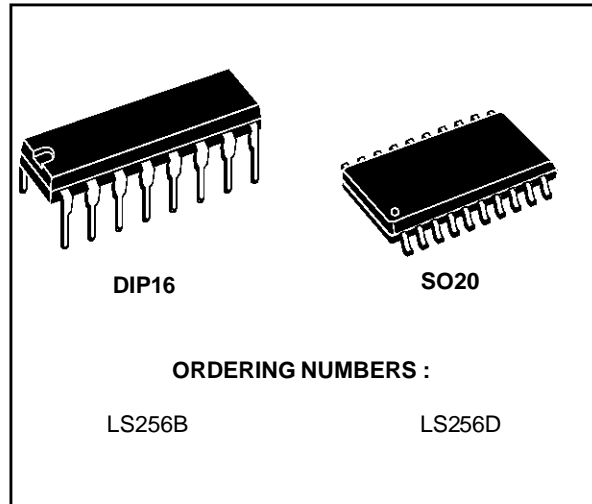


**TELEPHONE SPEECH CIRCUIT WITH MULTIFREQUENCY
TONE GENERATOR INTERFACE**

- 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



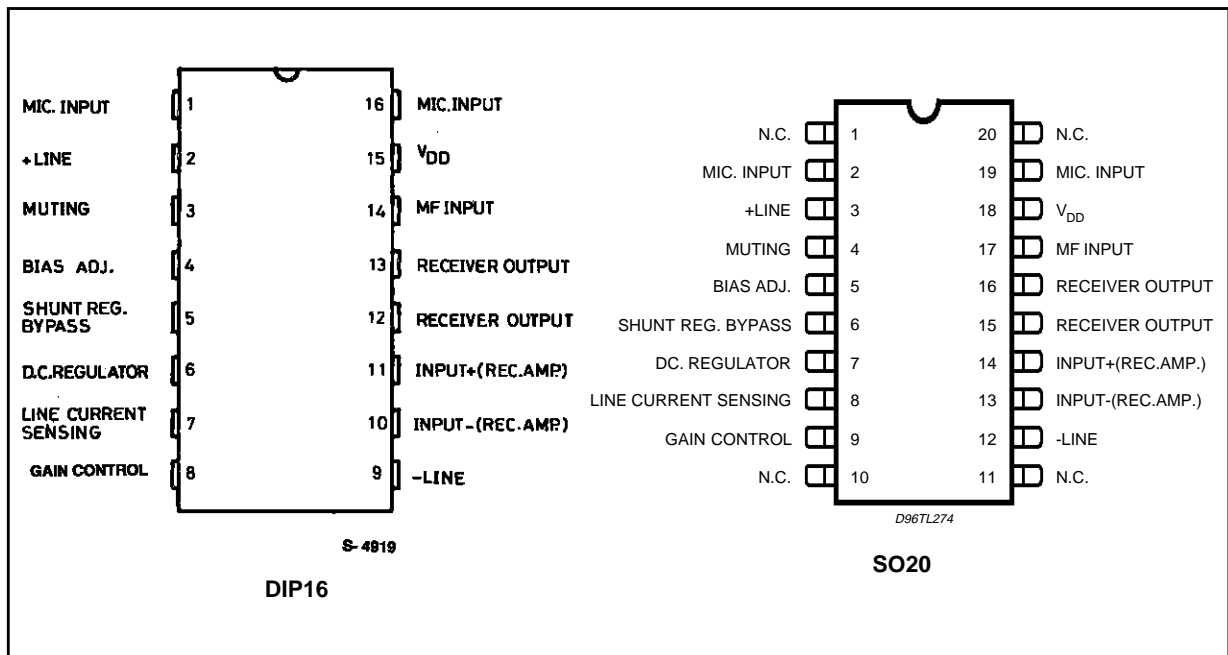
DESCRIPTION

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 transducers for both transmitter and receiver (typically piezoceramic capsules, but

