

Onstate Tech			HCCC-2 Parts List			HHO CCPWM
			BOM HCCC-2 V1 CCPWM controller			Date: June 17/20
			HHO Constant Current PWM Controller			HCCC-2 V1
NOTE: BOM part values have priority over schematic part values.						
Designation	Qty.	Value:	Description:	Note	Digikey #: Main Part <value>KEBK-ND (CFR-12JB-52-<value>)	Digikey #: Alt. Part CF18JT<value>CT-ND (CF18JT<value>)
All resistors are 1/8W axial 5% unless specified.						
R1	1	10k	10k Ohm resistor	Freq adj limit	10kEBK-ND	CF18JT10kOCT-ND
R2	1	20k	20k Ohm resistor	wave Vout shift		
R3	1	10k	10k Ohm resistor	wave Vout Vshift		
R4	1	10k	10k Ohm resistor	DC%+		
R5	1	7.5k	7.5k Ohm resistor	DC%-		
R6	1	1.0k	1.0k Ohm resistor	sqr op-amp load, low R=sqr		
R7,R9,R11,R13	4	2.2k	2.2k Ohm resistor	op-amp out load		
R8	1	20k	20k Ohm resistor	CL+/OP1 Rlimit		
R10	1	2.2k	2.2k Ohm resistor	Rcs LP filter RC		
R12	1	100R	100R (20-200R) Ohm resistor	Qgate Rin limit		
R14	1	150k	150k (100k-200k) Ohm resistor	Qgate GND R		
R16	1	7.5k	7.5k (2.2-10k) Ohm resistor	LED brightness		
R17	1	0R	0R Ohm resistor, wire	Vin RC filter		
		100R	100 Ohm resistor	if using voltmeter		
R18	1	150k	150k Ohm resistor	CC CL+div		
R19	1	1.0k	1.0k Ohm resistor	CC CL - div		
R20	1	10k	10k Ohm resistor	Ext. OP1 Rlimit		
R21	1	150k	150k Ohm resistor	STN1+pull-up		
R22	1	20k	20k Ohm resistor	SN1 ref+		
R23	1	10k	10k Ohm resistor	SN1 ref-		
R24	1	2.2k	2.2k Ohm resistor	SN1 op-amp out load		
R25	1	150k	150k Ohm resistor	SN1 op hyst.		
R26	1	560k	560k Ohm resistor	12V UVLO op hyst		
		1.0uF	1.0uF (105) (add parallel to R26)	optional, out hyst		
R27	1	36k	36k Ohm resistor	12Vin, UVLO +div sig		
			75k Ohm resistor	24Vin, UVLO +div sig		
R28	1	10k	10k Ohm resistor	SN1 ref+ div		
R29	1	20k	20k Ohm resistor	SN1 ref- div		
R30	1	36k	36k Ohm resistor	SN1 op hyst.		
R31	1	NA	resistor	HD4/LED R load		
R32	1	100R	100 Ohm resistor	HD2/PWM ON/OFF load		
R	1	4.7M	4.7M Ohm resistor	CL offset, IC1d -in/+9V		
R15	1	22R	22R (15-47R) Ohm, MF 1%, 1/4W	+Vin filter/power limit	CF14JT22R0CT-ND	S20CACT-ND
JP1	1	wire	22awg black wire, 0.7"	Voltmeter gnd		
Rcs-1/2/3	3	0.005R	0.005 (0R005) Ohm resistor, 3W 1% AXIAL, 0.7"		696-1733-ND	MR3FT5L00CT-ND
D1	1	1N4002	diode, 100V 1A DO41	power protection		1N4002-TPMSCT-ND
D2,D3	2	1N4148	diode, 100V 0.2A DO35	UVLO/SN1 SW OFF		1N4148FSCT-ND
LH4	1	1N4148	diode, 100V 0.2A DO35	UVLO/SN1 OP1 SW OFF		1N4148FSCT-ND
IC1	1	LM224N	LM224N quad op-amp, 14-DIP	CCPWM IC	296-7030-5-ND	
			TI better than ON Semi.			
IC2	1	LM258	dual op-amp, 8-DIP, 258/358	UVLO/SN1 IC	LM258NFS-ND	
			rotate IC pins to offset IC, pin8 to R22, pin5-pin6			
OP1	1	814A	AC-DC optoisolator, 70V, 50mA, 4-	Ext. in ON/OFF ctrl	FOD814A-ND	
REG1	1	9V	7809 9V reg. 1A, TO-220	DC 9V reg. 11.5Vin min.	497-13702-5-ND	
		10V	7810 10V reg. 1A, TO-220	10V reg. 12.5Vin min.		
All capacitors are ceramic mono 0.2" ±10% X7R radial unless specified						
C1	1	0.01uF	0.01uF (103), 50V	freq adj, RC	BC1095CT-ND	any mono cer cap.
