

# **MOTOROLA** **SEMICONDUCTOR** **TECHNICAL DATA**

## **QUAD GENERAL-PURPOSE INTERFACE BUS (GPIB) TRANSCEIVERS**

The MC3440A, MC3441A are quad bus transceivers intended for usage in instruments and programmable calculators equipped for interconnection into complete measurement systems. These transceivers allow the bidirectional flow of digital data and commands between the various instruments. Each of the transceiver versions provides four open-collector drivers and four receivers featuring input hysteresis.

The MC3440A version consists of three drivers controlled by a common Enable input and a single driver without an Enable input. Terminations are provided in the device.

The MC3441A differs in that all four drivers are controlled by the common Enable input. Again, the terminations are provided.

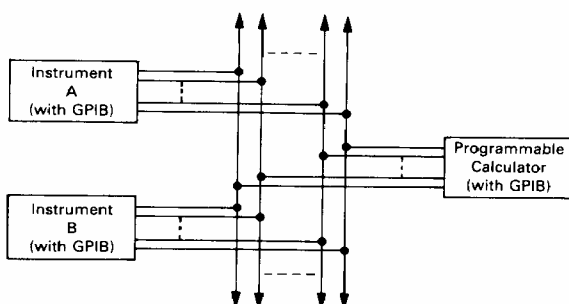
- Receiver Input Hysteresis Provides Excellent Noise Rejection
- Open-Collector Driver Outputs Permit Wire-OR Connection
- Tailored to Meet the Standards Set by the IEEE and IEC Committees on Instrument Interface (488-1978)
- Terminations comply with IEEE 488-1978; terminations removed when device is unpowered
- Provides Electrical Compatibility with General-Purpose Interface Bus

### **MAXIMUM RATINGS** ( $T_A = 25^\circ\text{C}$ unless otherwise noted.) (Note 1)

| Rating                                                                    | Symbol     | Value           | Unit                       |
|---------------------------------------------------------------------------|------------|-----------------|----------------------------|
| Power Supply Voltage                                                      | $V_{CC}$   | 7.0             | Vdc                        |
| Input Voltage                                                             | $V_I$      | 5.5             | Vdc                        |
| Driver Output Current                                                     | $I_{O(D)}$ | 150             | mA                         |
| Power Dissipation (Package Limitation)<br>Derate above $25^\circ\text{C}$ | $P_D$      | 830<br>6.7      | mW<br>mW/ $^\circ\text{C}$ |
| Operating Ambient Temperature Range                                       | $T_A$      | 0 to $+70$      | $^\circ\text{C}$           |
| Storage Temperature Range                                                 | $T_{stg}$  | $-65$ to $+150$ | $^\circ\text{C}$           |

Note 1: Devices should not be operated at these values. The "Electrical Characteristics" provide conditions for actual device operation.

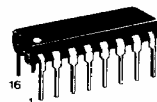
### **TYPICAL APPLICATION — GPIB MEASUREMENT SYSTEM**



## **MC3440A** **MC3441A**

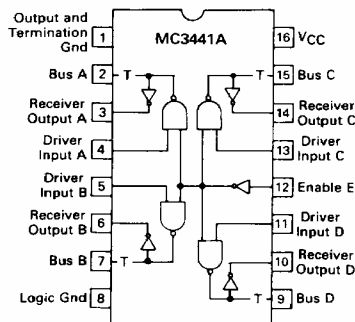
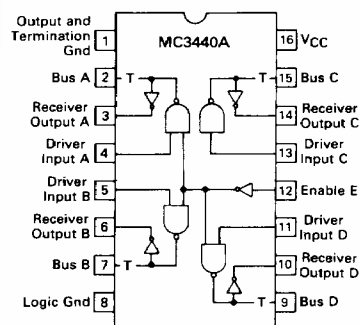
### **QUAD INTERFACE BUS TRANSCEIVERS**

