

## DESCRIPTION

Demonstration circuit 1902B features the ideal diode bridge controller LT<sup>®</sup>4320 suitable for applications that require low to medium current AC to DC full-wave rectification or DC polarity correction and a small compact solution (see Table 2).

The LT4320 drives four N-channel MOSFETs to perform full-wave rectification functionally similar to a diode bridge but with much lower power dissipation. This topology eases thermal design, and increases usable output voltage. In addition, an all N-channel topology has benefits over a P-channel topology such as a wider selection of MOSFETs, lower cost, lower  $R_{DS(ON)}$ , and smaller footprint.

Only a few essential components are required to operate the LT4320 as an ideal diode bridge: four N-channel

MOSFETs, a bypass ceramic capacitor, and an AC smoothing capacitor ( $C_{LOAD}$ ). The DC1902B includes low  $R_{DS(ON)}$  N-channel MOSFETs (10m $\Omega$  typical) to support low to medium current applications. When an AC voltage source is used, the onboard  $C_{LOAD}$  (C2) capacitor allows for up to 1.5A of average output current. Add additional  $C_{LOAD}$  capacitance to support higher current AC applications. A unidirectional TVS (D1) is included to protect the application from brief overvoltage events up to the part rating. A footprint for bidirectional TVS (D2) is also included and is recommended for electrically harsh conditions.

**Design files for this circuit board are available at <http://www.linear.com/demo>**

LT, LT, LTC, LTM, Linear Technology and the Linear logo are registered trademarks of Linear Technology Corporation. All other trademarks are the property of their respective owners.

## PERFORMANCE SUMMARY

Table 1. DC Efficiency of the DC1902B at Various Input Voltages

DC INPUT VOLTAGE (V)	DC OUTPUT VOLTAGE (V)	DC LOAD CURRENT (A)	EFFICIENCY (%) (TYPICAL)
12.046	11.977	3.500	99.43
20.045	19.972	3.500	99.64
40.025	39.952	3.500	99.82

# DEMO MANUAL DC1902B

## QUICK START PROCEDURE

1. Connect a DC or AC power supply to VIN1 and VIN2 in any polarity as shown in Figure 1. Make sure the output voltage of the DC or AC power supply is within the input voltage range of the DC1902B as shown in Table 2.
  2. Connect a load and a voltmeter across VOUT+ to VOUT- as shown in Figure 1.
  3. For a DC input, raise the output voltage of the DC power supply to the desired level. Check the DC1902B output voltage across VOUT+ to VOUT-. The reading should be very close to the input voltage of the DC1902B.
  4. For an AC input, raise the output voltage of the AC power supply to the desired level. Make sure the load current is within the current limits as shown in Table 2 with the demo board supplied C<sub>LOAD</sub> (C2). Add additional C<sub>LOAD</sub> capacitance, if higher output load current is desired. With an oscilloscope in place of the output voltmeter, make sure the lowest point of the output voltage (droop) is above the minimum operating voltage specified in the LT4320 data sheet.
- Note:** Maximum load current with an AC input should be limited to about 3A due to MOSFET and PCB limitations.

Table 2. Maximum Load Current per Input Voltage and Type of Voltage Source

VOLTAGE SOURCE	INPUT VOLTAGE	MAXIMUM LOAD CURRENT
DC	9VDC to 60VDC	3.5A
AC, 60Hz	12VAC <sub>RMS</sub>	0.7A*
AC, 60Hz	24VAC <sub>RMS</sub>	1.5A*

\*Limited by demo board supplied C2.

