

TABLE 1 : NPN GENERAL PURPOSE

The devices shown in this table are general purpose transistors designed for small and medium signal amplification from d.c. to radio frequencies. Typical application areas include: AUDIO FREQUENCY AMPLIFIERS, DRIVERS and OUTPUT STAGES, OSCILLATORS, AND GENERAL PURPOSE SWITCHES.

Type	V _{CBO} V	V _{CEO} V	Max I _c mA	Max V _{CE(sat)} at			h _{FE} at			Min f _T at		P _{tot} at T _{amb} = 25°C mW	Complement
				V	I _c mA	I _B mA	Min	Max	I _c mA	MHz	I _c mA		
ZTX453	120	100	1000	0.7	150	15	40	200	150	150	50	1000	—
ZTX452	100	80	1000	0.7	150	15	40	150	150	150	50	1000	ZTX552
MPSA06	80	80	500	0.25	100	10	50	—	100	100	10	750	MPSA56
BC546P	80	65	200	0.25	10	0.5	75	200	2	300*	10	500	BC556P
ZTX451	80	60	1000	0.35	150	15	50	150	150	150	50	1000	ZTX551
BFS61	80	60	1000	0.35	150	15	40	160	150	150	50	500	BFS98
MPS2222A	75	45	800	1.0	500	50	100	300	150	300	20	500	MPS2907A
ZTX304	70	70	500	0.35	50	5	50	300	10	150	10	300	ZTX504
MPSA05	60	60	500	0.25	100	10	50	—	100	100	10	750	—
BCY65EP	60	60	100	0.35	10	0.25	120	460	2	125	10	1000†	BCY77P
BC182P	60	50	200	0.25	10	0.5	100	480	2	150	10	300	BC212P
ZTX107	60	50	100	0.1*	10	1	125	500	2	350*	10	300	ZTX212
ZTX450	60	45	1000	0.25	150	15	100	300	150	150	50	1000	ZTX550
BFS60	60	40	1000	0.25	150	15	100	300	150	150	50	500	BFS97
2N4401	60	40	600	0.4	150	15	100	300	150	250	20	500	2N4403
2N4400	60	40	600	0.4	150	15	50	150	150	200	20	500	2N4402
2N3904	60	40	200	0.2	10	1	100	300	10	300	10	500	2N3906
2N3903	60	40	200	0.2	10	1	50	150	10	250	10	500	2N3905
BFS59	60	30	1000	0.35	150	15	40	300	150	150	50	500	BFS96
MPS2222	60	30	800	1.6	500	50	100	300	150	250	20	500	MPS2907
BC547P	50	45	200	0.25	10	0.5	75	450	2	300*	10	500	BC557P
ZTX382	50	45	200	0.25	10	0.5	100	850	2	150	10	350	—
BC107P	50	45	200	0.2	10	0.5	120	460	2	150	10	300	BC177P
BC237P	50	45	200	0.2	10	0.5	120	460	2	150	10	300	BC307P
ZTX237	50	45	200	0.25	10	0.5	120	460	2	150	10	300	ZTX212
ZTX223	50	30	800	0.3	100	10	100	450	50	100	50	500	—
ZTX303	45	45	500	0.35	50	5	50	300	10	150	10	300	ZTX503
BCY59P	45	45	200	0.35	10	0.25	120	630	2	125	10	1000†	BCY79P
ZTX238	45	30	200	0.25	10	0.5	120	800	2	150	10	350	ZTX213
ZTX383	45	30	200	0.25	10	0.5	100	850	2	150	10	350	—
ZTX384	45	30	200	0.25	10	0.5	250	—	2	150	10	350	—
BC183P	45	30	200	0.25	10	0.5	100	850	2	150	10	300	BC213P
ZTX108	45	30	100	0.1*	10	1	125	900	2	350*	10	300	ZTX213
2N4123	40	30	200	0.3	50	5	50	150	2	250	10	500	2N4125
ZTX302	35	35	500	0.25	50	5	100	300	10	150	10	300	ZTX502
ZTX301	35	35	500	0.25	50	5	50	300	10	150	10	300	ZTX501
BCY58P	32	32	200	0.35	10	0.25	120	630	2	125	10	1000†	BCY78P
BC548P	30	30	200	0.25	10	0.5	75	800	2	300*	10	500	BC558P
2N4124	30	25	200	0.3	50	5	120	360	2	300	10	500	2N4126
BC108P	30	20	200	0.2	10	0.5	120	800	2	150	10	300	BC178P
BC238P	30	20	200	0.2	10	0.5	120	800	2	150	10	300	BC308P
ZTX300	25	25	500	0.35	10	1	50	300	10	150	10	300	ZTX500
MPSA20	—	40	100	0.25	10	1	40	400	5	125	5	500	—

