EG8010 SPWMChip data sheet

Single-phase pure sine wave inverter dedicated chip

REV 2.2

Version Change History

<table>
<tr><th>version number</th><th>date</th><th>describe</th></tr>
<tr><td>V1.0</td><td>2010Year9moon12day</td><td>EG8010First draft of data sheet.</td></tr>
<tr><td>V2.0</td><td>2010Year10moon18day</td><td>1.renewEG8010Pin definitions and functions.
<table>
<tr><td>V1.0</td><td></td><td>V2.0</td><td></td></tr>
<tr><td>Pins</td><td>Defined Functions</td><td></td><td>Defined Functions</td></tr>
<tr><td>Pin6</td><td>LCDDI</td><td>Pin6</td><td>SPWMEN</td></tr>
<tr><td>Pin7</td><td>LCDCLK</td><td>Pin7</td><td>FANCTR</td></tr>
<tr><td>Pin8</td><td>LCDEN</td><td>Pin8</td><td>LEDOUT</td></tr>
<tr><td>Pin9</td><td>IDSPSEL</td><td>Pin9</td><td>PWMTYP</td></tr>
<tr><td>Pin16</td><td>FQDJ</td><td>Pin16</td><td>FRQADJ/V_{FB2}</td></tr>
<tr><td>Pin23</td><td>SPWMEN</td><td>Pin23</td><td>NC</td></tr>
<tr><td>Pin24</td><td>FANCTR</td><td>Pin24</td><td>LCDCLK</td></tr>
<tr><td>Pin25</td><td>LEDOUT</td><td>Pin25</td><td>LCDDI</td></tr>
<tr><td>Pin31</td><td>FRQOUT</td><td>Pin31</td><td>LCDEN</td></tr>
</table>
Remark:SPWMENFunctionV1.0Version is defined as "0" start upSPWMOutput, "1"closureSPWMOutput;
V2.0middleSPWMENdefined as"1"start upSPWMOutput,"0"closureSPWMOutput.
2.renewSSTSoft start time expires3S.
3.Update the over temperature protection value to4.3V, over temperature release value reaches4.0V.
4.Updated typical application circuit diagram.
5.Updated Output Voltage Feedback section description.
6.Add toPWMOutput type description.
7.renewRS232Serial communication commands and functions.</td></tr>
<tr><td>V2.1</td><td>2010Year11moon15day</td><td>1.Updated typical application circuit diagram (short circuit protectionLM393part), and application diagram IR2103Drive toIR2106driver.
2.Added industrial frequency transformer sine wave inverter application circuit diagram.</td></tr>
<tr><td>V2.2</td><td>2011Year08moon20day</td><td>1.Add toEG8010+IR2110+Typical application diagram of locking function and updated typical application circuit diagram parameters.
2.Modify the diagram8.9a RS232Optocoupler isolation communication circuitMAX232Chip9 Feet and 10Foot connection.
3.In the temperature detection feedback part8.3Added the optionNTC25°C resistance 10KB, constant value 3380</td></tr>
</table>

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EG8010Chip data sheetV2.2

1.Features

- 5V single power supply
- Pin setting 4 pure sine wave output frequencies:
  - 50Hz pure sine wave fixed frequency
  - 60Hz pure sine wave fixed frequency
  - 0-100Hz pure sine wave frequency adjustable
  - 0-400Hz pure sine wave frequency adjustable
- Unipolar and bipolar modulation
- Built-in dead zone control, pin setting 4 types of dead zone time:
  - 300nS dead time
  - 500nS dead time
  - 1.0uS dead time
  - 1.5uS dead time
- External 12MHz crystal oscillator
- PWM carrier frequency 23.4KHz
- Real-time processing of voltage, current and temperature feedback
- Overvoltage, undervoltage, overcurrent, overheating protection function
- Pin setting soft start mode 3S response time
- Serial communication to set output voltage, frequency and other parameters
- The external serial port 12832 LCD display module displays the voltage, frequency, temperature, current and other information of the inverter. Yijing
- Microelectronics provides modification of corresponding functions or parameters according to the customer's application.

2.describe

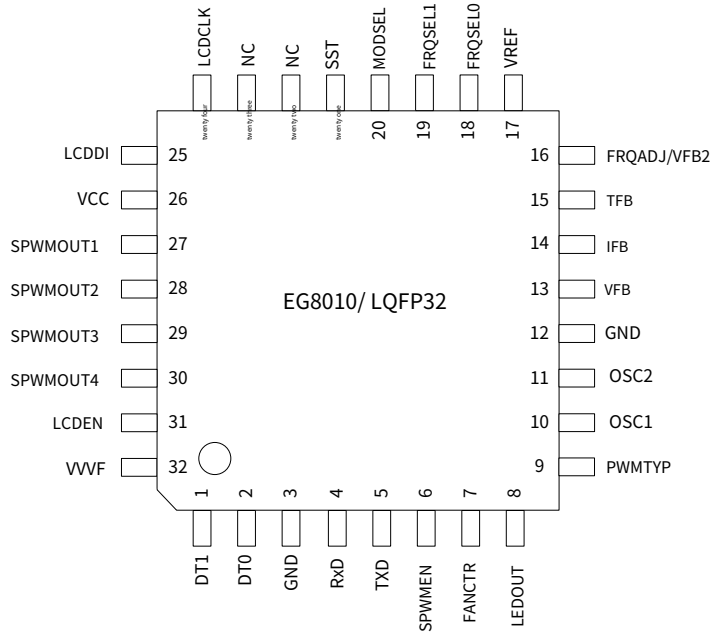
EG8010 is a digital, fully functional pure sine wave inverter generator chip with dead time control. It is used in DC-DC-AC two-stage power conversion architecture or DC-AC single-stage power frequency transformer step-up conversion architecture. With an external 12MHz crystal oscillator, it can achieve high-precision, low distortion and harmonic pure sine wave 50Hz or 60Hz inverter dedicated chip. The chip adopts CMOS technology and integrates SPWM sine generator, dead time control circuit, amplitude factor multiplier, soft start circuit, protection circuit, RS232 serial communication interface and 12832 serial LCD driver module.

3.Application Areas

- Single-phase pure sine wave inverter
- Photovoltaic inverter
- Wind power inverter
- upsupssystem
- Digital generator system
- Medium frequency power supply
- Single-phase motor speed controller
- Single-phase inverter
- Sine wave dimmer
- Sine wave voltage regulator
- Sine wave generator
- Inverter welding machine

4.Pinout

4.1.Pin Definition



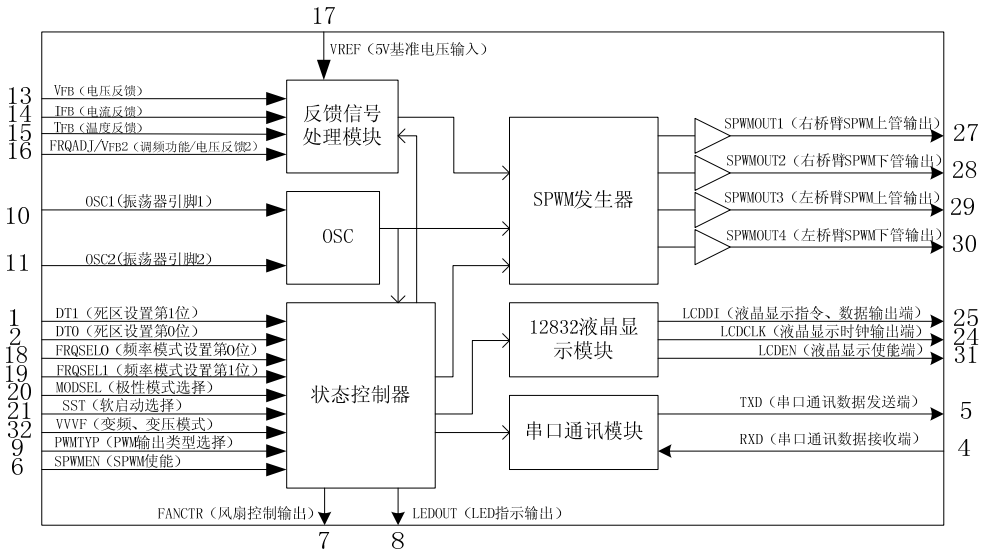
picture4-1. EG8010Pin Definition

4.2.Pin Description

lead Number	Pin Name	I/O	describe
26	VCC	VCC	+5V working power supply terminal of the chip
3,12	GND	GND	Chip ground
1	DT1	I	DT1, DT0 is to set the dead time of the upper and lower MOS tubes of PWM output: "00" is 300nS dead time; "01" is 500nS dead time; "10" is 1.0uS dead time; "11" is 1.5uS dead time
2	DT0	I	
4	RxD	I	Serial communication data receiving end
5	TXD	O	Serial communication data sending end
6	SPWMEN	I	SPWM output enable terminal,"1" is to start SPWM output,"0" turns off SPWM output
7	FANCTR	O	External fan control, when TFBWhen the pin detects that the temperature is higher than 45°C, it outputs a high level "1" to start the fan. When the temperature is lower than 40°C after running, it outputs a low level "0" to stop the fan.
8	LEDOUT	O	External LED alarm output, when a fault occurs, the output is low level "0" to light up the LED Normal: Steady on Overcurrent: flash 2 times, off for 2 seconds, keep on repeating Overvoltage: flash 3 times, off for 2 seconds, keep on repeating Undervoltage: flash 4 times, off for 2 seconds, keep on repeating

