



Microcontroladores & Control del tiempo y frecuencia

Carlos González (FAE)

Helping
Innovation

- **Microcontroladores**
 - **Introducción**
 - Holtek Semiconductors
 - **Microcontroladores 8 bit / 32 bit**
 - Microcontroladores de propósito general 8 bit
 - Microcontroladores de propósito general 32 bit
 - Microcontroladores de propósito especial para la gestión de interfaces hombre máquina
 - Soluciones Wireless, Bluetooth BLE, NFC, RF 2,4 GHz & 1GHz
 - MCU Developer Platform, Dev Kits, IDE's, Programadores, Soporte, Ejemplos.
- **Control del Tiempo y Frecuencia**
 - **Introducción**
 - Micro Crystal AG
 - Wi2Wi
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 - Cristales y Osciladores de Alta Frecuencia
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Microcontroladores



Introducción

Holtek Semiconductors

Empresa líder en la fabricación de circuitos integrados ubicada en Taiwán.

- Principales actividades: **Diseño de microcontroladores, componentes periféricos**
- En continua expansión en el diseño y fabricación de microcontroladores para nuevos diseños.

- Gama de productos en la actualidad:
 - MCU de propósito general (8/32 bits)
 - MCU para aplicaciones específicas:
 - Voz, comunicaciones, periféricos de PC, electrodomésticos, equipos médicos, automoción y seguridad, etc.
 - Otros dispositivos:
 - Control energía, control/gestión LCD y Led, sensores de huella de alta precisión, módulos con variedad de sensores y otros periféricos.



Holtek Semiconductors

Ventajas de usar Holtek:

- Alta calidad del dispositivo que incluye alta inmunidad al ruido y protección ESD
- Plazos de entrega razonables
- Relación calidad/precio superior
- Disponibilidad de dispositivos tipo OTP y tipo Flash
- Desarrollo ASIC MCU y ASSP (Application Specific Standard Product)
- Disponibilidad de herramientas de diseño profesionales y compilador C





Microcontroladores
8 bit / 32 bit

General Purpose MCU	Display MCU	USB MCU
32-Bit Flash MCU 8-Bit Flash MCU 8-Bit High Supply Voltage Flash MCU	8-Bit LCD Display Flash MCU 8-Bit LCD / LED Flash MCU	USB Interface Flash MCU
Motor MCU & Peripheral	OPA MCU	Health & Measurement
Motor Controller & Driver Flash MCU Motor Controller & Driver Peripheral	OPA Flash MCU	24-Bit A/D Flash MCU 24-Bit A/D Peripheral Health Care Flash MCU Measurement Flash MCU R to F MCU
Security & Safety	Touch MCU & Peripheral	Voice & Music MCU
Security & Safety Flash MCU Sound Effect Flash MCU Security & Safety IC	Touch Flash MCU Ultra-Low Power Touch Flash MCU Touch Key IC	Cortex-M0+ 32-Bit Voice / Music Flash MCU Voice & Music MCU Voice Record / Playback Flash MCU

Wireless	Communication	Battery & Power Management
BLE 2.4GHz RF Sub-1GHz RF NFC Infrared / Encoder / Decoder RF Module	Interface Bridge Telecom IC	Battery Management Li Battery & Power Management Flash MCU Inverter Flash MCU LDO & Detector DC to DC Converter AC to DC Converter
Display Driver	Special Purpose MCU	Module
LCD Controller & Driver LED Controller & Driver AC / DC LED Lighting Driver	Bank & Commercial Flash MCU Special Purpose Flash MCU Low Power Flash MCU CAN Bus Flash MCU USB Data Logger Flash MCU	RF Module Digital Sensor
EEPROM Memory	Analog	Video
I ² C EEPROM	General OP Amplifier Audio Amplifier 24-Bit A/D Peripheral	CCD / CIS Analog Signal Processor Currency Recognition Processor

32-Bit Flash MCU

8-Bit Flash MCU

8-Bit High Supply Voltage Flash MCU

8-Bit OTP MCU

- ▶ Low Pin Count Flash MCU
- ▶ Low Pin Count Flash MCU with Multi-interface
- ▶ Flash MCU with EEPROM
- ▶ Flash MCU with LCD Driver
- ▶ I/O Flash MCU with High Current Driver
- ▶ A/D Flash MCU with High Accuracy / Low Current LIRC
- ▶ Advanced A/D Flash MCU
- ▶ A/D Flash MCU
- ▶ A/D Flash MCU with High Current LED Driver
- ▶ Low Power A/D Flash MCU
- ▶ Low Power A/D Flash MCU with LCD Driver

8-Bit Flash MCU

Low Power A/D Flash MCU

Part No.	Max. Freq.	VDD	Program Memory	Data Memory	Data EEPROM	Stack	IAP	I/O	Timer	ADC	Temp. Sensor	SCOM	RTC	Interface	Package
HT66L2540*	16MHz	1.8V~5.5V	4K×16	256×8	256×8	8	√	26	16-bit PTM×1 16-bit STM×1	12-bit ×8	√	4	√	SPI/I ² C/UART×1	16NSOP 24/28SSOP 28QFN
HT66L2550*	16MHz	1.8V~5.5V	8K×16	512×8	256×8	8	√	30	16-bit PTM×2 16-bit STM×1	12-bit ×8	√	4	√	SPI/I ² C/UART×1	24/28SSOP 32QFN

* Under development, available in 2Q, 2022.

Low Power A/D Flash MCU with LCD Driver

Part No.	Max. Freq.	VDD	Program Memory	Data Memory	Data EEPROM	Stack	IAP	I/O	Timer	ADC	Temp. Sensor	LCD	RTC	Interface	Package
HT67L2540*	16MHz	1.8V~5.5V	4K×16	256×8	256×8	8	√	22	16-bit PTM×1 16-bit STM×1	12-bit ×8	√	24×4	√	SPI/I ² C/UART×1	48LQFP
HT67L2550*	16MHz	1.8V~5.5V	8K×16	512×8	512×8	8	√	30	16-bit PTM×2 16-bit STM×1	12-bit ×8	√	32×4	√	SPI/I ² C/UART×1	48/64LQFP

* Under development, available in 2Q, 2022.

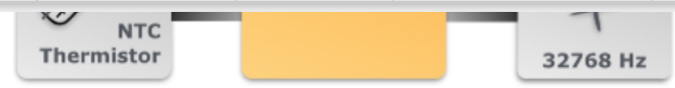
PDF Data Logger

LCD PDF Data Logger



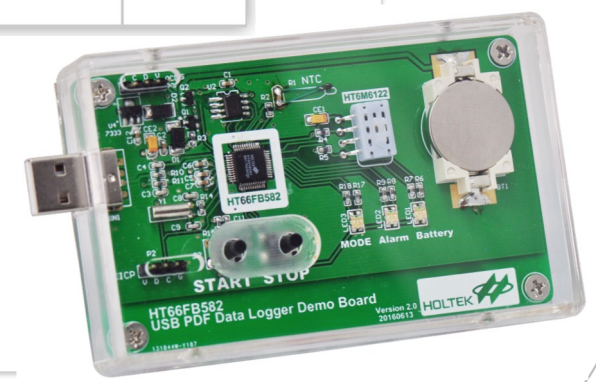
• A/D Flash USB MCU (USB 2.0 Full Speed) (* Items in this solution Δ Other related products)

	Part Number	VDD	IO / ADC	TIMER	ROM/RAM/EEP	CLOCK	OTHERS	INTERFACE	PACKAGE
*	HT66FB582	2.2 ~ 5.5V	41 / 12bitx16	6	48K / 1024 / 16K	12MHz HIRC	16bit MDU, LDO 70mA, RTC, Endpoint, Comp, Built-in OSC	SPI/I ² C,SPI,UART	48LQFP 46QFN



No WAS-16A1

- Wireless
- ASIC/Memory
- Non Holtek
- MCU
- Analog/Power



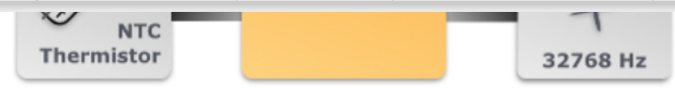
PDF Data Logger

LCD PDF Data Logger



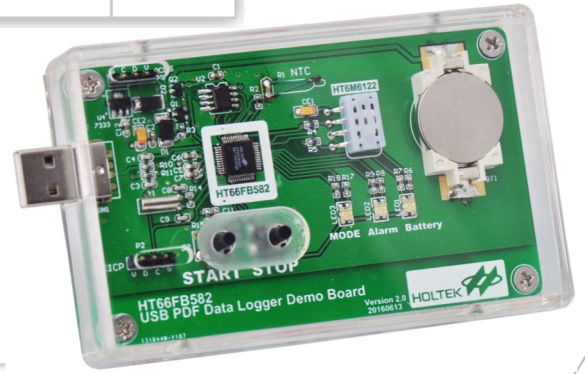
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No WAS-16A1

