APRIL. 1998

DATA SHEET

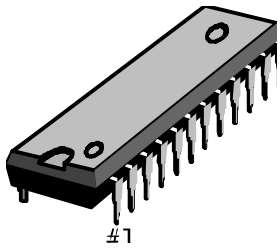
KA2143B

SAMSUNG ELECTRONICS

R/G/B VIDEO AMPLIFIER

The KA2143B is a very high frequency video amplifier system with OSD interface intended to be used in Monitor with high resolution up to 1024 × 768. It contains 3 matched R/G/B video Amplifiers with Blank signal and provides a flexible interfacing to DC controlled adjustment system.

24-DIP-300



FUNCTIONS

- R/G/B Video Amplifier
- OSD Interface
- Contrast/OSD Contrast/SUB Contrast Control
- Blank/Clamp Gate
- Video Clamp

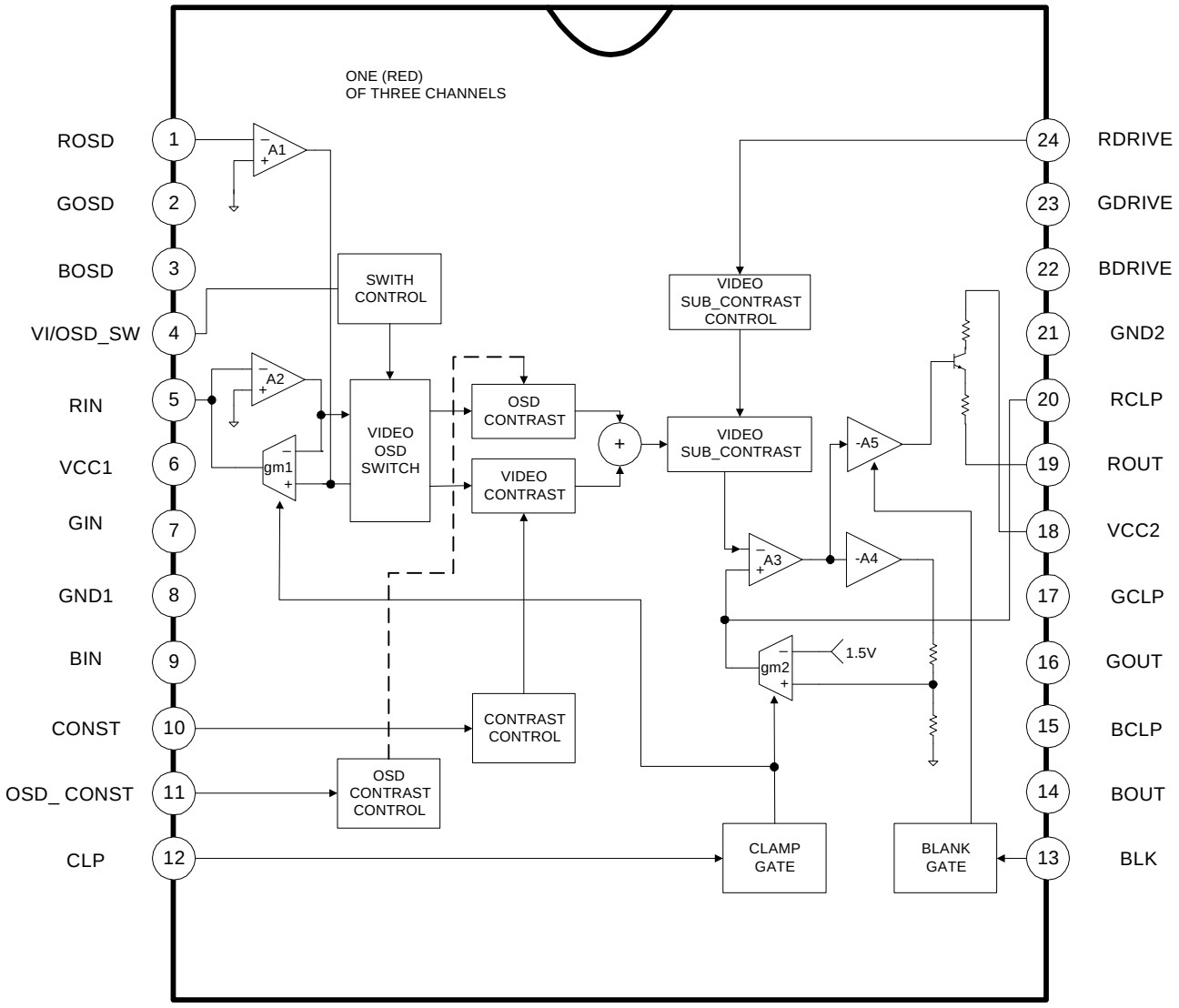
FEATURES

- 3-Channel R/G/B Video Amplifier, 110MHz Bandwidth
- TTL OSD Input, 50MHz Bandwidth
- DC Contrast Control range: -38dB
- DC SUB Contrast Control range: -11dB
- Capable of 7.5V_{PP} Output Swing Range
- Video/OSD high speed Switch

ORDERING INFORMATION

Device	Package	Operating Temperature
KA2143B	24-DIP-300	-20 °C ~ +70 °C

BLOCK DIAGRAM



SAMSUNG ELECTRONICS

PIN CONFIGURATIONS

Table 1. Pin Configurations

Pin No	Symbol	I/O	Configurations
1	ROSD	I	Red OSD Input
2	GOSD	I	Green OSD Input
3	BOSD	I	Blue OSD Input
4	VI/OSD_SW	I	Video or OSD Switch
5	RIN	I	Red Video Input
6	V_{CC1}	-	V_{CC} (normal)
