THOMSON SEMICONDUCTORS

TEA2021

T-74-05-01

7 W AUDIO AMPLIFIER

The TEA2021 is a monolithic integrated circuit designed for classe B audio amplification, with up to 7 W output power : it is internally protected against overheating.
It provides the advantages following :

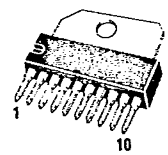
- The idling current stability obtained from a built-in temperature and voltage-compensating network makes thermal runaway impossible
- High open-loop gain.
- The use of PNP transistors in the preamplifier allows DC input voltage to be zero.
- Others highlights include : few external components
  . simple heatsinking
  . space and cost saving.

- High output power : 7 W at V_{CC} = 16 V, R_L = 4 Ω
- Low noise
- High supply voltage ripple rejection
- Load dump protection up to 40 V

The circuit is protected against overheating, output short-circuits (V_{CC} = 15 V), polarity inversion and fortuitous open ground.

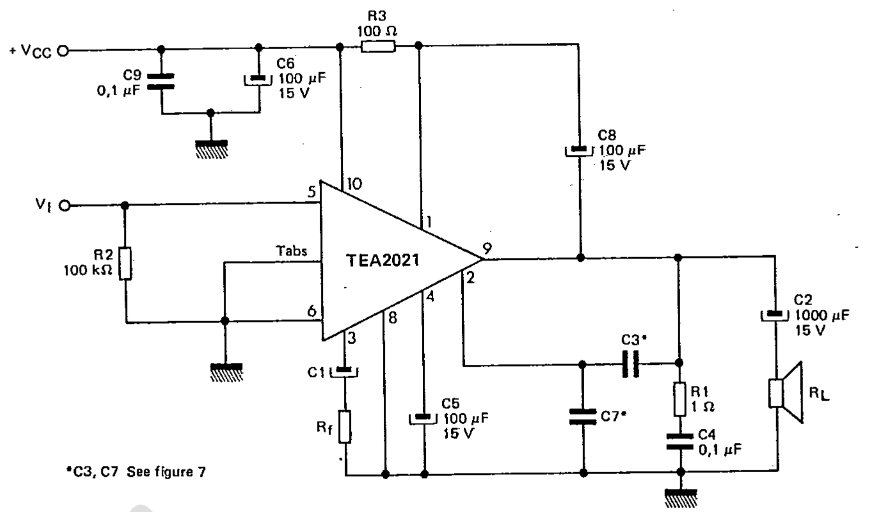
7 W AUDIO AMPLIFIER

CASE CB-313



SP SUFFIX
PLASTIC PACKAGE

SCHEMATIC



*C3, C7 See figure 7

NT8318-A

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THOMSON COMPONENTS

 T-74-05-01

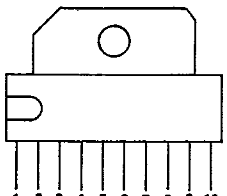
MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Peak supply voltage (50 ms)	V_{CC}	40	V
DC supply voltage	V_{CC}	28	V
Supply voltage	V_{CC}	20	V
Peak output current (non repetitive)	I_O	4	A
Peak output current (repetitive)	I_O	3	A
Junction temperature	T_j	– 40,+ 150	°C
Storage temperature	T_{stg}	– 40,+ 150	°C

