TUNGSRAM

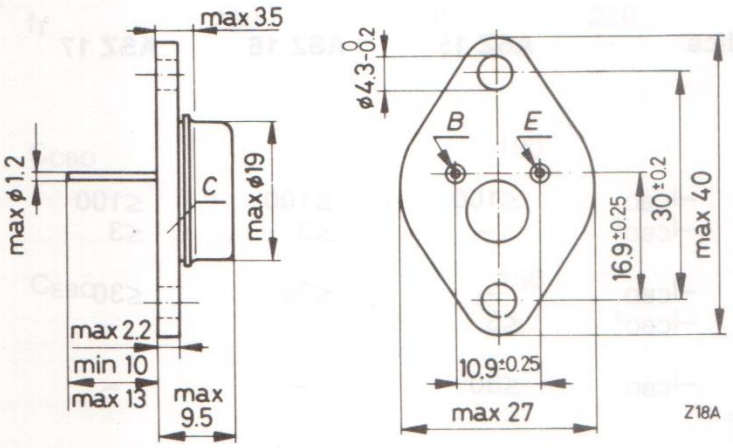
SEMI-CONDUCTOR DEVICES '80/81

DIODES
RECTIFIERS
THYRISTORS
TRANSISTORS

PNP Germanium Alloy Transistors

intended for use in AF power stages and for switching purposes. The collector is electrically connected to the case. For isolated mounting, as requested, one insulating washer and two insulating bushes are supplied. The devices are available in matched pairs (2-ASZ 15, 2-ASZ 16, 2-ASZ 17, 2-ASZ 18), too.

Dimensions in mm



Case: TO-3

Mass: approx. 15 g

Accessories (available as requested)

Insulating washer: CL-MO24/C
Insulating bush: VA-M168/B

Absolute maximum ratings		**ASZ 15**	**ASZ 16**	**ASZ 17**	**ASZ 18**	
Collector-base voltage[1]	$-V_{CBO}$	100	60	60	100	V
Collector-emitter voltage[2]	$-V_{CEO}$	60	32	32	32	V
Emitter-base voltage	$-V_{EBO}$	40	20	20	40	V
Collector current	$-I_C$		8			A
Peak collector current	$-I_{CM}$		10			A
Base current	$-I_B$		1			A
Peak base current	$-I_{BM}$		2			A
Emitter current	I_E		9			A
Peak emitter current	I_{EM}		12			A
Junction temperature	T_j		90			°C
Storage temperature	T_s		–65 . . . + 90			°C
Total power dissipation[3]	P_{tot}		26			W

[1] Permitted at switching over from a thermostable "on" state to "off" state in case $T_{amb} \leq 55$ °C and $R_{thja} \leq 9$ K/W
[2] see limit curves, too
[3] $T_{case} \leq 38$ °C

Thermal resistance

junction to case	R_{thjc}	= 2	K/W
case to heat sink	R_{thch}	= 0.5	K/W
case to heat sink with a simple mica isolation	R_{thch}	= 1	K/W

