IC op amp selection charts

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The three charts on the following pages graphically illustrate the relationship between price and the three most important op amp parameters. The three charts are:

1. Input bias current vs Price
2. Slew rate vs Price
3. Input offset voltage temperature sensitivity vs Price

The charts show a total of 389 devices—284 monolithic and 105 hybrid. Each device in the chart guide has a number next to it and each op amp is represented by that number throughout the three charts. The chart guide also lists the price per unit (in quantities of 100) to simplify the job of finding a particular device on the charts.

Slew rate (SR)

The time rate of change of the closed-loop amplifier output voltage for a maximum-step signal input (a maximum-step signal input is the largest input voltage step for which the amplifier performance remains linear). This definition of slew rate assumes that the amplifier is operating with unity amplification.

Input offset voltage temperature sensitivity ($\Delta V_{IO}/\Delta T$)

The ratio of the change in input offset voltage to the change in circuit temperature for a constant output voltage. This is an average value for a specified temperature range.

Input bias current (I_{IB})

The input bias current actually has two different definitions. The first, which agrees with the EIA glossary, is that it is the sum of the input bias current entering into the two input terminals of a balanced amplifier, or, the bias current entering the input of a single-ended amplifier. In general, this definition is agreed to by manufacturers of monolithic op amps and their devices are specified according to it.

The definition above, however, is far from universally accepted. Hybrid (and also discrete) manufacturers take a different viewpoint in the case of a balanced amplifier. They contend that the correct definition is not the average of the two currents but is rather the larger of the two currents.

What all this means is that you must keep this difference in terminology in mind when using the bias current chart. A good rule of thumb is that if the particular op amp is monolithic, the bias is the average of the two inputs. If you are looking at a hybrid device, in most cases the bias is the larger of the two inputs.

For a copy of this article circle 350 on Inquiry Card.

Chart Guide to Manufacturers and Devices

Hybrid op amps

Amelco		
1	$ 15.00	2809CG
2	17.00	2709CG
3	25.00	2809BG
4	30.00	2709BG
5	58.50	2404BG
6	58.50	2405BG
Amperex		
7	17.00	ATF401
8	20.00	ATF404
Analog Devices		
9	26.00	P501A
10	31.00	P501B
11	42.00	P501C
Burr-Brown		
12	5.95	3057/01
13	7.50	3053/01
14	9.00	3056/01
15	12.75	3052/01
16	12.75	3055/01
17	14.25	3054/01
18	16.50	3051/01
19	18.00	3050/01
20	27.00	3054S/01
21	30.75	3050S/01
Data Device		
22	13.00	007C
23	13.00	107C
24	15.00	008C-2
25	15.00	108C-2
26	16.00	007B
27	16.00	107B
28	17.00	008C-1
29	17.00	108C-1
30	20.00	007A
31	20.00	107A
32	21.00	248C-2
33	25.00	008B-3
34	25.00	108B-3
35	27.00	008B-2
36	27.00	108B-2
37	28.00	248C-1
38	29.00	008B-1
39	29.00	108B-1
40	31.00	007A-4
41	31.00	107A-4
42	34.00	248B-3
43	39.00	008A-2
44	39.00	108A-2
45	42.00	248B-2
46	51.00	008A-1
47	51.00	108A-1
48	51.00	248B-1
49	51.00	H50
50	53.00	007A-3
51	53.00	107A-3
52	60.00	248A-2
53	60.00	HC50
54	68.00	248A-1
55	68.00	HB50
56	70.00	007A-2
57	70.00	107A-2
58	75.00	007A-1
59	75.00	107A-1
General Instrument		
60	30.00	NC210B
61	41.50	NC210A
Keithley		
62	125.00	302
63	150.00	301K
64	185.00	301
65	200.00	300
66	250.00	50200
Melcor		
67	13.00	1821
68	49.00	1895
69	56.00	1672
70	82.00	1941
National Semiconductor		
71	11.60	NH0002C
72	11.70	NH0005C
73	17.00	NH0001C
74	17.40	NH0005
75	18.00	NH0004C
76	20.00	NH0002
77	27.00	NH0003C
78	40.00	NH0005A
79	45.00	NH0003
80	48.00	NH0001
81	60.00	NH0004
Optical Electronics		
82	24.00	9406
83	36.00	9412
Philbrick-Nexus		
84	4.50	1301
85	4.50	1303
86	6.50	T-52
87	7.65	1300
88	11.50	T82AH
89	16.00	C1A-2
90	21.50	1406
91	25.00	1408/01/02
92	40.50	1404/01
93	45.50	1405
94	52.00	1407/01
95	63.75	1402/01/02
96	104.00	1412
97	137.00	Q85AH
98	153.00	Q25AH
Zeltex		
99	18.00	ZA101D
100	25.00	ZA801D
101	49.00	161
102	54.00	161-10
103	69.00	161-03
104	86.00	162
105	105.00	162-04

