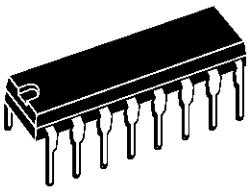
SGS-THOMSON MICROELECTRONICS

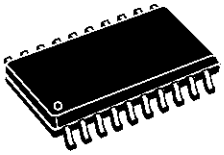
LS256

TELEPHONE SPEECH CIRCUIT WITH MULTIFREQUENCY TONE GENERATOR INTERFACE

- PRESENTS THE PROPER DC PATH FOR THE LINE CURRENT
- HANDLES THE VOICE SIGNAL, PERFORMING THE 2/4 WIRES INTERFACE AND CHANGING THE GAIN ON BOTH SENDING AND RECEIVING AMPLIFIERS TO COMPENSATE FOR LINE ATTENUATION BY SENSING THE LINE LENGTH THROUGH THE LINE CURRENT
- ACTS AS LINEAR INTERFACE FOR MF, SUPPLYING A STABILIZED TO THE DIGITAL CHIP AND DELIVERING TO THE LINE THE MF TONE GENERATED BY THE DIALER



DIP16



SO20

ORDERING NUMBERS :

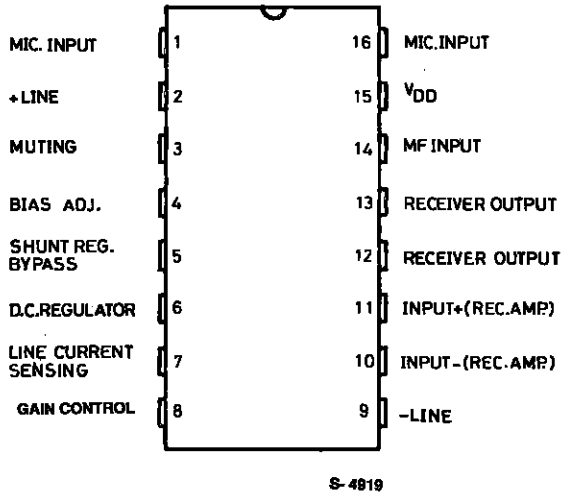
LS256B LS256D

DESCRIPTION

The LS256 is a monolithic integrated circuit in 16-lead dual in-line and SO20 plastic packages to replace the hybrid circuit in telephone set. It works with the same type of transdurcers for both transmitter and receiver (typically piezoceramic capsules, but the device can work also with dynamic ones). Many of its electrical characteristics can be controlled by means of external components to meet different specifications.

In addition to the speech operation, the LS256 acts as an interface for the MF tone signal.

PIN CONNECTIONS (top view)



