

# LTP8803-1A 54V Input, High Current DC/DC Power µModule with PMBus Interface

## DESCRIPTION

Demonstration circuit 3190A-D is a high current, high density, high efficiency open-frame µModule® regulator with 45V to 65V input range. The demo board has a [LTP™8803-1A](#) µModule regulator which provides microprocessor 1.15V voltage from 54V power distribution architecture with digital power system management. The maximum output current for the demo board is 160A. Please see LTP8803-1A data sheet for more detailed information.

DC3190A-D powers up to default settings and produces 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

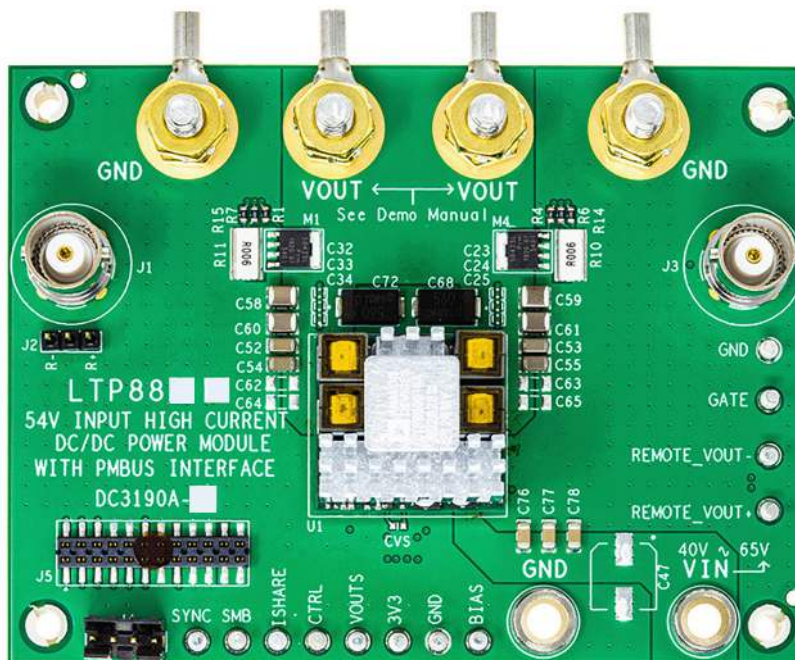
The software can be downloaded from: [LTpowerPlay](#)

For more details and instructions of LTpowerPlay, please refer to LTpowerPlay GUI for LTP8803-1A Quick Start Guide.

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

All registered trademarks and trademarks are the property of their respective owners.

