Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of “Quality Parts,Customers Priority,Honest Operation,and Considerate Service”,our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!

Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832
Email & Skype: info@chipsmall.com Web: www.chipsmall.com
Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China

Features

- **Two Alignment-free PLL FM Demodulators, Automatic Lock-in on the Received Sound Carrier Frequency**
- **Mono and Dual Channel Application**
- **Sound IF Inputs Provided for Ceramic Filters**
- **Automatic Mute for Second Sound Channel (Squelch)**
- **Mute Function for Both Sound Channels**
- **5-V Supply Voltage, Low-power Consumption**
- **Few External Components**
- **Pb-free Package, which is Compliant with Requirements of RoHS**

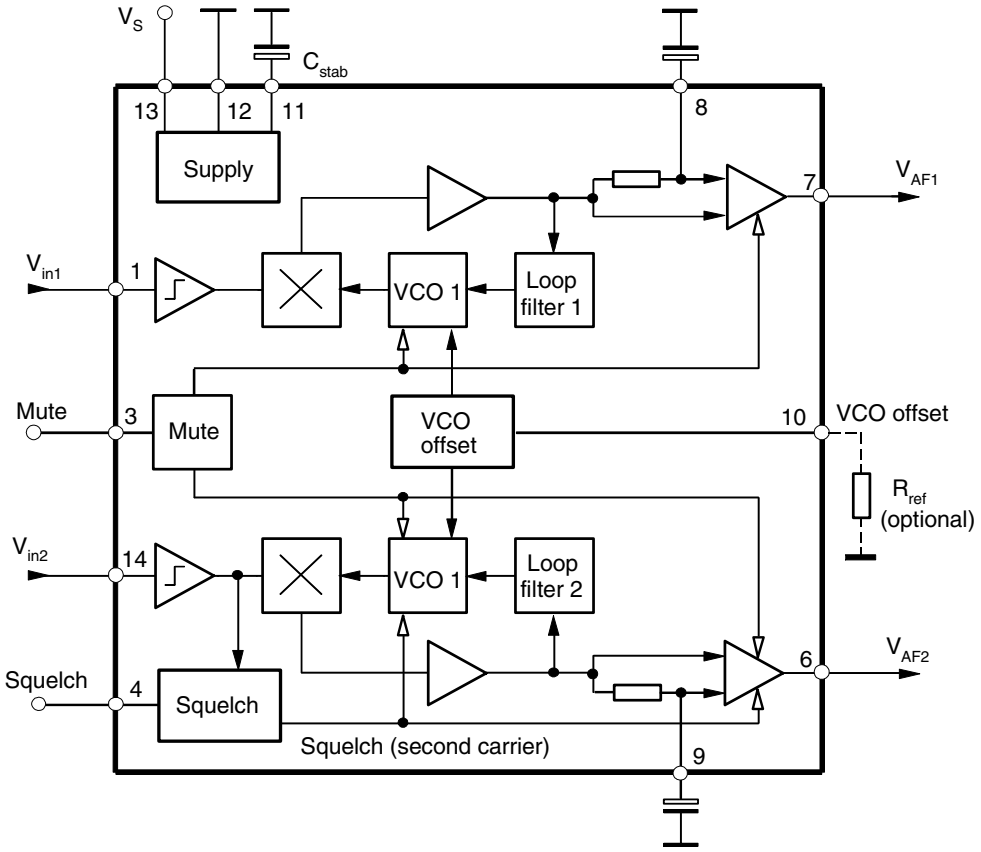
Dual-channel FM Sound Demodulator for TV Systems

U2860B-M

1. Description

The U2860B-M is a dual-channel FM sound demodulator realized with Atmel's advanced bipolar process. All TV FM standards, from 4.5 MHz up to 6.5 MHz (standard M, B/G, I, D/K) can be processed with high performance. The circuit is alignment-free and has a minimum number of external components. With 5V supply voltage, the U2860B-M is suitable for TV, VCR and multimedia applications.

