MILITARY SPECIFICATION

CV7083-6 / CV7494

SEMICONDUCTOR DEVICE

Description:- This specification covers the detail requirements for Germanium PNP Power Transistors and is in accordance with Specification K1007, Issue 3, except as otherwise stated.

Mechanical Dimensions and Outlines:- K1007 Section B, 10.3.2.1., 10.3.2.1.1. Type A, 10.4.2.1.

Connections:- 1 - Base, 2 - Emitter, Case - Collector.

Absolute Maximum Ratings:-

Rating	V_{CB}					V_{CE}	V_{EB}	I_{CAV}	I_{CM}	I_{EAV}	I_{EM}	I_{BAV}
	CV7083	CV7084	CV7085	CV7086	CV7494							
Unit	V	V	V	V	V	See rating curves on Pages 14-17	V	A	A	A	A	A
Min.												
Max.	-60	-60	-80	-80	-100		-40	8	10	9	12	1
Note							1					

Rating	I_{BM}	P_{tot}	T_{stg}	T_m	Shock	Vibration
Unit	A	W	°C	°C	g	g
Min.			-55			
Max.	2	38	+85	+90	1500	20
Note		2			3	

Notes:- 1. At $I_C = 0$.
2. See derating curve on Page 11.
3. 0.5 ms duration.
4. Commercial equivalents:- CV7083 - OC29
CV7084 - OC35
CV7085 - OC28
CV7086 - OC36
CV7494 - OC20

Primary Electrical Characteristics

Characteristic		I_{CBO}	I_{CBO}	I_{CBO}	$V_{CE(sust.)}$					$V_{CE(sat.)}$	V_{BE}	V_{BE}
					CV7083	CV7084	CV7085	CV7086	CV7494			
Unit		mA	mA	mA	V	V	V	V	V	V	V	V
Min.					35	35	60	37	75			
Max.		0.1	3.0	12.0						0.5	0.8	1.6
Conditions	V_{CB} V	-0.5	Rated Max.	Rated Max.							0	0
	V_{EB} V											
	I_C A				5	5	5	5	5	6		
	I_E A	0	0	0							1.0	6
	I_B mA									600		
	T_m °C	25	25	85								

Characteristic		h_{FE}					f_{hfb}
		CV7083	CV7084	CV7085	CV7086	CV7494	
Unit							kc/s
Min.		45	25	20	30	25	200
Max.		130	75	55	110	75	
Conditions	V_{CB} V	0	0	0	0	0	-12
	V_{EB} V						
	I_C A						
	I_E A	1.0	1.0	1.0	1.0	1.0	0.05
	T_m °C						

APPLICABLE DOCUMENTS:- T.V.C. Information Sheets Nos. 9 and 10.

REQUIREMENTS:-

Marking According to K1007, Section B, 1.3.4. omitting (b) from 1.3.4.1.

QUALITY ASSURANCE PROVISIONS:-

Destructive Tests The tests listed in Table II, Group B Inspection, Sub-groups 2, 3 and 4 and in Table III, Group C Inspection, Sub-group 2 are considered destructive.

Group C Inspection 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 Section A1.2(c). Washer and two bushes as shown on Page 13 shall be packed with each device.

NATO STOCK NUMBERS:-

CV7083	5960-99-037-2158
CV7084	5960-99-037-2159
CV7085	5960-99-037-2160
CV7086	5960-99-037-2161
CV7494	5960-99-037-3710

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

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

Table I

GROUP A INSPECTION

Examination or Test	Test Conditions		AQL %	Insp. Level	Symbol	Limits		Units
	K1007/ NATO Ref.	Specific Conditions				Min.	Max.	
SUB-GROUP 1			0.65	I				
Visual and Mechanical Inspection	5.1.1.							
SUB-GROUP 2			0.65	II				
Collector-Base Cut-off Current (1)	7.2.5.1.	V_{CB} = -0.5V I_E = 0			I_{CBO}		0.1	mA
Collector-Base Cut-off Current (2)	7.2.5.1.	I_E = 0 CV7083, V_{CB} = -60V CV7084, V_{CB} = -60V CV7085, V_{CB} = -80V CV7086, V_{CB} = -80V CV7494, V_{CB} = -100V			I_{CBO}		3.0	mA
Static Forward Current Transfer Ratio (1)	7.3.4.1.	V_{CB} = 0, +0 -0.2V I_E = 1A			h_{FE}			
		CV7083				45	130	
		CV7084				25	75	
		CV7085				20	55	
		CV7086				30	110	
		CV7494				25	75	

Table I

GROUP A INSPECTION

Examination or Test	Test Conditions		AQL %	Insp. Level	Symbol	Limits		Units
	K1007/ NATO Ref.	Specific Conditions				Min.	Max.	
SUB-GROUP 3			4.0	IA				
Sustaining Voltage	7.2.2.2.2	Fig. 7.2.2./7 V_{CC} = -30V L = 0.1H I_c = 5A V_{EB} = 2V +Vg = 2V -Vg = 3V Pulse duration 50 µs p.r.f. = 4 c.p.s. Clamping voltage = sustaining voltage + 3V						
		CV7083			$V_{CE(sust.)}$	35		V
		CV7084				35		V
		CV7085				60		V
		CV7086				37		V
		CV7494				75		V
Small Signal, Short Circuit, Forward Current Transfer Ratio Cut-off Frequency. Common Base	7.5.1.	V_{CB} = -12V I_E = 50 mA			f_{hfb}	200		kc/s

Table I

GROUP A INSPECTION

Examination or Test	Test Conditions		AQL %	Insp. Level	Symbol	Limits		Units
	K1007/ NATO Ref.	Specific Conditions				Min.	Max.	
SUB-GROUP 3 CONT'D								
Base-emitter Voltage (1)		See Fig. 3 Page 12 I_E = 1A			V_{BE}		0.8	V
Base-emitter Voltage (2)		See Fig. 3 Page 12 I_E = 6A			V_{BE}		1.6	V
Collector Emitter Saturation Voltage	7.3.3.	I_C = 6A I_B = 600 mA			V_{CE} (sat.)		500	mV
Emitter-Base Cut-off Current	7.2.6.	I_B = 0 V_{BE} = 10V			I_{EBO}		3	mA
SUB-GROUP 4			4.0	IA				
Collector-Base Cut-off Current (3)	7.2.5.1.	T_m = +85°C I_E = 0 CV7083, V_{CB} = -60V CV7084, V_{CB} = -60V CV7085, V_{CB} = -80V CV7086, V_{CB} = -80V CV7494, V_{CB} = -100V			I_{CBO}		12	mA

Table I

GROUP A INSPECTION

Examination or Test	Test Conditions		AQL %	Insp. Level	Symbol	Limits		Units
	K1007/ NATO Ref.	Specific Conditions				Min.	Max.	
SUB-GROUP 4 CONT'D								
Static Forward Current Transfer Ratio (2)	7.3.4.1.	V_{CB} = 0, +0 -0.2V I_E = 6A			h_{FE}			
		CV7083				35	80	
		CV7084				20	45	
		CV7085				15	30	
		CV7086				20	65	
		CV7494				20	45	
Static Forward Current Transfer Ratio (3)	7.3.4.1.	V_{CB} = 0, +0 -0.2V I_E = 1A T_m = -55°C			h_{FE}			
		CV7083				22		
		CV7084				12		
		CV7085				10		
		CV7086				15		
		CV7494				12		

