MILITARY SPECIFICATION

CV7478

SEMICONDUCTOR DEVICE, TRANSISTOR

Description: This specification covers the detail requirements for a NPN Silicon Planar High Frequency Transistor and is in accordance with K1007, Issue 3, except as otherwise stated.

Mechanical Dimensions and Outlines:- K1007, Section B 10.3.2.4 and K1007/A1/D14D

Connections: Lead 1. Emitter
Lead 2. Base
Lead 3. Collector
Lead 4. Case

Absolute Maximum Ratings:-

RATING	V_{CB}	V_{EB}	V_{CE}	P_{tot}	P_{tot}	I_C	T_{stg}	T_{opr}	Shock	Vibration
UNIT	V	V	V	mW	mW	mA	°C	°C	g	g
MIN	-	-	-	-	-	-	-65	-	-	-
MAX	30	3.0	15	300	200	50	200	200	1500	20
NOTES				A	B				C	

Note:- A. Case temperature 25°C, See Derating Curve Fig. 1 Page 10
B. Ambient temperature 25°C, See Fig. 1 Page 10
C. Duration 0.5 mS.
D. Prototype 2N918.

CV 7478

Primary Electrical Characteristics

Characteristic		I_{CBO}	I_{CBO}	h_{FE}	h_{FE}	V_{CE} (sat)	V_{BE} (sat)	f_T	C_{ob}	C_{ob}	C_{TE}	F
Unit		nA	µA			V	V	Mc/s	pF	pF	pF	db
Min		-	-	20	8	-	-	600	-	-	-	-
Max		10	1.0	150	-	0.4	1.0	-	1.7	3.0	2.0	6.0
CONDITIONS	V_{CB} V	15	15	-	-	-	-	-	10	0	-	-
	V_{CE} V	-	-	1.0	1.0	-	-	10	-	-	-	6.0
	V_{EB} V	-	-	-	-	-	-	-	-	-	0.5	
	I_E mA	0	0	-	-	-	-	-	0	0	-	-
	I_C mA	-	-	3.0	3.0	10	10	4.0	-	-	0	1.0
	I_B mA	-	-	-	-	1.0	1.0	-	-	-	-	-
	f Mc/s	-	-	-	-	-	-	100	1.0	1.0	1.0	60
	Rg ohm	-	-	-	-	-	-	-	-	-	-	400
	T_{amb} °C	25	+150	25	-55	25	25	25	25	25	25	25

Reliability Assurance Provisions: Under discussion.

20th January, 1965

Requirements:-

Marking	The device shall be marked as K1007, Section B 1.3.4. Minimum requirements are 1.3.4.1 (a) and (c).

Quality Assurance Provisions:-

Destructive Tests	The tests listed in Table 2 Group B Inspection, Sub Groups 2, 3 and 4 and Table 3, Group C Inspection, Sub Group 2 are considered destructive.
Group C Inspection:	This inspection shall be conducted on the initial lot, and thereafter every ninety days or every fifth lot, whichever occurs first.

Preparation for Delivery:-

Packaging	The device shall be packed according to K1007, Issue 3, Section A. 1.2.(c).

NATO Stock Number 5960-99-037-3687

This specification has been prepared by, and the Qualification Approval Authority is:-
Ministry of Aviation, Royal Radar Establishment, Malvern, Worcs., England.

TABLE 1 GROUP A INSPECTION

Examination or Test	TEST CONDITIONS		AQL %	Insp. Level	Sym-bol	LIMITS		Units
	K1007/NATO Ref.	Specific Conditions				Min.	Max.	
SUB GROUP 1			0.65	I				
Visual and Mechanical Inspection	5.1	Including Physical Dimensions						
SUB GROUP 2			1.0	II				
Collector-emitter sustaining voltage	7.2.2.2.1	I_C = 3.0mA I_B = 0 tp ≤ 300 µS ≤ 2% duty cycle			V_{CEO} (sust)	15	-	V
Collector-Base cut-off Current	7.2.5.1	V_{CB} = 15V I_E = 0			I_{CBO}	-	10	nA
Static Forward current transfer ratio	7.3.4	I_C = 3.0 mA V_{CE} = 1.0V			h_{FE}	20	150	
Collector-emitter saturation voltage	7.3.5	I_C = 10 mA I_B = 1.0 mA			V_{CE} (sat)	-	0.4	V
Base-emitter saturation voltage	7.3.1	I_C = 10 mA I_B = 1.0 mA			V_{BE} (sat)	-	1.0	V
Collector Voltage	7.2.1	I_C = 1 µA I_E = 0			BV_{CBO}	30	-	V

