JPEG Image Compression and Expansion LSI

BU6550KS

The BU6550KS is a LSI that compresses and expands JPEG images and which complies with recommended ISO and IEC standards. It also has high-speed processing capabilities suitable for full-motion JPEG. The BU6550KS is compatible with various color format inputs, such as RGB and YUV (4 : 2 : 2 and 4 : 1 : 1, respectively). Because of internal line memory control, raster-to-block conversion is possible just by connecting the BU6550KS to SRAM.

●Applications
Digital still cameras

●Features
1) Compression and expansion in the YUV modes (4 : 2 : 2 and 4 : 1 : 1) corresponding to RGB and JPEG base lines.
2) Realtime compression and expansion of 720 × 480 dot, 30 frame-per-second images.
3) Internal JPEG-recommended Q table (programmable with an external MPU) and Huffman table. Q table settings can be made using an external MPU.
4) Compressed data volume can be adjusted with the effective Q table, calculated by multiplying by the scale factor (alpha factor).
5) Internal DMA features for the high-speed transfer of compressed and expanded data.
6) Pin-controlled power down mode.
7) Frame extension synchronization pin (DCSTRG) simplifies the synchronization of motion JPEG expansion.
8) Internal compressed data count capability.
9) Two settings (8 and 16 bits) for interface with the MPU (host bus).

●Absolute maximum ratings (Ta=25℃)

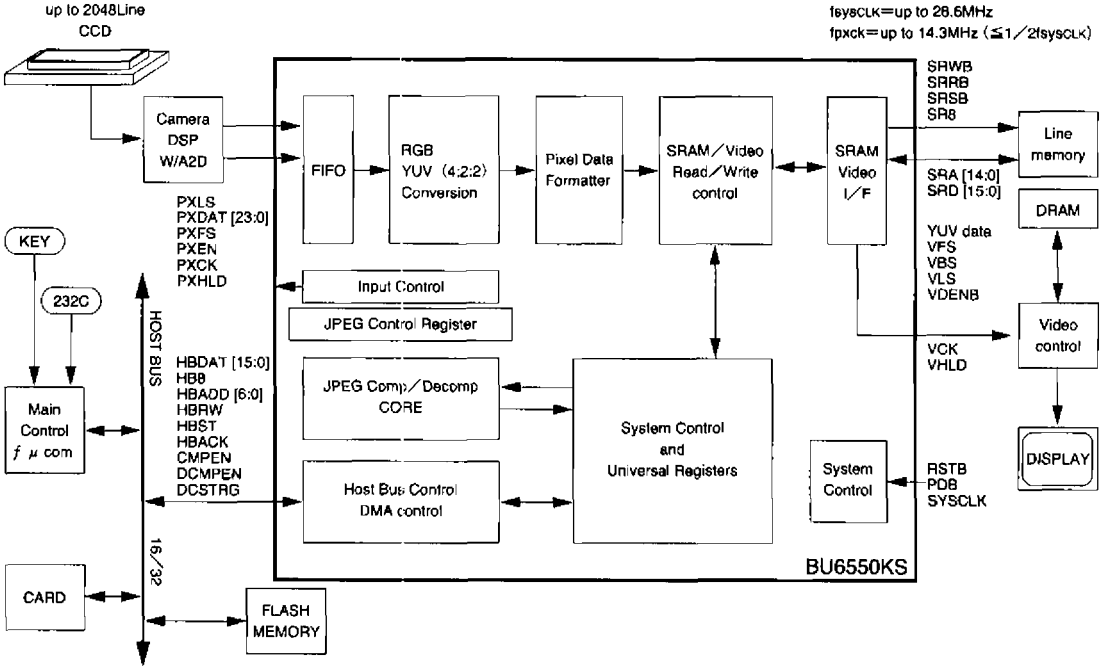
Parameter	Symbol	Limits	Unit
Power supply voltage	V_{CC}	7	V
Power dissipation	Pd	1600	mW
Operating temperature	Topr	0~70	℃
Storage temperature	Tstg	−55~125	℃

* Reduced by 16 mW for each increase in Ta of 1℃ over 25℃.

