

OEVC I BOM V1.0				
Imported from Open Office, which came from CvPCB export of BOM since Schematic BOM exports don't work on OSX.				
Added copy of DK order for exact PM and links, no all parts ordered.				
"Id"	"Designator"	"Package"	"Quantity"	"Designation"
1	"BT1"	"Keystone_3001_	1	"Battery_Cell"
2	"Q1,Q2,Q3,Q4"	"SOT563"	4	"Dual_Fet_Sm_30V_400mA_NX3008NBKV"
3	"D3,D8,D11"	"PG-TDSON-8-4	3	"Dual_Diode_Lg_Schottky_V6KL45DU"
4	"Q5,Q6,Q7"	"PG-TDSON-8-4	3	"DualFetLg_40V_20A_IPG20N04S4L11ATMA1"
5	"U1"	"Teensy36_custc	1	"TEENSY 3.6"
6	"T1"	"SignalCommuni	1	"WE-LAN_7490100111A"
7	"J14"	"LP-51"	1	"Polycase 4.55" x 3.29" x 1.25" "
8	"C1,C2,C3,C4,C5"	"C_0603_1608M	11	"100nF"
9	"D1,D6,D9"	"SOT-23"	3	"Diode_Dual_Shottkey_Sm_CA_bas40-06hmfh"
10	"D2,D7,D10"	"SOT-23"	3	"Diode_Dual_Shottkey_Sm_CK_bas40-05hmfh"
11	"D5"	"D_SMC"	1	"SMCJ18A-E3/57T"
12	"J2,J4"	"Single_43_63_F	2	"Single_Pin"
13	"J3,J21,J22"	"PinHeader_1x10	3	"Conn_01x10"
14	"J13"	"Non_Placed_Pa	1	"PCB Screws, #4 x 1/4" QTY 4"
15	"J15"	"Non_Placed_Pa	1	"Mating Connector 34 pin"
16	"J16"	"Non_Placed_Pa	1	"Mating Terminals sm QTY 30"
17	"J17"	"Non_Placed_Pa	1	"Mating Termianls LG QTY 4"
18	"J18"	"Non_Placed_Pa	1	"Coin Cell CR927 or CR1025"
19	"J19"	"Non_Placed_Pa	1	"0.1 headers for Teensy Mount"
20	"J20"	"349580340"	1	"MOLEX_34958_X34X"
21	"R1,R2,R3,R4,R5"	"R_0603_1608M	16	"2k2"
22	"R5,R6"	"R_1206_3216M	2	"R1206 120 OHM"
23	"R10"	"R_1206_3216M	1	"20R0"
24	"R12"	"R_1206_3216M	1	"40R2"
25	"R14"	"R_1206_3216M	1	"80R6"
26	"R16,R18,R19,R20"	"R_0603_1608M	12	"10K"
27	"R17"	"R_1206_3216M	1	"158R0"
28	"R21"	"R_1206_3216M	1	"316R0"
29	"R25"	"R_1206_3216M	1	"R1206 634R0"
30	"U2,U3"	"SOIC-8_3.9x4.9	2	"CAN_SN65HVD23x"
31	"U4"	"Converter_DCD	1	"traco_TSR_0.5-2450"
32	"D4"	"D_SMA"	1	"B140-E3/61T"
33	"R7"	"R_0603_1608M	1	"10R0"
34	"JP2"	"SolderJumper-2	1	"CAN_2_Term_SolderJumper"