THERMAL CHARACTERISTICS

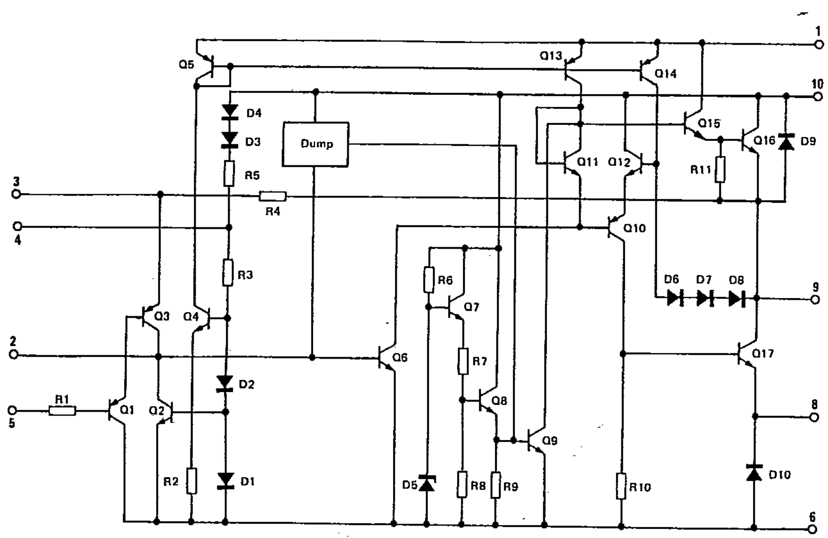
Characteristic	Symbol	Value	Unit
Junction-case thermal resistance	$R_{th(j-c)}$	10	°C/W
Junction ambient thermal resistance	$R_{th(j-a)}$	55	°C/W

PIN CONFIGURATION



1	Bootstrap
2	Compensation
3	Feed-back network
4	Ripple rejection
5	Input
6	Preamplifier ground and substrate
7	No to be used
8	Output stage ground
9	Output
10	Supply voltage V_{CC}

ELECTRICAL DIAGRAM



T-74-05-01

ELECTRICAL CHARACTERISTICS

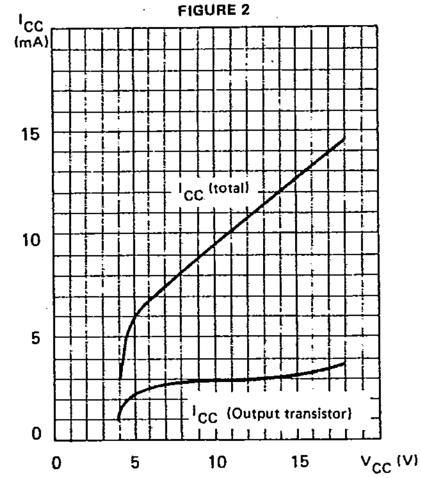
T_{amb} = + 25°C Note 1 V_{CC} = 14.4 V (Unless otherwise specified)

Characteristic	Symbol	Min	Typ	Max	Unit
Supply voltage Pin 10	V_{CC}	4	–	20	V
Quiescent output voltage (V_{CC} = 14.4 V) Pin 9	V_O	6.4	7.2	8	V
Quiescent current (V_{CC} = 14.4 V) Pin 10	I_{CC}	–	12	20	mA
Bias current (V_{CC} = 14.4 V) Pin 5	I_B	–	0.4	–	µA
Output power (d = 10 % ; f = 1 KHz)	P_O				W
V_{CC} = 14.4 V ; R_L = 4 Ω		5.5	6	–	
V_{CC} = 13.2 V ; R_L = 3.2 Ω		–	5.8	–	
Input voltage saturation (sine wave)	V_{Irms}	220	–	–	mV
Sensitivity (f = 1 KHz)	S				mV
P_O = 6 W ; V_{CC} = 14.4 V ; R_L = 4 Ω ; R_f = 56 Ω		–	75	–	
P_O = 6 W ; V_{CC} = 14.4 V ; R_L = 4 Ω ; R_f = 22 Ω		–	30	–	
P_O = 5.8 W ; V_{CC} = 13.2 V ; R_L = 3.2 Ω ; R_f = 56 Ω		–	60	–	
P_O = 5.8 W ; V_{CC} = 13.2 V ; R_L = 3.2 Ω ; R_f = 10 Ω		–	12	–	
Input resistance Pin 5	Z_I	–	5	–	MΩ
Frequency response (–3 dB), (V_{CC} = 14.4 V ; R_L = 4 Ω ; R_f = 56 Ω)	B				Hz
C3 = 820 pF			40 - 20 000		
C3 = 1500 pF			40 - 10 000		
Distortion (V_{CC} = 14.4 V ; P_O = 50 mW→2.5 W ; R_L = 4 Ω ; f = 1 KHz)	d	–	0.3	–	%
Voltage gain (open loop) (V_{CC} = 14.4 V ; R_L = 4 Ω ; f = 1 KHz)	A_V	–	80	–	dB
Voltage gain (closed loop)	A_V				dB
V_{CC} = 14.4 V ; R_L = 4 Ω ; f = 1 KHz ; R_f = 56 Ω		34	37	40	
Input noise voltage (V_{CC} = 16 V ; B(–3 dB) = 40 - 15 000 Hz)	v_n	–	2	–	µV
Input noise current (V_{CC} = 16 V ; B(–3 dB) = 40 - 15 000 Hz)	i_n	–	80	–	pA
Efficiency (V_{CC} = 14.4 V ; P_O = 6 W ; R_L = 4 Ω ; f = 1 KHz)	η	–	67	–	%
Supply voltage rejection	SVR				dB
V_{CC} = 14.4 V ; R_L = 4 Ω ; V_{ripple} = 1 Vrms ; f = 100 Hz ; A_V = 37 dB ; C5 = 100 µF		40	48	–	

