

LTC3888

8-Phase, Dual-Output Synchronous Buck Converter with Power System Management

DESCRIPTION

Demonstration circuit 2652A-A is an 8-phase dual-output, high efficiency, high density, synchronous buck converter with 7V to 14V input range. Each output can supply up to 120A maximum load current with 1V output. The demo board showcases the [LTC®3888](#), which is a PMBus-compliant dual loop 8-phase step-down DC/DC controller with digital power system management. The LTC3888 is designed to work with DrMOS devices that provide an output current sense and temperature monitor. Please refer to LTC3888’s data sheet for more detailed information.

DC2652A-A powers up to default settings and produces power based on configuration resistors (or with the setting in its non-volatile memory) without the need for any serial bus communication. This allows easy evaluation of

the DC/DC converter. To fully explore the extensive power system management features of the part, download the GUI software LTpowerPlay™ onto your PC and use ADI’s I²C/SMBus/PMBus dongle DC1613A to connect to the board. LTpowerPlay allows the user to reconfigure the part on the fly and store the configuration in EEPROM, view telemetry of voltage, current, temperature and fault status.

GUI Download

The software can be downloaded from:

[here](#)

For more details and instructions of LTpowerPlay, please refer to LTpowerPlay Quick Start Procedure.

Design files for this circuit board are available.

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BOARD PHOTO

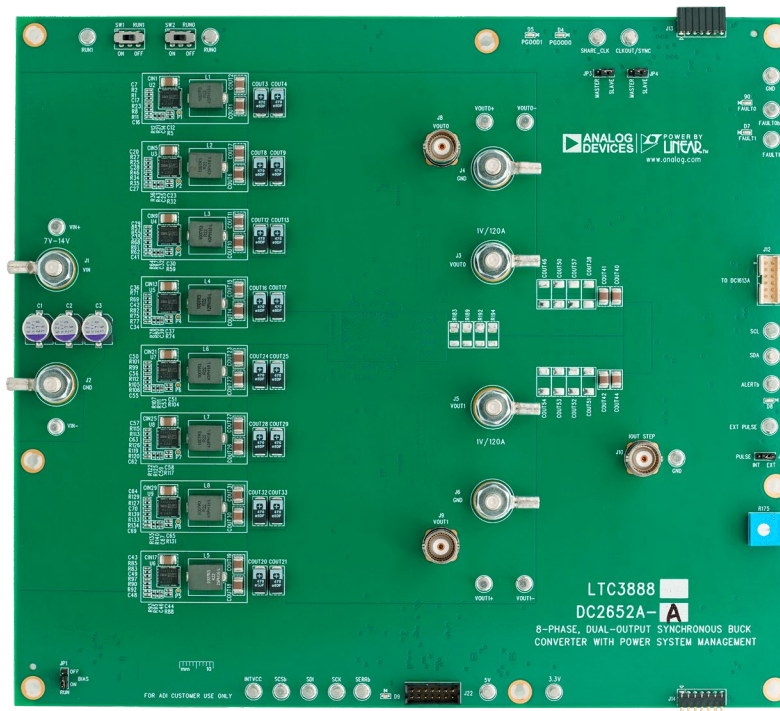


Figure 1. Dual-Output LTC3888/DC2652A-A Demo Circuit

DEMO MANUAL DC2652A-A

PERFORMANCE SUMMARY

Specifications are at $T_A = 25^\circ\text{C}$

| PARAMETER | CONDITIONS | VALUE |
|------------------------------------|---|----------------------------|
| Input Voltage Range | | 7V to 14V |
| Output Voltage, V_{OUT0} | $V_{IN} = 7$ to 14V, $I_{OUT0} = 0\text{A}$ to 120A | 0.3 to 1.8V, Default: 1.0V |
| Maximum Output Current, I_{OUT0} | $V_{IN} = 7$ to 14V, $V_{OUT0} = 0.3\text{V}$ to 1.8V | 120A |
| Output Voltage, V_{OUT1} | $V_{IN} = 7$ to 14V, $I_{OUT1} = 0\text{A}$ to 120A | 0.3 to 1.8V, Default: 1.0V |
| Maximum Output Current, I_{OUT1} | $V_{IN} = 7$ to 14V, $V_{OUT1} = 0.3\text{V}$ to 1.8V | 120A |
| Typical Efficiency of V_{OUT0} | $V_{IN} = 12\text{V}$, $V_{OUT0} = 1.0\text{V}$, $I_{OUT0} = 120\text{A}$ | 91.7% |
| Typical Efficiency of V_{OUT1} | $V_{IN} = 12\text{V}$, $V_{OUT1} = 1.0\text{V}$, $I_{OUT1} = 120\text{A}$ | 91.7% |
| Default Switching Frequency | | 500kHz |

QUICK START PROCEDURE

DC2652A-A is easy to set up to evaluate the performance of LTC3888. Refer to Figure 2 for the proper measurement equipment setup and follow the procedure below.

1. With power off, connect the input power supply (7V-14V) to V_{IN} (J1) and GND (J2).
2. Connect the 1.0V output load (Initial load: no load) between V_{OUT0} (J3) and GND (J4).
3. Connect the 1.0V output load (Initial load: no load) between V_{OUT1} (J5) and GND (J6).
4. Connect the DMMs to the input and outputs. Set default jumper position:
 - JP1: ON
 - JP2: EXT
 - JP3: SLAVE
 - JP4: SLAVE
 - SW1: ON
 - SW2: ON
5. Turn on the input power supply and check for the proper output voltages. V_{OUT0} should be $1.0\text{V} \pm 0.5\%$ and V_{OUT1} should be $1.0\text{V} \pm 0.5\%$.
6. Once the proper output voltages are established, adjust the loads within the operating range and observe the output voltage regulation, ripple voltage and other parameters.
7. Connect the dongle and control the output voltages from the GUI. See LTpowerPlay Quick Start Procedure for details.

Note:

1. When measuring the efficiency, it is recommended to monitor the V_{IN} , V_{OUT0} and V_{OUT1} at the locations close to the power stage. Here are examples:
 - (1) Monitor V_{IN} across CIN9 and V_{OUT0} across C_{OUT11} for V_{OUT0} efficiency measurement
 - (2) Monitor V_{IN} across CIN29 and V_{OUT1} across C_{OUT31} for V_{OUT1} efficiency measurement
2. When measuring the output or input voltage ripple, do not use the long ground lead on the oscilloscope probe. Figure 3 for the proper scope probe technique. Short, stiff leads need to be soldered to the (+) and (-) terminals of an output capacitor. The probe's ground ring needs to touch the (-) lead and the probe tip needs to touch the (+) lead.
3. When doing the load transient test, it is recommended to use a function generator to generate a pulse (~3% duty cycle with 10Hz~100Hz frequency). Then applying this pulse to the EXT PULSE (E9) and GND (E10) turrets, the dynamic load circuit will work well to achieve desired load transient test by adjusting the amplitude, rising edge and falling edge of the pulse. Here are examples:
 - (1) Set the amplitude of the pulse to 3.4V for a 0A to 30A load transient test with $10\text{m}\Omega$ I_{OUT} sensing resistor
 - (2) Set the amplitude of the pulse to 3.6V for a 0A to 40A load transient test with $10\text{m}\Omega$ I_{OUT} sensing resistor

