OPA182, OPA189

Full-power-bandwidth

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summary

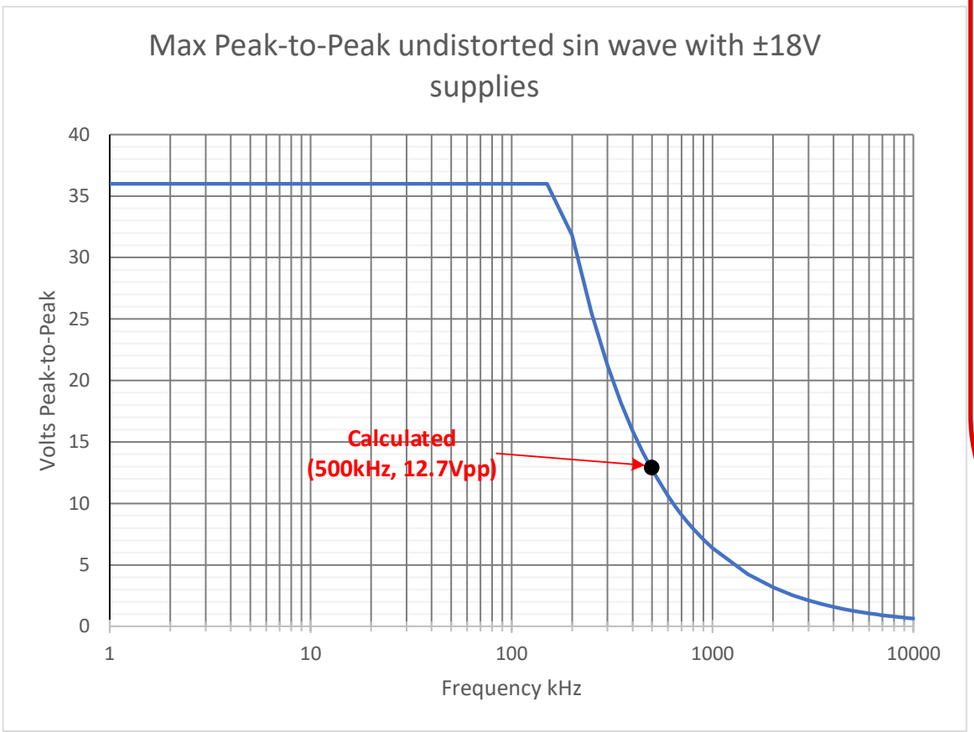
- Neither OPA182, or OPA189 maximum output voltage vs frequency match the equation.
- OPA189 appears to be off by one decade. When using the calculated curve (not the published curve), the distortion occurs roughly at the frequency and amplitude expected (only tested two points)
- OPA182 appears to be off by a factor of 2. However, the measured results seem to match the published curve better than the theoretical results.