Figure 1-1. Block Diagram



Rev. 4794E–TVVCR–12/05

2. Pin Configuration

Figure 2-1. Pinning

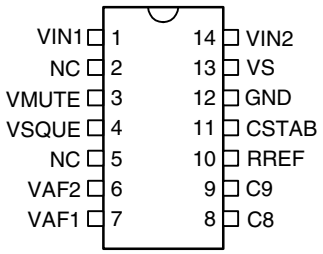


Table 2-1. Pin Description

Pin	Symbol	Function
1	VIN1	Intercarrier input of sound channel 1 (5.5 MHz)
2	NC	Not connected
3	VMUTE	Mute for sound channel 1 + 2 “on/off”
4	VSQUE	Automatic mute for 2nd sound channel (squelch) “on/off”
5	NC	Not connected
6	VAF2	Audio output AF2 of sound channel 2
7	VAF1	Audio output AF1 of sound channel 1
8	C8	Decoupling capacitor for sound channel 1
9	C9	Decoupling capacitor for sound channel 2
10	RREF	VCO offset of the free-running frequency
11	CSTAB	Internal supply voltage stabilization
12	GND	Ground
13	VS	Supply voltage
14	VIN2	Intercarrier input of sound channel 2 (5.74 MHz)

3. Circuit Description

The U2860B-M includes two identical sound IF channels. Each consists of a limiter amplifier, PLL FM demodulator and AF amplifier. Additionally, this circuit contains a squelch function, mute switch and internal voltage regulation.

4. Limiter Amplifiers

The intercarrier signals are fed through external ceramic bandpass filters to a 7-stage limiter amplifier. This guarantees high input sensitivity and excellent AM suppression.

5. PLL FM Demodulators

The alignment-free Phase Locked Loop (PLL) demodulator covers a wide frequency range of 4.5 MHz up to 6.5 MHz with low-noise performance. The linear voltage to frequency characteristic results in low harmonic distortion. The free-running frequency of the internal VCO circuit is about 5.5 MHz. For this frequency, the input sensitivity and VCO locking is optimal. An additional external resistor at pin 10 allows a frequency shift of ±1 MHz via an internal offset current. With this option, it is possible to shift the optimum conditions to the upper frequency (6.5 MHz) or to the lower frequency (4.5 MHz). The offset current acts simultaneously on both VCO circuits. If no resistor is connected, the offset current is disabled.

6. Audio Amplifiers

The demodulated signals are amplified to 500 mVrms with low output impedance at the audio outputs (pin 6 and pin 7). AC decoupling at pin 8 and pin 9 of the audio amplifiers leads to high common mode rejection.

7. Squelch Function

For channel 2 the audio output amplifier and VCO2 is muted automatically (squelch) when the second sound carrier is not present. This avoids a wrong identification for stereo and dual sound in the stereo decoder. Therefore, with mono sound, there is no output signal at pin 6. The automatic squelch function can be disabled by switching pin 4 to ground.

8. Mute Switch

Simultaneous muting of both circuits is possible by switching pin 3 to ground.

9. Internal Voltage Stabilizer

The internal bandgap reference ensures constant performance independent of supply voltage and temperature.

10. 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 12, unless otherwise specified.

Parameters	Pin	Symbol	Value	Unit
Supply voltage	13	V_S	9.0	V
Supply current	13	I_S	33	mA
Power dissipation V_S = +9 V		P	300	mW
Output currents	6, 7	I_{out}	±1.5	mA
External voltages	1, 14 3, 4 6, 7, 8, 9, 10, 11	V_{ext} V_{ext} V_{ext}	2.0 V_S 4.5V	V V V
Junction temperature		T_j	+125	°C
Storage temperature		T_{stg}	–25 to +125	°C
Electrostatic handling[1] all pins		V_{ESD}	±200	V

Note: 1. Machine model in accordance with ESD S5.2 standard.

11. Thermal Resistance

Parameters	Symbol	Value	Unit
Junction ambient when soldering to PCB	R_{thJA}	90	K/W

12. Operating Range

Parameters	Symbol	Value	Unit
Supply voltage range, pin 13	V_S	4.5 to 9.0	V
Ambient temperature	T_{amb}	0 to 85	°C

