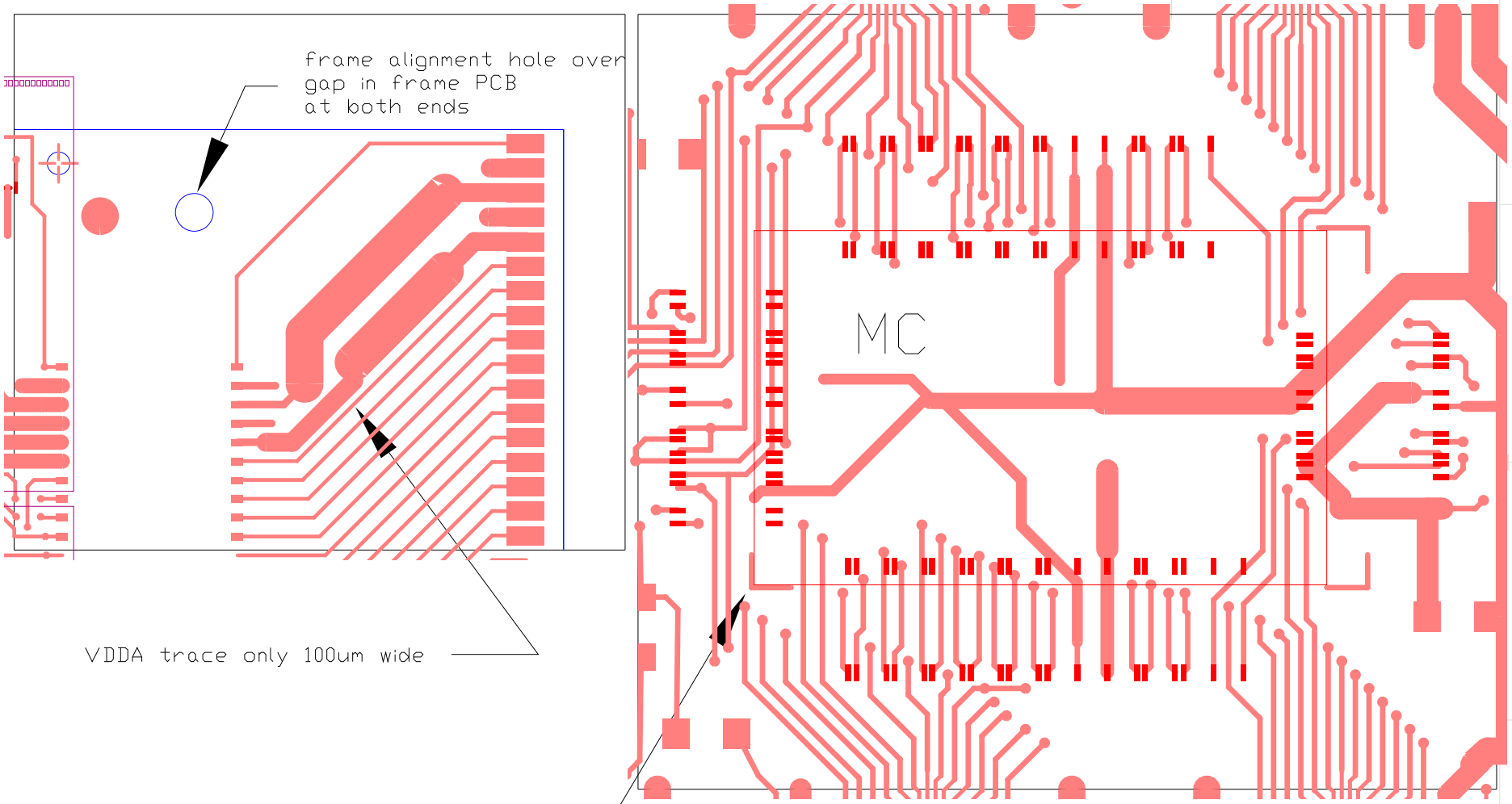


Notes:	ATLAS PIXEL DETECTOR FLEX HYBRID VERSION 3
	ERRATA
	R. Boyd, University of Oklahoma
Tolerance: n/a	APFHV3-ER 0
	NONE 1 October, 2001 1/1

SPECIFICATIONS
for
apfhv3
(ATLAS Pixel Flex Hybrid version 3)
-------- Alternate specifications must be submitted in writing -------

Order Quantity: 50 pieces

Number of metal layers	2
Substrate material	25.4 μm [1 mil] polyimide (Upilex preferred) w/sputtered seed metal (e.g., Cr or Ti) and
sputtered	CU starter layer (adhesiveless Cu)
Delivered substrate size	86.6 mm x 19.6 mm ± 0.10 mm [3.4 in. x 0.7717 in. ± 0.040 in.]
Metalization	
Base metalization	16 μm [630 μin] minimum
Barrier metal (where required)	2 μm [79 μin] Ni, ± 0.5 μm [19.7 μin]
Au plating:	No greater than 0.2 μm [7.9 μin].
Top to bottom metal registration tolerance	No via hole breakout of any cover pad
Cover layer (top & bottom)	10 μm [390 μin] to 25.4 μm [1 mil] 1 kV holdoff voltage Coefficient of thermal expansion < 130 ppm/°C Examples: DuPont PI 2734, Pyralux PC 1010 or PC 2010. Must be hard, scratch resistant and radiation tolerant to 100 Gy

Required cover layer total tolerance (see drawing):

Bottom	± 127 μm [5 mil] maximum
Top	± 127 μm [5 mil] maximum

DESIGN FEATURES

Note: Many (> 500) wire bond pads are on a 150 μm [5.9 mil] pitch. The traces from these pads are fanned out to a wider trace and space in a short distance. Most traces and spaces are 100 μm [3.9 mil].

Min. trace width	75 μm [2.9 mil]
Min. trace space	75 μm [2.9 mil]
Min. feature space	

Via cover pad to trace*	100 µm [3.9 mil]
Bond pad space	50 µm [2.0 mil]
Bond pad size	100 µm x 300 µm [3.9 mil x 11.8 mil]
Cover pad size*	200 µm diameter [7.9 mil]
Via hole size*	25.4 µm [1 mil] minimum

* These parameters can be optimized for manufacturer's process

DESIGN FILE NOTES

Gerber files:

Device	Gerber photoplotter with RS-274-X aperture generation

Parameter settings:

OffsetX	0.000
OffsetY	0.000

Plotfile Info:

Coordinate Format	2.4
Coordinate Units	Inch
Data Mode	Absolute
Zero Suppression	None
End Of Block	*

Drill file info:

Tolerance Drill +	0.00 %
Tolerance Drill -	0.00 %
Rotate	no
Mirror	no
Optimize	yes
Auto fit	yes
OffsetX	0.000
OffsetY	0.000
Format	2.4 (1/10000 in.)
Zero suppression	None

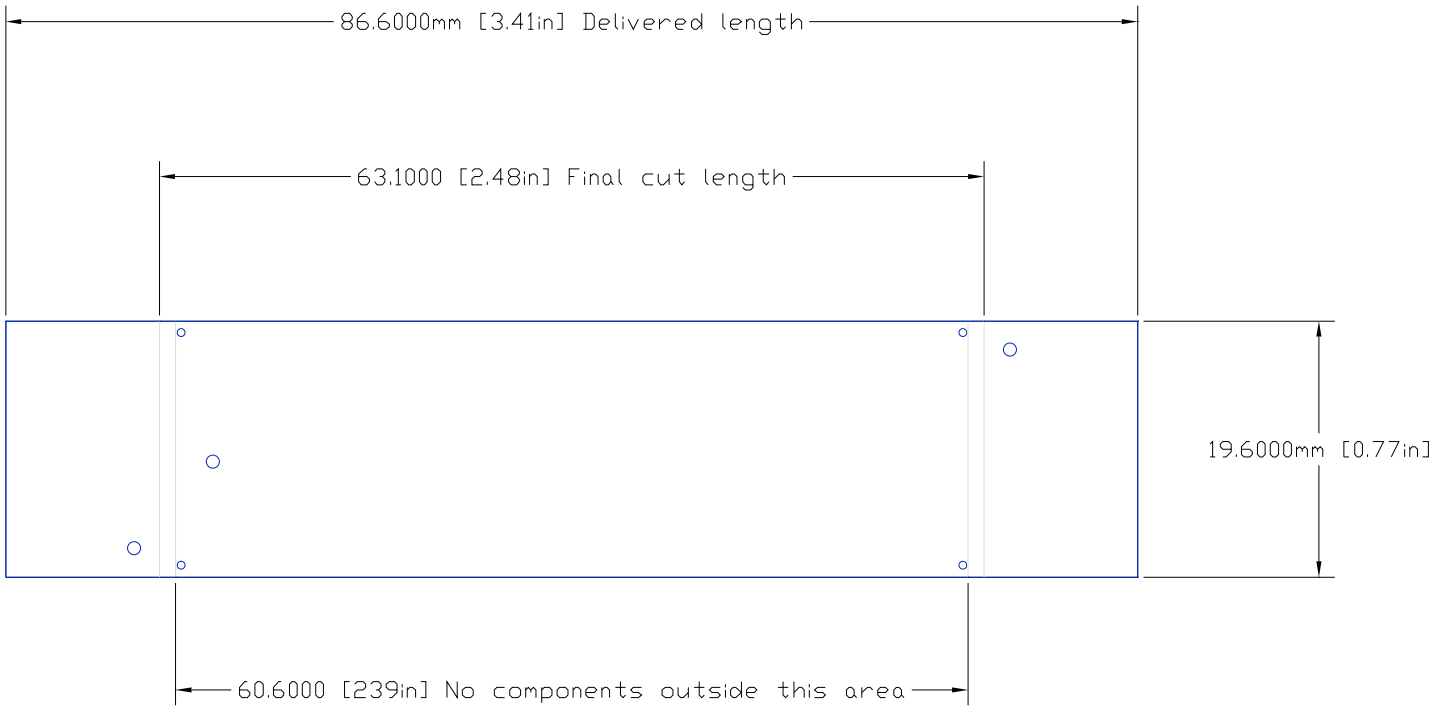
Drills used:

Code	Size	Count	Plated Through
T01	0.050mm**	632	632
T02	0.300mm	4	0
T03	1.000mm	3	1 (see drawing)

** Via drill size can be optimized for fabrication process

FILE DEFINITIONS:

File name	Definition	
apfhv3_fab.pdf	This file (specifications, fabrication drawings, schematic, etc.)	
apfhv3_gerber.zip	Zip file containing the following:	
	top.gbr	Top metal layer
	bottom.gbr	Bottom metal layer
	bottom_mask.gbr	Bottom solder mask, negative
	top_mask.gbr	Top solder mask, negative
	cut.gbr	Circuit outline (cutting guide)
	drill.xcl	Excellon drill file
	rack.drl	Drill tool list



1 mm 5 mm 1 cm

Notes:
Flex vendor not responsible for final cut length.

Tolerence: +-0.076mm [0.003in]

ATLAS PIXEL DETECTOR FLEX HYBRID

OUTLINE DIMENSIONS

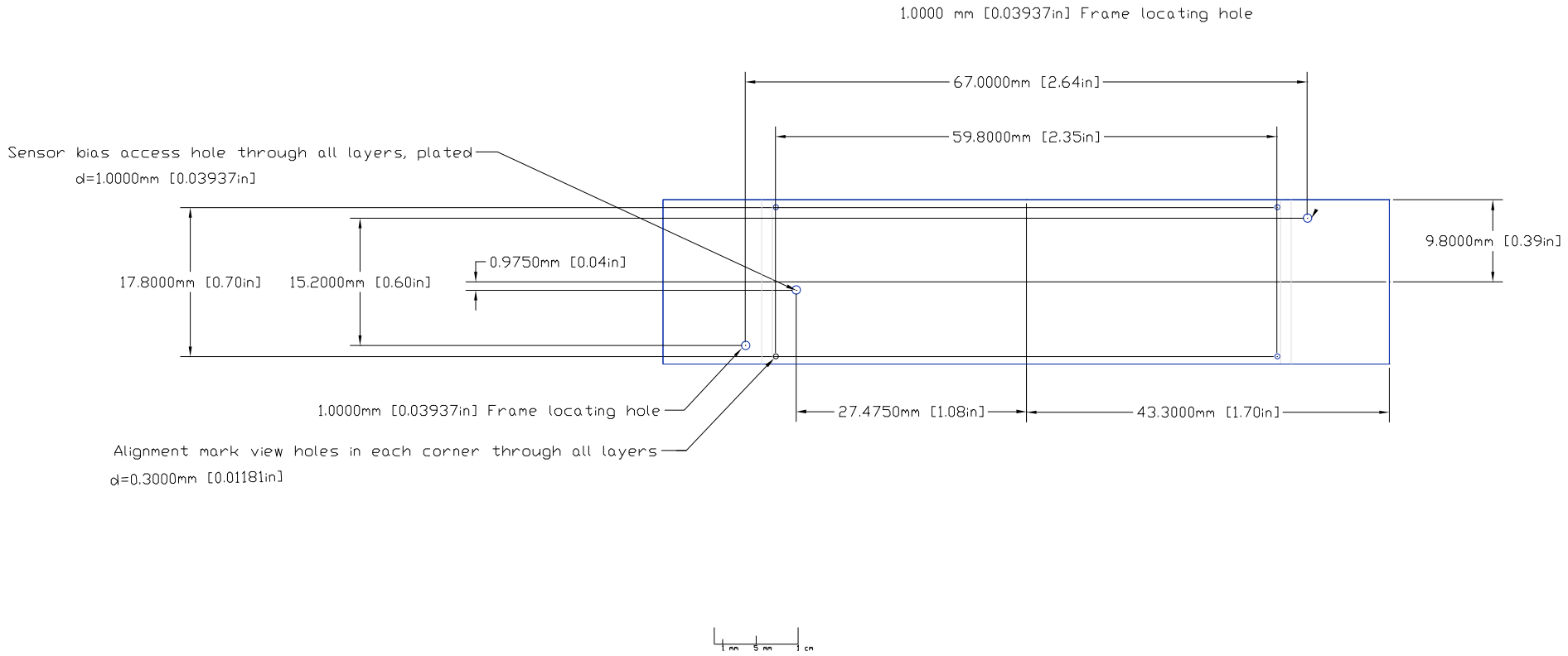
R. Boyd, University of Oklahoma

APFHV3-OL

2

NONE 1 October, 2001

1/1



Notes:
Holes NOT plated through except as noted.

