



Crystal and Oscillator

Catalogue



MANUDAX






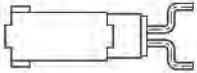
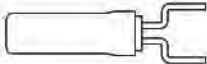
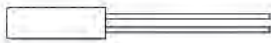



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MDX general catalogue

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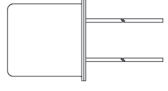
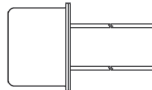
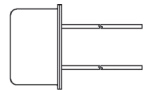
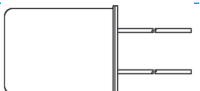

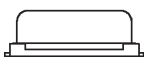






Dessins non contractuels

Tuning Fork 32,768 KHz Crystals		
9	MXC212	
10	MXC315	
11	MXC415	
12	MXC519	
13	MXC200S	
14	MXC206J	
15	MXC200T	
16	MFS206MDX	
17	Codification Tuning Fork 32,768 KHz Crystals (Part Numbering System)	
18	Ceramic 7x5 mm oscillator 32,768 KHz	
19	Ceramic 5x3 mm oscillator 32,768 KHz	
20	Ceramic 3x2 mm oscillator 32,768 KHz	

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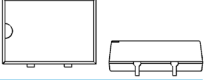

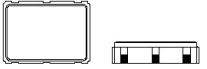













Dessins non contractuels

Quartz Crystal catalogue		
23	M5U (case HC45/U or UM1)	
24	M5U5 (case UM5)	
25	M5U4 (case UM4)	
26	MDX (49U)	
27	M9S (HC49/S)	
28	MSM (HC49/SM)	
29	MSX (HC49/SM low height)	
30	M9SNCF (metal SMD)	
31	M9LNCF (metal SMD low height)	
32	MDX75104 (ceramic 7x5mm crystal)	
33	MDX53104 (ceramic 5x3mm crystal)	
34	MDX32104 (ceramic 3x2mm crystal)	
35	Codification Quartz (Part Numbering System)	

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Dessins non contractuels

Oscillator catalogue		
39/40	MHC/MHH/MTH (Metal Oscillator TTL/HCMOS – DIL8/DIL14)	
41	MCH/MTH serie	
42/43	M5750/M3750/M2750/M1750 (7x5mm Ceramic Oscillator)	
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42/43	M5320/M3320/M2320/M1320 (3x2mm Ceramic Oscillator)	
44	M3750E/M2750E/M3750L (7x5mm PECL-LVDS Ceramic Oscillator)	
45	Metal VCXO (DIL8/ DIL14)	
46	SMD VCXO (Ceramic 7x5mm)	
47	MTD-T (Metal TTL DIL14 TCXO 5V)	
48	MTD-H (Metal HCMOS DIL14 TCXO 5V)	
49	MTD-H-3 (Metal HCMOS DIL14 TCXO 3,3V)	
50	MTD-S (Metal DIL14 Sine Wave TCXO)	
51	MT5-S (Ceramic 5x3mm Sine Wave TCXO)	
52	MT3-S (Ceramic 3x2mm Sine Wave TCXO)	
53	MVTD-T (Metal DIL14 TTL VCTCXO)	
54	MVTD-H (Metal DIL14 HCMOS VCTCXO)	
55	MVTD-S (Metal DIL14 Sine Wave VCTCXO)	
56	MVT5-S (Ceramic 5x3mm Sine Wave VCTCXO)	
57	MVT3-S (Ceramic 3x2mm Sine Wave VCTCXO)	

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Dessins non contractuels

Programmable Oscillators – Ultra Low Jitter - 7x5 and 5x3 mm		
59/61	MAE108xC - MAE105xC Series (XO HCMOS)	
62/64	MAE108xP, MAE108xL - MAE105xP, MAE105xL Séries (XO PECL / LVDS)	
65/67	MAE1087C - MAE1057C Series (VCXO – HCMOS)	
68/70	MAE1087P (L) - MAE1057P (L) Series (VCXO – PECL / LVDS)	



Tuning Fork 32,768 KHz Crystals

Catalogue



MANUDAX

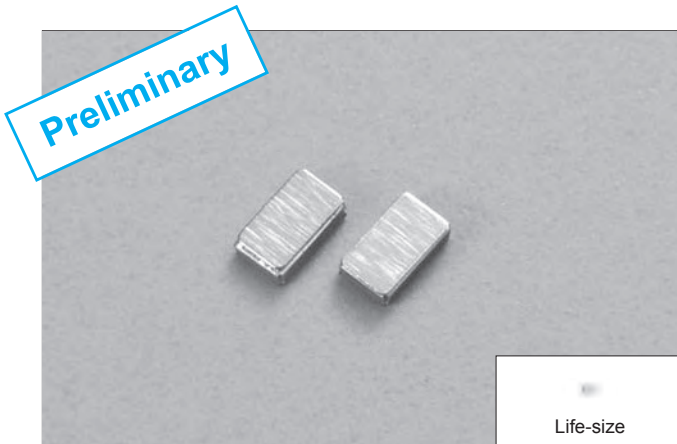
Z.A. Les Petites Haies - 28, rue de Valenton - B.P. 302 -
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Tape & Reel 3Kpcs



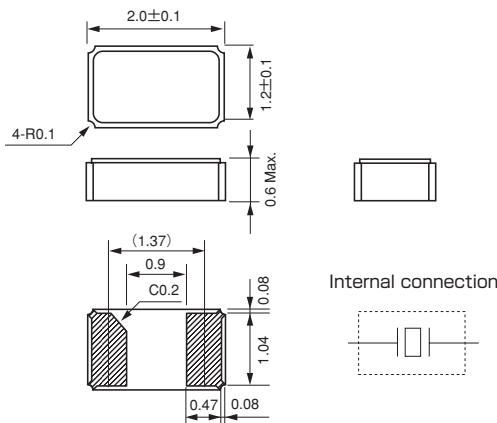
Tuning fork Crystal Unit



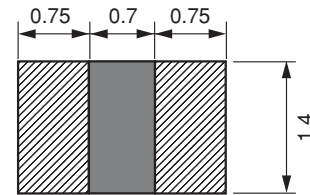
◆ **Features**

- Tuning fork crystal with ceramic packaged type.
- High-density SMD type
Ultra-light weight with ultra-miniature packaging.
High-stability assured with tight vacuum sealing.
- Most appropriate for portable devices and mobile telecommunications devices.
- Complete Pb free product.

◆ **Dimensions (mm)**



◆ **Solder pad layout (mm)**



* Do not design any patterns on shaded area.

◆ **Standard Specifications**

Part Numbering system is in Page 17

Item	Model	MXC212	Conditions
Nominal Frequency	f ₀	32.768KHz	
Frequency Tolerance	Δf/f ₀	±30ppm	at 25°
Load capacitance	C _L	12.5 pF	Need to specify your requirement
Operating Temperature Range	T _{OPR}	-40°C~+85°C	
Storage Temperature Range	T _{STR}	-55°C~+125°C	
Turnover Temperature	T _M	25°C±5°C	
Temperature Coefficient	β	-0.034±0.006ppm/°C ²	
Motional (series) resistance	R ₁	75K Ω Max.	at 25°C
Level of drive	DL	0.5 μ W Max.	
Aging (first year)	Δf/f ₀	±30ppm Max.	

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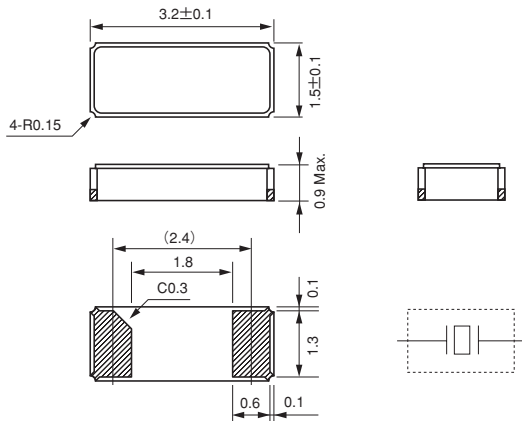
Tape & Reel 3Kpcs



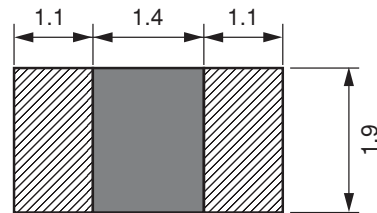
◆ **Features**

- Tuning fork crystal with ceramic packaged type.
- High-density SMD type
Ultra-light weight with ultra-miniature packaging.
High-stability assured with tight vacuum sealing.
- Most appropriate for portable devices and mobile telecommunications devices.
- Complete Pb free product.

◆ **Dimensions (mm)**



◆ **Solder pad layout (mm)**



* Do not design any patterns on shaded area.

◆ **Standard Specifications**

Part Numbering system is in Page 17

Item	Model	MXC315	Conditions
Nominal Frequency	f ₀	32.768KHz	
Frequency Tolerance	Δf/f ₀	±20ppm	at 25°
Load capacitance	C _L	9.0pF, 12.5 pF	Need to specify your requirement
Operating Temperature Range	T _{OPR}	-40°C~+85°C	
Storage Temperature Range	T _{STR}	-55°C~+125°C	
Turnover Temperature	T _M	25°C±5°C	
Temperature Coefficient	β	-0.034±0.006ppm/°C ²	
Motional (series) resistance	R ₁	70K Ω Max.	at 25°C
Level of drive	DL	1 μ W Max.	
Aging (first year)	Δf/f ₀	±3ppm Max.	25°C±3°C
Quality Factor	Q	30000 Typ.	
Shunt capacitance	C ₀	0.95pF Typ.	

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Tape & Reel 3Kpcs



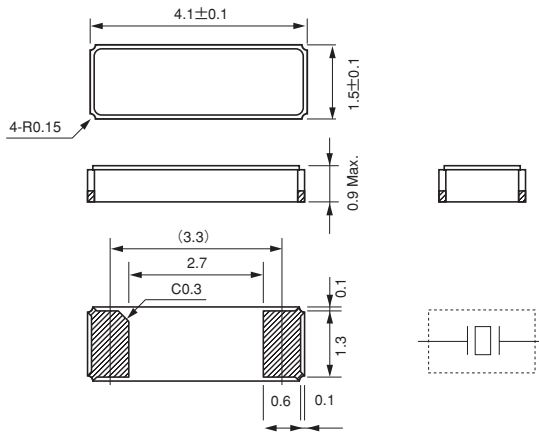
Tuning fork Crystal Unit



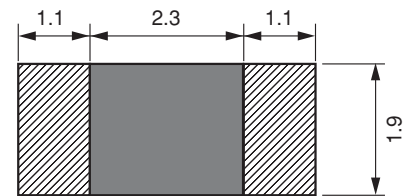
◆ **Features**

- Tuning fork crystal with ceramic packaged type.
High-density SMD type
- Light weight with small and thin packaging.
High-stability assured with tight vacuum sealing.
- Most appropriate for portable devices, automotive applications and mobile telecommunications devices.
- Complete Pb free product.

◆ **Dimensions (mm)**



◆ **Solder pad layout (mm)**



* Do not design any patterns on shaded area.

◆ **Standard Specifications**

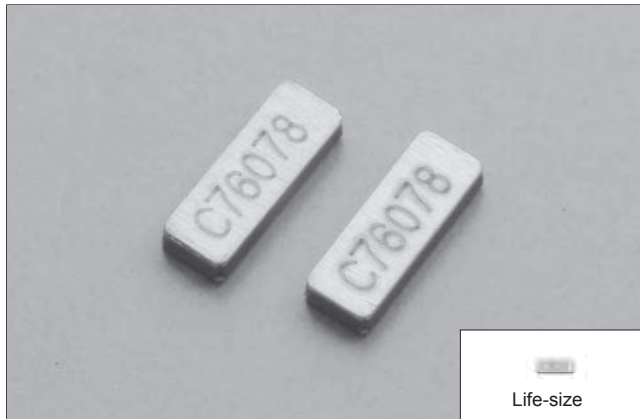
Part Numbering system is in Page 17

Item	Model	MXC415	Conditions
Nominal Frequency	f ₀	32.768KHz	
Frequency Tolerance	Δf/f ₀	±20ppm	at 25°
Load capacitance	C	9.0pF, 12.5 pF	Need to specify your requirement
Operating Temperature Range	T _{OPR}	-40°C~+85°C	
Storage Temperature Range	T _{STR}	-55°C~+125°C	
Turnover Temperature	T _M	25°C±5°C	
Temperature Coefficient	β	-0.034±0.006ppm/°C ²	
Motional (series) resistance	R ₁	70K Ω Max.	at 25°C
Level of drive	DL	1 μ W Max.	
Aging (first year)	Δf/f ₀	±3ppm Max.	25°C±3°C
Quality Factor	Q	53000 Typ.	
Shunt capacitance	C ₀	1.10pF Typ.	

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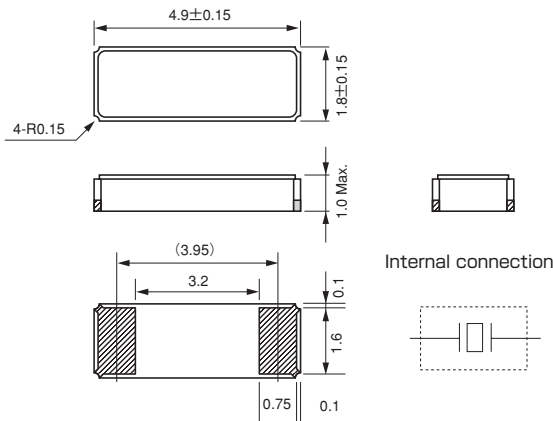
Tape & Reel 3Kpcs



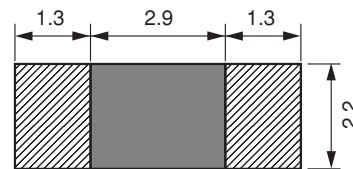
◆ **Features**

- Tuning fork crystal with ceramic packaged type.
- Small & thin packaging and light weight.
- Most appropriate for portable devices and mobiletelecommunications devices.
- Complete Pb free product.

◆ **Dimensions (mm)**



◆ **Solder pad layout (mm)**



* Do not design any patterns on shaded area.

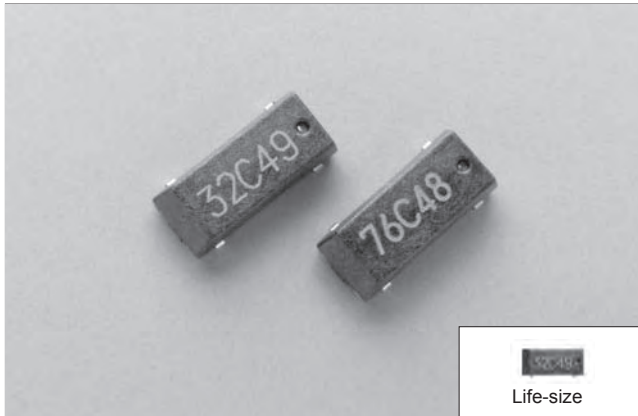
◆ **Standard Specifications**

Part Numbering system is in Page 17

Item	Model	MXC519	Conditions
Nominal Frequency	f ₀	32.768KHz	
Frequency Tolerance	Δf/f ₀	±20ppm	at 25°
Load capacitance	C _L	12.5 pF	Need to specify your requirement
Operating Temperature Range	T _{OPR}	-40°C~+85°C	
Storage Temperature Range	T _{STR}	-55°C~+125°C	
Turnover Temperature	T _M	25°C±5°C	
Temperature Coefficient	β	-0.034±0.006ppm/°C ²	
Motional (series) resistance	R ₁	70K Ω Max.	at 25°C
Level of drive	D _L	1 μ W Max.	
Aging (first year)	Δf/f ₀	±3ppm Max.	25°C±3°C
Quality Factor	Q	57000 Typ.	
Shunt capacitance	C ₀	1.35pF Typ.	

