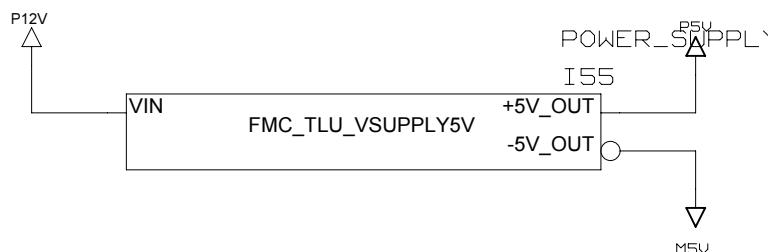
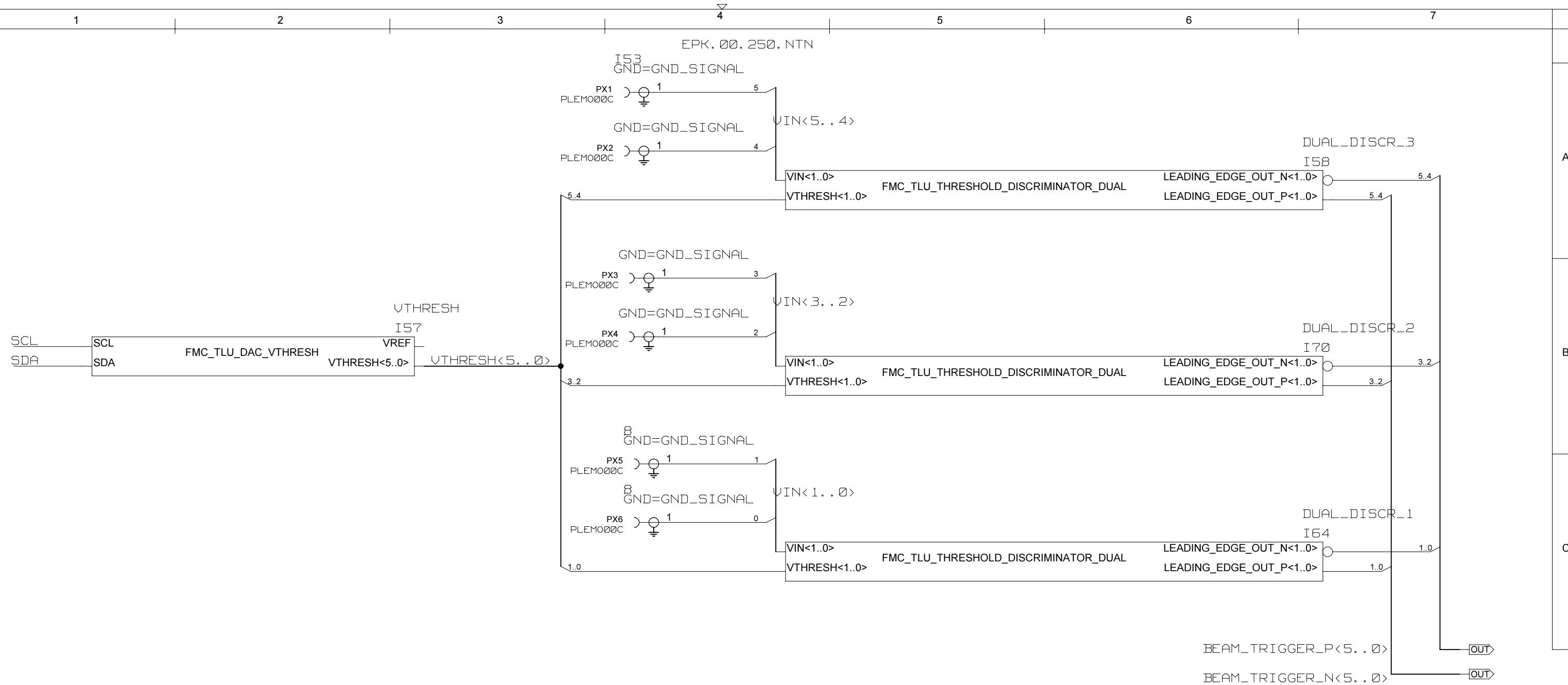




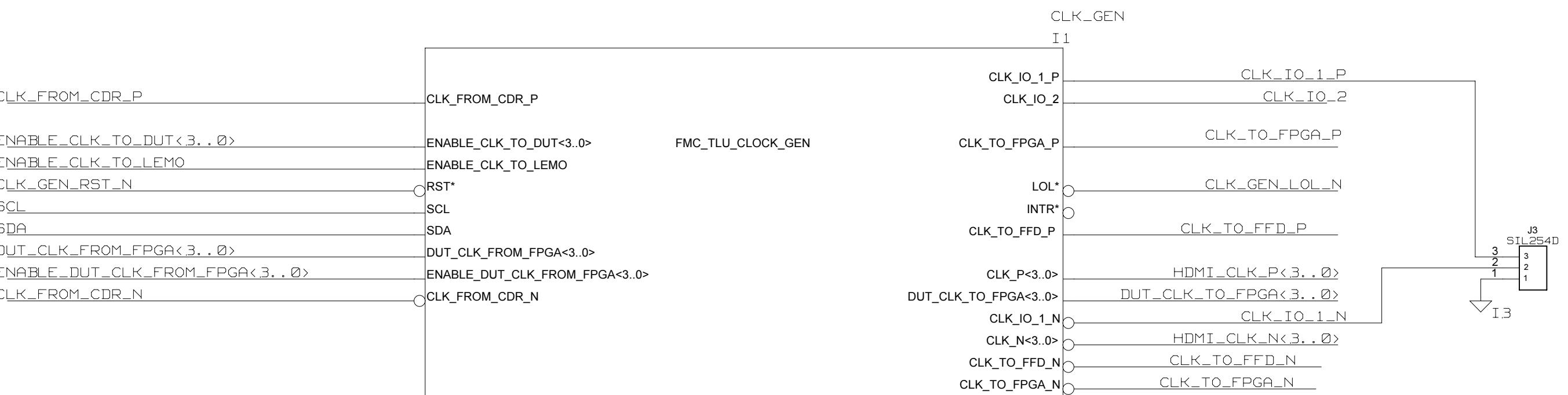
	Thu May 04 13:37:48 2017					
ISSUE	DATE	MOD NO.	DRN BY.	CHKD.	APPD.	STATUS
USED ON						
© UOB-HEP 2011						
UOB-HEP <small>UNIVERSITY OF BRISTOL HIGH ENERGY PHYSICS GROUP</small>						
H.H.WILLS PHYSICS LAB, TYNDALL AVE, BRISTOL, BS8 1TL.						
TITLE	fmc_tlu_v1.lib					FRONT PANEL DUT CONNECTORS
MODULE:	fmc_tlu_top_level.e					
						3 X HDMI < DUT ONLY >
						1 X HDMI < DUT OR UPLINK >
LICENSED UNDER THE TAPR OPEN HARDWARE LICENSE (WWW.TAPR.ORG/OHL)						
A2 MODULE PAGE: 2 OF 7 OVERALL PAGE: 2 OF 29						
TOTAL NO. OF SHEETS						



	Mon Mar 27 17:58:51 2017					
ISSUE	DATE	MOD NO.	DRN BY.	CHKD.	APPD.	STATUS
USED ON	© UOB-HEP 20					
UOB-HEP UNIVERSITY OF BRISTOL HIGH ENERGY PHYSICS GROUP	H.H.WILLS PHYSICS LAB, TYNDALL AVE, BRISTOL, BS8 1TL. LICENSED UNDER THE TAPR OPEN HARDWARE LICENSE (WWW.TAPR.ORG/OHL)					
TITLE	fmc_tlu_v1.lib					
MODULE:	fmc_tlu_top_level.e					
DISCRIMINATORS						
A	2	MODULE PAGE: 3 OF 7 OVERALL PAGE: 3 OF 29				

1 | 2 | 3 | 4 | 5 | 6 | 7

A



B

C

	Thu Mar 30 17:10:57 2017					
ISSUE	DATE	MOD NO.	DRN BY.	CHKD.	APPD.	STATUS
USED ON						

© UOB-HEP 20 16

UOB-HEP
UNIVERSITY OF BRISTOL
HIGH ENERGY PHYSICS GROUP
H.H.WILLS PHYSICS LAB, TYNDALL AVE, BRISTOL, BS8 1TL.

TITLE fmc_tlu_v1.lib CLOCK GENERATION
MODULE: fmc_tlu_top_level.e

LICENSED UNDER THE TAPR OPEN HARDWARE LICENSE (WWW.TAPR.ORG/OHL)

A2

MODULE PAGE: 4 OF 7
OVERALL PAGE: 4 OF 29

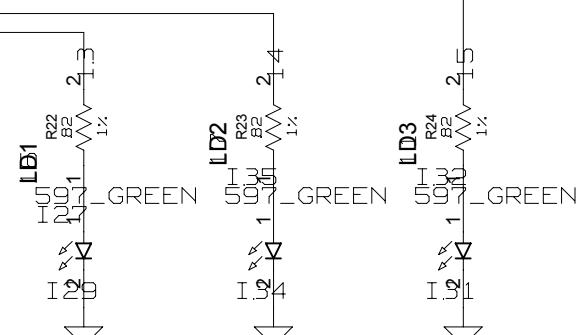
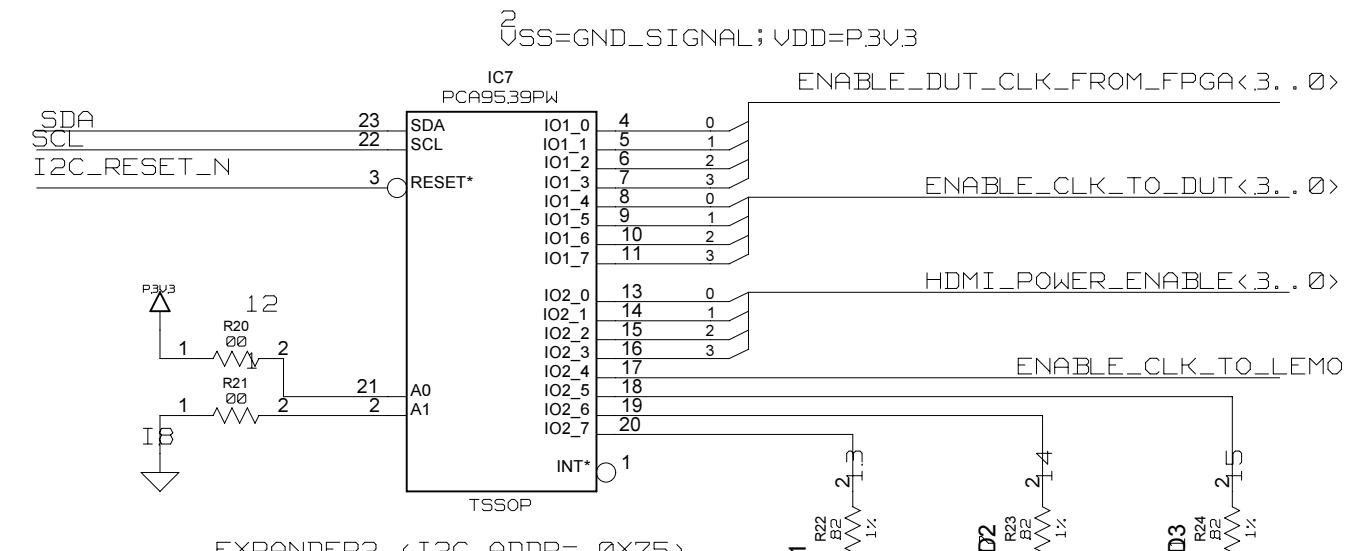
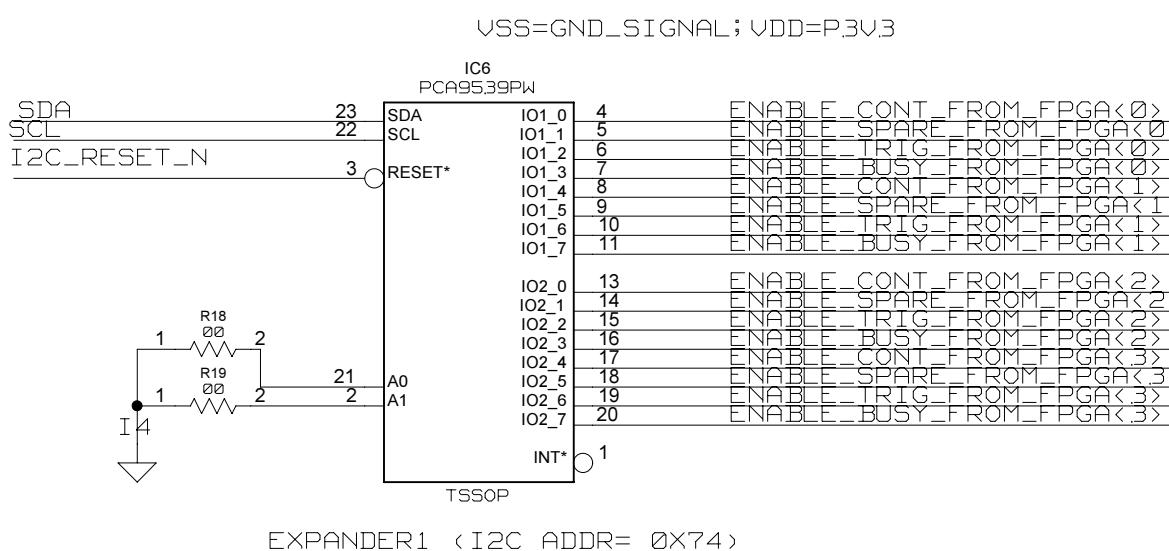
TOTAL NO. OF SHEETS