Note 1 : The characteristics above were obtained using the circuit shown in figure 1.

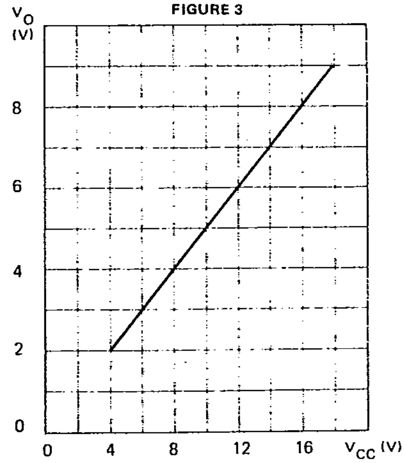
TYPICAL QUIESCENT CURRENT VERSUS SUPPLY VOLTAGE

FIGURE 2



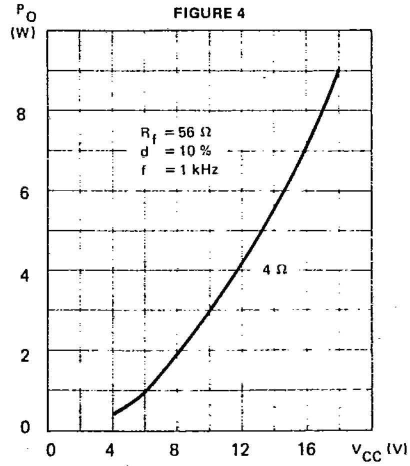
TYPICAL QUIESCENT OUTPUT VOLTAGE (pin 8) VERSUS SUPPLY VOLTAGE

FIGURE 3



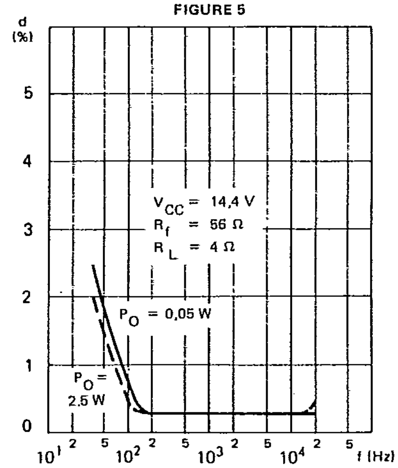
TYPICAL POWER OUTPUT VERSUS SUPPLY VOLTAGE

