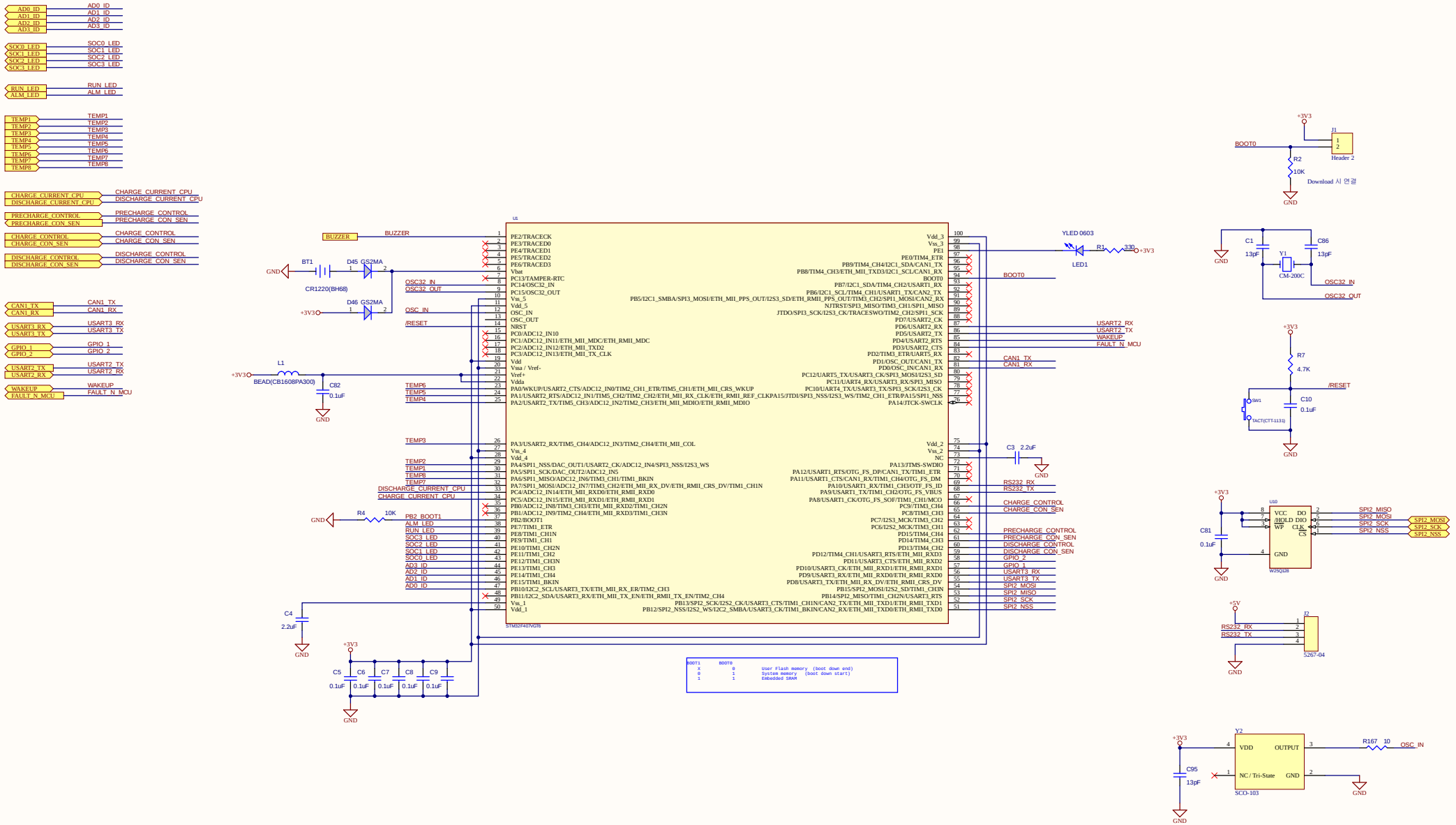
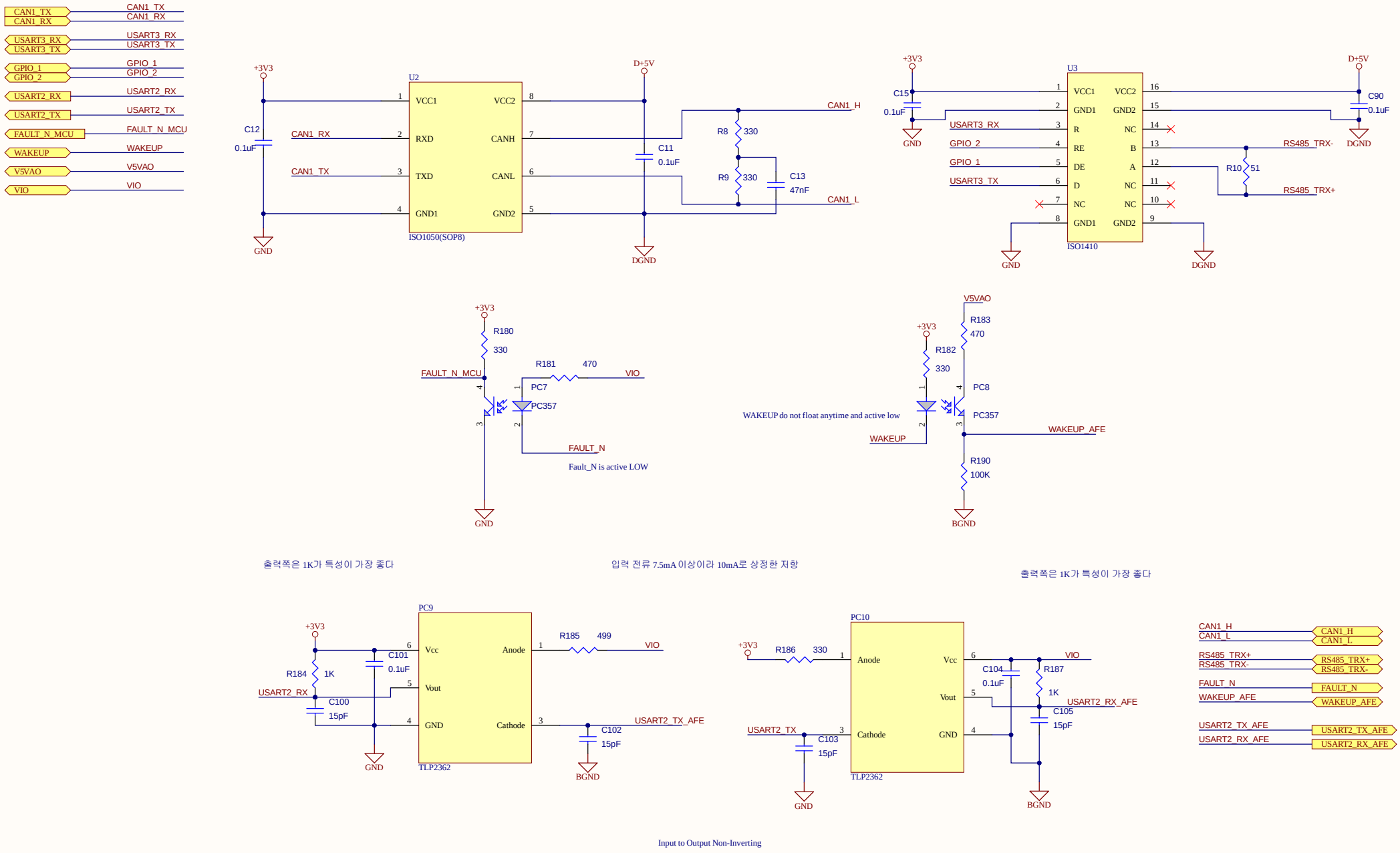
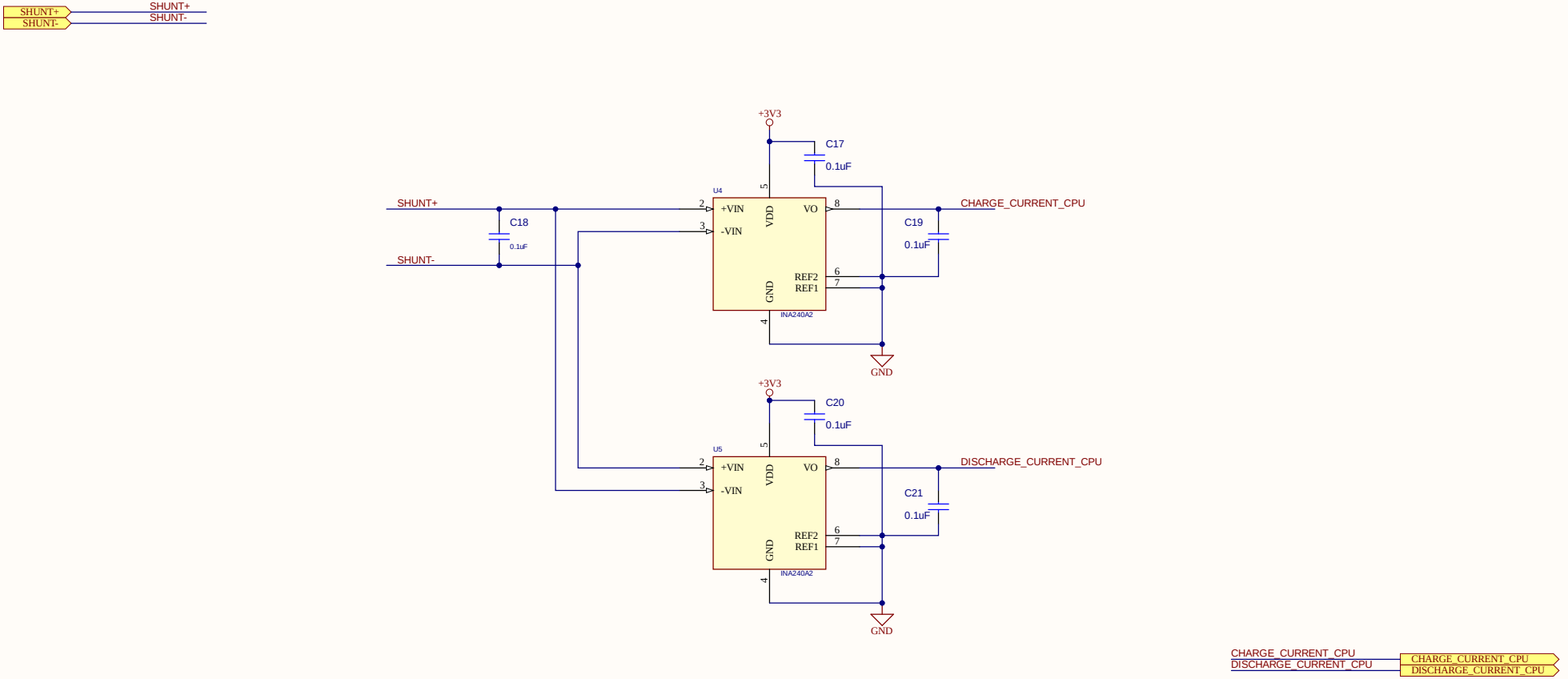
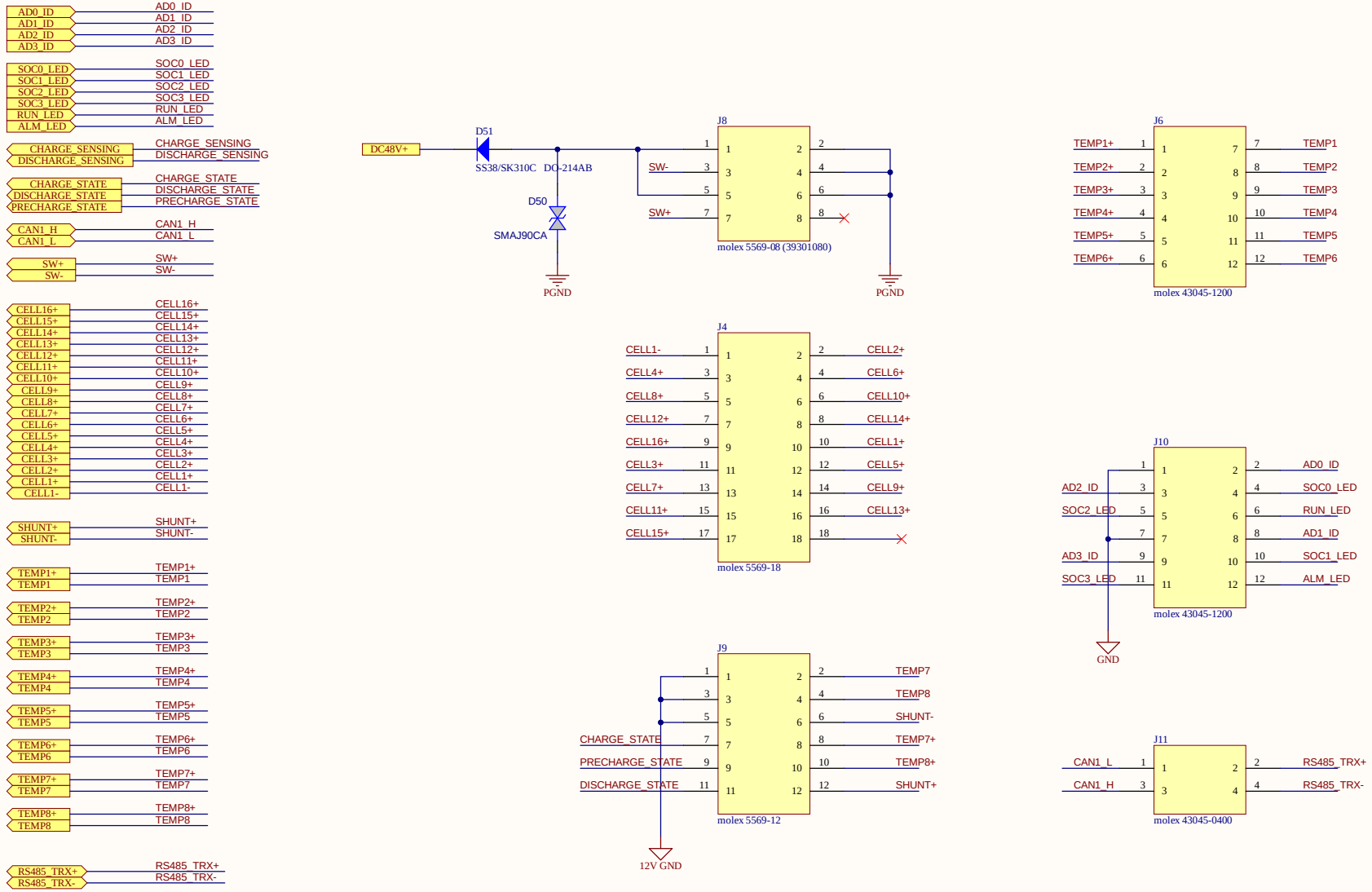

AD0_ID
AD1_ID
AD2_ID
AD3_ID
SOC0_LED
SOC1_LED
SOC2_LED
SOC3_LED
RUN_LED
ALM_LED
TEMP1
TEMP2
TEMP3
TEMP4
TEMP5
TEMP6
TEMP7
TEMP8
CHARGE_CURRENT_CPU
DISCHARGE_CURRENT_CPU
PRECHARGE_CONTROL
PRECHARGE_CON_SEN
CHARGE_CONTROL
CHARGE_CON_SEN
DISCHARGE_CONTROL
DISCHARGE_CON_SEN
CAN1_TX
CAN1_RX
USART3_RX
USART3_TX
GPIO_1
GPIO_2
USART2_TX
USART2_RX
WAKEUP
FAULT_N_MCU
BUZZER
BT1
CR1220(BH68)
D45 GS2MA
D46 GS2MA
OSC32_IN
OSC32_OUT
OSC_IN
/RESET
L1
BEAD(CB1608PA300)
C82
0.1uF
R4
10K
PB2_BOOT1
C4
2.2uF
C5
C6
C7
C8
C9
0.1uF
STM32F407VGT6
PE2/TRACECK
PE3/TRACED0
PE4/TRACED1
PE5/TRACED2
PE6/TRACED3
Vbat
PC13/TAMPER-RTC
PC14/OSC32_IN
PC15/OSC32_OUT
Vss_5
Vdd_5
OSC_IN
OSC_OUT
NRST
PC0/ADC12_IN10
PC1/ADC12_IN11/ETH_MII_MDC/ETH_RMII_MDC
PC2/ADC12_IN12/ETH_MII_TXD2
PC3/ADC12_IN13/ETH_MII_TX_CLK
Vdd
Vssa / Vref-
Vref+
Vdda
PA0/WKUP/USART2_CTS/ADC12_IN0/TIM2_CH1_ETR/TIM5_CH1/ETH_MII_CRS_WKUP
PA1/USART2_RTS/ADC12_IN1/TIM5_CH2/TIM2_CH2/ETH_MII_RX_CLK/ETH_RMII_REF_CLKPA15/JTDI/SPI3_NSS/I2S3_WS/TIM2_CH1_ETR/PA15/SPI1_NSS
PA2/USART2_TX/TIM5_CH3/ADC12_IN2/TIM2_CH3/ETH_MII_MDIO/ETH_RMII_MDIO
PA3/USART2_RX/TIM5_CH4/ADC12_IN3/TIM2_CH4/ETH_MII_COL
Vss_4
Vdd_4
PA4/SPI1_NSS/DAC_OUT1/USART2_CK/ADC12_IN4/SPI3_NSS/I2S3_WS
PA5/SPI1_SCK/DAC_OUT2/ADC12_IN5
PA6/SPI1_MISO/ADC12_IN6/TIM3_CH1/TIM1_BKIN
PA7/SPI1_MOSI/ADC12_IN7/TIM3_CH2/ETH_MII_RX_DV/ETH_RMII_CRS_DV/TIM1_CH1N
PC4/ADC12_IN14/ETH_MII_RXD0/ETH_RMII_RXD0
PC5/ADC12_IN15/ETH_MII_RXD1/ETH_RMII_RXD1
