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NTE7148 Integrated Circuit Color TV Single-Chip Signal Processor for NTSC Systems (PLL Detection)

Description:

The NTE7148 is an integrated circuit in a 52-Lead DIP type package designed for use in color TVs based on the NTSC (National Television System Committee) system with an on-chip circuit for all VIF, SIF, video, chroma, and deflection signal processing.

Functions and Features:

VIF

- PLL Detection (High Video and Audio Quality)
- High-Gain VIF Amplifier
- High Speed AGC
- On-Chip APC Time Constant Switch

SIF

- Simultaneous Sound IN/OUT
- Video/Audio Simultaneous Muting, or Audio-Only Muting Possible

Audio-Visual Switch

- Internal/External Audio-Visual Switch ($V_{CC} = 9V$)

Delay Line	Video External, Audio External	Switch Rating
OFF	IN	6.9V to 9.0V
OFF	EXT	4.7V to 6.6V
ON	EXT	2.4V to 4.3V
ON	IN	0V to 2.1V

OSD

- RGB 3 Input
- RGB Linear Amplifier (-6dB Input: 2V to 5V)
- Fast Blanking (B Input Combined Use)

Chroma

- On-Chip ACC Filter
- On-Chip Killer Filter
- Killer-Circuit Hysteresis Operation
- On-Chip Carrier Filter

Video

- Black Enhancement
- DC Playback
- On-Chip Delay Line
- Wideband Width (9MHz): Delay Line Short
- Dual Rank On-Chip Differential Circuit Also Available for Soft Also
- S Input Supported (VCR Application)
- Variable DC Transmission Volume Available

Deflection

- Adjustment-Free Horizontal, Vertical Synchronization
- Dual AFC System with Excellent Anti-Noise Characteristics
- External Adjustmant of Vertical Synchronization Sensitivity
- Vertical Size is Constant with No-Signal
- Highly Stable Image During Playback of Copy Protected tapes (Macro-Vision Tape etc.)
- High Stability Against VCR Skew Distortion

Absolute Maximum Ratings: ($T_A = +25^\circ\text{C}$ unless otherwise specified)

Maximum Supply Voltage, $V_{11\text{max}}$	11V
Maximum Supply Voltage, $V_{14\text{max}}$	11V
Maximum Supply Current, $I_{30\text{max}}$	16mA
Circuit Current, I_{44}	-6mA
Circuit Current, I_6	-3mA
FBP Input Current (Peak Current), $I_{22\text{max}}$	5mA
FBP Input Current (Peak Current), $I_{21\text{max}}$	10mA
Allowable Power Dissipation ($T_A \leq +60^\circ\text{C}$), $P_{D\text{max}}$	1.35W
Operating Temperature Range, T_{opr}	-10° to +65°C
Storage Temperature Range, T_{stg}	-55° to +150°C

Recommended Operating Conditions: ($T_A = +25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Supply Voltage	V_{11}		-	9	-	V
	V_{14}		-	9	-	V
Supply Current	I_{30}		-	13	-	mA
Operating Voltage Range	$V_{11\text{op}}$		8.0	-	9.5	V
	$V_{14\text{op}}$		8.0	-	9.5	V
Operating Current Range	$I_{30\text{op}}$		10	-	16	mA

