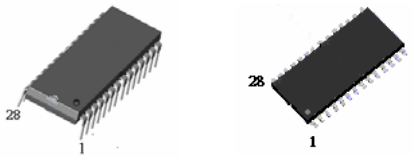
Voice Switched Speakerphone Circuit

The PJ34018 Speakerphone integrated circuit incorporates the necessary amplifiers, attenuators, and control functions to produce high quality hands-free speakphone system. Included are a microphone amplifier, a power audio amplifier for the speaker transmit and receive attenuation, a monitoring system for background sound level, and an attenuation control system which responds to the relative transmit and receive levels as well as the background level. Also included are all necessary regulated voltages for both internal and external circuitry, allowing lin-powered operation (on additional power supplies required). A chip select pin allows the chip to be powered down when not in use. A volume control function may be implemented with an external potentiometer. PJ34018 applications include speakerphone for household and business use, intercom system, automotive telephones, and others.

DIP-28 SOP-28



Pin:1.RR	11.Cp1	21.Vb
2.Rtx	12.Cp2	22.Gnd
3.Txi	13.Xdi	23.Xdc
4.Txo	14.Skg	24.Vlc
5.Tli	15.Sko	25.Acf
6.Tlo	16.V+	26.Rxo
7.Rli	17.Agc	27.Rxi
8.Rlo	18. $\overline{CS}$	28.Rrx
9.Mci	19.Ski	
10.Mco	20.Vcc	

FEATURE

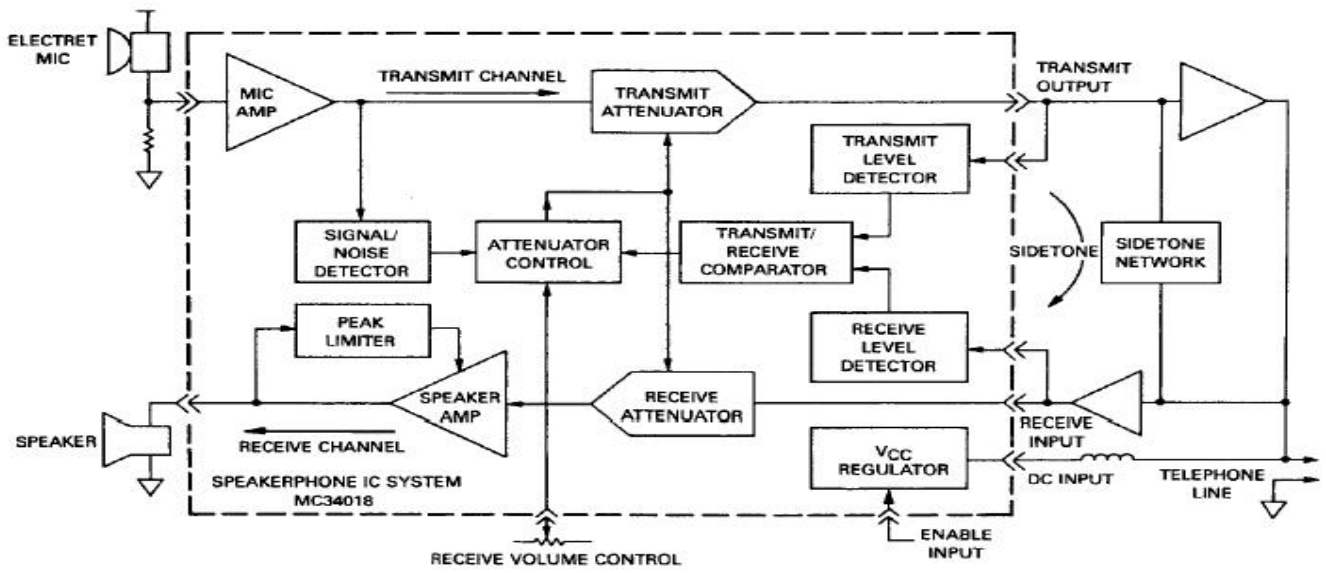
- All necessary level detection and attenuation controls for A hands-free telephone in a single integrated circuit.
- Background noise level monitoring with long time constant
- Wide operating dynamic range through single compression
- On-chip supply and reference voltage regulation
- Typical 100mW output power (into 25Ohms) with peak Limiting to minimize distortion
- Chip select pin for active/standby operation
- Linear Volume Control Function
- Standard 20-pin plastic DIP package (0.600 inch wide) And SOP package

