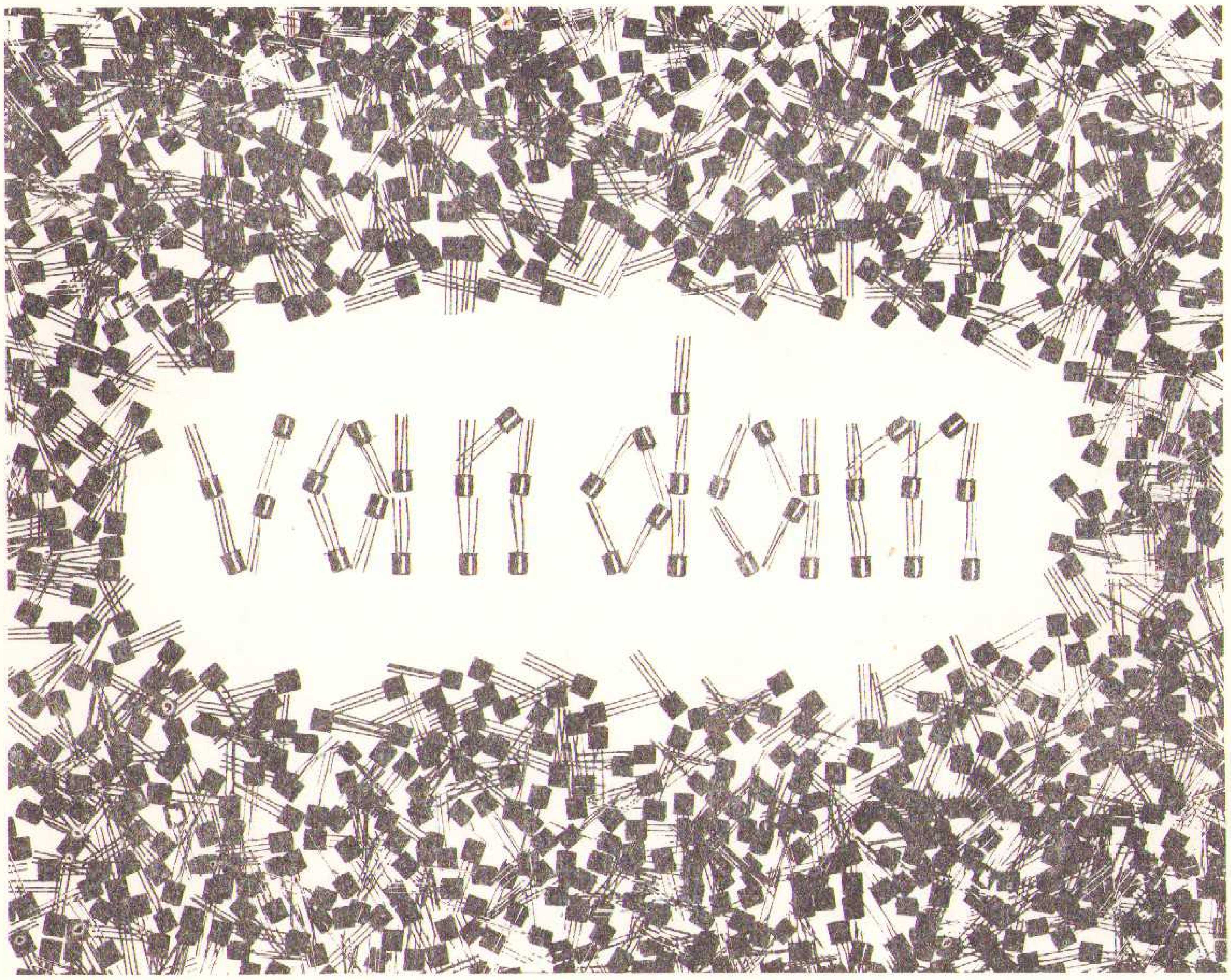
TECHNISCHE DOCUMENTATIE 1969

DEEL 11·12 NOVEMBER·DECEMBER



van dam
ELEKTRONICA

Snellemanstraat 10 - 11 bij Zwaanshals, Rotterdam - noord
Telefoon: 010 - 240812 - 243497, administratie: 010 - 245516
Giro: 295 550. Bank: AMRO-bank, Middell.str. te Rotterdam.
Postorders en correspondentie: Postbus 3149 te Rotterdam.

Filiaal: Reguliersgracht 105 bij Frederiksplein te Amsterdam
Telefoon: 020 - 248967.

Prijs ƒ 2,50

Technische documentatie 1969, tweede jaargang
Deel 11 en 12 november-december 1969

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Abonnementen gaan in per 1 januari en eindigen per 31 december.

Omslagfoto: ZE ZIJN ER WEER ! ! ! De BC 170B en BC 171B van ITT.

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Verhuizingen.

Bij verhuizingen, danwel onjuiste adressering dient hiervan vóór de eerste van de nieuwe maand melding te worden gemaakt. Dit dient beslist te geschieden onder vermelding van het op de enveloppe vermelde abonnénummer. Zonder dit nummer wordt Uw adreswijziging onbehandeld en onherroepelijk retourgezonden!!! Mocht het in Uw voornemen liggen op korte termijn te verhuizen, noteert U nú dan vast dit nummer op één van onze uitgaven. Dit voorkomt wederzijds overlast. Correspondentie uitsluitend te richten aan: Van Dam Elektronica, POSTBUS 3149 te Rotterdam-noord.

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Technische documentatie 1970.

Ook in 1970 wordt deze uitgave voortgezet; u ontvangt hiervoor op korte termijn een acceptgirokaart. Het is ook mogelijk nu reeds het abonnementsgeld over te maken op onze girorekening 295550 onder vermelding van "verlenging TD 1970, abonnénummer ......".

Geeft U de voorkeur aan het gebruiken van de door ons gezonden acceptgirokaart, stort U deze dan zo spoedig mogelijk, zodat wij tijdig in staat zijn onze oplage te bepalen!

μμμμμμμμμμμμμμμμμμμμμμμμμμμμμμμμμμμμμμμμμμμμμμμμμμμμμμμμμμμμμμμμμμμμμμμμμμμμμμμμμμμμμμμ

Inleiding.

Zoals gebruikelijk zijn in dit nummer weer verschillende interessante en moderne halfgeleiders opgenomen. Deze hebben zowel betrekking op het audio-gebied als op digitaal gebied.

In dit (dubbel-)nummer vragen wij speciaal Uw aandacht voor de transistortypen BC170B en BC171B van het fabrikaat ITT. Deze zijn door hun speciale prijs en hun eigenschappen een speciale bestudering van het groot aantal toepassingsgebieden waard.

Tot slot verwijzen wij U nog naar ons postbusnummer; voor een snelle levering dient U alle correspondentie en postorders uitsluitend te richten aan:

VAN DAM ELEKTRONICA POSTBUS 3149 ROTTERDAM-NOORD

van dam
ELEKTRONICA

Snellemanstraat 10 - 11 bij Zwaanshals, Rotterdam - noord
Telefoon: 010 - 240812 - 243497, administratie: 010 - 245516
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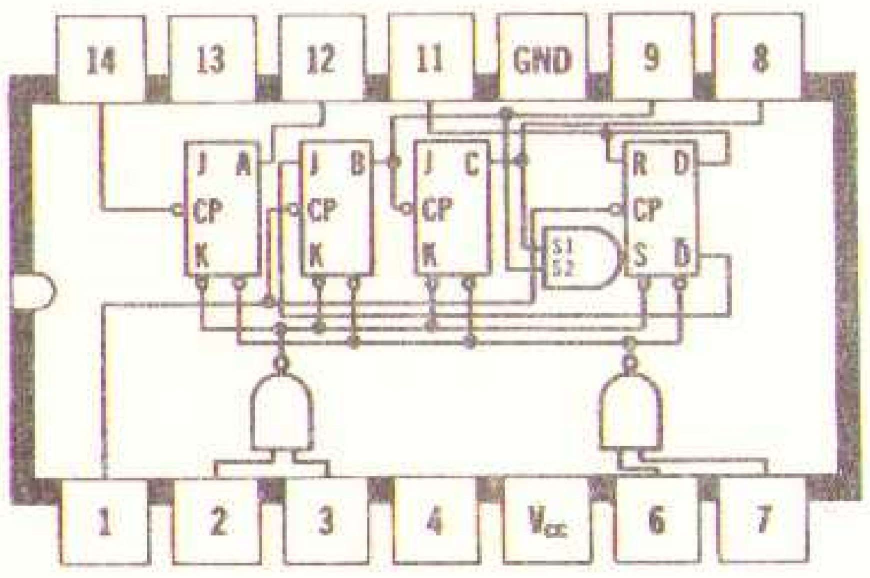
Telefoon: 020 - 248967.

TTL

SN5490N/SN7490N
SN5490J/SN7490J

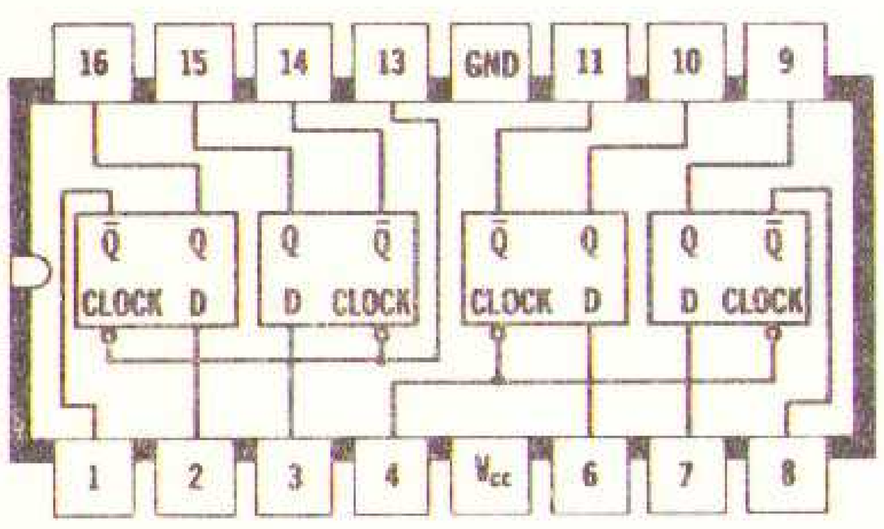
Decade counter



Maximum count frequency — 18 MHz
Minimum clock pulse width — 50 nsec
Power dissipation — 160 mW
Fan out — 10 Series 54/74 loads

SN5475N/SN7475N
SN5475J/SN7475J

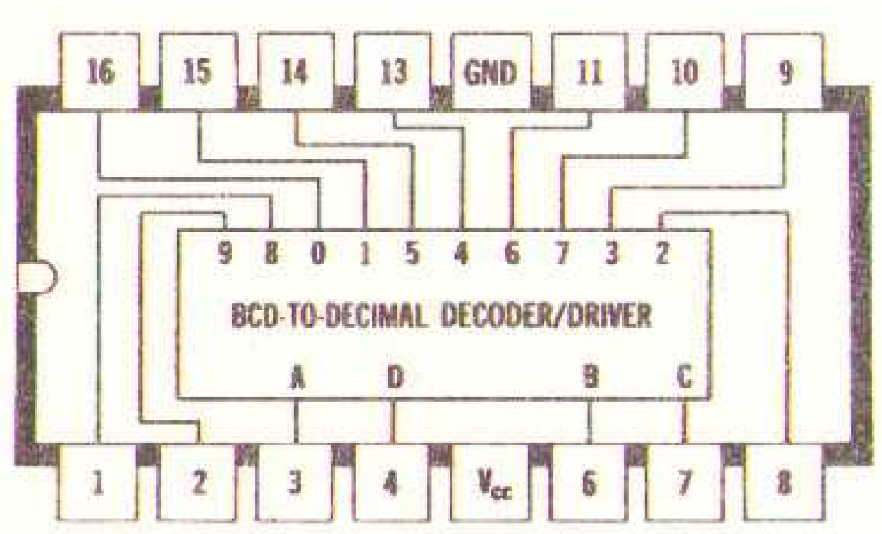
Quadruple bistable latch



Propagation delay — 30 nsec
Power dissipation — 160 mW
Fan out — 10 Series 54/74 loads

SN7441AN
SN7441AJ

BCD-to-decimal decoder driver



Power dissipation — 105 mW
Maximum voltage on any output — 55 V
Fan out — drives gas filled readout tubes directly

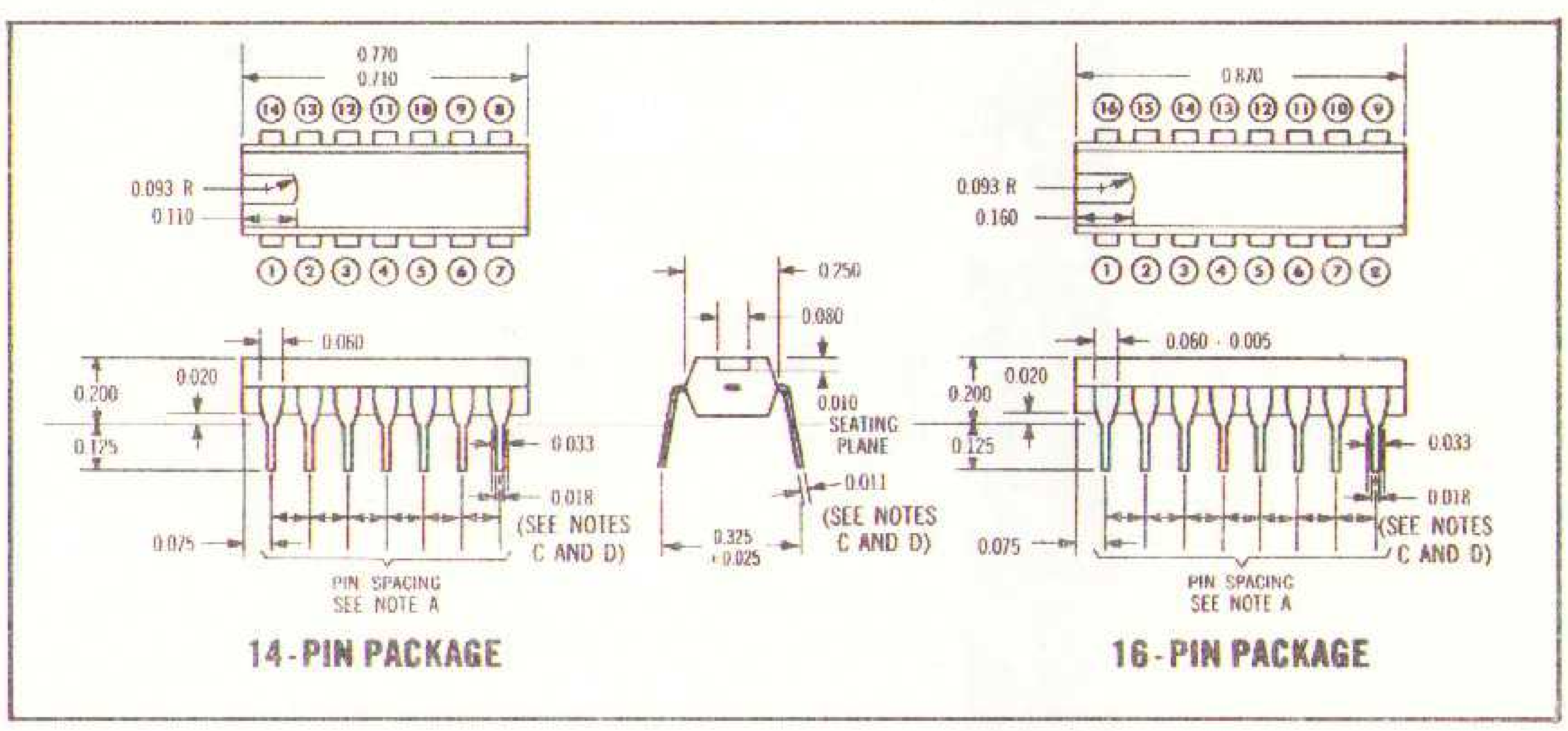
Reeds geruime tijd hebben wij aan ons leveringsprogramma enkele digitale schakelingen uit de TTL-reeks van Texas Instuments toegevoegd, te weten:

SN 7490N — Decadeteller met uitgevoerde in- en uitgangen voor gebruik als 2-teller en 5-teller. Deze schakeling is tevens uitgerust met een reset op 0 en op 9. Bij gebruik als tienteller dienen de aansluitingen 12 en 1 extern te worden doorverbonden.

SN 7475N — Dit IC wordt veelal gebruikt als elektronisch buffergeheugen. Door aan de ingangen D een logische informatie aan te bieden en ingang CLOCK een puls te geven, kan de aangeboden informatie worden vastgelegd. In combinatie met bovenstaande teller vormt dit IC een tussengeheugen.

SN 7441AN — Dit IC bevat een decoder voor het BCD-stelsel en bevat tevens hoogspanningstransistoren en is hierdoor in staat een nixiebuis rechtstreeks te sturen. De maximaal toelaatbare Vce van de inwendige nixie-drivers bedraagt 55 volt.

Met deze drie geïntegreerde schakelingen uit de MSI (Medium-Scale-Integration) reeks is op eenvoudige wijze een teller samen te stellen, welke:
a. klein is van afmetingen.
b. weinig soldeerpunten bevat.
c. een telfrequentie heeft van DC tot 18MHz.
d. een grote betrouwbaarheid heeft.

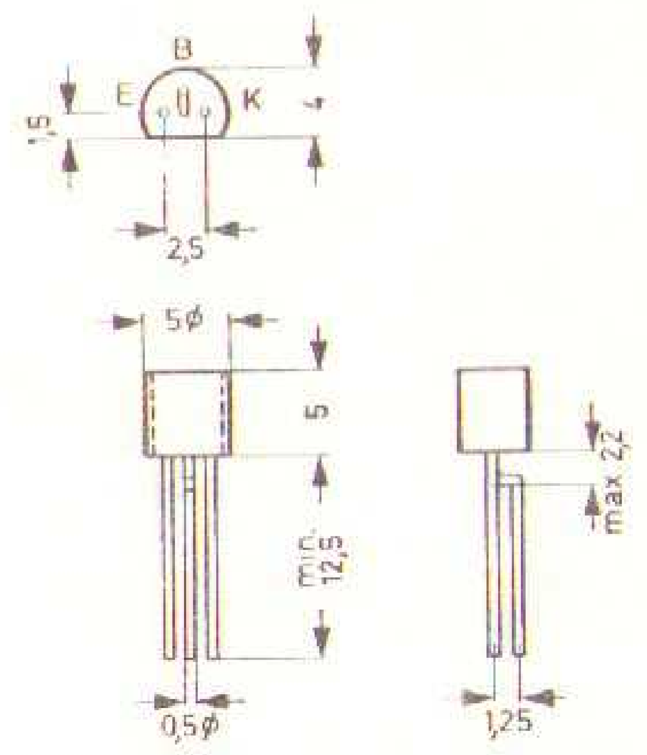


NOTES:
A. The true-position pin spacing is 0.100 between centerlines. Each pin centerline is located within ±0.010 of its true longitudinal position relative to pin 1 and 14 or 16.
B. All dimensions in inches unless otherwise noted.
C. This dimension does not apply for solder-dipped leads.
D. When solder-dipped leads are specified, dipped area of the lead extends from the lead tip to the seating plane shoulder.

TEXAS INSTRUMENTS
INCORPORATED

BC 170

NPN-Silizium-Planar-Transistor
für Schalter und Verstärker



Kunststoffgehäuse
Gewicht ca. 0,23 p
Das Kunststoffgehäuse ist lichtundurchlässig.
Maße in mm

Grenzwerte

Kollektor-Basis-Spannung	U_{CB0}	20	V
Kollektor-Emitter-Spannung	U_{CE0}	20	V
Emitter-Basis-Spannung	U_{EB0}	5	V
Kollektorstrom	I_C	100	mA
Verlustleistung bei $T_U = 25\,°C$	P_{tot}	200 *)	mW
Sperrschichttemperatur	T_j	125	°C
Lagerungstemperaturbereich	T_S	−50 … +125	°C

Statische Kennwerte bei $T_j = 25\,°C$

Kollektor-Basis-Stromverhältnis

Die Transistoren werden nach dem Kollektor-Basis-Stromverhältnis B in 3 Gruppen (A, B und C) ausgemessen. Bei $U_{CE} = 1\,V$ gelten folgende B-Werte:

		(BC 170 A)	BC 170 B	(BC 170 C)
bei $I_C = 1\,mA$	B	35 … 100	80 … 250	200 … 600
bei $I_C = 30\,mA$	B	> 30	> 60	> 150

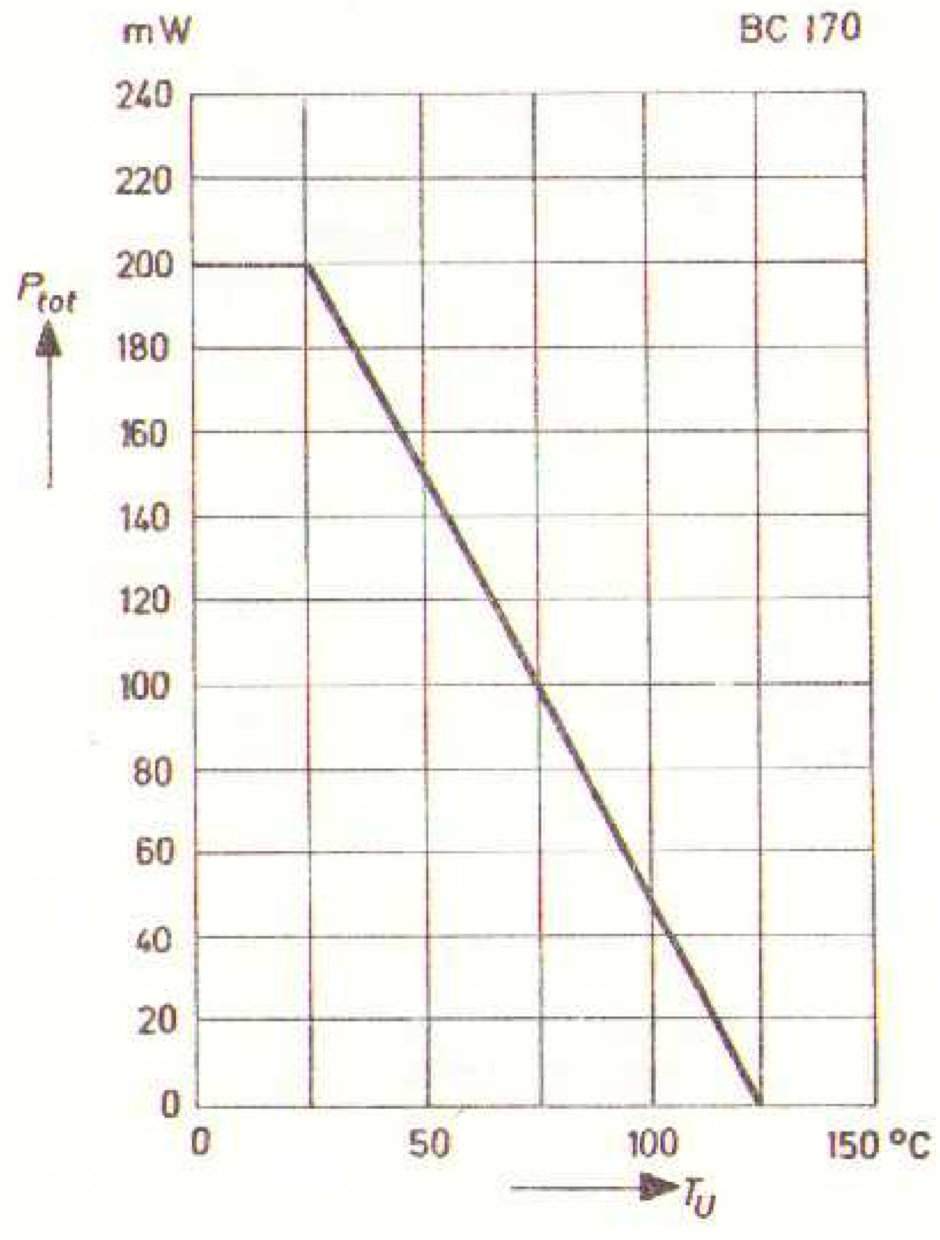
Kollektor-Sättigungsspannung			
bei $I_C = 1\,mA$, $I_B = 0{,}1\,mA$	U_{CEsat}	< 0,25	V
bei $I_C = 30\,mA$, $I_B = 3\,mA$	U_{CEsat}	< 0,4	V
Basis-Sättigungsspannung			
bei $I_C = 1\,mA$, $I_B = 0{,}1\,mA$	U_{BEsat}	< 0,7	V
Kollektorreststrom bei $U_{CB0} = 15\,V$	I_{CB0}	< 0,1	µA
Emitterreststrom bei $U_{BE} = 4\,V$	I_{EB0}	< 0,1	µA
Wärmewiderstand Sperrschicht - umgebende Luft	R_{thU}	< 500 *)	grd/W

*) Dieser Wert gilt dann, wenn die Anschlußdrähte in 2 mm Abstand vom Gehäuse auf 25 °C gehalten werden.

Dynamische Kennwerte bei $T_U = 25\,°C$

Kollektor-Basis-Kapazität bei $U_{CB0} = 10\,V$, $f = 1\,MHz$	C_{CB0}	4	pF
Emitter-Basis-Kapazität bei $U_{EB0} = 0{,}5\,V$, $f = 1\,MHz$	C_{EB0}	12	pF
Transitfrequenz bei $U_{CE} = 5\,V$, $I_C = 20\,mA$, $f = 50\,MHz$	f_T	100	MHz
Rauschzahl bei $U_{CE} = 5\,V$, $I_C = 0{,}2\,mA$, $R_G = 2\,k\Omega$, $f = 1\,kHz$, $\Delta f = 200\,Hz$	F	< 6	dB

Zulässige Verlustleistung in Abhängigkeit von der Umgebungstemperatur
$P_{tot} = f\,(T_U)$



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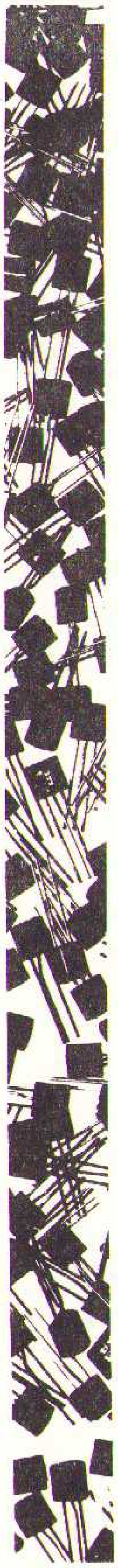
BC 171



NPN-Silizium-Epitaxie-Planar-Transistor
besonders geeignet für rauscharme NF-Vor- und Treiberstufen

van dam
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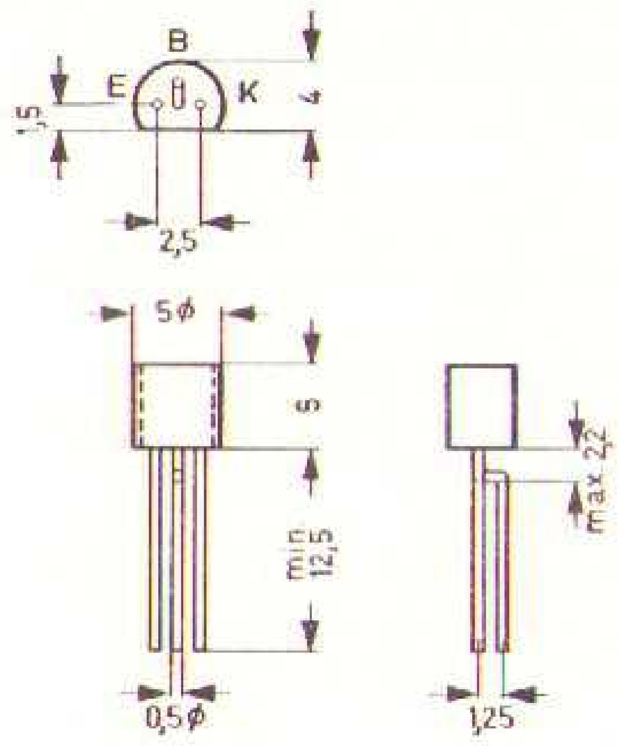


Kunststoffgehäuse
Gewicht ca. 0,23 p
Das Kunststoffgehäuse ist lichtundurchlässig.
Maße in mm

Grenzwerte

Kollektor-Basis-Spannung	U_{CBO}	45	V
Kollektor-Emitter-Spannung	U_{CEO}	45	V
Emitter-Basis-Spannung	U_{EBO}	5	V
Kollektorstrom	I_C	100	mA
Verlustleistung bei $T_U = 25\,°C$	P_{tot}	200 *)	mW
Sperrschichttemperatur	T_j	125	°C
Lagerungstemperaturbereich	T_S	−55 ... +125	°C

Statische Kennwerte bei $T_j = 25\,°C$

Kollektor-Basis-Stromverhältnis

Die Transistoren werden nach der Kleinsignal-Stromverstärkung h_{21e} in 2 Gruppen (A und B) ausgemessen. Bei $U_{CE} = 5\,V$ gelten folgende *B*-Werte:

		(BC 171 A)	BC 171 B
bei $I_C = 0{,}01\,mA$	B	90 (> 40)	150 (> 40)
bei $I_C = 2\,mA$	B	180	290
bei $I_C = 20\,mA$	B	225	350
bei $I_C = 100\,mA$ **)	B	210	300

Basis-Emitter-Spannung bei $U_{CE} = 5\,V$,

$I_C = 0{,}01\,mA$	U_{BE}	0,5	V
$I_C = 2\,mA$	U_{BE}	0,62 (0,55 ... 0,7)	V
$I_C = 20\,mA$	U_{BE}	0,7	V
$I_C = 100\,mA$	U_{BE}	0,76	V

Kollektor-Sättigungsspannung

bei $I_C = 10\,mA$, $I_B = 0{,}5\,mA$	$U_{CE\,sat}$	0,09 (< 0,25)	V
bei $I_C = 100\,mA$, $I_B = 5\,mA$	$U_{CE\,sat}$	0,2 (< 0,6)	V

*) Dieser Grenzwert gilt dann, wenn die Anschlußdrähte in 2 mm Abstand vom Gehäuse auf 25 °C gehalten werden.
**) Impulsmessung

BC 171

Basis-Sättigungsspannung			
bei I_C = 10 mA, I_B = 0,5 mA	$U_{BE\,sat}$	0,7	V
bei I_C = 100 mA, I_B = 5 mA	$U_{BE\,sat}$	0,9	V
Kollektorreststrom			
bei U_{CB0} = 45 V	I_{CB0}	0,2 (< 15)	nA
bei U_{CB0} = 45 V, T_j = 125 °C	I_{CB0}	0,2 (< 15)	µA
Wärmewiderstand Sperrschicht - umgebende Luft	R_{thU}	< 500 *)	grd/W

Dynamische Kennwerte bei T_U = 25 °C

Transitfrequenz bei I_C = 10 mA, U_{CE} = 5 V, f = 100 MHz	f_T	300 (> 150)	MHz
Kollektor-Basis-Kapazität bei U_{CB0} = 10 V, f = 1 MHz	C_{CB0}	4	pF
Emitter-Basis-Kapazität bei U_{EB0} = 0,5 V, f = 1 MHz	C_{EB0}	12	pF
Rauschzahl bei I_C = 0,2 mA, U_{CE} = 5 V, R_G = 2 kΩ, f = 1 kHz, Δf = 200 Hz	F	2 (< 6)	dB

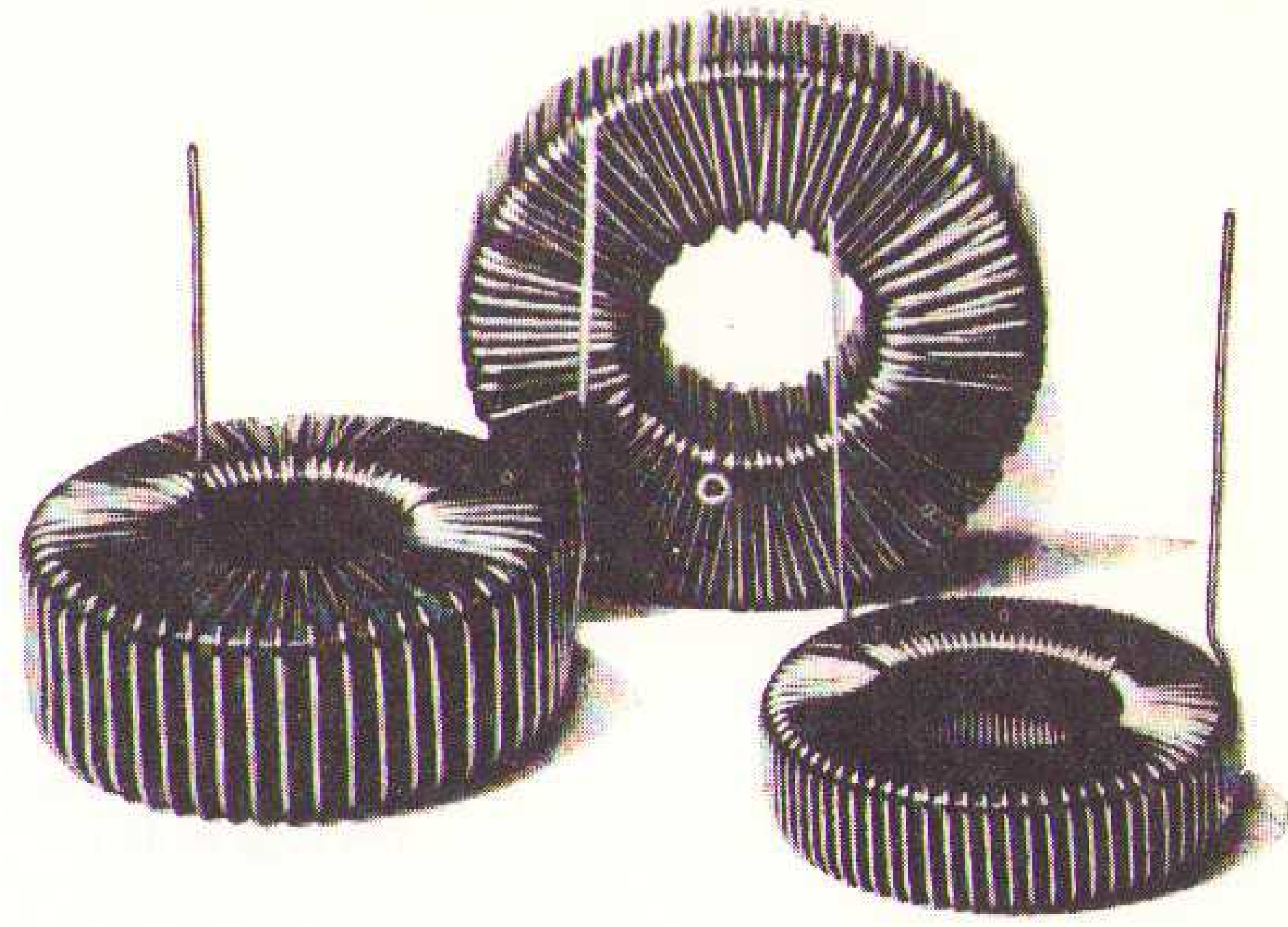
Die Transistoren werden nach der Kleinsignal-Stromverstärkung h_{21e} in 2 Gruppen (A und B) ausgemessen. Die folgenden Kleinsignal-Kennwerte gelten bei I_C = 2 mA, U_{CE} = 5 V, f = 1 kHz.

		(BC 171 A)	BC 171 B	
Stromverstärkung in Emitterschaltung	h_{21e}	220 (125…260)	330 (240…500)	
Eingangswiderstand				
in Emitterschaltung	h_{11e}	2,7 (1,6…4,5)	4,5 (3,2…8,5)	kΩ
in Basisschaltung	h_{11b}	13,5	13,5	Ω
Spannungsrückwirkung				
in Emitterschaltung	h_{12e}	1,5	2	$\times 10^{-4}$
in Basisschaltung	h_{12b}	1,5	2,8	$\times 10^{-4}$
Ausgangsleitwert				
in Emitterschaltung	h_{22e}	18 (< 30)	30 (< 60)	µS
in Basisschaltung	h_{22b}	0,05	0,06	µS

Zulässige Verlustleistung in Abhängigkeit von der Umgebungstemperatur wie BC 170 B.

*) Dieser Wert gilt dann, wenn die Anschlußdrähte in 2 mm Abstand vom Gehäuse auf 25 °C gehalten werden.

ONTSTOORSPOELEN VOOR THYRISTOR- EN TRIAC-REGELINGEN



Door de steeds verdere opkomst van thyristor- en triacregelingen is het van grotere noodzaak geworden een norm uit te geven, waarin de stoorinvloeden van dergelijke schakelingen aan banden worden gelegd. Zo is internationaal een advies opgesteld (beter bekend onder "CISPR-aanbeveling"), welke op deze materie betrekking heeft. In Duitsland is naar aanleiding hiervan reeds een norm uitgegeven (nummer VDE 0875 t/m VDE 0877), waarin de stoorinvloeden van dergelijke vermogensregelingen aan verscheidene voorwaarden dienen te voldoen; het betreft hier vooral het frequentiegebied tussen 150kHz en 30MHz. Naar aanleiding van deze norm heeft Vacuumschmelze GMBH verscheidene typen ontstoorspoelen ontwikkeld, welke aan deze norm voldoen. Aangezien het te verwachten is, dat binnenkort een groot gedeelte van deze norm in Nederland zal worden overgenomen, vestigen wij uw aandacht op dit produkt.

In ons leveringsprogramma zijn 6 verschillende typen opgenomen voor nominale stromen tussen 0,6 en 10 ampère. In figuur 3 zijn enkele karakteristieken opgenomen van het type FD-1,6-01-KN, geschakeld volgens figuur 1 met als condensator C 0,1µF (Rifa metaal papier type PME). Zonder deze ontstoring zou bij 150 kHz het stoorniveau circa 120dB (10^6µV) bedragen, terwijl dit na aanbrenging van de getekende ontstoorspoel en condensator is afgenomen tot 65dB (2×10^3µV). Zoals uit deze grafiek valt af te leiden, voldoet deze ontstoring voor frequenties boven 0,5MHz beter dan in de CISPR-aanbeveling is vereist.

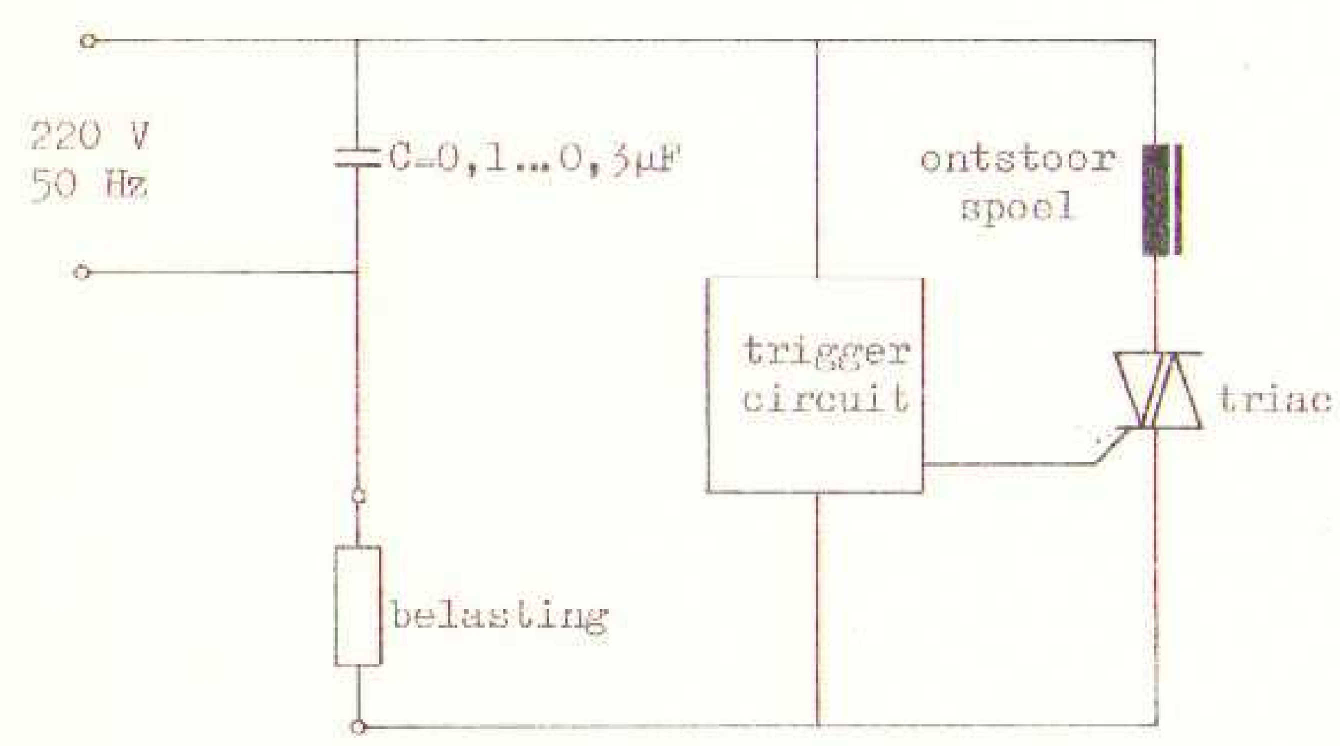
Teneinde de meest gunstige demping te kunnen verkrijgen op de gewenste frequentie geven we hieronder de formule om de meest gunstige waanden te kunnen berekenen.

