Electronics Explorer Board - Reference Manual

- This page is still under construction and new information is being added every day.
- This reference manual provides the technical specifications of the Electronics Explorer Board. For simple instructions on using the EE Board, visit the Quick Start Guide or check out the projects on themain page.
- Because of the length of this page, it is recommended to use the links on the right for navigation.

Overview

The Electronics Explorer is an all-in-one package for designing and testing analog and digital circuits. It is built around a large, solderless breadboard to allow for quick and simple prototyping. Operation of the EE Board is easily managed with Digilent's WaveForms software. Features of the EE Board include:

- 4-channel, 40MSa Oscilloscope
- 4-channel Voltmeter
- 2 Programmable Reference Voltages
- 2-channel Arbitrary Waveform Generator
- Triple-output Power Supply
- 32-channel Digital Pattern Generator
- Discrete Digital I/O's (buttons, switches, LEDs, etc.)

Functional Description

When operated with WaveForms, the Electronics Explorer Board is an entire circuit laboratory all in its own. For analog projects, the EE Board can be used as an oscilloscope and waveform generator. It also functions as a voltmeter that has additional access to user-programmable reference voltages. For digital projects, the EE Board can be used as a logic analyzer and digital pattern generator. It offers a variety of options for virtual digital I/O devices as well. Lastly, it includes various user-programmable power supplies.

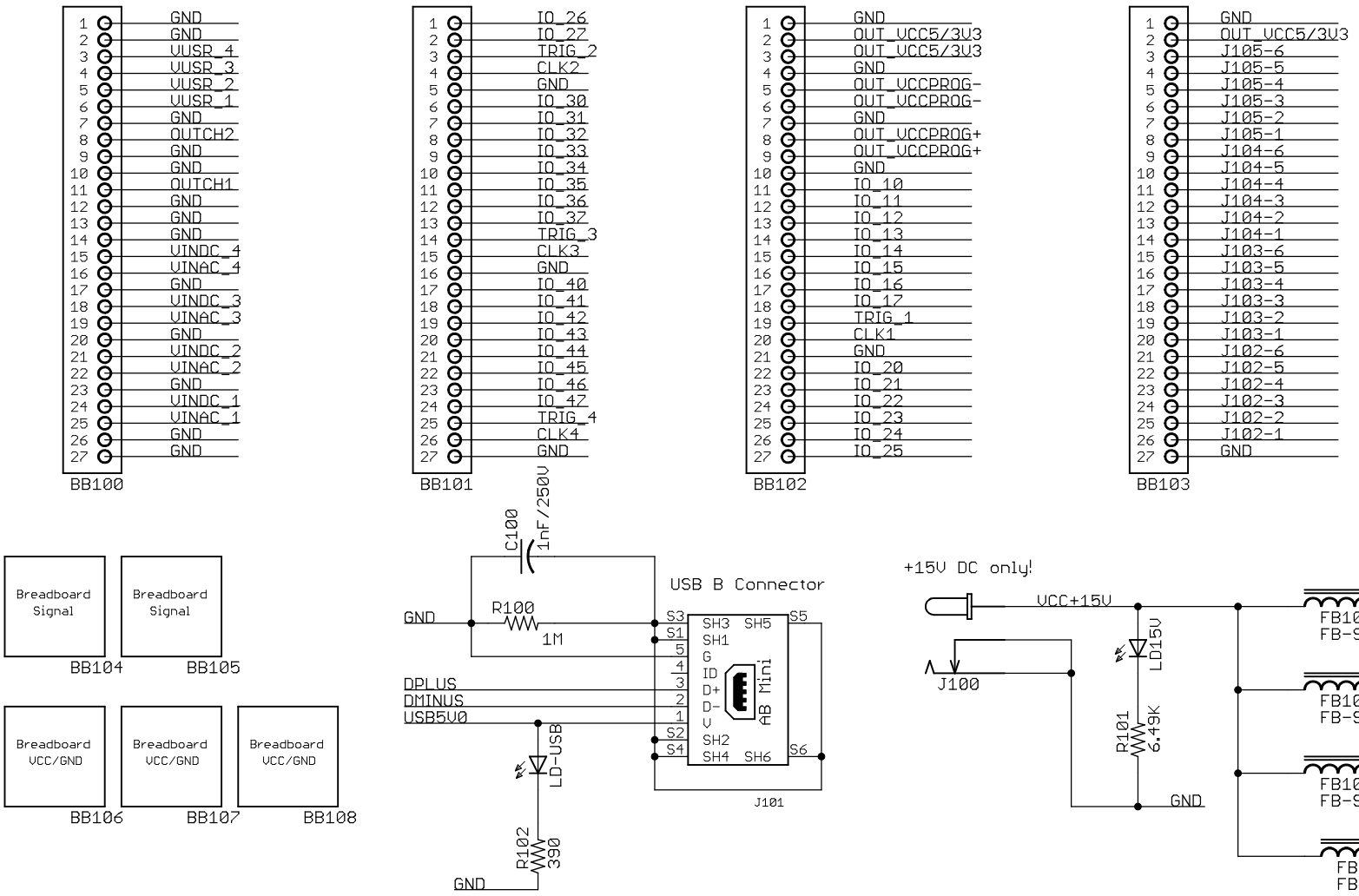
Interfacing

Communication with the EE Board utilizes a USB connection and interfacing is quite simple. A micro-USB cable is used to connect the board to a computer. The EE Board also has a barrel-jack adapter for 12V of external power. With the USB cable and external power supply connected, turning the board switch to “ON” prepares it for communication with WaveForms.

All programming and interfacing is done within the WaveForms software. The Quick Start Guide discuess this process further.

Physical Dimensions

The full assembly is 7.75“W x 6.25”L x 1.00“H. On the surface are two full-size 630-hole breadboards with three 100-hole power rails. There are also seven mini 24-hole breadboards that are wired specifically for the various functions offered by the EE Board. The board is mounted on four 1” lug nuts. These sere to elevate the board as well as hold the protective casing that covers the circuitry on the under-side of the board.



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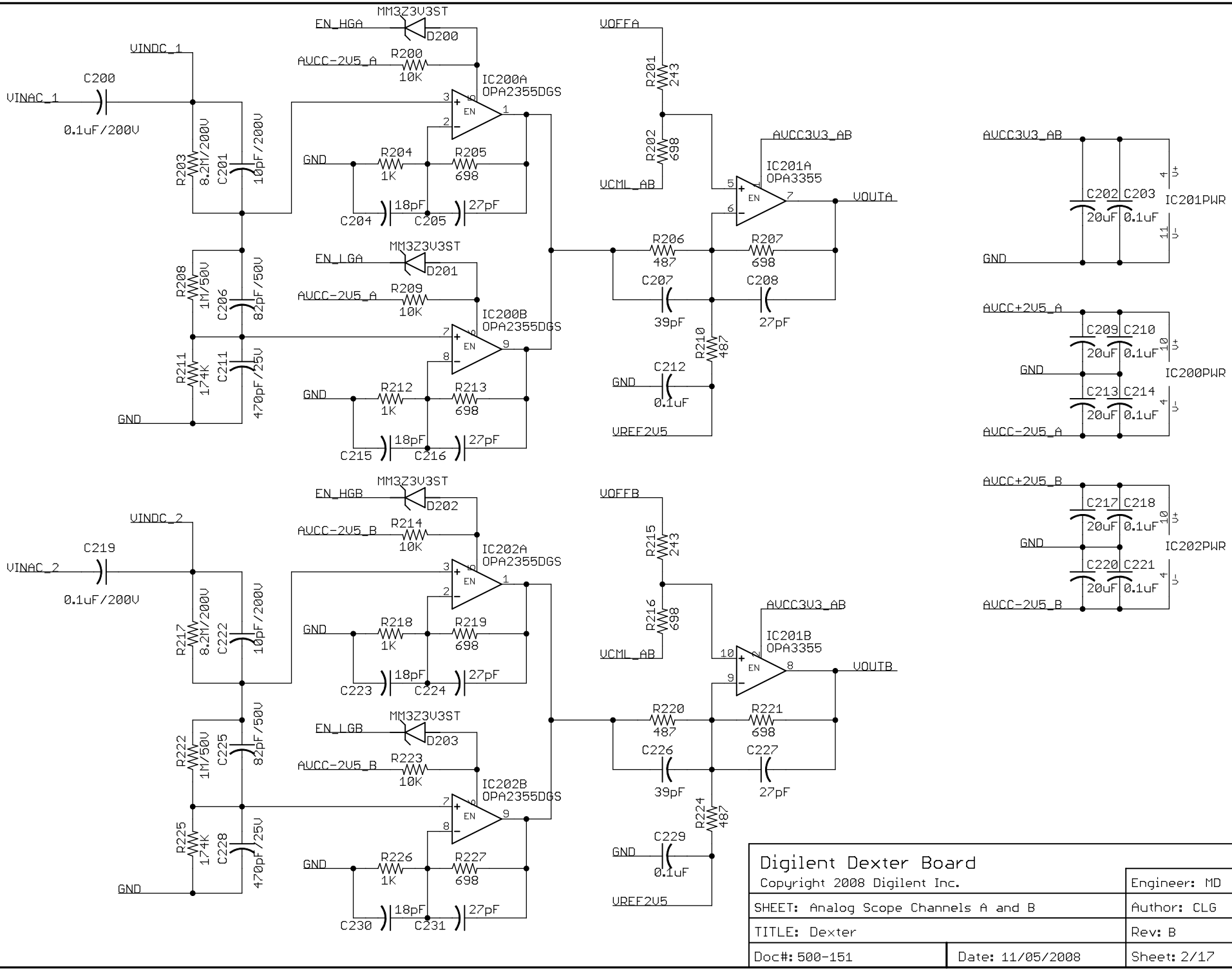
Digilent Dexter Board

