

Ordering number : EN5635

Monolithic Linear IC



LA7688

Single-Chip CTV Signal-Processing Circuit for PAL and NTSC Formats

Overview

The LA7688 integrates VIF, SIF, video, chrominance, and deflection processing circuits for PAL/NTSC format TV sets on a single chip and is provided in a 52-pin shrink package.

The VIF and SIF circuits achieve semi-adjustment-free operation, and are adjustment-free except for the VCO coil and the RF AGC circuit. The chrominance circuit can be made adjustment-free by using the LC89950 1H delay line IC. All the signal processing required for a multi-format color TV can be implemented by combining this product with the LA7642 SECAM decoder IC.

Features

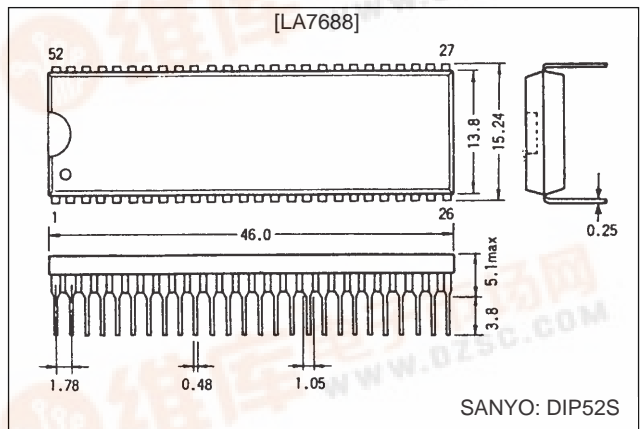
- [VIF] • PLL detector • Buzz canceller
- [SIF] • PLL detector • Audio switch
- [VIDEO] • Built-in trap • Built-in DL
- Aperture control
- Video switch (SVO output)
- Black expansion
- [CHROMA] • PAL/NT • Base band processing (adjustment free)
- Built-in bandpass filter

- [OSD] • Analog OSD
- [DEF] • Automatic 50/60 Hz discrimination
- Fixed vertical size • Double AFC
- Built-in sync separator circuit
- [Other features] • Sandcastle pulse (for the 1H delay line)
- fsc output (for SECAM systems)
- Primary color output

Package Dimensions

unit: mm

3218-DIP52S



Specifications

Maximum Ratings at Ta = 25°C

| Parameter | Symbol | Conditions | Ratings | Unit |
|-----------------------------|---------------------|--|-------------|------|
| Maximum supply voltage | V ₄₀ max | | 9 | V |
| | V ₄₅ max | | 9 | V |
| Maximum supply current | I ₂₄ max | | 16 | mA |
| FBP input current | I ₂₆ max | | 5 | mA |
| | I ₃₂ max | | 10 | mA |
| FBP input voltage | I ₂₆ min | | -5 | V |
| Allowable power dissipation | P _d max | Ta ≤ 65°C When mounted on a printed circuit board* | 1.3 | W |
| Operating temperature | T _{opr} | | -10 to +65 | °C |
| Storage temperature | T _{stg} | | -55 to +150 | °C |

Note : * Printed circuit board size: 83 × 86 × 1.5 mm, material: Bakelite

Operating Conditions at Ta = 25°C

| Parameter | Symbol | Conditions | Ratings | Unit |
|----------------------------|--------------------|------------|----------|------|
| Recommended supply voltage | V ₄₀ | | 7.6 | V |
| | V ₄₅ | | 7.6 | V |
| Recommended supply current | I ₂₄ | | 12 | mA |
| Operating voltage range | V ₄₀ op | | 7 to 8.2 | V |
| | V ₄₅ op | | 7 to 8.2 | V |
| Operating current range | I ₂₄ op | | 10 to 16 | mA |