Table II

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	5.1.2.	According to drawings 10.3.2.1., 10.3.2.1.1. Type A, and 10.4.2.1.						
SUB-GROUP 2			4.0	IA				
Solderability	5.13.							
Temperature Cycling	5.5.	-55°C to +85°C						
Moisture Resistance	5.3.							
SUB-GROUP 3			4.0	IA				
Vibration Fatigue	5.15.	Non-operating						
SUB-GROUP 4								
Omitted								
SUB-GROUP 5								
Omitted								
SUB-GROUP 6								
Omitted								

Table II

GROUP B INSPECTION

Examination or Test	Test Conditions		AQL %	Insp. Level	Symbol	Limits		Units
	K1007/ NATO Ref.	Specific Conditions				Min.	Max.	
SUB-GROUP 7			4.0	I				
High Temperature Life (Non-operating)	6.2.1. 6.6.1.2.2.	T_m = +85°C t = 1000 hours						
SUB-GROUP 8			4.0	IA				
Operating Life	6.3. 6.5. 6.6.1. 6.6.1.2.2.	T_m between +25°C and +85°C $V_{cb} \geq \frac{1}{2} V_{CB}$ max. P_{tot} = max. value given by derating curve on Page 11 corresponding to the chosen T_m						
Post Test End Points for Sub-groups 2, 3, 7 and 8								
Collector-Base Cut-off Current (2)	7.2.5.1.	As in Group A, Sub-group 2			I_{CBO}		3.3	mA
Static Forward Current Transfer Ratio (1)	7.3.4.	As in Group A, Sub-group 2			h_{FE}			
		CV7083				35	180	
		CV7084				22	80	
		CV7085				18	60	
		CV7086				27	120	
		CV7494				22	80	

Table III

GROUP C 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								
Omitted								
SUB-GROUP 2			6.5	IA				
Shock	5.17.	Non-operating. Five blows each orientation Y1, Y2, X_1 and Z_1						
Post Test End Points for Sub-group 2								
Collector-Base Cut-off Current (2)	7.2.5.1.	As in Group A, Sub-group 2			I_{CBO}		3.3	mA
Static Forward Current Transfer Ratio (1)	7.3.4.	As in Group A, Sub-group 2			h_{FE}			
		CV7083				35	180	
		CV7084				22	80	
		CV7085				18	60	
		CV7086				27	120	
		CV7494				22	80	

TO BE READ IN CONJUNCTION WITH T.V.C. INFORMATION SHEETS Nos. 9 AND 10.

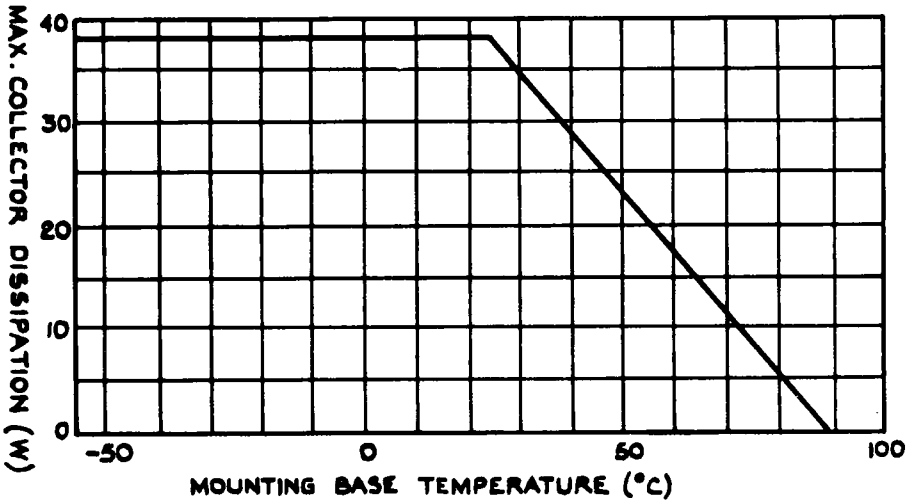


FIG.1 DISSIPATION RATING - TRANSISTOR MOUNTED ON HEAT SINK

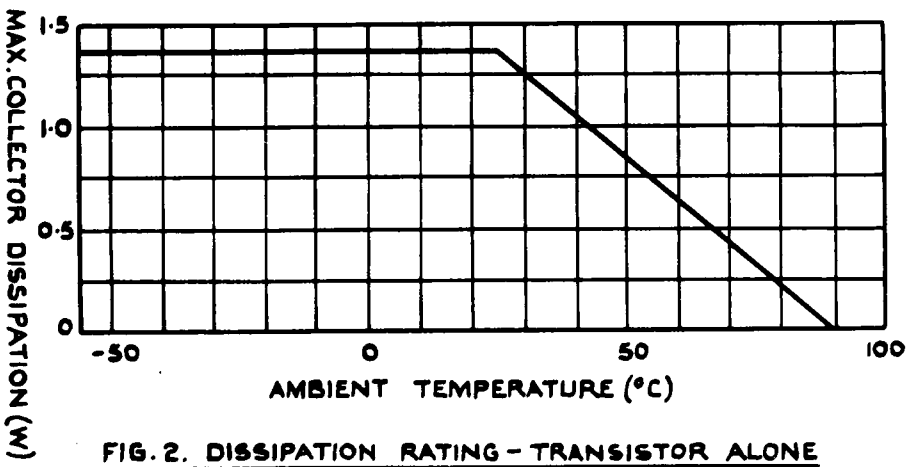


FIG. 2. DISSIPATION RATING - TRANSISTOR ALONE IN FREE AIR.

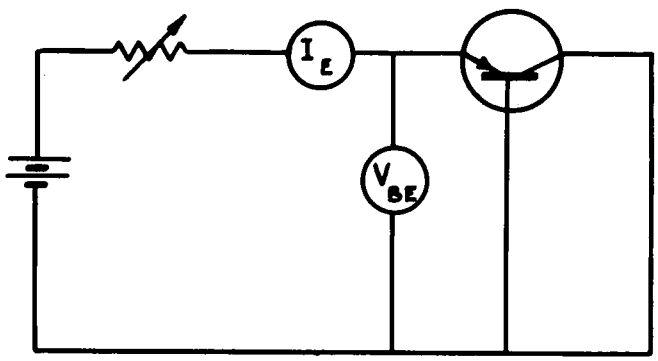
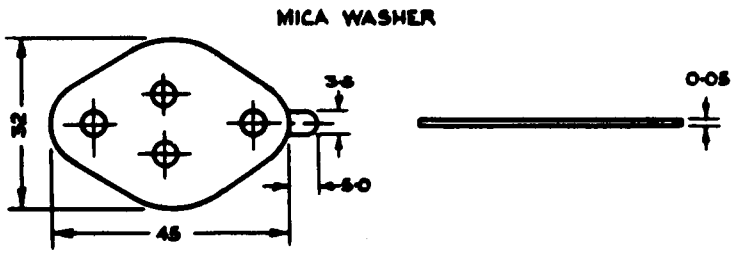
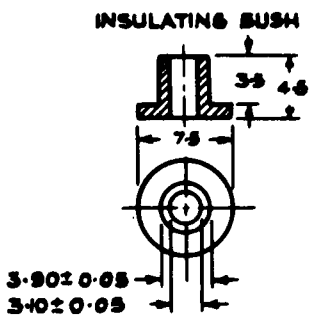


