

# FMS6203

## Low-cost 3-Channel Video Filter Drivers for SD/PS/HD

### Features

- Three 6<sup>th</sup> order video anti-aliasing or reconstruction filters
- Supports Component YPrPb or RGB video
- Three channels selectable to 8MHz, 16MHz, 32MHz for SD/PS/HD applications
- Includes wide bandwidth bypass mode
- 6dB gain option available for 150Ω, doubly terminated video load
- 0dB gain option available for high-impedance loading
- Selectable Clamp or Bias mode on Pb,Pr / B,R inputs
- Inputs and outputs can be either AC or DC coupled
- DC-coupled outputs eliminate expensive coupling capacitors
- Output Disable
- 5V Only
- 2kV CDM / 8kV HBM ESD protection
- Lead (Pb) Free packages - TSSOP-14

### Applications

- Cable and Satellite set top boxes
- DVD players
- HDTV
- Personal Video Recorders (PVR)
- Video On Demand (VOD)

### Description

The FMS6203 offers comprehensive filtering for set top box or DVD applications. It is intended to replace passive LC filters and drivers with a low-cost integrated device.

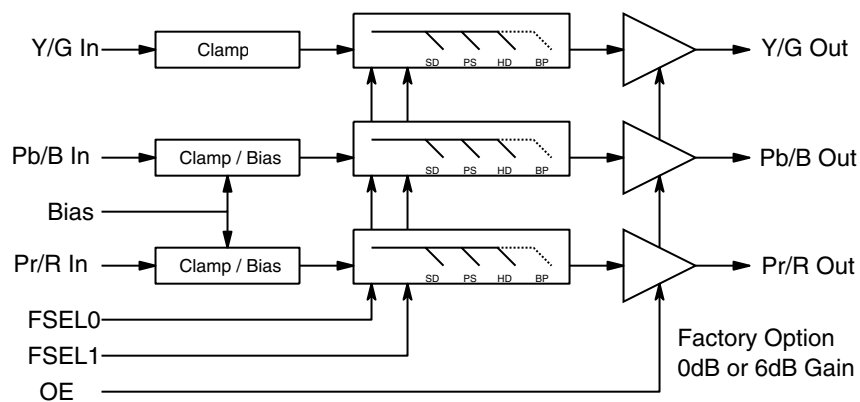
Filter channels are specialized for either component (YPbPr) or RGB video signals. These channels offer selectable frequency response of 8, 16, or 32MHz. The filters can also be bypassed for high-frequency operation. Additional functionality of these channels include input biasing mode and output disable.

The FMS6203 may be driven directly by a DC-coupled DAC output or an AC-coupled signal. All inputs accept standard 1V<sub>pp</sub> video signals.

Each channel includes an output amplifier capable of driving a single (150Ω), AC or DC-coupled video load. All outputs can be disabled to save power in DC coupled applications.

The device is available in two factory set options, a 0dB gain option and a 6dB gain option.

### Functional Block Diagram

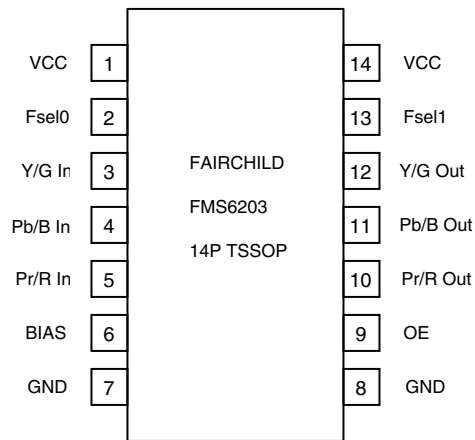


## Ordering Information

Part Number	Gain Setting	Package	Pb-Free	Operating Temperature Range	Packing Method
FMS6203MTC1400	0dB	TSSOP-14	Yes	0°C to 85°C	Tube
FMS6203MTC1400X	0dB	TSSOP-14	Yes	0°C to 85°C	Tape and Reel
FMS6203MTC1406	6dB	TSSOP-14	Yes	0°C to 85°C	Tube
FMS6203MTC1406X	6dB	TSSOP-14	Yes	0°C to 85°C	Tape and Reel

Moisture sensitivity level for all parts is MSL-1.

