

**ASSP**

# RGB ENCODER

## MB3514

### ■ Description

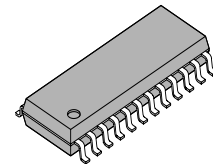
The MB3514 is an RGB encoder that receives analog RGB and composite synchronous signals and outputs NTSC and PAL composite video signals. Y (luminance) and C (chrominance) signals and analog RGB signals can also be output.

The MB3514 incorporates a matrix circuit, balanced modulator, and Y-C signal mixer for RGB signals. It generates various signals required for encoding, which makes it suitable for personal computers.

### ■ Features

- Compatible with NTSC and PAL
- Composite video, Y and C, and RGB signal outputs
- Internal 75  $\Omega$  driver (for output of composite video, Y and C, and RGB signals)
- Half-H killer
- Burst signal generator
- +5 V single power supply
- Low power consumption: 275 mW (Typical)
- 24-pin plastic SOP

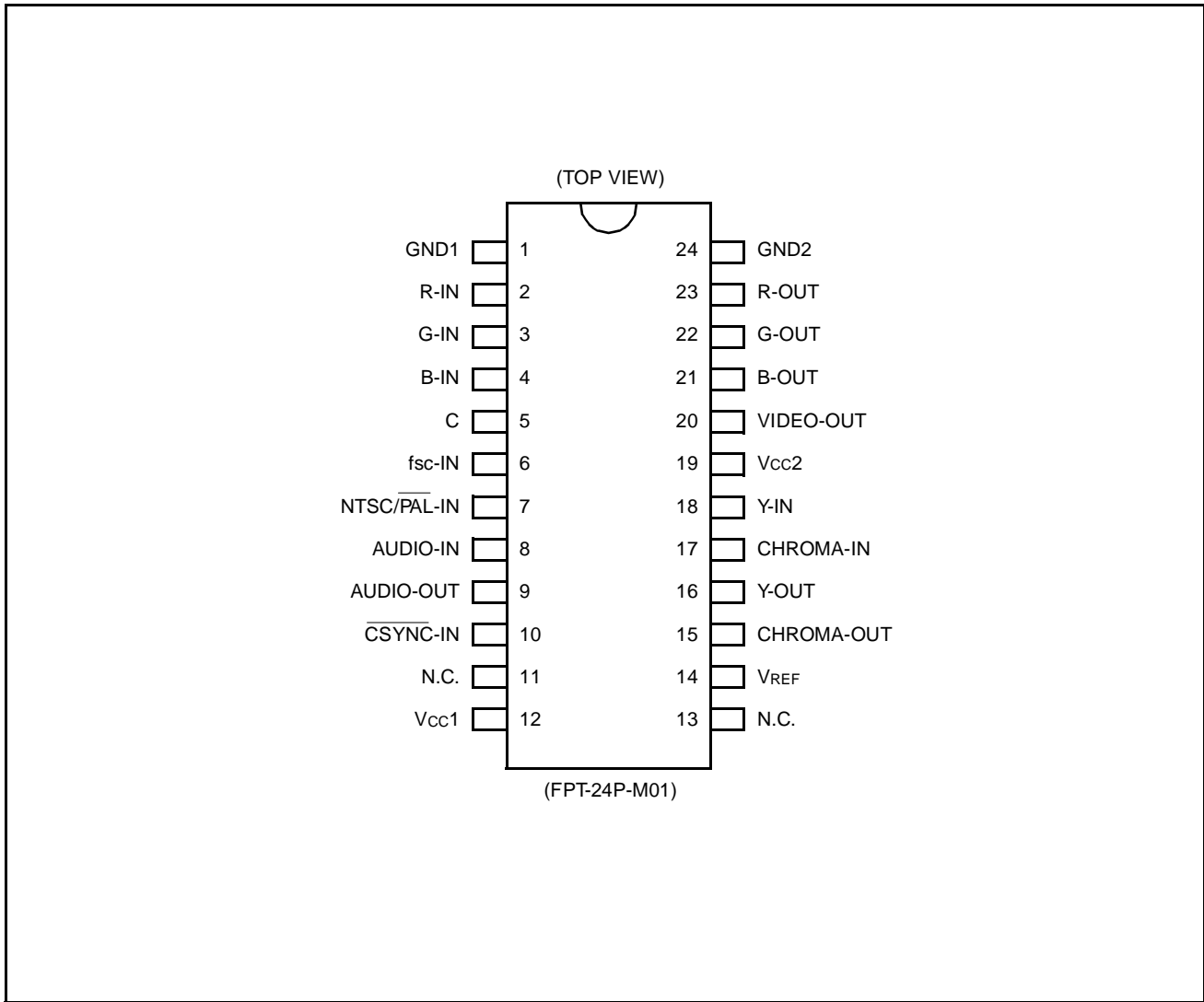
**24-pin plastic SOP  
(FPT-24P-M01)**



This device contains circuitry to protect the inputs against damage due to high static voltages or electric fields. However, it is advised that normal precautions be taken to avoid application of any voltage higher than maximum rated voltages to this high impedance circuit.

