

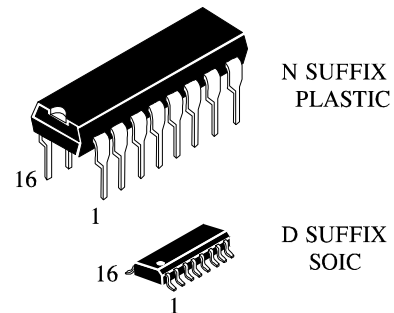
### +5V-Powered, Multichannel RS-232

### Drivers / Receivers

MAX232 is purposed for application in high-performance information processing systems and control devices of wide application.

Input voltage levels are compatible with standard CMOS levels.

- Output voltage levels are compatible with input levels of K-MOS, N-MOS and TTL integrated circuits.
- Supply voltage : 5V
- Low input current: 1.0  $\mu\text{A}$ ; 0.1  $\mu\text{A}$  at  $T = 25^\circ\text{C}$ .
- Output current 24 mA.
- Latching current not less than 450 mA at  $T = 25^\circ\text{C}$
- The transmitter outputs and receiver inputs are protected to  $\pm 15\text{kV}$  Air ESD.



#### ORDERING INFORMATION

MAX232CPE Plastic DIP

MAX232CSE SOIC

MAX232CWE SOIC

$T_A$ MAX232CWE<sup>0</sup> C

For all packages

#### Truth table

| Inputs                                                     | Outputs            |
|------------------------------------------------------------|--------------------|
| $R_{IN}, T_{IN}$                                           | $R_{OUT}, T_{OUT}$ |
| H                                                          | L                  |
| L                                                          | H                  |
| Note -<br>H – voltage high level;<br>L – low voltage level |                    |

