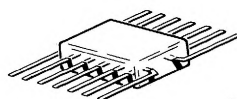


MC1541F

Dual-channel gated sense amplifier with separate wideband differential input amplifiers. Either input can be gated on from saturated logic levels. The sense amplifier features adjustable threshold, saturated logic output levels, and a strobe input that accommodates saturated logic levels. Designed to detect bipolar signals from either of two sense lines. Operates with core memory cycle times less than 0.5 μ s.

Typical Amplifier Features:

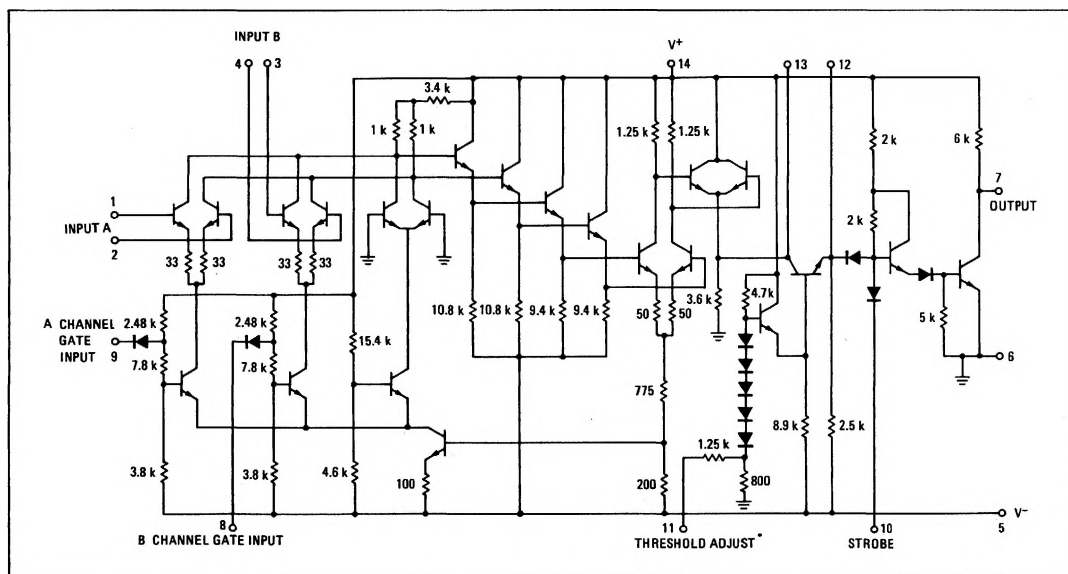
- Nominal Threshold – 17 mV
- Input Offset Voltage – 1.0 mV typical
- Propagation Delay
 - Input to Gate-Output – 20 ns
 - Input to Amplifier-Output – 10 ns
 - Gate Response Time – 15 ns
 - Strobe Response Time – 15 ns
- Common Mode Input Range – 1.5 Volts
- Differential Mode Input Range
 - With Gate On – 600 mV
 - With Gate Off – 1.5 Volts
- Power Dissipation – 140 mW typical



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

Rating	Symbol	Value	Unit
Power Supply Voltage	V^+	+10	Vdc
	V^-	-10	Vdc
Differential Input Signal	V_{in}	± 5	Vdc
Common Mode Input Voltage	CMV_{in}	± 5	Vdc
Load Current	I_L	25	mA
Power Dissipation (Package Limitation) Derate above 25°C	P_D	500	mW
		3.3	mW/ $^\circ\text{C}$
Operating Temperature Range	T_A	-55 to +125	$^\circ\text{C}$
Storage Temperature Range	T_{stg}	-65 to +150	$^\circ\text{C}$

CIRCUIT SCHEMATIC

MC1541F (continued)

