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# NC7SZ66

## Low Voltage Single SPST Normally Open Bus Switch

### Features

- Broad  $V_{CC}$  Operating Range: 1.65 V to 5.5 V
- Rail-to-Rail Signal Handling
- Power Down High-Impedance Inputs/Outputs
- 5  $\Omega$  Switch Connection between Two Ports
- Minimal Propagation Delay through the Switch
- Low  $I_{CC}$
- Zero Bounce in Flow-Through Mode
- Control Input Compatible with CMOS Input Levels
- Ultra-Small MicroPak™ Packages
- Space-Saving SOT23 and SC70 Packages

### Description

The NC7SZ66 is a ultra high-speed (UHS) CMOS compatible single-pole/single-throw (SPST) bus switch. The LOW on resistance of the switch allows inputs to be connected to outputs with minimal propagation delay and without generating additional ground bounce noise. The device is organized as a 1-bit switch with a switch enable (OE) signal. When OE is HIGH, the switch is on and port A is connected to port B. When OE is LOW, the switch is open and a high-impedance state exists between the two ports..

### Ordering Information

| Part Number | Top Mark | Package                                | Packing Method            |
|-------------|----------|--|---------------------------|
| NC7SZ66M5X  | 7Z66     | 5-Lead SOT23, JEDEC MO-178 1.6 mm      | 3000 Units on Tape & Reel |
| NC7SZ66P5X  | Z66      | 5-Lead SC70, EIAJ SC-88a, 1.25 mm Wide | 3000 Units on Tape & Reel |
| NC7SZ66L6X  | EE       | 6-Lead, MicroPak™, 1x1 mm Wide         | 5000 Units on Tape & Reel |

## Connection Diagrams



Figure 1. Logic Symbol

## Pin Configurations

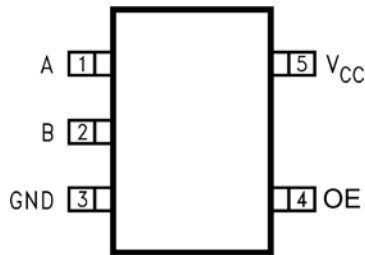


Figure 2. SC70 and SOT23 (Top View)



Figure 3. MicroPak™ (Top Through View)

## Pin Definitions

| Pin # SC70 / SOT23 | Pin # MicroPak™ | Name            | Description         |
|--------------------|-----------------|-----------------|---------------------|
| 1                  | 1               | A               | Bus A I/O           |
| 2                  | 2               | B               | Bus B I/O           |
| 3                  | 3               | GND             | Ground              |
| 4                  | 4               | OE              | Switch Enable Input |
| 5                  | 6               | V <sub>CC</sub> | Supply Voltage      |
|                    | 5               | NC              | No Connect          |

## Function Table

| OE | B <sub>0</sub> | Function     |
|----|----------------|--------------|
| L  | High Z-State   | Disconnected |
| H  | A <sub>0</sub> | Connect      |

H = HIGH Logic Level

L = LOW Logic Level

## Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

| Symbol                | Parameter   | Min.   | Max.            | Unit        |
|-----------------------|---|--------|-----------------|-------------|
| $V_{CC}$              | Supply Voltage                                    | -0.5   | 7.0             | V           |
| $V_S$                 | DC Switch Voltage <sup>(1)</sup>                  | -0.5   | $V_{CC}$ to 0.5 | V           |
| $V_{IN}$              | DC Input Voltage                                  | -0.5   | 7.0             | V           |
| $I_{IK}$              | DC Input Diode Current                            |        | -50             | mA          |
|                       | $V_{IN} < 0$ V                                    |        |                 |             |
| $I_{OUT}$             | DC Output Sink Current                            |        | 128             | mA          |
| $I_{CC}$ or $I_{GND}$ | DC $V_{CC}$ or Ground Current                     |        | $\pm 100$       | mA          |
| $T_{STG}$             | Storage Temperature Range                         | -65    | +150            | $^{\circ}C$ |
| $T_J$                 | Junction Temperature Under Bias                   |        | +150            | $^{\circ}C$ |
| $T_L$                 | Junction Lead Temperature (Soldering, 10 Seconds) |        | +260            | $^{\circ}C$ |
| $P_D$                 | Power Dissipation at +85 $^{\circ}C$              | SOT-23 | 200             | mW          |
|                       |   | SC70-5 | 150             |             |
| ESD                   | Human Body Model, JEDEC:JESD22-A114               |        | 4000            | V           |
|                       | Charge Device Model: JEDEC:JESD22-C101            |        | 1500            |             |

**Note:**

- The input and output negative voltage ratings may be exceeded if the input and output diode current ratings are observed.

