

## InGaP HBT GAIN BLOCK MMIC AMPLIFIER, DC - 8 GHz

### Typical Applications

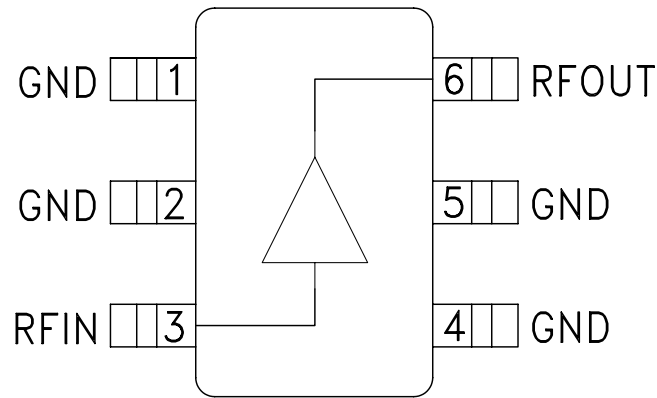
The HMC311SC70(E) is ideal for:

- Cellular / PCS / 3G
- WiBro / WiMAX / 4G
- Fixed Wireless & WLAN
- CATV & Cable Modem
- Microwave Radio & Test Equipment

### Features

- P1dB Output Power: +15 dBm
- Output IP3: +30 dBm
- Gain: 15 dB
- Cascadable, 50 Ohm I/O's
- Single Supply: +5V
- Industry Standard SC70 Package

### Functional Diagram



### General Description

The HMC311SC70(E) is a GaAs InGaP Heterojunction Bipolar Transistor (HBT) Gain Block MMIC SMT DC to 8 GHz amplifier. Packaged in an industry standard SC70, the amplifier can be used as either a cascadable 50 Ohm gain stage or to drive the LO port of HMC mixers with up to +15 dBm output power. The HMC311SC70(E) offers 15 dB of gain and an output IP3 of +30 dBm while requiring only 54 mA from a +5V supply. The Darlington topology results in reduced sensitivity to normal process variations, and yields excellent gain stability over temperature while requiring a minimal number of external bias components.

