# GESI EXPANSION BOARD

## TABLE OF CONTENTS

| REV | E3A |
|---|---|
| VER | 0.2 |

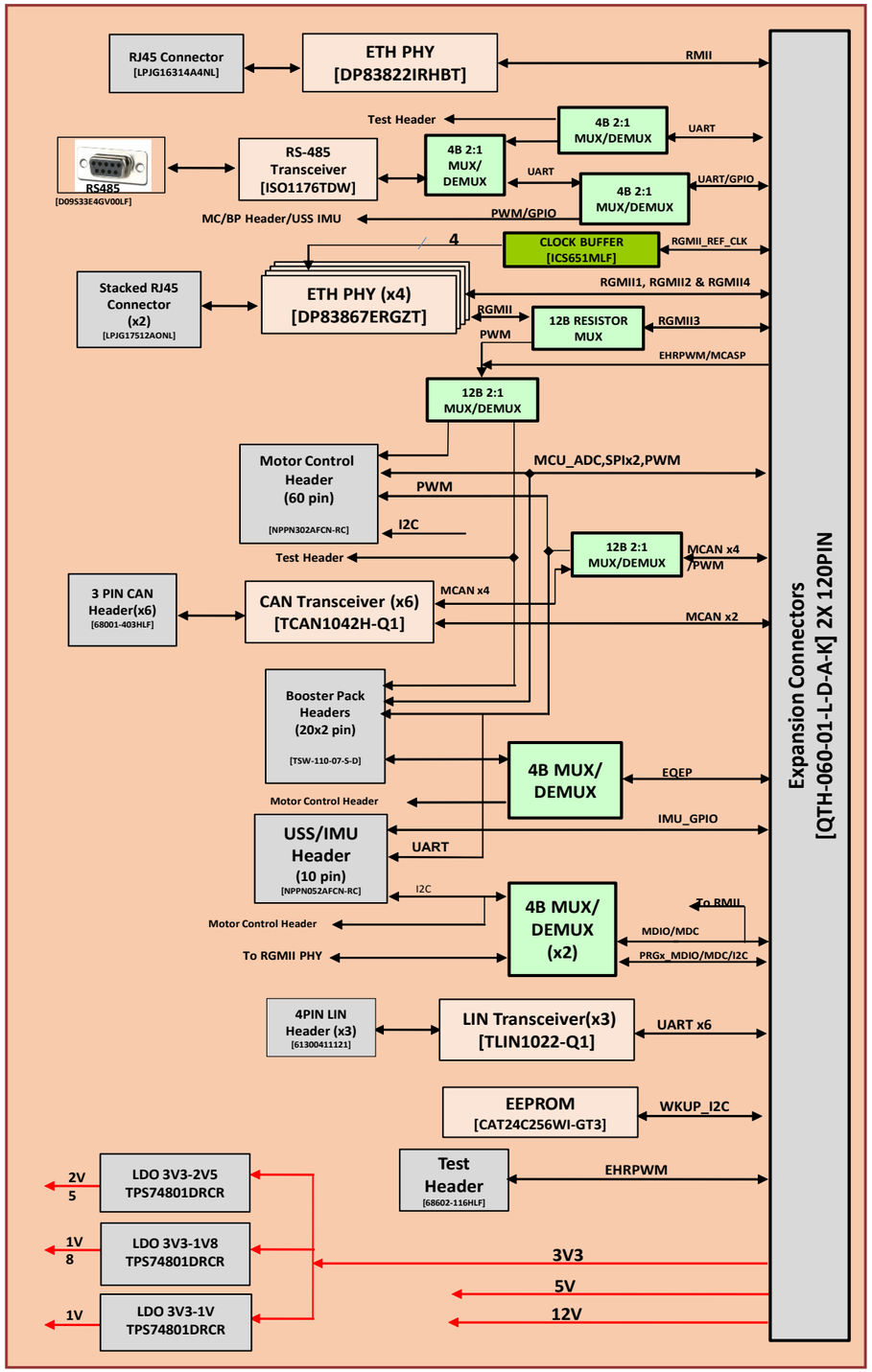


| | | |
|---|---|---|
| Project : J7 EVM | TEXAS INSTRUMENTS | Title: TABLE OF CONTENTS<br>Size: C — PROC084 001 J7EXPC01EVM — Rev: E3A<br>Date: Thursday, December 05, 2019 — Sheet 1 of 25 |

# REVISION HISTORY

| VER # | DATE | DESCRIPTION OF CHANGES | AUTHOR | REVIEWED BY | APPROVED BY |
|---|---|---|---|---|---|
| 0.1 | 21-NOV-2019 | Drafted from "PROC084E3_SCH, VER: 1.3".<br>TP62 & TP63 moved to DNI and Hardware Schematic page Updated | Mistral Design Team | | |
| 0.2 | 26-NOV-2019 | Updated the RGMII REF CLOCK Buffer U31 Part# to 651SDCGI | Mistral Design Team | | |
| | | | | | |

# BLOCK DIAGRAM




| | | |
|---|---|---|
| Project : J7 EVM | TEXAS INSTRUMENTS | Title: BLOCK DIAGRAM |
| | | Size: C — PROC084 001 J7EXPC01EVM — Rev: E3A |
| | | Date: Thursday, December 05, 2019 — Sheet 3 of 25 |

# EXP_CONN #1

J1

CON_PMC_2X60_M
QTH-060-01-L-D-A-K
CON PMC 2X60 0.50MM PITCH MALE ST SMD

FROM PRG1_RGMII2 PHY
(11) PRG0_RGMII2_RXC
(11) PRG0_RGMII2_RD3
(11) PRG0_RGMII2_RX_CTL
(11) PRG0_RGMII2_RD0
(11) PRG0_RGMII2_RD1
(11) PRG0_RGMII2_RD2

MCAN6 & 7
(6) EXP_MCAN6_TX
(6) EXP_MCAN6_RX
(6) EXP_MCAN7_TX
(6) EXP_MCAN7_RX
(7) PRG1_PRU1_GPO9
(7) PRG1_PRU1_GPO10
(20) SPI6_D0/PRG1_ECAP0_SYNC_IN

FROM PRG1_MUX
(13) PRG1_RGMII2_RD0
(13) PRG1_RGMII2_RD2
(13) PRG1_RGMII2_RD1
(13) PRG1_RGMII2_RD3
(13) PRG1_RGMII2_RX_CTL
(13) PRG1_RGMII2_RXC

MCAN9
(15) MCAN9_TX
(15) MCAN9_RX
(20,21) SPI3_CS1
(21) SPI3_CS2
(7) PROFI_UART_SEL — 0E R300
(20) IMU_GPIO1 — DNI R301
GPIO0_48

(8) WKUP_I2C0_SDA
(8) WKUP_I2C0_SCL

FROM PRG0_RGMII1 PHY
(10) PRG0_RGMII1_RD0
(10) PRG0_RGMII1_RX_CTL
(10) PRG0_RGMII1_RXC
(10) PRG0_RGMII1_RD2
(10) PRG0_RGMII1_RD1
(10) PRG0_RGMII1_RD3

TO PRG0_RGMII2 PHY
(11) PRG0_RGMII2_TD1
(11) PRG0_RGMII2_TD0
(11) PRG0_RGMII2_TXC
(11) PRG0_RGMII2_TD2
(11) PRG0_RGMII2_TX_CTL
(11) PRG0_RGMII2_TD3

TO MOTOR CONTROL HEADER
(9,23) MDIO0_MDC
(9,23) MDIO0_MDIO
(20,21) SPI3_D0
(20,21) SPI3_D1
(20,21) SPI3_CLK

TP60 I2C0_SCL
TP61 I2C0_SDA
TP25 I2C1_SCL
TP26 I2C1_SDA

Silk Screen for J1 :
"EXP_CONN#01"

VCC_3V3
R86 10K
R41 10K

DGND
DGND

# EXP_CONN #2

LIN
(16) LIN1_UART_RXD
(16) LIN1_UART_TXD
(21) EQEP0_A
(21) EQEP0_B
(10,11) PRG0_RGMII_INT#
(12,13) PRG1_RGMII_INT#
[GPIO1_23]
[GPIO1_24]

BOARD ID EEPROM
(8) EEPROM_A0
(8) EEPROM_A1
(8) EEPROM_A2
(8) EEPROM_WP
(20) PRG1_PWM3_B2
(10,11) GPIO_PRG0_RGMII_RST
GPIO0_61

(7) EHRPWM0_SYNCI/MCASP10_ACLKX
(7) EHRPWM0_SYNCO/MCASP10_AFSX
(7) EHRPWM_TZn_IN0/MCASP10_AXR8
EHRPWM0_A/MCASP10_AXR1
(21) BP_MCASP10_AXR1 — 0E R276
(8) EHRPWM0_A — DNI R277

(8) EHRPWM0_B
(8) EHRPWM1_B
(8) EHRPWM1_A
(8) EHRPWM2_A
(8) EHRPWM_TZn_IN2
(8) EHRPWM_TZn_IN1
(8) EHRPWM2_B
(23) RMII8_PHY_RESET
GPIO0_96

(22) CON_MCU_ADC1_AIN0
(22) CON_MCU_ADC1_AIN1
(22) CON_MCU_ADC1_AIN2
(22) CON_MCU_ADC1_AIN3
(22) CON_MCU_ADC1_AIN4
(22) CON_MCU_ADC1_AIN5
(22) CON_MCU_ADC1_AIN6
(22) CON_MCU_ADC1_AIN7

TO MOTOR CONTROL HEADER
(20) MCU_ADC_EXT_TRIGGER1

TP31 I2C6_SCL
TP32 I2C6_SDA

J2

CON_PMC_2X60_M
QTH-060-01-L-D-A-K
CON PMC 2X60 0.50MM PITCH MALE ST SMD

Silk Screen for J2 :
"EXP_CONN#02"

DGND
DGND

VCC_12V0
C11 0.1uF 50V
C12 0.1uF 50V
C14 22uF 35V
DGND

PRG1_RGMII2_TX_CTL (13)
PRG1_RGMII2_TD3 (13)
PRG1_RGMII2_TXC (13)
PRG1_RGMII2_TD0 (13)
PRG1_RGMII2_TD2 (13)
PRG1_RGMII2_TD1 (13)
TO PRG1_RGMII2 PHY

EXP_MCAN5_TX (6)
EXP_MCAN5_RX (6)
EXP_MCAN4_TX (6)
EXP_MCAN4_RX (6)
PRG1_PRU0_GPO10 (7)

MCAN4 & 5
DNI R285 PRG1_UART0_CTSn (21)
R286 0E SPI6_CS1/PRG1_PWM3_TZ_IN (20)

SPI6_CLK/PRG1_ECAP0_SYNC_OUT (20)
SPI6_D1/PRG1_ECAP0_IN_APWM_OUT (20)

VCC_3V3
R3 DNI
TO PRG1_MUX

EXP_PRG1_RGMII1_TD3 (6)
EXP_PRG1_RGMII1_TD0 (6)
EXP_PRG1_RGMII1_TX_CTL (6)
EXP_PRG1_RGMII1_TD2 (6)
EXP_PRG1_RGMII1_TXC (6)
EXP_PRG1_RGMII1_TD1 (6)

EXP_PRG1_MDIO0_MDC (9)
EXP_PRG1_MDIO0_MDIO (9)
MCAN11_TX (15)
MCAN11_RX (15)
MCAN11

GPIO0_62
GPIO_PRG1_RGMII_RST (12,13)
SOC_PORZ_OUT (10,11,12,13,23)
TP33

PRG0_RGMII1_TD1 (10)
PRG0_RGMII1_TD0 (10)
PRG0_RGMII1_TX_CTL (10)
PRG0_RGMII1_TD3 (10)
PRG0_RGMII1_TD2 (10)
PRG0_RGMII1_TXC (10)
TO PRG0_RGMII1 PHY

EXP_PRG1_RGMII1_RD0 (6)
EXP_PRG1_RGMII1_RXC (6)
EXP_PRG1_RGMII1_RD1 (6)
EXP_PRG1_RGMII1_RD3 (6)
EXP_PRG1_RGMII1_RX_CTL (6)
EXP_PRG1_RGMII1_RD2 (6)
FROM PRG0_RGMII2 PHY

EXP_PRG0_MDIO0_MDC (9)
EXP_PRG0_MDIO0_MDIO (9)
GPIO0_60
CAN_STB (14,15)
RGMII_REF_CLOCK (6)
TO RGMII REF CLOCK BUFFER

GPIO0_68
GPIO_LIN_EN (16,17,18)

SOC_I2C2_SCL TP22
SOC_I2C2_SDA TP23
EXP_RSTz TP24

VCC_3V3
C55 0.1uF 50V
C53 0.1uF 50V
C59 22uF 35V
DGND

I2C3_SCL TP34
I2C3_SDA TP35
EQEP0_I (21)
EQEP0_S (21)

EXP_REFCLK
MUX_MC/BP_SEL (7,21) TP27 TP28
PRG1_IEP0_EDIO_OUTVALID (20)
PERIPH_RSTz (21) TP29
EXP_MUX1 MCAN/PWM_SEL (6)
EXP_MUX2 MDIO_MDC_SEL0 (9)
EXP_MUX3 MDIO_MDC_SEL1 (9)

