

## 54V Input, High Current Dc-to-Dc Power $\mu$ Module with PMBus Interface

### General Description

The DC3190B-E is a high current, high density, high efficiency open-frame  $\mu$ Module<sup>®</sup> regulator with 45V to 65V input range. The DC3190B-E evaluation board has an [LTP8800-2](#)  $\mu$ Module (micromodule) regulator which provides microprocessor 0.75V voltage from 54V power distribution architecture with digital power system management (PSM). The maximum output current for the evaluation board is 135A. See LTP8800-2 data sheet for more detailed information.

The DC3190B-E 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-to-dc converter. To fully explore the extensive PSM features of the DC3190B-E, download LTpowerPlay<sup>®</sup> graphical user interface (GUI) software to your PC and use Analog Devices I<sup>2</sup>C/SMBus/PMBus dongle [DC1613A](#) to connect to the evaluation board. The 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.

### Features and Benefits

- DC3190B-E evaluation board
- Transient circuit included for load transient evaluation
- GUI with LTpowerPlay

### DC3190B-E Evaluation Board Files

FILE	DESCRIPTION
<a href="#">DC3190B-E</a>	Demo board design files
<a href="#">LTpowerPlay</a>	GUI software for <a href="#">LTP8800-2</a> Quick Start Guide
<a href="#">DC1613A</a>	I <sup>2</sup> C/SMBus/PMBus dongle

[Ordering Information](#) appears at end of data sheet.

### Quick Start

#### Required Equipment

- Power supply #1: capable of sourcing 65V and 10A
- Power supply #2: capable of sourcing 7V and 1A
- Power supply #3: capable of sourcing 3.3V and 1A
- Electronic load: capable of sinking 0.75V and 135A
- Two digital multimeters (DMMs)

#### Procedure

The DC3190B-E is easy to set up to evaluate the performance of the LTP8800-2. See [Figure 2](#) for the proper measurement equipment setup and follow the procedure below.

1. With power off, connect the input power supply to VIN (45V to 65V) and GND.
2. With power off, connect the auxiliary power supply to 7V0 (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 VOUT to GND.
5. Connect the DMMs to the input and output.
6. Turn on the 3.3V and 7V auxiliary power supply before turning on the input power supply.
7. Turn on the input power supply and check for the proper output voltage. The  $V_{OUT}$  should be  $0.75V \pm 0.5\%$ .
8. Once the input and output voltages are properly established, adjust the load current within the operating range of 0A to 135A max. Observe the output voltage regulation, output voltage ripples, load transient response, and other parameters.
9. Connect the dongle and control the output voltages from the GUI (optional).
10. Turn off the input power supply before turning off the auxiliary power supply.
11. Turn off the 3.3V and 7V auxiliary power supply.

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.

## Evaluation Board Photo

Part marking is either ink mark or laser mark.

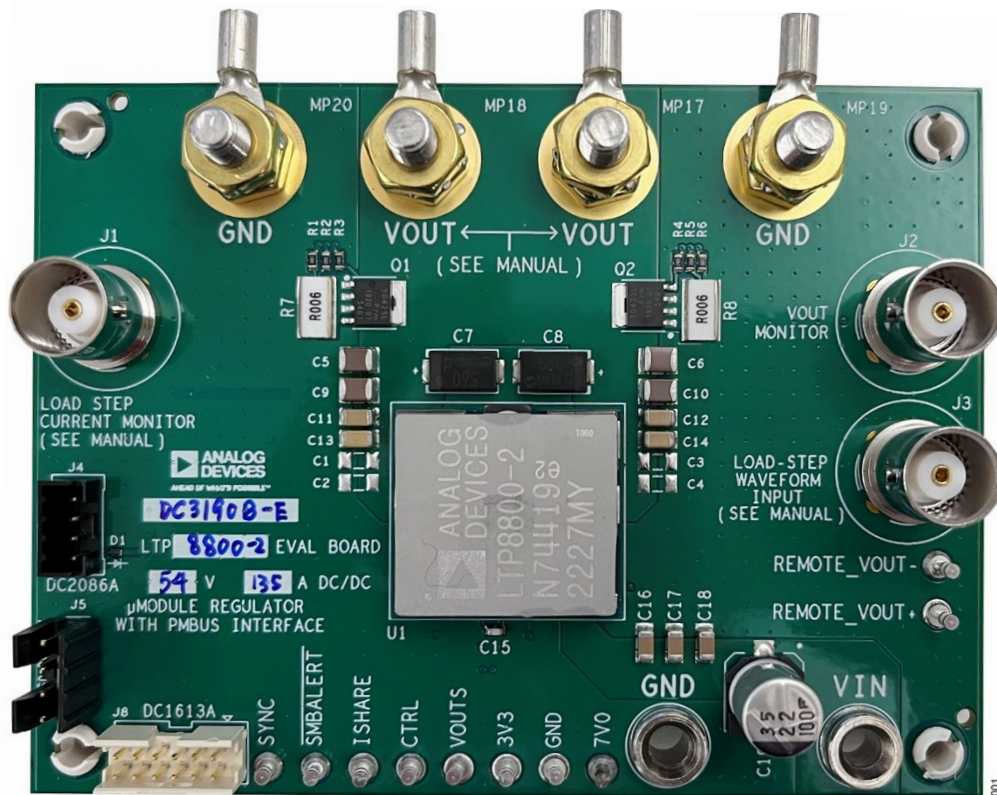
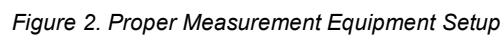


