GENERAL DESCRIPTION: The SMC KR2376-XX is a 2376-bit Read Only Memory with all the logic necessary to encode single pole single throw keyboard closures into a usable 9-bit code. Data and strobe outputs are directly compatible with TTL/DTL or MOS logic arrays without the use of any special interface components.

The KR2376-XX is fabricated with low threshold, P-channel technology and contains 2942 P-channel enhancement mode transistors on a single monolithic chip, available in a 40 pin dual-in-line package.

FEATURES
- Outputs directly compatible with TTL/DTL or MOS logic arrays.
- External control provided for output polarity selection.
- External control provided for selection of odd or even parity.
- Two key roll-over operation.
- N-key lockout.
- Programmable coding with a single mask change.
- Self-contained oscillator circuit.
- Externally controlled delay network provided to eliminate the effect of contact bounce.
- One integrated circuit required for complete keyboard assembly.
- Static charge protection on all input and output terminals.
- Entire circuit protected by a layer of glass passivation.

TYPICAL CONNECTION OF KR2376-XX

Fig.1

PACKAGE: 40-Pin D.I.P.
MAXIMUM GUARANTEED RATINGS

- Operating Temperature Range: 0°C to +70°C
- Storage Temperature Range: -65°C to +150°C
- GND and VGG, with respect to VCC: -20V to +0.3V
- Logic Input Voltages, with respect to VCC: -20V to +0.3V

※ Stresses above those listed may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or at any other condition above those indicated in the operational sections of this specification is not implied.

ELECTRICAL CHARACTERISTICS

(TA = 0°C to +70°C, VCC = +5V±0.5V, VGG = -12V±1.0V, unless otherwise noted)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
<th>Conditions</th>
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<tbody>
<tr>
<td>CLOCK</td>
<td>20</td>
<td>50</td>
<td>100</td>
<td>KHz</td>
<td>see fig.1 footnote(**) for typical R-C values</td>
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<tr>
<td>DATA INPUT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Logic &quot;0&quot; Level</td>
<td></td>
<td></td>
<td></td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Logic &quot;1&quot; Level</td>
<td></td>
<td></td>
<td></td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Input Capacitance</td>
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<td></td>
<td></td>
<td>pF</td>
<td></td>
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<tr>
<td>INPUT CURRENT</td>
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<td></td>
<td></td>
<td>µA</td>
<td></td>
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<td>*Control, Shift &amp; Y0</td>
<td>10</td>
<td>100</td>
<td>140</td>
<td>µA</td>
<td>V_IN = +5.0V</td>
</tr>
<tr>
<td>thru Y10</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>*Control, Shift &amp; Y0</td>
<td>5</td>
<td>30</td>
<td>50</td>
<td>µA</td>
<td>V_IN = Ground</td>
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<tr>
<td>thru Y10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data Invert, Parity</td>
<td>.01</td>
<td>1</td>
<td></td>
<td>µA</td>
<td>V_IN = -5.0V to +5.0V</td>
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<tr>
<td>Invert</td>
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<tr>
<td>DATA OUTPUT &amp; X OUTPUT</td>
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<td></td>
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<tr>
<td>Logic &quot;0&quot; Level</td>
<td></td>
<td></td>
<td></td>
<td>V</td>
<td>I_OH = 100 µA (see fig.7)</td>
</tr>
<tr>
<td>Logic &quot;1&quot; Level</td>
<td></td>
<td></td>
<td></td>
<td>V</td>
<td>I_OH = 100 µA</td>
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<tr>
<td>POWER CONSUMPTION</td>
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<td>mW</td>
<td>Nom.Power Supp.Voltages (see fig.8)</td>
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<td>SWITCH CHARACTERISTICS</td>
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<tr>
<td>Minimum Switch Closure</td>
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<td></td>
<td>see timing diagram-fig.2</td>
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<tr>
<td>Contact Closure Resistance between X1 and Y1</td>
<td>300</td>
<td>Ohm</td>
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<tr>
<td>Contact Open Resistance</td>
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<td></td>
<td>Ohm</td>
<td></td>
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<tr>
<td>between X1 and Y1</td>
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<td></td>
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</tbody>
</table>

