

HIGH FREQUENCY AMPLIFIERS

MC1552G
MC1553G

... a three-stage, direct-coupled, common-emitter cascade incorporating series-series feedback to achieve stable voltage gain, low distortion, and wide bandwidth. Employs a temperature-compensated dc feedback loop to stabilize the operating point and a current-biased emitter follower output. Intended for use as either a wide-band linear amplifier or as a fast rise pulse amplifier.

Typical Amplifier Features:

- **High Gain** – 34 dB $\pm$ 1.0 dB (MC1552)
52 dB $\pm$ 1.0 dB (MC1553)
- **Wide Bandwidth** – 40 MHz (MC1552)
35 MHz (MC1553)
- **Low Distortion** – 0.2% at 200 kHz
- **Low Temperature Drift** – $\pm$ 0.002 dB/ $^{\circ}$ C



Lead 6 connected to case

CASE 71

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

Rating	Symbol	Value	Unit
Power Supply Voltage, Pin 9	V^+	9	Vdc
Input Voltage, Pin 1 to Pin 2 ($R_S = 500 \text{ ohms}$)	V_{in}	1.0	V(RMS)
Power Dissipation (Package Limitation) Derate above 25°C	P_D	680 4.6	mW mW/°C
Operating Temperature Range	T_A	-55 to +125	°C
Storage Temperature Range	T_{stg}	-65 to +150	°C

CIRCUIT SCHEMATICS

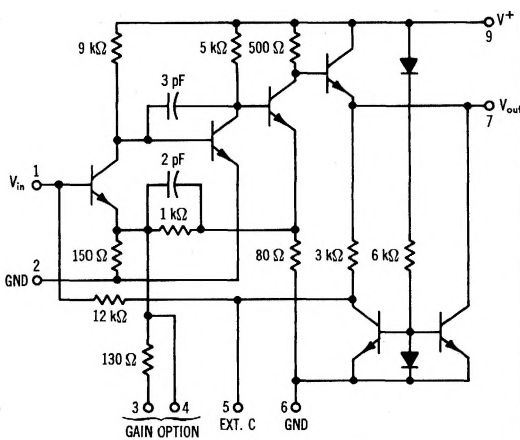


FIGURE 1 — MC1552 (LOW GAIN)

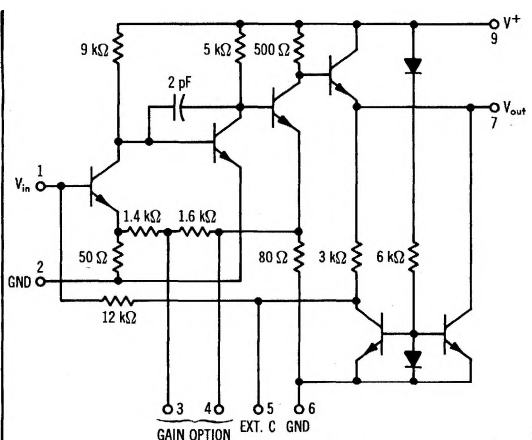


FIGURE 2—MC1553 (HIGH GAIN)

MC1552G, MC1553G (continued)

