

Contents

page 1 : Transient simulation 25-mV peak 1-kHz
purely differential sinusoid

page 2 : Selected waveforms

page 3 : Fourier analysis of page 2

page 4 : Transient simulation, 25 mV peak 1-kHz
purely common-mode sinusoid

page 5 : Selected waveforms

$$(a) A_d = \frac{V_{od}}{V_{id}} = \frac{11.5 \text{ V}_{p-p}}{50 \text{ mV}_{p-p}} = \pm 230 \quad (\text{page 2})$$

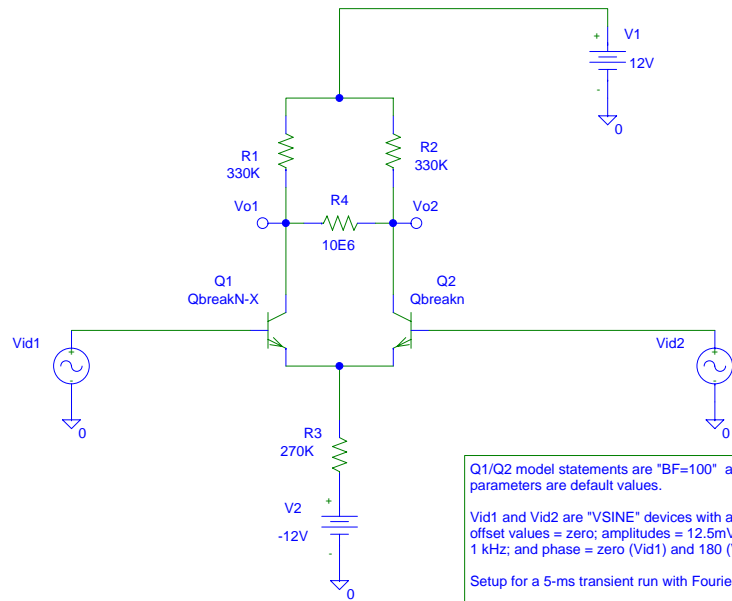
$$A_{cm} = \frac{V_{o1}}{V_{cm}} = \frac{30 \text{ mV}_{p-p}}{50 \text{ mV}_{p-p}} = -0.60 \quad (\text{page 5})$$

$$CMRR = \left| \left(\frac{\frac{1}{2} A_d}{A_{cm}} \right) \right| = 192$$

$$R_{id} = 2 \frac{V_{id1}}{i_{id1}} = 2 \frac{25 \text{ mV}_{p-p}}{186 \text{ nA}_{p-p}} = 269 \text{ k}\Omega \quad (\text{page 2})$$

$$R_{icm} = \frac{V_{cm}}{i_{icm}} = \frac{50 \text{ mV}_{p-p}}{1.8 \text{ nA}_{p-p}} = 28 \text{ M}\Omega \quad (\text{page 5})$$