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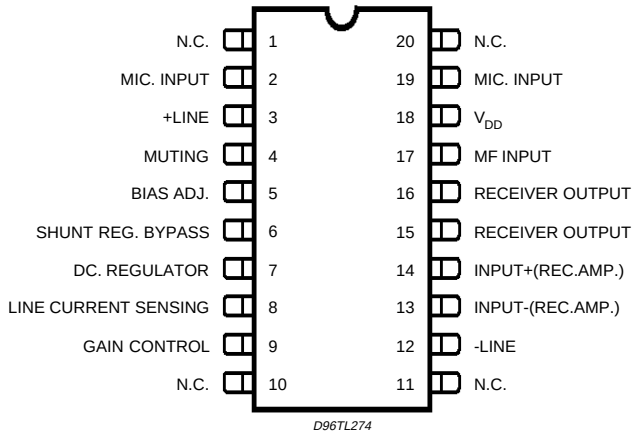
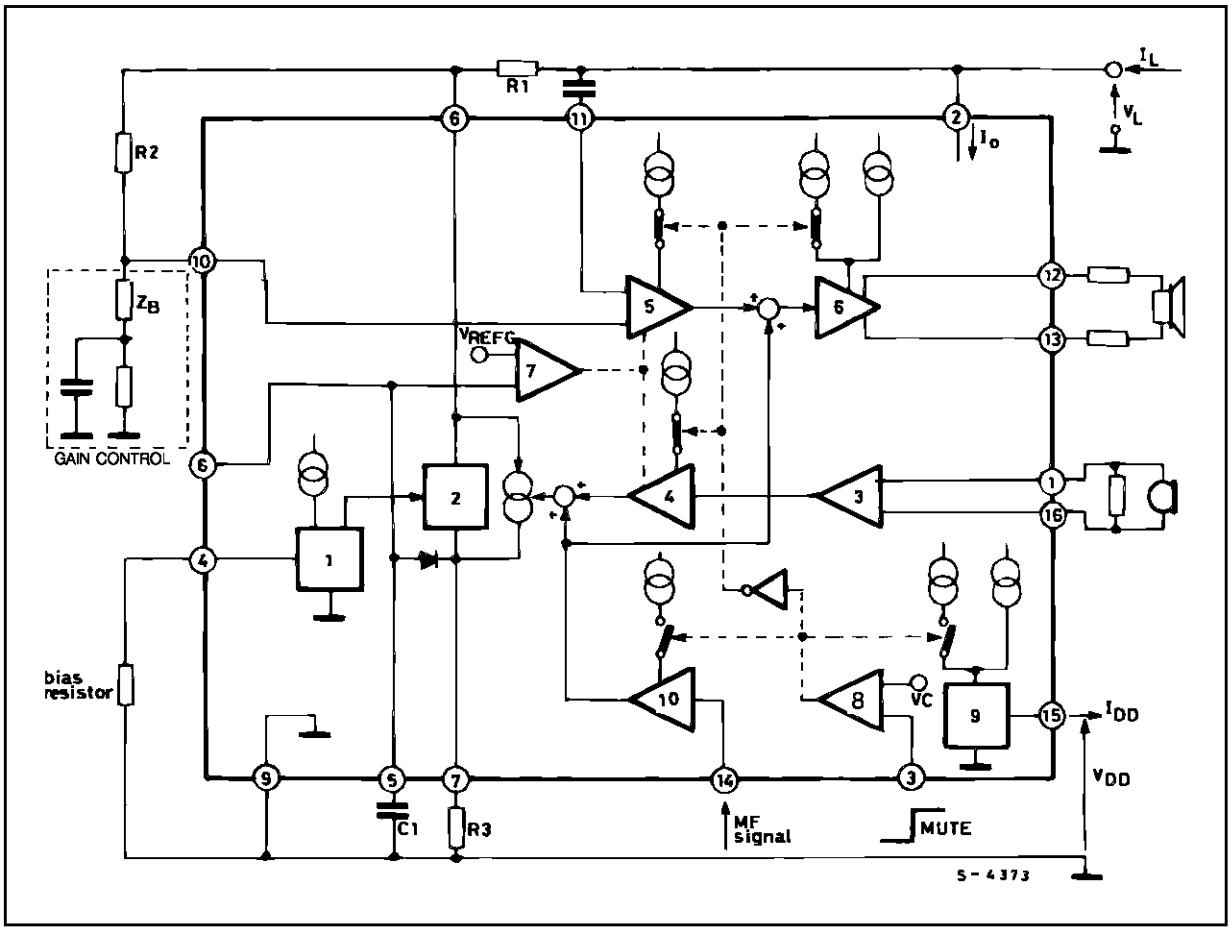


SO20

BLOCK DIAGRAM (ref. to DIP16)



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_L	Line Voltage (3ms pulse duration)	22	V
I_L	Forward Line Current	150	mA
I_L	Reverse Line Current	– 150	mA
P_{tot}	Total Power Dissipation at T_{amb} = 70°C	1	W
T_{op}	Operating Temperature	– 45 to 70	°C
T_{stg}, T_j	Storage and Junction Temperature	– 65 to 150	°C

THERMAL DATA

Symbol	Parameter		DIP16	SO20	Unit
$R_{th\ j\text{-}amb}$	Thermal Resistance Junction-ambient	Max	80	150	°C/W

TEST CIRCUITS (ref. to DIP16)

