PRODUCT DESCRIPTION

The JARViE DAC Demo Board allows one to easily explore the functionality of the Linear Technologies LTC2642A-16, a 16-bit voltage output DAC. The demo board possesses two DACs that can be controlled synchronously or asynchronously. All DAC outputs are buffered rail-to-rail allowing outputs to swing all the way to their supply rails. Demo board output voltages can be connected directly to the target application's analog inputs using the board SMA connectors and or test points.

DAC voltage outputs are set by supplying a 16-bit word through its 3-wire SPI interface. The SPI interface can operate at +3.3V or +5V logic levels. Any controller capable of driving an SPI interface at the recommended logic levels can supply this word (e.g. Arduino, STM32 Nucleo, DC590, Linduino etc.).

The following GitHub repo provides all support info to quickly get started with the demo board, https://github.com/DudeYarvie/JARVIE_16-Bit_DAC_Demo_Board

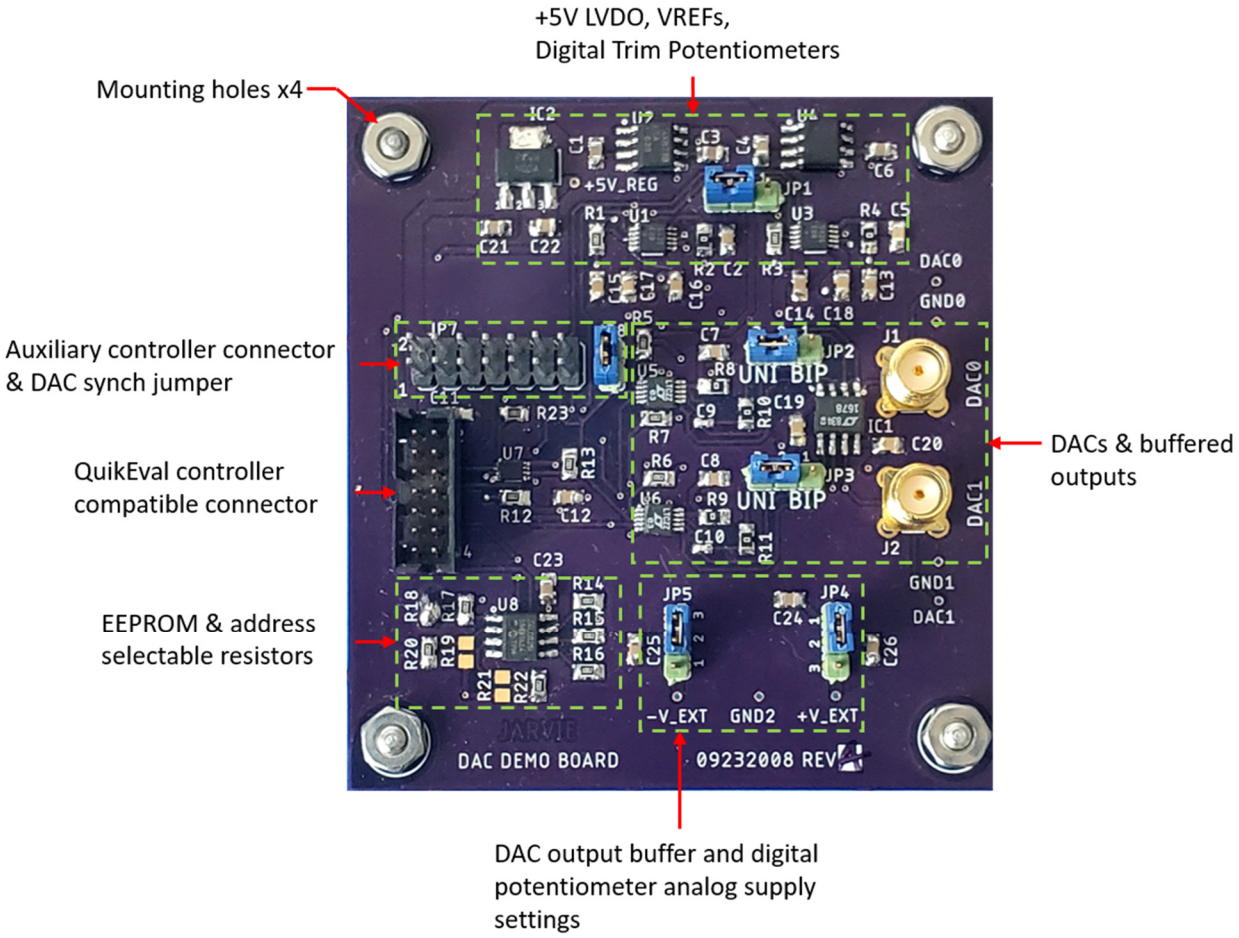


Figure 1. DAC Demo Board

QUICK START PROCEDURE

1. Connect an Arduino UNO or Linduino controller to the demo board as shown in Figure 2.
2. Connect the UNO to a host PC with a standard USB A/B cable.
3. Download the source files from *src* folder in the GitHub repository linked on pg.1.
4. Upload the Arduino UNO MCU with the *JARVIE_DAC_DEMO_BOARD.ino* using the Arduino IDE.
5. Using a serial terminal (e.g. Putty, HyperTerminal, etc.) open a 115200 baud, 8-bit, no parity, no flow control serial connection between the PC and controller.
6. Configure VREF and DAC mode in the firmware by issuing the appropriate commands listed in the GitHub *Software* section.
7. Set the output voltage of either DAC0 or DAC1 using the appropriate command listed GitHub *Software* section.