- Wireless
- ASIC/Memory
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- MCU
- Analog/Power



32-Bit Flash MCU

8-Bit Flash MCU

8-Bit High Supply Voltage Flash MCU

8-Bit OTP MCU

- ▶ Cortex-M0+ 32-Bit MCU
- ▶ Cortex-M0+ 32-Bit USB MCU
- ▶ Cortex-M0+ 32-Bit LCD MCU
- ▶ Cortex-M0+ 32-Bit 5V MCU
- ▶ Cortex-M0+ 32-Bit 5V USB MCU
- ▶ Cortex-M0+ 32-Bit 5V USB Smart Card Reader MCU
- ▶ Cortex-M0+ 32-Bit Data Bridge MCU
- ▶ Cortex-M0+ 32-Bit BLDC MCU
- ▶ Cortex-M0+ 32-Bit BLDC Flash MCU with Gate-Driver
- ▶ Cortex-M0+ 32-Bit BLDC MCU with Driver

32-Bit Flash MCU

8-Bit Flash MCU

8-Bit High Supply Voltage Flash MCU

8-Bit OTP MCU

- ▶ Cortex-M0+ 32-Bit USB Data Logger LCD MCU
- ▶ Cortex-M0+ 32-Bit 5V Touch MCU
- ▶ Cortex-M0+ 32-Bit BLE MCU
- ▶ Cortex-M0+ 32-Bit Music Synthesizer MCU with Data Flash ROM
- ▶ Enhanced 24-Bit A/D Cortex-M0+ 32-Bit MCU
- ▶ Enhanced 24-Bit A/D Cortex-M0+ 32-Bit LCD MCU
- ▶ 2.4GHz RF Transceiver Cortex-M0+ 32-Bit MCU
- ▶ Cortex-M0+ 32-Bit Music Synthesizer MCU
- ▶ Cortex-M3 32-Bit MCU
- ▶ Cortex-M3 32-Bit Fingerprint MCU

32-Bit Flash MCU

Cortex-M0+ 32-Bit BLE MCU

Part No.	Max. Freq.	VDD	Flash	SRAM	ADC	Timers #	Ver.	Data Rate	Output Power	Sensitivity	Interface	Others	I/O	Package
HT32F67741	40MHz	2.0V~3.6V	64KB	8KB	1Msps 12-bit×6	RTC×1, WDT×1, BFTM×2, SCTM×4, GPTM×1, MCTM×1	5.2	1/2Mbps	+3.5dBm	-94/-91dBm	USART×1, UART×2, SPI×2, I ² C×2	CRC×1 TRNG×1	25	46QFN

Note: # BFTM: Basic Function Timer, SCTM: Single-Channel Timer, GPTM: General-Purpose Timer, MCTM: Motor Control Timer.

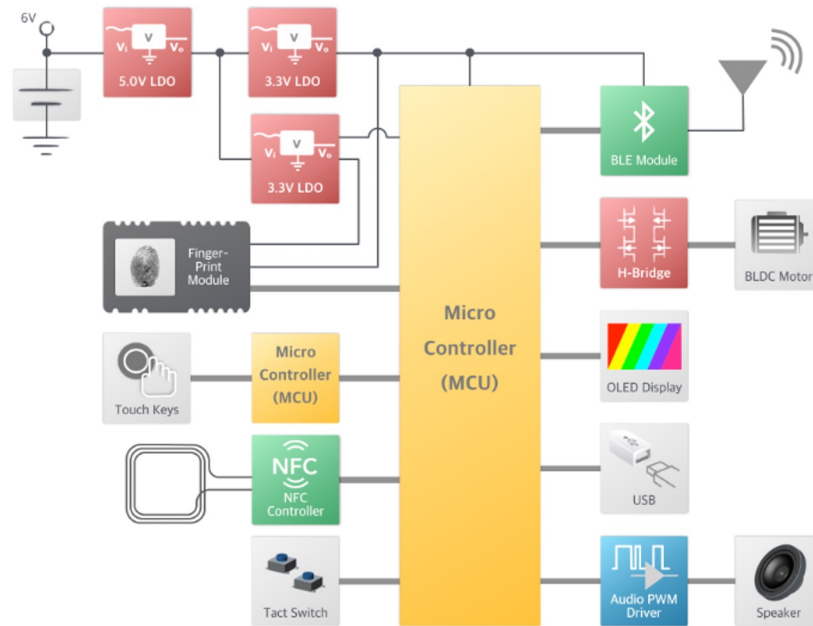
Enhanced 24-Bit A/D Cortex-M0+ 32-Bit MCU

Part No.	Max. Freq.	VDD	Flash	SRAM	ADC	Timers ^{*1}	Cap. ^{*2} or PWM	Cpm. PWM ^{*3}	RTC	Interface	Others	I/O	Package	
HT32F59041	20MHz	2.5V~5.5V	64KB	8KB	SAR ADC 1Msps 12-bit×12	Delta Sigma ADC 24-bit×4	BFTM×2 PWM×2 GPTM×1 MCTM×1	16	3	√	USART×1 UART×2 SPI×1 I ² C×1	CRC DIV	30	48LQFP

Cortex-M3 32-Bit MCU

Part No.	Max. Freq.	VDD	Flash	SRAM	PDMA	ADC	CMP	Timers ^{*1}	Cap. ^{*2} or PWM	Cpm. PWM ^{*3}	RTC	SCI ^{*4}	USB ^{*5}	EBI ^{*6}	I ² S	Inter- face	Others	I/O	Package
HT32F12345	96MHz	2.0V ~ 3.6V	64KB	16KB	12CH	1Msps 12-bit ×12	2	BFTM×2 GPTM×2 MCTM×2	16	6	√	—	√	√	√	SDIO×1 USART×2 UART×2 SPI×2, I ² C×2	CRC	37 37 51	46QFN 48LQFP 64LQFP
HT32F12365	96MHz	2.0V ~ 3.6V	256KB	64KB	12CH	1Msps 12-bit ×16	2	BFTM×2 GPTM×2 MCTM×2	16	6	√	2	√	√	√	SDIO×1 USART×2 UART×2 SPI×2, I ² C×2	AES CRC	37 37 51 80	46QFN 48LQFP 64LQFP 100LQFP
HT32F12366			256KB	128KB															
HT32F12364	72MHz	1.65V ~ 3.6V	256KB	128KB	6CH	1Msps 12-bit ×8	—	BFTM×2 SCTM×2 PWM×1 GPTM×1	10	—	√	1	√	√	—	USART×1 UART×2 SPI×2, I ² C×2	AES CRC	32 38 52	40QFN 48LQFP 64LQFP

