



CT2728

Type A+DC6mA RCD sensor

Version: V1.04



Overview

The CT2728 is an A+6-type leakage current detection ring with an integrated current transformer. When used with the external ILM2112TQC IC, it forms a Type B residual current monitoring device for EV charging stations that complies with A+6 requirements. Its digital output provides high accuracy, low temperature drift, and strong interference immunity. The solution meets applicable IEC and GB requirements for EV charging stations. Together with a simple peripheral circuit, the ILM2112TQC provides a complete, high-performance leakage current detection solution.

Key Features

- Digital output
- Built-in self-test function
- 5 V supply
- Low temperature drift

Applicable Standards

- IEC 62955 — Residual direct current detecting device (RDC-DD) for permanently connected AC electric vehicle charging stations
- IEC 61851 — Electric vehicle conductive charging system
- IEC 62752 — In-cable control and protection device (IC-CPD) for Mode 2 charging of electric road vehicles
- GB/T 40820 — Residual direct current detecting device (RDC-DD) for Mode 3 charging of electric vehicles
- GB/T 22794 — Type F and Type B residual current operated circuit-breakers, with and without integral overcurrent protection, for household and similar uses

Detection Ring Dimensions

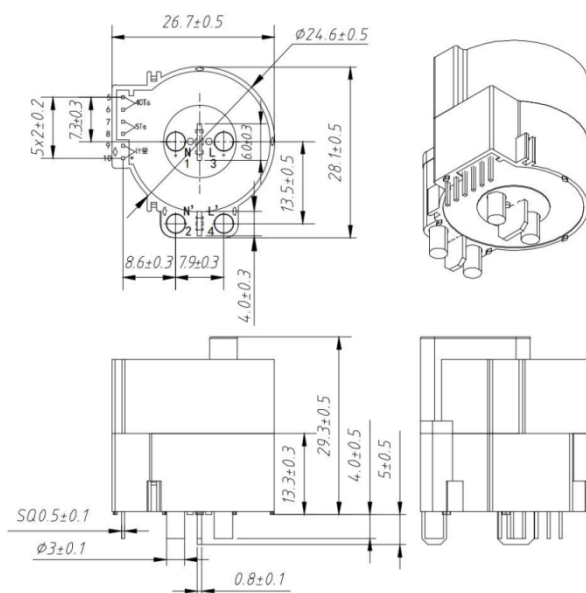


Figure 1

Detection Ring Pin Description

Pin	Function	Turns
5-6	Leakage current detection coil	40
7-8	Leakage self-test coil	5
9-10	Current transformer coil	2000
1-2	Neutral conductor jumper	1
3-4	Live conductor jumper	1

Detection Ring Electrical Parameters

Metering Section

No.	Function	Parameter	Unit
01	Rated frequency	50/60	Hz
02	Rated input current	32	A
03	Rated output current	16	mA
04	Rated burden	10	Ω

05	Maximum input current	40	A
06	Accuracy class	0.2	
07	AC withstand voltage	No breakdown or flashover between the primary and secondary windings	4 kVAC, 1 min; leakage current < 1 mA
08	Insulation resistance	Primary-to-secondary winding resistance $\geq 1000 \text{ M}\Omega$	500VDC
09	Operating temperature	-40 ~ +105	°C
10	Relative humidity	$\leq 95\%$	

Leakage Current Detection Section

No.	Function	Parameter	Unit
01	Dielectric withstand voltage	No breakdown or flashover between the primary and secondary windings	4 kVAC, 1 min; leakage current < 1 mA
02	Insulation resistance	Primary-to-secondary winding resistance $\geq 1000 \text{ M}\Omega$	500VDC
03	Operating temperature	-40 ~ +105	°C
04	Relative humidity	$\leq 95\%$	