Background

$$MaxPeak = \frac{20\ \frac{V}{\mu s}}{2 \cdot \pi \cdot 500\ kHz} = 6.366\ V$$

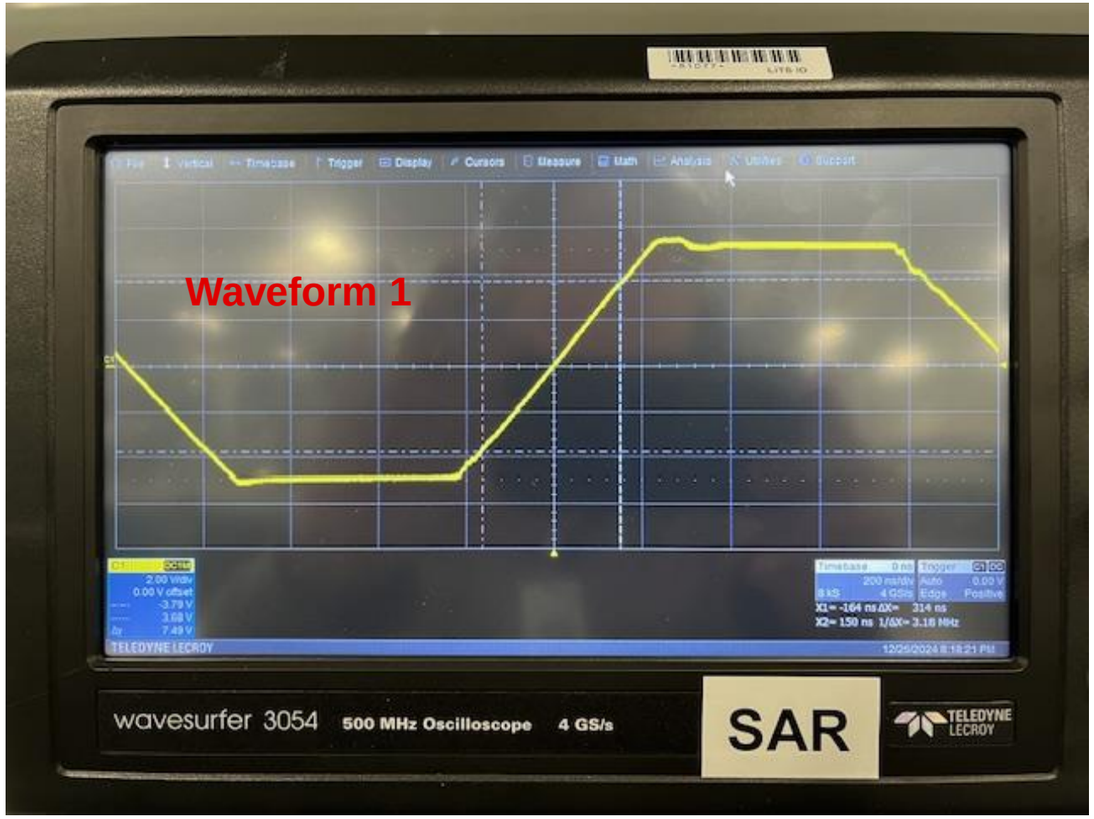
$$MaxPP = 2 \cdot MaxPeak = 12.732\ V$$

excel-full-power-bw.zip



- The two full-power bandwidth curves are both given in peak-to-peak.
- The equation $V_{MAX\_PK} = \frac{SR}{2\pi f}$ is for max undistorted peak sinusoidal signal from slew rate limits
- Multiply by 2 for PP
- The excel file I used to generate the full power bandwidth curves is linked below (zipped)
- The calculation shows one point on the curve at 500kHz.
- The two curves in the data sheets do not match the theoretical curve.
- It is possible that the OPA182 curve is measured and accurate. That curve was not too far from the theoretical curve, and matches measured results bettor than theory.
- I think the OPA189 curve is just incorrect. The measured results match the theoretical curve but the data sheet curve does not match the theoretical curve.

OPA189 – slew rate verification



$$\frac{7.49\ V}{0.314\ \mu s} = 23.854\ \frac{V}{\mu s}$$

Slew rate confirmation. Spec says 20V/us, measured 24V/us

OPA189 – Full power BW curve

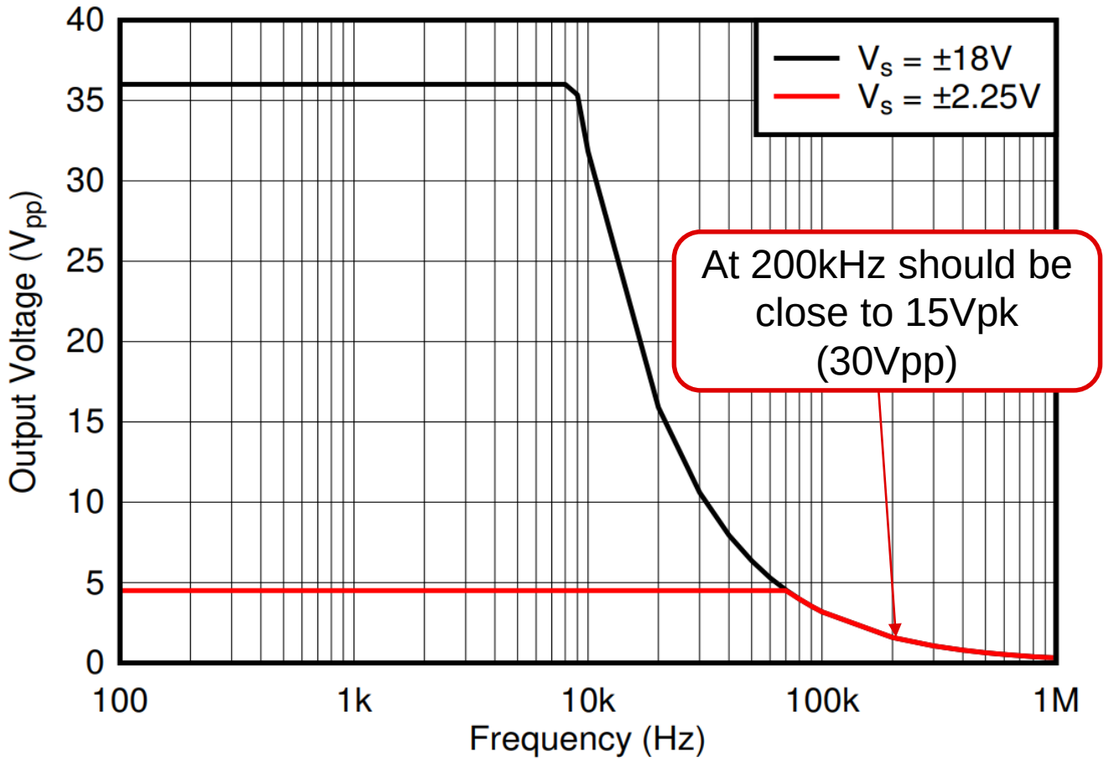
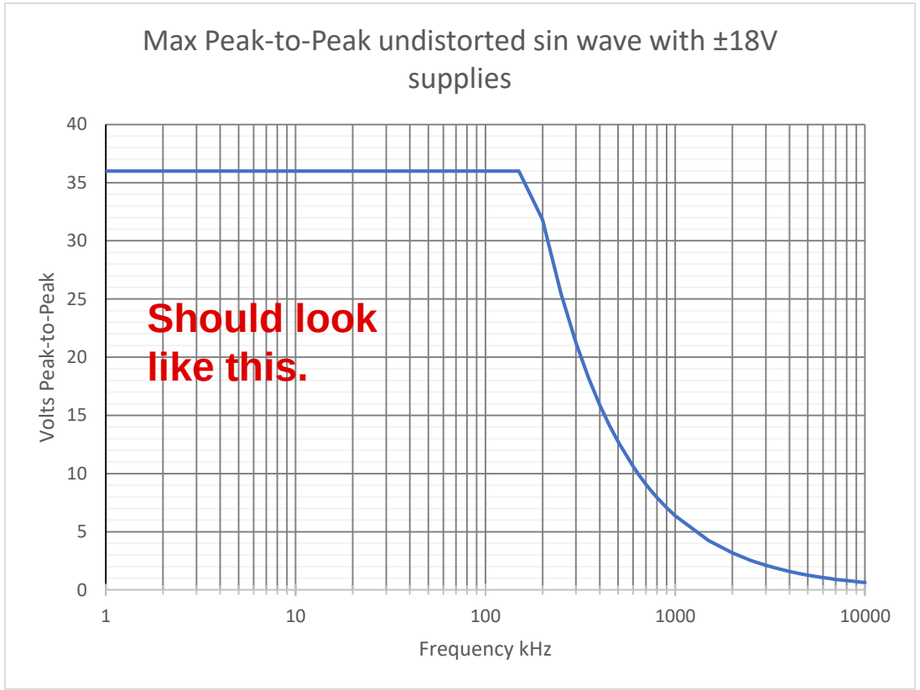