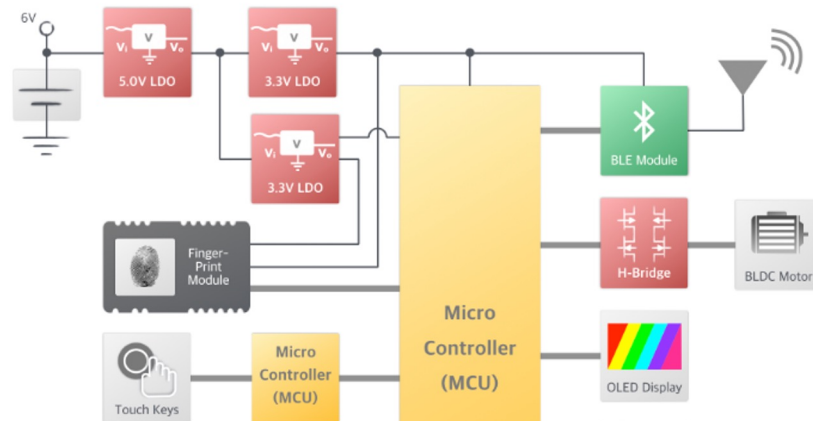
Smart Door Locks



No. WAS-2043

- Wireless
- MCU
- ASIC/Memory
- Analog/Power
- Non Holtek

Smart Door Locks

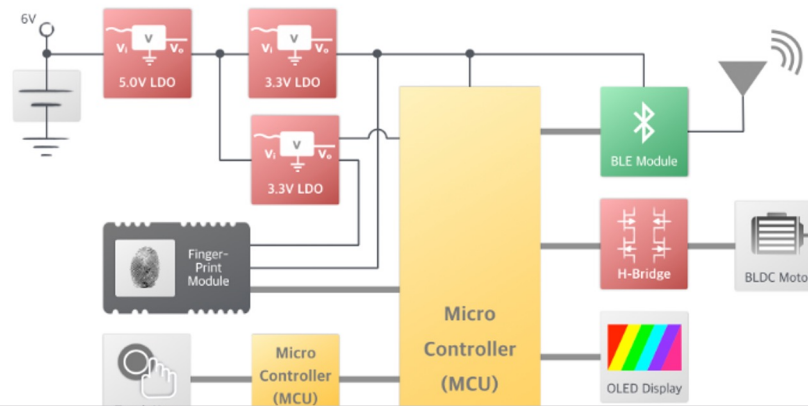


Enhanced Touch I/O Flash MCU (* Items in this solution Δ Other related products)									
	Part Number	VDD	IO/Touch Key	TIMER	ROM/RAM/EEP	CLOCK	Interface	Others	Package
*	BS83B12C	2.2V~5.5V	18/12	1	2KW/512B/64B	8/12/16 MHz	SPI/I ² C	High current LED output,LVR	20 SOP/SSOP/QFN
	BS83B16C		22/16			HIRC			24 SOP/SSOP/QFN

No.WAS-2043

- Wireless
- MCU
- ASIC/Memory
- Analog/Power
- Non Holtek

Smart Door Locks



Cortex-M0 32-Bit USB MCU (* Items in this solution Δ Other related products)

Part Number	VDD	Max. Freq.	ROM /SRAM	PDMA	ADC	CMP	Timer	Cap. or PWM Cpm. PWM	Interface	Other	I/O	Package
HT32F52342	2.0V~3.6V	48MHz	64KB /8KB	6CH	1Msps 12bitx12	2	7	14 3	USART, UART, SPI, I ² C, SCI, USB, I ² S	EBI, CRC	26	33 QFN
HT32F52352			128KB 64 LQFP /16KB								39	48 LQFP
HT32F52344	1.65V~3.6V	60MHz	64KB /16KB	6CH	1Msps 12bitx12	2	6	10 3	UART, SPI, I ² C, USB	EBI, CRC, DIV	26	33 QFN
* HT32F52354			128KB /16KB								38	46 QFN

No. WAS-2043

- Wireless
- ASIC/Memory
- Non Holtek

■ Analog/Power



BLE
Cortex-M0+ 32-Bit BLE MCU

Part No.	Max. Freq.	VDD	Flash	SRAM	ADC	Timers #	Ver.	Data Rate	Output Power	Sensitivity	Interface	Others	I/O	Package
HT32F67741	40MHz	2.0V~3.6V	64KB	8KB	1Msps 12-bit×6	RTC×1, WDT×1, BFTM×2, SCTM×4, GPTM×1, MCTM×1	5.2	1/2Mbps	+3.5dBm	-94/-91dBm	USART×1, UART×2, SPI×2, I ² C×2	CRC×1 TRNG×1	25	46QFN

Note: # BFTM: Basic Function Timer, SCTM: Single-Channel Timer, GPTM: General-Purpose Timer, MCTM: Motor Control Timer.

BLE Controller

Part No.	VDD	Ver.	Data Rate	Output Power	Sensitivity	Interface	Package
BC7701	2.0V~3.6V	5.2	1/2 Mbps	+3.5dBm	-94/-91dBm	UART	32QFN

BLE Beacon Transmitter

Part No.	VDD	Frequency	Beacon Packet Handler	Output Power	Oscillator	BQB 5.0	Interface	Package
BC7161	2.0V~3.6V	2402/2426/2480MHz	√	-10~+8dBm	32MHz	√	I ² C×1	8SOP-EP 10MSOP-EP

BLE Beacon Transceiver

Part No.	VDD	Frequency	Beacon Packet Handler	Output Power	Sensitivity	Oscillator	BQB 5.2	Interface	Package
BC7262*	1.9V~3.6V	2402/2426/2480MHz	√	-10~+8dBm	-93dBm	32MHz	√	I ² C×1	10SOP-EP

* Under development, available in 3Q, 2022.

2.4GHz RF

2.4GHz RF Transceiver Cortex-M0+ 32-Bit MCU

Part No.	Max. Freq.	VDD	Flash	SRAM	PDMA	ADC	Timers ^{*1}	RTC	Frequency	Data Rate	Output Power	Sensitivity	Interface	Others	I/O	Package
HT32F67041*	60MHz	2.2V~3.6V	64KB	8KB	6CH	1Msps 12-bit×16	BFTM×2 SCTM×4 GPTM×1	√	2402~2480 MHz	125/250/ 500Kbps	-10~+6 dBm	-97dBm @ 250Kbps	UART×2 SPI×2 I ² C×2	AES CRC	16	32QFN
HT32F67051*			29												46QFN	
			128KB												29	48LQFP-EP

* Under development, available in 1Q, 2022.

Note: 1. BFTM: Basic Function Timer, SCTM: Single-Channel Timer, GPTM: General-Purpose Timer, MCTM: Motor Control Timer.

2.4GHz RF Transceiver A/D Flash MCU

Part No.	Max. Freq.	VDD	Program Memory	Data Memory	Data EEPROM	Stack	I/O	Timer	ADC	Frequency	Data Rate	Output Power	Sensitivity	Interface	Package
BC66F5652	16MHz	1.9V~3.6V	8K×16	512×8	128×8	8	22	10-bit PTM×1 16-bit CTM×1 16-bit STM×1	12-bit ×12	2402~2480 MHz	125/250/ 500Kbps	-10~+6 dBm	-97dBm @ 250Kbps	SPI/I ² C×1 UART×1	28SSOP
BC66F5662			16K×16	2048×8	1024×8	16	24	10-bit PTM×2 16-bit STM×3	12-bit ×4						46QFN

2.4GHz RF Transceiver

Part No.	VDD	Frequency	Modulation	Data Rate	Output Power	Sensitivity	Oscillator	Interface	Package
BC5602	1.9V~3.6V	2402~2480MHz	GFSK	125/250/500Kbps	-10~+6dBm	-97dBm@250Kbps	16MHz	SPI	16QFN

2.4GHz RF Transmitter with Encoder A/D Flash MCU

Part No.	Max. Freq.	VDD	Program Memory	Data Memory	Data EEPROM	Stack	I/O	Timer	ADC	Frequency	Modulation	Data Rate	Output Power	Package
BC66F5132	8MHz	2.0V~3.6V	2K×14	64×8	32×14 [#]	4	12	8-bit×1	10-bit×4	2402~2480MHz	GFSK	125/250/500Kbps	-10~+8dBm	24SSOP-EP

Note: # Emulated EEPROM.