ORDERING INFORMATION

Device	Operating Temperature (Ambient)	Package
PJ34018CD	-20℃～+85℃	DIP-28
PJ34018CS		SOP-28

ABSOLUTE MAXIMUM RATINGS

SIMPLIFIED BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS(T_A=25° C,Voltages referred to pin 22)

Parameter	Value	Unit
V+ terminal Voltage (pin 16)	+12,-1.0	
$\overline{CS}$ (pin 18)	+12,-1.0	
Speaker amplifier Ground(pin 14)	+3.0,-1.0	
VLC(pin 24)	+VCC,-1.0	
Storage temperature	-65 ~ +150	

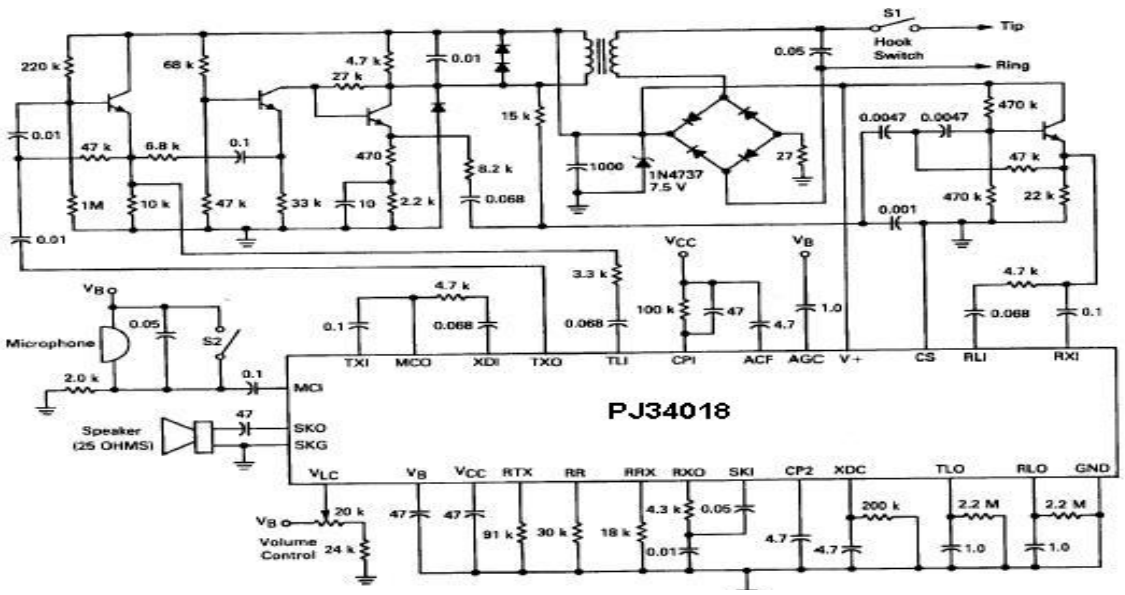
RECOMMENDED OPERATION CONDITIONS

Parameter	Value	Unit
V+ Terminal Voltage (pin 16)	+6.0 to +11	V
$\overline{CS}$ (pin 18)	0 to +11	V
Icc (pin 20)	0 to 3.0	mA
VLC(pin 24)	0.55VB to VB	V
Receive Signal(pin 27)	0 to 250	mVrms
Microphone Signal(pin 9)	0 to 5.0	mVrms
Speaker Amplifier Ground (pin 14)	-10 to +10	mVdc
Ambient Temperature	-20 to +60	C

TEMPERATURE CHARACTERISTICS(-20 to +60℃)

Parameter	Pin	TYP Change	Unit
V+ Supply Current (V+ 11V,Pin 18 = 0.7V)	16	-0.2	%/ ℃
V+ Supply Current(V+ 11V,Pin 18 = 1.6V)	16	-0.4	%/ ℃
Vcc Voltage(V+ = 7.5V)	20	+0.1	%/ ℃
Attenuator Gain (Max and Min Setting)	—	±0.003	dB/℃
Delta RXO,TXO Voltage	4,26	±0.24	%/ ℃
Speaker AMP Gain	15,19	±0.003	dB/℃
Microphone AMP Gain	9,10	±0.001	dB/℃
Microphone Amp Input Resistance	9	+0.4	%/ ℃
Tx-Rx Switching Threshold (@20 μA)	5,7	±0.2	nA/℃