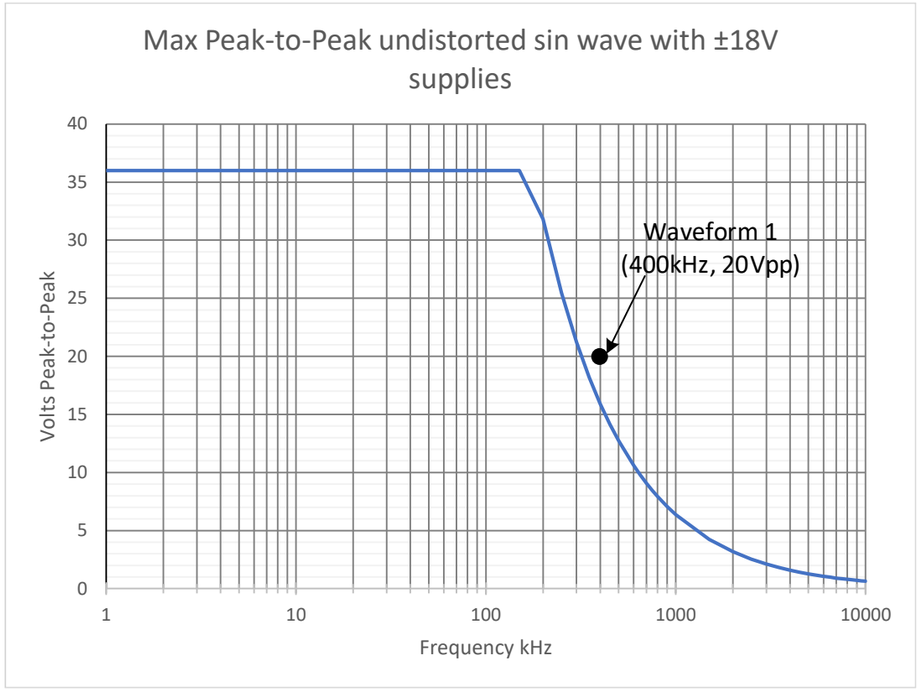
Figure 7-36. Maximum Output Voltage Amplitude vs Frequency

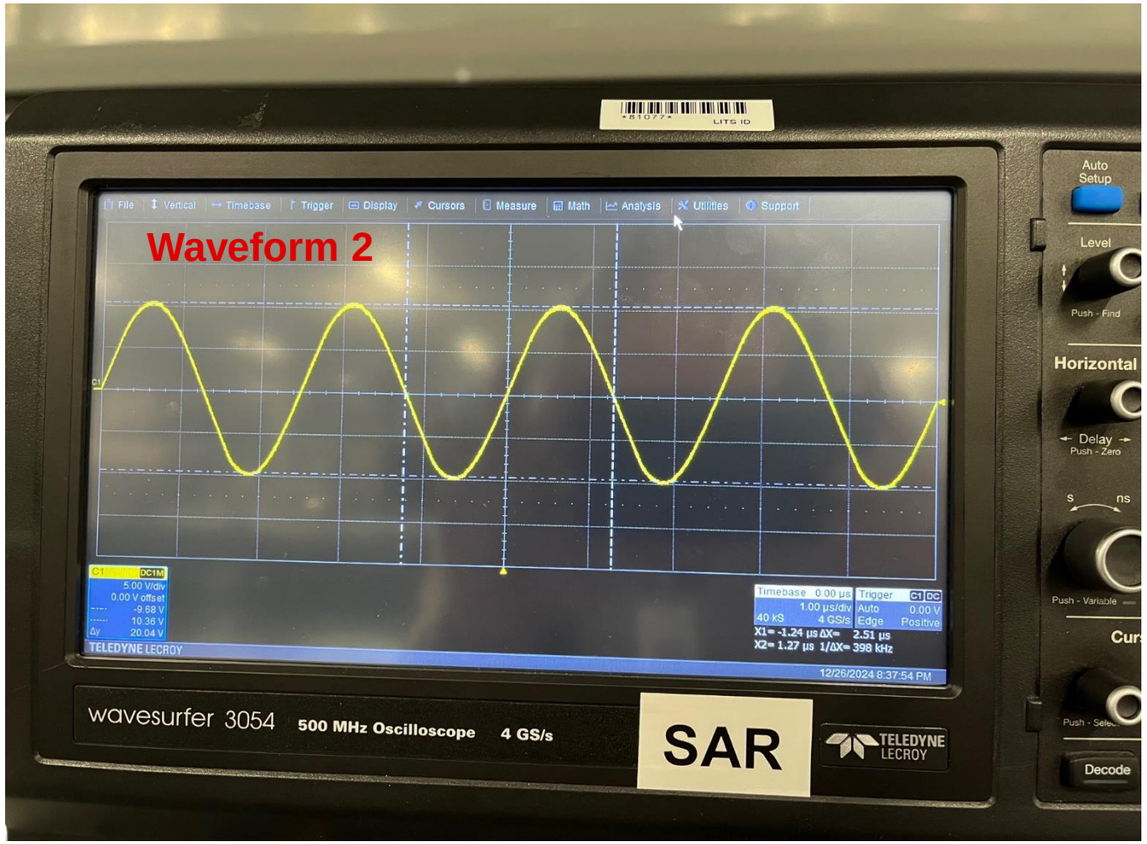
$$MaxPeak = \frac{20\ \frac{V}{\mu s}}{2 \cdot \pi \cdot 200\ kHz} = 15.915\ V$$

