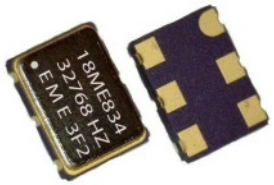
EME83 SERIES TCXO

Low Power (nA Current Consumption) 32.768kHz

FEATURES

- **EME83x is a 32.768kHz CMOS output TCXO with a maximum frequency stability of ±5ppm (±2.62 minutes / year) over the operating temperature range -40° to +85°C. This time-keeping accuracy is outstanding in the industry.**
- **A proprietary temperature compensation technique is applied to the built-in X-Cut 32.768kHz tuning fork crystal and temperature sensor.**
- **A 400nA current compensation (average f_{OUT} ≤128Hz, 4 min TMP.) makes it ideal for battery operated devices.**
- **The TCXO is packaged in a 7 x 5 x 1.8mm package, ideal for miniaturized applications.**
- **Designed for long-term frequency reference applications.**



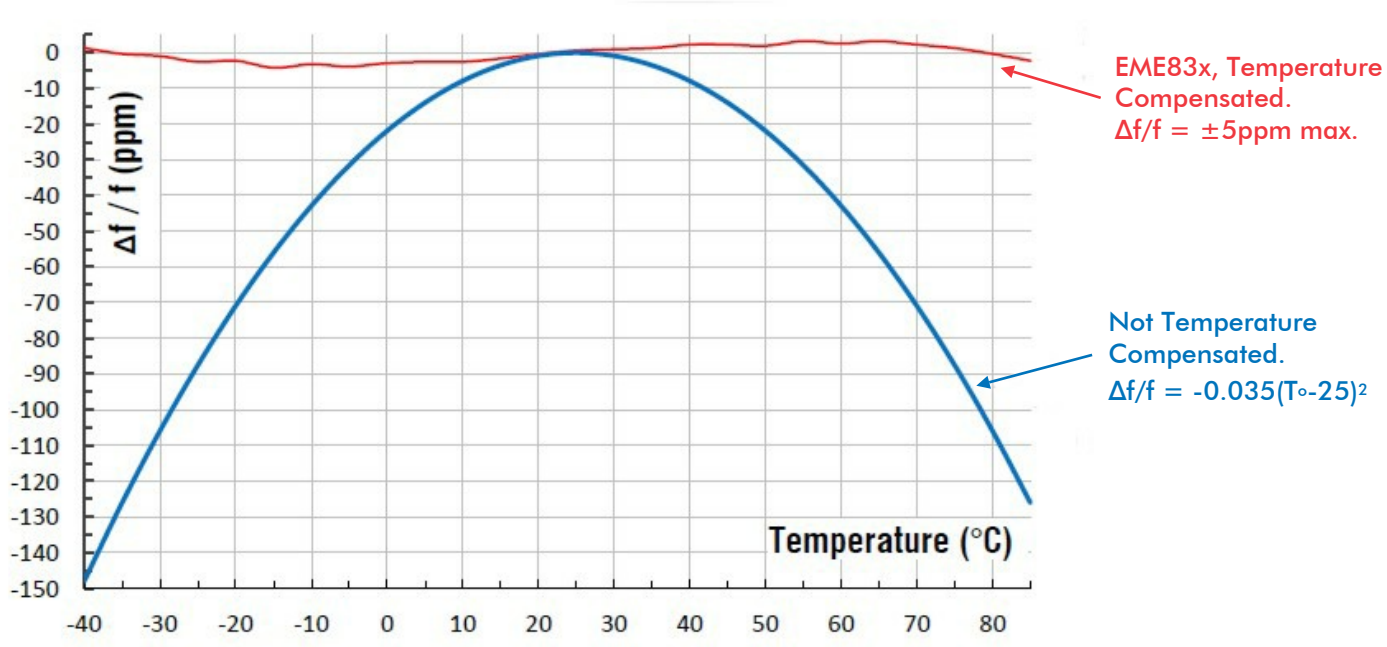
APPLICATIONS

- Frequency Reference for real time clocks (RTC).
- Portable instrumentation.
- Timing synchronization for networks, servers, hubs, routers and switches.
- Timing Reference input for various energy metering ICs.
- Smart metering, data loggers.
- GPS receivers, telematics.

