# CμL9960

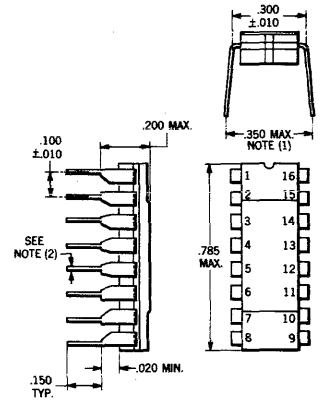
## DECIMAL DECODER/DRIVER

### COUNTING MICROLOGIC® INTEGRATED CIRCUIT

**GENERAL DESCRIPTION** — The CμL 9960 Decoder/Driver is a monolithic silicon circuit which accepts 1-2-4-8 binary coded decimal inputs at integrated circuit signal levels and produces ten mutually exclusive outputs which can directly control the ionizing potentials of many gas filled cold cathode indicator tubes. The CμL 9960 is designed specifically for use with the CμL 9958 Decade Counter or CμL 9959 Buffer-Storage, but can be used with other integrated circuit types. Only true values are required as inputs thereby simplifying the connection with counters or other information sources.

**PHYSICAL DIMENSIONS**

CμL PACKAGE OUTLINE




**NOTES:**

1. Leads are intended for insertion in hole rows on .300" centers. They are purposely shipped with "positive" (.350) misalignment to facilitate insertion.
2. Board-drilling dimensions should equal your practice for a conventional .020 inch diameter lead.

PRODUCT CODE: U6B996079X

**RULES FOR USE OF CμL 9960**

The principal intended use of the CμL 9960 is with industrial and ground support systems, from 0°C to +75°C ambient, and with operating $V_{CC}$ from 3.3 to 5.5 volts. The lower limit of the temperature range may be extended to −55°C by raising the minimum $V_{CC}$ to 4.0 volts.

**ABSOLUTE MAXIMUM RATINGS** (Note 1)

| | | |
|---|---|---|
| | Storage Temperature | −55°C to +125°C |
| | Operating Temperature | 0°C to +75°C |
| | Supply Voltage (0°C to +75°C) | 6 V |
| | Input Voltage | +4 V, −2 V |
| $I_{OL}$ | Current into each Output Terminal (In the ON State) | 15 mA |
| $I_{OH}$ | Current into each Output Terminal (In the OFF State) (Notes 2 and 3) | 0.6 mA |

**ELECTRICAL CHARACTERISTICS** (25°C Free Air Temperature unless otherwise noted)

| Symbol | Characteristic | Min. | Typ. | Max. | Units | Test Conditions |
|---|---|---|---|---|---|---|
| $V_{CC}$ | Power Supply (Note 4) | 3.3 | | 5.5 | V | |
| $P_D$ | Power Consumption | | 45 | | mW | $V_{CC}$ = 4.0 V Input High |
| $V_{IH}$ | Input High | 1.0 | | | V | |
| $V_{IL}$ | Input Low | | | 0.4 | V | |
| $V_{OL}$ | ON Output Voltage (Note 2) | | | 4.0 | V | $V_{IH}$ = 1.0 V, $I_{OL}$ = 3 mA |
| $V_{OH}$ | OFF Output Voltage | 55 | | | V | $I_{OH}$ = 0.2 mA |
| $I_{CO}$ | OFF Output Leakage Current | | | 50 | μA | $V_{OUT}$ = 0.2 mA |

**NOTES:**

(1) These ratings are limiting values above which serviceability of unit may be impaired.

(2) Outputs in the OFF state Must not be left floating, they should be tied to $V_{CC}$ through 10kΩ if they are not connected to the cathodes of a readout tube.

(3) Total current through all 9 outputs in the OFF state must not exceed 1.5 mA.

