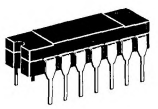
# MC1543L

## DUAL SENSE AMPLIFIER

## DUAL MECL CORE-MEMORY SENSE AMPLIFIER

A dual dc coupled sense amplifier. Output levels are compatible with emitter coupled logic levels. MC1543L offers adjustable threshold and excellent threshold stability over a wide range of power-supply voltage variation.



CERAMIC PACKAGE
CASE 632
TO-116

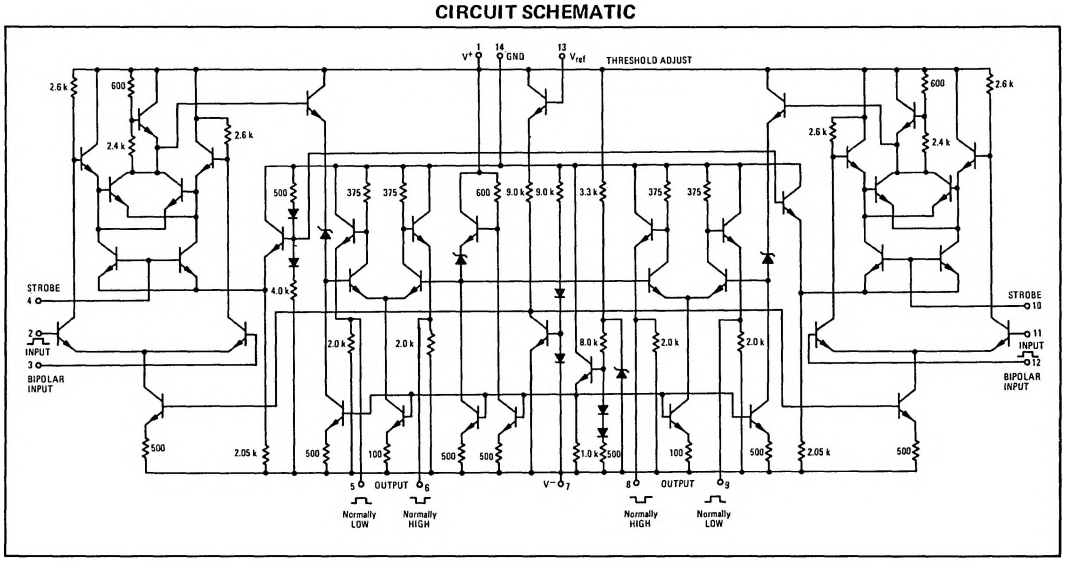
### Typical Amplifier Features:

- Input Threshold
  Adjustable from 10 to 40 mV (Positive or Negative Signals)
- Both OR and NOR Outputs Available
- Low Power Dissipation
- Threshold Insensitive to + or - Supply Variation
- Each Amplifier is Separately Strobed

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

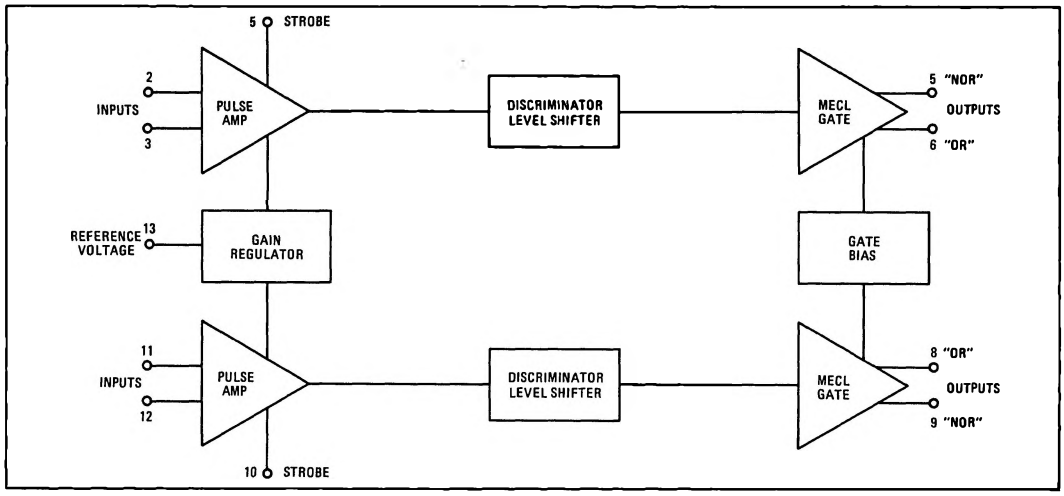
| Rating | Symbol | Value | Unit |
|---|---|---|---|
| Power Supply Voltage | $V^+$<br>$V^-$ | +10<br>−10 | Vdc<br>Vdc |
| Differential Input Signal | $V_{in}$ | ±5.0 | Vdc |
| Common Mode Input Voltage | $CMV_{in}$ | ±5.0 | Vdc |
| Load Current | $I_L$ | 25 | mA |
| Power Dissipation (Package Limitation)<br>Ceramic Dual-in-Line Package<br>Derate above 25°C | $P_D$ | <br>1000<br>6.7 | <br>mW<br>mW/°C |
| Operating Temperature Range | $T_A$ | −55 to +125 | °C |
| Storage Temperature Range | $T_{stg}$ | −65 to +150 | °C |