RELATED EUROQUARTZ PRODUCTS

- If temperature compensation is not required please consider using Euroquartz HA series 32.768kHz (AT-CUT crystal, µA current consumption, ±25/±50/±200ppm over commercial or industrial temperature ranges).
- If tighter than ±5ppm frequency stability is required, i.e. ±1~±2.5ppm over -40° to +85°C, please consider use of EM572T 32.768kHz TCXO or VEM572T 32.768kHz VCTCO series. (All use AT-Cut crystals, mA current consumption.)

FREQUENCY-TEMPERATURE CHARACTERISTICS



EUROQUARTZ LIMITED Blacknell Lane CREWKERNE Somerset UK TA18 7HE
Tel: +44 (0)1460 230000 Fax: +44 (0)1460 230001 info@euroquartz.co.uk www.euroquartz.co.uk

GENERAL SPECIFICATIONS (at 25°C and specified input voltage)

Product Series		**EME831, EME832, EME833 and EME834**				
Temperature Measurement Period (TMP), Also known as Compensation Interval.		**EME831**	**EME832**	**EME833**	**EME834**	
		Every 1 minute	Every 2 minutes	Every 30 seconds	Every 4 minutes (standard series)	
		Overall power consumption increases for more frequent measurement periods. For lowest power consumption the 4 minute measurement period (model EME834) is recommended. For peak current during temperature measurement see I_{DD} data below				
Frequency		Standard frequency: 32.768kHz				
		Also available in 4.096kHz, 1.024kHz, 128Hz, 32Hz, 1Hz, 1/10Hz, 1/60Hz.				
Supply Voltage (V_{DD}) Range		1.7V minimum, 5.5V maximum				
Supply Voltages (V_{DD})	**(V_{DD})**	1.8V ±5%	2.5V ±5%	3.0V ±5%	3.3V ±5%	5.0V ±5%
	Tolerance	1.71V ~ 1.89V	2.37V ~ 2.62V	2.85V ~ 3.15V	2.97V ~ 3.63V	4.75V ~ 5.25V
	Voltage Code	**18**	**25**	**3**	**33**	**5**
Supply Current (I_{DD1}) Typical Conditions: No load, 25°C, f_{OUT} = 32.768kHz		0.79µA	1.05µA	1.25µA	1.37µA	2.05µA
Peak Current during Temperature Measurement (I_{DD2}) Typical. Conditions: No load, 25°C, f_{OUT} = 32.768kHz		1.95µA	2.0µA	2.03µA	2.05µA	2.14µA
Supply Current (I_{DD3}) when Pad 1 is disabled. Typical Conditions: No load, 25°C, f_{OUT} = 32.768kHz		0.39µA	0.47µA	0.53µA	0.56µA	0.80µA
Supply Current (I_{DD4}) Typical Conditions: No load, 25°C, f_{OUT} = 32Hz		327nA	408nA	460nA	470nA	700nA
Initial Calibration Tolerance		±1.5ppm maximum over -40° to +85°C w.r.t. f_O at +25°C				
Frequency Stability (ppm) over temperature		±5ppm maximum over -40° to +85°C w.r.t. f_O at +25°C				
	Timing Error over Time	Per day	±0.432 s/day max.			
		Per month	±12.960 s/month max.			
		Per year	±2.628 minutes/year max.			
Frequency Stability						
vs. Ageing		±3ppm/year maximum first year at 25°C				
vs. Load Change		±0.2ppm max. for a 10% load condition change				
vs. Reflow		±1ppm max. 1 reflow and measured 24 hours afterwards				
vs. All range of VDD (Δf/V)		±1ppm/Volt max. V_{DD} = 1.7V to 5.5V.				
Supply Voltage Variation (ΔV_{DD})		0.25 V max. Supply voltage stability at specified V_{DD}. Condition $\Delta V / \Delta t$ = 1 V/µs				
Output Wave Form		CMOS Square Wave				
Output Load		15pF				

