Residual Current Monitors
RCMP20-01 Series

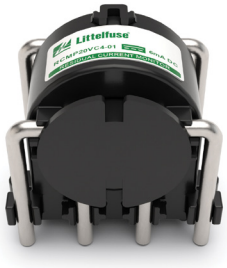
Mode 3 Charging Stations

IEC RoHS REACH

RCMP20HT-01

RCMP20HC4-01

RCMP20VT-01



RCMP20VC4-01

Description

The RCMP20-01 Series is a Residual Direct Current Monitoring module (RDC-M-module) that monitors ground-fault currents, residual currents or leakage currents in single-phase or multiple-phase installations. The RCMP20-01 Series is suitable for integration into Mode 3 electric vehicle charging, according to IEC 62955.

Fault currents in AC and DC may occur in EV charging stations. Common Type A RCDs do not detect DC currents and this type of fault current can blind the protection device, leaving the user exposed to possibility of electrical shock. It is required to install RCMP20-01 Series as a DC fault sensor in Mode 3 charging stations to work in combination with a Type A RCD.

Mode 3

Permanently connected AC electric vehicle charging stations are considered Mode 3 charging, according to IEC 61851-1 and IEC 60364-7-722. The RCMP20-01 Series monitors the residual direct current that type A RCD protection does not detect.

Function

The RCMP20-01 Series is continuously monitoring DC residual currents. When fault current exceeds the threshold values, the device sends a trip signal. The module, when coupled with an appropriate switching device, will meet the requirements of an RDC-M-module.

Applications

- Ground-fault detection
- Leakage current measurement for charging station (Mode 3)

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Features & Benefits

FEATURES	BENEFITS
Proprietary ASIC	Ensures supply chain continuity
High EMI resilience	Proven design prevents nuisance (false) circuit trip
Integrated PCB	Lessens components on reference board and reduce installation time, compact design and less complexity
Optional integrated load conductors	
Higher cross-sectional area of integrated conductors	Excellent thermal characteristics minimizes PCB temperature rise, allowing more compact design
Largest current transformer aperture in industry	Supports higher charging currents
Flexible design for OEM **- Vertical or horizontal mount** **- Open or 2-4 integrated conductors**	RCMP Series allows space optimization by adapting itself to the design
Wide variants range and customization options available for high volume customers	RCMP Series can be completely adapted to a specific design to fit in aperture, dimensions, weight and performance
Test Function	Self-diagnostic of any possible disfunction

Certification & Compliance

IEC	IEC 62955
RoHS	Compliant
REACH	Compliant

TECHNICAL DATA / SPECIFICATIONS

Electrical data

PARAMETER		SYMBOL	UNIT	MIN	TYPICAL	MAX
Supply Voltage		U_S	VDC	4.75	5	5.25
Supply Current with no fault current (Note 1)		I_S	mA	-	-	2.5
Supply current, peak >200mA DC fault current (Note 1)		I_P	mA	-	-	6
Power Consumption		-	-	-	14	33
Rated Load Current up to 3 Phase	RCM with Open Aperture (Note 2)	I_{L1}	A	-	-	125
	RCM with Integrated Conductors (Note 3)	I_{L2}	A	-	-	40
Rated residual operating current		I_{RC}	mA DC	-	6	-
Frequency		f	Hz	50	-	60
Effective DC Test current @5V		I_T	mA DC	-	7.8	-

Note 1: Fault Out not connected. External pull up current not included.

Note 2: Maximum rated load current is dependent on cable cross section - temperature of RCMP must not exceed 105 °C at rated load.

Note 3: Maximum rated load current dependent on PCB mounting & layout – temperature of integrated conductors & RCMP must not exceed 105 °C.