GPMC0_A22
MAIN_UART4_RTSn (7)
RMII8_RXD0 (23)
RMII8_TXD1 (23)
RMII8_RXD1 (23)
GPMC0_A16 MAIN_UART4_TXD (7)
GPIO0_105
GPMC0_A15
GPIO0_104
MAIN_UART4_RXD (7)
RMII8_PHY_INTn (23)
RMII8_RX_ER (23)
RMII8_TXD0 (23)
RMII8_TX_EN (23)
RMII8_CRS_DV (23)

0E R295 MAIN_UART4_CTSn (7)
R296 DNI IMU_GPIO0 (20)
RMII8 SIGNALS

VCC_5V0
C35 0.1uF 50V
C36 0.1uF 50V
C37 22uF 35V
DGND

LIN2_UART_RXD (16)
LIN2_UART_TXD (16)
LIN3_UART_RXD (17)
LIN3_UART_TXD (17)
LIN4_UART_RXD (17)
LIN4_UART_TXD (17)
LIN5_UART_RXD (18)
LIN5_UART_TXD (18)

VSYS_IO_3V3
C29 0.1uF 50V
C30 0.1uF 50V
C31 22uF 35V
DGND

LIN6_UART_RXD (18)
LIN6_UART_TXD (18)

VSYS_IO_1V8
TP62 TP63
TP30 THRU-HOLE

Project :
J7 EVM

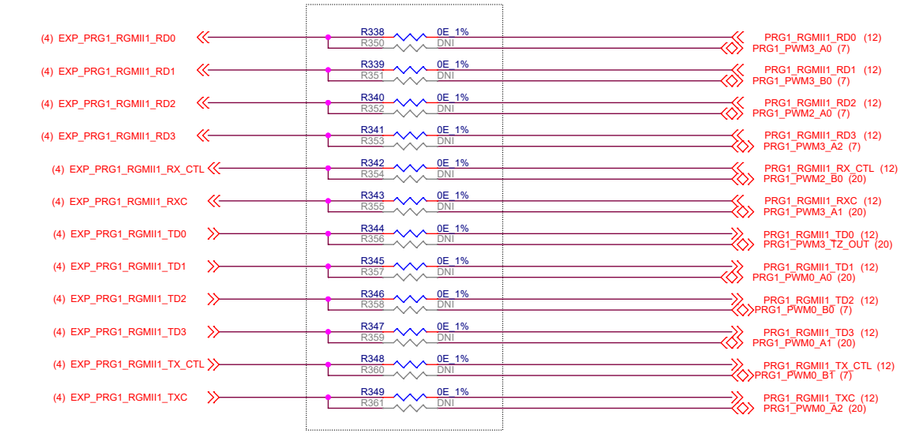
TEXAS INSTRUMENTS

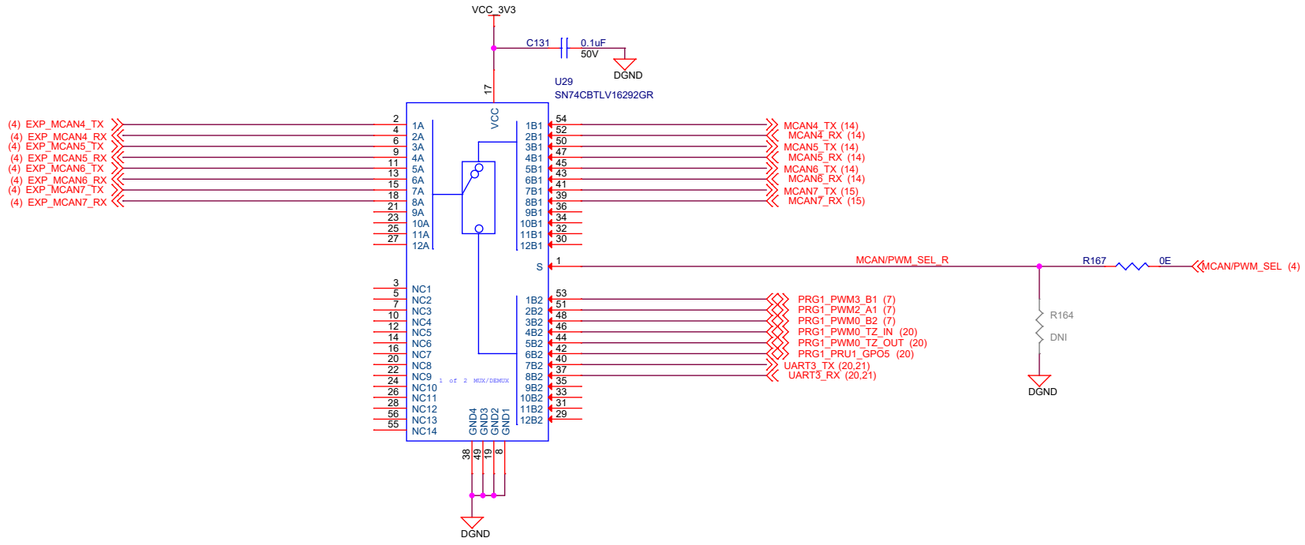
Title: EXPANSION CONNECTORS

| Size | PROC084 001 J7EXPC01EVM | Rev |
|---|---|---|
| C | | E3A |
| Date: Thursday, December 05, 2019 | Sheet 4 of 25 | |

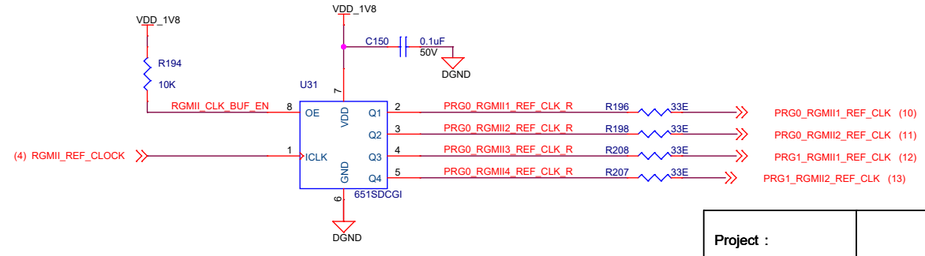
# PRG1 MUX - 01

PCB NOTE: keep these resistors placement as Tripad without stub in PCB



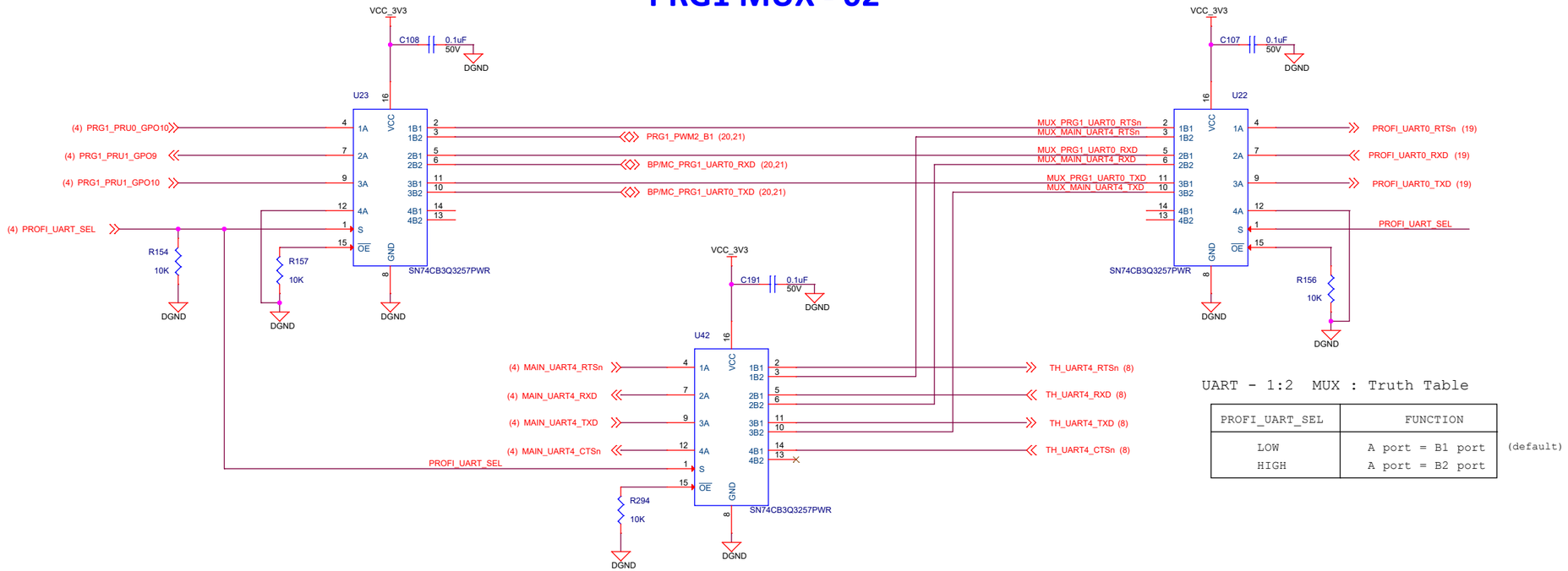




# RGMII REF CLOCK BUFFER



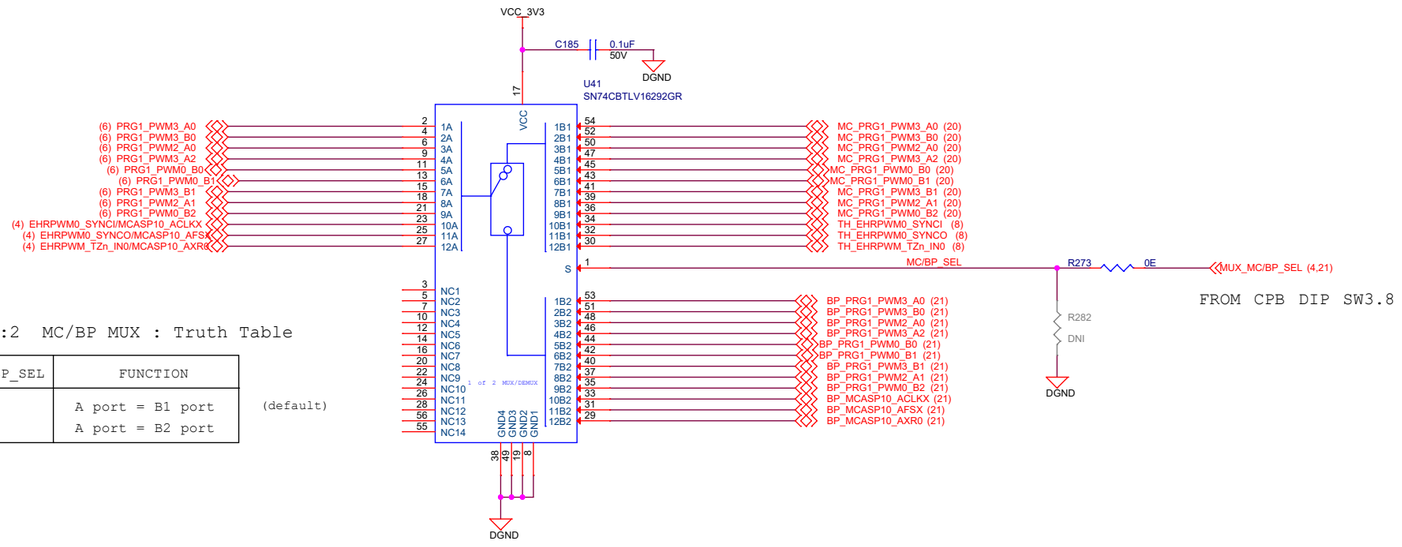

| | | |
|---|---|---|
| Project : J7 EVM | TEXAS INSTRUMENTS | Title: PRG1 MUX - 01 |
| | | Size: C — PROC084 001 J7EXPC01EVM — Rev: E3A |
| | | Date: Thursday, December 05, 2019 — Sheet 6 of 25 |

# PRG1 MUX - 02




UART - 1:2 MUX : Truth Table

| PROFI_UART_SEL | FUNCTION | |
|---|---|---|
| LOW | A port = B1 port | (default) |
| HIGH | A port = B2 port | |



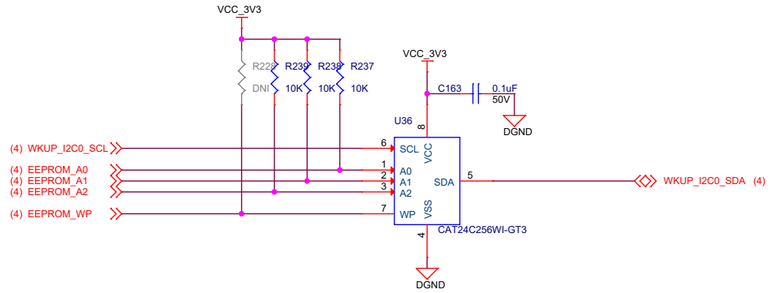

PRG1 - 1:2 MC/BP MUX : Truth Table

| PRG1_MC/BP_SEL | FUNCTION | |
|---|---|---|
| LOW | A port = B1 port | (default) |
| HIGH | A port = B2 port | |

