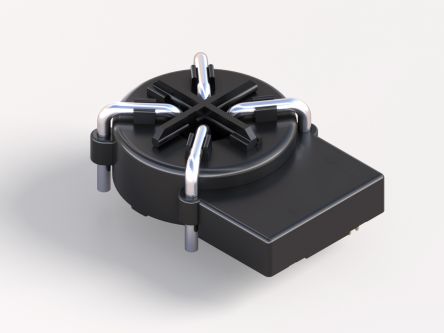
RCC32-E31T

Features

> Type-A+6mA residual current module for EV charging pile protection
> Mounted on PCB board
> Dual digital open-drain output,20mAAC/6mADC trip indication
> 3-phase primary conductors on module（typ.32A,max.40A)
> PWM output for DC residual current value indication（0~30mA)
> Error output for system fault indication
> High-frequency response up to 2kHz



Product Apperance

Standard

> Meets the requirements of GB/T 40820 (IEC 62955) for the residual current operation characteristics of the mode three charge RDC-PD
> Meets the basic residual current operating characteristics requirements of GB/T 22794 (IEC 62423) and adapts to DC 6mA test requirements

Trip-Current（residual current related characteristics)

Wav.	Freq.	Min.	Typ.	Max.	Unit
AC	50Hz	20.0	23.0	26.0	mA
A0	50Hz	11.0	19.0	30.0	mA
A90	50Hz	10.0	24.0	30.0	mA
A135	50Hz	10.0	28.0	35.0	mA
2PDC	50Hz	3.5	5.2	7.0	mA
3PDC	50Hz	3.1	4.6	6.2	mA
S-DC	-	3.0	4.6	6.0	mA

Trip-Time (residual current related characteristics)

Wav.	Freq.	Current	Typ.	Unit
AC	50Hz	30mA	115.0	ms
AC	50Hz	60mA	50.0	ms
AC	50Hz	150mA	15.0	ms
AC	50Hz	5A~100A	8.5	ms
A0	50Hz	42mA	35.0	ms
A0	50Hz	84mA	30.0	ms
A0	50Hz	350mA	15.0	ms
A0	50Hz	42mA+6mADC	45.0	ms
A0	50Hz	84mA+6mADC	20.0	ms
A0	50Hz	350mA+6mADC	15.0	ms
2PDC/3PDC	50Hz	60mA	40.0	ms
2PDC/3PDC	50Hz	120mA	15.0	ms
2PDC/3PDC	50Hz	300mA	15.0	ms
2PDC/3PDC	50Hz	5A~50A	10.0	ms
S-DC	-	6mA	140.0	ms.
S-DC	-	60mA	45.0	ms
S-DC	-	300mA	10.0	ms

Electrical & Reliability Parameters

Char.	Value
Working Temperature	-40℃~105℃
Storage Temparature	-40℃~105℃
Supply Voltage（VDD）(1)	4.85~5.15 VDC
Static Power Consumption	≤ 110 mW
Clearance	≥ 5.6 mm
（Primary-Primary/Secondary）	≥ 10.0 mm
Creepage	≥ 8.0 mm
（Primary-Primary/Secondary）	≥ 10.0 mm
Voltage Input,low level	0~0.6 VDC
Voltage Input,high level	4.2~5 VDC
FIT (2)	Please contact us
Designed Life (3)	≥ 20 years
Working Altitude (4)	≤ 4000m

(1) It is sugguested to control VDD within 4.9~5.1 VDC to get better performance
(2) The calculation of FIT according to IEC 61709 , is based on the FIT values of different different components in the BoM list . And the calculation principle : ground mobile , no dust or harmful substances
(3) The calculation and claim of product life is based on the MTBF value according to IEC 61709
(4) The calculation about altitude is based on the principles : reinforced insulation , insulation material group 3 , pollution degree 2 , overvoltage category 3

