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NTE1416
Integrated Circuit
Chrominance and Luminance Processor for NTSC Color TV

Description:

The NTE1416 is an MSI integrated circuit in a 28–Lead DIP type package designed for NTSC systems to process both color and luminance signals for color televisions. This device provides two functions: The processing of color signals for the band pass amplifier, color synchronizer, and demodulator circuits and also the processing of luminance signal for the luminance amplifier and pedestal clamp circuits. The number of peripheral parts and controls can be minimized and the manhours required for assembly can be considerbly reduced.

Features:

- Few External Components Required
- DC Controlled Circuits make a Remote Controlled System Easy
- Protection Diodes in every Input and Output Pin
- “Color Killer” Needs No Adjustements
- “Contrast” Control Does Not Prevent the Natural Color of the Picture, as the Color Saturation Level Changes Simultaneously
- ACC (Automatic Color Controller) Circuit Operates Very Smoothly with the Peak Level Detector
- “Brightness Control” Pin can also be used for ABL (Automatic Beam Limitter)

Absolute Maximum Ratings: (T_A = +25°C unless otherwise specified)

Supply Voltage, V_{CC} 14.4V
Brightness Controlling Voltage, V_3 . . . . . 14.4V
Resolution Controlling Voltage, V_4 . . . . . 14.4V
Contrast Controlling Voltage, V_{10} 14.4V
Tint Controlling Voltage, V_7 . . . . . 14.4V
Color Controlling Voltage, V_9 . . . . . 14.4V
Auto Controlling Voltage, V_8 . . . . . 14.4V
Luminance Input Signal Voltage, V_5 . . . . . +5V
Chrominance Signal Input Voltage, V_{13} . . . . . +2.5V
Demodulator Input Signal Voltage, V_{25} . . . . . +5V
R.G.B. Output Current, I_{26}, I_{27}, I_{28} . . . . . –40mA
Gate Pulse Input Voltage, V_{20} . . . . . +5V
Gate Pulse Output Current, I_{20} . . . . . –10mA
Blanking Pulse Input Voltage, V_{24} . . . . . ±6V
Power Dissipation (T_A = +25°C), P_{d1} 1.2W
Power Dissipation (T_A = +70°C), P_{d2} 750mW
Operating Temperature Range, T_{opr} . . . . . –20° to +70°C
Storage Temperature Range, T_{stg} . . . . . –40° to+125°C

Recommended Operating Conditions:

Supply Voltage 12V
Chrominance Input Voltage (Burst signal level) . . . . . $150mV_{p-p}$
Luminance Input Voltage (Sync White Level) . . . . . $1.0V_{p-p}$
Burst Gate Pulse Input Voltage . . . . . $3.0V_p$
Blanking Pulse Input Voltage . . . . . $2.5V_p$
Color Saturation Controlling Voltage Range (V_{CC} = 12V) . . . . . 0 to 5.7V
Tint Controlling Voltage Range (V_{CC} = 12V) . . . . . 0 to 5.7V
Contrast Controlling Voltage Range (V_{CC} = 12V) . . . . . 0 to 12V
Resolutions Controlling Voltage Range (V_{CC} = 12V) . . . . . 0 to 12V
Brightness Controlling Voltage Range (V_{CC} = 12V) . . . . . 8 to 10V
Note 1. In case of operating in V_{CC} = +14.4V, set the surrounding temperature (T_A) to be +67°C

Test Conditions: (V_{CC} = 12V unless otherwise specified)

Parameter	Min	Typ	Max	Unit
Color Saturation Controlling Pin9	0	$V_8/2$	V_8	V
Tint Controlling Pin7	0	$V_8/2$	V_8	V
Contrast Controlling Pin10	0	V_{CC} x 0.78	V_{CC}	V
Resolution Controlling Pin4	0	–	V_{CC}	V

