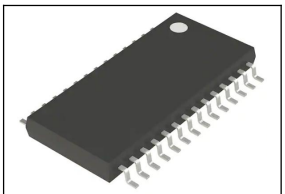
SC34018

Voice Switched Speakerphone Circuit

General Description


SOP28

The SC34018 Speakerphone integrated circuit incorporates the necessary amplifiers, attenuators, and control functions to produce a high quality hands-free speakerphone system. Included are a microphone amplifier, a power audio amplifier for the speaker, transmit and receive attenuators, 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 line-powered operation (no 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. SC34018 applications include speakerphones for household and business use, intercom systems, automotive telephones, and others.

SC34018 is available in SOP28 package.

Features

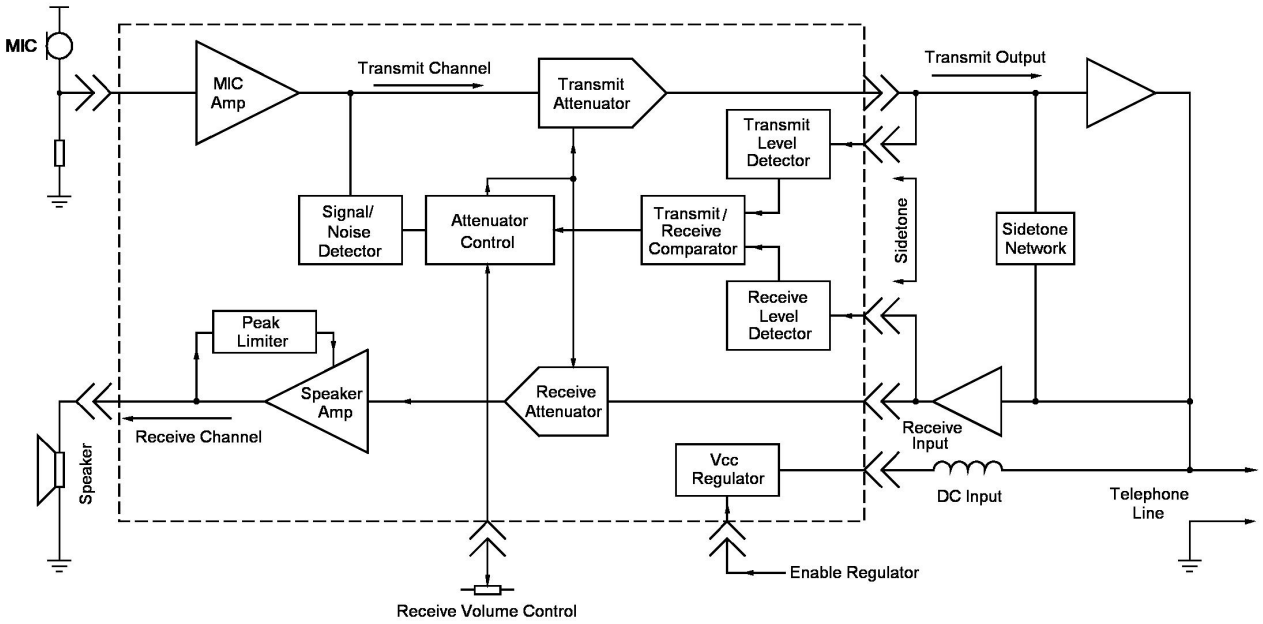
- All necessary level detection and attenuation controls for a hands-free telephone in a single integrated circuit
- Background noise level monitoring with long time constant
- Wide operating dynamic range through signal compression
- On-chip supply and reference voltage regulation
- Typical 100mW output power (into 25Ω) with peak limiting to minimize distortion
- Chip Select pin for active standby operation
- Linear Volume Control Function

Package Information

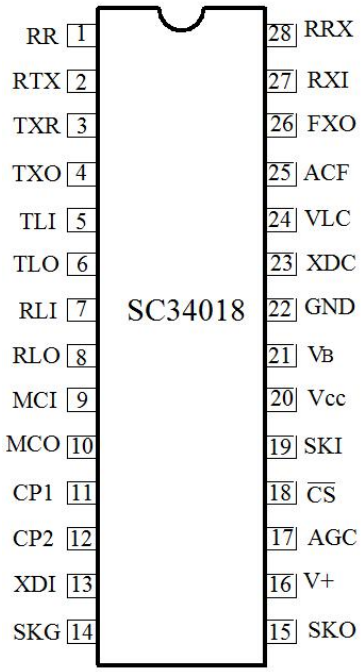
Part NO.	Package Description	Package Marking	Package Option
SC34018CP	SOP28	CHMC SXXXX SC34018CP	25/Tube 1000/Reel

CHMC:Trademark SC34018CP:Part NO. SXXXX:Lot NO.