PB0/ADC12_IN8/TIM3_CH3/ETH_MII_RXD2/TIM1_CH2N
PB1/ADC12_IN9/TIM2_CH4/ETH_MII_RXD3/TIM1_CH3N
PB2/BOOT1
PE7/TIM1_ETR
PE8/TIM1_CH1N
PE9/TIM1_CH1
PE10/TIM1_CH2N
PE11/TIM1_CH2
PE12/TIM1_CH3N
PE13/TIM1_CH3
PE14/TIM1_CH4
PE15/TIM1_BKIN
PB10/I2C2_SCL/USART3_TX/ETH_MII_RX_ER/TIM2_CH3
PB11/I2C2_SDA/USART3_RX/ETH_MII_TX_EN/ETH_RMII_TX_EN/TIM2_CH4
Vss_1
Vdd_1
Vdd_3
Vss_3
PE1
PE0/TIM4_ETR
PB9/TIM4_CH4/I2C1_SDA/CAN1_TX
PB8/TIM4_CH3/ETH_MII_TXD3/I2C1_SCL/CAN1_RX
BOOT0
PB7/I2C1_SDA/TIM4_CH2/USART1_RX
PB6/I2C1_SCL/TIM4_CH1/USART1_TX/CAN2_TX
PB5/I2C1_SMBA/SPI3_MOSI/ETH_MII_PPS_OUT/I2S3_SD/ETH_RMII_PPS_OUT/TIM3_CH2/SPI1_MOSI/CAN2_RX
NJTRST/SPI3_MISO/TIM3_CH1/SPI1_MISO
JTDO/SPI3_SCK/I2S3_CK/TRACESWO/TIM2_CH2/SPI1_SCK
PD7/USART2_CK
PD6/USART2_RX
PD5/USART2_TX
PD4/USART2_RTS
PD3/USART2_CTS
PD2/TIM3_ETR/UART5_RX
PD1/OSC_OUT/CAN1_TX
PD0/OSC_IN/CAN1_RX
PC12/UART5_TX/USART3_CK/SPI3_MOSI/I2S3_SD
PC11/UART4_RX/USART3_RX/SPI3_MISO
PC10/UART4_TX/USART3_TX/SPI3_SCK/I2S3_CK
PA14/JTCK-SWCLK
Vdd_2
Vss_2
NC
PA13/JTMS-SWDIO
PA12/USART1_RTS/OTG_FS_DP/CAN1_TX/TIM1_ETR
PA11/USART1_CTS/CAN1_RX/TIM1_CH4/OTG_FS_DM
PA10/USART1_RX/TIM1_CH3/OTF_FS_ID
PA9/USART1_TX/TIM1_CH2/OTG_FS_VBUS
PA8/USART1_CK/OTG_FS_SOF/TIM1_CH1/MCO
PC9/TIM3_CH4
PC8/TIM3_CH3
PC7/I2S3_MCK/TIM3_CH2
PC6/I2S2_MCK/TIM3_CH1
PD15/TIM4_CH4
PD14/TIM4_CH3
PD13/TIM4_CH2
PD12/TIM4_CH1/USART3_RTS/ETH_MII_RXD3
PD11/USART3_CTS/ETH_MII_RXD2
PD10/USART3_CK/ETH_MII_RXD1/ETH_RMII_RXD1
PD9/USART3_RX/ETH_MII_RXD0/ETH_RMII_RXD0
PD8/USART3_TX/ETH_MII_RX_DV/ETH_RMII_CRS_DV
PB15/SPI2_MOSI/I2S2_SD/TIM1_CH3N
PB14/SPI2_MISO/TIM1_CH2N/USART3_RTS
PB13/SPI2_SCK/I2S2_CK/USART3_CTS/TIM1_CH1N/CAN2_TX/ETH_MII_TXD1/ETH_RMII_TXD1
