DC3190B-G

LTP8813

54V, 110A Continuous/140A Peak DC-to-DC µModule Regulator with PMBus Interface

General Description

The DC3190B-G is the demonstration circuit for the LTP8813, a high-current, high-density, high-efficiency open-frame µModule® (micromodule) regulator with a 45V to 65V input range. The DC3190B-G board includes an LTP8813 µModule regulator, which provides microprocessor voltage of 3.3V from a 54V power distribution architecture with digital power system management (PSM). The maximum continuous output current for the DC3190B-G board is 110A. The maximum transient output current is 140A. Refer to the LTP8813 data sheet for more detailed information.

The DC3190B-G 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-G, download the LTpowerPlay® graphical user interface (GUI) software to your PC and use the Analog Devices DC1613A I2C/ system management bus (SMBus)/power management bus (PMBus) dongle to connect to the DC3190B-G board.

The LTpowerPlay allows the user to reconfigure the part on-the-fly, store the configuration in electrically erasable programmable read-only memory (EEPROM), and view telemetry of voltage, current, temperature, and fault status.

Features and Benefits

- DC3190B-G Board
- Transient Circuit Included for Load Transient Evaluation
- GUI with LTpowerPlay

DC3190B-G Evaluation Board Files

FILE	DESCRIPTION
DC3190B-G	Demo board design files
LTpowerPlay	GUI software for LTP8813 Quick Start Guide
DC1613A	I2C/SMBus/PMBus dongle

***Ordering Information* appears at end of this user guide.**

Evaluation Board Photo

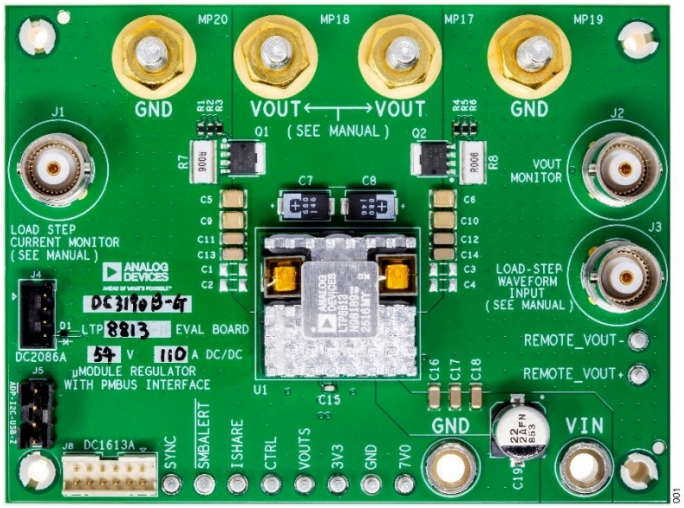

Figure 1. DC3190B-G Evaluation Board (Part Marking is Either Ink Mark or Laser Mark)

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Performance Summary

Specifications are at T_A = 25°C.

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Input voltage range, V_{IN}		45		65	V
Output voltage			3.30		V
Default switching frequency		788	813	838	kHz
Maximum output current	110A steady-state, 140A transient. Derating is necessary for certain V_{IN} and thermal conditions.		110		A
Converter efficiency	V_{IN} = 54V, f_{SW} = 813kHz, V_{OUT} = 3.3V, I_{OUT} = 110A, measured with pulsed load (pulse length: 3 seconds)		94.07		%

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 3.3V and 110A
- Two digital multimeters (DMMs)

Quick Start Procedure

The DC3190B-G is easy to set up to evaluate the LTP8813's performance. See *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} (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 V_{OUT} to GND.
5. Connect the DMMs to the input and output.
6. Connect the DC1613A dongle and control the output voltages from the GUI (optional).
7. Turn on the 3.3V and 7V auxiliary power supply before turning on the input power supply.
8. Turn on the input power supply and check for the proper output voltage. The V_{OUT} should be 3.25V ±0.5%.
9. Once the input and output voltages are properly established, adjust the load current within the operating range of 0A to 110A max. Observe the output voltage regulation, output voltage ripple, load transient response, and other parameters. For operation under heavy load conditions, the use of a cooling fan is required.
10. Turn off the input power supply before turning off the auxiliary power supplies.
11. Turn off the 3.3V and 7V auxiliary power supplies.

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.