## Pin Configuration



## Pin Assignments

Pin#	Pin	Type	Description
1	VCC	Input	+5V supply
2	F <sub>SEL0</sub>	Input	Selects filter corner frequency
3	Y/G In	Input	Selectable video input
4	Pb/B In	Input	Selectable video input
5	Pr/R In	Input	Selectable video input
6	BIAS	Input	Input Bias on Pb/B Pr/R 0=Bias 1=Clamp
7	GND	Input	Must be tied to ground. Do not float.
8	GND	Input	Must be tied to ground. Do not float.
9	OE	Input	Output disable control 0=On 1=Off
10	Pr/R Out	Output	Filtered SD,PS,HD,BP video output
11	Pb/B Out	Output	Filtered SD,PS,HD,BP video output
12	Y/G Out	Output	Filtered SD,PS,HD,BP video output
13	F <sub>SEL1</sub>	Input	Selects filter corner frequency
14	VCC	Input	+5V supply

## Absolute Maximum Ratings

The “Absolute Maximum Ratings” are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the Electrical Characteristics tables are not guaranteed at the absolute maximum ratings. The “Recommended Operating Conditions” table defines the conditions for actual device operation.

Parameter	Min.	Max.	Unit
DC Supply Voltage	-0.3	6	V
Analog and Digital I/O	-0.3	$V_{CC} + 0.3$	V
Output Current, Any One Channel (Do Not Exceed)		50	mA

## Reliability Information

Parameter	Min.	Typ.	Max.	Unit
Junction Temperature			150	°C
Storage Temperature Range	-65		150	°C
Lead Temperature (Soldering, 10s)			300	°C
Thermal Resistance ( $\theta_{JA}$ ) JEDEC Standard Multi-Layer Test Boards, Still Air		97		°C/W

## Recommended Operating Conditions

Parameter	Min.	Typ.	Max.	Unit
Operating Temperature Range	-40		85	°C
Supply Voltage Range	4.75	5.0	5.25	V

### DC Electrical Characteristics

$T_c = 25^\circ\text{C}$ ,  $V_{cc} = 5\text{V}$ ,  $R_{source} = 37.5\Omega$ , inputs AC coupled with  $0.1\mu\text{F}$ , all outputs AC coupled with  $220\mu\text{F}$  into  $150\Omega$  loads, referenced to  $400\text{kHz}$ ; all gain options; unless otherwise noted.

Symbol	Parameter	Conditions	Min.	Typ.	Max	Units
$I_{CC}$	Supply Current <sup>1</sup>	No load		36	75	mA
$I_{CC1}$	Supply Current <sup>1</sup>	No load , Output disabled		15	35	mA
$V_{IN}$	Video Input Voltage Range	Referenced to GND if DC-coupled		1.0		V <sub>pp</sub>
$V_{IL}$	Digital Input Low <sup>1</sup>	$F_{Sel0}, F_{Sel1}$	0		0.8	V
$V_{IH}$	Digital Input High <sup>1</sup>	$F_{Sel0}, F_{Sel1}$	2.4		$V_{CC}$	V
$T_{ENABLE}$	Output Enable Time	150 Ohm DC load		300		ns

### Standard Definition Electrical Characteristics

$T_c = 25^\circ\text{C}$ ,  $V_{in} = 1V_{pp}$ ,  $V_{cc} = 5\text{V}$ ,  $R_{source} = 37.5\Omega$ , all inputs AC coupled with  $0.1\mu\text{F}$ , all outputs AC coupled with  $220\mu\text{F}$  into  $150\Omega$  loads, referenced to  $400\text{kHz}$ , all gain options; unless otherwise noted.

Symbol	Parameter	Conditions	Min.	Typ.	Max	Units
$AV_{SD}$	Channel Gain Error <sup>1</sup>		-0.4	0	0.4	dB
$f_{1dBSD}$	-1dB Bandwidth <sup>1</sup>		5.2	7.15		MHz
$f_{cSD}$	-3dB Bandwidth			8		MHz
$f_{SBSD}$	Attenuation(stopband reject) <sup>1</sup>	$f = 27\text{MHz}$	40	50		dB
DG	Differential Gain			0.3		%
DP	Differential Phase			1.0		°
THD	Output Distortion	$V_{OUT} = 1.4V_{pp}$ , 3.58MHz		0.6		%
$X_{TALKSD}$	Crosstalk (ch-to-ch)	1 MHz		-70		dB
SNR	Signal-to-Noise Ratio <sup>2</sup>	NTC-7 weighting, 100kHz to 4.2MHz		75		dB
$t_{pdSD}$	Propagation Delay	Delay from input to output, 4.5MHz		85		ns

### Progressive Scan Electrical Characteristics

$T_c = 25^\circ\text{C}$ ,  $V_{in} = 1V_{pp}$ ,  $V_{cc} = 5\text{V}$ ,  $R_{source} = 37.5\Omega$ , all inputs AC coupled with  $0.1\mu\text{F}$ , all outputs AC coupled with  $220\mu\text{F}$  into  $150\Omega$  loads, referenced to  $400\text{kHz}$ , all gain options; unless otherwise noted.

