



### Features

- Eight Darlington transistors with common emitters
- Output current to 500 mA
- Output voltage to 50 V
- Integral suppression diodes
- Versions for all popular logic families
- Output can be paralleled
- Inputs pinned opposite outputs to simplify board layout

### Description

The ULN2801A, ULN2802A, ULN2803A and ULN2804A each contain eight Darlington transistors with common emitters and integral suppression diodes for inductive loads. Each Darlington features a peak load current rating of 600 mA (500 mA continuous) and can withstand at least 50 V in the OFF state. Outputs may be paralleled for higher current capability.

Four versions are available to simplify interfacing to standard logic families: the ULN2801A is designed for general purpose applications with a current limit resistor; the ULN2802A has a 10.5 k $\Omega$  input resistor and Zener for 14-25 V PMOS; the ULN2803A has a 2.7 k $\Omega$  input resistor for 5 V TTL and CMOS; the ULN2804A has a 10.5 k $\Omega$  input resistor for 6-15 V CMOS.

All types are supplied in an 18-lead plastic DIP with a copper lead form and feature the convenient input-opposite-output pinout to simplify board layout.

**Table 1. Device summary**

| Order codes | Package |
|-------------|---------|
| ULN2801A    | DIP-18  |
| ULN2802A    |         |
| ULN2803A    |         |
| ULN2804A    |         |

# Contents

|   |   |    |
|---|---|----|
| 1 | Diagram .....                             | 3  |
| 2 | Pin configuration .....                   | 4  |
| 3 | Maximum ratings .....                     | 5  |
| 4 | Electrical characteristics .....          | 6  |
| 5 | Test circuits .....                       | 7  |
| 6 | Typical performance characteristics ..... | 9  |
| 7 | Package mechanical data .....             | 11 |
| 8 | Revision history .....                    | 13 |

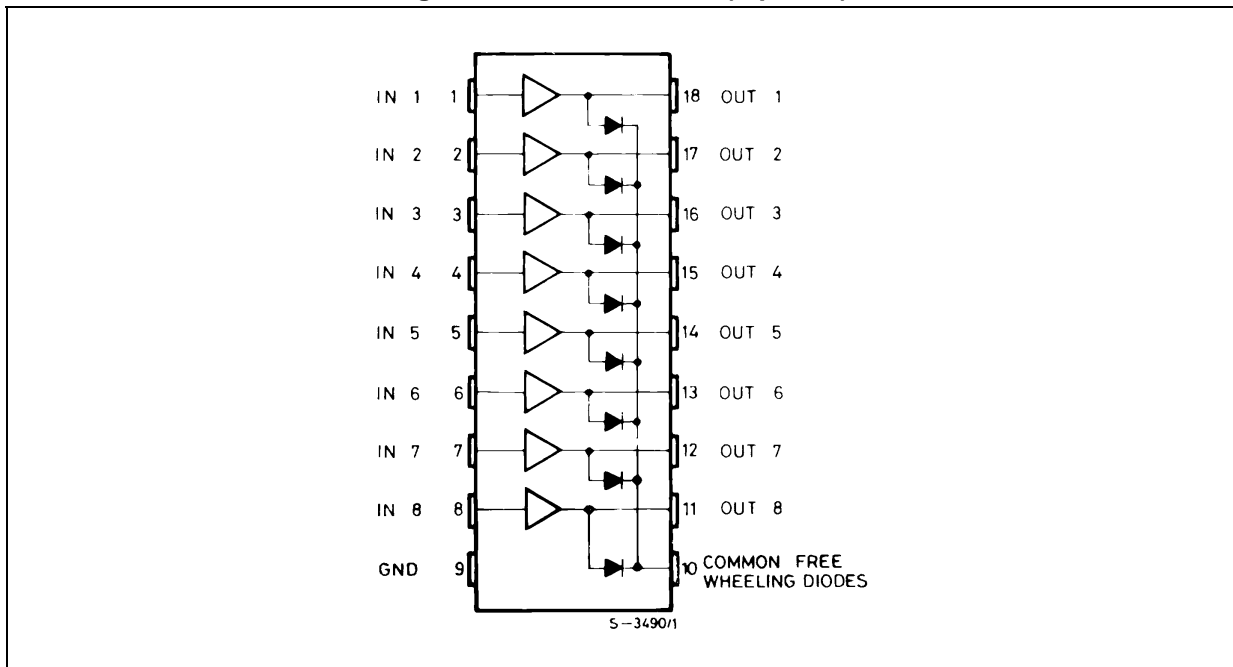
# 1 Diagram

Figure 1. Schematic diagrams



## 2 Pin configuration

Figure 2. Pin connections (top view)



