

Consumer Electronic Circuits

In Brief . . .

These integrated circuits reflect Motorola's continuing commitment to semiconductor products necessary for consumer system designs. This tabulation is arranged to simplify selection of consumer integrated circuit devices that satisfy the primary functions for home entertainment products, including television, hi-fi audio and AM/FM radio.

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Entertainment Radio Receiver Circuits

Table 1. Entertainment Receiver RF/IF

Function	Features	Suffix/ Package	Device
E.T.R.® Front End	Mixer/VCO/Wideband AGC/IF Amp for Electronically Tuned AM Stereo Receivers	P/648, D/751B	MC13025
AMax® Front End	Mixer/VCO/Wideband AGC/IF Amp plus Audio Noise Blanking	DW/751D, P/738	MC13027
Dual Conversion AM Tuner	1st Mixer/OSC, 2nd Mixer/OSC, High Gain IF, AGC, Wideband AGC, Detector	DW/751F	MC13030

Table 2. C–Quam® AM Stereo Decoders

Function	Features	Suffix/ Package	Device
AM Stereo Decoder	Medium Voltage 6 to 10 V, Basic Decoder	P/738	MC13020
Advanced AM Stereo Decoder	Medium Voltage 4 to 10 V, Decoder, IF Amp, Signal Quality Detector and Audio Blend	P/710, DW/751F	MC13022
Advanced AM Stereo Decoder	Medium Voltage 4 to 10 V, Decoder, IF Amp, Signal Quality Detector and Audio Blend. (MC13022A has 10 dB more audio output than MC13022.)	P/710, DW/751F	MC13022A
AM Stereo Tuner	Low Voltage 1.8 to 8 V for Manually Tuned Radio Mass Market	P/724, DW/751E	MC13024
Low Voltage AM Stereo Decoder	IF Amp/Decoder for Advanced C–Quam Receivers. 2.2 to 12 V Operation, Audio Blend, Adjustable Audio Output Levels	P/648, D/751B	MC13028A
Medium Voltage AM Stereo Decoder	IF Amp/Decoder for Advanced C–Quam Receivers. AM/FM Switch and Audio Mute Included, 4 to 10 V Operation.	DW/751D, H/738	MC13029A
Advanced AM Stereo Tuner with FM Stereo Decoder	Medium Voltage 4 to 10 V, RF Mixer, L. O., IF, AM/FM Switching, Signal Quality, Muting, and Audio Blend Functions, FM Stereo Decoder. For E.T.R. Products.	P/738, DW/751D	MC13035
AM/FM Stereo Decoder	Medium Voltage 4 to 10 V, IF Amp, AM/FM Switching, Signal Quality, Muting, and Audio Blend Functions, FM Stereo Decoder. For E.T.R. Products.	P/648, DW/751B	MC13037
AMax Stereo Decoder	AM Stereo Decoder with the features of the MC13022A plus an Audio Noise Blanker. To be used with the MC13027 AMax Front End device.	DW/751F, P/710	MC13122

Table 3. Audio Amplifiers

Function	P _O (Watts)	V _{CC} Vdc Max	V _{in} @ Rated P _O mV Typ	I _D mA Typ	R _L (Ohms)	Suffix/ Package	Device
Mini Watt SOIC Audio Amp	1.0 W	35	80	11	16	D/751	MC13060
Low Power Audio Amp	500 mW	16	–	2.5 mA	8 – ∞	D/751, P/626, DTB/948J	MC34119

Video Circuits

Table 4. Video Circuits

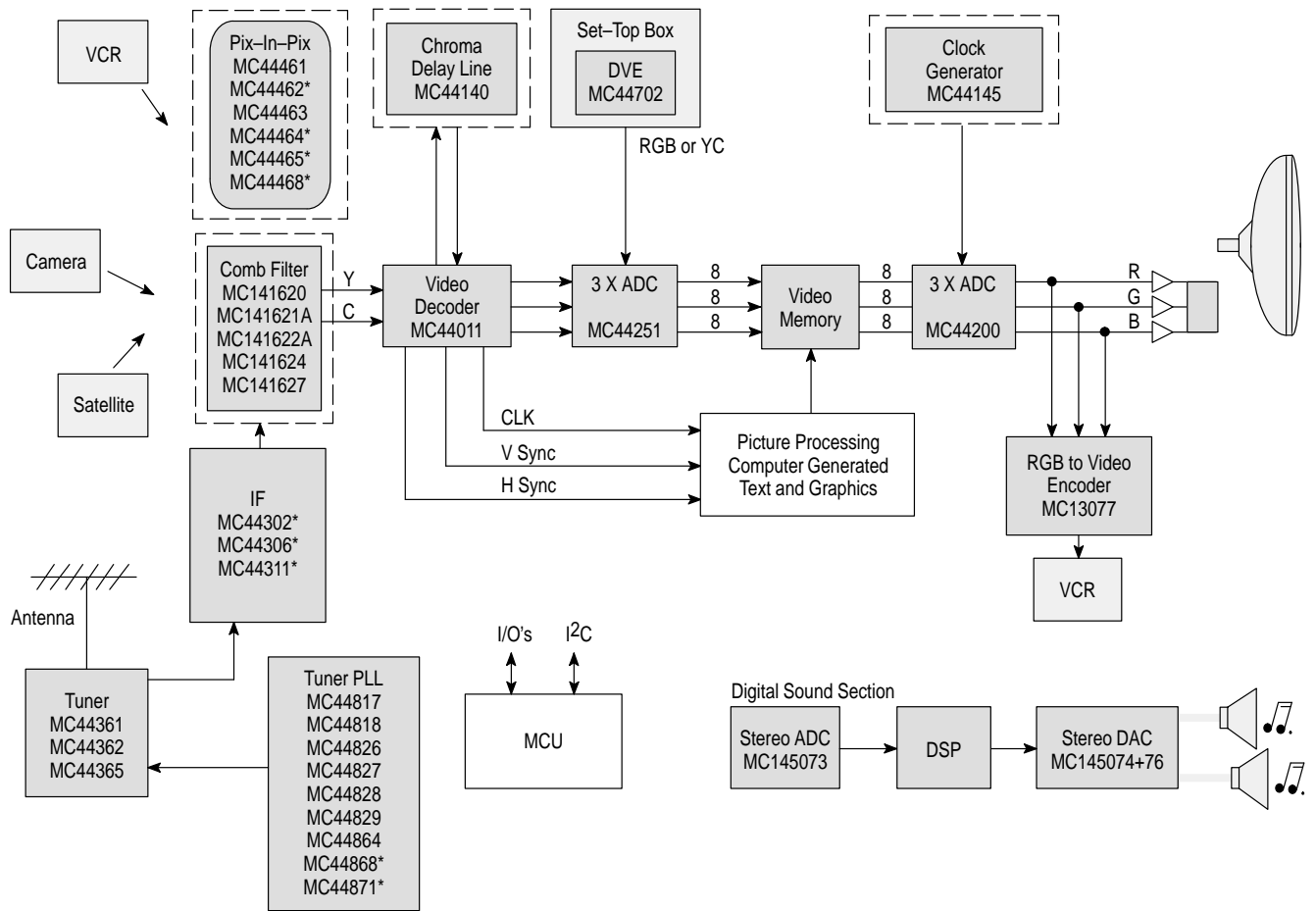
Function	Features	Suffix/ Package	Device
Encoders			
Video Overlay Synchronizer	Complete Color TV Video Overlay Synchronizer, remote or local system control and RGB encoder.	P/711, FN/777	MC1378
Advanced RGB to PAL/NTSC Encoder	RGB and Sync inputs, Composite Video and S-VHS out; PAL/NTSC selectable; subcarrier from crystal or external source.	P/738, DW/751D	MC13077
TV Decoder			
Chroma 4 Multistandard Decoders (TV Set)	PAL/NTSC/SECAM decoding, Composite Video/S-VHS Inputs, RGB Outputs, horizontal and vertical drive outputs, geometry correction and beam current monitor, digital internal filters, no external tank, 16:9 capability, μ P and crystal controlled.	P/711	MC44002
	Same as MC44002, but without SECAM decoding.	P/711	MC44007
Video Capture Chip Sets			
Chroma 4 Multistandard Video Processor (Multimedia)	PAL/NTSC/S-VHS input, RGB/YUV outputs; horizontal and vertical timing outputs; all digital internal filters, no external tanks; μ P and crystal controlled.	FN/777, FU/824E	MC44011
Chroma Digital Delay Line	For PAL and SECAM applications of the MC44011, MC44002, MC44007.	P/648, DW/751G	MC44140
Pixel Clock PLL/Sync Sep.	PAL/NTSC sync separator, 6.0–40 MHz pixel clock PLL.	D/751A	MC44145
Triple 8–Bit Video A/D	Video clamps for RGB/YUV, 18 MHz, High Z TTL outputs.	FN/777, FU/824A	MC44251
TV Picture-in-Picture			
Picture-in-Picture (PIP) Controller	Completely self-contained NTSC picture-in-picture function.	B/859	MC44461
Y–C Picture-in-Picture (PIP) Controller	Completely self-contained NTSC picture-in-picture function, with Y–C input and output capability, for use in high performance S–Video systems.	B/859	MC44462
Replay and Multiple Picture-in-Picture (PIP) Controller	Offers either multiple PIP windows or several seconds of replay. Used with external DRAM.	B/859	MC44463
Audio–Video Replay and Multiple PIP Controller	Up to 8 seconds Audio replay on Video replay as well as multiple PIP windows used with external DRAM.	B/859	MC44464
Multi–Standard PIP Controller	PAL/NTSC and SECAM operation, 50/60 Hz; 4:3 or 16:9; RGB/YUV I/O; external DRAM.	B/859	MC44465
YUV/RGB PIP Controller	Complete self-contained NTSC PIP function with YUV or RGB I/O compatibility. "V" chip parental control.	B/859	MC44468
Comb Filters			
Enhanced Comb Filter	Fast 8–Bit A/D Converter, Two 8–Bit D/A Converters, Two Line–Delay Memories, utilizes NTSC Subcarrier Frequency clock, CMOS Technology.	FU/898	MC141620
Advanced Comb Filter (ACF)	Composite Video input; YC outputs in digital and analog form; all digital internal filters.	FU/898	MC141621A
Advanced Comb Filter – II (ACF–II)	Composite Video input; YC outputs in digital and analog form; all digital internal filters; vertical enhancer circuit.	P/898	MC141622A
Advanced Comb Filter – I (ACF–I)	Low cost 1h filter.	FU/873 SP/TBD	MC141624
Advanced PAL/NTSC Comb Filter	Composite Video input; YC outputs in digital and analog form; all digital internal filters.	FB/898	MC141627
Deflection			
Horizontal Processor	Linear balanced phase detector, oscillator and predriver, adjustable DC loop gain and duty cycle.	P/626	MC1391
TV IF Circuits			
IF Amplifier	1st and 2nd video IF amplifiers, 50 dB gain at 45 MHz, 60 dB AGC range.	D/751, P/626	MC1350