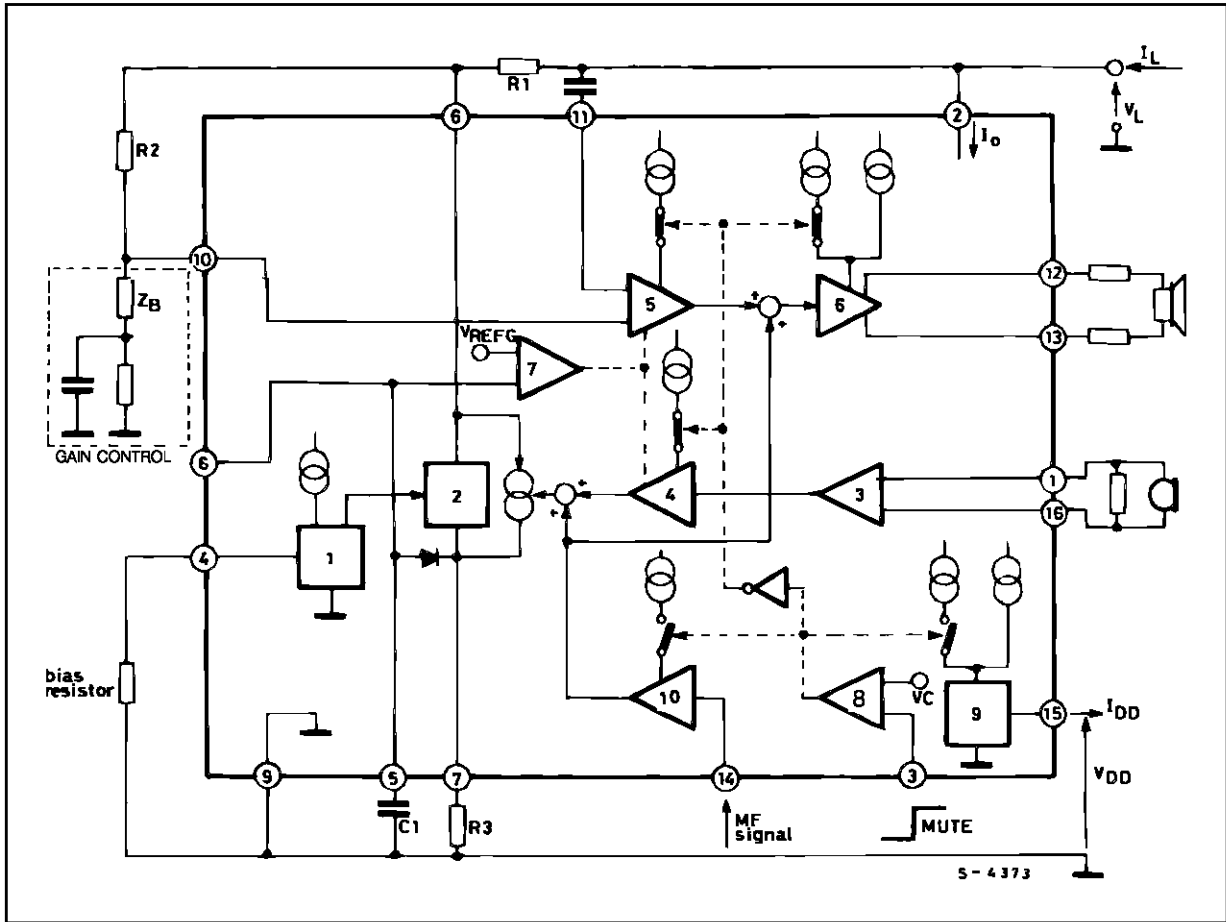
the device can work also with dynamic ones). Many of its electrical characteristics can be controlled by means of external components to meet different specifications.

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

PIN CONNECTIONS (top view)



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 $T_{amb} = 70^\circ\text{C}$	1	W
T_{op}	Operating Temperature	- 45 to 70	$^\circ\text{C}$
T_{stg}, T_j	Storage and Junction Temperature	- 65 to 150	$^\circ\text{C}$

THERMAL DATA

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

TEST CIRCUITS (ref. to DIP16)