ELECTRICAL CHARACTERISTICS

($V^+ = +5.0$ Vdc $\pm 1\%$, $V^- = -5.0$ Vdc $\pm 1\%$, $V_{th}(\text{pin } 11) = -5.0$ Vdc $\pm 1\%$, $C_{ext} = 0.01$ μ F, $T_A = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Fig. No.	Symbol	Min	Typ	Max	Unit
Input Threshold Voltage ($T_A = +25^\circ\text{C}$) ($-55^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$)	8	V_{th}	14 12	17 17	20 22	mV
Input Offset Voltage	8	V_{io}	-	1.0	6.0	mV
Input Bias Current ($V_1 = V_2 = V_3 = V_4 = 0$) ($V_1 = V_2 = V_3 = V_4 = 0$, $T_A = -55^\circ\text{C}$)	9	I_b	- -	5.0 -	25 50	μ A
Input Offset Current	9	I_{io}	-	1.0	2.0	μ A
Output Voltage High ($V_1 = V_2 = V_3 = V_4 = 0$)	10	V_{OH}	4.9	-	-	Vdc
Output Voltage Low ($V_1 = V_2 = V_3 = V_4 = 0$, $V_{12} = +5.0$ Vdc, $I_7 = 10$ mAdc) ($V_{12} = +5.0$ Vdc, $I_7 = 10$ mAdc, $T_A = +125^\circ\text{C}$)	10	V_{OL}	- -	- -	350 400	mVdc
Strobe Load Current ($V_{10} = 0$)		I_S	-	-	1.2	mAdc
Strobe Reverse Current ($V_{10} = +5.0$ Vdc) ($V_{10} = +5.0$ Vdc, $T_A = +125^\circ\text{C}$)		I_{SR}	- -	- -	2.0 25	μ Adc
Input Gate Voltage Low ($V_1 = V_3 = 25$ mVdc, $V_2 = V_4 = 0$)	11	V_{GL}	-	0.7	-	Vdc
Input Gate Voltage High ($V_1 = V_3 = 25$ mVdc, $V_2 = V_4 = 0$)	11	V_{GH}	-	1.6	-	Vdc
Input Gate Load Current (V_8 or $V_9 = 0$)		I_G	-	-	2.5	mAdc
Input Gate Reverse Current (V_8 or $V_9 = 5.0$ Vdc) ($T_A = 25^\circ\text{C}$) ($T_A = +125^\circ\text{C}$)		I_{GR}	- -	- -	2.0 25	μ Adc
Common Mode Range Input Gate High Input Gate Low	13	V_{CM}	- -	± 1.5 ± 1.5	- -	Vdc
Differential Mode Range Input Gate High Input Gate Low	14	V_{DH} V_{DL}	- -	± 600 ± 1.5	- -	mV Vdc
Power Dissipation		P_D	-	140	180	mW

SWITCHING CHARACTERISTICS

Characteristic	Fig. No.	Symbol	Min	Typ	Max	Unit
Propagation Delay Input to Amplifier Output ($V_1 = 25$ mV pulse, $V_{10} = +2.0$ Vdc)	8	t_{IA}	-	10	15	ns
Input to Output ($V_1 = 25$ mV pulse, $V_{10} = +2.0$ Vdc)	8	t_{IO}	-	20	30	
Strobe to Output ($V_1 = V_2 = V_3 = V_4 = 0$, $V_{10} = +2.0$ V pulse)	12	t_{SO}	-	15	20	
Gate Input to Amplifier Input ($V_1 = 25$ mV pulse, $V_9 = 2.0$ V pulse)	11	t_{GI}	-	10	15	
Gate Input to Amplifier Output ($V_1 = 25$ mVdc, $V_9 = 2.0$ V pulse)	11	t_{GA}	-	30	35	
Recovery Time Differential Mode Input Gate High } V_1 or $V_3 = 400$ mV pulse Input Gate Low }	14	t_{DR}	- -	30 0	50 -	ns
Common Mode Input Gate High } V_1 or $V_3 = 1.5$ V pulse Input Gate Low }	13	t_{CMR}	- -	15 15	30 30	

