

LTC5556 1.5GHz to 7GHz Dual Programmable Gain Downconverting Mixer

DESCRIPTION

Demonstration circuit 2693A is optimized for evaluation of the **LTC®5556** dual programmable gain downconverting mixer. Each channel incorporates an active mixer and a digital IF VGA with 15.5dB gain control range. The IF gain of each channel is independently programmable through the SPI in 0.5dB steps. Its single-ended RF ports have a range from 1.5GHz to 7GHz. The LO port is internally matched to 50Ω from 500MHz to 8GHz with 9dB return loss. The differential IF port is usable from 1MHz to 1000MHz. There is a reduced power mode available through the SPI or RP pin, which lowers the total current consumption by 25%.

Design files for this circuit board are available at <http://www.analog.com/DC2693A>

All registered trademarks and trademarks are the property of their respective owners.

ABSOLUTE MAXIMUM INPUT RATINGS

Supply Voltage

(V _{DD} , V _{CC1} , V _{CC2} , IF1 ⁺ , IF1 ⁻ , IF2 ⁺ , IF2 ⁻)	4V
EN1, EN2 Input Voltages	-0.3V to V _{CC} + 0.3V
LO ⁺ , LO ⁻ Input Power (500MHz to 8GHz)	+10dBm
RF1, RF2 Input Power (1.5GHz to 7GHz)	+20dBm
LO ⁺ , LO ⁻ Input DC Voltage	±0.5V
IF DVGA Peak Differential Input Voltage	±4V
SDI, CLK, CSB, RP Input Voltages	-0.3V to V _{DD} + 0.3V
Operating Temperature Range (T _C)	-40°C to 105°C
Junction Temperature (T _J)	150°C
Storage Temperature Range	-65°C to 150°C

Caution: This part is sensitive to electrostatic discharge (ESD). Observe proper ESD precautions when handling the LTC5556.