### 3 Maximum ratings

**Table 2. Absolute maximum ratings**

| Symbol    | Parameter  | Value       | Unit |
|-----------|--|-------------|------|
| $V_O$     | Output voltage                                     | 50          | V    |
| $V_I$     | Input voltage (for ULN2802A - ULN2803A - ULN2804A) | 30          | V    |
| $I_C$     | Continuous collector current                       | 500         | mA   |
| $I_B$     | Continuous base current                            | 25          | mA   |
| $P_{TOT}$ | Power Dissipation (one Darlington pair)            | 1           | W    |
|           | Power Dissipation (total package)                  | 2.25        |      |
| $T_A$     | Operating ambient temperature range                | - 20 to 85  | °C   |
| $T_{STG}$ | Storage temperature range                          | - 55 to 150 | °C   |
| $T_J$     | Junction temperature                               | -20 to 150  | °C   |

**Table 3. Thermal data**

| Symbol     | Parameter                           | Value | Unit |
|------------|-------------------------------------|-------|------|
| $R_{thJA}$ | Thermal resistance junction-ambient | 55    | °C/W |

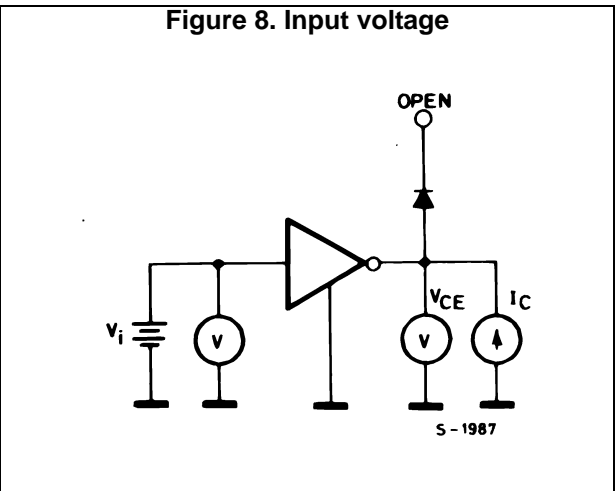
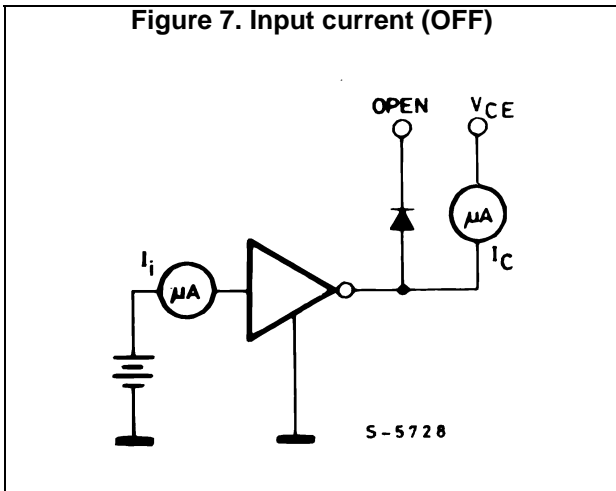
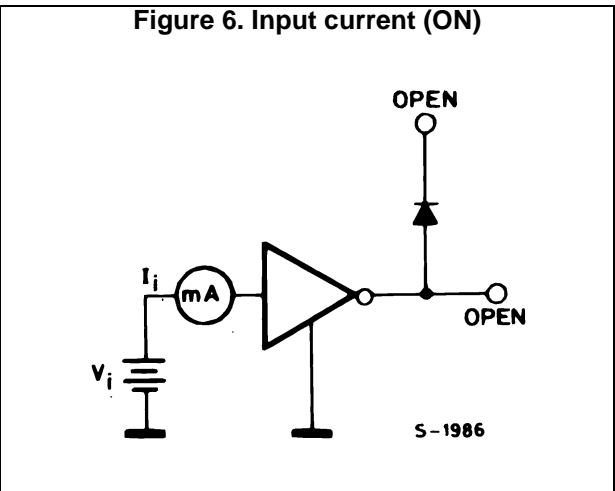
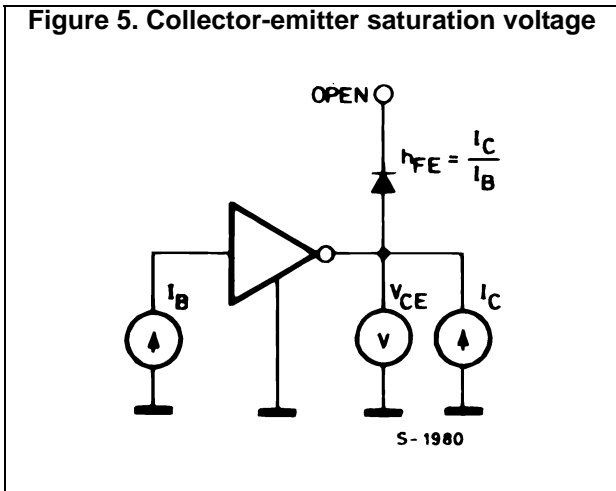
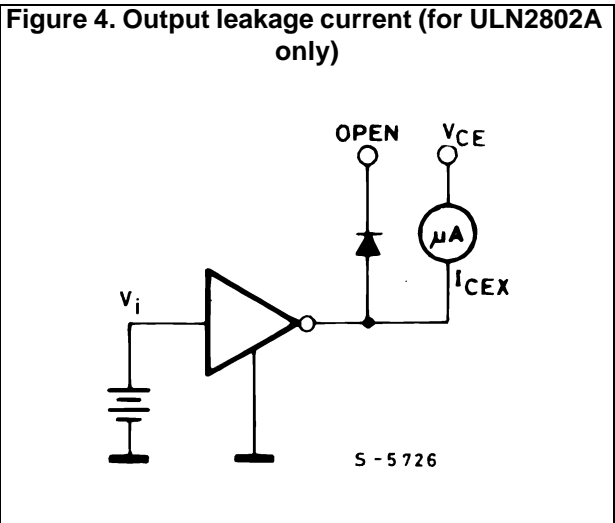
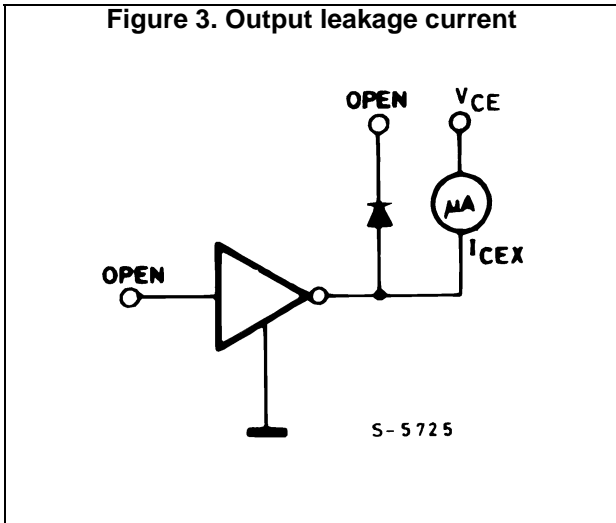
## 4 Electrical characteristics

$T_A = 25\text{ °C}$  unless otherwise specified.