35	"JP1"	"SolderJumper-2	1	"CAN_1_Term_SolderJumper"				
36	"C11"	"C_0603_1608M	1	"10nF"				
37	"C12"	"C_0603_1608M	1	"100pF"				
38	"R8"	"R_0603_1608M	1	"2K21"				
39	"R39,R40"	"R_0603_1608M	2	"1K"				
40	"R41,R42"	"R_0603_1608M	2	"49R9"				
41	"U5"	"MSOP-16_3x4m	1	"LTC6820"				
42	"J7"	"Molex_Nano-Fit	1	"Conn_01x04 displays_0.96inch_I2C_OLED"				
Index	Quantity	Part Number	Manufacturer Pa	Description	Customer Refere	Backorder	Unit Price	Extended Price
	4	WM13040-ND	0349590340	MINI50 CONN RCPT 34CKT CPA BLK P		0	2.68000	\$10.72
	3	WM13038-ND	0349580340	MINI50 VHDR 34CKT BLK POL A TRAY		0	2.05000	\$6.15
	100	WM16762CT-ND	5600230548	CTX50 RECEPTACLE TERMINAL, UNSEA		0	0.09220	\$9.22
	10	A129007CT-ND	7-1452659-1	MCON 1.2 - LL		0	0.24800	\$2.48
	5	102-4244-ND	VX7805-500	DC DC CONVERTER 5V 2.5W		0	2.74200	\$13.71
	4	36-3001-ND	3001	BATTERY RETAINER COIN PC PIN		0	0.58000	\$2.32
	2	1568-1465-ND	DEV-14058	TEENSY 3.6 (HEADERS)		0	36.88000	\$73.76
	20	BAS40-05HMFH	BAS40-05HMFH	AUTOMOTIVE SCHOTTKY BARRIER DIOD		0	0.14000	\$2.80
	20	BAS40-06HMFH	BAS40-06HMFH	AUTOMOTIVE SCHOTTKY BARRIER DIOD		0	0.14000	\$2.80
	3	732-5711-1-ND	7490100111A	TRANSFORMER LAN 10/100 SMD		0	3.74000	\$11.22
	10	IPG20N04S4L11	IPG20N04S4L11	MOSFET 2N-CH 8TDSON		0	1.10800	\$11.08
							Kit Subtotal:	\$160.88
	20	V6KL45DUHM3/	V6KL45DUHM3/	DIODE SCHOTTKY 45V 6A FLATPAK		0	0.52700	\$10.54
	10	1727-1149-1-ND	NX3008NBKV,11	MOSFET 2N-CH 30V 0.4A SOT666		0	0.38300	\$3.83
	200	RMCF0603FT2K	RMCF0603FT2K	RES 2.21K OHM 1% 1/10W 0603		0	0.00710	\$1.42
	20	RMCF1206JT20I	RMCF1206JT20I	RES 20 OHM 5% 1/4W 1206		0	0.03000	\$0.60
	20	RMCF1206FT40	RMCF1206FT40	RES 40.2 OHM 1/4W 1% 1206 SMD		0	0.03800	\$0.76
	20	RMCF1206FT15	RMCF1206FT15	RES 158 OHM 1% 1/4W 1206		0	0.03800	\$0.76
	20	RMCF1206FT80	RMCF1206FT80	RES 80.6 OHM 1/4W 1% 1206 SMD		0	0.03800	\$0.76
	20	RMCF1206FT31	RMCF1206FT31	RES 316 OHM 1/4W 1% 1206 SMD		0	0.03800	\$0.76
	20	RMCF1206FT63	RMCF1206FT63	RES 634 OHM 1/4W 1% 1206 SMD		0	0.03800	\$0.76
	25	SR6004-ND	6004	SHT MTL SCREW PAN PHIL #4 1=1		0	0.19880	\$4.97
							Subtotal	\$171.42