QUICK START PROCEDURE

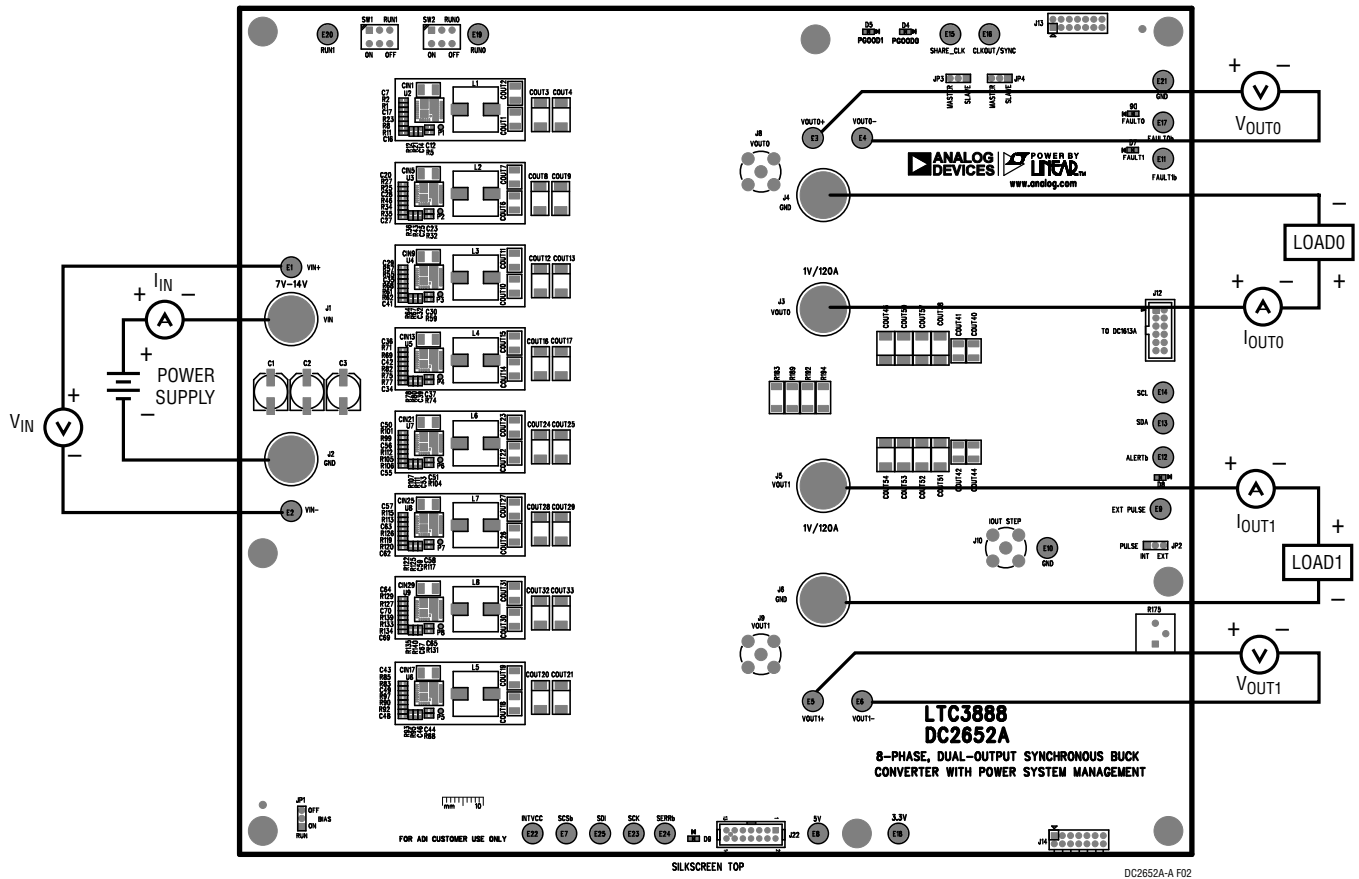


Figure 2. Proper Measurement Equipment Setup

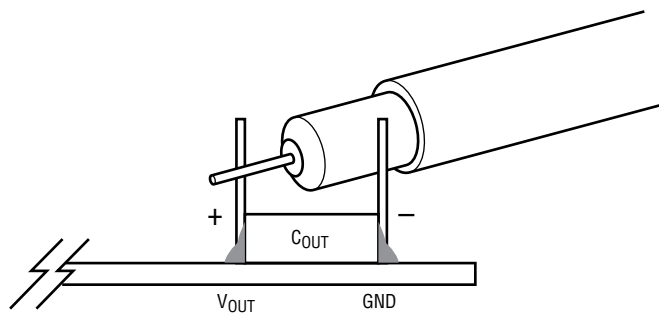


Figure 3. Measuring Output Voltage Ripple

DEMO MANUAL DC2652A-A

QUICK START PROCEDURE

Connecting a PC to DC2652A-A

You can use a PC to reconfigure the power management features of LTC3888 such as: nominal V_{OUT} , margin set

points, OV/UV limits, temperature fault limits, sequencing parameters, the fault log, fault responses, GPIOs and other functionalities. The DC1613A dongle may be plugged when V_{IN} is present.

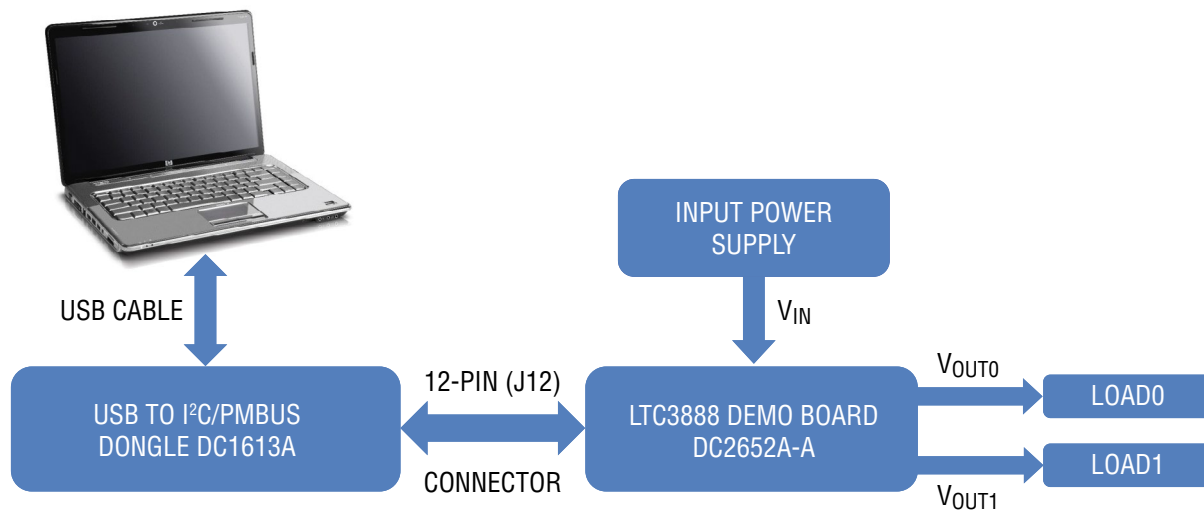


Figure 4. Demo Setup with PC

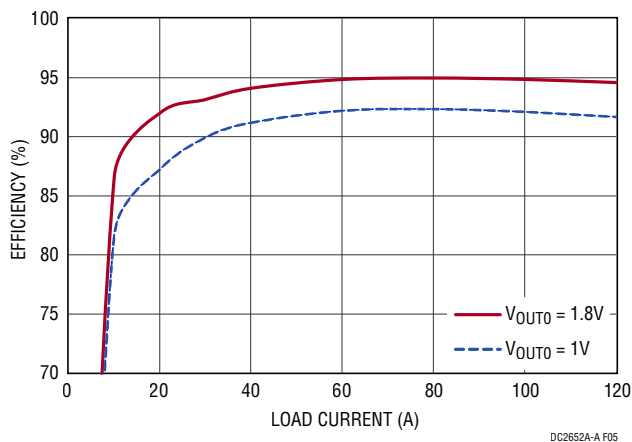


Figure 5. Efficiency vs. Load Current on V_{OUT0}

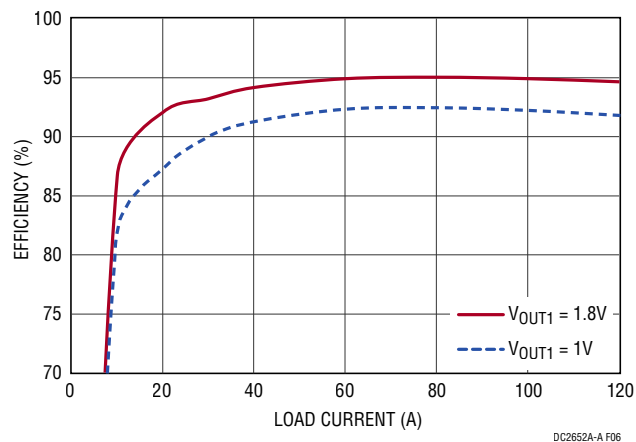


Figure 6. Efficiency vs. Load Current on V_{OUT1}

QUICK START PROCEDURE

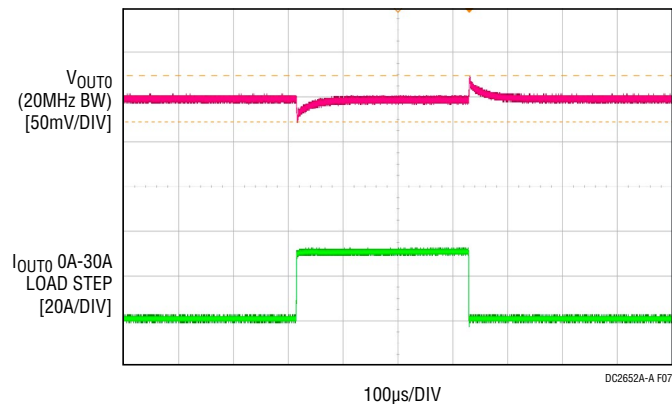


Figure 7. V_{OUT0} Load Transient Response at $V_{IN} = 12V$, $V_{OUT0} = 1.0V$

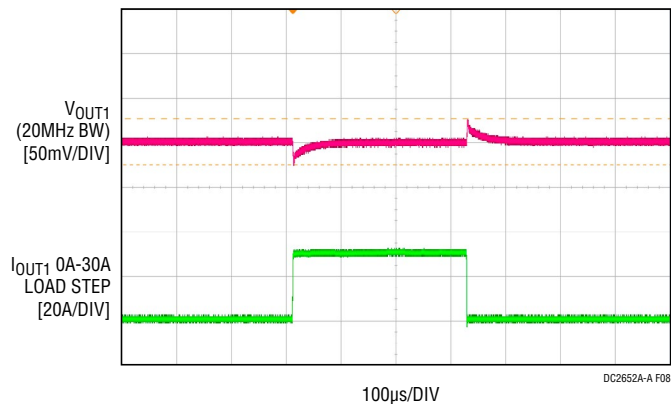


Figure 8. V_{OUT1} Load Transient Response at $V_{IN} = 12V$, $V_{OUT1} = 1.0V$

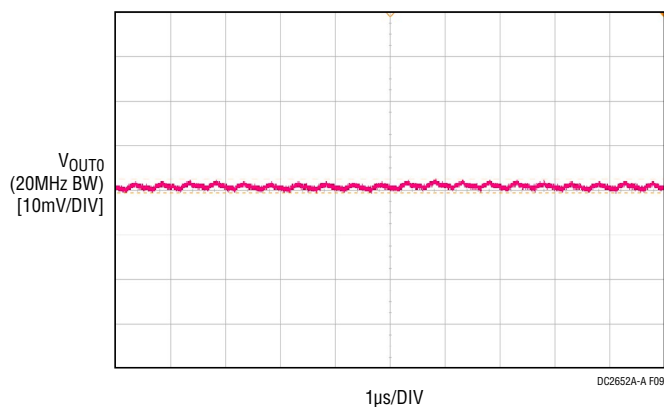


Figure 9. V_{OUT0} Voltage Ripple at $V_{IN} = 12V$, $V_{OUT0} = 1.0V$, $I_{OUT0} = 120A$

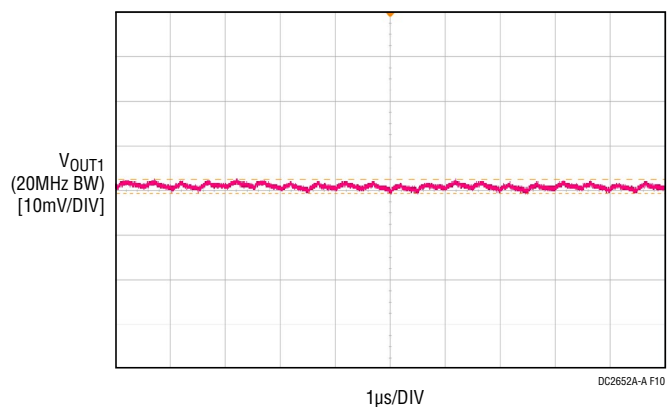


Figure 10. V_{OUT1} Voltage Ripple at $V_{IN} = 12V$, $V_{OUT1} = 1.0V$, $I_{OUT1} = 120A$

