



**RACTRON**  
**ELECTRONICS**

深圳市瑞科创电子有限公司

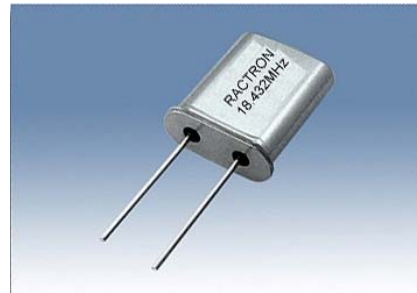
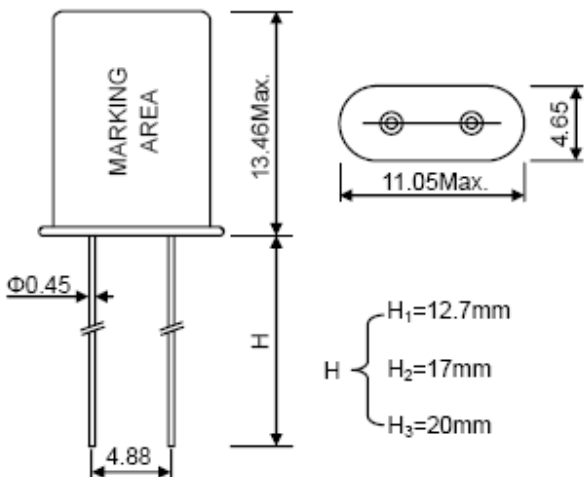
地址：广东深圳市福田区上步南路1001号锦峰大厦A座3楼308-312室  
电话：0755-83062006 82767281 82767282 82767283 32971587  
传真：0755-83004913 www.ractron.com bojillsheng@ractron.com.cn

石英晶体谐振器 Crystal Resonators HC-49U DIP DATASHEET

	项目	Item	规格
1	标称频率	Nominal Frequency	3MHz - 86MHz
2	外壳尺寸	Holder Type	HC-49U DIP
3	振动模式	Mode of Vibration	Fundamental 基频/AT 3 <sup>rd</sup> overtone 三次泛音/AT
3	拐点温度	Turnover Temperature	25°C ± 5°C
4	频率精度	Frequency Tolerance @ 25°C	±10ppm      ± 15ppm ±20ppm      ± 30ppm ±50ppm      ±100ppm
5	工作温度	Operating Temperature	- 0°C ~ +50°C    -10°C ~ +60°C -10°C ~ +70°C    -20°C ~ +70°C -30°C ~ +80°C    -40°C ~ +85°C
6	温度频差	Freq Stability vs. Temp	±10ppm      ±15ppm ±20ppm      ±30ppm ±50ppm      ±100ppm
7	负载电容	Load Capacitance	6pF            8pF 10pF          12.5pF 16pF          20pF 30pF          50pF
8	谐振电阻	Equivalent Series Resis	35K Ω
9	静电容	Shunt Capacitance	1.8pF max
10	激励电平	Drive Level	1 μW standard
11	绝缘电阻	Insulation Resistance	500M Ω at DC100V
12	年老化率	Aging Rate a Year	±5ppm/year (Max)
13	检测仪器	Test Impedance Meter	S&A250B
14	印字形式	Marking	
15	存储温度	Storage Temperature Range	-40°C ~ +85°C
16	存储湿度	Storage Humidity Range	0~95% RH

DIMENSIONS 外形尺寸

HC-49U





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机械及环境性能 Physical and Environment Characteristics