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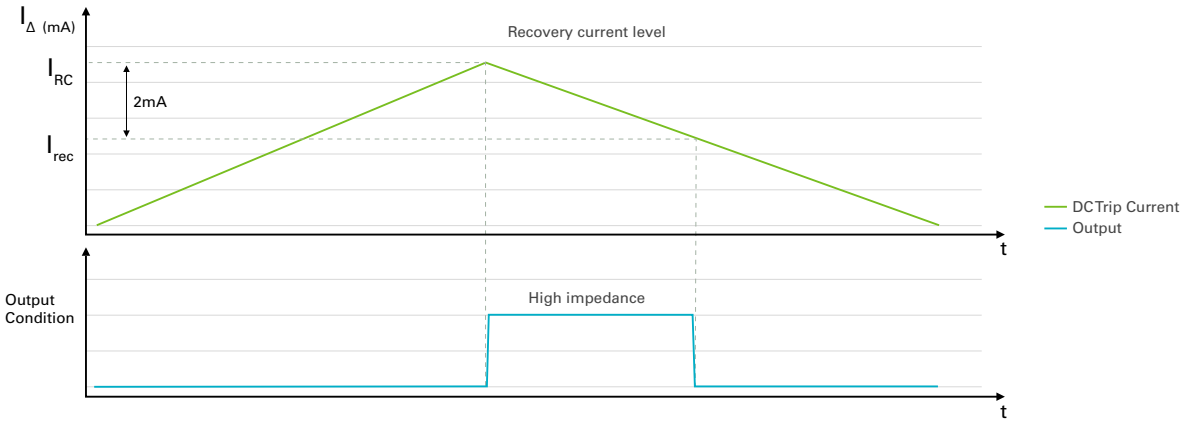
Response data

PARAMETER	SYMBOL	UNIT	MIN	TYPICAL	MAX
DC trip threshold	$I_{\Delta RC, DC}$	mA DC	3	4.5	6
Scaling factor of the DC component	$S_{pwm-out}$	%/mA	-	6.66	-
Recovery current level	I_{rec}	mA DC	2	-	-
Max. measuring range, peak	$I_{RC\ peak}$	mA DC	-	-	10
Frequency range	f_{Δ}	Hz	50Hz	-	60Hz
Fault Out drain current	I_{FO}	mA	-	-	150
Fault Out pull up voltage	U_{FO}	V	-	-	24
Maximum supply voltage (without function)	Us_{max}	V	-	-	8
Vtest-in low Test-in input voltage, low level	$U_{Test-in,\ low}$	V	-	-	0.2
Vtest-in high Test-in input voltage, high level	$U_{Test-in,\ high}$	V	-	-	4.75

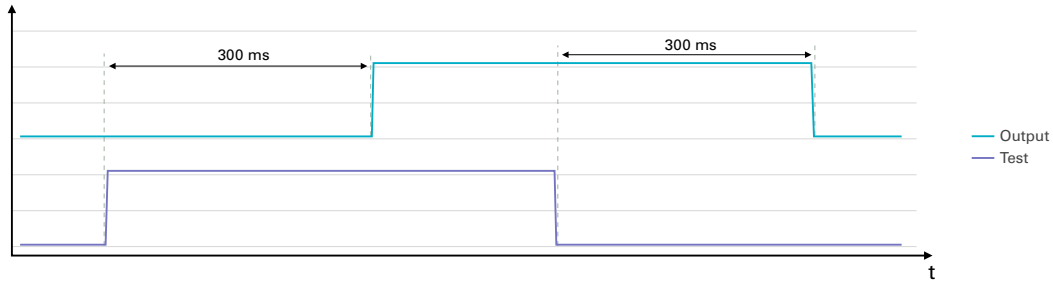
Response time

	6mA => 6mA	60mA => 60mA	200mA
Standard Values acc. To IEC62955:2018	10s	0.3s	0.1s
Typical values of sensor	0.70s	0.15s	0.07s

AC 50/60Hz RECOVERY CURRENT LEVEL



AC/DC TEST FUNCTION



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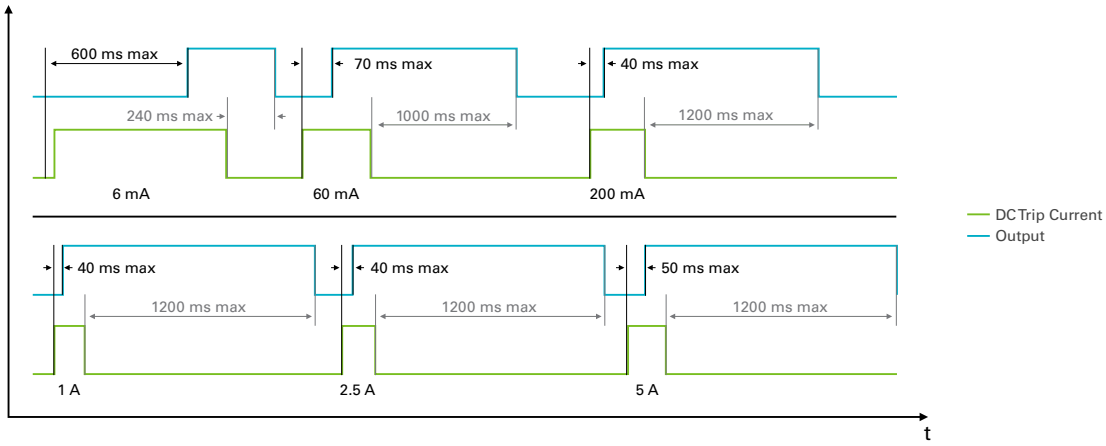
TRIP TIMES



