TYPE NUMBER	MFR	APP	CMP	GBP MIN	SLEW RATE MIN	V_S^+ MAX	V_S^- MAX	T_{op} MAX	A_{VOL} MIN	V_{IO} MAX	I_B MAX	I_{IO} MAX	P_{TOT} MAX	I_{OUT} MIN	V_{OUT} MIN	V_{ICM} MAX	V_{IDF} MAX	dV_{IO}/dT MAX	P_O MAX	I_O MAX	CM RR MIN	PS RR MIN	R_{IN} MIN
ULN2747A	OBS	DGK	INT	.4MHZ	0.3V/uS	+18V	-18V	70C	88dB	6MV	500NA	200NA	.	5MA	12V	15V	30V	.	85MW	3MA	70dB	76dB	300K
ULS2139D	SPU	GPU	EXT	.3MHZ	1V/uS	+18V	-18V	125C	94dB	3MV	500NA	60NA	.	10MA	10V	18V	18V	.	150MW	.	80dB	75dB	150K
ULS2139G	SPU	GPU	EXT	.3MHZ	1V/uS	+18V	-18V	125C	94dB	3MV	500NA	60NA	.	10MA	10V	18V	18V	.	150MW	.	80dB	75dB	150K
ULS2139H	SPU	GPU	EXT	.3MHZ	1V/uS	+18V	-18V	125C	94dB	3MV	500NA	60NA	.	10MA	10V	18V	18V	.	150MW	.	80dB	75dB	150K
ULS2139M	SPU	GPU	EXT	.3MHZ	1V/uS	+18V	-18V	125C	94dB	3MV	500NA	60NA	.	10MA	10V	18V	18V	.	150MW	.	80dB	75dB	150K
ULS2151D	SPU	GPK	INT	.	0.5V/uS	+22V	-22V	125C	94dB	2MV	50NA	5NA	.	5MA	10V	15V	30V	.	85MW	.	85dB	85dB	1.5M
ULS2151G	SPU	GPK	INT	.	0.5V/uS	+22V	-22V	125C	94dB	2MV	50NA	5NA	.	5MA	10V	15V	30V	.	85MW	.	85dB	85dB	1.5M
ULS2151H	SPU	GPK	INT	.	0.5V/uS	+22V	-22V	125C	94dB	2MV	50NA	5NA	.	5MA	10V	15V	30V	.	85MW	.	85dB	85dB	1.5M
ULS2151M	SPU	GPK	INT	.	0.5V/uS	+22V	-22V	125C	94dB	2MV	50NA	5NA	.	5MA	10V	15V	30V	.	85MW	.	85dB	85dB	1.5M
ULS2156D	OBS	HSR	INT	.	1V/uS	+22V	-22V	125C	100dB	4MV	15NA	2NA	.	.	.	15V	30V	.	45MW	.	.	.	1M
ULS2157H	OBS	DGK	INT	94HZ	0.5V/uS	+22V	-22V	125C	94dB	2MV	50NA	5NA	.	5MA	10V	15V	30V	.	85MW	.	85dB	85dB	1.5M
ULS2157K	OBS	DGK	INT	.	0.5V/uS	+22V	-22V	125C	94dB	2MV	50NA	5NA	.	5MA	10V	15V	30V	.	85MW	.	85dB	85dB	1.5M
ULS2158D	OBS	GPU	EXT	.	0.5V/uS	+22V	-22V	125C	94dB	2MV	50NA	5NA	.	5MA	10V	15V	30V	.	85MW	.	85dB	85dB	1.5M
ULS2171D	SPU	GPK	INT	.	1V/uS	+22V	-22V	125C	94dB	2MV	15NA	7NA	.	5MA	10V	15V	30V	.	90MW	.	85dB	85dB	8M
ULS2171G	SPU	GPK	INT	.	1V/uS	+22V	-22V	125C	94dB	2MV	15NA	7NA	.	5MA	10V	15V	30V	.	90MW	.	85dB	85dB	8M
ULS2171H	SPU	GPK	INT	.	1V/uS	+22V	-22V	125C	94dB	2MV	15NA	7NA	.	5MA	10V	15V	30V	.	90MW	.	85dB	85dB	8M
ULS2171M	SPU	GPK	INT	.	1V/uS	+22V	-22V	125C	94dB	2MV	15NA	7NA	.	5MA	10V	15V	30V	.	90MW	.	85dB	85dB	8M
ULS2172D	OBS	GPU	EXT	.	1V/uS	+22V	-22V	125C	94dB	2MV	15NA	7NA	.	5MA	10V	15V	30V	.	90MW	.	85dB	85dB	8M
ULS2173D	OBS	LBC	INT	.	0.1V/uS	+22V	-22V	125C	100dB	2MV	3NA	1.5NA	.	.	.	15V	30V	.	35MW	.	.	.	7M
ULS2174D	OBS	LBC	EXT	.	0.1V/uS	+22V	-22V	125C	100dB	2MV	3NA	1.5NA	.	.	.	15V	30V	.	35MW	.	.	.	7M
ULS2741D	OBS	GPK	INT	.4MHZ	0.3V/uS	+22V	-22V	125C	94dB	3MV	80MA	30NA	.	10MA	16V	15V	30V	15uV/C	150MW	3MA	80dB	86dB	1M
ZA702M1	ZEU	PIA	INT	.	0.1V/uS	+18V	-18V	70C	.	4MV	50NA	.	.	5MA	10V	10V	10V	50uV/C	.	10MA	80dB	.	100M
ZA703M1	ZEU	PIA	INT	.	0.1V/uS	+18V	-18V	70C	.	4MV	5pA	.	.	5MA	10V	10V	10V	60uV/C	.	10MA	80dB	.	10G
ZA801M1	ZEU	GPK	INT	2MHZ	6V/uS	+18V	-18V	85C	100dB	2MV	25pA	.	.	10MA	10V	15V	15V	50uV/C	.	3MA	70dB	.	10G
ZA801M2	ZEU	GPK	INT	2MHZ	6V/uS	+18V	-18V	85C	100dB	2MV	25pA	.	.	10MA	10V	15V	15V	20uV/C	.	3MA	70dB	.	10G
ZA801M3	ZEU	GPK	INT	2MHZ	6V/uS	+18V	-18V	85C	100dB	2MV	25pA	.	.	10MA	10V	15V	15V	10uV/C	.	3MA	70dB	.	10G
ZA801D1	ZEU	GPK	INT	2MHZ	6V/uS	+18V	-18V	85C	100dB	2MV	25pA	.	.	10MA	10V	15V	15V	50uV/C	.	3MA	70dB	.	10G