13. Electrical Characteristics

V_S = 5V, T_{amb} = 25°C, reference point pin , unless otherwise specified

Parameters	Test Conditions	Pin	Symbol	Min.	Typ.	Max.	Unit
DC Supply (Pin 13)							
Supply voltage range			V_S	4.5	5.0	9.0	V
Supply current			I_S		27	33	mA
Intercarrier Input 1 (Pin 1)							
DC input voltage			V_{DC}		1.75		V
Input resistance(1)			R_{in}		680	750	Ω
Input limiting voltage	Input signal v_{in}: f = 5.5 MHz output signal AF1: v_{AF1} = –3 dB		v_{lim}			150	µV
Intercarrier Input 2, Pin 14							
DC input voltage			V_{DC}		1.75		V
Input resistance(1)			R_{in}		680	750	Ω
Input limiting voltage	Input signal v_{in}: f = 5.74 MHz output signal AF2: v_{AF2} = –3 dB		v_{lim}			150	µV
Input signal for automatic second sound carrier mute off (squelch)	Audio output AF2 active		v_{in}	> 0.7	1.0	< 1.5	mV
FM Demodulators, Internal VCO's (Pin 10)							
Free-running frequency			f_{VCO}		5.5		MHz
Oscillator drift (free-running) as function of temperature	ΔT = 55°C		Δf_{VCO}		500		kHz
Oscillator shift (free-running) as function of supply voltage	4.5V < V_S < 5.5V		Δf_{VCO}		200		kHz
Adjustment range of free-running frequencies	By external resistor R_{ref} at pin 10		Δf_{adj}	±1			MHz
Adjustment resistance for free-running frequencies			R_{ref}	15	22	30	kΩ
FM Demodulators, Internal VCO's (Pin 10)							
Steepness of free-running frequency adjustment	Resistor R_{ref} at pin 10		S		200		kHz/kΩ
Capture range of PLL's			Δf_{cap}	±1.4	±1.9		MHz
Holding range of PLL's			Δf_{hold}	±2.0	±3.0		MHz
Audio Outputs, AF1 (Pin 7) and AF2 (Pin 6)							
DC output voltage			V_{DC}		2.2		V
DC output current			I_{DC}		1.0	–1.3	mA
Output resistance(1)			R_{out}		150		
AC output peak current			i_{AC}			±1.0	mA

Note: 1. This parameter is given as an application information and not measured during final testing.

13. Electrical Characteristics (Continued)

V_S = 5V, T_{amb} = 25°C, reference point pin , unless otherwise specified

Parameters	Test Conditions	Pin	Symbol	Min.	Typ.	Max.	Unit
AF output voltage, RMS value	v_{in} = 10 mV f = 5.5 MHz FM-dev. = 27 kHz f_{mod} = 1 kHz		v_{AF}		500		mV
Difference between the output signals			Δv_{AF}			±1	dB
Total harmonic distortion	v_{in} = 10 mV f = 5.5 MHz FM-dev. = 27 kHz f_{mod} = 1 kHz		THD		0.1	0.5	%
AM suppression	v_{in} = 10 mV f = 5.5 MHz f_{mod} = 1 kHz reference signal: FM-dev. = 50 kHz test signal: m = 30%		α_{AM}	46	66		dB
Crosstalk attenuation between the AF outputs	f = 50 Hz to 12.5 kHz		α_{att}		70		dB
Supply voltage ripple rejection	V_{RR} < 200 mV, f = 70 Hz		RR		24		dB
Mute Switch (Pin 3)							
Control voltage - mute off - mute on	 AF outputs active AF outputs not active		V_{mute}	 2.0 0		 V_S 0.8	 V V
Control current			I_{mute}		150		µA
Squelch Function, (Pin 4)							
Control voltage for automatic mute 2nd carrier - off - on			V_{sque}	 0 2.0		 0.8 V_S	 V V
Control current			I_{sque}		150		µA

Note: 1. This parameter is given as an application information and not measured during final testing.

