

LTC2153-14, LTC2153-12,
 LTC2152-14, LTC2152-12,
 LTC2151-14, LTC2151-12,
 LTC2150-14, LTC2150-12

12-Bit/14-Bit, 170Msps to 310Msps ADCs

DESCRIPTION

Demonstration circuit 1565A supports a family of 12-Bit/14-Bit 170Msps to 310Msps ADCs. Each assembly features one of the following devices: LTC2153-14/LTC2153-12, LTC2152-14/LTC2152-12, LTC2151-14/LTC2151-12, LTC2150-14/LTC2150-12, high speed ADCs.

The versions of the 1565A demo board are listed in Table 1. Depending on the required resolution and sample rate, the DC1565A is supplied with the appropriate ADC. The

circuitry on the analog inputs is optimized for analog input frequencies from 5MHz to 140MHz. Refer to the data sheet for proper input networks for different input frequencies.

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

LT, LT, LTC, LTM, μ Module, Linear Technology and the Linear logo are registered trademarks and PScope is a trademark of Linear Technology Corporation. All other trademarks are the property of their respective owners.

Table 1. DC1565A Variants

| DC1565A VARIANTS | ADC PART NUMBER | RESOLUTION | MAXIMUM SAMPLE RATE | INPUT FREQUENCY |
|------------------|-----------------|------------|---------------------|-----------------|
| 1565A-A | LTC2152-14 | 14-Bit | 250Msps | 5MHz to 140MHz |
| 1565A-B | LTC2151-14 | 14-Bit | 210Msps | 5MHz to 140MHz |
| 1565A-C | LTC2150-14 | 14-Bit | 170Msps | 5MHz to 140MHz |
| 1565A-D | LTC2152-12 | 12-Bit | 250Msps | 5MHz to 140MHz |
| 1565A-E | LTC2151-12 | 12-Bit | 210Msps | 5MHz to 140MHz |
| 1565A-F | LTC2150-12 | 12-Bit | 170Msps | 5MHz to 140MHz |
| 1565A-G | LTC2153-14 | 14-Bit | 310Msps | 5MHz to 140MHz |
| 1565A-H | LTC2153-12 | 12-Bit | 310Msps | 5MHz to 140MHz |

PERFORMANCE SUMMARY (T_A = 25°C)

| PARAMETER | CONDITIONS | MIN | TYP | MAX | UNITS |
|--|--|-----|----------------------------|-----|--------------------|
| Supply Voltage – DC1565A | Depending on Sampling Rate and the A/D Converter Provided, This Supply Must Provide Up to 500mA. | 3 | 3.6 | 6 | V |
| Analog Input Range | Depending on SENSE Pin Voltage | | 1.5 or 1.32 | | V _{P-P} |
| Logic Input Voltages | Minimum Logic High Maximum Logic Low | | 1.3 0.6 | | V V |
| Logic Output Voltages (Differential) | Nominal Logic Levels (100 Ω Load, 3.5mA Mode) Common Mode Minimum Logic Levels (100 Ω Load, 3.5mA Mode) Common Mode | | 350 1.25 247 1.25 | | mV V mV V |
| Sampling Frequency (Convert Clock Frequency) | See Table 1 | | | | |
| Encode Clock Level | Differential Encode Mode (ENC ⁻ Not Tied to GND) | 0.2 | | 1.9 | V |
| Resolution | See Table 1 | | | | |

dc1565afa

DEMO MANUAL DC1565A

PERFORMANCE SUMMARY (T_A = 25°C)

| | | | |
|-----------------------|---------------------------|--|--|
| Input Frequency Range | See Table 1 | | |
| SFDR | See Applicable Data Sheet | | |
| SNR | See Applicable Data Sheet | | |

QUICK START PROCEDURE

Demonstration circuit 1565A is easy to set up to evaluate the performance of the LTC2152 A/D converter family. Refer to Figure 1 for proper measurement equipment setup and follow the procedure below:

Setup

If a DC1371 Data Acquisition and Collection System was supplied with the DC1565A demonstration circuit, follow the DC1371 Quick Start Guide to install the required software and for connecting the DC1371 to the DC1565A and to a PC.

