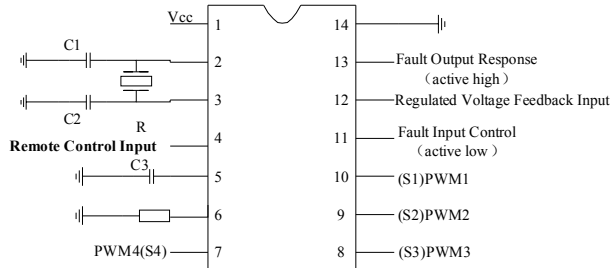


HT1112 Voltage-Regulated Sinusoidal SHE-PWM Invert IC for Single-Phase Inverters

Voltage-Regulated inverter control IC adjusts the ratio of the AC output voltage to DC-bus voltage by detecting the feedback ac output voltage to shape and control the inverter output voltage. The chip is mainly used for the inverter power supplies, in which a transformer is used to boost the output AC voltage in the latest stage, can be also used for high frequency inverters whose DC/DC is open-loop.

● Pin Configurations



1:Vcc 4.5V~5.5V

2,3:External crystal oscillator: 15.36MHz/50Hz,
18.432MHz/60Hz

4: Remote control, when P₄ is driven to logic '1', PWM1~
PWM4 outputs will be all driven low, when P₄ is driven to
logic '0', PWM outputs will be in normal state. The pin must
be connected to ground through a resistor(1k) when this
function is not be used.

5: C3=1uF

6: R=1KΩ

7~10: PWM signal outputs

11: Fault input control (active low), the effective time
is no less than 5us. When the Fault control pin is
driven to logic '0', the PWM outputs will be all
driven low. This characteristic can be used as short-
circuit detecting.

12: AC feedback

13: Fault output response, active high

14: GND

● Basic Performance Parameters

1. Phase number: Single
2. Fundamental frequency: 50Hz/15.36MHz, 60Hz/18.432MHz (crystal frequency is a linear relationship with fundamental frequency, if fundamental frequency need to be changed, only other external crystal oscillator is used instead. $50/60=15.36/18.43$)
3. Ratio of DC voltage conversion (the ratio of output AC voltage to DC-bus voltage): 0.55~0.93
4. Number of eliminated harmonics: 2nd~252nd orders
5. Switching frequency: 12.6kHz/50Hz, 15.12kHz/60Hz
6. Voltage-regulated accuracy of output fundamental voltage: < 3%
7. Control time of Dead-time: > 2us/50Hz, 1.6us/60Hz
8. Frequency accuracy: < 0.1%
9. Frequency stability: depends on the stability of external oscillator, at least at 10⁻⁵ level.
10. Operating temperature: -40~+70°C
11. Storage temperature: -55~+125°C
12. Package form: DIP-14

● Electrical Characteristics

Supply voltage Range: 4.5~5.5V

Total power consumption: 800mW

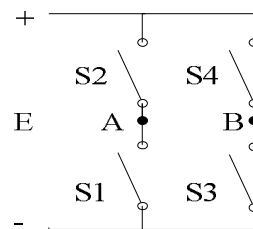
Outflow GND maximum current: 95mA

Inflow Vcc maximum current: 95mA

Maximal output sink current of arbitrary pin: 25mA

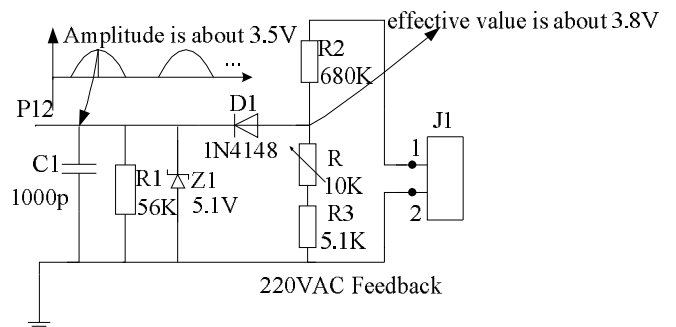
Maximal output source current of arbitrary pin: 25mA

● Circuit diagram of single-phase switch



PWM output signals of the chip PWM1-PWM4 control power transistors S1-S4 respectively.

