

LTM8028

36V_{IN}, UltraFast, Low Output Noise, 5A μ Module Regulator

DESCRIPTION

Demonstration circuit 1738A features the **LTM[®]8028**, a μ Module[®] step-down converter that integrates both a high efficiency switching regulator and a 5A UltraFast[™] linear regulator, resulting in a low noise solution suitable for high speed data applications. The demo circuit is designed for an input voltage of 6V to 36V and an operating frequency of 250kHz. The output voltage is digitally programmable from 0.8V to 1.8V in 50mV increments by adjusting the three tri-state inputs V00, V01, and V02.

The user may adjust the output voltage over a continuous $\pm 10\%$ range by applying a voltage to MARGA. A PGOOD signal indicates that the output is within 10% of the target

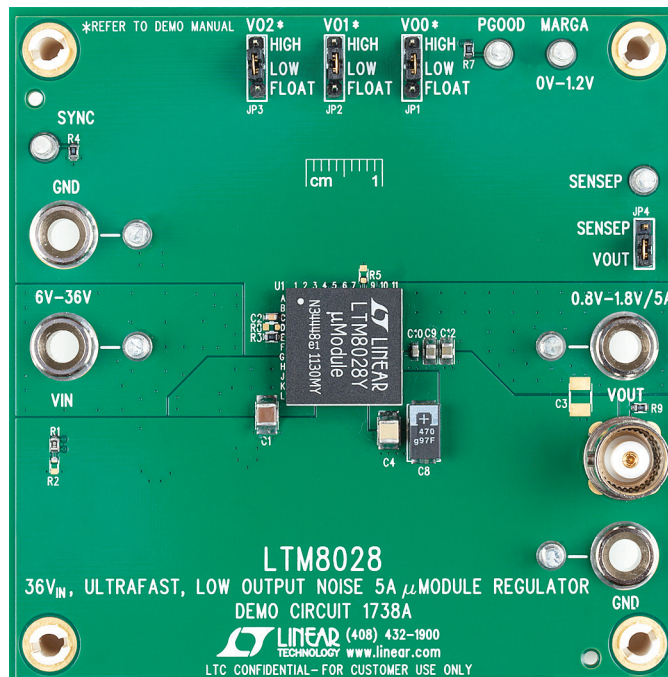
voltage. The SENSEP pin creates a Kelvin sense connection to account for voltage drops due to PCB resistances between the regulator and the load.

The LTM8028 data sheet gives a complete description of the part, operation and application information. The data sheet must be read in conjunction with this demo manual prior to working on or modifying DC1738A.

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

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BOARD PHOTO



DEMO MANUAL DC1738A

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

| PARAMETER | CONDITIONS | MIN | TYP | MAX | UNITS |
|------------------------|---|-------|-----|-------|-------|
| Input Voltage Range | $V_{OUT} = 0.8\text{V to } 1.8\text{V}$ | 6 | | 36 | V |
| Output Voltage* | Default Setting | 1.773 | 1.8 | 1.827 | V |
| Maximum Output Current | | 5 | | | A |
| Switching Frequency | $R_T = 165\text{k}\Omega$ | | 250 | | kHz |

*For other output voltage settings, refer to Table 1

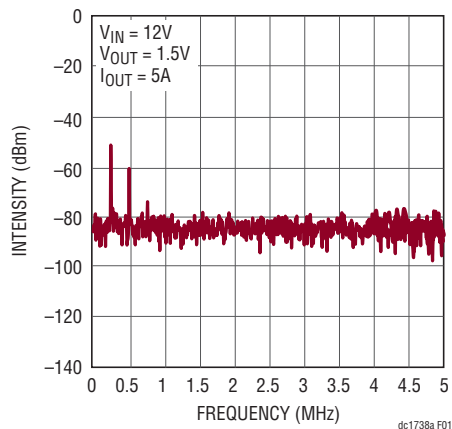


Figure 1. DC1738A Output Noise Spectrum

Table 1: VO2 to V00 Setting vs Nominal Output Voltage

| VO2 | VO1 | V00 | VOUT(NOM) |
|-------|------------|-------|-----------|
| Low | Low | Low | 0.80V |
| Low | Low | Float | 0.85V |
| Low | Low | High | 0.90V |
| Low | Float | Low | 0.95V |
| Low | Float | Float | 1.00V |
| Low | Float | High | 1.05V |
| Low | High | Low | 1.10V |
| Low | High | Float | 1.15V |
| Low | High | High | 1.20V |
| Float | Low | Low | 1.25V |
| Float | Low | Float | 1.30V |
| Float | Low | High | 1.35V |
| Float | Float | Low | 1.40V |
| Float | Float | Float | 1.45V |
| Float | Float | High | 1.50V |
| Float | High | Low | 1.55V |
| Float | High | Float | 1.60V |
| Float | High | High | 1.65V |
| High | Don't Care | Low | 1.70V |
| High | Don't Care | Float | 1.75V |
| High | Don't Care | High | 1.80V |