			Over temperature: Flash 5 times, turn off for 2 seconds, keep cycling
9	PWMTYP	I	PWM output type selection "0" is a positive polarity PWM type output, which is used to effectively drive IR2110 and other drive devices at a high level, that is, the pin SPWMOUT is high level to turn on the power MOS tube. "1" is a negative polarity PWM type output, which is used to effectively drive the cathode of the diode inside the TLP250 and other optocoupler devices. That is, the pin SPWMOUT is low level to turn on the power MOS tube. **When designing an application, you can refer to the typical application circuit diagram and configure the pin status according to the driver device. Otherwise, the inconsistency will cause the upper and lower power MOS tubes to be turned on at the same time.**
10	OSC1	I	12M crystal oscillator pin 1
11	OSC2	I	12M Crystal Oscillator Pin 2
13	VFB	I	Sine wave output voltage feedback input terminal
14	IFB	I	Load current feedback input
15	TFB	I	Temperature feedback input
16	FRQADJ/ VFB2	I	Function multiplexing pin, in FM mode (unipolar modulation) as FM voltage 0-5V input, in bipolar modulation as the right bridge arm output voltage feedback input
17	VREF	I	Internal reference power supply input of the chip
18	FRQSEL0	I	FRQSEL1 (Pin 19) , FRQSEL0 (pin 18) is to set the frequency mode, "00" means output frequency of 50Hz; "01" is the output frequency of 60Hz; "10" is the output frequency range of 0-100Hz, which is adjusted by the FRQADJ pin; "11" is the output frequency range of 0-400Hz, which is adjusted by the FRQADJ pin
19	FRQSEL1	I	
20	MODSEL	I	Unipolar and bipolar modulation options: “0” is unipolar modulation mode; "1" is bipolar modulation
twenty one	SST	I	Soft start function enable input: "0" does not support the soft start function; "1" supports soft start function, and the soft start time is 3S
twenty two,twenty three	NC	-	Empty feet
twenty four	LCDCLK	O	Serial port 12832 LCD display module clock output terminal
25	LCDDI	O	Serial port 12832 LCD display module command and data output terminal
27	SPWMOUT1	O	The right bridge arm upper tube SPWM output, when unipolar modulation, this pin is used as the fundamental wave output of the right bridge arm upper tube, and when bipolar modulation, it is used as SPWM modulation output
28	SPWMOUT2	O	The right bridge arm lower tube SPWM output, when unipolar modulation, this pin is used as the fundamental wave output of the right bridge arm lower tube, when bipolar modulation, it is used as SPWM modulation output
29	SPWMOUT3	O	Left bridge arm upper tube SPWM output, this pin is used as left bridge arm SPWM modulation output in unipolar and bipolar modulation.
30	SPWMOUT4	O	Left bridge arm lower tube SPWM output, this pin is used as left bridge arm SPWM modulation output in unipolar and bipolar modulation.
31	LCDEN	O	Serial port 12832 LCD display module enable output
32	VVVF	I	Frequency conversion and voltage conversion function enable pin: “0” is variable frequency but constant voltage mode; "1" is the variable frequency and variable voltage mode, which is used for inverter and motor control

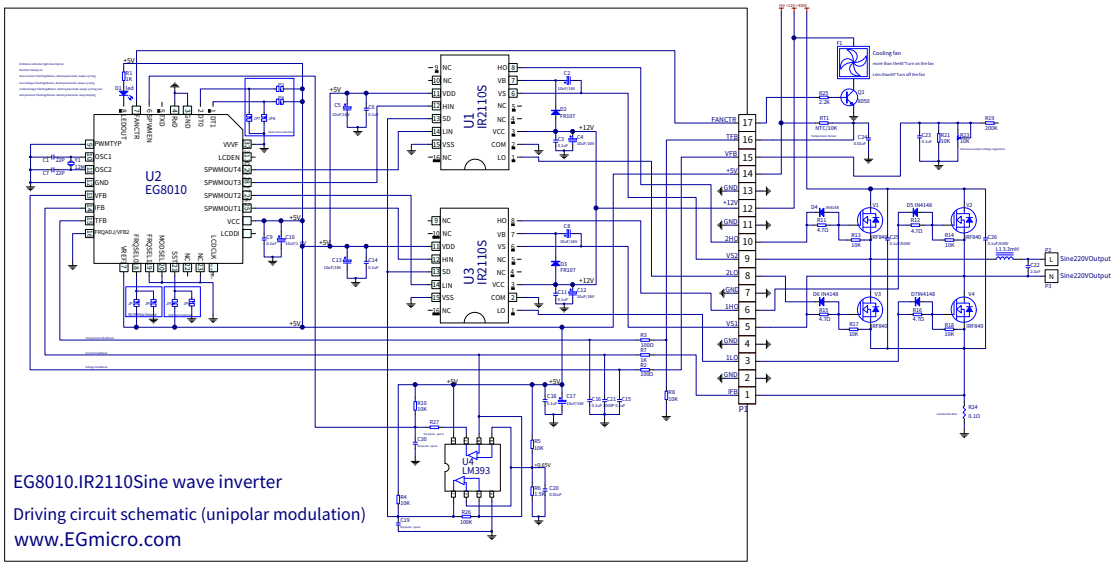
5.Structure diagram



picture5-1. EG8010Structure diagram

6.Typical application circuit

6.1 EG8010+IR2110STypical application circuit diagram of pure sine wave inverter (unipolar modulation method)



picture6-1. EG8010+IR2110STypical application circuit diagram of pure sine wave inverter (unipolar modulation method)

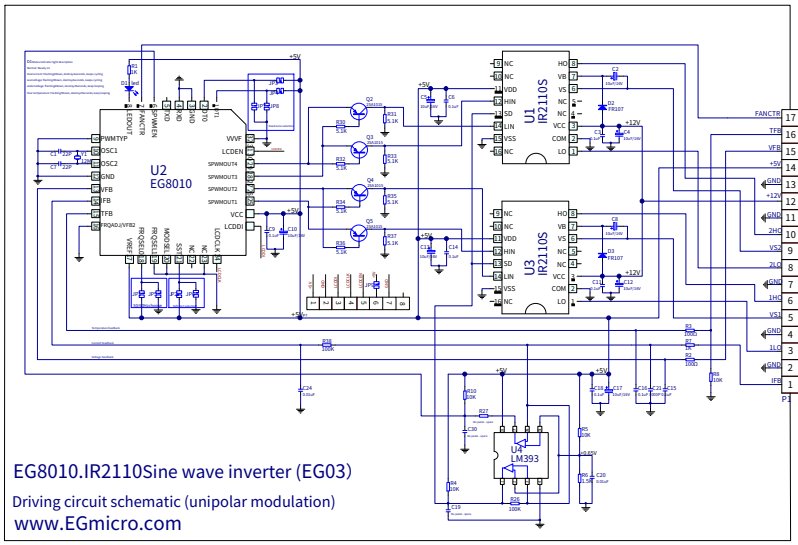
Note:

1.In fixed frequency mode50Hz(FRQSEL1,FRQSEL0=00)or60Hz(FRQSEL1,FRQSEL0=01),FRQADJ/VFB2andVVVFThe pin is invalid, and the sine wave output voltage is determined by the feedback resistor.R23It can be used for dimming and voltage regulation.