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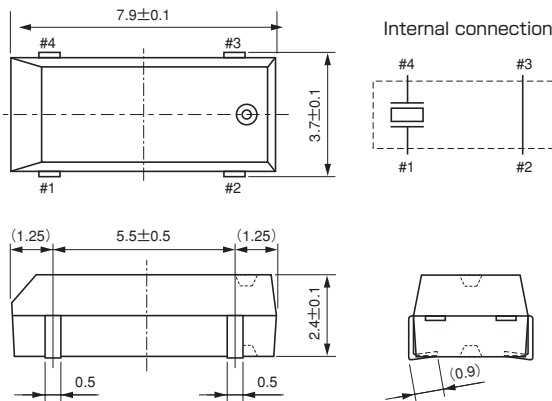
Tape & Reel 3Kpcs



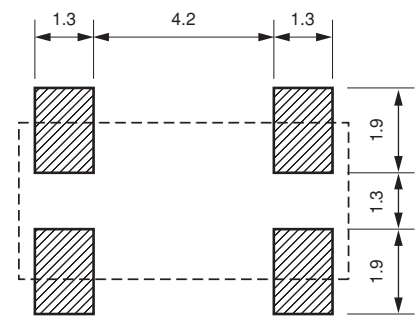
◆ **Features**

- Embedded with heat resistant cylinder type crystal bringing highly stable characteristics.
- Automatic mounting and reflowable type.
- Most appropriate for clock source for portable and automotive equipment with low power consumption.

◆ **Dimensions (mm)**



◆ **Solder pad layout (mm)**



◆ **Standard Specifications**

Part Numbering system is in Page 17

Item	Model	MXC200S	MXC250S	Conditions
Nominal Frequency	f_0	32.768KHz	30KHz~100KHz	Need to contact us for the available frequency in MXC250
Frequency Tolerance	$\Delta f/f_0$	± 20 ppm	± 30 ppm	at 25°
Load capacitance	C_L			Need to specify your requirement
Operating Temperature Range	T_{OPR}	-40°C~+85°C		
Storage Temperature Range	T_{STR}	-55°C~+125°C		
Turnover Temperature	T_M	25°C \pm 5°C		
Temperature Coefficient	β	-0.034 \pm 0.006ppm/°C ²		
Motional (series) resistance	R_1	50K Ω Max.		at 25°C
Level of drive	D_L	1 μ W Max.		
Aging (first year)	$\Delta f/f_0$	± 3 ppm Max.	± 5 ppm Max.	25°C \pm 3°C
Quality Factor	Q	70000 Typ.	70000 Typ.~100000 Typ.	Depend on frequency
Shunt capacitance	C_0	1.35pF Typ.	0.8pF~1.7pF Typ.	Depend on frequency

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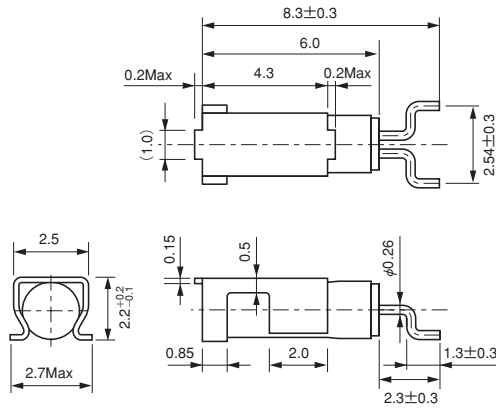
Tape & Reel 3Kpcs



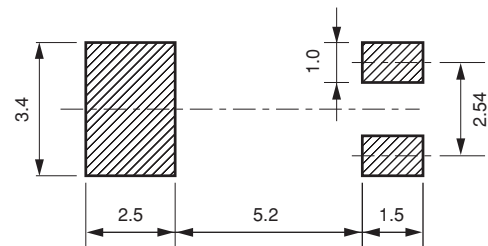
◆ **Features**

- High-density mounting SMD with jacket.
- Automatic mounting and reflowable type.
- Most appropriate for clock source for portable and other various equipment with low powerconsumption.

◆ **Dimensions (mm)**



◆ **Solder pad layout (mm)**



◆ **Standard Specifications**

Part Numbering system is in Page 17

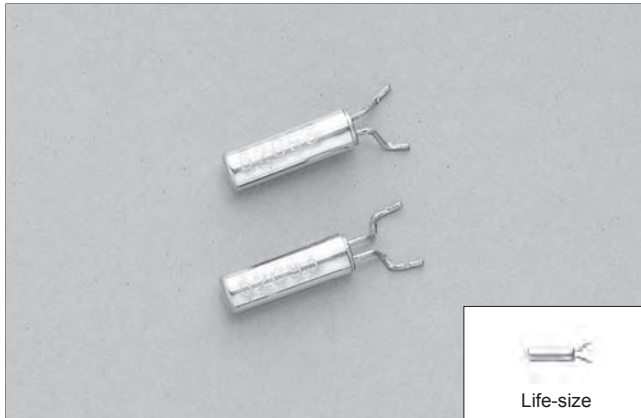
Item	Model	MXC206J	Conditions
Nominal Frequency	f ₀	32.768KHz	
Frequency Tolerance	Δf/f ₀	±20ppm	at 25°
Load capacitance	C _L	12.5 pF	Need to specify your requirement
Operating Temperature Range	T _{OPR}	-40°C~+85°C	
Storage Temperature Range	T _{STR}	-55°C~+125°C	
Turnover Temperature	T _M	25°C±5°C	
Temperature Coefficient	β	-0.034±0.006ppm/°C ²	
Motional (series) resistance	R ₁	50K Ω Max.	at 25°C
Level of drive	DL	1 μ W Max.	
Aging (first year)	Δf/f ₀	±3ppm Max.	25°C±3°C
Quality Factor	Q	70000 Typ.	
Shunt capacitance	C ₀	1.35pF Typ.	

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Tape & Reel 2Kpcs



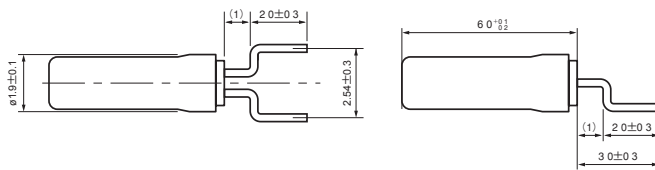
Tuning fork Crystal Unit



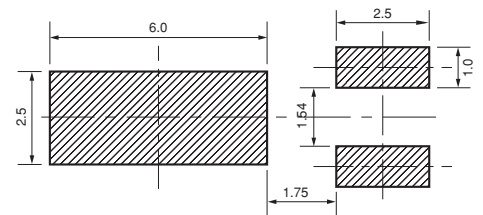
◆ **Features**

- Lead formed SMD type with embossed tape. Automatic mounting and reflowable type.
- Most appropriate for clock source for portable and other various equipment with low power consumption.

◆ **Dimensions (mm)**



◆ **Solder pad layout (mm)**

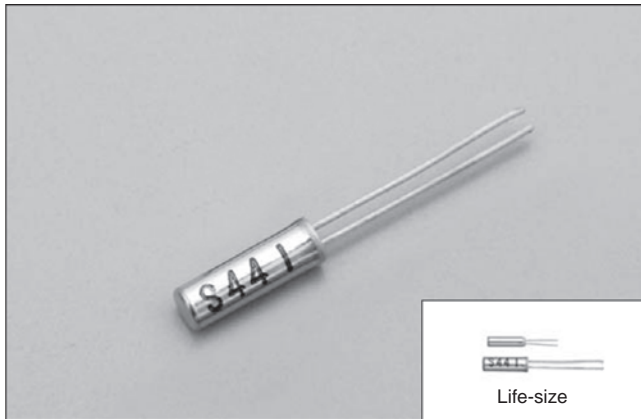


◆ **Standard Specifications**

Part Numbering system is in Page 17

Item	Model	MXC200T	Conditions
Nominal Frequency	f ₀	32.768KHz	
Frequency Tolerance	Δf/f ₀	±20ppm	at 25°
Load capacitance	C _L	12.5 pF	Need to specify your requirement
Operating Temperature Range	T _{OPR}	-40°C~+85°C	
Storage Temperature Range	T _{STR}	-55°C~+125°C	
Turnover Temperature	T _M	25°C±5°C	
Temperature Coefficient	β	-0.034±0.006ppm/°C ²	
Motional (series) resistance	R ₁	50K Ω Max.	at 25°C
Level of drive	DL	1 μ W Max.	
Aging (first year)	Δf/f ₀	±3ppm Max.	25°C±3°C
Quality Factor	Q	70000 Typ.	
Shunt capacitance	C ₀	1.35pF Typ.	

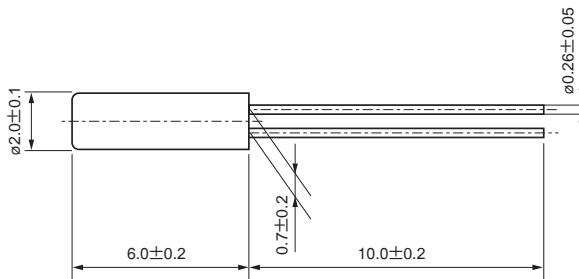
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◆ **Features**

- Best suited for portable devices with low current consumption.
- For a clock source in digital equipment.

◆ **Dimensions (mm)**



◆ **Standard Specifications**

Part Numbering system is in Page 17

Item	Model	MFS206MDX	Conditions
Nominal Frequency	f ₀	32.768KHz	
Frequency Tolerance	Δf/f ₀	±20ppm	at 25°
Load capacitance	C _L	12.5 pF	Need to specify your requirement
Operating Temperature Range	T _{OPR}	-20°C~+70°C	
Storage Temperature Range	T _{STR}	-40°C~+85°C	
Turnover Temperature	T _M	25°C±5°C	
Temperature Coefficient	β	-0.034±0.006ppm/°C ²	
Motional (series) resistance	R ₁	35K Ω Max.	at 25°C
Level of drive	DL	1 μ W Max.	
Aging (first year)	Δf/f ₀	±3ppm Max.	25°C±3°C
Quality Factor	Q	70000 Typ.	Depend on frequency
Shunt capacitance	C ₀	1.35pF Typ.	Depend on frequency

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MDX codification 32,768 KHz Crystals (Part Numbering System)

Case	Frequency code	Tolerance at 25°C (ppm)	Load capacitance	Packing Specification
MFS206	- 32	D	F	T
↓	↓	↓	↓	↓
<p>MFS206 MXC200T MXC206J MXC200S MXC519 MXC415 MXC315 MXC212</p>	<p>32,768 KHz</p>	<p>D = +/- 20 ppm F = +/- 15 ppm E = +/- 10 ppm H = +/- 5 ppm</p>	<p>A = Series B = 6.0pF C = 9.0pF (STD) D = 9.5pF E = 12.0pF F = 12.5pF (STD) G = 13.0pF Q = 10.0pF S = 11.0pF V = 8.0pF Y = 7.0pF Z = Others</p>	<p>T = Tape & Reel B = Bulk</p>



◆ **Application**

- Ethernet, FibreChannel, SONET/SDH line cards, T1/E1, T3/E3 line cards
- Pb free product

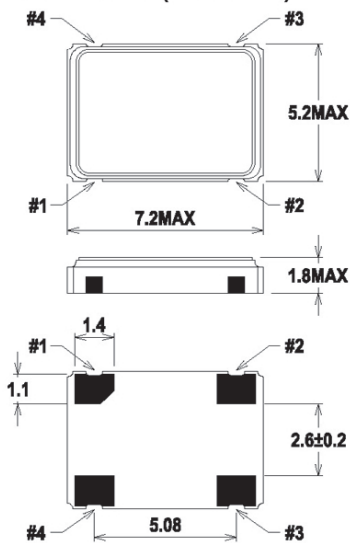
◆ **Options**

- TAPE & REEL

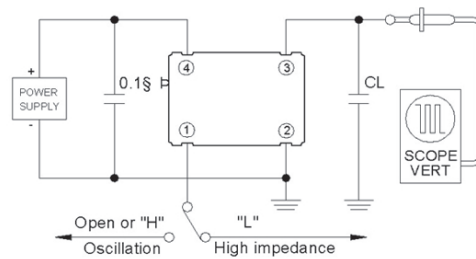
◆ **ELECTRICAL SPECIFICATION**

1. FREQUENCY	32.768000 KHz
2. FREQUENCY STABILITY	± 10ppm, ± 15ppm, ± 25ppm, ± 50 ppm
3. OPERATING TEMPERATURE RANGE	-20°C ~ +70°C, -40°C ~ +85°C, -40°C ~ +125°C
4. STORAGE TEMPERATURE RANGE	-55°C to +125°C
5. INPUT VOLTAGE	3.3Vdc ± 0.33Vdc
6. INPUT CURRENT (@ 3.3Vdc)	10mA MAX
8. LOGIC FAMILY	HCMOS
9. SYMMETRY (@ 50% VDD)	50% ± 5%
10. OUTPUT LOAD	15pF
11. RISE & FALL TIME (@ 20% To 80% VDD)	1 uS MAX
12. "0" LEVEL	0.33 MAX
13. "1" LEVEL	2.97 MIN

◆ **DIMENSION (Unit : mm)**

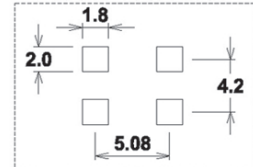


◆ **TEST SET-UP DIAGRAM**

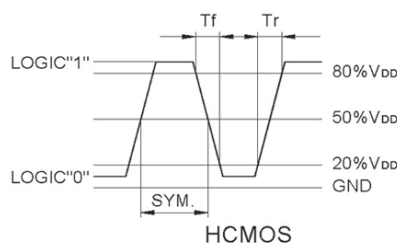


No.	Pin Connection
# 1	Tri-State or N/C
# 2	GND
# 3	Output
# 4	Vdc

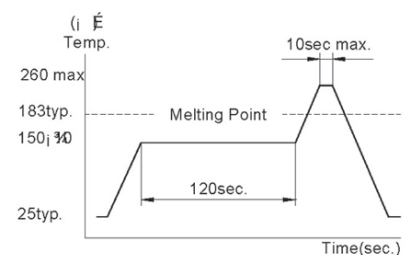
LAND PATTERN



◆ **WAVEFORM**



◆ **SOLDER REFLOW GUIDE**





◆ **Application**

- Ethernet, FibreChannel, SONET/SDH line cards, T1/E1, T3/E3 line cards
- Pb free product

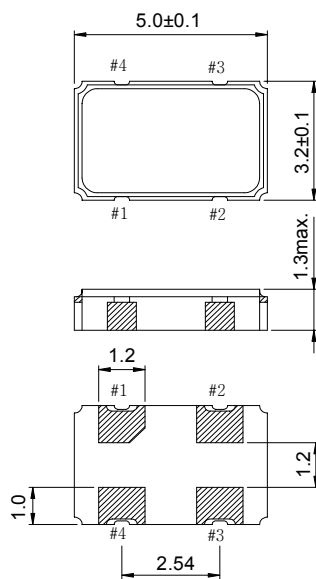
◆ **Options**

- TAPE & REEL

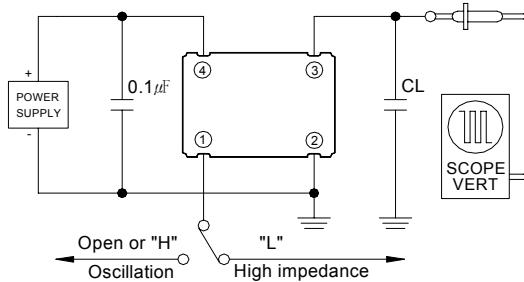
◆ **ELECTRICAL SPECIFICATION**

1. FREQUENCY	32.768000 KHz
2. FREQUENCY STABILITY	± 10ppm, ± 15ppm, ± 25ppm, ± 50 ppm
3. OPERATING TEMPERATURE RANGE	-20°C ~ +70°C, -40°C ~ +85°C, -40°C ~ +125°C
4. STORAGE TEMPERATURE RANGE	-55°C to +125°C
5. INPUT VOLTAGE	3.3Vdc ± 0.16Vdc
6. INPUT CURRENT (@ 3.3Vdc)	1mA MAX
8. LOGIC FAMILY	HCMOS
9. SYMMETRY (@ 50% VDD)	50% ± 5%
10. OUTPUT LOAD	15pF
11. RISE & FALL TIME (@ 20% To 80% VDD)	1 uS MAX
12. "0" LEVEL	0.33 MAX
13. "1" LEVEL	2.97 MIN