Symbol	Parameter	Conditions	Min.	Typ.	Max	Units
$AV_{PS}$	Channel Gain Error <sup>1</sup>		-0.4	0	0.4	dB
$f_{1dBSPS}$	-1dB Bandwidth <sup>1</sup>		10	13.5		MHz
$f_{cPS}$	-3dB Bandwidth			16		MHz
$f_{SBPS}$	Attenuation(stopband reject) <sup>1</sup>	$f = 54\text{MHz}$	37	44		dB
THD	Output Distortion	$V_{OUT} = 1.4V_{pp}$ , 7MHz		0.55		%
$X_{TALKPS}$	Crosstalk (ch-to-ch)	1 MHz		-75		dB
SNR	Signal-to-Noise Ratio <sup>2</sup>	Unweighted; 100kHz to 15MHz		66		dB
$t_{pdPS}$	Propagation Delay	Delay from input to output, 10MHz		47		ns

#### Notes:

- 100% tested at  $25^\circ\text{C}$
- $SNR = 20 * \log(714\text{mV} / \text{rms noise})$

### High Definition Electrical Characteristics

$T_c = 25^\circ\text{C}$ ,  $V_{in} = 1V_{pp}$ ,  $V_{cc} = 5V$ ,  $R_{source} = 37.5\Omega$ , all inputs AC coupled with  $0.1\mu\text{F}$ , all outputs AC coupled with  $220\mu\text{F}$  into  $150\Omega$  loads, referenced to 400kHz, all gain options; unless otherwise noted.

Symbol	Parameter	Conditions	Min.	Typ.	Max	Units
$AV_{HD}$	Channel Gain Error <sup>1</sup>		-0.4	0	0.4	dB
$f_{1dBHD}$	-1dB Bandwidth <sup>1</sup>		28	31		MHz
$f_{cHD}$	-3dB Bandwidth			32		MHz
$f_{SBHD}$	Attenuation(stopband reject) <sup>1</sup>	$f = 74.25\text{MHz}$	30	40		dB
THD	Output Distortion	$V_{OUT} = 0.7V_{pp}$ , 22MHz ; 0dB ; $10k\Omega$ load		0.5		%
		$V_{OUT} = 1.4V_{pp}$ , 22MHz ; 6dB ; $150\Omega$ load		0.5		%
$X_{TALKHD}$	Crosstalk (ch-to-ch)	1 MHz		-75		dB
		30 MHz		-57		dB
SNR	Signal-to-Noise Ratio <sup>2</sup>	Unweighted, 100kHz to 30MHz		66		dB
$t_{pdHD}$	Propagation Delay	Delay from input to output, 20MHz		25		ns

### Bypass Mode Electrical Characteristics

$T_c = 25^\circ\text{C}$ ,  $V_{in} = 1V_{pp}$ ,  $V_{cc} = 5V$ ,  $R_{source} = 37.5\Omega$ , all inputs AC coupled with  $0.1\mu\text{F}$ , all outputs AC coupled with  $220\mu\text{F}$  into  $150\Omega$  loads, referenced to 400kHz, all gain options; unless otherwise noted.

Symbol	Parameter	Conditions	Min.	Typ.	Max	Units
$AV_{BP}$	Channel Gain Error <sup>1</sup>	DC	-0.4	0	0.4	dB
$f_{1dBBP}$	-1dB Bandwidth			90		MHz
$f_{cBP}$	-3dB Bandwidth			115		MHz
THD	Output Distortion	$V_{OUT} = 0.7V_{pp}$ , 22MHz ; 0dB ; $10k\Omega$ load		0.3		%
		$V_{OUT} = 1.4V_{pp}$ , 22MHz ; 6dB ; $150\Omega$ load		0.25		%
$X_{TALKBP}$	Crosstalk (ch-to-ch)	1 MHz		-74		dB
		30 MHz		-64		dB
SNR	Signal-to-Noise Ratio <sup>2</sup>	Unweighted, 100kHz to 30MHz		70		dB