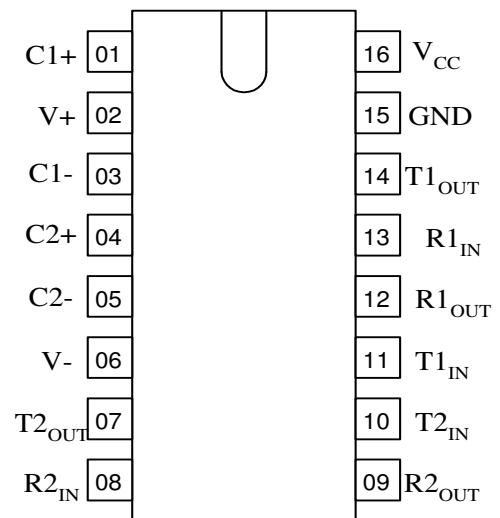


Table of pin description

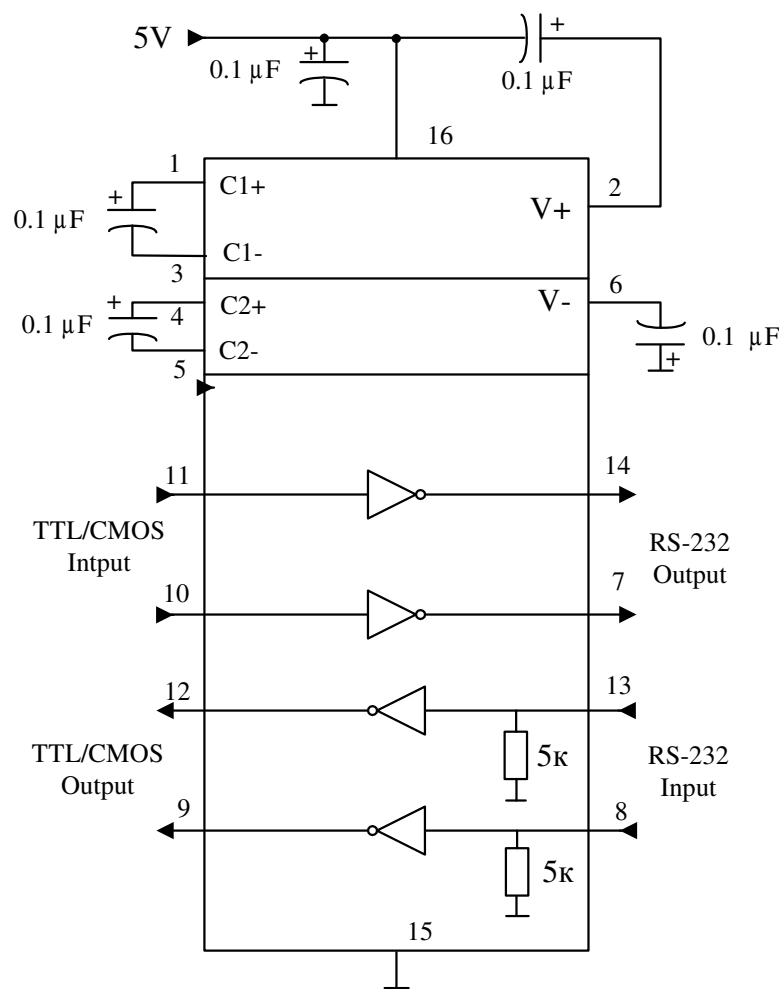
| Pin No. | Symbol            | Pin name                                                           |
|---------|-------------------|--------------------------------------------------------------------|
| 01      | C1+               | Output of external capacitance of positive voltage multiplier unit |
| 02      | V+                | Output of positive voltage of multiplier unit                      |
| 03      | C1-               | Output of external capacitance of positive voltage multiplier unit |
| 04      | C2+               | Output of external capacitance of negative voltage multiplier unit |
| 05      | C2-               | Output of external capacitance of negative voltage multiplier unit |
| 06      | V-                | Output of negative voltage of multiplier unit                      |
| 07      | T2 <sub>OUT</sub> | Output of transmitter data (levels RS – 232)                       |
| 08      | R2 <sub>IN</sub>  | Input of receiver data (levels RS – 232)                           |
| 09      | R2 <sub>OUT</sub> | Output of receiver data (levels TTL/KMOS)                          |
| 10      | T2 <sub>IN</sub>  | Input of transmitter data (levels TTL/KMOS)                        |
| 11      | T1 <sub>IN</sub>  | Input of transmitter data (levels TTL/KMOS)                        |
| 12      | R1 <sub>OUT</sub> | Output of receiver data (levels TTL/KMOS)                          |
| 13      | R1 <sub>IN</sub>  | Input of receiver data (levels RS – 232)                           |
| 14      | T1 <sub>OUT</sub> | Output of transmitter data (levels RS – 232)                       |
| 15      | GND               | Common output                                                      |
| 16      | V <sub>CC</sub>   | Supply output of voltage source                                    |

Maximum conditions

| Symbol           | Parameter                                   | Rate                 |              | Unit |
|------------------|---------------------------------------------|----------------------|--------------|------|
|                  |                                             | min                  | max          |      |
| V <sub>CC</sub>  | Supply voltage                              | -0.3                 | 6.0          | V    |
| V+               | Transmitter high output voltage             | V <sub>CC</sub> -0.3 | 14           |      |
| V-               | Transmitter low output voltage              | -0.3                 | -14          |      |
| V <sub>TIN</sub> | Transmitter input voltage                   | -0.3                 | V+ +0.3      |      |
| V <sub>RIN</sub> | Receiver input voltage                      | -30                  | 30           |      |
| P <sub>D</sub>   | Dissipated power                            | -                    | 842<br>762   | mW   |
|                  | DIP – package                               |                      |              |      |
|                  | SO - package                                |                      |              |      |
| I <sub>SC</sub>  | Output current of transmitter short circuit | -                    | Continuously | mA   |
| T <sub>a</sub>   | Ambient temperature                         | -60                  | 150          | °C   |

