LINEAR INTEGRATED CIRCUITS DATA BOOK

FIRST EDITION

MOTOROLA Semiconductor Products Inc.

LINEAR

INTEGRATED CIRCUITS DATA BOOK

MC1710

DIFFERENTIAL COMPARATOR

MONOLITHIC DIFFERENTIAL VOLTAGE COMPARATOR

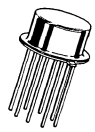
. . . designed for use in level detection, low-level sensing, and memory applications.

- Differential Input Characteristics –
  Input Offset Voltage = 1.0 mV
  Offset Voltage Drift = 3.0 μV/°C
- Fast Response Time – 40 ns
- Output Compatible With All Saturating Logic Forms –
  V_{out} = +3.2 V to -0.5 V typical
- Low Output Impedance – 200 ohms

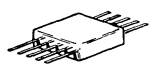
DIFFERENTIAL COMPARATOR INTEGRATED CIRCUIT

MONOLITHIC SILICON EPITAXIAL PASSIVATED

Lead 4 connected to case



G SUFFIX
METAL PACKAGE
CASE 601
TO-99



F SUFFIX
CERAMIC PACKAGE
CASE 606
TO-91

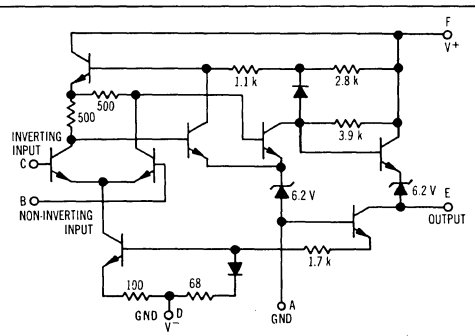
MAXIMUM RATINGS (T_A = 25°C unless otherwise noted)

Rating	Symbol	Value	Unit
Power Supply Voltage	V^+ V^-	+14 -7.0	Vdc Vdc
Differential Input Signal	V_{in}	±5.0	Volts
Common Mode Input Swing	CMV_{in}	±7.0	Volts
Peak Load Current	I_L	10	mA
Power Dissipation (package limitations) Metal Can Derate above T_A = +25°C Flat Package Derate above T_A = +25°C	P_D	 680 4.6 500 3.3	 mW mW/°C mW mW/°C
Operating Temperature Range	T_A	-55 to +125	°C
Storage Temperature Range	T_{stg}	-65 to +150	°C

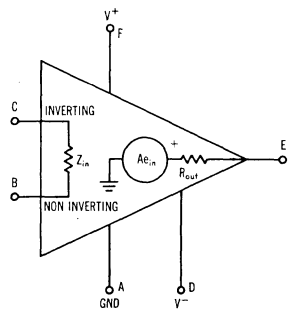
PIN CONNECTIONS

Schematic	A	B	C	D	E	F
"G" Package	1	2	3	4	7	8
"F" Package	1	2	3	5	6	8

CIRCUIT SCHEMATIC



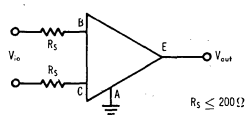
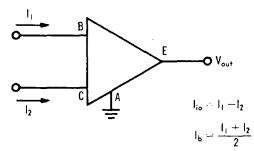
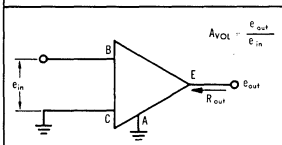
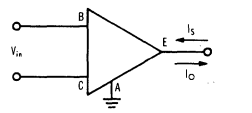
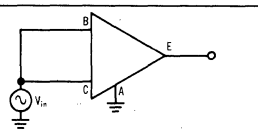
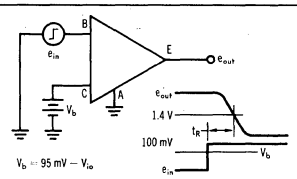
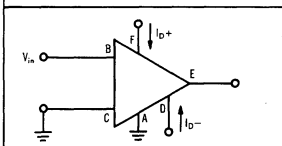
EQUIVALENT CIRCUIT



See Packaging Information Section for outline dimensions.

See current MCC1710/1710C data sheet for standard linear chip information.

