

# endrich news

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## OUR PRODUCT OF THE MONTH: MEMS OSCILLATORS WITH WIDEST RANGE OF FEATURES



Customers can order an almost endless combination of frequencies, voltages and frequency stability's (PPM) in a range of industry-standard packages. Plus SiTime offers unique features to optimize system design and performance.

- **Customizable Frequency:** 1 Hz to 700 MHz with up to 6 decimals of accuracy
- **Supply Voltage:** 1.8, 2.5, 2.8 or 3.3 V (customizable between 2.5 - 3.3 V)
- **Frequency Stability:**  $\pm 0.1$ ,  $\pm 0.2$ ,  $\pm 0.25$ ,  $\pm 0.5$ ,  $\pm 1$ ,  $\pm 1.5$ ,  $\pm 2.5$ ,  $\pm 5$ ,  $\pm 10$ ,  $\pm 25$ ,  $\pm 50$  ppm
- **Spread Spectrum:** Center-spread and down-spread options
- **Digital Control:**  
Digitally controlled oscillators (DCXOs) for jitter cleaning and fail-safe functions
- **Pull Range:** Programmable from  $\pm 25$  up to  $\pm 3200$  ppm
- **Output Drive Strength:** Programmable high and low drive strength settings
- **Packaging Options:** Industry standard 2012, 2016, 2320, 3225, 5032 or 7050 packages, ultra-small 1508 chip scale packages, and SOT and SOIC packages
- **Operating Temperature Range:** Extended commercial, industrial, and high-temperature up to  $-55$  to  $+125$  °C
- **Output:** Output logic options (LVCMOS and differential) and output enable/spread disable/standby control options

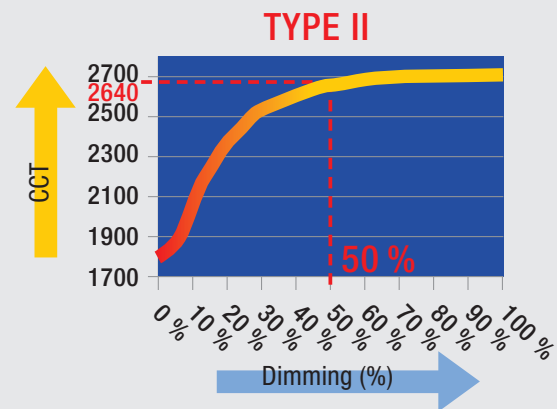
Contact for information: Mr. Gensler · Tel.: +49(0)7452-6007-31 · e-mail: a.gensler@endrich.com

## CITIZEN WARM ON DIMMING COBS



**Citizen Electronics** has developed the Dim-to-Warm COB series CLC0x0 which can change the colour temperature from 2700 K to 1800 K and 3150 K to 1850 K by dimming with a triac dimmer or potentiometer. The aim of this product is to imitate the effect of the incandescent lamp which became warmer by dimming. Those COBs can be used in combination with solderfree holders from Bender+Wirth, which we also available from Endrich stock.

