

For detailed explanations of column heading notations, see App. A.

Also for ready references the more important abbreviations used in the column headings are listed below:

LEFT HAND PAGE

APP = application

(codes at APP.E.)

CMRR = common mode

rejection ratio

COMP = compensation

(frequency)

$V_{in}/dT$  = input offset voltage

temperature drift

GBP = gain bandwidth

product

$I_B$  = input bias current

$I_{in}$  = input bias offset

current

$I_Q$  = quiescent supply

current

MFR = manufacturer

(codes at App.C.)

$P_D$  = quiescent power

consumer

PSRR = power supply rejection

ratio

$V_{ICM}$  = common mode input

voltage rating

$V_{dif}$  = differential input

voltage rating

$V_{in}$  = input offset voltage

$V_S$  = dc supply voltage

RIGHT HAND PAGE

Lead out coding summary

(details at APP.G.) for different

cases (APP.F.)

A = gain adjust

B = bias adjust

C = case

E- = inverting input

E+ = non-inverting input

F, F\* = input frequency

compensation

G = ground

J = high level input

K = output, open collector

L = output, open emitter

M = metal case

N = not connected

O = special terminal

R, R\* = outputs

S = strobe

T, T\* = offset balance

V+ = +ve dc supply

V- = -ve dc supply

W = guard ring

X = blank position, no lead

+ + = +ve supplementary dc

supply

- - = -ve supplementary dc

supply

0, 0\* = output frequency

compensation

| CASE (APP.F.) | LD 1 | LD 2 | LD 3 | LD 4 | LD 5 | LD 6 | LD 7 | LD 8 | LD 9 | LD 10 | LD 11 | LD 12 | LD 13 | LD 14 | LD 15 | LD 16 | EUROPE SUBSTITUTE | USA SUBSTITUTE | IS        | TYPE NUMBER |             |
|---------------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|-------|-------------------|----------------|-----------|-------------|-------------|
| CHP           | .    | .    | .    | .    | .    | .    | .    | .    | .    | .     | .     | .     | .     | .     | .     | .     | MLM139AL          | LM139AD        | 0         | AM139A-DICE |             |
| DIL-14/1C     | R2   | R1   | V+   | E-1  | E+1  | E-2  | E+2  | E+3  | E-3  | E-4   | E+4   | G     | R4    | R3    | .     | .     | MLM139AL          | LM139AD        | 0         | AM139A-DIP  |             |
| FLP-14/3C     | R2   | R1   | V+   | E-1  | E+1  | E-2  | E+2  | E+3  | E-3  | E-4   | E+4   | G     | R4    | R3    | .     | .     | MLM139AF          | LM139AF        | 0         | AM139A-FLP  |             |
| CHP           | .    | .    | .    | .    | .    | .    | .    | .    | .    | .     | .     | .     | .     | .     | .     | .     | AML D139          | LD139          | 0         | AM139-DICE  |             |
| DIL-14/1C     | R2   | R1   | V+   | E-1  | E+1  | E-2  | E+2  | E+3  | E-3  | E-4   | E+4   | G     | R4    | R3    | .     | .     | LM139DD           | LM139D         | 0         | AM139-DIP   |             |
| FLP-14/3C     | R2   | R1   | V+   | E-1  | E+1  | E-2  | E+2  | E+3  | E-3  | E-4   | E+4   | G     | R4    | R3    | .     | .     | .                 | LM139F         | 0         | AM139-FLP   |             |
| CHP           | .    | .    | .    | .    | .    | .    | .    | .    | .    | .     | .     | .     | .     | .     | .     | .     | AML D148          | LD148          | 0         | AM148-DICE  |             |
| DIL-14/1C     | R1   | E-1  | E+1  | V+   | E+2  | E-2  | R2   | R3   | E-3  | E+3   | V-    | E+4   | E-4   | R4    | .     | .     | AML M149D         | LM148D         | 0         | AM148-DIP   |             |
| CHP           | .    | .    | .    | .    | .    | .    | .    | .    | .    | .     | .     | .     | .     | .     | .     | .     | AML D149          | LD149          | 0         | AM149-DICE  |             |
| DIL-14/1C     | R1   | E-1  | E+1  | V+   | E+2  | E-2  | R2   | R3   | E-3  | E+3   | V-    | E+4   | E-4   | R4    | .     | .     | LM149D            | AML M149D      | 0         | AM149-DIP   |             |
| DIL-14/1C     | N    | N    | FT   | E-   | E+   | V-   | N    | N    | T*   | R     | V+    | F*    | N     | N     | .     | .     | UA201AD           | LM201AD        | 0         | AM201-DIP   |             |
| FLP-10/3C     | N    | FT   | E-   | E+   | V-   | T*   | R    | V+   | F*   | N     | .     | .     | .     | .     | .     | .     | SFC2201APT        | LM201AF        | 0         | AM201A-FLP  |             |
| T05-8/1M      | FT   | E-   | E+   | V-M  | T*   | R    | V+   | F*   | .    | .     | .     | .     | .     | .     | .     | .     | SFC2101A          | LM201AH        | 0         | AM201A-T05  |             |
| DIL-14/1C     | N    | N    | FT   | E-   | E+   | V-   | N    | N    | T*   | R     | V+    | F*    | N     | N     | .     | .     | UA201AD           | LM201D         | 0         | AM201-DIP   |             |
| FLP-10/3M     | N    | FT   | E-   | E+   | V-   | T*   | R    | V+   | F*   | N     | .     | .     | .     | .     | .     | .     | SFC2201APM        | LM201F         | 0         | AM201-FLP   |             |
| T05-8/1M      | FT   | E-   | E+   | V-M  | T*   | R    | V+   | F*   | .    | .     | .     | .     | .     | .     | .     | .     | SFC2101A          | LM201H         | 0         | AM201-T05   |             |
| DIL-14/1C     | N    | N    | T    | N    | E+   | V-   | N    | N    | L    | R     | V+    | T*    | N     | N     | .     | .     | .                 | LM202D         | 0         | AM202-DIP   |             |
| T05-8/1M      | T    | N    | E+   | V-   | L    | R    | V+   | T*   | .    | .     | .     | .     | .     | .     | .     | .     | UA102M            | LM202H         | 0         | AM202-T05   |             |
| T05-8/1M      | G    | E+   | E-   | V-M  | S1   | S2   | R    | V+   | .    | .     | .     | .     | .     | .     | .     | .     | SN52106L          | LM206H         | 0         | AM206-T05   |             |
| DIL-14/1C     | N    | N    | N    | E-   | E+   | V-   | N    | N    | N    | R     | V+    | N     | N     | N     | .     | .     | SN52107JA         | LM207D         | 0         | AM207-DIP   |             |
| FLP-10/3C     | N    | N    | E-   | E+   | V-   | N    | R    | V+   | N    | N     | .     | .     | .     | .     | .     | .     | SFC2207PT         | LM207F         | 0         | AM207-FLP   |             |
| T05-8/1M      | N    | E-   | E+   | V-M  | N    | R    | V+   | N    | .    | .     | .     | .     | .     | .     | .     | .     | SFC2207           | LM207H         | 0         | AM207-T05   |             |
| DIL-14/1C     | N    | F    | N    | E-   | E+   | N    | V-   | N    | N    | R     | V+    | F*    | N     | N     | .     | .     | UA208AD           | LM208AD        | 0         | AM208A-DIP  |             |
| T05-8/1M      | F    | E-   | E+   | V-M  | N    | R    | V+   | F*   | .    | .     | .     | .     | .     | .     | .     | .     | SFC2208A          | LM208AH        | 0         | AM208A-T05  |             |
| DIL-14/1C     | N    | F    | N    | E-   | E+   | N    | V-   | N    | N    | R     | V+    | F*    | N     | N     | .     | .     | UA208D            | LM208D         | 0         | AM208-DIP   |             |
| T05-8/1M      | F    | E-   | E+   | V-M  | N    | R    | V+   | F*   | .    | .     | .     | .     | .     | .     | .     | .     | SFC2208           | LM208H         | 0         | AM208-T05   |             |