QUICK START PROCEDURE

Demonstration circuit 1738A is an easy way to evaluate the performance of the LTM8028. Refer to Figure 2 for proper measurement equipment setup and follow the procedure below:

1. Place JP1-JP3 according to Table 1 to program the desired output voltage.
2. With power off, connect the input power supply, load and meters, as shown in Figure 2. Preset the V_{IN} supply between 6V to 36V.
3. Turn on the power at the input.
4. Check for the proper output voltage.

5. Once the proper output voltage is established, adjust the load within the operating range and observe the output voltage regulation, ripple voltage, efficiency and other parameters.
6. In order to use the Kelvin sense connection to account for output voltage drops, place JP4 in the SENSEP position and connect the SENSEP turret at the input of the load.
7. In order to minimize EMI noise, an input filter can be utilized by removing R6 on the bottom of the board and populating the optional circuit components.

NOTE: If there is no output, temporarily disconnect the load to make sure that the load is not set too high or is shorted.

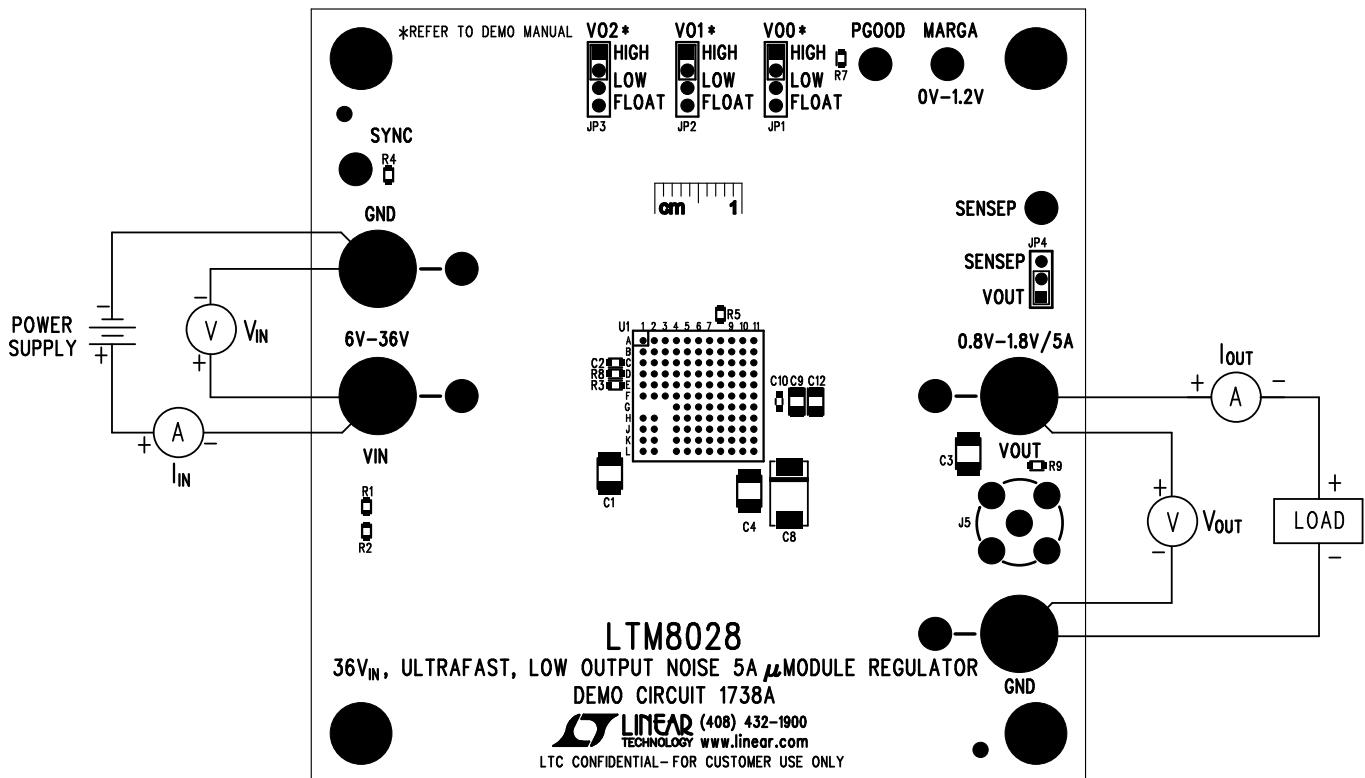


Figure 2. Proper Measurement Equipment Setup

DEMO MANUAL DC1738A

PARTS LIST

| ITEM | QTY | REFERENCE | PART DESCRIPTION | MANUFACTURER/PART NUMBER |
|---|-----|-------------------|--|--|
| Required Circuit Components | | | | |
| 1 | 1 | C1 | CAP., X7R, 10µF, 50V, 10%, 1210 | MURATA, GRM32ER71H106K |
| 2 | 1 | C2 | CAP., X7R, 0.01µF, 16V, 5%, 0603 | AVX, 0603YC103JAT2A |
| 3 | 1 | C4 | CAP., X5R, 100µF, 6.3V, 20%, 1210 | AVX, 12106D107MAT2A |
| 4 | 1 | C8 | CAP., POSCAP, 470µF, 4V, D3L | SANYO, 4TPF470ML |
