



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

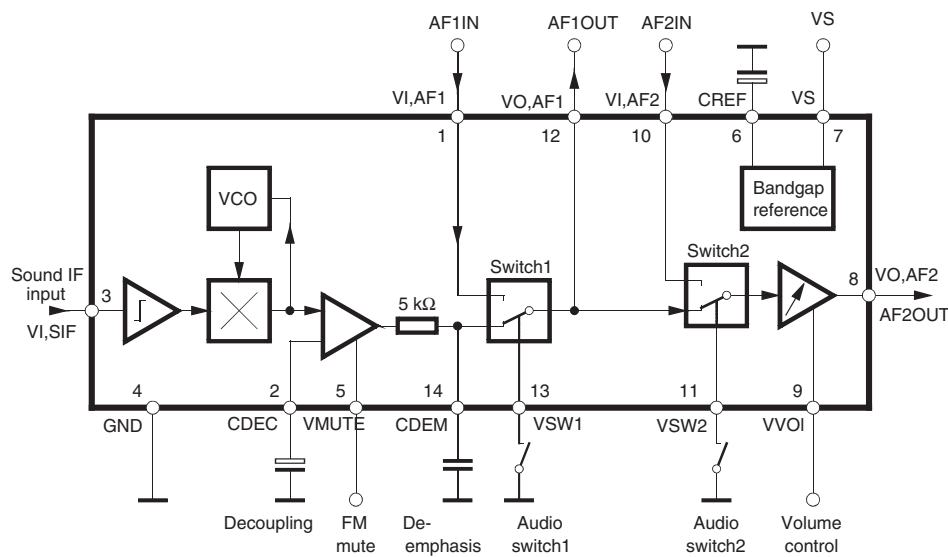


Mono FM Sound Demodulator for TV Systems

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



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-k Ω 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

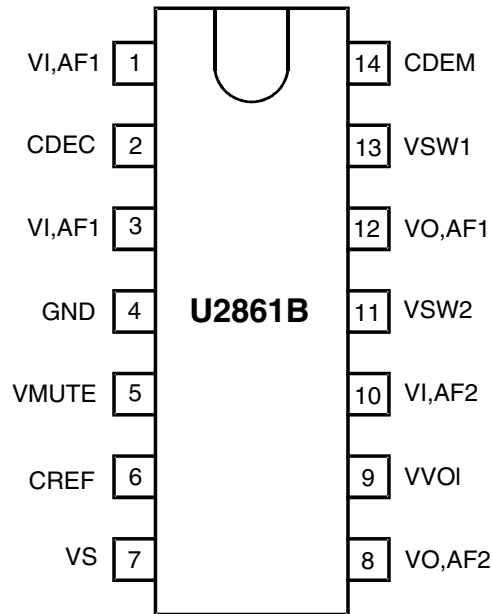


Table 3-1. Pin Description

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	I_S	25	mA
Power dissipation $V_S = 6\text{ V}$		P	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	V
	11		+12.0	V
Junction temperature		T_j	+125	°C
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-Ω 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.	Typ.	Max.	Unit
DC Supply (Pin 7)						
Supply voltage SO14 package		V_S	4.5	5.0	6.0	V
Supply current		I_S		20	25	mA
FM Sound IF Input (Pin 3)						
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	$\tau = 50 \mu s$	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	$V_{in} = 10 \text{ mV}$, $f = 5.5 \text{ MHz}$, $f_{mod} = 1 \text{ kHz}$ Reference signal: FM-deviation = 27 kHz Test signal: $m = 30\%$	a_{AM}	42	60		dB
Supply voltage ripple rejection	$V_{RR} < 200 \text{ mV}$, $f = 70 \text{ Hz}$	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 $V_{11} < 1.5$ or $V_{11} > 4.0V$ input pin 10 is selected.