Electrical Characteristics: (T_A = +25°C, V_{CC} = 12V, Note 2 unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Supply Current	I_{CC}		32	43	54	mA
Burst Output Voltage	e_b	Rainbow color bar signal input $150mV_{p-p}$, Color auto center, Contrast max.	0.5	0.7	0.9	V_{p-p}
ACC Range 1	ACC1	Rainbow color bar signal input $300mV_{p-p}$, Burst Output Voltage / e_b	0.9	1.0	1.1	times
ACC Range 2	ACC2	Rainbow color bar signal input $15mV_{p-p}$, Burst Output Voltage / e_b	0.6	0.8	1.0	times
Chroma Output Voltage 1	e_{c1}	Rainbow color bar signal input $150mV_{p-p}$, Color min, Contrast max.	0.5	0.7	0.9	V_{p-p}
Chroma Output Voltage 2	e_{c2}		–	–	5	mV_{p-p}
Chroma Output Voltage 3	e_{c3}	Rainbow color bar signal input $150mV_{p-p}$, Color center, Contrast max.	120	190	260	mV_{p-p}
Chroma Output Voltage 4	e_{c4}		130	190	260	mV_{p-p}
Variable Range of Chroma Output Voltage at auto	Δe_{ca}	Rainbow color bar signal input $150mV_{p-p}$, Color auto max min, Contast max.	±25	±35	±45	%
Free Running Frequency	f_o	No input signal to Pin19 Be trimed 3.579545 MHz by using a trimer capacitor for standard sample, Deviation from f; 3.579545 MHz	–	–	±150	Hz
Oscillator Controlling Sensitivity	β	Burst signal input $0.7V_{p-p}$ Converted from V_{16-17} in case of 100Hz burst frequency variation	1.0	1.5	2.0	Hz/mV
Phase Detector Sensitivity	μ	Burst signal input $0.7V_{p-p}$, Converted from phase error and V_{16-17} in case of 100Hz burst frequency variation	25	45	65	mV/ degree

Note 2. Color control is manual state and tint is center for the items not specifically specified.

Electrical Characteristics (Cont'd): (T_A = +25°C, V_{CC} = 12V, Note 2 unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Phase Error	$\Delta\Phi$	Burst signal input 0.7V_{p-p}, Phase error to 100Hz of burst frequency variation	–	1.5	3.0	degree /100Hz
APC Pull–in Frequency Range	f_p	Burst signal input 0.7V_{p-p}, Measured by changing the burst frequency	±350	±500	–	Hz
Variable Range of Tint	$\Delta\Theta1$	Burst signal input 0.7V_{p-p}, Tint; max min, manual, Tint center, Range from 0 as a standard	±37	±45	±53	degree
Variable Range of Tint at Auto	$\Delta\Theta2$	Burst signal input 0.7V_{p-p}, Tint; max min, auto Tint center, Range from 0 as standard	±12	±17	±22	degree
B–Y Output Voltage	e_{o1}	Dem. input 0.2Vp–p, f = 3.59MHz, Bright VR was set to be V_{26} = 3.5V (DC) No blanking input	1.5	2.0	2.5	V_{p-p}
Ratio of R–Y to B–Y	R/B	Dem. input 0.2V_{p-p}, f = 3.59MHz, R Output Voltage/e_{o1} Bright VR was set to be V_{26} = 3.5V (DC) No blanking input	0.86	0.94	1.04	times
Ratio of G–Y to B–Y	G/B	Dem. input 0.2V_{p-p}, f = 3.59MHz, G Output Voltage/e_{o1} Bright VR was set to be V_{26} = 3.5V (DC) No blanking input	0.25	0.30	0.35	times
Relative Output phase G–Y to R–Y	$\angle R$	Dem. input 0.2V_{p-p}, f = 3.59MHz, B = 0 degree, phase difference Bright VR was set to be V_{26} = 3.5V(DC) No blanking input	94	97.5	102	degree
Relative Output phase G–Y to B–Y	$\angle G$	Dem. input 0.2V_{p-p}, f = 3.59MHz, B = 0 degree, phase difference Bright VR was set to be V_{26} = 3.5V(DC) No blanking input	228	235	242	degree
Maximum Color Difference Output Voltage	e_{o2}	Dem. input 1.2V_{p-p}, f = 3.59MHz, Bright VR was set to be V_{26} = 3.5V (DC) No blanking input	4.8	5.7	–	V_{p-p}
Residual Carrier	e_{car}	No signal input, Output; 3.58MHz each, Carrier leak component, Bright VR was set to be V_{26} = 3.5V(DC), No blanking input	–	–	100	mV_{p-p}
Demodulation Frequency Characteristic	e_{of}	Attenuation factor of demodulation output at f = 500kHz, Dem. input 0.2V_{p-p}, f = 3.08MHz, Assuming the output at f = 10kHz is 0 dB	–1.5	–0.9	–0.4	dB
Overall Color Difference Output Voltage	e_{o3}	Rainbow color bar signal input 150mV_{p-p}, Color auto center, Contrast max, in R output	1.0	1.7	2.4	V_{p-p}
Overall Color Difference Output Variable Range by Contrast	Δe_{oc}		3.4	3.85	4.3	V_{p-p}
Color Killer Tolerance	e_k	Burst input Voltage at Pin13 150mV_{p-p} = 0dB, Attenuation value in operating the killer	–27	–32	–40	dB

