



SANYO Semiconductors

# DATA SHEET

## LA7161BM/BV — Monolithic Linear IC VHF Band RF Modulator (US3, 4ch, JPN1, 2ch, TWN13ch compatible)

### Overview

The LA7161BM/BV is a VHF band RF module. It supports US3, 4ch, JPN1, 2ch, TWN13ch.

### Functions

- RF VCO (AGC).
- RF Mixer.
- RF Buffer.
- Video clamp.
- White clip.
- Audio FM.
- 4V regulator.
- Reference OSC.

### Specifications

**Maximum Ratings** at  $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	$V_{CC \text{ max}}$		7.0	V
Allowable power dissipation	$P_d \text{ max}$	$T_a \leq 75^\circ\text{C}$	350*	mW
Operating temperature	$T_{opr}$		-20 to +75	$^\circ\text{C}$
Storage temperature	$T_{stg}$		-55 to +150	$^\circ\text{C}$

\* Mounted to the glass epoxy resin made board (114.3mm×76.1mm×1.6mm)

**Operating Conditions** at  $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Recommended operating voltage	$V_{CC}$		5.0	V
Operating voltage range	$V_{CC \text{ op}}$		4.5 to 5.5	V

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**SANYO Semiconductor Co., Ltd.**

TOKYO OFFICE Tokyo Bldg., 1-10, 1 Chome, Ueno, Taito-ku, TOKYO, 110-8534 JAPAN

## LA7161BM/BV

**Electrical Characteristics/Operating Characteristics** at Ta = 25°C, V<sub>CC</sub> = 5.0V, Measured with US3ch unless otherwise specified

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Current drain 1	I <sub>CC1</sub>	No signal, pin 6 high	26	37	48	mA
Current drain 2	I <sub>CC2</sub>	No signal, pin 6 low	17	25	33	mA
Regulator voltage	V <sub>reg</sub>	No signal	3.7	3.9	4.1	V
Antenna driver voltage	V <sub>ant</sub>	Pin 6 high, 220Ω load	3.2	3.5	3.8	V
RF type						
Video carrier output US	P <sub>us</sub>	No signal (Note 1)	85	87	89	dBμ
Video carrier output JP	P <sub>jp</sub>	No signal (Note 1)	84.5	86.5	88.5	dBμ
Video carrier output TW	P <sub>tw</sub>	No signal (Note 1)	84	86	88	dBμ
Audio carrier output ratio	P/S	S: fp+4.5MHz	14.5	16	17.5	dB
Audio 2 <sup>nd</sup> harmonic distortion	P/S2	S2: fp+2×4.5MHz	50	65		dB
Audio 3 <sup>rd</sup> harmonic distortion	P/S3	S3: fp+3×4.5MHz	45	55		dB
Chroma beat	P/CB	V <sub>in</sub> = 3.58MHz, 0.6Vp-p CB: fp+920kHz	65	72		dB
Video harmonic distortion	P/V2	V <sub>in</sub> = 1MHz, 1Vp-p V2: fp+2MHz	45	65		dB
Video type						
Video modulation	M <sub>p</sub>	V <sub>in</sub> = Stair step, 1Vp-p	75	80	85	%
White clip level (Max video modulation)	WCL	V <sub>in</sub> = Stair step, 1.5Vp-p	88	93	98	%
Differential gain	DG	V <sub>in</sub> = 10-Stair step, 1Vp-p	-5		5	%
Differential phase	DP	V <sub>in</sub> = 10-Stair step, 1Vp-p	-5		5	Deg
Audio type						
Audio modulation	M <sub>s</sub>	A <sub>in</sub> = 1kHz, 1Vp-p (Note 2)	90	100	110	%
Maximum audio modulation	M <sub>smx</sub>	THD<3%	400			%
Audio distortion	THD	A <sub>in</sub> = 1 kHz, 1Vp-p		0.4	2	%
Audio S/N	AS/N	A <sub>in</sub> = 1 kHz, 1Vp-p V <sub>in</sub> = Color bar, 1Vp-p	45	52		dB

Note 1: 9.5dB added to the RFOUT value measured with a analyzer of the input impedance of 50Ω.