DC1565A Demonstration Circuit Board Jumpers

The DC1565A demonstration circuit board should have the following jumper settings as default positions: (as per Figure 1)

JP2 PAR/SER: Selects parallel or serial programming mode. (default - serial)

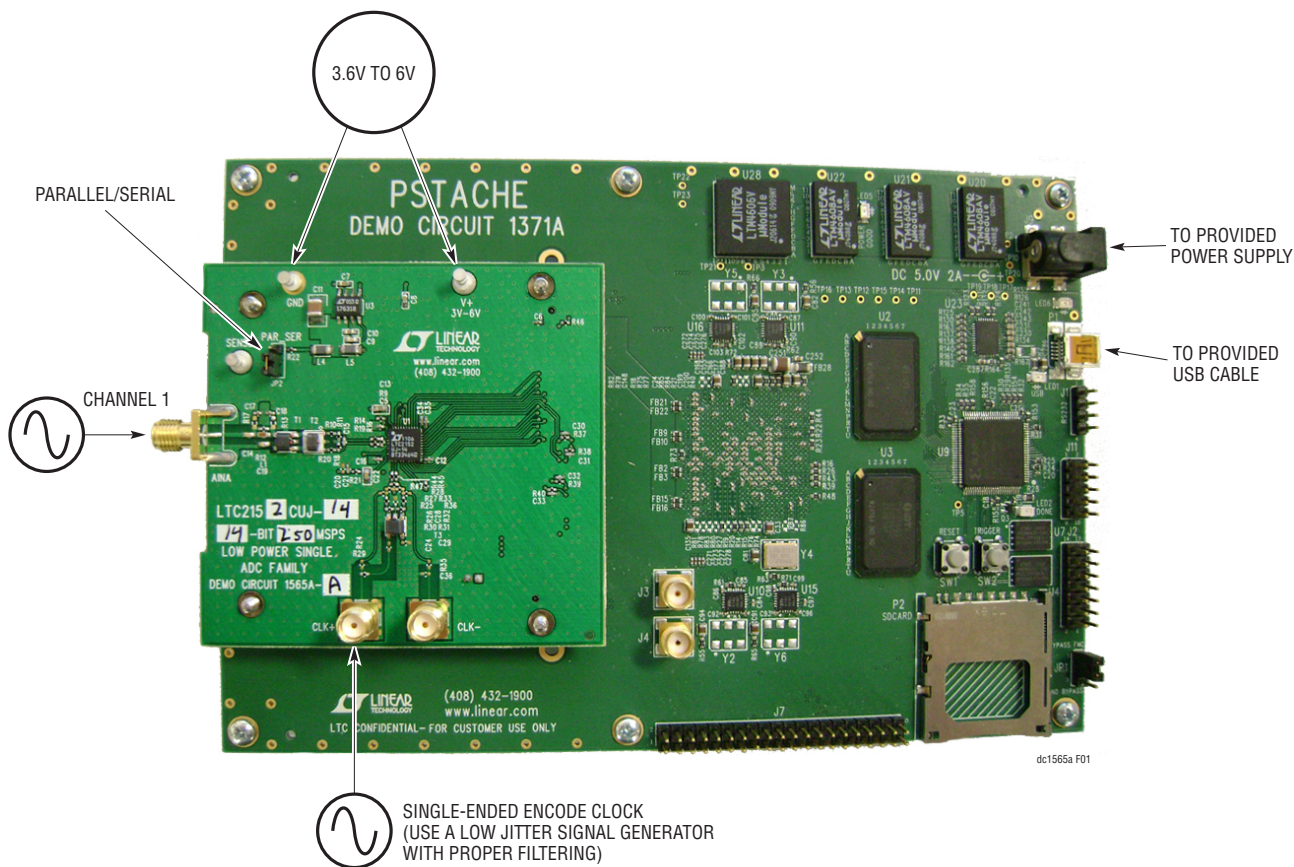


Figure 1. DC1565 Setup

dc1565afa

QUICK START PROCEDURE

Applying Power and Signals to the DC1565A Demonstration Circuit

The DC1371 is used to acquire data from the DC1565A, the DC1371 must first be connected to a powered USB port and have 5V applied power before applying 3.6V to 6V across the pins marked V⁺ and GND on the DC1565A. DC1565A requires 3.6V for proper operation.