# MB3514

## ■ PIN ASSIGNMENT

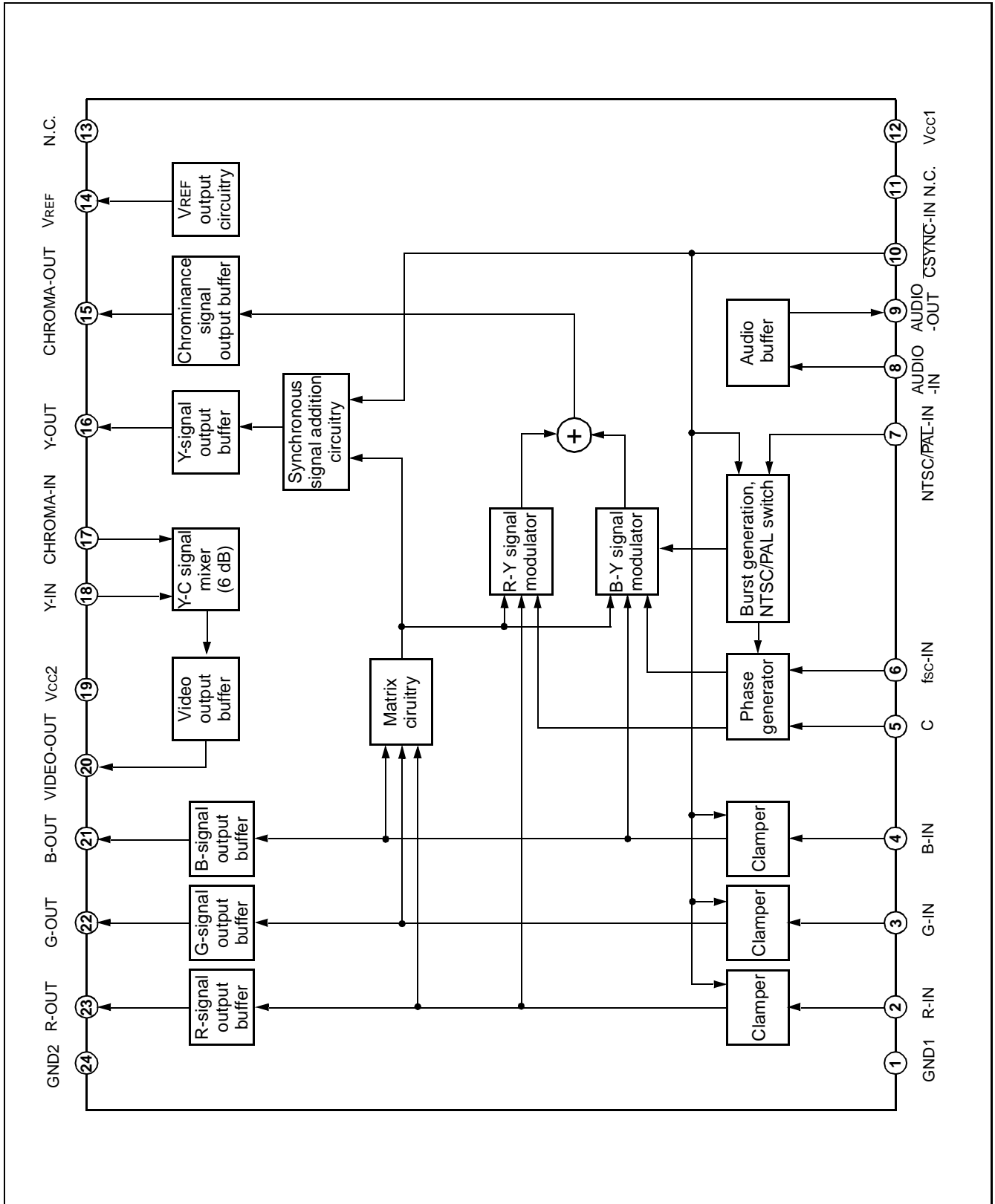


## ■ PIN DESCRIPTION

Pin No.	Symbol	I/O	Pin Name	Description
1	GND1	-	GND1 pin	Ground except for 75 $\Omega$ output driver.
2 3 4	R-IN G-IN B-IN	I	Analog RGB input pin	$\overline{\text{CSYNC}}\text{-IN}$ = Low level: R-IN, G-IN, and B-IN pins are clamped. In this case, the pedestal level is input via these pins (100% = 1 Vp-p).
5	C	-	Phase generating capacitor connection pin	Ground via 100 pF capacitor.
6	fsc-IN	I	Subcarrier input pin	Input subcarrier via coupling capacitor. Input level: 300 to 700 mVp-p
7	NTSC/PAL-IN	I	NTSC/PAL mode selection pin	High level: NTSC mode Low level: PAL mode
8	AUDIO-IN	I	Audio buffer input pin	The input impedance is about 25 k $\Omega$ .
99	AUDIO-OUT	O	Audio buffer output pin	-
10	$\overline{\text{CSYNC}}\text{-IN}$	I	Composite synchronous signal input pin	$\overline{\text{CSYNC}}\text{-IN}$ = Low level: R-IN, G-IN, and B-IN pins are clamped while outputting the SYNC signal.
11	N.C.	-	(Open pin)	-
12	Vcc1	-	Power supply pin	Ground except for 75 $\Omega$ output driver.
13	N.C.	-	(Open pin)	-
14	VREF	-	Reference voltage pin	Ground via about 10 $\mu\text{F}$ capacitor.
15	CHROMA-OUT	O	Chrominance signal output pin	Can be directly driven at 75 $\Omega$
16	Y-OUT	O	Y-signal output pin	Can be directly driven at 75 $\Omega$
17	CHROMA-IN	I	Chrominance signal input pin	-
18	Y-IN	I	Y-signal input pin	-
19	Vcc2	-	Power supply pin	Power supply for 75 $\Omega$ output driver
20	VIDEO-OUT	O	Composite video signal output pin	Can be directly driven at 75 $\Omega$
21 22 23	B-OUT G-OUT R-OUT	O	Analog RGB signal output pin	Can be directly driven at 75 $\Omega$
24	GND2	-	GND2 pin	Ground for 75 $\Omega$ output driver

# MB3514

## ■ BLOCK DIAGRAM



## ■ ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Values	Unit
Supply voltage	VCC	7	V
Digital signal input voltage	VID	0 to VCC	V
Storage temperature	Tstg	-55 to +125	°C

