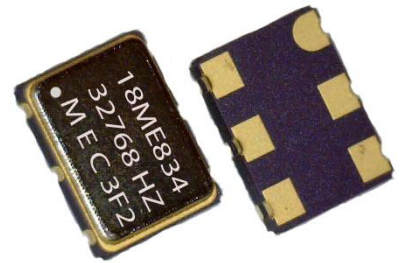




**Features:**

- ◆ ME83x is a 32.768 KHz CMOS output TCXO with a maximum frequency stability of  $\pm 5$  ppm ( $\pm 2.62$  minutes / year) over  $-40$  to  $+85^{\circ}\text{C}$ , much better time-keeping accuracy than the competition.
- ◆ A proprietary temperature compensation technique is applied to the built-in X-cut 32.768 KHz tuning fork crystal and temperature sensor.
- ◆ A 400 nA current consumption (average,  $f_{\text{out}} \leq 128$  Hz, 4 min TMP.) makes it ideal for battery-operated devices.
- ◆ 5 x 7x1.8 ceramic SMD package, ideal for new miniaturizing applications.
- ◆ Designed for long-term frequency reference applications.



RoHS Compliant Product  
by Mercury

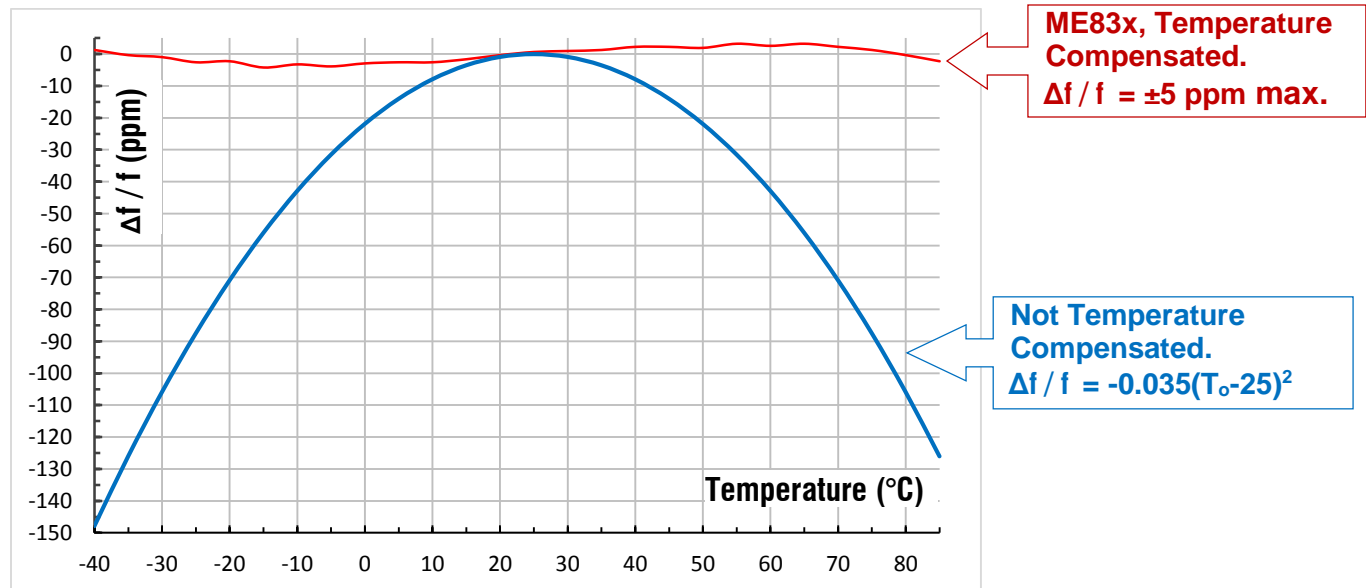
**Applications:**

- ◆ Frequency reference for real time clocks (RTCs)
- ◆ Smart metering, data loggers
- ◆ Portable instruments
- ◆ GPS receivers. Telematics.
- ◆ Timing synchronization for networks, servers, hubs, routers and switches
- ◆ Timing reference input for various energy metering ICs.

**Related Mercury Products:**

- ◆ If temperature compensation is not required, please use Mercury HA series 32.768K (AT-cut crystals;  $\mu\text{A}$  current Consumption,  $\pm 25/\pm 50/\pm 200$  ppm over commercial or industrial temperature ranges ).
- ◆ If tighter than  $\pm 5$  ppm frequency stability is required, such as  $\pm 1 \sim \pm 2.5$  ppm over  $-40$  to  $+85^{\circ}\text{C}$ , please use Mercury M572T 32.768K TCXO or VM572T 32.768K VCTCXO series (All AT-cut crystals; mA current consumption).

