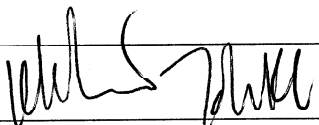


DATA SHEET

FM1236 MK3 RTMA M/N Desktop Video & FM Radio Module

Product specifications

Approval by :



Name / Date : Toh Kong Lim / 18.10.2001



PHILIPS

QSS Desktop Video & FM Radio Module

FM1236/F H-3

FEATURES

- RTMA M /N Systems and FM Radio Broadcast reception
- True 5 V device (low power dissipation)
- Full frequency range from channel A2 (55.25 MHz) to channel A69 (801.25 MHz)
- FM radio band coverage from 87.50 MHz to 108.00 MHz
- PLL controlled tuning
- Programmable PLL step size (31.25 / 50 kHz or 62.5 kHz)
- True-synchronous vision IF demodulator (PLL)
- Ultra linear FM PLL demodulator for FM radio broadcast
- Demodulated video output, AF/MPX sound output, second IF sound output.
- I²C-bus control of tuning, address selection, AFC status information
- Complies with FCC sub-part 15 (b)
- Small horizontally mounted metal 70 mm housing



DESCRIPTION

The FM1236/F H-3 family belongs to the new FM1200 MK3 family of small size frontends, which are designed to meet a wide range of RF applications in the PC /TV Multi-Media environment. The FM1236/F H-3 combines the functions of an FM radio tuner, an all-band TV tuner, and a NTSC demodulation unit.

The frontends have a built-in digitally (I²C) PLL tuning system. A DC-DC converter circuit is built-in in the FM1236/F H-3 to synthesize the tuning voltage required, thus making the frontend a true 5V device.

MARKING

The following items of information are printed on a sticker that is on the top cover of the tuner:

- Type number
- Code number
- Origin letter of factory
- Change code
- Year and week code

ORDERING INFORMATION

| TYPE | DESCRIPTION | ORDER NUMBERS |
|---------------|--|----------------|
| FM1236 /F H-3 | Standard F connectors / Horizontal Mount | 3139 147 18261 |

QSS Desktop Video & FM Radio Module**FM1236/F H-3****INTERMEDIATE FREQUENCIES**

| SYSTEM | M |
|-----------------|-----------|
| Picture carrier | 45.75 MHz |
| Colour carrier | 42.17 MHz |
| Sound carrier | 41.25 MHz |
| FM radio | 10.70 MHz |

CHANNEL COVERAGE

| BAND | FREQUENCY (MHz) |
|---------------|----------------------|
| FM radio band | 87.50 to 108.00 MHz |
| Low band | 55.25 to 160.00 MHz |
| Mid band | 160.00 to 442.00 MHz |
| High band | 442.00 to 801.25 MHz |

PINNING

| SYMBOL | PIN | DESCRIPTION |
|--------------------------|-----|--|
| N.C. | 1 | (AGC Monitor) Do Not Connect * |
| N.C. | 2 | (Tuning Voltage Monitor) Do Not Connect * |
| +5V | 3 | Supply Voltage Vb, Tuner section |
| SCL | 4 | I ² C-Serial Clock |
| SDA | 5 | I ² C-Serial Data |
| AS | 6 | I ² C-Address Select |
| - | x | |
| - | x | |
| AF-R | 9 | FM radio Left Channel (**) |
| AF-L | 10 | FM radio Right Channel |
| 2 nd IF sound | 11 | Second IF sound output |
| CVBS | 12 | Composite Video Baseband Signal |
| +5V, IF | 13 | Supply Voltage, IF section |
| AF/MPX | 14 | AF/MPX TV sound output (**) |
| GROUND | | Mounting Tags (TH1,TH2,TH3,TH4) |

* For process use only

** See remarks on pg 20.

QSS Desktop Video & FM Radio Module**FM1236/F H-3****LIMITING VALUES****Limiting values under operational conditions**

The tuners are guaranteed to function properly under the following conditions.

| SYMBOL | PARAMETER | PIN | MIN. | TYP. | MAX. | UNIT |
|------------------|---|-----|----------------------|------------|-------------------------|---|
| V _{AGC} | AGC Voltage Monitor (not to be connected) (See Note 1) | 1 | 10 M | | | Ω |
| V _T | Tuning Voltage Monitor (not to be connected) | 2 | - | - | - | - |
| V _S | Supply Voltage V _b Ripple susceptibility (see Note 2) 20Hz - 100kHz 100kHz - 200kHz Supply current | 3 | 4.75 | 5 80 | 5.25 5 10 150 | V mV _{pp} mV _{pp} mA |
| V _{SCL} | SCL bus input voltage | 4 | -0.3 | | 5.25 | V |
| V _{SDA} | SDA Bus input voltage SDA Bus current (open collector) | 5 | -0.3 -1.0 | | 5.25 5 | V mA |
| | AS voltage (see Note 3) | 6 | | | 5.25 | V |
| | FM - Right Channel - DC voltage - Load impedance | 9 | | 1.0 100 | | V kΩ |
| | FM - Left Channel - DC voltage - Load impedance | 10 | | 1.0 100 | | V kΩ |
| | 2 nd IF sound output - Load impedance D.C. A.C. | 11 | 1.0 1.0 | | | kΩ kΩ |
| | Composite Video Baseband Signal - Load impedance D.C. (see 10.3) (modulus) A.C. - Load time constant | 12 | 75 75 | | 100 | Ω Ω ns |
| | Supply voltage, IF section (see Note 2) Ripple susceptibility (max permitted) 20Hz - 100kHz 100kHz - 500kHz Current | 13 | 4.75 | 100 | 5.25 10 10 160 | V mV _{pp} mV _{pp} mA |
| | AF output - Load impedance D.C. A.C. | 14 | 100.0 10.0 | | | kΩ kΩ |

Note 1 : Minimum impedance required is 10MΩ, otherwise AGC voltage is loaded down. For process only.

Note 2 : Maximum allowable Ripple voltage superimposed on the +5V supply in the frequency range from 20 Hz to 500 kHz. Criteria : for TV : Δf < 2.12 kHz or AM < 0.28%

Note 3 : For detailed information about address coding, refer to Application Information.

QSS Desktop Video & FM Radio Module**FM1236/F H-3****Environmental conditions**

| SYMBOL | PARAMETER | CONDITIONS | MIN. | MAX. | UNIT |
|-----------------------------------|---------------------|------------|------|------|------------------|
| Non-operational Conditions | | | | | |
| T _{AMB} | Ambient temperature | | -25 | +85 | °C |
| RH | Relative humidity | | - | 100 | % |
| g _B | Bump acceleration | 25 g | - | 245 | m/s ² |
| g _S | Shock acceleration | 50 g | - | 490 | m/s ² |
| | Vibration amplitude | (10-55 Hz) | - | 0.35 | mm |
| Operational conditions | | | | | |
| T _{AMB} | Ambient temperature | | 0 | +60 | °C |
| RH | Relative humidity | | - | 95 | % |

OVERALL PERFORMANCE**Conditional data**

Unless otherwise specified, all electrical values for "Overall performance" apply at the following conditions.

| SYMBOL | PARAMETER | VALUE | UNIT |
|--------------------|---------------------------------------|-----------|------|
| T _{AMB} | ambient temperature | 25 ± 5 | °C |
| RH | relative humidity | 60 ± 15 | % |
| V _S | supply voltage (tuner and IF section) | 5 ± 0.125 | V |
| Z _{S(AE)} | aerial source impedance (unbalanced) | 75 | Ω |
| Z _{IF} | second IF sound output load | 0.5 | kΩ |
| | Video output load | 75 | Ω |
| V _{ST} | AF1 sound output load | 100 | kΩ |