TABLE 1 GROUP A INSPECTION (Cont'd)

Examination or Test	TEST CONDITIONS		AQL %	Insp. Level	Symbol	LIMITS		Units
	K1007/NATO Ref.	Specific Conditions				Min.	Max.	
SUB GROUP 2 (Cont'd)								
Emitter-Base Breakdown Voltage	7.3.2.	I_C = 0 I_E = 10 µA			BV_{EBO}	3.0	-	V
SUB GROUP 3			2.5	I				
Transition Frequency		V_{CE} = 10V I_C = 4.0 mA f = 100 Mc/s			f_T	600		Mc/s
Output Capacitance (1)	7.4.8	V_{CB} = 10V I_E = 0 f = 1 Mc/s			C_{ob}	-	1.7	pF
Output Capacitance (2)	7.4.8	V_{CB} = 0 I_E = 0 f = 1 Mc/s			C_{ob}	-	3.0	pF
Input Capacitance		V_{EB} = 0.5V I_C = 0 f = 1 Mc/s.			C_{ib}	-	2.0	pF

TABLE 1 GROUP A INSPECTION (Cont'd)

Examination or Test	TEST CONDITIONS		AQL %	Insp. Level	Symbol	LIMITS		Units
	K1007/NATO Ref.	Specific Conditions				Min.	Max.	
SUB GROUP 4			4.0	IA				
Noise Figure		f = 60 Mc/s V_{CE} = 6.0V I_C = 1.0 mA R_G = 400 ohms. See Figs. 2 and 3, Page 11 and 12			F	-	6.0	db
Collector Base Cut-off Current	7.2.5.1	V_{CB} = 15V I_E = 0 T_{amb} = 150°C			I_{CBO}	-	1.0	µA
Static Forward current Transfer ratio	7.3.4	T_{amb} = -55°C I_C = 3.0 mA V_{CE} = 1.0 V			h_{FE}	8	-	

TABLE 2 GROUP B INSPECTION

See Page 3. Quality Assurance Provisions

Examination or Test	TEST CONDITIONS		AQL %	Insp. Level	Symbol	LIMITS		Units
	K1007/NATO Ref.	Specific Conditions				Min.	Max.	
SUB GROUP 1			6.5	IC				
Physical Dimensions	5.1	According to drawings 10.3.2.4 and K1007/A1/D14D						
SUB GROUP 2			4.0	IA				
Solderability	5.13							
Temperature Cycling	5.5	-65°C to +200°C						
Moisture Resistance	5.3							
SUB GROUP 3								
Vibration Fatigue	5.15	non-operating	4.0	IA				
SUB GROUP 4								
Lead Fatigue	5.10.2	3 cycles	0.5	IA				
SUB GROUPS 5 & 6								
Omitted								
SUB GROUP 7								
High Temperature Life	6.2.1	Duration = 1000 hrs. T_{stg} = 200°C	4.0	I Note 1				

TABLE 2 GROUP B INSPECTION

See Page 3. Quality Assurance Provisions

Examination or Test	TEST CONDITIONS		AQL %	Insp. Level	Symbol	LIMITS		Units
	K1007/NATO Ref.	Specific Conditions				Min.	Max.	
SUB GROUP 8			4.0	IA				
Operating Life	6.3	At any single temperature between 25° and 175°C P_{tot} = According to chosen temperature as derating curve. V_{CB} = 10V. Min. Duration 1000 hours.						
Post Test End Points for SUB GROUPS 2, 3 7 and 8								
Collector-Base cut-off Current	7.2.5.1	V_{CB} = 15V			I_{CBO}	-	20	nA
Static Forward current transfer ratio	7.3.4	I_C = 3mA V_{CE} = 1.0V			Δh_{FE}	-	25	%

TABLE 3 GROUP C INSPECTION

Examination or Test	TEST CONDITIONS		AQL %	Insp. Level	Symbol	LIMITS		Units
	K1007/NATO Ref.	Specific Conditions				Min.	Max.	
SUB GROUP 1								
Omitted								
SUB GROUP 2								
Shock (non operating)	5.17.1	5 blows in each of three mutually perpendicular directions	6.5	IA				
Post Test End Points								
Collector-Base Cut-off Current	7.2.5.1	V_{CB} = 15V I_E = 0			I_{CBO}	-	20	nA
Static Forward current transfer ratio	7.3.4	I_C = 3 mA V_{CE} = 1.0V			h_{FE}^{Δ}	18	165	-