## BOARD PHOTO Part marking is either ink mark or laser mark



# DEMO MANUAL DC3190A-D

## PERFORMANCE SUMMARY Specifications are at $T_A = 25^\circ\text{C}$ , air cooling 900LFM

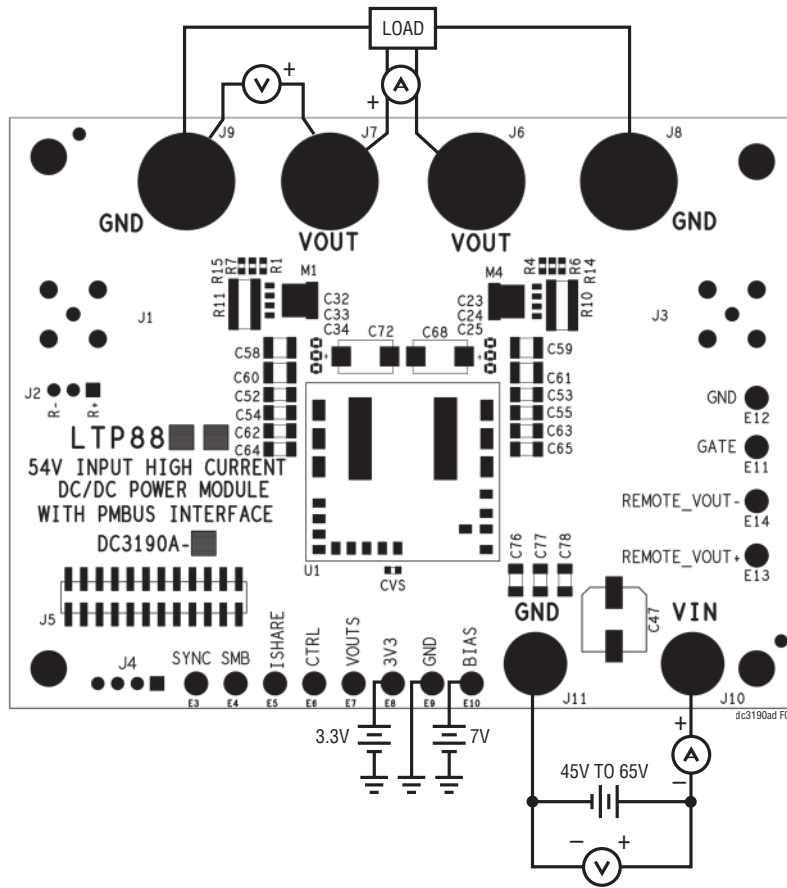
PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Input Voltage Range $V_{IN}$		45		65	V
Output Voltage		1.144	1.15	1.156	V
Default Switching Frequency		582	600	618	kHz
Maximum Output Current	Derating is Necessary for Certain $V_{IN}$ and Thermal Conditions		160		A
Converter Efficiency	$V_{IN} = 54\text{V} \cdot f_{SW} = 600\text{kHz}$ , $V_{OUT} = 1.15\text{V}$ , $I_{OUT} = 160\text{A}$		90.5		%

Demonstration circuit 3190A-D is easy to set up to evaluate the performance of the LTP8803-1A. Refer to Figure 1 for the proper measurement equipment setup and follow the procedure below.

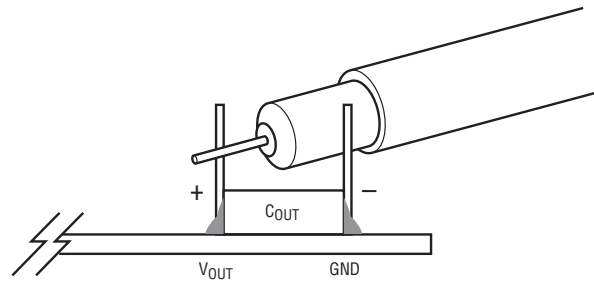
1. With power off, connect the input power supply to  $V_{IN}$  (45V to 65V) and GND.
2. With power off, connect the auxiliary power supply to BIAS (7V) and GND.
3. With power off, connect the auxiliary power supply to 3V3 (3.3V) and GND.
4. With power off, connect the load from  $V_{OUT}$  to GND.
5. Connect the DMMs to the input and outputs.
6. Turn on the auxiliary power supply and the input power supply and check for the proper output voltage.  $V_{OUT}$  should be  $1.15\text{V} \pm 0.5\%$ .
7. Once the input and output voltages are properly established, adjust the load current within the operating range of 0A to 160A max. Observe the output voltage regulation, output voltage ripples, load transient response and other parameters.
8. Connect the dongle and control the output voltages from the GUI. See LTpowerPlay GUI for the LTP8803-1A 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 2 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.

**QUICK START PROCEDURE**



**Figure 1. Proper Measurement Equipment Setup**



**Figure 2. Measuring Output Voltage Ripple**

# DEMO MANUAL DC3190A-D

## CONNECTING PC TO DC3190A-D

Use a PC to reconfigure the power management features of the LTP8803-1A 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. LTpowerPlay utilizes the DC1613A USB-to-SMBus controller to communicate with one of 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 Analog Devices Digital Power Products visit the LTpowerPlay Help menu. Online help also available through the LTpowerPlay.