2.In fixed voltage variable frequency mode (VVVFThe pin is "0" Low level)0~100Hz(FRQSEL1,FRQSEL0=10)or0Hz~400Hz(FRQSEL1,FRQSEL0=11),FQDJThe pin needs to be connected to an external potentiometer to output frequencyFQDJpin, the output voltage is adjusted byR23set up.

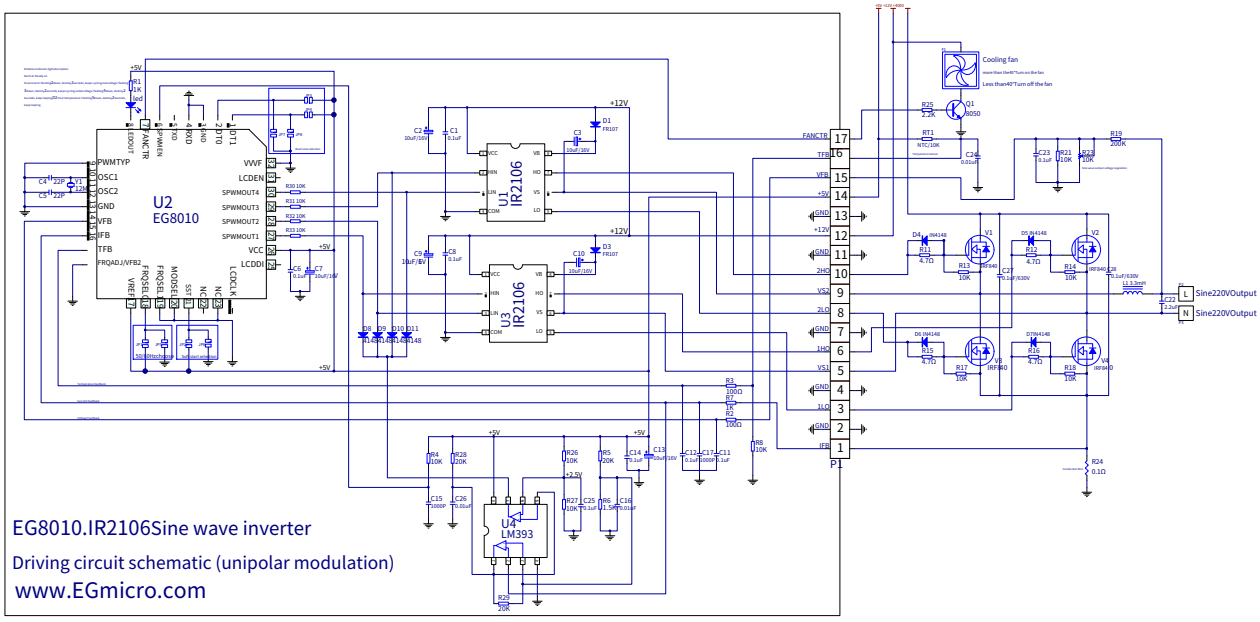
3.Frequency conversion mode (VVVFThe pin is "1"High level)0~100Hz(FRQSEL1,FRQSEL0=10)or0Hz~400Hz(FRQSEL1,FRQSEL0=11),FQDJThe pin needs to be connected to an external potentiometer.FQDJpin adjusts the output frequency and output voltage, the internal circuit maintains V/F=constant,R23Set the output frequency to50HzThe output voltage is effectively220V.

6.2 EG8010+IR2110S+Typical application circuit diagram of latching pure sine wave inverter (unipolar modulation mode)



picture6-2. EG8010+IR2110S+Typical application circuit diagram of latching pure sine wave inverter (unipolar modulation mode)

6.3 EG8010+IR2106STypical application circuit diagram of pure sine wave inverter (unipolar modulation method)



picture6-3. EG8010+IR2106STypical application circuit diagram of pure sine wave inverter (unipolar modulation method)

Note:

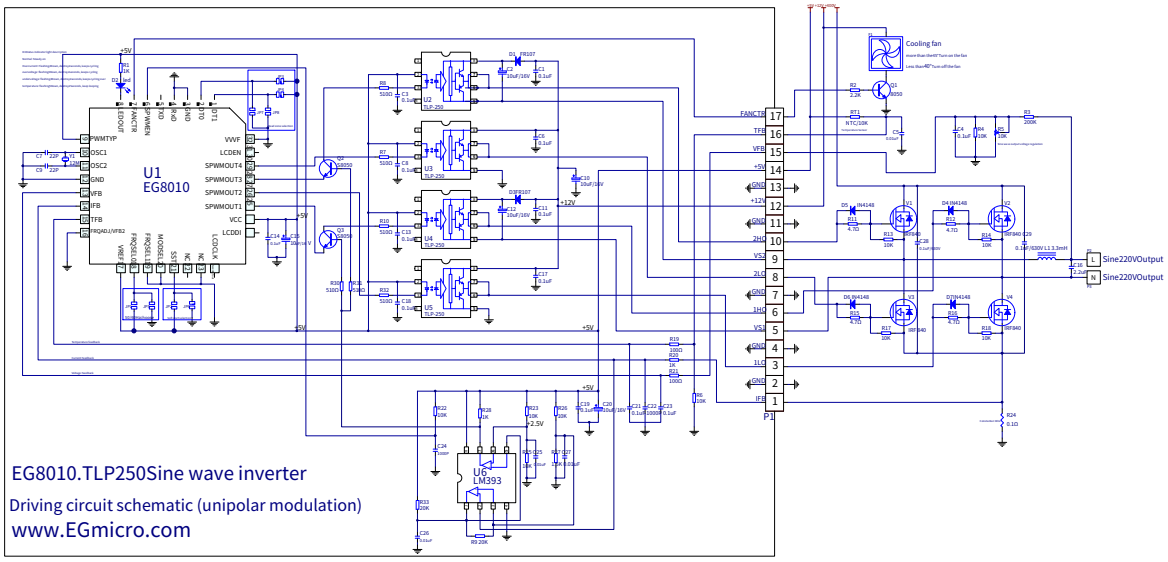
1.In fixed frequency mode50Hz(FRQSEL1,FRQSEL0=00)or60Hz(FRQSEL1,FRQSEL0=01),FRQADJ/VFB2andVVVFThe pin is invalid, and the sine wave output voltage is determined by the feedback resistor.R23It can be used for dimming and voltage regulation.

2.In fixed voltage variable frequency mode (VVVFThe pin is "0" Low level)0~100Hz(FRQSEL1,FRQSEL0=10)or0Hz~400Hz(FRQSEL1,FRQSEL0=11),FQDJThe pin needs to be connected to an external potentiometer to output frequencyFQDJpin, the output voltage is adjusted byR23set up.

3.Frequency conversion mode (VVVFThe pin is "1"High level)0~100Hz(FRQSEL1,FRQSEL0=10)or0Hz~400Hz(FRQSEL1,FRQSEL0=11),FQDJThe pin needs to be connected to an external potentiometer.FQDJpin adjusts the output frequency and output voltage, the internal circuit maintains

V/F=constant,R23Set the output frequency to50HzThe output voltage is effectively220V.