Block Diagram



Pin Connection



SC34018(SOP28)

Pin Description

Pin	Description	Symbol
1	A resistor to ground provides a reference current for the transmit and receive attenuators	RR
2	A resistor to ground determines the nominal gain of the transmit attenuator. The transmit channel gain is inversely proportional to the RTX resistance.	RTX
3	Input to the transmit attenuator input resistance is nominally 5.0kΩ.	TXI
4	Output of the transmit attenuator. The TXO output signal drives the input of the transmit level detector, as well as the external circuit which drives the telephone line.	TXO
5	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.	TLI
6	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.	TLO
7	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.	RLI
8	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 the receive signal ceases.	RLO
9	Microphone amplifier input. Input impedance is nominally 10kΩ and the dc bias voltage is approximately equal to VB.	MCI
10	Microphone amplifier output. The MIC amp gain is internally set at 34dB(50V/V)	MCO
11	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.	CP1
12	A capacitor at this pin peak detects the speech signals for comparison with the background noise level held at CP1.	CP2
13	Input to the transmit detector system. The microphone amplifier output is ac coupled to the XDI pin through an external resistor.	XDI
14	High current ground pin for the speaker amp output stage. The SKG voltage should be within 10mV of the ground voltage at Pin22.	SKG
15	Speaker amplifier output. The SKO pin will source and sink up to 100uA when ac coupled to the speaker. The speaker amp gain is internally set at 34dB(50V/V)	SKO
16	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 6.0to 11V(7.5V nominal) at 7.0mA.	V+
17	A capacitor from this pin to VB stabilizes the speaker amp gain controls the attack and decay time of this circuit. The gain control loop limits the speaker amp input to prevent clipping at SKC. The internal resistance at the AGC pin is nominally 110kΩ.	AGC
18	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 CS pin is a Logic "0". Input impedance is nominally 140kΩ. The input voltage should not exceed 11V.	$\overline{CS}$
19	Input to the speaker amplifier. Input impedance is nominally 20kΩ.	SKI

Pin Description

Continue

Pin	Description	Symbol
20	A 5.4V regulated output which powers all circuits except the speaker amplifier output stage. Vcc can be used to power external circuitry such as a microprocessor (3.0mA max). A filter capacitor is required. The SC34018can be powered by a separate regulated supply by connecting V+ and Vcc to a voltage between 4.5V and 6.5V while maintaining CS at a Logic "1".	Vcc
21	An output voltage equal to approximately Vcc/2 which serves as an analog ground for the speakerphone system. Up to 1.5mA of external load current may be sourced from VB. Output impedance is 250Ω. A filter capacitor is required	V_B
22	Ground pin for the IC (except the speaker amplifier).	GND
23	Transmit detector output. A resistor and capacitor at this 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 the idle mode. The internal resistor at XDC is nominally 2.6kΩ.	XDC
24	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.	VLC
25	Attenuator control filter. A capacitor connected to this pin reduces noise transients as the attenuator control switches levels of attenuation.	ACF
26	Output of the receive attenuator. Normally this pin is ac coupled to the input of the speaker amplifier.	RXO
27	Input of the receive attenuator. Input resistance is nominally 5.0kΩ.	RXI
28	A resistor to ground determines the nominal gain of the receive attenuator. The receive channel gain is directly proportional to the RRX resistance.	RRX

Absolute Maximum Ratings (Voltages referred to Pin 22)(Ta=25°C)

Parameter	Value	Units
V+ Terminal Voltage (Pin 16)	-1.0~+12	V
$\overline{CS}$ (Pin 18)	-1.0~+12	V
Speaker Amp Ground (Pin 14)	-1.0~3.0	V
VLC (Pin 24)	-1.0~Vcc	V
Storage Temperature	-65~+150	℃

"Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. They are not meant to imply that the devices should be operated at these limits. The "Electrical Characteristics" tables provide conditions for actual device operation.

Recommended Operating Condtions

Parameter	Value	Units
V+ Terminal Voltage (Pin 16)	6.0~11	V
$\overline{CS}$ (Pin 18)	0~11	V
Icc (Pin 20)	0~3.0	mA
VLC (Pin 24)	$0.55V_B$~V_B	V
Receive Signal (Pin 27)	0~250	mVrms
Microphones Signal (Pin 9)	0~5.0	mVrms
Speaker Amp Ground (Pin 14)	-10~10	mVdc
Ambient Temperature	-20~60	℃

Temperature Characteristics (-20 TO +60°C)

Characteristics	Pin	Typ change	Unit
V+ Supply Current (V+ 11V, Pin 18=0.7V)	16	-0.2	%/°C
V+ Supply Current (V+ 11V, Pin 18=1.6V)	16	-0.4	%/°C
Vcc Voltage (V+ =7.5V)	20	+0.1	%/°C
Attenuator Gain (max and min setting)		±0.003	dB/°C
Delta RXO, TXO Voltage	4, 26	±0.24	%/°C
Speaker AMP Gain	15, 19	±0.001	dB/°C
Microphone AMP Gain	9, 10	±0.4	dB/°C
Microphone AMP Input resistance	9	+0.4	%/°C
Tx-Rx Switching threshold (20μA)	5, 7	±0.2	nA/°C

