

# MC10EP451, MC100EP451

## 3.3V / 5V ECL 6-Bit Differential Register with Master Reset

### Description

The MC10/100EP451 is a 6-bit fully differential register with common clock and single-ended Master Reset (MR). It is ideal for very high frequency applications where a registered data path is necessary.

All inputs have a 75 k $\Omega$  pulldown resistor internally. Differential inputs have an override clamp. Unused differential register inputs can be left open and will default LOW. When the differential inputs are forced to  $< V_{EE} + 1.2$  V, the clamp will override and force the output to a default state. When in the default state, and since the flip-flop is edge triggered, the output reaches a determined, but not predicted, valid state.

The positive transition of CLK (pin 4) will latch the registers. Master Reset (MR) HIGH will asynchronously reset all registers forcing Q outputs to go LOW.

The 100 Series contains temperature compensation.

### Features

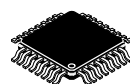
- 450 ps Typical Propagation Delay
- Maximum Frequency > 3.0 GHz Typical
- Asynchronous Master Reset
- 20 ps Skew Within Device, 35 ps Skew Device-To-Device
- PECL Mode Operating Range:  $V_{CC} = 3.0$  V to 5.5 V  
With  $V_{EE} = 0$  V
- NECL Mode Operating Range:  $V_{CC} = 0$  V  
With  $V_{EE} = -3.0$  V to  $-5.5$  V
- Open Input Default State
- Safety Clamp on Inputs
- Pb-Free Packages are Available\*



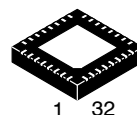
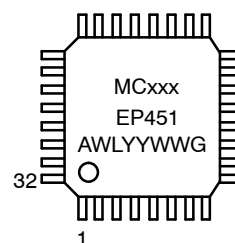
ON Semiconductor®

<http://onsemi.com>

### MARKING DIAGRAM\*



LQFP-32  
FA SUFFIX  
CASE 873A



QFN32  
MN SUFFIX  
CASE 488AM



|       |                     |
|-------|---------------------|
| xxx   | = 10 or 100         |
| A     | = Assembly Location |
| WL, L | = Wafer Lot         |
| YY, Y | = Year              |
| WW, W | = Work Week         |
| G     | = Pb-Free Package   |

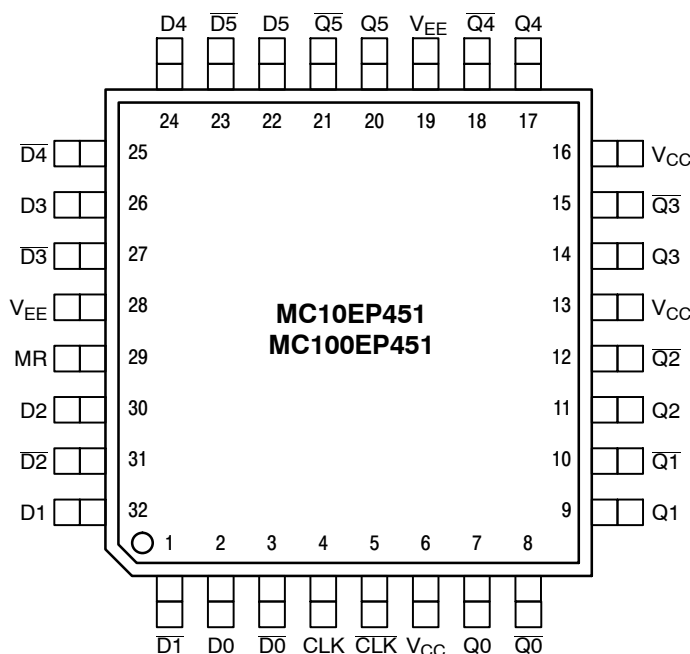
\*For additional marking information, refer to Application Note AND8002/D.

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 8 of this data sheet.

\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

# MC10EP451, MC100EP451



Warning: All  $V_{CC}$  and  $V_{EE}$  pins must be externally connected to Power Supply to guarantee proper operation.

Figure 1. LQFP-32 Pinout (Top View)

Table 1. PIN DESCRIPTION

| PIN                        | FUNCTION                                                                                                                                                                                                                                   |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| D [0:5]*, $\bar{D}$ [0:5]* | ECL Differential Data Inputs                                                                                                                                                                                                               |
| MR*                        | ECL Master Reset Input                                                                                                                                                                                                                     |
| CLK*, $\bar{CLK}$ *        | ECL Differential Clock Inputs                                                                                                                                                                                                              |
| Q [0:5], $\bar{Q}$ [0:5]   | ECL Differential Data Outputs                                                                                                                                                                                                              |
| $V_{CC}$                   | Positive Supply                                                                                                                                                                                                                            |
| $V_{EE}$                   | Negative Supply                                                                                                                                                                                                                            |
| EP for QFN-32, only        | The Exposed Pad (EP) on the QFN-32 package bottom is thermally connected to the die for improved heat transfer out of package. The exposed pad must be attached to a heat-sinking conduit. The pad is electrically connected to $V_{EE}$ . |

\* Pins will default LOW when left open.