ZA801E1	ZEU	GPK	INT	2MHZ	6V/uS	+18V	-18V	85C	100dB	2MV	25pA	.	.	10MA	10V	15V	15V	50uV/C	.	3MA	70dB	.	10G
ZA802M1	ZEU	PIA	INT	3MHZ	6V/uS	+18V	-18V	85C	100dB	2MV	5pA	.	.	10MA	10V	15V	15V	50uV/C	.	3MA	90dB	.	10G
ZA804M1	ZEU	LNA	INT	2MHZ	6V/uS	+18V	-18V	85C	100dB	2MV	25pA	.	.	10MA	10V	15V	15V	50uV/C	.	3MA	70dB	.	10G
ZA804M2	ZEU	LNA	INT	2MHZ	6V/uS	+18V	-18V	85C	100dB	2MV	25pA	.	.	10MA	10V	15V	15V	20uV/C	.	3MA	70dB	.	10G
ZA903M1	ZEU	LVD	INT	2MHZ	6V/uS	+18V	-18V	60C	100dB	0.5MV	10pA	.	.	10MA	10V	15V	15V	3uV/C	.	3MA	78dB	.	10G
ZA903M2	ZEU	LVD	INT	2MHZ	6V/uS	+18V	-18V	60C	100dB	0.5MV	10pA	.	.	10MA	10V	15V	15V	1uV/C	.	3MA	78dB	.	10G
ZEL-1	ZEU	PIA	INT	.5MHZ	2.5V/uS	+18V	-18V	85C	114dB	.	50NA	15NA	.	5MA	10V	10V	15V	20uV/C	.	5MA	80dB	.	300K
ZEL-1/02	ZEU	PIA	INT	.5MHZ	2.5V/uS	+18V	-18V	85C	114dB	.	50NA	15NA	.	5MA	10V	10V	15V	2.5uV/C	.	5MA	80dB	.	300K
ZEL-1/03	ZEU	PIA	INT	.5MHZ	2.5V/uS	+18V	-18V	85C	114dB	.	50NA	15NA	.	5MA	10V	10V	15V	5uV/C	.	5MA	80dB	.	300K
ZEL-1/04	ZEU	PIA	INT	.5MHZ	2.5V/uS	+18V	-18V	85C	114dB	.	50NA	15NA	.	5MA	10V	10V	15V	10uV/C	.	5MA	80dB	.	300K
ZEL-1AC	ZEU	PIA	INT	.5MHZ	2V/uS	+18V	-18V	85C	114dB	.	50NA	5NA	.	20MA	10V	10V	15V	20uV/C	.	8MA	80dB	.	300K
ZEL-1C	ZEU	PIA	INT	.5MHZ	2V/uS	+18V	-18V	85C	114dB	.	50NA	5NA	.	20MA	10V	10V	15V	20uV/C	.	8MA	80dB	.	300K
ZEL-1E	ZEU	PIA	INT	.5MHZ	2.5V/uS	+25V	-25V	85C	114dB	.	50NA	5NA	.	4MA	20V	20V	25V	20uV/C	.	5MA	80dB	.	300K
ZLD709	FEG	GPU	EXT	.	.	+18V	-18V	125C	88dB	5MV	500NA	200NA	300MWF	.	12V	10V	5V	20uV/C	165MW	.	80dB	76dB	150K
ZLD709C	FEG	GPU	EXT	.	.	+18V	-18V	75C	84dB	7.5MV	1.5uA	500NA	300MWF	.	10V	10V	5V	20uV/C	200MW	.	65dB	74dB	50K
ZLD709CE	FEG	GPU	EXT	.	.	+18V	-18V	75C	84dB	7.5MV	1.5uA	500NA	300MWF	.	10V	10V	5V	20uV/C	200MW	.	65dB	74dB	50K
ZLD709CF	FEG	GPU	EX	.	.	+18V	-18V	75C	84dB	7.5MV	1.5uA	500NA	300MWF	.	10V	10V	5V	20uV/C	200MW	.	65dB	74dB	50K
ZLD709F	FEG	GPU	EXT	.	.	+18V	-18V	125C	88dB	5MV	500NA	200NA	300MWF	.	12V	10V	5V	20uV/C	165MW	.	80dB	76dB	150K
ZLD741	FEG	GPK	INT	.	.25V/uS	+22V	-22V	125C	94dB	5MV	500NA	200NA	500MWF	.	12V	15V	30V	.	85MW	3MA	70dB	76dB	300K
ZLD741C	FEG	GPK	INT	.	.25V/uS	+18V	-18V	70C	86dB	6MV	500NA	200NA	500MWF	.	12V	15V	30V	.	85MW	3MA	70dB	76dB	300K
ZLD741CE	FEG	GPK	INT	.	.25V/uS	+18V	-18V	70C	86dB	6MV	500NA	200NA	500MWF	.	12V	15V	30V	.	85MW	3MA	70dB	76dB	300K
ZLD741CP	FEG	GPK	INT	.	.25V/uS	+18V	-18V	70C	86dB	6MV	500NA	200NA	500MWF	.	12V	15V	30V	.	85MW	3MA	70dB	76dB	300K
ZN402E	FEG	PRA	EXT	2MHZ	6V/uS	+18V	-18V	70C	80dB	6MV	1.2uA	0.5uA	250MWF	.	10V	10V	5V	15uV/C	.	7MA	70dB	80dB	100K
ZN402T	FEG	PRA	T	2MHZ	6V/uS	+18V	-18V	70C	80dB	6MV	1.2uA	0.5uA	300MWF	.	10V	10V	5V	15uV/C	.	7MA	70dB	80dB	100K
ZN402P	FEG	PRA	EXT	2MHZ	6V/uS	+18V	-18V	70C	80dB	6MV	1.2uA	0.5uA	250MWF	.	10V	10V	5V	15uV/C	.	7MA	70dB	80dB	100K
ZN424E	FEG	PRA	EXT	2MHZ	6V/uS	+18V	-18V	70C	80dB	6MV	1.2uA	0.5uA	250MWF	.	10V	10V	5V	15uV/C	.	7MA	70dB	80dB	100K
ZN424P	FEG	PRA	EXT	2MHZ	6V/uS	+18V	-18V	70C	80dB	6MV	1.2uA	0.5uA	250MWF	.	10V	10V	5V	15uV/C	.	7MA	70dB	80dB	100K
ZN424T	FEG	PRA	EXT	2MHZ	6V/uS	+18V	-18V	70C	80dB	6MV	1.2uA	0.5uA	300MWF	.	10V	10V	5V	15uV/C	.	7MA	70dB	80dB	100K

