Figure 6: Linear Volume Control Curve
(7 bits, reg. 05 d6-d0, reg. 05 d7 = 0)

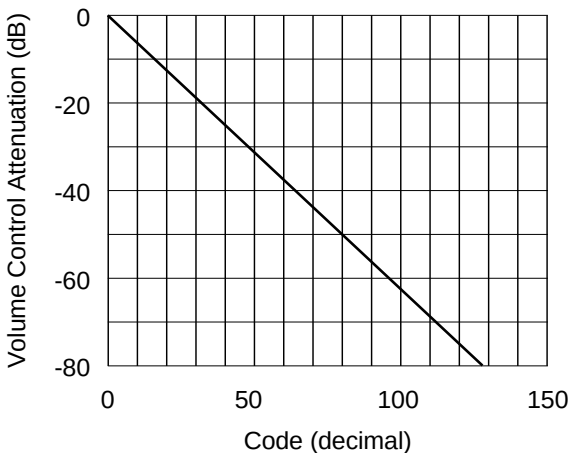
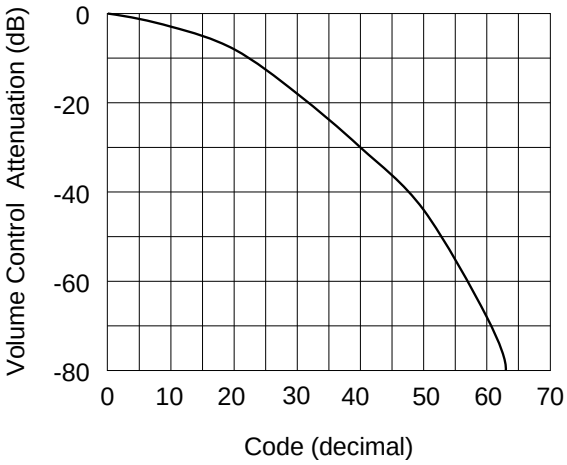


Figure 7: Non-Linear Volume Control Curve
(6 bits, reg. 05 d6-d1, reg. 05 d7 = 1)



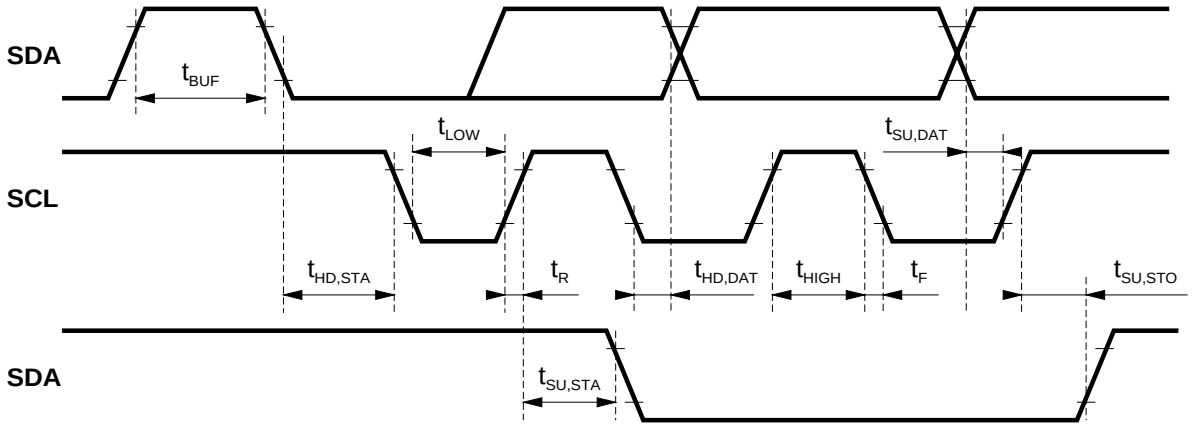
I²C Bus Charateristics

Symbol	Parameter	Test Conditions	Min.	Typ	Max.	Unit
SCL						
V_{IL}	Low Level Input Voltage		-0.5		1.5	V
V_{IH}	High Level Input Voltage		3		V_{CC}+0.5	V
I_{LI}	Input Leakage Current	V_{IN} = 0 to V_{CC}	-10		10	µA
f_{SCL}	Clock frequency		0		100	kHz
t_R	Input rise Time	1.5V to 3V			1.000	ns
t_F	Input Fall Time	1.5V to 3V			300	ns
C_I	Input Capacitance				10	pF
SDA						
V_{IL}	Low Level input Voltage		-0.5		1.5	V
V_{IH}	High Level input Voltage		3		V_{CC}+0.5	V
I_{LI}	Input Leakage Current	V_{IN} = 0 to V_{CC}	-10		10	µA
C_I	Input Capacitance				10	pF
t_R	Input rise Time	1.5V to 3V			1.000	ns
t_F	Input Fall Time	1.5V to 3V			300	ns
V_{OL}	Low Level Output Voltage	I_{OL} = 3mA			0.4	V
t_F	Output Fall Time	3V to 1.5V			250	ns
C_L	Load Capacitance				400	pF
C_I	Input Capacitance				10	pF

ELECTRICAL CHARACTERISTICS (continued)
I²C Bus Charateristics

Symbol	Parameter	Test Conditions	Min.	Typ	Max.	Unit
TIMING						
t_{LOW}	Clock Low period		4.7			µs
t_{HIGH}	Clock High period		4			µs
$t_{SU,DAT}$	Data Set-up Time		250			ns
$t_{HD,DAT}$	Data Hold Time		0		340	ns
$t_{SU,STO}$	Set-up Time from Clock High to Stop		4			µs
t_{BUF}	Start Set-up Time following a Stop		4.7			µs
$t_{HD,STA}$	Start Hold Time		4			µs
$t_{SU,STA}$	Start Set-up Time following Clock Low to High Transition		4.7			µs

Figure 8: I²C Bus Timing



I²C BUS SPECIFICATIONS

Data transfers follow the usual I²C format: after the start condition (S), a 7-bit slave address is sent, followed by an eight-bit which is a data direction bit (W). An 8-bit sub-address is sent to select a register, followed by an 8-bit data word to be included in the register.

The IC's I²C bus decoder permits the automatic incrementation mode in write mode.

The circuit operates up to clock frequencies of 400 kHz.

String Format

Write only mode (S = start condition, P = stop condition, A = acknowledge)

S	SLAVE ADDRESS	0	A	SUB-ADDRESS	A	DATA	A	P

Read only mode

S	SLAVE ADDRESS	1	A	DATA 0	A	DATA 1	A	DATA 2	A	DATA 3	A	P

Slave Address

Address	A7	A6	A5	A4	A3	A2	A1	A0
Value	1	0	0	0	1	0	1	X

Write Address: 10001010
Read Address: 10001011

I²C BUS SELECTION (continued)

STV2238D: Summary Input Signals (Write Mode)

Reg.Addr. (Hex)	DATA D7	DATA D6	DATA D5	DATA D4	DATA D3	DATA D2	DATA D1	DATA D0
00	PIFVCO Free Running Fine Adjustment							Not to be used
01	PIF Over-modulation	AFC Defeat	L/L' Mode	NEG/POS Modulation	PIFVCO Free Running Coarse Adjustment			
02	CVBS Output	Not to be used		CVBS Output Amplitude Adjustment				
03	Tuner AGC gain		Tuner AGC Starting Point Adjustment					
04	Intercarrier Filter ON/OFF	QSS and AM demod defeat	FM/AM Output Selection	FM Demod. Defeat	FM deviation and FM De-emphasis		Main Audio Output selection (int./ext.)	
05	Volume Control Curve	Volume Control						
06	Not to be used	QSS/ Inter-carrier	CVBS Mute	SAW Filter Switch	AGC SIF Time Constant	Sound Standard Selection		PIF VCO compensation
07	Blue Screen	CO Insertion	Contrast					
08	Oversize Blanking	Half Contrast	Saturation					
09	CO Blanking	RGB Blanking	Brightness					
0A	RGBext/YUVext Insertion		Red Drive Adjustment					
0B	NTSC Set-up	Black Stretch	Green Drive Adjustment					
0C	LSB RED Cut-off Counter	CO Freeze	Blue Drive Adjustment					
0D	Manual Cut-off Selection		Red Cut-off Adjustment					
0E	LSB GREEN Cut-off Counter	Not to be used	Green Cut-off Adjustment					
0F	White insertion ON/OFF	CVBS2 ON/OFF	Chroma Trap ON/ OFF	Coring ON/OFF	Peaking			
10	Not to be used		RGBosd Contrast Selection	APR Threshold				APR on/ off
11	ACCO ON/OFF	NTSC 104 Matrix	PAL/NTSC Demod. Gain	Bell Filter Shift				
12	Not to be used		Chroma DL ON/OFF	Chroma Out ON/OFF	Bandpass Shift			
13	Not to be used		Crystal Input Pin Disable	Chroma Standard Selection		Crystal Selection		3rd Crystal
14	Flesh Char.	Flesh on/off	HUE					
15	Not to be used			SVHS switch	Second Video Switch Control		Main Video Switch Control	
16	Interlace	HOUT Disable	Horizontal Shift					
17	50/60Hz Selection		Vertical Amplitude					
18	Vertical Synchro ON/OFF	Line Synchro ON/ OFF	PLL1 Time Constant		Vertical Position			
19	Not to be used				Noise Detector Threshold		long blanking	4/3-16/9
1A	Manual Cut-off Register - Red							
1B	Manual Cut-off Register - Green							
1C	Manual Cut-off Register - Blue							
1D	Not to be used							
1E	Not to be used			AGC SIF time constant	Not to be used			
1F	Audio Out (Mono or Sound sub-carriers)		Not to be used		Luma Delay Shift	Not to be used		VOUT Inhibition

I²C BUS SELECTION (continued)

STV2238D: Summary Output Signals (Read Mode)

Reg. Addr. (Hex)	DATA D7	DATA D6	DATA D5	DATA D4	DATA D3	DATA D2	DATA D1	DATA D0
00	Chroma Standard Selection Status		Crystal Selection Status		Video Input Status	Field Lock Status	50/60 Hz Status	Power ON Reset
01	FM Dem. VCO Cal. Status	Scanning VCO Cal. Status	FBosd Detection	FBext Detection	Safety Status	Horizontal Lock Status	Noise Detector Status	SVHS Status
02	Cut-off loop status		FM Sound Carrier Levels			Digital AF Status		
03	IC Identification							

STV2238D: Input Signals (Write Mode)

Not used data bits must be set to “0”.

Reg. Addr. (Hex)	Description	Bits	Data d7	d6	d5	d4	d3	d2	d1	d0	Comments
PIVCO FREE RUNNING FINE											
00	PIFVCO Free Running Fine Adjustment	7	0	0	0	0	0	0	0	X	PIF Typical + 0.7 MHz.
			1	0	0	0	0	0	0	X	PIF Free Running mid range.
			1	1	1	1	1	1	1	X	PIF Typical - 0.7MHz.
PIF FREE RUNNING COARSE											
01	PIFVCO Free Running Coarse Adjustment for 38.9 MHz Carrier	4	X	X	0	X	0	0	0	0	PIFVCO = F0 + 2.0 MHz.
			X	X	0	X	0	1	1	1	PIFVCO = F0 (mid range).
			X	X	0	X	1	1	1	1	PIFVCO = F0 - 1.8 MHz.
	PIFVCO Free Running Coarse Adjustment for 38.9MHz Carrier (L')		X	X	1	1	0	0	0	0	PIFVCO = F0 + 1.3 MHz.
			X	X	1	1	0	1	1	1	PIFVCO = F0 (mid range).
			X	X	1	1	1	1	1	1	PIFVCO = F0 - 1.2 MHz.
	PIF Modulation	1	X	X	X	0	X	X	X	X	0 = Negative Modulation.
			X	X	X	1	X	X	X	X	1 = Positive Modulation.
	L/L' Standard Selection	1	X	X	0	1	X	X	X	X	0 = L Standard.
			X	X	1	1	X	X	X	X	1 = L' Standard.
	Digital AFC Defeat	1	X	0	X	X	X	X	X	X	0 = AFC Active.
			X	1	X	X	X	X	X	X	1 = AFC Defeat (read register 02, d2 d1 d0 = 011).
	PIF Over-modulation	1	0	X	X	X	X	X	X	X	0 = Normal modulation, over-modulation detection off.
			1	X	X	X	X	X	X	X	1 = Over-modulation regulation active.
PIF FEATURES											
02	CVBS Output Amplitude	5	X	X	X	0	0	0	0	0	$V_{Typ.}$ - 1.6 dB.
			X	X	X	1	0	0	0	0	$V_{Typ.}$ = 1.6 V (black / white).
			X	X	X	1	1	1	1	1	$V_{Typ.}$ + 1.5 dB.
	CVBS Output	1	0	X	X	X	X	X	X	X	CVBSout at 2 $_{VPP}$, no external sound trap.
			1	X	X	X	X	X	X	X	CVBSout at 2.3 $_{VPP}$, external sound trap.
TUNER DELAY											
03	Tuner AGC Starting Point Adjustment	6	X	X	0	0	0	0	0	0	Min. Start point 0.5 mV_{RMS} at PIF input.
			X	X	1	0	0	0	0	0	Typ. Start point 3.1 mV_{RMS} at PIF input.
			X	X	1	1	1	1	1	1	Max. Start point 20 mV_{RMS} at PIF input
	Tuner AGC Gain	2	0	0	X	X	X	X	X	X	50µA/dB.
			0	1	X	X	X	X	X	X	95µA/dB.
			1	0	X	X	X	X	X	X	170µA/dB.
			1	1	X	X	X	X	X	X	270µA/dB.

I²C BUS SELECTION (continued)
Input Signals (Write Mode) — (continued)
Data bits that are not used must be set to "0".

Reg. Addr (Hex)	Description	Bits	Data								Comments
			d7	d6	d5	d4	d3	d2	d1	d0	
SIF FEATURES and AUDIO SWITCHES											
04	Main Audio Output	2	X X X X	X X X X	X X X X	X X X X	X X X X	X X X X	0 0 1 1	0 1 0 1	FM/AM audio selected. External audio selected. MUTE selected. MUTE selected.
	FM De-emphasis Switch and FM deviation range control	2	X X X X	X X X X	X X X X	X X X X	0 0 1 1	0 1 0 1	X X X X	X X X X	Automatic control, according to sound standard. Deemphasis at 75µs and FM deviation at ±25 kHz. Deemphasis at 50µs and FM deviation at ±50 kHz. Not allowed.
	FM demod defeat	1	X X	X X	X X	0 1	X X	X X	X X	X X	FM demodulator active. 1 = FM demodulator defeat, FM out muted.
	AM/FM output selection	1	X X	X X	0 1	X X	X X	X X	X X	X X	FM output selected. 1 = AM output selected.
	QSS and AM demod. defeat	1	X X	0 1	X X	X X	X X	X X	X X	X X	QSS and AM demod active, intercarrier filter OFF QSS and AM demod not active (OFF)
	Intercarrier filter ON/OFF	1	0 1	X X	X X	X X	X X	X X	X X	X X	Intercarrier filter ON Intercarrier filter OFF
05	Volume Control Attenuation, Linear curve (dB)	1	0 0	0 1	0 1	0 1	0 1	0 1	0 1	0 1	Attenuation = 0 dB. Attenuation = 78 dB. 7 bits resolution.
	Volume Control Attenuation, Non-linear curve (d0 = 0, d7 = 1)	1	1 1	0 1	0 1	0 1	0 1	0 1	0 1	0 0	Attenuation = 0 dB. Attenuation = 78 dB. 6 bits resolution.
06	Sound standard selection	2	X X X X	X X X X	X X X X	X X X X	X X X X	0 0 1 1	0 1 0 1	X X X X	6.5 MHz sound selected. 6.0 MHz sound selected. 5.5 MHz sound selected. 4.5 MHz sound selected.
	AGC SIF time constant (AM)	1	X X	X X	X X	X X	0 1	X X	X X	X X	0 = auto time constant. 1 = fast time constant forced.
	SAW filter switch output	1	X X	X X	X X	0 1	X X	X X	X X	X X	0 = output low (0.4 V Max.). 1 = output high (4 V Min.).
	CVBS output (from PIF circuit)	1	X X	X X	0 1	X X	X X	X X	X X	X X	0 = CVBS output enable. 1 = CVBS output muted.
	QSS/Inter-carrier Application	1	X X	0 1	X X	X X	X X	X X	X X	X X	QSS application. Inter-carrier application.
	PIF VCO compensation	1	X X	X X	X X	X X	X X	X X	X X	0 1	Optimized for PIF from 33.9 to 38.9 MHz Optimized for PIF 45.75 & 58.75 MHz
VIDEO CONTROLS											
07	Contrast control	6	X X	X X	0 1	0 1	0 1	0 1	0 1	0 1	-24 dB gain (Min. contrast). 0 dB gain (Max. contrast).
	Cut-off pulse insertion	1	X X	0 1	X X	X X	X X	X X	X X	X X	After internal frame blanking. After Vertical oversize blanking (a08d7 = 1).
	Blue screen feature	1	0 1	X X	X X	X X	X X	X X	X X	X X	Blue screen OFF. Blue screen ON.
08	Saturation control	6	X X	X X	0 1	0 1	0 1	0 1	0 1	0 1	-40 dB gain (Min. saturation). +9 dB gain (Max. saturation).
	Half contrast enable	1	X X	0 1	X X	X X	X X	X X	X X	X X	Disabled. Enabled.
	Oversize blanking enable	1	0 1	X X	X X	X X	X X	X X	X X	X X	Disabled. Enabled.

