

# LTM4678 Dual 25A or Single 50A µModule Regulator with Digital Power System Management 2x LTM4678; 100A

## DESCRIPTION

Demonstration circuit 2638A-A is a high efficiency, high density, µModule regulator with 4.5V to 16V input range. The output voltage is adjustable from 0.5V to 3.3V, and it can supply 100A maximum load current. The demo board has two [LTM®4678](#) µModule® regulators, and the LTM4678 is a dual 25A or single 50A step-down regulator with PMBus power system management. Please see LTM4678 data sheet for more detailed information.

DC2638A-A powers up to default settings and produce power based on configuration resistors 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 I<sup>2</sup>C/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:

#### [LTpowerPlay](#)

For more details and instructions of LTpowerPlay, please refer to LTpowerPlay GUI for LTM4678 Quick Start Guide.

**[Design files for this circuit board are available.](#)**

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## PERFORMANCE SUMMARY

Specifications are at T<sub>A</sub> = 25°C

PARAMETER	CONDITIONS	VALUE
Input Voltage Range		4.5V to 16V
Output Voltage Range	V <sub>IN</sub> = 4.5V-16V, I <sub>OUT</sub> = 0A to 100A	0.5V to 3.3V, Default: 1.0V
Maximum Output Current, I <sub>OUT</sub>	V <sub>IN</sub> = 4.5V-16V, V <sub>OUT</sub> = 0.5V to 3.3V	100A
Typical Efficiency	V <sub>IN</sub> = 12V, V <sub>OUT</sub> = 1.0V, I <sub>OUT</sub> = 100A	86.2% (See Figure 5)
Default Switching Frequency		350kHz

## BOARD PHOTO

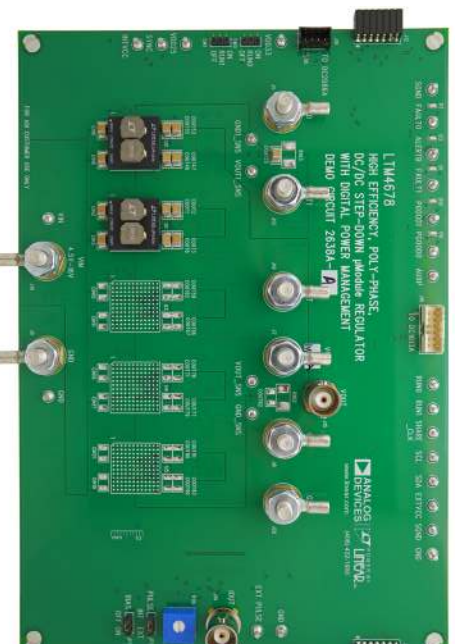


Figure 1. 2x LTM4678; 100A DC2638A-A Demo Circuit

# DEMO MANUAL DC2638A-A

## QUICK START PROCEDURE

Table 1. LTM4678 Demo Boards for Up to 250A Point-of-Load Regulation

MAXIMUM OUTPUT CURRENT	NUMBER OF OUTPUTS	NUMBER OF LTM4678 $\mu$ Module REGULATORS ON THE BOARD	DEMO BOARD NUMBER
25A	2	1	DC2552A
50A	1	1	DC2570A
100A	1	2	DC2638A-A
150A	1	3	DC2638A-B
200A	1	4	DC2638A-C
250A	1	5	DC2638A-D

Demonstration circuit 2638A-A is easy to set up to evaluate the performance of the LTM4678EY. Refer to Figure 2 for the proper measurement equipment setup and follow the procedure below.

1. With power off, connect the input power supply to  $V_{IN}$  (4.5V–16V) and GND (input return).
2. Connect the 1.0V output load between  $V_{OUT}$  and GND (Initial load: no load).
3. Connect the DVMs to the input and output. Set default jumper position: SW0: ON; SW1: ON.
4. Turn on the input power supply and check for the proper output voltage.  $V_{OUT}$  should be  $1.0V \pm 0.5\%$ .
5. Once the proper output voltages are established, adjust the load within the operating range and observe the output voltage regulation, ripple voltage and other parameters.

6. Connect the dongle and control the output voltage from the GUI. See “LTPowerPlay GUI for the LTM4678 Quick Start Guide” for details.

Note: When measuring the output or input voltage ripple, do not use the long ground lead on the oscilloscope probe. See 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.

### Connecting a PC to DC2638A-A

You can use a PC to reconfigure the power management features of the LTM4678 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.