| 5 | 1 | C9 | CAP., X5R, 10µF, 10V, 20%, 0805 | TAIYO YUDEN, LMK212ABJ106MG-T |
| 6 | 1 | C10 | CAP., X5R, 4.7µF, 4V, 20%, 0603 | AVX, 06034D475MAT2A |
| 7 | 1 | C12 | CAP., X5R, 22µF, 10V, 20%, 0805 | TAIYO YUDEN, LMK212BBJ226MG-T |
| 8 | 1 | R1 | RES., CHIP, 402kΩ, 1/10W, 1%, 0603 | VISHAY, CRCW0603402KFKEA |
| 9 | 1 | R3 | RES., CHIP, 165kΩ, 1/16W, 1%, 0603 | VISHAY, CRCW0603165KFKEA |
| 10 | 2 | R4, R7 | RES., CHIP, 100kΩ, 1/16W, 1%, 0603 | VISHAY, CRCW0603100KFKEA |
| 11 | 1 | R6 | RES., CHIP, 0Ω, 1/4W, 1%, 1206 | NIC, NRC12ZOTRF |
| 12 | 1 | R9 | RES., CHIP, 49.9Ω, 1/16W, 1%, 0603 | VISHAY, CRCW060349R9FKEA |
| 13 | 1 | U1 | IC., MODULE REGULATOR, LTM8028EY, BGA-114 LEAD | LINEAR TECHNOLOGY CORPORATION, LTM8028EY |
| Additional Demo Board Circuit Components | | | | |
| 1 | 0 | C3, C6 (OPT) | CAP., 1210 | |
| 2 | 0 | C5 (OPT) | CAP., 0603 | |
| 3 | 0 | C7 (OPT) | CAP., ALUM | |
| 4 | 1 | C11 | CAP., ALUM, 22µF, 50V | SUN ELECT., 50CE22BS |
| 5 | 0 | R2, R5, R8 (OPT) | RES., CHIP, 0603 | |
| 6 | 0 | FB1 (OPT) | FERRITE BEAD, M TYPE | TAIYO YUDEN, FBMJ3216HS800T |
| 7 | 0 | L1 (OPT) | IND., 10µH | VISHAY, IHLP-2525CZ-01 |
| Hardware: For Demo Board Only | | | | |
| 1 | 8 | E1-E8 | TESTPOINT, TURRET, 0.094" | MILL-MAX, 2501-2-00-80-00-00-07-0 |
| 2 | 3 | JP1-JP3 | JMP, 0.079", SINGLE ROW HEADER, 4 PIN | SAMTEC, TMM-104-02-L-S |
| 3 | 1 | JP4 | JMP, 0.079", SINGLE ROW HEADER, 3 PIN | SAMTEC, TMM-103-02-L-S |
| 4 | 4 | J1-J4 | CONN, BANANA JACK, KEYSTONE-575-4 | KEYSTONE, 575-4 |
| 5 | 1 | J5 | CONN, BNC | CONNEX, 112404 |
| 6 | 4 | XJP1-XJP4 | SHUNT, 0.079" CENTER | SAMTEC, 2SN-BK-G |
| 7 | 4 | MTGS AT 4 CORNERS | STAND-OFF, SNAP-ON, NYLON, 0.50" TALL | |