**Frequency-Temperature Characteristic**



**MERCURY** [www.mercury-crystal.com](http://www.mercury-crystal.com)

Taiwan: TEL (886)-2-2406-2779, FAX (886)-2-2496-0769, e-mail: [sales-tw@mercury-crystal.com](mailto:sales-tw@mercury-crystal.com)  
 U.S.A.: TEL (1)-909-466-0427, FAX (1)-909-466-0762, e-mail: [sales-us@mercury-crystal.com](mailto:sales-us@mercury-crystal.com)

**General Specifications** (at +25°C and specified input voltage)

Product Series		ME831, ME832, ME833 and ME834				
		ME831	ME832	ME833	ME834	
Temperature Measurement Period (TMP). Also known as Compensation Interval.		Every 1 minute	Every 2 minutes	Every 30 seconds	Every 4 minutes (standard series)	
	During the temperature measurement the power consumption increases. For lowest power consumption the 4-minute measurement period (model ME834) is recommended. For peak current during temperature measurement see I <sub>DD</sub> data below.					
Frequency		Standard frequency: 32.768 KHz				
		Also available in 4.096 KHz, 1.024 KHz, 128 Hz, 32 Hz, 1Hz, 1/10 Hz, 1/60 Hz.				
Supply Voltage (V <sub>DD</sub> ) Range		1.7V min.; 5.5V max.				
Supply Voltages (V <sub>DD</sub> )	(V <sub>DD</sub> )	1.8V±5%	2.5V±5%	3.0V±5%	3.3V±5%	5V±5%
	Tolerance	1.71V ~ 1.89V	2.37V ~ 2.62V	2.85V ~ 3.15V	2.97V ~ 3.63V	4.75V ~ 5.25V
	Voltage Code	<b>18</b>	<b>25</b>	<b>3</b>	<b>33</b>	<b>5</b>
Supply Current (I <sub>DD1</sub> ). Typical. Conditions: No load. 25°C. F <sub>out</sub> =32.768 KHz.		0.79 uA	1.05 uA	1.25 uA	1.37 uA	2.05 uA
Peak Current during Temperature Measurement (I <sub>DD2</sub> ). Typical. Conditions: No load. 25°C. F <sub>out</sub> =32.768 KHz.		1.95uA	2.00 uA	2.03 uA	2.05 uA	2.14 uA
Supply Current (I <sub>DD3</sub> ) when pad 1 is disabled. Typical. Conditions: No load. 25°C. F <sub>out</sub> =32.768 KHz		0.39 uA	0.47 uA	0.53 uA	0.56uA	0.80 uA
Supply Current (I <sub>DD4</sub> ). Typical. Conditions: No load. 25°C. F <sub>out</sub> =32 Hz.		327 nA	408 nA	460 nA	470 nA	700 nA
Initial Calibration Tolerance		±1.5 ppm max. at specified V <sub>DD</sub> , T <sub>a</sub> = +25±2°C. Output enable.				
Frequency Stability (ppm) over Temperature		±5 ppm max. over -40°C to +85°C. w.r.t fo at +25°C.				
		Timing Error over Time	Per day	±0.432 sec/day max.		
			Per month	±12.960 sec/month max.		
			Per year	±2.628 minutes / year max.		
Frequency Stability vs Aging vs Load Change vs Reflow vs all range of V <sub>DD</sub> (Δf/V)		±3 ppm/year max. first year at +25°C ±0.2 ppm max. for a ±10% loading condition change ±1 ppm max. 1 reflow and measured 24 hours afterwards ±1 ppm/volt max. V <sub>DD</sub> = 1.7 V to 5.5 V.				
Supply Voltage Variation (ΔV <sub>DD</sub> )		0.25 V max. Supply voltage stability. At specified V <sub>DD</sub> . Condition: ΔV / Δt = 1 V/μs				
Output Wave Form		CMOS Square wave.				
Output Load		15 pF				