Reference Circuit

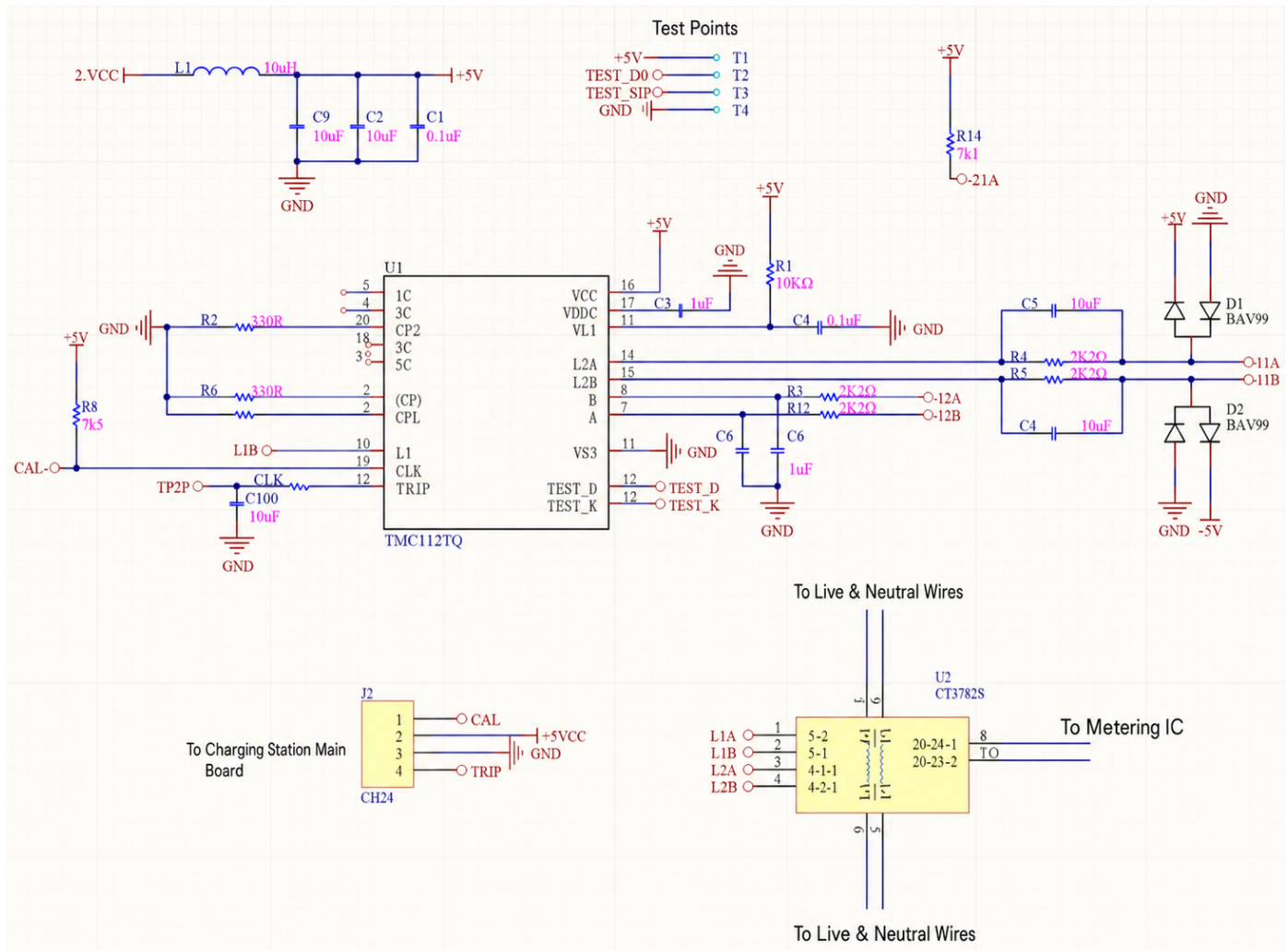
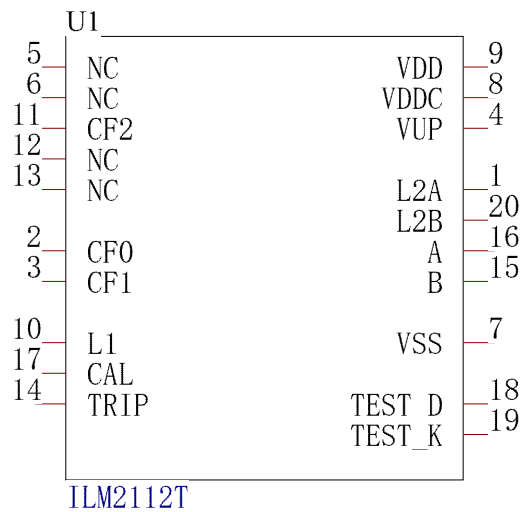


Figure 2

J1 is the interface to the charging station main control board, U2 is the CT2728, and U1 is the ILM2112TQC IC.

T1–T4 are test points and must be reserved in the user's PCB design.

ILM2112T Pin Description



Pin	Pin Name	Description
1	L2A	Connect to terminal A of the 40-turn coil
2	CF0	Input/configuration pin for selecting the matching CT model
3	CF1	Input/configuration pin for selecting the matching CT model
4	VUP	External RC circuit; see the reference circuit
5	NC	Leave unconnected
6	NC	Leave unconnected
7	VSS	Ground
8	VDDC	Connect a 1 μ F capacitor
9	VDD	5 V supply
10	L1	5-turn coil pin
11	CF2	Input/configuration pin for selecting the matching CT model
12	NC	Leave unconnected
13	NC	Leave unconnected
14	TRIP	Leakage fault signal output
15	B	40-turn detection coil, terminal B
16	A	40-turn detection coil, terminal A
17	CHK	Input; calibration pin
18	TEST_D	Reserved test pad

19	TEST_K	Reserved test pad
20	L2B	Connect to terminal B of the 40-turn coil

Figure 2 shows a reference leakage detection circuit using the CT2728 and ILM2112TQC. Connector J1 interfaces with the charging station main control board. CAL is the leakage self-test input, and TRIP is the digital leakage fault output. The timing of these two pins is described below.