| DIL-14/1C     | N    | N    | T    | N    | E+   | V-   | N    | N    | L    | R     | V+    | T*    | N     | N     | .     | .     | SN52110JA         | LM210D         | 0         | AM210-DIP   |             |
| FLP-10/3C     | N    | T    | N    | E+   | V-   | L    | R    | V+   | T*   | N     | .     | .     | .     | .     | .     | .     | .                 | LM210F         | 0         | AM210-FLP   |             |
| T05-8/1M      | T    | N    | E+   | V-   | L    | R    | V+   | T*   | .    | .     | .     | .     | .     | .     | .     | .     | SFC2210           | LM210H         | 0         | AM210-T05   |             |
| DIL-14/1C     | N    | G    | E+   | E-   | N    | V-   | T    | T*S  | R    | N     | V+    | N     | N     | N     | .     | .     | SN52111J          | LM211D         | 0         | AM211-DIP   |             |
| T05-8/1M      | G    | E+   | E-   | V-   | T    | T*S  | R    | V+   | .    | .     | .     | .     | .     | .     | .     | .     | SFC2211           | LM211H         | 0         | AM211-T05   |             |
| DIL-14/1C     | N    | T    | W    | E-   | E+   | W*   | V-   | N    | F    | R     | V+    | T*    | N     | N     | .     | .     | .                 | LM212D         | 0         | AM212-DIP   |             |
| FLP-10/3C     | N    | W    | E-   | E+   | W*   | V-   | R    | V+   | T    | T*    | .     | .     | .     | .     | .     | .     | .                 | LM212F         | 0         | AM212-FLP   |             |
| T05-8/1M      | T    | E-   | E+   | V-   | F    | R    | V+   | T*   | .    | .     | .     | .     | .     | .     | .     | .     | .                 | LM212H         | 0         | AM212-T05   |             |
| CHP           | .    | .    | .    | .    | .    | .    | .    | .    | .    | .     | .     | .     | .     | .     | .     | .     | .                 | LD216A         | 0         | AM216A-DICE |             |
| DIL-14/1C     | N    | T    | W    | E-   | E+   | W*   | V-   | N    | F    | R     | V+    | T*    | N     | N     | .     | .     | .                 | LM216AD        | 0         | AM216A-DIP  |             |
| FLP-10/3C     | N    | W    | E-   | E+   | W*   | V-   | R    | V+   | T    | T*    | .     | .     | .     | .     | .     | .     | .                 | LM216AF        | 0         | AM216A-FLP  |             |
| T05-8/1M      | T    | E-   | E+   | V-   | F    | R    | V+   | T*   | .    | .     | .     | .     | .     | .     | .     | .     | .                 | LM216AH        | 0         | AM216A-T05  |             |
| CHP           | .    | .    | .    | .    | .    | .    | .    | .    | .    | .     | .     | .     | .     | .     | .     | .     | .                 | LD216          | 0         | AM216-DICE  |             |
| DIL-14/1C     | N    | T    | W    | E-   | E+   | W*   | V-   | N    | F    | R     | V+    | T*    | N     | N     | .     | .     | .                 | LM216D         | 0         | AM216-DIP   |             |
| FLP-10/3C     | N    | W    | E-   | E+   | W*   | V-   | R    | V+   | T    | T*    | .     | .     | .     | .     | .     | .     | .                 | LM216F         | 0         | AM216-FLP   |             |
| T05-8/1M      | T    | E-   | E+   | V-   | F    | R    | V+   | T*   | .    | .     | .     | .     | .     | .     | .     | .     | .                 | LM216H         | 0         | AM216-T05   |             |
| DIL-14/1C     | N    | N    | T*F  | E-   | E+   | V-   | N    | N    | F*T  | R     | V+    | ∅     | N     | N     | .     | .     | .                 | LM218D         | 0         | AM218-DIP   |             |
| FLP-10/3C     | N    | T*F  | E-   | E+   | V-   | F*T  | R    | V+   | ∅    | N     | .     | .     | .     | .     | .     | .     | .                 | LM218F         | 0         | AM218-FLP   |             |
| T05-8/1M      | T*F  | E-   | E+   | V-   | F*T  | R    | V+   | ∅    | .    | .     | .     | .     | .     | .     | .     | .     | .                 | LM218H         | 0         | AM218-T05   |             |
| DIL-14/1C     | N    | N    | G1   | E+1  | E-1  | V-   | R2   | G2   | E+2  | E-2   | V+    | R1    | N     | N     | .     | .     | .                 | TDE0119DP      | LM219D    | 0           | AM219-DIP   |
| FLP-10/3C     | R1   | G1   | E+1  | E-1  | V-   | R2   | G2   | E+2  | E-2  | V+    | .     | .     | .     | .     | .     | .     | .                 | LM219F         | 0         | AM219-FLP   |             |
| T05-10/1M     | R1   | G1   | E+1  | E-1  | V-   | R2   | G2   | E+2  | E-2  | V+    | .     | .     | .     | .     | .     | .     | .                 | LM219H         | 0         | AM219-T05   |             |
| DIL-14/1C     | R1   | E-1  | E+1  | V+   | E+2  | E-2  | R2   | R3   | E-3  | E+3   | G     | E+4   | E-4   | R4    | .     | .     | .                 | LM224AD        | 0         | AM224A-DIP  |             |
| DIL-14/1C     | R1   | E-1  | E+1  | V+   | E+2  | E-2  | R2   | R3   | E-3  | E+3   | G     | E+4   | E-4   | R4    | .     | .     | .                 | LM224D         | 0         | AM224-DIP   |             |
| DIL-14/1C     | R2   | R1   | V+   | E-1  | E+1  | E-2  | E+2  | E+3  | E-3  | E-4   | E+4   | G     | R4    | R3    | .     | .     | .                 | MLM239AL       | LM239AD   | 0           | AM239A-DIP  |
| DIL-14/1C     | R2   | R1   | V+   | E-1  | E+1  | E-2  | E+2  | E+3  | E-3  | E-4   | E+4   | G     | R4    | R3    | .     | .     | .                 | MLM239L        | LM239D    | 0           | AM239-DIP   |
| DIL-14/1C     | R1   | E-1  | E+1  | V+   | E+2  | E-2  | R2   | R3   | E-3  | E+3   | V-    | E+4   | E-4   | R4    | .     | .     | .                 | LM248D         | 0         | AM248-DIP   |             |
| DIL-14/1C     | R1   | E-1  | E+1  | V+   | E+2  | E-2  | R2   | R3   | E-3  | E+3   | V-    | E+4   | E-4   | R4    | .     | .     | .                 | LM249D         | 0         | AM249-DIP   |             |
| CHP           | .    | .    | .    | .    | .    | .    | .    | .    | .    | .     | .     | .     | .     | .     | .     | .     | .                 | LD301A         | 0         | AM301A-DICE |             |
| DIL-8/1P      | FT   | E-   | E+   | V-   | T*   | R    | V+   | F*   | .    | .     | .     | .     | .     | .     | .     | .     | .                 | SFC2301ADC     | LM301AN   | 0           | AM301A-DIL8 |
| DIL-14/1C     | N    | N    | FT   | E-   | E+   | V-   | N    | N    | T*   | R     | V+    | F*    | N     | N     | .     | .     | .                 | UA301AD        | LM301AJ14 | 0           | AM301A-DIP  |
| T05-8/1M      | FT   | E-   | E+   | V-M  | T*   | R    | V+   | F*   | .    | .     | .     | .     | .     | .     | .     | .     | .                 | SFC2301AH      | LM301AH   | 0           | AM301A-T05  |
| CHP           | .    | .    | .    | .    | .    | .    | .    | .    | .    | .     | .     | .     | .     | .     | .     | .     | .                 | LD301          | 0         | AM301-DICE  |             |
| DIL-14/1C     | N    | N    | FT   | E-   | E+   | V-   | N    | N    | T*   | R     | V+    | F*    | N     | N     | .     | .     | .                 | LM301D         | 0         | AM301-DIP   |             |

