

General Description

The MAX2181 evaluation kit (EV kit) simplifies evaluation of the MAX2181 FM low-noise amplifier. The EV kit enables testing of the device's features and performance and does not require additional support circuitry or software. The signal input and output use SMA connectors to facilitate connection of RF test equipment.

The EV kit is fully assembled with the device on board and incorporates input matching components for the U.S. FM broadcast band.

Features

- Easy Evaluation of the MAX2181
- +6V to +24V Single-Supply Operation
- RF Input and Output Matched to 50Ω
- Proven PCB Layout
- Fully Assembled and Tested

[Ordering Information](#) appears at end of data sheet.

Quick Start

Required Test Equipment

- RF signal generator (or generators) capable of delivering a signal in the 76MHz to 162.5MHz (FM) range at a power level of -34dBm. (A higher power source is required to measure distortion performance. See the *Measurements* section for more details)
- RF spectrum analyzer that covers the operating frequency range
- DC power supply capable of supplying +6V to +24V
- 50Ω cables with SMA connectors
- Ammeter to measure supply current (optional)
- Noise-figure meter to measure NF (optional)
- Network analyzer to measure gain and return loss (optional)

Connections and Setup

Checking Gain

The EV kit is fully assembled and factory tested. Follow the steps below for proper device evaluation in the default configuration.

- 1) Connect a DC supply with its output disabled (preset to +10V) to the VBATT and GND terminals (through an ammeter, if desired) on the EV kit.
- 2) Set the RF generator to the desired frequency at a power level of -37dBm. Disable the generator's output and connect it to the FMIN SMA connector on the EV kit.
- 3) Connect an SMA cable from the FMOUT SMA connector to the input of the spectrum analyzer.
- 4) Turn on the DC supply. The supply current should read approximately 56mA.
- 5) Activate the RF generator's output. The signal on the spectrum analyzer's display should indicate a typical

gain, as shown on the MAX2181 IC data sheet after accounting for cable and board losses.

- 6) Optional: Another method of determining gain is by using a network analyzer. This has the advantage of displaying gain versus a swept frequency band, in addition to displaying input and output return loss. Refer to the user manual of the network analyzer for setup information. **Note:** Depending on the settings of the device's maximum gain and power detector, the AGC loop can become active for input power levels as low as -24dBm. To ensure consistent results are obtained, the stimulus level of the network analyzer should be no greater than -34dBm, ensuring that the gain is unaffected by the AGC loop.

Detailed Description of Hardware

Test Points

The MAX2181 signal path includes a power detector and AGC loop, which can be adjusted for maximum gain and AGC threshold. In addition, the AGC loop can be overridden by applying an external voltage to the FMAGC pin. Table 1 describes how to control the performance of the device using the test points on the EV kit.

Measurements

Noise

Noise figure can be measured using a NF meter. Because of the large number of FM broadcast signals that might be present, this measurement should take place with the EV kit in a screen box or other type of RF shield.

Distortion

Two-tone distortion of the amplifier can be measured using a power combiner to couple the signals from two generators into FMIN on the EV kit. During closed-loop operation, as the signal levels increase, the device's input impedance is reduced. At the upper end of the input signal level range, where each tone can be greater than 120dBμV, this reduced impedance could create distortion within the signal generators. For accurate distortion measurement, the input of the EV kit should be isolated from the signal generators and power combiner. This can be accomplished using a ferrite isolator.

Layout Considerations

Electrical

At high-signal-level conditions, the RF currents flowing in the device can induce voltages in the PCB ground plane, known as "ground bounce." To avoid unwanted spurious products due to ground bounce, proper grounding techniques must be followed.

Thermal

The device is designed to meet data sheet specifications at supply voltages up to +15V and to function at supply voltages up to +24V. Under these conditions, a significant amount of power must be dissipated by the device. This requires the application PCB to provide a low thermal impedance path to a thermal ground.

The EV kit PCB design accounts for this by providing an array of thermal vias in the ground plane and a wide top metal trace connecting the package pad to a nearby screw. Adjacent pins 5-7 and 14-16 are all grounded, which allows the wide trace.