Pin 17 is a 5 V TTL-level input. Because the I/O of a charging station MCU is typically 3.3 V, a transistor may be used for 3.3 V-to-5 V level conversion.

Set the logic levels of the three configuration pins CF0, CF1, and CF2 according to the CT model, as follows:

CT Model	CF2	CF1	CF0
CT2728	0	0	0
CT1719	1	1	1
CT1836	1	0	0

The component BOM is shown below:

Description	Reference Designator	Quantity
X7R 0.1uF 25V 10% 0603	C1, C5, C10	3
X7R 10uF 25V 10% 0603	C2, C9	1
X7R 1uF 25V 10% 0603	C3	1
X7R 68nF 50V 10% 0603	C4, C6	2
X7R 3.3nF 50V 10% 0603	C7, C8	2
BAV99 100V SOD-123	D1, D2	2
MCL2012H100MT 10uH 0.1A 0805	L1	1
10KΩ 0603 1%	R1,	1
220Ω 0603 1%	R4,R5	2
8.2KΩ 0603 1%	R7, R10	2
2KΩ 0603 1%	R8,R11, R14, R2, R6, R9	6
ILM2112TQC TSSOP-20	U1	1
CT2728	U2	1

IC Absolute Maximum Ratings

Parameter	Unit	Min.	Max.	Remarks
VCC	V	-0.3	6	Supply voltage
TA	°C	-40	85	Operating temperature
TA-S	°C	-40	105	Storage temperature

IC Electrical Characteristics

Ta=25°C, Vcc=5V					
Parameter	Symbol	Min.	Typ.	Max.	Unit
Supply voltage	Vcc	4.8	5	5.2	V
Operating current	IC	-	14	-	mA
TRIP pin (output)	VH	4.2	5	5	V
	VL	0	-	0.6	V
CHK pin (input)	VH	4.2	-	Vcc	V
	VL	0	-	0.5	V
Operating temperature	TA	-40	-	85	-
Storage temperature	TA-S	-40	-	105	-
Product weight	m	-	30	-	g
Startup time	Ton	-	-	800	ms
Residual operating current					
Parameter	Symbol	Min.	Typ.	Max.	Unit
DC_SM	-	3	4.5	6	mA

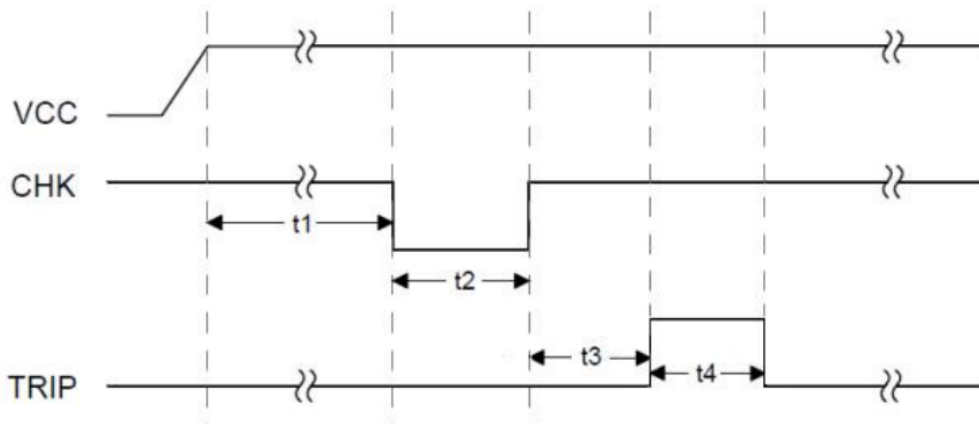
AC (50HZ)	-	15	22	30	mA
A0° (50HZ)	-	10.5	22	42	mA
A90° (50HZ)	-	7.5	22	42	mA
A135° (50HZ)	-	3.3	28	42	mA
2PDC	-	3.5	5.5	7.5	mA
3PDC	-	3.1	4.5	6.2	mA
F_ICCPD	-	15	28	42	mA
Residual current operating time					
Parameter	Symbol	Min.	Typ.	Max.	Unit
DC 6mA	-	-	380	650	ms
DC 60mA	-	-	63	80	ms
DC 300mA	-	-	11	28	ms
AC 30mA	-	-	115	200	ms
AC 60mA	-	-	63	80	ms
AC 150mA	-	-	15	28	ms
A0 42mA	-	-	68	150	ms
A0 84mA	-	-	50	100	ms
A0 350mA	-	-	13	28	ms
A0 42mA +6mADC	-	-	73	200	ms
A0 84mA +6mADC	-	-	46	100	ms
A0 350mA +6mADC	-	-	14	28	ms
2PDC/3PDC 60mA	-	-	63	100	ms
2PDC/3PDC 120mA	-	-	18	80	ms