Electrical Characteristics

Parameter		Symbol	Condition	Pin	Min	Typ	Max	Unit
Supply voltages								
V+ supply current		Iv+	V+=11V, Pin 18=0.7V	16			9.0	mA
			V+=11V, Pin 18=1.6V				800	μA
Vcc Voltage		Vcc	V+=7.5V	20	4.9	5.4	5.9	Vdc
Line Regulation		Δ VccLN	6.5V<V+<11V			65	150	mV
Output Resistance		Rovcc	Icc=3.0mA			6.0	20	Ω
Dropout Voltage		Vccsat	V+=5.0V			80	300	mV
VB Voltage		VB	V+=7.5V	21	2.5	2.9	3.3	Vdc
Output Resistance		ROVB	IB=1.7mA			250		Ω
Attenuators								
Receive Attenuator Gain	Rx Mode	GRX	Pin24=VB; Pin27=250mVrms	26,27	2.0	6.0	10	dB
	Range	Δ GRX	Rx to Tx Mode		40	44	48	dB
	Idle Mode	GRXI	Pin 27=250mVrms		-20	-16	-12	dB
RXO Voltage (Rx Mode)		VRXO			1.8	2.3	3.2	Vdc
Delta RXO Voltage (Switch from Rx To Tx Mode)		Δ VRXO					100	mV
RXO Sink Current (Rx Mode)		IRXOL			75			μA
RXO Source Current (Rx Mode)		IRXOH			1.0		3.0	mA
RXI Input Resistance		RRXI			3.5	5.0	8.0	kΩ
Volume Control Range (Rx Attenuator Gain, Rx Mode)		VCR	0.6VB<Pin 24<VB		24.5		32.5	dB
Attenuators								
Transmit Attenuat-or Gain	Rx Mode	GTX	Pin 3=250mVrms	3,4	4.0	6.0	8.0	dB
	Range	Δ GTX	Rx to Tx Mode		40	44	48	dB
	Idle Mode	GTXI	Pin 3=250mVrms		-16.5	-13	-8.5	dB
TXO Voltage (Tx Mode)		VTXO			1.8	2.3	3.2	Vd
Delta TXO Voltage (Switch from Tx To Rx Mode)		Δ VTXO					100	mV
TXO Sink Current (Tx Mode)		ITXOL			75			μA
TXO Source Current (Tx Mode)		ITXOH			1.0		3.0	mA
TXI Input Resistance		RTXI			3.5	5.0	8.0	kΩ

Electrical Characteristics (continue)

Parameter		Symbol	Condition	Pin	Min	Typ	Max	Unit
ACF Voltage	Rx Mode	ΔV_{ACF}	Vcc-Pin25 Voltage	20,25		150		mV
	Rx Mode					6.0		mV
	Idle Mode					75		mV
Speaker Amplifier								
Speaker Amp Gain		G_{SPK}	Pin19=20mVrms	15,19	33	34	35	dB
SKI Input Resistance		R_{SKI}	Pin19=Cap Couple to GND		15	22	37	kΩ
SKO Voltage		V_{SKO}			2.4	3.0	3.6	Vd
SKO High Voltage		V_{SKOH}	Pin19=0.1V, -100mA Load at Pin 15		5.5			Vdc
SKO Low Voltage		V_{SKOL}	Pin19=0.1V, -100mA Load at Pin 15				600	mV
Microphone Amplifier								
Mike Amp Gain		G_{MCI}		9,10	32.5	34	35	dB
Mike Amp Input Resistance		R_{MCI}			6.5	10	16	kΩ
Logamps								
RLO Leakage Current		I_{LKRLO}	Pin 8=VB+1.0V	8			2.0	μA
TLO Leakage Current		I_{LKTLO}	Pin 6=VB+1.0V	6			2.0	μA
Transmit-Receive Switch Threshold		I_{TH}	Ratio of ITLI to IRLI-at 20μA-to switch Tx-Rx comparator	5,7 ,25	0.8		1.2	μA
Transmit Detector								
XDC Voltage	Idle Mode	V_{XDC}		23		0		Vdc
	Tx Mode					4.0		Vdc
CP2 Current Source		I_{CP2}		12	5.0	10	13	μA
Distortion								
Rx Mode-RXI to SKO		R_{XD}	Pin27=10mVrms 1.0kHz	27,15		1.5		%
Tx Mode-MCI to TXO		T_{XD}	Pin9=5.0mVrms 1.0kHz	4,9		2.0		%

Notes : 1. V+=7.5V, CS=0.7V except where noted.

