

**MOTOROLA SEMICONDUCTOR TECHNICAL DATA**

**MC3481  
MC3485**

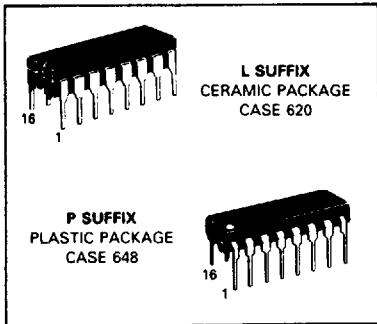
**IBM 360/370  
QUAD LINE DRIVER**  
**SILICON MONOLITHIC  
INTEGRATED CIRCUIT**

**QUAD SINGLE-ENDED LINE DRIVER**

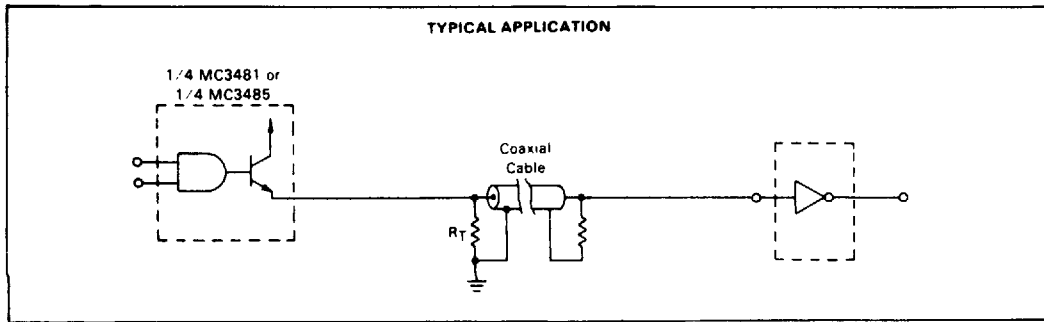
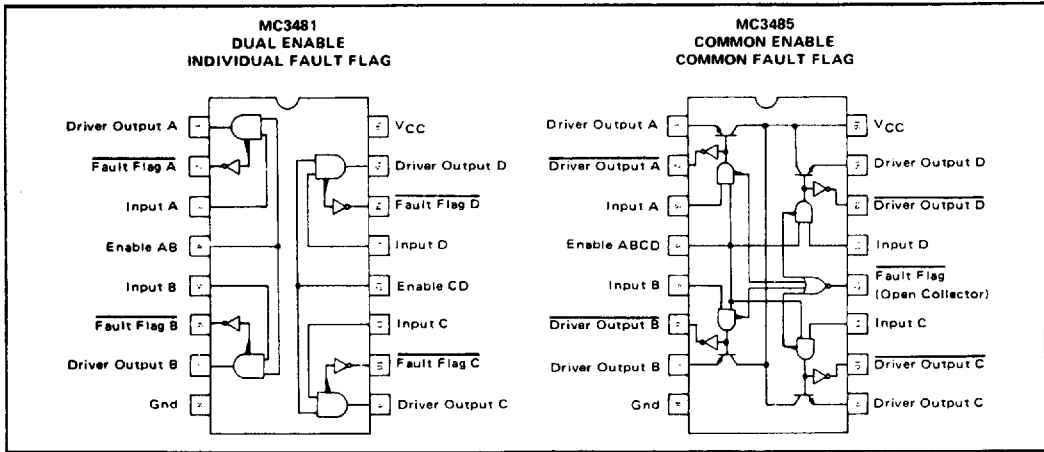
The MC3481 and MC3485 are quad single-ended line drivers specifically designed to meet the IBM 360/370 I/O specification (GA22-6974-3).

Output levels are guaranteed over the full range of output load and fault conditions. Compliance with the IBM requirements for fault protection, flagging, and power up/power down protection for the bus make this an ideal line driver for party line operations.