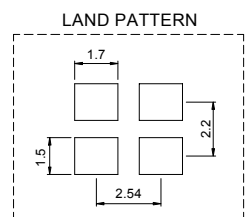
◆ **DIMENSION (Unit :**



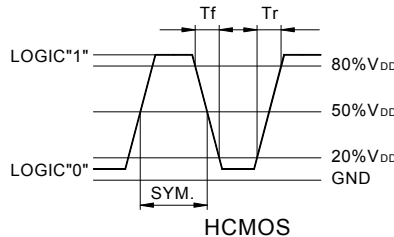
◆ **TEST SET-UP DIAGRAM**



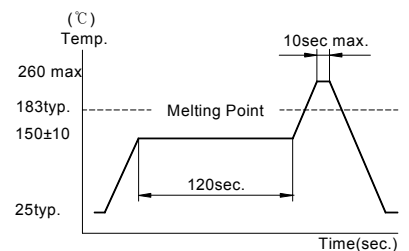
No.	PIN CONNECTION
# 1	E/D or N/C
# 2	GND
# 3	OUTPUT
# 4	Vcc



◆ **WAVEFORM**



◆ **SOLDER REFLOW GUIDE**



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◆ Application

- Ethernet, FibreChannel, SONET/SDH line cards, T1/E1, T3/E3 line cards
- Pb free product

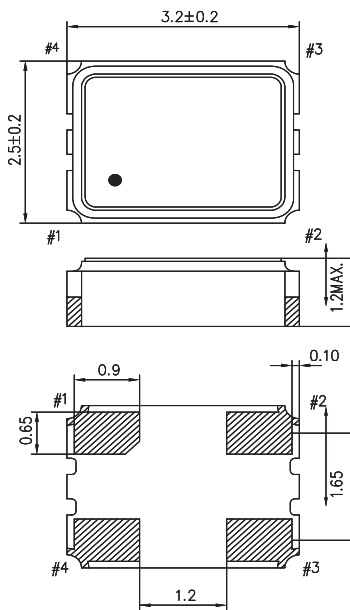
◆ Options

- TAPE & REEL

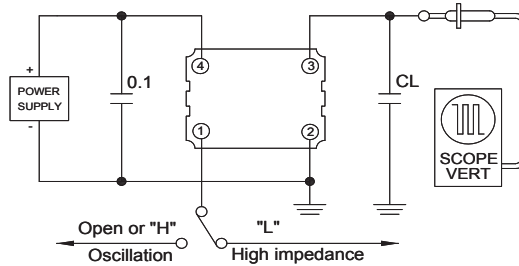
◆ ELECTRICAL SPECIFICATION

1. FREQUENCY	32.768000 KHz
2. FREQUENCY STABILITY	± 10ppm, ± 15ppm, ± 25ppm, ± 50 ppm
3. OPERATING TEMPERATURE RANGE	-20°C ~ +70°C, -40°C ~ +85°C, -40°C ~ +125°C
4. STORAGE TEMPERATURE RANGE	-55°C to +125°C
5. INPUT VOLTAGE	3.3Vdc ± 0.16Vdc
6. INPUT CURRENT (@ 3.3Vdc)	20mA MAX
8. LOGIC FAMILY	HCMOS
9. SYMMETRY (@ 50% VDD)	50% ± 10%
10. OUTPUT LOAD	15pF
11. RISE & FALL TIME (@ 20% To 80% VDD)	500 nS MAX
12. "0" LEVEL	0.33 MAX
13. "1" LEVEL	2.97 MIN

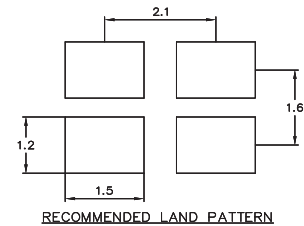
◆ DIMENSION (Unit : mm)



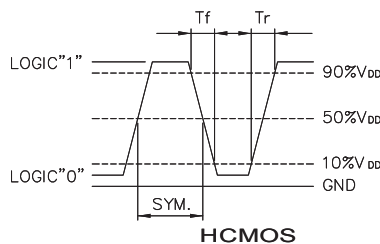
◆ TEST SET-UP DIAGRAM



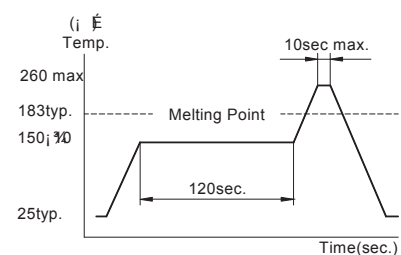
TERMINAL	CONNECTION
#1	N/C or E/D
#2	GND
#3	OUTPUT
#4	Vcc



◆ WAVEFORM



◆ SOLDER REFLOW GUIDE





Quartz Crystal

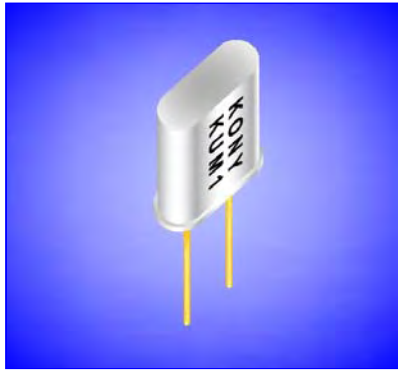
Catalogue



MANUDAX

Z.A. Les Petites Haies - 28, rue de Valenton - B.P. 302 -
94709 MAISONS-ALFORT Cedex - FRANCE
Téléphone : 33 (0)1 41 78 94 44 - Télécopie : 33 (0)1 48 99 41 86
www.manudax.fr - Courriel : manudax@manudax.fr

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◆ Feature

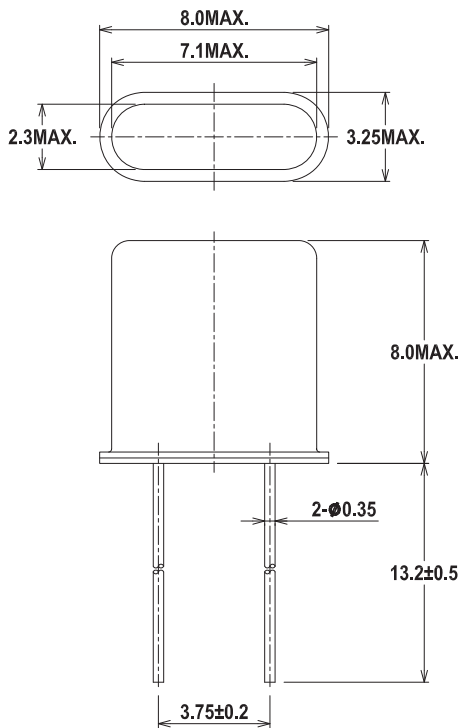
- Wide Frequency Range
- Highly Reliable
- AT-cut
- Resistance Weld Seal
- Excellent Aging

◆ Options

- Insulating Pad
- 3rd Lead (Bottom)
- Vinyl-pack or box

Part Numbering system is in Page 35

◆ Dimension(mm)



◆ Standard Specification

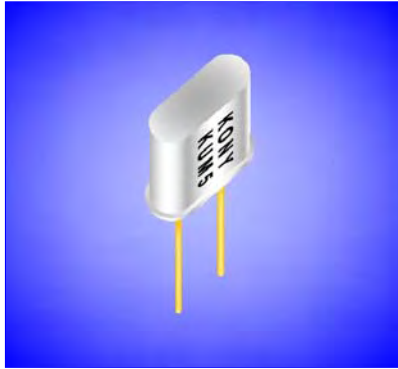
(Nominal frequency referenced to frequency at 25 °C ± 2 °C)

PARAMETERS	M5U
Frequency Range	7.15909MHz ~ 160.0000MHz
Frequency Tolerance @ 25°C±3°C	± 30ppm (Typ.)
Stability Over Operating Temperature Range (in reference to 25°C)	± 30ppm (Typ.)
Operating Temperature Range	-20°C +70°C // -40°C +85°C
Equivalent Series Resistance (ESR)	*See Table
Shunt Capacitance	7pF maximum
Load Capacitance	10pF ~ Series
Drive Level	100µW (1000µW max.)
Aging per year	±5ppm
Insulation Resistance	500 Megaohms Minimum at 100V _{DC}
•Tighter tolerances, stabilities & operating temperature ranges available	

◆ Nominal Frequency & ESR

Frequency Range (MHz)	Mode	Max. ESR (Ω)	Frequency Range (MHz)	Mode	Max. ESR (Ω)	
7.1590 ~ 7.999	Fundamental	100	20.0000 ~ 33.999	Fundamental	30	
8.0000 ~ 9.999		80	28.6363 ~ 39.999	3rd Overtone	60	
10.0000 ~ 10.999		60	36.0000 ~ 49.999		50	
11.0000 ~ 11.999		50	50.0000 ~ 85.999			
12.0000 ~ 13.999		40	86.0000 ~ 106.250	5th Overtone	100	
14.0000 ~ 14.999		30	100.0000 ~ 150.000		7th Overtone	120
15.0000 ~ 19.999			150.0000 ~ 160.000			

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◆ Feature

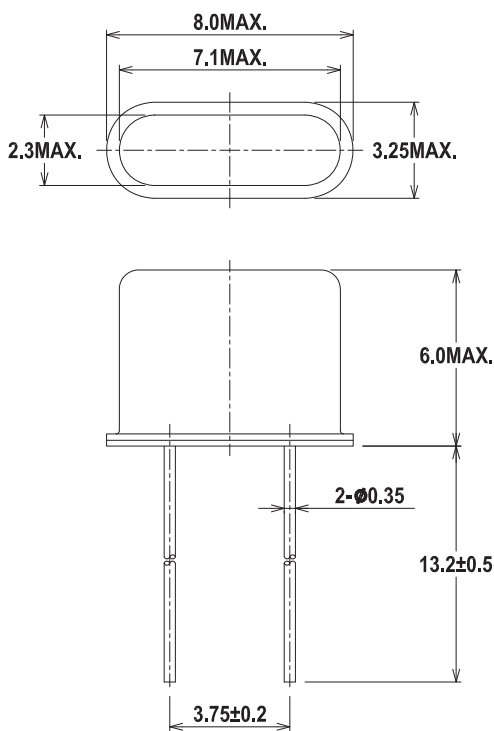
- Wide Frequency Range
- Highly Reliable
- AT-cut
- Resistance Weld Seal
- Excellent Aging

◆ Options

- Insulating Pad
- 3rd Lead (Bottom)
- Vinyl-pack or box

Part Numbering system is in Page 35

◆ Dimension(mm)



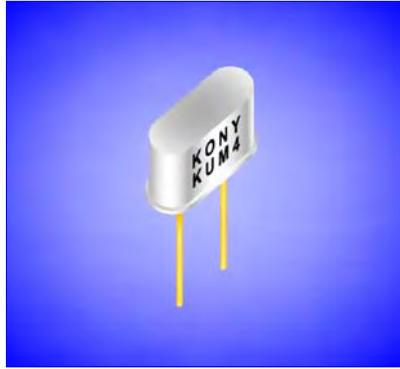
◆ Standard Specification

(Nominal frequency referenced to frequency at 25 °C \pm 2 °C)

PARAMETERS	M5U5
Frequency Range	10.0000MHz ~ 106.5000MHz
Frequency Tolerance @ 25°C \pm 3°C	\pm 30ppm (Typ.)
Stability Over Operating Temperature Range (in reference to 25°C)	\pm 30ppm (Typ.)
Operating Temperature Range	-20°C +70°C // -40°C +85°C
Equivalent Series Resistance (ESR)	*See Table
Shunt Capacitance	7pF maximum
Load Capacitance	10pF ~ Series
Drive Level	100 μ W (1000 μ W max.)
Aging per year	\pm 5ppm
Insulation Resistance	500 Megaohms Minimum at 100V _{DC}
•Tighter tolerances, stabilities & operating temperature ranges available	

◆ Nominal Frequency & ESR

Frequency Range (MHz)	Mode	Max. ESR (Ω)	Frequency Range (MHz)	Mode	Max. ESR (Ω)
10.0000 ~ 10.999	Fundamental	60	20.0000 ~ 33.999	3rd Overtone	40
11.0000 ~ 11.999			28.6363 ~ 39.999		80
12.0000 ~ 13.999			36.0000 ~ 49.999		60
14.0000 ~ 14.999		50.0000 ~ 85.999			
15.0000 ~ 19.999		50	86.0000 ~ 106.5000		100



◆ Feature

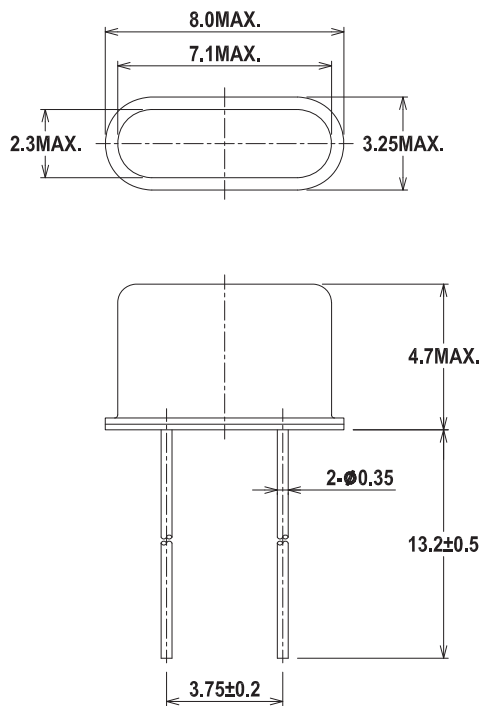
- Wide Frequency Range
- Highly Reliable
- AT-cut
- Resistance Weld Seal
- Excellent Aging

◆ Options

- Insulating Pad
- 3rd Lead (Bottom)
- Vinyl-pack or box

Part Numbering system is in Page 35

◆ Dimension(mm)



◆ Standard Specification

(Nominal frequency referenced to frequency at 25 °C ± 2 °C)

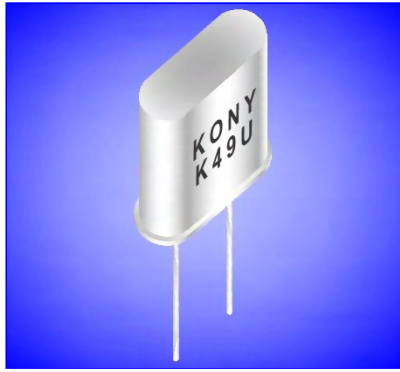
PARAMETERS	M5U4
Frequency Range	10.0000MHz ~ 86.0000MHz
Frequency Tolerance @ 25°C±3°C	± 30ppm (Typ.)
Stability Over Operating Temperature Range (in reference to 25°C)	± 30ppm (Typ.)
Operating Temperature Range	-20°C +70°C // -40°C +85°C
Equivalent Series Resistance (ESR)	*See Table
Shunt Capacitance	7pF maximum
Load Capacitance	10pF ~ Series
Drive Level	100µW (1000µW max.)
Aging per year	±5ppm
Insulation Resistance	500 Megaohms Minimum at 100V _{DC}
•Tighter tolerances, stabilities & operating temperature ranges available	

◆ Nominal Frequency & ESR

Frequency Range (MHz)	Mode	Max. ESR (Ω)	Frequency Range (MHz)	Mode	Max. ESR (Ω)
10.0000 ~ 10.999	Fundamental	80	15.0000 ~ 19.999	Fundamental	60
11.0000 ~ 11.999			20.0000 ~ 33.999		40
12.0000 ~ 13.999			36.0000 ~ 49.999	3rd Overtone	80
14.0000 ~ 14.999		50.0000 ~ 86.000			