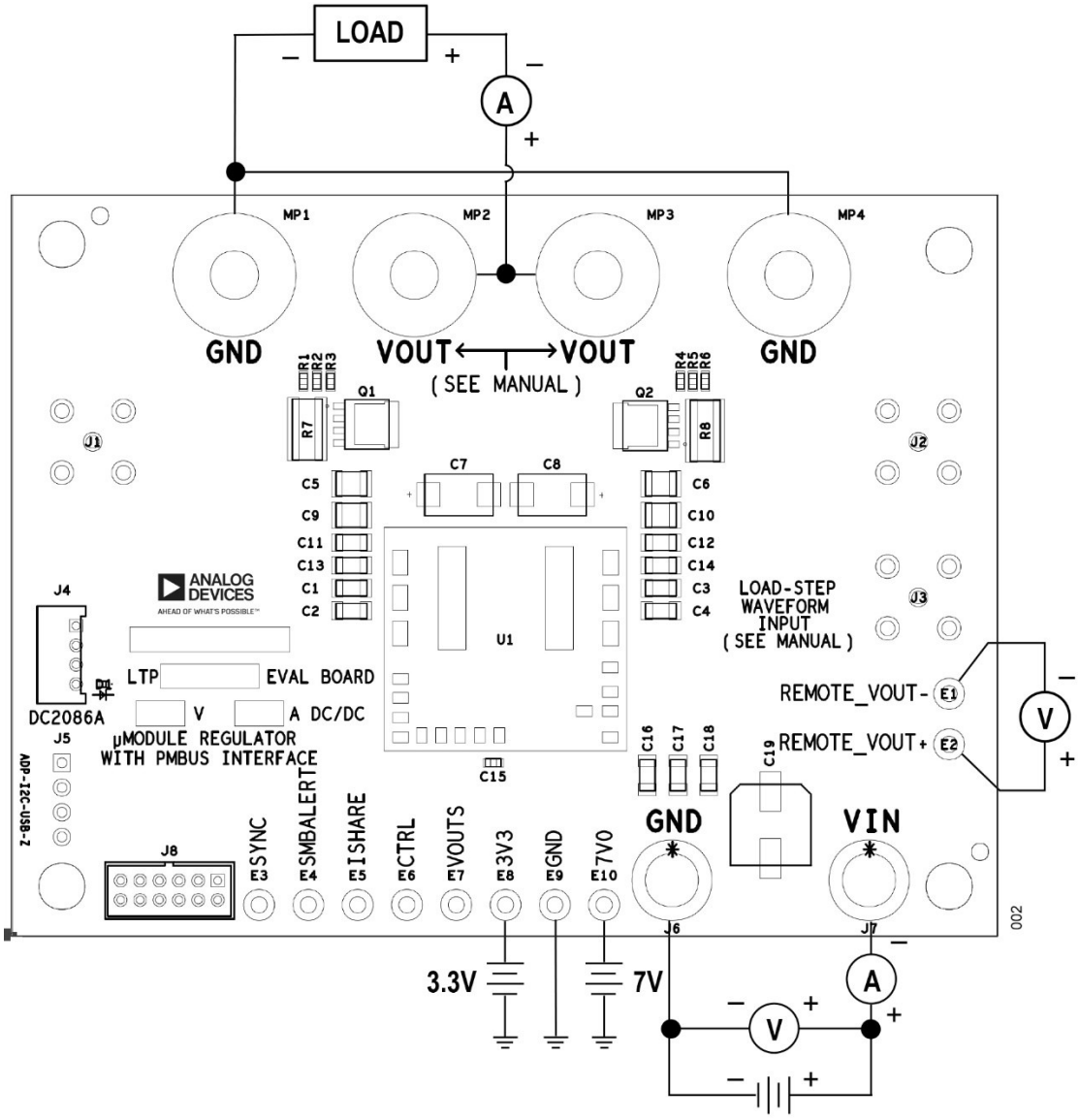


Figure 2. Proper Measurement Equipment Setup

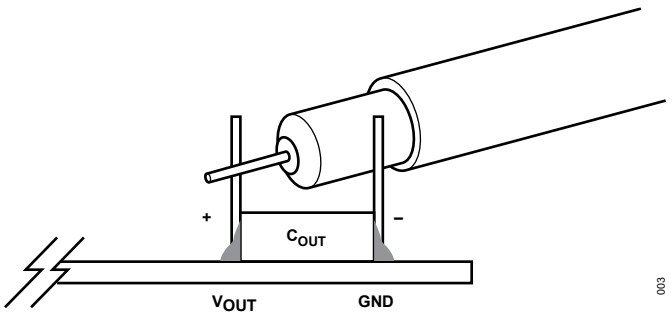


Figure 3. Measuring Output Voltage Ripple

Connect PC to the DC3190B-G Evaluation Board

Use a PC to reconfigure the PSM features of the LTP8813, including nominal V_{OUT}, margin set points, overvoltage/undervoltage (OV/UV) limits, temperature fault limits, sequencing parameters, the fault log, fault responses, general purpose input/outputs (GPIOs), and other functionalities.

The LTpowerPlay utilizes the DC1613A USB-to-SMBus dongle to communicate with one of the demo systems, or a customer board (see *Figure 4*). 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 (see *Figure 5*).