Note 2: 100% = ±25kHz modulation.

### Cautions for use

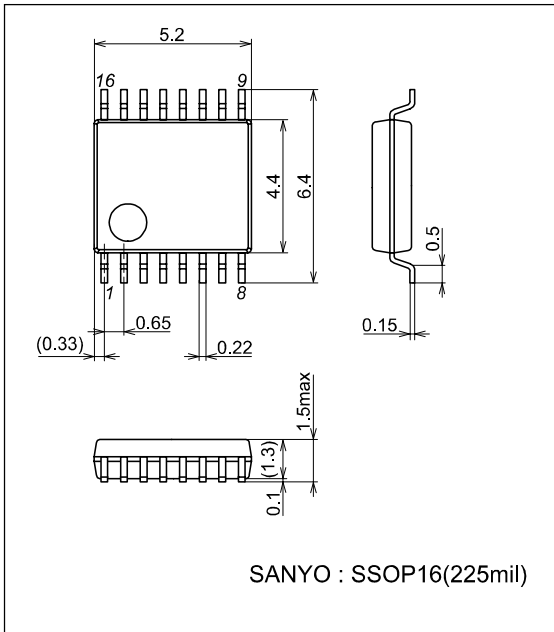
- Set the variable L (between pins 9 and 10) of RFVCO so that the RF output frequency becomes 67.25MHz when 2.7 V is applied to V12 (pin 12) in the US4ch mode for the US specifications, 97.25MHz when 2.6V is applied to V12 (pin 12) in the JPN2ch mode for the JPN specifications, and 211.25MHz when 2.5V is applied to V12 (pin 12) in the TWN13ch mode for the TWN specifications.  
Set the C (pins 9-10) value of RF VCO, so that the V12 (pin 12) voltage difference ΔV12 CH between US 4CH and US3CH in the US specification and the V12 (pin 12) voltage difference ΔV12CH between JPN2CH and JPN1CH in the JPN specification becomes ΔV12CH≤±0.25V. (This is necessary because the oscillation frequency during free run (without PLL control) of PF VCO differs due to the floating capacity of pattern.)
- Handle pins 9 and 10 with care to prevent electrostatic breakdown because their high frequency characteristics are extremely important.

# LA7161BM/BV

## Package Dimensions

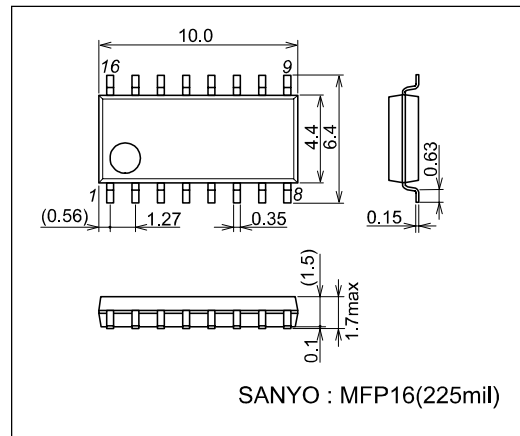
unit: mm  
3178B

[LA7161BV]