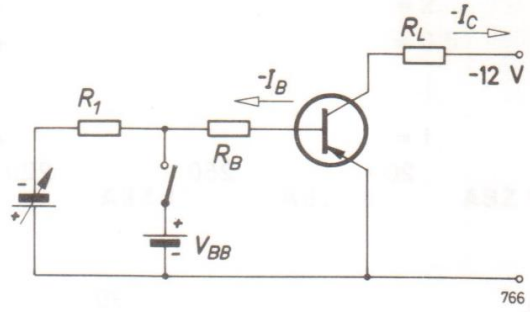
Static characteristics[1]		**ASZ 15**	**ASZ 16**	**ASZ 17**	**ASZ 18**	
T_{amb} = 25°C						
Collector-base cut-off current						
$-V_{CB}$ = 0.5 V	$-I_{CBO}$	≤100	≤100	≤100	≤100	µA
$-V_{CB}$ = 60 V	$-I_{CBO}$[2]	–	≤3	≤3	–	mA
$-V_{CB}$ = 60 V, T_j = 100°C	$-I_{CBO}$	–	≤30	≤30	–	mA
$-V_{CB}$ = 100 V	$-I_{CBO}$[2]	≤3	–	–	≤3	mA
$-V_{CB}$ = 100 V, T_j = 100°C	$-I_{CBO}$	≤30	–	–	≤30	mA
Emitter-base cut-off current[2]						
$-V_{EB}$ = 20 V	$-I_{EBO}$	–	≤3	≤3	–	mA
$-V_{EB}$ = 40 V	$-I_{EBO}$	≤3	–	–	≤3	mA
Base current and DC forward current transfer ratio						
$-V_{CB}$ = 0 V, I_E = 1 A	$-I_B$[2]	17.5 . . . 50	7.2 . . . 21.5	13 . . . 38	9 . . . 33	mA
	h_{21E}	20 . . . 55	45 . . . 135	25 . . . 75	30 . . . 110	
$-V_{CB}$ = 0 V, I_E = 6 A	$-I_B$	190 . . . 375	73 . . . 175	130 . . . 285	90 . . . 285	mA
	h_{21E}	15 . . . 30	35 . . . 80	20 . . . 45	20 . . . 65	
Base-emitter voltage						
$-V_{CB}$ = 0 V, I_E = 6 A	$-V_{BE}$[2]	≤1.6	≤1.4	≤1.4	≤1.6	V
Collector-emitter saturation voltage						
$-I_C$ = 10 A, $-I_B$ = 1 A	$-V_{CEsat}$		≤0.4			V
Collector-base saturation voltage						
$-I_C$ = 10 A, $-I_B$ = 1 A	$-V_{BEsat}$		≤1.4			V

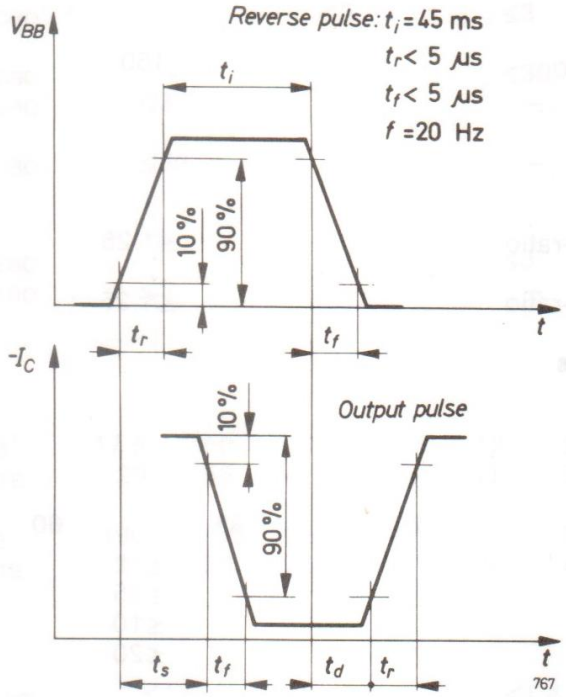
[1] measured under pulsed conditions
[2] AQL = 1%

Dynamic characteristics		**ASZ 15**	**ASZ 16**	**ASZ 17**	**ASZ 18**	
T_{amb} = 25°C						
Transition frequency $-V_{CE}$ = 5 V, $-I_C$ = 1 A, f = 300 kHz	f_T	200	250	220	220	kHz
Collector-base capacitance $-V_{CB}$ = 5 V, f = 500 kHz	C_{CBO}			190		pF
Emitter-base capacitance $-V_{EB}$ = 5 V, f = 500 kHz	C_{EBO}			150		pF
Pair conditions[1]						
T_{amb} = 25°C						
$-V_{CB}$ = 0 V, I_E = 1 A	h_{21E}-ratio			≤1.25		
$-V_{CB}$ = 0 V, I_E = 6 A	h_{21E}-ratio			≤1.25		
Switching characteristics						
T_{amb} = 25°C						
$-I_C$ = 1 A, R_B = 10 Ω, R_1 = 220 Ω, R_L = 12 Ω						
$-I_B$		75	35	60	50	mA
Delay time	t_d			≤ 2		µs
Rise time	t_r			≤25		µs
Storage time	t_s			≤10		µs
Fall time	t_f			≤20		µs
$-I_C$ = 10 A, R_B = 1 Ω, R_1 = 13 Ω, R_L = 1.2 Ω						
$-I_B$		1.35	0.6	1	1	A
Delay time	t_d			≤ 1		µs
Rise time	t_r			≤20		µs
Storage time	t_s			≤15		µs
Fall time	t_f			≤35		µs

