

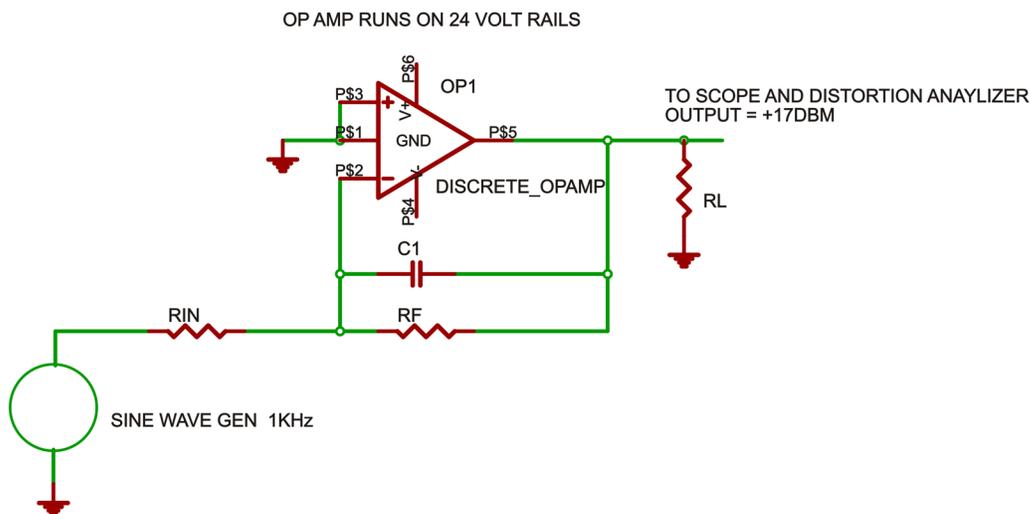
# DISTORTION IN SMT RESISTORS??

Dave Hill March 2007

added to March 2011

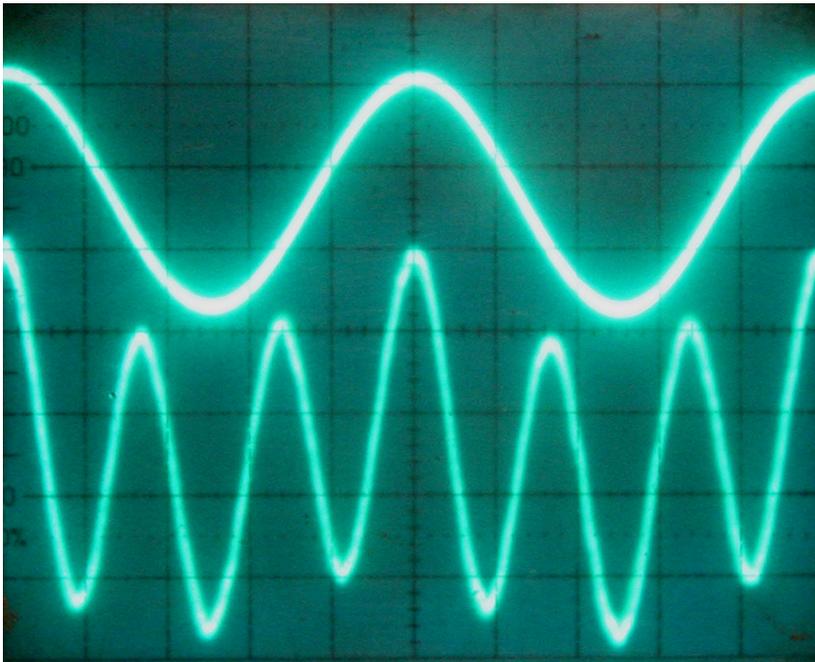
This is the result of normal trouble shooting - debug on a new product design