6.4 EG8010+TLP250Typical application circuit diagram of pure sine wave inverter (unipolar modulation method)



picture6-4. EG8010+TLP250Typical application circuit diagram of pure sine wave inverter (unipolar modulation method)

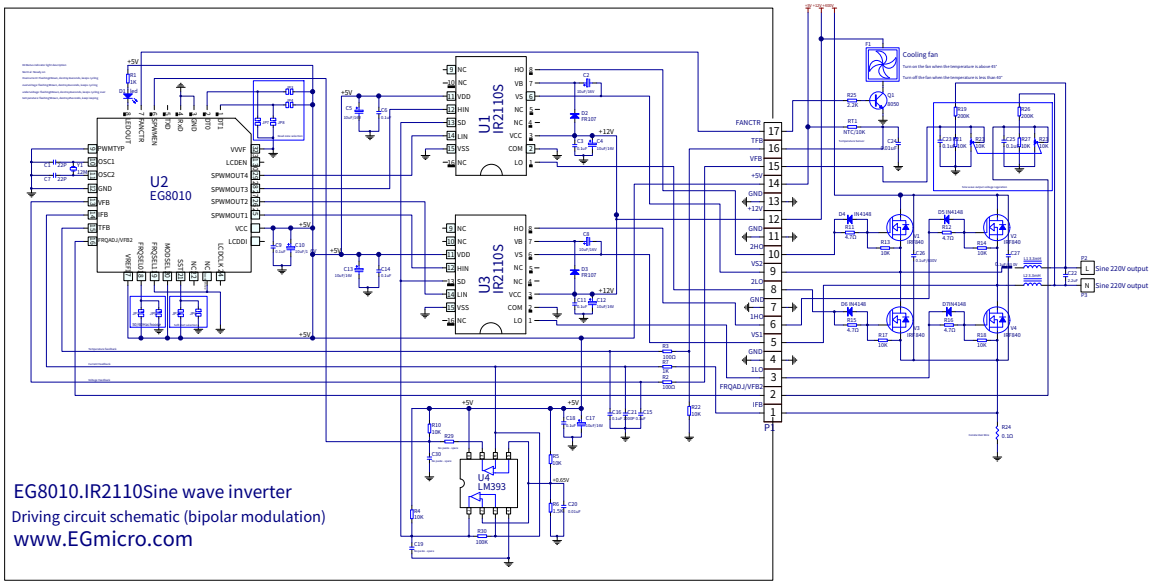
Note:

1.In fixed frequency mode50Hz(FRQSEL1,FRQSEL0=00)or60Hz(FRQSEL1,FRQSEL0=01)The sine wave output voltage is determined by the feedback resistorR23It can be used for dimming and voltage regulation.

2.In fixed voltage variable frequency mode (VVFThe pin is "0" Low level)0~100Hz(FRQSEL1,FRQSEL0=10)or0Hz~400Hz(FRQSEL1,FRQSEL0=11),FQDJThe pin needs to be connected to an external potentiometer to output frequencyFQDJpin, the output voltage is adjusted byR23set up.

3.Frequency conversion mode (VVFThe pin is "1"High level)0~100Hz(FRQSEL1,FRQSEL0=10)or0Hz~400Hz(FRQSEL1,FRQSEL0=11),FQDJThe pin needs to be connected to an external potentiometer.FQDJpin adjusts the output frequency and output voltage, the internal circuit maintains V/F=constant,R23Set the output frequency to50HzThe output voltage is effectively220V.

6.5 EG8010+IR2110STypical application circuit diagram of pure sine wave inverter (bipolar modulation method)



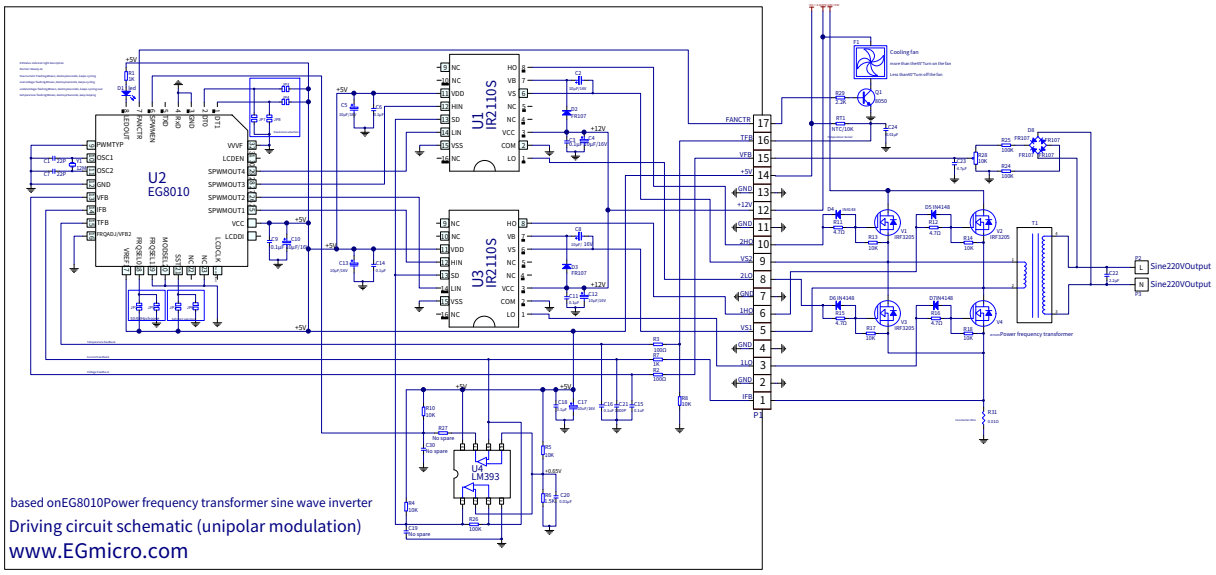
picture6-5. EG8010+IR2110STypical application circuit diagram of pure sine wave inverter (bipolar modulation method)

Note:

1.In fixed frequency mode50Hz(FRQSEL1,FRQSEL0=00)or60Hz(FRQSEL1,FRQSEL0=01), when bipolar modulation is used, the pin20(MODSEL)Connect to high level, the sine wave output voltage is determined by the double resistorR23Make adjustments or voltage adjustments.

2.FM functionality is not supported when using bipolar modulation.

6.6 EG8010+IR2110STypical application circuit diagram of pure sine wave inverter (power frequency transformer)



picture6-6. EG8010+IR2110STypical application circuit diagram of industrial frequency transformer sine wave inverter

Note:

1. T1A power frequency transformer is required, and a high voltage filter capacitor is required at the secondary of the power frequency transformer to filter outPWMHigh frequency modulation signal, after capacitor filtering, outputs the power frequency50Hz/60HzSine wave.

2.Full-bridge power of the primary of the power frequency transformerMOSThe tube model needs to be selected according to the input voltage, and tubes with low on-resistance should be selected as much as possible.

7.Electrical Characteristics

7.1Limit parameters

Unless otherwise specified, in TA=25°C

symbol	parameter name	Test Conditions	Minimum	maximum	unit
VCC	power supply	Vcc pin relative to GND Voltage	- 0.3	6.5	V
I/O	All input and output ports	All I/O pins to GND Voltage	- 0.3	5.5	V
Isink	The maximum output sink of the output pin Current	-	-	25	mA
Isource	The maximum output pull of the output pin Current	-	-	- 5	mA
TA	Ambient temperature	-	- 45	85	℃
Tstr	Storage temperature	-	- 65	125	℃

Note: Exceeding the listed limit parameters may cause permanent damage to the chip. Long-term operation under extreme conditions will affect the reliability of the chip.

7.2Typical parameters

Unless otherwise specified, in TA=25°C,Vcc=5V,OSC=12MHz

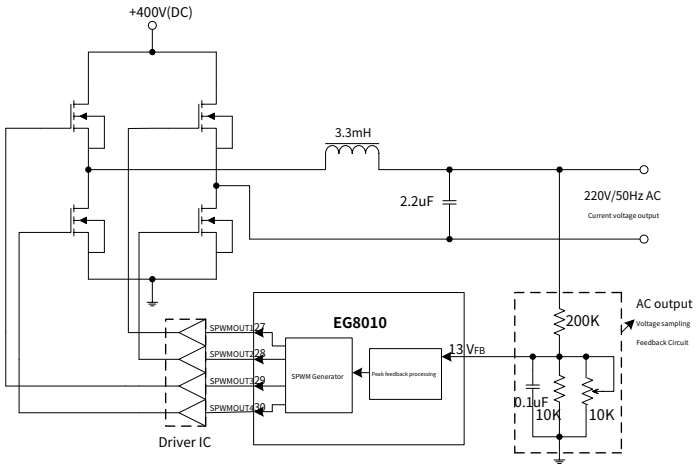
symbol	parameter name	Test Conditions	Minimum	typical	maximum	unit
Vcc	power supply	-	2.7	5	5.5	V
VREF	Reference power input	-	-	5	-	V
I/O	All input and output	Voltage of all I/O pins to GND	0	-	5	V
Icc	Quiescent Current	Vcc=5V,OSC=12MHz	-	10	15	mA
VFB	Peak feedback reference voltage	Vcc=5V	-	3.0	-	V
IFB	Current protection reference voltage	Vcc=5V	-	0.5	-	V
TFB	Temperature protection reference voltage	Vcc=5V	-	4.3	-	V
Vin(H)	Input logic signal high potential	Vcc=5V	2.0	5.0	5.5	V
Vin(L)	Input logic signal low potential	Vcc=5V	- 0.3	0	1.0	V
Vout(H)	Output logic signal high level	Vcc=5V,IOH=-3mA	3.0	5.0	-	V
Vout(L)	Output logic signal low level	Vcc=5V,IOL=10mA	-	-	0.45	V
Isink	The maximum output sink of the output pin Current	-	-	-	20	mA
Isource	The maximum output pull of the output pin Current	-	-	-	- 3	mA