Basic Line Powered Speakerphone



ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Min.	Typ.	Max.	Units
SUPPLY VOLATAGE					
V+ Supply Current V+=11V, Pin 18=0.7V V+=11V, Pin 18=1.6V	I_{V+}	-	-	9.0 800	mA μA
V_{CC} Voltage (V+=7.5V) Line Regulation (6.5V<V+<11V) Output Resistance (I_{CC}=3mA) Dropout Voltage (V+ = 5.0V)	Vcc V_{CCLN} R_{OVCC} $V_{CC\ SAT}$	4.9 - - -	5.4 65 6.0 80	5.9 150 20 300	Vdc mV ohms mV
VB Voltage(V+=7.5V) Output Resistance (I B=1.7mA)	V_B R_{OVB}	2.5 -	2.9 250	3.3 -	Vdc ohms
ATTENUATORS					
Receive Attenuator Gain (@1.0kHz) Rx Mode, Pin 24= VB, Pin 27 = 250 mV_{rms} Range (Rx to Tx Modes) Idle Mode, Pin 27= 250mVrms	 G_{RX} $\triangle G_{RX}$ G_{RIX}	 2.0 40 -20	 6.0 44 -16	 10 48 -12	 dB dB dB
RXO Voltage (Rx Mode)	V_{RXO}	1.8	2.3	3.2	Vdc
Delta RXO Voltage (Switch from Rx to Tx Mode)	$\triangle V_{RXO}$	-	-	100	mV
RXO Sink Current (Rx mode)	I_{RXOL}	75	-	-	μA
RXO Source Current (Rx mode)	I_{RXOH}	1.0	-	3.0	mA
RXI Input Resistance	R_{RXI}	3.5	5.0	8.0	kΩ
Volume Control Range (Rx Attenuator Gain, Rx Mode, 0.6VB < Pin 24 <VB	V_{CR}	24.5	-	32.5	dB
Transmit Attenuator Gain (@1.0kHz) Tx Mode, Pin 3= 250 mV_{rms} Range (Tx to Rx Mode) Idle Mode, Pin 3= 250mVrms	 G_{TX} $\triangle G_{TX}$ G_{TIX}	 4.0 40 -16.5	 6.0 44 -13	 8.0 48 -8.5	 dB dB dB
TXO Voltage (Rx Mode)	V_{TXO}	1.8	2.3	3.2	Vdc
Delta TXO Voltage (Switch from Tx to Rx Mode)	$\triangle V_{TXO}$	-	-	100	mV
TXO Sink Current (Rx mode)	I_{TXOL}	75	-	-	μA
TXO Source Current (Rx mode)	I_{TXOH}	1.0	-	3.0	mA
TXI Input Resistance	R_{TXI}	3.5	5.0	8.0	kΩ
ACF Voltage (VCC-Pin 25 Voltage) Rx Mode Tx Mode Idle Mode	$\triangle V_{ACF}$	-	 150 6.0 75	-	 mV mV mV
SPEAKER AMPLIFIER					
Speaker Amp Gain (pin 19 = 20mVrms)	G_{SPK}	33	34	35	dB
SKI Input Resistance	R_{SKI}	15	22	37	KΩ
SKO Voltage (Pin 19 =Cap couple to GND)	V_{SKO}	2.4	3.0	3.6	Vdc
SKO High Voltage (Pin 19 = 0.1V, -100mA Load at Pin 15)	V_{SKOH}	5.5	-	-	Vdc
SKO Low Voltage (pin 19=0.1V, +100mA Load at Pin 15)	V_{SKOL}	-	-	600	mV

ELECTRICAL CHARACTERISTICS(Continued)

Parameter	Symbol	Min.	Typ.	Max.	Units
MICROPHONE AMPLIFIER					
Microphone Amp Gain (Pin 9 = 10mV$_{rms}$,1kHz)	G_{MCI}	32.5	34	35	dB
Microphone Amp Input Resistance	R_{MCI}	6.5	10	16	kΩ
LOGAMPS					
RLO Leakage Current (Pin 8 = VB+1.0V)	I_{LKRLO}	-	-	2.0	μA
TLO Leakage Current (Pin 6 = VB+1.0V)	I_{LKTLO}	-	-	2.0	μA
Transmit-Receive Switching Threshold (Ratio of |TL| to |RL| - at 20 μA - to Switch Tx-Rx Comparator)	I_{TH}	0.8	-	1.2	-
TRANSMIT DETECTOR					
XDC Voltage Idle Mode Tx Mode	V_{XDC}	-	 0 4.0	-	 Vdc Vdc
CP2 Current Source	I_{CP2}	5.0	10	13	μA
Distortion Rx Mode RXI to SKO (pin 27 = 10mVrms,1KHz)	R_{XD}	-	1.5	-	%
Tx Mode MCI to TXO (Pin 9 = 5mV$_{rms}$,1kHz)	T_{XD}	-	2.0	-	%