### Electrical Specifications, $V_s = 5V$ , $R_{bias} = 22\text{ Ohm}$ , $T_A = +25^\circ\text{C}$

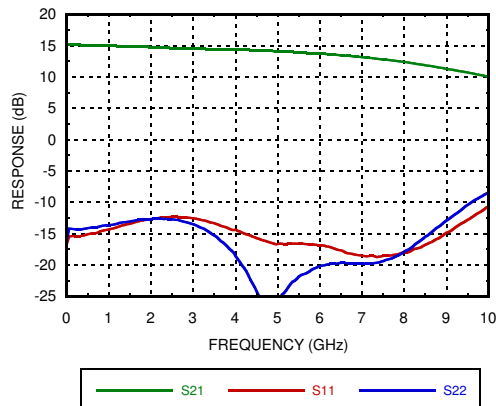
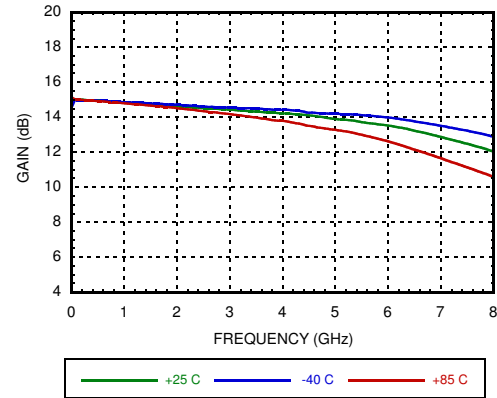
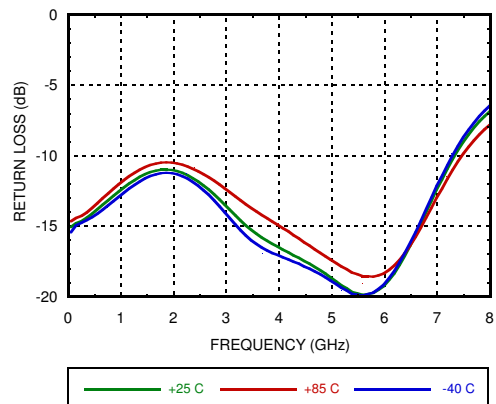
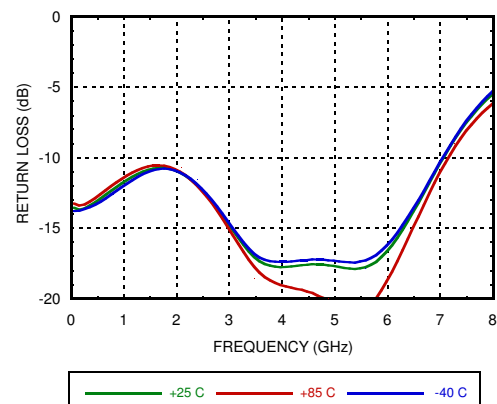
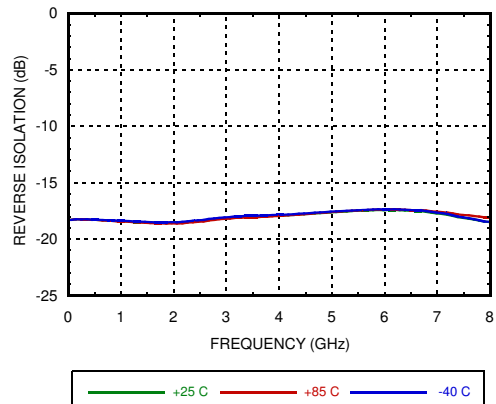
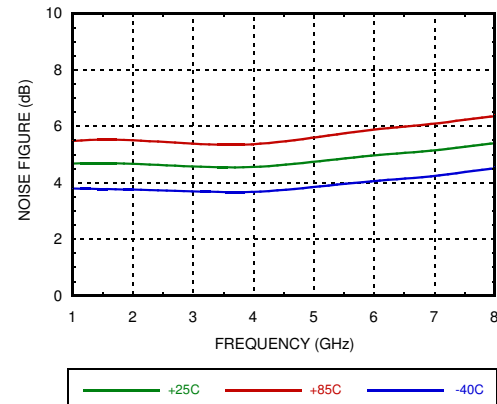
| Parameter                                |               | Min. | Typ.  | Max.  | Units  |
|------------------------------------------|---------------|------|-------|-------|--------|
| Gain                                     | DC - 1.0 GHz  | 14.0 | 15.0  |       | dB     |
|                                          | 1.0 - 4.0 GHz | 13.0 | 15.0  |       | dB     |
|                                          | 4.0 - 6.0 GHz | 12.5 | 14.5  |       | dB     |
|                                          | 6.0 - 8.0 GHz | 11.0 | 13.0  |       | dB     |
| Gain Variation Over Temperature          | DC - 1.0 GHz  |      | 0.004 | 0.007 | dB/ °C |
|                                          | 1.0 - 4.0 GHz |      | 0.007 | 0.012 | dB/ °C |
|                                          | 4.0 - 6.0 GHz |      | 0.012 | 0.016 | dB/ °C |
|                                          | 6.0 - 8.0 GHz |      | 0.018 | 0.022 | dB/ °C |
| Return Loss Input / Output               |               |      | 15    |       | dB     |
| Reverse Isolation                        |               |      | 18    |       | dB     |
| Output Power for 1 dB Compression (P1dB) | DC - 2.0 GHz  | 13.5 | 15.5  |       | dBm    |
|                                          | 2.0 - 4.0 GHz | 12.0 | 15.0  |       | dBm    |
|                                          | 4.0 - 6.0 GHz | 10.0 | 13.0  |       | dBm    |
|                                          | 6.0 - 8.0 GHz | 8.0  | 11.0  |       | dBm    |
| Output Third Order Intercept (IP3)       | DC - 2.0 GHz  |      | 30    |       | dBm    |
|                                          | 2.0 - 6.0 GHz |      | 27    |       | dBm    |
|                                          | 6.0 - 8.0 GHz |      | 24    |       | dBm    |
| Noise Figure                             |               |      | 5     |       | dB     |
| Supply Current (Icq)                     |               |      | 55    | 74    | mA     |