8.Application Design

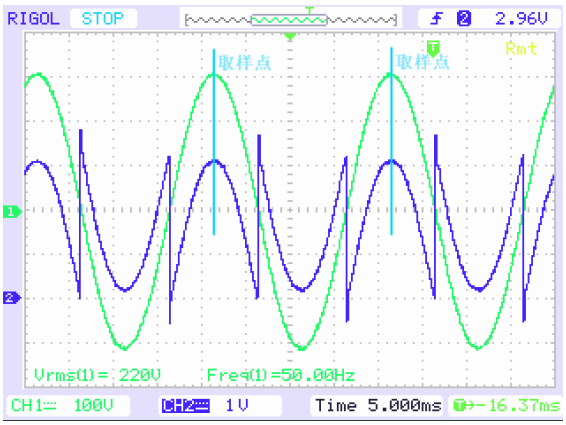
8.1 Output Voltage Feedback

EG8010The working modes of the chip are divided into unipolar modulation mode and bipolar modulation mode. In unipolar modulation, only one bridge arm (EG8010Pinout SPWMOUT3,SPWMOUT4)DoSPWMModulation output, the other bridge arm (EG8010PinoutSPWMOUT1,SPWMOUT2) for fundamental wave output, the filter inductor needs to be connected to SPWMThe output end of the modulation bridge arm and the voltage sampling feedback circuit also need to be connected toSPWMThe output end of the modulated bridge arm inductor is shown in the figure8.1a. Dual bridge arms in bipolar modulation (EG8010PinoutSPWM3,SPWM4,SPWM1,SPWM2) Do it at the same timeSPWMModulated output, when applied, the filtering characteristics of two inductors will be better. The voltage sampling feedback circuit requires two voltage divider networks for differential feedback processing, as shown in the figure8.1c.

In unipolar modulation mode,EG8010The voltage feedback processing of the chip is through pin (13) V_{FB}Measure the AC voltage output by the inverter, pin (16) FRQADJ/V_{FB2}Only in FM modeFQDJFunction at this timeV_{FB2}Feedback is invalid, the circuit structure is shown in Figure 8.1a Voltage sampling feedback part, measuring the feedback peak voltage and the internal reference sine wave peak voltage3VThe error calculation is performed and the output voltage value is adjusted accordingly. When the output voltage increases, the voltage of this pin also increases. After the error value of the internal circuit is calculated, the amplitude factor multiplier coefficient is adjusted to reduce the output voltage to achieve the voltage regulation process. Conversely, when the voltage of this pin decreases, the chip will increase the output voltage.



picture8.1a EG8010Unipolar modulation output voltage feedback circuit

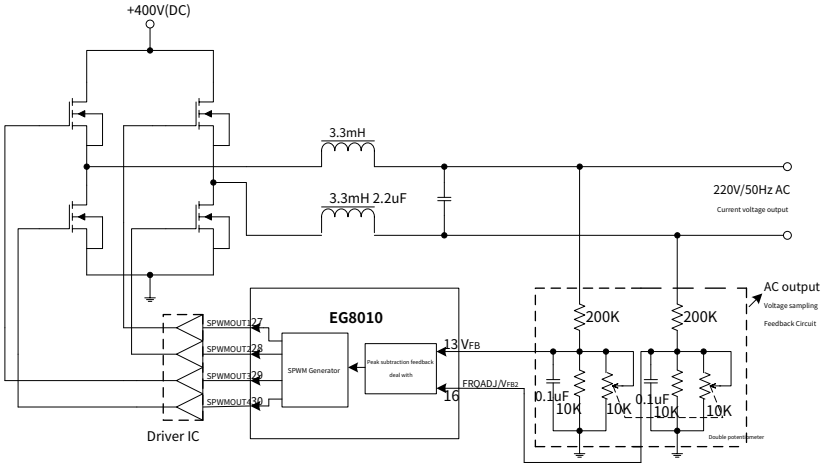


CH1:220V/50HzSine wave output waveformCH1:V_{FB}Feedback signal input waveform

picture8.1bMeasuredSPWMUnipolar modulation pure sine wave output waveform andV_{FB}Feedback waveform

picture8.1bThis is the actual test waveform of the unipolar modulation method.EG8010The peak point sampling output voltage is adopted, which has high voltage regulation accuracy and fast voltage adjustment speed. When the output voltage deviates due to some reasons such as load change or input voltage fluctuation,EG8010Can1-3 The desired output voltage is adjusted within one AC cycle.

In bipolar modulation mode,EG8010The voltage feedback processing of the chip is through pin (13) V_{FB}Measure the output voltage of the left bridge arm and the pin (16) FRQADJ/V_{FB2}OnlyV_{FB2}Function to measure the output voltage of the right bridge arm at this timeFQDJThe frequency modulation function is invalid. The circuit structure is shown in Figure 8.1c. The voltage feedback part measures the peak differential voltage and the internal reference sine wave peak voltage through two differential feedbacks.3VThe error calculation is performed and the output voltage value is adjusted accordingly. After the internal circuit error value is calculated, the amplitude factor multiplier coefficient is adjusted to achieve the voltage stabilization process. Bipolar modulation can also be used in1-3The desired output voltage is adjusted within one AC cycle.



picture8.1c EG8010Bipolar modulation output voltage feedback circuit

To prevent too low or too high output voltage from being supplied to the load,EG8010Overvoltage and undervoltage protection functions are set internally, and the overvoltage protection setting value 3.15VThe delay time is300mS,Undervoltage protection setting value2.75VThe delay time is3S, when overvoltage or undervoltage protection occurs,EG8010 According to the pin (9) PWMTYPThe setting status will outputSPWMOUT1~SPWMOUT4arrive"0" or"1"level, turn off all powerMOSFET Make the output voltage to a low level, once it enters the overvoltage and undervoltage protection,EG8010will be8SAfter release, turn the power back onMOSFETThe tube then determines the output voltage. Release open powerMOSFETThe duration of the tube is100mS,Released100mSIf the overvoltage or undervoltage event still exists,EG8010 Then turn off all powerMOSFETMake the output voltage to low level and wait again8SIf the normal operation reaches1More than minutesEG8010The number of overvoltage or undervoltage events will be cleared, otherwise the number of consecutive releases will accumulate.5Still not functioning properly afterEG8010Will shut down completelySPWMThe output of the module needs to be released after the system is powered on again.

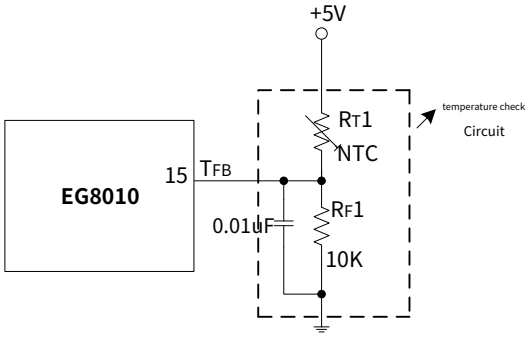
8.2 Output Current Feedback

EG8010Chip pinsIFBIt is used to measure the inverter output load current and is mainly used for overcurrent protection detection. The circuit structure is shown in Figure 8.1a. Current sampling feedback part. The internal reference peak voltage of this pin is set to0.5VOvercurrent detection delay time600mS, when the load current is too high and exceeds the inverter load current for some reason,EG8010According to the pin (9) PWMTYPThe setting status will outputSPWMOUT1~SPWMOUT4 arrive"0" or"1"level, turn off all powerMOSFETThe output voltage is low, which is mainly used to protect the powerMOSFETand load, once it enters overcurrent protection,EG8010will be16SAfter release, turn the power back onMOSFETThe tube then determines the load overcurrent condition and releases the powerMOSThe duration of the tube is100mS,Released100mSThe overcurrent event is judged again in the time. If the overcurrent event still exists,EG8010Then turn off all powerMOSFETMake the output voltage to low level and wait again16SIf the normal operation reaches1More than minutes EG8010The number of overcurrent events will be cleared, otherwise the continuous release times will accumulate.5After the error occurs, it still does not work properlyEG8010Will shut down completelySPWM The output of the module needs to be released after the system is powered on again. If some occasions such as when the starting current is large and the time is long, it is not suitable to apply this function.IFBPin is grounded.