EUROQUARTZ LIMITED Blacknell Lane CREWKERNE Somerset UK TA18 7HE
Tel: +44 (0)1460 230000 Fax: +44 (0)1460 230001 info@euroquartz.co.uk www.euroquartz.co.uk

Low Power (nA Current Consumption) 32.768kHz

Output Voltage Levels	**V_{OH}**	V_{DD} - 0.4V min. I_{OH} = -0.1mA, all V_{DD} range	
	V_{OL}	0.4V max., I_{OL} = 0.1mA, all V_{DD} range	
Rise Time (t_R) and Fall Time (t_F)		100 ns max., at 20% to 80% of waveform. 15pF load.	
Start-up Time (T_S)		1ms max., at +25°C; 3ms max. over -40° to +85°C	
Duty Cycle (Symmetry)		32768Hz, 4096Hz & 1024Hz: 50%±10% max.	Measured at 50% of VDD over -40° to +85°C
		128Hz, 32Hz, 1Hz, 1/10Hz, 1/60Hz: 50% ±5% max.	
Pin 1 OE Thresholds		Vih = 0.8 *V_{DD}	
		Vil = 0.2*V_{DD}	

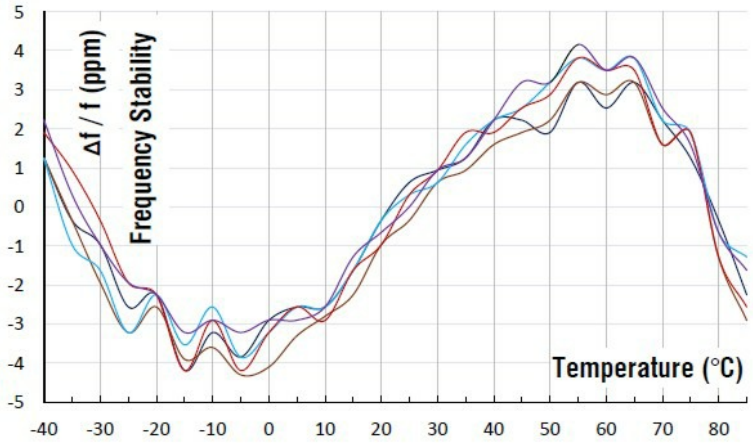
ENVIRONMENTAL PERFORMANCE and SPECIFICATIONS

Green Compliance	RoHS Compliant, Pb (lead) free in accordance with EU Directive 2002/95/EC
Moisture Sensitivity Level	MSL = 1. According to IPC/JEDEC J-STD-020D.1
Humidity	85% RH, 85°C for 48 hours
Hermeticity	Leak rate 2 x 10^{-8} ATM-cm3/s maximum.
Solderability	MIL-STD-202F method 208E
Vibration	MIL-STD-202F method 204, 35G, 50 to 2000Hz
Shock	MIL-STD-202F method 213B, test condition E, 1000g ½ sinewave
Electrostatic Sensitivity	2kV minimum, Human Body Model (HBM) according to IEC 610000-4-2
Contact Pad Surface Finish	0.3 ~ 1.2µm gold over 1.27 ~ 8.89µm nickel
Solder Reflow	20s masx at peak temperature of 260°C. Two reflows maximum
Weight of the device	0.196 grams typical

ABSOLUTE MAXIMUM RATINGS

Supply Voltage (VDD)	-0.5V minimum, 6.5V maximum VSS = 0V
Ambient Temperature Range	-40° to +85°C
Storage Temperature Range	-40° to +85°C for temperature compensated units