Monolithic op amps

Advanced Micro Devices		
201	3.25	748C
202	3.25	301
203	3.25	741C
204	3.45	301A
205	3.95	307
206	5.95	748
207	5.95	741
208	7.50	201
209	7.95	715C
210	12.00	201A
211	13.00	207
212	15.00	101
213	30.00	101A
214	30.00	715
215	33.00	107
Amelco		
216	3.95	709B
217	7.95	809B
218	8.75	811BE
219	15.00	810B
220	15.00	808B
221	15.00	741B
222	16.00	819B
223	27.80	709A
224	27.80	805BE
225	28.00	808A
226	45.00	807BE
Analog Devices		
227	5.80	502J
228	8.00	502K
229	9.75	801A
230	13.00	801B
231	15.00	801S

Fairchild

232	1.90	μA709C
233	3.25	μA741C
234	3.25	μA739C
235	3.25	μA748C
236	3.49	μA749C
237	3.90	μA709
238	5.95	μA741
239	5.95	μA747C
240	5.95	μA748
241	7.95	μA715C
242	9.95	μA709A
243	11.95	μA749A
244	15.00	μA725C
245	15.00	μA735C
246	15.00	μA747A
247	22.50	μA740C
248	25.00	μA725B
249	25.00	μA735B
250	30.00	μA715A
251	37.50	μA725A
252	37.50	μA735A
253	49.00	μA740A

ITT

254	3.90	MIC709
255	5.95	MIC741
256	9.60	MIC709A

Motorola

257	3.80	MC1709
258	6.50	MC1520
259	7.50	MC1539
260	7.50	MC1712
261	8.50	MC1530
262	8.50	MC1531
263	8.50	MC1533
264	8.50	MC1535
265	15.00	MC1539G
266	28.00	MC1556
267	39.00	MC1536

National Semiconductor

268	1.90	LM709C
269	3.00	LM302
270	3.25	LM741C
271	3.25	LM748C
272	3.45	LM301A
273	3.90	LM709
274	3.95	LM307
275	5.95	LM741
276	5.95	LM748
277	6.00	LM202
278	7.50	LM201
279	7.50	LH201
280	10.00	LM308
281	12.00	LM201A
282	13.00	LM207
283	15.00	LM101
284	15.00	LH101
285	15.00	LM102
286	20.00	LM308A
287	30.00	LM208
288	30.00	LM101A
289	33.00	LM107
290	40.00	LM208A
291	60.00	LM108
292	150.00	LM108A

Nucleonic

293	1.90	LA709C
294	3.00	LA302
295	3.25	LA741C
296	3.25	LA748C
297	3.45	LA301A
298	3.90	LA709
299	3.95	LA307
300	5.95	LA741
301	5.95	LA748
302	6.00	LA202
303	7.50	LA201
304	7.50	LAH201
305	10.00	LA308
306	12.00	LA201A
307	13.00	LA207
308	15.00	LA101
309	15.00	LAH101
310	15.00	LA102
311	20.00	LA308A
312	30.00	LA208
313	30.00	LA101A
314	33.00	LA107
315	40.00	LA208A
316	60.00	LA108
317	150.00	LA108A

Optical Electronics

318	7.30	9300
319	9.00	9314
320	14.00	9302
321	23.00	9308

Philco

322	1.75	7709C
323	1.75	7712C
324	3.10	7741C
325	3.80	7709
326	5.00	7712
327	5.95	7411
328	8.80	7709A

Precision Monolithics

329	11.70	SSS741B
330	13.00	SSS201A
331	14.50	SSS207
332	24.00	SSS747B
333	36.00	SSS741
334	37.50	SSS725
335	40.00	SSS101A
336	40.00	SSS107
337	60.00	SSS747

Qualidyne

338	2.18	QC741C
339	2.85	QC301A
340	3.02	QC307
341	3.25	QC748C
342	3.25	QC201
343	3.32	QC1041C
344	3.99	QC741
345	4.36	QC101
346	5.53	QC201A
347	6.37	QC748
348	6.43	QC207
349	6.70	QC1100C
350	7.04	QC747C
351	7.50	QC2307
352	9.05	QC308
353	9.05	QC1456
354	9.60	QC1735-9
355	11.06	QC101A
356	12.00	QC1735-3
357	12.40	QC1041A
358	12.40	QC107
359	13.07	QC208
360	13.74	QC747
361	14.74	QC2207
362	15.00	QC1735-1
363	17.76	QC1556
364	25.80	QC108
365	33.50	QC2107