I²C BUS SELECTION (continued)
Input Signals (Write Mode) — (continued)
Data bits that are not used must be set to “0”.

Reg. Addr. (Hex)	Description	Bits	Data								Comments
			d7	d6	d5	d4	d3	d2	d1	d0	
VIDEO CONTROLS											
09	Brightness control	6	X X	X X	0 1	0 1	0 1	0 1	0 1	0 1	-30% of B/W at Max. contrast. +30% of B/W at Max. contrast.
	RGB blanking	1	X X	0 1	X X	X X	X X	X X	X X	X X	Not active (normal operation). Active.
	Cut-off blanking	1	0 1	X X	X X	X X	X X	X X	X X	X X	"Cut-off blanking" enable: RGB output blanked when I_{CATH} voltage is far from internal cut-off reference (cut-off loop not locked), during IC start-up. "Cut-off blanking" disable: RGB output not blanked by cut-off loop.
0A	Red drive adjustment (white point R)	6	X X	X X	0 1	0 1	0 1	0 1	0 1	0 1	-6 dB gain (Min. drive). 0 dB gain (Max. drive).
	RGBext/YUVext selection	2	0 0 1 1	0 1 0 1	X X X X	X X X X	X X X X	X X X X	X X X X	X X X X	RGB ext. insertion enable, controlled by FBext input pin. RGB ext. insertion disable, FBext control disable. RGB ext. insertion forced (FBext not active) YUV ext insertion forced
0B	Green drive adjustment (white point G)	6	X X	X X	0 1	0 1	0 1	0 1	0 1	0 1	-6 dB gain (Min. drive). 0 dB gain (Max. drive).
	Black stretch enable	1	X X	0 1	X X	X X	X X	X X	X X	X X	Black stretch disable. Black stretch enable.
	Black stretch ref level	1	0 1	X X	X X	X X	X X	X X	X X	X X	0IRE (no set-up). 7.5IRE (7.5IRE set-up).
0C	Blue drive adjustment (white point B)	6	X X	X X	0 1	0 1	0 1	0 1	0 1	0 1	-6 dB gain (Min. drive). 0 dB gain (Max. drive).
	Cut-off loop control	1	X X	0 1	X X	X X	X X	X X	X X	X X	Cut-off loop active. Cut-off loop frozen.
	LSB (9th bit) Red cut-off counter	1	0 1	X X	X X	X X	X X	X X	X X	X X	LSB = 0 LSB = 1
0D	Red cut-off adjustment (Black point R)	6	X X	X X	0 1	0 1	0 1	0 1	0 1	0 1	-150 mV. +150 mV.
	Manual Cut-off Selection	6	0 1	0 1	X X	X X	X X	X X	X X	X X	Automatic Cut-off application, data = 00hex in registers 1A,1B, 1C. Manual cut-off application DC at R,G,B output are adjusted thanks registers 1A, 1B, 1C.
			0 1	1 0	X X	X X	X X	X X	X X	X X	Not allowed. Not allowed.
0E	Green cut-off adjustment (Black point G)	6	X X	X X	0 1	0 1	0 1	0 1	0 1	0 1	-150 mV. +150 mV.
	LSB (9th bit) Green cut-off counter	1	0 1	X X	X X	X X	X X	X X	X X	X X	LSB = 0 LSB = 1
0F	Peaking control	4	X X	X X	X X	X X	0 1	0 1	0 1	0 1	0 dB at center Freq. Min. peaking. + 6dB at center Freq.Max. peaking.
	Coring on sharpness	1	X X	X X	X X	0 1	X X	X X	X X	X X	Coring off. Coring on.
	Chroma trap selection	1	X X	X X	0 1	X X	X X	X X	X X	X X	Trap on (CVBS mode & color identified). Trap off;
	CVBS2 ON/OFF	1	X X	0 1	X X	X X	X X	X X	X X	X X	CVBS2 output active. CVBS2 output not active.
	White insertion	1	0 1	X X	X X	X X	X X	X X	X X	X X	White insertion not active. White insertion enable during HOUT soft mode.

I²C BUS SELECTION (continued)
Input Signals (Write Mode) — (continued)
Data bits that are not used must be set to “0”.

Reg. Addr. (Hex)	Description	Bits	Data								Comments
			d7	d6	d5	d4	d3	d2	d1	d0	
VIDEO CONTROLS											
10	APR enable	1	X	X	X	X	X	X	X	0	APR disable.
			X	X	X	X	X	X	X	1	APR enable.
	APR threshold	5	X	X	X	0	0	0	0	X	50 IRE.
			X	X	X	1	1	1	1	X	100 IRE.
	RGB OSD contrast selection	1	X	X	0	X	X	X	X	X	Contrast control disable.
			X	X	1	X	X	X	X	X	Contrast control enable.
CHROMA CONTROLS											
11	Bell filter adjust	5	X	X	X	0	0	0	0	0	0 kHz.
			X	X	X	1	1	1	1	1	+100 kHz.
	PAL/NTSC demodulation gain	1	X	X	0	X	X	X	X	X	0 dB gain (nominal).
			X	X	1	X	X	X	X	X	+6 dB gain.
	NTSC matrix	1	X	0	X	X	X	X	X	X	90° matrix selection.
			X	1	X	X	X	X	X	X	104° matrix selection (in NTSC only).
	ACC overload disable	1	0	X	X	X	X	X	X	X	ACC overload active.
			1	X	X	X	X	X	X	X	ACC overload disable.
12	Bandpass adjust	4	X	X	X	X	0	0	0	0	f = fosc.
			X	X	X	X	1	1	1	1	f = 1.1*fosc.
	Chroma reference output	1	X	X	X	0	X	X	X	X	Chroma reference output off.
			X	X	X	1	X	X	X	X	Chroma reference output on.
	Chroma DL selection	1	X	X	0	X	X	X	X	X	ON.
			X	X	1	X	X	X	X	X	OFF.
13	Secam or 3crystals application selection	1	X	X	X	X	X	X	X	0	SECAM /PAL/NTSC application.
			X	X	X	X	X	X	X	1	Three crystals PAL/NTSC application.
	Crystal selection	2	X	X	X	X	X	0	0	X	XTAL1 (4.43/3.5XX MHz).
			X	X	X	X	X	0	1	X	XTAL2 (3.5XX MHz).
			X	X	X	X	X	1	0	X	XTAL3 (3.5XX MHz).
			X	X	X	X	X	1	1	X	Not allowed.
	Standard selection	2	X	X	X	0	0	X	X	X	PAL.
			X	X	X	0	1	X	X	X	NTSC.
			X	X	X	1	0	0	0	0	SECAM (only with XTAL1).
			X	X	X	1	0	0	1	X	Not allowed.
			X	X	X	1	0	1	0	X	Not allowed.
			X	X	X	1	1	X	X	0	AUTO P/S/N two crystals.
			X	X	X	1	1	X	X	1	AUTO P/N three crystals.
	Crystal inhibition	1	X	X	0	X	X	X	X	0	Two crystals, P/S/N application.
			X	X	0	X	X	X	X	1	Three crystals, P/N application.
			X	X	1	X	X	X	X	0	One crystal, P/S/N 4.43 application.
			X	X	1	X	X	X	X	1	Two crystals, P/N application.
14	Hue control (in NTSC only)	6	X	X	0	0	0	0	0	0	-45°.
			X	X	1	1	1	1	1	1	+45°.
	Flesh enable	1	X	0	X	X	X	X	X	X	Flesh disable (off).
			X	1	X	X	X	X	X	X	Flesh enable (on).
	Wide flesh charac-teristic selection	1	0	X	X	X	X	X	X	X	Normal characteristic.
			1	X	X	X	X	X	X	X	Wide characteristic.

I²C BUS SELECTION (continued)
Input Signals (Write Mode) — (continued)
Data bits that are not used must be set to “0”.

Reg. Addr. (Hex)	Description	Bits	Data								Comments
			d7	d6	d5	d4	d3	d2	d1	d0	
CHROMA CONTROLS											
15	Main Video switch	2	X X X	X X X	X X X	X X X	X X X	X X X	0 0 1	0 1 X	CVBS1 selected. CVBS2 selected. Y/CVBS3 selected.
	Second Video switch control	2	X X X X	X X X X	X X X X	X X X X	0 0 1 1	0 1 0 1	X X X X	X X X X	CVBS1 selected. CVBS2 selected. Y/CVBS3 selected. Y+C selected.
	SVHS switch Chroma decoder input selection	1	X X	X X	X X	0 1	X X	X X	X X	X X	Main CVBS selected. CHR input selected (SVHS).
SCANNING CONTROLS											
16	Horizontal shift	6	X X	X X	0 1	0 1	0 1	0 1	0 1	0 1	-2.5µs. +2.5µs.
	Horizontal output pulse disable	1	X X	0 1	X X	X X	X X	X X	X X	X X	Normal mode. HOUT disable (high level).
	Interlace	1	0 1	X X	X X	X X	X X	X X	X X	X X	Interlace mode. De-interlace mode.
17	Vertical amplitude	6	X X	X X	0 1	0 1	0 1	0 1	0 1	0 1	1.5 V on V_{AMP} Pin. 6.0 V on V_{AMP} Pin.
	50/60Hz selection	2	0 0 1 1	0 1 0 1	X X X X	X X X X	X X X X	X X X X	X X X X	X X X X	Auto (50 Hz when no ident.). 60 Hz. 50 Hz. Auto (60 Hz when no ident.).
18	Vertical position	4	X X	X X	X X	X X	0 1	0 1	0 1	0 1	4 V high level on VOUT Pin. 6 V high level on VOUT Pin.
	PLL1 time constant	2	X X X X	X X X X	0 0 1 1	0 1 0 1	X X X X	X X X X	X X X X	X X X X	Auto time constant selection. Short time constant. Long time constant. Very long time constant.
	Horizontal synchronization	1	X X	0 1	X X	X X	X X	X X	X X	X X	PLL1 active. PLL1 not active (horizontal free running mode).
	Vertical synchronization	1	0 1	X X	X X	X X	X X	X X	X X	X X	Vertical synchronization active. Vertical free running mode.
19	4/3 16/9 selection	1	X X	X X	X X	X X	X X	X X	X X	0 1	0.1 V low level on VOUT Pin. 2 V low level on VOUT Pin.
	Frame blanking	1	X X	X X	X X	X X	X X	X X	0 1	X X	Adapted to standard. Long blanking (50 Hz blanking) both in 50 Hz and 60 Hz modes
	Noise detector threshold	2	X X	X X	X X	X X	0 1	0 1	X X	X X	Low threshold. High threshold.

I²C BUS SELECTION (continued)
Input Signals (Write Mode) — (continued)
Data bits that are not used must be set to “0”.

Reg. Addr. (Hex)	Description	Bits	Data								Comments
			d7	d6	d5	d4	d3	d2	d1	d0	
MISCELLANEOUS											
1A	Manual Cut-off Register Red	8	0 1	0 1	0 1	0 1	0 1	0 1	0 1	0 1	Low DC at RGB output. High DC at RGB output.
1B	Manual Cut-off Register Green	8	0 1	0 1	0 1	0 1	0 1	0 1	0 1	0 1	Low DC at RGB output. High DC at RGB output.
1C	Manual Cut-off Register Blue	8	0 1	0 1	0 1	0 1	0 1	0 1	0 1	0 1	Low DC at RGB output. High DC at RGB output.
1D	Not To Be Used	8	0	0	0	0	0	0	0	0	
1E	Not To Be Used	7	0	0	0	X	0	0	0	0	
	SIF AGC time constant (positive modulation)	1	0 0	0 0	0 0	0 1	0 0	0 0	0 0	0 0	Automatic mode forced Long time constant
1F	VOUT Inhibition	1	X X	X X	0 0	0 0	X X	0 0	0 0	0 1	VOUT normal operating. VOUT inhibition (forced to high DC level controlled by vertical position register).
	Luma Delay Shift	1	X X	X X	0 0	0 0	0 1	0 0	0 0	X X	Standard luma delay. -140 ns on luma delay.
	AM/FMOUT pin selection	2	0 0 1 1	0 1 0 1	0 0 0 0	0 0 0 0	X X X X	0 0 0 0	0 0 0 0	X X X X	Output of AM/FM demodulator. Sound sub-carriers selected. Audio output muted. Main audio switch output, either internal or external audio depending on main audio switch selection. reg04hex; d0 = 0: internal audio. reg04hex; d0 = 1: external audio.

I²C BUS SELECTION (continued)

Output Signals (Read Mode)

Reg. Addr. (Hex)	Description	Bits	Data								Comments
			d7	d6	d5	d4	d3	d2	d1	d0	
00	Power-on reset	1	X X	X X	X X	X X	X X	X X	X X	0 1	Normal mode. Power down mode.
	Field frequency	1	X X	X X	X X	X X	X X	X X	0 1	X X	50 Hz. 60 Hz.
	Field lock status	1	X X	X X	X X	X X	X X	0 1	X X	X X	Not locked. Locked.
	Video identification	1	X X	X X	X X	X X	0 1	X X	X X	X X	No identification. Video identification.
	Standard status crystal selection	2	X X X X	X X X X	0 0 1 1	0 1 0 1	X X X X	X X X X	X X X X	X X X X	XTAL1 (4.43 MHz). XTAL2 (3.5X MHz). XTAL3 (3.5X MHz). XTAL1 (3.5X MHz).
	Standard selection	2	0 0 1 1	0 1 0 1	X X X X	X X X X	X X X X	X X X X	X X X X	X X X X	PAL. NTSC. SECAM. COLOR OFF.
01	SVHS status	1	X X	X X	X X	X X	X X	X X	X X	0 1	No SVHS (CVBS mode). SVHS mode.
	Noise detection	1	X X	X X	X X	X X	X X	X X	0 1	X X	High S/N. Low S/N.
	Scanning Horizontal phase locked loop status	1	X X	X X	X X	X X	X X	0 1	X X	X X	Not locked. Locked.
	Safety status	1	X X	X X	X X	X X	0 1	X X	X X	X X	Safety not active. Safety active.
	Fast Blanking detection on external fast blanking pin (during frame retrace)	1	X X	X X	X X	0 1	X X	X X	X X	X X	No insertion detected. Insertion on FBext.
	Fast blanking detection on OSD fast blanking pin (during frame retrace)	1	X X	X X	0 1	X X	X X	X X	X X	X X	No insertion detected. Insertion on FBosd.
	Scanning VCO calibration	1	X X	0 1	X X	X X	X X	X X	X X	X X	Not calibrated. Calibrated.
	FM demodulation VCO calibration	1	0 1	X X	X X	X X	X X	X X	X X	X X	Not calibrated. Calibrated.
02	Digital AFC status	3	X X X X X	X X X X X	X X X X X	X X X X X	X X X X X	0 0 0 1 1	1 1 0 0 0	1 0 0 0 1	F_{PLL} - F0 < -300 kHz0. -300 kHz < F_{PLL} - F0 < -60 kHz. -60 kHz < F_{PLL} - F0 < +60 kHz. +60 kHz < F_{PLL}- F0 +300 kHz. +300 kHz < F_{PLL} - F0.
	Sound carrier level	3	X X X X X X X X	X X X X X X X X	0 0 0 0 1 1 1 1	0 0 1 1 1 1 0 0	0 1 1 0 0 1 1 0	X X X X X X X X	X X X X X X X X	X X X X X X X X	Level 1 (low sound carrier signal). Level 2. Level 3. Level 4. Level 5. Level 6. Level 7. Level 8 (high sound carrier signal)
	Blue cut-off register and cut-off loop status	2	0 0 1 1	0 1 0 1	X X X X	X X X X	X X X X	X X X X	X X X X	X X X X	Blue CO register <011110000 Blue CO register >100001111 011110000< Blue Co register <100001111 and Icath not locked 011110000< Blue Co register <100001111 and Icath locked
03	IC identification	3	X X	X X	X X	X X	X X	X X	X X	0 1	TQFP64 SDIP56

I²C BUS SELECTION (continued)

Power-On Reset - Initial Bus Register Conditions

Power-On Reset is active when the power supply voltage is below TBD Volts.

