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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB 24850-2020

Replacing GB 24850-2013

**Minimum allowable values of energy efficiency and energy
efficiency grades for flat panel televisions and set-top boxes**

平板电视与机顶盒能效限定值及能效等级

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1 Scope

China's mandatory energy efficiency standard for flat panel televisions and set-top boxes - two products regulated together because they are used together and left on together, and because in most households the box draws power continuously whether or not anyone is watching. It specifies the energy efficiency grades, the minimum allowable values of energy efficiency, the energy conservation evaluation values, the test methods and the inspection rules for flat panel televisions and set-top boxes. It is a long document, and the length is in the measurement. A television's consumption depends on the panel technology, the screen area, the resolution, the peak luminance and - more than anything - on the content being displayed and on the automatic brightness control reacting to the room. A figure measured on a static pattern with that control disabled bears no relation to what the set uses at home. The standard therefore prescribes dynamic video test material, the state of the automatic brightness control during the measurement, the luminance conditions, the stabilisation, and the way the on-mode power is combined with the standby and networked standby power into an index expressed against the screen area. The set-top box is regulated on the same principle from the other direction: its on-mode power matters less than its standby and its networked standby, since the box is rarely switched off at the wall and, if it is always connected, never truly idle. The grades are tabulated by product category and size, with the minimum allowable value as the market threshold and the energy conservation evaluation value as the certification threshold. Issued on 23 July 2020 and in force since 1 August 2021, it replaces GB 24850-2013.

This Standard specifies energy efficiency grades, minimum allowable values of energy efficiency, energy efficiency calculation and test methods for flat panel televisions and general-purpose set-top boxes (also known as "digital TV receiver"). This Standard is

applicable to LCD TV and OLED TV that work normally under AC220V, 50Hz power supply conditions; of which the main functions include ground, cable, satellite or other analog and digital signal reception, demodulation and display (hereafter collectively referred to as "flat panel TV"). It is also applicable to liquid crystal and OLED display device of which the main function is a TV, without a tuner, but it is circulated as a TV product. This Standard applies to set-top boxes that work normally under AC220V, 50Hz power supply conditions, including cable set-top boxes, ground set-top boxes, satellite set-top boxes and network set-top boxes. This Standard is not applicable to live broadcast satellite set-top boxes.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

GB 3174, Characteristics of PAL-D television broadcasting system

GB/T 8170, Rules of rounding off for numerical values & expression and judgement of limiting values

GB/T 14857, Specifications of encoding parameters of digital television for studio

GB/T 17309.1, Methods of measurement on receivers for television broadcast transmissions - Part 1: General considerations - Electrical

3.2 passive standby mode the flat panel TV is connected to power supply and produces neither sound nor image, but it can be switched to on mode by remote control or other external signals low power state that the set-top box is connected to power supply and does not provide the main function NOTE: The set-top box can enter this mode only after receiving external excitation signals such as remote control and buttons. Through excitation by remote control device, internal signal, the set-top box can return to on mode from this mode.

3.3 passive standby power under the test methods specified in this Standard, the active power of flat panel TVs and set-top boxes measured in passive standby mode

3.4 on mode static power for flat panel televisions under the test methods specified in this Standard, the active power measured when a flat panel TV is playing a static test image under on mode

3.5 on mode dynamic power for flat panel televisions under the test method specified in this Standard, the active power measured when a flat panel TV is playing dynamic test signals under on mode

3.6 on mode power for flat panel televisions active power used to calculate and evaluate the energy efficiency of flat panel TVs NOTE: The on mode power for flat panel televisions is

determined from the on mode static power and the on mode dynamic power, see 6.2.

3.7 fluctuation values of power for flat panel televisions the ratio of the absolute value of the difference between the on mode static power and the on mode dynamic power TO the on mode static power

3.8 minimum allowable values of energy efficiency for flat panel televisions under the test methods specified in this Standard, the minimum energy efficiency value and the maximum passive standby power value allowed for flat panel TVs The minimum energy efficiency required by minimum allowable values of energy efficiency for the flat panel television, of which the resolution is not greater than 1920x1080, is grade 3 of energy efficiency grades in Table 1. The minimum energy efficiency required by minimum allowable values of energy efficiency for the flat panel television, of which the resolution is greater than 1920x1080 but not greater than 3840x2160, is grade 4 of energy efficiency grades in Table 1. The minimum energy efficiency required by minimum allowable values of energy efficiency for the flat panel television, of which the resolution is greater than 3840x2160, is grade 5 of energy efficiency grades in Table 1. The passive standby power of all flat panel televisions shall be less than or equal to 0.50W (be round off according to the relevant provisions of

GB/T 8170; keep two significant digits). For flat panel televisions that use external power, the external power supply used shall also comply with the minimum allowable values of energy efficiency in GB 20943.