Electrical Characteristics: ($T_A = +25^\circ\text{C}$, $V_{CC} = V_{11} = V_{14} = 9\text{V}$, $I_{CC} = I_{30} = 13\text{mA}$ unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Circuit Voltage and Current						
Horizontal Supply Voltage	V_{30}	$V_{CC} = 9\text{V}$, $I_{CC} = 13\text{mA}$	7.3	7.8	8.3	V
Supply Current	I_{11+14}	$V_{CC} = 9\text{V}$, $I_{CC} = 13\text{mA}$, $I_F \text{ AGC } 4\text{V}$	102	120	138	mA
VIF						
Quiescent Video Output Voltage	V_{44}	Quiescent	4.3	4.7	5.1	V
Quiescent AFT Output Voltage	V_{47}	Quiescent	3.1	4.7	6.1	V
Maximum RF AGC Voltage	$V_{49\text{H}}$	$CW = 85\text{dB}\mu$, RF AGC VR = Min	7.6	8.0	8.3	V
Minimum RF AGC Voltage	$V_{49\text{L}}$	$CW = 85\text{dB}\mu$, RF AGC VR = Max	0	0.01	0.3	V
Input Sensitivity	V_i	VIF input level for video output at 0.9 V_{P-P} (40% MOD)	33	39	45	$\text{dB}\mu$
AGC Range	GR	Max input ($V_0 = 0.8V_{P-P}$) - input sensitivity	54	62	70	dB
Maximum Permissible Input	$V_{i\text{max}}$	VIF input level for video output at +1dB	97	104	111	$\text{dB}\mu$
Video Output Detection	V_{O44}	$V_i = 80\text{dB}\mu$, AM = 78% MOD	1.7	2.0	2.3	V_{P-P}
Differential Gain	DG	$V_i = 80\text{dB}\mu$, AM = 87.5%, video MOD	-	3.0	10	%
Differential Phase	DP	$V_i = 80\text{dB}\mu$, AM = 87.5%, video MOD	-	1.0	10	DEG
Video S/N	S/N	$V_i = 80\text{dB}\mu$, $20 \log \frac{1.46 (V_{P-P})}{\text{noise } (V_{\text{rms}})}$	47	54	61	dB
Synchronization Signal Tip Level	$V_{44 \text{ TIP}}$	$CW = 80\text{dB}\mu$	2.1	2.4	2.7	V
Frequency Characteristics	f_C	Frequency at video output of -3dB	6	9	12	MHz
9200kHz VIF Intermodulation	I_{920}	$V/3.58\text{MHz}/V/920\text{kHz}$, $V_i = 80\text{dB}\mu$	35	42	49	dB

Electrical Characteristics (Cont'd): ($T_A = +25^\circ\text{C}$, $V_{CC} = V_{11} = V_{14} = 9\text{V}$, $I_{CC} = I_{30} = 13\text{mA}$ unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
VIF (Cont'd)						
Maximum AFT Output Voltage	V_{47H}	CW = 80dB μ , frequency change	8.3	8.7	9.0	V
Minimum AFT Output Voltage	V_{47L}	CW = 80dB μ , frequency change	0.1	0.3	0.8	V
AFT Detection Sensibility	S_f	CW = 80dB μ , frequency change	45	70	100	mV/kHz
AFT Switch Operation Start Voltage	V_{AFTSW}	Measuring with sweep signal	0.5	1.0	1.5	V
Black Noise Threshold Level	V_{BTH}	Measuring with sweep signal	1.1	1.4	1.7	V
APC Pull-In Range (U)2	f_{PU-2}	CW = 80dB μ , $f_p = 53\text{MHz}$ to 64MHz	0.8	1.7	4.0	MHz
APC Pull-In Range (L)2	f_{PL-2}	CW = 80dB μ , $f_p = 53\text{MHz}$ to 64MHz	–	–2	–1	MHz
VCO Maximum Variable Range	Δf_U	Quiescent	0.9	1.7	4.0	MHz
	Δf_L	Quiescent	–4	–2	–1	MHz
VCO Control Sensitivity	β	Quiescent	1.5	3.0	5.5	kHz/mV
Audio–Visual Switches						
Video Output DC Voltage	V_{38}	Quiescent	3.0	3.4	3.8	V
Internal Video Input Voltage	V_{42}	Quiescent	4.4	4.8	5.2	V
External Video Input Voltage	V_{40}	Quiescent	4.4	4.8	5.2	V
External Audio Input Voltage	V_3	Quiescent	5.2	5.6	6.0	V
SIF AF						
SIF Limiting Voltage	V_{lim}	SIF output level for detection output at –3dB	33	40	47	dB μ
FM Detection Output Voltage	V_{O1}	$V_i = 100\text{dB}\mu$, $\Delta f = \pm 25\text{kHz}$	440	550	670	mV $_{rms}$
FM Detection Output Distortion Ratio	THD	$V_i = 100\text{dB}\mu$, $\Delta f = \pm 25\text{kHz}$	0	0.4	1.0	%
AM Rejection	AMR	$V_i = 80\text{dB}\mu$, $\frac{\text{FM: } \Delta f = \pm 25\text{kHz}}{\text{AM: } 30\%}$	40	60	80	dB
AF Amplifier Voltage Gain	G_{AF}	$V_i = 100\text{mV}_{rms}$, $f = 400\text{Hz}$	18	20	22	dB
AF Maximum Output Voltage	$V_{O6 \text{ max}}$	Output level for AF amplifier output distortion at 10%	2.0	2.8	3.6	V $_{rms}$
AF Electronic Attenuator Range	ATT	$V_i = 200\text{mV}_{rms}$, $f = 400\text{Hz}$	70	80	100	dB
Video						
Black Enhancement Threshold	B_{STH}	APL variable	40	50	60	IRE
Maximum Black Enhancement Gain	B_{Smax}	APL variable	–35	–27	–20	IRE
Soft Video Tone Variable Range	Δ_{Soft}	$f = 2\text{MHz}$, 100mV_{P-P} , video tone VR: 4V \rightarrow 0V	–6	–4	–2	dB
Sharp Video Tone Variable Range	Δ_{Sharp}	$f = 2\text{MHz}$, 100mV_{P-P} , video tone VR: 4V \rightarrow 9V, contrast VR: 6V	7	10	13	dB
Video Voltage Gain Audio–Visual Switch 9V	GV9V	$f = 100\text{MHz}$, 100mV_{P-P} contrast VR: 9V, video, tone VR: 4V	15	18	21	dB
Video Voltage Gain Audio–Visual Switch 0V	GV0V	$f = 100\text{MHz}$, 100mV_{P-P} contrast VR: 0V, video tone VR: 4V	15	18	21	dB

