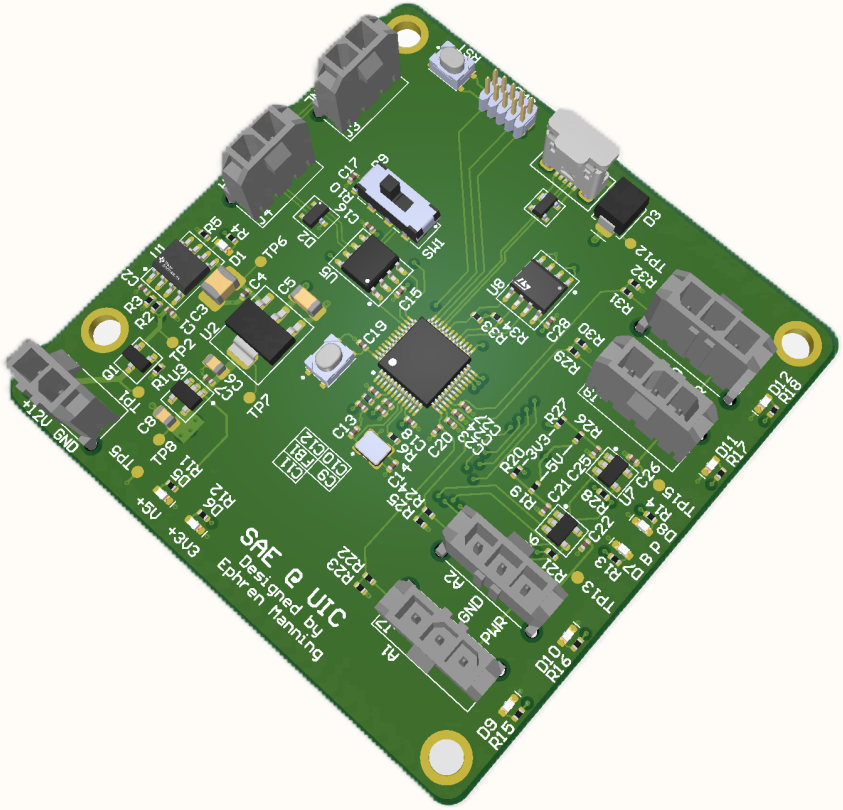
Electronic Throttle & Brake Controller

Revision A



Project Title:	Electronic Throttle and Brake Controller	
Sheet Title:	Cover Page	
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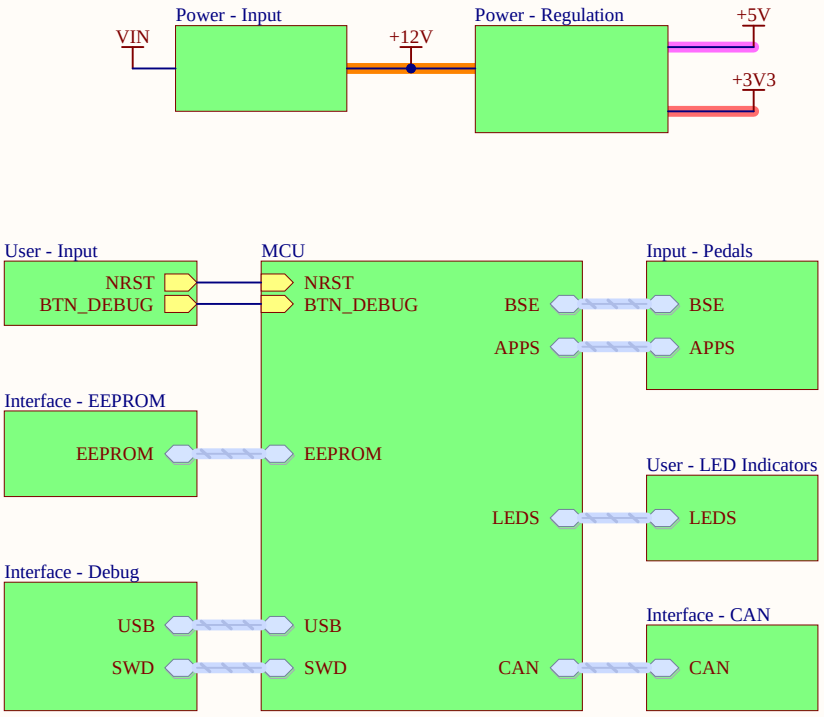
Schematic Overview