Tolerance: +-0.076mm [0.003in]

ATLAS PIXEL DETECTOR FLEX HYBRID

HOLE PLACEMENT

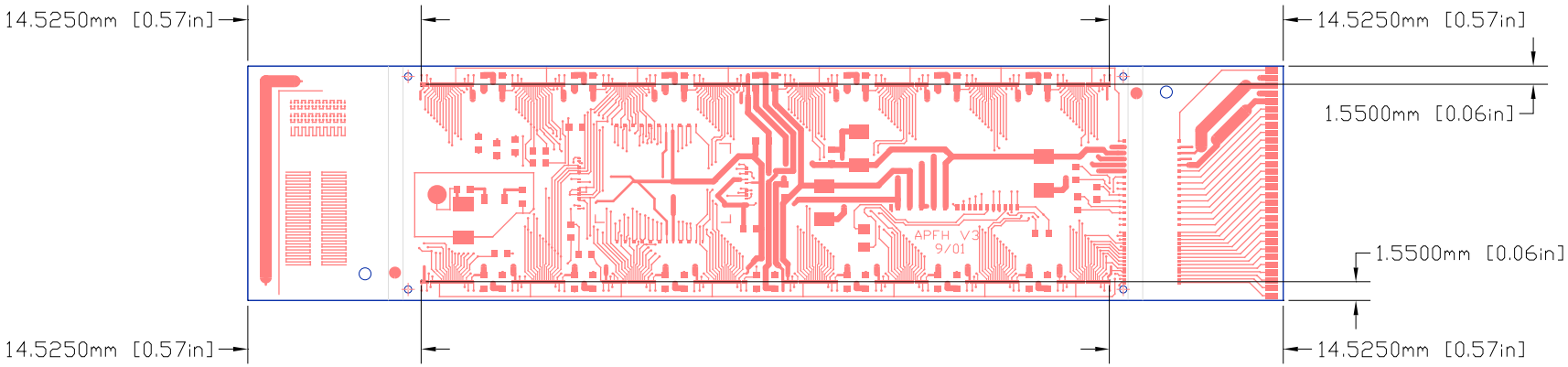
R. Boyd, University of Oklahoma

APFHV3-HP

0

NONE 1 October, 2001

1/1



1 mm 5 mm 1 cm

Notes:

ATLAS PIXEL DETECTOR FLEX HYBRID

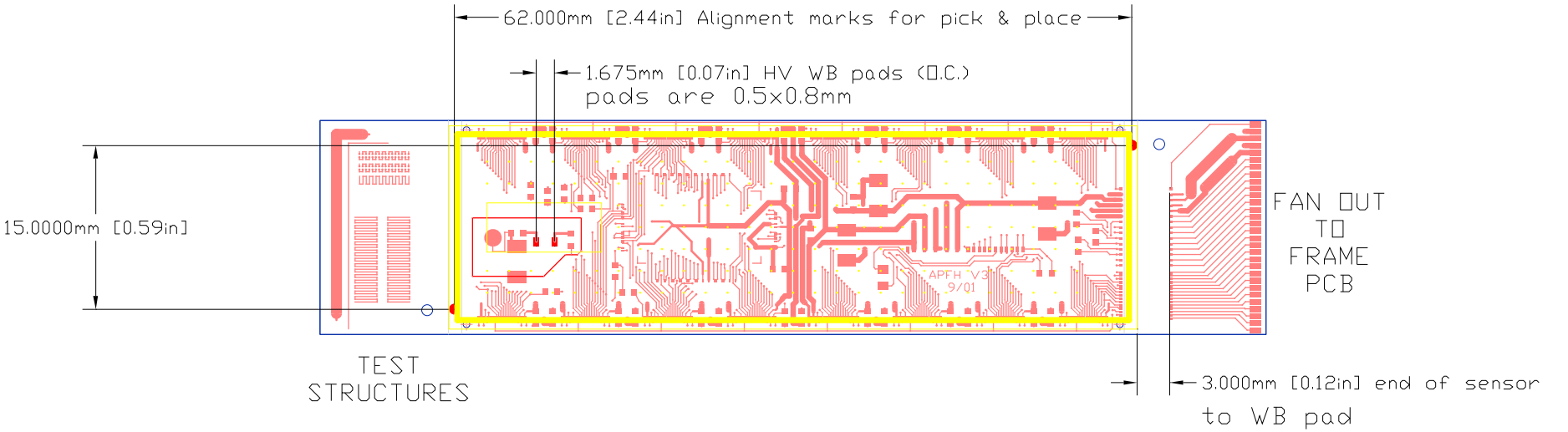
TOP METAL TO OUTLINE
DIMENSIONS & TOLERENCES

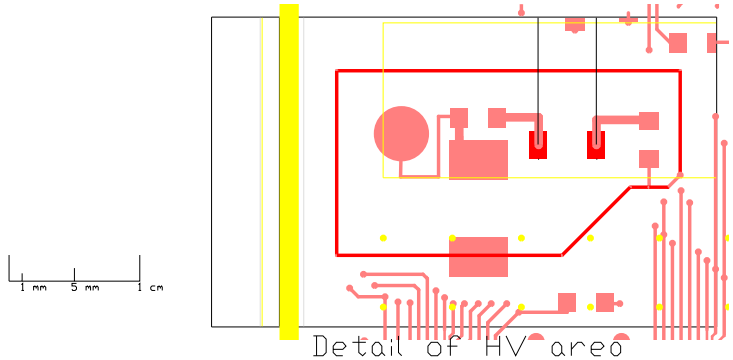
R. Boyd, University of Oklahoma

Tolerence: +-0.127mm [0.005in]

APFHV3-MR 2

NONE 1 October, 2001 1/1





Notes:
See following sheets for bond pad dimensions

Tolerance: no via breakout

ATLAS PIXEL DETECTOR FLEX HYBRID

TOP METAL FEATURES

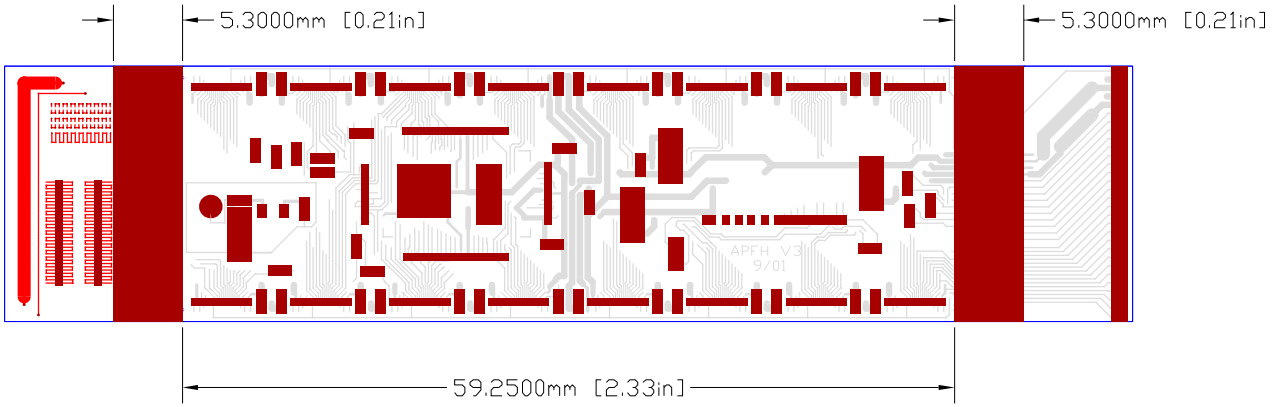
R. Boyd, University of Oklahoma

APFHV3-TF

2

NONE 1 October, 2001

1/1



1 mm 5 mm 1 cm

Notes:

ATLAS PIXEL DETECTOR FLEX HYBRID VERSION 3

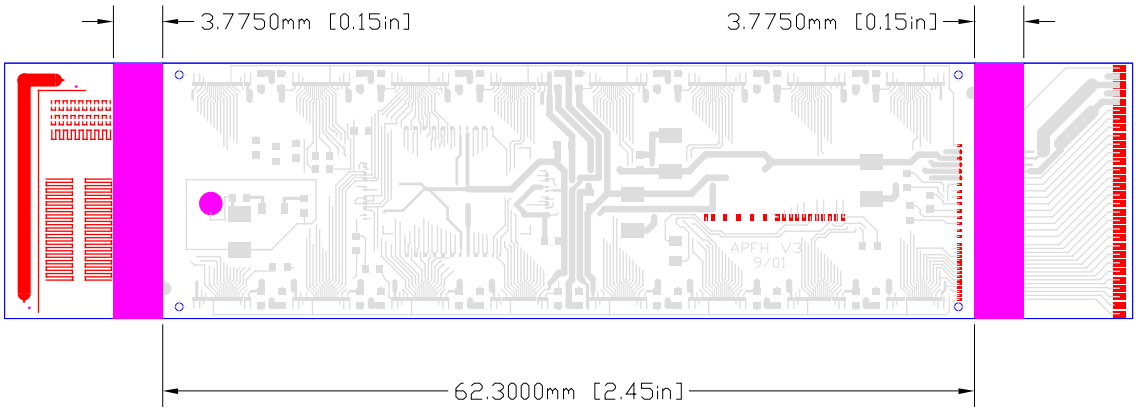
TOP SOLDER MASK

R. Boyd, University of Oklahoma

Placement Tolerance:
0.1016mm [0.004in] w.r.t metal
Opening Tolerance:
0.0254mm [0.001in]

APFHV3-TM 0

NONE 1 October, 2001 1/1



1 mm 5 mm 1 cm

Notes:

ATLAS PIXEL DETECTOR FLEX HYBRID VERSION 3

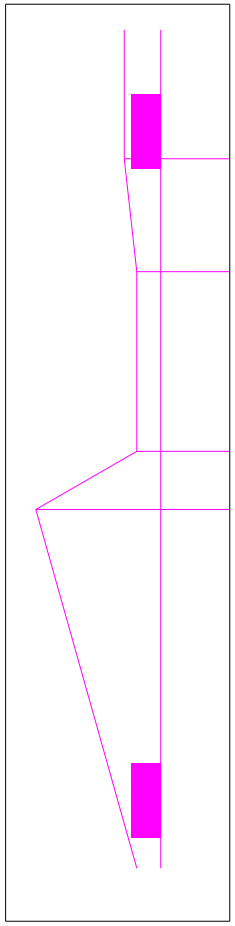
BOTTOM SOLDER MASK

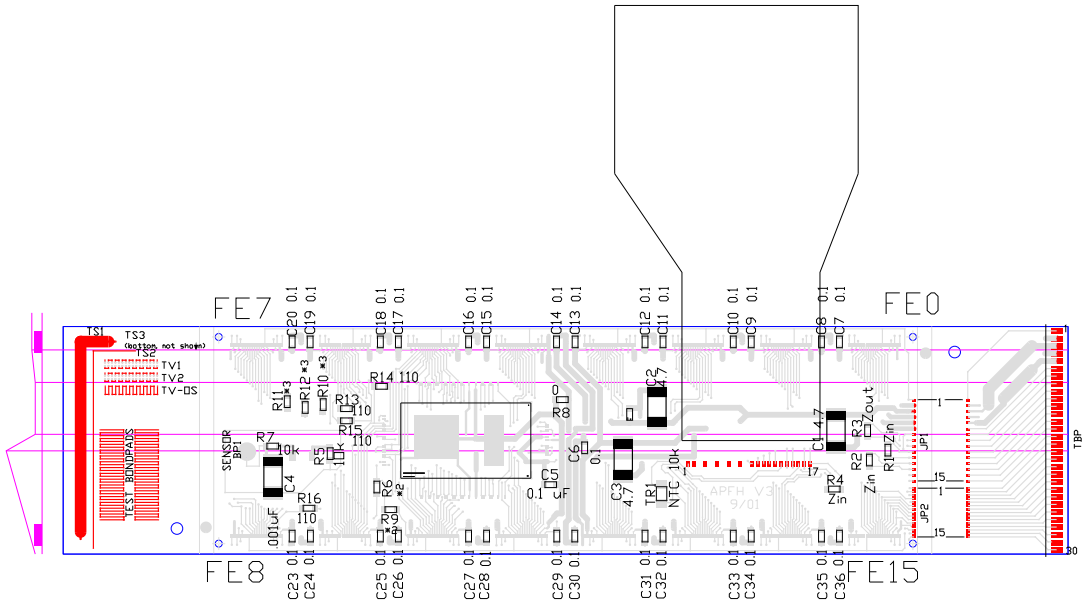
R. Boyd, University of Oklahoma

Placement Tolerance:
0.1016mm [0.004in] w.r.t metal
Opening Tolerance:
0.0254mm [0.001in]

APFHV3-BM 0

NONE 1 October, 2001 1/1





Detail of projection
of component heights
+ tolerences onto
envelope (1)

1 mm 5 mm 1 cm

Notes:

1. Component tolerences include:
   component height
   soldering height
   component placement

See schematic for #1, #2, #3, component specifications & other assembly notes

Tolerence: n/a

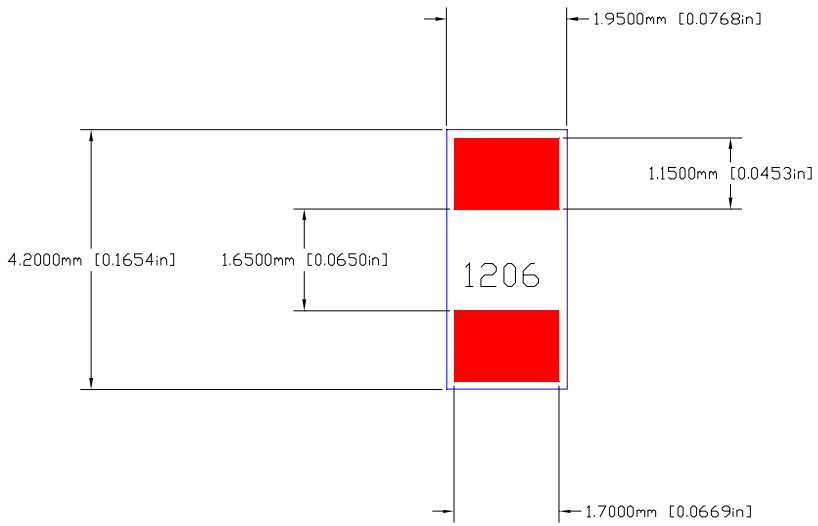
ATLAS PIXEL DETECTOR FLEX HYBRID VERSION 3

ASSEMBLY DRAWING

R. Boyd, University of Oklahoma

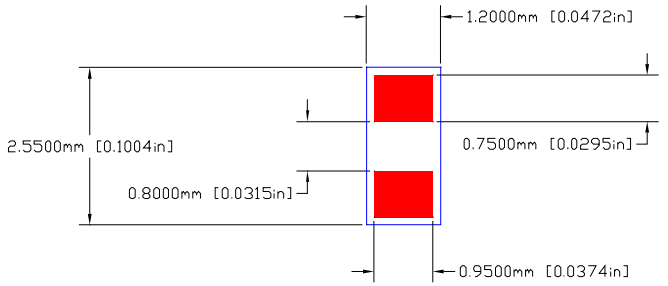
APFHV3-AD 0

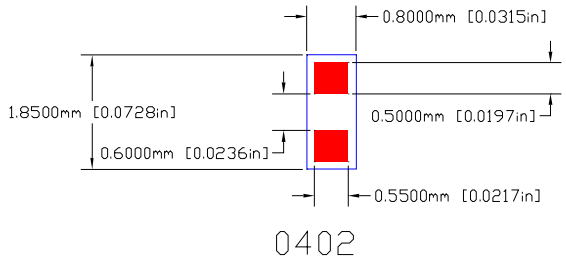
NONE 1 October, 2001 1/1

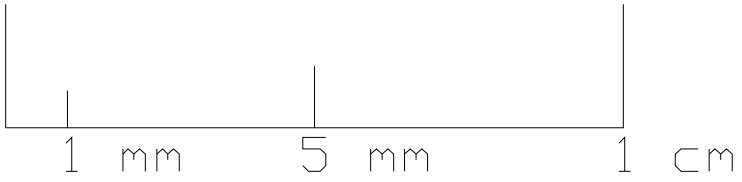


solder mask opening

top metal







Notes:
Tolerances:
solder mask w.r.t. metal
+- 0.127mm [5 mil]
metal x-y dim.
+- 0.005mm [0.2mil]
Tolerance: see notes