FIGURE 4



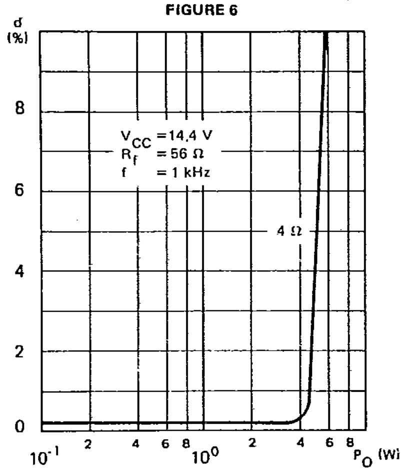
TYPICAL DISTORTION VERSUS FREQUENCY

FIGURE 5



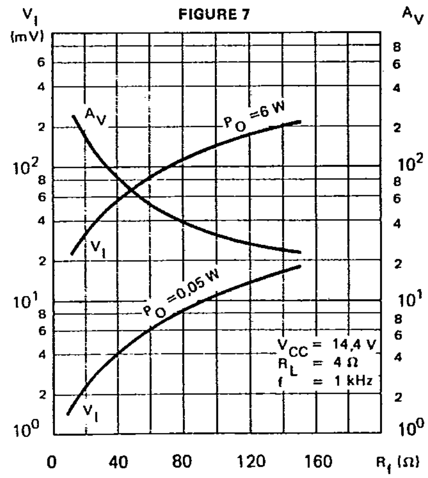
TYPICAL DISTORTION VERSUS OUTPUT POWER

FIGURE 6



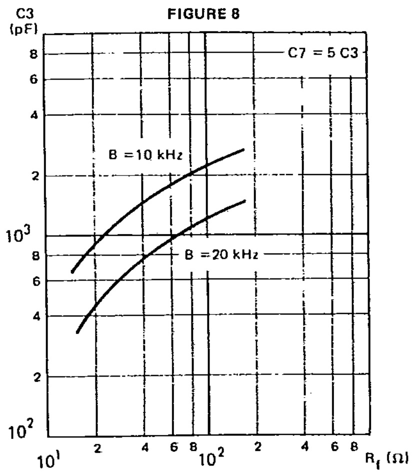
TYPICAL RELATIVE VOLTAGE GAIN (CLOSED LOOP) AND TYPICAL INPUT VOLTAGE VERSUS FEEDBACK RESISTANCE (R_f)