[1] measured under pulsed conditions

Test circuit for measuring switching times

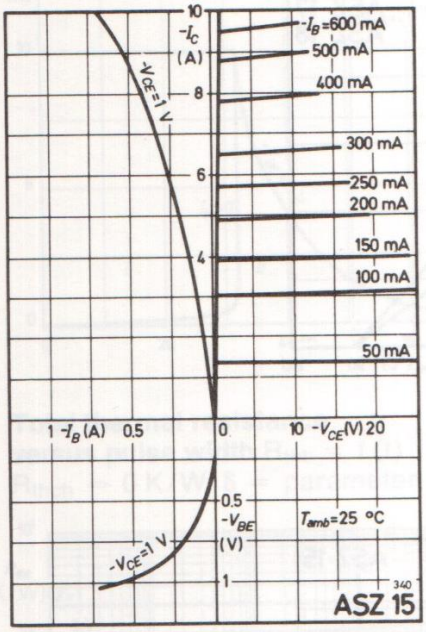




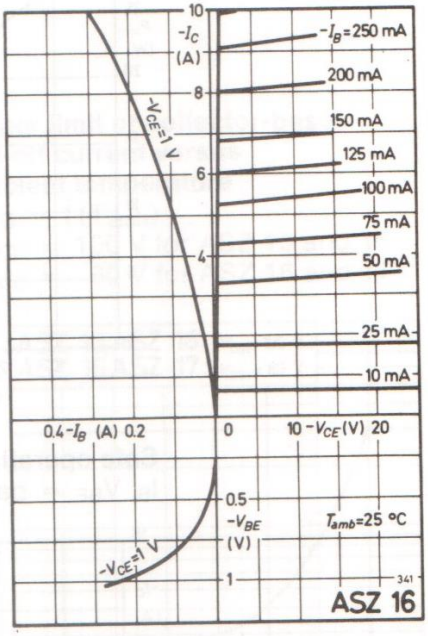
Square-wave generator

Pulse frequency	f	= 20 Hz
Pulse duration	t_i	= 45 ms
Rise time	t_r	≤ 5 µs
Fall time	t_f	≤ 5 µs

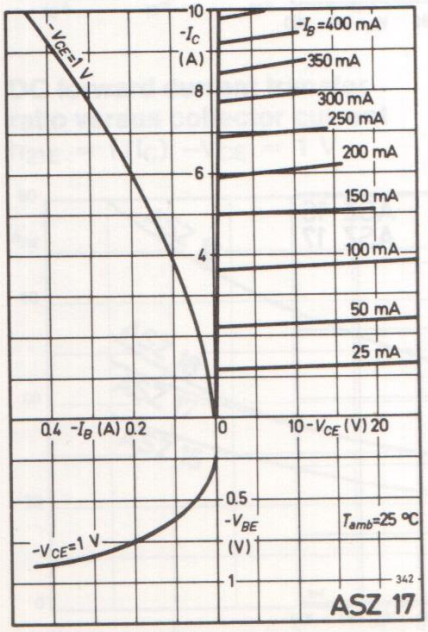
Transfer, output and input characteristics
$I_C = f(I_B)$, $-V_{CE} = 1$ V
$I_C = f(V_{CE})$, $-I_B$ = parameter
$V_{BE} = f(I_B)$, $-V_{CE} = 1$ V



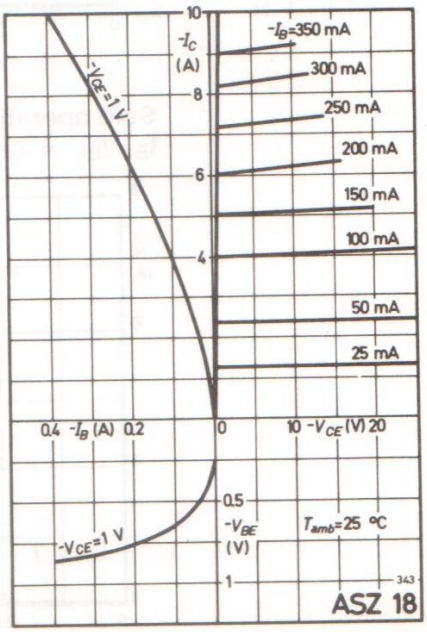
Transfer, output and input characteristics
$I_C = f(I_B)$, $-V_{CE} = 1$ V,
$I_C = f(V_{CE})$, $-I_B$ = parameter
$V_{BE} = f(I_B)$, $-V_{CE} = 1$ V