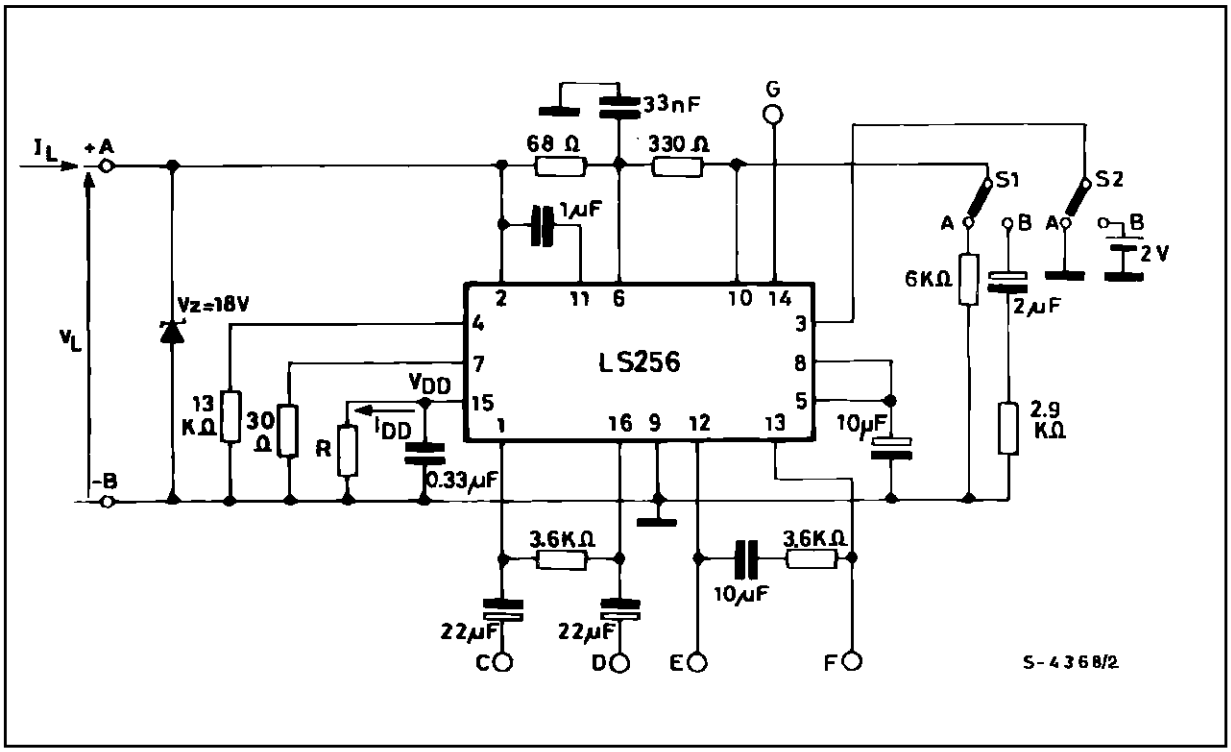
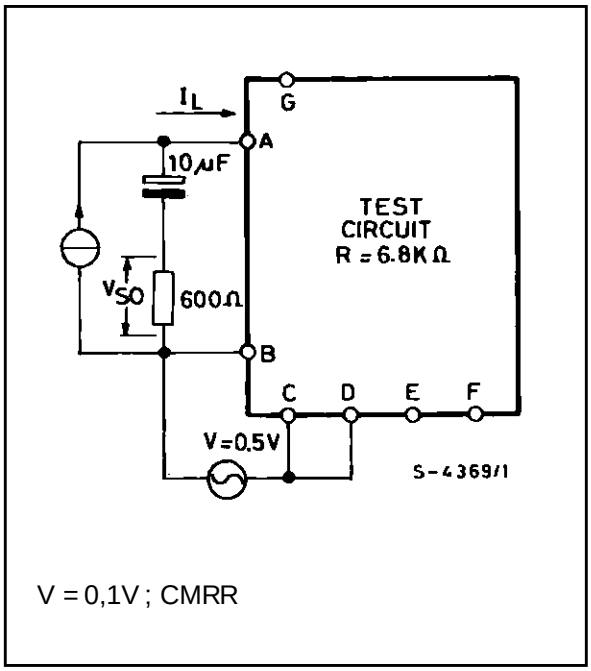
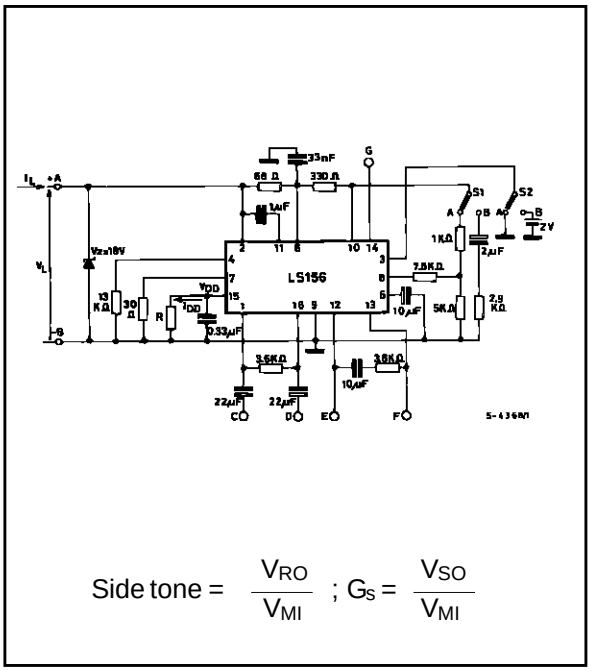