SHEET: Connectors and Breadboards		Author: CLG
TITLE: Dexter		Rev: B
Doc#: 500-151	Date: 11/05/2008	Sheet: 1/17
		Engineer: MD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10K
C200
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IC200A
OPA2355DGS
R203
8.2M/200V
C201
10pF/200V
GND
R204
1K
R205
698
C204
18pF
C205
27pF
VOFFA
R201
243
R202
698
VCML_AB
AVCC3V3_AB
IC201A
OPA3355
VOUTA
MM3Z3V3ST
EN_LGA
D201
R208
1M/50V
C206
82pF/50V
AVCC-2V5_A
R209
10K
IC200B
OPA2355DGS
R211
174K
C211
470pF/25V
GND
R212
1K
R213
698
C215
18pF
C216
27pF
R206
487
R207
698
C207
39pF
C208
27pF
R210
487
C212
GND
0.1uF
VREF2V5
AVCC3V3_AB
C202
C203
IC201PWR
20uF
0.1uF
GND
AVCC+2V5_A
C209
C210
IC200PWR
20uF
0.1uF
GND
C213
C214
20uF
0.1uF
AVCC-2V5_A
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EN_HGB
D202
VINDC_2
AVCC-2V5_B
R214
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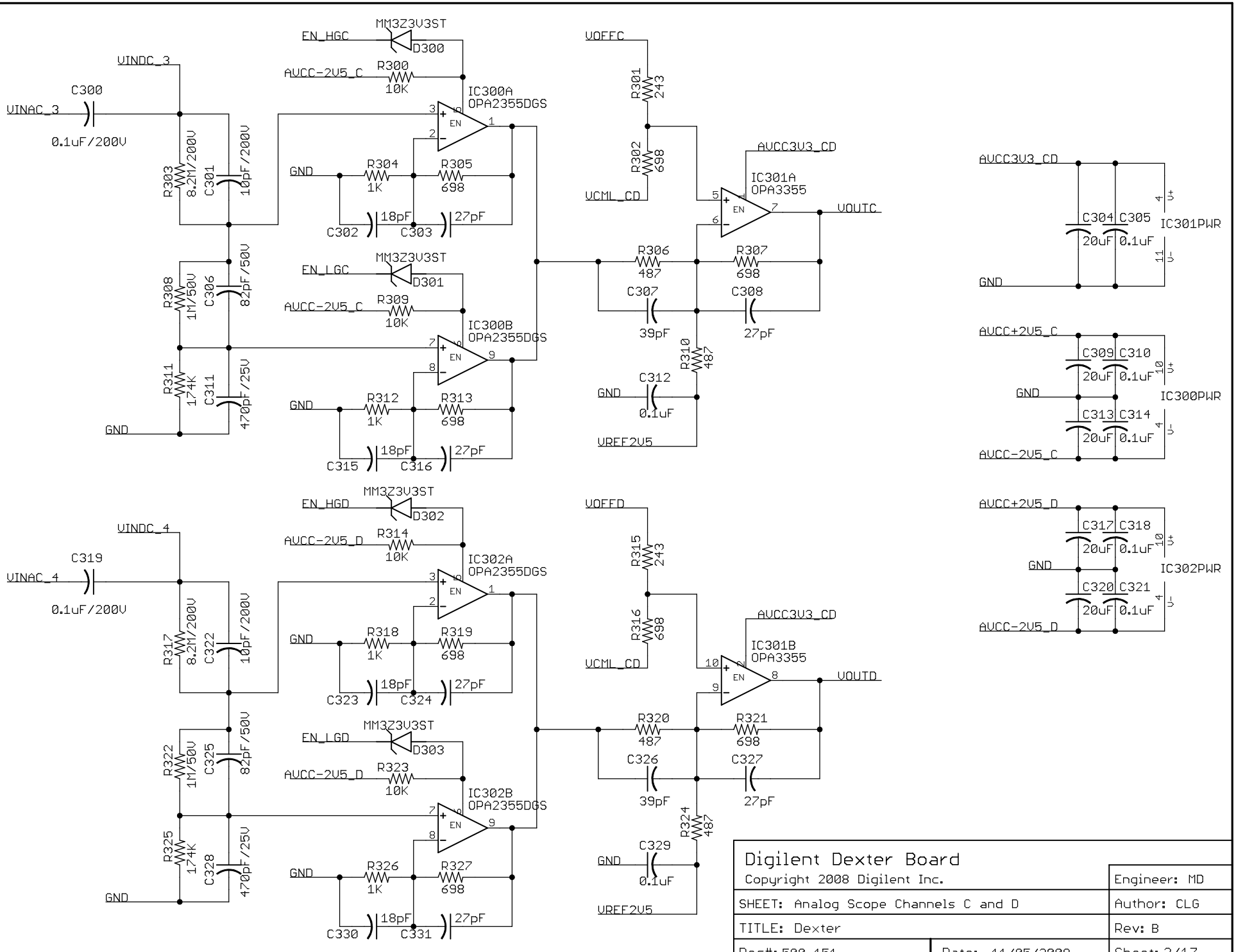
C219
VINAC_2
0.1uF/200V
IC202A
OPA2355DGS
R217
8.2M/200V
C222
10pF/200V
GND
R218
1K
R219
698
C223
18pF
C224
27pF
VOFFB
R215
243
R216
698
VCML_AB
AVCC3V3_AB
IC201B
OPA3355
VOUTB
MM3Z3V3ST
EN_LGB
D203
R222
1M/50V
C225
82pF/50V
AVCC-2V5_B
R223
10K
IC202B
OPA2355DGS
R225
174K
C228
470pF/25V
GND
R226
1K
R227
698
C230
18pF
C231
27pF
R220
487
R221
698
C226
39pF
C227
27pF
R224
487
C229
GND
0.1uF
VREF2V5
AVCC+2V5_B
C217
C218
IC202PWR
20uF
0.1uF
GND
C220
C221
20uF
0.1uF
AVCC-2V5_B
Digilent Dexter Board
Copyright 2008 Digilent Inc.
Engineer: MD
SHEET: Analog Scope Channels A and B
Author: CLG
TITLE: Dexter
Rev: B
Doc#: 500-151
Date: 11/05/2008
Sheet: 2/17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VINAC_3
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IC300A
OPA2355DGS
R303
8.2M/200V
C301
10pF/200V
GND
R304
1K
R305
698
C302
18pF
C303
27pF
R308
1M/50V
C306
82pF/50V
EN_LGC
D301
R309
10K
IC300B
OPA2355DGS
R311
174K
C311
470pF/25V
R312
1K
R313
698
C315
18pF
C316
27pF
VOFFC
R301
243
R302
698
VCML_CD
AVCC3V3_CD
IC301A
OPA3355
VOUTC
R306
487
R307
698
C307
39pF
C308
27pF
R310
487
C312
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C304
C305
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0.1uF
IC301PWR
GND
AVCC+2V5_C
C309
C310
20uF
0.1uF
IC300PWR
C313
C314
20uF
0.1uF
AVCC-2V5_C
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EN_HGD
D302
VINDC_4
C319
VINAC_4
0.1uF/200V
AVCC-2V5_D
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OPA2355DGS
R317
8.2M/200V
C322
10pF/200V
GND
R318
1K
R319
698
C323
18pF
C324
27pF
R322
1M/50V
C325
82pF/50V
EN_LGD
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10K
IC302B
OPA2355DGS
R325
174K
C328
470pF/25V
R326
1K
R327
698
C330
18pF
C331
27pF
VOFFD
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243
R316
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R321
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C326
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C327
27pF
R324
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C329
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C318
20uF
0.1uF
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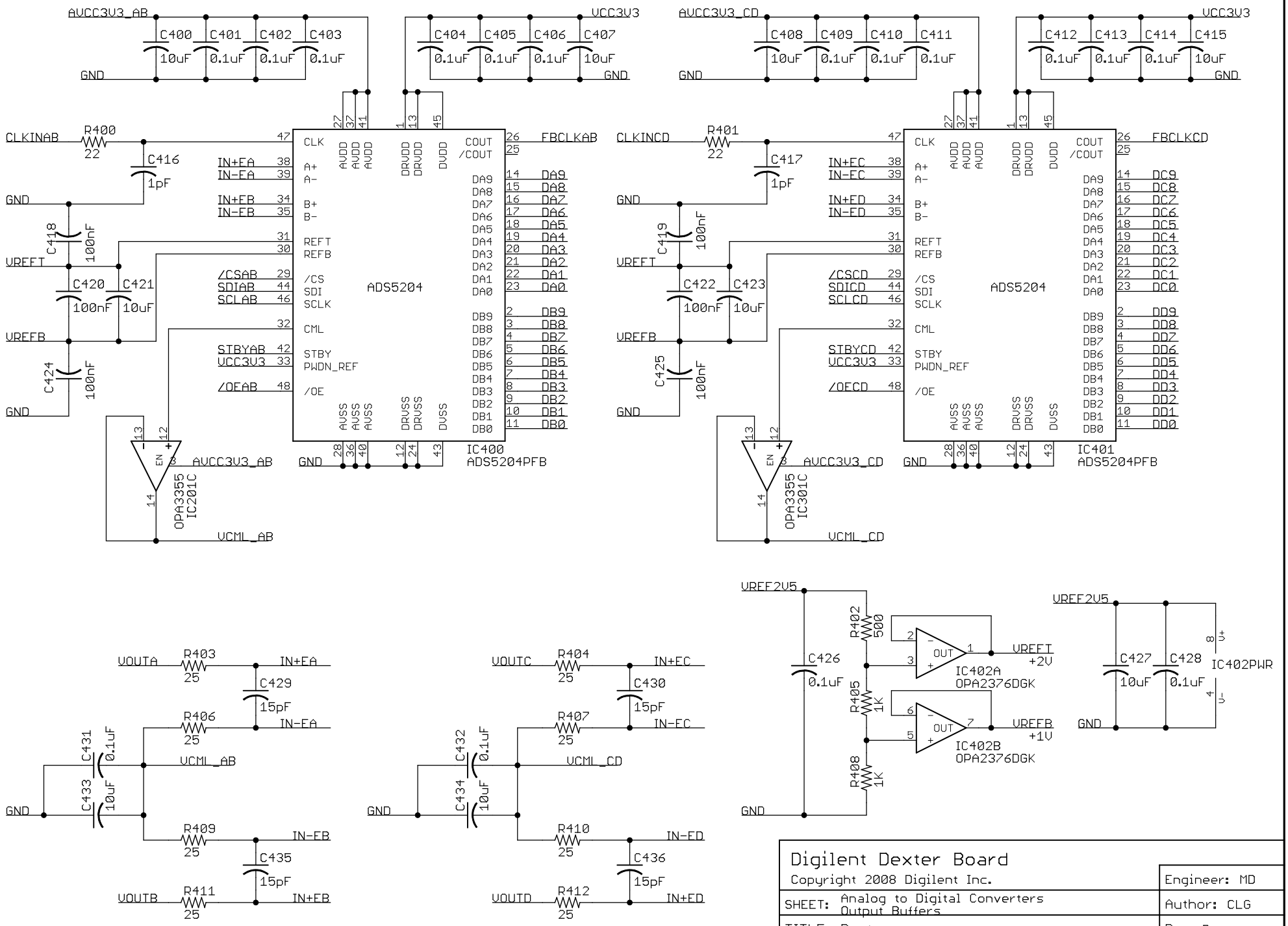
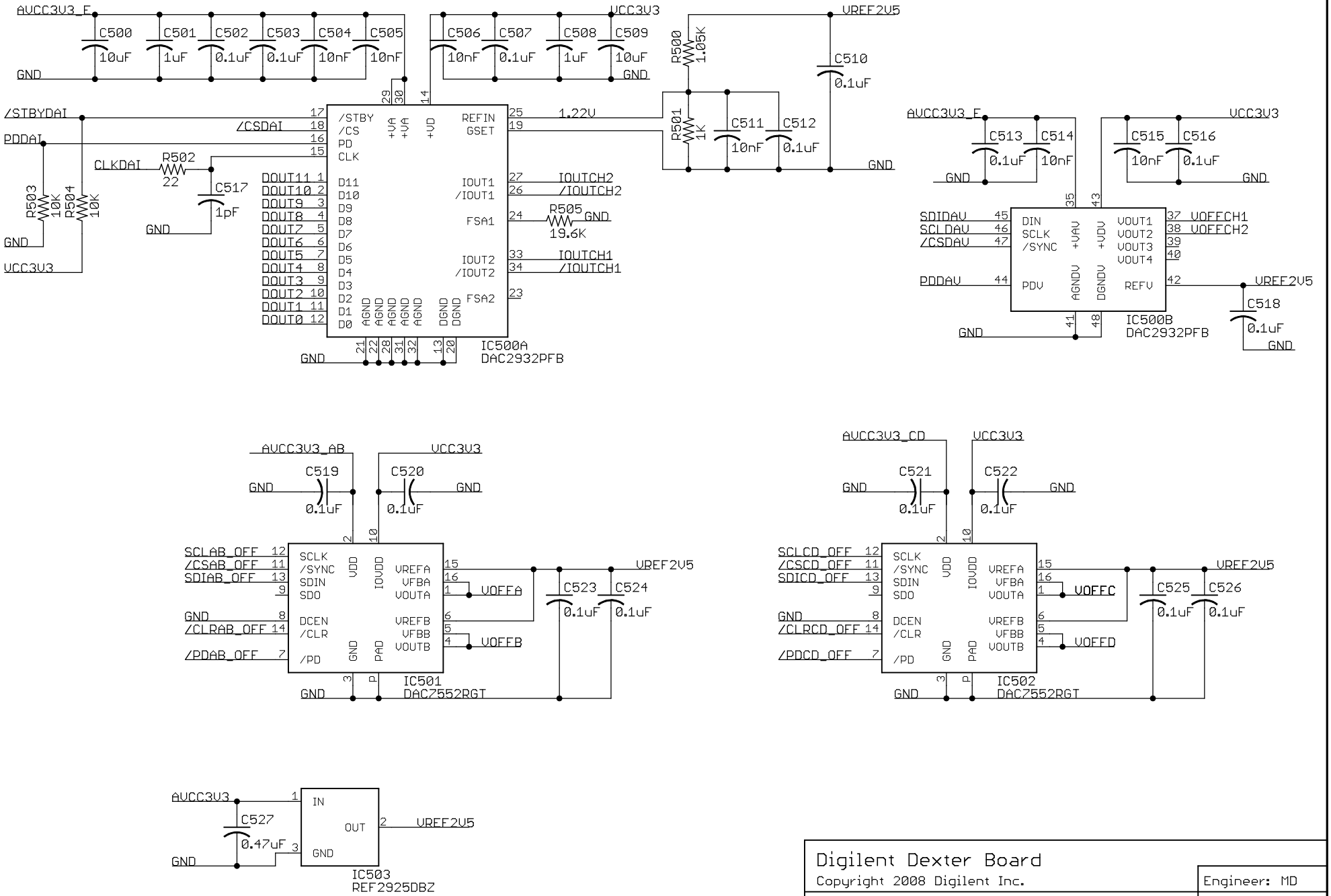
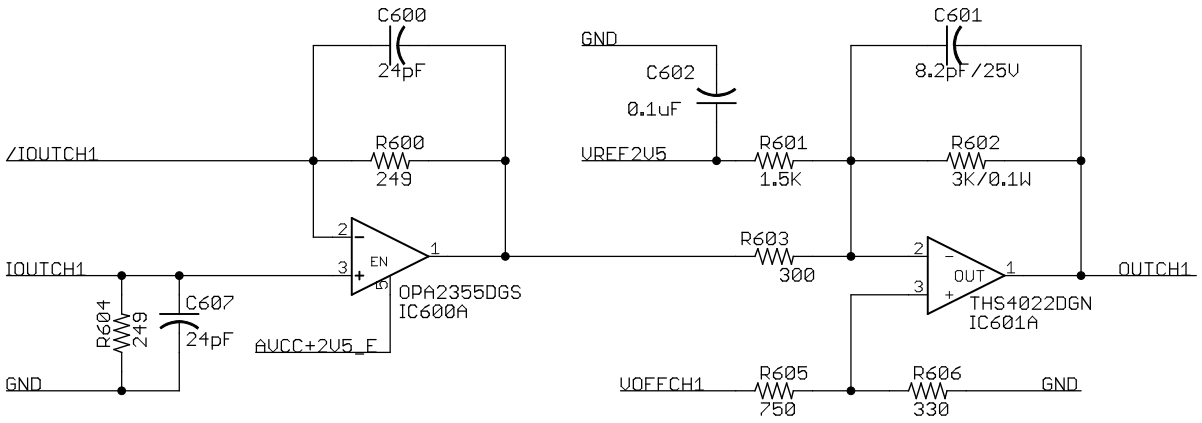
GND
C320
C321
20uF
0.1uF
AVCC-2V5_D
Digilent Dexter Board
Copyright 2008 Digilent Inc.
Engineer: MD
SHEET: Analog Scope Channels C and D
Author: CLG
TITLE: Dexter
Rev: B
Doc#: 500-151
Date: 11/05/2008
Sheet: 3/17