TUNER CHARACTERISTICS

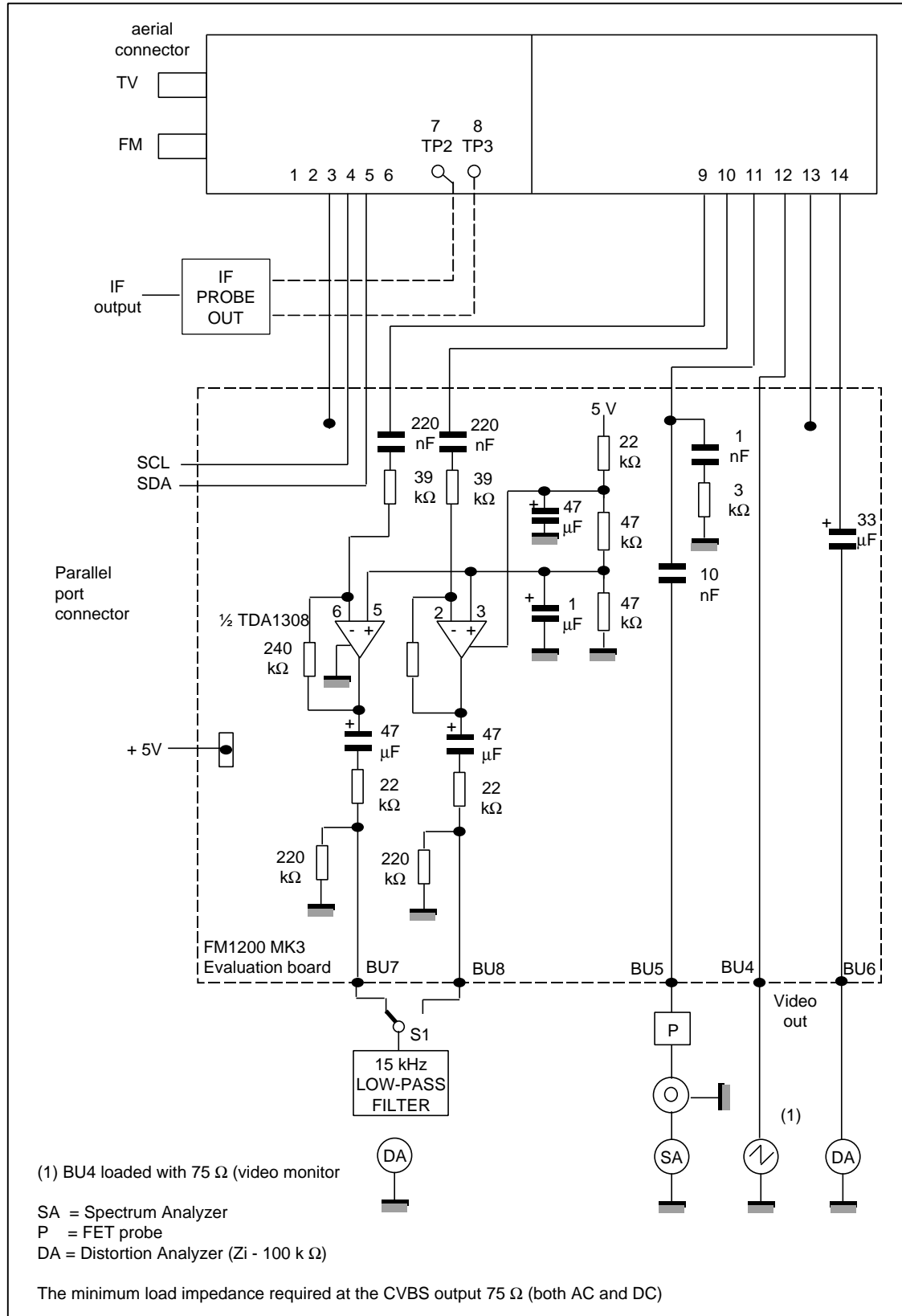
| EQUIPMENT | PARAMETER | VALUE | UNIT |
|-------------------|-----------------|-------|------|
| DC Voltmeter | input impedance | 10 | MΩ |
| Oscilloscope | input impedance | | |
| | resistance | 1 | MΩ |
| | capacitance | 15 | PF |
| Spectrum analyzer | input impedance | 50 | Ω |
| FET probe | input impedance | | |
| | resistance | 10 | MΩ |
| | capacitance | 3.5 | PF |

QSS Desktop Video & FM Radio Module

FM1236/F H-3

TEST DIAGRAM

The frontend characteristics are measured according to the test diagram depicted below :



QSS Desktop Video & FM Radio Module**FM1236/F H-3****Definitions of test signals**

| TEST SIGNAL | FREQ. (MHz) | AMPLITUDE | MODULATION |
|--|--------------------|-----------------------------|--|
| A0: unmodulated vision carrier | 477.25 | 60 dB(μ V) | |
| A1: M -system signal with video modulation | 477.25 | 60 dB(μ V) (top sync.) | 87.5% (rest carrier 12.5%), 2T-pulse and bar, unless otherwise indicated |
| B1: unmodulated main sound carrier M system | A1 + 4.5 MHz | - 7 dB respectively wrt A1 | |
| B2: FM-modulated main sound carrier M system | A1 + 4.5 MHz | - 7 dB respectively wrt A1 | freq.dev.= 25 kHz, mod.freq. 1kHz, 75 μ s pre-emphasis, unless otherwise indicated |
| C1: FM-modulated Mono sound carrier | 98.00 MHz | 60 dB μ V | freq. dev. = 22.5 kHz , mod. freq. = 1 kHz |
| C2: FM-modulated Mono sound carrier | 97.70 or 98.30 MHz | 60 dB μ V | freq. dev. = 22.5 kHz , mod. freq. = 1 kHz |
| C3: FM-modulated Stereo sound carrier | 98.00 MHz | 60 dB μ V | freq. dev. = 75.0 kHz , mod. freq. = 1 kHz, 10% pilot carrier (L=R), 90 % M+S signal level |

AERIAL INPUT CHARACTERISTICS

| SYMBOL | PARAMETER | CONDITIONS | MIN. | MAX. | UNIT |
|--------------------|--------------------------------------|---|------|----------|------------|
| V _{SWR} | | referred to 75 Ω at RF picture carrier frequency both inputs | - | 5 | |
| V _{SURGE} | surge protection | Both inputs | 5 | | kV |
| V _{ANT} | antenna terminal disturbance voltage | Both inputs up to 300 MHz Both inputs up to 1 GHz | - | 34 46 | dB μ V |

QSS Desktop Video & FM Radio Module**FM1236/F H-3****GENERAL CHARACTERISTICS**

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---------------|---------------------------------|---|----------|------|--------|------|
| f_b | frequency range | | | | | |
| | low band | | 55.25 | | 160.00 | MHz |
| | mid band | | 160.00 | | 442.00 | MHz |
| | high band | | 442.00 | | 801.25 | MHz |
| | FM band | | 87.50 | | 108.00 | MHz |
| Δf_b | margin | | | | | |
| | low band | | 1.5 | | | MHz |
| | mid/high band | | 1.5 | | | MHz |
| | FM band | | 1.5 | | | MHz |
| voltage gain | low band | | 36 | 45 | 52 | dB |
| | mid band | | 36 | 45 | 52 | dB |
| | high band | | 36 | 42 | 50 | dB |
| α_j | Image rejection | - wanted test signal F_{ant} | | | | |
| | low band | at 60 dBuV | 60 | | | dB |
| | mid band | - unwanted test signal at ($F_{ant} + 91.5$) MHz | 60 | | | dB |
| | high band | | 45 | | | dB |
| α_{IF} | IF rejection | - wanted test signal F_{ant} . | | | | |
| | Ch A2 All others | - unwanted test signal A0 with frequency ($F_{IF,PC} - 1$) MHz | 55 60 | | | dB |
| t_{ij} | Oscillators lock-in time | Tuning speed (lock bit, CP = 1) | | | 150 | ms |
| V_{ESD} | ESD protection at the terminals | All terminals of each frontend are protected against electrostatic discharge up to The products are classified in category B (MIL-STD-883C). | 2 | | | kV |

QSS Desktop Video & FM Radio Module**FM1236/F H-3**

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---------------------------------|---|-----------------------------|------|------|------|------------|
| FM radio characteristics | | | | | | |
| α_{26} | Limiting Sensitivity for (S+N)/N mono | test signal C1, bit C7 = 0 | - | 20 | 35 | dB μ V |
| α_{50} | | test signal C3 | - | 30 | 45 | dB μ V |
| S/N | Signal-to-Noise Ratio mono at $\Delta f = 22.5$ kHz $\Delta f = 75.0$ kHz | test signal C1, bit C7 = 0 | 43 | 53 | | dB |
| | | test signal C3 | 53 | 63 | | dB |
| $\alpha_{j(FM)}$ | FM image rejection | test signal C1 | 50 | 60 | | dB |
| | frequency response | test signal C3; 3 dB points | 40 | | 14 | kHz |
| | audio output level | | | | | |
| | FM AF output level at terminal Bu7/Bu8 – mono | test signal C1, bit C7 = 0 | 200 | 300 | 400 | mV |
| | Stereo | test signal C3, bit C7 = 1 | 350 | 450 | 550 | mV |
| | stereo separation | test signal C3 | 25 | 33 | | dB |
| | total harmonic distortion | test signal C3 | | 0.8 | 2.0 | % |

