TOSHIBA
Leading Innovation >>>

ApP Lite™ PROCESSOR

GRAPHICS SOLUTIONS
Stunning imagery, long battery life

Create a sophisticated and engaging watch experience with Toshiba's design solution. The TZ1200 features a built-in 96MHz ApP Lite processor and GHz class 2.5 D graphic engines capable of rendering stunning graphics at ultra-low power consumption. Toshiba's complete reference design helps create elegant solutions with a long battery life.

> APPLICATIONS

- Classic watches
- Sport watches and smart fitness trackers
- Healthcare wearable devices
- AAL (Ambient Assistant Living) wearable devices

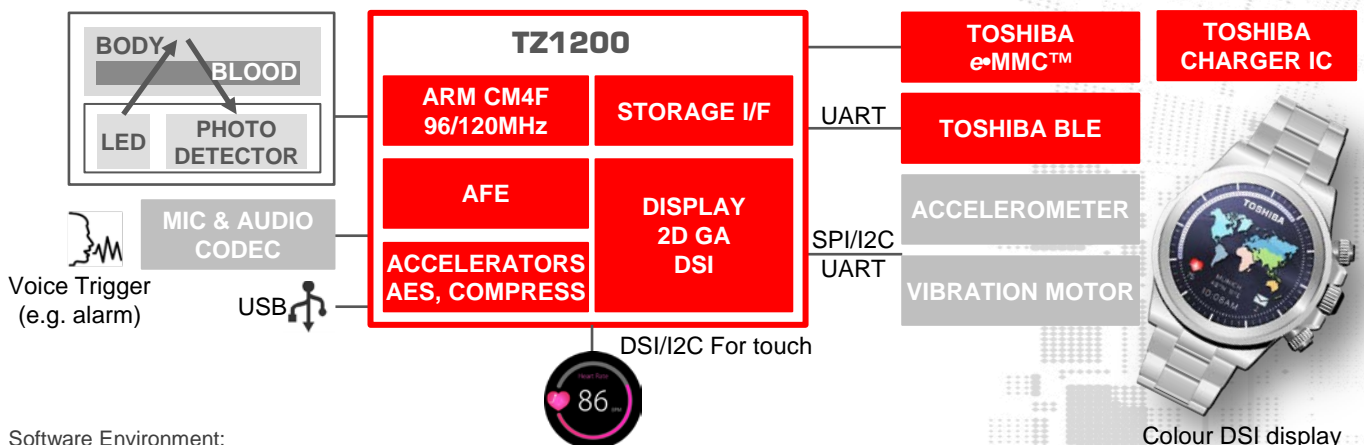| > FEATURES	> ADVANTAGES
The TZ1200 has 2D graphics accelerators for drawing, blit/blend, rotation and scaling	Designers can create high-end graphics with excellent animations, a low CPU load and ultra-low power consumption : 'Minute watch': ~30µA average current 'Second watch': ~450µA average current
The TZ1200 features built-in 24-Bit ADC and AFE and flexible data filtering by software.	Multiple biomedical sensing measurements without the need for additional external components.
Bluetooth Low Energy (BLE) standalone device featuring 3.3mA Rx / 3.6mA Tx @0dBm and deep sleep power consumption of 100nA.	Combined with the TZ1200's data compression engine, designers can communicate with a smartphone while achieving class-leading ultra-low power consumption
Watch reference design	A complete platform solution can be licensed including hardware platform, watch software, housing, etc.

> BENEFITS

- Graphics can be created and tailored to suit a dedicated target segment of end-users
- The convenience of an always-on display yet long-battery life (30+ days without charging)
- Reliable healthcare and fitness data
- High-integration with low bill of materials leads to attractive small sized products
- Proven design, quick time-to-market

> TZ1200 REFERENCE DESIGN

BODY
BLOOD
LED
PHOTO DETECTOR

MIC & AUDIO CODEC

Voice Trigger (e.g. alarm)