*Typical †T_{case} = 45°C

TABLE 2 : PNP GENERAL PURPOSE

The devices shown in this table are general purpose transistors designed for small and medium signal amplification from d.c. to radio frequencies. Typical application areas include: AUDIO FREQUENCY AMPLIFIERS, DRIVERS and OUTPUT STAGES, OSCILLATORS, AND GENERAL PURPOSE SWITCHES.

Type	V _{CBO} V	V _{CEO} V	Max I _C mA	Max V _{CE(sat)} at			h _{FE} at			Min f _T at		P _{tot} at T _{amb} = 25°C mW	Complement	
				V	I _C mA	I _B mA	Min	Max	I _C mA	MHz	I _C mA			
ZTX552	100	100	1000	0.7	150	15	40	150	150	150	50	1000	ZTX452	
MPSA56	80	80	500	0.25	100	10	50	—	100	100	10	750	MPSA06	
BC556P	80	65	200	0.25	10	0.5	75	450	2	150*	10	500	BC546P	
ZTX551	80	60	1000	0.35	150	15	50	150	150	150	50	1000	ZTX451	
BFS98	80	60	1000	0.35	150	15	40	160	150	150	50	500	BFS61	
ZTX504	70	70	500	0.6	50	5	50	300	10	150	10	300	ZTX304	
MPS2907A	60	60	600	1.6	500	50	100	300	150	200	50	500	MPS2222A	
MPSA55	60	60	500	0.25	100	10	50	—	100	100	10	750	MPSA05	
BCY77P	60	60	100	0.25	10	0.25	120	460	2	180*	10	1000†	BCY65EP	
ZTX212	60	50	200	0.25	10	0.5	60	400	2	200	10	500	ZTX107	
BC212P	60	50	200	0.6	100	5	60	400	2	200	10	300	BC182P	
ZTX550	60	45	1000	0.25	150	15	100	300	150	150	50	1000	ZTX450	
BFS97	60	40	1000	0.25	150	15	100	300	150	50	150	500	BFS60	
MPS2907	60	40	600	1.6	500	50	100	300	150	200	50	500	MPS2222	
BFS96	60	30	1000	0.35	150	15	40	300	150	150	50	500	BFS59	
BC557P	50	45	200	0.25	10	0.5	75	450	2	150*	10	500	BC547P	
BC177P	50	45	200	0.2	10	0.5	120	460	2	130	10	300	BC107P	
BC307P	50	45	200	0.2	10	0.5	120	460	2	130*	10	300	BC237P	
BCY70P	50	40	200	0.5	50	5	100	—	10	250	10	350	—	
BCY71P	45	45	200	0.5	50	5	100	400	10	15	0.1	350	—	
ZTX503	45	45	500	0.35	50	5	50	300	10	150	10	300	ZTX303	
ZTX531	45	45	500	0.7	10	0.5	40	120	0.01	30	0.5	250	ZTX331	
BCY79P	45	45	200	0.25	10	0.25	120	460	2	180*	10	1000†	BCY59P	
ZTX213	45	30	200	0.25	10	0.5	80	550	2	200	10	500	ZTX108	
BC213P	45	30	200	0.6	100	5	80	600	2	200	10	300	BC183P	
2N4403	40	40	600	0.4	150	15	100	300	150	200	20	500	2N4401	
2N4402	40	40	600	0.4	150	15	50	150	150	150	20	500	2N4400	
2N3906	40	40	200	0.25	10	1	100	300	10	250	10	500	2N3904	
2N3905	40	40	200	0.25	10	1	50	150	10	200	10	500	2N3903	
ZTX502	35	35	500	0.25	50	5	50	100	300	10	150	10	300	ZTX302
ZTX501	35	35	500	0.25	50	5	50	300	10	150	10	300	ZTX301	
BCY78P	32	32	200	0.25	10	0.25	120	630	2	180*	10	1000†	BCY58P	
ZTX530	30	30	500	0.7	10	0.5	100	400	0.1	30	0.5	250	ZTX330	
BC558P	30	30	200	0.25	10	0.5	75	800	2	150*	10	500	BC548P	
2N4125	30	30	200	0.4	50	5	50	150	2	200	10	500	2N4123	
BC178P	30	25	200	0.2	10	0.5	120	800	2	130	10	300	BC108P	
BC308P	30	25	200	0.2	10	0.5	120	800	2	130*	10	300	BC238P	
BCY72P	30	25	200	0.5	50	3	100	—	10	250	10	350	—	
ZTX500	25	25	500	0.35	50	5	50	300	10	150	10	300	ZTX300	
2N4126	25	25	200	0.4	50	5	120	360	2	250	10	500	2N4124	