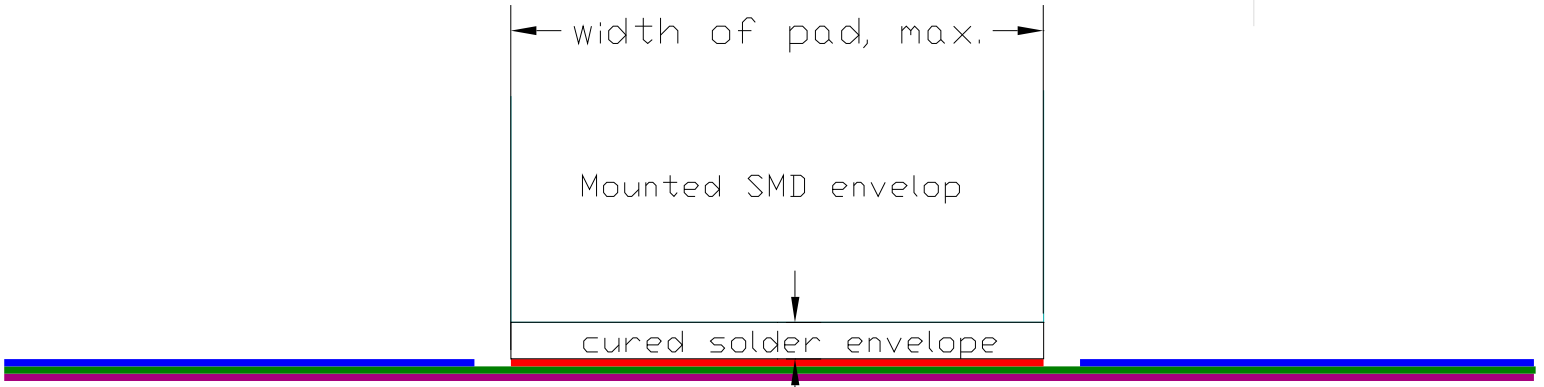
ATLAS PIXEL DETECTOR FLEX HYBRID PROBE CARD

SMD PAD AND SOLDER MASK OPENING SIZES

R. Boyd, University of Oklahoma

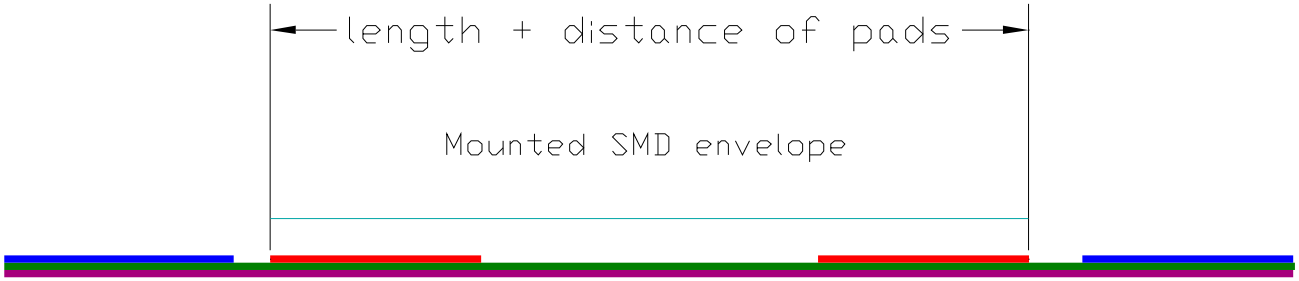
APFHPCv3-SMD | 0

NONE | 1 October, 2001 | 1/1



End view

Side view



circuit substrate

bottom solder mask

top solder mask

top metal

Notes:
Metal thickness:
15 - 27 um [0.6 - 1.0 mil]

Tolerance: in drawing

ATLAS PIXEL DETECTOR FLEX HYBRID

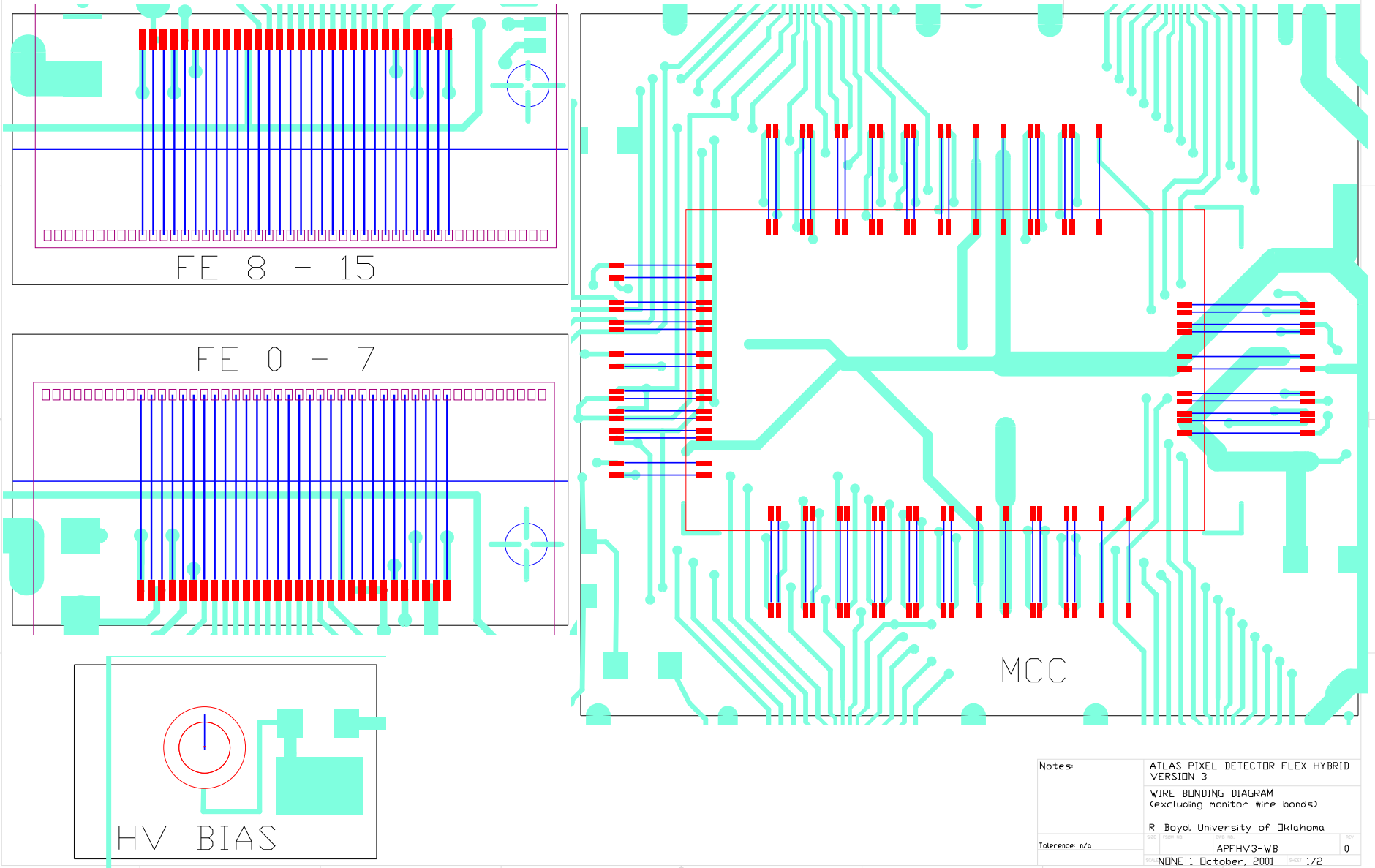
MOUNTED SMD ENVELOPE

R. Boyd, University of Oklahoma

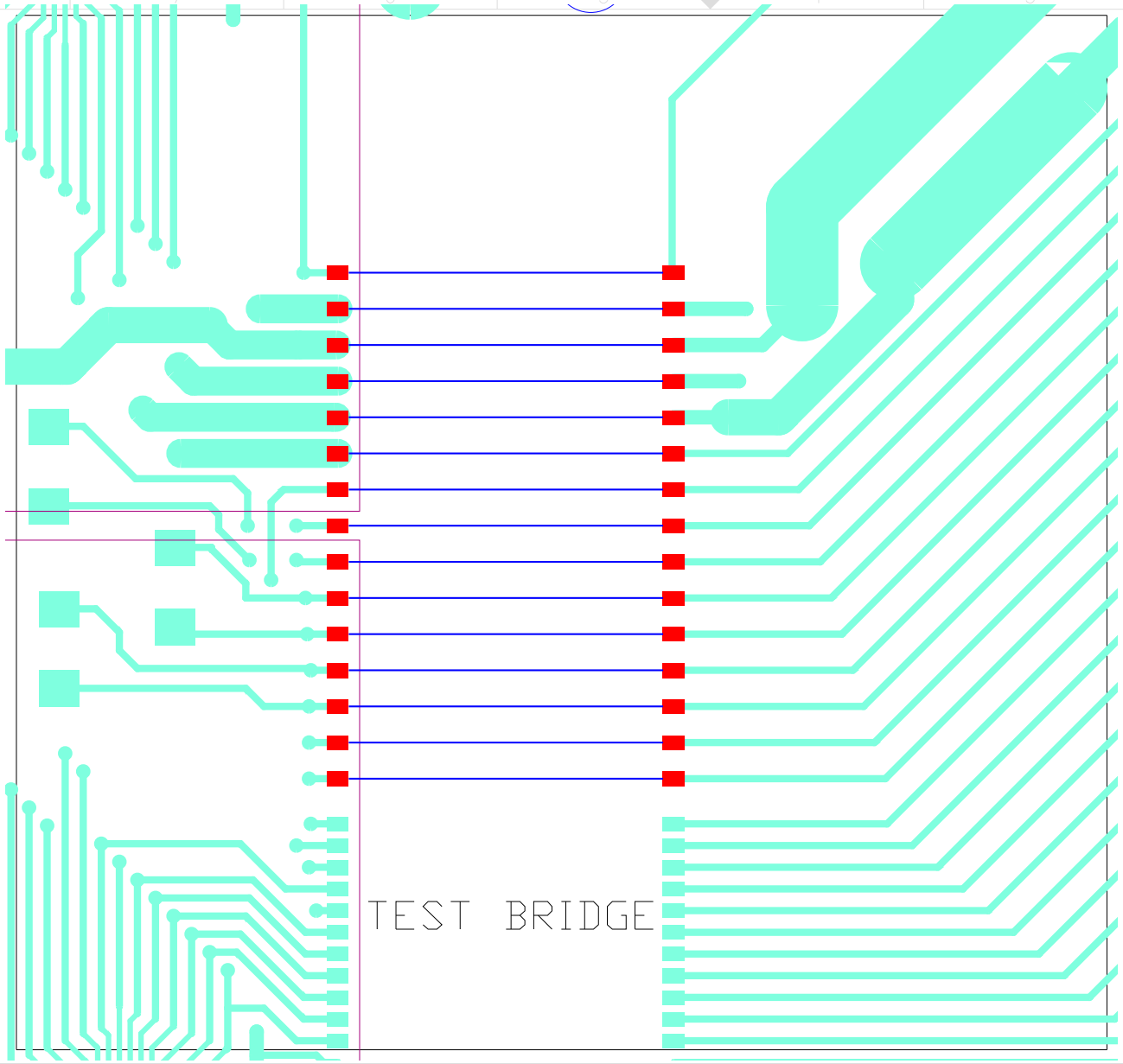
APFHPCv3-ENV

0

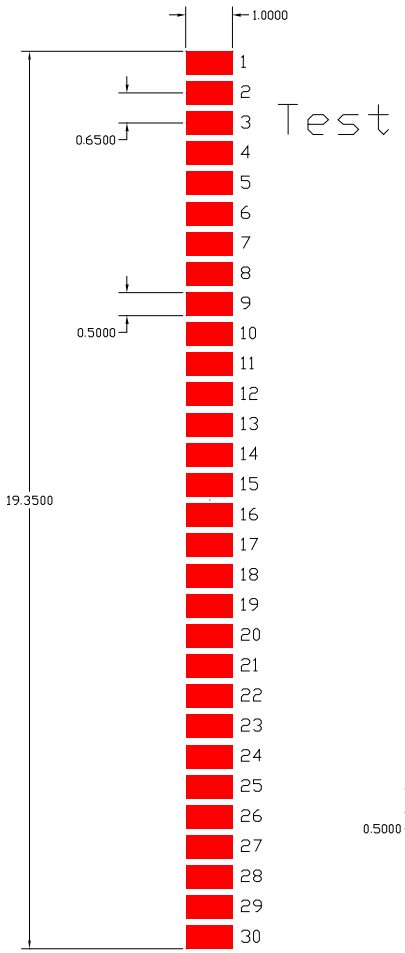
NONE | 1 October, 2001 | 1/1



Notes:	ATLAS PIXEL DETECTOR FLEX HYBRID VERSION 3
	WIRE BONDING DIAGRAM (excluding monitor wire bonds)
	R. Boyd, University of Oklahoma
Tolerance: n/a	APFHV3-WB 0
	NONE 1 October, 2001 1/2

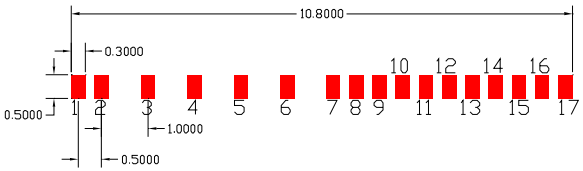


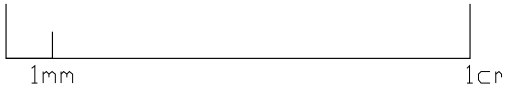
Notes:	ATLAS PIXEL DETECTOR FLEX HYBRID VERSION 3
	WIRE BONDING DIAGRAM (excluding monitor wire bonds)
	R. Boyd, University of Oklahoma
Tolerance: n/a	APFHV3-WB 0
	NONE 1 October, 2001 2/2



Test

Pigtail





ATLAS Pixel Flex Hybrid Module
connector pad def.'s & dim.'s

Drawn by: R. Boyd, University of Oklahoma

Document Number:

REV:

Date: 27 July, 2001

Units: mm

Scale: n/a

V3 and v4.x Pigtail Connector Signals

Pin #	Flex v3 Signal Name	Flex v4.x Signal Name	Pigtail Signal Name
1	Vcal	Vcal	spare1
2	VDD_AMS	VDD_AMS	spare2
3	VDDA	VDDA	VDDA
4	AGnd	AGnd	AGnd
5	VDD	VDD	VDD
6	DGnd	DGnd	DGnd
7	STRIN	DTO2N	STRI/DTO2N
8	STRIP	DTO2P	STRI/DTO2P
9	RSIB	RSIB	RSIB
10	DTON	DTON	DTON
11	DTOP	DTOP	DTOP
12	NTC_RET	NTC_RET	NTC_RET
13	DCIN	DCIN	DCIN
14	DCIP	DCIP	DCIP
15	NTC	NTC	NTC
16	XCKN	XCKN	XCKN
17	XCKP	XCKP	XCKP

ATLAS PIXEL FLEX HYBRID MODULE PIGTAIL CONNECTOR			
University of Olahoma		Scale:	n/a
Dwg.#	Rev. A	Units:	n/a
Drawn By:	R. Boyd	Date:	27 February, 2002

V3 and v4.x Test Connector Signals

Pad #	Signal Name 3.x	Signal Name 4.x
1	Vcal	
2	VDD_AMS	spare 2
3	DGnd	
4	VDD	
5	AGnd	
6	VDDA	
7	RSIB	
8	DTOP	
9	DTON	
10	STRIP	DTO2P
11	STRIN	DTO2N
12	DCIN	
13	DCIP	
14	CKN	
15	CKP	

Pad #	Signal Name
16	CCK
17	DA
18	LD
19	SYNCN
20	SYNCP
21	XCKN
22	XCKP
23	LV1N
24	LV1P
25	STRN
26	STRP
27	VDDA
28	VDD
29	DGnd
30	AGnd

ATLAS PIXEL FLEX HYBRID MODULE TEST CONNECTOR			
University of Olahoma		Scale: n/a	
Dwg.#	Rev. A	Units: n/a	
Drawn By:	R. Boyd	Date:	26 February, 2002

NOTES:

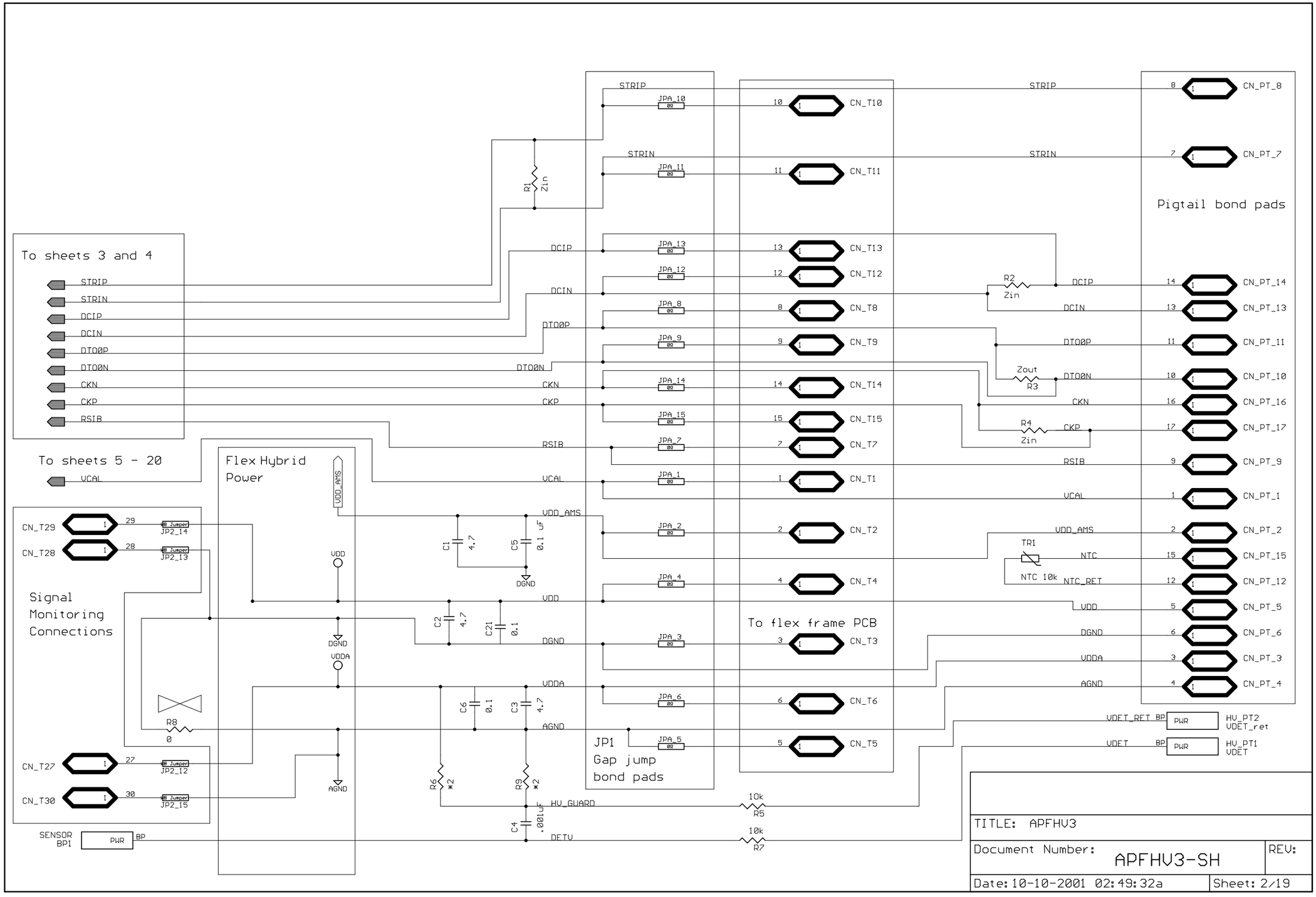
*1 All resistors in Ohms, 0402, 1/16 W
*2 Use of R6 and R9 is mutually exclusive! One or the other can be zero Ohms, but not both.
*3 r_clamp - 10k?
*4 All capacitors 10 WVDC unless otherwise noted
*5 All capacitors 0402 except: C1 - C4 are 1206
*6 NTC is 0603

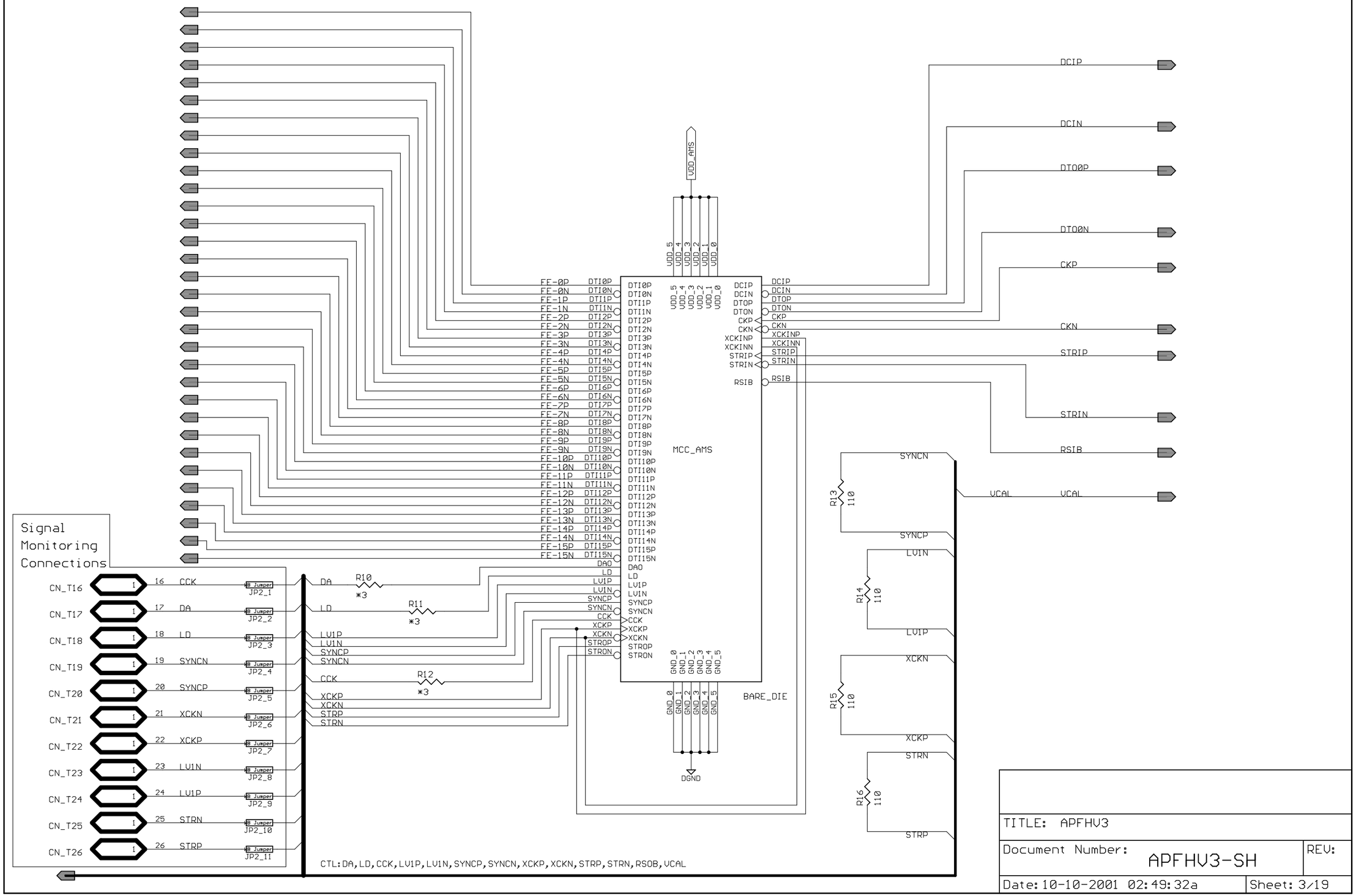
*7

denotes solder pads shorted on layout.

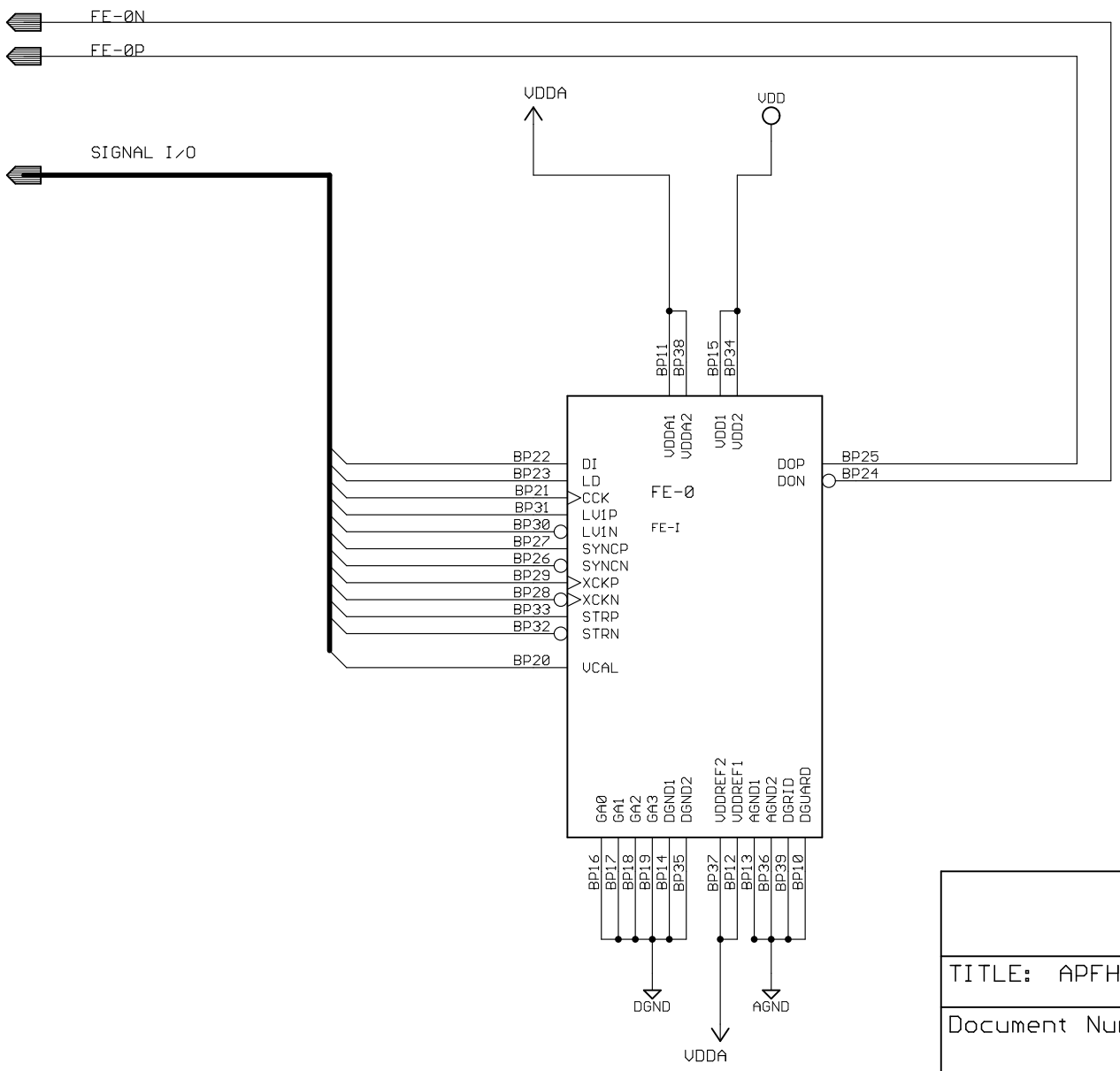
Missing parts designators:
C22

TITLE: APFHV3		
Document Number: APFHV3-SH		REV:
Date: 10-10-2001 02:49:32a	Sheet: 1/19	