QUICK START PROCEDURE

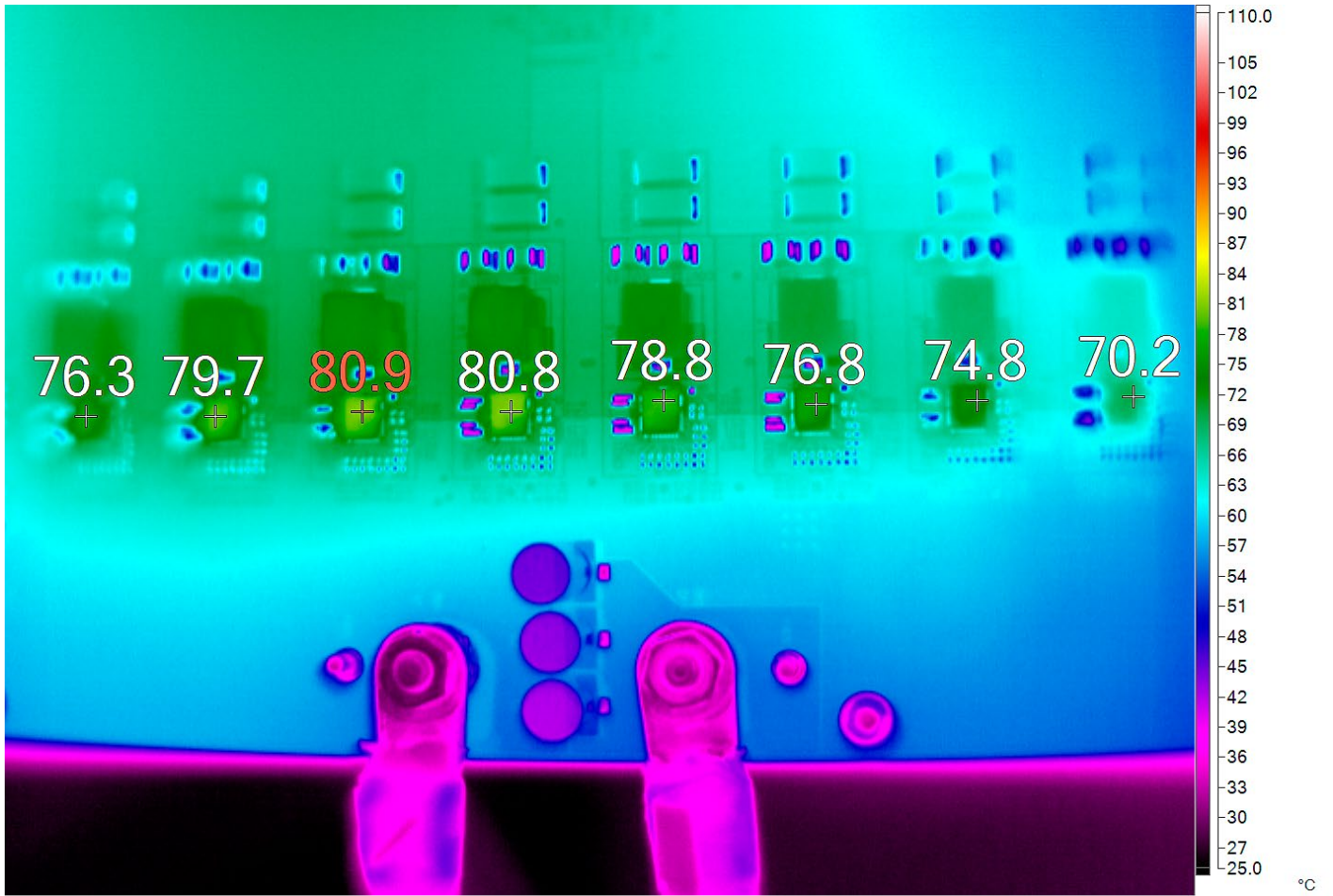


Figure 11. Thermal at $V_{IN} = 12V$, $V_{OUT0} = 1.0V$, $I_{OUT0} = 120A$, $V_{OUT1} = 1.0V$, $I_{OUT1} = 120A$, $T_A = 23^\circ C$, No Airflow

DEMO MANUAL DC2652A-A

LTPOWERPLAY QUICK START PROCEDURE

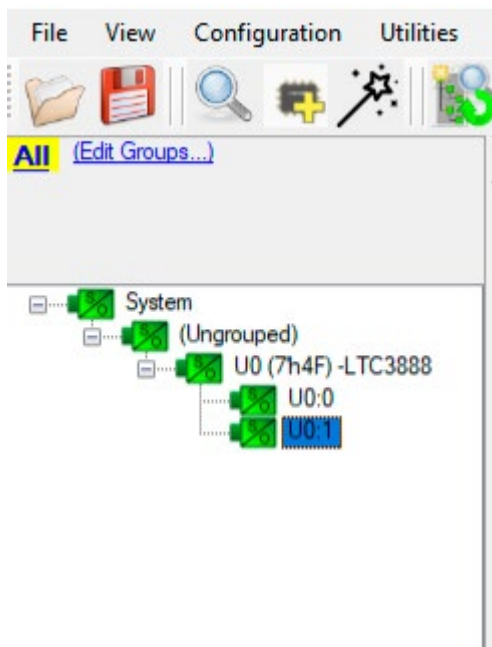
The following procedure describes how to use LTpowerPlay to monitor and change the settings of LTC3888.

1 Download and install the LTpowerPlay GUI:

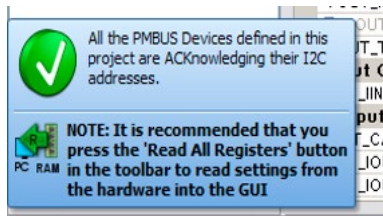
[here](#)

2. Launch the LTpowerPlay GUI.

a. The GUI should automatically identify the DC2652A-A. The system tree on the left hand side should look like this:



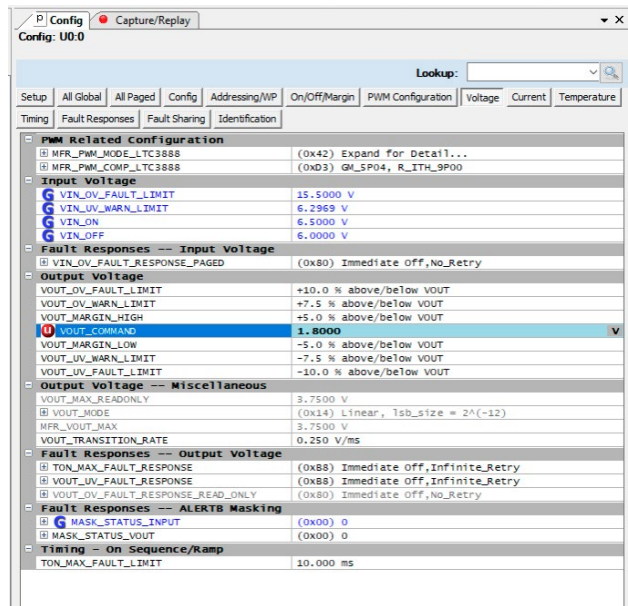
b. A green message box shows for a few seconds in the lower left-hand corner, confirming that LTC3888 is communicating:



c. In the Toolbar, click the “R” (RAM to PC) icon to read the RAM from the LTC3888. This reads the configuration from the RAM of LTC3888 and loads it into the GUI.



d. If you want to change the output voltage to a different value, like 1.8V. In the Config tab, type in 1.8 in the VOUT_COMMAND box, like this:



Then, click the “W” (PC to RAM) icon to write these register values to the LTC3888. After finishing this step, you will see the output voltage will change to 1.8V.



If the write is successful, you will see the following message:



e. You can save the changes into the NVM. In the toolbar, click “RAM to NVM” button, as following



f. Save the demo board configuration to a (*.proj) file. Click the Save icon and save the file. Name it whatever you want.

