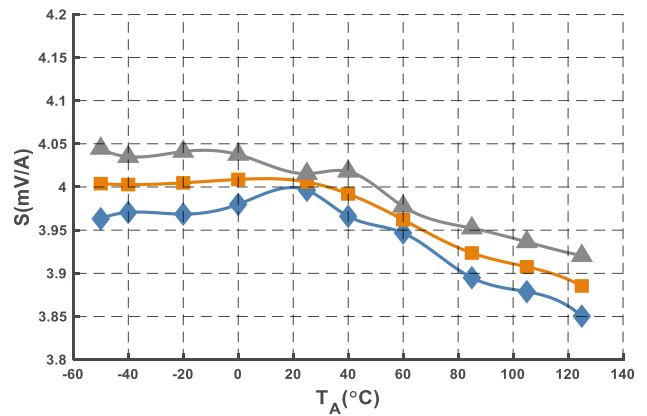


Figure 15. Sensitivity (@I_{PN} = 1000 A)

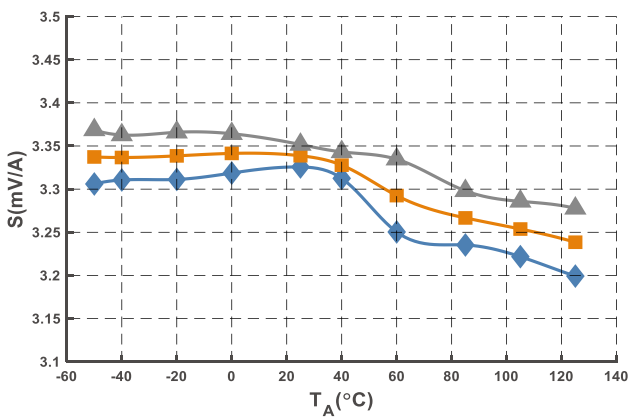


Figure 16. Sensitivity (@I_{PN} = 1200 A)

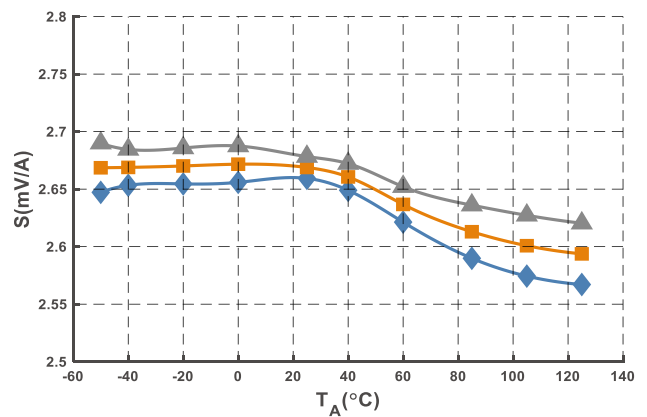


Figure 17. Sensitivity (@I_{PN} = 1500 A)

Typical Temperature Characteristics

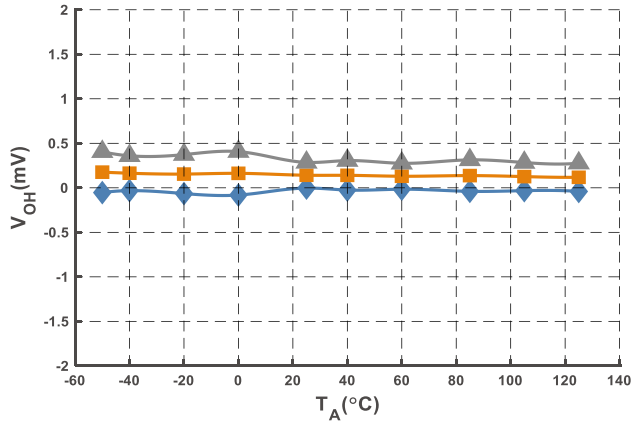


Figure 18. Hysteresis

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 electric offset, 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

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

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

5) Symmetry

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

6) Hysteresis

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

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

5. Application Information

Electrical Connection

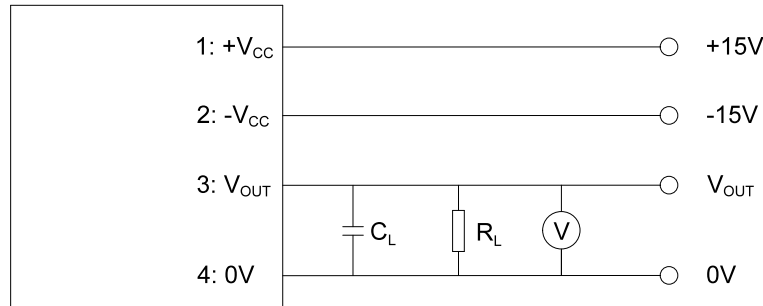


Figure 20. Electrical Connection

Mounting Recommendation

1. Mounting method:
 - 1 × Φ 4.5 mm hole and 1 × Φ 4.5 mm slotted hole
 - 2 × M4 copper or SS304 screws (Recommended torque 1.2 N·m)
 - Or
 - 1 × Φ 4.5 mm hole and 2 × Φ 4.5 mm slotted holes (Fixed to the busbar)
 - 3 × M4 copper or SS304 screws (Recommended torque 1.2 N·m)
2. Primary through hole dimensions: 40 mm × 30 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.