SCHEMATIC DIAGRAM

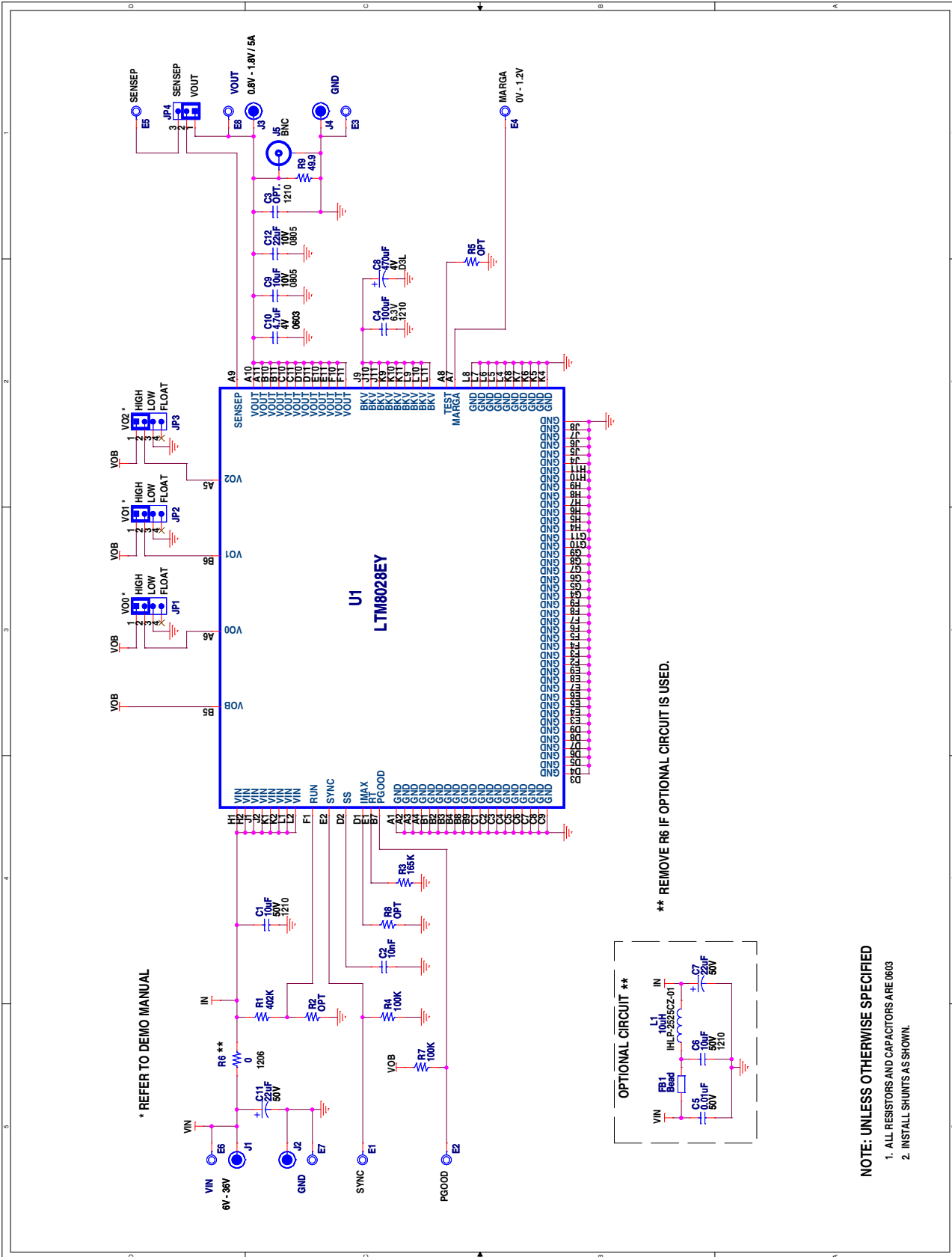


Figure 3. DC1738A Demo Circuit Schematic

DEMO MANUAL DC1738A

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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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