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

Characteristic	Fig. No.	Gain Option	Symbol	Min	Typ	Max	Unit
Voltage Gain	3	MC1552	V_{out}/V_{in}	44	50	56	V/V
				87	100	113	
		MC1553		175	200	225	
				350	400	450	
Voltage Gain Variation (T _A = -55°C to +125°C)	3	All	—	—	+0.2	—	dB
Bandwidth	3, 6	MC1552	BW	21	40	—	MHz
				17	35	—	
		MC1553		17	35	—	
				7.5	15	—	
Input Impedance (f = 100 kHz, R _L = 1 kΩ)	—	All	Z _{in}	7	10	—	kΩ
Output Impedance (f = 100 kHz, R _S = 50 Ω)	—	All	Z _{out}	—	16	50	Ω
DC Output Voltage	3	All	V _{out} (dc)	2.5	2.9	3.2	Vdc
DC Output Voltage Variation (T _A = -55°C to +125°C)	3	All	ΔV _{out} (dc)	—	+0.05	—	Vdc
Output Voltage Swing (Z _L ≥ 1 kΩ, V _{in} = 100 mV rms)	3	All	V _{out}	3.6	4.2	—	V _{p-p}
Power Dissipation	—	All	P _D	—	75	120	mW
Delay Time	3, 4	MC1552	t _{pd}	—	8	—	ns
				—	9	—	
		MC1553		—	10	—	
				—	25	—	
Rise Time	3, 4	MC1552	t _r	—	9	16	ns
				—	12	20	
		MC1553		—	11	20	
				—	30	45	
Overshoot	3, 4	All	(V _{os} /V _p)100	—	5	—	%
Noise Figure (R _S = 400 Ω, f ₀ = 30 MHz, BW = 3 MHz)	—	All	NF	—	5	—	dB
Total Harmonic Distortion (V _{out} = 2 V _{p-p} , f = 200 kHz, R _L = 1 kΩ)	—	All	THD	—	0.2	—	%

* To obtain the voltage-gain characteristic desired, use the following pin connections:

Type	Voltage Gain	Pin Connections
MC1552	50	Pin 3 Open
	100	Ground Pin 3
MC1553	200	Connect Pin 3 to Pin 4
	400	Pins 3 and 4 Open

NOTES

1. Ground Pin 6 as close to can as possible to minimize overshoot. Best results by directly grounding can.

2. If large input and output coupling capacitors are used, place shield between them to avoid input-output coupling.

3. A high-frequency capacitor must always be used to bypass the power supply. This capacitor should be as close to the circuit as possible.

4. Voltage gain can be adjusted to any value between 50 and 3000 by connecting an external resistor from Pin 4 to ground on MC1552, or from Pin 3 to ground on MC1553, as shown in

Figure 8. Under these conditions, the following equations must be used to determine C₁ and C₂ rather than the circuits shown in Figure 5.

$$\text{Fig. 5b } C_1 = \frac{1}{2\pi f_c (1.7 \times 10^4)} \text{ Farads; } C_2 = \frac{1}{8 C_1 (V_{out}/V_{in})} \text{ Farads}$$

$$\text{Fig. 5c } C_1 = \frac{V_{out}/V_{in}}{2\pi f_c (1.5 \times 10^4)} \text{ Farads}$$

$$\text{Fig. 5d } C_2 = \frac{V_{out}/V_{in}}{2\pi f_c (1.3 \times 10^3)} \text{ Farads}$$

FIGURE 3—TEST CIRCUIT

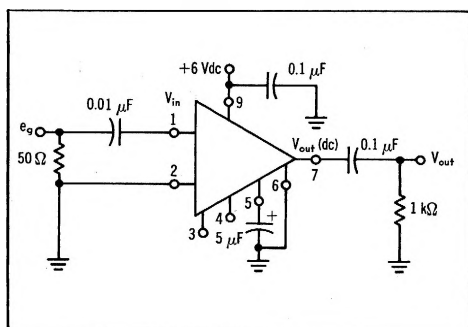
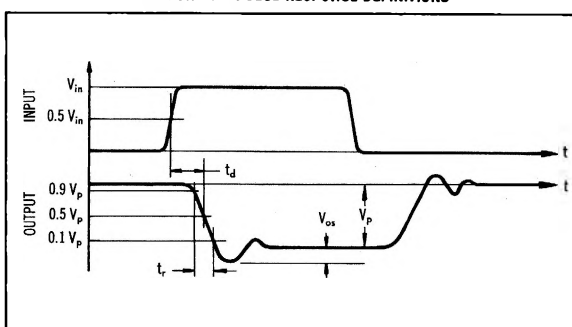