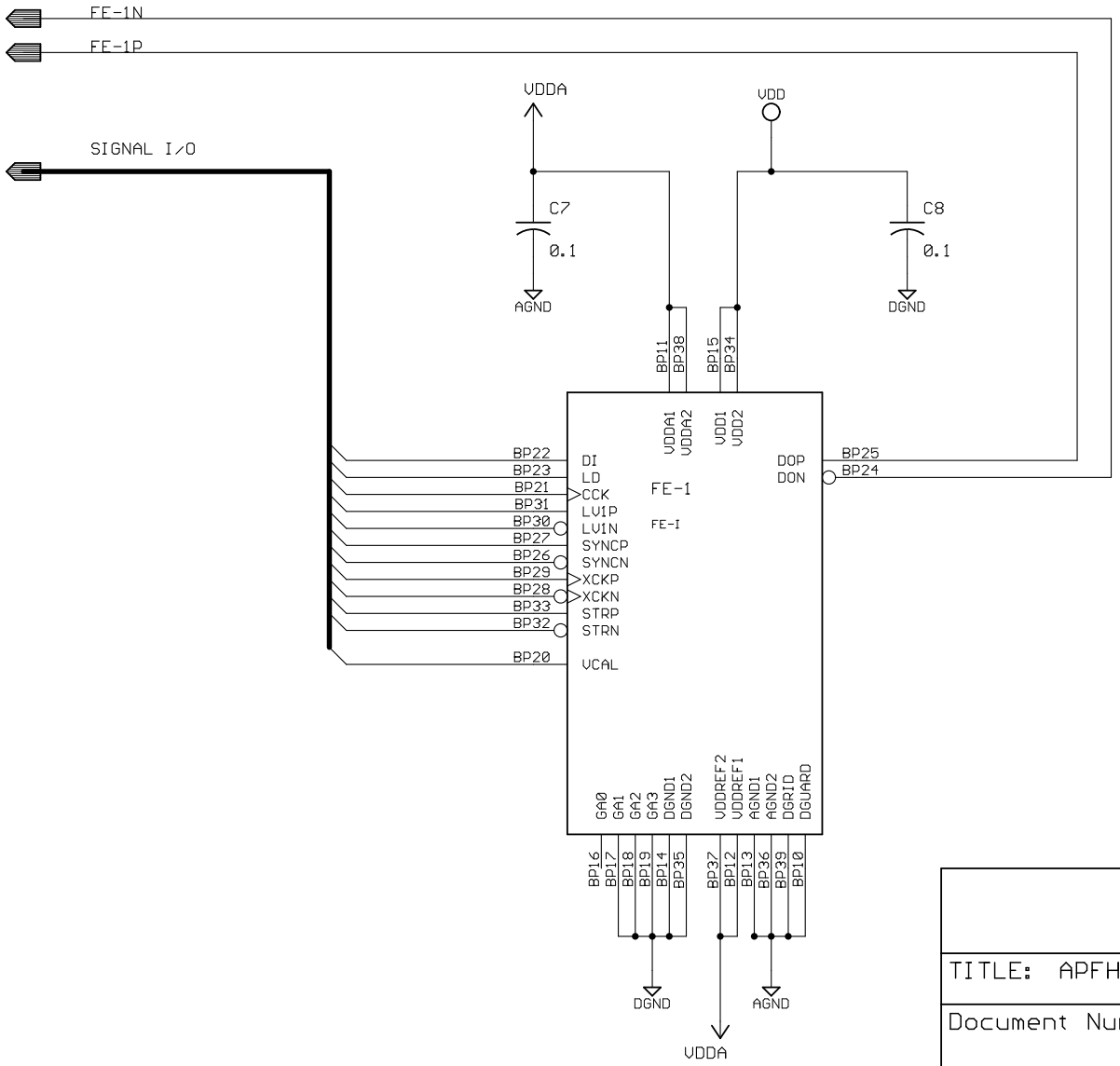

To sheets 3 and 4
STRIP
STRIN
DCIP
DCIN
DTO0P
DTO0N
CKN
CKP
RSIB
To sheets 5 - 20
VCAL
Flex Hybrid
Power
VDD_AMS
CN_T29
CN_T28
JP2_14
JP2_13
Signal
Monitoring
Connections
VDD
DGND
VDDA
AGND
R8
0
CN_T27
CN_T30
JP2_12
JP2_15
SENSOR
BP1
PWR
BP
R1
Zin
C1
4.7
C5
0.1 uF
C2
4.7
C21
0.1
C6
0.1
C3
4.7
R6
*2
R9
*2
C4
.001uF
HV_GUARD
DETV
JPA_10
JPA_11
JPA_13
JPA_12
JPA_8
JPA_9
JPA_14
JPA_15
JPA_7
JPA_1
JPA_2
JPA_4
JPA_3
JPA_6
JPA_5
JP1
Gap jump
bond pads
CN_T10
CN_T11
CN_T13
CN_T12
CN_T8
CN_T9
CN_T14
CN_T15
CN_T7
CN_T1
CN_T2
CN_T4
CN_T3
CN_T6
CN_T5
To flex frame PCB
R2
Zin
Zout
R3
R4
Zin
10k
R5
10k
R7
TR1
NTC 10k
Pigtail bond pads
CN_PT_8
CN_PT_7
CN_PT_14
CN_PT_13
CN_PT_11
CN_PT_10
CN_PT_16
CN_PT_17
CN_PT_9
CN_PT_1
CN_PT_2
CN_PT_15
CN_PT_12
CN_PT_5
CN_PT_6
CN_PT_3
CN_PT_4
VDET_RET
VDET
HV_PT2
VDET_ret
HV_PT1
VDET
TITLE: APFHV3
Document Number: APFHV3-SH
REV:
Date: 10-10-2001 02:49:32a
Sheet: 2/19



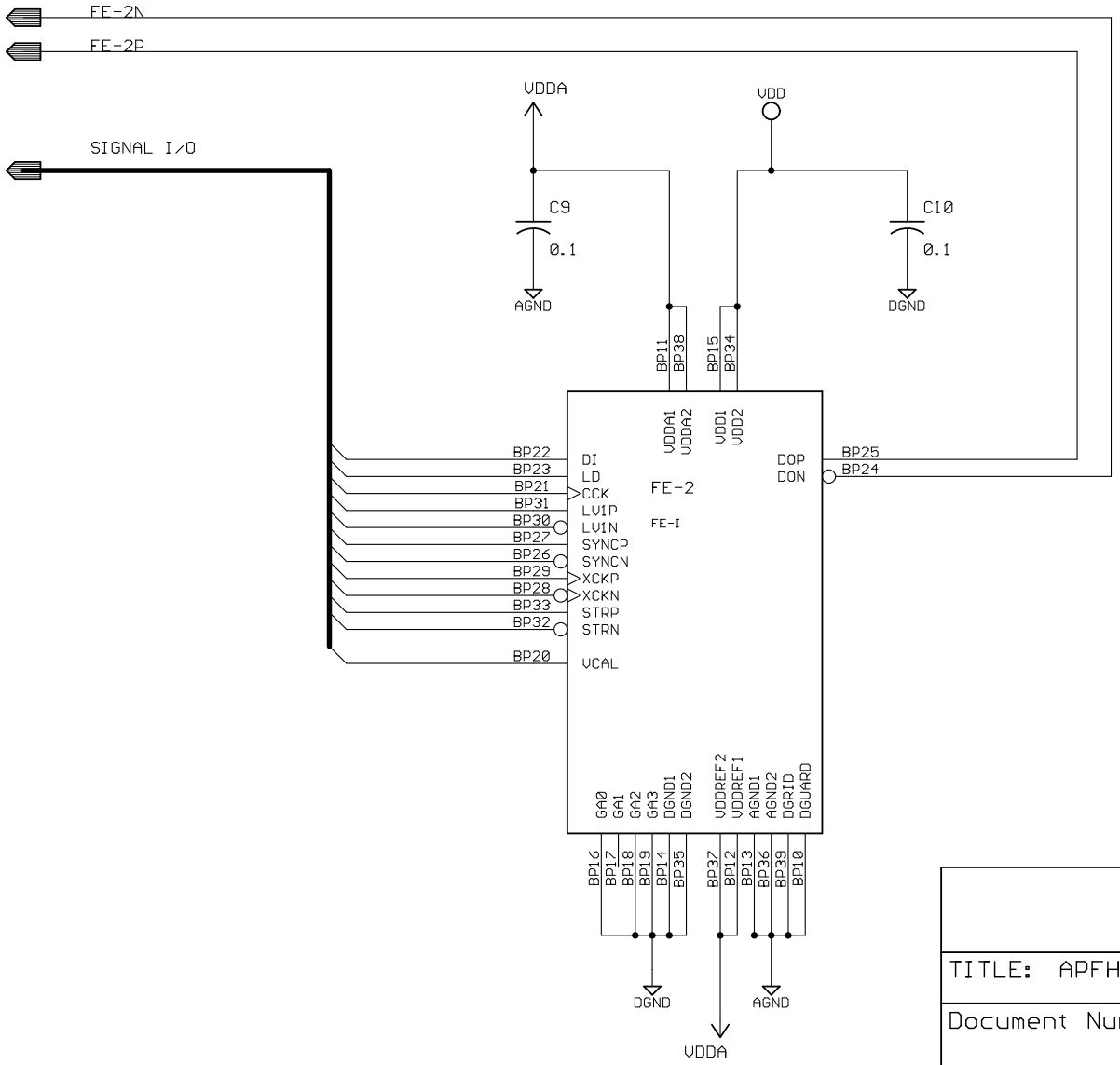
TITLE: APFHV3		
Document Number: APFHV3-SH		REV:
Date: 10-10-2001 02:49:32a	Sheet: 3/19	



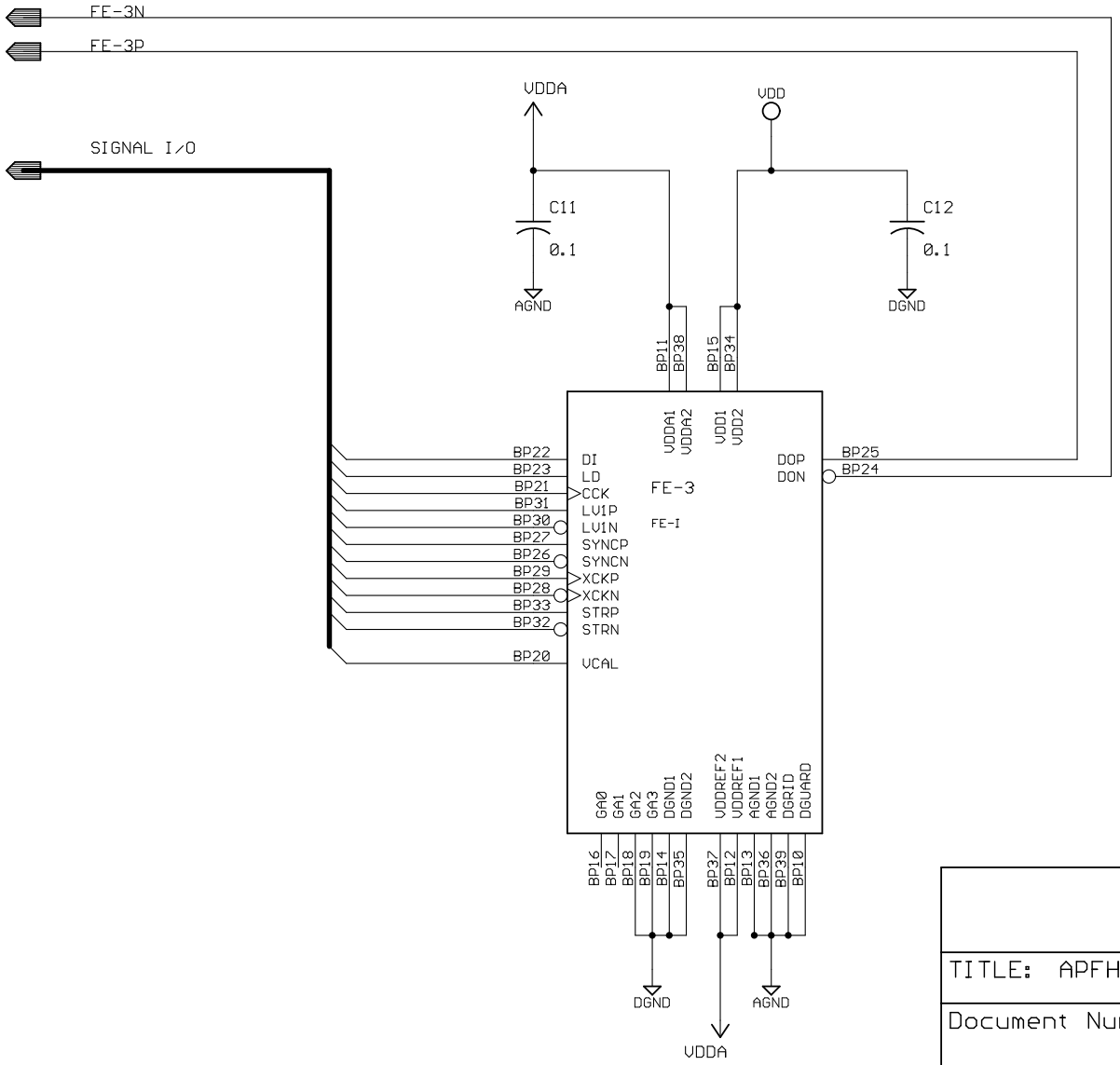
TITLE: APFHV3		
Document Number:	APFHV3-SH	REV:
Date: 10-10-2001 02:49:32a	Sheet: 4/19	



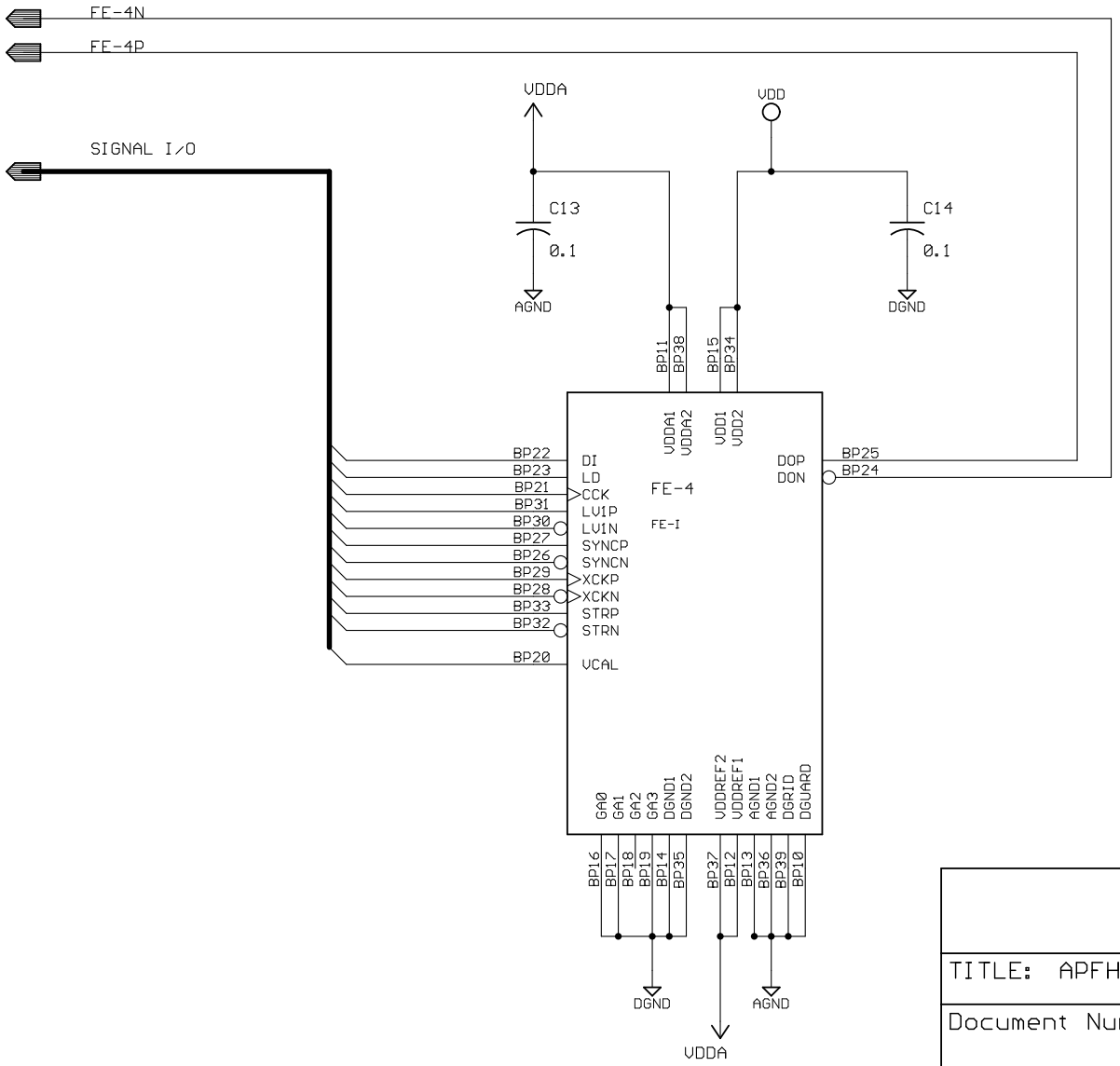
TITLE: APFHV3		
Document Number:	APFHV3-SH	REV:
Date: 10-10-2001 02:49:32a		Sheet: 5/19