Figure 1. DC3190B-E Evaluation Board



## Revision History

12/2023 – Rev Sp0 Initial Release

## Connect PC to the DC3190B-E Evaluation Board

Use a PC to reconfigure the PSM features of the LTP8800-2, including nominal  $V_{OUT}$ , margin set points, OV/UV limits, temperature fault limits, sequencing parameters, the fault log, fault responses, GPIOs and other functionalities.

The LTpowerPlay utilizes the DC1613A USB-to-SMBus controller to communicate with one of the demo systems, or a customer board. The LTpowerPlay software also provides an automatic update feature to keep the LTpowerPlay software current with the latest set of device drivers and documentation. The LTpowerPlay software can be downloaded at [LTpowerPlay](#).

To access technical support documentation for Analog Devices digital PSM products, visit the LTpowerPlay Help menu. The online help is also available through the LTpowerPlay interface.

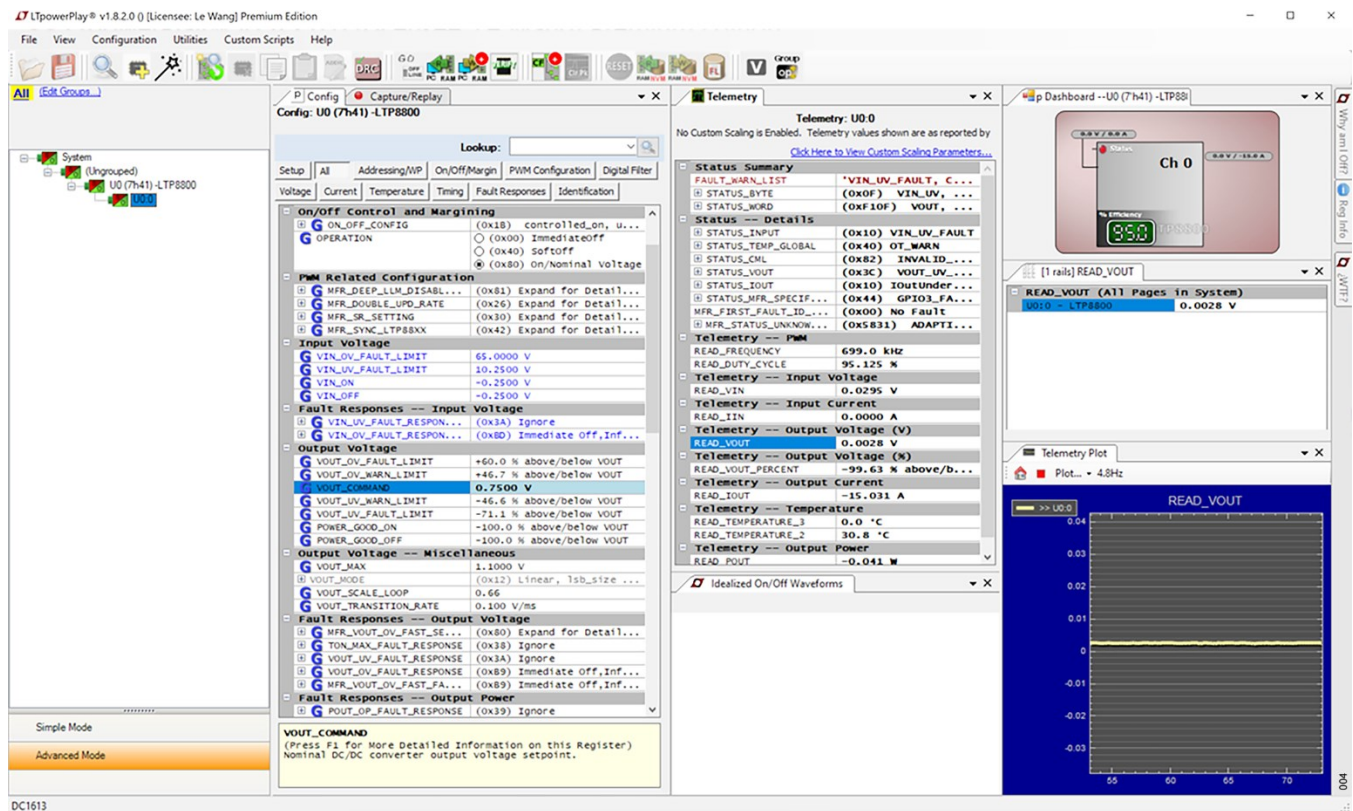


Figure 4. LTP8800-2 LTpowerPlay Main Interface

## 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		0.746	0.750	0.754	V
Default Switching Frequency		679	700	721	kHz
Maximum Output Current	Derating is necessary for certain $V_{IN}$ and thermal conditions		135		A
Converter Efficiency	$V_{IN} = 54\text{V}$ , $f_{SW} = 700\text{kHz}$ , $V_{OUT} = 0.75\text{V}$ , $I_{OUT} = 135\text{A}$		87.76		%



## Typical Performance Characteristics

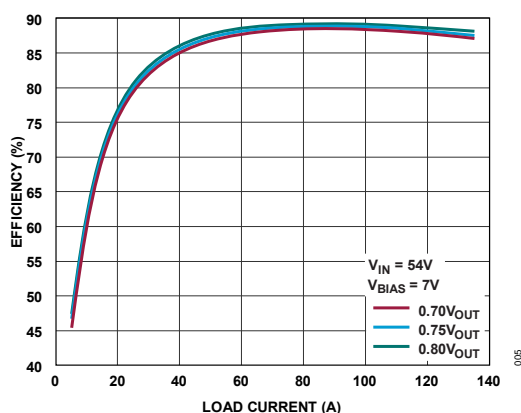


Figure 5. Measured LTP8800-2 Efficiency at  $V_{IN} = 54V$ ,  $f_{SW} = 700kHz$ , Forced Air Cooled with 900LFM

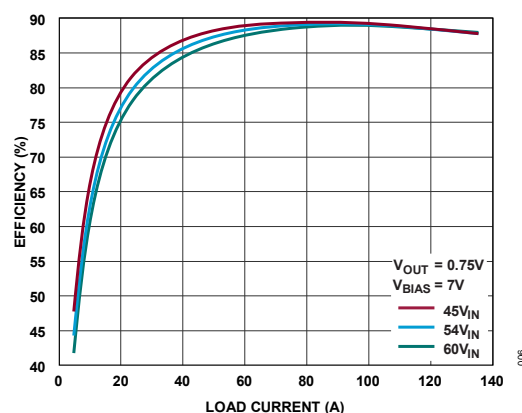


Figure 6. Measured LTP8800-2 Efficiency at  $V_{OUT} = 0.75V$ ,  $f_{SW} = 700kHz$ , Forced Air Cooled with 900LFM

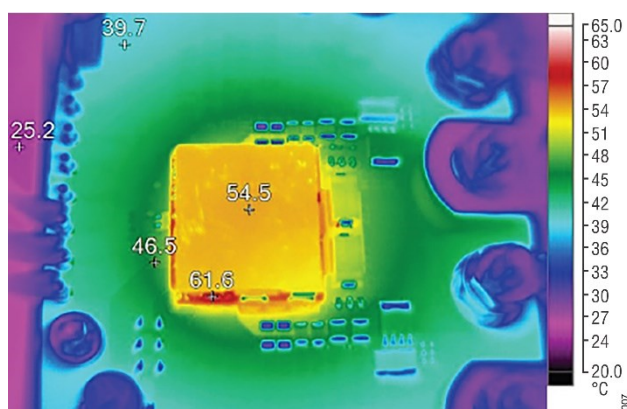


Figure 7. LTP8800-2 Thermal Performance at  $V_{IN} = 54V$ ,  $I_{OUT} = 135A$ ,  $T_A = 25^\circ C$ , 500LFM Forced Airflow