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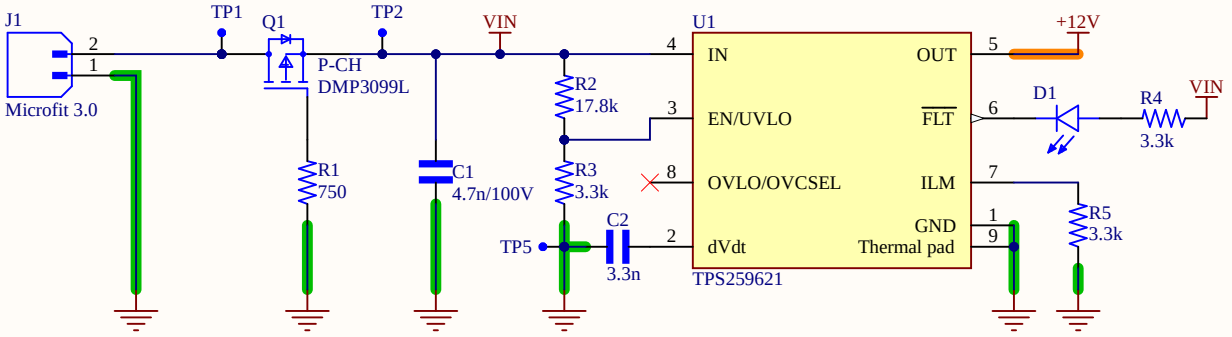
Power - Input



Design Note:
UVLO set at 1.1V, resistor divider output is equal to 1.1V when VIN = 7V, causing undervoltage lock-out.

Design Note:
Current limit is set by:
R = 903/(I-0.0112). A 3.3K resistor sets current limit to 300mA.

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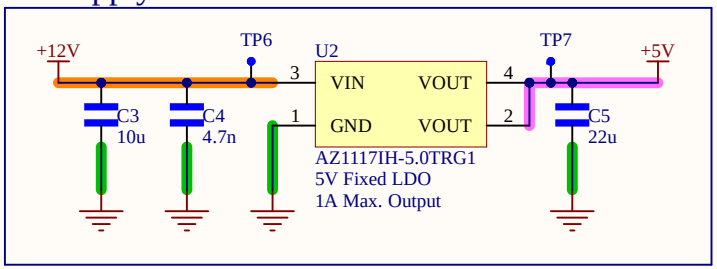
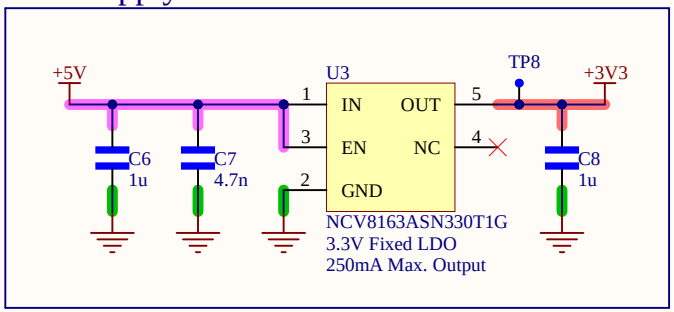
Power - Regulation

5V Supply



3.3V Supply



Power Estimations:
3.3V Current Consumption:
MCU: ~30 mA
LEDs: 4 mA * 7 = 28 mA

5V Current Consumption:
3.3V LDO: ~60 mA
CAN Trans: ~50 mA

Used Power: 120 mA * 5V = .6W
Power Supplied: .6W/.8 = 0.75 W
Input Current at 12V: 0.75 W / 12V = 63mA

