
Low voltage voice switch interface circuit for hands-free operation in telephone

Description

The voice switch interface circuit U4087B is a linear integrated circuit for improvement of handsfree performance of U4090B system.

The U4087B provides an optimized interface to U4090B, the necessary level detectors and switching control for a properly operating speakerphone. The detection sensitivity and timing are externally controllable. Additionally, the

U4087B provides a back- ground noise monitor which makes the circuit insensitive to room noise.

The Block diagram shows level detectors, back ground noise monitor.

Due to low voltage operation it can be operated via power supply management of U4090B requiring 3.0 mA typ.

Features

- Low voltage operation: 3.0 to 6.5 V
- Four point signal sensing for improved sensitivity
- Monitoring system for background noise level
- Case: SO 16
- Chip Disable for active/standby operation

Benefits

- Fast channel switching allows quasi duplex operation
- Low current consumption for high output volume

Block diagram

Figure 1 Block diagram with external circuit

U4087B

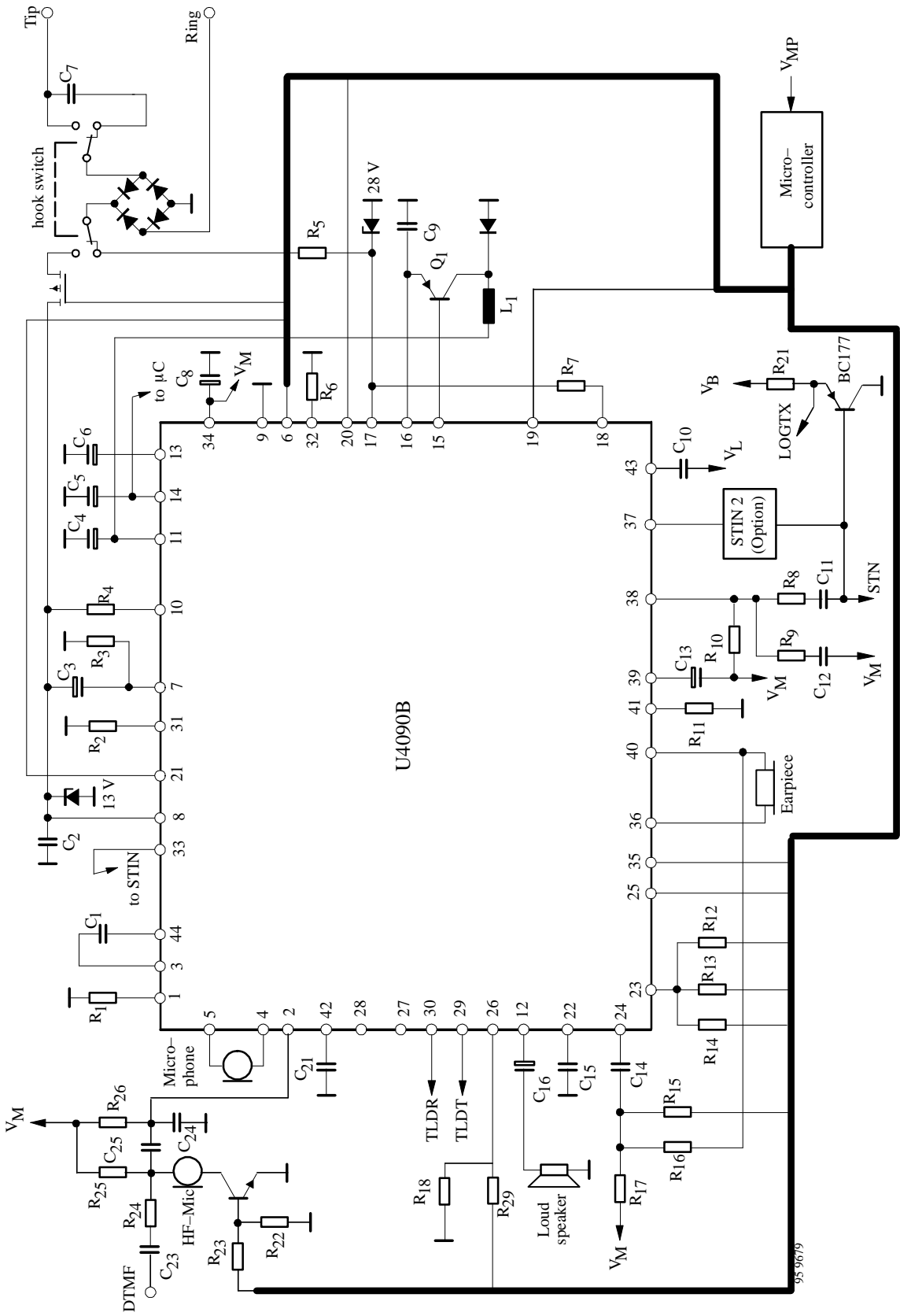


Figure 2 Application for handsfree operation

Typical value of external components

C ₁	100 nF
C ₂	4.7 nF
C ₃	10 µF
C ₄	220 µF
C ₅	47 µF
C ₆	470 µF
C ₇	820 nF
C ₈	100 µF
C ₉	100 nF
C ₁₀	150 nF
C ₁₁	68 nF
C ₁₂	33 nF
C ₁₃	10 µF
C ₁₄	100 nF
C ₁₅	1 µF
C ₁₆	47 µF
C ₁₇	10 µF
C ₁₈	10 µF
C ₁₉	68 nF
C ₂₀	68 nF
C ₂₁	1 µF
C ₂₂	100 nF
C ₂₃	6.8 nF
C ₂₄	10 nF
C ₂₅	100 nF
L ₁	2.2 mH
R ₁	27 kΩ
R ₂	20 kΩ

R ₃	> 68 kΩ
R ₄	10 Ω
R ₅	1.5 kΩ
R ₆	62 kΩ