Video and audio characteristics

| PARAMETER | TEST SIGNAL | TEST POINT | MIN. | TYP. | MAX. | UNIT |
|---|-------------|------------|------|-------|-------|-----------------|
| CVBS output level | A1 | BU4 | 0.7 | 1.0 | 1.3 | V _{pp} |
| Amplitude video signal | A1 | BU4 | | 0.35 | | V |
| DC level of sync. Pulse | A1 | BU4 | | 0.35 | | V |
| CVBS amplitude at discrete frequencies | | | | | | |
| 2 MHz | A1 | BU4 | | 0.0 | - 1.5 | dB |
| 3 MHz | A1 | BU4 | | - 0.5 | - 2.5 | dB |
| 3.58 MHz | A1 | BU4 | | -1.0 | - 4.0 | dB |
| Sound Carriers Rejection | A1 + B1 | BU4 | 40 | 60 | | dB |
| Unweighted CVBS Signal to Noise Ratio | A1 +B1 | BU4 | 40 | 45 | | dB |
| Gain limited sensitivity (at -1dB video signal) Carrier level of test signal | A1 | BU4 | | 20 | 33 | dB μ V |

QSS Desktop Video & FM Radio Module**FM1236/F H-3**

| PARAMETER | TEST SIGNAL | TEST POINT | MIN. | TYP. | MAX. | UNIT |
|---|-------------|------------|------|------|------|-------|
| Audio output characteristics AF output level (C7=0) | A1 + B1 | | 350 | 450 | 550 | mVrms |
| THD (Total Harmonic Distortion) | | | - | 0.2 | 0.6 | % |
| Signal-to -Noise ratio measured via LP 20 kHz filter, RMS detector 75µs de-emphasis for AF1 at 1 kHz | A1 + B1 | BU6 | 50 | 63 | - | dB |
| Audio sensitivity (S/N = 40 dB) | A1 + B1 | BU6 | - | - | 40 | dBµV |

APPLICATION INFORMATION**DEMONSTRATION KIT**

A demonstration kit is available for the FM1236/F H-3 (software, Application Note and evaluation board). Please contact your local Sales Engineer for details about the price and availability

I²C PROGRAMMING

For information regarding general aspects of I²C bus control see 'The I²C-bus and how to use it', published by Philips Semiconductors under the code : 9398 393 40011.

The FM1236/F H-3 contains two I²C transceivers, one in the tuner part and one in the IF part. It is imperative to ensure that both I²C devices are programmed correctly according to their addresses

If in doubt, please refer to the demonstration software.

QSS Desktop Video & FM Radio Module

FM1236/F H-3

Tuner Part Programming (Write Mode)

BIT ALLOCATION
(WRITE MODE , R/W = 0).

| Write Data | MSB | bit6 | bit5 | bit4 | bit3 | bit2 | bit1 | LSB | ACK |
|----------------------------|-----|------|------|------|------|------|------|-------|-----|
| Address Byte ADB | 1 | 1 | 0 | 0 | 0 | MA1 | MA0 | R/W=0 | A |
| Divider Byte 1 DB1 | 0 | N14 | N13 | N12 | N11 | N10 | N9 | N8 | A |
| Divider Byte 2 DB2 | N7 | N6 | N5 | N4 | N3 | N2 | N1 | N0 | A |
| Control Byte CB | 1 | CP | T2 | T1 | T0 | RSA | RSB | OS | A |
| Bandswitch Byte BB | P7 | P6 | P5 | P4 | P3 | P2 | P1 | P0 | A |
| Auxiliary Byte AB (note *) | ATC | AL2 | AL1 | AL0 | 0 | 0 | 0 | 0 | A |

Note *: By default it is set to AL2=0, AL1=1, AL0=0. This sets the tuner TOP to 112 dBuV upon power-on reset.

ADDRESS SELECTION (BYTE ADB)

| Voltage at terminal 6 | Address | MA1 | MA0 |
|-------------------------------|---------|-----|-----|
| 0 0.1 V _{cc} | C0 | 0 | 0 |
| 0.2.....0.3 V _{cc} | C2 | 0 | 1 |
| 0.4 0.6 V _{cc} | C4 | 1 | 0 |
| 0.9 V _{cc} 5 V | C6 | 1 | 1 |

Note: If the AS pin is left floating, the internal biasing will automatically set the address to C2.

PROGRAMMABLE DIVIDER SETTING (BYTES DB1 AND DB2)

Divider ratio:
$$N = F_{OSC}/F_{ss}$$

where $F_{OSC} = (F_{RF} + F_{IF})$ and F_{ss} is the step-size set by RSA and RSB as described below.

$$N = 8192*N13 + 4096*N12 + 2048*N11 + 1024*N10 + 512*N9 + 256*N8 + 128*N7 + 64*N6 + 32*N5 + 16*N4 + 8*N3 + 4*N2 + 2*N1 + N0$$

Note: For TV Mode: $F_{IF} = 45.75 \text{ MHz}$, For FM Radio Mode: $F_{IF} = 10.7 \text{ MHz}$

CONTROL BYTE CB

Charge Pump Setting:

CP can be set to either 0 (low current) or 1 (high current).

CP = 1, charge pump current = 280uA results in fastest tuning (default mode)

CP = 0, charge pump current = 60uA results in moderate speed tuning with slightly better residual oscillator FM. **It is recommended to set CP=0 in the FM mode at all times.**

Test Mode Setting:

T2 = 0, T1 = 0, T0 = 1 for normal operation (default)

T2 = 0, T1 = 1, T0 = 1 indicates that Byte AB will follow Byte CB instead of Byte BB for the current IIC Byte sequence.

QSS Desktop Video & FM Radio Module**FM1236/F H-3**PLL Disabling:

OS=0 for normal operation,

OS=1 switches off the PLL tuning amplifier (PLL tuning is disabled)

Ratio Select Bits

RSA = 0, RSB = 0 gives 50 kHz step-size

RSA = 0, RSB = 1 gives 31.25 kHz step-size (for slow picture-search)

RSA = 1, RSB = 0 gives 166.7 kHz step-size

RSA = 1, RSB = 1 gives 62.5 kHz step-size (for normal picture-search)

BANDSWITCHING BYTE BB

| PORTS | P0 | P1 | P2 | P3 | P4 | P5 | P6 | P7 |
|----------------|----|----|----|----|----|----|----|----|
| LOW BAND | 1 | 0 | 0 | 0 | 0 | X | X | X |
| MID BAND | 0 | 1 | 0 | 0 | 0 | X | X | X |
| HIGH BAND | 0 | 0 | 1 | 0 | 0 | X | X | X |
| FM BAND STEREO | 1 | 0 | 0 | 1 | 1 | X | 0 | X |
| FM BAND MONO | 1 | 0 | 0 | 1 | 1 | X | 1 | X |

AUXILLIARY BYTE AB

The AGC Take Over Point can be set by programming the following bits AL2, AL1, AL0

| IF output level, symmetrical mode | Remark | AL2 | AL1 | AL0 |
|--------------------------------------|--|-----|-----|-----|
| 115 dB μ V | | 0 | 0 | 0 |
| 115 dB μ V | | 0 | 0 | 1 |
| 112 dB μ V | default mode at POR | 0 | 1 | 0 |
| 109 dB μ V | Recommended for negative modulation | 0 | 1 | 1 |
| 106 dB μ V | Recommended for positive modulation | 1 | 0 | 0 |
| 103 dB μ V | | 1 | 0 | 1 |
| I _{AGC} = 0 | External AGC . See remarks (1). | 1 | 1 | 0 |
| 3.5 V | Disabled . See remarks (1). | 1 | 1 | 1 |

Remarks:

- 1). The AGC detector is disabled. Both the sinking and sourcing current from the IC is disabled. The AGC output goes into a high impedance state and an external AGC source can be connected in parallel and will not be influenced.
- 2). The AGC detector is disabled and I_{AGC} = 9 μ A.

It is recommended to set the TOP at 109 dB μ V FOR NTSC M systems.**For FM radio, it is also recommended to set the TOP to 109 dB μ V.**

QSS Desktop Video & FM Radio Module**FM1236/F H-3****Important:**

ATC = AGC time constant.

In M mode (negative modulation) ATC = 1 $I_{AGC} = 9 \mu A$, time constant = 50 ms

Tuner Part Programming (Read Mode)

BIT ALLOCATION (READ MODE R/W = 1)

| | MSB | bit6 | bit5 | bit4 | bit3 | bit2 | bit1 | LSB | ACK |
|------------------|-----|------|------|------|------|------|------|-------|-----|
| Address Byte ADB | 1 | 1 | 0 | 0 | 0 | MA1 | MA0 | R/W=1 | A |
| Status Byte SB | POR | FL | 1 | 1 | AGC | A2 | A1 | A0 | A |

The following data can be read from the device through the status byte:

POR (power on reset): POR is internally set to 1 in case V_{cc} drops below 3V. The POR bit is reset when an end of data is detected by the PLL-IC.

FL: in lock flag (FL = 1 when the phase lock loop is in lock).