Non significant bit (X) are preset to “0”.

Reg. Addr. (Hex)	Initial Data Value								Comments
00	1	0	0	0	0	0	0	0	PIFVCO free running fine adjustment Typical.
01	0	0	0	0	0	1	1	1	PIFVCO coarse BG = 38.9 MHz, Negative modulation, AFC defeat, no PIF over-modulation.
02	0	0	0	1	0	0	0	0	CVBS amplitude Typical, $2V_{PP.}$
03	0	0	1	0	0	0	0	0	Tuner AGC starting point Typical, Tuner AGC gain Min.
04	0	0	0	0	0	0	0	0	FM/AM out selected, FM de-emphasis 50µs, FM deviation ±50 kHz, FM demod. active, FM out selected.
05	0	1	1	1	1	1	1	1	Volume control attenuation at maximum, linear curve (dB).
06	0	0	0	0	0	0	0	0	Automatic sound standard selection, normal AGC SIF time constant, saw filter switch control at low level, CVBS out enabled.
07	0	0	1	0	0	0	0	0	Contrast at middle, cut-off pulse insertion after internal frame blanking, blue screen disabled.
08	0	0	1	0	0	0	0	0	Saturation at middle, half contrast disabled, oversize blanking disabled.
09	0	0	1	0	0	0	0	0	Brightness at middle, RGB Blanking not active.
0A	0	0	1	0	0	0	0	0	Red drive at middle, RGBext insertion enabled (FBext Pin control).
0B	0	0	1	0	0	0	0	0	Green drive at middle, black stretch disabled, black stretch ref 0IRE.
0C	0	0	1	0	0	0	0	0	Blue drive at middle, cut-off loop active.
0D	0	0	1	0	0	0	0	0	Red cut-off at middle, automatic cut-off loop.
0E	0	0	1	0	0	0	0	0	Green cut-off at middle.
0F	0	0	0	0	1	0	0	0	Peaking on luma at middle, coring off, trap ON(CVBS & color identified), CVBS2 ON, white insertion not active.
10	0	0	0	1	0	0	0	0	APR disabled, APR threshold at middle, RGB osd contrast disabled.
11	0	0	0	0	0	0	0	0	No shift of bell filter center frequency, 0dB P/N demod. gain, 90° matrix selection, ACC overload ON.
12	0	0	0	0	0	0	0	0	No shift of bandpass center frequency, chroma reference output off, chroma delay line on.
13	0	0	0	0	0	0	0	0	Two crystals application P/S/N, PAL XTAL1 forced mode, two crystal applications.
14	0	0	1	0	0	0	0	0	Hue at middle, flesh disabled, normal flesh characteristic.
15	0	0	0	0	0	0	0	0	CVBS1 selected on main CVBS output, CVBS1 selected on second CVBS output, CVBS mode.
16	0	0	1	0	0	0	0	0	Horizontal shift at middle, horizontal output enabled, interlace mode.
17	0	0	1	0	0	0	0	0	Vertical amplitude at middle, auto 50/60 Hz identification.
18	0	0	0	0	1	0	0	0	Vertical position at middle, automatic time constant selection on PLL1, PLL1 active, Vertical synchronization active.
19	0	0	0	0	0	0	0	0	4/3 selection, frame blanking adapted to standard, noise detector low threshold.
1A	0	0	0	0	0	0	0	0	Not active, auto cut-off.
1B	0	0	0	0	0	0	0	0	Not active, auto cut-off.
1C	0	0	0	0	0	0	0	0	Not active, auto cut-off.
1D	0	0	0	0	0	0	0	0	Not to be used.
1E	0	0	0	0	0	0	0	0	Not to be used, except d4: automatic SIF AGC time constant control in L/L’ standards.
1F	0	0	0	0	0	0	0	0	VOUT pulse active, standard luma delay, AM/FM mono sound selected.

I²C BUS SPECIFICATION COMPATIBILITY

The STV223XD/3X/4X I²C bus specification is compatible with the STV2238D specification. However, some dedicated settings must be used for the different versions. The following sections show the differences between the different versions compared to that of the STV2238D specification, and the settings to adjust.

STV2248 compared to STV2238D.

- Register 06hex, data D4:
  SAW Filter Switch function is not used.
  It must be set to “0”.
- Register 08hex, data D6:
  Half contrast function is not used.
  It must be set to “0”.

STV2247 compared to STV2238D.

- Register 06hex, data D4:
  SAW Filter Switch function is not used.
  It must be set to “0”.
- Register 08hex, data D6:
  Half contrast function is not used.
  It must be set to “0”.
- Register 01hex, data D5:
  L/L’ mode is not used.
  It must be set to “0”.
- Register 04hex, data D5:
  AM is not used.
  FM/AM output selection must be set to “0”.
- Register 13hex, datas D0 and D5:
  2 crystals, P/N application: D5 = 1 and D0 = 1.
  3 crystals, P/N application: D5 = 0 and D0 = 1.
- Register 11 hex, datas D0, D1, D2, D3 and D4:
  Bell filter is not used.
  It must be set to “0”.

STV2246 compared to STV2238D

The same register differences and setting changes mentioned in the above STV2247 specification is also valid for the STV2246, plus the following.

- Register 06hex, data D6:
  Inter-carrier application must be selected.
  It must be set to “1”.
- Register 02hex, datas D0, D1, D2, D3, D4
  CVBS output amplitude at nominal value. It must be set to D4D3D2D1D0 = 1 0000
- Register 04hex, data D6:
  QSS and AM demod must be OFF, it must be set to “1”.

STV2286 compared to STV2238D

The same register differences and setting changes mentioned in the above STV2246 specification is also valid for the STV2286, plus the following.

- Register 0Ahex, data D6 and D7:
  External RGB is not used.
  D7 = 0 and D6 = 1.

STV2238 compared to STV2238D

- Register 06hex, data D4:
  SAW Filter Switch function is not used.
  It must be set to “0”.
- Register 08hex, data D6:
  Half contrast function is not used.
  It must be set to “0”.
- Register 10hex, datas D0 and D4:
  APR function is not used.
  It must be set to “0”.
- Register 15hex, data D2 and D3:
  Second video switch is not used.
  It must be set to “0”.
- Register 0Ahex, data D6 and D7:
  External RGB is not used.
  D6 = 1 and D7 = 0.

STV2237 compared to STV2238D

The same register differences and setting changes mentioned in the above STV2238 specification is also valid for the STV2237, plus the following.

- Register 01hex, data D5:
  L/L’ mode is not used.
  It must be set to “0”.
- Register 04hex, data D5:
  AM is not used.
  FM/AM output selection must be set to “0”.
- Register 13hex, datas D0 and D5:
  2 crystals, P/N application: D5 = 1 and D0 = 1.
  3 crystals, P/N application: D5 = 0 and D0 = 1.
- Register 11 hex, datas D0, D1, D2, D3 and D4:
  Bell filter is not used.
  It must be set to “0”.

STV2236 compared to STV2238D

The same register differences and setting changes mentioned in the above STV2237 specification is also valid for the STV2236, plus the following.

- Register 06hex, data D6:
  Inter-carrier application must be selected.
  It must be set to “1”.
- Register 02hex, datas D0, D1, D2, D3, D4
  CVBS output amplitude at nominal value. It must be set to D4 D3 D2 D1 D0 = 1 0000
- Register 04hex, data D6:
  QSS and AM demod must be OFF, it must be set to 1.

I²C BUS SPECIFICATION COMPATIBILITY

STV2237D compared to STV2238D

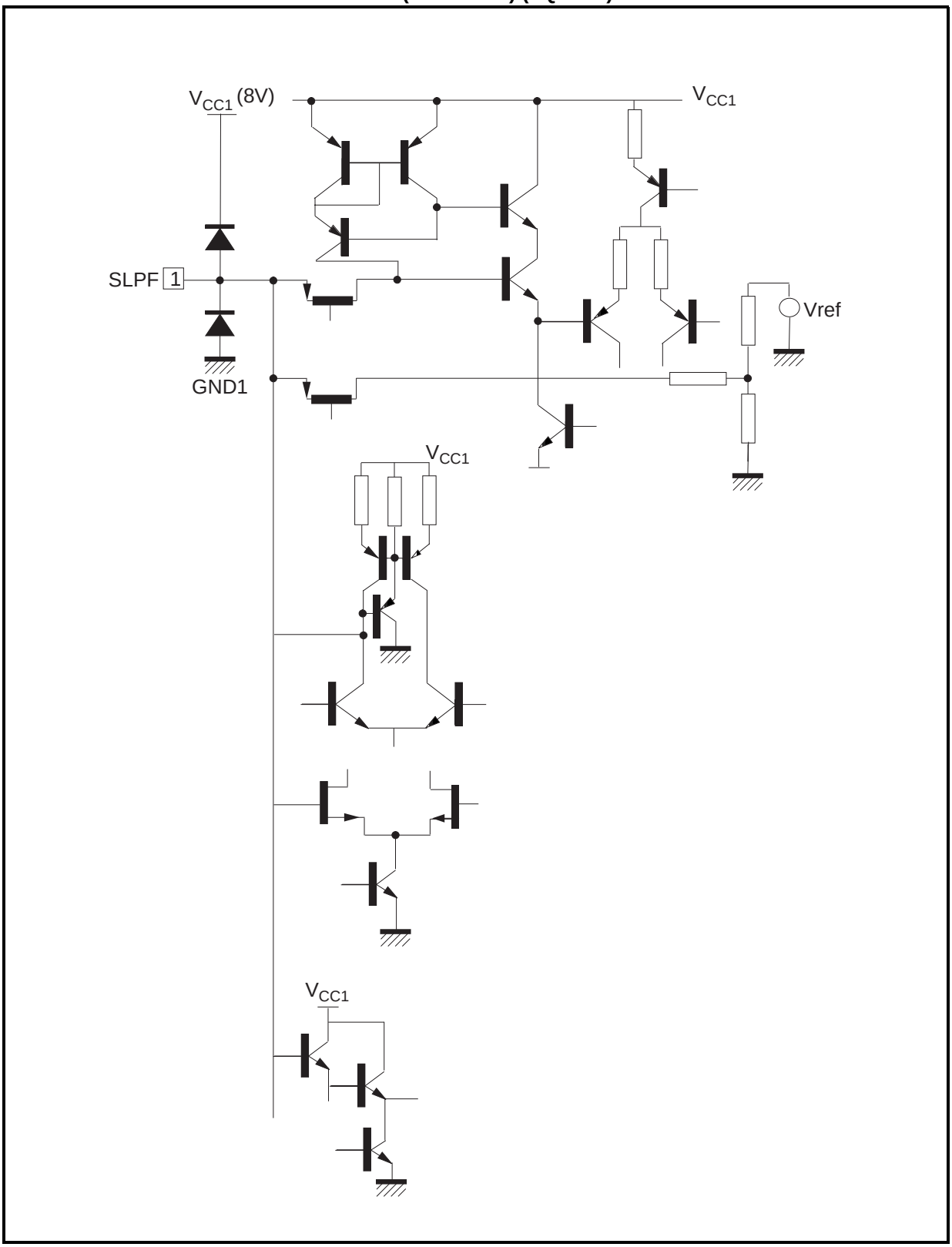
- Register 01hex, data D5:
  L/L' mode is not used.
  It must be set to "0".
- Register 04hex, data D5:
  AM is not used.
  FM/AM output selection must be set to "0".
- Register 13hex, datas D0 and D5:
  2 crystals, P/N application: D5 = 1 and D0 = 1.
  3 crystals, P/N application: D5 = 0 and D0 = 1.
- Register 11 hex, datas D0, D1, D2, D3 and D4:
  Bell filter is not used.
  It must be set to "0".

STV2236D compared to STV2238D

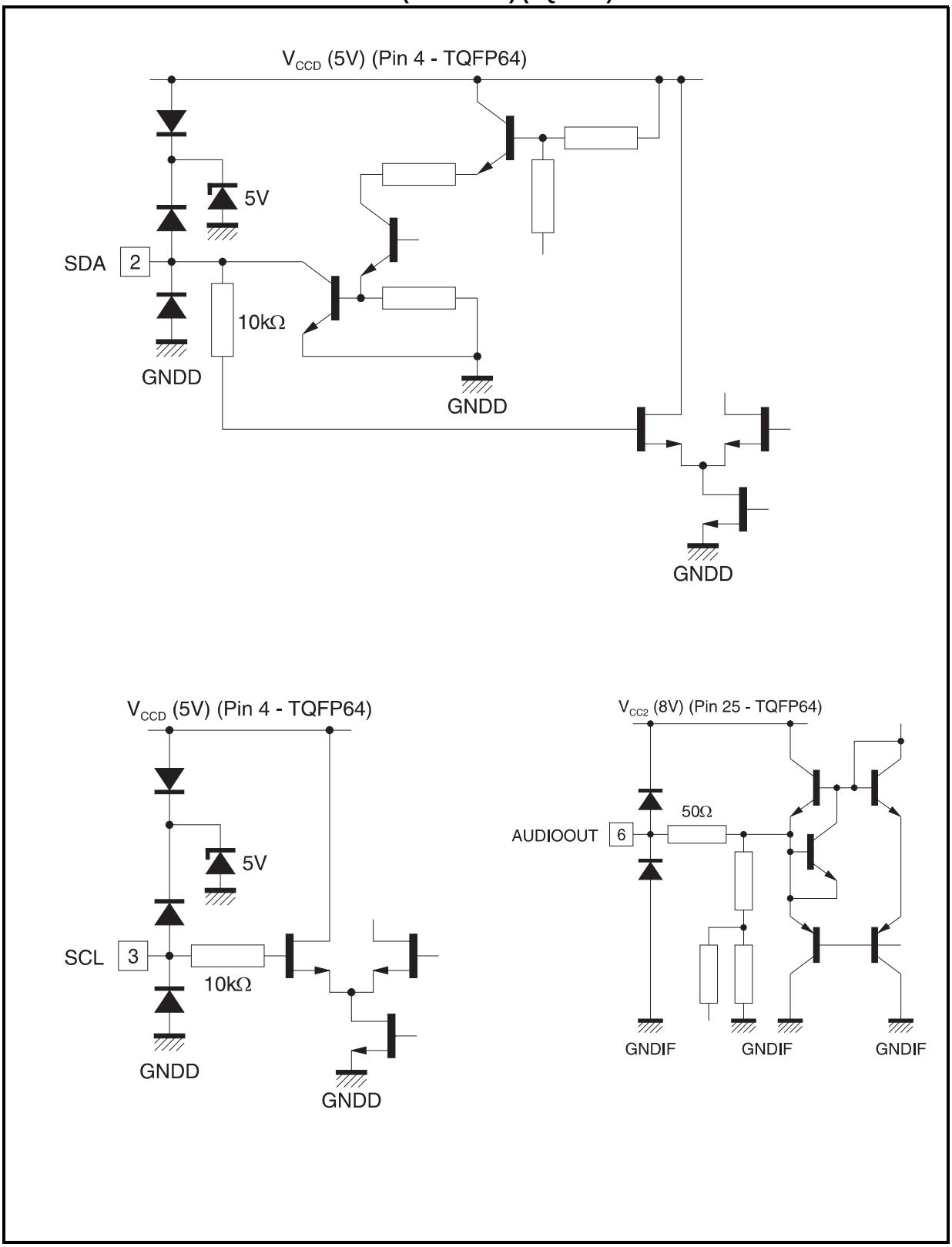
The same register differences and setting changes mentionned in the above STV2237D specification is also valid for STV2236D, plus the following.

- Register 06hex, data D6:
  Inter-carrier application must be selected.
  It must be set to "1".
- Register 02hex, datas D0, D1, D2, D3, D4
  CVBS output amplitude at nominal value. It must be set to D4 D3 D2 D1 D0 = 1 0000
- Register 04hex, data D6:
  QSS and AM demod must be OFF, it must be set to "1".