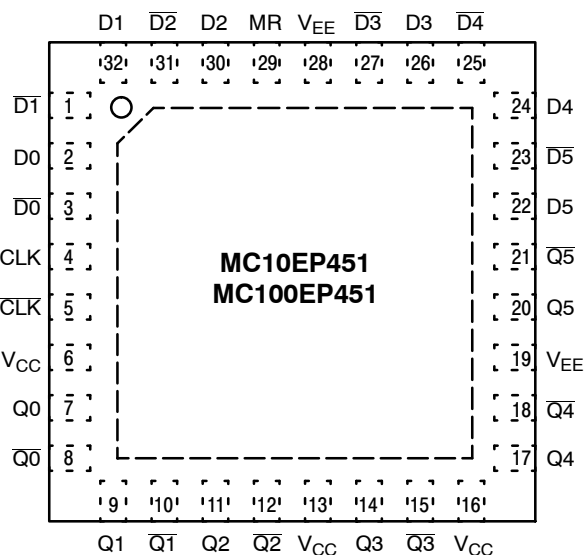


Figure 2. QFN-32 Pinout (Top View)

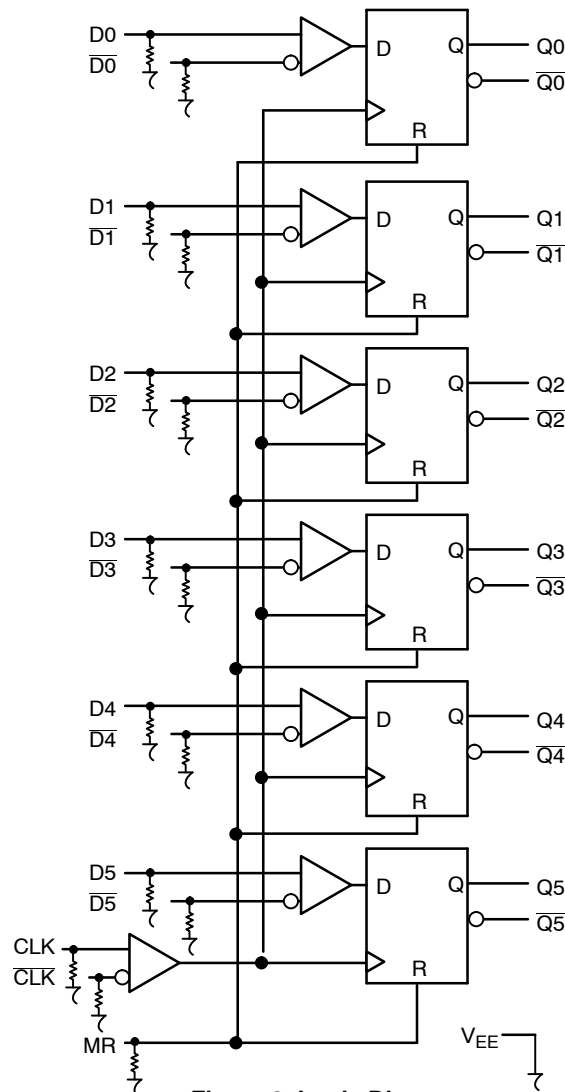


Figure 3. Logic Diagram

# MC10EP451, MC100EP451

**Table 2. ATTRIBUTES**

| Characteristics                                               | Value                                                     |                             |
|---------------------------------------------------------------|-----------------------------------------------------------|-----------------------------|
| Internal Input Pulldown Resistor                              | 75 kΩ                                                     |                             |
| Internal Input Pullup Resistor                                | N/A                                                       |                             |
| ESD Protection                                                | Human Body Model<br>Machine Model<br>Charged Device Model | > 2 kV<br>> 200 V<br>> 2 kV |
| Moisture Sensitivity, Indefinite Time Out of Drypack (Note 1) | Pb Pkg                                                    | Pb-Free Pkg                 |
| LQFP-32<br>QFN-32                                             | Level 2                                                   | Level 2<br>Level 1          |
| Flammability Rating                                           | Oxygen Index: 28 to 34                                    | UL 94 V-0 @ 0.125 in        |
| Transistor Count                                              | 919 Devices                                               |                             |
| Meets or exceeds JEDEC Spec EIA/JESD78 IC Latchup Test        |                                                           |                             |

1. For additional information, see Application Note AND8003/D.

**Table 3. MAXIMUM RATINGS**

| Symbol           | Parameter                                          | Condition 1                                    | Condition 2                                                                    | Rating      | Unit         |
|------------------|----------------------------------------------------|------------------------------------------------|--------------------------------------------------------------------------------|-------------|--------------|
| V <sub>CC</sub>  | PECL Mode Power Supply                             | V <sub>EE</sub> = 0 V                          |                                                                                | 6           | V            |
| V <sub>EE</sub>  | NECL Mode Power Supply                             | V <sub>CC</sub> = 0 V                          |                                                                                | -6          | V            |
| V <sub>I</sub>   | PECL Mode Input Voltage<br>NECL Mode Input Voltage | V <sub>EE</sub> = 0 V<br>V <sub>CC</sub> = 0 V | V <sub>I</sub> $\leq$ V <sub>CC</sub><br>V <sub>I</sub> $\geq$ V <sub>EE</sub> | 6<br>-6     | V<br>V       |
| I <sub>out</sub> | Output Current                                     | Continuous<br>Surge                            |                                                                                | 50<br>100   | mA<br>mA     |
| T <sub>A</sub>   | Operating Temperature Range                        |                                                |                                                                                | -40 to +85  | °C           |
| T <sub>stg</sub> | Storage Temperature Range                          |                                                |                                                                                | -65 to +150 | °C           |
| $\theta_{JA}$    | Thermal Resistance (Junction-to-Ambient)           | 0 lfpm<br>500 lfpm                             | LQFP-32<br>LQFP-32                                                             | 80<br>55    | °C/W<br>°C/W |
| $\theta_{JC}$    | Thermal Resistance (Junction-to-Case)              | Standard Board                                 | LQFP-32                                                                        | 12 to 17    | °C/W         |
| $\theta_{JA}$    | Thermal Resistance (Junction-to-Ambient)           | 0 lfpm<br>500 lfpm                             | QFN-32<br>QFN-32                                                               | 31<br>27    | °C/W<br>°C/W |
| $\theta_{JC}$    | Thermal Resistance (Junction-to-Case)              | 2S2P                                           | QFN-32                                                                         | 12          | °C/W         |
| T <sub>sol</sub> | Wave Solder<br>Pb<br>Pb-Free                       |                                                |                                                                                | 265<br>265  | °C           |

