

Analysis of ouput Voltage for different IV resistors and Rails to find the optimise design conditions:

A. Use: J/K jfets, Rail = 20V and Idss = 9mA

Jfet = K170 / J74, Yfs = 20mS, i/p about 15 ohm; ? mV

IV resistor	Equivalent		Cut off freq	DAC lout (mA)		Ratio	Rail (v)	Idss	Output stage	Distortion		Input DC offset	Input volt at DAC lout
J/K	R-IV	IV Cap (pf)	Fc=1/2PiRC	Vout (Vrms)	Vout (Vrms)	1.67	20	9	Vdc out	PCM63	PCM1702	mV	mVrms
1000	500	4,700	67,726	707	424	1.67	20	9.00	11.00				
1200	600	3,917	67,726	849	509	1.67	20	10.80	9.20				
1500	750	3,133	67,726	1,061	636	1.67	20	13.50	6.50	0.008	0.007	0.5 to 3.5mV	
1800	900	2,611	67,726	1,273	764	1.67	20	16.20	3.80	20V rail with 1k5 IV resistor is not giving good output levels ==> must increase Rail voltage!			
2000	1000	2,350	67,726	1,414	849	1.67	20	18.00	2.00				
2200	1100	2,136	67,726	1,556	934	1.67	20	19.80	0.20				
2500	1250	1,880	67,726	1,768	1,061	1.67	20	22.50	-2.50				
<-- Pass Default values				Vout > 1Vrms					>=6.5V				

B. Use: J/K jfets, Rail = 30V and Idss = 10mA

Jfet = K170 / J74, Yfs = 20mS, i/p about 15 ohm; ? mV

IV resistor	Equivalent		Cut off freq	DAC lout (mA)		Ratio	Rail (v)	Idss	Output stage	Distortion		Input DC offset	Input volt at DAC lout
J/K	R-IV	IV Cap (pf)	Fc=1/2PiRC	Vout (Vrms)	Vout (Vrms)	1.67	30	10	Vdc out	PCM63	PCM1702	mV	mVrms
1000	500	4,700	67,726	707	424	1.67	30	10.00	20.00				
1200	600	3,917	67,726	849	509	1.67	30	12.00	18.00				
1500	750	3,133	67,726	1,061	636	1.67	30	15.00	15.00	Rail is high but output voltage is too low ! Not very practical for low lout DAC chips.			
1800	900	2,611	67,726	1,273	764	1.67	30	18.00	12.00				
2000	1000	2,350	67,726	1,414	849	1.67	30	20.00	10.00				
2200	1100	2,136	67,726	1,556	934	1.67	30	22.00	8.00				
2500	1250	1,880	67,726	1,768	1,061	1.67	30	25.00	5.00				
<-- Pass Default values				Vout > 1Vrms					>=6.5V				

C. Use: K/K jfets, Idss = 10mA

Jfet = K369 and K363, Yfs = 40mS, input ?mV

IV resistor	Equivalent		Cut off freq	DAC lout (mA)		Ratio	Rail (v)	Idss	Output stage	Distortion		Input DC offset	Input volt at DAC lout
J/K	R-IV	IV Cap (pf)	Fc=1/2PiRC	Vout (Vrms)	Vout (Vrms)	1.67	20	10	Vdc out	PCM63	PCM1702	mV	mVrms
1000	1000	4,700	33,863	1,414	849	1.67	20	10.00	10.00				
1200	1200	3,917	33,863	1,697	1,018	1.67	20	12.00	8.00				
1500	1500	3,133	33,863	2,122	1,273	1.67	22	15.00	7.00				
1800	1800	2,611	33,863	2,546	1,528	1.67	25	18.00	7.00	Output voltage is high enough for IV resistor of 1k5! Thus no need very high Rail voltage!			
2000	2000	2,350	33,863	2,829	1,697	1.67	27	20.00	7.00				
2200	2200	2,136	33,863	3,112	1,867	1.67	29	22.00	7.00				
2500	2500	1,880	33,863	3,536	2,122	1.67	30	25.00	5.00				
15	10,000		1,061,033	Vout > 1Vrms					>=6.5V				

Observations:

1. K/K input mode has double IV resistance value, but requires the Jfet to have higher Yfs to get same input impedance. Thus K369 and K363 is excellent choice for this.
2. K/K input mode can use rail 20V to 22V to get the almost balance output DC offset (half rail) with jets from 8mA to 10mA. At this level, the output AC level is >1Vrms.
3. From the table C, it seems that IV resistor of 1k5 is best choice with Rail of 22V. It will be good for DAC with lout from 1mA to 2mA. Output level will be >1Vrms
4. For balance output levels, it will be doubled and thus there is no issue to drive a power amplifier directly in most situations.
5. Parallel of PCM1702/PCM1704/AD1862 DAC is recommended to get higher ouput levels of lout to be close to PCM63 output levels.

Actual Measurement Results:

1) IV resistors: 1k5 // 3000p with 1kHz signal

2)Transformer 18V x 2, 9V x 1 30VA

3) IV Rail: +/-20V

DAC	IV type	SE o/p Vrms	Distortion	I/P imp	i/P offset	I/P Vrms	Noise (uV)	Set	Idss
PCM1702	J/K IV	0.623	0.003~0.004%	14.7	Max 2.9mV	0.0125	5uV	1	9.3mA
PCM1702	K/K IV	1.24	0.01~0.013%	20.4	max 1.3mV	0.0173	10uV	2	9.1mA
PCM63	J/K IV	1.03	0.009~0.012%	14.7	Max 3.5mV	0.0208	5uV	1	9.3mA
PCM63	K/K IV	2.06	0.018~0.021%	20.2	<1mV	0.0286	11uV	2	9.1mA

2) IV resistors: 1k5 // 3000p with 1kHz signal

2)Transformer 18V x 2, 9V x 1 30VA

3) IV Rail: +/-20.5V

Set 3

DAC	IV type	SE o/p Vrms	Distortion	I/P imp	i/P offset	I/P Vrms	Noise (uV)	Set	Idss
PCM1702	K/K IV	1.24	0.01~0.011%	12.7	Max 1.3mV	0.018	8~9uV	3	8.4mA
PCM63	K/K IV	2.05	0.015~0.02%	20.9	max 1.0mV	0.0295	9~10uV	3	8.4mA

3) IV resistors: 1k5 // 3000p with 1kHz signal

2)Transformer 18V x 2, 9V x 1 30VA

3) IV Rail: +/-22V

Set 4

DAC	IV type	SE o/p Vrms	Distortion	I/P imp	i/P offset	I/P Vrms	Noise (uV)	Set	Idss
PCM1702	K/K IV	1.24/2.48	0.005~6%	12.7	Max 1.3mV	0.018	8~9uV	3	9.1
PCM63	K/K IV	2.05/4.11	0.01%	20.9	max 1.0mV	0.0295	9~10uV	3	9.1

Set 4 use SM5842 and DF1704 tested for PCM1704 at 24 bit mode, better resolution and 3D and more open sound.

AT -60dB, -33dB THD+N; -42dB for THD ONLY