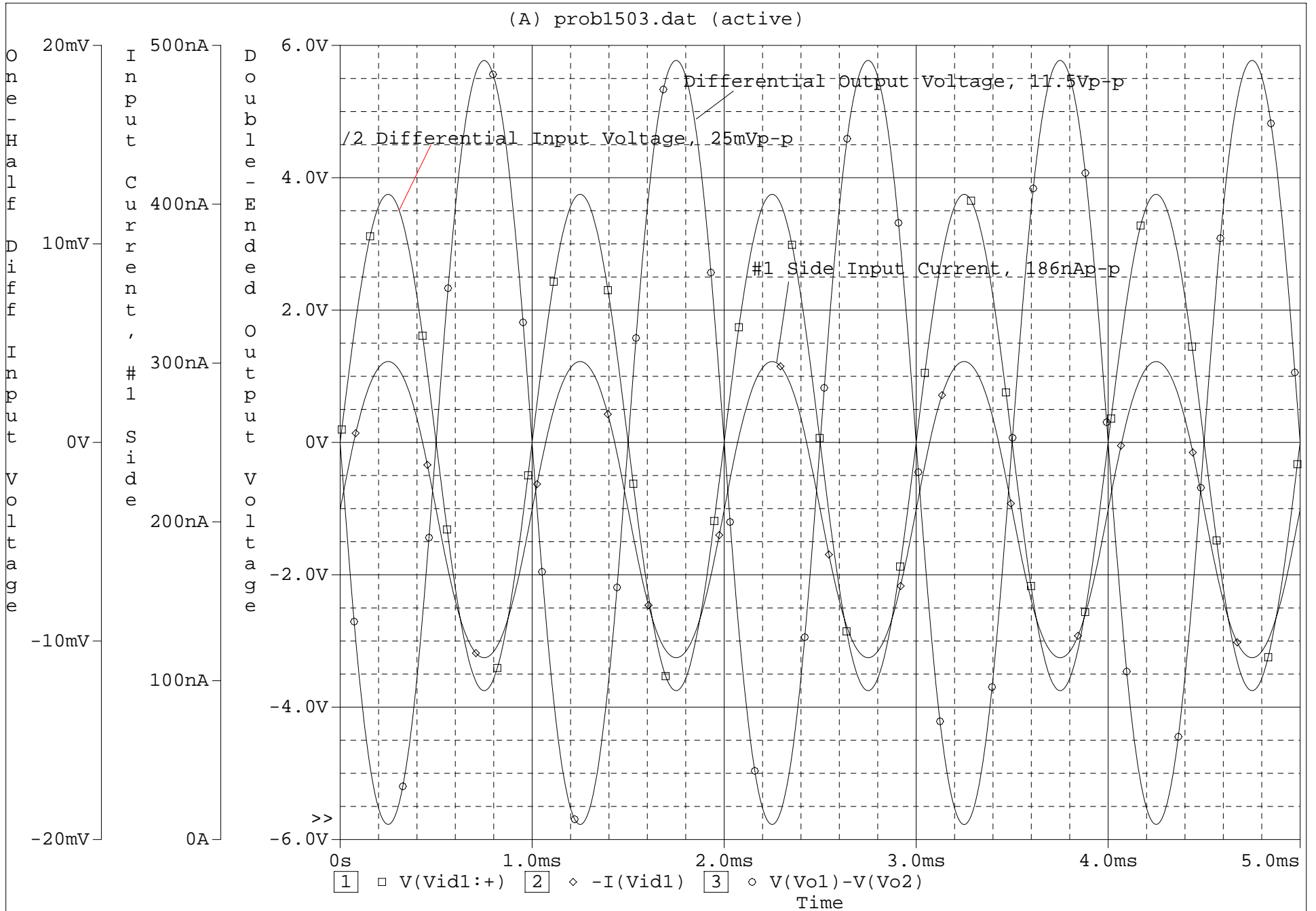
$$(b) \text{ At } V_{id} = 50 \text{ mV}_{p-p} (25 \text{ mV}_p), \text{ THD} \approx 1.8\% \quad (\text{page 3})$$



Q1/Q2 model statements are "BF=100" all other parameters are default values.

Vid1 and Vid2 are "VSINE" devices with ac, dc, and offset values = zero; amplitudes = 12.5mV; frequency = 1 kHz; and phase = zero (Vid1) and 180 (Vid2).

Setup for a 5-ms transient run with Fourier enabled.



prob1503.out

**** 06/11/08 14:32:38 ***** Evaluati on PSpice (Nov 1999) *****

* C:\Program Files\OrCAD_Demo\PSpice\UserProjects\prob1503.sch

Comments - This is a portion of the output file created for a transient simulation of a 1-kHz sinusoidal differential input voltage of 12.5 mVpeak on each side (total of 25 mVpeak). Fourier analysis was enabled in the setup. "Center frequency" was selected at 1 kHz. Significant harmonics are the 3rd and 5th (3 and 5 kHz). Total harmonic distortion is 1.8%. Further increase in the input amplitude would make a large increase in the distortion level.

Resistor R4 was added solely to create a name for the output voltage "V(R4)" that the Fourier setup would accept. RJK

FOURIER COMPONENTS OF TRANSIENT RESPONSE V(R_R4)