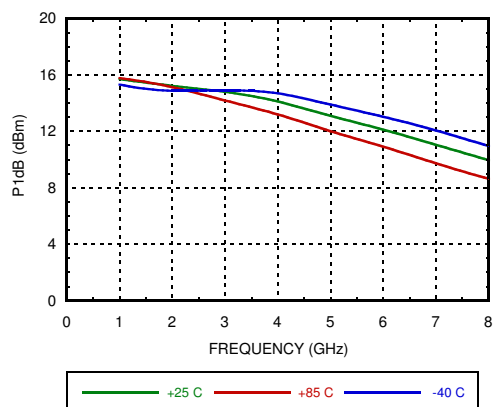
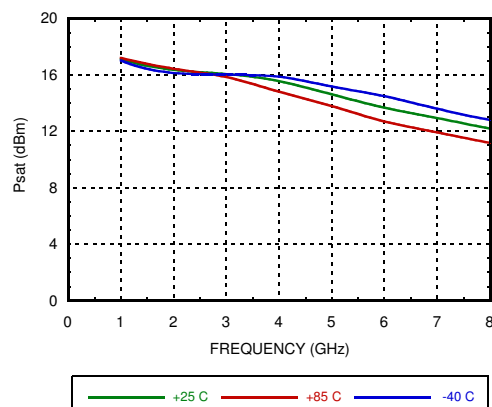
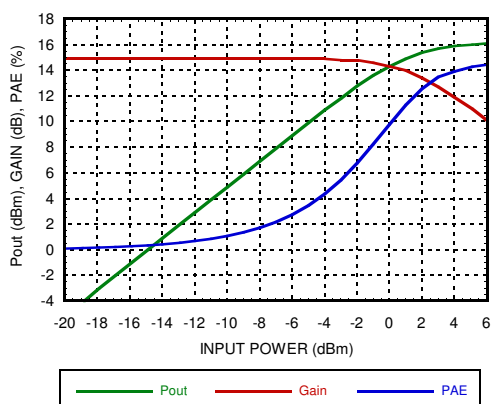
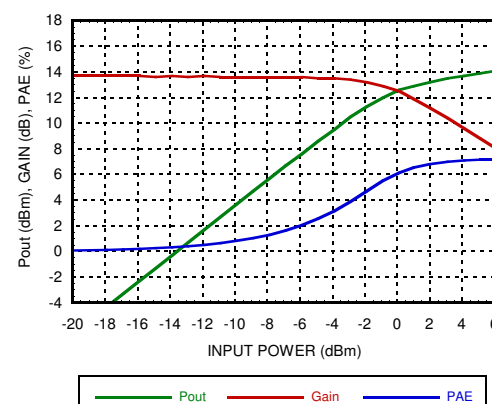
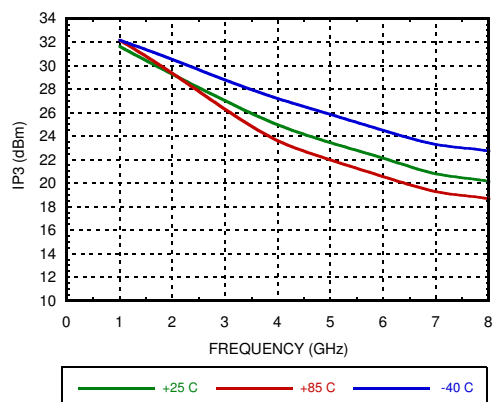
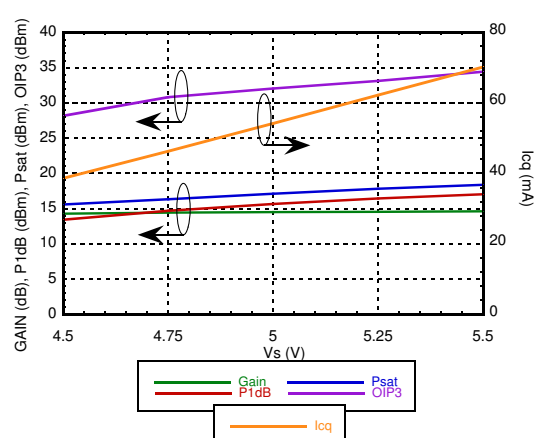
Note: Data taken with broadband bias tee on device output.

Information furnished by Analog Devices is believed to be accurate and reliable. However, no responsibility is assumed by Analog Devices for its use, nor for any infringements of patents or other rights of third parties that may result from its use. Specifications subject to change without notice. No license is granted by implication or otherwise under any patent or patent rights of Analog Devices. Trademarks and registered trademarks are the property of their respective owners.