Regulators on the board produce the voltages required for the ADC. The DC1565A demonstration circuit requires up to 500mA depending on the sampling rate and the A/D converter supplied.

The DC1565A should not be removed, or connected to the DC1371 while power is applied.

Analog Input Network

For optimal distortion and noise performance the RC network on the analog inputs may need to be optimized for different analog input frequencies. For input frequencies above 140MHz, refer to the LTC2152 data sheet for a proper input network. Other input networks may be more appropriate for input frequencies less than 5MHz.

In almost all cases, filters will be required on both analog input and encode clock to provide data sheet SNR.

The filters should be located close to the inputs to avoid reflections from impedance discontinuities at the driven end of a long transmission line. Most filters do not present 50Ω outside the passband. In some cases, 3dB to 10dB pads may be required to obtain low distortion.

If your generator cannot deliver full-scale signals without distortion, you may benefit from a medium power amplifier based on a Gallium Arsenide Gain block prior to the final filter. This is particularly true at higher frequencies where IC based operational amplifiers may be unable to deliver the combination of low noise figure and High IP3 point required. A high order filter can be used prior to this final amplifier, and a relatively lower Q filter used between the amplifier and the demo circuit.

Apply the analog input signal of interest to the SMA connector on the DC1565A demonstration circuit board marked J4 AINA. This input is capacitively coupled to a balun transformer ETC1-1-13 (lead free part number: MABA007159-000000).

Encode Clock

NOTE: Apply an encode clock to the SMA connector on the DC1565A demonstration circuit board marked CLK⁺. As a default the DC1565A is populated to have a single-ended input.

For the best noise performance, the encode input must be driven with a very low jitter, sine wave source. The amplitude should be large, up to 3V_{P-P} or 13dBm.

Using bandpass filters on the clock and the analog input will improve the noise performance by reducing the wideband noise power of the signals. Data sheet FFT plots are taken with 10-pole LC filters made by TTE (Los Angeles, CA) to suppress signal generator harmonics, non-harmonically related spurs and broadband noise. Low phase noise Agilent 8644B generators are used for both the clock input and the analog input.

Digital Outputs

The data outputs, data clock, and frame clock signals are available on J1 of the DC1565A. This connector follows the VITA-57/FMC standard, but all signals should be verified when using an FMC carrier card other than the DC1371.

Software

The DC1371 is controlled by the PScope™ System Software provided or downloaded from the Linear Technology website at <http://www.linear.com/software/>.

To start the data collection software if PScope.exe, is installed (by default) in \Program Files\LTC\PScope\, double click the PScope icon or bring up the run window under the start menu and browse to the PScope directory and select PScope.

If the DC1565A demonstration circuit is properly connected to the DC1371, PScope should automatically detect the DC1565A, and configure itself accordingly.

If everything is hooked up properly, powered and a suitable convert clock is present, clicking the Collect button should result in time and frequency plots displayed in the PScope window. Additional information and help for PScope is available in the DC1371 Quick Start Guide and in the online help available within the PScope program itself.