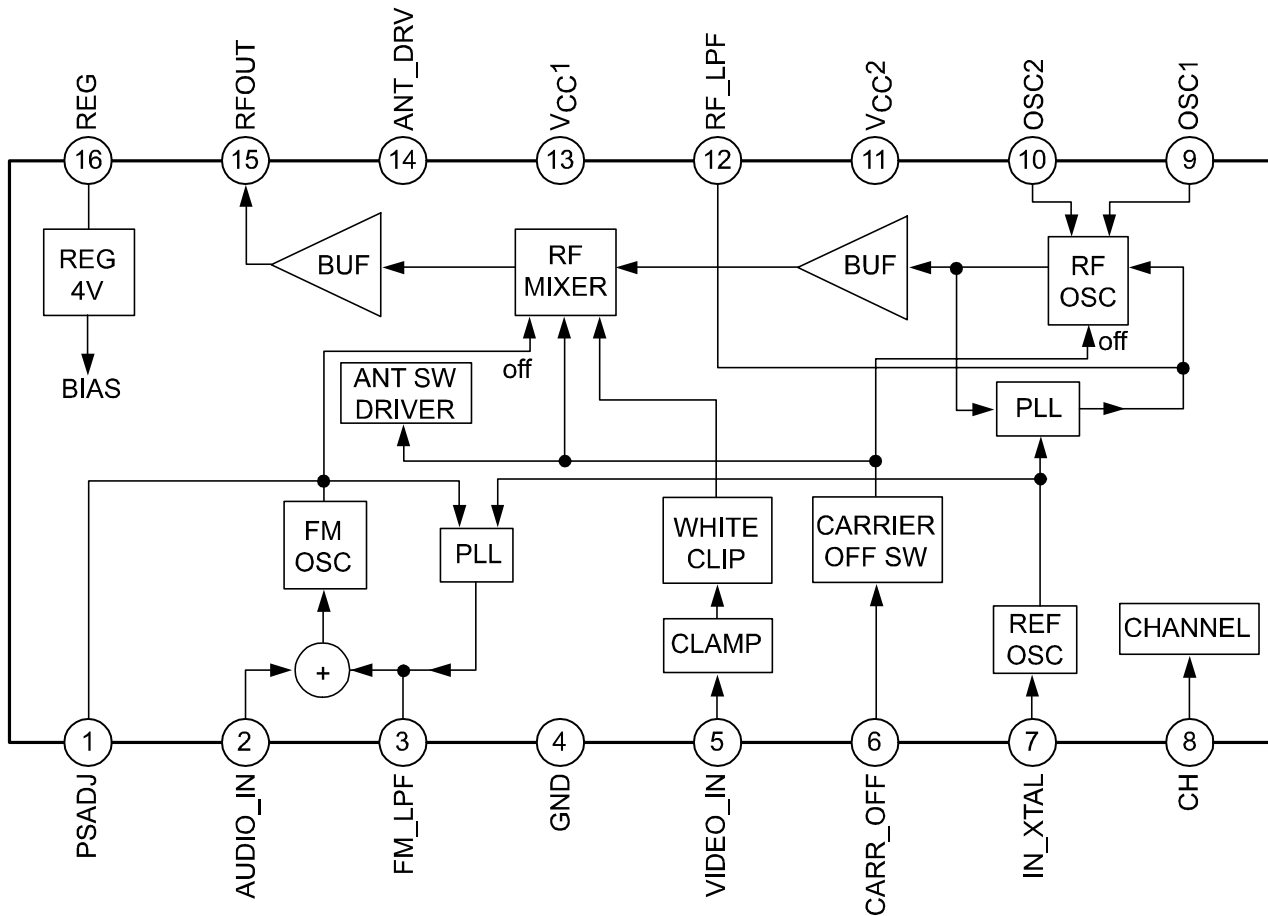


unit: mm  
3035B

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## Block Diagram



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# LA7161BM/BV

## Pin Equivalent Circuit

Pin No.	Symbol	Voltage	Equivalent circuit	Remarks
1	P/S ADJ	2.7		Capacitor and additionally a resistor may be inserted between the circuit and GND to attenuate the audio inter-carrier level.
2	AUDIO IN	0		FM audio input
3	FM LPF	2.2		Control pin of output FM oscillator for the PLL phase detector charge pump.
4	GND	0		
5	VIDEO IN	2.6		Video input Clamped with sink chip
6	CARR OFF	-		Hi:14PIN Hi RF Operating Lo:14PIN Lo RF Stop