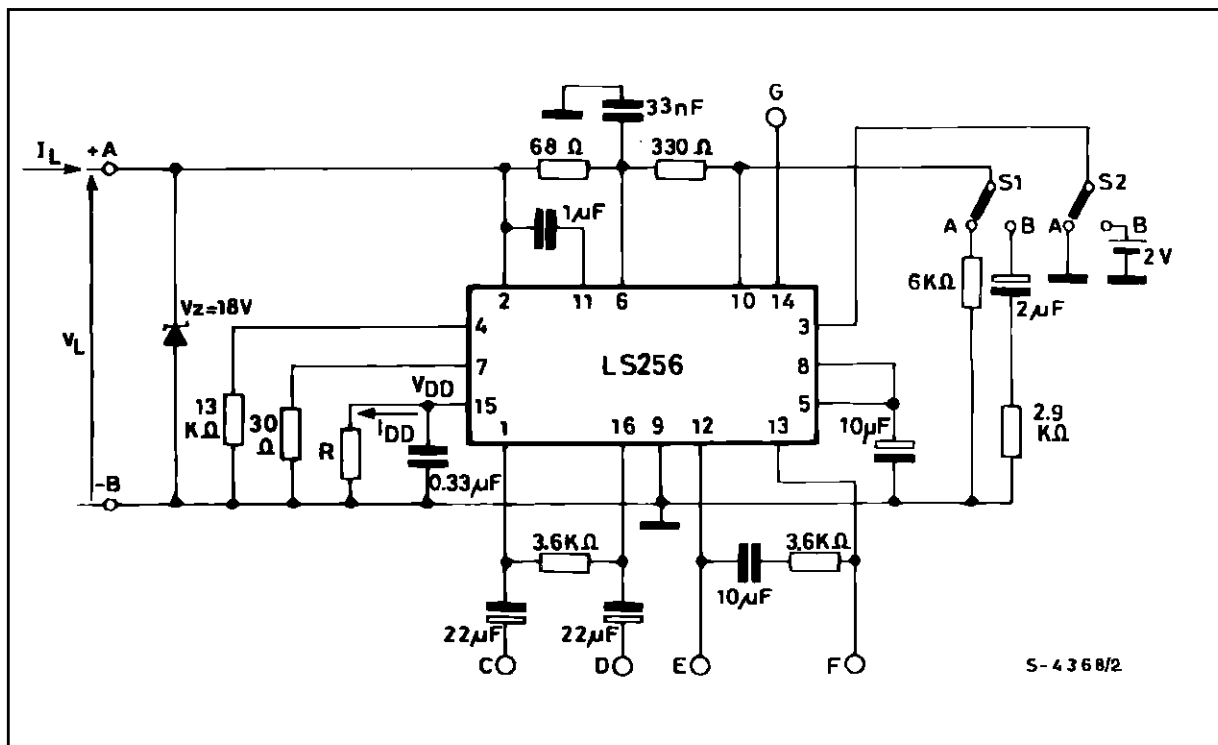


Figure 1.

Figure 2.

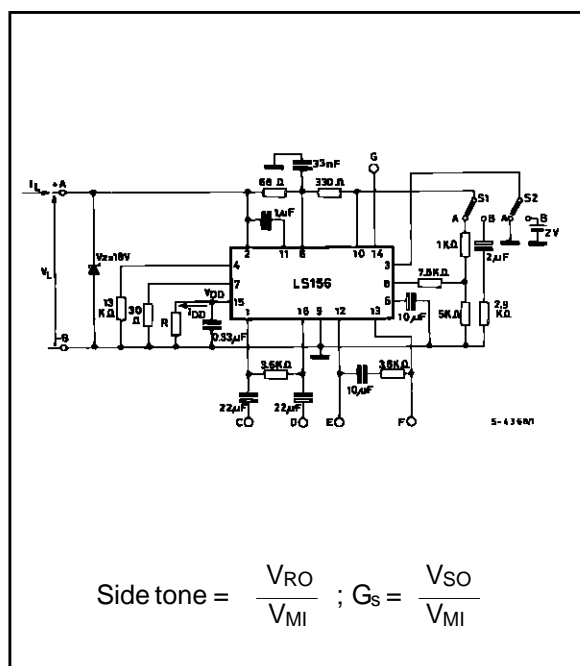
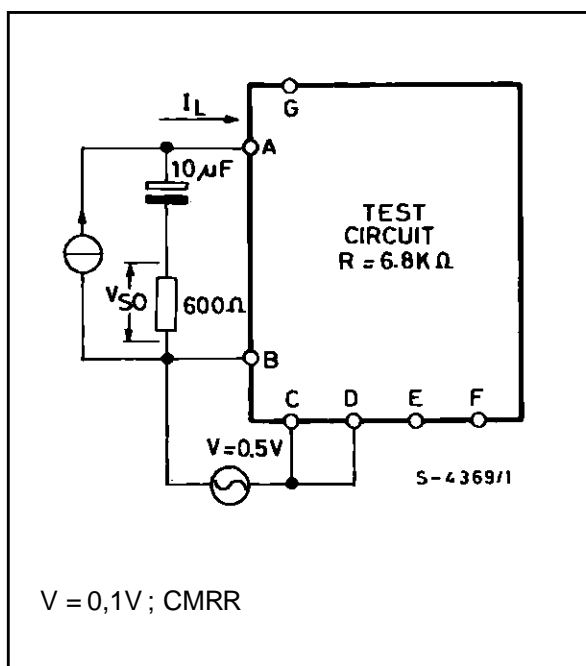


Figure 3.