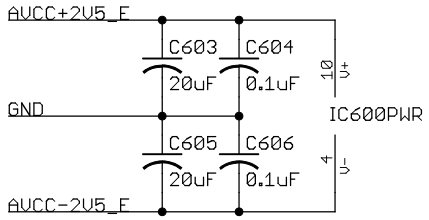


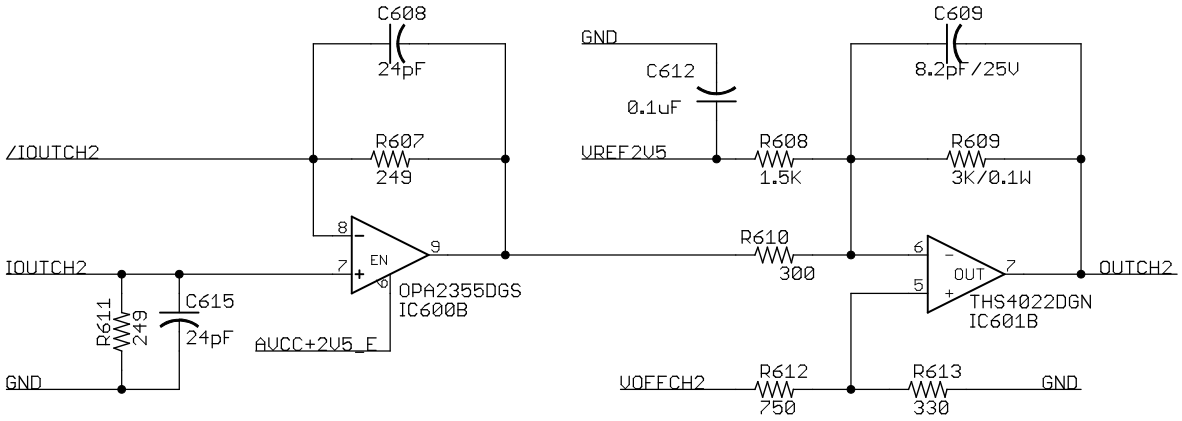
Digilent Dexter Board Copyright 2008 Digilent Inc.		Engineer: MD
SHEET: Analog to Digital Converters Output Buffers		Author: CLG
TITLE: Dexter		Rev: B
Doc#: 500-151	Date: 11/05/2008	Sheet: 4/17

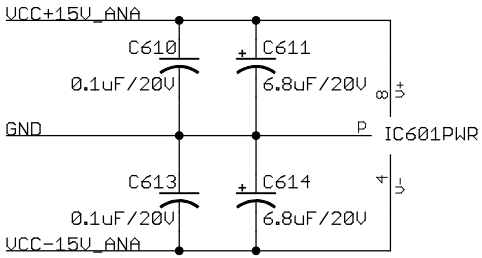


Digilent Dexter Board Copyright 2008 Digilent Inc.		Engineer: MD
SHEET: Digital to Analog Converters		Author: CLG
TITLE: Dexter		Rev: B
Doc#: 500-151	Date: 11/05/2008	Sheet: 5/17