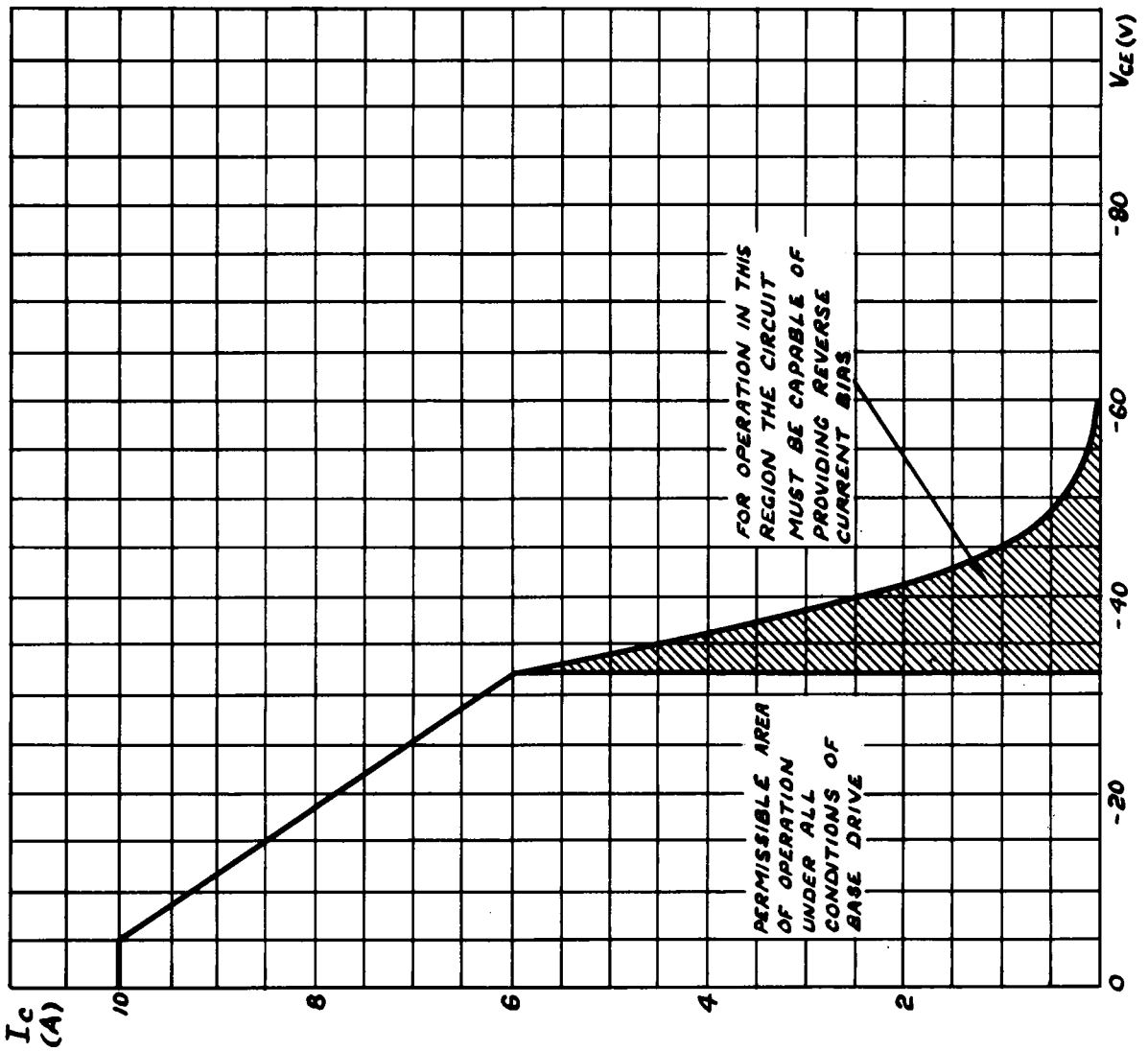
FIG. 3 CIRCUIT FOR MEASURING V_{BE}



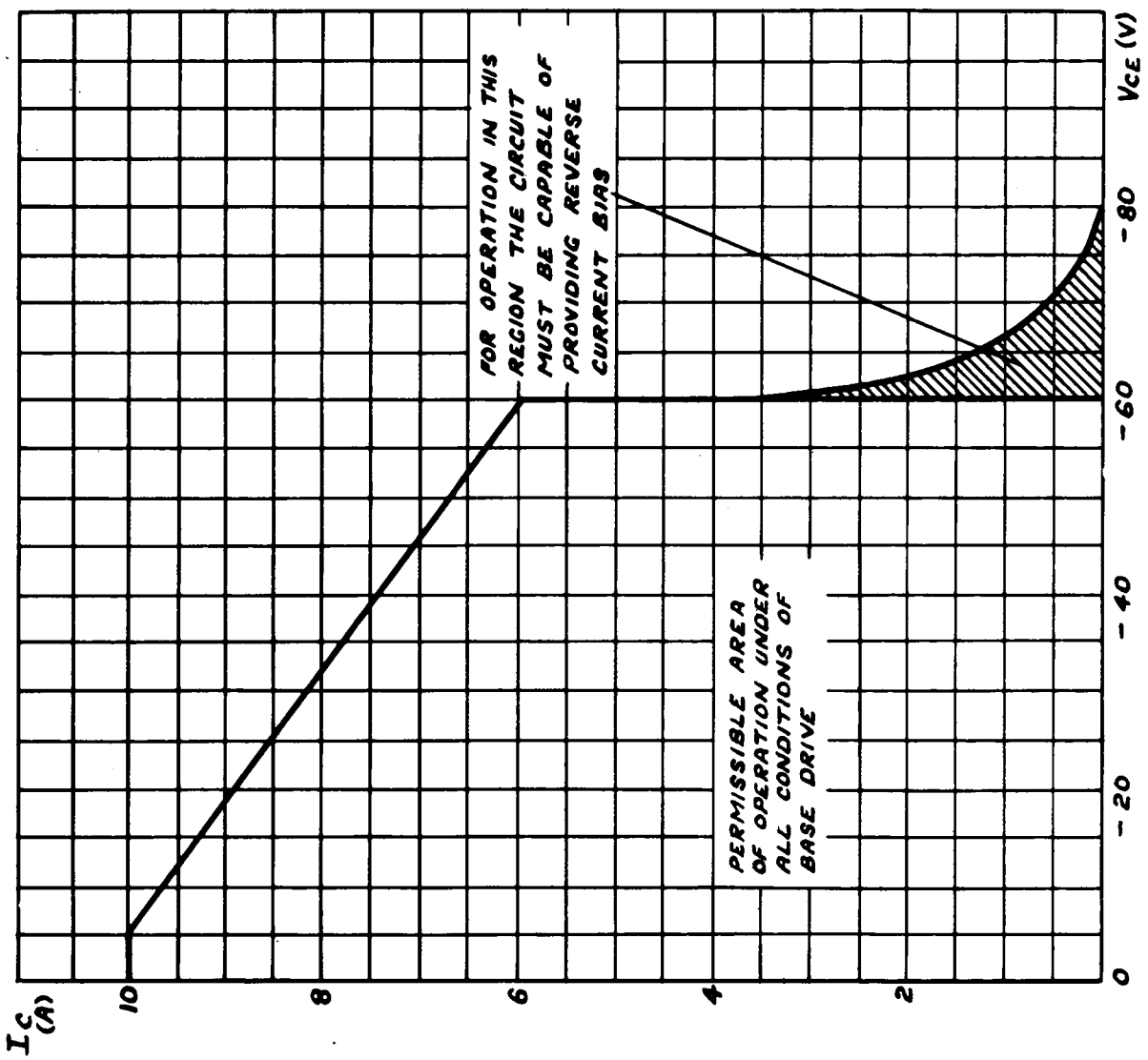


ALL DIMENSIONS IN mm.

