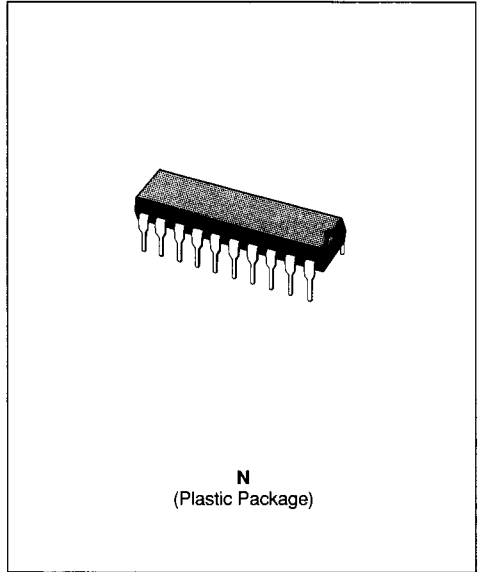


**NMOS MICROCONTROLLERS**

- LOW COST
- POWERFUL INSTRUCTION SET
- CERAMIC OR CRYSTAL OSCILLATOR INPUT/OUTPUT
- 512 x 8 ROM. 32 x 4 RAM
- TWO-LEVEL SUBROUTINE STACK
- 16µs INSTRUCTION TIME
- SINGLE SUPPLY OPERATION (4.5 – 6.3V)
- LOW CURRENT DRAIN (6mA max.)
- INTERNAL BINARY COUNTER REGISTER WITH SERIAL I/O CAPABILITY
- GENERAL PURPOSE AND TRI-STATE® OUTPUTS
- LSTTL/CMOS COMPATIBLE IN AND OUT
- DIRECT DRIVE OF LED DIGIT AND SEGMENT LINES
- SOFTWARE/HARDWARE COMPATIBLE WITH OTHER MEMBERS OF ETL9313 FAMILY
- EXTENDED TEMPERATURE RANGE DEVICE ETL9310 ETL9311 (– 40°C to + 85°C)
- WIDER SUPPLY RANGE (4.5 – 9.5V) OPTIONALLY AVAILABLE
- SOIC 20 PACKAGE AVAILABLE

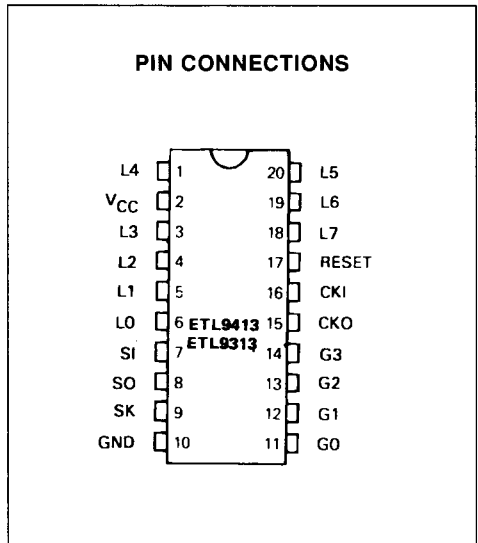


**DESCRIPTION**

The ETL9413 and ETL9313 Single-Chip N-Channel Microcontrollers are fully compatible with the COPS® family, fabricated using N-channel, silicon gate MOS technology. The Controller Oriented Processors are complete microcomputers containing all system timing, internal logic, ROM, RAM and I/O necessary to implement dedicated control functions in a variety of applications. Features include single supply operation, a variety of output configuration options, with an instruction set, internal architecture and I/O scheme designed to facilitate keyboard input, display output and BCD data manipulation. They are an appropriate choice for use in numerous human interface control environments. Standard test procedures and reliable high-density fabrication techniques provide the medium to large volume customers with a customized Controller Oriented Processor at a low end-product cost.

The ETL9413 is identical to the ETL9410, but with 15 I/O lines instead of 19.

The ETL9313 is exact functional equivalent but extended temperature version of ETL9413.



**OPTION LIST**

The ETL9413/ETL9313 - mask programmable options are assigned numbers which correspond with the ETL9410 pins.

The options are programmed at the same time as the ROM pattern to provide the user with the hardware flexibility to interface to various I/O components using little or no external circuitry.

Option 1 = 0 : Ground Pin - no options available

Option 2 : CKO Output

- = 0 : Clock output to ceramic resonator
- = 1 : Pin is RAM power supply ( $V_R$ ) input
- = 2 : Multi-COP SYNC input
- = 3 : No connection

Option 3 : CKI Input

- = 0 : Oscillator input divided by 8 (500kHz max.)
- = 1 : Single-pin RC controlled oscillator divided by 4
- = 2 : External Schmitt trigger level clock divided by 4

Option 4 :  $\overline{\text{RESET}}$  Input

- = 0 : Load device to  $V_{CC}$
- = 1 : Hi-Z input

Option 5 : L<sub>7</sub> Driver

- = 0 : Standard output
- = 1 : Open-drain output
- = 2 : High current LED direct segment drive output
- = 3 : High current TRI-STATE® push-pull output
- = 4 : Low-current LED direct segment drive output
- = 5 : Low-current TRI-STATE® push-pull output

Option 6 : L<sub>6</sub> Driver

same as Option 5

Option 7 : L<sub>5</sub> Driver

same as Option 5

Option 8 : L<sub>4</sub> Driver

same as Option 5

Option 9 :  $V_{CC}$  Pin

- = 0 : 4.5V to 6.3V operation
- = 1 : 4.5V to 9.5V operation

Option 10 : L<sub>3</sub> Driver  
same as Option 5

Option 11 : L<sub>2</sub> Driver  
same as Option 5

Option 12 : L<sub>1</sub> Driver  
same as Option 5

Option 13 : L<sub>0</sub> Driver  
same as Option 5

Option 14 : SI Input  
= 0 : load device to  $V_{CC}$   
= 1 : HI-Z input

Option 15 : SO Driver  
= 0 : Standard Output  
= 1 : Open-drain output  
= 2 : Push-pull output

Option 16 : SK Driver  
same as Option 15

Option 17 : G<sub>0</sub> I/O Port  
= 0 : Standard output  
= 1 : Open-drain output

Option 18 : G<sub>1</sub> I/O Port  
same as Option 17

Option 19 : G<sub>2</sub> I/O Port  
same as Option 17

Option 20 : G<sub>3</sub> I/O Port  
same as Option 17

Option 21 : must be set to zero

Option 22 : same as Option 21

Option 23 : same as Option 21

Option 24 : same as Option 21

Option 25 : L Input Levels  
= 0 : Standard TTL input levels ("0" = 0.8V,  
"1" = 2.0V)  
= 1 : Higher voltage input levels ("0" = 1.2V,  
"1" = 3.6V)

Option 26 : G Input Levels  
same as Option 25

Option 27 : SI Input Levels  
same as Option 25

Option 28 : Bonding, must be set to 3 for  
ETL9413/ -9313

**TEST MODE** (non-standard operation)

The SO output has been configured to provide for standard test procedures for the custom-programmed ETL9413. With SO forced to logic "1", two test modes are provided, depending upon the value of SI :

- a. RAM and Internal Logic Test Mode (SI = 1)
- b. ROM Test Mode (SI = 0)

These special test modes should not be employed by the user ; they are intended for manufacturing test only.

The ETL9413 is the same chip as the ETL9410 but in a 20-pin package. The four D ports are not bonded.

Consequently, the electrical characteristics, the functional description and the instruction set are identical to the ETL9410 but without the D outputs. Please, refer to the ETL9410/9411 data sheet.

Note that the OBD instruction can be used but the D outputs are not available.