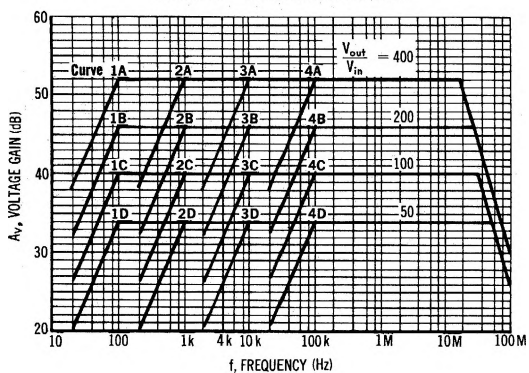
FIGURE 4—PULSE RESPONSE DEFINITIONS



TYPICAL CHARACTERISTICS

 $T_A = 25^\circ\text{C}$

FIGURE 5a—FREQUENCY RESPONSE



TEST CIRCUITS FOR FREQUENCY RESPONSE

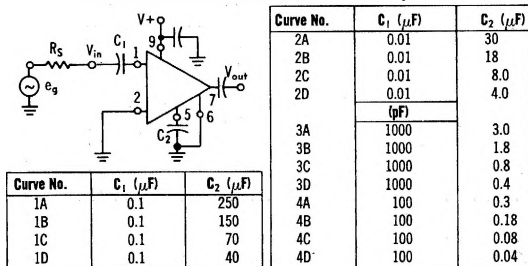
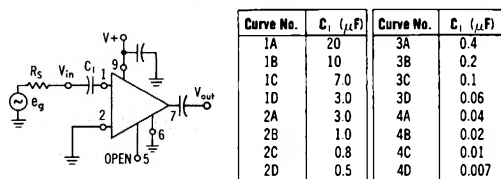
FIGURE 5b—CAPACITIVE COUPLED INPUT ($R_s < 5k\Omega$)FIGURE 5c—CAPACITIVE COUPLED INPUT ($R_s < 500\Omega$)

FIGURE 5d—TRANSFORMER COUPLED INPUT

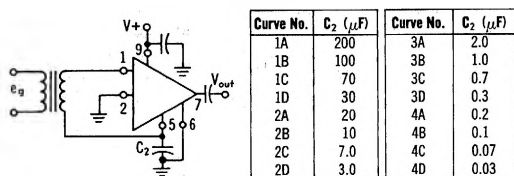


FIGURE 6—VOLTAGE GAIN versus FREQUENCY

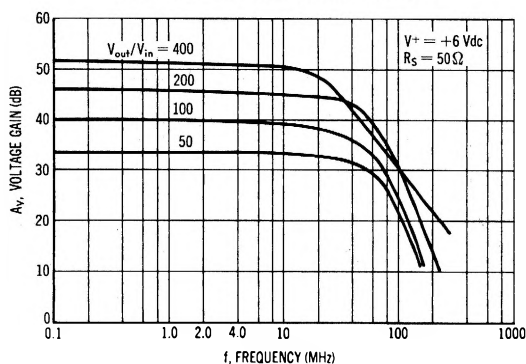


FIGURE 7—MAXIMUM NEGATIVE SWING SLEW RATE versus LOAD CAPACITANCE

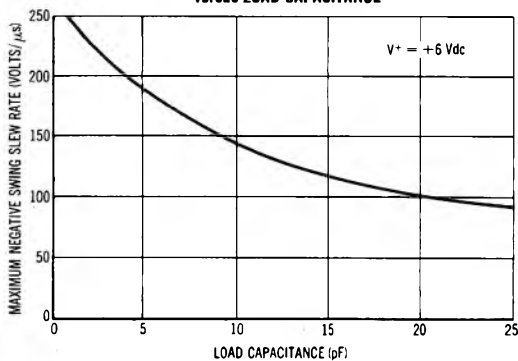
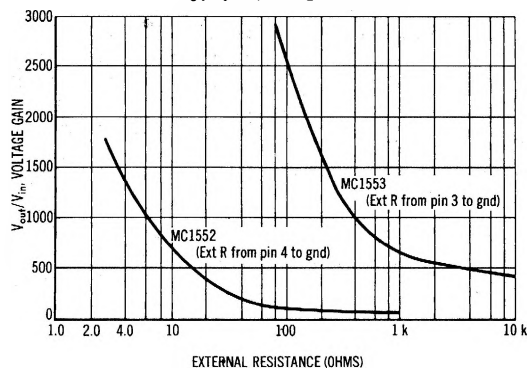