OEVC I/O List/worksheet			
HVAC Controls	??	Which to use, how are they wired, where are the wires in the target	
Drive Controls	6 PRND Inputs, actually (PRNDIL)	What polarity and configuration are they? We'll look at the connectors on the vehicle	
Communication	2 Can 2.0		
Outputs			
Speedo Pulses		Expecting it works with Open Collector output with 1.2K pullup	
Possible relays for Brake and Reverse light			
Fuel Gauge output	Use Resistor array?	BMW: 40E-400F Ohms, Vanagon: 55F to 560E Ohms. Target RH2720: 280F-40E. (33F 240E spec) Alternate: 0F-90E Ohms. Kirk and Rod verified that empty is 10ohms and full is 75ohms on the gauge.	
CAN Outputs			
HVAC:	Do we have to Man in the Middle it? To do, Look up CAN signals		
Drive Controller:			
PRND	Use previous code		
Steering Angle sensor	Use Previous Code, manual Calibrate of GM Volt sensor to fake the Tesla one		
Ext Conn Pin Count	Arduino pin#	Molex Use 1	Use 2
1	GND		
2	-----	14V+ In	
3	4,6	CAN1L	
4	3	CAN1H	
5	34,35	CAN2L	
6	33	CAN2H	
7	17	Speedo Pulse Out	
8	16	Tach Pulse Out	
9	15	Fuel Warning Light open collector	
10	36	PRNDL	IC Reset
11	37	PRNDL	CID reset
12	38	PRNDL	Climate On input
13	39	PRNDL	Analog Climate input Temp
14	A21	PRNDL	Analog Climate input Fan
15	A22	PRNDL	
16	14	Misc Input	
17	20	Misc Input	
18	2	Misc Open Collector Output	
19	5	Misc Open Collector Output	
20	7	Misc Open Collector Output	
21		Relay1 Coil +	
22	8	Relay1 Coil -	
23		Relay2 Coil +	
24	9	Relay2 Coil -	
25	24,25,26,27,28,29	Fuel Level out, LSB to MSB	
Power Connections	1	1 Relay1	Future feature
	2	2 Relay1	
	3	3 Relay2	
	4	4 Relay2	
Internal Connections			
	10	CS for isospi	
	11	MISO for isospi	
	12	MOSI for isospi	
	13	SCK for isospi	
		Reserve for BMS Voltage Board	
			All analog pins can be measured, but not by both ADCs. The following images show which ADC can access each pin. If the text next to the pin number says ADC0_SE# then it can be measured by ADC0, if it says ADC1_SE# by ADC1. Some pins can be measured by both.

Welcome to Teensy[®] 3.6
32 Bit Arduino-Compatible Microcontroller

To begin using Teensy, please visit the website & click [Getting Started](http://www.pjrc.com/teensy).
www.pjrc.com/teensy

Teensy[®] 3.6 Back Side
Additional pins and features available on the back side

Cut to separate VIN from VUSB, if using a battery charger or external power.

Teensy 3.6 pins are not 5 volt tolerant. Do not apply more than 3.3 volts.

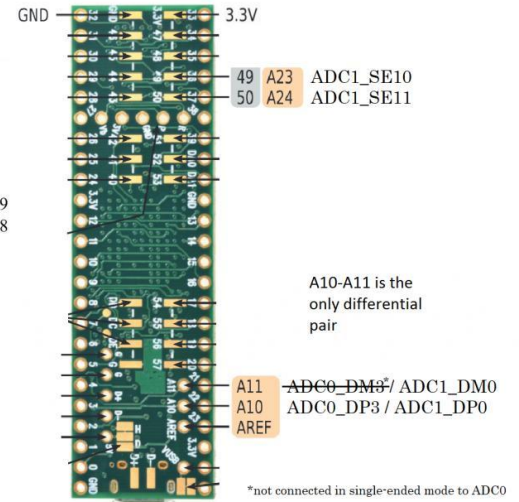
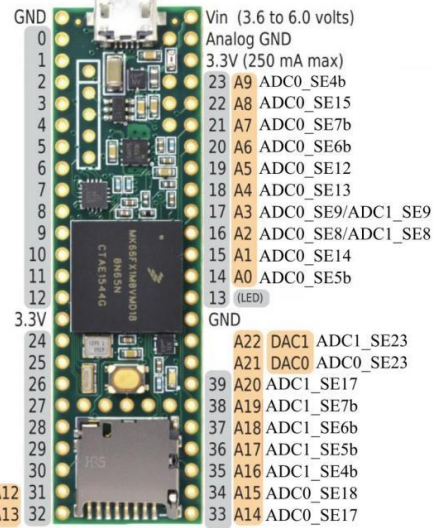
For solutions to the most common issues and technical support, please visit:
www.pjrc.com/help