### DIMMING BEHAVIOUR:



PRODUCT NAME

CLC020-057A5-273H3D2-18

CLC030-081B8-313H3H3-185

CLC031-081B8-313H3H3-185

CLC032-069A5-313H3H3-185

CLC033-081CL-313H3H3-185

CLC034-081CL-313H3H3-185

CLC035-093C1-313H3H3-185

### PRODUCT LINE UP

#### CLC020 SERIES

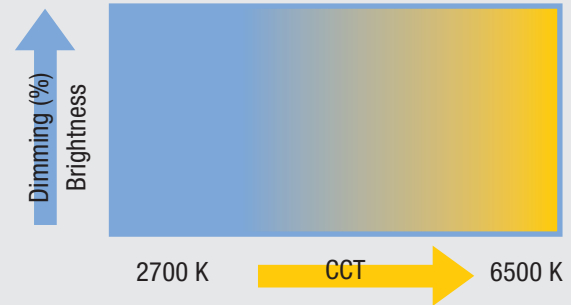
#### CLC030 SERIES

Appearance							
<b>Lumen</b>	980 lm	1870 lm	1330 lm	940 lm	1520 lm	2300 lm	2920 lm
<b>Power</b>	13.5 W	15.8 W	10.7 W	8.2W	12.0 W	19.7 W	29.0 W
<b>LPW</b>	72.6	118.4	124.3	114.6	126.7	116.8	100.7
<b>Ra min</b>	90 (2700 K)	90	90	90	90	90	90
<b>R9 min</b>	50 (2700 K)	50	50	50	50	50	50
<b>CCT</b>	1800-2700 K	1850 - 3100 K	1850 - 3100 K	1850 - 3100 K	1850 - 3100 K	1850 - 3100 K	1850 - 3100 K
<b>PCB Size</b>	14 x 19 mm	26x19mm					

## CITIZEN TUNABLE WHITE LEDS



### DIMMING BEHAVIOUR:



For the field of colour changing **Citizen Electroincs** has engineered several Tunable White LEDs with a colour temperature range from 6500 K to 2700 K. This LED Modul is based on the smallest CSP package and includes LEDs of two colours for a smooth colour change by dimming. As the LED has 4 terminals it is needed to use one 4-channel driver or two separate drivers. B-Versions can be used with solderfree Bender+Wirth holders.

PRODUCT NAME

LCN-C01A,B  
(10001M)

LCN-C02A,B  
(20001M)

### PRODUCT LINE UP

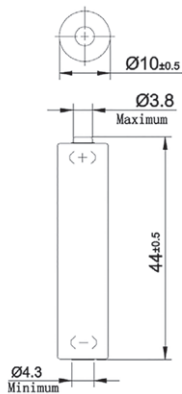
<b>Outline</b>	–	 Size: 15 x 15 mm	 Size: 19 x 19 mm
<b>CCT range</b>	–	2700-6500K	
<b>CCT</b>	K	2700	6500
<b>Luminous flux</b>	lm	(920)	(1100)
<b>Efficacy</b>	lm/W	105	126
<b>LES</b>	Ø lmm	11 (11 lm/mm <sup>2</sup> )	
<b>Number of LEDs</b>	–	8 (8s1p)	8 (8s2p)
<b>Drive Current</b>	mA	350	350
<b>Vf</b>	V	25.0	25.0
<b>Ra</b>	–	≥ 80	≥ 80

## FR03 AAA – LITHIUM IRON DISULFIDE (Li-FeS<sub>2</sub>) BATTERIES



**EVE offer new cylindrical lithium iron disulfide (Li-FeS<sub>2</sub>) batteries.** Cylindrical lithium iron disulfide batteries have Lithium for the anode, iron disulfide for the cathode, and a lithium salt in an organic solvent blend as the electrolyte. They deliver a voltage of 1.5 V and are designed for superior performance. They are compatible in any application using 1.5 V AAA batteries. Some of the advantages of those batteries are: work at low temperature extremes where other types will not, excellent performance even after 15 year storage at ambient conditions and longer service than other primary battery types. Samples are immediately available from stock in Nagold.

### DIMENSIONS (MM)



### APPLICATIONS

- Wireless mouse or keyboard
- Digital cameras
- Medical equipment
- GPS
- Electronic dictionaries
- Calculators
- Measuring instrument
- Digital video
- Radio transceiver
- Electronic clocks
- Sensors

### MAIN FEATURES

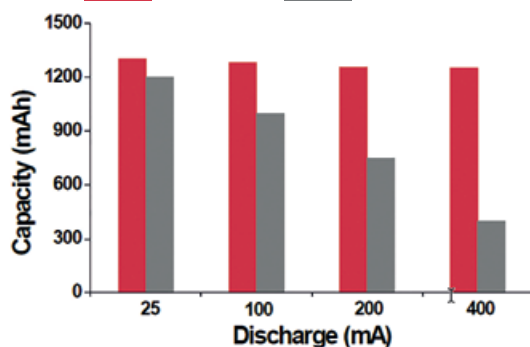
- Direct drop-in compatibility in applications using 1.5 V "AAA" battery size
- Far greater power than other battery types
- Provides longer service than other battery types in moderate to heavy drain applications
- Greater service advantage over other battery types at low temperature extremes operating at -40 °C
- Higher operating voltage and flatter discharge curve than other 1.5 V battery types
- Superior leakage resistance compared to other 1.5 V battery types
- Outstanding service maintenance when stored at ambient conditions
- Considerably lighter than other 1.5 V battery types
- Good service maintenance after high temperature storage up to +60 °C
- No added mercury, cadmium, or lead