EQUIVALENT CIRCUIT

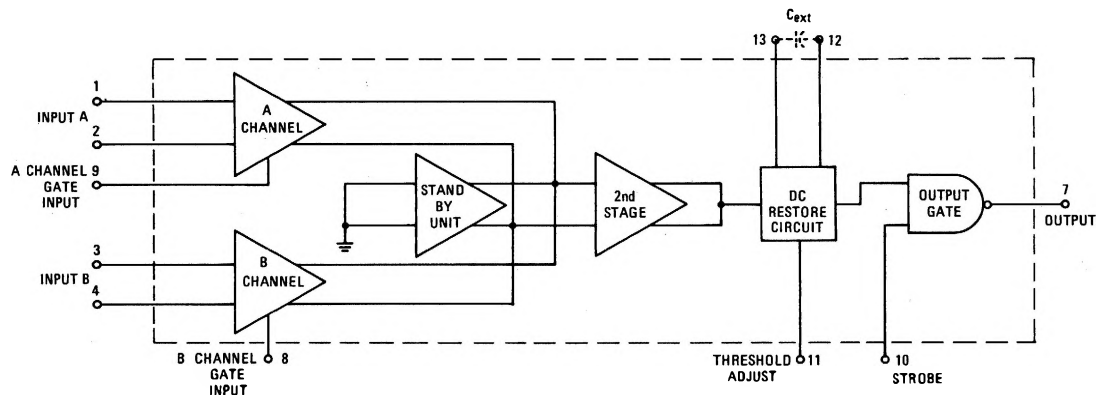


FIGURE 1 – TYPICAL OPERATION

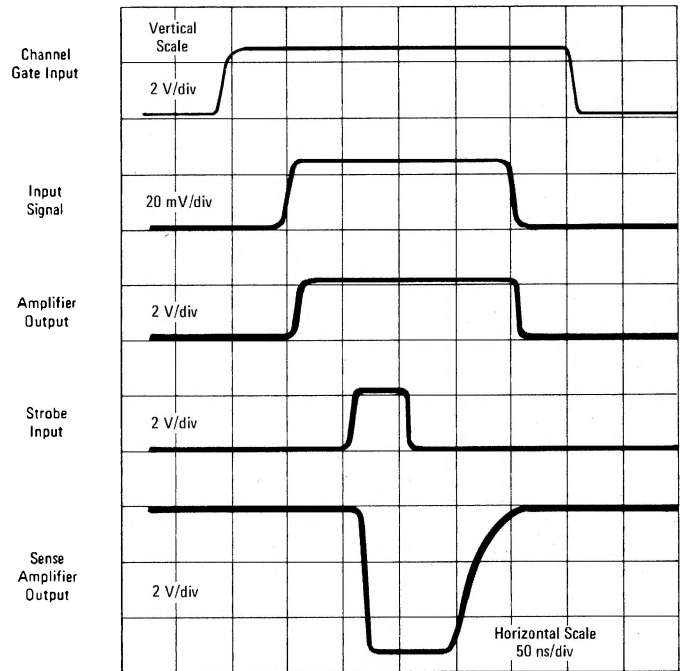


FIGURE 2 – TYPICAL INPUT THRESHOLD versus TEMPERATURE

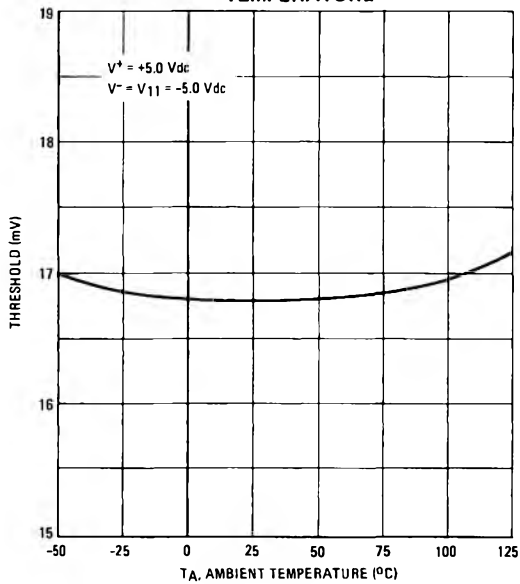


FIGURE 3 – TYPICAL THRESHOLD versus THRESHOLD VOLTAGE ADJUST