Voor een ontstoring als in figuur 1 is weergegeven geldt voor een demping van 50dB op 150kHz: $L \times C \geq 400$ µH x µF. Bij een inductie van 1-3mH komen we dan aan een condensatorwaarde van 0,1 - 0,3 µF. Deze condensator dient qua spanning en kwaliteit zorgvuldig te worden gekozen. De voorkeur verdient hier een zelfherstellend metaalpapier type (bijvoorbeeld Rifa PME).

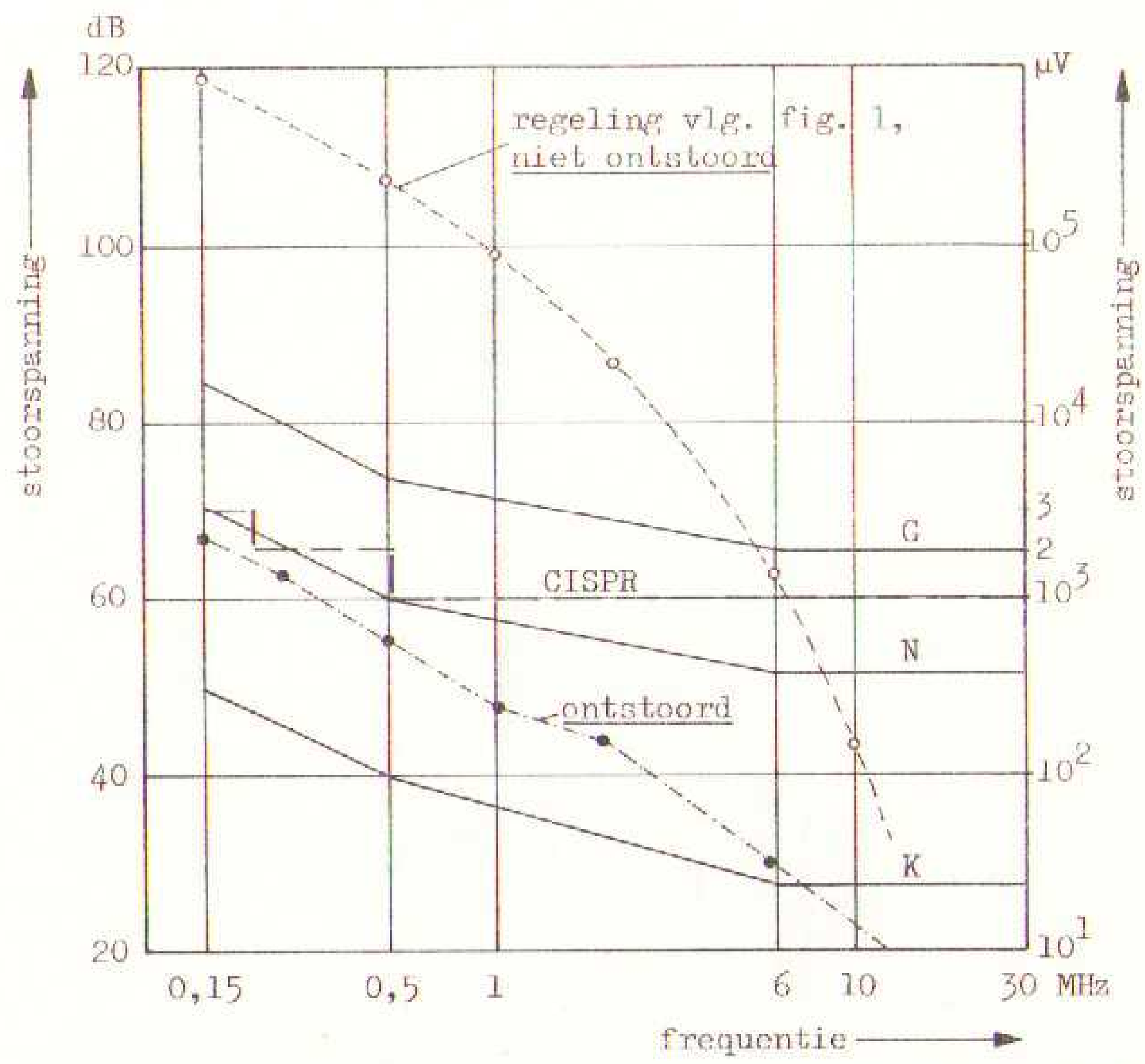
Typenummers en technische gegevens van ontstoorspoelen.

Typenummer	In A	Ln mH	Leff mH	Ro mΩ	afmetingen Du - Di - H	gewicht gram
FD-0,6-01-N	0,6	1,5	1,5	1400	28 - 11 - 10	21
FD- 1 -01-N	1	1,4	1,4	850	32 - 13 - 11	29
FD-1,6-01-KN	1,6	8,0	2,2	440	35 - 15 - 11	37
FD-2,5-01-KN	2,5	4,5	1,1	250	36 - 15 - 13	50
FD- 4 -01-KN	4	4,0	1,8	130	38 - 15 - 15	68
FD- 6 -01-KN	6	2,5	1,2	90	44 - 17 - 17	110
FD- 10 -01-KN	10	1,2	1,4	40	50 - 16 - 18	150

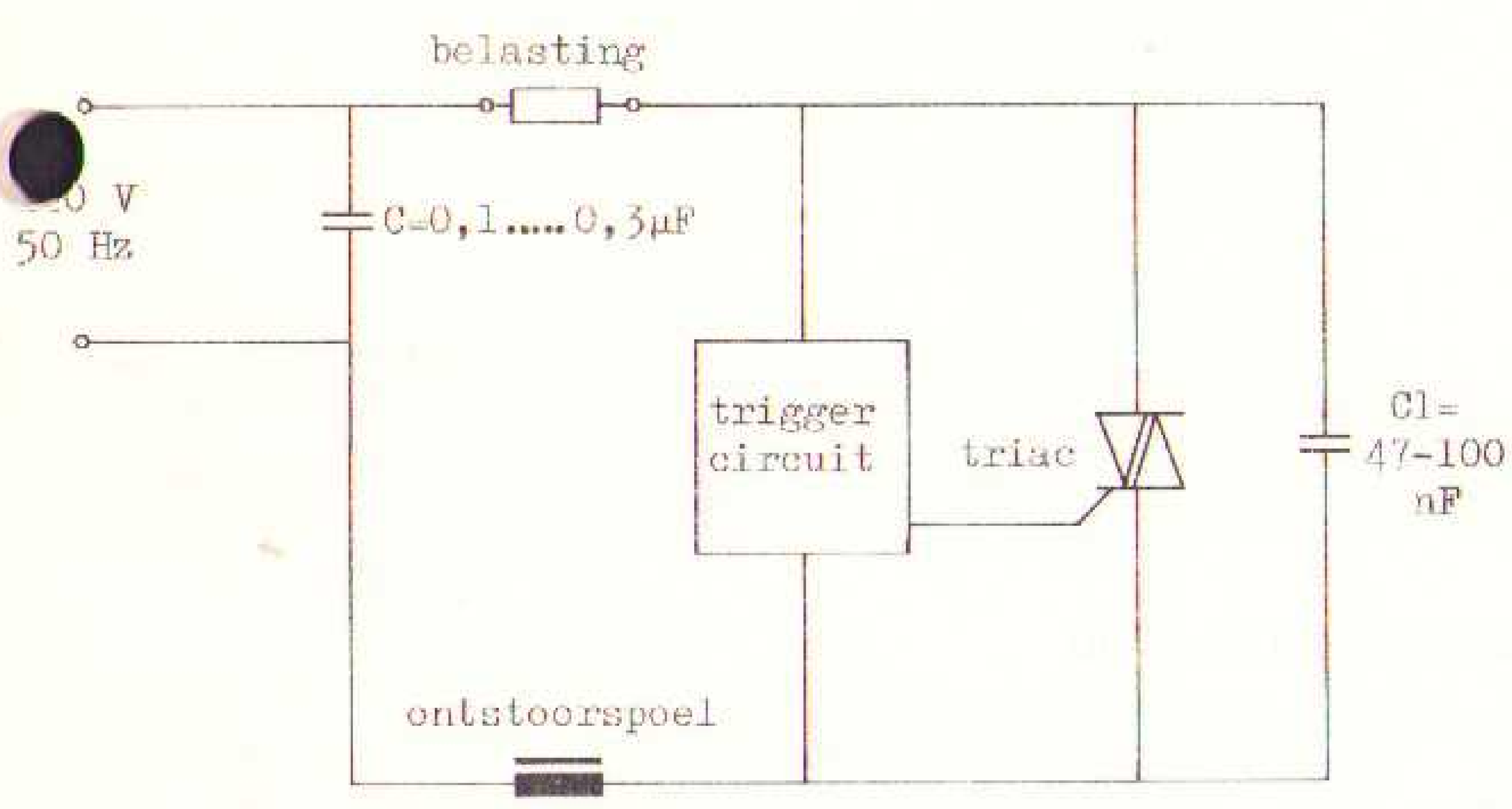
Ln : inductie bij 160 kHz volgens DIN 41260.
Leff : werkzame inductie bij 150 Hz.
Ro : gelijkstroomweerstand volgens DIN 41260.
In : nominale stroom, gekozen volgens DIN 323 (R5).
Afmetingen: in mm.



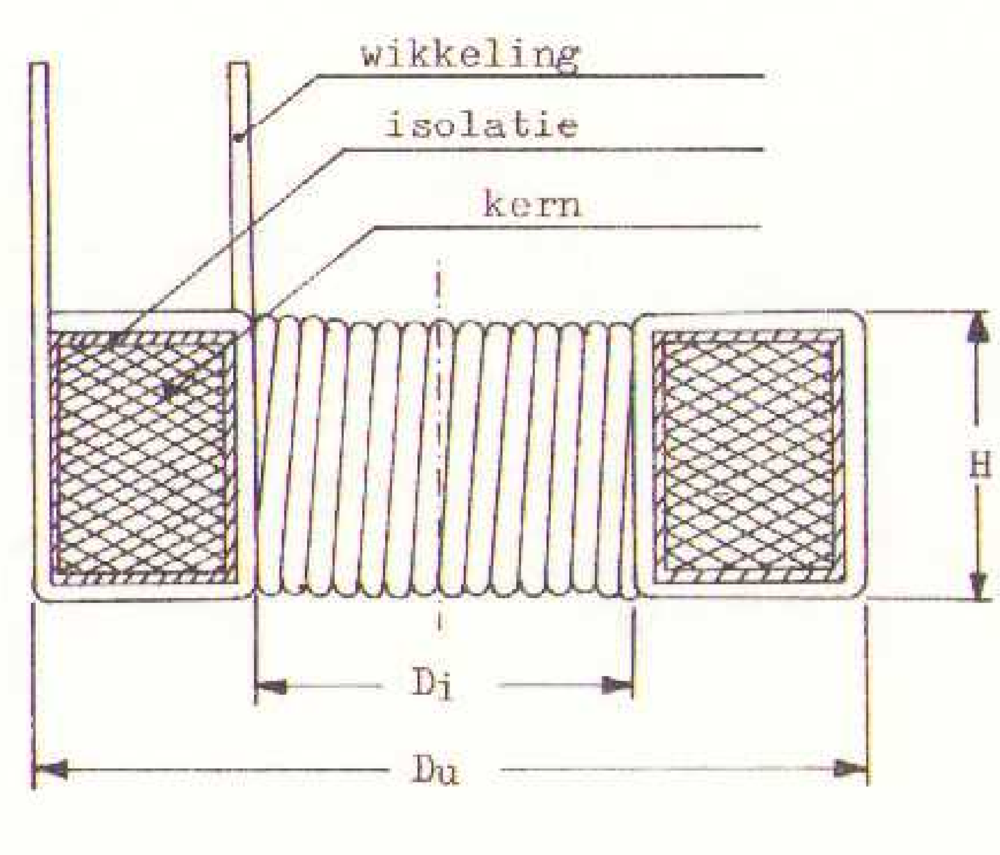
Figuur 1. Schakelvoorbeeld voor ontstoorspoel (zie ook grafiek in figuur 3)



Figuur 3. Grafiek stoorspanningen volgens CISPR, vDE 0875 (kromme G,N en K) en stoorspanningen volgens figuur 1.



Figuur 2. Schakelvoorbeeld voor ontstoorspoel.



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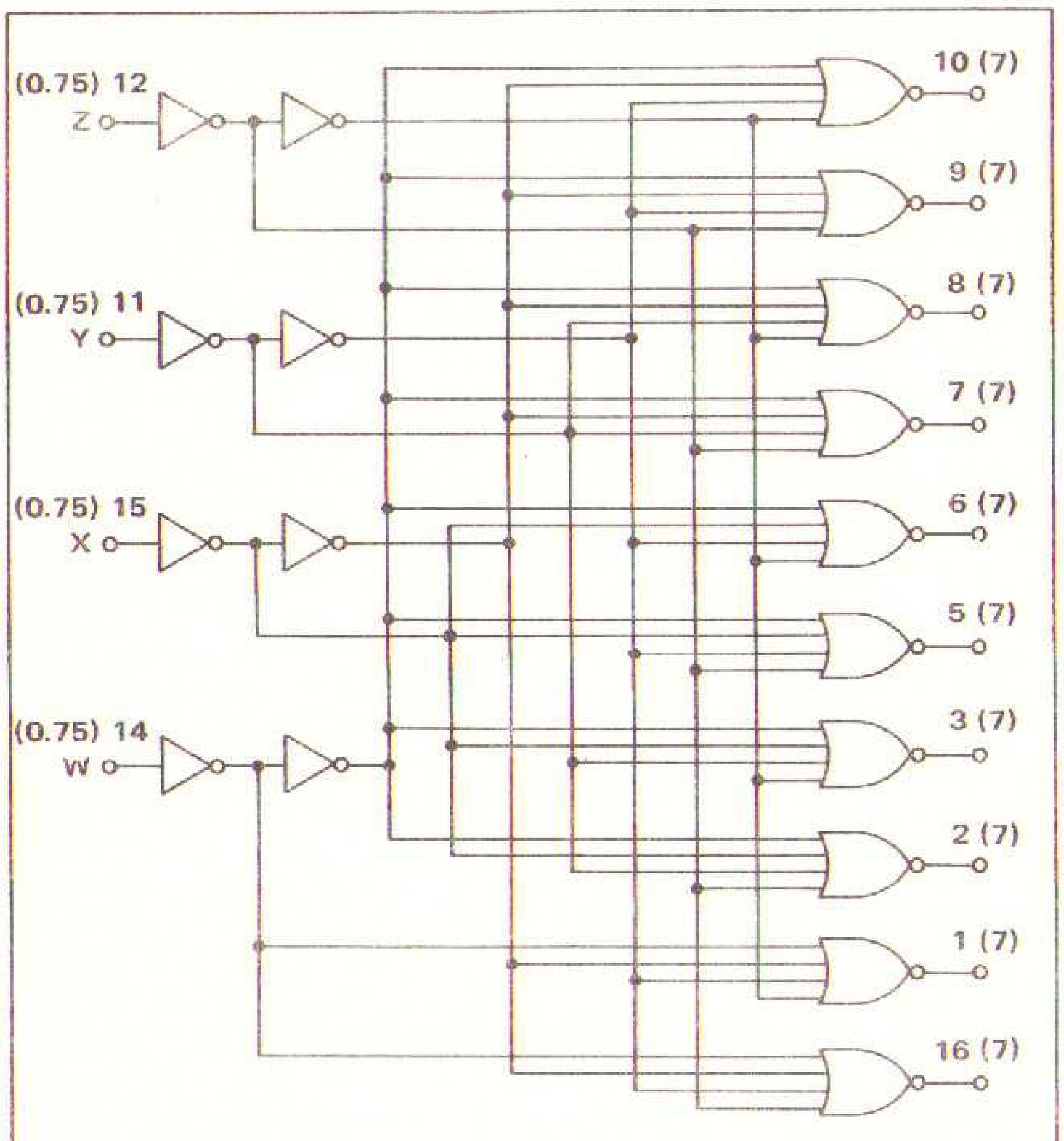
Postbus 3149, Rotterdam, Tel.: 010-240812

MC770P • MC870P*

JANUARY 1969



Number in Parenthesis Indicates Loading Factor.

The MC770P/870P is a monolithic BCD to decimal decoder consisting of eight inverters and ten 4-input NOR gates which are utilized to convert binary coded decimal (8-4-2-1) input to an output, via the appropriate one of ten output lines.

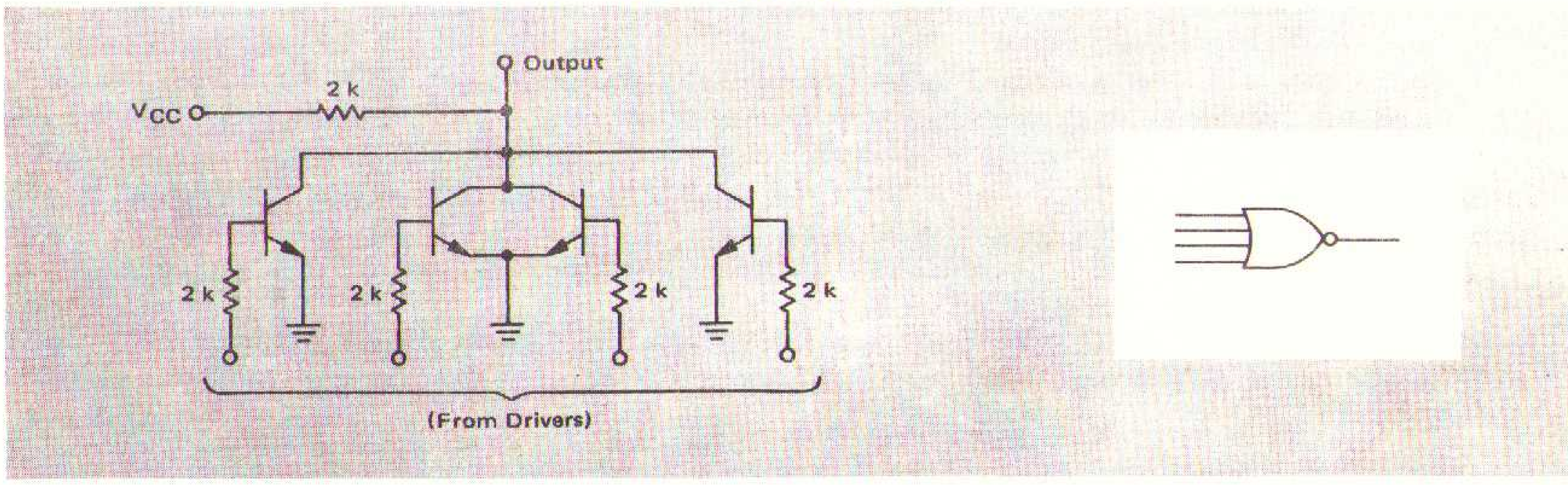
TRUTH TABLE

OUTPUT VALUE	INPUT CONFIGURATION*			
When "1" is Present at	W	X	Y	Z
Pin 10 = 0	0	0	0	0
9 = 1	0	0	0	1
8 = 2	0	0	1	0
7 = 3	0	0	1	1
6 = 4	0	1	0	0
5 = 5	0	1	0	1
3 = 6	0	1	1	0
2 = 7	0	1	1	1
1 = 8	1	0	0	0
16 = 9	1	0	0	1

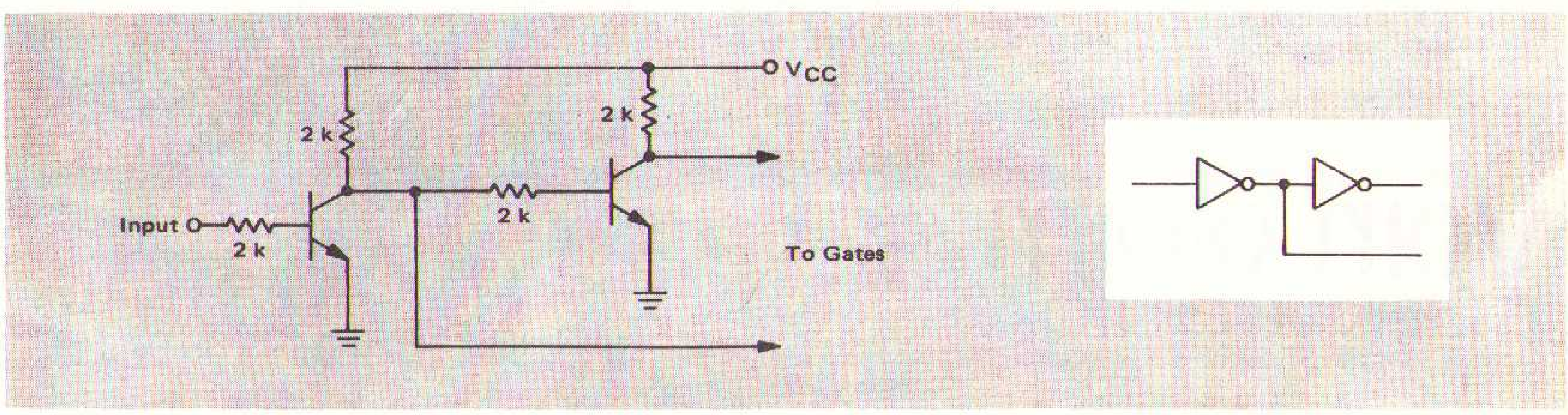
*Any input configuration not shown will result in the zero level at all ten outputs.

t_{pd} = 36 ns
P_D = 100 mW typ (All inputs high)

4-INPUT NOR GATE (1 OF 10)



DUAL SERIES INVERTING DRIVER (1 OF 4)



*P suffix = 16 pin dual in-line plastic package, Case 612.

ELECTRICAL CHARACTERISTICS

TEST VOLTAGE VALUES (Volts)

	@ Test Temperature	V_{in}	V_{on}	V_{BOT}	V_{off}	V_{CC}
MC870P	0°C	0.880	0.850	1.80	0.500	3.60
	+25°C	0.830	0.800	1.80	0.460	3.60
	+75°C	0.740	0.710	1.80	0.400	3.60
MC770P	+15°C	0.865	0.865	1.80	0.475	3.60
	+25°C	0.850	0.850	1.80	0.460	3.60
	+55°C	0.800	0.800	1.80	0.430	3.60

Characteristic	Symbol	Pin Under Test	MC870P Test Limits 0°C Min	0°C Max	+25°C Min	+25°C Max	+75°C Min	+75°C Max	Unit	MC770P Test Limits +15°C Min	+15°C Max	+25°C Min	+25°C Max	+55°C Min	+55°C Max	Unit
Input Current	$0.75\ I_{in}$	11	-	113	-	105	-	105	µAdc	-	113	-	113	-	113	µAdc
		12	-	↓	-	↓	-	↓	↓	-	↓	-	↓	-	↓	↓
		14	-	↓	-	↓	-	↓	↓	-	↓	-	↓	-	↓	↓
		15	-	↓	-	↓	-	↓	↓	-	↓	-	↓	-	↓	↓
Output Current	I_{A7}*	10	-1.05	-	-0.98	-	-0.98	-	mAdc	1.05	-	-1.05	-	-1.05	-	mAdc
Output Voltage	V_{out}	1**	-	400	-	350	-	300	mVdc	-	400	-	300	-	320	mVdc
Power Supply Current Drain	I_{PD}	13	-	-	-	32	-	-	mAdc	-	-	-	32	-	-	mAdc
Switching Times	t_{14+1+}	1	-	-	-	40	-	-	ns	-	-	-	40	-	-	ns
	t_{14-1-}	1	-	-	-	↓	-	-	↓	-	-	-	↓	-	-	↓
	t_{15+6+}	6	-	-	-	↓	-	-	↓	-	-	-	↓	-	-	↓
	t_{15-6-}	6	-	-	-	↓	-	-	↓	-	-	-	↓	-	-	↓
	t_{11+8+}	8	-	-	-	↓	-	-	↓	-	-	-	↓	-	-	↓
	t_{11-8-}	8	-	-	-	↓	-	-	↓	-	-	-	↓	-	-	↓
	t_{12+9+}	9	-	-	-	↓	-	-	↓	-	-	-	↓	-	-	↓
	t_{12-9-}	9	-	-	-	↓	-	-	↓	-	-	-	↓	-	-	↓

TEST VOLTAGE APPLIED TO PINS LISTED BELOW:

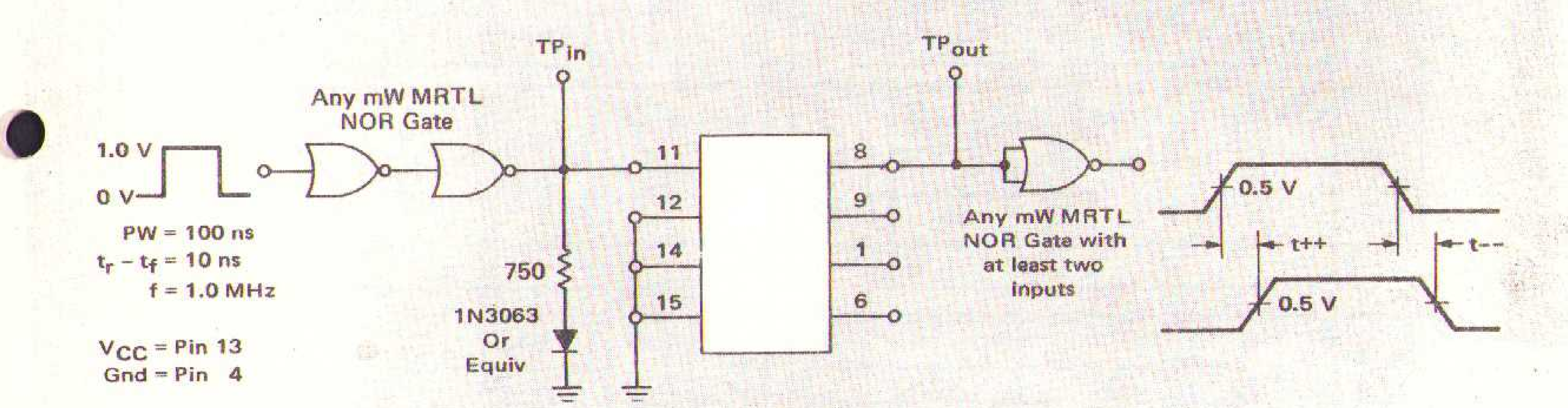
Characteristic	Pin Under Test	V_{in} (Pulse In)	V_{on} (Pulse Out)	V_{BOT}	V_{off}	V_{CC}	Gnd
Input Current	11	11	-	-	-	13	4,12,14,15
	12	12	-	-	-	↓	4,11,14,15
	14	14	-	-	-	↓	4,11,12,15
	15	15	-	-	-	↓	4,11,12,14
Output Current	10	-	10*	-	*	13	4
Output Voltage	1**	-	**	-	**	13	4
Power Supply Current Drain	13	11,12,14,15	-	-	-	13	4
Switching Times t_{14+1+}	1	14	1	-	-	13	4,11,12,15
t_{14-1-}	1	14	1	-	-	↓	4,11,12,15
t_{15+6+}	6	15	6	-	-	↓	4,11,12,14
t_{15-6-}	6	15	6	-	-	↓	4,11,12,14
t_{11+8+}	8	11	8	-	-	↓	4,12,14,15
t_{11-8-}	8	11	8	-	-	↓	4,12,14,15
t_{12+9+}	9	12	9	-	-	↓	4,11,14,15
t_{12-9-}	9	12	9	-	-	↓	4,11,14,15

Pins not listed are left open.

*Test is shown for one output only. The other outputs are tested in the same manner. Inputs must have V_{on} and V_{off} applied in accordance with the truth table for the output under test.

**Test shown is for one output only. All nine outputs, excepting the one which is "ON" according to the truth table, are to be tested for all usable input configurations shown in the truth table — a total of 90 tests.

SWITCHING TIMES TEST CIRCUIT AND WAVEFORMS



Switching Circuit indicates one input and one output. Other input and output combinations are tested in a similar manner.

Load and driving gates must be of same series as unit under test.

MC780P • MC880P

JANUARY 1969

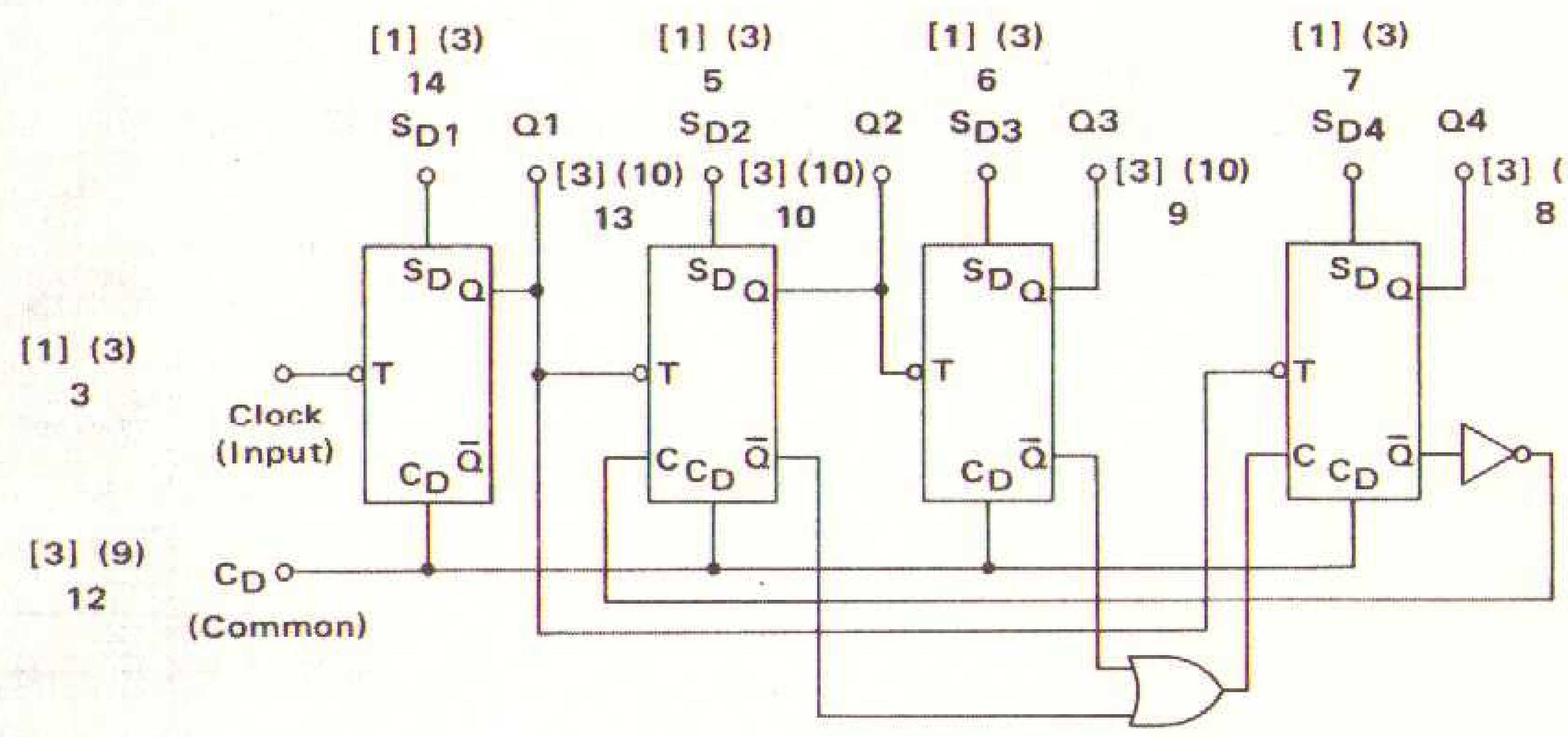
The MC780P/MC880P is a monolithic decade up counter consisting of four flip-flops internally interconnected. A common direct clear is provided to return all outputs to the logical zero level. Individual direct set inputs are provided to set the counter to any specific count.

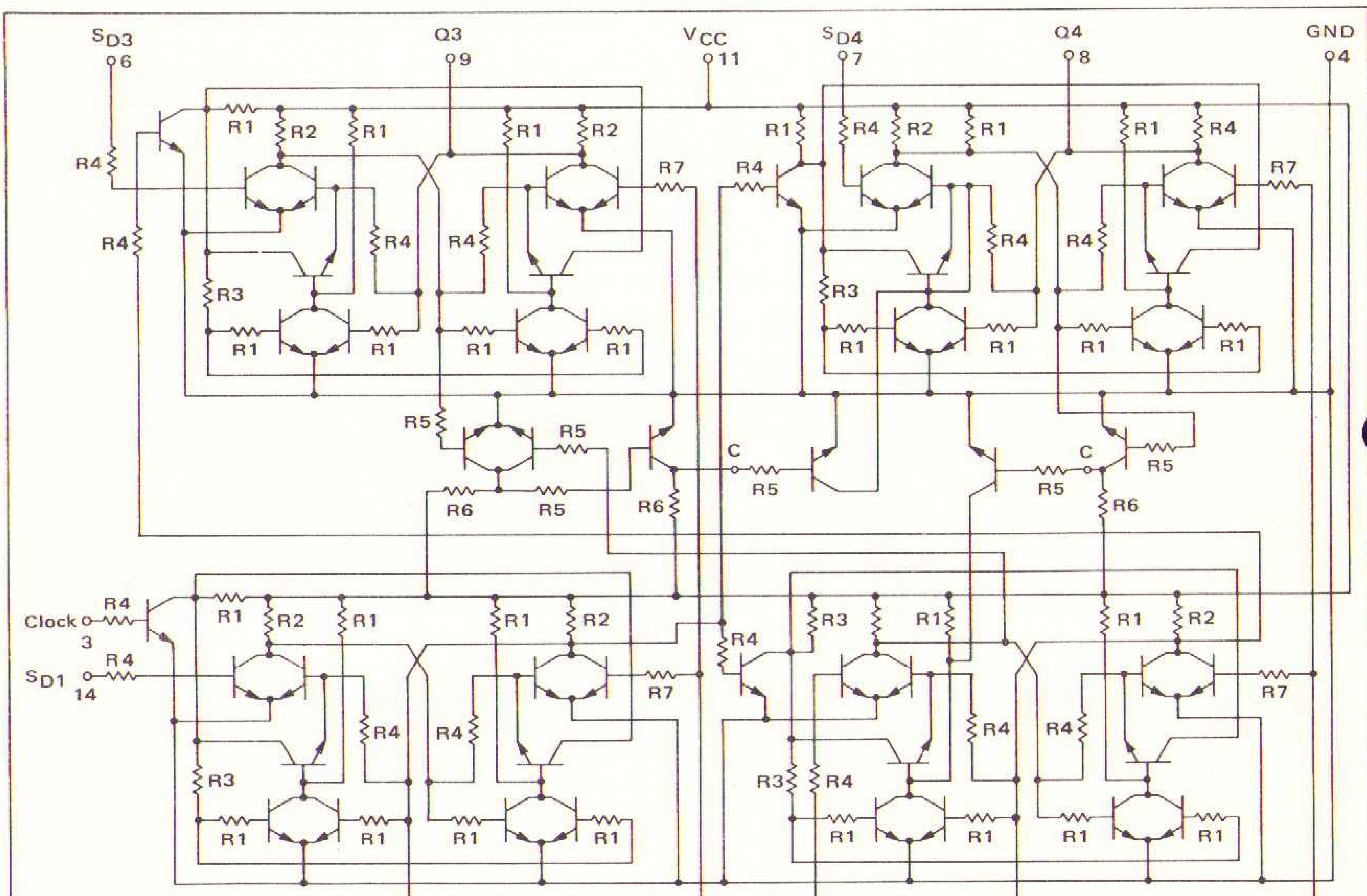
DECODING LOGIC

0	$\bar{A}$	$\bar{B}$	$\bar{C}$	$\bar{D}$
1	A	$\bar{B}$	$\bar{C}$	$\bar{D}$
2	$\bar{A}$	B	$\bar{C}$	$\bar{D}$
3	A	B	$\bar{C}$	$\bar{D}$
4	$\bar{A}$	$\bar{B}$	C	$\bar{D}$
5	A	$\bar{B}$	C	$\bar{D}$
6	$\bar{A}$	B	C	$\bar{D}$
7	A	B	C	$\bar{D}$
8	$\bar{A}$	$\bar{B}$	$\bar{C}$	D
9	A	$\bar{B}$	$\bar{C}$	D

P_D = 250 mW typ
f = 4.0 MHz Counting Frequency

Number in parenthesis indicates loading factor for mW MRTL.
Number in brackets indicates loading factor for MRTL.