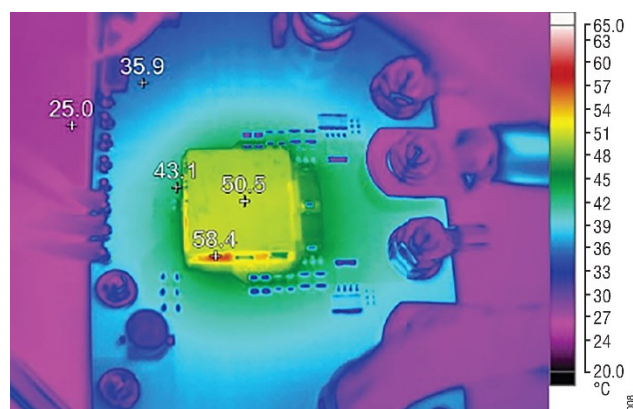


Figure 8. LTP8800-2 Thermal Performance at  $V_{IN} = 54V$ ,  $I_{OUT} = 135A$ ,  $T_A = 25^\circ C$ , 900LFM Forced Airflow

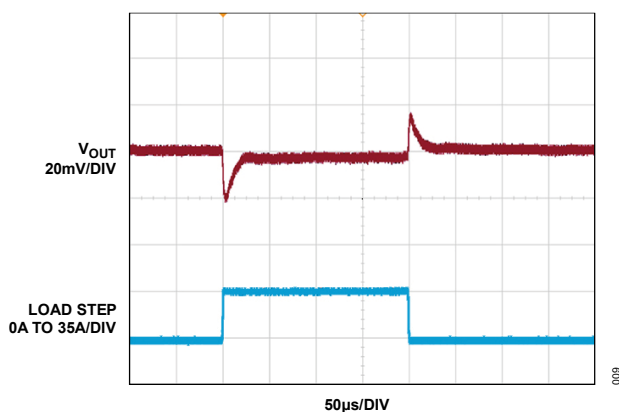


Figure 9. LTP8800-2 Load Transient Responses with Load Steps 0A to 35A at  $di/dt = 35A/\mu s$

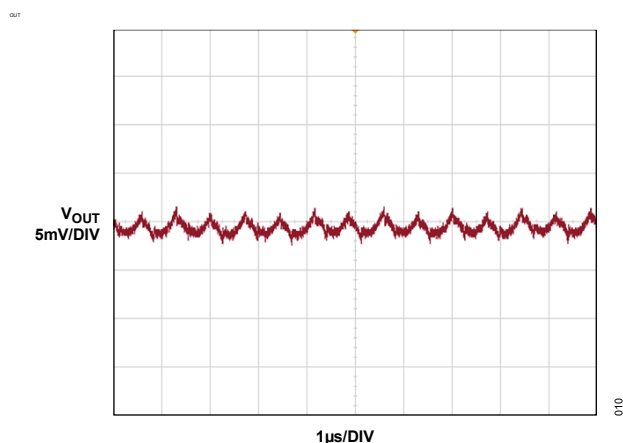


Figure 10. LTP8800-2 Output Voltage Ripple Measured Through J2 (54V Input,  $I_{OUT} = 135A$ , 20MHz BW Limit)