Recommended Operating Conditions

| Symbol    | Parameter                                | Rate |          | Unit        |
|-----------|------------------------------------------|------|----------|-------------|
|           |                                          | min  | max      |             |
| $V_{CC}$  | Supply voltage                           | 4.5  | 5.5      | V           |
| $V_{+}$   | Transmitter output high voltage          | 5.0  | -        |             |
| $V_{-}$   | Transmitter output low voltage           | -5.0 | -        |             |
| $V_{TIN}$ | Transmitter input voltage                | 0    | $V_{CC}$ |             |
| $V_{RIN}$ | Receiver input voltage                   | -30  | 30       |             |
| $I_{SC}$  | Transmitter short circuit output current | -    | $\pm 60$ | mA          |
| $T_a$     | Ambient temperature                      | -40  | 85       | $^{\circ}C$ |



**Static parameters**

| Static parameters |                            |                                                 |      |      |                 |                   |      |
|-------------------|----------------------------|-------------------------------------------------|------|------|-----------------|-------------------|------|
| Symbol            | Parameter                  | Test conditions                                 | Rate |      |                 |                   | Unit |
|                   |                            |                                                 | 25°C |      | -40 °C to 85 °C |                   |      |
|                   |                            |                                                 | min  | max  | min             | max               |      |
| I <sub>CC</sub>   | Consumption current static | V <sub>CC</sub> =5.0 V<br>V <sub>IL</sub> = 0 V | -    | 10.0 | -               | 14.0 <sup>*</sup> | mA   |

**Receiver electrical parameters**

|           |                        |                                                                                 |     |     |     |     |      |
|-----------|------------------------|---------------------------------------------------------------------------------|-----|-----|-----|-----|------|
| $V_h$     | Hysteresis voltage     | $V_{CC}=5.0\text{ V}$                                                           | 0.2 | 0.9 | 0.2 | 1.0 | V    |
| $V_{On}$  | On (operation) voltage | $V_O \leq 0.1\text{ V}$<br>$I_{OL} \leq 20\text{ uA}$                           | -   | 2.4 | -   | 2.3 |      |
| $V_{off}$ | Off (dropout) voltage  | $V_O \geq V_{CC}-0.1\text{ V}$<br>$I_{OH} \leq -20\text{ uA}$                   | 0.8 | -   | 0.9 | -   |      |
| $V_{OL}$  | Output low voltage     | $I_{OL} = 3.2\text{ mA}$<br>$V_{CC} = 4.5\text{ V}$<br>$V_{IH} = 2.4\text{ V}$  | -   | 0.3 | -   | 0.4 |      |
| $V_{OH}$  | Output high voltage    | $I_{OH} = -1.0\text{ mA}$<br>$V_{CC} = 4.5\text{ V}$<br>$V_{IL} = 0.8\text{ V}$ | 3.6 | -   | 3.5 | -   |      |
| $R_I$     | Input resistance       | $V_{CC} = 5.0\text{ V}$                                                         | 3.0 | 7.0 | 3.0 | 7.0 | kOhm |

**Transmitter electrical parameters**

|          |                                   |                                                                                                                                          |     |           |     |           |            |
|----------|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|-----|-----------|-----|-----------|------------|
| $V_{OL}$ | Output low voltage                | $V_{CC} = 4.5\text{ V}$<br>$V_{IH} = 2.0\text{ V}$<br>$R_L = 3.0\text{ kOhm}$                                                            | -   | -5.2      | -   | -5.0      | V          |
| $V_{OH}$ | Output high voltage               | $V_{CC} = 4.5\text{ V}$<br>$V_{IL} = 0.8\text{ V}$<br>$R_L = 3.0\text{ kOhm}$                                                            | 5.2 | -         | 5.0 | -         |            |
| $I_{IL}$ | Input low current                 | $V_{CC}=5.5\text{ V}$<br>$V_{IL}=0\text{ V}$                                                                                             | -   | -1.0      | -   | -10.0     | uA         |
| $I_{IH}$ | Input high current                | $V_{CC}=5.5\text{ V}$<br>$V_{IH}=V_{CC}$                                                                                                 |     | 1.0       |     | 10.0      |            |
| SR       | Speed of output front change      | $V_{CC}=5.0\text{ V}$<br>$C_L=50 - 1000\text{ pF}$<br>$R_L = 3.0 - 7.0\text{ kOhm}$                                                      | 3.0 | 30        | 2.7 | 27        | V/ $\mu$ s |
| $R_O$    | Output resistance                 | $V_{CC} = V_+ = V_- = 0\text{ V}$<br>$V_O = \pm 2\text{ V}$                                                                              | 350 | -         | 300 | -         | Ohm        |
| $I_{SC}$ | Short circuit output current      | $V_{CC}=5.5\text{ V}$<br>$V_O = 0\text{ V}$<br>$V_I = V_{CC}$<br>$V_I = 0\text{ V}$                                                      |     | -50<br>50 |     | -60<br>60 | mA         |
| ST       | Speed of information transmission | $V_{CC}=4.5\text{ V}$<br>$C_L = 1000\text{ pF}$<br>$R_L = 3.0\text{ kOhm}$<br>$t_w = 7\text{ us}$ (for extreme<br>$-t_w = 8\text{ us}$ ) | 140 | -         | 120 | -         | kbps       |

