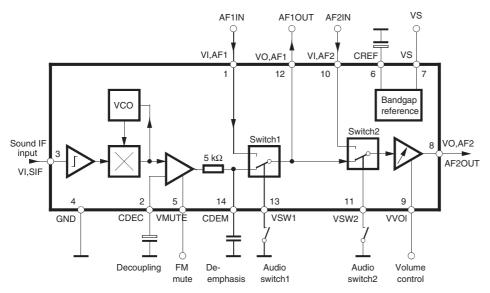
Features

- Completely Alignment-free
- PLL Demodulator for FM Intercarrier Sound IF Signals (Mono)
- Two Audio Switches
- Very Few External Components
- Volume Control by DC Voltage
- Supply Voltage: 5V
- Pb-free Package, which is Compliant with Requirements of RoHS

1. Description

The U2861B is an alignment-free FM sound IF demodulator for all TV standards from 4.5 MHz up to 6.5 MHz (standard M, N, B/G, I, D/K). The circuit includes two switchable audio inputs and volume control. With a supply voltage of 5V, the U2861B is suitable for TV, VCR and Multimedia applications.

Figure 1-1. Block Diagram



Mono FM Sound Demodulator for TV Systems

U2861B

ead Free

Rev. 4798B-TVVCR-07/05





2. Circuit Description

Sound IF Limiter Amplifier

The intercarrier signal coming from the sound filter is fed to a 7-stage limiter amplifier. This guarantees high input sensitivity and excellent AM suppression.

2.1 PLL - FM Demodulator

The alignment-free "Phase-Locked-Loop" (PLL) FM demodulator covers a wide frequency range of 4.5 MHz up to 6.5 MHz with excellent noise performance.

Due to the fact that the voltage-to-frequency characteristic is linear, a low harmonic distortion can be achieved. The free-running frequency of the internal VCO circuit is about 5.5 MHz.

The demodulated FM signal is led via de-emphasis and buffered to pin 12. The de-emphasis low-pass filter consists of an internal $5 \cdot k\Omega$ series resistor and an external capacitor at pin 14. The FM muting is possible by switching pin 5 to ground.

2.2 Audio Switch 1

The first audio switch (pin 13) has inputs for the demodulated FM signal and the external AF1 signal from pin 1.

For multistandard purposes, it is possible to handle internal FM and external AM audio signals. The output of switch1 is also permanently available at pin 12 (e.g., for SCART interface).

2.3 Audio Switch 2 and Volume Control

The second audio switch (pin 11) has inputs for the audio signal from switch 1 and the external AF2 signal at pin 10. The switched AF signal is fed to volume control. The output voltage can be controlled by a DC voltage at pin 9.

2.4 Internal Voltage Stabilizer

The internal band-gap reference ensures constant performance independent of supply voltage and temperature.

3. Pin Configuration

Figure 3-1. Pinning

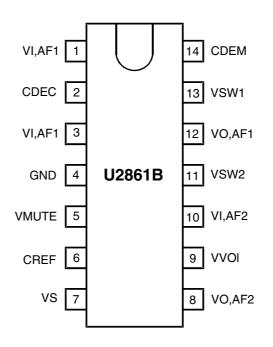


Table 3-1.	Pin Description
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Table 5-1.	Fin Description	
Pin	Symbol	Function
1	VI,AF1	Audio input 1 (e.g., AM signal)
2	CDEC	Decoupling capacitor
3	VI,SIF	FM sound IF input
4	GND	Ground
5	VMUTE	FM mute switch
6	CREF	Internal reference voltage
7	VS	Supply voltage
8	VO,AF2	Switched audio output 2
9	VVOL	Volume control
10	VI,AF2	Audio input 2 (e.g., from SCART)
11	VSW2	Audio switch 2
12	VO,AF1	Switched audio output 1
13	VSW1	Audio switch 1
14	CDEM	De-emphasis and mute switch





4. Absolute Maximum Ratings

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability. Reference point pin 4, unless otherwise specified.

Parameters	Pin	Symbol	Value	Unit	
Supply voltage SO14 package	7	V _S	6.0	V	
Supply current	7	۱ _S	25	mA	
Power dissipation $V_S = 6 V$		Р	150	mW	
Output currents	8, 12	I _{out}	1.0	mA	
External voltages	1, 2, 3, 5, 6, 8, 9, 10, 12, 13, 14 V _{ext} +4.5		+4.5	V	
	11		+12.0	V	
Junction temperature		Т _ј	+125		
Storage temperature		T _{stg}	-25 to +125	°C	
Electrostatic handling ⁽¹⁾	All	V _{ESD}	±200	V	

Note: 1. Equivalent to discharging a 200-pF capacitor through a $0-\Omega$ resistor

5. Thermal Resistance

Parameters	Symbol	Value	Unit
Junction ambient when soldered to PCB SO14 package	R _{thJA}	140	K/W

6. Electrical Characteristics

 $V_{S} = +5V$, $T_{amb} = +25^{\circ}C$; reference point pin 4, unless otherwise specified.