PB12/SPI2_NSS/I2S2_WS/I2C2_SMBA/USART3_CK/TIM1_BKIN/CAN2_RX/ETH_MII_TXD0/ETH_RMII_TXD0
BOOT1 BOOT0
X 0 User Flash memory (boot down end)
0 1 System memory (boot down start)
1 1 Embedded SRAM
YLED 0603
R1
330
LED1
USART2_RX
USART2_TX
WAKEUP
FAULT_N_MCU
CAN1_TX
CAN1_RX
RS232_RX
RS232_TX
CHARGE_CONTROL
CHARGE_CON_SEN
PRECHARGE_CONTROL
PRECHARGE_CON_SEN
DISCHARGE_CONTROL
DISCHARGE_CON_SEN
GPIO_2
GPIO_1
USART3_RX
USART3_TX
SPI2_MISO
SPI2_MOSI
SPI2_SCK
SPI2_NSS
C3 2.2uF
J1
Header 2
R2
10K
Download 시 연결
C1
13pF
C86
13pF
Y1
CM-200C
OSC32_IN
OSC32_OUT
R7
4.7K
/RESET
SW1
TACT(CTT-1131)
C10
0.1uF
U10
W25Q128
C81
0.1uF
J2
5267-04
Y2
SCO-103
C95
13pF
R167 10
OSC_IN
Title
mBMS-16S
Size
A2
Number
01 CPU
Revision
Rev 1.0.3
Date: 10-22-2026
Sheet of
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Drawn By:



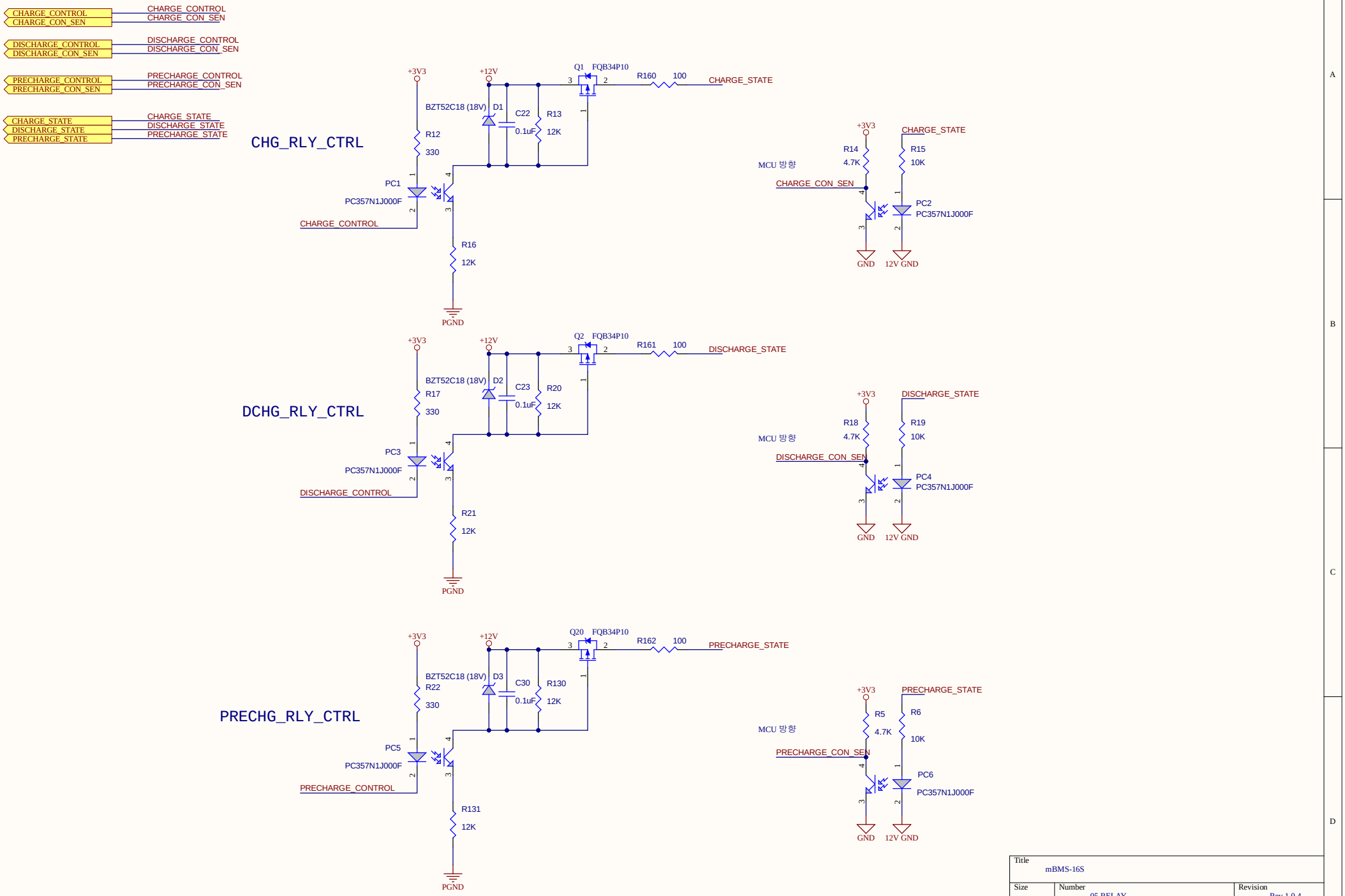
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Size: A3	Number: 02 CAN Comm	Revision: Rev 1.0.3
Date: 10-22-2026	Sheet of	
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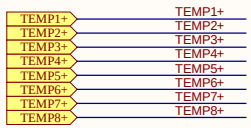
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Size: A3	Number: 03 VOLT CURR	Revision: Rev 1.0.3
Date: 10-22-2026	Sheet of	
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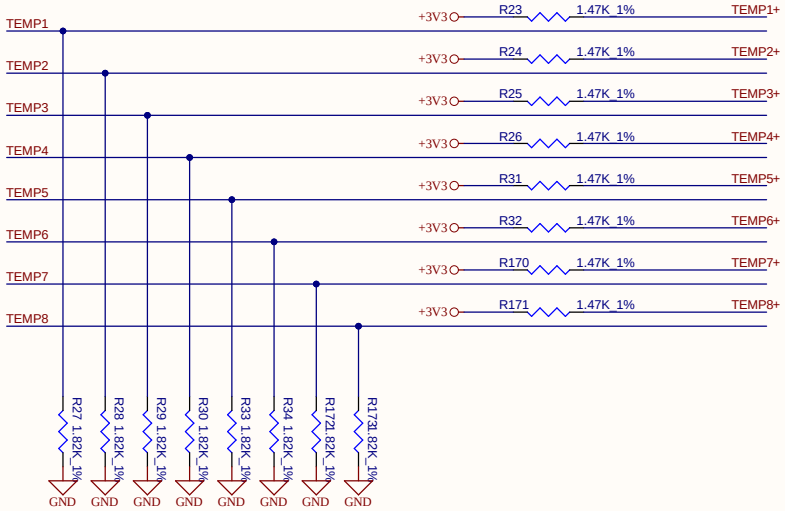


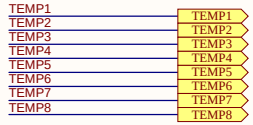
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Size: A3	Number: 04 CELL CONNECTOR	Revision: Rev 1.0.3
Date: 10-22-2026	Sheet of	
File: D:\3. 양산 관련 자료\..\04 CELL CONNECTOR.SchDoc	Drawn By:	



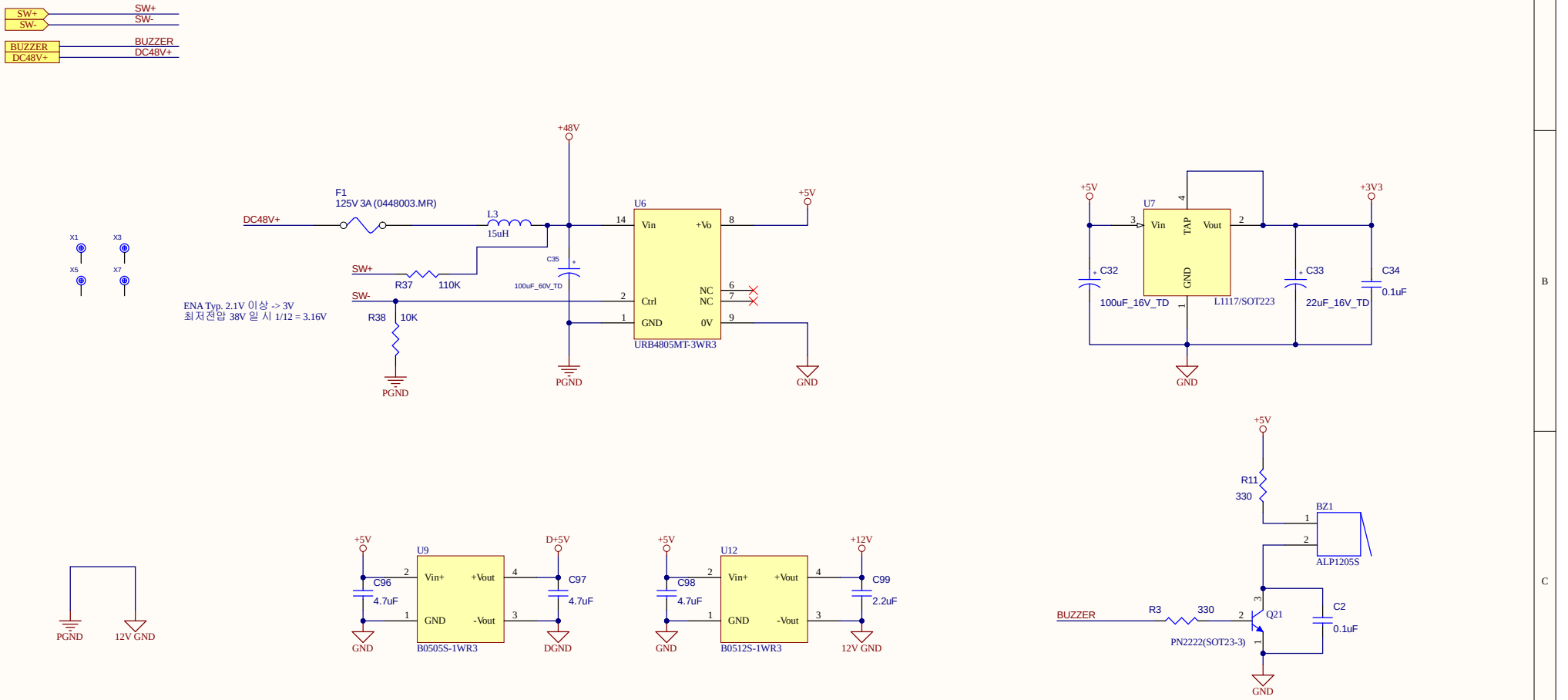