Sub-1GHz RF

Sub-1GHz RF Transceiver A/D Flash MCU

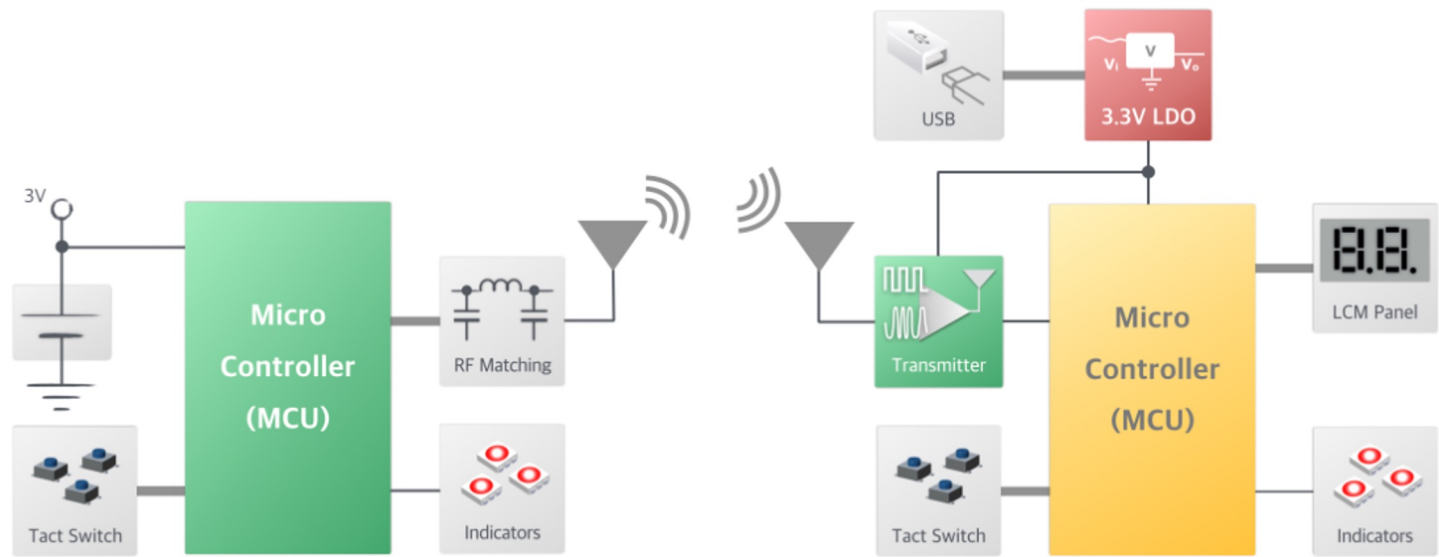
Part No.	Max. Freq.	VDD	Program Memory	Data Memory	Data EEPROM	Stack	I/O	Timer	ADC	Band	Data Rate	Max. Output Power	Rx Current Consumption	Package
BC66F3652	16MHz	1.9V~3.6V	8K×16	512×8	128×8	8	22	10-bit PTM×1 16-bit CTM×1 16-bit STM×1	12-bit ×12	315/433/470/ 868/915MHz	2~250 Kbps	13dBm	4.2mA@433MHz 5.5mA@868MHz	46QFN
BC66F3662	16MHz	1.9V~3.6V	16K×16	2048×8	1024×8	16	22	10-bit PTM×2 16-bit STM×2	12-bit ×4	315/433/470/ 868/915MHz	2~250 Kbps	13dBm	4.2mA@433MHz 5.5mA@868MHz	46QFN

Sub-1GHz RF Transceiver

Part No.	VDD	Band	OOK/GFSK	Low Current	External Inductor	Data Rate	Max. Output Power	Sensitivity	Package
BC3601	2.0V~3.6V	315/433/470/868/915MHz	GFSK	—	—	2~250Kbps	17dBm	-121dBm@2kbps	24QFN
BC3602	1.9V~3.6V	315/433/470/868/915MHz	GFSK	√	√	2~250Kbps	13dBm	-120dBm@2kbps	24QFN
BC3603*	1.8V~3.6V	315/433/470/868/915MHz	√	√	—	OOK: 0.5~20Kbps GFSK: 2~250Kbps	20dBm	-121dBm@2kbps	16QFN

* Under development, available in 2Q, 2022.

Hopping Code Remote Controller



No.WAS-2052

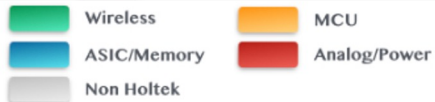
- Wireless
- MCU
- ASIC/Memory
- Analog/Power
- Non Holtek

Hopping Code Remote Controller

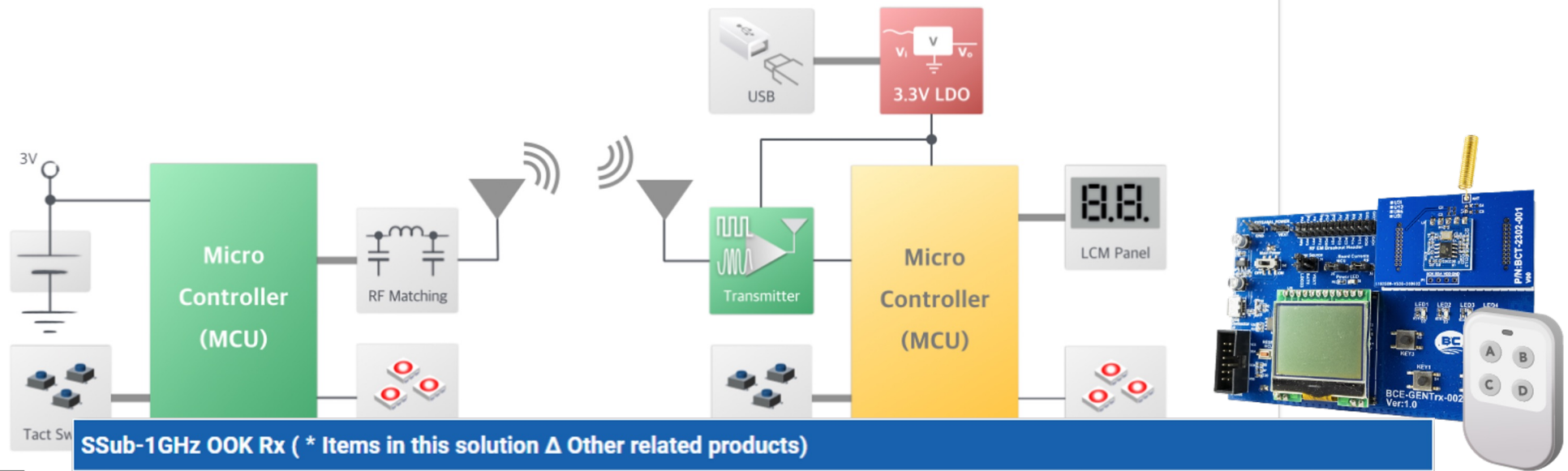


Sub-1GHz RF Transmitter Flash MCU (* Items in this solution Δ Other related products)

	Part Number	VDD	IO	TIMER	ROM/RAM/EEP	CLOCK	Band	Symbol Rate	Output Power	Others	Package
*	BC68F2130	2.0V~3.6V	8	2	2KW/256B/-	16MHz HIRC	315/433/868/915 MHz	0.5~25 Ksps (OOK)	0/10/13 dBm	OOK/FSK, LVD/LVR, IAP	16 NSOP-EP/QFN
	BC68F2140		14		4KW/256B/-						24 SSOP-EP/QFN
	BC68F2150		8KW/256B/-								



Hopping Code Remote Controller



SSub-1GHz OOK Rx (* Items in this solution Δ Other related products)

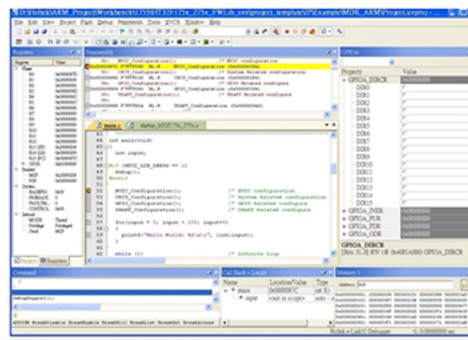
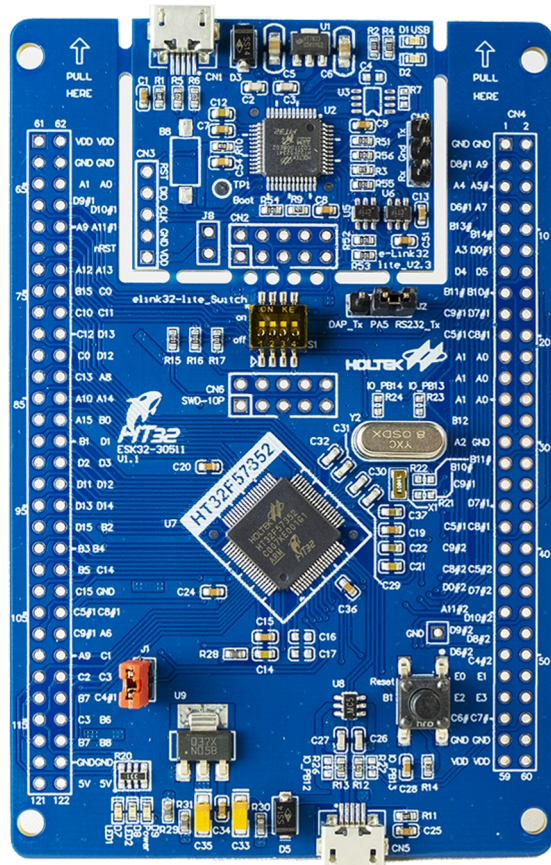
No.WAS-2052

- Wireless
- ASIC/Mem
- Non Holtek

	Part Number	VDD	IO/ADC	TIMER	ROM/RAM/EEP	CLOCK	Interface	Others	Package
*	HT66F2370	2.2V~5.5V	58/12-bitx16	7	32KW/3KB/512B	8/12/16MHz HIRC	SPI/I ² C,SPIA, UART	SCOM, CRC ,Comparator	48/64 LQFP
	HT66F2372	1.8V~5.5V	44/12-bitx16		32KW/3KB/1KB				28 SOP 44/48 LQFP