$$MaxPP = 2 \cdot MaxPeak = 31.831\ V$$



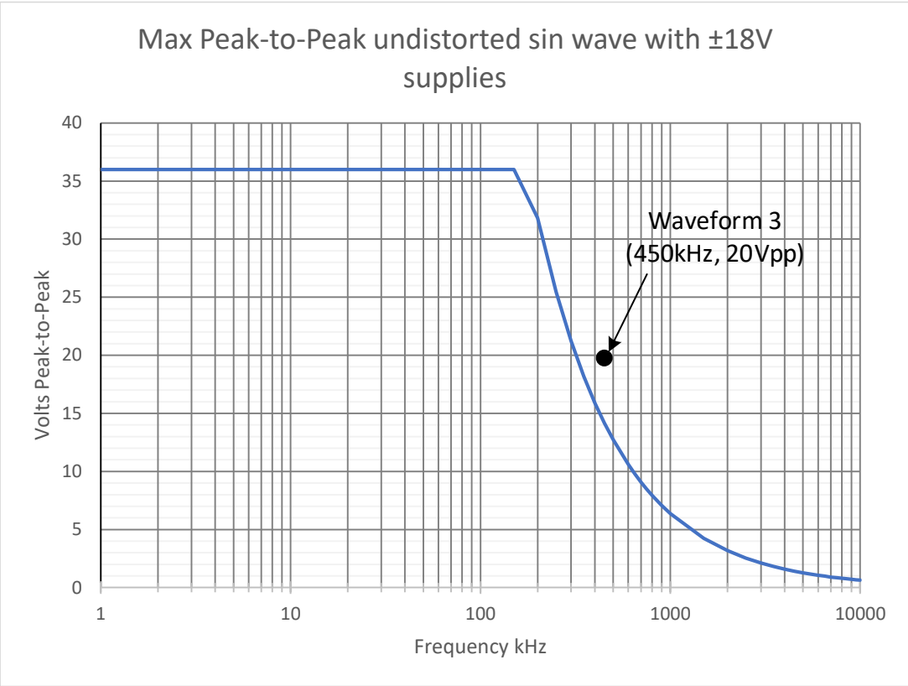
OPA189 - undistorted



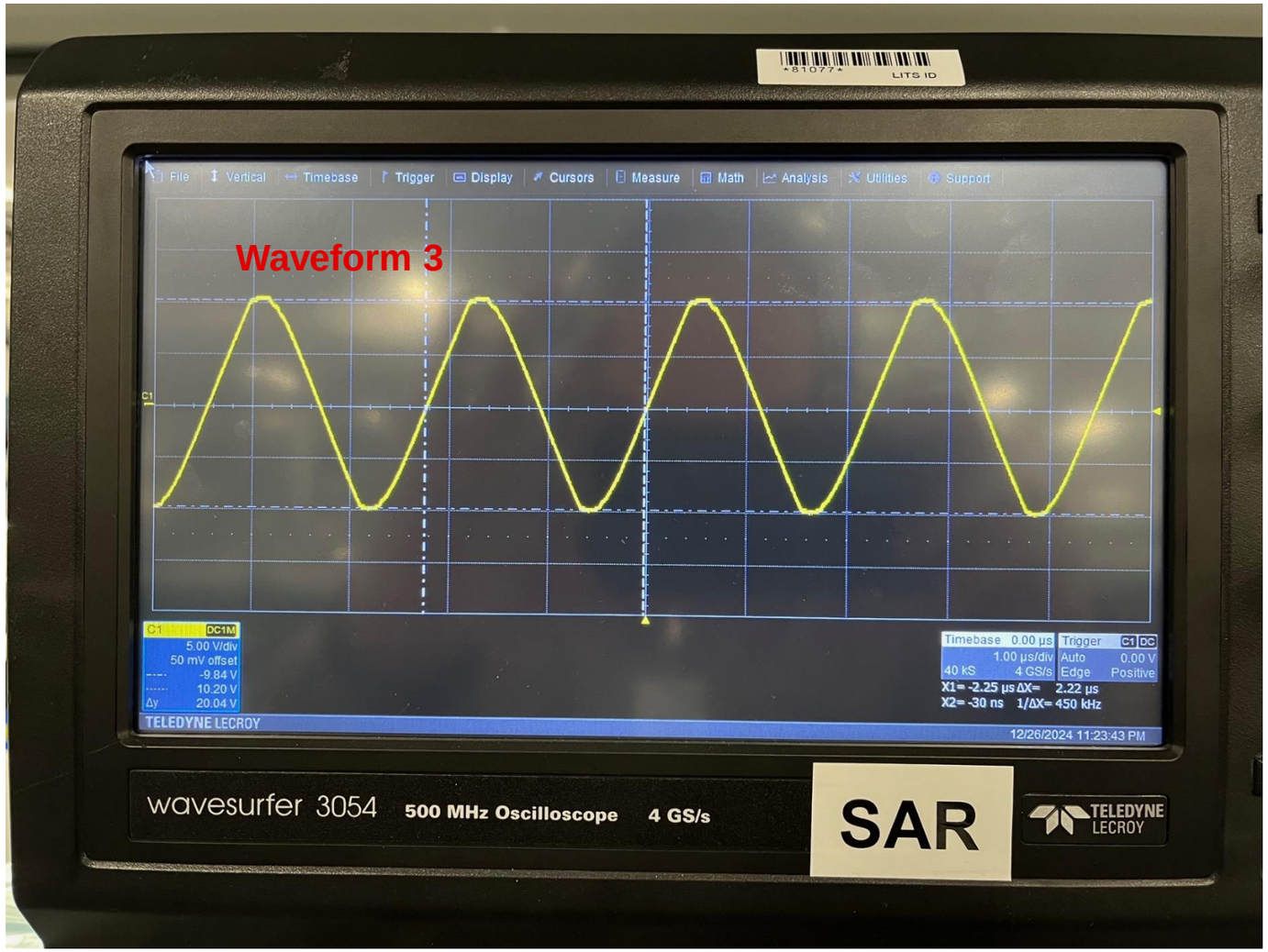


No visible distortion

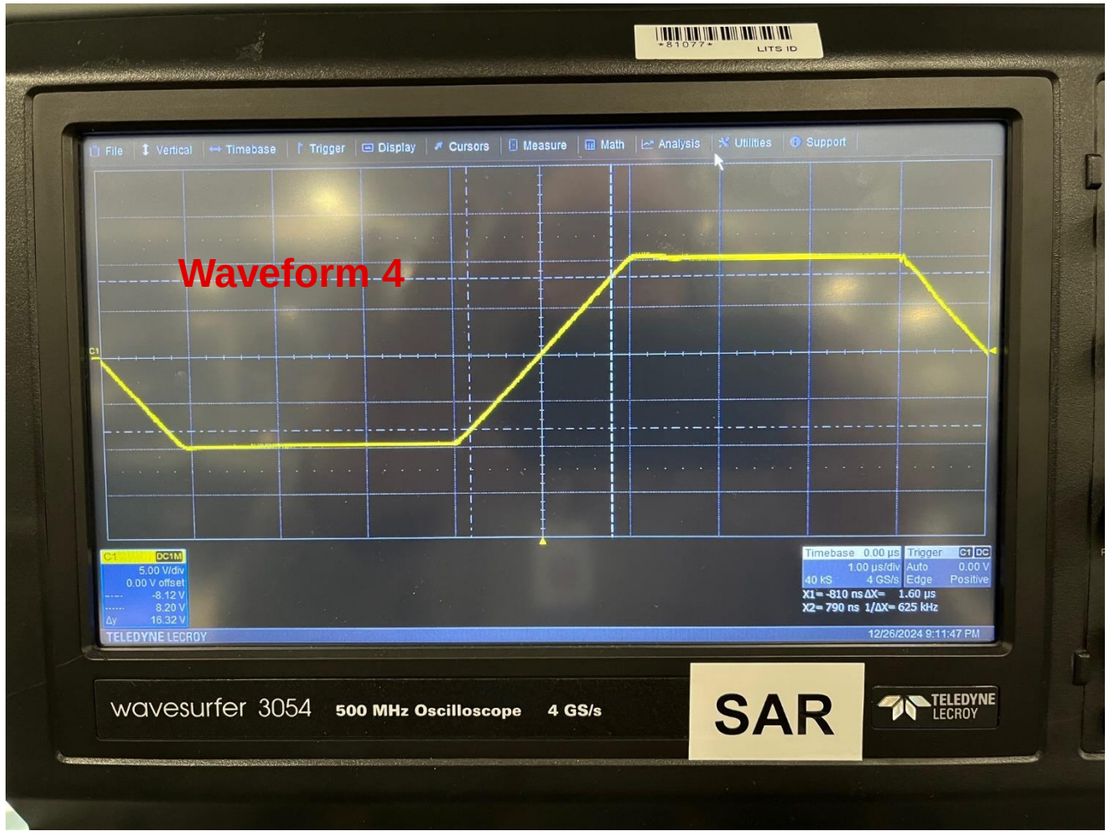
OPA189 - distorted



For 20Vpp input, distortion becomes visible at about 450kHz. No distortion at 400kHz (see previous slide). The transition from undistorted to distorted happens quickly as frequency is adjusted from 400kHz to 450kHz.