ELECTRICAL CHARACTERISTICS ($V^+ = +12$ Vdc, $V^- = -6$ Vdc, $T_A = 25°C$ unless otherwise noted)

Characteristic Definitions (linear operation)	Characteristic	Symbol	Min	Typ	Max	Unit
	Input Offset Voltage V_{out} = 1.4 Vdc, T_A = 25°C V_{out} = 1.8 Vdc, T_A = -55°C V_{out} = 1.0 Vdc, T_A = +125°C	V_{io}	 - - -	 1.0 - -	 2.0 3.0 3.0	mVdc
	Temperature Coefficient of Input Offset Voltage	TC_{Vio}	-	3.0	-	μV/°C
	Input Offset Current V_{out} = 1.4 Vdc, T_A = 25°C V_{out} = 1.8 Vdc, T_A = -55°C V_{out} = 1.0 Vdc, T_A = +125°C	I_{io}	 - - -	 1.0 - -	 3.0 7.0 3.0	μAdc
	Input Bias Current V_{out} = 1.4 Vdc, T_A = 25°C V_{out} = 1.8 Vdc, T_A = -55°C V_{out} = 1.0 Vdc, T_A = +125°C	I_b	 - - -	 12 - -	 20 45 20	μAdc
	Open Loop Voltage Gain T_A = 25°C T_A = -55 to +125°C	A_{VOL}	 1250 1000	 1700 -	 - -	V/V
	Output Resistance	R_{out}	-	200	-	ohms
	Differential Voltage Range	V_{in}	±5.0	-	-	Vdc
	Positive Output Voltage $V_{in} \geq 5.0$ mV, $0 \leq I_O \leq 5.0$ mA	V_{OH}	2.5	3.2	4.0	Vdc
	Negative Output Voltage $V_{in} \geq -5.0$ mV	V_{OL}	-1.0	-0.5	0	Vdc
	Output Sink Current $V_{in} \geq -5.0$ mV, $V_{out} \geq 0$, T_A = 25°C $V_{in} \geq -5.0$ mV, $V_{out} \geq 0$, T_A = -55°C	I_S	 2.0 1.0	 2.5 2.0	 - -	mAdc
	Input Common Mode Range	CMV_{in}	±5.0	-	-	Volts
	Common Mode Rejection Ratio V^- = -7.0 Vdc, $R_S \leq 200\Omega$	CM_{rej}	80	100	-	dB
	Propagation Delay Time For Positive and Negative Going Input Pulse	t_{pd}	-	40	-	ns
	Power Supply Current $V_{out} \leq 0$ Vdc	I_D^+ I_D^-	- -	6.4 5.5	9.0 7.0	mAdc
	Power Consumption TO-99 Metal Can TO-91 Flat Package		 - -	 115 115	 150 150	mW