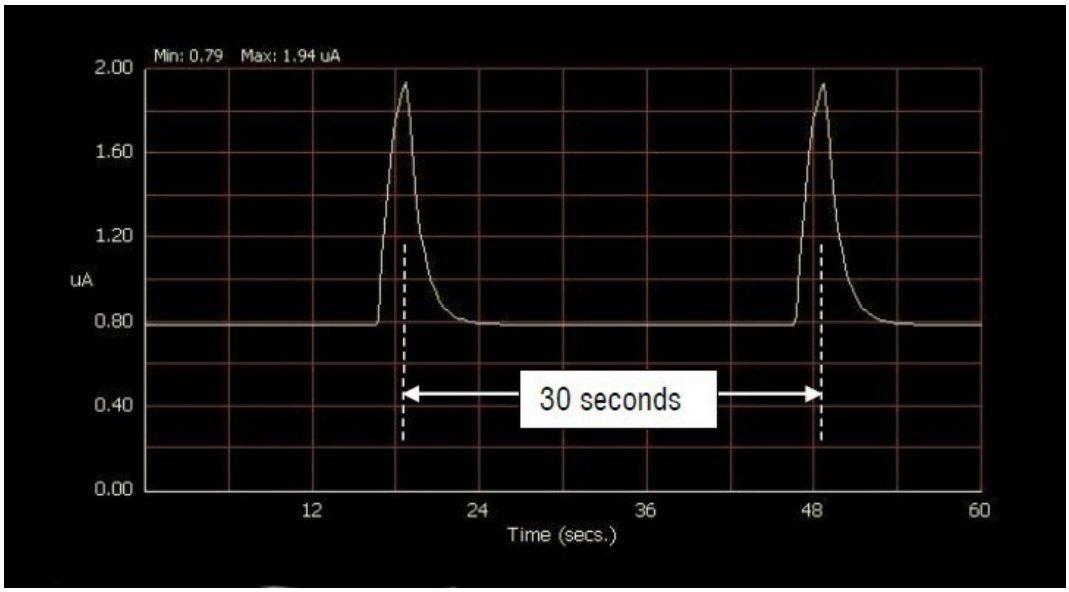
TYPICAL FREQUENCY STABILITY OVER TEMPERATURE



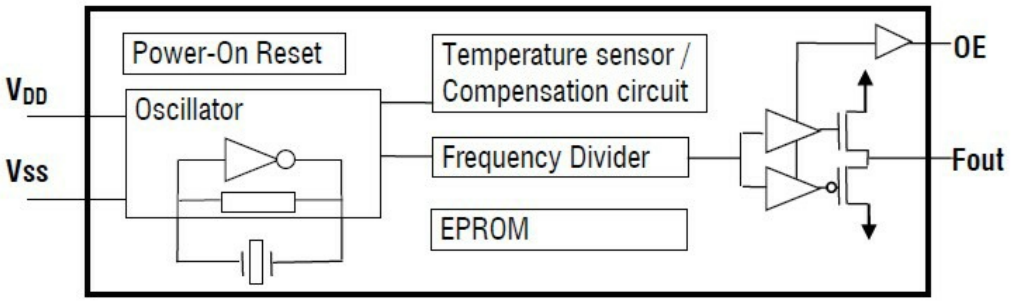
EUROQUARTZ LIMITED Blacknell Lane CREWKERNE Somerset UK TA18 7HE
Tel: +44 (0)1460 230000 Fax: +44 (0)1460 230001 info@euroquartz.co.uk www.euroquartz.co.uk

PEAK CURRENT DURING MEASUREMENT PERIOD

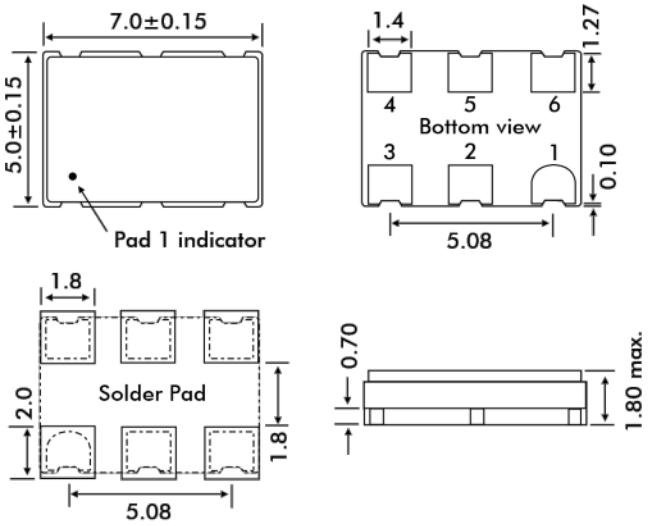
Example shown: 18EME833 Series (VDD = 1.8V, temperature measurement period = 30 seconds.)



