

# LTC3260EMSE

## High Voltage, Low Noise, Dual Supply Inverting Charge Pump

### DESCRIPTION

Demonstration circuit 1793A is a high voltage inverting charge pump with low noise dual-polarity LDO regulators featuring the LTC®3260EMSE. The LTC3260 operates with an input voltage from 4.5V to 32V. The demo board provides selectable LDO± output set magnitudes of 3.3V, 5V, 12V and 24V for each polarity. Additional LDO± set point jumper selections and optional topside ADJ± resistors allow the user to set other desired LDO± output voltages. The demo board also provides the means to select between Burst Mode® operation or constant-frequency

mode operation, plus select an operating frequency of 500kHz, 200kHz, and 50kHz.

The LTC3260 data sheet gives a complete description of the device, operation and application information. The data sheet must be read in conjunction with this quick start guide for demo circuit 1793A.

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

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### PERFORMANCE SUMMARY

Specifications are at  $T_A = 25^\circ\text{C}$

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
$V_{IN}$	Input Voltage		4.5		32	V
VLDO+	LDO+ Output Voltage	$V_{IN} \geq \text{LDO+ Set Point} + 0.8\text{V}$	1.2		32	V
VLDO–	LDO– Output Voltage	$V_{OUT} \leq \text{LDO– Set Point} - 0.5\text{V}$	–32		–1.2	V
$V_{OUT}$	Output Voltage	MODE = 0V MODE $\geq$ 2V		$-V_{IN}$ $-0.94 \cdot V_{IN}$		V V

### QUICK START PROCEDURE

Refer to Figure 1 for the proper measurement equipment setup and jumper settings, and follow the procedure below.

NOTE: When measuring the input or output voltage ripple, care must be taken to avoid a long ground lead on the oscilloscope probe. Measure the input or output voltage ripple by touching the probe tip directly across the  $V_{IN}$  or  $V_{OUT}$  and GND terminals. See Figure 2 for proper scope probe technique.

- Make sure the jumper settings are as follows:
  - JP1:** EN+ is in the ON position.
  - JP2:** EN– is in the ON position.
  - JP3:** MODE is in the BURST position.
  - JP4:** FREQ is in the 500kHz position.
  - JP5:** LDO+ is set to the 5V setting.
  - JP6:** LDO– is set to the –5V setting.
- Set PS1 to 12V.

## QUICK START PROCEDURE

3. Slowly increase the load on LDO– to –50mA and observe how the output ripple on  $V_{OUT}$  changes and how the burst frequency increases. When the load is large enough, the charge pump will run constant frequency to keep  $V_{OUT}$  in regulation.
  4. Slowly increase the load on LDO+ to 50mA and observe the output ripple and the output voltage on LDO+.
  5. Set the LDO+ load and the LDO– load to 0mA and turn off PS1.
- NOTE: To avoid applying an overvoltage to the ADJ± pins, power must be turned off before changing the LDO+ or LDO– jumpers.
6. Set the JP5 LDO+ jumper to the 3.3V position and JP6 LDO– to the –3.3V position.
  7. Repeat steps 2 through 5.
  8. Set the JP5 LDO+ jumper to the 12V position and JP6 LDO– to the –12V position.
  9. Turn on and set PS1 to 15V.
  10. Repeat steps 3 through 5.
  11. Set the JP5 LDO+ jumper to the 24V position and JP6 LDO– to the –24V position.
  12. Turn on and set PS1 to 32V.
  13. Repeat steps 3 through 6.
  14. Turn on and set PS1 to 12V.
  15. Slowly increase the load on  $V_{OUT}$  to –100mA and observe the output ripple and output voltage on  $V_{OUT}$ .
  16. Set the load on  $V_{OUT}$  to 0mA.
  17. Change the JP3 MODE jumper from Burst Mode operation to constant-frequency mode and repeat steps 14 and 15.
  18. Change the JP4 FREQ jumper from 500kHz to 200kHz, then slowly increase the load on  $V_{OUT}$  from 0mA to –50mA and observe the output ripple and output voltage on  $V_{OUT}$ .
  19. Set the load on  $V_{OUT}$  to 0mA.
  20. Change the JP4 FREQ jumper from 200kHz to 50kHz. Slowly increase the load on  $V_{OUT}$  from 0mA to –10mA and observe the output ripple and output voltage on  $V_{OUT}$ .

Figures 4 and 5 illustrate how the efficiency varies with load current in Burst Mode operation and in constant-frequency mode operation.