PARTS LIST

| ITEM | QTY | REFERENCE | PART DESCRIPTION | MANUFACTURER/PART NUMBER |
|------------------------------------|-----|---|---|---------------------------|
| Required Circuit Components | | | | |
| 1 | 6 | C1, C2, C3, C4, C5, C6 | CAP., 270µF, ALUM, 16V, 20%, SMD 8 × 11.9mm, E12 | PANASONIC/16SVPC270M |
| 2 | 18 | COUT1, COUT2, COUT6, COUT7, COUT10, COUT11, COUT14, COUT15, COUT18, COUT19, COUT22, COUT23, COUT26, COUT27, COUT30, COUT31, COUT64, COUT65 | CAP., 100µF, X5R, 6.3V, 20%, 1210 | AVX/12106D107MAT2A |
| 3 | 32 | CIN1, CIN2, CIN3, CIN4, CIN5, CIN6, CIN7, CIN8, CIN9, CIN10, CIN11, CIN12, CIN13, CIN14, CIN15, CIN16, CIN17, CIN18, CIN19, CIN20, CIN21, CIN22, CIN23, CIN24, CIN25, CIN26, CIN27, CIN28, CIN29, CIN30, CIN31, CIN32 | CAP., 22µF, X7R, 25V, 10%, 1210 | AVX/12103C226KAT2A |
| 4 | 16 | COUT3, COUT4, COUT8, COUT9, COUT12, COUT13, COUT16, COUT17, COUT20, COUT21, COUT24, COUT25, COUT28, COUT29, COUT32, COUT33 | CAP., 470µF, TANT, POSCAP, 2.5V, 20%, 7343, TPF Series | PANASONIC/ETPF470M5H |
| 5 | 16 | C7, C16, C20, C27, C29, C34, C36, C41, C43, C48, C50, C55, C57, C62, C64, C69 | CAP., 0.47µF, X5R, 10V, 10%, 0402 | AVX/0402ZD474KAT2A |
| 6 | 1 | C8 | CAP., 4.7µF, X5R, 16V, 20%, 0603 | MURATA/GRM188R61C475MAAJD |
| 7 | 1 | C9 | CAP., 1µF, X7R, 16V, 20%, 0603 | AVX/0603YC105MAT2A |
| 8 | 1 | C10 | CAP., 2.2µF, X5R, 16V, 10%, 0603 | KEMET/C0603C225K4PAC7867 |
| 9 | 2 | C11, C108 | CAP., 2.2µF, X5R, 16V, 10%, 0805 | AVX/0805YD225KAT2A |
| 10 | 16 | C12, C14, C23, C25, C30, C32, C37, C39, C44, C46, C51, C53, C58, C59, C65, C67 | CAP., 4.7µF, JB, 10V, 20%, 0402 | TDK/C1005JB1A475M050BC |
| 11 | 8 | C17, C28, C35, C42, C49, C56, C63, C70 | CAP., 330pF, X7R, 50V, 10%, 0402 | AVX/04025C331KAT2A |
| 12 | 2 | C18, C19 | CAP., 3300pF, X7R, 50V, 10%, 0603 | AVX/06035C332KAT2A |
| 13 | 2 | C21, C22 | CAP., 330pF, X7R, 50V, 10%, 0603 | KEMET/C0603S331K5RAC7867 |
| 14 | 3 | CIN33, CIN34, COUT67 | CAP., 10µF, X7R, 16V, 10%, 1210 | AVX/1210YC106KAT2A |
| 15 | 1 | COUT66 | CAP., 4.7µF, X5R, 16V, 20%, 1210 | AVX/1210YD475MAT2A |
| 16 | 2 | C110, C113 | CAP., 1µF, X7R, 50V, 10%, 0805 | MURATA/GRM21BR71H105KA12L |
| 17 | 1 | C111 | CAP., 4.7µF, X5R, 16V, 10%, 0603 | AVX/0603YD475KAT2A |
| 18 | 1 | C112 | CAP., 0.1µF, X7R, 16V, 10%, 0603 | AVX/0603YC104KAT2A |
| 19 | 1 | C114 | CAP., 5.6pF, COG/NPO, 50V, ±0.25pF, 0603 | AVX/06035A5R6CAT2 |
| 20 | 1 | C116 | CAP., 100pF, COG/NPO, 25V, 5%, 0603 | AVX/06033A101JAT2 |
| 21 | 1 | D1 | DIODE, SCHOTTKY, 200V, 1A, PowerDI-123, AEC-Q101 | DIODES INC./DFLS1200-7 |
| 22 | 8 | L1, L2, L3, L4, L5, L6, L7, L8 | IND., 215nH, PWR, FERRITE, 10%, 61A, 0.29mΩ, 10.4 × 8.0mm SMD | EATON/FP1007R3-R22-R |
| 23 | 1 | L9 | IND., 4.7µH, PWR, 20%, 5.9A, 40mΩ, 5.48 × 5.28mm SMD, XAL5030, AEC-Q200 | COILCRAFT/XAL5030-472ME |

DEMO MANUAL DC2652A-A

PARTS LIST

| ITEM | QTY | REFERENCE | PART DESCRIPTION | MANUFACTURER/PART NUMBER |
|------|-----|---|--|------------------------------|
| 24 | 1 | R3 | RES., 1 Ω , 5%, 1/10W, 0603, AEC-Q200 | VISHAY/CRCW06031R00JNEA |
| 25 | 3 | R9, R10, R18 | RES., 1k Ω , 1%, 1/10W, 0603, AEC-Q200 | NIC/NRC06F1001TRF |
| 26 | 7 | R15, R17, R48, R49, R51, R54, R244 | RES., 10k Ω , 1%, 1/10W, 0603, AEC-Q200 | KOA SPEER/RK73H1JTDD1002F |
| 27 | 1 | R16 | RES., 4.99k Ω , 1%, 1/10W, 0603, AEC-Q200 | NIC/NRC06F4991TRF |
| 28 | 8 | R23, R46, R68, R82, R97, R112, R126, R139 | RES., 10k Ω , 1%, 1/16W, 0402, AEC-Q200 | NIC/NRC04F1002TRF |
| 29 | 1 | R41 | RES., 18.7k Ω , 1%, 1/10W, 0603, AEC-Q200 | NIC/NRC06F1872TRF |
| 30 | 1 | R53 | RES., 2k Ω , 1%, 1/10W, 0603, AEC-Q200 | KOA SPEER/RK73H1JTDD2001F |
| 31 | 4 | R89, R98, R234, R235 | RES., 10 Ω , 1%, 1/10W, 0603 | NIC/NRC06F10R0TRF |
| 32 | 1 | R250 | RES., 2 Ω , 1%, 1/10W, 0603, AEC-Q200 | VISHAY/CRCW06032R00FKEA |
| 33 | 1 | R251 | RES., 100k Ω , 1%, 1/10W, 0603, AEC-Q200 | PANASONIC/ERJ3EKF1003V |
| 34 | 1 | R252 | RES., 60.4k Ω , 1%, 1/10W, 0603, AEC-Q200 | PANASONIC/ERJ3EKF6042V |
| 35 | 1 | R253 | RES., 619k Ω , 1%, 1/10W, 0603, AEC-Q200 | NIC/NRC06F6193TRF |
| 36 | 1 | R255 | RES., 200k Ω , 1%, 1/10W, 0603 | NIC/NRC06F2003TRF |
| 37 | 1 | R256 | RES., 84.5k Ω , 1%, 1/10W, 0603, AEC-Q200 | NIC/NRC06F8452TRF |
| 38 | 1 | U1 | IC, 8-Phase, Dual Output Synch. Buck Cvrtr, QFN-52 (UHG) | LINEAR TECH/LTC3888IUHG#PBF |
| 39 | 8 | U2, U3, U4, U5, U6, U7, U8, U9 | IC, Powerstage Gate Driver, DrMOS, PQFN 5mm x 6mm, 70A | INFINEON/TDA21470AUMA1 |
| 40 | 1 | U22 | IC, 1A SYNC. STEP-DOWN CONVERTER, DFN-14 | LINEAR TECH/LTC3646EDE-1#PBF |

Additional Demo Board Circuit Components

| | | | | |
|----|----|--|--|----------------------|
| 1 | 0 | C13, C24, C31, C38, C45, C52, C60, C66 | CAP., OPTION, 0402 | |
| 2 | 0 | C15, C26, C33, C40, C47, C54, C61, C68, C115, C119, C121, C122 | CAP., OPTION, 0603 | |
| 3 | 0 | COUT38, COUT45, COUT46, COUT50, COUT51, COUT52, COUT53, COUT54, COUT57, COUT58, COUT59, COUT62 | CAP., OPTION, 7343 | |
| 4 | 4 | COUT39, COUT60, COUT61, COUT63 | CAP., 470 μ F, TANT, POSCAP, 2.5V, 20%, 7343, TPF Series | PANASONIC/ETPF470M5H |
| 5 | 10 | COUT40, COUT41, COUT42, COUT44, COUT47, COUT48, COUT55, COUT56, C84, C85 | CAP., 100 μ F, X5R, 6.3V, 20%, 1210 | AVX/12106D107MAT2A |
| 6 | 2 | COUT43, COUT49 | CAP., 1 μ F, X7R, 16V, 20%, 0603 | AVX/0603YC105MAT2A |
| 7 | 4 | C102, C103, C105, C106 | CAP., 10 μ F, X5R, 10V, 10%, 0603 | AVX/0603ZD106KAT2A |
| 8 | 2 | C104, C107 | CAP., 0.01 μ F, C0G, 25V, 5%, 0603 | AVX/06033A103JAT2 |
| 9 | 1 | C86 | CAP., 0.1 μ F, X7R, 50V, 10%, 0603 | AVX/06035C104KAT2A |
| 10 | 2 | C87, C89 | CAP., 1 μ F, X7R, 16V, 20%, 0603 | AVX/0603YC105MAT2 |
| 11 | 1 | C88 | CAP., 150pF, C0G, 25V, 10%, 0603 | AVX/06033A151KAT2 |
| 12 | 1 | C90 | CAP., 0.1 μ F, X7R, 50V, 10%, 0603 | AVX/06035C104KAT2A |
| 13 | 2 | C91, C92 | CAP., 0.01 μ F, C0G, 25V, 5%, 0603 | AVX/06033A103JAT2A |
| 14 | 6 | C99, C100, C101, C117, C118, C120 | CAP., 0.1 μ F, X7R, 50V, 10%, 0603 | AVX/06035C104KAT2A |
| 15 | 0 | D2, D3 | DIODE, OPTION, SOD-323 | |