<b>Output Voltage Levels</b>	<b>V<sub>OH</sub></b>	V <sub>DD</sub> - 0.4 V min. I <sub>OH</sub> = -0.1 mA, all V <sub>DD</sub> range
	<b>V<sub>OL</sub></b>	0.4 V max. I <sub>OL</sub> = 0.1 mA, all V <sub>DD</sub> range
<b>Rise Time (T<sub>f</sub>) and Fall Time (T<sub>f</sub>)</b>	100 nano. sec. max. Measured at 20% ↔ 80% of the waveform. 15 pF load.	
<b>Start-up Time (T<sub>s</sub>)</b>	1 m. sec. max. at +25°C; 3 m. sec. max. over -40°C to +85°C	
<b>Duty Cycle (Symmetry)</b>	32768 Hz, 4096 Hz and 1024 Hz: 50% ±10% max.	Measured at 50% of V <sub>DD</sub> over 40°C to +85°C.
	128 Hz, 32 Hz, 1Hz, 1/10 Hz, 1/60 Hz: 50% ±5% max.	
<b>Pin 1 OE Thresholds</b>	V <sub>ih</sub> = 0.8 * V <sub>DD</sub> .	
	V <sub>il</sub> = 0.2 * V <sub>DD</sub>	

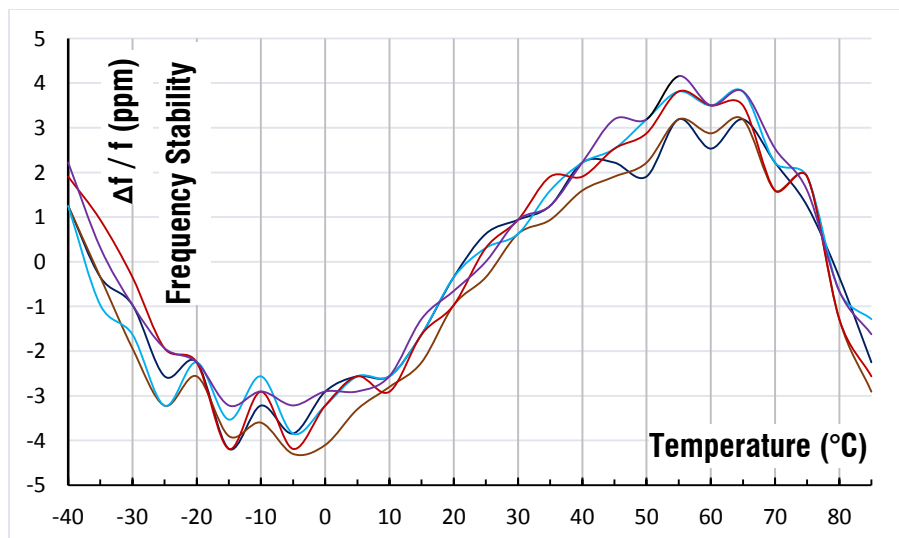
**Environmental Performance and Specifications**

<b>Green Compliance</b>	RoHS compliant, Pb (lead) free in accordance with EU Directive 2002/95/EC
<b>Moisture Sensitivity Level</b>	MSL= 1. According to IPC/JEDEC J-STD-020D.1
<b>Humidity</b>	85% RH, 85°C, 48 hours
<b>Hermeticity</b>	Leak rate 2x10 <sup>-8</sup> ATM-cm <sup>3</sup> /sec max.
<b>Solderability</b>	MIL-STD-202F method 208E
<b>Vibration</b>	MIL-STD-202F method 204, 35G, 50 to 2000 Hz
<b>Shock</b>	MIL-STD-202F method 213B, test condi. E, 1000GG ½ sine wave
<b>Electrostatic Sensitivity</b>	2KV min. Human body model (HBM) according to IEC 61000-4-2.
<b>Contact pad surface finish</b>	0.3~1.2 um gold over 1.27~8.89 um nickel
<b>Solder Reflow</b>	20 sec. max. at peak temperature of 260°C. Two reflows max.
<b>Weight of the Device</b>	0.196 grams typical

