

# TUP TUN DUG DUS

Wherever possible in Elektor circuits, transistors and diodes are simply marked 'TUP' (Transistor, Universal PNP), 'TUN' (Transistor, Universal NPN), 'DUG' (Diode, Universal Germanium) or 'DUS' (Diode, Universal Silicon). This indicates that a large group of similar devices can be used, provided they meet the minimum specifications listed in tables 1a and 1b. For further information, see the article 'TUP-TUN-DUG-DUS' in Elektor 1, p. 9.

	type	U <sub>ce0</sub> max	I <sub>c</sub> max	h <sub>fe</sub> min.	P <sub>tot</sub> max	f <sub>T</sub> min.
TUN	NPN	20 V	100 mA	100	100 mW	100 MHz
TUP	PNP	20 V	100 mA	100	100 mW	100 MHz

Table 1a. Minimum specifications for TUP and TUN.

Table 1b. Minimum specifications for DUS and DUG.

	type	U <sub>R</sub> max	I <sub>F</sub> max	I <sub>R</sub> max	P <sub>tot</sub> max	C <sub>D</sub> max
DUS	Si	25 V	100 mA	1 μA	250 mW	5 pF
DUG	Ge	20 V	35 mA	100 μA	250 mW	10 pF

Table 2. Various transistor types that meet the TUN specifications.

TUN		
BC 107	BC 208	BC 384
BC 108	BC 209	BC 407
BC 109	BC 237	BC 408
BC 147	BC 238	BC 409
BC 148	BC 239	BC 413
BC 149	BC 317	BC 414
BC 171	BC 318	BC 547
BC 172	BC 319	BC 548
BC 173	BC 347	BC 549
BC 182	BC 348	BC 582
BC 183	BC 349	BC 583
BC 184	BC 382	BC 584
BC 207	BC 383	

Table 4. Various diodes that meet the DUS or DUG specifications.

DUS		DUG
BA 127	BA 318	OA 85
BA 217	BAX 13	OA 91
BA 218	BAY 61	OA 95
BA 221	1N914	AA 116
BA 222	1N4148	
BA 317		

Table 5. Minimum specifications for the BC107, -108, -109 and BC177, -178, -179 families (according to the Pro-Electron standard). Note that the BC179 does not necessarily meet the TUP specification (I<sub>c,max</sub> = 50 mA).

	NPN	PNP
	BC 107 BC 108 BC 109	BC 177 BC 178 BC 179
V <sub>ce0</sub> max	45 V 20 V 20 V	45 V 25 V 20 V
V <sub>eb0</sub> max	6 V 5 V 5 V	5 V 5 V 5 V
I <sub>c</sub> max	100 mA 100 mA 100 mA	100 mA 100 mA 50 mA
P <sub>tot.</sub> max	300 mW 300 mW 300 mW	300 mW 300 mW 300 mW
f <sub>T</sub> min.	150 MHz 150 MHz 150 MHz	130 MHz 130 MHz 130 MHz
F max	10 dB 10 dB 4 dB	10 dB 10 dB 4 dB

Table 3. Various transistor types that meet the TUP specifications.

TUP		
BC 157	BC 253	BC 352
BC 158	BC 261	BC 415
BC 177	BC 262	BC 416
BC 178	BC 263	BC 417
BC 204	BC 307	BC 418
BC 205	BC 308	BC 419
BC 206	BC 309	BC 512
BC 212	BC 320	BC 513
BC 213	BC 321	BC 514
BC 214	BC 322	BC 557
BC 251	BC 350	BC 558
BC 252	BC 351	BC 559

Table 6. Various equivalents for the BC107, -108, ... families. The data are those given by the Pro-Electron standard; individual manufacturers will sometimes give better specifications for their own products.

NPN	PNP	Case	Remarks
BC 107	BC 177		
BC 108	BC 178		
BC 109	BC 179		
BC 147	BC 157		P <sub>max</sub> = 250 mW
BC 148	BC 158		
BC 149	BC 159		
BC 207	BC 204		
BC 208	BC 205		
BC 209	BC 206		
BC 237	BC 307		
BC 238	BC 308		
BC 239	BC 309		
BC 317	BC 320		I <sub>c,max</sub> = 150 mA
BC 318	BC 321		
BC 319	BC 322		
BC 347	BC 350		
BC 348	BC 351		
BC 349	BC 352		
BC 407	BC 417		P <sub>max</sub> = 250 mW
BC 408	BC 418		
BC 409	BC 419		
BC 547	BC 557		P <sub>max</sub> = 500 mW
BC 548	BC 558		
BC 549	BC 559		
BC 167	BC 257		169/259
BC 168	BC 258		I <sub>c,max</sub> = 50 mA
BC 169	BC 259		
BC 171	BC 251		251 ... 253
BC 172	BC 252		low noise
BC 173	BC 253		
BC 182	BC 212		I <sub>c,max</sub> = 200 mA
BC 183	BC 213		
BC 184	BC 214		
BC 582	BC 512		I <sub>c,max</sub> = 200 mA
BC 583	BC 513		
BC 584	BC 514		
BC 414	BC 416		low noise
BC 414	BC 416		
BC 414	BC 416		
BC 413	BC 415		low noise
BC 413	BC 415		
BC 382			
BC 383			
BC 384			
BC 437			P <sub>max</sub> = 220 mW
BC 438			
BC 439			
BC 467			P <sub>max</sub> = 220 mW
BC 468			
BC 469			
	BC 261 BC 262 BC 263		low noise

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The letters after the type number denote the current gain:  
 A: a' (β, h<sub>fe</sub>) = 125-260  
 B: a' = 240-500  
 C: a' = 450-900.