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# LA7161BM/BV

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Pin No.	Symbol	Voltage	Equivalent circuit	Remarks
7	IN XTAL	3.5		<p>4MHz oscillator inserted between the circuit and GND. External input of the 4MHz signal possible. Insertion of about 270kΩ resistor between the circuit and GND ensures compatibility with 3.58MHz of VTR chroma.</p> <p>TWN CH selector pin Insert a 270k resistor in a circuit to VCC.</p>
8	CH	1.7		<p>CH selector pin</p> <p>JP1: 1.2V to 2.3V</p> <p>0.8 or less</p> <p>4.2 or more</p> <p>US4: 2.7V to 3.8V</p> <p>*TWN CH</p> <p>OPEN: REF OSC 4MHz</p> <p>GND: REF OSC 3.58MHz</p>
9	OSC1 OSC2	3.7		RF oscillator pin
10	VCC2	5.0		RF VCO typ VCC
11	RF LPF	2.6		Control pin of output RF oscillator for the PLL phase detector charge pump.
12	VCC 1	5.0		

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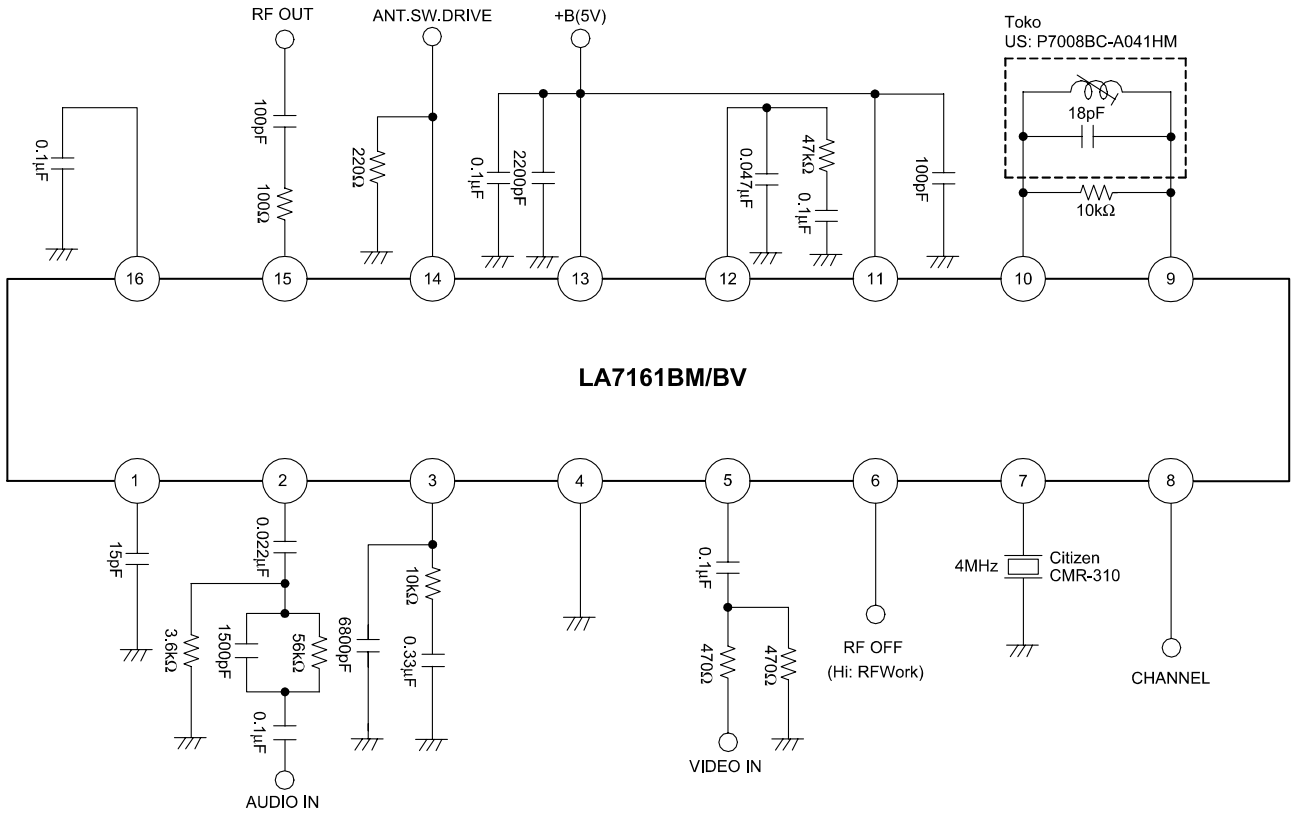
# LA7161BM/BV

