SEMICONDUCTOR PRODUCTS SHORTFORM

SGS ATES 1978/79

INTRODUCTION

This publication aims to provide condensed information on the vast range of standard devices currently produced by SGS-ATES.
For easy consultation the products have been divided into several sections according to the main product families and in some cases depending on the main applications sectors.
Each device is presented along with its essential electrical characteristics and the package outlines are shown in the last section of the booklet. If further information is required SGS-ATES can provide individual data sheets for all the devices on request.
All the data sheets for the individual devices are collected in "databooks" organized according to product families. These can be acquired through SGS-ATES sales network.

ALPHA-NUMERICAL INDEX

ALPHA-NUMERICAL INDEX (continued)

ALPHA-NUMERICAL INDEX (continued)

ALPHA-NUMERICAL INDEX (continued)

ALPHA-NUMERICAL INDEX (continued)

ALPHA-NUMERICAL INDEX (continued)

ALPHA-NUMERICAL INDEX (continued)

ALPHA-NUMERICAL INDEX (continued)

ALPHA-NUMERICAL INDEX (continued)

SMALL SIGNAL PROFESSIONAL SILICON TRANSISTORS

SGS ATES

PROFESSIONAL TRANSISTORS

General purpose amplifiers

TYPE	POLARITY	LV_{CEO} (V)	I_C RANGE (mA)	h_{FE} min/typ	and V_{CEsat} (V)	@ I_C (mA)	NF (dB)	f_T (MHz)	C_{ob} (pF)	t_{on} (ns)	t_{off} (ns)	PACKAGE
BCY 58	NPN	32	0.1-200	80/520	0.12	10	2	200	3.5	85	480	TO-18
BCY 59	NPN	45	0.1-200	80/360	0.12	10	2	200	3.5	85	480	TO-18
BCY 70	PNP	40	0.01-100	50/150	0.14	10	6	400	2	48	320	TO-18
BCY 71	PNP	45	0.01-100	100/200	0.14	10	2	350	2	–	–	TO-18
BCY 72	PNP	25	0.01-100	50/150	0.14	10	6	350	2	48	320	TO-18
BCY 77	PNP	60	0.01-200	80/260	0.12	10	2	180	4.5	85	480	TO-18
BCY 78	PNP	32	0.01-200	80/520	0.12	10	2	180	4.5	85	480	TO-18
BCY 79	PNP	45	0.01-200	80/360	0.12	10	2	180	4.5	85	480	TO-18
BFR 16	NPN	60	0.01-10	150/350	0.15	1	1.5	100	3.5	–	–	TO-18
BFR 17	NPN	60	0.01-10	450/530	0.15	1	1.5	100	3.5	–	–	TO-18
BFR 18	NPN	55	0.1-500	60/90	0.13	150	2	90	12	–	–	TO-18
BFR 19	NPN	35	0.1-1000	40/80	0.13	150	2	100	12.5	–	–	TO-39
BFR 20	NPN	35	0.1-1000	90/250	0.13	150	–	90	13	130	450	TO-39
BFR 21	NPN	70	0.1-1000	40/70	0.13	150	–	90	13	130	450	TO-39
BFW 43	PNP	150	0.01-50	40/100	0.1	10	–	50	5	–	–	TO-18
BFW 44	PNP	150	0.01-50	40/100	0.1	10	–	50	5	–	–	TO-39
BFX 38	PNP	55	0.1-1000	60/120	0.3	500	–	150	15	33	–	TO-39
BFX 39	PNP	55	0.1-1000	25/65	0.3	500	–	150	15	33	–	TO-39
BFX 40	PNP	75	0.1-1000	60/120	0.3	500	–	150	15	33	–	TO-39
BFX 41	PNP	75	0.1-1000	25/65	0.3	500	–	150	15	33	–	TO-39
BFX 68	NPN	50	0.01-500	100/130	0.5	150	3.5	100	18	–	–	TO-39
BFX 69	NPN	30	0.01-500	40/80	0.6	150	6	80	18	–	–	TO-39
BFX 69A	NPN	40	0.01-500	40/90	0.4	150	3.5	84	13	–	–	TO-39
BFX 74	PNP	35	0.1-500	30/45	1	150	–	90	31	–	–	TO-39
BFX 74A	PNP	60	0.1-500	30/50	0.2	150	–	150	15	–	–	TO-39
BFX 90	PNP	180	0.01-10	80/200	0.1	10	1	60	5	–	–	TO-18
BFX 91	PNP	180	0.01-10	80/200	0.1	10	1	60	5	–	–	TO-39
BFY 50	NPN	35	0.1-1000	30/55	0.14	150	–	100	7	55	–	TO-39
BFY 51	NPN	30	0.1-1000	40/70	0.14	150	–	110	7	55	–	TO-39
BFY 52	NPN	20	0.1-1000	60/130	0.14	150	–	120	7	55	–	TO-39
BFY 56	NPN	45	0.1-1000	30/70	0.13	150	–	90	14	150	350	TO-39
BFY 56A	NPN	55	0.1-1000	40/80	0.13	150	–	90	14	150	350	TO-39
BFY 64	PNP	40	0.01-500	60/130	0.18	150	1	250	6	35	70	TO-39
BSV 15	PNP	40	0.1-1000	25/55	0.5	500	–	50	20	500	650	TO-39
BSV 16	PNP	60	0.1-1000	25/55	0.5	500	–	50	20	500	650	TO-39
BSX 45	NPN	40	0.1-1000	25/40	0.5	500	–	50	15	200	850	TO-39
BSX 46	NPN	60	0.1-1000	25/40	0.5	500	–	50	15	200	850	TO-39
BSY 51	NPN	25	0.1-500	40/80	0.15	150	6	80	10	–	–	TO-39
BSY 52	NPN	25	0.1-500	100/200	0.15	150	6	150	10	–	–	TO-39
BSY 54	NPN	30	0.1-500	100/200	0.15	150	3	150	10	–	–	TO-39
BSY 56	NPN	80	0.1-500	100/200	0.2	150	6	100	10	–	–	TO-39

PROFESSIONAL TRANSISTORS (continued)

High frequency amplifiers

TYPE	POLARITY	LV_{CEO} (V)	PG (dB)	NF (dB)	f (MHz)	h_{FE} min/typ	I_C (mA)	I_{CBO} max (nA)	f_T (MHz)	C_{ob} (pF)	C_{re} (pF)	PACKAGE
			and		@		@					
BFR 10	NPN	40	–	–	–	60/90	150	–	350	5	–	TO-39
BFR 11	NPN	40	–	–	–	60/90	150	–	350	5	–	TO-18
BFR 36	NPN	30	6.5	–	800	40/95	150	–	1400	3.1	2.1	TO-39
BFR 37	NPN	30	14	5	500	80/150	10	–	1400	–	0.22	TO-72 (1)
BFR 38	PNP	35	14	3.5	800	25/50	3	50	1000	–	0.3	TO-72
BFR 90	NPN	15	19.5	2.5	500	25/50	14	50	5000	0.5	0.4	T pl. (1)
BFR 90A	NPN	15	13.5	2.2	1000	40/80	5	100	5000	–	0.4	T pl. (1)
BFR 90H	NPN	15	12	2.4	1000	25/50	14	100	5000	–	0.4	T pl. (2)
BFR 91*	NPN	12	16.5	2	500	25/50	30	50	5000	0.7	0.8	T pl. (1)
BFR 96*	NPN	15	16	3.3	500	25/52	75	100	5000	1.3	1.4	T pl. (1)
BFR 97/2N 3866	NPN	30	10	–	400	10/100	50	–	1000	3	–	TO-39
BFR 98/2N 4427	NPN	20	–	–	–	10/100	100	–	1000	4	–	TO-39
BFR 99	PNP	25	10	4	800	25/80	10	50	2300	1.1	0.4	TO-72
BFT 95	PNP	15	–	2	1000	80 typ	5	100	5000	–	0.6	T pl. (1)
BFT 95H	PNP	15	–	2	1000	80 typ	5	100	5000	–	0.6	T pl. (2)
BFT 96	PNP	15	10	4	1000	30/80	50	100	5000	–	1	T pl. (1)
BFW 16A	NPN	25	16	5	200	25 min	150	20	1200	4	1.7	TO-39
BFW 17A	NPN	25	16	6	200	25 min	150	20	1100	4	1.7	TO-39
BFW 63	NPN	30	35	3	60	25/70	4	–	600	1.35	0.2	TO-72 (1)
BFW 64	NPN	30	21	5	200	30/70	4	–	650	–	0.2	TO-72 (1)
BFW 68	NPN	40	–	5.8	100	50/120	10	10	400	3	–	TO-18
BFW 70	NPN	30	35	2.6	60	30/75	10	–	900	–	0.22	TO-72 (1)
BFW 92	NPN	15	16	4	500	20/50	25	50	1600	0.7	0.6	T pl. (1)
BFW 94	NPN	20	12	–	500	30/80	50	–	3000	–	1.5	4-lead pl.
BFX 17	NPN	40	6.5	–	150	20/50	500	–	400	6	–	TO-39
BFX 18	NPN	30	33	2.5	60	25/80	4	50	550	–	0.4	TO-72
BFX 19	NPN	30	20	3.5	200	20/75	2.5	50	550	–	0.4	TO-72
BFX 20	NPN	30	16	5.5	450	20/75	2.5	50	550	–	0.4	TO-72
BFX 21	NPN	30	10	7	800	20/70	2.5	50	550	–	0.4	TO-72
BFX 31	NPN	30	33	2.3	60	25/80	4	50	500	–	0.4	TO-72
BFX 48	PNP	30	–	3.5	100	90/160	10	–	550	2.2	–	TO-18
BFX 73	NPN	15	18	6	200	20/50	3	10	900	1	–	TO-72
BFX 89	NPN	15	7	7	800	20 min	25	10	1200	1.7	0.6	TO-72
BFY 72	NPN	28	–	–	–	40/100	150	–	350	5	–	TO-39
BFY 74	NPN	45	–	–	–	40/75	10	10	360	3	–	TO-18
BFY 75	NPN	45	–	–	–	65/114	10	10	360	3	–	TO-18
BFY 90	NPN	15	8	5.5	800	20 min	25	10	1400	1.5	0.6	TO-72
BSX 93	NPN	15	–	–	–	20/70	100	–	650	2.5	–	TO-18

* Coming soon

PROFESSIONAL TRANSISTORS (continued)

Low-level low-noise amplifiers

TYPE	POLARITY	LV_{CEO} (V)	NF (dB)	h_{FE} min/typ	and V_{CEsat} (V)	@ I_C (mA)	I_C RANGE (mA)	f_T (MHz)	C_{ob} (pF)	PACKAGE
BCY 58	NPN	32	2	80/520	0.12	10	0.1-200	200	3.5	TO-18
BCY 59	NPN	45	2	80/360	0.12	10	0.1-200	200	3.5	TO-18
BCY 77	PNP	60	2	80/260	0.12	10	0.01-200	180	4.5	TO-18
BCY 78	PNP	32	2	80/360	0.12	10	0.01-200	180	4.5	TO-18
BCY 79	PNP	45	2	80/360	0.12	10	0.01-200	180	4.5	TO-18
BFR 16	NPN	60	1	150/350	0.15	1	0.01-10	100	3.5	TO-18
BFR 17	NPN	60	1	450/530	0.15	1	0.01-10	100	3.5	TO-18
BFX 31	NPN	30	2.3	20/75	–	2.5	0.1-50	500	–	TO-18
BFX 37	PNP	80	1	125/200	0.1	10	0.001-10	70	4.5	TO-18
BFY 76	NPN	60	1.5	150/190	0.15	1	0.01-5	100	3.5	TO-18

High voltage transistors

TYPE	POLARITY	LV_{CEO} (V)	h_{FE} min/typ	@ I_C (mA)	I_C RANGE (mA)	I_{CBO} max (nA)	f_T (MHz)	C_{ob} (pF)	PACKAGE
BFS 89	NPN	300	25/80	50	0.1-100	50	90	3.5	TO-39
BFW 43	PNP	150	40/100	10	0.01-50	10	50	5	TO-18
BFW 44	PNP	150	40/100	10	0.01-50	10	50	5	TO-39
BFX 90	PNP	180	80/200	10	0.01-50	10	60	5	TO-18
BFX 91	PNP	180	80/200	10	0.01-50	10	60	5	TO-39

PROFESSIONAL TRANSISTORS (continued)

Fast and ultra fast switches

TYPE	POLARITY	LV_{CEO} (V)	τ_S (ns)	t_{on} (ns)	t_{off} (ns)	h_{FE} min/typ	and V_{CEsat} (V)	@ I_C (mA)	I_C RANGE (mA)	PACKAGE
BFR 10	NPN	40	–	14	80	40/65	0.4	500	0.1-500	TO-39
BFR 11	NPN	40	–	14	80	40/65	0.4	500	0.1-500	TO-18
BFX 94A	NPN	30	–	14	80	35/62	0.4	500	0.1-500	TO-18
BFX 95A	NPN	30	–	14	80	75/125	0.4	500	0.1-500	TO-18
BFX 96A	NPN	30	–	14	80	35/62	0.4	500	0.1-500	TO-39
BFX 97A	NPN	30	–	14	80	75/125	0.4	500	0.1-500	TO-39
BSS 26	NPN	40	–	15	40	25/45	0.3	500	10-1000	TO-18
BSV 15	PNP	40	500	500	650	25/55	0.5	500	0.1-1000	TO-39
BSV 16	PNP	60	500	500	650	25/55	0.5	500	0.1-1000	TO-39
BSV 59	NPN	30	–	18	25	20/50	0.48	500	10-500	TO-18
BSV 77	NPN	40	–	15	40	30/50	0.35	500	10-1000	TO-39
BSV 89	NPN	10	13	12	18	25/45	0.3	100	10-100	TO-18
BSV 90	NPN	13.5	13	12	18	25/55	0.3	100	1-100	TO-18
BSV 91	NPN	15	13	12	18	25/45	0.35	100	10-100	TO-18
BSV 92	NPN	15	13	12	18	25/60	0.3	100	1-100	TO-18
BSV 95	NPN	50	–	15	40	20/50	0.35	500	10-1000	TO-39
BSX 12	NPN	12	13	10	15	30/60	0.24	300	10-1000	TO-39
BSX 19	NPN	15	5	7	12	20/60	0.3	10	0.1-100	TO-18
BSX 20	NPN	15	6	7	15	40/120	0.3	10	0.1-100	TO-18
BSX 26	NPN	15	8	9	15	25/55	0.18	100	1-500	TO-18
BSX 27	NPN	6	3	12	12	25/80	0.19	10	1-30	TO-18
BSX 28	NPN	12	6.5	9	13	12/50	0.3	100	0.1-100	TO-18
BSX 29	PNP	12	–	25	35	20/40	0.25	100	1-100	TO-18
BSX 30	NPN	30	–	22	22	30/63	0.23	150	10-500	TO-39
BSX 32	NPN	40	–	22	40	20/60	0.6	1000	1-1000	TO-39
BSX 36	PNP	40	–	17	70	30/85	0.18	150	0.01-500	TO-18
BSX 39	NPN	20	8	9	15	15/40	0.39	300	10-500	TO-18
BSX 45	NPN	40	–	2000	850	25/40	0.5	500	0.1-1000	TO-39
BSX 46	NPN	60	–	200	850	25/40	0.5	500	0.1-1000	TO-39
BSX 87	NPN	15	13	25	25	30/55	0.15	10	1-500	TO-18
BSX 87A	NPN	15	8	9	15	30/65	0.17	30	1-500	TO-18
BSX 88	NPN	15	25	40	75	30/45	0.2	10	0.5-100	TO-18
BSX 88A	NPN	20	10	18	50	35/55	0.15	100	0.5-100	TO-18
BSX 93	NPN	15	6	9	13	40/80	0.15	10	0.1-100	TO-18

PROFESSIONAL TRANSISTORS (continued)

General purpose switches

TYPE	POLARITY	LV_{CEO} (V)	τ_s (ns)	t_{on} (ns)	t_{off} (ns)	h_{FE} min/typ	and V_{CEsat} (V)	@ I_C (mA)	I_C RANGE (mA)	PACKAGE
BFR 20	NPN	35	–	130	450	90/250	0.13	150	0.1-1000	TO-39
BFR 21	NPN	70	–	130	450	40/70	0.13	150	0.1-1000	TO-39
BFW 68	NPN	40	–	30	240	50/120	0.09	10	0.1-50	TO-18
BFX 38	PNP	55	160	33	–	60/120	0.3	500	0.1-1000	TO-39
BFX 39	PNP	55	160	33	–	25/65	0.3	500	0.1-1000	TO-39
BFX 40	PNP	75	160	33	–	60/120	0.3	500	0.1-1000	TO-39
BFX 41	PNP	75	160	33	–	25/65	0.3	500	0.1-1000	TO-39
BFX 48	PNP	30	–	20	95	90/160	0.1	10	0.01-50	TO-18
BFX 94	NPN	30	80	30	120	40/70	0.2	150	0.1-800	TO-18
BFX 94A	NPN	30	70	20	100	40/75	0.14	150	0.1-800	TO-18
BFX 95	NPN	30	80	30	120	100/160	0.2	150	0.1-800	TO-18
BFX 95A	NPN	30	70	20	100	100/220	0.14	150	0.1-800	TO-18
BFX 96	NPN	30	80	30	120	40/70	0.2	150	0.1-800	TO-39
BFX 96A	NPN	30	70	20	100	40/75	0.14	150	0.1-800	TO-39
BFX 97	NPN	30	80	30	120	100/160	0.2	150	0.1-800	TO-39
BFX 97A	NPN	30	70	20	100	100/220	0.14	150	0.1-800	TO-39
BFY 50	NPN	35	140	55	–	30/55	0.14	150	0.1-1000	TO-39
BFY 51	NPN	30	160	55	–	40/70	0.14	150	0.1-1000	TO-39
BFY 52	NPN	20	220	55	–	60/130	0.14	150	0.1-1000	TO-39
BFY 56	NPN	45	–	150	350	30/70	0.13	150	0.1-1000	TO-39
BFY 56A	NPN	55	–	150	350	40/80	0.13	150	0.1-1000	TO-39
BFY 64	PNP	40	–	35	70	50/130	0.18	150	0.01-500	TO-39
BFY 72	NPN	28	–	14	80	15/90	0.4	500	0.1-500	TO-39
BSS 15/2N 5320	NPN	75	–	80	800	30/80	0.5	500	0.1-2000	TO-39
BSS 16/2N 5321	NPN	50	–	80	800	40/145	0.8	500	0.1-2000	TO-39
BSS 17/2N 5322	PNP	75	–	100	1000	30/80	0.7	500	0.1-2000	TO-39
BSS 18/2N 5323	PNP	50	–	100	1000	40/145	1.2	500	0.1-2000	TO-39
BSX 33	NPN	55	–	120	350	40/80	0.15	150	0.1-1000	TO-18

SPECIAL ASSEMBLIES

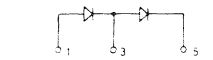
SPECIAL ASSEMBLIES

Silicon diode assemblies

(Characteristics of each diode: V_F= 1V max @ I_F= 100 mA; BV= 60V min; C_o= 3 pF max)

TYPE	t_{rr} max (ns) @I_F=I_R=10 to 200 mA	CONNECTION	PACKAGE
BAX 45	25	A	TO-77
BAX 46	25	B	TO-72 (2)
BAX 47	25	C	TO-77
BAX 48	25	D	TO-72 (2)
BAX 49	25	E	TO-96
BAX 50	25	F	TO-96
BAX 51	25	G	TO-96
BAX 52	25	H	TO-12
BAX 53	25	H	TO-72 (2)
BAX 54	25	I	TO-12
BAX 55	25	I	TO-72 (2)
BAX 56	4	J	TO-77
BAX 57	4	J •	TO-77
BAX 58	4	K	TO-72 (2)
BAX 59	4	K •	TO-72 (2)
BAX 60	4	L	TO-77
BAX 61	4	L •	TO-77
BAX 62	4	M	TO-72 (2)
BAX 63	4	M •	TO-72 (2)
BAX 64	4	N •	TO-77
BAX 65	4	N	TO-77
BAX 66	4	O •	TO-77
BAX 67	4	O	TO-77
BAX 68	4	P •	TO-77
BAX 69	4	P	TO-77
BAX 70	4	Q •	TO-77
BAX 71	4	Q	TO-77
BAX 72	4	R •	TO-96
BAX 73	4	R	TO-96

CIRCUIT CONNECTION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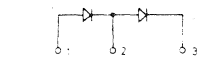
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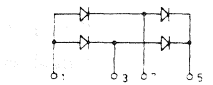
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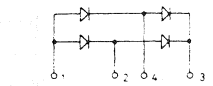
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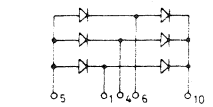
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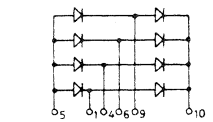
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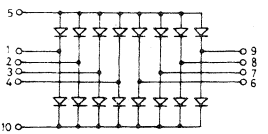
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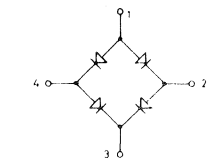
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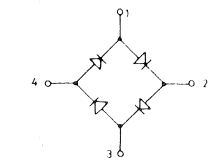
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CIRCUIT CONNECTION


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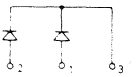
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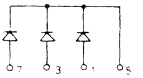
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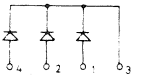
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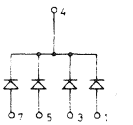
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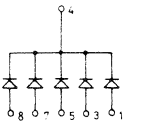
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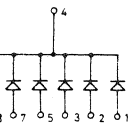
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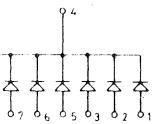
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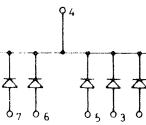

R

• With inverted diodes

SPECIAL ASSEMBLIES (continued)