QUICK START PROCEDURE

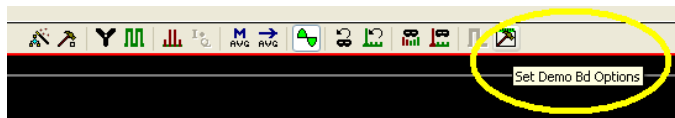


Figure 2. PScope Toolbar

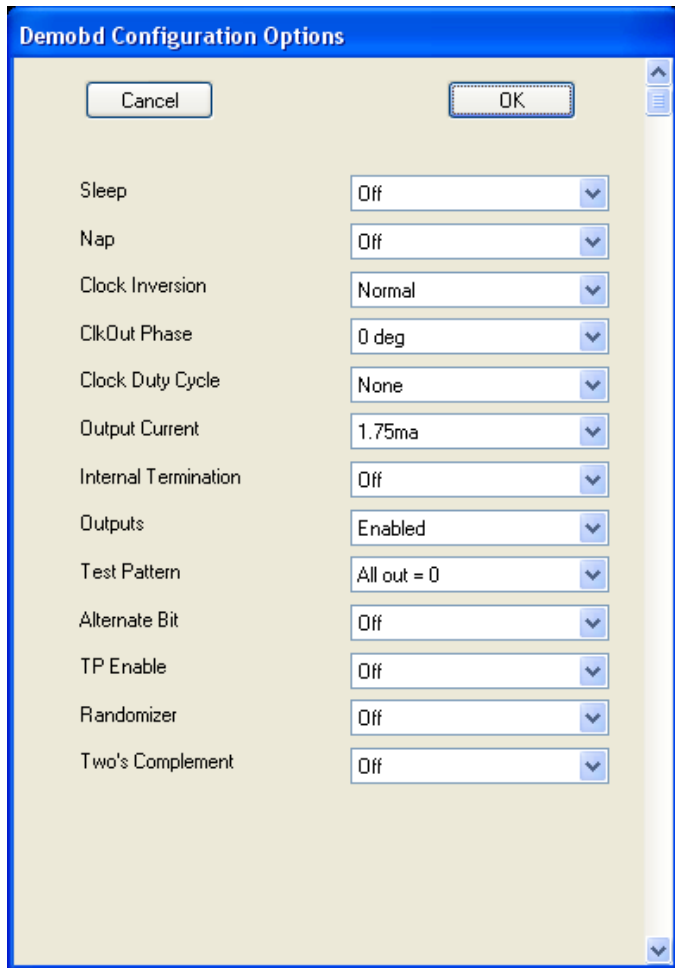


Figure 3. Demobd Configuration Options

Serial Programming

PScope has the ability to program the DC1565A board serially through the DC1371. There are several options available in the LTC2152 family that are only available through serially programming. PScope allows all of these features to be tested.

These options are available by first clicking on the Set Demo Bd Options icon on the PScope toolbar (Figure 2).

This will bring up the menu shown in Figure 3.

This menu allows any of the options available for the LTC2152 family to be programmed serially. The LTC2152 family has the following options:

Sleep Mode: Selects between normal operation, sleep mode.

- Off (Default): Entire ADC is powered, and active
- On: The entire ADC is powered down

NAP: Selects between normal operation and nap mode.

- Off (Default): Channel one is active
- On: Channel one is in nap mode

Clock Inversion: Selects the polarity of the CLKOUT signal:

- Normal (Default): Normal CLKOUT polarity
- Inverted: CLKOUT polarity is inverted

ClkOut Phase: Selects the phase delay of the CLKOUT signal:

- None (Default): No CLKOUT delay
- 45 deg: CLKOUT delayed by 45 degrees
- 90 deg: CLKOUT delayed by 90 degrees
- 135 deg: CLKOUT delayed by 135 degrees

Clock Duty Cycle: Enable or disables duty cycle stabilizer

- Stabilizer off (Default): Duty cycle stabilizer disabled
- Stabilizer on: Duty cycle stabilizer enabled

QUICK START PROCEDURE

Output Current: Selects the LVDS output drive current

- 1.75mA (Default): LVDS output driver current
- 2.1mA: LVDS output driver current
- 2.5mA: LVDS output driver current
- 3.0mA: LVDS output driver current
- 3.5mA: LVDS output driver current
- 4.0mA: LVDS output driver current
- 4.5mA: LVDS output driver current

Internal Termination: Enables LVDS internal termination

- Off (Default): Disables internal termination
- On: Enables internal termination