(4) For operation using gas filled readout tubes requiring 6 to 10mA ON current, $V_{CC}$ Min. = 4.0 V.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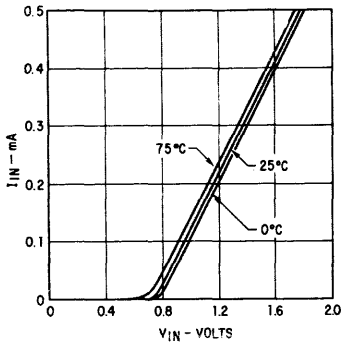
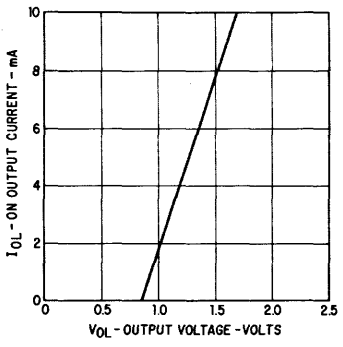
## TYPICAL ELECTRICAL CHARACTERISTICS

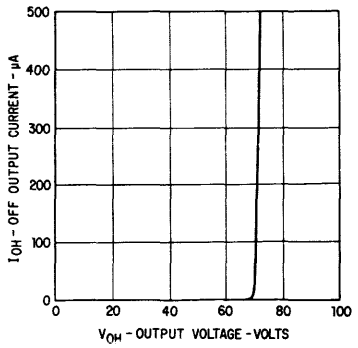
INPUT CHARACTERISTICS




ON OUTPUT CURRENT VERSUS OUTPUT VOLTAGE




OFF OUTPUT CURRENT VERSUS OUTPUT VOLTAGE



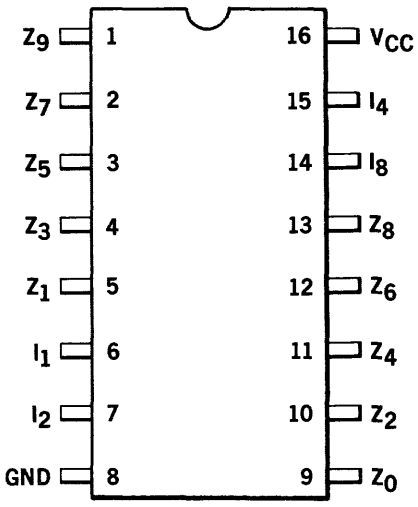

### TRUTH TABLE

With the coding shown in the table only one of the outputs will be low or On at any time.

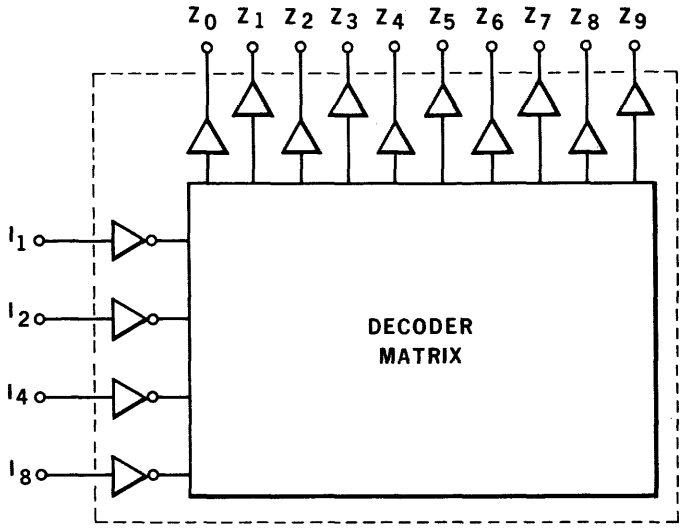
| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| $I_1$ | H | L | H | L | H | L | H | L | H | L |
| $I_2$ | H | H | L | L | H | H | L | L | H | H |
| $I_4$ | H | H | H | H | L | L | L | L | H | H |
| $I_8$ | H | H | H | H | H | H | H | H | L | L |
| ON Output | $Z_0$ | $Z_1$ | $Z_2$ | $Z_3$ | $Z_4$ | $Z_5$ | $Z_6$ | $Z_7$ | $Z_8$ | $Z_9$ |