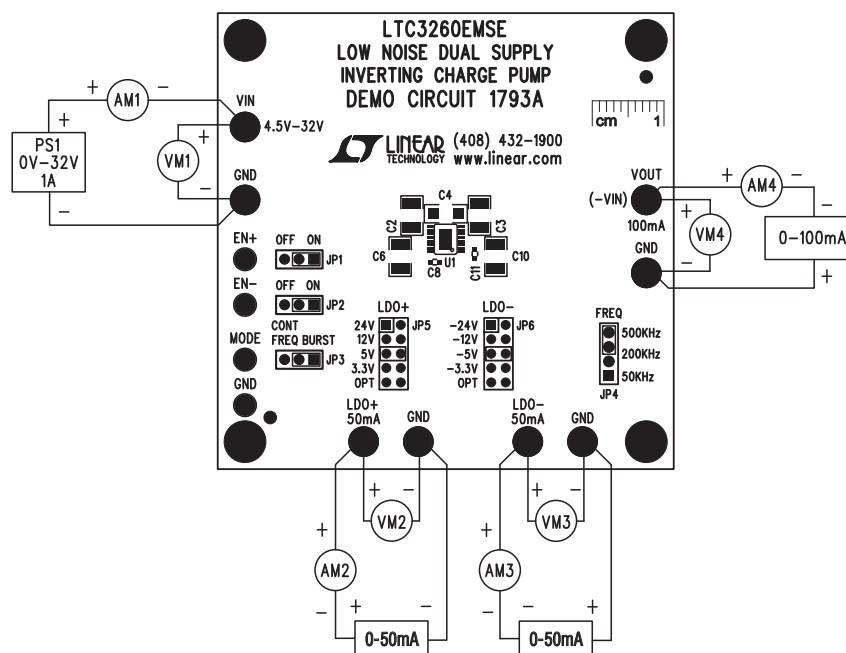


Figure 1. Proper Measurement Equipment Setup for DC1793A

## QUICK START PROCEDURE

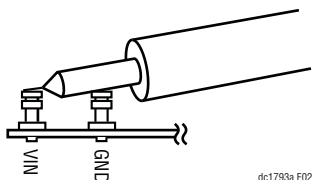


Figure 2. Measuring Input or Output Ripple

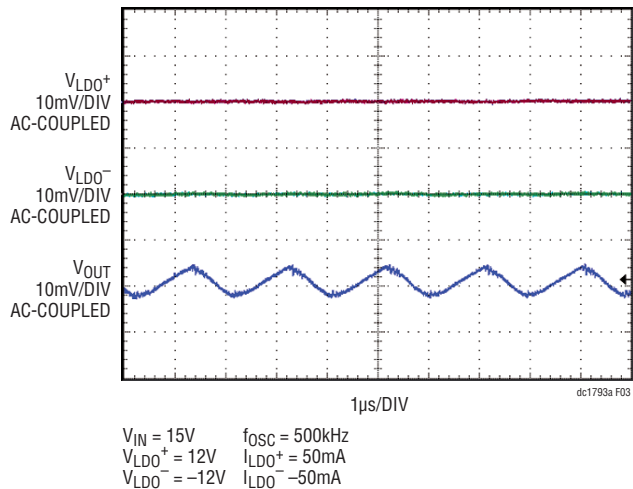


Figure 3. LDO Rejection of  $V_{OUT}$  Ripple

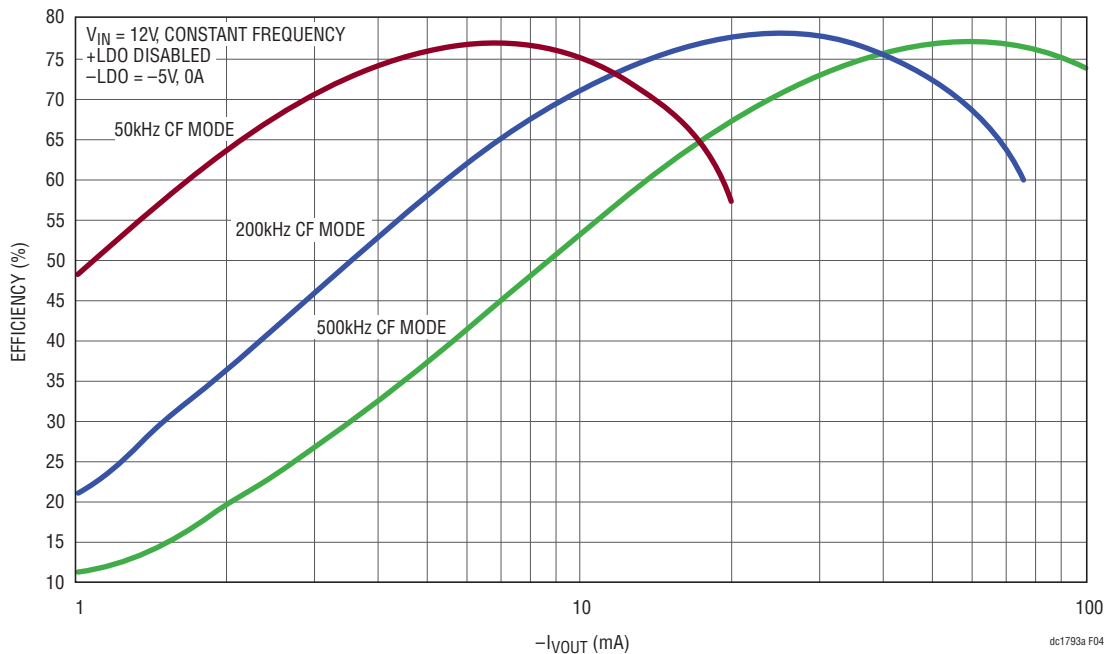


Figure 4.  $V_{IN}$  to  $V_{OUT}$  Constant-Frequency Mode Operation Efficiency

## QUICK START PROCEDURE

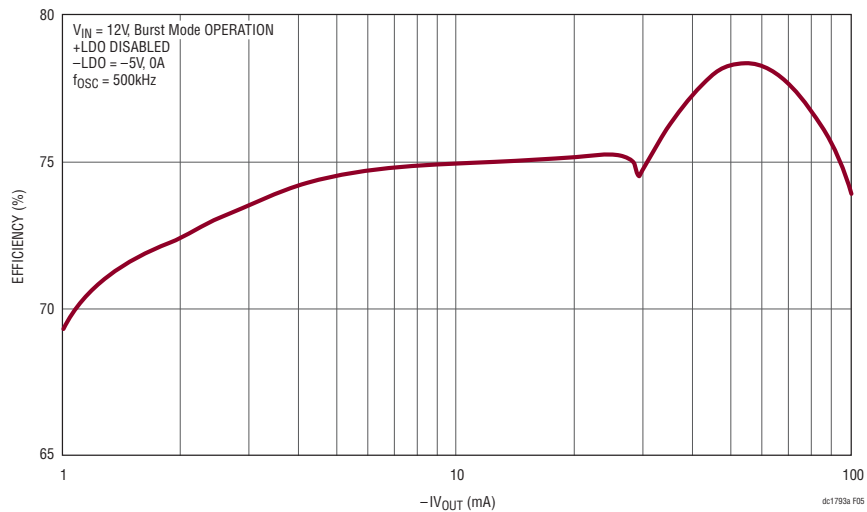


Figure 5. V<sub>IN</sub> to V<sub>OUT</sub> Burst Mode Operation Efficiency

## PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
<b>Required Circuit Components</b>				
1	4	C2, C3, C6, C10	CAP, CER, 10μF, 50V, X7S, 10%, 1210	TDK, C3225X7S1H106K
2	1	C4	CAP, CER, 1μF, 50V, X7R, 10%, 1206	MURATA, GRM31MR71H105KA88
3	2	R11, R18	RES, 100k, 1/16W, 1%, 0402, SMD	VISHAY, CRCW0402100KFKED
4	1	U1	LOW NOISE DUAL-SUPPLY INVERTING CHARGE PUMP	LINEAR TECHNOLOGY, LTC3260EMSE#PBF
<b>Additional Demo Board Circuit Components</b>				
5	1	C1	CAP, CER, 4.7μF, 50V, X7R, 10%, 1210	MURATA, GRM32ER71H475KA88L
6	0	C5, C7, C9 (OPT)	CAP, CER, 0603, 50V	OPT
7	2	C8, C11	CAP, CER, 0.01μF, 25V, X7R, 10%, 0402	MURATA, GRM155R71E103KA01D
