

# MOTOROLA SEMICONDUCTOR TECHNICAL DATA

## Advance Information High Performance Decoder/ Sink Driver

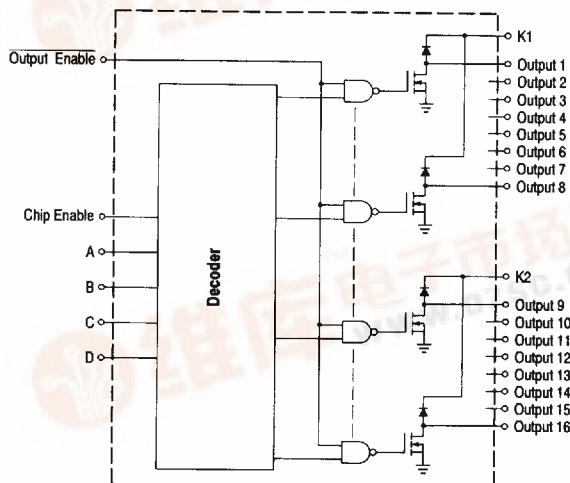
The MC34142 is a high performance 4 to 16 multiplexed driver. This integrated circuit features a 4 to 16 decoder, 16 open drain N-channel MOS output devices with clamp diodes. The outputs are controlled by 4 address inputs, an output enable, and a chip enable.

Typical applications include solenoid drivers, LED drivers, lamp drivers, and relay drivers.

This device is offered in a PLCC and a wide body surface mount package.

- SMARTMOS™ Technology
- 35 V Maximum Output Off-State Voltage
- 500 mA Maximum Output Sink Current
- Regulated Output Saturation Voltage
- 16 Open Drain MOS Outputs
- 4 Input CMOS Decoder
- Chip Select and Output Enable Input Pins
- Internal Freewheel Diodes
- Functional Equivalent to the UCN5816A

### Simplified Block Diagram

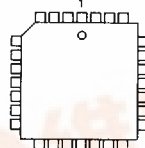


## MC34142

**FN SUFFIX**  
PLASTIC PACKAGE  
CASE 776

**DW SUFFIX**  
PLASTIC PACKAGE  
CASE 751F  
(SO-28L)

### PIN CONNECTIONS



(Top View)

- |                    |               |               |
|--------------------|---------------|---------------|
| Pin 1. Chip Enable | 11. Output 6  | 20. Output 13 |
| 2. N.C.            | 12. Output 7  | 21. Output 14 |
| 3. V <sub>CC</sub> | 13. Output 8  | 22. Output 15 |
| 4. Output Enable   | 14. Ground    | 23. Output 16 |
| 5. K1              | 15. Ground    | 24. K2        |
| 6. Output 1        | 16. Output 9  | 25. Input A   |
| 7. Output 2        | 17. Output 10 | 26. Input B   |
| 8. Output 3        | 18. Output 11 | 27. Input C   |
| 9. Output 4        | 19. Output 12 | 28. Input D   |
| 10. Output 5       |               |               |



(Top View)

### ORDERING INFORMATION

| Device    | Temperature Range | Package |
|-----------|-------------------|---------|
| MC34142FN | 0° to + 70°C      | PLCC    |
| MC34142DW |                   | SO-28L  |

## MAXIMUM RATING

| Rating                                                                                                                                                | Symbol                             | Value       | Unit      |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|-------------|-----------|
| Power Supply Voltage                                                                                                                                  | V <sub>CC</sub>                    | 7.0         | V         |
| Output Voltage                                                                                                                                        | V <sub>O</sub>                     | 35          | V         |
| Drive Output Sink Current (Note 1)                                                                                                                    | I <sub>O</sub>                     | 500<br>1000 | mA        |
| Power Dissipation and Thermal Characteristics<br>FN Suffix, Plastic Package, Case 776<br>T <sub>A</sub> = 25°C<br>Thermal Resistance, Junction to Air | P <sub>D</sub><br>R <sub>θJA</sub> | 1.9<br>66   | W<br>°C/W |
| DW Suffix, Plastic Package, Case 751F<br>T <sub>A</sub> = 25°C<br>Thermal Resistance, Junction to Air                                                 | P <sub>D</sub><br>R <sub>θJA</sub> | 1.5<br>80   | W<br>°C/W |
| Operating Junction Temperature                                                                                                                        | T <sub>J</sub>                     | +150        | °C        |
| Operating Ambient Temperature<br>MC34142                                                                                                              | T <sub>A</sub>                     | 0 to +70    | °C        |
| Storage Temperature                                                                                                                                   | T <sub>stg</sub>                   | -55 to +150 | °C        |

ELECTRICAL CHARACTERISTICS (V<sub>CC</sub> = 5.0 V, for typical values T<sub>A</sub> = 25°C, for min/max values T<sub>A</sub> = 0° to +70°C.)