Note: Permanent device damage may occur if the above ABSOLUTE MAXIMUM RATINGS are exceeded. Functional operation should be restricted to the conditions as detailed in the operational sections of this data sheet. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

## ■ RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Values			Unit
		Min.	Typical	Max.	
Supply voltage	VCC	4.75	5.00	5.25	V
Subcarrier input voltage	Vfsc	0.3	0.5	0.7	Vp-p
RGB input voltage	VR, G, B	0	-	1.0	Vp-p
Digital low-level input voltage	VIL	-	-	0.8	V
Digital high-level input voltage	VIH	2.0	-	-	V
Operating temperature	Top	0	-	70	°C

## MB3514

## ■ ELECTRICAL CHARACTERISTICS

(Recommended operating conditions unless otherwise noted.)

(VCC1, 2 = +5.0 V, TA = +25°C)

Parameter	Symbol	Condition	Values			Unit
			Min.	Typical	Max.	
RGB output voltage	VO-R	R-IN=1VP-P	1.28	1.43	1.58	VP-P
	VO-G	G-IN=1VP-P				
	VO-B	B-IN=1VP-P				
Synchronization level	VOY (CS)	Y-OUT	0.48	0.57	0.66	VP-P
Y level at 100% red	VOY (R)		0.365	0.42	0.475	V
Y level at 100% green	VOY (G)		0.718	0.83	0.934	V
Y level at 100% blue	VOY (B)		0.133	0.15	0.174	V
Y level at 100% white	VOY (W)		1.23	1.40	1.57	V
Synchronization level	VOV-Y (CS)	VIDEO-OUT	0.48	0.57	0.66	VP-P
Y level at 100% red	VOV-Y (R)		0.374	0.43	0.486	V
Y level at 100% green	VOV-Y (G)		0.730	0.84	0.949	V
Y level at 100% blue	VOV-Y (B)		0.136	0.16	0.181	V
Y level at 100% white	VOV-Y (W)		1.24	1.43	1.62	V
Burst level	VOC (BT)	CHROME-OUT	0.44	0.52	0.60	VP-P
	VOV-C (BT)	VIDEO-OUT	0.48	0.57	0.66	VP-P
Red chrominance ratio	R/BT	CHROME-OUT, VIDEO-OUT	2.84	3.16	3.48	-
Red phase	$\theta_R$		94	104	114	deg
Green chrominance ratio	G/BT		2.65	2.95	3.25	-
Green phase	$\theta_G$		231	241	251	deg
Blue chrominance ratio	B/BT		2.02	2.24	2.46	-
Blue phase	$\theta_B$		337	347	357	deg
PAL burst level ratio	RBT		0.9	1.0	1.1	-
PAL burst phase	$\theta_{PAL}$		125	135	145	deg
	$\theta/PAL$		215	225	235	
Number of bursts	NBT		CHROME-OUT, VIDEO-OUT	8	10	12
Position of bursts	td-BT	Time from rise of CSYNC-IN pulse to gen- eration of VIEO-OUT burst signal	0.4	0.5	0.7	$\mu$ s
Carrier leak	VL	CHROMA-OUT, VIDEO-OUT	0	-	40	mVP-P
Mixer amplifier voltage gain	Y	GY	-	6	-	dB
	C	Gc				