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◆ **Feature**

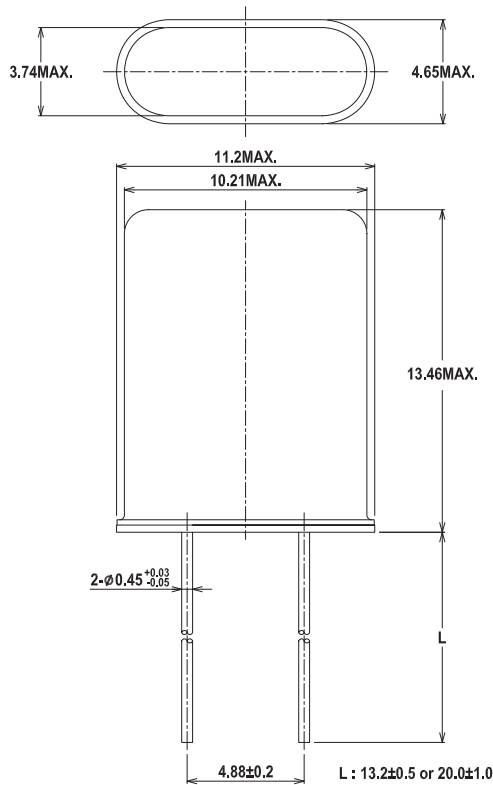
- Wide Frequency Range
- Resistance Weld Seal
- Excellent Aging
- AT-cut

◆ **Options**

- Insulating Pad
- 3rd Lead (Top or Bottom)
- Custom Lead length
- Tape or Vinyl-pack or box
- 13.46mm Height Max

Part Numbering system is in Page 35

◆ **Dimension(mm)**



◆ **Standard Specification**

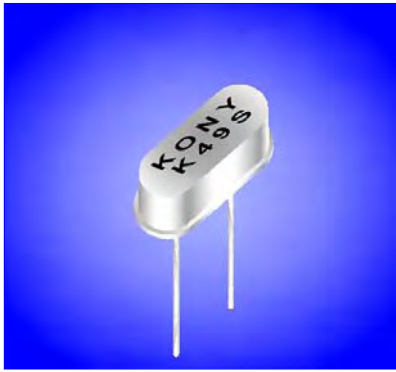
(Nominal frequency referenced to frequency at 25 °C ± 2 °C)

PARAMETERS	MDX (49U)
Frequency Range	1.8432MHz ~ 200.0000MHz
Frequency Tolerance @ 25°C ± 3°C	± 30ppm (Typ.)
Stability Over Operating Temperature Range (in reference to 25°C)	± 50ppm (Typ.)
Operating Temperature Range	-20°C +70°C // -40°C +85°C
Equivalent Series Resistance (ESR)	*See Table
Shunt Capacitance	7pF maximum
Load Capacitance	10pF ~ Series
Drive Level	100µW (1000µW max.)
Aging per year	±5ppm
Insulation Resistance	500 Megaohms Minimum at 100V _{DC}
•Tighter tolerances, stabilities & operating temperature ranges available	

◆ **Nominal Frequency & ESR**

Frequency Range (MHz)	Mode	Max. ESR (Ω)	Frequency Range (MHz)	Mode	Max. ESR (Ω)
1.8432 ~ 1.999	Fundamental	700	6.0000 ~ 7.999	Fundamental	40
2.0000 ~ 2.399		500	8.0000 ~ 9.999		35
2.4000 ~ 2.999		300	10.0000 ~ 12.999		30
3.0000 ~ 3.199		200	13.0000 ~ 17.999		25
3.2000 ~ 3.499		150	18.0000 ~ 32.000		20
3.5000 ~ 3.999		120	24.0000 ~ 85.000	3rd Overtone	40
4.0000 ~ 4.399		100	85.0000 ~ 130.000	5th Overtone	60
4.4000 ~ 4.999		80	150.0000 ~ 200.000	7th Overtone	100
5.0000 ~ 5.999		50			

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◆ **Features**

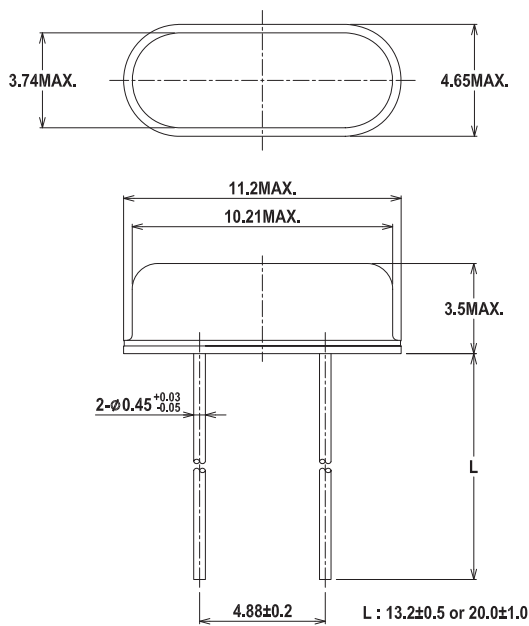
- Strip Resonator Crystal
- Resistance Weld Seal
- AT-cut or BT-cut
- Excellent Aging

◆ **Options**

- Insulating Pad
- 3rd Lead (Bottom)
- Custom Lead length
- Tape or Vinyl-pack
- 3.5mm Height Max

Part Numbering system is in Page 35

◆ **Dimension(mm)**



◆ **Standard Specification**

(Nominal frequency referenced to frequency at 25 °C ± 2 °C)

PARAMETERS	M9S
Frequency Range	3.2680MHz ~ 75.0000MHz
Frequency Tolerance @ 25°C±3°C	± 30ppm (Typ.)
Stability Over Operating Temperature Range (in reference to 25°C)	± 50ppm (Typ.)
Operating Temperature Range	-20°C +70°C // -40°C +85°C
Equivalent Series Resistance (ESR)	*See Table
Shunt Capacitance	7pF maximum
Load Capacitance	10pF ~ Series
Drive Level	25µW (1000µW max.)
Aging per year	±5ppm
Insulation Resistance	500 Megaohms Minimum at 100V _{DC}
•Tighter tolerances, stabilities & operating temperature ranges available	

◆ **Nominal Frequency & ESR**

Frequency Range (MHz)	Mode	Max. ESR (Ω)	Frequency Range (MHz)	Mode	Max. ESR (Ω)
3.268000 ~ 3.999999	Fundamental	200	14.000000 ~ 32.000000	Fundamental	50
4.000000 ~ 4.999999		150	28.224000 ~ 29.999999	3rd Overtone	100
5.000000 ~ 7.299999		120	30.000000 ~ 75.000000		80
7.300000 ~ 9.999999		80	29.000000 ~ 50.000000	BT-cut	50
10.000000 ~ 13.999999		60			

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◆ Features

- 2 Contact, 4.2mm Height
- Strip Resonator Crystal
- Resistance Weld Seal
- AT-cut or BT-cut
- Excellent Aging

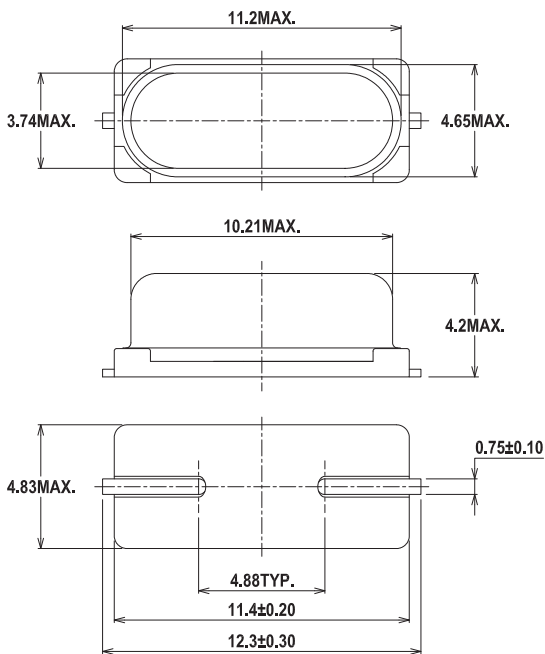
◆ Options

- Tape & Reel

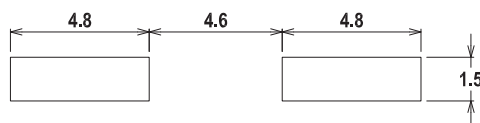


Part Numbering system is in Page 35

◆ Dimension(mm)



◆ Recommended Land pattern



◆ Standard Specification

(Nominal frequency referenced to frequency at 25 °C ± 2 °C)

PARAMETERS	MSM
Frequency Range	3.579545MHz ~ 70.0000MHz
Frequency Tolerance @ 25°C±3°C	± 30ppm (Typ.)
Stability Over Operating Temperature Range (in reference to 25°C)	± 50ppm (Typ.)
Operating Temperature Range	-20°C +70°C // -40°C +85°C
Equivalent Series Resistance (ESR)	*See Table
Shunt Capacitance	7pF maximum
Load Capacitance	10pF ~ Series
Drive Level	25µW (1000µW max.)
Aging per year	±5ppm
Insulation Resistance	500 Megaohms Minimum at 100V _{DC}
•Tighter tolerances, stabilities & operating temperature ranges available	

◆ Nominal Frequency & ESR

Frequency Range (MHz)	Mode	Max. ESR (Ω)	Frequency Range (MHz)	Mode	Max. ESR (Ω)
3.579545 ~ 3.999999	Fundamental	200	14.000000 ~ 32.000000	3rd Overtone	50
4.000000 ~ 4.999999		150	28.224000 ~ 29.999999		100
5.000000 ~ 7.299999		120	30.000000 ~ 70.000000		80
7.300000 ~ 9.999999		80	29.000000 ~ 48.000000	BT-cut	50
10.000000 ~ 13.999999		60			

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◆ Features

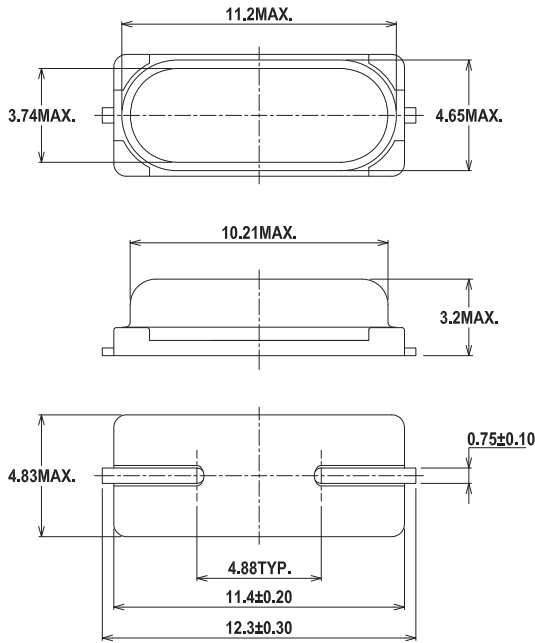
- 2 Contact, 3.2mm Height
- Strip Resonator Crystal
- Resistance Weld Seal
- AT-cut or BT-cut
- Excellent Aging

◆ Options

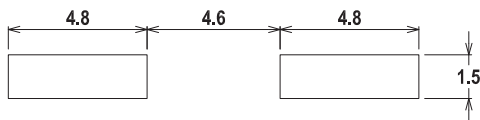
- Tape & Reel

Part Numbering system is in Page 35

◆ Dimension(mm)



◆ Recommended Land pattern



◆ Nominal Frequency & ESR

Frequency Range (MHz)	Mode	Max. ESR (Ω)	Frequency Range (MHz)	Mode	Max. ESR (Ω)
3.579545 ~ 3.999999	Fundamental	200	14.000000 ~ 32.000000	3rd Overtone	50
4.000000 ~ 4.999999		150	28.224000 ~ 29.999999		100
5.000000 ~ 7.299999		120	30.000000 ~ 70.000000		80
7.300000 ~ 9.999999		80	29.000000 ~ 48.000000	BT-cut	50
10.000000 ~ 13.999999		60			

PARAMETERS	MSX
Frequency Range	3.579545MHz ~ 70.0000MHz
Frequency Tolerance @ 25°C±3°C	± 30ppm (Typ.)
Stability Over Operating Temperature Range (in reference to 25°C)	± 50ppm (Typ.)
Operating Temperature Range	-20°C +70°C // -40°C +85°C
Equivalent Series Resistance (ESR)	*See Table
Shunt Capacitance	7pF maximum
Load Capacitance	10pF ~ Series
Drive Level	25µW (1000µW max.)
Aging per year	±5ppm
Insulation Resistance	500 Megaohms Minimum at 100V _{DC}
•Tighter tolerances, stabilities & operating temperature ranges available	



◆ Features

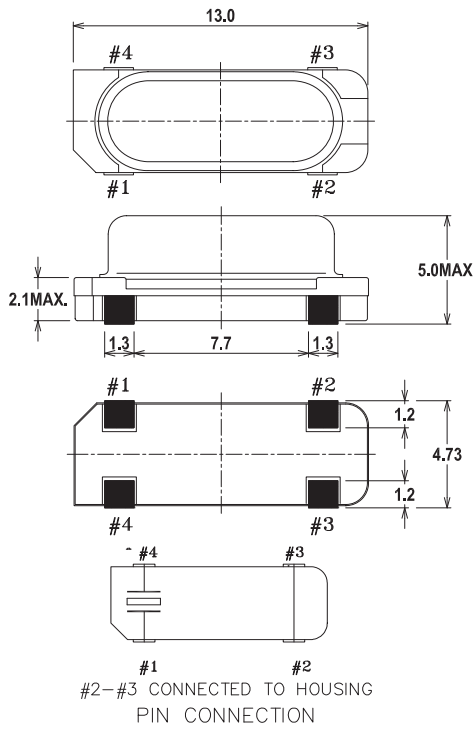
- 4 Contact, 5.0mm Height
- Strip Resonator Crystal
- Resistance Weld Seal
- AT-cut or BT-cut
- Excellent Aging

◆ Options

- Tape & Reel

Part Numbering system is in Page 35

◆ Dimension(mm)

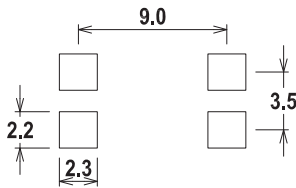


◆ Standard Specification

(Nominal frequency referenced to frequency at 25 °C ± 2 °C)

PARAMETERS	M9SNCF
Frequency Range	3.2680MHz ~ 75.0000MHz
Frequency Tolerance @ 25°C±3°C	± 50ppm (Typ.)
Stability Over Operating Temperature Range (in reference to 25°C)	± 50ppm (Typ.)
Operating Temperature Range	-20 °C ~ 70 °C
Equivalent Series Resistance (ESR)	*See Table
Shunt Capacitance	7pF maximum
Load Capacitance	10pF ~ Series
Drive Level	25µW (1000µW max.)
Aging per year	±5ppm
Insulation Resistance	500 Megaohms Minimum at 100V _{DC}
•Tighter tolerances, stabilities & operating temperature ranges available	

◆ Recommended Land pattern



◆ Nominal Frequency & ESR

Frequency Range (MHz)	Mode	Max. ESR (Ω)	Frequency Range (MHz)	Mode	Max. ESR (Ω)
3.268 ~ 3.999	Fundamental	200	14.000 ~ 40.000	Fundamental	50
4.000 ~ 4.999		150	28.224 ~ 29.999	3rd Overtone	100
5.000 ~ 7.299		120	30.000 ~ 75.000		80
7.300 ~ 9.999		80	29.000 ~ 75.000	BT-cut	50
10.000 ~ 13.999		60			