### CIRCUIT SCHEMATIC




See Packaging Information Section for outline dimensions.

**EQUIVALENT CIRCUIT**




**ELECTRICAL CHARACTERISTICS (Each Amplifier)**
($V^+$ = +5.0 Vdc ±5%, $V^-$ = −5.2 Vdc ±5%, $V_{ref}$ = 0.54 V ±1%, $T_A$ = +25°C unless otherwise noted)

| Characteristic | Fig. No. | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Input Threshold Voltage | 8 | $V_{th}$ | 17 | 20 | 23 | mV |
| Power Supply Currents ($V_2 = V_3 = V_{11} = V_{12} = V_{14} = 0$) | 6 | $I_{CC}$ | – | 9.5 | 12 | mAdc |
| | 6 | $I_{EE}$ | – | 26.5 | 33 | mAdc |
| Input Bias Current | 7 | $I_b$ | – | 3.5 | 10 | μAdc |
| Input Offset Current | 7 | $I_{io}$ | – | 0.05 | 0.5 | μAdc |
| Output Voltage High | 9 | $V_{OH}$ | −0.85 | −0.8 | −0.67 | Vdc |
| Output Voltage Low | 9 | $V_{OL}$ | – | −1.7 | −1.46 | Vdc |
| Strobe Threshold Level | 10 | $V_{ST}$ | – | −1.30 | – | Vdc |
| Strobe Input Current High | 10 | $I_{SH}$ | – | 25 | 50 | μAdc |
| Strobe Input Current Low | 10 | $I_{SL}$ | – | 0.01 | 0.1 | μAdc |
| Input Common Mode Range | 14 | $V_{CM}$ | 3.0 | 4.0 | – | Vdc |
| Input Threshold Range (by varying $V_{ref}$) | 8 | $V_{thR}$ | – | 10-40 | – | mV |
| Power Dissipation | 6 | $P_D$ | – | 185 | 230 | mW |
| Reference Supply Input Current (Pin 13) | 6 | $I_{ref}$ | – | 10 | 40 | μA |

**SWITCHING CHARACTERISTICS**

| | | | | | | |
|---|---|---|---|---|---|---|
| Propagation Delay (Input to Output) | 11 | $t_{IO}$ | – | 28 | 35 | ns |
| Propagation Delay (Strobe to Output) | 12 | $t_{SO}$ | – | 16 | 20 | ns |
| Strobe Release Time | 12 | $t_{SR}$ | – | 18 | 30 | ns |
| Recovery Time (Differential Mode) ($e_{in}$ = 400 mVdc) | 13 | $t_{DR}$ | – | 10 | 15 | ns |
| Recovery Time (Common Mode) ($e_{in}$ = 4.0 Vdc) | 14 | $t_{CMR}$ | – | 3.0 | 15 | ns |
| Strobe Width Minimum | 12 | $t_S$ | – | 8.0 | – | ns |