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

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_D = 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_{IDF} = 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

ø,ø* = 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
DIL14-1P	E-1	E+1	T1	V-	T2	E+2	E-2	T*2	V+2	R2	N	R1	V+1	T*1	.	.	TBB0747A	UA747DC	0	ULN2747A
TO5-8/1M	F	E-	E+	V-	ø	R	V+	F*	.	.	.	.	.	.	.	.	.	MC1539G	0	ULS2139D
FLP-10/3C	N	F	E-	E+	V-	ø	R	V-	F*	N	.	.	.	.	.	.	.	.	0	ULS2139G
DIL-14/1C	N	F	E-	E+	V-	N	N	N	N	ø	R	V+	F*	N	.	.	.	.	0	ULS2139H
DIL-8/1P	F	E-	E+	V-	ø	R	V+	F*	.	.	.	.	.	.	.	.	.	.	0	ULS2139M
TO5-8/1M	T	E-	E+	V-	T*	R	V+	N	.	.	.	.	.	.	.	.	LM741AH	UA741AHM	0	ULS2151D
FLP-10/3C	N	T	E-	E+	V-	T*	R	V+	N	N	.	.	.	.	.	.	LM741AF	UA741AFM	0	ULS2151G
DIL-14/1C	N	T	E-	E+	V-	N	N	N	N	T*	R	V+	N	N	.	.	LM741AD	UA741ADM	0	ULS2151H
DIL-8/1P	T	E-	E+	V-	T*	R	V+	N	.	.	.	.	.	.	.	.	.	LM741EJ	0	ULS2151M
TO5-8/1M	T	E-	E+	V-	T*	R	V+	N	.	.	.	.	.	.	.	.	.	RM4131T	0	ULS2156D
DIL-14/1C	E-1	E+1	T1	V-	T2	E+2	E-2	T*2	V+2	R2	N	R1	V+1	T*1	.	.	LM747AD	UA747ADM	0	ULS2157H
TO5-10/1M	R1	V+1	E-1	E+1	V-	E+2	E-2	V+2	R2	N	.	.	.	.	.	.	TBC0747	UA747AHM	0	ULS2157K
TO5-8/1M	TF	E-	E+	V-	T*	R	V+	F*	.	.	.	.	.	.	.	.	.	UA748AHM	0	ULS2158D
TO5-8/1M	T	E-	E+	V-	T*	R	V+	N	.	.	.	.	.	.	.	.	S5556T	MC1556G	0	ULS2171D
FLP-10/3G	N	T	E-	E+	V-	T*	R	V+	N	N	.	.	.	.	.	.	.	.	0	ULS2171G
DIL-14/1C	N	T	E-	E+	V-	N	N	N	N	T*	R	V+	N	N	.	.	.	.	0	ULS2171H
DIL-8/1P	T	E-	E+	V-	T*	R	V+	N	.	.	.	.	.	.	.	.	.	S5556V	0	ULS2171M
TO5-8/1M	TF	E-	E+	V-	T*	R	V+	F*	.	.	.	.	.	.	.	.	SFC2101A	LM101AH	0	ULS2172D
TO5-8/1M	T	E-	E+	V-	T*	R	V+	N	.	.	.	.	.	.	.	.	.	RM1556AT	0	ULS2173D
TO5-8/1M	TF	E-	E+	V-	T*	R	V+	F*	.	.	.	.	.	.	.	.	.	.	0	ULS2174D
TO5-8/1M	T	E-	E+	V-	T*	R	V+	N	.	.	.	.	.	.	.	.	LM741AH	UA741AHM	0	ULS2741D
DIM-9/5P	A	E+	E-	T	E+	Q	V-	R	A*	.	.	.	.	.	.	.	.	.	0	ZA702M1
DIM-9/5P	A	E+	E-	T	E+	Q	V-	R	A*	.	.	.	.	.	.	.	.	.	0	ZA703M1
DIM-7/5P	E+	E-	V+	G	V-	R	T	.	.	.	.	.	.	.	.	.	.	ZA801M2	0	ZA801M1
DIM-7/5P	E+	E-	V+	G	V-	R	T	.	.	.	.	.	.	.	.	.	.	ZA801M3	0	ZA801M2
