

MILITARY SPECIFICATION

CV 7338

SEMICONDUCTOR DEVICE, TRANSISTOR, ASZ21

Description:- This specification covers the detail requirements for a FNP Germanium transistor and is in accordance with Specification K1007, except as otherwise stated.

Mechanical Dimensions and Outlines:- K1007, Section B, 10.3.2.4. and 10.4.2.4.

Connections:- 1. Emitter. 2. Base. 3. Collector and Case.

Absolute Maximum Ratings:-

Rating	V_{CB}	V_{CE}	V_{CE}	I_{CM}	I_{CAV}	I_{EM}	I_{EAV}	I_{BM}	I_{BAV}	Rev. I_{EM}	Rev. I_{BAV}	P_{tot}
Unit	V	V	V	mA	mA	mA	mA	mA	mA	mA	mA	mW
Min.	-	-	-	-	-	-	-	-	-	-	-	-
Max.	20	15	9	50	30	60	35	25	5.0	-10	-5	100
Note		1	2		5		5		5	3	3, 5	4

Rating	T	T (stg)	Shock	Vibration
Unit	$^{\circ}C$	$^{\circ}C$	g	g
Min.	-55	-55	-	-
Max.	+75	+75	1500	20
Note			6	

NOTES:- 1. $+V_{BE} > 500$ mV

2. $I_C = 5$ mA, $I_B = 0$

3. If the reverse emitter-base current is not limited to this value, then the reverse emitter-base voltage must be limited to 2.5V.

4. See derating curve on Page 9.

5. Averaged over any 50 mS period.

6. 0.5 mS duration.

Primary Electrical Characteristics

Characteristic	I_{CBO} /uA	I_{CEX} /uA	I_{EBO} /uA	$V_{CE\ sat}$ V	V_{BE} mV	h_{FE}	f_T Mc/s	C_{ob} pF	C_{Te} pF	t_s ns	$R_{th(j-a)}$ $^{\circ}C/mW$
Unit											
Minimum						35	300				
Typical	2.5	30	0.1	0.7	375	50	450	3.5	10	50	0.35
Maximum	7.0	100	50	1.1	550			5.0	12	100	0.5
Conditions											
V_{CB}	V	-6						-2	-6		
V_{CE}	V		-15		-2	-6	-1				
V_{EB}	V		-0.2						-1.0		
I_C	mA		0	50	10	10	1.0	30	10		
I_E	mA	0							0	0	
I_B	mA			3.0	0.4						
f	Mc/s						100	1.0	1.0		
T_{amb}	$^{\circ}C$	25	55	25	25	25	25	25	25	25	25

REQUIREMENTS:-

Marking. K1007, Section B, 1.3.4.

QUALITY ASSURANCE PROVISIONS:-

Destructive Tests. The tests listed in Table II.
Group B Inspection, Subgroups 2, 3 and 4 and in Table III
Group C Inspection, Subgroup 2 are considered destructive.

Group C Inspection. Inspection shall be conducted on the
initial lot and thereafter every 90 days or every fifth lot
whichever occurs first.

PREPARATION FOR DELIVERY:-

Packaging. The device shall be packed according to K1007,
Section A 1.2. (e).

JOINT SERVICE CATALOGUE NUMBER:- 5960-99-037-3138

This specification has been prepared by and the Qualification Approval
Authority is:-

Admiralty Surface Weapons Establishment,
Portsmouth, Hants., England.