**TEMPERATURE TESTS** (−55°C to +125°C)

| | | | | | | |
|---|---|---|---|---|---|---|
| Input Threshold Voltage (−55°C) | 8 | $V_{th}$ | 18 | 21.5 | 25 | mV |
| Input Threshold Voltage (+125°C) | | | 15 | 18.5 | 22 | |
| Input Bias Current | 7 | $I_b$ | 2.2 | 7.0 | 20 | μAdc |
| Input Offset Current | 7 | $I_{io}$ | 0.02 | 0.1 | 1.0 | μAdc |

## TYPICAL CHARACTERISTICS

FIGURE 1 – TYPICAL INPUT THRESHOLD versus TEMPERATURE

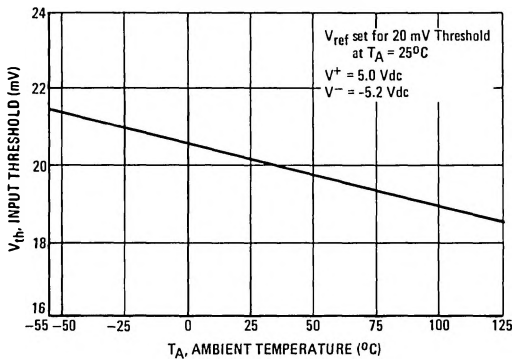



FIGURE 2 –TYPICAL INPUT THRESHOLD versus REFERENCE VOLTAGE

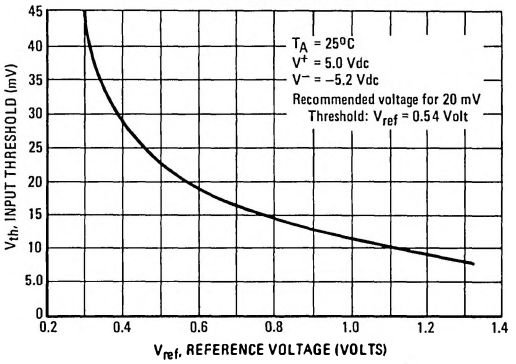



FIGURE 3A – TYPICAL INPUT THRESHOLD versus $V^+$

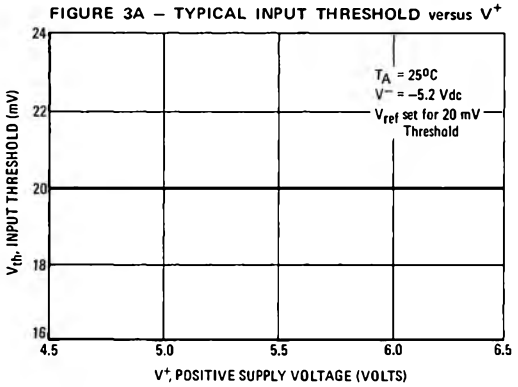



FIGURE 3B – TYPICAL INPUT THRESHOLD versus $V^-$

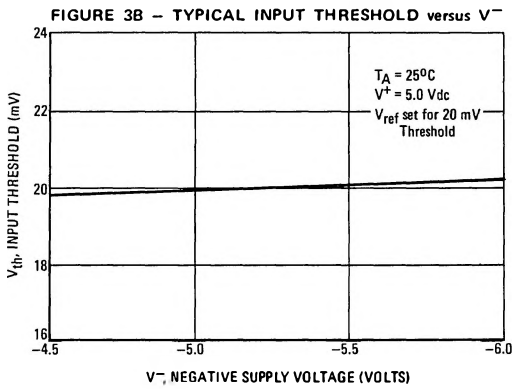



FIGURE 4 – TYPICAL INPUT THRESHOLD versus INPUT PULSE WIDTH

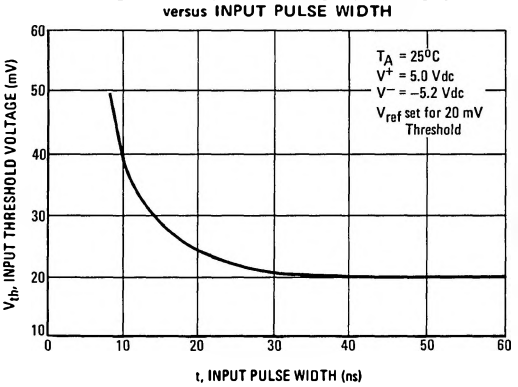



FIGURE 5 – INPUT-OUTPUT TRANSFER CHARACTERISTICS (one output)