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Operating Characteristics at Ta = 25°C, V_{CC40, 45} = 7.8 V, I₂₄ = 12 mA

| Parameter | Symbol | Conditions | Ratings | | | Unit |
|----------------------------------|----------------------|--|---------|------|------|--------|
| | | | min | typ | max | |
| [Circuit Voltages and Currents] | | | | | | |
| Horizontal power-supply voltage | V _{CCH} | Deflection system (V ₂₄) | 6.4 | 6.9 | 7.4 | V |
| Current drain | I ₄₀ | | 78 | 90 | 100 | mA |
| | I ₄₅ | | 34 | 40 | 48 | mA |
| [VIF Block] | | | | | | |
| RF AGC maximum voltage | V _{50H} | | 7.5 | 7.8 | 7.8 | V |
| RF AGC minimum voltage | V _{50L} | | | 0.2 | 0.6 | V |
| Input sensitivity | V _i | | | 39 | 45 | dBμ |
| AGC range | GR | | 56 | 60 | | dB |
| Maximum allowable input | V _{IN max} | | 95 | 100 | | dBμ |
| Quiescent video output voltage | V ₈ | | 4.1 | 4.4 | 4.7 | V |
| Synchronizing signal tip voltage | V _{8tip} | | 1.7 | 2.0 | 2.3 | V |
| Video output amplitude | V _O | | 1.7 | 2.0 | 2.3 | Vp-p |
| Black noise threshold voltage | V _{BTH} | | 1.0 | 1.3 | 1.7 | V |
| Black noise clamp voltage | V _{BCL} | | 2.7 | 3.0 | 3.3 | V |
| Output signal-to-noise ratio | S/N | | 48 | 52 | | dB |
| 1.07 MHz beat level | C/S | | 40 | 44 | | dB |
| Frequency characteristics | f _C | | 6 | 9 | | MHz |
| Differential gain | DG | | | 5 | 10 | % |
| Differential phase | DP | | | 6 | 10 | deg |
| Quiescent AFT voltage | V ₇ | | 3.6 | 3.9 | 4.2 | V |
| Maximum AFT voltage | V _{7H} | | 7.3 | 7.6 | 7.8 | V |
| Minimum AFT voltage | V _{7L} | | 0 | 0.3 | 0.7 | V |
| AFT detection sensitivity | Sf | | 10 | 15 | 20 | mV/kHz |
| VIF input resistance | R _i | f = 38.9 MHz | 1.0 | 1.3 | 1.6 | kΩ |
| VIF input capacitance | C _i | f = 38.9 MHz | 2 | 3 | 5 | pF |
| APC pull-in range (U) | f _{PU} | | 0.8 | 2.0 | | MHz |
| APC pull-in range (L) | f _{PL} | | | -2 | -0.8 | MHz |
| VCO1 maximum variation range | Δf _{U1} | | 0.8 | 2.0 | | MHz |
| | Δf _{L1} | | | -2.0 | -0.8 | MHz |
| SIF signal level | S _{OUT} | | 110 | 140 | 170 | mVrms |
| VCO1 control sensitivity | β | | 2.4 | 4.8 | 9.6 | kHz |
| [SIF Block] | | | | | | |
| SIF limiting sensitivity | V _i (lim) | | 40 | 46 | 52 | dBμ |
| FM detector output voltage | V _O (FM) | | 390 | 500 | 710 | mVrms |
| AMR | AMR | | 40 | 60 | | dB |
| Total harmonic distortion | THD | | | 0.3 | 1.0 | % |
| SIF S/N | S/N (SIF) | | 55 | 62 | | dB |
| FM detector range (L) | W _{FML} | | | 2.5 | 4.0 | MHz |
| FM detector range (H) | W _{FMH} | | 7.0 | 8.0 | | MHz |
| FM detector output variability | ΔV _O | | 0 | 2.0 | 3.0 | dB |
| [INT/EXT Switching Block] | | | | | | |
| AFT EXT gain | G _{AF} | | -0.7 | -0.2 | +0.3 | dB |
| AFT EXT distortion | THD _{AF} | | | 0.03 | 0.5 | % |
| System switch I-SE | V _{1TH1} | Notes: I = INT, E = EXT P/N = PAL/NTSC SE = SECAM | 0 | | 1.2 | V |
| System switch I-P/N | V _{1TH2} | | 1.7 | | 2.6 | V |
| System switch E-P/N | V _{1TH3} | | 2.9 | | 3.8 | V |
| System switch E-SE | V _{1TH4} | | 4.1 | | 5 | V |
| [Video Switching Block] | | | | | | |
| Video signal input 1 DC voltage | V _{10DC} | | 3.2 | 3.5 | 3.8 | V |
| Video signal input 1 AC voltage | V _{10AC} | | | 1.0 | | Vp-p |
| Video signal input 2 DC voltage | V _{14DC} | | 3.2 | 3.5 | 3.8 | V |
| Video signal input 2 AC voltage | V _{14AC} | | | 1.0 | | Vp-p |
| SVO pin DC voltage | V _{16DC} | | 2.5 | 2.8 | 3.1 | V |
| SVO pin AC voltage | V _{16AC} | | 1.7 | 2.0 | 2.3 | Vp-p |