NOTES

1. Maximum Sample Size 125

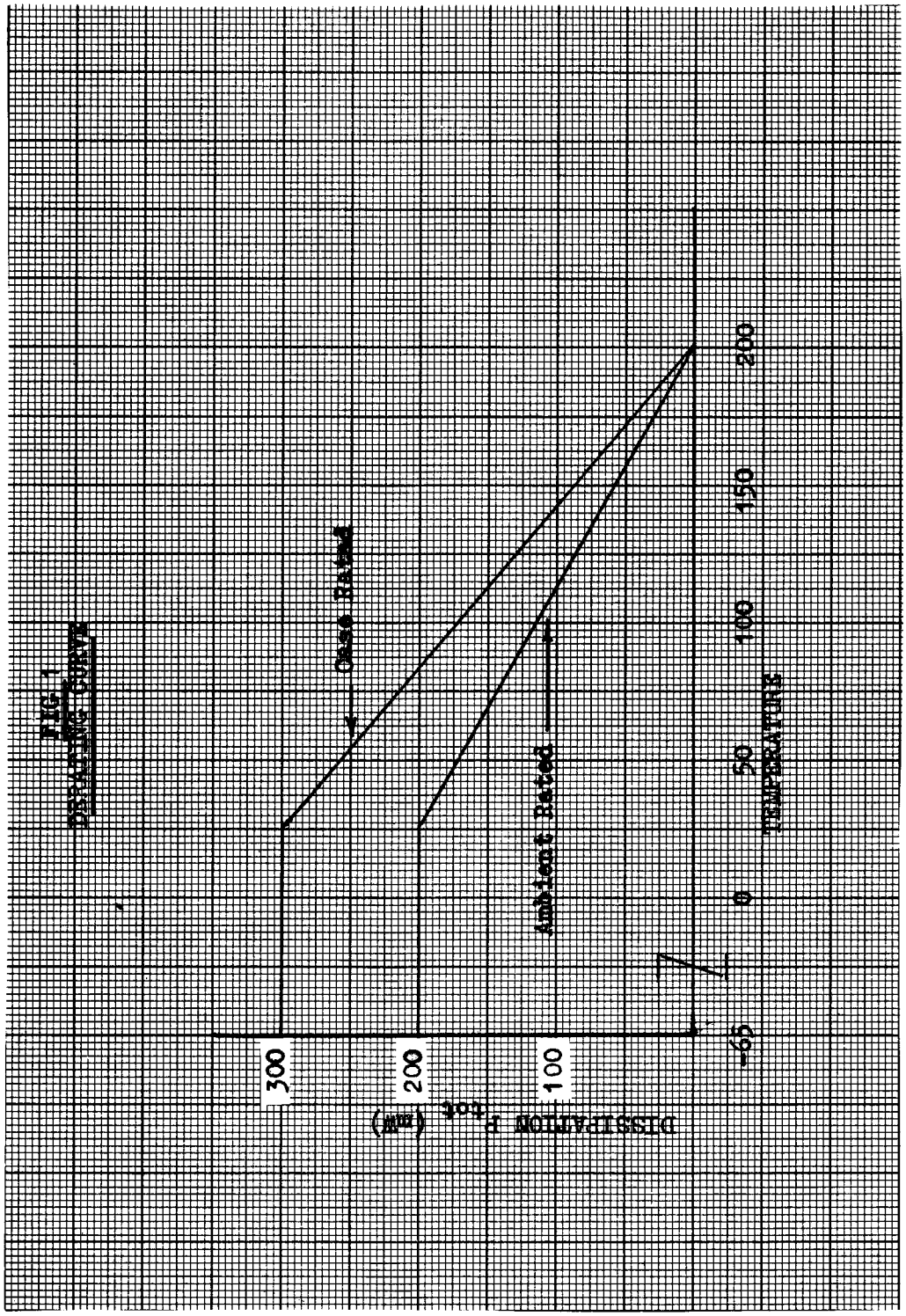
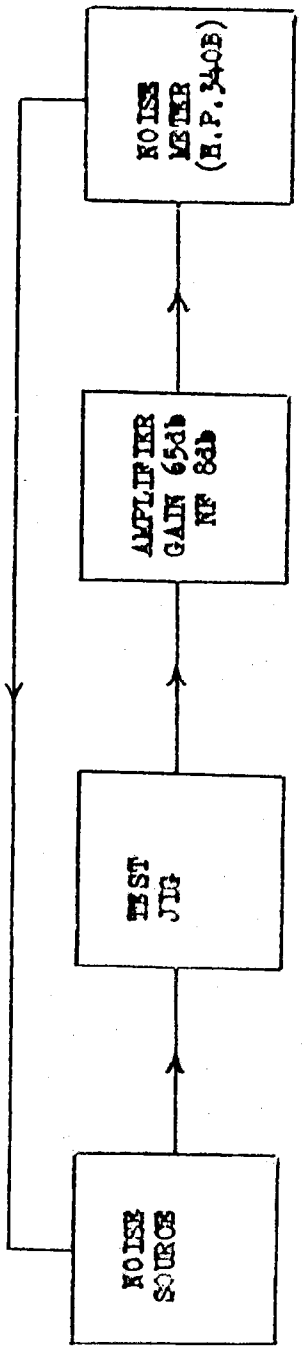