Note 2. Color control is manual state and tint is center for the items not specifically specified.

Electrical Characteristics (Cont'd): (T_A = +25°C, V_{CC} = 12V, Note 2 unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Luminance Gain	Av1	R,G,B, Output each, Studio color bar input $1V_{p-p}$ in white level, contrast max, Resolution min, Pedestal of Pin26 is 2V, Bright VR was set	4.5	5.0	5.5	times
Luminance Gain Variable Range by Contrast	Δe_{vc}	Studio color bar input $1V_{p-p}$ in white level, contrast max/min, resolution min, in B output	4.0	4.5	5.0	times
Luminance Amp. Frequency Characteristic	f_v	Sine wave signal input 0.1Vrms Input frequency at Av1 = –6dB Resolution min, in B output, Bright VR was set to be V_{26} = 3.5V(DC) No blanking input, 0dB = 16kHz Output	5	6	–	MHz
Resolution Variation Range	Δf_{vp}	Sine wave signal 0.1Vrms, f = 2MHz Contrast max, Resolution min to max, in B Output max/min	5.0	7.0	9.0	dB
DC Restored	T_{DC}	Stair Step signal input $1V_{p-p}$, APL 10 to 90% in B Output	65	75	85	%
Brightness Controlling Sensitivity	BR	$\Delta E_O/\Delta V_3$, E_O = 2V to 5V, R,G,B, Output each	4.0	4.5	5.0	–
Maximum R,G,B Output Voltage	E_{om}	R.G.B. Output Voltage each at V_3 = 12V	7.0	–	–	V
Differential Gain	D.G.	Stair Step signal input $1V_{p-p}$, f = 3.58MHz, APL = 50%, Contrast max, Resolution min, Pedestal of Pin26 is 2V, Bright VR was set	–	–	5.0	%
Quiescent Output Voltage	E_o	R,G,B Output each, Bright VR was set to be V_3 = 9V, No Luminance signal input, Contrast max, VCO is operating, Blanking	2.5	3.5	4.5	V
E_o Supply Voltage Coefficient	E_{o-v}	V_{CC} = 12V ± 20%, V_{26} = 3.5V (V_{CC} = 12V), R,G,B Output each Blanking	0.2	0.25	0.3	V/V
E_o Temperature Coefficient	ΔE_{o-t}	T_A = –20° to +70°C, V_{26} = 3.5V (T_A = +25°C) R,G,B Output each	–4.0	–2.0	0	mV/°C
Difference Output Voltage	ΔE_{R-G} ΔE_{G-B} ΔE_{B-R}	V26 = 3.5V VCO is operating R,G,B Output each, No blanking input	–	0	300	mV

Note 2. Color control is manual state and tint is center for the items not specifically specified.

Pin Connection Diagram