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Size: A3	Number: 05 RELAY	Revision: Rev 1.0.4
Date: 10-22-2026	Sheet of	
File: D:\3. 양산 관련 자료\..\05 RELAY.SchDoc	Drawn By:	



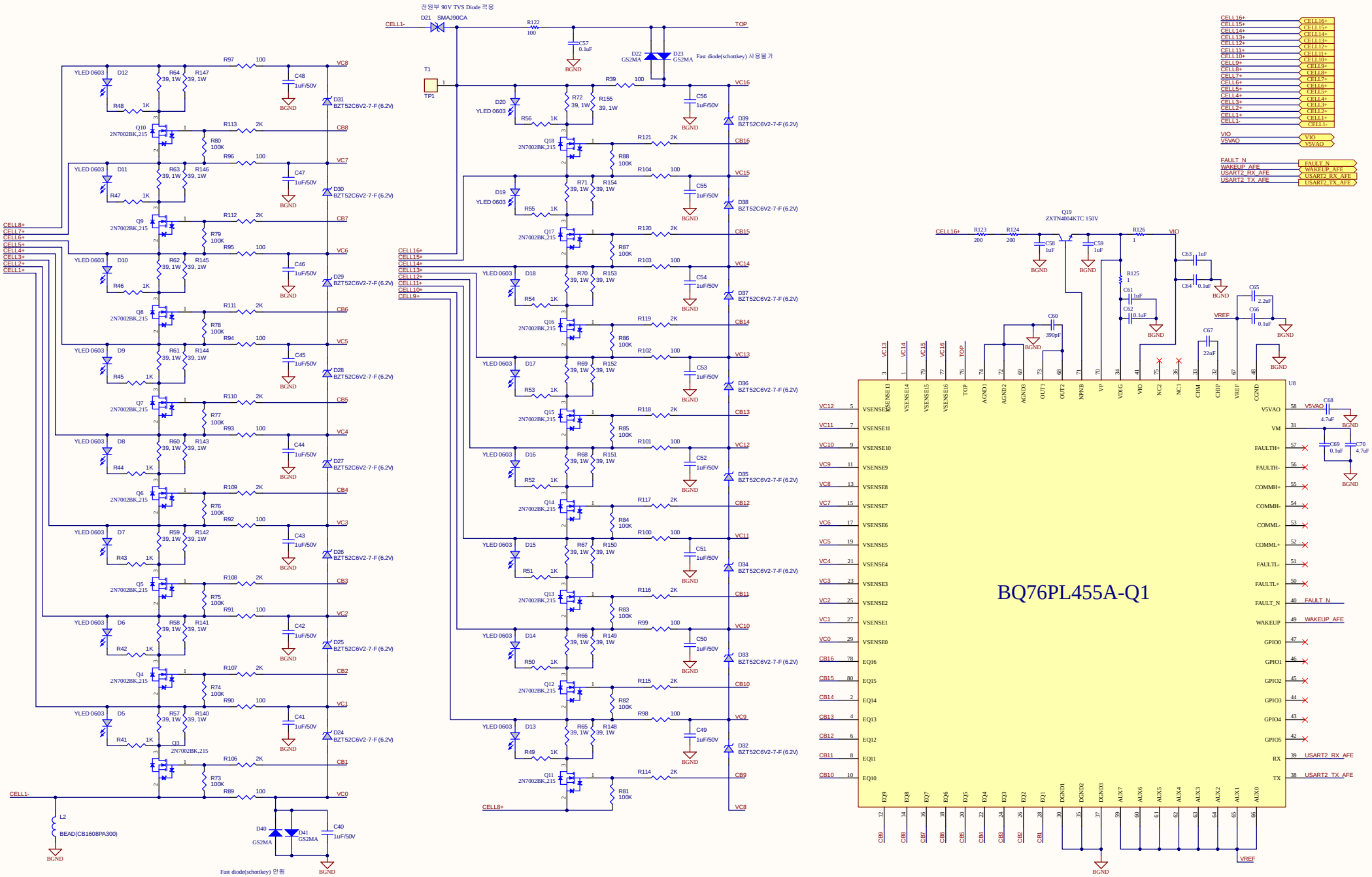


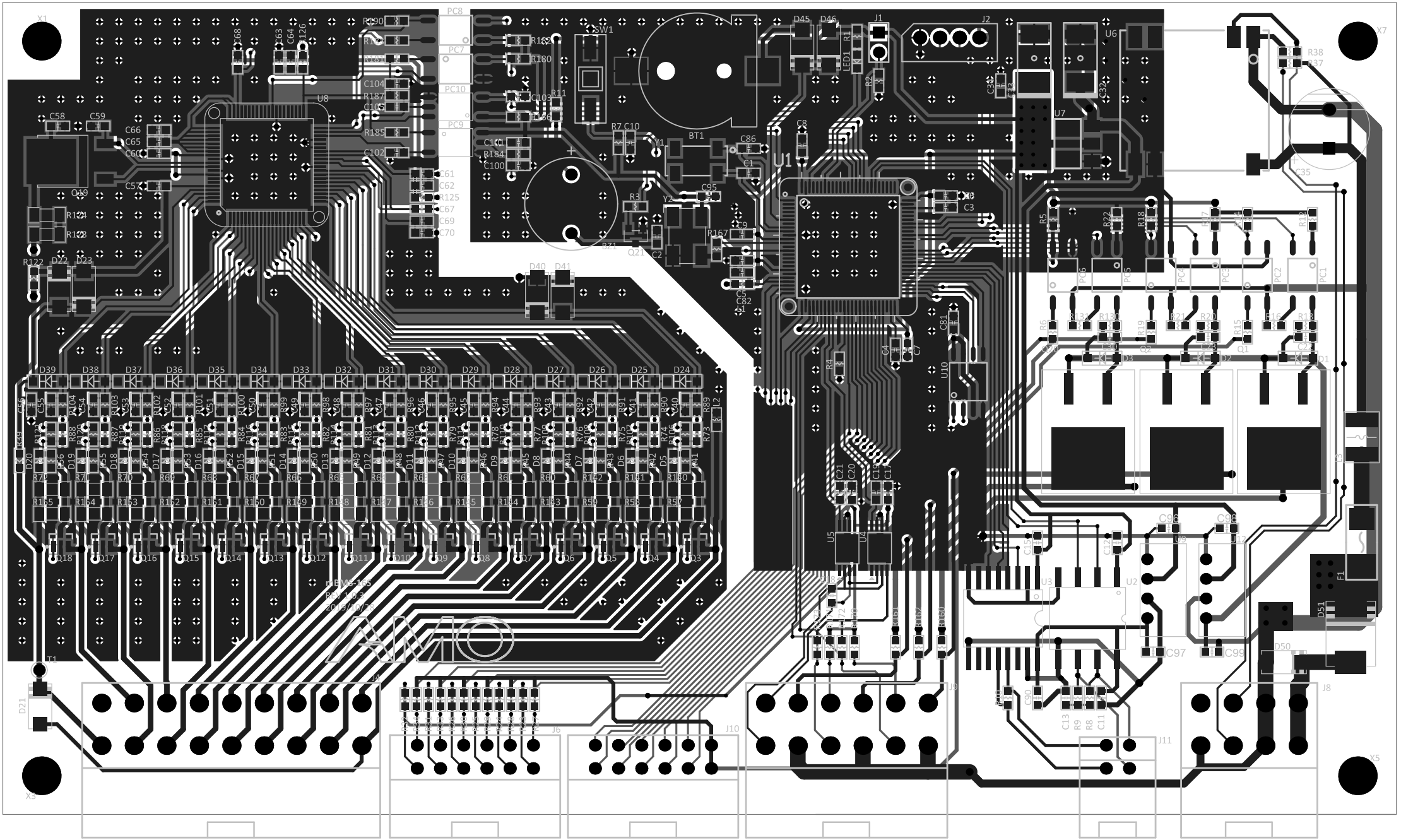


Title: mBMS-16S		
Size: A3	Number: 06 TEMP	Revision: Rev 1.0.3
Date: 10-22-2026		Sheet of
File: D:\3. 양산 관련 자료\..\06 TEMP.SchDoc		Drawn By:



Title	mBMS-16S	
Size: A3	Number: 07 POWER	Revision: Rev 1.0.3
Date: 10-22-2026	Sheet of	
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전원부 90V TVS Diode 적용
D21 SMAJ90CA
CELL1-
TOP
R122 100
C57 0.1uF
D22 GS2MA
D23 GS2MA Fast diode(schottkey) 사용불가
T1
TP1
R39 100
VC16
D20 YLED 0603
R56 1K
R72 39, 1W
R155 39, 1W
C56 1uF/50V
D39 BZT52C6V2-7-F (6.2V)
Q18 2N7002BK,215
R121 2K
R88 100K
CB16
R104 100
VC15
D19 YLED 0603
R55 1K
R71 39, 1W
R154 39, 1W
C55 1uF/50V
D38 BZT52C6V2-7-F (6.2V)
Q17 2N7002BK,215
R120 2K
R87 100K
CB15
R103 100
VC14
D18 YLED 0603
R54 1K
R70 39, 1W
R153 39, 1W
C54 1uF/50V
D37 BZT52C6V2-7-F (6.2V)
Q16 2N7002BK,215
R119 2K
R86 100K
CB14
R102 100
VC13
D17 YLED 0603
R53 1K
R69 39, 1W
R152 39, 1W
C53 1uF/50V
D36 BZT52C6V2-7-F (6.2V)
Q15 2N7002BK,215
R118 2K
R85 100K
CB13
R101 100
VC12
D16 YLED 0603
R52 1K
R68 39, 1W
R151 39, 1W
C52 1uF/50V
D35 BZT52C6V2-7-F (6.2V)
Q14 2N7002BK,215
R117 2K
R84 100K
CB12
R100 100
VC11
D15 YLED 0603
R51 1K
R67 39, 1W
R150 39, 1W
C51 1uF/50V
D34 BZT52C6V2-7-F (6.2V)
Q13 2N7002BK,215
R116 2K
R83 100K
CB11
R99 100
VC10
D14 YLED 0603
R50 1K
R66 39, 1W
R149 39, 1W
C50 1uF/50V
D33 BZT52C6V2-7-F (6.2V)
Q12 2N7002BK,215
R115 2K
R82 100K
CB10
R98 100
VC9
D13 YLED 0603
R49 1K
R65 39, 1W
R148 39, 1W