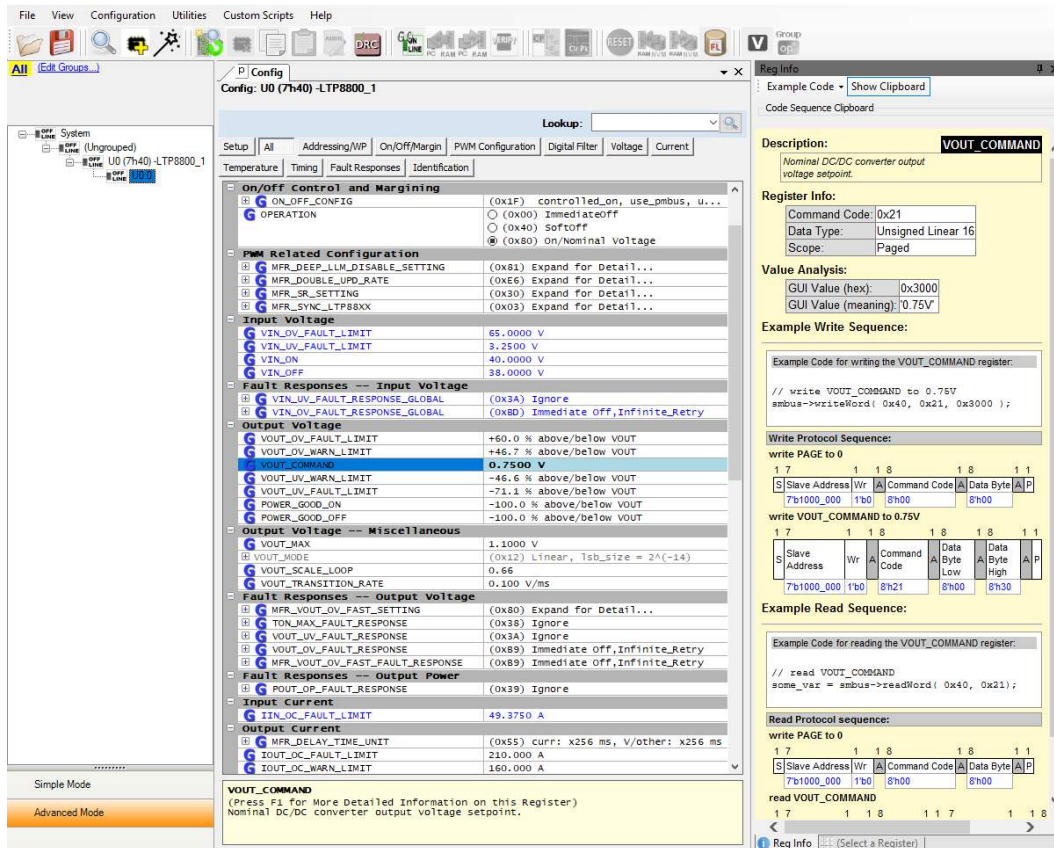


Figure 3. LTpowerPlay Main Interface

**TYPICAL PERFORMANCE CHARACTERISTICS**

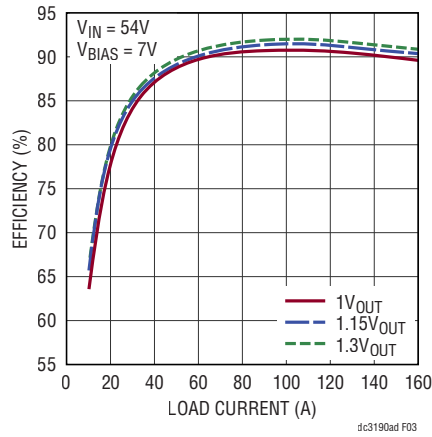
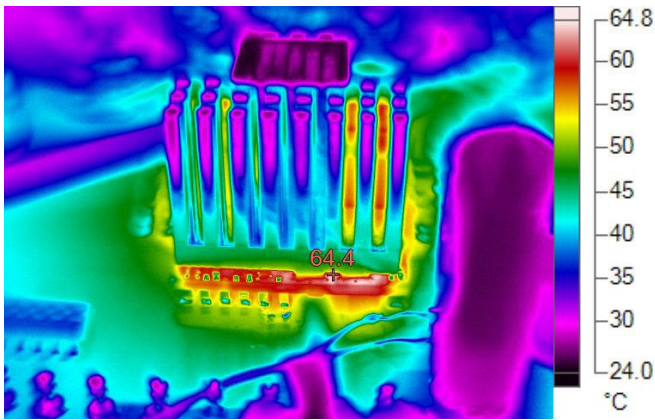
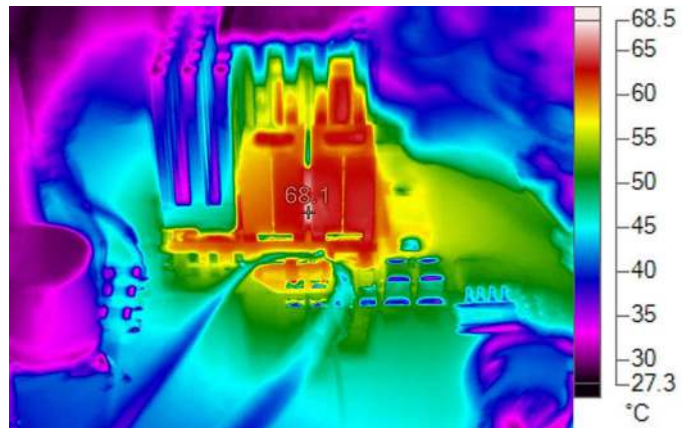


Figure 4. Measured LTP8803-1A Efficiency at  $V_{IN} = 54V$ ,  $f_{SW} = 600kHz$ , Forced Air Cooled with 900LFM