#### **SILICON MONOLITHIC INTEGRATED CIRCUITS**

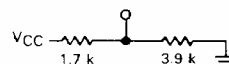


**P SUFFIX**  
 PLASTIC PACKAGE  
 CASE 648

### **PIN CONNECTIONS**



— T — = Bus Termination



MOTOROLA LINEAR/INTERFACE DEVICES

## MC3440A, MC3441A

**ELECTRICAL CHARACTERISTICS** (Unless otherwise noted,  $4.5\text{ V} \leq V_{CC} \leq 5.5\text{ V}$  and  $0 \leq T_A \leq 70^\circ\text{C}$ , typical values are at  $T_A = 25^\circ\text{C}$ ,  $V_{CC} = 5.0\text{ V}$ )

| Characteristic                                                                                                                                                                                                            | Symbol      | Min | Typ | Max         | Unit          |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-----|-----|-------------|---------------|
| <b>DRIVER PORTION</b>                                                                                                                                                                                                     |             |     |     |             |               |
| Input Voltage — High Logic State                                                                                                                                                                                          | $V_{IH(D)}$ | 2.0 | —   | —           | V             |
| Input Voltage — Low Logic State                                                                                                                                                                                           | $V_{IL(D)}$ | —   | —   | 0.8         | V             |
| Input Current — High Logic State<br>( $V_{IH} = 2.4\text{ V}$ )                                                                                                                                                           | $I_{IH(D)}$ | —   | —   | 40          | $\mu\text{A}$ |
| Input Current — Low Logic State<br>( $V_{IL} = 0.4\text{ V}$ , $V_{CC} = 5.0\text{ V}$ , $T_A = 25^\circ\text{C}$ )                                                                                                       | $I_{IL(D)}$ | —   | —   | -0.25       | mA            |
| Input Clamp Voltage<br>( $I_{IK} = -12\text{ mA}$ )                                                                                                                                                                       | $V_{IK(D)}$ | —   | —   | -1.5        | V             |
| Output Voltage — High Logic State<br>( $V_{IH(S)} = 2.4\text{ V}$ or $V_{IL(D)} = 0.8\text{ V}$ )                                                                                                                         | $V_{OH(D)}$ | 2.5 | —   | —           | V             |
| Output Voltage — Low Logic State<br>( $V_{IH(S)} = 2.0\text{ V}$ , $V_{IL(E)} = 0.8\text{ V}$ , $I_{OL(D)} = 48\text{ mA}$ )<br>( $V_{IH(D)} = 2.0\text{ V}$ , $V_{IL(E)} = 0.8\text{ V}$ , $I_{OL(D)} = 100\text{ mA}$ ) | $V_{OL(D)}$ | —   | —   | 0.5<br>0.80 | V             |

|                                                                                                                    |              |     |      |     |    |
|--------------------------------------------------------------------------------------------------------------------|--------------|-----|------|-----|----|
| <b>RECEIVER PORTION</b>                                                                                            |              |     |      |     |    |
| Input Hysteresis                                                                                                   | —            | 400 | 580  | —   | mV |
| Input Threshold Voltage — Low to High Output Logic State<br>( $V_{CC} = 5.0\text{ V}$ , $T_A = 25^\circ\text{C}$ ) | $V_{ILH(R)}$ | 0.8 | 0.98 | —   | V  |
| Input Threshold Voltage — High to Low Output Logic State<br>( $V_{CC} = 5.0\text{ V}$ , $T_A = 25^\circ\text{C}$ ) | $V_{IHL(R)}$ | —   | 1.56 | 2.0 | V  |
| Output Voltage — High Logic State<br>( $V_{IL(R)} = 0.8\text{ V}$ , $I_{OH(R)} = -400\text{ }\mu\text{A}$ )        | $V_{OH(R)}$  | 2.4 | —    | —   | V  |
| Output Voltage — Low Logic State<br>( $V_{IH(R)} = 2.0\text{ V}$ , $I_{OL(R)} = 16\text{ mA}$ )                    | $V_{OL(R)}$  | —   | —    | 0.5 | V  |
| Output Short-Circuit Current<br>( $V_{IL(R)} = 0.8\text{ V}$ ) (Only one output may be shorted at a time)          | $I_{OS(R)}$  | -20 | —    | -55 | mA |

|                                                                                                                                                                                                                                                                    |           |                       |                  |                           |    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-----------------------|------------------|---------------------------|----|
| <b>BUS TERMINATION PORTION</b>                                                                                                                                                                                                                                     |           |                       |                  |                           |    |
| Bus Voltage ( $V_{IL(D)} = 0.8\text{ V}$ )<br>( $I_{BUS} = -12\text{ mA}$ )<br>(No Load)                                                                                                                                                                           | $V_{BUS}$ | —<br>2.50             | —                | -1.5<br>3.70              | V  |
| Bus Current<br>( $V_{IL(D)} = 0.8\text{ V}$ , $V_{BUS} \geq 5.0\text{ V}$ )<br>( $V_{IL(D)} = 0.8\text{ V}$ , $V_{BUS} \leq 5.5\text{ V}$ )<br>( $V_{IL(D)} = 0.8\text{ V}$ , $V_{BUS} = 0.5\text{ V}$ )<br>( $V_{CC} = 0$ , $0 \leq V_{BUS} \leq 2.75\text{ V}$ ) | $I_{BUS}$ | 0.7<br>—<br>-1.3<br>— | —<br>—<br>—<br>— | —<br>2.5<br>-3.2<br>+0.04 | mA |