FROM CPB DIP SW3.8

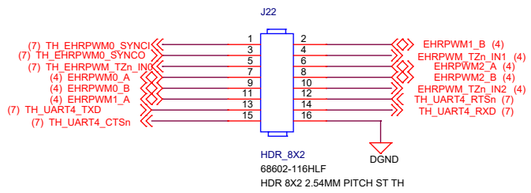
| | | | |
|---|---|---|---|
| Project : J7 EVM | TEXAS INSTRUMENTS | Title: PRG1 MUX - 02 | |
| | | Size: C | PROC084 001 J7EXPC01EVM — Rev: E3A |
| | | Date: Thursday, December 05, 2019 | Sheet 7 of 25 |

# BOARD ID EEPROM



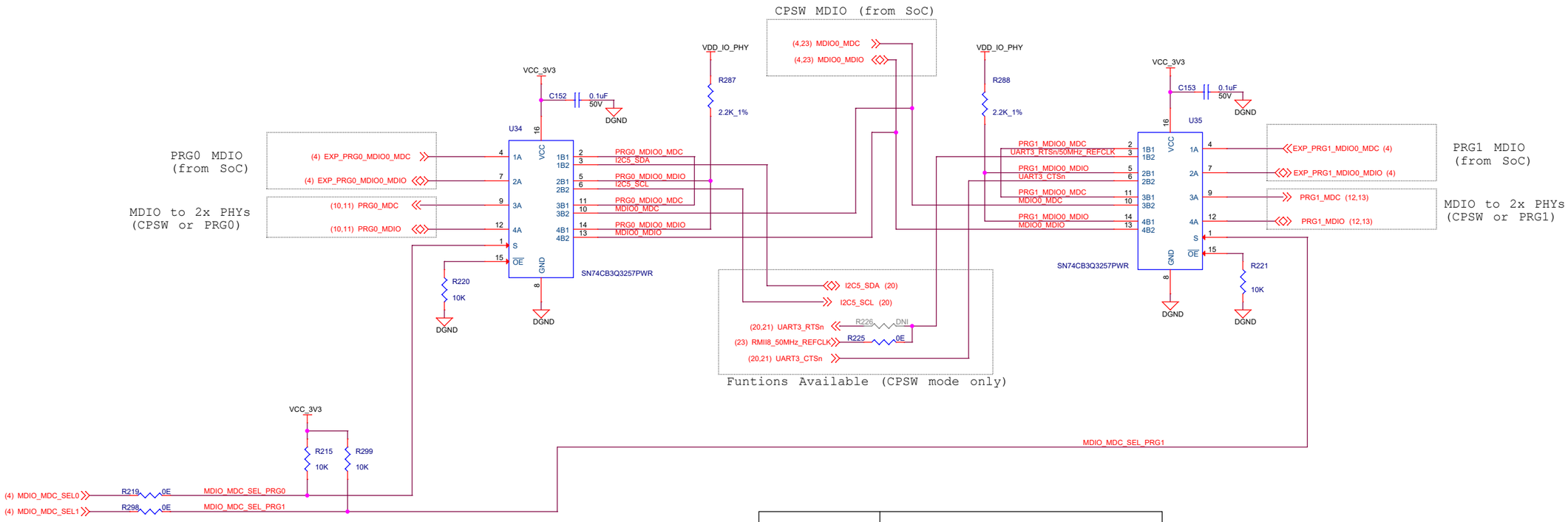

Note: EEPROM Address is 0x52 (set by base board)

# Test Connector




| | | |
|---|---|---|
| Project : J7 EVM | TEXAS INSTRUMENTS | Title: TEST CONNECTOR & EEPROM |
| | | Size: C — PROC084 001 J7EXPC01EVM — Rev: E3A |
| | | Date: Thursday, December 05, 2019 — Sheet 8 of 25 |

# MDIO MDC MUX




| MDIO_MDC_SEL | MDIO/MDC PORT CONNECTION TO PHY's |
|---|---|
| LOW | PRGx MDIO/MDC |
| HIGH | CPSW9G MDIO/MDC |

| | | | |
|---|---|---|---|
| Project : J7 EVM | TEXAS INSTRUMENTS | Title: MDIO MDC MUX | |
| | | Size: C | PROC084 001 J7EXPC01EVM — Rev: E3A |
| | | Date: Thursday, December 05, 2019 | Sheet 9 of 25 |

IO Selection between
1.8V and 3.3V

# PRG0 GB_ETHERNET RGMII 1

VCC_3V3 — ''R1'' R169 0402 0E — VDD_IO_PHY
VDD_1V8 — ''R2'' R168 0402 DNI DNI

| IO Voltage for PHY Chips | Resistor Selection | |
|---|---|---|
| 3V3 | Mount-R1 & DNI-R2 | (default) |
| 1V8 | Mount-R2 & DNI-R1 | |

VDD_IO_PHY: C175 0.1uF 50V, C169 0.1uF 50V, C58 0.1uF 50V, C171 1uF 10V, C165 10uF 16V — DGND
VDD_1V0: C164 10uF 16V, C56 1uF 10V, C172 1uF 10V, C57 0.1uF 50V, C51 0.1uF 50V, C168 0.1uF 50V, C52 0.1uF 50V — DGND
VDD_2V5: C49 1uF 10V, C54 1uF 10V, C170 0.1uF 50V, C173 0.1uF 50V — DGND

Silk Screen for J21 BOTTOM :
"PRG0_RGMII1"

PCB Note: Route signals as 100-ohm differential

## RJ45

U37 — DP83867ERGZT

| | | | |
|---|---|---|---|
| (4) PRG0_RGMII1_TD0 | R235 0E 1% | PRG0_RGMII1_TD0_R | 28 TX_D0/SGMII_SIN |
| (4) PRG0_RGMII1_TD1 | R234 0E 1% | PRG0_RGMII1_TD1_R | 27 TX_D1/SGMII_SIP |
| (4) PRG0_RGMII1_TD2 | R233 0E 1% | PRG0_RGMII1_TD2_R | 26 TX_D2 |
| (4) PRG0_RGMII1_TD3 | R229 0E 1% | PRG0_RGMII1_TD3_R | 25 TX_D3 |
| (4) PRG0_RGMII1_TX_CTL | R249 0E 1% | PRG0_RGMII1_TX_CTL_R | 37 TX_CTRL |
| (4) PRG0_RGMII1_TXC | R236 0E 1% | PRG0_RGMII1_TXC_R | 29 GTX_CLK |
| (4) PRG0_RGMII1_RD0 | R241 0E 1% | PRG0_RGMII1_RD0_R | 33 RX_D0/SGMII_COP |
| (4) PRG0_RGMII1_RD1 | R242 0E 1% | PRG0_RGMII1_RD1_R | 34 RX_D1/SGMII_CON |
| (4) PRG0_RGMII1_RD2 | R243 0E 1% | PRG0_RGMII1_RD2_R | 35 RX_D2/SGMII_SOP |
| (4) PRG0_RGMII1_RD3 | R244 0E 1% | PRG0_RGMII1_RD3_R | 36 RX_D3/SGMII_SON |
| (4) PRG0_RGMII1_RX_CTL | R250 0E 1% | PRG0_RGMII1_RX_CTL_R | 38 RX_CTRL |
| (4) PRG0_RGMII1_RXC | R240 0E 1% | PRG0_RGMII1_RXC_R | 32 RX_CLK |
| | TP16 | PRG0_RGMII1_CLK_OUT | 18 CLK_OUT |
| (6) PRG0_RGMII1_REF_CLK | R232 DNI | PRG0_RGMII1_XIN | 15 X_I |
| | C166 27pF — Y4 25.000MHz 445I23D25M00000 — C167 27pF | PRG0_RGMII1_XOUT | 14 X_O |
| (9,11) PRG0_MDC | | | 16 MDC |
| (9,11) PRG0_MDIO | | | 17 MDIO |
| | | PRG0_RGMII1_RESET# | 43 RESET_N |
| | | | 44 INT/PWDN |
| | | | 20 JTAG_CLK |
| | | | 23 JTAG_TDI |
| | | | 21 JTAG_TDO |
| | | | 22 JTAG_TMS |
| | | | 49 EP |

VDD_IO_PHY: 19 VDDIO, 30 VDDIO, 41 VDDIO
VDD_1V0: 6 VDDA1P0, 24 VDD1P0, 31 VDD1P0, 42 VDD1P0
TP17 DNI
VDD_2V5: 13 VDDA1P8, 48 VDDA1P8, 3 VDDA2P5, 9 VDDA2P5

| | | |
|---|---|---|
| 12 RBIAS | PRG0_RGMII1_RBIAS_11K_1% | R77 — DGND |
| 39 GPIO_0 | PRG0_RGMII1_GPIO0_100 | |
| 40 GPIO_1 | PRG0_RGMII1_GPIO1 | |
| 1 TD_P_A | | |
| 2 TD_M_A | | |
| 4 TD_P_B | | |
| 5 TD_M_B | | |
| 7 TD_P_C | | |
| 8 TD_M_C | | |
| 10 TD_P_D | | |
| 11 TD_M_D | | |
| 47 LED0 | PRG0_RGMII1_LED0 | |
| 46 LED1 | PRG0_RGMII1_LED1_1000 | |
| 45 LED2 | PRG0_RGMII1_LED2_ACT | |

J21A

| | | |
|---|---|---|
| PRG0_RGMII1_D0_P | A9 / A1 | TX1+ |
| PRG0_RGMII1_D0_N | A2 | TX1- |
| PRG0_RGMII1_D1_P | A3 | TX2+ |
| PRG0_RGMII1_D1_N | A4 | TX2- |
| PRG0_RGMII1_D2_P | A5 | TX3+ |
| PRG0_RGMII1_D2_N | A6 | TX3- |
| PRG0_RGMII1_D3_P | A7 | TX4+ |
| PRG0_RGMII1_D3_N | A8 | TX4- |
| | SH1 | SH2 — ETH_EARTH |

VCC_3V3 — R66 220E 1% — PRG0_RGMII1_ACT_LED — A10 / A12 / A11
YELLOW — RIGHT LED
R82 220E 1% PRG0_RGMII1_1000Mbps — A14
ORANGE — LEFT LED
R80 220E 1% PRG0_RGMII1_100Mbps — A13
GREEN
CON_RJ45-28_LPJG17512AONL
DGND

C184 1000pF 2KV — R271 1M 1% — DGND — ETH_EARTH

## RESET LOGIC

VDD_IO_PHY — C50 0.1uF 50V — DGND
U38 SN74LVC1G08DBVRE4
(4,11,12,13,23) SOC_PORZ_OUT
(4,11) GPIO_PRG0_RGMII_RST — R246 0E — GPIO_PRG0_RGMII1_RST — R245 DNI — DGND
(4,11) PRG0_RGMII_INT#

| RJ45-LED | FUNCTION |
|---|---|
| YELLOW | ACTIVITY |
| ORANGE | 1000Mbps Speed |
| GREEN | 100Mbps Speed |

## SPEED AND ACTIVITY LED DRIVERS

VDD_IO_PHY — R79 DNI, R84 DNI, R251 5.76K_1%, R255 10K_1%, R254 DNI, R252 DNI, R253 DNI, R256 DNI
R78 DNI, R85 DNI, R93 2.49K_1%, R89 2.49K_1%, R90 DNI, R92 DNI, R91 DNI, R88 DNI — DGND

PRG0_RGMII1_RD0_R
PRG0_RGMII1_RD2_R
PRG0_RGMII1_RX_CTL_R
PRG0_RGMII1_LED1_1000
PRG0_RGMII1_LED2_ACT
PRG0_RGMII1_GPIO0_100
PRG0_RGMII1_GPIO1
PRG0_RGMII1_LED0

PHY ADD = 00000
Auto_neg = Enabled
ANEGsel 10/100/1000
RGMII Clock Skew TX = 0ns
RGMII Clock Skew RX = 2ns

PRG0_RGMII1_100Mbps — PRG0_RGMII1_GPIO0_100 — Q9 BSS138-7-F — DGND
PRG0_RGMII1_1000Mbps — PRG0_RGMII1_LED1_1000 — Q11 BSS138-7-F — DGND
PRG0_RGMII1_ACT_LED — PRG0_RGMII1_LED2_ACT — Q7 BSS138-7-F — DGND

| | | |
|---|---|---|
| Project : J7 EVM | TEXAS INSTRUMENTS | Title: PRG0 GB_ETHERNET RGMII 1 |
| | | Size: C — PROC084 001 J7EXPC01EVM — Rev: E3A |
| | | Date: Thursday, December 05, 2019 — Sheet 10 of 25 |

# PRG0 GB_ETHERNET RGMII 2

TP48 PRG0_RGMII2_TD0
TP49 PRG0_RGMII2_TD1
TP50 PRG0_RGMII2_TD2
TP51 PRG0_RGMII2_TD3
TP52 PRG0_RGMII2_TX_CTL
TP53 PRG0_RGMII2_TXC