L = Low
H = High

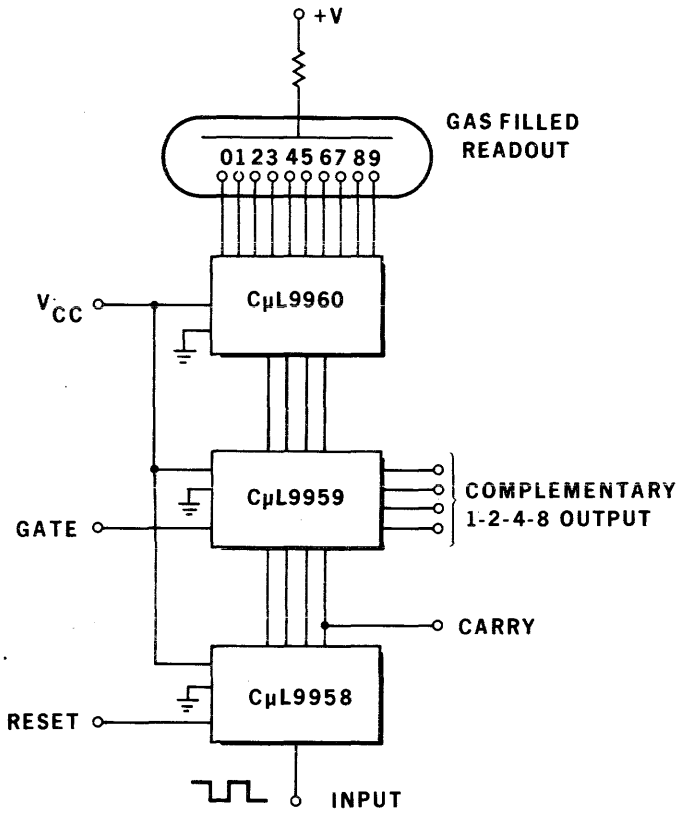
16 PIN DUAL IN-LINE PACKAGE
(Top View)

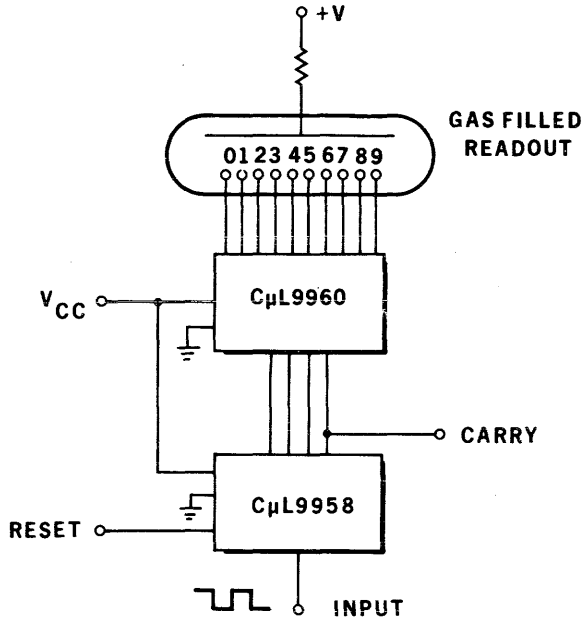



BLOCK DIAGRAM



## TYPICAL APPLICATIONS




* The CμL9960 is suitable for driving all commercial available numeric gas filled readout tubes in which ON Cathode current does not exceed 10mA and **total** OFF Cathode leakages do not exceed 1.5mA. The Values of +V and R may be chosen following the readout tube manufacturers' specifications.

### LOADING RULES FOR CμL9960

| Driving Device | At $V_{cc}$ of | |
|---|---|---|
| CμL9959 | 3.3 to 5.5 V | 2 CμL9960 inputs |
| CμL9958 | 3.3 to 5.5 V | 1 CμL9960 plus 1 CμL9958 Count Input |
| Industrial Range Milliwatt RTL | 3.6 V ±10% | 1 CμL9960 |
| Industrial Range RTL | 3.6 ±10% | 6 CμL9960 |
| Industrial Range DTμL 6K Family | 4.5 V Min. | 1 CμL9960 |
| Industrial Range DTμL 2K Family | 4.5 V Min. | 3 CμL9960 |