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| Parameter | Symbol | Conditions | Ratings | | | Unit |
|---|---------------------|----------------------------------|---------|------|------|-------|
| | | | min | typ | max | |
| [Filter Block] | | | | | | |
| Filter automatic adjustment open voltage | V _{9OPN} | f _{SC} = 4.43 MHz | 3.3 | 3.8 | 4.3 | V |
| S input threshold | V _{9TH} | | 1.5 | 2.0 | 2.5 | V |
| C-TRAP | G _{TRAP} | | -20 | -26 | -32 | dB |
| C-BPF1 | G _{BPF1} | | -5 | -3 | -1 | dB |
| C-BPF2 | G _{BPF2} | | -2 | -1 | 0 | dB |
| C-BPF3 | G _{BPF3} | | -6 | -4 | -2 | dB |
| Y-DL TIME1 | T _{dy1} | PAL | 400 | 450 | 500 | ns |
| Y-DL TIME2 | T _{dy2} | NTSC | 410 | 460 | 510 | ns |
| Y-DL TIME3 | T _{dy3} | S (PAL) | 230 | 280 | 330 | ns |
| Y-DL TIME4 | T _{dy4} | SECAM | 510 | 560 | 610 | ns |
| [Video Block] | | | | | | |
| Contrast center | E _{CEN} | | 1.0 | 1.2 | 1.4 | Vp-p |
| Contrast variation range | d _{GC} | | 18 | 22 | 26 | dB |
| Brightness minimum (0.5 V) | VB min | | 0.4 | 0.7 | 1.0 | V |
| Brightness typical (2.5 V) | VB typ | | 1.9 | 2.2 | 2.5 | V |
| Brightness maximum (4.5 V) | VB max | | 3.4 | 3.7 | 4.0 | V |
| Soft control characteristics | d _{GSOFT} | | -6.0 | -4.0 | -2.0 | dB |
| Sharp control characteristics | d _{GSHARP} | | 4.5 | 7.5 | 10.5 | dB |
| Y signal frequency characteristics (1) | BW1 | S-VHS | 3.9 | 4.4 | 4.9 | MHz |
| Y signal frequency characteristics (2) | BW2 | PAL | 3.0 | 3.35 | 3.7 | MHz |
| Y signal frequency characteristics (3) | BW3 | NTSC | 2.5 | 2.85 | 3.2 | MHz |
| DC transmission ratio | d _{VAPL} | | | 100 | | % |
| Black expansion threshold | BS _{TH} | | 40 | 50 | 60 | IRE |
| Black expansion maximum gain | BS _{max} | | -20 | -13 | -6 | IRE |
| [Chrominance Common] | | | | | | |
| R-Y output DC voltage | V _{39DC} | | 3.6 | 4.0 | 4.4 | V |
| R-Y output AC voltage | E _{39AC} | | 0.45 | 0.60 | 0.75 | Vp-p |
| B-Y output DC voltage | V _{38DC} | | 3.6 | 4.0 | 4.4 | V |
| B-Y output AC voltage | E _{38AC} | | 0.35 | 0.5 | 0.65 | Vp-p |
| R-Y input DC voltage | V _{37DC} | | 4.2 | 4.6 | 5.0 | V |
| R-Y input AC voltage | E _{37AC} | | 0.45 | 0.60 | 0.75 | Vp-p |
| R-Y input AC range | E _{37ALC} | | 160 | 200 | 250 | mVp-p |
| B-Y input DC voltage | V _{36DC} | | 4.2 | 4.6 | 5.0 | V |
| B-Y input AC voltage | E _{36AC} | | 0.35 | 0.5 | 0.65 | Vp-p |
| B-Y input AC range | E _{36ALC} | | 160 | 200 | 250 | mVp-p |
| Residual color | E _{CMIN} | | | | 200 | mVp-p |
| Contrast color amplitude characteristics | d _{GCC} | | 30 | 35 | 40 | dB |
| RGB output DC difference voltage | d _{VC} | With no chrominance signal input | -0.3 | 0 | +0.3 | V |
| RGB output DC voltage temperature characteristics | ∂VC/∂T | With no chrominance signal input | | 0 | | mV/°C |
| RGB output residual high-frequency level | E _{car} | | | | 0.2 | Vp-p |
| RGB output residual carrier level | e _{car} | With no chrominance signal input | | | 0.3 | Vp-p |
| fSC output pin DC voltage | V _{27OPN} | | 4.5 | 5.0 | 5.3 | V |
| fSC output level P | V _{27ACP} | PAL | 0.14 | 0.2 | 0.26 | Vp-p |
| fSC output level N | V _{27ACN} | NTSC | 0.19 | 0.26 | 0.33 | Vp-p |
| DEF COIN-L | V _{27LO} | | 1.0 | 1.3 | 1.6 | V |
| Crystal switching threshold | V _{27TH} | | | 400 | | μA |
| PAL switching threshold | V _{18PTH} | | | | 0.6 | V |
| NT switching threshold | V _{18NTH} | | 0.9 | | | V |