TP54 PRG0_RGMII2_RD0
TP55 PRG0_RGMII2_RD1
TP56 PRG0_RGMII2_RD2
TP57 PRG0_RGMII2_RD3
TP58 PRG0_RGMII2_RX_CTL
TP59 PRG0_RGMII2_RXC

VDD_IO_PHY: C43 0.1uF 50V, C161 0.1uF 50V, C154 0.1uF 50V, C41 1uF 10V, C47 10uF 16V → DGND

VDD_1V0: C48 10uF 16V, C40 1uF 10V, C156 1uF 10V, C44 0.1uF 50V, C159 0.1uF 50V, C155 0.1uF 50V, C160 0.1uF 50V → DGND

VDD_2V5: C162 1uF 10V, C157 1uF 10V, C39 0.1uF 50V, C42 0.1uF 50V → DGND

VDD_IO_PHY, VDD_1V0, TP14 DNI, VDD_2V5

## U5 DP83867ERGZT

| | | | |
|---|---|---|---|
| (4) PRG0_RGMII2_TD0 | R70 0E_1% | PRG0_RGMII2_TD0_R | 28 TX_D0/SGMII_SIN |
| (4) PRG0_RGMII2_TD1 | R71 0E_1% | PRG0_RGMII2_TD1_R | 27 TX_D1/SGMII_SIP |
| (4) PRG0_RGMII2_TD2 | R72 0E_1% | PRG0_RGMII2_TD2_R | 26 TX_D2 |
| (4) PRG0_RGMII2_TD3 | R76 0E_1% | PRG0_RGMII2_TD3_R | 25 TX_D3 |
| (4) PRG0_RGMII2_TX_CTL | R59 0E_1% | PRG0_RGMII2_TX_CTL_R | 37 TX_CTRL |
| (4) PRG0_RGMII2_TXC | R69 0E_1% | PRG0_RGMII2_TXC_R | 29 GTX_CLK |
| (4) PRG0_RGMII2_RD0 | R67 0E_1% | PRG0_RGMII2_RD0_R | 33 RX_D0/SGMII_COP |
| (4) PRG0_RGMII2_RD1 | R64 0E_1% | PRG0_RGMII2_RD1_R | 34 RX_D1/SGMII_CON |
| (4) PRG0_RGMII2_RD2 | R61 0E_1% | PRG0_RGMII2_RD2_R | 35 RX_D2/SGMII_SOP |
| (4) PRG0_RGMII2_RD3 | R60 0E_1% | PRG0_RGMII2_RD3_R | 36 RX_D3/SGMII_SON |
| (4) PRG0_RGMII2_RX_CTL | R58 0E_1% | PRG0_RGMII2_RX_CTL_R | 38 RX_CTRL |
| (4) PRG0_RGMII2_RXC | R68 0E_1% | PRG0_RGMII2_RXC_R | 32 RX_CLK |
| (6) PRG0_RGMII2_REF_CLK | R73 DNI, TP15 | PRG0_RGMII2_CLK_OUT | 18 CLK_OUT |
| | R75 0E | PRG0_RGMII2_XIN | 15 X_I |
| | | PRG0_RGMII2_XOUT | 14 X_O |
| (9,10) PRG0_MDC | | | 16 MDC |
| (9,10) PRG0_MDIO | | | 17 MDIO |
| | | PRG0_RGMII2_RESET# | 43 RESET_N |
| | | | 44 INT/PWDN |
| | | | 20 JTAG_CLK |
| | | | 23 JTAG_TDI |
| | | | 21 JTAG_TDO |
| | | | 22 JTAG_TMS |
| | | | 49 EP → DGND |

| | | | |
|---|---|---|---|
| | | PRG0_RGMII2_RBIAS 11K_1% R227 → DGND | 12 RBIAS |
| | | PRG0_RGMII2_GPIO0_100 | 39 GPIO_0 |
| | | PRG0_RGMII2_GPIO1 | 40 GPIO_1 |
| | | | 1 TD_P_A |
| | | | 2 TD_M_A |
| | | | 4 TD_P_B |
| | | | 5 TD_M_B |
| | | | 7 TD_P_C |
| | | | 8 TD_M_C |
| | | | 10 TD_P_D |
| | | | 11 TD_M_D |
| | | PRG0_RGMII2_LED0 | 47 LED0 |
| | | PRG0_RGMII2_LED1_1000 | 46 LED1 |
| | | PRG0_RGMII2_LED2_ACT | 45 LED2 |

C46 27pF, C45 27pF, Y2 25.000MHz 445I23D25M00000, R74 0E → DGND

## RESET LOGIC

VCC_3V3, R63 10K, VDD_IO_PHY, C38 0.1uF 50V → DGND

(4,10,12,13,23) SOC_PORZ_OUT

(4,10) GPIO_PRG0_RGMII_RST — R62 0E — GPIO_PRG0_RGMII2_RST

U4 SN74LVC1G08DBVRE4 → DGND

(4,10) PRG0_RGMII_INT#

Silk Screen for J21 TOP : "PRG0_RGMII2"

PCB Note: Route signals as 100-ohm differential

## RJ45

J21B — CON_RJ45-28_LPJG17512AONL

| | | |
|---|---|---|
| PRG0_RGMII2_D0_P | B1 | TX1+ |
| PRG0_RGMII2_D0_N | B2 | TX1- |
| PRG0_RGMII2_D1_P | B3 | TX2+ |
| PRG0_RGMII2_D1_N | B4 | TX2- |
| PRG0_RGMII2_D2_P | B5 | TX3+ |
| PRG0_RGMII2_D2_N | B6 | TX3- |
| PRG0_RGMII2_D3_P | B7 | TX4+ |
| PRG0_RGMII2_D3_N | B8 | TX4- |
| | B9 | |
| | B10 | SH3 |
| | B12 | SH4 → ETH_EARTH |
| PRG0_RGMII2_ACT_LED | B11 | |
| PRG0_RGMII2_1000Mbps | B14 | |
| PRG0_RGMII2_100Mbps | B13 | |

VCC_3V3, R65 220E_1% → YELLOW (RIGHT LED), R83 220E_1% → ORANGE (LEFT LED), R81 220E_1% → GREEN (LEFT LED) → DGND

| RJ45-LED | FUNCTION |
|---|---|
| YELLOW | ACTIVITY |
| ORANGE | 1000Mbps Speed |
| GREEN | 100Mbps Speed |

VDD_IO_PHY

R223 2.49K_1%, R222 DNI, R57 5.76K_1%, R53 10K_1%, R54 DNI, R56 DNI, R55 DNI, R52 DNI

R224 DNI, R218 DNI, R209 2.49K_1%, R213 2.49K_1%, R212 DNI, R210 DNI, R211 DNI, R214 DNI → DGND

PRG0_RGMII2_RD0_R
PRG0_RGMII2_RD2_R
PRG0_RGMII2_RX_CTL_R
PRG0_RGMII2_LED1_1000
PRG0_RGMII2_LED2_ACT
PRG0_RGMII2_GPIO0_100
PRG0_RGMII2_GPIO1
PRG0_RGMII2_LED0

PHY ADD = 00011
Auto_neg = Enabled
ANEGsel 10/100/1000
RGMII Clock Skew TX = 0ns
RGMII Clock Skew RX = 2ns

## SPEED AND ACTIVITY LED DRIVERS

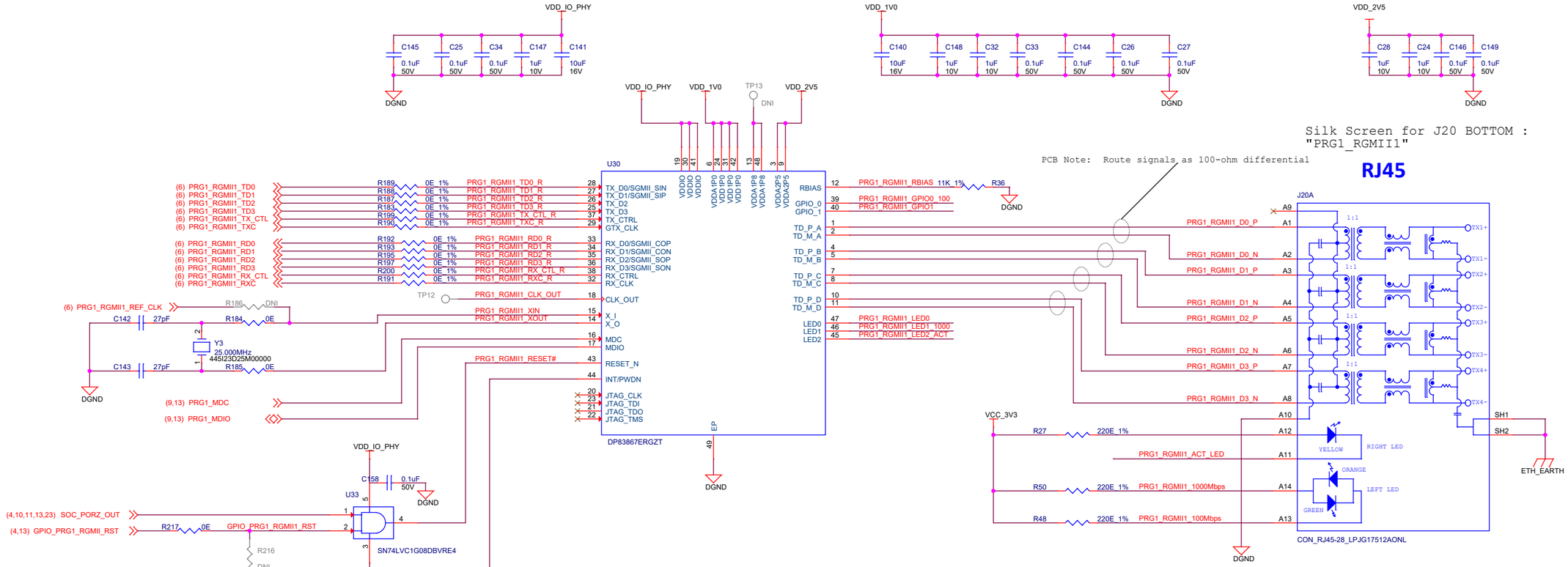
PRG0_RGMII2_100Mbps — PRG0_RGMII2_GPIO0_100 — Q10 BSS138-7-F → DGND

PRG0_RGMII2_1000Mbps — PRG0_RGMII2_LED1_1000 — Q12 BSS138-7-F → DGND

PRG0_RGMII2_ACT_LED — PRG0_RGMII2_LED2_ACT — Q8 BSS138-7-F → DGND

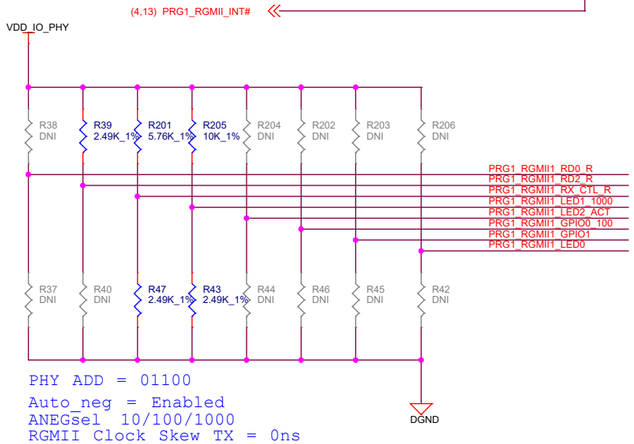
| | | | |
|---|---|---|---|
| Project : J7 EVM | TEXAS INSTRUMENTS | Title: PRG0 GB_ETHERNET RGMII 2 | |
| | | Size: C — PROC084 001 J7EXPC01EVM | Rev: E3A |
| | | Date: Thursday, December 05, 2019 | Sheet 11 of 25 |

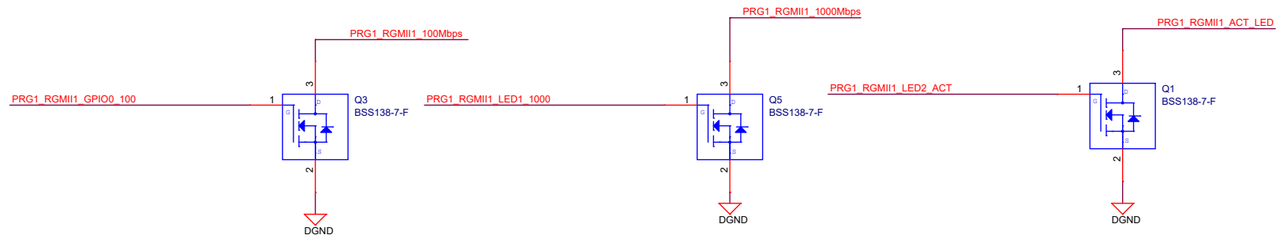
# PRG1 GB_ETHERNET RGMII 1










| RJ45-LED | FUNCTION |
|---|---|
| YELLOW | ACTIVITY |
| ORANGE | 1000Mbps Speed |
| GREEN | 100Mbps Speed |

| | | |
|---|---|---|
| Project : J7 EVM | TEXAS INSTRUMENTS | Title: PRG1 GB_ETHERNET RGMII 1 |
| | | Size: C — PROC084 001 J7EXPC01EVM — Rev: E3A |
| | | Date: Thursday, December 05, 2019 — Sheet 12 of 25 |