NOMINAL CAPACITY (100 MA, 0.8 V OFF)	≥ 1100 MAH
NOMINAL VOLTAGE	1.5 V
MAX. CONSTANT CURRENT	1500 MA
MAX. PULSE CURRENT (2 SEC ON / 8 SEC OFF)	2000 MA
OPERATING TEMPERATURE	-40 ~ +60 C
WEIGHT	APPROX. 7.0 G
TYPICAL LI CONTENT	0.48 G
TYPICAL IR	≤ 400 MΩ

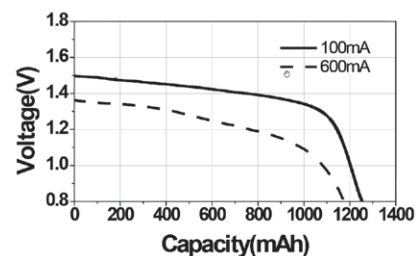
### MILLIAMP-HOURS CAPACITY

Constant Current Discharge to 0.8 Volts at 21 °C

■ AAA Lithium ■ AAA Alkaline

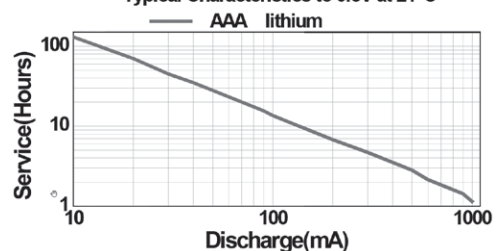


### DISCHARGE CURVE AT 21 °C



### CONSTANT CURRENT PERFORMANCE

Typical Characteristics to 0.8V at 21°C



# THE SMALLEST SQUARED GDT WITH A 5 KA 8/20 $\mu$ s SURGE CAPABILITY IN THE MARKET TODAY



The **SH Series Gas Discharge Tube (GDT)** is designed to provide high levels of protection against fast-rising transients caused by lightning disturbances. It is offered in a squared surface mount package (5.0 × 5.0 × 4.2 mm) with a 5 kA surge capability and a  $\leq 0.7$  pF off-state capacitance value.

## FEATURES

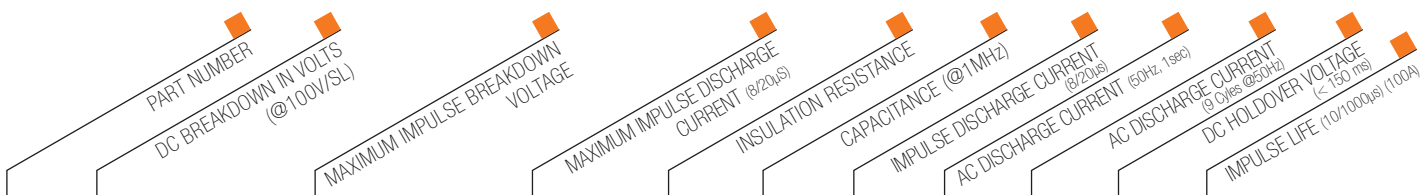
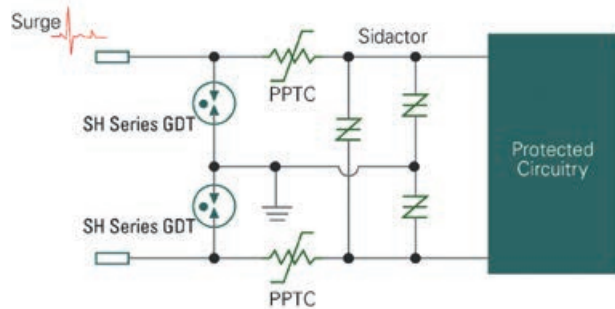
- 5 kA surge capability in minimal footprint (5.0 × 5.0 × 4.2 mm)
- Ultra-low capacitance ( $< 0.7$  pF) that does not vary as the signal voltage varies
- Surface mount form factor with squared body and terminals

