

Circuits, as published and used by Elektor and the Dutch Elektuur, contain universal transistors and diodes to the abbreviations: TUP (Transistor Universal Pnp), TUN (Transistor Universal Npn), DUS (Diode Universal Silicon), and DUG (Diode Universal Germanium). Many transistors and diodes fit this way in these categories and makes component selection easier. Good system!

Table 1a. Transistors						
	Type	U <sub>ceo</sub> (max)	I <sub>c</sub> (max)	h <sub>fe</sub> (min)	P <sub>tot</sub> (max)	f <sub>T</sub> (min)
TUN	NPN	20Volt	0.1 Amp	100	0.1 Watt	100 Mhz
TUP	PNP	20Volt	0.1 Amp	100	0.1 Watt	100 Mhz

The minimum specifications have to be met,  
in Table 1a above,  
before you can call it a  
'TUP' or a 'TUN'.

Table 1b. Diodes						
	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 Volt	0.1 Amp	1 uAmp	0.25 Watt	5 pF
DUG	Ge	20 Volt	0.035 A	100 uAmp	0.25 Watt	10 pF

The minimum specifications have to be met, in  
Table 1b above,  
before you can call it a 'DUS'  
or a 'DUG'.

Table 2.			Table 3.		
TUN	(NPN)		TUP	(PNP)	
BC107	BC208	BC384	BC157	BC253	BC416
BC108	BC209	BC407	BC158	BC261	BC417
BC109	BC237	BC408	BC159	BC262	BC418
BC147	BC238	BC409	BC177	BC263	BC419
BC148	BC239	BC413	BC178	BC307	BC512
BC149	BC317	BC414	BC179	BC308	BC513
BC171	BC318	BC547	BC204	BC309	BC514
BC172	BC319	BC548	BC205	BC320	BC557
BC173	BC347	BC549	BC206	BC321	BC558
BC182	BC348	BC582	BC212	BC322	BC559
BC183	BC349	BC583	BC213	BC350	
BC184	BC382	BC584	BC214	BC351	
BC207	BC383		BC251	BC352	
			BC252	BC415	

In the above tables, Table 2 & 3, you  
can use several different transistor types for a  
TUP or a TUN.  
Obviously the tables are not  
complete. It would be almost impossible to list  
all available transistor types available today.

From the above listed types are all A, B, or C  
types usable.

Table 4.		
DUS		DUG
BA127	BA318	OA85
BA217	BAX13	OA91
BA218	BAY61	OA95
BA221	1N914	AA116
BA222	1N4148	
BA317		

Several different types of diodes are suitable as a 'DUS' or 'DUG'.

Table 6.		
	NPN	PNP
	BC107	BC177
	BC108	BC178
	BC109	BC179
U <sub>ceo</sub> (max)	45 V 20 V 20 V	45 V 25 V 20 V
U <sub>ebo</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
(A), (B) or (C) added to transistor type: (A) = hfe 125 to 260 (B) = hfe 240 to 500 (C) = hfe 450 to 900		

The most important parameters of the BC107...BC109 and the BC177...BC179.  
 These transistors have been chosen as an example of information.

Table 5. Row 1				Row 2				Row 3			
NPN	PNP	Case Note		NPN	PNP	Case Note		NPN	PNP	Case Note	
BC107 BC108 BC109	BC177 BC178 BC179			BC317 BC318 BC319	BC320 BC321 BC322		$I_{C\max} = 150\text{ mA}$	BC467 BC468 BC469			$P_{\max} = 220\text{ mW}$
BC147 BC148 BC149	BC157 BC158 BC159		$P_{\max} = 250\text{ mW}$	BC347 BC348 BC349	BC350 BC351 BC352			BC167 BC168 BC169	BC257 BC258 BC259		100/250: $I_{C\max} = 50\text{ mA}$
BC171 BC172 BC173	BC251 BC252 BC253		251...253 Noise Free	BC382 BC383 BC384				BC547 BC548 BC549	BC557 BC558 BC559		$P_{\max} = 500\text{ mW}$
BC182 BC183 BC184	BC212 BC213 BC214		$I_{C\max} = 150\text{ mA}$	BC407 BC408 BC409	BC417 BC418 BC419		$P_{\max} = 250\text{ mW}$	BC582 BC583 BC584	BC512 BC513 BC514		$I_{C\max} = 200\text{ mA}$
BC207 BC208 BC209	BC204 BC205 BC206			BC413 BC414	BC415 BC416		Noise Free		BC261 BC262 BC263		Noise Free
BC237 BC238 BC239	BC307 BC308 BC309			BC437 BC438 BC439			$P_{\max} = 220\text{ mW}$	<a href="http://www.uoguelph.ca/~antoon">http://www.uoguelph.ca/~antoon</a>			

The letter after the transistor indicates the  $h_{fe}$ .

Example: BC107A,  $h_{fe} = 125 \dots 260$

BC107B,  $h_{fe} = 240 \dots 500$

BC107C,  $h_{fe} = 450 \dots 900$

Substitutes within the BC series of transistors are also possible. In Table 6 you see that the transistors are grouped in three. Example, the BC107, BC147, BC317 and BC413 can be substituted with each other, but a BC548 may not be exchanged for a BC107. Why? The BC548 is the second of a group of three. Your choice would be a BC547(A,B, or C).