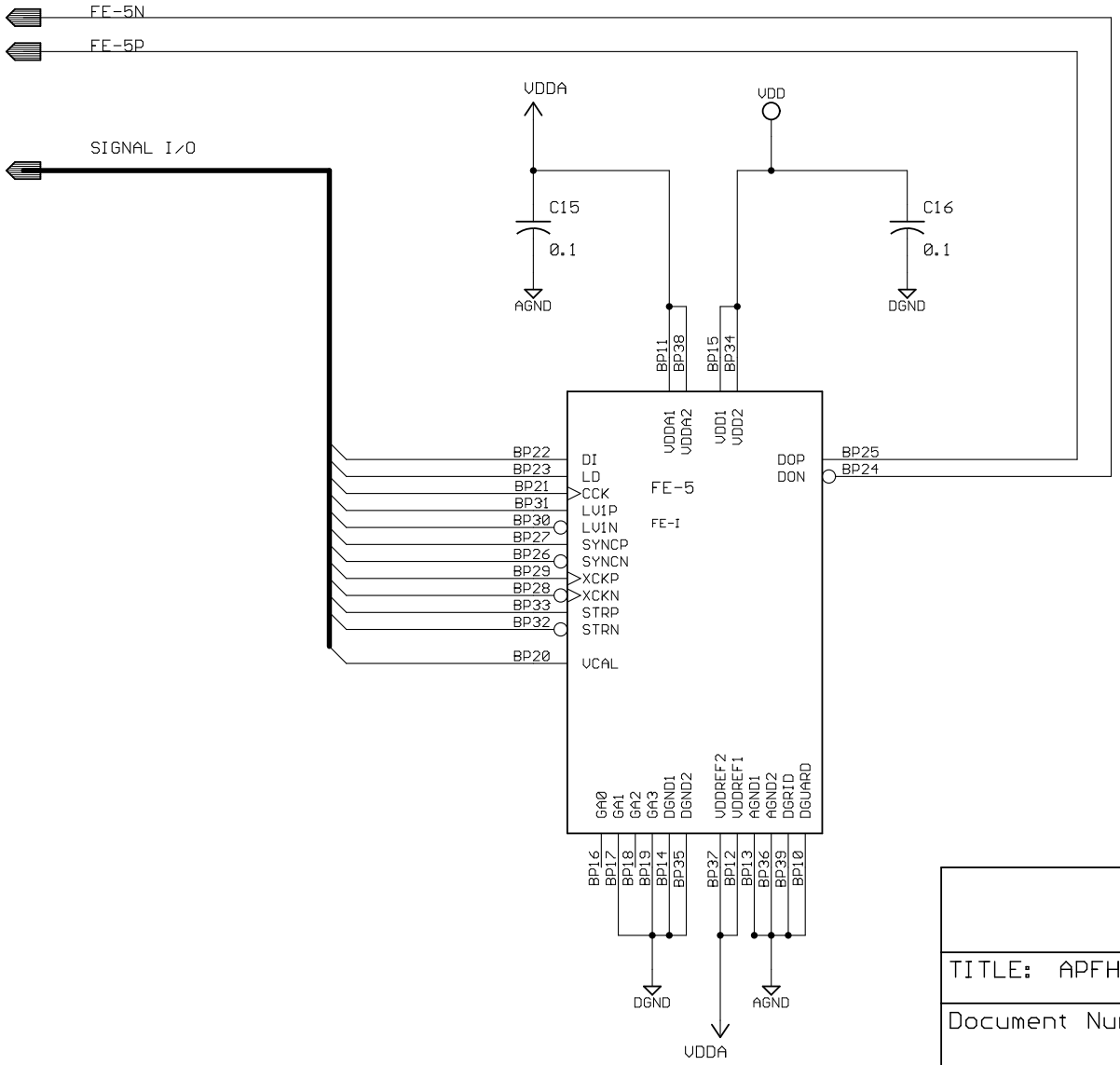
TITLE: APFHV3		
Document Number:	APFHV3-SH	REV:
Date: 10-10-2001 02:49:32a	Sheet: 6/19	



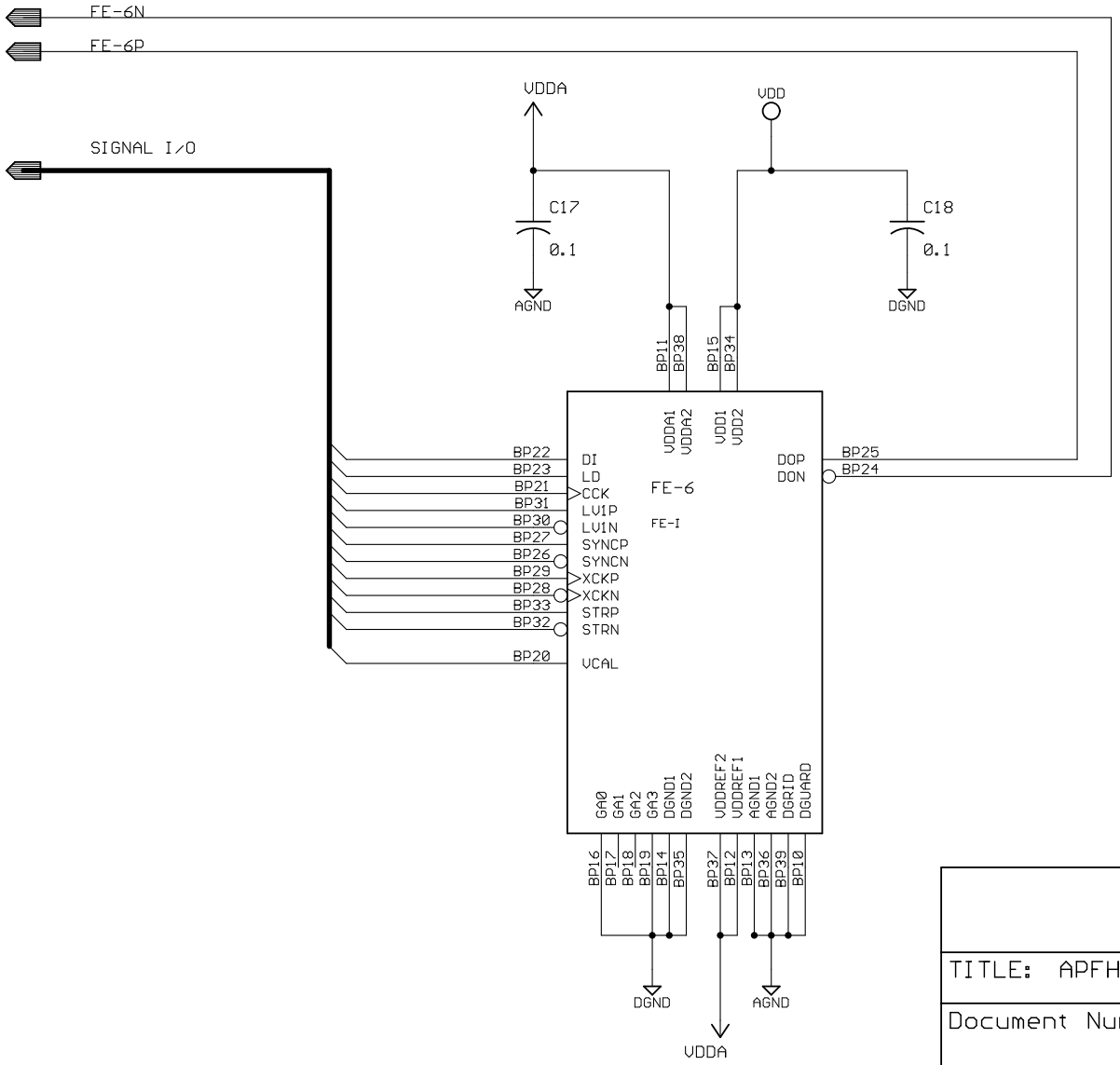
TITLE: APFHV3		
Document Number:	APFHV3-SH	REV:
Date: 10-10-2001 02:49:32a	Sheet: 7/19	



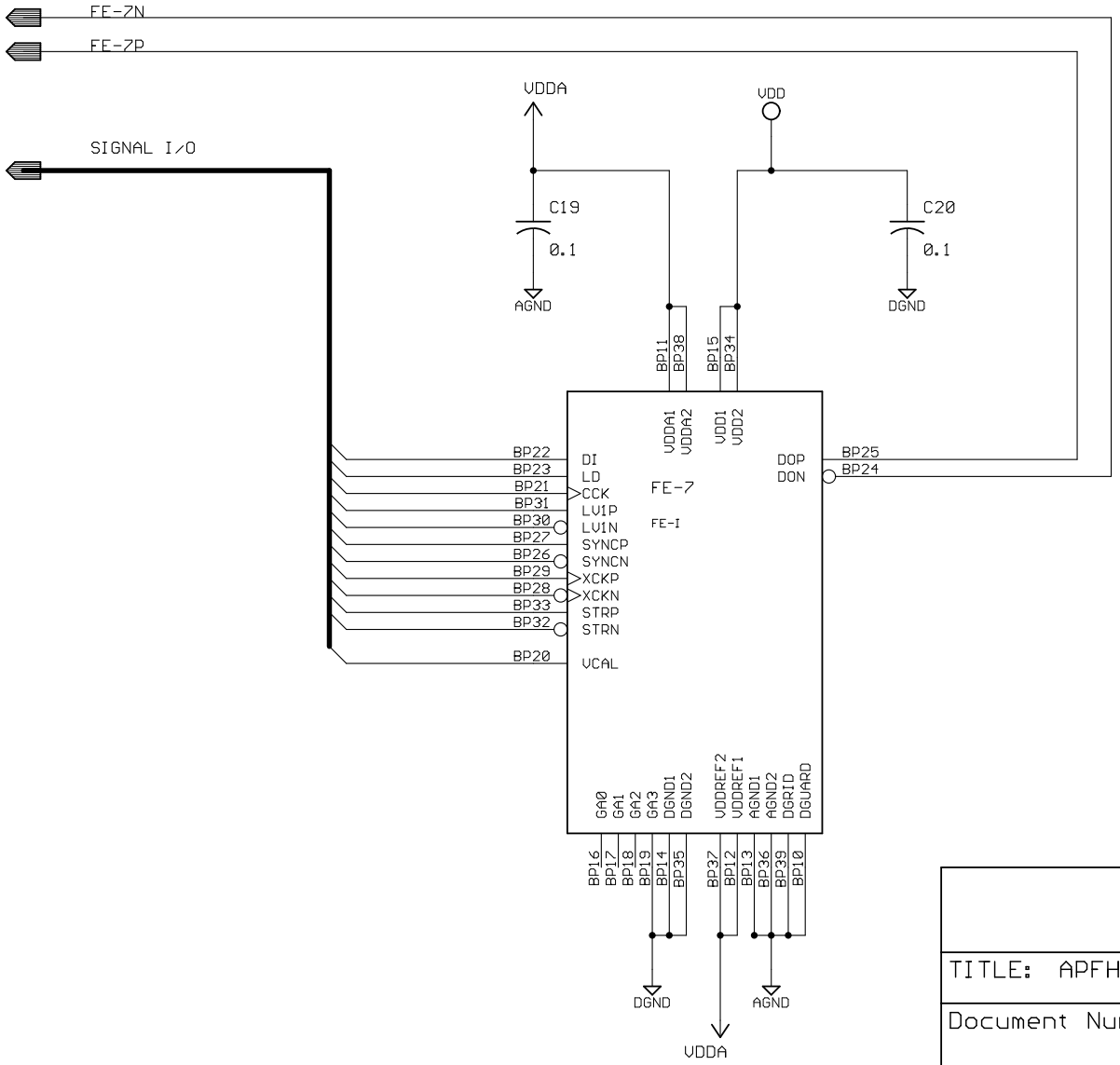
TITLE: APFHV3		
Document Number:	APFHV3-SH	REV:
Date: 10-10-2001 02:49:32a		Sheet: 8/19