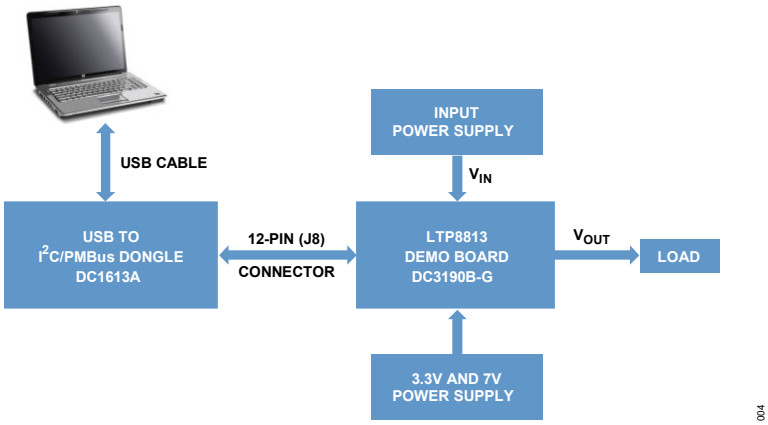


Figure 4. Demo Setup with PC

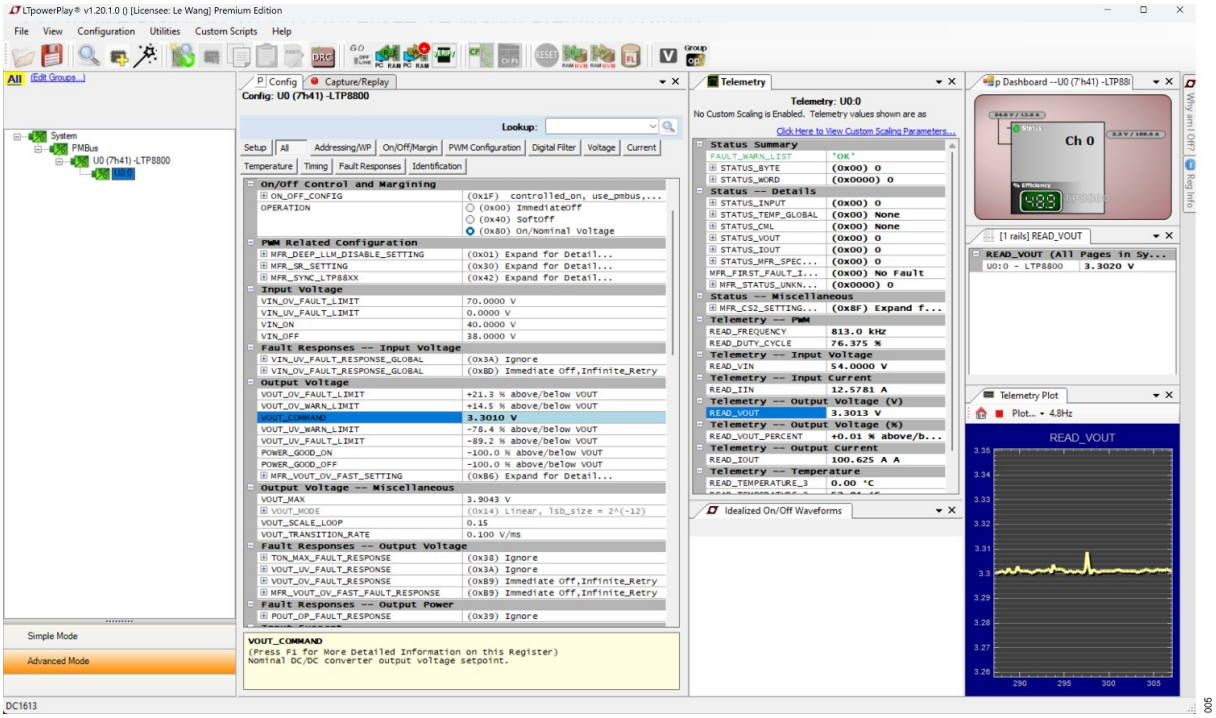


Figure 5. LTP8813 LTpowerPlay Main Interface

Typical Performance Characteristics

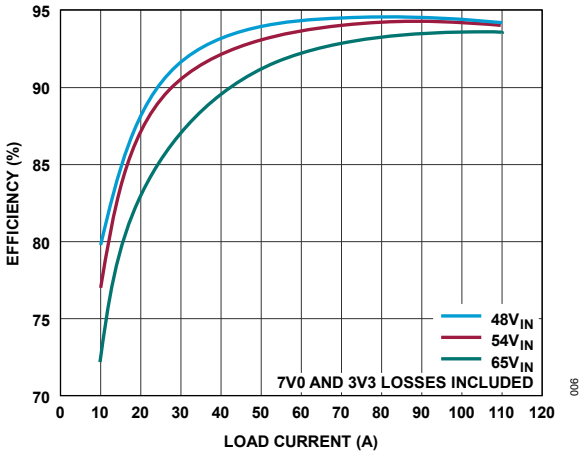
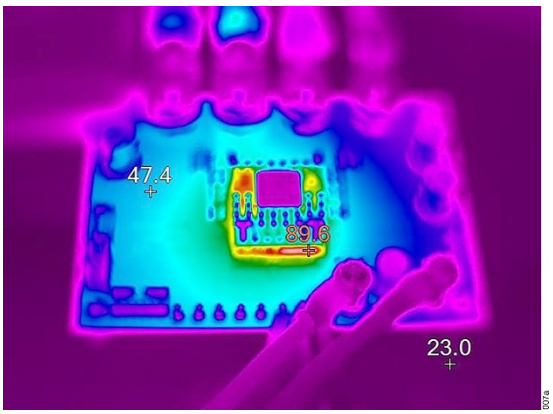
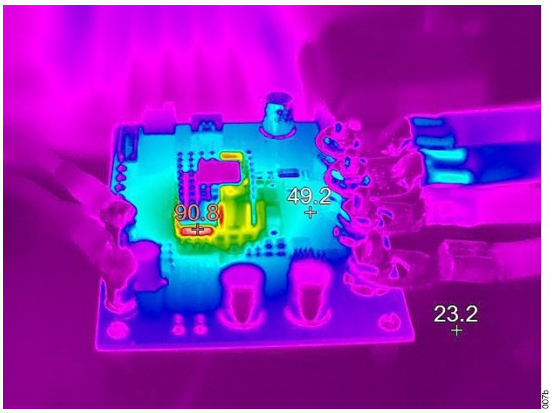


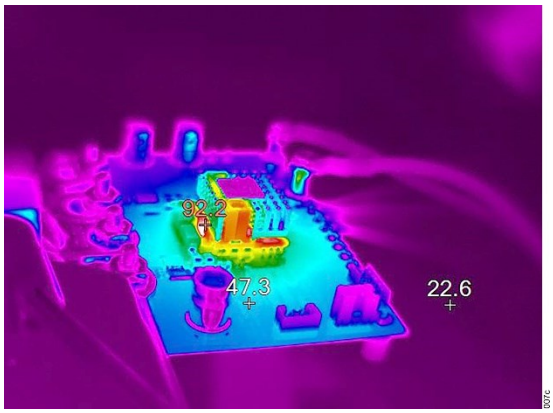
Figure 6. Measured LTP8813 Efficiency at V_{OUT} = 3.3V, T_A = 25°C, under a Pulsed Load (Pulse Length: 3 seconds)



(a)



(b)



(c)

Figure 7. LTP8813 Thermal Performance at V_{IN} = 54V, V_{OUT} = 3.3V, I_{OUT} = 110A, T_A = 25°C, 700LFM Forced Airflow