序号	类别	规范	检验标准
1	自由跌落	从60cm高度自由跌落到30mm厚硬木板上，跌落三次	$\Delta f/f \leq \pm 5\text{ppm}$ $\Delta R \leq 20\%$
2	振动	频率10~55Hz，振幅1.5mm，X、Y、Z方向各振动2小时。	$\Delta f/f \leq \pm 5\text{ppm}$ $\Delta R \leq 20\%$
3	引出端强度	a. 拉力：固定振荡器主体，沿引脚轴向施加0.9Kg拉力，保持30±5秒。 b. 弯曲：引脚端头悬挂450g的重物，弯曲90°，时间2~3秒，以相同速度返回原位置，再反向操作一次。	引脚无拔出或断裂现象 $\Delta f/f \leq \pm 5\text{ppm}$ $\Delta R \leq 20\%$
4	密封性	将谐振器浸在酒精中，加压5Kg/cm <sup>2</sup> ，时间五分钟。	测量引脚与基座间绝缘电阻>500MΩ (DC100V)
5	可焊性	从引脚末端至底部2~2.5mm放入235℃±5℃的焊槽内，时间2±0.5秒。	沾锡面>90%，频率变化≤±10ppm
6	耐焊接热	从引脚末端至底部2~2.5mm处放入260℃±10℃的焊槽内，时间10±0.5秒	$\Delta f/f \leq \pm 5\text{ppm}$ $\Delta R \leq 20\%$
7	温度循环	将谐振器放置在高低温箱中，将温度设置在-20℃，温度到达后保持30分钟，再将温箱升温到+80℃，保持30分钟，这是一个循环；再将温箱降温到-20℃，开始下一个循环，如此循环三次	$\Delta f/f \leq \pm 5\text{ppm}$ $\Delta R \leq 20\%$
8	恒定湿热	在40±3℃，90~95% RH，放置96小时，取出后恢复2小时	$\Delta f/f \leq \pm 5\text{ppm}$ $\Delta R \leq 20\%$
9	高温老化	85℃±2℃老化96小时，取出后常温下恢复2小时	$\Delta f/f \leq \pm 5\text{ppm}$ $\Delta R \leq 20\%$
10	耐低温	-40℃±2℃放置96小时，取出后常温下恢复2小时	$\Delta f/f \leq \pm 5\text{ppm}$ $\Delta R \leq 20\%$



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Physical and Environment Characteristics

Item	Condition of test	Performance Requirements
Mechanical Shock	Resonator shall be measured after 3 times random dropping from the height of 60cm onto hard wooden board of thickness more than 30mm	No visible damage, and measured Values shall meet Table 1
Vibration	Subject resonator to following vibration: Frequency: 10~55Hz Amplitude: 1.5mm Duration: 3 mutually perpendicular planes in each 2 hours Direction: X Y and Z axis	No visible damage, and measured Values shall meet Table 1
Terminal Strength Terminal Pulling Terminal Bending	Force of 5N is applied to each lead in axial direction for $30 \pm 5$ sec. When force of 5N is applied to each lead in axial direction, the lead shall folded up $90^\circ$ from the axial direction and folded back to the axial direction. The speed of folding shall be each 3 seconds.	No visible damage, and measured Values shall meet Table 1
Solder ability	Lead terminals are immersed up to 2mm from Resonator's body in soldering bath of $235 \pm 5^\circ\text{C}$ for $2 \pm 0.5$ sec.	More than 95% of the terminal surface of the resonator shall be covered with fresh solder
Resistance to Soldering Heat	Lead terminals are immersed up to 2mm from Resonator's body in soldering bath of $260 \pm 10^\circ\text{C}$ for $10 \pm 0.5$ seconds and then resonator shall be measured after being placed in natural conditions for 2 hours.	No visible damage, and measured Values shall meet Table 1
Temperature Cycling	Subject the resonator to $-20^\circ\text{C}$ for 30 min, followed by a high temperature of $+80^\circ\text{C}$ for 30 min. Cycling shall be repeated 5 times. resonator shall be measured after being placed in natural conditions for 2 hours.	No visible damage, and measured Values shall meet Table 1
Heat Resistance	Subject the resonator to $+85^\circ\text{C} \pm 5^\circ\text{C}$ for 96 hours, resonator shall be measured after being placed in natural conditions for 2 hours.	No visible damage, and measured Values shall meet Table 1
Cold Resistance	Subject the resonator to $-40^\circ\text{C} \pm 5^\circ\text{C}$ for 96 hours, resonator shall be measured after being placed in natural conditions for 2 hours.	No visible damage, and measured Values shall meet Table 1
Humidity	Subject the resonator at $+40^\circ\text{C} \pm 5^\circ\text{C}$ and 90%~95% R.H. for 96 hours, resonator shall be measured after being placed in natural conditions for 2 hours.	No visible damage, and measured Values shall meet Table 1