Silicon differential amplifiers

TYPE	POLARITY	P_D max (W)	LV_{CEO} min (V)	I_C RANGE (mA)	h_{FE} min/max	and V_{CEsat} max (V)	@ I_C (mA)	NF max (dB)	f_T min (MHz)	C_{ob} max (pF)	h_{FE1}/h_{FE2} max (%)	$V_{BE1}-V_{BE2}$ max (mV)	PACKAGE
BFX 11	PNP	0.5	45	0.001-400	80	0.25	50	5	130	8	25	5	TO-39(4)
BFX 15	NPN	0.6	40	0.01-100	90	–	10	–	50	15	10	5	TO-39(4)
BFX 16	NPN	0.5	45	0.001-30	200	0.35	1	3	60	6	10	5	TO-96
BFX 36	PNP	0.6	60	0.001-50	100/300	–	0.01	3	40	6	10	3	TO-39(4)
BFX 70	NPN	0.6	60	0.01-100	50/150	–	10	8	60	15	10	5	TO-39(4)
BFX 71	NPN	0.6	60	0.01-100	50/200	–	10	–	50	15	25	15	TO-39(4)
BFX 72	NPN	0.6	60	0.01-100	50/200	–	10	–	50	15	10	5	TO-39(4)
BFX 99	NPN	0.6	60	0.01-100	50/150	–	10	8	60	15	10	0.5	TO-39(4)
BFY 81	NPN	0.5	45	0.001-20	150	0.35	1	4	60	6	25	10	TO-39(4)
BFY 82	NPN	0.5	45	0.01-30	50	1	10	–	250	3.5	25	15	TO-39(4)
BFY 83	NPN	0.6	60	0.01-100	50	0.4	10	8	50	15	25	15	TO-39(4)
BFY 84	NPN	0.38	12	0.01-100	20	–	3	6	600	1.7	25	15	TO-39(4)
2N 2060	NPN	0.6	60	0.01-100	50/150	1.2	50	8	60	15	10	5	TO-39(3)
2N 2060A	NPN	0.6	60	0.01-100	50/150	0.6	50	8	60	15	10	3	TO-39(3)
2N 2223	NPN	0.6	60	0.01-100	50/200	1.2	50	8	50	15	20	15	TO-39(3)
2N 2223A	NPN	0.6	60	0.01-100	50/200	1.2	50	8	50	15	10	5	TO-39(3)
2N 2453	NPN	0.2	30	0.001-10	400 typ.	1	5	7	150	8	15	5	TO-39(3)
2N 2639	NPN	0.6	45	0.01-10	50/300	–	0.01	4	80	8	10	5	TO-39(3)
2N 2642	NPN	0.6	45	0.01-10	100/300	–	0.01	4	80	8	10	5	TO-39(3)
2N 2643	NPN	0.6	45	0.01-10	100/300	–	0.01	4	80	8	20	10	TO-39(3)
2N 2903	NPN	0.3	30	0.001-10	125/625	–	1	7	150	8	20	10	TO-39(3)
2N 2903A	NPN	0.3	30	0.001-10	125/625	–	1	7	150	8	10	5	TO-39(3)
2N 2915	NPN	0.6	45	0.001-20	150	0.35	1	4	60	6	10	3	TO-39(3)
2N 2916	NPN	0.5	45	0.001-20	300	0.35	1	3	60	6	10	3	TO-39(3)
2N 2917	NPN	0.6	45	0.001-20	150	0.35	1	4	60	6	20	5	TO-39(3)
2N 2918	NPN	0.6	45	0.001-20	150	0.35	1	3	60	6	20	5	TO-39(3)
2N 2919	NPN	0.6	60	0.001-20	150	0.35	1	4	60	6	10	3	TO-39(3)
2N 2920	NPN	0.5	60	0.001-30	300	0.35	1	3	60	6	10	3	TO-39(4)
2N 2920A	NPN	0.5	60	0.001-30	300	0.35	1	3	60	6	20	1.5	TO-39(4)
2N 3409	NPN	0.6	30	0.001-100	50/200	0.15	10	4	250	8	25	10	TO-39(4)
2N 3410	NPN	0.6	30	0.01-100	50/200	0.15	10	4	250	8	10	10	TO-39(4)
2N 3411	NPN	0.6	30	0.01-100	50/200	0.15	10	4	250	8	10	5	TO-39(4)
2N 3423	NPN	0.6	15	0.01-100	20/200	–	3	3.5•	600	1.7	20	10	TO-39(3)
2N 3424	NPN	0.6	15	0.01-100	20/200	–	3	3.5•	600	1.7	10	5	TO-39(3)
2N 3680	NPN	0.3	50	0.001-10	150/800	0.1	1	3	60	6	15	3	TO-39(3)
2N 3726	PNP	0.5	45	0.001-300	115	0.25	50	4	200	8	10	5	TO-39(4)
2N 4015	PNP	0.5	60	0.001-20	115	0.25	50	4	135	8	10	5	TO-39(4)

• Typical value

SPECIAL ASSEMBLIES (continued)

Silicon differential amplifiers (continued)

TYPE	POLARITY	P_D max (W)	LV_{CEO} min (V)	I_C RANGE (mA)	h_{FE} min	and V_{CEsat} max (V)	@ I_C (mA)	NF max (dB)	f_T min (MHz)	C_{ob} max (pF)	h_{FE1}/h_{FE2} max (%)	$V_{BE1}-V_{BE2}$ max (mV)	PACKAGE
2N 4020	PNP	0.6	45	0.001-100	200	0.25	10	2	50	6	25	5	TO-39 (4)
2N 4021	PNP	0.6	60	0.001-100	100	0.25	10	3	40	6	25	5	TO-39 (4)
2N 4022	PNP	0.6	60	0.001-100	200	0.25	10	2	50	6	25	5	TO-39 (4)
2N 4023	PNP	0.6	45	0.001-100	200	0.25	10	2	50	6	10	3	TO-39 (4)
2N 4024	PNP	0.6	60	0.001-100	100	0.25	10	3	40	6	10	3	TO-39 (4)
2N 4025	PNP	0.6	60	0.001-100	200	0.25	10	2	50	6	10	3	TO-39 (4)

Silicon dual NPN/PNP amplifiers

TYPE	P_D max (W)	LV_{CEO} min (V)	I_C RANGE (mA)	h_{FE} min	and V_{CEsat} max (V)	@ I_C (mA)	NF max (dB)	f_T min (MHz)	C_{ob} max (pF)	t_{on} max (ns)	t_{off} max (ns)	PACKAGE
BFX 79	0.6	60	0.01-500	60	0.25	150	3*	60	20	–	–	TO-39 (4)
BFX 80	0.5	60	0.001-50	160	0.35	1	4	40	6	–	–	TO-39 (4)
BFX 81	0.5	20	1-200	40	0.20	30	–	350	6	60	90	TO-39 (4)

* Typical value

SPECIAL ASSEMBLIES (continued)

Silicon darlington amplifiers

TYPE	POLARITY	P_D max (W)	LV_{CEO} min (V)	I_C RANGE (mA)	h_{FE} min	and V_{CEsat} (V)	@ I_C (mA)	NF max (dB)	C_{ob} max (pF)	PACKAGE
BFX 66	NPN	0.5	60	0.1-150	2000	1.3	100	6	30	TO-72 (3)
BFX 67	NPN	0.5	60	0.01-200	7000	1.6	100	–	20	TO-72 (3)
2N 997	NPN	0.5	40	0.01-200	7000	1.6	100	–	–	TO-18
2N 998	NPN	0.5	60	0.5-200	5000*	1.2	50	6	30	TO-72 (3)
2N 999	NPN	0.5	60	0.01-200	7000	1.6	100	–	20	TO-72 (3)

* Typical value

Silicon transistor arrays

TYPE	POLARITY	P_D max (W)	LV_{CEO} min (V)	I_C RANGE (mA)	h_{FE} min	@ I_C (mA)	V_{CEsat} max (V)	@ I_C (mA)	t_{on} max (ns)	t_{off} max (ns)	PACKAGE
BGY 15	NPN	0.8	40	0.1-100	80	50	0.25	10	150	900	DIP K
BGY 16	PNP	0.8	40	0.1-100	80	50	0.25	10	150	900	DIP K
BSW 17	NPN	0.8	120	0.01-100	30	30	0.6	10	–	–	DIP H

Quad silicon transistors

TYPE	POLARITY	P_D max (W)	LV_{CEO} min (V)	I_C RANGE (mA)	h_{FE} min	and V_{CEsat} max (V)	@ I_C (mA)	NF max (dB)	f_T min (MHz)	PACKAGE
BGY 17	NPN	1	40	1-700	25	0.45	500	–	250	DIP H
SPQ 918	NPN	0.9	15	0.01-30	50*	0.4	10	6	600	DIP H
SPQ 2483	NPN	0.9	40	0.01-30	150	0.5	10	3*	50	DIP H
SPQ 2484	NPN	0.9	40	0.01-30	300	0.5	10	2*	50	DIP H
SPQ 6001	NPN/PNP	1.25	30	0.1-400	20	1.4	300	–	200	DIP H
SPQ 6002	NPN/PNP	1.25	30	0.1-400	30	1.4	300	–	200	DIP H
SPQ 6501	NPN/PNP	1.25	30	0.1-400	20	1.4	300	–	200	DIP H
SPQ 6502	NPN/PNP	1.25	30	0.1-400	30	1.4	300	–	200	DIP H

* Typical value

Silicon reference diodes

TYPE	V_Z typ (V)	and DYNAMIC Z_Z (Ω)	@ I_Z (μA)	TEMPERATURE COEFF. (%/°C)	T_{op} (°C)	I_R (nA)	@ V_R (V)	PACKAGE
BZX 43	6.7	750	100	± 0.001	0-100	100	5	TO-18 (2)
BZX 44	6.7	750	100	± 0.002	0-100	100	5	TO-18 (2)
BZX 45	6.7	750	100	± 0.005	0-100	100	5	TO-18 (2)

SMALL SIGNAL CONSUMER SILICON TRANSISTORS

SGS ATES

CONSUMER TRANSISTORS

RF amplifiers-mixer/oscillators

TYPE	POLARITY	DESCRIPTION	V_{CEO} (V)	V_{EBO} (V)	h_{FE} typ @	I_C (mA)	PG (dB)	and @ NF (dB)	f (MHz)	P_D (mW) @ T_a = 25°C	f_T (MHz)	PACKAGE
BF 155	NPN	UHF amp oscillator and mixer	40	3	70	2.5	10	7	800	200	600	TO-72
BF 161	NPN	UHF mixer oscillator	50	5	60	3	12	6.5	800	175	550	TO-72
BF 166	NPN	VHF AGC amplifier	40	3	50	2.5	18	3	200	175	500	TO-72
BF 222	NPN	Amp conv. for radio FM tuners	40	4	60	2	20	5	100	175	400	TO-72
BF 251	NPN	VHF AGC amplifier	30	4	80	4	33	3	36	150	600	TO-72(1)
BF 252	NPN	VHF AGC amplifier	30	4	30*	2	19	–	100	–	–	TO-72(1)
BF 287	NPN	AM-mixer-oscill. and AM-FM amp	40	4	60	2	22	–	10.7	250	700	TO-72(1)
BF 324	PNP	Amplifier for FM tuners	35	4	50	4	–	3	100	250	500	TO-92
BF 414	PNP	VHF/FM low noise input stage	30	4	80	1	–	2	100	–	400	TO-92
BF 516	PNP	VHF-UHF amplifier	35	3	50	3	19	2.5	200	200	850	TO-72

* minimum value

TV TUNERS - amplifiers-mixer/oscillators

TYPE	POLARITY	DESCRIPTION	V_{CEO} (V)	V_{EBO} (V)	h_{FE} typ @	I_C (mA)	PG (dB)	and @ NF (dB)	f (MHz)	P_D (mW) @ T_a = 25°C	f_T (MHz)	PACKAGE
BF 272A	PNP	UHF-VHF AGC amplifier	35	3	50	3	15	3.5	800	200	850	TO-72
BF 272S	PNP	Low-noise VHF-UHF amplifier	35	3	50	3	16	3	800	200	900	TO-72
BF 316A	PNP	UHF-mixer and oscillator	35	3	50	3	12	5	800	200	600	TO-72
BF 479	PNP	Low-noise VHF-UHF amplifier	25	3	50	10	18	3.5	800	170	1400	T pl.
BF 479S	PNP	Amp for PIN diode tuner	25	3	50	8	15	3.5	800	170	1300	T pl.
BF 506	PNP	VHF mixer and oscillator	35	4	40	3	17	2.5	200	250	400	TO-92
BF 509	PNP	VHF AGC amplifier	35	4	70	3	18	2	200	250	700	TO-92
BF 679	PNP	UHF-VHF AGC amplifier	35	3	60	3	15	3.5	800	170	1000	T pl.
BF 679M	PNP	UHF mixer and oscillator	35	3	60	3	15	4	800	170	1000	T pl.
BF 679S	PNP	UHF-VHF AGC amplifier	35	3	60	3	16	3	800	170	1000	T pl.
BF 680	PNP	UHF mixer and oscillator	35	3	50	3	12	5	800	170	650	T pl.
BF 680A	PNP	UHF mixer and oscillator	35	3	60	3	12	5	800	170	700	T pl.

CONSUMER TRANSISTORS (continued)

IF amplifiers

TYPE	POLARITY	DESCRIPTION	V_{CEO} (V)	V_{EBO} (V)	h_{FE} typ @	I_C (mA)	PG (dB)	and @ NF (dB)	f (MHz)	P_D (mW) @T_a = 25°C	f_T (MHz)	PACKAGE
BF 167	NPN	AGC-IF amplifier for TV	30	4	45	4	28	3	36	150	600	TO-72 (1)
BF 173	NPN	IF vision amp-output stage	25	4	70	7	26	–	36.4	175	1000	TO-72 (1)
BF 251	NPN	AGC-IF amplifier	30	4	80	4	33	3	36	150	600	TO-72 (1)
BF 271	NPN	IF vision amp-output stage	25	4	75	10	27	–	36	250	900	TO-72 (1)
BF 288	NPN	Gain control. AM-FM IF amp	40	4	90	1	45	–	0.47	250	500	TO-72 (1)

Audio preamplifiers/drivers

TYPE	POLARITY	DESCRIPTION	V_{CBO} (V)	h_{FE} min/max	@ I_C (mA)	V_{CEsat} (mV)	@ I_C (mA)	I_C RANGE (mA)	h_{FE} max/min RATIO	I_C max (mA)	P_D (mW) @T_a = 25°C	PACKAGE
BC 107	NPN	Audio driver	50	110/450	2	70	10	0.01-100	2	100	300	TO-18
BC 108	NPN	Low voltage	30	110/800	2	70	10	0.01-100	2	100	300	TO-18
BC 109	NPN	Low noise Hi-Fi	30	200/800	2	70	10	0.01-100	2	100	300	TO-18
BC 177	PNP	General purpose	50	30 min.	0.01	75	10	0.1-200	–	200	300	TO-18
BC 178	PNP	General purpose	30	30 min.	0.01	75	10	0.1-200	–	200	300	TO-18
BC 179	PNP	Low noise	25	30 min.	0.01	75	10	0.1-200	–	200	300	TO-18
BC 297	PNP	Audio driver	50	75/260	100	700	500	0.1-1000	1.4	1000	375	TO-18
BC 298	PNP	Audio driver	30	75/260	100	700	500	0.1-1000	1.4	1000	375	TO-18
BC 377	NPN	Audio driver	50	75/260	100	700	500	0.1-1000	1.4	1000	375	TO-18
BC 378	NPN	Audio driver	30	75/260	100	700	500	0.1-1000	1.4	1000	375	TO-18
BC 477	PNP	High volt.-low level	90	70/250	2	100	10	2-100	2	150	360	TO-18
BC 478	PNP	Low level, low noise	50	110/450	2	100	10	0.01-100	2	150	360	TO-18
BC 479	PNP	Low level, low noise	40	220/450	2	100	10	0.01-100	2	150	360	TO-18

CONSUMER TRANSISTORS (continued)

High voltage amplifiers

TYPE	POLARITY	DESCRIPTION	V_{CEO} (V)	V_{CBO} (V)	I_C max (mA)	C_{obo} (C_{rel}) (pF)	h_{FE} typ	@ I_C (mA)	P_D (W) @T_a = 25°C	PACKAGE
BC 300	NPN	Audio driver	80	120	1000	(10)	140	5	0.85	TO-39
BC 393	PNP	Video amplifier	180	180	100	4	150	10	0.4	TO-18
BC 394	NPN	Video amplifier	180	180	100	5	90	10	0.4	TO-18
BF 257	NPN	Video output	160	160	200	3	80	30	1	TO-39
BF 258	NPN	Video output	250	250	200	3	80	30	1	TO-39
BF 259	NPN	Video output	300	300	200	3	80	30	1	TO-39
BF 657	NPN	Video output*	160	160	200	3	80	30	1	TO-39
BF 658	NPN	Video output*	250	250	200	3	80	30	1	TO-39
BF 659	NPN	Video output*	300	300	200	3	80	30	1	TO-39

* $R_{th\ j\text{-}case} \leqslant 20°C/W$

Medium power audio amplifiers

TYPE	POLARITY	DESCRIPTION	V_{CBO} (V)	h_{FE} min/max	@ I_C (A)	V_{CEsat} (V)	@ I_C (A)	I_C RANGE (mA)	h_{FE} max/min RATIO	I_C max (A)	P_D (mW) @T_a = 25°C	PACKAGE
BC 119	NPN	Audio output	60	40/120	0.15	0.8	1	50-1000	–	1	800	TO-39
BC 120	NPN	Audio output	60	20	0.15	1.5	1	10-1000	–	1	800	TO-39
BC 139	PNP	Audio output	40	40/90	0.1	1	0.5	1-500	–	0.5	700	TO-39
BC 140	NPN	General purpose	60	40/250	0.1	0.6	1	0.1-1000	2.5	1	800	TO-39
BC 141	NPN	General purpose	80	40/250	0.1	0.6	1	0.1-1000	2.5	1	800	TO-39
BC 160	PNP	General purpose	60	40/250	0.1	0.6	1	0.1-1000	–	1	800	TO-39
BC 161	PNP	General purpose	80	40/250	0.1	0.6	1	0.1-1000	–	1	800	TO-39
BC 300	NPN	Audio driver	120	40/240	0.15	0.2	0.15	0.1-1000	–	1	850	TO-39
BC 301	NPN	Audio driver	90	40/240	0.15	0.2	0.15	0.1-1000	–	1	850	TO-39
BC 302	NPN	Audio driver	60	40/240	0.15	0.2	0.15	0.1-1000	–	1	850	TO-39
BC 303	PNP	Audio driver	85	40/240	0.15	0.25	0.15	0.1-1000	–	1	850	TO-39
BC 304	PNP	Audio driver	60	40/240	0.15	0.25	0.15	0.1-1000	–	1	850	TO-39
BC 440	NPN	General purpose	50	40/250	0.5	1	1	0.1-2000	1.4	2	1000	TO-39
BC 441	NPN	General purpose	75	40/250	0.5	1	1	0.1-2000	1.4	2	1000	TO-39
BC 460	PNP	General purpose	50	40/250	0.5	1	1	0.1-2000	1.4	2	1000	TO-39
BC 461	PNP	General purpose	75	40/250	0.5	1	1	0.1-2000	1.4	2	1000	TO-39

SILICON POWER TRANSISTORS

POWER TRANSISTORS

Hometaxial for linear and switching applications

	TYPE	POLARITY	V_{CBO} (V)	V_{CEO} (V)	I_C (A)	h_{FE} min/max	@ I_C (A)	V_{CEsat} max (V)	@ I_C (A)	P_D (W) @ T_C = 25°C	PACKAGE
*	BD 142	NPN	50	45	15	12/60	4	1.1	4	117	TO-3
	BD 181	NPN	55	45	15	20/70	3	1	3	117	TO-3
	BD 182	NPN	70	60	15	20/70	4	1	4	117	TO-3
	BD 183	NPN	85	80	15	20/70	3	1	3	117	TO-3
*	BDX 10/2N 3055H	NPN	100	60	15	20/70	4	1	4	115	TO-3
*	BDX 10C/2N 3055C	NPN	80	60	15	12/–	4	1.1	4	115	TO-3
	BDX 11/2N 3442	NPN	160	140	10	20/70	3	1	3	117	TO-3
	BDX 12/2N 4347	NPN	140	120	10	20/70	2	1	2	100	TO-3
	BDX 13/40251	NPN	50	40	15	15/60	8	1.5	8	117	TO-3
	BDX 60	NPN	100	70	15	20/70	5	1.5	8	150	TO-3
*	BDX 71/2N 6099	NPN	70	60	10	20/80	4	2.5	10	75	TO-220
	BDX 73/2N 6101	NPN	80	70	10	20/80	5	2.5	10	75	TO-220
	BDX 75/2N 6103	NPN	45	40	16	15/60	8	2.5	16	75	TO-220

* Also available in epitaxial-base version

Multi-epitaxial planar for high current switching applica.

TYPE	POLARITY	V_{CBO} (V)	V_{CEO} (V)	I_C (A)	V_{CEsat} max (V)	@ I_C (A)	t_f (μs)	@ I_C/I_B (A)	P_D (W) @ T_C = 25°C	PACKAGE
2N 5038	NPN	150	90	20	1	12	0.5	12/1.2	140	TO-3
2N 5039	NPN	120	75	20	1	10	0.5	10/1	140	TO-3
2N 5671	NPN	120	90	30	0.75	15	0.5	15/1.2	140	TO-3 (3)
2N 5672	NPN	150	120	30	0.75	15	0.5	15/1.2	140	TO-3 (3)
2N 6032	NPN	120	90	50	1.3	50	0.5	50/5	140	TO-3 (4)
2N 6033	NPN	150	120	40	1	40	0.5	40/4	140	TO-3 (4)
2N 6354	NPN	150	120	10	1	10	0.2	5/0.5	140	TO-3
2N 6496	NPN	150	110	15	1	8	0.5	8/0.8	140	TO-3

POWER TRANSISTORS (continued)

Epitaxial-base for linear and switching applications

TYPE	POLARITY	V_{CBO} (V)	V_{CEO} (V)	I_C (A)	h_{FE} min	and V_{CEsat} max (V)	@ I_C (A)	P_D (W) @ T_C = 25°C	PACKAGE
BD 135	NPN	45	45	1.5	25	0.5	0.5	10	TO-126
BD 136	PNP	45	45	1.5	25	0.5	0.5	10	TO-126
BD 137	NPN	60	60	1.5	25	0.5	0.5	10	TO-126
BD 138	PNP	60	60	1.5	25	0.5	0.5	10	TO-126
BD 139	NPN	80	80	1.5	25	0.5	0.5	10	TO-126
BD 140	PNP	80	80	1.5	25	0.5	0.5	10	TO-126
BD 375	NPN	50	45	2	20	1	1	25	TO-126
BD 376	PNP	50	45	2	20	1	1	25	TO-126
BD 377	NPN	75	60	2	20	1	1	25	TO-126
BD 378	PNP	75	60	2	20	1	1	25	TO-126
BD 379	NPN	100	80	2	20	1	1	25	TO-126
BD 380	PNP	100	80	2	20	1	1	25	TO-126
BD 433	NPN	22	22	4	50	0.5	2	36	TO-126
BD 434	PNP	22	22	4	50	0.5	2	36	TO-126
BD 435	NPN	32	32	4	50	0.5	2	36	TO-126
BD 436	PNP	32	32	4	50	0.5	2	36	TO-126
BD 437	NPN	45	45	4	40	0.6	2	36	TO-126
BD 438	PNP	45	45	4	40	0.6	2	36	TO-126
BD 439	NPN	60	60	4	25	0.8	2	36	TO-126
BD 440	PNP	60	60	4	25	0.8	2	36	TO-126
BD 441	NPN	80	80	4	15	0.8	2	36	TO-126
BD 442	PNP	80	80	4	15	0.8	2	36	TO-126
BD 533	NPN	45	45	4	25	0.8	2	50	TO-220
BD 534	PNP	45	45	4	25	0.8	2	50	TO-220
BD 535	NPN	60	60	4	25	0.8	2	50	TO-220
BD 536	PNP	60	60	4	25	0.8	2	50	TO-220
BD 537	NPN	80	80	4	15	0.8	2	50	TO-220
BD 538	PNP	80	80	4	15	0.8	2	50	TO-220
BD 663	NPN	45	45	12	20	1	2	75	TO-220
BD 664	PNP	45	45	12	20	1	2	75	TO-220
BD 705	NPN	45	45	12	20	1	4	75	TO-220
BD 706	PNP	45	45	12	20	1	4	75	TO-220
BD 707	NPN	60	60	12	15	1	4	75	TO-220
BD 708	PNP	60	60	12	15	1	4	75	TO-220
BD 709	NPN	80	80	12	15	1	4	75	TO-220
BD 710	PNP	80	80	12	15	1	4	75	TO-220
BD 711	NPN	100	100	12	15	1	4	75	TO-220
BD 712	PNP	100	100	12	15	1	4	75	TO-220

POWER TRANSISTORS (continued)

Epitaxial-base for linear and switching applications (continued)