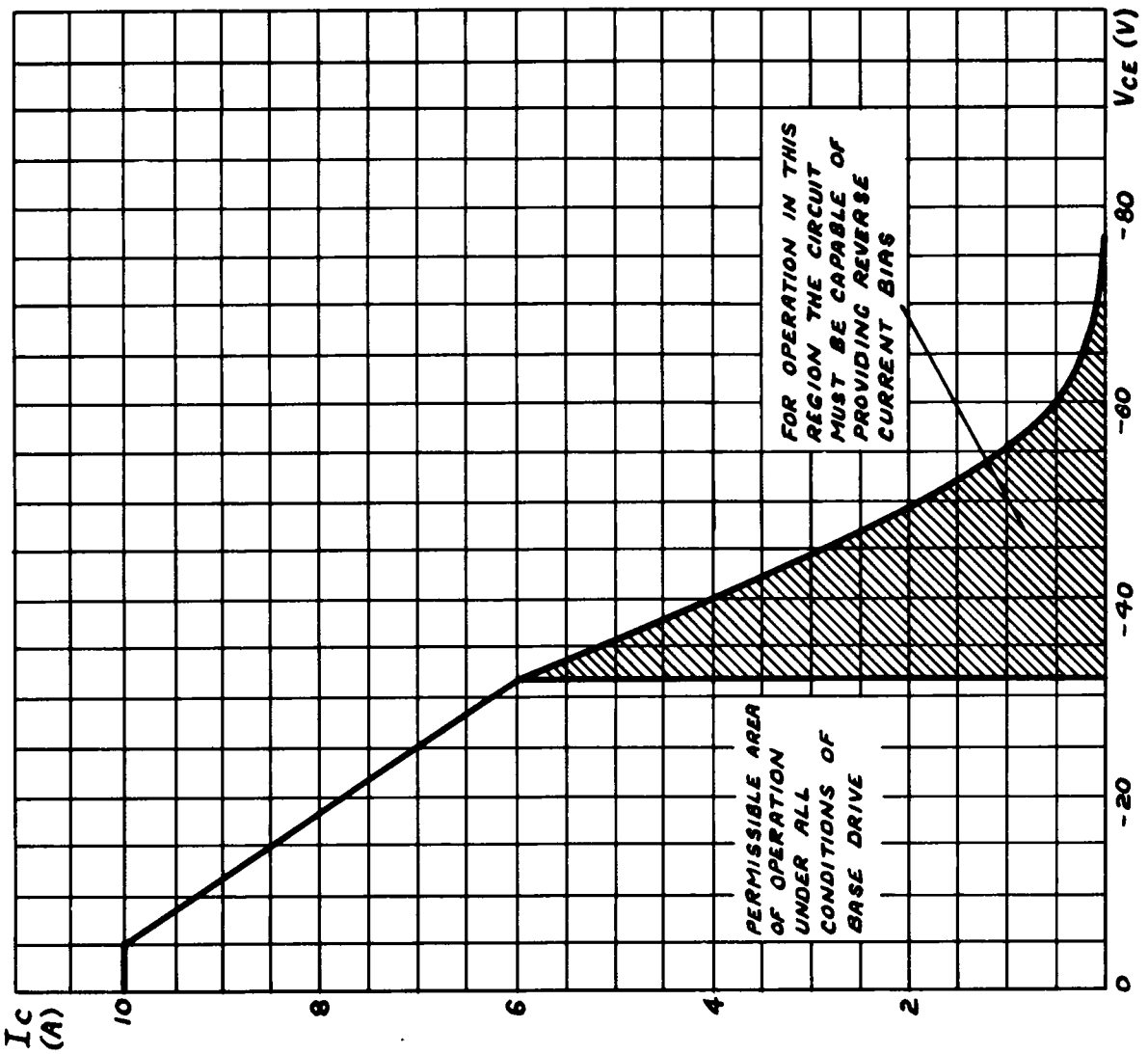
FIG. 4 DETAILS OF ITEMS TO BE SUPPLIED WITH EACH DEVICE.



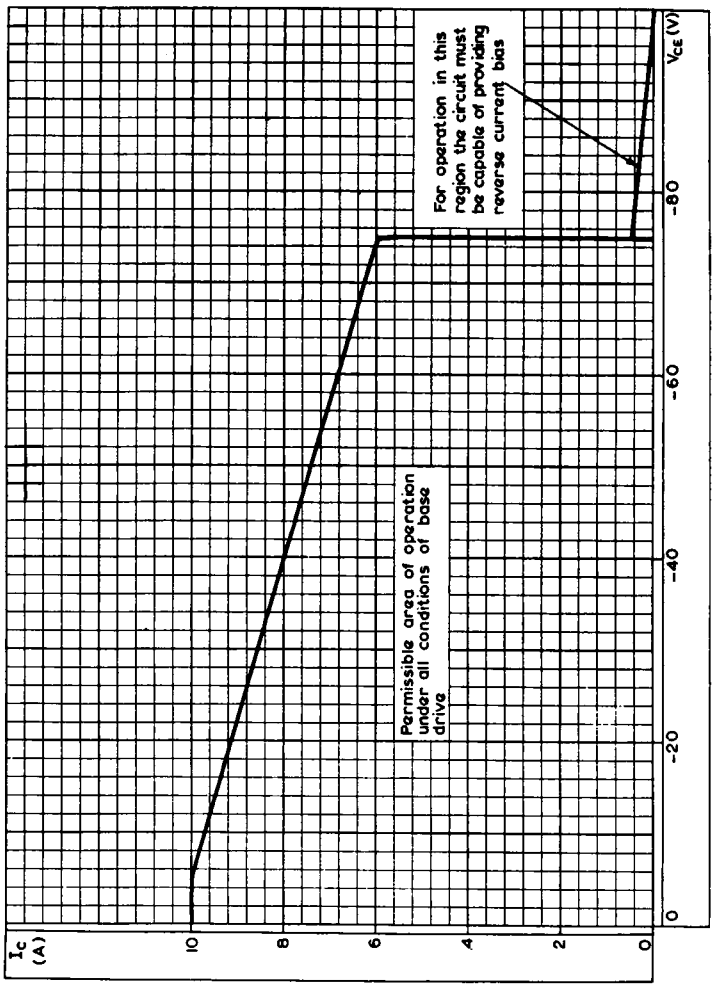
COLLECTOR CURRENT PLOTTED AGAINST ABSOLUTE MAXIMUM COLLECTOR-EMITTER VOLTAGE. CV7083/4