Table 1. Control Performance with Test Points

| TEST POINT | FUNCTION | DESCRIPTION |
|------------|-----------------------------|---|
| ANTSENSE | Antenna sense | Disables the device and sets the supply current to 20mA (typ) if the antenna fault is detected. Refer to the MAX2181 IC data sheet. |
| FMAGC | FM AGC loop control voltage | Applying a DC control voltage to FMAGC allows the user to override the AGC loop. 0V gives maximum gain; 5V gives minimum gain. |
| FMDDET | FM AGC threshold | Sets the FM AGC threshold. Refer to the MAX2181 IC data sheet. Default value on the EV kit is 99dBμV (typ) referred to the FMOUT SMA connector (R4 = 43kΩ). |
| FMGAIN | FM gain control | Sets the maximum value of FM gain (FMAGC = 0V). Default setting on the EV kit is 6dB (typ) referred to the FMOUT SMA connector (R2 = 10kΩ). |
| LDO | Regulated voltage | Allows measurement of internal regulator voltage. |

Component List

| DESIGNATION | QTY | DESCRIPTION |
|---|-----|--|
| ANTSENSE, FMAGC, FMDET, FMGAIN, LDO, VBATT (x2) | 7 | Test points |
| C3, C9 | 2 | 0.1 μ F \pm 10% ceramic capacitors (0603) Murata GRM188R71E104K |
| C4 | 1 | 2700pF \pm 10% ceramic capacitor (0603) Murata GRM1885C1H272K |
| C5 | 1 | 0.47 μ F \pm 10% ceramic capacitors(0603) Murata GRM188R71C474K |
| C6 | 1 | 100pF \pm 5% ceramic capacitor (0603) Murata GRM1885C1H101J |
| C7 | 1 | 33pF \pm 5% ceramic capacitor (0603) Murata GRM1885C1H3300J |
| C10 | 1 | 10 μ F \pm 10% tantalum capacitor (C case) AVX TAJC106K035R |
| C11 | 1 | 10 μ F \pm 10% tantalum capacitor (A case) AVX TAJA106K010R |
| FMIN, FMOUT | 2 | Connectors |
| GND | 2 | Test points |
| L1 | 1 | 470nH \pm 5% inductor (0603) Murata LQW18ANR47J00 |

| DESIGNATION | QTY | DESCRIPTION |
|-------------|-----|---|
| L2 | 0 | Not installed, \pm 5% midi spring air-cored inductor Coilcraft 1812SMS-R10JL |
| L3 | 1 | 82nH \pm 5% inductor (1008) Murata LQW2UAS82NJ00 |
| L4 | 1 | 27nH \pm 5% inductor (0603) Murata LQW18AN27NJ00 |
| R1 | 1 | 43k Ω resistor |
| R2 | 1 | 61.9 Ω resistor |
| R3 | 1 | 105 Ω resistor |
| R4 | 1 | 20k Ω resistor |
| R6 | 1 | 0 Ω resistor |
| R7 | 1 | 100k Ω resistor |
| R8 | 1 | 10k Ω resistor |
| U1 | 1 | FM automotive low-noise amplifier (16 TQFN-EP*) Maxim MAX2181 |
| — | 1 | Metal heat sink |
| — | 10 | Screws |
| — | 5 | Standoffs |
| — | 1 | Brown box, 9 3/16in x 7in x 7/8in |
| — | 1 | ESD bag, 4in x 6in with ESD logo |
| — | 1 | Pink foam, 12in x 12in x 5mm |
| — | 1 | Web instructions |
| — | 1 | PCB: MAX2181 EVALUATION KIT# |

*EP = Exposed pad.

Component Suppliers

| SUPPLIER | PHONE | WEBSITE |
|----------------------------|--------------|------------------------|
| AVX North America | 864-967-2150 | www.avx.com |
| Keystone Electronics Corp. | 800-221-5510 | www.keyelco.com |
| Murata Americas | 800-241-6514 | www.murataamericas.com |

Note: Indicate that you are using the MAX2181 when contacting these component suppliers.