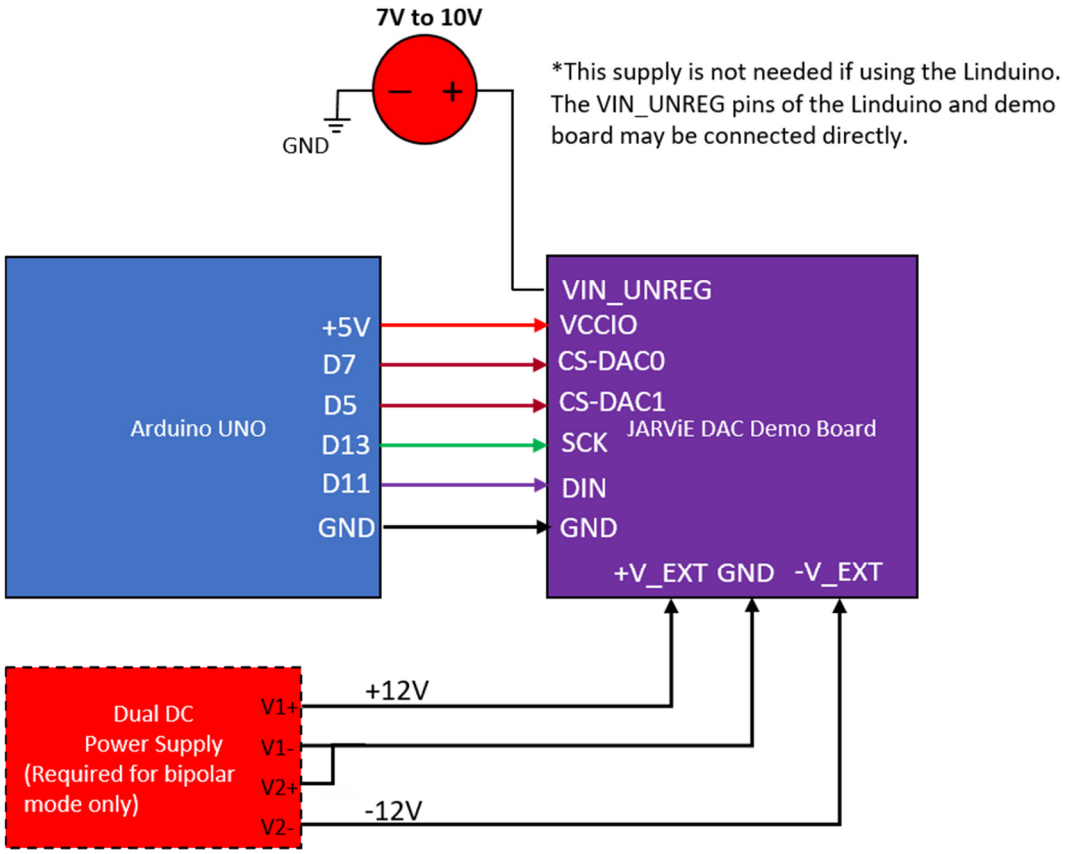


Figure 2 Controller to Demo Board Connection Diagram

HARDWARE DESCRIPTION

POWER CONNECTIONS

A low noise, bipolar power supply can be connected to the +V_EXT, -V_EXT, and GND test points. If an external supply is connected, the respective jumpers must be placed in the EXT position shown in **Figure 1**. This provides power to the LT1678 amplifier and optional digital potentiometers U1 and U3. The LT1678 will work with supplies as high as ±15V.

JUMPER SELECTIONS

JP1: Select the source for VREF, either +2.5V or +5V from the onboard MAX873AESA+ or MAX875AESA+ references.
JP2: Sets DAC0 to either unipolar or bipolar mode. In bipolar mode, set JP4 and JP5 to the EXT supplies and apply an appropriate supply voltage to +V_EXT, -V_EXT and GND test points.
JP3: Sets DAC1 to either unipolar or bipolar mode. In bipolar mode, set JP4 and JP5 to EXT supplies and apply an appropriate supply voltage to +V-EXT, -V_EXT and GND test points.
JP4: Sets amplifier and potentiometer +V supply to either external (+V_EXT) or onboard +5V_VREG.
JP5: Sets amplifier and potentiometer -V supply to either external (-V_EXT) or ground.
JP8: Sets the asynchronous or synchronous control of DAC0 and DAC1. Asynchronous mode allows the DAC outputs to be set to different values. Synchronous mode will set the DAC outputs to the same value at the same time.

CONNECTION TO CONTROLLER

J3 and JP7 can both be used to power and access the demo board serial communication interfaces. J3 is a specialized connector place on-board to easily accommodate Linear Technology USB serial controllers. Connect the DC590 or Linduino serial controllers to J3 using a QuickEval 14-conductor ribbon cable or equivalent. J3 and JP7 allows access to a 2kbit EEPROM via the I2C interface. The EEPROM address is set to 0x80 by default. JP7 provides a flexible way to connect many controllers to the demo board using flying wires.

BOARD OUTPUT CONNECTIONS

Both DAC outputs are accessible through SMA connectors and test points. Both outputs are rail-to-rail buffered and can be configured for either unipolar or bipolar operation using JP2 and or JP3 jumper selections.

REFERENCE CONNECTION

JP1 selects between the onboard +2.5V and +5V references. The reference voltage can be monitored at the JP1. An external reference may be applied to the center pin of JP1 by removing the jumper.
A TRIM pin facilitates adjustment of the reference voltage over a ±6% range using the on-board 100kΩ potentiometer.