C49 1uF/50V
D32 BZT52C6V2-7-F (6.2V)
Q11 2N7002BK,215
R114 2K
R81 100K
CB9
CELL8+
VC8
CELL16+
CELL15+
CELL14+
CELL13+
CELL12+
CELL11+
CELL10+
CELL9+
R97 100
VC8
D12 YLED 0603
R48 1K
R64 39, 1W
R147 39, 1W
C48 1uF/50V
D31 BZT52C6V2-7-F (6.2V)
Q10 2N7002BK,215
R113 2K
R80 100K
CB8
R96 100
VC7
D11 YLED 0603
R47 1K
R63 39, 1W
R146 39, 1W
C47 1uF/50V
D30 BZT52C6V2-7-F (6.2V)
Q9 2N7002BK,215
R112 2K
R79 100K
CB7
R95 100
VC6
D10 YLED 0603
R46 1K
R62 39, 1W
R145 39, 1W
C46 1uF/50V
D29 BZT52C6V2-7-F (6.2V)
Q8 2N7002BK,215
R111 2K
R78 100K
CB6
R94 100
VC5
D9 YLED 0603
R45 1K
R61 39, 1W
R144 39, 1W
C45 1uF/50V
D28 BZT52C6V2-7-F (6.2V)
Q7 2N7002BK,215
R110 2K
R77 100K
CB5
R93 100
VC4
D8 YLED 0603
R44 1K
R60 39, 1W
R143 39, 1W
C44 1uF/50V
D27 BZT52C6V2-7-F (6.2V)
Q6 2N7002BK,215
R109 2K
R76 100K
CB4
R92 100
VC3
D7 YLED 0603
R43 1K
R59 39, 1W
R142 39, 1W
C43 1uF/50V
D26 BZT52C6V2-7-F (6.2V)
Q5 2N7002BK,215
R108 2K
R75 100K
CB3
R91 100
VC2
D6 YLED 0603
R42 1K
R58 39, 1W
R141 39, 1W
C42 1uF/50V
D25 BZT52C6V2-7-F (6.2V)
Q4 2N7002BK,215
R107 2K
R74 100K
CB2
R90 100
VC1
D5 YLED 0603
R41 1K
R57 39, 1W
R140 39, 1W
C41 1uF/50V
D24 BZT52C6V2-7-F (6.2V)
Q3 2N7002BK,215
R106 2K
R73 100K
CB1
R89 100
VC0
CELL8+
CELL7+
CELL6+
CELL5+
CELL4+
CELL3+
CELL2+
CELL1+
CELL1-
L2
BEAD(CB1608PA300)
BGND
D40 GS2MA
D41 GS2MA
C40 1uF/50V
Fast diode(schottkey) 안됨
CELL16+
CELL15+
CELL14+
CELL13+
CELL12+
CELL11+
CELL10+
CELL9+
CELL8+
CELL7+
CELL6+
CELL5+
CELL4+
CELL3+
CELL2+
CELL1+
CELL1-
VIO
V5VAO
FAULT_N
WAKEUP_AFE
USART2_RX_AFE
USART2_TX_AFE
Q19 ZXTN4004KTC 150V
R123 200
R124 200
C58 1uF
C59 1uF
R126 1
R125 1
C61 1uF
C62 0.1uF
C60 390pF