PARTS LIST

| ITEM | QTY | REFERENCE | PART DESCRIPTION | MANUFACTURER/PART NUMBER |
|------|-----|--|---|---------------------------|
| 16 | 2 | D4, D5 | LED, GREEN, WATER CLEAR, 0603 | Würth/150060GS75000 |
| 17 | 3 | D6, D7, D8 | LED, SUPER RED, WATERCLEAR, 0603 | Würth/150060SS75000 |
| 18 | 1 | D9 | LED, SUPER RED, WATERCLEAR, 0603 | Würth/150060SS75000 |
| 19 | 6 | D10, D11, D12, D13, D14, D15 | DIODE, SCHOTTKY, 20V, 0.5A, SOD-882, LEADLESS | NEXPERIA/PMEG2005AEL,315 |
| 20 | 2 | Q1, Q2 | XSTR., MOSFET, N-CH, 40V, 14A, DPAK (TO-252) | VISHAY/SUD50N04-8M8P-4GE3 |
| 21 | 4 | Q3, Q4, Q5, Q6 | XSTR., MOSFET, P-CH, 30V, 3.5A, SOT23-3, AEC-Q101 | DIODES INC./DMP3130L-7 |
| 22 | 2 | Q7, Q8 | XSTR., MOSFET, N-CH, 60V, 210mA, SOT-23 | DIODES INC./2N7002-13-F |
| 23 | 1 | Q9 | XSTR., MOSFET, P-CH, 30V, 3.5A, SOT23-3, AEC-Q101 | DIODES INC./DMP3130L-7 |
| 24 | 64 | R1, R2, R5, R6, R8, R12, R21, R22, R25, R27, R29, R32, R34, R36, R43, R50, R55, R57, R58, R59, R61, R64, R66, R67, R69, R71, R72, R74, R75, R78, R80, R81, R83, R85, R86, R88, R90, R93, R95, R96, R99, R101, R102, R104, R105, R107, R110, R111, R113, R115, R116, R117, R119, R122, R124, R125, R127, R129, R130, R131, R133, R135, R138, R140 | RES., 0 Ω , 1/16W, 0402 | NIC/NRC04ZOTRF |
| 25 | 0 | R4, R7, R11, R26, R33, R35, R56, R60, R62, R70, R73, R77, R84, R87, R92, R100, R103, R106, R114, R118, R120, R128, R132, R134 | RES., OPTION, 0402 | |
| 26 | 14 | R28, R30, R166, R198, R200, R202, R203, R257, R276, R279, R281, R283, R286, R288 | RES., 0 Ω , 1/10W, 0603, AEC-Q200 | NIC/NRC06ZOTRF |
| 27 | 0 | R37, R38, R39, R40, R42, R44, R47, R52, R179, R180, R181, R182, R187, R188, R191, R196, R197, R199, R201, R204, R210, R211, R212, R213, R268, R269, R274, R275, R277, R278, R280, R282, R284, R285, R287, R289, R290, R291, R292 | RES., OPTION, 0603 | |
| 28 | 0 | R162, R163, R183, R184, R189, R190, R192, R193, R194, R195 | RES., OPTION, 2010 | |
| 29 | 1 | R164 | RES., 2 Ω , 1%, 1/10W, 0603, AEC-Q200 | VISHAY/CRCW06032R00FKEA |
| 30 | 1 | R165 | RES., 3.3 Ω , 1%, 1/10W, 0603, AEC-Q200 | VISHAY/CRCW06033R30FKEA |
| 31 | 1 | R167 | RES., 154k Ω , 1%, 1/10W, 0603, AEC-Q200 | NIC/NRC06F1543TR |
| 32 | 1 | R168 | RES., 1M Ω , 1%, 1/10W, 0603, AEC-Q200 | NIC/NRC06F1004TRF |
| 33 | 2 | R169, R170 | RES., 20k Ω , 1%, 1/10W, 0603 | NIC/NRC06F2002TRF |
| 34 | 1 | R171 | RES., 681k Ω , 1%, 1/10W, 0603, AEC-Q200 | NIC/NRC06F6813TRF |
| 35 | 2 | R172, R218 | RES., 10k Ω , 1%, 1/10W, 0603, AEC-Q200 | KOA SPEER/RK73H1JTDD1002F |
| 36 | 1 | R173 | RES., 301 Ω , 1%, 1/10W, 0603, AEC-Q200 | NIC/NRC06F3010TRF |

DEMO MANUAL DC2652A-A

PARTS LIST

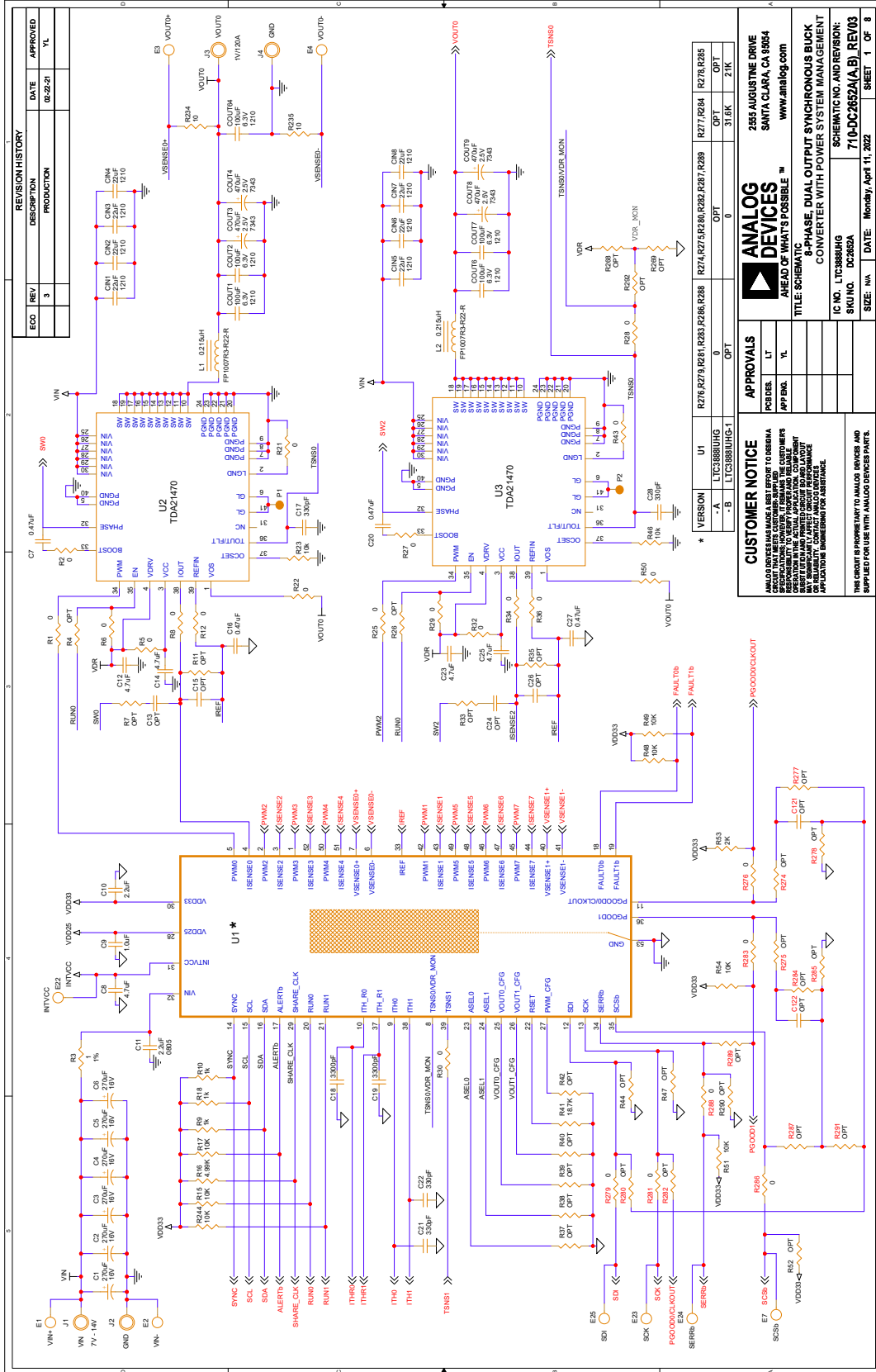
| ITEM | QTY | REFERENCE | PART DESCRIPTION | MANUFACTURER/PART NUMBER |
|------|-----|--|--|----------------------------------|
| 37 | 1 | R174 | RES., 82.5Ω, 1%, 1/10W, 0603, AEC-Q200 | NIC/NRC06F82R5TRF |
| 38 | 1 | R175 | RES., 5kΩ, 10%, 1/2W, THT 3/8" SQ, 1-TURN, TOP ADJ., TRIMPOT | BOURNS/3386P-1-502LF |
| 39 | 0 | R176 | RES., OPTION, 2512 | |
| 40 | 1 | R177 | RES., 0.01Ω, 1%, 1W, 2512, PWR, METAL, SENSE, AEC-Q200 | VISHAY/WSL2512R0100FEA |
| 41 | 1 | R178 | RES., 1.21kΩ, 1%, 1/10W, 0603 | PANASONIC/ERJ3EKF1211V |
| 42 | 2 | R185, R186 | RES., 27.4Ω, 1%, 1W, 2512, AEC-Q200 | PANASONIC/ERJ1TNF27R4U |
| 43 | 2 | R205, R206 | RES., 10Ω, 1%, 1/10W, 0603 | NIC/NRC06F10R0TRF |
| 44 | 2 | R207, R208 | RES., 4.99kΩ, 1%, 1/10W, 0603, AEC-Q200 | NIC/NRC06F4991TRF |
| 45 | 0 | R209 | RES., OPTION, 1206 | |
| 46 | 5 | R214, R215, R216, R217, R219 | RES., 2kΩ, 1%, 1/10W, 0603, AEC-Q200 | KOA SPEER/RK73H1JTDD2001F |
| 47 | 1 | R220 | RES., 15.8kΩ, 1%, 1/10W, 0603, AEC-Q200 | NIC/NRC06F1582TRF |
| 48 | 1 | R233 | RES., 2kΩ, 1%, 1/10W, 0603, AEC-Q200 | KOA SPEER/RK73H1JTDD2001F |
| 49 | 1 | R258 | RES., 0Ω, 1/8W, 0805 | VISHAY/CRCW08050000Z0EA |
| 50 | 2 | R242, R246 | RES., 332kΩ, 1%, 1/10W, 0603, AEC-Q200 | NIC/NRC06F3323TRF |
| 51 | 2 | R243, R245 | RES., 3.32kΩ, 1%, 1/10W, 0603, AEC-Q200 | PANASONIC/ERJ3EKF3321V |
| 52 | 2 | R262, R263 | RES., 1Ω, 1%, 1/8W, 0805, AEC-Q200 | VISHAY/CRCW08051R00FKEA |
| 53 | 7 | R259, R260, R261, R264, R267, R272, R273 | RES., 1Ω, 5%, 1/10W, 0603, AEC-Q200 | VISHAY/CRCW06031R00JNEA |
| 54 | 3 | R265, R266, R270 | RES., 10kΩ, 1%, 1/10W, 0603, AEC-Q200 | KOA SPEER/RK73H1JTDD1002F |
| 55 | 1 | U13 | OSC., 3.81Hz to 1MHz, 5pF, 90ppm, TSOT23-6 | ANALOG DEVICES/LTC6992IS6-1#PBF |
| 56 | 1 | U14 | IC, Single R to R In/Out Op Amp, TSOT23-5, 100V/μs, 85MHz | ANALOG DEVICES/LT1803IS5#PBF |
| 57 | 1 | U15 | IC,EEPROM, I ² C, TSSOP-8, 2Kb (256 × 8), 400kHz | MICROCHIP/24LC024-I/ST |
| 58 | 1 | U18 | IC, TRANSLATING TRANSCEIVER, XQFN-12 | NXP/NTB0104GU12,115 |
| 59 | 1 | U19 | IC, SWITCH QUAD SPST, TSSOP-16 | ANALOG DEVICES/ADG711BRUZ |
| 60 | 2 | U20, U21 | IC, 1.1A ADJ. SINGLE RESISTOR LDO, MSOP-8 | LINEAR TECH/LT3080EMS8E-1#PBF |
| 61 | 1 | U23 | IC, 4-BIT DUAL-SUPPLY BUS XCVR, TSSOP-16 | TEXAS INSTRUMENTS/SN74AVC4T774PW |
| 62 | 1 | U24 | IC, DUAL BUFFER GATE, SOT23-6 | TEXAS INSTRUMENTS/SN74LVC2G34DBV |
| 63 | 1 | U25 | IC, I ² C BUS TO SPI BRIDGE, TSSOP-16 | NXP/SC18IS602BIPW, 112 |