DIM-7/5P	E+	E-	V+	G	V-	R	T	.	.	.	.	.	.	.	.	.	.	.	0	ZA801M3
DIM-14/1P	N	N	N	E-	E+	V-	V-	N	N	R	V+	N	N	T	.	.	.	.	0	ZA801D1
DIM-14/1M	N	N	N	E-	E+	V-	GC	N	N	R	V+	N	N	T	.	.	.	.	0	ZA801E1
DIM-7/5P	E+	E-	V+	G	V-	R	T	.	.	.	.	.	.	.	.	.	.	.	0	ZA802M1
DIM-7/5P	E+	E-	V+	G	V-	R	T	.	.	.	.	.	.	.	.	.	.	ZA804M2	0	ZA804M1
DIM-7/5P	E+	E-	V+	G	V-	R	T	.	.	.	.	.	.	.	.	.	.	.	0	ZA804M2
DIM-9/5P	T	E+	E-	T*	V+	G	V-	R	T1	.	.	.	.	.	.	.	.	ZA903M2	0	ZA903M1
DIM-9/5P	T	E+	E-	T*	V+	G	V-	R	T1	.	.	.	.	.	.	.	.	.	0	ZA903M2
DIM-7/5P	E+	E-	V+	G	V-	R	T	.	.	.	.	.	.	.	.	.	.	ZEL-1/04	0	ZEL-1
DIM-7/5P	E+	E-	V+	G	V-	R	T	.	.	.	.	.	.	.	.	.	.	.	0	ZEL-1/02
DIM-7/5P	E+	E-	V+	G	V-	R	T	.	.	.	.	.	.	.	.	.	.	ZEL-1/02	0	ZEL-1/03
DIM-7/5P	E+	E-	V+	G	V-	R	T	.	.	.	.	.	.	.	.	.	.	ZEL-1/03	0	ZEL-1/04
DIM-7/5P	E+	E-	V+	G	V-	R	T	.	.	.	.	.	.	.	.	.	.	ZEL-1C	0	ZEL-1AC
DIM-7/5P	E+	E-	V+	G	V-	R	T	.	.	.	.	.	.	.	.	.	.	.	0	ZEL-1C
DIM-7/5P	E+	E-	V+	G	V-	R	T	.	.	.	.	.	.	.	.	.	.	ZEL-1C	0	ZEL-1E
TO5-8/1M	F	E-	E+	V-M	ø	ø*R	V+	F*	.	.	.	.	.	.	.	.	TAA522	UA709AHM	0	ZLD709
TO5-8/1M	F	E-	E+	V-M	ø	ø*R	V+	F*	.	.	.	.	.	.	.	.	TAA521	UA709HC	0	ZLD709C
DIL-14/1P	N	N	F	E-	E+	V-	N	N	ø	R	V+	F*	N	N	.	.	TAA521A	UA709CDL14	0	ZLD709CE
FLP-10/3C	N	F	E-	E+	V-	ø	Rø*	V+	F*	N	.	.	.	.	.	.	SF.C2709PT	UA709CFP10	0	ZLD709CF
FLP-10/3C	N	F	E-	E+	V-	ø	Rø*	V+	F*	N	.	.	.	.	.	.	SF.C2709AP	UA709AFP10	0	ZLD709F
TO5-8/1M	T	E-	E+	V-	T*	R	V+	N	.	.	.	.	.	.	.	.	TBA222	UA741TO5	0	ZLD741
TO5-8/1M	T	E-	E+	V-	T*	R	V+	N	.	.	.	.	.	.	.	.	TBA221	UA741CT05	0	ZLD741C
DIL-14/1P	N	N	T	E-	E+	V-	N	N	T*	R	V+	N	N	N	.	.	TBA221A	UA741CDL14	0	ZLD741CE
DIL-14/1P	N	N	T	E-	E+	V-	N	N	T*	R	V+	N	N	N	.	.	TBA221A	UA741CDL14	0	ZLD741CP
DIL-14/1P	T	E-	N	E+	T*ø	R	V-	N	N	N	S	N	N	V+	.	.	ZN424E	.	0	ZN402E
TO5-8/1M	E-	E+	Tø	R	V-	S	V+	T*	.	.	.	.	.	.	.	.	ZN424T	.	0	ZN402T
DIL-8/1P	V+	T	E-	E+	T*ø	R	V-	S	.	.	.	.	.	.	.	.	ZN424P	.	0	ZN402P
DIL-14/1P	T	E-	N	E+	T*ø	R	V-	N	N	N	S	N	N	V+	.	.	ZN402E	.	0	ZN424E
DIL-8/1P	V+	T	E-	E+	T*ø	R	V-	S	.	.	.	.	.	.	.	.	ZN402P	.	0	ZN424P
TO5-8/1M	E-	E+	Tø	R	V-	S	V+	T*	.	.	.	.	.	.	.	.	ZN402T	.	0	ZN424T

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:

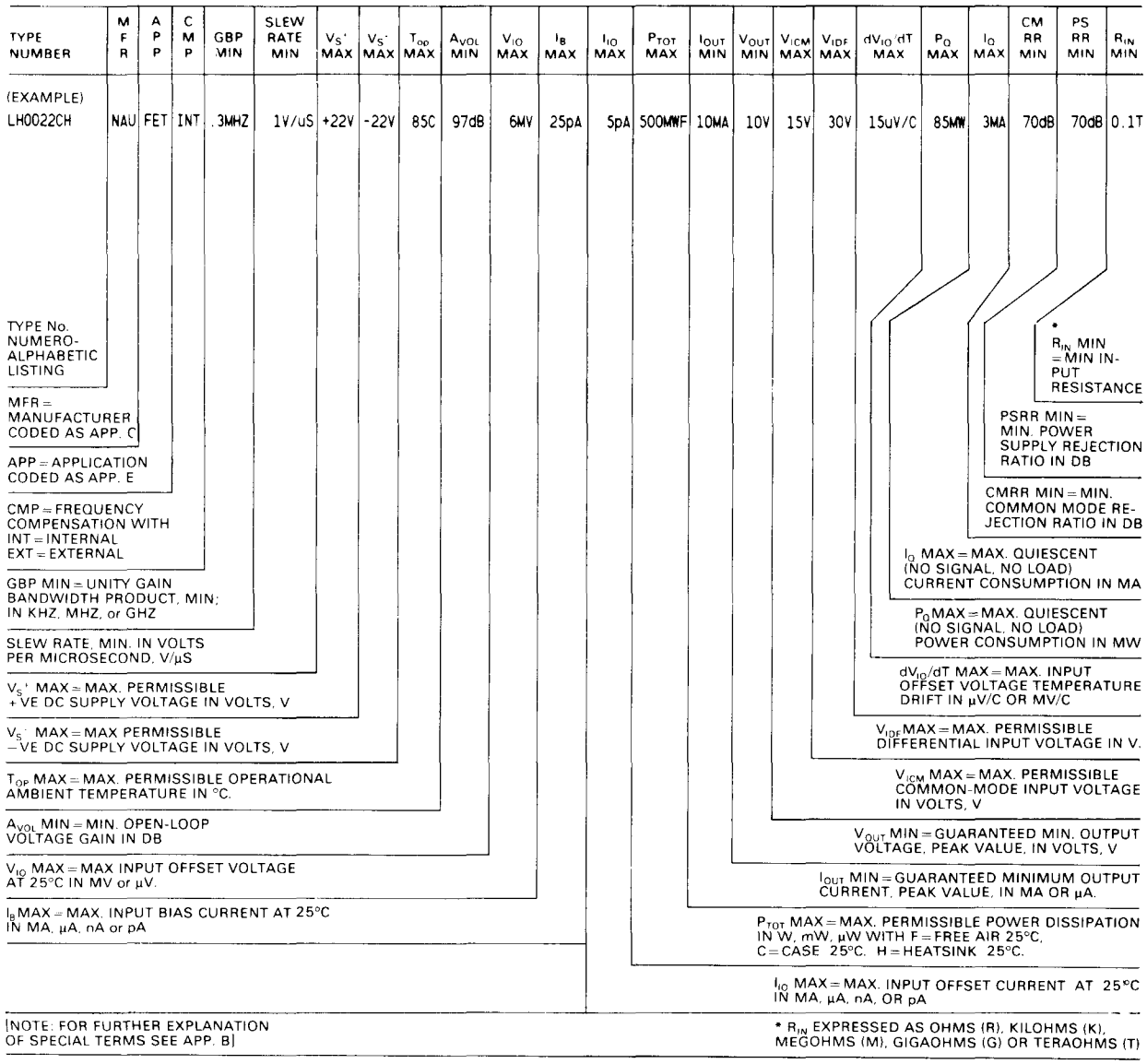
App. B Glossary of *Opamp Terms*
App. C Tabulation *Codes for Manufacturers*
App. D IC Manufacturers' *House Numbers*
App. E Tabulation *Codes for Applications*
App. F *Case Outline and Leadout Diagrams*
App. G Codes for *Leadout Connections*

Unit symbols used in the tables are:

A = amperes
C = ° centigrade
dB = decibels
G = gigaohms (megohms x 10^3)
GHZ = gigahertz (megahertz x 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 x 10^{-3})
NV = nanovolts (microvolts x 10^{-3})
PA = picoamps (microamps x 10^{-12})
R = ohms
T = teraohms (megohms x 10^6)
V = volts
WC = watts, case at 25C
WF = watts, free air at 25C
WH = watts, heatsink, 25C
μA = microamps
μS = microseconds
μV = microvolts
μW = microwatts
μWF = 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