For price, delivery, and to place orders: Analog Devices, Inc., One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106  
Phone: 781-329-4700 • Order online at [www.analog.com](http://www.analog.com)  
Application Support: Phone: 1-800-ANALOG-D

## InGaP HBT GAIN BLOCK MMIC AMPLIFIER, DC - 8 GHz

**Broadband Gain & Return Loss**

**Gain vs. Temperature**

**Input Return Loss vs. Temperature**

**Output Return Loss vs. Temperature**

**Reverse Isolation vs. Temperature**

**Noise Figure vs. Temperature**


**InGaP HBT GAIN BLOCK  
MMIC AMPLIFIER, DC - 8 GHz**
**P1dB vs. Temperature**

**Psat vs. Temperature**

**Power Compression @ 1 GHz**

**Power Compression @ 6 GHz**

**Output IP3 vs. Temperature**

**Gain, Power, IP3 & Supply Current vs.  
Supply Voltage @ 1 GHz**


## InGaP HBT GAIN BLOCK MMIC AMPLIFIER, DC - 8 GHz

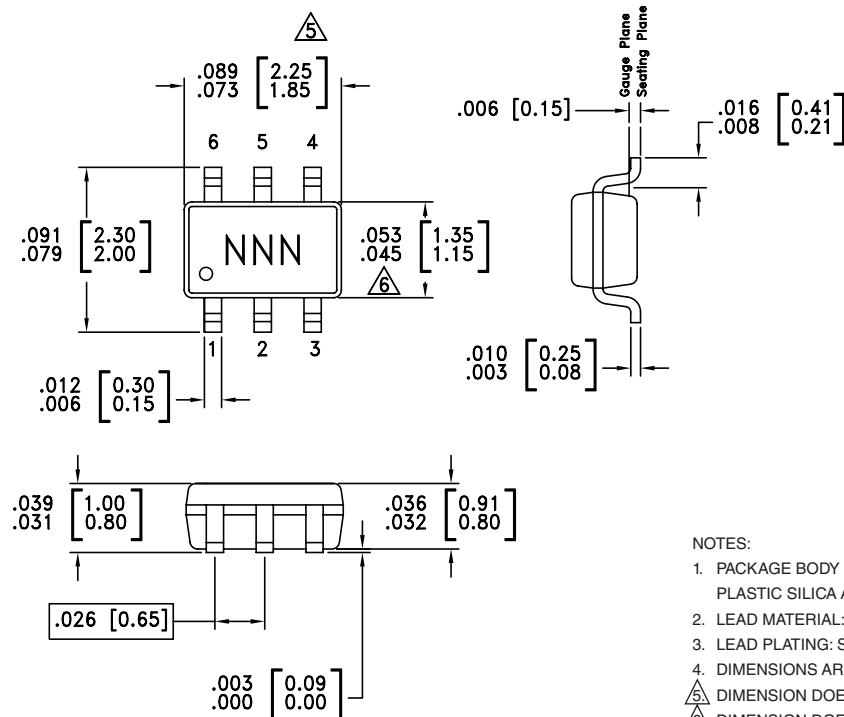
### Absolute Maximum Ratings

|                                                                             |                         |
|-----------------------------------------------------------------------------|-------------------------|
| Collector Bias Voltage (Vcc)                                                | +7V                     |
| RF Input Power (RFIN)(Vcc = +3.9V)                                          | +10 dBm                 |
| Junction Temperature                                                        | 150 °C                  |
| Continuous P <sub>diss</sub> (T = 85 °C)<br>(derate 5.21 mW/°C above 85 °C) | 0.34 W                  |
| Thermal Resistance<br>(junction to lead)                                    | 191 °C/W                |
| Storage Temperature                                                         | -65 to +150 °C          |
| Operating Temperature                                                       | -40 to +85 °C           |
| ESD Sensitivity (HBM)                                                       | Class1A,<br>Passed 250V |



**ELECTROSTATIC SENSITIVE DEVICE  
OBSERVE HANDLING PRECAUTIONS**

### Outline Drawing



#### NOTES:

1. PACKAGE BODY MATERIAL: LOW STRESS INJECTION MOLDED PLASTIC SILICA AND SILICON IMPREGNATED.
2. LEAD MATERIAL: COPPER ALLOY
3. LEAD PLATING: Sn/Pb
4. DIMENSIONS ARE IN INCHES [MILLIMETERS].
5. DIMENSION DOES NOT INCLUDE MOLDFLASH OF 0.15mm PER SIDE.
6. DIMENSION DOES NOT INCLUDE MOLDFLASH OF 0.25mm PER SIDE.
7. ALL GROUND LEADS MUST BE SOLDERED TO PCB RF GROUND.