# PRG1 GB_ETHERNET RGMII 2

TP36 PRG1_RGMII2_TD0
TP37 PRG1_RGMII2_TD1
TP38 PRG1_RGMII2_TD2
TP39 PRG1_RGMII2_TD3
TP40 PRG1_RGMII2_TX_CTL
TP41 PRG1_RGMII2_TXC

TP42 PRG1_RGMII2_RD0
TP43 PRG1_RGMII2_RD1
TP44 PRG1_RGMII2_RD2
TP45 PRG1_RGMII2_RD3
TP46 PRG1_RGMII2_RX_CTL
TP47 PRG1_RGMII2_RXC

VDD_IO_PHY: C138 0.1uF, C132 0.1uF, C9 0.1uF, C16 1uF, C22 10uF → DGND

VDD_1V0: C23 10uF, C134 1uF, C15 1uF, C133 0.1uF, C136 0.1uF, C19 0.1uF, C137 0.1uF → DGND

VDD_2V5: C139 1uF 10V, C135 1uF 10V, C17 0.1uF 50V, C13 0.1uF 50V → DGND

TP7 DNI

U3 DP83867ERGZT

VDDIO (19, 30, 41) VDD_IO_PHY
VDD1P0 (6, 24, 33, 42) VDD_1V0
VDD1P8 (13, 48) VDD_1V0
VDDA2P5 (3, 9) VDD_2V5

| | | | |
|---|---|---|---|
| (4) PRG1_RGMII2_TD0 | R29 0E_1% | PRG1_RGMII2_TD0_R | 28 TX_D0/SGMII_SIN |
| (4) PRG1_RGMII2_TD1 | R30 0E_1% | PRG1_RGMII2_TD1_R | 27 TX_D1/SGMII_SIP |
| (4) PRG1_RGMII2_TD2 | R31 0E_1% | PRG1_RGMII2_TD2_R | 26 TX_D2 |
| (4) PRG1_RGMII2_TD3 | R35 0E_1% | PRG1_RGMII2_TD3_R | 25 TX_D3 |
| (4) PRG1_RGMII2_TX_CTL | R17 0E_1% | PRG1_RGMII2_TX_CTL_R | 37 TX_CTRL |
| (4) PRG1_RGMII2_TXC | R28 0E_1% | PRG1_RGMII2_TXC_R | 29 GTX_CLK |
| (4) PRG1_RGMII2_RD0 | R24 0E_1% | PRG1_RGMII2_RD0_R | 33 RX_D0/SGMII_COP |
| (4) PRG1_RGMII2_RD1 | R23 0E_1% | PRG1_RGMII2_RD1_R | 34 RX_D1/SGMII_CON |
| (4) PRG1_RGMII2_RD2 | R22 0E_1% | PRG1_RGMII2_RD2_R | 35 RX_D2/SGMII_SOP |
| (4) PRG1_RGMII2_RD3 | R19 0E_1% | PRG1_RGMII2_RD3_R | 36 RX_D3/SGMII_SON |
| (4) PRG1_RGMII2_RX_CTL | R16 0E_1% | PRG1_RGMII2_RX_CTL_R | 38 RX_CTRL |
| (4) PRG1_RGMII2_RXC | R25 0E_1% | PRG1_RGMII2_RXC_R | 32 RX_CLK |

RBIAS: 12 PRG1_RGMII2_RBIAS 11K_1% R182 → DGND

GPIO_0: 39 PRG1_RGMII2_GPIO0_100
GPIO_1: 40 PRG1_RGMII2_GPIO1

TD_P_A/TD_M_A: 1, 2
TD_P_B/TD_M_B: 4, 5
TD_P_C/TD_M_C: 7, 8
TD_P_D/TD_M_D: 10, 11

LED0: 47 PRG1_RGMII2_LED0
LED1: 46 PRG1_RGMII2_LED1_1000
LED2: 45 PRG1_RGMII2_LED2_ACT

TP11 PRG1_RGMII2_CLK_OUT → 18 CLK_OUT

(6) PRG1_RGMII2_REF_CLK — R32 DNI — C21 27pF — R34 0E — C20 27pF — R33 0E — Y1 25.000MHz 445I23D25M00000 — DGND

PRG1_RGMII2_XIN → 15 X_I
PRG1_RGMII2_XOUT → 14 X_O

16 MDC
17 MDIO
(9,12) PRG1_MDC
(9,12) PRG1_MDIO

PRG1_RGMII2_RESET# → 43 RESET_N

44 INT/PWDN

20 JTAG_CLK
23 JTAG_TDI
21 JTAG_TDO
22 JTAG_TMS

EP 49 → DGND

(4,12) PRG1_RGMII_INT#

## RESET LOGIC

VCC_3V3
R21 10K
VDD_IO_PHY
C18 0.1uF 50V → DGND

U2 SN74LVC1G08DBVRE4
(4,10,11,12,23) SOC_PORZ_OUT
(4,12) GPIO_PRG1_RGMII_RST — R20 0E — GPIO_PRG1_RGMII2_RST
→ DGND

Silk Screen for J20 TOP : "PRG1_RGMII2"

PCB Note: Route signals as 100-ohm differential

## RJ45

J20B CON_RJ45-28_LPJG17512AONL

| | | |
|---|---|---|
| PRG1_RGMII2_D0_P | B9 / B1 | TX1+ |
| PRG1_RGMII2_D0_N | B2 | TX1- |
| PRG1_RGMII2_D1_P | B3 | TX2+ |
| PRG1_RGMII2_D1_N | B4 | TX2- |
| PRG1_RGMII2_D2_P | B5 | TX3+ |
| PRG1_RGMII2_D2_N | B6 | TX3- |
| PRG1_RGMII2_D3_P | B7 | TX4+ |
| PRG1_RGMII2_D3_N | B8 | TX4- |

1:1 transformers

VCC_3V3
R26 220E_1% — PRG1_RGMII2_ACT_LED — B11 — YELLOW — RIGHT LED
R51 220E_1% — PRG1_RGMII2_1000Mbps — B14 — ORANGE — LEFT LED
R49 220E_1% — PRG1_RGMII2_100Mbps — B13 — GREEN
B10, B12 → DGND

SH3, SH4 → ETH_EARTH

| RJ45-LED | FUNCTION |
|---|---|
| YELLOW | ACTIVITY |
| ORANGE | 1000Mbps Speed |
| GREEN | 100Mbps Speed |

## SPEED AND ACTIVITY LED DRIVERS

PRG1_RGMII2_GPIO0_100 → Q4 BSS138-7-F (PRG1_RGMII2_100Mbps) → DGND
PRG1_RGMII2_LED1_1000 → Q6 BSS138-7-F (PRG1_RGMII2_1000Mbps) → DGND
PRG1_RGMII2_LED2_ACT → Q2 BSS138-7-F (PRG1_RGMII2_ACT_LED) → DGND

VDD_IO_PHY

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| R180 2.49K_1% | R179 2.49K_1% | R15 5.76K_1% | R11 10K_1% | R12 DNI | R14 DNI | R13 DNI | R10 DNI |
| R181 DNI | R178 DNI | R170 2.49K_1% | R174 2.49K_1% | R173 DNI | R171 DNI | R172 DNI | R175 DNI |

PRG1_RGMII2_RD0_R
PRG1_RGMII2_RD2_R
PRG1_RGMII2_RX_CTL_R
PRG1_RGMII2_LED1_1000
PRG1_RGMII2_LED2_ACT
PRG1_RGMII2_GPIO0_100
PRG1_RGMII2_GPIO1
PRG1_RGMII2_LED0

→ DGND

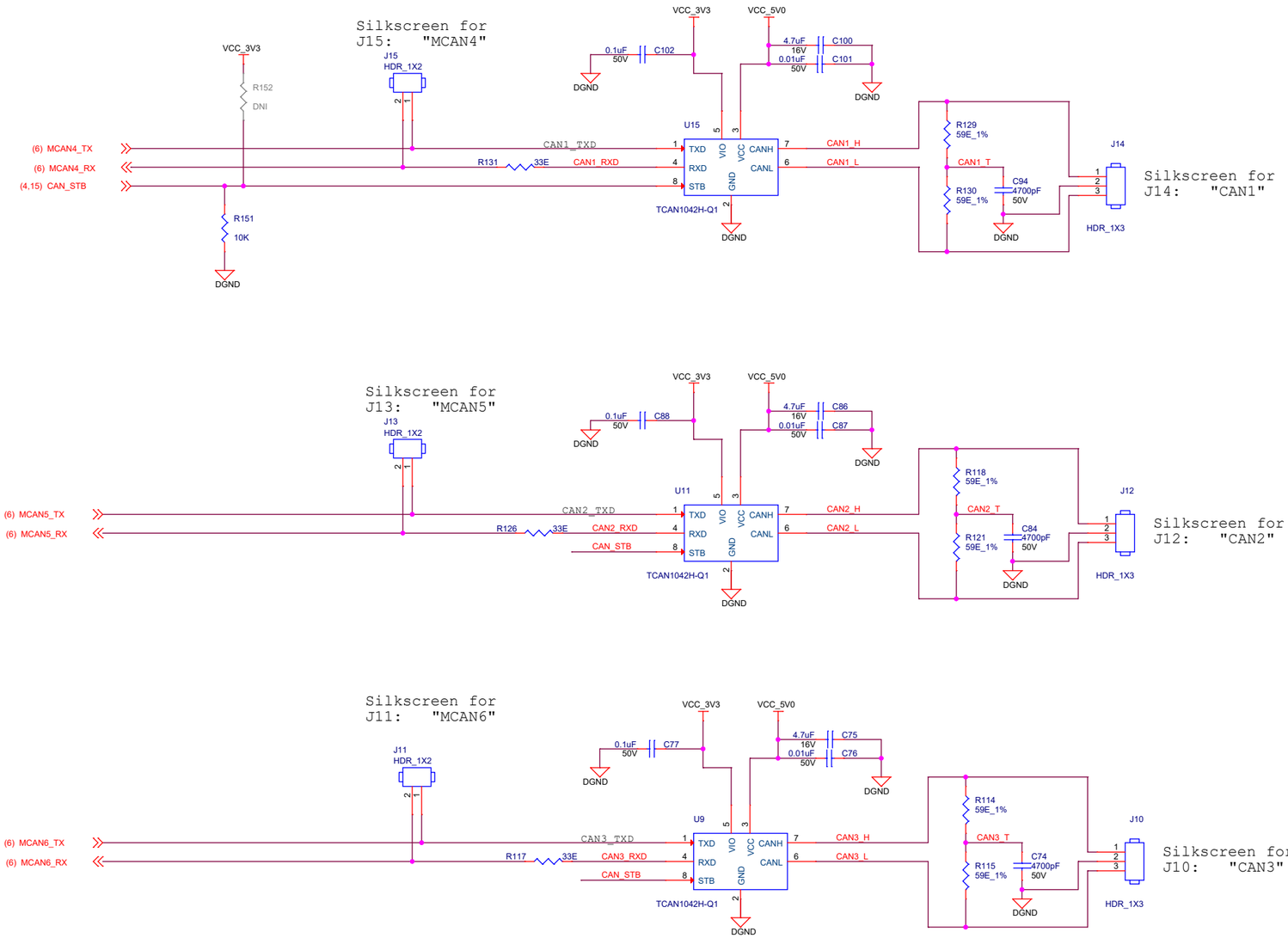
PHY ADD = 01111
Auto_neg = Enabled
ANEGsel 10/100/1000
RGMII Clock Skew TX = 0ns
RGMII Clock Skew RX = 2ns