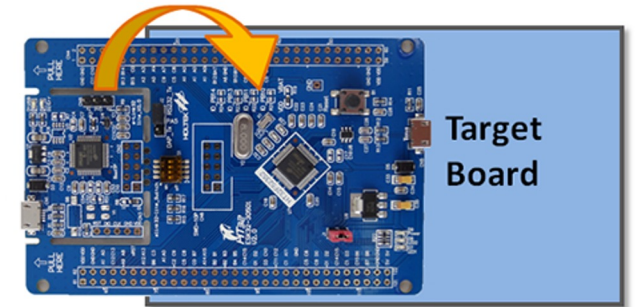
MCU Developer Platform, Dev
Kits, IDE's, Programadores,
Soporte



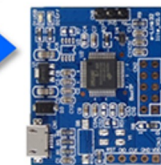
 **KEIL**
An ARM® Company

 **IAR**
SYSTEMS

Evaluate



Develop



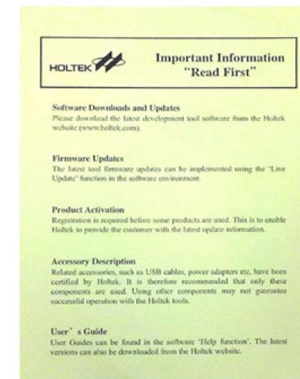
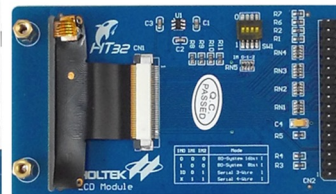
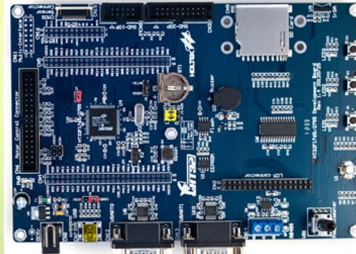
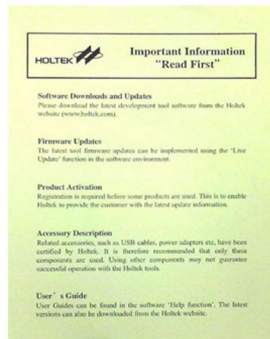
Debugger

SWD



Any Board with a
SWD-10P Connector

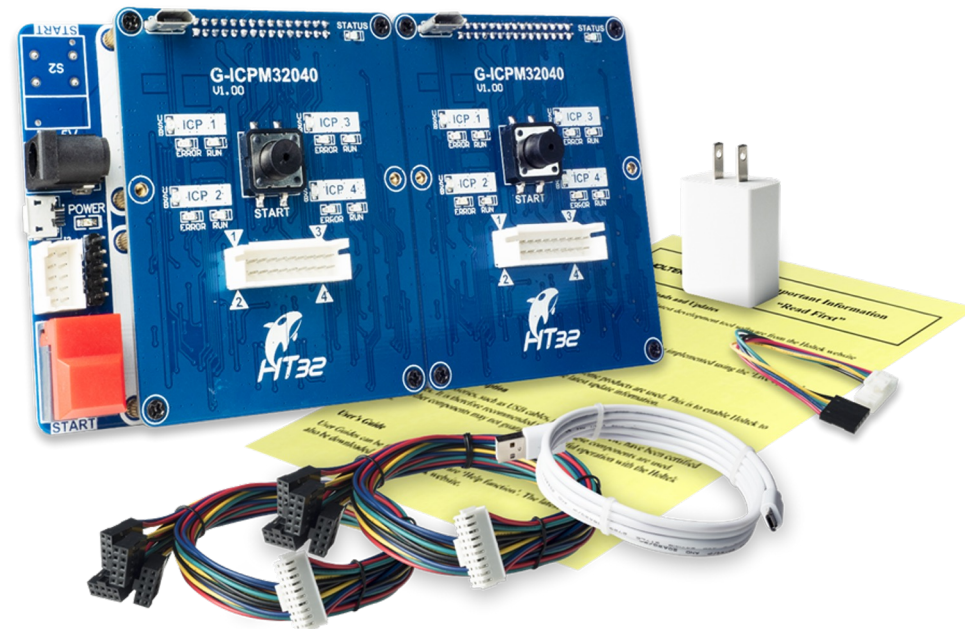
Kits de desarrollo

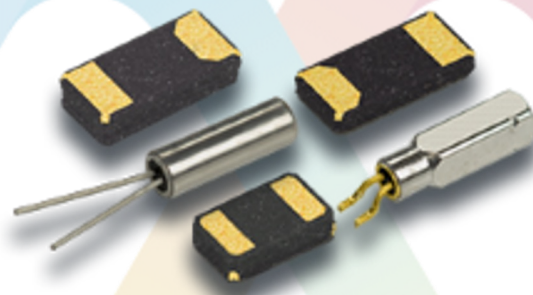


Debuggers



Programadores





Control del tiempo y frecuencia



Introducción

Micro Crystal AG

Empresa del Grupo Swatch, afincada en Suiza y fundada en 1978.

- Fabricante líder de cristales de cuarzo en miniatura (32 kHz a 250 MHz), relojes en tiempo real (RTC), osciladores y OCXO.
- Sus productos se pueden encontrar en los principales fabricantes mundiales de dispositivos portátiles, IoT, dispositivos móviles, productos de consumo, ordenadores, electrónica de automóviles, relojes, controles industriales, así como dispositivos médicos implantables y otras aplicaciones de productos de alta confiabilidad.
- Micro Crystal AG brinda un soporte a sus clientes desde el diseño hasta la producción en masa.

A COMPANY OF THE  SWATCH GROUP

Wi2Wi

fundada en 2004 con sede en EEUU.

- Diseñador, integrador y fabricante global de soluciones de tecnología inalámbrica para una amplia gama de mercados globales.
- Soluciones de conectividad inalámbrica, y tras la adquisición de Precision Devices Inc. (PDI), ofrece productos de control de frecuencia, así como filtros de RF y microondas para aviónica, espacio, militar, defensa, infraestructura, industrial, automoción, medicina, comunicaciones, Internet de las cosas (IoT), dispositivos de navegación personal y aplicaciones de consumo.
- Wi2Wi ofrece una amplia gama de productos de soluciones "listas para usar" y personalizadas, aprovechando su tecnología junto con asociaciones globales de primer nivel con empresas líderes en la industria del silicio y la cadena de suministro para servir a muchas de las empresas más grandes e innovadoras del mundo.















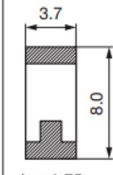
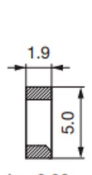
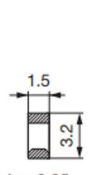
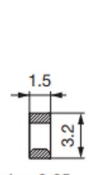
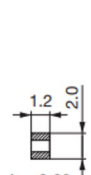
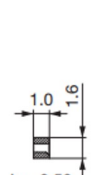
Soluciones de *timing*

Cristales kHz

Applications

- IoT
- Computing
- Automotive
- Wireless Units
- Smart Metering
- Industrial Control
- Embedded Modules
- GPS and Navigation
- Tablets, Smart Phones
- Security and Access Control
- Wearables, Portable Devices
- Remote Keyless Entry Systems
- High Temperature Range Designs
- Ultra Small Size Devices, Smart Cards
- Healthcare, Medical and Medical Implantable

kHz Tuning Fork Crystals in Ceramic Packages

Crystal Type	30.0 kHz to 2'000 kHz Tuning Fork Crystals						Units
	CC1V-T1A	CC4V-T1A	CM7V-T1A	CM7V-T1A low ESR	CM8V-T1A	CM9V-T1A	
Product Type							
Dimensions (l x w x h)	8.0 x 3.7 x 1.75	5.0 x 1.9 x 0.90	3.2 x 1.5 x 0.65	3.2 x 1.5 x 0.65	2.0 x 1.2 x 0.60	1.6 x 1.0 x 0.50	mm
  			 h = 0.35 on request		 h = 0.35 on request	 h = 0.35 on request	mm
 PCB Symbol, Footprint & 3D Model available on product pages on website	 h = 1.75	 h = 0.90	 h = 0.65	 h = 0.65	 h = 0.60	 h = 0.50	mm
Lid Material	Ceramic	Ceramic	Metal	Metal	Metal	Metal	
Operating Temp. Range TA	-40 to +85	-40 to +85	-40 to +85	-40 to +85	-40 to +85	-40 to +85	°C
Operating Temp. Range TB ¹⁾	-40 to +125	-40 to +125	-40 to +125	-40 to +125	-40 to +125	-40 to +125	°C