6. Electrical Characteristics (Continued)

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

Parameters	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
Audio Input 1 (Pin 1)						
Input resistance		R_{in}		50		$k\Omega$
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)						
Control voltage for: FM demodulated signal External signal AF1	⁽²⁾	V_{sw1}	2.0 0		4.5 0.8	V V
Switching current		I_{sw1}			70	μA
Audio Input 2 (Pin 10)						
Input resistance		R_{in}		50		$k\Omega$
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)						
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 $V_{11} < 1.5$ or $V_{11} > 4.0V$ input pin 10 is selected.

Figure 6-1. Test Circuit

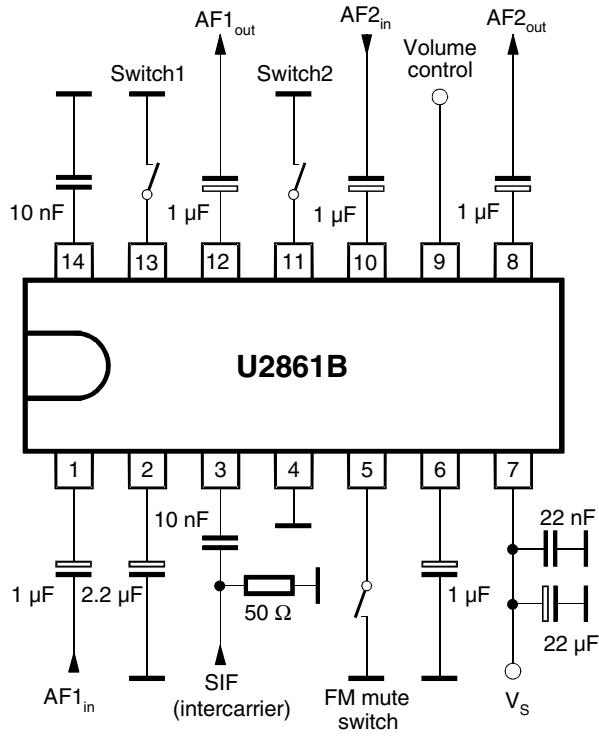
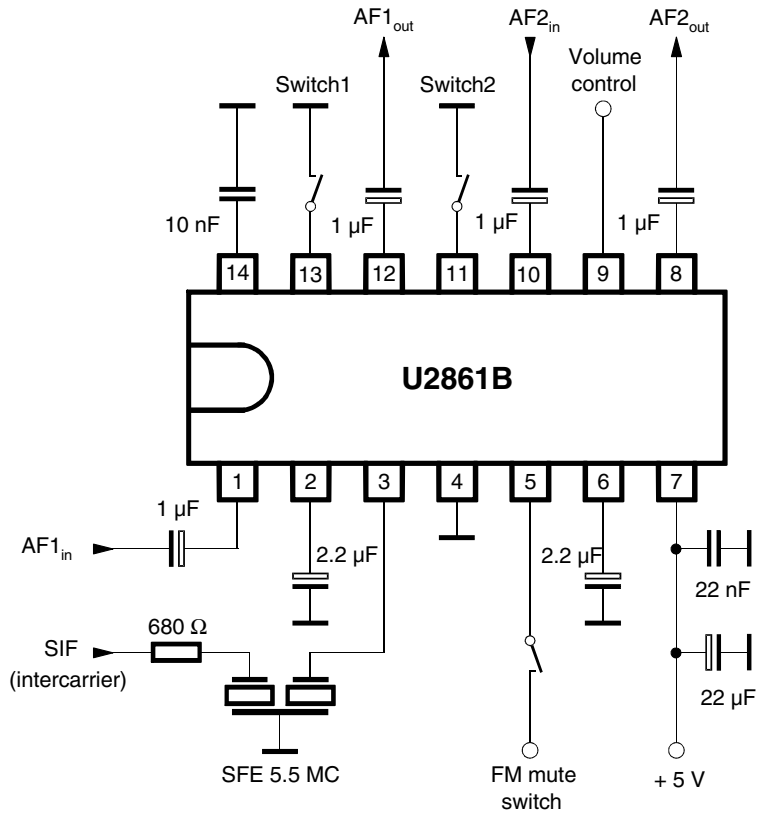