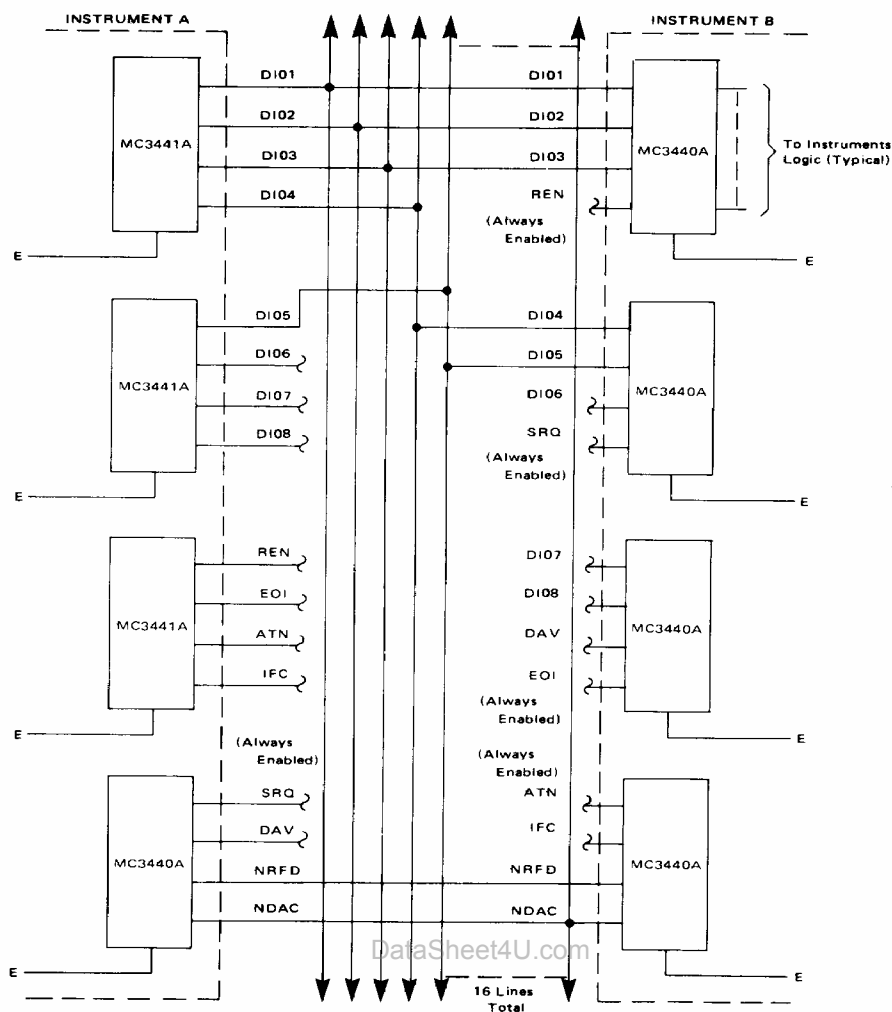
|                                                                                   |          |    |    |    |    |
|-----------------------------------------------------------------------------------|----------|----|----|----|----|
| <b>TOTAL DEVICE POWER CONSUMPTION</b>                                             |          |    |    |    |    |
| Power Supply Current<br>( $V_{IH(D)} = 2.4\text{ V}$ , $V_{IL(E)} = 0\text{ V}$ ) | $I_{CC}$ | 30 | 56 | 75 | mA |