**Table 4. Electrical characteristics**

| Symbol                | Parameter                                       | Test condition   | Min. | Typ. | Max. | Unit          |
|-----------------------|---|--|------|------|------|---------------|
| $I_{CEX}$             | Output leakage current                          | $V_{CE} = 50\text{ V}$   |      |      |      | $\mu\text{A}$ |
|                       |   | $T_A = 70\text{ °C}$ , $V_{CE} = 50\text{ V}$ (Figure 3)                                     |      |      | 50   |               |
|                       |   | $T_A = 70\text{ °C}$ for ULN2802A, $V_{CE} = 50\text{ V}$ ,<br>$V_I = 6\text{ V}$ (Figure 4) |      |      | 100  |               |
|                       |   | $T_A = 70\text{ °C}$ for ULN2804A, $V_{CE} = 50\text{ V}$ ,<br>$V_I = 1\text{ V}$ (Figure 4) |      |      | 500  |               |
| $V_{CE(SAT)}$         | Collector-emitter saturation voltage (Figure 5) | $I_C = 100\text{ mA}$ , $I_B = 250\text{ }\mu\text{A}$                                       |      | 0.9  | 1.1  | V             |
|                       |   | $I_C = 200\text{ mA}$ , $I_B = 350\text{ }\mu\text{A}$                                       |      | 1.1  | 1.3  |               |
|                       |   | $I_C = 350\text{ mA}$ , $I_B = 500\text{ }\mu\text{A}$                                       |      | 1.3  | 1.6  |               |
| $I_{I(ON)}$           | Input current (Figure 6)                        | for ULN2802A, $V_I = 17\text{ V}$  |      | 0.82 | 1.25 | mA            |
|                       |   | for ULN2803A, $V_I = 3.85\text{ V}$  |      | 0.93 | 1.35 |               |
|                       |   | for ULN2804A, $V_I = 5\text{ V}$   |      | 0.35 | 0.5  |               |
|                       |   | $V_I = 12\text{ V}$  |      | 1    | 1.45 |               |
| $I_{I(OFF)}$          | Input current (Figure 7)                        | $T_A = 70\text{ °C}$ , $I_C = 500\text{ }\mu\text{A}$  | 50   | 65   |      | $\mu\text{A}$ |
| $V_{I(ON)}$           | Input voltage (Figure 8)                        | $V_{CE} = 2\text{ V}$ , for ULN2802A   |      |      | 13   | V             |
|                       |   | $I_C = 300\text{ mA}$  |      |      | 2.4  |               |
|                       |   | for ULN2803A   |      |      | 2.7  |               |
|                       |   | $I_C = 200\text{ mA}$  |      |      | 3    |               |
|                       |   | $I_C = 250\text{ mA}$  |      |      | 5    |               |
|                       |   | for ULN2804A   |      |      | 6    |               |
|                       |   | $I_C = 125\text{ mA}$  |      |      | 7    |               |
|                       |   | $I_C = 200\text{ mA}$  |      |      | 8    |               |
| $I_C = 275\text{ mA}$ |   |  |      |      |      |               |
| $I_C = 350\text{ mA}$ |   |  |      |      |      |               |
| $h_{FE}$              | DC Forward current gain (Figure 5)              | for ULN2801A, $V_{CE} = 2\text{ V}$ ,<br>$I_C = 350\text{ mA}$                               | 1000 |      |      |               |
| $C_I$                 | Input capacitance                               |  |      | 15   | 25   | pF            |
| $t_{PLH}$             | Turn-on delay time                              | $0.5 V_I$ to $0.5V_O$  |      | 0.25 | 1    | $\mu\text{s}$ |
| $t_{PHL}$             | Turn-off delay time                             | $0.5 V_I$ to $0.5V_O$  |      | 0.25 | 1    | $\mu\text{s}$ |
| $I_R$                 | Clamp diode leakage current (Figure 9)          | $V_R = 50\text{ V}$  |      |      | 50   | $\mu\text{A}$ |
|                       |   | $T_A = 70\text{ °C}$ , $V_R = 50\text{ V}$   |      |      | 100  |               |
| $V_F$                 | Clamp diode forward voltage (Figure 10)         | $I_F = 350\text{ mA}$  |      | 1.7  | 2    | V             |