Teensy 3.6 System Requirements:
PC computer with Windows 7, 8, 10 or later
or Ubuntu Linux 12.04 or later
or Macintosh OS-X 10.7 or later
USB Micro-B Cable

7 14833 87941 1

A11	Battery+, diff option for precharge	ADC 1 for Positive
A10	Load + diff option for precharge	ADC 1 for Positive
21/A7	Battery -	ADC 0 for Negative
22/A8	Load -	ADC 0 for Negative
23/A9, 30,31/A12,32/	Control lines	
GND		
AGND		
5V		
3.3V		
	Reserve for I2C	
18	SDA0	
19	SCL0	

ADC1_SE14 A12
ADC1_SE15 A13



OEVC early part reserach notes			
Relay	Buy Link	Datasheet Link	Description
Z2247-ND	\$3.14	https://www.digikey.com/short/jwfttq	http://omronfs.omron.com/en_US/ecb/products/pdf/en-g8hn.pdf
JSM1A-12V-5	\$1.75	https://www.digikey.com/product-detail.aspx	https://media.digikey.com/pdf/Data%20Sheet Alternate solder-in low cost relay
Relay Socket, PCB Mount			
VCFM-1000-ND	\$4.22	https://www.digikey.com/short/jwftqd	http://www.te.com/commerce/DocumentDelivery/DDEController?Action=srchtrv&DocNm=VCFM-X0000-A001&DocType=DS&DocLang=English
Fuse			
F991-ND	\$0.25	https://www.digikey.com/short/j2pwr	http://www.littelfuse.com/~media/automotive/datasheets/fuses/passenger-car-and-commercial-vehicle/blade-fuses/littelfuse_mini_datasheet.pdf
Fuseholders			
36-3544-2-ND	\$0.91	https://www.digikey.com/short/j2p2tr	http://keyelco.com/userAssets/file/M65p42.c Thru-hole, OE prefer
36-3588CT-ND	\$1.44	https://www.digikey.com/short/j2p23t	http://keyelco.com/userAssets/file/M65p43.c Surface mount
ESD Protection ICs			
RCLAMP3328P.TZTCT-ND	\$1.06	https://www.digikey.com/short/jwhvq	https://media.digikey.com/pdf/Data%20Sheet 8-channel, unidirectional, 5V clamp
BAT54SLT1GOSCT-ND	\$0.19	https://www.digikey.com/short/jwhvv	http://www.onsemi.com/pub/Collateral/BAT54 1-channel, schottky, dual diode
497-7222-1-ND	\$1.72	https://www.digikey.com/short/jwh1tt	http://www.st.com/content/ccc/resource/tech 6-channel, unidirectional, dual diodes, non schottkey 0.8V drop at 10ma
F2914CT-ND	\$3.26	https://www.digikey.com/short/jwh13t	http://www.littelfuse.com/~media/electronic 4-channel, TVS ESD array, SCR latching
Connector			
			Molex Mini50 series
Board			
34961-0340 90 deg	\$3.37	https://www.digikey.com/product-detail.aspx	https://www.molex.com/pdm_docs/sd/349610340_sd.pdf
34958-0340 STR	\$2.05	https://www.digikey.com/product-detail.aspx	https://www.molex.com/pdm_docs/sd/349580340_sd.pdf
Mating			
34959-0340	\$2.48	https://www.mouser.com/ProductDetail/Molex/34959-0340?qs=4JX4e57RtWydie8z1Ux4Gw%3D%3D	
34959-0340	\$2.68		
Crimp Sm			
560023-0548	\$0.10	https://www.digikey.com/product-detail/en/molex-llc/5600230548/WM16762CT-ND/7428700	
Crimp Lg			
7-1452659 Tyco	\$0.25	https://www.digikey.com/product-detail/en/te-connectivity-amp-connectors/7-1452659-1/A129007CT-ND/8548835	
BMS 4 Pin HV Sense Connector			
Molex 10-84-4042	\$0.64	https://www.digikey.com/product-detail.aspx	https://www.molex.com/pdm_docs/sd/010844020_sd.pdf