# QUICK START PROCEDURE

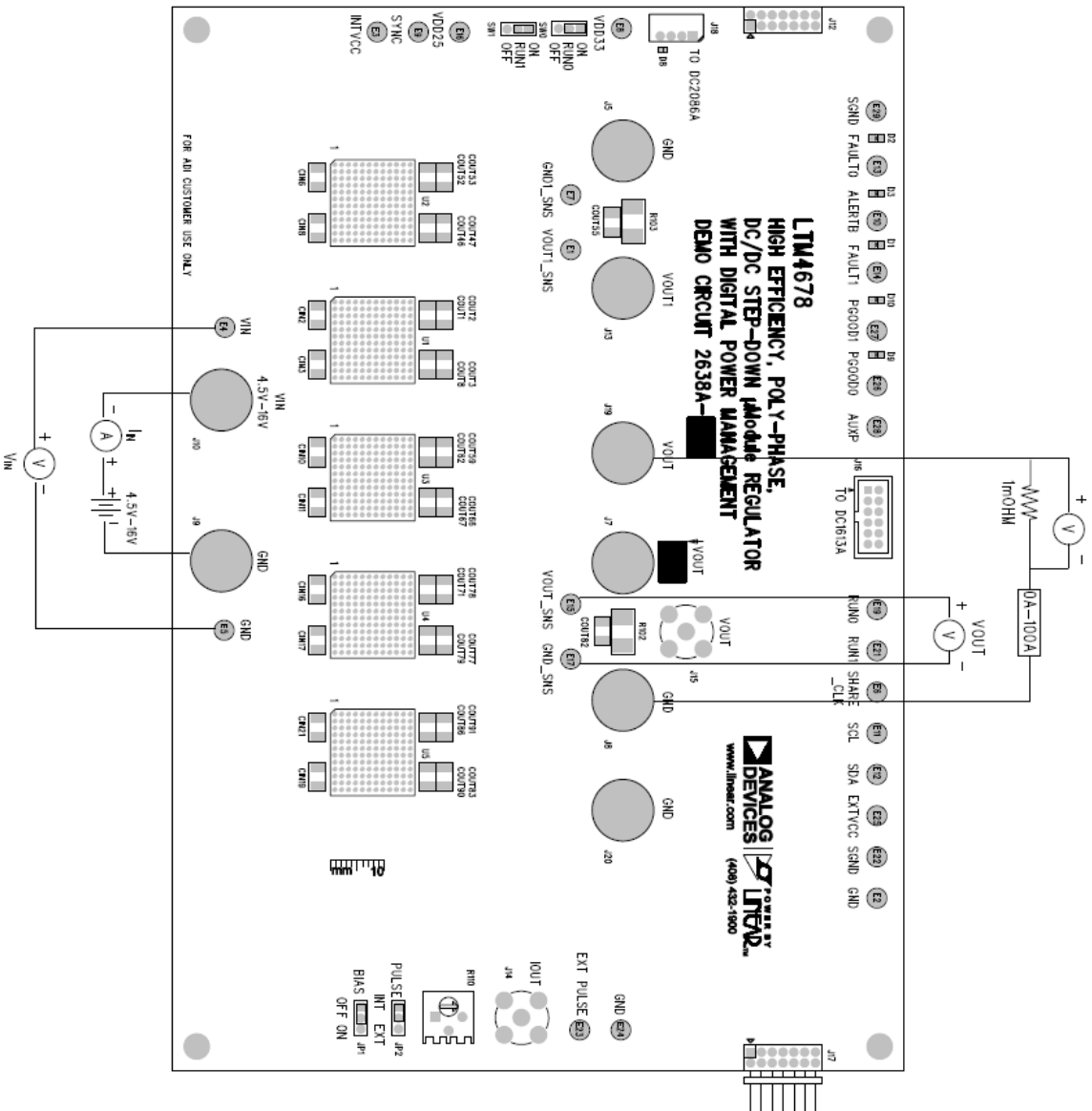


Figure 2. Proper Measurement Equipment Setup

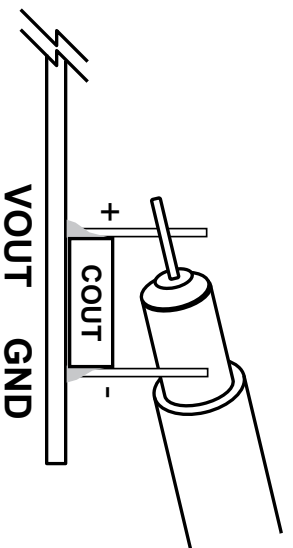


Figure 3. Measuring Output Voltage Ripple

## QUICK START PROCEDURE

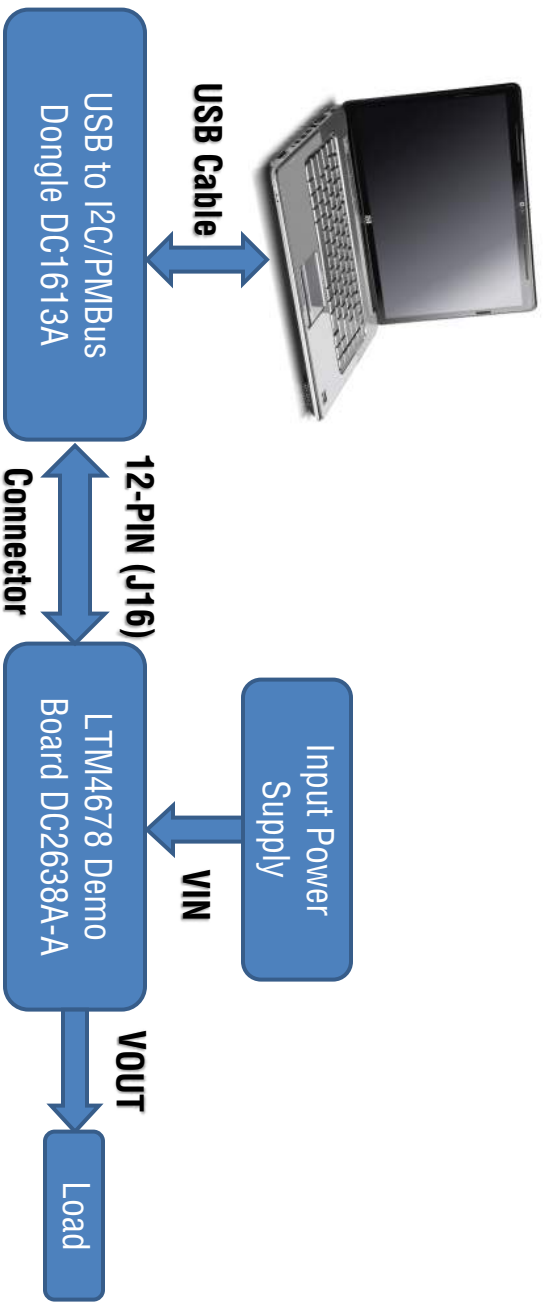


Figure 4. Demo Setup with PC

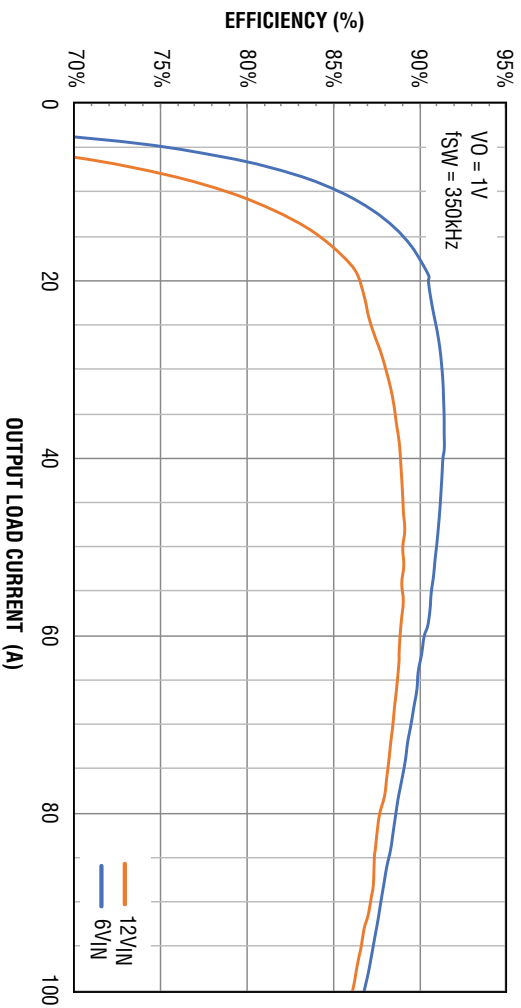


Figure 5. Efficiency vs Load Current

## QUICK START PROCEDURE

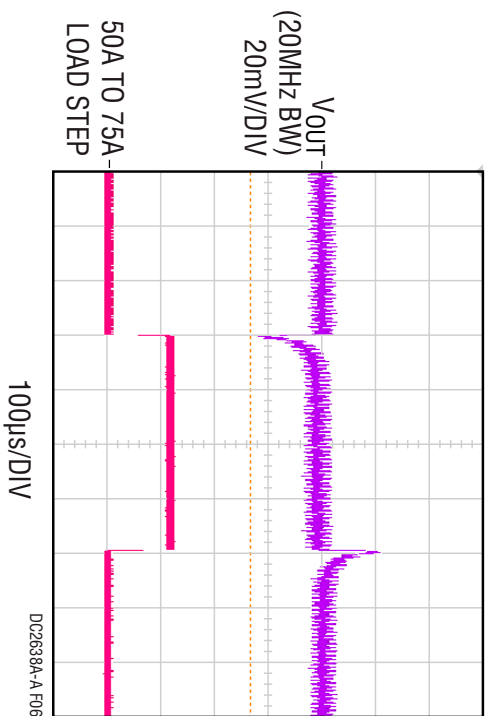


Figure 6. Output Voltage  $V_{OUT}$  vs Load Current @  $V_{IN} = 12V$ ,  $V_{OUT} = 1V$ ,  $f_{sw} = 350kHz$

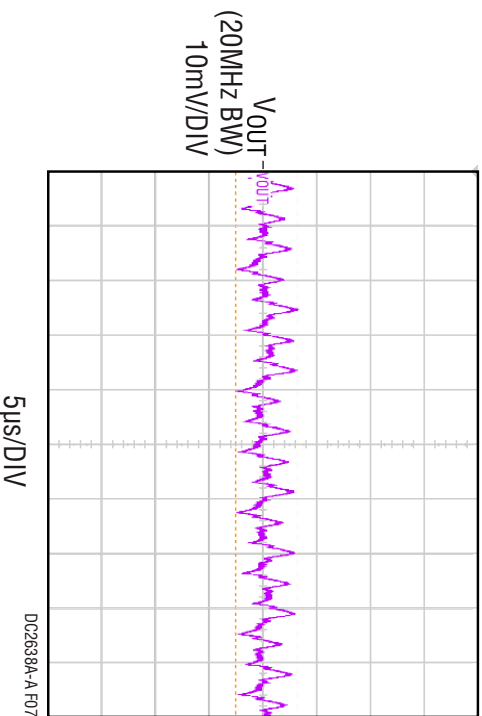


Figure 7. Output Voltage Ripple @  $V_{IN} = 12V$ ,  $V_{OUT} = 1V$ ,  $I_{OUT} = 100A$ ,  $f_{sw} = 350kHz$

**QUICK START PROCEDURE**



Figure 8. Thermal @  $V_{IN} = 12V$ ,  $V_{OUT} = 1.0V$ ,  $I_{OUT} = 78A$ ,  
 $T_A = 25^\circ C$ , No Airflow

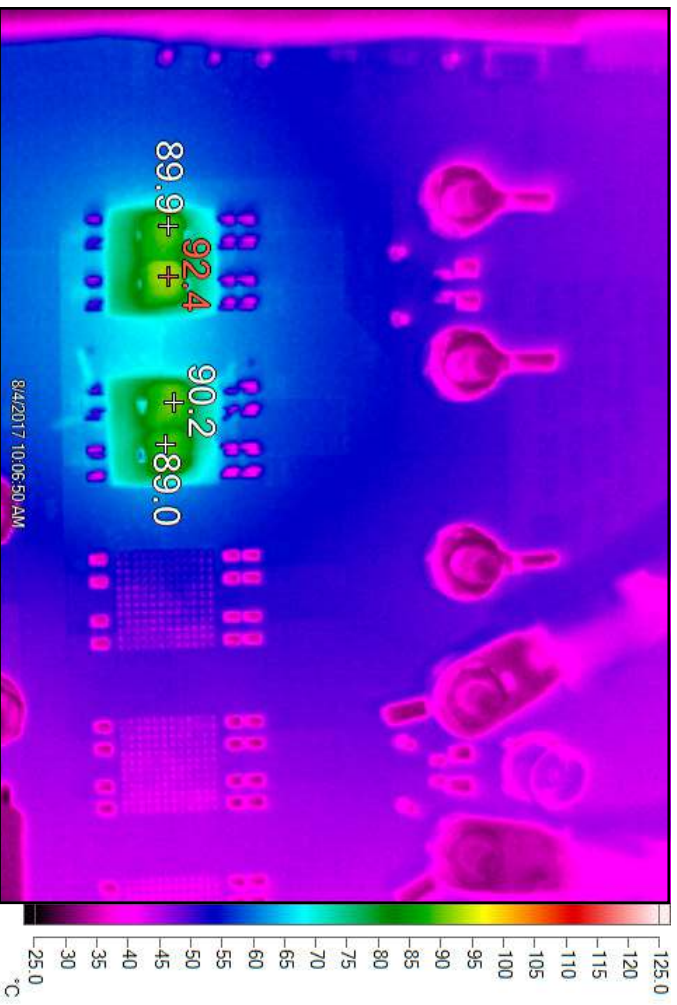


Figure 9. Thermal @  $V_{IN} = 12V$ ,  $V_{OUT} = 1.0V$ ,  $I_{OUT} = 100A$ ,  
 $T_A = 25^\circ C$ , 400LPM Airflow