Figure 1.



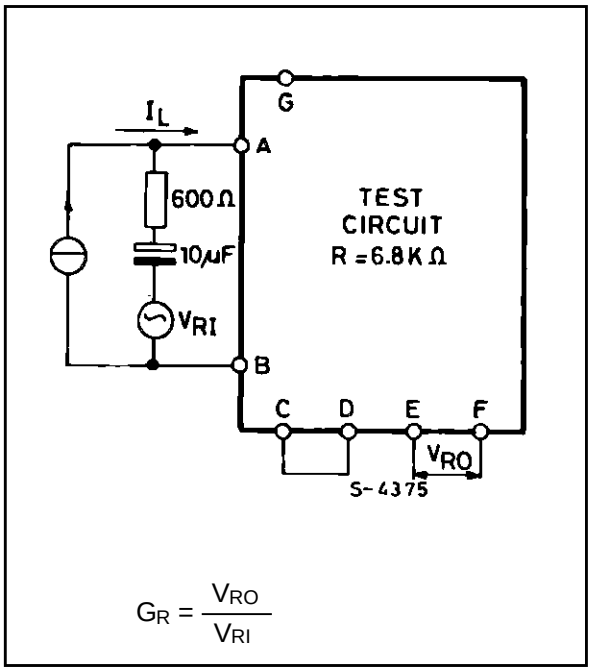
V = 0,1V ; CMRR

Figure 2.



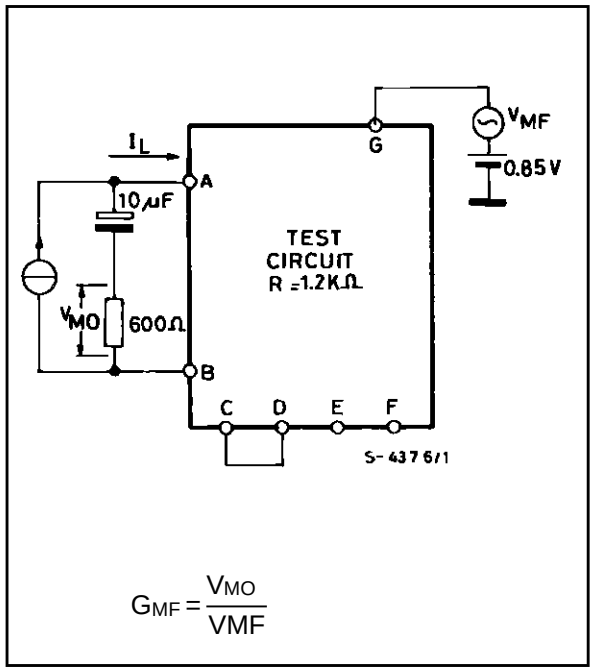
Side tone = $\frac{V_{RO}}{V_{MI}}$; $G_S = \frac{V_{SO}}{V_{MI}}$

Figure 3.



$$G_R = \frac{V_{RO}}{V_{RI}}$$

Figure 4.