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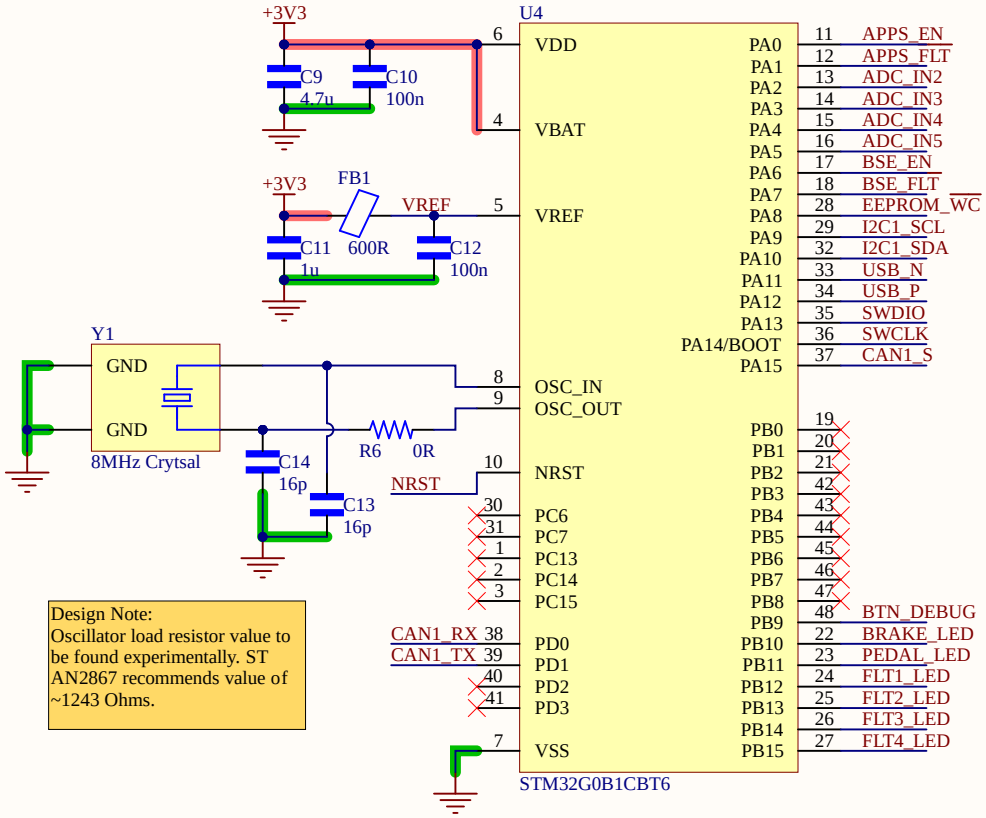
MCU - STM32G0



Design Note:
Oscillator load resistor value to be found experimentally. ST AN2867 recommends value of ~1243 Ohms.

APPS
ADC_IN2, ADC_IN3, APPS_EN, APPS_FLT → APPS_1, APPS_2, APPS_EN, APPS_FLT → APPS
Overview[3B], Input - Pedals[4B]

BSE
ADC_IN4, ADC_IN5, BSE_EN, BSE_FLT → BSE_1, BSE_2, BSE_EN, BSE_FLT → BSE
Overview[3B], Input - Pedals[4C]

LEDS
BRAKE_LED, PEDAL_LED, FLT1_LED, FLT2_LED, FLT3_LED, FLT4_LED → LEDS
Overview[3C], User - LED Indicators[1B]

CAN
CAN1_TX, CAN1_RX, CAN1_S → CAN_TX, CAN_RX, CAN_S → CAN
Overview[3C], Interface - CAN[3A]

SWD
SWDIO, SWCLK, NRST → SWD
Overview[2C], Interface - Debug[3B]

USB
USB_N, USB_P → USB
Overview[2C], Interface - Debug[3C]

EEPROM
I2C1_SCL, I2C1_SDA, EEPROM_WC → SCL, SDA, WC → EEPROM
Overview[2C], Interface - EEPROM[3B]

NRST, BTN_DEBUG
Overview[2B], User - Input[3B]
Overview[2B], User - Input[3B]