Table 4. Video Circuits (continued)

Function	Features	Suffix/ Package	Device
Tuner PLL Circuits			
PLL Tuning Circuits	1.3 GHz, 10 mV sensitivity selectable prescaler (MC44817), op amp, 4 band buffers, 3-wire bus interface, lock detect.	D/751B	MC44817, B
	1.3 GHz, 10 mV sensitivity prescaler, op amp, 4 band buffers, I ² C interface, lock detect.	D/751B	MC44818
	Similar to MC44817, with lower power consumption, push-pull lock detector output, no divide-by-8 bypass, in a TSSOP package.	DTB/948F	MC44827
	Similar to MC44818, with lower power consumption, push-pull lock detector output, in a TSSOP package.	DTB/948F	MC44828
	1.3 GHz prescaler, 10 mV sensitivity 50 to 950 MHz, op amp, 3 band buffers, Mixer/Osc Decoder and I ² C Bus.	D/751A	MC44829
	1.3 GHz, 10 mV sensitivity selectable prescaler, op amp, 4 band buffers, I ² C interface, 3 DACs for automatic tuner alignment.	M/967	MC44864, MC44868
	Similar to the MC44828, with high speed I ² C interface, on-chip dc/dc converter.	DTB/948F	MC44871
Modulator			
Color TV Modulator with Sound	RF oscillator/modulator, and FM sound oscillator/modulator.	P/646	MC1374
UHF TV Modulator	Multi-standard PLL tuned UHF TV modulator with AM or FM sound.	DTB/948E, DW/751D	MC44353, MC44354, MC44355
Video Data Converters			
Triple 8-Bit Video A/D	Video clamps for RGB/YUV, 18 MHz conversion, high Z outputs.	FN/777, FU/824A	MC44251
Triple 8-Bit Video DAC	TTL inputs, 75 Ω drive outputs.	FB/824	MC44200
Monitor Subsystem			
Multimode Color Monitor Processor	Adaptable to 30 kHz to 64 kHz horizontal, 45 to 100 Hz vertical frequency, multiple sync including sync-on-green, horizontal and vertical drive outputs, double PLL, 70 MHz RGB pre-amps, contrast and brightness controls.	B/859	MC13081X
RGB Video Processor	80 MHz bandwidth, blank and clamp inputs, main contrast and subcontrast controls.	P/738	MC13280AY
	Same as above, except 100 MHz bandwidth.	P/738	MC13281B
	Same as above, except 100 MHz bandwidth and pin compatible with MC13282A.	P/724	MC13281A
RGB Video Processor with OSD Inputs	100 MHz bandwidth, blank and clamp inputs, main contrast and subcontrast controls, OSD inputs, OSD contrast control, pin compatible with MC13281A.	P/724	MC13282A
	Same as above, except 130 MHz bandwidth.	P/724	MC13283
Miscellaneous			
Subcarrier Reference Generator	Provides continuous subcarrier sine wave and 4x subcarrier, locked to incoming burst.	P/626, D/751	MC44144
Sync Separator/Pixel Clock PLL	PAL/NTSC sync separator with vertical and composite sync output, 6 to 40 MHz pixel clock PLL.	D/751A	MC44145
Dual Video Amplifiers	Gain @ 4.43 MHz = 6.0 dB ±1.0 dB, fixed gain, internally compensated, CMOS Technology.	P/626, F/904	MC14576C
	Gain @ 5.0 MHz = 10 dB max, 10 MHz = 6.0 dB max, adjustable gain, internally compensated, CMOS Technology.	P/626, F/904	MC14577C
Transistor Array	One differential pair and 3 isolated transistors, 15 V, 50 mA.	P/646, D/751A	MC3346

Video Circuits (continued)

Video Capture Block Diagram



* In Development

Digitally Controlled Video Processor for Multimedia Applications

MC44011FN, FB

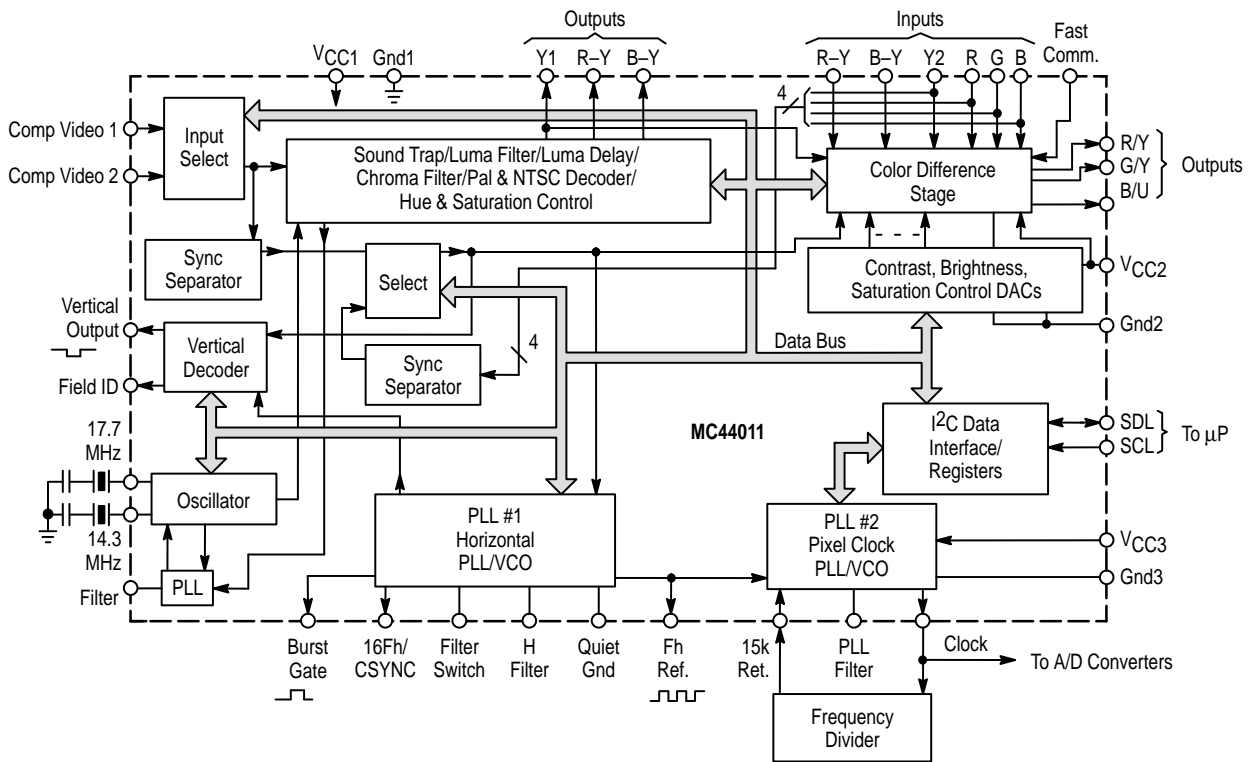
Case 777, 824E

The MC44011, a member of the MC44xxx Chroma 4 family, is designed to provide RGB or YUV outputs from a variety of inputs. The inputs may be either PAL or NTSC composite video (two inputs), S-VHS, RGB, and color difference (R-Y, B-Y).