Typical Resistance Values

R1 = 1.5 k	R5 = 1.0 k
R2 = 640Ω	R6 = 3.6 k
R3 = 750Ω	R7 = 600Ω
R4 = 450Ω	

ELECTRICAL CHARACTERISTICS

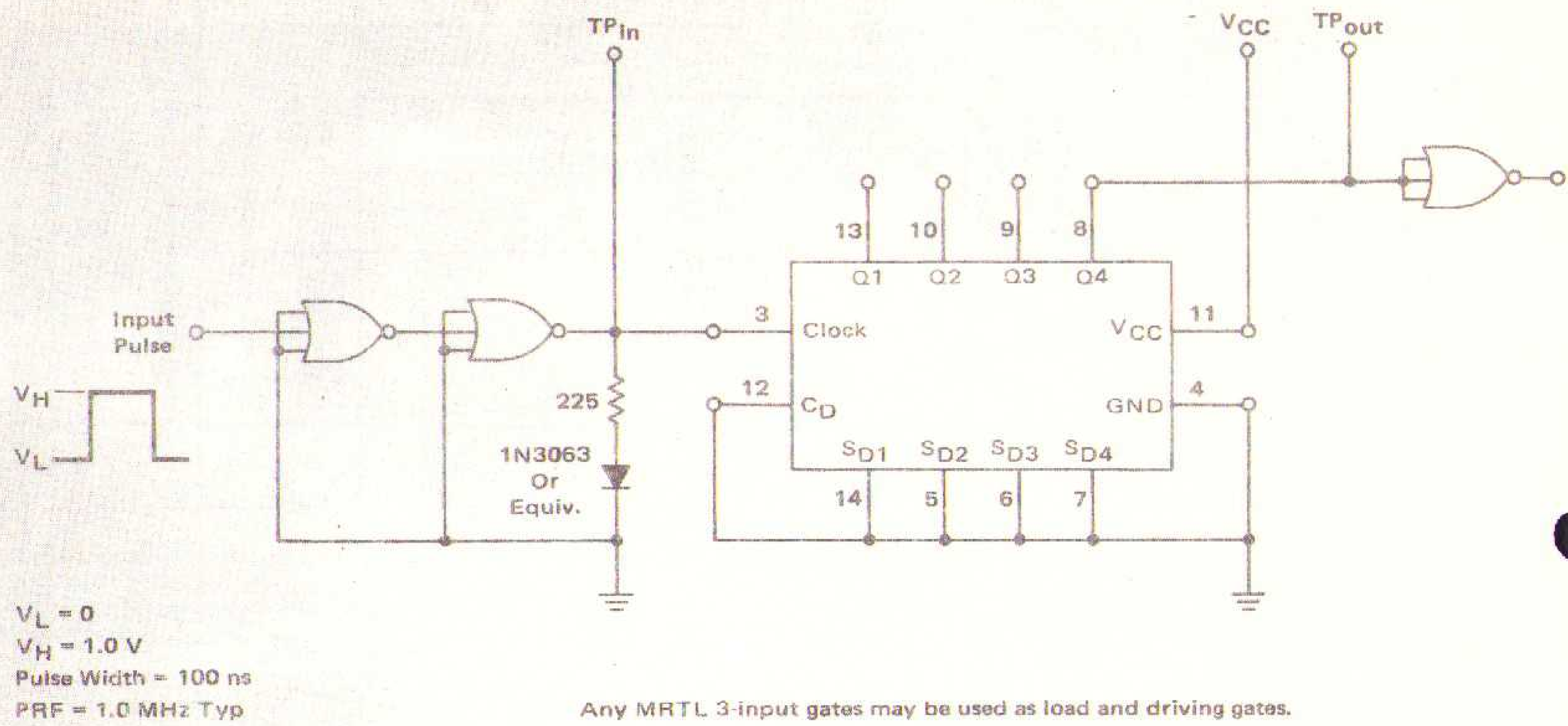
	@ Test Temperature	V_{in}	V_{on}	V_{BOT}	V_{off}	V_{CC}
		TEST VOLTAGE VALUES (Volts)				
MC880P	0°C	0.960	0.930	1.80	0.570	3.60
MC880P	+25°C	0.910	0.880	1.80	0.500	3.60
MC880P	+75°C	0.820	0.790	1.80	0.450	3.60
MC780P	+15°C	0.865	0.865	1.80	0.475	3.60
MC780P	+25°C	0.850	0.850	1.80	0.460	3.60
MC780P	+55°C	0.800	0.800	1.80	0.430	3.60

Characteristic	Symbol	Pin Under Test	MC880P Test Limits 0°C Min	0°C Max	+25°C Min	+25°C Max	+75°C Min	+75°C Max	Unit	MC780P Test Limits +15°C Min	+15°C Max	+25°C Min	+25°C Max	+55°C Min	+55°C Max	Unit	TEST VOLTAGE APPLIED TO PINS LISTED BELOW: V_{in}	V_{on}	V_{BOT}	V_{off}	V_{CC}	Gnd
Input Current	I_{in}	3 5 6 7 14	- - - - -	600 ↓	- - - - -	600 ↓	- - - - -	570 ↓	μAdc ↓	- - - - -	500 ↓	- - - - -	500 ↓	- - - - -	470 ↓	μAdc ↓	3 5 6 7 14	- - - - -	- - - - -	- - - - -	11 ↓	4 ↓
	$3\ I_{in}$	12	-	1800	-	1800	-	710		-	1500	-	1500	-	1410		12	-	-	-		
Output Current	I_{A3}	8 9 10 13	-1.80 ↓	- - - -	-1.80 ↓	- - - -	-1.71 ↓	- - - -	mAdc ↓	-1.65 ↓	- - - -	-1.65 ↓	- - - -	-1.56 ↓	- - - -	mAdc ↓	- - - -	8 9 10 13	7 6 5 14	- - - -	11 ↓	4 ↓
Output Voltage	V_{out}*	8 9 10 13	- - - -	500 ↓	- - - -	400 ↓	- - - -	400 ↓	mVdc ↓	- - - -	400 ↓	- - - -	300 ↓	- - - -	320 ↓	mVdc ↓	- - - -	- - - -	- - - -	- - - -	11 ↓	4 ↓
Saturation Voltage	$V_{CE(sat)}$	8 9 10 13	- - - -	400 ↓	- - - -	300 ↓	- - - -	350 ↓	mVdc ↓	- - - -	300 ↓	- - - -	290 ↓	- - - -	320 ↓	mVdc ↓	- - - -	- - - -	12 ↓	- - - -	11 ↓	4 ↓
Power Supply Current Drain	I_{PD}	11	-	-	-	75	-	-	mAdc	-	-	-	75	-	-	mAdc	-	-	-	-	11	4
Switching Times																	Pulse In	Pulse Out				
Propagation Delay	t_{3-8+}	8	-	-	-	100	-	-	ns	-	-	-	100	-	-	ns	3	8	-	-	11	4
	t_{3-8-}	8	-	-	-	75	-	-	ns	-	-	-	75	-	-	ns	3	8	-	-	11	4

Pins not listed are left open.

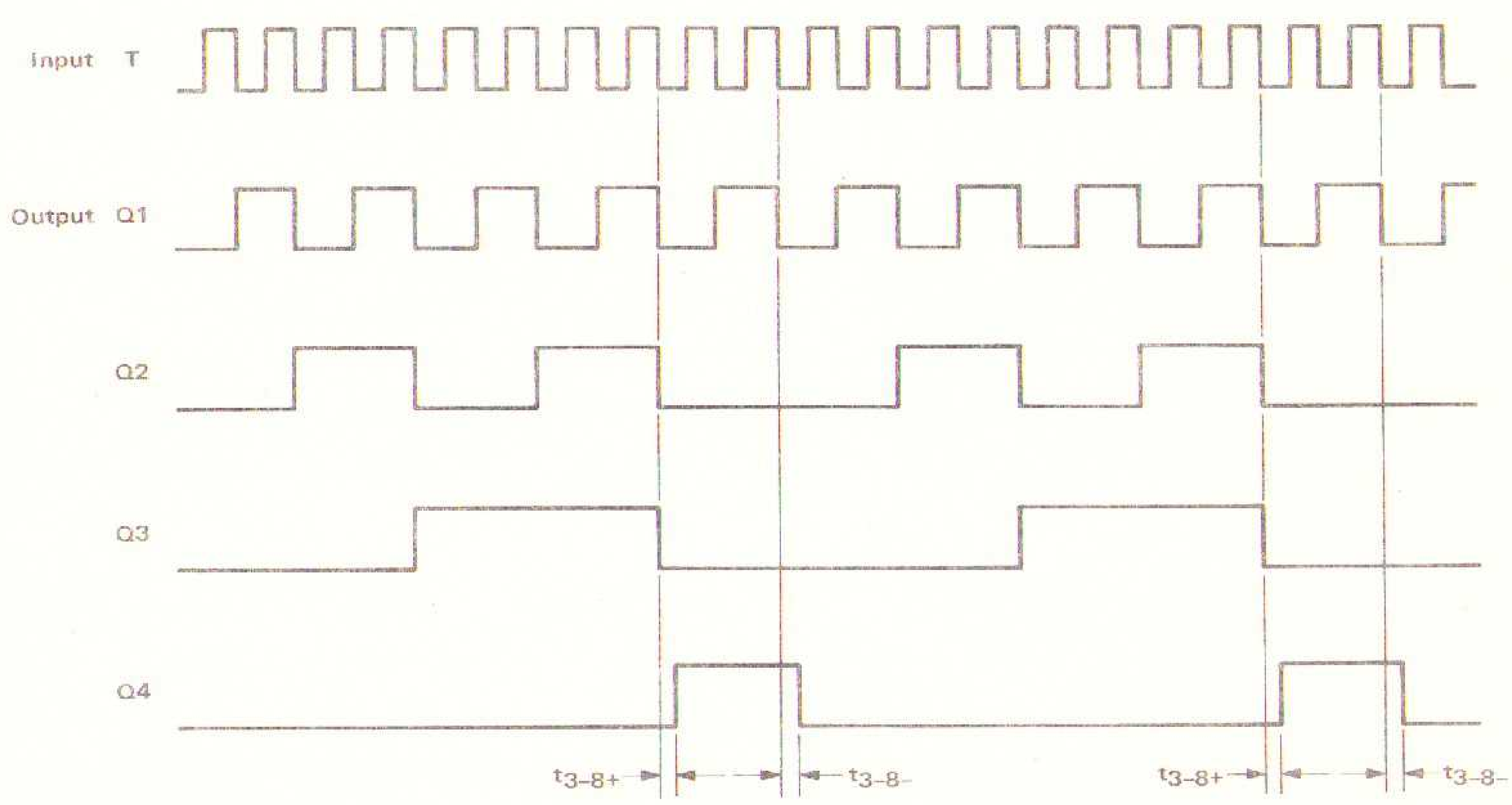
*Apply momentary ground to pin under test prior to measurement of V_{out} on that pin.

SWITCHING TIME TEST CIRCUIT



Any MRTL 3-input gates may be used as load and driving gates.

VOLTAGE WAVEFORMS AND DEFINITIONS



Daten für Entwicklungsmuster

SAJ 110

MAC 6251-08-2D, Ausgabe August 1969

Siebenstufiger Frequenzteiler

Monolitisch integrierte Schaltung in Bipolar-Technik, vorzugsweise zum Einsatz in elektronischen Orgeln. Die Schaltung enthält sieben Flipflops, deren Ein- und Ausgänge herausgeführt sind.

Die Ausgangsspannung jeder Stufe wird über einen Emitterfolger ausgekoppelt, um zu gewährleisten, daß ihre Amplitude weitgehend lastunabhängig ist. Da kein interner Emitterwiderstand vorhanden ist, kann dabei Ausgangsstrom nur in einer Richtung fließen.

Die einzelnen Flipflops können ohne zusätzliche Bauelemente zu einer Teilerkette zusammengeschaltet werden. Einige Stufen sind bereits intern gemäß Bild 2 miteinander verbunden.

Bei Verwendung in elektronischen Orgeln kann der Frequenzteiler SAJ 110 mit Sinus- oder Rechteckspannung angesteuert werden. Die Rechteck-Ausgangsspannung läßt sich mit RC-Filtern zur Änderung des Frequenzspektrums verformen. Diese Filter müssen über Trenndioden, z. B. BA 170, angeschlossen werden, um unerwünschte Rückwirkungen zu vermeiden.

Wenn man durch eine geeignete Schaltung (siehe Bild 3) alle Eingänge und Ausgänge durch einen Impuls mit hinreichend steiler Anstiegsflanke ($t_r < 10\ \mu s$) auf ein Potential < 3 V bringt (siehe Bild 7), bleiben alle Ausgänge in Nullstellung. Das kann für den Einsatz des SAJ 110 in Zählschaltungen von Interesse sein.

Der SAJ 110 wird normalerweise im Dual-in-Line-Kunststoffgehäuse TO-116 geliefert (Zusatz "A" zur Typenbezeichnung, siehe Bild 1a). Auf besonderen Wunsch ist der SAJ 110 jedoch auch in der Ausführung Quad-in-Line lieferbar (Zusatz "B" zur Typenbezeichnung, siehe Bild 1b).

Bild 1a: SAJ 110 "A" im Dual-in-Line-Kunststoffgehäuse TO-116 (Dil)
Gewicht ca. 1 p Abmessungen in mm

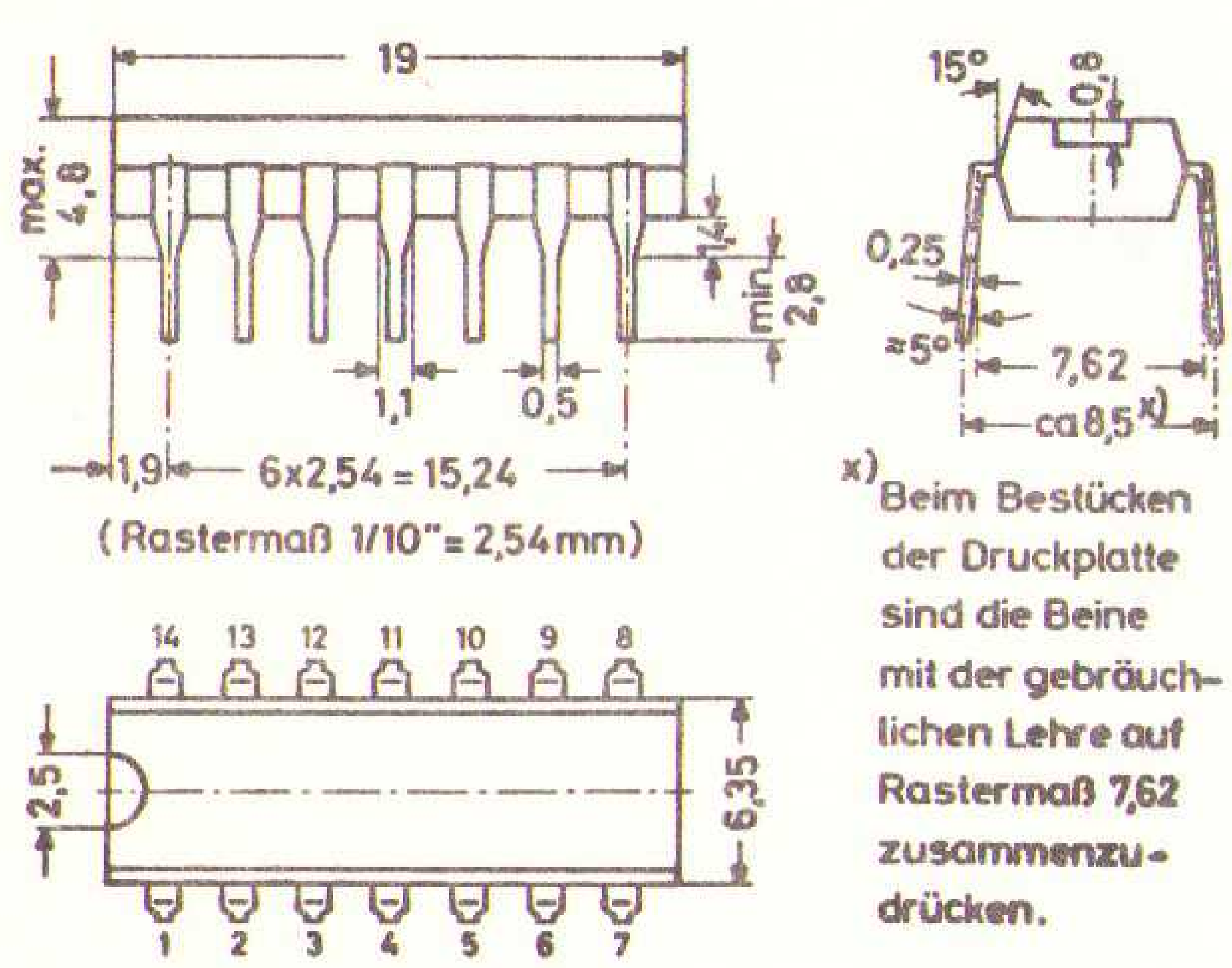


Bild 1b: SAJ 110 "B" im Quad-in-Line-Kunststoffgehäuse (Quil)
Gewicht ca. 1 p Abmessungen in mm

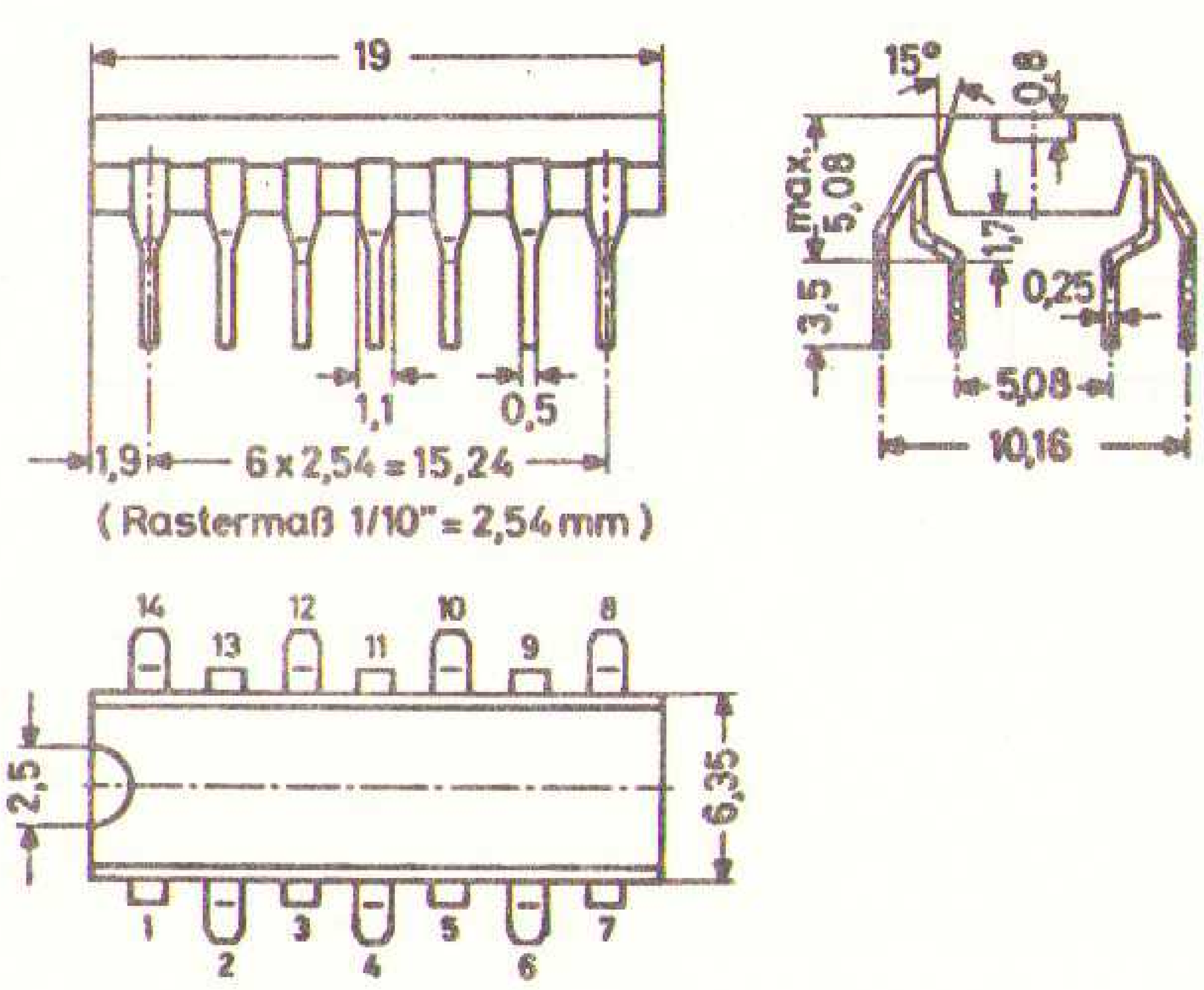
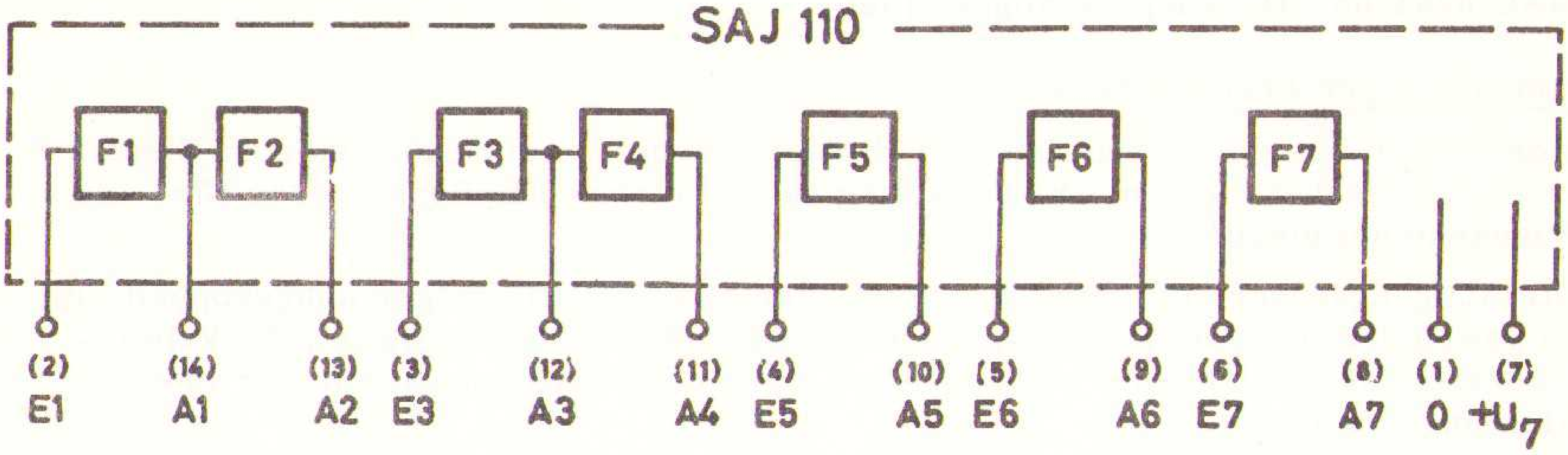


Bild 2: Blockschaltbild des SAJ 110

Die Zahlen in Klammern sind die Anschlußnummern der umstehenden Maßbilder.



Kennwerte bei T_U = 25 °C, U_7 = 9 V, f_e = 1 kHz, $R_{L1} \ldots R_{L7}$ je 2,2 kΩ alle sieben Stufen direkt hintereinandergeschaltet

Stromaufnahme	I_7	30	mA
Umschaltzeit der Ausgangsspannung	t_s	< 0,5	µs
Ausgangswiderstand (offener Emitter!)	r_a	< 100	Ω

Empfohlene Betriebswerte

Betriebstemperaturbereich	T_U	0...60	°C
Betriebsspannung	U_7	9	V
Lastwiderstand für jeden der Ausgänge	R_L	5,6 (> 2,2)	kΩ
höchste Eingangsfrequenz	f_{max}	100	kHz

Bild 3: Rückstellschaltung für Zählanwendungen

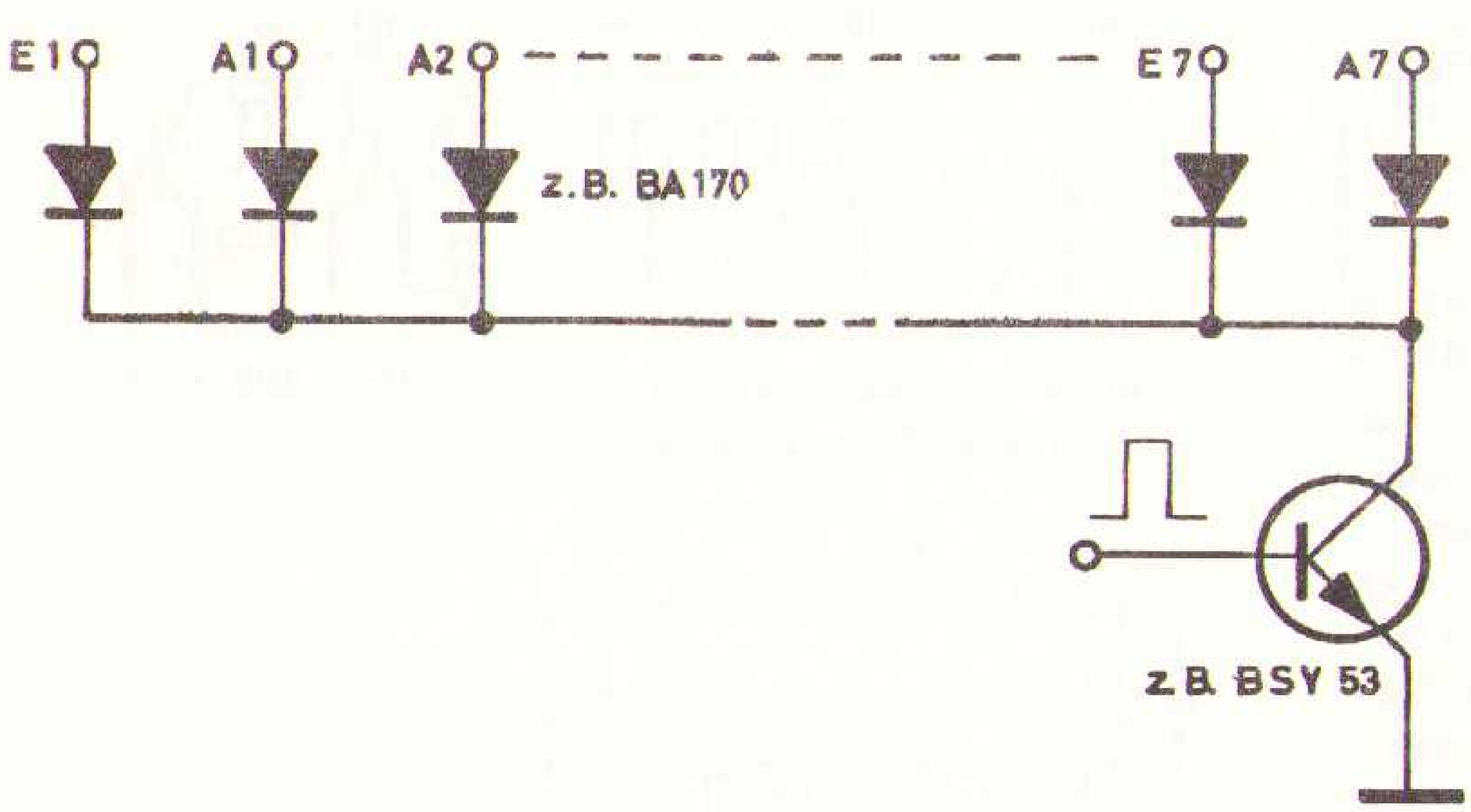


Bild 4: Ausgangsspannung in Abhängigkeit von der Betriebsspannung

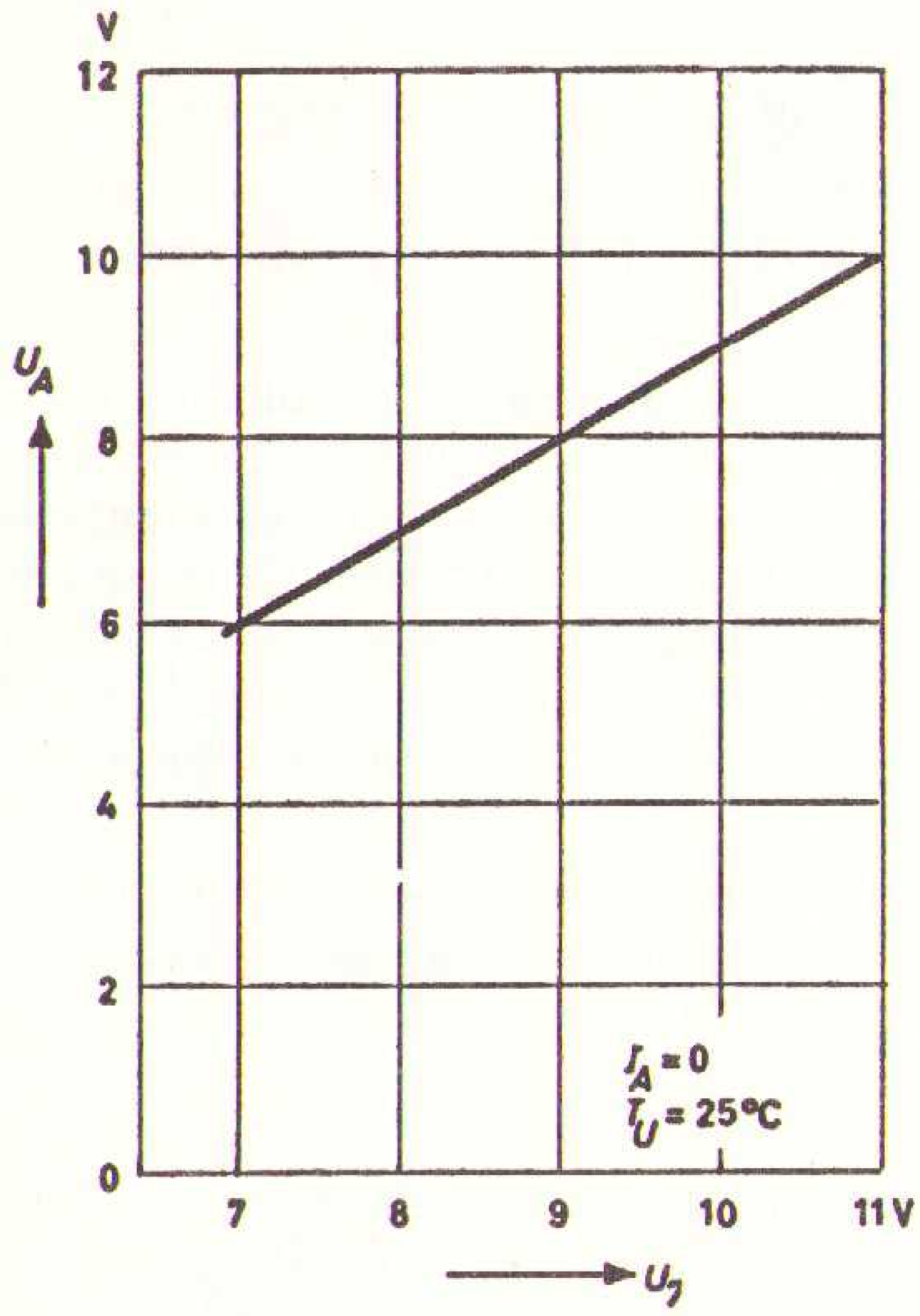


Bild 5: Zulässige Streugrenzen für die Eingangsimpulse in Abhängigkeit von der Betriebsspannung

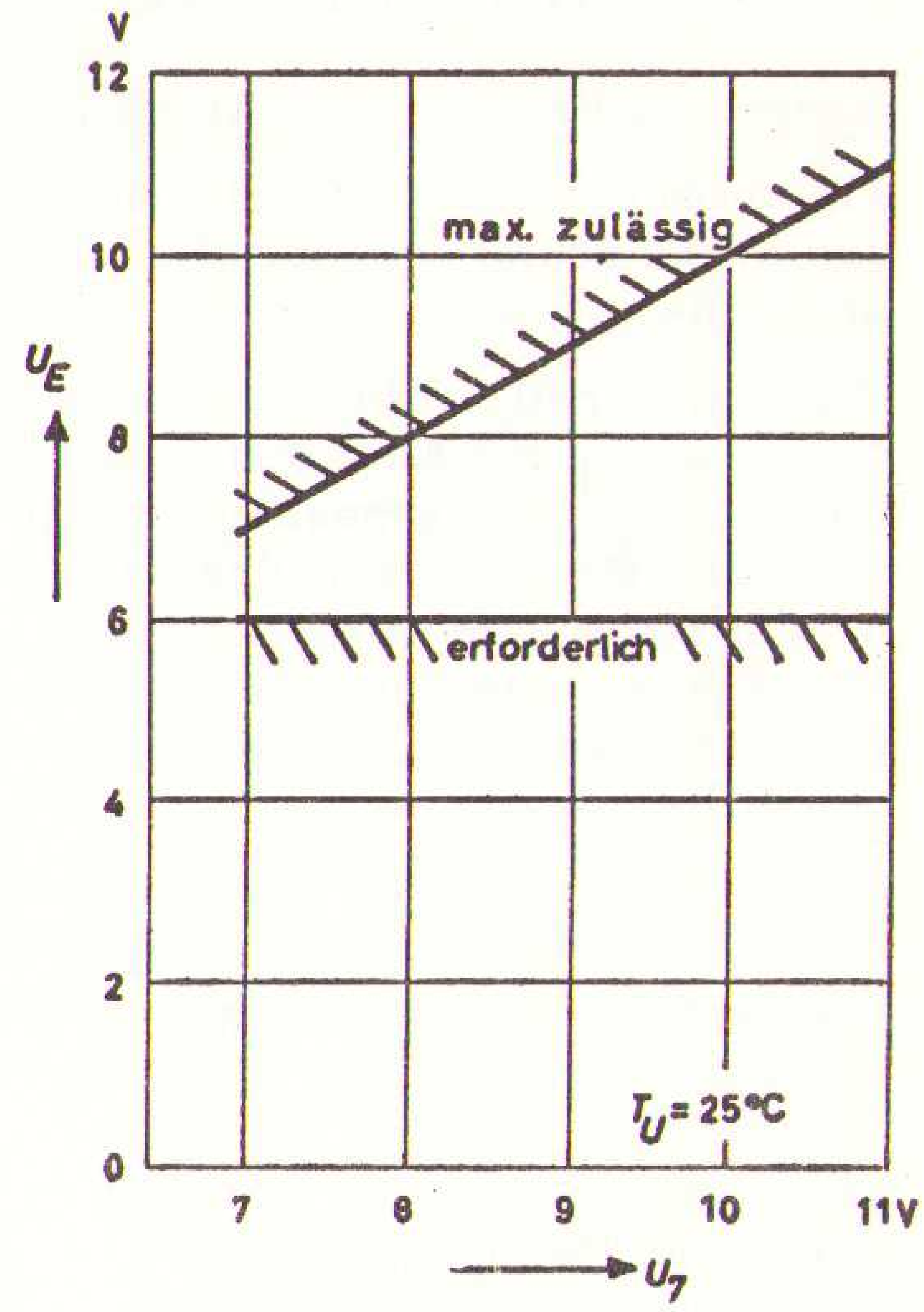


Bild 6: Eingangskennlinie

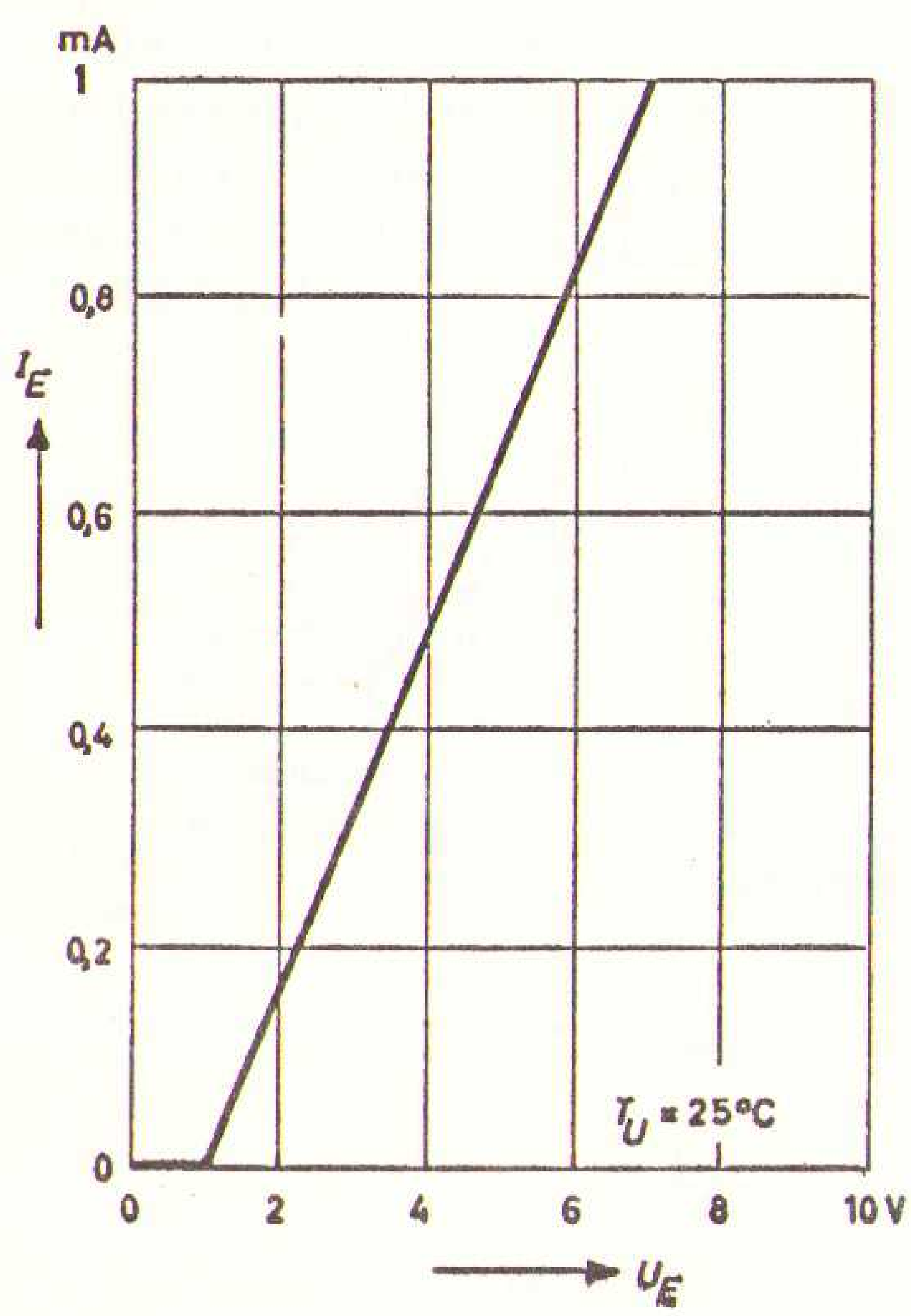
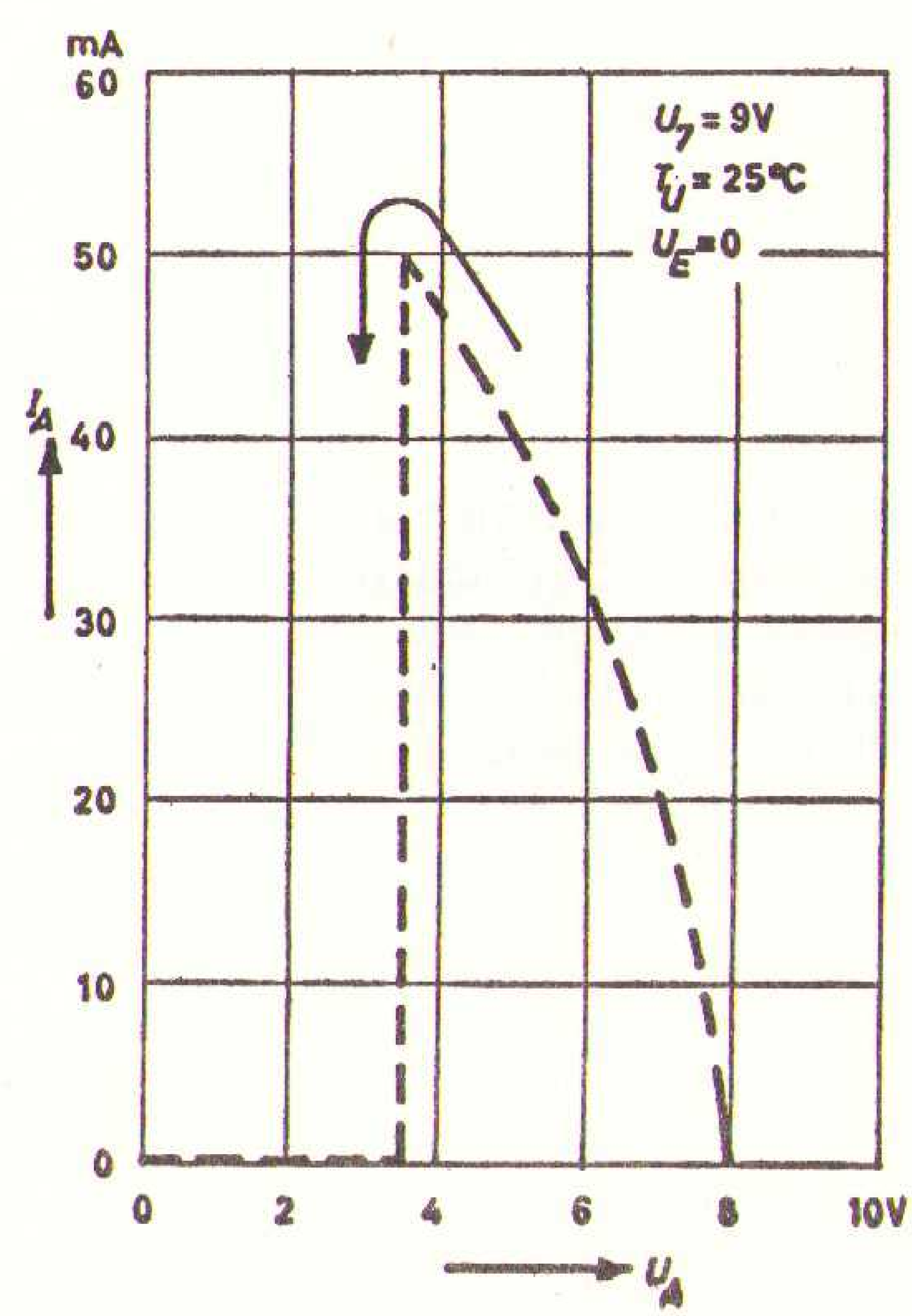


Bild 7: Ausgangsstrom in Abhängigkeit von der Ausgangsspannung (mit Impulsen gemessen



T E N T A T I V E   D A T A

TAA 710

MAC 6251-09-1E, Edition October 1969

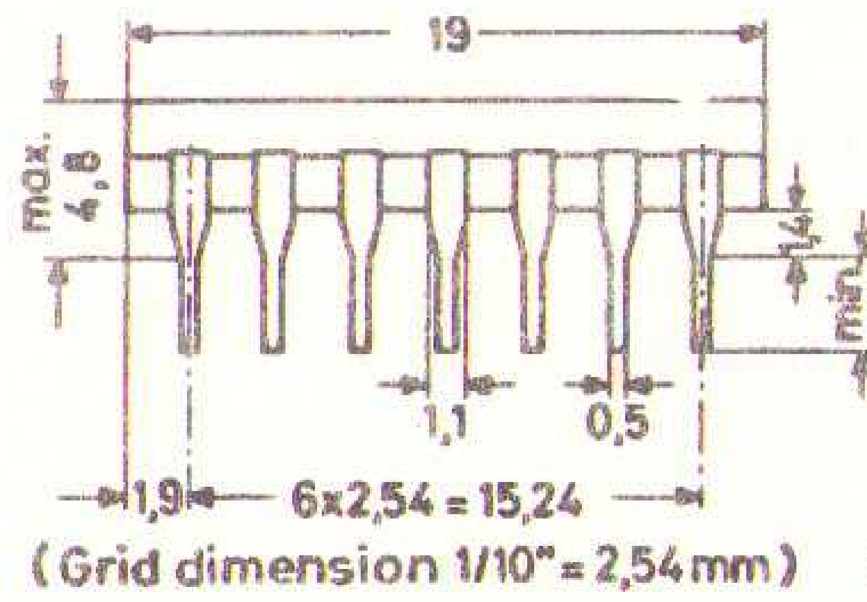
Integrated FM Sound IF Amplifier with Pulse Counting Type Discriminator

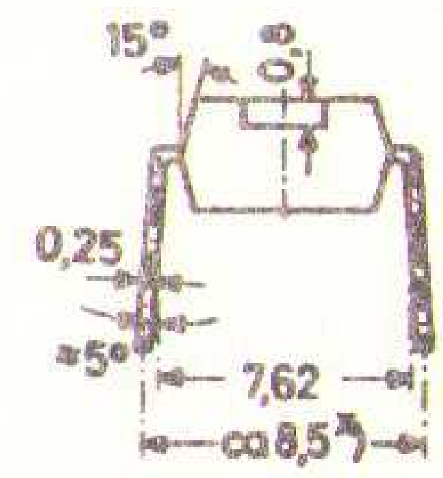
The monolithic integrated sound IF amplifier TAA 710 is designed specifically for use in the sound channel of intercarrier TV receivers. It uses the superheterodyne principle.