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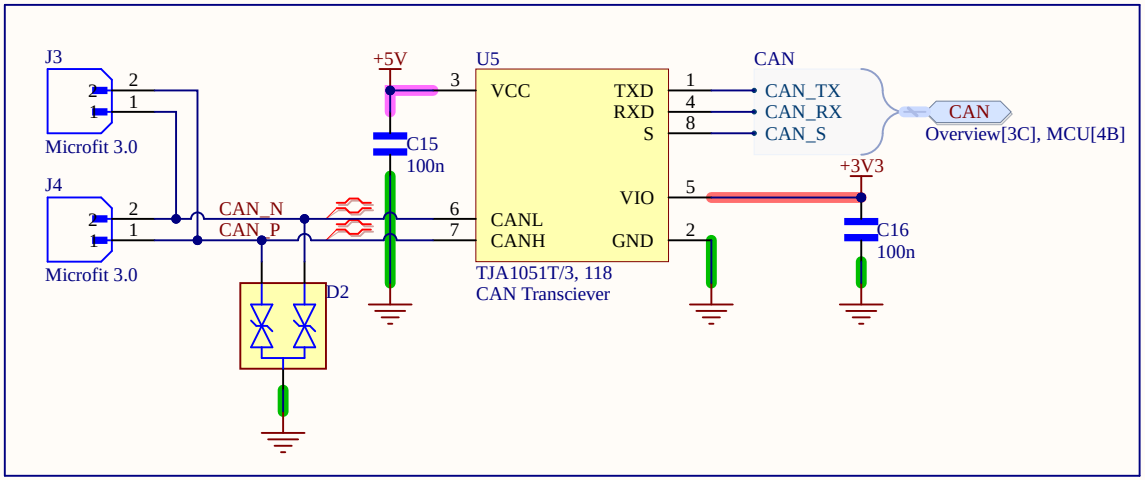
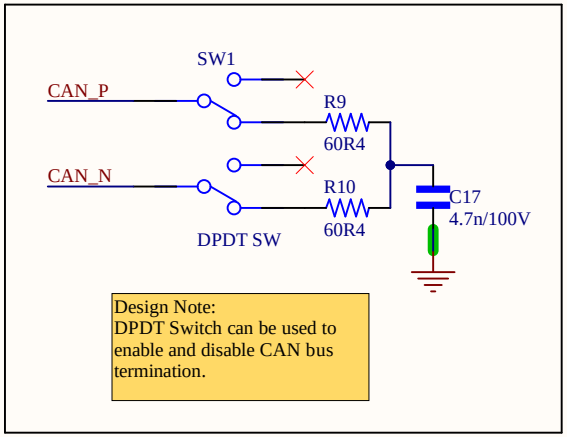
Interface - CAN

CAN Transciever



120 Ohm Termination Switch



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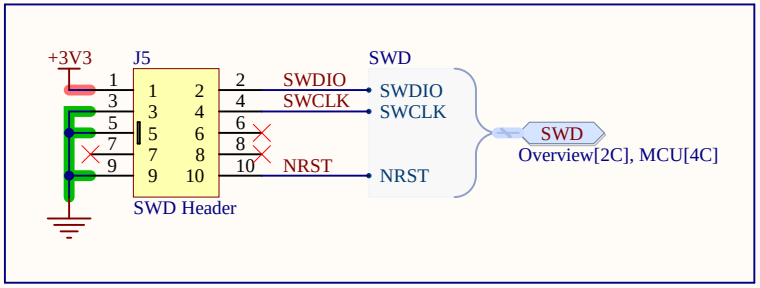
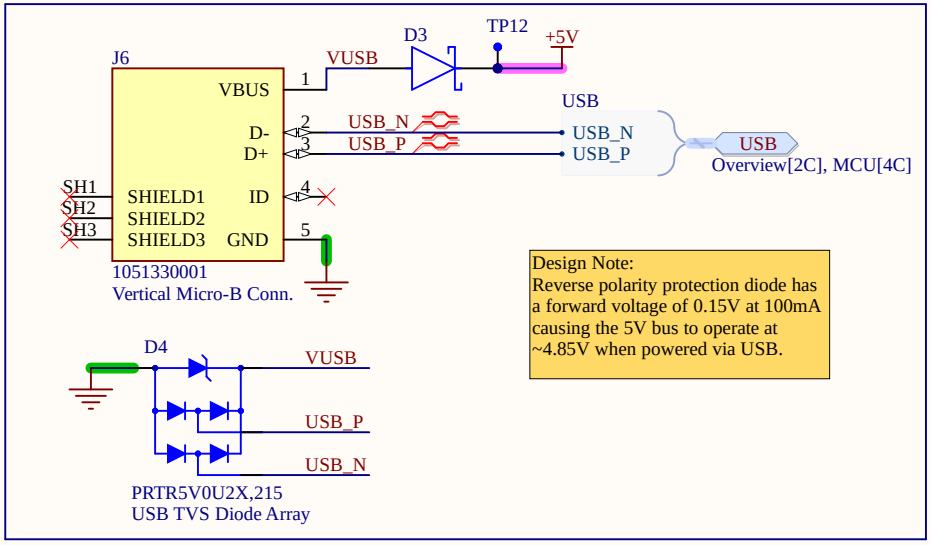
Interface - Debug