PARTS LIST

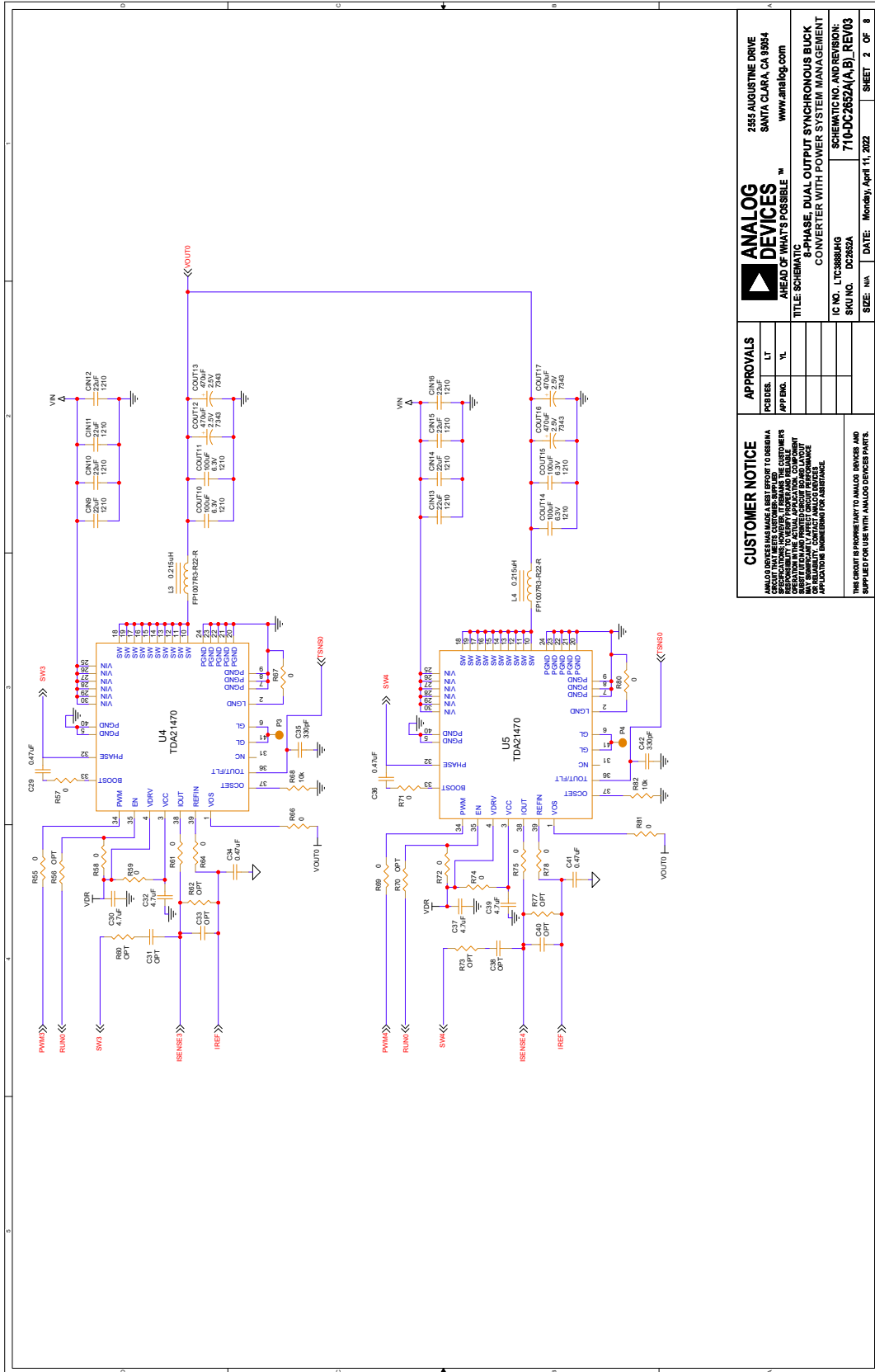
| ITEM | QTY | REFERENCE | PART DESCRIPTION | MANUFACTURER/PART NUMBER |
|--------------------------------------|-----|--|---|----------------------------------|
| Hardware: For Demo Board Only | | | | |
| 1 | 4 | XJP1, XJP2, XJP3, XJP4 | CONN., SHUNT, FEMALE, 2 POS, 2mm | Wurth/60800213421 |
| 2 | 8 | MP1, MP2, MP3, MP4, MP5, MP6, MP7, MP8 | STANDOFF, NYLON, SNAP-ON, 0.50" | Wurth/702935000 |
| 3 | 25 | E1, E2, E3, E4, E5, E6, E7, E8, E9, E10, E11, E12, E13, E14, E15, E16, E17, E18, E19, E20, E21, E22, E23, E24, E25 | TEST POINT, TURRET, 0.094" MTG. HOLE, PCB 0.062" THK | MILL-MAX/2501-2-00-80-00-00-07-0 |
| 4 | 6 | J1, J2, J3, J4, J5, J6 | STUD, FASTENER, #10-32 | PennEngineering/KFH-032-10ET |
| 5 | 12 | J1, J2, J3, J4, J5, J6 | NUT, HEX, #10-32, STEEL, ZINC PLATE | KEYSTONE/4705 |
| 6 | 6 | J1, J2, J3, J4, J5, J6 | RING, LUG, #10, CRIMP, 16/14 AWG, NON-INSULATED, SOLDERLESS TERMINALS | KEYSTONE/8205 |
| 7 | 6 | J1, J2, J3, J4, J5, J6 | WASHER, FLAT, STEEL, ZINC PLATE, OD: 0.436 [11.1] | KEYSTONE/4703 |
| 8 | 4 | JP1, JP2, JP3, JP4 | CONN., HDR, MALE, 1 × 3, 2mm, VERT, ST, THT | Wurth/62000311121 |
| 9 | 3 | J8, J9, J10 | CONN., RF, BNC, RCPT, JACK, 5-PIN, ST, THT, 50Ω | AMPHENOL RF/112404 |
| 10 | 1 | J12 | CONN., HDR, SHROUDED, MALE, 2 × 6, 2mm, VERT, ST, THT | AMPHENOL/98414-G06-12ULF |
| 11 | 1 | J13 | CONN., HDR, FEMALE, 2 × 7, 2mm, R/A THT | SOLUTIONS/NPPN072FJFN-RC |
| 12 | 1 | J14 | CONN., HDR, MALE, 2 × 7, 2mm, R/A THT | MOLEX/0877601416 |
| 13 | 1 | J22 | CONN., HDR, SHROUDED, MALE, 2 × 7, 2mm, VERT, ST, THT | MOLEX/87831-1420 |
| 14 | 2 | SW1, SW2 | SWITCH, SLIDE, DPDT, 0.3A, 6VDC, PTH | C&K/JS202011CQN |

DEMO MANUAL DC2652A-A

SCHEMATIC DIAGRAM



SCHEMATIC DIAGRAM



| | |
|---|---|
| ANALOG DEVICES 255 AUGUSTINE DRIVE SANTA CLARA, CA 95054 www.analog.com | |
| TITLE: SCHEMATIC 8-PHASE, DUAL OUTPUT SYNCHRONOUS BUCK CONVERTER WITH POWER SYSTEM MANAGEMENT | |
| IC NO. LTC3888BG | SCHEMATIC NO. AND REVISION: 710-DC2652A(A,B)_REV03 |
| SKU NO. DC2652A | DATE: Monday, April 11, 2022 |
| SIZE: 1/4x | SHEET 2 OF 8 |