8.3 Temperature detection feedback

EG8010Chip pinsTFBIt is used to measure the working temperature of the inverter, mainly used for over-temperature protection detection and working temperature output display. 12832 LCDOn the module, the circuit structure is shown in Figure 8.3a temperature detection circuit. As shown in the figure, the NTC thermistor RT1 and the measuring resistor RF1 form a simple voltage divider circuit. The voltage divider value changes with the temperature value. The size of this voltage will reflect the size of the NTC resistor and thus obtain the corresponding temperature value. NTC uses a thermistor with a resistance of 10K (B constant value of 3380) corresponding to 25°C.TFBThe overtemperature voltage of the pin is set at4.3V, when over temperature protection occurs,EG8010According to the pin (9) PWMTYPThe setting status will outputSPWMOUT1~SPWMOUT4arrive"0"

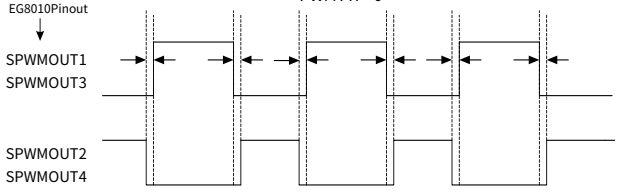
or"1"level, turn off all powerMOSFETMake the output voltage to low level, once it enters the over temperature protection,EG8010The operating temperature will be re-judged ifT_{FB}The voltage on the pin is lower than4.0V,EG8010The over-temperature protection will be exited and the inverter will work normally. If the over-temperature protection function is not used, this pin needs to be grounded.



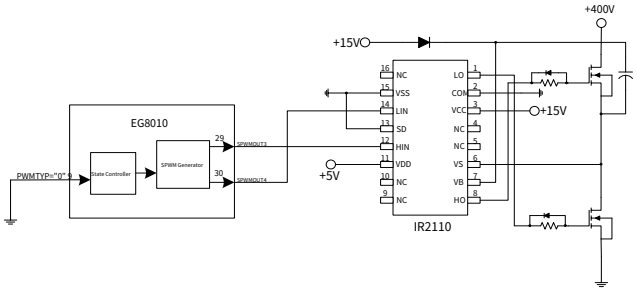
picture8.3a EG8010Temperature detection circuit

8.4 PWM Output Type

EG8010Chip pinsPWMTYPYes SettingsPWMOutput type,PWMTYPfor"0”Is positive polarityPWMThis type of output is used in situations where the dead zone level is low level at the same time (such as drivingIR2110orIR2106etc. driver chip), Figure8.4ayesEG8010PinoutSPWMOUTOutput waveform, high level effective drive powerMOSTube, Figure8.4byesPWMTYP = "0"Positive polarityPWMType DrivenIR2110Application circuit.

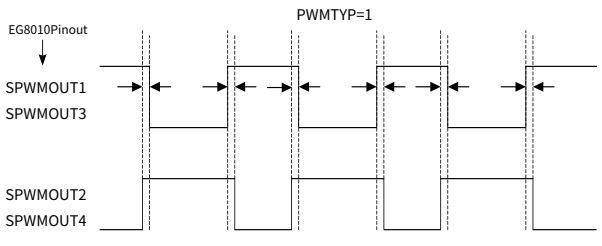


picture8.4a EG8010Positive polarityPWMType Output

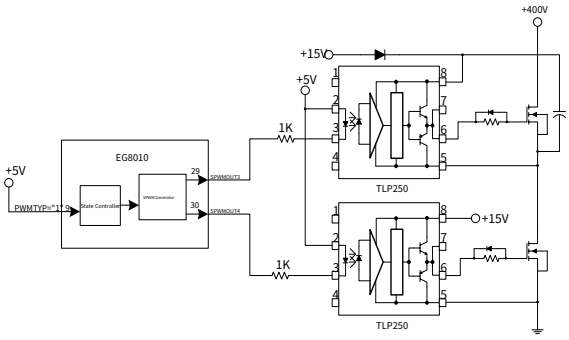


picture8.4b EG8010Positive polarityPWMdriveIR2110

PWMTYPfor"1"Negative polarityPWMThis type of output is used in situations where the dead zone level is high at the same time (such as drivingTLP250cathode of optocoupler devices, etc.)EG8010PinoutSPWMOUTThe output waveform is shown in the figure8.4c, low level effectively drives the optocoupler, and the optocoupler outputs high level driving power MOSTube, Figure8.4dyesPWMTYP="1"Negative polarityPWMType DrivenTL250Application circuit of optocoupler device.



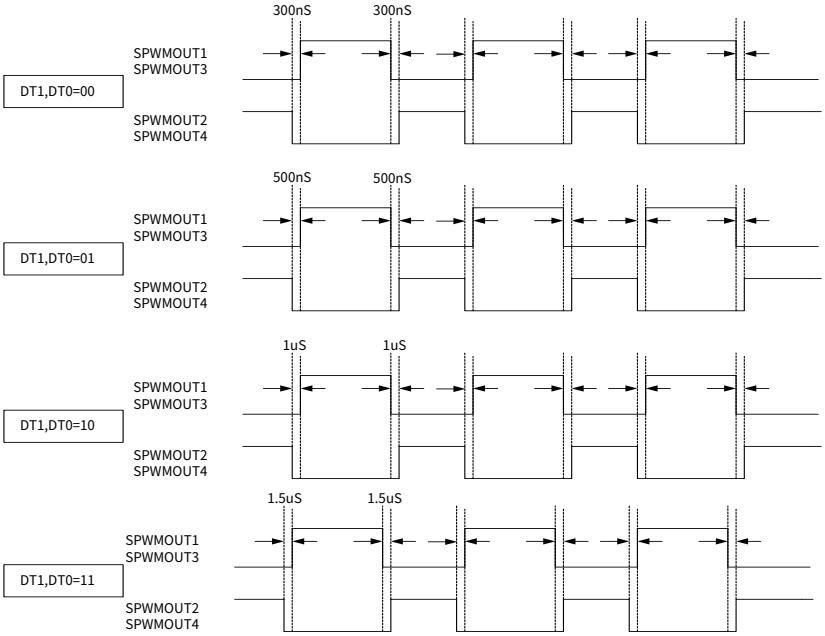
picture8.4c EG8010Negative polarityPWMType Output



picture8.4d EG8010Negative polarityPWMdriveTLP250Optocoupler Devices

8.5 Dead time setting

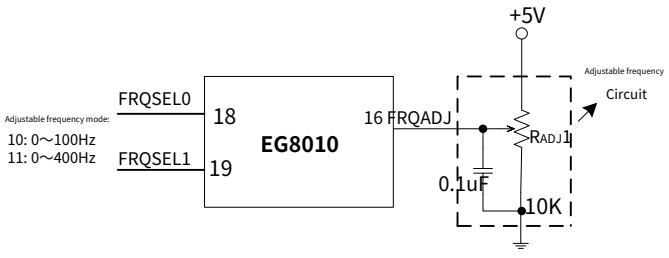
EG8010The chip pins DT1 and DT0 are used to control the dead time. Dead time control is one of the important parameters of the power MOS tube. If there is no dead time or it is too small, the upper and lower power MOS tubes will be turned on at the same time and burn the MOS tube. If the dead time is too large, it will cause waveform distortion and serious heating of the power tube. Figure 8.5a is the internal dead time control timing of EG8010. As shown in the figure, pins DT1 and DT0 are used to set 4 types of dead time. "00" is 300nS dead time, "01" is 500nS dead time, "10" is 1uS dead time, and "11" is 1.5us dead time.



picture8.5a EG8010Deadband control setting

8.6 Frequency Setting

EG8010The frequency mode is divided into fixed frequency mode and adjustable frequency mode.EG8010Only unipolar modulation is used, that is, in adjustable frequency mode, the pin (20)MODSELThe frequency mode is set by pins FRQSEL1 and FRQSEL0. The fixed frequency mode is "00" for outputting 50Hz frequency, and "01" for outputting 60Hz frequency. The FRQADJ function is invalid in the fixed frequency mode. When working in bipolar modulation mode, pin (16) will be used as V_{FB2}Voltage feedback circuit; the adjustable frequency mode is "10" means the output frequency range is 0-100Hz adjustable, "11" means the output frequency range is 0-400Hz adjustable, the adjustable frequency is adjusted by the FRQADJ pin. The circuit is shown in Figure 8.6a. The input voltage of the FRQADJ pin changes from 0-5V, and the corresponding fundamental output frequency changes from 0-100Hz or 0-400Hz. This function combined with the VVVF pin can be applied to single-phase inverter systems.