TYPE NUMBER
MFR
APP
CMP
GBP MIN
SLEW RATE MIN
V_S^+ MAX
V_S^- MAX
T_{op} MAX
A_{VOL} MIN
V_{IO} MAX
I_B MAX
I_{IO} MAX
P_{TOT} MAX
I_{OUT} MIN
V_{OUT} MIN
V_{ICM} MAX
V_{IDF} MAX
dV_{IO}/dT MAX
P_Q MAX
I_Q MAX
CM RR MIN
PS RR MIN
R_{IN} MIN
(EXAMPLE)
LH0022CH
NAU
FET
INT
.3MHZ
1V/uS
+22V
-22V
85C
97dB
6MV
25pA
5pA
500MWF
10MA
10V
15V
30V
15uV/C
85MW
3MA
70dB
70dB
0.1T
TYPE No. NUMERO-ALPHABETIC LISTING
MFR = MANUFACTURER CODED AS APP. C
APP = APPLICATION CODED AS APP. E
CMP = FREQUENCY COMPENSATION WITH INT = INTERNAL EXT = EXTERNAL
GBP MIN = UNITY GAIN BANDWIDTH PRODUCT, MIN; IN KHZ, MHZ, or GHZ
SLEW RATE, MIN. IN VOLTS PER MICROSECOND, V/μS
V_S^+ MAX = MAX. PERMISSIBLE +VE DC SUPPLY VOLTAGE IN VOLTS, V
V_S^- MAX = MAX PERMISSIBLE −VE DC SUPPLY VOLTAGE IN VOLTS, V
T_{OP} MAX = MAX. PERMISSIBLE OPERATIONAL AMBIENT TEMPERATURE IN °C.
A_{VOL} MIN = MIN. OPEN-LOOP VOLTAGE GAIN IN DB
V_{IO} MAX = MAX INPUT OFFSET VOLTAGE AT 25°C IN MV or μV.
I_B MAX = MAX. INPUT BIAS CURRENT AT 25°C IN MA, μA, nA or pA
[NOTE: FOR FURTHER EXPLANATION OF SPECIAL TERMS SEE APP. B]
* R_{IN} MIN = MIN INPUT RESISTANCE
PSRR MIN = MIN. POWER SUPPLY REJECTION RATIO IN DB
CMRR MIN = MIN. COMMON MODE REJECTION RATIO IN DB
I_Q MAX = MAX. QUIESCENT (NO SIGNAL, NO LOAD) CURRENT CONSUMPTION IN MA
P_Q MAX = MAX. QUIESCENT (NO SIGNAL, NO LOAD) POWER CONSUMPTION IN MW
dV_{IO}/dT MAX = MAX. INPUT OFFSET VOLTAGE TEMPERATURE DRIFT IN μV/C OR MV/C
V_{IDF} MAX = MAX. PERMISSIBLE DIFFERENTIAL INPUT VOLTAGE IN V.
V_{ICM} MAX = MAX. PERMISSIBLE COMMON-MODE INPUT VOLTAGE IN VOLTS, V
V_{OUT} MIN = GUARANTEED MIN. OUTPUT VOLTAGE, PEAK VALUE, IN VOLTS, V
I_{OUT} MIN = GUARANTEED MINIMUM OUTPUT CURRENT, PEAK VALUE, IN MA OR μA.
P_{TOT} MAX = MAX. PERMISSIBLE POWER DISSIPATION IN W, mW, μW WITH F = FREE AIR 25°C, C = CASE 25°C. H = HEATSINK 25°C.
I_{IO} MAX = MAX. INPUT OFFSET CURRENT AT 25°C IN MA, μA, nA, OR pA
* R_{IN} EXPRESSED AS OHMS (R), KILOHMS (K), MEGOHMS (M), GIGAOHMS (G) OR TERAOHMS (T)

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_{IDF} = 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
ϕ,ϕ* = 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 SUBSTI-TUTE	USA SUBSTI-TUTE	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.

TYPE No. REPEATED ON R.H. MARGIN

ISS = ISSUE NUMBER OF DATA ENTRY

USA SUBSTITUTE = SUGGESTED ALTERNATIVE AVAILABLE IN USA.

EURO SUBSTITUTE = PROELECTRON STANDARD OR OTHER TYPE AVAILABLE IN EUROPE

Appendix C
Tabulation Codes for Manufacturers

ADU **Advanced Micro Devices Inc.,**
901 Thompson Pl., Sunnyvale, CA 94086, USA

ANG **Analog Devices Ltd,**
Central Ave., East Molesey, KT8 9BR, Surrey, UK

ANU **Analog Devices Inc.,**
P.O. Box 280, Norwood, Mass., 02062

BLG **Bell & Howell Ltd,**
Lennox Road, Basingstoke, Hants, UK

BLU **Bell & Howell** (Control Products Divison),
706 Bostwick Ave, Bridgeport, Conn. 06605, USA

BUG **Burr-Brown International Ltd,**
17 Exchange Rd, Watford, WQD1 7EB, Herts., UK

BUU **Burr-Brown Research Corp.,**
P.O. Box 11400, Tucson, AZ. 85734, USA

CMG **Computing Techniques Ltd,**
Brookers Rd, Billingshurst, Sussex, RH14 9RZ, UK

DAG **Datel UK Ltd,**
Stephenson Close, Portway Ind. Estate, Andover, Hants, UK

DAU **Datel Systems Inc.,**
1020 Turnpike St., Canton, MA 02021, USA

FAG **Fairchild Camera & Instrument (UK) Ltd,**
230 High St., Potters Bar, Herts., UK

FAU **Fairchild Semiconductor**
464 Ellis St., Mountain View, CA 94042, USA

FEG **Ferranti Ltd,** (Electronic Department),
Gem Mill, Chadderton, Oldham, Lancs., OL9 8NP, UK

FUJ **Fujitsu Ltd,**
1015 Kamikodanaka, Kawasaki, Japan

HAG **Harris Semiconductor (Memec) Ltd,**
The Firs, Whitchurch, Nr. Aylesbury, Bucks., HP22 4JU, UK

HAU **Harris Semiconductor**
P.O. Box 883, Melbourne, FL, 32901, USA

HIJ **Hitachi Ltd** (Semiconductor and IC Div.),
1450 Josuihonimachi, Kodaira City, Tokyo, Japan

ING **Intersil Inc.,**
8 Tessa Rd, Richfield Trading Estate, Reading, Berks., UK

INU **Intersil Inc.,**
10900 N. Tantau Ave, Cupertino, CA, 95014, USA

ITG **ITT Semiconductors**
Maidstone Rd, Foots Cray, Sidcup, Kent, DA14 5HT, UK

ITU **ITT Semiconductors**
74 Commerce Way, Woburn, MA, 01801, USA

MNG **Mitsubishi Shoji Kaisha Ltd,**
Bow Bells House, Bread St., London, EC4, UK

MNJ **Mitsubishi Electric Corp.,**
2–12 Marunouchi, Chiyoda-ku, Tokyo, Japan

MTG **Motorola Ltd** (Semiconductor Products Div.),
York House, Empire Way, Wembley, Middlesex, HA9 0PR, UK

MTU **Motorola Semiconductor Products Inc.,**
5005 E. McDowell Road, Phoenix, AZ, 85008, USA

MUG **Mullard Ltd,**
Mullard House, Torrington Place, London, WC1E 7HD, UK

NAG **National Semiconductor (UK) Ltd,**
Harpur Centre, Bedford, MK40 3LF, UK

NAU **National Semiconductor Corp.,**
2900 Semiconductor Drive, Santa Clara, CA, 95051, USA

NIJ **Nippon Electric Co. Ltd,**
1753 Shimonumabe, Nakahara-ku, Kawasaki, Japan

OAU **Opamp Labs Inc.,**
1033 N. Sycamore Ave., Los Angeles, CA 90038, USA

OBS Obsolete – no longer commercially available.