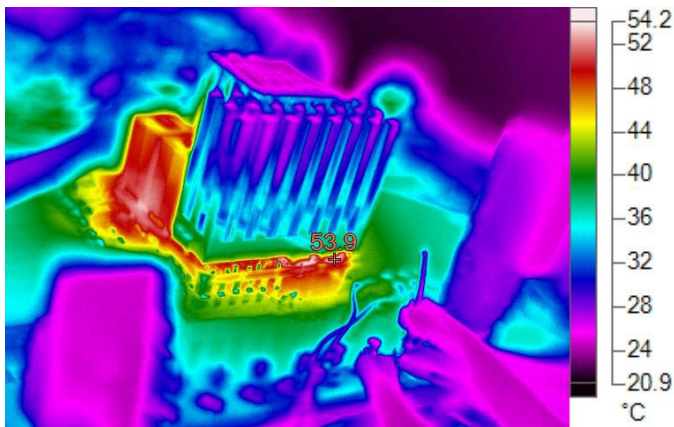


(a)

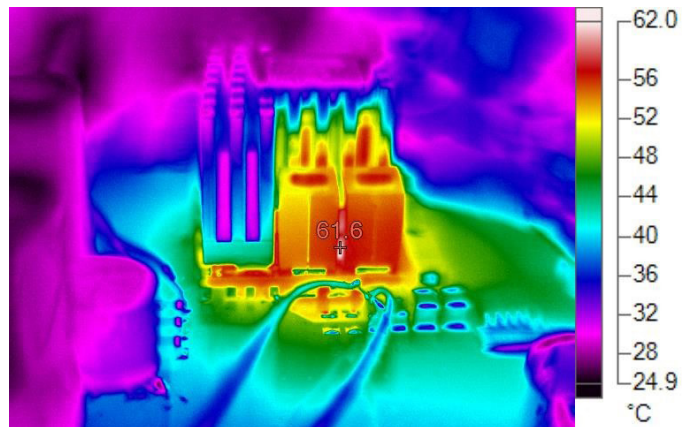


(b)

Figure 5. LTP8803-1A Thermal Performance at  $V_{IN} = 54V$ ,  $I_{LOAD} = 160A$ ,  $T_A = 25^\circ C$ , 500LFM Forced Airflow



(a)



(b)

Figure 6. LTP8803-1A Thermal Performance at  $V_{IN} = 54V$ ,  $I_{LOAD} = 160A$ ,  $T_A = 25^\circ C$ , 900LFM Forced Airflow