BLOCK DIAGRAM



PACKAGE DIMENSIONS and SUGGEST SOLDER LAYOUT

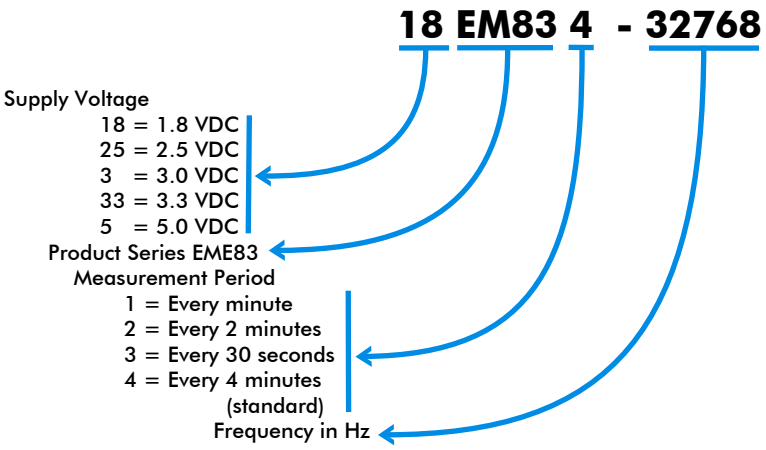


Pad Connections
1 Output Enable/Disable
2 Do not connect
3 Ground
4 Output
5 Do not connect
6 Supply Voltage

EUROQUARTZ LIMITED Blacknell Lane CREWKERNE Somerset UK TA18 7HE
Tel: +44 (0)1460 230000 Fax: +44 (0)1460 230001 info@euroquartz.co.uk www.euroquartz.co.uk

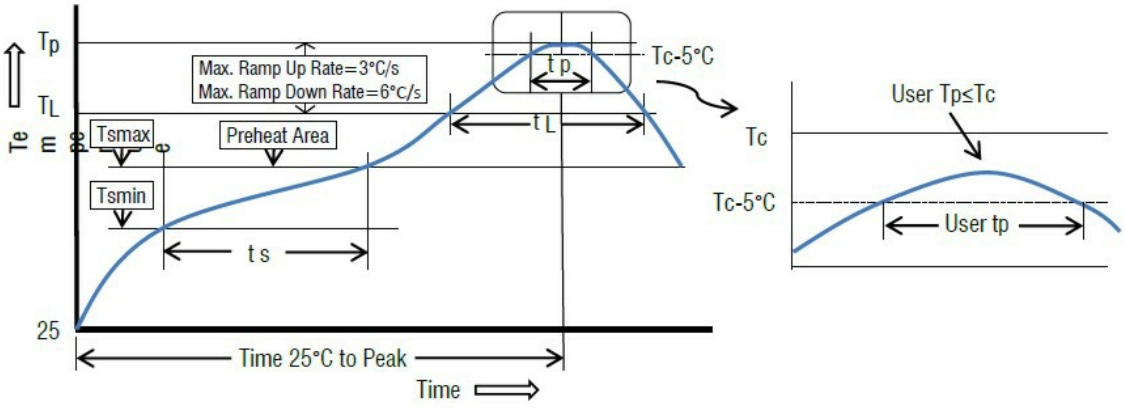
PART NUMBER SCHEDULE

Example: 18EM834-32768



Orderable Part Numbers	Output Frequency
xxME83y-1/60	1/60Hz
xxME83y-1/10	1/10Hz
xxME83y-1	1Hz
xxME83y-32	32Hz
xxME83y-128	128Hz
xxME83y-1024	1024Hz
xxME83y-4096	4096Hz
xxME83y-32768	32768Hz

RECOMMENDED SOLDER REFLOW PROFILE (per IPC/JEDEC J-STD-020D.1)



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

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

EUROQUARTZ LIMITED Blacknell Lane CREWKERNE Somerset UK TA18 7HE
Tel: +44 (0)1460 230000 Fax: +44 (0)1460 230001 info@euroquartz.co.uk www.euroquartz.co.uk