14. Diagrams

Figure 14-1. Total Harmonic Distortion

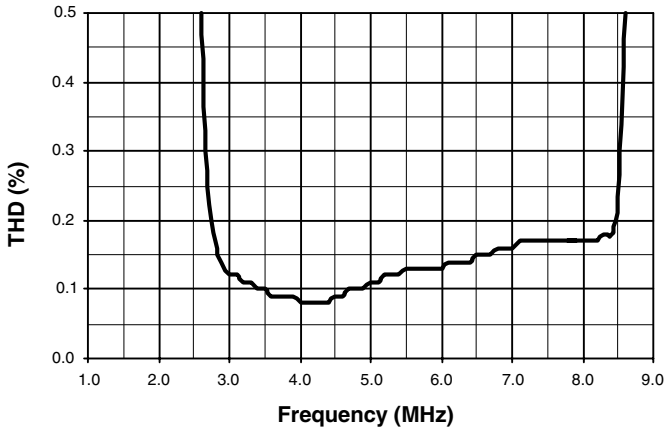


Figure 14-2. AM Suppression

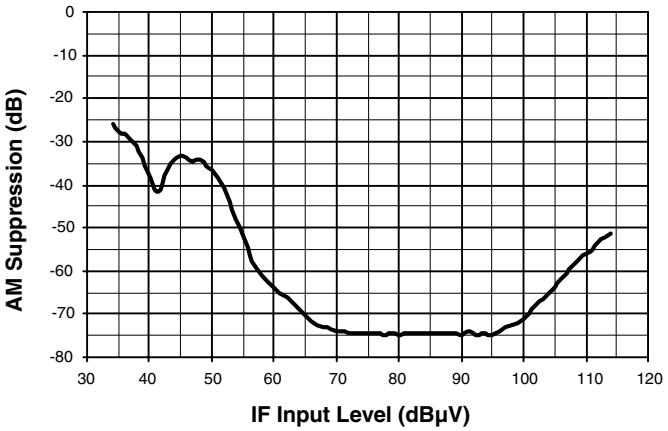


Figure 14-3. VCO Free-running Frequency

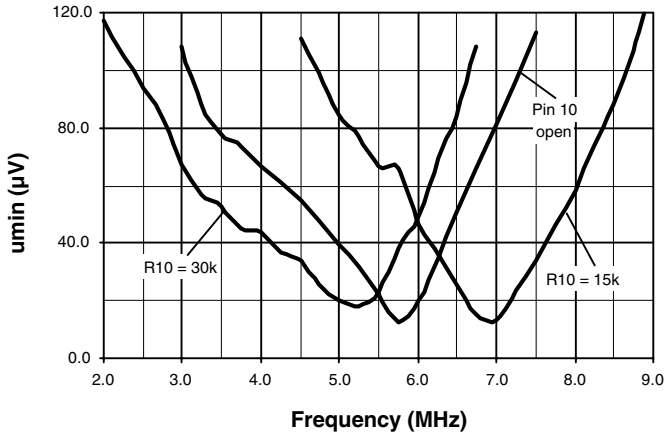


Figure 14-4. Capture and Hold Range

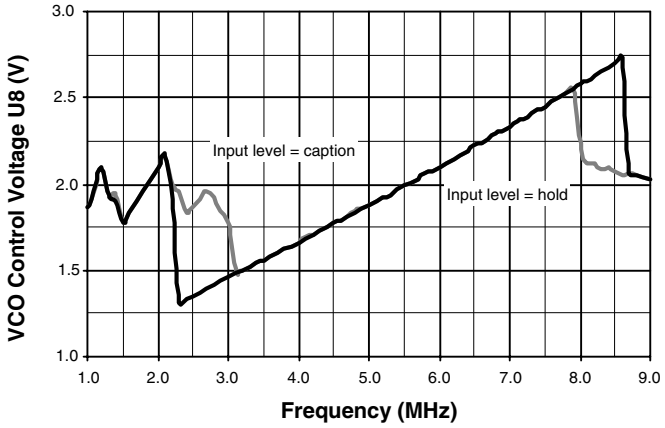


Figure 14-5. Limiter Characteristics

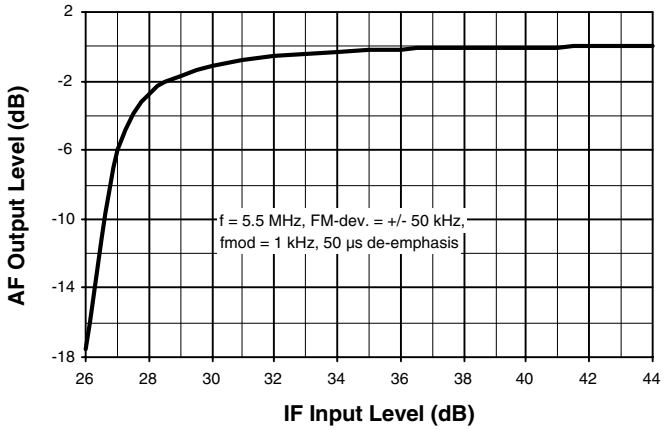
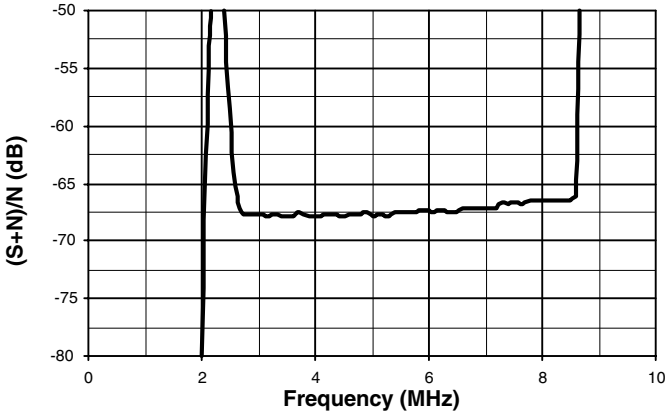