FIG. 1
POWER/TEMPERATURE DERATING CURVE

FIG 2

60 Mc/s R.F. Measurement Circuit



Bandwidth 1 Mc/s Minimum

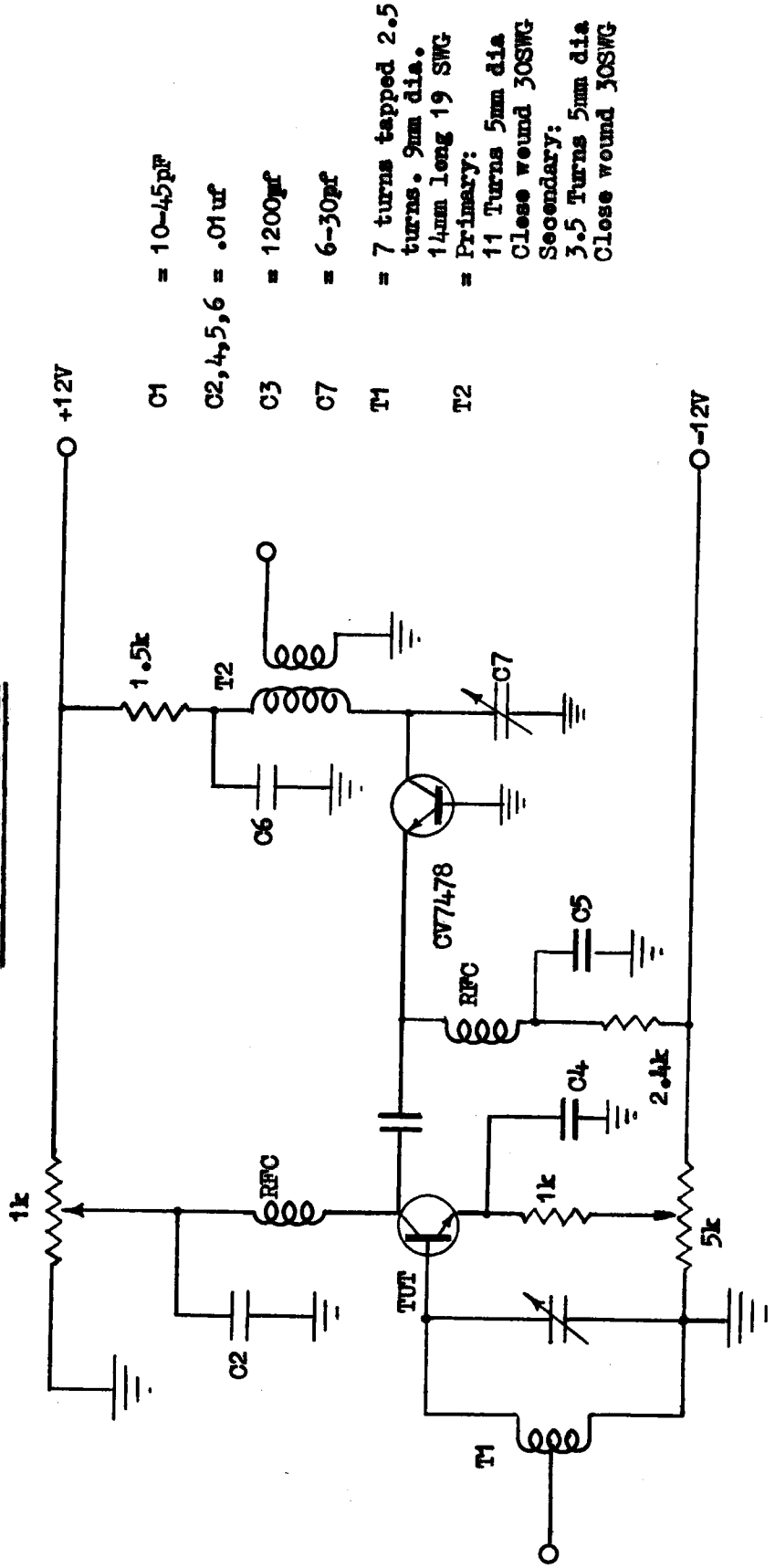
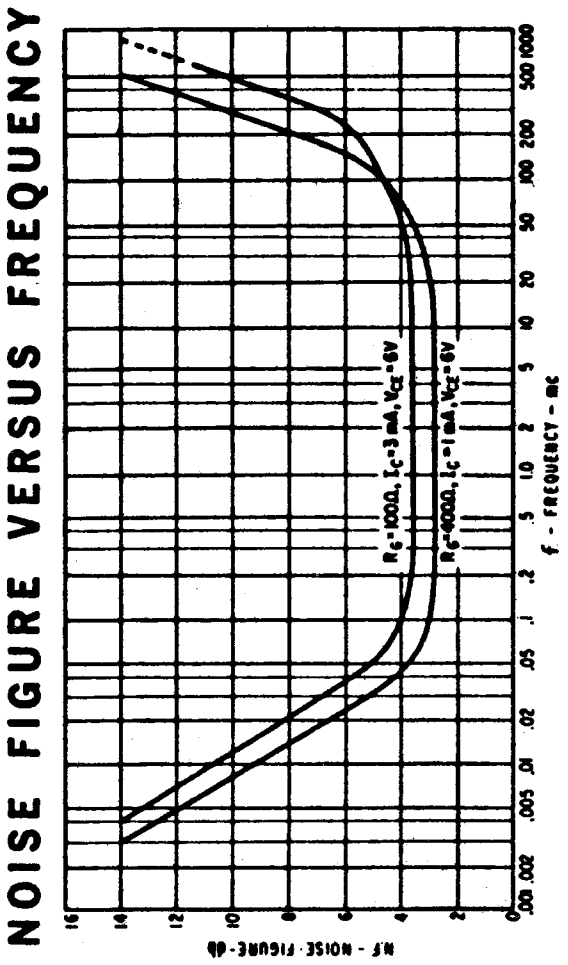