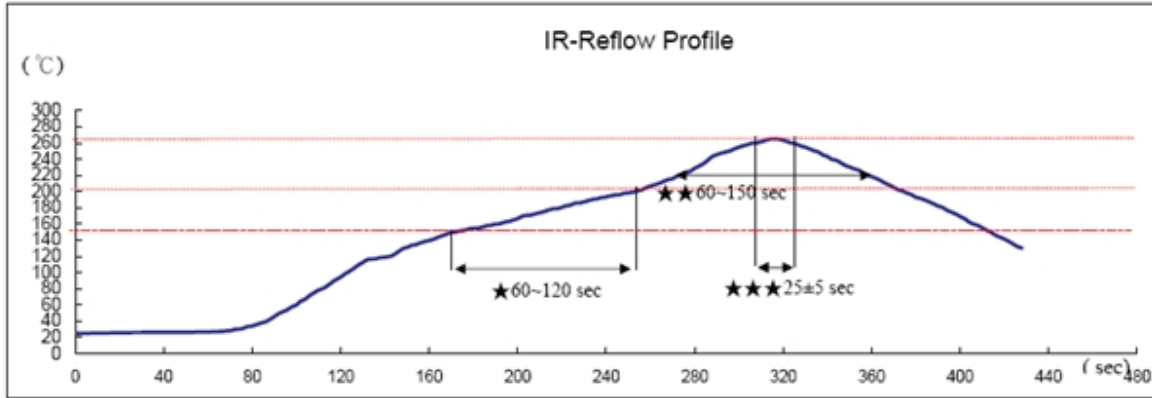


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无铅陶瓷贴片产品回流焊温度曲线



Reference Standard: JEDEC-STD 020  
Test conditions: ★Pre-heating : 150°C to 200°C, 60~120secs.  
★★Heating : 217°C, 60~150sec.  
★★★Peak temperature : 260±5°C, 25±5sec.

10MHz 20MHz 电性能测试数据

THE TESTING DATA OF ELECTRICAL CHARACTERISTICS

TEST DATE:01/16/2012  
FREQUENCY:10.000MHZ

PART NO. :  
ORDER NO. :

NO	FREQUENCY	OFFSET	ICC	PULL_H	PULL_L	FREQ_V_H	FREQ_V_L	START_T	LINE	P_P
	@ 25 °C	0.45	2	12	-4	0.2	0.2	2	10	
	(HZ)	(PPM)	(mA)	(PPM)	(PPM)	(V)	(V)	(mS)	%	(V)
1	10000000.40	0.04	1.10	6.73	-6.44	0.01	-0.01	0.16	0.79	1.25
2	10000000.00	0.00	1.00	6.15	-5.89	0.01	0.00	0.14	0.70	1.24
3	10000000.20	0.02	1.15	6.40	-6.13	0.02	0.00	0.14	0.72	1.24
4	10000000.60	0.06	1.10	6.40	-6.09	0.01	0.00	0.14	0.77	1.24
5	9999999.80	-0.02	1.10	6.51	-6.21	0.01	0.00	0.19	0.84	1.24
6	10000000.60	0.06	1.15	6.73	-6.35	0.02	0.00	0.19	0.83	1.26
7	10000000.60	0.06	1.05	6.42	-6.05	0.02	0.01	0.13	0.82	1.25
8	10000000.50	0.05	1.10	6.21	-5.94	0.02	0.00	0.18	0.71	1.23
9	10000000.20	0.02	1.10	6.89	-6.53	0.01	0.00	0.22	0.84	1.25
10	10000001.10	0.11	1.10	6.73	-6.38	0.01	0.00	0.15	0.81	1.24

OK_QTY	AVG:	0.04	1.10	6.52	-6.20	0.01	0.16	0.78	1.24
10.00	STD:	0.04	0.04	0.25	0.22	0.01	0.03	0.06	0.01
	GA:	8.89	****	-37.08	44.98	7.00	****	****	****
	CP:	4.05	6.86	5.44	6.14	13.33	20.40	55.86	18.50
	CPK:	3.69	6.86	3.42	3.38	13.33	20.40	55.86	18.50

INSPECTOR: KELLA  
SUPERVISOR: MILLER



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THE TESTING DATA OF ELECTRICAL CHARACTERISTICS

TEST DATE:01/26/2013  
FREQUENCY:20.000MHZ

PART NO. :  
ORDER NO. :