Figure 14-6. Signal-to-noise Ratior



15. Drawings

Figure 15-1. SIF Inputs

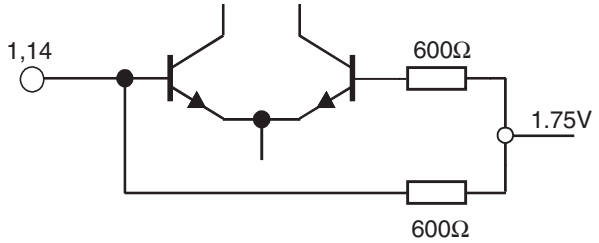


Figure 15-2. Mute Switch/Squelch Switch

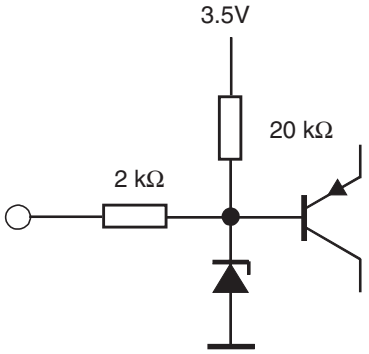


Figure 15-3. Audio Outputs

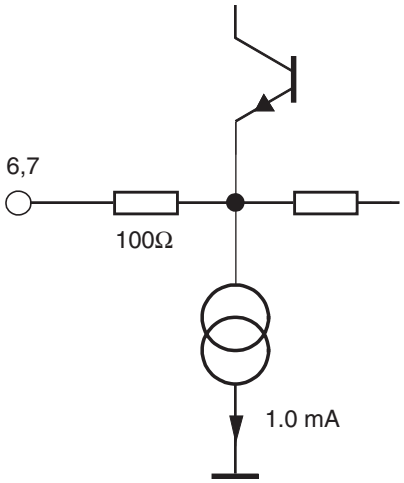


Figure 15-4. Decoupling Capacitor

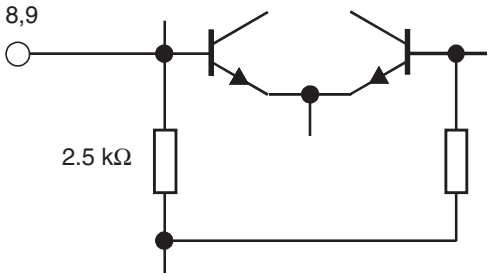


Figure 15-5. VCO Offset (Reference Resistor)

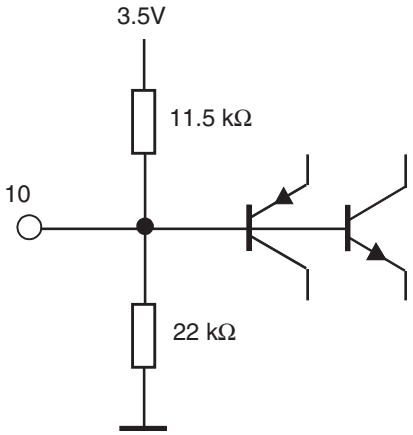
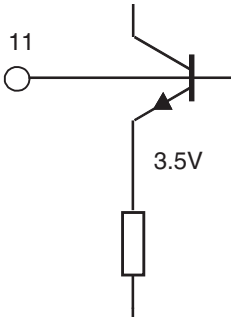