- Separate Enable and Fault Flags — MC3481
- Common Enable and Fault Flag — MC3485
- Power Up/Down Does Not Disturb Bus
- Schottky Circuitry for High-Speed — PNP Inputs
- Internal Bootstraps for Faster Rise Times
- Driver Output Current Foldback Protection
- MC3485 has LS Totem Pole Driver Output



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## MC3481, MC3485

MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$  unless otherwise noted)

Rating	Symbol	Value	Unit
Power Supply Voltage	$V_{CC}$	- 7.0	V
Input Voltage	$V_I$	10	V
Driver Output Voltage	$V_O$	5.5	V
Power Dissipation (Package Limitation)	$P_D$	1150	mW
Ceramic Package		962	
Plastic Package	1 R $\theta$ JA	7.7	mW/°C
Derate Above $T_A = 25^\circ\text{C}$			
Operating Ambient Temperature Range	$T_A$	0 to +70	°C
Junction Temperature	$T_J$	+175	°C
Ceramic Package		+150	
Plastic Package			
Storage Temperature Range	$T_{stg}$	65 to +150	°C

## RECOMMENDED OPERATING CONDITIONS

Characteristic	Symbol	Min	Typ	Max	Unit
Power Supply Voltage	$V_{CC}$	4.5	5.0	5.95	Vdc
High Level Output Current	$I_{OH}$	—	—	59.3	mA
Operating Ambient Temperature Range	$T_A$	0	—	+70	°C

**SWITCHING CHARACTERISTICS** (See Note 1. Unless otherwise noted, these specifications apply over recommended temperature range. I/O Driver characteristics are guaranteed for  $V_{CC} = 5.0\text{V} \pm 10\%$  and Select-Out Driver characteristics are guaranteed for  $V_{CC} = 5.25$  to  $5.95\text{V}$ . Typical values measured at  $T_A = 25^\circ\text{C}$  and  $V_{CC} = 5.0\text{V}$ . See Tables 1 and 2, Figures 1 and 2 for load conditions.)

Characteristics	Symbol	Min	Typ	Max	Unit
Propagation Delay Time					ns
High-to-Low-Level, Driver Output					
As I/O Driver	$t_{PHL(D)}$	—	18	—	
As Select-Out Driver	$t_{PHL(DS)}$	—	19	—	
Low-to-High-Level, Driver Output					
As I/O Driver	$t_{PLH(D)}$	—	20	—	
As Select-Out Driver	$t_{PLH(DS)}$	—	21	—	
High-to-Low-Level, Driver Output					
As I/O Driver	$t_{PHL(\bar{D})}$	—	25	—	
As Select-Out Driver	$t_{PHL(DS)}$	—	26	—	
Low-to-High-Level, Driver Output					
As I/O Driver	$t_{PLH(\bar{D})}$	—	25	—	
As Select-Out Driver	$t_{PLH(DS)}$	—	26	—	
High-to-Low-Level, Fault Flag — MC3481					
As I/O Driver	$t_{PHL(\bar{F})}$	—	45	—	
As Select-Out Driver	$t_{PHL(FS)}$	—	47	—	
Low-to-High-Level, Fault Flag — MC3481					
As I/O Driver	$t_{PLH(\bar{F})}$	—	40	—	
As Select-Out Driver	$t_{PLH(FS)}$	—	42	—	
Ratio of Propagation Delay Times					
As I/O Driver	$t_{PLH(D)}$ $t_{PHL(D)}$	—	1.0	—	

Notes 1. Reference IBM specification GA22-6974-3 for test terminology.

2. The fault protection circuitry of the MC3481/85 requires relatively clean input voltage waveforms for current operation. Noise pulses which enter the threshold region (0.8 to 2.0 V) may cause the output to enter the fault protect mode. To exit the protect mode, it is necessary to gate an input of the affected driver to the low logic state.