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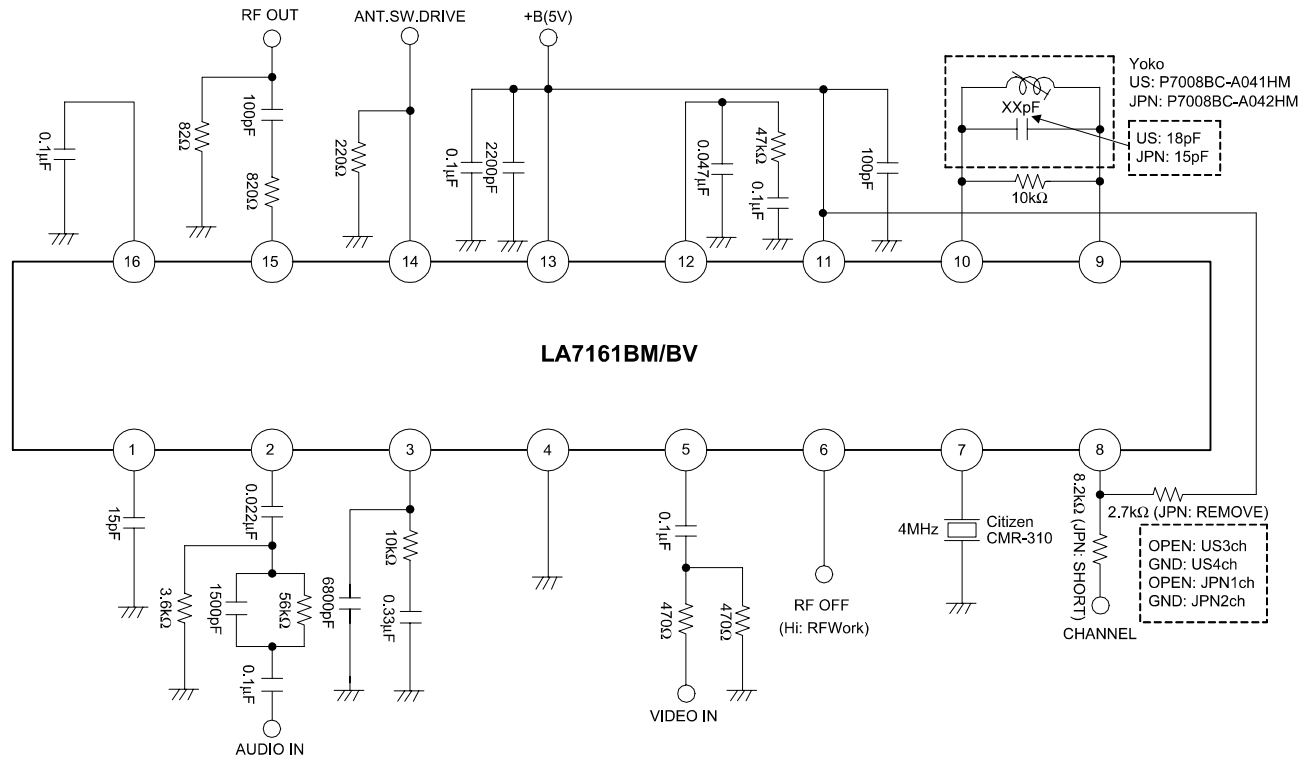
Pin No.	Symbol	Voltage	Equivalent circuit	Remarks
13	ANT DRV	3.5		Antena driver pin 15mA drive
14	RF OUT	3.0		RF mixed signal output
15	REG	3.9		Regulator output