Figure 6-2. Basic Application Circuit



7. Internal Pin Configuration

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

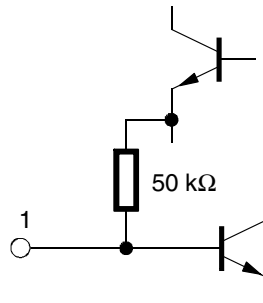


Figure 7-2. Decoupling Capacitor (Pin 2)

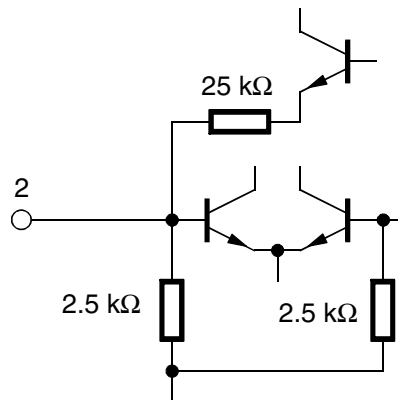


Figure 7-3. FM Sound IF Input (Pin 3)

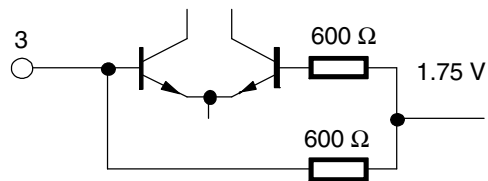


Figure 7-4. Internal Reference Voltage (Pin 6)

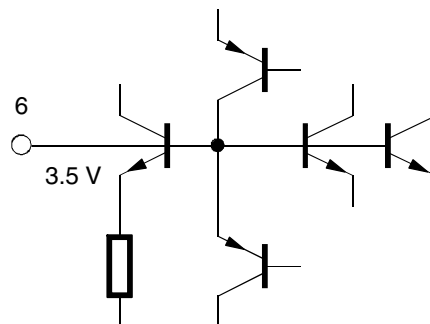


Figure 7-5. Audio Output 2 (Pin 8)

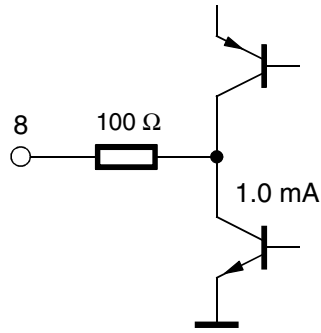


Figure 7-6. Volume Control (Pin 9)

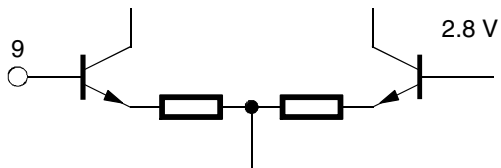


Figure 7-7. Audio Input 2 (Pin 10)

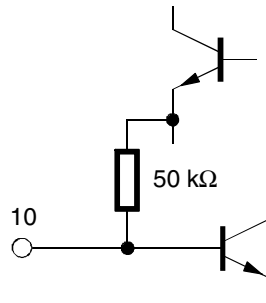


Figure 7-8. Audio Switch 2 (Pin 11)

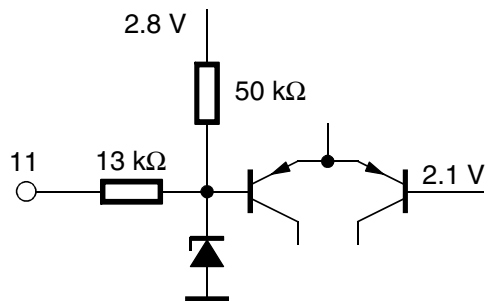


Figure 7-9. Audio Output 2 (Pin 12)