C63 1uF
C64 0.1uF
C65 2.2uF
C66 0.1uF
C67 22nF
VREF
U8
BQ76PL455A-Q1
VC13 VC14 VC15 VC16 TOP AGND1 AGND2 AGND3 OUT1 OUT2 NPNB VP VDIG VIO NC2 NC1 CHM CHP VREF CGND
VSENSE13 VSENSE12 VSENSE11 VSENSE10 VSENSE9 VSENSE8 VSENSE7 VSENSE6 VSENSE5 VSENSE4 VSENSE3 VSENSE2 VSENSE1 VSENSE0
EQ16 EQ15 EQ14 EQ13 EQ12 EQ11 EQ10
EQ9 EQ8 EQ7 EQ6 EQ5 EQ4 EQ3 EQ2 EQ1
DGND1 DGND2 DGND3
AUX7 AUX6 AUX5 AUX4 AUX3 AUX2 AUX1 AUX0
V5VAO VM FAULTH+ FAULTH- COMMH+ COMMH- COMML- COML+ FAULTL- FAULTL+ FAULT_N WAKEUP GPIO0 GPIO1 GPIO2 GPIO3 GPIO4 GPIO5 RX TX
C68 4.7uF
C69 0.1uF
C70 4.7uF
Title mBMS-16S
Size A2
Number 08 CELL MONITOR
Revision Rev 1.0.3
Date: 10-22-2026
Sheet of
File: D:\3. 양산관련자료\..\08 CELL MONITOR.SchDoc
Drawn By:



Comment	Description	Designator	Footprint	LibRef	Quantity
CR1220(BH68)		BT1	CR1220 BH-68	BATTERY	1
ALP12055		BZ1	ALP12055	BUZZER	1
13pF		C1, C86, C95	C_1608	CAP NP	3
0.1uF	[NoValue], Capacitor	C2, C5, C6, C7, C8, C9, C10, C11, C12, C15, C17, C18, C19, C20, C21, C22, C23, C30, C34, C57, C62, C64, C66, C69, C81, C82, C90, C101, C104	C_1608	CAP NP, Cap	29
2.2uF		C3, C4, C99	C_1608	CAP NP	3
47nF		C13	C_1608	CAP NP	1
100uF 16V TD		C32	TAN-D	CAP POL	1
22uF 16V TD		C33	TAN-D	CAP POL	1
100uF 60V TD		C35	C_DIP_10*12.5	CAP POL	1
1uF/50V		C40, C41, C42, C43, C44, C45, C46, C47, C48, C49, C50, C51, C52, C53, C54, C55, C56	C_1608	CAP NP	17
1uF	Capacitor	C58, C59, C61, C63	C_1608	Cap	4
390pF	Capacitor	C60	C_1608	Cap	1
1.8uF	Capacitor	C65	C_1608	Cap	1
22nF	Capacitor	C67	C_1608	Cap	1
4.7uF	Capacitor, [NoValue]	C68, C70, C96, C97, C98	C_1608	Cap, CAP NP	5
15pF		C100, C102, C103, C105	C_1608	CAP NP	4