The recovered 5.5 MHz signal is fed to the IC through a parallel resonance circuit. Mixed with a 5.7 MHz oscillator voltage, it is converted to a 200 kHz intermediate frequency. This is passed through a low pass filter suppressing undesired signals of higher frequencies. Thereafter, the 200 kHz intermediate frequency is amplified by a limiting amplifier providing a good AM rejection ratio. The signal is then fed into a pulse counting discriminator incorporating the appropriate de-emphasis. The recovered audio signal is amplified by an emitter follower, thus providing a low output impedance.

Normally, the TAA 710 is delivered in the dual-in-line epoxy package TO-116 (Fig. 1a, add suffix "A" to type No.). Upon special request it is also available in the quad-in-line epoxy package (Fig. 1b, add suffix "B" to type No.).

Fig. 1a: TAA 710 "A"
in dual-in-line (Dil)
epoxy TO-116 package
Weight about 1 p
Dimensions in mm





x)To insert the TAA 710 on the printed circuit board, squeeze the connections to a 7.62 mm grid dimension, using a common gauge.

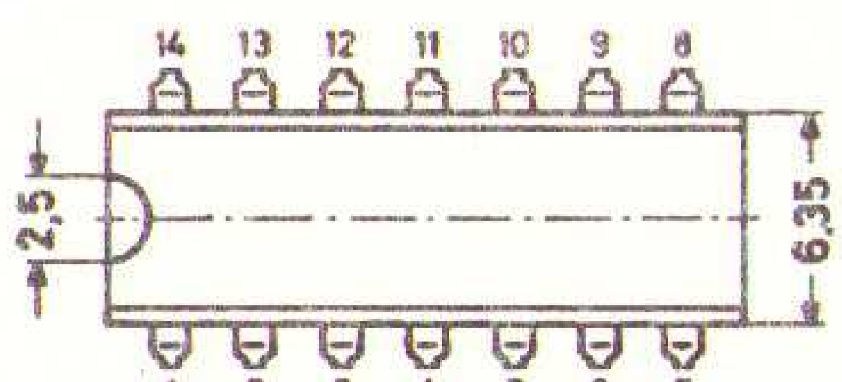
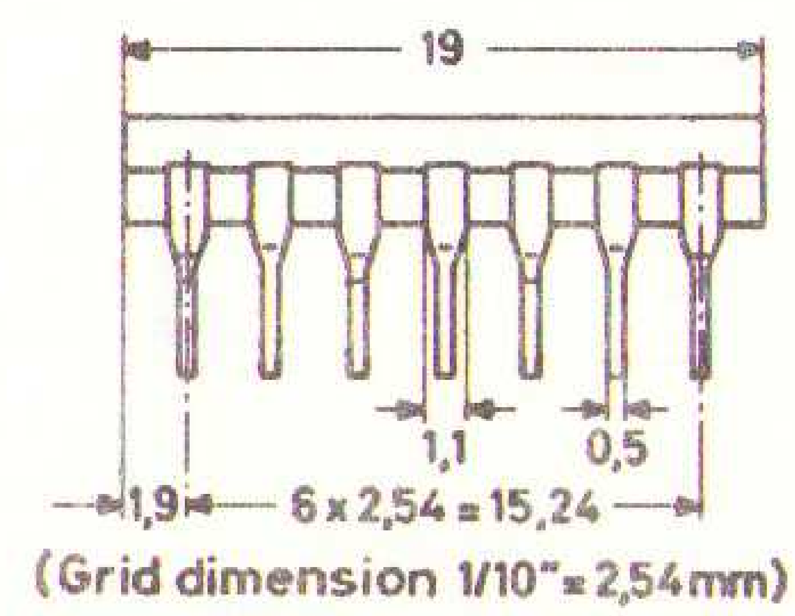
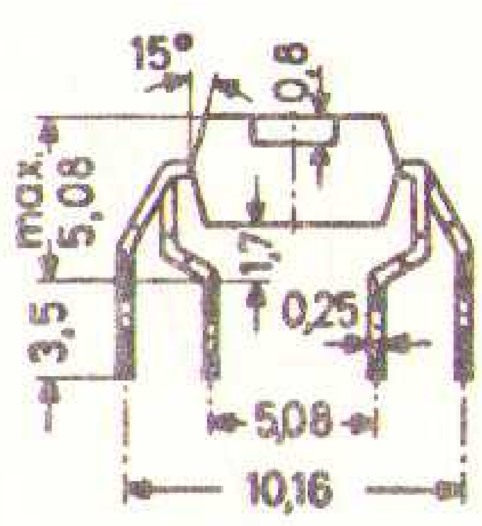
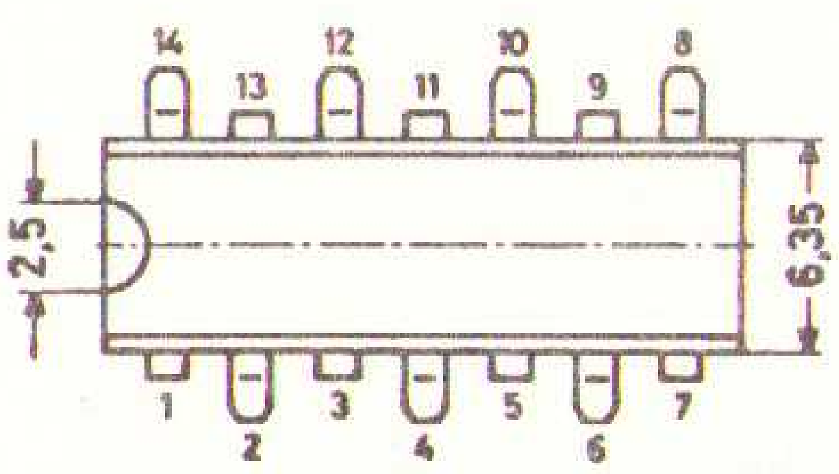


Fig. 1b: TAA 710 "B"
in quad-in-line (Quil)
epoxy package
Weight about 1 p
Dimensions in mm







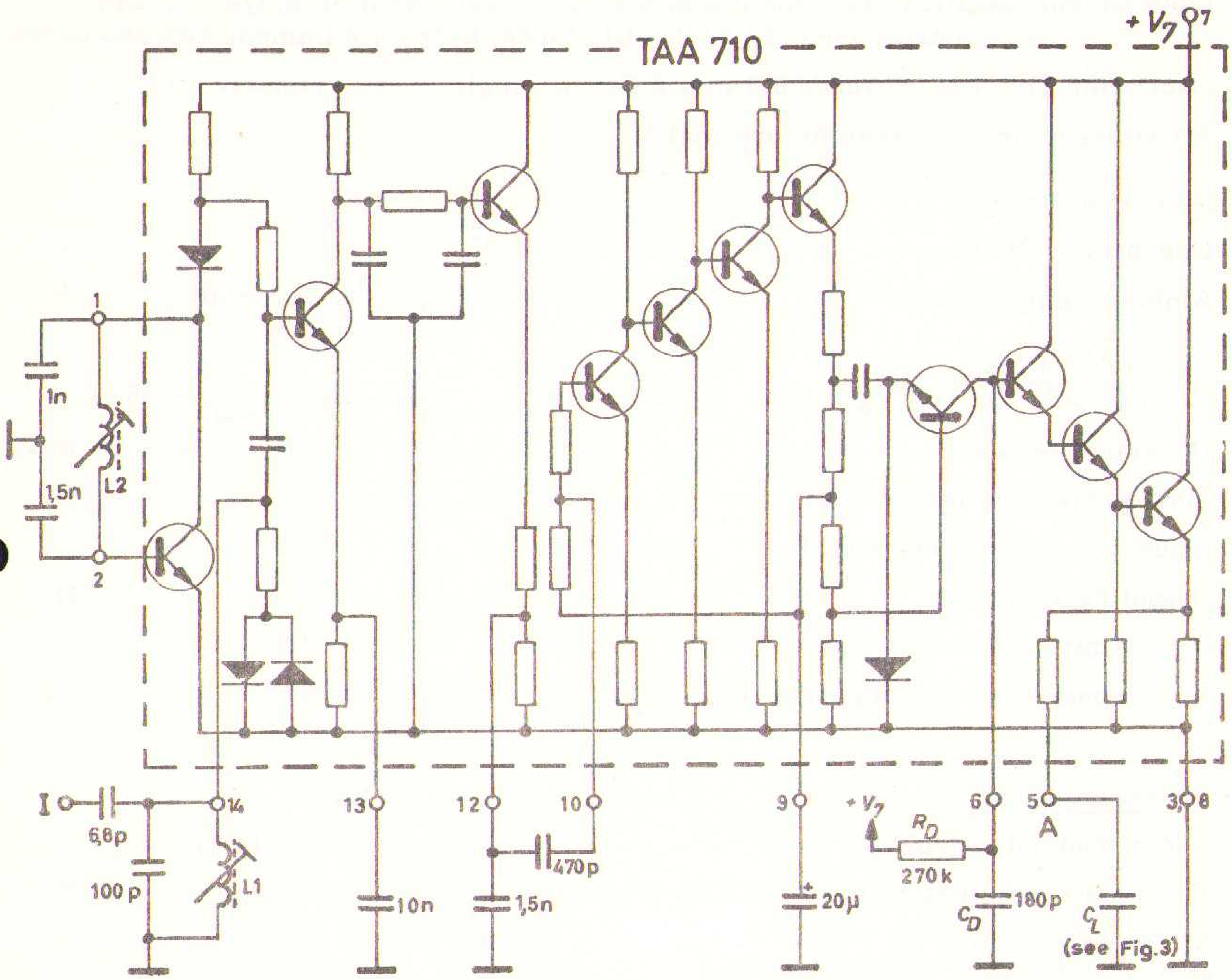


Fig. 2: Circuitry of the TAA 710, including the required external components

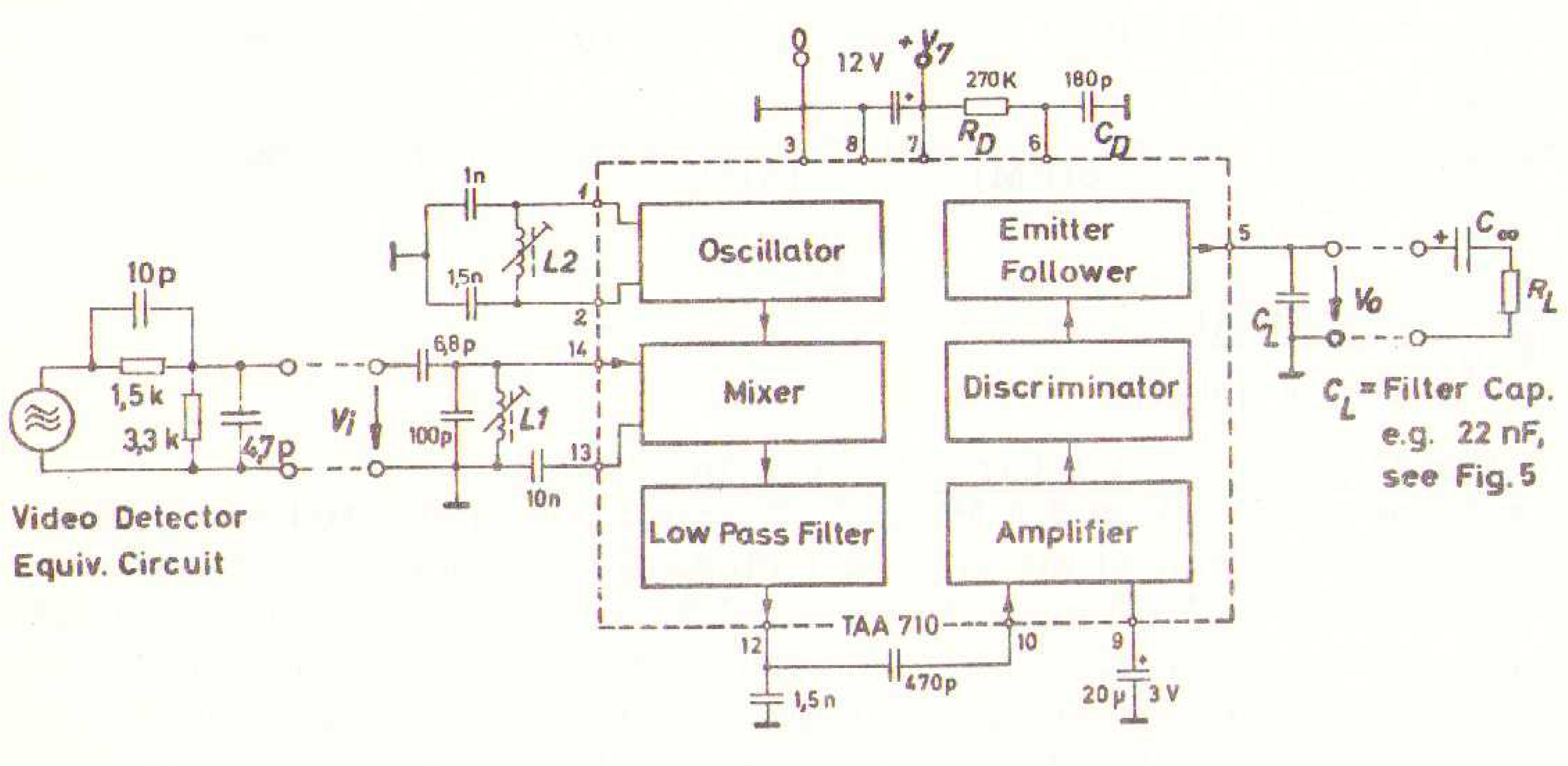


Fig. 3: Block circuit diagram of the TAA 710 with external components, also measuring circuit

Coil Data for Fig. 3: Vogt coil set D 21-1634, thread core GW 4/13 x 0,5
Input Circuit Coil L 1: 24 turns 0.3 mm ϕ CuLS, coil form SP 5,1/8,1/3-846, cap core K 12,7/10 FCI, turns distributed among two chambers

Oscillator Coil L 2: 11 turns 0.3 mm ϕ CuLS, single-layer cylindric coil.

All voltages are referred to terminal 3.

Maximum Ratings

Operating voltage	V_7	15	V
Ambient temperature	T_{amb}	0. . . +60	°C

Characteristics
IC in circuit Fig.3 at V_7 = 12 V, f_i = 5.5 MHz, f_{osc} = 5.7 MHz, T_{amb} = 25 °C

DC supply current	I_7	11	mA
Input resistance (see Fig. 4)	$R_{14/3}$	30	kΩ
Input capacitance (see Fig. 4)	$C_{14/3}$	6.5	pF
Output resistance	$R_{5/8}$	120	Ω
Input limiting voltage [1])	V_i	250	µV
Time constant of de-emphasis ($R_D \cdot C_D$)	τ	50	µs

furtheron, at $\Delta f_i = \pm$ 25 kHz, f_{AF} = 1 kHz, V_i = 1 mV. . . 1 V :

Recovered output voltage	V_{5pp}	1.3 (> 1)	V
Total harm. distortion for Z_L > 5 kΩ (Fig. 5)	k_{tot}	0.35	%
AM rejection ratio [2]) at m = 30 % and $f_{AF(AM)}$ = 800 Hz (see Fig. 6 and 7)	α'	> 40	dB
Ratio signal to (noise+AM) [3]) at m = 30 % and $f_{AF(AM)}$ = 800 Hz, broadband measurement BW = 20 Hz. . . 15 kHz	α	> 40	dB

[1]) Input voltage at which the output voltage is 3 dB down with respect to V_i = 5 mV

[2]) $\alpha' = 20 \log \frac{V'_{o\,(FM)}}{V'_{o\,(AM)}}$ $V'_{o(FM)}$ and $V'_{o(AM)}$ measured selectively

[3]) $\alpha = 20 \log \frac{V_{o\,(FM)}}{V_{o\,(AM\,+\,Noise)}}$

Proposal for the Alignment of the Circuit Shown in Fig. 3
Inject an RF voltage of 100 mV at 5.5 MHz, 30 % amplitude modulated with 1 kHz through the equivalent circuit of the video detector. Connect a DC voltmeter (R_i > 10 kΩ) and an AF millivoltmeter to terminal 5. Screw in the ferrite core of the oscillator coil L 2 until a DC voltage of approx. 4 V appears at terminal 5. The oscillator is thus tuned for an operating point of the discriminator in the middle of its characteristic. Reduce the generator voltage to 2 mV and tune the input circuit coil L 1 so that the 1 kHz output voltage at term. 5 is at a minimum.

Fig. 4: Loci of Input Impedance

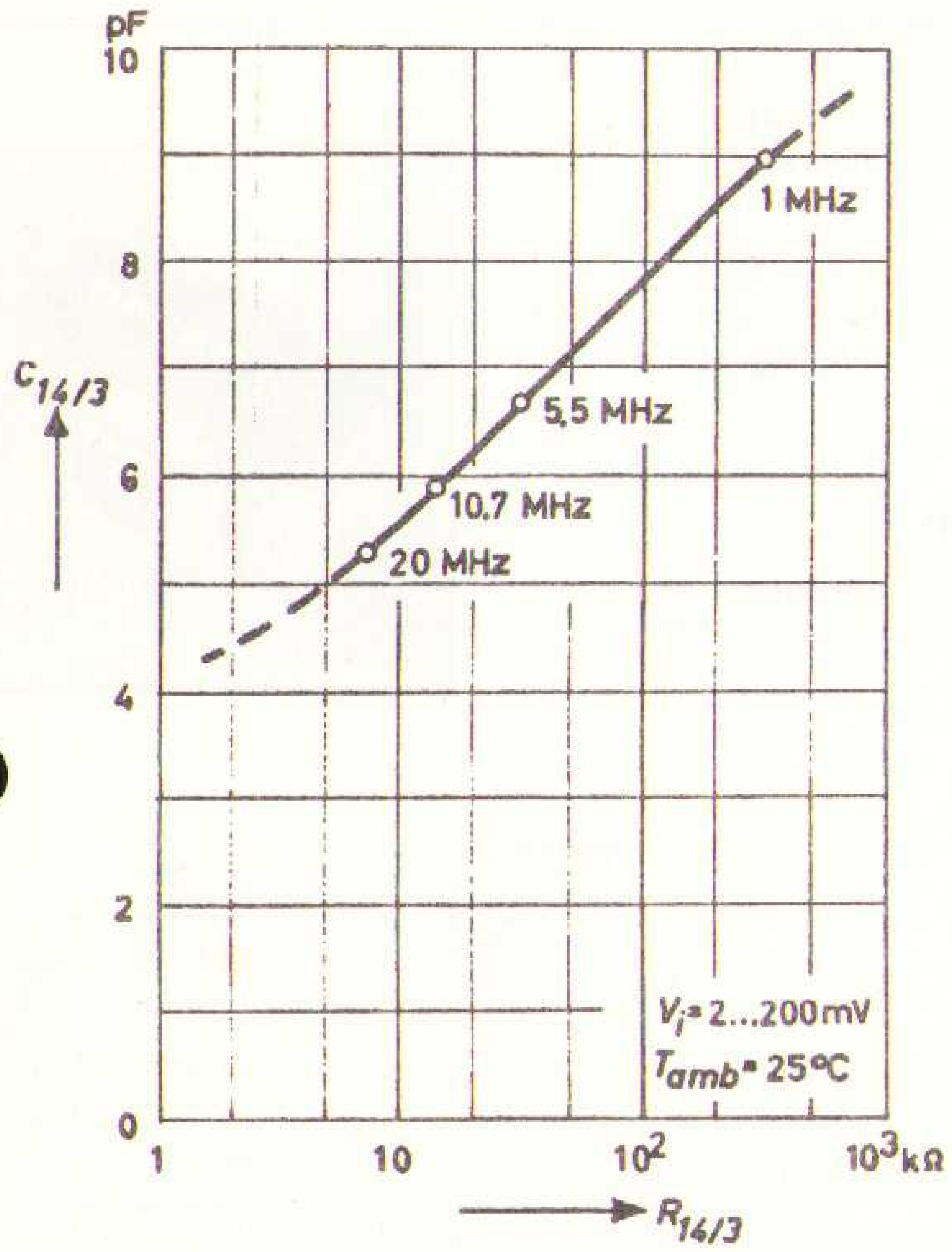


Fig. 5: Total Harm. Distortion versus Load Impedance and Frequency Deviation

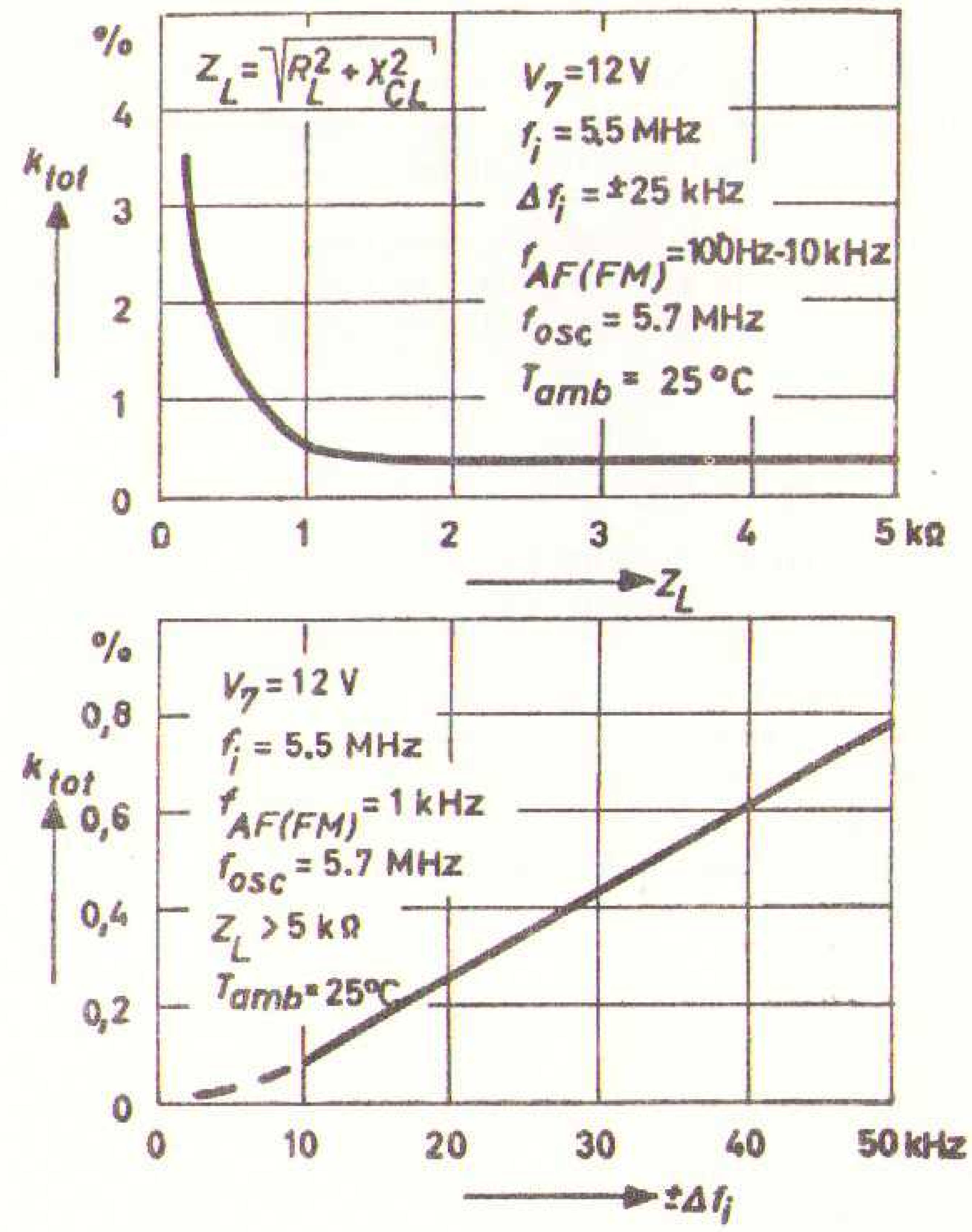


Fig. 6: AM Rejection Ratio versus Input Voltage

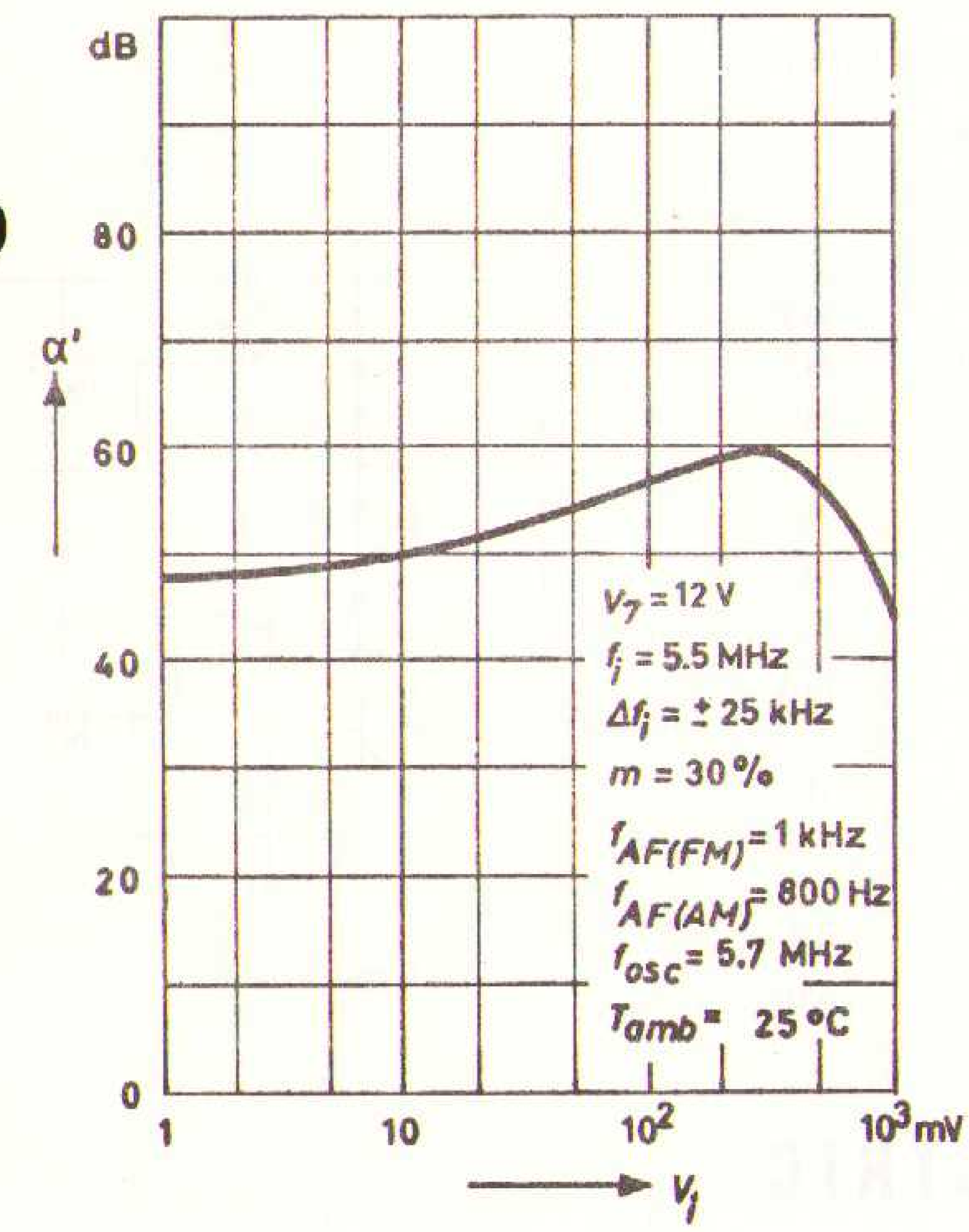
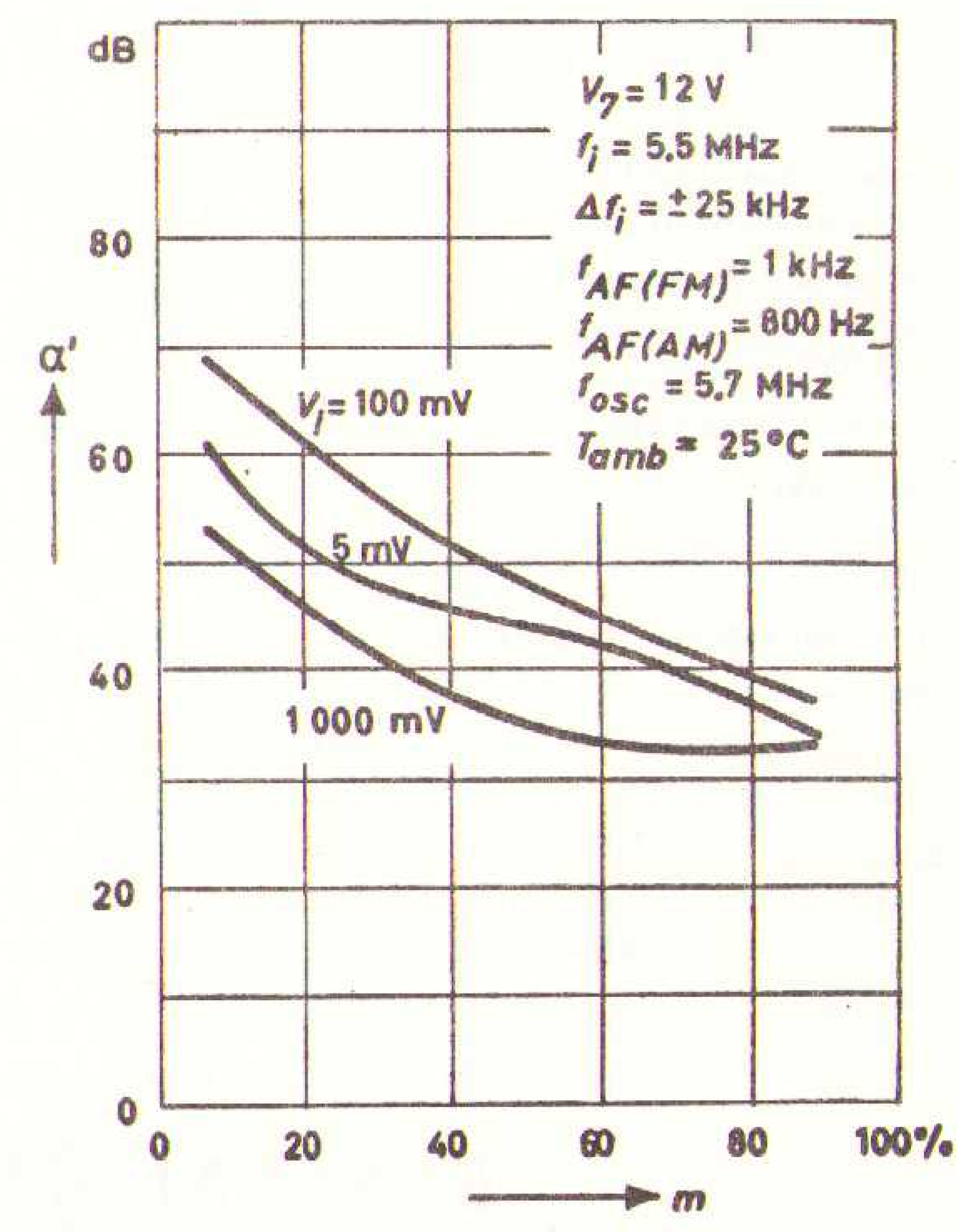


Fig. 7: AM Rejection Ratio versus AM Modulation Factor



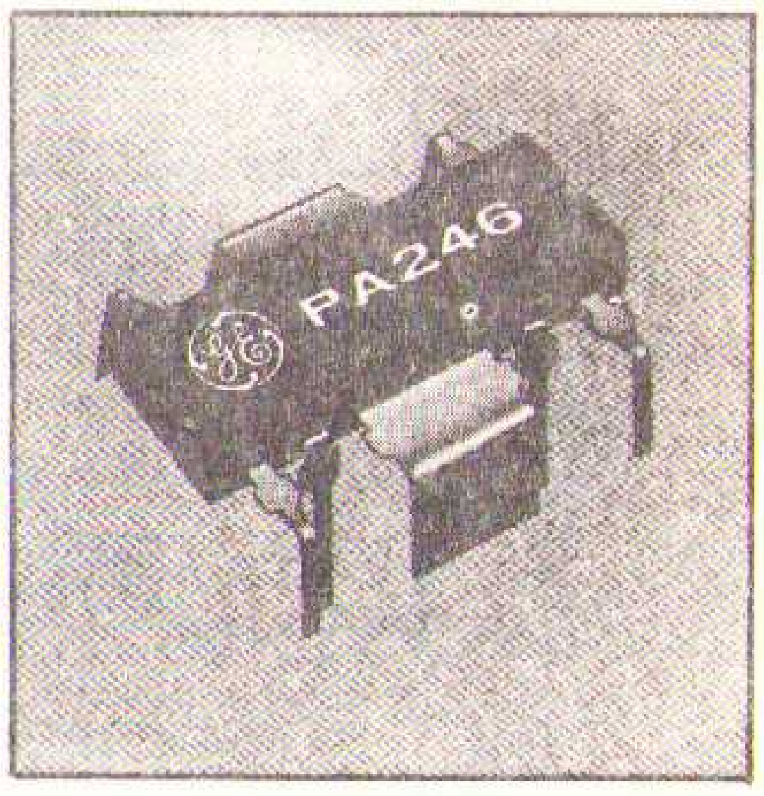
ELECTRONIC INNOVATIONS IN ACTION
SEMICONDUCTORS

Integrated Circuit
5-Watt Power Amplifier

PA246

The General Electric PA246 is a monolithic power amplifier designed to deliver 5 watts of continuous power to a 16-ohm load. It can, however, be operated from a wide variety of supply voltages and load impedances, thereby providing user versatility.

The PA246 is housed in a specially designed power package having 8 leads plus two heat sink tabs. The leads are staggered to allow proper printed circuit board design and external heat sinking can be readily attached to the tabs during the flow soldering of the PC board.

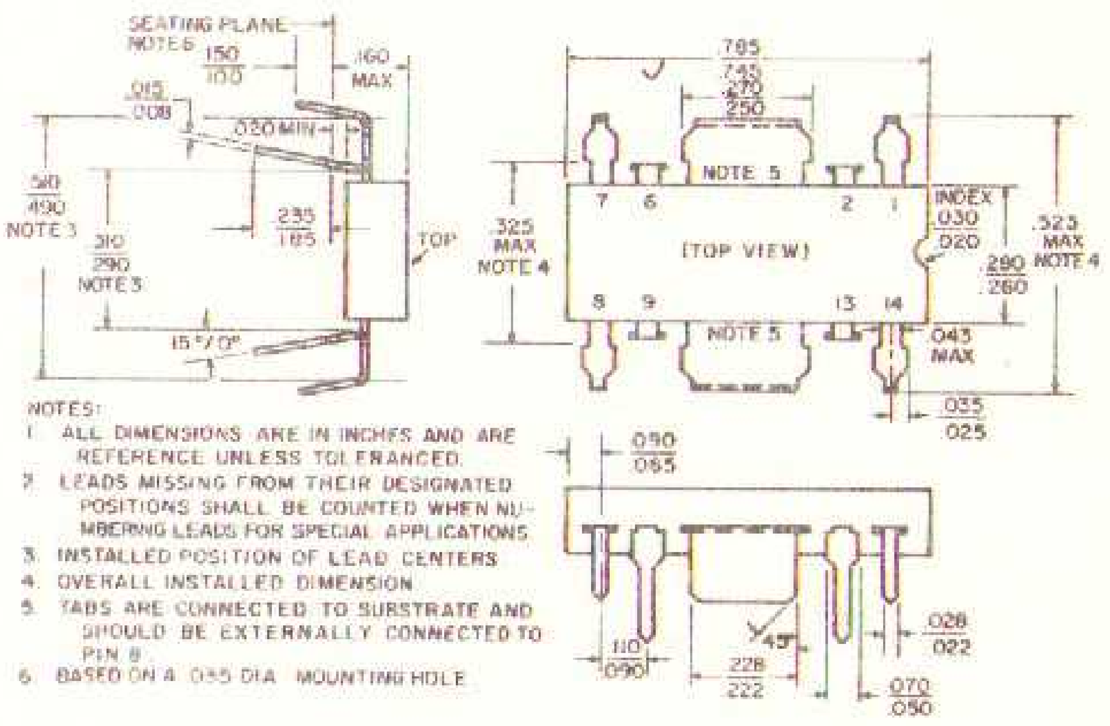


FEATURES

- 5 Watt rms Output, 10 Watt Peak
- Staggered Lead Plastic Package
- High Sensitivity
- −55°C to +125°C Operating Temp.
- Usable Power from a Wide Range of Power Supply Voltages and Load Impedances
- High Output Voltage Swing: 30 Volts Peak-to-Peak

APPLICATIONS

Monaural & Stereo Phonographs
Tape Players/Recorders
Intercoms
FM, AM & TV Receivers
Movie Projectors
Servo Amplifiers
Op Amp Boosters



Package Outline

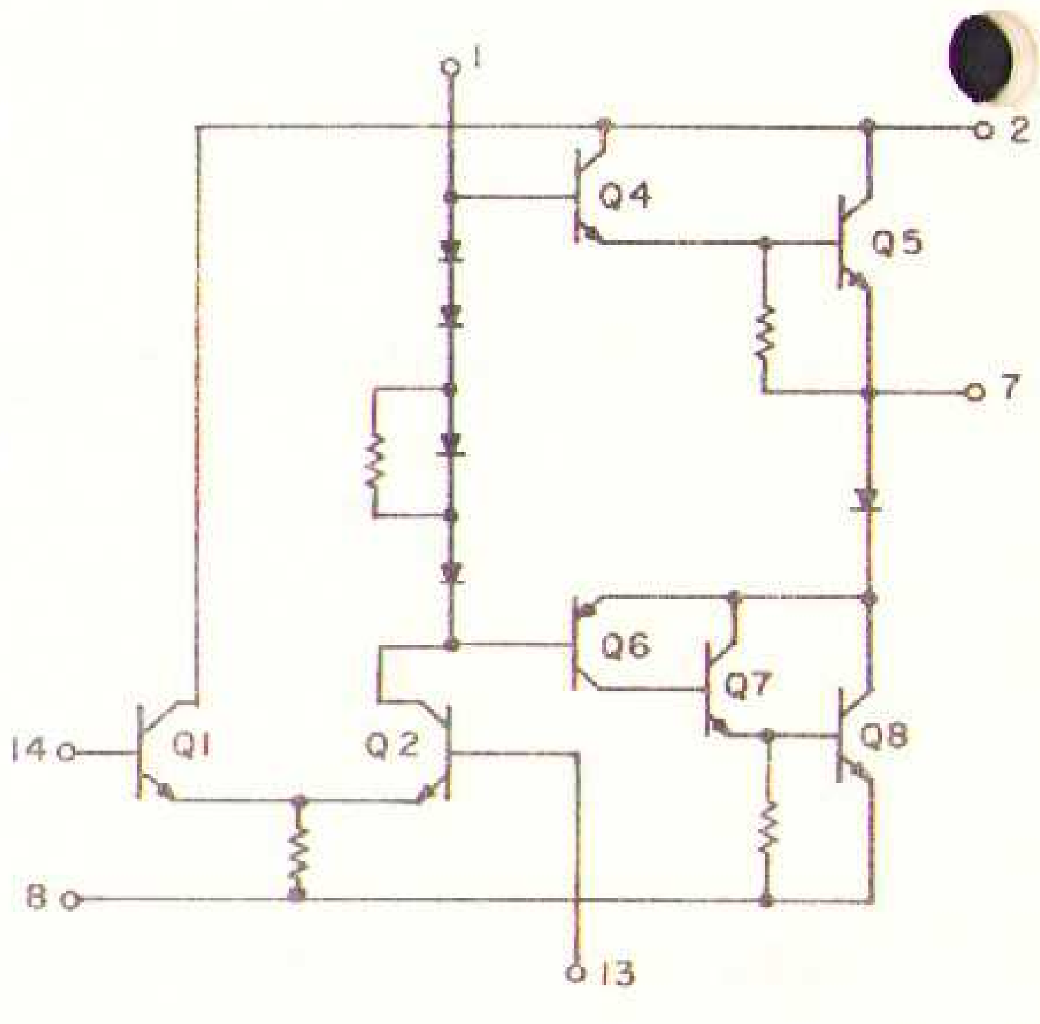
maximum ratings: (25°C)

Supply Voltage	37	Volts
Output Current (peak)	1.25	Amp
Package Dissipation (Tabs at 70°C) (Derate 11°C/W above 70°C)	5	Watts
Temperature		
Storage	−65 to 150°C	
Operating	−55 to 125°C	

electrical characteristics: (25°C) (34V supply in Test Circuit)

	Min.	Typ.	Max.	
Audio Power Output (continuous) (<5% total harmonic distortion)	5.0			Watts
Input Voltage for P_o = 5 watts*				
($R_6 = 0$)		12		mV
($R_6 = 6.8k$)		180	200	mV
Efficiency (P_o = 5 watts)		58		%
Distortion at 1 kHz*				
(5 watts P_o)		0.7	5	%
(0.05 watts P_o)		0.5	2	%
Output Quiescent Voltage* (pin 7)		17		V
Quiescent Current	3	10	20	mA
Frequency Response* (± 3 dB at P_o = 2.5W)		30 to 100k		Hz
Noise Output Level Relative to 5 watts output (Input open) BW = 30 Hz to 100kHz		−70		dB
Output Impedance*		0.6		ohms

*Performance is determined by external components used in the test circuit.