BOARD LAYOUT

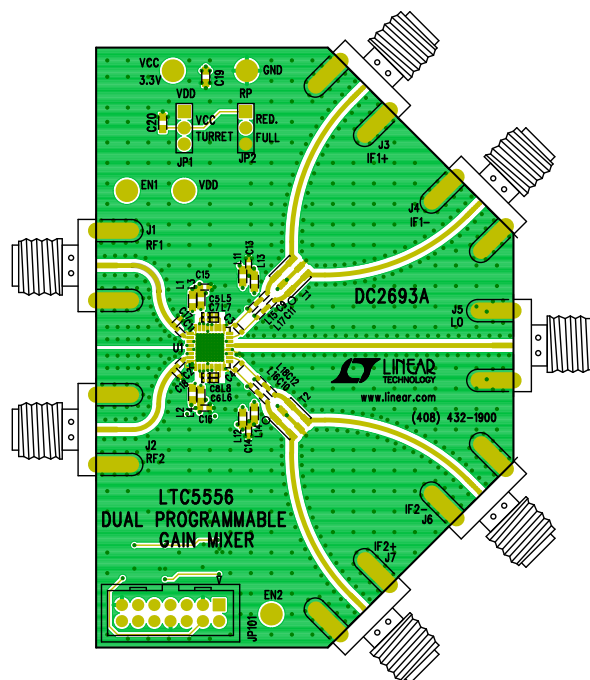


Figure 1. DC2693A

PROPER TEST SETUP

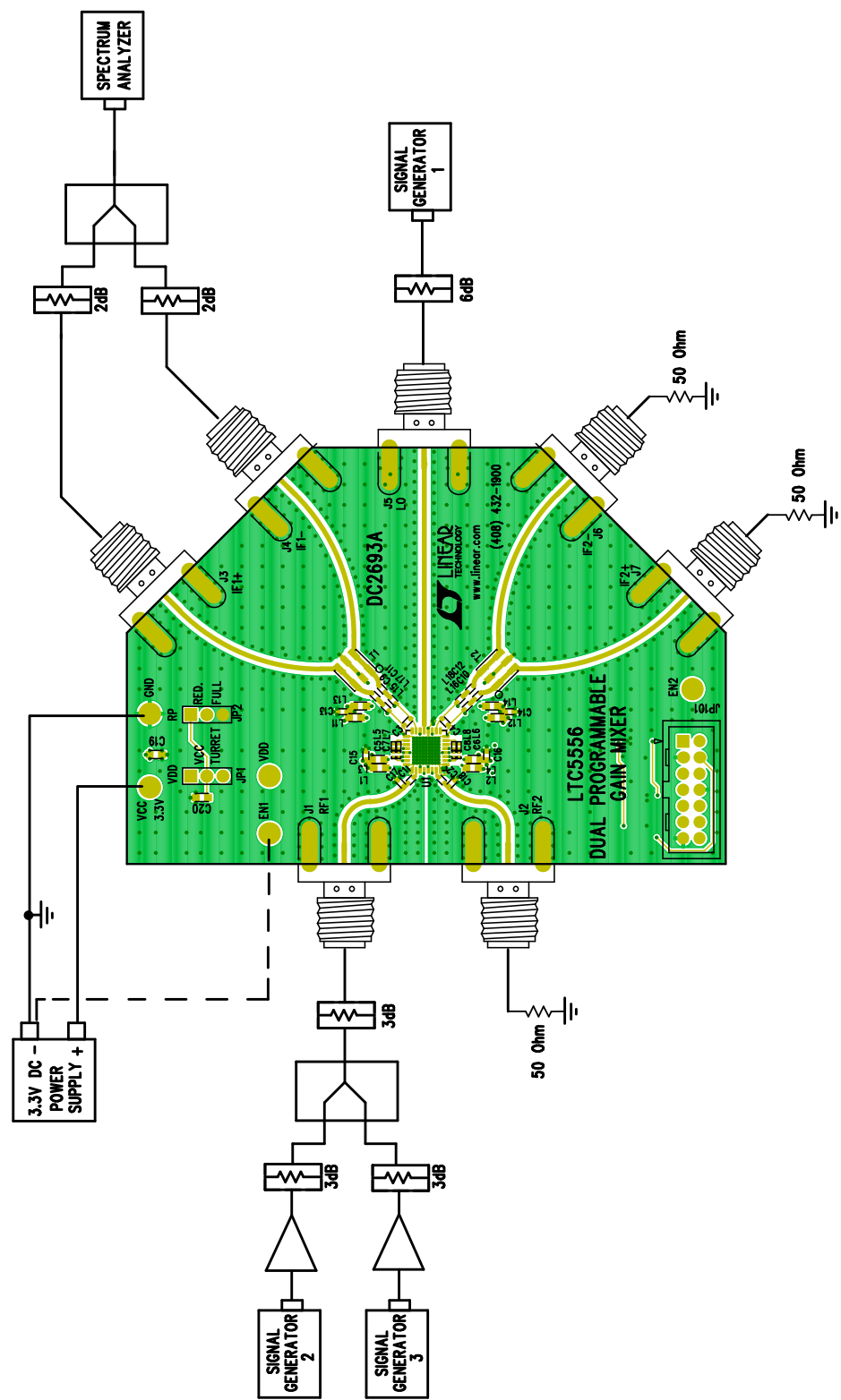


Figure 2. Test Setup for Downconverting Mixer 2-Tone Measurement

NOTES ON TEST EQUIPMENT AND SETUP

- High performance signal generators with low harmonic outputs should be used for 2-tone measurements. Otherwise, low-pass filters at the signal generator outputs should be used to suppress harmonics.
- High quality combiners should be used to present a broadband 50Ω termination on all ports as well as provide good port-to-port isolation. Adding attenuator pads further improves source isolation and helps prevent the signal generators from producing intermodulation products.
- Spectrum analyzers can produce significant internal distortion products if they are overdriven. Generally, spectrum analyzers are designed to operate at their best with about -30dBm to -40dBm at their input. The spectrum analyzer's input attenuation setting should be used to avoid saturating the instrument.
- Set the spectrum analyzer's input attenuation depending on the spectrum analyzer used.
- Before performing measurements on the DUT, the system performance should be evaluated to ensure that a clean input signal is obtained and that the spectrum analyzer's internal distortion is minimized.