**Absolute Maximum Rating**

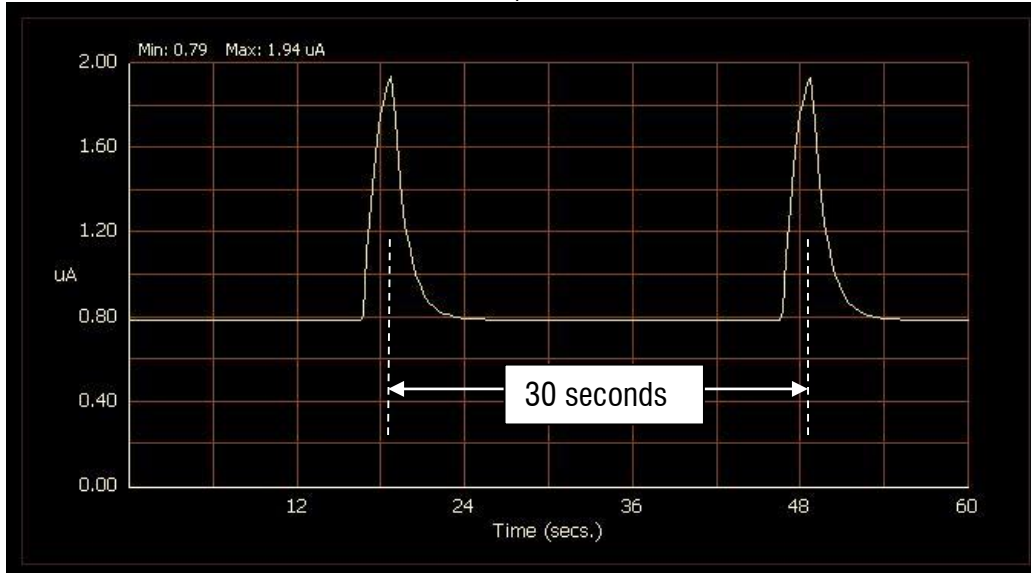
<b>Supply Voltage (V<sub>DD</sub>)</b>	-0.5V min.; 6.5V max. V <sub>SS</sub> = 0V
<b>Ambient temperature range</b>	-40 to +85°C
<b>Storage temperature range</b>	-40 to +85°C for temperature compensated units

**Typical Frequency Stability over Temperature:**

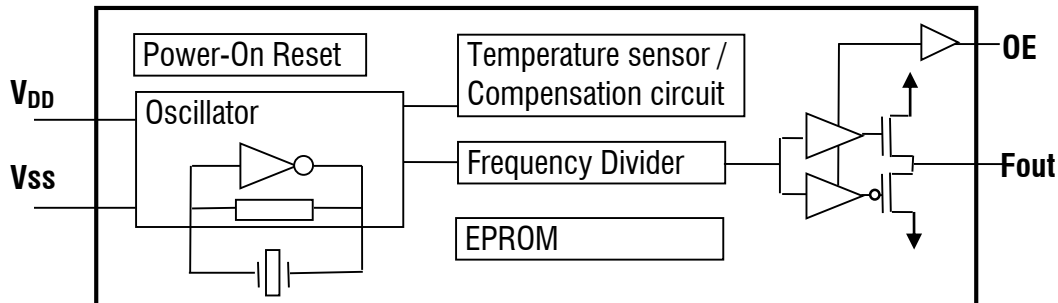


**Peak Current during Temperature Measurement Period**

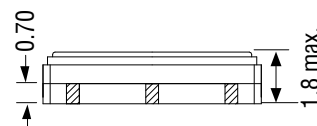
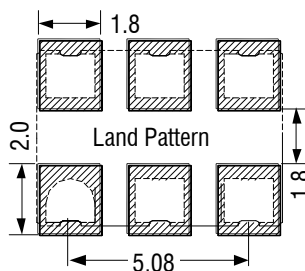
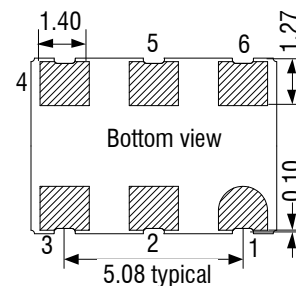
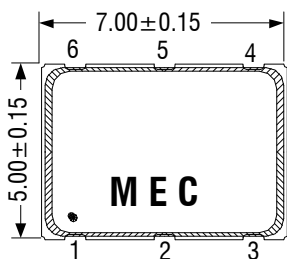
Example shown below: 18ME833 series. ( $V_{DD} = 1.8V$ , temperature measurement period = 30 sec.)