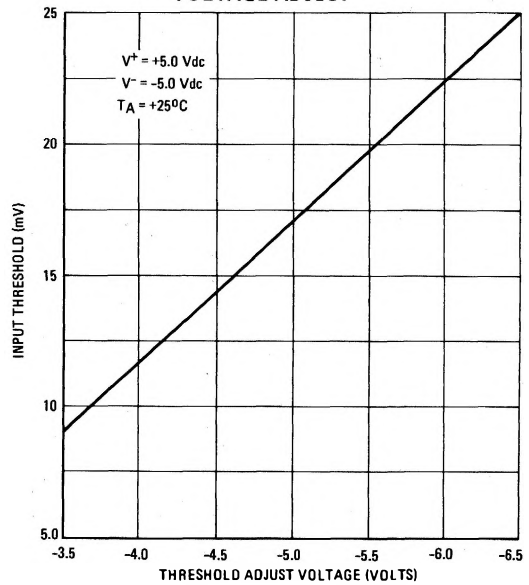


FIGURE 4 – TYPICAL INPUT THRESHOLD versus V^-

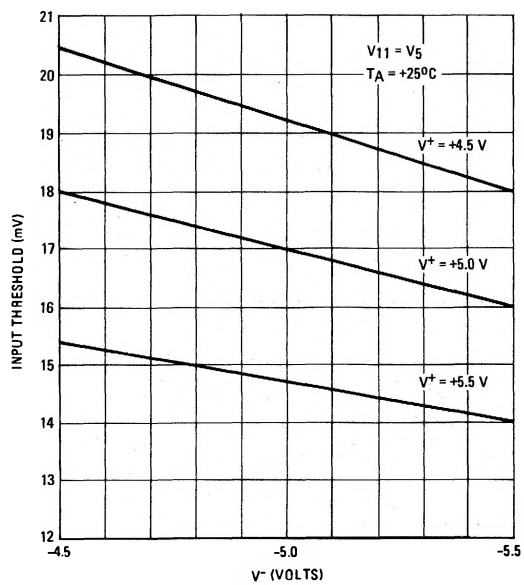


FIGURE 5 – TYPICAL INPUT THRESHOLD versus INPUT PULSE WIDTH

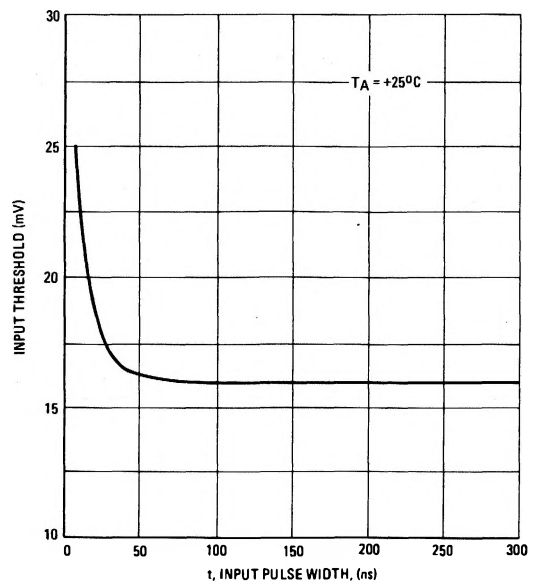


FIGURE 6 – INPUT-OUTPUT TRANSFER CHARACTERISTICS

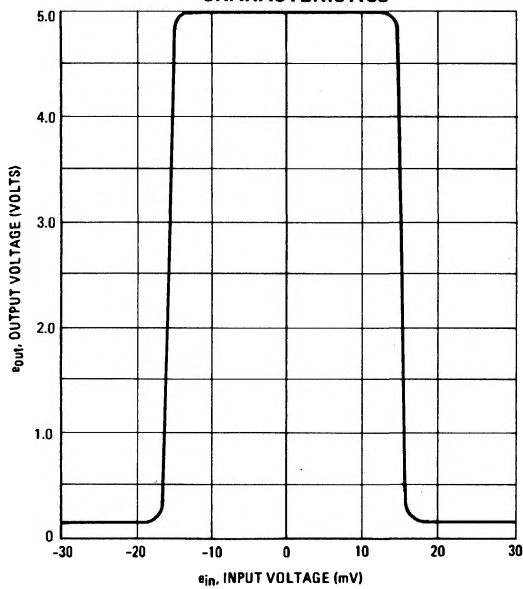