The loop must be phase-locked during at least 8 periods of the internal 7.8125 kHz reference-frequency (i.e. 1 msec) before the FL flag is internally set to 1.

AGC : internal AGC flag. AGC=1 when internal AGC is active (level below 3V)

A2, A1, A0 : Used for indicating if the FM signal received is transmitted in stereo or mono.

If A2 =1 and A1=A0=0, then the signal is in stereo, otherwise, it is mono.

QSS Desktop Video & FM Radio Module**FM1236/F H-3****IF Part Programming (Write Mode)**

The IF uses the new TDA9887 demodulation IC from Philips Semiconductors.

I²C Bus Control –format to WRITE (slave receives data)

| | | | | | | | | |
|---|---------------|-------|---|-----|---|------|---|---|
| S | SLAVE ADDRESS | R/W=0 | A | SAD | A | DATA | A | P |
|---|---------------|-------|---|-----|---|------|---|---|

| BIT | FUNCTION |
|------------------------|---------------------------------------|
| S | START condition |
| Standard SLAVE ADDRESS | 100 0011X where X is the value of R/W |
| R/W = 0 | Write Mode |
| A | acknowledge, generated by slave |
| SUBADDRESS (SAD) | See table below |
| DATA | Bytes B, C and E (described below) |
| P | STOP condition |

SUB ADDRESS BYTE (SAD, second byte after slave address)

| DATA BYTE FOLLOWING SAD | MSB | | | | | | | LSB | |
|----------------------------|-------------------|----|------------------|------------------|------------------|------------------|----|-----|--|
| | D7 ⁽¹⁾ | D6 | D5 | D4 | D3 | D2 | D1 | D0 | |
| SWITCHING (B DATA) | 0 | 0 | X ₍₂₎ | X ₍₂₎ | X ₍₂₎ | X ₍₂₎ | 0 | 0 | |
| ADJUST (C DATA) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | |
| DATA (E DATA) | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | |

DESCRIPTION OF THE BITS OF THE VARIOUS DATA BYTES

| DATA BYTE | BIT | SUBADDRESS | FUNCTION |
|-----------|-----------|------------|---|
| B DATA | B0 | SWITCHING | video mode (sound trap) |
| | B1 | SWITCHING | auto mute FM |
| | B2 | SWITCHING | carrier mode |
| | B3 and B4 | SWITCHING | TV standard positive/negative modulation (B3=0) |
| | B5 | SWITCHING | forced mute audio |
| | B6 | SWITCHING | FM Sensitivity |
| | B7 | SWITCHING | Not used |
| C DATA | Co to C4 | ADJUST | TOP adjustment |
| | C5 to C6 | ADJUST | de-emphasis |
| | C7 | ADJUST | audio gain |
| E DATA | E0 and E1 | DATA | standard sound carrier |
| | E2 to E4 | DATA | standard video IF |
| | E5 | DATA | VIF, SIF and tuner minimum gain |
| | E6 | DATA | L standard PLL gating HIGH |
| | E7 | DATA | VIF-AGC |

QSS Desktop Video & FM Radio Module

FM1236/F H-3

For convenience, the programming has been consolidated as a single table.

| | | | | | | | |
|-----------------------------|-------------|----------------|-----------------|-------------|-------------------------|---------------------------|-------------------------|
| Video Trap Bypass | B 0 | 0 | X | X | X | X | X |
| Auto Mute FM | B 1 | 1 | 1 | 1 | 1 | 1 | X |
| Carrier Mode | B 2 | 1 | X | X | X | X | X |
| FM Mode | B 3 | 0 | 1 | 1 | 1 | 1 | X |
| TV Modulation | B 4 | 1 | X | X | X | X | X |
| Forced Mute Audio | B 5 | 0 | 0 | 0 | 0 | 0 | 1 |
| FM Sensitivity (OP1) | B 6 | 0 | X | X | 1 | 0 | X |
| L/L' Sound (OP2) | B 7 | X | X | X | X | X | X |
| TOP Adjustment | C 0 | 0 | 0 | 0 | 0 | 0 | X |
| | C 1 | 0 | 0 | 0 | 0 | 0 | X |
| | C 2 | 0 | 0 | 0 | 0 | 0 | X |
| | C 3 | 0 | 0 | 0 | 0 | 0 | X |
| De-Emphasis | C 4 | 1 | 1 | 1 | 1 | 1 | X |
| De-Emphasis Time | C 5 | 0 | X | 0 | 0 | 0 | X |
| Audio Gain | C 6 | 0 | 1 | 0 | 0 | 0 | X |
| Sound Intercarrier | E 0 | 0 | X | X | X | X | X |
| | E 1 | 0 | X | X | X | X | X |
| Video IF | E 2 | 1 | X | X | X | X | X |
| | E 3 | 0 | X | X | X | X | X |
| | E 4 | 0 | X | X | X | X | X |
| IF Gain | E 5 | 0 | 1 | 1 | 1 | 1 | X |
| L/L' PLL Gating | E 6 | 1 | X | X | X | X | X |
| VIF AGC Output | E 7 | 0 | 0 | 0 | 0 | 0 | 0 |
| Description | Bits | M | Stereo | Mono | High Sensitivity | Normal Sensitivity | Force Audio Mute |
| | | TV Mode | FM Modes | | | | TV & FM |

QSS Desktop Video & FM Radio Module**FM1236/F H-3****IF Part Programming (Read Mode)**

The IF uses the new TDA9887 demodulation IC from Philips Semiconductors.

I²C Bus Control –format to READ (slave transmits data)

| | | | | | | |
|---|---------------|-------|---|------|----|---|
| S | SLAVE ADDRESS | R/W=1 | A | DATA | AN | P |
|---|---------------|-------|---|------|----|---|

| BIT | FUNCTION |
|------------------------|--|
| S | START condition |
| Standard SLAVE ADDRESS | 100 0011X where X is the value of R/W |
| R/W = 1 | Read Mode |
| A | acknowledge, generated by slave |
| DATA | Byte D (described below) |
| AN | acknowledge not, generated by the master |
| P | STOP condition, generated by the master |

The master generates an acknowledge when it has received the dataword READ. The master next generates an acknowledge, then slave begins transmitting the dataword READ, and so on until the master generates no acknowledge and transmits a STOP condition.

Byte D (Transmitted byte after read condition - Status Register)

| FUNCTION | MSB | | | | | | | LSB |
|----------|--------|------|-------|------|------|------|------|------|
| | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
| READ | AFCWIN | VIFL | FMIFL | AFC4 | AFC3 | AFC2 | AFC1 | PONR |

PONR = 1 After power-on reset or after supply breakdown

PONR = 0 After a successful reading of the status register

FMIFL = 0 FM IF Level low.

FMIFL = 1 FM IF Level high.

VIFL = 1 Video IF level HIGH

VIFL = 0 Video IF level LOW

QSS Desktop Video & FM Radio Module**FM1236/F H-3**

AFC STATUS

It is possible to monitor the AFC status via the D1-D4 bits. Thus auto search tuning for FM can be implemented by reading the AFC status through the bits D1-D4.

| Function | Bits | | | |
|---|------|----|----|----|
| | D4 | D3 | D2 | D1 |
| AFC F_{VIF} vs F_0 (1) | | | | |
| $F_{VIF} \leq F_0 - 187.5$ kHz | 0 | 1 | 1 | 1 |
| $F_{VIF} = F_0 - 162.5$ kHz | 0 | 1 | 1 | 0 |
| $F_{VIF} = F_0 - 137.5$ kHz | 0 | 1 | 0 | 1 |
| $F_{VIF} = F_0 - 112.5$ kHz | 0 | 1 | 0 | 0 |
| $F_{VIF} = F_0 - 87.5$ kHz | 0 | 0 | 1 | 1 |
| $F_{VIF} = F_0 - 62.5$ kHz | 0 | 0 | 1 | 0 |
| $F_{VIF} = F_0 - 37.5$ kHz | 0 | 0 | 0 | 1 |
| $F_{VIF} = F_0 - 12.5$ kHz | 0 | 0 | 0 | 0 |
| $F_{VIF} = F_0 + 12.5$ kHz | 1 | 1 | 1 | 1 |
| $F_{VIF} = F_0 + 37.5$ kHz | 1 | 1 | 1 | 0 |
| $F_{VIF} = F_0 + 62.5$ kHz | 1 | 1 | 0 | 1 |
| $F_{VIF} = F_0 + 87.5$ kHz | 1 | 1 | 0 | 0 |
| $F_{VIF} = F_0 + 112.5$ kHz | 1 | 0 | 1 | 1 |
| $F_{VIF} = F_0 + 137.5$ kHz | 1 | 0 | 1 | 0 |
| $F_{VIF} = F_0 + 162.5$ kHz | 1 | 0 | 0 | 1 |
| $F_{VIF} \geq F_0 + 187.5$ kHz | 1 | 0 | 0 | 0 |