# Appendix A

# Explanatory notes to tabulations

The general layout plan of the information in the tables of this compendium should be immediately evident from the data tabulation explanatory chart set out overleaf.

Supporting Appendices with additional information are:

- App. B Glossary of *Opamp Terms*
- App. C Tabulation *Codes for Manufacturers*
- App. D IC Manufacturers' *House Numbers*
- App. E Tabulation *Codes for Applications*
- App. F *Case Outline and Leadout Diagrams*
- App. G Codes for *Leadout Connections*

Unit symbols used in the tables are:

- A = amperes
- C = °centigrade
- dB = decibels
- G = gigaohms (megohms  $\times 10^3$ )
- GHZ = gigahertz (megahertz  $\times 10^3$ )
- K = kilohms
- KHZ = kilohertz
- M = megohms
- MA = milliamperes, mA
- MAX = maximum
- MHZ = megahertz
- MIN = minimum
- MV = millivolts
- MWC = milliwatts, case at 25C
- MWF = milliwatts, free air at 25C
- MWH = milliwatts, heat sink, 25C
- NA = nanoamps (microamps  $\times 10^{-3}$ )
- NV = nanovolts (microvolts  $\times 10^{-3}$ )
- PA = picoamps (microamps  $\times 10^{-12}$ )
- R = ohms
- T = teraohms (megohms  $\times 10^6$ )
- V = volts
- WC = watts, case at 25C
- WF = watts, free air at 25C
- WH = watts, heatsink, 25C
- $\mu$ A = microamps
- $\mu$ S = microseconds
- $\mu$ V = microvolts
- $\mu$ W = microwatts
- $\mu$ WF = microwatts, free air at 25C

Where a unit symbol appears in the middle of a value, it indicates the position of the decimal point, e.g. 3K3 = 3.3K.



## Appendix A

### LEFT HAND PAGE

For detailed explanations of column heading notations, see App. A.