7	GIN	I	Green Video Input
8	GND	-	Ground
9	BIN	I	Blue Video Input
10	CONST	I	Contrast Control
11	OSD_CONST	I	OSD Contrast Control
12	CLP	I	Clamp Gate Signal Input
13	BLK	I	Blank Gate Signal Input
14	BOUT	O	Blue Video Output
15	BCLP	-	Blue Clamp Cap
16	GOUT	O	Green Video Output
17	GCLP	-	Green Clamp Cap
18	Vcc2	-	V_{CC} (output part)
19	ROUT	O	Red Video Output
20	RCLP	-	Red Clamp Cap
21	GND	-	Ground
22	BDRIVE	I	Blue Gain Control
23	GDRIVE	I	Green Gain Control
24	RDRIVE	I	Red Gain Control

PIN DESCRIPTION

Table 2. Pin Description

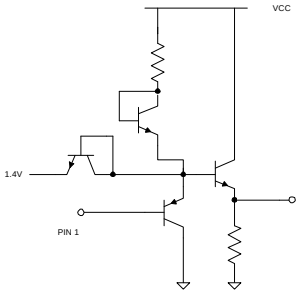
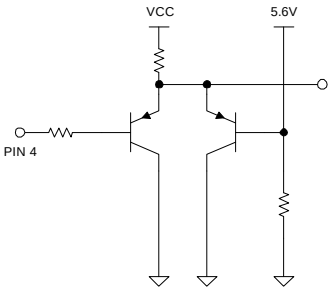
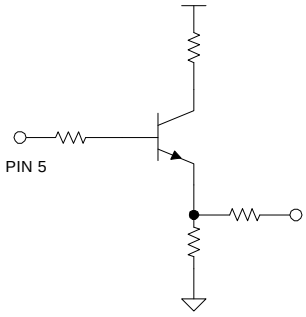
Pin No	Pin Name	Schematic	Description
1 2 3	Red OSD Input (ROSD) Green OSD Input (GOSD) Blue OSD Input (BOSD)		OSD input signals are in TTL level and will be connected to ground when switching video input
4	Video/OSD Switch (VI/OSD_SW)		Videl/OSD switch signal is TTL level OSD Input = “High” Video Input = “Low”
5 7 9	Red Video Input (RIN) Green Video Input (GIN) Blue Video Input (BIN)		MAX Input Video Signal is 0.7Vpp
6	V_{CC1}	-	Supply Voltage (except drive stage)
8	GND	-	Ground

Table 2. Pin Description(Continued)