Project : J7 EVM

TEXAS INSTRUMENTS

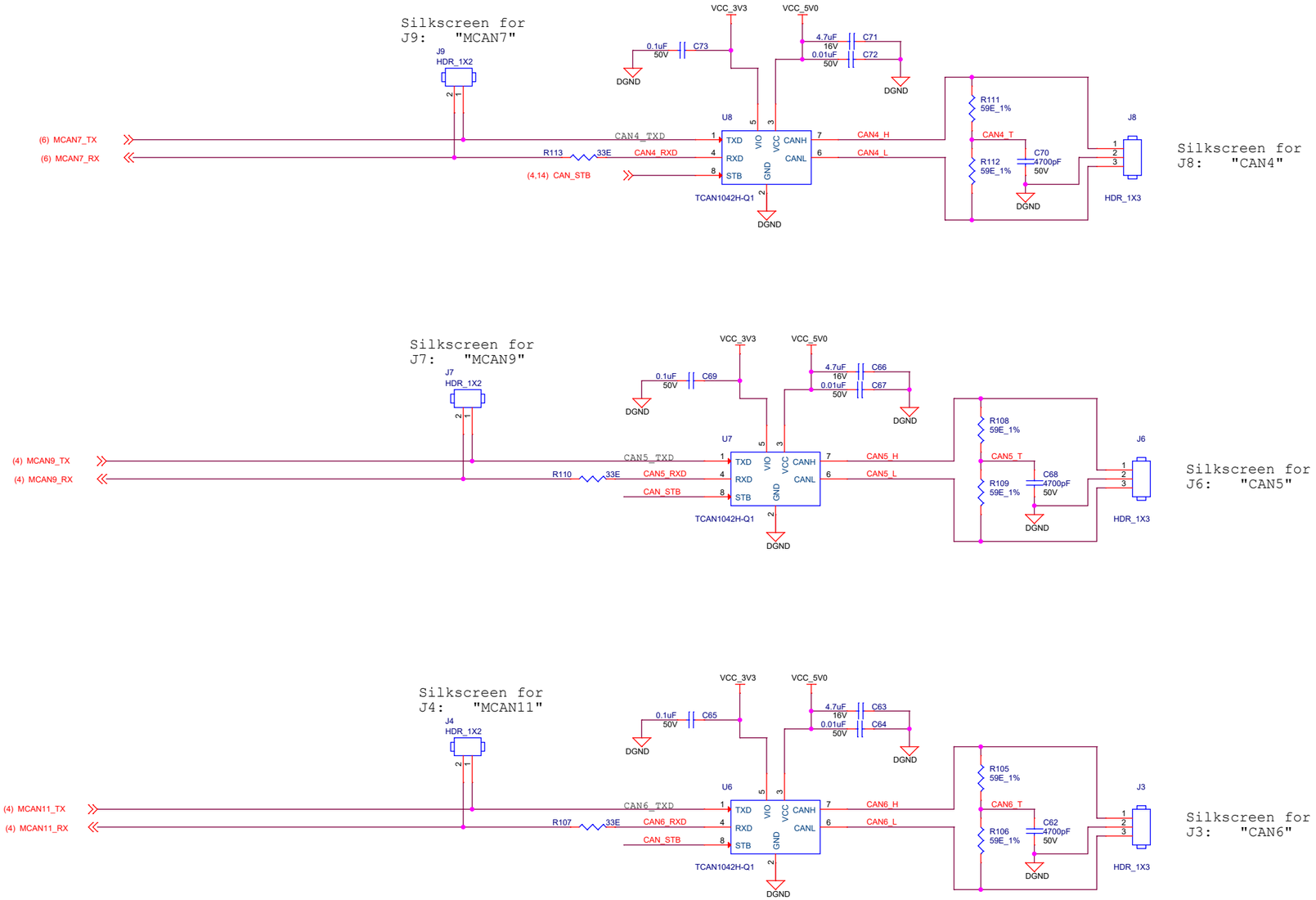
| | |
|---|---|
| Title | PRG1 GB_ETHERNET RGMII 2 |
| Size | C |
| | PROC084 001 J7EXPC01EVM |
| Rev | E3A |
| Date: | Thursday, December 05, 2019 |
| Sheet | 13 of 25 |

# CAN TRANSCEIVERS - 01



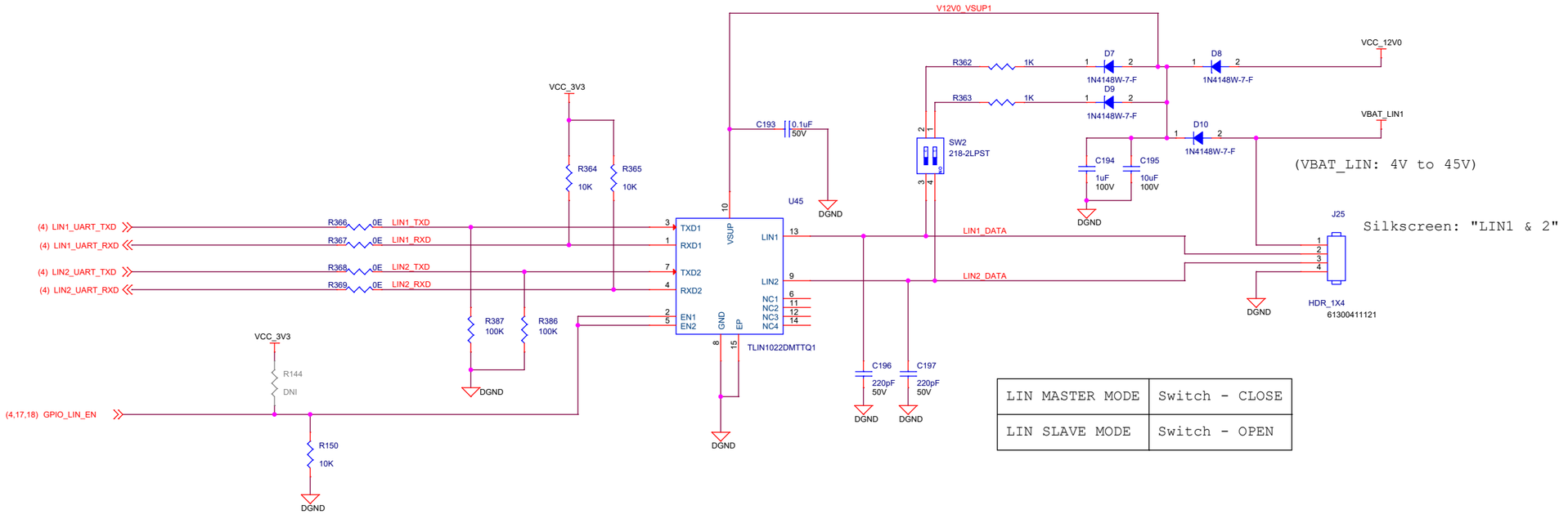

| | | | |
|---|---|---|---|
| Project : J7 EVM | TEXAS INSTRUMENTS | Title: CAN TRANSCEIVERS - 01 | |
| | | Size: C | PROC084 001 J7EXPC01EVM — Rev: E3A |
| | | Date: Thursday, December 05, 2019 | Sheet 14 of 25 |

# CAN TRANSCEIVERS - 02




| | | |
|---|---|---|
| Project : J7 EVM | TEXAS INSTRUMENTS | Title: CAN TRANSCEIVERS - 02 |
| | | Size: C — PROC084 001 J7EXPC01EVM — Rev: E3A |
| | | Date: Thursday, December 05, 2019 — Sheet 15 of 25 |

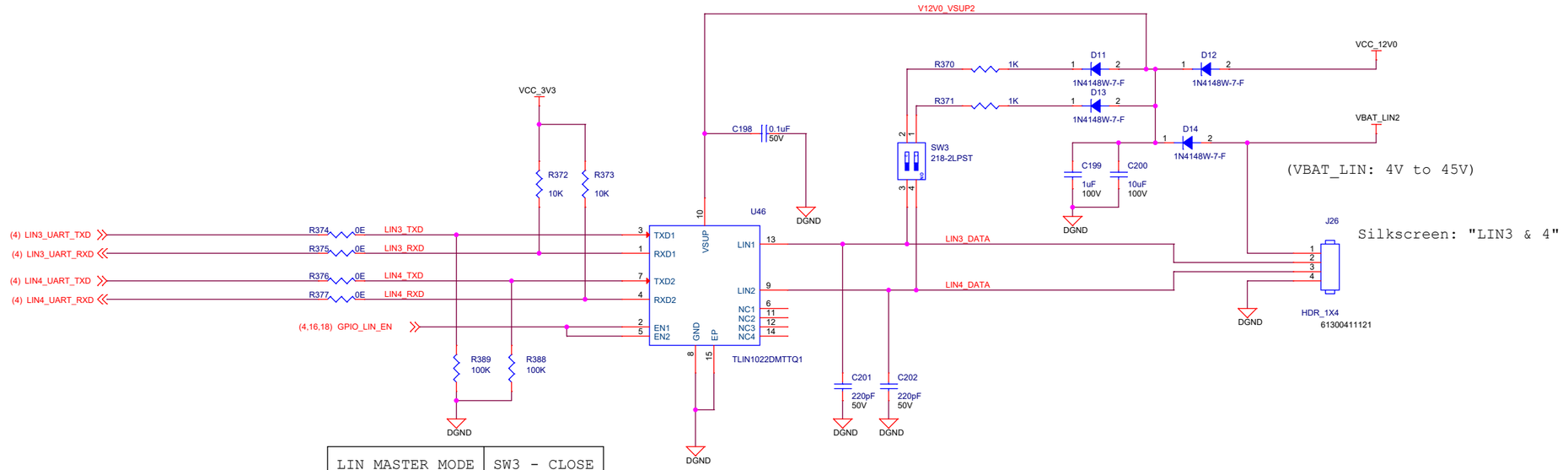
# LIN INTERFACE - 01




| | |
|---|---|
| LIN MASTER MODE | Switch - CLOSE |
| LIN SLAVE MODE | Switch - OPEN |

| | | | |
|---|---|---|---|
| Project : J7_EVM | TEXAS INSTRUMENTS | Title: LIN INTERFACE-01 | |
| | | Size: C | PROC084 001 J7EXPC01EVM — Rev: E3 |
| | | Date: Thursday, December 05, 2019 | Sheet 16 of 25 |

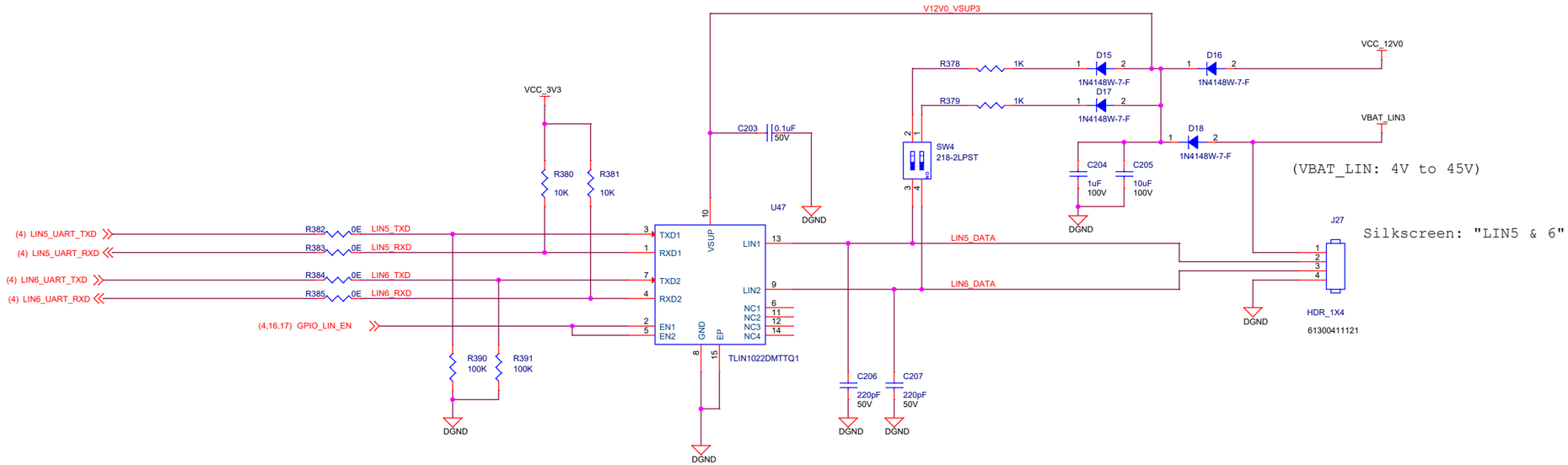
# LIN INTERFACE - 02




| | |
|---|---|
| LIN MASTER MODE | SW3 - CLOSE |
| LIN SLAVE MODE | SW3 - OPEN |

| | | | |
|---|---|---|---|
| Project : J7_EVM | | Title: LIN INTERFACE-02 | |
| | | Size: C | PROC084 001 J7EXPC01EVM — Rev: E3 |
| | | Date: Thursday, December 05, 2019 | Sheet 17 of 25 |