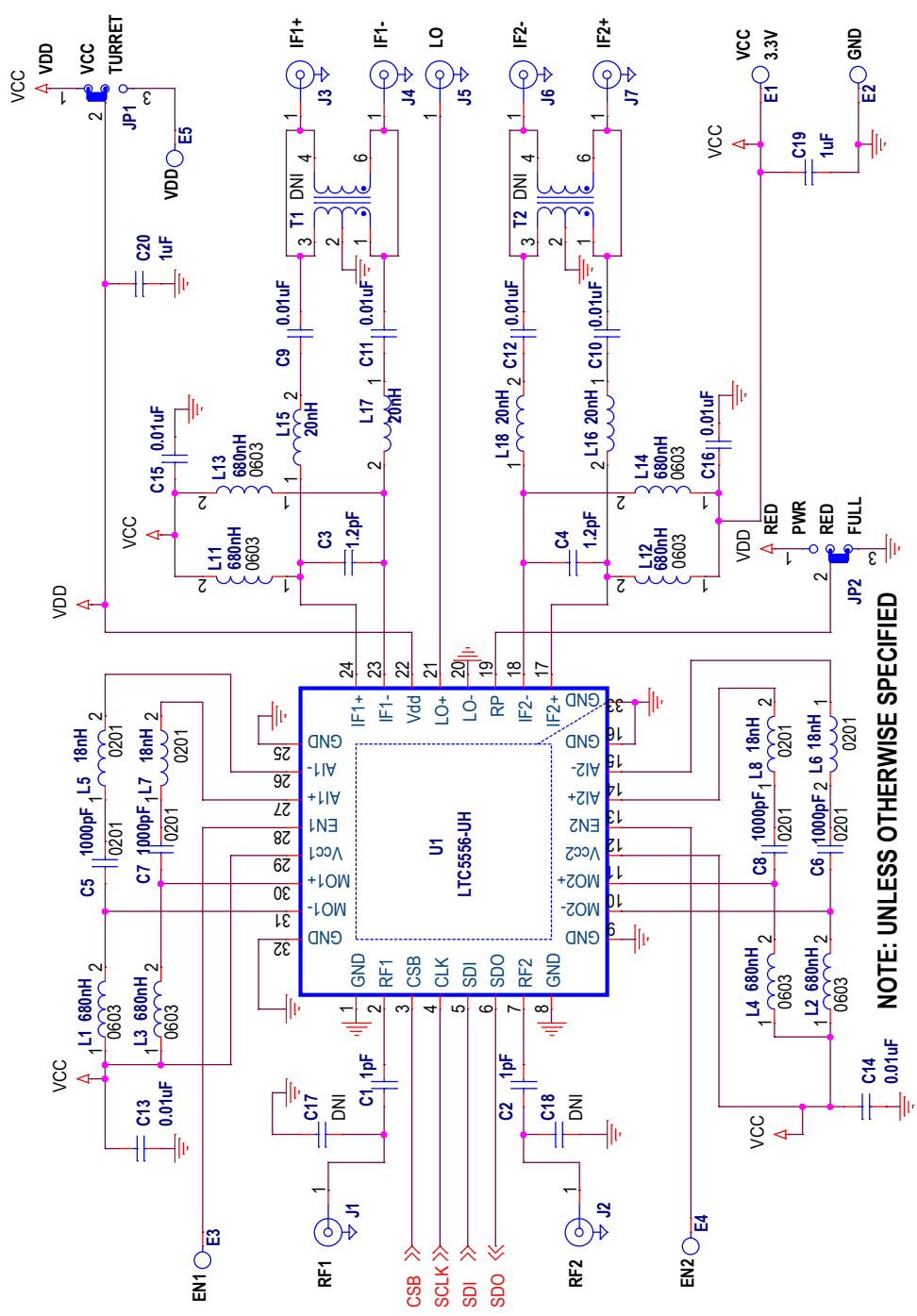
QUICK START PROCEDURE

1. Connect all test equipment as shown in Figure 2.
2. Set the power supply output voltage to 3.3V and set the current limit to 500mA.
3. Connect the ground and V_{CC} turrets to the power supply.
BE SURE TO CONNECT THE V_{CC} TURRET BEFORE THE EN TURRET TO ENSURE THAT THE PART DOES NOT GET DAMAGED. ALSO, REMOVE POWER FROM EN TURRET BEFORE REMOVING POWER FROM THE V_{CC} TURRET.
4. Connect the EN turret to the power supply.
5. Set the LO signal generator to provide a 3330MHz CW signal at about 0dBm to the demo board's LO port.
6. Set the RF signal generators to provide one 3599MHz CW signal and one 3601MHz CW signal. The signals should be applied to the 2-way combiner. The output of the combiner should be applied to the demo board's RF input port. The two tones should be set to -5dBm each at the mixer's RF input port.
7. Set up the LTC5556 digital settings to get the RF attenuation and power mode that you'd like to test.
8. Set the spectrum analyzer's center frequency to 270MHz with a span of 10MHz. Combine the DC2693A IF1⁺ and IF1⁻ outputs using a 180° combiner. Connect the combiner's output to the spectrum analyzer
9. Perform various measurements (Conversion Gain, OIP3, LO leakage, etc.).

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
1	2	C1, C2	CAP., 1pF, C0G, 50V, $\pm 0.05\text{pF}$, 0402, HIGH Q	MURATA, GJM1555C1H1R0WB01D