NO	FREQUENCY @ 25 °C (MHZ)	OFFSET 0.45 -0.45 (PPM)	ICC 2 (mA)	V Ver 0.2 -0.2 (PPM)	START_T 2 (mS)	PULL_H 999 5 (PPM)	PULL_L -5 1 (PPM)	VP_P (V)	VC L		
1	20	0	1.7	-0.001	0	0.001	6.5	-6.5	1.22	0.7	OK
2	20	-0.02	1.7	-0.001	-0.004	0.001	6.3	-6.5	1.24	0.5	OK
3	20	0.01	1.8	0.002	-0.002	0.003	6.5	-6.5	1.22	0.5	OK
4	20	0.01	1.8	0.001	-0.002	0.001	6.3	-6.5	1.22	0.4	OK
5	20	0.01	1.7	0.002	0.001	0.02	6.5	-6.7	1.24	0.6	OK
6	20.000001	0.03	1.8	0.002	0.003	0.02	6.9	-6.9	1.25	0.6	OK
7	19.999999	-0.04	1.8	0.002	0	0.002	6.5	-7	1.24	0.4	OK
8	20.000001	0.05	1.8	0.002	0.003	0.02	6.9	-7	1.22	0.5	OK
9	19.999999	-0.03	1.7	0.001	-0.001	0.002	6.8	-7.1	1.22	0.4	OK
10	20	0	1.7	0.002	0.003	0.02	6.4	-6.7	1.24	0.6	OK
11	20.000001	0.04	1.8	0.001	0.001	0.001	6.7	-6.9	1.22	0.5	OK
12	19.999999	-0.04	1.7	0	0.002	0.02	6.5	-6.5	1.22	0.7	OK
13	19.999999	-0.03	1.7	0.003	0.003	0.002	6.8	-7	1.22	0.5	OK
14	19.999999	-0.05	1.8	0.003	0.005	0.001	6.9	-6.9	1.24	0.5	OK
15	19.999999	-0.05	1.7	0.005	0.001	0.001	6.5	-7	1.22	0.5	OK
16	20	0.02	1.7	0.002	0.02	0.02	6.5	-7	1.22	0.6	OK
17	20.000001	0.04	1.8	0.003	0.001	0.001	6.8	-6.8	1.22	0.4	OK
18	20	0.02	1.7	0.006	0.002	0.002	6.5	-7	1.22	0.5	OK
19	20	0.02	1.8	0.004	0.007	0.002	6.7	-6.5	1.22	0.5	OK
20	19.999999	-0.07	1.8	0.004	0.004	0.02	6.5	-6.6	1.22	0.6	OK
	AVG:	0.0	1.7	0.0	0.0	0.0	6.6	-6.8	1.2	0.5	
	STD:	0.0	0.0	0.0	****	0.0	0.2	0.2	0.0	0.1	
	GA:	-1.0									
	CP:	4.4									
		116									
	CPK:	4.4									
		116									