SWD Header



USB Micro-B Connector



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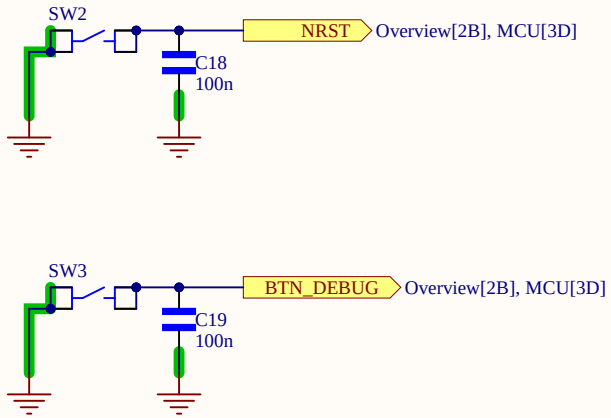
User - Input



Design Note:
BTN_DEBUG is connected to a GPIO input and can be programmed for different purposes.

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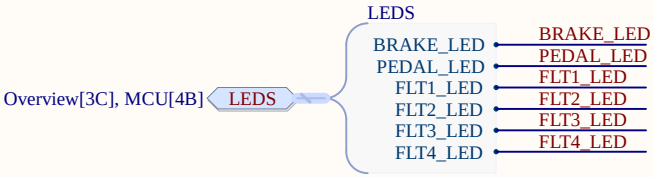
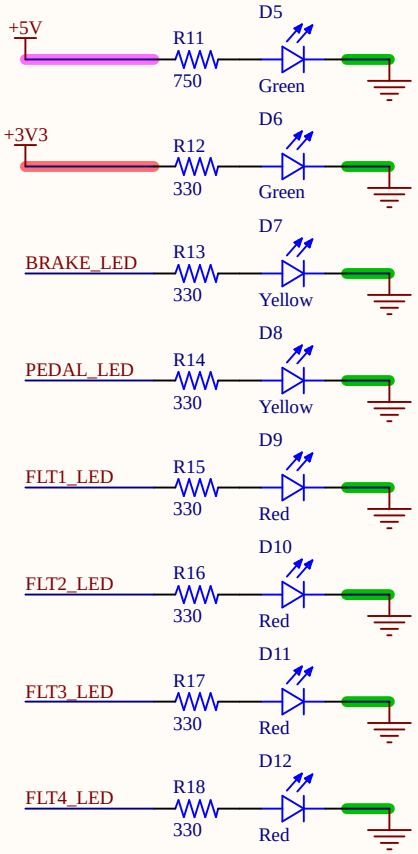
User - LED Indicators



Design Note:
All LEDs have a forward voltage of 2V and are configured for 4 mA of forward current.