## LTPowerPLAY SOFTWARE GUI

LTPowerPlay is a powerful Windows-based development environment that supports Analog Devices power system management ICs and µModules, including the LTM4675, LTM4676, LTM4677, LTM4678, LTC3880, LTC3882 and LTC3883. The software supports a variety of different tasks. You can use LTPowerPlay to evaluate Analog Devices ICs by connecting to a demo board system. LTPowerPlay can also be used in an offline mode (with no hardware present) in order to build a multichip configuration file that can be saved and reloaded at a later time. LTPowerPlay provides unprecedented diagnostic and debug features. It becomes a valuable diagnostic tool during board bringup to program or tweak the power management scheme in a system, or to diagnose power issues when bringing up rails. LTPowerPlay utilizes the

DC1613A USB-to-SMBus controller to communicate with one of many potential targets, including the LTM4675, LTM4676, LTM4677, LTM4678, LTC3880, LTC3882, LTC3883's demo system, or a customer board. The software also provides an automatic update feature to keep the software current with the latest set of device drivers and documentation. The LTPowerPlay software can be downloaded from:

[LTPowerPlay](#)

To access technical support documents for ADI Digital Power Products visit the LTPowerPlay Help menu. Online help also available through the LTPowerPlay.

The screenshot displays the LTPowerPlay software interface. The top menu bar includes File, View, Configuration, Utilities, Custom Scripts, and Help. The main window is titled 'D Config - Capture/Reply' and shows configuration for 'Rail A φ4'. The 'Setup' tab is active, displaying various parameters:

- Setup:** All Global, All Paged, Addressing/VP, General Config, On/Off/Flag, PWM Configuration, Voltage, Current, Temperature, Timing, Fault Response.
- Input Voltage:** VIN\_OV\_FAULT\_LIMIT: 15.5000 V, VIN\_OV\_WARN\_LIMIT: 6.2500 V, VIN\_OV: 6.0000 V, VFR\_PWM\_MODE: 000,000 no/ims.
- Output Voltage:** VOUT\_OV\_FAULT\_LIMIT: +10.0 % above/below VOUT, VOUT\_OV\_WARN\_LIMIT: +7.5 % above/below VOUT, VOUT\_MARGIN\_HIGH: +5.0 % above/below VOUT, VOUT\_COMMAND: 1.0000 V, VOUT\_MARGIN\_LOW: -5.0 % above/below VOUT, VOUT\_OV\_FAULT\_LIMIT: -7.0 % above/below VOUT.
- Fault Responses - Output Voltage:** VOUT\_MAX\_FAULT\_RESPONSE: (0x60) immediate Off/infinite Duty, VOUT\_OV\_FAULT\_RESPONSE: (0x60) immediate Off/infinite Duty, VOUT\_OV\_FAULT\_RESPONSE: (0x60) immediate Off/infinite Duty.
- Output Voltage - Miscellaneous:** VOUT\_MAX: 2.7500 V, VOUT\_MARGIN\_ON: (0x54) Linear, 1st\_sste = 2X-1(2), VOUT\_TRANSDUCER\_GAIN: 0.250 V/mV, MASK\_STATUS\_INPUT: (0x00) 0, MASK\_STATUS\_OUTPUT: (0x00) 0, Timing - On Sequence/Ramp: TON\_MAX\_FAULT\_LIMIT: 10,000 ms.

The 'Telemetry' tab shows real-time data for 'Rail A φ4':

- Telemetry - PWM: READ\_FREQUENCY: 551.0 kHz
- Telemetry - Input Voltage: READ\_VOLT\_PEAKE\_LTC: 12.2091 V
- Telemetry - Input Current: READ\_CURRENT: 16.0919 A
- Telemetry - Output Voltage (V): READ\_VOLT: -0.1918 A, VFR\_VOLT\_PEAKE\_LTC: 1.0084 V, VFR\_VOLT\_PEAKE\_LTC: 1.0027 V
- Telemetry - Output Voltage (%): READ\_VOLT\_PEAKE\_LTC: +8.34 % above/below VOUT, VFR\_VOLT\_PEAKE\_LTC: +8.27 % above/below VOUT
- Telemetry - Temperature: VFR\_VOLT\_PEAKE\_LTC: 218.506 mA, READ\_VOLT\_PEAKE\_LTC: -196.045 mA, PWR\_OUT\_CURRENT: 376.959 mA, TOTAL\_RAIL\_CURRENT: 376.959 mA, PWR\_OUT\_CURRENT\_DEVIAT: -308.000 %
- Telemetry - Temperature: VFR\_TEMPERATURE\_1\_PEAKE\_LTC: 31.5 °C, VFR\_TEMPERATURE\_1\_PEAKE\_LTC: 31.2 °C, PHASE\_TEMP\_DEVIATION: 8.563 %
- Telemetry - Output Power: READ\_POWER: -0.197 W, READ\_POWER: -0.001 W

The 'Telemetry - General' section shows: READ\_VOLT\_RAIL\_PEAKE\_IN\_SYSTEM: Rail A φ4 - LTM4678: 1.0000 V, Rail A φ2 - LTM4678: 1.0000 V, Rail A φ3 - LTM4678: 1.0024 V, Rail A φ4: 1.0027 V.

At the bottom, there is a 'Telemetry Plot' showing a graph of 'READ\_VOLT' over time, with a scale from 0.80 to 1.04 and a frequency of 48Hz. A 'Dashboard' window shows a digital readout of '0.000' for 'Ch 1'.

Figure 10. LTPowerPlay Main Interface

## LTPowerPLAY QUICK START PROCEDURE

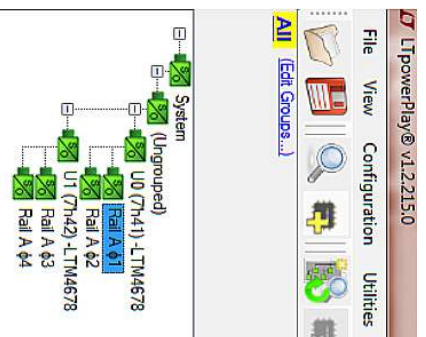
The following procedure describes how to use LTPowerPlay to monitor and change the settings of LTM4678.

1. Download and install the LTPowerPlay GUI:

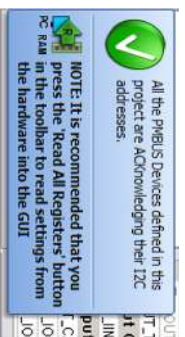
### LTPowerPlay

2. Launch the LTPowerPlay GUI.

- a. The GUI should automatically identify the DC2638A-A. The system tree on the left hand side should look like this:



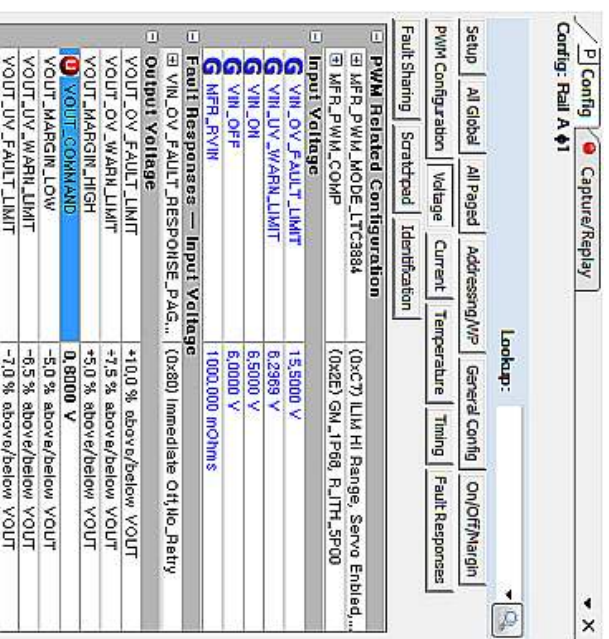
- b. A green message box shows for a few seconds in the lower left hand corner, confirming that LTM4678 is communicating:



- c. In the Toolbar, click the “R” (RAM to PC) icon to read the RAM from the LTM4678. This reads the configuration from the RAM of LTM4678 and loads it into the GUI.