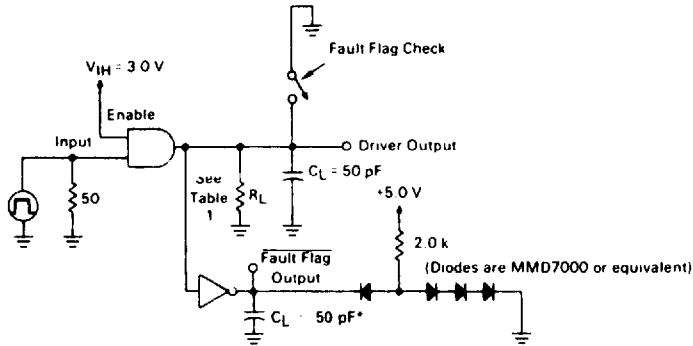
## MC3481, MC3485

**ELECTRICAL CHARACTERISTICS** (Unless otherwise noted, these specifications apply over recommended power supply and temperature ratings. Typical values measured at  $T_A = 25^\circ\text{C}$  and  $V_{CC} = +5.0\text{ V}$ )

Characteristic	Symbol	MC3481			MC3485			Unit
		Min	Typ	Max	Min	Typ	Max	
High-Level Input Voltage Note 2	$V_{IH}$	2.0	—	—	2.0	—	—	V
Low-Level Input Voltage Note 2	$V_{IL}$	—	—	0.8	—	—	0.8	V
High-Level Input Current ( $V_{CC} = 4.5\text{ V}$ , $V_{IH} = 2.7\text{ V}$ ) - Input Enable ( $V_{CC} = 4.5\text{ V}$ , $V_{IH} = 5.5\text{ V}$ ) - Input Enable	$I_{IH}$	—	—	20 40 100 200	—	—	20 80 100 400	$\mu\text{A}$
Low-Level Input Current ( $V_{CC} = 5.95\text{ V}$ , $V_{IL} = 0.4\text{ V}$ ) - Input Enable	$I_{IL}$	—	—	-250 -500	—	—	-250 -1000	$\mu\text{A}$
Input Clamp Voltage ( $I_{IC} = -18\text{ mA}$ )	$V_{IC}$	—	—	-1.5	—	—	-1.5	V
High-Level Driver Output Voltage ( $V_{CC} = 4.5\text{ V}$ , $V_{IH} = 2.0\text{ V}$ , $I_{OH} = -59.3\text{ mA}$ ) ( $V_{CC} = 5.25\text{ V}$ , $V_{IH} = 2.0\text{ V}$ , $I_{OH} = -41\text{ mA}$ )	$V_{OH(D)}$ $V_{OH(DS)}$	3.11 3.9	3.6	—	3.11 3.9	3.6	—	V
Low-Level Driver Output Voltage ( $V_{CC} = 5.5\text{ V}$ , $V_{IL} = 0.8\text{ V}$ , $I_{OL} = -240\text{ }\mu\text{A}$ ) ( $V_{CC} = 5.95\text{ V}$ , $V_{IL} = 0.8\text{ V}$ , $I_{OL} = -1.0\text{ mA}$ )	$V_{OL(D)}$ $V_{OL(DS)}$	—	—	+0.15 +0.15	—	—	+0.15 +0.15	V
Driver Output Short Circuit Current ( $V_{CC} = 5.5\text{ V}$ , $V_{IH} = 2.0\text{ V}$ , $V_{OS} = 0\text{ V}$ ) ( $V_{CC} = 5.95\text{ V}$ , $V_{IH} = 2.0\text{ V}$ , $V_{OS} = 0\text{ V}$ )	$I_{OS(D)}$ $I_{OS(DS)}$	—	—	-5.0 -5.0	—	—	-5.0 -5.0	mA
Driver Output Reverse Leakage Current ( $V_{CC} = 4.5\text{ V}$ , $V_{IL} = 0\text{ V}$ , $V_O = 3.11\text{ V}$ ) ( $V_{CC} = 0\text{ V}$ , $V_{IL} = 0\text{ V}$ , $V_O = 3.11\text{ V}$ )	$I_{OR1}$ $I_{OR2}$	—	—	+100 +200	—	—	+100 +200	$\mu\text{A}$