Note

1. F_0 = nominal F_{VIF}

AFCWIN = 1 F_{VIF} inside AFC Window

AFCWIN = 0 F_{VIF} outside AFC Window

PROGRAMMING EXAMPLES

Example 1: To tune to Ch A14 (471.25 MHz) in high band

$F_{osc} = 471.25 + 45.75 = 517.00$ MHz

$N = (517.00 \text{ MHz}) / (62.5 \text{ kHz}) = 20\ 50$ (Hexadecimal)

So DB1 = 20 H

and DB2 = 50 H

CB = 86H if CP is set to low or CB = C6H if CP is set to high

BB = 44 H (because of high band selected)

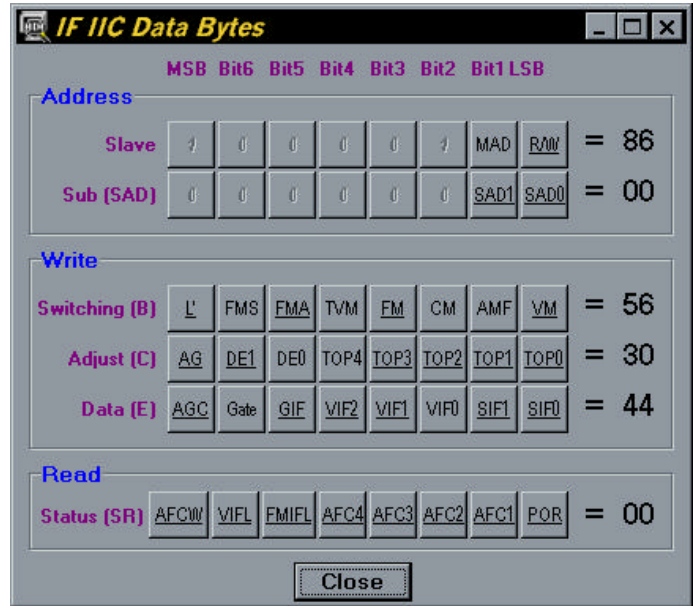
QSS Desktop Video & FM Radio Module

FM1236/F H-3

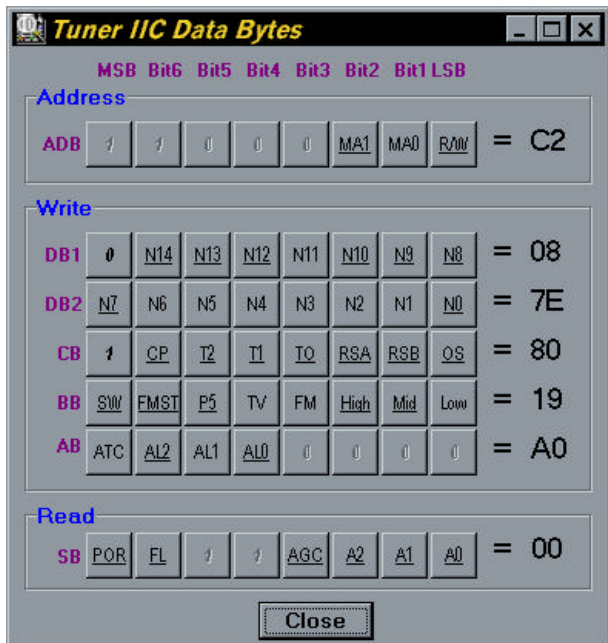
Example 2 : To tune to M system program at Ch A2 (55.25 MHz)



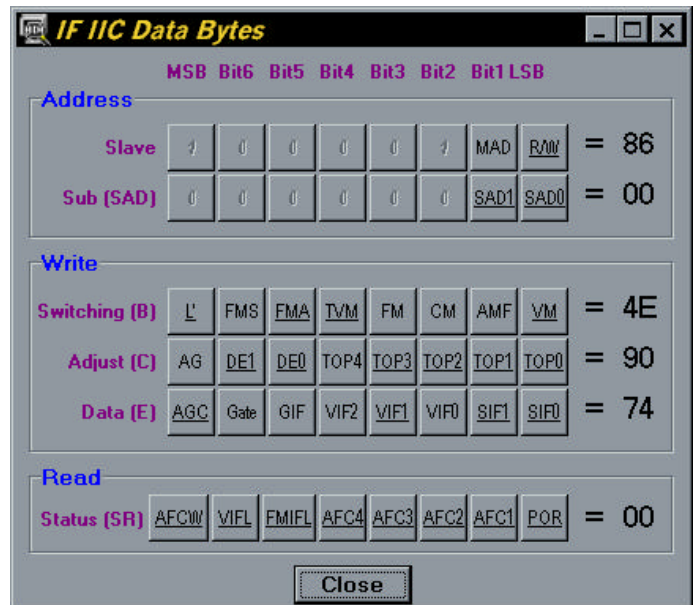
Tuner I²C program



Example 3 : To tune to a FM radio broadcast at 98.00 MHz



Tuner I²C program



IF I²C program

Note: Stereo Mode and Normal FM Sensitivity has been selected.

Important:

When tuning to a desired FM channel, it is recommended first to set to the TV mode at a high frequency (e.g. 150 MHz), then set to FM mode (IF=10.70 MHz) and then set to the desired FM station. This is to ensure that the tuning voltage does not stay locked at 0V.

QSS Desktop Video & FM Radio Module

FM1236/F H-3

LOADING OF I²C BUS

The FM1236/F H-3 contains a series impedance $R = 200$ ohms in the SCL and SDA lines. Both lines also have capacitive loads of $C = 22$ pF max. Care must be taken to ensure that the total load on the bus does not exceed that as mentioned in the brochure "The I²C-bus and how to use it".

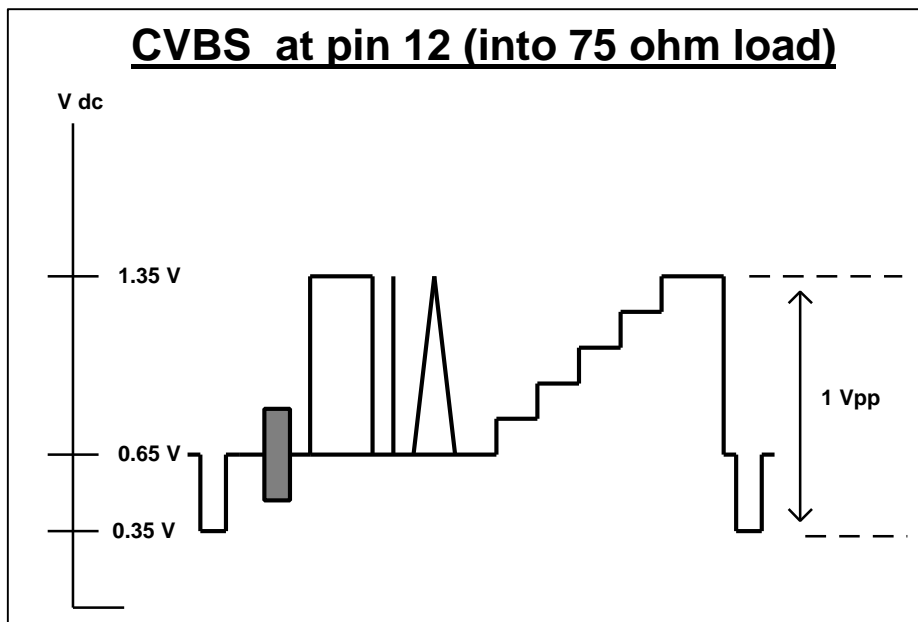
CVBS LOAD / TUNING VOLTAGE SUPPLY

A video buffer is built into the frontend to enable the unit to drive a 75Ω load directly (e.g. into the SAA711x directly). A DC-DC converter for providing the required tuning voltage supply is already built into the FM1236/F H-3.

AUDIO OUTPUT AT PINS 9 & 10

The pins 9 and 10 are used to provide the FM radio stereo outputs AF_L and AF_R. For TV sound, the MONO output is also available at these 2 pins.

CVBS OUTPUT LEVEL



QSS Desktop Video & FM Radio Module

FM1236/F H-3

MECHANICAL DATA

See product drawing 3139 149 0120

AERIAL CONNECTIONS

Standard F sockets female 75Ω.

SOLDERABILITY

The solderability of pins and mounting tags when tested initially and after 16 hour steam ageing in accordance with "IEC 60068-2-20", test Ta, method 1 (solder bath 235°C for 2s), results in a wetted area of 95%. No de-wetting will occur when soldered at 260°C for 5s.

RESISTANCE TO SOLDERING HEAT

The product will not be damaged when tested in accordance with "IEC 60068-2-20", test Tb, method 1A (solder bath 260°C for 10±1 s).