A2

1 | 2 | 3 | 4 | 5 | 6 | 7

A

A



	Mon Mar 27 17:58:54 2017					
ISSUE	DATE	MOD NO.	DRN BY.	CHKD.	APPD.	STATUS
USED ON						

© UOB-HEP 20 11

UOB-HEP
UNIVERSITY OF BRISTOL
HIGH ENERGY PHYSICS GROUP

TITLE fmc_tlu_v1_l1b I2C I/O EXTENDERS
MODULE: fmc_tlu_top_level_e

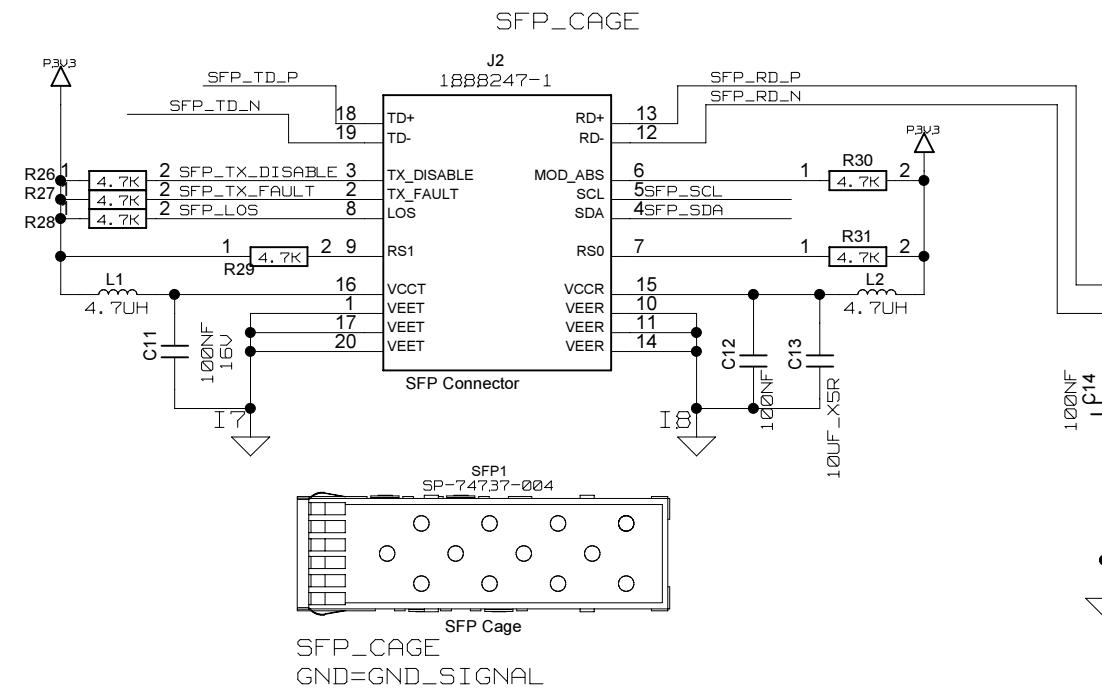
LICENSED UNDER THE TAPR OPEN HARDWARE LICENSE (WWW.TAPR.ORG/OHL)

A2

MODULE PAGE: 5 OF 7
OVERALL PAGE: 5 OF 29

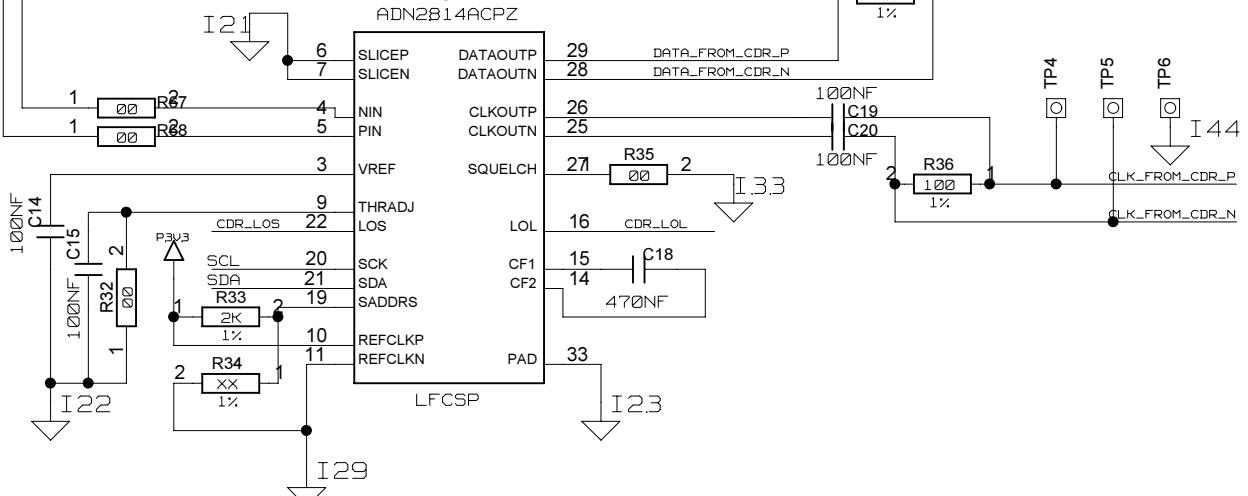
TOTAL NO. OF SHEETS

A2



CDR < I2C ADDR= 0X60>
VEE=GND_SIGNAL; VCC=P3V3
IC8

SN65LVDS2 OR SN65LVDT2
SN65LVDT2 HAS TERMINATION.
SN65LVDS2 REQUIRES EXTERNAL TERMINATION.



E TERMINATION IN FPGA IF POSSIBLE

This diagram illustrates a digital logic section, likely a state machine or controller, using discrete components and integrated circuits.

- Clock Distribution:** The top left shows a clock distribution network. A reference clock line labeled `CLK_TO_FFD_P` splits into two paths. One path goes through resistor R_{25} (1.2kΩ) and inverter I_{63} to produce `CLK_TO_FFD_N`. The other path goes through resistor R_{38} (1.2kΩ) and inverter I_{55} to produce `DATA_TO_FFD_P`.
- D Flip-Flop:** The middle section contains a D flip-flop (QFN package). Its inputs are connected as follows:
 - `CLK_TO_FFD_N` is connected to the `CLK` input.
 - `DATA_TO_FFD_N` is connected to the `D` input.
 - The `Q*` output is connected to the `Q` input via resistor R_{43} (0Ω).
 - The `Q*` output is also connected to the `D*` input via resistor R_{44} (0Ω).
 - The `SEL` input is connected to ground.
- Output Buffers:** The right side features two output buffers. The first buffer, consisting of resistors R_{45} (1.5kΩ) and R_{46} (1.5kΩ), drives the `SFP_TD_P` line. The second buffer, also with resistors R_{45} and R_{46} , drives the `SFP_TD_N` line. Both buffers include a 10nF capacitor (C_{21} and C_{22}) connected between their outputs and ground.
- Other Components:** Various resistors (e.g., R_{39} , R_{66} , R_{74} , R_{75}) and inverters (I_{55} , I_{63}) are used throughout the circuit to implement specific logic functions.

	Fri May 05 14:40:28 2017					
ISSUE	DATE	MOD NO.	DRN BY.	CHKD.	APPD.	STATUS
USED ON						

UOB-HEP
UNIVERSITY OF BRISTOL
HIGH ENERGY PHYSICS GROUP

H.H.WILLS PHYSICS LAB, TYNDALL AVE, BRISTOL, BS8 1TL.

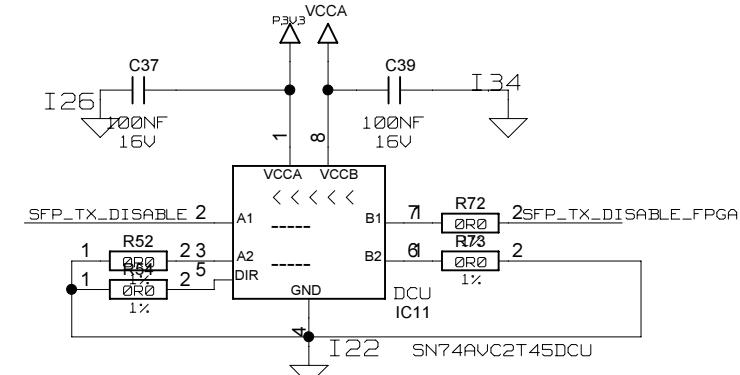
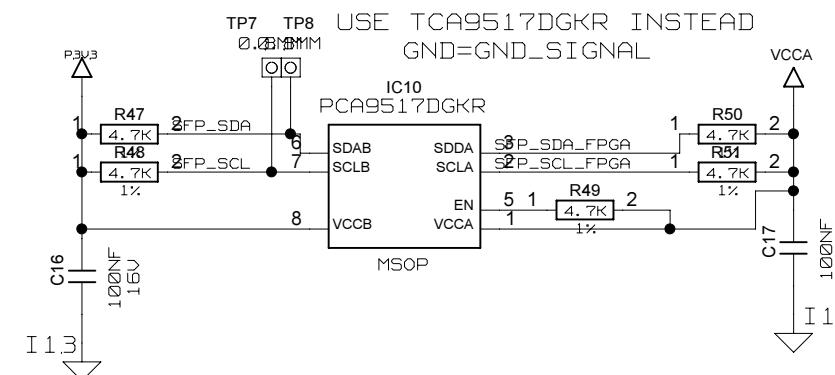
TITLE fmc_tlu_v1_l1b
MODULE: fmc_tlu_top_level

SFP INTERFACE

A2

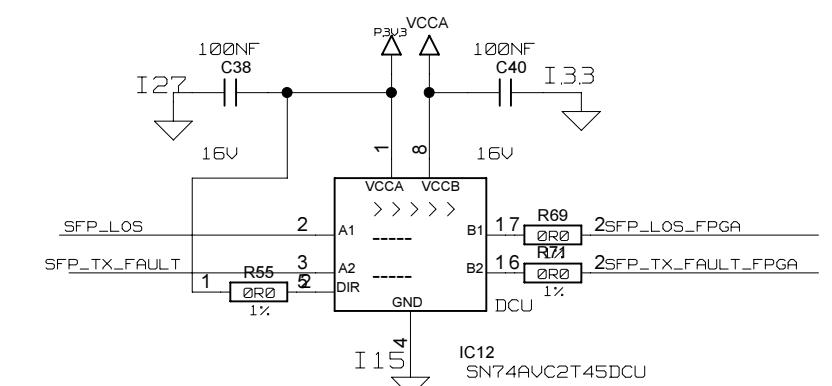
MODULE PAGE: 6 OF 7
OVERALL PAGE: 6 OF 29