◆ Features

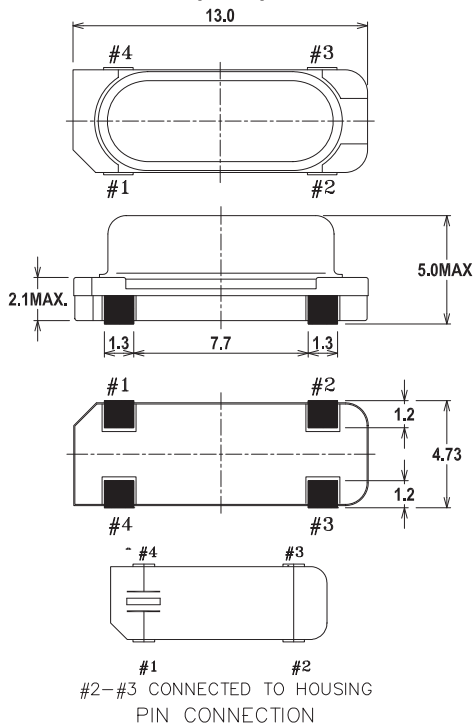
- 4 Contact, 4.0mm Height
- Strip Resonator Crystal
- Resistance Weld Seal
- AT-cut or BT-cut
- Excellent Aging

◆ Options

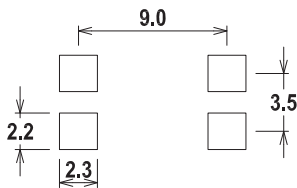
- Tape & Reel

Part Numbering system is in Page 35

◆ Dimension(mm)



◆ Recommended Land pattern



◆ Nominal Frequency & ESR

Frequency Range (MHz)	Mode	Max. ESR (Ω)	Frequency Range (MHz)	Mode	Max. ESR (Ω)
3.579545 ~ 3.999999	Fundamental	200	14.000000 ~ 32.000000	Fundamental	50
4.000000 ~ 4.999999		150	28.224000 ~ 29.999999	3rd Overtone	100
5.000000 ~ 7.299999		120	30.000000 ~ 70.000000		80
7.300000 ~ 9.999999		80	29.000000 ~ 48.000000	BT-cut	50
10.000000 ~ 13.999999		60			

◆ Standard Specification

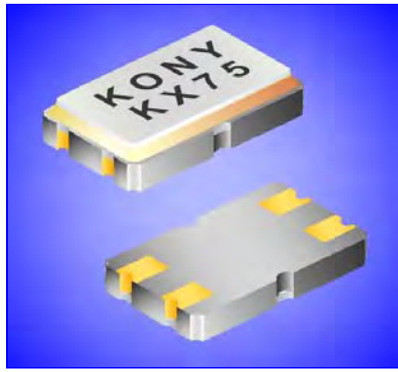
(Nominal frequency referenced to frequency at 25 °C ± 2 °C)

PARAMETERS	M9LNCF
Frequency Range	3.579545MHz ~ 70.0000MHz
Frequency Tolerance @ 25°C±3°C	± 30ppm (Typ.)
Stability Over Operating Temperature Range (in reference to 25°C)	± 50ppm (Typ.)
Operating Temperature Range	-20°C +70°C // -40°C +85°C
Equivalent Series Resistance (ESR)	*See Table
Shunt Capacitance	7pF maximum
Load Capacitance	10pF ~ Series
Drive Level	25μW (1000μW max.)
Aging per year	±5ppm
Insulation Resistance	500 Megaohms Minimum at 100V _{DC}
•Tighter tolerances, stabilities & operating temperature ranges available	

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Quartz Crystal Unit



◆ Features

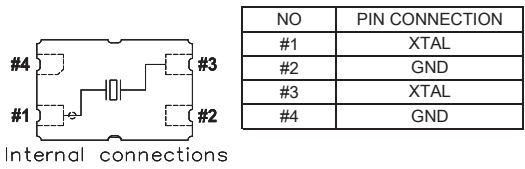
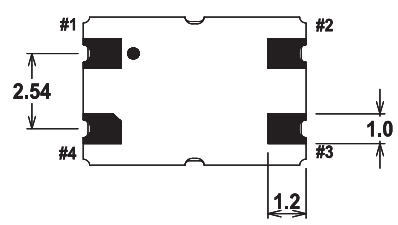
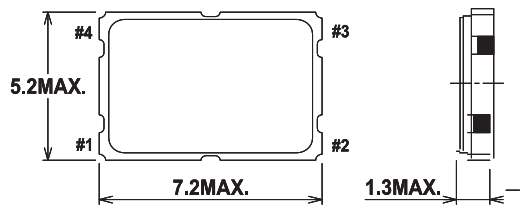
- High Frequency Range
- Miniature SMD Crystal
- Seam Sealed
- AT-cut

◆ Options

- Tape & Reel
- Contour size : 7.0mm X 5.0mm

Part Numbering system is in Page 35

◆ Dimension(mm)

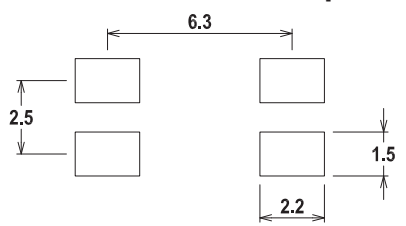


◆ Standard Specification

(Nominal frequency referenced to frequency at 25 °C ±2 °C)

PARAMETERS	MDX75104
Frequency Range	6.0000MHz ~ 125.0000MHz
Frequency Tolerance @ 25°C±3°C	± 30ppm (Typ.)
Stability Over Operating Temperature Range (in reference to 25°C)	± 50ppm (Typ.)
Operating Temperature Range	-20°C +70°C // -40°C +85°C
Equivalent Series Resistance (ESR)	*See Table
Shunt Capacitance	7pF maximum
Load Capacitance	10pF ~ Series
Drive Level	25µW (1000µW max.)
Aging per year	±5ppm
Insulation Resistance	500 Megaohms Minimum at 100V _{DC}
•Tighter tolerances, stabilities & operating temperature ranges available	

◆ Recommended Land pattern



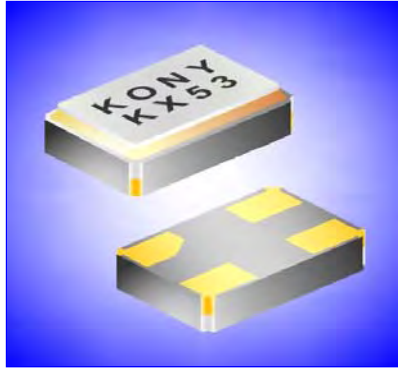
◆ Nominal Frequency & ESR

Frequency Range (MHz)	Mode	Max. ESR (Ω)
9.600000 ~ 49.152000	Fundamental	50
36.000000 ~ 125.000000	3rd Overtone	70

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◆ Features

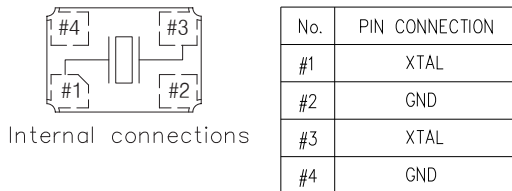
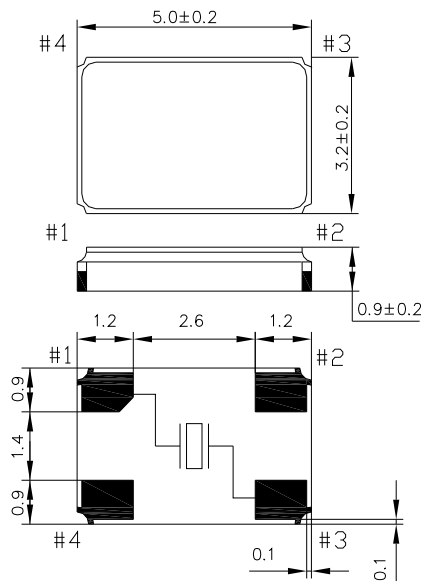
- High Frequency Range
- Miniature SMD Crystal
- Seam Sealed
- AT-cut

◆ Options

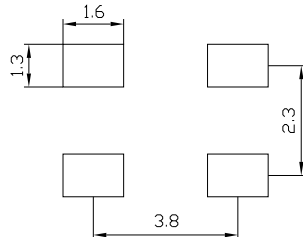
- Tape & Reel
- Contour size : 5.0mm X 3.2mm

Part Numbering system is in Page 35

◆ Dimension(mm)



◆ Recommended Land pattern



◆ Nominal Frequency & ESR

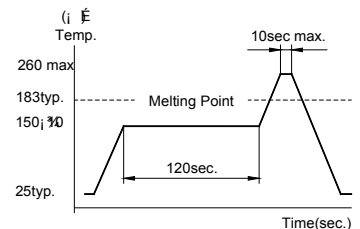
Frequency Range (MHz)	Mode	Max. ESR (Ω)
8.000000 ~ 33.330000	Fundamental	60
40.000000 ~ 90.000000	3rd Overtone	80

◆ Standard Specification

(Nominal frequency referenced to frequency at 25 °C ± 2 °C)

PARAMETERS	MDX53104
Frequency Range	8.0000MHz ~ 90.0000MHz
Frequency Tolerance @ 25°C±3°C	± 30ppm (Typ.)
Stability Over Operating Temperature Range (in reference to 25°C)	± 50ppm (Typ.)
Operating Temperature Range	-20°C +70°C // -40°C +85°C
Equivalent Series Resistance (ESR)	*See Table
Shunt Capacitance	7pF maximum
Load Capacitance	10pF ~ Series
Drive Level	25 μ W (1000 μ W max.)
Aging per year	±5ppm
Insulation Resistance	500 Megaohms Minimum at 100V _{DC}
•Tighter tolerances, stabilities & operating temperature ranges available	

◆ SOLDER REFLOW GUIDE





◆ **Features**

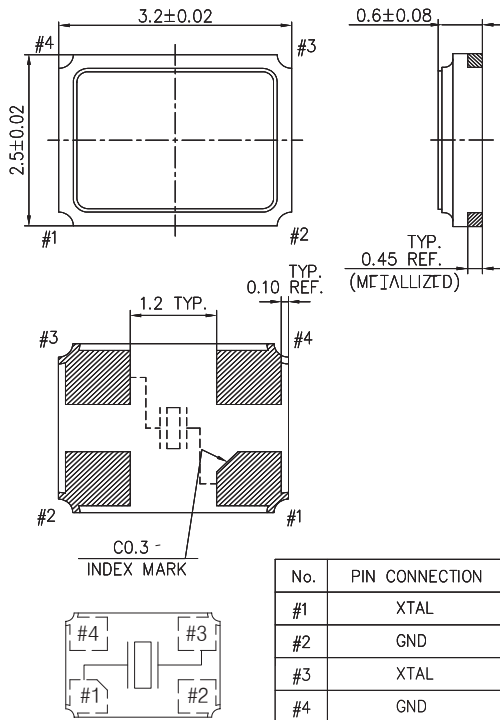
- High Frequency Range
- Miniature SMD Crystal
- Seam Sealed
- AT-cut

◆ **Options**

- Tape & Reel
- Contour size : 3.2mm X 2.5mm

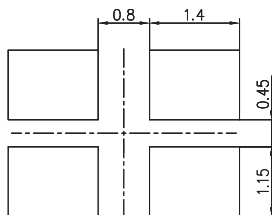
Part Numbering system is in Page 35

◆ **Dimension(mm)**



Internal connections

◆ **Recommended Land pattern**



◆ **Nominal Frequency & ESR**

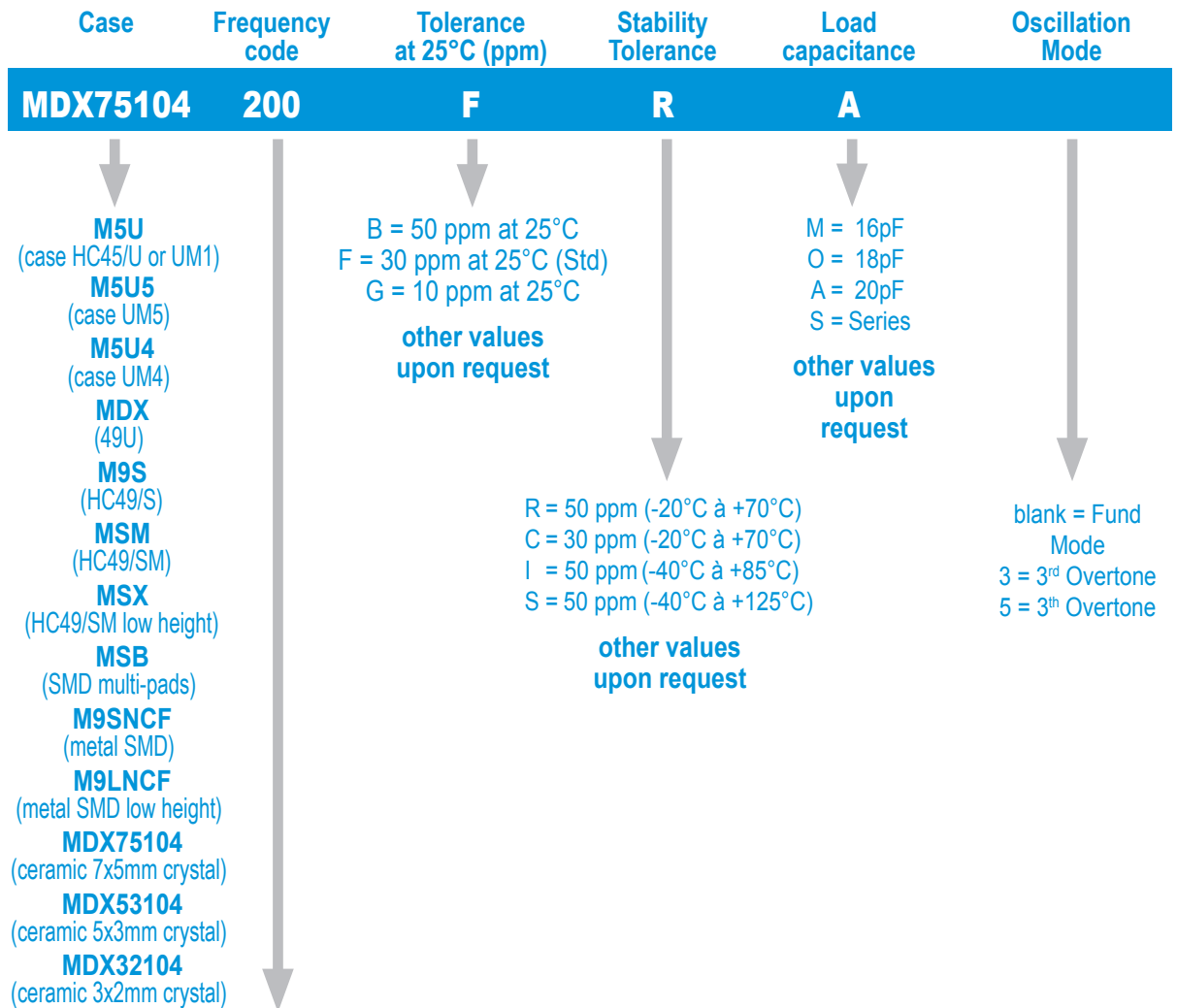
Frequency Range (MHz)	Mode	Max. ESR(Ω)
12.000000~15.999999	Fundamental	100
16.000000~20.999999		60
21.000000~36.000000		40

◆ **Standard Specification**

(Nominal frequency referenced to frequency at 25 °C ± 2 °C)

PARAMETERS	MDX32104
Frequency Range	12.0000MHz ~ 36.0000MHz
Frequency Tolerance @ 25°C±3°C	± 30ppm (Typ.)
Stability Over Operating Temperature Range (in reference to 25°C)	± 50ppm (Typ.)
Operating Temperature Range	-20°C +70°C // -40°C +85°C
Equivalent Series Resistance (ESR)	*See Table
Shunt Capacitance	7pF maximum
Load Capacitance	12pF ~ Series
Drive Level	25µW (1000µW max.)
Aging per year	±5ppm
Insulation Resistance	500 Megaohms Minimum at 100V _{DC}
•Tighter tolerances, stabilities & operating temperature ranges available	

MDX codification Quartz (Part Numbering System)