OTU **Optical Electronics Inc.,**
P.O. Box 11140, Tucson, AZ, 85734, USA

PLG **Plessey Semiconductors,**
Cheney Manor, Swindon, Wilts., SN2 2QW, UK

PRG **Precision Monolithics** (Bourns Trimpot Ltd)
17/27 High St., Hounslow, Middlesex, UK

PRU **Precision Monolithics (Bourns) Inc.,**
1500 Space Park Drive, Santa Clara, CA, 95050, USA

RAG **Raytheon Semiconductor**
The Pinnacles, Harlow, Essex, CM19 5BB, UK

RAU **Raytheon Semiconductor,**
350 Ellis Street, Mountain View, CA, 94042, USA

RCG **RCA (Great Britain) Ltd,**
Lincoln Way, Windmill Road, Sunbury-on-Thames, Middlesex, UK

RCU **RCA Solid State Division**
Route 202, Somerville, NJ, 08876, USA

SAJ **Sanken Electric Co. Ltd,**
1-22-8 Nishi-Ikebukuro, Toshima-Ku, Tokyo, Japan

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

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

Appendix E
Tabulation Codes for Applications

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

Appendix G
Codes for Leadout Connections

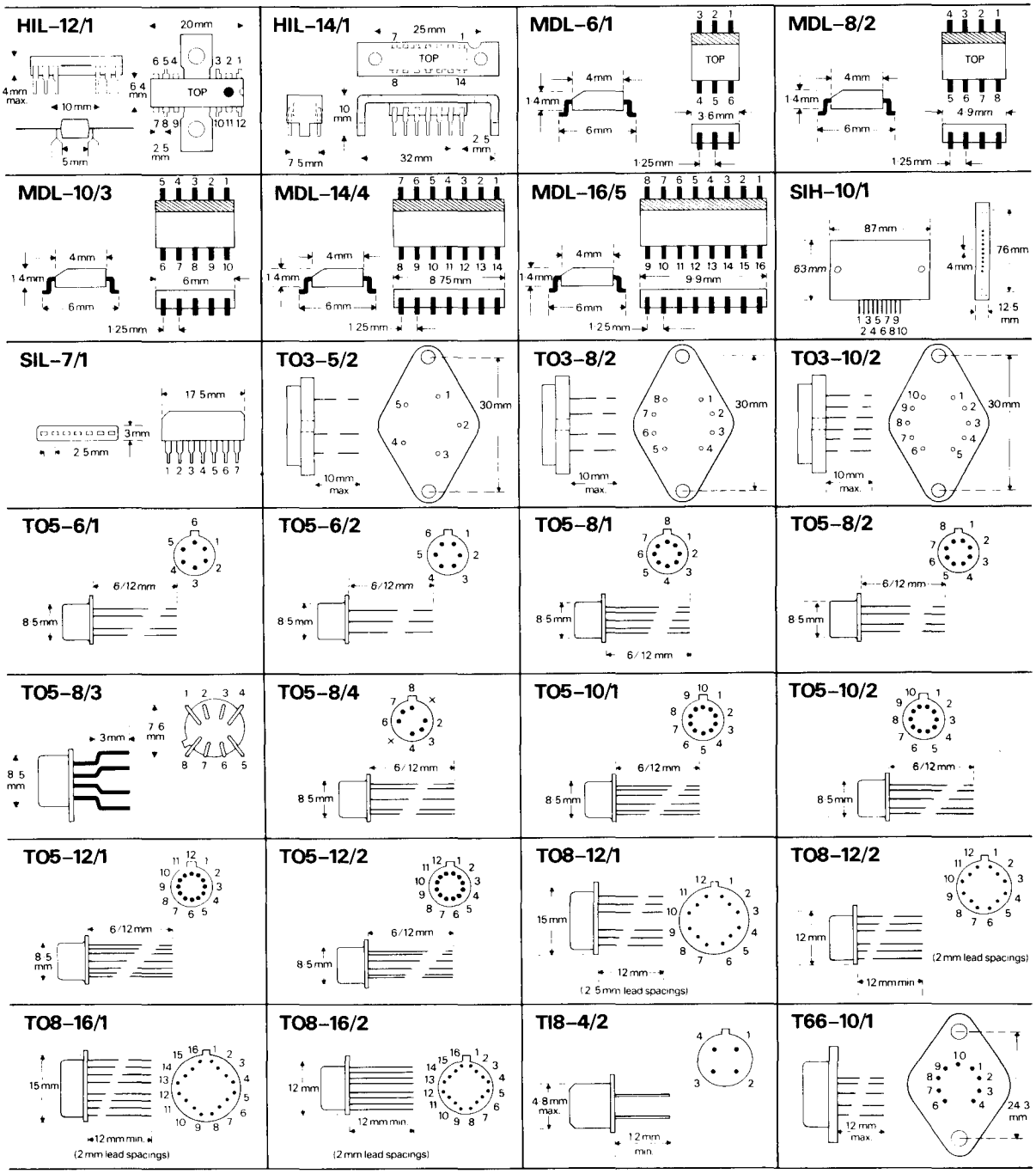
I: Connection Codes in Serial Order

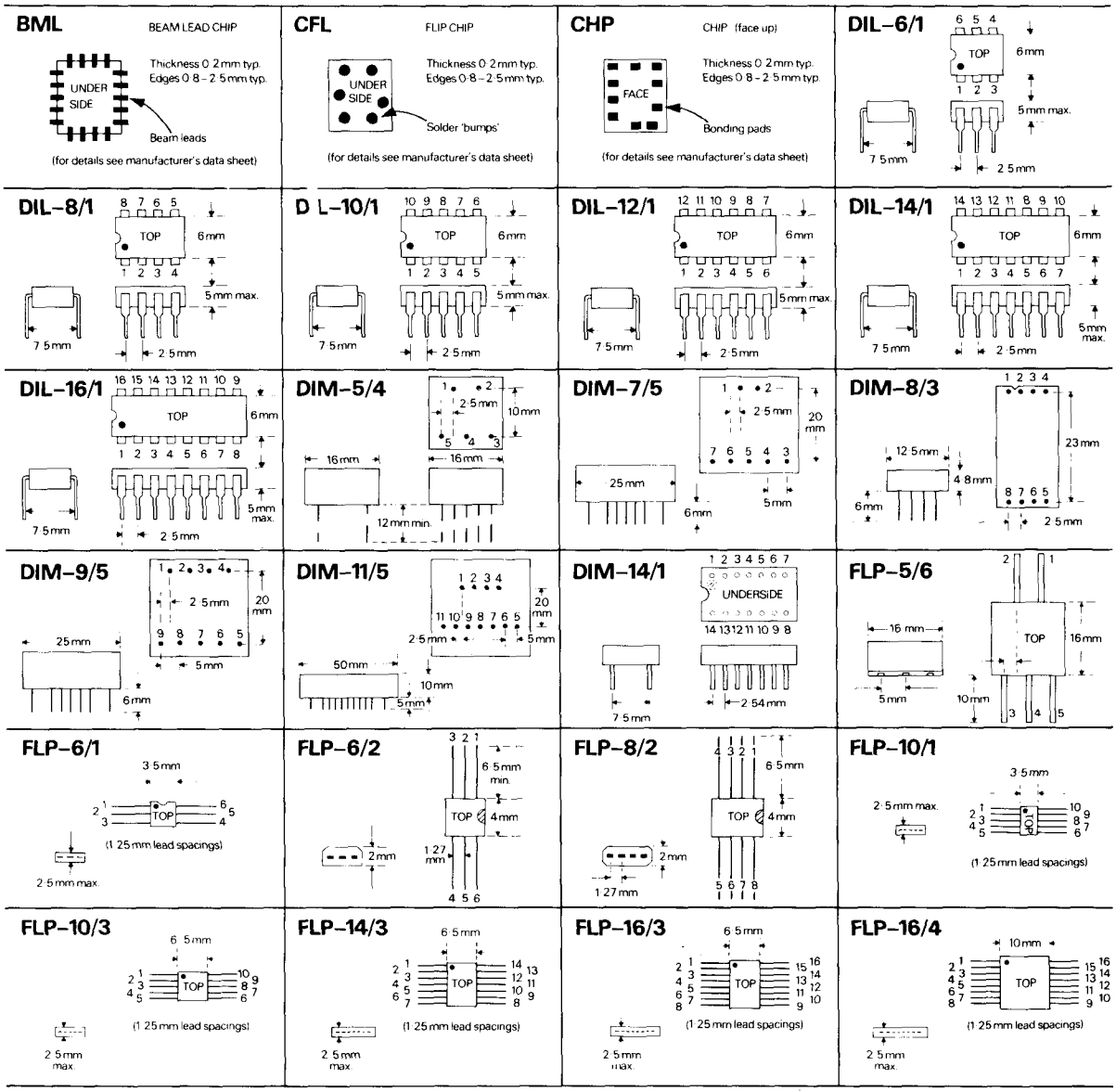
A = Gain adjust, 1
A* = Gain adjust, 2
B = Bias adjust or set
C = Case, package, screen