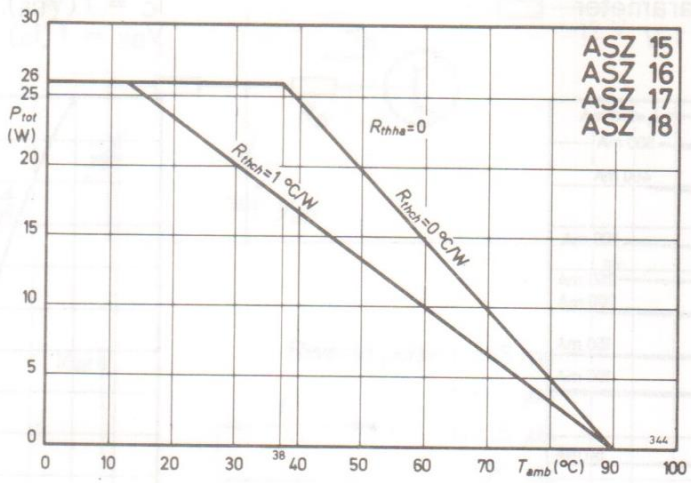
Transfer, output and input characteristics
$I_C = f(I_B)$, $-V_{CE} = 1$ V
$I_C = f(V_{CE})$, $-I_B$ = parameter
$V_{BE} = f(I_B)$, $-V_{CE} = 1$ V



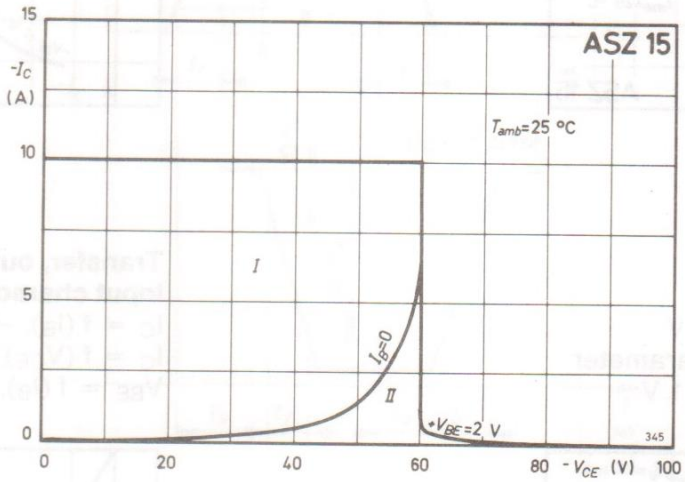
Transfer, output and input characteristics
$I_C = f(I_B)$, $-V_{CE} = 1$ V
$I_C = f(V_{CE})$, $-I_B$ = parameter
$V_{BE} = f(I_B)$, $-V_{CE} = 1$ V



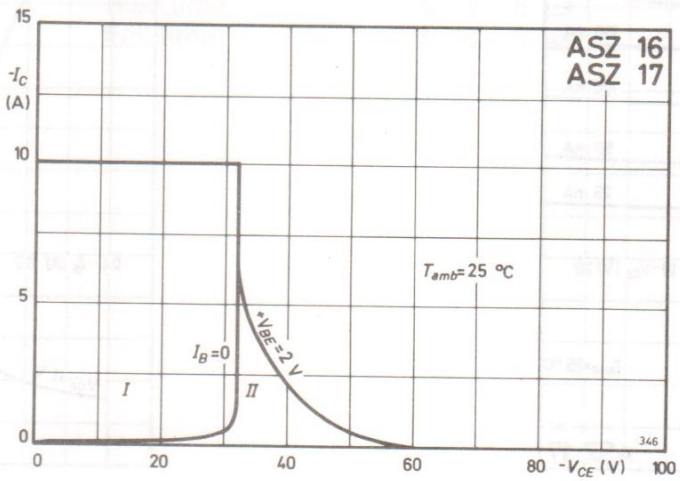
Permissible total power dissipation versus ambient temperature
$P_{tot} = f(T_{amb})$, R_{thch} = parameter