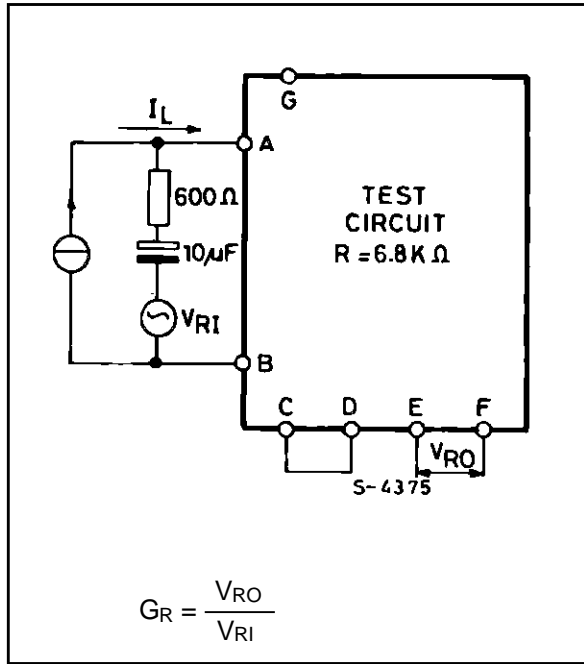
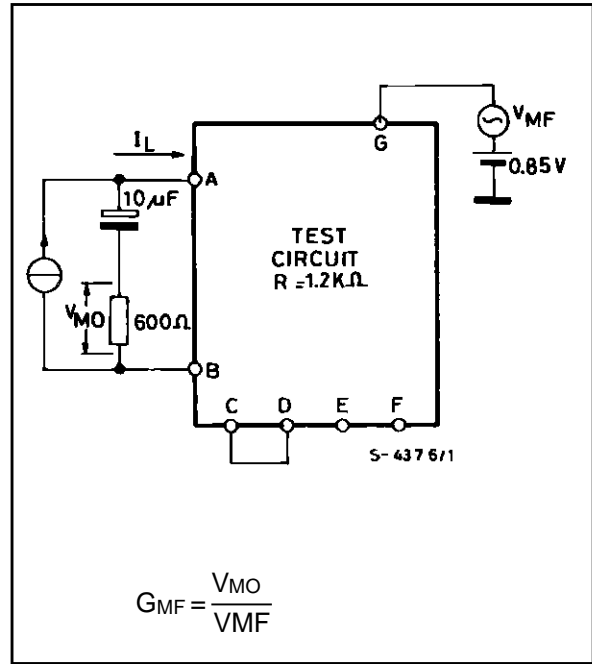


Figure 4.



ELECTRICAL CHARACTERISTICS (refer to the test circuits, S1, S2 in (a),
 $T_{amb} = -25$ to $+50^{\circ}\text{C}$, $f = 200$ to 3400Hz , unless otherwise specified)