Outputs: Enables digital outputs

- Enabled (Default): Enables digital outputs
- Disabled: Disables digital outputs

Test Pattern: Selects digital output test patterns

- All out = 0 (default): All digital outputs are 0
- All out = 1: All digital outputs are 1
- Checkerboard: OF, and D13-D0 Alternate between 101 0101 1010 0101 and 010 1010 0101 1010 on alternating samples.
- Alternating: Digital outputs alternate between all 1's and all 0's on alternating samples

Alternate Bit: Alternate bit polarity mode

- Off (Default): Disables alternate bit polarity
- On: Enables alternate bit polarity (Before enabling ABP, be sure the part is in offset binary mode)

TP Enable: Selects digital output test patterns. The desired test pattern can be entered into the text boxes provided.

- Off(default): ADC input data is displayed
- On: Test pattern is displayed.

Randomizer: Enables data output randomizer

- Off (Default): Disables data output randomizer
- On: Enables data output randomizer

Two's Complement: Enables two's complement mode

- Off (Default): Selects offset binary mode
- On: Selects two's complement mode

Once the desired settings are selected hit OK and PScope will automatically update the register of the device on the DC1565A demo board.

DEMO MANUAL DC1565A

PARTS LIST

| ITEM | QTY | REFERENCE | PART DESCRIPTION | MANUFACTURER/PART NUMBER |
|------------------------------------|-----|--|---|------------------------------------|
| Required Circuit Components | | | | |
| 1 | 4 | C1, C3, C8, C10 | Capacitor, X7R, 1 μ F, 10V, 10%, 0603 | AVX, 0603ZC105KAT2A |
| 2 | 2 | C2, C9 | Capacitor, X5R, 0.1 μ F, 10V, 10%, 0603 | AVX, 0603ZD104KAQ2A |
| 3 | 2 | C4, C11 | Capacitor, X7R, 47 μ F, 10V, 10%, 1210 | Murata, GRM32ER71A476KE15L |
| 4 | 8 | C5, C6, C12, C16, C21, C23, C34, C35 | Capacitor, X5R, 0.1 μ F, 10V, 10%, 0402 | AVX, 0402ZD104KAQ2A |
| 5 | 1 | C7 | Capacitor, X5R, 4.7 μ F, 6.3V, 20%, 0603 | AVX, 06036D475MAT2A |
| 6 | 1 | C13 | Capacitor, X5R, 2.2 μ F, 10V, 20%, 0603 | AVX, 0603ZD225MAT2A |
| 7 | 2 | C14, C19 | Capacitor, X7R, 0.01 μ F, 50V, 10%, 0603 | AVX, 06035C103KAQ2A |
| 8 | 3 | C15, C26, C27 | Capacitor, C0G, 4.7pF, 50V, 5%, 0402 | AVX, 04025A4R7JAT2A |
| 9 | 2 | C17, C18 | Capacitor, C0G, 8.2pF, 50V, 5%, 0402 | AVX, 04025A8R2JAT2A |
| 10 | 5 | C20, C24, C28, C29, C36 | Capacitor, X7R, 0.01 μ F, 16V, 10%, 0402 | Murata, GRM155R71C103KA01D |
| 11 | 1 | C22 | Capacitor, X5R, 2.2 μ F, 10V, 20%, 0603 | AVX, 0603ZD225MAT2A |
| 12 | 0 | R15, C25 | OPT 0402 | |
| 13 | 4 | C30, C31, C32, C33 | Capacitor, C0G, 47pF, 16V, 10%, 0402 | AVX, 0402YA470KA |
| 14 | 1 | D1 | Diode Schottky, RF SER, 15V, SOT-23 | Avago, HSMS-2822-TR1G |
| 15 | 1 | JP1 | Header, 2-Pin 0.079 Single Row | Samtec, TMM-102-02-L-S |
| 16 | 1 | J1 | BGA Connector, 40 \times 10 | Samtec, SEAM-40-02.0-S-10-2-A-K-TR |
| 17 | 2 | J2, J3 | Connector, SMA, 50 Ω , Straight Mount | Connex., 132134 |
| 18 | 1 | J4 | Connector, SMA, 50 Ω , EDGE-LANCH | E. F. Johnson, 142-0701-851 |
| 19 | 1 | L1 | Inductor, 56nH, 0603 | Murata, LQP18MN56NG02D |
| 20 | 0 | L2 | OPT 0603 | |
| 21 | 3 | L3, L4, L5 | Ferrite Bead, 1206 | Murata, BLM31PG330SN1L |
| 22 | 0 | L6 | Bead, OPT 1206 | |
| 23 | 22 | R1, R2, R3, R4, R5, R6, R7, R8, R10, R16, R20, R21, R23, R24, R25, R27, R28, R33, R34, R35, R36, R47 | Resistor, Chip, 100, 1/16W, 5%, 0402 | NIC, NRC04J101TRF |
| 24 | 5 | R9, R37, R38, R39, R40 | Resistor, Chip, 1k, 1/16W, 5%, 0402 | Yageo, RC0402FR-071KL |
| 25 | 2 | R11, R18 | Resistor, Chip, 33.2 Ω , 1/16W, 1%, 0402 | NIC, NRC04F33R2TRF |
| 26 | 1 | R12 | Resistor, Chip, 86.6 Ω , 1/16W, 1%, 0402 | NIC, NRC04F86R6TRF |
| 27 | 2 | R13, R17 | Resistor, Chip, 86.6 Ω , 1/16W, 1%, 0603 | Vishay, CRCW060386R6FNEA |
| 28 | 2 | R14, R19 | Resistor, Chip, 10 Ω , 1/16W, 5%, 0402 | Vishay, CRCW040210R0JNED |