TYPE	POLARITY	V_{CBO} (V)	V_{CEO} (V)	I_C (A)	h_{FE} min	and V_{CEsat} max (V)	@ I_C (A)	P_D (W) @T_C = 25°C	PACKAGE
BD 905	NPN	45	45	15	15	1	5	90	TO-220
BD 906	PNP	45	45	15	15	1	5	90	TO-220
BD 907	NPN	60	60	15	15	1	5	90	TO-220
BD 908	PNP	60	60	15	15	1	5	90	TO-220
BD 909	NPN	80	80	15	15	1	5	90	TO-220
BD 910	PNP	80	80	15	15	1	5	90	TO-220
BD 911	NPN	100	100	15	15	1	5	90	TO-220
BD 912	PNP	100	100	15	15	1	5	90	TO-220
BDW 21	NPN	45	45	10	15	1	4	90	TO-3
BDW 22	PNP	45	45	10	15	1	4	90	TO-3
BDW 21A	NPN	60	60	10	15	1	4	90	TO-3
BDW 22A	PNP	60	60	10	15	1	4	90	TO-3
BDW 21B	NPN	80	80	10	15	1	4	90	TO-3
BDW 22B	PNP	80	80	10	15	1	4	90	TO-3
BDW 21C	NPN	100	100	10	15	1	4	90	TO-3
BDW 22C	PNP	100	100	10	15	1	4	90	TO-3
BDW 51	NPN	45	45	15	20	1	5	125	TO-3
BDW 52	PNP	45	45	15	20	1	5	125	TO-3
BDW 51A	NPN	60	60	15	20	1	5	125	TO-3
BDW 52A	PNP	60	60	15	20	1	5	125	TO-3
BDW 51B	NPN	80	80	15	20	1	5	125	TO-3
BDW 52B	PNP	80	80	15	20	1	5	125	TO-3
BDW 51C	NPN	100	100	15	20	1	5	125	TO-3
BDW 52C	PNP	100	100	15	20	1	5	125	TO-3
BDX 18	PNP	100	60	15	20	1.1	4	117	TO-3
MJ 2955	PNP	100	60	15	20	1.1	4	150	TO-3
2N 3055E	NPN	100	60	15	20	1	4	115	TO-3
2N 3713	NPN	80	60	10	15	1 •	3	150	TO-3
2N 3714	NPN	100	80	10	15	1 •	3	150	TO-3
2N 3715	NPN	80	60	10	30	0.8 •	3	150	TO-3
2N 3716	NPN	100	80	10	30	0.8 •	3	150	TO-3
2N 3789	PNP	60	60	10	15	1 •	3	150	TO-3
2N 3790	PNP	80	80	10	15	1 •	3	150	TO-3
2N 3791	PNP	60	60	10	30	1 •	3	150	TO-3
2N 3792	PNP	80	80	10	30	1 •	3	150	TO-3
2N 5190	NPN	40	40	4	25	0.6	1.5	40	TO-126
2N 5191	NPN	60	60	4	25	0.6	1.5	40	TO-126
2N 5192	NPN	80	80	4	20	0.6	1.5	40	TO-126

• @ I_C = 5A

POWER TRANSISTORS (continued)

Epitaxial-base for linear and switching applications (continued)

TYPE	POLARITY	V_{CBO} (V)	V_{CEO} (V)	I_C (A)	h_{FE} min	and V_{CEsat} max (V)	@ I_C (A)	P_D (W) @ T_C = 25°C	PACKAGE
2N 5193	PNP	40	40	4	25	0.6	1.5	40	TO-126
2N 5194	PNP	60	60	4	25	0.6	1.5	40	TO-126
2N 5195	PNP	80	80	4	20	0.6	1.5	40	TO-126
2N 5875	PNP	60	60	10	20	1 •	4	150	TO-3
2N 5876	PNP	80	80	10	20	1 •	4	150	TO-3
2N 5877	NPN	60	60	10	20	1 •	4	150	TO-3
2N 5878	NPN	80	80	10	20	1 •	4	150	TO-3
2N 6107	NPN	80	70	7	30	1	2	40	TO-220
2N 6109	NPN	60	50	7	30	1	2.5	40	TO-220
2N 6111	NPN	40	30	7	30	1	3	40	TO-220
2N 6121	NPN	45	45	4	25	0.6	1.5	40	TO-220
2N 6122	NPN	60	60	4	25	0.6	1.5	40	TO-220
2N 6123	NPN	80	80	4	20	0.6	1.5	40	TO-220
2N 6124	PNP	45	45	4	25	0.6	1.5	40	TO-220
2N 6125	PNP	60	60	4	25	0.6	1.5	40	TO-220
2N 6126	PNP	80	80	4	20	0.6	1.5	40	TO-220
2N 6288	PNP	40	30	7	30	1	3	40	TO-220
2N 6290	PNP	60	50	7	30	1	2.5	40	TO-220
2N 6292	PNP	80	70	7	30	1	2	40	TO-220

• @ I_C = 5A

POWER TRANSISTORS (continued)

Epitaxial-base darlingtons for linear and switching applications

TYPE	POLARITY	V_{CBO} (V)	V_{CEO} (V)	I_C (A)	h_{FE} min	and V_{CEsat} max (V)	@ I_C (A)	P_D (W) @ T_C = 25°C	PACKAGE
BD 675A	NPN	45	45	4	750	2.8	2	40	TO-126
BD 676A	PNP	45	45	4	750	2.8	2	40	TO-126
BD 677	NPN	60	60	4	750	2.5	1.5	40	TO-126
BD 678	PNP	60	60	4	750	2.5	1.5	40	TO-126
BD 677A	NPN	60	60	4	750	2.8	2	40	TO-126
BD 678A	PNP	60	60	4	750	2.8	2	40	TO-126
BD 679	NPN	80	80	4	750	2.5	1.5	40	TO-126
BD 680	PNP	80	80	4	750	2.5	1.5	40	TO-126
BD 679A	NPN	80	80	4	750	2.8	2	40	TO-126
BD 680A	PNP	80	80	4	750	2.8	2	40	TO-126
BD 681	NPN	100	100	4	750	2.5	1.5	40	TO-126
BD 682	PNP	100	100	4	750	2.5	1.5	40	TO-126
BDW 23	NPN	45	45	6	750	2	2	50	TO-220
BDW 24	PNP	45	45	6	750	2	2	50	TO-220
BDW 23A	NPN	60	60	6	750	2	2	50	TO-220
BDW 24A	PNP	60	60	6	750	2	2	50	TO-220
BDW 23B	NPN	80	80	6	750	2	2	50	TO-220
BDW 24B	PNP	80	80	6	750	2	2	50	TO-220
BDW 23C	NPN	100	100	6	750	2	2	50	TO-220
BDW 24C	PNP	100	100	6	750	2	2	50	TO-220
BDW 93	NPN	45	45	12	750	2	5	80	TO-220
BDW 94	PNP	45	45	12	750	2	5	80	TO-220
BDW 93A	NPN	60	60	12	750	2	5	80	TO-220
BDW 94A	PNP	60	60	12	750	2	5	80	TO-220
BDW 93B	NPN	80	80	12	750	2	5	80	TO-220
BDW 94B	PNP	80	80	12	750	2	5	80	TO-220
BDW 93C	NPN	100	100	12	750	2	5	80	TO-220
BDW 94C	PNP	100	100	12	750	2	5	80	TO-220
BDX 53	NPN	45	45	8	750	2	3	60	TO-220
BDX 54	PNP	45	45	8	750	2	3	60	TO-220
BDX 53A	NPN	60	60	8	750	2	3	60	TO-220
BDX 54A	PNP	60	60	8	750	2	3	60	TO-220
BDX 53B	NPN	80	80	8	750	2	3	60	TO-220
BDX 54B	PNP	80	80	8	750	2	3	60	TO-220
BDX 53C	NPN	100	100	8	750	2	3	60	TO-220
BDX 54C	PNP	100	100	8	750	2	3	60	TO-220

POWER TRANSISTORS (continued)

Epitaxial-base darlingtons for linear and switching appli. (contd.)

TYPE	POLARITY	V_{CBO} (V)	V_{CEO} (V)	I_C (A)	h_{FE} min	and V_{CEsat} max (V)	@ I_C (A)	P_D (W) @ T_C = 25°C	PACKAGE
BDX 85	NPN	45	45	10	750	2	4	100	TO-3
BDX 86	PNP	45	45	10	750	2	4	100	TO-3
BDX 85A	NPN	60	60	10	750	2	4	100	TO-3
BDX 86A	PNP	60	60	10	750	2	4	100	TO-3
BDX 85B	NPN	80	80	10	750	2	4	100	TO-3
BDX 86B	PNP	80	80	10	750	2	4	100	TO-3
BDX 85C	NPN	100	100	10	750	2	4	100	TO-3
BDX 86C	PNP	100	100	10	750	2	4	100	TO-3
BDX 87	NPN	45	45	12	750	2	6	120	TO-3
BDX 88	PNP	45	45	12	750	2	6	120	TO-3
BDX 87A	NPN	60	60	12	750	2	6	120	TO-3
BDX 88A	PNP	60	60	12	750	2	6	120	TO-3
BDX 87B	NPN	80	80	12	750	2	6	120	TO-3
BDX 88B	PNP	80	80	12	750	2	6	120	TO-3
BDX 87C	NPN	100	100	12	750	2	6	120	TO-3
BDX 88C	PNP	100	100	12	750	2	6	120	TO-3
MJ 900	PNP	60	60	8	1000	2	3	150	TO-3
MJ 1000	NPN	60	60	8	1000	2	3	150	TO-3
MJ 901	PNP	80	80	8	1000	2	3	150	TO-3
MJ 1001	NPN	80	80	8	1000	2	3	150	TO-3
MJ 2500	PNP	60	60	10	1000	2	5	150	TO-3
MJ 3000	NPN	60	60	10	1000	2	5	150	TO-3
MJ 2501	PNP	80	80	10	1000	2	5	150	TO-3
MJ 3001	NPN	80	80	10	1000	2	5	150	TO-3
MJE 700	PNP	60	60	4	750	2.5	1.5	40	TO-126
MJE 800	NPN	60	60	4	750	2.5	1.5	40	TO-126
MJE 701	PNP	60	60	4	750	2.8	2	40	TO-126
MJE 801	NPN	60	60	4	750	2.8	2	40	TO-126
MJE 702	PNP	80	80	4	750	2.5	1.5	40	TO-126
MJE 802	NPN	80	80	4	750	2.5	1.5	40	TO-126
MJE 703	PNP	80	80	4	750	2.8	2	40	TO-126
MJE 803	NPN	80	80	4	750	2.8	2	40	TO-126

POWER TRANSISTORS (continued)

Epitaxial-base darlingtons for linear and switching appli. (contd.)

TYPE	POLARITY	V_{CBO} (V)	V_{CEO} (V)	I_C (A)	h_{FE} min	and V_{CEsat} max (V)	@ I_C (A)	P_D (W) @ $T_C = 25°C$	PACKAGE
2N 6034	PNP	40	40	4	750	2	2	40	TO-126
2N 6035	PNP	60	60	4	750	2	2	40	TO-126
2N 6036	PNP	80	80	4	750	2	2	40	TO-126
2N 6037	NPN	40	40	4	750	2	2	40	TO-126
2N 6038	NPN	60	60	4	750	2	2	40	TO-126
2N 6039	NPN	80	80	4	750	2	2	40	TO-126
2N 6050	PNP	60	60	12	750	2	6	150	TO-3
2N 6051	PNP	80	80	12	750	2	6	150	TO-3
2N 6052	PNP	100	100	12	750	2	6	150	TO-3
2N 6053	PNP	60	60	8	750	2	4	100	TO-3
2N 6054	PNP	80	80	8	750	2	4	100	TO-3
2N 6055	NPN	60	60	8	750	2	4	100	TO-3
2N 6056	NPN	80	80	8	750	2	4	100	TO-3
2N 6057	NPN	60	60	12	750	2	6	150	TO-3
2N 6058	NPN	80	80	12	750	2	6	150	TO-3
2N 6059	NPN	100	100	12	750	2	6	150	TO-3
2N 6386	NPN	40	40	8	1000	2	3	65	TO-220
2N 6387	NPN	60	60	10	1000	2	5	65	TO-220
2N 6388	NPN	80	80	10	1000	2	5	65	TO-220

POWER TRANSISTORS (continued)

Planar for switching applications

TYPE	POLARITY	DESCRIPTION	V_{CBO} (V)	V_{CEO} (V)	I_C (A)	h_{FE} min	and V_{CEsat} max (V)	@ I_C (A)	f_T typ (MHz)	P_D (W) @T_C= 25°C	PACKAGE
BFX 34	NPN	General purpose	120	60	5	40*	1	5	70 •	5	TO-39
BSS 44	PNP	General purpose	65	60	5	45 typ	1	5	80	5	TO-39
BSW 67	NPN	High voltage switch	120	120	1.5	15	1	1	80	5	TO-39
BSW 68	NPN	High voltage switch	150	150	1.5	15	1	1	80	5	TO-39
BU 100A	NPN	General purpose	150	100	10	20	1.5	5	100	62	TO-3
BU 125	NPN	TV horizontal output	130	60	7	15	1.2	5	50 •	10△	TO-39
BU 125S	NPN	General purpose	250	150	3	30	1.5†	0.25	15 •	10△	TO-39
BUX 77	NPN	Fast switching	100	80	5	30	1	5	–	40	TO-66
BUX 78	PNP	Fast switching	100	80	5	30	1	5	–	40	TO-66
BUY 47	NPN	High voltage switch	150	120	7	15	1	5	90	10△	TO-39
BUY 48	NPN	High voltage switch	200	170	7	15	1	5	90	10△	TO-39
BUY 49S	NPN	High voltage switch	250	200	3	40	0.2	0.5	50 •	10△	TO-39
BUY 68	NPN	General purpose	100	60	7	40*	1	5	50 •	7	TO-39
2N 3418	NPN	General purpose	85	60	3	15	0.5	2	40	15△	TO-39
2N 3419	NPN	General purpose	125	80	3	15	0.5	2	40	15△	TO-39
2N 3420	NPN	General purpose	85	60	3	30	0.5	2	40	15△	TO-39
2N 3421	NPN	General purpose	125	80	3	30	0.5	2	40	15△	TO-39
2N 3440S	NPN	General purpose	300	250	1	40	0.5■	0.02	15 •	10	TO-39
2N 3867	PNP	General purpose	40	40	3	25	1.3	2.5	60 •	6	TO-39
2N 3868	PNP	General purpose	60	60	3	20	1.3	2.5	60 •	6	TO-39
2N 4895	NPN	General purpose	120	60	5	40*	1	5	50	7	TO-39
2N 4896	NPN	General purpose	120	60	5	100*	1	5	80	7	TO-39
2N 4897	NPN	General purpose	150	80	5	40*	1	5	50	7	TO-39
2N 5336	NPN	Medium power switch	80	80	5	20	1.2	5	30 •	6	TO-39
2N 5337	NPN	Medium power switch	80	80	5	40	1.2	5	30 •	6	TO-39
2N 5338	NPN	Medium power switch	100	100	5	20	1.2	5	30 •	6	TO-39
2N 5339	NPN	Medium power switch	100	100	5	40	1.2	5	30 •	6	TO-39
2N 6303	PNP	General purpose	80	80	3	30	0.75	1.5	60 •	6	TO-39

■ I_C= 50 mA • min. △ T_C= 50°C † I_C= 0.5A * I_C= 2A

POWER TRANSISTORS (continued)

High voltage for switching applications

TYPE	POLARITY	DESCRIPTION	V_{CBO} (V)	V_{CEO} (V)	I_{CM} (A)	V_{CEsat} max (V) @	I_C/I_B (A)	t_{off} max (μs) @	I_C/I_B (A)	P_D (W) @T_C = 25°C	PACKAGE
BU 326S	NPN	High volt. switch	800	400	8	3	4/1.25	0.3 • typ	2.5/0.5	60■	TO-3(1)
BU 406	NPN	TV horiz. deflect.	400	200	10	1	5/0.5	0.75	5/0.5	60	TO-220
BU 406D*	NPN	TV horiz. deflect.	400	–	10	1	5/0.65	0.75	5/0.65	60	TO-220
BU 406H	NPN	TV horiz. deflect.	400	200	10	1	5/0.8	0.4	5/0.8	60	TO-220
BU 407	NPN	TV horiz. deflect.	330	150	10	1	5/0.5	0.75	5/0.5	60	TO-220
BU 407D*	NPN	TV horiz. deflect.	330	–	10	1	5/0.65	0.75	5/0.65	60	TO-220
BU 407H	NPN	TV horiz. deflect.	330	150	10	1	5/0.8	0.4	5/0.8	60	TO-220
BU 408	NPN	TV horiz. deflect.	400	200	10	1	6/1.2	0.4	6/1.2	60	TO-220
BU 408D*	NPN	TV horiz. deflect.	400	–	10	1	6/1.2	0.5	6/1.2	60	TO-220
BU 409	NPN	TV horiz. deflect.	250	150	10	1	3/0.4	–	–	60	TO-220
BU 606	NPN	TV horiz. deflect.	400	200	10	1	5/0.5	0.75	5/0.5	60	TO-3
BU 606D*	NPN	TV horiz. deflect.	400	–	10	1	5/0.65	0.75	5/0.65	60	TO-3
BU 607	NPN	TV horiz. deflect.	330	200	10	1	5/0.5	0.75	5/0.5	60	TO-3
BU 607D*	NPN	TV horiz. deflect.	330	–	10	1	5/0.65	0.75	5/0.65	60	TO-3
BU 608	NPN	TV horiz. deflect.	400	200	10	1	6/1.2	0.4	6/1.2	60	TO-3
BU 608D*	NPN	TV horiz. deflect.	400	–	10	1	6/1.2	0.5	6/1.2	60	TO-3
BU 806△	NPN	TV horiz. deflect.	400	400	10	1.5	5/0.05	0.4 • typ	5/0.05	60	TO-220
BU 807△	NPN	TV horiz. deflect.	330	330	10	1.5	5/0.05	0.4 • typ	5/0.05	60	TO-220
BUW 24	NPN	High volt. switch	450	350	10	1.5	2.5/0.5	0.3 • typ	2.5/0.5	100	TO-3(1)
BUW 25	NPN	High volt. switch	600	400	10	1.5	3/0.6	0.5 •	3/0.6	125	TO-3(1)
BUW 26	NPN	High volt. switch	800	450	10	1.5	3/0.6	0.5 •	3/0.6	125	TO-3(1)
BUW 34	NPN	High volt. switch	500	400	15	1.5	5/1	0.35•typ	5/1	125	TO-3(1)
BUW 35	NPN	High volt. switch	800	400	15	1.5	8/2.5	0.35•typ	5/1	125	TO-3(1)
BUW 36	NPN	High volt. switch	900	450	15	3	8/2.5	0.35•typ	5/1	125	TO-3(1)
BUX 97	NPN	High volt. switch	750	350	8	3	4/1.25	0.5 • typ	4/1.25	60■	TO-3(1)
BUX 97A	NPN	High volt. switch	800	400	8	3	4/1.25	0.5 • typ	4/1.25	60■	TO-3(1)
BUX 97B	NPN	High volt. switch	800	450	8	3	4/1.25	0.5 • typ	4/1.25	60■	TO-3(1)
BUY 18S	NPN	High volt. switch	400	200	10	1	5/0.5	1	5/0.5	50■	TO-3
BUY 69A	NPN	High volt. switch	1000	400	15	3.3	8/2.5	–	–	100	TO-3(1)
BUY 69B	NPN	High volt. switch	800	325	15	3.3	8/2.5	–	–	100	TO-3(1)

* D= Integrated damper diode ■ T_C= 75°C • t_{fall} △ = Darlington

LINEAR INTEGRATED CIRCUITS

LINEAR INTEGRATED CIRCUITS

Hi-Fi audio power amplifiers

TYPE	V_S max (V)	VOLTAGE GAIN (dB) (open loop)	P_O (W)	@ DISTORTION %	and R_L (Ω)	and V_S (V)	OUTPUT PEAK CURRENT (A)	NOTES	PACKAGE
TDA 2010	± 18	100	12	1	4	± 14	3.5	Thermal and short-circuit prot.	DIP D
			9	1	8	± 14	3.5		
TDA 2020	± 22	100	20	1	4	± 18	3.5	Thermal and short-circuit prot.	DIP D
			16.5	1	8	± 18	3.5		
TDA 2030	± 18	90	14	0.5	4	± 14	3.5	Thermal and short-circuit prot.	Pentawatt®
			9	0.5	8	± 14	3.5		

Protected audio amplifiers

TYPE	V_S max (V)	VOLTAGE GAIN (dB) (open loop)	P_O (W)	and R_L (Ω)	@ V_S (V)	OUTPUT PEAK CURRENT (A)	NOTES	PACKAGE
TCA 830S	20	75	3.4	4	12	2 ■	Thermal shut-down	DIP F
			2	4	9	2.5 ●		
TBA 810S/AS	20	80	7	4	16	2.5 ■	Thermal shut-down	DIP F/G
			6	4	14.4	3.5 ●		
TBA 810P/AP	20	80	7	4	16	3 ■	Thermal shut-down	DIP F/G
			7	2	14.4	4 ●		
TDA 2002	18	80	8	2	14.4	3.5 ■	Thermal shut-down and load dump protection up to 40V	Pentawatt®
			5.2	4	14.4	4.5 ●		
TDA 2002A	18	80	8	2	14.4	3.5 ■	Thermal shut-down	Pentawatt®
			5.2	4	14.4	4.5 ●		
TCA 940E	24	75	6.5	8	20	3 ■	Thermal and short-circuit protect.	DIP F
						3.5 ●		
TCA 940	24	75	5	8	18	3 ■	Thermal and short-circuit protect.	DIP G
			10	4	20	3.5 ●		
TBA810CB/ACB	20	80	6	4	14.4	3 ■	Thermal and short-circuit protect.	DIP F/G
			7	2	14.4	4 ●	Load dump prot. up to 40V	

■ Repetitive ● Non repetitive

LINEAR INTEGRATED CIRCUITS (continued)

Audio amplifiers

TYPE	V_S max (V)	VOLTAGE GAIN (dB) (open loop)	P_O (W)	@ R_L (Ω)	and V_S (V)	OUTPUT PEAK CURRENT (A)	PACKAGE
TAA 611A	12	68	0.65	4	6	1	TO-100, DIP A
			1.15	8	9		
TAA 611B	15	70	1.15	8	9	1	DIP A
			2.1	8	12		
TAA 611C	16	72	2.1	8	12	1	DIP B, C, D
			3.3	8	15		
TAA 611E	12	68	0.65	4	6	1	TO-100, DIP A
			1.15	8	9		
TAA 611F	15	70	1.15	8	9	1	DIP A
			2.1	8	12		
TBA 820	16	75	2	8	12	1.5 •	DIP E
			1.6	4	9		
TBA 641A	12	46*	2.2	4	9	2	DIP A, D
TBA 641B	16	46*	4.5	4	14	2.5	DIP B, C, D
TBA 800	30	80	5	16	24	1.5 ■	DIP F
						2 •	

* Closed loop • Non repetitive ■ Repetitive

DC motor speed regulators

TYPE	V_S RANGE (V)	V_M OUT. VOLT. (V)	LIMITING OUTPUT CURRENT (mA)	$R_{th\ j\text{-}c/j\text{-}a}$ (°C/W)	REF. VOLTAGE (V)	LINE REGUL. (%/V)	LOAD REGUL. (%/mA)	PACKAGE
TCA 900	5.5-12	3.6	400	10/100	2.6	0.1	0.005	TO-126 (1)
TCA 910	10-16	5.6	400	10/100	2.6	0.1	0.005	TO-126 (1)
TDA 1151	2.5-18	3.6	600	10/100	1.2	0.1	0.005	TO-126 (1)

LINEAR INTEGRATED CIRCUITS (continued)

Voltage stabilizers (varicap supply)

TYPE	V_O (V)	I_Z max (mA)	DYNAMIC r_Z (Ω)	TEMPERATURE COEFF. (mV/°C)	PACKAGE
TAA 550A/TBA 271A	30 to 32	15	10	-3.2 to 1.6	TO-18 (1)
TAA 550B/TBA 271B	32 to 34	15	10	-3.2 to 1.6	TO-18 (1)
TAA 550C/TBA 271C	34 to 36	15	10	-3.2 to 1.6	TO-18 (1)

TV circuits

TYPE	DESCRIPTION	TEMP. RANGE (°C)	PACKAGE
TCA 511	TV horizontal and vertical processor	0 to +70	DIP K
TDA 440	Video IF amplifier and detector	0 to +70	DIP K
TDA 1170	TV B/W vertical deflection system	–	DIP F
TDA 1180	Horizontal deflection and sync. separator	0 to +70	DIP K
TDA 1190	Complete TV sound channel	–	DIP F
TDA 1251	Constant Current Consumption power supply for class B audio amplifiers	–	TO-126(1)
TDA 1270	Colour TV vertical deflection system	–	DIP F
TDA 1370	Vertical deflection system	–	DIP F
TDA 2140	4.43 MHz oscillator, APC, flip-flop, PAL switch, PAL identif. for colour TV sets	0 to +70	DIP K
TDA 2150	Luminance and chrominance amplifier for colour TV sets	0 to +70	DIP K
TDA 2160	Chroma demodulator, RGB matrix and video preamplifier for colour TV sets	0 to +70	DIP K
TDA 2190	Complete sound channel with CCC and VCR facility	0 to +70	DIP N