Figure 15-6. Internal Supply Voltage Stabilization



16. Test Circuit and Application Circuit

Figure 16-1. Test Circuit

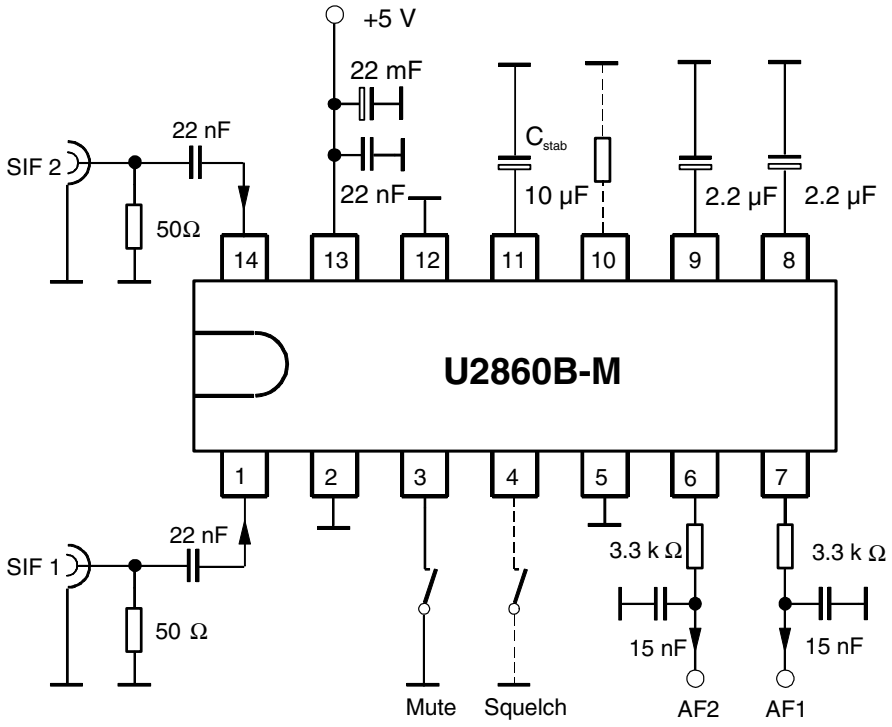
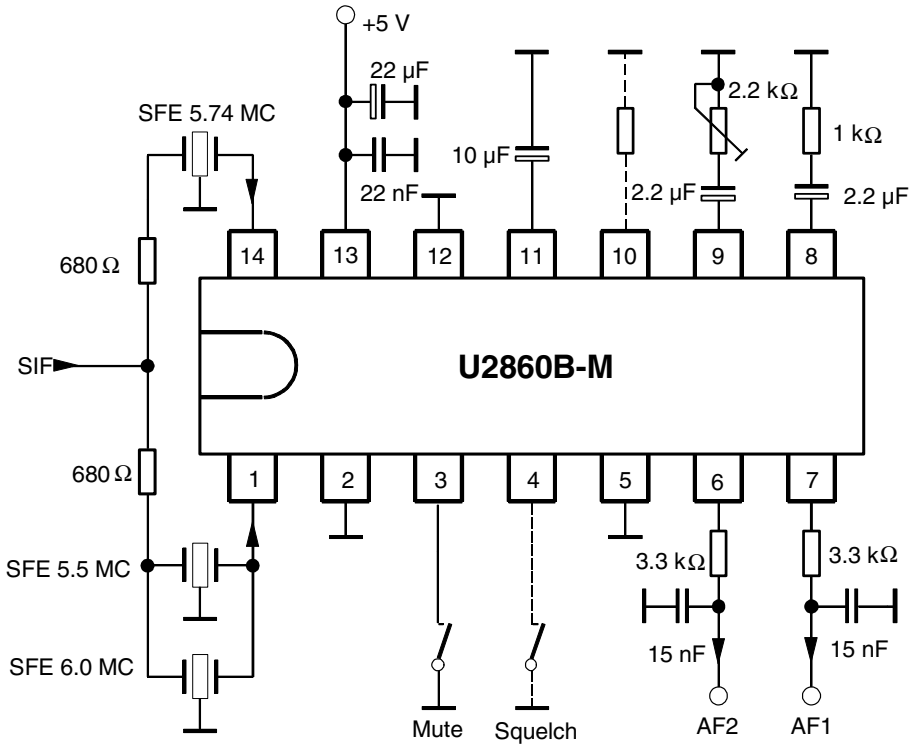


