

RING (DE)MODULATOR FOR TELEPHONY AND INDUSTRIAL EQUIPMENT

The TBA673 is a monolithic integrated circuit comprising a 4-transistor modulator and demodulator circuit.

The four transistors must be as identical as possible; the lay-out has been designed to achieve this and the best possible tracking of the transistor parameters with temperature.

QUICK REFERENCE DATA

Collector cut-off current

$$I_E = 0; V_{CB} = 5 \text{ V}; T_{amb} = 25 \text{ }^\circ\text{C}$$

$$I_{CBO} < 100 \text{ nA}$$

Base-emitter voltage differences
between transistors 1, 2, 3, 4

$$|V_{BE1} - V_{BE2}| < 5 \text{ mV}$$

$$V_{CB} = 5 \text{ V}; -I_E = 150 \text{ } \mu\text{A}$$

$$|V_{BE3} - V_{BE4}| < 5 \text{ mV}$$

D. C. current gain differences
between transistors 1, 2, 3, 4

$$|h_{FB1} - h_{FB2}| < 0,008$$

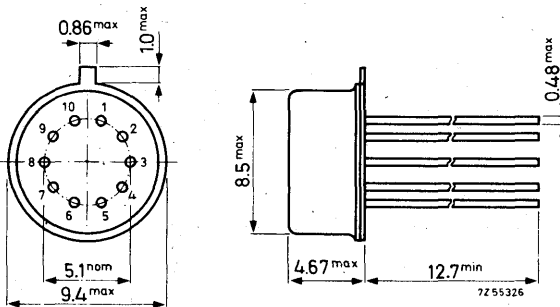
$$V_{CB} = 5 \text{ V}; -I_E = 150 \text{ } \mu\text{A}$$

$$|h_{FB3} - h_{FB4}| < 0,008$$

PACKAGE OUTLINE

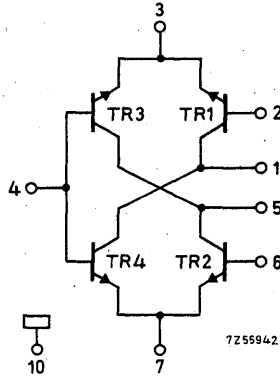
Dimensions in mm

TO-74 (reduced height)



TBA673

CIRCUIT DIAGRAM



RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Voltages (each transistor)

Collector-emitter voltage (open base)	V_{CEO}	max.	17,5	V
Emitter-base voltage (open collector)	V_{EBO}	max.	6,2	V
Collector-substrate voltage	V_{CS}	max.	65	V

Currents (each transistor)

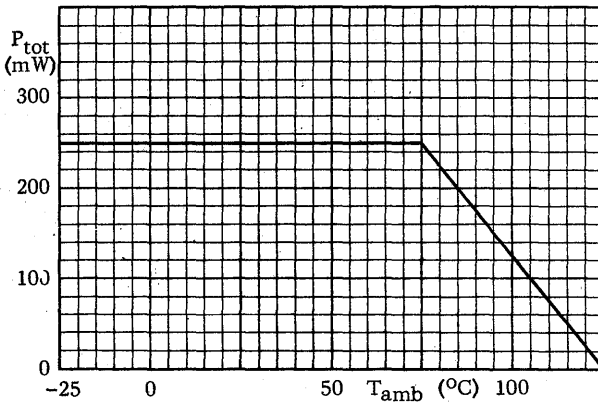
Collector current	I_C	max.	20	mA
→ Emitter cut-off current	I_{EBO}	max.	10	μ A

Power dissipation (4 transistors)

Total power dissipation See curve below

Temperatures

Storage temperature	T_{stg}	-55 to +125	$^{\circ}$ C
Operating ambient temperature		See curve below	



$T_{amb} = 25\text{ }^{\circ}\text{C}$ unless otherwise specified

CHARACTERISTICS

Collector cut-off current

$I_E = 0; V_{CB} = 5\text{ V}$

I_{CBO}	typ.	5	nA
	<	100	nA

Collector-substrate leakage current

$V_{CS} = 5\text{ V}$

I_{CS}	typ.	5	nA
	<	100	nA

Emitter cut-off current

$I_C = 0; V_{EB} = 1\text{ V}$

I_{EBO}	typ.	5	nA
	<	100	nA

Breakdown voltages

$I_E = 0; I_C = 50\text{ }\mu\text{A}$

$V_{(BR)CBO}$	>	45	V
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$I_B = 0; I_C = 200\text{ }\mu\text{A}$