TOTAL NO. OF SHEETS



B

DIR LOW : B → A
DIR HIGH: A → B



C

	Thu Mar 30 17:11:07 2017					
ISSUE	DATE	MOD NO.	DRN BY.	CHKD.	APPD.	STATUS
USED ON						

© UOB-HEP 20

UOB-HEP
UNIVERSITY OF BRISTOL
HIGH ENERGY PHYSICS GROUP

TITLE fmc_tlu_v1_l1b

MODULE: fmc_tlu_top_level_e

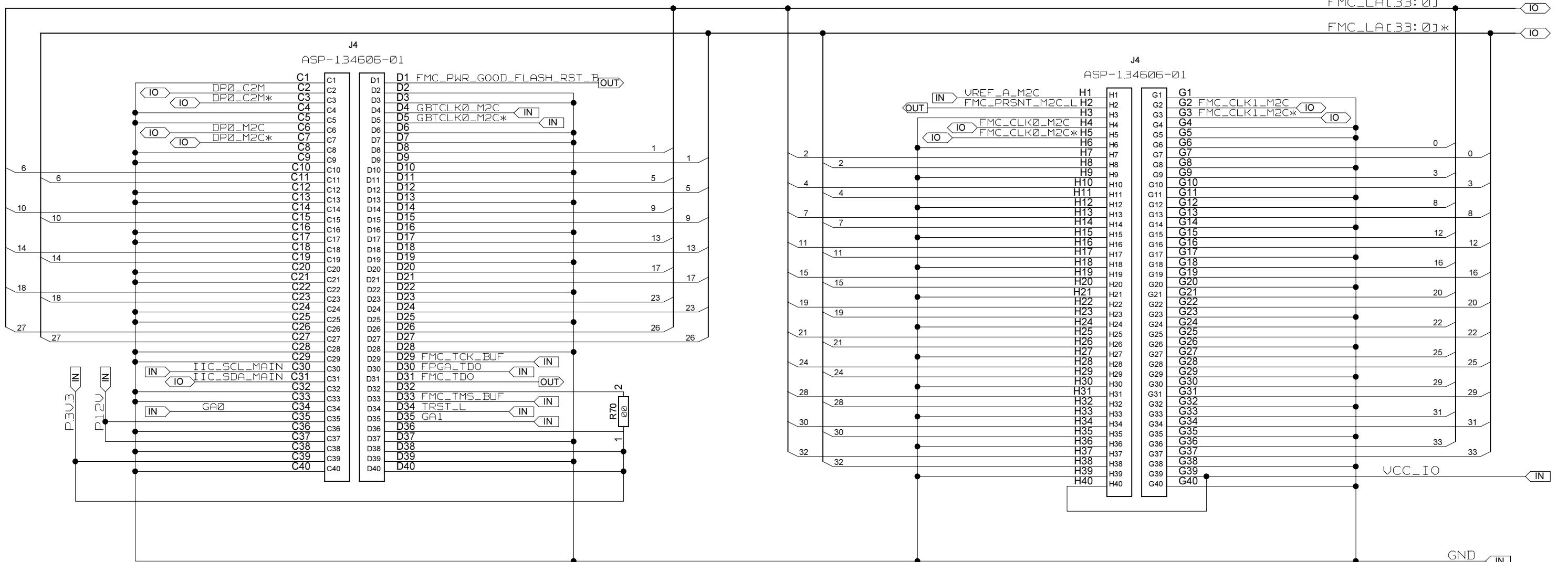
LEVEL TRANSLATORS

A2

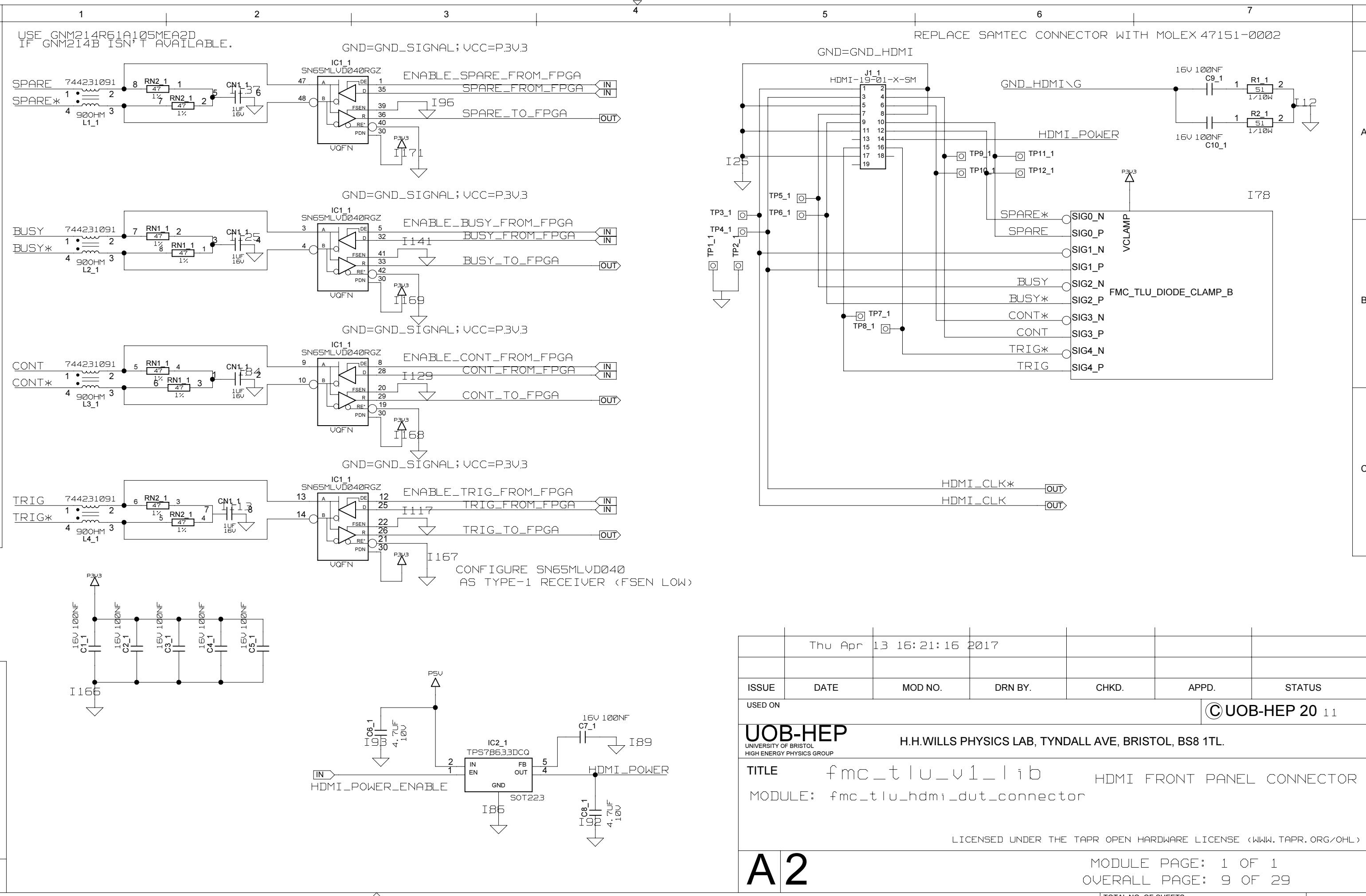
MODULE PAGE: 7 OF 7
OVERALL PAGE: 7 OF 29

TOTAL NO. OF SHEETS

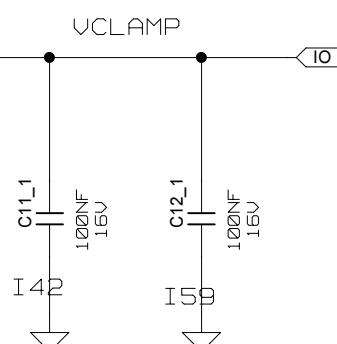
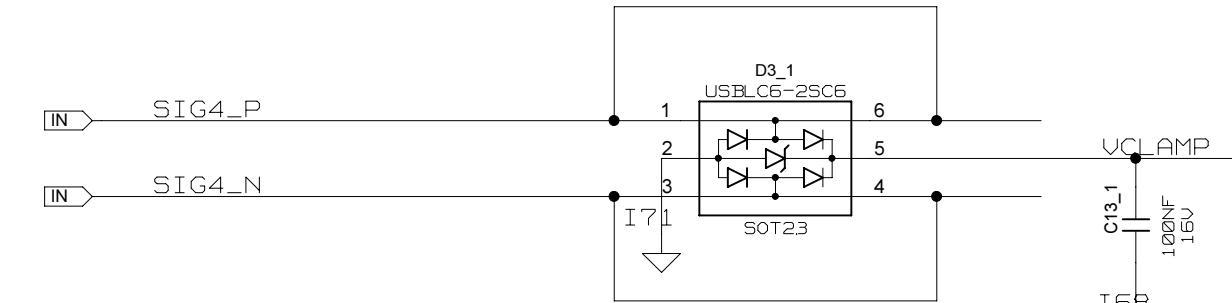
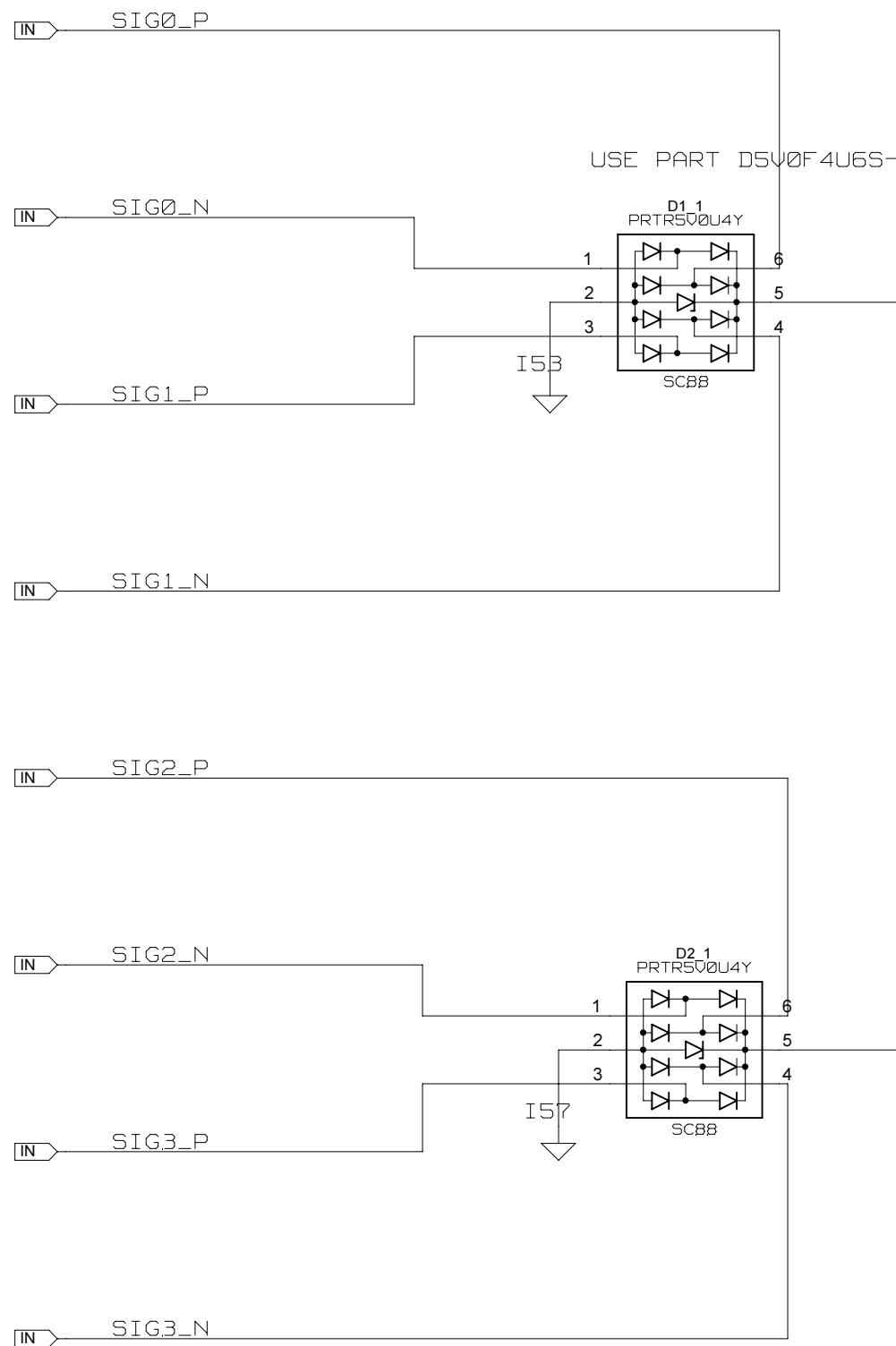
1 | 2 | 3 | 4 | 5 | 6 | 7



	Thu Mar 30 11:19:40 2017				
ISSUE	DATE	MOD NO.	DRN BY.	CHKD.	APPD.
USED ON					
UOB-HEP UNIVERSITY OF BRISTOL HIGH ENERGY PHYSICS GROUP	H.H.WILLS PHYSICS LAB, TYNDALL AVE, BRISTOL, BS8 1TL. LICENSED UNDER THE TAPR OPEN HARDWARE LICENSE (WWW.TAPR.ORG/OHL)				
C UOB-HEP 20					
TITLE	fmc_tlu_v1.lib				
MODULE:	pc036a_fmc_lpc_connector				
FMC LPC					
A2	MODULE PAGE: 1 OF 1 OVERALL PAGE: 8 OF 29				
	TOTAL NO. OF SHEETS				



1 | 2 | 3 | 4 | 5 | 6 | 7



ISSUE	DATE	MOD NO.	DRN BY.	CHKD.	APPD.	STATUS
USED ON						

© UOB-HEP 2017
UOB-HEP
UNIVERSITY OF BRISTOL
HIGH ENERGY PHYSICS GROUP

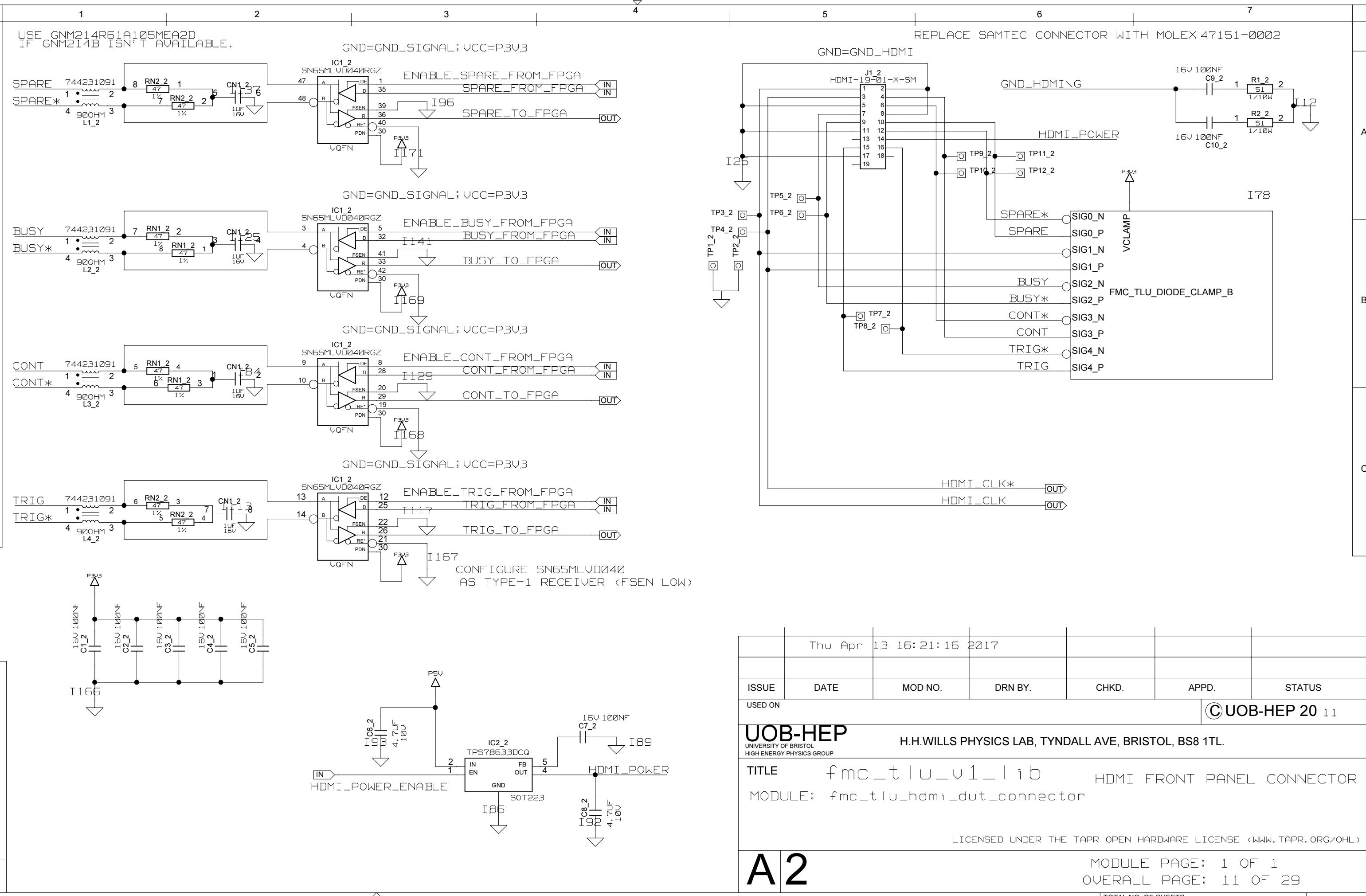
TITLE: fmc_tlu_v1_l1b
MODULE: fmc_tlu_diode_clamp_b