Parameters	Test Conditions	Symbol	Min.	Тур.	Max.	Unit
DC Supply (Pin 7)		1				
Supply voltage SO14 package		Vs	4.5	5.0	6.0	v
Supply current		ا _S		20	25	mA
FM Sound IF Input (Pin 3)	•	I				•
Input limiting voltage, RMS value	AF output signal at pin 8 and pin12: -3 dB	V _{i,SIF}			150	μV_{RMS}
DC input voltage		V _{DC}		1.7		V
Input resistance	(1)	R _{in}		600	750	Ω
Input capacitance	(1)	C _{in}		1.5		pF
FM - PLL					•	
Free-running frequency		f _{vco}		5.5		MHz
Oscillator drift (free running) as function of temperature	$\Delta T = 55^{\circ}C$	Δf_{vco}		500		kHz
Oscillator shift (free running) as function of supply voltage	4.5 V < V _s < V _{S,max}	Δf_{vco}		200		kHz
Capture range of PLL		Δf_{cap}	±1.4	±1.9		MHz
Holding range of PLL		Δf_{hold}	±2.0	±2.5		MHz
Decoupling Capacitor (Pin 2)					•	
Value of decoupling capacitor		C _{dec}		2.2		μF
De-emphasis Capacitor (Pin 14)					•	
Value of de-emphasis capacitor	τ = 50 μs	C _{dem}		10		nF
Audio Output 2 (Pin 8)						
DC output voltage		V _{DC}		2.2		V
Output resistance		R _{out}		130		Ω
AC output peak current		I _{AC}			±1.0	mA
DC output current		I _{DC}			-1.2	mA
AF output voltage, RMS value	$V_{in} = 10 \text{ mV}, f = 5.5 \text{ MHz}$ FM-deviation = 27 kHz $f_{mod} = 1 \text{ kHz}$	V _{o,AF2}		500		mV _{RMS}
Total harmonic distortion	$V_{in} = 10 \text{ mV}, f = 5.5 \text{ MHz}$ FM-deviation = 27 kHz $f_{mod} = 1 \text{ kHz}$	THD		0.1	0.5	%
AM suppression	V_{in} = 10 mV, f = 5.5 MHz, f _{mod} =1 kHz Reference signal: FM-deviation = 27 kHz Test signal: m = 30%	a _{AM}	42	60		dB
Supply voltage ripple rejection	V _{BB} < 200 mV, f = 70 Hz	RR		30		dB

Notes: 1. This parameter is given as application information and is not tested during production.

2. Without external control voltage at pin 13, the internal FM is demodulated.

3. Without control voltage at pin 11, the audio signal from switch 1 is automatically selected. With V11 < 1.5 or V11 > 4.0V input pin 10 is selected.





6. Electrical Characteristics (Continued)

 V_{S} = +5V, T_{amb} = +25°C; reference point pin 4, unless otherwise specified.

Parameters	Test Conditions	Symbol	Min.	Тур.	Max.	Unit
Audio Input 1 (Pin 1)			I			
Input resistance		R _{in}		50		kΩ
Internal DC bias voltage		V _{DC}		3.0		V
AF1 input signal		V _{i,AF1}			900	mV _{RMS}
Mode Selection Audio Switch 1	(Pin 13)		I			•
Control voltage for: FM demodulated signal External signal AF1	(2)	V _{sw1}	2.0 0		4.5 0.8	V V
Switching current		l _{sw1}			70	μA
Audio Input 2 (Pin 10)						
Input resistance		R _{in}		50		kΩ
Internal DC bias voltage		V _{DC}		3.0		V
AF2 input signal		V _{i,AF2}			900	mV _{RMS}
Audio Output 1 (Pin 12)	· ·					•
DC output voltage		V _{DC}		2.3		V
AF output voltage		V _{o,AF}		500		mV _{RMS}
Output resistance		R _{out}		130		Ω
Mode Selection Audio Switch 2	(Pin 11)					•
Control voltage for: External signal AF2 Signal from switch 1 Signal from switch 1	(3)	V _{sw}	0 4.0	2.8	1.5 12.0	V V V
Switching current		I _{sw}			60	μA
Volume Control (Pin 9)	I		I			•
AF control range		ΔAF		80		dB
Control voltage: Minimal volume Maximal volume		V _{vol}	0	4	4.5	V V
Mute Switch (Pin 5)	· · ·		-	•	•	
Control voltage for "mute off"	AF "on"	V _{mute}	2.1	2.9	4.5	V
Control voltage for "mute on"	AF "off"	V _{mute}	0		1.5	V

Notes: 1. This parameter is given as application information and is not tested during production.