## TYPICAL PERFORMANCE CHARACTERISTICS

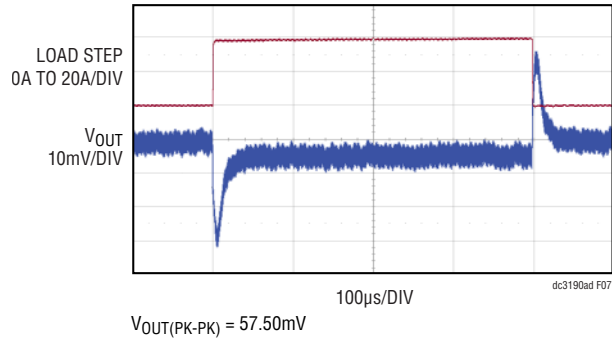


Figure 7. LTP8803-1A Load Transient Responses with Load Steps 0A to 40A to 0A at  $di/dt = 40A/\mu s$

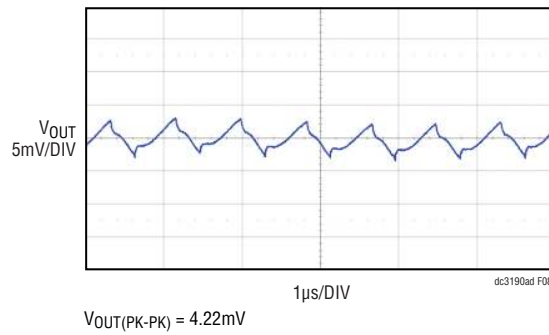


Figure 8. LTP8803-1A Output Voltage Ripple Measured through J3 (54V Input,  $I_{OUT} = 160A$ , 20MHz BW Limit)

## PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
<b>Required Circuit Components</b>				
1	18	C5-C22	CAP, 10 $\mu$ F , X7S, 6.3V, 20%, 0603	TDK, C1608X7S0J106M080AC
2	5	C45, C46, C76-C78	CAP, 2.2 $\mu$ F , X7R, 100V, 10%, 1206	SAMSUNG, CL31B225KCHSNNE
3	1	C48	CAP, 10 $\mu$ F , X7S, 16V, 10%, 0805	MURATA, GRM21BC71C106KE11L
4	1	C49	CAP, 2.2 $\mu$ F , X7R, 16V, 10%, 0805	KEMET, C0805C225K4RACTU
5	4	C52-C55	CAP, 100 $\mu$ F , X5R, 6.3V, 20%, 1206	TDK, C3216X5R0J107M160AB
6	4	C58-C61	CAP, 100 $\mu$ F , X6S, 6.3V, 20%, 1210	SAMSUNG, CL32X107MQVNNNE
7	10	C66-C75	CAP, 560 $\mu$ F , ALUM POLY, SP-CAP, 2V, 20%, 7343	PANASONIC, EEFGX0D561R
8	1	CVS	CAP, 100pF, X7R, 16V, 10%, 0603	AVX, 0603YC101KAT2A
9	4	J6-J9	EVAL BOARD STUD HARDWARE SET, #10-32	ANALOG DEVICES, 720-0010
10	1	LB1	LABEL SPEC, DEMO BOARD SERIAL NUMBER	BRADY, THT-96-717-10
11	4	M1-M4	XSTR., MOSFET, N-CH, 25V, 70A, LPAK55, Power-SO8	NEXPERIA, PSMN5R4-25YLDX
12	4	R1-R4	RES., 24.9 $\Omega$ , 1%, 1/10W, 0603, AEC-Q200	PANASONIC, ERJ3EKF24R9V
13	8	R5-R8, R13-R16	RES., 200 $\Omega$ , 1%, 1/10W, 0603	VISHAY, CRCW0603200RFKEA
14	4	R9-R12	RES., 0.006 $\Omega$ , 1%, 3W, 2512, LONG-SIDE TERM., METAL, SENSE, AEC-Q200	SUSUMU, KRL6432E-M-R006-F-T1
15	1	R17	RES., 49.9 $\Omega$ , 1%, 1/10W, 0603	PANASONIC, ERJ3EKF49R9V
16	5	R18-R22	RES., 4.99k, 1%, 1/10W, 0603, AEC-Q200	PANASONIC, ERJ3EKF4991V
17	1	R25	RES., 750 $\Omega$ , 1%, 1/10W, 0603, AEC-Q200	STACKPOLE ELECTRONICS, INC., RMCF0603FT750R
18	1	R26	RES., 10k, 1%, 1/10W, 0603, AEC-Q200	VISHAY, CRCW060310K0FKEA
19	1	R27	RES., 10k, 1%, 1/16W, 0402, AEC-Q200	VISHAY, CRCW040210K0FKED
20	1	R31	RES., 1.3k, 0.1%, 1/10W, 0603, METAL FILM, AEC-Q200	PANASONIC, ERA3AEB132V
21	1	R32	RES., 1k, 0.1%, 1/10W, 0603	YAGEO, RT0603BRD071KL
22	1	R33	RES., 7.5 $\Omega$ , 1%, 1/10W, 0603	YAGEO, RC0603FR-077R5L
23	1	RSN	RES., 0 $\Omega$ , 1/10W, 0603, AEC-Q200	PANASONIC, ERJ3GEY0R00V
24	1	RSP	RES., 1 $\Omega$ , 1%, 1/10W, 0603, AEC-Q200	NIC, NRC06F1R00TRF
25	1	U1	IC, 170A DC/DC CONVERTER, PRELIM.	ANALOG DEVICES, LTP8803-1AIPV#PBF
<b>Additional Demo Board Circuit Components</b>				
1	0	C23-C34	CAP, 22 $\mu$ F , FEEDTHRU, 4V, 20%, 05035, SMD, 3-TERM., EMI FILTER, 2A	MURATA, NFMJMPC226R0G3D
2	0	C47	CAP, 22 $\mu$ F , ALUM, 100V, 20%, 8mm x 10.2mm, SMD, RADIAL, AEC-Q200, CE-BS	SUN ELECTRONIC INDUSTRIES CORP, 100CE22BS
3	0	C62-C65	CAP, OPTION, 1206	
4	0	CFF	CAP, OPTION, 0603	
5	0	D1	DIODE, OPTION, SOD-323	
6	1	PCB1	PCB, DC3190A	ADI APPROVED SUPPLIER, 600-DC3190A
7	0	R34, R37-R39, RFF	RES., OPTION, 0603	