LINEAR INTEGRATED CIRCUITS (continued)

Radio circuits

TYPE	DESCRIPTION	f RANGE (Hz)	V_S RANGE (V)	DRAIN CURRENT (mA)	VOLTAGE GAIN (dB)	AUDIO V_O (V_{rms})	DISTORTION %	AM REJECTION (dB)	PACKAGE
TBA 651	AM/HF amp-converter and IF amplifier	10k-30M	4.5-18	11.5	60	0.6	1	–	DIP J
TCA 3089	Hi-Fi IF/FM amp and det.	10.7M	6.5-16	23	–	0.4	0.5	55 •	DIP K
TDA 1200	Hi-Fi IF/FM amp and det.	10.7M	6.5-16	23	–	0.14	0.5	40*	DIP K
TDA 1220	AM/FM radio receivers	–	4-16	25	–	0.3	1	45 •	DIP K
TDA 1230	IF/FM amplifier detect audio amplifier	10.7M	9-28	40	–	–	1	50 •	DIP F

* $\Delta f = \pm 25$ kHz • $\Delta f = \pm 75$ kHz

Fixed voltage regulators

TYPE	V_O (V)	MAX. OUT. CURRENT I_O (mA)	V_i max (V)	LOAD REGUL. % @ ΔI_O (mA)	LINE REGUL. % @ ΔV_i (V)	TEMP. RANGE (°C)	PACKAGE
L 005	5	850	20	0.3	10-600	0.1	7.5-12	0 to 70	TO-3 (2)
L 036	12	720	27	0.3	10-500	0.1	14.5-21	0 to 70	TO-3 (2)
L 037	15	600	27	0.3	10-450	0.16	17.5-24	0 to 70	TO-3 (2)
L 129	5	850	20	0.3	10-600	0.1	7.5-12	-25 to 85	TO-126(1)/TO-220
L 130	12	720	27	0.3	10-500	0.1	14.5-21	-25 to 85	TO-126(1)/TO-220
L 131	15	600	27	0.3	10-450	0.16	17.5-24	-25 to 85	TO-126(1)/TO-220
L 192/5*	5	250	35	0.3	2-250	0.02	8-18	-25 to 150	Pentawatt®
L 192/12*	12	250	40	0.3	2-250	0.03	15-25	-25 to 150	Pentawatt®
L 192/15*	15	250	40	0.3	2-250	0.05	18-28	-25 to 150	Pentawatt®

* With two rectifying diodes integrated in the same chip

LINEAR INTEGRATED CIRCUITS (continued)

Fixed voltage regulators (continued)

TYPE	V_O (V)	MAX. OUT. CURRENT I_O (mA)	V_i max (V)	LOAD REGUL. %	@ ΔI_O (mA)	LINE REGUL. %	@ ΔV_i (V)	TEMP. RANGE (°C)	PACKAGE
L 2005	5	2000	35	0.3	5-2000	0.02	8-18	-55 to 150	TO-3
L 2005C	5	2000	35	0.3	5-2000	0.02	8-18	-25 to 150	TO-3/TO-220
L 2075	7.5	2000	35	0.16	5-2000	0.03	10.5-20.5	-55 to 150	TO-3
L 2075C	7.5	2000	35	0.16	5-2000	0.03	10.5-20.5	-25 to 150	TO-3/TO-220
L 2085	8.5	2000	40	0.14	5-2000	0.04	11.5-21.5	-55 to 150	TO-3
L 2085C	8.5	2000	40	0.14	5-2000	0.04	11.5-21.5	-25 to 150	TO-3/TO-220
L 2012	12	2000	40	0.1	5-2000	0.05	15-25	-55 to 150	TO-3
L 2012C	12	2000	40	0.1	5-2000	0.05	15-25	-25 to 150	TO-3/TO-220
L 2015	15	2000	40	0.08	5-2000	0.05	18-28	-55 to 150	TO-3
L 2015C	15	2000	40	0.08	5-2000	0.05	18-28	-25 to 150	TO-3/TO-220
L 2018	18	2000	40	0.07	5-2000	0.09	20-30	-55 to 150	TO-3
L 2018C	18	2000	40	0.07	5-2000	0.09	20-30	-25 to 150	TO-3/TO-220
L 2024	24	2000	40	0.05	5-2000	0.1	27-37	-55 to 150	TO-3
L 2024C	24	2000	40	0.05	5-2000	0.1	27-37	-25 to 150	TO-3/TO-220
L 7805	5	1500	35	0.3	5-1500	0.025	8-12	-55 to 150	TO-3
L 7805C	5	1500	35	0.3	5-1500	0.025	8-12	0 to 125	TO-3/TO-220
L 7875	7.5	1500	35	0.16	5-1500	0.035	11-18	-55 to 150	TO-3
L 7875C	7.5	1500	35	0.16	5-1500	0.035	11-18	0 to 125	TO-3/TO-220
L 7885	8.5	1500	35	0.14	5-1500	0.04	11-17	-55 to 150	TO-3
L 7885C	8.5	1500	35	0.14	5-1500	0.04	11-17	0 to 125	TO-3/TO-220
L 7812	12	1500	35	0.1	5-1500	0.05	16-22	-55 to 150	TO-3
L 7812C	12	1500	35	0.1	5-1500	0.05	16-22	0 to 125	TO-3/TO-220
L 7815	15	1500	35	0.08	5-1500	0.05	20-26	-55 to 150	TO-3
L 7815C	15	1500	35	0.08	5-1500	0.05	20-26	0 to 125	TO-3/TO-220
L 7818	18	1500	35	0.07	5-1500	0.09	23-29	-55 to 150	TO-3
L 7818C	18	1500	35	0.07	5-1500	0.09	23-29	0 to 125	TO-3/TO-220
L 7824	24	1500	40	0.05	5-1500	0.1	30-36	-55 to 150	TO-3
L 7824C	24	1500	40	0.05	5-1500	0.1	30-36	0 to 125	TO-3/TO-220
TBA 435	8.5	140	20	0.3	5-100	0.15	11.5-20	0 to 70	TO-39 (2)
TBA 625A	5	140	20	0.3	5-100	0.2	8-20	0 to 70	TO-39 (2)
TBA 625B	12	140	27	0.3	5-100	0.2	15-27	0 to 70	TO-39 (2)
TBA 625C	15	140	27	0.3	5-100	0.25	18-27	0 to 70	TO-39 (2)
TDA 1405	5	850	20	0.3	10-600	0.1	7.5-12	0 to 70	TO-126 (1)
TDA 1412	12	720	27	0.3	10-500	0.1	14.5-21	0 to 70	TO-126 (1)
TDA 1415	15	600	27	0.3	10-450	0.16	17.5-24	0 to 70	TO-126 (1)

LINEAR INTEGRATED CIRCUITS (continued)

Variable voltage regulators

TYPE	V_O (V)	MAX. OUT. CURRENT I_O (mA)	V_i max (V)	LOAD REGUL. %	@ ΔI_O (mA)	TEMP. RANGE (°C)	NOTES	PACKAGE
L 123	2 to 37	150	40	0.03	1-50	-55 to 125	Var. volt.-Pos/neg.reg.	TO-100(1)
L 123C	2 to 37	150	40	0.03	1-50	0 to 70	Var. volt.-Pos/neg reg.	TO-100(1)/DIP H
L 146C	2 to 37	150	80	0.03	1-50	-25 to 150	Pos/neg voltage reg.	DIP H (1)
L 200	2.85 to 36	2000	40	0.15	•	-55 to 150	Curr. and voltage reg.	TO-3 (4-lead)
L 200C	2.85 to 36	2000	40	0.15	•	-25 to 150	Curr. and voltage reg.	TO-3 (4-lead) Pentawatt®

• 10-2000

Integrated darlington pairs

TYPE	LV_{CEO} (V)	V_{CBO} (V)	I_C max (A)	h_{FE} NPN/PNP	@ I_C (A)	V_{CEsat} (V)	@ I_C (A)	P_D (W) @T_C= 60°C	PACKAGE
* **L 149** ▲	44	55	3	10000/10000	3	3	3	30	Pentawatt®
TDA 1410	36	50	3 •	5000/2500	2	1.7	2	30	Pentawatt®
TDA 1420	44	55	3 •	2500/1000	3	2.3	3	30	Pentawatt®
* **TDA 1490** ▲	44	55	3	10000/10000	3	3	3	30	Pentawatt®

* Coming soon • Repetitive

▲With thermal, short circuit and second breakdown protection, inhibit facilities.

Operational amplifiers

TYPE	INPUT OFFSET VOLTAGE (mV)	R_I (MΩ)	LARGE SIGNAL VOLTAGE GAIN	SLEW RATE (V/μs)	V_S max (V)	OUT. SHORT-CIRCUIT PROTECTION	INTERNAL FREQ. COMPENSATION	TEMP. RANGE (°C)	PACKAGE
LS 101	1	0.8	160 000	10	± 22	YES	NO	-55 to 125	TO-99
LS 101A	0.7	4	160 000	10	± 22	YES	NO	-55 to 125	TO-99
LS 201	2	0.4	150 000	10	± 22	YES	NO	0 to 70	TO-99/SO-8/■
LS 201A	0.7	4	160 000	10	± 22	YES	NO	-25 to 85	TO-99
LS 301A	0.7	2	160 000	10	± 18	YES	NO	0 to 70	TO-99/SO-8/■
LS 107	0.7	4	160 000	0.7	± 22	YES	YES	-55 to 125	TO-99
LS 207	0.7	4	160 000	0.5	± 22	YES	YES	-25 to 85	TO-99
LS 307	2	2	160 000	0.5	± 18	YES	YES	0 to 70	TO-99/SO-8/■
LS 141	1	2	200 000	0.5	± 22	YES	YES	-55 to 125	TO-99
LS 141A	0.8	6	200 000	0.7	± 22	YES	YES	-55 to 125	TO-99
LS 141C	2	2	200 000	0.5	± 18	YES	YES	0 to 70	TO-99/SO-8/■
LS 148	1	2	150 000	5.5	± 22	YES	NO	-55 to 125	TO-99
LS 148A	0.7	10	250 000	5.5	± 22	YES	NO	-55 to 125	TO-99
LS 148C	2	2	150 000	5.5	± 22	YES	NO	0 to 70	TO-99/SO-8/■
LS 709	1	0.4	45 000	0.3	± 18	NO	NO	-55 to 125	TO-99
LS 709A	0.6	0.7	45 000	0.3	± 18	NO	NO	-55 to 125	TO-99
LS 709C	2	0.25	45 000	0.3	± 18	NO	NO	0 to 70	TO-99/DIP H
LS 776	2	5	400 000	0.8	± 18	YES	YES	-55 to 125	TO-99
LS 776C	2	5	400 000	0.8	± 18	YES	YES	0 to 70	TO-99/■
LS 8141*	1	2	200 000	0.5	± 22	YES	YES	0 to 70	SO-8/■
LS 8141A*	0.8	6	200 000	0.7	± 22	YES	YES	0 to 70	SO-8/■
LS 8141C*	2	2	200 000	0.5	± 18	YES	YES	0 to 70	SO-8/■
LS 8148*	1	2	150 000	5.5	± 22	YES	NO	0 to 70	SO-8/■
LS 8148A*	0.7	10	250 000	5.5	± 22	YES	NO	0 to 70	SO-8/■
LS 8148C*	2	2	150 000	5.5	± 22	YES	NO	0 to 70	SO-8/■

* Gold series HI-REL ■ Minidip

LINEAR INTEGRATED CIRCUITS (continued)

Dual operational amplifiers

TYPE	INPUT OFFSET VOLTAGE (mV)	R_i (MΩ)	LARGE SIGNAL VOLTAGE GAIN	SLEW RATE (V/μs)	V_S max (V)	OUT. SHORT-CIRCUIT PROTECTION	INTERNAL FREQ. COMPENSATION	TEMP. RANGE (°C)	PACKAGE
LS 147C	1	2	200 000	0.5	± 18	YES	YES	0 to 70	DIP H
LS 204 •	0.7	5	150 000	1.2	± 18	YES	YES	-25 to 85	TO-99
LS 204A•	0.7	5	150 000	1.2	± 18	YES	YES	-55 to 125	TO-99
LS 204C•	2	4	150 000	0.9	± 18	YES	YES	0 to 70	TO-99/SO-8/■
TBA 231*	1	0.15	20 000	1	± 18	YES	NO	0 to 70	DIP H

• Coming soon * Typical noise figure 1.5 dB ■ Minidip

Comparators/sense amplifiers

TYPE	INPUT OFFSET VOLTAGE (mV)	INPUT OFFSET CURRENT (μA)	LARGE SIGNAL VOLTAGE GAIN	RESPONSE TIME (ns)	V_S max(V)	OUT. SHORT-CIRCUIT PROTECTION	INTERNAL FREQ. COMPENSATION	TEMP. RANGE (°C)	PACKAGE
μA 710	0.6	0.75	1700	40	+ 14 -7	NO	NO	-55 to + 125	TO-99
μA 710C	1.6	1.8	1500	40	+ 14 -7	NO	NO	0 to + 70	TO-99/DIP H
μA 711	1	0.5	1500	40	+ 14 -7	NO	NO	-55 to + 125	TO-100 (1)
μA 711C	1	0.5	1500	40	+ 14 -7	NO	NO	0 to + 70	TO-100 (1)/DIP H

Special functions

TYPE	DESCRIPTION	TEMP. RANGE (°C)	PACKAGE
L 120	Phase control for TRIAC and SCR triggering	0 to 70	DIP K
L 121	Burst control for TRIAC and SCR triggering	0 to 70	DIP K
L 150	Expandor circuit for telecom	-25 to 85	DIP P
L 201	High volt., high current 7 darlington transistor arrays	0 to 85	DIP K
L 202	High volt., high current 7 darlington transistor arrays	0 to 85	DIP K
L 203	High volt., high current 7 darlington transistor arrays	0 to 85	DIP K
L 204	High volt., high current 7 darlington transistor arrays	0 to 85	DIP K
L 401	High volt., high current 5 darlington trans. array with enable	0 to 85	DIP K
L 402	High volt., high current 5 darlington trans. array with enable	0 to 85	DIP K
L 403	High volt., high current 5 darlington trans. array with enable	0 to 85	DIP K
LS 025	Balanced modulator	-25 to 85	TO-100(1)/■
LS 8025	Balanced modulator Hi-Rel	-25 to 85	■
LS 045	Channel amplifier	-25 to 85	TO-99/SO-8
LS 8045	Channel amplifier Hi-Rel	-25 to 85	SO-8
LS 159	1-differential amplifier and 3 indep. trans. arrays	-25 to 85	■
LS 8159	1-differential amplifier and 3 indep. trans. arrays Hi-Rel	-55 to 125	■
LS 454	Preamplifier for cassette recorder with ALC	–	SO-16
SAJ 210	7-stage frequency divider for electronic organs	0 to 70	DIP H
TBA 331	1 differential amp. and 3 independent NPN trans. array	0 to 85	DIP H
TDA 1054M	Preamplifier for cassette recorder with ALC(matching $<$3dB)	–	DIP J
TDA 2020D	Hi-Fi driver preamp. with thermal and short-circ. protection	0 to 85	DIP D
TDA 2054M	Preamp.for CrO_2 cassette recorder with ALC(matching $<$3dB)	0 to 85	DIP J
TDA 3310	Low noise transistors array (5 NPN)	0 to 85	DIP H
TDA 7770	Multifunction system for tape recorders	0 to 85	DIP F

■ SO-14

COS/MOS INTEGRATED CIRCUITS

Features

- Very low power dissipation: 10 nW typ/gate package; 10 μW typ/MSI package
- Wide supply voltage range: 3 to 12V for HBC/HBF 4000A/4700A series
  3 to 18V for HCC/HCF 4000B/4500B series
- High noise immunity: 45% of supply voltage/typ (1V min. guaranteed)
- High speed operation: 10 MHz for gates and flip-flops; 5 MHz for MSI
- Direct interface with HLL (H 100 family): V_{DD}= 10.8 to 12V for HBC/HBF 4000A/4700A series
  V_{DD}= 10.8 to 18V for HCC/HCF 4000B/4500B series
  No external components or special rules needed
- DTL and TTL compatibility
- High fanout HBC/HBF 4000A/4700A series
  Output drive current standardized for HCC/HCF 4000B/4500B series
- Excellent temperature stability: ± 1.5% shift in transfer characteristics over -55°C to +125°C
- Inputs fully protected
- High input impedance: $10^{12}\Omega$ typ
- Low output impedance
- Single phase clock
- HCC/HCF 4000B/4500B types meet all requirements of Jedec "Standard specifications for description of B-series CMOS devices".
- Packages: plastic DIP HBF4XXXAE and HCF4XXXBE; ceramic DIP HBC4XXXAD, HCC4XXXBD, HBC/HBF4XXXAF (frit-seal) and HCC/HCF4XXXBF (frit-seal); ceramic flat package HBC4XXXAK and HCC4XXXBK; also available in chip form.

Maximum ratings

DC supply voltage range (V_{DD}): -0.5V to +15V for HBC/HBF 4000A/4700A series
-0.5V to +20V for HCC/HCF 4000B/4500B series
Device dissipation (per package): 200 mW
All device inputs: V_I= -0.5V to V_{DD} +0.5V
Operating temperature ranges: HBC/HCC types: -55°C to +125°C
HBF/HCF types: -40°C to + 85°C
Storage temperature range: -65°C to +150°C

Recommended operating conditions

V_{DD}= 3 to 12V for HBC/HBF 4000A/4700A series
V_{DD}= 3 to 18V for HCC/HCF 4000B/4500B series
V_I = 0 to V_{DD}

COS/MOS INTEGRATED CIRCUITS

HBC/HBF 4000A series

TYPE	DESCRIPTION	•PROPAG. DELAY TIME t_{PHL}/t_{PLH} (ns)	•OUT. DRIVE CURRENT N-CHANNEL SINK I_{DN} (mA)	•OUT. DRIVE CURRENT P-CHANNEL SOURCE I_{DP} (mA)	•CLOCK FREQUENCY f max (MHz)	PACKAGE
Gates						
NOR/NAND						
4000A	Dual 3-input NOR gate plus inverter	25/25	2.5	-1	–	DIP H,L,P,V
4001A	Quad 2-input NOR gate	25/25	2.5	-1	–	DIP H,L,P,V
4002A	Dual 4-input NOR gate	25/25	2.5	-1	–	DIP H,L,P,V
4011A	Quad 2-input NAND gate	25/25	0.6	-1.2	–	DIP H,L,P,V
4012A	Dual 4-input NAND gate	50/50	0.6	-1.2	–	DIP H,L,P,V
4023A	Triple 3-input NAND gate	25/25	0.6	-1.2	–	DIP H,L,P,V
4025A	Triple 3-input NOR gate	25/25	2.5	-1	–	DIP H,L,P,V
Multilevel/Functional						
4019A	Quad AND/OR select gate	50/50	2.5	-1.5	–	DIP K,M,Q,W
4030A	Quad exclusive OR gate	40/40	2.4	-1.3	–	DIP H,L,P,V
4037A	Triple AND/OR bi-phase pairs	75/75	2	-1.6	–	DIP H,L,P,V
4048A	Expandable 8-input gate	225/225	9	-9	–	DIP K,M,Q,W
Buffers & Inverters						
4007A	Dual complementary pair plus inverter	20/20	2.5	-2.5	–	DIP H,L,P,V
4041A	Quad true/complement buffer	40/45	10	-8	–	DIP H,L,P,V
4049A	Hex buffer/converter (inverting)	10/25	16	-2.5	–	DIP K,M,Q,W
4050A	Hex buffer/converter (non inverting)	10/25	16	-2.5	–	DIP K,M,Q,W
Flip-flops						
4013A	Dual "D" flip-flop with set/reset	75/75	2.5	-1.3	10	DIP H,L,P,V
4027A	Dual J-K master-slave flip-flop	75/75	2.5	-1.3	8	DIP K,M,Q,W
Latches						
4042A	Quad clocked "D" latch	75/75	2	-2	10	DIP K,M,Q,W
4043A	Quad 3-state NOR R/S latch	75/75	1	-1	10	DIP K,M,Q,W
4044A	Quad 3-state NAND R/S latch	75/75	1	-1	10	DIP K,M,Q,W
Multivibrators						
4047A	Monostable/Astable multivibrator	400/400	2.5	-2.5	–	DIP H,L,P,V

• V_{DD}= 10V

COS/MOS INTEGRATED CIRCUITS (continued)

HBC/HBF 4000A series (continued)

TYPE	DESCRIPTION	•PROPAG. DELAY TIME t_{PHL}/t_{PLH} (ns)	•OUT. DRIVE CURRENT N-CHANNEL SINK I_{DN} (mA)	•OUT. DRIVE CURRENT P-CHANNEL SOURCE I_{DP} (mA)	•CLOCK FREQUENCY f max (MHz)	PACKAGE
Shift registers						
Static						
4006A	18-stage static shift register	125	0.5	-0.3	5	DIP H,L,P,V,
4014A	8-stage static shift register	100	0.5	-0.44	5	DIP K,M,Q,W
4015A	Dual 4-stage static shift register	100	0.5	-0.44	5	DIP K,M,Q,W
4021A	8-stage static shift register	100	0.5	-0.44	5	DIP K,M,Q,W
4031A	64-stage static shift register	200	10	-1.5	4	DIP K,M,Q,W
Dynamic						
4062A	200-stage dynamic shift register	–	–	–	–	DIP K,W
Parallel-In/Parallel-Out						
4034A	MSI 8-stage static shift register	240	0.5	-0.25	5	DIP U, X
4035A	4-stage parallel in/out shift register	100	2.5	-1.3	5	DIP K,M,Q,W
Counters						
Binary/Ripple						
4020A	14-stage binary/ripple counter	150	0.6	-0.5	7	DIP K,M,Q,W
4024A	7-stage binary counter	125	1	-0.7	7	DIP H,L,P,V
4040A	12-stage binary/ripple counter	125	1	-1	10	DIP K,M,Q,W
4045A	21-stage counter	–	6	-6	10	DIP K,M,Q,W
4060A	14-stage ripple-carry binary counter/ divider and oscillator	–	0.75	-0.5	4	DIP K,M,Q,W
Synchronous						
4017A	Decade counter/divider	125	1	-1	5	DIP K,M,Q,W
4018A	Presettable divide-by "N" counter	125	1	-1	5	DIP K,M,Q,W
4022A	Divide-by-8-counter/divider	125	1	-0.8	5	DIP K,M,Q,W
4059A	Programmable divide-by-"N" counter	140	12	-1.5	5	DIP U,X

• V_{DD}= 10 V

COS/MOS INTEGRATED CIRCUITS (continued)

HBC/HBF 4000A series (continued)

TYPE	DESCRIPTION	• PROPAG. DELAY TIME t_{PHL}/t_{PLH} (ns)	• OUT. DRIVE CURRENT N-CHANNEL SINK I_{DN} (mA)	• OUT. DRIVE CURRENT P-CHANNEL SOURCE I_{DP} (mA)	• CLOCK FREQUENCY f max (MHz)	PACKAGE
Display counters/decoders/drivers						
Decade counters & 7-segment decoders						
4026A	Decade counter/divider	125	1	-1	5	DIP K,M,Q,W
4029A	Presettable up/down counter	150	0.64	-0.2	5	DIP K,M,Q,W
4033A	Decade counter/divider	125	1	-1	5	DIP K,M,Q,W
Multiplexers						
4016A	Quad bilateral switch	20	–	–	10	DIP H,L,P,V
4066A	Quad bilateral switch	20	–	–	10	DIP H,L,P,V
Arithmetic circuits						
Binary adders						
4008A	4-bit full adder with parallel carry	120	1.5	-1.5	–	DIP K,M,Q,W
4032A	Triple serial adder (positive logic)	250	2.4	-1.2	5	DIP K,M,Q,W
4038A	Triple serial adder (negative logic)	250	2.4	-1.2	5	DIP K,M,Q,W
BCD-decimal decoders						
4028A	BCD-to decimal decoder	100	2.4	-1.9	–	DIP K,M,Q,W
Arithmetic arrays						
4057A	LSI 4-bit arithmetic array	–	–	–	–	DIP T
Memories (RAMs)						
Word-organized						
4036A	Binary addressing: 4 word x 8-bit	–	–	–	–	DIP U,X
4039A	Direct word-line addressing: 4 word x 8-bit	–	–	–	–	DIP U,X
Phase-locked loop						
4046A	Micropower phase-locked loop	–	–	–	–	DIP K,M,Q,W