$V_{(BR)CEO}$	>	17,5	V
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$-I_S = 50\text{ }\mu\text{A}$

$V_{(BR)CS}$	>	65	V
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$I_C = 0; I_E = 10\text{ }\mu\text{A}$

$V_{(BR)EBO}$	>	6,2	V
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D.C. current gain

$I_C = 150\text{ }\mu\text{A}; V_{CB} = 5\text{ V}$

h_{FE}	>	35	
	typ.	90	

$I_C = 10\text{ mA}; V_{CB} = 5\text{ V}$

h_{FE}	>	35	
	typ.	75	

Transition frequency at $f = 35\text{ MHz}$

$I_C = 150\text{ }\mu\text{A}; V_{CB} = 5\text{ V}$

f_T	typ.	140	MHz ←
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$I_C = 1\text{ mA}; V_{CB} = 5\text{ V}$

f_T	typ.	320	MHz ←
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Collector-base capacitance

$V_{CB} = 5\text{ V}; I_E = 0$

C_{cb}	typ.	0,4	pF
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Collector-substrate capacitance

$V_{CS} = 5\text{ V}; I_E = 0$

C_{cs}	typ.	2,8	pF
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Base-emitter voltage difference

between transistors TR1 and TR2 at

$-I_{E1} = -I_{E2} = 150\text{ }\mu\text{A}; V_{CB1} = V_{CB2} = 5\text{ V}$

$ V_{BE1} - V_{BE2} $	typ.	2	mV
	<	5	mV

between transistors TR3 and TR4 at

$-I_{E3} = -I_{E4} = 150\text{ }\mu\text{A}; V_{CB3} = V_{CB4} = 5\text{ V}$

$ V_{BE3} - V_{BE4} $	typ.	2	mV
	<	5	mV

D.C. current gain differences

between transistors TR1 and TR2 at

$-I_{E1} = -I_{E2} = 150\text{ }\mu\text{A}; V_{CB1} = V_{CB2} = 5\text{ V}$

$ h_{FB1} - h_{FB2} $	typ.	0,002	
	<	0,008	

between transistors TR3 and TR4 at

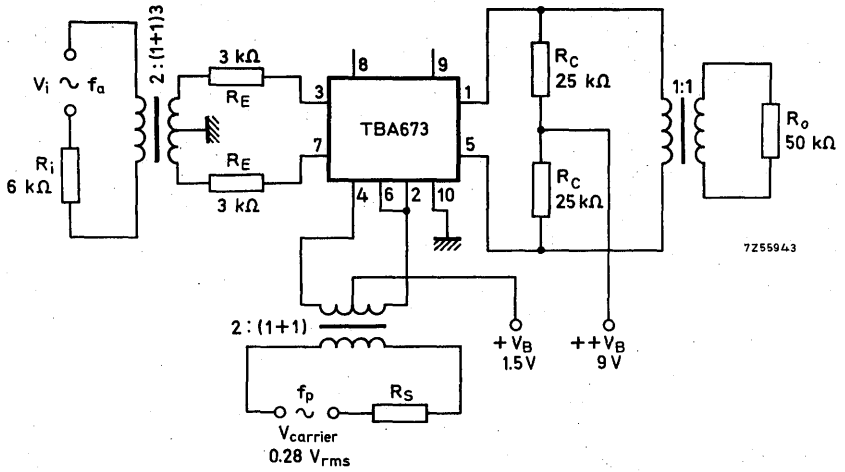
$-I_{E3} = -I_{E4} = 150\text{ }\mu\text{A}; V_{CB3} = V_{CB4} = 5\text{ V}$

$ h_{FB3} - h_{FB4} $	typ.	0,002	
	<	0,008	

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APPLICATION INFORMATION

Telephony carriers ring modulator



Performance at $T_{amb} = 25^{\circ}C$

Conversion gain at $f_a = 1$ kHz

$V_i = 0,4$ V; $f_p = 34$ kHz

Carrier leakage power in R_o at $f_p = 34$ kHz

G_c typ. $-0,75$ dB

P_{oc} typ. 3 nW