FIGURE 7 – CHANNEL GATE INPUT-AMPLIFIER OUTPUT TRANSFER CHARACTERISTICS

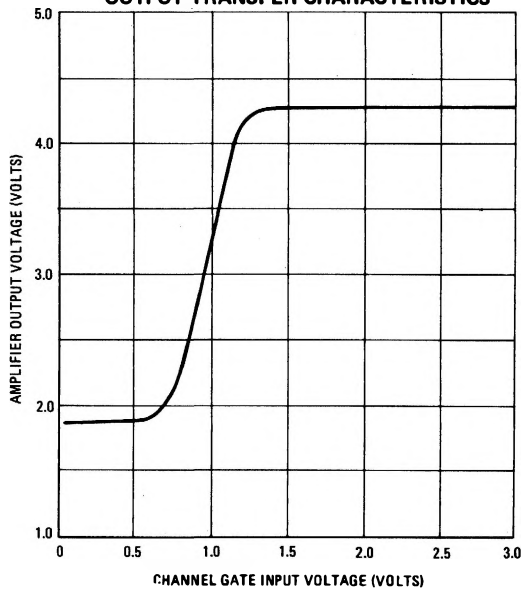
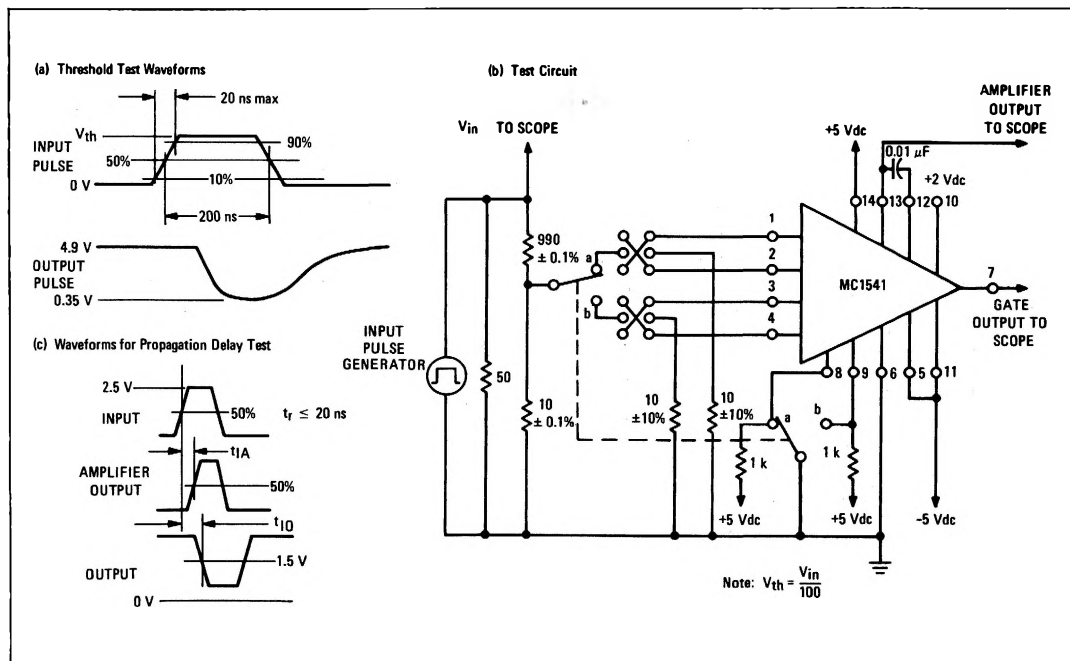


FIGURE 8 – INPUT THRESHOLD FOR OUTPUT VOLTAGE SWING FROM V_{OH} TO V_{OL}
PROPAGATION DELAY FROM INPUT TO OUTPUT



MC1541F (continued)