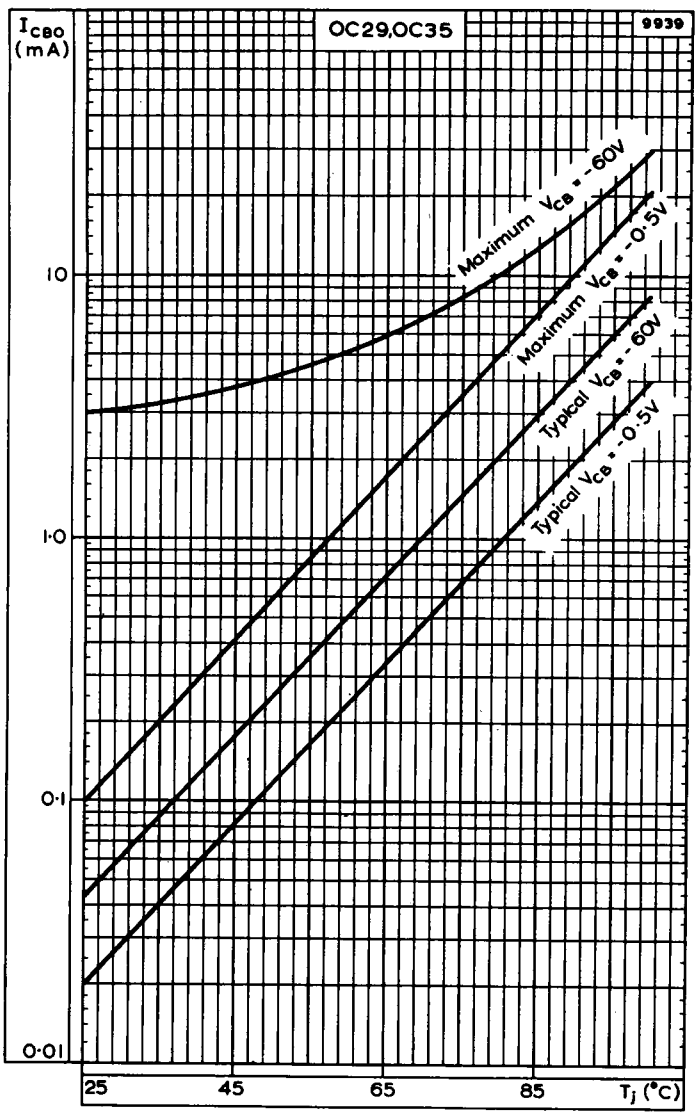
COLLECTOR CURRENT PLOTTED AGAINST ABSOLUTE MAXIMUM COLLECTOR-EMITTER VOLTAGE. CV7085



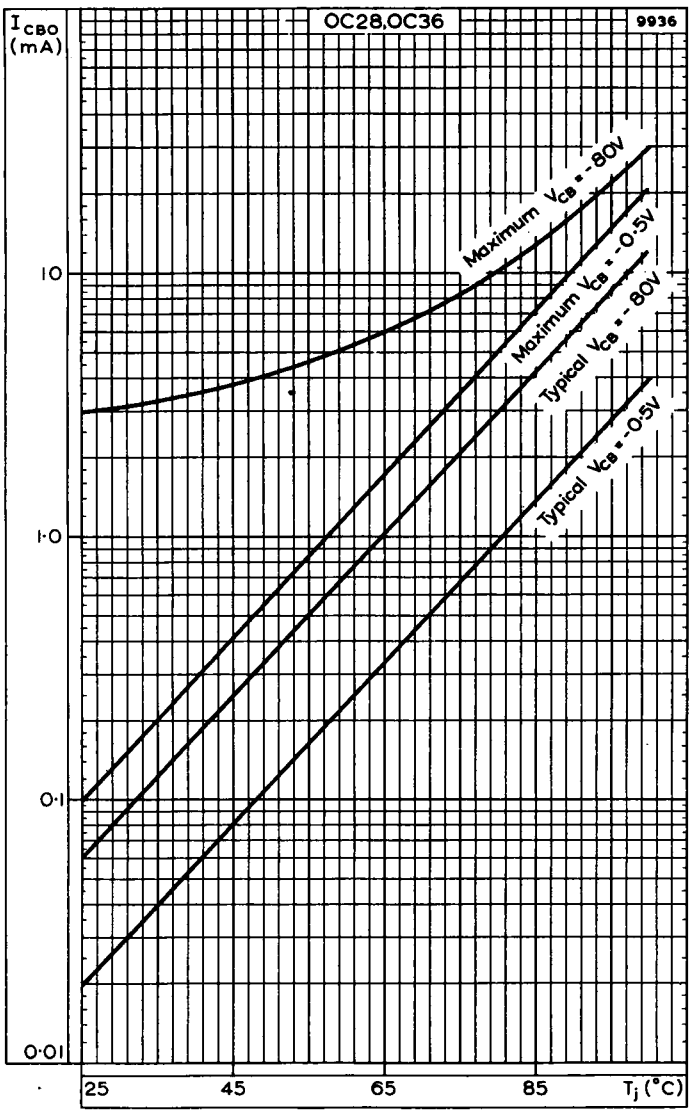
COLLECTOR CURRENT PLOTTED AGAINST ABSOLUTE MAXIMUM COLLECTOR-EMITTER VOLTAGE. CV7086



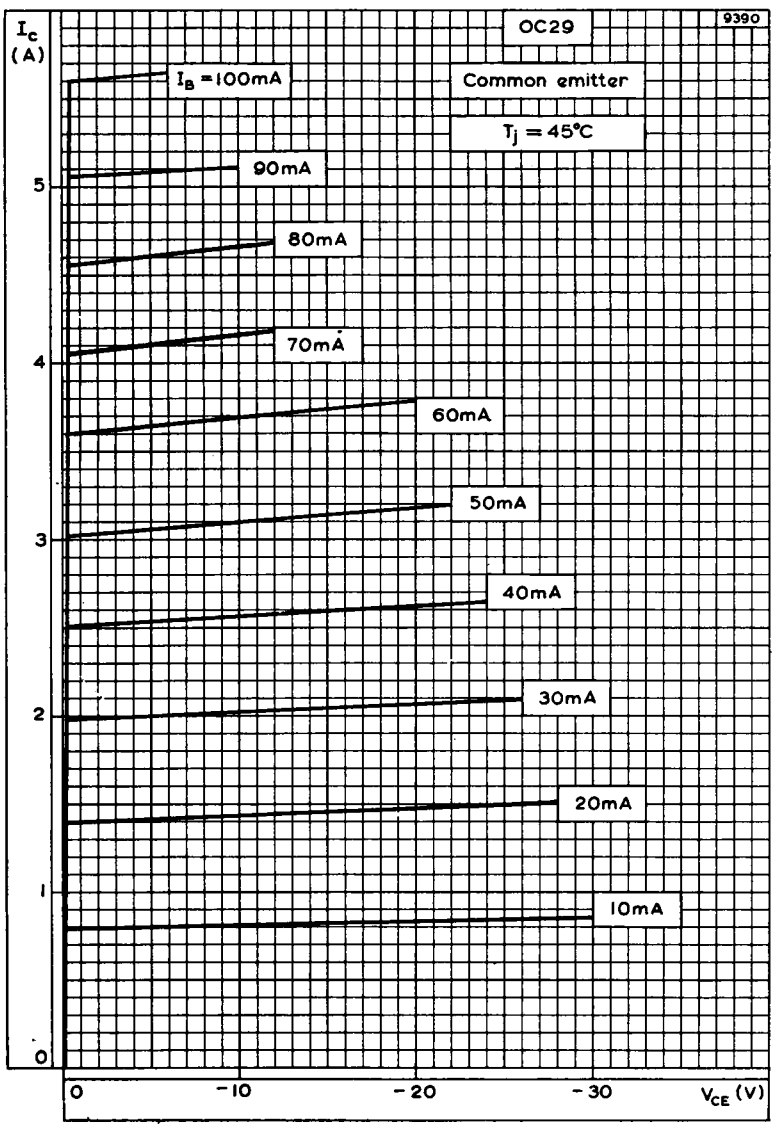
COLLECTOR CURRENT PLOTTED AGAINST ABSOLUTE MAXIMUM COLLECTOR-EMITTER VOLTAGE **CV7494**