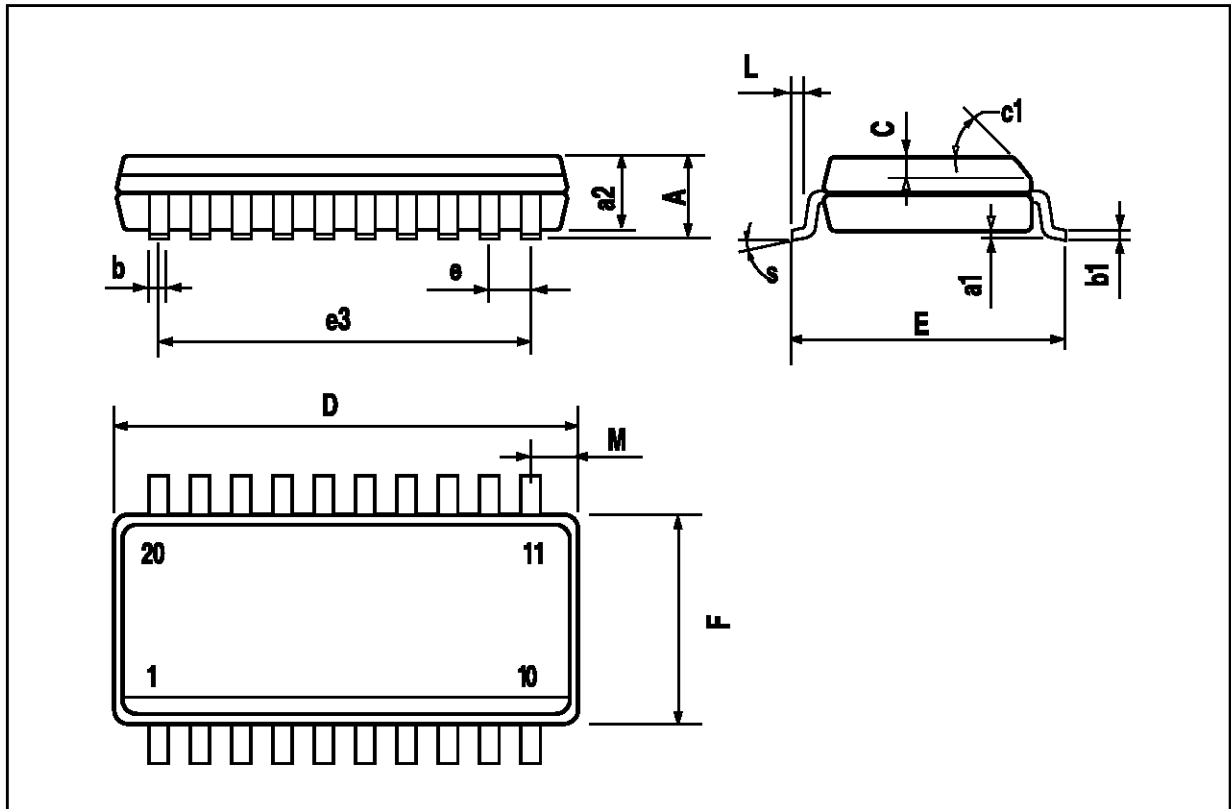
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit	Fig.	
SPEECH OPERATION								
V_L	Line Voltage	$T_{amb} = 25^{\circ}\text{C}$ $I_L = 12\text{mA}$ $I_L = 20\text{mA}$ $I_L = 80\text{mA}$	3.9		4.7 5.5 12.2	V		
CMRR	Common Mode Rejection	$f = 1\text{kHz}$, $I_L = 12$ to 80mA	50			dB	1	
G_S	Sending Gain	$T_{amb} = 25^{\circ}\text{C}$, $f = 1\text{kHz}$ $V_{MI} = 2\text{mV}$ $I_L = 52\text{mA}$ $I_L = 25\text{mA}$	44 48	45 49	46 50	dB	2	
	Sending Gain Flatness	$V_{MI} = 2\text{mV}$, $f_{ref} = 1\text{kHz}$ $I_L = 12$ to 80mA			± 1	dB	2	
	Sending Distortion	$f = 1\text{kHz}$ $I_L = 16$ to 80mA $V_{SO} = 1\text{V}$ $V_{SO} = 1.3\text{V}$			2 10	%	2	
	Sending Noise	$V_{MI} = 0\text{V}$; $I_L = 40\text{mA}$; S1 in (b)			-68.5	dBmp	2	
	Microphone Input Impedance Pin 1-16	$V_{MI} = 2\text{mV}$, $I_L = 12$ to 80mA		40			kΩ	
	Sending Loss in MF Operation	$V_{MI} = 2\text{mV}$ S2 in (b) $I_L = 52\text{mA}$ $I_L = 25\text{mA}$	-30 -30				dB	2
	G_R	Receiving Gain	$V_{RI} = 0.3\text{V}$, $f = 1\text{kHz}$, $T_{amb} = 25^{\circ}\text{C}$ $I_L = 52\text{mA}$ $I_L = 25\text{mA}$	2.5 7	3.5 8	4.5 9	dB	3
Receiving Gain Flatness		$V_{RI} = 0.3\text{V}$, $f_{ref} = 1\text{kHz}$ $I_L = 12$ to 80mA			± 1	dB	3	
Receiving Distortion		$f = 1\text{kHz}$ $I_L = 12\text{mA}$ $V_{RO} = 1.6\text{V}$ $I_L = 12\text{mA}$ $V_{RO} = 1.9\text{V}$ $I_L = 50\text{mA}$ $V_{RO} = 1.8\text{V}$ $I_L = 50\text{mA}$ $V_{RO} = 2.1\text{V}$			2 10 2 10	%	3	
Receiving Noise		$V_{RI} = 0\text{V}$; $I_L = 12$ to 80mA ; S1 in (b)		100			μV	3
Receiver Output Impedance Pin 12-13		$V_{RO} = 50\text{mV}$, $I_L = 40\text{mA}$			100		Ω	