FIG 3

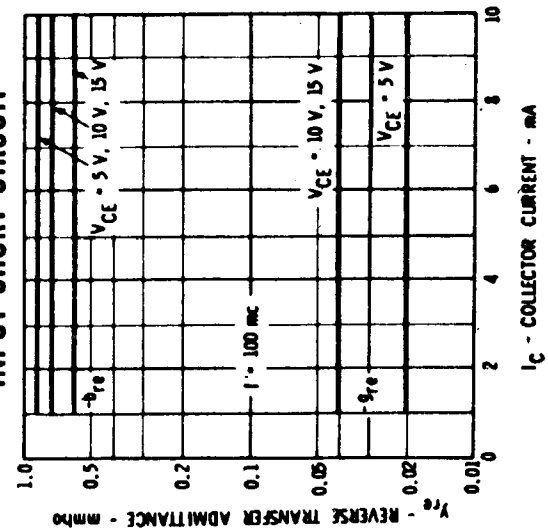
60 Mc/s N.F. TEST JIG

APPLICATION DATA

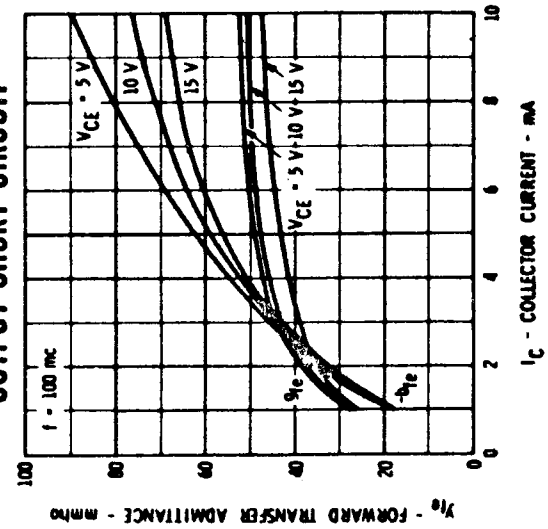


APPLICATION DATA

REVERSE TRANSFER ADMITTANCE VERSUS COLLECTOR CURRENT — INPUT SHORT CIRCUIT



FORWARD TRANSFER ADMITTANCE VERSUS COLLECTOR CURRENT — OUTPUT SHORT CIRCUIT



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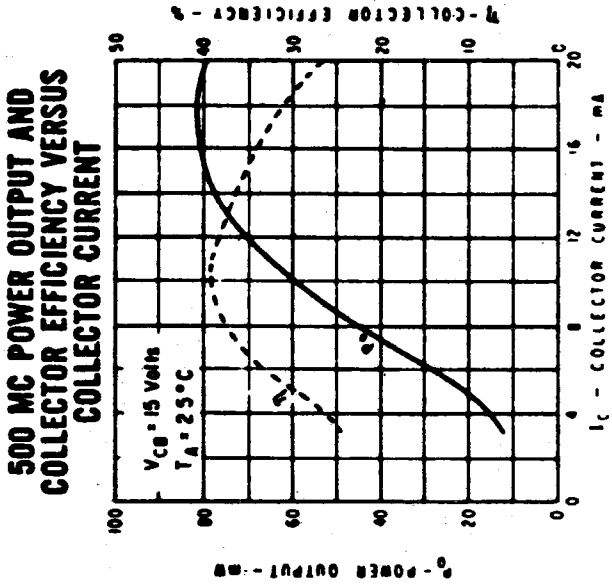
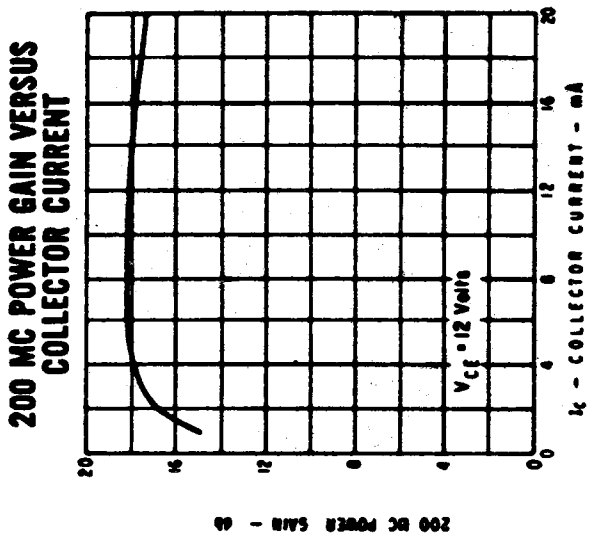
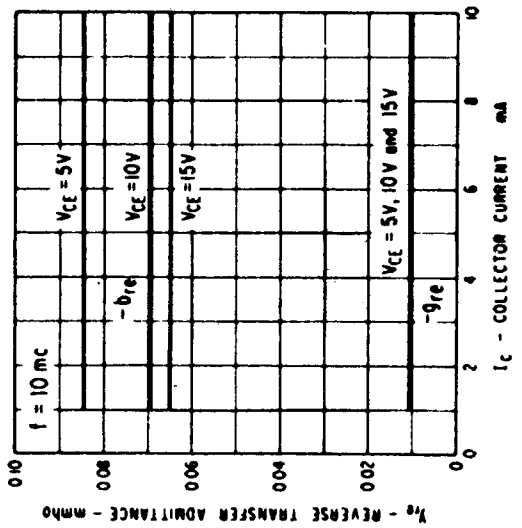