LICENSED UNDER THE TAPR OPEN HARDWARE LICENSE (WWW.TAPR.ORG/OHL)

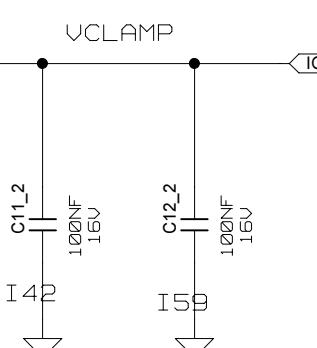
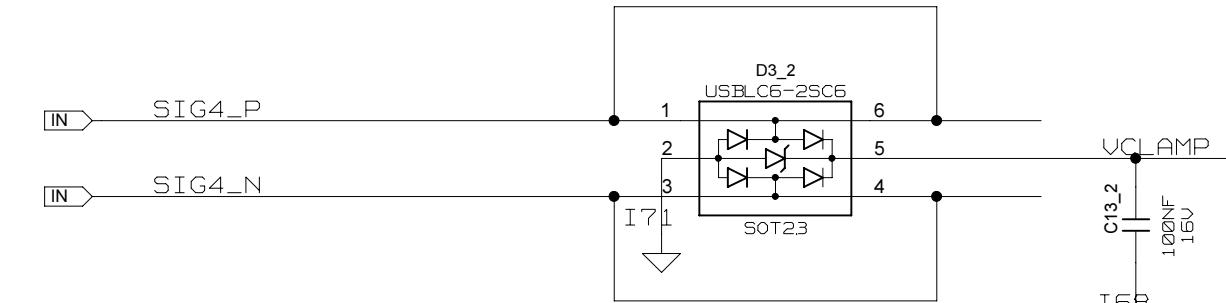
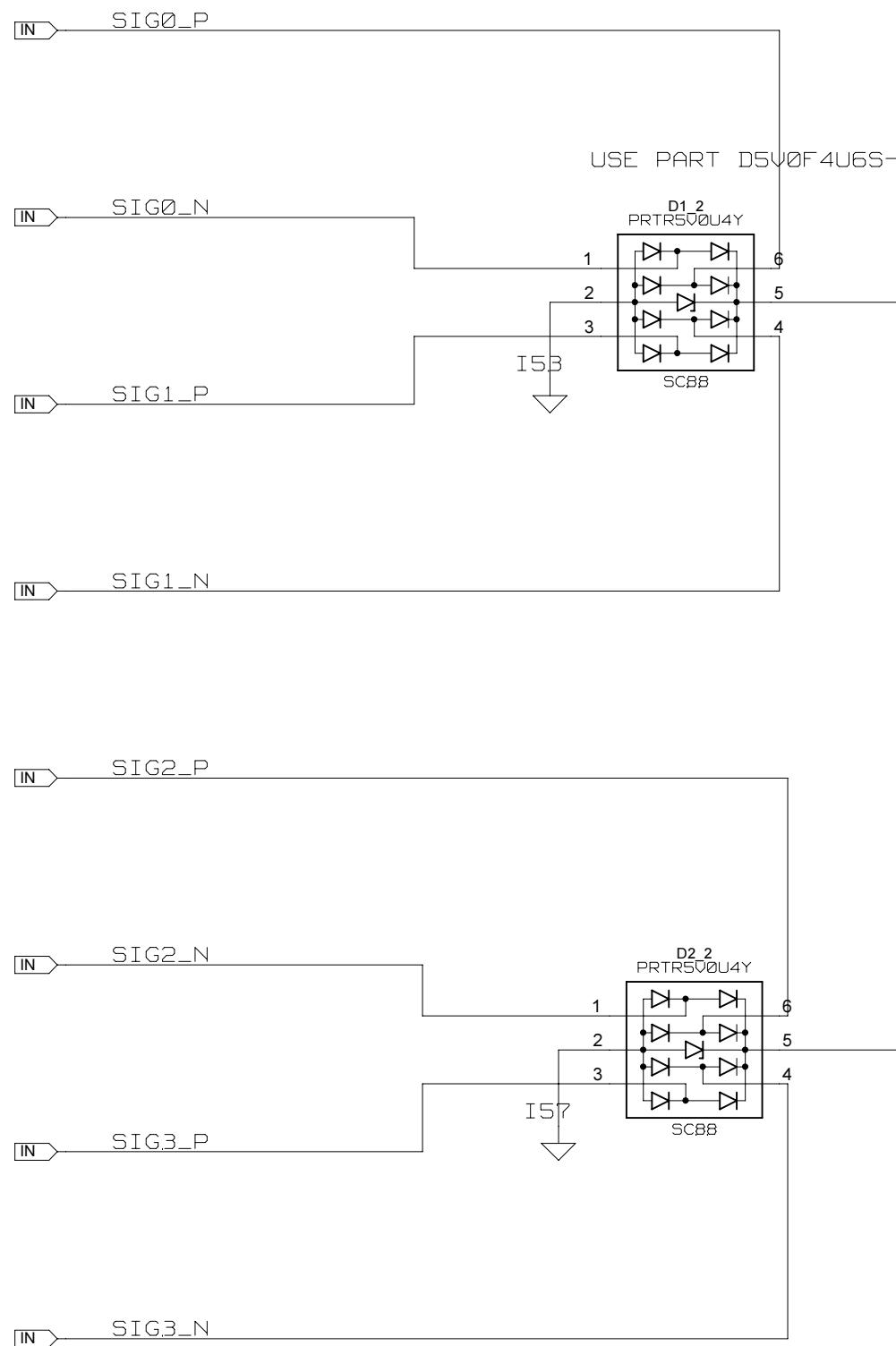
A2

MODULE PAGE: 1 OF 1
OVERALL PAGE: 10 OF 29

TOTAL NO. OF SHEETS



1 | 2 | 3 | 4 | 5 | 6 | 7



ISSUE	DATE	MOD NO.	DRN BY.	CHKD.	APPD.	STATUS
USED ON						

© UOB-HEP 2017
UOB-HEP
UNIVERSITY OF BRISTOL
HIGH ENERGY PHYSICS GROUP

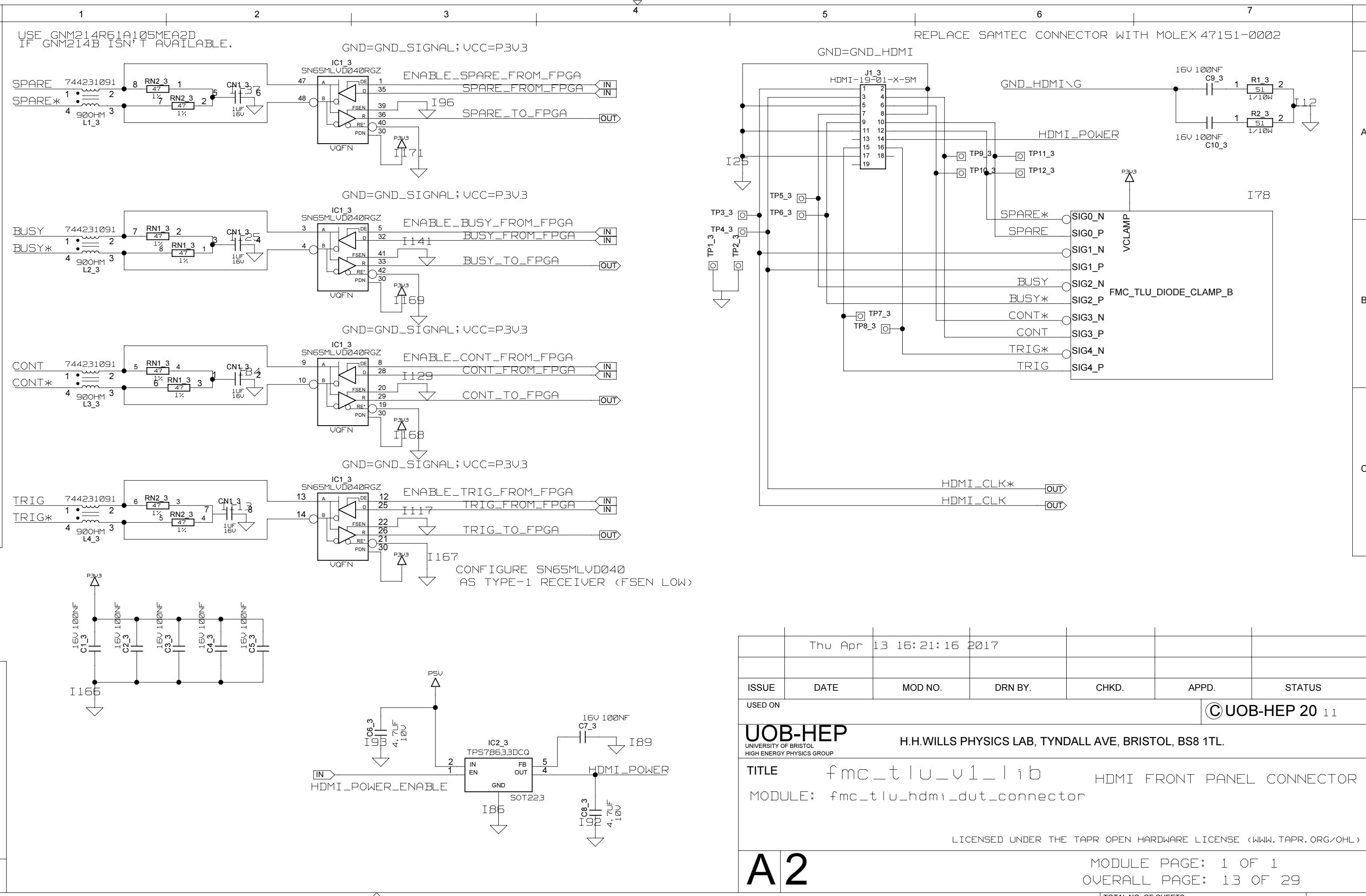
TITLE: fmc_tlu_v1_l1b
MODULE: fmc_tlu_diode_clamp_b

LICENSED UNDER THE TAPR OPEN HARDWARE LICENSE (WWW.TAPR.ORG/OHL)