Fréquence en MHz	Codes Fréquences	SR Max.	Fréquence en MHz	Codes Fréquences	SR Max.	Fréquence en MHz	Codes Fréquences	SR Max.
3.579545	035	200	10.000000	100	60	24.000000	240	50
3.686400	037	200	10.738635	107	60	24.576000	245	50
4.000000	040	150	11.000000	110	60	25.000000	250	50
4.096000	0409	150	11.059200	111	60	26.800000	268	120 / 3 OT
4.194304	041	150	12.000000	120	60	* 26.800000	268B	50
4.433619	044	150	12.288000	122	60	27.000000	270	80 / 3 OT
4.915200	049	150	12.500000	125	60	28.636360	286	80 / 3OT
5.000000	050	120	13.000000	130	60	28.800000	288B	50
5.068800	051	120	13.500000	135	60	30.000000	300	80 / 3 OT
5.200000	052	120	14.318180	143	50	32.000000	320	80 / 3 OT
6.000000	060	120	14.745600	147	50	* 32.000000	320B	50
6.144000	061	120	15.000000	150	50	33.000000	330	80 / 3 OT
6.553600	065	120	16.000000	160	50	* 33.000000	330B	50
7.000000	070	120	16.384000	163	50	* 33.868800	338B	50
7.159090	071	120	18.000000	180	50	* 36.000000	360B	50
7.200000	072	120	18.432000	184	50	40.000000	400	80 / 3 OT
7.372800	073	80	18.867000	188	50	* 40.000000	400B	50
7.680000	077	80	19.660800	196	50	48.000000	480	80 / 3 OT
8.000000	080	80	20.000000	200	50	50.000000	500	80 / 3 OT
9.216000	092	80	22.000000	220	50	60.000000	600	80 / 3 OT
9.830400	098	80	22.118400	221	50	64.000000	640	80 / 3 OT
						66.000000	660	80 / 3 OT

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Oscillator

Catalogue



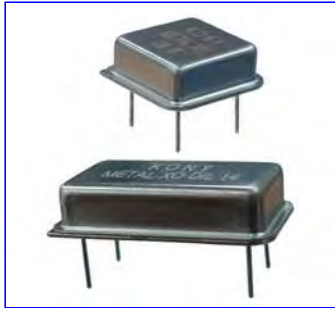
MANUDAX

Z.A. Les Petites Haies - 28, rue de Valenton - B.P. 302 -
94709 MAISONS-ALFORT Cedex - FRANCE
Téléphone : 33 (0)1 41 78 94 44 - Télécopie : 33 (0)1 48 99 41 86
www.manudax.fr - Courriel : manudax@manudax.fr

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Crystal Oscillators



◆ **Application**

- Gigabit Ethernet
- Fiber Channel
- ADSL,DSL,DS3,ES3,E1,STS-1,T1
- Network Processors, Voice Over Packet
- Pb free product

◆ **Options**

- Stick

◆ **Standard Specification**

(Nominal frequency referenced to frequency at 25°C ±2°C)

	MHC/MHH
Logic Family	HCMOS
Frequency Stability	+/-25ppm , +/-50ppm , +/-100ppm
Operating Temp.Range	-20°C ~ +70°C
Storage Temp.Range	-55°C ~ +125°C
High Level ("1")	+90% V _{DD} Min
Low Level ("0")	+10% V _{DD} Max
Symmetry	40% ~ 60% (@ +50% V _{DD} Level)

MHC,MHH,MTH	Input Voltage +5.0Vdc ±10%					Input Voltage +3.3Vdc ±10%					Input Voltage +1.8Vdc ±5%		
Frequency Range(MHz)	0.500 ~ 6.000	6.000+ ~ 24.000	24.000+ ~ 106.250			0.500 ~ 6.000	6.000+ ~ 24.000	24.000+ ~ 106.250			0.500 ~ 6.000	6.000+ ~ 24.000	24.000+ ~ 70.000
Input Current	12mA Max	20mA Max	35mA Max	50mA Max	65mA Max	20mA Max	25mA Max	30mA Max	35mA Max	60mA Max	10mA Max		
Rise & Fall Time	8.0 ns Max		5.0 ns Max	3.0ns Max		4.0 ns Max	3.0 ns Max		3.0ns	4.0 ns Max	3.0 ns Max		
Output Load	50pF		30pF	15pF		50pF	30pF		15pF	15pF			

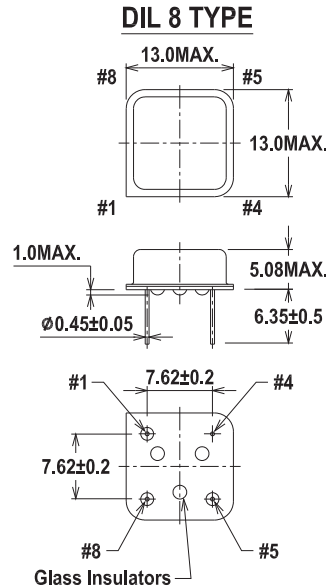
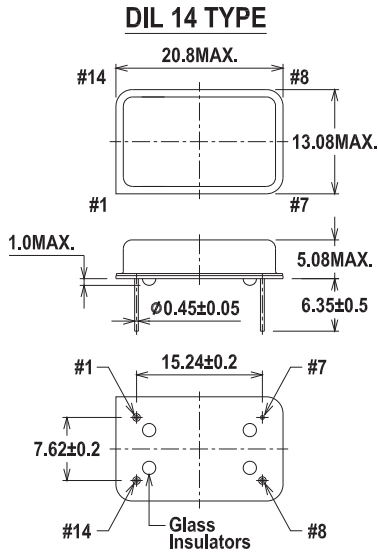
◆ **Parts Number Guide**

MHC / MHH										MTH										
Classification	Description									Classification	Description									
Example	M	H	C	1	1	00			-	25.0000 MHz (Frequency)	Example	M	T	H	0	6	0	C	-	25.0000 MHz (Frequency)
Logo	M									MDX-KONY	Logo	M								MDX-KONY
Logic		H								HCMOS	Logic		T						Tri-state	
Case			C							DIL 14	Symmetry								45/55,less than 50MHz/40/60, more than 50MHz / -20°C+70°C	
			H							DIL 8									45/55,more than 50MHz / -20°C+70°C	
Symmetry				1						45/55,less than 50MHz or 40/60,more than 50MHz								45/55,less than 50MHz/40/60, more than 50MHz / -40°C+85°C		
				2						45/55,more than 50MHz										
					00					+/-100ppm	Freq. Range					3			0.500MHz ~ 6.000MHz	
Frequency Stability					45					+/-50ppm					6				+6.000MHz ~ 24.000MHz	
					44					+/-25ppm					8				+24.000MHz and more	
											Case					0			DIL 14	
Temperature Range								()		-20°C ~ +70°C (Standard)					9				DIL 8	
						A				-40°C ~ +85°C	Frequency Stability						A		+/-25ppm	
						B				-20°C ~ +85°C							B		+/- 50ppm	
								()	+5.0V								C		+/-100ppm	
Supply Voltage									3	+3.3V	Supply Voltage							()	+5.0V	
									2	+1.8V								3	+3.3V	
																		2	+1.8V	





◆ **Dimension(mm)**

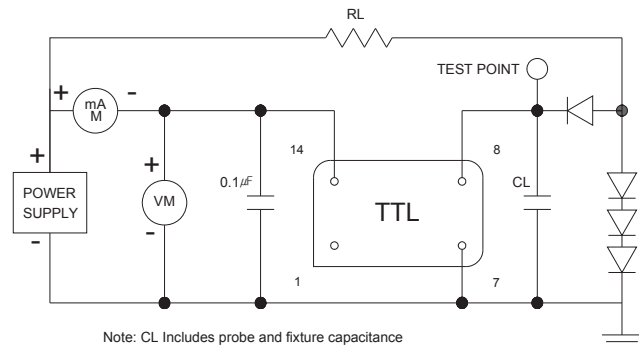
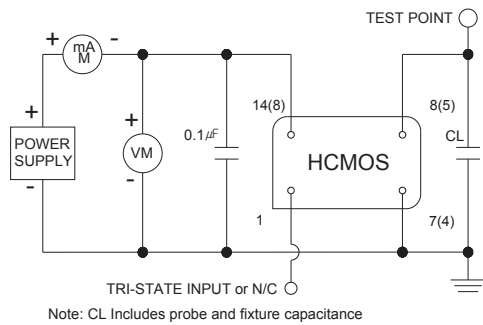


◆ **Pin Connection**

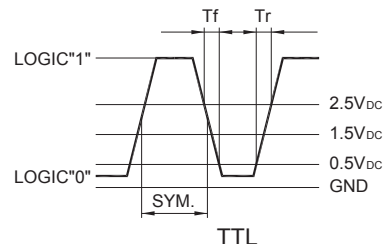
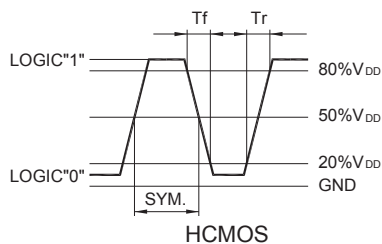
DIL 14 TYPE	
Pin No.	Pin Functions
#1	Tri-State or N/C
#7	GND
#8	Output
#14	Vdc

DIL 8 TYPE	
Pin No.	Pin Functions
#1	Tri-State or N/C
#4	GND
#5	Output
#8	Vdc

◆ **Test Circuit**



◆ **Output Waveform**





Application

- MPU
- Disc Driver
- Laptop
- Pb free product

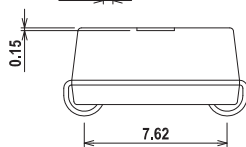
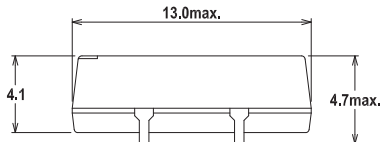
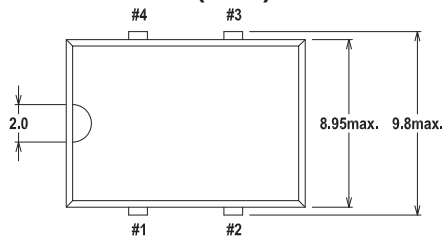
Options

- Stick
- Tri-State output on MTH

Standard Specification

(Nominal frequency referenced to frequency at 25°C ±2°C)

Dimension(mm)



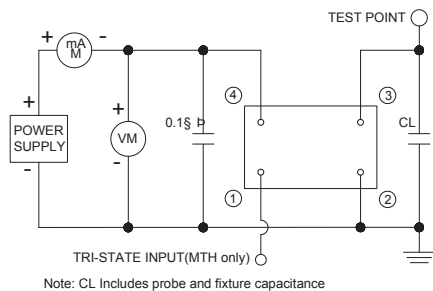
No.	Pin Connection
# 1	Tri-State or N/C
# 2	GND
# 3	Output
# 4	Vdc

	MCH/MTHXXH , MCH/MTHXXH-3
Logic Family	HCMOS
Frequency Stability	+/-25ppm , +/-50ppm , +/-100ppm
Operating Temp.Range	0°C ~ +70°C , -40°C ~ +85°C
Storage Temp.Range	-55°C ~ +125°C
High Level ("1")	+90% V _{DD} Min
Low Level ("0")	+10% V _{DD} Max
Symmetry	40% ~ 60% (@ +50% V _{DD} Level)

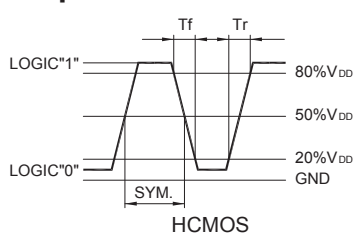
MCH/MTHXXH	Input Voltage +5.0Vdc ±10%		
Frequency Range(MHz)	1.000 ~ 4.000	4.000+ ~ 24.000	24.000+ ~ 70.000
Input Current	15mA Max		30mA Max 45mA Max
Rise & Fall Time	8.0 ns Max		
Output Load	50pF	30pF	15pF

MCH/MTHXXH-3	Input Voltage +3.3Vdc ±10%		
Frequency Range(MHz)	1.000 ~ 4.000	4.000+ ~ 24.000	24.000+ ~ 70.000
Input Current	20mA Max		25mA Max 35mA Max
Rise & Fall Time	4.0 ns Max	3.0 ns Max	1.5ns Max
Output Load	30pF		15pF

Test Circuit



Output Waveform



Parts Number Guide

Classification	Description									
Example	M	C	H	0	8	H	B	3	—	25.000000 MHz (Frequency)
Logo	M									MDX-KONY
PIN1 N/C or Tri-state		C								No Tri-state
		T								Tri-state
Logic			H							HCMOS
Symmetry				0						40/60% max, 0°C to +70 C
				A						45/55% max, 0°C to +70 C
				2						40/60% max, -40 to +85 C
				4						45/55% max, -40 to +85 C, 50 MHz max.
Frequency Range					3					1 ~ 4MHz
					6					4+ ~ 24MHz
					8					24+ ~ 70MHz
Package size						H				H-pack size (Plastic SMD, J-Lead)
Frequency Stability							B			+/-50ppm
							C			+/-100ppm
Supply Voltage										5.0V
								3		3.3V

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◆ Application

- Ethernet, FibreChannel, SONET/SDH line cards, T1/E1, T3/E3 line cards
- Pb free product

◆ Options

- TAPE & REEL

◆ Standard Specification

(Nominal frequency referenced to frequency at 25°C ±2°C)

Logic Family		HCMOS														
Frequency Stability		+/-10ppm , +/-15ppm , +/-25ppm , +/-50ppm , +/-100ppm														
Operating Temp.Range		-20°C ~ +70°C , -40°C ~ +85°C , -40°C ~ +125°C														
Storage Temp.Range		-55°C ~ +125°C														
High Level ("1")		+90% V _{DD} Min														
Low Level ("0")		+10% V _{DD} Max														
Symmetry		40% ~ 60% (@ +50% V _{DD} Level)														
Jitter		1.544 ~ 80.000MHz						80.0001 MHz ~ 125.0000 MHz								
		5ps RMS (1-sigma) max 1.5ps RMS (1-sigma) max, phase jitter in 10KHz ~ 20MHz Freq. Band 50ps peak-to-peak max						3ps RMS (1-sigma) max 1ps RMS (1-sigma) max, phase jitter in 10KHz ~ 20MHz Freq. Band 30ps peak-to-peak max								
7 X 5 PKG.	M575xH			M375xH			M275xH			M175xH						
Frequency Range(MHz)	1.000 ~ 50.000	50.000+ ~ 70.000	70.000+ ~ 106.25	1.000 ~ 35.328	35.328+ ~ 50.000	50.000+ ~ 125.000	1.544 ~ 32.000	32.000+ ~ 50.000	50.000+ ~ 125.000	1.544 ~ 36.000	36.000+ ~ 50.000	50.000+ ~ 70.000				
Input Voltage	+ 5.0 Vdc ± 10%			+ 3.3 Vdc ± 10%			+ 2.5 Vdc ± 5%			+ 1.8 Vdc ± 5%						
Input Current	30mA Max	50mA Max	65mA Max	15mA Max	25mA Max	40mA Max	15mA Max	25mA Max	35mA Max	4mA Max	7mA Max	10mA Max				
Rise & Fall Time	10nS Max	6nS Max		10nS Max	5nS Max		10nS Max	7nS Max	3nS Max	4nS Max	2.5nS Max					
Output Load	50pF	30pF	15pF	15pF			15pF			15pF						
5 X 3.2 PKG.	M553xH				M353xH				M253xH				M153xH			
Frequency Range	1.544 ~ 32.000	32.000+ ~ 50.000	50.000+ ~ 70.000	70.000+ ~ 125.000	1.8432 ~ 40.000	40.000+ ~ 60.000	60.000+ ~ 80.000	80.000+ ~ 125.000	1.8432 ~ 32.000	32.000+ ~ 50.000	50.000+ ~ 70.000	70.000+ ~ 125.000	1.8432 ~ 36.000	36.000+ ~ 50.000	50.000+ ~ 70.000	70.000+ ~ 125.000
Input Voltage	+ 5.0 Vdc ± 10%				+ 3.3 Vdc ± 10%				+ 2.5 Vdc ± 5%				+ 1.8 Vdc ± 5%			
Input Current	27mA Max	50mA Max	65mA Max		15mA Max	25mA Max	40mA Max	55mA Max	15mA Max	25mA Max	35mA Max		15mA Max	25mA Max	35mA Max	
Rise & Fall Time	8nS Max	5nS Max	3nS Max		7nS Max	5nS Max	3nS Max		10nS Max	7nS Max	3nS Max		10nS Max	7nS Max	3nS Max	
Output Load	50pF	30pF	15pF		15pF				15pF				15pF			
3.2 X 2.5 PKG.	M532xH			M332xH			M232xH			M132xH						
Frequency Range	1.8432 ~ 50.000	50.000+ ~ 80.000		1.8432 ~ 50.000	50.000+ ~ 80.000		1.8432 ~ 50.000	50.000+ ~ 80.000		1.8432 ~ 50.000	50.000+ ~ 80.000		1.8432 ~ 50.000	50.000+ ~ 80.000		
Input Voltage	+ 5.0 Vdc ± 10%			+ 3.3 Vdc ± 10%			+ 2.5 Vdc ± 5%			+ 1.8 Vdc ± 5%						
Input Current	20mA Max	35mA Max		10mA Max	18mA Max		8mA Max	15mA Max		8mA Max	15mA Max		8mA Max	15mA Max		
Rise & Fall Time	5nS Max			5nS Max			5nS Max			5nS Max						
Output Load	15pF			15pF			15pF			15pF						