FIGURE 7



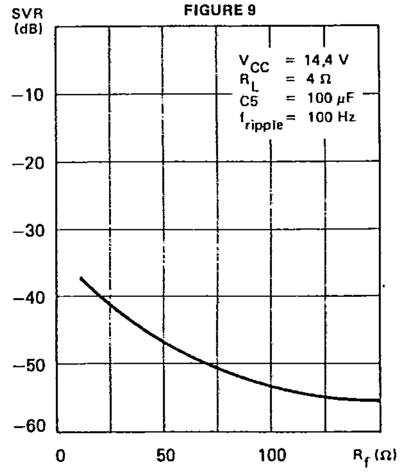
TYPICAL VALUES OF C3 VERSUS R_f FOR VARIOUS VALUES OF B

FIGURE 8



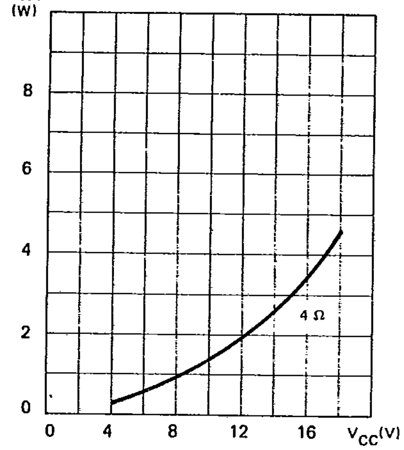
TYPICAL SUPPLY VOLTAGE REJECTION RATIO VERSUS FEEDBACK RESISTANCE

FIGURE 9



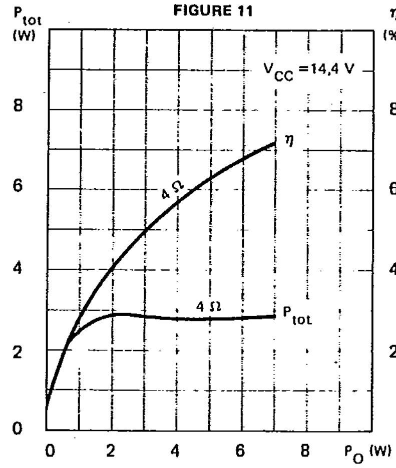
MAXIMUM POWER DISSIPATION VERSUS SUPPLY VOLTAGE (Sine wave operation)

FIGURE 10

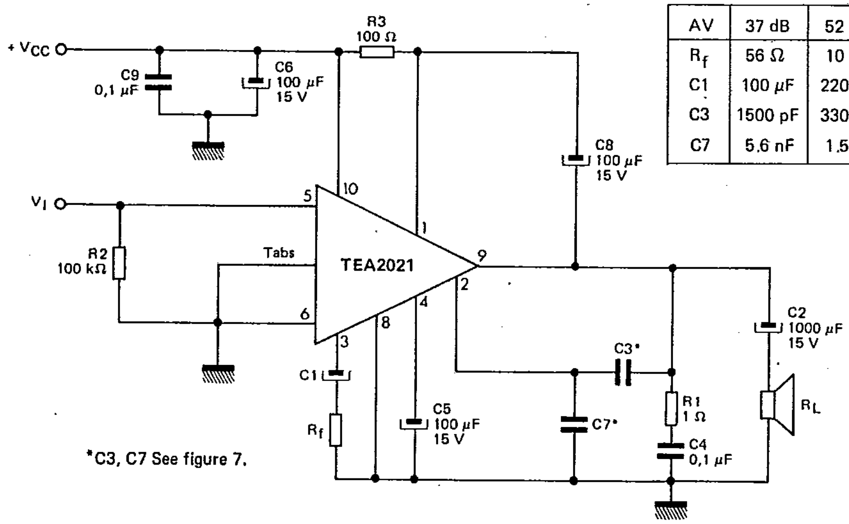


TYPICAL POWER DISSIPATION AND EFFICIENCY VERSUS OUTPUT POWER

FIGURE 11



TEST AND APPLICATION CIRCUIT



AV	37 dB	52 dB
R_f	56 Ω	10 Ω
C1	100 μF	220 μF
C3	1500 pF	330 pF
C7	5,6 nF	1,5 nF

*C3, C7 See figure 7.

BUILT-IN PROTECTION SYSTEMS

Load dump protection

The load dump case occurs in a car when the engine is running and the battery is disconnected : voltage spikes on the power line are supplied by the alternator since there is no clampling effect due to battery capacitance.

The TEA2021 was designed to withstand a pulse train on pin 10, of the type shown in fig. 12. Providing an LC filter is included, as shown in fig. 13, a much higher pulse train amplitude (up to 100 V peak) in allowed on the supply line with no damage to the device.

Short-circuit protection

The TEA2021 can withstand a permanent short-circuit accross the load for a supply voltage up to 15 V.

Polarity inversion protection

High current (up to 5 A) can be handled by the device with no damage for a longer period than the blow-out time of a quick 1 A fuse (normally connected in series with the supply). This feature is added to avoid destruction if, during fitting to the car, a mistake on the connection of the supply is made.

Open ground protection

When the radio is in the ON condition and the ground is accidentally opened, a standard audio amplifier will be damaged. On the TEA2021, protection diodes are included to avoid any damage.

Inductive load protection

A protection diode is provided between pins 9 and 10 (see the internal schematic diagram) the allow used of the TEA 2021 with inductive loads.