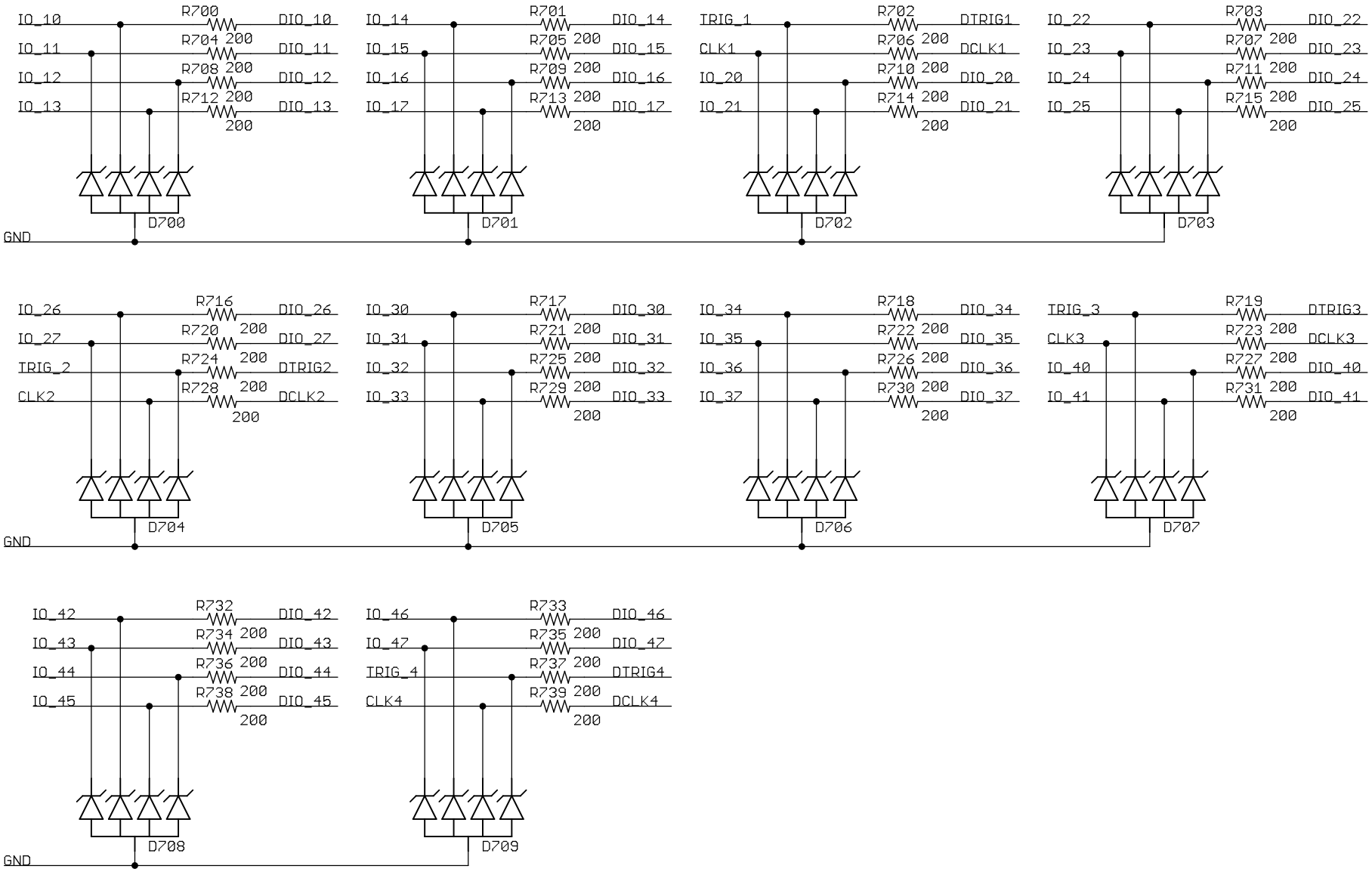




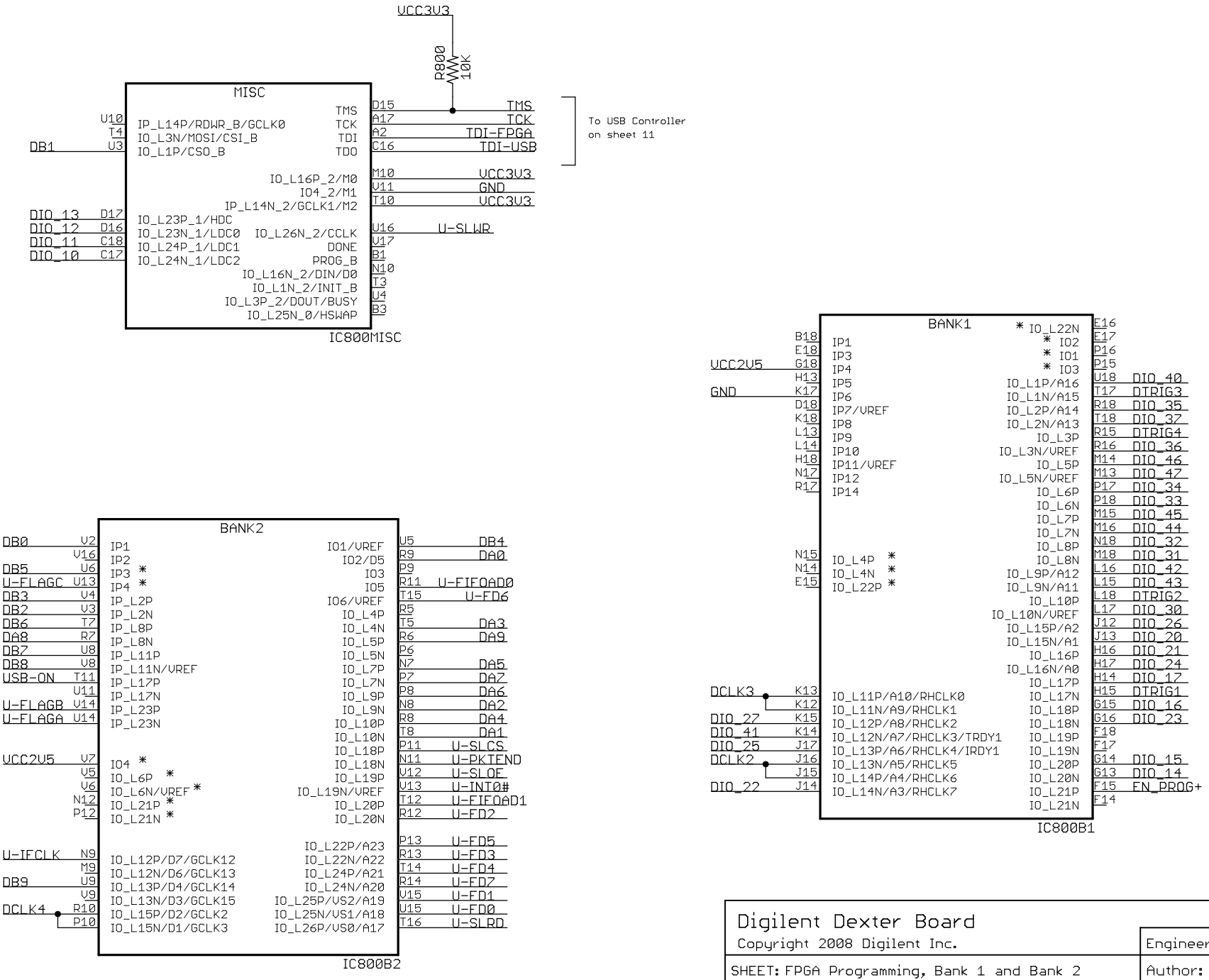




Digilent Dexter Board Copyright 2008 Digilent Inc.		Engineer: MD
SHEET: Waveform Generator Channels Analog Amplifiers		Author: CLG
TITLE: Dexter		Rev: B
Doc#: 500-151	Date: 11/05/2008	Sheet: 6/17