MASS

Approximately 45g.

PACKAGING INFO

The products are packed in the carton box and transferred to customers by Pallet Transport.

| | Dimension b x w x h (cm) | No. of sets | Gross Wt (Kg) |
|--------|-----------------------------|----------------|------------------|
| Carton | 46 x 34 x 5.4 | 40 | 2.34 |
| Pallet | 120 x 105 x 105 | 4280 | 272.38 |

Carton Boxes are made of Corrugated Fibreboard which are free of environmentally banned substances.

ROBUSTNESS OF PINS

The pins will not be damaged when tested in accordance with "IEC 60068-2-21":

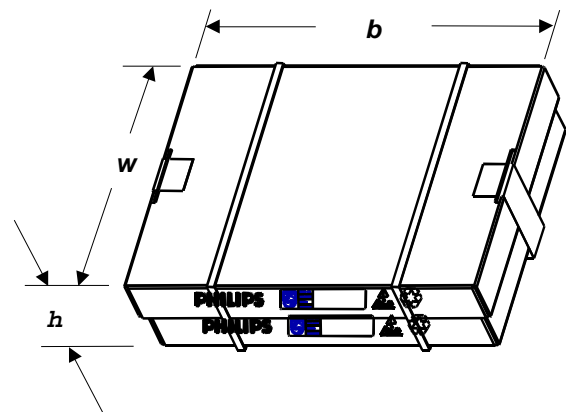
- Test Ua1, tensile of 10N in axial direction
- Test Ua2, thrust of 4N in axial direction

PUNCHING PATTERN OF CHASSIS PCB

For optimum mounting of the tuner to a PCB, the punching pattern is recommended (see 3139 149 0120).

The tuner must be mounted without clearance between the tuner supporting surface and the printed circuit board (PCB). When mounted in this way, the tuner must be soldered to the PCB. This can be achieved by pressing the unit vertically onto the PCB during soldering.

Example of Carton Box:



QSS Desktop Video & FM Radio Module

FM1236/F H-3


DEFINITIONS

| Data sheet status | |
|--|---|
| Objective specification | This data sheet contains target or goal specifications for product development. |
| Preliminary specification | This data sheet contains preliminary data; supplementary data may be published later. |
| Product specification | This data sheet contains final product specification. |
| Application Information | |
| Where application information is given, it is advisory and does not form part of the specification | |

LIFE SUPPORT APPLICATIONS

These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips for any damages resulting from such improper use or sale.

PURCHASE OF PHILIPS I²C COMPONENTS

| | |
|---|---|
|  | <p>Purchase of Philips I²C components conveys a license under the Philips I²C patent to use the components in the I²C systems to the I²C specification defined by Philips. This specification can be ordered using the code 9398 393 40011.</p> |
|---|---|

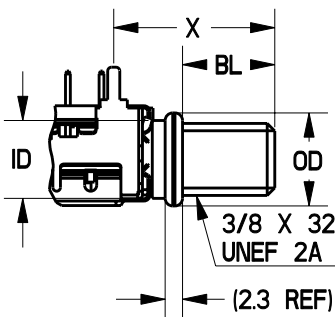
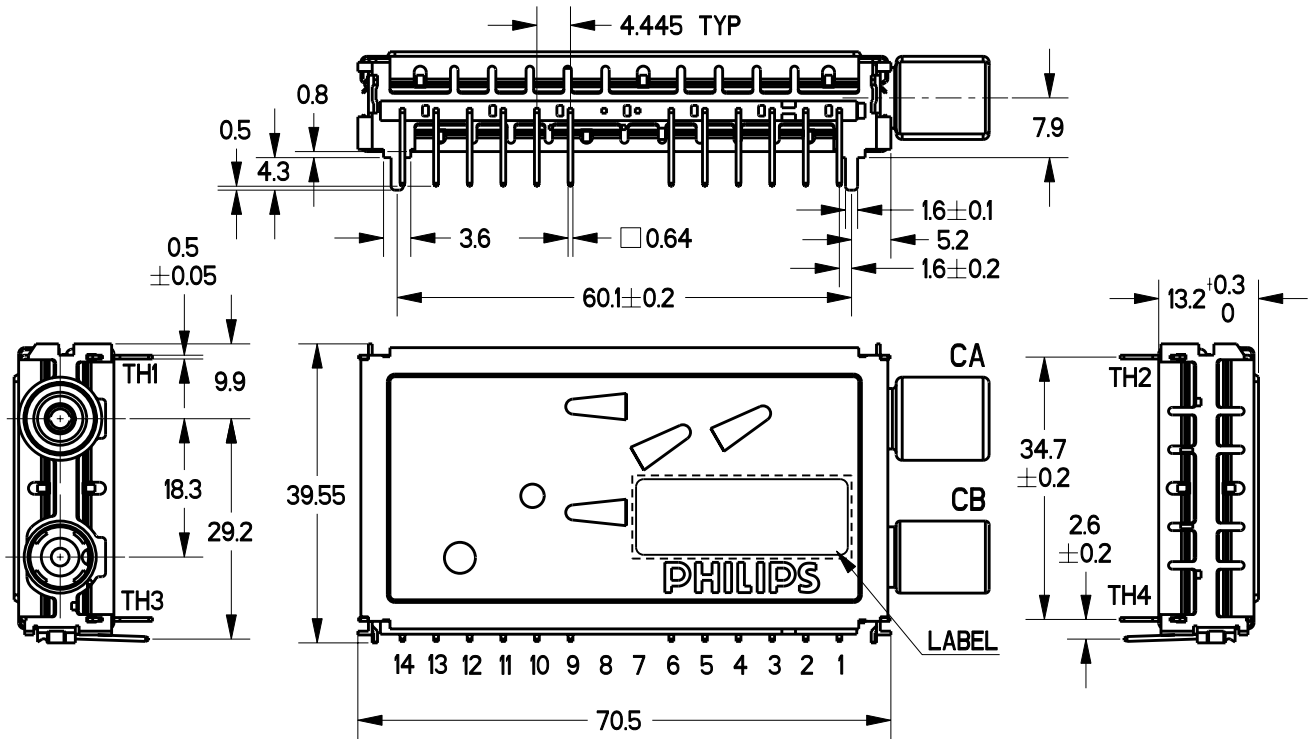
PHILIPS



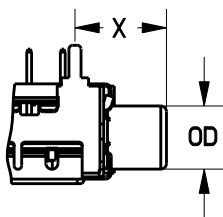
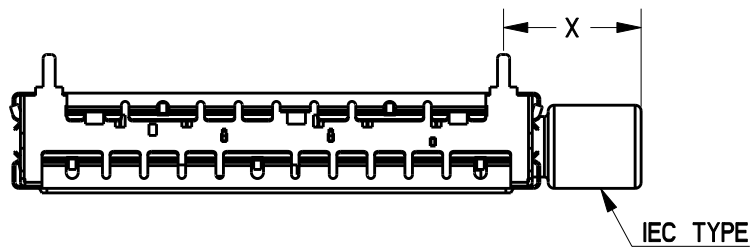
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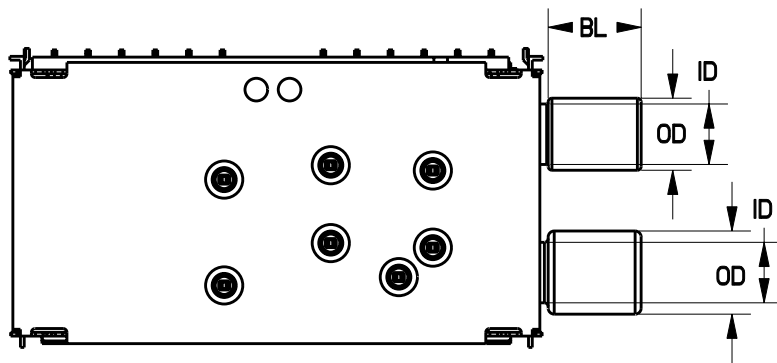
HORIZONTAL MOUNTING



F- TYPE



PHONO TYPE



NOTE:

- GENERAL TOLERANCE ±0.5mm
- ALL DIMENSIONS IN MILLIMETER.
- DRAWING NOT TO SCALE.
- CONNECTOR CB IS VOID FOR SINGLE CONNECTOR VERSIONS.

| | | | | | |
|---------------------------------|---|----------------------|---------------|--------------------------|---|
| CLASS NO. 3UM900 00-12-19 | PRODUCT DRAWING FQ/FM1200MK3 MECHANICS | | 3139 149 0120 | | 1 1 01-01-19 1 01-10-18 - - |
| 01-01-19 | NAME SOH KL | SUPERS XXXX XXX XXXX | 4 | 10 | 110 - 1 |
| SV | CHECK | DATE 00-12-19 | © | PHILIPS ELECTRONICS N.V. | |
| | | | | | A4 |