E+ = Input, non-inverting, low-level
E− = Input, inverting, low-level
F = Input frequency compensation, 1
F* = Input frequency compensation, 2
G = Ground, common, earth, zero volts
J+ = Input, non-inverting, high-level
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


HIL-12/1
HIL-14/1
MDL-6/1
MDL-8/2
MDL-10/3
MDL-14/4
MDL-16/5
SIH-10/1
SIL-7/1
TO3-5/2
TO3-8/2
TO3-10/2
TO5-6/1
TO5-6/2
TO5-8/1
TO5-8/2
TO5-8/3
TO5-8/4
TO5-10/1
TO5-10/2
TO5-12/1
TO5-12/2
TO8-12/1
TO8-12/2
TO8-16/1
TO8-16/2
TI8-4/2
T66-10/1
TOP
(2 mm lead spacings)
(2.5 mm lead spacings)


BML
BEAM LEAD CHIP
Thickness 0·2mm typ.
Edges 0·8 - 2·5mm typ.
UNDER SIDE
Beam leads
(for details see manufacturer's data sheet)
CFL
FLIP CHIP
Thickness 0·2mm typ.
Edges 0·8 - 2·5mm typ.
UNDER SIDE
Solder 'bumps'
(for details see manufacturer's data sheet)
CHP
CHIP (face up)
Thickness 0·2mm typ.
Edges 0·8 - 2·5mm typ.
FACE
Bonding pads
(for details see manufacturer's data sheet)
DIL-6/1
DIL-8/1
DIL-10/1
DIL-12/1
DIL-14/1
DIL-16/1
DIM-5/4
DIM-7/5
DIM-8/3
DIM-9/5
DIM-11/5
DIM-14/1
FLP-5/6
FLP-6/1
FLP-6/2
FLP-8/2
FLP-10/1
FLP-10/3
FLP-14/3
FLP-16/3
FLP-16/4
TOP
UNDERSIDE
6mm
5mm max.
7·5mm
2·5mm
(1·25mm lead spacings)
2·5mm max.