OPA182 – slew rate verification



$$\frac{16.32\ V}{1.6\ \mu s} = 10.2\ \frac{V}{\mu s}$$

Slew rate confirmation. Spec says 10V/us, measured 10.2V/us

OPA182 – Full power BW curve

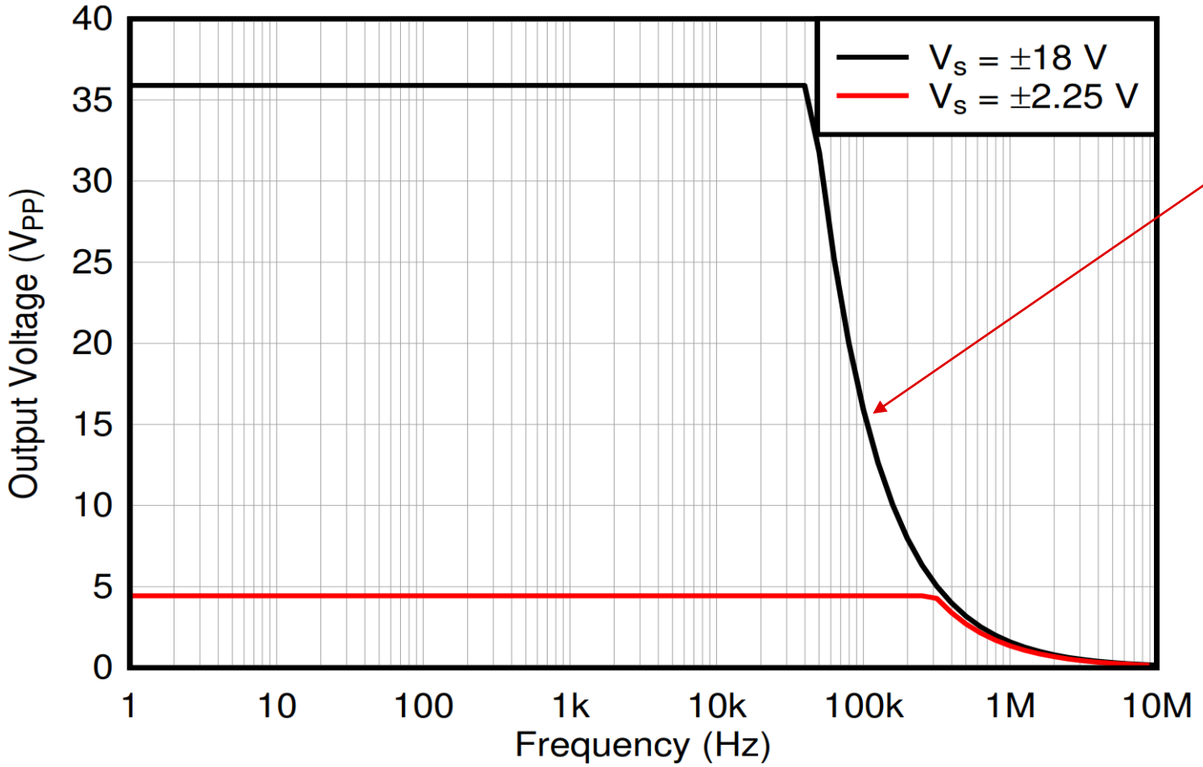
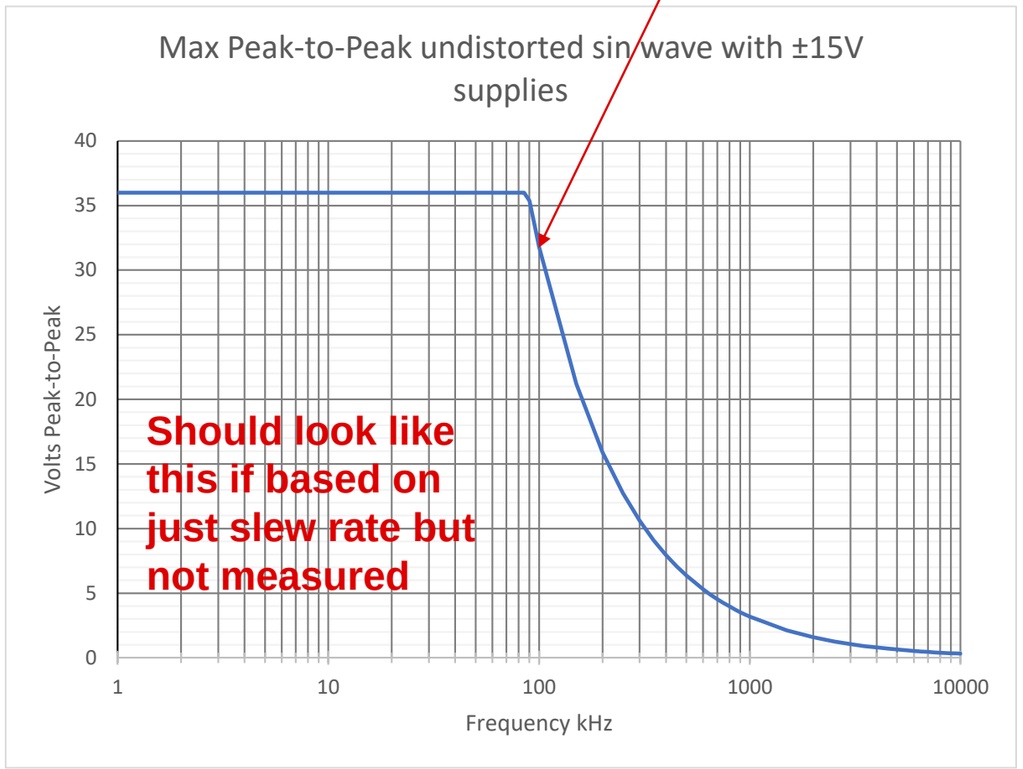
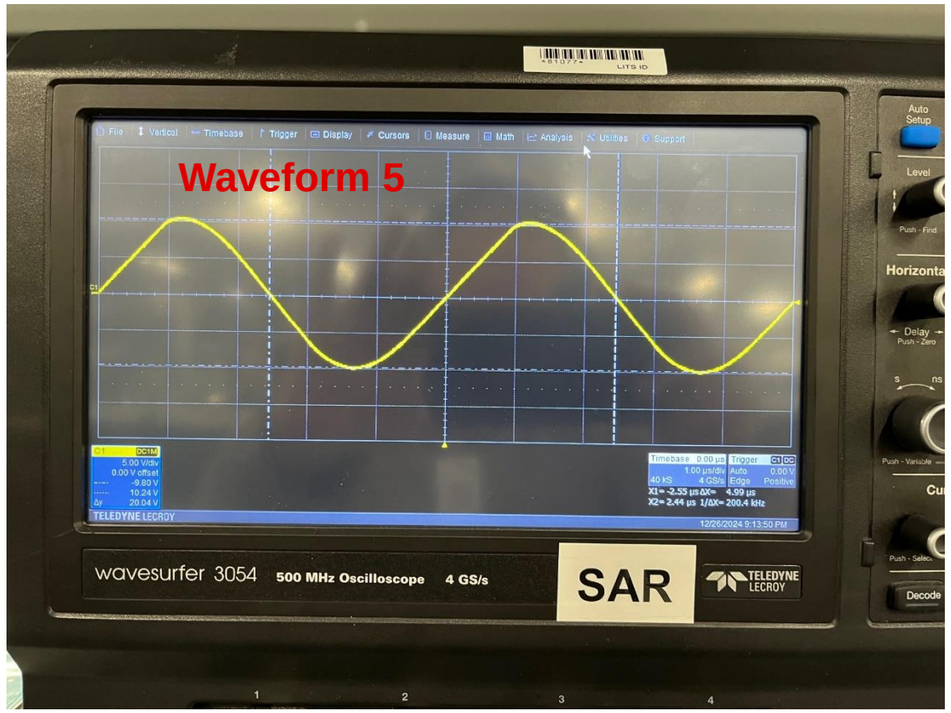