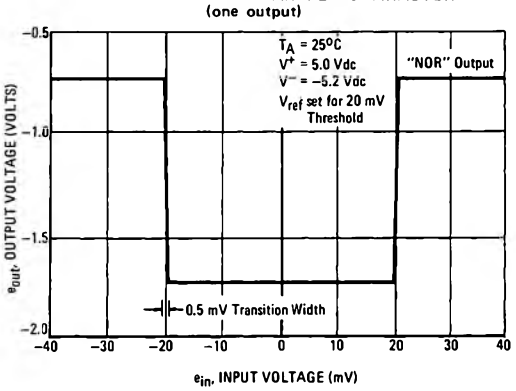


FIGURE 6 – POWER SUPPLY CURRENT DRAIN

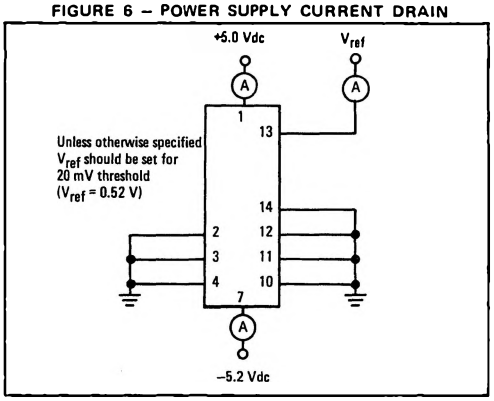



FIGURE 7 – INPUT BIAS CURRENT
INPUT OFFSET CURRENT

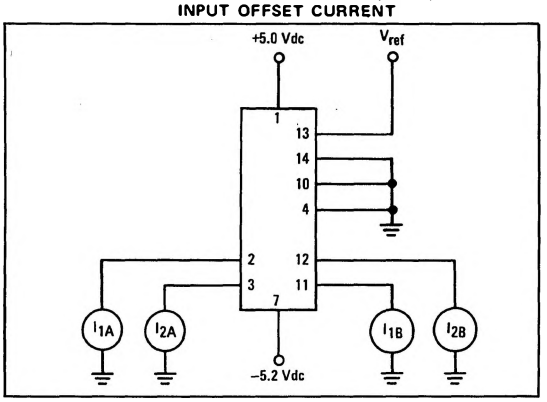



FIGURE 8 – INPUT THRESHOLD LEVEL

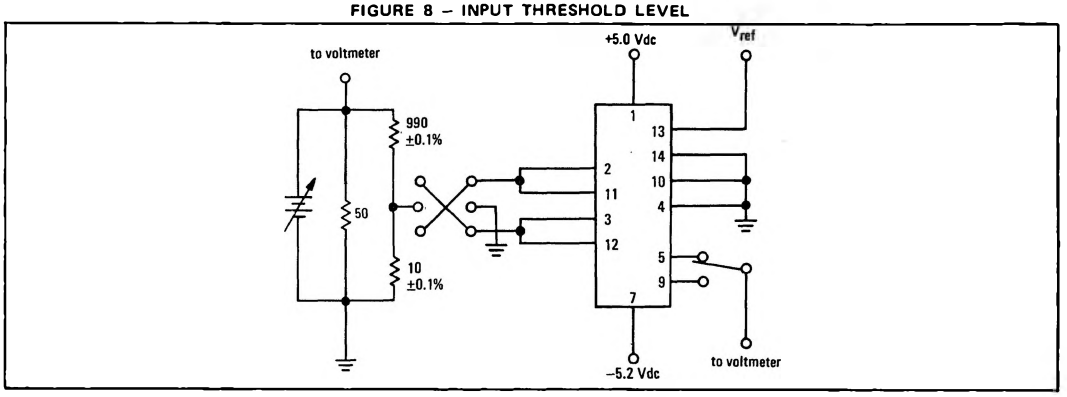