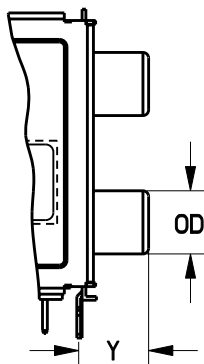
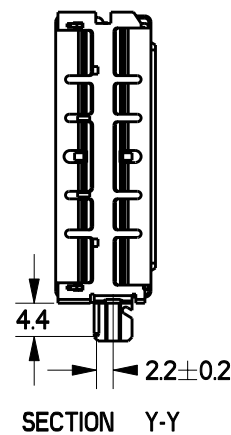
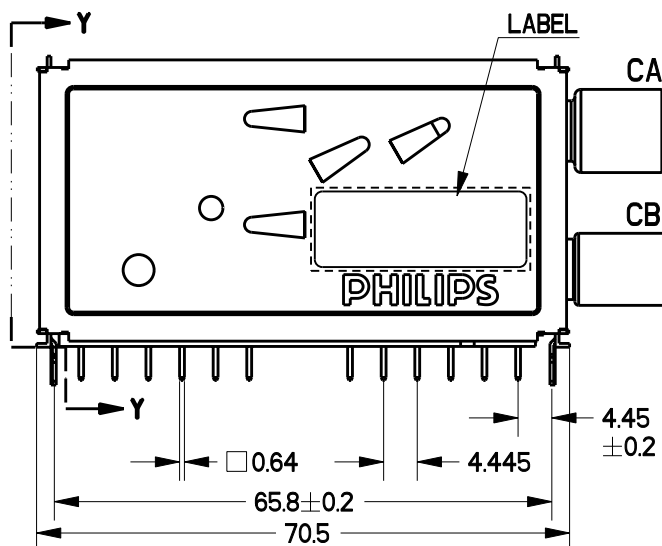
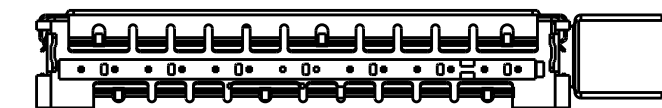
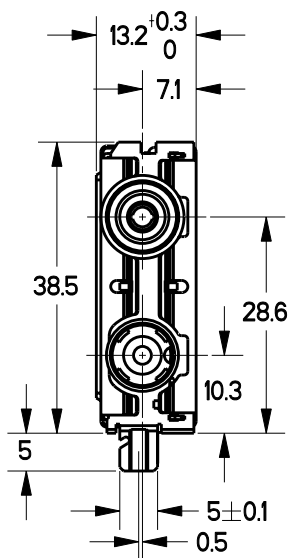
PHILIPS



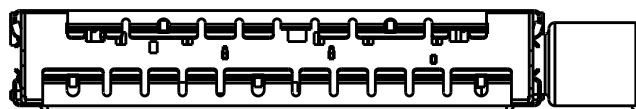
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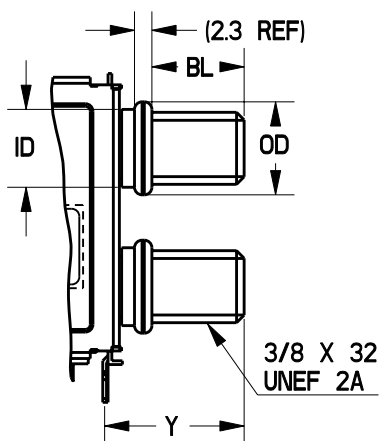
VERTICAL MOUNTING



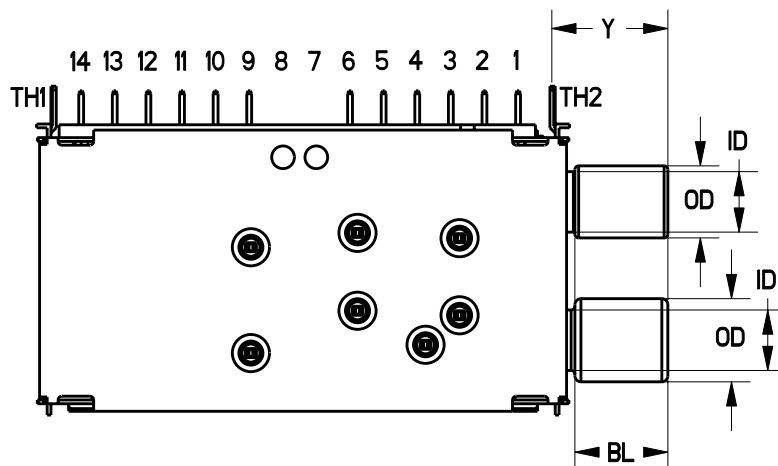
PHONO TYPE



IEC TYPE



F- TYPE



- NOTE:
- GENERAL TOLERANCE $\pm 0.5\text{mm}$
 - ALL DIMENSIONS IN MILLIMETER.
 - DRAWING NOT TO SCALE.
 - CONNECTOR CB IS VOID FOR SINGLE CONNECTOR VERSIONS.

| | | | | | | | | | |
|-------------|--|----------------------|--|------------------------|--|--------------------------|--|------------|--|
| CLASS NO. | | 3UM900 | | PRODUCT DRAWING | | 3139 149 0120 | | 1 | |
| 00-12-19 | | | | FQ/FM1200MK3 MECHANICS | | | | 1 01-01-19 | |
| 01-01-19 | | | | | | | | 1 01-10-18 | |
| NAME SOH KL | | SUPERS XXXX XXX XXXX | | 4 | | 10 | | 110 - 2 | |
| SV | | CHECK | | DATE 00-12-19 | | PHILIPS ELECTRONICS N.V. | | A4 | |

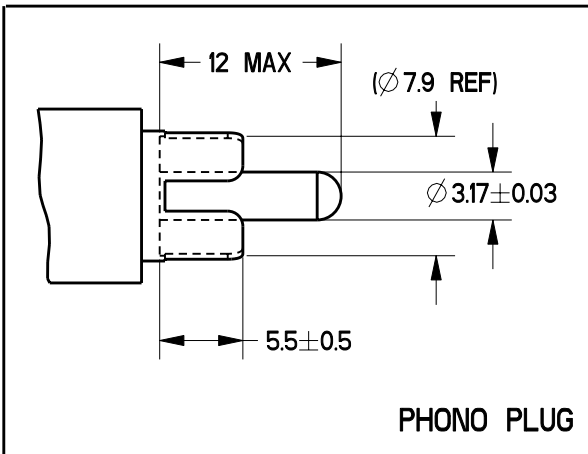
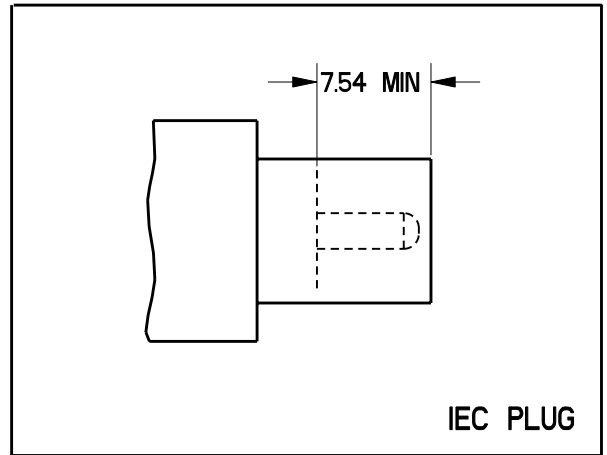
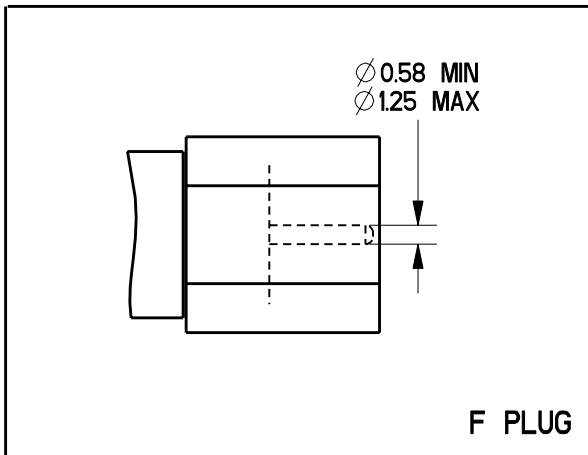