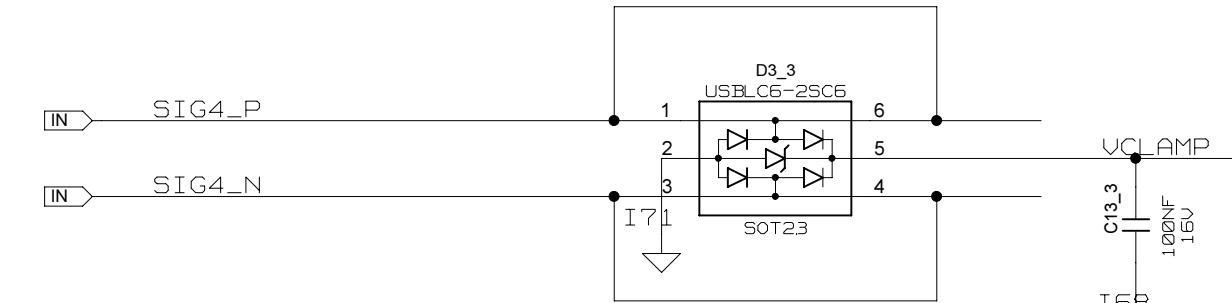
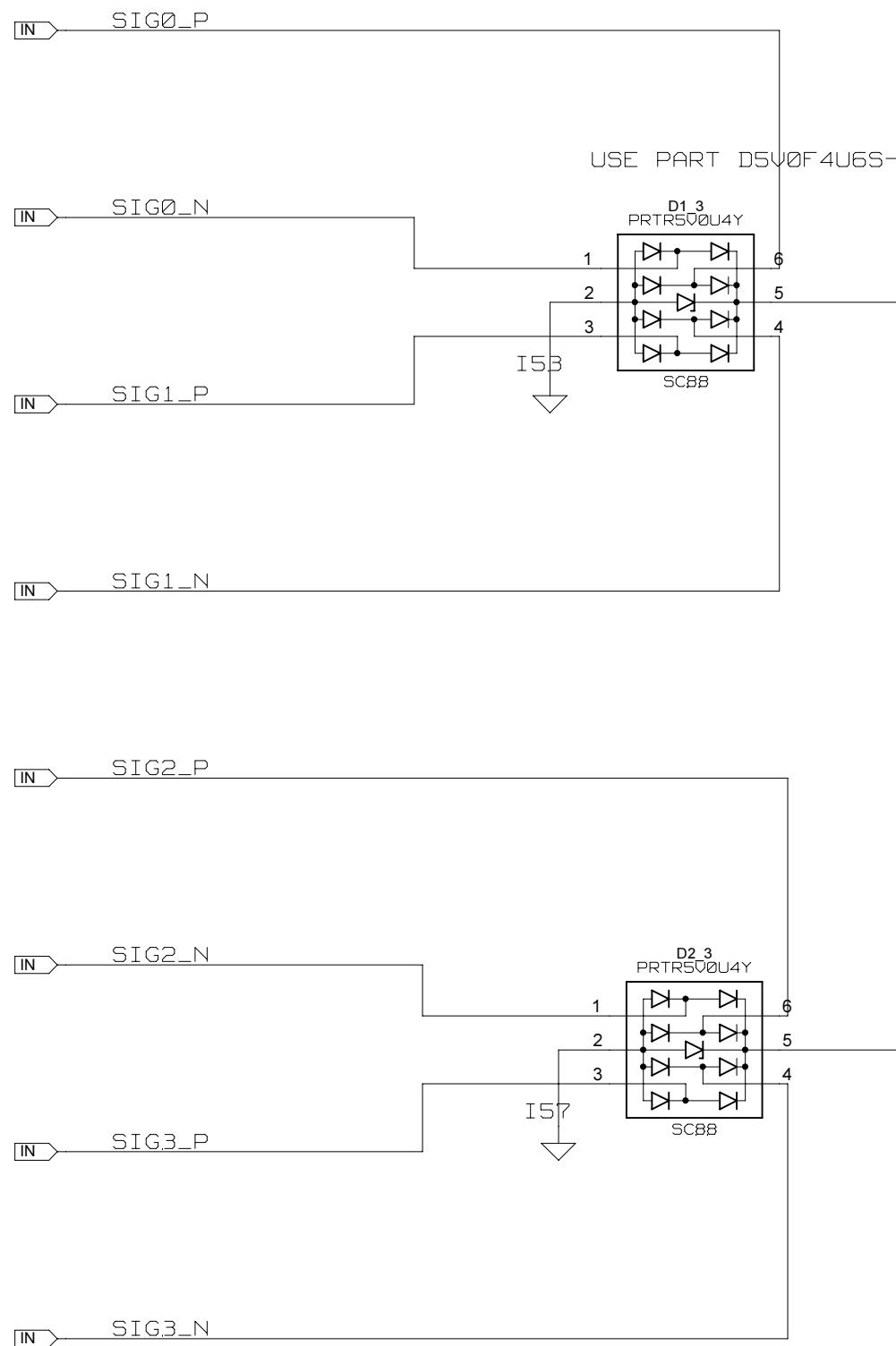
A2

MODULE PAGE: 1 OF 1
OVERALL PAGE: 12 OF 29

TOTAL NO. OF SHEETS



1 | 2 | 3 | 4 | 5 | 6 | 7



	Thu Jun 22 10:11:39 2017				
ISSUE	DATE	MOD NO.	DRN BY.	CHKD.	APPD.
USED ON					

UOB-HEP
UNIVERSITY OF BRISTOL
HIGH ENERGY PHYSICS GROUP

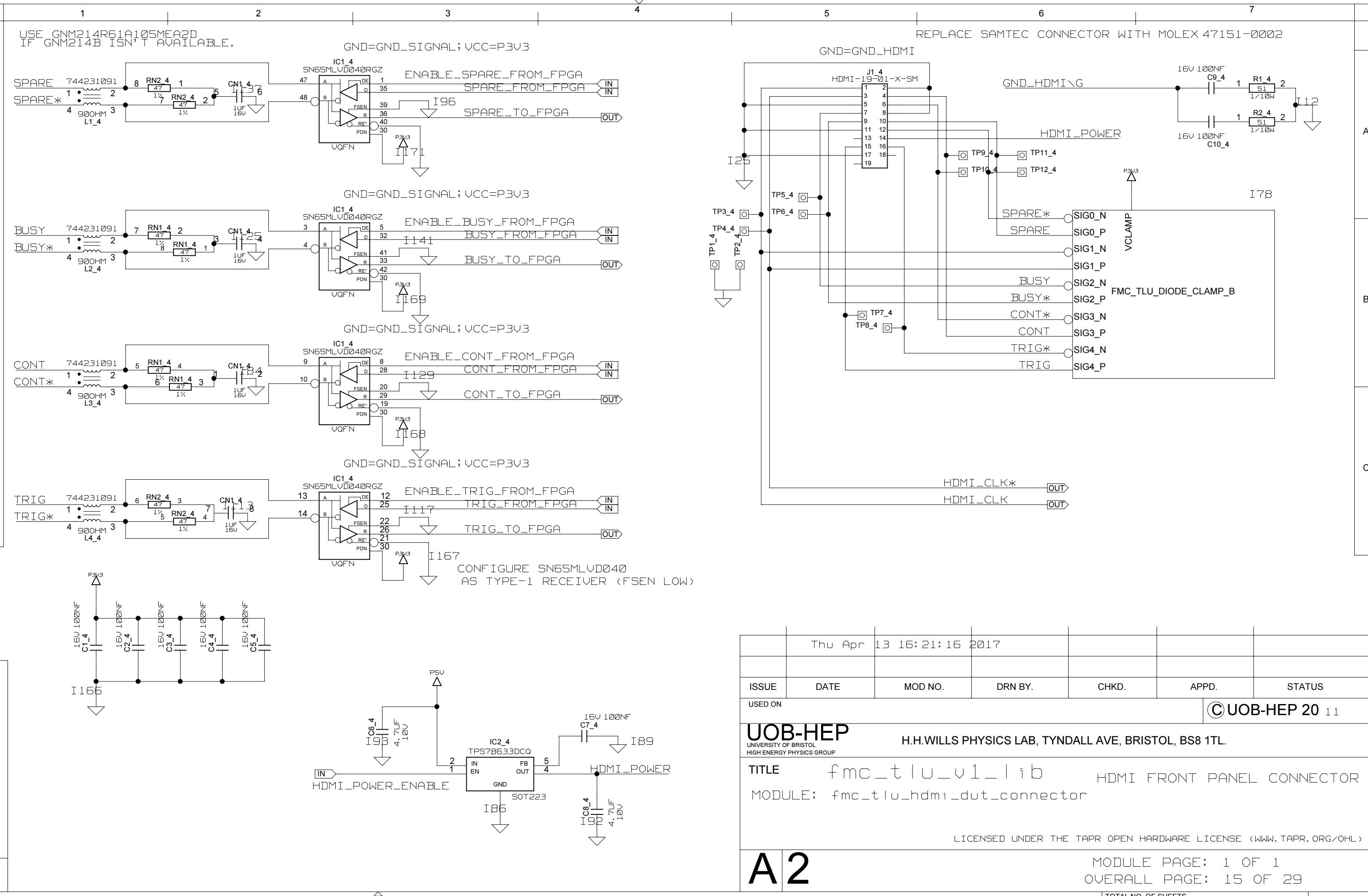
TITLE: fmc_tlu_v1_l1b
MODULE: fmc_tlu_diode_clamp_b

LICENSED UNDER THE TAPR OPEN HARDWARE LICENSE (WWW.TAPR.ORG/OHL)

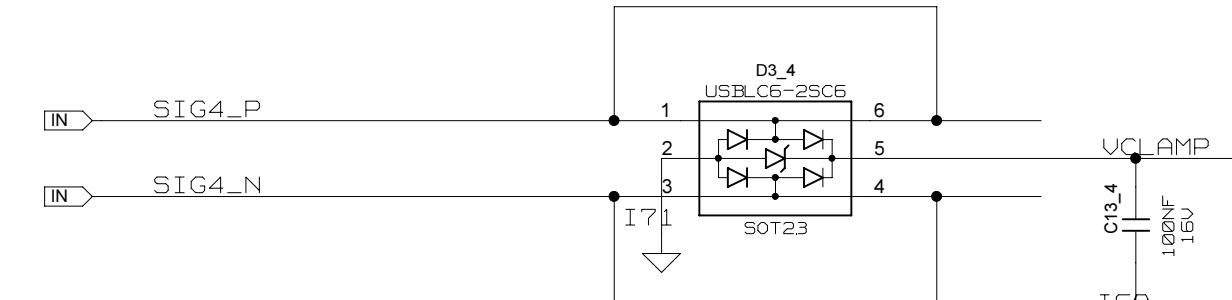
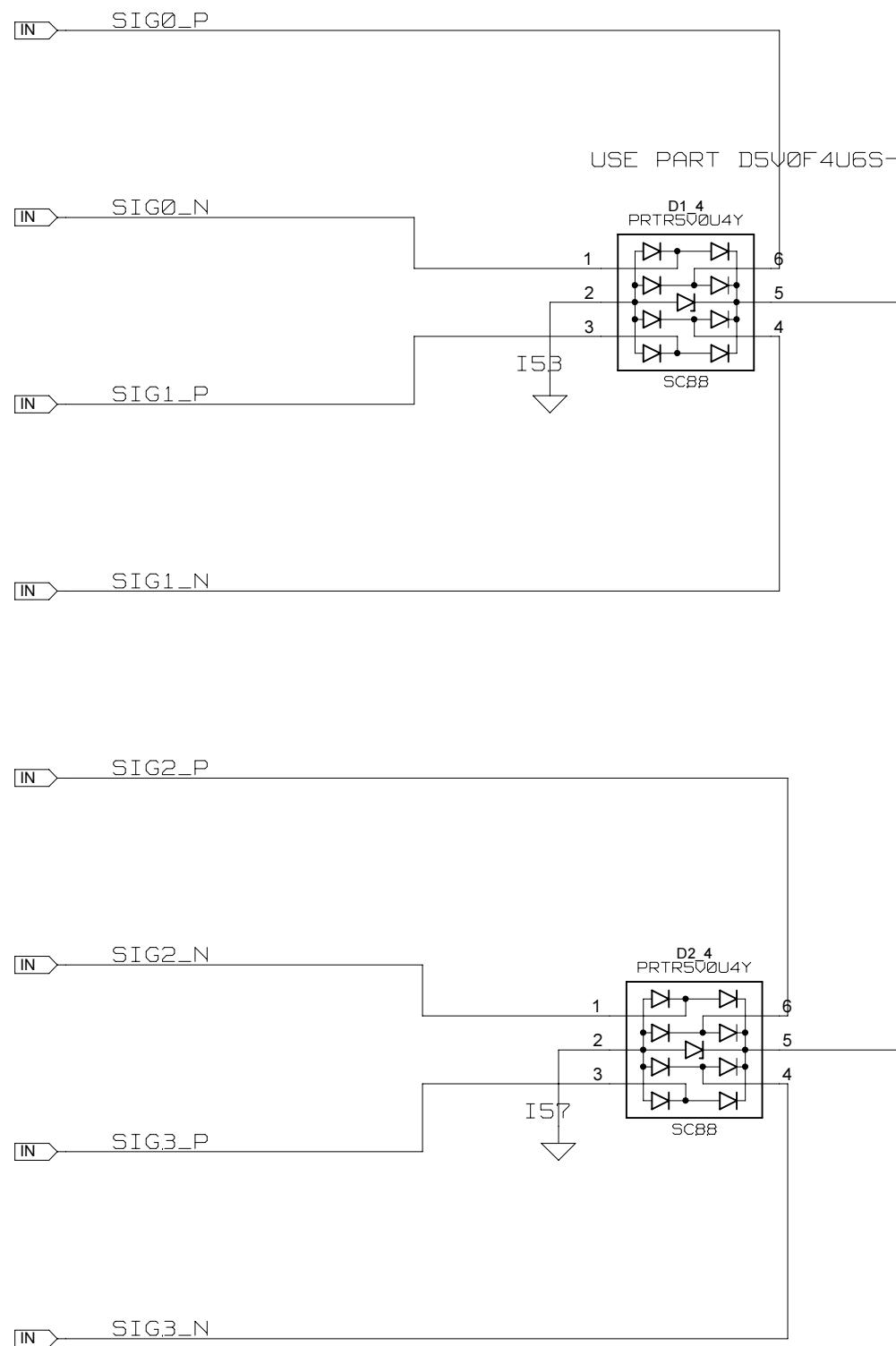
A2