R ₇	680 kΩ
R ₈	22 kΩ
R ₉	330 Ω
R ₁₀	3 kΩ
R ₁₁	62 kΩ
R ₁₂	30 kΩ
R ₁₃	62 kΩ
R ₁₄	120 kΩ
R ₁₅	47 kΩ
R ₁₆	1 kΩ
R ₁₇	1.2 Ω
R ₁₈	30 kΩ
R ₁₉	6.8 kΩ
R ₂₀	6.8 kΩ
R ₂₁	15 kΩ
R ₂₂	330 kΩ
R ₂₃	220 kΩ
R ₂₄	68 kΩ
R ₂₅	2 kΩ
R ₂₆	3.3 kΩ
R ₂₇	18 kΩ
R ₂₈	2 kΩ
R ₂₉	
R ₃₁	56 kΩ

Pin description

Pin	Symbol	Function
1	TLI1	Transmit level detector input on the line side
2	TLO1	Transmit level detector output on the line side
3	RLO1	Receive level detector output on the line side, and input to the receive background monitor
4	RLI1	Receive level detector input on the line side
5	GND	Ground
6	CD	Chip Disable A logic low (< 0.8 V) sets normal operation. A logic high (> 2.0 V) disables the IC to conserve power. Input impedance is nominally 90 k Ω .
7	V _B	Supply voltage 2.8 to 6.5 V, approx. @ 3 mA AGC circuit reduces the receive attenuator gain @ 25 dB – Receive mode @ 2.8 V
8	RLO2	Receive level detector output on the microphone/speaker side
9	RLI2	Receive level detector input on the microphone/speaker side
10	NC	Not connected
11	NC	Not connected
12	C _T	Response time An RC at this pin sets the response time for the circuit to switch modes
13	V _M	It is a system ac ground, and biases the volume control. A filter cap is required
14	CPT	An RC at this pin sets the time constant for the transmit background monitor
15	TLI2	Transmit level detector input on the microphone/speaker side
16	TLO2	Transmit level detector output on the microphone/speaker side, and input to the transmit background monitor

Absolute maximum ratings

Reference point pin 1, $T_{amb} = 25^{\circ}\text{C}$, unless otherwise specified.