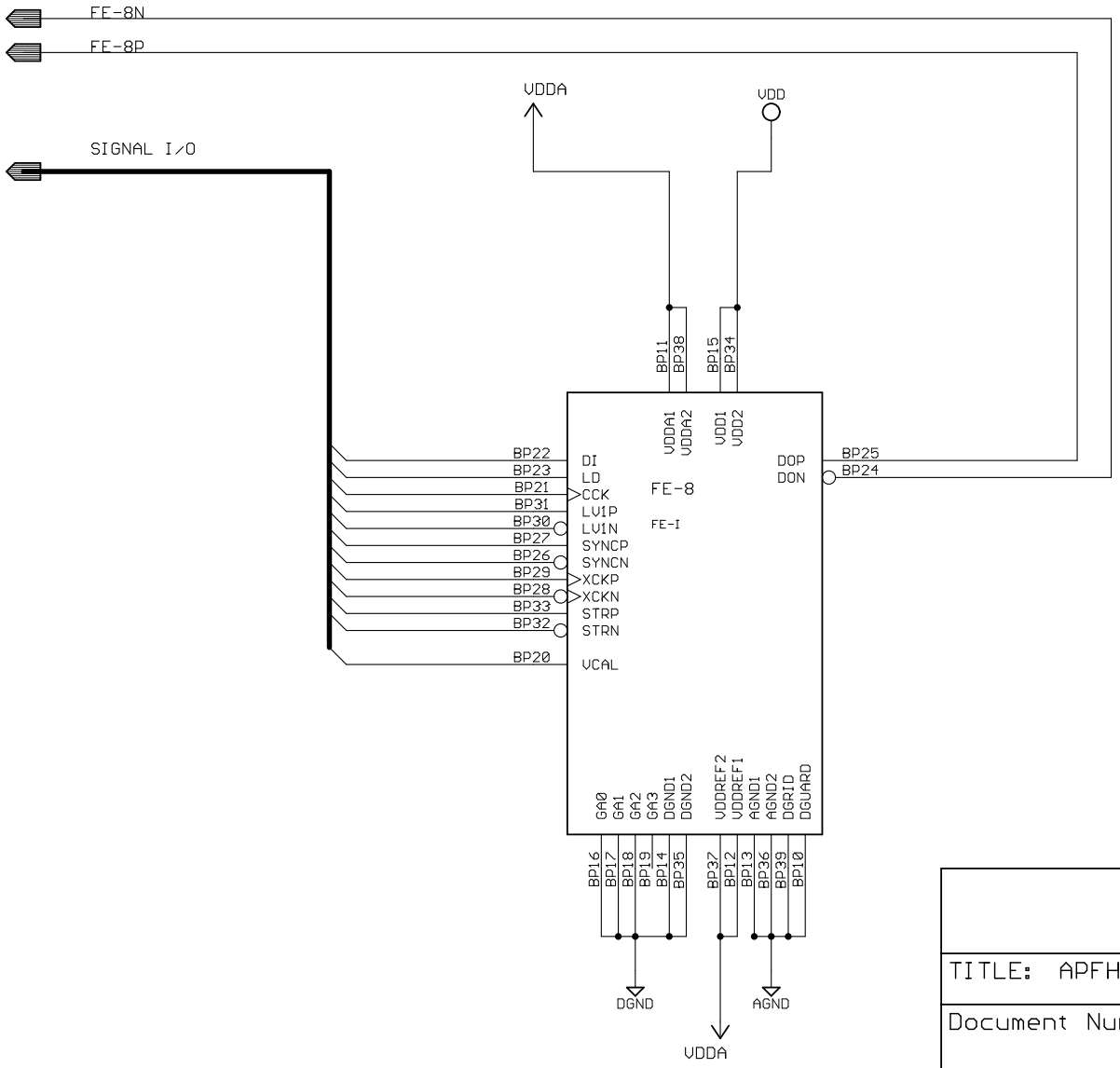
TITLE: APFHV3		
Document Number:	APFHV3-SH	REV:
Date: 10-10-2001 02:49:32a		Sheet: 9/19



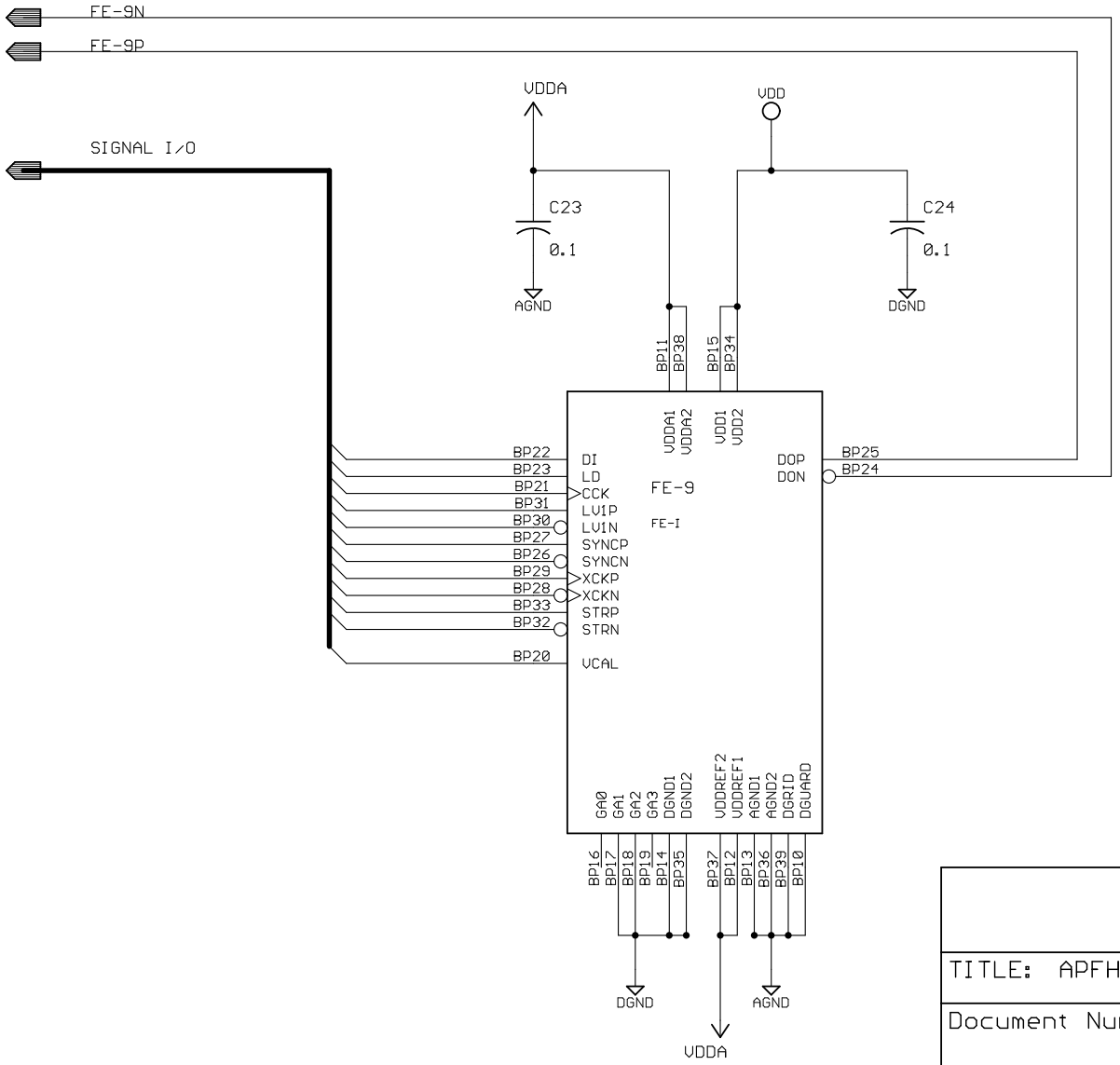
TITLE: APFHV3		
Document Number:	APFHV3-SH	REV:
Date: 10-10-2001 02:49:32a	Sheet: 10/19	



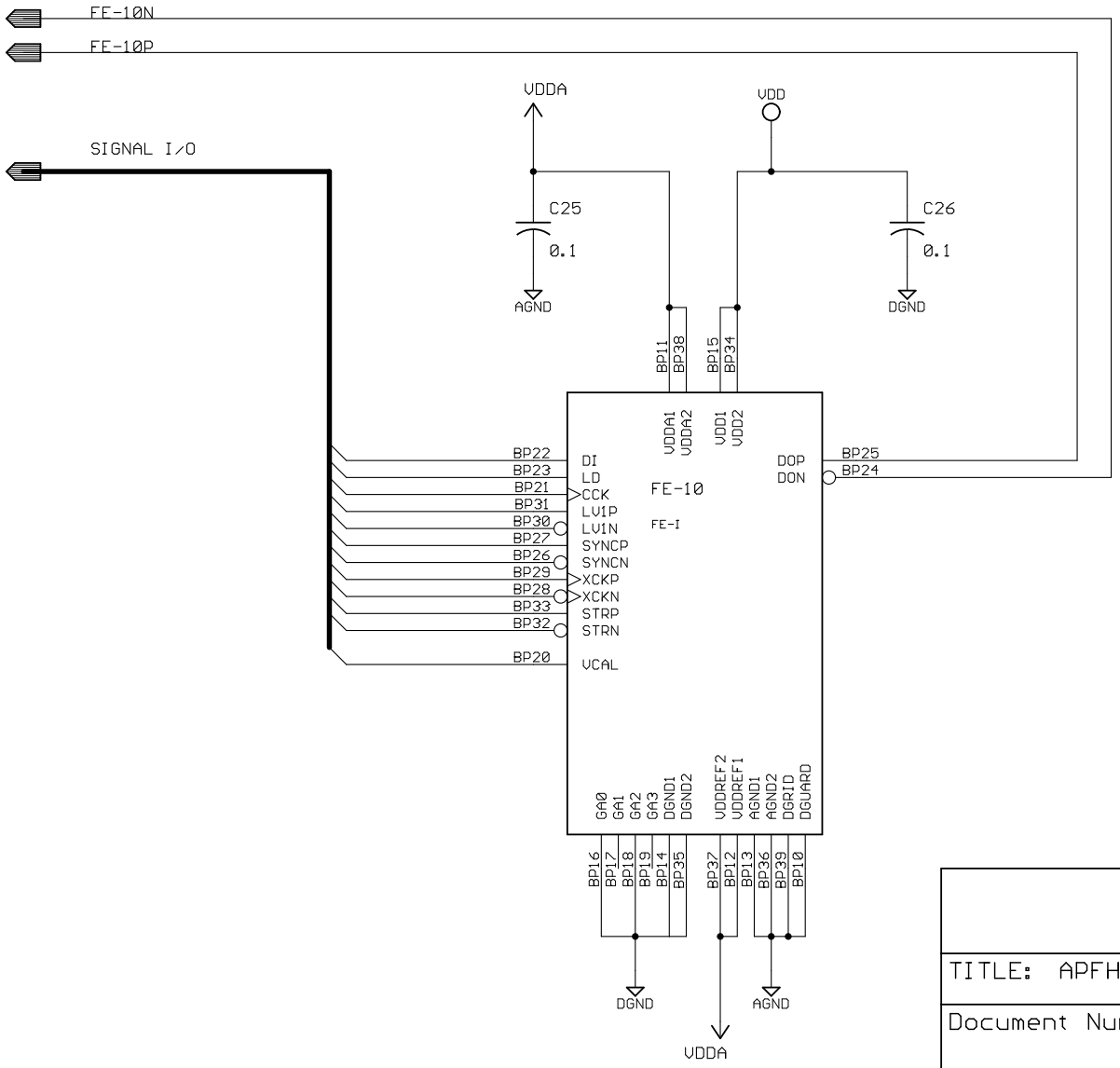
TITLE: APFHV3		
Document Number:	APFHV3-SH	REV:
Date: 10-10-2001 02:49:32a		Sheet: 11/19



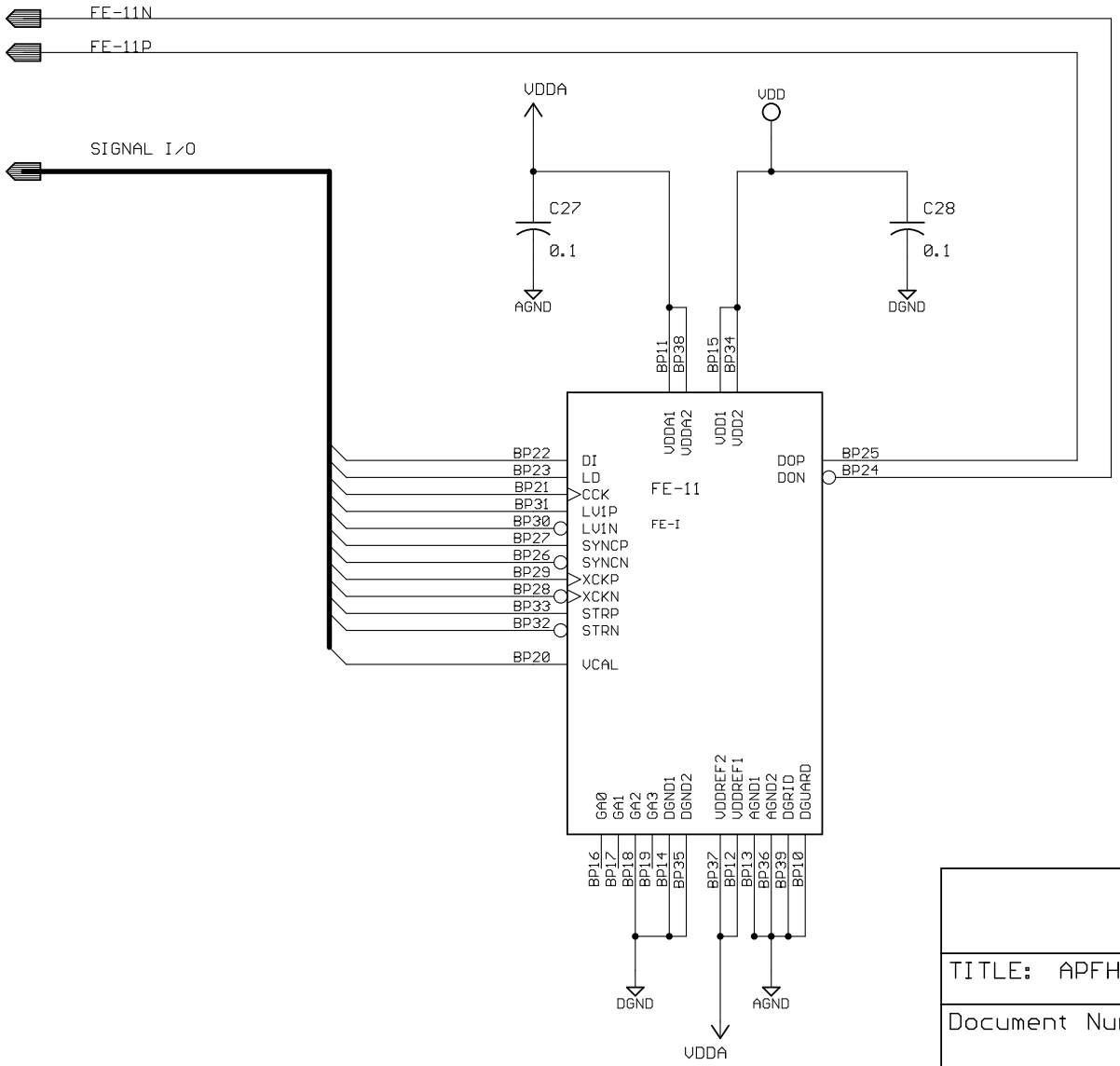
TITLE: APFHV3		
Document Number:	APFHV3-SH	REV:
Date: 10-10-2001 02:49:32a		Sheet: 12/19



