CHANGE NOTIFICATION

Linear Technology Corporation
1630 McCarthy Blvd., Milpitas, CA 95035-7417
(408) 432-1900

June 17, 2015

Dear Sir/Madam: PCN#061715

Subject: **Notification of Change of Crystals on the LTP5900/LTP5901/LTP5902**

Due to a supplier issue, Linear Technology Corporation will be modifying the Bill Of Materials (BOM) for the listed products, specifically the 20MHz crystal. Shipments of these products have been halted until the qualification of an alternate 20MHz crystal is completed, and shipments are expected to resume in end of July 2015. During this transition the BOM will also be modified to change the 32kHz crystal to a Lead (Pb) free component, which will render all versions of the LTP5900, LTP5901 and LTP5902 “Lead Free” versus RoHS compliant as a percentage of mass.

Description of the reason for this product change notice: During normal product testing some of the ECS-200-CDX-0914 20 MHz crystals used on the LTP5900, LTP5901 and LTP5902 (“Products”) were found under very specific temperature stress conditions to briefly drift outside of crystal’s specifications. As a result the LTP5900, LTP5901 and LTP5902 would infrequently lose timing synchronization with the network, reset and then rejoin the network.

This issue has only been observed when devices are operating below 0°C and only following extended temperature cycling. During temperature cycling between -40°C and 85°C, devices only demonstrate this issue following more than seven days of temperature cycling at roughly 12 cycles per day. No failures have been recorded at temperatures above 0°C. If the Products are not being used in applications below 0°C, the risk of such failure is extremely low. However, if such low temperature application is used, you may contact Linear Technology to arrange for replacement units.

While slower temperature ramp rates very likely result in a reduced or zero failure rate, experimentally determining the effect of slower ramp rates in a timely manner is not feasible. Failure rates on the least robust crystal lots, when temperature cycled between -40°C and 85°C at roughly 12 cycles per day, have been observed at approximately 0.5 resets/rejoins per week on devices demonstrating the failure. Failure rates have been found to vary by crystal manufacturing lot from 0% to approximately 40%.

While ECS, the supplier of the 20 MHz crystal, has generated a Failure Analysis Report (see attached) with a Corrective Action, the process of ECS supplying new crystals manufactured per the Corrective Action and of Linear Technology qualifying the crystals will take longer when compared with switching to a different 20MHz crystal. However, Linear Technology will test to ensure the effectiveness of the ECS-200-CDX-0914 Corrective Action.

List of part numbers affected:

LTP5900IPC-WHMAxxx
LTP5901IPC-WHMAxxx
LTP5902IPC-WHMAxxx
LTP5901IPC-IPMAxxx
LTP5902IPC-IPMAxxx
LTP5901IPC-IPRA/B/Cxxx
LTP5902IPC-IPRA/B/Cxxx

Should you have any further questions or concerns please contact your local Linear Technology Sales person or you may contact me at 408-432-1900 ext. 2077, or by e-mail at jason.hu@linear.com. If I do not hear from you by August 17, 2015, we will consider this change to be approved by your company.

Sincerely,

Jason Hu
Quality Assurance Engineer

ECS INC. INTERNATIONAL

Failure Analysis Report

1105 S. Ridgeview, Olathe KS 66062 Tel (800) 237-1041 Fax (913) 782-6991 www.ecsxtal.com

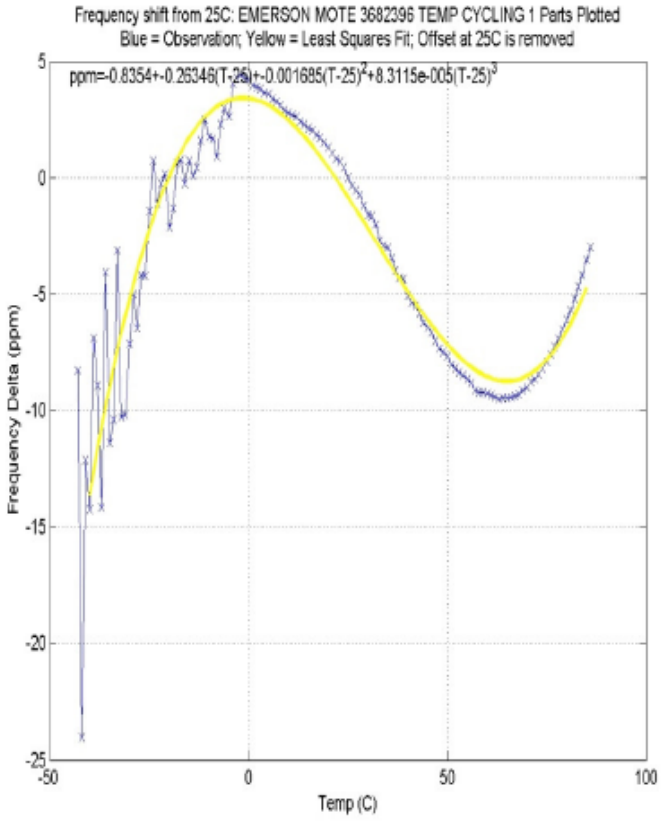
ATTN:	Gordon Charles	DATE:	6/5/2015
COMPANY:	Linear Technology		
ADDRESS:	32990 Alvarado-Niles Road	Email:	gcharles@linear.com
	Union City, CA 94587		

CUST. FILE No.			ECS FAR No.	15-006	
CUST. PART No.		REC. DATE	5/26/2015	QUANTITY	6

Background Information at Customer:

	Dead
	Not Stable
X	Incorrect Freq.
	Other

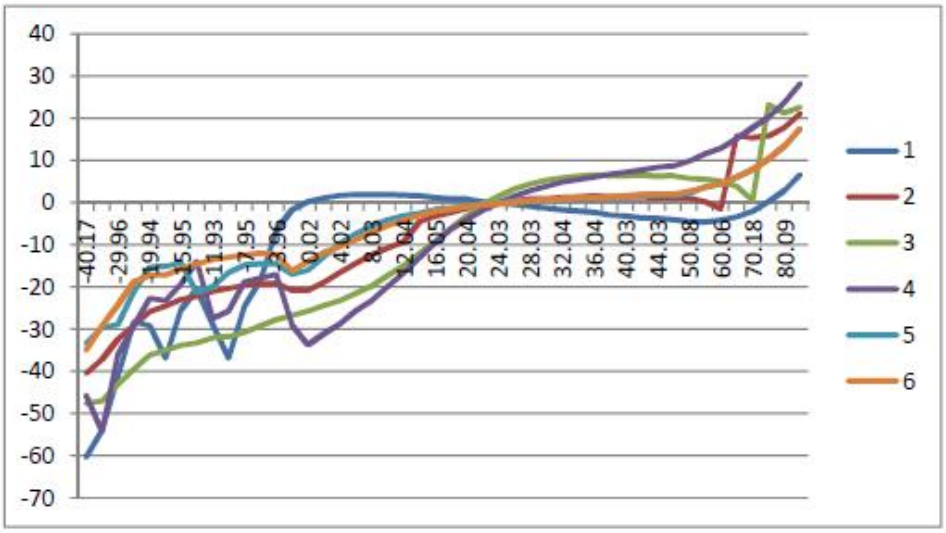
The crystals are a samples of those that failed after thermal shock (-55/125 degC, 500 cycles). Crystals have failed in circuit at cold.



ECS PART NO./Frequency/Lot #	ECS-200-CDX-0914, 20.000 MHz, D Lot Code

Failure Mode(s) at ECS:

Units were found to be out of spec over temperature



Cause and Analysis:

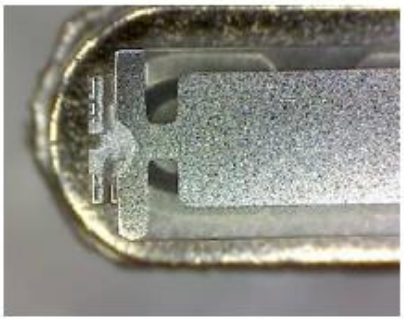
Units were leak tested, parts tested good.

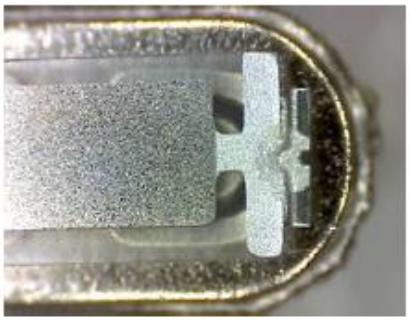
Test machine: Helium tester ,data as below:

Helium test
Specifications <3 × 10 EXP (-9)Pa * m3/S
Specifications <3 × 10 EXP (-9)Pa * m3/S
Specifications <3 × 10 EXP (-9)Pa * m3/S
Specifications <3 × 10 EXP (-9)Pa * m3/S
Specifications <3 × 10 EXP (-9)Pa * m3/S
Specifications <3 × 10 EXP (-9)Pa * m3/S

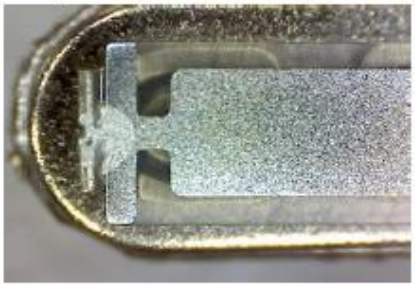
3 units were decapped, No damage to the Electrode was observed.

#1 crystal.





#3 crystal .



4 crystal .

The temp. stability failure is due to blank angle, We checked blank supplier and asked them to trace and check about the blanks they supplied

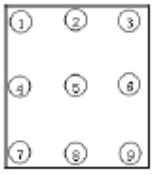
The root cause of this temperature characteristic problem is because of the blank's angle spread is getting bigger and has poor concentration which is related with the raw material's angle and smoothness as show in temperature data above.

Corrective Action:

We are moving forward with precision blank s for this item (New blank with ECD<100 and Q value = over 2.4 mil.), we asked blank manufacturer to build up with good quality quartz wafer and better as we already decided to use new blank s for this item

According to the comparison about the trouble lot and other normal lot, we can see the thickness of the trouble lot is much bigger than other normal lot's. The trouble lot was produced in December 2014, and at that time Blank Supplier hasn't set up the control system about the nine points' thickness measuring, and we were in data gathering phase. So the root cause of this abnormity is that because Blank supplier had not set up nine points' thickness measuring system.

Measuring extreme value of nine points' thickness:



We will control the blank angle more tightly

Blank Angle for CDX-0914 Rev. B = 3°01'00"±30"

Before input the blank, will input testing lot for temp curve and will check if the blank angle is proper and all within the spec first for every lot. (as of 6/04/15)

☐ Details Attached:

Shipped on:	Shipped Via:
Shipped to:	
Factory FAR No.	

ECS INC. INTERNATIONAL
BY: Dan Kelly