GROUP A INSPECTION

Table I

Examination or Test	Test Conditions		AQL %	Insp. Level	Sym- bol	Limits		Units
	K1007/ NATO Ref.	Specific Conditions				Min.	Max.	
<u>SUBGROUP 1</u> Visual and Mechanical Inspection.	5.1	Excluding Physical Dimensions	0.65	I				
<u>SUBGROUP 2</u> Collector Base Cut-off Current (1)	7.2.5.1	$V_{CB} = -6V$ $I_E = 0$	0.65	II	I_{CBO}		7.0	μA
Collector Base Cut-off Current (2)	7.2.5.1	$V_{CB} = -20V$ $I_E = 0$			I_{CBO}		50	μA
Static Short-circuit Forward Current Transfer Ratio.	7.3.4.2	$V_{CE} = -2V$ $I_C = 10\text{ mA}$			h_{FE}	35		
Storage Time		See Fig. 2, Page 10			t_S		100	ns
<u>SUBGROUP 3</u> Emitter Base Cut-off Current	7.2.6	$V_{EB} = -2.5V$ $I_C = 0$	2.5	I	I_{EBO}		50	μA
Collector Emitter Saturation Voltage	7.3.3	$I_C = 50\text{ mA}$ $I_B = 3.0\text{ mA}$			$V_{CE(sat)}$		1.1	V

Table I
GROUP A INSPECTION

Examination or Test	Test Conditions		AQL %	Insp. Level	Sym- bol	Limits		Units
	K1007/ NATO Ref.	Specific Conditions				Min.	Max.	
SUBGROUP 3 (Contd.)								
Base-Emitter Voltage	7.3.2	$V_{CE} = -2V$ $I_C = 10 \text{ mA}$			V_{BE}		550	mV
Transition Frequency	7.5.2	$V_{CE} = -2V$ $I_C = 10 \text{ mA}$ $f = 100 \text{ Mc/s}$			f_T	300		Mc/s
SUBGROUP 4			4.0	IA				
Collector Emitter Cut-off Current, Emitter Base Reverse Biased.	7.2.5.5	$T_{amb} = 55^\circ C$ $V_{CE} = -15V$ $V_{BE} = +0.2V$			I_{CEX}		100	μA
Collector Emitter Cut-off Current	7.2.5.2	$V_{CE} = -9V$ $I_B = 0$			I_{CEO}		5	mA
Output Capacitance	7.4.8	$V_{CB} = -6V$ $I_E = 0$ $f = 1 \text{ Mc/s}$			C_{ob}		5	pF
Emitter Depletion Layer Capacitance		$V_{EB} = -1V$ $I_C = 0$ $f = 1 \text{ Mc/s}$			C_{Te}		12	pF

Table II
GROUP B INSPECTION
See Page 3, Quality Assurance Provisions

Examination or Test	Test Conditions		AQL %	Insp. Level	Synbol	Limits		Units
	K1007/ NATO Ref.	Specific Conditions				Min.	Max.	
<u>SUBGROUP 1</u> Physical Dimensions	5.1	According to Drawings 10.3.2.4 and 10.4.2.4	6.5	IC				
<u>SUBGROUP 2</u> Solderability	5.13		4.0	IA				
Temperature Cycling	5.5	-55°C to +70°C						
Moisture Resistance	5.3							
<u>SUBGROUP 3</u> Vibration Fatigue	5.15	Non-Operating	4.0	IA				
<u>SUBGROUP 4</u> Lead Fatigue	5.10.1	1 cycle	6.5	IA				
<u>SUBGROUP 5</u> Omitted								
<u>SUBGROUP 6</u> Omitted								

GROUP B INSPECTION

Table II

Examination or Test	Test Conditions		AQL %	Insp. Level	Sym- bol	Units		Units
	K1007// NATO Ref.	Specific Conditions				Min.	Max.	
<u>SUBGROUP 7</u> High Temperature Life (Non-operating)	6.2.1	$T_{amb} = 75^{\circ}C$	4.0	IA				
	6.6.1.2.2	$t = 1000$ hrs.						
<u>SUBGROUP 8</u> Operating Life	6.3	T_{amb} between $25^{\circ}C$ and $60^{\circ}C$	4.0	IA				
	6.5	$V_{CB} = -10V$						
	6.6.1.1	$P_{tot} = \text{max. value given by}$						
	6.6.1.2.2	derating curve on Page 9 corresponding to the chosen T_{amb} .						
<u>Post Test End Points for Subgroups 2, 3, 7 and 8</u>	7.2.5.1	As in Group A, Subgroup 2.			I_{CBO}		75	μA
	7.3.4.2	As in Group A, Subgroup 2.						
Collector Base Cut-off Current (2)								
Static Short-circuit Forward Current Transfer Ratio.							27	