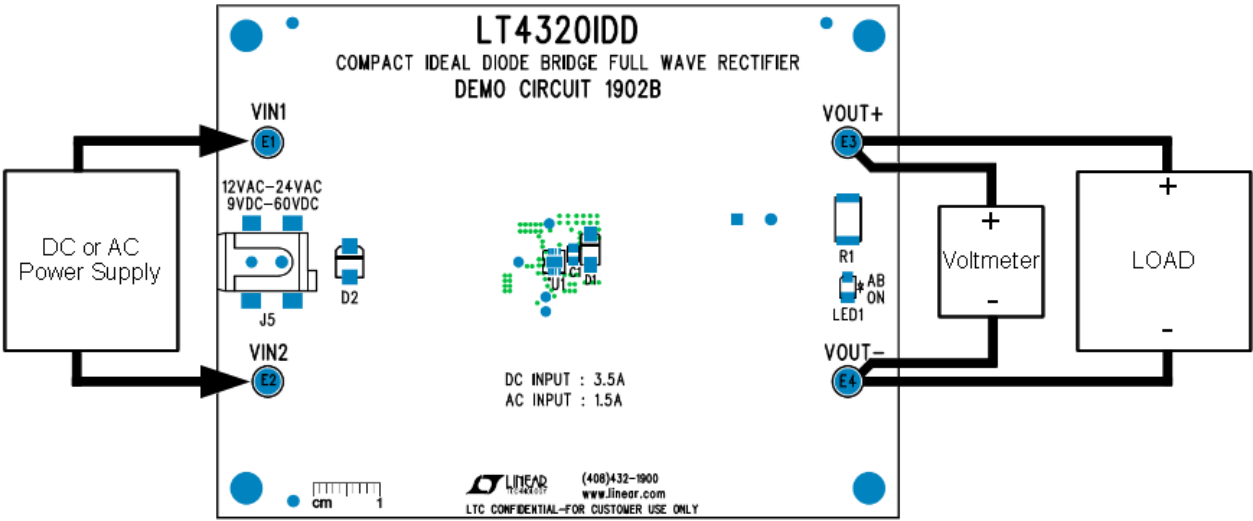


Figure 1. DC1902B Setup

## THERMAL PLOT

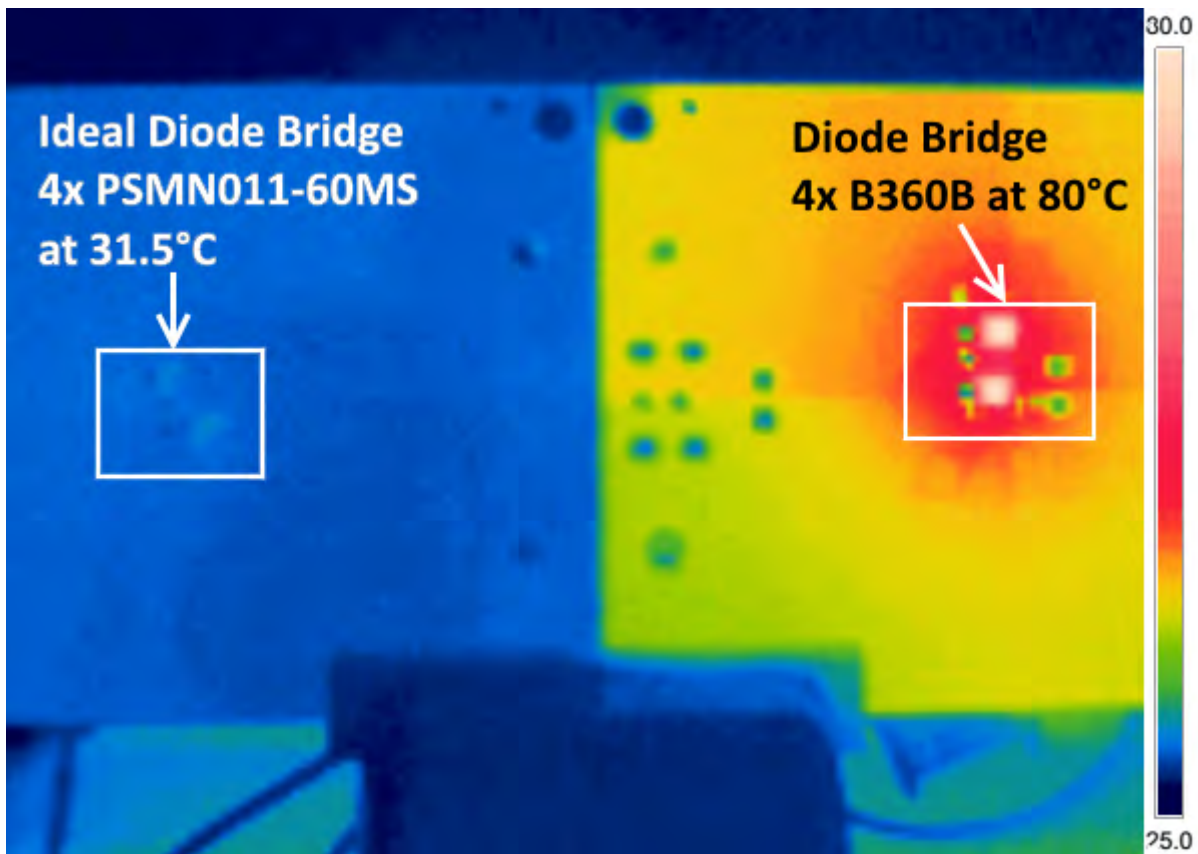


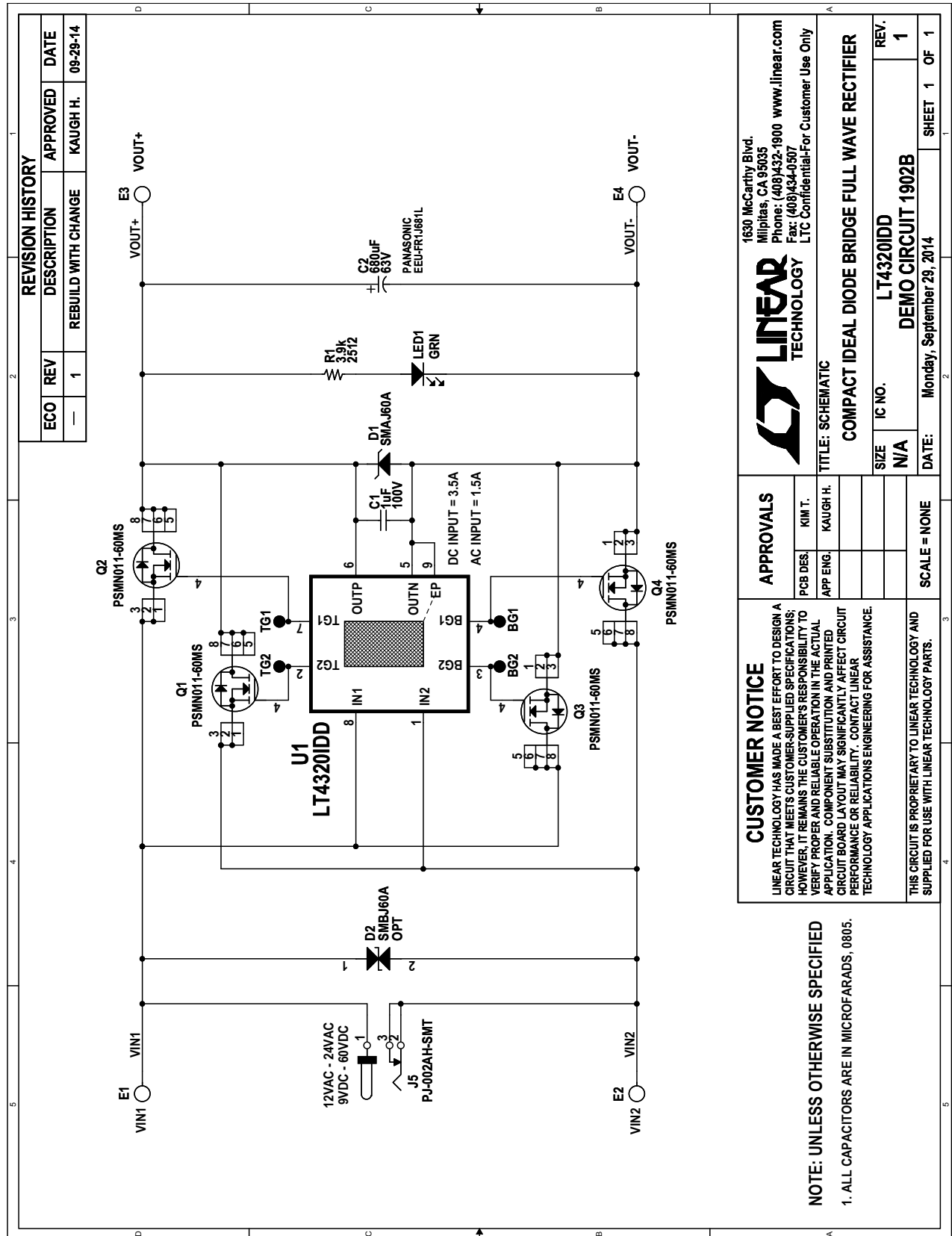
Figure 2. Ideal Diode Bridge Using Four PSMN011-60MS vs Diode Bridge Using Four B360B Passing 3ADC (VIN1 Positive with Respect to VIN2)