MODULE PAGE: 1 OF 1
OVERALL PAGE: 14 OF 29

TOTAL NO. OF SHEETS



1 | 2 | 3 | 4 | 5 | 6 | 7



	Thu Jun 22 10:11:39 2017				
ISSUE	DATE	MOD NO.	DRN BY.	CHKD.	APPD.
USED ON					

UOB-HEP
UNIVERSITY OF BRISTOL
HIGH ENERGY PHYSICS GROUP

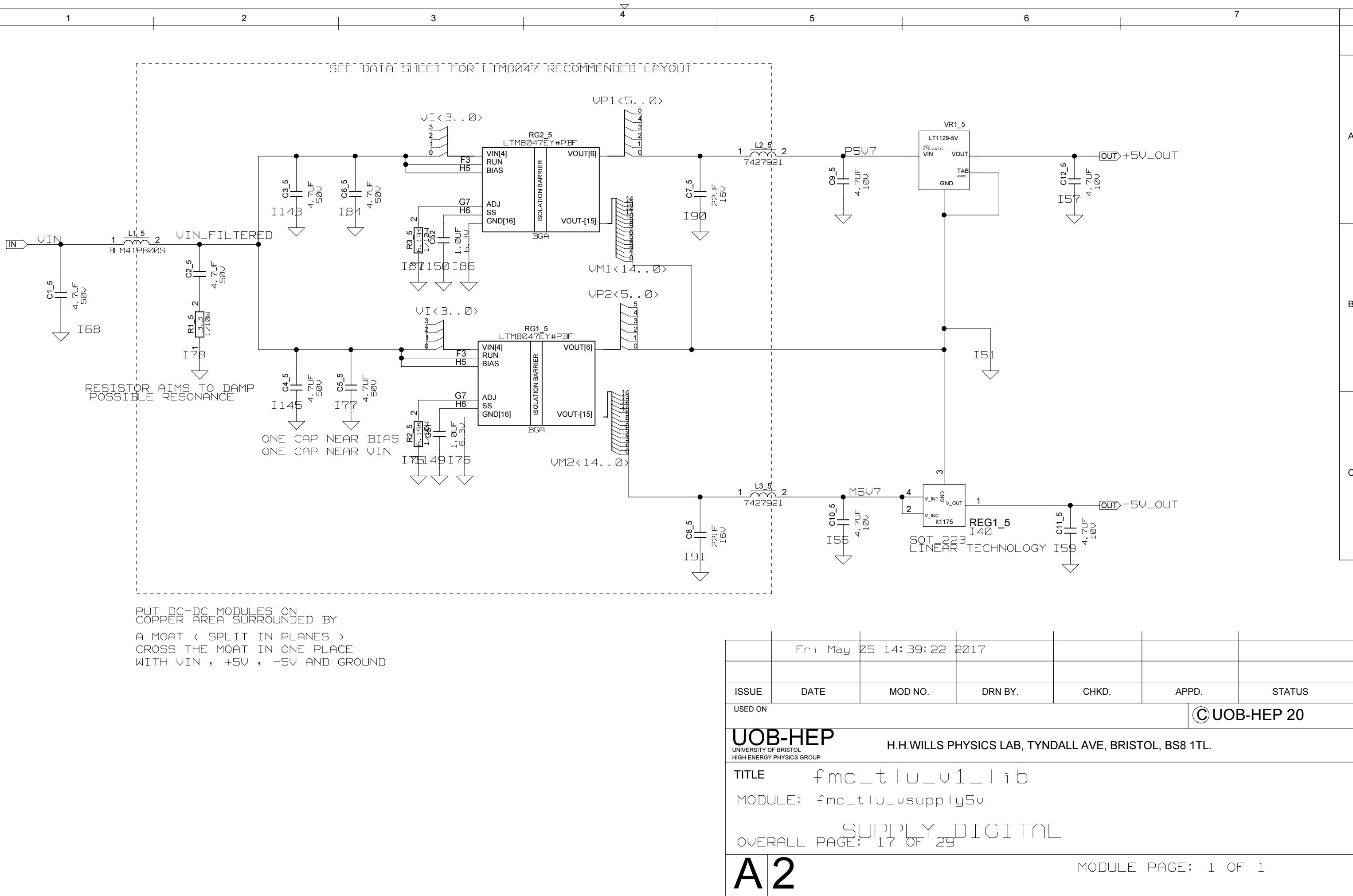
TITLE fmc_tlu_v1_l1b
MODULE: fmc_tlu_diode_clamp_b

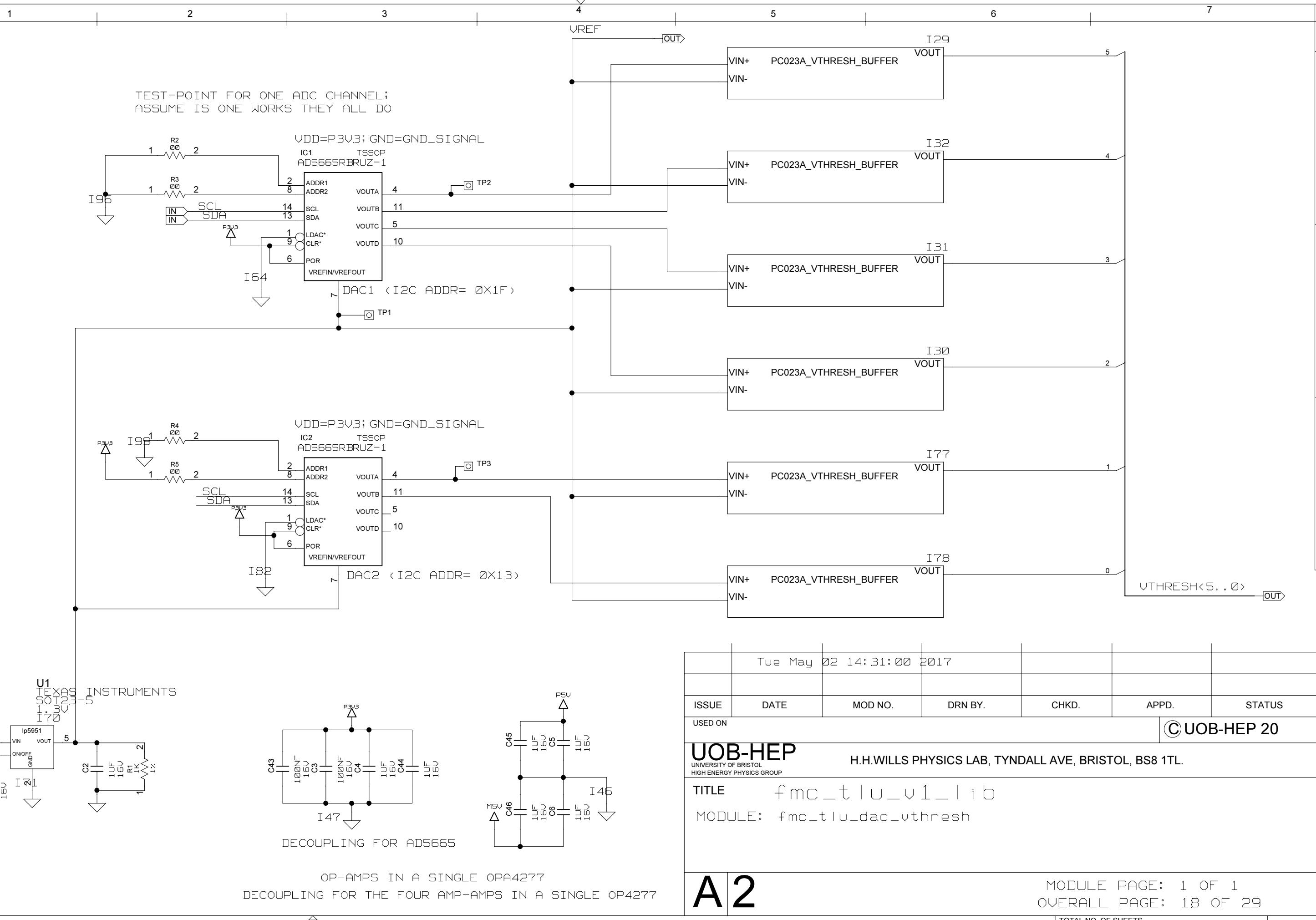
LICENSED UNDER THE TAPR OPEN HARDWARE LICENSE (WWW.TAPR.ORG/OHL)

A2

MODULE PAGE: 1 OF 1
OVERALL PAGE: 16 OF 29

TOTAL NO. OF SHEETS





A2

1 | 2 | 3 | 4 | 5 | 6 | 7

A

INVERTING BUFFER WITH X-1 GAIN

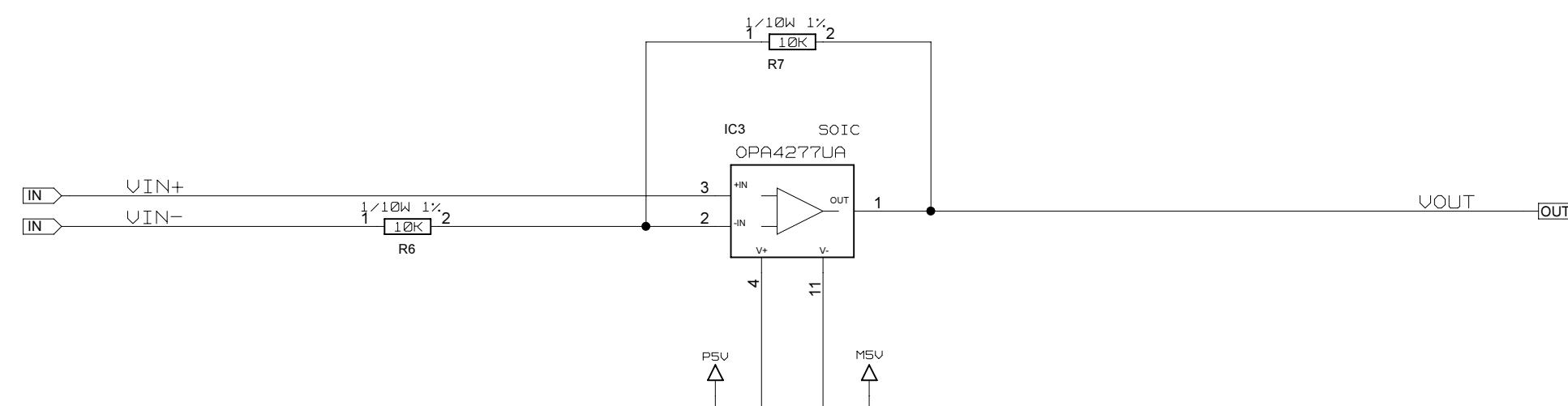
A

B

B

C

C



	Mon Mar 27 17:58:27 2017					
ISSUE	DATE	MOD NO.	DRN BY.	CHKD.	APPD.	STATUS
USED ON						(C) UOB-HEP 20

UOB-HEP
UNIVERSITY OF BRISTOL
HIGH ENERGY PHYSICS GROUP

TITLE: fmc_tlu_v1_l1b
MODULE: pc023a_vthresh_buffer

H.H.WILLS PHYSICS LAB, TYNDALL AVE, BRISTOL, BS8 1TL.

A2

MODULE PAGE: 1 OF 1
OVERALL PAGE: 19 OF 29

TOTAL NO. OF SHEETS

A2

1 | 2 | 3 | 4 | 5 | 6 | 7

A

INVERTING BUFFER WITH X-1 GAIN

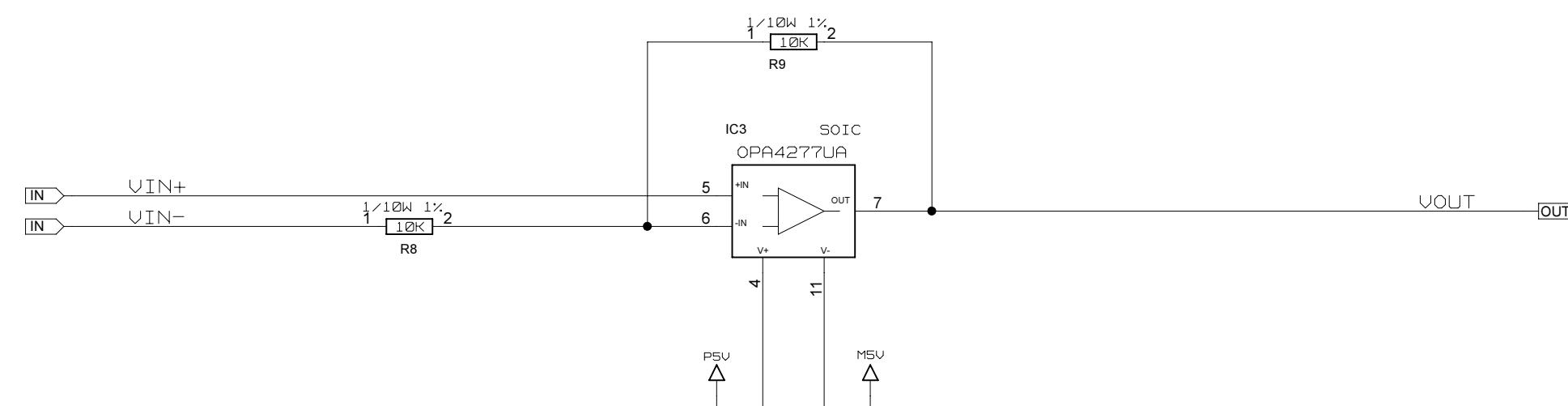
A

B

B

C

C



	Mon Mar 27 17:58:27 2017					
ISSUE	DATE	MOD NO.	DRN BY.	CHKD.	APPD.	STATUS
USED ON						(C) UOB-HEP 20

UOB-HEP
UNIVERSITY OF BRISTOL
HIGH ENERGY PHYSICS GROUP

TITLE: fmc_tlu_v1_l1b
MODULE: pc023a_vthresh_buffer

H.H.WILLS PHYSICS LAB, TYNDALL AVE, BRISTOL, BS8 1TL.