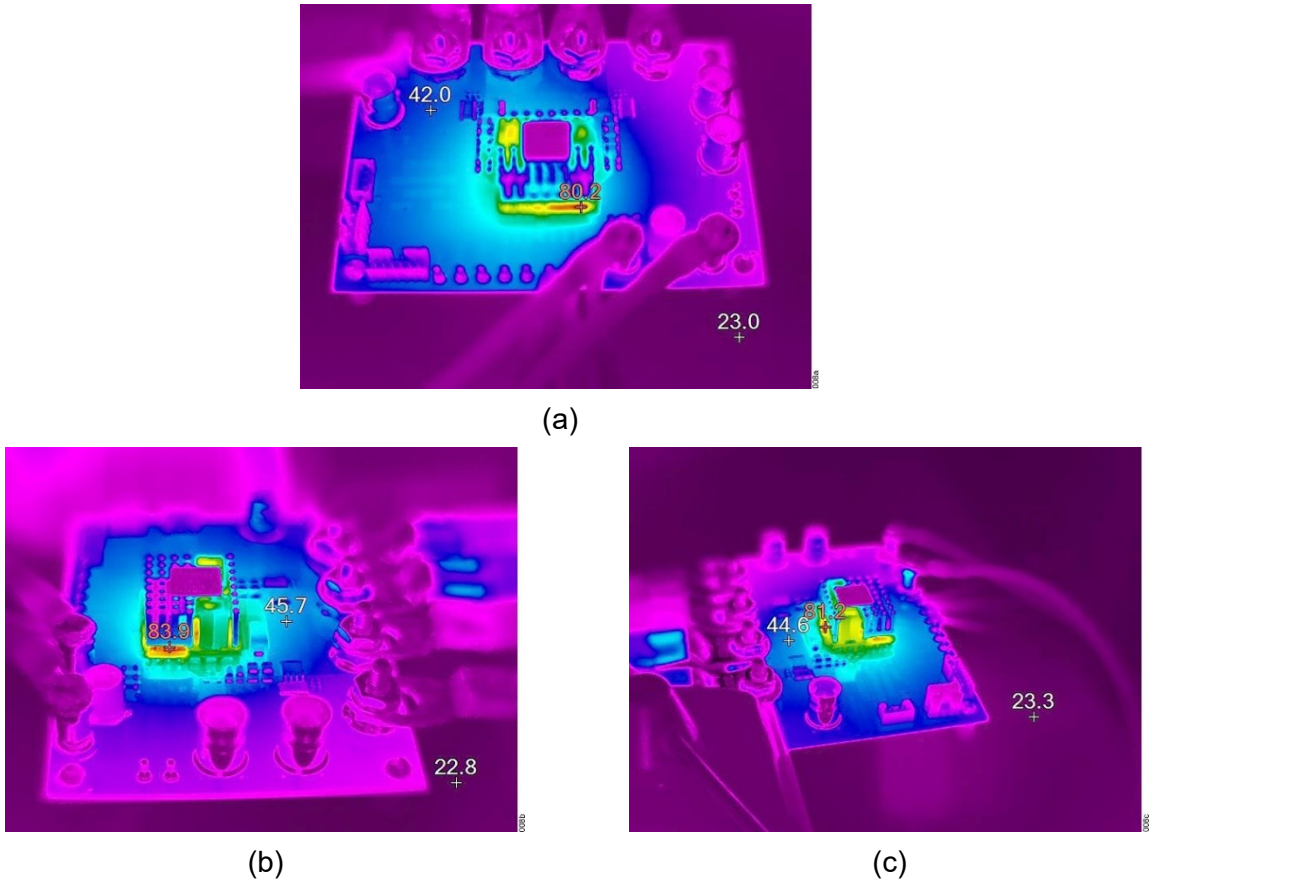


Figure 8. LTP8813 Thermal Performance at V_{IN} = 54V, V_{OUT} = 3.3V I_{OUT} = 110A, T_A = 25°C, 900LFM Forced Airflow

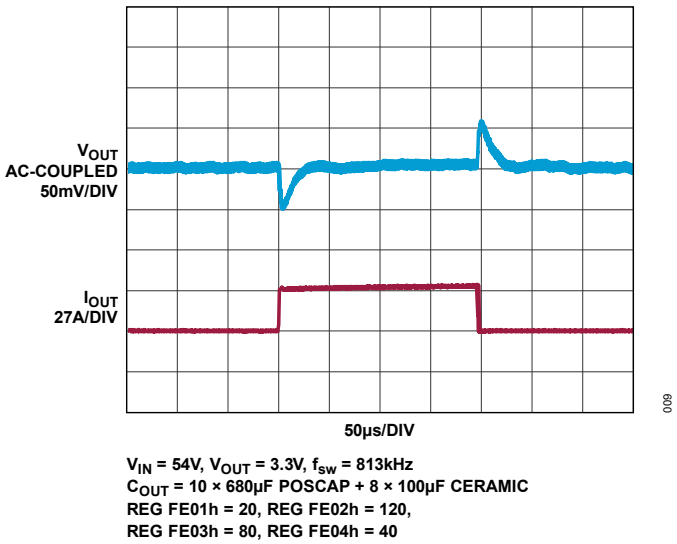


Figure 9. LTP8813 Load Transient Responses with Load Steps 0A to 27.5A at dI/dt = 27.5A/µs (Step pulse applied through J1)

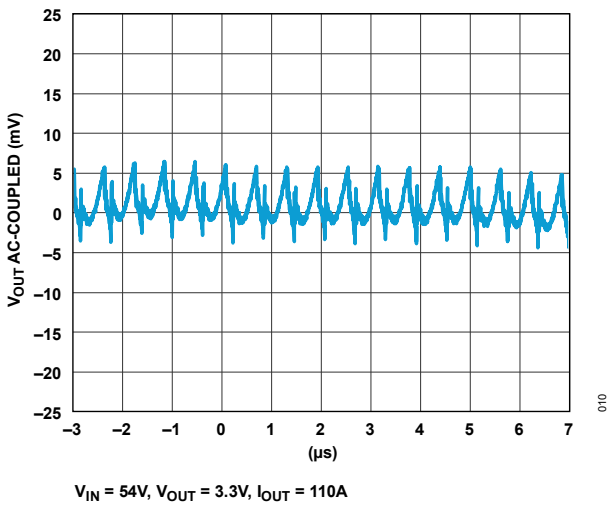


Figure 10. LTP8813 Output Voltage Ripple Measured Through J2 (20MHz Bandwidth (BW) Limit)