FIGURE 9 – OUTPUT VOLTAGE LEVELS

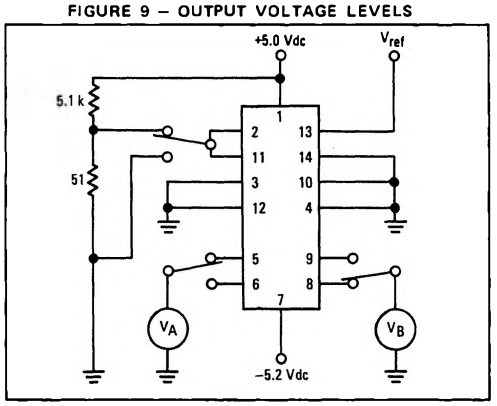



FIGURE 10 – STROBE THRESHOLD LEVEL
STROBE INPUT CURRENTS

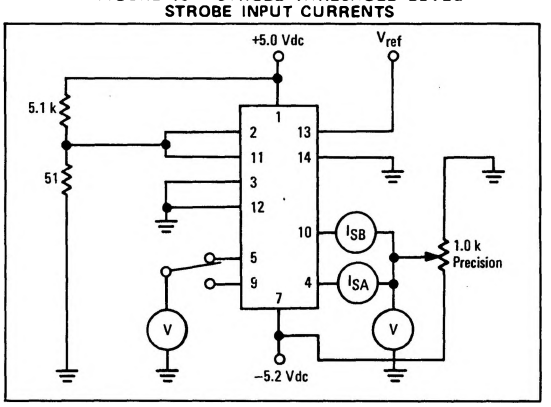


FIGURE 11 – PROPAGATION DELAY – INPUT TO OUTPUT

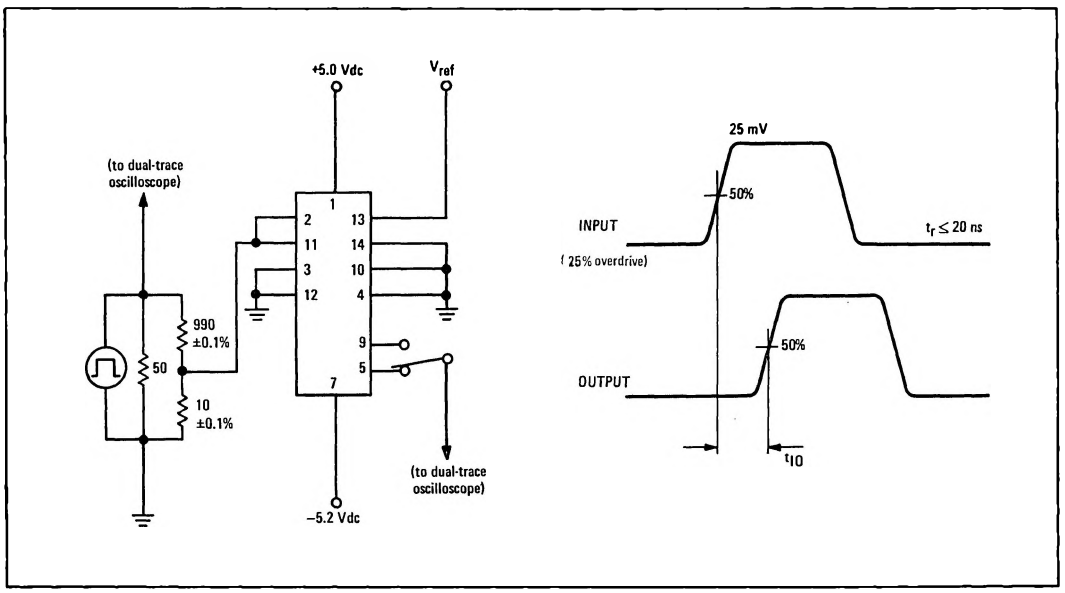