*Typical †T_{case} = 45°C

TABLE 3 : NPN SWITCHING

The transistors in this table are characterised for general medium/high speed switching applications and other application areas, e.g. high speed core driving.

Type	V _{CEO} V	Max I _C mA	Max V _{CE(sat)}			h _{FE}		Min f _T		Max. Switching Times			Complement	
			at			at		at		at				
			V	I _C mA	I _B mA	Min	Max	I _C mA	MHz	I _C mA	t _{on} ns	t _{off} ns		I _C mA
BCY65EP	60	100	0.35	10	0.25	120	460	2	125	10	150	800	10	BCY77P
MPS3642	45	500	0.22	150	15	40	120	150	—	—	14	80	300	—
BCY59P	45	200	0.35	10	0.25	120	630	2	125	10	150	800	10	BCY79P
ZTX360	40	1000	0.6	500	50	25	150	560	200	50	40	75	500	—
MPS2222A	40	800	1.0	500	50	100	300	150	300	20	35	285	150	MPS2907A
2N4401	40	600	0.4	150	15	100	300	150	250	20	35	255	150	2N4403
2N4400	40	600	0.4	150	15	50	150	150	200	20	35	255	150	2N4402
2N3904	40	200	0.2	10	1	100	300	10	300	10	70	250	10	2N3906
2N3903	40	200	0.2	10	1	50	150	10	250	10	70	225	10	2N3905
BCY58P	32	200	0.35	10	0.25	120	630	2	125	10	150	800	10	BCY78P
MPS2222	30	800	1.6	500	50	100	300	150	250	20	35	285	150	MPS2907
2N4123	30	200	0.3	50	5	50	150	2	250	10	37*	136*	10	2N4125
2N4124	25	200	0.3	50	5	120	360	2	300	10	37*	136*	10	2N4126
MPS706A	20	200	0.6	10	1	20	60	10	200	10	40	75	10	—
MPS706	20	200	0.6	10	1	20	50*	10	200	10	40	75	10	—
ZTX314	15	500	0.2	10	1	40	120	10	500	10	12	18	10	—
ZTX313	15	500	0.24	10	1	40	120	10	500	10	12	18	10	—
ZTX311	15	500	—	—	—	50	200	10	200	10	(note 1)		—	
MPS2369A	15	200	0.25	10	1	40	120	10	—	—	12	18	10	—
MPS2369	15	200	0.25	10	1	40	120	10	—	—	12	18	10	—
ZTX312	12	500	0.24	10	1	40	—	10	400	10	15	20	10	—
ZTX310	12	500	0.6	10	1	20	—	10	200	10	(note 2)		—	

*Typical

Note 1: t_{stg} = 60ns.

Note 2: t_{stg} = 25ns.

TABLE 4 : PNP SWITCHING

The transistors in this table are characterised for general medium/high speed switching applications and other application areas, e.g. high speed core driving.