FIGURE 9 – INPUT BIAS CURRENT TEST CIRCUIT

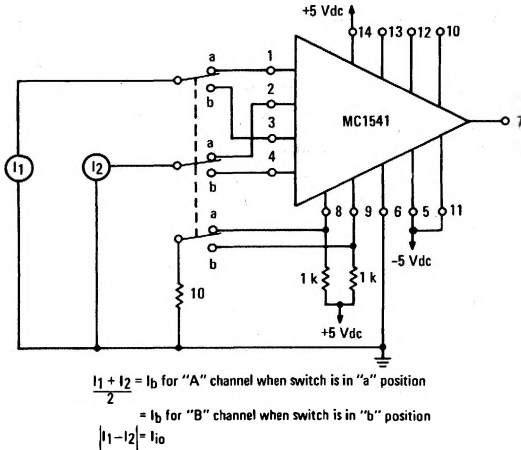


FIGURE 10 – OUTPUT VOLTAGE LEVELS

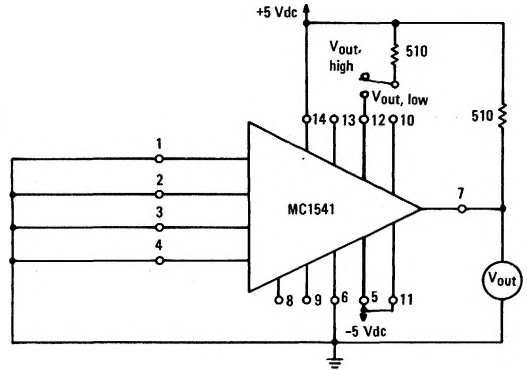
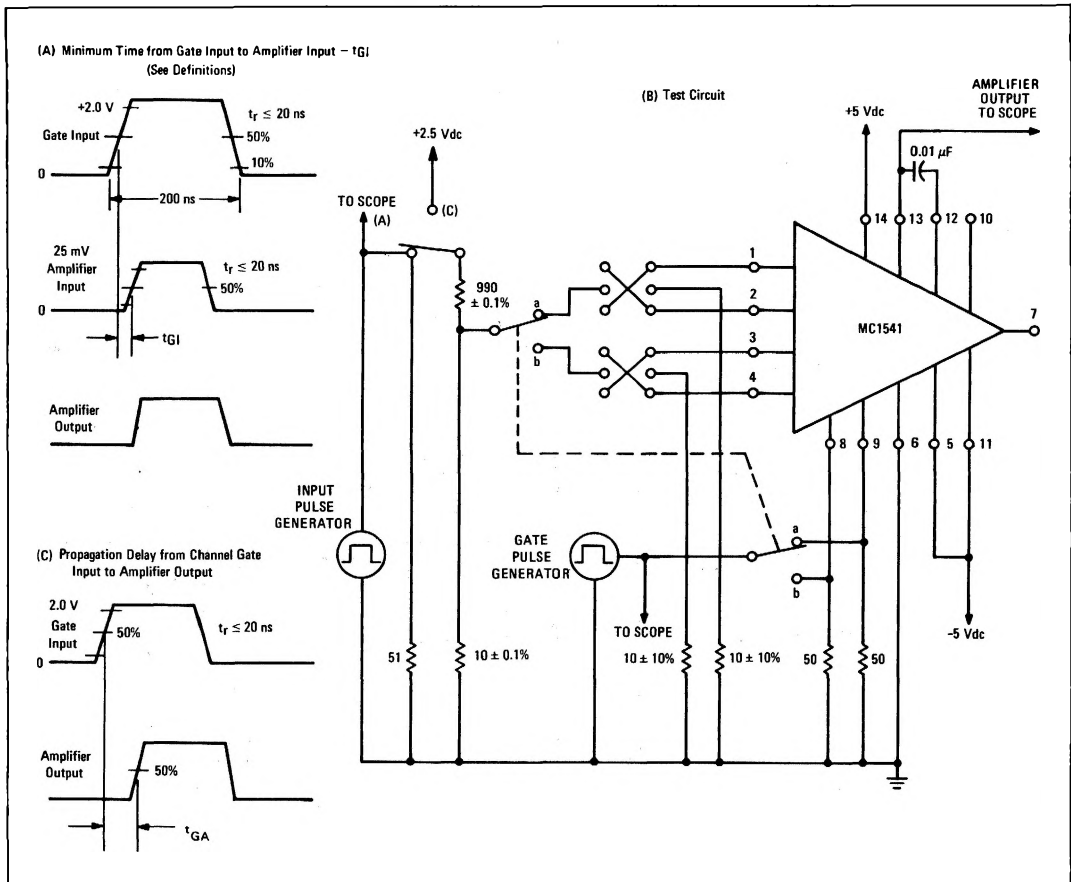


FIGURE 11 – MINIMUM TIME FROM CHANNEL GATE INPUT TO AMPLIFIER INPUT
PROPAGATION DELAY FROM CHANNEL GATE INPUT TO AMPLIFIER OUTPUT



MC1541F (continued)

