LINEAR INTEGRATED CIRCUIT

LS342

MULTIFREQUENCY TO TELEPHONE LINE INTERFACE CIRCUIT

The LS342 is a monolithic integrated circuit in dual in-line minidip plastic package. It interfaces the multifrequency tone diallers M751 and M761/761A to the line in telephone sets, performing the following functions:

- Adjustment of the DC current/voltage characteristic and AC input line impedance by means of an external resistor (R_E).
- Sending to the line of the multifrequency signal.
- Adjustment of the signal level by means of an external resistor (R_T).
- Stabilized supply voltage to the tone dialler.

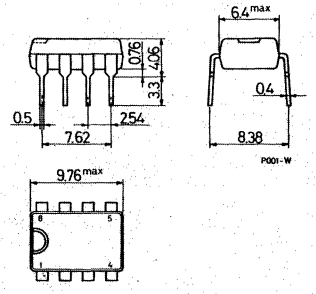
ABSOLUTE MAXIMUM RATINGS

V_L	Maximum line voltage (pulse duration $\leqslant$ 10 ms)	22	V
I_L	Maximum forward current	155	mA
I_L	Maximum reverse current	-150	mA
P_{tot}	Total power dissipation at T_{amb} = 70°C	800	mW
T_{op}	Operating temperature	-40 to 70	°C
T_{stg}, T_j	Storage and junction temperature	-55 to 150	°C

ORDERING NUMBER: LS342D

MECHANICAL DATA

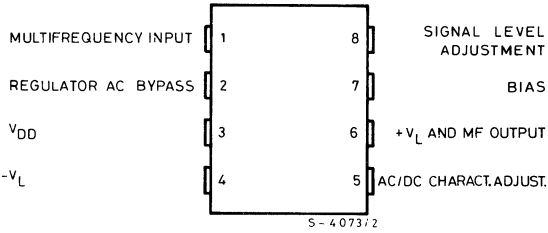
Dimensions in mm



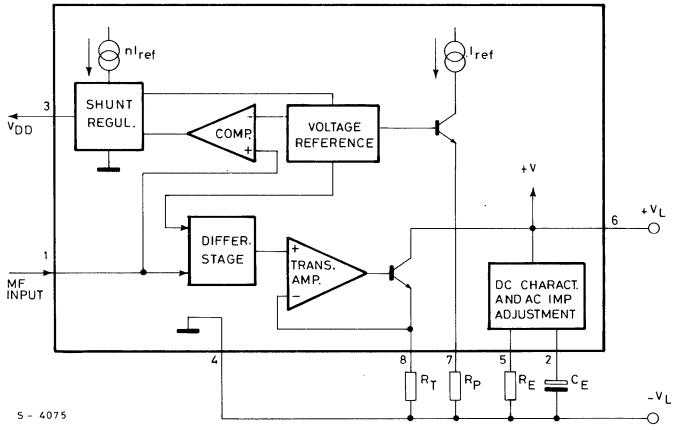
LS342

CONNECTION DIAGRAM

(top view)



BLOCK DIAGRAM



DESCRIPTION

The LS342 interface the M751 and M761/761A tone diallers with the telephone line. Power is only applied to the system when the handset is lifted and a key pressed. At this time S1 is also switched (see fig. 2) disconnecting the speech circuit from the line and connecting the dialling circuit.
In the dialling condition the LS342 performs 3 functions:

1) D.C. and A.C. line termination
2) Tone dialler power supply
3) Amplification and transmission of tone pairs.

In the initial stage of switch-on the supply voltage V_{DD} is regulated at $\cong$ 4 volt. This overdrives the M751/761/761A internal oscillator causing a rapid start-up and therefore rapid generation of output tones.
When the system reaches its normal operating point the supply voltage V_{DD} is stabilized at 2.5V $\pm$ 4%.

THERMAL DATA

$R_{thj\text{-}amb}$	Thermal resistance junction-ambient	max	100 °C/W

ELECTRICAL CHARACTERISTICS (I_L = 10 to 100 mA; T_{amb} = -25 to +60°C; f = 1 KHz; S in (b), unless otherwise specified).