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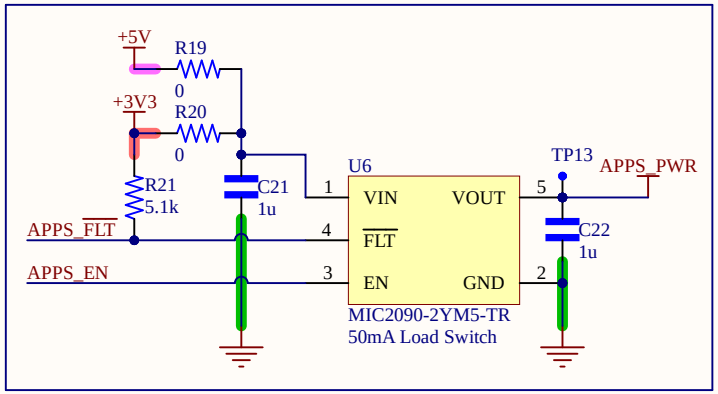
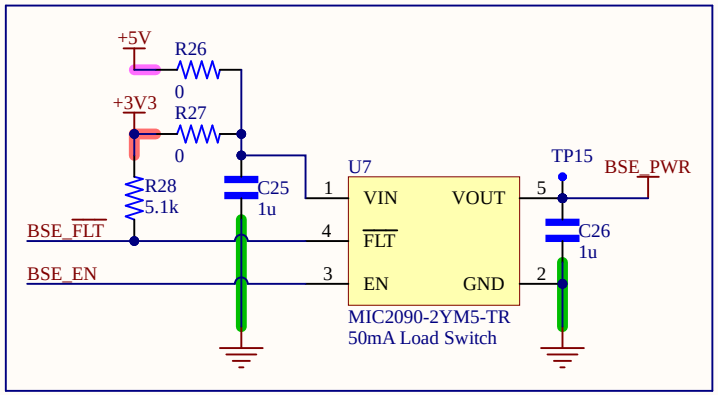
Input - Pedals

APPS Load Switch

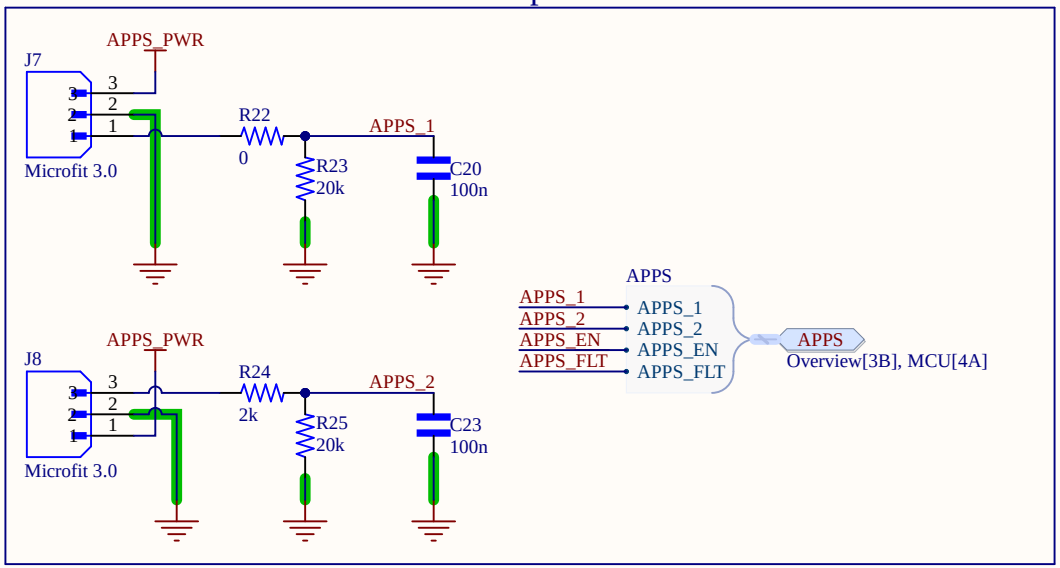


Design Note:
Use 0 ohm resistors to select sensor voltage. ADC pins are not 5V tolerant so resistor divider values will need to be adjusted.