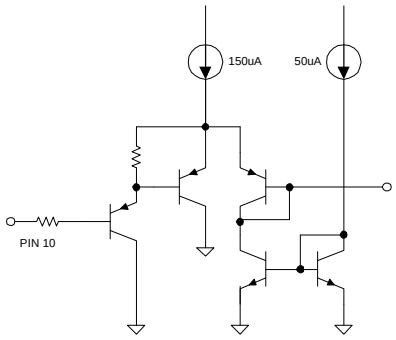
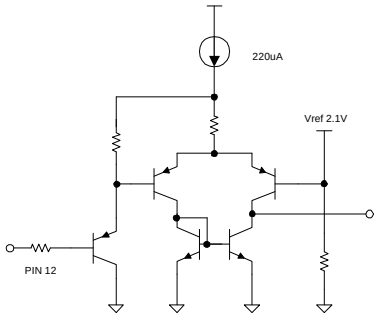
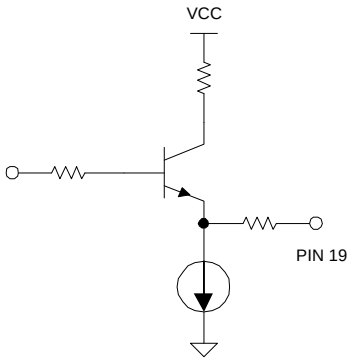
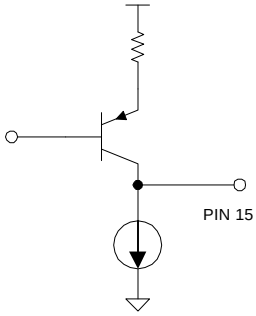
Pin No	Pin Name	Schematic	Description
10 11 22 23 24	Video Contrast (CONST) OSD Contrast (OSD_CONST) Blue Drive (BDRIVE) Green Drive (GDRIVE) Red Drive (RDRIVE)		Video and OSD maximum contrast control range (0V ~ 4V) is -38dB. Sub contrast gain (RGB Drive) control range (0V ~ 4V) is -11dB
12 13	Clamp Gate Input (CLP) Blank Gate Input (BLK)		Video Amp actives when clamp gate and blank gate signal is in low TTL level
19 16 14	Red Video Output (ROUT) Green Video Output (GOUT) Blue Video Output (BOUT)		Video signal output
15 17 20	Blue Clamp Cap (BCLP) Green Clamp Cap (GCLP) Red Clamp Cap (RCLP)		Brightness controlling actives by changing and discharging of the external cap. (0.1μF)

Table 2. Pin Description(Continued)

Pin No	Pin Name	Schematic	Description
18	VCC2	-	Supply voltage for drive part
21	GND	-	Ground

THERMAL & ESD CHARACTERISTICS

Table 3. Thermal & ESD Parameter

No	Item	Symbol	Value			Unit
			Min	Typ	Max	
1	Thermal Resistance (Junction-ambient)	θja	-	61	-	°C/W
2	Junction Temperature	Tj	-	150	-	°C
3	Human Body Mode (C = 100p, R = 1.5k)	HBM	2	-	-	KV
4	Machine Model (C = 200p, R = 0)	MM	300	-	-	V
5	Charge Device Model	CDM	800	-	-	V

ABSOLUTE MAXIMUM RATINGS (TA = 25 °C) (1)

Table 4. Absolute Maximum Ratings

No	Item	Symbol	Value			Unit
			Min	Typ	Max	
1	Maximum Supply Voltage	Vccmax	-	-	13.5	V
2	Operating Temperature (2)	Topr	-20	-	70	°C
3	Storage Tempperture	Tstg	-65	-	150	°C
4	Operating Supply Voltage	Vccop	11.4	12.0	12.6	V (3)
5	Maximum Supply Current	I_{CC}max			120	mA
6	Power Dissipation	P_D	-	-	2.0	W

ELECTRICAL CHARACTERISTICS

DC Electrical Characteristics

T_A = 25 °C, V_{CC1} = V_{CC2} = 12V: V_{10} = 4V: V_{11} = 4V; V_{13} = 4V; Vdrive = 4V; V_4 = 0V; V_{12} = 0V unless otherwise stated