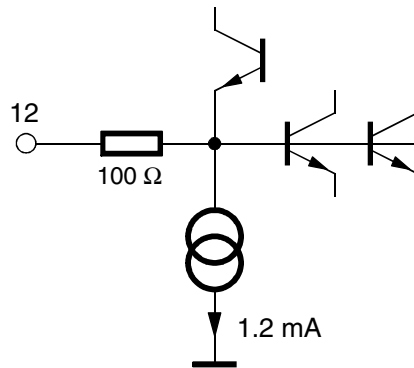


Figure 7-10. Switch 1 (Pin 13)

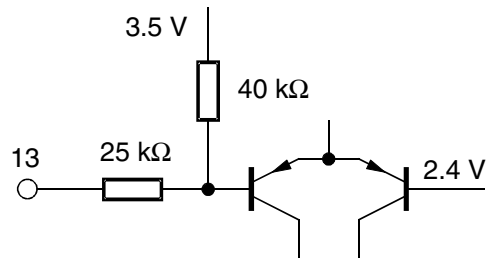


Figure 7-11. De-emphasis (Pin 14)

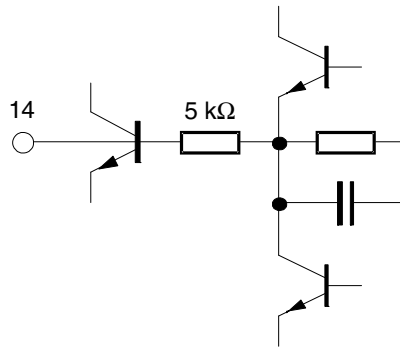
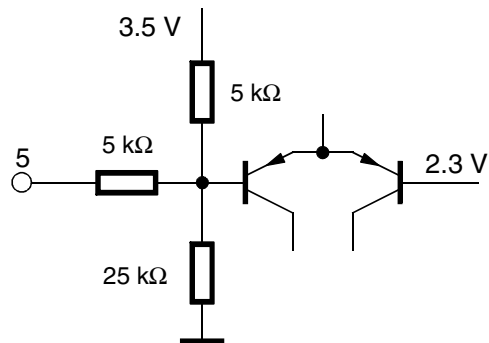


Figure 7-12. Mute switch (Pin 5)

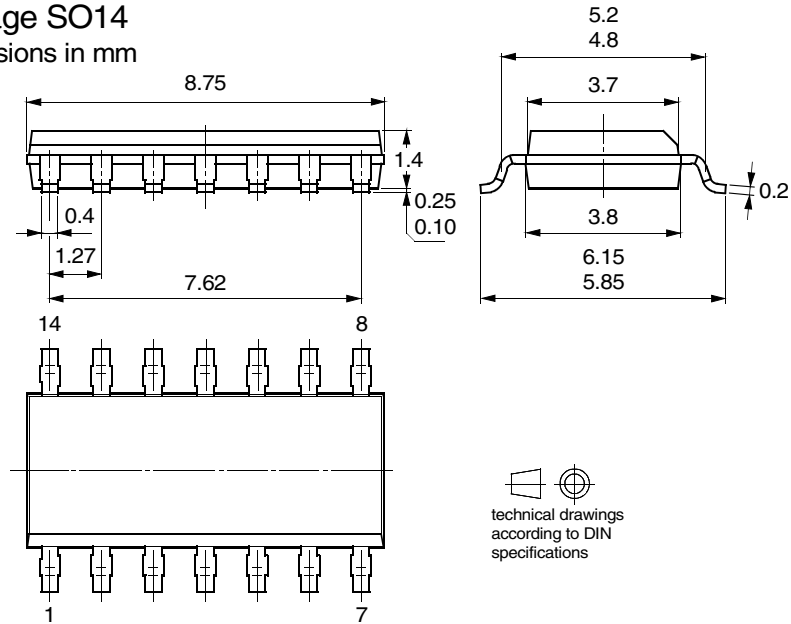


8. Ordering Information

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

Package SO14
Dimensions in mm





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