TYPICAL CHARACTERISTICS

FIGURE 1 – VOLTAGE TRANSFER CHARACTERISTICS

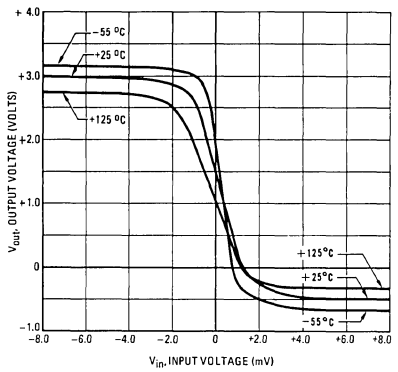


FIGURE 2 – INPUT OFFSET VOLTAGE versus TEMPERATURE

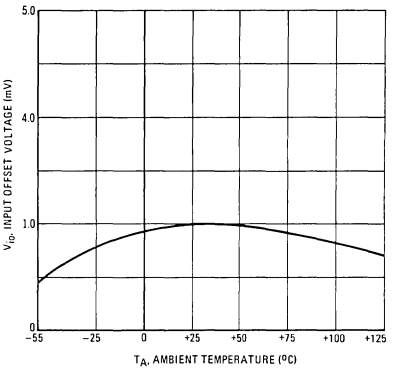


FIGURE 3 – INPUT OFFSET CURRENT versus TEMPERATURE

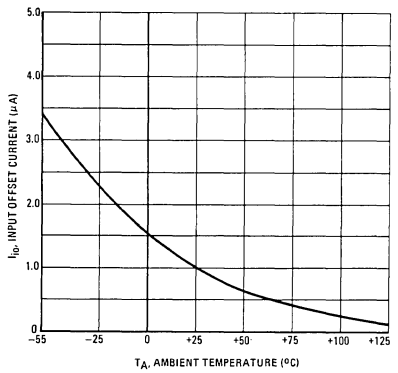


FIGURE 4 – INPUT BIAS CURRENT versus TEMPERATURE

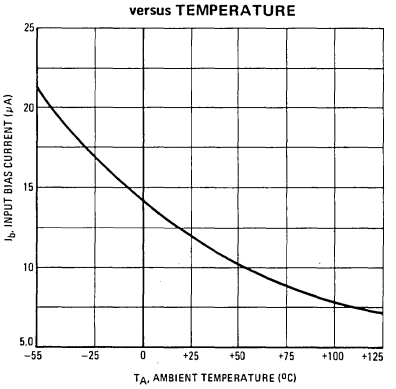


FIGURE 5 – GAIN VARIATION WITH POWER SUPPLY VOLTAGE

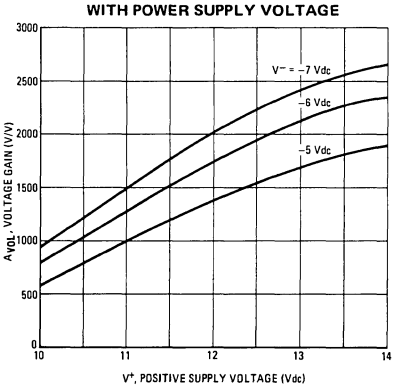


FIGURE 6 – VOLTAGE GAIN versus TEMPERATURE

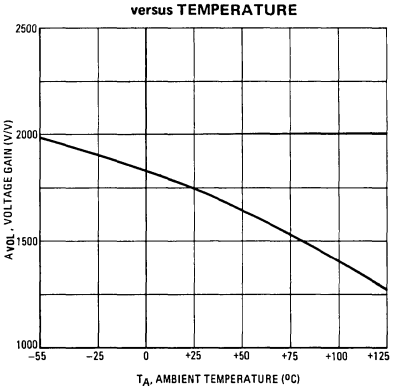


FIGURE 7 – RESPONSE TIME

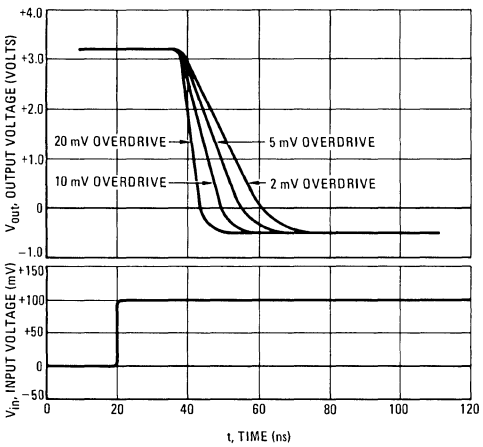


FIGURE 8 – POWER DISSIPATION versus TEMPERATURE

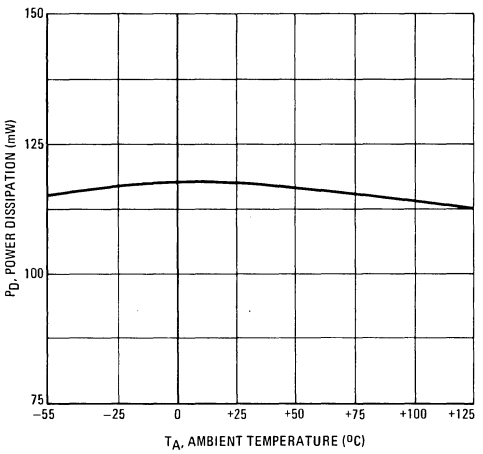


FIGURE 9 – RECOMMENDED SERIES RESISTANCE versus MRTL LOADS

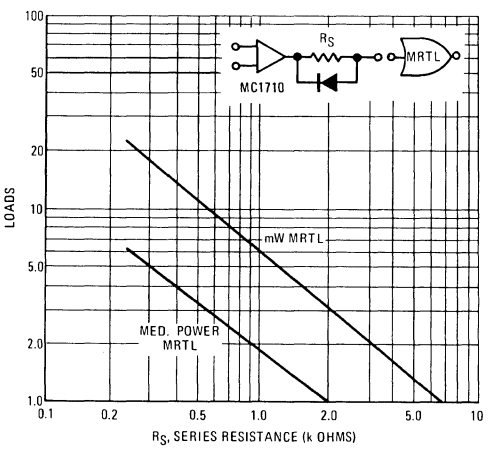
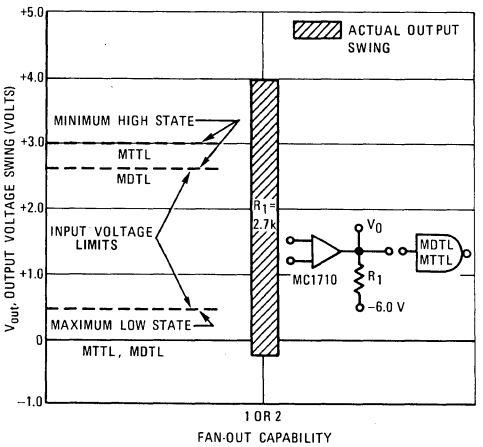


FIGURE 10 – FAN-OUT CAPABILITY WITH MDTL OR MTTL OUTPUT SWING



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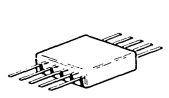
MC1710C

DIFFERENTIAL COMPARATOR

DIFFERENTIAL COMPARATOR

. . . designed for use in level detection, low-level sensing, and memory applications.



F SUFFIX