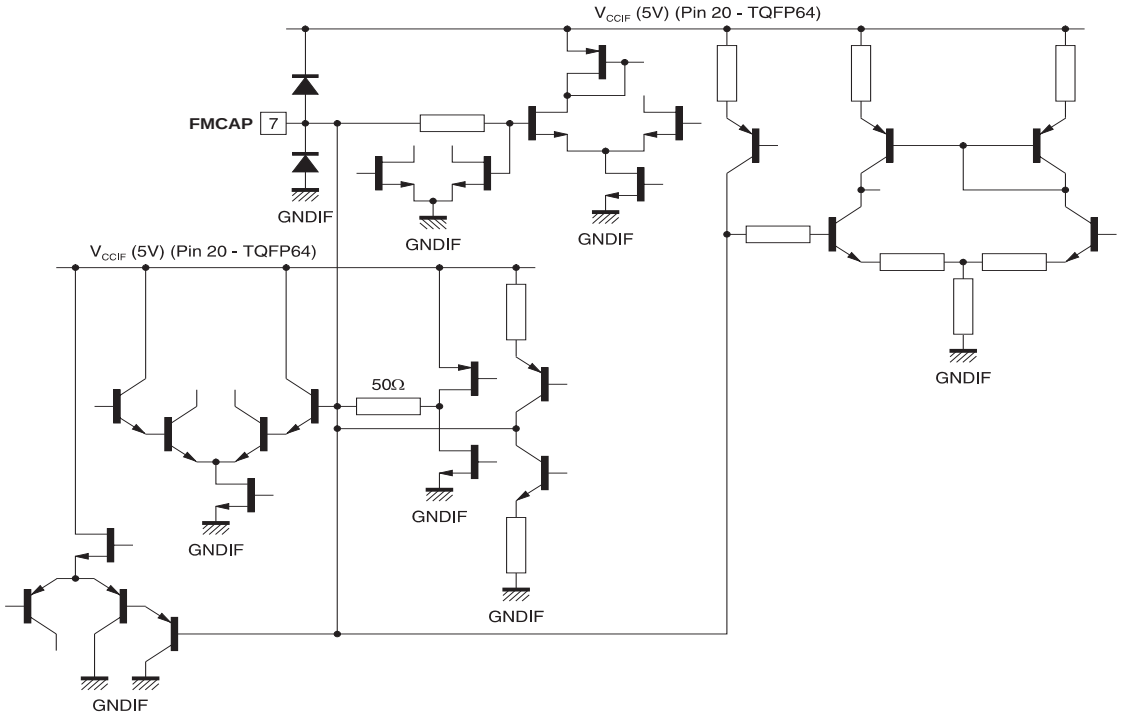
INPUT/OUTPUT SCHEMATIC DIAGRAMS (STV2238D) (TQFP64)

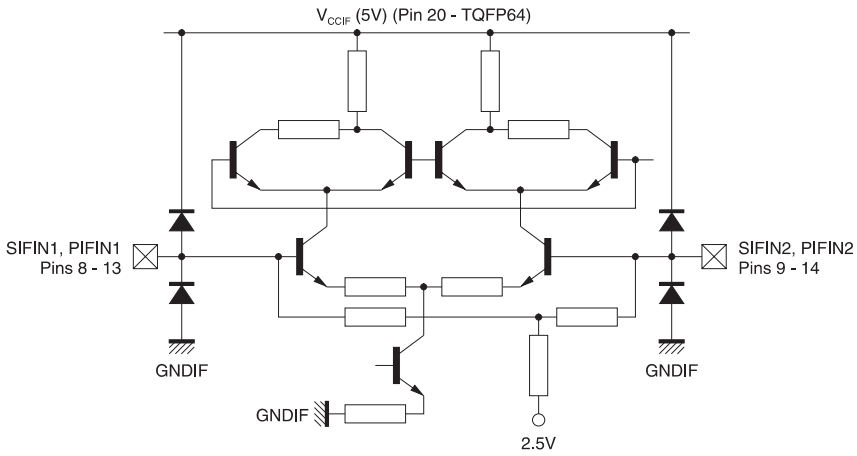


INPUT/OUTPUT SCHEMATIC DIAGRAMS (STV2238D) (TQFP64)

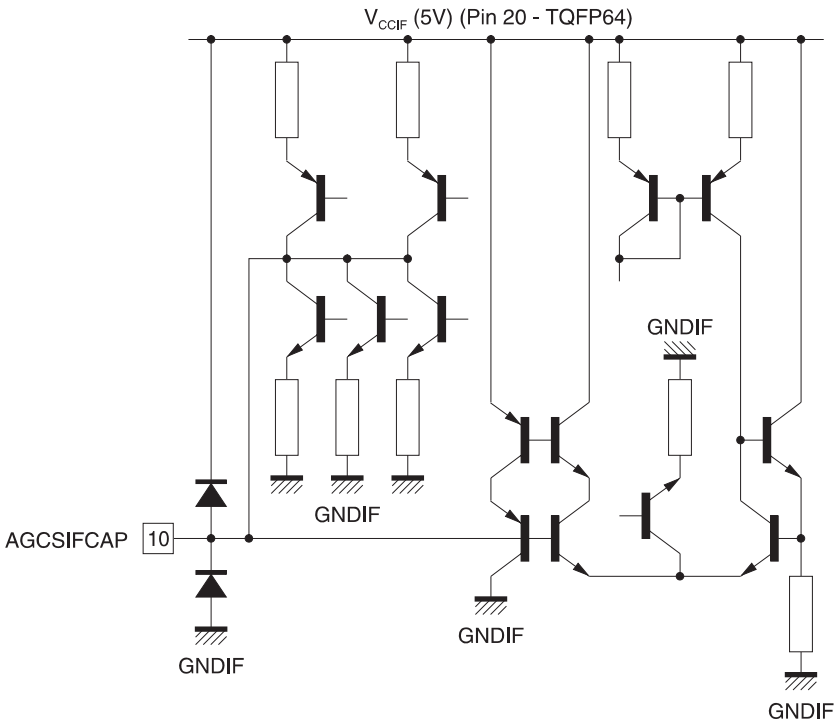


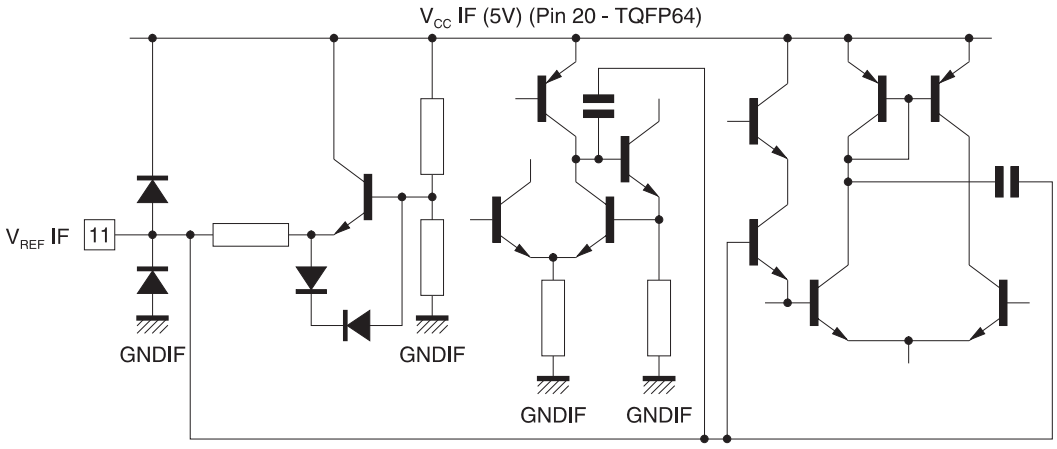
INPUT/OUTPUT SCHEMATIC DIAGRAMS (STV2238D) (TQFP64) (continued)



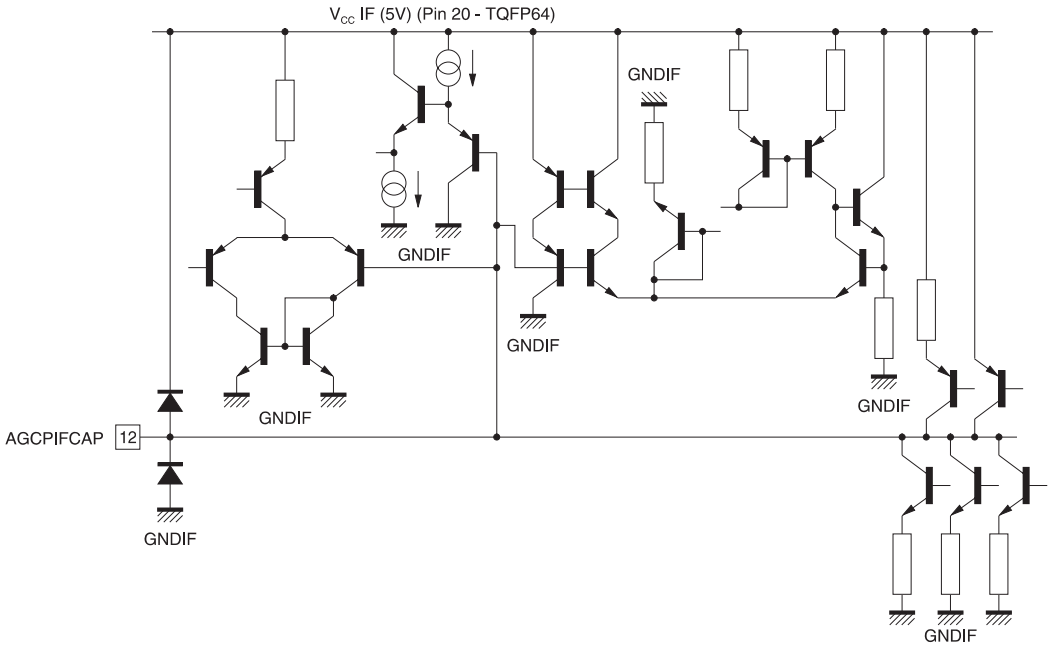


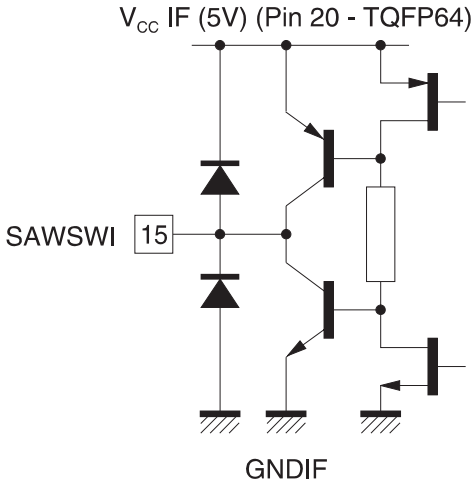
INPUT/OUTPUT SCHEMATIC DIAGRAMS (STV2238D) (TQFP64) (continued)

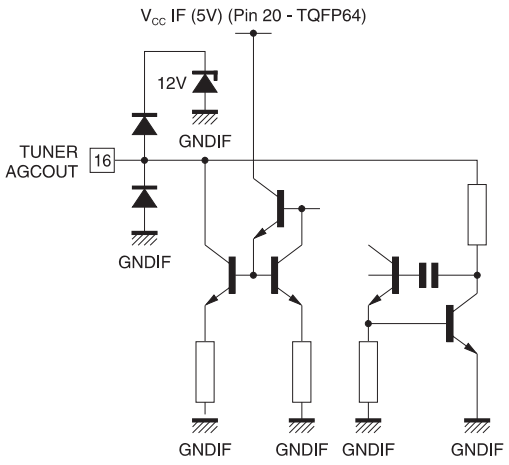




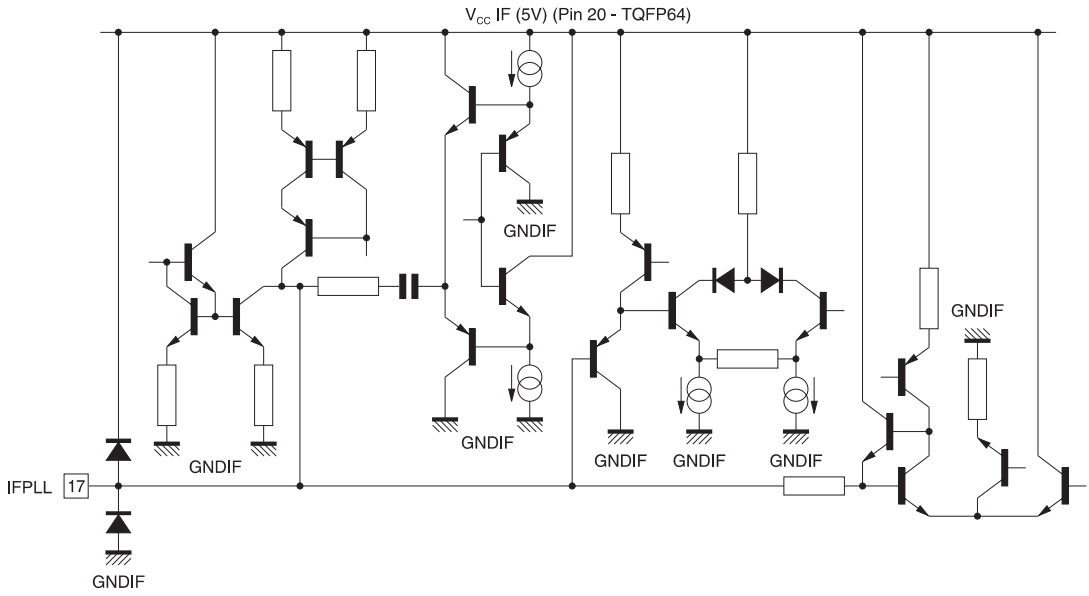
INPUT/OUTPUT SCHEMATIC DIAGRAMS (STV2238D) (TQFP64) (continued)

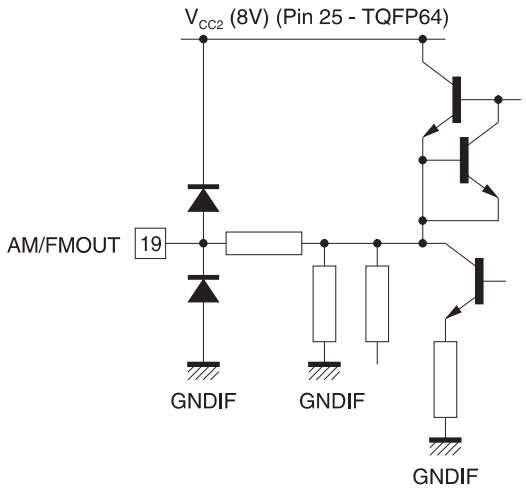




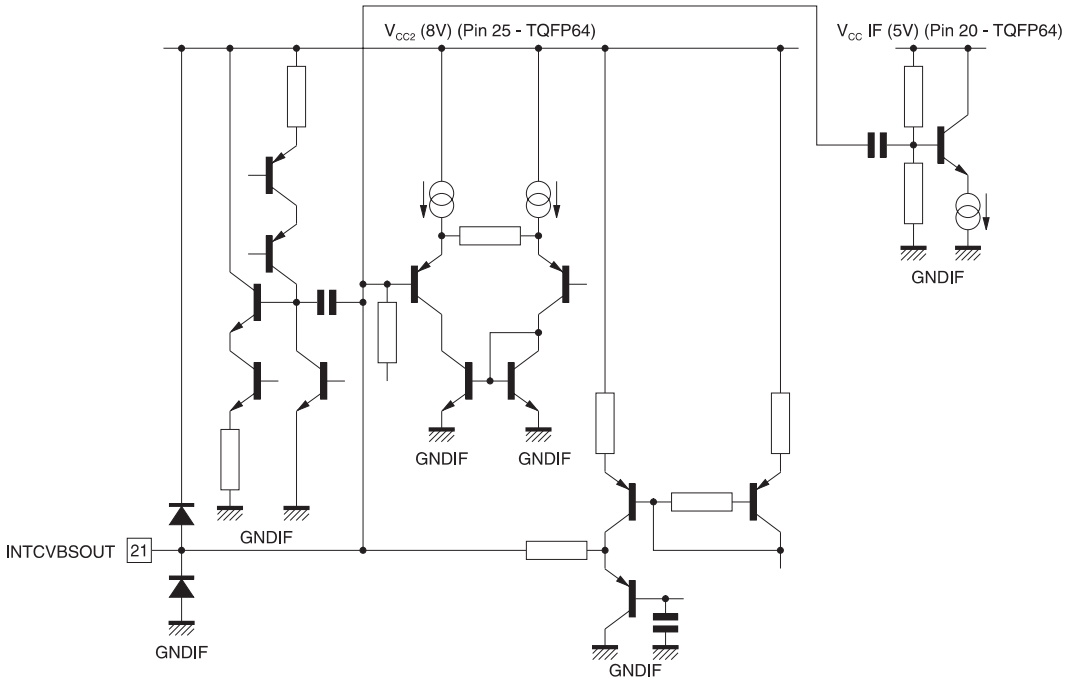


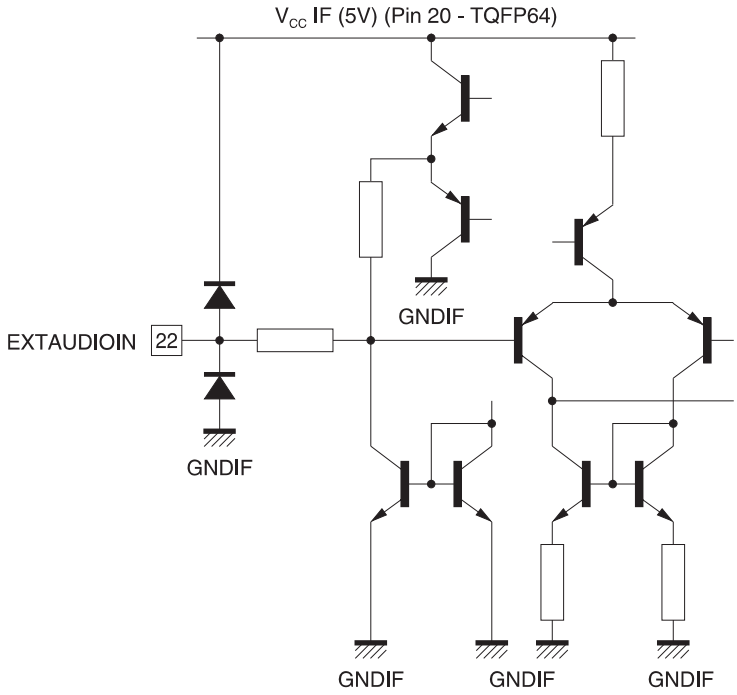
INPUT/OUTPUT SCHEMATIC DIAGRAMS (STV2238D) (TQFP64) (continued)