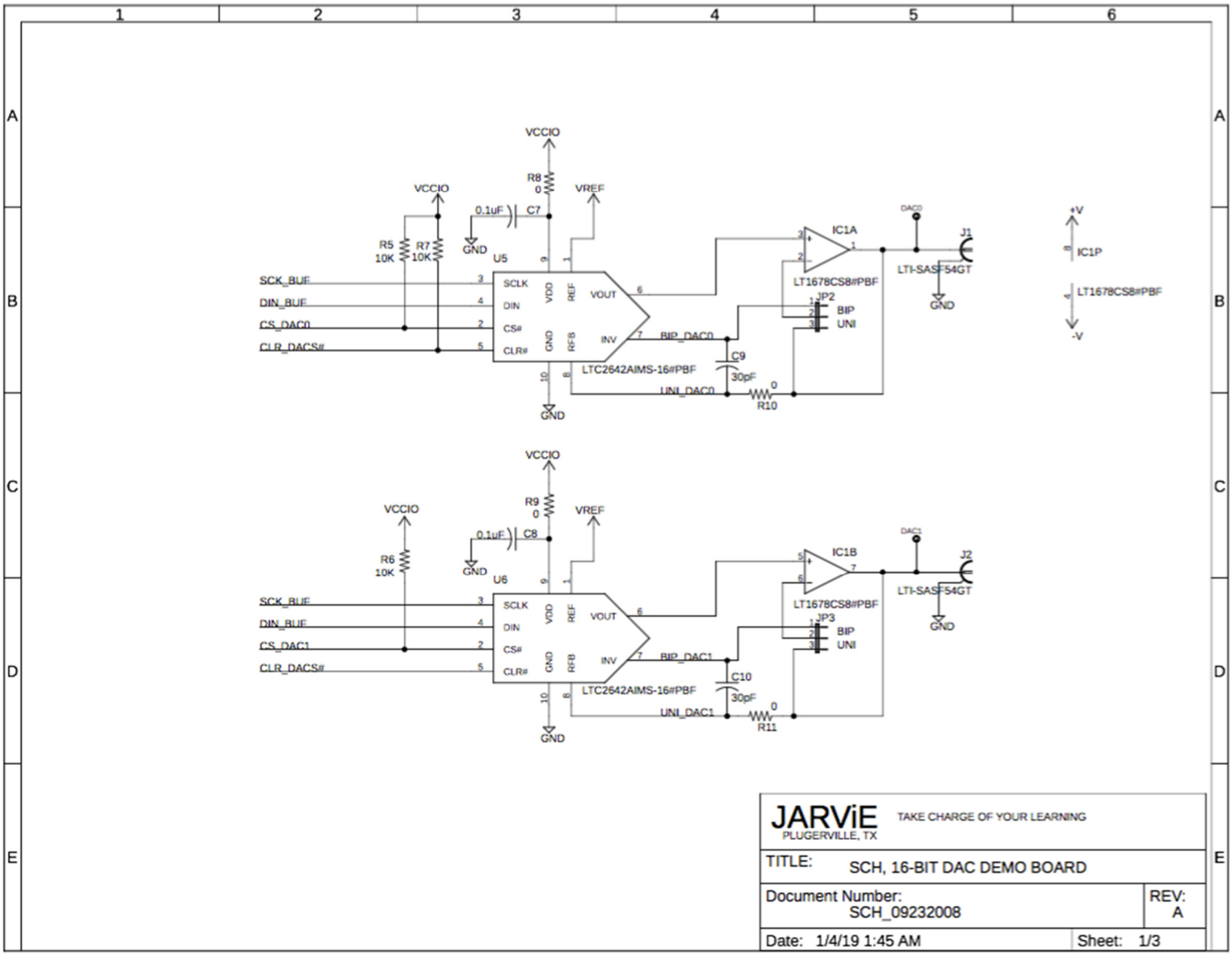
FIRMWARE DESCRIPTION

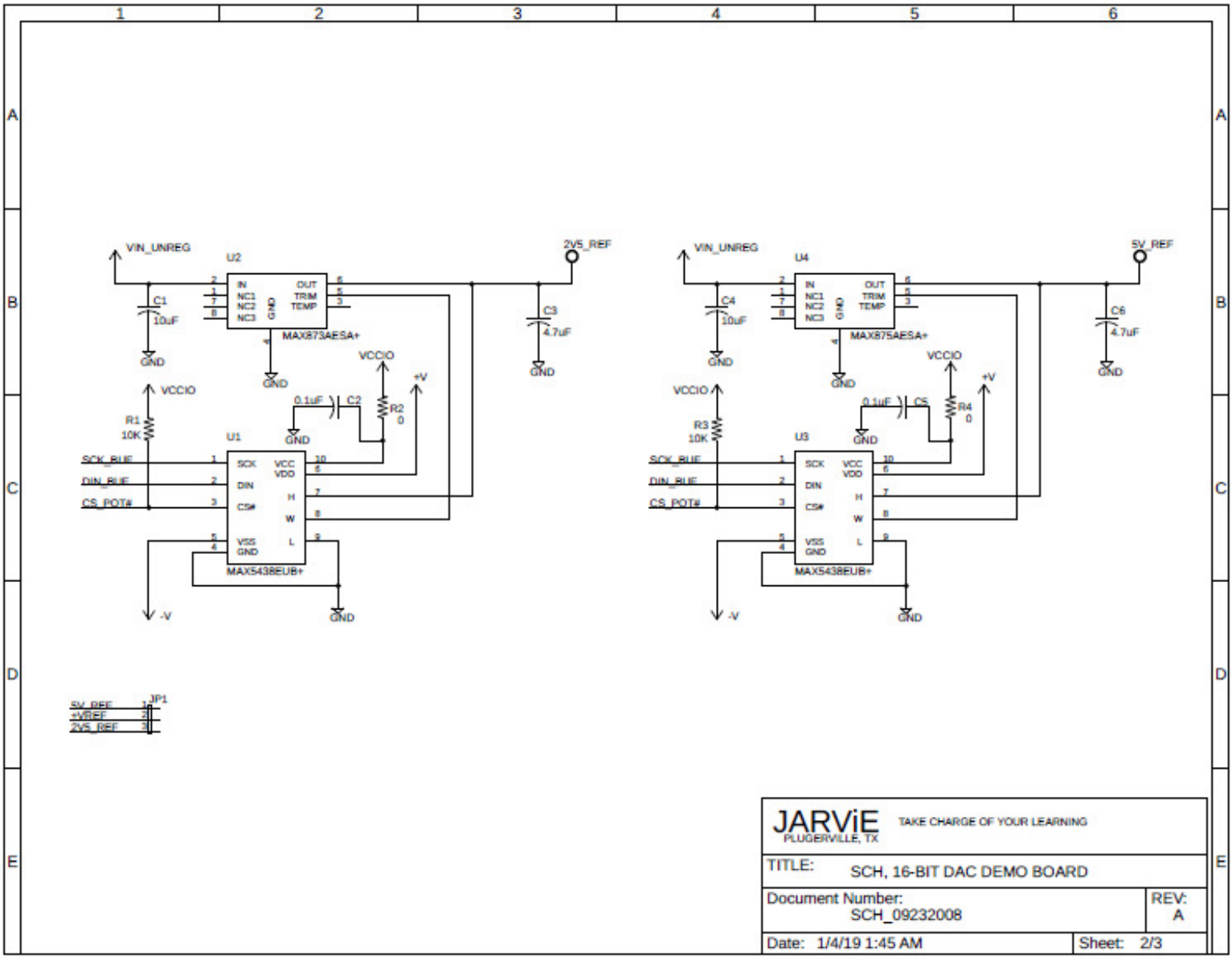
The firmware was developed in the Arduino IDE v1.8.9. Refer to the *Software* section on the GitHub repo to see which commands are supported. The controller firmware provides a quick path to understanding the performance of the LT2642 and how to control it through its SPI interface. By default, the firmware will initialize both DAC outputs to 0V if DAC is set to the unipolar mode and midscale if the DAC is set to bipolar mode. Equation 1 correlates decimal counts to the analog voltage the DAC will output.