Note 1:V+=7.5V, $\overline{CS}$ =0.7V except where noted.

Note 2:Rx mode:pin7=-100 μA, pin5=+100 μA, except where noted

Tx mode: pin 5,13=-100 μA, pin 7= +100 μA, pin 11=0V. Idle mode: Pin 5=-100 μA, pin 7,13=+100 μA

Note 3:Current into a pin designed as + ,current out of a pin designed as -;

Note 4:Voltage referred to pin 22,Tamb=25º C

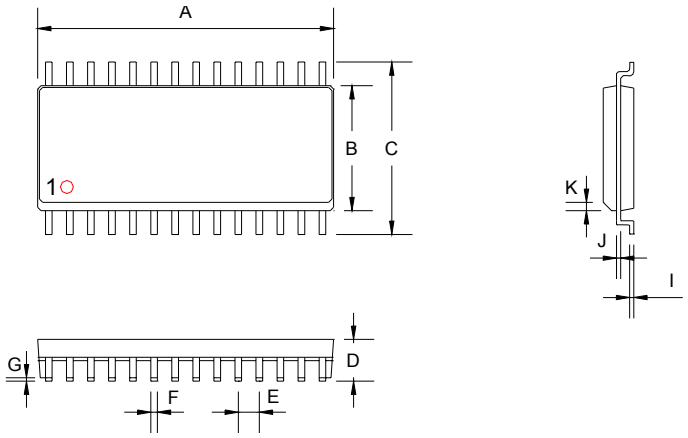
ELECTRICAL CHARACTERISTICS(Continued)

PIN	NAME	DESCRIPTION
1	RR	A resistor to ground provides a reference current for the transmit and receive attenuators
2	RTX	A resistor to ground determines the nominal gain of the transmit attenuator , the transmit channel gain is inversely proportional to RTX resistance.
3	TXI	Input to the transmit attenuator. Input resistance is nominally 5.0k ohms.
4	TXO	Output of the transmit attenuator. The TXO output signal drivers the input of transmit level detcetor, as well as the external circuit which drivers the telephone line.
5	TLI	Input of the transmit level detector. An external resistor ac coupled to The TLI pin sets the detection level. Decreasing this resistor increases the sensitivity to transmit channel signals.
6	TLO	Output of the transmit level detector. The external resistor and capacitor set the time the comparator will hold the system in the transmit mode after speech ceases.
7	RLI	Input of the receive level detector. An external resistor ac coupled to The RLI pin sets the detection level. Decreasing this resistor increases the sensitivity to receive channel signals
8	RLO	Output of the receive level detector. The external resistor and capacitor set the time the comparator will hold the system in the receive mode after speech ceases
9	MCI	Microphone amplifier input. Input impedance is nominally 10k ohms and the dc bias voltage is approximately equal to VB
10	MCO	Microphone amplifier output. The MIC amp gain is internally set at 34dB(50V/V)
11	CP1	A parallel resistor and capacitor connected between this pin and VCC holds a voltage corresponding to the background noise level. The transmit detector compares the CP1 voltage with the speech signal from CP2.
12	CP2	A capacitor at this pin peak detects the speech signals for comparison with the background noise level held at CP1.
13	XDI	Input to the transmit detector system. The microphone amplifier output is ac coupled to the XDI pin through an external resistor
14	SKG	High current ground pin for the speaker amplifier output stage. The SKG voltage should be within 10mV of the ground voltage at pin 22
15	SKO	Speaker amplifier output. The SKO pin will source and sink up to 100mA when ac coupled to the speaker. The speaker amplifier gain is internally set at 34dB(50V/V).
16	V+	Input DC supply voltage. V+ can be powered from Tip and Ring if an ac decoupling inductor is used to prevent loading ac line signals. The required V+ voltage is 6.0V to 11V(7.5V nominal) at 7.0mA
17	AGC	A capacitor from this pin to VB stabilizes the speaker amplifier gain control loop, and additionally controls the attack and decay time of this circuit. The gain control loop limits the speaker amplifier input to prevent clipping at SKO. The internal resistance at AGC pin is nominally 110k ohms.
18	$\overline{CS}$	Digital chip select input. When at a logic "0" (<0.7V) the VCC regulator is enabled. When at a logic "1" (>1.6V),the chip is in the standby mode drawing 0.5mA.An open $\overline{CS}$ pin is a logic "0". Input Impedance is nominally 140k ohms. The input voltage should not exceed 11V
19	SKI	Input to the speaker amplifier. Input impedance is nominally 20k ohms
20	VCC	A 5.4V regulated output which powers all circuits except the speaker amplifier output stage
21	VB	An output voltage equal to approximately VCC/2 which series as an analog ground for the speakerphone system. Up to 1.5mA of external load current may be sourced from VB. Output impedance is 250 ohms. A filter capacitor is required
22	GND	Ground pin for the IC(except the speaker amplifier)