## APPLICATIONS

- G.Fast, xDSL, 10 GbE, and 10/100/1000 BaseT Ethernet port protection
- Satellite, CATV equipment and set top boxes
- Coaxial cable
- Ethernet, RS-485, RS-232, etc. interfaces
- Broadband equipment
- General telecom equipment
- Industrial automation
- Power Inverter/Variable Frequency Drivers (VFDs)

## BENEFITS

- Ideal for high surge, high-density layout applications such as radio base station power and cable modems
- Minimizes insertion losses and demodulation to be compatible with high speed, wide bandwidth applications such as G. Fast and xDSL equipment
- Simplifies the pick and place process during the automated PCB manufacturing



## ELECTRICAL CHARACTERISTICS

	COMPONENT SPECIFICATIONS (AT 25°C)						LIFE RATINGS						
	MIN	TYP	MAX	@100V/ $\mu$ s	1000V/ $\mu$ s	1Time	MIN	MAX	MAX	MIN	MIN	MIN	
<b>SH75</b>	60	75	90	600	700		1G $\Omega$					52V	
<b>SH90</b>	72	90	108	600	700		@50V					52V	
<b>SH145</b>	116	145	174	600	700				10 Shots @ (5kA)			52V	
<b>SH230</b>	184	230	276	600	700							135V	
<b>SH250</b>	200	250	300	600	700		1G $\Omega$	0.7pf				135V	300 Shots
<b>SH300</b>	240	300	360	650	800	6 kA	@100V		1 Shot at 135V	5A	15A	135V	
<b>SH350</b>	280	350	420	750	900							135V	
<b>SH400</b>	320	400	480	850	1000				6kA **			135V	
<b>SH470</b>	376	470	564	900	1100		1G $\Omega$					150V	
<b>SH600</b>	480	600	720	1000	1200		@250V					150V	

## GD32F4 SERIES OF MCUS

The **GD32F4 series** belongs to the high performance line of GD32 MCU Family. It is a new 32-bit generalpurpose microcontroller based on the ARM® Cortex®-M4 RISC core with best cost-performance ratio in terms of enhanced processing capacity, reduced power consumption and peripheral set. The Cortex®-M4 core features a Floating Point Unit (FPU) that accelerates single precision floating point math operations and supports all ARM® single precision instructions and data types. The GD32F4 device incorporates the ARM® Cortex®-M4 32-bit processor core operating at up to 200 MHz frequency with Flash accesses zero wait states to obtain maximum efficiency. It provides up to 3072 KB on-chip Flash memory and 512 KB SRAM memory. An extensive range of enhanced I/Os and peripherals connected to two APB buses. The devices offer up to three 12-bit

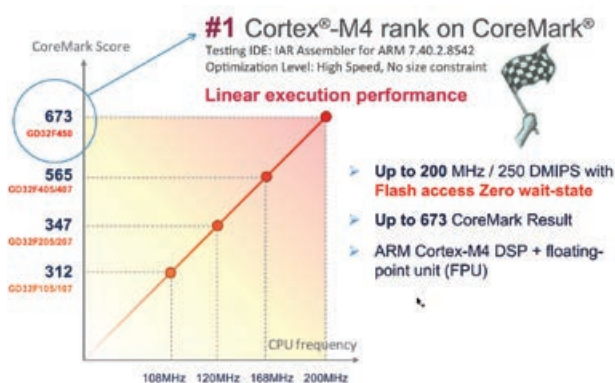
2.6 M SPS ADCs, two 12-bit DACs, up to eight general-purpose 16-bit timers, two 16-bit PWM advanced-control timers, two 32-bit general-purpose timers, and two 16-bit basic timers, as well as standard and advanced communication interfaces: up to six SPIs, three I2Cs, four USARTs and four UARTs, two I2Ss, two CANs, a SDIO, USB device/host/OTG FS and HS, and an Ethernet MAC. Additional peripherals as Digital camera interface (DCI), EXMC interface with SDRAM extension support, TFT-LCD Interface (TLI) and Image Processing Accelerator (IPA) are included.