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| Parameter | Symbol | Conditions | Ratings | | | Unit |
|---|----------------------|--------------------------------------|---------|-------|-------|--------|
| | | | min | typ | max | |
| [Chrominance System PAL Block] | | | | | | |
| ACC amplitude characteristics 1 | ACC1p | | -2 | +1 | +4 | dB |
| ACC amplitude characteristics 2 | ACC2p | | -4 | 0 | +2 | dB |
| Killer operating point | E KILp | | -37 | -30 | -25 | dB |
| Killer hysteresis | dE KILp | | 1 | 3 | 7 | dB |
| RGB output level | E Bp | Chrominance: 50%, color: typical | 4.1 | 4.6 | 5.1 | Vp-p |
| Maximum RGB output | EBmaxp | Chrominance: 50%, color: maximum | 5.4 | 5.9 | 6.4 | Vp-p |
| APC pull-in range + | df scp+ | | 500 | | | Hz |
| APC pull-in range - | df scp- | | | | -500 | Hz |
| Demodulated output ratio B/R | B/Rp | | 1.50 | 1.78 | 2.00 | double |
| Demodulated output ratio G/R | G/Rp | With no B-Y signal | -0.56 | -0.51 | -0.46 | double |
| Demodulated output ratio G/B | G/Bp | With no R-Y signal | -0.21 | -0.91 | -0.17 | double |
| Demodulation angle | RBp | | 85 | 90 | 95 | deg |
| [Chrominance System NTSC Block] | | | | | | |
| ACC amplitude characteristics 1 | ACC1n | | -2 | +1 | +4 | dB |
| ACC amplitude characteristics 2 | ACC2n | | -4 | 0 | +2 | dB |
| ACC phase characteristics 1 | PCC1n | | -3 | 0 | +3 | deg |
| ACC phase characteristics 2 | PCC2n | | -5 | 0 | +5 | deg |
| Killer operating point | E KILn | | -40 | -34 | -29 | dB |
| Killer hysteresis | dE KILn | | 1 | 4 | 8 | dB |
| RGB output level | E Bn | Chrominance: 50%, color: typical | 3.4 | 3.9 | 4.4 | Vp-p |
| Maximum RGB output | EBmaxn | Chrominance: 50%, color: maximum | 5.0 | 5.5 | 6.0 | Vp-p |
| APC pull-in range + | df scn+ | | 350 | | | Hz |
| APC pull-in range - | df scn- | | | | -350 | Hz |
| Tint control variation range | dP TI | | -33 | | +50 | deg |
| Demodulated output ratio R | R/Bn | | 0.81 | 0.90 | 0.99 | double |
| Demodulated output ratio G | G/Bn | | 0.24 | 0.30 | 0.36 | double |
| Demodulation angle RB | RBn | | 95 | 105 | 115 | deg |
| Demodulation angle GB | GBn | | -130 | -120 | -110 | deg |
| [RGB Block] | | | | | | |
| OSD input level | E OSD | Standard input, 100% white level | | 0.7 | | Vp-p |
| OSD input DC voltage | V OSD | With no signal | 2.9 | 3.2 | 3.5 | V |
| F-BLK input threshold level | V _{28TH} | | 0.8 | 1.0 | 1.2 | V |
| OSD output pedestal level difference | V OSDC | | -0.3 | 0 | +0.3 | Vp-p |
| OSD output maximum | E OSDmax | | 4.3 | 4.8 | 5.3 | Vp-p |
| OSD output minimum | E OSDmin | | 0.3 | 0.6 | 0.9 | Vp-p |
| Character signal output frequency characteristics | BW OSD | | 5 | 7 | | MHz |
| TV-OSD crosstalk (C-Y) | CT TVC | | 50 | | | dB |
| OSD-TV crosstalk (C-Y) | CT OSDC | | 40 | | | dB |
| Character signal inter-character crosstalk | CT OSD | | 30 | | | dB |
| [DEF Block] | | | | | | |
| Vertical free-running period 50 | TV _{FREE50} | | 312.0 | 312.5 | 313.0 | H |
| Vertical free-running period 60 | TV _{FREE60} | | 262.0 | 262.5 | 263.0 | H |
| Vertical synchronization maximum period 50 | TV _{max50} | Horizontal synchronizing signal only | 356.5 | 357.0 | 357.5 | H |
| Vertical synchronization maximum period 60 | TV _{max60} | Horizontal synchronizing signal only | 296.5 | 297.0 | 297.5 | H |
| Vertical synchronization minimum period 50 | TV _{min50} | | 268.5 | 269.0 | 269.5 | H |
| Vertical synchronization minimum period 60 | TV _{min60} | | 224.5 | 225.0 | 225.5 | H |
| Vertical blanking peak value | V _{HVBL} | | | 0.6 | 1.0 | V |
| Vertical blanking pulse width 50 | PW _{BLK50} | | 23 | 23.5 | 24 | H |
| Vertical blanking pulse width 60 | PW _{BLK60} | | 19 | 19.5 | 20 | H |
| Vertical output pulse width | PW _{VOU} | | 8.0 | 8.5 | 9.0 | H |
| Vertical output voltage H | V _{OUTH} | | 5.3 | 5.6 | 5.9 | V |
| Vertical output voltage M | V _{OUTM} | | 4.0 | 4.3 | 4.6 | V |
| Vertical output voltage L | V _{OUTL} | | | | 0.3 | V |