A2

MODULE PAGE: 1 OF 1
OVERALL PAGE: 20 OF 29

TOTAL NO. OF SHEETS

A2

1 | 2 | 3 | 4 | 5 | 6 | 7

A

INVERTING BUFFER WITH X-1 GAIN

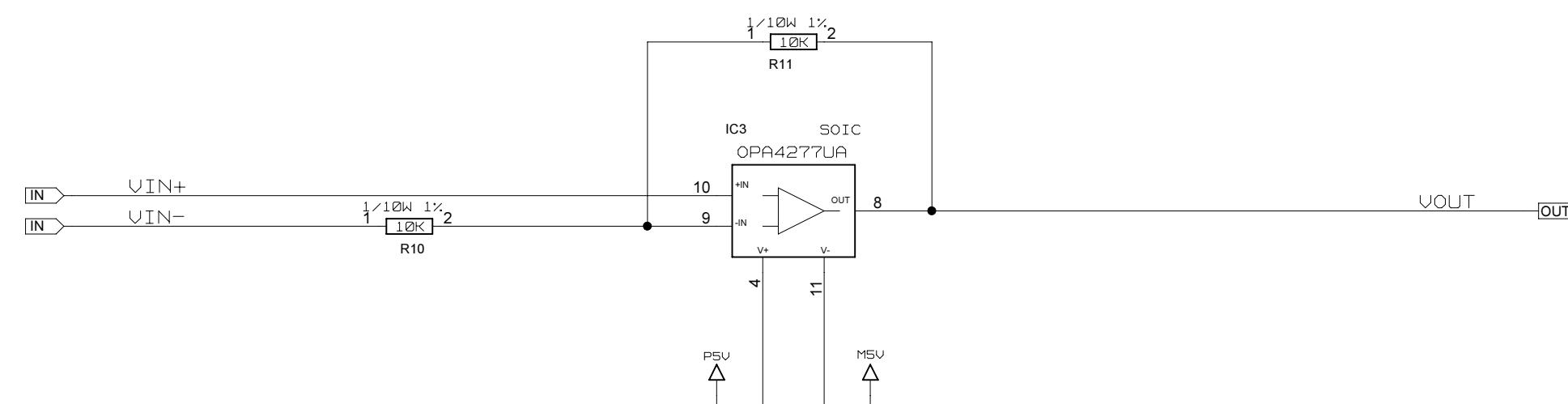
A

B

B

C

C



	Mon Mar 27 17:58:27 2017					
ISSUE	DATE	MOD NO.	DRN BY.	CHKD.	APPD.	STATUS
USED ON						(C) UOB-HEP 20

UOB-HEP
UNIVERSITY OF BRISTOL
HIGH ENERGY PHYSICS GROUP

TITLE: fmc_tlu_v1_l1b
MODULE: pc023a_vthresh_buffer

H.H.WILLS PHYSICS LAB, TYNDALL AVE, BRISTOL, BS8 1TL.

A2

MODULE PAGE: 1 OF 1
OVERALL PAGE: 21 OF 29

TOTAL NO. OF SHEETS

A2

1 | 2 | 3 | 4 | 5 | 6 | 7

A

INVERTING BUFFER WITH X-1 GAIN

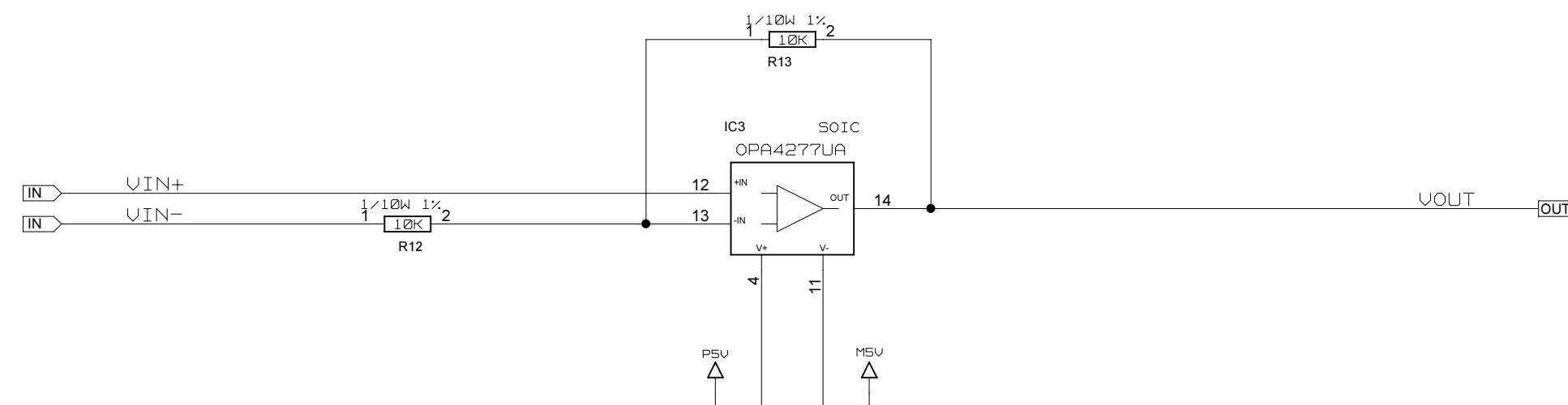
A

B

B

C

C



	Mon Mar 27 17:58:27 2017					
ISSUE	DATE	MOD NO.	DRN BY.	CHKD.	APPD.	STATUS
USED ON						(C) UOB-HEP 20

UOB-HEP
UNIVERSITY OF BRISTOL
HIGH ENERGY PHYSICS GROUP

TITLE: fmc_tlu_v1_l1b
MODULE: pc023a_vthresh_buffer

H.H.WILLS PHYSICS LAB, TYNDALL AVE, BRISTOL, BS8 1TL.

A2

MODULE PAGE: 1 OF 1
OVERALL PAGE: 22 OF 29

TOTAL NO. OF SHEETS

1 | 2 | 3 | 4 | 5 | 6 | 7

A

INVERTING BUFFER WITH X-1 GAIN

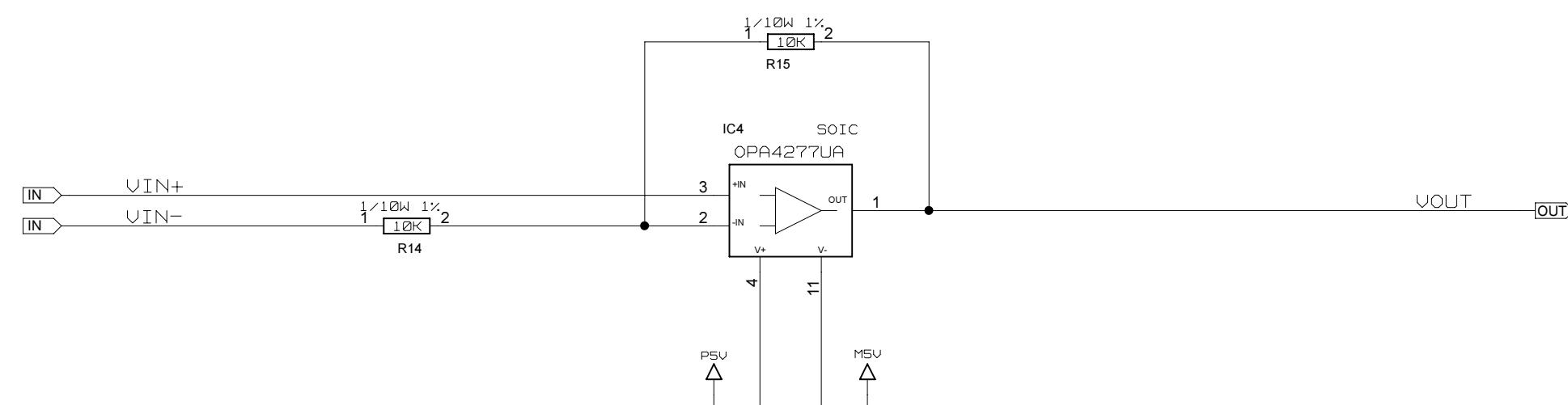
A

B

B

C

C



	Mon Mar 27 17:58:27 2017					
ISSUE	DATE	MOD NO.	DRN BY.	CHKD.	APPD.	STATUS
USED ON						(C) UOB-HEP 20

UOB-HEP
UNIVERSITY OF BRISTOL
HIGH ENERGY PHYSICS GROUP

TITLE: fmc_tlu_v1_l1b
MODULE: pc023a_vthresh_buffer

H.H.WILLS PHYSICS LAB, TYNDALL AVE, BRISTOL, BS8 1TL.

A2

MODULE PAGE: 1 OF 1
OVERALL PAGE: 23 OF 29

TOTAL NO. OF SHEETS

1 | 2 | 3 | 4 | 5 | 6 | 7

A

INVERTING BUFFER WITH X-1 GAIN

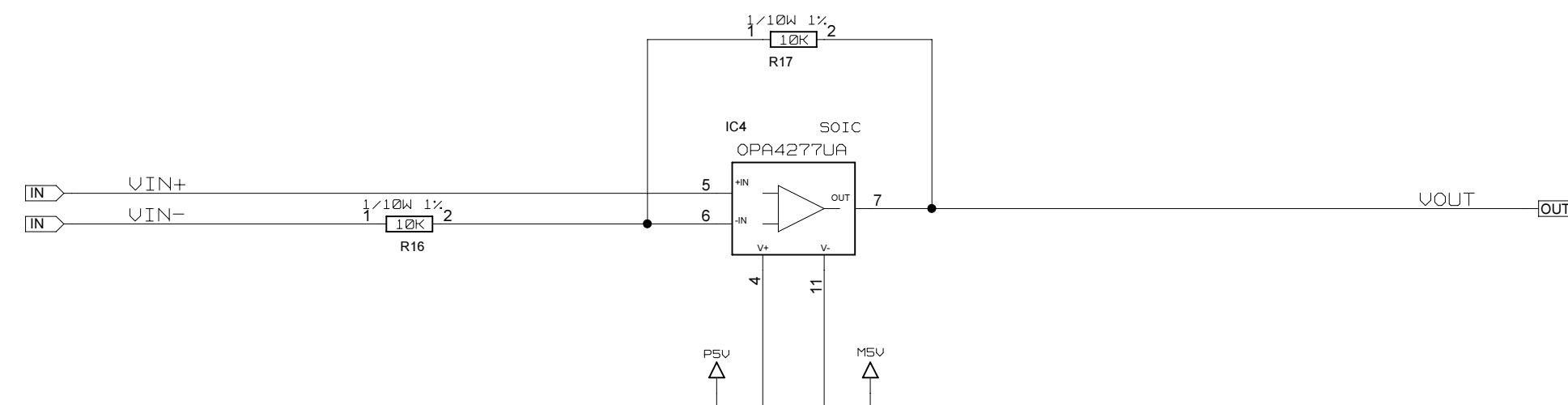
A

B

B

C

C



	Mon Mar 27 17:58:27 2017					
ISSUE	DATE	MOD NO.	DRN BY.	CHKD.	APPD.	STATUS
USED ON						(C) UOB-HEP 20

UOB-HEP
UNIVERSITY OF BRISTOL
HIGH ENERGY PHYSICS GROUP

TITLE: fmc_tlu_v1_l1b
MODULE: pc023a_vthresh_buffer

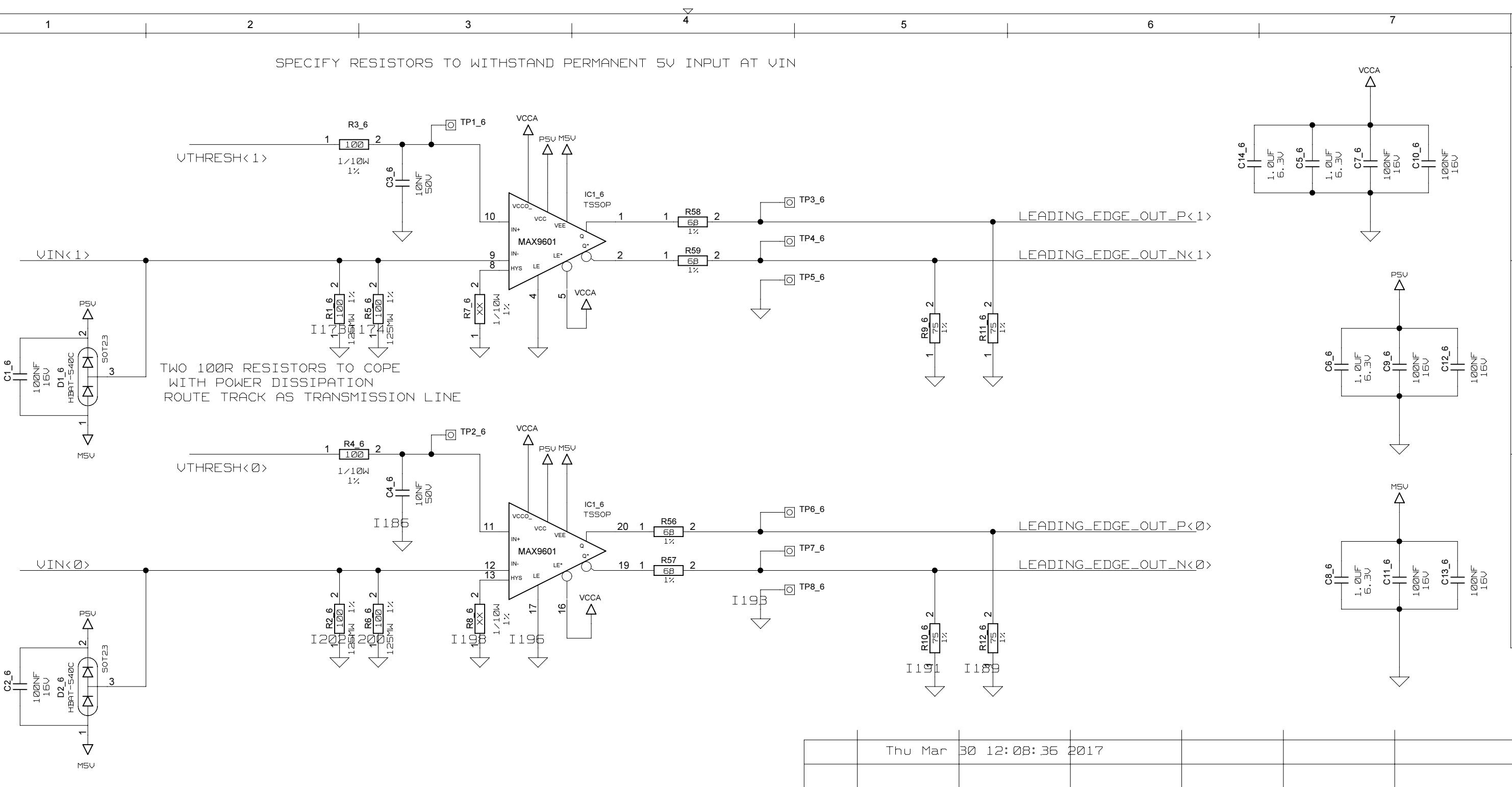
H.H.WILLS PHYSICS LAB, TYNDALL AVE, BRISTOL, BS8 1TL.