## Ordering Information

PART	TYPE
DC3190B-E	Evaluation board

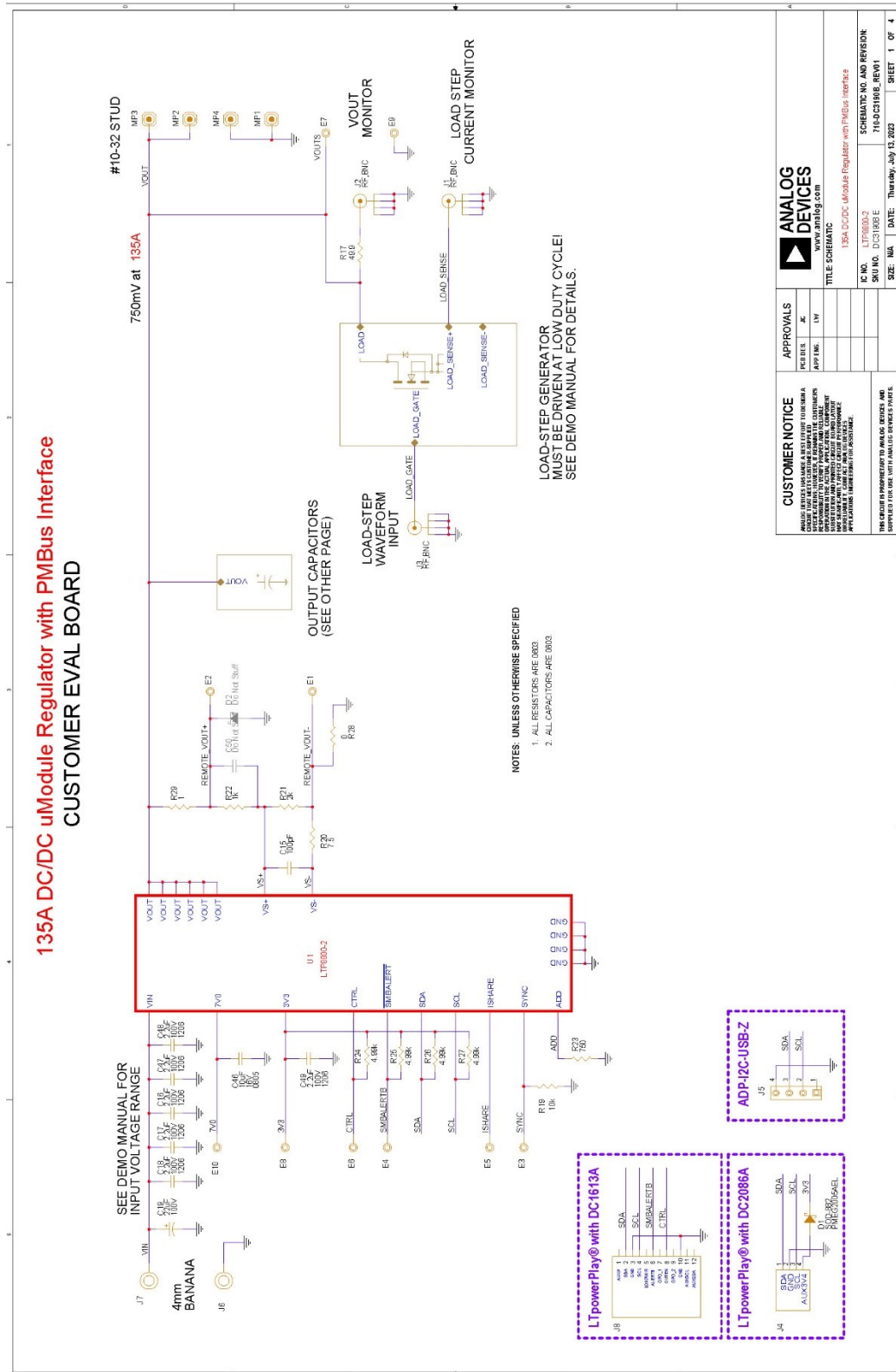
## DC3190B-E Evaluation Board Bill of Materials