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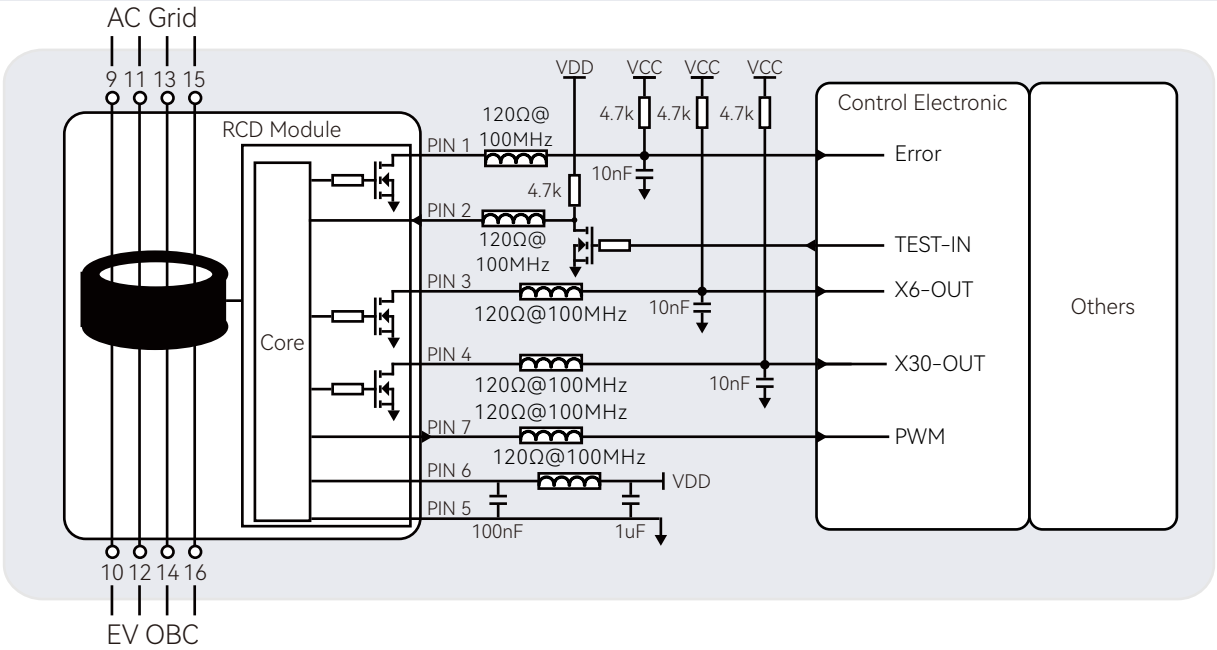
Typical Application Schematic & Pin Definition



Pin-No.	Pin Name	Function
PIN-1	Error	> Open-drain output pin for indicating the system fault condition > When no system fault,this pin will be conducted to GND > When system fault occured,this pin will be high-impedance > It is recommended that the PIN pin add beads and place them close to the pins
PIN-2	TEST-IN	> When this pin been conducted to 0 VDC,module will calculate the zero-point-drift and store the value to register in the MCU to finish the calibration operation > After calibration finished,system will internally generate simulated residual current,to checkwhether module can do the correct response.Durring this procedure,X30-OUT&X6-OUT will turn to high-impedance if module working correct > It is recommended that the PIN pin add beads and 1nF capacitance to ground and be placedclose to the pins Attention: > When using the TEST-IN function,the main circuit must be cut-off to ensure no residual current flowing > When using this pin function,please follow the timing diagram figure
PIN-3	X6-OUT	> This output is in a high state (including during self-test) if the residual current exceeds the preset DC trip value (typically 4.6 mADC for this module) > For other conditions, this output is low (GND) > It is recommended that the PIN pin add beads and place them close to the pins
PIN-4	X30-OUT	> This output can only be in a high-impedance state during a well-functioning self-test of the module > For other conditions, this output is low (GND) > It is recommended that the PIN pin add beads and place them close to the pins
PIN-5	GND	> Product power grounding pins
PIN-6	VDD	> The product power supply pins, standard supply voltage 5 VDC > The input voltage range is required to be 4.85~5.15 VDC, and the power output capability is > 100mA > Power supply ripple ≤ 150mV (LDO circuit recommended, refer to power chip LP2985A-50DB)
PIN-7	PWM	> It is recommended that the PIN pin add beads and place them close to the pins > indicates the residual current component with duty cycle and has 8kHz PWM > Output resolution = 3.33%mADC, 0~30mADC; Accuracy of about ± 0.5mA > It is recommended that the PIN pin add beads and place them close to the pins
PIN-8	N.C.	> Unused
PIN-9,11,13,15	AC Primary	> All 4 PINs AC in together or AC out together
PIN-10,12,14,16	AC Primary	> All 4 PINs AC in together or AC out together