## Recommended Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. Fairchild does not recommend exceeding them or designing to Absolute Maximum Ratings.

| Symbol        | Parameter                 | Conditions             | Min. | Max.     | Unit          |
|---------------|---------------------------|------------------------|------|----------|---------------|
| $V_{CC}$      | Supply Voltage Operating  |                        | 1.65 | 5.50     | V             |
| $V_{IN}$      | Input Voltage             |                        | 0    | 5.5      | V             |
| $V_S$         | Switch Input Voltage      |                        | 0    | $V_{CC}$ | V             |
| $V_{OUT}$     | Output Voltage            |                        | 0    | $V_{CC}$ | V             |
| $t_r, t_f$    | Input Rise and Fall Times | $V_{CC}=2.3$ V - 3.6 V | 0    | 10       | ns/V          |
|               |                           | $V_{CC}=4.5$ V - 5.5 V | 0    | 5        |               |
|               |                           | Switching I/O          | 0    | DC       |               |
| $T_A$         | Operating Temperature     |                        | -40  | +85      | $^{\circ}C$   |
| $\theta_{JA}$ | Thermal Resistance        | SOT-23                 |      | 300      | $^{\circ}C/W$ |
|               |                           | SC70-5                 |      | 425      |               |

**Note:**

- Unused inputs must be held HIGH or LOW; they may not float.

## DC Electrical Characteristics

All typical values are at the specified  $V_{CC}$ , and  $T_A = 25^\circ\text{C}$ .