TEST\_QTY: 20  
OK\_QTY: 20  
NG\_QTY: 0  
INSPECTOR: KELLA  
SUPERVISOR: MILLER

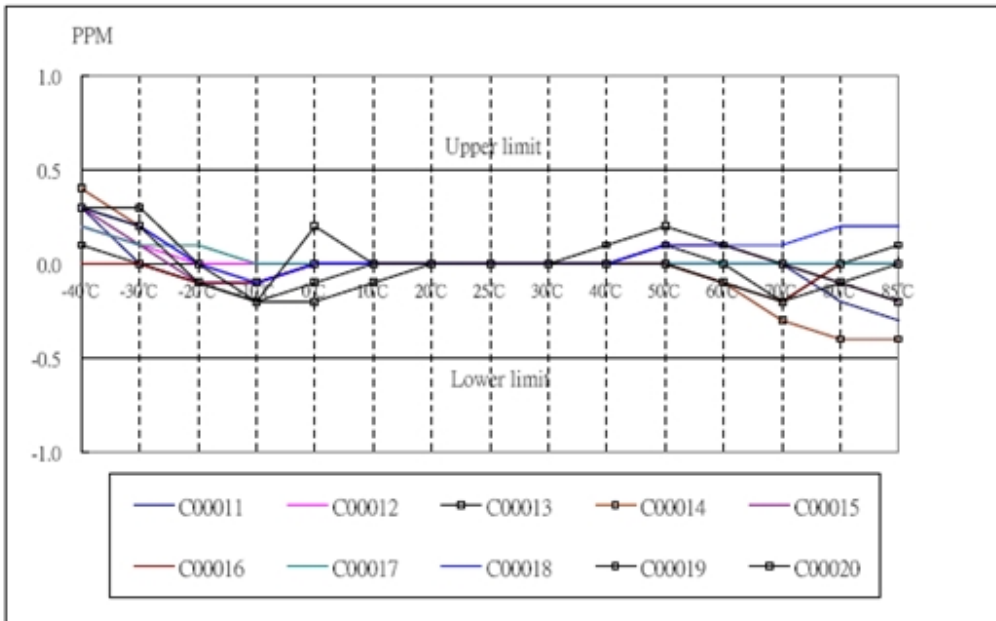
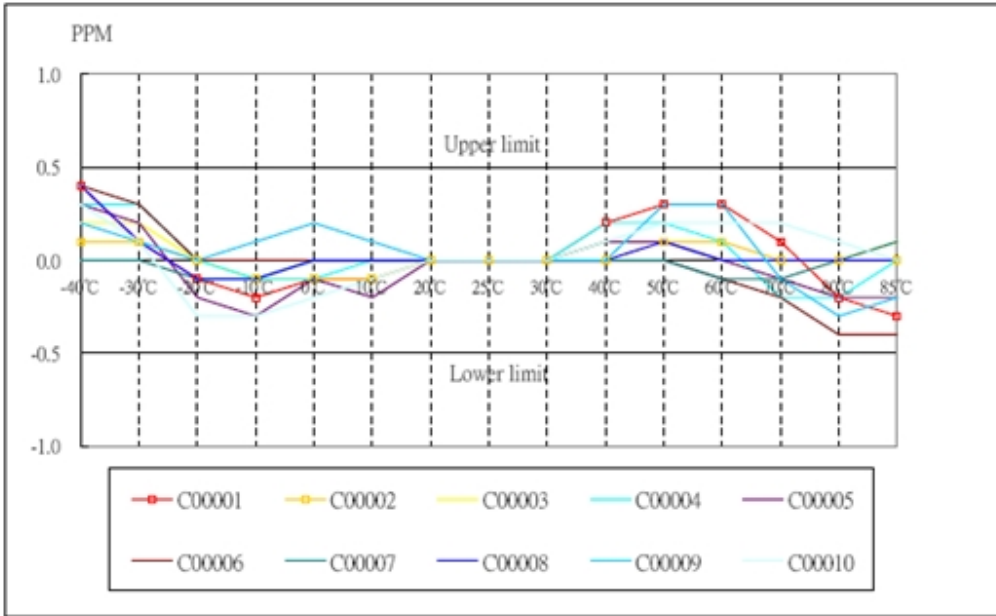


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10MHz 20MHz 温度稳定性测试数据







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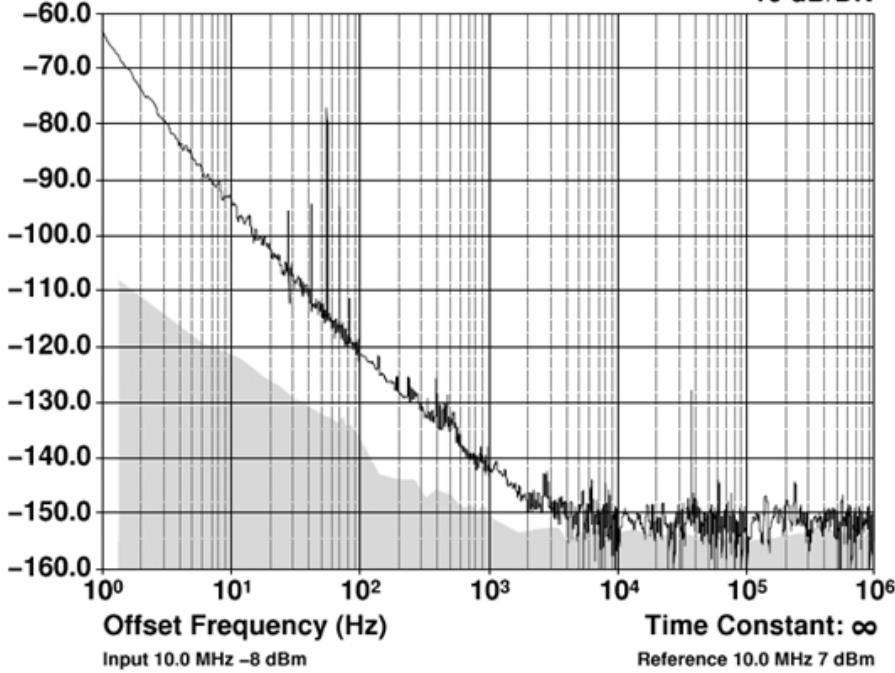
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10MHz 20MHz 相位噪声测试数据

### $\mathcal{L}(f)$ Phase Noise at 10.0 MHz (dBc/Hz)

10 dB/Div



### $\mathcal{L}(f)$ Phase Noise at 20.0 MHz (dBc/Hz)

10 dB/Div