The MC44011 provides a sampling clock output for use by a subsequent analog to digital converter. The sampling clock (6.0 to 40 MHz) is phase-locked to the horizontal frequency. Additional outputs include composite sync, vertical sync, field identification, luminance, burst gate, and horizontal frequency.

Control of the MC44011, and reading of status flags is accomplished via an I²C bus.

- Multistandard Decoder, Accepts NTSC and PAL Composite Video
- Dual Composite Video or S-VHS Inputs
- All Chroma and Luma Channel Filtering, and Luma Delay Line are Integrated Using Sampled Data Filters Requiring no External components
- Digitally Controlled via I²C Bus
- Auxiliary Y, R-Y, B-Y Inputs
- Switched RGB Inputs with Separate Saturation Control
- Line-Locked Sampling Clock for Digitizing Video Signals
- Burst Gate Pulse Output for External Clamping
- Vertical Sync and Field Ident Outputs
- Software Selectable YUV or RGB Outputs Able to Drive A/D Converters



Triple 8-Bit A/D Converter

MC44251FN, FU

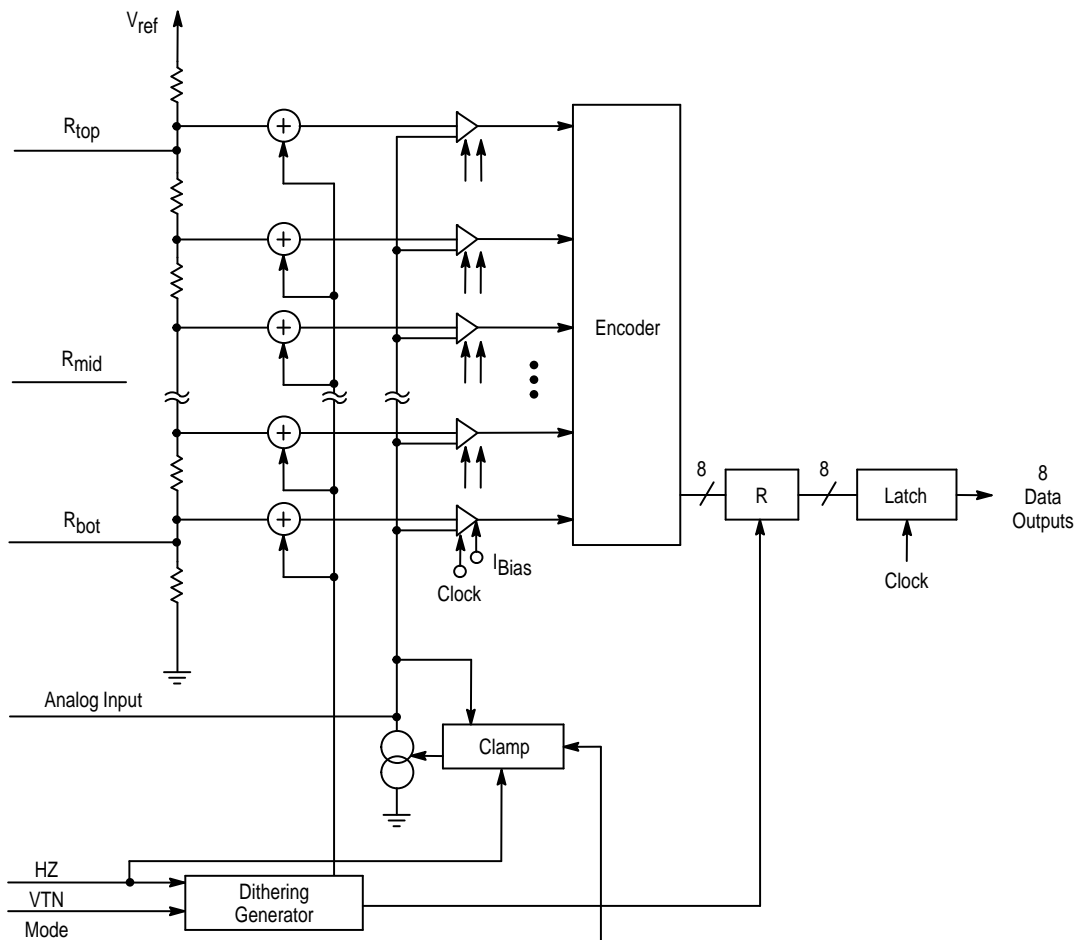
Case 777, 824A

The MC44251 contains three independent parallel analog to digital converters. Each ADC consists of 256 latching comparators and an encoder. Input clamps allow for AC coupling of the input signals, and dc coupling is also allowed. For video processing performance enhancements, a dither generator with subsequent digital correction is provided to each ADC. The outputs of the MC44251 can be set to a high impedance state.

These A/Ds are especially suitable as front end converters in TV picture processing.

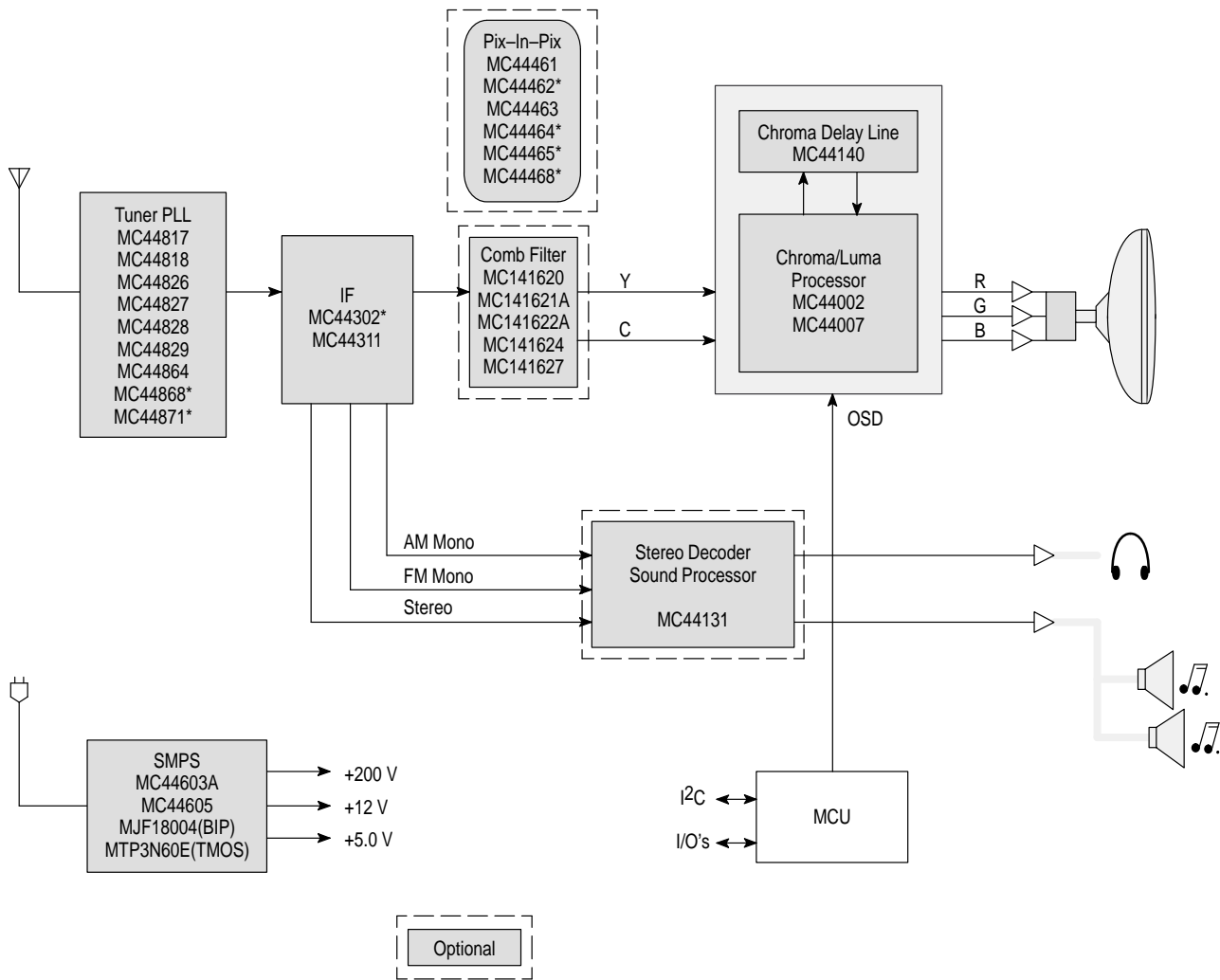
- 18 MHz Maximum Conversion Speed (MC44251)
- Input Clamps Suitable for RGB and YUV Applications
- Built-in Dither Generator with Subsequent Digital Correction
- Single 5.0 V Power Supply