RCA

366	1.18	CA3029
367	1.90	CA3010
368	1.90	CA3030
369	1.90	CA3047
370	2.28	CA3029A
371	2.28	CA3037
372	2.88	CA3015
373	3.48	CA3010A
374	3.48	CA3030A
375	3.48	CA3037A
376	3.48	CA3038
377	3.48	CA3033
378	3.48	CA3047A
379	4.68	CA3008
380	4.68	CA3015A
381	4.68	CA3038A
382	5.88	CA3033A
383	6.48	CA3016
384	7.08	CA3008A
385	8.28	CA3016A

Radiation

386	3.50	RA2911
387	7.50	RA2909
388	10.70	RA2605
389	10.70	RA2625
390	12.80	RA2505
391	14.00	RA2515
392	14.00	RA2525
393	17.85	RA2600
394	17.85	RA2620
395	18.50	RA909
396	24.80	RA2500
397	27.25	RA2510
398	27.25	RA2520
399	33.00	RA2909A
400	36.30	RA909A

Raytheon

401	1.90	RC709
402	3.25	RC741
403	3.25	RC4709
404	3.90	RM709
405	5.00	RC4131
406	5.95	RM741
407	7.00	RC4741
408	7.00	RC4132
409	7.50	RC101A
410	7.50	RC107
411	9.35	RM709A
412	12.00	RM4709
413	20.00	RM4131
414	20.00	RM4741
415	30.00	RM101A
416	30.00	RM4132
417	33.00	RM107

Signetics

418	1.65	N5709
419	3.00	N5741
420	3.00	N5748
421	3.75	S5709
422	5.00	S5741
423	5.00	S5748
424	5.10	N516
425	35.00	S516

Silicon General

426	3.05	SG741C
427	3.10	SG748C
428	3.20	SG301
429	3.25	SG301A
430	3.75	SG307
431	5.65	SG748
432	5.80	SG741
433	7.00	SG201
434	7.10	SG747C
435	10.80	SG201A
436	11.80	SG207
437	14.00	SG101
438	17.10	SG747
439	28.00	SG101A
440	31.00	SG107

Siliconix

441	7.50	LM201H
442	10.50	LM201F
443	10.50	LM201D
444	12.50	LH101H
445	12.50	LM101H
446	15.50	LH101F
447	15.50	LH101D
448	15.50	LM101F
449	15.50	LM101D
450	45.50	L174

Solitron

451	3.25	UC4741C
452	3.25	UC4301A
453	5.95	UC4741
454	7.05	UC4747C
455	10.00	UC4250C
456	20.00	UC4747
457	28.00	UC4250
458	30.00	UC4101A

Texas Instruments

459	0.85	SN72709N
460	0.90	SN72702N
461	1.35	SN52709N
462	1.45	SN52702N
463	1.60	SN52709BN
464	1.65	SN52709AN
465	1.85	SN52702AN
466	2.40	SN72741B
467	2.95	SN72741N
468	3.18	SN72702F
469	3.72	SN72709F
470	4.66	SN52709BF
471	5.77	SN52709F
472	6.01	SN52702F
473	7.79	SN52702AF
474	8.36	SN52709AF

Transitron

475	3.70	TOA1709
476	3.70	TOA1809
477	5.75	TOA1741
478	5.75	TOA1747
479	5.75	TOA1748
480	7.50	TOA4709
481	11.50	TOA7741
482	12.80	TOA7709
483	13.95	TOA7809
484	19.50	TOA7748

For further information on the manufacturers and their products, circle the following numbers on the Inquiry Card.

Advanced Micro Devices	Circle Number 201
Amelco	Circle Number 202
Amperex	Circle Number 203
Analog Devices	Circle Number 204
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Data Device Corp.	Circle Number 206
Fairchild	Circle Number 207
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ITT	Circle Number 209
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Signetics	Circle Number 223
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Siliconix	Circle Number 225
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Texas Instruments	Circle Number 227
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Zeltex	Circle Number 229