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

# MC10EP451, MC100EP451

**Table 4. 10EP DC CHARACTERISTICS, PECL**  $V_{CC} = 3.3 \text{ V}$ ,  $V_{EE} = 0 \text{ V}$  (Note 2)

| Symbol      | Characteristic                                                             | -40°C |      |      | 25°C |      |      | 85°C |      |      | Unit          |
|-------------|----------------------------------------------------------------------------|-------|------|------|------|------|------|------|------|------|---------------|
|             |                                                                            | Min   | Typ  | Max  | Min  | Typ  | Max  | Min  | Typ  | Max  |               |
| $I_{EE}$    | Power Supply Current                                                       | 80    | 95   | 125  | 80   | 95   | 125  | 80   | 95   | 125  | mA            |
| $V_{OH}$    | Output HIGH Voltage (Note 3)                                               | 2165  | 2290 | 2415 | 2230 | 2355 | 2480 | 2290 | 2415 | 2540 | mV            |
| $V_{OL}$    | Output LOW Voltage (Note 3)                                                | 1365  | 1490 | 1615 | 1430 | 1555 | 1680 | 1470 | 1615 | 1740 | mV            |
| $V_{IH}$    | Input HIGH Voltage (Single-Ended)                                          | 2090  |      | 2415 | 2155 |      | 2480 | 2215 |      | 2540 | mV            |
| $V_{IL}$    | Input LOW Voltage (Single-Ended)                                           | 1365  |      | 1690 | 1430 |      | 1755 | 1490 |      | 1815 | mV            |
| $V_{IHCMR}$ | Input HIGH Voltage Common Mode Range (Differential Configuration) (Note 4) | 2.0   |      | 3.3  | 2.0  |      | 3.3  | 2.0  |      | 3.3  | V             |
| $I_{IH}$    | Input HIGH Current                                                         |       |      | 150  |      |      | 150  |      |      | 150  | $\mu\text{A}$ |
| $I_{IL}$    | Input LOW Current                                                          | 0.5   |      |      | 0.5  |      |      | 0.5  |      |      | $\mu\text{A}$ |

**Table 5. 10EP DC CHARACTERISTICS, PECL**  $V_{CC} = 5.0 \text{ V}$ ,  $V_{EE} = 0 \text{ V}$  (Note 5)

| Symbol      | Characteristic                                                             | -40°C |      |      | 25°C |      |      | 85°C |      |      | Unit          |
|-------------|----------------------------------------------------------------------------|-------|------|------|------|------|------|------|------|------|---------------|
|             |                                                                            | Min   | Typ  | Max  | Min  | Typ  | Max  | Min  | Typ  | Max  |               |
| $I_{EE}$    | Power Supply Current                                                       | 80    | 95   | 125  | 80   | 95   | 125  | 80   | 95   | 125  | mA            |
| $V_{OH}$    | Output HIGH Voltage (Note 3)                                               | 3865  | 3990 | 4115 | 3930 | 4055 | 4180 | 3990 | 4115 | 4240 | mV            |
| $V_{OL}$    | Output LOW Voltage (Note 3)                                                | 3065  | 3190 | 3315 | 3130 | 3255 | 3380 | 3170 | 3315 | 3440 | mV            |
| $V_{IH}$    | Input HIGH Voltage (Single-Ended)                                          | 3790  |      | 4115 | 3855 |      | 4180 | 3915 |      | 4240 | mV            |
| $V_{IL}$    | Input LOW Voltage (Single-Ended)                                           | 3065  |      | 3390 | 3130 |      | 3455 | 3190 |      | 3515 | mV            |
| $V_{IHCMR}$ | Input HIGH Voltage Common Mode Range (Differential Configuration) (Note 4) | 2.0   |      | 5.0  | 2.0  |      | 5.0  | 2.0  |      | 5.0  | V             |
| $I_{IH}$    | Input HIGH Current                                                         |       |      | 150  |      |      | 150  |      |      | 150  | $\mu\text{A}$ |
| $I_{IL}$    | Input LOW Current                                                          | 0.5   |      |      | 0.5  |      |      | 0.5  |      |      | $\mu\text{A}$ |

**Table 6. 10EP DC CHARACTERISTICS, NECL**  $V_{CC} = 0 \text{ V}$ ,  $V_{EE} = -5.5 \text{ V}$  to  $-3.0 \text{ V}$  (Note 6)

| Symbol      | Characteristic                                                             | -40°C        |       |       | 25°C         |       |       | 85°C         |       |       | Unit          |
|-------------|----------------------------------------------------------------------------|--------------|-------|-------|--------------|-------|-------|--------------|-------|-------|---------------|
|             |                                                                            | Min          | Typ   | Max   | Min          | Typ   | Max   | Min          | Typ   | Max   |               |
| $I_{EE}$    | Power Supply Current                                                       | 80           | 95    | 125   | 80           | 95    | 125   | 80           | 95    | 125   | mA            |
| $V_{OH}$    | Output HIGH Voltage (Note 3)                                               | -1135        | -1010 | -885  | -1070        | -945  | -820  | -1010        | -885  | -760  | mV            |
| $V_{OL}$    | Output LOW Voltage (Note 3)                                                | -1935        | -1810 | -1685 | -1870        | -1745 | -1620 | -1830        | -1685 | -1560 | mV            |
| $V_{IH}$    | Input HIGH Voltage (Single-Ended)                                          | -1210        |       | -885  | -1145        |       | -820  | -1085        |       | -760  | mV            |
| $V_{IL}$    | Input LOW Voltage (Single-Ended)                                           | -1935        |       | -1610 | -1870        |       | -1545 | -1810        |       | -1485 | mV            |
| $V_{IHCMR}$ | Input HIGH Voltage Common Mode Range (Differential Configuration) (Note 4) | $V_{EE}+2.0$ |       | 0.0   | $V_{EE}+2.0$ |       | 0.0   | $V_{EE}+2.0$ |       | 0.0   | V             |
| $I_{IH}$    | Input HIGH Current                                                         |              |       | 150   |              |       | 150   |              |       | 150   | $\mu\text{A}$ |
| $I_{IL}$    | Input LOW Current                                                          | 0.5          |       |       | 0.5          |       |       | 0.5          |       |       | $\mu\text{A}$ |

NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lfm. Electrical parameters are guaranteed only over the declared operating temperature range. Functional operation of the device exceeding these conditions is not implied. Device specification limit values are applied individually under normal operating conditions and not valid simultaneously.

- Input and output parameters vary 1:1 with  $V_{CC}$ .  $V_{EE}$  can vary +0.3 V to -2.2 V.
- All loading with 50  $\Omega$  to  $V_{CC} - 2.0 \text{ V}$ .
- $V_{IHCMR}$  min varies 1:1 with  $V_{EE}$ .  $V_{IHCMR}$  max varies 1:1 with  $V_{CC}$ . The  $V_{IHCMR}$  range is referenced to the most positive side of the differential input signal.
- Input and output parameters vary 1:1 with  $V_{CC}$ .  $V_{EE}$  can vary +2.0 V to -0.5 V.
- Input and output parameters vary 1:1 with  $V_{CC}$ .

# MC10EP451, MC100EP451

**Table 7. 100EP DC CHARACTERISTICS, PECL**  $V_{CC} = 3.3\text{ V}$ ,  $V_{EE} = 0\text{ V}$  (Note 7)

| Symbol      | Characteristic                                                             | -40°C |      |      | 25°C |      |      | 85°C |      |      | Unit          |
|-------------|----------------------------------------------------------------------------|-------|------|------|------|------|------|------|------|------|---------------|
|             |                                                                            | Min   | Typ  | Max  | Min  | Typ  | Max  | Min  | Typ  | Max  |               |
| $I_{EE}$    | Power Supply Current                                                       | 85    | 105  | 135  | 85   | 105  | 135  | 85   | 105  | 135  | mA            |
| $V_{OH}$    | Output HIGH Voltage (Note 8)                                               | 2155  | 2280 | 2405 | 2155 | 2280 | 2405 | 2155 | 2280 | 2405 | mV            |
| $V_{OL}$    | Output LOW Voltage (Note 8)                                                | 1355  | 1480 | 1605 | 1355 | 1480 | 1605 | 1355 | 1480 | 1605 | mV            |
| $V_{IH}$    | Input HIGH Voltage (Single-Ended)                                          | 2075  |      | 2420 | 2075 |      | 2420 | 2075 |      | 2420 | mV            |
| $V_{IL}$    | Input LOW Voltage (Single-Ended)                                           | 1355  |      | 1675 | 1355 |      | 1675 | 1355 |      | 1675 | mV            |
| $V_{IHCMR}$ | Input HIGH Voltage Common Mode Range (Differential Configuration) (Note 9) | 2.0   |      | 3.3  | 2.0  |      | 3.3  | 2.0  |      | 3.3  | V             |
| $I_{IH}$    | Input HIGH Current                                                         |       |      | 150  |      |      | 150  |      |      | 150  | $\mu\text{A}$ |
| $I_{IL}$    | Input LOW Current                                                          | 0.5   |      |      | 0.5  |      |      | 0.5  |      |      | $\mu\text{A}$ |

NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lfm. Electrical parameters are guaranteed only over the declared operating temperature range. Functional operation of the device exceeding these conditions is not implied. Device specification limit values are applied individually under normal operating conditions and not valid simultaneously.

7. Input and output parameters vary 1:1 with  $V_{CC}$ .  $V_{EE}$  can vary +0.3 V to -2.2 V.

8. All loading with 50  $\Omega$  to  $V_{CC} - 2.0\text{ V}$ .

9.  $V_{IHCMR}$  min varies 1:1 with  $V_{EE}$ .  $V_{IHCMR}$  max varies 1:1 with  $V_{CC}$ . The  $V_{IHCMR}$  range is referenced to the most positive side of the differential input signal.

**Table 8. 100EP DC CHARACTERISTICS, PECL**  $V_{CC} = 5.0\text{ V}$ ,  $V_{EE} = 0\text{ V}$  (Note 10)

| Symbol      | Characteristic                                                              | -40°C |      |      | 25°C |      |      | 85°C |      |      | Unit          |
|-------------|-----------------------------------------------------------------------------|-------|------|------|------|------|------|------|------|------|---------------|
|             |                                                                             | Min   | Typ  | Max  | Min  | Typ  | Max  | Min  | Typ  | Max  |               |
| $I_{EE}$    | Power Supply Current                                                        | 85    | 105  | 135  | 85   | 105  | 135  | 85   | 105  | 135  | mA            |
| $V_{OH}$    | Output HIGH Voltage (Note 11)                                               | 3855  | 3980 | 4105 | 3855 | 3980 | 4105 | 3855 | 3980 | 4105 | mV            |
| $V_{OL}$    | Output LOW Voltage (Note 11)                                                | 3055  | 3180 | 3305 | 3055 | 3180 | 3305 | 3055 | 3180 | 3305 | mV            |
| $V_{IH}$    | Input HIGH Voltage (Single-Ended)                                           | 3775  |      | 4120 | 3775 |      | 4120 | 3775 |      | 4120 | mV            |
| $V_{IL}$    | Input LOW Voltage (Single-Ended)                                            | 3055  |      | 3375 | 3055 |      | 3375 | 3055 |      | 3375 | mV            |
| $V_{IHCMR}$ | Input HIGH Voltage Common Mode Range (Differential Configuration) (Note 12) | 2.0   |      | 5.0  | 2.0  |      | 5.0  | 2.0  |      | 5.0  | V             |
| $I_{IH}$    | Input HIGH Current                                                          |       |      | 150  |      |      | 150  |      |      | 150  | $\mu\text{A}$ |
| $I_{IL}$    | Input LOW Current                                                           | 0.5   |      |      | 0.5  |      |      | 0.5  |      |      | $\mu\text{A}$ |

NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lfm. Electrical parameters are guaranteed only over the declared operating temperature range. Functional operation of the device exceeding these conditions is not implied. Device specification limit values are applied individually under normal operating conditions and not valid simultaneously.