FIGURE 12 – PROPAGATION DELAY FROM STROBE INPUT TO OUTPUT

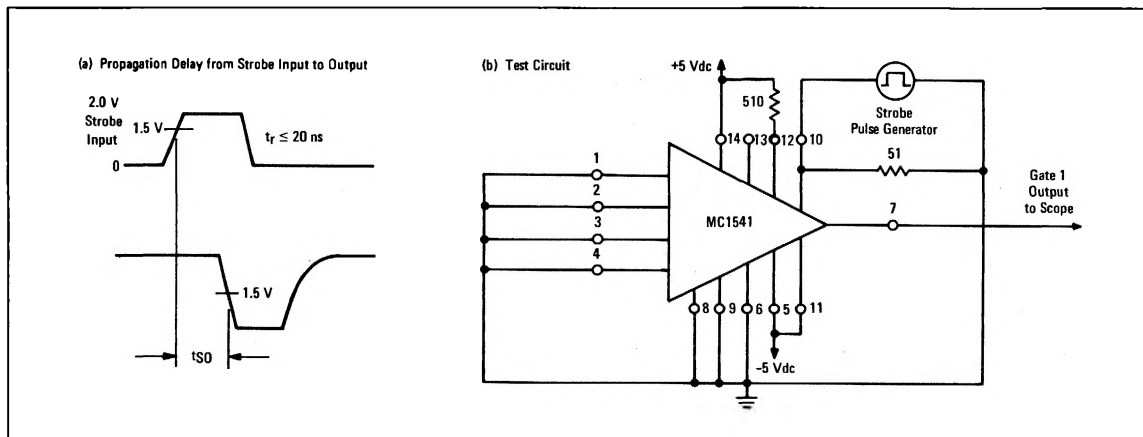


FIGURE 13 – COMMON MODE RECOVERY AND COMMON MODE RANGE

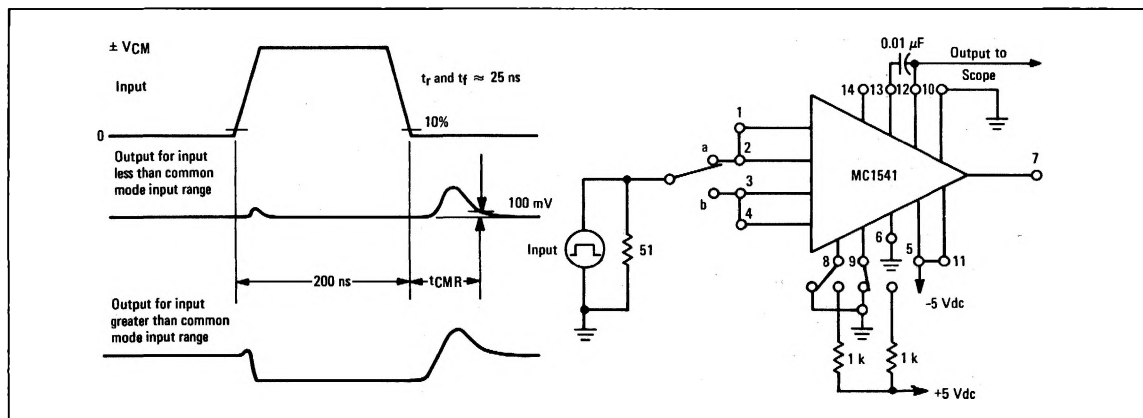
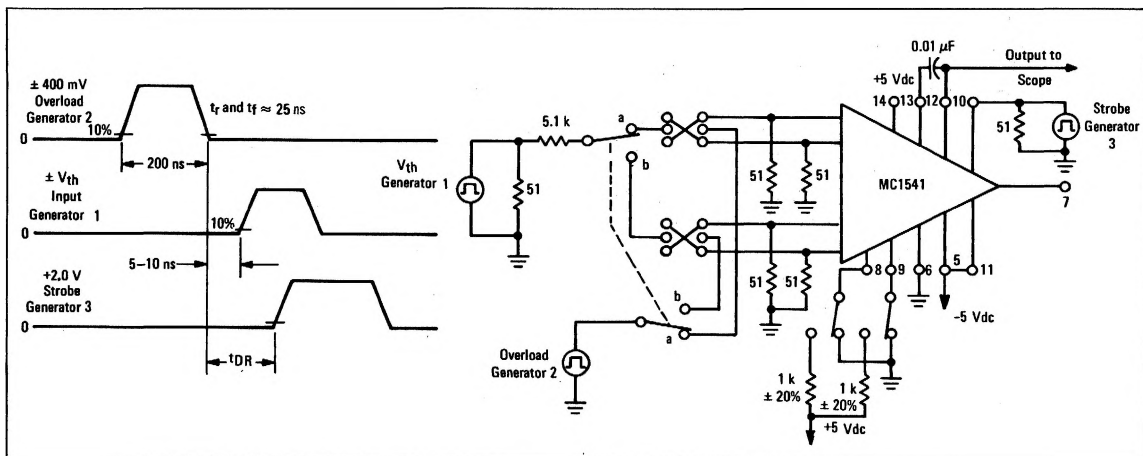