DC3190B-G Evaluation Board Bill of Materials

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
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., 680µF, TANT, POLY, POSCAP, 6.3V, 20%, 7343, D4	PANASONIC, 6TPE680MI
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-CHANNEL, 25V, 70A, LFPAK55, 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.,511Ω,0.1%,1/10W,0603	SUSUMU, RG1608P-5110-B-T5
19	1	R22	RES.,2.87kΩ,0.1%,1/10W,0603	SUSUMU, RG1608P-2871-B-T5
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.,110A CONTINUOUS, 140A TRANSIENT DC-to-DC µModule REGULATOR WITH PMBus INTERFACE	ANALOG DEVICES, LTP8813IPV#PBF

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Additional Demo Board Circuit Components				
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-G	ADI APPROVED SUPPLIER, 600-DC3190B-G
Hardware for Demo Board Only				
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-MH4	STANDOFF, NYLON, SNAP-ON, 0.375"	KEYSTONE, 8832
8	4	MP1-MP4	STUD, FASTENER, #10-32	PENNENGINEERING, KFH-032-10ET
9	4	MP5-MP8	WASHER, FLAT, STEEL, ZINC PLATE, OD: 0.436 [11.1]	KEYSTONE, 4703
10	8	MP9-MP16	NUT, HEX, #10-32, STEEL, ZINC PLATE	KEYSTONE, 4705
11	4	MP17-MP20	RING, LUG, #10, CRIMP, 16/14 AWG, NON-INSULATED, SOLDERLESS TERMINALS	KEYSTONE, 8205

DC3190B-G Evaluation Board Schematics

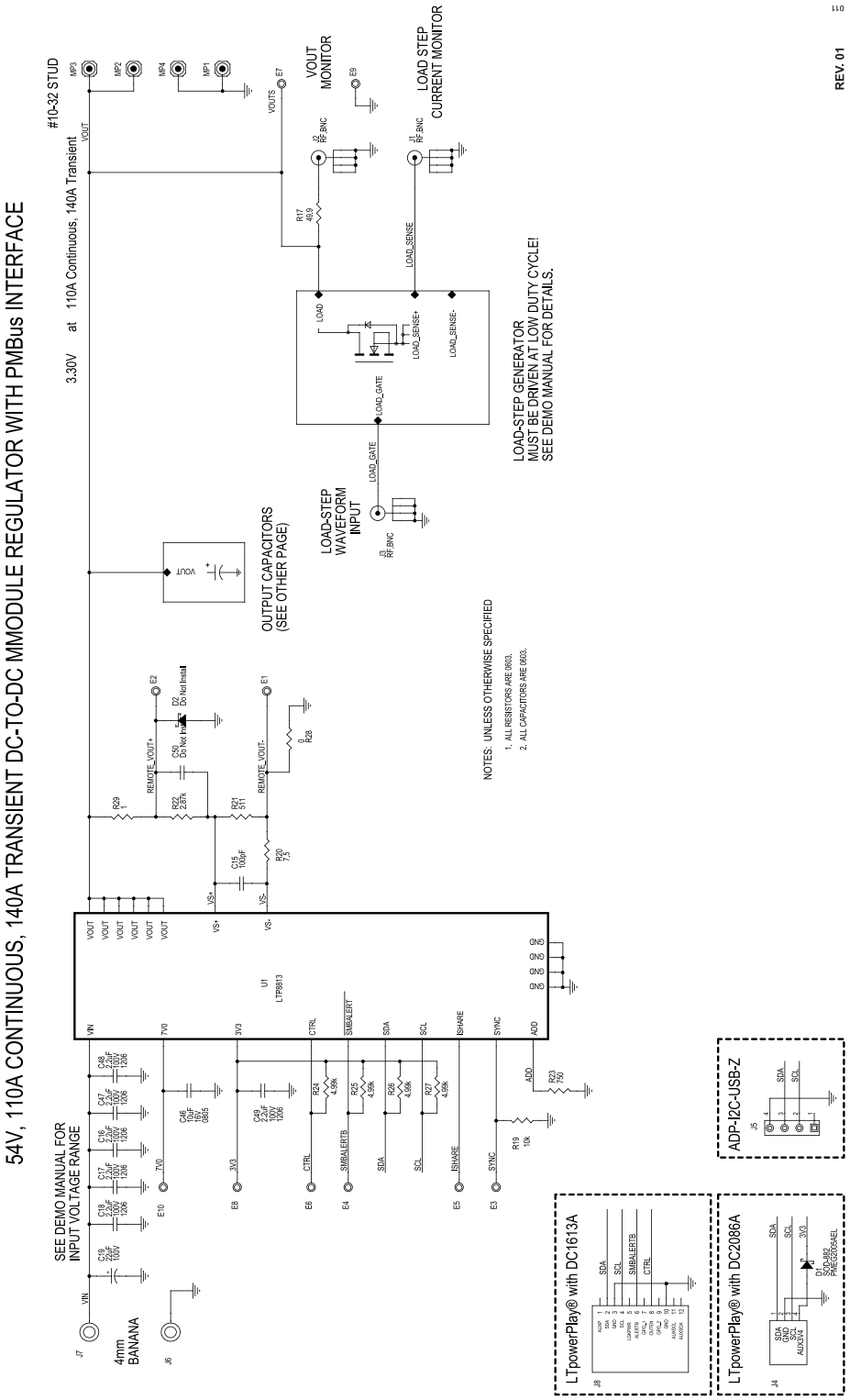


Figure 11. DC3190B-G Evaluation Board Schematic Diagram (Page 1 of 4)