High-Level Driver Output Voltage ( $V_{CC} = 4.5\text{ V}$ , $V_{IL} = 0.8\text{ V}$ , $I_{OH} = -400\text{ }\mu\text{A}$ )	$V_{OH(\bar{D})}$	—	—	—	2.5	3.0	—	V
Low-Level Driver Output Voltage ( $V_{CC} = 4.5\text{ V}$ , $V_{IH} = 2.0\text{ V}$ , $I_{OL} = +8.0\text{ mA}$ )	$V_{OL(\bar{D})}$	—	—	—	—	—	0.5	V
Driver Output Short Circuit Current ( $V_{CC} = 5.5\text{ V}$ , $V_{OS} = 0\text{ V}$ , only one output shorted at a time) ( $V_{CC} = 5.95\text{ V}$ , $V_{OS} = 0\text{ V}$ , only one output shorted at a time)	$I_{OS(\bar{D})}$ $I_{OS(\bar{DS})}$	—	—	—	-15 -15	-60	-100 -110	mA
High-Level Fault Flag Output Voltage ( $V_{CC} = 4.5\text{ V}$ , $I_{OH} = -400\text{ }\mu\text{A}$ )	$V_{OH(\bar{F})}$	2.5	3.0	—	—	—	—	V
Low-Level Fault Flag Output Voltage ( $V_{CC} = 4.5\text{ V}$ , $V_{IH} = 2.0\text{ V}$ , $I_{OL} = +8.0\text{ mA}$ , Driver Output shorted to Ground)	$V_{OL(\bar{F})}$	—	—	0.5	—	—	0.5	V
Fault Flag Output Short Circuit Current ( $V_{CC} = 5.5\text{ V}$ , $V_{OS} = 0\text{ V}$ , only one output shorted at a time) ( $V_{CC} = 5.95\text{ V}$ , $V_{OS} = 0\text{ V}$ , only one output shorted at a time)	$I_{OS(\bar{F})}$ $I_{OS(\bar{FS})}$	-15	—	-100 -110	—	—	—	mA
High-Level Fault Flag Output Current ( $V_{CC} = 5.95\text{ V}$ , $V_{OH} = 5.95\text{ V}$ )	$I_{OH(\bar{F})}$	—	—	—	—	—	+100	$\mu\text{A}$
High-Level Power Supply Current ( $V_{CC} = 5.5\text{ V}$ , $V_{IH} = 2.0\text{ V}$ , no output loading) ( $V_{CC} = 5.95\text{ V}$ , $V_{IH} = 2.0\text{ V}$ , no output loading)	$I_{CCH}$ $I_{CCHS}$	—	50	70 80	—	55	75 85	mA
Low-Level Power Supply Current ( $V_{CC} = 5.5\text{ V}$ , $V_{IL} = 0.8\text{ V}$ , no output loading) ( $V_{CC} = 5.95\text{ V}$ , $V_{IL} = 0.8\text{ V}$ , no output loading)	$I_{CCL}$ $I_{CCLS}$	—	35	55 70	—	35	55 70	mA