10. Input and output parameters vary 1:1 with  $V_{CC}$ .  $V_{EE}$  can vary +2.0 V to -0.5 V.

11. All loading with 50  $\Omega$  to  $V_{CC} - 2.0\text{ V}$ .

12.  $V_{IHCMR}$  min varies 1:1 with  $V_{EE}$ .  $V_{IHCMR}$  max varies 1:1 with  $V_{CC}$ . The  $V_{IHCMR}$  range is referenced to the most positive side of the differential input signal.

# MC10EP451, MC100EP451

**Table 9. 100EP DC CHARACTERISTICS, NECL**  $V_{CC} = 0\text{ V}$ ,  $V_{EE} = -5.5\text{ V}$  to  $-3.0\text{ V}$  (Note 13)

| Symbol      | Characteristic                                                              | -40°C        |       |       | 25°C         |       |       | 85°C         |       |       | Unit          |
|-------------|-----------------------------------------------------------------------------|--------------|-------|-------|--------------|-------|-------|--------------|-------|-------|---------------|
|             |                                                                             | Min          | Typ   | Max   | Min          | Typ   | Max   | Min          | Typ   | Max   |               |
| $I_{EE}$    | Power Supply Current                                                        | 85           | 105   | 135   | 85           | 105   | 135   | 85           | 105   | 135   | mA            |
| $V_{OH}$    | Output HIGH Voltage (Note 14)                                               | -1145        | -1020 | -895  | -1145        | -1020 | -895  | -1145        | -1020 | -895  | mV            |
| $V_{OL}$    | Output LOW Voltage (Note 14)                                                | -1945        | -1820 | -1695 | -1945        | -1820 | -1695 | -1945        | -1820 | -1695 | mV            |
| $V_{IH}$    | Input HIGH Voltage (Single-Ended)                                           | -1225        |       | -880  | -1225        |       | -880  | -1225        |       | -880  | mV            |
| $V_{IL}$    | Input LOW Voltage (Single-Ended)                                            | -1945        |       | -1625 | -1945        |       | -1625 | -1945        |       | -1625 | mV            |
| $V_{IHCMR}$ | Input HIGH Voltage Common Mode Range (Differential Configuration) (Note 15) | $V_{EE}+2.0$ |       | 0.0   | $V_{EE}+2.0$ |       | 0.0   | $V_{EE}+2.0$ |       | 0.0   | V             |
| $I_{IH}$    | Input HIGH Current                                                          |              |       | 150   |              |       | 150   |              |       | 150   | $\mu\text{A}$ |
| $I_{IL}$    | Input LOW Current                                                           | 0.5          |       |       | 0.5          |       |       | 0.5          |       |       | $\mu\text{A}$ |

NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lfpm. Electrical parameters are guaranteed only over the declared operating temperature range. Functional operation of the device exceeding these conditions is not implied. Device specification limit values are applied individually under normal operating conditions and not valid simultaneously.

13. Input and output parameters vary 1:1 with  $V_{CC}$ .

14. All loading with  $50\ \Omega$  to  $V_{CC} - 2.0\text{ V}$ .

15.  $V_{IHCMR}$  min varies 1:1 with  $V_{EE}$ ,  $V_{IHCMR}$  max varies 1:1 with  $V_{CC}$ . The  $V_{IHCMR}$  range is referenced to the most positive side of the differential input signal.

**Table 10. AC CHARACTERISTICS**  $V_{CC} = 0\text{ V}$ ;  $V_{EE} = -3.0\text{ V}$  to  $-5.5\text{ V}$  or  $V_{CC} = 3.0\text{ V}$  to  $5.5\text{ V}$ ;  $V_{EE} = 0\text{ V}$  (Note 16)

| Symbol                   | Characteristic                                                                  | -40°C      |            |            | 25°C       |            |            | 85°C       |            |            | Unit |
|--------------------------|---------------------------------------------------------------------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------|
|                          |                                                                                 | Min        | Typ        | Max        | Min        | Typ        | Max        | Min        | Typ        | Max        |      |
| $V_{OUTpp}$              | Output Voltage Amplitude @ 3 GHz (Figure 4) (Note 17)                           | 540        | 670        |            | 520        | 650        |            | 450        | 580        |            | mV   |
| $t_{PLH}$ ,<br>$t_{PHL}$ | Propagation Delay to CLK to Q, $\bar{Q}$ MR to Q, $\bar{Q}$ Output Differential | 330<br>430 | 430<br>530 | 530<br>630 | 350<br>450 | 450<br>550 | 550<br>650 | 390<br>490 | 490<br>590 | 590<br>690 | ps   |
| $t_{RR}$                 | Reset Recovery MR to CLK                                                        | 240        | 145        |            | 250        | 150        |            | 260        | 160        |            | ps   |
| $t_S$ ,<br>$t_H$         | Setup Time D to CLK<br>Hold Time CLK to D                                       | 80<br>80   | 40<br>40   |            | 80<br>80   | 40<br>40   |            | 80<br>80   | 40<br>40   |            | ps   |
| $t_{PW}$                 | Minimum Pulse Rate MR                                                           | 400        |            |            | 400        |            |            | 400        |            |            | ps   |
| $t_{SKEW}$               | Within-Device Skew (Note 18)<br>Device-To-Device Skew (Note 19)                 |            | 20<br>35   | 40<br>100  |            | 20<br>35   | 40<br>100  |            | 20<br>35   | 40<br>100  |      |
| $t_{JITTER}$             | CLOCK Random Jitter (RMS) @ $\leq 3.0\text{ GHz}$ (Figure 4)                    |            | 0.2        | 1          |            | 0.2        | 1          |            | 0.2        | 1          | ps   |
| $t_r$ ,<br>$t_f$         | Output Rise/Fall Times Q, $\bar{Q}$ (20% – 80%)                                 | 100<br>100 | 150<br>150 | 250<br>250 | 110<br>110 | 160<br>160 | 260<br>260 | 130<br>130 | 180<br>180 | 280<br>280 | ps   |

NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lfpm. Electrical parameters are guaranteed only over the declared operating temperature range. Functional operation of the device exceeding these conditions is not implied. Device specification limit values are applied individually under normal operating conditions and not valid simultaneously.

16. Measured using a 750 mV source, 50% duty cycle clock source. All loading with  $50\ \Omega$  to  $V_{CC} - 2.0\text{ V}$ .

17.  $V_{OL}$  and  $V_{OH}$  specifications not guaranteed for  $F_{max}$  testing.

18. Skew is measured between outputs under identical transitions and conditions on any one device.

19. Device-To-Device skew for identical transitions at identical  $V_{CC}$  levels.

## MC10EP451, MC100EP451

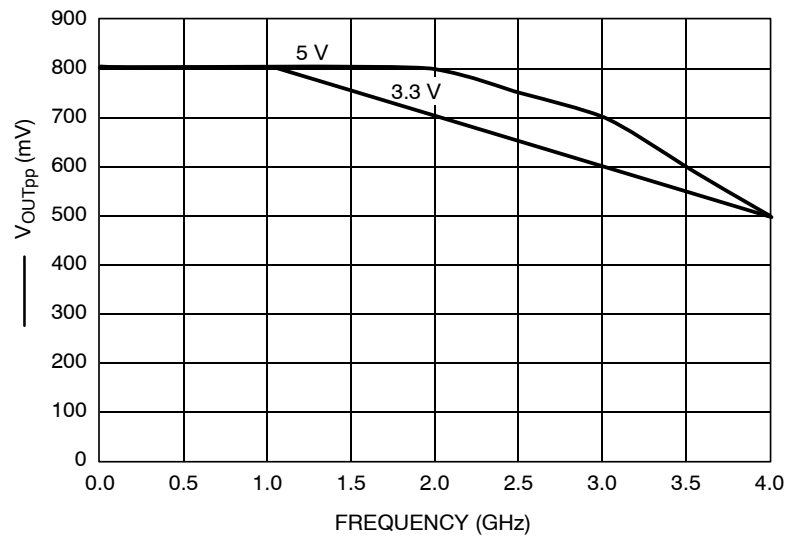


Figure 4.  $F_{\max}$  Typical

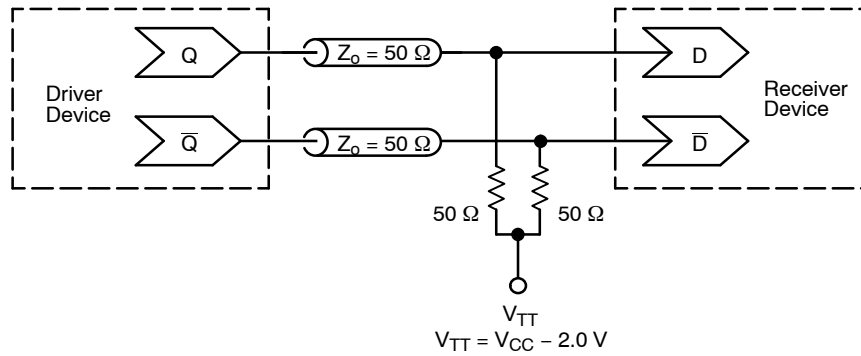


Figure 5. Typical Termination for Output Driver and Device Evaluation  
(See Application Note AND8020/D – Termination of ECL Logic Devices.)

# MC10EP451, MC100EP451

## ORDERING INFORMATION

| Device          | Package              | Shipping <sup>†</sup> |
|-----------------|----------------------|-----------------------|
| MC10EP451FA     | LQFP-32              | 250 Units / Tray      |
| MC10EP451FAG    | LQFP-32<br>(Pb-Free) | 250 Units / Tray      |
| MC10EP451FAR2   | LQFP-32              | 2000 / Tape & Reel    |
| MC10EP451FAR2G  | LQFP-32<br>(Pb-Free) | 2000 / Tape & Reel    |
| MC100EP451FA    | LQFP-32              | 250 Units / Tray      |
| MC100EP451FAG   | LQFP-32<br>(Pb-Free) | 250 Units / Tray      |
| MC100EP451FAR2  | LQFP-32              | 2000 / Tape & Reel    |
| MC100EP451FAR2G | LQFP-32<br>(Pb-Free) | 2000 / Tape & Reel    |
| MC10EP451MNG    | QFN-32<br>(Pb-Free)  | 72 Units / Tray       |
| MC10EP451MNR4G  |                      | 1000 / Tape & Reel    |
| MC100EP451MNG   |                      | 72 Units / Tray       |
| MC100EP451MNR4G |                      | 1000 / Tape & Reel    |

