按照下面组装,注意接反有可能烧坏电路板, 注意电源接线正负极,PCB 板上标有电源正负



二.下载最新 TMCL-IDE 软件 <u>https://www.trinamic.com/support/software/tmcl-ide/</u> 安装完成后单击如下软件图标



连接成功后会自动显示 所连接的模块 如下图 TMC5160





#### 三.设置电流

根据所连接电机的电流值设置运行电流(motor cutrrent)和停止电流(Standby current)

Connected devices ×	
Device	
✓ ↔ USB	
🗸 🌂 COM8: USB port	
🗸 📥 ID1: Landungsbruecke [V 3.03]	
🖢 Direct mode	
<ul> <li>Stepper motion controller driver IC</li> </ul>	
✓ ★ TMC5160	
🔎 Register browser	
👫 Datagram mode	
🖢 Direct mode	
🏲 Flags view	Y Current cottings @TMC5160 [Ag] <1ct
✓ Motor 1	
Motion calculator	Current Set R-sense
🖬 CoolStep & StallGuard	
🔟 Chopper Settings	Sense resistor voltage 🗋 vsense
✓ Control mode	
🟙 Velocity mode	Motor current <sub>IRUN</sub> 4 - 0.40 A
🛗 Position mode	
💙 Info graph	
📈 Velocity graph	RMS
🚈 Position graph	Standby current <sub>IHOLD</sub> 2 🗧 0.24 A

#### 四.速度模式



#### 设置最大速度和加速度





Stealthchop 静音模式选择,



定义速度低于某个数值时 静音模式 Stealthchop 启动

L Chopper Settings @TMC5160 [Aα] <1st motor of 1> (Land						
Thresholds StealthChop	SpreadCycle High Speed					
	✓ Enable stealthChop					
User def. amplitude (offset):	60 [0255] 🖨					
User def. amplitude (gradient):	1 [015] 🖨					
PWM Frequency:	1/1024 fclk +					
	PWM automatic amplitude sca					
Freewheeling:	Freewheeling +					
	Set IHold = 0 before for options other than normal operation.					

使能 Stealthchop 模式 详细介绍参照 TMC5160datasheet

닖 Chopper Settings @	TMC516	0 [Aα] <1st moto	or of 1> (Land <mark>x</mark>			
Thresholds Stealt	hChop	SpreadCycle	High Speed			
Enable spreadCycle (otherwise classic chopper)						
Off time:			3 [015] 🖨			
Hysteresis:			0 [015] ≑			
Random off time:	🗌 Enab	le random mod	ulation			
Blank time selection:	36 cloc	٢S	•			

使能 Spreadcycle 模式 详细介绍参照 TMC5160datasheet

1	Chopper Setting	gs @TMC5160	) [Aα] <1st moto	r of 1> (Land	×
	Thresholds St	ealthChop	SpreadCycle	High Speed	
		$\checkmark$	] High Speed en	abled	
5	8				
-	High speed chop	per mode: 🗌	Switch to other high-speed velo	r chopper mod ocity range	e in
	High speed fullst	ep mode: 🗌	Switch to full-s velocity range	tep in high-spe	ed
1	<b>x</b>				
	-				
,	7				
3	<b>7</b>				
5	lestart motor:	V Kesel	Stdll		

设置高速模式

++ USB		
🗸 🔍 COM8: USB port	Coolstep & StallGuard @1MC5160 [Adj <1st motor of 1> (Landungsbruecke)	
🗸 📥 ID1: Landungsbruecke [V 3.03]	coolStep & stallGuard	
Direct mode	actual motor current vs. time: 1	32 1024
✓ Stepper motion controller driver IC	stallGuard value vs. time: 0	28 896 26 832
✓ ★ TMC5160	velocity: 0	24 768 22 704 20 640
Register browser		18 576 16 512 14 448
🖽 Datagram mode		12 384 10 320
Direct mode		6 192 4 128
Flags view		<b></b> ₹ %⁴
✓ Motor 1		
Motion calculator	stallGuard2 coolStep TMCL	
Mr CoolStep & StallGuard	✓ Filter enable Run current: 3 [0, 31] ♠	
🖬 Chopper Settings		
★ Current settings	stall guard threshold: -10 🗘 Standby current: 1 [031] 🗘	
✓ Control mode		
🖽 Velocity mode	stall velocity threshold: 0	
🖽 Position mode	Pestart motor:	
✓ Info graph		
🗠 Velocity graph		đ
🗠 Position graph		
Stallguard 模式配置(无传感器	器力矩检测) 参考 datasheet   Stallguard 介绍	