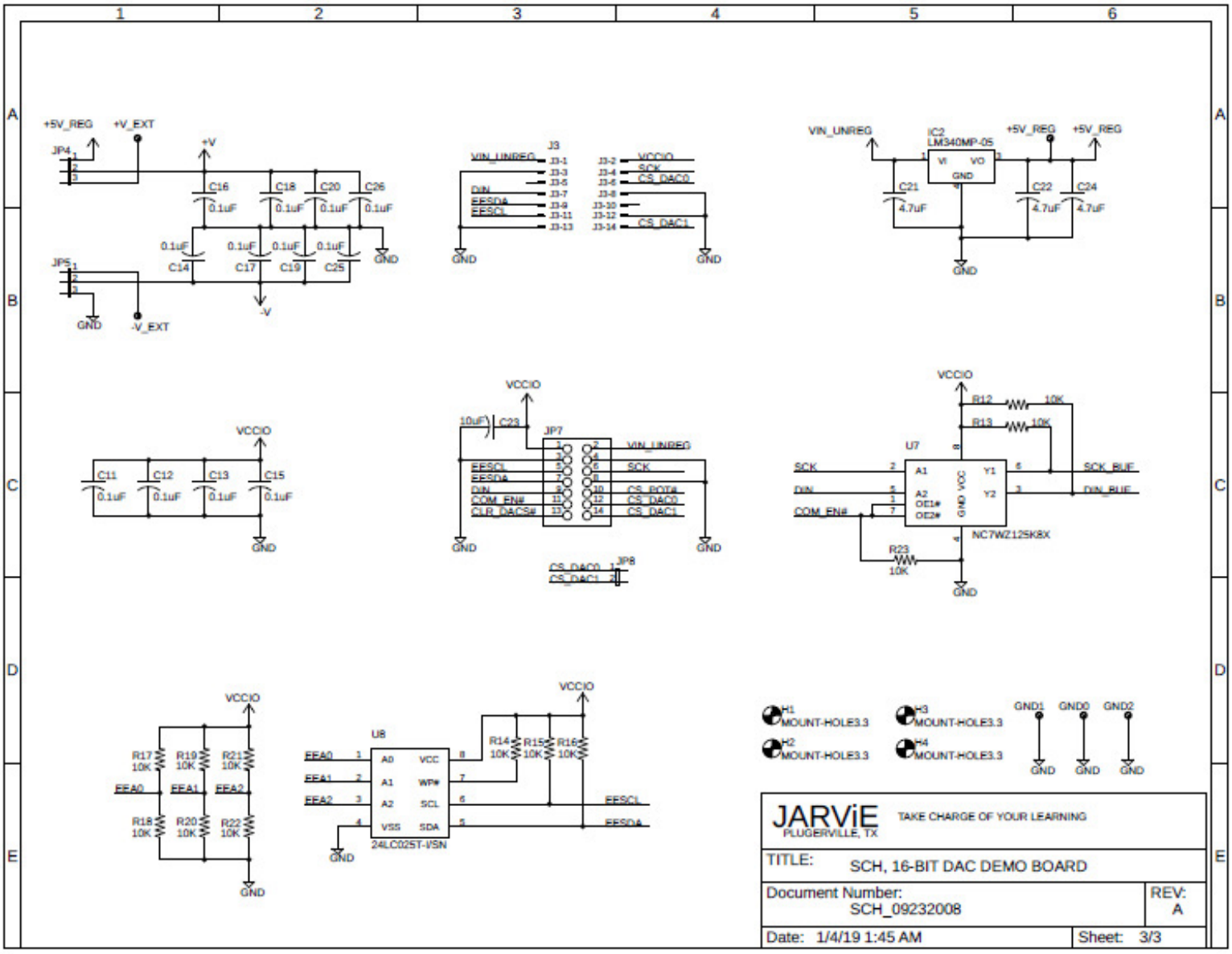
DEMO BOARD BOM

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER	MPN
1	1	JP7	HDR, 14POS 2.54mm	TE CONNECTIVITY	5-146250-7
2	6	R2, R4, R8, R9, R10, R11	RES, 0805 0Ohm 1/4W JUMPER	YAGEO	RC0805JR-7W0RL
3	16	C2, C5, C7, C8, C11, C12, C13, C14, C15, C16, C17, C18, C19, C20, C25, C26	CAP, 0805 0.1uF 10% 16V X7R	KEMET	C0805C104K4RAC
4	17	R1, R3, R5, R6, R7, R12, R13, R14, R15, R16, R17, R18, R19, R20, R21, R22, R23	RES, 0805 10K 1% 1/8W	BOURNS	CR0805-FX-1002ELF
5	3	C1, C4, C23	CAP, 0805 10uF 20% 25V X5R	MURATA	GRM21BR61E106MA73L
6	1	U8	EEPROM 2kBit	MICROCHIP	24LC025T-I/SN
7	2	C9, C10	CAP, 0402 30pF 1% 50V C0G	KEMET	CBR04C300F5GAC
8	5	C3, C6, C21, C22, C24	CAP, 0805 4.7uF 10% 16V X7R	TAIYO YUDEN	EMK212BJ475KDHT