USB

TZ1200
- ARM CM4F 96/120MHz
- STORAGE I/F
- AFE
- DISPLAY 2D GA DSI
- ACCELERATORS AES, COMPRESS

DSI/I2C For touch

86

UART

TOSHIBA e•MMC™

TOSHIBA CHARGER IC

TOSHIBA BLE

ACCELEROMETER

VIBRATION MOTOR

SPI/I2C
UART

Colour DSI display

Software Environment:
- BSP driver package available for Keil MDK
- Graphic library support, SDL (Simple Direct Media Layer) www.libsdl.org
- Text-To-Speech software library
- Bluetooth Low Energy SDK for Toshiba TC35678
- Activity meter (steps, exercise strength), sleep analysis
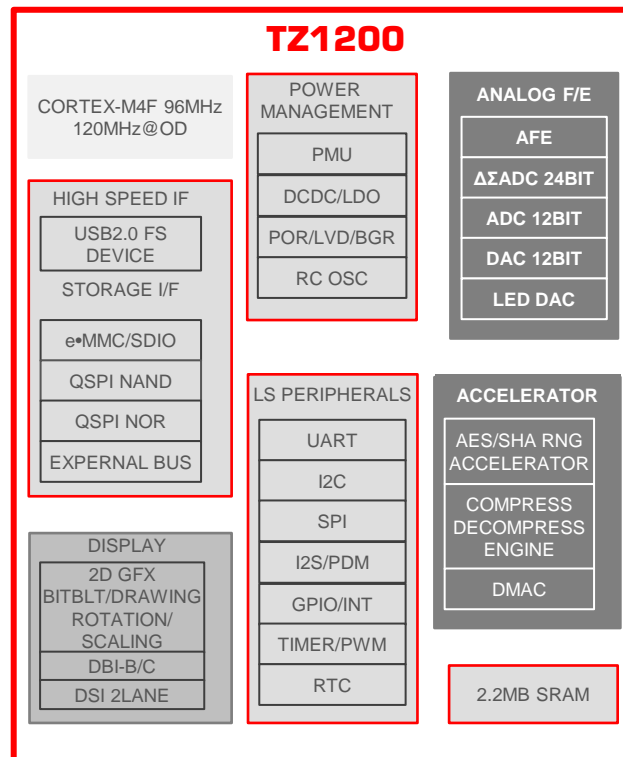- Healthcare library: ECG, PPG measurement

TZ1200 GRAPHICS & SMART FUNCTIONS

96MHz Built-in ARM Cortex M4F processor (up to 120MHz with Over Drive)

TZ1200

CORTEX-M4F 96MHz 120MHz@OD	POWER MANAGEMENT	ANALOG F/E
	PMU	AFE
HIGH SPEED IF	DCDC/LDO	ΔΣADC 24BIT
USB2.0 FS DEVICE	POR/LVD/BGR	ADC 12BIT
STORAGE I/F	RC OSC	DAC 12BIT
e•MMC/SDIO		LED DAC
QSPI NAND	**LS PERIPHERALS**	**ACCELERATOR**
QSPI NOR	UART	AES/SHA RNG ACCELERATOR
EXPERNAL BUS	I2C	COMPRESS DECOMPRESS ENGINE
	SPI	
DISPLAY	I2S/PDM	DMAC
2D GFX BITBLT/DRAWING ROTATION/ SCALING	GPIO/INT	
DBI-B/C	TIMER/PWM	2.2MB SRAM
DSI 2LANE	RTC	

2D Graphic Accelerators:
- Bit-Blit with alpha-blending, rotation/resize/drawing

Display I/F:
- MIPI DBI (parallel/DSI x2 lane), 480x320 pixel
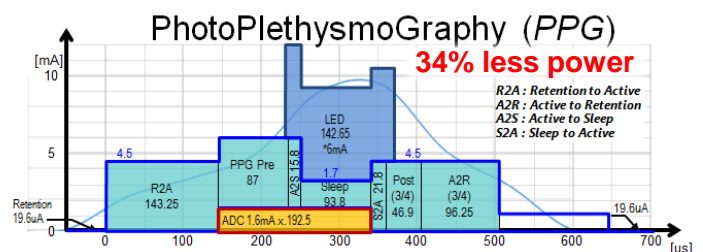
Other Smart Functions:

- Various storage interfaces
- Built-in security engine (AES/SHA2/TRNG) for secure booting
- Lossless internal compression/ decompression engine for sensor data
- 24-bit Delta-Sigma ADC with op-amp and LED drivers

UFBGA Package (8 x 8 x 0.6, 0.4mm pitch)

CONTINUOUS OPTICAL HEART-RATE

Continuous optical heart-rate measurement with TZ1200's built-in 24-bit ADC and LED driver:
- Measurement interval 32ms
- TZ1200 in 'retention' power down mode (26µA)
- Only short (142µs) LED pulse (6mA) needed
- Just 154µA average current / 0.558mW
- Comparison: Fitbit Surge: 0.734mW

PhotoPlethysmoGraphy (*PPG*)

34% less power

R2A : Retention to Active
A2R : Active to Retention
A2S : Active to Sleep
S2A : Sleep to Active

ALWAYS-ON SECOND/MINUTE WATCH

Second/Minute watch with an always-on display:
- JDI LPM013M091A DSI colour display, 320 x 300 pixel
- 350mAh battery, 3.8V (10% loss calculated)
- TZ1200 in RTC or retention power down
- Display power consumption: 0,693mW**

Second Watch (display update every second*)

TZ1200 Current (DSI & logic block) [µA]	TZ1200 Power (DSI & logic block) [mW]	Total Power (Display & TZ1200) [mW]	Battery Life [days]
317.71	0.758	1.451	34.4

Minute Watch (display update every minute*)

TZ1200 Current (DSI & logic block) [µA]	TZ1200 Power (DSI & logic block) [mW]	Total Power (Display & TZ1200) [mW]	Battery Life [days]
28.44	0.089	0.782	63.8

*TZ1200 values measured on TZ1200 evaluation board under typical conditions
**Display power calculated from datasheet values, Memory in Pixel (MiP) mode

Toshiba offers a wide range of semiconductors and storage products, making us a single-source option for a number of solutions and customers.

PRODUCT REFERENCES

Device	Part Number
ApP Lite Processor	TZ1201
ApP Lite Processor	TZ1011/21/31/41
Bluetooth LE	TC35678
eMMC NAND 4GB	THGBMDG5D1
Charger IC	TC7710AWBG

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