### Package Information

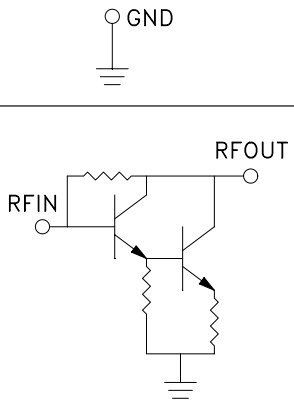
| Part Number | Package Body Material                              | Lead Finish   | MSL Rating          | Package Marking |
|-------------|----------------------------------------------------|---------------|---------------------|-----------------|
| HMC311SC70  | Low Stress Injection Molded Plastic                | Sn/Pb         | MSL1 <sup>[1]</sup> | 311             |
| HMC311SC70E | RoHS-compliant Low Stress Injection Molded Plastic | 100% matte Sn | MSL1 <sup>[2]</sup> | 311E            |

[1] Max peak reflow temperature of 235°C

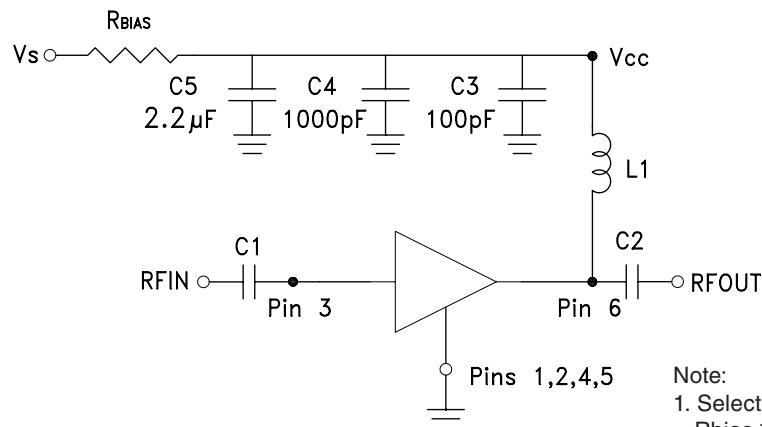
[2] Max peak reflow temperature of 260°C

## InGaP HBT GAIN BLOCK MMIC AMPLIFIER, DC - 8 GHz

### Pin Descriptions

| Pin Number | Function | Description                                                               | Interface Schematic                                                                 |
|------------|----------|---------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| 1, 2, 4, 5 | GND      | These pins must be connected to RF/DC ground.                             |  |
| 3          | RFIN     | This pin is DC coupled.<br>An off chip DC blocking capacitor is required. |                                                                                     |
| 6          | RFOUT    | RF output and DC Bias for the output stage.                               |                                                                                     |

### Application Circuit



Note:

1. Select Rbias to achieve Icq using equation below, Rbias ≥ 22 Ohm.
2. External blocking capacitors are required on RFIN and RFOUT.