Table III GROUP C INSPECTION
See Page 3, Quality Assurance Provisions

Examination or Test	K1007/ NATO Ref.	Test Conditions Specific Conditions	AQL %	Insp. Level	Sym- bol	Limits		Units
						Min.	Max.	
<u>SUBGROUP 1</u>								
Omitted								
<u>SUBGROUP 2</u>								
Shock	5.17	Non-operating. Five blows each orientation: Y1, Y2, X and Z.	6.5	IA				
<u>Post Test End Points For Subgroup 2</u>								
Collector Base Cut-off Current (2)	7.2.5.1	As in Group A, Subgroup 2.			I _{CBO}		75	/uA
Static Short-circuit Forward Current Transfer Ratio.	7.3.4.2	As in Group A, Subgroup 2.			h _{FE}		27	

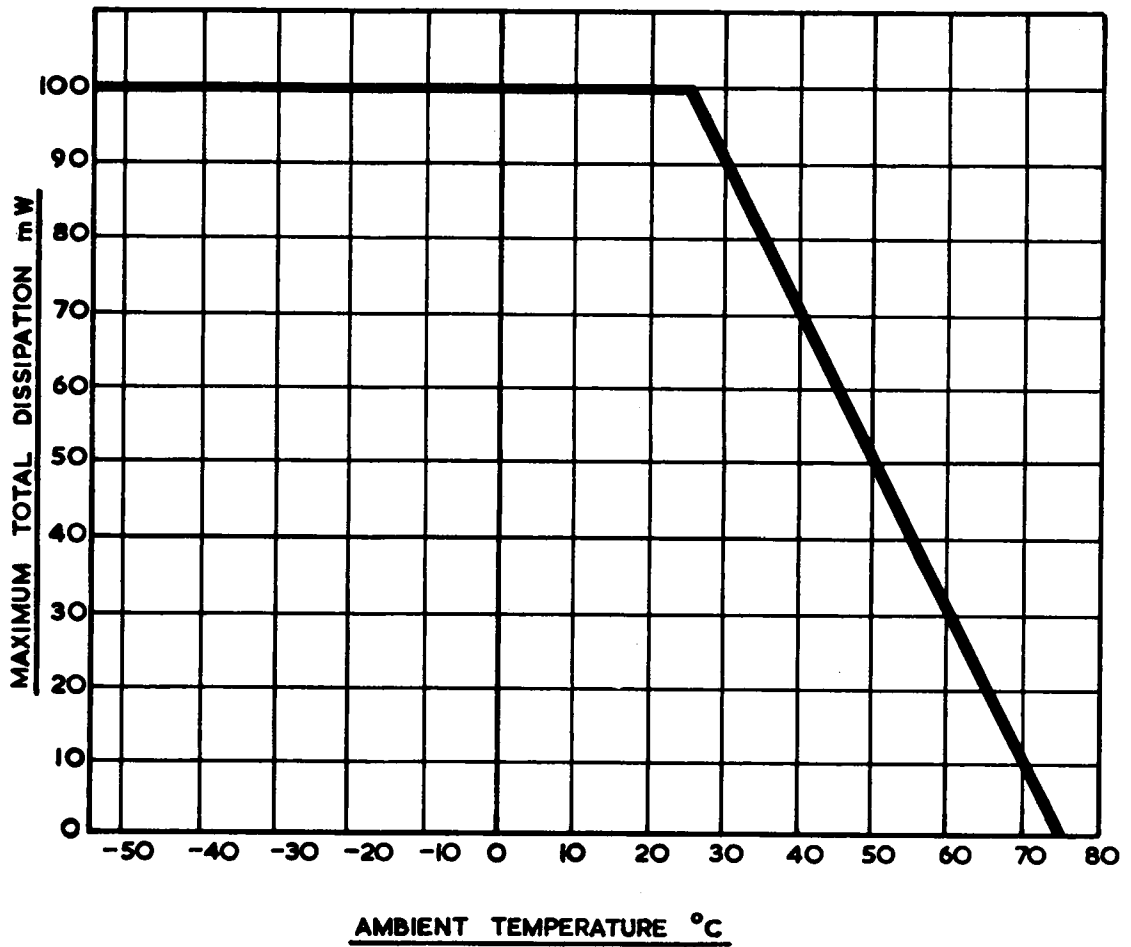


FIG. 1.