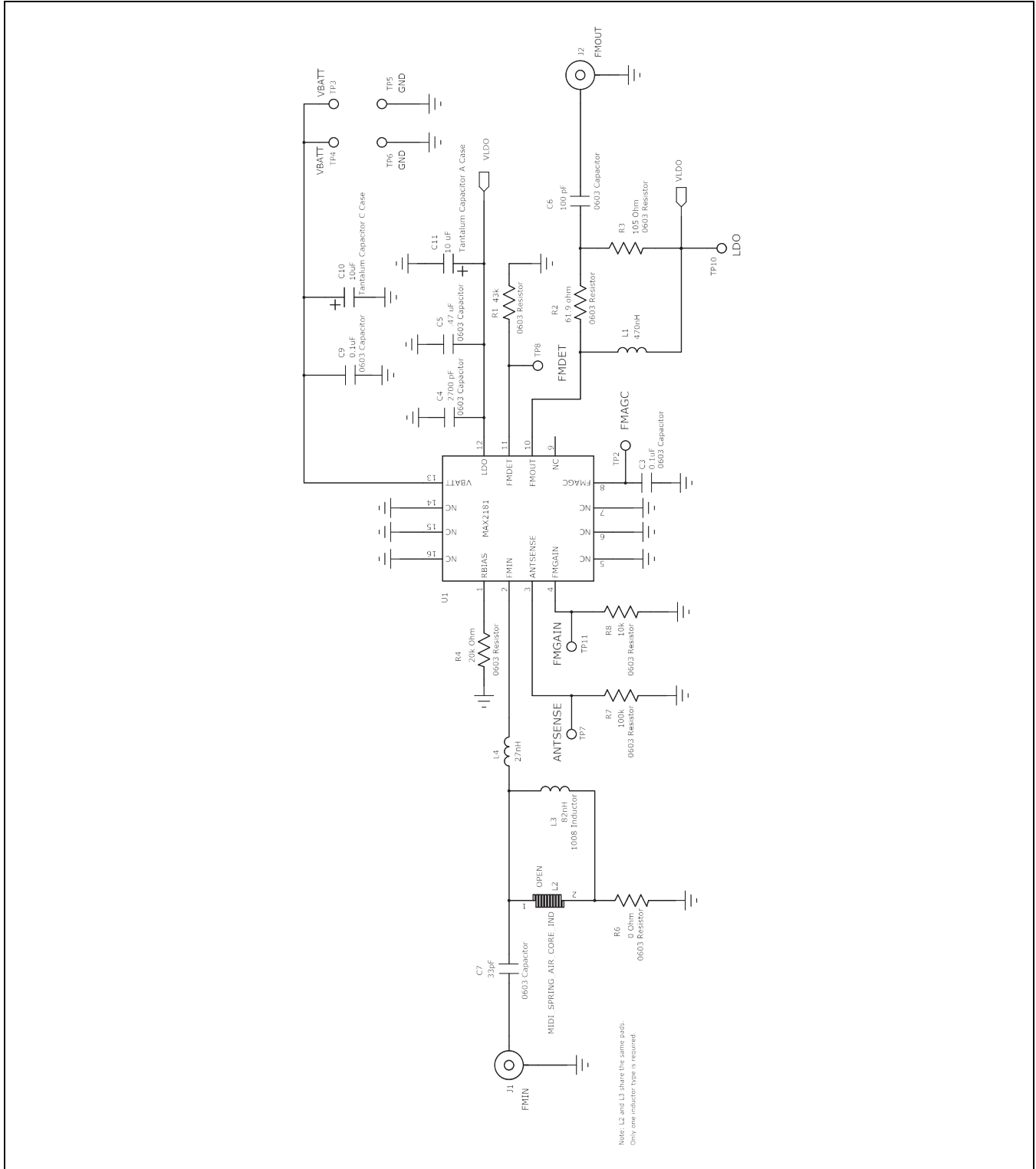


Figure 1. MAX2181 EV Kit Schematic

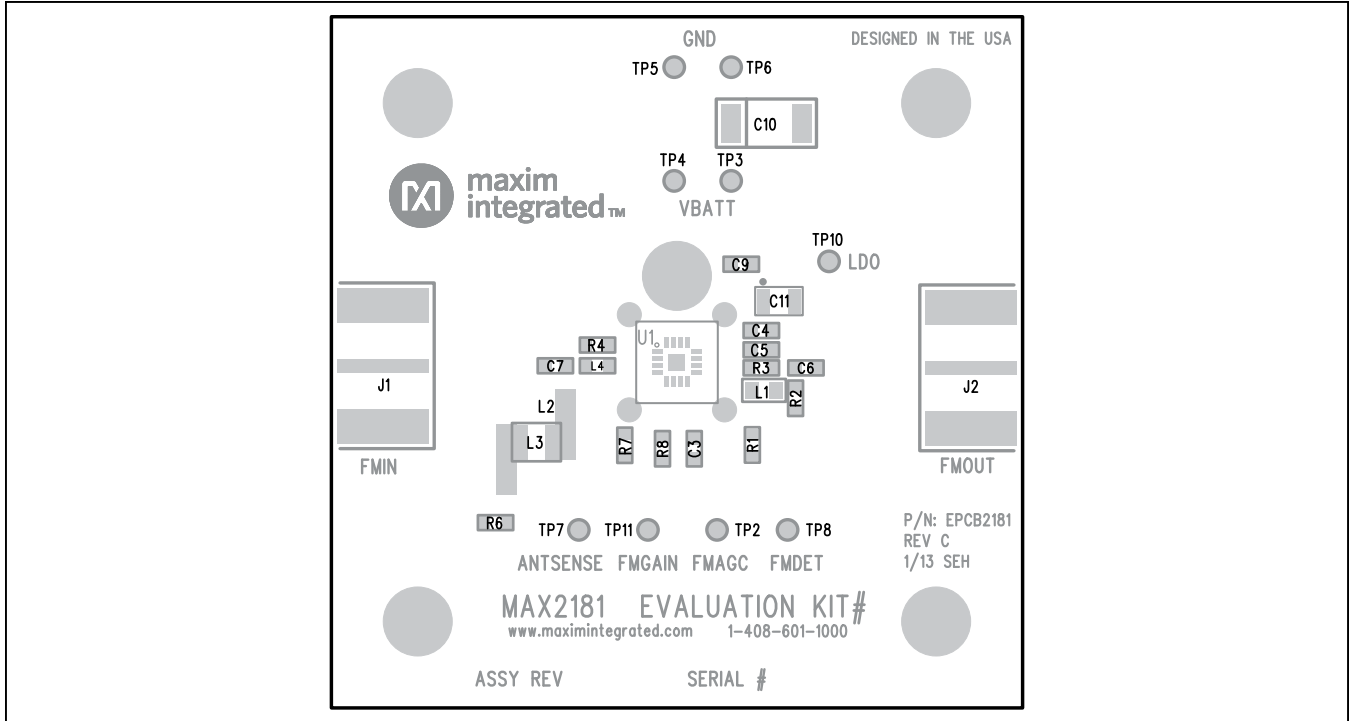


Figure 2. MAX2181 EV Kit Component Placement Guide—Top Silkscreen

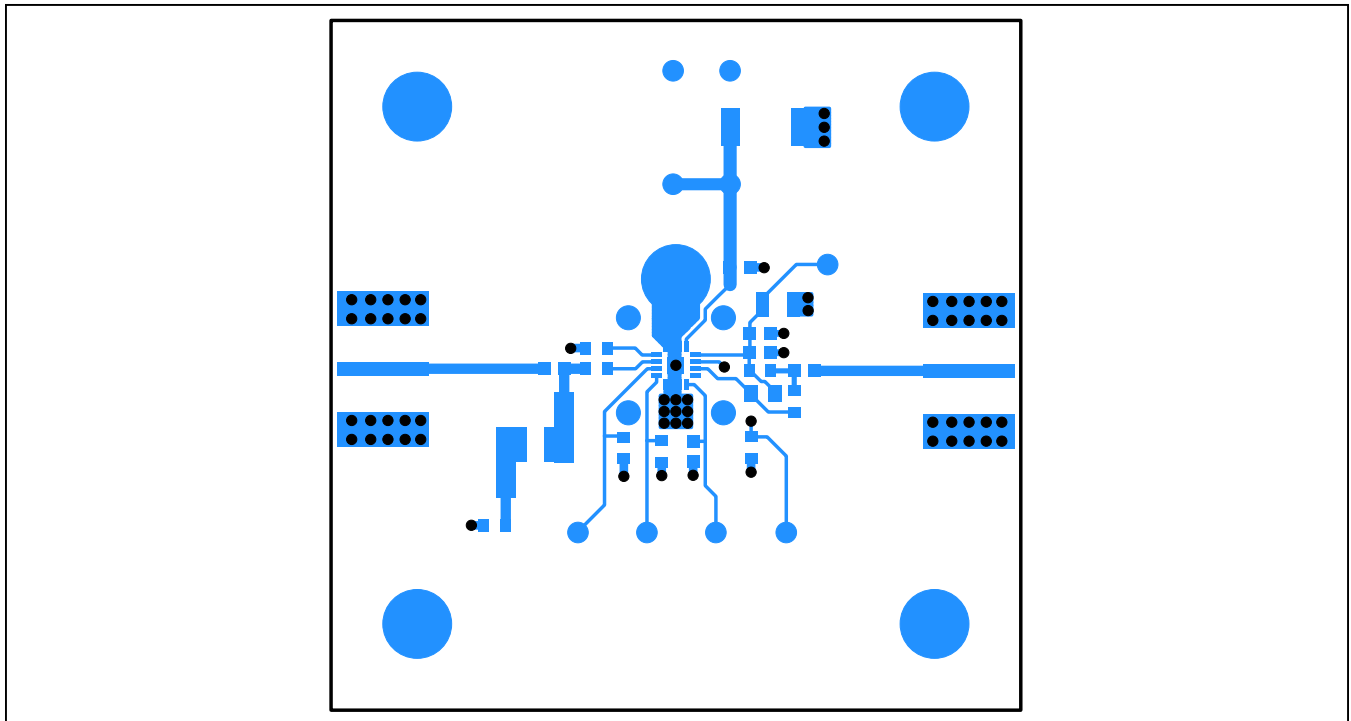


Figure 3. MAX2181 EV Kit PCB Layout—Top Copper

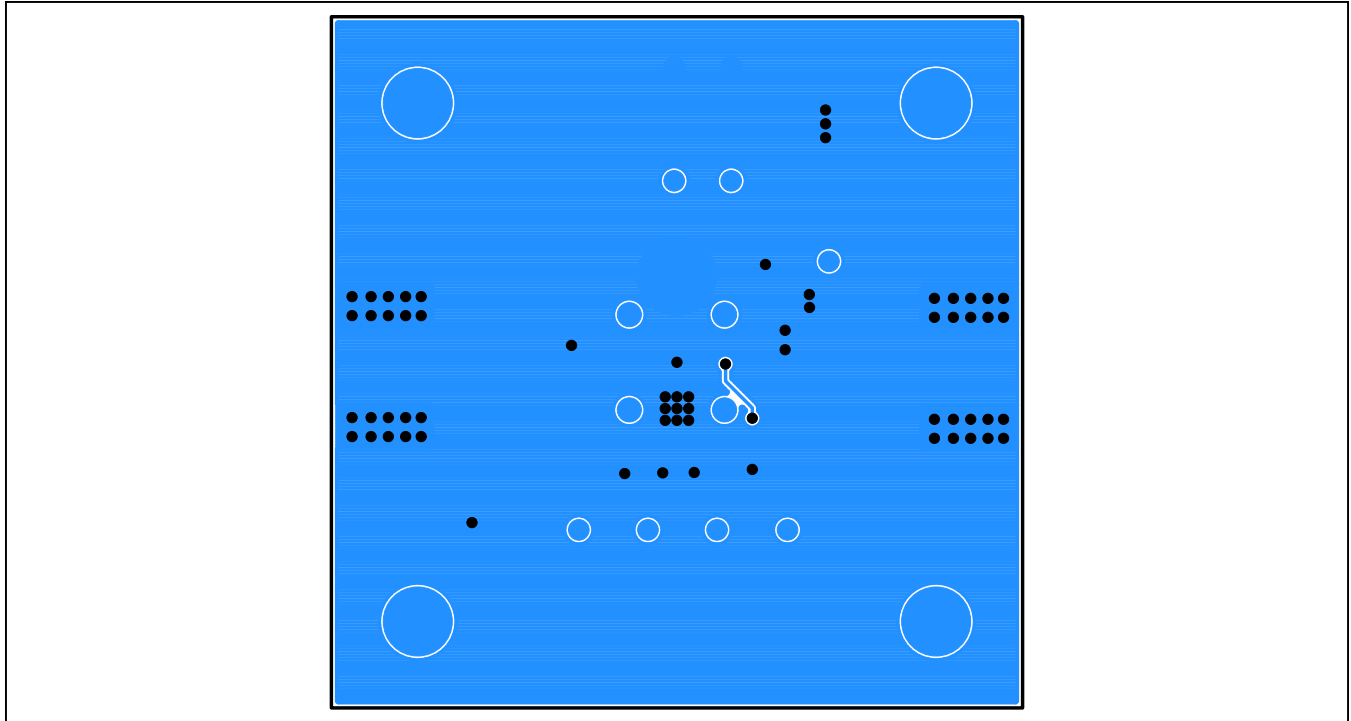


Figure 4. MAX2181 EV Kit PCB Layout—Bottom Copper

Ordering Information

| PART | TYPE |
|---------------|--------|
| MAX2181EVKIT# | EV Kit |

#Denotes RoHS compliant.

Revision History

| REVISION NUMBER | REVISION DATE | DESCRIPTION | PAGES CHANGED |
|-----------------|---------------|-----------------|---------------|
| 0 | 12/13 | Initial release | — |

For pricing, delivery, and ordering information, please contact Maxim Direct at 1-888-629-4642, or visit Maxim Integrated's website at www.maximintegrated.com.

Maxim Integrated cannot assume responsibility for use of any circuitry other than circuitry entirely embodied in a Maxim Integrated product. No circuit patent licenses are implied. Maxim Integrated reserves the right to change the circuitry and specifications without notice at any time.



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.