General Data

PARAMETER	SYMBOL	UNIT	MIN	TYPICAL	MAX
Aperture	A	mm	-	-	20
Operating temperature	To	°C	-40	-	105
Storage temperature	Ts	°C	-40	-	105
Altitude	H	m	-	-	2000
Dielectric strengh	Acc. IEC62955				
Overvoltage Category	Intended for use in EVSE up to CAT III				
Impulse voltage	U_I	kV	-	-	7.4
AC Withstand Voltage at 50Hz	U_W	kV	-	3.5kV@50Hz	-

General Data (Continued)

PARAMETER	DEVICE	SYMBOL	UNIT	TYPICAL
Mass	RCMP20HT	m	g	28.2
	RCMP20HC2	m	g	42.8
	RCMP20HC3	m	g	47.5
	RCMP20HC4	m	g	52.4
	RCMP20VT	m	g	29.7
	RCMP20C2	m	g	48.5
	RCMP20C3	m	g	58.5
	RCMP20C4	m	g	68.5

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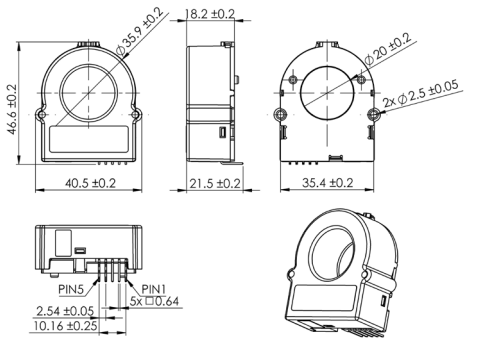
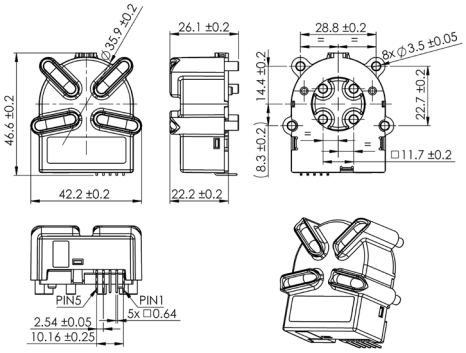
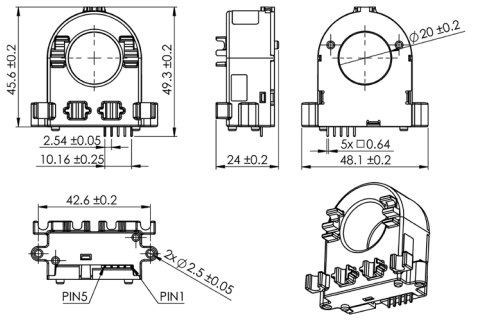
Dimension Diagrams