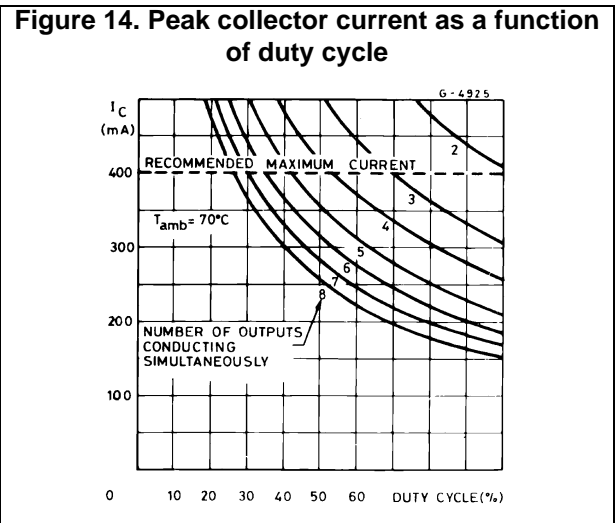
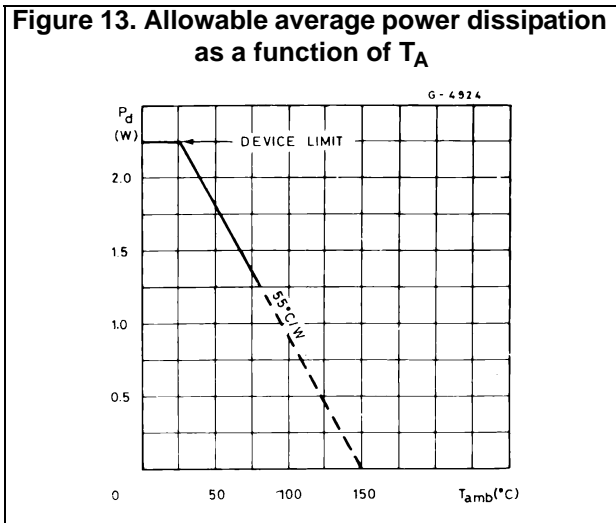
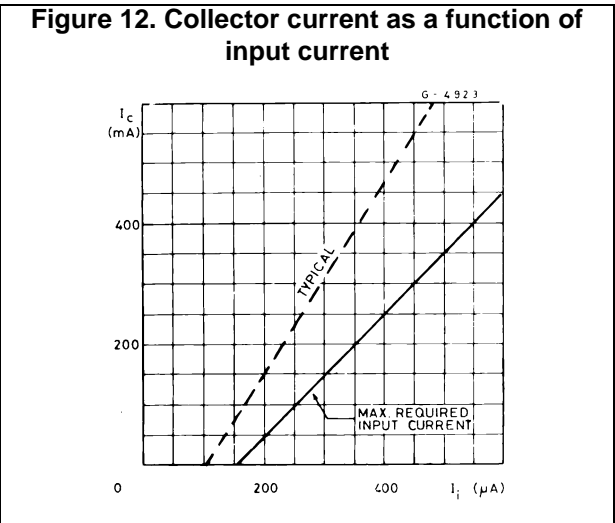
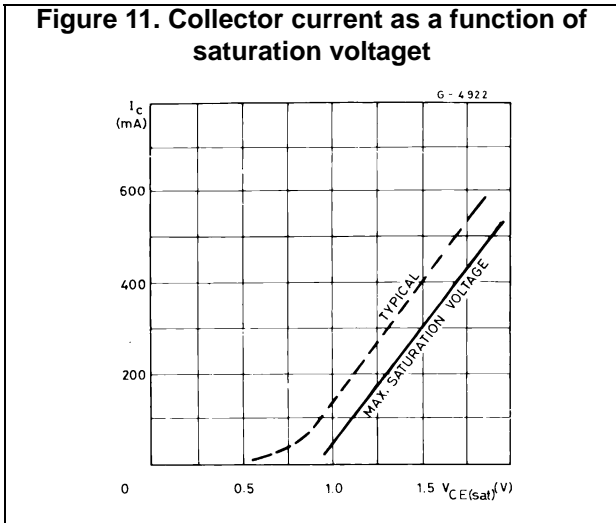
# 5 Test circuits







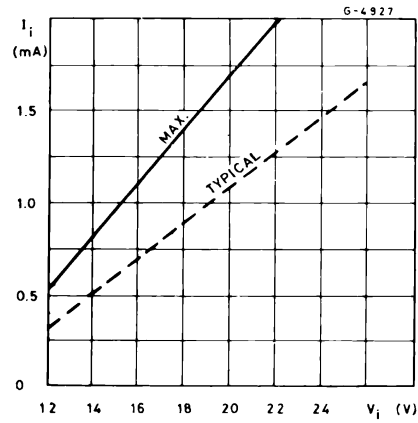
## 6 Typical performance characteristics