Simplified Diagram of One of the ADCs



Video Circuits (continued)

Color TV Block Diagram



* In Development

Multistandard Video/Timebase Processor

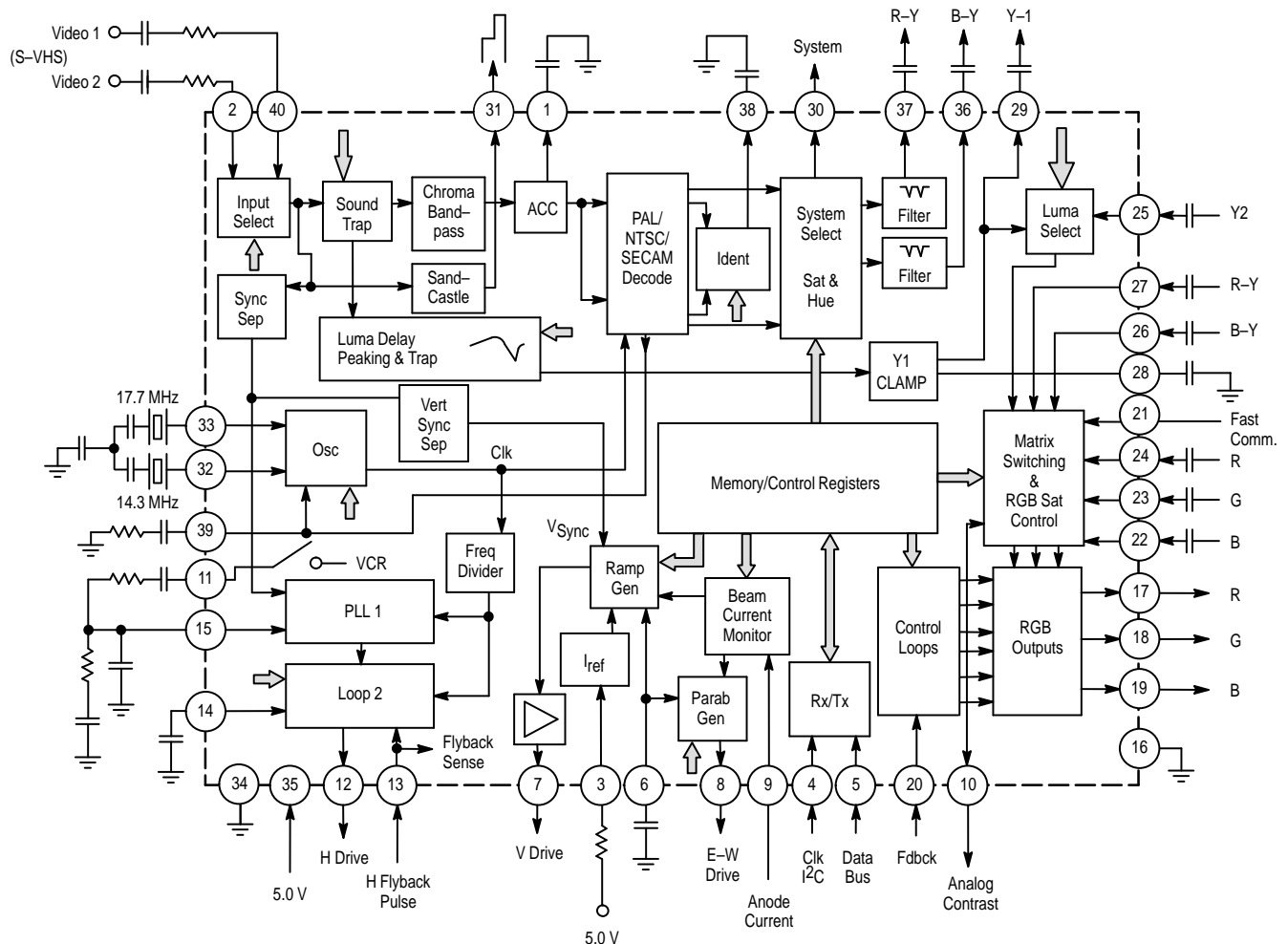
MC44002P, MC44007P

Case 711

The MC44002/7 is a highly advanced circuit which performs most of the basic functions required for a color TV. All of its advanced features are under processor control via an I²C bus, enabling potentiometer controls to be removed completely. In this way the component count may be reduced dramatically to allow significant cost savings and the possibility of implementing sophisticated automatic test routines. Using the MC44002/7, TV manufacturers will be able to build a standard chassis for anywhere in the world.

- Operation from a Single 5.0 V Supply; Typical Current Consumption Only 120 mA
- Full PAL/SECAM/NTSC Capability (MC44002 Only)
- MC44007 Decodes PAL/NTSC Only
- Dual Composite Video or S-VHS Inputs
- All Chroma/Luma Channel Filtering, and Luma Delay Line are Integrated Using Sampled Data Filters Requiring No External Components

- Filters Automatically Commutate with Change of Standard
- Chroma Delay Line is Realized with Companion Device (MC44140)
- RGB Drives Incorporate Contrast and Brightness Controls and Auto Gray Scale
- Switched RGB Inputs with Saturation Control
- Auxiliary Y, R-Y, B-Y Inputs
- Line Timebase Featuring H-Phase Control and Switchable Phase Detector Gain and Time Constant
- Vertical Timebase Incorporating the Vertical Geometry Corrections
- E-W Parabola Drive Incorporating the Horizontal Geometry Corrections
- Beam Current Monitor with Breathing Compensation
- 16:9 Display Mode Capability



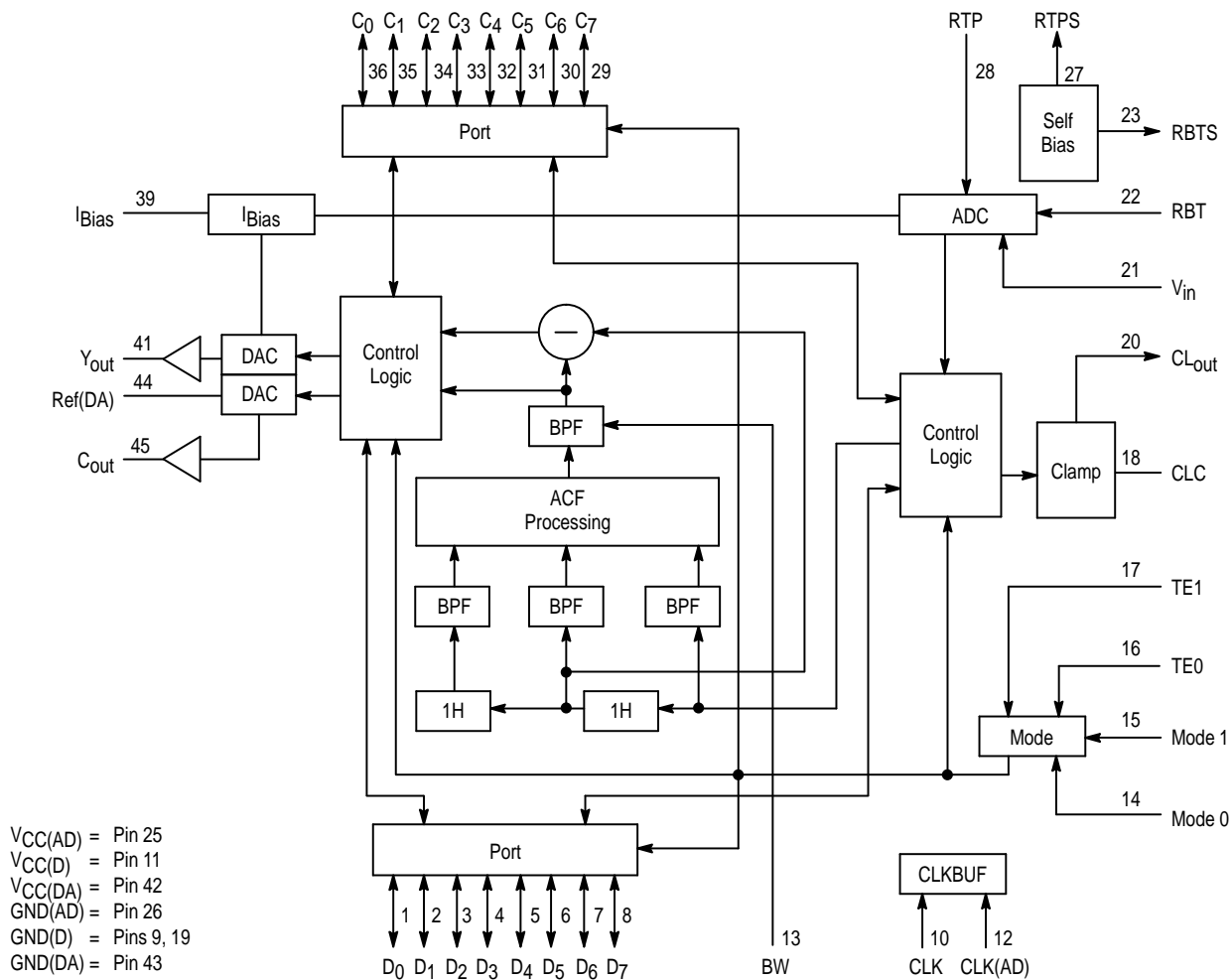
Advanced NTSC Comb Filter

MC141621FB

Case 898

The MC141621 is an advanced NTSC comb filter for VCR and TV applications. It separates the luminance (Y) and chrominance (C) signals from the NTSC composite video signal by using digital signal processing techniques. This filter allows a video signal input of an extended frequency bandwidth by using a 4.0 F_{SC} clock. In addition, the filter minimizes dot crawl and cross color effects. The built-in A/D and D/A converters allow easy connections to analog video circuits.