ELECTRICAL CHARACTERISTICS(Continued)

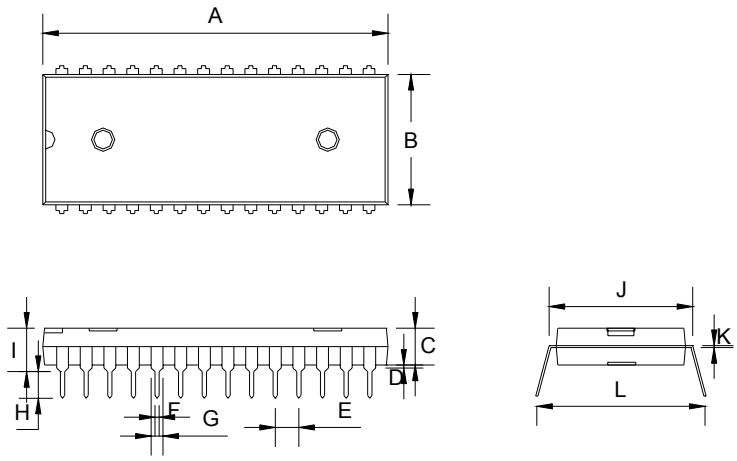
PIN	NAME	DESCRIPTION
23	XDC	Transmit detector output. A resistor and capacitor at his pin hold the system in the transmit mode during pauses between words or phrases. When the XDC pin voltage decays to ground, the attenuators switch from the transmit mode to idle mode. The internal resistor at XDC is nominally 2.6k ohms(see fig.1).
24	VLC	Volume control input>connecting this pin to the slider of a variable resistor provides receive mode volume control. The VLC pin voltage should be less than or equal to VB
25	ACF	Attenuator control filter. A capacitor connected to this pin reduces noise transient as the attenuator control switches level of attenuation
26	RXO	Output of the receive attenuator. Normally this pin is ac coupled to the input of the speaker amplifier
27	RXI	Input of the receive attenuator. Input impedance is nominally is 5.0k ohms
28	RRX	A resistor to ground determines the nominal gain of the receive attenuator. The receive channel gain is directly proportional to the RRX resistance

SOP-28 Mechanical drawing



SOP-28 DIMENSION				
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	17.70	18.00	0.697	0.709
B	7.41	7.59	0.292	0.299
C	10.15	10.55	0.400	0.415
D	2.37	2.63	0.093	0.104
E	1.27BSC		0.05BSC	
F	0.40REF		0.016REF	
G	0.10	0.30	0.004	0.012
H	0.60	1.00	0.024	0.040
I	0.25BSC		0.010BSC	
J	0.254TYP		TYP	
K	0.5		0.020	

DIP-28 Mechanical drawing



DIP-28 DIMENSION				
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	36.95	37.21	1.454	1.465
B	13.76	14.02	0.541	0.552
C	3.81	4.06	0.150	0.160
D	0.38	-	0.015	-
E	2.54TYP		0.100BSC	
F	0.45TYP		0.018TYP	
G	1.27TYP		0.050TYP	
H	3.04	3.56	0.119	0.140
I	-	5.34	-	0.210
J	14.98	15.49	0.589	0.610
K	0.25NOM		0.010NOM	
L	16.00	17.02	0.629	0.670