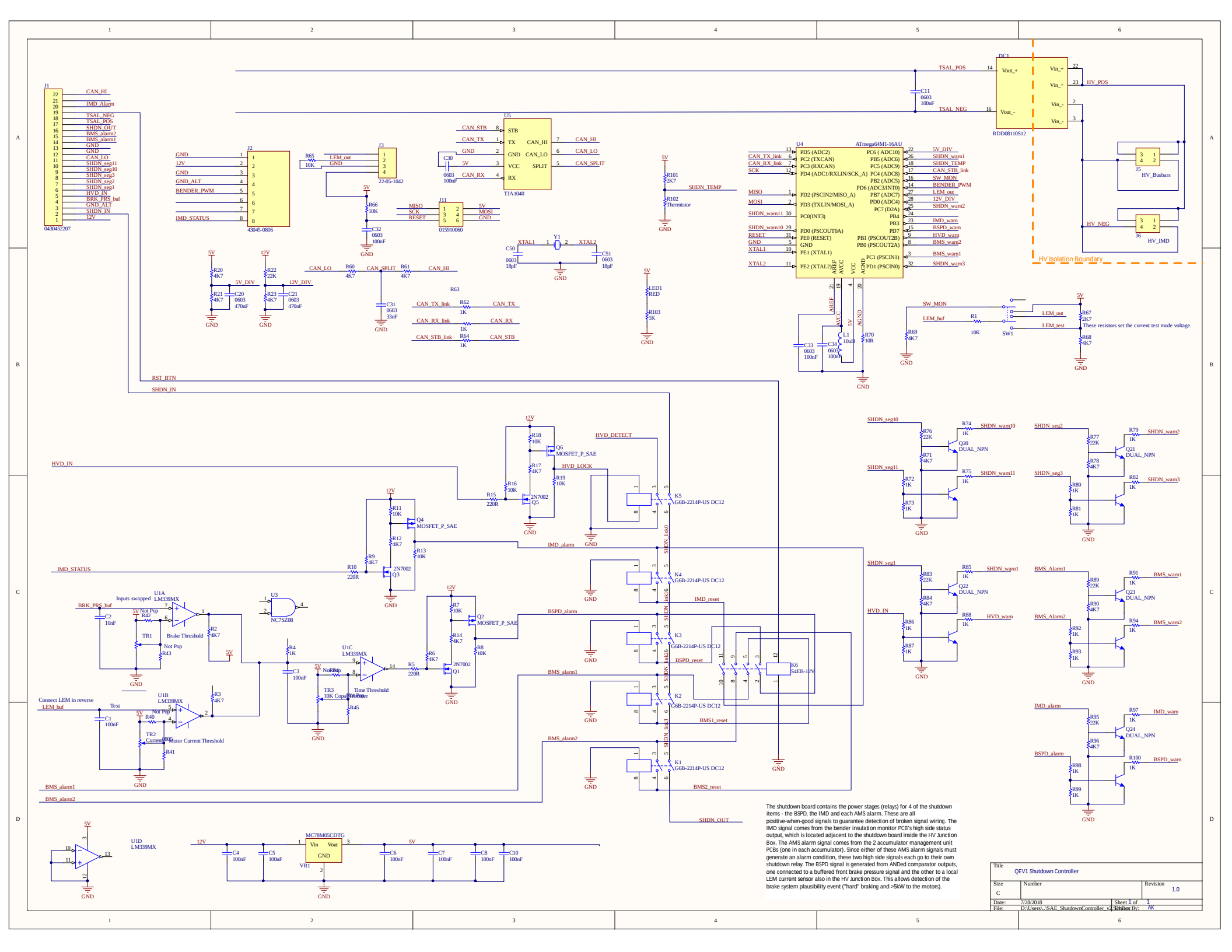
J1
CAN_HI
IMD_Alarm
TSAL_NEG
TSAL_POS
SHDN_OUT
BMS_alarm2
BMS_alarm1
SHDN_seg11
SHDN_seg10
SHDN_seg3
SHDN_seg2
SHDN_seg1
HVD_IN
BRK_PRS_buf
GND_ALT
SHDN_IN
12V
0430452207
J2
GND
12V
GND
GND_ALT
BENDER_PWM
IMD_STATUS
43045-0806
J3
LEM_out
GND
22-05-1042
R65
10K
R66
10K
C32
0603
100nF
U5
CAN_STB
CAN_TX
GND
VCC
RX
STB
TX
CAN_HI
GND
CAN_LO
SPLIT
CAN_RX
CAN_SPLIT
TJA1040
C30
0603
100nF
J11
MISO
SCK
RESET
5V
MOSI
GND
015910060
Y1
XTAL1
XTAL2
C50
C51
0603
18pF
U4
ATmega64M1-16AU
CAN_TX_link
CAN_RX_link
SCK
MISO
MOSI
SHDN_warn11
SHDN_warn10
RESET
XTAL1
XTAL2
PD5 (ADC2)
PC2 (TXCAN)
PC3 (RXCAN)
PD4 (ADC1/RXLIN/SCK_A)
PD2 (PSCIN2/MISO_A)
PD3 (TXLIN/MOSI_A)
PC0(INT3)
PD0 (PSCOUT0A)
PE0 (RESET)
PE1 (XTALL)
PE2 (XTAL2)
PC6 (ADC10)
PB5 (ADC6)
PC5 (ADC9)
PB4 (ADC8)
PB2 (ADC5)
PD6 (ADC3/INT0)
PB7 (ADC7)
PD0 (ADC4)
PC7 (D2A)
PB4
PB3
PD7
PB1 (PSCOUT2B)
PB0 (PSCOUT2A)
PC1 (PSCIN1)
PD1 (PSCIN0)
5V_DIV
SHDN_warn1
SHDN_TEMP
CAN_STB_link
SW_MON
BENDER_PWM
LEM_out
12V_DIV
SHDN_warn2
IMD_warn
BSPD_warn
HVD_warn
BMS_warn2
BMS_warn1
SHDN_warn3
AREF
AVCC
AGND
VCC
DC1
RDD08110S12
Vout_+
Vout_-
Vin_+
Vin_+
Vin_-
Vin_-
TSAL_POS
TSAL_NEG
HV_POS
HV_NEG
C11
0603
100nF
J5
HV_Busbars
J6
HV_IMD
HV Isolation Boundary
R101
2K7
R102
Thermistor
SHDN_TEMP
LED1
RED
R103
1K
R20
4K7
R21
4K7
C20
0603
470nF
5V_DIV
R22
22K
R23
4K7
C21
0603
470nF
12V_DIV
CAN_LO
R60
4K7
CAN_SPLIT
R61
4K7
CAN_HI
C31
0603
33nF
R63
CAN_TX_link
R62
1K
CAN_TX
CAN_RX_link
1K
CAN_RX
CAN_STB_link
R64
1K
CAN_STB
C33
0603
100nF
C34
0603
100nF
L1
10uH
R70
10R
SW_MON
LEM_buf
R1
10K
SW1
LEM_out
LEM_test
R67
2K7
R68
4K7
R69
4K7
These resistors set the current test mode voltage.
RST_BTN
SHDN_IN
HVD_IN
IMD_STATUS
BRK_PRS_buf
LEM_buf
Connect LEM in reverse
BMS_alarm1
BMS_alarm2
U1A
LM339MX
Inputs swapped
U1B
LM339MX
U1C
LM339MX
U1D
LM339MX
U3
NC7SZ08
TR1
Brake Threshold
TR2
Current Motor Current Threshold
TR3
Time Threshold
Not Pop
R2
4K7
R3
4K7
R4
1K
R5
220R
R6
4K7
R7
10K
R8
10K
R9
4K7
R10
220R
R11
10K
R12
4K7
R13
10K
R14
4K7
R15