$$G_{MF} = \frac{V_{MO}}{VMF}$$

ELECTRICAL CHARACTERISTICS (refer to the test circuits, S1, S2 in (a), T_{amb} = – 25 to + 50°C, f = 200 to 3400Hz, unless otherwise specified)

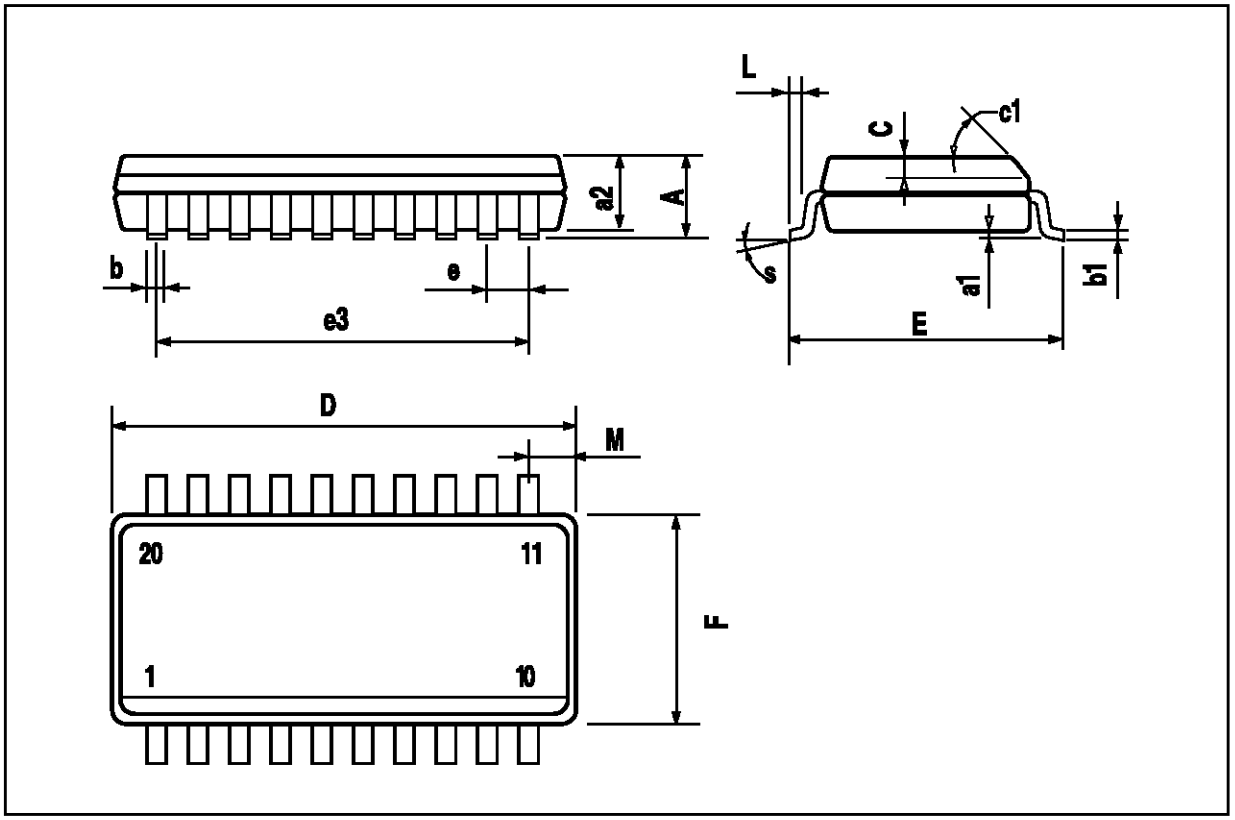
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit	Fig.
SPEECH OPERATION							
V_L	Line Voltage	T_{amb} = 25°C I_L = 12mA I_L = 20mA I_L = 80mA	3.9		4.7 5.5 12.2	V	
CMRR	Common Mode Rejection	f = 1kHz, I_L = 12 to 80mA	50			dB	1
G_S	Sending Gain	T_{amb} = 25°C, f = 1kHz I_L = 52mA V_{MI} = 2mV I_L = 25mA	44 48	45 49	46 50	dB	2
	Sending Gain Flatness	V_{MI} = 2mV, f_{ref} = 1kHz I_L = 12 to 80mA			± 1	dB	2
	Sending Distortion	f = 1kHz V_{SO} = 1V I_L = 16 to 80mA V_{SO} = 1.3V			2 10	%	2
	Sending Noise	V_{MI} = 0V; I_L = 40mA; S1 in (b)			–68.5	dBmp	2
	Microphone Input Impedance Pin 1-16	V_{MI} = 2mV, I_L = 12 to 80mA	40			kΩ	
	Sending Loss in MF Operation	V_{MI} = 2mV I_L = 52mA S_2 in (b) I_L = 25mA	– 30 – 30			dB	2
G_R	Receiving Gain	V_{R1} = 0.3V, f = 1kHz, T_{amb} = 25°C I_L = 52mA I_L = 25mA	2.5 7	3.5 8	4.5 9	dB	3
	Receiving Gain Flatness	V_{RI} = 0.3V, f_{ref} = 1kHz I_L = 12 to 80mA			± 1	dB	3
	Receiving Distortion	f = 1kHz I_L = 12mA V_{RO} = 1.6V I_L = 12mA V_{RO} = 1.9V I_L = 50mA V_{RO} = 1.8V I_L = 50mA V_{RO} = 2.1V			2 10 2 10	%	3
	Receiving Noise	V_{RI} = 0V; I_L = 12 to 80mA; S1 in (b)		100		μV	3
	Receiver Output Impedance Pin 12-13	V_{RO} = 50mV, I_L = 40mA			100	Ω	