**Notes:**

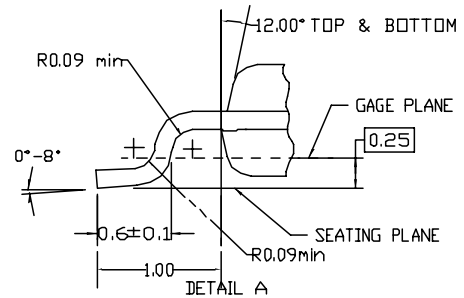
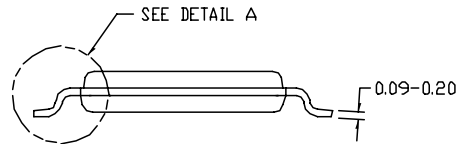
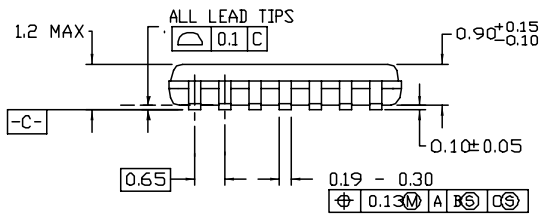
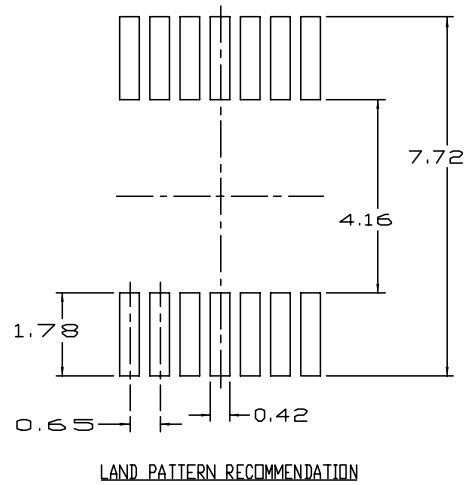
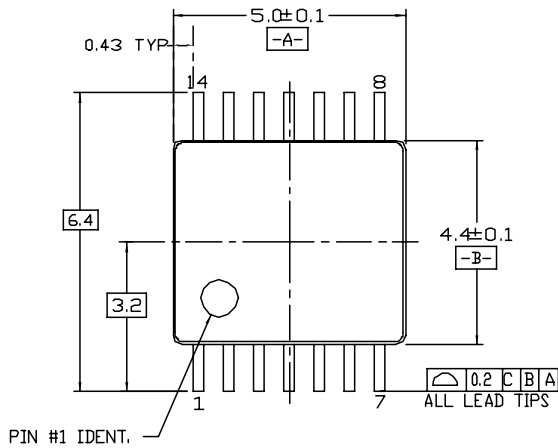
- 100% tested at  $25^\circ\text{C}$
- $SNR = 20 * \log(714\text{mV} / \text{rms noise})$

### Frequency Select Truth Table

$F_{SEL1}$	$F_{SEL0}$	Filter Freq	Video Format	Sync Format
0	0	8MHz	SD,480i	Bi-level, 4.7 $\mu\text{s}$ pulse width
0	1	16MHz	PS,480p	Bi-level, 2.35 $\mu\text{s}$ pulse width
1	0	32MHz	HD,1080i,720p	Tri-level, 589ns pulse width
1	1	Bypass	-	-

# Mechanical Dimensions

## 14-Lead (TSSOP)



NOTES:

- A. CONFORMS TO JEDEC REGISTRATION MO-153, VARIATION AB, REF NOTE 6, DATED 7/93
- B. DIMENSIONS ARE IN MILLIMETERS
- C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS
- D. DIMENSIONING AND TOLERANCES PER ANSI Y14.5M, 1982

MTC14revD

**TRADEMARKS**

The following are registered and unregistered trademarks Fairchild Semiconductor owns or is authorized to use and is not intended to be an exhaustive list of all such trademarks.

ACEx™	FAST®	ISOPLANAR™	PowerSaver™	SuperSOT™-6
ActiveArray™	FASTr™	LittleFET™	PowerTrench®	SuperSOT™-8
Bottomless™	FPS™	MICROCOUPLER™	QFET®	SyncFET™
Build it Now™	FRFET™	MicroFET™	QS™	TCM™
CoolFET™	GlobalOptoisolator™	MicroPak™	QT Optoelectronics™	TinyLogic®
CROSSVOLT™	GTO™	MICROWIRE™	Quiet Series™	TINYOPTO™
DOME™	HiSeC™	MSX™	RapidConfigure™	TruTranslation™
EcoSPARK™	I <sup>2</sup> C™	MSXPro™	RapidConnect™	UHC™
E <sup>2</sup> CMOS™	i-Lo™	OCX™	μSerDes™	UltraFET®
EnSigna™	ImpliedDisconnect™	OCXPro™	ScalarPump™	UniFET™
FACT™	IntelliMAX™	OPTOLOGIC®	SILENT SWITCHER®	VCX™
FACT Quiet Series™		OPTOPLANAR™	SMART START™	Wire™
Across the board. Around the world.™		PACMAN™	SPM™	
The Power Franchise®		POP™	Stealth™	
Programmable Active Droop™		Power247™	SuperFET™	
		PowerEdge™	SuperSOT™-3	

**DISCLAIMER**

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

**LIFE SUPPORT POLICY**

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION. As used herein:

- |   |   |
|---|---|
| <p>1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in significant injury to the user.</p> | <p>2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.</p> |
|---|---|

**PRODUCT STATUS DEFINITIONS**

**Definition of Terms**

Datasheet Identification	Product Status	Definition
Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
No Identification Needed	Full Production	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
Obsolete	Not In Production	This datasheet contains specifications on a product that has been discontinued by Fairchild semiconductor. The datasheet is printed for reference information only.

Rev. 118