Parameters	Symbol	Value	Unit
Supply voltage Pin 7	V_B	- 0.3 to + 7.0	V
Voltages: Pin Pin Pin		- 0.3 to ($V_B + 0.3$) - 0.3 to ($V_B + 0.3$) - 0.3 to ($V_B + 0.3$)	V
Storage temperature range	T_{stg}	- 55 to + 150	$^{\circ}\text{C}$
Junction temperature	T_j	125	$^{\circ}\text{C}$
Ambient temperature range	T_{amb}	- 20 to + 60	$^{\circ}\text{C}$
Power dissipation $T_{amb} = 60^{\circ}\text{C}$ SO 16	P_{tot}	750	mW
Maximum thermal resistance Junction ambient SO 16	R_{thJA}	70	K/W

Operation recommendation

Parameters	Test conditions / Pin	Symbol	Min.	Typ.	Max.	Unit
Supply voltage	Pin 7	V_B	3.0	-	6.5	V
CD input Pin MUTE input Pin			0	-	V_S	V
Ambient temperature range		T_{amb}	- 20	-	+ 60	$^{\circ}\text{C}$

Electrical characteristics

$T_{amb} = + 25^{\circ}\text{C}$, $V_S = 5.0\text{ V}$, $CD \leq 0.8\text{ V}$, unless otherwise specified

Parameters	Test conditions / Pin	Symbol	Min.	Typ.	Max.	Unit
Power supply						
Supply current	$V_B = 6.5\text{ V}$, $CD = 0.8\text{ V}$ $V_B = 6.5\text{ V}$, $CD = 2.0\text{ V}$	I_B		3.0 600.0	5.0 800.0	mA μA
CD input resistance	$V_S = V_{CD} = 6.5\text{ V}$	R_{CD}	50.0	90.0		$\text{k}\Omega$
CD input voltage	- High - Low	V_{CDH} V_{CDL}	2.0 0.0		V_S 0.8	V
Attenuator control						
C_T voltage	Pin 14 - V_B R mode, $V_{CI} = V_B$ Idle mode T mode	V_{CT}		+ 240.0 0.0 - 240.0		mV
C_T Source current	R mode	I_{CTR}	- 85.0	- 60.0	- 40.0	μA
C_T Sink current	T mode	I_{CTT}	+ 40.0	+ 60.0	+ 85.0	μA
C_T Slow idle current		I_{CTS}		0.0		μA
C_T Fast idle internal resistance		R_{FI}	1.5	2.0	3.6	$\text{k}\Omega$

U4087B

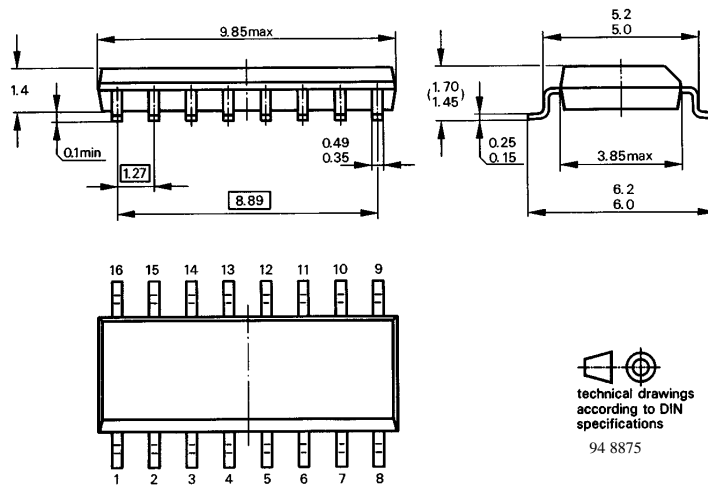
Parameters	Test conditions / Pin	Symbol	Min.	Typ.	Max.	Unit
Level detectors and background noise monitor						
Transmit Receive switching threshold	Ratio of current at RLI1 + RLI2 to 20 μ A at TLI1 + TLI2 to switch from T to R	I_{TH}	0.8	1.0	1.2	
Source current	at RLO1, RLO2, TLO1, TLO2	I_{LSO}		- 2.0		mA
Sink current	at RLO1, RLO2, TLO1, TLO2	I_{LSK}		4.0		μ A
CPR, CPT output resistance	$I_O = 1.2$ mA	R_{CP}		150		Ω
CPR, CPT leakage current		I_{CPLK}		- 0.2		μ A

Ordering information

Type	Package
U4087B-FP	SO 16

Dimensions in mm

Package: SO 16



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