# PNP Transistors for AF output stages and switching applications

Not for new development

TF 78/30 and TF 78/60 are alloyed PNP germanium transistors in cases 8 A 3 DIN 41878 (sim. TO-8). The terminals are electrically insulated from the case.
For mounting the transistors on a chassis, mounting parts Q 62901-B 2-A and Q 62901-B 2-B are available, to be ordered separately.
TF 78/30 and TF 78/60 are designed for AF power stages and for switching applications; for use in push-pull power stages, the transistors TF 78/30 are also available in pairs.
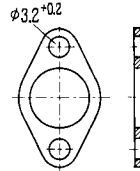
Type	Order number
TF 78/30 II	Q 62606-X 3078-X 2
TF 78/30 III	Q 62606-X 3078-X 3
TF 78/30 IV	Q 62606-X 3078-X 4
TF 78/30 V	Q 62606-X 3078-X 5
TF 78/30 paired	Q 62606-P 3078
TF 78/60 II	Q 62606-X 6078-X 2
TF 78/60 III	Q 62606-X 6078-X 3
TF 78/60 IV	Q 62606-X 6078-X 4
TF 78/60 V	Q 62606-X 6078-X 5
Tensioning plate	Q 62901-B 2-A
washer	Q 62901-B 2-B
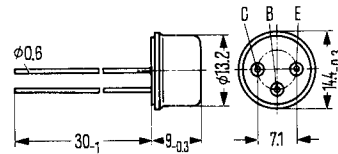
Weight approx. 5.5 g   Dimensions in mm
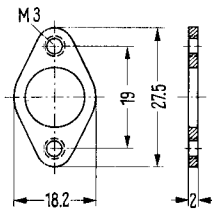
Part A: Tensioning plate   Part B: Washer

Maximum ratings		TF 78/30	TF 78/60	
Collector-emitter voltage	$-V_{CEO}$	24	45	V
Collector-emitter voltage ($V_{BE} \geqq 0.25$ V)	$-V_{CEV}$	32	64	V
Collector-base voltage	$-V_{CBO}$	32	64	V
Emitter-base voltage	$-V_{EBO}$	10	16	V
Collector current	$-I_C$	600	600	mA
Base current	$-I_B$	100	100	mA
Junction temperature	T_j	90	90	°C
Storage temperature	T_s	-30 to $+75$	-30 to $+75$	°C
Total power dissipation ($T_{case} \leqq 45$ °C)	P_{tot}	3	3	W
Thermal restance				
Junction to ambient air	R_{thJamb}	$\leqq 120$	$\leqq 120$	K/W
Junction to case	$R_{thJcase}$	$\leqq 15$	$\leqq 15$	K/W

Static characteristics ($T_{case} = 25\ °C$)

The transistors TF 78/30 and TF 78/60 are classified in groups of static forward current transfer ratio h_{FE} at $-I_C = 50$ mA, which are indicated by Roman numerals. The following values apply at a collector voltage of $-V_{CE} = 0.7$ V and the following collector currents.

	II	III	IV	V	h_{FE} group
$-I_C$ mA	h_{FE} I_C/I_B	h_{FE} I_C/I_B	h_{FE} I_C/I_B	h_{FE} I_C/I_B	V_{BE} V
50	38 (30 to 45)*	56 (45 to 67)*	83 (67 to 100)*	125 (100 to 150)*	0.27 (<0.45)
200	35	52	77	116	0.41 (<0.65)
500	25	37	55	83	0.54 (<1.0)

Collector saturation voltage for the characteristics which pass the operating points stated below:

		TF 78/30, TF 78/60	
$-V_{CE} = 0.7$ V; $-I_C = 50$ mA	$-V_{CEsat}$	0.19 (<0.3)	V
$-V_{CE} = 0.7$ V; $-I_C = 200$ mA	$-V_{CEsat}$	0.21 (<0.4)	V
$-V_{CE} = 0.7$ V; $-I_C = 500$ mA	$-V_{CEsat}$	0.26 (<0.5)	V

Cutoff currents

Collector-emitter cutoff current ($-V_{CEV}$[1])	$-I_{CEV}$	10 (<30)*	µA
Collector-base cutoff current ($-V_{CBO}$[1])	$-I_{CBO}$	10 (<30)	µA
Collector-emitter cutoff current ($-V_{CEO} = 5$ V)	$-I_{CEO}$	200	µA
Emitter-base cutoff current ($-V_{EBO}$[1])	$-I_{EBO}$	8 (<30)*	µA

Dynamic characteristics ($T_{case} = 25\ °C$)

Test conditions: $-I_C = 5$ mA; $-V_{CE} = 5$ V

Cutoff frequency in common emitter circuit	f_α	12	kHz
Cutoff frequency in common base circuit	f_β	700	kHz
Base series resistance	$r_{bb'}$	50	Ω
Collector junction capacitance	$C_{b'c}$	70	pf

Four-terminal characteristics
Test condition: $-I_C = 5$ mA; $-V_{CE} = 5$ V; $f = 1$ kHz

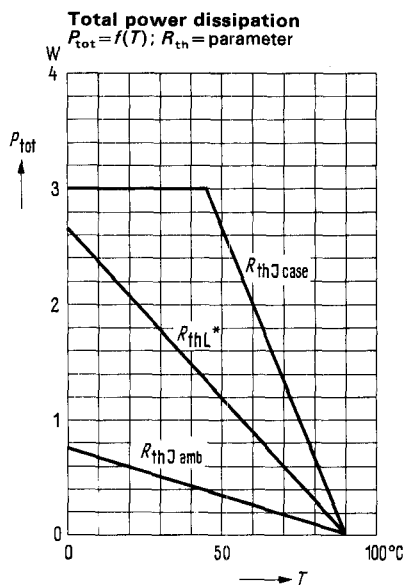|		
h_{11e}	350	Ω
h_{12e}	6	$\cdot 10^4$
h_{21e}	45	—
h_{22e}	100	µmhos
y_{21e}	127	mmhos