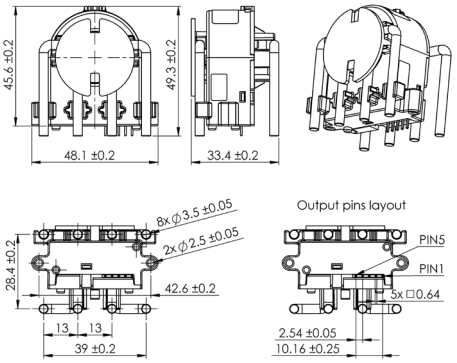
RCMP20HT-01



RCMP20HC4-01



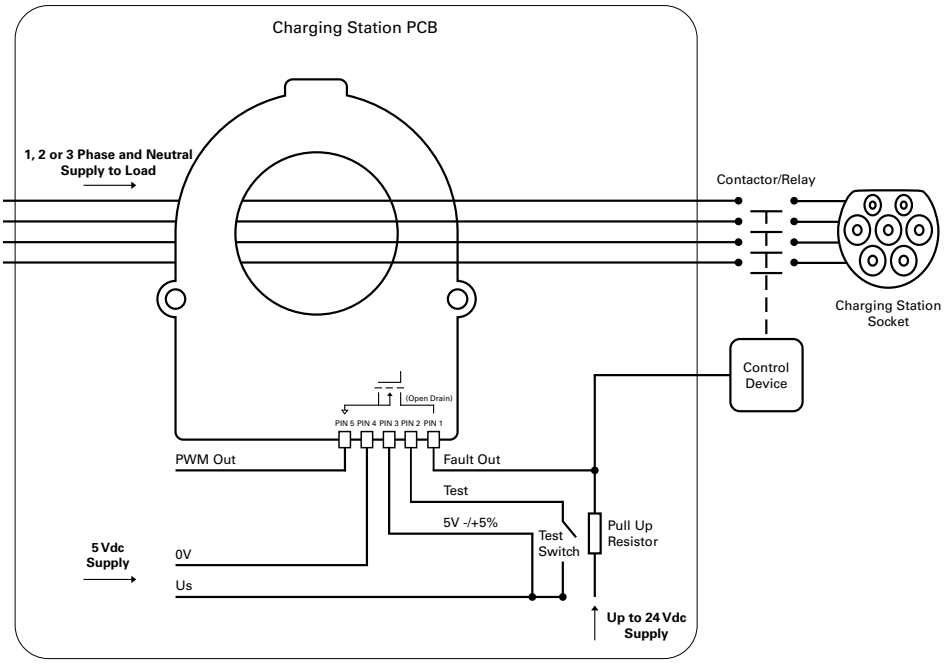
RCMP20VT-01



RCMP20VC4-01

Note: Clearance and creepage distances between output pins and integrated conductors are 6.5mm minimum.

Wiring Diagrams



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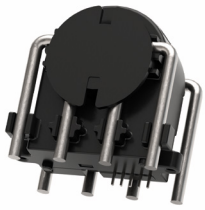
RCMP20HT-01

RCMP20HC4-01

RCMP20VT-01



RCMP20VC4-01

Pin Description

PIN NO.	FUNCTION	DESCRIPTION
PIN 1	Trip Out	Open drain output. This pin should be connected to a suitable external pull-up resistor to the required signalling level, normally 5V, max 24V. The pin will have a low impedance (LOW state) when there is no fault and the test function is not activated. It will have high impedance (HIGH state) if the residual fault exceeds the trip threshold or the test function is activated. The Trip Out pin will self-reset (return to LOW) once the fault is removed or the test function is deactivated. As the Trip out pin resets on the removal of the fault it is advised not to directly control a contactor/relay so as to prevent them from 'chattering'. It is recommended that the signal is latched by the hardware or software of the control device.
PIN 2	Test Function	Test function is provided to verify the correct operation of the residual current sensing. This pin should be disconnected when the test function is not activated. To activate the test function 5V should be applied to this pin. Pin 1 will go HIGH if test is successful. The switch shown on wiring diagram is for illustrative purpose only. 5V can also be remotely applied to this pin through other means e.g. microcontroller. Current draw of the pin is 0.3mA.
PIN 3	Supply Voltage	Positive supply voltage 5V±5% DC. Must be capable of supplying at least 10mA.
PIN 4	0 V/GND	Ground connection.
PIN 5	PWM	Output of this pin is a PWM signal of f=13kHz and duty cycle proportional to the fault current flowing through RCM. V pulse on is 3.3V and 13% duty cycle with no fault present. Duty cycle increases proportional to the fault current present. **This is for monitoring purposes only and is not a safety function!**

Ordering Information

SERIES	PCB MOUNTING	CONDUCTORS	PART NUMBER	ORDER CODE
RCMP20-01	Vertical	Open Aperture	RCMP20VT-01	90169
		2	RCMP20VC2-01	90170
		3	RCMP20VC3-01	90171
		4	RCMP20VC4-01	90172
	Horizontal	Open Aperture	RCMP20HT-01	90177
		2	RCMP20HC2-01	90178
		3	RCMP20HC3-01	90179
		4	RCMP20HC4-01	90180

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