- Built-in High Speed 8-Bit A/D Converter
- Two Line Memories (1820 Bytes)
- Advanced Combing Process
- Two 8-Bit D/A Converters
- Built-in Clamp Circuit
- On-Chip Reference Voltage Regulator for ADC
- Digital Interface Mode



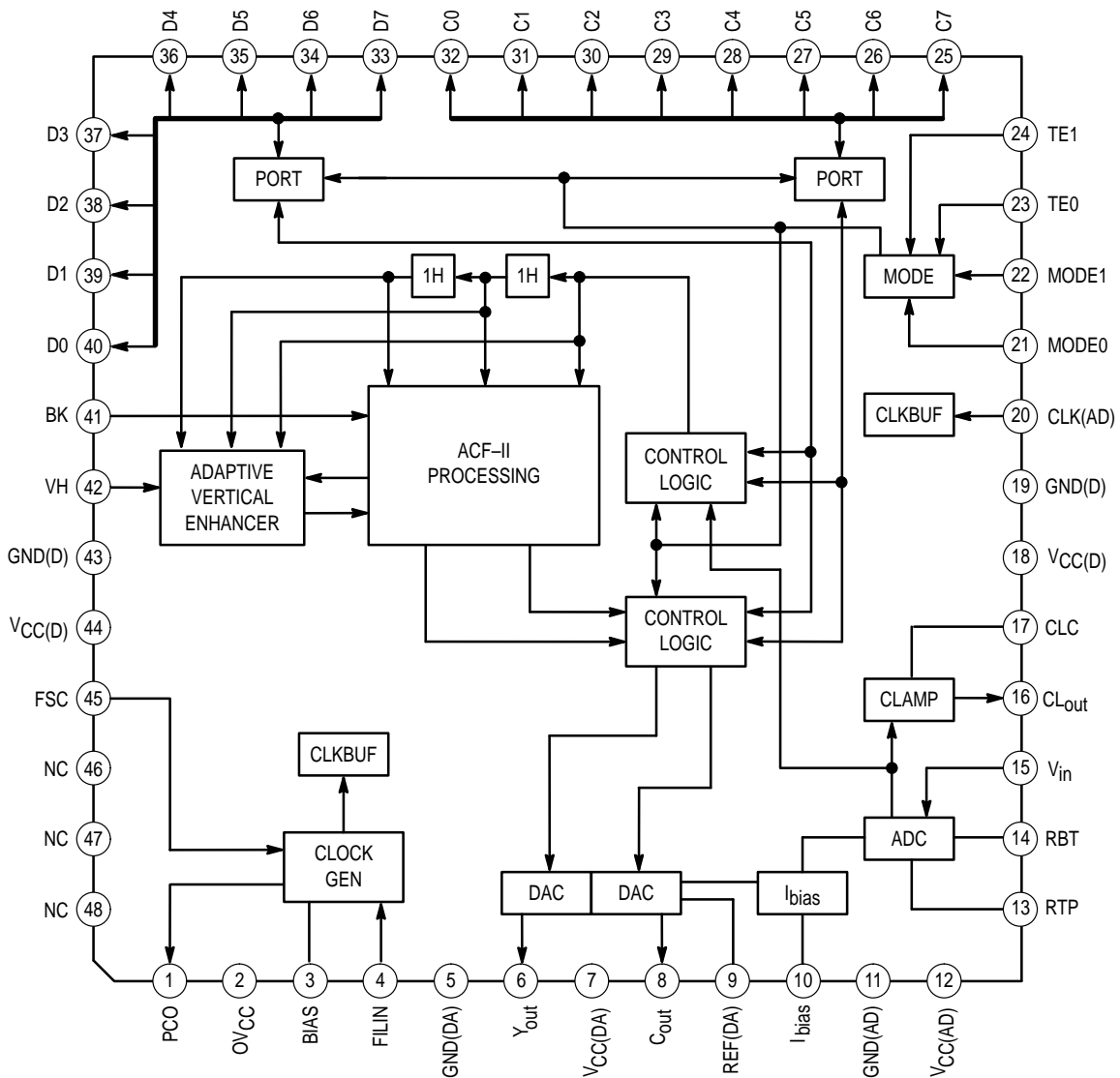
Advanced Comb Filter-II (ACF-II)

MC141622AFU

Case 898

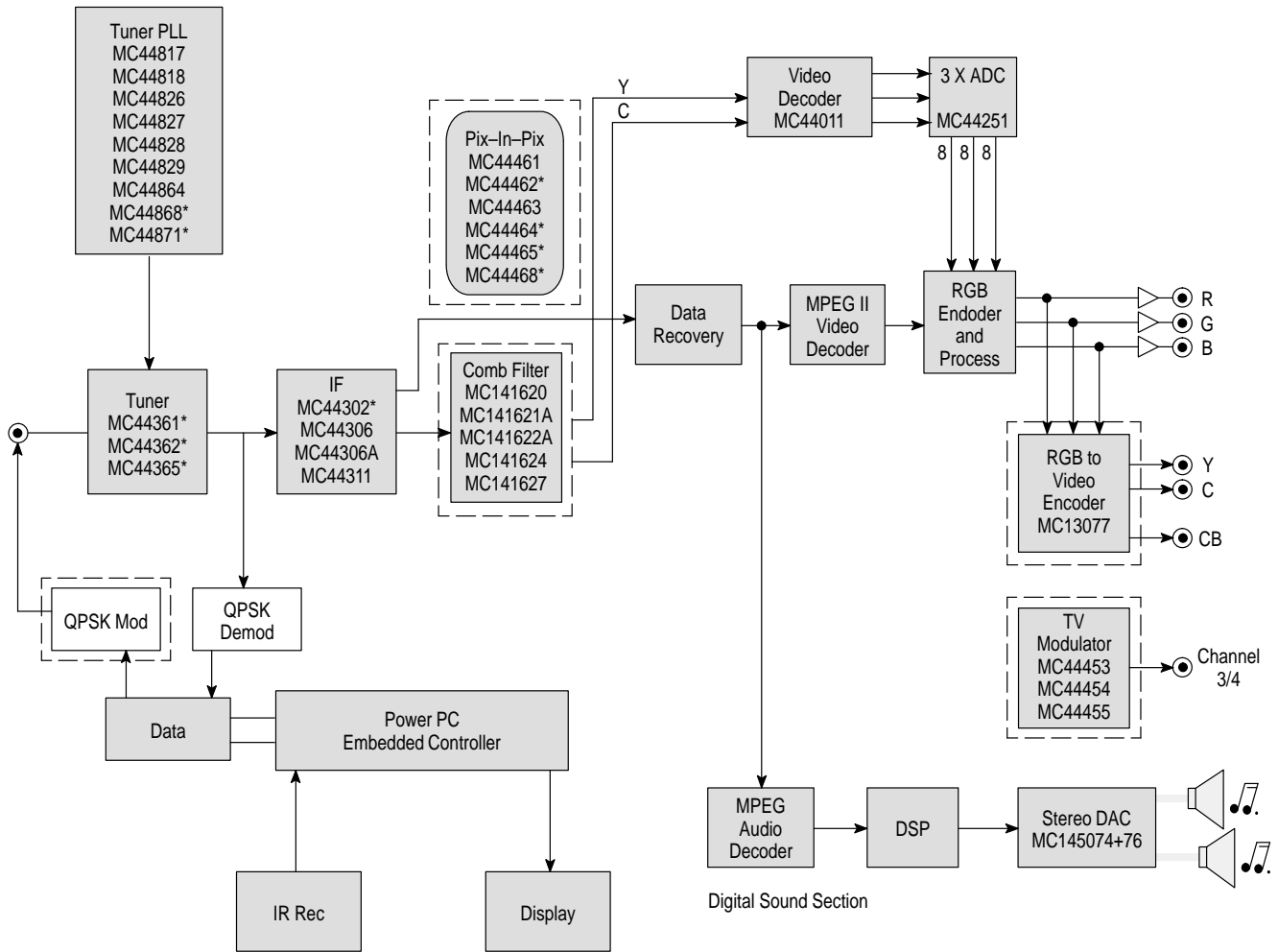
The Advanced Comb Filter-II is a video signal processor for VCRs and TVs. Its function is to separate the Luminance Y and Chrominance C signals from the NTSC composite video signal. The ACF-II minimizes dot-crawl and cross-color. A built-in PLL provides a 4xfsc clock from either an NTSC subcarrier signal or a 4xfsc input. This allows a video signal input of an extended frequency bandwidth. The built-in vertical enhancer circuit improves the quality of the Luminance Y signal. The built-in A/D and D/A converters allow easy connection to analog video circuits.