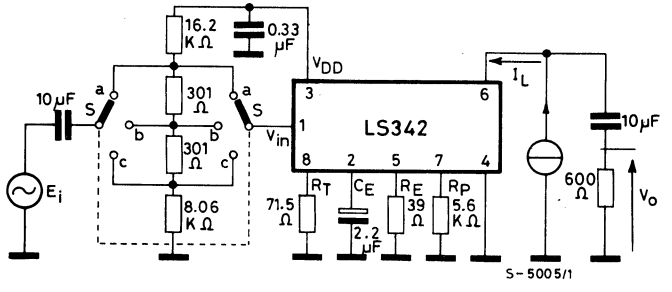
Parameter		Test conditions		Min.	Typ.	Max.	Unit
V_L	Line voltage	E_i = 0	I_L = 10 mA I_L = 17 mA I_L = 60 mA I_L = 150 mA		4.2 4.6 6.3 9.8	4.5 5 6.8 11.5	V
G_s	Sending gain	T_{amb} = 25°C E_i = 50 mV f = 500 Hz to 2 KHz		12.4		14	dB
ΔG_s	Sending gain spread over temperature					± 0.2	dB
THD*	Distortion	S in (a) E_i = 120 mV **				2	%
		S in (c) E_i = 95 mV **				2	
A_R	Return loss	Z_{REF} = 600Ω f = 300 Hz to 3.4 KHz		14			dB
Z_{OUT}	Output impedance (pins 6, 4)	C_E = 2.2 μF R_E = 39Ω			750		Ω
V_{DD}	Supply voltage for digital device	T_{amb} = 25°C		2.4	2.5	2.6	V
I_{DD}	Supply current for digital device	V_{DD} = 2.4V		1.8			mA
t_s***	Start-up time					5	msec
Z_{IN}	Input impedance (pin 1)			4			MΩ

* The distortion of the device is not affected by a signal coming from the line with the following levels: -13 dBm if I_L = 10 mA, -8 dBm if I_L = 20 mA.

** The different AC and DC levels are intended to simulate the limit working operation of the digital devices M751, M761, M761A.

*** The time necessary because the AC signal is varying within ± 1 dB of its steady-state value.

Fig. 1 - Test circuit



APPLICATION INFORMATION

The table shows the recommended values for the circuit of fig. 2.

Component	Recomm. value	Purpose	Note
R_E	39 Ω	DC characteristic AC impedance adjustment	The relationships involving R_E are: • $V_L = (I_L - I_o) R_E + V_o$ where $I_o \cong 6$ mA and $V_o \cong 4V$ • $Z_o = 22 R_E$ (f = 1 KHz) The following relationship must be always verified $R_E \geqslant \frac{Vp \cdot Z_L}{(I_L - I_o) Z_L - 22 Vp}$ where Vp is the maximum peak value of the MF signal in the line and Z_L is the line impedance.
R_p	5.6 KΩ	Bias resistor	R_p can be reduced in order to increase the output current from pin 3 (V_{DD}). In this case, the total current consumption is increased.
R_T	71.5Ω	Signal level adjustment	The MF gain is: $G_{MF} = 0.97 \frac{Z_L // Z_o}{R_T}$ The recommended value for R_T is good to set the Europe I standard (-9 dBm, -11 dBm). If the Europe II or the American Standard is required, R_T must be decreased. In the mean time, the minimum operation current will increase because the pin 8 voltage is fixed by an internal reference (190 mV typ.).
C_E	2.2 μF	Regulator AC bypass	A value greater than 2.2 μF gives a system start time too high when line current is between 10 mA and 17 mA. A value less than 2.2 μF gives an alteration of the AC line impedance because its reactance is not negligible at low frequencies.
C_f	0.33 μF	DC filtering	The C_f range is from 0.33 μF to 0.47 μF. The lowest values is ripple limited, the higher values is starting up time limited.
C_L	30 nF	Matching to a capacitive line	This is needed with a capacitive line because the output impedance of the LS342 is essentially resistive. The range of C_L is between 30 and 60nF.

Fig. 2 - Application circuit with M751/M761A.