5.2 Minimum allowable values of energy efficiency for set-top boxes The minimum allowable values of energy efficiency for set-top boxes is grade 3 of energy efficiency grades in Table 2. For set-top boxes that use external power, the external power supply used shall also comply with the minimum allowable values of energy efficiency in GB 20943.

6 Calculation method for energy efficiency

6.1 Calculation of power fluctuation value for flat panel televisions The power fluctuation value of LCD TV is calculated according to formula (1): Where, ΔP - Power fluctuation value, expressed in %; P_j - On mode static power, in watts (W); P_d - On mode dynamic power, in watts (W).

Annex A

(normative) Test methods for energy efficiency for flat panel televisions A.1 Test environment A.1.1 Working conditions Unless otherwise specified, the audio part and video part shall be under on mode. Various settings shall be adjusted in accordance with A.3.2. If the adjustment position is different, it shall be explained in the test result. A.1.2 Ambient conditions Test under temperature, humidity and air pressure within the following range: - Ambient temperature: $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$; - Relative humidity: 25%~75%; - Atmospheric pressure: 86kPa~106kPa. A.1.3 Power supply The voltage is $\text{AC}220\text{x}(1 \pm 1\%) \text{V}$. The frequency is

50x(1±1%) Hz. The total harmonic distortion shall not exceed 2%. A.1.4 Test site In order to avoid stray light from interfering with the test results, the test shall be carried out in a dark room and the stray illumination of the dark room shall be less than or equal to 1lx. A.2 Test signals A.2.1 Video test signal The test signal shall be differentiated according to the characteristics of resolution, amplitude-to-type ratio. The analog signal shall meet the requirements of GB 3174. The standard definition digital signal shall comply with relevant regulations of GB/T 14857. The video signal format shall be 720x576i/50Hz. The high-definition digital signal shall comply with relevant regulations of GY/T 155. The video signal Figure A.1 -- Schematic diagram of limit eight grayscale nine window signal A.2.1.3 Dynamic video signal The dynamic video signal is a 50Hz active test sequence defined by IEC 62087- 2:2015. The signal length is 10min. A.2.2 Audio test signal The audio test signal is a sine wave signal that the frequency is 1kHz and the signal level is -18dBFS. A.3 Test conditions A.3.1 Test interface and input signal The test signal input terminal of energy efficiency for flat panel televisions prefers to use RF input interface (if there is more than one RF interface, it shall test separately; select the worst result for assessment of energy efficiency grades). The modulation mode of analog radio frequency signal is set according to the provisions of GB/T 17309.1. The modulation mode of ground digital radio frequency signal is set according to GB 20600. The modulation mode of wired digital radio frequency signal is set according to GY/T 170. The modulation mode of satellite digital radio frequency signal is set according to GB/T 17700. If there is no RF input interface, use digital audio-video interface or use baseband interface for testing. Prefer digital interface for testing. When using digital audio-video interface, the video signal format of HDTV is 1920x1080i/50Hz; the video signal format of standard definition TV is 720x576i/50Hz. The input video signal format of products with a resolution greater than 1920x1080 is 1920x1080i/50Hz. The audio test signal frequency is 1kHz. The signal level is -18dBFS. When using baseband interface, the video signal format of HDTV is 1920x1080i/50Hz. The video signal format of standard definition TV is 720x576i/50Hz. The audio test signal frequency is 1kHz. The rated input voltage is 500mV (effective value). Information such as test interface, channel modulation mode, channel parameters, radio frequency signal level, digital single-channel video signal bit rate shall be stated in the inspection report. A.3.2 Adjustment of standard on mode for flat panel televisions A.3.2.1 General requirements - The volume control is adjusted to the position where the main sound speaker outputs 50mW. For televisions with surround sound equipment, speakers other than the front speakers shall be turned off. A.3.2.8 Other controls If controlled by other users, put it in the exit-factory position. If there is no preset location setting, adjust them to the position where it can get the best picture and sound. A.3.2.9 Additional functions of flat panel televisions Additional functions refer to functions other than the basic functions of TV demodulation, decoding, display screen, and sound production, such as DVD, networking, video, computer, game console. Additional functions that can be closed by the user shall be adjusted to the off mode. A.3.2.10 Factory menu The menu other than those used by the default user, if the calling method and use method are not introduced in the user manual,