Table 5. DC Electrical Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Supply Current	Icc	(4)	65	85	97	mA
Video Input Resistance	R_{IN}	Any Amplifier	10	100	-	kΩ
Clamp Gate Low Input Voltage	V_{12L}	Clamp Comparators On	0.8	1.5	3.0	V
Clamp Gate High Input Voltage	V_{12h}	Clamp Comparators Off	0.8	1.5	2.0	V
Clamp Gate Low Input Current	I_{12IL}	V_{12} = 0V	-5.0	-2.0	-	µA
Clamp Gate High Input Current	I_{12h}	V_{12} = 12V	-	0.01	1.0	µA
Blank Gate Low Input Voltage	V_{13L}	Blank Gate On	0.8	1.5	-	V
Blank Gate High Input Voltage	V_{13h}	Blank Gate Off	-	1.5	2.0	V
Blank Gate Low Input Current	I_{13L}	V_{13} = 0V	-5.0	-2.0	-	µA
Blank Gate High Input Current	I_{13h}	V_{13} = 12V	-	0.01	1.0	µA
Video Input bias Voltage	V_{bias}		1.6	1.9	2.2	V
Output Clamp Cap Charge Current	I_{clamp+}	Clamp Comparators On	0.45	0.75	1.05	mA
Output Clamp Cap Discharge Current	I_{clamp-}	Clamp Comparators Off	-1.05	-0.75	-0.45	mA

Table 5. DC Electrical Characteristics (Continued)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Video Output High Voltage	V_{OH}	$V_{15,17,20}$ = 9V	6.2	7.5	9.0	V
Video Black Level Output Voltage	V_{OBL}		1.2	1.5	1.8	V
Video ΔBlack Level Output Voltage	ΔV_{OBL}	Between Any Two Amplifiers	-0.3	-	0.3	V
Video Output Blanked Voltage	V_{OB}	Blank Gate On	-	50	500	mV
Contrast/Drive Control Input Current	Iosd, Idirve, Icon	Vcontrast = Vdrive: 0V to 4V	-	25 0.25	2 1	μA
Cut-Off Control Input Current	I_{21}		-	1.0	2.0	μA
Spot Killer Voltage	V_{spot}	V_{CC} Adjusted to Activate	8.0	10.4	11.2	V

AC Electrical Characteristics

T_A = 25 °C, V_{CC1} = V_{CC2} = 12V; V_4 = 0V. Manually adjust Video Output pins 14, 16 and 19 to 4V DC for the AC test (12) unless otherwise stated (14)

Table 6. AC Electrical Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Video Amplifier Gain	AV max	V_{10} = Vdrive = 4V, Vin = 560mVpp	15.5	17.5	19.5	dB
Contrast Attenuation 1	ΔAvc1	V_{10} = 2V	-8	-6	-4	dB
Contrast Attenuation 2	ΔAvc2	V_{10} = 0.25V	-	-38	-30	dB
Drive Attenuation1	ΔAvd1	Vdrive = 2V	-6	-4	-2	dB
Drive Attenuation 2	ΔAvd2	Vdrive = 0.25V	-13	-10	-7	dB
Absolute Gain Match	ΔAv match	V_{10} = 4V, Vdrive = 4V (6)	-1	-	1	dB
Gain Change between Amplifiers	ΔAv track	V_{10} = 4V to 2V (6, 7)	-1	-	1	dB
Video Amplifier Distortion	THD	V_O = $1V_{PP}$, f = 19kHz	-	1	5	%
Video Amp Bandwidth (8,9)	f (-3dB)	V_{10} = 4V, Vdrive = 4V,	90	110	-	MHz
Video Output Rise Time (8)	tr (Video)	V_O = $4V_{PP}$	-	3.2	3.8	ns
Video Output Fall Time (8)	tf (Video)	V_O = $4V_{PP}$	-	3.5	5	ns
Video Amplifier 10kHz Isolation	Viso_10K	V_{10} = 4V (10)	-	-65	-45	dB
Video Amplifier 10MHz Isolation	Viso_10M	V_{10} = 4V (8, 10)	-	-50	-35	dB
Blank Output Rise Time (8)	tr (Blank)	Blank Output = $1V_{PP}$	-	6	15	ns

Table 6. AC Electrical Characteristics (Continued)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Blank Output Fall Time [8]	tf (Blank)	Blank Output = $1V_{PP}$	-	10	30	ns
End of Blanking Propagation Delay	tr - prop (Blank)	Blank Output = $1V_{PP}$	-	23	50	ns
Start of Blanking Propagation Delay	tf - prop (Blank)	Blank Output = $1V_{PP}$	-	20	45	ns

OSD Electrical Characteristics

T_A = 25 °C; V_{CC1} = V_{CC2} = 12V; V_{10} = 4V; V_{11} = 4V; V_{13} = 4V;
Vdrive = 4V; V_4 = 4V; V_{12} = 0V unless otherwise stated