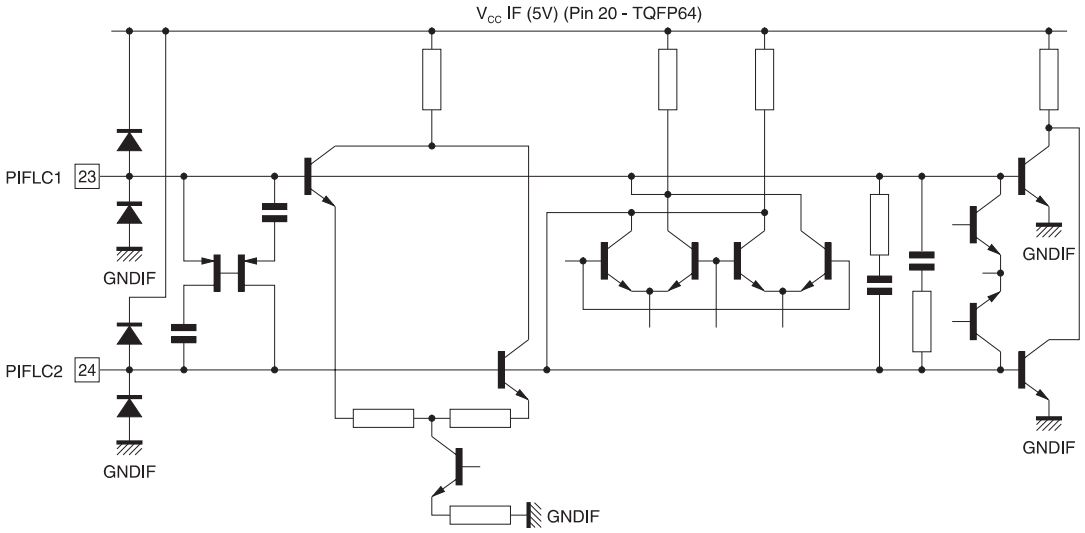


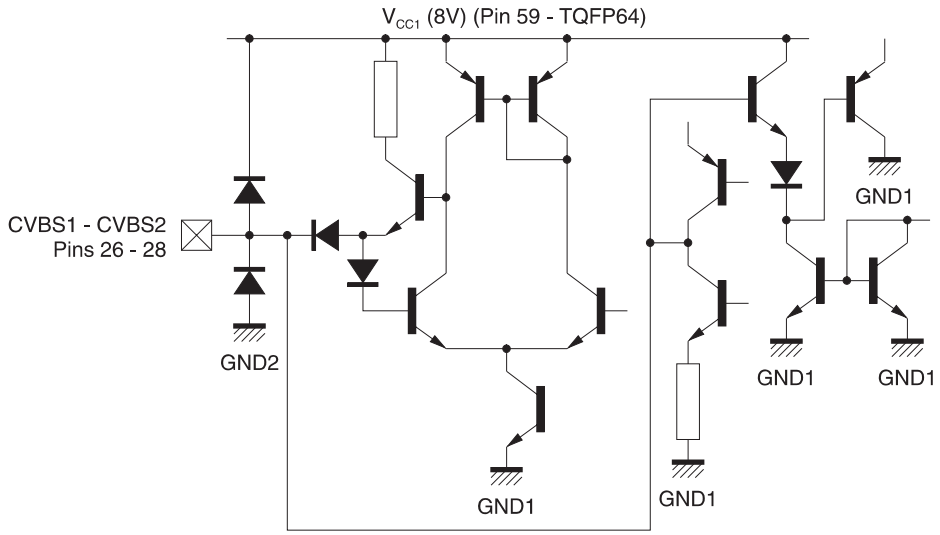
INPUT/OUTPUT SCHEMATIC DIAGRAMS (STV2238D) (TQFP64) (continued)



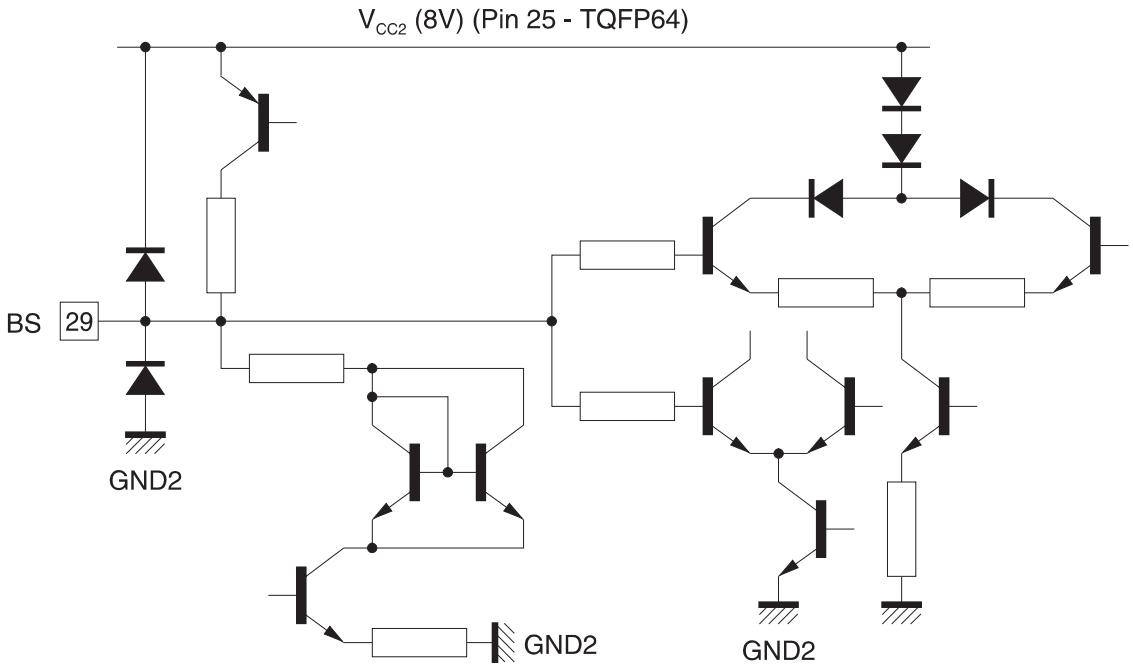


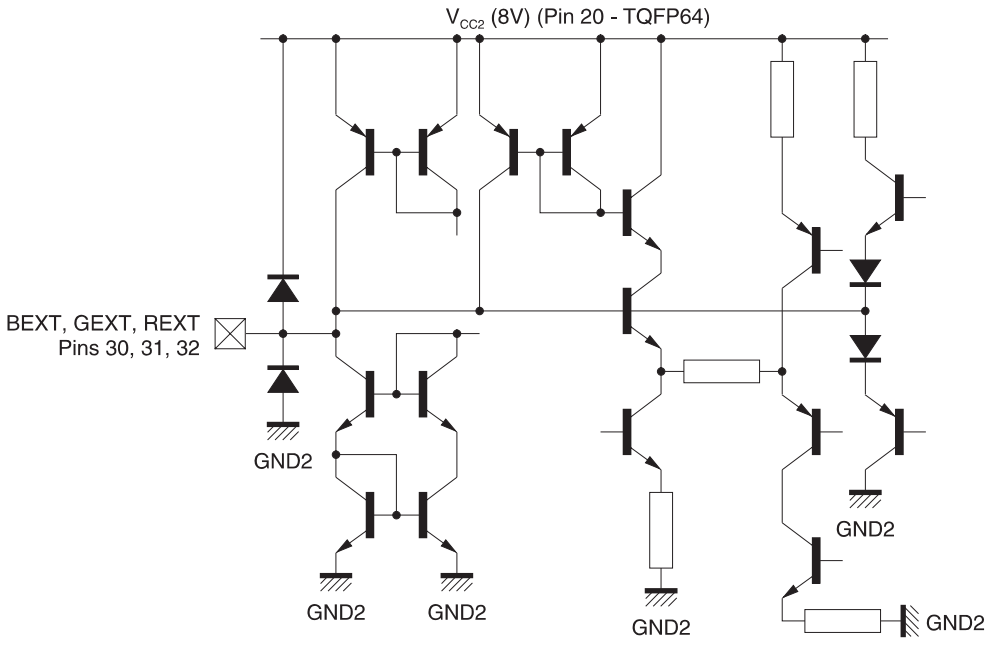
INPUT/OUTPUT SCHEMATIC DIAGRAMS (STV2238D) (TQFP64) (continued)



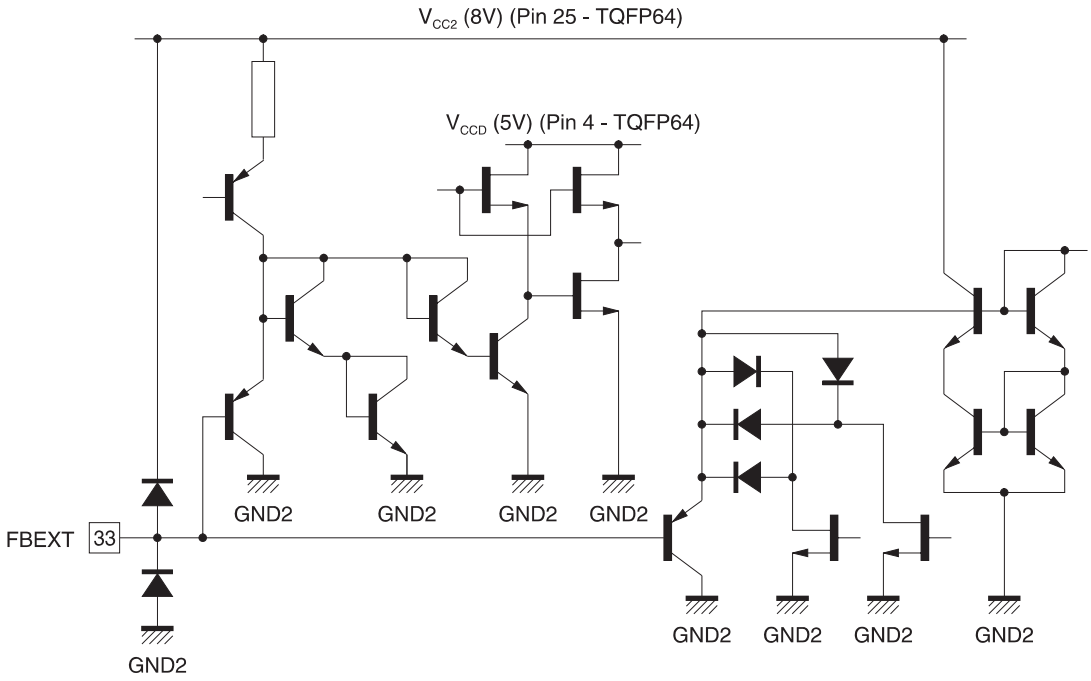


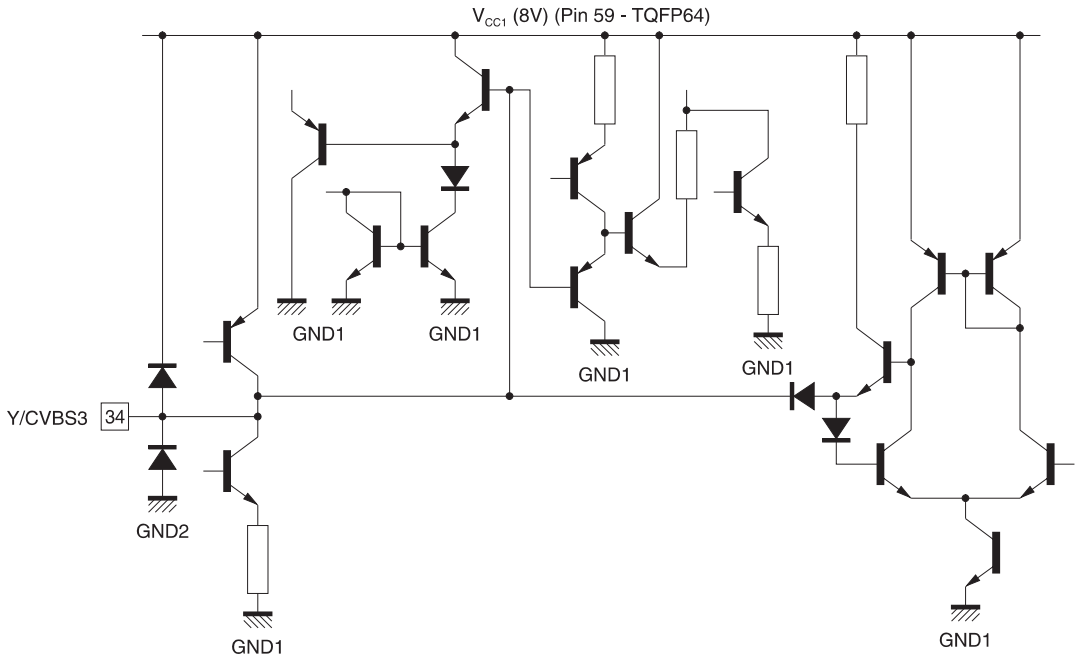
INPUT/OUTPUT SCHEMATIC DIAGRAMS (STV2238D) (TQFP64) (continued)



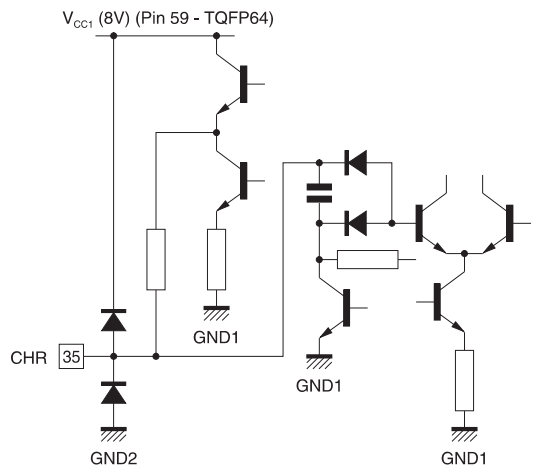


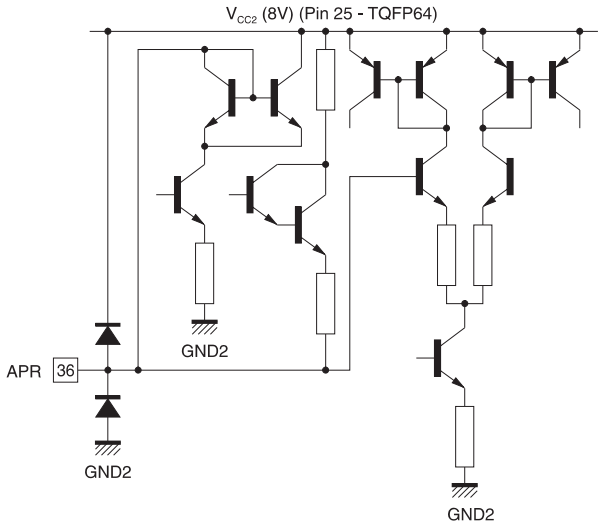
INPUT/OUTPUT SCHEMATIC DIAGRAMS (STV2238D) (TQFP64) (continued)