● Circuit diagram of steady voltage feedback



Chip works after circuit is powered on, initial Ratio of DC voltage conversion is set at 0.55. When the pin P11 is driven high, the chip will be set to automatic voltage regulation condition. By adjusting the Ratio of DC voltage conversion, the output AC voltage will be stabilized to AC 220V or other voltage values (at this time, values of R2 and R3 need to be adjusted).

● Application suggestion

The chip is best used for the applications of Single-phase inverter power supplies, in which a transformer is used for boosting the output AC voltage in the latest stage, can be also used for high frequency inverters whose DC/DC is open-loop. If voltage-regulated feedback circuit is not connected (i.e. P12 is driven to logic "0" or suspending) Ratio of DC voltage conversion of the chip is 0.93

● Application Case

1KW Single-phase power frequency invert power supply module

This is a sinusoidal invert power module with full-featured protection, which uses DC/AC/power frequency transformer two-stage structure of power conversion, and full-bridge DC/AC circuit reverses the voltage from DC 24V to AC(24*Ratio of DC voltage conversion/1.414)V, and then power frequency transformer transforms the voltage to a standard AC 220V 50Hz. The invert chip HT1112 controls the DC-AC block, input and output of the module are completely isolated.

1、a) DC/AC Section





Heat sink size:277mm*120mm

Board size: 230mm*120mm. Every switch contains four paralleled power transistors, so the total number of power transistors is sixteen.

b) Power frequency transformer



Transformer ratio:13/240

2、DC and AC electrical characteristics

Input rated voltage : DC24V

Input rated DC current : 50A

Under-voltage protection : DC 21V

Over-voltage protection : DC 30V

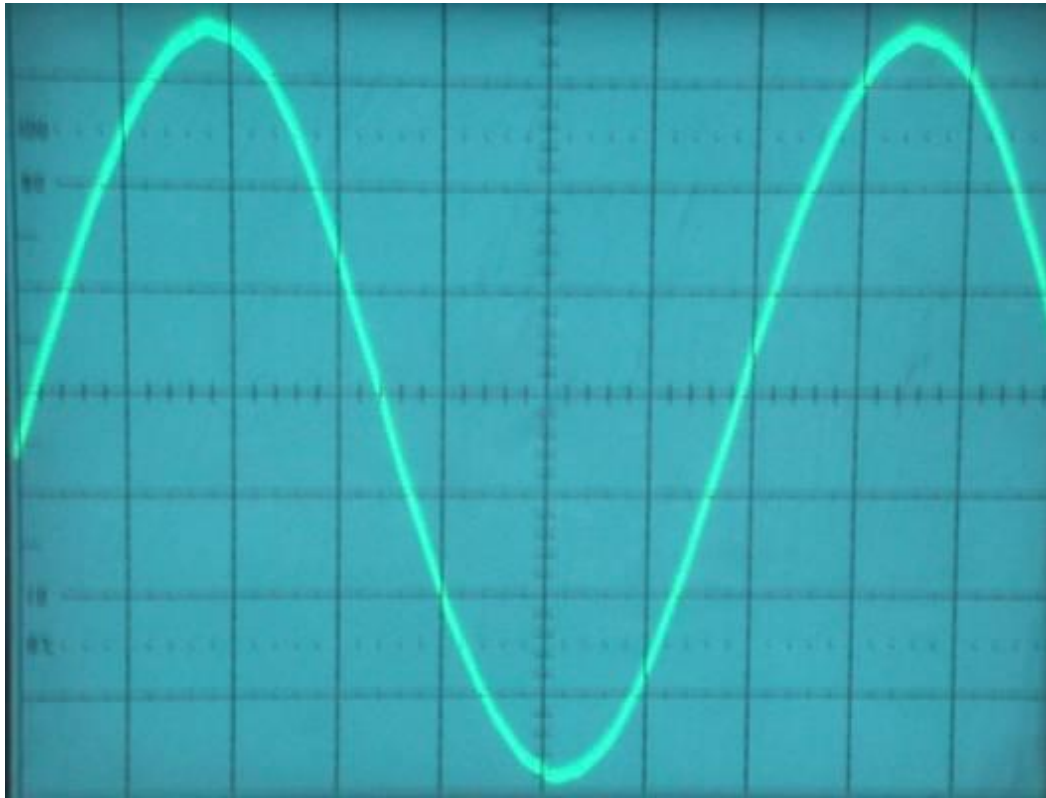
Output voltage : AC220V

Output frequency : 50Hz (adjusted according to user's requirements)