2. Rx Mode: Pin 7=-100μA, Pin 5=+100μA, except where noted.

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

Idle Mode: Pin 5=-100μA,Pin 7,13=+100μA.

3. Current into a pin designated as +; current out of a pin designated as -.

4. Voltage referred to pin 22, Ta=+25°C.

Test Circuit

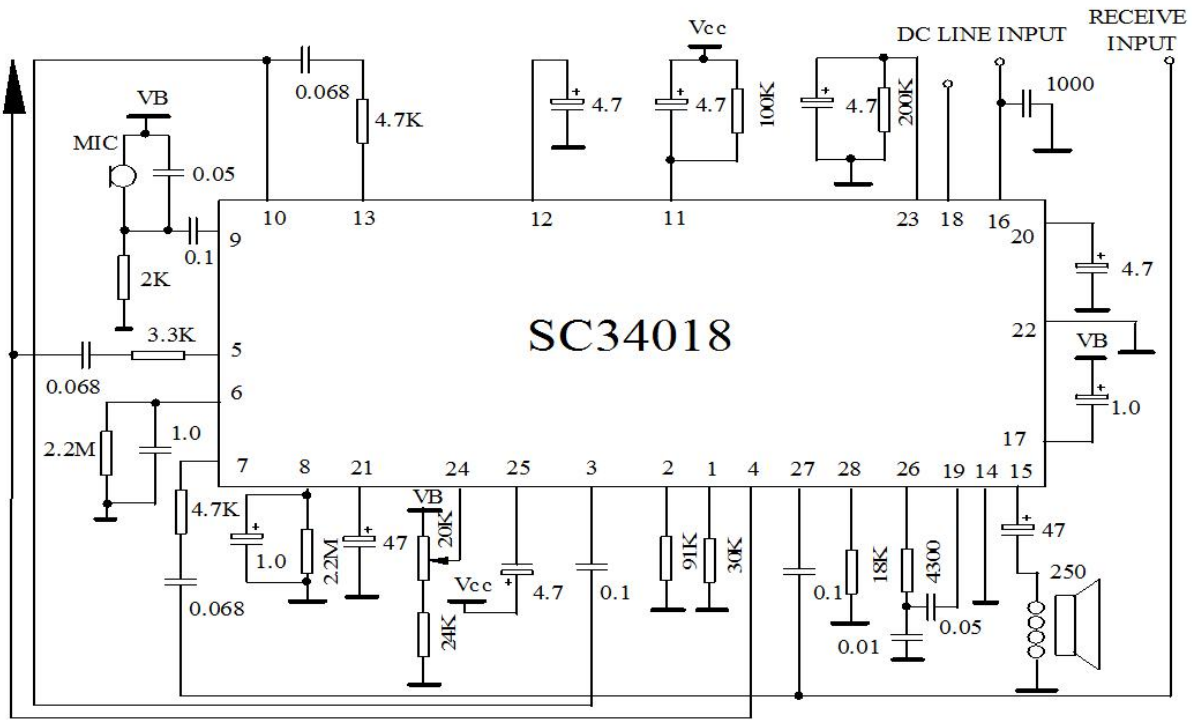
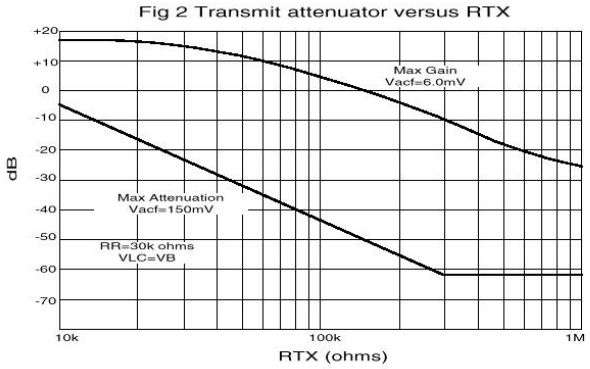
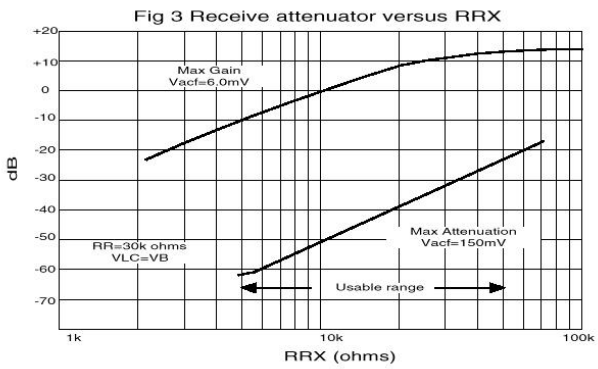
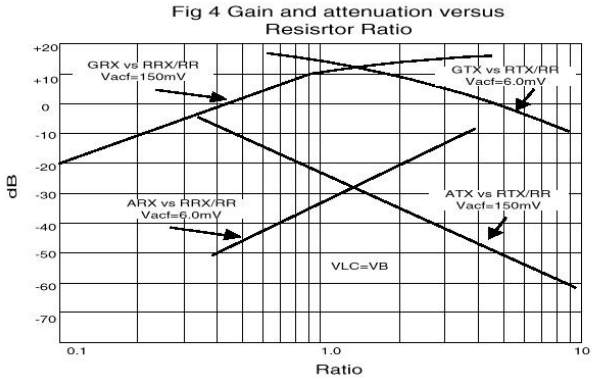