Type	V _{CEO} V	Max I _C mA	Max V _{CE(sat)}			h _{FE}			Min f _T		Max. Switching Times at			Complement
			at			at			at		at			
			V	I _C mA	I _B mA	Min	Max	I _C mA	MHz	I _C mA	t _{on} ns	t _{off} ns	I _C mA	
MPS2907A	60	600	1.6	500	50	100	300	150	200	50	50	110	150	MPS2222A
BCY77P	60	100	0.25	10	0.25	120	460	2	180*	10	85	150	10	BCY65EP
BCY79P	45	200	0.25	10	0.25	120	460	2	180*	10	85	150	10	BCY59P
2N4403	40	600	0.4	150	15	100	300	150	200	20	35	255	150	2N4401
2N4402	40	600	0.4	150	15	50	150	150	150	20	35	255	150	2N4400
MPS2907	40	600	1.6	500	50	100	300	150	200	15	50	110	150	MPS2222
2N3906	40	200	0.25	10	1	100	300	10	250	10	70	300	10	2N3904
2N3905	40	200	0.25	10	1	50	150	10	200	10	70	260	10	2N3903
BCY78P	32	200	0.25	10	0.25	120	630	2	180*	10	85	150	10	BCY58P
2N4125	30	200	0.4	50	5	50	150	2	200	10	43*	155*	10	2N4123
2N4126	25	200	0.4	50	5	120	360	2	250	10	43*	155*	10	2N4124
ZTX510	12	200	0.2	30	3	40	150	30	400	30	60	90	30	—

*Typical



TABLE 5 : NPN LOW NOISE

The transistors in this table are characterised for low noise, low level amplification and are ideally suited for audio pre-amplifiers as well as universal applications.

Type	V _{CEO} V	Max I _C mA	Max V _{CE(sat)} at			h _{FE} at			Min f _T at		Max. Noise Figure at			Complement
			V	I _C mA	I _B mA	Min	Max	I _C mA	MHz	I _C mA	N dB	I _C μA	f Hz	
BCY65EP	60	100	0.35	10	0.25	120	460	2	125	10	6	200	1k	BCY77P
2N5209	50	50	0.7	10	1	100	300	0.1	30	0.5	3	200	30 – 15k	2N5086
2N5210	50	50	0.7	10	1	200	600	0.1	30	0.5	2	200	30 – 15k	2N5087
ZTX331	45	500	0.7	10	0.5	40	120	0.01	30	0.5	3*	10	1k	ZTX531
BC550P	45	200	0.25	10	0.5	200	800	2	300*	10	3	200	30 – 15k	BC560P
ZTX382	45	200	0.25	10	0.5	100	850	2	150	10	6	200	30 – 15k	—
BCY59P	45	200	0.35	10	0.25	120	630	2	125	10	6	200	1k	BCY79P
BC414P	45	100	0.25	10	0.5	200	800	2	250*	10	3	200	30 – 15k	BC416P
2N3904	40	200	0.2	10	1	100	300	10	300	10	5	200	30 – 15k	2N3906
2N3903	40	200	0.2	10	1	50	150	10	250	10	6	200	30 – 15k	2N3905
BCY58P	32	200	0.35	10	0.25	120	630	2	125	10	6	200	1k	BCY78P
ZTX330	30	500	0.7	10	0.5	100	400	0.1	30	0.5	3*	10	1k	ZTX530
BC549P	30	200	0.25	10	0.5	200	800	2	300*	10	4	200	30 – 15k	BC559P
ZTX239	30	200	0.25	10	0.5	180	800	2	150	10	4	200	30 – 15k	ZTX214
ZTX383	30	200	0.25	10	0.5	100	850	2	150	10	6	200	30 – 15k	—
BC184P	30	200	0.25	10	0.5	250	—	2	150	10	4	200	30 – 15k	BC214P
ZTX384	30	200	0.25	10	0.5	250	—	2	150	10	4	200	30 – 15k	—
2N4123	30	200	0.3	50	5	50	150	2	250	10	6	200	30 – 15k	2N4125
BC413P	30	100	0.25	10	0.5	200	800	2	250*	10	3	200	30 – 15k	BC415P
ZTX109	30	100	0.1*	10	1	240	900	2	350*	10	4	10	1k	ZTX214
2N4124	25	200	0.3	50	5	120	360	2	300	10	5	20	30 – 15k	2N4126
ZTX114	25	200	0.35	10	0.1	200	—	2	350*	10	3	30	1k	—
BC109P	20	50	0.2	10	0.5	180	800	2	300	10	4	200	30 – 15k	BC179P
BC239P	20	50	0.2	10	0.5	180	800	2	150	10	4	200	30 – 15k	BC309P

*Typical

TABLE 6 : PNP LOW NOISE

The transistors in this table are characterised for low noise, low level amplification and are ideally suited for audio pre-amplifiers as well as universal applications.