2. Without external control voltage at pin 13, the internal FM is demodulated.

3. Without control voltage at pin 11, the audio signal from switch 1 is automatically selected. With V11 < 1.5 or V11 > 4.0V input pin 10 is selected.

U2861B [Preliminary]

Figure 6-1. Test Circuit

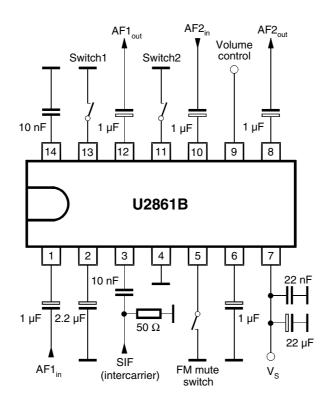
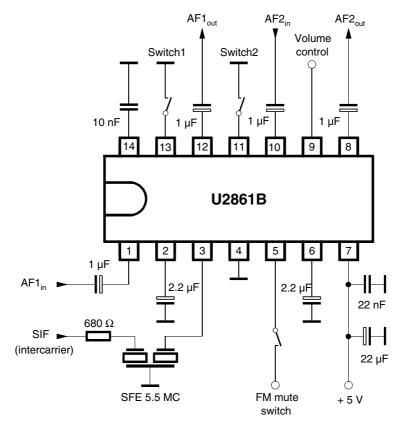


Figure 6-2. Basic Application Circuit







7. Internal Pin Configuration

Figure 7-1. Audio Input 1 (Pin 1)

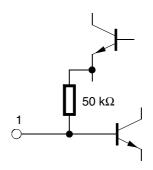


Figure 7-2. Decoupling Capacitor (Pin 2)

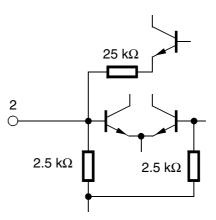


Figure 7-3. FM Sound IF Input (Pin 3)

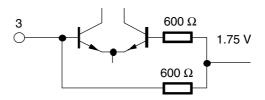
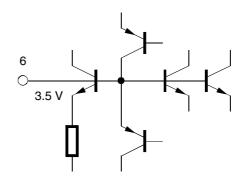


Figure 7-4. Internal Reference Voltage (Pin 6)



U2861B [Preliminary]

Figure 7-5. Audio Output 2 (Pin 8)

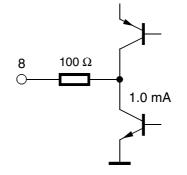


Figure 7-6. Volume Control (Pin 9)

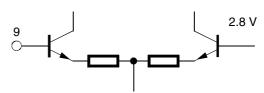


Figure 7-7. Audio Input 2 (Pin 10)

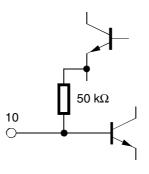


Figure 7-8. Audio Switch 2 (Pin 11)

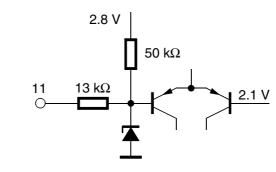






Figure 7-9. Audio Output 2 (Pin 12)

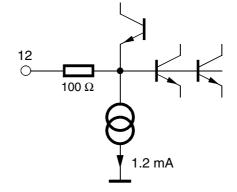


Figure 7-10. Switch 1 (Pin 13)

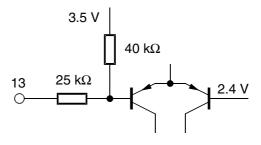
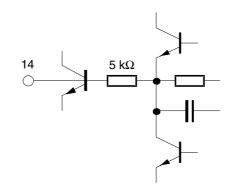
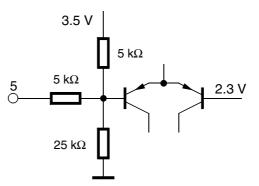


Figure 7-11. De-emphasis (Pin 14)





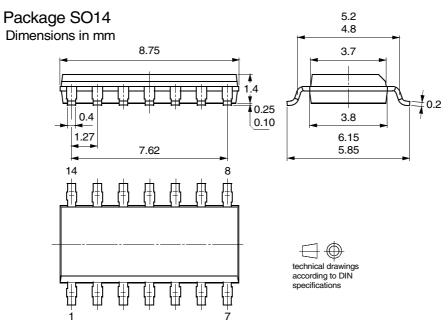


U2861B [Preliminary]

8. Ordering Information

Extended Type Number	Package	Remarks	Standard Package Quantity
U2861B-MFPG3Y	SO14, Pb-free	Taped and reeled	4,000
U2861B-MFPY	SO14, Pb-free	Tube	3,100

9. Package Information







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