- Built-in High Speed 8-Bit A/D Converter
- Two Line Memories (1820 Bytes)
- Advanced Comb-II Process
- Vertical Enhancer Circuit
- Two High Speed 8-Bit D/A Converters
- 4xfsc PLL Circuit
- Built-in Clamp Circuit
- Digital Interface Mode
- On-Chip Reference Voltage Regulator for A/D Converter



Video Circuits (continued)

Set-Top Block Diagram



* In Development

PLL Tuning Circuits with 3-Wire Bus

MC44817BD, D

Case 751B

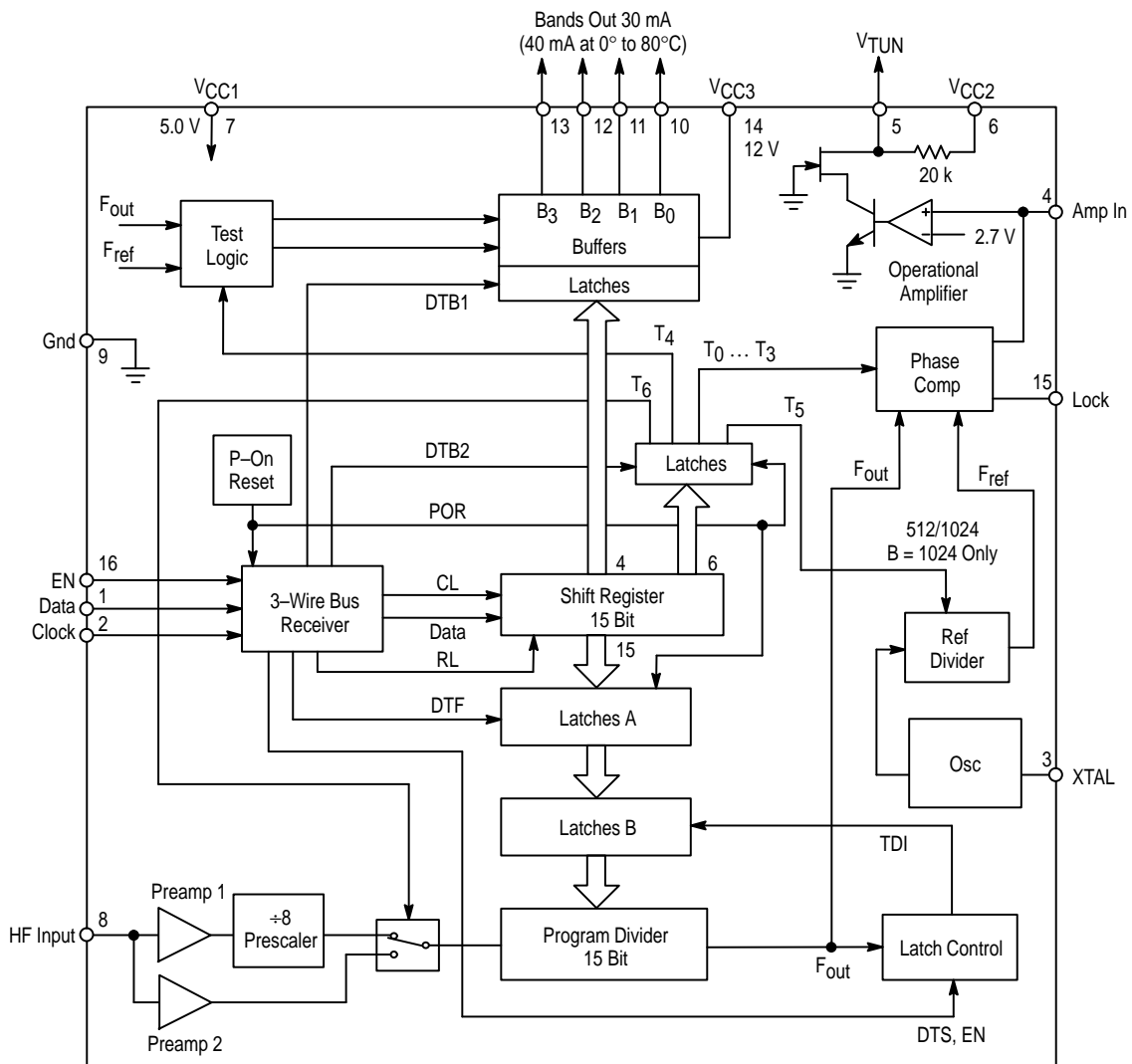
The MC44817/17B are tuning circuits for TV and VCR tuner applications. They contain on one chip all the functions required for PLL control of a VCO. The integrated circuits also contain a high frequency prescaler and thus can handle frequencies up to 1.3 GHz.

The MC44817 has programmable 512/1024 reference dividers while the MC44817B has a fixed reference divider of 1024.

The MC44817/17B are manufactured on a single silicon chip using Motorola's high density bipolar process, MOSAIC™ (Motorola Oxide Self Aligned Implanted Circuits).

- Complete Single Chip System for MPU Control (3-Wire Bus). Data and Clock Inputs are IIC Bus Compatible
- Divide-by-8 Prescaler Accepts Frequencies up to 1.3 GHz
- 15 Bit Programmable Divider Accepts Input Frequencies up to 165 MHz

- Reference Divider: Programmable for Division Ratios 512 and 1024. The MC44817B has a Fixed 1024 Reference Divider
- 3-State Phase/Frequency Comparator
- Operational Amplifier for Direct Tuning Voltage Output (30 V)
- Four Integrated PNP Band Buffers for 40 mA (V_{CC1} to 14.4 V)
- Output Options for the Reference Frequency and the Programmable Divider
- Bus Protocol for 18 or 19 Bit Transmission
- Extra Protocol for 34 Bit for Test and Further Features
- High Sensitivity Preamplifier
- Circuit to Detect Phase Lock
- Fully ESD Protected