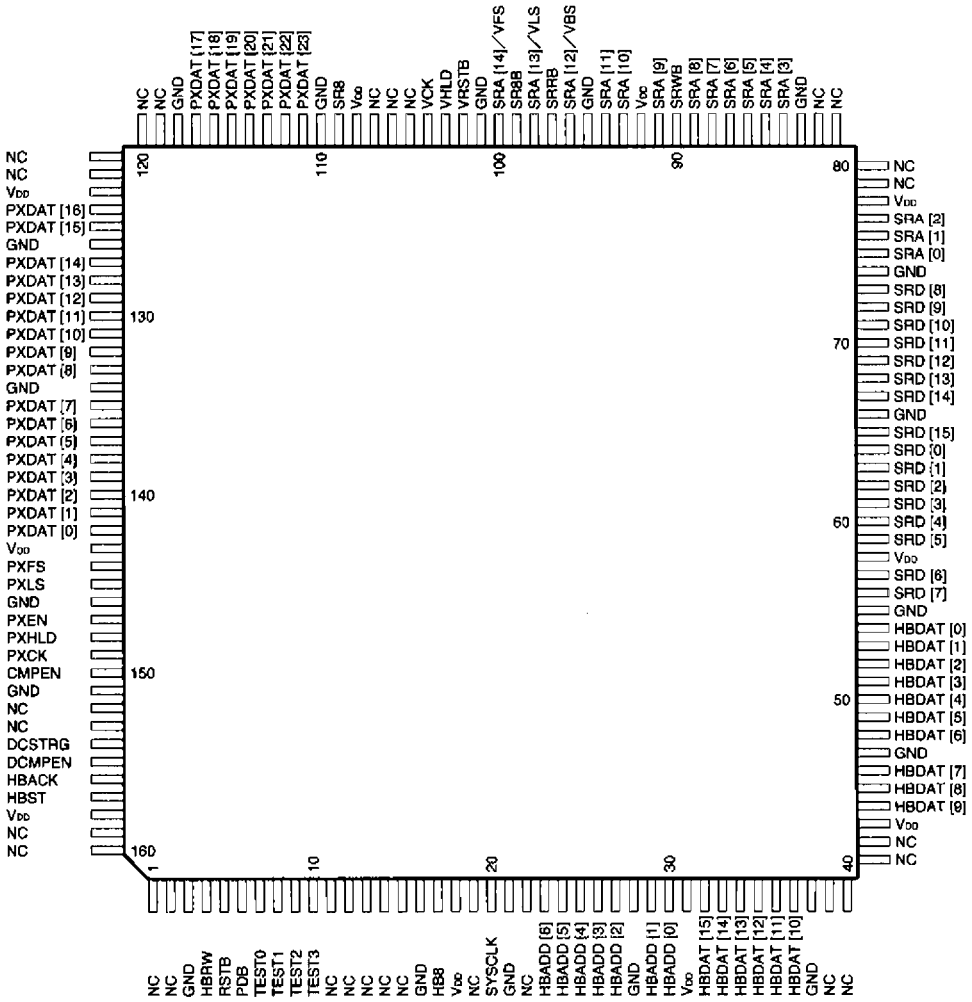
●Recommended operating conditions (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit
Power supply voltage	V_{DD}	3.0	3.3	3.6	V
System clock frequency	f_{CLK}	—	—	28.6	MHz

●Block diagram



●Pin descriptions



●Electrical characteristics (unless otherwise noted, Ta=25℃, V_{DD}=3.3V)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Current consumption	I_{DDOP}	—	100	—	mA	
H input voltage	V_{IH}	2.0	—	V_{CC}	V	
L input voltage	V_{IL}	0	—	0.8	V	
H input current	I_{IH}	—	0.1	1.0	μA	
L input current	I_{IL}	—	0.1	1.0	μA	
H output current	I_{OH}	—	—	2.2	mA	V_{OH}=2.97V
L output current	I_{OL}	—	—	2.2	mA	V_{OL}=0.33V

●Circuit operation

(1) Compression of JPEG image data

The input signal of image data from the camera interface (CCD) is compressed in the JPEG format and output as compressed data to the host bus interface. The maximum size of image data input is 2,048 × 2,048 pixels. Horizontal and vertical image data size can be set in 16-pixel increments.

The input signal from the camera interface (CCD)

<Raster data>

RGB input (8 bits each of R, G and B) data bus width : 24 bits

YUV (4 : 2 : 2) input (8 bits each of Y, U and V) data bus width : 16 bits

YUV (4 : 1 : 1) input (8 bits each of Y, U and V) data bus width : 12 bits

<MCU data>

YUV (4 : 2 : 2) input (8 bits each of Y, U and V) data bus width : 16 bits Raster data is image data that is input in a format suited to the video signal's horizontal and vertical timing. In other words, the data stream proceeds from left to right in a single row, beginning with the first row from the top and proceeding downward. Input raster data is converted to MCU data by the SRAM line buffer. MCU data is 8 pixels by 8 pixels (horizontal by vertical), and is transferred 1 block at a time.

Output signal from the host bus interface

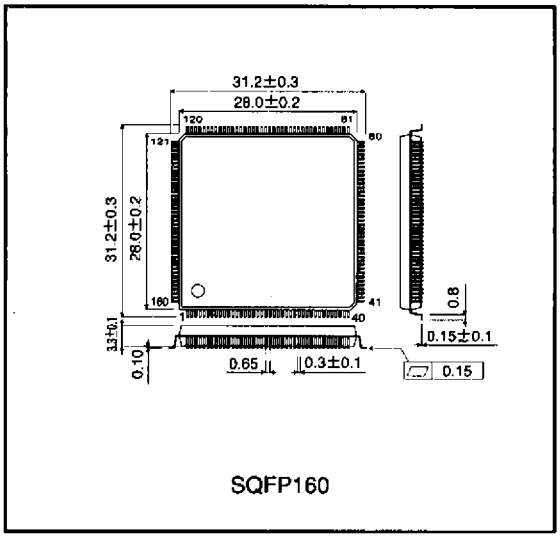
The JPEG data stream is output in the DMA mode. Data width depends on the data bus width, which can be set to 8 or 16 bits. The register can be set to either add a header to the data stream or to output data only. When no header is added, the system control must add and output the header.

(2) Expansion of JPEG data

The JPEG data stream is input from the host bus interface in the DMA mode and expanded. Expanded image data is output in the YUV (4 : 2 : 2) MCU format (which has a width of 16 bits) from the video interface, which is also shared with the SRAM interface, and which outputs the frame-line synchronization signal, not the address. As with compression, image size can be set in 16-pixel increments, with a maximum size of 2,048 × 2,048 pixels. Horizontal and vertical size, Q table, alpha factor and other information is determined internally from the header.

(3) Motion JPEG (recording and playback of full-motion video) Image data of up to 720 × 480 pixels can be compressed and expanded at the high realtime speed of 30 frames per second at a system clock frequency of 28.6MHz. This makes possible the recording and playback of full-motion video images.

●External dimensions (Units: mm)



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