• V_{DD} = 10V

COS/MOS INTEGRATED CIRCUITS (continued)

HCC/HCF 4000B/4500B series

TYPE	DESCRIPTION	■ PROPAG. DELAY TIME t_{PHL}/t_{PLH} (ns)	■ OUT. DRIVE CURRENT N-CHANNEL SINK I_{OL} (mA)	■ OUT. DRIVE CURRENT P-CHANNEL SOURCE I_{OH} (mA)	■ CLOCK FREQUENCY f max (MHz)	PACKAGE
Gates						
NOR/NAND						
4000B	Dual 3-input NOR plus inverter	45/45	6.8	-6.8	–	DIP H,L,P,V
4001B	Quad 2-input NOR	45/45	6.8	-6.8	–	DIP H,L,P,V
4002B	Dual 4-input NOR	45/45	6.8	-6.8	–	DIP H,L,P,V
4011B	Quad 2-input NAND	45/45	6.8	-6.8	–	DIP H,L,P,V
4012B	Dual 4-input NAND	45/45	6.8	-6.8	–	DIP H,L,P,V
4023B	Triple 3-input NAND	45/45	6.8	-6.8	–	DIP H,L,P,V
4025B	Triple 3-input NOR	45/45	6.8	-6.8	–	DIP H,L,P,V
4068B	8-input NAND/AND	55/55	6.8	-6.8	–	DIP H,L,P,V
4078B	8-input NOR/OR	55/55	6.8	-6.8	–	DIP H,L,P,V
Level shifter						
40109B*	Quad low-to-high voltage	–	6.8	-6.8	–	DIP K,M,Q,W
OR/AND						
4071B	Quad 2-input OR	45/45	6.8	-6.8	–	DIP H,L,P,V
4072B	Dual 4-input OR	45/45	6.8	-6.8	–	DIP H,L,P,V
4073B	Triple 3-input AND	45/45	6.8	-6.8	–	DIP H,L,P,V
4075B	Triple 3-input OR	45/45	6.8	-6.8	–	DIP H,L,P,V
4081B	Quad 2-input AND	45/45	6.8	-6.8	–	DIP H,L,P,V
4082B	Dual 4-input AND	45/45	6.8	-6.8	–	DIP H,L,P,V
Buffers & Inverters						
4007UB	Dual compl. pair plus inverter	25/25	6.8	-6.8	–	DIP H,L,P,V
4041UB	Quad true/complement buffer	25/25	6.8	-6.8	–	DIP H,L,P,V
4049UB	Hex buffer/converter (invert.)	15/25	48	-12	–	DIP K,M,Q,W
4050B	Hex buffer/converter (non-invert.)	15/30	48	-12	–	DIP K,M,Q,W
4069UB	Hex inverter	25/25	6.8	-6.8	–	DIP H,L,P,V
4502B	Strobed hex inverter/buffer	40/65	40.8	-6.8	–	DIP K,M,Q,W
40107B*	Dual 2-input NAND buff./driver	30/50	100	–	–	Minidip

* Coming soon ■ V_{DD}= 15V

COS/MOS INTEGRATED CIRCUITS (continued)

HCC/HCF 4000B/4500B series (continued)

TYPE	DESCRIPTION	■ PROPAG. DELAY TIME t_{PHL}/t_{PLH} (ns)	■ OUT. DRIVE CURRENT N-CHANNEL SINK I_{OL} (mA)	■ OUT. DRIVE CURRENT P-CHANNEL SOURCE I_{OH} (mA)	■ CLOCK FREQUENCY f max (MHz)	PACKAGE
Multifunction/AOI						
4019B	Quad AND/OR select	50/50	6.8	-6.8	–	DIP K,M,Q,W
4030B*	Quad exclusive-OR	45/45	6.8	-6.8	–	DIP H,L,P,V
4048B*	Multif. expandable 8-input (3 state out.)	100/100	6.8	-6.8	–	DIP K,M,Q,W
4070B	Quad exclusive-OR	50/50	6.8	-6.8	–	DIP H,L,P,V
4077B	Quad exclusive-NOR	50/50	6.8	-6.8	–	DIP H,L,P,V
4085B	Dual 2-wide,2-input AND/OR invert(AOI)	–	6.8	-6.8	–	DIP H,L,P,V
4086B	Exp. 4-wide,2-input AND/OR invert(AOI)	–	6.8	-6.8	–	DIP H,L,P,V
Decoders/Encoders						
4028B	BCD-to-decimal decoder	60/60	6.8	-6.8	–	DIP K,M,Q,W
4514B	4-bit latch/4-to-16 line decod.(out. high)	135/135	6.8	-6.8	–	DIP X,U
4515B	4-bit latch/4-to-16 line decod.(out. low)	135/135	6.8	-6.8	–	DIP X,U
4532B	8-input priority encoder	45/45	6.8	-6.8	–	DIP K,M,Q,W
4555B	Dual 1-of-4 decod./demultipl.(out. high)	70/70	6.8	-6.8	–	DIP K,M,Q,W
4556B	Dual 1-of-4 decod./demultipl.(out. low)	70/70	6.8	-6.8	–	DIP K,M,Q,W
Schmitt trigger						
4093B	Quad 2-input NAND	120/120	6.8	-6.8	–	DIP H,L,P,V
40106B*	Hex	60/60	6.8	-6.8	–	DIP H,L,P,V
Multivibrators						
4047B*	Monostable/astable	–	6.8	-6.8	–	DIP H,L,P,V
4098B	Dual monostable	–	6.8	-6.8	–	DIP K,M,Q,W
Flip-flops						
4013B	Dual "D" with set/reset capabil.	45/45	6.8	-6.8	24	DIP H,L,P,V
4027B	Dual "J-K" with set/reset capabil.	45/45	6.8	-6.8	24	DIP K,M,Q,W
4095B	Gated "J-K" (non inverting)	75/75	6.8	-6.8	24	DIP H,L,P,V
4096B	Gated "J-K" (inverting & non-inverting)	75/75	6.8	-6.8	24	DIP H,L,P,V
40174B*	Hex "D"	60/60	6.8	-6.8	15.5	DIP K,M,Q,W

* Coming soon ■ V_{DD}= 15V

COS/MOS INTEGRATED CIRCUITS (continued)

HCC/HCF 4000B/4500B series (continued)

TYPE	DESCRIPTION	■ PROPAG. DELAY TIME t_{PHL}/t_{PLH} (ns)	■ OUT. DRIVE CURRENT N-CHANNEL SINK I_{OL} (mA)	■ OUT. DRIVE CURRENT P-CHANNEL SOURCE I_{OH} (mA)	■ CLOCK FREQUENCY f max (MHz)	PACKAGE
Latches						
4042B	Quad clocked "D"	40/40	6.8	-6.8	–	DIP K,M,Q,W
4043B	Quad NOR R/S (3-state outputs)	50/50	6.8	-6.8	–	DIP K,M,Q,W
4044B	Quad NAND R/S (3-state outputs)	50/50	6.8	-6.8	–	DIP K,M,Q,W
4099B	8-bit addressable	50/50	6.8	-6.8	–	DIP K,M,Q,W
4508B*	Dual 4-bit	50/50	6.8	-6.8	–	DIP U,X
Registers						
Shift registers static						
4006B*	18-stage	80/80	6.8	-6.8	16	DIP H,L,P,V
4014B*	8-stage with synch. par. or serial in./ser. out.	80/80	6.8	-6.8	16	DIP K,M,Q,W
4015B*	Dual 4-stage with serial in./parallel out.	80/80	6.8	-6.8	16	DIP K,M,Q,W
4021B*	4-stage with asynch, parallel in. or synch. serial input/serial output	80/80	6.8	-6.8	16	DIP K,M,Q,W
4031B*	64-stage	80/80	6.8	-6.8	16	DIP K,M,Q,W
4034B*	8-stage bidir. parall. or serial in./par. out.	140/140	6.8	-6.8	6	DIP U,X
4035B*	4-stage parall. in./parall. out. with "J-K" input and true/complement output	80/80	6.8	-6.8	16	DIP K,M,Q,W
4094B	8-stage shift-and-store bus	95/95	6.8	-6.8	6	DIP K,M,Q,W
40100B*	32-bit left/right	115/115	6.8	-6.8	6	DIP K,M,Q,W
40104B*	3-state 4-bit left/right	110/110	6.8	-6.8	12	DIP K,M,Q,W
40194B*	4-bit left/right	110/110	6.8	-6.8	12	DIP K,M,Q,W
Storage registers						
4076B	4-bit "D" type with 3-state out.	90/90	6.8	-6.8	16	DIP K,M,Q,W
40108B*	4x4 multiport	100/100	6.8	-6.8	9	DIP U,X
40208B*	4x4 multiport	100/100	6.8	-6.8	9	DIP U,X
FIFO buffer registers						
40105B*	4-bit x 16 word	–	6.8	-6.8	–	DIP K,M,Q,W
Counters						
Clock timer						
4045B*	21-stage	1000/1000	47	-47	24	DIP K,M,Q,W

* Coming soon ■ V_{DD}= 15V

HCC/HCF 4000B/4500B series (continued)

TYPE	DESCRIPTION	■ PROPAG. DELAY TIME t_{PHL}/t_{PLH} (ns)	■ OUT. DRIVE CURRENT N-CHANNEL SINK I_{OL} (mA)	■ OUT. DRIVE CURRENT P-CHANNEL SOURCE I_{OH} (mA)	CLOCK FREQUENCY f max (MHz)	PACKAGE
Binary ripple						
4020B*	14-stage	120/120	6.8	-6.8	24	DIP K,M,Q,W
4024B	7-stage	120/120	6.8	-6.8	24	DIP K,M,Q,W
4040B*	12-stage	120/120	6.8	-6.8	24	DIP K,M,Q,W
4060B*	14-stage counter/divider and oscill.	240/240	6.8	-6.8	24	DIP K,M,Q,W
Synchronous						
4017B	Decade count./divid. plus 10 decade decim. out.	80/80	6.8	-6.8	16	DIP K,M,Q,W
4018B	Presett. divide-by "N" count. fixed or progr.	60/60	6.8	-6.8	15	DIP K,M,Q,W
4022B	Divide-by-8 count./divid. with 8 dec. out.	80/80	6.8	-6.8	16	DIP K,M,Q,W
4029B	Presett. up/down counter, binary or BCD-decoder	55/55	6.8	-6.8	14	DIP K,M,Q,W
4510B*	Presett. 4-bit BCD up/down counter	75/75	6.8	-6.8	11	DIP K,M,Q,W
4516B*	Presett. 4-bit binary up/down counter	75/75	6.8	-6.8	11	DIP K,M,Q,W
4518B	Dual BCD up counter	80/80	6.8	-6.8	8	DIP K,M,Q,W
4520B	Dual binary up counter	80/80	6.8	-6.8	8	DIP K,M,Q,W
40102B*	Presett. 2-decade BCD down counter	95/95	6.8	-6.8	4.8	DIP K,M,Q,W
40103B*	Presett. 8-bit binary down counter	95/95	6.8	-6.8	4.8	DIP K,M,Q,W
40160B*	Decade counter/asynch. clear	60/60	6.8	-6.8	12	DIP K,M,Q,W
40161B*	Binary counter/asynch. clear	60/60	6.8	-6.8	12	DIP K,M,Q,W
40163B*	Binary counter/synch. clear	60/60	6.8	-6.8	12	DIP K,M,Q,W
40192B*	Presett. 4-bit BCD up/down counter	90/90	6.8	-6.8	11	DIP K,M,Q,W
40193B*	Presett. 4-bit binary up/down counter	90/90	6.8	-6.8	11	DIP K,M,Q,W
Display drivers						
With counter						
4026B*	Decade counter/divider with 7-segment display outputs and display enable	90/90	6.8	-6.8	7.5	DIP K,M,Q,W
4033B*	Decade counter/divider with 7-segment display outputs and ripple blanking	90/90	6.8	-6.8	7.5	DIP K,M,Q,W
For light-emitting-diode drive						
4511B	BCD-to-7-segment latch decod. driver	150/180	6.8	–	–	DIP K,M,Q,W

* Coming soon ■ V_{DD}= 15V

HCC/HCF 4000B/4500B series (continued)

TYPE	DESCRIPTION	■ PROPAG. DELAY TIME t_{PHL}/t_{PLH} (ns)	■ OUT. DRIVE CURRENT N-CHANNEL SINK I_{OL} (mA)	■ OUT. DRIVE CURRENT P-CHANNEL SOURCE I_{OH} (mA)	■ CLOCK FREQUENCY f max (MHz)	PACKAGE
For liquid-crystal-display drive						
4054B	4-line	250/250	6.8	-3	–	DIP K,M,Q,W
4055B	BCD-to-7-segment decoder/driv. with "display-frequency" output	375/375	6.8	-3	–	DIP K,M,Q,W
4056B	BCD-to-7-segment decoder/driv. with strobed-latch function	375/375	6.8	-3	–	DIP K,M,Q,W
Multiplexers/demultiplexers						
Analog/digital						
4016B	Quad bilateral switch	–	–	–	–	DIP H,L,P,V
4051B	Single 8-channel	120/120	–	–	–	DIP K,M,Q,W
4052B	Differential 4-channel	120/120	–	–	–	DIP K,M,Q,W
4053B	Triple 2-channel	120/120	–	–	–	DIP K,M,Q,W
4066B*	Quad bilateral switch	–	–	–	–	DIP H,L,P,V
4067B	Single 16-channel	95/95	–	–	–	DIP U,X
4097B	Differential 8-channel	95/95	–	–	–	DIP U,X
Data selector						
4512B*	8-channel data selector	50/50	6.8	-6.8	–	DIP K,M,Q,W
40257B*	Quad 2-line-to-1-line	50/50	6.8	-6.8	–	DIP K,M,Q,W
Phase locked loop						
4046B*	Micropower	–	6.8	-6.8	–	DIP K,M,Q,W
Arithmetic circuits						
Adders/comparators						
4008B	4-bit full adder with parall. carry output	115/115	6.8	-6.8	–	DIP K,M,Q,W
4032B*	Triple serial adder,positive logic	90/90	6.8	-6.8	12	DIP K,M,Q,W
4038B*	Triple serial adder, negative logic	90/90	6.8	-6.8	12	DIP K,M,Q,W
4063B	4-bit magnitude comparator	175/175	6.8	-6.8	–	DIP K,M,Q,W
Parity generator/checker						
40101B*	9-bit	100/100	6.8	-6.8	–	DIP H,L,P,V

* Coming soon ■ V_{DD}= 15V

COS/MOS INTEGRATED CIRCUITS (continued)

HCC/HCF 4000B/4500B series (continued)

TYPE	DESCRIPTION	■ PROPAG. DELAY TIME t_{PHL}/t_{PLH} (ns)	■ OUT. DRIVE CURRENT N-CHANNEL SINK I_{OL} (mA)	■ OUT. DRIVE CURRENT P-CHANNEL SOURCE I_{OH} (mA)	■ CLOCK FREQUENCY f max (MHz)	PACKAGE
ALU/rate multipliers						
4089B	Binary rate multiplier	45/45	6.8	-6.8	7	DIP K,M,Q,W
4527B	BCD rate multiplier	45/45	6.8	-6.8	7	DIP K,M,Q,W
40181B*	4-bit arithmetic unit	120/120	6.8	-6.8	–	DIP U, X
40182B*	Look-ahead-carry block	75/75	6.8	-6.8	–	DIP K,M,Q,W

* Coming soon ■ V_{DD}= 15V

HBC/HBF 4700A proprietary series

TYPE	DESCRIPTION	● PROPAG. DELAY TIME t_{PHL}/t_{PLH} (ns)	● OUT. DRIVE CURRENT N-CHANNEL SINK I_{DN} (mA)	● OUT. DRIVE CURRENT P-CHANNEL SOURCE I_{DP} (mA)	● CLOCK FREQUENCY f max (MHz)	PACKAGE
4700A	Quartz crystal 16-stage car clock circuit	–	20	-20	10	Minidip
4704A	BCD-7-segment decoder driver	–	–	–	–	DIP K,Q
4714A	Quartz crystal 23-stage car clock circuit	–	8	-8	10	DIP H,P
4715A	Hex Schmitt trigger inverting	60	2.5	-2.5	–	DIP H,P,
4721A	Hex Schmitt trigger non-inverting	45	2.5	-2.5	–	DIP H,P
4727A	7 stage frequency divider for electron. organs	40	1	-1	–	DIP H
4728A	23 stage car clock circuit 64 Hz output	–	8	-8	10	DIP H,P
4730A*	Adjustable 23 stage freq. divider 0.5 Hz out.	–	8	-8	10	DIP H,P
4731A*	Adjustable 16 stage freq. divider 64 Hz out.	–	8	-8	10	DIP H,P
4740A	7 stage frequency divider for electron. organs	40	1	-1	–	DIP H
M 1024	Remote Control - Transmitter	–	–	–	–	DIP K,Q

* Coming soon ● V_{DD}= 10V

MOS INTEGRATED CIRCUITS

SGS-ATES MOS PROCESSES

1 - **P-channel enhancement mode with a P-type polycrystalline silicon gate**
- Threshold voltage: 1.5 to 2.5 V
- Supply voltages: V_{CC}= +5V, V_{GG}= -12V
- Speed: up to 5 MHz
- Used in static and dynamic 2 ϕ applications
- Compatible with bipolar circuits

2 - **Low threshold N-channel enhancement mode with a N-type polycrystalline silicon gate**
- Threshold voltage: 0.6 to 1.2V
- Supply voltage: V_{CC}= +5V
- Speed: up to 5 MHz
- Used in static and dynamic systems
- Compatible with bipolar circuits

3 - **N-channel enhancement mode with a N-type polycrystalline silicon gate**
- Threshold voltage: 1.2 to 2V
- Supply voltages: V_{DD}= +12V, V_{BB}= -5V, V_{CC}= 5V
- Used in static and dynamic systems
- Compatible with bipolar circuits

4 - **N-channel enhancement mode with double N-type polycrystalline silicon gate**
- Threshold voltage: 1.2 to 2V
- Supply voltages: V_{DD}= +12V, V_{BB}= -5V, V_{CC}= 5V
- Used for UV erasable and electrically programmable ROMs
- Compatible with bipolar circuits

5 - **N-channel PLANOX® silicon gate ion-implanted MOS technology**
- Threshold voltage: 0.9 to 1.5V
- Supply voltage: V_{GG}= 12V, V_{DD}= 5V
- Compatible with TTL
- Used for Microprocessor

6 - **N-channel PLANOX® silicon gate ion-implanted MOS technology**
- Supply voltage: V_{CC}= 5V
- Compatible with TTL
- Used for Microcomputer components

MOS INTEGRATED CIRCUITS

Shift registers

TYPE	MODE(Static,Dynamic)	DESCRIPTION	TECHNOLOGY	V_{CC} (V)	V_{DD} (V)	V_{GG} (V)	f max (MHz)	V_{IH} (V)	V_{OH} (V)	I_{DD} (mA)	I_{GG} (mA)	POWER CONS. (mW)	TEMP. RANGE (°C)	PACKAGE
M 142	S	Quad 80 bit single phase	2	5	–	–	3	2	2.4	–	50 (I_{CC})	280	0-70	DIP M,K
M 142A	S	Quad 80 bit single phase	2	5	–	–	5	2	2.4	–	50 (I_{CC})	280	0-70	DIP M,K
M 130	D	1024 bit two phase	1	5	-5	–	5	3.05	3.15	35	–	500	0-70	TO-99,
M 136	D	Dual 512 bit two phase	1	5	-5	–	5	3.05	3.15	35	–	500	0-70	TO-99,
M 141	D	Quad 256 bit two phase	1	5	-5	–	5	3.05	3.15	35	–	500	0-70	DIP M,K

TV circuits

TYPE	DESCRIPTION	TECHNOLOGY	V_{CC} (V)	POWER CONS. (mW)	TEMP. RANGE (°C)	PACKAGE
M 054	1 of 16 decoder (internal pull-up)	3	18	450	0-70	DIP U
M 055	1 of 16 decoder (open drain)	3	18	450	0-70	DIP U
M 190	Keyboard encoder	3	13	240	0-70	DIP O
M 191	Tuning scale display	3	13	240	0-70	DIP K
M 192	Program display	CMOS	13	–	0-70	DIP K
M 193	Electronic Program Memory	3	13	700	0-70	DIP I
M 1024	30 channel TV remote control transmitter	CMOS	9	20	-25-70	DIP K
M 1025	30 channel TV remote control receiver	1	18	400	-25-70	DIP K
M 1130	30 channel TV remote control receiver	1	18	450	-25-70	DIP O

MOS INTEGRATED CIRCUITS (continued)

Electronic organ circuits

TYPE	DESCRIPTION	TECHNOLOGY	V_{CC} (V)	V_{GG} (V)	f (MHz)	No. RHYTHMS	No. OUTPUTS	POWER CONS. (mW)	TEMP. RANGE (°C)	PACKAGE
M 087	Tone generator	1	5	-12	2	–	–	–	0-70	DIP K
M 147	13 bit latch pedal sustain	1	5	-12	2 or 0.5	–	–	–	0-70	DIP U
M 250 ☆	Rhythm generator	–	5	-12	DC to 0.1	12	8	180	0-70	DIP U
M 251	Arpeggio, chord and bass generator	1	5	-12	1 to 12 (kHz)	–	–	360	0-70	DIP Z
M 252 ☆	Rhythm generator	1	5	-12	DC to 0.1	15	8	180	0-70	DIP K
M 253 ☆	Rhythm generator	1	5	-12	DC to 0.1	12	8	180	0-70	DIP U
M 254 ☆	Rhythm generator	–	5	-12	DC to 0.1	8	12	180	0-70	DIP U
M 255 ☆	Rhythm generator	1	5	-12	DC to 0.1	6	5	180	0-70	DIP K
H 629	Gates (1x12 inputs)	*	15	–	–	–	–	–	0-60	DIP H

* Bipolar ☆ROM

Memories

TYPE	MODE	DESCRIPTION	TECHNOLOGY	V_{CC} (V)	V_{DD} (V)	V_{GG} (V)	t_{acc} (μs)	V_{IH} (V)	V_{OH} (V)	I_{DD} (mA)	I_{GG} (mA)	POWER CONS. (mW)	TEMP. RANGE (°C)	PACKAGE
M 240	ROM	512x8 bit	1	5	–	-12	0.5	2.25	2.4	25	25	–	0-70	DIP U,X
M 280	ROM	2Kx8 bit	2	5	–	–	0.45	2.2	2.2	40	–	–	0-70	DIP U,X
M 2102	RAM	1024x1 bit static	2	5	–	–	0.5	2.2	2.2	30	–	300	0-70	DIP K,M
M 2102A	RAM	1024x1 bit static	2	5	–	–	0.25	2.2	2.2	33	–	–	0-70	DIP K,M
• M 2107B	RAM	4096x1 bit dyn.	3	5	12	–	0.25	2.2	2.4	50	–	600	0-70	DIP Y
M 2316E	ROM	2Kx8 bit	2	5	–	–	0.45	2.2	2.2	40	–	–	0-70	DIP U,X
M 2704	PROM	512x8 bit	4	5	12	–	0.45	2.2	2.2	–	–	–	0-70	DIP X (1)
M 2708	PROM	1Kx8 bit	4	5	12	–	0.45	2.2	2.2	55	–	–	0-70	DIP X (1)
• M 4027P	RAM	4096x1 bit dyn.	3	5	12	–	0.25	2.2	2.4	50	–	600	0-70	DIP K,M

• V_{BB} = -5V

MOS INTEGRATED CIRCUITS (continued)