9	1	J3	HDR, 14POS 2mm SHROUDED	MOLEX	87831-1420
10	1	IC1	IC, PRECISION AMPLIFIER DUAL LOW NOISE	ANALOG DEVICES	LT1678CS8#PBF
11	6	JP1, JP2, JP3, JP4, JP5, JP8	SHUNT	HARWIN	M7583-05
12	1	JP8	HDR, 1x2 2.54mm	TE CONNECTIVITY	3-826646-2
13	5	JP1, JP2, JP3, JP4, JP5	HDR, 1x3 2.54mm	TE CONNECTIVITY	3-826646-2
14	1	IC2	IC, REG LINEAR 5V 1A SOT223-4	TEXAS INSTRUMENTS	LM340MP-5.0/NOPB
15	2	U5, U6	IC, DAC 16BIT V-OUT 10-MSOP	ANALOG DEVICES	LTC2642AIMS-16#PBF
16	2	J1, J2	CONN, SMA JACK STRAIGHT	TE CONNECTIVITY	5-1814832-1
17	2	U1, U3	IC, DIGITAL POTENTIOMETER 128-TAP 100k	MAXIM	MAX5438EUB+
18	1	U2	IC, VOLTAGE REFERENCE 2.5V	MAXIM	MAX873BESA+
19	1	U4	IC, VOLTAGE REFERENCE 5V	MAXIM	MAX875BESA+
20	1	U7	IC, DUAL 3-STATE BUFFER	ON SEMI	NC7WZ125K8X