2	2	C3, C4	CAP., 1.2pF, C0G, 50V, $\pm 0.05\text{pF}$, 0402, HIGH Q	MURATA, GJM1555C1H1R2WB01D
3	4	C5, C6, C7, C8	CAP., 1000pF, X7R, 50V, 10%, 0201	MURATA, GRM033R71H102KA12D
4	8	C9, C10, C11, C12, C13, C14, C15, C16	CAP., 0.01 μF , X7R, 50V, 10%, 0402	MURATA, GRM155R71H103KA88
5	0	C17, C18	DNI	DNI
6	2	C19, C20	CAP., 1 μF , X7R, 16V, 10%, 0603	MURATA, GRM188R71C105KA12D
7	2	C101, C102	CAP., 0.1 μF , X7R, 50V, 10%, 0402	MURATA, GRM155R71H104KE14D
8	5	E1, E2, E3, E4, E5	TEST POINT, TURRET, 0.064", MTG. HOLE	MILL-MAX, 2308-2-00-80-00-00-07-0
9	7	J1, J2, J3, J4, J5, J6, J7	CONN., SMA, JACK, RCPT, END LAUNCH, STR, 50 Ω	CINCH, 142-0701-851
10	2	JP1, JP2	CONN., HDR., MALE, 1 \times 3, 2mm, THT, STR	SAMTEC, TMM-103-02-L-S
11	1	JP101	CONN., HDR., MALE, 2 \times 7, 2mm, THT, VERT, SHROUDED	MOLEX, 87831-1420
12	8	L1, L2, L3, L4, L11, L12, L13, L14	IND., 680nH, RF, FERRITE, 5%, 0603	COILCRAFT, 0603AF-681XJEU
13	4	L5, L6, L7, L8	IND., 18nH, FILM, 3%, 0201, HIGH Q	MURATA, LQP03HQ18NH02D
14	4	L15, L16, L17, L18	IND., 20nH, CER., 2%, 0402, HIGH Q	COILCRAFT, 0402HP-20NXGLU
17	2	R101, R107	RES., 200k Ω , 1%, 1/16W, 0402	VISHAY, CRCW0402200KFKED
18	5	R102, R103, R104, R105, R106	RES., 1k Ω , 1%, 1/16W, 0402	VISHAY, CRCW04021K00FKED
20	0	T1, T2	DNI	DNI
21	1	U1	1.5GHz to 7GHz DUAL PROGRAMMABLE GAIN DOWNCONVERTING MIXER	LINEAR TECH., LTC5556IUH#PBF
22	1	U101	DUAL SUPPLY TRANSLATING TRANSCEIVER, 3-STATE	NXP, 74LVC1T45GW
23	2	U102, U103	DUAL BUFFER WITH 3-STATE OUTPUT	FAIRCHILD, NC7WZ17P6X