Circuit Diagram

GENERAL ELECTRIC

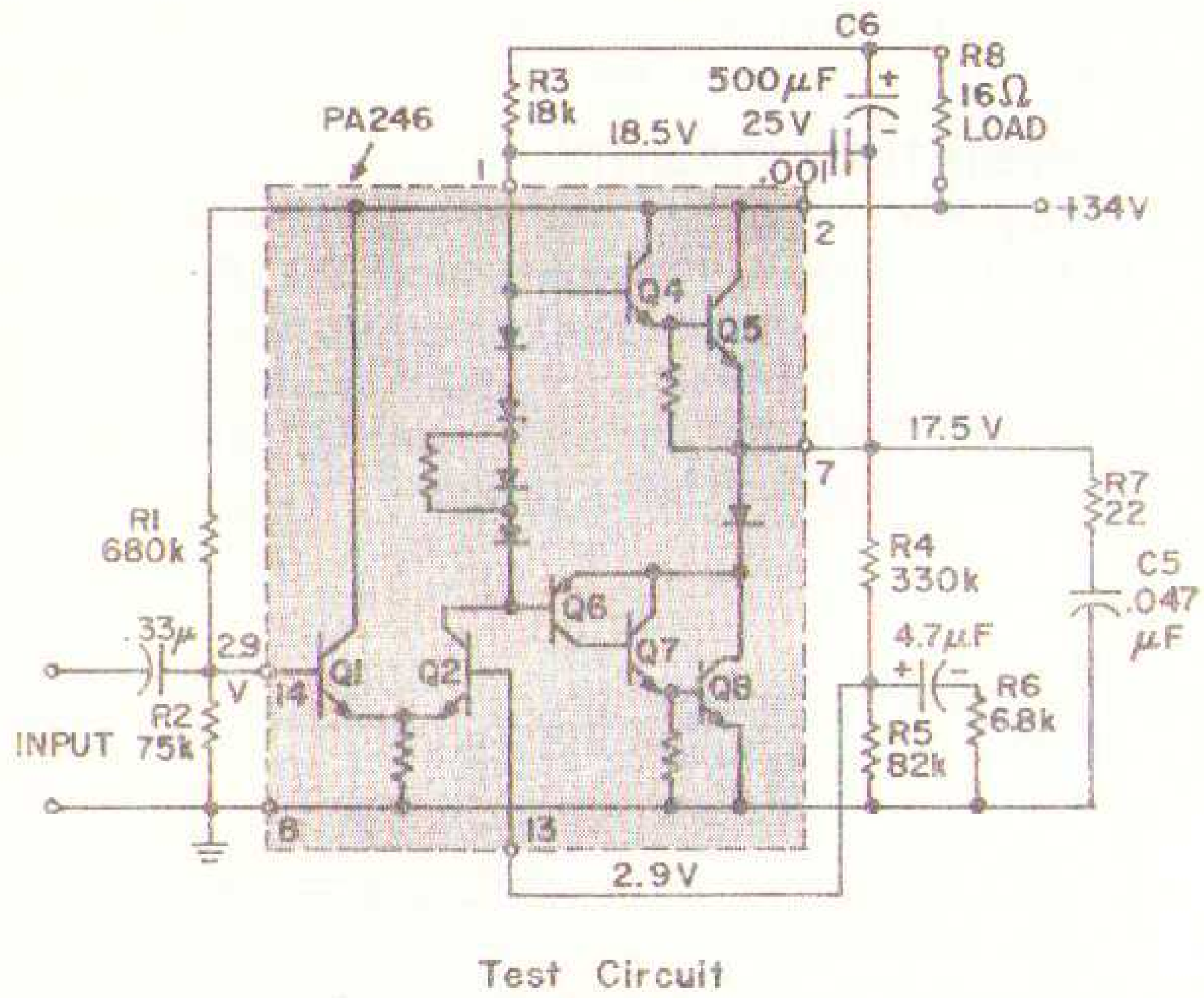


Figure 1. 5-Watt Power Amplifier Test Circuit

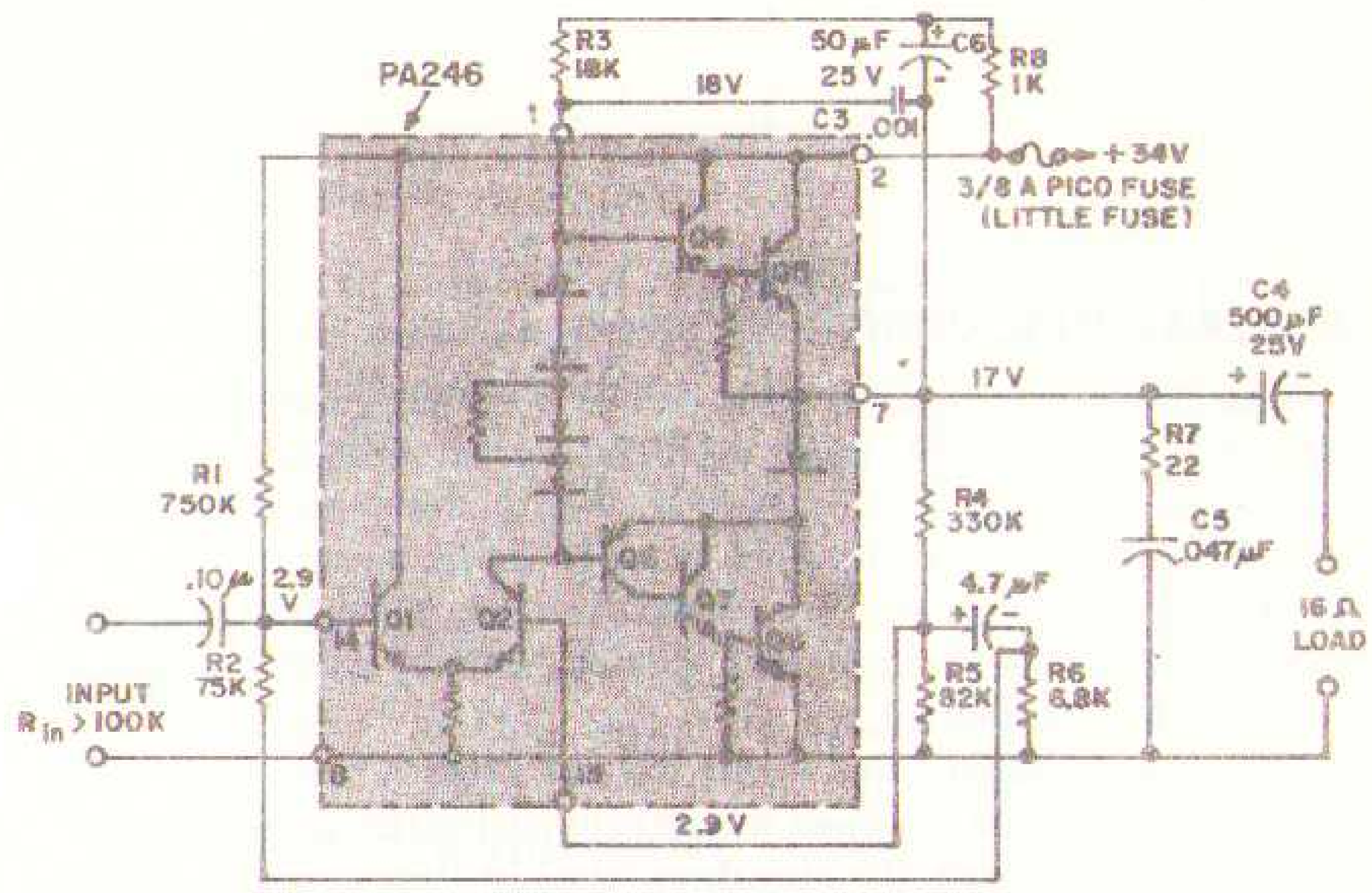


Figure 2. Circuit Modified for Grounded Load and Input Bootstrapping

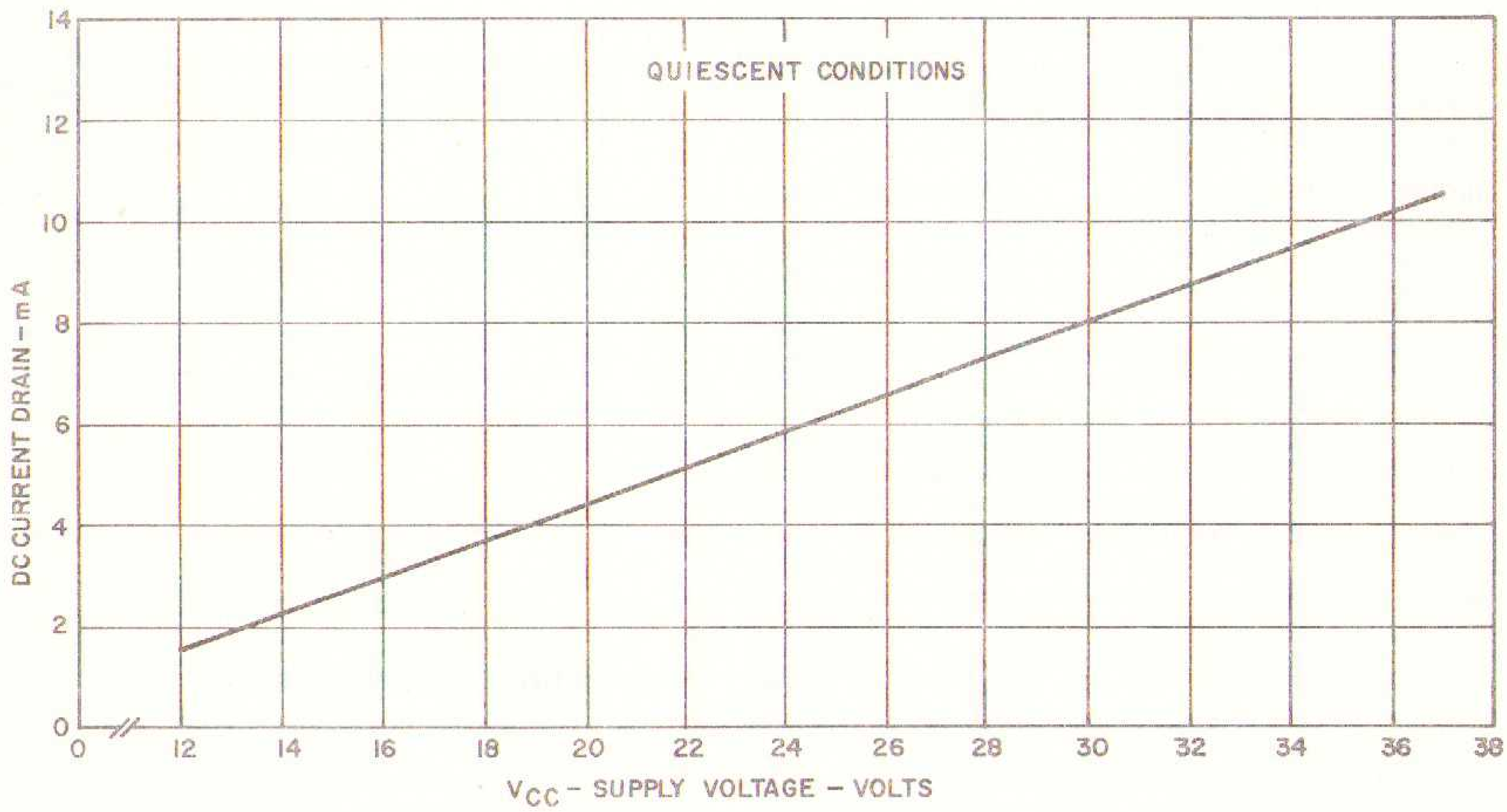


Figure 3. DC Current Drain vs. Supply Voltage

5-WATT POWER AMPLIFIER

GENERAL DESCRIPTION

The PA246 monolithic amplifier is a general purpose power driver for use in consumer and industrial systems requiring up to five watts of power output. While the primary application of this device is intended to be in audio equipment, it will be found useful also as a voltage supply regulator, servo motor driver, relay and lamp driver, and op amp booster, to name a few examples.

In order to deliver five watts output from a monolithic chip, General Electric developed an improved plastic package based on a modification of the standard dual-in-line package (DIP). This new package contains two heat sink tabs and eight leads in a staggered arrangement. The staggering of leads provides a spacing of 140 mils between mounting holes. The two tabs extend from each side of the package, along with the leads, and are made of copper for good heat transfer. The tabs can be readily attached to an external heat sink during the flow solder run of the printed circuit board used for mounting.

The power device will operate from a wide range of supply voltage up to 37 volts and can drive a wide range of loads with up to 1.25 amps peak. The five watt rating is based on a 34 volt supply and a 16-ohm load operating in Test Circuit of Figure 1. Under other conditions, power output can be found from Figures 7, 8, 9.

CIRCUIT CONFIGURATION

The circuit consists of a differential pair at the input which provides the total amplifier gain followed by an emitter follower output stage. The output is a quasi-complementary push-pull circuit composed of a composite NPN transistor formed by Q_4, Q_5 and a composite PNP transistor formed by Q_6, Q_7, Q_8. The bias current in the output is determined by the current which flows through the diode string at the collector of Q_2. By means of matching the forward voltage drop of the output base-emitter junctions to the diode string, sufficient quiescent current will flow to insure elimination of crossover distortion. The diode in the emitter of Q_5 acts to provide uniform dc bias from unit to unit and to supply ac degeneration. Standby current is low, typically 10 mA, and operation is essentially class B. Figure 2 shows the variation of dc current drain with supply voltage.

The input differential stage can be biased using conventional operational amplifier techniques. The base voltage of Q_1 is set by the voltage divider R_1, R_2. The feedback network of R_4, R_5 determine the dc output voltage at pin 7 so that the base voltage at Q_2 equals the voltage at pin 14. The circuit resistors are chosen to keep pin 7 voltage at ½ the supply voltage. The resistor in the emitters of Q_1, Q_2 then sets the bias current level at the input stage.

The open loop ac gain depends upon the value of R_3 which is external to the amplifier. The closed loop gain is set by the ratio of R_4/R_6. Amplifier stability is maintained by a roll off capacitor connected between pins 1 & 7. Positive feedback is provided by means of C_6 & R_8 in order to have sufficient drive on the positive peak swing of the output.

The amplifier is recommended to be used in either of the circuit configurations shown in Figure 1 and Figure 2. The specified values are based on the circuit of Figure 1 which shows the load connected to the power supply terminal. Figure 2 shows the load when it must be tied to ground and the addition of two extra components in order to accomplish this. Also, input bootstrapping is illustrated for raising the input impedance to over 100K. Power performance will be the same for both circuits.

TEMPERATURE STABILITY

Amplifier operation over temperature extremes is illustrated in Figure 4. The curves show the effect of temperature on quiescent current, output quiescent voltage, gain, and distortion. Good temperature stability is maintained because the monolithic structure contains matched transistors and diodes that track with ambient changes.

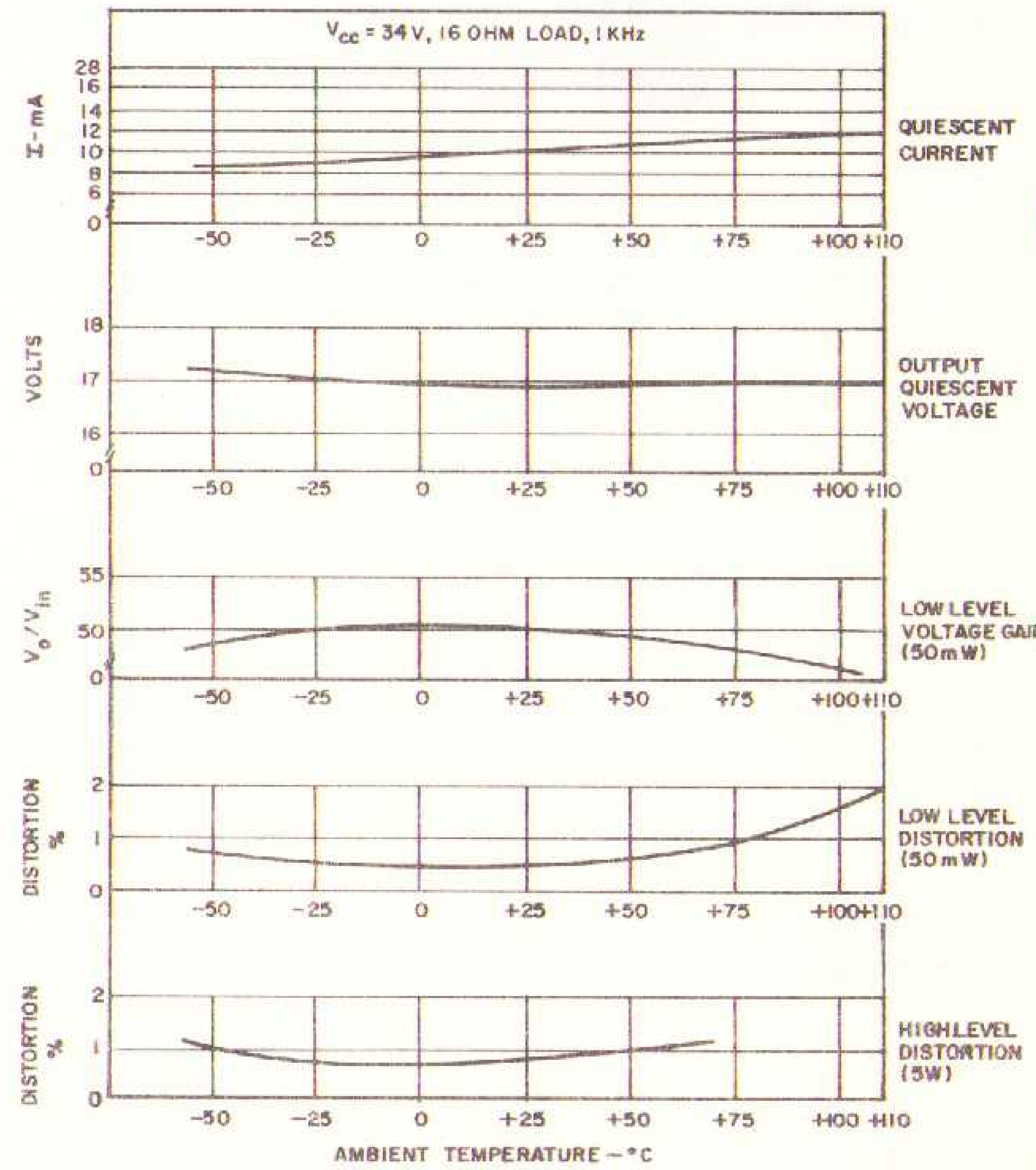


Figure 4. Stability of Performance Characteristics with Ambient Temperature

DISTORTION PERFORMANCE

Disortion is kept low by means of the ac feedback network shown in Figures 1 and 2 and by the circuit biasing arrangement that eliminates any crossover discontinuity. The typical total harmonic distortion (THD) at full power over the audio range is given in Figure 5. The increase of distortion at the frequency extremes as shown depends upon the external circuit elements rather than on the PA246 device. The frequency range can be improved at the low end by using larger coupling capacitors C_1, C_4 and at the high end by increasing the roll-off as determined by C_3, R_7, C_5.

Typical distortion at different power output levels is shown in Figure 6. Both THD and intermodulation distortion are presented.

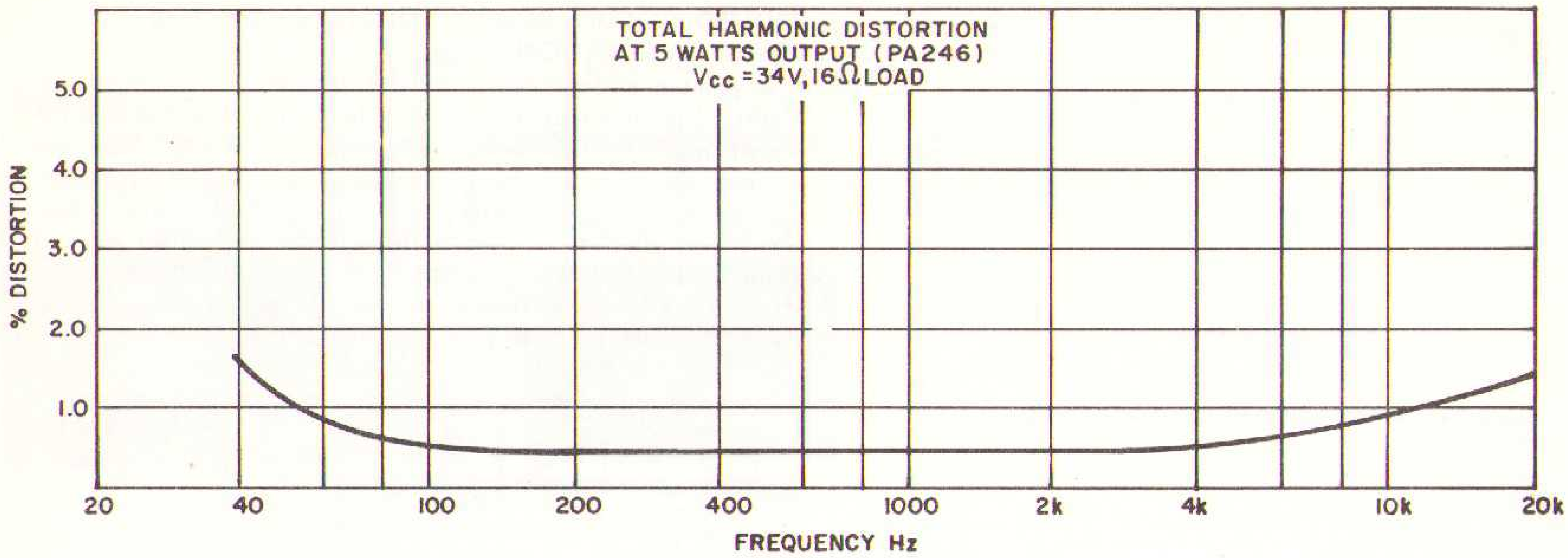


Figure 5. Typical Distortion Over the Audio Range

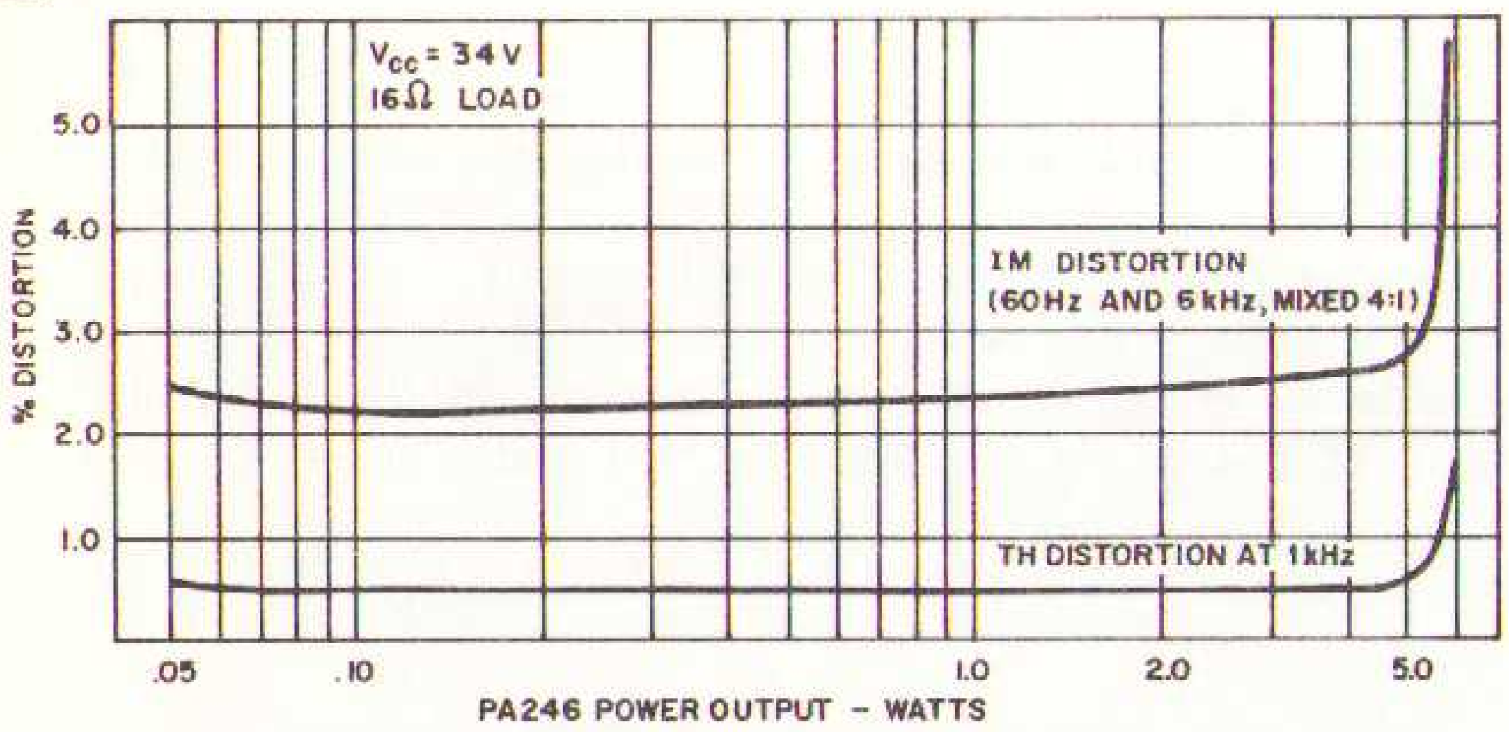


Figure 6. Typical Distortion vs. Power Output Level

POWER OUTPUT FOR DIFFERENT LOADS & SUPPLY VOLTAGES

The PA246 is rated at 5 watts output when operated into a 16-ohm load at 34 volts supply voltage. For operation at other supply voltages, a graph is presented in Figure 7 to show available power output and the corresponding device dissipation. The dotted line indicates the points of maximum available power for 3% THD which is approximately the onset of clipping. For each voltage curve there is a point of maximum power dissipation which occurs for some output power below the maximum level. The heat sink requirements are based on this maximum dissipated power as will be shown later.

Operating conditions at different voltages for 8-ohms and 22-ohm loads are given in Figures 8 and 9. Power output for the 22-ohm load falls under 5 watts in order to stay within the device voltage ratings.

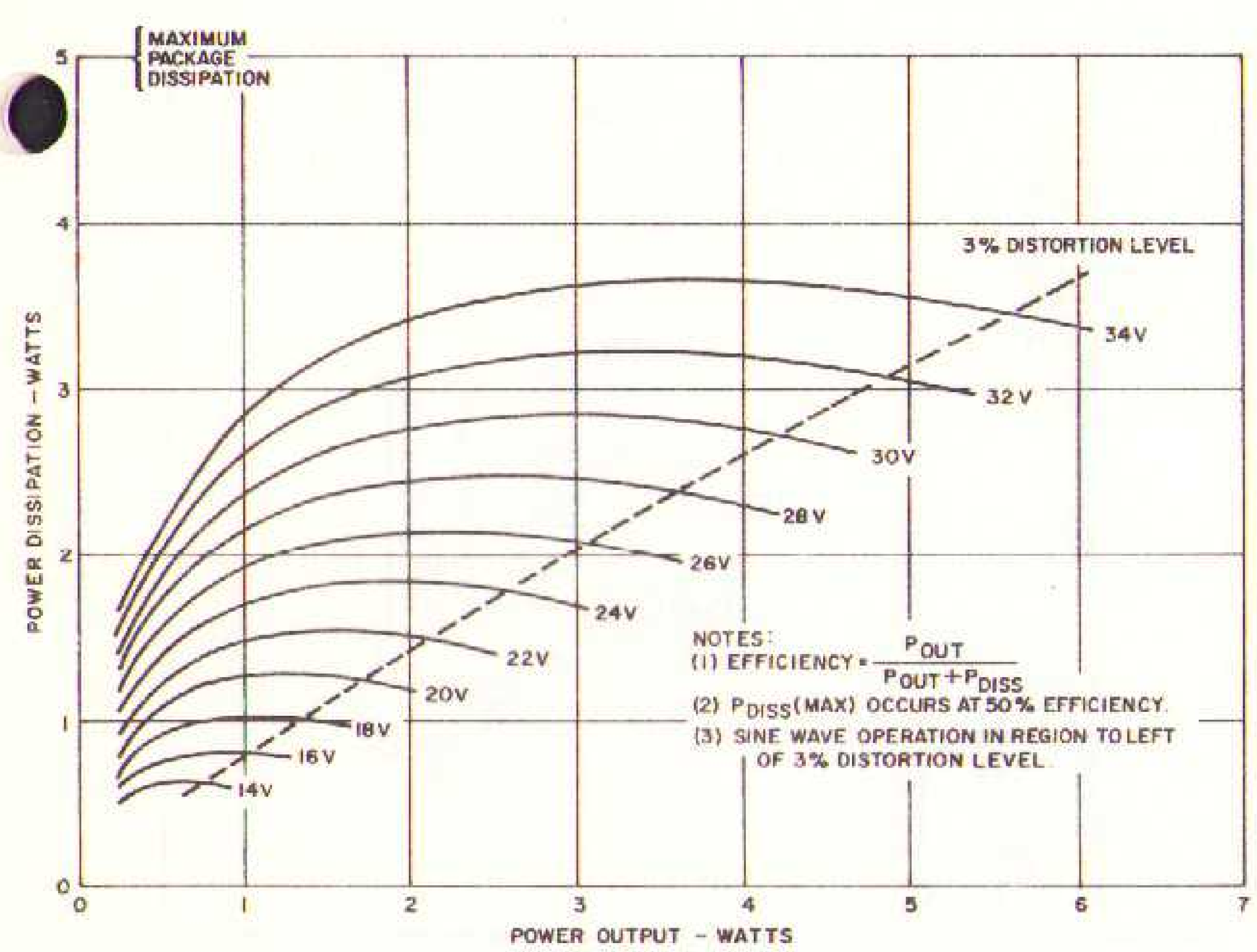


Figure 7. Internal Dissipation vs. Power Output Delivered to a 16-ohm Load

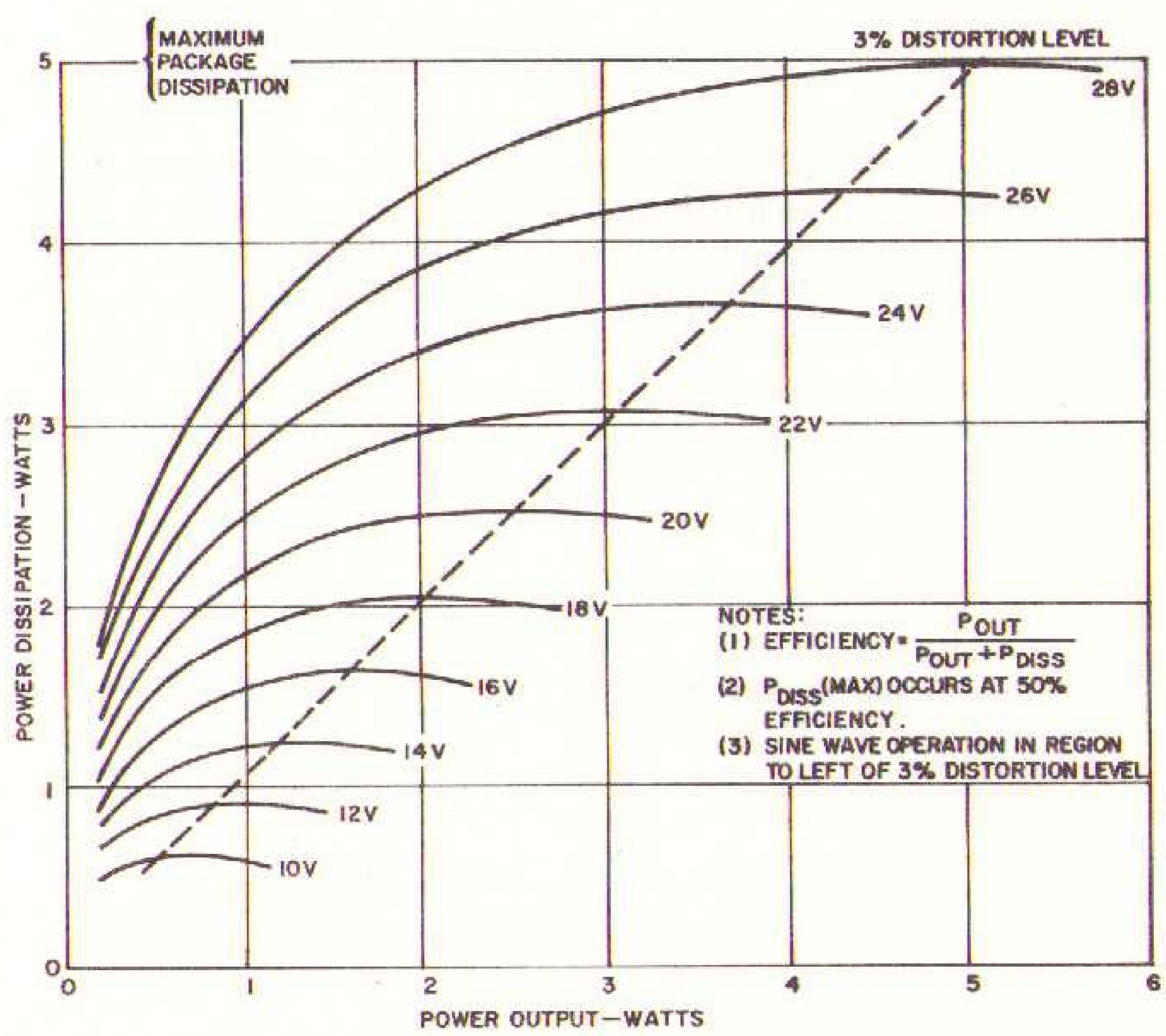


Figure 8. Internal Dissipation vs. Power Output Delivered to an 8-ohm Load

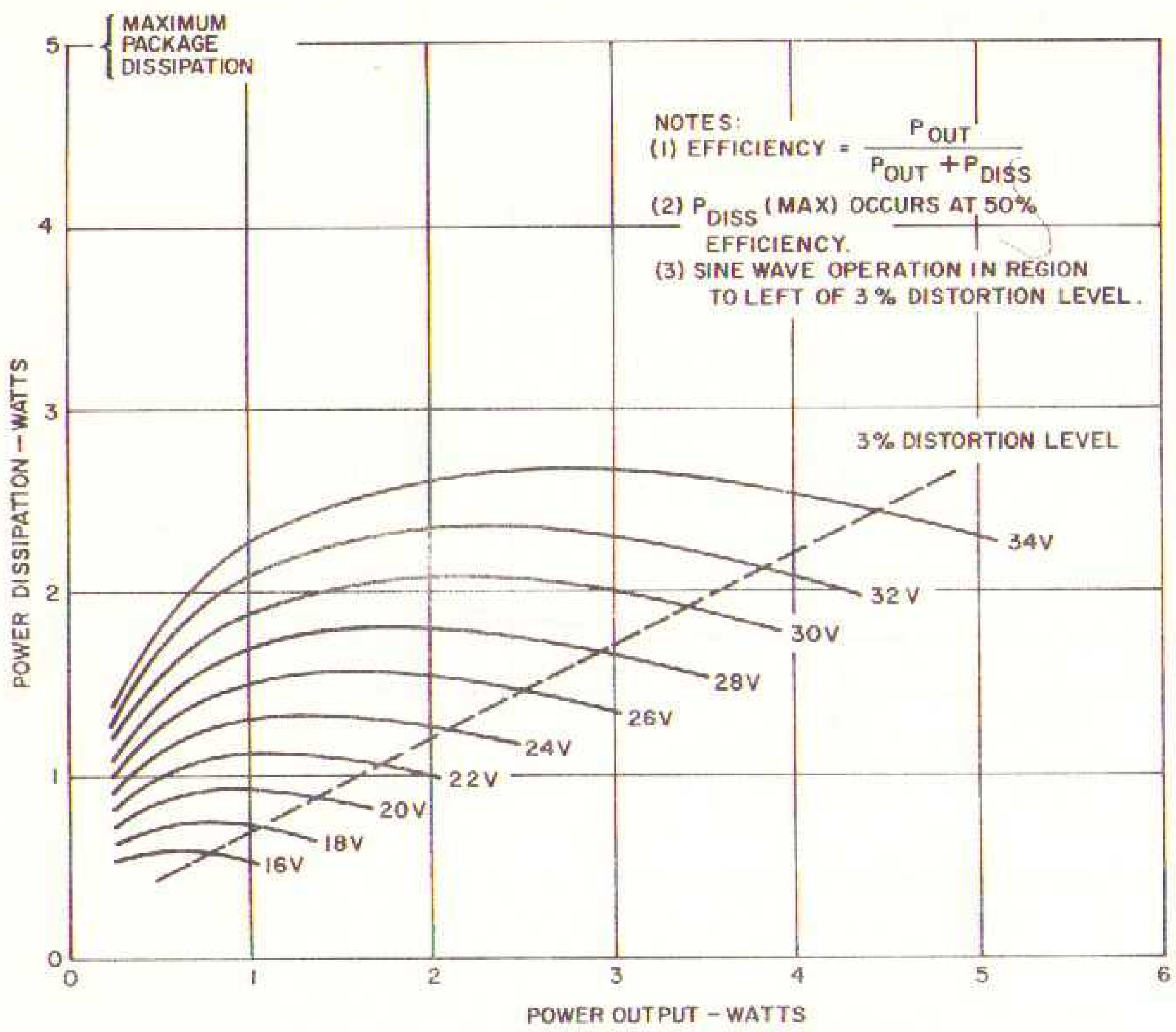


Figure 9. Internal Dissipation vs. Power Output Delivered to a 22-ohm Load

HEAT SINK CONSIDERATIONS

The two heat sink tabs are intended to be cooled to maintain device operation within the dissipation—tab temperature curve presented in Figure 10. The package thermal resistance is 11°C/watt, junction to tabs, as indicated by the slope of the curve. Power derating is based on a maximum pellet temperature of 125°C to assure device reliability.