Also for ready references the more important abbreviations used in the column headings are listed below:

- APP = application  
(codes at APP.E.)
- CMRR = common mode rejection ratio
- CMP = compensation  
(frequency)
- $dV_{io}/dT$  = input offset voltage temperature drift
- GBP = gain bandwidth product
- $I_B$  = input bias current
- $I_{IO}$  = input bias offset current
- $I_Q$  = quiescent supply current
- MFR = manufacturer  
(codes at App.C.)
- $P_Q$  = quiescent power consumer
- PSRR = power supply rejection ratio
- $V_{icm}$  = common mode input voltage rating
- $V_{idc}$  = differential input voltage rating
- $V_{io}$  = input offset voltage
- $V_S$  = dc supply voltage

### RIGHT HAND PAGE

Lead out coding summary (details at APP.G.) for different cases (APP.F.)

- A = gain adjust
- B = bias adjust
- C = case
- E- = inverting input
- E+ = non-inverting input
- F,F\* = input frequency compensation
- G = ground
- J = high level input
- K = output, open collector
- L = output, open emitter
- M = metal case
- N = not connected
- Q = special terminal
- R,R\* = outputs
- S = strobe
- T,T\* = offset balance
- V+ = +ve dc supply
- V- = -ve dc supply
- W = guard ring
- X = blank position, no lead
- + + = +ve supplementary dc supply
- - = -ve supplementary dc supply
- $\phi, \phi^*$  = output frequency compensation

| CASE (APP. F.) | LD 1 | LD 2 | LD 3 | LD 4 | LD 5 | LD 6 | LD 7 | LD 8 | LD 9 | LD 10 | LD 11 | LD 12 | LD 13 | LD 14 | LD 15 | LD 16 | EUROPE SUBSTITUTION | USA SUBSTITUTION | ISS     | TYPE NUMBER |          |
|----------------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|-------|---------------------|------------------|---------|-------------|----------|
| T05-8/1M       | T    | E-   | E+   | V-   | T*   | R    | V+   | N    | .    | .     | .     | .     | .     | .     | .     | .     | .                   | .                | LH0022H | 0           | LH0022CH |

CASE = PACKAGE OF DIFFERENT TYPES CODED ACCORDING TO APP. F - FIRST NUMBER INDICATES NUMBER OF LEAD POSITIONS EG DIL-14 = 14 LEAD DUAL-IN-LINE PACKAGE

LD1, LD2, ETC = LEAD NUMBERS WITH CONNECTIONS ACCORDING TO PAGE FOOTNOTE OR APP. G.

EURO SUBSTITUTION = PROELECTRON STANDARD OR OTHER TYPE AVAILABLE IN EUROPE

USA SUBSTITUTION = SUGGESTED ALTERNATIVE AVAILABLE IN USA.

ISS = ISSUE NUMBER OF DATA ENTRY

TYPE No. REPEATED ON R.H. MARGIN

# Appendix C

## Tabulation Codes for Manufacturers

|            |   |            |  |
|------------|---|------------|--|
| <b>ADU</b> | <b>Advanced Micro Devices Inc.,</b><br>901 Thompson Pl., Sunnyvale, CA 94086, USA                         | <b>ITU</b> | DA14 5HT, UK<br><b>ITT Semiconductors</b><br>74 Commerce Way, Woburn, MA, 01801, USA                             |
| <b>ANG</b> | <b>Analog Devices Ltd,</b><br>Central Ave., East Molesey, KT8 9BR, Surrey,<br>UK                          | <b>MNG</b> | <b>Mitsubishi Shoji Kaisha Ltd,</b><br>Bow Bells House, Bread St., London, EC4, UK                               |
| <b>ANU</b> | <b>Analog Devices Inc.,</b><br>P.O. Box 280, Norwood, Mass., 02062  | <b>MNJ</b> | <b>Mitsubishi Electric Corp.,</b><br>2-12 Marunouchi, Chiyoda-ku, Tokyo, Japan                                   |
| <b>BLG</b> | <b>Bell &amp; Howell Ltd,</b><br>Lennox Road, Basingstoke, Hants, UK                                      | <b>MTG</b> | <b>Motorola Ltd</b> (Semiconductor Products Div.),<br>York House, Empire Way, Wembley, Middlesex,<br>HA9 0PR, UK |
| <b>BLU</b> | <b>Bell &amp; Howell</b> (Control Products Divison),<br>706 Bostwick Ave, Bridgeport, Conn. 06605,<br>USA | <b>MTU</b> | <b>Motorola Semiconductor Products Inc.,</b><br>5005 E. McDowell Road, Phoenix, AZ, 85008,<br>USA                |
| <b>BUG</b> | <b>Burr-Brown International Ltd,</b><br>17 Exchange Rd, Watford, WQD1 7EB, Herts.,<br>UK                  | <b>MUG</b> | <b>Mullard Ltd,</b><br>Mullard House, Torrington Place, London,<br>WC1E 7HD, UK                                  |
| <b>BUU</b> | <b>Burr-Brown Research Corp.,</b><br>P.O. Box 11400, Tucson, AZ, 85734, USA                               | <b>NAG</b> | <b>National Semiconductor (UK) Ltd,</b><br>Harpur Centre, Bedford, MK40 3LF, UK                                  |
| <b>CMG</b> | <b>Computing Techniques Ltd,</b><br>Brookers Rd, Billingshurst, Sussex, RH14 9RZ,<br>UK                   | <b>NAU</b> | <b>National Semiconductor Corp.,</b><br>2900 Semiconductor Drive, Santa Clara, CA,<br>95051, USA                 |
| <b>DAG</b> | <b>Datel UK Ltd,</b><br>Stephenson Close, Portway Ind. Estate,<br>Andover, Hants, UK                      | <b>NIJ</b> | <b>Nippon Electric Co. Ltd,</b><br>1753 Shimonumabe, Nakahara-ku, Kawasaki,<br>Japan                             |
| <b>DAU</b> | <b>Datel Systems Inc.,</b><br>1020 Turnpike St., Canton, MA 02021, USA                                    | <b>OAU</b> | <b>Opamp Labs Inc.,</b><br>1033 N. Sycamore Ave., Los Angeles, CA<br>90038, USA                                  |
| <b>FAG</b> | <b>Fairchild Camera &amp; Instrument (UK) Ltd,</b><br>230 High St., Potters Bar, Herts., UK               | <b>OBS</b> | Obsolete – no longer commercially available.   |
| <b>FAU</b> | <b>Fairchild Semiconductor</b><br>464 Ellis St., Mountain View, CA 94042, USA                             | <b>OTU</b> | <b>Optical Electronics Inc.,</b><br>P.O. Box 11140, Tucson, AZ, 85734, USA                                       |
| <b>FEG</b> | <b>Ferranti Ltd,</b> (Electronic Department),<br>Gem Mill, Chadderton, Oldham, Lancs.,<br>OL9 8NP, UK     | <b>PLG</b> | <b>Plessey Semiconductors,</b><br>Cheney Manor, Swindon, Wilts., SN2 2QW, UK                                     |
| <b>FUJ</b> | <b>Fujitsu Ltd,</b><br>1015 Kamikodanaka, Kawasaki, Japan   | <b>PRG</b> | <b>Precision Monolithics</b> (Bourns Trimpot Ltd)<br>17/27 High St., Hounslow, Middlesex, UK                     |
| <b>HAG</b> | <b>Harris Semiconductor (Memec) Ltd,</b><br>The Firs, Whitchurch, Nr. Aylesbury, Bucks.,<br>HP22 4JU, UK  | <b>PRU</b> | <b>Precision Monolithics (Bourns) Inc.,</b><br>1500 Space Park Drive, Santa Clara, CA,<br>95050, USA             |
| <b>HAU</b> | <b>Harris Semiconductor</b><br>P.O. Box 883, Melbourne, FL, 32901, USA                                    | <b>RAG</b> | <b>Raytheon Semiconductor</b><br>The Pinnacles, Harlow, Essex, CM19 5BB, UK                                      |
| <b>HIJ</b> | <b>Hitachi Ltd</b> (Semiconductor and IC Div.),<br>1450 Josuihonimachi, Kodaira City, Tokyo,<br>Japan     | <b>RAU</b> | <b>Raytheon Semiconductor,</b><br>350 Ellis Street, Mountain View, CA, 94042,<br>USA                             |
| <b>ING</b> | <b>Intersil Inc.,</b><br>8 Tessa Rd, Richfield Trading Estate, Reading,<br>Berks., UK                     | <b>RCG</b> | <b>RCA (Great Britain) Ltd,</b><br>Lincoln Way, Windmill Road, Sunbury-on-<br>Thames, Middlesex, UK              |
| <b>INU</b> | <b>Intersil Inc.,</b><br>10900 N. Tantau Ave, Cupertino, CA, 95014,<br>USA                                | <b>RCU</b> | <b>RCA Solid State Division</b><br>Route 202, Somerville, NJ, 08876, USA   |
| <b>ITG</b> | <b>ITT Semiconductors</b><br>Maidstone Rd, Fooks Cray, Sidcup, Kent,                                      | <b>SAJ</b> | <b>Sanken Electric Co. Ltd,</b><br>1-22-8 Nishi-Ikebukuro, Toshima-Ku, Tokyo,<br>Japan                           |