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| AERIAL CONNECTOR TYPE | | | CONNECTOR DISTANCE, X | CONNECTOR DISTANCE, Y | BODY LENGTH, BL | OVERALL DIAMETER, OD | INNER DIAMETER, ID |
|-----------------------|----|------------|-----------------------|-----------------------|-----------------|----------------------|--------------------|
| I | CA | IEC FEMALE | 18.2±0.5 | 15.35±0.5 | 12.2±0.3 | ∅11.0±0.1 | ∅8.0±0.2 |
| | CB | IEC MALE | | | | ∅9.53±0.05 | |
| L | CA | IEC FEMALE | 24.6±0.5 | 21.75±0.5 | 12.2±0.3 | ∅11.2±0.1 | ∅9.0±0.3 |
| | CB | - | - | - | - | - | - |
| F | CA | F- TYPE | 21.3±0.5 | 18.45±0.5 | 12.2±0.3 | ∅12.3+0/-0.3 | ∅10.2±0.2 |
| | CB | | | | | | |
| G | CA | F- TYPE | 25.6±0.5 | 22.75±0.5 | 16.5±0.3 | ∅12.3+0/-0.3 | ∅10.2±0.2 |
| | CB | | | | | | |
| W | CA | F- TYPE | 29.0±0.5 | 26.15±0.5 | 19.9±0.3 | ∅12.3+0/-0.3 | ∅10.2±0.2 |
| | CB | | | | | | |
| P | CA | PHONO | 12.1±0.5 | 9.25±0.5 | - | ∅8.35+0/-0.1 | - |
| | CB | | | | | | |

MALE CONNECTOR REQUIREMENTS



For dimensions which are not reflected in the drawing, refer to IEC 600169-24 (for F plug) and IEC 600169-2 (for IEC plug).

| | | | | | |
|---------------------------------|---|---------------|--------------------------|---|----------|
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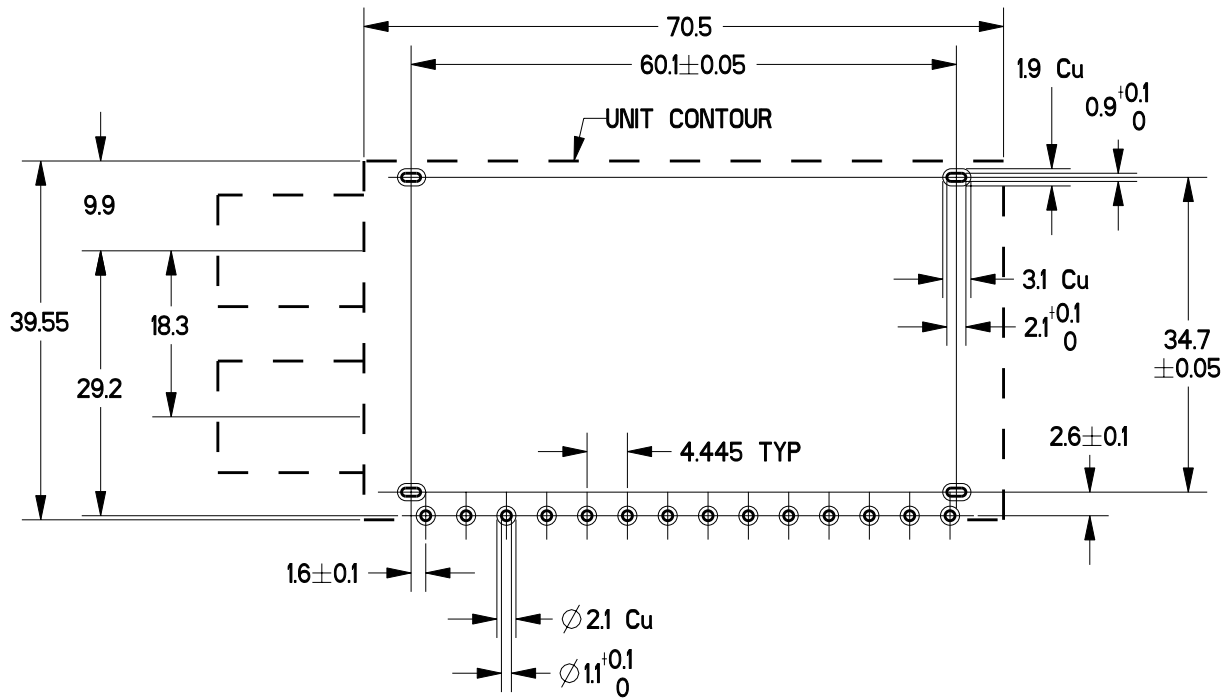


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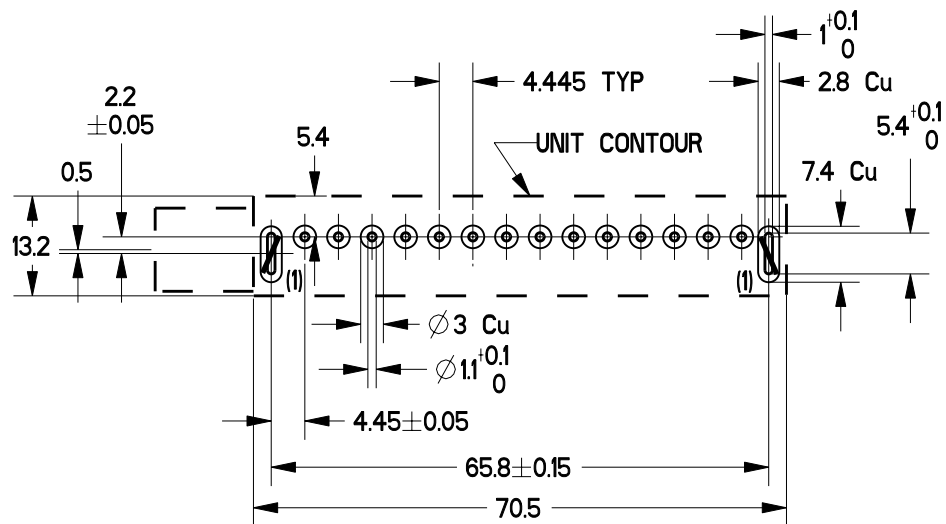


PUNCHING PATTERN OF CHASSIS PCB

PUNCHING PATTERN SEEN FROM SOLDER SIDE



HORIZONTAL MOUNTING



(1) LUG TWIST ANGLE 30° IN DIRECTION SHOWN.

VERTICAL MOUNTING

| | | | | | |
|---------------------------------|---|---------------|--------------------------|---|----------|
| CLASS NO. 3UM900 00-12-19 | PRODUCT DRAWING FQ/FM1200MK3 MECHANICS | 3139 149 0120 | | 1 | --- |
| 01-01-19 | | 10 | 110 - 4 | 1 | 01-01-19 |
| NAME SOH KL | SUPERS XXXX XXX XXXX | 4 | | 1 | 01-10-18 |
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Philips Components – Business Unit Tuners

Brazil: Philips Components South America, SAO PAULO,
Tel. +55 11 3841 2211, Fax. +55 11 3841 2399

China: Philips Electronics China Group, Shanghai
Tel: +86 21 6354 1088, Fax: +86 21 6354 1060

France: Philips Composants, SURESNES,
Tel. +33 1 4728 6600, Fax. +33 1 47286233

Germany: Philips GmbH, Tuners Competence Center Krefeld,
Tel. +49 2151 5350 138, Fax. +49 2151 5350 153

Hong Kong: Philips Hong Kong, KOWLOON,
Tel. +852 2666 2818, Fax. +852 2666 2814

India: Philips India Ltd., MUMBAI,
Tel. +91 22 691 2000, Fax. +91 22 691 2125

Japan: Philips Components, MINATO-KU, TOKYO,
Tel. +81 3 3740 4377, Fax. +81 3 3740 5232

Korea (Republic of): Philips Electronics (Korea) Ltd., SEOUL,
Tel. +82 2 709 1472, Fax. +82 2 709 1480

Singapore: Philips Components, SINGAPORE,
Tel. +65 350 1814, Fax. +65 255 2493

Spain: Philips Components, BARCELONA,
Tel. +34 93 270 4059, Fax. +34 93 270 4012

Taiwan: Philips Taiwan Ltd., TAIPEI,
Tel. +886 2 2134 2900, Fax. +886 2 2134 2929

Turkey: Türk Philips Ticaret A.S., UMRANIYE/ISTANBUL,
Tel. +90 216 522 1500, Fax. +90 216 522 18 13

United Kingdom: Philips Components Ltd., DORKING,
Tel. +44 1306 512 054, Fax. +44 1306 875 343

United States:
Philips Components, FARMINGTON HILLS, MI,
Tel. +1 248 553 6080, Fax. +1 248 553 0449

For all other countries apply to:

Philips Tuners Competence Center
Kreuzweg 60, D-47809 Krefeld, Germany
Tel: +49 2151 5350 -239/-598, Fax: +49 2151 5350 153

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