C2	1	1.0uF	1.0uF (105) 25V	ICs DC PWR filter	445-173436-1-ND	
C3	1	0.1uF	0.1uF (104) 50V	DC% ref filter	478-7335-1-ND	
C4	1	1.0uF	1.0uF (105) 25V	Rcs LP PWM filter C	445-173436-1-ND	
C5	1	0.1uF	0.1uF (104) 50V	LP PWM filter C, fb	478-7335-1-ND	
C6	1	1.0uF	1.0uF (105) 25V	Ext. VR CC softstart	445-173436-1-ND	
C7	1	0.1uF	0.1uF (104) 50V	CC VR in filter	478-7335-1-ND	
C8	1	2.2nF	2.2nF (222) 50V	freq adj, RC	BC2675CT-ND	
C9,C10	1	100uF	100uF alum ele cap, 0.15" 50V radi	DC power filter	493-11615-1-ND	
		100uF	100uF 50V alum ele, low ESR, 3.5r	DC power filter	P12392-ND	
			120uF 50V alum ele, low ESR, 3.5mm radial, 3000Hrs@105°C		P12394-ND	

C11	1	1.0uF	1.0uF (105), 50V	CELL ripple filter	490-9146-1-ND	
			1.0uF (105) film, 0.2", 63V radial		399-11516-ND	
			1.0uF (105) film, 0.2", 63V radial		495-2470-1-ND	
C12	1	1.0uF	1.0uF (105), 50V	12V SW, Qsw ripple filter	490-9146-1-ND	
		1.0uF	1.0uF (105), 100V	24V SW, Qsw ripple filter	490-9198-1-ND	
C13	1	1.0uF	1.0uF (105), 50V	Vcell sw filter		
C14	1	1.0uF	1.0uF (105), 50V	Vcell ripple filter		
C15	1	1.0uF	1.0uF (105), 50V	Vcell ripple filter		
C16	1	1.0uF	1.0uF (105) 25V	UVLO Vin filter		
C17	1	0.1uF	0.1uF (104) 50V	UVLO VR3 adj filter		
C18	1	1.0uF	1.0uF (105) 25V	SN1 sig in filter		
C-F1	1	1000uF	220-2200uF ele. Cap (optional)	Battery DC power filter		
			Cap will get hot when running high currents			
VR1,VR2,VR3	3	20k	20k trimmer R, top adjust	setting input adj	987-1578-ND	
LH1	1	2-pin	0.1" 2-PIN, inline locking header co	voltage dsp	A19421-ND	455-2247-ND
LH2	1	2-pin	0.1" 2-PIN, inline locking header co	9V pwr		455-2247-ND
LH3	1	3-pin	0.1" 3-PIN, inline locking header co	SN1	A19470-ND	455-2248-ND
	1	2-pin	0.1" 2-PIN, inline locking header conn.			
LH4	1	3-pin	0.1" 3-PIN, inline locking header co	Ext. ON/OFF ctrl		
LH5	1	2-pin	0.1" 2-PIN, inline header conn. Male	Ext. CL ctrl		
shunt jumper	1	2-PIN	0.1" 2-pos shunt jumper (LH5)	ON/OFF PWM enable	S9341-ND	
HD1	1	2-SIP	0.1" 2-PIN, inline header pins	Vcs shunt	any	any
HD2	1	2-SIP	0.1" 2-PIN, inline header pins	Ext. ON/OFF		
HD3	1	2-pin	0.1" 2-PIN, inline locking header	Rcs shunt		
HD4	1	3-SIP	0.1" 3-PIN inline header,	optional, IC2 out		
			bi-colour LED, CC	sensor LED ind.		
shunt jumper	1	2-PIN	0.1" 2-pos shunt jumper (HD5)	12/24V mode	S9341-ND	
LED1	1	LED	Green LED, 5mm, radial	any 5mm LED	160-1684-ND	
Q1,Q2,Q3	3	N-CH	N-Ch MOSFET, 60V 120A 4.2mOhm	HHO CELL switch	IRFP3306PBF-ND	
			TO-247		IRFP3206PBF-ND	
			100V		IRFP4110PBF	
			55V 8mOhm		IRFP064NPBF	
8-32 MS	1	8-32x1/2"	8-32x1/2" machine screw, pan philli	+Vin terminal	H716-ND	any
8-32 nut	1	8-32 nut	8-32 nut		H726-ND	any
10-32 MS	2	10-32x5/8"	10-32x5/8" machine screw, pan phil	GND/OUT terminal	377-1403-ND	any
8-32 nut	2	10-32 nut	10-32 nut		H727-ND	any
PCB	1	HCCC-2	HHO CCPWM Controller			
Heatsinks	1					
Enclosure	1					
Total parts	91					
See Onstate HCCC-2 schematic for more information.						
All components can be substituted with similar specification parts.						
Module Assembly.				Testing.		
1. Install hardware (screws, nuts)				1. Have DMM and power supply ready.		
2. Insert all low-profile parts first. Resistors, diodes, ICs parts				2. Check with DMM for shorting on input and in/out		
3. Insert all small capacitors, VR, connectors, LEDs				3. Apply 14.4V power. LED1 (power) should be ON.		
4. Insert any remaining low-profile parts.				4. Measure output voltage. Should be 9V±0.1V		
5. Insert tall/larger parts.				5. If used: HD2=open, shunt header on Pin1/2 LH5 and Pin2/3 LH4.		
6. Insert N-CH MOSFETs				6. Set all VRs to center. Measure output frequency at A. Adjust VR1 to set FREQ.		
7. Check component placement and alignment.				7. Adjust VR3 to output OFF, then rotate for output ON.		
8. Machine solder				8. Disconnect LH5 shunt header will shut off output.		
9. Check component placement and solder joints.				9. Voltage at LH5 header pin1 should be >8V. Q MOSFET gate >7V.		
10. Manual solder parts as required on schematic. Wire, cap, res				10. Short SN1 (-/s, pin 2/3) or HD2 or open LH5/LH4 should shut-off PWM output.		