- d. If you want to change the output voltage to a different value, like 0.8V. In the Config tab, type in 0.8 in the VOUT\_COMMAND box, like this:



- Then, click the “W” (PC to RAM) icon to write these register values to the LTM4678. After finishing this step, you will see the output voltage will change to 0.8V.



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



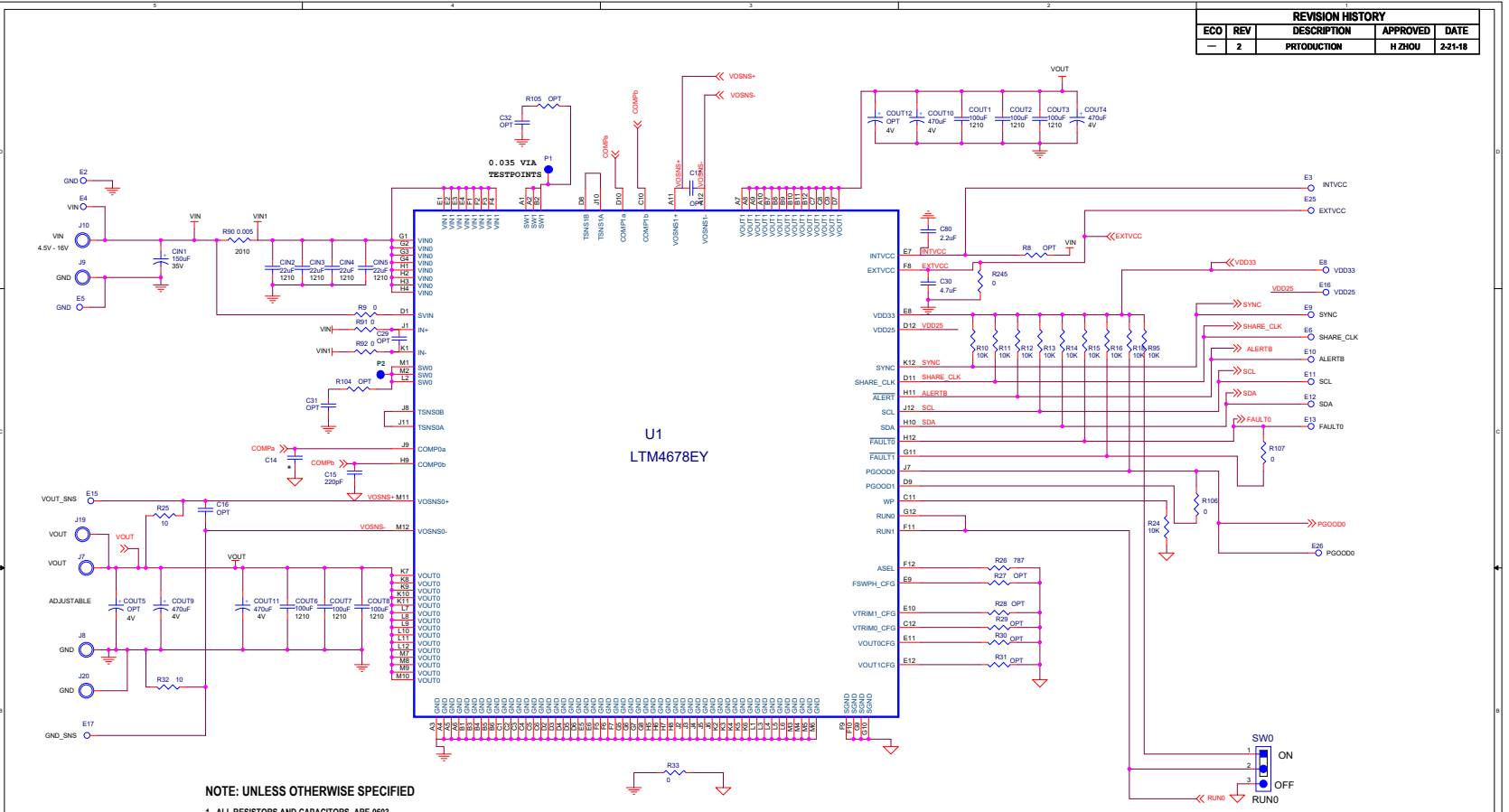
- e. You can save the changes into the NVM. In the tool bar, click “RAM to NVM” button, as following



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



REVISION HISTORY				
ECO	REV	DESCRIPTION	APPROVED	DATE
-	2	PRODUCTION	H ZHOU	2/21/18



NOTE: UNLESS OTHERWISE SPECIFIED  
1. ALL RESISTORS AND CAPACITORS ARE 0603.

ASSY	Module	Iout	C14	CIN10, 11, 12, 13	CIN14, 15, 16, 17	CIN18, 19, 20, 21	COUT60, 61, 64, 63	COUT72, 73, 75, 80	COUT84, 87, 88, 93	COUT58, 59, 62, 65, 66, 67	COUT70, 71, 74, 77, 78, 79	COUT82, 83, 86, 89, 90, 91
-A	U1,U2	100A	10nF	OPT	OPT	OPT	OPT	OPT	OPT	OPT	OPT	OPT
-B	U1,U2,U3	150A	12nF	22uF	OPT	OPT	470uF	OPT	OPT	100uF	OPT	OPT
-C	U1,U2,U3,U4	Up to 200A	18nF	22uF	22uF	OPT	470uF	470uF	OPT	100uF	100uF	OPT
-D	U1,U2,U3,U4,U5	Up to 250A	27nF	22uF	22uF	22uF	470uF	470uF	470uF	100uF	100uF	100uF

\*WHEN VIN < 5.75V, SHORT INTVCC to VIN WITH R8=R135=R158=R188=R231=0  
\*WHEN EXTVCC IS USED, R245=OPEN

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**APPROVALS**

PCB DES.	HZ
APP ENG.	H Zhou

**ANALOG DEVICES**

POWER BY LINEAR

www.analog.com www.linear.com Phone: (408)432-1800

**TITLE: SCHEMATIC**

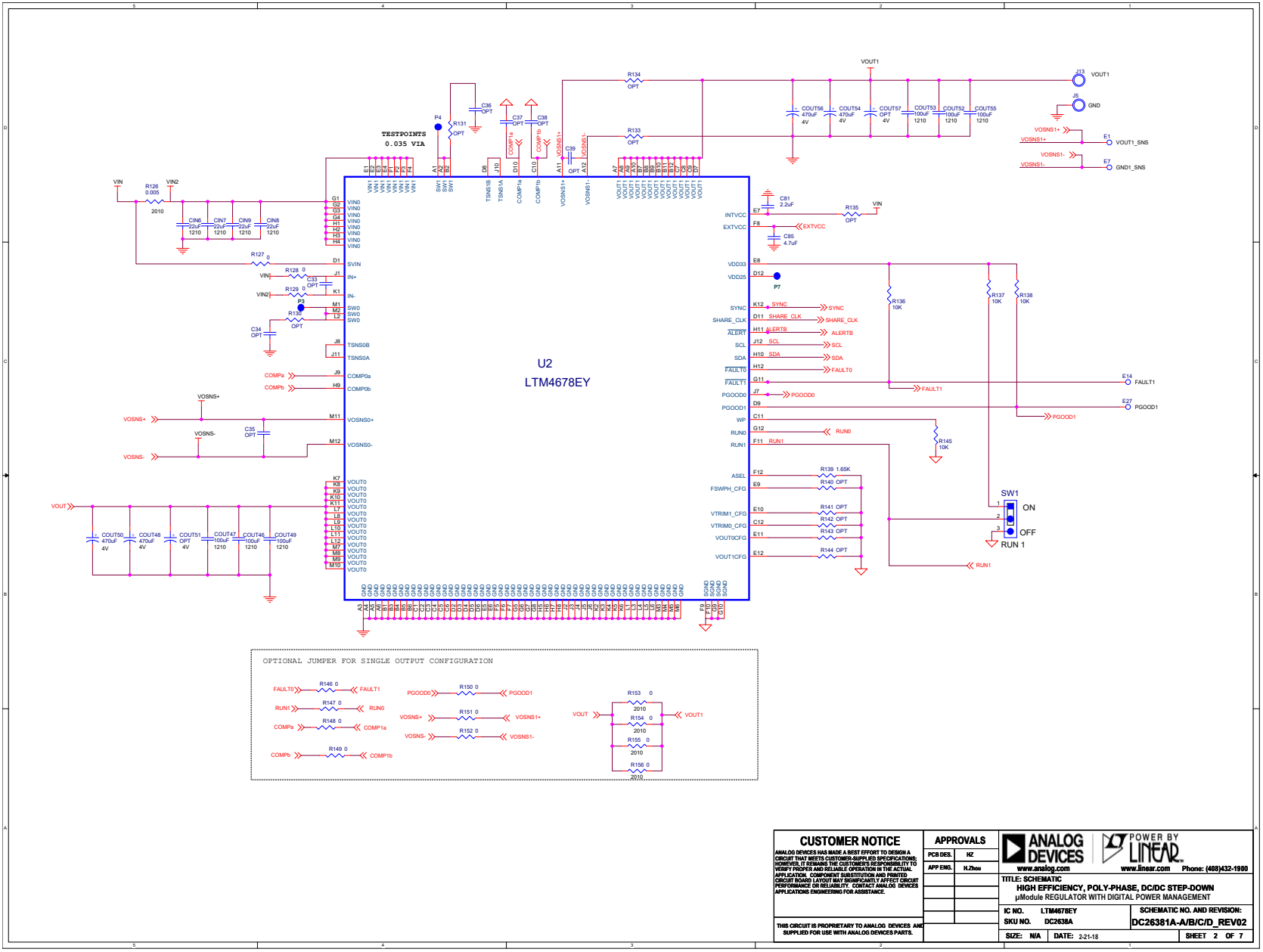
HIGH EFFICIENCY, POLY-PHASE, DC/DC STEP-DOWN μModule REGULATOR WITH DIGITAL POWER MANAGEMENT