Heat sink design is based on worst case power dissipation as found from the curves of Figures 7, 8, and 9. For example, consider the amplifier operating from a 34 volt supply into a 16-ohm load. Full power output before clipping will be 5 watts with 3.55 watts device dissipation (58% efficiency). However, on a worst case basis the maximum dissipation indicated is 3.7 watts. Referring to Figure 10, with 3.7 watts of package dissipation the tab temperature must be maintained below 84°C at the highest operating ambient. Tab temperature should be measured at the high ambient with the selected heat sink soldered in place in order to check for safe operation.

As a starting point in determining heat sink area, Figure 11 is given as a guide. Because heat sink effectiveness depends upon many factors, such as the nature and shape of the heat sink material and its environment, it is emphasized that any design should be final checked with a tab temperature measurement. For the example amplifier with 3.7 watts dissipation to operate at a maximum ambient of 50°C, Figure 11 indicates that a sink of 2 inch^2 per tab (.035 inch thick copper) might be suitable.

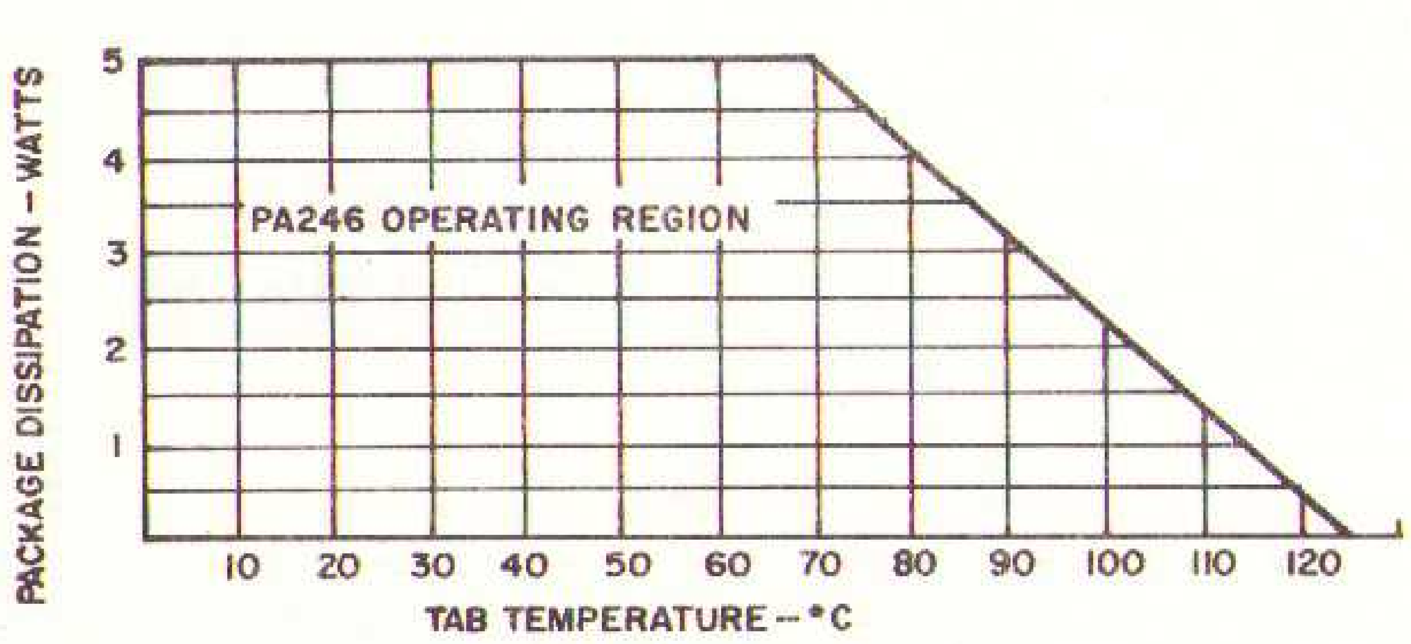


Figure 10. Allowable Package Dissipation as Determined by Measured Tab Temperature

PRINTED CIRCUIT BOARD CONSTRUCTION FOR DEVICE EVALUATION

A printed circuit board (PCB) layout of the circuit in Figure 2 is shown in Figure 12. Heat radiating fins are inserted into the tab slots along with the PA246 and are soldered together. The heat sink fins are copper (other solderable metals are also suitable) with an area of 2 square inches. Some heat sinking is also available from the copper ground plane of the PCB. The illustrated board will handle conservatively 5 watts of continuous power (34 volt supply, 16-ohm load) in ambients up to 50°C. A Photograph of the completed

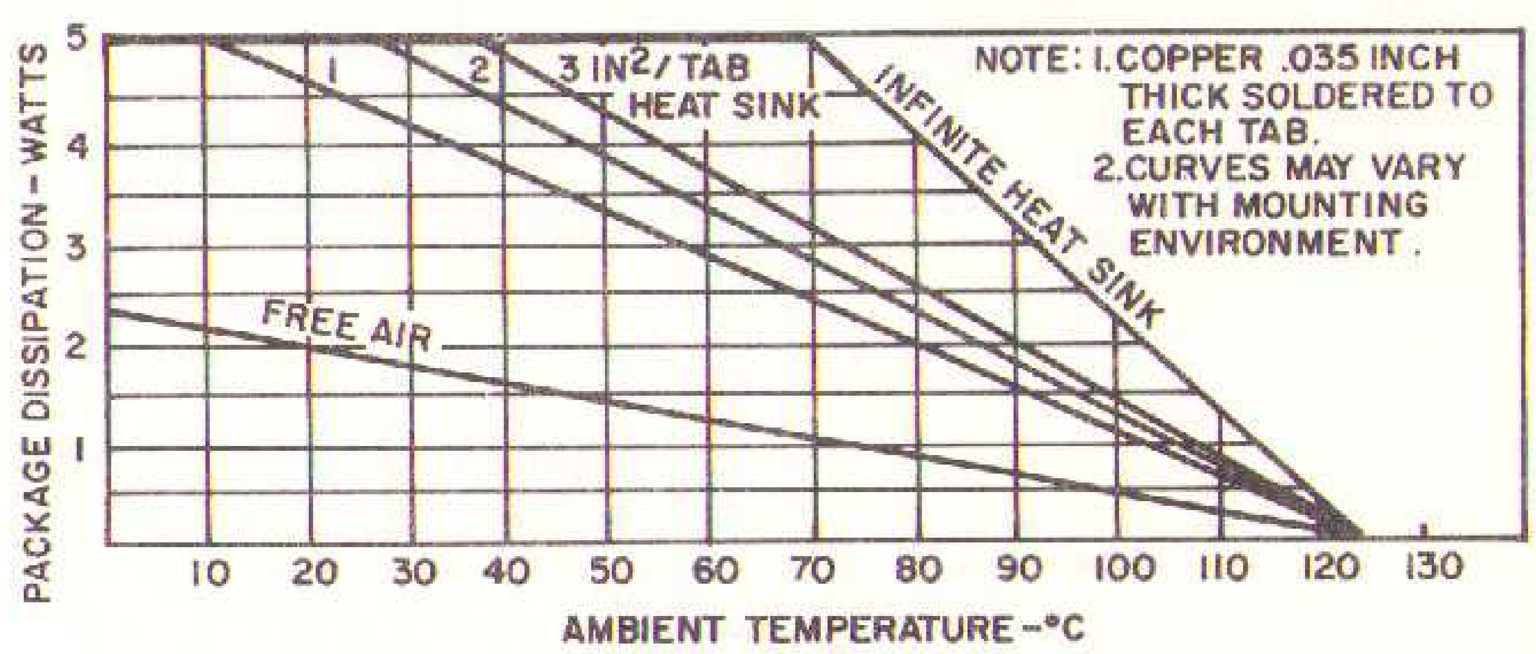


Figure 11. Allowable Package Dissipation vs. Ambient Temperature

board with all parts soldered in place is shown in Figure 13.

Smaller heat sink size might be used if the signal input is from an audio program source. Because of the low duty cycle the average package dissipation will be well below the maximum dissipation. The heat sink area would then be found as before based on an estimated average dissipation. This approach, of course, is less conservative than the worst-case design.

An outline of a suggested heat fin is shown in Figure 14.

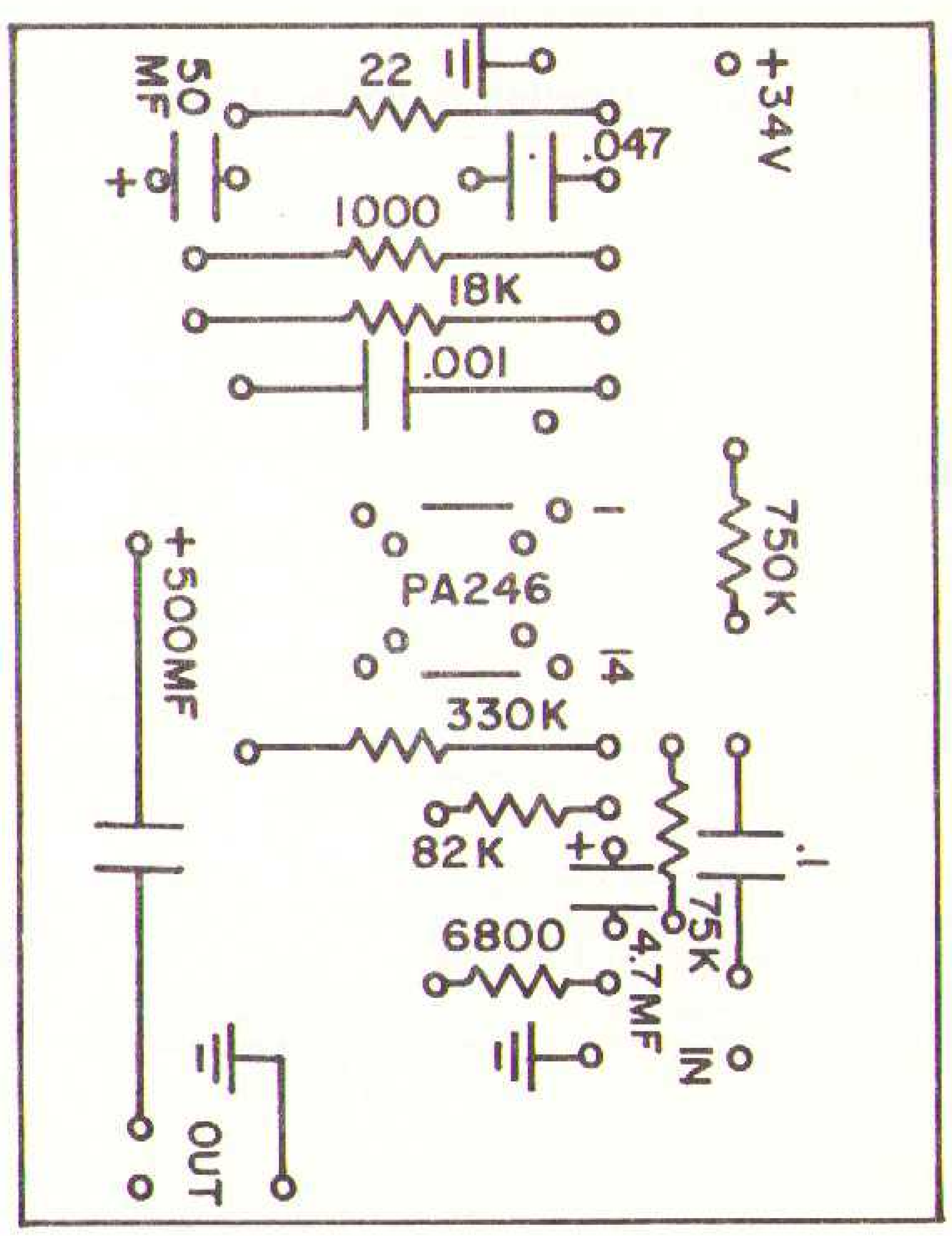


Figure 12a. Parts Layout—Component Side of PC Board

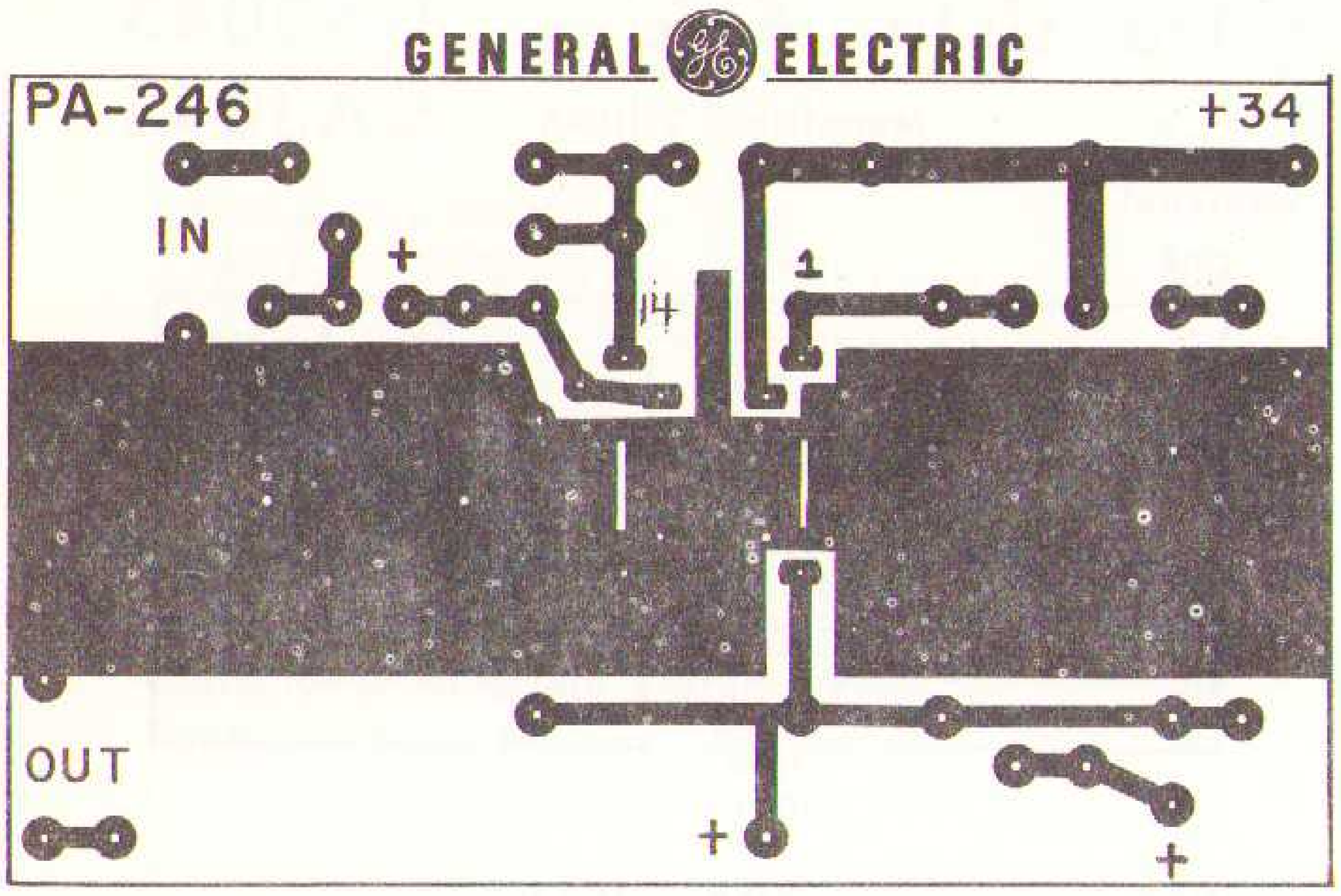


Figure 12 b. Pattern for Printed Circuit Side of Board

The mounting tab is dimensioned to fit into the same mounting slot as the device, but it will still clear the adjacent leads.

The dimensions of the mounting hole layout will be found in Figure 15. The width of the heat sink slot should be .025 inches plus the thickness of the external heat sink fin material.

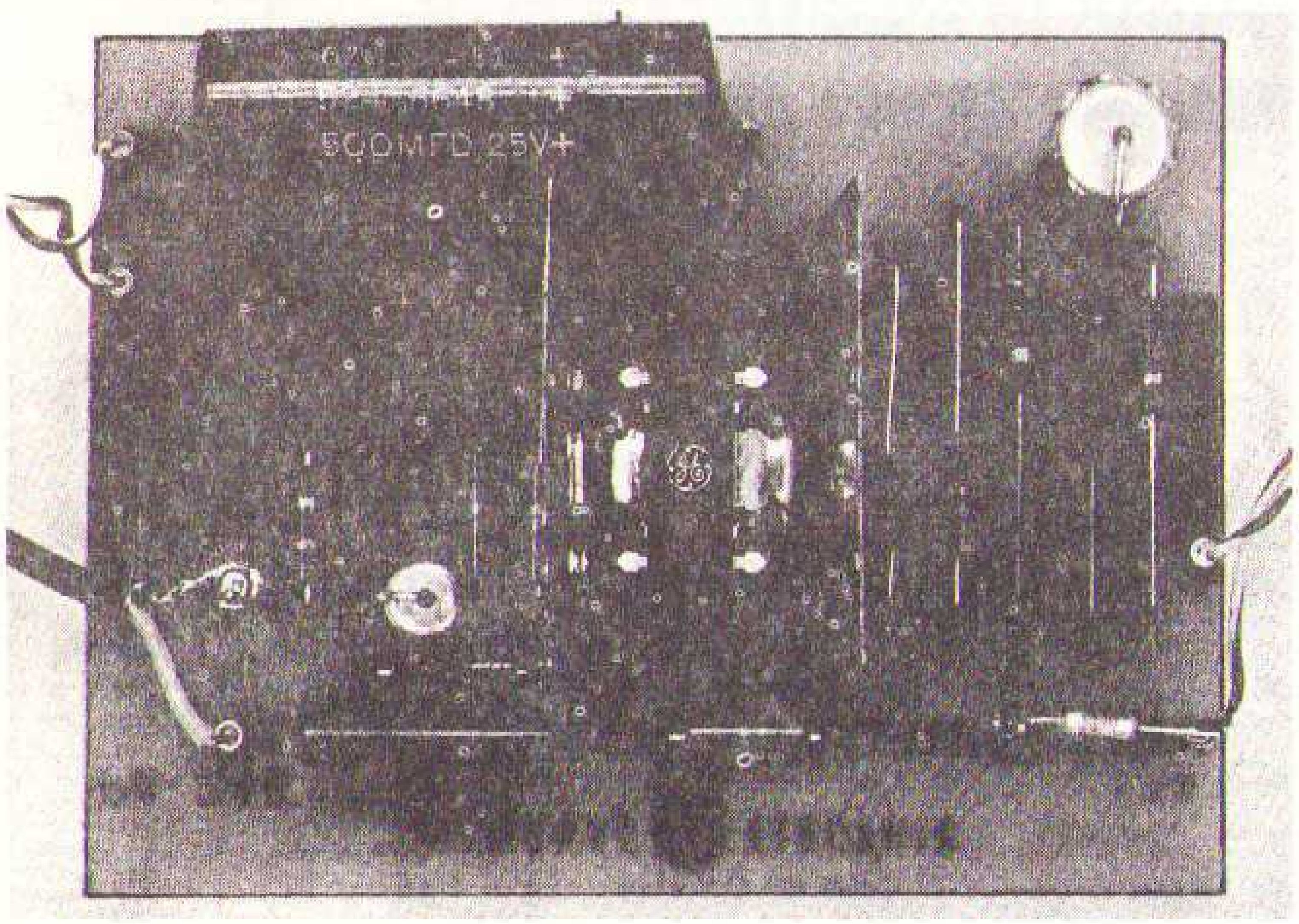


Figure 13. Completed Circuit Assembly of Amplifier Shown in Figure 2

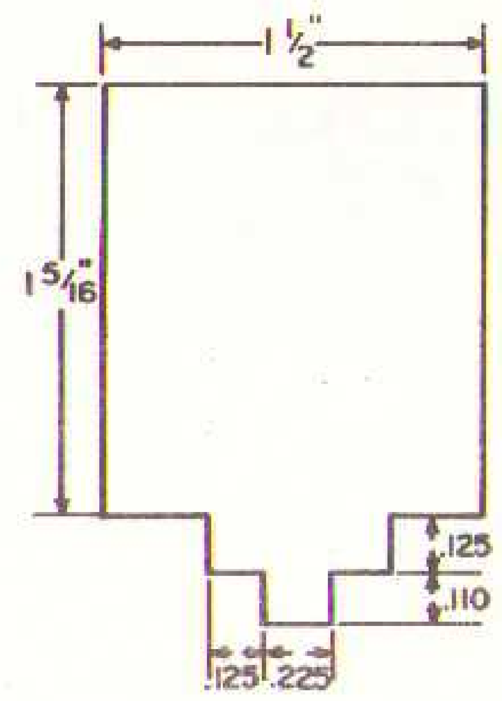
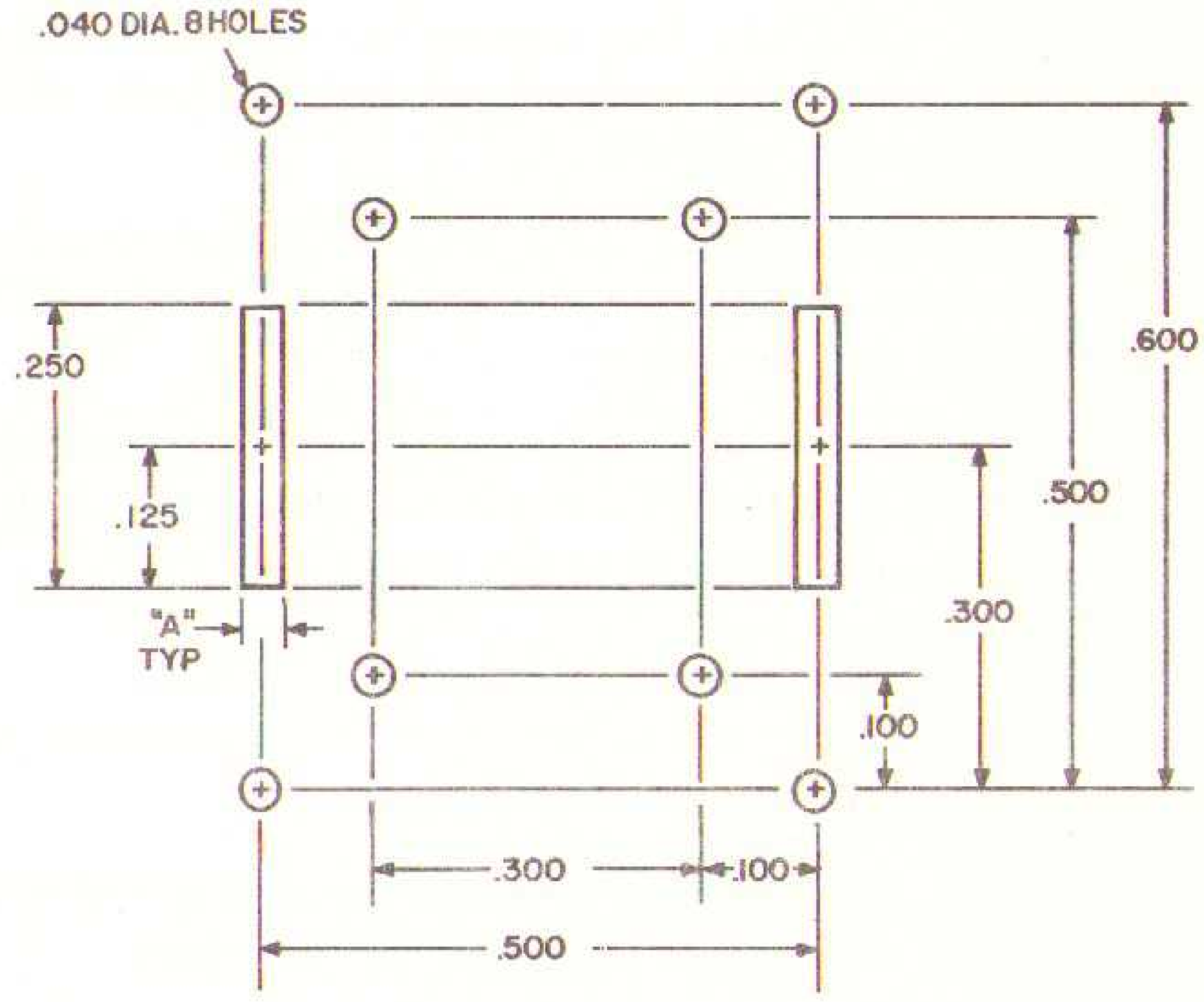


Figure 14. Heat Radiating Fin (.015" thick copper)



A	HEAT SINK FIN THICK*
.040	.015
.060	.035

* SLOT WIDTH BASED ON FIN THICKNESS

Figure 15. Device Mounting Hole Layout Dimensions

Na de 800mW en 3W geïntegreerde audioversterker heeft General Electric nu ook een 5 watt uitvoering op de markt gebracht, waarvan op voorgaande pagina's uitgebreide technische gegevens en toepassingen. Voor de 800mW (PA230) en 2W (PA237) verwijzen wij U naar onze technische documentatie 1969 deel 5/6 pagina 23 t/m 35.

* Voor prijzen van de in deze documentatie genoemde materialen verwijzen wij U naar de bijgevoegde prijslijst. Al deze artikelen zijn uit voorraad magazijn Rotterdam leverbaar; tussentijdse verkoop voorbehouden!

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RCA linear integrated circuits

General Purpose Transistor Arrays

Monolithic Silicon

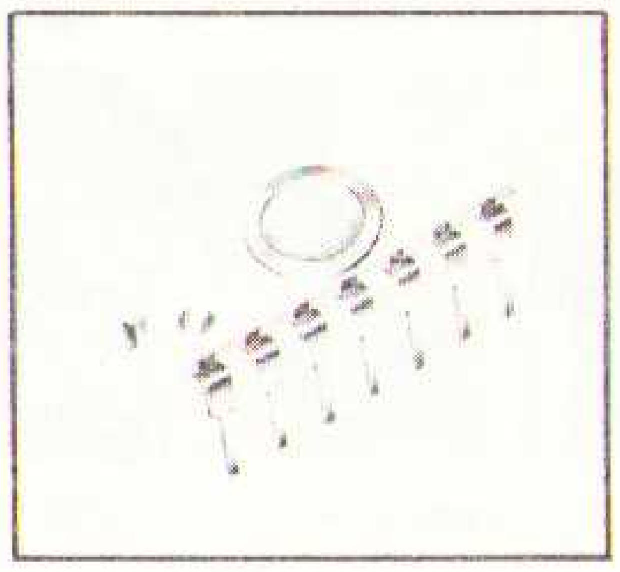
CA3045
CA3046

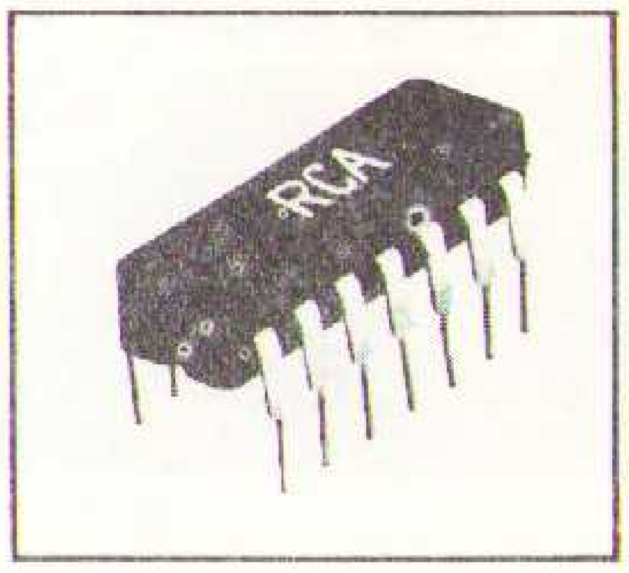
The CA3045 and CA3046 each consist of five general purpose silicon n-p-n transistors on a common monolithic substrate. Two of the transistors are internally connected to form a differentially-connected pair.

The transistors of the CA3045 and CA3046 are well suited to a wide variety of applications in low power systems in the DC through VHF range. They may be used as discrete transistors in conventional circuits however, in addition, they provide the very significant inherent integrated circuit advantages of close electrical and thermal matching.

The CA3045 is supplied in an hermetic 14-lead Dual-In-Line ceramic package rated for operation over the full military temperature range.

The CA3046 is electrically identical to the CA3045 but is supplied in a dual-in-line plastic package for applications requiring only a limited temperature range.





CA3045 CA3046

THREE ISOLATED TRANSISTORS AND ONE DIFFERENTIALLY-CONNECTED TRANSISTOR PAIR

For Low-Power Applications at Frequencies from DC through the VHF Range

APPLICATIONS

- General use in all types of signal processing systems operating anywhere in the frequency range from DC to VHF
- Custom designed differential amplifiers
- Temperature compensated amplifiers
- See RCA Application Note, ICAN-5296 "Application of the RCA-CA3018 Integrated-Circuit Transistor Array" for suggested applications.

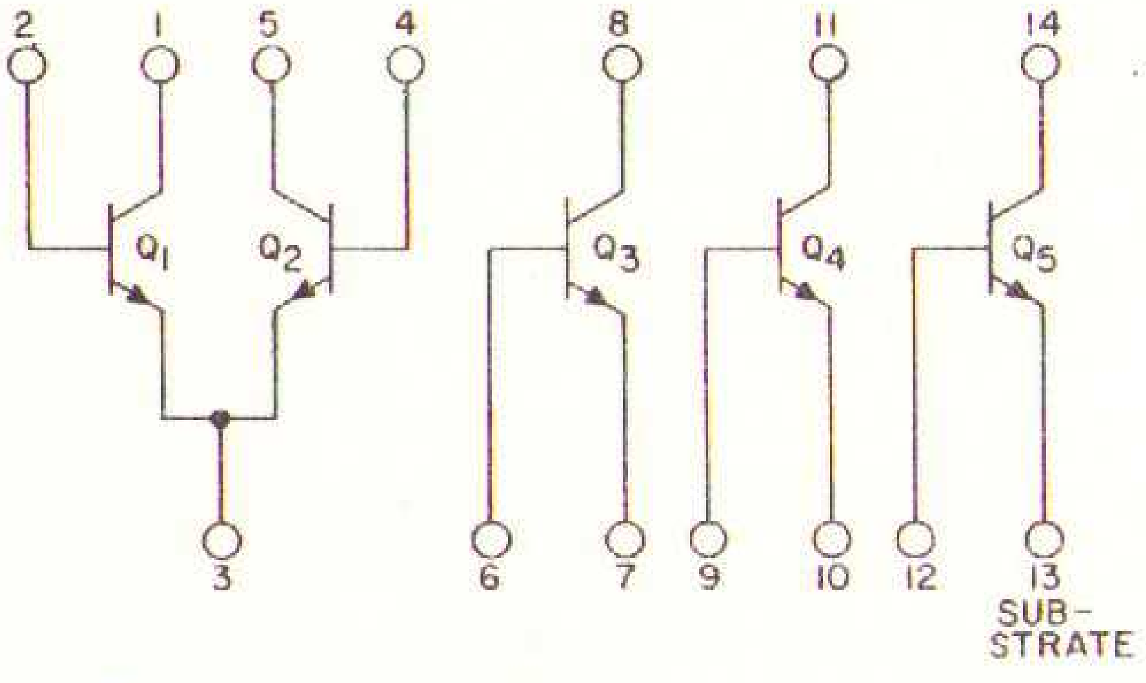


Fig.1 - Schematic diagram.

FEATURES

- Two matched pairs of transistors
  - V_{BE} matched ±5 mV
  - Input offset current 2 μA max. at I_C = 1 mA
- 5 general purpose monolithic transistors
- Operation from DC to 120 MHz
- Wide operating current range
- Low noise figure - - 3.2 dB typ. at 1 kHz
- Full military temperature range for CA3045
  - -55 to +125°C

RCA Electronic Components

ABSOLUTE MAXIMUM RATINGS AT T_A = 25°C:

	CA3045 Each Transistor	CA3045 Total Package	CA3046 Each Transistor	CA3046 Total Package	
Power Dissipation:					
At T_A = 25°C	300	750	300	750	mW
At T_A = 25°C to 55°C	-	-	300	750	mW
At T_A > 55°C	-	-	Derate at 6.67		mW/°C
At T_A = 25°C to 75°C	300	750	-	-	mW
At T_A > 75°C	Derate at 8		-	-	mW/°C
Collector-to-Emitter Voltage, V_{CEO} . .	15	-	15	-	V
Collector-to-Base Voltage, V_{CBO}	20	-	20	-	V
Collector-to-Substrate Voltage, V_{CIO}*.	20	-	20	-	V
Emitter-to-Base Voltage, V_{EBO}	5	-	5	-	V
Collector Current, I_C	50	-	50	-	mA
Temperature Range:					
Operating	-55 to +125		0 to +85		°C
Storage	-65 to +200		-25 to +85		°C

* The collector of each transistor of the CA3045 and CA3046 is isolated from the substrate by an integral diode. *The substrate (terminal 13) must be connected to the most negative point in the external circuit to maintain isolation between transistors and to provide for normal transistor action.*

ELECTRICAL CHARACTERISTICS, at T_A = 25°C (ABSOLUTE MAXIMUM RATINGS).

Characteristics apply for each transistor in the CA3045 and CA3046 as specified.

CHARACTERISTICS	SYMBOLS	SPECIAL TEST CONDITIONS	LIMITS Type CA3045 Type CA3046 MIN.	TYP.	MAX.	UNITS	CHARAC-TERISTIC CURVES FIG.
STATIC CHARACTERISTICS							
Collector-to-Base Breakdown Voltage	$V_{(BR)CBO}$	$I_C = 10\,\mu A$, $I_E = 0$	20	60	-	V	-
Collector-to-Emitter Breakdown Voltage	$V_{(BR)CEO}$	$I_C = 1$ mA, $I_B = 0$	15	24	-	V	-
Collector-to-Substrate Breakdown Voltage	$V_{(BR)CIO}$	$I_C = 10\,\mu A$, $I_{CI} = 0$	20	60	-	V	-
Emitter-to-Base Breakdown Voltage	$V_{(BR)EBO}$	$I_E = 10\,\mu A$, $I_C = 0$	5	7	-	V	-
Collector-Cutoff Current	I_{CBO}	$V_{CB} = 10$ V, $I_E = 0$	-	0.002	40	nA	2
Collector-Cutoff Current	I_{CEO}	$V_{CE} = 10$ V, $I_B = 0$	-	See curve	0.5	μA	3
Static Forward Current-Transfer Ratio (Static Beta)	h_{FE}	$V_{CE} = 3$ V, $I_C = 10$ mA $I_C = 1$ mA $I_C = 10\,\mu A$	- 40 -	100 100 54	- - -	- - -	4
Input Offset Current for Matched Pair Q_1 and Q_2. $\lvert I_{IO_1} - I_{IO_2}\rvert$		$V_{CE} = 3$ V, $I_C = 1$ mA	-	0.3	2	μA	5
Base-to-Emitter Voltage	V_{BE}	$V_{CE} = 3$ V, $I_E = 1$ mA $I_E = 10$ mA	- -	0.715 0.800	- -	V	6
Magnitude of Input Offset Voltage for Differential Pair $\lvert V_{BE_1} - V_{BE_2}\rvert$		$V_{CE} = 3$ V, $I_C = 1$ mA	-	0.45	5	mV	6,8
Magnitude of Input Offset Voltage for Isolated Transistors $\lvert V_{BE_3} - V_{BE_4}\rvert$, $\lvert V_{BE_4} - V_{BE_5}\rvert$, $\lvert V_{BE_5} - V_{BE_3}\rvert$		$V_{CE} = 3$ V, $I_C = 1$ mA	-	0.45	5	mV	6,8
Temperature Coefficient of Base-to-Emitter Voltage	$\frac{\Delta V_{BE}}{\Delta T}$	$V_{CE} = 3$ V, $I_C = 1$ mA	-	-1.9	-	mV/°C	7
Collector-to-Emitter Saturation Voltage	V_{CES}	$I_B = 1$ mA, $I_C = 10$ mA	-	0.23	-	V	-
Temperature Coefficient: Magnitude of Input-Offset Voltage	$\frac{\lvert\Delta V_{IO}\rvert}{\Delta T}$	$V_{CE} = 3$ V, $I_C = 1$ mA	-	1.1	-	μV/°C	8

ELECTRICAL CHARACTERISTICS (Cont'd.)

DYNAMIC CHARACTERISTICS							
Low-Frequency Noise Figure	NF	f = 1 kHz, V_{CE} = 3 V, I_C = 100 μA Source Resistance = 1 kΩ	-	3.25	-	dB	9(b)
Low-Frequency, Small-Signal Equivalent-Circuit Characteristics:							
Forward Current-Transfer Ratio	h_{fe}	f = 1 kHz, V_{CE} = 3 V, I_C = 1 mA	-	110	-	-	10
Short-Circuit Input Impedance	h_{ie}		-	3.5	-	kΩ	
Open-Circuit Output Impedance	h_{oe}		-	15.6	-	μmho	
Open-Circuit Reverse Voltage-Transfer Ratio	h_{re}		-	1.8×10^{-4}	-	-	
Admittance Characteristics:							
Forward Transfer Admittance	Y_{fe}	f = 1 MHz, V_{CE} = 3 V, I_C = 1 mA	-	31-j1.5	-		11
Input Admittance	Y_{ie}		-	0.3+j0.04	-		12
Output Admittance	Y_{oe}		-	0.001+j0.03	-		13
Reverse Transfer Admittance	Y_{re}		-	See curve	-		14
Gain-Bandwidth Product	f_T	V_{CE} = 3 V, I_C = 3 mA	300	550	-	-	15
Emitter-to-Base Capacitance	C_{EB}	V_{EB} = 3 V, I_E = 0	-	0.6	-	pF	-
Collector-to-Base Capacitance	C_{CB}	V_{CB} = 3 V, I_C = 0	-	0.58	-	pF	-
Collector-to-Substrate Capacitance	C_{CI}	V_{CS} = 3 V, I_C = 0	-	2.8	-	pF	-

STATIC CHARACTERISTICS

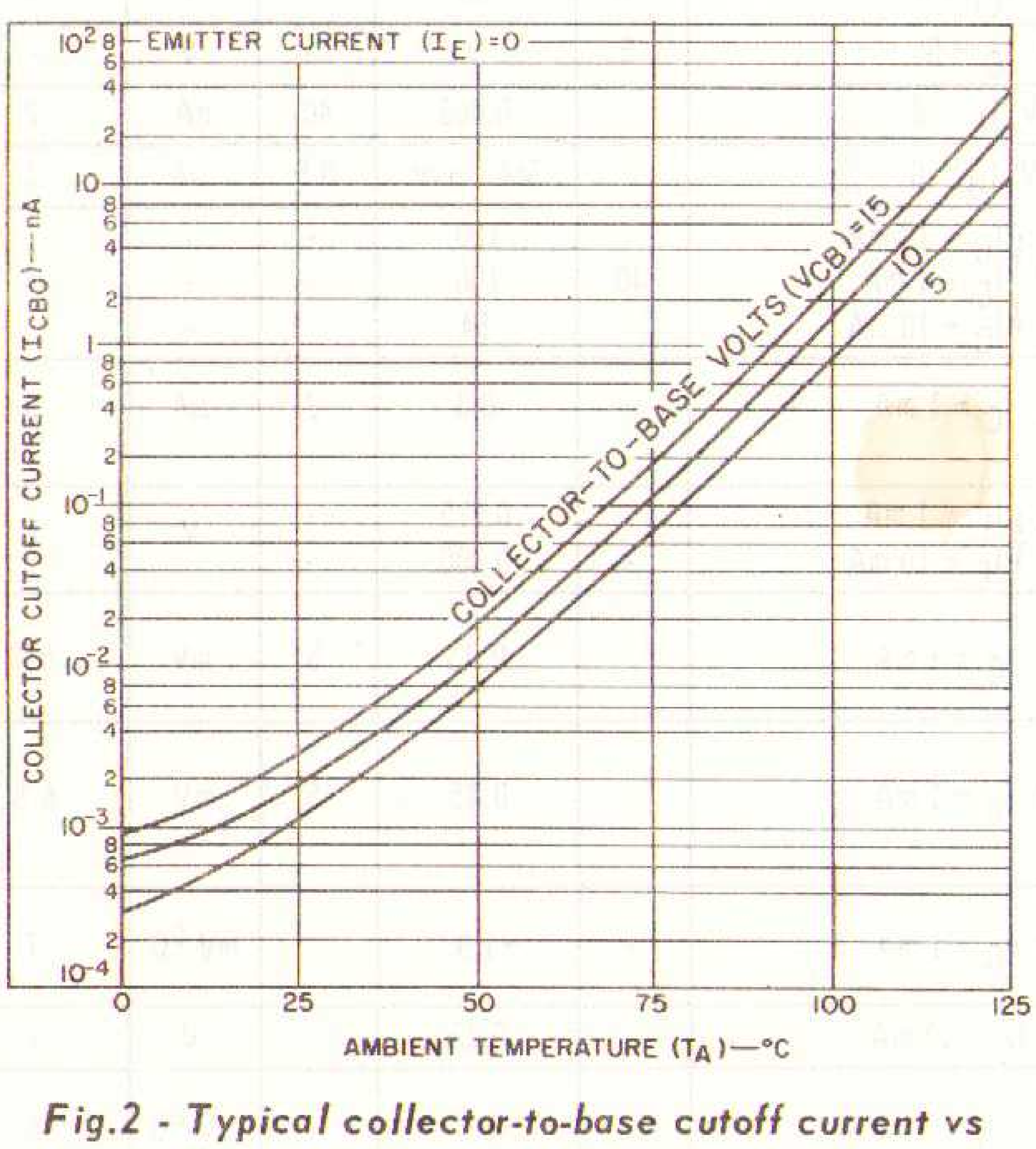


Fig.2 - Typical collector-to-base cutoff current vs ambient temperature for each transistor.