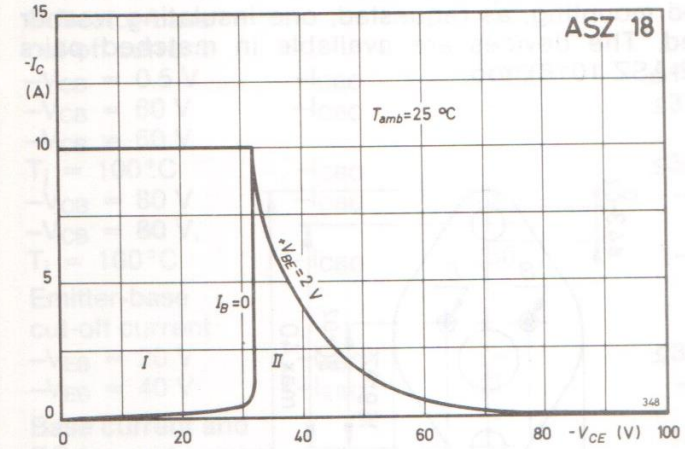
Safe operating area $I_C = f(V_{CE})$
I_B, V_{BE} = parameter



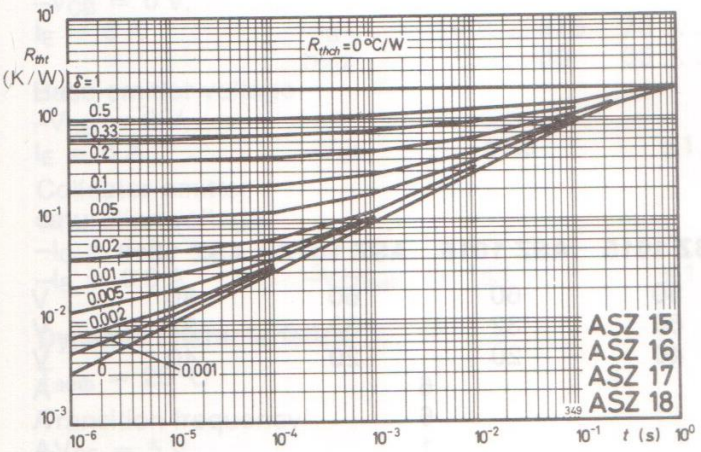
Safe operating area $I_C = f(V_{CE})$
I_B, V_{BE} = parameter



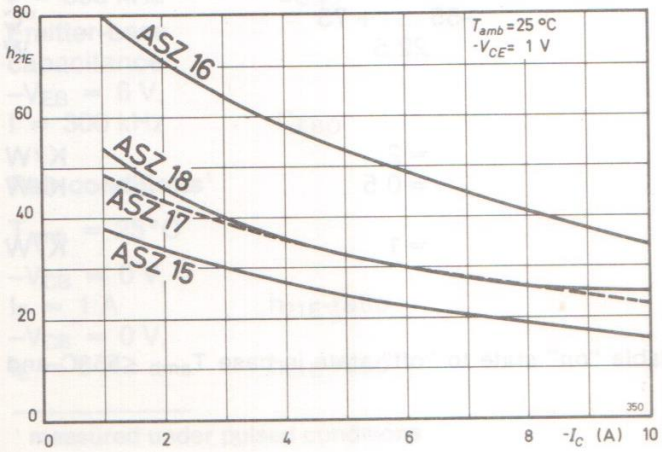
Safe operating area $I_C = f(V_{CE})$
I_B, V_{BE} = parameter



Total thermal resistance versus pulse width $R_{tht} = f(t)$
R_{thch} = 0 K/W, δ = parameter



DC forward current transfer ratio versus collector current
$h_{21E} = f(I_C)$, $-V_{CE}$ = 1 V



Upper limit of collector-base cut-off current versus ambient temperature
$I_{CBO} = f(T_{amb})$
$-V_{CB}$ = 100 V for ASZ 15 and 18
$-V_{CB}$ = 60 V for ASZ 16 and 17