In particular, the TEA2021 can drive the coupling transformer for audio modulation in CB transmitters.

DC voltage protection

The maximum operating DC voltage on the TEA2021 is 20 V.

However the device can withstand a DC voltage up to 28 V with no damage. This could occur during winter if two batteries were series connected to crank the engine.

FIGURE 12

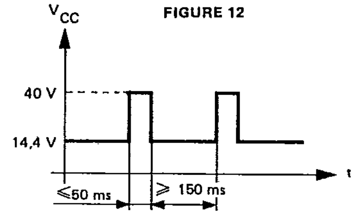
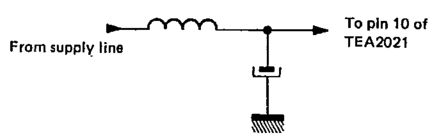
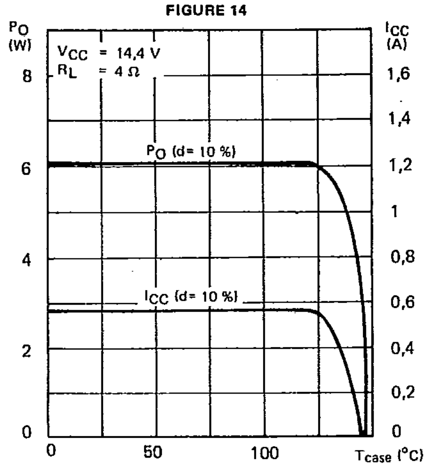


FIGURE 13



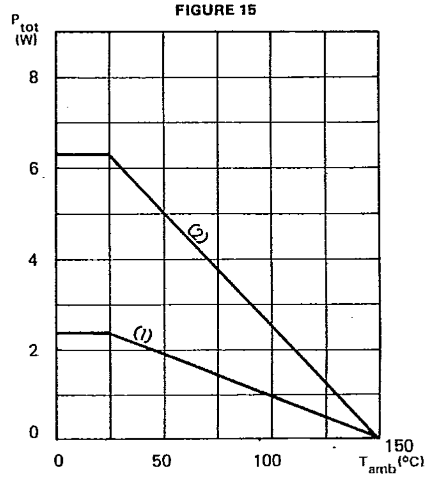
OUTPUT POWER AND SUPPLY CURRENT VERSUS PACKAGE TEMPERATURE

FIGURE 14



MAXIMUM POWER DISSIPATION

FIGURE 15



(1) Without heatsink
(2) With heatsink 10°C/W

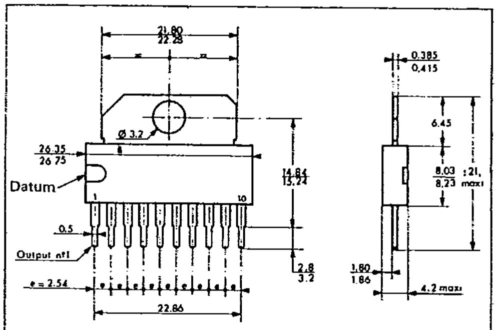
THERMAL PROTECTION

A thermal limiting circuit is internally provided on TEA 2021 to prevent chip temperature exceeding 150°C. This protection offers the following advantages :

1 - An overload on the output (even of permanent), or an above-limit ambient temperature can be withstood.

2 - The heatsink can be designed with smaller safety margins compared with that of a conventional power audio amplifier.

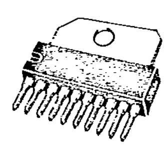
The TEA2021 will remain undamaged in the event of excessive junction temperature : all that happens is that P_O (and therefore P_{tot}) are reduced (fig. 14).



10 Outputs

DIN				
CEI	D.A.T.A.	JEDEC	SITELESC	CB-313

CASE CB-313



SP SUFFIX
PLASTIC PACKAGE

These specifications are subject to change without notice.
Please inquire with our sales offices about the availability of the different packages.