Appendix C

|            |  |            |  |
|------------|--|------------|--|
| <b>SGG</b> | <b>SGS-ATES (UK) Ltd,</b><br>Planar House, Walton Street, Aylesbury, Bucks., UK                                    | <b>SPU</b> | <b>Sprague Electric Company</b> (Semiconductor Div.),<br>115 Northeast Cutoff, Worcester, MA, 01606, USA |
| <b>SGI</b> | <b>SGS-ATES Componenti Spa,</b><br>Via Olivetti, 2 Agrate Brianza, 20041, Milan, Italy                             | <b>TDG</b> | <b>Teledyne Semiconductor,</b><br>Heathrow House, Bath Road, Cranford, Hounslow, Middlesex, TW5 9QP, UK  |
| <b>SHG</b> | <b>Shindengen Hyokuto Boeki Haisha Ltd,</b><br>St. Alphage House, Fore St., London, EC2Y 5DA, UK                   | <b>TDU</b> | <b>Teledyne (Amelco) Semiconductor,</b><br>1300 Terra Bella Ave, Mountain View, CA, 94032, USA           |
| <b>SHJ</b> | <b>Shindengen Electric Mfg Co., Ltd,</b><br>New Ohtemachi Bldng, 2-1, 2-chome, Ohtemachi, Chiyoda-ku, Tokyo, Japan | <b>TEB</b> | <b>Teledyne-Philbrick,</b><br>Heathrow House, Bath Road, Cranford, Hounslow, Middlesex, TW5 9QP, UK      |
| <b>SIG</b> | <b>Siemens Ltd,</b><br>Great West Road, Brentford, Middlesex, TW8 9DG, UK  | <b>TEU</b> | <b>Teledyne-Philbrick,</b><br>Allied Drive at Route 128, Dedham, MA, 02026, USA                          |
| <b>SIW</b> | <b>Siemens Aktiengesellschaft,</b><br>Richard-Strauss-Strasse 76, D-8000 Munchen 2, Postfach 202109, W. Germany    | <b>TGG</b> | <b>Texas Instruments Ltd,</b><br>Manton Lane, Bedford, UK  |
| <b>SJG</b> | <b>Signetics International Corporation</b><br>Yeoman House, 63 Croydon Rd, London, SE20, UK                        | <b>TGU</b> | <b>Texas Instruments Inc.</b> (Components Group),<br>P.O. Box 5012, Dallas, Texas, 75222, USA            |
| <b>SJU</b> | <b>Signetics Corp.,</b><br>811 East Arques Ave, Sunnydale, CA. 94086, USA  | <b>THF</b> | <b>Thomson-CSF (Sescosem),</b><br>50 Rue Jean Pierre Timbaud, BP 120, 92403, Courbevoie, France          |
| <b>SKU</b> | <b>Silicon General Inc.,</b><br>7382 Bolsa Avenue, Westminster, CA, 92683, USA                                     | <b>THG</b> | <b>Thomson-CSF (UK) Ltd,</b><br>Ringway House, Bell Rd, Daneshill, Basingstoke, Hants., RG24 0QG, UK.    |
| <b>SLG</b> | <b>Siliconix Ltd,</b><br>30A High St., Thatcham, Newbury, Berks., RG13 4JG, UK                                     | <b>TKJ</b> | <b>Tokyo Sanyo Electric Co. Ltd</b> (Semiconductor Div.),<br>Oizumachi, Oragun, Gumma, Japan             |
| <b>SLU</b> | <b>Siliconix Incorporated,</b><br>2201 Laurelwood Road, Santa Clara, CA, 95054, USA                                | <b>TOG</b> | <b>Toshiba (UK) Ltd,</b><br>Toshiba House, Great South West Rd, Feltham, Middlesex, UK                   |
| <b>SOJ</b> | <b>Sony Semiconductor Corp.,</b><br>14-1, Asa hi-sho 4, Atsuigi-shi, Kanagawa-ken, 243, Japan                      | <b>TOJ</b> | <b>Toshiba (Tokyo Shibaura) Electric Co.,</b><br>2-1, 5-chome, Ginza Chuo-ku, Tokyo, Japan               |
| <b>SPG</b> | <b>Sprague Electric (UK) Ltd,</b><br>159 High St., Yiewsley, W. Drayton, Middlesex, UB7 7RY, UK                    | <b>TRU</b> | <b>Transitron Electronic Corp.,</b><br>168 Albion St., Wakefield, MA, 01881, USA                         |
|            |  | <b>ZEU</b> | <b>Zeltex Inc.,</b><br>940 Detroit Ave, Concord, CA, 94518, USA  |