| Characteristic | Symbol | Min | Typ | Max | Unit |
|----------------|--------|-----|-----|-----|------|
|----------------|--------|-----|-----|-----|------|

## POWER SUPPLY SECTION

|                      |                 |      |     |      |    |
|----------------------|-----------------|------|-----|------|----|
| Logic Supply Voltage | V <sub>CC</sub> | 4.75 | 5.0 | 5.25 | V  |
| Supply Current       | I <sub>CC</sub> | —    | —   | 0.5  | mA |
| Outputs Off          |                 | —    | —   | 4.0  |    |
| Outputs On           |                 | —    | —   | 4.0  |    |

## LOGIC INPUT SECTION

|                                                                     |                                    |          |        |          |    |
|---------------------------------------------------------------------|------------------------------------|----------|--------|----------|----|
| Input Threshold Voltage — High State Logic 1<br>— Low State Logic 0 | V <sub>IH</sub><br>V <sub>IL</sub> | 2.2<br>— | —<br>— | —<br>0.8 | V  |
| Input Current (V <sub>IN</sub> = 5.0 V)                             | I <sub>IN</sub>                    | —        | —      | 20       | μA |

## OUTPUT SECTION

|                                                                                               |                   |            |        |            |    |
|-----------------------------------------------------------------------------------------------|-------------------|------------|--------|------------|----|
| Output Saturation Voltage<br>I <sub>Sink</sub> = 100 mA<br>I <sub>Sink</sub> = 400 mA         | V <sub>Sat</sub>  | 1.1<br>1.2 | —<br>— | 1.3<br>1.4 | V  |
| Output Leakage Current (V <sub>O</sub> = 35)                                                  | I <sub>Leak</sub> | —          | —      | 100        | μA |
| Clamp Diode Leakage Current (V <sub>R</sub> = 35 V)                                           | I <sub>R</sub>    | —          | —      | 100        | μA |
| Clamp Diode Forward Voltage<br>I <sub>forward</sub> = 100 mA<br>I <sub>forward</sub> = 400 mA | V <sub>F</sub>    | 0.8<br>1.1 | —<br>— | 1.2<br>1.6 | V  |

SWITCHING CHARACTERISTICS (T<sub>A</sub> = 25°C)

|                                                                                                |                                      |          |        |            |    |
|------------------------------------------------------------------------------------------------|--------------------------------------|----------|--------|------------|----|
| Output Rise Time                                                                               | t <sub>r</sub>                       | —        | 40     | —          | ns |
| Output Fall Time                                                                               | t <sub>f</sub>                       | —        | 40     | —          | ns |
| Propagation Delay Time<br>Output Enable Low to Output Low<br>Output Enable High to Output High | t <sub>plL</sub><br>t <sub>phH</sub> | 50<br>50 | —<br>— | 150<br>150 | ns |
| Setup Time, Data to Output Enable                                                              | t <sub>su</sub>                      | —        | 40     | —          | ns |
| Hold Time, Output Enable to Data                                                               | t <sub>h</sub>                       | —        | 40     | —          | ns |



APPLICATION CIRCUIT INFORMATION

The MC34142 is a high performance 4 x 16 multiplexed driver. This integrated circuit features a 4 x 16 decoder, 16 open-drain output devices with clamp diodes, an output enable, and a chip enable. Typical applications include solenoid drivers, LED drivers, lamp drivers, and relay drivers.

The inputs to this device are TTL/CMOS compatible, making them ideal to be driven from a microcomputer. Table 1 is a truth table for the input logic versus the appropriate activated output. Notice, for a specific input, only one output can be activated.

The outputs on the MC34142 are open drain DMOS power MOSFETs. Each output is capable of sinking in excess of

500 mA. The outputs have been uniquely designed to control the "on-resistance" of the power MOSFET. The voltage drop across the MOSFET is regulated and temperature compensated to give a consistent saturation voltage characteristic over load and temperature. Figure 2 shows a curve of the Output Saturation Voltage versus Sink Current.

Each output also has a flyback diode clamp to protect the device from inductive load kickbacks. Special care should be taken when laying out the printed circuit board to use these clamp diodes effectively. A capacitor should be placed close to the K1 and K2 clamp outputs.