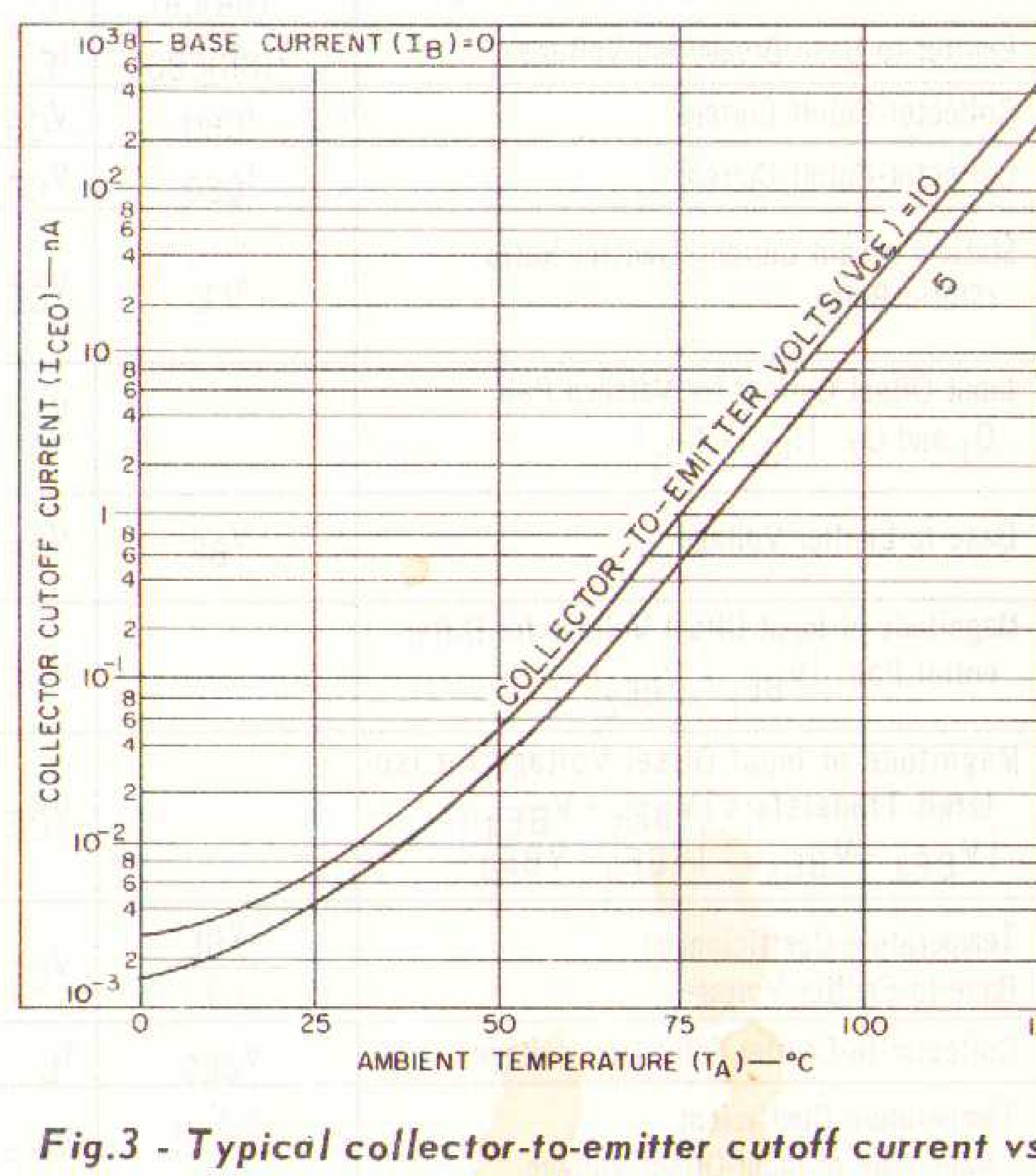


Fig.3 - Typical collector-to-emitter cutoff current vs ambient temperature for each transistor.

STATIC CHARACTERISTICS

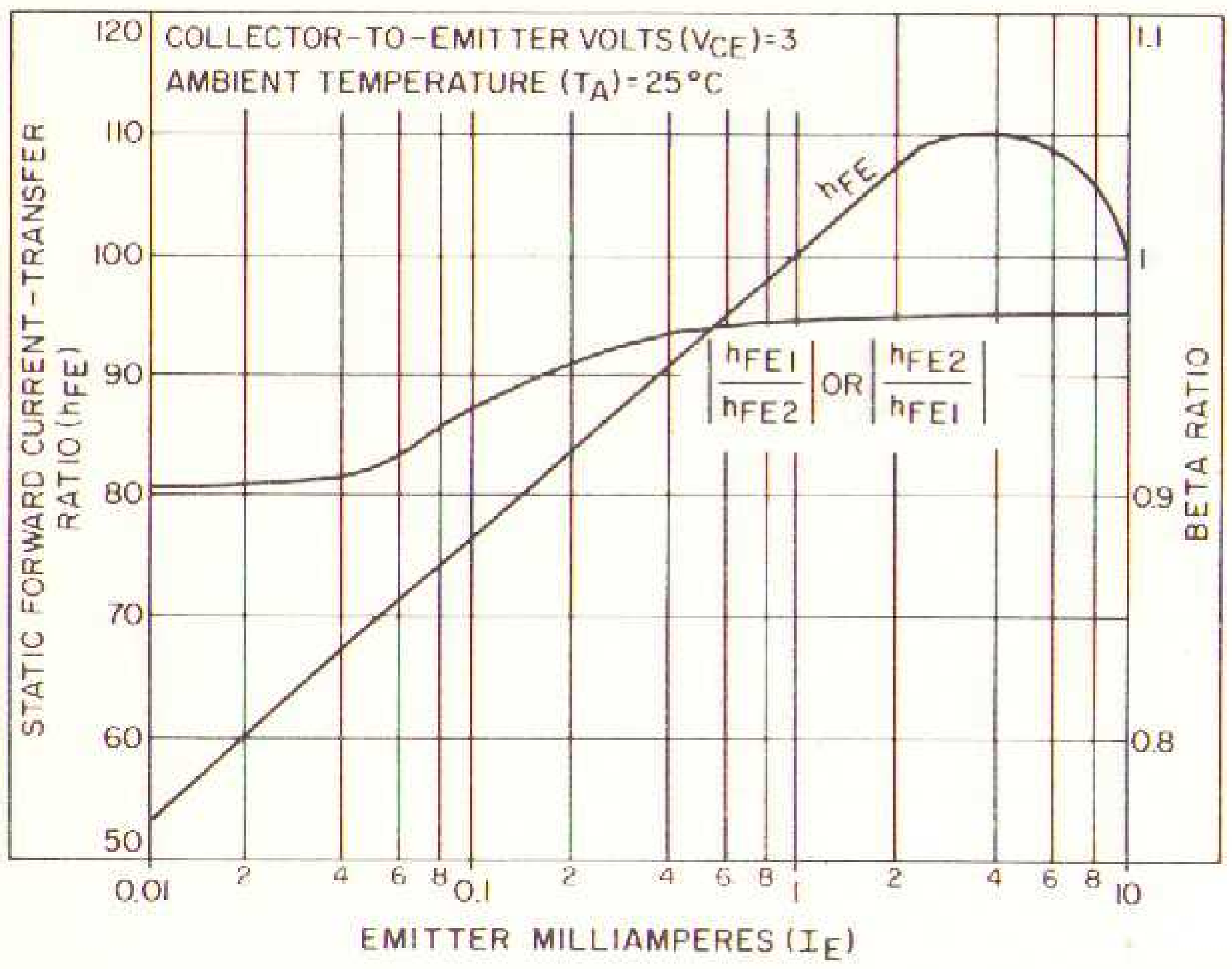


Fig.4 - Typical static forward current-transfer ratio and beta ratio for transistors Q_1 and Q_2 vs emitter current.

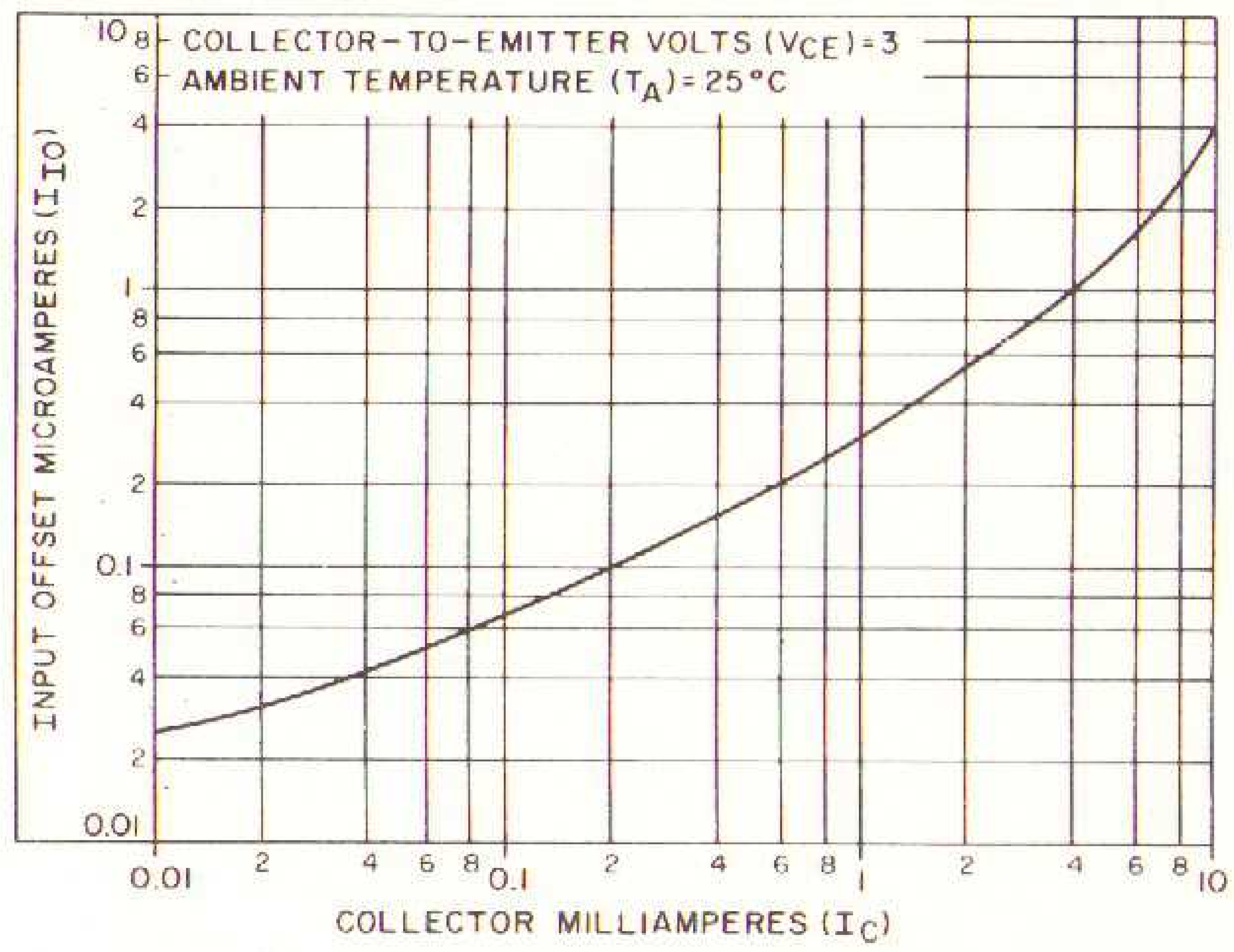


Fig.5 - Typical input offset current for matched transistor pair Q_1Q_2 vs collector current.

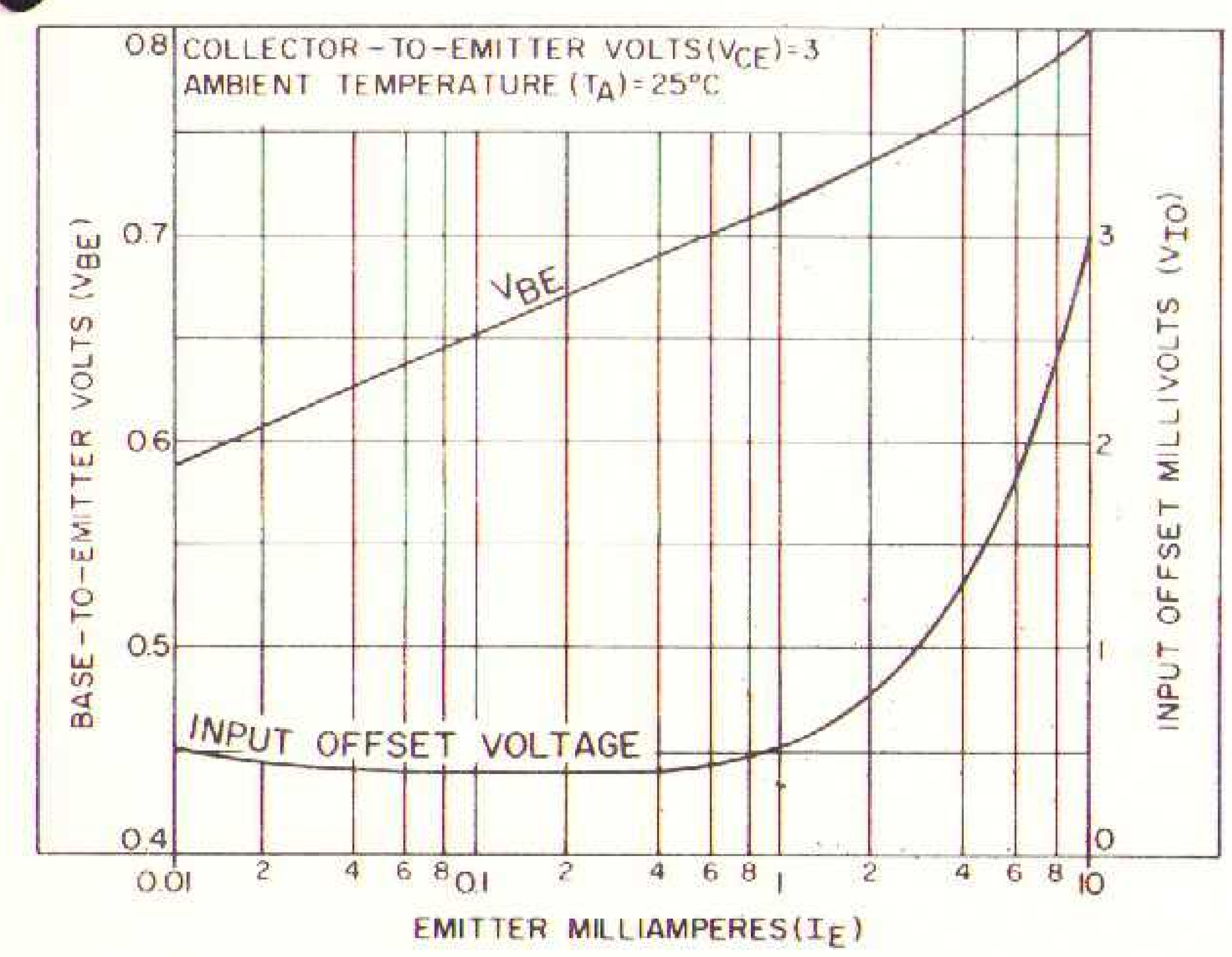


Fig.6 - Typical static base-to-emitter voltage characteristic and input offset voltage for differential pair and paired isolated transistors vs emitter current.

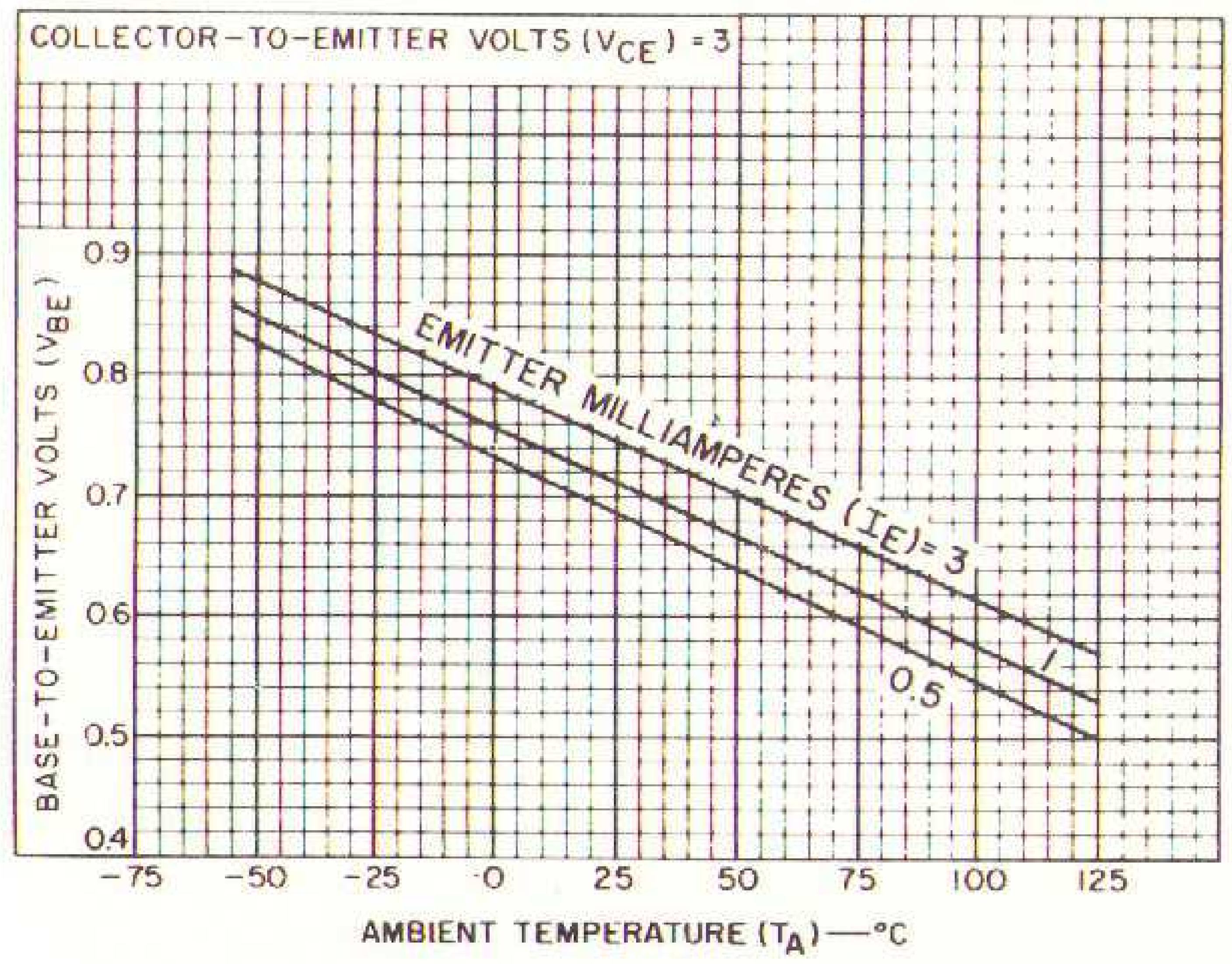


Fig.7 - Typical base-to-emitter voltage characteristic vs ambient temperature for each transistor.

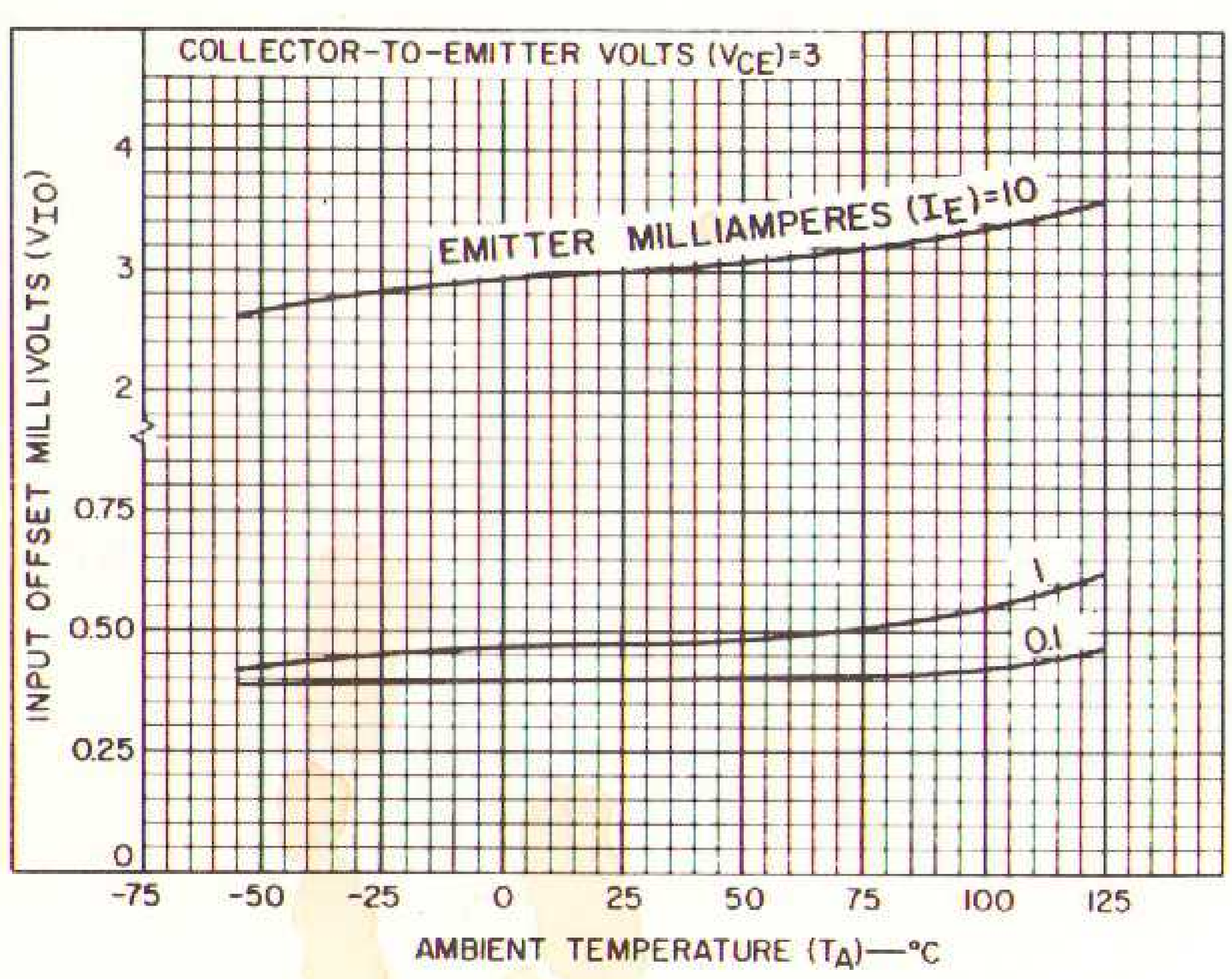


Fig.8 - Typical input offset voltage characteristics for differential pair and paired isolated transistors vs ambient temperature.

DYNAMIC CHARACTERISTICS FOR EACH TRANSISTOR

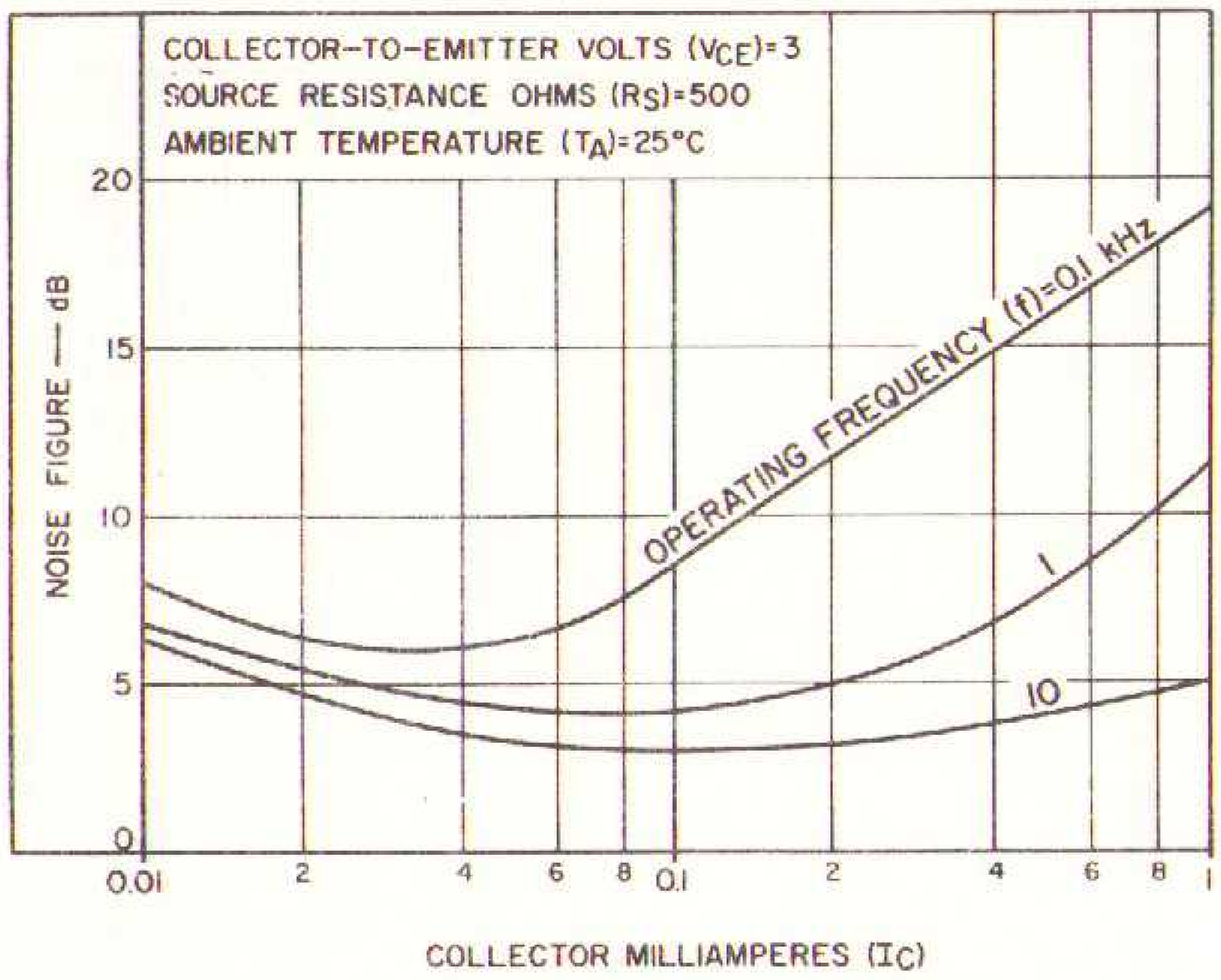


Fig.9(a) - Typical noise figure vs collector current.

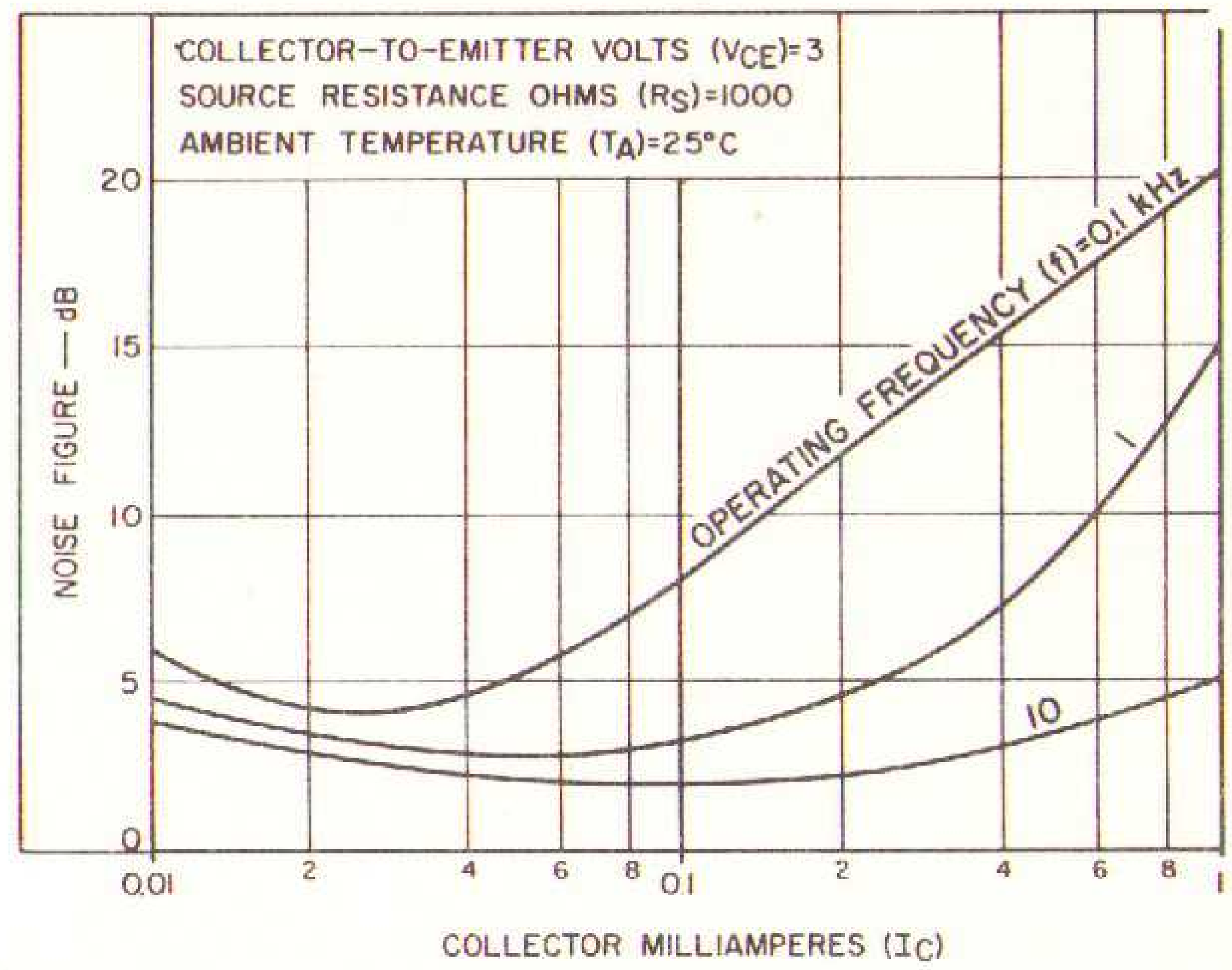


Fig.9(b) - Typical noise figure vs collector current.

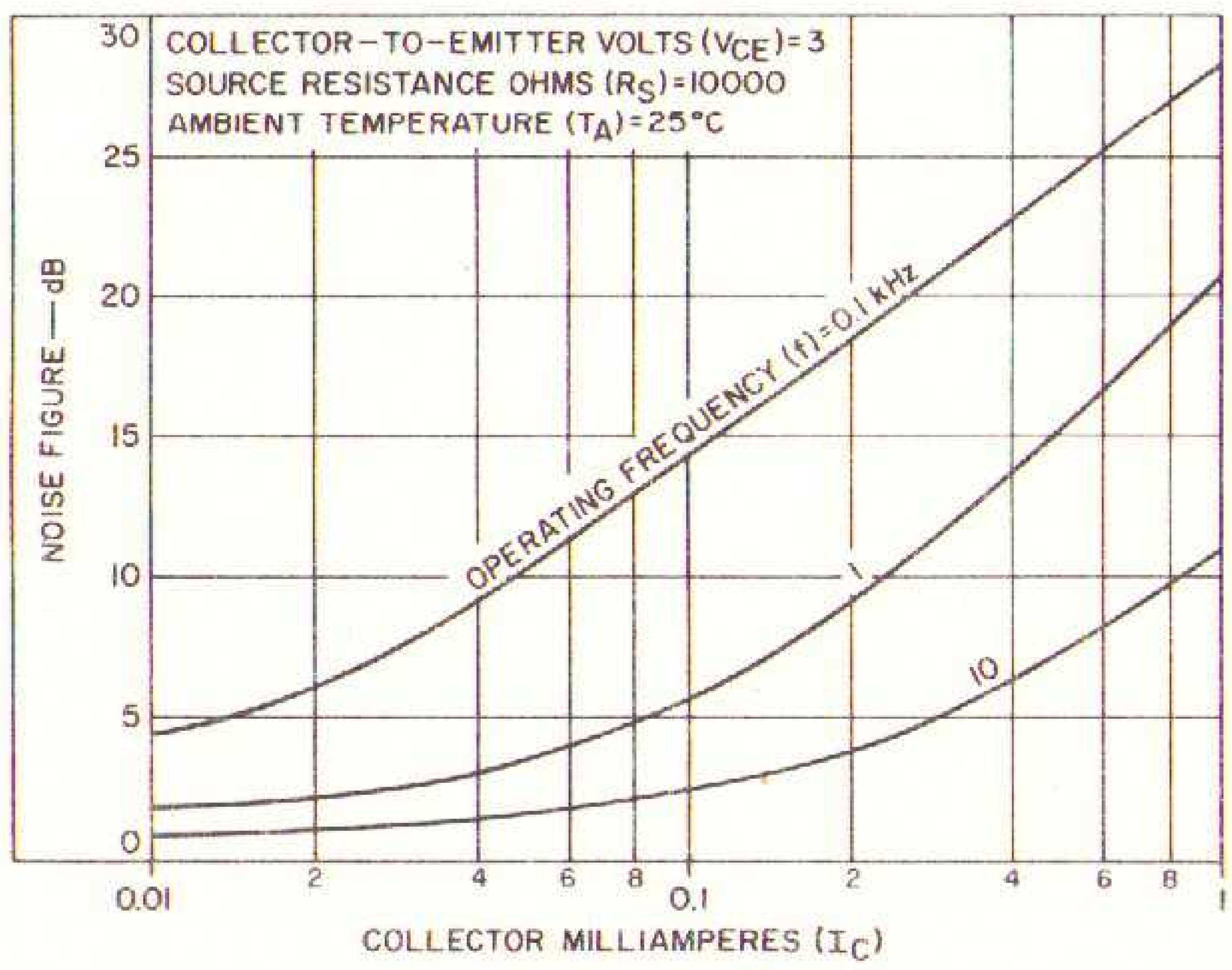


Fig.9(c) - Typical noise figure vs collector current.

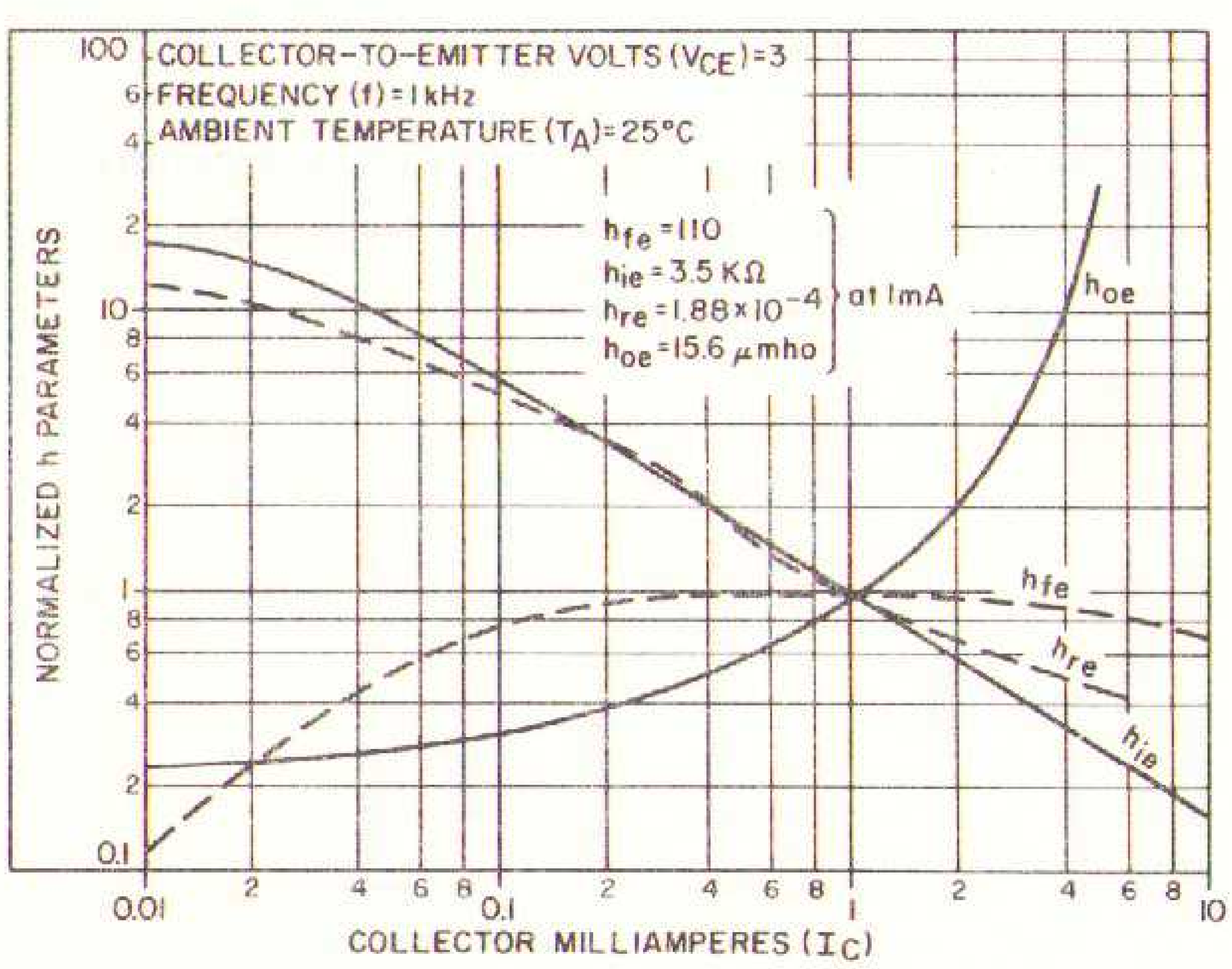


Fig.10 - Typical normalized forward current-transfer ratio, short-circuit input impedance, open-circuit output impedance, and open-circuit reverse voltage-transfer ratio vs collector current.