# Appendix D

## IC Manufacturers'

### House Numbers

(General Note: Manufacturers often adopt their own 'in-house' serial numbering for their ICs. Listed below are the initial letters of numerical series used by different manufacturers.)

|                |                               |            |                               |
|----------------|-------------------------------|------------|-------------------------------|
| <b>AD</b>      | Analog Devices                | <b>OP</b>  | Precision Monolithics         |
| <b>ADO</b>     | Analog Devices                | <b>P</b>   | Teledyne-Philbrick            |
| <b>AM</b>      | Advanced Micro Devices; Datel | <b>PF</b>  | Teledyne-Philbrick            |
| <b>AMD</b>     | Advanced Micro Devices        | <b>PG</b>  | General Instruments (obs.)    |
| <b>AMLM</b>    | Advanced Micro Devices        | <b>PP</b>  | Teledyne-Philbrick            |
| <b>AMSSS</b>   | Advanced Micro Devices        | <b>RA</b>  | Radiation (now Harris)        |
| <b>AMU</b>     | Advanced Micro Devices        | <b>RC</b>  | Raytheon                      |
| <b>C</b>       | Bell & Howell                 | <b>RL</b>  | Raytheon                      |
| <b>CA</b>      | RCA                           | <b>RM</b>  | Raytheon                      |
| <b>CIA</b>     | Teledyne-Philbrick            | <b>RSN</b> | Raytheon                      |
| <b>CMP</b>     | Precision Monolithics         | <b>RV</b>  | Raytheon                      |
| <b>CN</b>      | Ferranti                      | <b>S</b>   | Signetics                     |
| <b>DA</b>      | Teledyne-Philbrick            | <b>SA</b>  | Teledyne-Philbrick            |
| <b>EP</b>      | Teledyne-Philbrick            | <b>SE</b>  | Signetics; Mullard            |
| <b>ESL</b>     | Teledyne-Philbrick            | <b>SFC</b> | Thomson-CSF                   |
| <b>FSL</b>     | Teledyne-Philbrick            | <b>SG</b>  | Silicon General               |
| <b>FSS</b>     | Ferranti                      | <b>SH</b>  | Fairchild                     |
| <b>HA</b>      | Harris                        | <b>SK</b>  | RCA                           |
| <b>HEPC</b>    | Motorola                      | <b>SL</b>  | Plessey; Teledyne-Philbrick   |
| <b>ICH</b>     | Intersil                      | <b>SN</b>  | Texas Instruments             |
| <b>ICL</b>     | Intersil                      | <b>SP</b>  | Teledyne-Philbrick            |
| <b>JM</b>      | Fairchild                     | <b>SQ</b>  | Teledyne-Philbrick            |
| <b>JSF</b>     | Thomson-CSF                   | <b>SSS</b> | Precision Monolithics         |
| <b>L</b>       | Analog Devices; SGS-ATES      | <b>SU</b>  | Signetics; Mullard            |
| <b>LA</b>      | Teledyne-Philbrick            | <b>T</b>   | Teledyne-Philbrick Transitron |
| <b>LF</b>      | National Semiconductor        | <b>TA</b>  | AEG-Telefunken                |
| <b>LH</b>      | National Semiconductor        | <b>TAA</b> | Proelectron Standard          |
| <b>LM</b>      | National Semiconductor        | <b>TBA</b> | Proelectron Standard          |
| <b>M</b>       | Mitsubishi                    | <b>TBB</b> | Proelectron Standard          |
| <b>MC</b>      | Motorola Semiconductors       | <b>TBC</b> | Proelectron Standard          |
| <b>MCC</b>     | Motorola Semiconductors       | <b>TBE</b> | Proelectron Standard          |
| <b>MCCF</b>    | Motorola Semiconductors       | <b>TCA</b> | Proelectron Standard          |
| <b>MCE</b>     | Motorola Semiconductors       | <b>TDA</b> | Proelectron Standard          |
| <b>MCH</b>     | Motorola Semiconductors       | <b>TDB</b> | Proelectron Standard          |
| <b>MIC</b>     | ITT Semiconductors            | <b>TDC</b> | Proelectron Standard          |
| <b>MLF</b>     | Motorola; Teledyne-Philbrick  | <b>TDE</b> | Proelectron Standard          |
| <b>MLM</b>     | Motorola Semiconductors       | <b>TL</b>  | AEG-Telefunken                |
| <b>MLMC</b>    | Motorola Semiconductors       | <b>TOA</b> | Transitron                    |
| <b>MONO-OP</b> | Precision Monolithics         | <b>TSC</b> | Transitron                    |
| <b>N</b>       | Signetics; Mullard            | <b>U</b>   | Fairchild                     |
| <b>NC</b>      | General Instruments (obs.)    | <b>ULN</b> | Sprague                       |
| <b>NE</b>      | Signetics; Mullard            | <b>ULS</b> | Sprague                       |
| <b>NH</b>      | National Semiconductor        | <b>USL</b> | Teledyne-Philbrick            |
|                |                               | <b>ZA</b>  | Zeltex                        |
|                |                               | <b>ZEL</b> | Zeltex                        |
|                |                               | <b>ZLD</b> | Ferranti                      |
|                |                               | <b>ZN</b>  | Ferranti                      |
|                |                               | <b>μA</b>  | Fairchild                     |