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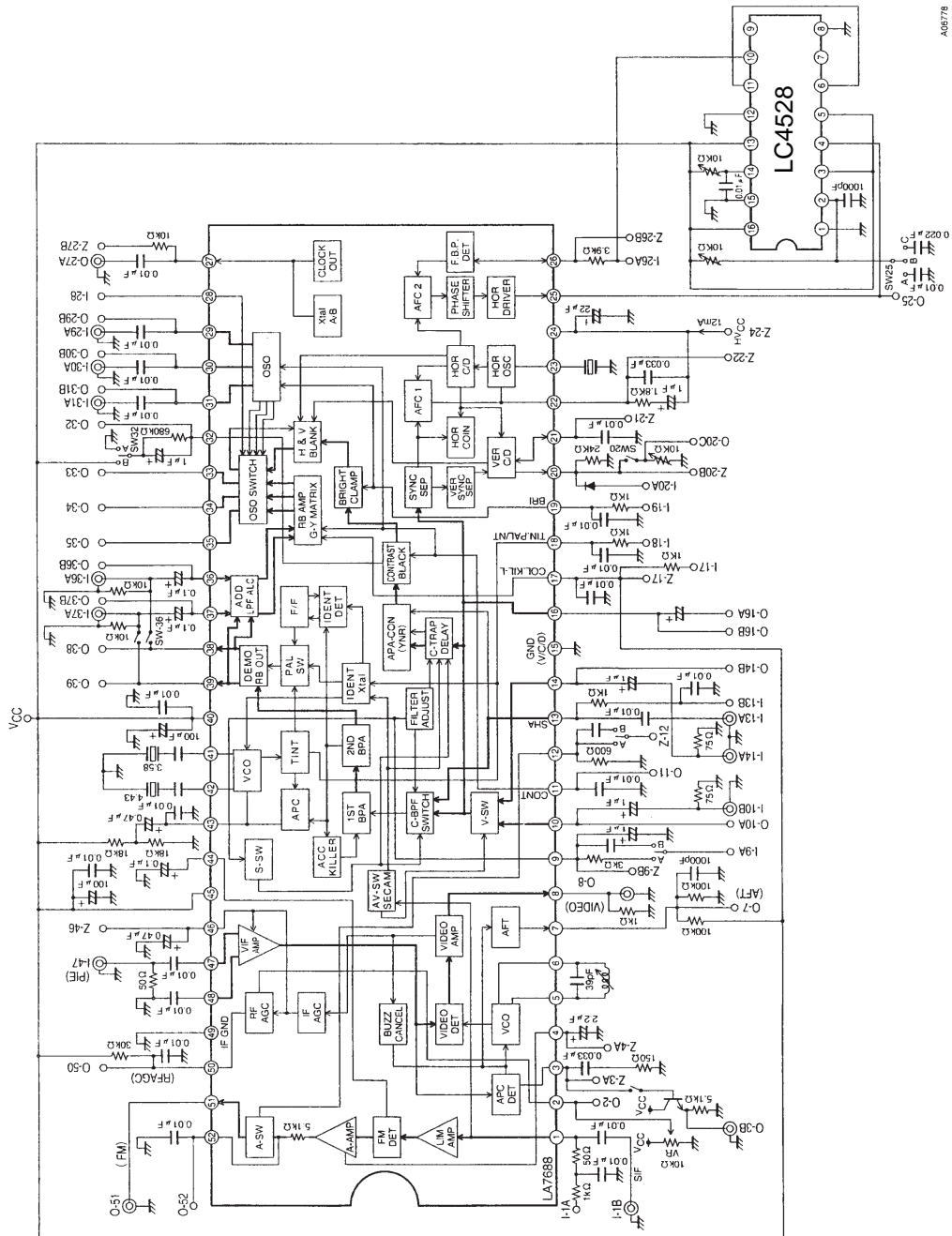
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| Parameter | Symbol | Conditions | Ratings | | | Unit |
|--|---------------------|------------|-----------|------|------|------------|
| | | | min | typ | max | |
| Vertical external trigger load resistance | RTR | | 3.0 | 4.7 | | k Ω |
| Vertical automatic synchronization stop voltage | V _{SAS} | | | 1.4 | 1.9 | V |
| Horizontal AFC gate release voltage | V _{GS} | | | 2.0 | 2.5 | V |
| Vertical output start V _{CC} voltage | SVV | | | 4.2 | 4.7 | V |
| Horizontal free-running deviation | Δf_H | | -150 | 0 | +150 | Hz |
| Horizontal free-running frequency V _{CC} dependence | $\Delta f_H/V_{CC}$ | | | 2 | | Hz |
| Horizontal pull-in range | f _{HPLL} | | ± 450 | | | Hz |
| Horizontal output start V _{CC} voltage | S _{HV} | | | 4.8 | 5.2 | V |
| AFC2 FBP peak value H | F _{BPH} | | 6.0 | 6.5 | 7.0 | V |