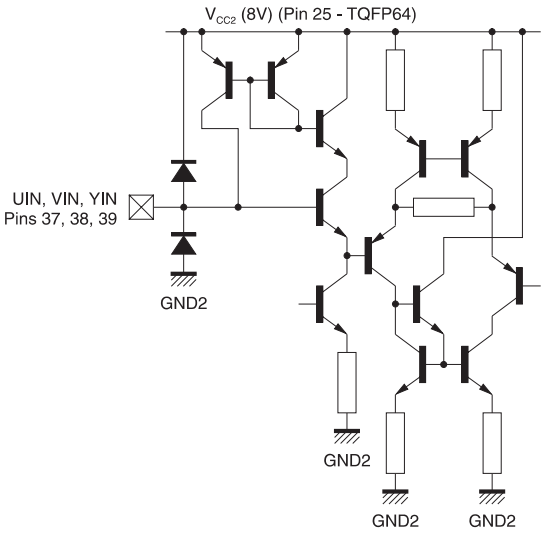


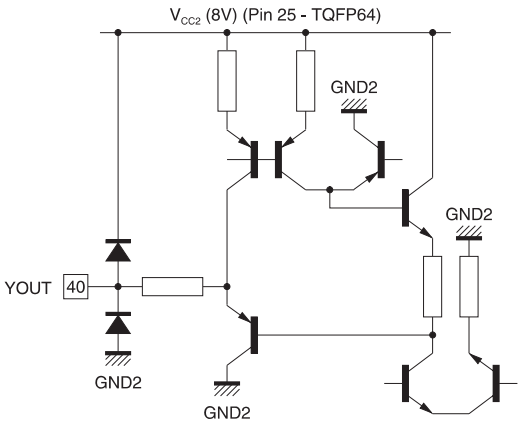


INPUT/OUTPUT SCHEMATIC DIAGRAMS (STV2238D) (TQFP64) (continued)

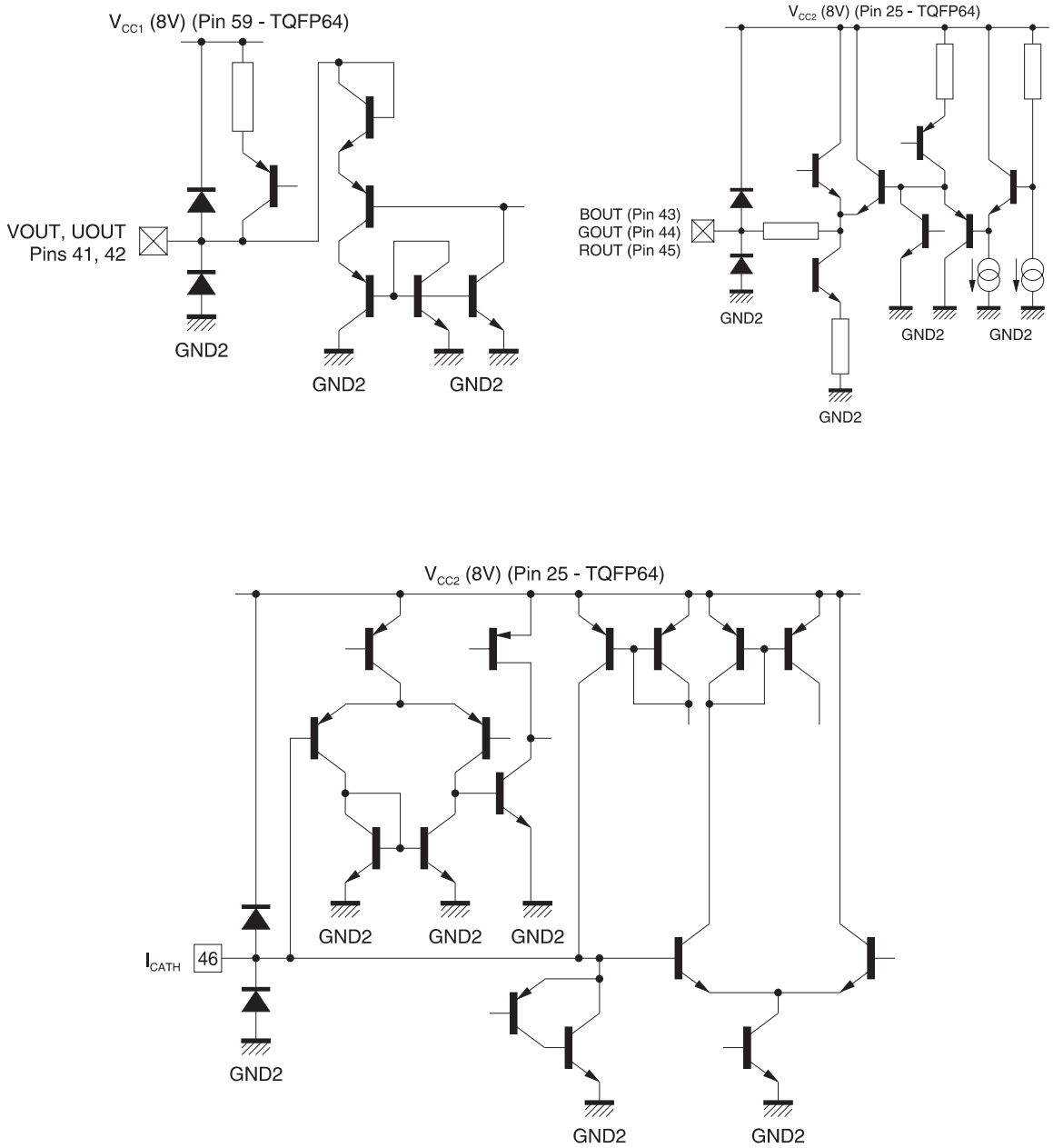




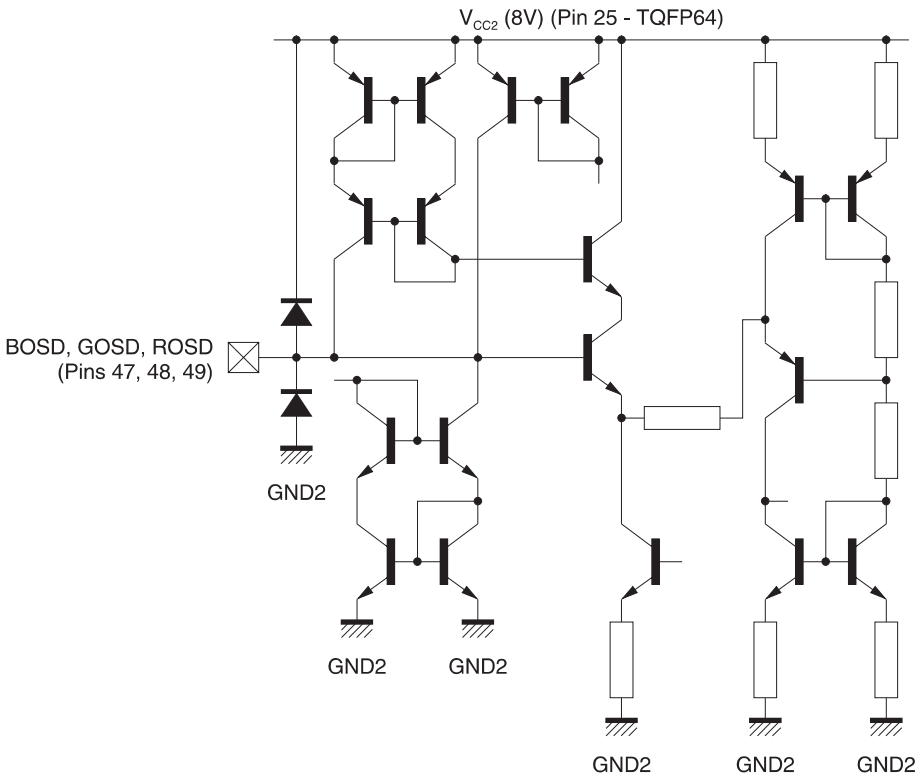


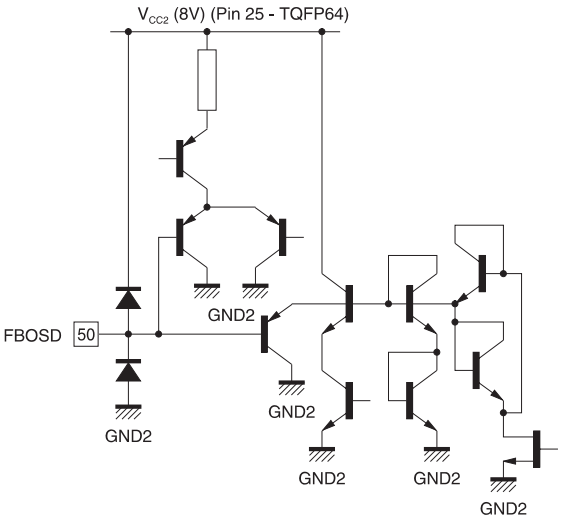


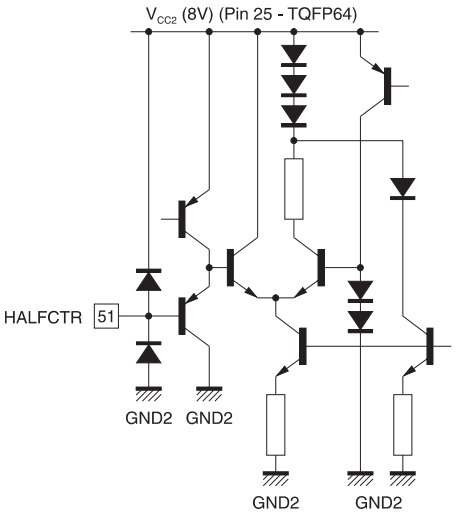
INPUT/OUTPUT SCHEMATIC DIAGRAMS (STV2238D) (TQFP64) (continued)



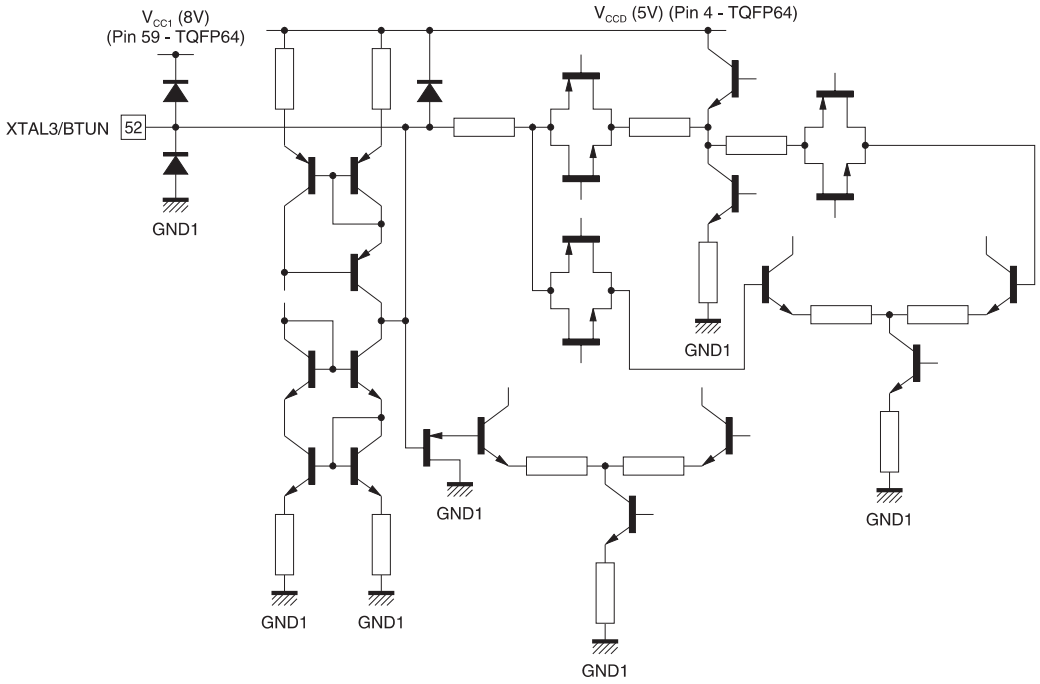
INPUT/OUTPUT SCHEMATIC DIAGRAMS (STV2238D) (TQFP64) (continued)

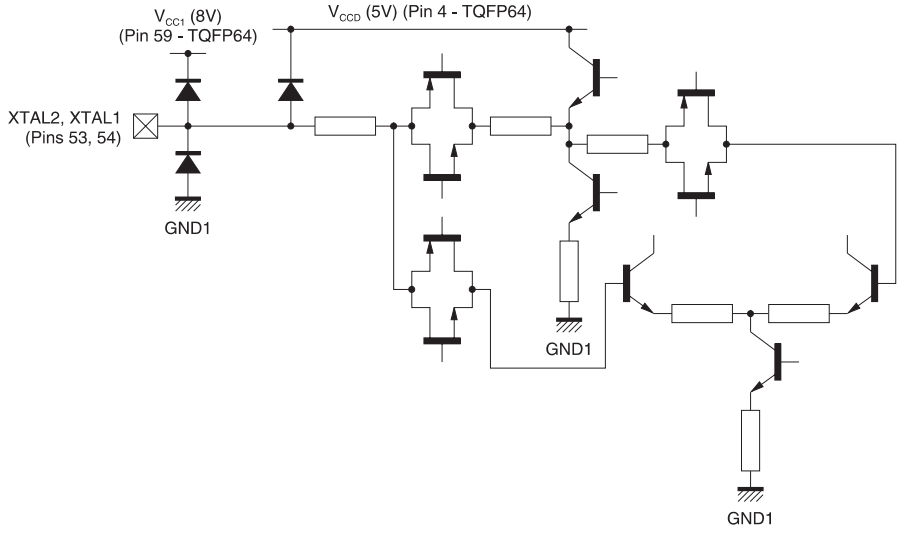




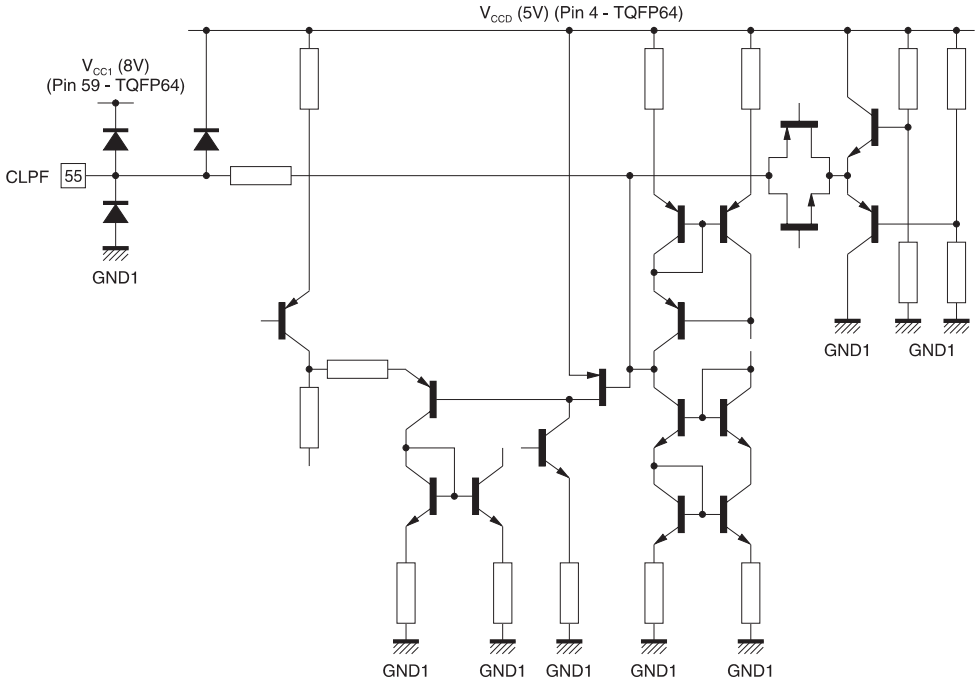


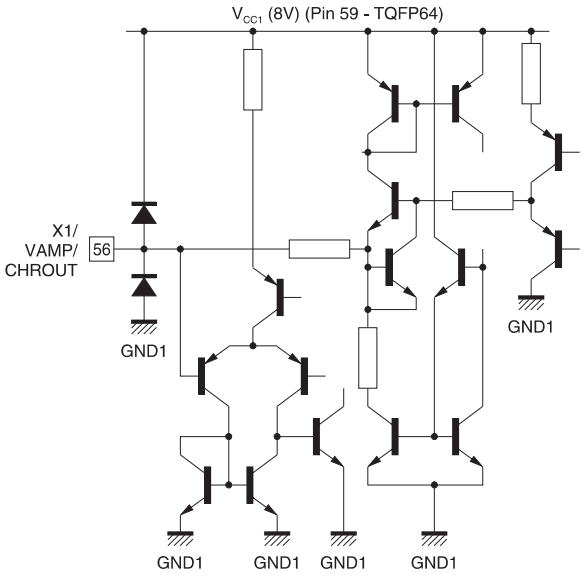
INPUT/OUTPUT SCHEMATIC DIAGRAMS (STV2238D) (TQFP64) (continued)