| <b>SWITCHING CHARACTERISTICS</b> ( $V_{CC} = 5.0\text{ V}$ , $T_A = 25^\circ\text{C}$ ) |              |     |     |     |      |
|-----------------------------------------------------------------------------------------|--------------|-----|-----|-----|------|
| Characteristic                                                                          | Symbol       | Min | Typ | Max | Unit |
| <b>DRIVER PORTION</b>                                                                   |              |     |     |     |      |
| Propagation Delay Time from Driver Input to Low Logic State Bus Output                  | $t_{PHL(D)}$ | —   | 13  | 30  | ns   |
| Propagation Delay Time from Driver Input to High Logic State Bus Output                 | $t_{PLH(D)}$ | —   | 17  | 30  | ns   |
| Propagation Delay Time from Enable Input to Low Logic State Bus Output                  | $t_{PHL(E)}$ | —   | 25  | 40  | ns   |
| Propagation Delay Time from Enable Input to High Logic State Bus Output                 | $t_{PLH(E)}$ | —   | 25  | 40  | ns   |
| <b>RECEIVER PORTION</b>                                                                 |              |     |     |     |      |
| Propagation Delay Time from Bus Input to High Logic State Receiver Output               | $t_{PLH(R)}$ | —   | 15  | 30  | ns   |
| Propagation Delay Time from Bus Input to Low Logic State Receiver Output                | $t_{PHL(R)}$ | —   | 15  | 30  | ns   |

MOTOROLA LINEAR/INTERFACE DEVICES

## MC3440A, MC3441A

## GENERAL PURPOSE INTERFACE BUS APPLICATION



## GPIB SIGNALS:

8 Line Data Bus: DI01 - DI08

5 General Interrupt Transfer Control Bus:

REN - Remote Enable

SRQ - Service Request

EOI - End or Identify

ATN - Attention

IFC - Interface Clear

3 Data Byte Transfer Control Bus

DAV - Data Valid

NRFD - Not Ready for Data

NDAC - Not Data Accepted

16 Total Signal Lines

MOTOROLA LINEAR/INTERFACE DEVICES

## MC3440A, MC3441A

FIGURE 1 — TEST CIRCUIT AND WAVEFORMS FOR PROPAGATION DELAY TIME FROM RECEIVER INPUT (BUS) TO OUTPUT

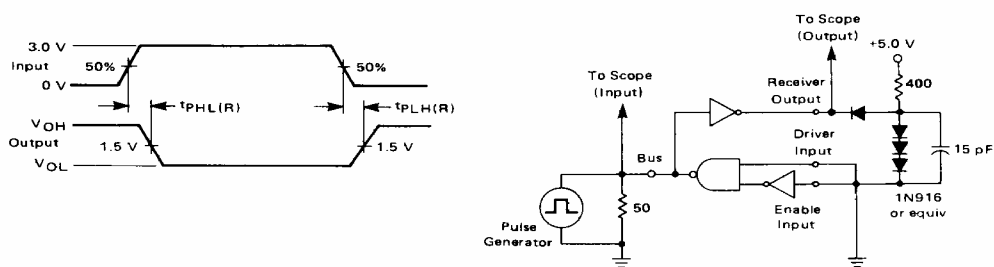


FIGURE 2 — TEST CIRCUIT AND WAVEFORMS FOR PROPAGATION DELAY TIME FROM DRIVER AND COMMON ENABLE INPUTS TO OUTPUT (BUS)

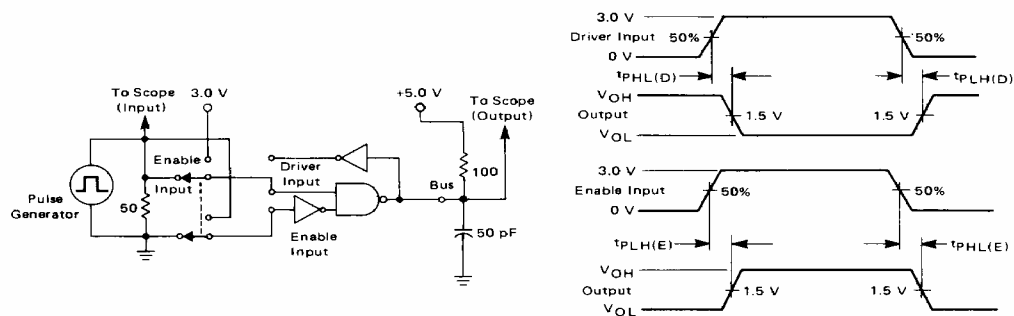
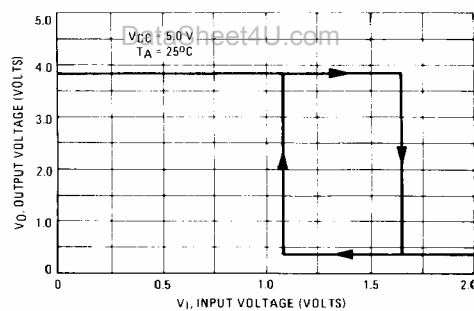


FIGURE 3 — TYPICAL RECEIVER HYSTERESIS CHARACTERISTICS



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