The device operates from a 2.6 to 3.6 V power supply and available in -40 to +85 °C temperature range. Three power saving modes provide the flexibility for maximum optimization of power consumption, an especially important consideration in low power applications.

### HIGH PERFORMANCE OF GD32F4

- Cortex®-M4 Core @ 200 MHz
- Support H/W DSP instructions + FPU
- Zero-wait state execution from Flash memory
- Flash from 512 KB to 3072 KB
- SRAM from 192 KB to 512 KB
- EXMC interface support external SDRAM & SRAM
- Up to 8 x UART (9 Mbit/s)
- Up to 6 x SPI (30 Mbit/s)
- Up to 3 x I2C (400 Kbit/s)

- Up to 2 x CAN2.0B
- Up to 2 x I2S
- Support SDIO, Ethernet MAC
- Support USB OTG FS + HS
- 8-14 bit Camera Interface
- LCD-TFT controller up to XGA resolution + IPA
- Up to 3 x 12 bit, 2.6M SPS ADCs (up to 24 chs)
- Up to 2 DACs
- Standby Current @ 2 uA

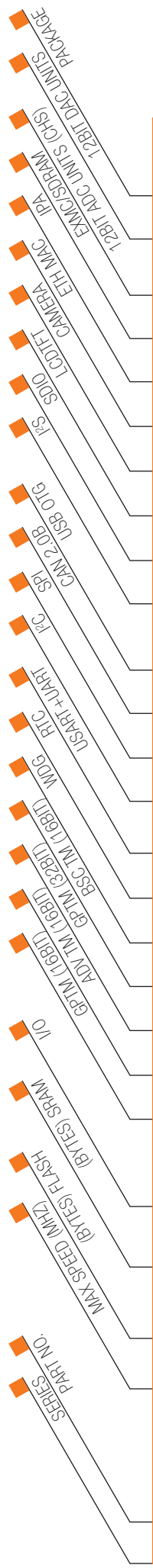


### TARGET APPLICATIONS

- Industrial automation
- Motor frequency conversion
- Security and alarm systems
- Graphic display
- Sensor network and nodes
- Consumer and handheld equipment
- High-end drone
- Intelligent robot
- IoT related



BGA176 (10\*10 mm)  
 BGA100 (7\*7 mm)  
 LQFP144 (20\*20 mm)  
 LQFP100 (14\*14 mm)  
 LQFP64 (10\*10 mm)