# DEMO MANUAL DC1902B

## PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
<b>Required Circuit Components</b>				
1	1	C1	CAP, X7S, 1 $\mu$ F, 100V, 10% 0805	TDK, C2012X7S2A105K
2	1	C2	CAP, ALUM, 680 $\mu$ F 63V, C-SANYO-12.5X35	PANASONIC, EEU-FR1J681L
3	1	U1	IC, LT4320IDD, DFN8DD	LINEAR TECHNOLOGY, LT4320IDD#PBF
4	4	Q1 TO Q4	MOSFET, N-CH, 60V, LFPK33	NXP, PSMN011-60MS
<b>Optional Circuit Components</b>				
1	1	D1	DIODE, TVS 400W, SMA-DIODE	DIODES INC, SMAJ60A-13-F
2	0	D2	DIODE, SMBJ60CA	OPT
3	4	E1 TO E4	TP, TURRET, 0.094"	MILL-MAX, 2501-2-00-80-00-00-07-0
4	1	J5	CONN, POWER JACK 2.1X5.5MM HI CUR SMD	CUI INC, PJ-002A-SMT
5	1	LED1	LED, GREEN SMD	ROHM, SML-010FTT86L
6	1	R1	RES, CHIP 3.9k, 5% 2512	VISHAY, CRCW25123K90JNEG
7	4	MH1 TO MH4	STAND-OFF, NYLON 0.50" TALL	KEystone, 8833 (SNAP ON)

## SCHEMATIC DIAGRAM



# DEMO MANUAL DC1902B

---

## DEMONSTRATION BOARD IMPORTANT NOTICE

Linear Technology Corporation (LTC) provides the enclosed product(s) under the following **AS IS** conditions:

This demonstration board (DEMO BOARD) kit being sold or provided by Linear Technology is intended for use for **ENGINEERING DEVELOPMENT OR EVALUATION PURPOSES ONLY** and is not provided by LTC for commercial use. As such, the DEMO BOARD herein may not be complete in terms of required design-, marketing-, and/or manufacturing-related protective considerations, including but not limited to product safety measures typically found in finished commercial goods. As a prototype, this product does not fall within the scope of the European Union directive on electromagnetic compatibility and therefore may or may not meet the technical requirements of the directive, or other regulations.

If this evaluation kit does not meet the specifications recited in the DEMO BOARD manual the kit may be returned within 30 days from the date of delivery for a full refund. THE FOREGOING WARRANTY IS THE EXCLUSIVE WARRANTY MADE BY THE SELLER TO BUYER AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. EXCEPT TO THE EXTENT OF THIS INDEMNITY, NEITHER PARTY SHALL BE LIABLE TO THE OTHER FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES.

The user assumes all responsibility and liability for proper and safe handling of the goods. Further, the user releases LTC from all claims arising from the handling or use of the goods. Due to the open construction of the product, it is the user's responsibility to take any and all appropriate precautions with regard to electrostatic discharge. Also be aware that the products herein may not be regulatory compliant or agency certified (FCC, UL, CE, etc.).

No License is granted under any patent right or other intellectual property whatsoever. **LTC assumes no liability for applications assistance, customer product design, software performance, or infringement of patents or any other intellectual property rights of any kind.**

LTC currently services a variety of customers for products around the world, and therefore this transaction **is not exclusive**.

**Please read the DEMO BOARD manual prior to handling the product.** Persons handling this product must have electronics training and observe good laboratory practice standards. **Common sense is encouraged.**

This notice contains important safety information about temperatures and voltages. For further safety concerns, please contact a LTC application engineer.

Mailing Address:

Linear Technology  
1630 McCarthy Blvd.  
Milpitas, CA 95035

Copyright © 2004, Linear Technology Corporation

dc1902bfa

6

Linear Technology Corporation

1630 McCarthy Blvd., Milpitas, CA 95035-7417

(408) 432-1900 • FAX: (408) 434-0507 • [www.linear.com](http://www.linear.com)

LT 1214 • PRINTED IN USA



© LINEAR TECHNOLOGY CORPORATION 2013