Type	V _{CEO} V	Max I _C mA	Max V _{CE(sat)}			h _{FE}			Min f _T		N dB	Max. Noise Figure at		Complement
			at V	at		Min	Max	at I _C mA	at MHz	I _C mA		I _C μA	f Hz	
				I _C mA	I _B mA									
BCY77P	60	100	0.25	10	0.25	120	460	2	180*	10	6	200	1k	BCY65EP
2N5086	50	50	0.3	10	1	150	500	0.1	40	0.5	3	200	30 – 15k	2N5209
2N5087	50	50	0.3	10	1	250	800	0.1	40	0.5	2	200	30 – 15k	2N5210
ZTX531	45	500	0.7	10	0.5	40	120	0.1	30	0.5	3*	100	1k	ZTX331
BCY71P	45	200	0.5	50	5	100	400	10	15	0.1	2	100	30 – 15k	—
BC560P	45	200	0.25	10	0.5	110	800	2	300*	10	2	200	30 – 15k	BC550P
BCY79P	45	200	0.25	10	0.25	120	460	2	180*	10	6	200	1k	BCY59P
BC416P	45	100	0.3	10	0.5	110	800	2	200*	10	2	200	30 – 15k	BC414P
BCY70P	40	200	0.5	50	5	100	—	10	250	10	6	100	30 – 15k	—
2N3906	40	200	0.25	10	1	100	300	10	250	10	4	200	30 – 15k	2N3904
2N3905	40	200	0.25	10	1	50	150	10	200	10	5	200	30 – 15k	2N3903
BCY78P	32	200	0.25	10	0.25	120	630	2	180*	10	6	200	1k	BCY58P
ZTX530	30	500	0.7	10	0.5	100	400	0.1	30	0.5	3*	100	1k	ZTX330
ZTX214	30	200	0.25	10	0.5	140	550	2	200	10	2	200	30 – 15k	ZTX109
BC559P	30	200	0.25	10	0.5	110	800	2	300*	10	4	200	30 – 15k	BC549P
2N4125	30	200	0.4	50	5	50	150	2	200	10	5	200	30 – 15k	2N4123
BC214P	30	200	0.6	100	5	140	600	2	200	10	2	200	30 – 15k	BC184P
BC415P	30	100	0.3	10	0.5	110	800	2	200*	10	2	200	30 – 15k	BC413P
BCY72P	25	200	500	50	5	100	—	10	250	10	6	100	30 – 15k	—
2N4126	25	200	0.4	50	5	120	360	2	250	10	4	200	30 – 15k	2N4124
BC179P	20	50	0.2	10	0.5	180	800	2	130*	10	4	200	30 – 15k	BC109P
BC309P	20	50	0.2	10	0.5	180	800	2	130*	10	4	200	30 – 15k	BC239P