Electrical Characteristics (Cont'd): ($T_A = +25^\circ\text{C}$, $V_{CC} = V_{11} = V_{14} = 9\text{V}$, $I_{CC} = I_{30} = 13\text{mA}$ unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Video (Cont'd)						
Contrast Control Center	C_{CEN}	$f = 100\text{MHz}$, 100mV_{P-P} , contrast VR: 6V	0.40	0.48	0.57	V_{P-P}
Contrast Variable Control Range	ΔC_V	Contrast VR: 3V \rightarrow 9V	18	20	22	dB
Bright Control	B R_H	Bright VR: 2V	5.5	6.5	7.5	V
	B R_{CEN}	Bright VR: 4.5V	3.1	3.6	4.1	V
	B R_L	Bright VR: 7.5V	–	0.3	1.2	V
D.L. Off Frequency Characteristics	f_V 9V	Contrast VR: 6V, video tone VR: 4V, 3dB down	7	8	–	MHz
D.L. On Frequency Characteristics	f_V 0V	Contrast VR: 6V, video tone VR: 4V, 3dB down	2.5	3.0	4.0	MHz
DC Transmission	R_{DC}	Input: stair step signal, 500mV_{P-P}	100	103	106	%
Delay Line Delay	T_{DL}	Input: white 100%	290	340	390	ns
Chroma						
ACC Amplitude Characteristics	A_{CC1}	+6dB	–3	0	+3	dB
	A_{CC2}	–20dB	–7	0	+2	dB
ACC Phase Characteristics	A_{CCP1}	+6dB	–3	0	+3	$^\circ\text{C}$
	A_{CCP2}	–20dB	–7	0	+7	$^\circ\text{C}$
Killer Operation Point	E_K		–35	–28	–21	dB
Color Control Color Residual	E_C min	Color VR: 0V, contrast VR: 9V	–	–	50	mV_{P-P}
Color Control Center	E_C CEN	Color VR: 4.5V, contrast VR: 6V	1.2	1.8	2.4	V_{P-P}
Maximum Demodulator Output	E_C max	Color VR: 9V, contrast VR: 9V	3.2	4.0	4.8	V_{P-P}
Color Contrast Variable Range	ΔC_C	Color VR: B–Y = $2.5V_{P-P}$, contrast VR: 3V \rightarrow 9V	17.5	19.5	21.5	dB
Tint Color Center	T_{CEN}	Tint VR: 4.5V, color VR: 4.5V, contrast VR: 6V	0	12	24	$^\circ\text{C}$
Tint Variable Range	ΔT	Tint VR: 0V \leftarrow 4.5V \rightarrow 8V, color VR: 4.5V, contrast VR: 6V	± 40	± 55	± 70	$^\circ\text{C}$
APC Pull-In Range	Δf_{APC}		± 300	± 500	–	Hz
Demodulator Output Ratio	R/B	Monochrome signal, contrast VR: 6V, color VR: B–Y = $1V_{PO}$	0.81	0.90	0.98	
	G/B		0.24	0.30	0.38	
Demodulator Phase Angle	RB		97	105	113	DEG
	GB		–130	–120	–110	DEG
Demodulator Output DC Voltage	V_{C-Y}	Burst signal only, color VR: 0V	4.7	5.2	5.7	V
Demodulator Output DC Offset Voltage	ΔV_{C-Y}	Burst signal only, color VR: 0V	–200	0	+200	mV
Demodulator Output Residual Carrier	E car	Quiescent, killer off, color VR: 0V	–	–	0.05	V_{P-P}
OSD						
Blanking Pulse Threshold Level	TH_{BL}	C – IN: color bar, B – IN: variable	0.5	0.8	1.1	V
–Y Out DC Voltage (OSD Mode)	V_{-Y}	B – IN: 1.5V	2.5	2.8	3.1	V