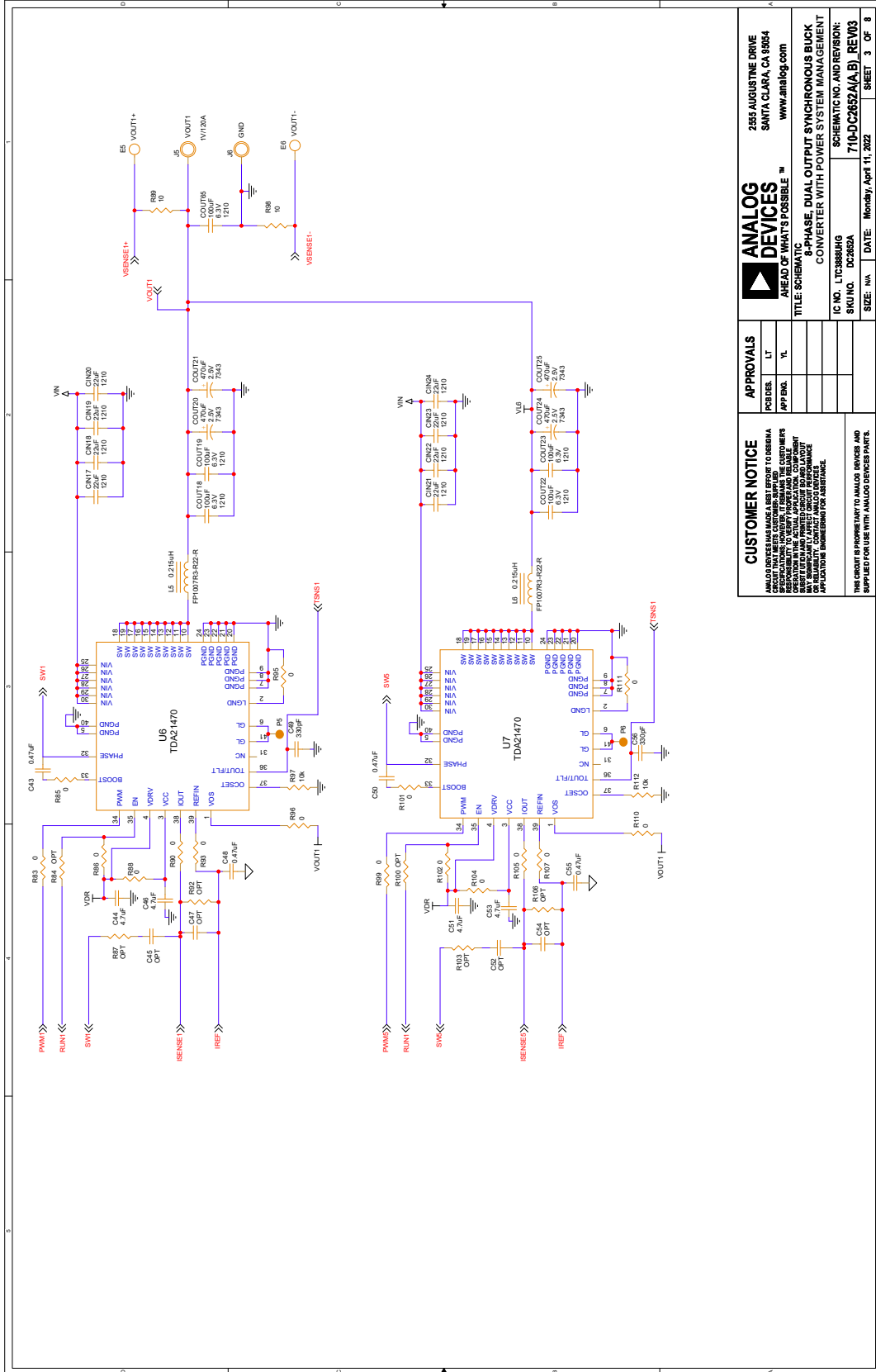
CUSTOMER NOTICE
ANALOG DEVICES MAKES A BEST EFFORT TO DESIGN A SCHEMATIC AND BOARD LAYOUT THAT WILL OPERATE AS SPECIFIED. HOWEVER, IT REMAINS THE CUSTOMER'S RESPONSIBILITY TO VERIFY THE SCHEMATIC AND BOARD LAYOUT IN THE ACTUAL APPLICATION. COMPONENTS ARE SHOWN AS REPRESENTATIVE. ANALOG DEVICES DOES NOT WARRANT THAT THE SCHEMATIC WILL AFFECT CIRCUIT PERFORMANCE IN ALL APPLICATIONS. APPLICATION ENGINEERING FOR ASSISTANCE.

| | |
|------------------|-------|
| APPROVALS | |
| DESIGNER: LT | DATE: |
| APP ENGR: YL | DATE: |

THIS SCHEMATIC IS UNCONTROLLED. ANY CHANGES TO THIS SCHEMATIC WILL BE REFLECTED IN THE BOARD LAYOUT ONLY. ANY CHANGES TO THIS SCHEMATIC WILL BE REFLECTED IN THE BOARD LAYOUT ONLY.

DEMO MANUAL DC2652A-A

SCHEMATIC DIAGRAM

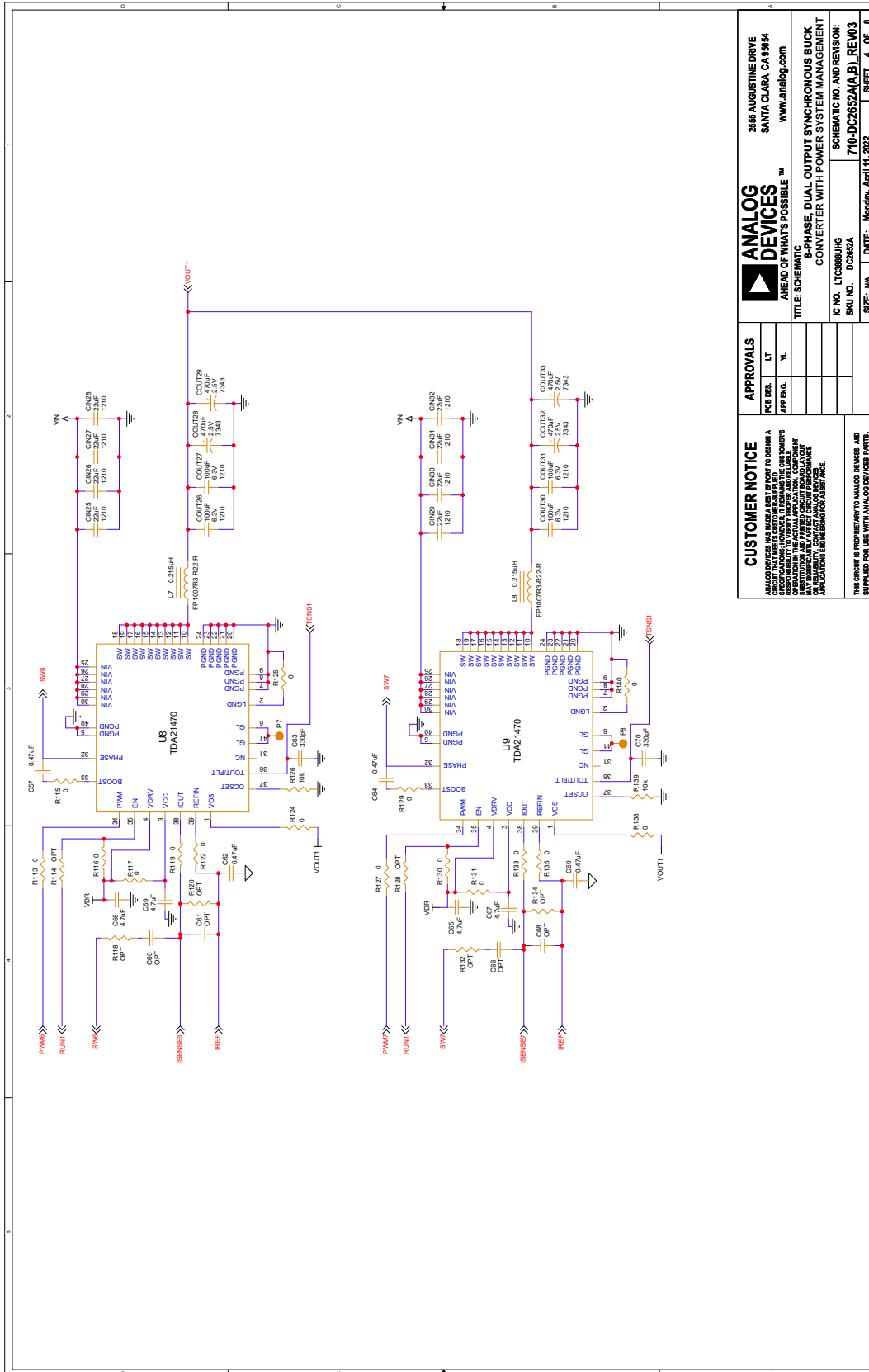


| | |
|---|------------------------------|
| ANALOG DEVICES 255 AUGUSTINE DRIVE SANTA CLARA, CA 95054 www.analog.com | |
| TITLE: SCHEMATIC 8-PHASE, DUAL OUTPUT SYNCHRONOUS BUCK CONVERTER WITH POWER SYSTEM MANAGEMENT | |
| IC NO. LTC3888UG | SCHEMATIC NO. AND REVISION: |
| SKU NO. DC2652A | 710-DC2652A(A, B) REV03 |
| SIZE: 1/4" | DATE: Monday, April 11, 2022 |
| SHEET 3 OF 8 | |

| | |
|---|--|
| CUSTOMER NOTICE | |
| ANALOG DEVICES MAKES A BEST EFFORT TO DESIGN A SCHEMATIC FOR THE CUSTOMER'S APPLICATION. OPERATIONAL PERFORMANCE, INCLUDING THE CUSTOMER'S OPERATIONAL LIFE, IS THE CUSTOMER'S RESPONSIBILITY. ANALOG DEVICES DOES NOT WARRANT THAT THE SCHEMATIC WILL AFFECT THE CUSTOMER'S PERFORMANCE. APPLICATION ENGINEERING FOR ASSISTANCE. | |
| THE CUSTOMER IS RESPONSIBLE FOR THE PROPER AND APPLICABLE USE OF ANALOG DEVICES PARTS. | |

| | |
|------------------|----|
| APPROVALS | |
| DESIGNER | LT |
| APP ENG. | YL |

SCHEMATIC DIAGRAM



CUSTOMER NOTICE
 ANALOG DEVICES HAS MADE A BEST EFFORT TO DESIGN A SCHEMATIC THAT REPRESENTS THE CUSTOMER'S OPERATIONAL REQUIREMENTS. IT REMAINS THE CUSTOMER'S RESPONSIBILITY TO VERIFY THE SCHEMATIC'S CORRECTNESS AND TO PROVIDE THE CUSTOMER WITH THE APPROPRIATE APPLICATIONS SUPPORT FOR THE SCHEMATIC'S INTENDED USE.