Microprocessors

TYPE	MODE	TECHNOLOGY	V_{CC} (V)	V_{GG} (V)	V_{DD} (V)	f (MHz)	V_{IH} (V)	V_{OH} (V)	I_{CC} (mA)	I_{DD} (mA)	I_{GG} (mA)	POWER CONS. (mW)	TEMP. RANGE (°C)	PACKAGE
M 3850	CPU	5	–	12	5	2	2.9	3.9 ●[1]	–	80	25	700	0-70	DIP R
M 3851	PSU	5	–	12	5	2	2.9	3.9 ●[1]	–	70	18	565	0-70	DIP R
M 3852	DMI	5	–	12	5	2	3.5	3.9 ●[2]	–	70	30	710	0-70	DIP R
M 3853	SMI	5	–	12	5	2	3.5	3.9 ●[2]	–	70	30	710	0-70	DIP R
M 3854	DMA	5	–	12	5	2	3.5	3.9 ●[2]	–	40	28	535	0-70	DIP R
M 3856	PSU	5	–	12	5	2	2.9	3.9 ●[1]	–	125	45	1065	0-70	DIP R
M 3857	PSU/SMI	5	–	12	5	2	2.9	3.9 ●[2]	–	125	45	1065	0-70	DIP R
M 3861	PIO	5	–	12	5	2	2.9	3.9 ●[1]	–	70	18	565	0-70	DIP R
M 3870*	μCOMP	6	5	–	–	4	–	–	–	–	–	–	0-70	DIP R
M 3871*	PIO	5	–	12	5	2	2.9	3.9 ●[1]	–	70	18	565	0-70	DIP R
Z 80	CPU	6	5	–	–	4	2	2.4	150	–	–	750	0-70	DIP R/DIP Z
Z 80	CTC	6	5	–	–	2.5	2	2.4	100	–	–	500	0-70	DIP R/DIP Z
Z 80	PIO	6	5	–	–	2.5	2	2.4	70	–	–	350	0-70	DIP R/DIP Z
Z 80	SIO	6	5	–	–	2.5	2	2.4	140	–	–	700	0-70	DIP R/DIP Z
Z 80	DMA	6	5	–	–	2.5	2	2.4	150	–	–	750	0-70	DIP R/DIP Z

* Coming soon ●[1] I_{OH}= -30 μA ●[2] DATA BUS I_{OH}= -100 μA

Other functions

TYPE	DESCRIPTION	TECHNOLOGY	V_{CC} (V)	V_{DD} (V)	V_{GG} (V)	f (MHz)	V_{IH} (V)	V_{OH} (V)	I_{CC} (mA)	POWER CONS. (mW)	TEMP. RANGE (°C)	PACKAGE
M 005	4-channel multip. (analogic switch)	1	–	-10	-25	1	–	–	–	–	0-70	TO-100 (1)
M 006	8-channel multip. (analogic switch)	1	5	–	-12	1	–	–	–	–	0-70	DIP K,M
M 009	2-channel multip. (analogic switch)	1	–	-10	-25	1	–	–	–	–	0-70	TO-99
M 100	Digital alarm clock	–	9	–	–	–	V_{CC}-2.5	0.7	15	100	0-70	DIP U

BIPOLAR DIGITAL ICs

BIPOLAR DIGITAL ICs

HLL-H 100, H 200 series ☆

TYPE	DESCRIPTION	t_{pd} (ns)	•P_D (mW)	f (MHz)	FANOUT	PACKAGE
Gates						
H 102/202	Quad 2-input NAND	105	75	–	25	DIP P/H
H 103/203	Triple 3-input NAND	110	75	–	25	DIP P/H
H 104/204	Expandable dual 4-input NAND	105	75	–	25	DIP P/H
H 105/205	Exp. dual 2-wide 2-input AND-OR-INVERT	110	175	–	25	DIP P/H
H 109/209	Expandable dual 4-input AND power	70	80	–	100 mA	DIP P/H
H 122/222	Quad 2-input (passive pull-up) NAND	120	75	–	10	DIP P/H
H 124/224	Exp. dual 4-input (passive pull-up) NAND	120	75	–	10	DIP P/H
H 167/267	Quad exclusive-OR	–	500	–	25	DIP P/H
H 168/268	Quad exclusive-OR open collector	–	–	–	25	DIP P/H
Flip-flops						
H 110/210	Dual JK with separate preset	–	480 ■	1	25	DIP P/H
H 111/211	Dual JK with separate preset and clear	–	480 ■	1	25	DIP Q/K
H 159/259	Quad latch	–	500	–	25	DIP Q/K
H 165/265	Quad Schmitt trigger	–	–	–	–	DIP Q/K
H 166/266	Quad Schmitt trigger open collector	–	–	–	–	DIP Q/K
Other functions						
H 112/212	Hex inverter (open collector)	110	55	–	25	DIP P/H
H 113/213	High to low level quad coverter (open coll.)	80	60	–	–	DIP P/H
H 114/214	Low to high level quad converter	100	55	–	25	DIP P/H
H 115/215	Hex inverter with strobe (open collector)	110	55	–	25	DIP Q/K
H 117/217	One-shot multivibrator (Tpw≅ 0.83 RxCx)	–	300	–	25	DIP P/H
H 118/218	Hex inverter (active pull-up)	110	60	–	25	DIP P/H
H 119/219	Hex inverter with strobe (active pull-up)	110	60	–	25	DIP Q/K
H 156/256	Binary counter	–	500	1	25	DIP P/H
H 157/257	Decade counter	–	500	1	25	DIP P/H
H 158/258	BCD to decimal decoder Nixie® driver	–	460	–	–	DIP Q/K
H 160/260	4-bit shift register	–	500	1.5	25	DIP Q/K

☆ Characteristics of the family: H 100 D1 V_{CC}= 10.8 to 20V, temp. range 0 to 75°C, ceramic DIP
H 100 D6 V_{CC}= 10.8 to 16V, temp. range -40 to 85°C, ceramic DIP
H 100 D2 V_{CC}= 10.8 to 16V, temp. range -55 to 125°C, ceramic DIP
H 200 B1 V_{CC}= 10.8 to 16V, temp. range 0 to 75°C, plastic DIP

Noise immunity = 5 V typ @ V_{CC} = 15V. HLL can interface directly with COS/MOS, provided V_{DD}=V_{CC}= 10.8 to 15 V for HBC/HBF 4000A/4700A series; V_{DD}=V_{CC}= 10.8 to 18V for HCC/HCF 4000B/4500B series. No external components or special rules are required.

• Intended as the typical worst case, per gate measured at V_{CC}= 20 V ■ Total P_D for the whole package

BIPOLAR DIGITAL ICs (continued)

TTL-T 100 series ☆

TYPE	DESCRIPTION	t_{pd} (ns)	P_D (mW)	f (MHz)	FANOUT	PACKAGE
Gates						
T 102	Quad 2-input NAND	6	44	–	10	DIP H, P
T 103	Triple 3-input NAND	6	33	–	10	DIP H, P
T 104	Dual 4-input NAND	6	22	–	10	DIP H, P
T 105	Dual AND-NOR	8	15	–	10	DIP H, P
T 106	Dual 4-input expander	–	–	–	–	DIP H, P
T 107	Single 8-input NAND	6	11	–	10	DIP H, P
T 108	Expandable 2 + 2 + 2 + 3 input AND-NOR	8	25	–	10	DIP H, P
T 109	Dual 4-input buffer NAND	8	30	–	30	DIP H, P
T 112	Quad 2-input open collector NAND	6	44	–	10	DIP H, P
T 115	Dual exclusive OR	8	27	–	10	DIP H, P
T 116	Hex inverter	6	66	–	10	DIP H, P
T 122	Quad 2-input NOR	6	44	–	10	DIP H, P
Flip-flops						
T 100	Master-slave JK	–	65	20	10	DIP H, P
T 101	Master-slave JK with J and K inputs	–	65	20	10	DIP H, P
T 110 •	Dual D	–	75	30	10	DIP H, P
T 120	Dual master-slave JK with common clock	–	140	50	10	DIP K, Q
T 121	Dual master-slave JK with common clock	–	140	50	10	DIP K, Q
T 176	Dual retriggerable multivibrator	–	–	–	–	DIP K, Q

☆ Characteristics of the family: noise immunity = 1 V typ; ceramic flat and DIP packages for extended temperature range (-55°C to 125°C); ceramic flat, ceramic and plastic DIP packages for standard temperature range (0°C to 75°C)

• Standard temperature range only

BIPOLAR DIGITAL ICs (continued)

TTL-T 100 series ☆ (continued)

TYPE	DESCRIPTION	t_{pd} (ns)	P_D (mW)	f (MHz)	FANOUT	PACKAGE
Other functions						
T 118	Retriggerable monostable	25	75	–	8	DIP H,P
T 150	4-bit universal shift register	–	300	15	6	DIP K,Q
T 151	1-of 10 decoder	20	145	–	10	DIP K,Q
T 152	Dual full adder	8	150	–	–	DIP K,Q
T 154 •	256-bit read only memory (50ns access time)	–	300	–	–	DIP K,Q
T 163	8-input multiplexer	25	135	–	10	DIP K,Q
T 164	Dual 4-input multiplexer	25	150	–	10	DIP K,Q
T 167 •	9-bit parity generator and checker	–	300	–	10	DIP H,P
T 168 •	Quad 2-input multiplexer	20	200	–	10	DIP K,Q
T 172 •	Quad line receiver	12	150	–	10	DIP H
T 173 •	Quad bistable latch	20	300	–	10	DIP K
T 174 •	Triple line receiver	18	300	–	10	DIP K
T 175 •	Dual line driver	20	250	–	–	DIP Q

☆ Characteristics of the family: noise immunity = 1 V typ; ceramic flat and DIP packages for extended temperature range (-55°C to 125°C); ceramic flat, ceramic and plastic DIP packages for standard temperature range (0°C to 75°C)

• Standard temperature range only

BIPOLAR DIGITAL ICs (continued)

TTL-T 74, T 54 series ☆

TYPE	DESCRIPTION	t_{pd} (ns)	P_D (mW)	FANOUT	PACKAGE
Gates					
T 7400/5400	Quad 2-input NAND	10	40	10	DIP H,P
T 7401/5401	Quad 2-input open-collector NAND	10	40	10	DIP H,P
T 7402/5402	Quad 2-input NOR	10	60	10	DIP H,P
T 7403/5403	Quad 2-input with open-collector NAND	10	40	10	DIP H,P
T 7404/5404	Hex inverter	10	60	10	DIP H,P
T 7405/5405	Hex inverter with open-collector	25	60	10	DIP H,P
T 7406/5406	Hex inverter with open-collector*	15	150	25	DIP H,P
T 7407/5407	Hex buffer/driver with open-collector*	14	145	–	DIP H,P
T 7408/5408	Quad 2-input AND	20	150	10	DIP H,P
T 7409/5409	Quad 2-input AND with open-collector	22	150	10	DIP H,P
T 7410/5410	Triple 3-input NAND	10	30	10	DIP H,P
T 7416/5416	Hex inverter with open-collector*	15	150	25	DIP H,P
T 7417/5417	Hex buffer/driver with open-collector*	14	145	–	DIP H,P
T 7420/5420	Dual 4-input NAND	10	20	10	DIP H,P
T 7426/5426	Quad 2-input NAND with open collector *	14	150	10	DIP H,P
T 7428/5428	Quad 2-input NOR buffer	15	112	30	DIP H,P
T 7430/5430	8-input NAND	10	10	10	DIP H,P
T 7433/5433	Quad 2-input NOR buffer with open-coll.	15	112	30	DIP H,P
T 7440/5440	Dual 4-input NAND buffer	10	70	30	DIP H,P
T 7450/5450	Expandable 2-input AND-OR	10	40	10	DIP H,P
T 7451/5451	Dual 2-input AND-OR	10	40	10	DIP H,P
T 7453/5453	Expandable 2-2-2-2 input AND-OR	10	40	10	DIP H,P
T 7454/5454	4-wide-2-input AND-OR-INVERT	10	25	10	DIP H,P
T 7460/5460	Dual 4-input expander	10	20	–	DIP H,P
T 7486/5486	Quad 2-input exclusive-OR	10	10	10	DIP H,P

☆ Characteristics of the family: T 74 series - temperature range 0 to 70°C, ceramic and plastic DIP
T 54 series - temperature range -55 to 125°C, ceramic DIP
Noise immunity = 1 V typ

* High voltage output

BIPOLAR DIGITAL ICs (continued)

TTL-T 74, T 54 series☆ (continued)

TYPE	DESCRIPTION	t_{pd} (ns)	P_D (mW)	f (MHz)	FANOUT	PACKAGE
Flip-flops						
T 7472/5472	J-K master-slave with AND inputs	–	50	20	10	DIP H,P
T 7473/5473	Dual J-K with clear	–	100	20	10	DIP H,P
T 7474/5474	Dual D	–	85	25	10	DIP H,P
T 7476/5476	Dual J-K master-slave with preset and clear	–	100	20	10	DIP K,Q
T 74107/54107	Dual J-K master-slave	–	100	20	10	DIP H,P
T 74121/54121	Monostable multivibrator	–	90	30	10	DIP H,P
T 74122/54122	Retriggerable multivibrator (with clear)	–	115	30	10	DIP H,P
T 74123/54123	Dual retriggerable multivibrator (with clear)	–	230	30	10	DIP K,Q
Other functions						
T 7441A/5441A	Decoder Nixie® driver	–	110	–	–	DIP K,Q
T 7442/5442	BCD-to-decimal decoder	25	140	–	10	DIP K,Q
T 7443/5443	Excess-3-to-decimal decoder	25	140	–	10	DIP K,Q
T 7444/5444	Excess-3-gray-to-decimal decoder	25	140	–	10	DIP K,Q
T 7475/5475	4-bit bistable latch	10	100	–	10	DIP K,Q
T 7481/5481	16-bit RAM	60	275	–	–	DIP H,P
T 7483/5483	4-bit full adder	–	350	–	10	DIP K,Q
T 7484/5484	16-bit RAM with gated write inputs	60	275	–	–	DIP K,Q
T 7490/5490	Decade counter	–	130	18	10	DIP H,P
T 7492/5492	Divide-by-12 counter	60	155	18	10	DIP H,P
T 7493/5493	Binary counter	–	130	18	10	DIP H,P
T 74157/54157	Quad 2-input data selector	9	250	–	10	DIP K,Q
T 74180/54180	8-bit odd/even parity generator/checker	–	150	–	10	DIP H,P
T 74192/54192	Up/down decade counter	–	325	32	10	DIP K,Q
T 74193/54193	Up/down binary counter	–	325	32	10	DIP K,Q

☆ Characteristics of the family: T 74 series – temperature range 0 to 70°C, ceramic and plastic DIP
T 54 series – temperature range -55 to 125°C, ceramic DIP
Noise immunity = 1 V typ.

BIPOLAR DIGITAL ICs (continued)

TTL-T 74 H, T 54 H series☆

TYPE	DESCRIPTION	t_{pd} (ns)	■ P_D (mW)	FANOUT	PACKAGE
T 74/54 H 00	Quad 2-input positive NAND gate	6	90	10	DIP H,P
T 74/54 H 04	Hex inverter	8	140	10	DIP H,P
T 74/54 H 05*	Hex inverter with open collector	11	140	10	DIP H,P
T 74/54 H 10	Triple 2-input positive NAND gate	6	70	10	DIP H,P
T 74/54 H 11	Triple 3-input positive AND gate	8	130	10	DIP H,P
T 74/54 H 20	Dual 4-input positive NAND gate	7	50	10	DIP H,P
T 74/54 H 21	Dual 4-input AND gate	8	80	10	DIP H,P
T 74/54 H 40	Dual 4-input positive NAND buffer	8	90	30	DIP H,P
T 74/54 H 50	Exp. dual 2-wide 2-input AND-OR-INVERTER gate	9	50	10	DIP H,P
T 74/54 H 51	Dual 2-wide 2-input AND-OR-INVERT gate	7	70	10	DIP H,P
T 74/54 H 52	Exp. 2-2-2-3 input AND-OR gate	10	90	10	DIP H,P
T 74/54 H 53*	Exp. 2-2-2-3 input AND-OR-INVERT gate	9	50	10	DIP H,P
T 74/54 H 54	Dual 2-wide 2-input AND-OR-INVERT gate	7	50	10	DIP H,P
T 74/54 H 61	Triple 3-input expander	10	40	–	DIP H,P
T 74/54 H 62	3-2-2-3 input AND-OR expander	–	30	–	DIP H,P
T 74/54 H 71*	JK master-slave flip-flop	–	100	10	DIP H,P
T 74/54 H 72	JK master-slave flip-flop	–	90	10	DIP H,P

☆ Characteristics of the family: T 74 H series - temperature range 0 to 70°C, ceramic and plastic DIP
T 54 H series - temperature range -55 to 125°C, ceramic DIP

* Coming soon

■ Values referred to T 74 H series

TTL-T 74 LS, T 54 LS series☆

TYPE	DESCRIPTION	t_{pd} (ns)	P_D (mW)	FANOUT	PACKAGE
T 74/54 LS 00	Quad 2-input NAND gate	5	8	20	DIP H,P
T 74/54 LS 02	Quad 2-input NOR gate	5	8	20	DIP H,P
T 74/54 LS 03	Quad 2-input NAND gate open-collector	10	10	20	DIP H,P
T 74/54 LS 04	Hex inverter	5	12	20	DIP H,P
T 74/54 LS 05	Hex inverter open-collector	10	25	20	DIP H,P
T 74/54 LS 08	Quad 2-input AND gate	7.5	8	20	DIP H,P
T 74/54 LS 09	Quad 2-input AND gate open-collector	10	10	20	DIP H,P
T 74/54 LS 10	Triple 3-input NAND gate	6	10	20	DIP H,P
T 74/54 LS 11	Triple 3-input AND gate	7.5	12	20	DIP H,P
T 74/54 LS 14	Hex Schmitt trigger	20	30	20	DIP H,P
T 74/54 LS 15*	Triple 3-input AND gate open-collector	10	15	20	DIP H,P
T 74/54 LS 21*	Dual 4-input AND gate	8	10	20	DIP H,P
T 74/54 LS 22*	Dual 4-input NAND gate open-collector	10	8	20	DIP H,P
T 74/54 LS 27*	Triple 3-input NOR gate	8	10	20	DIP H,P
T 74/54 LS 30	8-input NAND gate	7	12	20	DIP H,P
T 74/54 LS 32	Quad 2-input OR gate	7	12	20	DIP H,P
T 74/54 LS 40	Dual 4-input NAND buffer	10	20	20	DIP H,P
T 74/54 LS 42*	1 of 10 decoder	11	100	20	DIP K,Q
T 74/54 LS 51	Dual AND-OR-INVERT gate	8	8	20	DIP H,P
T 74/54 LS 54	2-3-3-2 input AND-OR-INVERT gate	10	15	20	DIP H,P
T 74/54 LS 55*	2 wide 4-input AND-OR-INVERT gate	10	16	20	DIP H,P
T 74/54 LS 74	Dual D flip-flop	10	42	20	DIP H,P
T 74/54 LS 83*	4-bit full adder	17	170	20	DIP K,Q
T 74/54 LS 85	4-bit magnitude comparator	15	80	20	DIP K,Q
T 74/54 LS 86	Quad exclusive OR gate	12	11	20	DIP H,P
T 74/54 LS 109	Dual J-K flip-flop	10	42	20	DIP K,Q
T 74/54 LS 112	Dual J-K edge-trigger flip-flop	10	42	20	DIP K,Q
T 74/54 LS 113*	Dual J-K edge-trigger flip-flop	10	42	20	DIP H,P
T 74/54 LS 114*	Dual J-K edge-trigger flip-flop	10	42	20	DIP H,P
T 74/54 LS 125	Quad 3-state buffer (low enable)	15	15	20	DIP H,P
T 74/54 LS 126*	Quad 3-state buffer (high enable)	15	15	20	DIP H,P
T 74/54 LS 132	Quad 2-input Schmitt trigger	20	30	20	DIP H,P
T 74/54 LS 133	13-input NAND gate	10	12	20	DIP H,P

☆ Characteristics of the family: T 74 LS series - temperature range 0 to 70°C, ceramic and plastic DIP
T 54 LS series - temperature range -55 to 125°C, ceramic DIP

* Coming soon

TTL-T 74 LS, T 54 LS series☆ (continued)

TYPE	DESCRIPTION	t_{pd} (ns)	P_D (mW)	FANOUT	PACKAGE
T 74/54 LS 136	Quad exclusive OR open-collector	23	16	20	DIP H,P
T 74/54 LS 138	1 of 8 decoder/demultiplexer	11	100	20	DIP K,Q
T 74/54 LS 139	Dual 1 of 4 decoder/demultiplexer	15	90	20	DIP K,Q
T 74/54 LS 151	8-input multiplexer	11	16	20	DIP K,Q
T 74/54 LS 153	Dual 4-input multiplexer	10	50	20	DIP K,Q
T 74/54 LS 155	Dual 1 of 4 decoder	9	20	20	DIP K,Q
T 74/54 LS 156*	Dual 1 of 4 decoder open-collector	15	30	20	DIP K,Q
T 74/54 LS 160	BCD decode counter asynch. reset	9	150	20	DIP K,Q
T 74/54 LS 161	4-bit binary counter asynch.	9	150	20	DIP K,Q
T 74/54 LS 162*	BCB decade counter synch, reset	9	150	20	DIP K,Q
T 74/54 LS 163*	4-bit binary counter synch. reset	9	150	20	DIP K,Q
T 74/54 LS 174	Hex D flip-flop with clear	12	52	20	DIP K,Q
T 74/54 LS 175	Quad flip-flop with clear	8	50	20	DIP K,Q
T 74/54 LS 181	4-bit ALU	20	200	20	DIP U
T 74/54 LS 190*	Up/down decad counter	20	150	20	DIP K,Q
T 74/54 LS 191	Up/down binary counter	20	150	20	DIP K,Q
T 74/54 LS 193	Up/down binary counter	20	150	20	DIP K,Q
T 74/54 LS 194	4-bit right/left shift register	15	150	20	DIP K,Q
T 74/54 LS 195	4-bit shift register	8	150	20	DIP K,Q
T 74/54 LS 196*	Decade counter	26	150	20	DIP H,P
T 74/54 LS 197*	4-bit binary counter	26	150	20	DIP H,P
T 74/54 LS 251	8-input multiplexer, 3-state	11	22	20	DIP K,Q
T 74/54 LS 253	Dual 4-input multiplexer, 3-state	10	33	20	DIP K,Q
T 74/54 LS 257	Quad 2-input multiplexer, 3-state (non inv.)	15	33	20	DIP K,Q
T 74/54 LS 258	Quad 2-input multiplexer, 3-state (inv.)	15	33	20	DIP K,Q
T 74/54 LS 259	8-bit addressable latch	15	42	20	DIP K,Q
T 74/54 LS 283*	4-bit full adder	17	130	20	DIP K,Q
T 74/54 LS 295*	4-bit shift register, 3-state	17	150	20	DIP H,P
T 74/54 LS 298*	Quad 2 multiplexer with output register	16	130	20	DIP K,Q
T 74/54 LS 365*	Hex buffer, 3-state, common enable	10	17	20	DIP K,Q
T 74/54 LS 366*	Hex inverter, 3-state, common enable	10	17	20	DIP K,Q
T 74/54 LS 367	Hex buffer, 3-state, 4-bit and 2-bit	10	17	20	DIP K,Q
T 74/54 LS 368	Hex inverter, 3-state, 4-bit and 2-bit	10	17	20	DIP K,Q

☆ Characteristics of the family: T 74 LS series - temperature range 0 to 70°C, ceramic and plastic DIP
T 54 LS series - temperature range -55 to 125°C, ceramic DIP

* Coming soon

BIPOLAR DIGITAL ICs (continued)

Interface circuits ☆

TYPE	DESCRIPTION	INPUT SENSIT. (mV)	t_{pd} (ms)	P_D (mW)	PACKAGE
Receivers					
T 75107A/55107A	Dual line receiver	25	17	20	DIP H,P
T 75108A/55108A	Dual line receiver, open collector output	25	19	20	DIP H,P
T 75207A/55207A	Dual MOS sense amplifier/line receiver	10	20	70	DIP H,P
T 75208A/55208A	Dual MOS sense amp/line receiver, open coll. out.	10	20	70	DIP H,P
Drivers					
T 75109/55109	Dual line driver	7 •	9	70	DIP H,P
T 75110/55110	Dual line driver	15 •	9	100	DIP H,P
T 75451A	Dual peripheral AND driver with open coll. out.	–	35	150	Minidip