BZT52C18 (18V)		D1, D2, D3	SOD-123	DIODE ZENER1	3
YLED 0603		D5, D6, D7, D8, D9, D10, D11, D12, D13, D14, D15, D16, D17, D18, D19, D20, LED1	LED_1608_21	LED	17
SMA390CA		D21, D50	DO214AC(SMA)	DIODE BI-DIR TRIG	2
GS2MA	Default Diode, [NoValue]	D22, D23, D40, D41, D45, D46	DO214AC(SMA)	Diode, 1N4007	6
BZT52C6V2-7-F (6.2V)		D24, D25, D26, D27, D28, D29, D30, D31, D32, D33, D34, D35, D36, D37, D38, D39	SOD-123_	DIODE ZENER1	16
SS38/SK310C DO-214AB	Default Diode	DS1	DO214AB(SMC)	Diode	1
125V 3A (0448003.MR)		F1	DO-214F	FUSE	1
Header 2	Header, 2-Pin	J1	HDR1X2	Header 2	1
5267-04		J2	molex 5267-04	5267-04	1
molex 5569-18		J4	Molex 5569-18a(39301180)	HX42003-18(molex 5569)	1
molex 43045-1200		J6, J10	MOLEX430451200	KF30002-WA-12	2
molex 5569-08 (39301080)		J8	Molex 5569-08a(39301080)	HX42003-08(molex 5569)	1
molex 5569-12		J9	Molex 5569-12a(39301120)	HX42003-12(molex 5569)	1
molex 43045-0400		J11	MOLEX430450400	43045-0400	1
BEAD(CB1608PA300)		L1, L2	L_1608	FB_0805	2
15uH	Inductor	L3	L_5040	Inductor	1
PC357N1J000F		PC1, PC2, PC3, PC4, PC5, PC6	PC452	PC817	6
PC357		PC7, PC8	PC452	PC817	2
TLP2362		PC9, PC10	SO-5	SOS Photocoupler	2
FQB34P10		Q1, Q2, Q20	D2PAK	FQB34P10	3
2N7002BK,215	N-Channel Trench MOSFET, 60 V, 0.35 A, -55 to 150 degC, 3-Pin SOT23, Tape and Reel	Q3, Q4, Q5, Q6, Q7, Q8, Q9, Q10, Q11, Q12, Q13, Q14, Q15, Q16, Q17, Q18	NXP-SOT23_N	2N7002BK,215	16
ZXTN4004KTC 150V	TRANSISTOR	Q19	TO252-3	NPNTR	1
PN2222(SOT23-3)	NPN General Purpose Amplifier	Q21	SOT23-3	2N3904	1
330		R1, R3, R8, R9, R11, R12, R17, R22, R180, R182, R186	R_1608	R	11
10K		R2, R4, R6, R15, R19, R38	R_1608	R	6
4.7K		R5, R7, R14, R18	R_1608	R	4