Fig. 1

Characteristic Curves







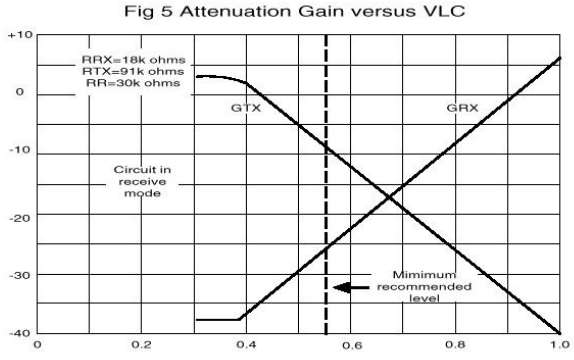


Fig 6 Attenuator Gain vs Vacf

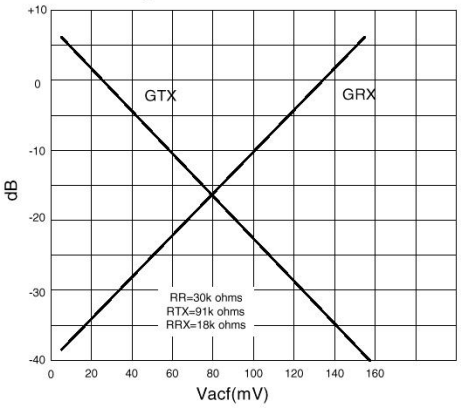


Fig 7 Log Amp Transfer Characteristics

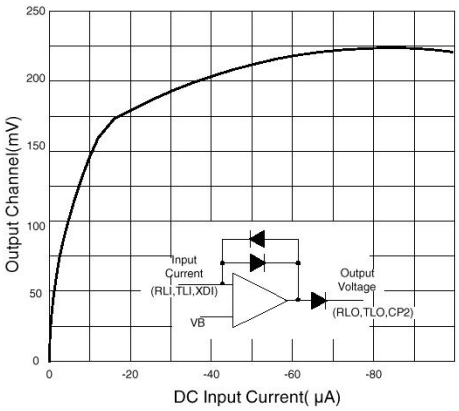


Fig 8 Log Amp Transfer Characteristics

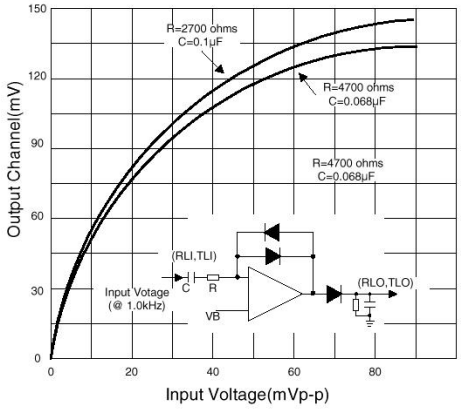


Fig 9 Speaker Amp Output vs Supply Voltage

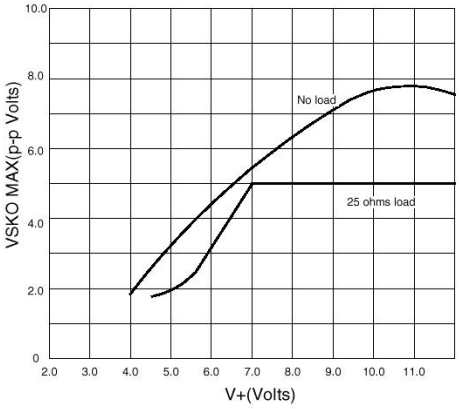


Fig 11 Transmit Detector operation