◆ Parts Number Guide

Classification	Description										
Example	M	5	7	5	0	H	C	E	--	20.000000 MHz (Frequency)	
Logo	M										MDX-KONY
Supply Voltage		5									5.0Volt
		3									3.3Volt
		2									2.5Volt
		1									1.8Volt
Package size			7	5							7 X 5mm
			5	3							5 X 3.2mm
			3	2							3.2 X 2.5mm
Temperature Range					0						-20 ~ +70C
					2						-40 ~ + 85C
					4						-40 ~ +125C
Logic & Duty						G					HCMOS, 45~55%
						H					HCMOS, 40~60%
Frequency Stability							AA				+/-15ppm
							A				+/-25ppm
							B				+/-50ppm
							C				+/-100ppm
							S				+/-10ppm
N/C or Tri-state								()			Standard Logic
								E			Tri-state

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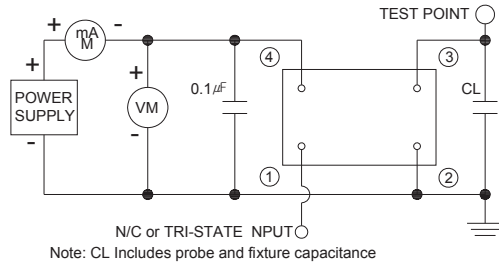
Dimension(mm)

	7 X 5 PKG.	5 X 3.2 PKG.	3.2 X 2.5 PKG.
Package Dimension	<p>Top view: #1, #2, #3, #4, 7.2MAX, 5.2MAX Side view: 1.32MAX Pin view: #1, #2, #3, #4, 1.4, 1.1, 2.6, 5.08</p>	<p>Top view: #1, #2, #3, #4, 5.0, 3.2 Side view: 1.3MAX Pin view: #1, #2, #3, #4, 1.2, 0.9, 1.2, 2.54</p>	<p>Top view: #1, #2, #3, #4, 2.5±0.20, 3.2±0.20 Side view: 1.2max Pin view: #1, #2, #3, #4, 1.0, 0.75, 1.2</p>
Recommended Land Pattern	<p>2.0, 1.8, 4.2, 5.08</p>	<p>1.5, 1.7, 2.2, 2.54</p>	<p>1.2, 1.5, 1.6, 2.1</p>

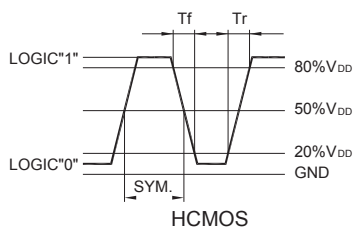
Pin Connection

Pin No.	Pin Functions
#1	Tri-State or N/C
#2	GND
#3	Output
#4	Vdc

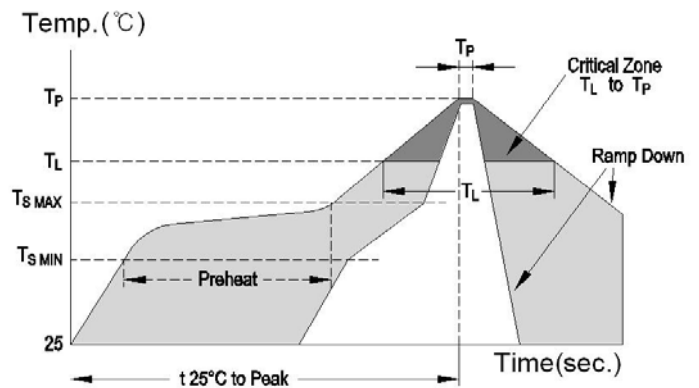
Test Circuit



Output Waveform



IR/Convection Reflow Profile



Ramp-up rate ($T_{S_{MAX}}$ to T_P)	3°C / second MAX
Preheat temperature ($T_{S_{MIN}}$ to $T_{S_{MAX}}$)	150 to 180°C
Preheat time	60 to 120 seconds
Time above temperature (T_L)	217°C , 60 second
Peak temperature (T_P)	260°C MAX , 10sec MAX
Ramp-down rate	4°C / sec MAX
Time 25°C to peak temperature	6 minutes MAX

Ref 2011-05a - All specifications are subject to change without notice



◆ Application

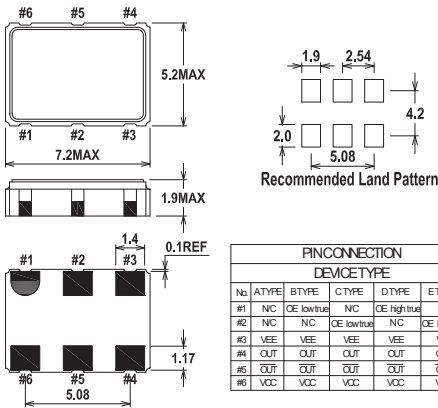
- 1/10 Gigabit Ethernet,
- SONET/SDH linecards.
- 2/4/10G FibreChannel
- Serial Attached SCSI(SAS)
- Passive Optical Network Devices
- HD Video Systems
- Pb free product

◆ Options

- TAPE & REEL



◆ Dimension(mm)



◆ Standard Specification

(Nominal frequency referenced to frequency at 25 °C ± 2 °C)

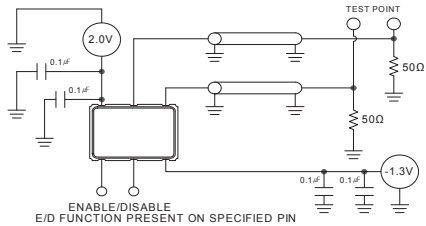
	M375XE	M275XE
Logic Family	LVPECL	LVPECL
Frequency Range	25 ~ 622.08MHz	50 ~ 160.000MHz
Frequency Stability	+/-10ppm , +/-15ppm , +/-25ppm , +/-50ppm , +/-100ppm	
Operating Temp.Range	-20 °C ~ +70 °C , -40 °C ~ +85 °C	
Storage Temp.Range	-55 °C ~ +125 °C	
Input Voltage	+3.3 Vdc ± 10%	+ 2.5 Vdc ± 5%
Input Current	110mA Max	
High Level ("1")	+0.98 Min	Vcc-1.03 V Min
Low Level ("0")	+0.38 Max	Vcc-1.62 V Max
Rise & Fall Time	0.8 ns Max	0.85 ns Max
Symmetry	45% ~ 55% (@ +50% of waveform)	
Output Load	50 Ω to Vcc-2V	

	M375XL
Logic Family	LVDS
Frequency Range	25 ~ 622.080MHz
Frequency Stability	+/-10ppm , +/-15ppm , +/-25ppm , +/-50ppm , +/-100ppm
Operating Temp.Range	-20 °C ~ +70 °C , -40 °C ~ +85 °C
Storage Temp.Range	-55 °C ~ +125 °C
Input Voltage	+3.3 Vdc ± 10%
Input Current	90mA Max
Amplitude Differential	500 ~ 900mVp-p
Rise & Fall Time	1ns Max
Symmetry	45% ~ 55% (@ +50% of waveform)
Output Load	100 Ω and 5pF LVDS

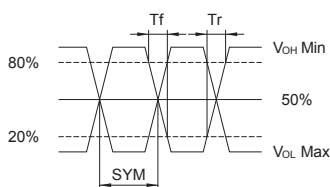
◆ Parts Number Guide

Classification	Description									
Example	M	3	7	5	0	E	C	E	--	25.000000 MHz (Frequency)
Logo	M	3								MDX-KONY
		3								3.3Volt
		2								2.5Volt
Package size			7	5						7 X 5mm
Temperature Range					0					-20 ~ +70C
						2				-40 ~ +85C
							4			-40 ~ +125C
Logic & Duty							E			LVPECL 45% ~ 55%
							L			LVDS, 5pF LVDS, 45% ~ 55%
Frequency Stability								AA		+/-15ppm
								A		+/-25ppm
								B		+/-50ppm
								C		+/-100ppm
								S		+/-10ppm
Device Type									A	N/C
									B	Pin1 OE low true, Pin2 N/C
									C	Pin1 N/C, Pin2 OE low true
									D	Pin1 OE high true, Pin2 N/C
									E	Pin1 N/C, Pin2 OE high true

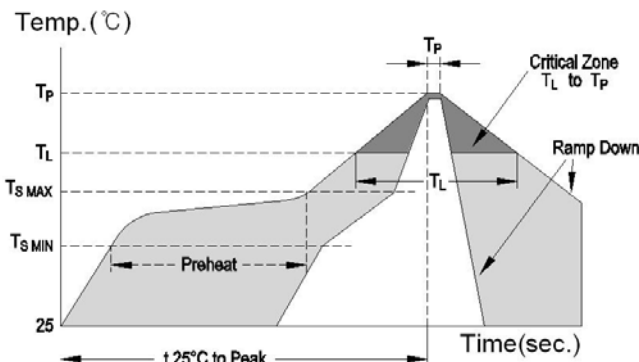
◆ Test Circuit



◆ Output Waveform

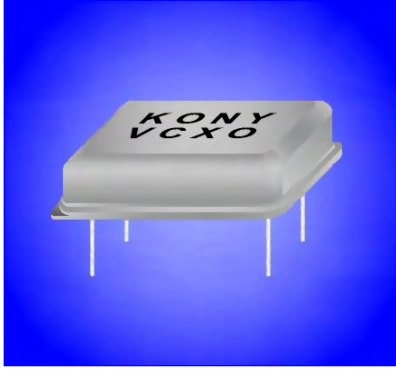


◆ IR/Convection Reflow Profile

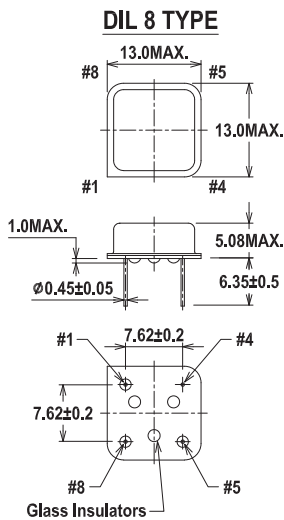
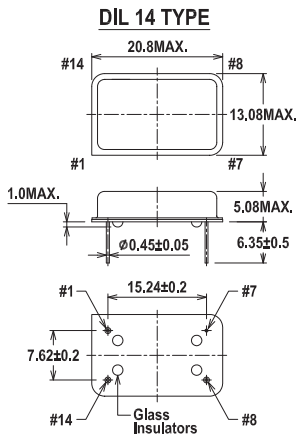


Ramp-up rate (T _S MAX to T _P)	3 °C / second MAX
Preheat temperature (T _S MIN to T _S MAX)	150 to 180 °C
Preheat time	60 to 120 seconds
Time above temperature (T _L)	217 °C , 60 second
Peak temperature (T _P)	260 °C MAX , 10sec MAX
Ramp-down rate	4 °C / sec MAX
Time 25 °C to peak temperature	6 minutes MAX

Ref 2010-12a - All specifications are subject to change without notice

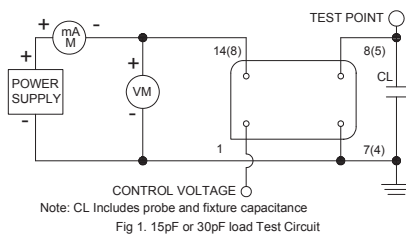


Dimension(mm)



No.	Pin Connection
# 1	Control Voltage
# 7 (4)	GND
# 8 (5)	Output
# 14 (8)	Vdc

Test Circuit



Application

- Phase-locked loops encountered in Telecom, LAN and Wireless data, and in video processing applications LVCMOS, LVTTTL compatible. ,
- Pb free product

Options

- Stick
- Tape & Reel

Standard Specification

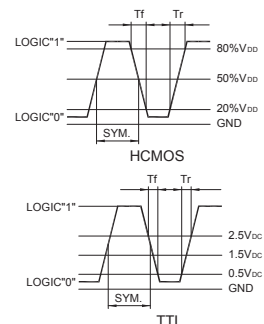
(Nominal frequency referenced to frequency at 25 °C ± 2 °C)

	+5Volt		+3.3Volt	
Logic Family	TTL or HCMOS		HCMOS	
Frequency Range	1.544 ~ 20MHz	20+ ~ 35.3280MHz	1.544 ~ 20MHz	20+ ~ 35.3280MHz
Frequency Stability	+/-25ppm , +/-30ppm , +/-50ppm			
Operating Temp.Range	0°C ~ +70°C , -10°C ~ +70°C , -40°C ~ +85°C			
Storage Temp.Range	-55°C ~ +125°C			
Input Voltage	+ 5.0 Vdc ± 10%		+ 3.3 Vdc ± 10%	
Control Voltage	1.0 ~ 4.0Volt , 0.5 ~ 4.5 Volt , 0.0 ~ 5.0Volt		0.3 ~ 3.0 Volt or 0.0 ~ 3.3Volt	
Pullability	+/-50ppm , +/-100ppm , +/-150ppm , +/-200ppm		+/-50ppm , +/-100ppm , +/-150ppm , +/-200ppm	
Input Current	20mA Max	25mA Max	20mA Max	25mA Max
High Level ("1")	+2.4Volt Min@TTL or +90% VDD Min@HCMOS		+90% VDD Min	
Low Level ("0")	+0.4Volt Max@TTL or +10% VDD Max@HCMOS		+10% VDD Max	
Rise & Fall Time	10 ns Max			
Symmetry	40% ~ 60% (@ +1.4Volt DC Level@TTL or +50% VDD@HCMOS)		40% ~ 60% (@ +1.4Volt DC Level or +50% VDD)	
Output Load	1TTL , 2TTL , 5TTL , 10TTL or 15pF , 30pF		15pF , 30pF	

Parts Number Guide

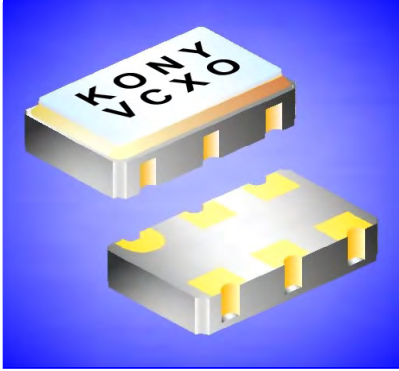
Classification	Description									
Example	M	5	B	H	7	2	F	--	14.318180 MHz (Frequency)	
Logo	M								MDX-KONY	
Input Voltage		3							+3.3Volt	
		5							+5.0volt	
Frequency Stability			1						+/-50ppm (0 ~ 70°C)	
			A						+/-25ppm (0 ~ 70°C)	
			B						+/-50ppm (-40 ~ 85°C)	
			C						+/-50ppm (-10 ~ 70°C)	
			D						+/-30ppm (0 ~ 70°C)	
Logic			H						Custom HCMOS	
Control Voltage					5				0.3 ~ 3.0Volt@+1.65Volt	
					6				0.0 ~ 3.3Volt@+1.65Volt	
					7				+2.5@±2.5Volt	
					8				+2.5@±2.0Volt	
					9				+2.5@±1.5Volt	
Pullability						1			+/-50ppm	
						2			+/-100ppm	
						3			+/-150ppm	
						A			+/-120ppm	
Package Size								B	+/-200ppm	
							F		Standard size(DIL 14)	
							K		Standard size Gull wing	
							H		Half(DIL 8)	
						J		Half size Gull wing		