※ Inputs with Internal Resistor to VGG

DESCRIPTION OF OPERATION

The KR2376-XX contains (see Fig.1), a 2376-bit ROM, 8-stage and 11-stage ring counters, an 11-bit comparator, an oscillator circuit, an externally controllable delay network for eliminating the effect of contact bounce, and TTL/DTL/MOS compatible output drivers.

The ROM portion of the chip is a 264 by 9-bit memory arranged into three 88-word by 9-bit groups. The appropriate levels on the Shift and Control inputs selects one of the three 88-word groups; the 88-individual word locations are addressed by the two ring counters. Thus, the ROM address is formed by combining the Shift and Control Inputs with the two ring counters.

The external outputs of the 8-stage ring counter and the external inputs to the 11-bit comparator are wired to the keyboard to form an X-Y matrix with the 88-keyboard switches as the crosspoints. In the standby condition, when no key is depressed, the two ring counters are clocked and sequentially address the ROM; the absence of a Strobe Output indicates that the Data Output indicates that the Data Outputs are 'not valid' at this time.
When a key is depressed, a single path is completed between one output of the 8-stage ring counter (X0 thru X7) and one input of the 11-bit comparator (Y0-Y10). After a number of clock cycles, a condition will occur where a level on the selected path to the comparator matches a level on the corresponding comparator input from the 11-stage ring counter. When this occurs, the comparator generates a signal to the clock control and to the Strobe Output (via the delay network). The clock control stops the clocks to the ring counters and the Data Outputs (B1-B9) stabilize with the selected 9-bit code, indicated by a 'valid' signal on the Strobe Output. The Data Outputs remain stable until the key is released.

As an added feature two inputs are provided for external polarity control of the Data Outputs. Parity Invert (pin 6) provides polarity control of the Parity Output (pin 7) while the Data and Strobe Invert Input (pin 20) provides for polarity control of Data Outputs B1 thru B8 (pins 8 thru 15) and the Strobe Output (pin 16).

SPECIAL PATTERNS
Since the selected coding of each key is defined during the manufacture of the chip, the coding can be changed to fit any particular application of the keyboard. Up to 264 codes of up to 8 bits (plus one parity bit) can be programmed into the KR2376-XX ROM covering most popular codes such as ASC11, EBCDIC, Selectric, etc., as well as many specialized codes. The ASC11 code is available as a standard pattern. For special patterns, use Fig. 9.

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**Fig. 2**

**TIMING DIAGRAM**

**Fig. 3**

**POWER SUPPLY CONNECTIONS FOR TTL/DTL OPERATION**

**POWER SUPPLY CONNECTIONS FOR MOS OPERATION**

**Fig. 4**

**OUTPUT DRIVER & "X" OUTPUT STAGE TO KEYBOARD**

**"Y" INPUT STAGE FROM KEYBOARD**
CODE ASSIGNMENT CHART
KR2376-ST
8 Bit ASCII, odd parity

DATA (B1-B8) INVERT TRUTH TABLE
DATA & STROBE INVERT INPUT (Pin 78)
DATA & STROBE INVERT INPUT (Pin 28)
CODE ASSIGNMENT CHART
DATA OUTPUTS (32-88)

STROBE INVERT TRUTH TABLE
DATA & STROBE INVERT INPUT (Pin 28)
INTERNAL STROBE
STROBE OUTPUT (Pin 15)

PARITY INVERT TRUTH TABLE
PARITY INVERT INPUT (Pin 6)
CODE ASSIGNMENT CHART
PARITY OUTPUT (Pin 7)

MODE SELECTION
% C = N
% C = S
% C = C
% C = INVALID (SPURIOUS DATA)

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