Figure 1. Typical Application

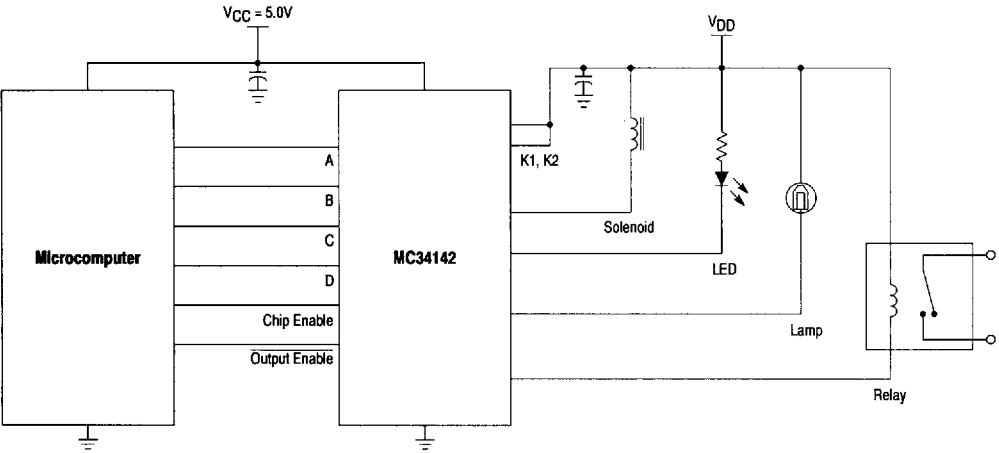


Figure 2. Output Saturation Voltage versus Load Current

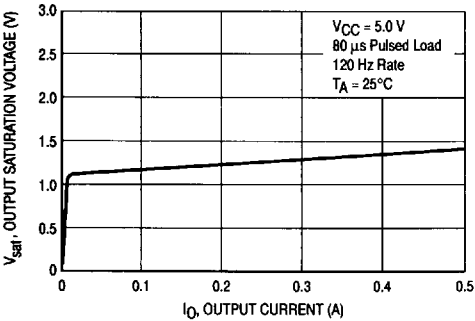


Figure 3. Propagation Delay

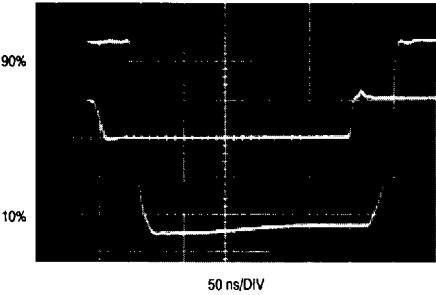


Figure 4. Output "Turn-On" Time

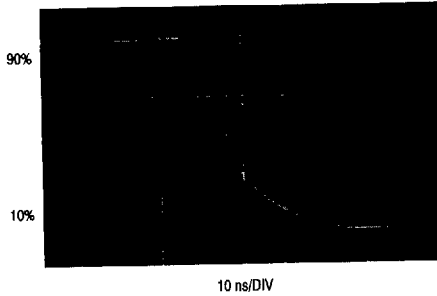


Figure 5. Output "Turn-Off" Time

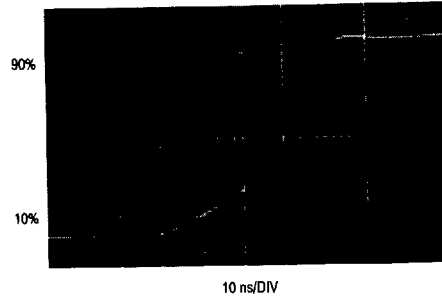


Table 1. Truth Table

| Output Enable | Chip Enable | Data Inputs |   |   |   | Selected Output<br>Active Low |
|---------------|-------------|-------------|---|---|---|-------------------------------|
|               |             | D           | C | B | A |                               |
| 0             | 1           | 0           | 0 | 0 | 0 | Output 1                      |
| 0             | 1           | 0           | 0 | 0 | 1 | Output 2                      |
| 0             | 1           | 0           | 0 | 1 | 0 | Output 3                      |
| 0             | 1           | 0           | 0 | 1 | 1 | Output 4                      |
| 0             | 1           | 0           | 1 | 0 | 0 | Output 5                      |
| 0             | 1           | 0           | 1 | 0 | 1 | Output 6                      |
| 0             | 1           | 0           | 1 | 1 | 0 | Output 7                      |
| 0             | 1           | 0           | 1 | 1 | 1 | Output 8                      |
| 0             | 1           | 1           | 0 | 0 | 0 | Output 9                      |
| 0             | 1           | 1           | 0 | 0 | 1 | Output 10                     |
| 0             | 1           | 1           | 0 | 1 | 0 | Output 11                     |
| 0             | 1           | 1           | 0 | 1 | 1 | Output 12                     |
| 0             | 1           | 1           | 1 | 0 | 0 | Output 13                     |
| 0             | 1           | 1           | 1 | 0 | 1 | Output 14                     |
| 0             | 1           | 1           | 1 | 1 | 0 | Output 15                     |
| 0             | 1           | 1           | 1 | 1 | 1 | Output 16                     |
| x             | 0           | x           | x | x | x | All Outputs<br>High           |
| 1             | x           | x           | x | x | x |                               |