CERAMIC PACKAGE
CASE 606
TO-91

L SUFFIX
CERAMIC PACKAGE
CASE 632
TO-116

Lead 4 connected to case

G SUFFIX
METAL PACKAGE
CASE 601
TO-99

Typical Amplifier Features:

- Differential Input Characteristics:
  Input Offset Voltage = 1.5 mV
  Offset Voltage Drift = 5.0 $\mu V/^{o}C$
- Fast Response Time — 40 ns
- Output Compatible with All Saturating Logic Forms
  V_{out} = +3.2 V to -0.5 V typical
- Low Output Impedance — 200 ohms

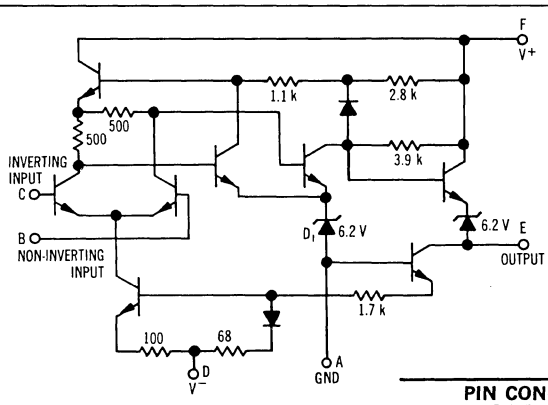
MAXIMUM RATINGS (T_A = 25°C unless otherwise noted)

Rating	Symbol	Value	Unit
Power Supply Voltage	V^+ V^-	+14 -7.0	Vdc Vdc
Differential Input Signal	V_{in}	±5.0	Volts
Common Mode Input Swing	CMV_{in}	±7.0	Volts
Peak Load Current	I_L	10	mA
Power Dissipation (package limitation) Metal Can Derate above 25°C Flat Package Derate above 25°C Plastic Package Derate above 25°C	P_D	 680 4.6 500 3.3 400 3.3	 mW mW/°C mW mW/°C mW mW/°C
Operating Temperature Range*	T_A	0 to +75	°C
Storage Temperature Range Metal Can and Flat Package Plastic Package	T_{stg}	 -65 to +150 -65 to +125	°C

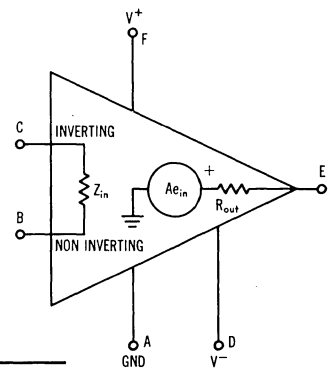
*For full temperature range (-55°C to + 125° C) and characteristic curves, see MC1710 data sheet.