**GD32F4 SERIES OF 32-BIT ARM® CORTEX®-M4 MCUS SELECTION GUIDE**

	MEMORY		TIMER		CONNECTIVITY			ANALOG INTERFACE	
	200	256 K	8	2	4+4	3	5	2	3(16)
<b>GD32F450</b>	200	512 K	8	2	1	3	5	2	1/0
GD32F450VET6	200	256 K	up to 82	2	1	3	5	2	LQFP100
GD32F450VGT6	200	1024 K	up to 82	2	1	3	5	2	LQFP100
GD32F450VIT6	200	2048 K	up to 82	2	1	3	5	2	LQFP100
GD32F450VKT6	200	3072 K	up to 82	2	1	3	5	2	LQFP100
GD32F450ZET6	200	512 K	up to 114	2	1	3	6	2	LQFP144
GD32F450ZGT6	200	1024 K	up to 114	2	1	3	6	2	LQFP144
GD32F450ZIT6	200	2048 K	up to 114	2	1	3	6	2	LQFP144
GD32F450ZKT6	200	3072 K	up to 114	2	1	3	6	2	LQFP144
GD32F450IGH6	200	1024 K	up to 140	2	1	3	6	2	BGA176
GD32F450IHH6	200	2048 K	up to 140	2	1	3	6	2	BGA176
GD32F450IKH6	200	3072 K	up to 140	2	1	3	6	2	BGA176
GD32F405	168	512 K	up to 51	2	1	3	3	2	LQFP64
GD32F405RET6	168	1024 K	up to 51	2	1	3	3	2	LQFP64
GD32F405RGT6	168	3072 K	up to 51	2	1	3	3	2	LQFP64
GD32F405RKT6	168	1024 K	up to 82	2	1	3	3	2	LQFP100
GD32F405VGT6	168	3072 K	up to 82	2	1	3	3	2	LQFP100
GD32F405VHT6	168	1024 K	up to 82	2	1	3	3	2	BGA100
GD32F405VKT6	168	3072 K	up to 82	2	1	3	3	2	BGA100
GD32F405VGH6	168	1024 K	up to 114	2	1	3	3	2	LQFP144
GD32F405ZGT6	168	3072 K	up to 114	2	1	3	3	2	LQFP144
GD32F405ZKT6	168	512 K	up to 51	2	1	3	3	2	LQFP64
GD32F407	168	1024 K	up to 51	2	1	3	3	2	LQFP64
GD32F407RGT6	168	3072 K	up to 51	2	1	3	3	2	LQFP64
GD32F407RKT6	168	512 K	up to 82	2	1	3	3	2	LQFP100
GD32F407VET6	168	1024 K	up to 82	2	1	3	3	2	LQFP100
GD32F407VGT6	168	3072 K	up to 82	2	1	3	3	2	BGA100
GD32F407VEH6	168	512 K	up to 114	2	1	3	3	2	BGA100
GD32F407VGH6	168	1024 K	up to 82	2	1	3	3	2	BGA100
GD32F407VKH6	168	3072 K	up to 82	2	1	3	3	2	BGA100
GD32F407ZET6	168	512 K	up to 114	2	1	3	3	2	LQFP144
GD32F407ZGT6	168	1024 K	up to 114	2	1	3	3	2	LQFP144
GD32F407ZKT6	168	3072 K	up to 114	2	1	3	3	2	LQFP144
GD32F407IEH6	168	512 K	up to 140	2	1	3	3	2	BGA176
GD32F407IGH6	168	1024 K	up to 140	2	1	3	3	2	BGA176
GD32F407IKH6	168	3072 K	up to 140	2	1	3	3	2	BGA176

# SEMINAR: ROTARY MAGNETIC ANGLE SENSORS & BRUSHLESS DC MOTORS ON THE 18. MAY 2017

**Seminar organised by Endrich GmbH  
together with Monolithic Power Systems (MPS).**

**Seminar language:** English

**Place:** Hotel Empfinger Hof (South Germany)

Limited number of participants, registration requested

**Abstract:** Magnetic Angle sensors and Brushless DC motors are becoming widely used in industrial, consumer and automotive

applications, often in combination to provide motor commutation and speed or position control. Product experts from Monolithic Power Systems (MPS) will describe in two sessions the design considerations when using rotary magnetic angle sensors, followed by the different techniques of driving brushless DC motors. Application examples will be demonstrated during both sessions, concluding with a combined field orientated brushless motor control solution incorporating magnetic angle position sensing.

## AGENDA

### Morning Session:

Designing with Rotary Magnetic Angle Sensors

#### The following topics will be covered

- Magnetic Angle Sensing vs Alternate Techniques
- Types of Magnetic Angle Sensor (Hall, MR/GMR)
- Principles of Operation (Multi-pole Track, Arc-Tangent, SpinAxis)
- Accuracy / Resolution / Linearity / Lag
- Sensor Output Types (Digital, ABZ, PWM, UVW)
- Magnet Types, Magnetic Field shapes, Magnet Positioning Considerations
- Matching the right sensor to the Application
- BLDC Motor control demo using the MPS MagAlpha sensor

### Afternoon Session:

Designing with Brushless DC Motor Drivers

#### The following topics will be covered

- BLDC Motor Types Overview
- Commutation schemes (Sensorless, Block, Sinusoidal, Field Orientated Control)
- BLDC Drive Methods
- Designing with BLDC gate drivers and fully integrated power stages
- Sensored Field Orientated Control – MP6570 FOC Engine with embedded magnetic angle sensor
- MP6570 demonstration

PLEASE REGISTER TILL 21. APRIL 2017 (FAX, TELEPHONE OR E-MAIL)

Last name, first Name

Company

e-mail

Phone number

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