<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

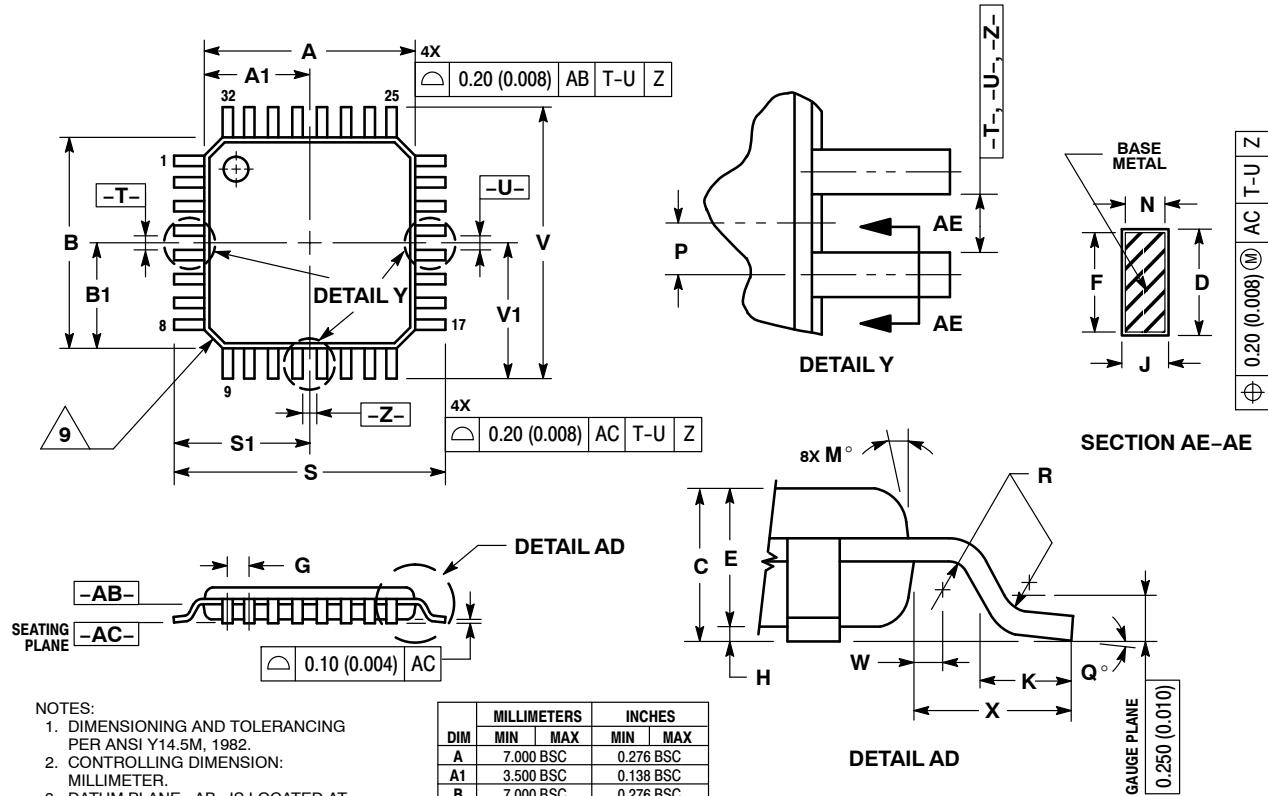
## Resource Reference of Application Notes

- AN1405/D** – ECL Clock Distribution Techniques
- AN1406/D** – Designing with PECL (ECL at +5.0 V)
- AN1503/D** – ECLinPS™ I/O SPICE Modeling Kit
- AN1504/D** – Metastability and the ECLinPS Family
- AN1568/D** – Interfacing Between LVDS and ECL
- AN1642/D** – The ECL Translator Guide
- AND8001/D** – Odd Number Counters Design
- AND8002/D** – Marking and Date Codes
- AND8020/D** – Termination of ECL Logic Devices
- AND8066/D** – Interfacing with ECLinPS
- AND8090/D** – AC Characteristics of ECL Devices

# MC10EP451, MC100EP451

## PACKAGE DIMENSIONS

LQFP-32  
FA SUFFIX  
CASE 873A-02  
ISSUE C



### NOTES:

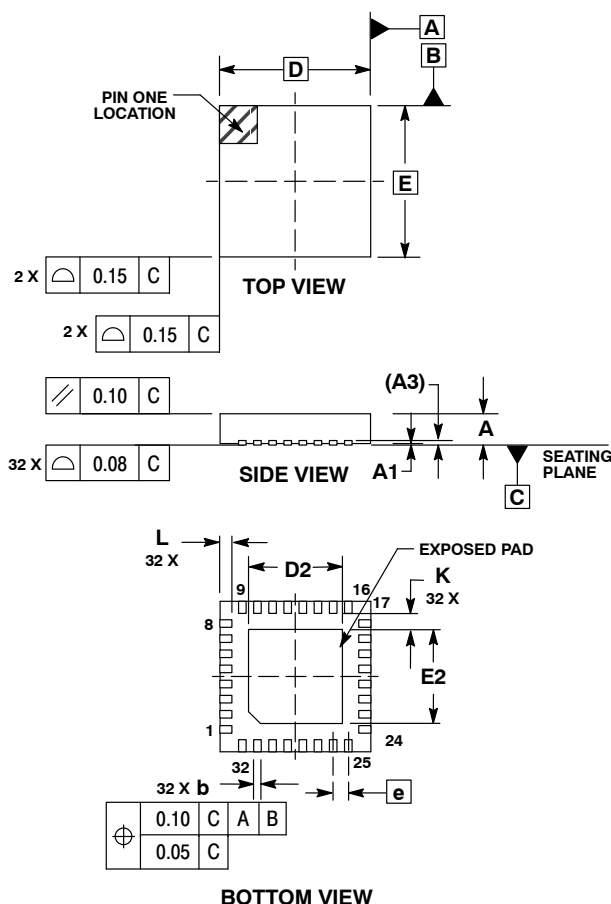
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DATUM PLANE -AB- IS LOCATED AT BOTTOM OF LEAD AND IS COINCIDENT WITH THE LEAD WHERE THE LEAD EXITS THE PLASTIC BODY AT THE BOTTOM OF THE PARTING LINE.
4. DATUMS -T-, -U-, AND -Z- TO BE DETERMINED AT DATUM PLANE -AB-.
5. DIMENSIONS S AND V TO BE DETERMINED AT SEATING PLANE -AC-.
6. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE PROTRUSION IS 0.250 (0.010) PER SIDE. DIMENSIONS A AND B DO INCLUDE MOLD MISMATCH AND ARE DETERMINED AT DATUM PLANE -AB-.
7. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. DAMBAR PROTRUSION SHALL NOT CAUSE THE D DIMENSION TO EXCEED 0.520 (0.020).
8. MINIMUM SOLDER PLATE THICKNESS SHALL BE 0.0076 (0.0003).
9. EXACT SHAPE OF EACH CORNER MAY VARY FROM DEPICTION.