6

CIRCUIT SCHEMATIC



EQUIVALENT CIRCUIT



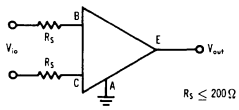
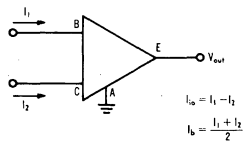
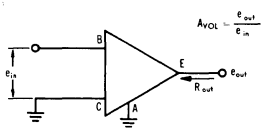
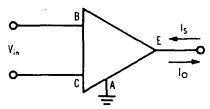
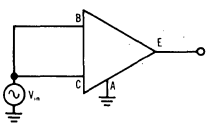
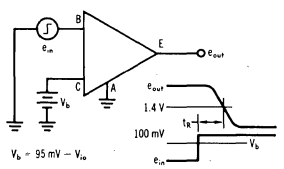
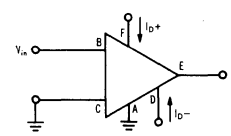
PIN CONNECTIONS

Schematic	A	B	C	D	E	F
"G" Package	1	2	3	4	7	8
"F" Package	1	2	3	5	6	8
"L" Package	2	3	4	6	9	11

See Packaging Information Section for outline dimensions.

See current MCC1710/1710C data sheet for standard linear chip information.

ELECTRICAL CHARACTERISTICS (V^+ = +12 Vdc, V^- = −6 Vdc, T_A = 25°C unless otherwise noted)

Characteristic Definitions	Characteristic	Symbol	Min	Typ	Max	Unit
	Input Offset Voltage V_{out} = 1.4 Vdc, T_A = 25°C V_{out} = 1.5 Vdc, T_A = 0°C V_{out} = 1.2 Vdc, T_A = +70°C	V_{io}	 - - -	 1.5 - -	 5.0 6.5 6.5	mVdc
	Temperature Coefficient of Input Offset Voltage	TC_{Vio}	-	5.0	-	μV/°C
	Input Offset Current V_{out} = 1.4 Vdc, T_A = 25°C V_{out} = 1.5 Vdc, T_A = 0°C V_{out} = 1.2 Vdc, T_A = +70°C	I_{io}	 - - -	 1.0 - -	 5.0 7.5 7.5	μAdc
	Input Bias Current V_{out} = 1.4 Vdc, T_A = 25°C V_{out} = 1.5 Vdc, T_A = 0°C V_{out} = 1.2 Vdc, T_A = +70°C	I_b	 - - -	 15 25 -	 25 40 40	μAdc
	Voltage Gain T_A = 25°C T_A = 0 to +70°C	A_{VOL}	 1000 800	 1500 -	 - -	V/V
	Output Resistance	R_{out}	-	200	-	ohms
	Differential Voltage Range	V_{in}	±5.0	-	-	Vdc
	Positive Output Voltage $V_{in} \geq$ 5.0 mV, 0 ≤ I_O ≤ 5.0 mA	V_{OH}	2.5	3.2	4.0	Vdc
	Negative Output Voltage $V_{in} \geq$ -5.0 mV	V_{OL}	-1.0	-0.5	0	Vdc
	Output Sink Current $V_{in} \geq$ -5.0 mV, $V_{out} \geq$ 0 T_A = 25°C T_A = 0°C	I_s	 1.6 0.5	 2.5 -	 - -	mAdc
	Input Common Mode Range V^- = -7.0 Vdc	CMV_{in}	±5.0	-	-	Volts
	Common Mode Rejection Ratio $R_S \leq$ 200 Ω	CM_{rej}	70	100	-	dB
	Propagation Delay Time For Positive and Negative Going Input Pulse	t_{pd}	-	40	-	ns
	Power Supply Current V_{out} ≤ 0 Vdc	I_D^+ I_D^-	- -	6.4 5.5	9.0 7.0	mAdc
	Power Consumption		-	110	150	mW

6