Frequency	F _L	32.768	32.768	32.768	32.768	32.768	32.768	kHz
Standard Load Capacitance ²⁾	C _L	9 / 12.5	6 / 7 / 9 / 12.5	6 / 7 / 9 / 12.5	6 / 7 / 9 / 12.5	4 / 7 / 9 / 12.5	4 / 7 / 9 / 12.5	pF
Frequency Tolerance @ 25°C ³⁾	ΔF/F	±20	±20	±20	±20	±20	±20	ppm
Series Resistance typ./max.	R _s	40 / 60	50 / 65	50 / 70	40 / 50	55 / 70	60 / 75	kΩ
Motional Capacitance typ.	C ₁	2.0	2.1	3.7	4.7	4.7	6.3	fF
Static Capacitance typ.	C ₀	1.6	1.2	1.2	1.3	1.2	1.4	pF
Drive Level max.	P	1.0	1.0	1.0	1.0	0.5	0.5	μW
Aging max. 1st Year @ 25°C	ΔF/F	±3	±3	±3	±3	±3	±3	ppm
Turnover Temperature	T ₀	25 ±5	25 ±5	25 ±5	25 ±5	25 ±5	25 ±5	°C
Frequency vs. Temperature	ΔF/F	-0.035 ppm/°C ² (T-T ₀) ² ±10%						ppm











Osciladores kHz

Applications

Lowest current, smallest package and high accuracy make Micro Crystal's oscillators ideal for:

- IoT
- Smart Pens
- Industrial Computing
- Wearables and Activity Bands
- Automotive, Driver Assistance
- Driving Recorders, Camera Systems
- Navigation and Emergency Call Systems
- Bluetooth Low Energy (BLE) Applications
- Tire Pressure Monitoring Systems (TPMS)
- Healthcare, Medical and Medical Implantable

Low Frequency Oscillators in Ceramic Packages

Product Type	OM-xxxx-C7	OV-xxxx-C7	OM-xxxx-C8	OM-xxxx-C9
Dimensions (l x w x h) mm	3.2 x 1.5 x 0.70	3.2 x 1.5 x 1.0	2.0 x 1.2 x 0.70	1.6 x 1.0 x 0.60
				
 PCB Symbol, Footprint & 3D Model available on product pages on website	 h = 0.70	 h = 1.0	 h = 0.70	 h = 0.60
Lid Material	Metal	Ceramic	Metal	Metal

32.768 kHz Oscillators

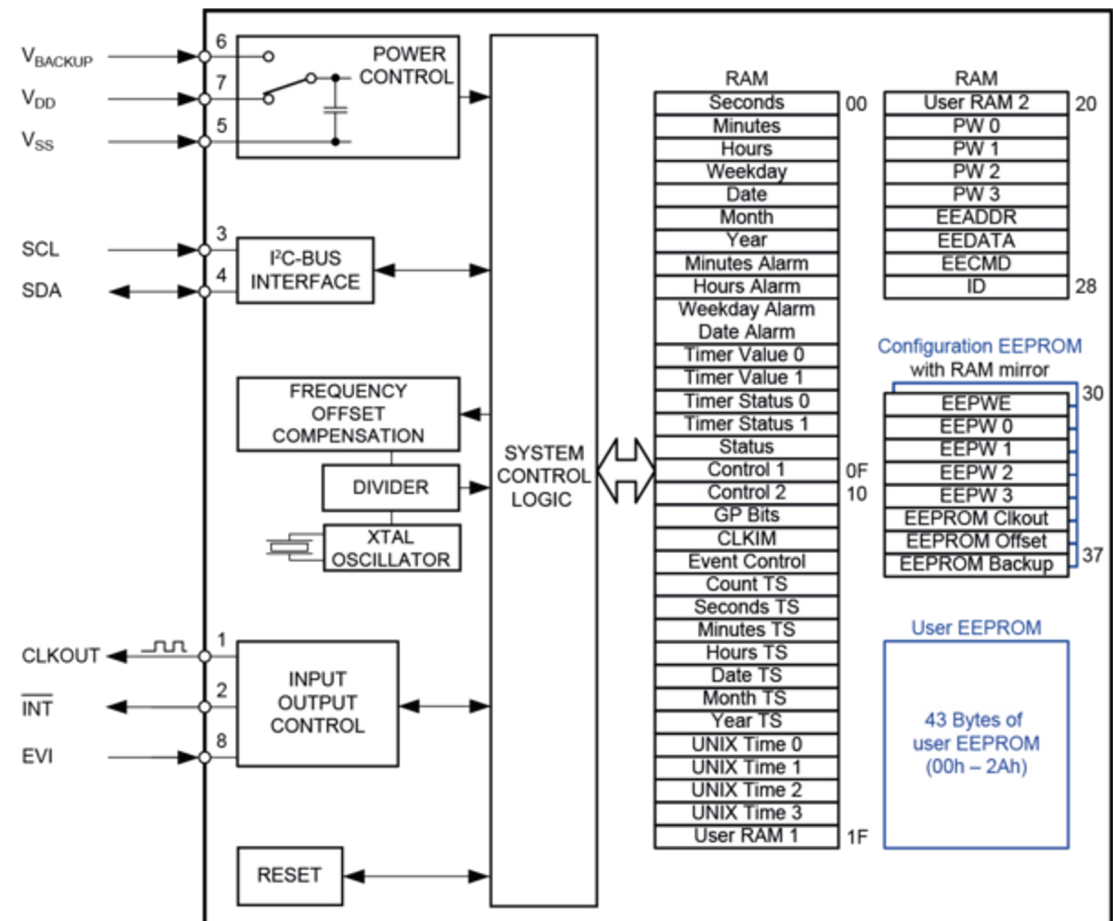
Product Type	Dimensions (l x w x h) mm	Frequency kHz	$\Delta F/F @ 25^\circ\text{C}$ ppm	Supply V_{DD} V	Current I_{DD} nA	T_{OP} °C	Duty Cycle %	CLKOE Input	$\Delta f/V$ ppm/V	Aging 1Y @ 25°C ppm
OM-7604-C7	3.2 x 1.5 x 0.70	32.768	± 20 ¹⁾	1.2 to 5.5	300	-40 to +125	40 to 60	✓	± 1.5	± 3.0
OV-7604-C7	3.2 x 1.5 x 1.0	32.768	± 20 ¹⁾	1.2 to 5.5	300	-40 to +125	40 to 60	✓	± 1.5	± 3.0
OM-7605-C8	2.0 x 1.2 x 0.70	32.768	± 20 ¹⁾	1.6 to 5.5	450	-40 to +125	40 to 60	✓	± 3.0	± 3.0
OM-7605-C9	1.6 x 1.0 x 0.60	32.768	± 20 ¹⁾	1.6 to 5.5	450	-40 to +125	40 to 60	✓	± 3.0	± 3.0




100.000 kHz Oscillators

OM-0100-C7	3.2 x 1.5 x 0.70	100.000	± 20 ¹⁾	1.2 to 5.5	650	-40 to +85	40 to 60	✓	± 1.5	± 3.0
OM-0100-C8	2.0 x 1.2 x 0.70	100.000	± 100 ¹⁾	1.6 to 5.5	550	-40 to +85	40 to 60	✓	± 3.0	± 3.0




Real-Time Clock (RTC)

- Los módulos de reloj en tiempo real (RTC) combinan un XTAL de 32,768 kHz con un oscilador basado en CMOS y RTC IC dentro de un encapsulado cerámico SMD en miniatura.
- EEPROM incorporada
- Consumo de energía ultrabajo: 45nA
- Alta precisión: ± 1 ppm, $\pm 0,09$ s/día
- Encapsulado más pequeño: 3,2 x 1,5 x 0,8 mm
- Rango de temperatura ampliado hasta +125 °C, incluido AEC-Q200