Dynamic parameters

| Symbol                                    | Parameter                                                | Test conditions                                                                                                                                                                 | Rate  |       |                         |       | Unit |
|-------------------------------------------|----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------|-------------------------|-------|------|
|                                           |                                                          |                                                                                                                                                                                 | 25 °C |       | from -40 °C<br>to 85 °C |       |      |
|                                           |                                                          |                                                                                                                                                                                 | min   | max   | min                     | max   |      |
| t <sub>PHLR</sub><br>(t <sub>PLHR</sub> ) | Signal propagation delay time<br>when switching on (off) | V <sub>CC</sub> = 4.5 V<br>C <sub>L</sub> = 150 pF<br>V <sub>IL</sub> = 0 V<br>V <sub>IH</sub> = 3.0 V<br>t <sub>LH</sub> = t <sub>HL</sub> ≤ 10 ns                             | -     | 9.7   | -                       | 10    | us   |
| t <sub>PHLT</sub><br>(t <sub>PLHT</sub> ) | Signal propagation delay time<br>when switching on (off) | V <sub>CC</sub> = 4.5 V<br>C <sub>L</sub> = 2500 pF<br>V <sub>IL</sub> = 0 V<br>V <sub>IH</sub> = 3.0 V<br>R <sub>L</sub> = 3 kOhm<br>t <sub>LH</sub> = t <sub>HL</sub> ≤ 10 ns |       | 5.0 * |                         | 6.0 * |      |

Capacitance

| Symbol   | Parameter           | $V_{CC}$ , | Rate | Unit |
|----------|---------------------|------------|------|------|
| $C_{IN}$ | Input capacitance   | 5.0        | 9.0  | pF   |
| $C_{PD}$ | Dynamic capacitance |            | 90   |      |