L CoolStep & StallGuard @TMC5160 [/	Aα] <1st motor of 1> (Landungsbr	uecke) :. 🔲 🔀
coolStep & stallGuard		
actual motor current vs. time: 1 stallGuard value vs. time: 0 velocity: 0	/	32 1024 30 960 28 896 26 832 24 764 22 704 16 512 14 448 10 320 8 256 192 4 128 4 12
stallGuard2 coolStep TMCL		0_0
Current minimum: 0 - 1/2 +	Threshold speed:	16 [ppt] 🖨
Current down step: 0 - slow +	Deactivation threshold speed:	0
Current up step:0 - tinyHysteresis width:6 €Hysteresis start:1 €	Slow run current:	0
1.		

Coolstep 模式配置 (电流随负载动态调节)参考 Datasheet 介绍

✓ 🕶 USB				
🗸 🔌 COM8: USB port		Q		
🗸 📥 ID1: Landungsbruecke [V 3.03]	Motion calculator @TMC51	60 [Aα] <1st motor of	1> (Landungsbruecke) : COM8	-Id 1 🛛 🔀 📉
Direct mode				
<ul> <li>Stepper motion controller driver IC</li> </ul>				~
✓ ★ TMC5160	TMCL axis parameters		System parameters	
🔎 Register browser	Velocity: [ppt]	0	_	
🖽 Datagram mode			Motor Full steps / rev.:	200 🗘
Direct mode	Acceleration: [ppta <sup>2</sup> ]	794		
Flags view	Microsteps: 8 (2	256x)	System Clock [MHz]	16.00 🖵
Motor 1				
Motion calculator	Physical units			
🖬 CoolStep & StallGuard	Fullstep Frequency [pps]:	0.00000	Acceleration fullsteps [pps <sup>2</sup> ]:	361.06940
🔟 Chopper Settings	Velocity (DDC)	0.00000	Assolution (DDC2)	1.00525
🗙 Current settings	velocity [RPS]:	0.00000	Acceleration [RPS*]:	1.80535
✓ Control mode	Velocity [RPM]:	0.00000	Acceleration [RPM/s]:	108.32082
🖽 Velocity mode	Time to reach velocity [s]:	0.00000		
🖽 Position mode	Fullsteps to reach velocity:	0.00000		
✓ Info graph	Misrostons to reach velocity	0.00000		
🗠 Velocity graph	microsteps to reach velocity:	0.00000		
🗠 Position graph				

### 计算器功能



## 位置控制模式(梯形加速)



Sixpoint 加速模式

# 六.寄存器配置

1							
P Register brow	wser@TMC5160 [Aa] <1st motor of 1> (La	ndungsb	ruecke) : COM8-Id	11			×
🖡 e.g. vel match	all names contains vel	<b>**</b> 3	1 🗈 🔽				Et ?
Address	Name (set chucked for auto update)	Name		ADR	ACS	Size/Mask	Rea
✓ 0x000x7F	All registers	🖌 🗸	tive registers				
0x00 (0)	GCONF	>	GCONF	0x00	RW	32	0x0
0x01 (1)	GSTAT	>	GSTAT	0x01	RWC	32	0x0
0x02 (2)	✓ IFCNT	>	IFCNT	0x02	R	32	0x0
0x03 (3)	SLAVECONF	/	SLAVECONF	0x03	W PD	32	0x0
0x04 (4)	IOIN / OUTPUT	i i	X COMPARE	0x05	W	32	0x0
0x05 (5)	X_COMPARE	: >	OTP PROG	0x06	W	32	0x0
0x06 (6)	✓ OTP_PROG	° >	OTP_READ	0x07	R	32	0x0
0x07 (7)	✓ OTP_READ	>	✗ FACTORY_CONF	0x08	RW	32	0x0
0x08 (8)	FACTORY_CONF	>	SHORT_CONF	0x09	W	32	0x0
0x09 (9)	SHORT_CONF	>	DRV_CONF	0x0A	W	32	0x0
0x0A (10)	✓ DRV_CONF	<u>د</u>	/.1				12
0x0B (11)	GLOBAL_SCALER	TMC5	160				î
0x0C (12)	✓ OFFSET_READ	XML-V	ersion:1.0				
0x10 (16)		-					
<ul> <li>Expand all</li> </ul>	Project: default	Main	description				
	Display="2">Display="2">Display="2">Display="2">Display="2">Display="2">Display="2">Display="2">Display="2">Display="2">Display="2">Display="2">Display="2">Display="2">Display="2">Display="2">Display="2">Display="2">Display="2">Display="2">Display="2">Display="2">Display="2">Display="2">Display="2">Display="2">Display="2">Display="2">Display="2">Display="2">Display="2">Display="2">Display="2">Display="2">Display="2">Display="2">Display="2">Display="2">Display="2">Display="2">Display="2">Display="2">Display="2">Display="2">Display="2">Display="2">Display="2">Display="2">Display="2">Display="2">Display="2">Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Display="2"/>Displa	Ø         Register browset ©TMC5160 [Ac] <1st motor of 1> (La           ▼ e.g. vel match all name, contains vel           Address         Name (set ch vsked for auto update)           ♥ 0x00.0x7F         ✓ All registers           0x00 (0)         Ø         GCONF           0x01 (1)         ✓ GSTAT           0x02 (2)         // FCNT           0x03 (3)         SLAVECONF           0x04 (4)         Ø         Ø IOIN / OUTPUT           0x05 (6)         ✓ OTP_PROG           0x07 (7)         Ø TP_READ           0x08 (8)         FACTORY_CONF           0x08 (10)         Ø BORT_CONF           0x08 (10)         Ø BV_CONF           0x08 (11)         Ø GLOBAL_SCALER           0x08 (11)         Ø GLOBAL_SCALER           0x08 (11)         Ø GLOBAL_SCALER           0x06 (12)         Ø FFSET_READ           0x10 (16)         Ø HVOLD_IRUN           ♥ Expand all         Project: default					Image: Second State         Comparison         <