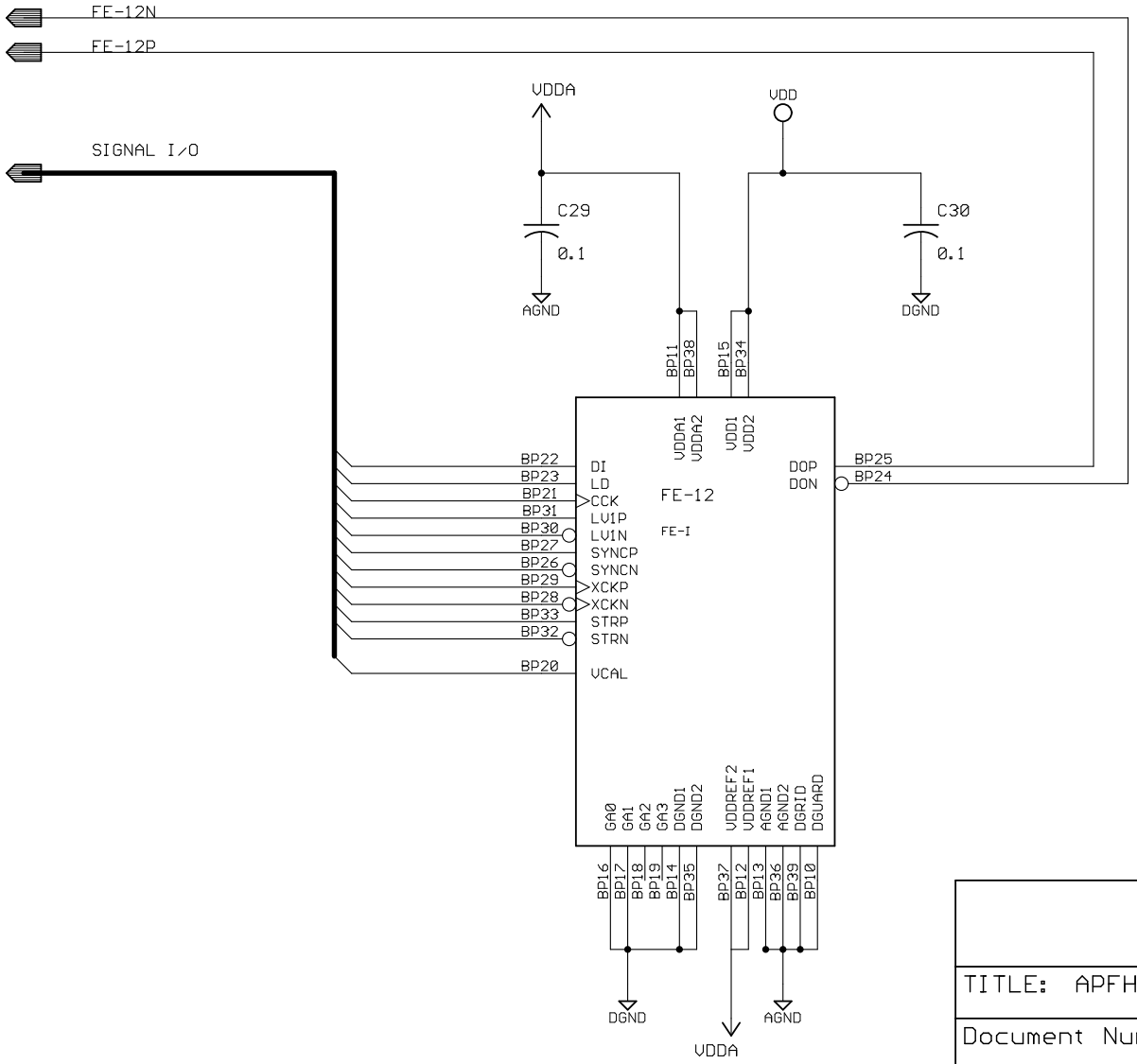
TITLE: APFHV3		
Document Number:	APFHV3-SH	REV:
Date: 10-10-2001 02:49:32a	Sheet: 13/19	



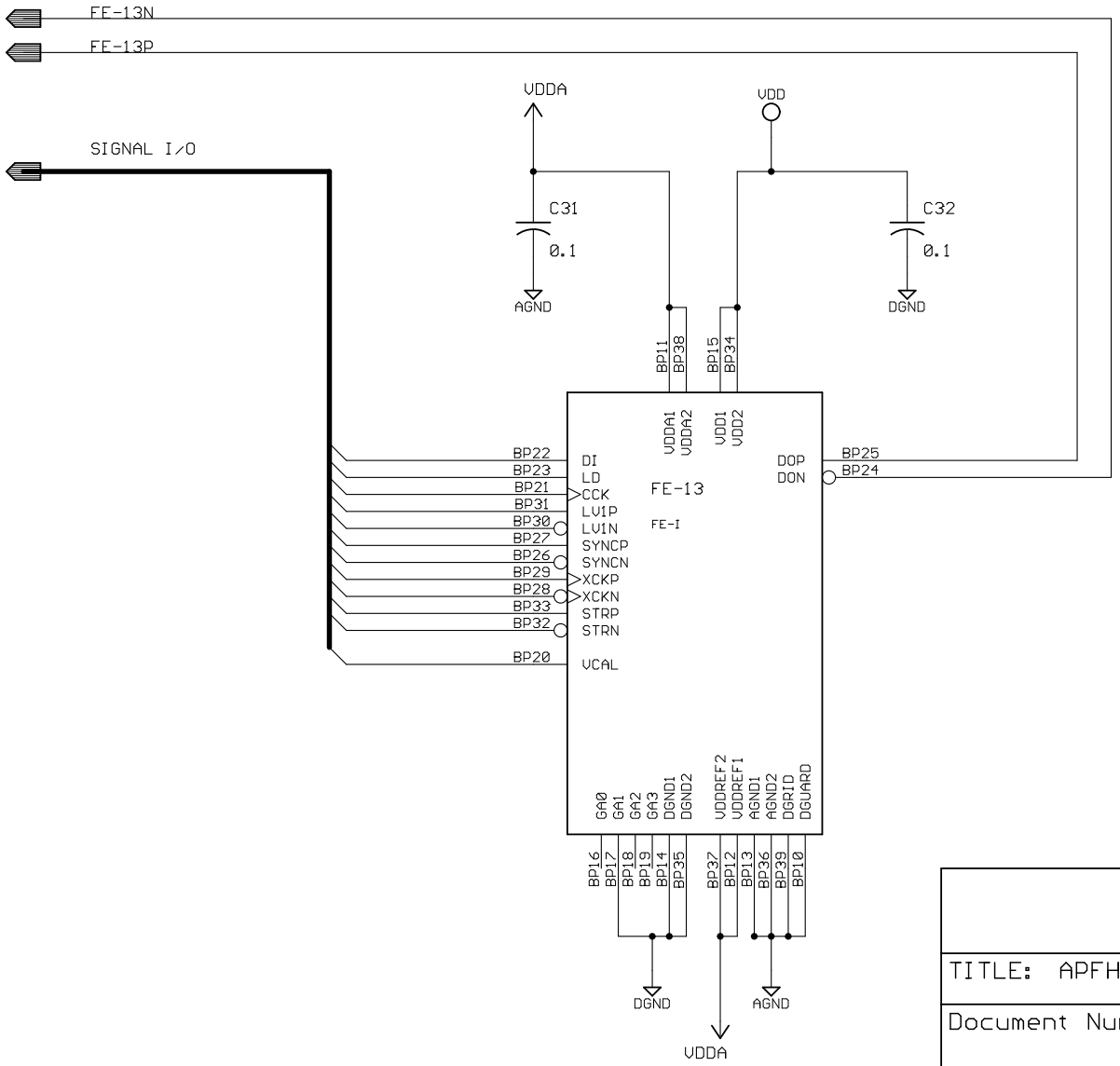
TITLE: APFHV3		
Document Number:	APFHV3-SH	REV:
Date: 10-10-2001 02:49:32a	Sheet: 14/19	



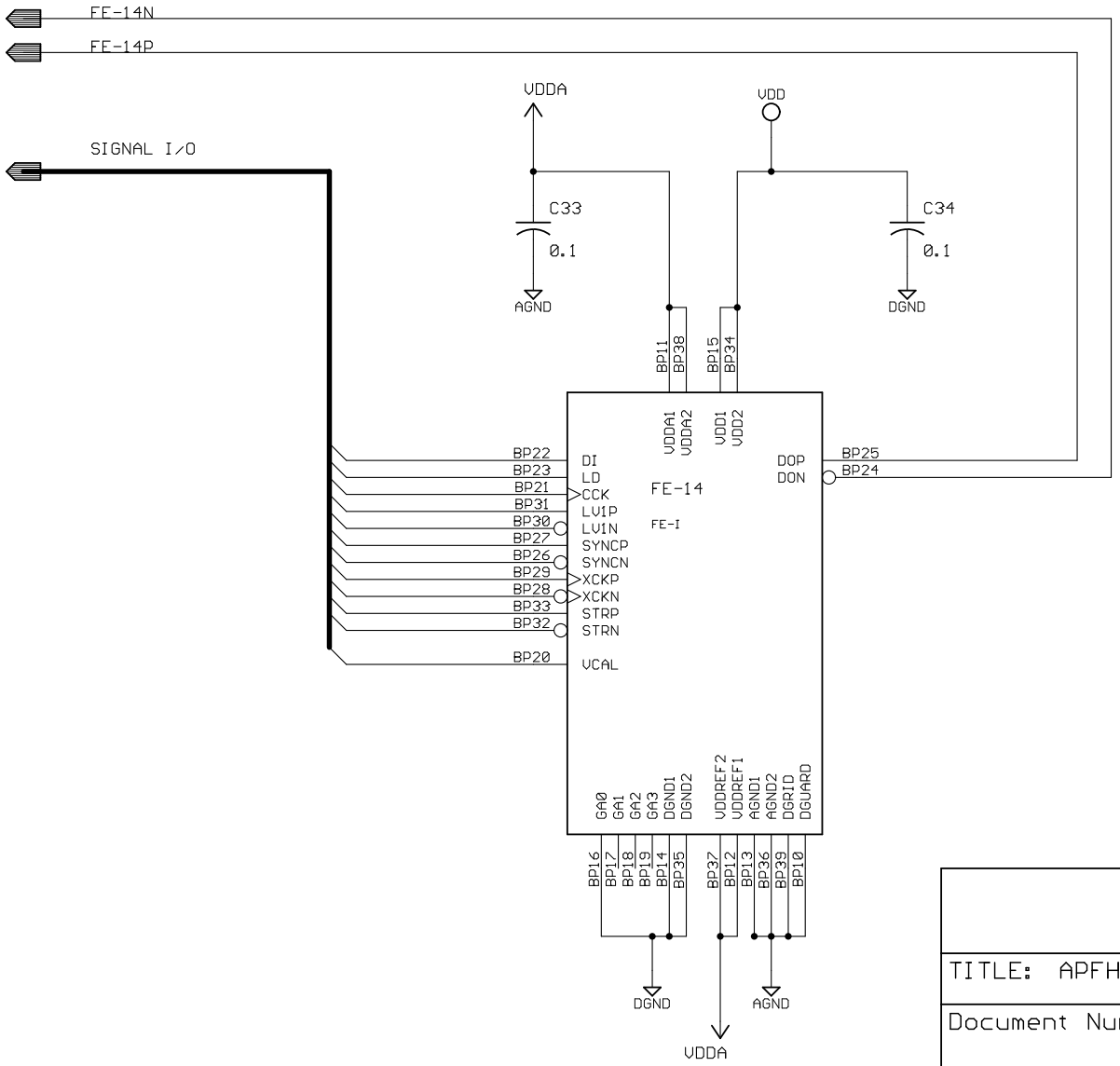
TITLE: APFHV3		
Document Number:	APFHV3-SH	REV:
Date: 10-10-2001 02:49:32a	Sheet: 15/19	



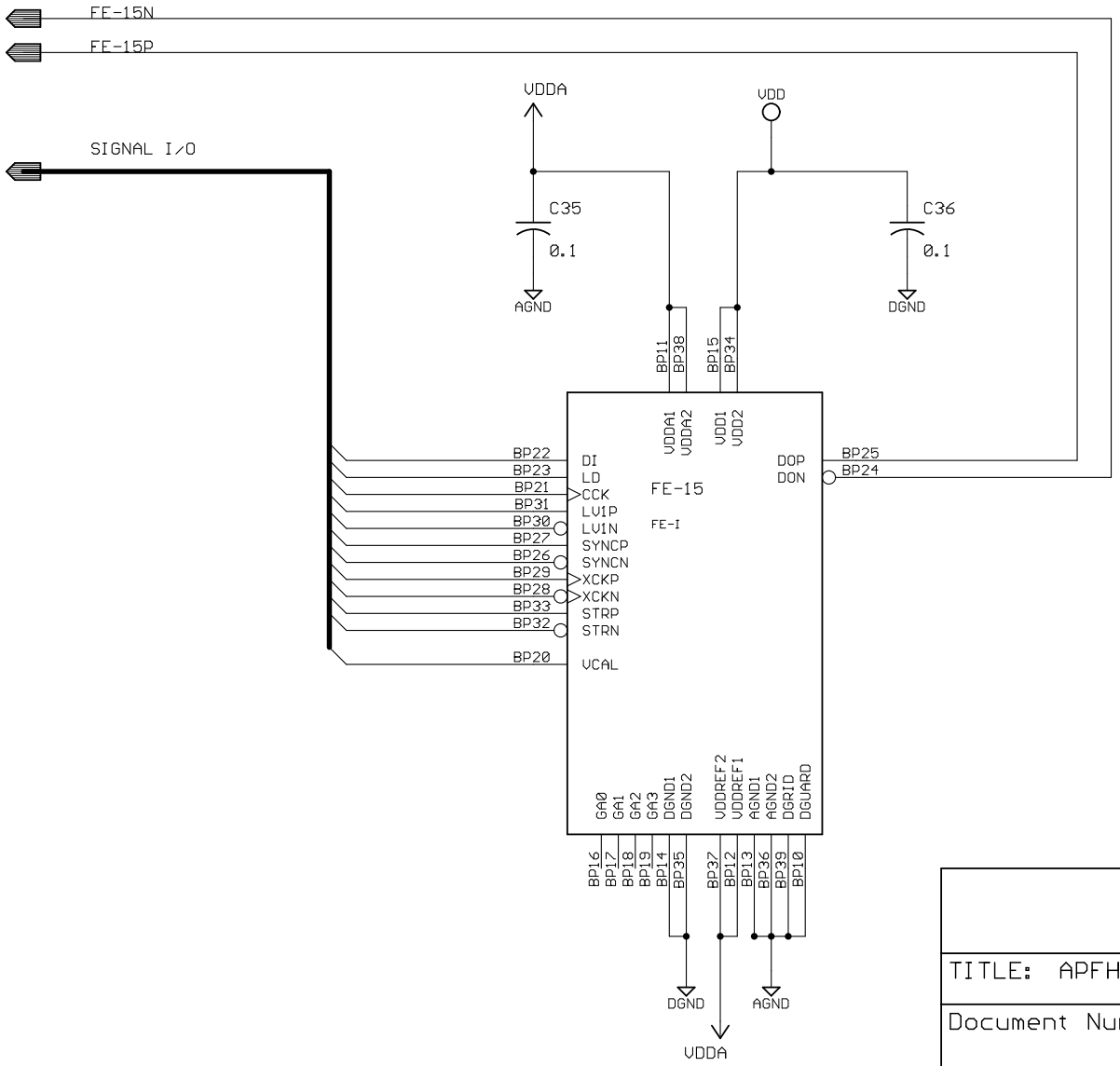
TITLE: APFHV3		
Document Number:	APFHV3-SH	REV:
Date: 10-10-2001 02:49:32a		Sheet: 16/19



TITLE: APFHV3		
Document Number:	APFHV3-SH	REV:
Date: 10-10-2001 02:49:32a		Sheet: 17/19



TITLE: APFHV3		
Document Number:	APFHV3-SH	REV:
Date: 10-10-2001 02:49:32a	Sheet: 18/19	



TITLE: APFHV3		
Document Number:	APFHV3-SH	REV:
Date: 10-10-2001 02:49:32a	Sheet: 19/19	