Figure 16-2. Application Circuit



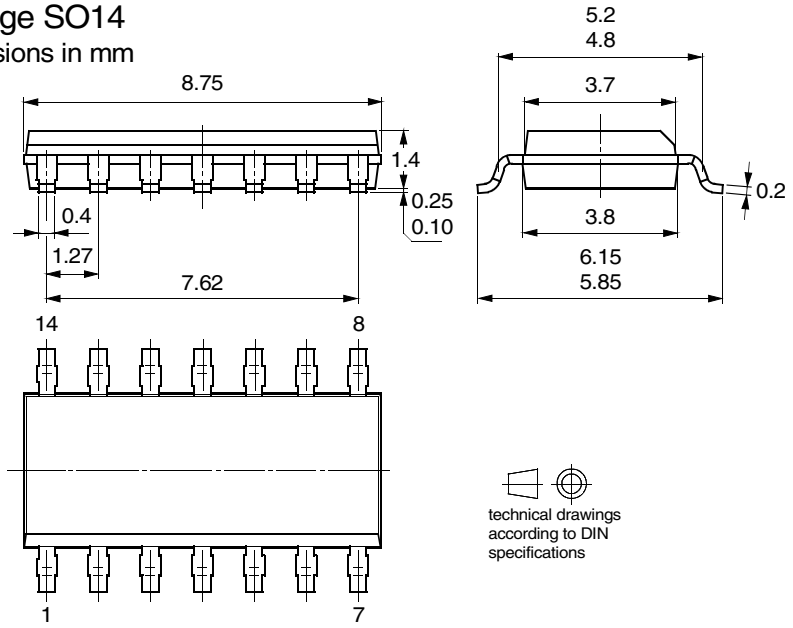
17. Ordering Information

Extended Type Number	Package	Remarks	Standard Package Quantitiy
U2860B-MFPG3G	SO14, Pb-free	Taped and reeled	4,000
U2860B-MFPY	SO14, Pb-free	Tube	3,100

18. Package Information

Package SO14

Dimensions in mm



Atmel Corporation

2325 Orchard Parkway
San Jose, CA 95131, USA
Tel: 1(408) 441-0311
Fax: 1(408) 487-2600

Regional Headquarters

Europe
Atmel Sarl
Route des Arsenaux 41
Case Postale 80
CH-1705 Fribourg
Switzerland
Tel: (41) 26-426-5555
Fax: (41) 26-426-5500

Asia
Room 1219
Chinachem Golden Plaza
77 Mody Road Tsimshatsui
East Kowloon
Hong Kong
Tel: (852) 2721-9778
Fax: (852) 2722-1369

Japan
9F, Tonetsu Shinkawa Bldg.
1-24-8 Shinkawa
Chuo-ku, Tokyo 104-0033
Japan
Tel: (81) 3-3523-3551
Fax: (81) 3-3523-7581

Atmel Operations

Memory
2325 Orchard Parkway
San Jose, CA 95131, USA
Tel: 1(408) 441-0311
Fax: 1(408) 436-4314

Microcontrollers
2325 Orchard Parkway
San Jose, CA 95131, USA
Tel: 1(408) 441-0311
Fax: 1(408) 436-4314

La Chantrerie
BP 70602
44306 Nantes Cedex 3, France
Tel: (33) 2-40-18-18-18
Fax: (33) 2-40-18-19-60

ASIC/ASSP/Smart Cards
Zone Industrielle
13106 Rousset Cedex, France
Tel: (33) 4-42-53-60-00
Fax: (33) 4-42-53-60-01

1150 East Cheyenne Mtn. Blvd.
Colorado Springs, CO 80906, USA
Tel: 1(719) 576-3300
Fax: 1(719) 540-1759

Scottish Enterprise Technology Park
Maxwell Building
East Kilbride G75 0QR, Scotland
Tel: (44) 1355-803-000
Fax: (44) 1355-242-743

RF/Automotive
Theresienstrasse 2
Postfach 3535
74025 Heilbronn, Germany
Tel: (49) 71-31-67-0
Fax: (49) 71-31-67-2340

1150 East Cheyenne Mtn. Blvd.
Colorado Springs, CO 80906, USA
Tel: 1(719) 576-3300
Fax: 1(719) 540-1759

Biometrics/Imaging/Hi-Rel MPU/
High Speed Converters/RF Datacom
Avenue de Rochepleine
BP 123
38521 Saint-Egreve Cedex, France
Tel: (33) 4-76-58-30-00
Fax: (33) 4-76-58-34-80

Literature Requests
www.atmel.com/literature

Printed on recycled paper.

4794E–TVVCR–12/05