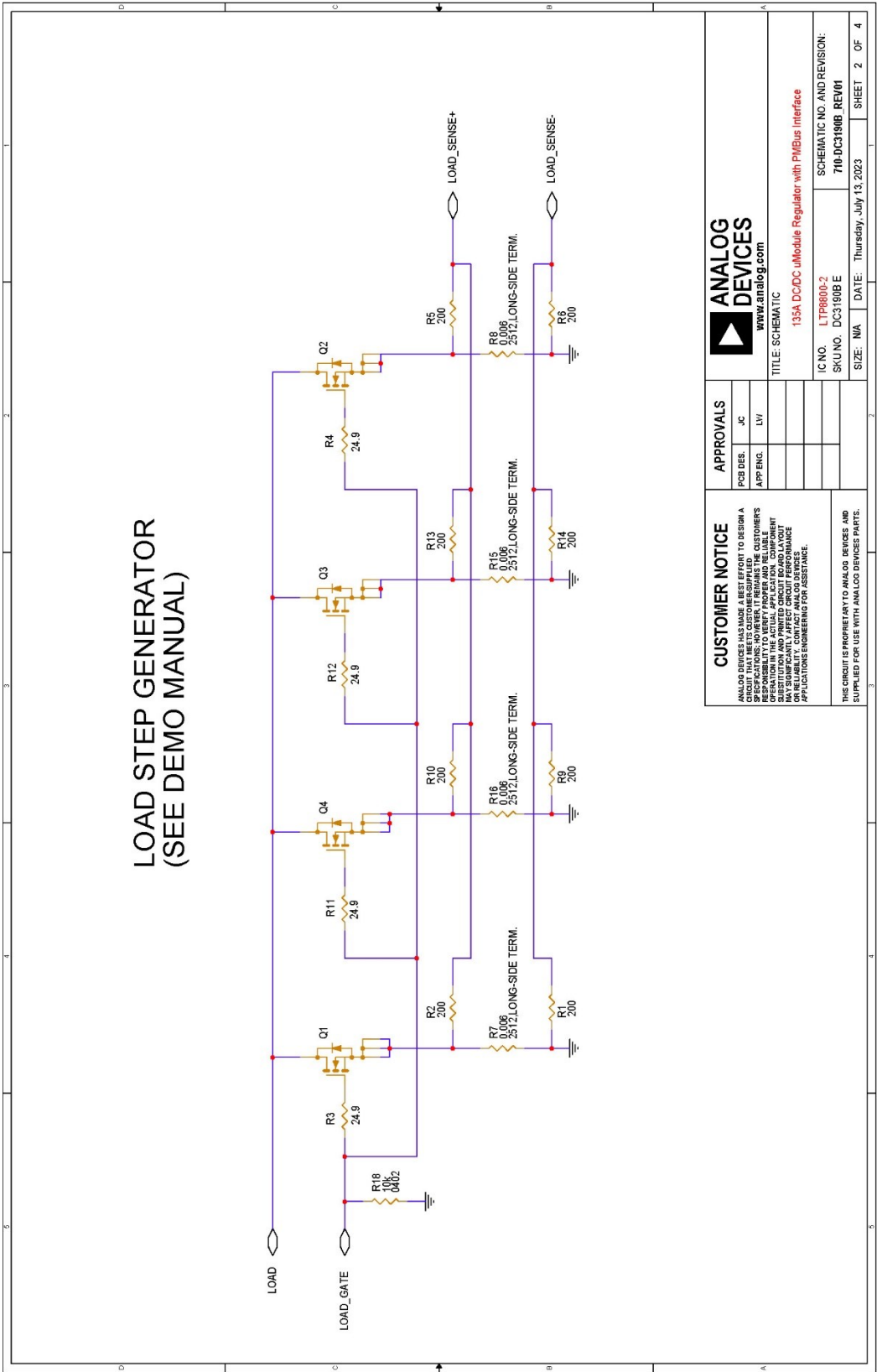
ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
<b>Required Circuit Components</b>				
1	4	C5, C6, C9, C10	CAP., 100µF, X6S, 10V, 20%, 1210	TDK, C3225X6S1A107M250AC
2	10	C7, C8, C20-C23, C26, C27, C34, C37	CAP., 560µF, ALUM POLY, SP-CAP, 2V, 20%, 7343, SMD	PANASONIC, EEFGX0D561R
3	4	C11-C14	CAP., CER 100µF 6.3V X5R 1206	MURATA, GRM31CR60J107MEA8L
4	1	C15	CAP., 100pF, X7R, 16V, 10%, 0603	AVX, 0603YC101KAT2A
5	6	C16-C18, C47-C49	CAP., 2.2µF, X7R, 100V, 10%, 1206	MURATA, GRM31CR72A225KA73L
6	1	C19	CAP., 22µF, ALUM, 100V, 20%, 8mm × 10.2mm, SMD, RADIAL, AEC-Q200, CE-FS	SUN ELECTRONIC INDUSTRIES CORP, 100CE22FS
7	18	C24, C25, C28-C33, C35, C36, C38-C45	CAP., 10µF, X7S, 6.3V, 20%, 0603	TDK, C1608X7S0J106M080AC
8	1	C46	CAP., 10µF, X7S, 16V, 10%, 0805	MURATA, GRM21BC71C106KE11L
9	1	D1	DIODE, SCHOTTKY, 20V, 0.5A, SOD-882, LEADLESS	NEXPERIA, PMEG2005AEL, 315
10	4	Q1-Q4	XSTR., MOSFET, N-CH, 25V, 70A, LFPK55, Power-SO8	NEXPERIA, PSMN5R4-25YLDX
11	8	R1, R2, R5, R6, R9, R10, R13, R14	RES., 200Ω, 1%, 1/10W, 0603	VISHAY, CRCW0603200RFKEA
12	4	R3, R4, R11, R12	RES., 24.9Ω, 1%, 1/10W, 0603, AEC-Q200	PANASONIC, ERJ3EKF24R9V