# Appendix E

## Tabulation Codes for Applications

|            |  |             |   |
|------------|--|-------------|---|
| <b>BDO</b> | Balanced differential-output amplifier         | <b>PAA</b>  | Parametric amplifier                                  |
| <b>CDA</b> | Current-difference amplifier                   | <b>PIA</b>  | Precision instrumentation amplifier                   |
| <b>CHP</b> | Chopper-stabilized amplifier                   | <b>PRA</b>  | Programmable opamp                                    |
| <b>CPR</b> | DC comparator                                  | <b>QCD</b>  | Quad current-difference amplifier                     |
| <b>DBD</b> | Dual balanced differential-output amplifier    | <b>QCP</b>  | Quad comparator                                       |
| <b>DCP</b> | Dual Comparator                                | <b>QFE</b>  | Quad fet-input opamp                                  |
| <b>DFE</b> | Dual fet-input opamp                           | <b>Q GK</b> | Quad general-purpose, internally-compensated, opamp   |
| <b>DGK</b> | Dual general purpose opamp                     | <b>QGU</b>  | Quad general-purpose, uncompensated, opamp            |
| <b>DGU</b> | Dual general-purpose uncompensated opamp       | <b>QLQ</b>  | Quad low-quiescent-power opamp                        |
| <b>DHS</b> | Dual high-slew-rate opamp                      | <b>QPI</b>  | Quad precision instrumentation amplifier              |
| <b>DLN</b> | Dual low-noise opamp                           | <b>QPR</b>  | Quad programmable opamp                               |
| <b>DPI</b> | Dual precision instrumentation amplifier       | <b>QSB</b>  | Quad super-beta opamp                                 |
| <b>DPR</b> | Dual programmable opamp                        | <b>SBA</b>  | Super-beta opamp                                      |
| <b>DSB</b> | Dual super-beta opamp                          | <b>TCP</b>  | Triple comparator                                     |
| <b>FET</b> | Fet-input opamp                                | <b>TFE</b>  | Triple fet-input opamp                                |
| <b>GPK</b> | General-purpose, internally-compensated, opamp | <b>TGK</b>  | Triple general-purpose, internally compensated, opamp |
| <b>GPU</b> | General-purpose, uncompensated, opamp          | <b>TGU</b>  | Triple general-purpose, uncompensated, opamp          |
| <b>HCO</b> | High current output opamp                      | <b>TLN</b>  | Triple low-noise opamp                                |
| <b>HIR</b> | High input resistance opamp                    | <b>TLP</b>  | Triple low-quiescent-power opamp                      |
| <b>HPO</b> | High power output opamp                        | <b>TOT</b>  | Triple operational transconductance amplifier         |
| <b>HSR</b> | High slew rate opamp                           | <b>TPI</b>  | Triple precision instrumentation amplifier            |
| <b>HVO</b> | High voltage output opamp                      | <b>TPR</b>  | Triple programmable opamp                             |
| <b>LBC</b> | Low input bias current opamp                   | <b>TSB</b>  | Triple super-beta opamp                               |
| <b>LCD</b> | Low input offset current drift opamp           | <b>VFA</b>  | Voltage-follower amplifier                            |
| <b>LNA</b> | Low noise opamp                                | <b>WBA</b>  | Wide-band opamp                                       |
| <b>LOC</b> | Low input offset current opamp                 | <b>XHG</b>  | Extra-high-gain opamp                                 |
| <b>LOV</b> | Low input offset voltage opamp                 | <b>XLP</b>  | Extra-low quiescent power opamp                       |
| <b>LQP</b> | Low quiescent power opamp                      | <b>XSR</b>  | Extra-high slew rate opamp                            |
| <b>LVD</b> | Low input offset voltage drift opamp           | <b>XWB</b>  | Extra-wide-band opamp                                 |
| <b>MWB</b> | Medium-wideband opamp                          |             |   |
| <b>OTA</b> | Operational transconductance amplifier         |             |   |