220R
R16
10K
R17
4K7
R18
10K
R19
10K
Q1
2N7002
Q2
MOSFET_P_SAE
Q3
2N7002
Q4
MOSFET_P_SAE
Q5
2N7002
Q6
MOSFET_P_SAE
HVD_DETECT
HVD_LOCK
IMD_alarm
IMD_reset
BSPD_alarm
BSPD_reset
BMS_alarm1
BMS1_reset
BMS_alarm2
BMS2_reset
SHDN_OUT
SHDN_link0
SHDN_link16
SHDN_link26
SHDN_link3
K1
G6B-2214P-US DC12
K2
G6B-2214P-US DC12
K3
G6B-2214P-US DC12
K4
G6B-2214P-US DC12
K5
G6B-2214P-US DC12
K6
S4EB-12V
SHDN_seg10
SHDN_seg11
SHDN_warn10
SHDN_warn11
Q20
DUAL_NPN
R74
1K
R75
1K
R76
22K
R71
4K7
R72
1K
R73
1K
SHDN_seg2
SHDN_seg3
SHDN_warn2
SHDN_warn3
Q21
DUAL_NPN
R79
1K
R82
1K
R77
22K
R78
4K7
R80
1K
R81
1K
SHDN_seg1
HVD_IN
SHDN_warn1
HVD_warn
Q22
DUAL_NPN
R85
1K
R88
1K
R83
22K
R84
4K7
R86
1K
R87
1K
BMS_Alarm1
BMS_Alarm2
BMS_warn1
BMS_warn2
Q23
DUAL_NPN
R91
1K
R94
1K
R89
22K
R90
4K7
R92
1K
R93
1K
IMD_alarm
BSPD_alarm
IMD_warn
BSPD_warn
Q24
DUAL_NPN
R97
1K
R100
1K
R95
22K
R96
4K7
R98
1K
R99
1K
MC78M05CDTG
VR1
Vin
Vout
GND
C4
100nF
C5
100nF
C6
100nF
C7
100nF
C8
100nF
C10
100nF
The shutdown board contains the power stages (relays) for 4 of the shutdown items - the BSPD, the IMD and each AMS alarm. These are all positive-when-good signals to guarantee detection of broken signal wiring. The IMD signal comes from the bender insulation monitor PCB's high side status output, which is located adjacent to the shutdown board inside the HV Junction Box. The AMS alarm signal comes from the 2 accumulator management unit PCBs (one in each accumulator). Since either of these AMS alarm signals must generate an alarm condition, these two high side signals each go to their own shutdown relay. The BSPD signal is generated from ANDed comparator outputs, one connected to a buffered front brake pressure signal and the other to a local LEM current sensor also in the HV Junction Box. This allows detection of the brake system plausibility event ("hard" braking and >5kW to the motors).
Title
QEV1 Shutdown Controller
Size
C
Number
Revision
1.0
Date:
7/28/2018
Sheet 1 of 1
File:
D:\Users\..\SAE_ShutdownController_v2.SchDoc
Drawn By:
AK