Figure 7-36. Maximum Output Voltage vs Frequency

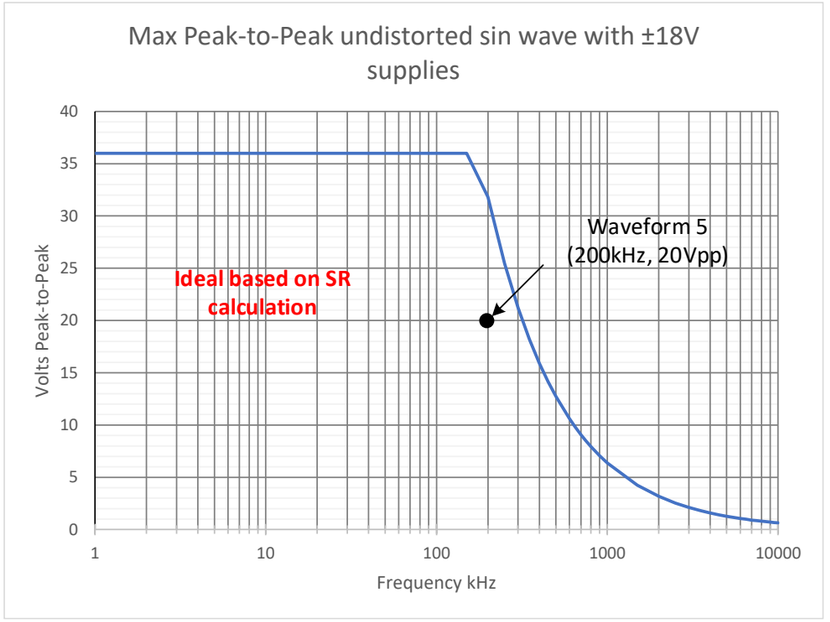
$$\frac{2 \cdot 10 \ \frac{V}{\mu s}}{2 \cdot \pi \cdot 100 \ kHz} = 31.831 \ V$$



OPA182 - distorted



Some visible distortion at 200kHz 20Vpp. According to calculation should not be distorted but according to data sheet curve should be.