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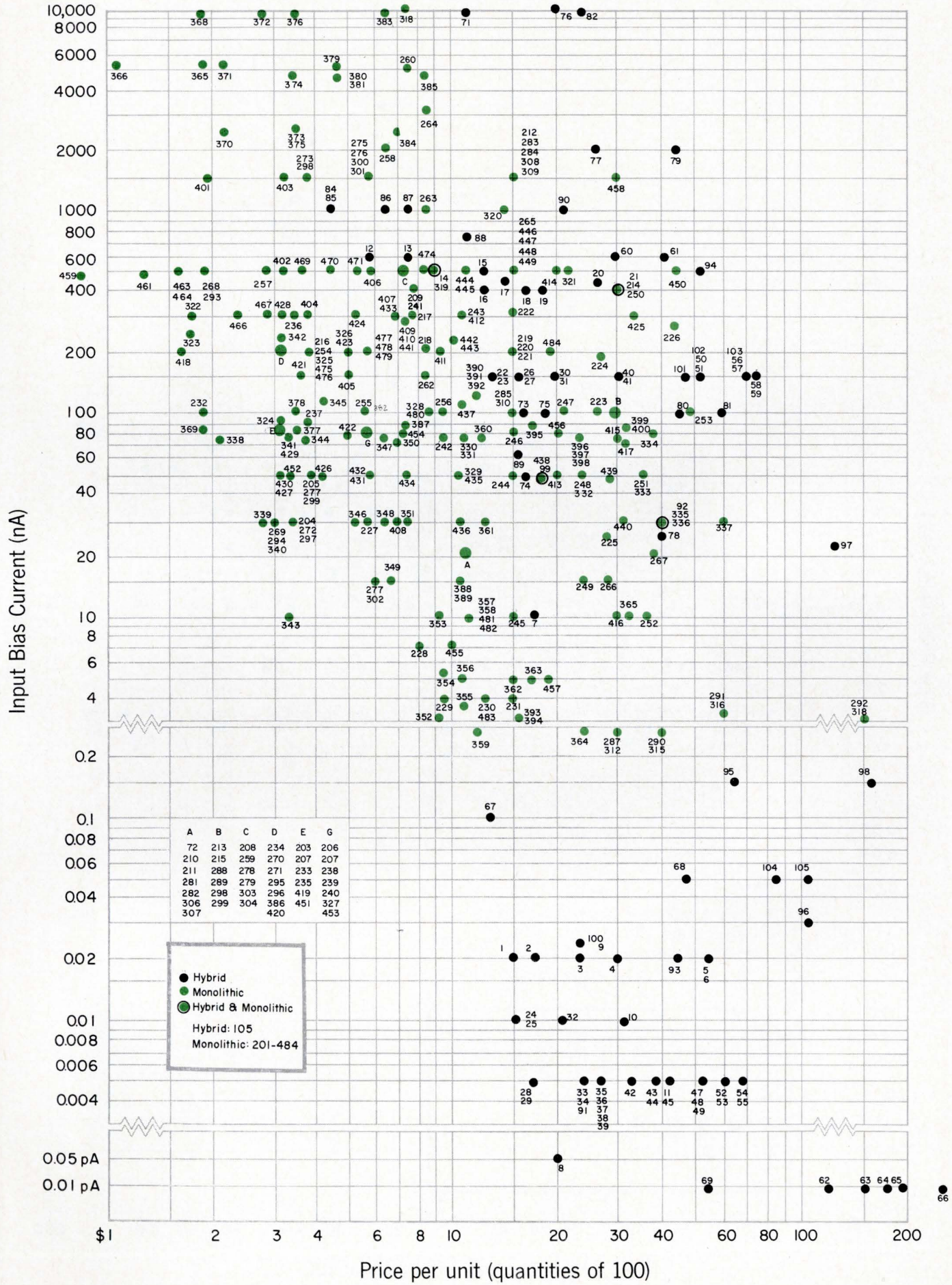
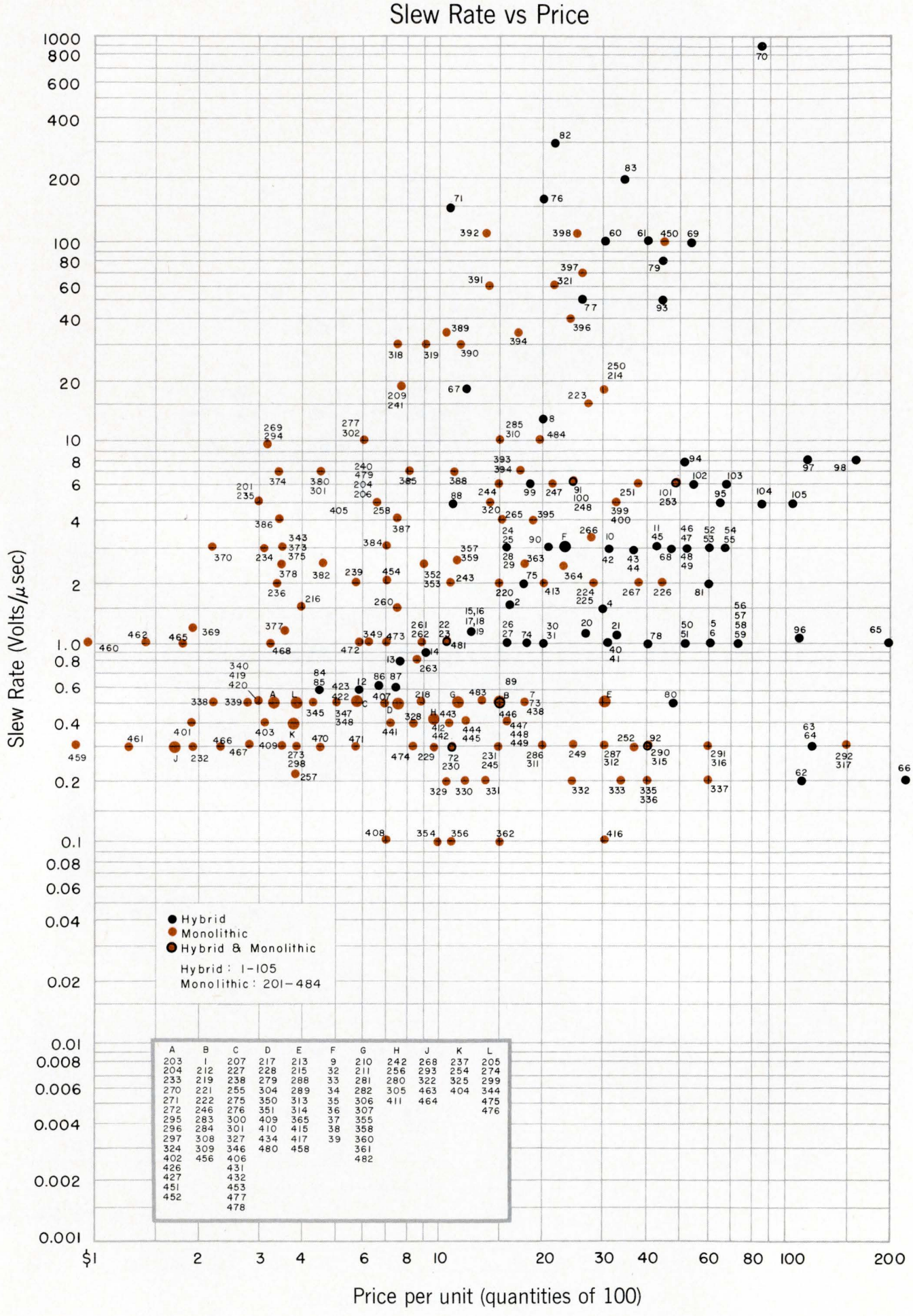