# DEMO MANUAL DC3190A-D

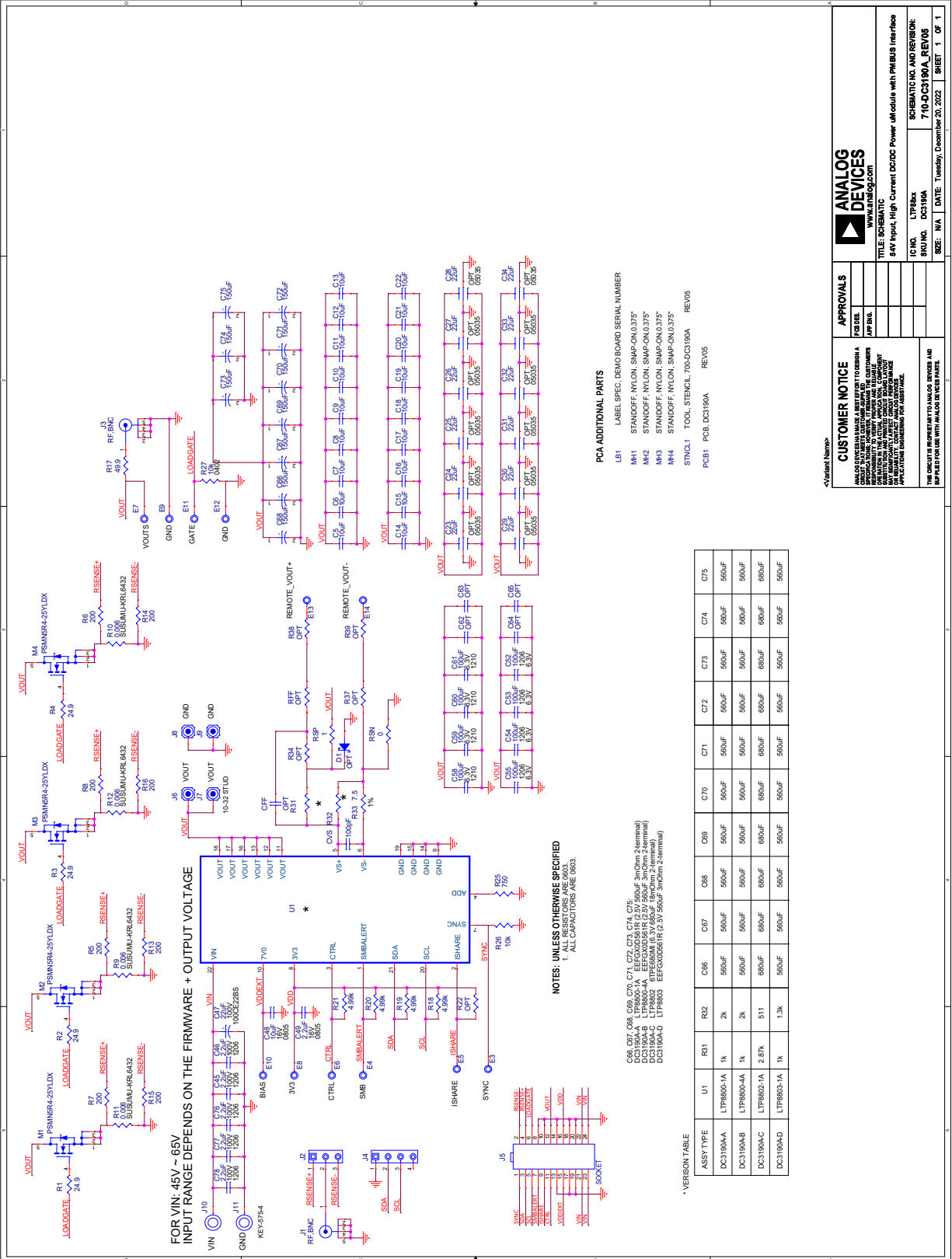
---

## PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
<b>Hardware: For Demo Board Only</b>				
1	12	E3-E14	TEST POINT, TURRET, 0.064" MTG. HOLE, PCB 0.062" THK	MILL-MAX, 2308-2-00-80-00-00-07-0
2	2	J1, J3	CONN., RF, BNC, RCPT, JACK, 5-PIN, ST, THT, 50Ω	AMPHENOL RF, 112404
3	1	J2	CONN., HDR, MALE, 1×3, 2.54mm, VERT, ST, THT	SAMTEC, TSW-103-07-L-S
4	1	J4	CONN., HDR, SHROUDED, MALE, 1×4, 2.54mm, VERT, ST, THT	AMPHENOL, 69167-104HLF
5	1	J5	CONN., SOCKET, FEMALE, 2×12, 2mm, SMD, BOTTOM ENTRY	SAMTEC, CLT-112-02-F-D-BE-A-K-TR
6	2	J10, J11	CONN., BANANA JACK, FEMALE, THT, NON-INSULATED, SWAGE, 0.218"	KEYSTONE, 575-4
7	4	MH1-MH4	STANDOFF, NYLON, SNAP-ON, 0.375"	KEYSTONE, 8832
8	1	STNCL1	TOOL, STENCIL, 700-DC3190A	ADI APPROVED SUPPLIER, 830-DC3190A