☆ Characteristics of the family: T 75 series - temperature range 0 to 70°C, ceramic and plastic DIP
T 55 series - temperature range -55 to 125°C, ceramic DIP

• "ON" output current (mA)

LPDTL-E 300 series ☆

TYPE	DESCRIPTION	t_{pd} (ns)	P_D (mW)	f (MHz)	FANOUT	PACKAGE
Gates						
E 301	Dual 3-input	60	2	–	10	DIP P,S
E 302	Quad 2-input	60	4	–	10	DIP P,S
E 303	Triple 3-input	60	3	–	10	DIP P,S
E 304	Dual 4-input with extender	60	2	–	10	DIP P,S
E 305	Dual 3-input with extender	60	2	–	10	DIP P,S
E 306	3 and 4-input with extender	60	2	–	10	DIP P,S
Flip-flops						
E 300	Clocked	–	–	2.5	10	DIP P,S

☆ Characteristics of the family: noise immunity = 1 V typ; ceramic flat and DIP packages for extended temperature range (-55°C to + 125°C) and standard temperature range (-20°C to + 100°C)

DTL-930 series ☆

TYPE	DESCRIPTION	t_{pd} (ns)	P_D (mW)	f (MHz)	FANOUT	PACKAGE
Gates						
9930	Expandable dual 4-input	25	16	–	10	DIP H,P,S
9932	Expandable dual 4-input buffer	35	27	–	25	DIP H,P,S
9933	Dual 4-input expander	–	–	–	–	DIP H,P,S
9934 •	Dual 5-input	25	16	–	10	DIP H,P,S
9935	Expandable hex inverter	25	48	–	10	DIP H,P,S
9936	Hex inverter	25	48	–	10	DIP H,P,S
9944	Expandable dual 4-input buffer without pull-up	20	20	–	27	DIP H,P,S
9946	Quad 2-input	25	32	–	10	DIP H,P,S
9962	Triple 3-input	25	24	–	10	DIP H,P,S
Flip-flops						
9093	Dual master-slave JK with separate clock	–	96	4.5	10	DIP H,P,S
9094	Dual master-slave JK with separate clock	–	110	10	9	DIP H,P,S
9097	Dual master-slave JK with common clock	–	110	10	9	DIP H,P,S
9099	Dual master-slave JK with common clock	–	96	4.5	10	DIP H,P,S
9945	Master-slave JK or RS	–	48	4.5	10	DIP H,P,S
9948	Master-slave JK or RS	–	55	10	9	DIP H,P,S
Other functions						
9951	Monostable	25	35	–	10	DIP H,P,S

☆ Characteristics of the family: noise immunity = 1 V typ; ceramic flat and DIP packages for extended temperature range (-55°C to + 125°C); ceramic flat, ceramic and plastic DIP packages for standard temperature range (0°C to + 75°C)

• Standard temperature range only

BIPOLAR DIGITAL ICs (continued)

RTL-9900 series☆

TYPE	DESCRIPTION	t_{pd} (ns)	P_D (mW)	f (MHz)	FANOUT	PACKAGE
Gates						
9900	NOR buffer	15	40	–	80	TO-99
9903 •	NOR 3-input	10	20	–	16	TO-99
9907	NOR 4-input	10	20	–	16	TO-99
9914	NOR dual 2-input	10	40	–	16	TO-99
9915	NOR dual 3-input	10	40	–	16	TO-100 (1)
Flip-flops						
9926	JK	–	90	20	–	TO-100 (1)
9974	JK	–	90	20	–	TO-99
Other functions						
9904	Half adder	20	75	–	16	TO-99
9905 •	Half shift register	20	77	–	16	TO-99
9927	Quad inverter	10	30	–	16	TO-100 (1)

☆ Characteristics of the family: TO-99 and TO-100 packages for extended temperature range (-55°C to +125°C) and standard temperature range (0°C to +70°C)

• Standard temperature range only

Consumer circuits

TYPE	DESCRIPTION	V_{CC} (V)	POWER CONS. (mW)	TEMP. RANGE (°C)	PACKAGE
H 580	Quad analog switch	30	180	0-70	DIP O
H 590	Quad analog switch	30	180	0-70	DIP O
H 629	Gates for electronic organ (12 input)	15	–	0-60	DIP H
H 770	Analog switch binary input	15	110	0-70	DIP K
H 771	Analog switch binary input	15	110	0-70	DIP K
H 772	Analog switch binary input	15	110	0-70	DIP K
H 773	Analog switch binary input	15	110	0-70	DIP K

SMALL SIGNAL JEDEC SILICON TRANSISTORS

JEDEC TRANSISTORS

High speed saturated switches

TYPE	POLARITY	RATED $V_{CEO}(V_{CER})$(V)	τ_S (t_{off}) max (ns)	@ I_C (mA)	h_{FE} min/max	@ I_C (mA)	V_{CEsat} max (V)	f_T min (MHz)	C_{obo} max (pF)	P_D (mW) @T_a = 25°C	PACKAGE
2N 706	NPN	(20)	60	10	20	10	0.6	200	6	300	TO-18
2N 706A	NPN	15	25	10	20/60	10	0.6	200	5	300	TO-18
2N 708	NPN	15	25	10	30/120	10	0.4	300	6	300	TO-18
2N 709	NPN	6	6	5	20/120	10	0.30 (3 mA)	600	3	300	TO-18
2N 709A	NPN	6	6	5	30/90	10	0.30 (3 mA)	800	3	360	TO-18
2N 722	PNP	(50)	(370)typ	150	30/90	150	1.5	60	45	400	TO-18
2N 743	NPN	12	14	10	20/60	10	0.35	280	5	300	TO-18
2N 744	NPN	12	18	10	40/120	10	0.35	280	5	300	TO-18
2N 753	NPN	15	35	10	40/120	10	0.6	200	5	300	TO-18
2N 834	NPN	10	25	10	25	10	0.25	350	4	300	TO-18
2N 834A	NPN	15	10	10	25	10	0.25	500	4	360	TO-18
2N 869A	PNP	18	(80)	30	40/120	30	0.2	400	6	360	TO-18
2N 914	NPN	15	20	20	30/120	10	0.25 (20 mA)	300	6	360	TO-18
2N 995	PNP	15	(125)typ	10	35/140	20	0.2	100	10	360	TO-18
2N 2205	NPN	12	25	10	20	10	0.22	200	6	300	TO-18
2N 2218	NPN	30	–	–	40/120	150	0.4	250	8	800	TO-39
2N 2218A	NPN	40	(285)	150	40/120	150	0.3	250	8	800	TO-39
2N 2219	NPN	30	–	–	100/300	150	0.4	250	8	800	TO-39
2N 2219A	NPN	40	(285)	150	100/300	150	0.3	300	8	800	TO-39
2N 2221	NPN	30	–	–	40/120	150	0.4	250	8	500	TO-18
2N 2221A	NPN	40	(285)	150	40/120	150	0.3	250	8	500	TO-18
2N 2222	NPN	30	–	–	100/300	150	0.4	250	8	500	TO-18
2N 2222A	NPN	40	(285)	150	100/300	150	0.3	300	8	500	TO-18
2N 2368	NPN	15	10	10	20/60	10	0.25	400	4	360	TO-18
2N 2369	NPN	15	13	10	40/120	10	0.25	500	4	360	TO-18
2N 2369A	NPN	15	13	10	40/120	10	0.2	500	4	360	TO-18
2N 2475	NPN	6	6	5	30/150	20	0.4	600	3	500	TO-18
2N 2894	PNP	12	(90)	30	40/150	30	0.2	400	6	360	TO-18
2N 2904	PNP	40	(100)	150	40/120	150	0.4	200	8	600	TO-39
2N 2904A	PNP	60	(100)	150	40/120	150	0.4	200	8	600	TO-39
2N 2905	PNP	40	(100)	150	100/300	150	0.4	200	8	600	TO-39
2N 2905A	PNP	60	(100)	150	100/300	150	0.4	200	8	600	TO-39
2N 2906	PNP	40	(100)	150	40/120	150	0.4	200	8	400	TO-18

JEDEC TRANSISTORS (continued)

High speed saturated switches (continued)

TYPE	POLARITY	RATED V_{CEO} (V)	τ_S (t_{off}) max (ns)	@ I_C (mA)	h_{FE} min/max	@ I_C (mA)	V_{CEsat} max (V)	f_T min (MHz)	C_{obo} max (pF)	P_D (mW) @T_a = 25°C	PACKAGE
2N 2906A	PNP	60	(100)	150	40/120	150	0.4	200	8	400	TO-18
2N 2907	PNP	40	(100)	150	100/300	150	0.4	200	8	400	TO-18
2N 2907A	PNP	60	(100)	150	100/300	150	0.4	200	8	400	TO-18
2N 3009	NPN	15	18	10	30/120	30	0.18	350	5	360	TO-18
2N 3012	PNP	12	(75)	30	30/120	30	0.2	400	6	360	TO-18
2N 3013	NPN	15	18	10	30/120	30	0.18	350	5	360	TO-18
2N 3014	NPN	20	18	10	30/120	30	0.18	350	5	360	TO-18
2N 3073	PNP	60	(100)	300	30/130	50	0.25	130	10	360	TO-18
2N 3121	PNP	45	(100)	300	30/130	50	0.25	130	10	360	TO-18
2N 3209	PNP	20	(90)	30	30/120	30	0.2	400	5	360	TO-18
2N 3250	PNP	40	(225)	10	50/150	10	0.25	250	6	360	TO-18
2N 3251	PNP	40	(250)	10	100/300	10	0.25	300	6	360	TO-18
2N 3252	NPN	30	(70)	500	30/90	500	0.5	200	12	1000	TO-39
2N 3253	NPN	40	(70)	500	25	150	0.35	175	12	1000	TO-39
2N 3299	NPN	30	(150)	300	40/120	150	0.22	250	8	800	TO-39
2N 3300	NPN	30	(150)	300	100/300	150	0.22	250	8	800	TO-39
2N 3301	NPN	30	(150)	300	40/120	150	0.22	250	8	360	TO-18
2N 3302	NPN	30	(150)	300	100/300	150	0.22	250	8	360	TO-18
2N 3303	NPN	12	15	100	30/120	300	0.33	450	15	600	TO-39(1)
2N 3426	NPN	12	15	100	30/120	300	0.33	450	25	600	TO-39(1)
2N 3444	NPN	50	(70)	500	20/60	500	0.6	150	12	1000	TO-39
2N 3502	PNP	45	(100)	300	115/300	50	0.25	200	8	700	TO-39
2N 3503	PNP	60	(100)	300	115/300	50	0.25	200	8	700	TO-39
2N 3504	PNP	45	(100)	300	115/300	50	0.25	200	8	400	TO-18
2N 3505	PNP	60	(100)	300	115/300	50	0.25	200	8	400	TO-18
2N 3724	NPN	30	(60)	500	60/150	100	0.20	300	12	800	TO-39
2N 3725	NPN	50	(60)	500	60/150	100	0.26	300	10	800	TO-39
2N 4013	NPN	30	(60)	500	60/150	100	0.20	300	12	360	TO-18
2N 4014	NPN	50	(60)	500	60/150	100	0.26	300	10	360	TO-18
2N 4034	PNP	40	(150)	50	70/200	10	0.14	400	3.5	360	TO-18
2N 4046	NPN	30	(60)	500	40/150	100	0.2	250	12	800	TO-39
2N 4047	NPN	50	(60)	500	40/150	100	0.26	250	10	800	TO-39

JEDEC TRANSISTORS (continued)

General purpose amplifiers and switches

TYPE	POLARITY	RATED $V_{CEO}(V_{CER})$(V)	h_{FE} min/max	@ I_C (mA)	V_{CEsat} max (V)	C_{obo} max (pF)	f_T min (MHz)	P_D (mW) @ $T_a = 25°C$	PACKAGE
2N 656	NPN	60	30/90	200	1	13	70	800	TO-39
2N 657	NPN	100	30/90	200	5	13 typ	70 typ	800	TO-39
2N 696	NPN	(40)	20/60	150	1.5	35	40	600	TO-39
2N 697	NPN	(40)	40/120	150	1.5	35	50	600	TO-39
2N 698	NPN	60	20/60	150	5	15	40	800	TO-39
2N 699	NPN	(80)	40/120	150	5	20	50	600	TO-39
2N 699B	NPN	80	40/120	150	5	15	60	870	TO-39
2N 718	NPN	28	40/120	150	1.5	35	50	400	TO-18
2N 718A	NPN	(50)	40/120	150	1.5	25	60	500	TO-18
2N 720	NPN	60	40/120	150	5	20	50	500	TO-18
2N 720A	NPN	80	40/120	150	5	15	50	500	TO-18
2N 722	PNP	35	30/90	150	1.3	45	60	400	TO-18
2N 869	PNP	18	20/120	10	1	9	100	360	TO-18
2N 869A	PNP	18	40/120	30	0.2	6	400	360	TO-18
2N 870	NPN	60	40/120	150	5	15	50	500	TO-18
2N 915	NPN	50	50/200	10	0.9	3.5	250	360	TO-18
2N 916	NPN	25	100/200	10	0.5	6	300	360	TO-18
2N 956	NPN	50	100/300	150	1.5	25	70	500	TO-18
2N 978	PNP	20	15/60	150	1.5	45	40	330	TO-18
2N 995	PNP	15	35/140	20	0.2	10	100	360	TO-18
2N 1132A	PNP	(50)	30/90	150	1.5	30	60	600	TO-39
2N 1420	NPN	28	100/300	150	1.5	35	50	600	TO-39
2N 1613	NPN	(50)	40/120	150	1.5	25	60	800	TO-39
2N 1711	NPN	(50)	100/300	150	1.5	25	70	800	TO-39
2N 1889	NPN	60	40/120	150	5	15	70	800	TO-39
2N 1890	NPN	60	100/300	150	5	15	60	800	TO-39
2N 1893	NPN	80	40/120	150	5	15	50	800	TO-39
2N 1983	NPN	25	80/240	5	–	45	40	600	TO-39
2N 1984	NPN	25	40/120	5	–	45	40	600	TO-39
2N 1986	NPN	25	60/240	150	1.5	35	40	600	TO-39
2N 1987	NPN	25	20/80	150	1.5	35	40	600	TO-39
2N 1990	NPN	60	20	30	0.5 (2 mA)	–	–	600	TO-39

JEDEC TRANSISTORS (continued)

General purpose amplifiers and switches (continued)

TYPE	POLARITY	RATED $V_{CEO}(V_{CER})$(V)	h_{FE} min/max	@ I_C (mA)	V_{CEsat} max (V)	C_{obo} max (pF)	f_T min (MHz)	P_D (mW) @ T_a = 25°C	PACKAGE
2N 1991	PNP	20	15/60	150	1.5	45	40	600	TO-39
2N 2049	NPN	(50)	100/300	150	0.4 (10 mA)	25	50	800	TO-39
2N 2193	NPN	50	40/120	150	0.35	20	50	800	TO-39
2N 2193A	NPN	50	40/120	150	0.25	20	50	800	TO-39
2N 2195	NPN	25	20	150	0.35	20	50	600	TO-39
2N 2218	NPN	30	40/120	150	0.4	8	250	800	TO-39
2N 2218A	NPN	40	40/120	150	0.3	8	250	800	TO-39
2N 2219	NPN	30	100/300	150	0.4	8	250	800	TO-39
2N 2219A	NPN	40	100/300	150	0.3	8	300	800	TO-39
2N 2221	NPN	30	40/120	150	0.4	8	250	500	TO-18
2N 2221A	NPN	40	40/120	150	0.3	8	250	500	TO-18
2N 2222	NPN	30	100/300	150	0.4	8	250	500	TO-18
2N 2222A	NPN	40	100/300	150	0.3	8	300	500	TO-18
2N 2297	NPN	35	40/120	150	0.2	12	60	800	TO-39
2N 2904	PNP	40	40/120	150	0.4	8	200	600	TO-39
2N 2904A	PNP	60	40/120	150	0.4	8	200	600	TO-39
2N 2905	PNP	40	100/300	150	0.4	8	200	600	TO-39
2N 2905A	PNP	60	100/300	150	0.4	8	200	600	TO-39
2N 2906	PNP	40	40/120	150	0.4	8	200	400	TO-18
2N 2906A	PNP	60	40/120	150	0.4	8	200	400	TO-18
2N 2907	PNP	40	100/300	150	0.4	8	200	400	TO-18
2N 2907A	PNP	60	100/300	150	0.4	8	200	400	TO-18
2N 3019	NPN	80	100/300	150	0.2	12	100	800	TO-39
2N 3020	NPN	80	40/120	150	0.2	12	80	800	TO-39
2N 3053	NPN	(50)	50/250	150	1.4	15	100	800	TO-39
2N 3073	PNP	60	30/130	50	0.25	10	130	360	TO-18
2N 3107	NPN	60	100/300	150	0.25	20	70	800	TO-39
2N 3108	NPN	60	40/120	150	0.25	20	60	800	TO-39
2N 3109	NPN	40	100/300	150	0.25	25	70	800	TO-39
2N 3110	NPN	40	40/120	150	0.25	25	60	800	TO-39
2N 3121	PNP	45	30/130	50	0.25	10	130	360	TO-18
2N 3250	PNP	40	50/150	10	0.25	6	250	360	TO-18

JEDEC TRANSISTORS (continued)

General purpose amplifiers and switches (continued)

TYPE	POLARITY	RATED V_{CEO} (V)	h_{FE} min/max	@ I_C (mA)	V_{CEsat} max (V)	C_{obo} max (pF)	f_T min (MHz)	P_D (mW) @T_a = 25°C	PACKAGE
2N 3251	PNP	40	100/300	10	0.25	6	300	360	TO-18
2N 3299	NPN	30	40/120	150	0.22	8	250	800	TO-39
2N 3300	NPN	30	100/300	150	0.22	8	250	800	TO-39
2N 3301	NPN	30	40/120	150	0.22	8	250	360	TO-18
2N 3302	NPN	30	100/300	150	0.22	8	250	360	TO-18
2N 3502	PNP	45	115/300	50	0.25	8	200	700	TO-39
2N 3503	PNP	60	115/300	50	0.25	8	200	700	TO-39
2N 3504	PNP	45	115/300	50	0.25	8	200	400	TO-18
2N 3505	PNP	60	115/300	50	0.25	8	200	400	TO-18
2N 3700	NPN	80	100/300	150	0.2	12	100	500	TO-18
2N 3701	NPN	80	40/120	150	0.2	12	80	500	TO-18
2N 3962	PNP	60	100	10	0.25	6	40	360	TO-18
2N 3963	PNP	80	100	10	0.25	6	40	360	TO-18
2N 3964	PNP	45	200	10	0.25	6	50	360	TO-18
2N 3965	PNP	60	200	10	0.25	6	50	360	TO-18
2N 4026	PNP	60	40/120	100	0.5 (500 mA)	20	100	500	TO-18
2N 4027	PNP	80	40/120	100	0.5 (500 mA)	20	100	500	TO-18
2N 4028	PNP	60	100/300	100	0.5 (500 mA)	20	150	500	TO-18
2N 4029	PNP	80	100/300	100	0.5 (500 mA)	20	150	500	TO-18
2N 4030	PNP	60	40/120	100	0.15 (150 mA)	20	100	800	TO-39
2N 4031	PNP	80	40/120	100	0.15 (150 mA)	20	100	800	TO-39
2N 4032	PNP	60	100/300	100	0.15 (150 mA)	20	150	800	TO-39
2N 4033	PNP	80	100/300	100	0.15 (150 mA)	20	150	800	TO-39
2N 4034	PNP	40	70/200	10	0.14	3.5	400	360	TO-18
2N 4035	PNP	40	150/300	10	0.14	3.5	450	360	TO-18
2N 4036	PNP	65	40/140	150	0.65	30	60	1000	TO-39

JEDEC TRANSISTORS (continued)

Low level amplifiers

TYPE	POLARITY	RATED V_{CEO} (V)	h_{FE} min/max	@ I_C (mA)	h_{FE} min/max	@ I_C (mA)	NF max (dB)	@ f (kHz)	NF max (dB)	@ f (kHz)	PACKAGE
2N 760A	NPN	60	40	0.1	76/333	1	–	–	–	–	TO-18
2N 910	NPN	60	35/100	0.1	75/135	10	12	1	–	–	TO-18
2N 911	NPN	60	20/45	0.1	35/70	10	15	1	–	–	TO-18
2N 929	NPN	45	40/120	0.01	350	10	4	Wideband	–	–	TO-18
2N 930	NPN	45	100/300	0.01	600	10	3	Wideband	–	–	TO-18
2N 2483	NPN	60	40/120	0.01	175	1	4	Wideband	3	10	TO-18
2N 2484	NPN	60	100/500	0.01	250	1	3	Wideband	2	10	TO-18
2N 2511	NPN	50	120	0.01	240/750	10	4	1	–	–	TO-18
2N 2586	NPN	45	120/360	0.01	600	1	3	1	2	10	TO-18
2N 3117	NPN	60	250/500	0.01	400	1	1	1	1	10	TO-18
2N 3962	PNP	60	60	0.01	100/300	0.01	3	1	10	0.1	TO-18
2N 3963	PNP	80	60	0.01	100/300	0.01	3	1	10	0.1	TO-18
2N 3964	PNP	45	180	0.01	250/500	0.01	2	1	4	0.1	TO-18
2N 3965	PNP	60	180	0.01	250/500	0.01	2	1	4	0.1	TO-18

High voltage amplifiers

TYPE	POLARITY	RATED V_{CEO} (V)	h_{FE} min/max	@ I_C (mA)	I_C RANGE (mA)	f_T min (MHz)	C_{obo} max (pF)	P_D (mW) @ T_a = 25°C	PACKAGE
2N 3930	PNP	180	80/300	10	0.01-50	40	7	400	TO-18
2N 3931	PNP	180	80/300	10	0.01-50	40	7	700	TO-39
2N 4358	PNP	240	80/300	10	0.01-50	40	7	700	TO-39

JEDEC TRANSISTORS (continued)

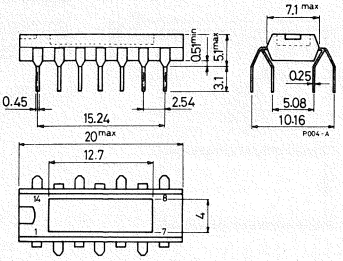
RF-IF amplifiers/oscillators

TYPE	POLARITY	RATED V_{CEO} (V)	f_T min (MHz)	C_{cb} max (pF)	PG min (dB)	@ f (MHz)	NF max (dB)	@ f (MHz)	P_D (mW) @ T_a = 25°C	PACKAGE
2N 707	NPN	25	–	5	6	100	–	–	300	TO-18
2N 918	NPN	15	600	1.7	15	200	6	60	200	TO-72
2N 2857	NPN	15	1000	1	12.5	450	4.5	450	200	TO-72
2N 3600	NPN	15	850	1	17	200	4.5	200	200	TO-72
2N 3839	NPN	15	1000	1	12.5	450	3.9	450	200	TO-72
2N 4034	PNP	40	400	3.5	15 typ	100	6	100	360	TO-18
2N 4035	PNP	40	450	3.5	15 typ	100	6	100	360	TO-18
2N 5109	NPN	20	1200	3.5	11	200	3 typ	200	2500*	TO-39
2N 5179	NPN	12	900	1	15	200	4.5	200	200	TO-72
2N 6304	NPN	15	1400	1	15	450	4.5	450	200	TO-72
2N 6305	NPN	15	1200	1	12	450	5.5	450	200	TO-72

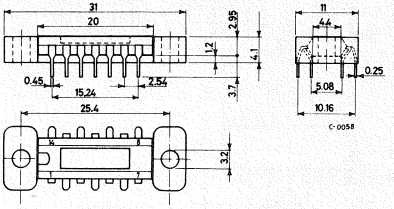
* T_C = 75°C

OUTLINE DRAWINGS DIMENSIONS IN MILLIMETRES

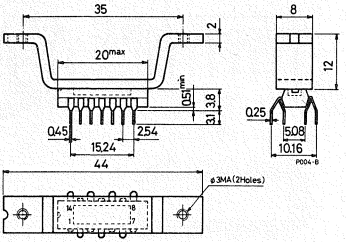
DIP A - 14 lead plastic split DIP with copper insert