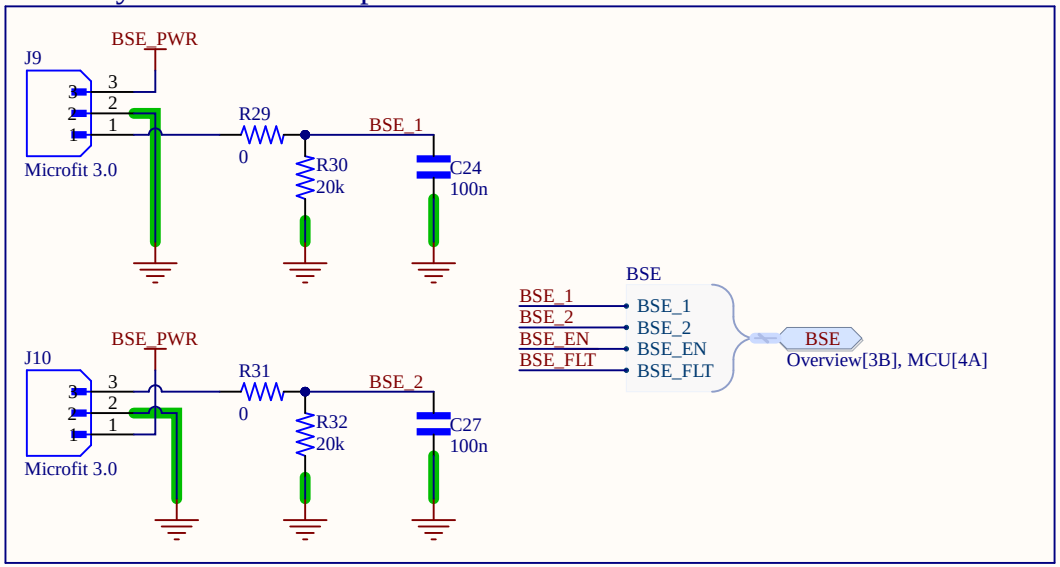
BSE Load Switch



Acceleration Pedal Position Sensor Inputs



Brake System Encoder Inputs



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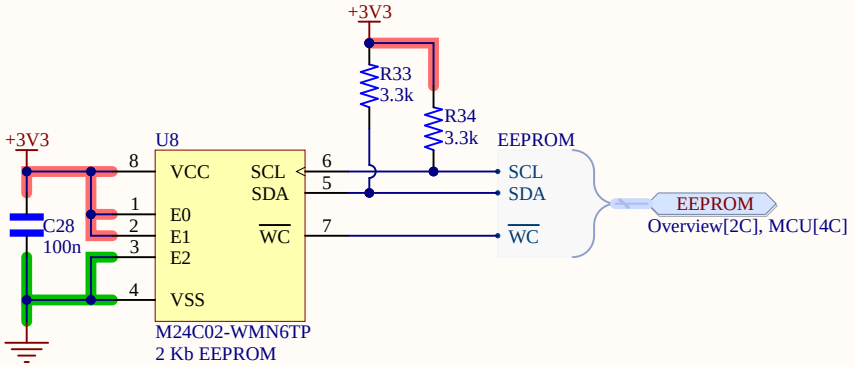
Interface - EEPROM



Design Note:
E2-E0 are used to set the LSBs of the I2C address. In this configuration address is 1010011 or 0x53. When WC is high writing data is disabled.

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SAE @ UIC
Designed by
Ephren Manning
+12V GND
J1
J4
J3
CANH CANL
U1
U2
U3
U5
U8
SW1
RST
SWD
USB
D3
TP1
TP2
TP5
TP6
TP7
TP8
TP12
+5V
+3V3
GND
PWR
J7
J9
J10
A1
A2
B1
B2
D9
D10
D11
D12
R15
R16
R17
R18