Digilent Dexter Board Copyright 2008 Digilent Inc.		Engineer: MD
SHEET: Digital Inputs / Outputs		Author: CLG
TITLE: Dexter		Rev: B
Doc#: 500-151	Date: 11/05/2008	Sheet: 7/17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10K
MISC
TMS
TCK
TDI
TDO
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IO4_2/M1
IP_L14N_2/GCLK1/M2
IO_L23P_1/HDC
IO_L23N_1/LDC0
IO_L26N_2/CCLK
IO_L24P_1/LDC1
DONE
IO_L24N_1/LDC2
PROG_B
IO_L16N_2/DIN/D0
IO_L1N_2/INIT_B
IO_L3P_2/DOUT/BUSY
IO_L25N_0/HSWAP
U10 IP_L14P/RDWR_B/GCLK0
T4 IO_L3N/MOSI/CSI_B
DB1 U3 IO_L1P/CSO_B
DIO_13 D17
DIO_12 D16
DIO_11 C18
DIO_10 C17
D15 TMS
A17 TCK
A2 TDI-FPGA
C16 TDI-USB
M10 VCC3V3
V11 GND
T10 VCC3V3
U16 U-SLWR
V17
B1
N10
T3
U4
B3
To USB Controller
on sheet 11
IC800MISC
BANK2
IP1
IP2
IP3 *
IP4 *
IP_L2P
IP_L2N
IP_L8P
IP_L8N
IP_L11P
IP_L11N/VREF
IP_L17P
IP_L17N
IP_L23P
IP_L23N
IO4 *
IO_L6P *
IO_L6N/VREF *
IO_L21P *
IO_L21N *
IO_L12P/D7/GCLK12
IO_L12N/D6/GCLK13
IO_L13P/D4/GCLK14
IO_L13N/D3/GCLK15
IO_L15P/D2/GCLK2
IO_L15N/D1/GCLK3
IO1/VREF
IO2/D5
IO3
IO5
IO6/VREF
IO_L4P
IO_L4N
IO_L5P
IO_L5N
IO_L7P
IO_L7N
IO_L9P
IO_L9N
IO_L10P
IO_L10N
IO_L18P
IO_L18N
IO_L19P
IO_L19N/VREF
IO_L20P
IO_L20N
IO_L22P/A23
IO_L22N/A22
IO_L24P/A21
IO_L24N/A20
IO_L25P/VS2/A19
IO_L25N/VS1/A18
IO_L26P/VS0/A17
DB0 V2
V16
DB5 U6
U-FLAGC U13
DB3 V4
DB2 V3
DB6 T7
DA8 R7
DB7 U8
DB8 V8
USB-ON T11
U11
U-FLAGB V14
U-FLAGA V14
VCC2V5 V7
V5
V6
N12
P12
U-IFCLK N9
M9
DB9 U9
V9
DCLK4 R10
P10
U5 DB4
R9 DA0
P9
R11 U-FIFOAD0
T15 U-FD6
R5
T5 DA3
R6 DA9
P6
N7 DA5
P7 DA7
P8 DA6
N8 DA2
R8 DA4
T8 DA1
P11 U-SLCS
N11 U-PKTEND
V12 U-SLOE
V13 U-INT0#
T12 U-FIFOAD1
R12 U-FD2
P13 U-FD5
R13 U-FD3
T14 U-FD4
R14 U-FD7
V15 U-FD1
U15 U-FD0
T16 U-SLRD
IC800B2
BANK1
IP1
IP3
IP4
IP5
IP6
IP7/VREF
IP8
IP9
IP10
IP11/VREF
IP12
IP14
IO_L4P *
IO_L4N *
IO_L22P *
IO_L11P/A10/RHCLK0
IO_L11N/A9/RHCLK1
IO_L12P/A8/RHCLK2
IO_L12N/A7/RHCLK3/TRDY1
IO_L13P/A6/RHCLK4/IRDY1
IO_L13N/A5/RHCLK5
IO_L14P/A4/RHCLK6
IO_L14N/A3/RHCLK7
* IO_L22N
* IO2
* IO1
* IO3
IO_L1P/A16
IO_L1N/A15
IO_L2P/A14
IO_L2N/A13
IO_L3P
IO_L3N/VREF
IO_L5P
IO_L5N/VREF
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IO_L6N
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IO_L8N
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IO_L9N/A11
IO_L10P
IO_L10N/VREF
IO_L15P/A2
IO_L15N/A1
IO_L16P
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IO_L18N
IO_L19P
IO_L19N
IO_L20P
IO_L20N
IO_L21P
IO_L21N
B18
E18
VCC2V5 G18
H13
GND K17
D18
K18
L13
L14
H18
N17
R17
N15
N14
E15
DCLK3 K13
K12
DIO_27 K15
DIO_41 K14
DIO_25 J17
DCLK2 J16
J15
DIO_22 J14
E16
E17
P16
P15
U18 DIO_40
T17 DTRIG3
R18 DIO_35
T18 DIO_37
R15 DTRIG4
R16 DIO_36
M14 DIO_46
M13 DIO_47
P17 DIO_34
P18 DIO_33
M15 DIO_45
M16 DIO_44
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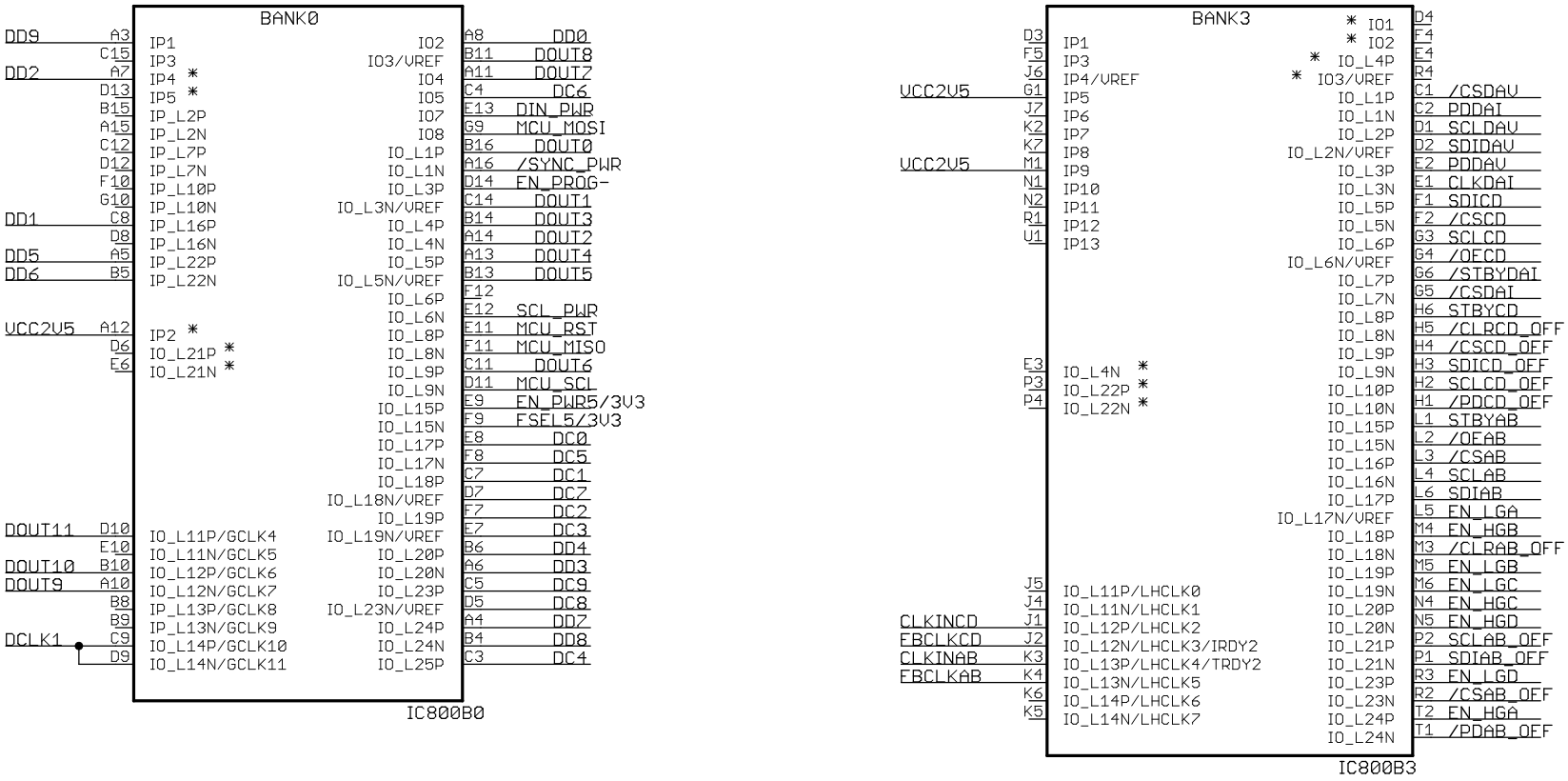
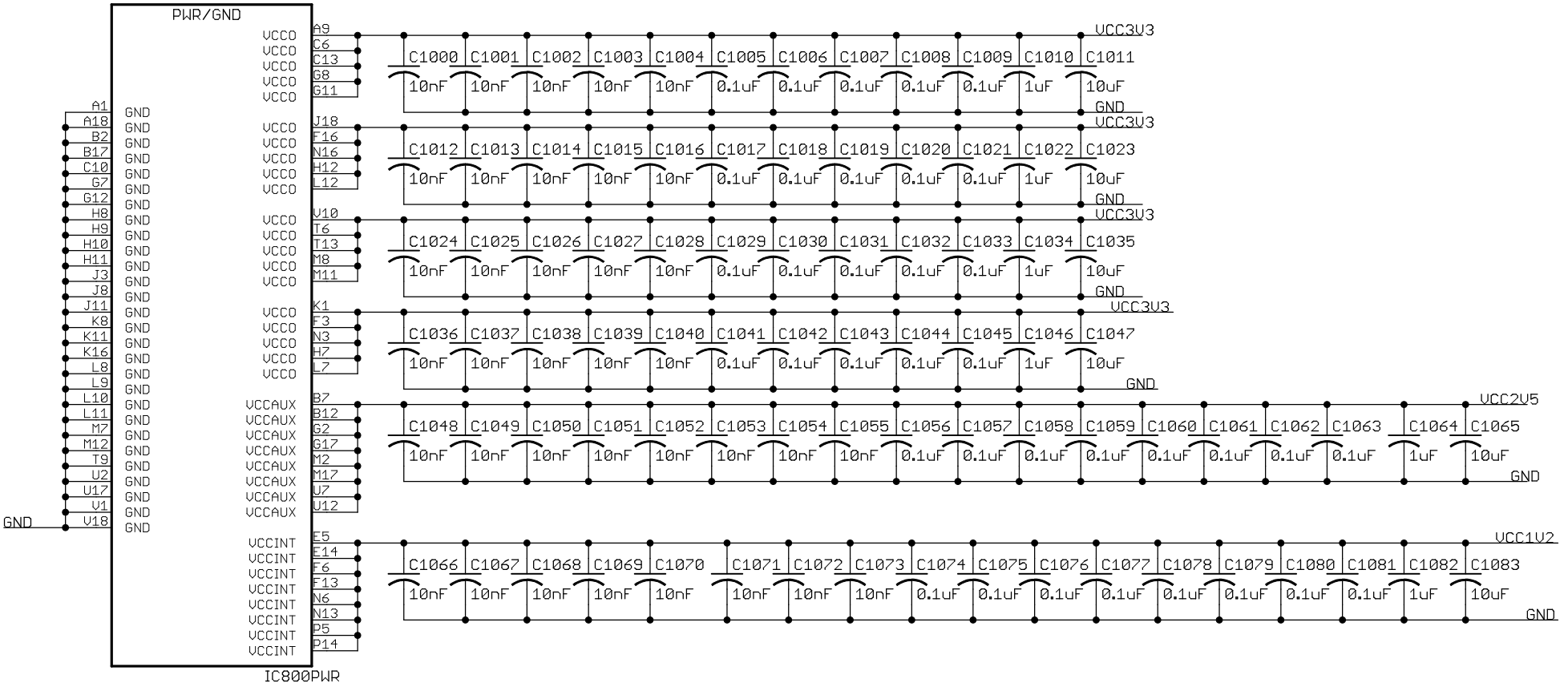
M18 DIO_31
L16 DIO_42
L15 DIO_43
L18 DTRIG2
L17 DIO_30
J12 DIO_26
J13 DIO_20
H16 DIO_21
H17 DIO_24
H14 DIO_17
H15 DTRIG1
G15 DIO_16
G16 DIO_23
F18
F17
G14 DIO_15
G13 DIO_14
F15 EN_PROG+
F14
IC800B1
Digilent Dexter Board
Copyright 2008 Digilent Inc.
Engineer: MD
SHEET: FPGA Programming, Bank 1 and Bank 2
Author: CLG
TITLE: Dexter
Rev: B
Doc#: 500-151
Date: 11/05/2008
Sheet: 8/17



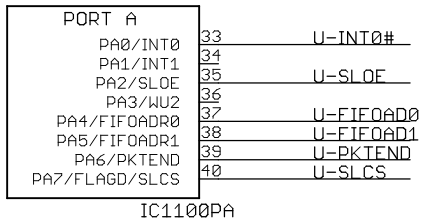
Digilent Dexter Board

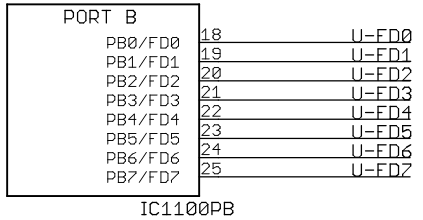
SHEET: FPGA Bank 0 and Bank 3		Author: CLG
TITLE: Dexter		Rev: B
Doc#: 500-151	Date: 11/05/2008	Sheet: 9/17