Mating *Molex 0050841040	\$0.40	https://www.digikey.com/product-detail.aspx	https://www.molex.com/pdm_docs/sd/050841040_sd.pdf
Terminal 0002081002	\$0.08	https://www.digikey.com/product-detail.aspx	https://www.molex.com/pdm_docs/sd/002081002_sd.pdf
Mosfet			
SSM6N67NU,LF	\$0.47	https://www.digikey.com/product-detail.aspx	https://toshiba.semicon-storage.com/info/doc Dual 30V Mosfet, 45mOhm each at 3V, 2A per side safe, Parallel for 4A contactor drive. Harder to solder, but small and inexpensive.
IPG20N04S4L11ATMA1	\$0.88	https://www.digikey.com/product-detail.aspx	https://www.infineon.com/dgdl/Infineon-IPG Automotive Dual MOSFET 40V 12mOhm N channel in PG-TDSON-8-4 pkg
NX3008NBKV,115	\$0.25	https://www.digikey.com/product-detail.aspx	https://assets.nexperia.com/documents/datasheet Automotive Mosfet Array 2 N-Channel (Dual) 30V 400mA 500mW Surface Mount SOT-666
Dual Diode			
PMEG3020CPA,115	\$0.30	https://www.digikey.com/product-detail/en/nexperia-usa-inc/PMEG3020CPA115/	Dual 2A Shottkey diode.
For Pin Protection:			
SD103ASDM-7-F	\$0.30	https://www.digikey.com/product-detail.aspx	https://www.diodes.com/assets/Datasheets Dual series connected pairs. 40V 350mA, 3x3mm SOT26, SOT23-6
RB541XNTR	\$0.27	https://www.digikey.com/product-detail.aspx	https://www.rohm.com/datasheet/RB541XN Three Independant, 2x2mm UMD6
SD103ATW-7-F	\$0.20	https://www.digikey.com/product-detail.aspx	https://www.diodes.com/assets/Datasheets Three Independant, 175mA, Shottkey 40V, 2x2mm SOT363
V6KL45DUHM3/I	\$0.40	https://www.digikey.com/product-detail.aspx	https://media.digikey.com/pdf/Data%20Sheet Automotive Dual 6A 40V Schottkey 5x6 flatpack
BAS40-05HMFHT116	\$0.09	https://www.digikey.com/product-detail.aspx	http://rohmsfs.rohm.com/en/products/databox Automotive Dual common Cathode signal Shottkey 40V SOT-23-3
BAS40-06HMFHT116	\$0.09	https://www.digikey.com/product-detail.aspx	http://rohmsfs.rohm.com/en/products/databox Automotive Dual common Annode signal Shottkey 40V SOT-23-3

Isolated Mosfet Drive										
ACPL-K30T-000E	\$2.50	https://www.digikey.com/product-det	https://docs.broadcom.com/docs/AV02-450	Automotive rated Photovoltaic Gate Drive						
ISOSPI										
LTC6820	\$3.05	https://www.digikey.com/product-det	https://www.analog.com/media/en/technical	isoSPI Isolated Communications Interface						
7490100111A	\$2.69	https://www.digikey.com/products/er	https://katalog.we-online.de/pbs/datasheet/7	Würth dual iso xformer						
Enclosure										
LP-51FMBR	\$4.05	https://www.polycase.com/lp-51f	https://www.polycase.com/uploads/1453112	Polycase 4.55" x 3.29" x 1.25" Recessed smooth cover						
Voltage Regulators										
VX7805-500	\$2.47	https://www.digikey.com/product-det	https://www.cui.com/product/resource/vx78	Low cost 5V switcher module						
TSR 0.5-2450	\$4.27	https://www.digikey.com/product-detail/en/traco-power/TSR-0.5-2450/1951-2736		Higher cost, but we've used them						