# LA7161BM/BV

## Test Circuit (USch)

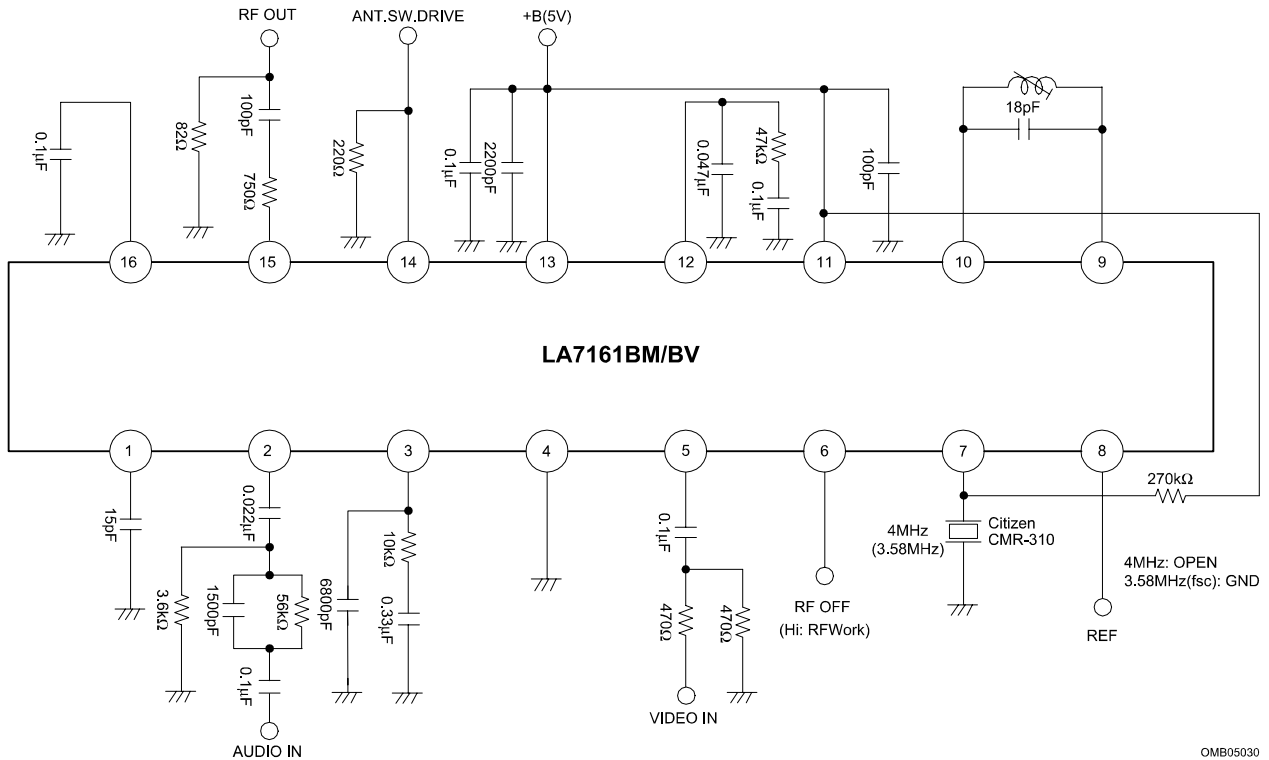


## Sample Application Circuit 1 (US, JPN ch)



# LA7161BM/BV

## Sample Application Circuit 2 (TWN ch)



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