| Symbol                                      | Parameter                                 | $V_{CC}$     | Conditions  | $T_A = -40$ to $+85^\circ\text{C}$ |            |               | $T_A = +25^\circ\text{C}$ |      | Units         |
|---|---|--------------|---|------------------------------------|------------|---------------|---------------------------|------|---------------|
|   |   |              |   | Min.                               | Typ.       | Max.          | Min.                      | Typ. |               |
| $V_{IH}$                                    | HIGH Level Input Voltage                  | 1.65 to 1.95 |   | $0.75 V_{CC}$                      |            |               |                           |      | V             |
|   |   | 2.30 to 5.50 |   | $0.7 V_{CC}$                       |            |               |                           |      |               |
| $V_{IL}$                                    | LOW Level Input Voltage                   | 1.65 to 1.95 |   |                                    |            | $0.25 V_{CC}$ |                           |      | V             |
|   |   | 2.30 to 5.50 |   |                                    |            | $0.3 V_{CC}$  |                           |      |               |
| $I_{IN}$                                    | Control Input Leakage Current             | 0 to 5.5     | $0 \leq V_{IN} \leq 5.5 \text{ V}$                |                                    | $\pm 0.05$ | $\pm 1.00$    |                           |      | $\mu\text{A}$ |
| $I_{OFF}$                                   | Off Leakage Current                       | 1.65 to 5.50 | $0 \leq A, B \leq V_{CC}$                         |                                    | $\pm 0.05$ | $\pm 10.00$   |                           |      | $\mu\text{A}$ |
| $R_{ON}$                                    | Switch On Resistance <sup>(3)</sup>       | 4.5          | $V_{IN}=0 \text{ V}, I_{IN}=30 \text{ mA}$        |                                    | 3          | 7             |                           |      | $\Omega$      |
|   |   |              | $V_{IN}=2.4 \text{ V}, I_{IN}=15 \text{ mA}$      |                                    | 5          | 12            |                           |      |               |
|   |   |              | $V_{IN}=4.5 \text{ V}, I_{IN}=30 \text{ mA}$      |                                    | 7          | 15            |                           |      |               |
|   |   | 3.0          | $V_{IN}=0 \text{ V}, I_{IN}=24 \text{ mA}$        |                                    | 4          | 9             |                           |      |               |
|   |   |              | $V_{IN}=3 \text{ V}, I_{IN}=24 \text{ mA}$        |                                    | 10         | 20            |                           |      |               |
|   |   | 2.30         | $V_{IN}=0 \text{ V}, I_{IN}=8 \text{ mA}$         |                                    | 5          | 12            |                           |      |               |
|   |   |              | $V_{IN}=2.3 \text{ V}, I_{IN}=8 \text{ mA}$       |                                    | 13         | 30            |                           |      |               |
|   |   | 1.8          | $V_{IN}=0 \text{ V}, I_{IN}=4 \text{ mA}$         |                                    | 7          | 28            |                           |      |               |
| $V_{IN}=1.8 \text{ V}, I_{IN}=4 \text{ mA}$ |   |              | 25  | 60                                 |            |               |                           |      |               |
| $R_{flat}$                                  | On Resistance Flatness <sup>(3,4,5)</sup> | 5.0          | $I_A = -30 \text{ mA}, 0 \leq V_{Bn} \leq V_{CC}$ |                                    |            |               |                           | 6    | $\Omega$      |
|   |   | 3.3          | $I_A = -24 \text{ mA}, 0 \leq V_{Bn} \leq V_{CC}$ |                                    |            |               |                           | 12   |               |
|   |   | 2.5          | $I_A = -8 \text{ mA}, 0 \leq V_{Bn} \leq V_{CC}$  |                                    |            |               |                           | 28   |               |
|   |   | 1.8          | $I_A = -4 \text{ mA}, 0 \leq V_{Bn} \leq V_{CC}$  |                                    |            |               |                           | 125  |               |
| $I_{CC}$                                    | Quiescent Supply Current                  | 1.65 to 5.50 | $V_{IN} = V_{CC} \text{ or GND}, I_{OUT} = 0$     |                                    | 0.05       | 10.00         |                           |      | $\mu\text{A}$ |

### Notes:

- Measured by the voltage drop between pins A and B at the indicated current through the switch. On resistance is determined by the lower of the voltages on the two (A or B) pins.
- Parameter is characterized but not tested in production.
- Flatness is defined as the difference between the maximum and minimum value of on resistance over the specified range of conditions.

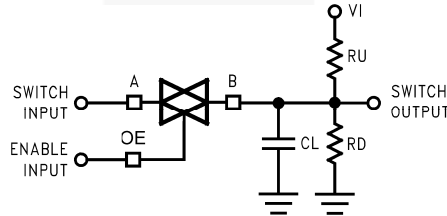
## AC Electrical Characteristics

All typical values are at the specified  $V_{CC}$ , and  $T_A = 25^\circ\text{C}$ .