2PDC/3PDC 300mA	-	-	12	28	ms
F_ICCPD 210mA	-	-	15	28	ms

Operating Instructions

1. Perform one CHK self-test calibration after power-up and another CHK calibration before charging.
2. The IC has an 800 ms startup delay after power-up, during which it does not respond or process signals.
3. The IC calculates the zero point during power-up and self-test.
4. A 5 V LDO is recommended for VCC. VCC ripple must be less than 50 mV.
5. The CT2728 detection ring must be located downstream of the charging station switching power supply to prevent leakage current from the power supply Y capacitor from passing through the ring.
6. Keep the CT2728 detection ring at least 3 cm away from relays.

Self-Test Timing



To ensure high accuracy and stable operation, the following t1, t2, t3, and t4 values are recommended:

t1: Waiting time after power-up is complete (recommended: $t1 \geq 1 \text{ s}$)

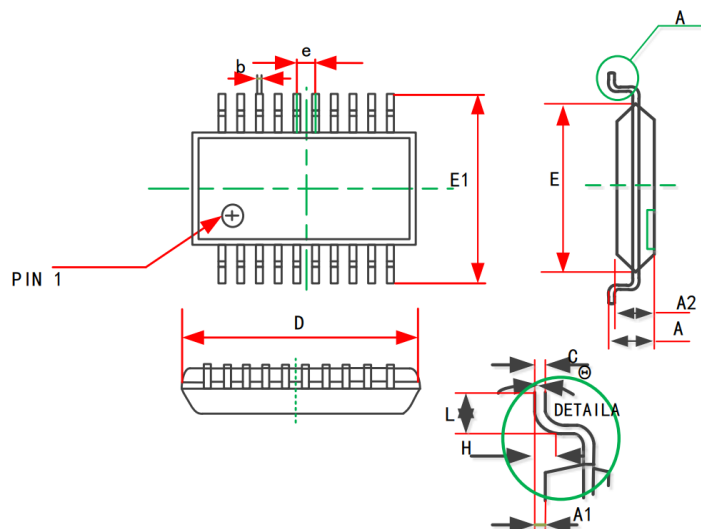
t2: Duration for triggering the IC self-test function ($0.6 \text{ s} \leq t2 \leq 1.2 \text{ s}$)

t3: Time allowed for the IC to complete self-test ($380 \text{ ms} \leq t3 \leq 450 \text{ ms}$)

t4: Self-test pass indication ($200\text{ ms} \leq t4 \leq 400\text{ ms}$). After the TRIP pin switches to a low level, the IC begins normal operation.

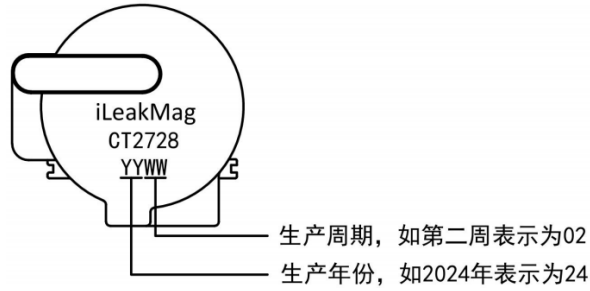
Note: During IC self-test, close the charging station main relay only after the TRIP signal output has completed.

IC Package Information



SYMBOL	Dimensions IN Millimeters		Dimensions IN Inches	
	MIN	MAX	MIN	MAX
D	6.400	6.600	0.252	0.259
E	4.300	4.500	0.169	0.177
b	0.190	0.300	0.007	0.012
c	0.090	0.200	0.004	0.008
E1	6.250	6.550	0.246	0.258
A	-	1.200	-	0.047
A2	0.800	1.000	0.031	0.039
A1	0.050	0.150	0.002	0.006
e	0.65(BSC)		0.026(BSC)	
L	0.500	0.700	0.020	0.028
H	0.25(TYP)		0.01(TYP)	
θ	1°	7°	1°	7°

Detection Ring Package Information



Warranty

1. Report product quality issues to the distributor within one year.
2. The warranty does not cover direct damage or failure caused by user negligence, misuse, improper installation or repair, or natural deterioration.

Revision History

Version	Description	Date
V1.0	Initial release	2024.08.12
V1.01	Text corrections	2025.03.25
V1.02	Added detection ring description	2025.07.09
V1.03	Added C10	2025.10.10
V1.04	Removed reserved diode D3	2025.11.01