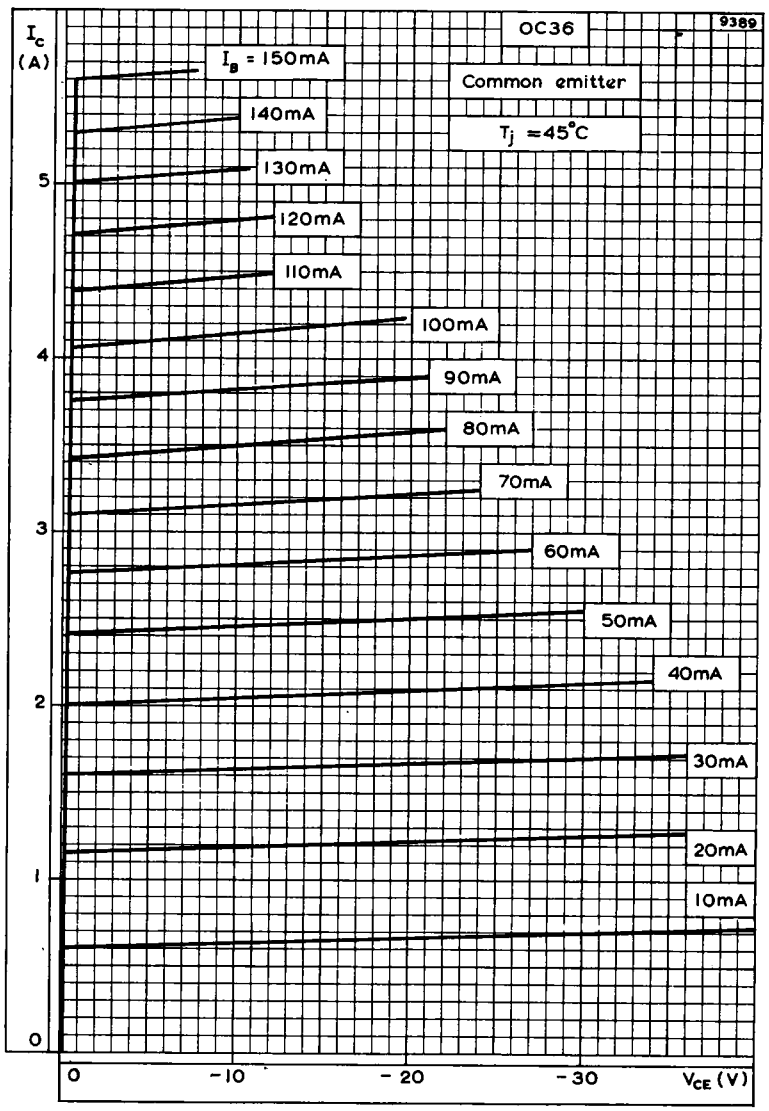
VARIATION OF I_{CBO} WITH JUNCTION TEMPERATURE. OC29, OC35



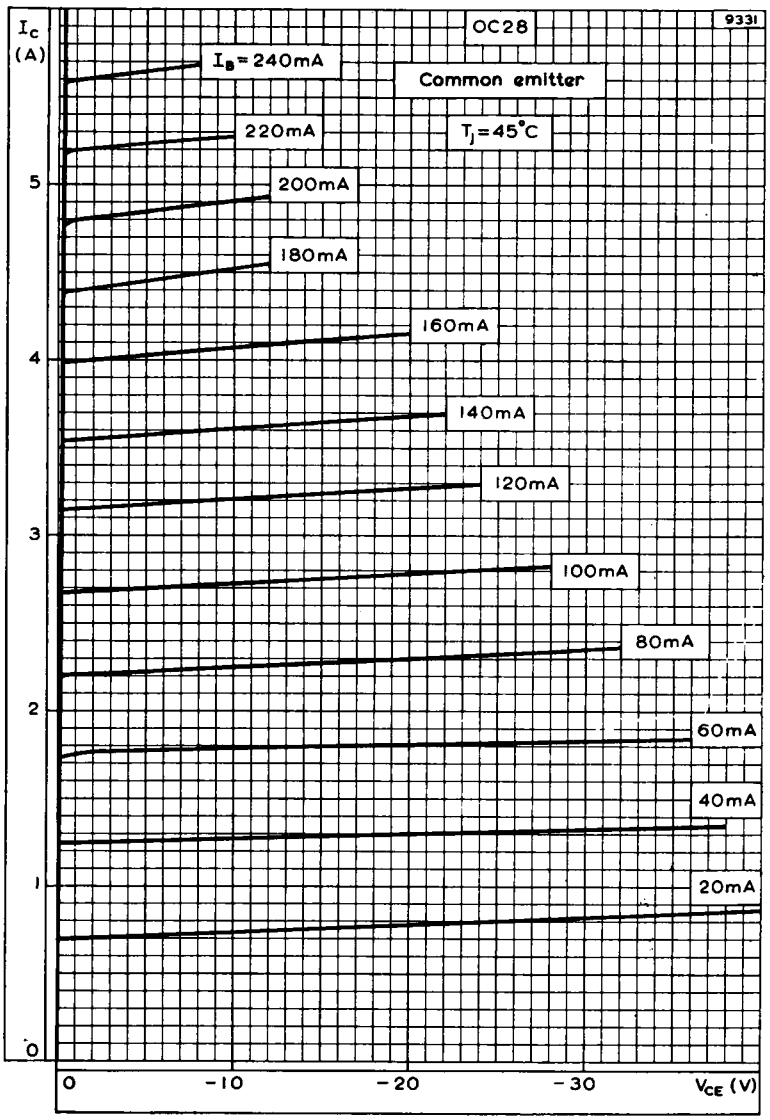
VARIATION OF I_{CBO} WITH JUNCTION TEMPERATURE. OC28, OC36



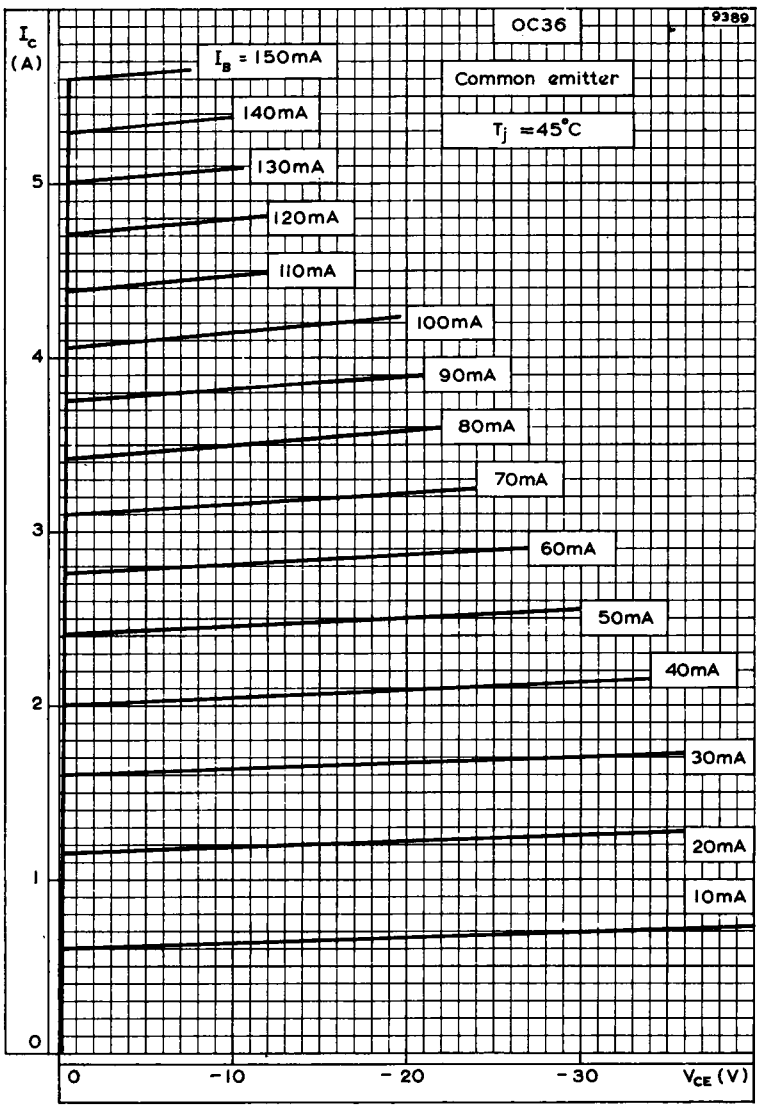
OUTPUT CHARACTERISTIC FOR OC29. COMMON EMITTER