**Block Diagram**



**Package Dimensions and Suggested Land Pattern: 5x7 mm Package unit: mm**



Pin 1	Output Enable
Pin 2	Do not connect
Pin 3	Ground
Pin 4	Frequency out
Pin 5	Do not connect
Pin 6	Supply Voltage

Pin 1 Connection	Output
No connection or $V_{DD}$	Frequency output
Ground	High impedance



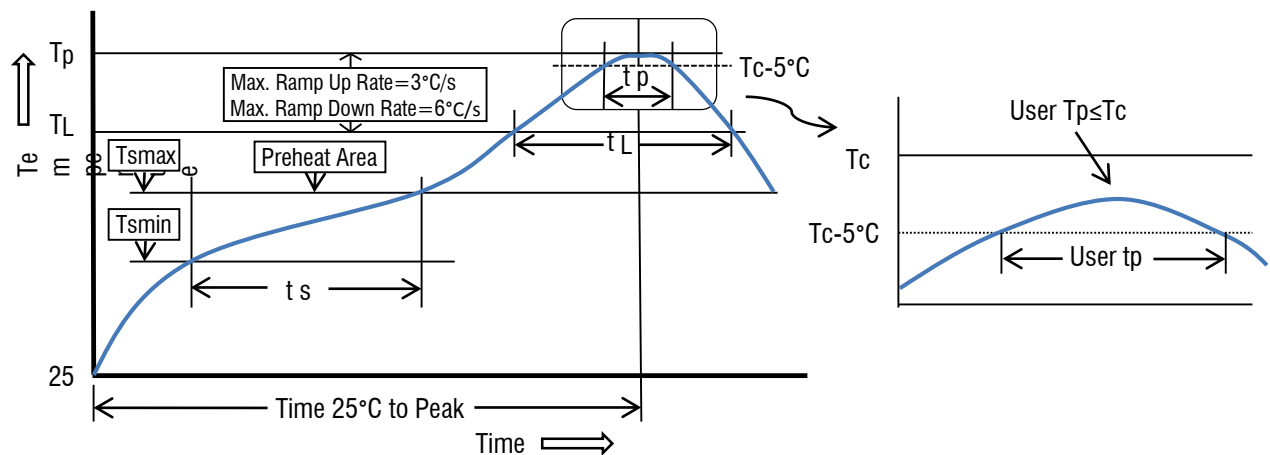
**Part Number Format:**

<b>Example:</b> 18ME834-32768					☞: Customer to specify
18	ME83	4	—	32768	
①	②	③	dash	④	

① Supply voltage code: “18” for +1.8V; “25” for +2.5V, “3” for +3.0V, “33” for “+3.3V, “5” for +5.0V  
 ② Product series: ME83    ③ Product series: 1, 2, 3 or 4 depends on temperature measurement period.  
 ④ Frequency in Hz: 32768 Hz.

Orderable Part Numbers	Output Frequency	Supply Voltage Codes	Product codes / Temperature Measurement Time
xxME83y-1/60	1/60 Hz	xx=18: V <sub>DD</sub> is 1.8V xx=25: V <sub>DD</sub> is 2.5V xx=3: V <sub>DD</sub> is 3.0V xx=33: V <sub>DD</sub> is 3.3V xx=5: V <sub>DD</sub> is 5.0V xx can be custom	ME831 (1 min.) y= 1 ME832 (2 min.) y= 2 ME833 (30 sec.) y= 3 ME834 (4 min.) y= 4
xxME83y-1/10	1/10 Hz		
xxME83y-1	1 Hz		
xxME83y-32	32 Hz		
xxME83y-128	128 Hz		
xxME83y-1024	1024 Hz		
xxME83y-4096	4096 Hz		
xxME83y-32768	32768 Hz		

**Recommended Solder Reflow Profile** (per IPC/JEDEC J-STD-020D.1)



Profile Feature	Sn-Pb Eutectic Assembly	Pb-free Assembly
Preheat/Soak		
- Temperature min. ( $T_s$ min.)	100°C	150°C
- Temperature max. ( $T_s$ max.)	150°C	200°C
- Time ( $t_s$ ) ( $T_s$ min. to $T_s$ max.)	60 to 120 seconds	60 to 180 seconds
Ramp-up rate ( $T_L$ to $T_p$ )	3°C / sec. max.	3°C / sec. max.
Liquidous temperature ( $T_L$ )	183°C	217°C
Time ( $t_L$ ) maintained above $T_L$	60 to 150 seconds	60 to 150 seconds
Peak package body temperature ( $T_p$ )	235°C	260°C
Time ( $T_p$ ) within 5°C of the classification temperature $T_c$	10 to 30 seconds	20 to 40 seconds
Ramp-down rate ( $T_p$ to $T_L$ )	6°C / second max.	6°C / second max.
Time 25°C to peak temperature	6 minutes max.	8 minutes max.

All temperatures refer to topside of the package, measured on the package body surface.