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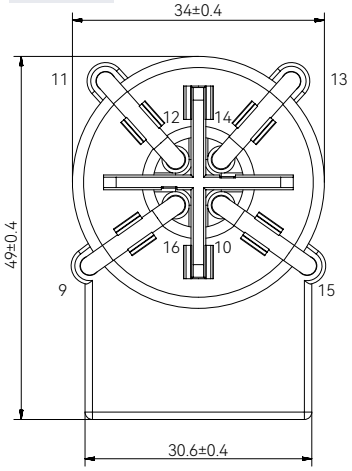
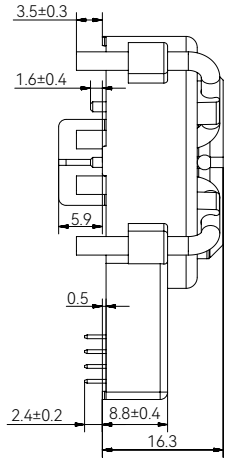
Mechanical dimensions

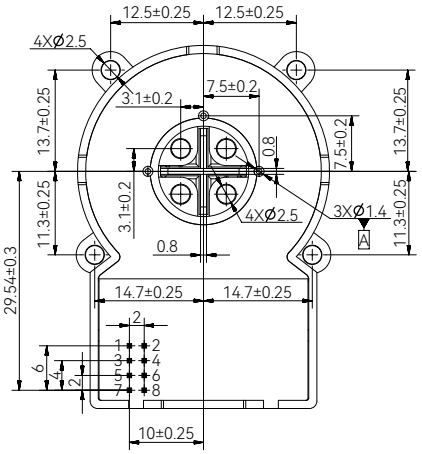
Front view



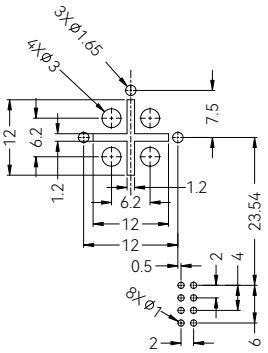
Side view



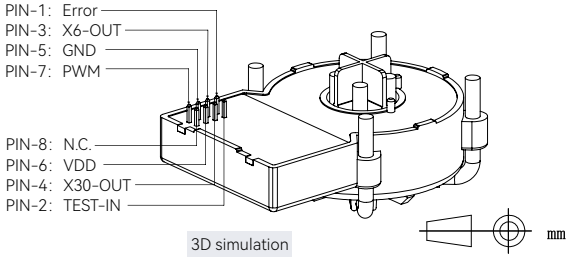
Front view



Recommended package diagram



Note: 4xϕ3 and 8xϕ1 are welded holes, and the rest are through holes.

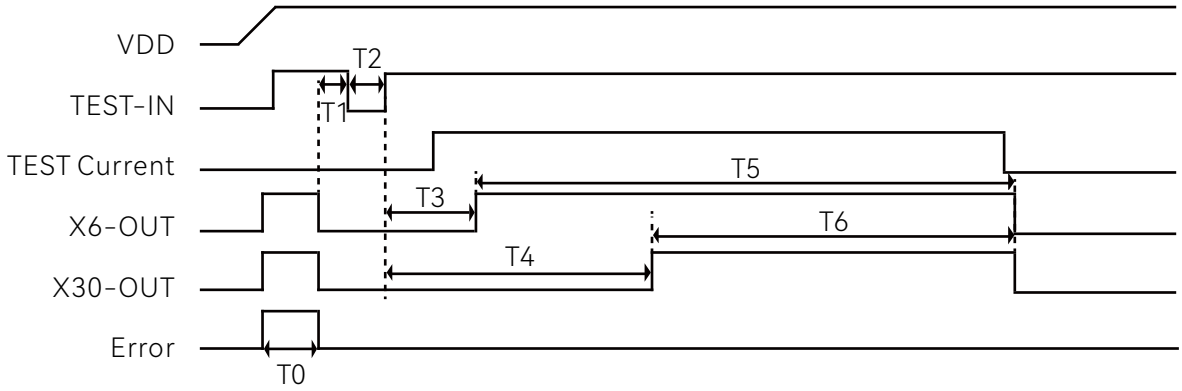


3D simulation

* The limit deviation of the dimensional tolerance is not inscribed GB/T 14486-MT5/B