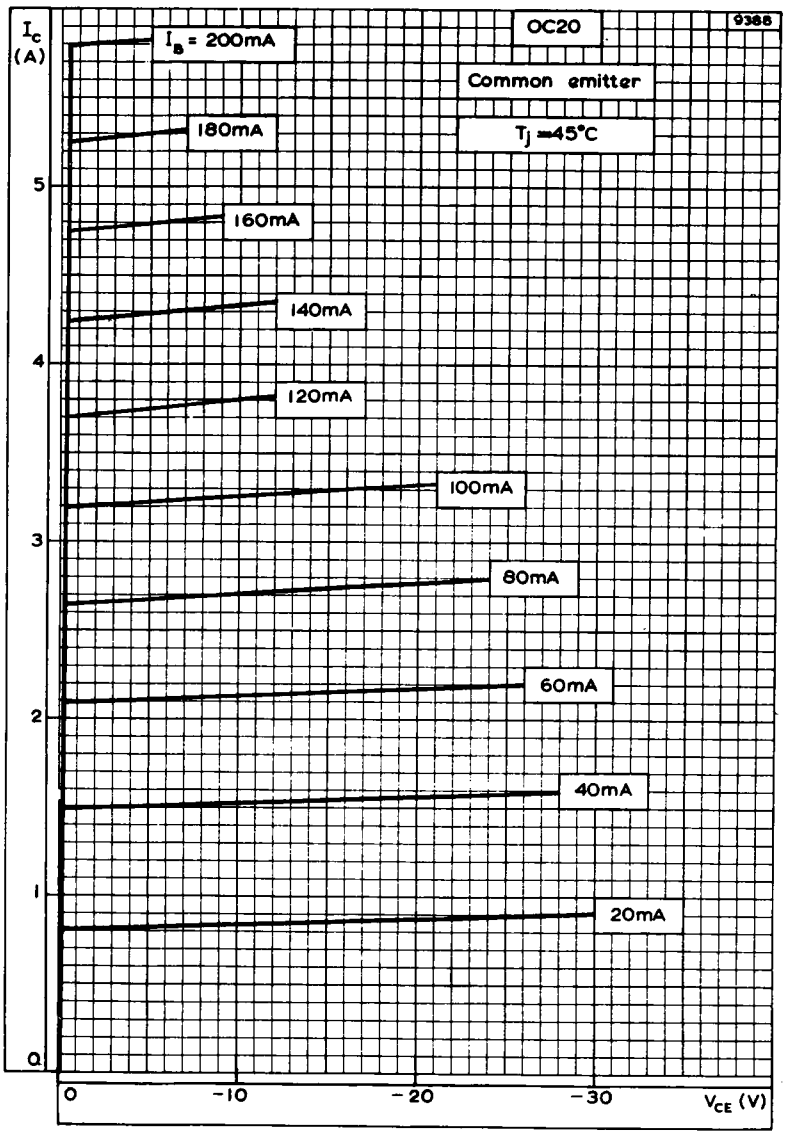
OUTPUT CHARACTERISTIC FOR OC36. COMMON EMITTER



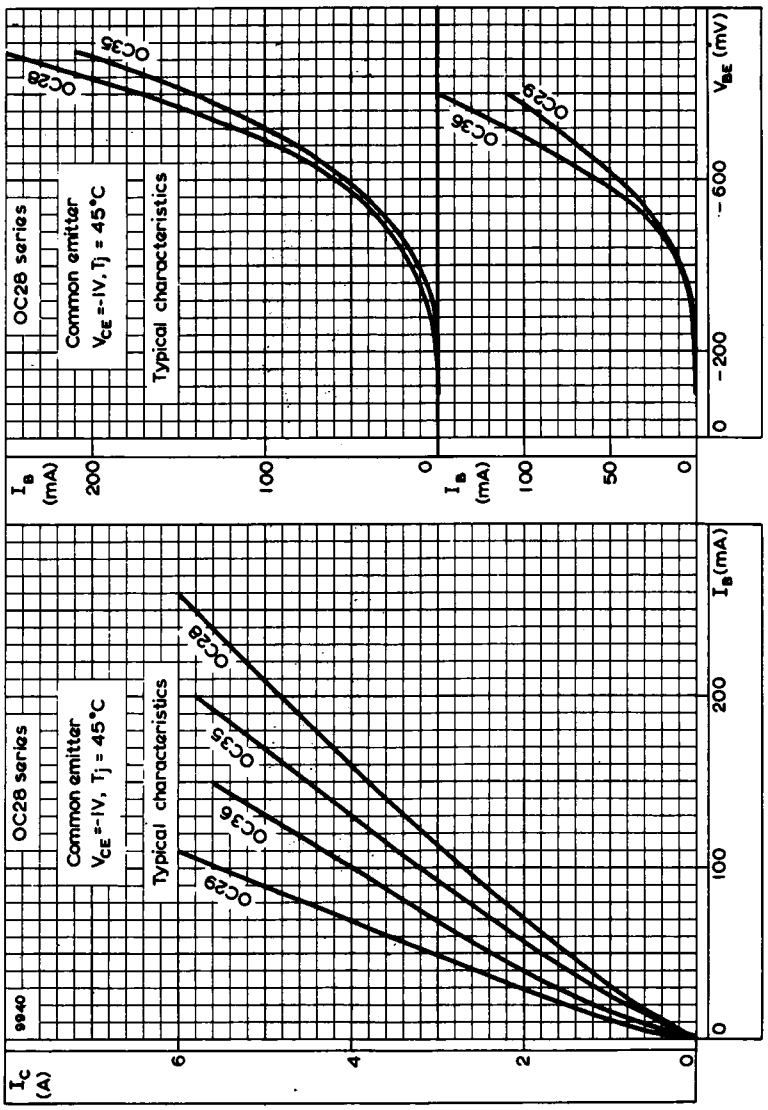
OUTPUT CHARACTERISTIC FOR OC28. COMMON EMITTER