FIGURE 14 – DIFFERENTIAL RECOVERY AND DIFFERENTIAL RANGE



DEFINITIONS

I_B	Input Bias Current — The average input current defined as $(I_1 + I_2 + I_3 + I_4)/4$.		
I_G	Channel Gate Load Current — The amount of current drain from the circuit when the channel gate input (Pin 8 or 9) is grounded.	t_{IO}	Propagation Delay, Input to Output — The time required for the gate output pulse at pin 7 to reach the 1.5 Volt level as referenced to 50% of the input pulse at pins 1 and 2 or 3 and 4.
I_{GR}	Channel Gate Reverse Current — The leakage current when the channel gate input (Pin 8 or 9) is high.	t_{SO}	Strobe Propagation Delay to Output — The time required for the output pulse at pin 7 to reach the 1.5 Volt level as referenced to the 1.5 Volt level of the strobe input at pin 10.
I_{io}	Input Offset Current — The difference between amplifier input current values $ I_1 - I_2 $ or $ I_3 - I_4 $.	V_{CM}	Maximum Common Mode Input Range — The common mode input voltage which causes the output voltage level of the amplifier to decrease by 100 mV. (This is independent of the channel gate input level.)
I_S	Strobe Load Current — The amount of current drain from the circuit when the strobe pin is grounded.	V_{DH}	Maximum Differential Input Range, Gate Input High — The differential input which causes the input stage to begin saturation.
I_{SR}	Strobe Reverse Current — The leakage current when the strobe input is high.	V_{DL}	Maximum Differential Input Range, Gate Input Low — The differential input signal which causes the output voltage level of the amplifier to decrease by 100 mV.
P_D	Power Dissipation — The amount of power dissipated in the unit.	V_{GH}	Channel Gate Input Voltage High — Gate pulse amplitude that allows the amplifier output pulse to just reach 100% of its final value. (Amplifier input is set at 25 mVdc).
t_{CMR}	Common Mode Recovery Time — The time required for the voltage at pin 12 to be within 100 mV of the dc value (after overshoot or ringing) as referenced to the 10% point of the trailing edge of a common mode overload signal.	V_{GL}	Channel Gate Input Voltage Low — Gate pulse amplitude that allows the amplifier output to just reach a 100 mV level. (Amplifier input is set at 25 mVdc).
t_{DR}	Differential Recovery Time — The time required for the device to recover from the specified differential input prior to strobe enable as referenced to the 10% point of the trailing edge of an input pulse. The device is considered recovered when the threshold with the overload signal applied is within 1.0 mV of the threshold with no overload input.	V_{io}	Input Offset Voltage — The difference in V_{th} between inputs at pins 1 and 2 or 3 and 4.
t_{GI}	Minimum Time Between Channel Gate Input and Signal Input — The minimum time between 50% point of channel gate input (Pin 8 or 9) and 50% point of signal input (Pins 1, 2, 3, or 4) that still allows a full width signal at amplifier output.	V_{OH}	Output Voltage High — The high-level output voltage when the output gate is turned off.
t_{GA}	Propagation Delay, Channel Gate Input to Amplifier Output — The time required for the amplifier output at pin 13 to reach 50% of its final value as referenced to 50% of the input gate pulse at pin 8 or 9 (Amplifier input = 25 mVdc).	V_{OL}	Output Voltage Low — The low-level output voltage when the output gate is saturated and the output sink current is 10 mA.
t_{IA}	Propagation Delay, Input to Amplifier Output — The time required for the amplifier output pulse at pin 13 to achieve 50% of its final value referenced to 50% of the input pulse at pins 1 and 2 or 3 and 4.	V_{th}	Input Threshold — Input pulse amplitude at pins 1, 2, 3 or 4 that causes the output gate to just reach V_{OL} .