IC NO. LTM4678EY SCHEMATIC NO. AND REVISION: DC2638A-A/B/C/D\_REV02

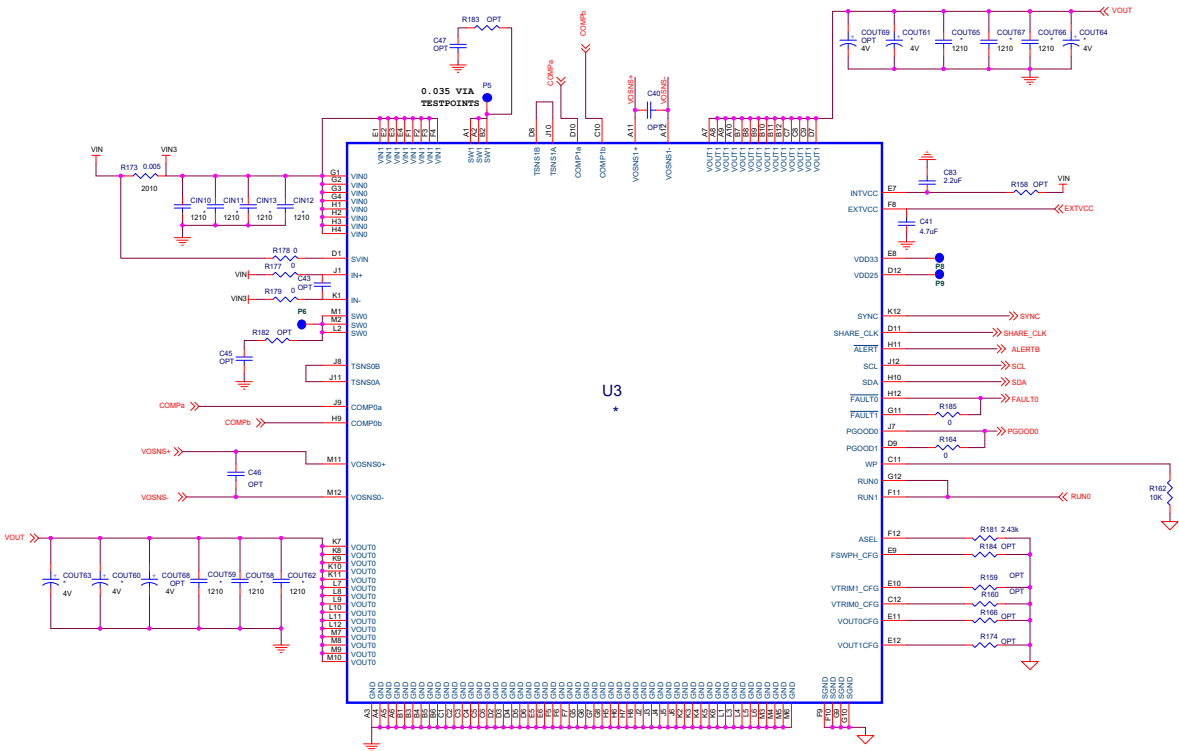
SKU NO. DC2638A

SIZE: N/A DATE: 2-21-18 SHEET 1 OF 7

THIS CIRCUIT IS PROPRIETARY TO ANALOG DEVICES AND SUPPLIED FOR USE WITH ANALOG DEVICES PARTS.



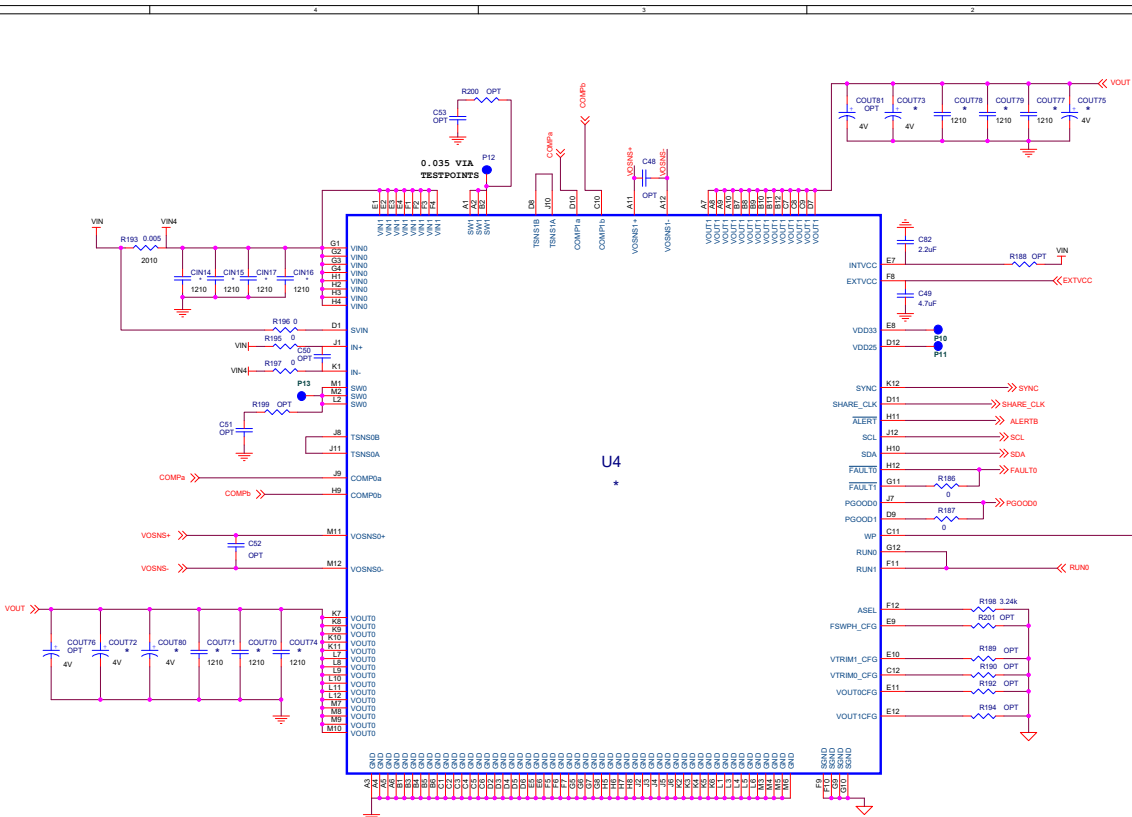
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	www.analog.com      www.linear.com      Phone: (408)432-1900		
<small>THIS CIRCUIT IS PROPRIETARY TO ANALOG DEVICES AND SUPPLIED FOR USE WITH ANALOG DEVICES PARTS.</small>	<b>TITLE: SCHEMATIC</b> HIGH EFFICIENCY, POLY-PHASE, DC/DC STEP-DOWN μModule REGULATOR WITH DIGITAL POWER MANAGEMENT		
	IC NO. LTM4678EY SKU NO. DC2638A	SCHEMATIC NO. AND REVISION: DC26381A-A/B/C/D_REV02	
	SIZE: N/A      DATE: 2/21/10	SHEET 2 OF 7	