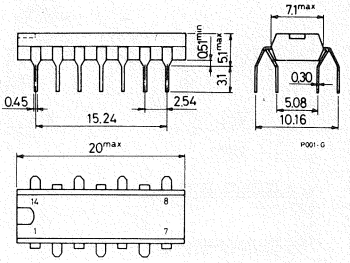
DIP D - 14 lead plastic DIP with spacer



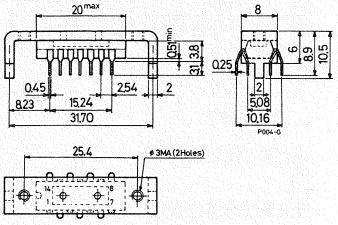
DIP B - 14 lead plastic split DIP with external bar



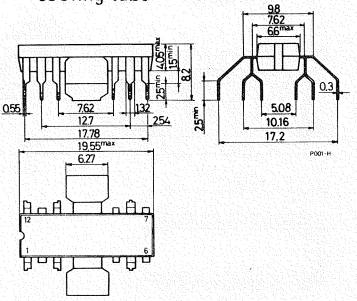
DIP E - 14 lead plastic split DIP



DIP C - 14 lead plastic split DIP with inverted external bar

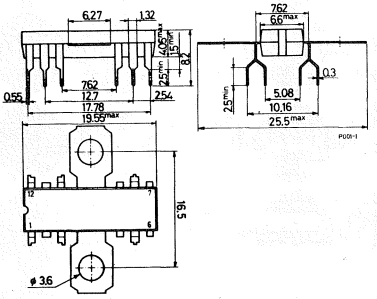


DIP F - 12 lead plastic split DIP with folded cooling tabs

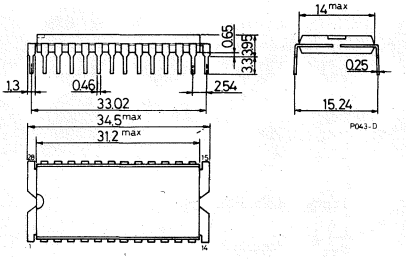


OUTLINE DRAWINGS (continued)

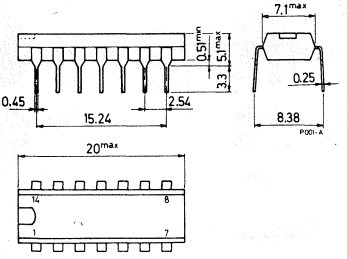
DIP G - 12 lead plastic split DIP with flat cooling tabs



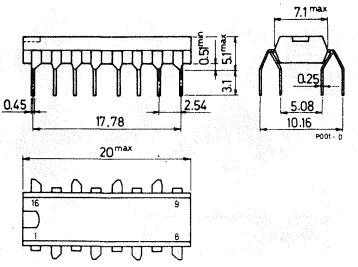
DIP I - 28 lead plastic DIP



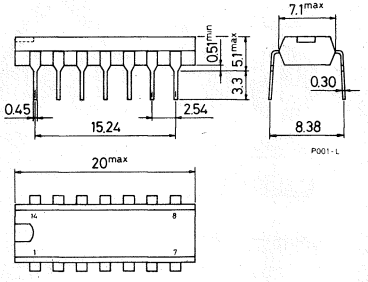
DIP H - 14 lead plastic DIP



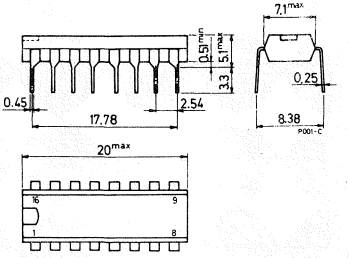
DIP J - 16 lead plastic split DIP



DIP H (1) - 14 lead plastic DIP with copper frame

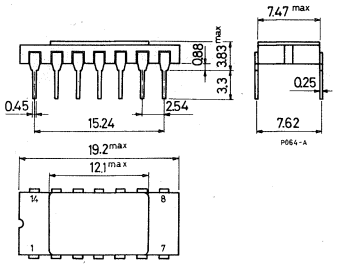


DIP K - 16 lead plastic DIP

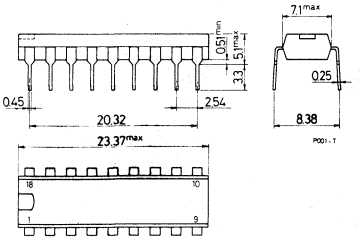


OUTLINE DRAWINGS (continued)

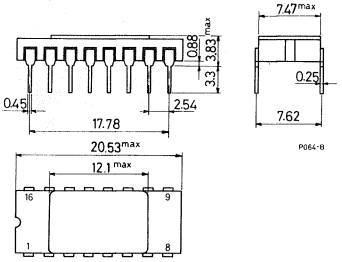
DIP L - 14 lead ceramic DIP



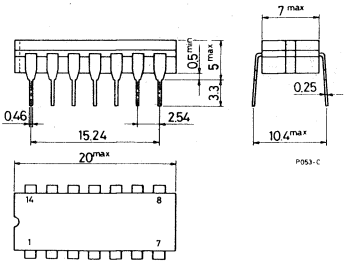
DIP O - 18 lead plastic DIP



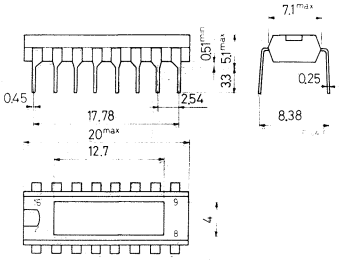
DIP M - 16 lead ceramic DIP



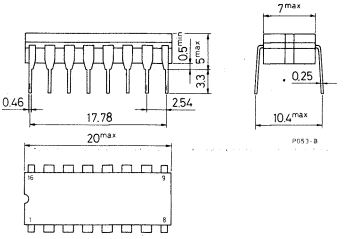
DIP P - 14 lead ceramic DIP



DIP N - 16 lead plastic DIP with copper insert

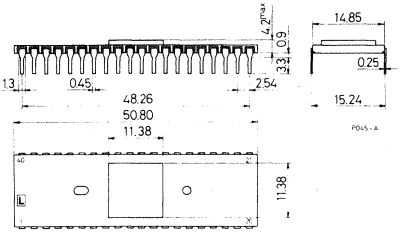


DIP Q - 16 lead ceramic DIP

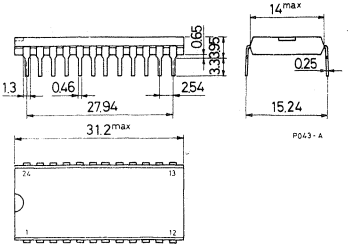


OUTLINE DRAWINGS (continued)

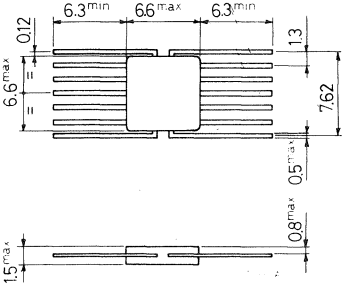
DIP R - 40 lead ceramic DIP



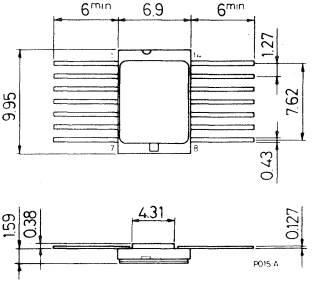
DIP U -24 lead plastic DIP



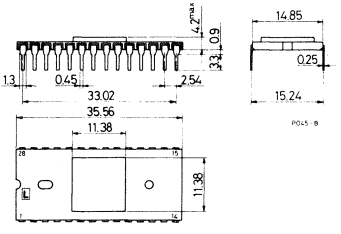
DIP S - 14 lead ceramic flat package



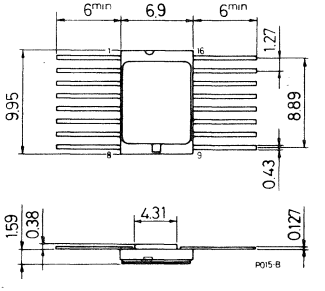
DIP V - 14 lead ceramic flat package



DIP T - 28 lead ceramic DIP

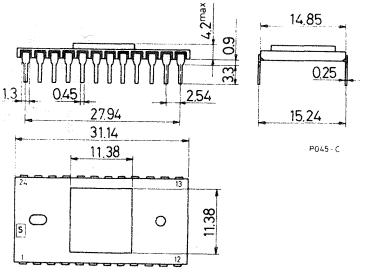


DIP W - 16 lead ceramic flat package

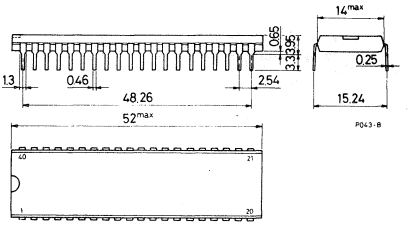


OUTLINE DRAWINGS (continued)

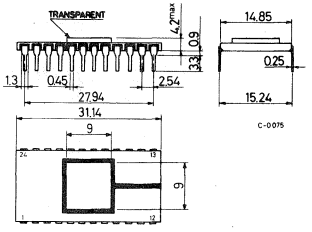
DIP X - 24 lead ceramic DIP



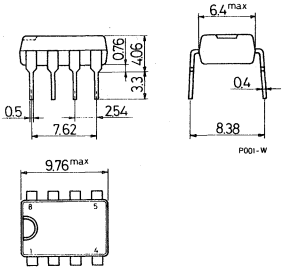
DIP Z - 40 lead plastic DIP



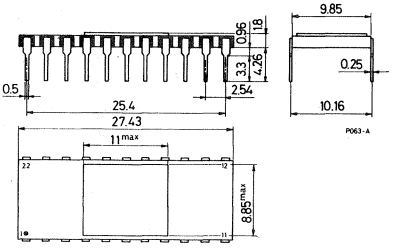
DIP X (1) - 24 lead ceramic DIP (with transparent lid)



Minidip - 8 lead plastic DIP



DIP Y - 22 lead ceramic DIP



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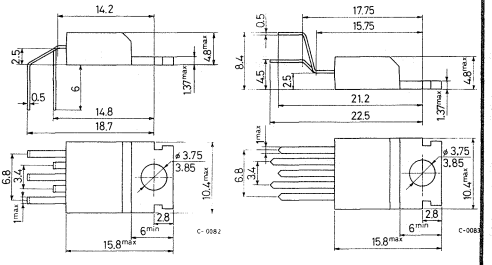
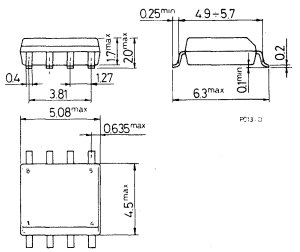


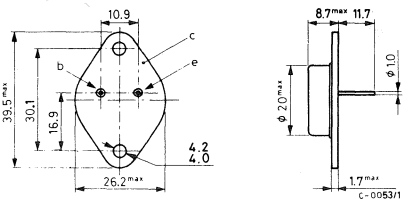
(version H) (version V)

OUTLINE DRAWINGS (continued)

SO-8 - 8 lead plastic micropackage

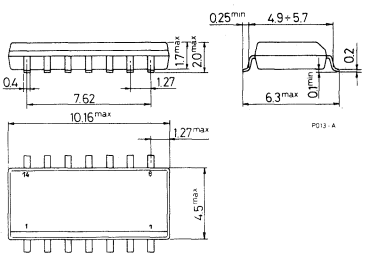


TO-3

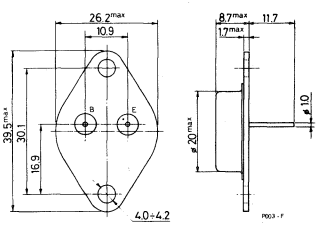


Collector connected to case

SO-14 - 14 lead plastic micropackage

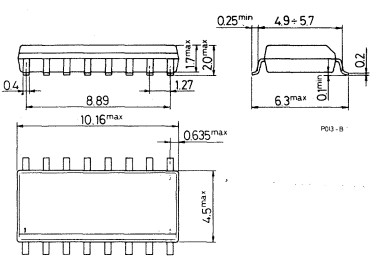


TO-3 (1)

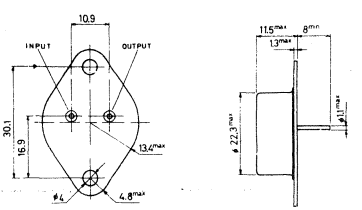


Collector connected to case

SO-16 - 16 lead plastic micropackage



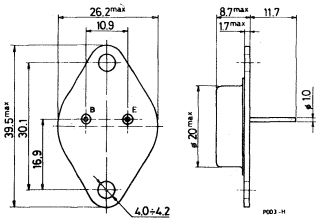
TO-3 (2)



Collector connected to case

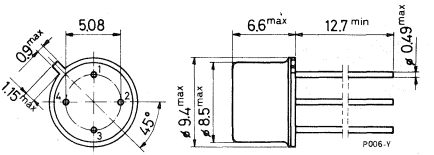
OUTLINE DRAWINGS (continued)

TO-3 (3)

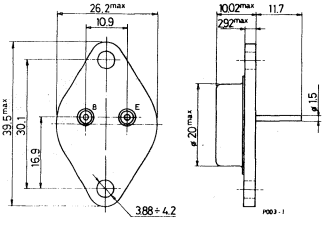


Ground connected to case

TO-12

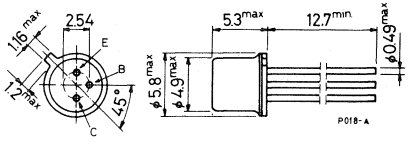


TO-3 (4)



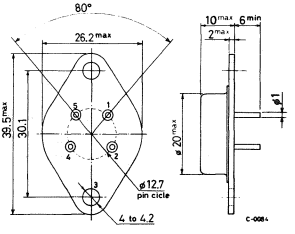
Collector connected to case

TO-18



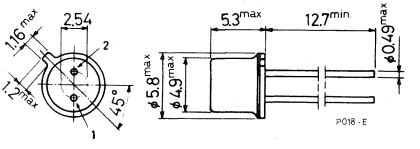
Collector connected to case

TO-3 (4-lead)



Ground connected to case

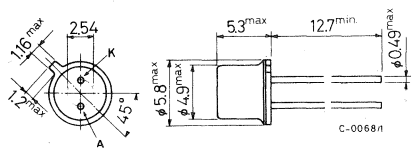
TO-18 (1)



Lead 1 connected to case

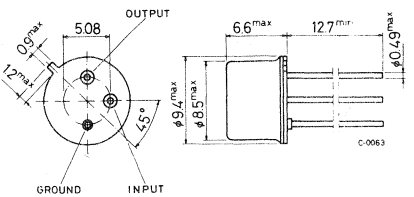
OUTLINE DRAWINGS (continued)

TO-18 (2)



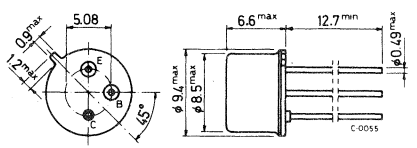
Anode connected to case

TO-39 (2)



Ground connected to case

TO-39



Collector connected to case

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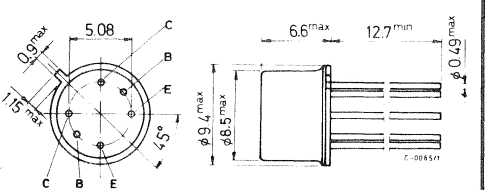
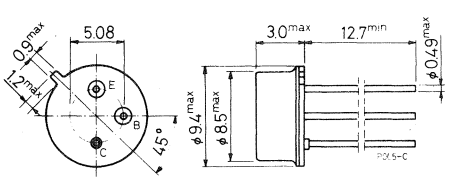


TO-39 (1)



Collector connected to case

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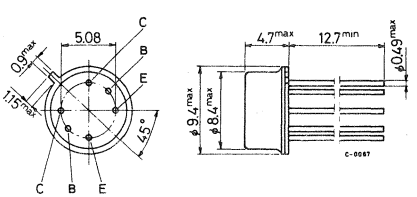
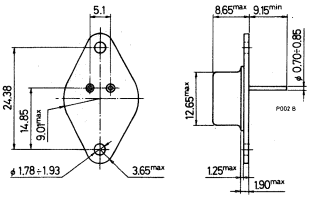


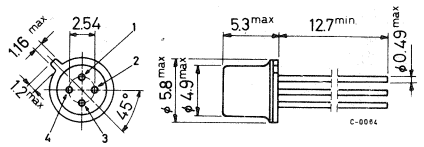
OUTLINE DRAWINGS (continued)

TO-66

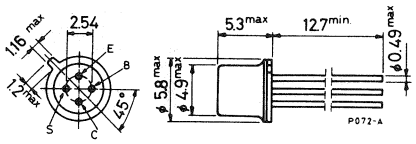


Collector connected to case

TO-72 (2)



TO-72



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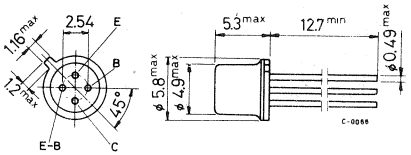

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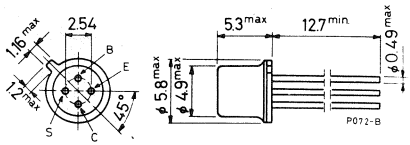
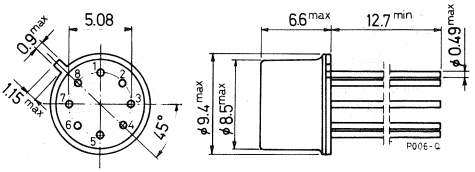
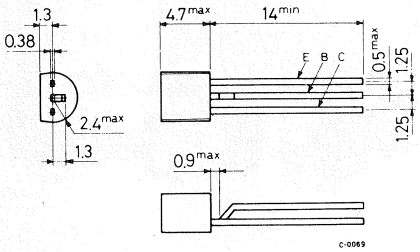


TO-77

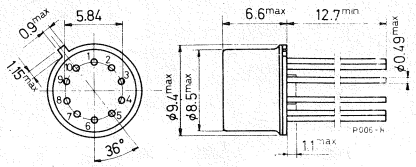


OUTLINE DRAWINGS (continued)

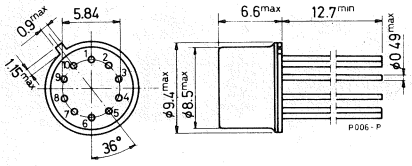
TO-92



TO-100



TO-96



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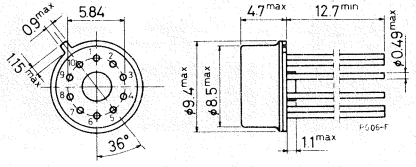
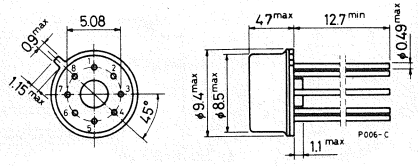
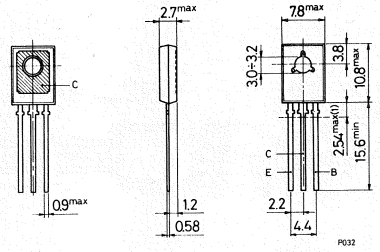


TO-99

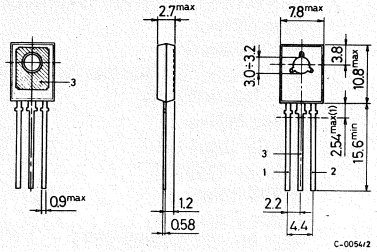


TO-126



OUTLINE DRAWINGS (continued)

TO-126 (1)



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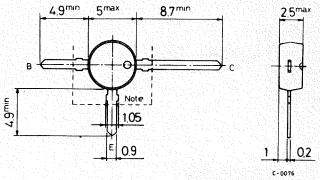
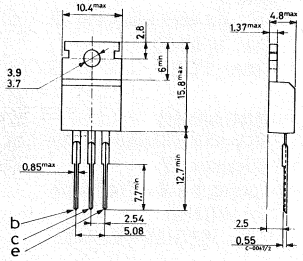


TO-220



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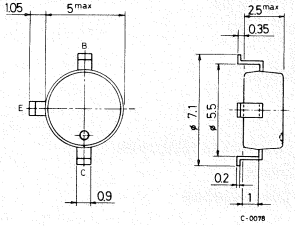
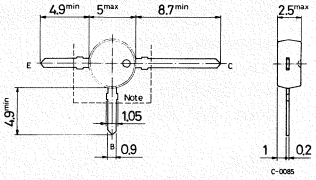
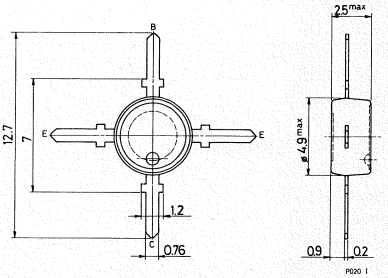


T plastic



4-lead plastic



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79 Massasoit Street
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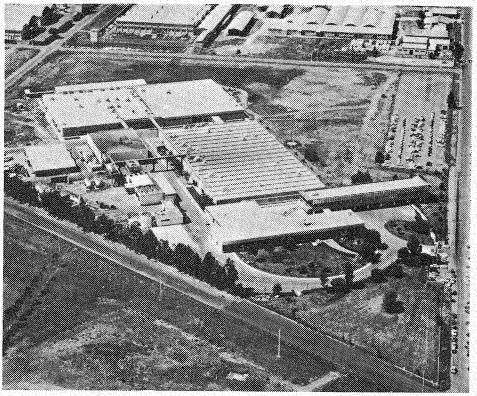
Telex: 923495 WHA

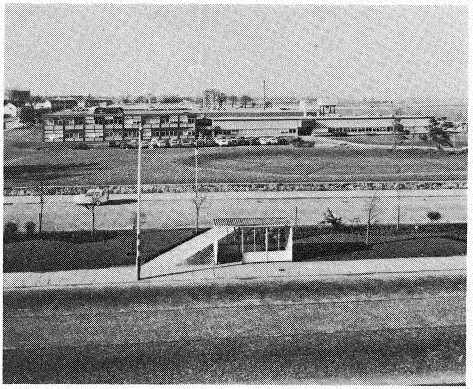
SGS-ATES FACTORIES

AGRATE (Italy)

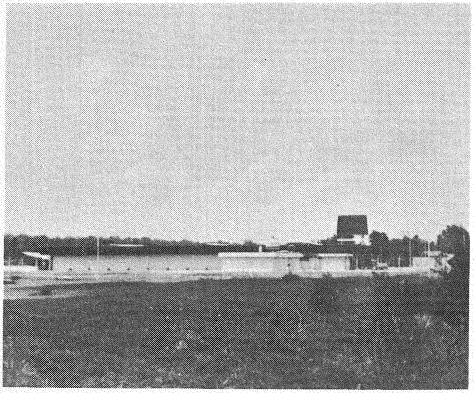


CATANIA (Italy)

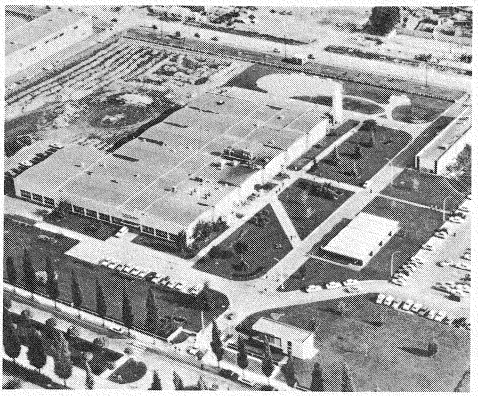
SINGAPORE



FALKIRK (U.K.)



MUAR (Malaysia)



RENNES (France)

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Italy – France – Germany – Singapore – Sweden – United Kingdom – U.S.A.