FIGURE 12 – PROPAGATION DELAY – STROBE TO OUTPUT and STROBE RELEASE TIME

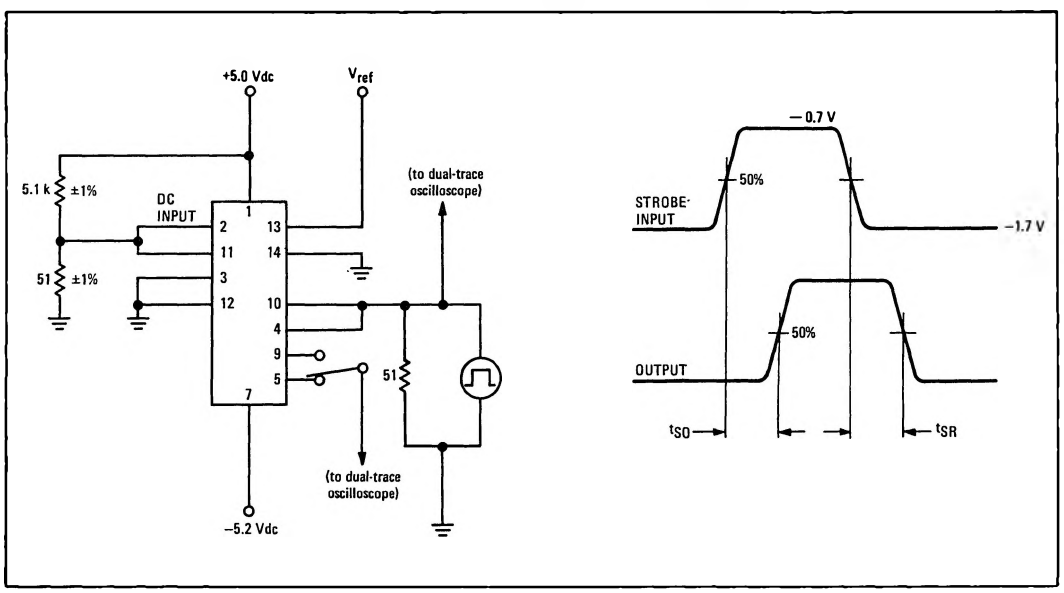


FIGURE 13 – DIFFERENTIAL MODE RECOVERY TIME
(See definition section)

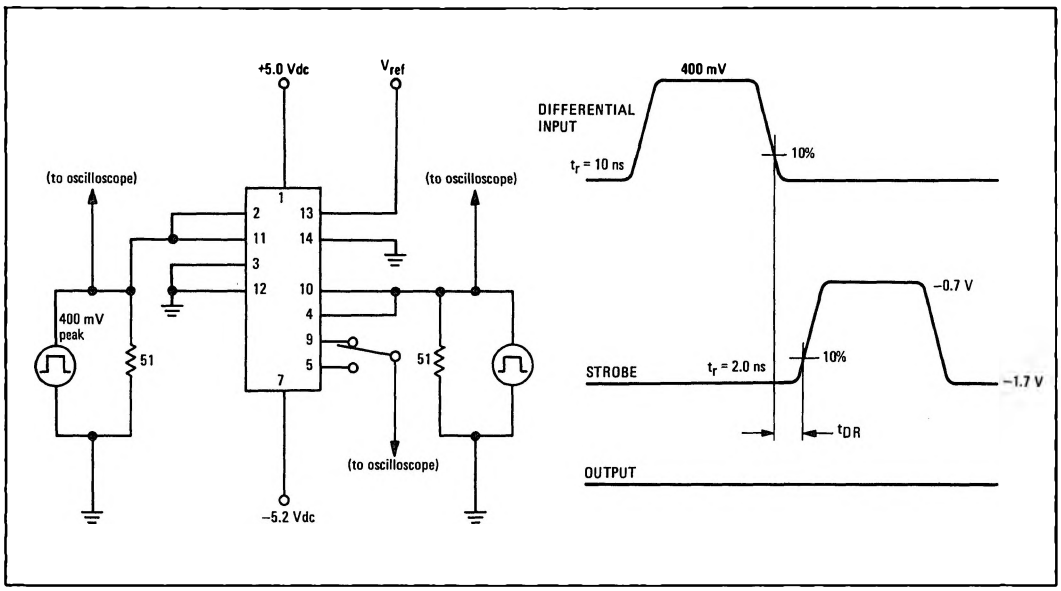
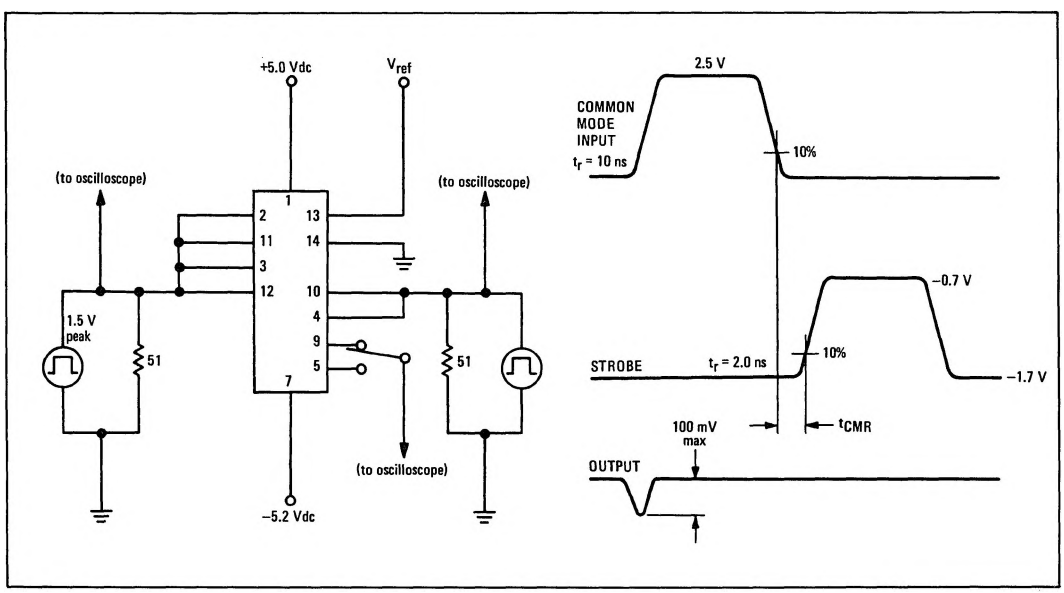