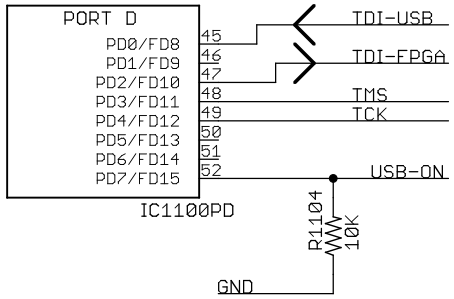
Engineer: MD

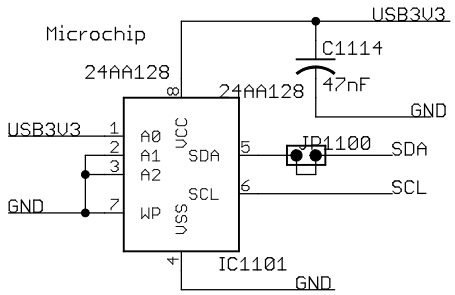


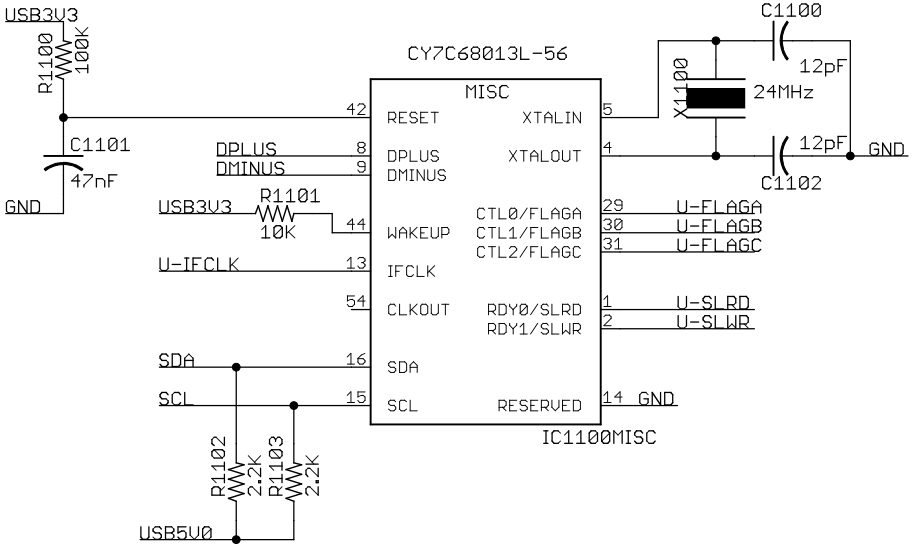
Digilent Dexter Board Copyright 2008 Digilent Inc.		Engineer: MD
SHEET: FPGA Power Supply		Author: CLG
TITLE: Dexter		Rev: B
Doc#: 500-151	Date: 11/05/2008	Sheet: 10/17