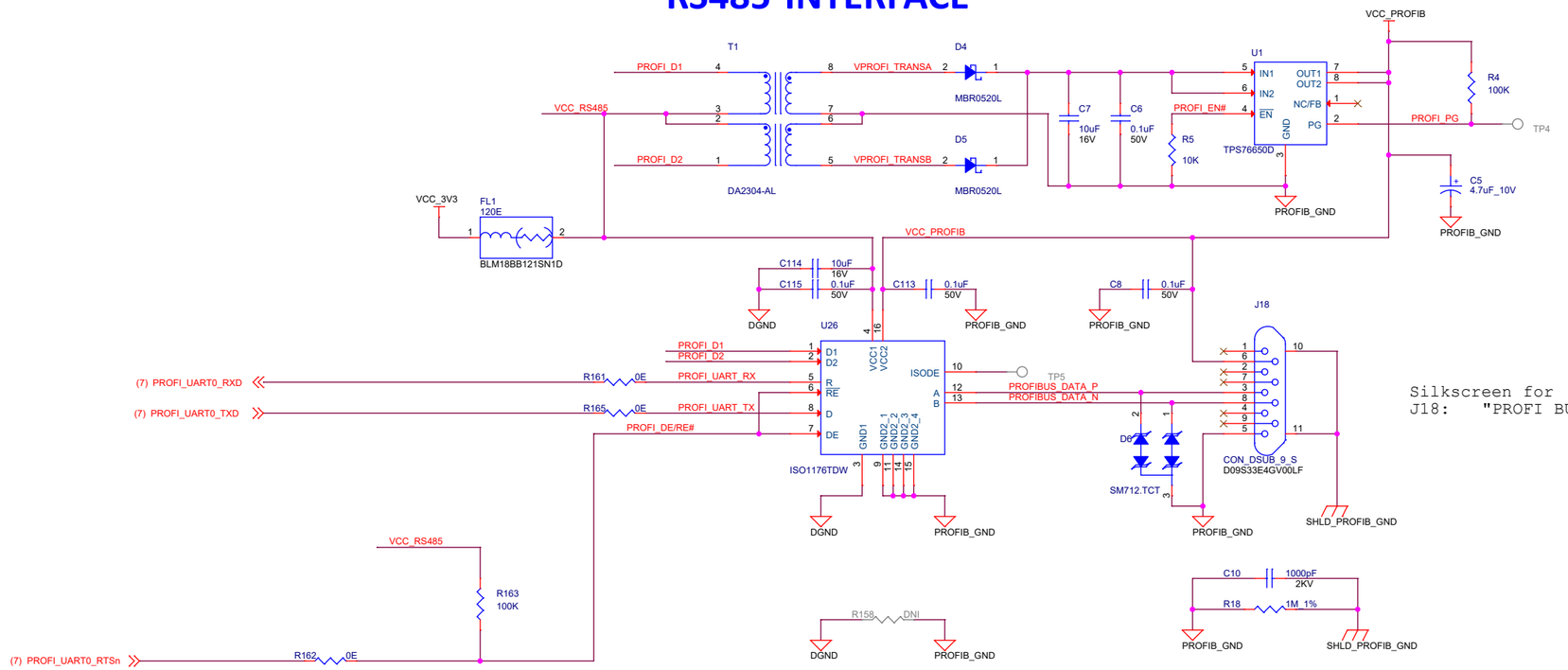
# LIN INTERFACE - 03




| | |
|---|---|
| LIN MASTER MODE | SW4 - CLOSE |
| LIN SLAVE MODE | SW4 - OPEN |

| | | | |
|---|---|---|---|
| Project : J7_EVM | TEXAS INSTRUMENTS | Title: LIN INTERFACE-03 | |
| | | Size: C | PROC084 001 J7EXPC01EVM — Rev: E3 |
| | | Date: Thursday, December 05, 2019 | Sheet 18 of 25 |

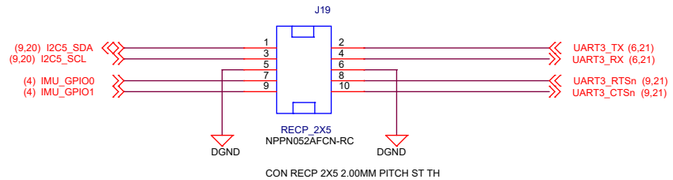
# RS485 INTERFACE




Silkscreen for
J18: "PROFI BUS"

| | | |
|---|---|---|
| Project : J7 EVM | TEXAS INSTRUMENTS | Title: RS485 INTERFACE |
| | | Size: C — PROC084 001 J7EXPC01EVM — Rev: E3A |
| | | Date: Thursday, December 05, 2019 — Sheet 19 of 25 |

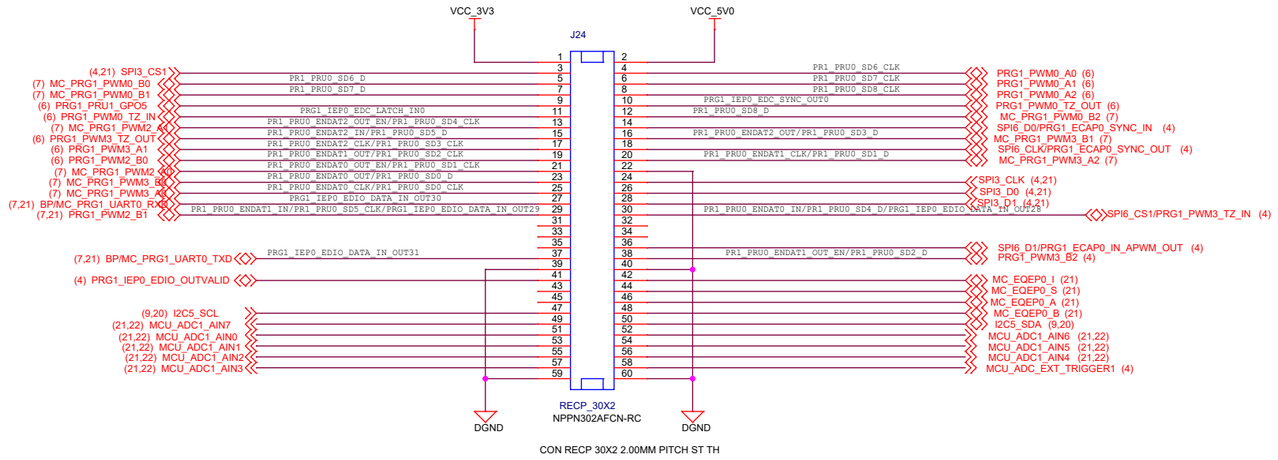
# USS/IMU SENSOR HEADER




CON RECP 2X5 2.00MM PITCH ST TH

Silkscreen for J19:
"IMU/USS HDR"

# MOTOR CONTROL HEADER



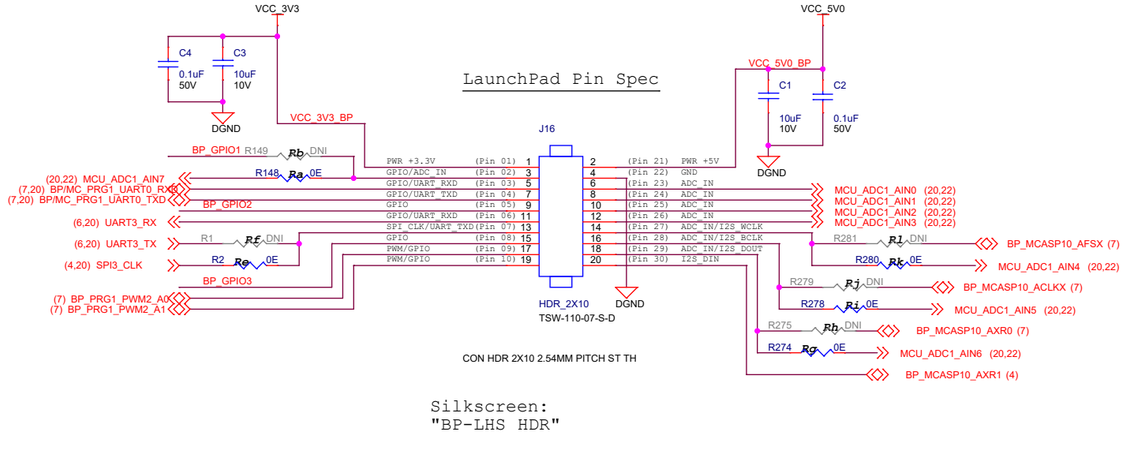

CON RECP 30X2 2.00MM PITCH ST TH

Silkscreen for J24:
"MOTOR CNTRL HDR"

| | | | |
|---|---|---|---|
| Project : J7 EVM | TEXAS INSTRUMENTS | Title: USS/IMU & MOTOR CONTROL | |
| | | Size: C | PROC084 001 J7EXPC01EVM — Rev: E3A |
| | | Date: Thursday, December 05, 2019 | Sheet 20 of 25 |

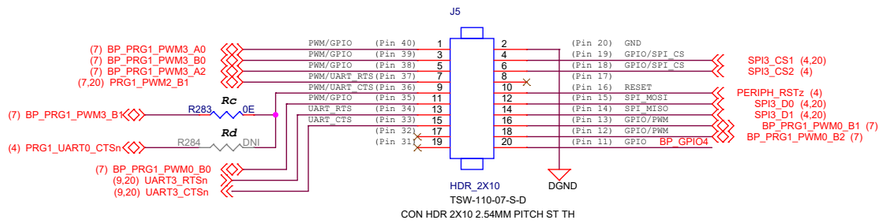
# GESI LAUNCHPAD- BOOSTERPACK INTERFACE HEADERS

## BOOSTER PACK I/F LHS CONN.

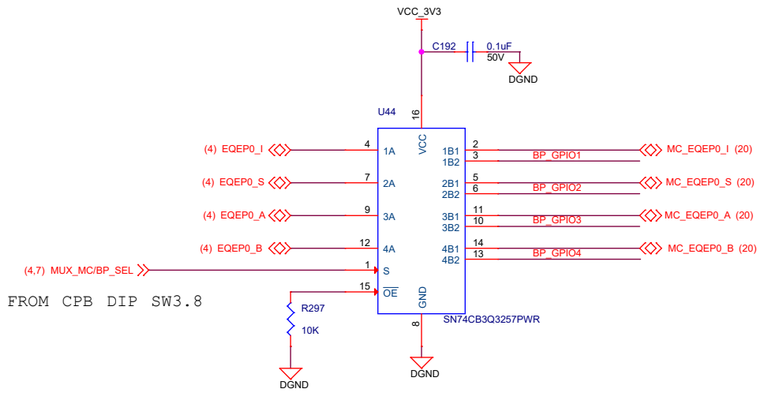



Silkscreen:
"BP-LHS HDR"

## BOOSTER PACK I/F RHS CONN.




Silkscreen:
"BP-RHS HDR"




NOTE: Except BOOST-DRV8848 all other below listed BP interfaces supported similar to maxwell EVM

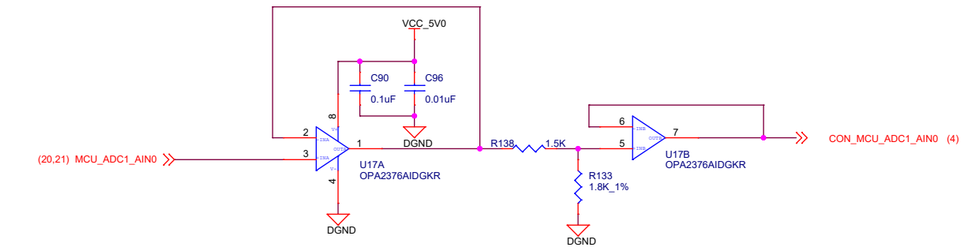
| S.No | Supported Booster Packs | Part to be mounted | Part not be mounted |
|---|---|---|---|
| 1 | BOOSTXL-ULN2003 | ***Ra*** | ***Rb*** |
| 2 | BOOST-DRV8711 | ***Rb*** | ***Ra*** |
| 3 | BOOSTXL-DRV8301 | ***Rc*** | ***Rd*** |
| 4 | CC3100BOOST | ***Rd*** | ***Rc*** |
| 5 | BOOST-CC2564MODA | ***Rd Rf Rh Rj Rl*** | ***Rc Re Rg Ri Rk*** |

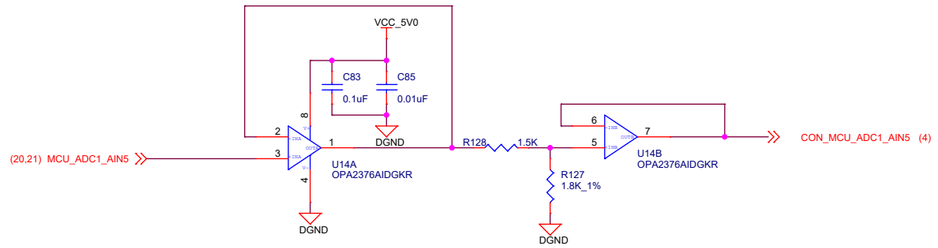
Project :
J7 EVM

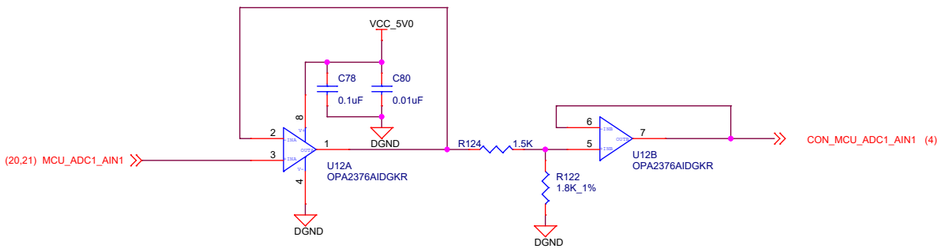
TEXAS INSTRUMENTS

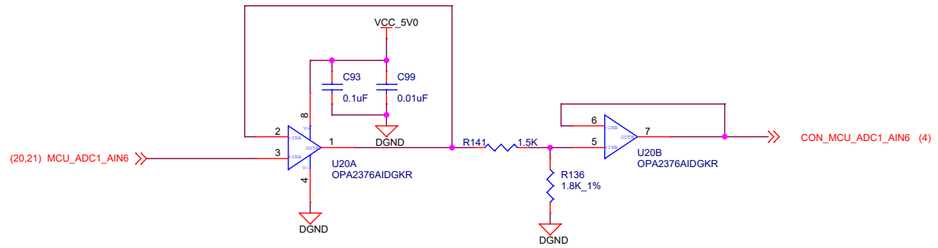
Title: BOOSTERPACK HEADER
Size: C | PROC084 001 J7EXPC01EVM | Rev: E3A
Date: Thursday, December 05, 2019 | Sheet 21 of 25