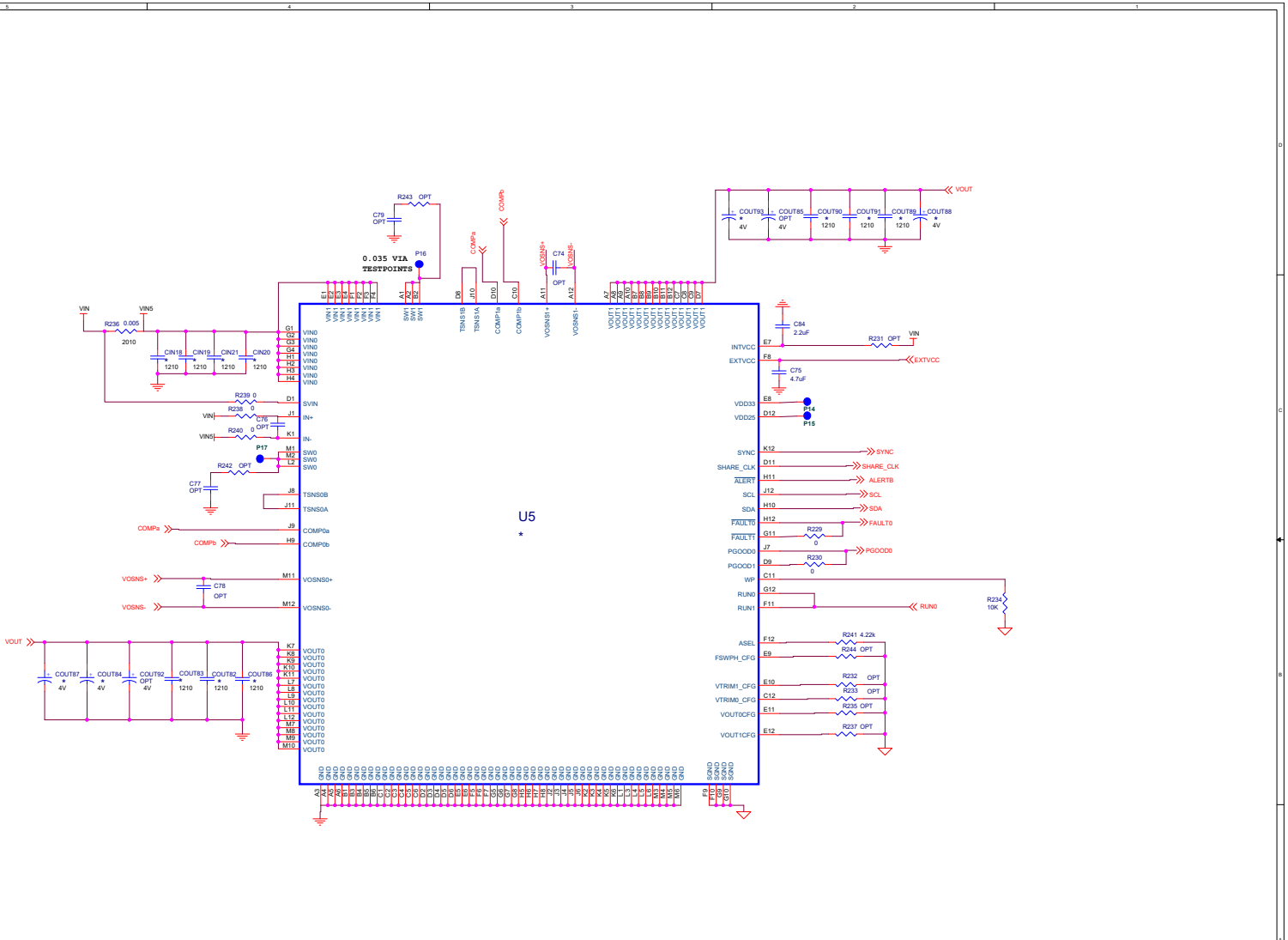
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	www.analog.com www.linear.com Phone: (484)432-1900	<b>TITLE: SCHEMATIC</b> HIGH EFFICIENCY, POLY-PHASE, DC/DC STEP-DOWN $\mu$ Module REGULATOR WITH DIGITAL POWER MANAGEMENT	
IC NO. LTM478EY SKU NO. DC2638A	SCHEMATIC NO. AND REVISION: DC26381A-A/B/C/D_REV02		
THIS CIRCUIT IS PROPRIETARY TO ANALOG DEVICES AND SUPPLIED FOR USE WITH ANALOG DEVICES PARTS.	SIZE: N/A DATE: 2-21-18	SHEET 3 OF 7	

# SCHEMATIC DIAGRAM

## DEMO MANUAL DC2638A-A

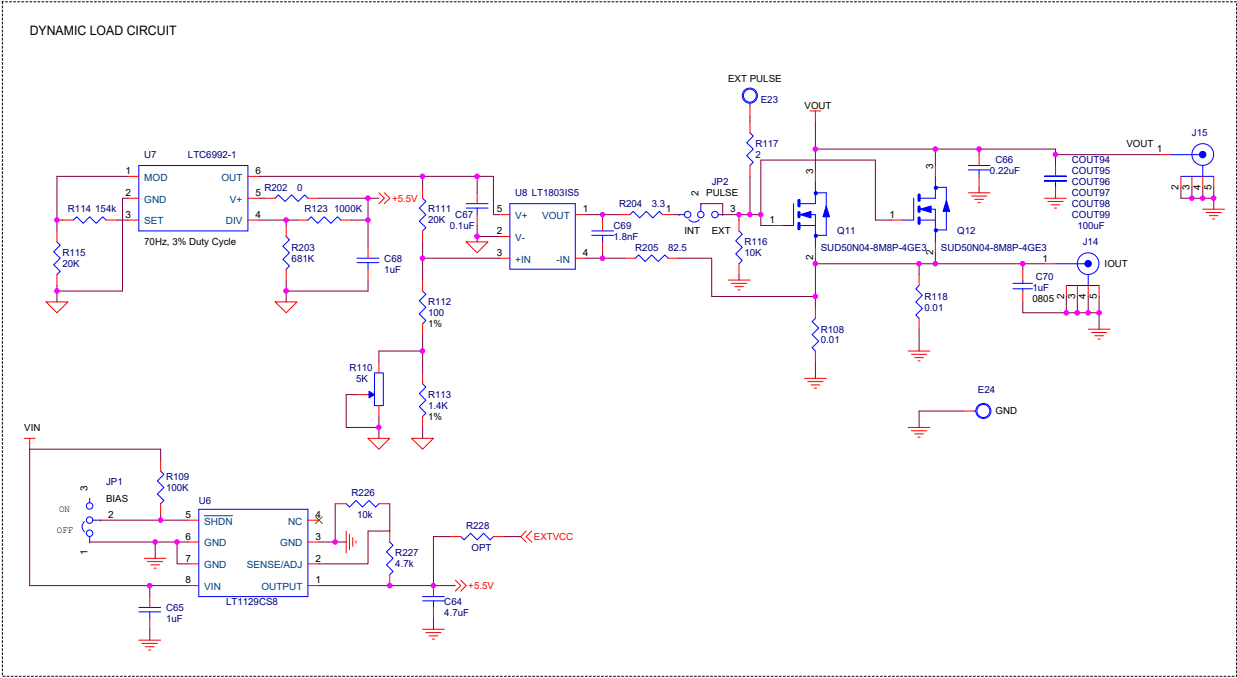


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	IC NO. LTM478EY SKU NO. DC2638A	SCHEMATIC NO. AND REVISION: DC26381A-A/B/C/D_REV02	
	SIZE: N/A      DATE: 2-21-16	SHEET 4 OF 7	