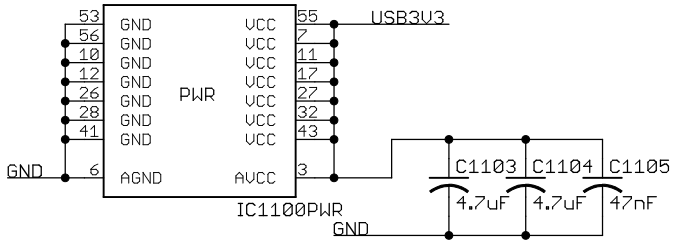


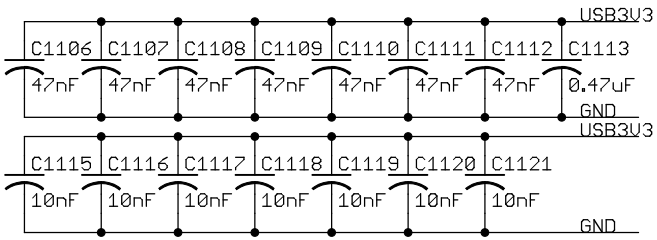




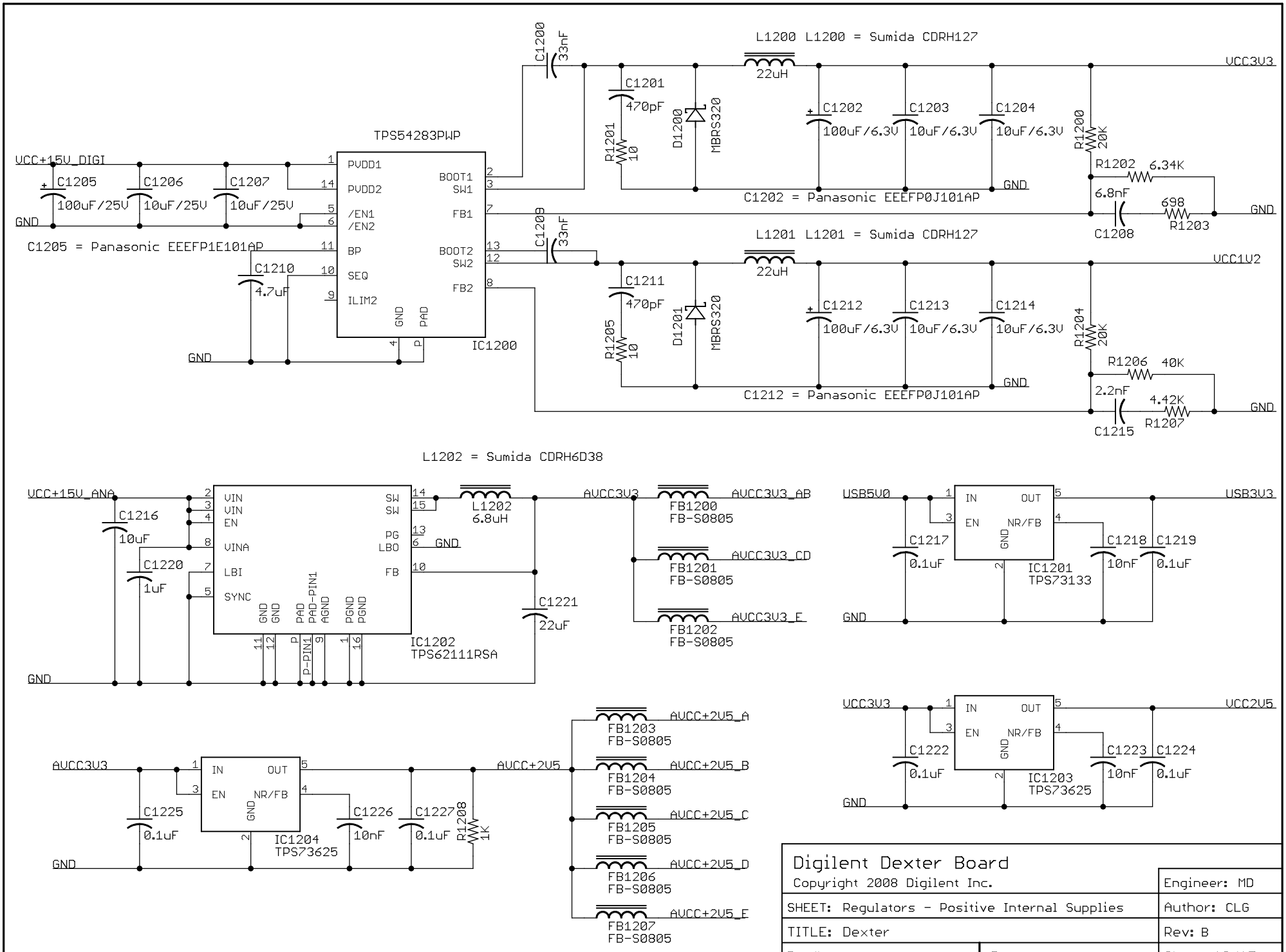




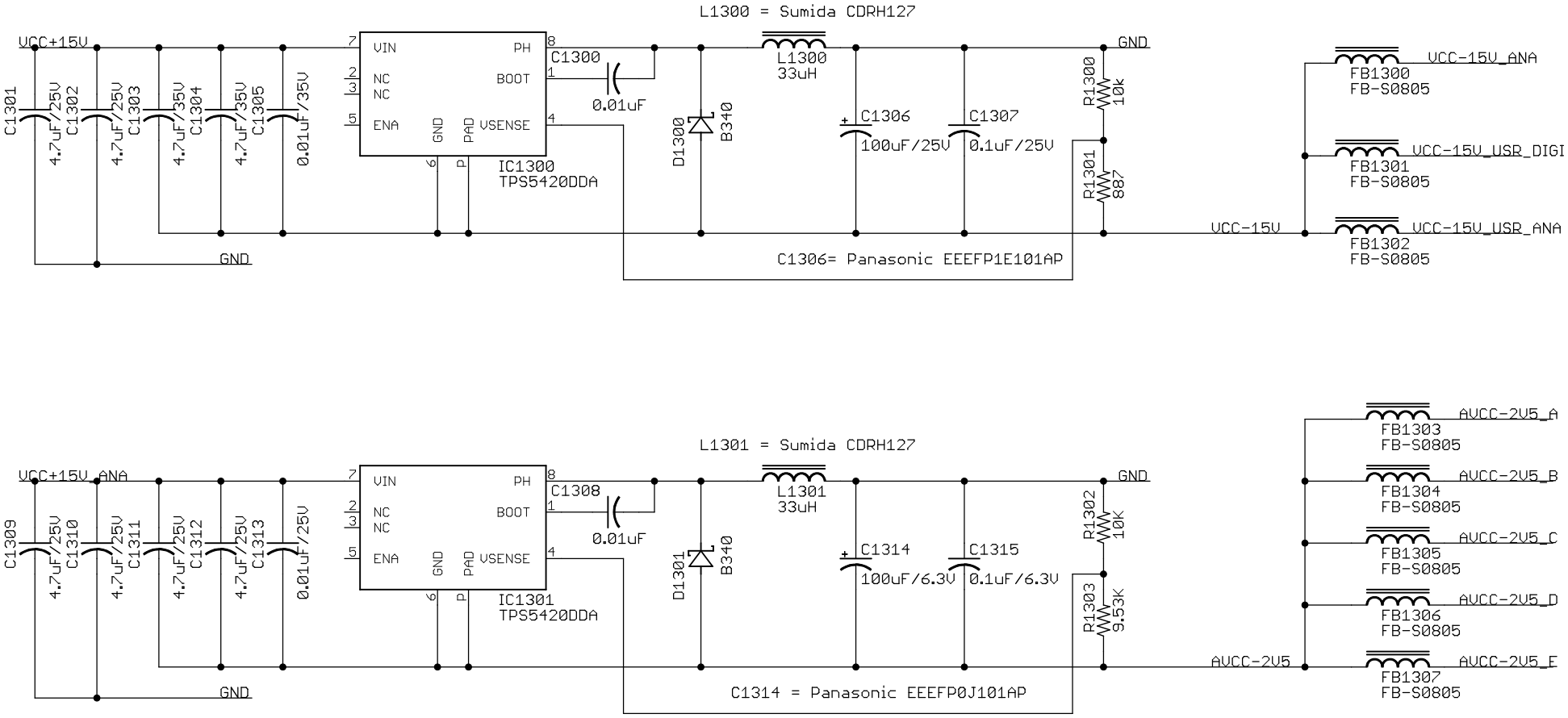




Digilent Dexter Board Copyright 2008 Digilent Inc.		Engineer: MD
SHEET: USB Controller		Author: CLG
TITLE: Dexter		Rev: B
Doc#: 500-151	Date: 11/05/2008	Sheet: 11/17



Digilent Dexter Board Copyright 2008 Digilent Inc.		Engineer: MD
SHEET: Regulators - Positive Internal Supplies		Author: CLG
TITLE: Dexter		Rev: B
Doc#: 500-151	Date: 11/05/2008	Sheet: 12/17



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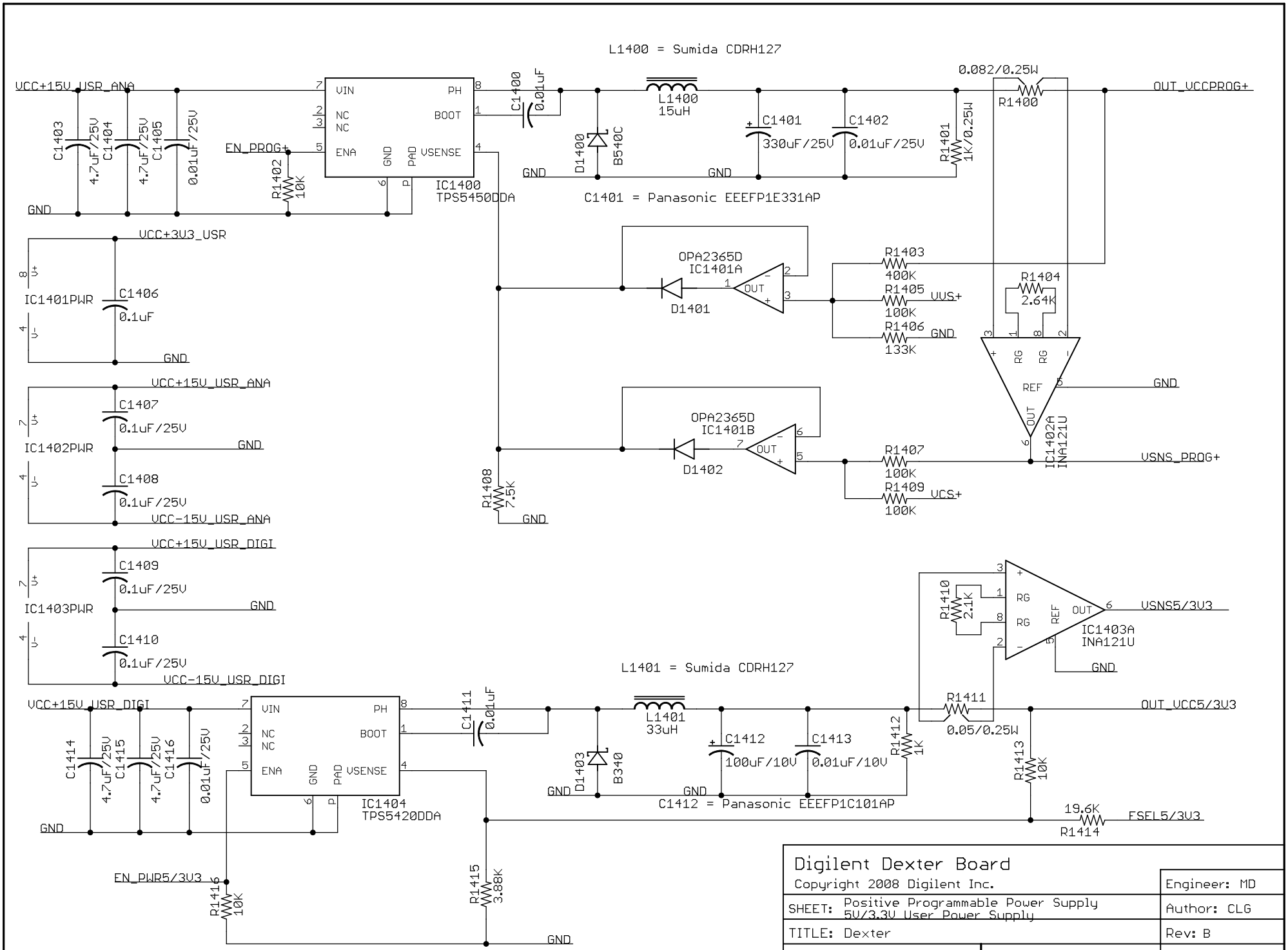
SHEET: Regulators - Negative Internal Supplies		Author: CLG
TITLE: Dexter		Rev: B
Doc#: 500-151	Date: 11/05/2008	Sheet: 13/17



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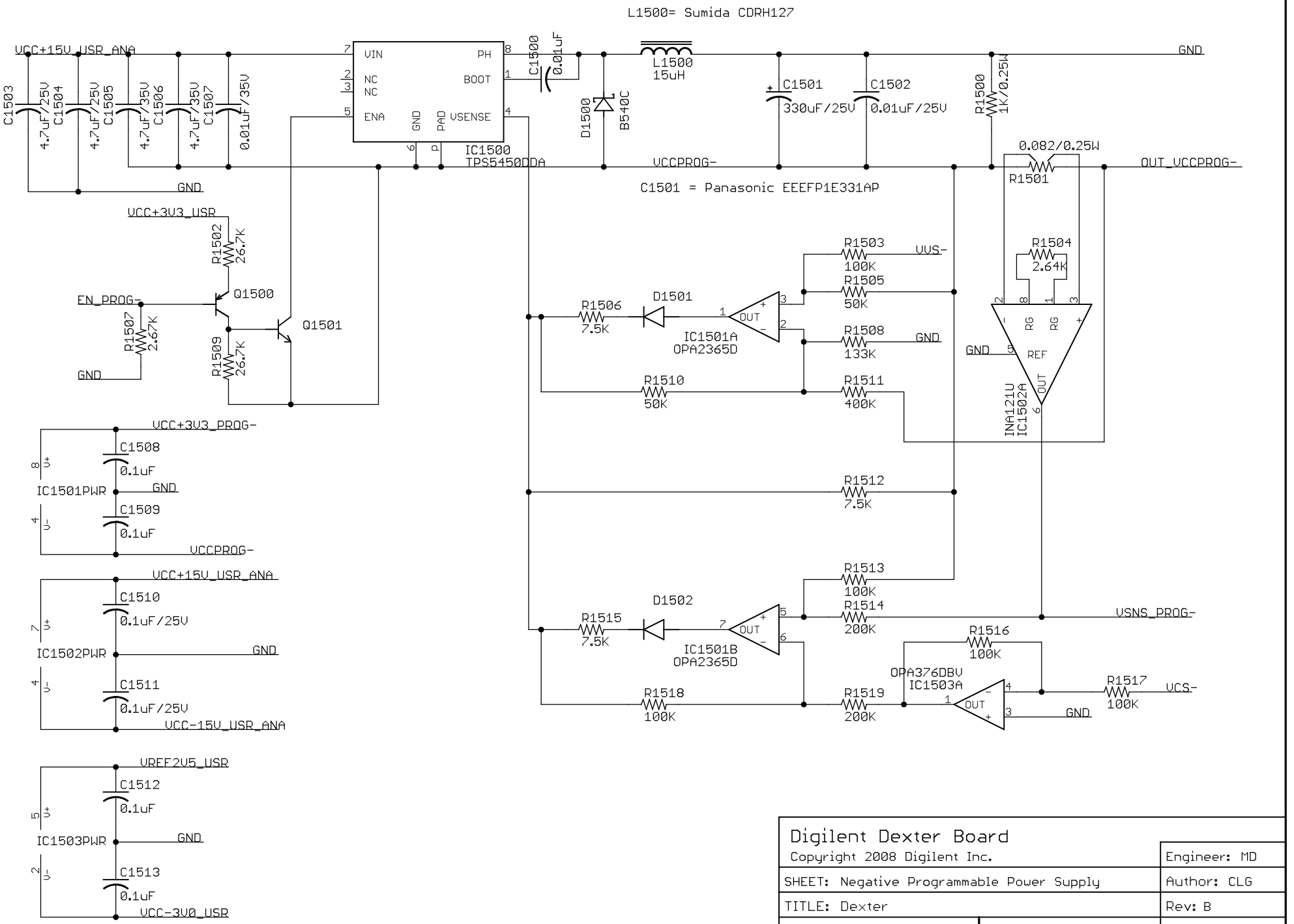
SHEET: Positive Programmable Power Supply 5V/3.3V User Power Supply		Author: CLG
TITLE: Dexter		Rev: B
Doc#: 500-151	Date: 11/05/2008	Sheet: 14/17