Timing diagram when measuring IC dynamic parameters

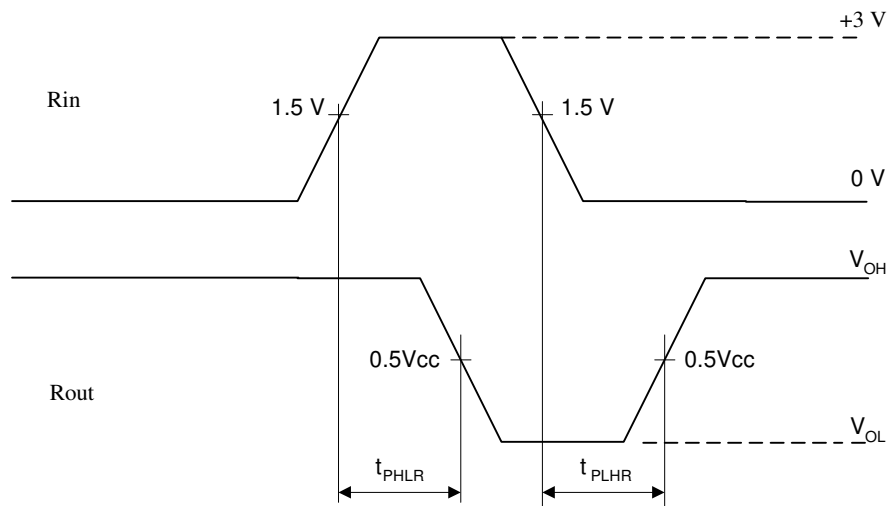


Figure 3

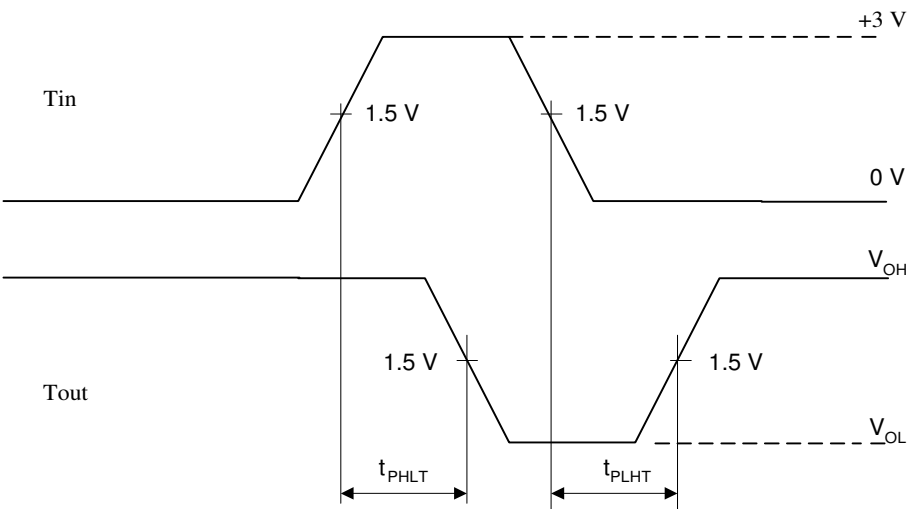


Figure 4

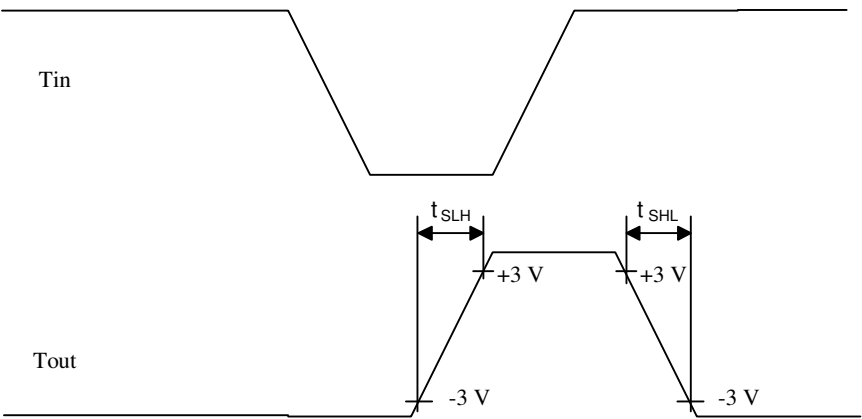


Figure 5

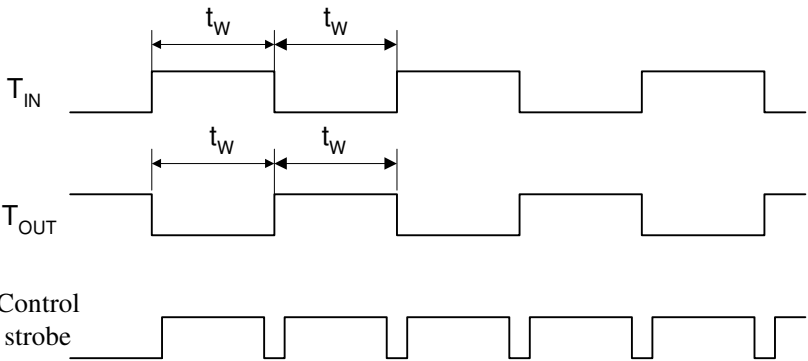
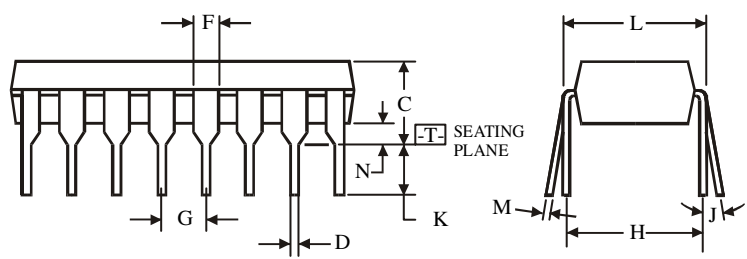
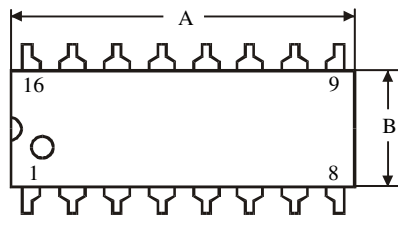


Figure 6

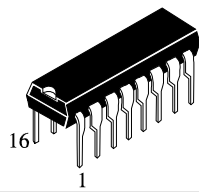
N SUFFIX PLASTIC DIP  
(MS - 001BB)



⊕ 0.25 (0.010) M T

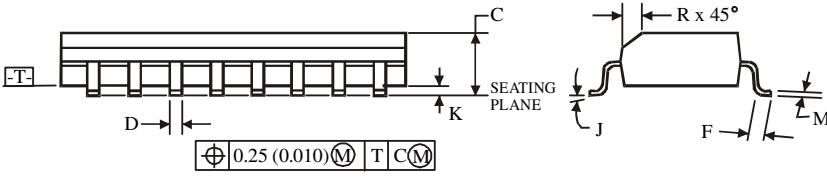
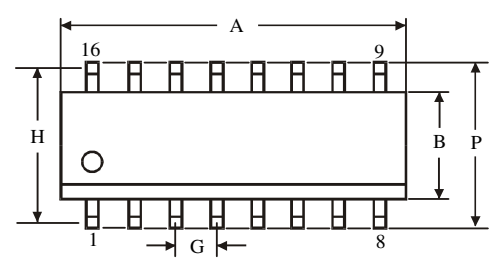
NOTES:

- 1. Dimensions “A”, “B” do not include mold flash or protrusions.  
Maximum mold flash or protrusions 0.25 mm (0.010) per side.



| Symbol | Dimension, mm |       |
|--------|---------------|-------|
|        | MIN           | MAX   |
| A      | 18.67         | 19.69 |
| B      | 6.1           | 7.11  |
| C      |               | 5.33  |
| D      | 0.36          | 0.56  |
| F      | 1.14          | 1.78  |
| G      | 2.54          |       |
| H      | 7.62          |       |
| J      | 0°            | 10°   |
| K      | 2.92          | 3.81  |
| L      | 7.62          | 8.26  |
| M      | 0.2           | 0.36  |
| N      | 0.38          |       |

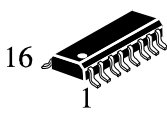
D SUFFIX SOIC  
(MS - 012AC)



⊕ 0.25 (0.010) M T C M

NOTES:

- 1. Dimensions A and B do not include mold flash or protrusion.
- 2. Maximum mold flash or protrusion 0.15 mm (0.006) per side  
for A; for B - 0.25 mm (0.010) per side.



| Symbol | Dimension, mm |      |
|--------|---------------|------|
|        | MIN           | MAX  |
| A      | 9.8           | 10   |
| B      | 3.8           | 4    |
| C      | 1.35          | 1.75 |
| D      | 0.33          | 0.51 |
| F      | 0.4           | 1.27 |
| G      | 1.27          |      |
| H      | 5.72          |      |
| J      | 0°            | 8°   |
| K      | 0.1           | 0.25 |
| M      | 0.19          | 0.25 |
| P      | 5.8           | 6.2  |
| R      | 0.25          | 0.5  |

## 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