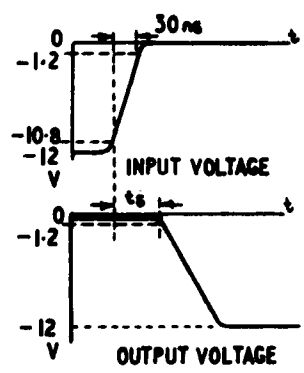
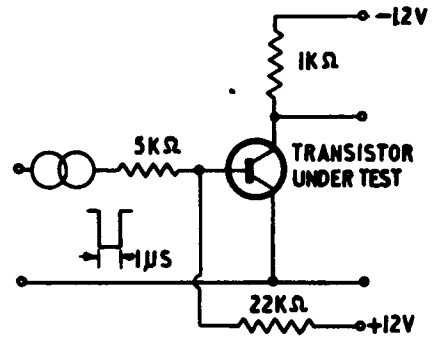
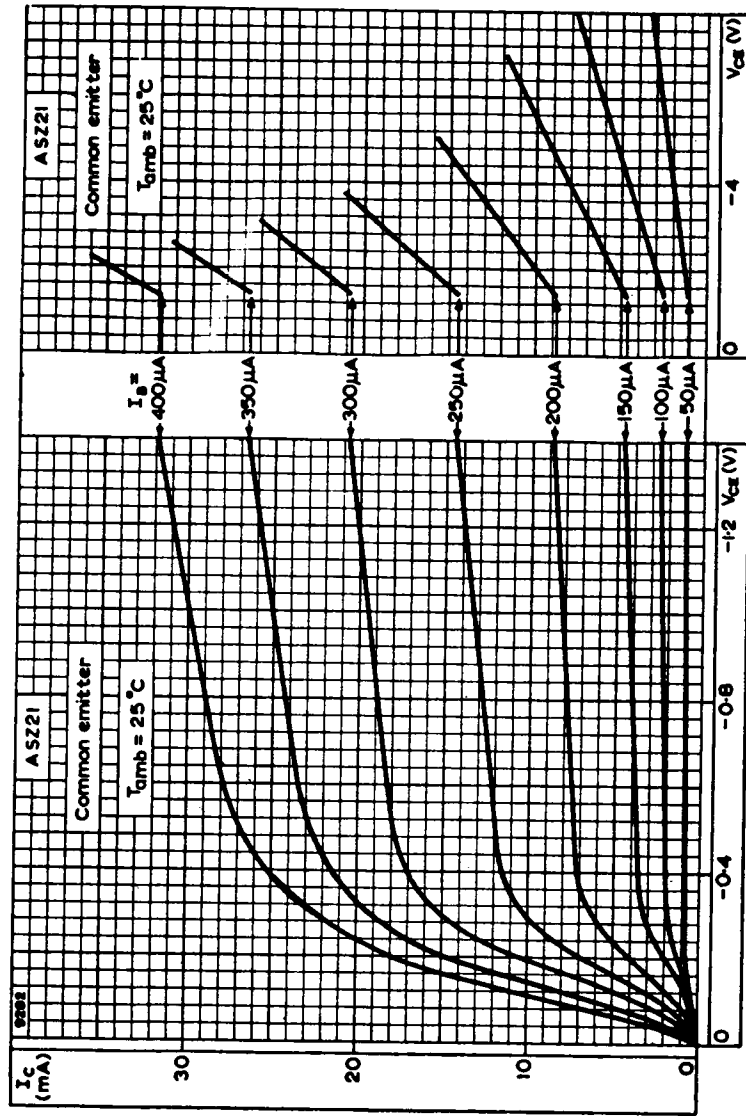
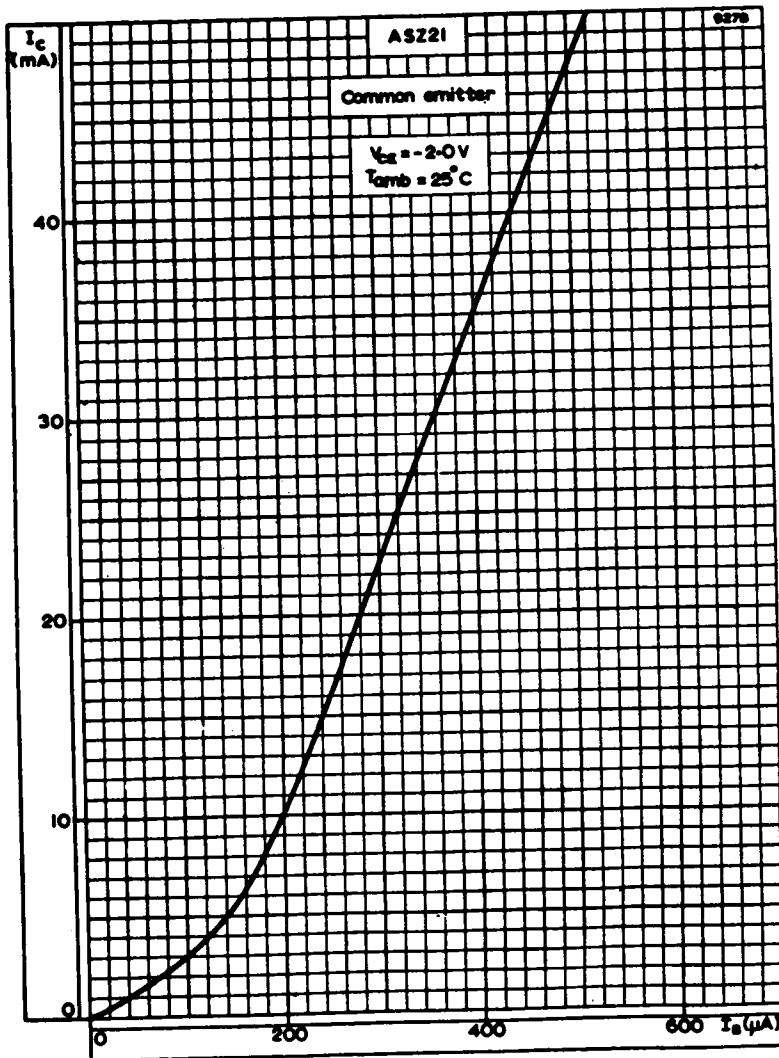