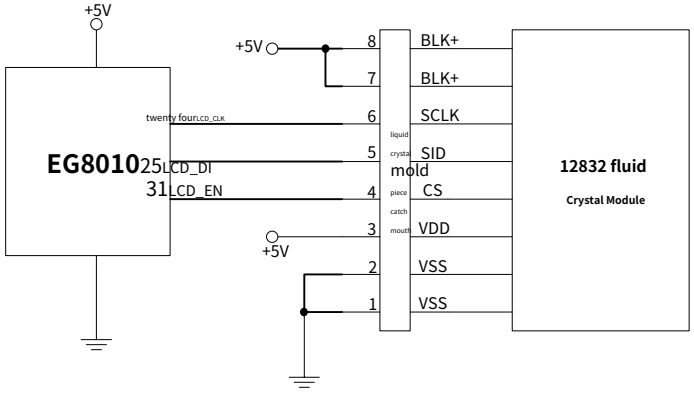
picture8.6a EG8010Frequency adjustment circuit

8.7 VVVF variable frequency and voltage conversion mode

In order to ensure that the electromagnetic torque of the motor is constant during frequency conversion, EG8010 ensures that the V/F value is constant when VVVF is "1", that is, the output voltage is adjusted while the output frequency is adjusted; when VVVF is "0", the output voltage is not adjusted when the output frequency is adjusted.

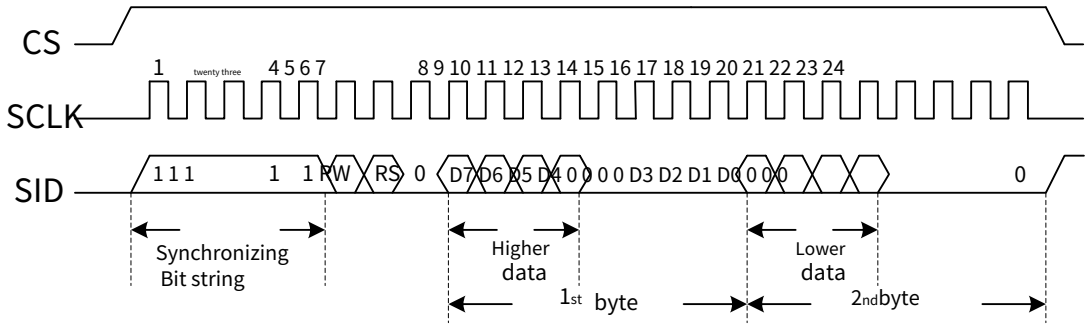
8.8 Three-wire serial interface 12832 LCD display control

EG8010Supports three-wire serial interface 12832 LCD display module. This function displays the inverter voltage, frequency, temperature, current and other information for users to observe. The connection method is shown in Figure 8.8a.



picture8.8a EG8010Three-wire serial interface 12832 LCD display module

EG8010The LCD communication control protocol of the chip is mainly aimed atST7920Liquid crystal modules such as12832Liquid crystal, control timing diagram is shown in 8.8b.



picture8.8b EG8010Serial LCD communication control timing diagram

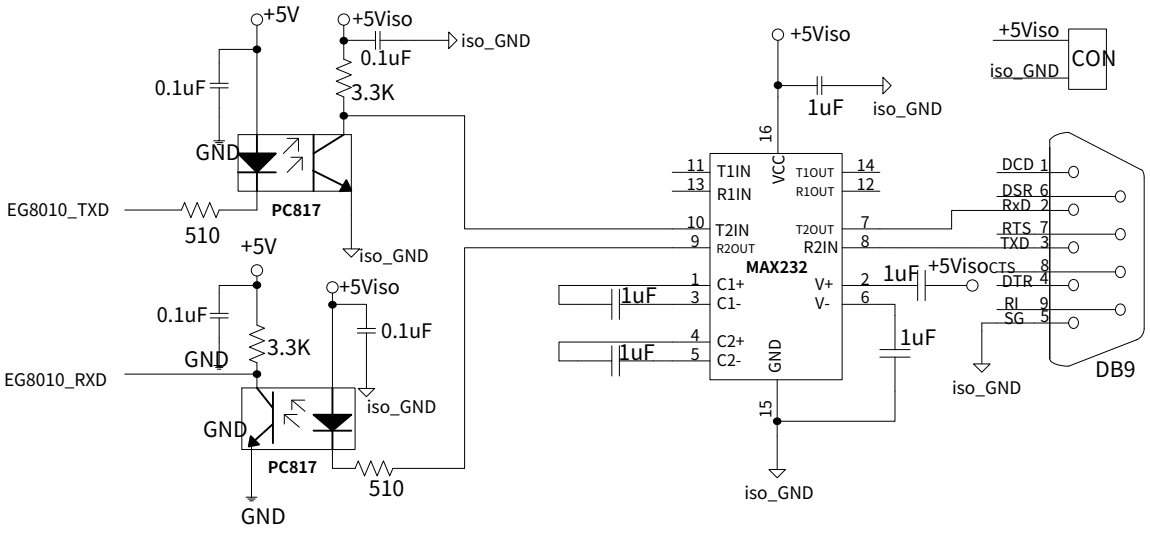
Figure 8.8c shows the information displayed on the LCD screen when EG8010 is connected to 12832, and Figure 8.8d shows the size of the 12832 LCD screen.

picture8.8c EG8010connect12832LCD screen displays information during operation

picture8.8d 12832LCD screen size diagram

8.9 RS232 serial communication interface

EG8010ApplicationRS232The serial communication interface sets the inverter's voltage, frequency, dead zone and other parameters. When used, optocoupler isolation communication is required as shown in the figure.8.9a.



picture8.9a RS232Optocoupler isolation communication circuit

Serial port parameters:

Baud rate:2400

Data bits:8

Check digit: None

Stop bits:1

Protocol Description:

In the communication, EG8010 acts as a slave, and the user can use MCU or PC as the host. Once the slave receives the command sent by the host, it immediately generates a response and replies data to the host.

Communication protocol data format

Host sends:	CODE	DATA			
Return from the machine:	BYTE1	BYTE2	BYTE3	BYTE4	

Serial port parameters:2400 8 N 1

The data format is shown in the figure. In one operation, the host sends two bytes of data, the first byte is the command byte, and the second byte is the data byte. After the slave receives the two bytes from the host, it immediately returns four bytes of data.