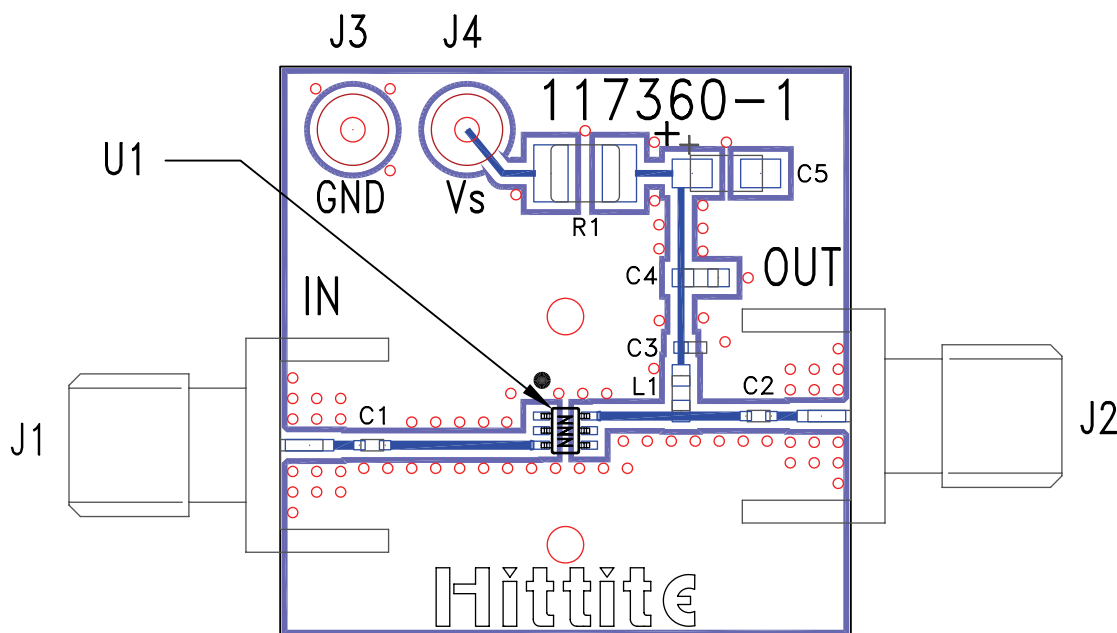
$$I_{cq} = \frac{V_s - 3.8}{R_{bias}}$$

### Recommended Component Values

| Component | Frequency (MHz) |        |        |        |        |        |        |        |
|-----------|-----------------|--------|--------|--------|--------|--------|--------|--------|
|           | 50              | 900    | 1900   | 2200   | 2400   | 3500   | 5200   | 5800   |
| L1        | 270 nH          | 56 nH  | 22 nH  | 22 nH  | 15 nH  | 8.2 nH | 3.3 nH | 3.3 nH |
| C1, C2    | 0.01 μF         | 100 pF | 100 pF | 100 pF | 100 pF | 100 pF | 100 pF | 100 pF |

**InGaP HBT GAIN BLOCK  
MMIC AMPLIFIER, DC - 8 GHz**

**Evaluation PCB**



**List of Materials for Evaluation PCB 118040 [1]**

| Item    | Description                     |
|---------|---------------------------------|
| J1 - J2 | PCB Mount SMA Connector         |
| J3 - J4 | DC Pin                          |
| C1 - C3 | 100 pF Capacitor, 0402 Pkg.     |
| C4      | 1000 pF Capacitor, 0603 Pkg.    |
| C5      | 2.2 $\mu$ F Capacitor, Tantalum |
| R1      | 22 Ohm Resistor, 1210 Pkg.      |
| L1      | 22 nH Inductor, 0603 Pkg.       |
| U1      | HMC311SC70 / HMC311SC70E        |
| PCB [2] | 117360 Evaluation PCB           |

[1] Reference this number when ordering complete evaluation PCB

[2] Circuit Board Material: Rogers 4350

The circuit board used in the final application should use RF circuit design techniques. Signal lines should have 50 Ohm impedance while the package ground leads should be connected directly to the ground plane similar to that shown. A sufficient number of via holes should be used to connect the top and bottom ground planes. The evaluation board should be mounted to an appropriate heat sink. The evaluation circuit board shown is available from Analog Devices upon request.

## Данный компонент на территории Российской Федерации

**Вы можете приобрести в компании MosChip.**

Для оперативного оформления запроса Вам необходимо перейти по данной ссылке:

<http://moschip.ru/get-element>

Вы можете разместить у нас заказ для любого Вашего проекта, будь то серийное производство или разработка единичного прибора.

В нашем ассортименте представлены ведущие мировые производители активных и пассивных электронных компонентов.

Нашей специализацией является поставка электронной компонентной базы двойного назначения, продукции таких производителей как XILINX, Intel (ex.ALTERA), Vicor, Microchip, Texas Instruments, Analog Devices, Mini-Circuits, Amphenol, Glenair.

Сотрудничество с глобальными дистрибьюторами электронных компонентов, предоставляет возможность заказывать и получать с международных складов практически любой перечень компонентов в оптимальные для Вас сроки.

На всех этапах разработки и производства наши партнеры могут получить квалифицированную поддержку опытных инженеров.

Система менеджмента качества компании отвечает требованиям в соответствии с ГОСТ Р ИСО 9001, ГОСТ РВ 0015-002 и ЭС РД 009

### Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: [info@moschip.ru](mailto:info@moschip.ru)

Skype отдела продаж:

moschip.ru

moschip.ru\_4

moschip.ru\_6

moschip.ru\_9