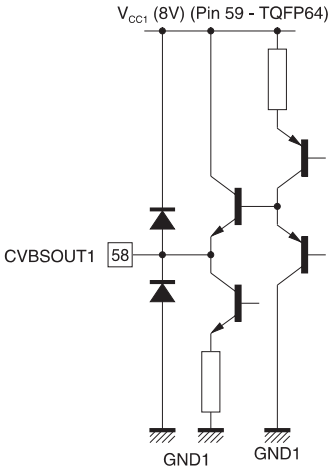




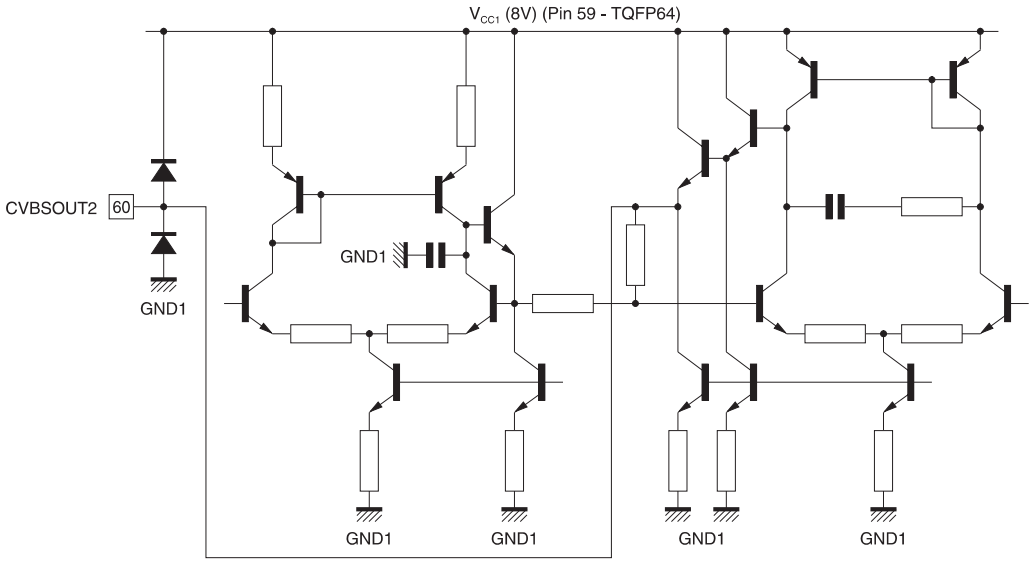
INPUT/OUTPUT SCHEMATIC DIAGRAMS (STV2238D) (TQFP64) (continued)

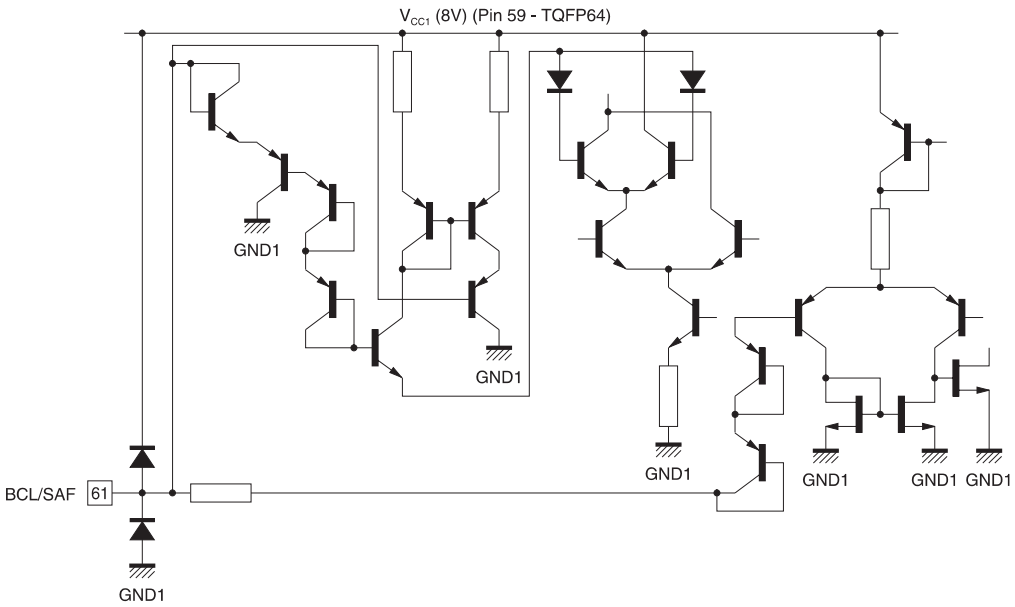




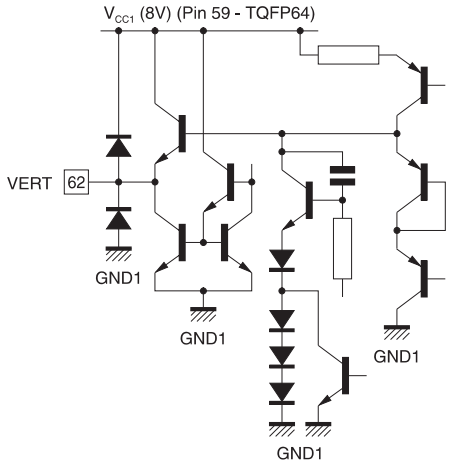


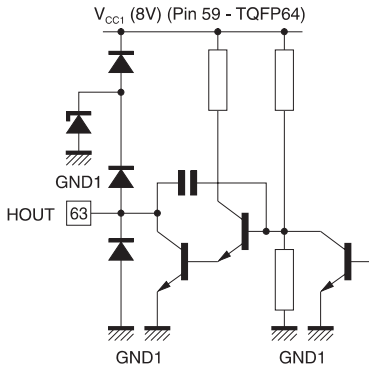
INPUT/OUTPUT SCHEMATIC DIAGRAMS (STV2238D) (TQFP64) (continued)

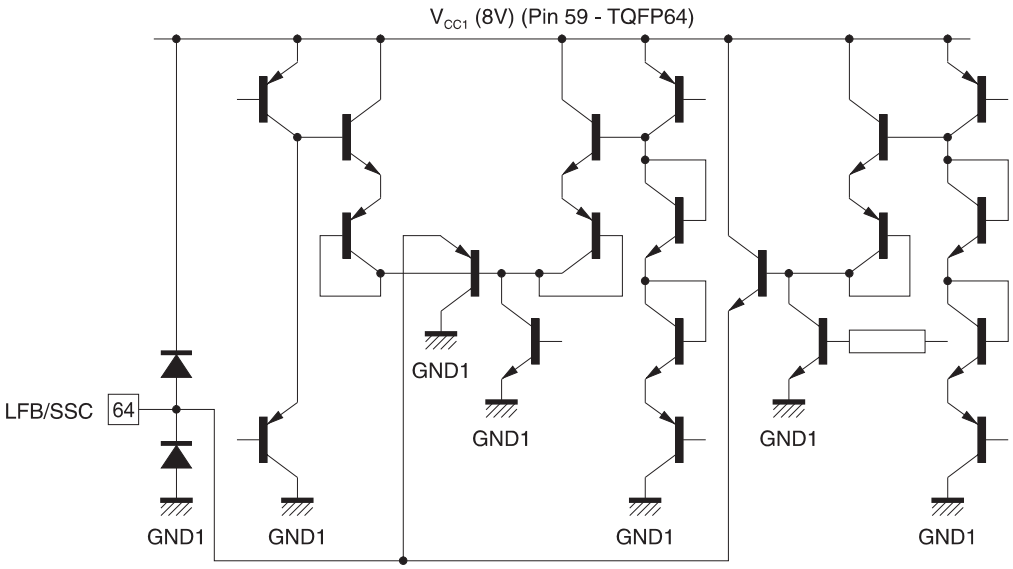


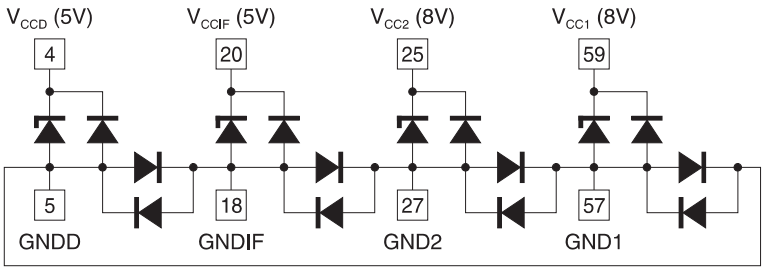


INPUT/OUTPUT SCHEMATIC DIAGRAMS (STV2238D) (TQFP64) (continued)

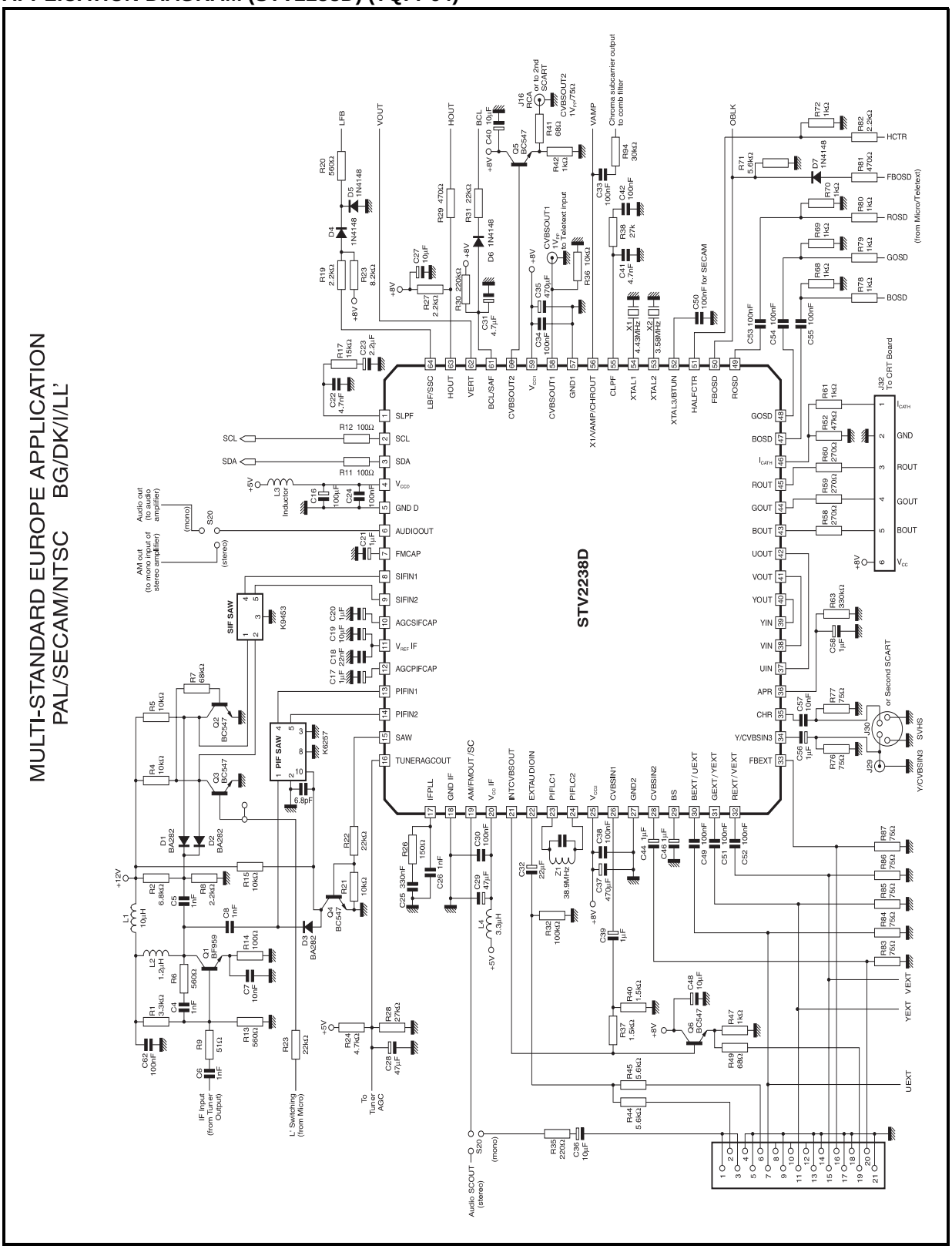




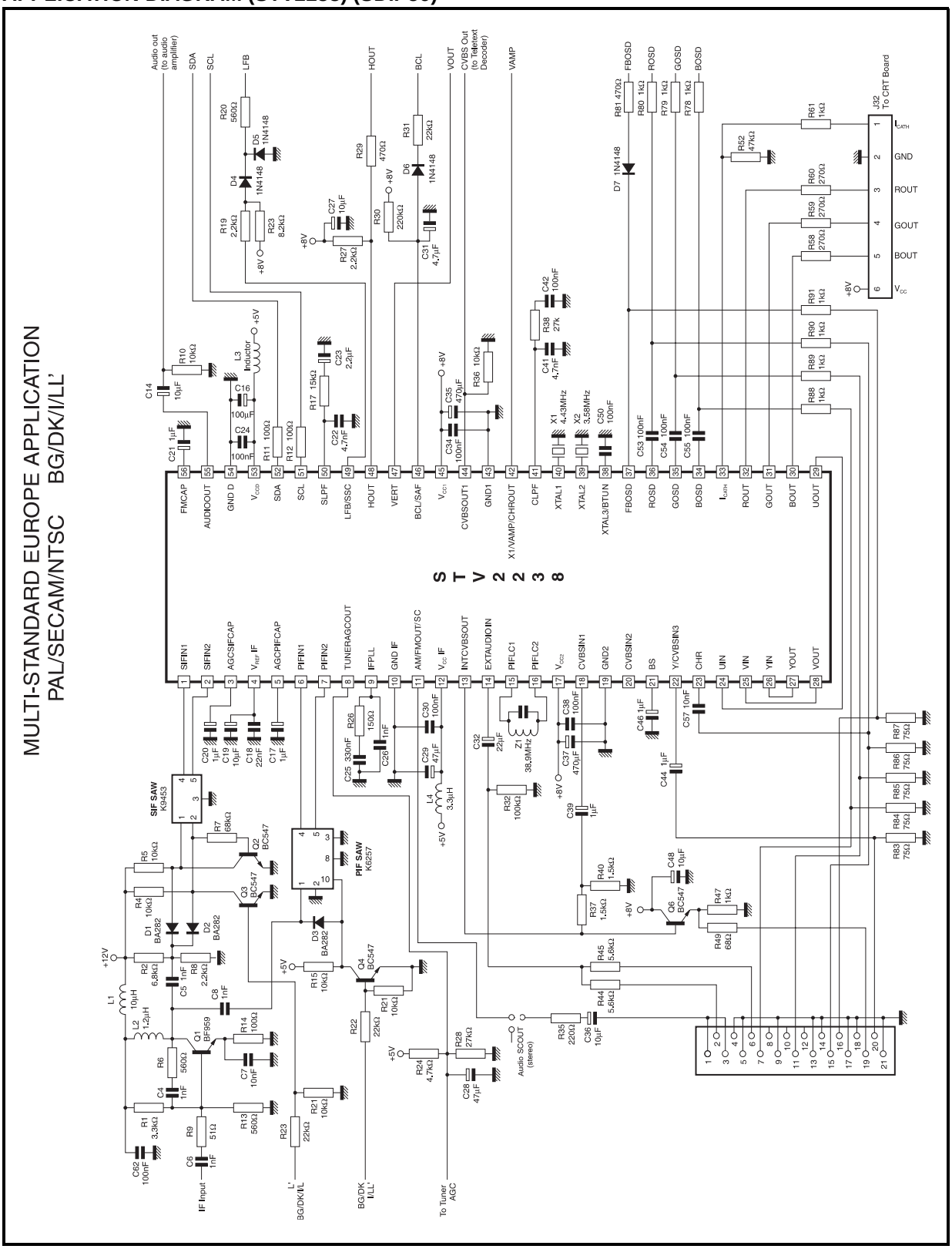




APPLICATION DIAGRAM (STV2238D) (TQFP64)