DC3190B-G Evaluation Board Schematics (continued)

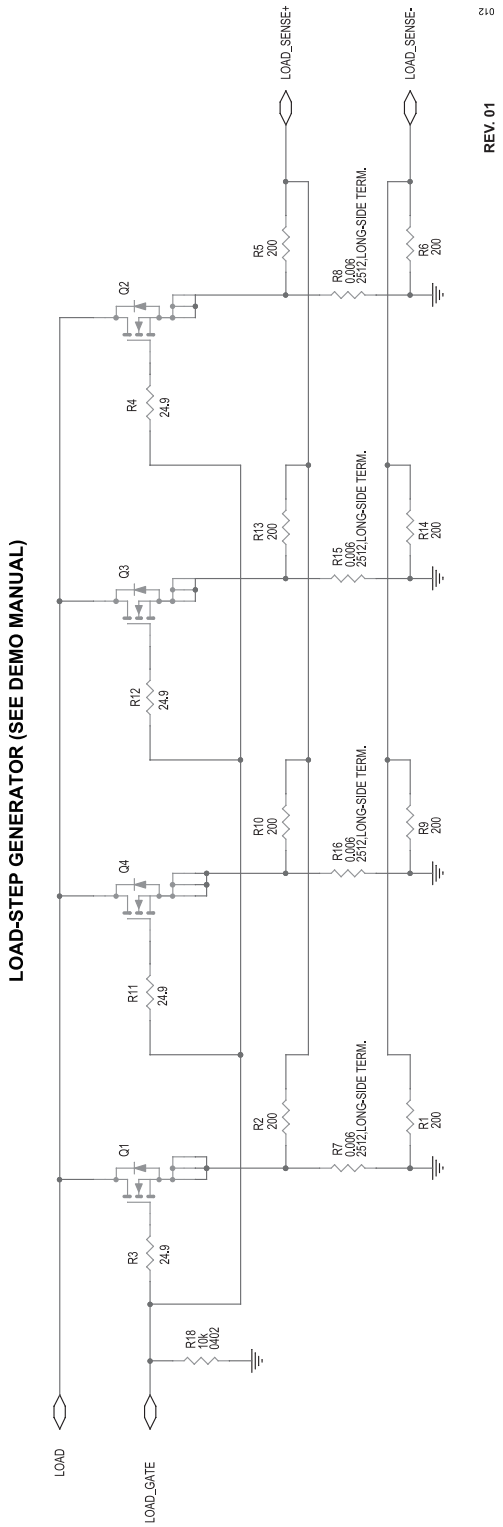


Figure 12. DC3190B-G Evaluation Board Schematic Diagram (Page 2 of 4)

DC3190B-G Evaluation Board Schematics (continued)