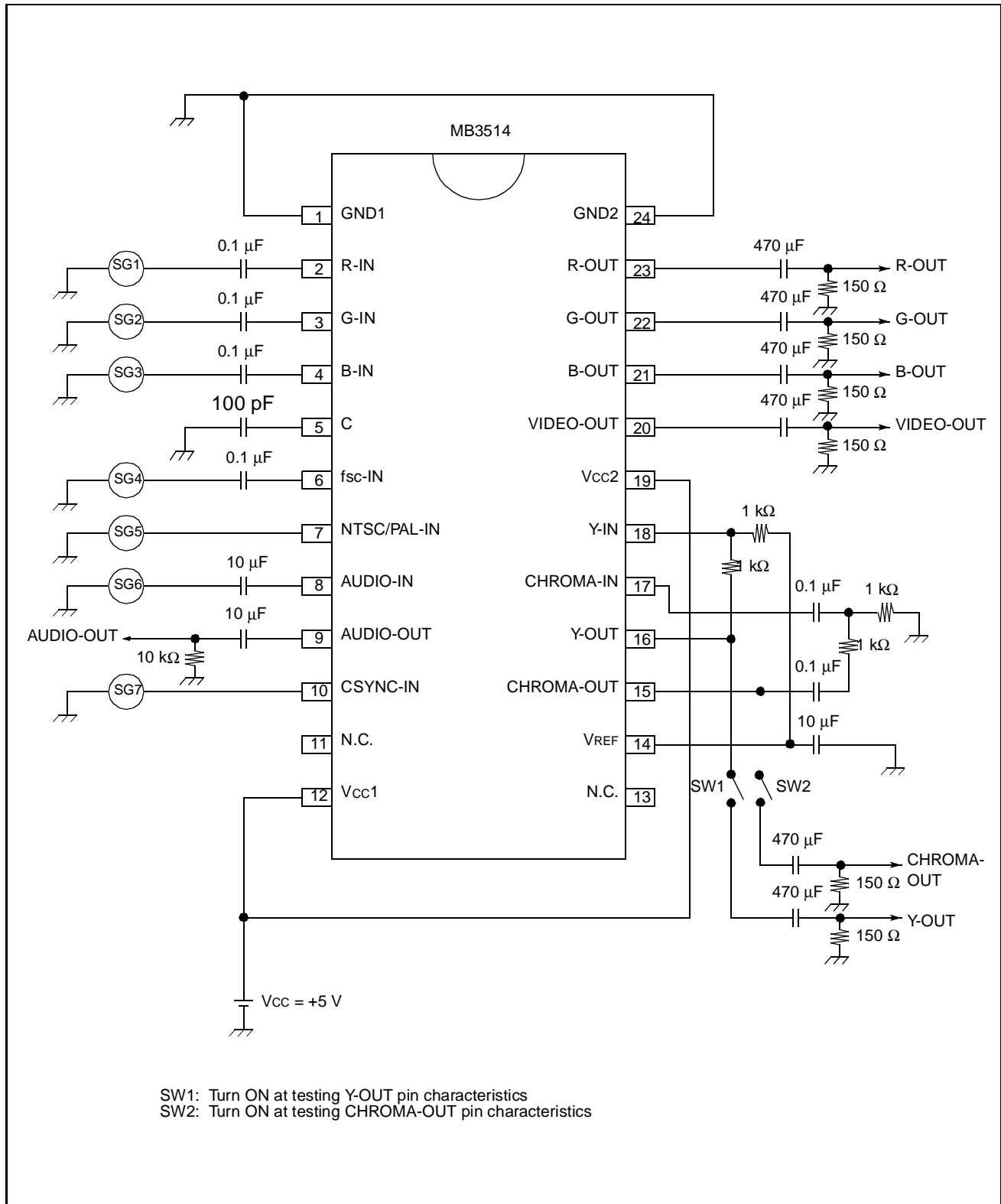
(continued)