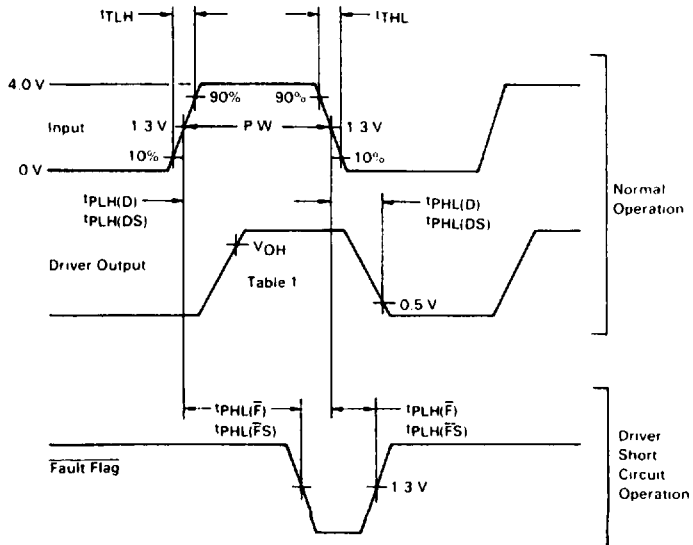
**MC3481, MC3485**

**FIGURE 1 — MC3481 AC TEST CIRCUIT AND WAVEFORMS**



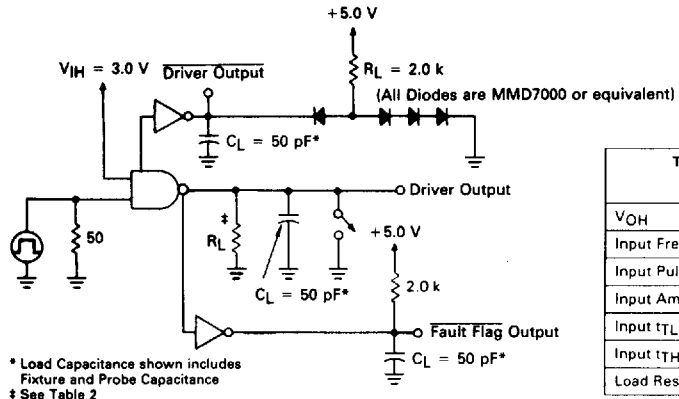
\* Load Capacitance shown includes Fixture and Probe Capacitance

Table 1	Driver Application	
	I/O	Select-Out
V <sub>OH</sub>	3.11 V	3.9 V
Input Frequency	5 MHz	1 MHz
Input Pulse Width	100 ns	500 ns
Input Amplitude	0 V to 4 V	0 V to 4 V
Input t <sub>TLH</sub>	≤ 6 ns	≤ 6 ns
Input t <sub>THL</sub>	≤ 6 ns	≤ 6 ns
Load Resistance (R <sub>L</sub> )	50	90



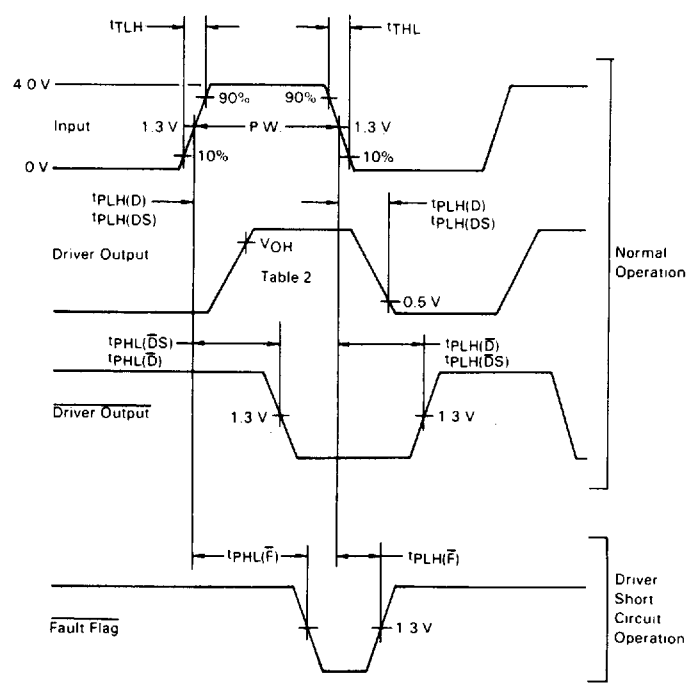
MC3481, MC3485

FIGURE 2 — MC3485 AC TEST CIRCUIT AND WAVEFORMS



\* Load Capacitance shown includes Fixture and Probe Capacitance  
 ‡ See Table 2

Table 2	Driver Application	
	I/O	Select-Out
$V_{OH}$	3.11 V	3.9 V
Input Frequency	5 MHz	1 MHz
Input Pulse Width	100 ns	500 ns
Input Amplitude	0 V to 4 V	0 V to 4 V
Input $t_{TLH}$	$\leq 6$ ns	$\leq 6$ ns
Input $t_{THL}$	$\leq 6$ ns	$\leq 6$ ns
Load Resistance ( $R_L$ )	50	90



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