FIGURE 14 – COMMON MODE RECOVERY TIME
COMMON MODE INPUT RANGE
(See definition section)



## DEFINITIONS

$I_{io}$ Input Offset Current — The difference between amplifier input current values $|I_{1A} - I_{2A}|$ or $|I_{1B} - I_{2B}|$.

$I_{SH}$ Strobe High Current — The amount of input current when the strobe pin is grounded.

$I_{SL}$ Strobe Low Current — The leakage current when the strobe input is tied to the negative supply.

$P_D$ Power Dissipation — The amount of power dissipated in the unit.

$t_{CMR}$ Common Mode Recovery Time — The minimum time by which the strobe input may follow the high level common mode input signal without causing a signal to appear at the amplifier output.

$t_{DR}$ Differential Mode Recovery Time — Differential recovery time, the minimum time by which the strobe input may follow the high level differential input signal without causing a signal to appear at the amplifier output.

$t_{IO}$ Propagation Delay, Amplifier Input to Amplifier Output — The time required for the amplifier output to reach 50% of its final value as referenced to 50% of the level of the pulse input (Amplifier input = 25 mVdc or 25% over set threshold).

$t_S$ Strobe Width — The amount of time the strobe must be high to obtain a given output. Minimum strobe width is that minimum time required to cause the output to complete a full swing $V_{OL}$ to $V_{OH}$ or $V_{OH}$ to $V_{OL}$.

$t_{SO}$ Propagation Delay, Strobe Input to Amplifier Output — The time required for the amplifier output pulse to achieve 50% of its final value referenced to 50% of the strobe input pulse at pins 4 or 10.

$t_{SR}$ Strobe Release Time — The time required for the output to change to 50% of its swing after the strobe reaches 50% of its level going low. A dc level of 50 mV is the input signal.

$V_{CM}$ Maximum Common Mode Input Range — The common mode input voltage which causes the output voltage level of the amplifier to change by 100 mV (strobe high).

$V_{OH}$ Output Voltage High — The high-level output voltage at pins 6 and 8 with no input — or at pins 5 and 9 with input above threshold.

$V_{OL}$ Output Voltage Low — The low-level output voltage at pins 5 and 9 with no input — or at pins 6 and 8 with input above threshold.

$V_{ST}$ Strobe Threshold Level — The voltage at which the strobe turns the amplifier to the ON state.

$V_{th}$ Input Threshold — Input pulse amplitude at pins 2, 3, 11, or 12 that causes the output gate to just reach its new value, $V_{OL}$ or $V_{OH}$.

$V_{thR}$ Input Threshold Range — The maximum spread of input threshold level that can be attained by varying the threshold voltage reference, $V_{ref}$.