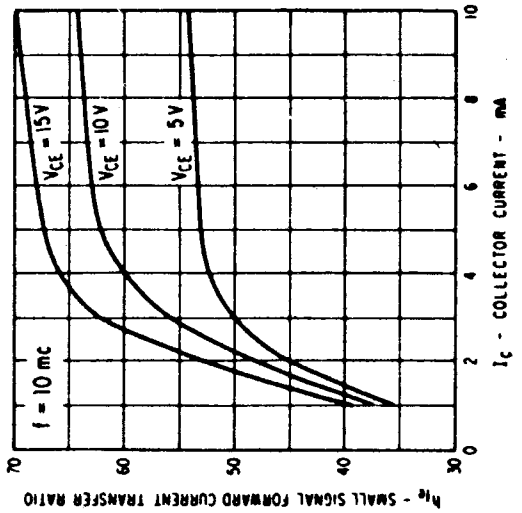


APPLICATION DATA

REVERSE TRANSFER ADMITTANCE VERSUS COLLECTOR CURRENT — INPUT SHORT CIRCUIT



SMALL SIGNAL CURRENT GAIN VERSUS COLLECTOR CURRENT- OUTPUT SHORT CIRCUIT



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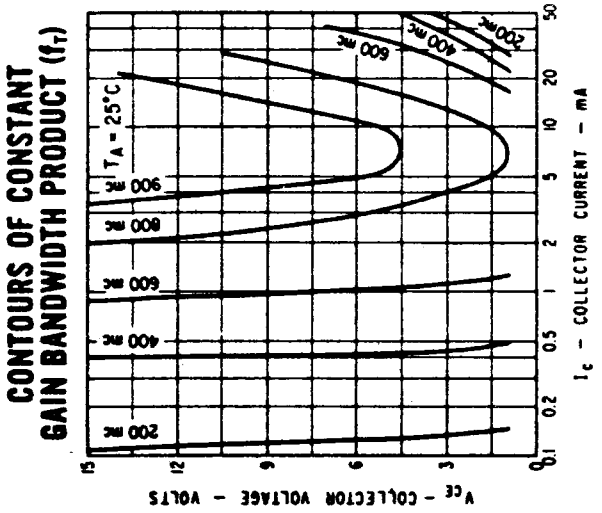

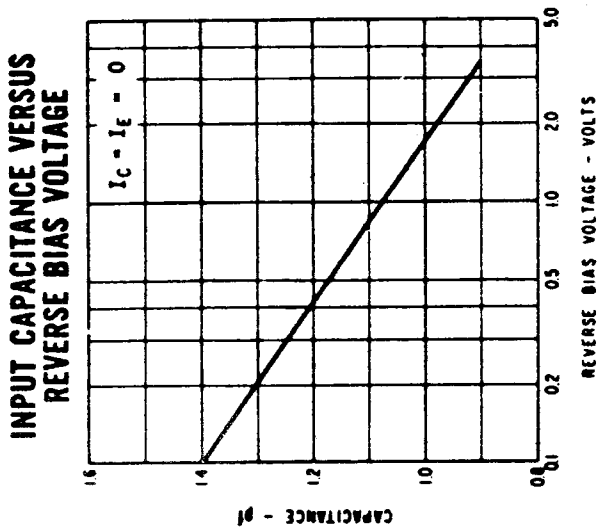

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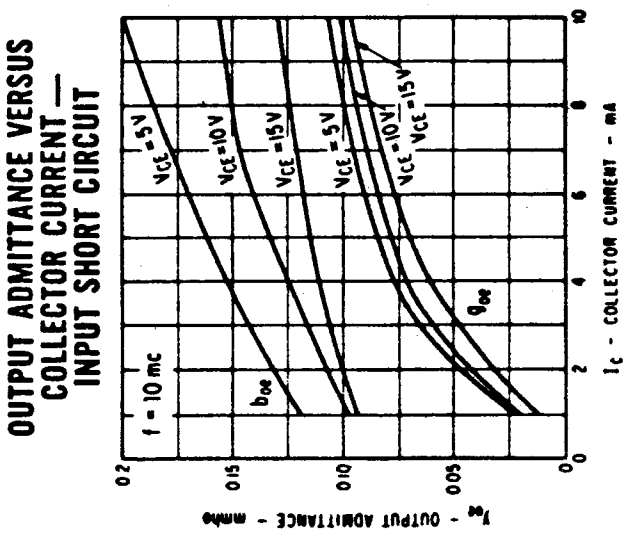