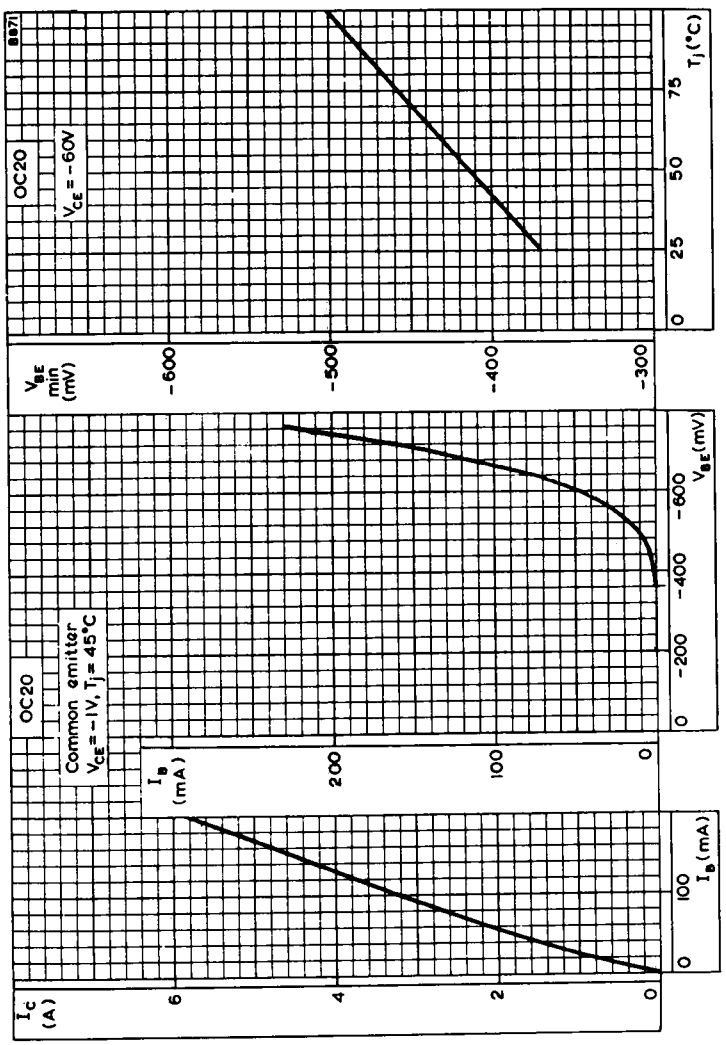
OUTPUT CHARACTERISTIC FOR OC36. COMMON EMITTER



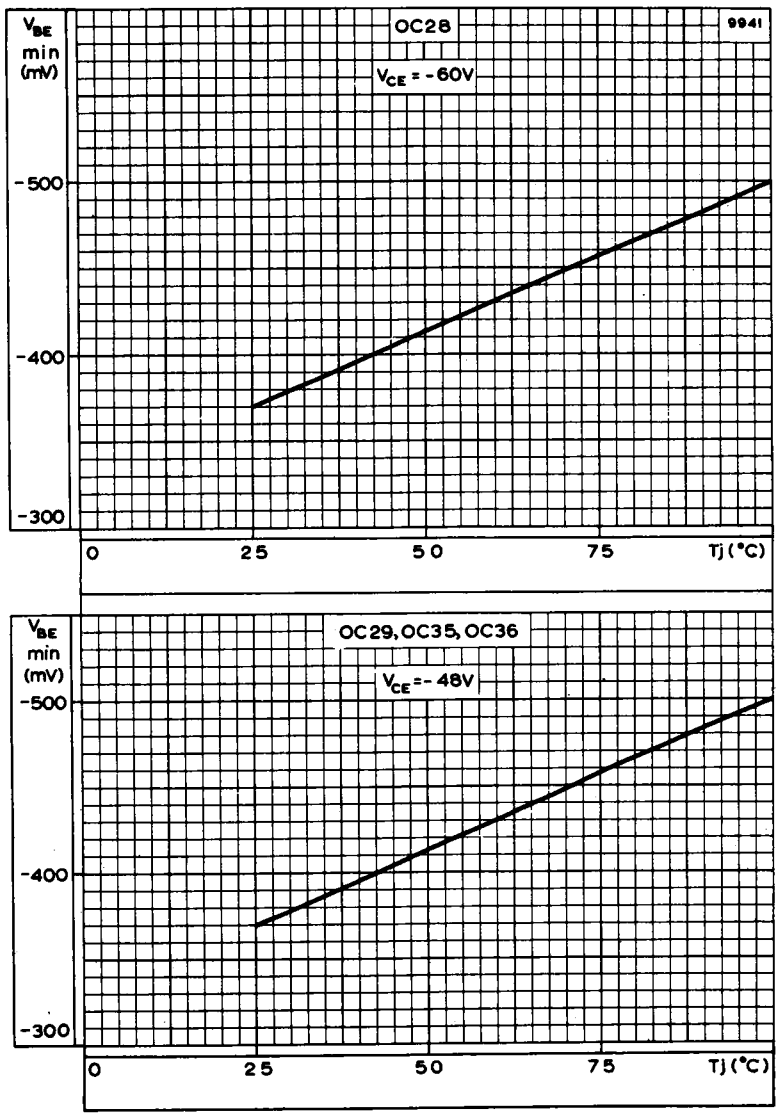
TYPICAL OUTPUT CHARACTERISTICS



TRANSFER AND INPUT CHARACTERISTICS. COMMON EMITTER



TYPICAL TRANSFER AND INPUT CHARACTERISTICS AND VARIATION OF V_{BE} WITH JUNCTION TEMPERATURE



VARIATION OF V_{BE} WITH JUNCTION TEMPERATURE

Typical operation in on-off power switching circuit

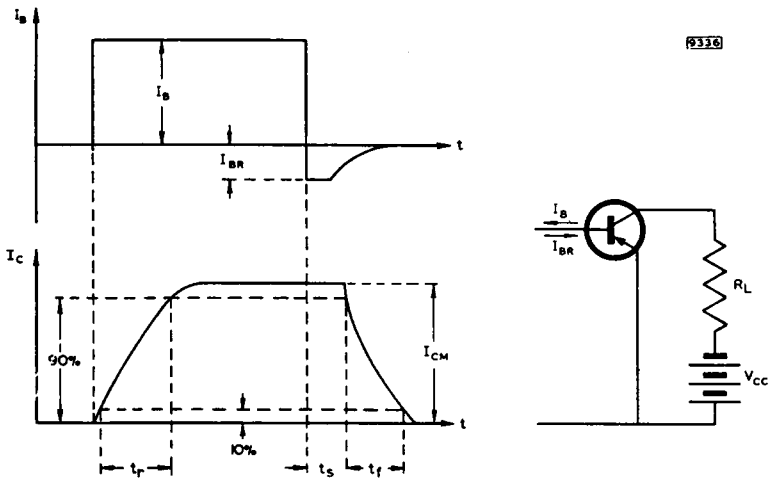


Fig. 2

D.C. supply voltage	V_{CC}	14				28				V
Load resistance	R_L	14		2.3		28		4.7		Ω
peak collector current	I_{CM}	1.0		6.0		1.0		6.0		A
		OC29	OC35 OC20	OC29	OC35 OC20	OC28	OC36	OC28	OC36	
'Turn On' base current	I_B	35	55	260	400	70	50	480	400	mA
'Reverse' base current	I_{BR}	8.7	13.7	65	100	17.5	12.5	120	100	mA
Switching times										
Rise time	t_r	20		20		20		20		μs
Storage time	t_s	15		15		15		15		μs
Fall time	t_f	40		35		40		35		μs

Rise time $t_r = \frac{\beta}{\omega 1} \log_e \frac{h_{FE} \mid I_B \mid}{h_{FE} \mid I_B \mid - \mid I_{CM} \mid}$

Fall time $t_f = \frac{\beta}{\omega 1} \log_e \left[1 + \frac{\mid I_{CM} \mid}{h_{FE} \mid I_{BR} \mid} \right]$

Storage time $t_s = \tau_s \log_e \frac{\mid I_B \mid + \mid I_{BR} \mid}{\frac{\mid I_{CM} \mid}{h_{FE}} + \mid I_{BR} \mid}$