# 上图为 TMC5160 内部寄存器配置

<ul> <li>Stepper motion controller driver IC</li> </ul>	Datagram mode @TM.		
✓ ★ TMC5160			
🔎 Register browser	Request:		
🔛 Datagram mode	Reply:		
🖢 Direct mode			
Flags view	• Read • Write Send		
✓ Motor 1			

V COMB: USB port						
ID1: Landungsbruecke [V 3.03]						
🖢 Direct mode 🛛 🛶 🛶 🛶 🛶 🛶 🛶 🛶						
✓ Stepper motion controller driver IC	🖢 Direct mod	de @TMC5160 : COM8-Id 1				×
★ TMC5160	TMCL Instru	ction Selector	Manual Inst	ruction Input	Anciwar	
🛱 Register browser	TWICE INSU U	ction selector	ivianuai irisc	ruction input	Allswei	
🖽 Datagram mode	Instruction:	4 - MVP move to position	<ul> <li>Address:</li> </ul>	1 \$	Host:	2
Direct mode	Type:	1 - REL relative	Instruction:	0 🗘	Target:	1
Flags view	iype.	( HEFERRITE	Tunar	0.*	Status:	100
✓ Motor 1	Motor:	0 - Motor 0	· Type:	0	Instr :	4
Motion calculator	Value:	51200 \$	Motor:	0 🗘	mad	7
🕍 CoolStep & StallGuard	Annuar	204076022	Value:	0 2	Value:	-204076032
🕍 Chopper Settings	Answer.	-204076032			Datagram:	02 01 64 04 f3 d6 0c 00 40
★ Current settings		Execute	Datagram:	01 00 00 00 00 00 00 00 01		
✓ Control mode	1	Conv		Execute		
III Velocity mode		· copj	_			
E Position mode						✓ Les:
✓ Info graph						
🖂 Velocity graph						
Position graph						

直接控制模式

✓ ↔ USB

🗸 🌂 COM8: USB port			
🗸 📥 ID1: Landungsbruecke [V 3.03]	Flags view	@TMC5160 : COM8-Id 1	×
🖢 Direct mode		TMC5160	
<ul> <li>Stepper motion controller driver IC</li> </ul>			<b>f</b> Readout
✓ ★ TMC5160			
🔎 Register browser	STA	event_stop_sg	
🛗 Datagram mode	0	event_pos_reached	
Direct mode	5	velocity reached	
Flags view	STA	nocition reached	
✓ Motor 1	d l	position_reactieu	
Motion calculator	SAN	vzero	
🔟 CoolStep & StallGuard		t_zerowait_active	
🔟 Chopper Settings		second move	~ ro
🗙 Current settings	Iow	high but cleared	
✓ Control mode	Show toolb	ar Remove flags	from toolbar
👯 Velocity mode			in officiological
🚻 Position mode			,
✓ Info graph			
🗠 Velocity graph			
🖂 Position graph			





示波器功能

重点为如下模式的参数配置, 配置好的话 会得到非常好的电机动态效果

✓ Motor 1
 ■ Motion calculator
 ■ CoolStep & StallGuard
 ■ Chopper Settings
 ★ Current settings