Dimensions in mm

TEST-IN timing diagram



>Suggest starting VDD from 0V, with a monotonous power on process and a time of<15ms
>T0 as the waiting time for system stability, T0 ≈ 270ms
>The VDD establishment time should be ⩽ 3ms/V, i.e. ⩽ 15ms to establish a stable 5V
>T1 is the waiting time after powering on, it is recommended that T1 ⩾ 100ms
>T2 is the system self check and internal calibration command. It is recommended that 50ms ⩽ T2 ⩽ 100ms. When the low level of the pin exceeds 50ms, the product begins to enter self check testing
>T3 is the waiting time for calibration completion, T3 ≈ 300ms. It is recommended to read X6 OUT after 300ms
>T4 is the enabling time of the self check signal, T4 ≈ 700ms. It is recommended to read X30-OUT after 300ms
>T5 is the delay time of the action signal, T5 ≈ 1480ms
>T6 is the maintenance time of the action signal after the self check is completed, T6 ≈ 1080ms

Attention: During the self check process, the main circuit must be cut off to ensure that there is no residual current flowing. After the X6-OUT and X30-OUT self checks are completed, the normal residual current trip logic can be activated

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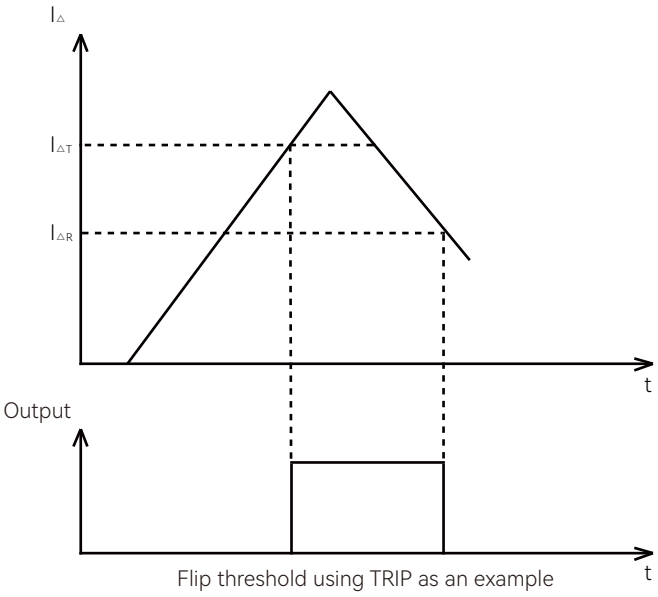
Digital Signal Flip Threshold



Flip threshold using TRIP as an example

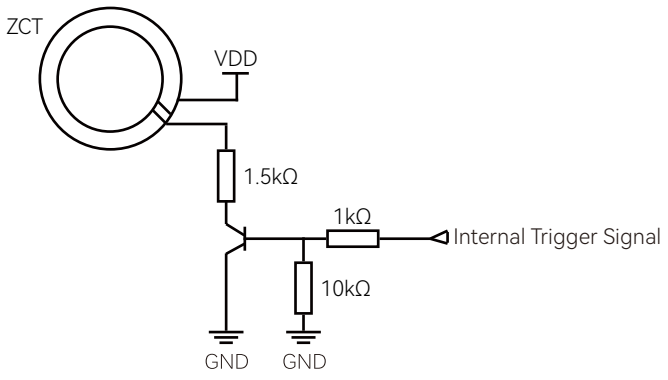
> For avoiding the signal oscillation, tripping signal output flipping has been set with tripping threshold and recovery threshold
> When tripping threshold $I_{\triangle T}$ reached, the related X-OUT flip, and when the current decrease to the recovery threshold $I_{\triangle R}$, the related X-OUT flip again, back to low level state
> $I_{\triangle T}$ is set as 100% typical tripping value, and $I_{\triangle R}$ is set as 55% typical tripping value

Vibration（GB/T 28046.3-2011 4.1.2.4）

Freq. (Hz)	PSD $(m/s^2)^2/Hz$	RMS (m/s2)	Test Direction	Test Duration
10	20	27.8	X-axis Y-axis Z-axis	8h / axis
55	6.5			
180	0.25			
300	0.25			
360	0.14			
1000	0.14			

> During the test, the product is placed on a double blister tray in a carton

Self-Test Circuit



> 2 widing on the ZCT to generate simualted DC residual current
> By using VDD to generate typical value = 6.53 mADC simulated residual current
> Use the most stringent 6mADC value to detect whether the module can work properly and identify residual current

Version history

Version number	Modifications	Reason for modification
V1.3.6	Update the product dimension drawing	Erratum
V1.3.7	Update the product feature parameters	Erratum
V1.3.8	Update the typical application diagram	Erratum
V1.3.9	Specification review and update	Audit
V1.4.0	Update the product dimension drawing	Erratum
V1.5.0	The UI of the product specification has been upgraded	