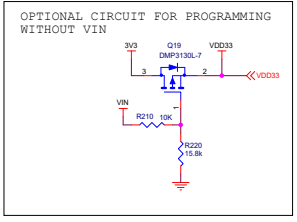
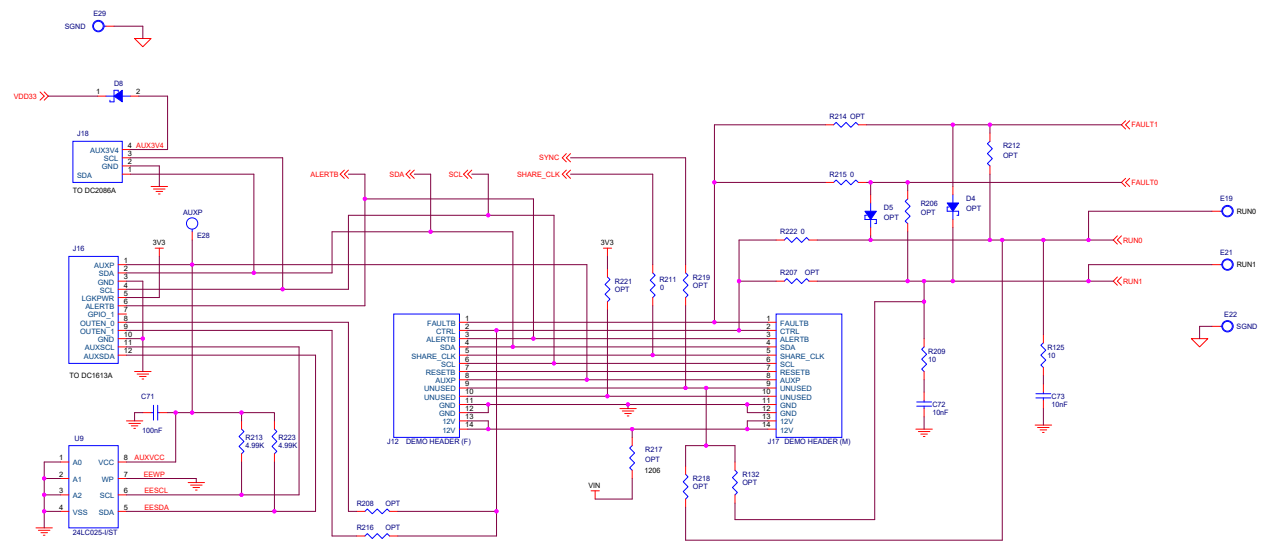
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<small>THIS CIRCUIT IS PROPRIETARY TO ANALOG DEVICES AND SUPPLIED FOR USE WITH ANALOG DEVICES PARTS.</small>	DC2638A-1A-B/C/D_REV02 SCHEMATIC NO. AND REVISION:	SHEET 5 OF 7	

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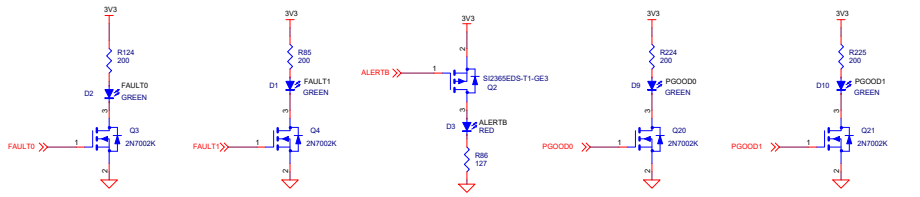


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	PCB DES.	HZ					
APP ENG.	H.Zhou						
<p><b>TITLE: SCHEMATIC</b> <b>HIGH EFFICIENCY, POLY-PHASE, DC/DC STEP-DOWN</b></p>							
	<p>IC NO. LTM4678EY</p> <p>SKU NO. DC2638A</p> <p>SIZE: N/A      DATE: 2-21-18</p>	<p>SCHEMATIC NO. AND REVISION: <b>DC26381A-A/B/C/D_REV02</b></p> <p>SHEET 6 OF 7</p>					

ALL PARTS ON THIS PAGE ARE FOR DEMO ONLY, NOT NEEDED IN CUSTOMER DESIGN



PSM STACKING CONNECTORS:  
 J1, MALE, CONN HEADER 14POS 2MM R/A GOLD, Molex Connector Corp. 87760-1416  
 J2, FEMALE, CONN RECEPT 2MM DUAL R/A 14POS, Sullins Conn. NPPNU72FJFN-RC



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	TITLE: SCHEMATIC HIGH EFFICIENCY, POLY-PHASE, DC/DC STEP-DOWN			
THIS CIRCUIT IS PROPRIETARY TO ANALOG DEVICES AND SUPPLIED FOR USE WITH ANALOG DEVICES PARTS.	IC NO. LTM47REY SKU NO. DC2638A		SCHEMATIC NO. AND REVISION: DC26381A-A/B/C/D_REV02	
	SIZE: N/A DATE: 2-21-18		SHEET 7 OF 7	

# DEMO MANUAL DC2638A-A

## PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
<b>Required Circuit Components</b>				
1	1	CIN1	CAP, 150µF, ALUM. ELECT, 35V, 20%, 8mm x10.2mm SMD, RADIAL, AEC-Q200	PANASONIC, EEHZA1V151P
2	18	COUT1, COUT2, COUT3, COUT6, COUT7, COUT8, COUT46, COUT47, COUT49, COUT52, COUT53, COUT55, COUT94, COUT95, COUT96, COUT97, COUT98, COUT99	CAP, 100µF, X5R, 6.3V, 20%, 1210	AVX, 12106D107MAT2A
3	8	CIN2, CIN3, CIN4, CIN5, CIN6, CIN7, CIN8, CIN9	CAP, 22µF, X5R, 25V, 10%, 1210	AVX, 12103D226KAT2A
4	8	COUT4, COUT9, COUT10, COUT11, COUT48, COUT50, COUT54, COUT56	CAP, 470µF, TANT POSCAP 4V, 20%, 7343, 10mΩ, TPE NO SUBS, ALLOWED	PANASONIC, 4TPF470ML
5	1	C14	CAP, 0.01µF, X7R, 16V, 10%, 0603	AVX, 0603YC103KAT2A
6	1	C15	CAP, 220pF, X7R, 16V, 10%, 0603	AVX, 0603YC221KAT2A
7	6	C30, C41, C49, C64, C75, C85	CAP, 4.7µF, X5R, 25V, 10%, 0603, NO SUBS, ALLOWED	MURATA, GRM188R61E475KE11D
8	2	C65, C68	CAP, 1µF, X7R, 25V, 10%, 1206	AVX, 12063C105KAT2A
9	1	C66	CAP, 0.22µF, X5R, 25V, 10%, 0805	AVX, 08053D224KAT2A
10	1	C67	CAP, 0.1µF, X7R, 25V, 10%, 1206	AVX, 12063C104KAT2A
11	1	C69	CAP, 1800pF, X7R, 16V, 10%, 0603	AVX, 0603YC182KAT2A
12	1	C70	CAP, 1µF, X5R, 25V, 10%, 0805	AVX, 08053D105KAT2A
13	1	C71	CAP, 0.1µF, X7R, 25V, 10%, 0603	AVX, 06033C104KAT2A
14	2	C72, C73	CAP, 0.01µF, X7R, 25V, 10%, 0603	AVX, 06033C103KAT2A
15	5	C80, C81, C82, C83, C84	CAP, 2.2µF, X7R, 25V, 10%, 0603	MURATA, GRM188Z71E225KE43D
16	1	D8	DIODE, SCHOTTKY RECT, 20V, 0.5A, SOD-882D, LEADLESS, 2-TERM.	NEXPERIA, PMEG2005AELD.315
17	1	Q2	XSTR., MOSFET, P-CH, 20V, 5.9A, TO-236 (SOT23-3)	VISHAY, SJ2365E5D5-T1-GE3
18	4	Q3, Q4, Q20, Q21	XSTR., MOSFET, SINGLE N-CH, 60V, 380mA, SOT23-3, AEC-Q101	ON SEMICONDUCTOR, 2N7002KT1G
19	2	Q11, Q12	XSTR., MOSFET, N-CH, 40V, TO-252 (DPAK)	VISHAY, SUD50N04-8M8P-4GE3
20	1	Q19	XSTR., MOSFET, P-CH, 30V, 3.5A, SOT23-3, AEC-Q101	DIODES INC., DMPF3130L-7
21	36	R9, R33, R91, R92, R106, R107, R127, R128, R129, R146, R147, R148, R149, R150, R151, R152, R164, R177, R178, R179, R185, R186, R187, R195, R196, R197, R202, R211, R215, R222, R229, R230, R238, R239, R240, R245	RES., 0Ω, 1/10W, 0603, AEC-Q200	VISHAY, CRCW06030000Z0EA