51		R10	R_1608	R	1
12K		R13, R16, R20, R21, R130, R131	R_1608	R	6
1.47K_1%		R23, R24, R25, R26, R31, R32, R170, R171	R_1608	R	8
1.82K_1%		R27, R28, R29, R30, R33, R34, R172, R173	R_1608	R	8
110K		R37	R_1608	R	1
100	[NoValue], Resistor	R39, R89, R90, R91, R92, R93, R94, R95, R96, R97, R98, R99, R100, R101, R102, R103, R104, R122, R160, R161, R162	R_1608	R, Res1	21
1K		R41, R42, R43, R44, R45, R46, R47, R48, R49, R50, R51, R52, R53, R54, R55, R56, R184, R187	R_1608	R	18
39, 1W	HRG3216Q-39R0-D-T1	R57, R58, R59, R60, R61, R62, R63, R64, R65, R66, R67, R68, R69, R70, R71, R72, R140, R141, R142, R143, R144, R145, R146, R147, R148, R149, R150, R151, R152, R153, R154, R155	R_3216[1206]	R	32
100K		R73, R74, R75, R76, R77, R78, R79, R80, R81, R82, R83, R84, R85, R86, R87, R88, R190	R_1608	R	17
2K		R106, R107, R108, R109, R110, R111, R112, R113, R114, R115, R116, R117, R118, R119, R120, R121	R_1608	R	16
200	Resistor	R123, R124	R 3216[1206]	Res1	2
1	Resistor	R125, R126	R_1608	Res1	2
10		R167	R_1608	R	1
470		R181, R183	R_1608	R	2
499		R185	R_1608	R	1
TACT(CT7-1131)		SW1	TACT_SMD	SW TACT-SPST	1
TP1		T1	TP	CON1	1
STM32F407VGT6		U1	TQFP100	mega103 13	1
ISO1050(SOP8)		U2	SOP-8	ISO1050(SOP8)	1
ISO1410		U3	SOIC 16	ISO1410	1
INA240A2		U4, U5	TSSOP8	INA131 5	2
UR84BDMT-3WR3	48V to 5V DCDC	U6	UR8_MT-3WR3	UR84BDMT-3WR3	1
L1117/SOT223		U7	SOT223	L1117	1
BQ76PL455A-Q1		U8	TQFP-80	BQ76PL455A-Q1	1
B0505S-1WR3		U9	B_S-1WR3	B_S-1WR3	1
W25Q128		U10	SOIMWW	AT45DB011/SOIC 2	1
B0512S-1WR3		U12	B_S-1WR3	B_S-1WR3	1
Jumip1		X1, X3, X5, X7	Hole(4mm)	Jumip1	4
CM-200C	32.768KHz	Y1	CM-200C	CRYSTAL CS-306	1
SCO-103		Y2	SCO-103	SCO-103	1