The Test Circuit



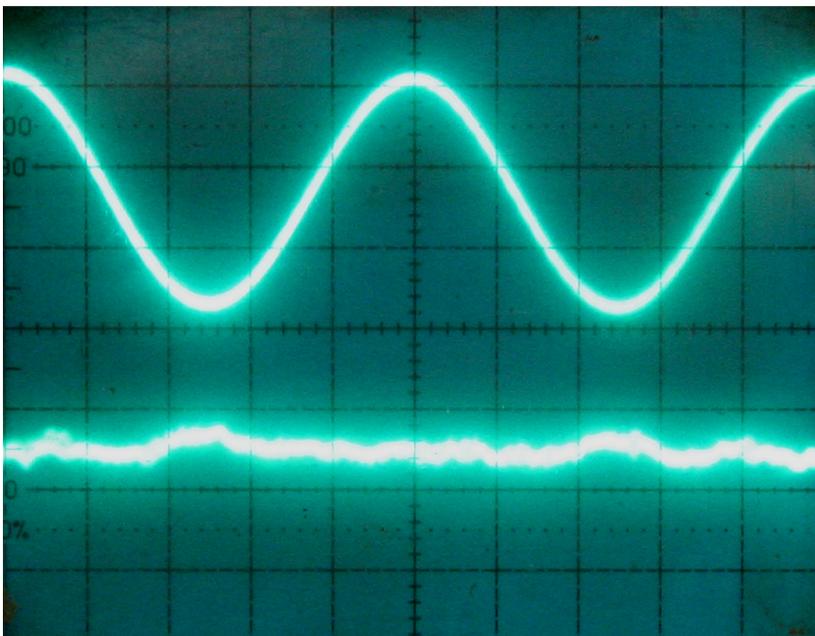
The need to do this was the result of not getting constant results with the discrete op amps in their test fixture and in the product being debugged. At the time of this, looking at why some parts distort and others do not is not productive towards finishing the design, only finding parts that work is. The failure of some parts could be for a number of reasons. A discussion with an engineer at RCD thought that the distortion could be a result of non clean laser trimming of the parts. It also seems that the larger package sized parts have less distortion, but more study would be required.

The test gear is a Tektronix SG505 generator and a Tektronix DA 4084 distortion analyzer. The measurement is THD + Noise



This is the system using standard 0805 resistors

The THD + noise measures .014% a portion of this is noise



This is the system using standard 1/4 watt MF resistors

The THD + noise measures .0008% a portion of this is noise

The resistors values are 10K ohm for Rin and 3.09K ohm for Rf. It appears that the amount of voltage swing across the smt part is the distortion generating process. All resistors are 1% unless noted Manufactures are a mix unless noted. The resistors tested were what was on hand

RIN 10K OHM	RF 3.09K OHM	DISTORTION
1/4W MF	1/4W MF	.0008%
0805	0805	.014%
1/4W MF	0805	.0018%
0603	1/4W MF	.026%
0603	0805	.025%
0805 RoHS	1/4W MF	.015%
0805 non RoHS	1/4W MF	.015%
0805 mfg=ASJ	1/4W MF	.015%
0805 0.1% mfg=RCD BLU-0805-1002-BT25W	1/4W MF	.0008%
2010 PANASONIC ERJ-12SF1002U	1/4W MF	.0009%
1206 PANASONIC ERJ-8ENP	1/4W MF	.0056%
0805 SUSUMU 0.5% RR1220P-103	1/4W MF	.0008%
0805 SUSUMU 0.5% RR1220P-103	0805 SUSUMU 0.5% RR1220P-3161 (CLOSE VALUE)	.0008%

March 2011

There is a relationship where thick film resistors will work fine. It has to do with the voltage across the part and the resistance. It seems that if the voltage is small or the part is of a larger package size there is low distortion. The distortion may still be there, but it could be low enough so it does not matter, depending on the circuit.

The RCD BLU and the Susumu parts have proven to work well since the original part of this was written. There are other mfg of thin film parts which are most likely be fine. I have not tested them at this time