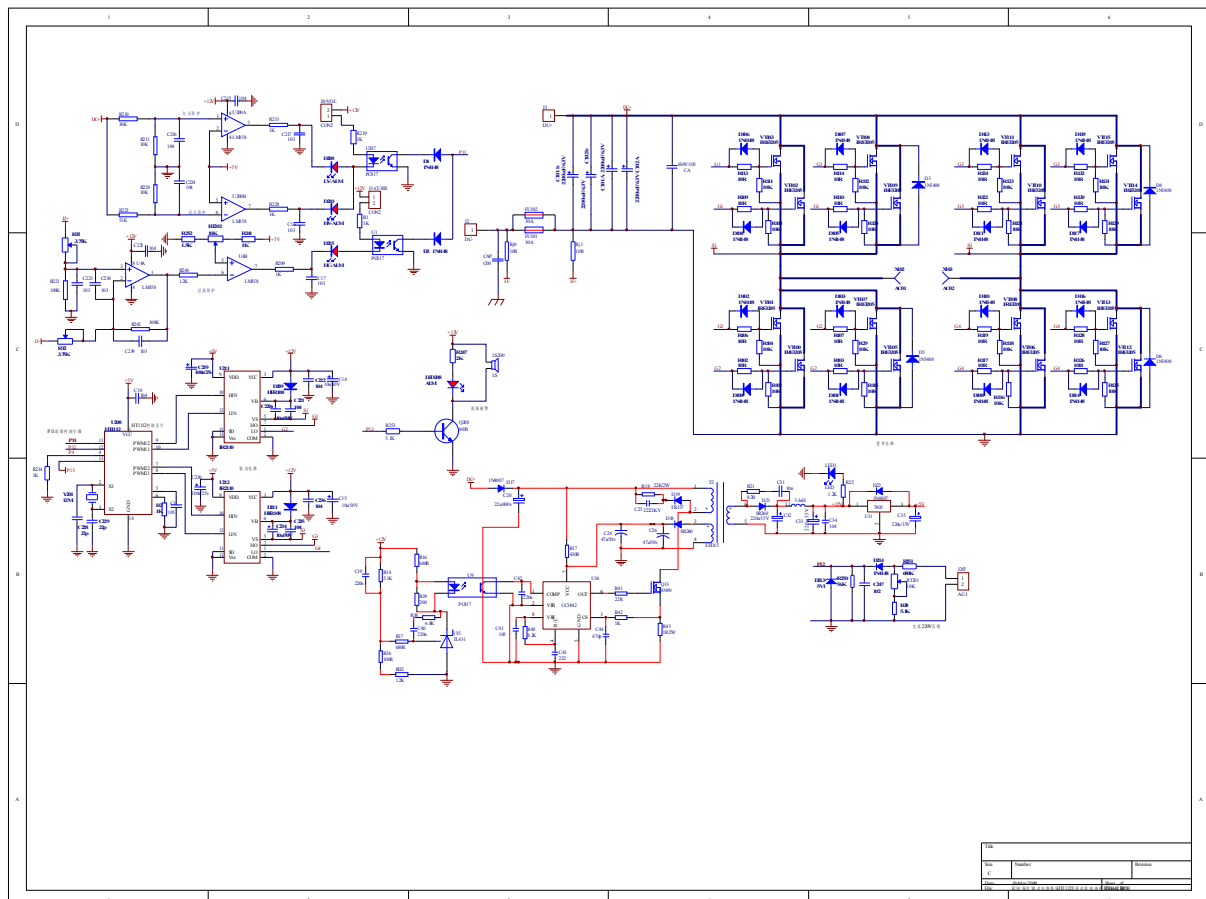
Test data:

Output power(W)	No-load	244	470	715.5	830	1020
Efficiency (%)		86.9	91.6	89.6	89.8	86.0
Input voltage(V)	25.23	24.47	21.62	23.33	22.99	22.14
Output voltage(V)	227.8	224	224.6	228.9	228	223.1

No-load voltage THD is 1.2%, full-load current THD is 2.4%.