| Symbol             | Parameter                                      | $V_{CC}$     | Conditions   | $T_A = -40$ to $+85^\circ\text{C}$ ,<br>$C_L = 50\text{Pf}$ ,<br>$R_U = R_D = 500\ \Omega$ |      |      | Units | Figure               |
|--------------------|--|--------------|--|--|------|------|-------|----------------------|
|                    |  |              |  | Min.   | Typ. | Max. |       |                      |
| $t_{PHL}, t_{PLH}$ | Propagation Delay<br>Bus-to-Bus <sup>(6)</sup> | 1.65 to 1.95 | $V_{IN} = \text{OPEN}$   |  |      | 4.3  | ns    | Figure 5<br>Figure 6 |
|                    |  | 2.3 to 2.7   |  |  |      | 1.2  |       |                      |
|                    |  | 3.0 to 3.6   |  |  |      | 0.8  |       |                      |
|                    |  | 4.5 to 5.5   |  |  |      | 0.3  |       |                      |
| $t_{PZL}, t_{PZH}$ | Output Enable Time                             | 1.65 to 1.95 | $V_{IN} = 2 \times V_{CC}$ for $t_{PZL}$ ,<br>$V_{IN} = 0\ \text{V}$ for $t_{PZH}$ | 1.5  | 7.0  | 14.2 | ns    | Figure 5<br>Figure 6 |
|                    |  | 2.3 to 2.7   |  | 1.5  | 3.3  | 7.0  |       |                      |
|                    |  | 3.0 to 3.6   | 1.5  | 2.4  | 5.5  |      |       |                      |
|                    |  | 4.5 to 5.5   | 1.5  | 2.0  | 4.5  |      |       |                      |
| $t_{PLZ}, t_{PHZ}$ | Output Disable Time                            | 1.65 to 1.95 | $V_{IN} = 2 \times V_{CC}$ for $t_{PLZ}$ ,<br>$V_{IN} = 0\ \text{V}$ for $t_{PHZ}$ | 1.5  | 9.2  | 18.2 | ns    | Figure 5<br>Figure 6 |
|                    |  | 2.3 to 2.7   |  | 1.5  | 5.3  | 9.0  |       |                      |
|                    |  | 3.0 to 3.6   | 1.5  | 4.0  | 7.0  |      |       |                      |
|                    |  | 4.5 to 5.5   | 1.5  | 2.7  | 5.0  |      |       |                      |
| $C_{IN}$           | Control Pin Input<br>Capacitance               |              | $V_{CC} = 0$   |  | 2    |      | pF    |                      |
| $C_{I/O}$          | Input / Output<br>Capacitance                  |              | $V_{CC} = 05.0\ \text{V}$  |  | 6    |      | pF    |                      |

**Note:**

6. This parameter is guaranteed by design but is not tested. The switch contributes no propagation delay other than the RC delay of the typical on resistance of the switch and the 50pF load capacitance, when driven by an ideal voltage source (zero output impedance).



**Notes:**

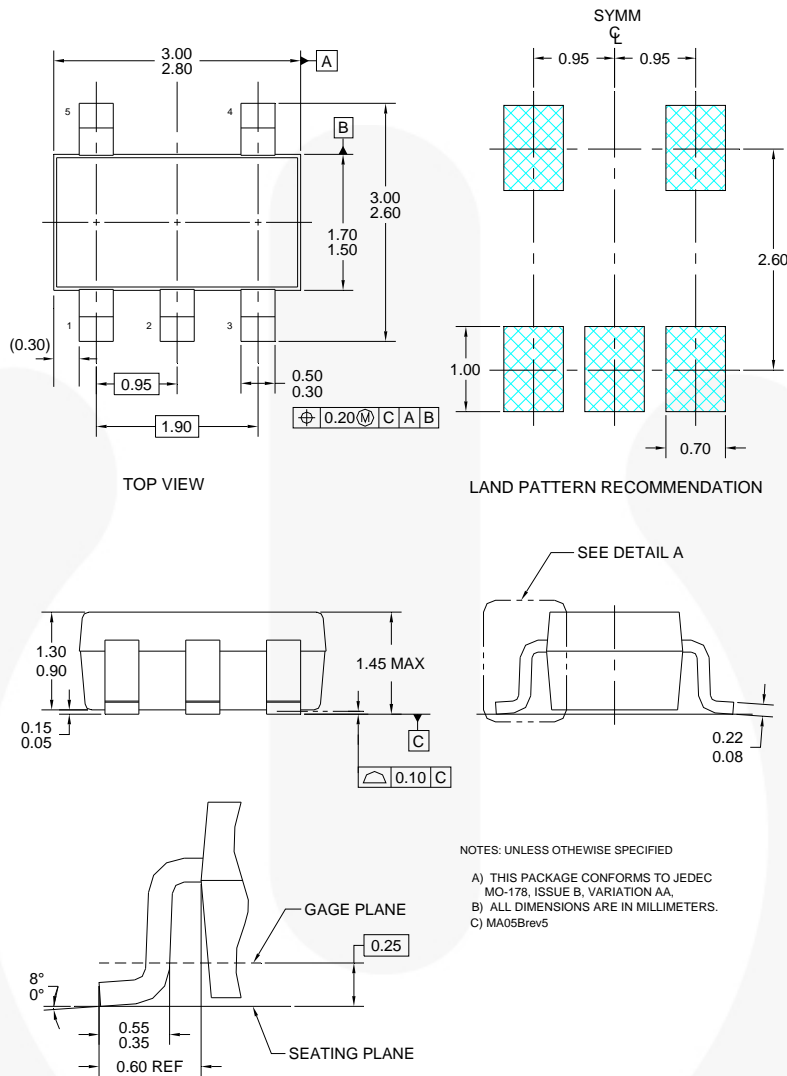
- Input driven by 50  $\Omega$ ; source terminated in 50  $\Omega$ .
- $C_L$  includes load and stray capacitance.
- Input PRR=1.0 MHz;  $t_w=500\ \text{ns}$ .