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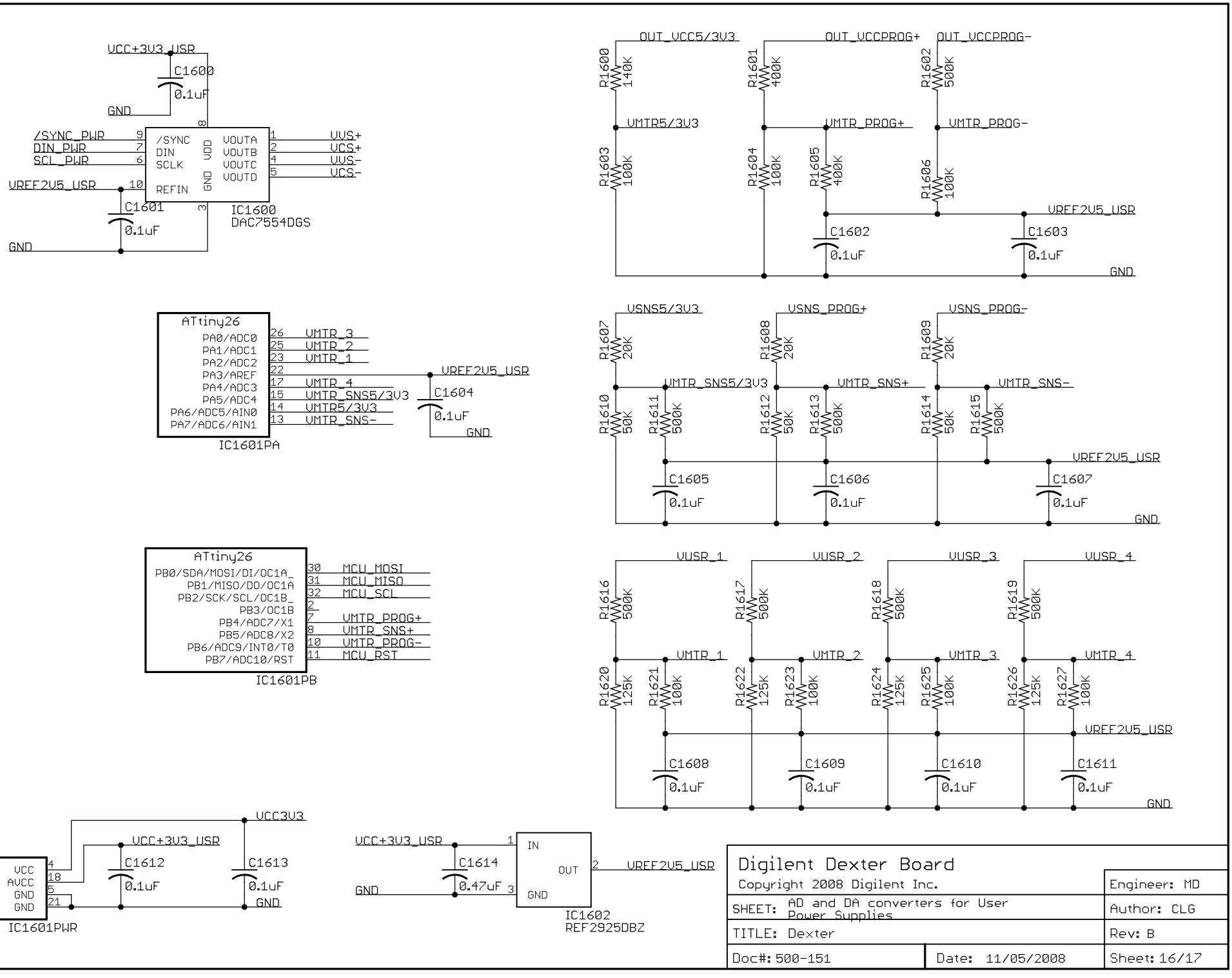
SHEET: Negative Programmable Power Supply		Author: CLG
TITLE: Dexter		Rev: B
Doc#: 500-151	Date: 11/05/2008	Sheet: 15/17


VCC+3V3_USR
C1600
0.1uF
GND
/SYNC_PWR
DIN_PWR
SCL_PWR
VREF2V5_USR
/SYNC
DIN
SCLK
REFIN
VDD
GND
VOUTA
VOUTB
VOUTC
VOUTD
VUS+
VCS+
VUS-
VCS-
C1601
0.1uF
IC1600
DAC7554DGS
OUT_VCC5/3V3
OUT_VCCPROG+
OUT_VCCPROG-
R1600 140K
R1601 400K
R1602 500K
VMTR5/3V3
VMTR_PROG+
VMTR_PROG-
R1603 100K
R1604 100K
R1605 400K
R1606 100K
C1602
C1603
ATtiny26
PA0/ADC0
PA1/ADC1
PA2/ADC2
PA3/AREF
PA4/ADC3
PA5/ADC4
PA6/ADC5/AIN0
PA7/ADC6/AIN1
VMTR_3
VMTR_2
VMTR_1
VMTR_4
VMTR_SNS5/3V3
VMTR_SNS-
C1604
IC1601PA
VSNS5/3V3
VSNS_PROG+
VSNS_PROG-
R1607 20K
R1608 20K
R1609 20K
VMTR_SNS5/3V3
VMTR_SNS+
VMTR_SNS-
R1610 50K
R1611 500K
R1612 50K
R1613 500K
R1614 50K
R1615 500K
C1605
C1606
C1607
PB0/SDA/MOSI/DI/OC1A_
PB1/MISO/DO/OC1A
PB2/SCK/SCL/OC1B_
PB3/OC1B
PB4/ADC7/X1
PB5/ADC8/X2
PB6/ADC9/INT0/T0
PB7/ADC10/RST
MCU_MOSI
MCU_MISO
MCU_SCL
VMTR_PROG+
VMTR_SNS+
VMTR_PROG-
MCU_RST
IC1601PB
VUSR_1
VUSR_2
VUSR_3
VUSR_4
R1616 500K
R1617 500K
R1618 500K
R1619 500K
VMTR_1
VMTR_2
VMTR_3
VMTR_4
R1620 125K
R1621 100K
R1622 125K
R1623 100K
R1624 125K
R1625 100K
R1626 125K
R1627 100K
C1608
C1609
C1610
C1611
VCC3V3
VCC+3V3_USR
C1612
C1613
0.1uF
GND
ATtiny26
VCC
AVCC
GND
GND
IC1601PWR
VCC+3V3_USR
C1614
0.47uF
GND
IN
OUT
GND
VREF2V5_USR
IC1602
REF2925DBZ
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TITLE: Dexter
Rev: B
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Date: 11/05/2008
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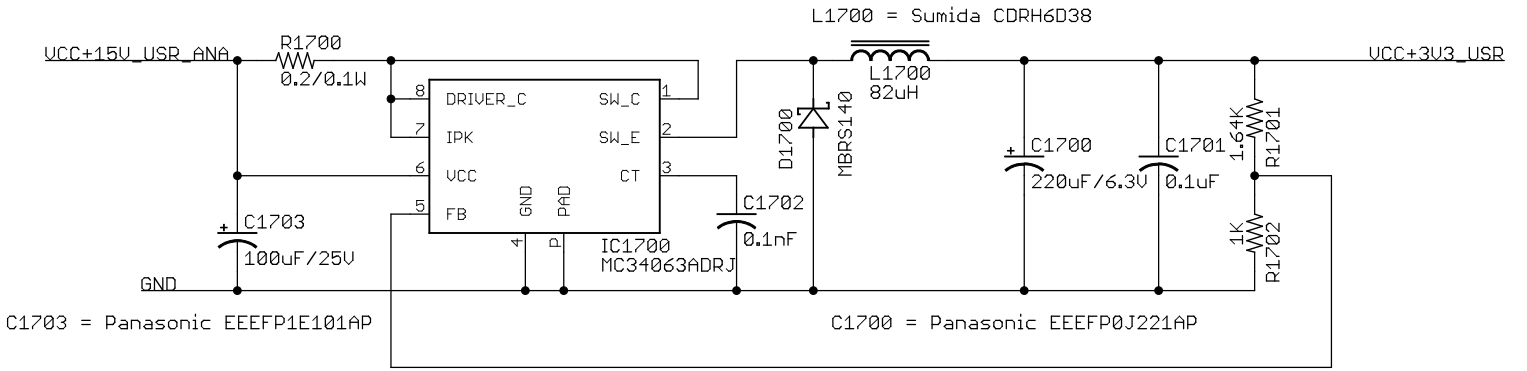

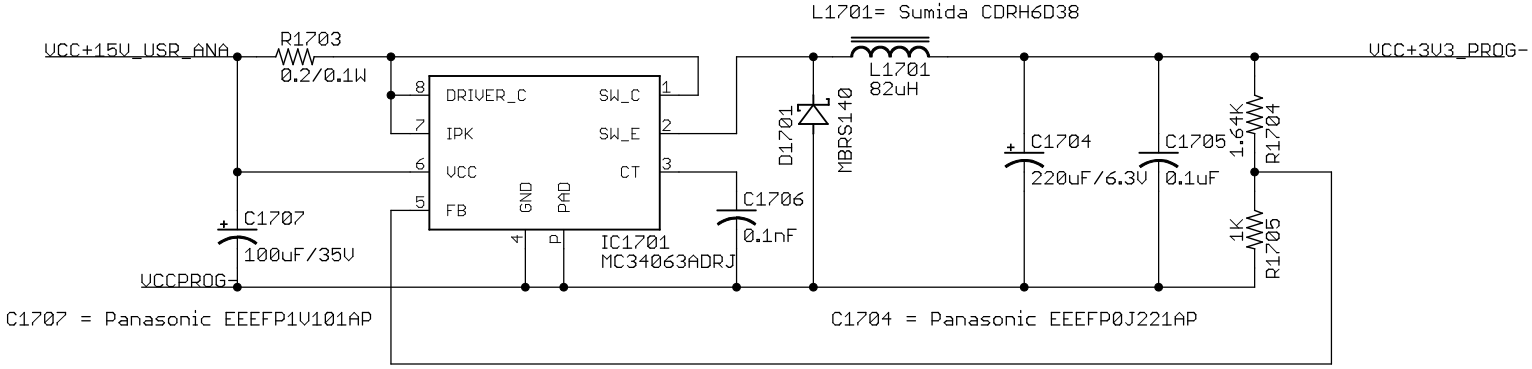

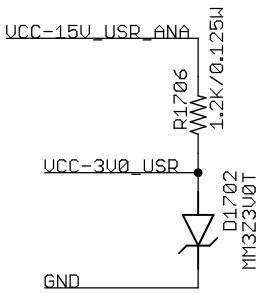

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