| AFC2 FBP peak value M | F _{BPM} | | 3.2 | 3.7 | 4.2 | V |
| AFC2 FBP peak value L | F _{BPL} | | -0.3 | +0.2 | +0.7 | V |
| Horizontal output pulse width | P _{WHOUT} | | 21.8 | 23.8 | 25.8 | μ s |
| Horizontal output phase maximum | HPmax | | 14 | 17 | | μ s |
| Horizontal output phase center | HPcen | | 4.8 | 5.8 | 6.8 | μ s |
| Horizontal output phase minimum | HPmin | | | 3.8 | 4.8 | μ s |
| Burst gate pulse width | PW _{BGP} | | 3 | 4 | 5 | μ s |
| Burst gate pulse phase | Td _{BGP} | | -0.2 | +0.3 | +0.8 | μ s |
| 50/60 Hz output voltage 50 | V50 | | | 1.1 | 1.5 | V |
| 50/60 Hz output voltage 60 | V60 | | 3.8 | 4.1 | | V |
| 50/60 Hz input voltage 50 | V _{IN50} | | 0.5 | | | V |
| 50/60 Hz input voltage 60 | V _{IN60} | | | | 7.0 | V |
| SECAM V pulse peak value | SVH | | 1.8 | 2.2 | 2.6 | V |
| SECAM V pulse width | SVW | | 11.0 | 11.5 | 12.0 | H |

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Test Circuit



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