**Figure 4. AC Test Circuit**



**Figure 5. AC Waveforms**

## Physical Dimensions



**Figure 6. 5-Lead SOT23, JEDEC MO-178 1.6 mm**

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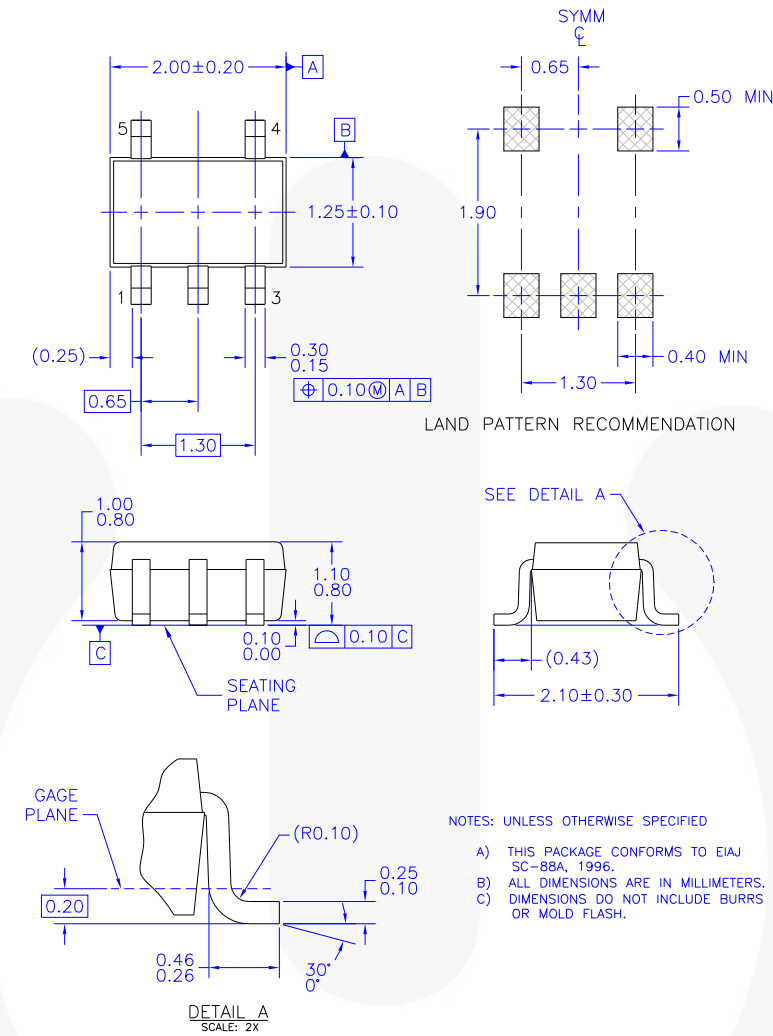
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| Package Designator | Tape Section       | Cavity Number | Cavity Status | Cover Type Status |
|--------------------|--------------------|---------------|---------------|-------------------|
| M5X                | Leader (Start End) | 125 (Typical) | Empty         | Sealed            |
|                    | Carrier            | 3000          | Filled        | Sealed            |
|                    | Trailer (Hub End)  | 75 (Typical)  | Empty         | Sealed            |