*Typical

ELECTRICAL CHARACTERISTICS

(a) TRANSISTOR ELECTRICAL CHARACTERISTICS

P.N.P. SMALL SIGNAL TRANSISTORS

Dice Type	V_{CB0}	V_{CE0}	I_{CB0}		h_{FE}			V_{CE}	$V_{CE(sat)}$			f_T	C_{obo}	Geometry			
	Min.	Min.	Max.	at V_{CB}	@	I_C	Min.		Max.	mA	I_C				I_B	Min.	Max.
	V	V	nA	V	Min.	Max.	mA		V	Max.	mA				mA	MHz	pF
BC556A	80	65	15	30	110	220	2	5	0.3	10	0.5	150	4.5 \S	G2			
BC556B	80	65	15	30	200	450	2	5	0.3	10	0.5	150	4.5 \S	G2			
BCY77A	60	60	20*	50*	120	220	2	5	0.25	10	0.25	180 \S	7	G2			
BCY77B	60	60	20*	50*	180	310	2	5	0.25	10	0.25	180 \S	7	G2			
BCY77C	60	60	20*	50*	250	460	2	5	0.25	10	0.25	180 \S	7	G2			
BC212A	60	50	15	30	100	300	2	5	0.07	10	0.5	200	5 \S	G2			
BC212B	60	50	15	30	200	400	2	5	0.07	10	0.5	200	5	G2			
BC307A	50	45	100*	50*	120	220	2	5	0.2	10	0.5	130 \S	6	G2			
BC307B	50	45	100*	50*	180	460	2	5	0.2	10	0.5	130 \S	6	G2			
BC557A	50	45	15	30	110	220	2	5	0.3	10	0.5	150	4.5 \S	G2			
BC557B	50	45	15	30	200	450	2	5	0.3	10	0.5	150	4.5 \S	G2			
BCY70	50	40	500	50	100	—	1	1	0.25	10	1.0	250	6	G3			
BCY79A	45	45	20*	35*	120	220	2	5	0.25	10	0.25	180 \S	7	G2			
BCY79B	45	45	20*	35*	180	310	2	5	0.25	10	0.25	180 \S	7	G2			
BCY79C	45	45	20*	35*	250	460	2	5	0.25	10	0.25	180 \S	7	G2			
BCY71	45	45	500	45	100	—	1	1	0.25	10	1.0	250	6	G3			
2N3905	40	40	50 \uparrow	30 \uparrow	40	—	1	1	0.25	10	1.0	200	4.5	G3			
2N3906	40	40	50 \uparrow	30 \uparrow	80	—	1	1	0.25	10	1.0	250	4.5	G3			
BC213A	45	30	15	30	100	300	2	5	0.07	10	0.5	200	5 \S	G2			
BC213B	45	30	15	30	200	400	2	5	0.07	10	0.5	200	5 \S	G2			
BC213C	45	30	15	30	350	600	2	5	0.07	10	0.5	200	5 \S	G2			
BC214B	45	30	15	30	200	600	2	5	0.07	10	0.5	200	5 \S	G2			
BC214C	45	30	15	30	350	400	2	5	0.07	10	0.5	200	5 \S	G2			
BCY78A	32	32	20*	25*	120	220	2	5	0.25	10	0.25	180 \S	7	G2			
BCY78B	32	32	20*	25*	180	310	2	5	0.25	10	0.25	180 \S	7	G2			
BCY78C	32	32	20*	25*	250	460	2	5	0.25	10	0.25	180 \S	7	G2			
BCY78D	32	32	20*	25*	380	630	2	5	0.25	10	0.25	180 \S	7	G2			
BC558A	30	30	15	30	110	220	2	5	0.3	10	0.5	150 \S	4.5 \S	G2			
BC558B	30	30	15	30	200	450	2	5	0.3	10	0.5	150 \S	4.5 \S	G2			
BC558C	30	30	15	30	420	800	2	5	0.3	10	0.5	150 \S	4.5 \S	G2			
BC559B	30	30	15	30	200	450	2	5	0.3	10	0.5	300 \S	4.5 \S	G2			
BC559C	30	30	15	30	420	800	2	5	0.3	10	0.5	300 \S	4.5	G2			
BCY72	30	25	500	30	100	—	1	1	0.25	10	1.0	250	6	G3			
BC308A	30	25	100	20	120	220	2	5	0.2	10	0.5	130 \S	6	G2			
BC308B	30	25	100	20	180	460	2	5	0.2	10	0.5	130 \S	6	G2			
BC308C	30	25	100	20	380	800	2	5	0.2	10	0.5	130 \S	6	G2			
BC309B	25	20	100	20	180	460	2	5	0.2	10	0.5	130	6	G2			
BC309C	25	20	100	20	380	800	2	5	0.2	20	0.5	130	6	G2			

$V_{CE(sat)}$, f_T and C_{obo} are parameters which are assembly dependent and figures quoted are those typically achieved on Ferranti assembly lines.

* I_{CES} at V_{CES} $\uparrow I_{CEX}$ at V_{CE} \S Typical