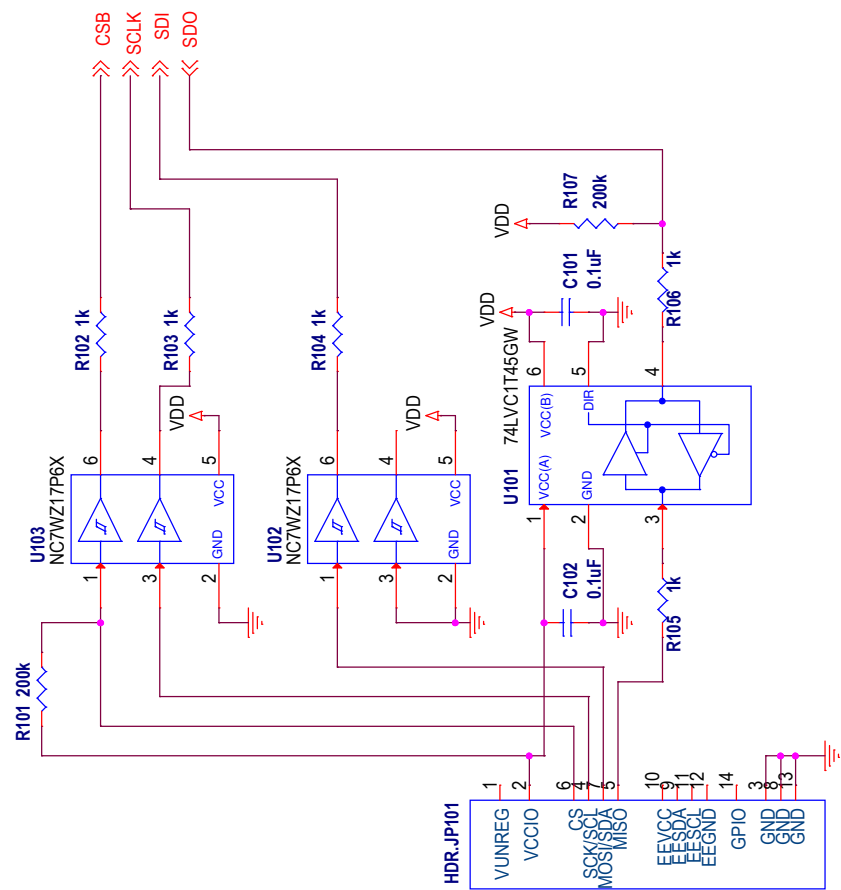
SCHEMATIC DIAGRAM



NOTE: UNLESS OTHERWISE SPECIFIED

ALL RESISTORS ARE IN OHMS, 0402
ALL CAPACITORS ARE IN pF, 0402
ALL INDUCTORS ARE IN nH, 0402

SCHEMATIC DIAGRAM



DEMO MANUAL DC2693A



ESD Caution

ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

Legal Terms and Conditions

By using the evaluation board discussed herein (together with any tools, components documentation or support materials, the "Evaluation Board"), you are agreeing to be bound by the terms and conditions set forth below ("Agreement") unless you have purchased the Evaluation Board, in which case the Analog Devices Standard Terms and Conditions of Sale shall govern. Do not use the Evaluation Board until you have read and agreed to the Agreement. Your use of the Evaluation Board shall signify your acceptance of the Agreement. This Agreement is made by and between you ("Customer") and Analog Devices, Inc. ("ADI"), with its principal place of business at One Technology Way, Norwood, MA 02062, USA. Subject to the terms and conditions of the Agreement, ADI hereby grants to Customer a free, limited, personal, temporary, non-exclusive, non-sublicensable, non-transferable license to use the Evaluation Board FOR EVALUATION PURPOSES ONLY. Customer understands and agrees that the Evaluation Board is provided for the sole and exclusive purpose referenced above, and agrees not to use the Evaluation Board for any other purpose. Furthermore, the license granted is expressly made subject to the following additional limitations: Customer shall not (i) rent, lease, display, sell, transfer, assign, sublicense, or distribute the Evaluation Board; and (ii) permit any Third Party to access the Evaluation Board. As used herein, the term "Third Party" includes any entity other than ADI, Customer, their employees, affiliates and in-house consultants. The Evaluation Board is NOT sold to Customer; all rights not expressly granted herein, including ownership of the Evaluation Board, are reserved by ADI. CONFIDENTIALITY. This Agreement and the Evaluation Board shall all be considered the confidential and proprietary information of ADI. Customer may not disclose or transfer any portion of the Evaluation Board to any other party for any reason. Upon discontinuation of use of the Evaluation Board or termination of this Agreement, Customer