Switching times

At an overdriving factor of $\ddot{u} = 1.5$ to 3 and a "turn-off" base current of $I_{B2} = 3.3$ mA ($-I_C = 200$ mA) the following switching times apply:

t_{on}	6 (<12)	µs
t_s	4 (<10)	µs
t_f	18 (<36)	µs

[1]) See maximum ratings
* AQL = 0.65%

Total power dissipation
$P_{tot} = f(T)$; R_{th} = parameter

Permissible pulse load
$\frac{K}{W}$ $r_{thJcase} = f(t)$; v = parameter

$R_{thJcase}$

R_{thL}^*

R_{thJamb}

$v = \frac{t}{\tau}$

$v = 0$

Collector current $I_C = f(I_B)$
$-V_{CE} = 0.7$ V

$-V_{CE} = 0.7$ V

Input characteristic $I_B = f(V_{BE})$
$-V_{CE} = 0.7$ V
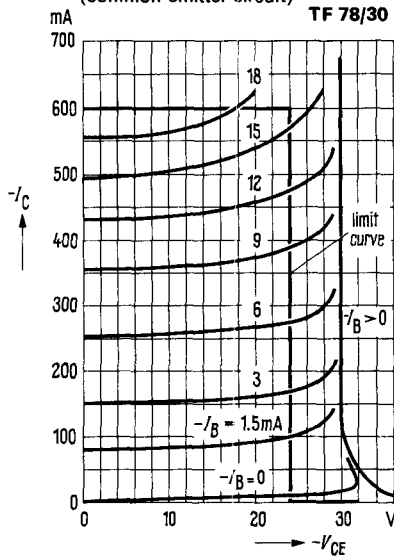(common emitter circuit)

$-V_{CE} = 0.7$ V
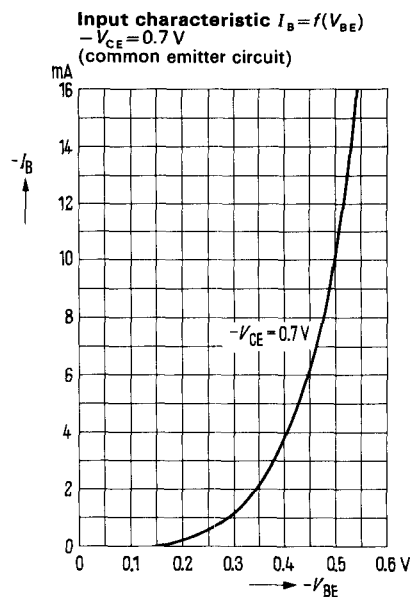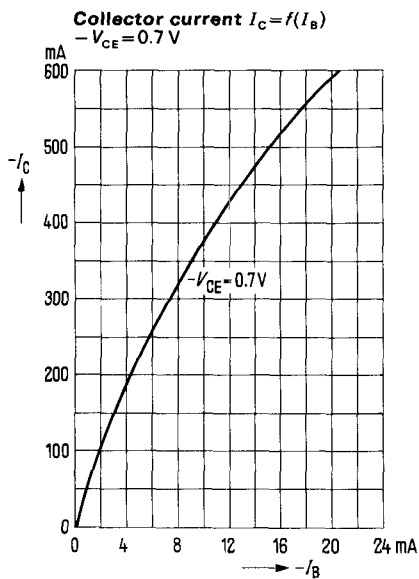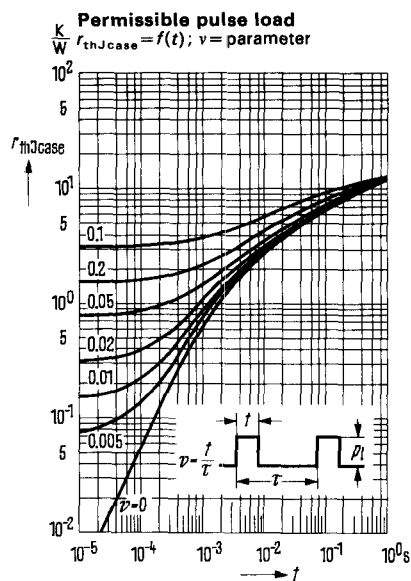
Output characteristics $I_C = f(V_{CE})$
$-V_{BE}$ = parameter
(common emitter circuit)
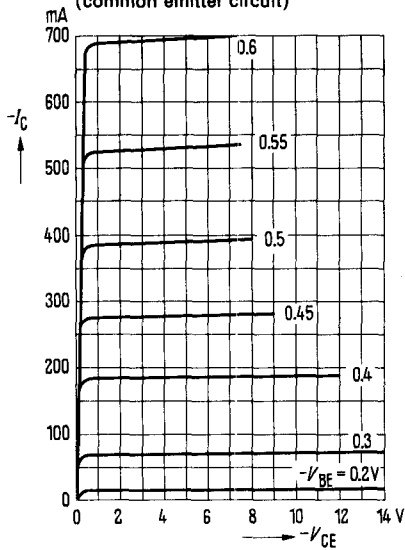
Output characteristics $I_C = f(V_{CE})$
$-I_B$ = parameter
(common emitter circuit)

Output characteristics and limit curve for switching operation $I_C = f(V_{CE})$
(common emitter circuit)   TF 78/30

Output characteristics and limit curve for switching operation $I_C = f(V_{CE})$
(common emitter circuit)   FT 78/60