PLL Tuning Circuit with I²C Bus

MC44818D

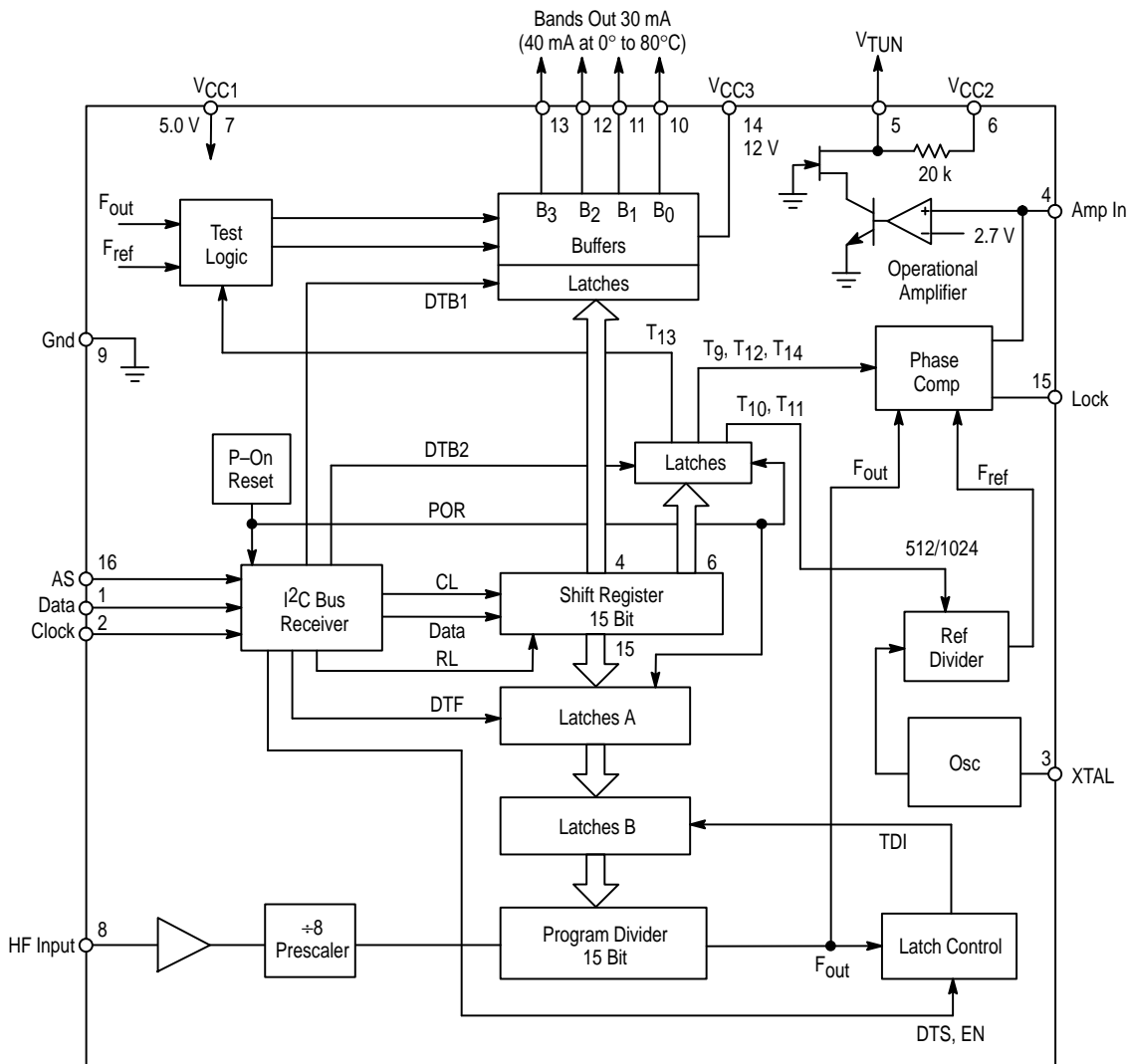
Case 751B

The MC44818 is a tuning circuit for TV and VCR tuner applications. It contains, on one chip, all the functions required for PLL control of a VCO. This integrated circuit also contains a high frequency prescaler and thus can handle frequencies up to 1.3 GHz. The MC44818 is a pin compatible drop-in replacement for the MC44817, where the only difference is the MC44818 has a fixed divide-by-8 prescaler (cannot be bypassed) and the MC44817 uses the three wire bus.

The MC44818 has programmable 512/1024 reference dividers and is manufactured on a single silicon chip using Motorola's high density bipolar process, MOSAIC™ (Motorola Oxide Self Aligned Implanted Circuits).

- Complete Single Chip System for MPU Control (I²C Bus). Data and Clock Inputs are 3-Wire Bus Compatible
- Divide-by-8 Prescaler Accepts Frequencies up to 1.3 GHz

- 15 Bit Programmable Divider Accepts Input Frequencies up to 165 MHz
- Reference Divider: Programmable for Division Ratios 512 and 1024.
- 3-State Phase/Frequency Comparator
- Operational Amplifier for Direct Tuning Voltage Output (30 V)
- Four Integrated PNP Band Buffers for 40 mA (V_{CC1} to 14.4 V)
- Output Options for the Reference Frequency and the Programmable Divider
- High Sensitivity Preamplifier
- Circuit to Detect Phase Lock
- Fully ESD Protected



PLL Tuning Circuit with 3–Wire Bus

MC44827DTB

Case 948F

The MC44827 is a tuning circuit for TV and VCR tuner applications. This device contains on one chip all the functions required for PLL control of a VCO. This integrated circuit also contains a high frequency prescaler and thus can handle frequencies up to 1.3 GHz.

The MC44827 is controlled by a 3–wire bus. It has the same function as the MC44828 which is I²C bus controlled. The MC44827 and MC44828 can replace each other to allow conversion between 3–wire bus and I²C bus control.

The MC44827 is manufactured on a single silicon chip using Motorola's high density bipolar process, MOSAIC™ (Motorola Oxide Self Aligned Implanted Circuits).

The MC44827 has the same features as MC44817 with the following differences:

- Lower Power Consumption, 200 mW Typical
- Improved Prescaler with Higher Margins for Sensitivity and Temperature Range. (A typical device is functional in a temperature range greater than –40 to 100°C.)
- Lock Detector with Push–Pull Output
- No Bypass of Divide–by–8 Prescaler
- TSSOP Package

PLL Tuning Circuit with I²C Bus

MC44828DTB

Case 948F

The MC44828 is a tuning circuit for TV and VCR tuner applications. This device contains on one chip all the functions required for PLL control of a VCO. This integrated circuit also contains a high frequency prescaler and thus can handle frequencies up to 1.3 GHz.

The MC44828 is controlled by an I²C bus. It has the same function as the MC44827 which is 3–wire bus controlled. The MC44827 and MC44828 can replace each other to allow conversion between 3–wire bus and I²C bus control.

The MC44828 is manufactured on a single silicon chip using Motorola's high density bipolar process, MOSAIC™ (Motorola Oxide Self Aligned Implanted Circuits).

The MC44828 has the same features as MC44818 with the following differences:

- Lower Power Consumption, 200 mW Typical
- Improved Prescaler with Higher Margins for Sensitivity and Temperature Range. (A typical device is functional in a temperature range greater than –40 to 100°C.)
- Lock Detector with Push–Pull Output
- TSSOP Package

PLL Tuning Circuit with DC/DC Converter and I²C Bus

MC44871DTB

Case 948F

The MC44871 is a tuning circuit for TV, VCR and Multimedia tuner applications. This device contains on one chip all the functions required for PLL control of a VCO. This integrated circuit also contains a high frequency prescaler and therefore can handle frequencies up to 1.3 GHz.

The MC44871 has an integrated dc/dc converter to generate the 30 V supply voltage for the tuning amplifier on the chip. A tuner using the MC44871 does not need an external 30 V supply.

The MC44871 is controlled by a I²C bus, and has a chip address function. The MC44871 data format is the same as the MC44818/MC44828.

The MC44871 is manufactured on a single silicon chip using Motorola's high density bipolar process, MOSAIC™ (Motorola Oxide Self Aligned Implanted Circuits).

The differences compared with the MC44828 are described hereafter:

- The Pin Called V_{CC2} for the MC44828 is Now Called CP (Charge Pump). This Pin is the Output of the dc/dc Converter; it Only Needs an External Capacitor (1.0 nF) Instead of the 30 V Supply Line
- High Speed I²C Bus (500 kHz)
- I²C Bus Read Mode for Lock Detector and A to D Converters
- HF Input is Symmetric
- MC44871 has Three PNP High Current (30 mA) Band Buffers (B0, B1, B2) and One NPN Low Current (5.0 mA) Band Buffer (B4)
- The Tuning Voltage Pin Needs an External pull–up Resistor (560 kΩ)
- Phase Comparator Output Current Has Been Decreased