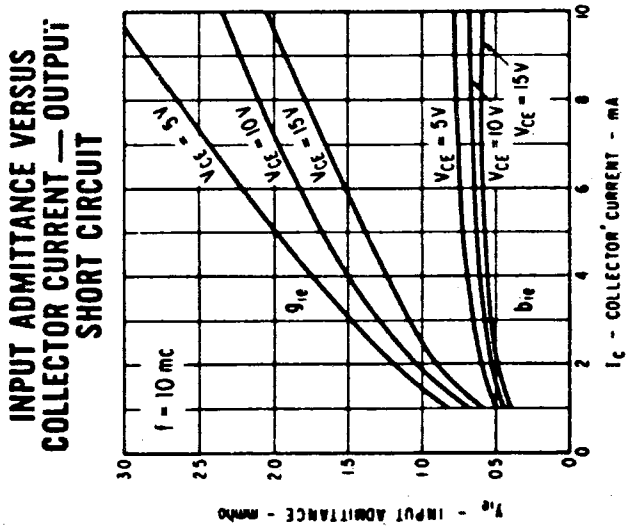

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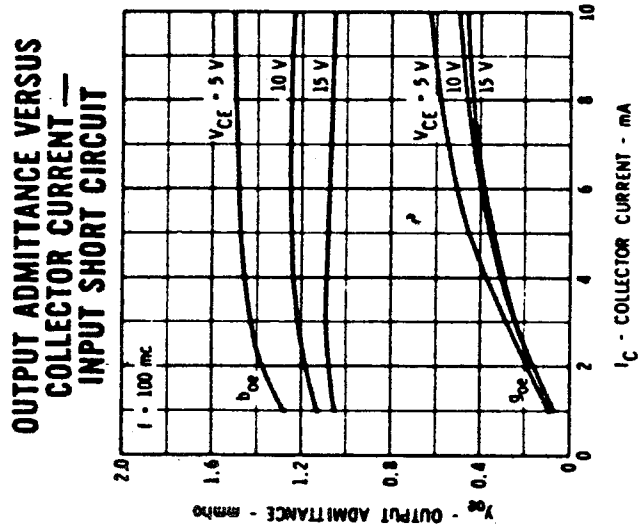

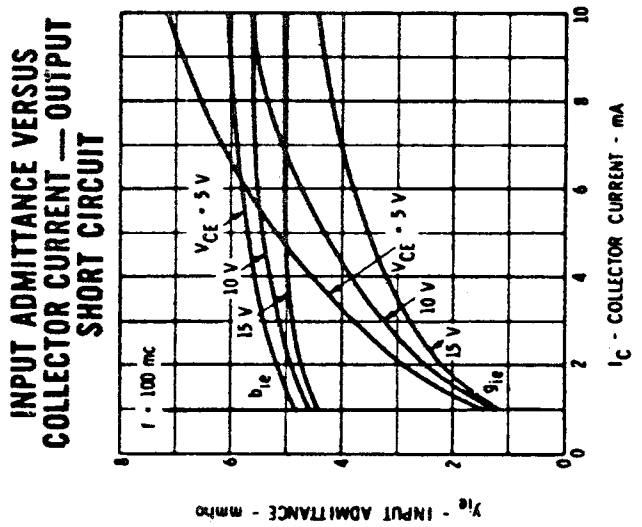

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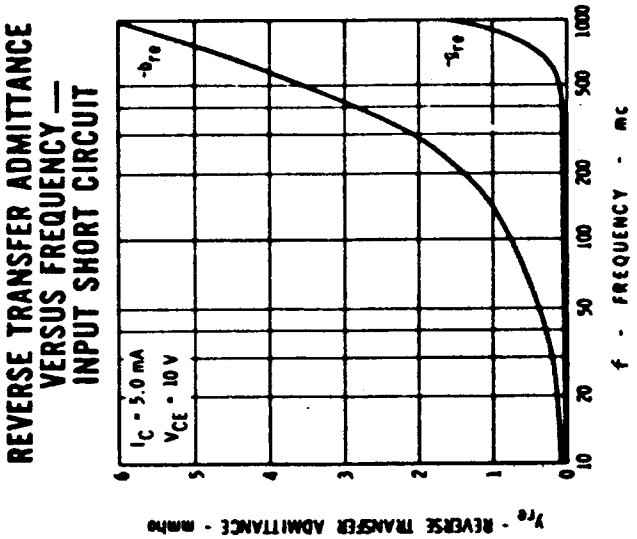

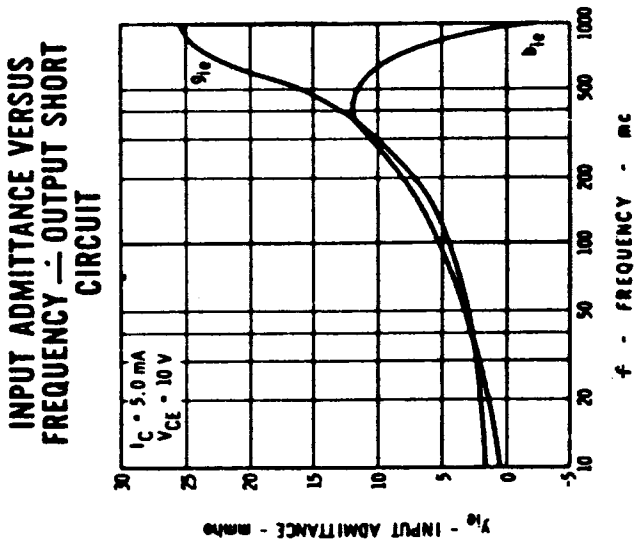

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