8	3	R1, R8, R10	RES, 1MΩ, 1/16W, 5%, 0402, SMD	VISHAY, CRCW04021M00JNED
9	2	R2, R13	RES, 1.91MΩ, 1/16W, 1%, 0402, SMD	VISHAY, CRCW04021M91FKED
10	2	R3, R14	RES, 909k, 1/16W, 1%, 0402, SMD	VISHAY, CRCW0402909KFKED
11	2	R5, R16	RES, 174k, 1/16W, 1%, 0402, SMD	VISHAY, CRCW0402174KFKED
12	0	R6, R17 (OPT)	RES, 0402, SMD	OPT
13	3	R7, R9, R12	RES, 1k, 1/16W, 5%, 0402, SMD	VISHAY, CRCW04021K00FKED
14	1	R19	RES, 1MΩ, 1/16W, 1%, 0402, SMD	VISHAY, CRCW04021M00FKED
15	1	R20	RES, 200k, 1/16W, 1%, 0402, SMD	VISHAY, CRCW0402200KFKED
<b>Hardware: For Demo Board Only</b>				
17	3	JP1-JP3	HEADER, 3 PIN, 1 ROW, 0.079"	SAMTEC, TMM-103-02-L-S
18	1	JP4	HEADER, 4 PIN, 1 ROW, 0.079"	SAMTEC, TMM-104-02-L-S
19	2	JP5, JP6	HEADER, 2×5 PINS, 2mm	SAMTEC, TMM-105-02-L-D
20	6	JP1-JP6	SHUNT, 2mm	SAMTEC, 2SN-KB-G
21	8	E1, E2, E7-E12	TP, TURRET, 0.094", PBF	MILL-MAX, 2501-2-00-80-00-00-07-0
22	4	E3-E6	TURRET, 0.061", DIA	MILL-MAX, 2308-2-00-80-00-00-07-0

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# DEMO MANUAL DC1793A

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

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

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