SCHEMATIC DIAGRAM



## REVISION HISTORY

REV	DATE	DESCRIPTION	PAGE NUMBER
0	02/23	Initial Release.	—



### 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.

### Legal Terms and Conditions

By using the evaluation board discussed herein (together with any tools, components documentation or support materials, the "Evaluation Board"), you are agreeing to be bound by the terms and conditions set forth below ("Agreement") unless you have purchased the Evaluation Board, in which case the Analog Devices Standard Terms and Conditions of Sale shall govern. Do not use the Evaluation Board until you have read and agreed to the Agreement. Your use of the Evaluation Board shall signify your acceptance of the Agreement. This Agreement is made by and between you ("Customer") and Analog Devices, Inc. ("ADI"), with its principal place of business at One Technology Way, Norwood, MA 02062, USA. Subject to the terms and conditions of the Agreement, ADI hereby grants to Customer a free, limited, personal, temporary, non-exclusive, non-sublicensable, non-transferable license to use the Evaluation Board FOR EVALUATION PURPOSES ONLY. Customer understands and agrees that the Evaluation Board is provided for the sole and exclusive purpose referenced above, and agrees not to use the Evaluation Board for any other purpose. Furthermore, the license granted is expressly made subject to the following additional limitations: Customer shall not (i) rent, lease, display, sell, transfer, assign, sublicense, or distribute the Evaluation Board; and (ii) permit any Third Party to access the Evaluation Board. As used herein, the term "Third Party" includes any entity other than ADI, Customer, their employees, affiliates and in-house consultants. The Evaluation Board is NOT sold to Customer; all rights not expressly granted herein, including ownership of the Evaluation Board, are reserved by ADI. CONFIDENTIALITY. This Agreement and the Evaluation Board shall all be considered the confidential and proprietary information of ADI. Customer may not disclose or transfer any portion of the Evaluation Board to any other party for any reason. Upon discontinuation of use of the Evaluation Board or termination of this Agreement, Customer agrees to promptly return the Evaluation Board to ADI. ADDITIONAL RESTRICTIONS. Customer may not disassemble, decompile or reverse engineer chips on the Evaluation Board. Customer shall inform ADI of any occurred damages or any modifications or alterations it makes to the Evaluation Board, including but not limited to soldering or any other activity that affects the material content of the Evaluation Board. Modifications to the Evaluation Board must comply with applicable law, including but not limited to the RoHS Directive. TERMINATION. ADI may terminate this Agreement at any time upon giving written notice to Customer. Customer agrees to return to ADI the Evaluation Board at that time. LIMITATION OF LIABILITY. THE EVALUATION BOARD PROVIDED HEREUNDER IS PROVIDED "AS IS" AND ADI MAKES NO WARRANTIES OR REPRESENTATIONS OF ANY KIND WITH RESPECT TO IT. ADI SPECIFICALLY DISCLAIMS ANY REPRESENTATIONS, ENDORSEMENTS, GUARANTEES, OR WARRANTIES, EXPRESS OR IMPLIED, RELATED TO THE EVALUATION BOARD INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTY OF MERCHANTABILITY, TITLE, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS. IN NO EVENT WILL ADI AND ITS LICENSORS BE LIABLE FOR ANY INCIDENTAL, SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES RESULTING FROM CUSTOMER'S POSSESSION OR USE OF THE EVALUATION BOARD, INCLUDING BUT NOT LIMITED TO LOST PROFITS, DELAY COSTS, LABOR COSTS OR LOSS OF GOODWILL. ADI'S TOTAL LIABILITY FROM ANY AND ALL CAUSES SHALL BE LIMITED TO THE AMOUNT OF ONE HUNDRED US DOLLARS (\$100.00). EXPORT. Customer agrees that it will not directly or indirectly export the Evaluation Board to another country, and that it will comply with all applicable United States federal laws and regulations relating to exports. GOVERNING LAW. This Agreement shall be governed by and construed in accordance with the substantive laws of the Commonwealth of Massachusetts (excluding conflict of law rules). Any legal action regarding this Agreement will be heard in the state or federal courts having jurisdiction in Suffolk County, Massachusetts, and Customer hereby submits to the personal jurisdiction and venue of such courts. The United Nations Convention on Contracts for the International Sale of Goods shall not apply to this Agreement and is expressly disclaimed.