13	4	R7, R8, R15, R16	RES., 0.006Ω, 1%, 3W, 2512, LONG-SIDE TERM., METAL, SENSE, AEC-Q200	SUSUMU, KRL6432E-M-R006-F-T5
14	1	R17	RES., 49.9Ω, 1%, 1/10W, 0603	PANASONIC, ERJ3EKF49R9V
15	1	R18	RES., 10kΩ, 1%, 1/16W, 0402, AEC-Q200	VISHAY, CRCW040210K0FKED
16	1	R19	RES., 10kΩ, 1%, 1/10W, 0603, AEC-Q200	VISHAY, CRCW060310K0FKEA
17	1	R20	RES., 7.5Ω, 1%, 1/10W, 0603	YAGEO, RC0603FR-077R5L
18	1	R21	RES., 2kΩ, 0.1%, 1/10W, 0603, METAL FILM, AEC-Q200	PANASONIC, ERA3AEB202V
19	1	R22	RES., 1kΩ, 0.1%, 1/10W, 0603, THIN-FILM	YAGEO, RT0603BRD071KL
20	1	R23	RES., 750Ω, 1%, 1/10W, 0603, AEC-Q200	PANASONIC, ERJ3EKF7500V
21	4	R24-R27	RES., 4.99kΩ, 1%, 1/10W, 0603, AEC-Q200	PANASONIC, ERJ3EKF4991V
22	1	R28	RES., 0Ω, 1/10W, 0603, AEC-Q200	PANASONIC, ERJ3GEY0R00V
23	1	R29	RES., 1Ω, 1%, 1/10W, 0603, AEC-Q200	VISHAY, CRCW06031R00FKEA
24	1	U1	IC., 135A DC-TO-DC µModule REGULATOR WITH PMBus INTERFACE	ANALOG DEVICES, LTP8800-2IPV#PBF
<b>Additional Demo Board Circuit Components</b>				
1	0	C1-C4	CAP., OPTION, 1206	
2	0	C50	CAP., OPTION, 0603	
3	0	D2	DIODE, OPTION, SOD-323	
4	1	PCB1	PCB, DC3190B-E	ADI APPROVED SUPPLIER, 600-DC3190B-E


ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
<b>Hardware for Demo Board Only</b>				
1	10	E1-E10	TEST POINT, TURRET, 0.064" MTG. HOLE, PCB 0.062" THK	MILL-MAX, 2308-2-00-80-00-00-07-0
2	3	J1-J3	CONN., RF, BNC, RCPT, JACK, 5-PIN, ST, THT, 50Ω	AMPHENOL RF, 112404
3	1	J4	CONN., HDR, SHROUDED, MALE, 1x4, 2mm, VERT, ST, THT	HIROSE ELECTRIC, DF3A-4P-2DSA
4	1	J5	CONN., HDR, SHROUDED, MALE, 1x4, 2.54mm, VERT, ST, THT	AMPHENOL, 69167-104HLF
5	2	J6, J7	CONN., BANANA JACK, FEMALE, THT, NON-INSULATED, SWAGE, 0.218	KEYSTONE, 575-4
6	1	J8	CONN., HDR, SHROUDED, MALE, 2x6, 2mm, VERT, ST, THT	AMPHENOL, 98414-G06-12ULF
7	4	MH1, MH2, MH3, MH4	STANDOFF, NYLON, SNAP-ON, 0.375	KEYSTONE, 8832
8	4	MP1, MP2, MP3, MP4	STUD, FASTENER, #10-32	PENNINGENGINEERING, KFH-032-10ET
9	4	MP5, MP6, MP7, MP8	WASHER, FLAT, STEEL, ZINC PLATE, OD: 0.436 [11.1]	KEYSTONE, 4703
10	8	MP9, MP10, MP11, MP12, MP13, MP14, MP15, MP16	NUT, HEX, #10-32, STEEL, ZINC PLATE	KEYSTONE, 4705
11	4	MP17, MP18, MP19, MP20	RING, LUG, #10, CRIMP, 16/14 AWG, NON-INSULATED, SOLDERLESS TERMINALS	KEYSTONE, 8205



## DC3190B-E Evaluation Board Schematics





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APPROVALS	
PCB DES.	JC
APP. ENG.	LVI
TITLE: SCHEMATIC	

ANALOG DEVICES HAS MADE A BEST EFFORT TO DESIGN A SCHEMATIC THAT MEETS THE SPECIFICATIONS OF THE IC. THE SCHEMATIC IS PROVIDED AS A GUIDE ONLY. THE USER MUST VERIFY THE SCHEMATIC AGAINST THE IC SPECIFICATIONS AND MAKE ANY NECESSARY CHANGES TO THE SCHEMATIC BEFORE PROCEEDING WITH THE BOARD LAYOUT. SUBSTITUTION AND PRINTED CIRCUIT BOARD LAYOUT ARE THE RESPONSIBILITY OF THE USER. ANALOG DEVICES ASSUMES NO LIABILITY FOR ANY DAMAGE OR LOSS OF DATA OR REVENUE OR ANY OTHER CONSEQUENCES ARISING FROM THE USE OF THIS SCHEMATIC. APPLICATIONS ENGINEERING FOR ASSISTANCE.