(VCC1, 2 = +5.0 V, TA = +25°C)

Parameter		Symbol	Condition	Values			Unit
				Min.	Typical	Max.	
Audio buffer amplifier	Voltage gain	GA	VIN=1VP-P, f=1 kHz	-1.0	0	1.0	dB
	Frequency characteristics	fA	If the output is 0 dB at f = 1 kHz, the output is decreased by 3 dB at this frequency.	30	-	-	kHz
	Distortion ratio	THD	VIN=1VP-P, f=1 kHz	0	-	1.0	%
Reference pin voltage		VREF	-	1.8	2.0	2.2	V
Consumption current 1		ICC1	-	30	39	56	mA
Consumption current 2		ICC2	-	12	16	23	mA

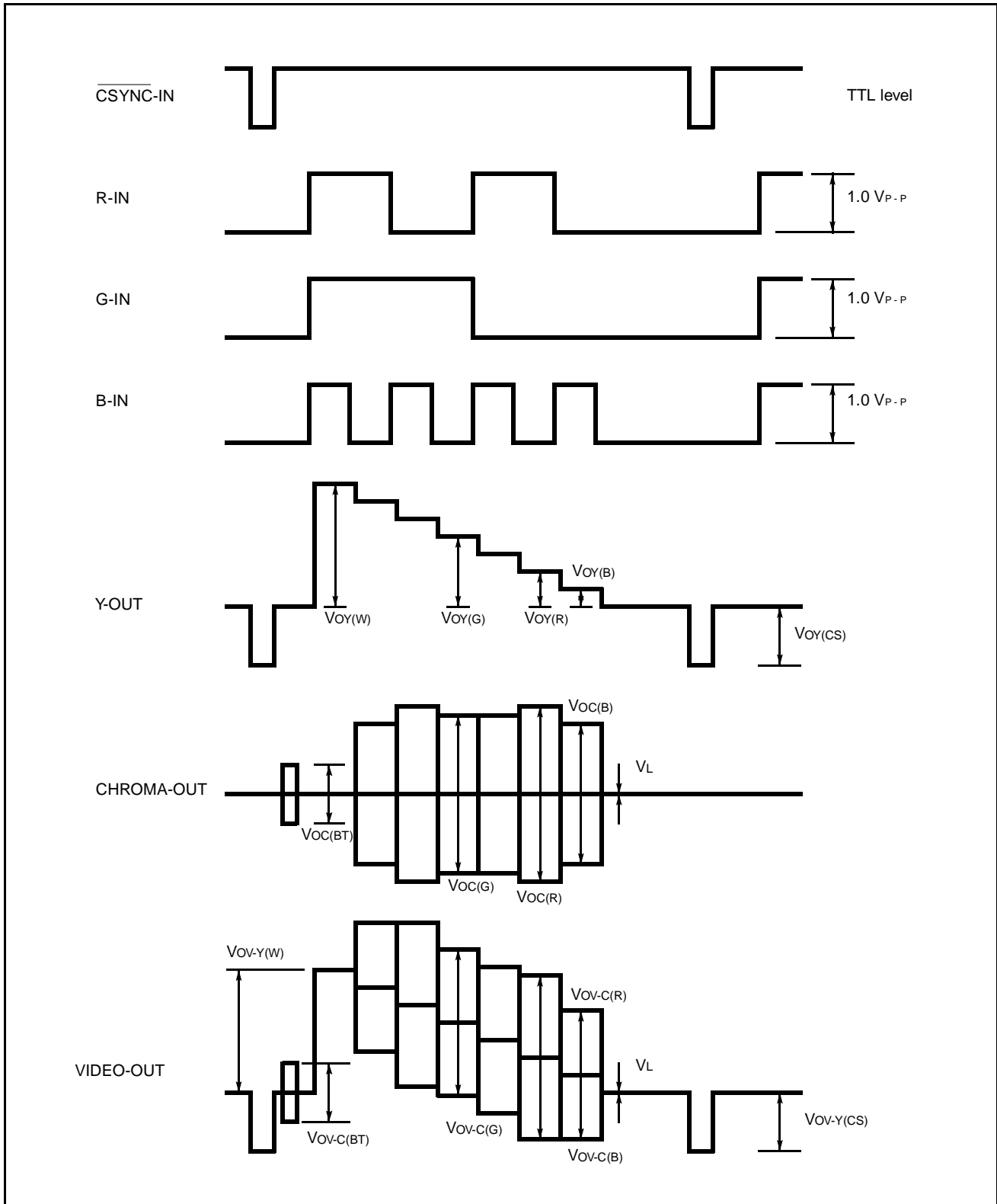
## MB3514

## ■ TEST CIRCUIT DIAGRAM





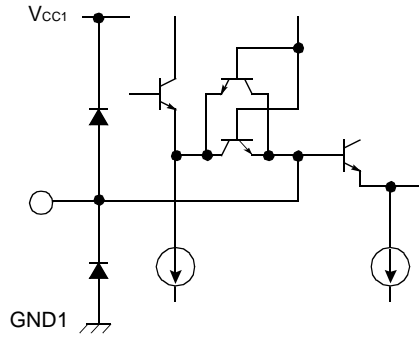