PARTS LIST

| ITEM | QTY | REFERENCE | PART DESCRIPTION | MANUFACTURER/PART NUMBER |
|------|-----|---------------|--|--|
| 29 | 2 | R26, R32 | Resistor, Chip, 5.1Ω, 1/16W, 1%, 0402 | Vishay, CRCW04025R10FKED |
| 30 | 1 | R29 | PES., Chip, 0Ω, 0402 | Vishay, CRCW04020000Z0ED |
| 31 | 2 | R30, R31 | Resistor, Chip, 49.9Ω, 1/16W, 1%, 0402 | Yageo, RC0402FR-0749R9L |
| 32 | 3 | R41, R42, R43 | Resistor, Chip, 5.1k, 1/16W, 1%, 0402 | NIC, NRC04F5101TRF |
| 33 | 3 | TP1, TP2, TP3 | Testpoint, Turret, 0.094" pbf | Mill-Max, 2501-2-00-80-00-00-07-0 |
| 34 | 2 | T1, T3 | Transformer, MABA-007159-000000 | M/A-COM, MABA-007159-000000 |
| 35 | 1 | T2 | Transformer, WBC1-1L | Coilcraft, WBC1-1L |
| 36 | 1 | U1 | IC, LTC2152CUJ, 40-Pin QFN 6mm × 6mm | Linear Technology, LTC2152CUJ#PBF |
| 37 | 1 | U3 | IC, LT1763CS8-1.8, S08 | Linear Technology, LT1763CS8-1.8#TRPBF |
| 38 | 1 | U4 | IC, LT1763CS8-3.3, S08 | Linear Technology, LT1763CS8-3.3#TRPBF |
| 39 | 1 | U5 | IC, EEPROM, 32k, 400khz, 8TSSOP | MICROChip, 24LC32A-I/ST |
| 40 | 1 | | Fab, Printed Circuit Board | Demo Circuit 1565A |
| 41 | 2 | | Top & Botton Stencil for Proto | Stencil 1565A |

DEMO MANUAL DC1565A

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



Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



Как с нами связаться

Телефон: 8 (812) 309 58 32 (многоканальный)

Факс: 8 (812) 320-02-42

Электронная почта: org@eplast1.ru

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.