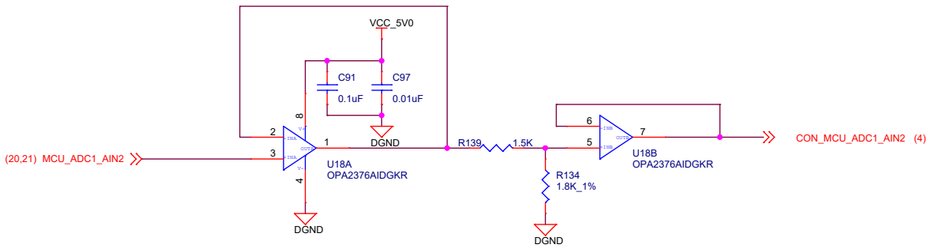
# ADC IN

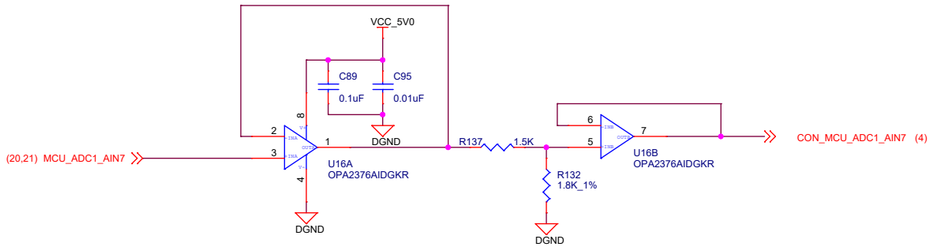


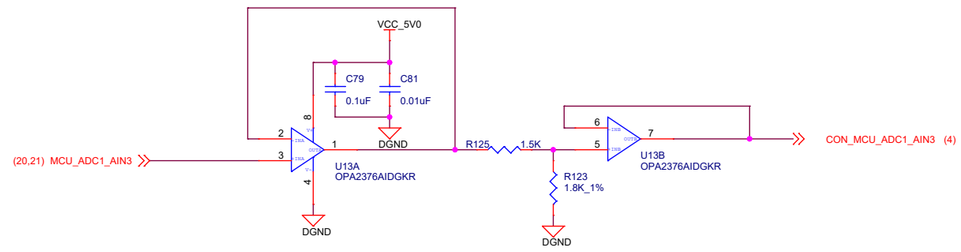



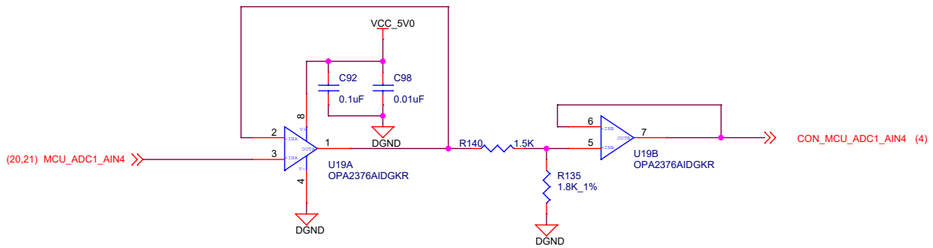



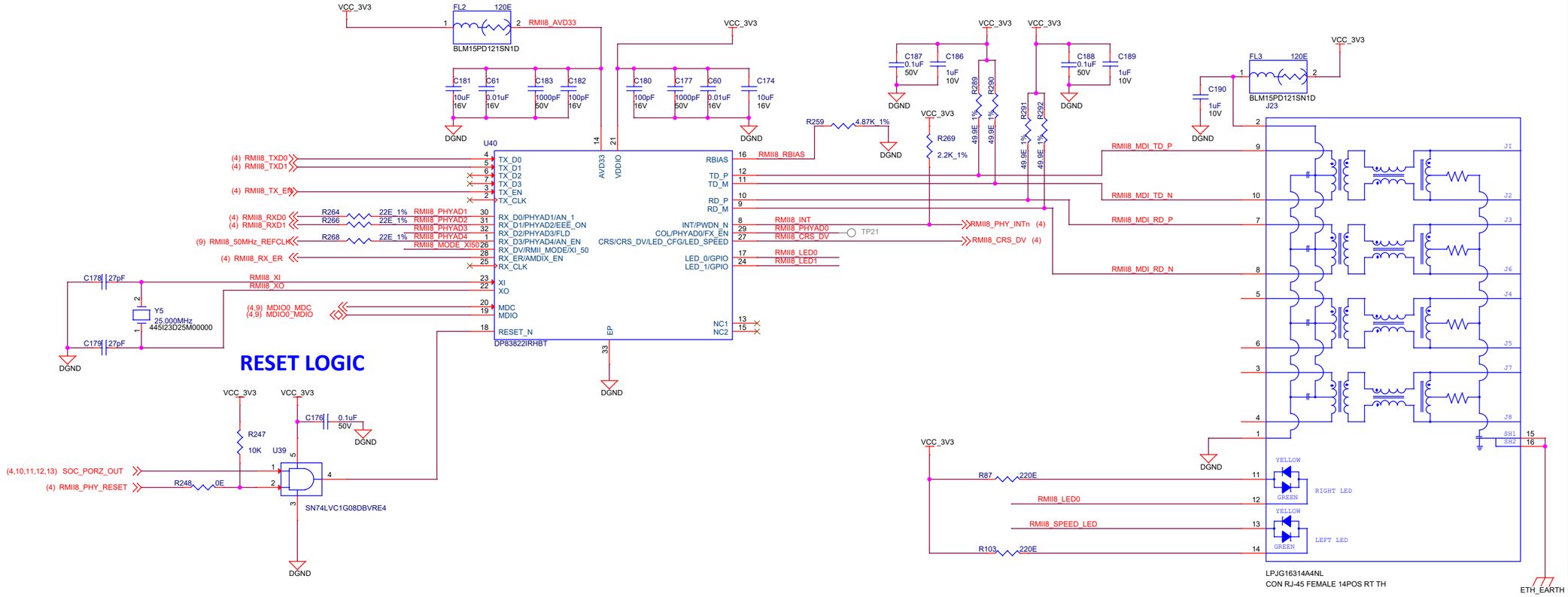




| | | |
|---|---|---|
| Project : J7 EVM | TEXAS INSTRUMENTS | Title: ADC IN |
| | | Size: C — PROC084 001 J7EXPC01EVM — Rev: E3A |
| | | Date: Thursday, December 05, 2019 — Sheet 22 of 25 |

# RMII8 INTERFACE




## RESET LOGIC




| PHY | Address | |
|---|---|---|
| QSGMII_PHY0 | 10000 | 0x10 |
| QSGMII_PHY1 | 10001 | 0x11 |
| QSGMII_PHY2 | 10010 | 0x12 |
| QSGMII_PHY3 | 10011 | 0x13 |
| PRG0_RGMII1 | 00000 | 0x00 |
| PRG0_RGMII2 | 00011 | 0x03 |
| PRG1_RGMII1 | 01100 | 0x0C |
| PRG1_RGMII2 | 01111 | 0x0F |
| RMII8 | 10111 | 0x17 |
| | | |

## RESISTOR STRAPPING

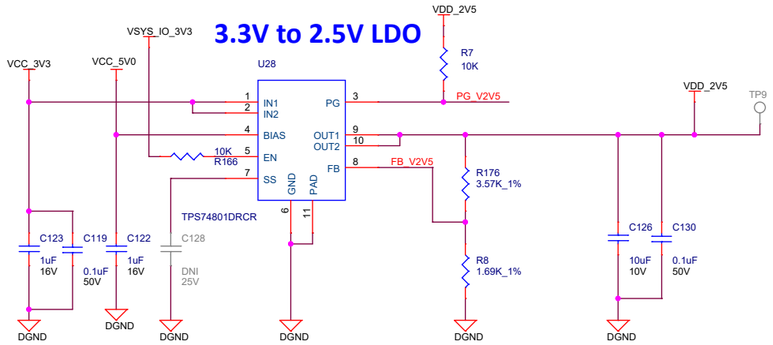


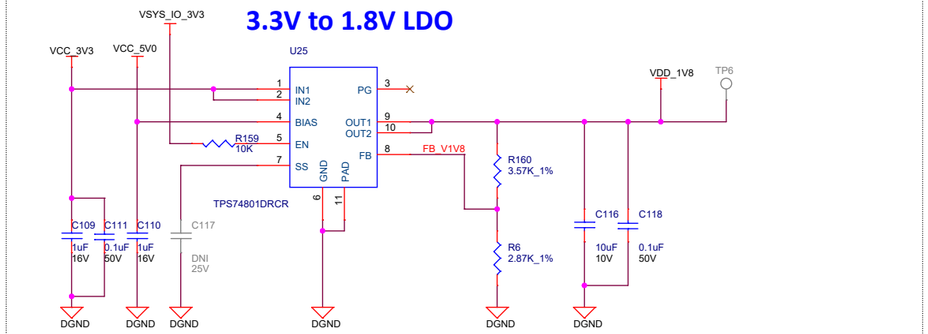

## PHY ADD : 10111

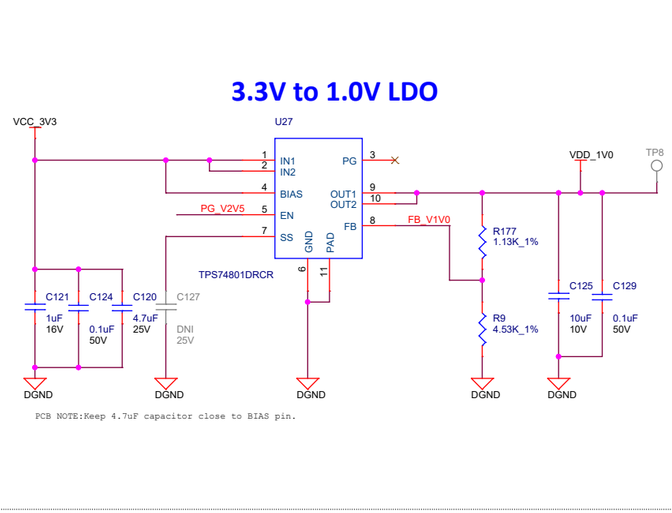
| Project : | | Title: RMII INTERFACE | |
|---|---|---|---|
| J7 EVM | TEXAS INSTRUMENTS | Size: C | PROC084 001 J7EXPC01EVM / Rev: E3A |
| | | Date: Thursday, December 05, 2019 | Sheet 23 of 25 |

# POWER SUPPLY

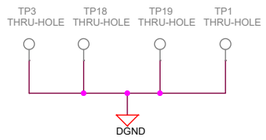
## ETHERNET POWER



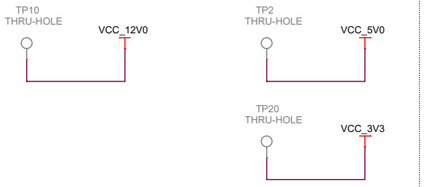




## GROUND TEST POINTS




## POWER TEST POINTS




| | | |
|---|---|---|
| Project : J7 EVM | TEXAS INSTRUMENTS | Title: P0WER SUPPLY |
| | | Size: C — PROC084 001 J7EXPC01EVM — Rev: E3A |
| | | Date: — Sheet 24 of 25 |

# HARDWARE SCHEMATICS

## ASSEMBLY NOTES

1. All MSL components should be baked as per JEDEC standard.

2. PCB should be baked at 120 degree for 8 hours.

3. Board assembly must comply with workmanship standards. IPC-A-610 Class 2, unless otherwise specified.

4. These assemblies are ESD sensitive, ESD precautions shall be observed.

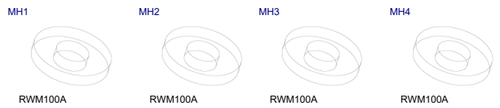
5. These assemblies must be clean and free from flux and all contaminants. Use of no clean flux is not acceptable.

6. Provide serial numbers to the assembled boards for identification.

7. The assembled board are wrapped in ESD Covers(individual) and packed securely before shipment.

## FIDUCIALS


## WASHERS



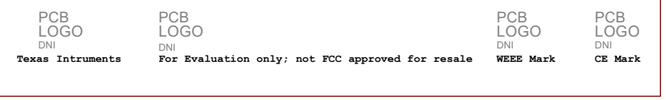

## BARE PCB


## LABELS

### Board Serial No.


### Assembly Revision.


## LOGOs




| | | |
|---|---|---|
| Project : J7 EVM | | Title: HARDWARE SCHEMATICS |
| | | Size: C — PROC084 001 J7EXPC01EVM — Rev: E3A |
| | | Date: Thursday, December 05, 2019 — Sheet 25 of 25 |