**Figure 15. Peak collector current as a function of duty cycle**



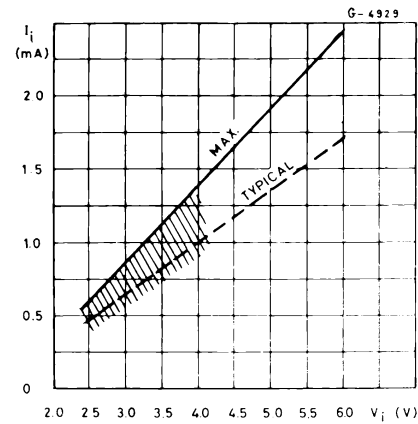
**Figure 16. Input current as a function of input voltage (for ULN2802A)**



**Figure 17. Input current as a function of input voltage (for ULN2804A)**



**Figure 18. Input current as a function of input voltage (for ULN2803A)**



## 7 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK<sup>®</sup> packages, depending on their level of environmental compliance. ECOPACK<sup>®</sup> specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK<sup>®</sup> is an ST trademark.

Table 5. DIP-18 mechanical data

| Dim. | mm.   |       |       |
|------|-------|-------|-------|
|      | Min.  | Typ.  | Max.  |
| a1   | 0.254 |       |       |
| B    | 1.39  |       | 1.65  |
| b    |       | 0.46  |       |
| b1   |       | 0.25  |       |
| D    |       |       | 23.24 |
| E    |       | 8.5   |       |
| e    |       | 2.54  |       |
| e3   |       | 20.32 |       |
| F    |       |       | 7.1   |
| l    |       |       | 3.93  |
| L    |       | 3.3   |       |
| Z    |       | 1.27  | 1.59  |

Figure 19. DIP-18 package dimensions



## 8 Revision history

**Table 6. Document revision history**

| Date        | Revision | Changes  |
|-------------|----------|--|
| 18-Sep-2003 | 1        | First release  |
| 10-Mar-2010 | 2        | Updated package mechanical data  |
| 19-Nov-2012 | 3        | Modified input voltage values Table 4 on page 6.   |
| 27-Jun-2018 | 4        | Updated: $I_{I(ON)}$ test condition in <a href="#">Table 4: Electrical characteristics</a> . |

**IMPORTANT NOTICE – PLEASE READ CAREFULLY**

STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, enhancements, modifications, and improvements to ST products and/or to this document at any time without notice. Purchasers should obtain the latest relevant information on ST products before placing orders. ST products are sold pursuant to ST's terms and conditions of sale in place at the time of order acknowledgement.

Purchasers are solely responsible for the choice, selection, and use of ST products and ST assumes no liability for application assistance or the design of Purchasers' products.

No license, express or implied, to any intellectual property right is granted by ST herein.

Resale of ST products with provisions different from the information set forth herein shall void any warranty granted by ST for such product.

ST and the ST logo are trademarks of ST. All other product or service names are the property of their respective owners.

Information in this document supersedes and replaces information previously supplied in any prior versions of this document.

© 2018 STMicroelectronics – All rights reserved



**Стандарт  
Электрон  
Связь**

Мы молодая и активно развивающаяся компания в области поставок электронных компонентов. Мы поставляем электронные компоненты отечественного и импортного производства напрямую от производителей и с крупнейших складов мира.

Благодаря сотрудничеству с мировыми поставщиками мы осуществляем комплексные и плановые поставки широчайшего спектра электронных компонентов.

Собственная эффективная логистика и склад в обеспечивает надежную поставку продукции в точно указанные сроки по всей России.

Мы осуществляем техническую поддержку нашим клиентам и предпродажную проверку качества продукции. На все поставляемые продукты мы предоставляем гарантию .

Осуществляем поставки продукции под контролем ВП МО РФ на предприятия военно-промышленного комплекса России , а также работаем в рамках 275 ФЗ с открытием отдельных счетов в уполномоченном банке. Система менеджмента качества компании соответствует требованиям ГОСТ ISO 9001.

Минимальные сроки поставки, гибкие цены, неограниченный ассортимент и индивидуальный подход к клиентам являются основой для выстраивания долгосрочного и эффективного сотрудничества с предприятиями радиоэлектронной промышленности, предприятиями ВПК и научно-исследовательскими институтами России.

С нами вы становитесь еще успешнее!

**Наши контакты:**

**Телефон:** +7 812 627 14 35

**Электронная почта:** [sales@st-electron.ru](mailto:sales@st-electron.ru)

**Адрес:** 198099, Санкт-Петербург,  
Промышленная ул, дом № 19, литера Н,  
помещение 100-Н Офис 331