SCHEMATIC


VCCIO
R8
0
VREF
0.1uF
C7
GND
R5
10K
R7
10K
U5
SCK_BUF
DIN_BUF
CS_DAC0
CLR_DACS#
SCLK
DIN
CS#
CLR#
VDD
GND
REF
RFB
VOUT
INV
LTC2642AIMS-16#PBF
BIP_DAC0
UNI_DAC0
C9
30pF
R10
IC1A
LT1678CS8#PBF
JP2
BIP
UNI
DAC0
J1
LTI-SASF54GT
+V
IC1P
LT1678CS8#PBF
-V
R9
R6
C8
U6
SCK_BUF
DIN_BUF
CS_DAC1
CLR_DACS#
BIP_DAC1
UNI_DAC1
C10
R11
IC1B
JP3
DAC1
J2
JARViE
PLUGERVILLE, TX
TAKE CHARGE OF YOUR LEARNING
TITLE: SCH, 16-BIT DAC DEMO BOARD
Document Number: SCH_09232008
REV: A
Date: 1/4/19 1:45 AM
Sheet: 1/3


VIN_UNREG
U2
MAX875AESA+
C1
10uF
C3
4.7uF
2V5_REF
VCCIO
+V
R1
10K
R2
0
0.1uF
C2
U1
MAX5438EUB+
SCK_BUF
DIN_BUF
CS_POT#
-V
GND
JP1
5V_REF
+VREF
2V5_REF
U4
C4
C6
R3
R4
U3
CS
JARViE
PLUGERVILLE, TX
TAKE CHARGE OF YOUR LEARNING
TITLE: SCH, 16-BIT DAC DEMO BOARD
Document Number: SCH_09232008
REV: A
Date: 1/4/19 1:45 AM
Sheet: 2/3


+5V_REG
+V_EXT
JP4
+V
C16
C18
C20
C26
0.1uF
C14
C17
C19
C25
JP5
GND
-V_EXT
-V
J3
VIN_UNREG
DIN
EESDA
EESCL
VCCIO
SCK
CS_DAC0
CS_DAC1
IC2
LM340MP-05
VI
VO
GND
C21
C22
C24
4.7uF
C11
C12
C13
C15
C23
10uF
JP7
COM_EN#
CLR_DACS#
CS_POT#
JP8
U7
R12
R13
10K
SCK_BUF
DIN_BUF
NC7WZ125K8X
R23
U8
24LC02ST-I/SN
EEA0
EEA1
EEA2
R14
R15
R16
R17
R18
R19
R20
R21
R22
H1
H2
H3
H4
MOUNT-HOLE3.3
GND1
GND0
GND2
JARViE
PLUGERVILLE, TX
TAKE CHARGE OF YOUR LEARNING
TITLE:
SCH, 16-BIT DAC DEMO BOARD
Document Number:
SCH_09232008
REV:
A
Date: 1/4/19 1:45 AM
Sheet: 3/3