APPROVALS

| | |
|----------|----|
| DESIGNER | LT |
| APP'G | YL |

ANALOG DEVICES
 2855 AUGUSTINE DRIVE
 SANTA CLARA, CA 95054
 www.analog.com

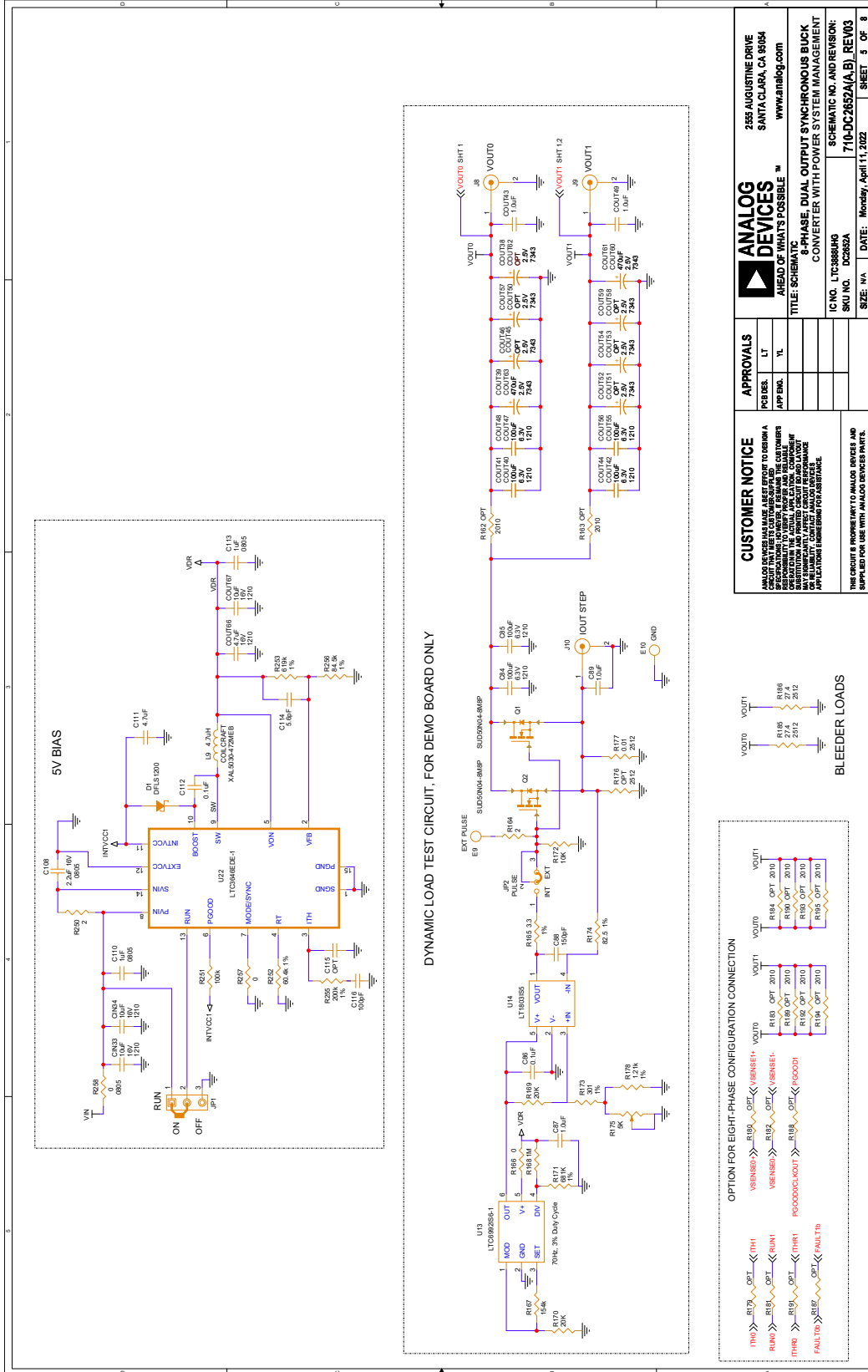
8-PHASE, DUAL OUTPUT SYNCHRONOUS BUCK CONVERTER WITH POWER SYSTEM MANAGEMENT

IC NO. LTC3888HJG
 SKU NO. DC2652A
 SCHEMATIC NO. AND REVISION: 710-DC2652A(A, B) REV.03

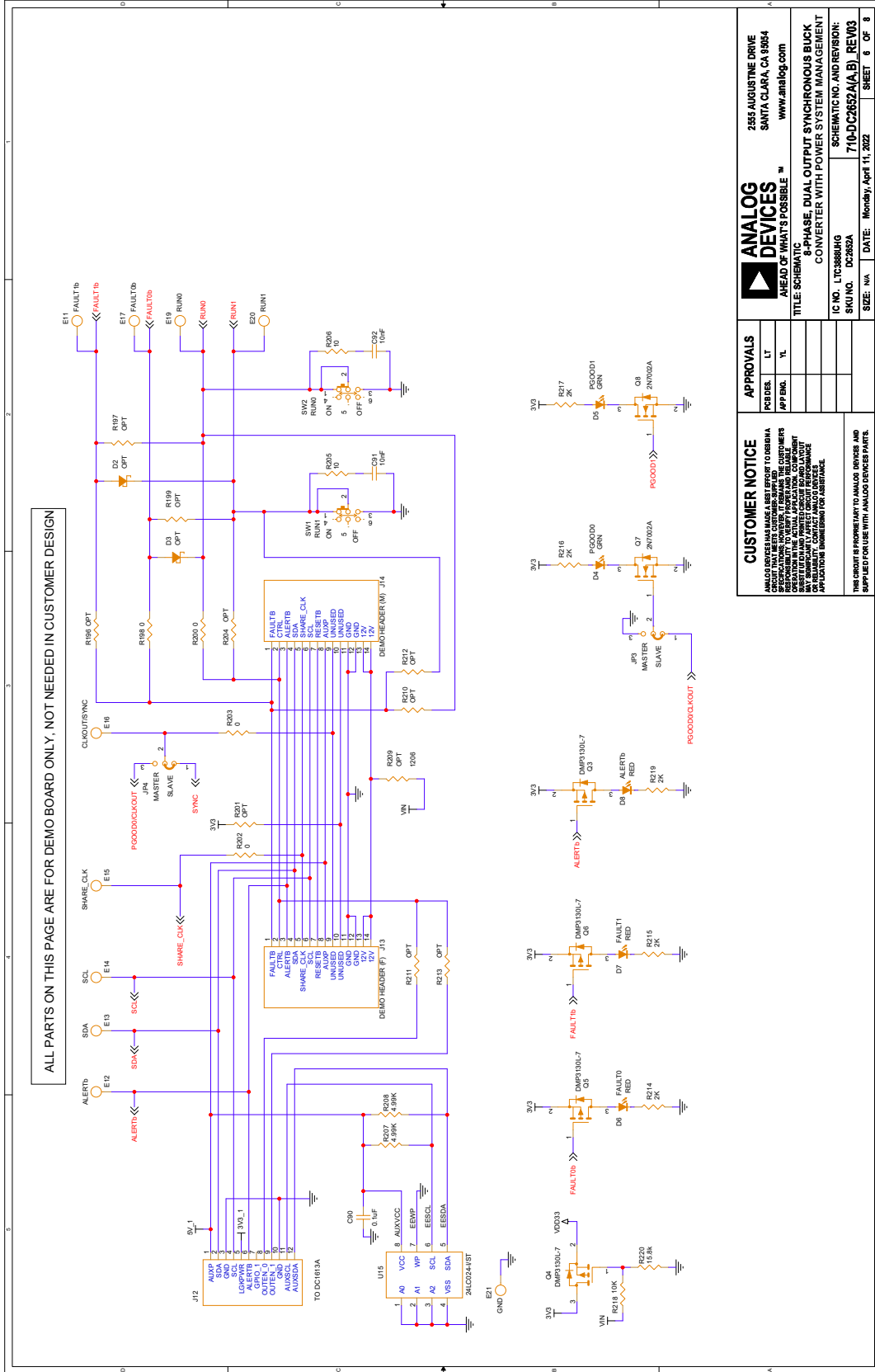
DATE: Monday, April 11, 2022
 SHEET 4 OF 8

DEMO MANUAL DC2652A-A

SCHEMATIC DIAGRAM



SCHEMATIC DIAGRAM



| | |
|---|--|
| ANALOG DEVICES 255 AUGUSTINE DRIVE SANTA CLARA, CA 95054 www.analog.com | |
| TITLE: SCHEMATIC 8-PHASE, DUAL OUTPUT SYNCHRONOUS BUCK CONVERTER WITH POWER SYSTEM MANAGEMENT | |
| IC NO. LTC3888BHG | SCHEMATIC NO. AND REVISION: 710-DC2652A(A, B) REV03 |
| SKU NO. DC2652A | DATE: Monday, April 11, 2022 |
| SIZE: 1/4" x 1/2" | SHEET: 6 OF 8 |

| | |
|--|-----------|
| CUSTOMER NOTICE ANALOG DEVICES HAS MADE A BEST EFFORT TO DESIGN A SCHEMATIC FOR THE CUSTOMER'S OPERATIONAL PURPOSES. IT REMAINS THE CUSTOMER'S RESPONSIBILITY TO VERIFY THE SCHEMATIC'S OPERATION IN THE ACTUAL APPLICATION. COMPONENTS ARE SHOWN AS AVAILABLE. ANALOG DEVICES MAY, WITHOUT NOTICE, MAKE CHANGES TO THE SCHEMATIC TO IMPROVE PERFORMANCE OR TO CORRECT ERRORS. APPLICATION ENGINEERING FOR ASSISTANCE. | |
| APPROVALS | |
| DESIGNER: _____ | LT: _____ |
| APP ENG: _____ | YL: _____ |
| DESIGN APPROVED BY ANALOG DEVICES AND APPROVED BY USER WITH ANALOG DEVICES PARTS. | |



ESD Caution

ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

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