Typical circuit diagram:



● Bill of materials

Designation	Parameter	Amount	Unit price(RMB)	Total(RMB)
Invert chip	HT1112 (contains crystal oscillator)	1		
Contains crystal oscillator	15.36MHz/50Hz, 18.432MHz/60Hz			
IC	7805	1	0.6	0.6
IC	IR2110	2	6	12
IC	UC3843	1	1.3	1.3
IC	LM358	3	0.5	1.5
Resistor	0R	1	0.02	0.02
Resistor	1K0	3	0.02	0.06
Resistor	1K2	2	0.02	0.04
Resistor	1K5	2	0.02	0.04
Resistor	1K	2	0.02	0.04
Resistor	2K0	10	0.02	0.2
Resistor	3K0	1	0.02	0.02
Resistor	3K6	2	0.02	0.04
Resistor	4K3	1	0.02	0.02
Resistor	5K1	8	0.02	0.16
Resistor	5R1	4	0.02	0.08
Resistor	8.2	1	0.02	0.02
Resistor	10K	19	0.02	0.38
Resistor	10R	20	0.02	0.4
Resistor	15K	2	0.02	0.04
Resistor	51R	1	0.02	0.02
Resistor	22K	1	0.02	0.02
Resistor	27K 1%	2	0.04	0.08
Resistor	30K	1	0.02	0.02
Resistor	56K	1	0.02	0.02
Resistor	100R	3	0.02	0.06
Resistor	110K	1	0.02	0.02
Resistor	330K	4	0.02	0.08
Resistor	470R	1	0.02	0.02
Resistor	680k	1	0.02	0.02
Resistor	DNL	2	0	0
variable resistor	20K	2	0.5	1
50A current divider	5MR	1	45	45
capacitor	1U0	1	0.12	0.12
capacitor	10n	1	0.06	0.06
capacitor	47u/25V	3	0.5	1.5
capacitor	330P	1	0.1	0.1

capacitor	470	1	0.06	0.06
Capacitor	10U/35V	7	0.2	1.4
capacitor	CAP	1	0.5	0.5
capacitor	22	2	0.06	0.12
capacitor	100U/63V	1	0.8	0.8
capacitor	102	6	0.06	0.36
capacitor	103	3	0.06	0.18
capacitor	104	15	0.06	0.9
capacitor	220U/35V	1	0.2	0.2
capacitor	222/2KV	2	0.3	0.6
capacitor	2200/63V	6	2.5	15
Diode	1N4007	2	0.15	0.3
Diode	1N4148	22	0.05	1.1
Diode	HER108	2	0.15	0.3
Diode	FR157	1	0.15	0.15
Diode	SR260	2	0.5	1
Zener Diode	TL431	1	0.4	0.4
Zener Diode	5V1	1	0.05	0.05
LED	ALM	6	0.15	0.9
triode transistor	1N2222	1	0.15	0.15
triode transistor	4N90	1	4	4
triode transistor	SI4148	1	6	6
triode transistor	8050	5	0.1	0.5
triode transistor	2N8050	2	0.15	0.3
MOSFET	IRF3205	16	2.6	41.6
Inductance	3U3	2	0.6	1.2
Optical coupler	PC817	2	0.5	1
Fuse	20A	3	0.5	1.5
Transformer	EFD15	1	4	4
Heat sink	277mm*120mm	2	35	70
connector	AC-J	1	0.2	0.2
connector	6X2	1	0.2	0.2
connector	6X2	1	0.2	0.2
connector	安普插片	6	0.2	1.2
SPEAKER	LS	1	0.6	0.6
Circuit board	23.4mm*120mm	1	40	40
Total		239	262.07	