Product Type	Interface	Features	IDD @ 3 V	Time Accuracy @ 25°C	Temp. Comp. -40 / 85°C	VDD min	VDD max	TMAX [°C]	Temp. Readback	Clock Out	Battery Switch	Battery Charge	Charge Pump	Time Stamp	Alarm	Timer	Event Input	Unix Time	Offset Comp	RAM [Bytes]	EEPROM [Bytes]	
New RV-3032-C7	I ² C	  	160 nA		±2.5 ppm	1.3 V	5.5 V	+85	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	16	32
New RV-5028-C7	I ² C	  	45 nA	±1 ppm		1.1 V	5.5 V	+85		✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	2	43
RV-3028-C7	I ² C	  	45 nA	±1 ppm		1.1 V	5.5 V	+85		✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	2	43
RV-8803-C7	I ² C	  	240 nA		±3 ppm	1.5 V	5.5 V	+105		✓				✓	✓	✓	✓			✓	1	
RV-8263-C7	I ² C		190 nA	±20 ppm		0.9 V	5.5 V	+85		✓					✓	✓				✓	1	
RV-4162-C7	I ² C		350 nA	±20 ppm		1.0 V	4.4 V	+85		✓					✓					✓		
RV-8523-C3	I ² C	 	130 nA	±20 ppm		1.2 V	5.5 V	+85		✓	✓				✓	✓						
RV-8564-C3	I ² C	 	250 nA	±20 ppm		1.2 V	5.5 V	+85		✓					✓	✓						
RV-8564-C2	I ² C	 	250 nA	±20 ppm		1.2 V	5.5 V	+85		✓					✓	✓						
RV-3129-C3	I ² C		800 nA		±6 ppm	1.3 V	5.5 V	+125	✓	✓	✓	✓			✓	✓					8	2
RV-8063-C7	SPI		190 nA	±20 ppm		0.9 V	5.5 V	+85		✓					✓	✓				✓	1	
RV-2123-C2	SPI	 	130 nA	±20 ppm		1.1 V	5.5 V	+85		✓					✓	✓				✓		
RV-3149-C3	SPI		800 nA		±6 ppm	1.3 V	5.5 V	+125	✓	✓	✓	✓			✓	✓					8	2

Package

C2	C3	C7
		
[mm] 5.0 x 3.2 x 1.2	3.7 x 2.5 x 0.9	3.2 x 1.5 x 0.8

 Standard Features	 Small Package	 Medical Implantable
 High Accuracy	 Low Power	

Osciladores y cristales MHz

- **Micro Crystal AG:**
 - Las unidades de cristal de cuarzo AT-Cut estándar de 8 a 30 MHz y los cristales Mesa invertidos de alta frecuencia fundamental (HFF) de 50 a 250 MHz funcionan en modo fundamental.
 - AT-cut y HFF están disponibles en paquetes de cerámica en miniatura de bajo perfil que soportan altas temperaturas, alta resistencia a golpes y vibraciones, son ideales para entornos hostiles y aplicaciones de alta confiabilidad.
- **Wi2Wi:**
 - Osciladores de reloj de cristal de cuarzo estándar y personalizados.
 - Distintos tipos de señal de salida CMOS, TTL, HCMOS, ACMOS, LVPECL, LVDS, y HCSL
 - Distintos tipos de encapsulados y opciones herméticamente selladas.






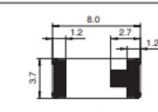
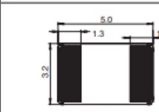
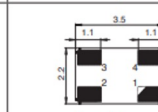
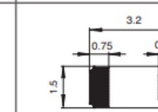
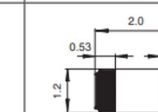
Osciladores y cristales MHz

Applications

Customer-specific applications such as:

- Filters
- Telemetry
- Animal Tracking
- Optical Network
- Avionics / Aerospace
- Radio Communication
- TCXO, VCTCXO, VCXO
- Downhole and Well Drilling
- Healthcare, Medical and Medical Implantable

SMD Ceramic AT-CUT Crystals 100% Lead Free

Type CC1A / F	Type CC2A	Type CC6A / F	Type CC7A	Type CC8A / CM8A
Package 8.0 x 3.7 mm	Package 5.0 x 3.2 mm	Package 3.5 x 2.2 mm	Package 3.2 x 1.5 mm	Package 2.0 x 1.2 mm
		 4 or 2 pads		 2 or 4 pads
 h = 1.75 mm	 h = 1.2 mm	 h = 1.0 mm	 h = 0.75 mm	 h = 0.60 mm

Standard (Fundamental Mode)

Product Type	Number of pads	Frequency MHz	Temp. Range °C	R _s typ. in Ω @ Fmin - Fmax	C ₁ typ. in fF @ Fmin - Fmax	C ₂ typ. in pF @ Fmin - Fmax	Key Features / Applications
CC1A-T1A	2	8 - 30	-55 to +125	60 - 30	4 - 11	2.0 - 4.0	
CC1F-T1A	2	30 - 250	-55 to +125	35 - 15	4 - 7	2.0 - 4.0	Inverted mesa crystal
CC2A-T1A	2	12 - 70	-55 to +125	60 - 10	3 - 12	2.0 - 5.0	
CC6A-T1D	4	16 - 70	-55 to +125	60 - 20	2 - 5	1.5 - 3.0	
CC6F-T1A	2	70 - 250	-55 to +125	30 - 15	5 - 6	2.4 - 3.2	Inverted mesa crystal
CC6F-T1A F	2	70 - 200	-55 to +125	35 - 15	3 - 3	2.4 - 3.2	Inverted mesa crystal Filter applications - low spurious
CC7A-T1A	2	20 - 50	-55 to +125	40 - 25	2 - 2	0.7 - 0.7	
CC8A-T1A	2	24 - 50	-55 to +125	40 - 20	1 - 1	0.7 - 0.7	Smallest package
CM8A-T1D	4	24 - 50	-55 to +125	40 - 20	1 - 1	0.7 - 0.7	Smallest package
CC7A-T1A Medical	2	14 - 50	0 to +55	60 - 25	2 - 2	0.7 - 0.7	Medical implantable
CC8A-T1A Medical	2	24 - 50	0 to +55	40 - 20	1 - 1	0.7 - 0.7	Medical implantable

High Temperature / High Shock and Vibration Resistant (Fundamental Mode)

CC1A-T1A H	2	8 - 24	-55 to +200	100 - 50	4 - 9	2.0 - 3.2	Harsh Environment
CC2A-T1A H	2	14 - 40	-55 to +200	70 - 40	5 - 10	2.5 - 4.0	Harsh Environment
CC6A-T1D H	4	16 - 40	-55 to +200	80 - 50	2 - 4	1.5 - 2.5	Harsh Environment

Osciladores y cristales MHz

Nominal Frequency : Specified in kHz or MHz

Output = (TTL,CMOS, DUAL OUTPUT,HCMOS,TCXO,VCXO,TCVCXO,ECL)









Tolerance = +/- 10-100ppm, or 1-2.5ppm or Special.

Operating Temp.= 0 to 70C,-20 to 70C, -30 to 80C, -40 to 85C, -55 to 125C, 0 to 50C, -30 to 60C, -30 to 75C, -55 to 170C, -20 to 185C, Ect.

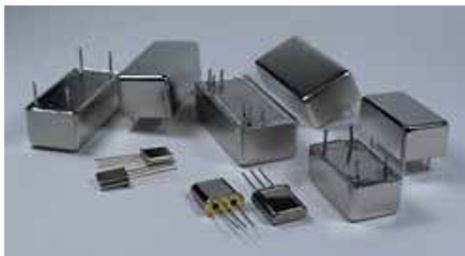
Frequency/Temperature Stability : Typically ± 25 ppm over -20 to +70°C or similar.







Package/Package size : Cut, Gull Wing SMD, Tape & Reel.

Storage Temp. Range.