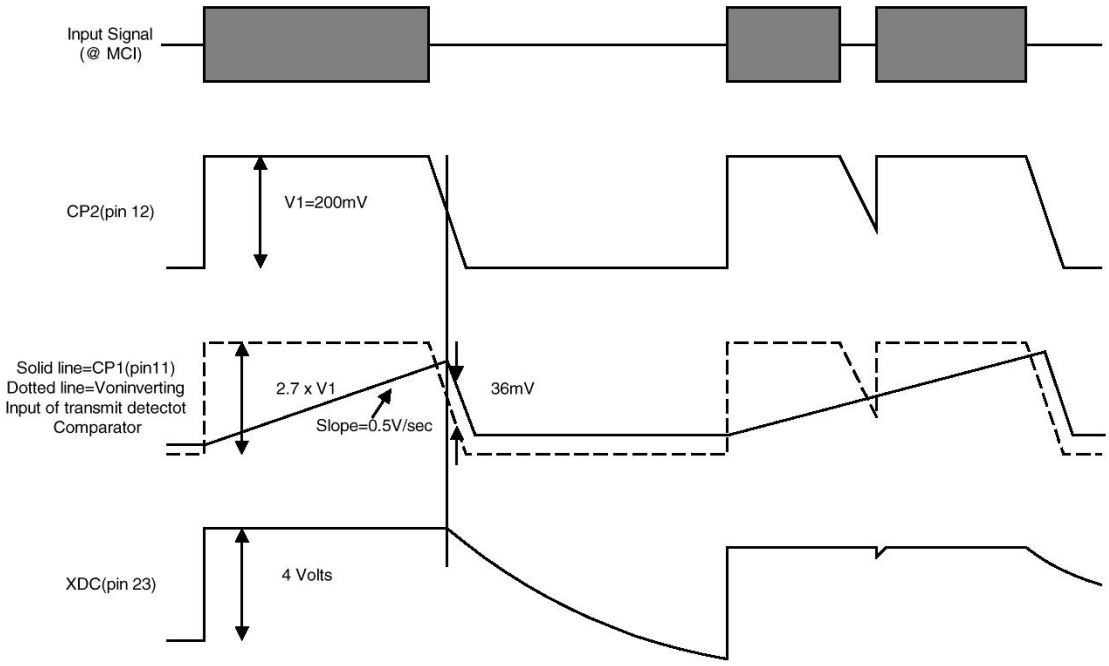


Fig 10 Response At CP1 and CP2

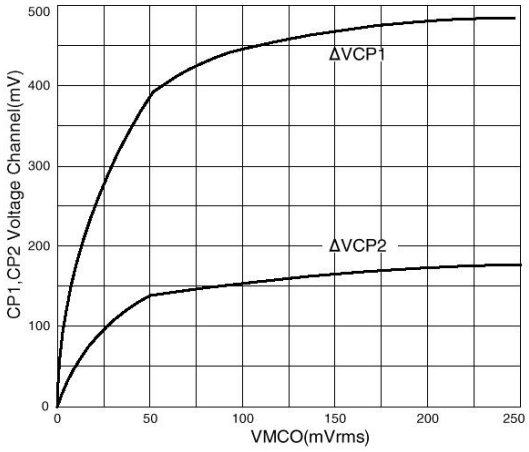


Fig 12 Supply Current vs Supply Voltage

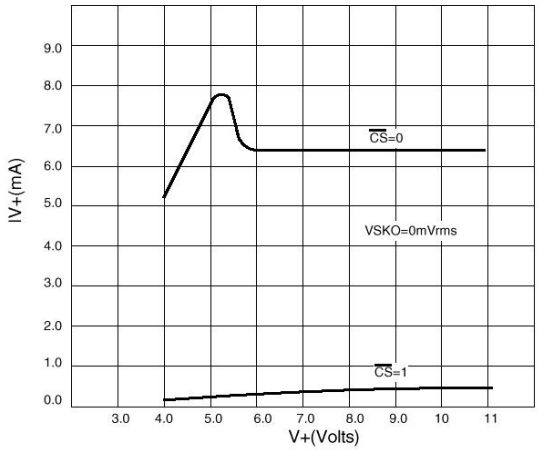


Fig 13 Supply Current vs Supply Voltage vs Speaker Power

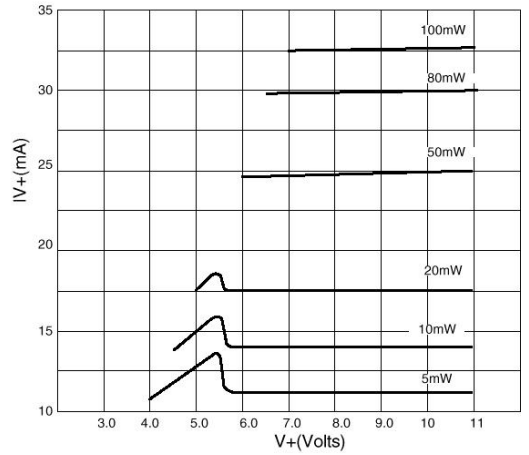


Fig 15 Supply Current vs Supply Voltage

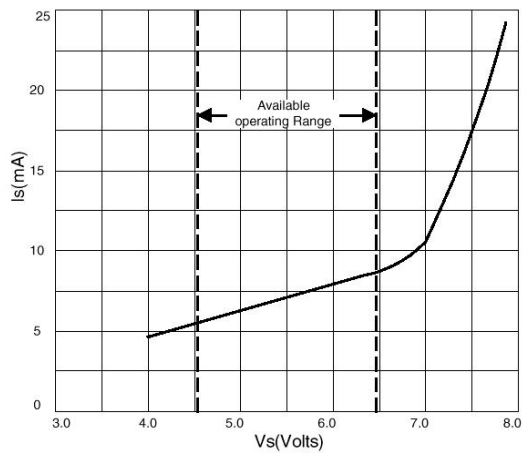
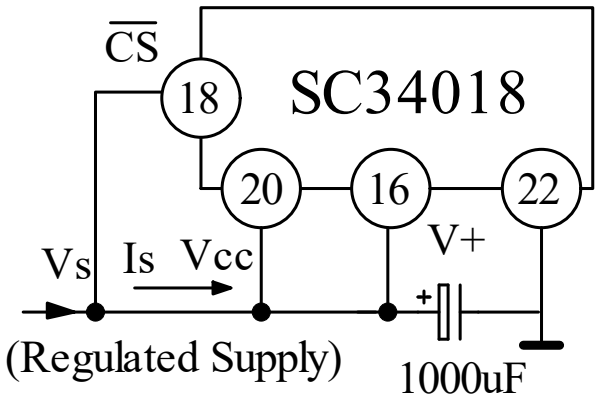