Designator	Quantity	Digikey Part Number	Manufacturer 1	Manufacturer Part Number 1
C1, C4, C7, C17	4	490-4765-1-ND	Murata Electronics	GCM155R72A472KA37D
C2	1	311-3623-1-ND	YAGEO	CC0402KRX7R8BB332
C3	1	1276-3389-1-ND	Samsung Electro-Mechanics	CL32B106KLJNNNE
C5	1	1276-3148-1-ND	Samsung Electro-Mechanics	CL31B226MPHNNNE
C6, C8	2	1276-1066-1-ND	Samsung Electro-Mechanics	CL21B105KAFNNNE
C9	1	1276-1482-1-ND	Samsung Electro-Mechanics	CL05A475MP5NRNC
C10, C12, C15, C16, C18, C19, C20, C23, C24, C27, C28	11	1276-1002-1-ND	Samsung Electro-Mechanics	CL05B104KP5NNNC
C11, C21, C22, C25, C26	5	1276-1076-1-ND	Samsung Electro-Mechanics	CL05A105KP5NNNC
C13, C14	2	490-GJM1555C1H160FB01JCT-ND	Murata Electronics	GJM1555C1H160FB01J
D1, D9, D10, D11, D12	5	732-4978-1-ND	Würth Elektronik	150060RS75000
D2	1	296-ESD2CANFD24DBZRQ1CT-ND	Texas Instruments	ESD2CANFD24DBZRQ1
D3	1	150-LSM115JE3/TR13CT-ND	Microchip Technology	LSM115JE3/TR13
D4	1	1727-3884-1-ND	Nexperia USA Inc.	PRTR5V0U2X,215
D5, D6	2	732-4980-1-ND	Würth Elektronik	150060VS75000
D7, D8	2	732-4981-1-ND	Würth Elektronik	150060YS75000
FB1	1	490-1006-1-ND	Murata Electronics	BLM15AG601SN1D
J1, J3, J4	3	WM1922-ND	Molex	43650-0216
J5	1	609-3712-ND	Amphenol ICC (FCI)	20021111-00010T4LF
J6	1	WM9734CT-ND	Molex	1051330001
J7, J8, J9, J10	4	WM1923-ND	Molex	436500316
Q1	1	DMP3099L-7DICT-ND	Diodes Incorporated	DMP3099L-7
R1, R11	2	311-750LRCT-ND	YAGEO	RC0402FR-07750RL
R2	1	YAG3012CT-ND	YAGEO	RC0402FR-0717K8L
R3, R4, R5, R33, R34	5	311-3.30KLRCT-ND	YAGEO	RC0402FR-073K3L
R6, R19, R20, R22, R26, R27, R29, R31	8	311-0.0JRCT-ND	YAGEO	RC0402JR-070RL
R9, R10	2	311-60.4LRCT-ND	YAGEO	RC0402FR-0760R4L
R12, R13, R14, R15, R16, R17, R18	7	311-330LRCT-ND	YAGEO	RC0402FR-07330RL
R21, R28	2	311-5.10KLRCT-ND	YAGEO	RC0402FR-075K1L
R23, R25, R30, R32	4	YAG1388CT-ND	YAGEO	RT0402BRD0720KL
R24	1	YAG2303CT-ND	YAGEO	RT0402BRD072KL
SW1	1	CKN10723CT-ND	C&K	JS202011JCQN
SW2, SW3	2	CKN10502CT-ND	C&K	PTS810 SJM 250 SMTR LFS
U1	1	296-TPS259621DDATCT-ND	Texas Instruments	TPS259621DDAT
U2	1	AZ1117IH-5.0TRG1DICT-ND	Diodes Incorporated	AZ1117IH-5.0TRG1
U3	1	NCV8163ASN330T1GOSCT-ND	onsemi	NCV8163ASN330T1G
U4	1	497-STM32G0B1CBT6-ND	STMicroelectronics	STM32G0B1CBT6
U5	1	568-8684-1-ND	NXP USA Inc.	TJA1051T/3,118
U6, U7	2	576-3964-1-ND	Microchip Technology	MIC2090-2YM5-TR
U8	1	497-8552-1-ND	STMicroelectronics	M24C02-WMN6TP
Y1	1	50-ECS-80-18-33-JGN-CT-ND	ECS Inc.	ECS-80-18-33-JGN-TR