FIG.2.

CIRCUIT FOR MEASURING STORAGE TIME (t_s)

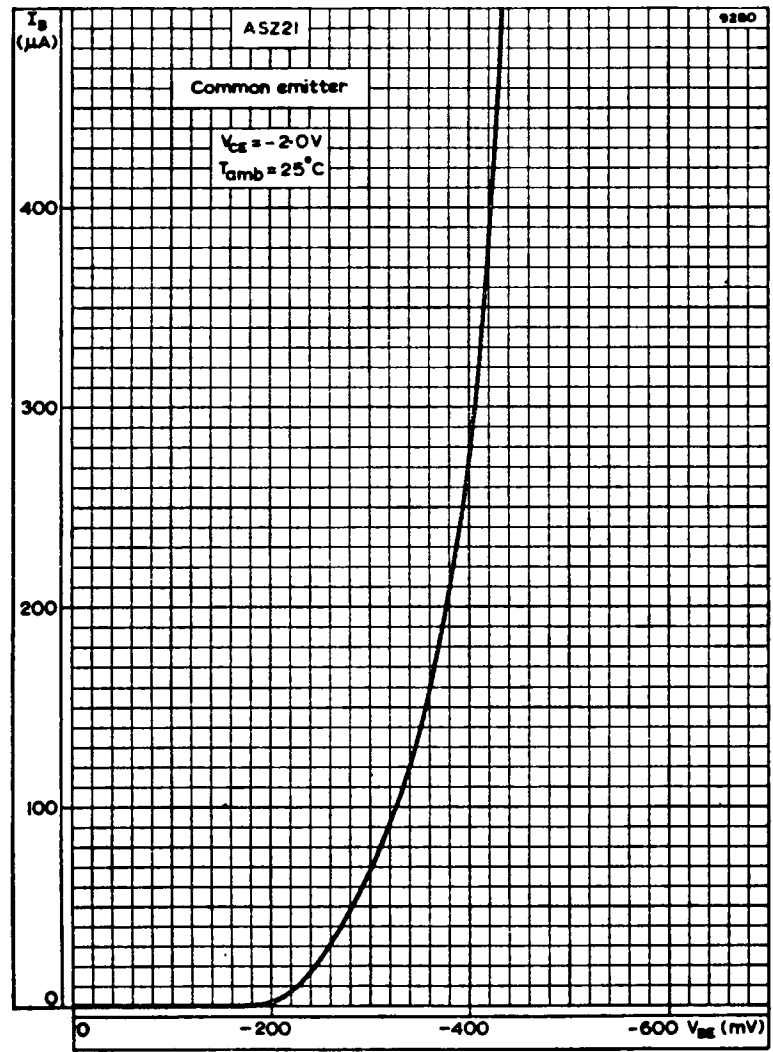


OUTPUT CHARACTERISTIC. COMMON EMITTER

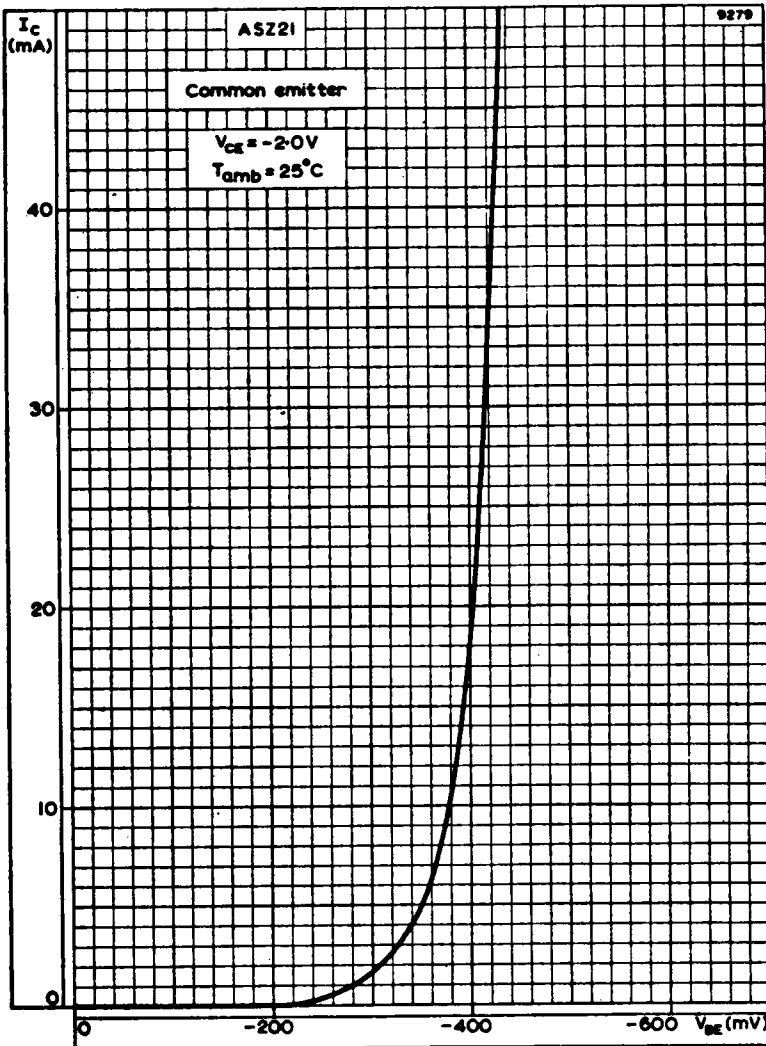


TRANSFER CHARACTERISTIC. COMMON EMITTER

APPLICATION DATA 3 CV7338

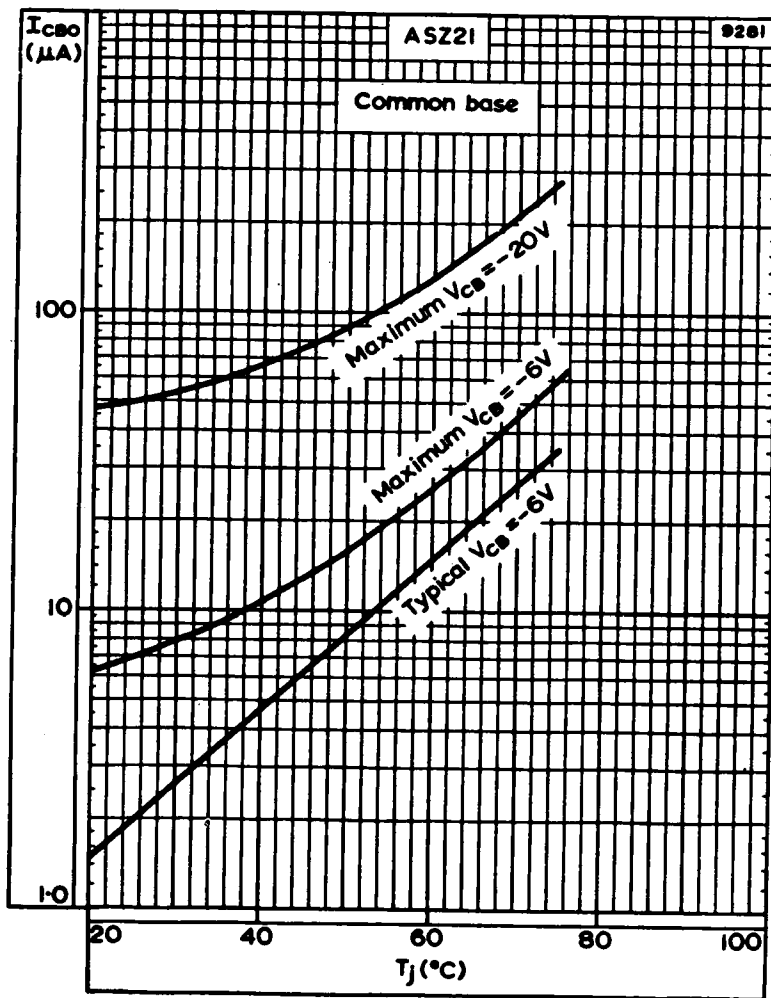


INPUT CHARACTERISTIC. COMMON EMITTER



COLLECTOR CURRENT PLOTTED AGAINST BASE VOLTAGE. COMMON EMITTER

APPLICATION DATA 5 CV7338

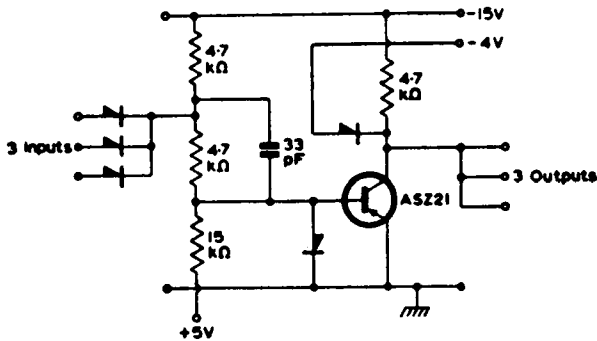


VARIATION OF I_{CBO} WITH JUNCTION TEMPERATURE

TYPICAL PERFORMANCE IN SWITCHING CIRCUIT.

Delay per stage in base-current switched logic circuit

Delay for stray capacitance on output = 0pF	—	8.0	—	ns
Delay for stray capacitance on output = 50pF	—	18	—	ns



BASE-CURRENT SWITCHED LOGIC CIRCUIT