FIGURE 8—VOLTAGE GAIN ADJUSTMENT BY USE OF EXTERNAL RESISTOR



INPUT ADMITTANCE

$V^+ = 6 \text{ Vdc}$, $R_L = 1 \text{ k}\Omega$, $T_A = 25^\circ\text{C}$

FIGURE 9 — GAIN = 50

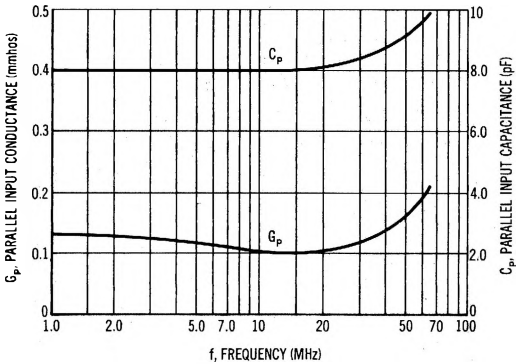


FIGURE 10 — GAIN = 100

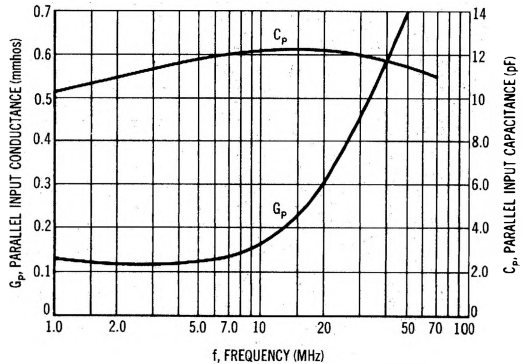


FIGURE 11 — GAIN = 200

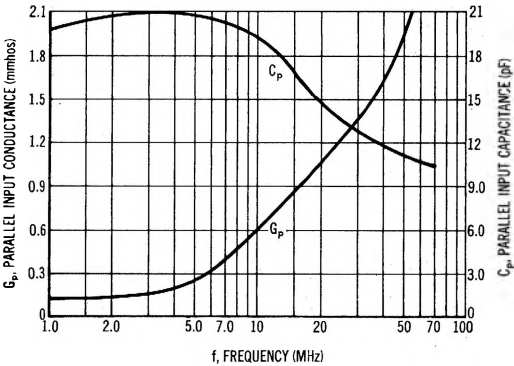


FIGURE 12 — GAIN = 400

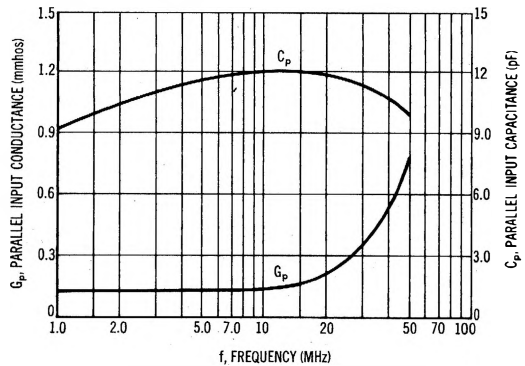


FIGURE 13 — OUTPUT IMPEDANCE versus FREQUENCY

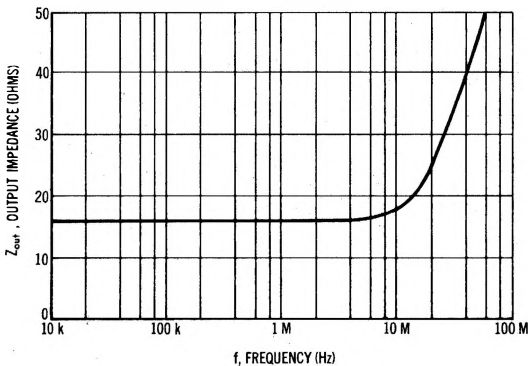


FIGURE 14 — BANDWIDTH versus SOURCE RESISTANCE