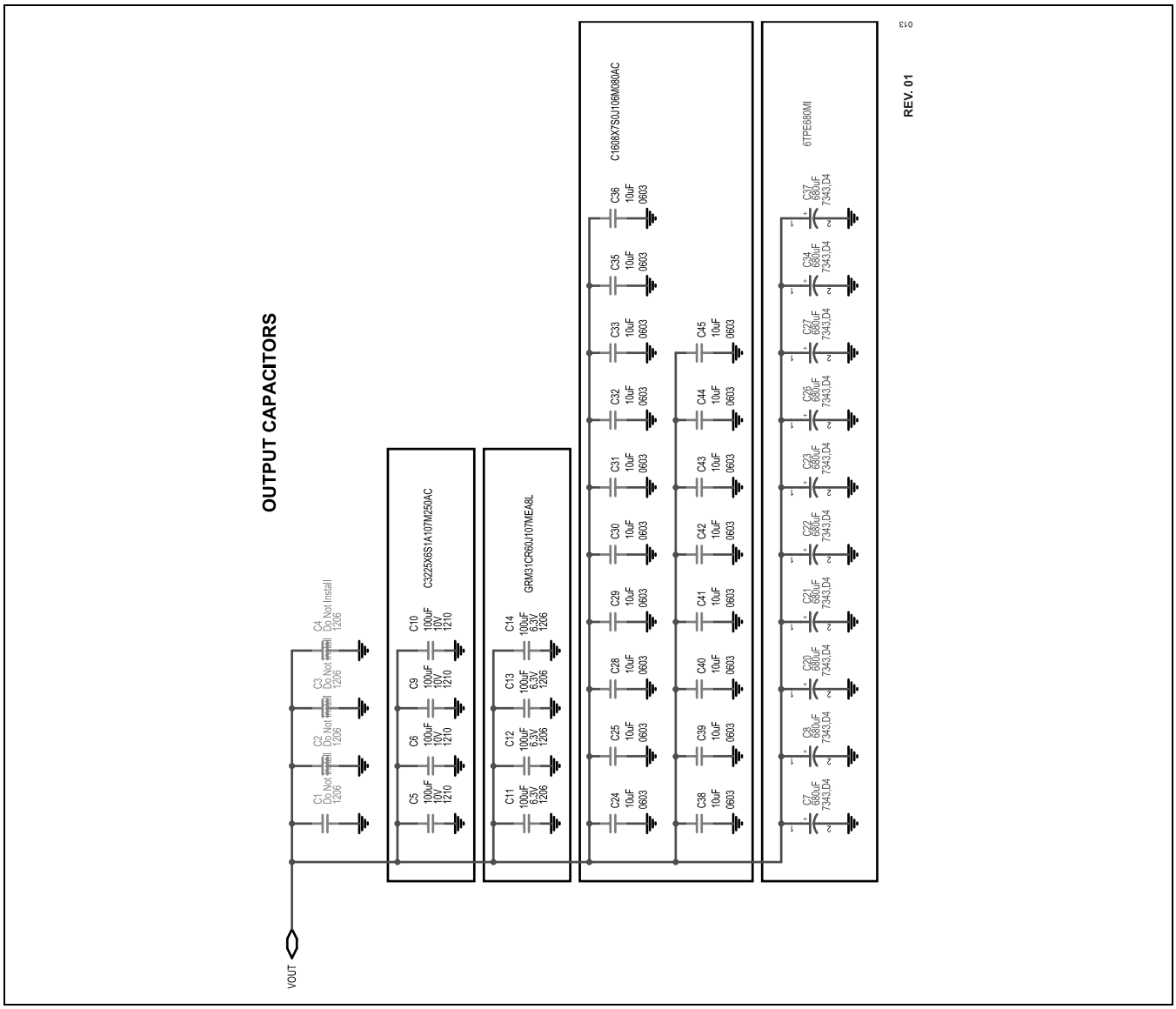


Figure 13. DC3190B-G Evaluation Board Schematic Diagram (Page 3 of 4)

DC3190B-G Evaluation Board Schematics (continued)

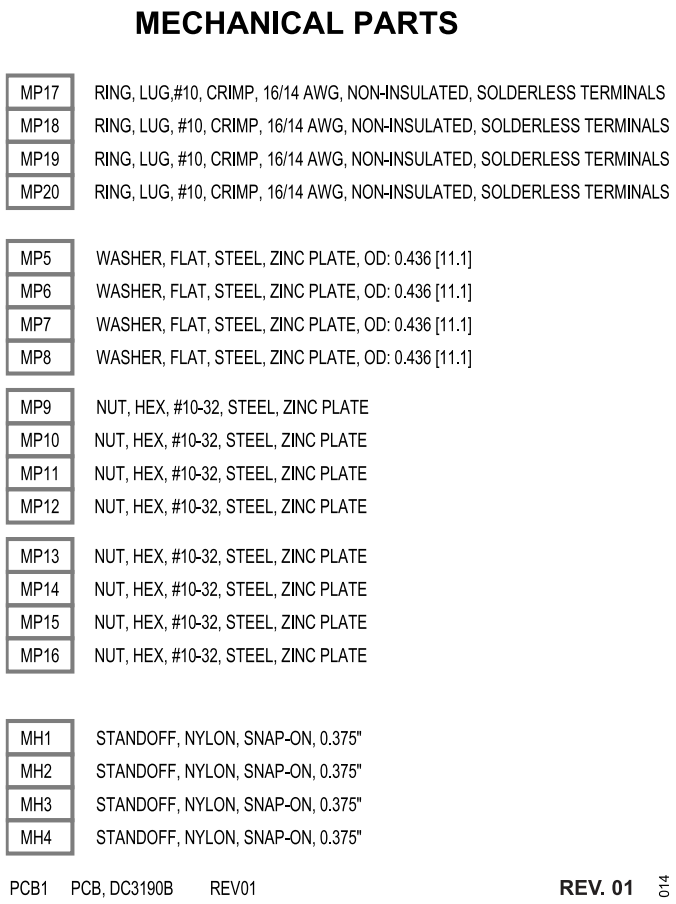


Figure 14. DC3190B-G Evaluation Board Schematic Diagram (Page 4 of 4)

Ordering Information

MODEL	DESCRIPTION
DC3190B-G	54V Input, high current DC-to-DC power µModule regulator evaluation board with PMBus interface.
DC1613A	USB-to-PMBus controller dongle.

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	1/26	Initial release.	—

Notes