agrees to promptly return the Evaluation Board to ADI. ADDITIONAL RESTRICTIONS. Customer may not disassemble, decompile or reverse engineer chips on the Evaluation Board. Customer shall inform ADI of any occurred damages or any modifications or alterations it makes to the Evaluation Board, including but not limited to soldering or any other activity that affects the material content of the Evaluation Board. Modifications to the Evaluation Board must comply with applicable law, including but not limited to the RoHS Directive. TERMINATION. ADI may terminate this Agreement at any time upon giving written notice to Customer. Customer agrees to return to ADI the Evaluation Board at that time. LIMITATION OF LIABILITY. THE EVALUATION BOARD PROVIDED HEREUNDER IS PROVIDED "AS IS" AND ADI MAKES NO WARRANTIES OR REPRESENTATIONS OF ANY KIND WITH RESPECT TO IT. ADI SPECIFICALLY DISCLAIMS ANY REPRESENTATIONS, ENDORSEMENTS, GUARANTEES, OR WARRANTIES, EXPRESS OR IMPLIED, RELATED TO THE EVALUATION BOARD INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTY OF MERCHANTABILITY, TITLE, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS. IN NO EVENT WILL ADI AND ITS LICENSORS BE LIABLE FOR ANY INCIDENTAL, SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES RESULTING FROM CUSTOMER'S POSSESSION OR USE OF THE EVALUATION BOARD, INCLUDING BUT NOT LIMITED TO LOST PROFITS, DELAY COSTS, LABOR COSTS OR LOSS OF GOODWILL. ADI'S TOTAL LIABILITY FROM ANY AND ALL CAUSES SHALL BE LIMITED TO THE AMOUNT OF ONE HUNDRED US DOLLARS (\$100.00). EXPORT. Customer agrees that it will not directly or indirectly export the Evaluation Board to another country, and that it will comply with all applicable United States federal laws and regulations relating to exports. GOVERNING LAW. This Agreement shall be governed by and construed in accordance with the substantive laws of the Commonwealth of Massachusetts (excluding conflict of law rules). Any legal action regarding this Agreement will be heard in the state or federal courts having jurisdiction in Suffolk County, Massachusetts, and Customer hereby submits to the personal jurisdiction and venue of such courts. The United Nations Convention on Contracts for the International Sale of Goods shall not apply to this Agreement and is expressly disclaimed.



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.