# Appendix G

## Codes for Leadout Connections

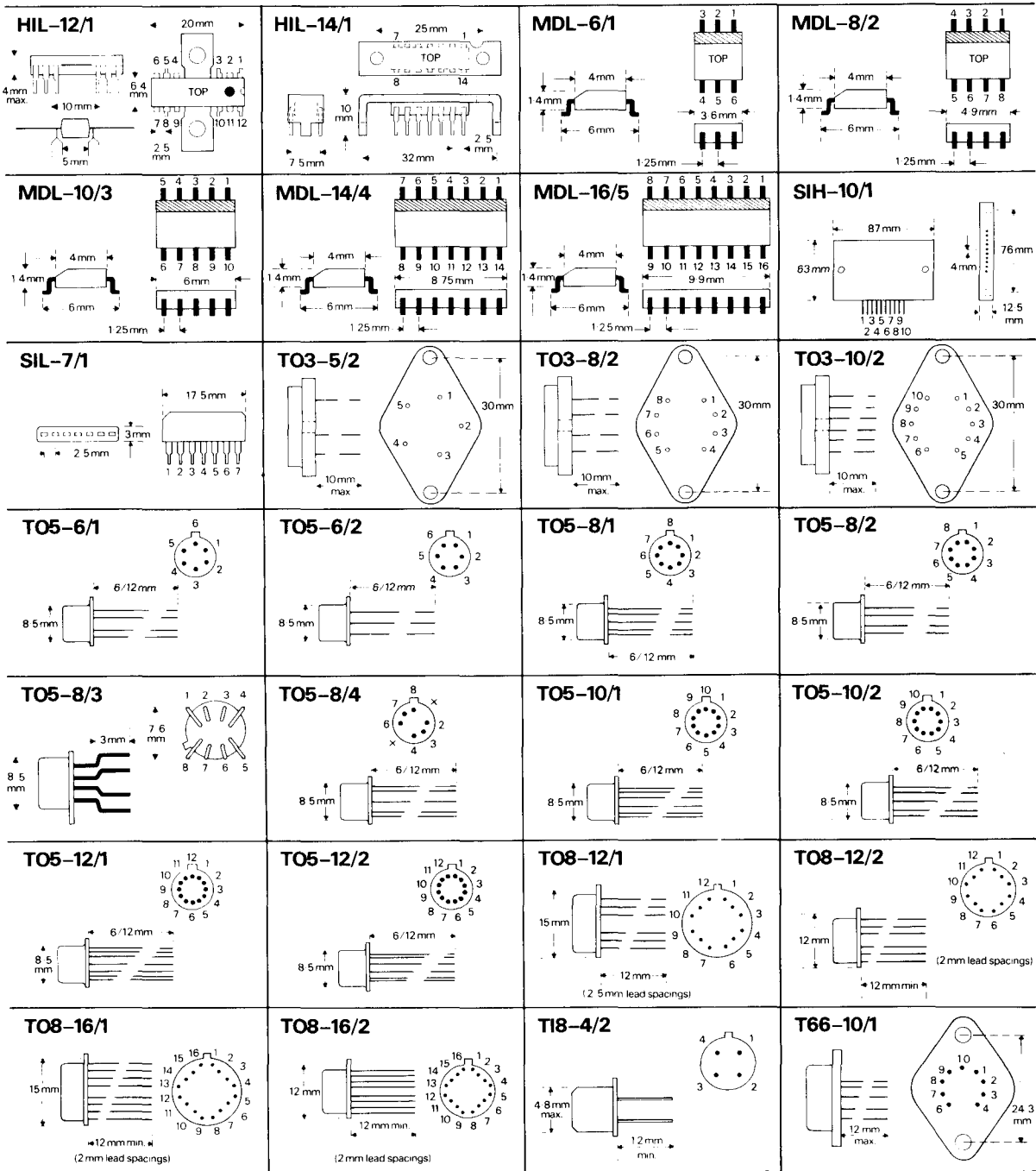
### *I: Connection Codes in Serial Order*

|    |  |
|----|--|
| A  | = Gain adjust, 1                                 |
| A* | = Gain adjust, 2                                 |
| B  | = Bias adjust or set                             |
| C  | = Case, package, screen                          |
| E+ | = Input, non-inverting, low-level                |
| E- | = Input, inverting, low-level                    |
| F  | = Input frequency compensation, 1                |
| F* | = Input frequency compensation, 2                |
| G  | = Ground, common, earth, zero volts              |
| J+ | = Input, non-inverting, high-level               |
| J- | = Input, inverting, high-level                   |
| K  | = Output, open collector                         |
| L  | = Output, open emitter                           |
| M  | = Metal casing                                   |
| N  | = Not connected, i.e. isolated lead              |
| Q  | = Special terminal (consult manufacturer's data) |
| R  | = Output, 1                                      |
| R* | = Output, 2                                      |
| S  | = Strobe   |
| T  | = Offset balance, trim or null, 1                |
| T* | = Offset balance, trim or null, 2                |
| V+ | = +ve dc supply                                  |
| V- | = -ve dc supply                                  |
| W  | = Guard ring                                     |
| X  | = Blank position, lead omitted                   |
| ++ | = +ve supplementary dc supply                    |
| -- | = -ve supplementary dc supply                    |
| φ  | = Output frequency compensation, 1               |
| φ* | = Output frequency compensation, 2               |

### *II: Lead Assignments in Alphabetical Order*

|   |
|---|
| Balance, offset, 1 = T                                    |
| Balance, offset, 2 = T*                                   |
| Bias adjust = B   |
| Blank position, without lead = X                          |
| Case = C  |
| Compensation, input, 1 = F                                |
| Compensation, input, 2 = F*                               |
| Compensation, output, 1 = φ                               |
| Compensation, output, 2 = φ*                              |
| DC supply, +ve = V+                                       |
| DC supply, -ve = V-                                       |
| Frequency compensation, input, 1 = F                      |
| Frequency compensation, input, 2 = F*                     |
| Frequency compensation, output, 1 = φ                     |
| Frequency compensation, output, 2 = φ*                    |
| Gain adjust, 1 = A  |
| Gain adjust, 2 = A*                                       |
| Ground = G  |
| Guard ring = W  |
| Input, inverting, high-level = J-                         |
| Input, non-inverting, high-level = J+                     |
| Input, inverting, low-level = E-                          |
| Input, non-inverting, low-level = E+                      |
| Input offset voltage, adjust, 1 = T                       |
| Input offset voltage, adjust, 2 = T*                      |
| Lead omitted, blank position = X                          |
| Lead in position but not connected = N                    |
| Metal case = M  |
| Not connected, but lead in position = N                   |
| Null, offset, 1 = T                                       |
| Null, offset, 2 = T*                                      |
| Offset voltage adjust, 1 = T                              |
| Offset voltage adjust, 2 = T*                             |
| Output, 1 = R   |
| Output, 2 = R*  |
| Output, open-collector = K                                |
| Output, open-emitter = L                                  |
| Package = C   |
| Special purpose terminal (data sheet to be consulted) = Q |
| Strobe = S  |
| Supply, dc, +ve = V+                                      |
| Supply, dc, -ve = V-                                      |
| Supply, dc, supplementary, +ve = ++                       |
| Supply, dc, supplementary, -ve = --                       |
| Trim (offset voltage), 1 = T                              |
| Trim (offset voltage), 2 = T*                             |

Appendix F



Appendix F