■ VIDEO SIGNAL WAVEFORM AND TEST ITEMS



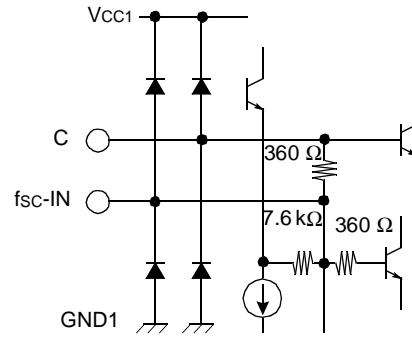
# MB3514

## ■ EQUIVALENT CIRCUIT DIAGRAMS

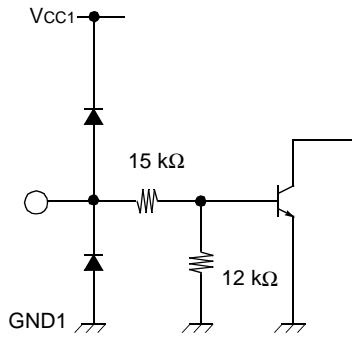
1. R-IN, G-IN, B-IN



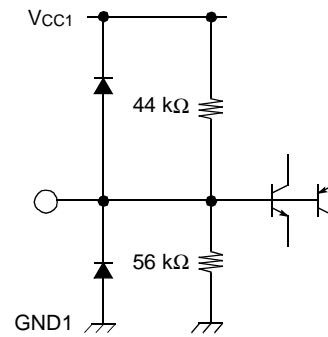
2. C, fsc-IN



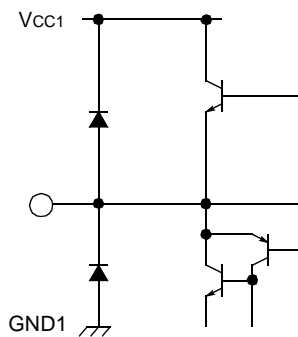
3. NTSC/PAL-IN, CSYNC-IN



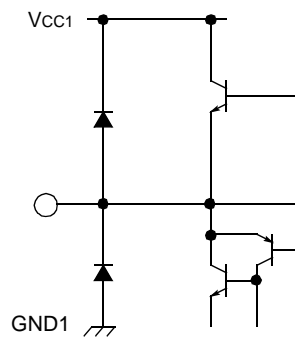
4. AUDIO-IN



5. AUDIO-OUT

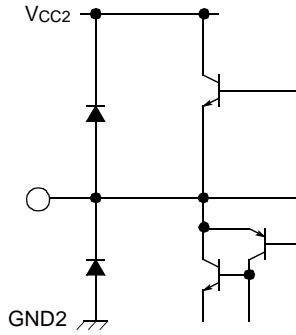


6. VREF

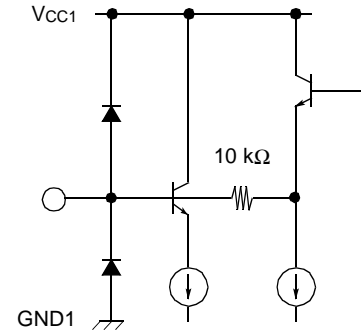


(Continued)

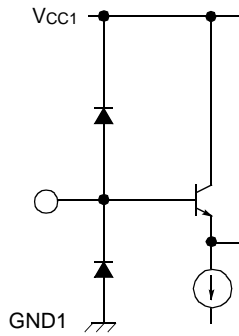
7. CHROMA-OUT, VIDEO-OUT, Y-OUT, B-OUT, G-OUT, R-OUT