Type/Series	Image	Package	Output	Frequency Range	Dimensions
LV5		SMD Seam Welded	LVDS	40MHz to 200MHz	5.00mm x 3.20mm x 1.20mm
LV7		SMD Seam Welded	LVDS	40MHz to 200MHz	7.0mm x 5.0mm x 1.8mm
O08		DIP8	TTL/CMOS LVCMOS	30KHz to 200MHz	13.2mm x 13.2mm x 5.6mm
O14		DIP14	TTL/CMOS LVCMOS	30KHz to 200MHz	20.4mm x 12.8mm x 5.08mm
FC7		SMD Seam Weld	LVC MOS LVDS LVPECL	10MHz to 1GHz	7.0mm x5.0mm x1.8mm
JC7		J Lead Gull Wing Thru Hole	TTL/CMOS LVCMOS HCMOS	30KHz - 200MHz	7.0mm x 5.0mm x 1.6mm
JL9		Ceramic J-Lead	TTL/CMOS LVCMOS HCMOS	30KHz - 200MHz	14mm x 9mm x 4.7 mm
JL4		Ceramic J-Lead	TTL/CMOS LVCMOS	30KHz - 200MHz	8.9mm x 7.4mm x 4.3 mm

Filtros de Cristal



Package	Image	Frequency Range	Thru-Hole/SMD	Discrete/Monolithic	Operating Temperature	Poles	Lead Free
FP		10.7MHz to 200MHz	Both	Both	-55 to +125°C	6	Yes
HA		10.7MHz to 200MHz	PTH	Both	-55 to +125°C	2	Yes
HA x 2		10.7MHz to 200MHz	PTH	Both	-55 to +125°C	4	Yes
S1		10.7MHz to 200MHz	SMD	Monolithic	-55 to +125°C	4	Yes
S2		10.7MHz to 200MHz	SMD	Monolithic	-55 to +125°C	4	Yes
S3		10.7MHz to 200MHz	SMD	Monolithic	-55 to +125°C	6	Yes

TCXO / VCXO / TCVCXO / OCXO y osciladores QPL







- TCXO (Oscilador de Cristal con Compensación de Temperatura)
 - Compensa automáticamente el oscilador generando un voltaje para corregir la variación de la frecuencia sobre la temperatura
- VCXO (Oscilador de Cristal Controlados por Voltaje)
 - Permite al usuario ajustar manualmente un voltaje de control para compensar todas las inestabilidades en la frecuencia de salida
- TCVCXO (Oscilador de Cristal Compensado por Temperatura y Controlado por Voltaje)
 - Combinación del TCXO y VCXO y ayudan a proporcionar una frecuencia muy estable y un ajuste manual de otros impactos de inestabilidad
- OCXO (Oscilador de Cristal Controlado por Horno)
 - Utiliza una cámara de temperatura controlada para mantener el cristal de cuarzo a una temperatura constante, con el fin de evitar cambios en la frecuencia debido a variaciones en la temperatura ambiente.

TCXO / VCXO / TCVCXO / OCXO y osciladores QPL

- TCXO (Oscilador de Cristal con Compensación de Temperatura)
 - Compensa automáticamente el oscilador generando un voltaje para corregir la variación de la frecuencia sobre la temperatura
- VCXO (Oscilador de Cristal Controlados por Voltaje)
 - Permite al usuario ajustar manualmente un voltaje de control para compensar todas las inestabilidades en la frecuencia de salida
- TCVCXO (Oscilador de Cristal Compensado por Temperatura y Controlado por Voltaje)
 - Combinación del TCXO y VCXO y ayudan a proporcionar una frecuencia muy estable y un ajuste manual de otros impactos de inestabilidad
- OCXO (Oscilador de Cristal Controlado por Horno)
 - Utiliza una cámara de temperatura controlada para mantener el cristal de cuarzo a una temperatura constante, con el fin de evitar cambios en la frecuencia debido a variaciones en la temperatura ambiente.



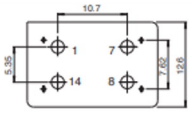
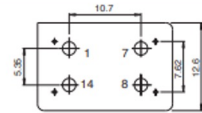
TCXO / VCXO / TC



Type/ Series	Image	Package	Output	Frequency Range	Dimensions	Features
TV02		SMD Seam Welded	Clipped Sine	10MHz to 52MHz	2.5 x 2.0 x 0.8mm	Small Footprint 1.8 to 3.3 V supply available
TV03		SMD Seam Welded	Clipped Sine	10MHz to 52MHz	3.2 x 2.5 x 1.0mm	Small Footprint 1.8 to 3.3 V supply available
TV05		SMD Seam Welded	TTL/CMOS LVCMOS Clipped Sine	10MHz to 52MHz	5.0 x 3.2 x 1.5mm	5V Available Multiple Output Types
TV07		SMD Seam Welded	TTL/CMOS LVCMOS Clipped Sine	8MHz to 52MHz	7.0 x 5.0 x 2.3mm	5V Available Multiple Output Types
TC02		SMD Seam Welded	Clipped Sine	10MHz to 52MHz	2.5 x 2.0 x .9mm	Small Footprint 1.8 to 3.3 V supply available
TC03		SMD Seam Welded	Clipped Sine	10MHz to 52MHz	3.2 x 2.5 x 1.0mm	Small Footprint 1.8 to 3.3 V supply available

TCXO / VCXO / TCVCXO / OCXO / SCOCXO / PDI











OCXOs DIL-14 Package RoHS	
Type SCOCXO	Type OCXO
Package DIL-14 20.2 x 12.6 mm	Package DIL-14 20.2 x 12.6 mm
	
	
h = 7.8 mm	h = 7.8 mm

Standard							
Product Type	Package size	Frequency (MHz)	Supply Voltage	Temperature Range	Output	Frequency Stability	Key Features / Applications
SCOCXOL	DIL-14	Up to 54	3.3 / 5.0 V	-55 to +85°C	HCMOS	From ±25 ppb	High Stability, Ultra Fast Warm-up, Ultra Low Power
SCOCXO	DIL-14	Up to 120	3.3 / 5.0 V	-55 to +85°C	HCMOS	From ±25 ppb	High Stability, Low Phase Noise
SCOCXOS	DIL-14	Up to 120	3.3 / 5.0 V	-55 to +85°C	Sine Wave	From ±25 ppb	High Stability, Low Phase Noise
OCXOVT-SAR	DIL-14	Up to 40	5.0 V	-40 to +55°C	Sine Wave	±3 ppb / 50 s	Cospas-Sarsat
OCXOS	DIL-14	Up to 54	3.3 / 5.0 V	-55 to +85°C	Sine Wave	From ±75 ppb	
OCXO	DIL-14	Up to 54	3.3 / 5.0 V	-55 to +85°C	HCMOS	From ±75 ppb	






TCXO / VCXO / TCVCXO / OCXO y

- Osciladores QPL (Qualified Product List):
 - Osciladores que cumplen el estándar MIL-PRF-55310.
 - Diseñados para aplicaciones en las áreas militar, espacial y de aviónica.
 - Productos resistentes, robustos y confiables.
 - Rango de temperatura de -55 °C a 125 °C.
 - Distintos encapsulados de metal y cerámica sellados herméticamente.
 - Distintas salidas, incluidas CMOS, HCMOS, AC MOS y TTL.
 - Personalización de frecuencia.

Type/Series	Image	Package	Output	Frequency Range	Dimensions
MIL-55310/08		Thru-Hole	TTL	750kHz to 50MHz	0.887L x 0.540W x 0.200H in
MIL-55310/09		Thru-Hole	TTL	750kHz to 60MHz	0.410D x 0.300H in
MIL-55310/14		Thru-Hole	TTL	750kHz to 25MHz	0.887L x 0.540W x 0.200H in
MIL-55310/16		Thru-Hole	TTL	750kHz to 60MHz	0.887L x 0.540W x 0.200H in 0.887L x 0.540W x 0.265H in
MIL-55310/17		Thru-Hole	TTL	12MHz to 50MHz	0.887L x 0.540W x 0.200H in
MIL-55310/18		Thru-Hole	CMOS	0.1Hz to 15MHz	0.887L x 0.540W x 0.200H in
MIL-55310/19		SMD	TTL	1MHZ to 60MHZ	0.480L x 0.480W x 0.085H in
MIL-55310/21		Flat Pack	TTL	1MHZ to 60MHZ	0.650L x 0.650W x 0.120H in

TCXO / VCXO / TCVCXO / OCXO y osciladores ODI

- Osciladores para espacio:
 - Diseñados para aplicaciones en las espacial y de aviónica.
 - Rendimiento y funcionalidad en el entorno extremo del espacio.
 - Productos resistentes, robustos y confiables.
 - De 750KHz hasta 850MHz.
 - Rango de temperatura de -55 °C a 125 °C.
 - Distintas salidas, incluidas CMOS, LVCMOS, LVDS y en LVPCEL.
 - Personalización de frecuencia, la estabilidad, el voltaje de suministro, salida.

Type/Series	Image	Package	Output	Frequency Range	Dimensions
FP1		Flat Pack	CMOS LVCMOS LVDS LVPECL	750KHz to 850MHz	25.35 x 35.31 x 5.33mm
FP2		Flat Pack	CMOS LVCMOS LVDS LVPECL	750KHz to 800MHz	16.51 x 16.51 x 4.5mm
FP4		Flat Pack	CMOS LVCMOS LVDS LVPECL	750KHz to 800MHz	20.6 x 20.6 x 10.49mm
FP6		Flat Pack	CMOS LVCMOS LVDS LVPECL	750KHz to 800MHz	24.4 x 25.4 x 4.45mm
JS4		J Lead Gull Wing Thru Hole	LVCMOS	750KHz to 200MHz	0.9 x 7.4 x 4.3mm



Muchas gracias