Command format:

Read Mode:

1.Read voltage, current, temperature, frequency data

achievement	able		Read voltage, current, temperature, frequencyADValue, chip returnsBYTE1(VoltageADvalue),BYTE2(CurrentADvalue),BYTE3(temperatureADvalue),BYTE4(frequencyADvalue)							
			BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0
host machine hair deliver	CODE	41H (read command)	0	1	0	0	0	0	0	1
	DATA	00H	0	0	0	0	0	0	0	0
from machine return Back	BYTE1	Voltage	V7	V6	V5	V4	V3	V2	V1	V0
	BYTE2	Current	I7	I6	I5	I4	I3	I2	I1	I0
	BYTE3	temperature	T7	T6	T5	T4	T3	T2	T1	T0
	BYTE4	frequency	F7	F6	F5	F4	F3	F2	F1	F0

V7~V0yesVFBPin feedback voltageADvalue I7~I0

yesIFBPin feedback currentADvalue T7~T0yesTFB

Pin feedback temperatureADvalue F7~F0Is to set

the sine wave output frequency

2.Enable/disableSPWMOutput

achievement	able		Enable/disableSPWMOutput After the chip receives the command, it returnsBYTE1For command bytes (81H), indicating that the write is successful							
			BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0
host machine hair deliver	CODE	81H	1	0	0	0	0	0	0	1
	CTL	Control Word	-	-	-	-	-	-	-	-
from machine return Back	BYTE1	81H	1	0	0	0	0	0	0	1
	BYTE2	reserve	0	0	0	0	0	0	0	0
	BYTE3	reserve	0	0	0	0	0	0	0	0
	BYTE4	reserve	0	0	0	0	0	0	0	0

The second byte sent by the host is the control wordCTL

CTLfor55H,start upSPWMOutput

CTLfor0A,prohibitSPWMOutput

3.Write control data

achievement	able		Write control data and set the chip working mode configuration through the serial port After the chip receives the command, it returnsBYTE1For command bytes (82H), indicating that the write is successful							
			BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0
host machine hair deliver	CODE	82H	1	0	0	0	0	0	1	0
	CTL	Control Word	MOD	DT1	DT0	VVVF	SST	MS	FS1	FS0
from machine return Back	BYTE1	82H	1	0	0	0	0	0	1	0
	BYTE2	reserve	0	0	0	0	0	0	0	0
	BYTE3	reserve	0	0	0	0	0	0	0	0
	BYTE4	reserve	0	0	0	0	0	0	0	0

MODis to set the control mode,0" To set controls for external ports, "1"Sets control for internal registers

DT1,DT0It is the dead zone control time setting,"00"yes300nS, "01"yes500nS, "10"yes1uS, "11"yes1.5uS

VVFIt is the frequency conversion mode selection.0" It is variable frequency but not constant voltage mode. "1"It is variable frequency and voltage mode

SSTis the soft start mode selection,0" is to turn off the soft start mode,1"Yes Enable soft start mode MSis the modulation mode selection,0" It is a unipolar modulation method. "1"It is a bipolar modulation method

FS1,FS0is the fundamental frequency selection,"00"yes50Hz, "01"yes60Hz, "10" yes0~100Hz, "11"yes0~400Hz

4.Write output voltage

achievement able			Write the output voltage. After the chip receives the command, it returnsBYTE1For command bytes (83H), indicating that the write is successful.							
			BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0
host machine	CODE	83H	1	0	0	0	0	0	1	1
hair deliver	Vol	byte	V7	V6	V5	V4	V3	V2	V1	V0
from machine return Back	BYTE1	83H	1	0	0	0	0	0	1	1
	BYTE2	reserve	0	0	0	0	0	0	0	0
	BYTE3	reserve	0	0	0	0	0	0	0	0
	BYTE4	reserve	0	0	0	0	0	0	0	0

The voltage is adjusted in a linear manner.1LSBfor19.6mV

Vol7~Vol0The data range is0x00~0xFF,correspondVFBThe pin voltage is0V~5V

5.Write output frequency

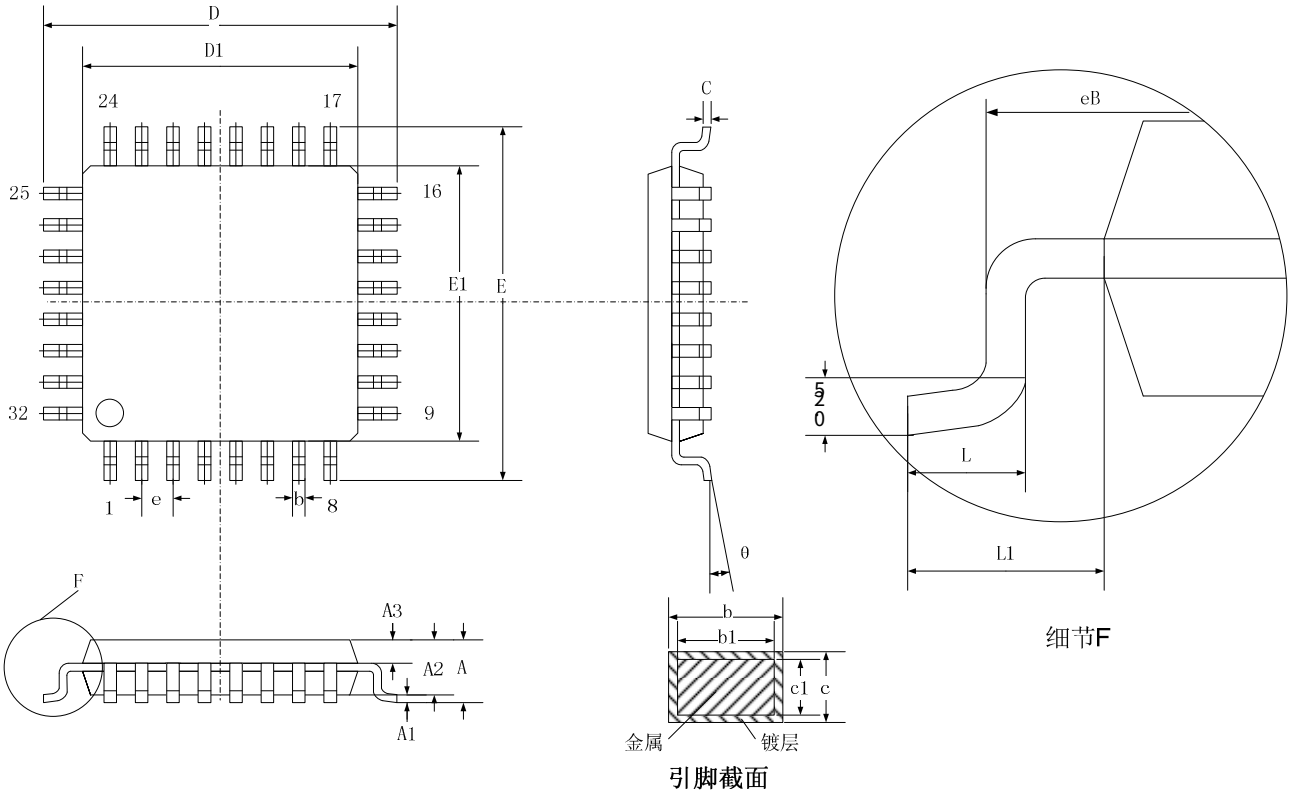
achievement able			Write output frequency After the chip receives the command, it returnsBYTE1For command bytes (84H), indicating that the write is successful.							
			BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0
host machine	CODE	84H	1	0	0	0	0	1	0	0
hair deliver	FQ	byte	F7	F6	F5	F4	F3	F2	F1	F0
from machine return Back	BYTE1	84H	1	0	0	0	0	1	0	0
	BYTE2	reserve	0	0	0	0	0	0	0	0
	BYTE3	reserve	0	0	0	0	0	0	0	0
	BYTE4	reserve	0	0	0	0	0	0	0	0

When FRQSEL1, FRQSEL0 = "10", the data of Frq7~Frq0 is 0x00, the output frequency is 0Hz. When the data of Frq7~Frq0 is 0xFF, the output frequency is 100Hz. When the data of Frq7~Frq0 is 0x7F, the output frequency is 50Hz. When FRQSEL1, FRQSEL0 = "11"

When the data of Frq7~Frq0 is 0x00, the output frequency is 0Hz. When the data of Frq7~Frq0 is 0xFF, the output frequency is 400Hz. When the data of Frq7~Frq0 is 0x7F, the output frequency is 200Hz. The adjustment of the frequency above is linear adjustment.

9.Package size

9. LQFP32Package size:



symbol	A	A1	A2	A3	b	b1	c	c1	D	D1	E	E1	e	eB	L	L1	θ
MIN	-	0.05	1.35	0.59	0.32	0.31	0.13	0.12	8.80	6.90	8.80	6.90	0.80 BSC	8.10	0.40	1.00 BSC	0
NOM	-	-	1.40	0.64	-	0.35	-	0.13	9.00	7.00	9.00	7.00		-	-		-
MAX	1.60	0.20	1.45	0.69	0.43	0.39	0.18	0.14	9.20	7.10	9.20	7.10		8.25	0.65		7
unit	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	o