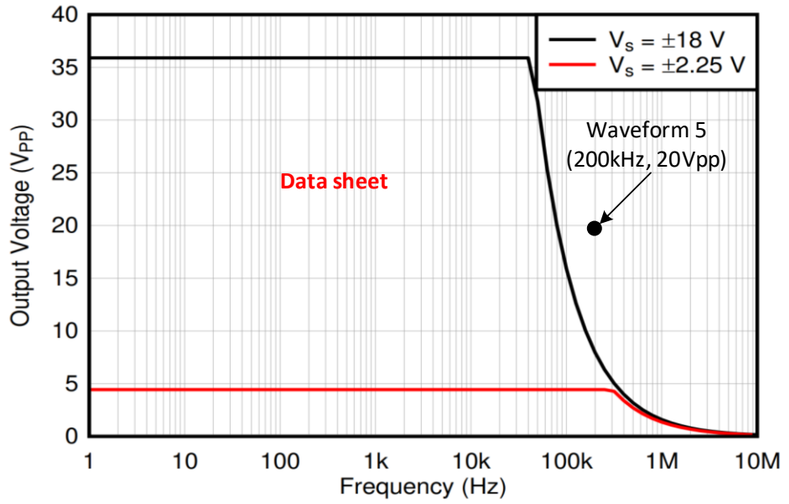
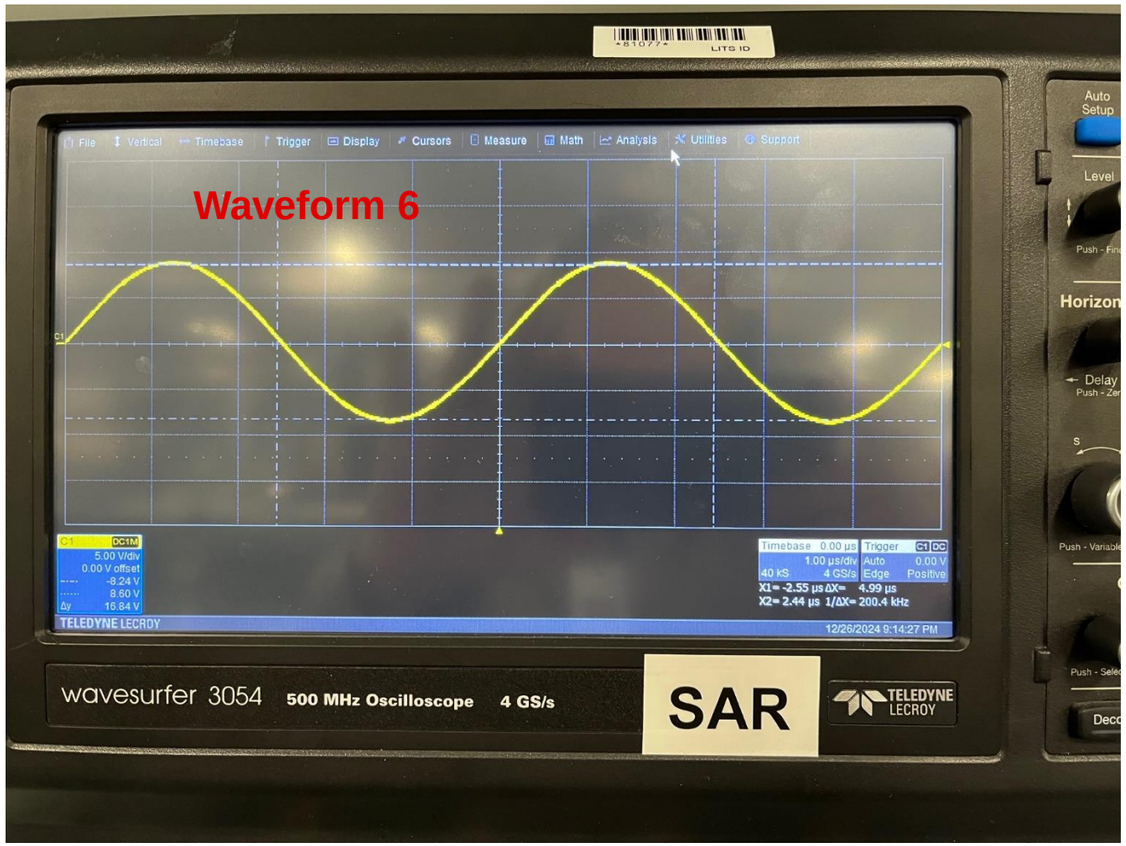
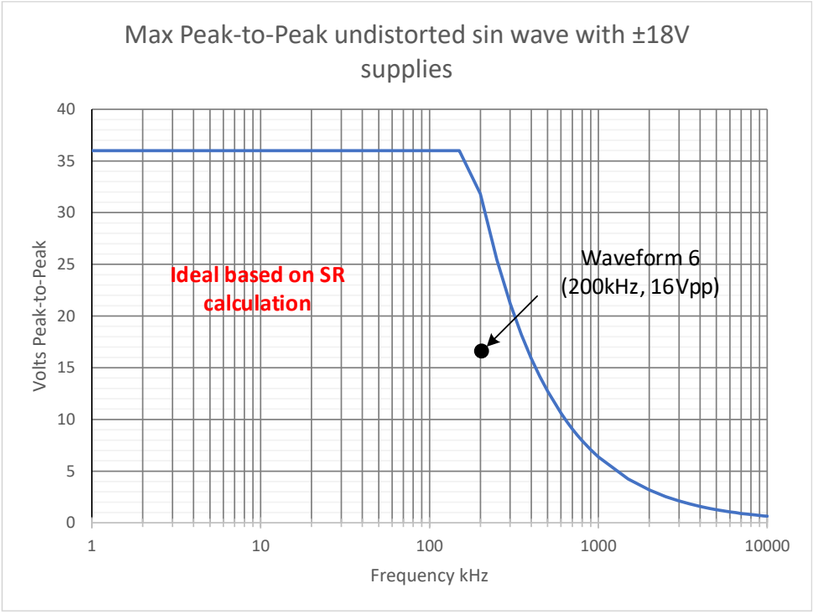


Figure 7-36. Maximum Output Voltage vs Frequency

OPA182 - undistorted





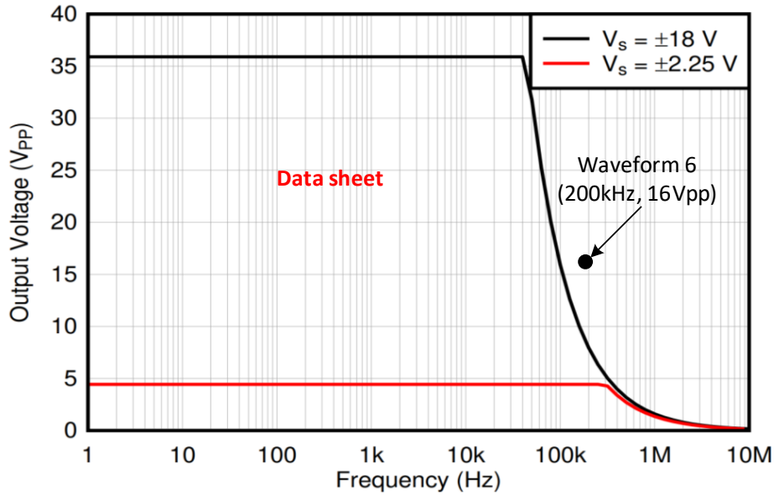


Figure 7-36. Maximum Output Voltage vs Frequency

No visible distortion at 200kHz 16Vpp. According to calculation should not be distorted but according to data sheet curve should be. I think the data sheet curve is close to accurate. Not sure if it was measured or is accurate by luck.