ELECTRICAL CHARACTERISTICS (continued)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit	Fig.
SPEECH OPERATION (continued)							
G_R	Sidetone	F = 1kHz, T_{amb} = 25°C, S_1 in (b) I_L = 52mA I_L = 25mA			 36 36	dB	2
Z_{ML}	Line Matching Impedance	V_{RI} = 0.3V, f = 1kHz I_L = 12 to 80mA	500	600	700	Ω	
MULTIFREQUENCY SYNTHESIZER INTERFACE							
V_{DD}	MF Supply Voltage (standby and operation)	I_L = 12 to 80mA	2.4	2.5		V	
I_{DD}	MF Supply Current Stand by Operation	 I_L = 12 to 80mA I_L = 12 to 80mA ; S_2 in (b)	 0.5 2			 mA mA	
	MF Amplifier Gain	I_L = 12 to 80mA, f_{MF} in = 1kHz V_{MF} in = 80mV	15		17	dB	4
V_I	DC Input Voltage Level (pin 14)	$V_{M\ Fin}$ = 80mV		$3V_{DD}$		V	
R_I	Input Impedance (pin 14)	$V_{M\ Fin}$ = 80mV	40			kΩ	
d	Distortion	$V_{M\ Fin}$ = 110mV I_L = 12 to 80mA			2	%	4
	Starting Delay Time	I_L = 12 to 80mA			5	ms	
	Muting Threshold Voltage (pin 3)	Speech Operation			1	V	
		MF Operation	1.6			V	
	Muting Stand by Current (pin 3)	I_L = 12 to 80mA			– 10	µA	
	Muting Operating Current (pin 3)	I_L = 12 to 80mA, S_2 in (b)			+ 10	µA	

SO20 PACKAGE MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			2.65			0.104
a1	0.1		0.3	0.004		0.012
a2			2.45			0.096
b	0.35		0.49	0.014		0.019
b1	0.23		0.32	0.009		0.013
C		0.5			0.020	
c1	45° (typ.)					
D	12.6		13.0	0.496		0.512
E	10		10.65	0.394		0.419
e		1.27			0.050	
e3		11.43			0.450	
F	7.4		7.6	0.291		0.299
L	0.5		1.27	0.020		0.050
M			0.75			0.030
S	8° (max.)					



DIP16 PACKAGE MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
a1	0.51			0.020		
B	0.77		1.65	0.030		0.065
b		0.5			0.020	
b1		0.25			0.010	
D			20			0.787
E		8.5			0.335	
e		2.54			0.100	
e3		17.78			0.700	
F			7.1			0.280
I			5.1			0.201
L		3.3			0.130	
Z			1.27			0.050