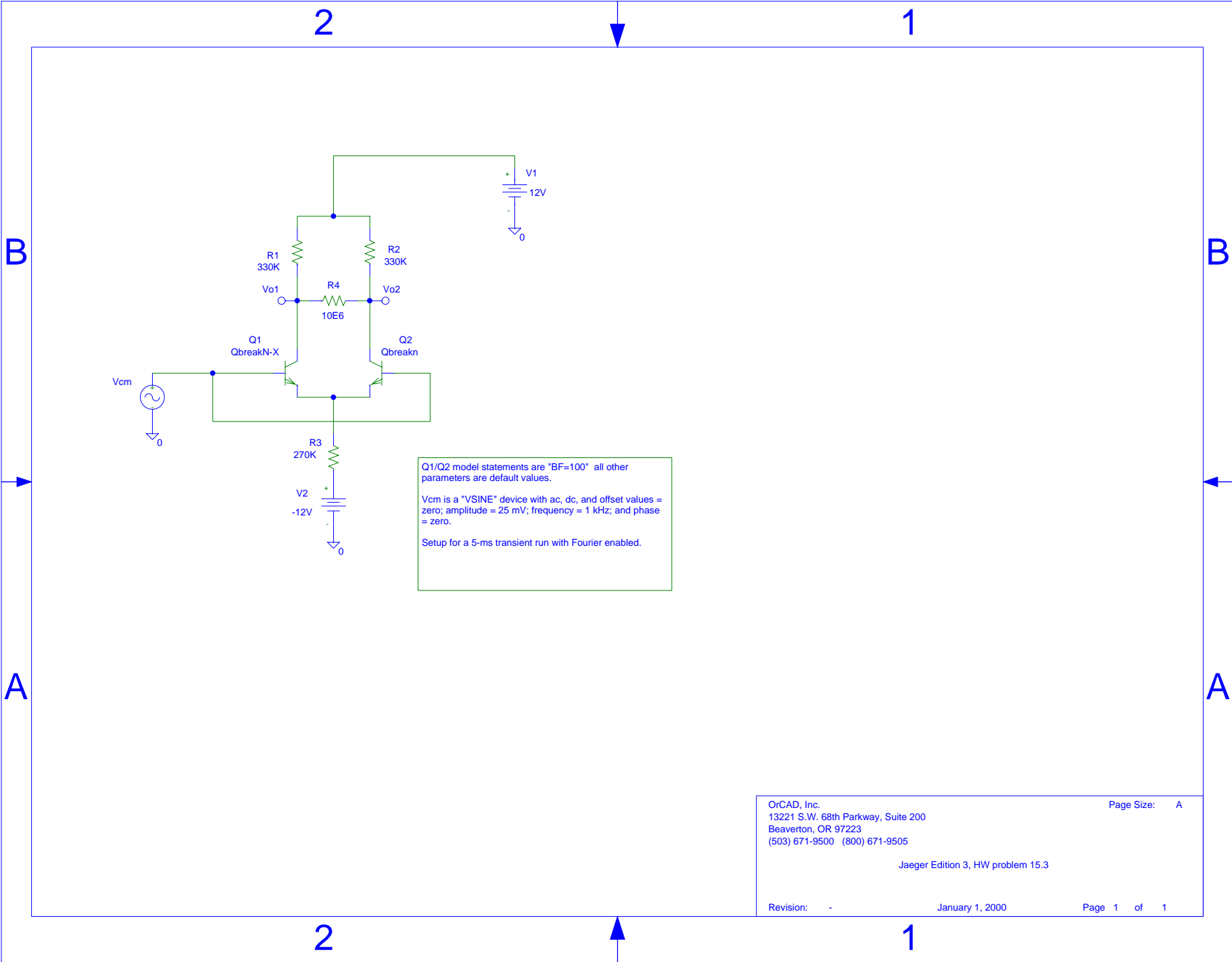
DC COMPONENT = 5.292954E-04

HARMONIC NO	FREQUENCY (HZ)	FOURIER COMPONENT	NORMALIZED COMPONENT	PHASE (DEG)	NORMALIZED PHASE (DEG)
1	1.000E+03	5.876E+00	1.000E+00	-1.800E+02	0.000E+00
2	2.000E+03	5.921E-04	1.008E-04	-5.948E+01	3.005E+02
3	3.000E+03	1.073E-01	1.826E-02	1.799E+02	7.199E+02
4	4.000E+03	8.119E-05	1.382E-05	-1.213E+02	5.987E+02
5	5.000E+03	2.357E-03	4.010E-04	-1.791E+02	7.209E+02
6	6.000E+03	2.432E-05	4.139E-06	2.583E+01	1.106E+03
7	7.000E+03	7.111E-05	1.210E-05	1.747E+02	1.435E+03
8	8.000E+03	2.019E-05	3.436E-06	-9.812E+01	1.342E+03
9	9.000E+03	1.120E-05	1.905E-06	-8.592E+00	1.611E+03
10	1.000E+04	7.148E-06	1.216E-06	1.406E+02	1.941E+03
11	1.100E+04	1.271E-05	2.163E-06	-1.173E+02	1.863E+03
12	1.200E+04	9.084E-06	1.546E-06	-4.436E+01	2.116E+03
13	1.300E+04	1.910E-06	3.251E-07	1.460E+02	2.486E+03
14	1.400E+04	6.376E-06	1.085E-06	-1.227E+02	2.397E+03
15	1.500E+04	8.265E-06	1.407E-06	-6.983E+01	2.630E+03
16	1.600E+04	3.642E-06	6.199E-07	1.574E+01	2.896E+03
17	1.700E+04	4.776E-06	8.128E-07	-1.296E+02	2.930E+03
18	1.800E+04	7.000E-06	1.191E-06	-7.872E+01	3.161E+03
19	1.900E+04	3.362E-06	5.721E-07	-3.650E+01	3.383E+03
20	2.000E+04	3.352E-06	5.704E-07	-1.278E+02	3.472E+03

TOTAL HARMONIC DISTORTION = 1.826594E+00 PERCENT

JOB CONCLUDED

TOTAL JOB TIME .09



(A) prob1503.dat