Table 7. OSD Electrical Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
OSD Input Low Input Voltage	V_{OSDL}		0.4	1.3	-	V
OSD Input High Input Voltage	V_{OSDh}		-	1.3	2.0	V
OSD Select Low Input Voltage	V_{4L}	Video Inputs are Selected	0.8	1.6	-	V
OSD Select High Input Voltage	V_{4h}	OSD Inputs are Selected	-	1.6	2.0	V
OSD Select Low Input Current	I_{4L}	V_4 = 0V	-15	-5	-	µA
OSD Select High Input Current	I_{4h}	V_4 = 12V	-	0.01	0.2	µA
OSD ΔOutput Black Level	$\Delta V_{BLV - OSD}$		-0.3	-	0.3	v
OSD Output Voltage	V_{OSD}	V_{11} = 4V, Vdrive = 2V	2.75	3.95	5.15	V_{PP}
OSD Output V_{PP} Attenuation	ΔV_{OSD_ATT}	V_{11} = 2V, Vdrive = 2V	30	50	70	%
Output Match between Channels	ΔV_{OSD}	V_{11} = 4V, Vdrive = 2V	0	5	10	%
Video to OSD Switch Time [8]	t_r (OSD S)	$V_1 = V_2 = V_3 = V_4$ [13]	-	4	10	ns
OSD to Video Switch Time [8]	t_f (OSD S)	$V_1 = V_2 = V_3 = V_4$ [13]	-	11	20	ns
Video to OSD Propagation Delay	t_r - prop (OSD S)	$V_1 = V_2 = V_3 = V_{10} = V_{11}$ = 4V	-	11	15	ns
OSD to Video Propagation Delay	t_f - prop (OSD S)	$V_1 = V_2 = V_3 = V_{10} = V_{11}$ = 4V	-	12	25	ns

NOTES;

1. Absolute maximum rating indicates limit beyond which damage to the device may occur.
2. Operating ratings indicate conditions for which the device is functional but do not guarantee specific performance limits. For guaranteed specifications and test conditions, See the Electrical Characteristics. The guaranteed specifications apply only for the test conditions listed. Some performance characteristics may degrade when the device is not operated under the listed test conditions.
3. VCC supply pins 6 and 18 must be externally wired together to prevent internal damage during V_{CC} power on/off cycles.
4. The supply current specified is the quiescent current for V_{CC1} and $V_{CC}2$ with RL = ∞, The supply current for V_{CC2} (pin 18) also depends on the output load.
5. Output voltage is dependent on load resistor. Test circuit uses RL = 390Ω.
6. Measure gain difference between any two amplifiers Vin = 560mV_{PP}.
7. ΔAv track is a measure of the ability of any two amplifiers to track each other and quantifies the matching of the three attenuators. It is the difference in gain change between any two amplifiers with the contrast voltage (V10) at either 4V or 2V measured relative to an Avmax condition V10 = 4V. For example, at AVmax the three amplifier` gains might be 17.1dB. 16.9dB, and 16.8dB and change to 11.2dB, 10.9dB and 10.7dB respectively for V10 = 2V. This yields the measured typical ± 0.1dB channel tracking.
8. When measuring video amplifier bandwidth or pulse rise and fall times, a double sided full ground plane printed circuit board without socket is recommended. Video amplifier 10MHz isolation test also requires this printed circuit board. The reason for a double sided full ground plane PCB is that large measurement variations occur in single sided PCB.
9. Adjust input frequency from 10MHz (Avmax reference level) to the - 3dB frequency (f -3dB).
10. Measure output levels of the other two undriven amplifiers relative to the driven amplifier to determine channel separation. Terminate the undriven amplifier inputs to simulate generator loading. Repeat test at fin = 10MHz for Iso_10MHz.
11. A minimum pulse width of 200 ns is guaranteed for a horizontal line of 15kHz. This limit is guaranteed by design. If a lower line rate is used a longer clamp pulse may be required.
12. During the AC test the 4V DC level is the center voltage of the AC output signal . For example. if the output is 4 V_{PP} the signal will swing between 2V DC and 6V DC.
13. When V1 = V2 = V3 = 0V and the video input is 0.7V. then tr (OSD S) = 11ns and tf (OSD S) = 4ns The video Output wave form will be inverted from the one shown in AC Test Circuit. Thus tr (OSD S) is actually a fall time and tf (OSD S) is actually a rise time in this condition.
14. These parameters are not tested on each product which is controlled by an internal qualification procedure.

APPLICATION CIRCUIT