Fig.14 Alternate Power Supply Configuration



Application Circuit

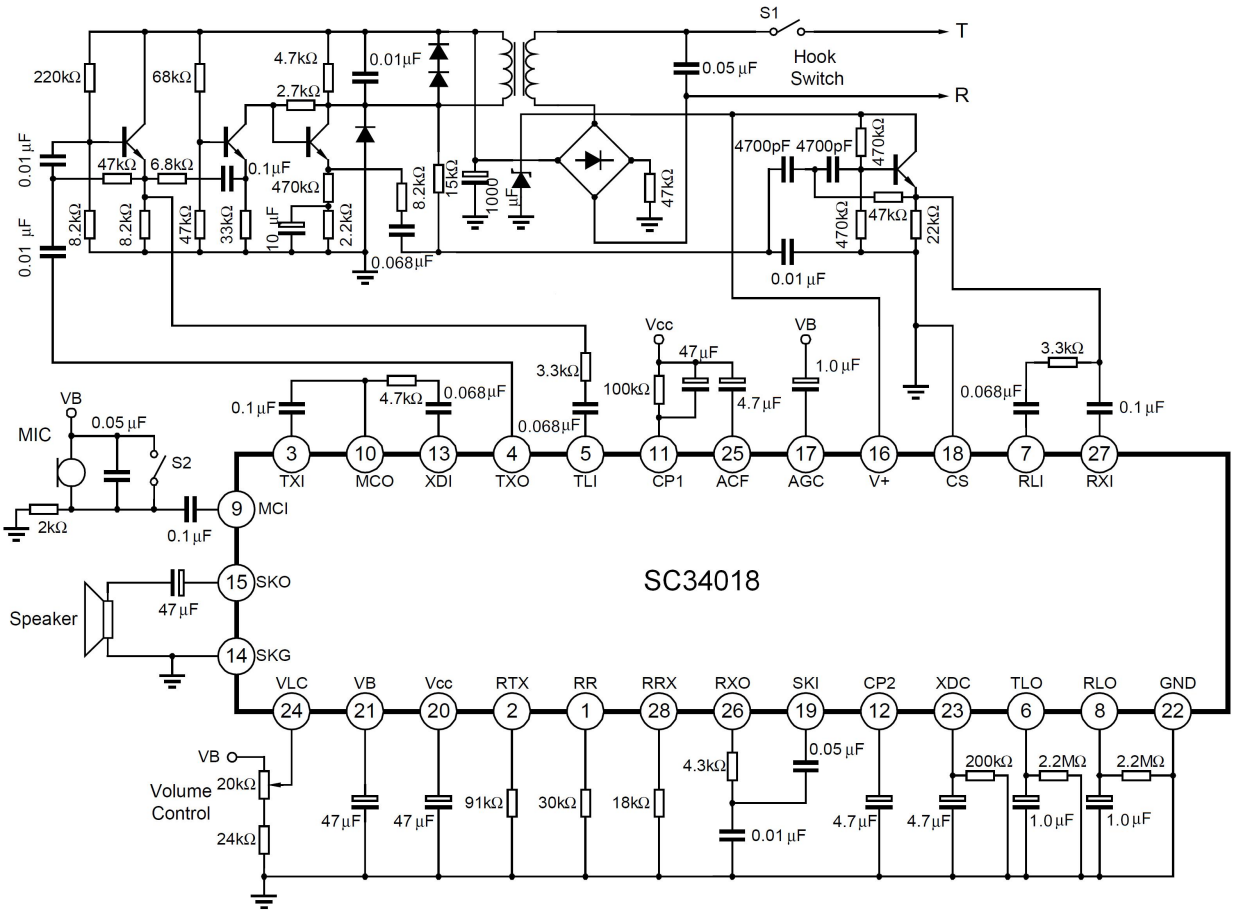


Fig. 16 Basic Line Powered Speakerphone

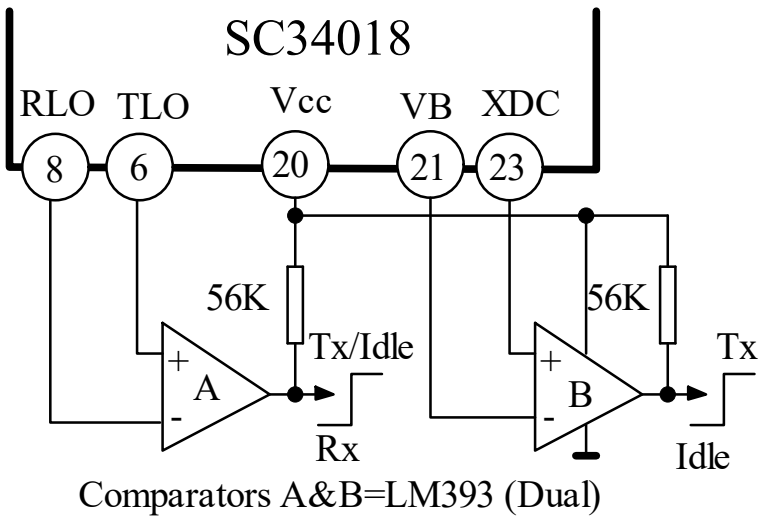
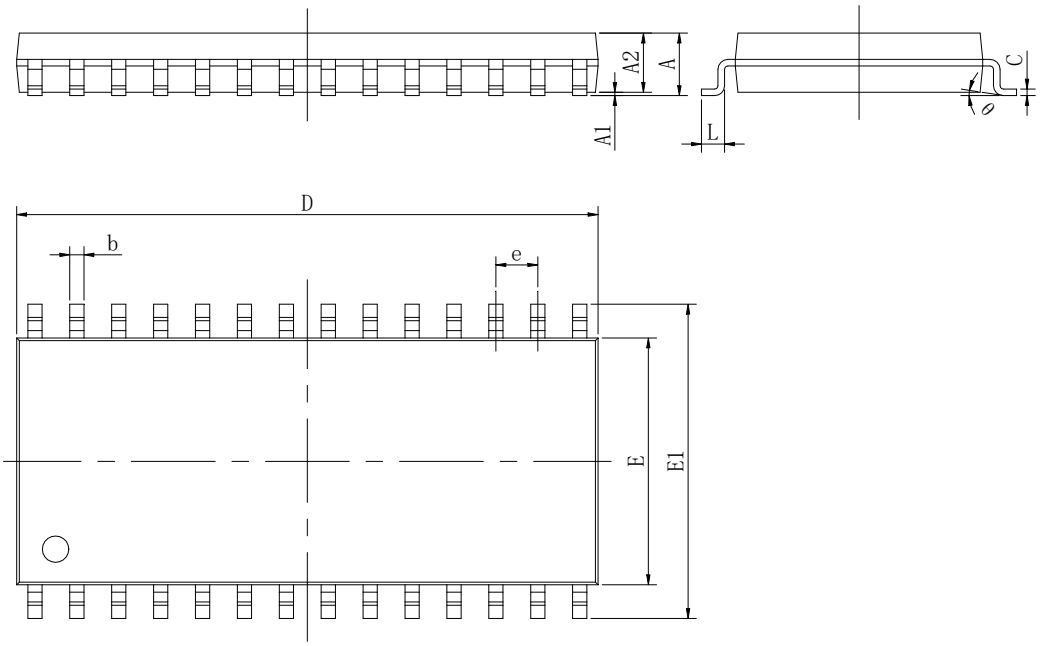


Fig.20 Digital Transmit/Idle/Receive Indication

Outline Dimensions

SOP28： Unit:mm



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	2.350	2.650	0.093	0.104
A1	0.100	0.300	0.004	0.012
A2	2.290	2.500	0.09	0.098
b	0.330	0.510	0.013	0.020
c	0.204	0.330	0.008	0.013
D	17.700	18.100	0.697	0.713
E	7.400	7.700	0.291	0.303
E1	10.210	10.610	0.402	0.418
e	1.270(BSC)		0.050(BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

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- Silicore Technology reserves the right to make changes without further notice to any products or specifications herein. Before customers place an order, customers need to confirm whether datasheet obtained is the latest version, and to verify the integrity of the relevant information.

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