8. CHROMA-IN

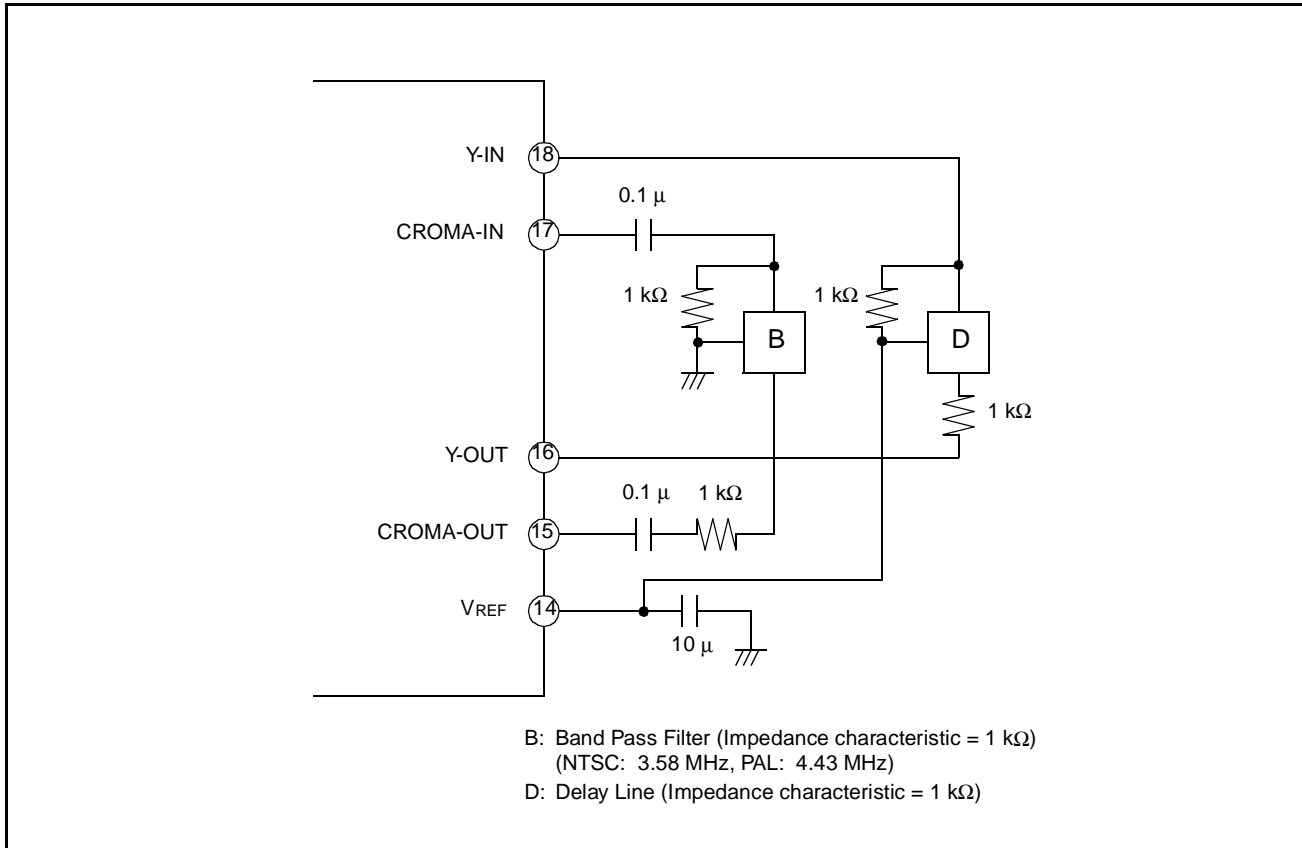


9. Y-IN



# MB3514

## ■ EXAMPLE OF RECOMMENDED CIRCUIT

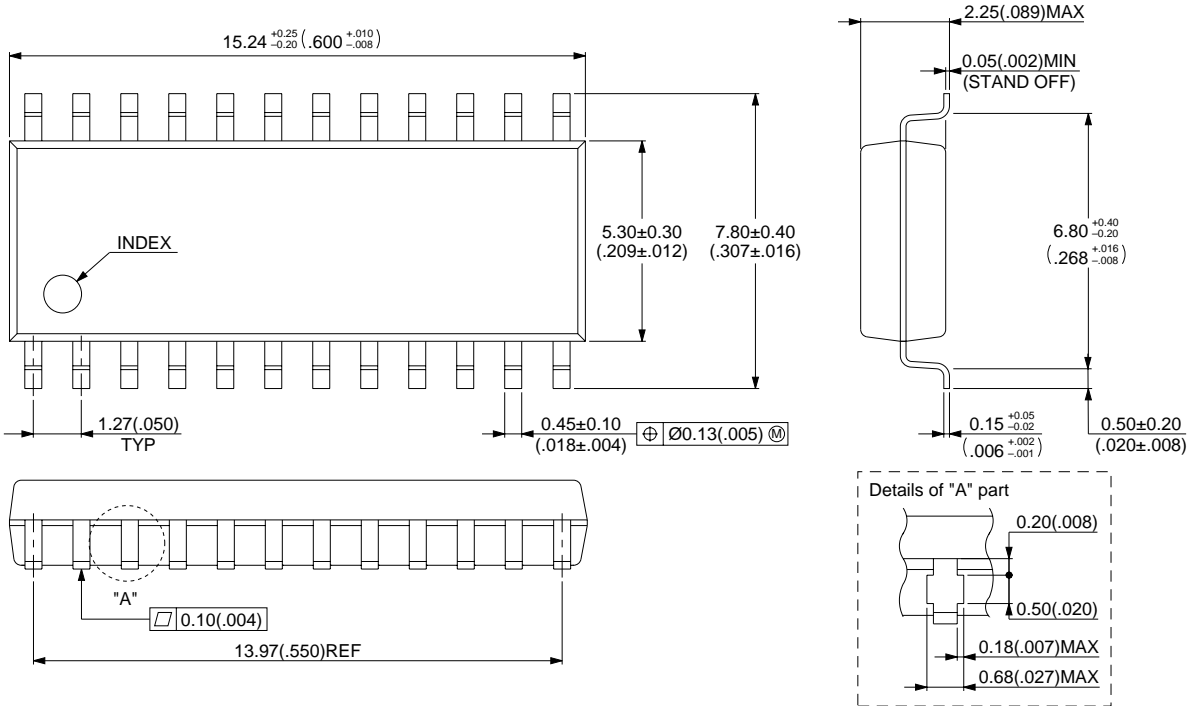


Note: Although there is no filter between Y-out and C-out, and between Y-in and C-in, in the test circuit, in actual use, the band pass filter (B) and delay line (D) must be provided as shown in the above figure.

# MB3514

## ■ PACKAGE DIMENSIONS

24 pins, Plastic SOP  
(FPT-24P-M01)



© 1994 FUJITSU LIMITED F24007S-3C-4

Dimensions in mm (inches).

# MB3514

## FUJITSU LIMITED

*For further information please contact:*

### **Japan**

FUJITSU LIMITED  
Corporate Global Business Support Division  
Electronic Devices  
KAWASAKI PLANT, 4-1-1, Kamikodanaka  
Nakahara-ku, Kawasaki-shi  
Kanagawa 211-8588, Japan  
Tel: (044) 754-3763  
Fax: (044) 754-3329

<http://www.fujitsu.co.jp/>

### **North and South America**

FUJITSU MICROELECTRONICS, INC.  
Semiconductor Division  
3545 North First Street  
San Jose, CA 95134-1804, USA  
Tel: (408) 922-9000  
Fax: (408) 922-9179

Customer Response Center  
*Mon. - Fri.: 7 am - 5 pm (PST)*  
Tel: (800) 866-8608  
Fax: (408) 922-9179

<http://www.fujitsumicro.com/>

### **Europe**

FUJITSU MIKROELEKTRONIK GmbH  
Am Siebenstein 6-10  
D-63303 Dreieich-Buchsschlag  
Germany  
Tel: (06103) 690-0  
Fax: (06103) 690-122

<http://www.fujitsu-edc.com/>

### **Asia Pacific**

FUJITSU MICROELECTRONICS ASIA PTE LTD  
#05-08, 151 Lorong Chuan  
New Tech Park  
Singapore 556741  
Tel: (65) 281-0770  
Fax: (65) 281-0220

<http://www.fmap.com.sg/>

F9803

© FUJITSU LIMITED Printed in Japan

All Rights Reserved.

The contents of this document are subject to change without notice. Customers are advised to consult with FUJITSU sales representatives before ordering.

The information and circuit diagrams in this document presented as examples of semiconductor device applications, and are not intended to be incorporated in devices for actual use. Also, FUJITSU is unable to assume responsibility for infringement of any patent rights or other rights of third parties arising from the use of this information or circuit diagrams.

FUJITSU semiconductor devices are intended for use in standard applications (computers, office automation and other office equipment, industrial, communications, and measurement equipment, personal or household devices, etc.).

#### **CAUTION:**

Customers considering the use of our products in special applications where failure or abnormal operation may directly affect human lives or cause physical injury or property damage, or where extremely high levels of reliability are demanded (such as aerospace systems, atomic energy controls, sea floor repeaters, vehicle operating controls, medical devices for life support, etc.) are requested to consult with FUJITSU sales representatives before such use. The company will not be responsible for damages arising from such use without prior approval.

Any semiconductor devices have inherently a certain rate of failure. You must protect against injury, damage or loss from such failures by incorporating safety design measures into your facility and equipment such as redundancy, fire protection, and prevention of over-current levels and other abnormal operating conditions.

If any products described in this document represent goods or technologies subject to certain restrictions on export under the Foreign Exchange and Foreign Trade Control Law of Japan, the prior authorization by Japanese government should be required for export of those products from Japan.