## Physical Dimensions



MAA05AREV5

**Figure 7. 5-Lead, SC70, EIAJ SC-88a, 1.25 mm Wide**

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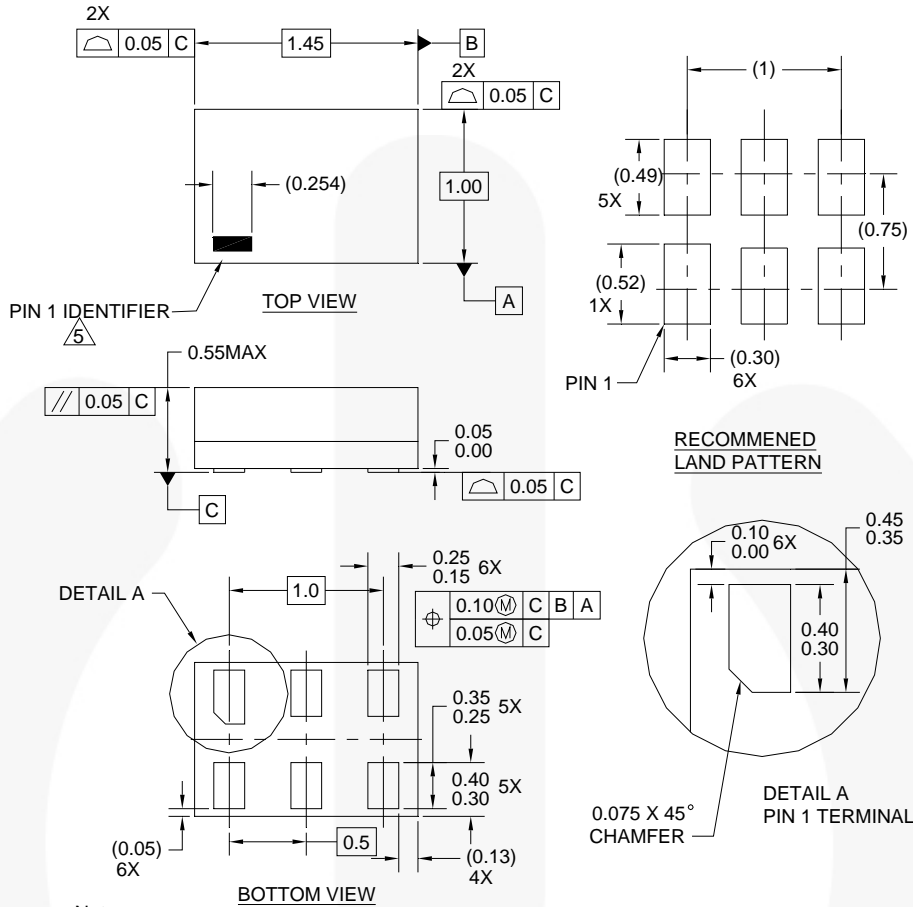
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| Package Designator | Tape Section       | Cavity Number | Cavity Status | Cover Type Status |
|--------------------|--------------------|---------------|---------------|-------------------|
| P5X                | Leader (Start End) | 125 (Typical) | Empty         | Sealed            |
|                    | Carrier            | 3000          | Filled        | Sealed            |
|                    | Trailer (Hub End)  | 75 (Typical)  | Empty         | Sealed            |



## Physical Dimensions



**Figure 8. 6-Lead, MicroPak™, 1.0 mm Wide**

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| Package Designator | Tape Section       | Cavity Number | Cavity Status | Cover Type Status |
|--------------------|--------------------|---------------|---------------|-------------------|
| L6X                | Leader (Start End) | 125 (Typical) | Empty         | Sealed            |
|                    | Carrier            | 5000          | Filled        | Sealed            |
|                    | Trailer (Hub End)  | 75 (Typical)  | Empty         | Sealed            |



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| FACT®                    | MotionMax™                                     | SuperFET®                             | UniFET™          |
| FAST®                    | mWSaver®                                       | SuperSOT™-3                           | Vcx™             |
| FastvCore™               | OptoHiT™                                       | SuperSOT™-6                           | VisualMax™       |
| FETBench™                | OPTOLOGIC®                                     | SuperSOT™-8                           | VoltagePlus™     |
| FPS™                     | OPTOPLANAR®                                    | SupreMOS®                             | XST™             |
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