PLL Tuning Circuit with I²C Bus

MC44829D

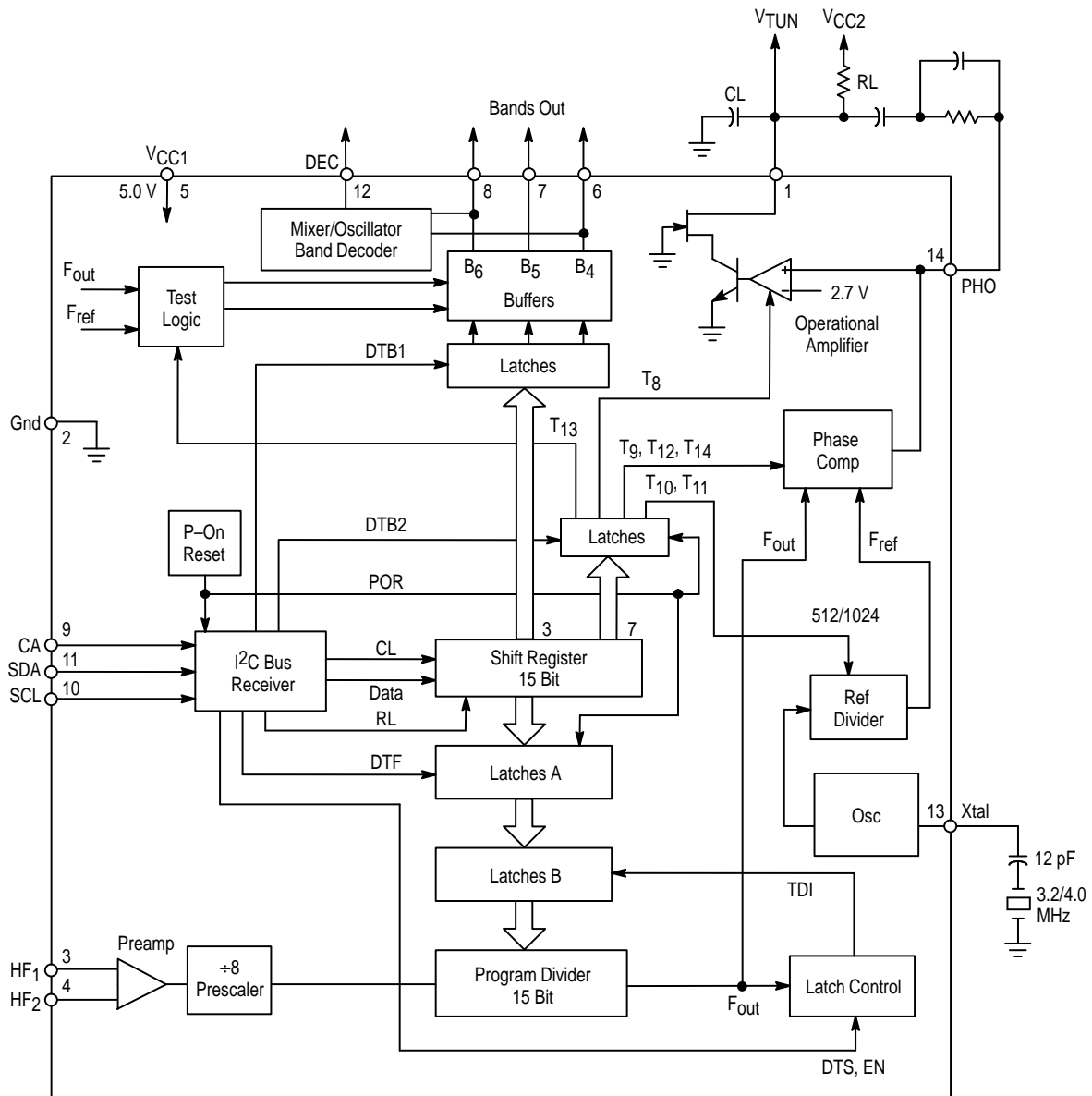
Case 751A

The MC44829 is a tuning circuit for TV and VCR tuner applications. It contains, on one chip, all the functions required for PLL control of a VCO. This integrated circuit also contains a high frequency prescaler and thus can handle frequencies up to 1.3 GHz. The circuit has a band decoder that provides the band switching signal for the mixer/oscillator circuit. The decoder is controlled by the buffer bits.

The MC44829 has programmable 512/1024 reference dividers and is manufactured on a single silicon chip using Motorola's high density bipolar process, MOSAIC™ (Motorola Oxide Self Aligned Implanted Circuits).

- Complete Single Chip System for MPU Control (I²C Bus)
- Divide-by-8 Prescaler Accepts Frequencies up to 1.3 GHz

- 15 Bit Programmable Divider
- Reference Divider: Programmable for Division Ratios 512 and 1024
- 3-State Phase/Frequency Comparator
- Operational Amplifier for Direct Tuning Voltage Output (30 V)
- Four Programmable Chip Addresses
- Integrated Band Decoder for the Mixer/Oscillator Circuit
- Band Buffers with Low "On" Voltage (0.4 V Maximum at 5.0 mA)
- Fully ESD Protected to MIL-STD-883C, Method 3015.7 (2000 V, 1.5 kΩ, 150 pF)



Advanced PAL/NTSC Encoder

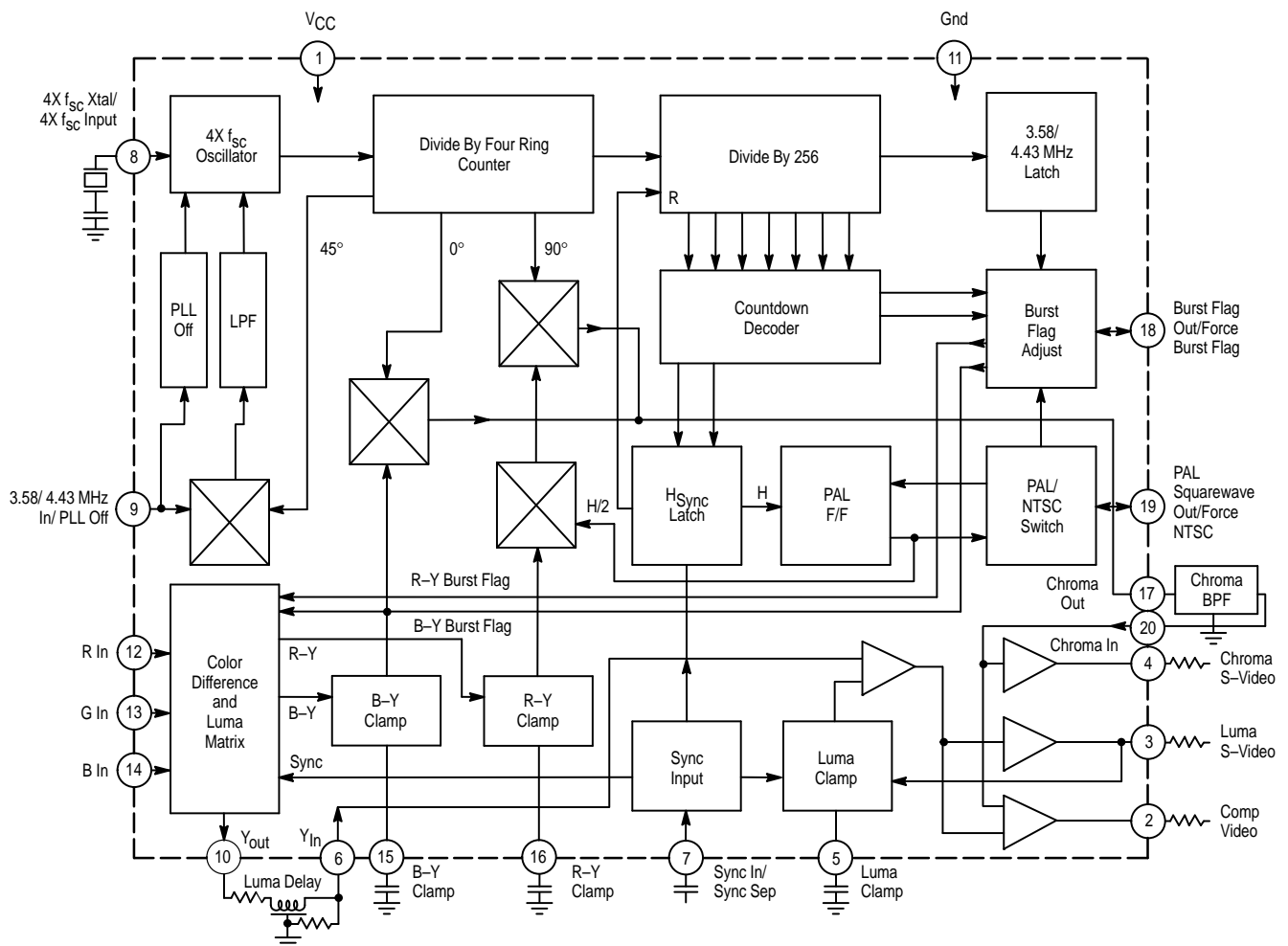
MC13077P, DW

Case 738, 751D

The MC13077 is an economical, high quality, RGB encoder for PAL or NTSC applications. It accepts red, green, blue and composite sync inputs and delivers either composite PAL or NTSC video, and S-Video Chroma and Luma outputs. The MC13077 is manufactured using Motorola's high density, bipolar MOSAIC® process.

- Single 5.0 V Supply
- Composite Output

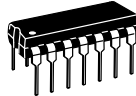
- S-Video Outputs
- PAL/NTSC Switchable
- PAL Squarewave Output
- PAL Sequence Resettable
- Internal/External Burst Flag
- Modulator Angles Accurate to 90°
- Burst Position/Duration Determined Digitally
- Subcarrier Reference from a Crystal or External Source



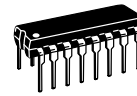
Consumer Electronic Circuits Package Overview



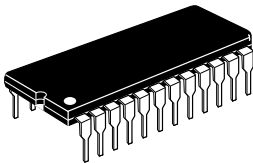
CASE 626
P SUFFIX



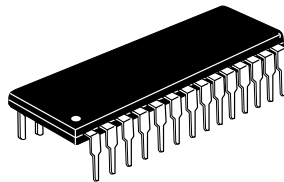
CASE 646
P SUFFIX



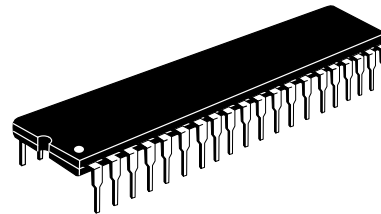
CASE 648
P SUFFIX



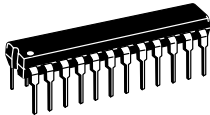
CASE 709
P SUFFIX



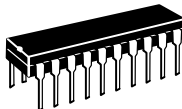
CASE 710
P SUFFIX



CASE 711
P SUFFIX



CASE 724
P SUFFIX



CASE 738
H, P SUFFIX



CASE 751
D SUFFIX



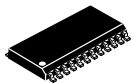
CASE 751A
D SUFFIX



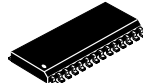
CASE 751B
D SUFFIX



CASE 751D
DW SUFFIX



CASE 751E
DW SUFFIX



CASE 751F
DW SUFFIX



CASE 751G
DW SUFFIX

Consumer Electronic Circuits Package Overview (continued)