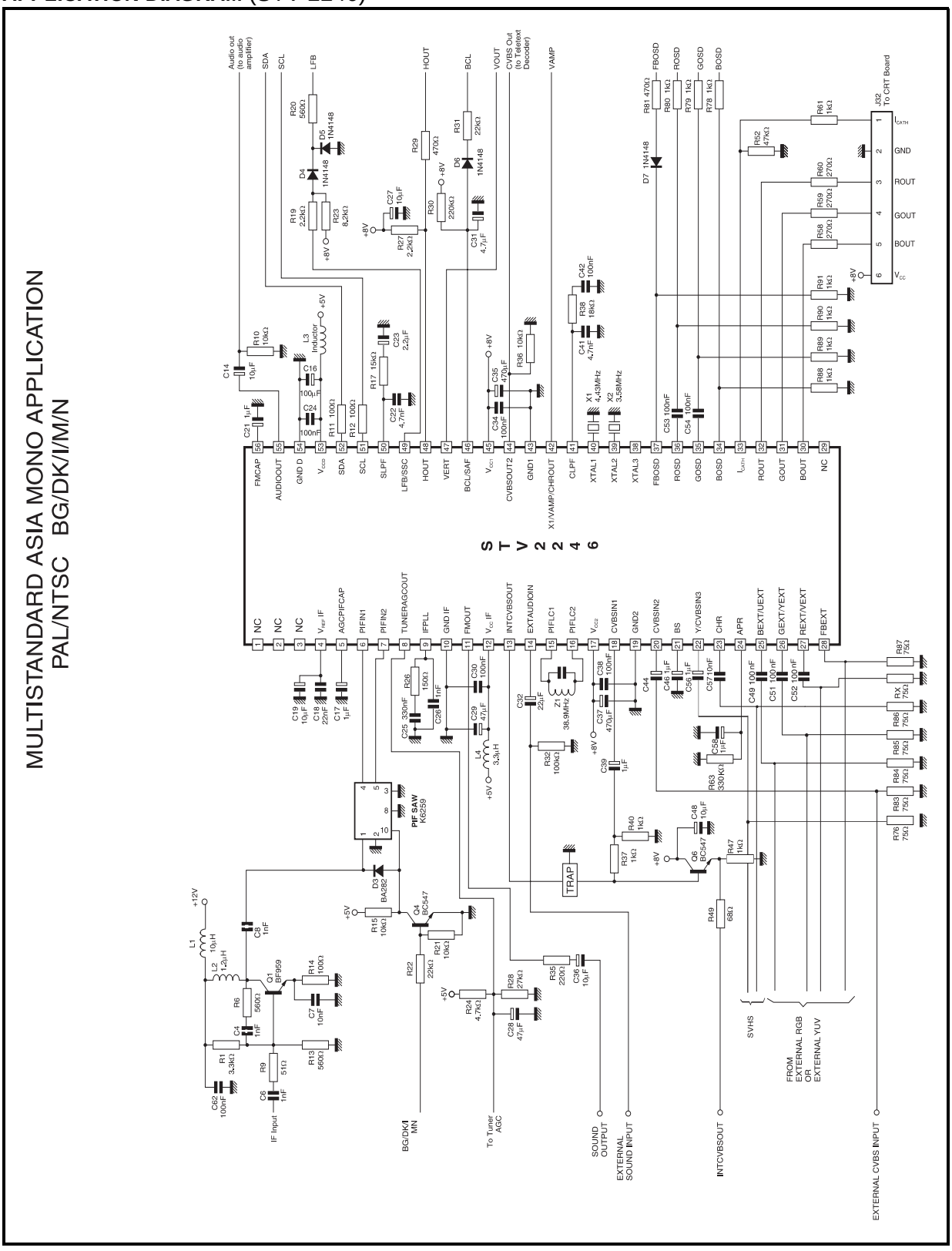


APPLICATION DIAGRAM (STV2238) (SDIP56)

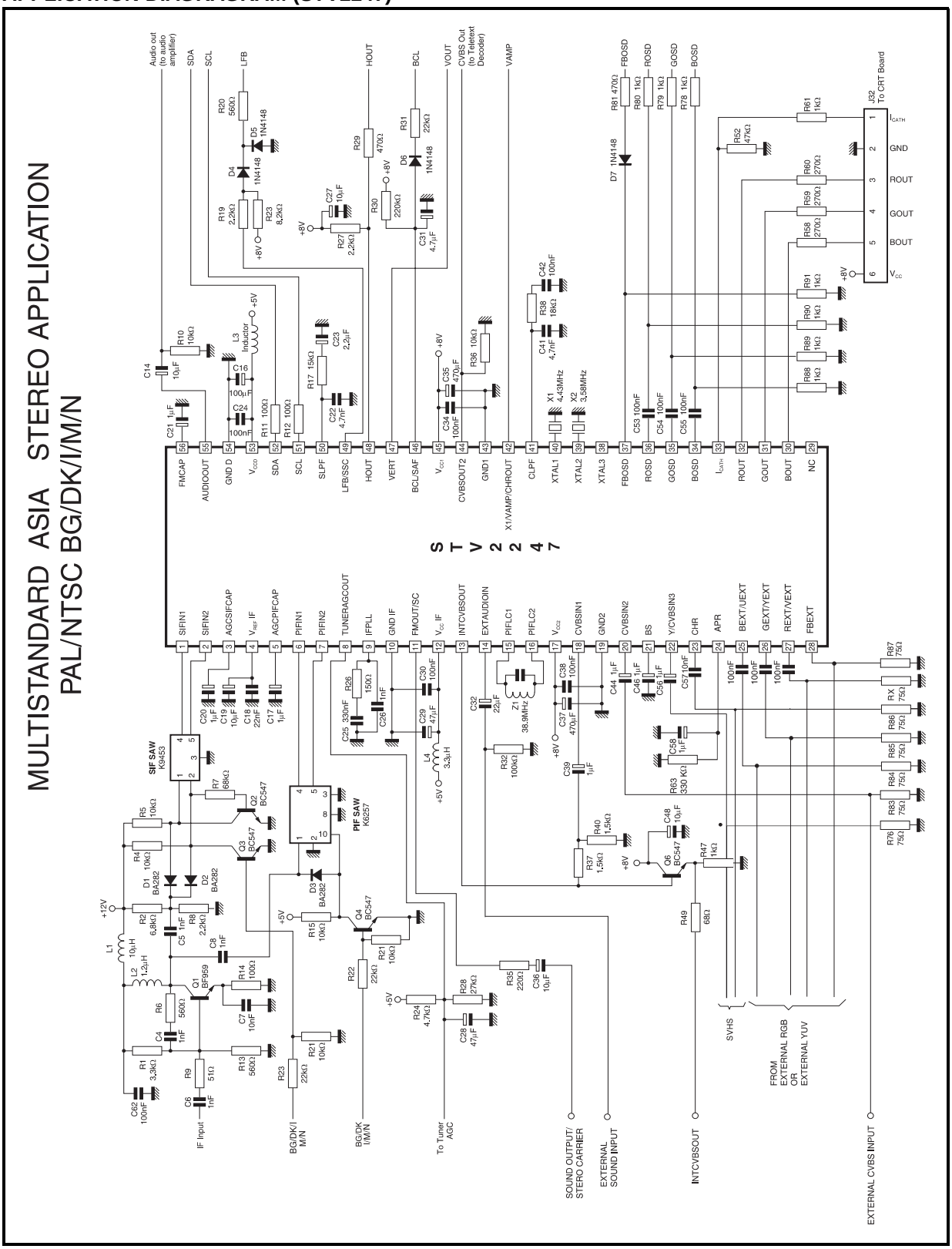


APPLICATION DIAGRAM (STV 2246)

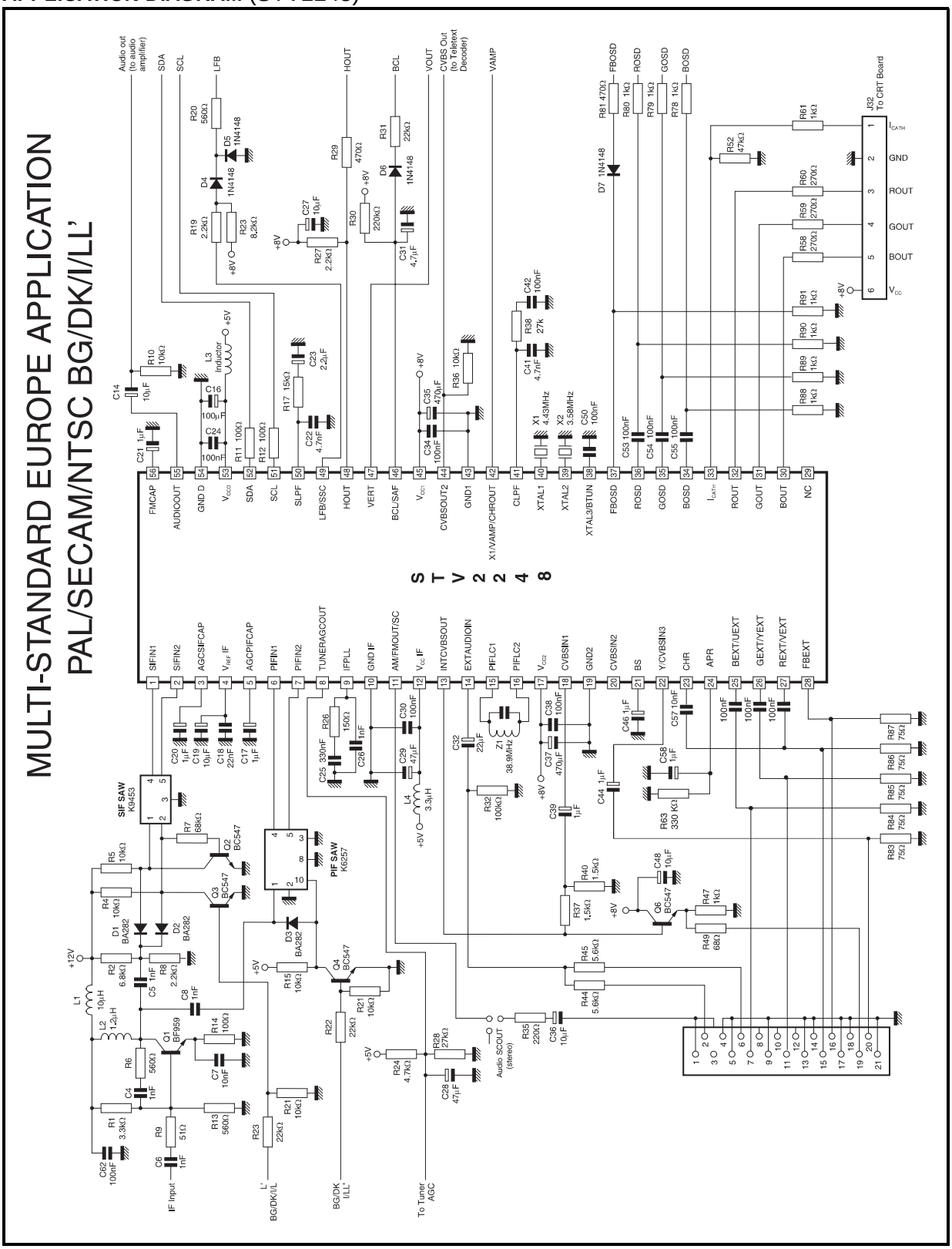
MULTISTANDARD ASIA MONO APPLICATION
PAL/NTSC BG/DK/I/M/N



APPLICATION DIAGRAGRAM (STV2247)

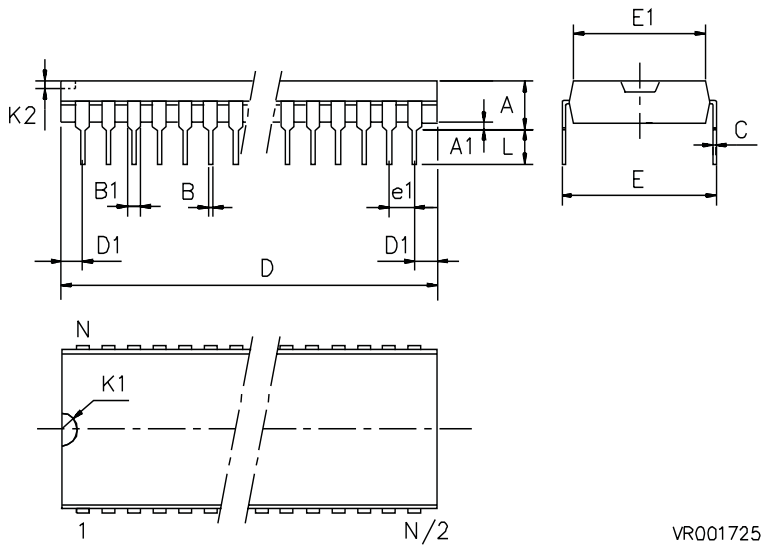


APPLICATION DIAGRAM (STV2248)



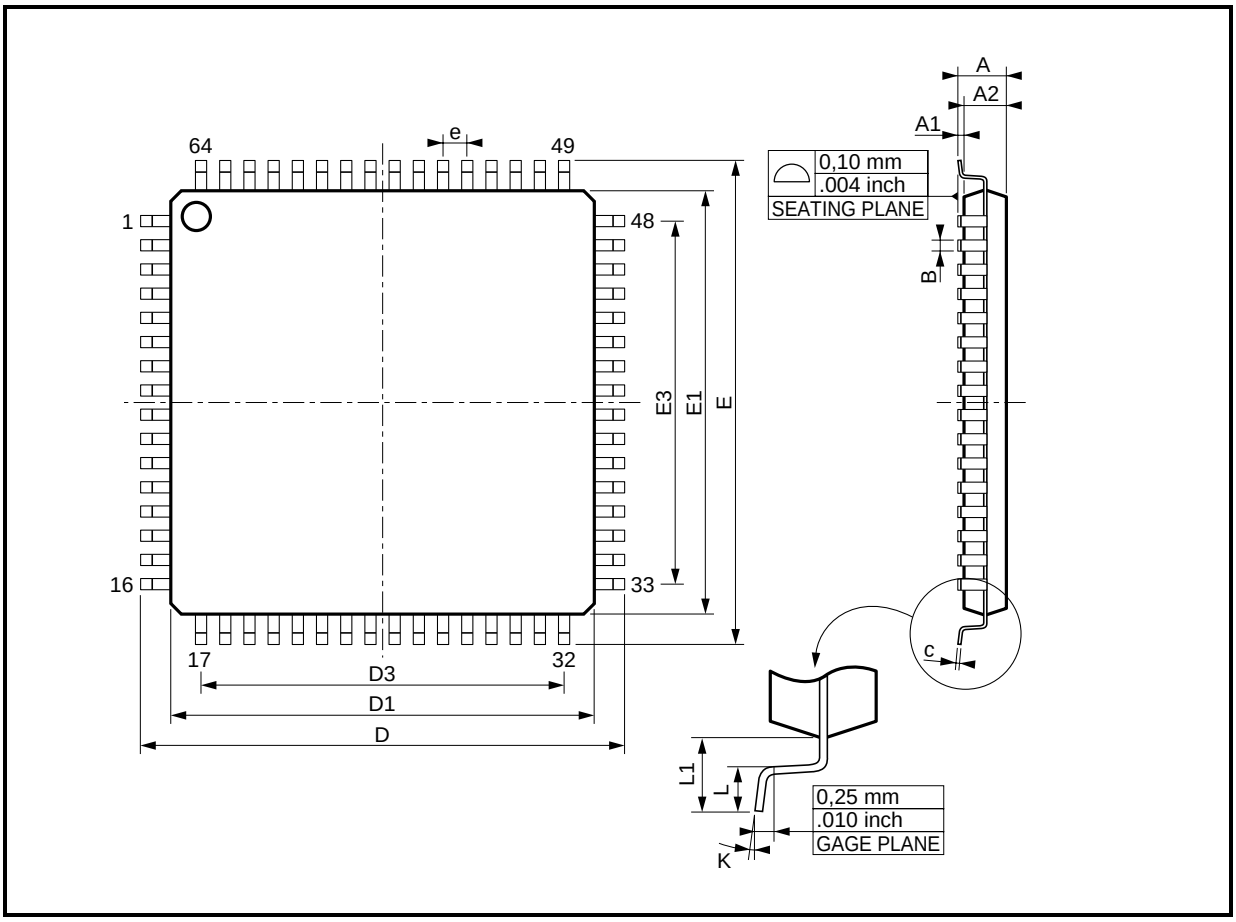
PACKAGE MECHANICAL DATA

56 Pin — Plastic Shrink DIP (SDIP)



Dimensions	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			5.08			0.200
A1	0.51			0.020		
B	0.35		0.59	0.014		0.023
B1	0.75		1.42	0.030		0.056
C	0.20		0.36	0.008		0.014
D		52.12			2.052	
D1	-	-	-	-	-	-
E		15.24				0.730
E1		13.72				0.540
K1	-	-	-	-	-	-
K2	-	-	-	-	-	-
L	2.54		3.81	0.100		0.150
e1		1.78			0.070	

64 Pin — Thin Plastic Quad Flat Pack (TQFP)



Dimensions	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			1.60			0.063
A1	0.05		0.15	0.002		0.006
A2	1.35	1.40	1.14	0.053	0.055	0.057
B	0.30	0.37	0.45	0.0118	0.0146	0.0177
C	0.09		0.20	0.0035		0.0079
D		16.00			0.630	
D1		14.00			0.551	
D2		12.00			0.472	
e		0.80			0.0315	
E		16.00			0.0630	
E1		14.00	1		0.551	
E3		12.00			0.472	
L	0.45	0.60	0.75	0.018	0.024	0.030
L1		1.00			0.039	
K	0^o (Mon.), 7^o (Max.)					