# DEMO MANUAL DC2638A-A

## PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
<b>Required Circuit Components</b>				
22	20	R10, R11, R12, R13, R14, R15, R16, R18, R24, R95, R116, R136, R137, R138, R145, R162, R191, R210, R226, R234	RES., 10k, 1%, 1/10W, 0603, AEC-Q200	VISHAY, CRCW060310K0FKEA
23	4	R25, R32, R125, R209	RES., 100 $\Omega$ , 1%, 1/10W, 0603	VISHAY, CRCW060310R0FKEA
24	1	R26	RES., 787 $\Omega$ , 1%, 1/10W, 0603, AEC-Q200	VISHAY, CRCW0603787RFEKA
25	4	R85, R124, R224, R225	RES., 200 $\Omega$ , 1%, 1/10W, 0603	VISHAY, CRCW0603200RFEKA
26	1	R86	RES., 127 $\Omega$ , 1%, 1/10W, 0603, AEC-Q200	VISHAY, CRCW0603127RFEKA
27	5	R90, R126, R173, R193, R236	RES., 0.005 $\Omega$ , 1%, 1/2W, 2010, SENSE, AEC-Q200	VISHAY, WSL20105L000FEA
28	2	R108, R118	RES., 0.01 $\Omega$ , 1%, 1/2W, 2010, SENSE, AEC-Q200	VISHAY, WSL2010R0100FEA
29	1	R109	RES., 100k, 1%, 1/10W, 0603, AEC-Q200	VISHAY, CRCW0603100KFEKA
30	1	R110	RES., 5k, 10%, 1/2W, THT 3/8 SQ, 1-TURN, TOP ADJ., TRIMPOT	
31	2	R111, R115	RES., 20k, 1%, 1/10W, 0603	VISHAY, CRCW060320K0FKEA
32	1	R112	RES., 100 $\Omega$ , 1%, 1/10W, 0603, AEC-Q200	VISHAY, CRCW0603100RFEKA
33	1	R113	RES., 1.4k, 1%, 1/10W, 0603, AEC-Q200	VISHAY, CRCW06031K40FEKA
34	1	R114	RES., 154k, 1%, 1/10W, 0603, AEC-Q200	VISHAY, CRCW0603154KFEKA
35	1	R117	RES., 2 $\Omega$ , 1%, 1/10W, 0603, AEC-Q200	VISHAY, CRCW06032R00FEKA
36	1	R123	RES., 1M $\Omega$ , 1%, 1/10W, 0603, AEC-Q200	VISHAY, CRCW06031M00FEKA
37	1	R139	RES., 1.65k, 1%, 1/10W, 0603, AEC-Q200	VISHAY, CRCW06031K65FEKA
38	4	R153, R154, R155, R156	RES., 0 $\Omega$ , 3/4W, 2010, AEC-Q200	VISHAY, CRCW20100000Z0EF
39	1	R181	RES., 2.43k, 1%, 1/10W, 0603, AEC-Q200	VISHAY, CRCW06032K43FEKA
40	1	R198	RES., 3.24k, 1%, 1/10W, 0603, AEC-Q200	VISHAY, CRCW06033K24FEKA
41	1	R203	RES., 681k, 1%, 1/10W, 0603, AEC-Q200	VISHAY, CRCW0603681KFEKA
42	1	R204	RES., 3.3 $\Omega$ , 1%, 1/10W, 0603, AEC-Q200	VISHAY, CRCW06033R30FEKA
43	1	R205	RES., 82.5 $\Omega$ , 1%, 1/10W, 0603, AEC-Q200	VISHAY, CRCW060382R5FEKA
44	2	R213, R223	RES., 4.99k, 1%, 1/10W, 0603, AEC-Q200	VISHAY, CRCW06034K99FEKA
45	1	R220	RES., 15.8k, 1%, 1/10W, 0603, AEC-Q200	VISHAY, CRCW060315K8FEKA
46	1	R227	RES., 4.7k, 1%, 1/10W, 0603, AEC-Q200	VISHAY, CRCW06034K70FEKA
47	1	R241	RES., 4.22k, 1%, 1/10W, 0603, AEC-Q200	VISHAY, CRCW06034K22FEKA
48	2	U1, U2	IC, DUAL 25A POP PSM MODULE, BGA-144	ANALOG DEVICES, LTM4678EY#PBF
49	1	U6	IC, 700mA $\mu$ Power LDO WITH SHUTDOWN, SO-8	ANALOG DEVICES, LT1129CS8#PBF
50	1	U7	IC, TIMER/BLOCK: VOLTAGE-CTRL. PWM, TSOT23-6	ANALOG DEVICES, LTC6992CSS6-1#RBF
51	1	U8	IC, SINGLE R TO R IN/OUT OP AMP TSOT23-5, 100V/ $\mu$ s, 85MHz	ANALOG DEVICES, LT1803IS5#PBF
52	1	U9	IC, MEMORY, EEPROM, 2Kb (256x8), TSSOP-8, 400kHz	MICROCHIP, 24LC025-1/ST

# DEMO MANUAL DC2638A-A

## PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
<b>Additional Demo Board Circuit Components</b>				
1	0	COUT5, COUT12, COUT51, COUT57, COUT60, COUT61, COUT63, COUT64, COUT68, COUT69, COUT72, COUT73, COUT75, COUT76, COUT80, COUT81, COUT84, COUT85, COUT87, COUT88, COUT92, COUT93	CAP, OPTION, D3L	
2	0	CIN10, CIN11, CIN12, CIN13, CIN14, CIN15, CIN16, CIN17, CIN18, CIN19, CIN20, CIN21, COUT58, COUT59, COUT62, COUT65, COUT66, COUT67, COUT70, COUT71, COUT74, COUT77, COUT78, COUT79, COUT82, COUT83, COUT86, COUT89, COUT90, COUT91	CAP, OPTION, 1210	
3	0	C16, C17, C29, C31, C32, C33, C34, C35, C36, C37, C38, C39, C40, C43, C45, C46, C47, C48, C50, C51, C52, C53, C74, C76, C77, C78, C79	CAP, OPTION, 0603	
4	0	D4, D5	DIODE, OPTION, SOD-323	
5	0	R8, R27, R28, R29, R30, R31, R104, R105, R130, R131, R132, R133, R134, R135, R140, R141, R142, R143, R144, R158, R159, R160, R166, R174, R182, R183, R184, R188, R189, R190, R192, R194, R199, R200, R201, R206, R207, R208, R212, R214, R216, R218, R219, R221, R228, R231, R232, R233, R235, R237, R242, R243, R244	RES., OPTION, 2512 RES., OPTION, 0603	
6	0	R102, R103	RES., OPTION, 2512	
7	0	R217	RES., OPTION, 1206	
8	0	U3, U4, U5	IC., OPTION, BGA-144	
9	0		PCA ASSY DWG, DC2638A	
<b>Hardware: For Demo Board Only</b>				
1	4	D1, D2, D9, D10	LED, GREEN, WATERCLEAR, 0603	WURTH ELEKTRONIK, 150060GS75000
2	1	D3	LED, SUPER RED, WATERCLEAR, 0603	WURTH ELEKTRONIK, 150060SS75000
3	27	E1, E2, E3, E4, E5, E6, E7, E8, E9, E10, E11, E12, E13, E14, E15, E16, E17, E20, E21, E22, E23, E24, E25, E26, E27, E28, E29	TEST POINT, TURRET, 0.064", MTG. HOLE	MILL-MAX, 2308-2-00-80-00-00-07-0
4	2	JP1, JP2	CONN., HDR, MALE, 1x3, 2mm, VERT STR, THT [11,1]	WURTH ELEKTRONIK, 62000311121
5	8	J5, J7, J8, J9, J10, J13, J19, J20	WASHER, FLAT, STEEL, ZINC PLATE, OD: 0.436 [11,1]	KEYSTONE, 4703
6	16	J5, J7, J8, J9, J10, J13, J19, J20	NUT, HEX, STEEL, ZINC PLATE, 10-32	KEYSTONE, 4705
7	8	J5, J7, J8, J9, J10, J13, J19, J20	STUD, FASTENER, #10-32	PENNINGENGINEERING, KFH-032-10ET
8	8	J5, J7, J8, J9, J10, J13, J19, J20	RING, LUG, CRIMP #10, NON-INSULATED, SOLDERLESS TERMINALS	KEYSTONE, 8205
9	1	J12	CONN., HDR, FEMALE, 2x7, 2mm, R/A THT	SULLINS CONNECTOR SOLUTIONS, NPPN072FJFN-RC

# DEMO MANUAL DC2638A-A

## PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
<b>Hardware: For Demo Board Only</b>				
10	2	J14, J15	CONN., RF BNC, RCPT JACK, 5-PIN, STR, THT, 50 $\Omega$	AMPHENOL RF 112404
11	1	J16	CONN., SHROUDED HDR, MALE, 2x6, 2mm, VERT, STR, THT	FCI, 98414-G06-12ULF
12	1	J17	CONN., HDR, MALE, 2x7, 2mm, R/A THT	MOLEX, 0877601416
13	2	SW0, SW1	CONN., HDR, MALE, 1x3, 2mm, VERT, STR, THT, 10 $\mu$ Au	SAMTEC, TMM-103-02-L-S
14	1	J18	CONN., SHROUDED HDR, MALE, 1x4, 2mm, VERT, STR, THT	HIROSE ELECTRIC, DF3A-4P-2DSA
15	1	LB1	LABEL SPEC, DEMO BOARD SERIAL NUMBER	BRADY, THT-96-717-10
16	4	MH1, MH2, MH3, MH4	STANDOFF NYLON, SNAP-ON, 0.50"	WURTH ELEKTRONIK, 702935000
17	2	XJP1, XJP2	CONN., SHUNT, FEMALE, 2 POS, 2mm	WURTH ELEKTRONIK, 60800213421
18	1		TOOL, STENCIL, 700-DC2638A	AMALOG DEVICES, 830-DC2638A
19	1		PCB, DC2638A	MAO BANG, 600-DC2638A



**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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