IC NO.	LTP8800-2	SCHEMATIC NO. AND REVISION:
SKU NO.	DC3190B E	710-DC3190B REV01
SIZE:	NA	DATE: Thursday, July 13, 2023
		SHEET 2 OF 4



MP17	RING LUG #10, CRIMP, 16/14 AWG NONINSULATED SOLDERLESS TERMINALS
MP18	RING LUG #10, CRIMP, 16/14 AWG NONINSULATED SOLDERLESS TERMINALS
MP19	RING LUG #10, CRIMP, 16/14 AWG NONINSULATED SOLDERLESS TERMINALS
MP20	RING LUG #10, CRIMP, 16/14 AWG NONINSULATED SOLDERLESS TERMINALS
MP5	WASHER FLAT, STEEL, ZINC PLATE, OD: 0.436 [11.1]
MP6	WASHER FLAT, STEEL, ZINC PLATE, OD: 0.436 [11.1]
MP7	WASHER FLAT, STEEL, ZINC PLATE, OD: 0.436 [11.1]
MP8	WASHER FLAT, STEEL, ZINC PLATE, OD: 0.436 [11.1]
MP9	NUT HEX #10-32, STEEL, ZINC PLATE
MP10	NUT HEX #10-32, STEEL, ZINC PLATE
MP11	NUT HEX #10-32, STEEL, ZINC PLATE
MP12	NUT HEX #10-32, STEEL, ZINC PLATE
MP13	NUT HEX #10-32, STEEL, ZINC PLATE
MP14	NUT HEX #10-32, STEEL, ZINC PLATE
MP15	NUT HEX #10-32, STEEL, ZINC PLATE
MP16	NUT HEX #10-32, STEEL, ZINC PLATE
WH1	STANDOFF, NYLON, SNAP-ON, 0.375"
WH2	STANDOFF, NYLON, SNAP-ON, 0.375"
WH3	STANDOFF, NYLON, SNAP-ON, 0.375"
WH4	STANDOFF, NYLON, SNAP-ON, 0.375"

<p><b>CUSTOMER NOTICE</b></p> <p>ANALOG DEVICES HAS BEEN REQUESTED TO DESIGN A SPECIFIC APPLICATION FOR THE CUSTOMER'S OPERATING REQUIREMENTS. HOWEVER, IT REMAINS THE CUSTOMER'S RESPONSIBILITY TO PROVIDE THE CORRECT INFORMATION FOR OPERATION IN THE ACTUAL APPLICATION. COMPONENTS ARE PROVIDED AS A GUIDE ONLY. ANALOG DEVICES DOES NOT WARRANT A SPECIFIC QUANTITY, EFFECT CIRCUIT PERFORMANCE, OR ANY OTHER SPECIFIC APPLICATIONS. ANALOG DEVICES ENGINEERING FOR ASSISTANCE.</p>		<p><b>APPROVALS</b></p> <table border="1"> <tr> <td>PCB DES.</td><td>JC</td></tr> <tr> <td>APP ENG.</td><td>LUV</td></tr> <tr> <td></td><td></td></tr> <tr> <td></td><td></td></tr> </table>		PCB DES.	JC	APP ENG.	LUV				
PCB DES.	JC										
APP ENG.	LUV										
<p><b>CUSTOMER NOTICE</b></p> <p>THE CIRCUIT IS PROPRIETARY TO ANALOG DEVICES AND IS SUPPLIED FOR USE WITH ANALOG DEVICES PARTS.</p>		<p><b>ANALOG DEVICES</b></p> <p> <a href="http://www.analog.com">www.analog.com</a></p> <p><b>155A DDCDC UModule Regulator with PIMBus Interface</b></p> <p>TITLE: SCHEMATIC</p>									
<p>I/C NO. <b>LT17889-0.2</b></p> <p>S/KU NO. <b>DC31906 E</b></p>		<p><b>SCHEMATIC NO. AND REVISION:</b></p> <p><b>710-DC31906 REV01</b></p>									
<p>SIZE: <b>NA</b></p> <p>DATE: <b>Thursday, July 13, 2023</b></p>		<p><b>SHEET 4 OF 4</b></p>									

## Notes

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