6. Dimensions

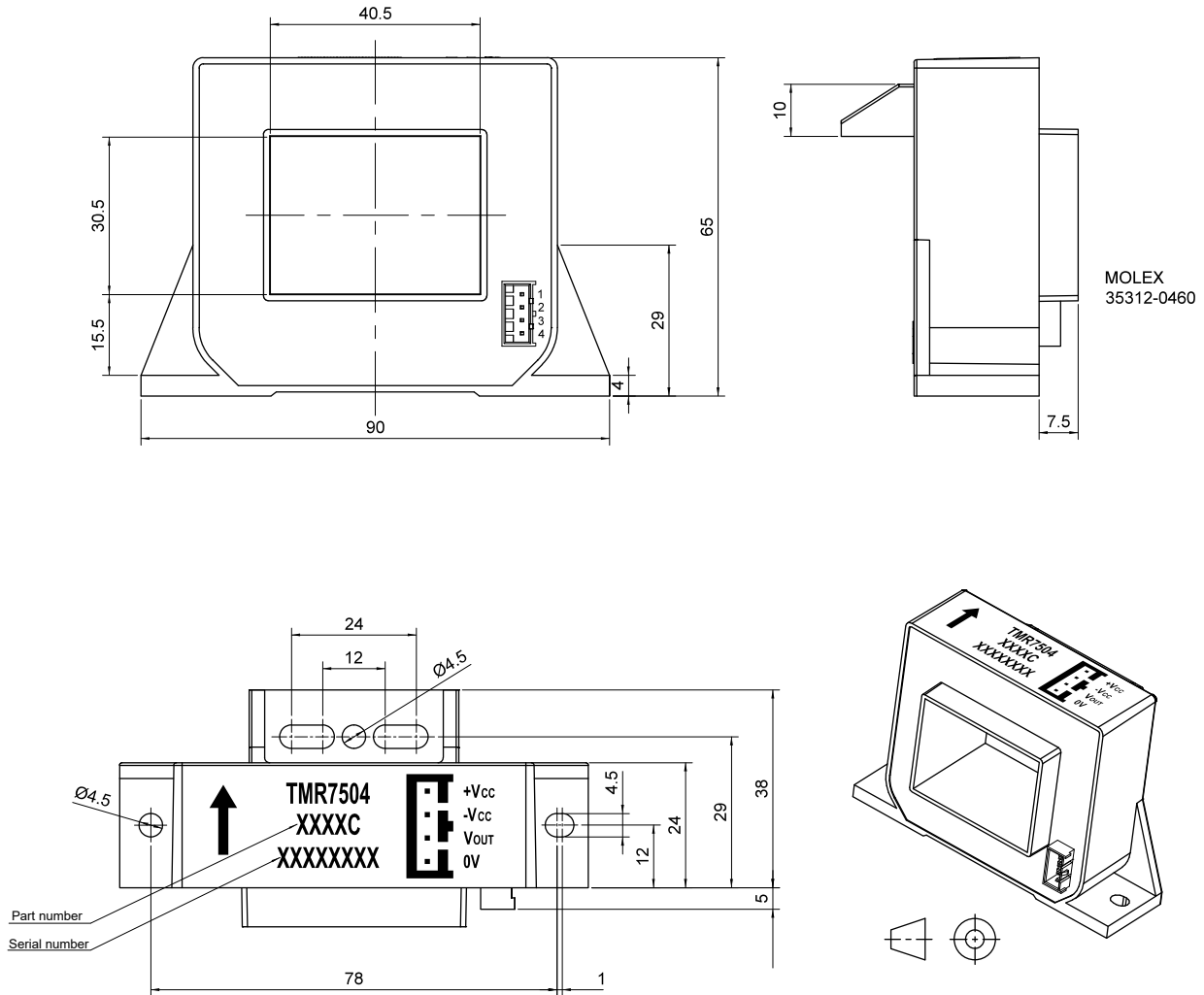


Figure 19. Dimension (unit: mm, tolerances for unmarked scales ± 1 mm)

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