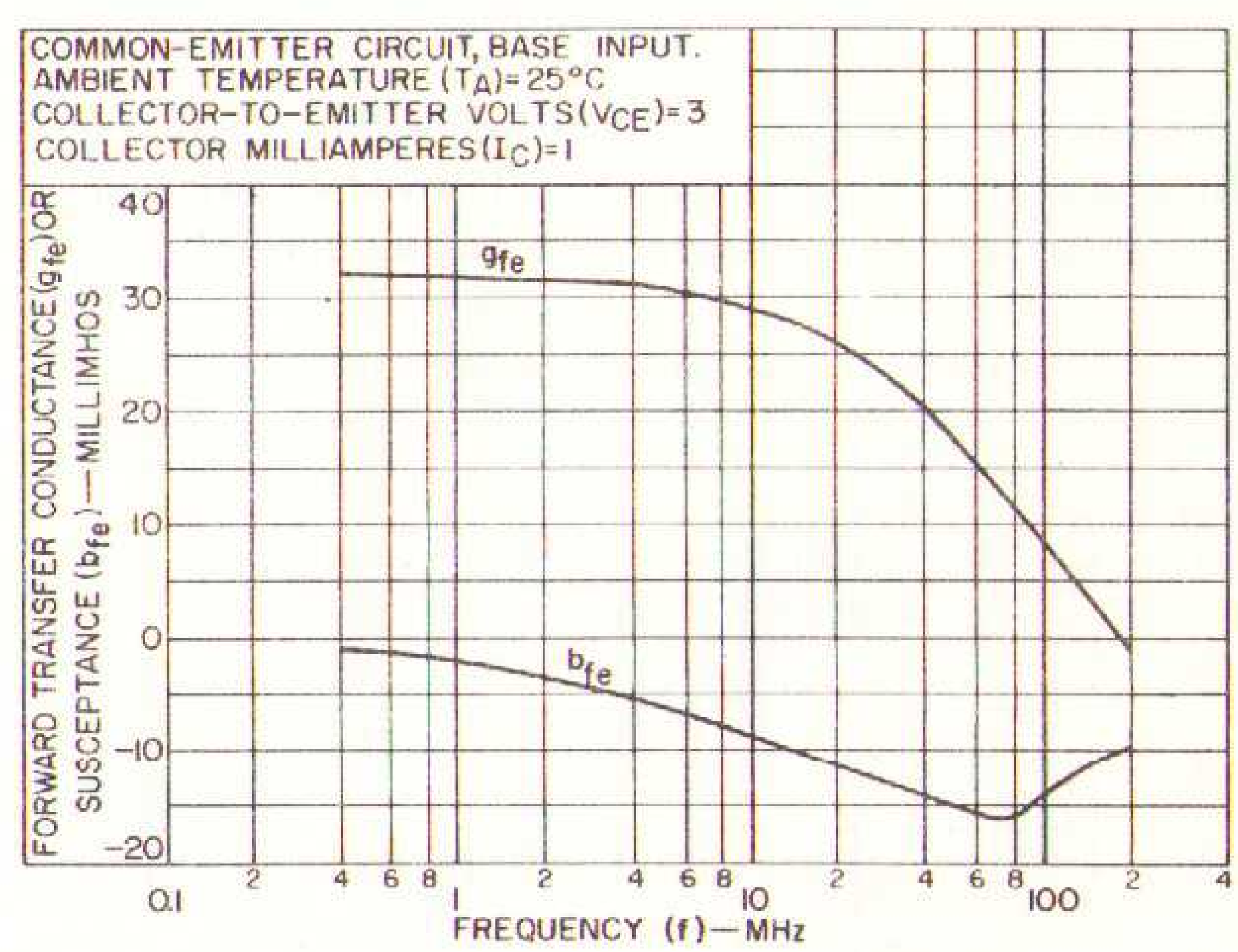


Fig.11 - Typical forward transfer admittance vs frequency.

DYNAMIC CHARACTERISTICS FOR EACH TRANSISTOR

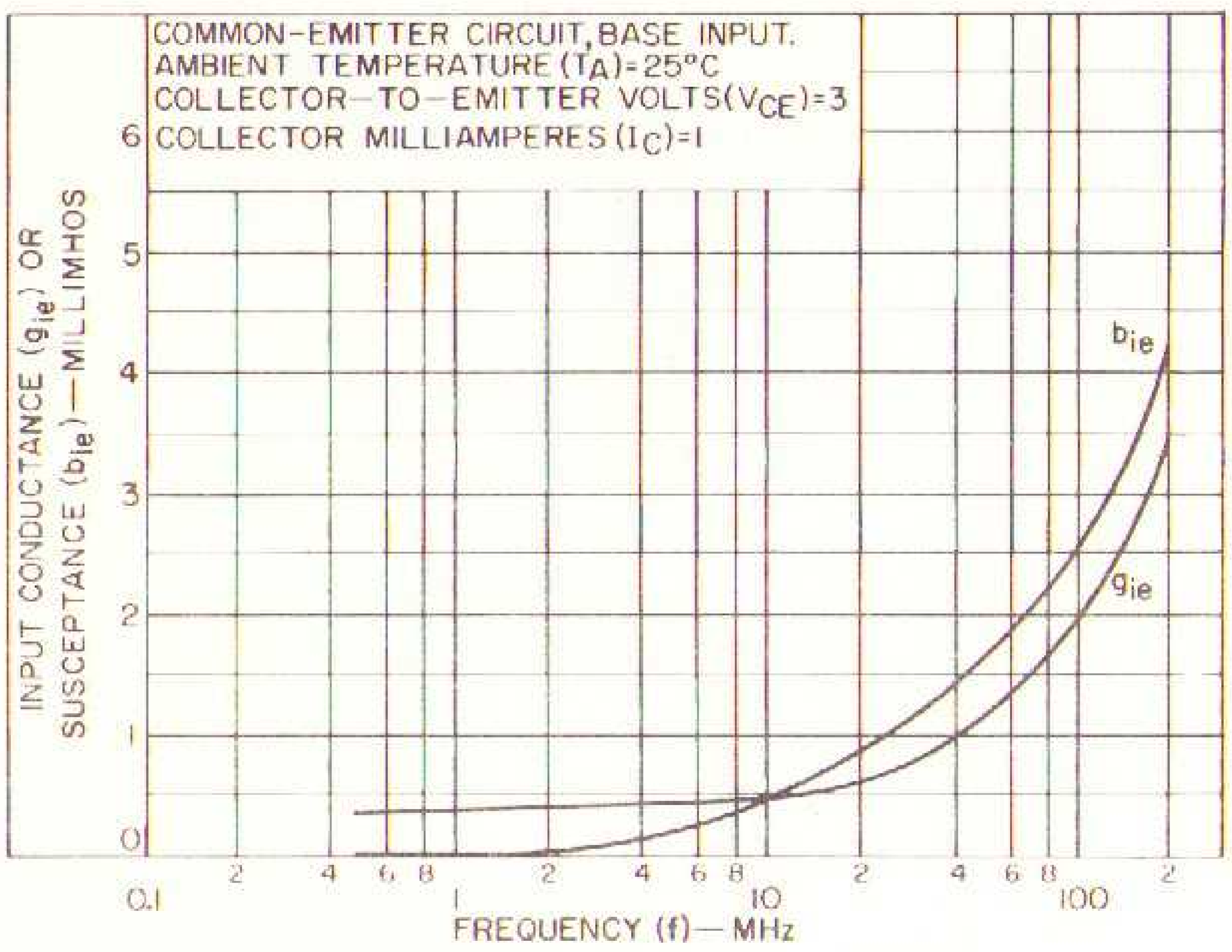


Fig.12 - Typical input admittance vs frequency.

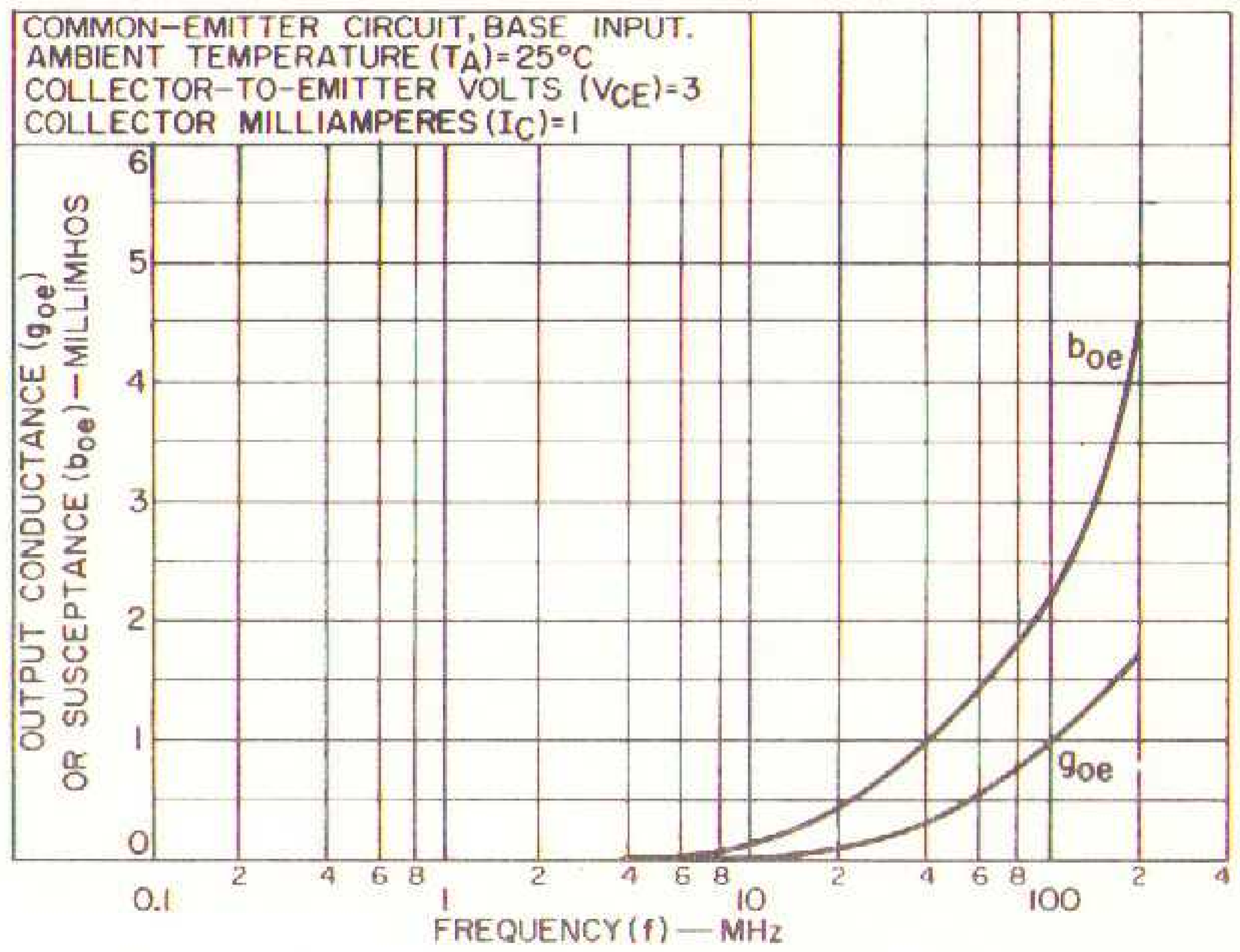


Fig.13 - Typical output admittance vs frequency.

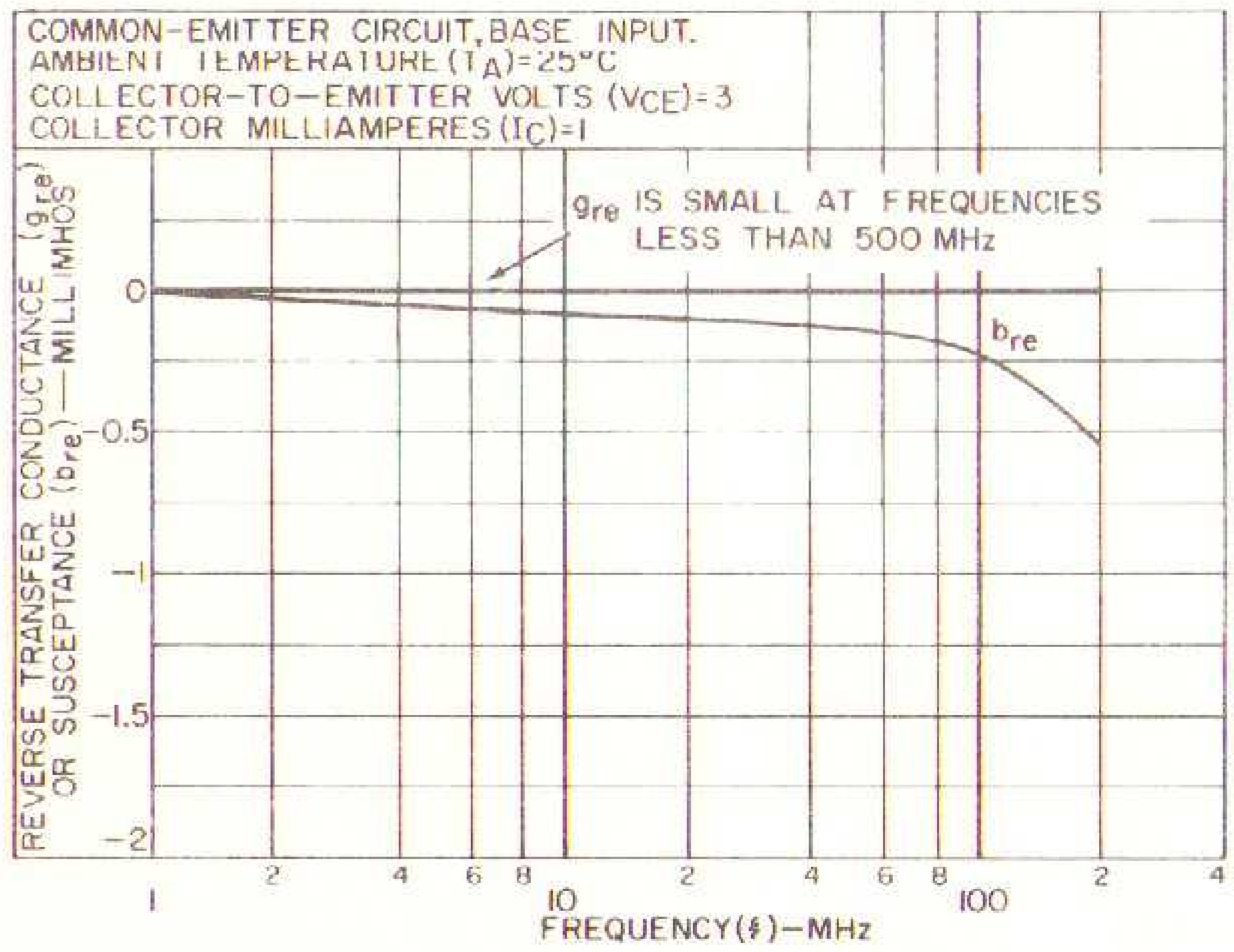


Fig.14 - Typical reverse transfer admittance vs frequency.

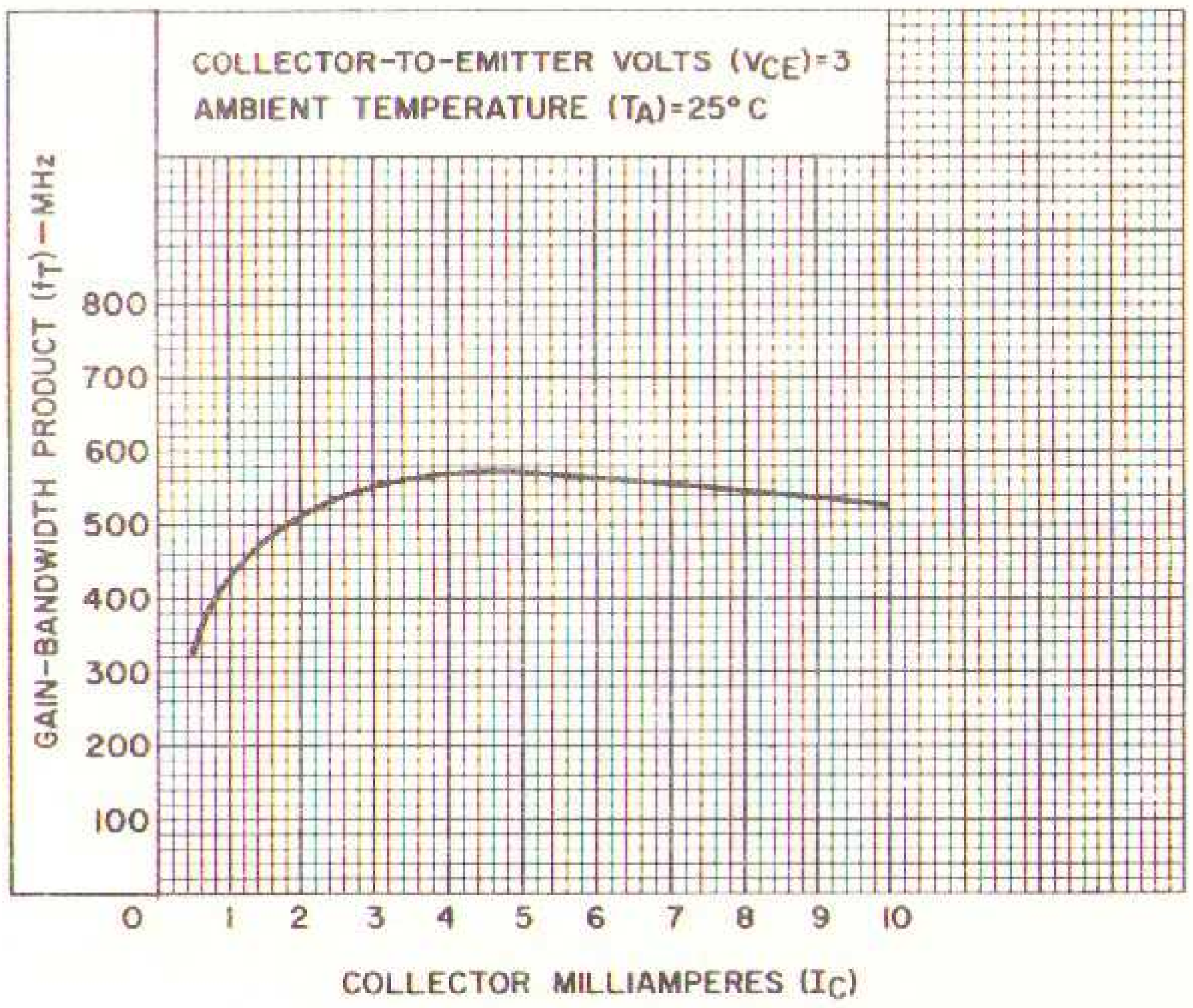
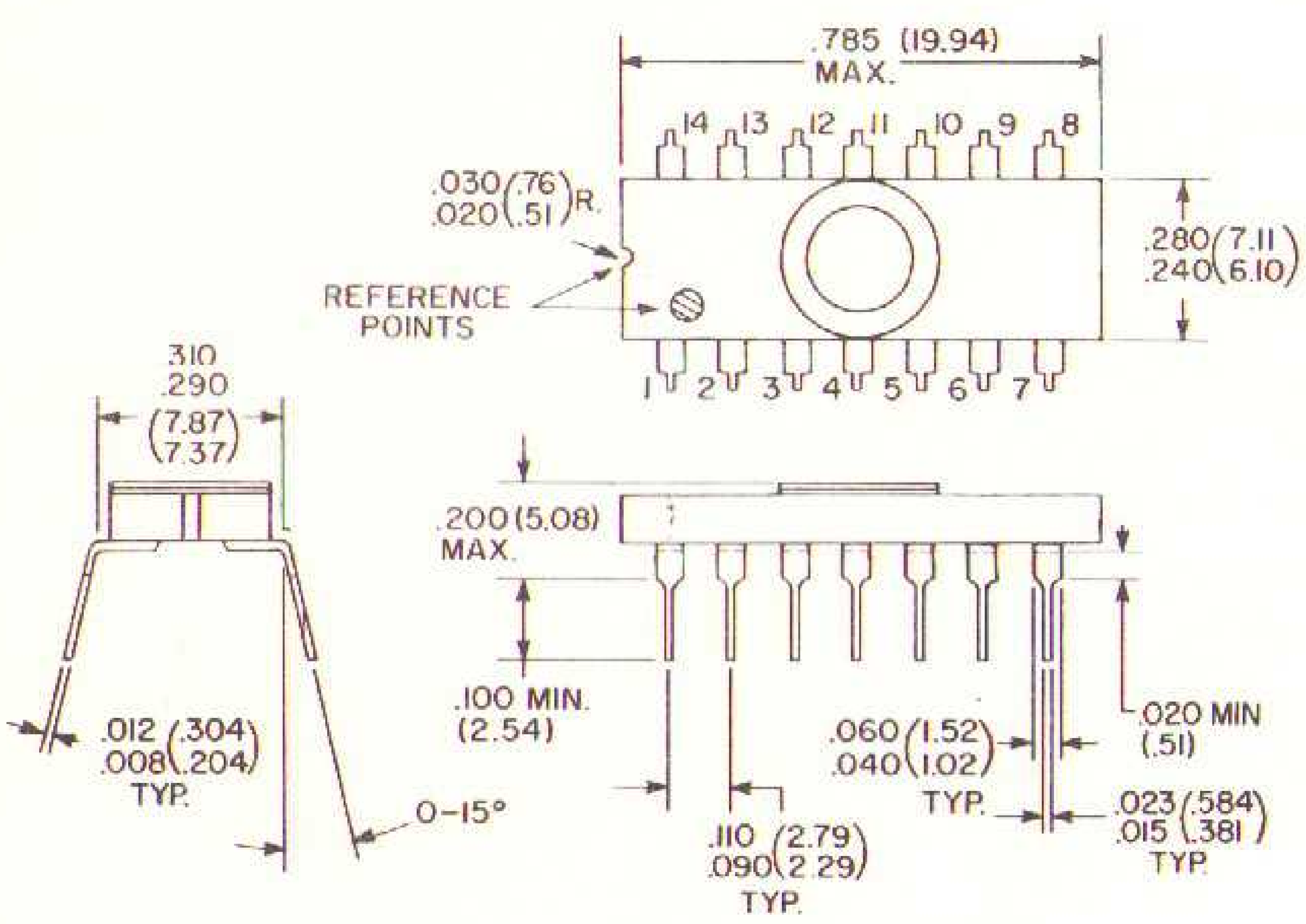


Fig.15 - Typical gain-bandwidth product vs collector current.

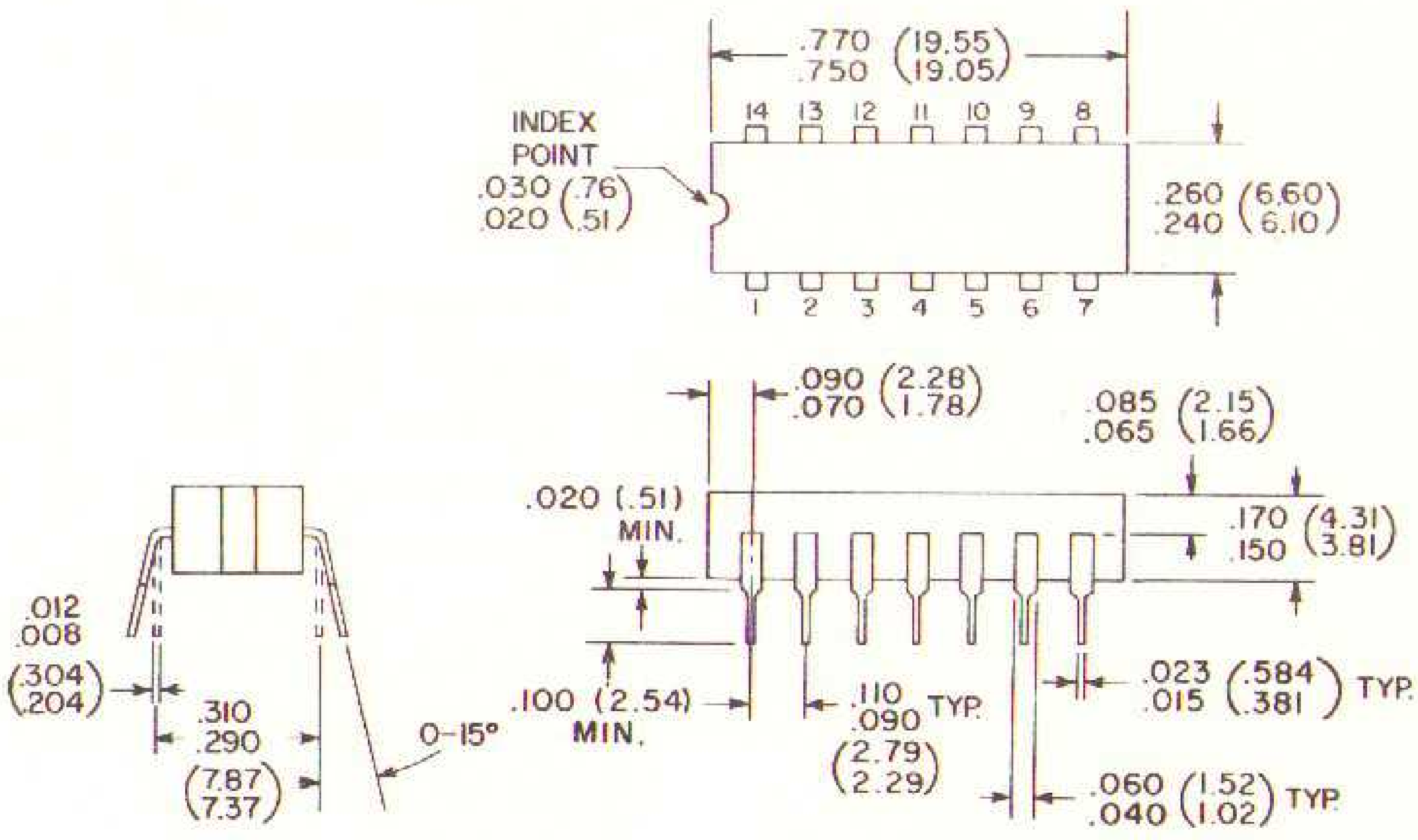
DIMENSIONAL OUTLINE CA3045

14-Lead Dual In-Line
Ceramic Package JEDEC TO-116



DIMENSIONAL OUTLINE CA3046

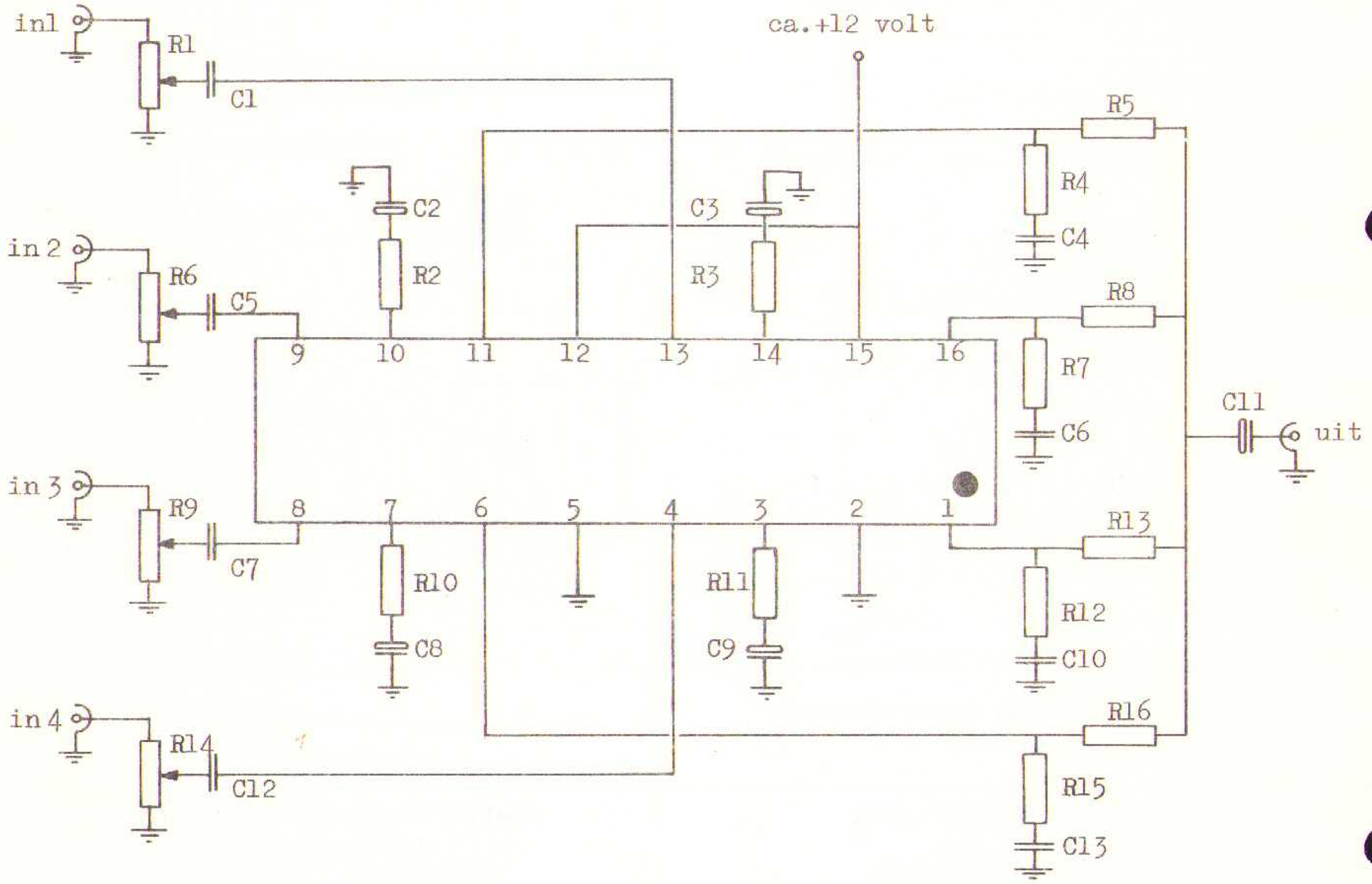
14-Lead Dual In-Line
Plastic Package JEDEC TO-116



4-KANAALS MIXER MET CA 3048.

Eén van de vele mogelijkheden tot toepassing van de nieuwe CA 3048 van R.C.A., waarvan de uitgebreide technische gegevens, aansluitingen en testschakelingen zijn opgenomen in onze technische documentatie 1969 deel 10, blz. 17 t/m 23, hebben wij hieronder opgenomen in de configuratie van een mixer voor 4 kanalen. Deze schakeling heeft een ruisgetal van 2dB bij 1kHz. Door voor de diverse onderdelen printuitvoeringen te gebruiken, is een vergaande miniaturisatie mogelijk.

schema



onderdelenlijst:

R1, R6, R9 en R14:	potmeter 220kΩ of 470kΩ log.
R2, R3, R10 en R11:	weerstand 820Ω $\frac{1}{4}$ watt (eventueel metaalfilm 1%).
R4, R7, R12 en R15:	weerstand 100Ω $\frac{1}{4}$ watt (eventueel metaalfilm 1%).
R5, R8, R13 en R16:	weerstand 8,2kΩ $\frac{1}{4}$ watt (eventueel metaalfilm 1%).
C1, C5, C7 en C12:	condensator 0,1μF 12V keramisch of PFE 0,1μF 50V.
C2, C3, C8 en C9 :	elco 50μF 3V (axiaal of tantaal).
C4, C6, C10 en C13:	condensator 8,2nF 50 volt of keramisch.
C11 :	elco 1,5μF 20V 10% tantaal (Sprague).
IC :	CA 3048 (R.C.A.).

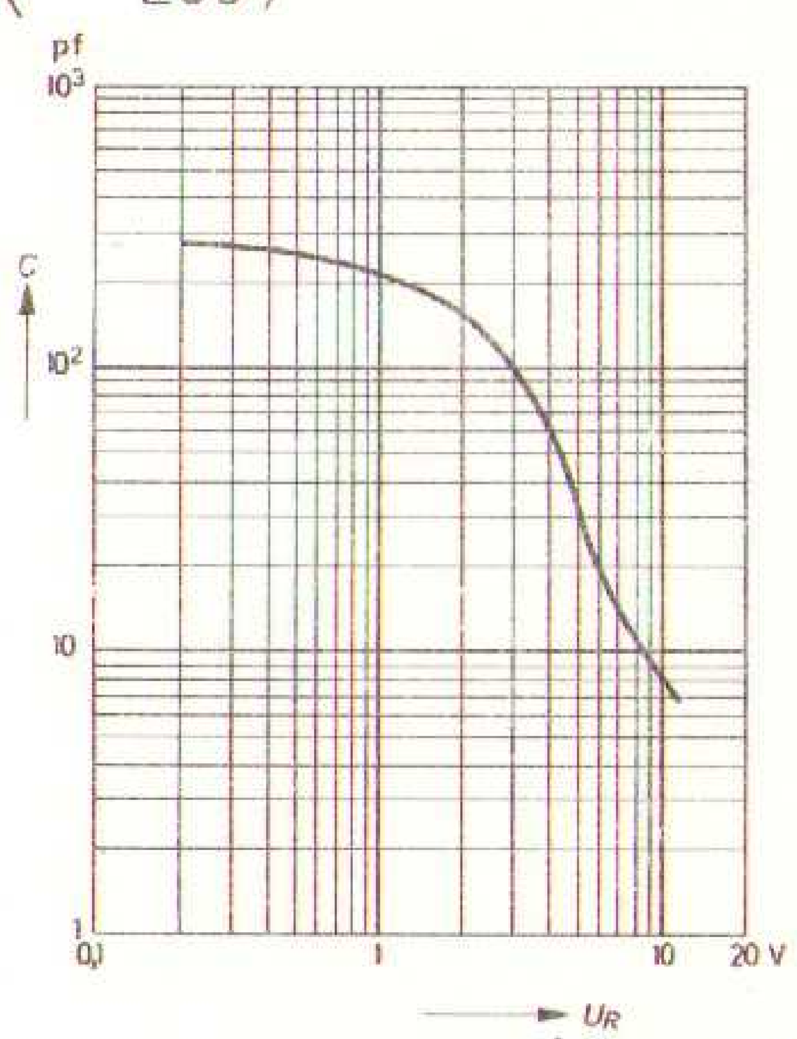
Middengolfontvanger met capaciteitsdioden

Het gebruik van capaciteitsdioden in de hier besproken middengolfontvanger biedt verscheidene belangrijke voordelen, zoals:

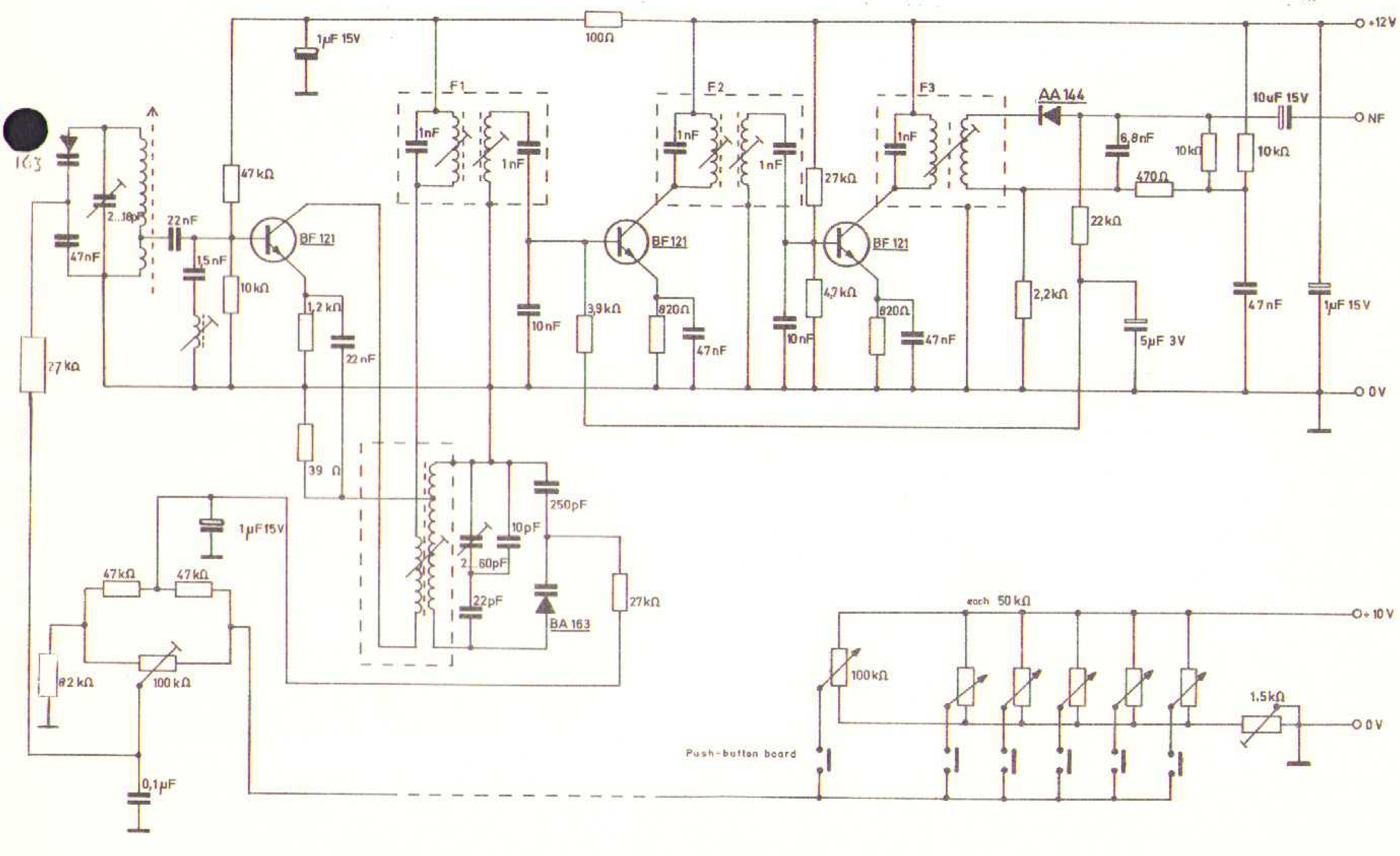
- doordat de afstemming geschiedt met behulp van gelijkspanning kan het afstemgedeelte en het hoogfrequentgedeelte afzonderlijk worden aangebracht, waarbij de plaatsing van deze afstemleidingen niet kritisch is.
- door voor de verschillende zenders een afzonderlijke instelpotentiometer te gebruiken is een eenvoudige afstemming met behulp van druktoetsschakelaars mogelijk; indien deze gescheiden worden aangebracht is een vergaande miniaturisering van het hoogfrequentgedeelte mogelijk.
- doordat het aantal verdraaiïngen van de instelling minimaal is geworden, is de mechanische slijtage minimaal geworden; de levensduur van de te gebruiken capaciteitsdioden is véél langer dan die van de conventionele afstemcondensator.
- door het grote regelbereik van de nieuwe capaciteitsdiode BA 163 van I.T.T., welke een capaciteitsverandering heeft van meer dan 26x, is het gehele middengolfgebied te beslaan. Enkele gegevens van deze diode zijn:

Capaciteit bij $U_R = 0 \ldots 1{,}5V$ $C = 260pF$
    bij $U_R = 1V$ $C = 180pF$
    bij $U_R = 4 \ldots 10V$ $C = 10pF$
Capaciteitsverhouding bij $U_R = 0 \ldots 10V$ C (0V) : C (10V): 35 (26)
    bij $U_R = 1 \ldots 10V$ C (1V) : C (10V): 25 (18)
Serieweerstand bij $U_R = 1V$: $R_s = 1{,}5\Omega$
Kwaliteitsfactor bij $U_R = 10V$ en $f = 0{,}3$-$1{,}5MHz$: $Q = 500$ (200)
    bij $U_R = 1V$ en $f = 0{,}15$-$0{,}5MHz$: $Q = 500$ (200)
Sperstroom bij $U_R = 10V$: I_R $0{,}5\mu A$
Maximale voedingsspanning: $U_R = 12$ volt
Doorbreekspanning: U_Z 14 volt

Capaciteit als functie van de spanning (gemiddelde waarde):



Toepassing als middengolfontvanger met BA 163 en BF 121.



★

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