| DIM | MILLIMETERS |       | INCHES    |       |
|-----|-------------|-------|-----------|-------|
|     | MIN         | MAX   | MIN       | MAX   |
| A   | 7.000 BSC   |       | 0.276 BSC |       |
| A1  | 3.500 BSC   |       | 0.138 BSC |       |
| B   | 7.000 BSC   |       | 0.276 BSC |       |
| B1  | 3.500 BSC   |       | 0.138 BSC |       |
| C   | 1.400       | 1.600 | 0.055     | 0.063 |
| D   | 0.300       | 0.450 | 0.012     | 0.018 |
| E   | 1.350       | 1.450 | 0.053     | 0.057 |
| F   | 0.300       | 0.400 | 0.012     | 0.016 |
| G   | 0.800 BSC   |       | 0.031 BSC |       |
| H   | 0.050       | 0.150 | 0.002     | 0.006 |
| J   | 0.090       | 0.200 | 0.004     | 0.008 |
| K   | 0.450       | 0.750 | 0.018     | 0.030 |
| M   | 12° REF     |       | 12° REF   |       |
| N   | 0.090       | 0.160 | 0.004     | 0.006 |
| P   | 0.400 BSC   |       | 0.016 BSC |       |
| Q   | 1°          | 5°    | 1°        | 5°    |
| R   | 0.150       | 0.250 | 0.006     | 0.010 |
| S   | 9.000 BSC   |       | 0.354 BSC |       |
| S1  | 4.500 BSC   |       | 0.177 BSC |       |
| V   | 9.000 BSC   |       | 0.354 BSC |       |
| V1  | 4.500 BSC   |       | 0.177 BSC |       |
| W   | 0.200 REF   |       | 0.008 REF |       |
| X   | 1.000 REF   |       | 0.039 REF |       |

# MC10EP451, MC100EP451

## PACKAGE DIMENSIONS

QFN32 5x5 0.5 P  
CASE 488AM-01  
ISSUE O

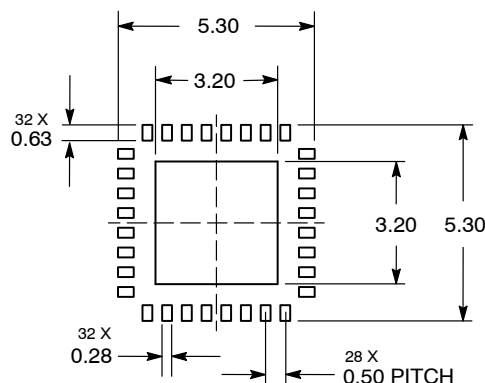


### NOTES:

1. DIMENSIONS AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.25 AND 0.30 MM TERMINAL
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

| MILLIMETERS |           |       |       |
|-------------|-----------|-------|-------|
| DIM         | MIN       | NOM   | MAX   |
| A           | 0.800     | 0.900 | 1.000 |
| A1          | 0.000     | 0.025 | 0.050 |
| A3          | 0.200 REF |       |       |
| b           | 0.180     | 0.250 | 0.300 |
| D           | 5.00 BSC  |       |       |
| D2          | 2.950     | 3.100 | 3.250 |
| E           | 5.00 BSC  |       |       |
| E2          | 2.950     | 3.100 | 3.250 |
| e           | 0.500 BSC |       |       |
| K           | 0.200     | ---   | ---   |
| L           | 0.300     | 0.400 | 0.500 |

### SOLDERING FOOTPRINT\*



\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

ECLinPS is a trademark of Semiconductor Components Industries, LLC (SCILLC).

ON Semiconductor and  are registered trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. "Typical" parameters which may be provided in SCILLC data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

## PUBLICATION ORDERING INFORMATION

### LITERATURE FULFILLMENT:

Literature Distribution Center for ON Semiconductor  
P.O. Box 5163, Denver, Colorado 80217 USA  
Phone: 303-675-2175 or 800-344-3860 Toll Free USA/Canada  
Fax: 303-675-2176 or 800-344-3867 Toll Free USA/Canada  
Email: [orderlit@onsemi.com](mailto:orderlit@onsemi.com)

N. American Technical Support: 800-282-9855 Toll Free  
USA/Canada  
Europe, Middle East and Africa Technical Support:  
Phone: 421 33 790 2910  
Japan Customer Focus Center  
Phone: 81-3-5773-3850

ON Semiconductor Website: [www.onsemi.com](http://www.onsemi.com)

Order Literature: <http://www.onsemi.com/orderlit>

For additional information, please contact your local Sales Representative

MC10EP451/D

## 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