A2

MODULE PAGE: 1 OF 1
OVERALL PAGE: 24 OF 29

TOTAL NO. OF SHEETS

A2



Thu Mar 30 12:08:36 2017

DATE MOD NO DRN BY CHKD APPD STATUS

1

-HEP
RISTOL

H.H.WILLS PHYSICS LAB, TYNDALL AVE, BRISTOL, BS8 1TL.

fmc_tlu_v1plib

MODULE: fmc_tlu_threshold_discriminator_dual

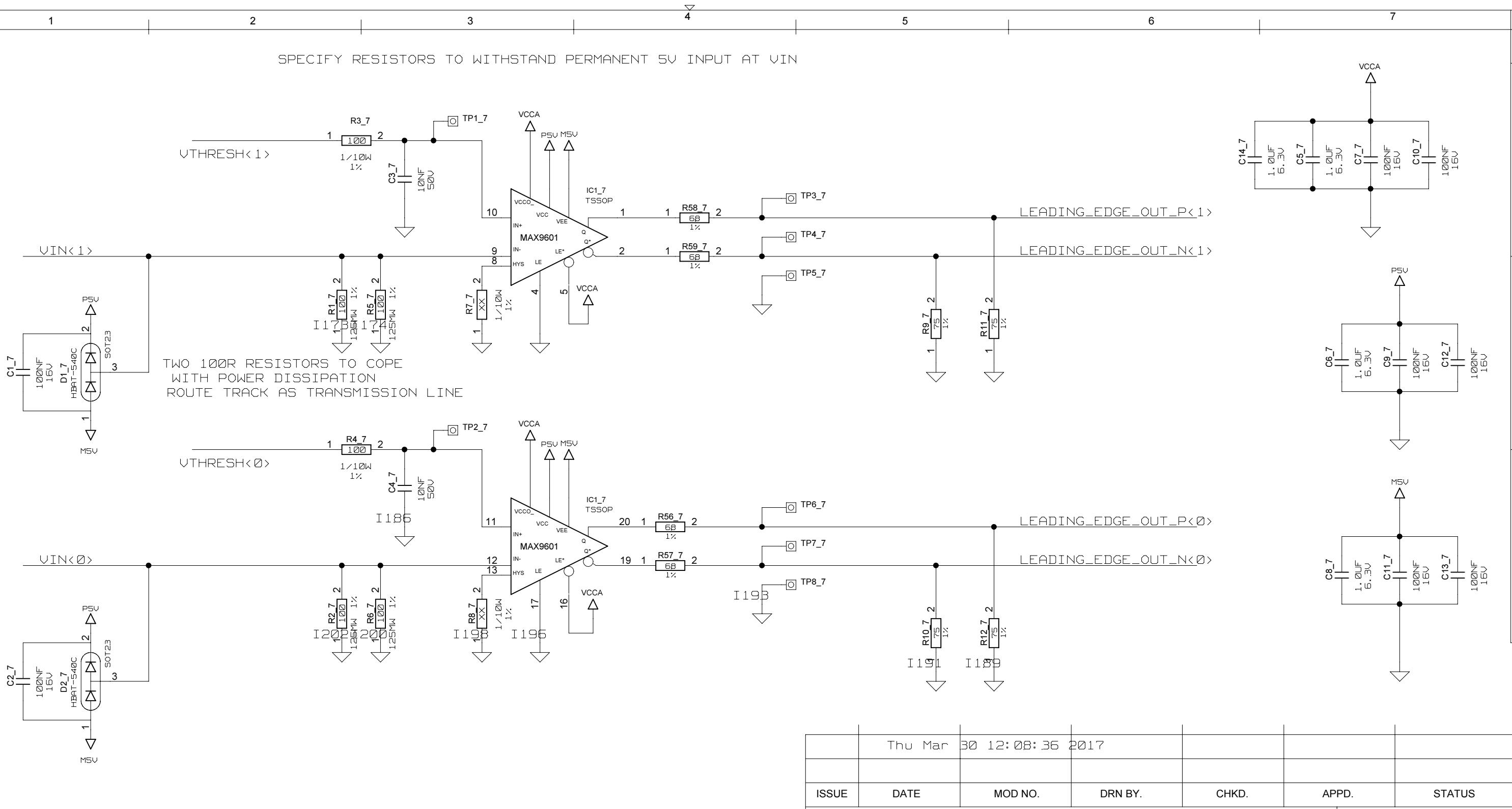
LICENSED UNDER THE TAPR OPEN HARDWARE LICENSE <www.tapr.org/ohl>

A 2

MODULE PAGE: 1 OF 1

OVERALL PAGE: 25 OF 29

TOTAL NO. OF SHEETS



Thu Mar 30 12:08:36 2017

DATE	MOD NO	DRN BY	CHKD	APPD	STATUS
------	--------	--------	------	------	--------

1

B-HEP
OF BRISTOL

H.H.WILLS PHYSICS LAB, TYNDALL AVE, BRISTOL, BS8 1TL.

fmc_tlu_v1.lib

MODULE: fmc_tlu_threshold_discriminator_dual

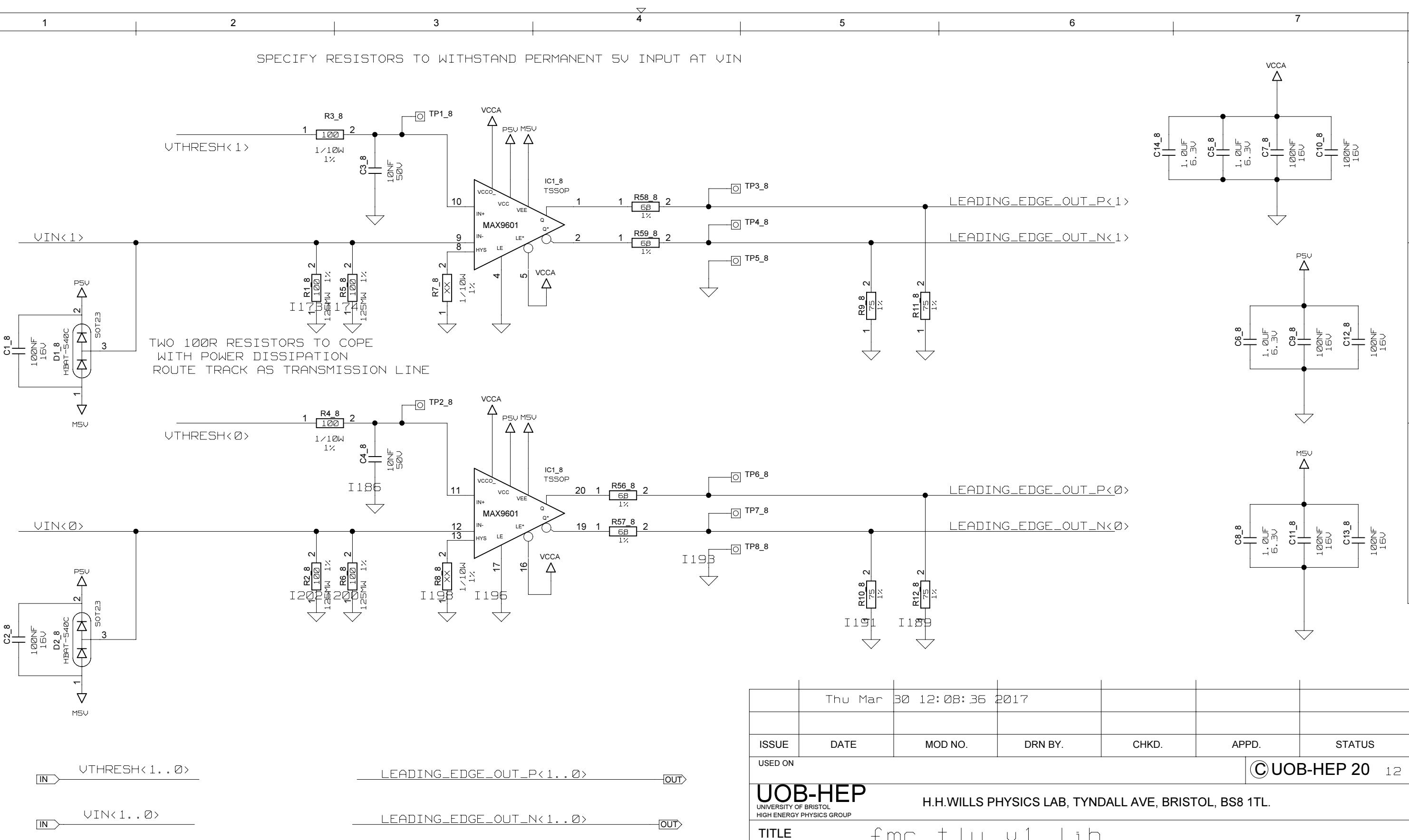
LICENSED UNDER THE TAPR OPEN HARDWARE LICENSE <www.tapr.org/ohl>

A2

MODULE PAGE: 1 OF 1

OVERALL PAGE: 26 OF 29

TOTAL NO. OF SHEETS



Thu Mar 30 12:08:36 2017

DATE MOD NO DRN BY CHKD APPD STATUS

UOB-HEP
UNIVERSITY OF BRISTOL

H.H.WILLS PHYSICS LAB, TYNDALL AVE, BRISTOL, BS8 1TL.

TITLE

fmc_tlu_v1plib

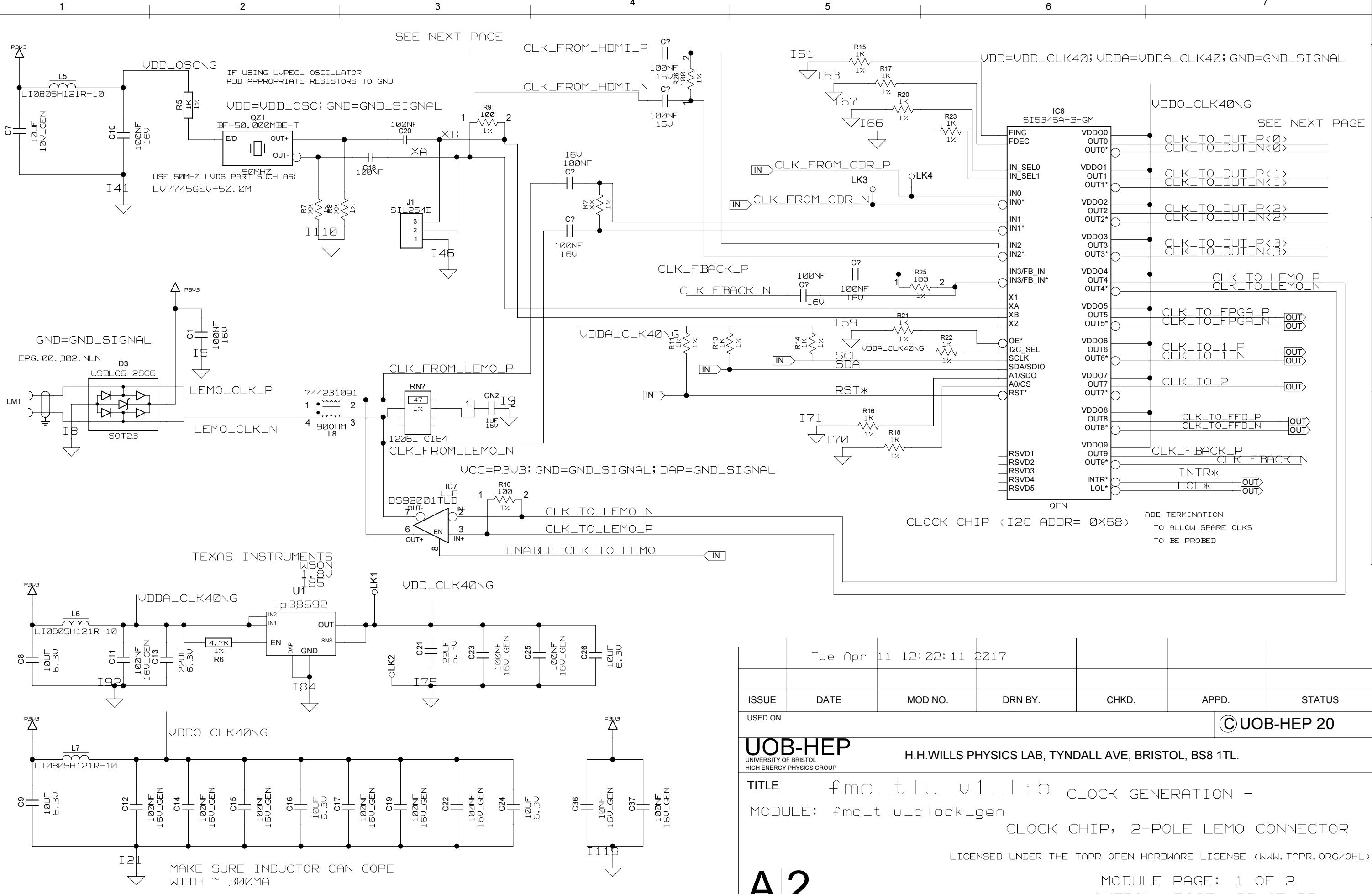
MODULE: fmc_tlu_threshold_discriminator_dual

LICENSED UNDER THE TAPR OPEN HARDWARE LICENSE <www.tapr.org/ohl>

A2

MODULE PAGE: 1 OF 1
OVERALL PAGE: 27 OF 29

TOTAL NO. OF SHEETS



A2

ERALL PAGE: 28 OF 29