ELECTRICAL CHARACTERISTICS (continued)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit	Fig.
SPEECH OPERATION (continued)							
G_R	Sidetone	$F = 1\text{kHz}$, $T_{\text{amb}} = 25^\circ\text{C}$, S_1 in (b) $I_L = 52\text{mA}$ $I_L = 25\text{mA}$			36 36	dB	2
Z_{ML}	Line Matching Impedance	$V_{RI} = 0.3\text{V}$, $f = 1\text{kHz}$ $I_L = 12$ 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)	$V_{M\text{Fin}} = 80\text{mV}$		$3V_{DD}$		V	
R_I	Input Impedance (pin 14)	$V_{M\text{Fin}} = 80\text{mV}$	40			$k\Omega$	
d	Distortion	$V_{M\text{Fin}} = 110\text{mV}$ $I_L = 12$ 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	

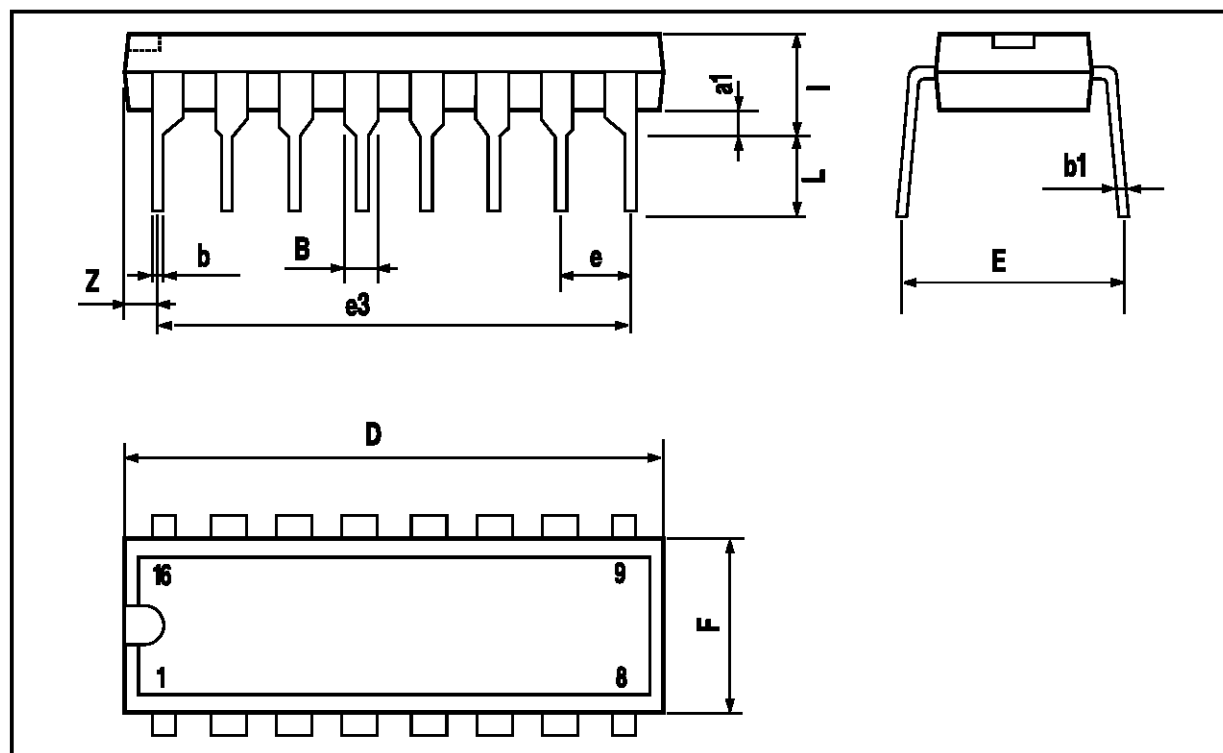
SO20 PACKAGE MECHANICAL DATA

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



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