Input Bias Current vs Price
Input Bias Current (nA)
10,000
8000
6000
4000
2000
1000
800
600
400
200
100
80
60
40
20
10
8
6
4
0.2
0.1
0.08
0.06
0.04
0.02
0.01
0.008
0.006
0.004
0.05 pA
0.01 pA
$1
2
3
4
6
8
10
20
30
40
60
80
100
200
Price per unit (quantities of 100)
A B C D E G
72 213 208 234 203 206
210 215 259 270 207 207
211 288 278 271 233 238
281 289 279 295 235 239
282 298 303 304 296 419 240 327
306 307 420 451 453
Hybrid
Monolithic
Hybrid & Monolithic
Hybrid: 105
Monolithic: 201-484


Slew Rate vs Price
Slew Rate (Volts/μsec)
1000
800
600
400
200
100
80
60
40
20
10
8
6
4
2
1.0
0.8
0.6
0.4
0.2
0.1
0.08
0.06
0.04
0.02
0.01
0.008
0.006
0.004
0.002
0.001
$1
2
3
4
6
8
10
20
30
40
60
80
100
200
Price per unit (quantities of 100)
Hybrid
Monolithic
Hybrid & Monolithic
Hybrid : 1–105
Monolithic : 201–484
A 203 204 233 270 271 272 295 296 297 324 402 426 427 451 452
B 1 212 219 221 222 246 283 284 308 309 456
C 207 227 238 255 275 276 300 301 327 346 406 431 432 453 477 478
D 217 228 279 304 350 351 409 410 434 480
E 213 215 288 289 313 314 365 415 417 458
F 9 32 33 34 35 36 37 38 39
G 210 211 281 282 306 307 355 358 360 361 482
H 242 256 280 305 411
J 268 293 322 463 464
K 237 254 325 404
L 205 274 299 344 475 476

Input Offset Voltage Temperature Sensitivity vs Price