Electrical Characteristics (Cont'd): ($T_A = +25^\circ\text{C}$, $V_{CC} = V_{11} = V_{14} = 9\text{V}$, $I_{CC} = I_{30} = 13\text{mA}$ unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
OSD (Cont'd)						
RGB – In Threshold Level	TH _R	R – IN: variable, B – IN: 1.5V	1.9	2.2	2.5	V
	TH _G	G – IN: variable, B – IN: 1.5V				
	TH _B	B – IN: variable				
RGB –Y Out DC Voltage (3V)	V _{R3V}	R, G, B – IN: 3V	5.2	5.5	5.8	V
	V _{G3V}					
	V _{B3V}					
RGB –Y Out DC Voltage (4V)	V _{R4V}	R, G, B – IN: 4V	5.7	6.0	6.3	V
	V _{G4V}					
	V _{B4V}					
RGB –Y Out DC Voltage (5V)	V _{R5V}	R, G, B – IN: 5V	6.2	6.5	6.8	V
	V _{G5V}					
	V _{B5V}					
Deflection						
Sync Separator Input DC Level	V _{SDC}		6.0	6.3	6.6	V
Vertical Free-Running Period	T _{V free}		262.0	262.5	263.0	H
Maximum Vertical Synchronization Period	T _{V max}	Input: horizontal synchronization signal only	296.5	297.0	297.5	H
Minimum Vertical Synchronization Period	T _{V min}		224.5	225.0	225.5	H
Vertical Blanking Pulse Width	P _{W VBL}		20.25	20.50	20.75	H
Vertical Blanking Pulse Wave Height Value	P _{H VBL}		7.0	7.5	–	V
Vertical Output Pulse Width	P _{W VOUT}		8.25	8.50	8.75	H
Vertical Output Voltage	V _{OUT H}		5.7	6.0	6.3	V
	V _{OUT M}		4.2	4.5	4.8	V
	V _{OUT L}		–	0.1	0.3	V
Vertical External Trigger Load Resistance	R _{TR}		2.7	3.6	–	kΩ
Vertical Automatic Synchronization Stop Voltage	V _{SAS}		–	1.9	2.4	V
Vertical Output Pulse Start V _{CC} Voltage	S _{VV}		–	3	4	V
Horizontal Free-Running Frequency Deviation	Δf _H	Deviation from 15.734kHz	–90	+30	+150	Hz
Horizontal Pull-In Range	f _{H PULL}	Deviation from 15.734kHz	±400	±500	–	Hz
Horizontal Output Pulse Width	P _{WH OUT}		21.8	23.8	25.8	μs
Horizontal Output Pulse Phase	H _{PF}		15	17	19	μs
	H _{P CEN}		3.4	4.4	5.4	μs
	H _{PR}		0	3	6	μs
Horizontal Output Pulse Start V _{CC} Voltage	S _{HV}		–	4.5	5.3	V

Electrical Characteristics (Cont'd): ($T_A = +25^\circ\text{C}$, $V_{CC} = V_{11} = V_{14} = 9\text{V}$, $I_{CC} = I_{30} = 13\text{mA}$ unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Deflection (Cont'd)						
AFC II FBP Peak Voltage	F_{BPH}		4.1	4.6	5.1	V
Burst Gate Pulse Delay Time	$T_{d\ BGP}$		0.2	0.6	1.2	μs
Burst Gate Pulse Width	$P_{W\ BGP}$		2.7	3.7	4.7	μs
VCR SW Input Voltage	VCR		–	1.3	2.0	V
X-Ray Protector Circuit Operation Input Voltage	V_{HD}		0.64	0.74	0.84	V
Horizontal Synchronization Detection Threshold Level	H coin		4.2	4.5	4.8	V
Horizontal Output Current	H_{OUT}	$I_{CC} = 13\text{mA}$	3.8	4.7	5.5	mA

Pin Connection Diagram