Output Waveform



Ref 2009-02b - All specifications are subject to change without notice





Application

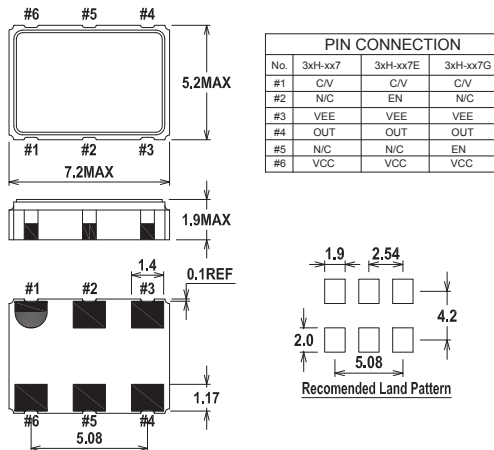
- SONET/SDH timing control and line cards
- T1/E1, T3/E3 platforms
- Satellite and microwave communications
- Pb free product

Options

- TAPE & REEL



Dimension(mm)



Standard Specification

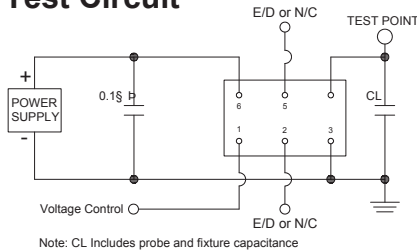
(Nominal frequency referenced to frequency at 25 °C±2 °C)

	+3.3V type	
	HCMOS	
Logic Family	HCMOS	
Frequency Range	1.544MHz ~35.328MHz	35.328+MHz ~ 200MHz
Frequency Stability	+/-25ppm, +/-50ppm, +/-100ppm	
Operating Temp.Range	0°C ~ +70°C, -40°C ~ +85°C	
Storage Temp.Range	-55°C ~ +125°C	
Input Voltage	+3.3 Vdc ± 10%	
Control Voltage	0.0-3.3Volt @ +1.65Volt or 0.3-3.0Volt @ +1.65Volt	
Pullability	+/-50ppm, +/-100ppm, +/-150ppm	
Input Current	35mA Max	60mA Max
High Level ("1")	+90% VDD Max	
Low Level ("0")	+10% VDD Max	
Rise & Fall Time	8ns Max	4 ns Max
Symmetry	40% ~ 60% (@+50% VDD)	
Output Load	15pF, 30pF	

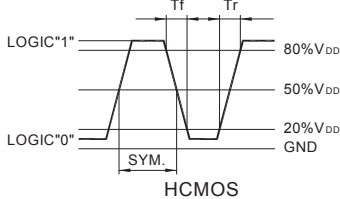
Parts Number Guide

Classification	Description										
Example	M	3	B	H	5	2	7				25.000000 MHz (Frequency)
Logo	M										MDX-KONY
Input Voltage		3									+3.3Volt
Frequency Stability		1									+/-50ppm (0 ~ 70°C)
		A									+/-25ppm (0 ~ 70°C)
		B									+/-50ppm (-40 ~ 85°C)
		C									+/-50ppm (-10 ~ 70°C)
		D									+/-30ppm (0 ~ 70°C)
Logic				H							Custom HCMOS
Control Voltage					5						0.3 ~ 3.0Volt@+1.65Volt
					6						0.0 ~ 3.3Volt@+1.65Volt
Pullability						1					+/-50ppm
						2					+/-100ppm
						3					+/-150ppm
						A					+/-120ppm
Package size							7				CMS Ceramic 7 x 5
									()		No Tri-state (4pins PKG)
E/D or Tri-state									E		PIN2-OE high true (6pins PKG)
									G		PIN5-OE high true (6pins PKG)

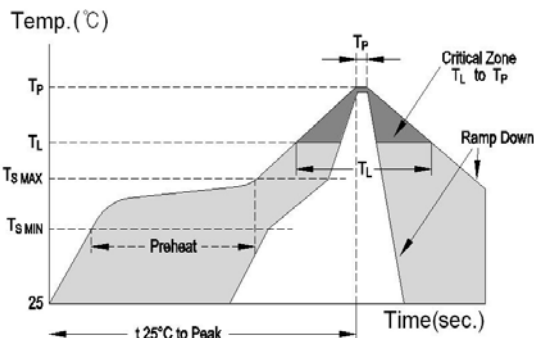
Test Circuit



Output Waveform

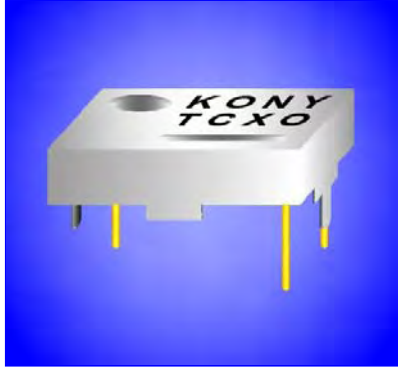


IR/Convection Reflow Profile



Ramp-up rate ($T_{S\text{MAX}}$ to T_P)	3°C / second MAX
Preheat temperature ($T_{S\text{MIN}}$ to $T_{S\text{MAX}}$)	150 to 180°C
Preheat time	60 to 120 seconds
Time above temperature (T_L)	217°C , 60 second
Peak temperature (T_P)	260°C MAX , 10sec MAX
Ramp-down rate	4°C / sec MAX
Time 25°C to peak temperature	6 minutes MAX

Ref 2010-12a - All specifications are subject to change without notice



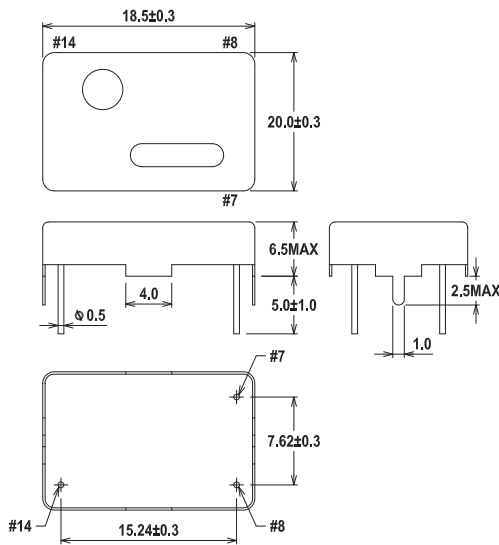
◆ Application

- Cellular Applications (GSM, TDMA, CDMA)
- GPS Devices
- Mobile and Portable Radio/Telephone Communications Transceivers
- Pb free product

◆ Options

- Carbon

◆ Dimension(mm)



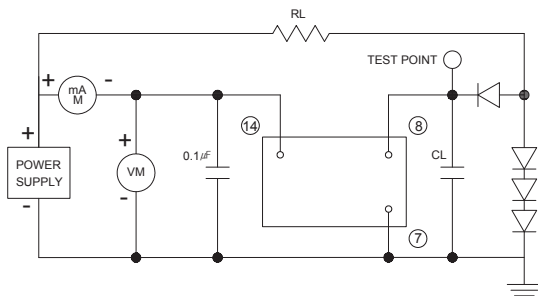
No.	Pin Connection
# 7	GND
# 8	Output
# 14	Vcc

◆ Standard Specification

(Nominal frequency referenced to frequency at 25 °C ± 2 °C)

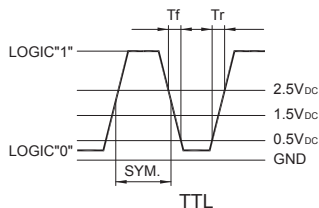
	MTD-T Serie
Logic Family	TTL
Frequency Range	8.000 MHz ~ 35.000 MHz
Frequency Stability	+/-5.0ppm, +/-2.5ppm, +/-2.0ppm
Pullability	+/-5ppm, +/-10ppm typ. (@Vcont = 2.5Vdc)
Operating Temp. Range	-40 °C ~ +85 °C, -30 °C ~ +75 °C, -20 °C ~ 70 °C
Storage Temp. Range	-55 °C ~ +125 °C
Input Voltage	+5.0 Vdc ± 5%
Input Current	15.0mA Max
Output Level	Symmetry : 40/60% max @ 1.5V Logic 0: 0.5V max Logic 1: 2.5V min Rise & Fall Times : 4ns max, 0.5 ~ 2.5V
Aging	+/- 1 ppm/year Max
Output Load	2TTL or 15pF
Phase Noise	-40 dBc/Hz max @ 1 Hz offset from carrier -80 dBc/Hz max @ 10 Hz -110 dBc/Hz max @ 100 Hz -135 dBc/Hz max @ 1 kHz -140 dBc/Hz max @ 10 kHz -145 dBc/hZ max @ 100 kHz

◆ Test Circuit



Note: CL Includes probe and fixture capacitance

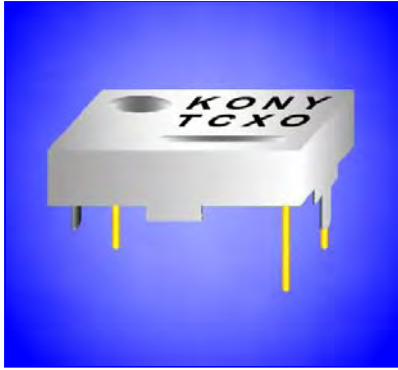
◆ Output Waveform



◆ Parts Number Guide

Classification	Designators									Description
Example	M	T	D	-	T	1	6	A	()	20.000 MHz (Frequency)
Logo	M									MDX
Package size		T								TCXO
Product			D							Dip type 18.5mm X 12.0mm
Output Level					T					TTL
Temperature Range						4	8			-40 °C ~ +85 °C
						3	8			-30 °C ~ +80 °C
						3	7			-30 °C ~ +75 °C
						2	7			-20 °C ~ +70 °C
						1	6			-10 °C ~ +60 °C
Frequency Stability									A	+/-2.0ppm
									B	+/-2.5ppm
									C	+/-5.0ppm
Supply Voltage									()	+5.0 Volt

Ref 2009-02b - All specifications are subject to change without notice



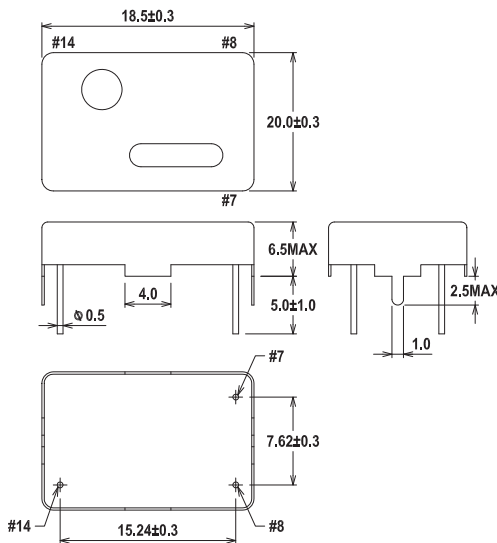
◆ Application

- Cellular Applications (GSM, TDMA, CDMA)
- GPS Devices
- Mobile and Portable Radio/Telephone Communications Transceivers
- Pb free product

◆ Options

- Carbon

◆ Dimension(mm)



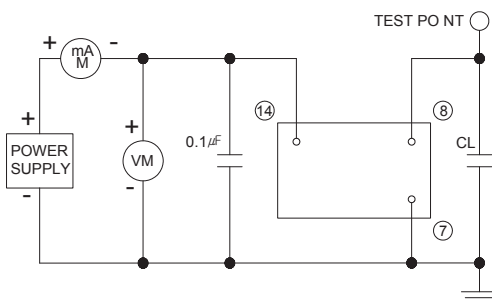
No.	Pin Connection
# 7	GND
# 8	Output
# 14	Vcc

◆ Standard Specification

(Nominal frequency referenced to frequency at 25 °C ±2 °C)

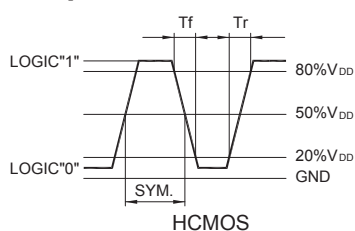
	MTD-H Series
Logic Family	HCMOS
Frequency Range	8.000 MHz ~ 35.000 MHz
Frequency Stability	+/-5.0ppm, +/-2.5ppm, +/-2.0ppm
Operating Temp.Range	-40°C ~ +85°C, -30°C ~ +75°C, -20°C ~ 70°C
Storage Temp.Range	-55°C ~ +125°C
Input Voltage	+ 3.3 Vdc ± 5%
Input Current	15.0mA Max
Output Level	Symmetry : 40/60% max @ 50% VDD Logic 0: 10% Vdd max Logic 1: 90% Vdd min Rise & Fall Times : 8ns max, 20~80%
Aging	+/- 1 ppm/year Max
Output Load	10Kohm//10pF, 15pF
Phase Noise	-40 dBc/Hz max @ 1 Hz offset from carrier -80 dBc/Hz max @ 10 Hz -110 dBc/Hz max @ 100 Hz -135 dBc/Hz max @ 1 kHz -140 dBc/Hz max @ 10 kHz -145 dBc/hZ max @ 100 kHz

◆ Test Circuit



Note: CL Includes probe and fixture capacitance

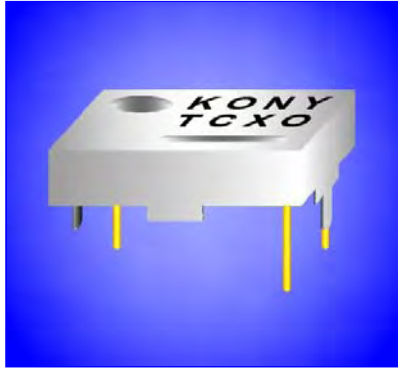
◆ Output Waveform



◆ Parts Number Guide

Classification	Designators							Description		
Example	M	T	D	-	H	1	6	A	()	20.000 MHz (Frequency)
Logo	M									MDX
Package size		T								TCXO
Product			D							Dip type 18.5mm X 12.0mm
Output Level				H						HCMOS
Temperature Range					4	8				-40°C ~ +85°C
					3	8				-30°C ~ +80°C
					3	7				-30°C ~ +75°C
					2	7				-20°C ~ +70°C
					1	6				-10°C ~ +60°C
Frequency Stability								A		+/-2.0ppm
								B		+/-2.5ppm
								C		+/-5.0ppm
Supply Voltage								()		+5 Volt

Ref 2009-02b - All specifications are subject to change without notice



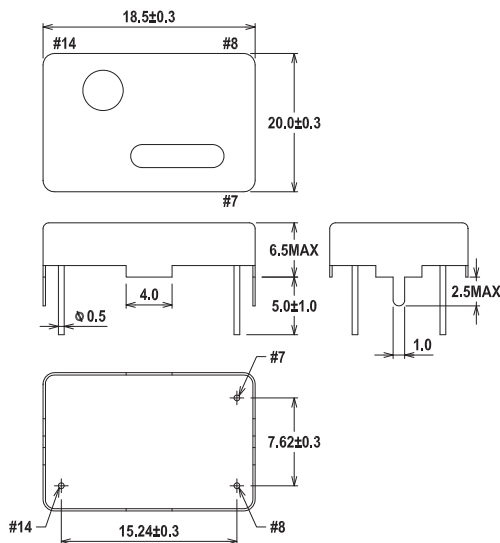
◆ Application

- Cellular Applications (GSM, TDMA, CDMA)
- GPS Devices
- Mobile and Portable Radio/Telephone Communications Transceivers
- Pb free product

◆ Options

- Carbon

◆ Dimension(mm)



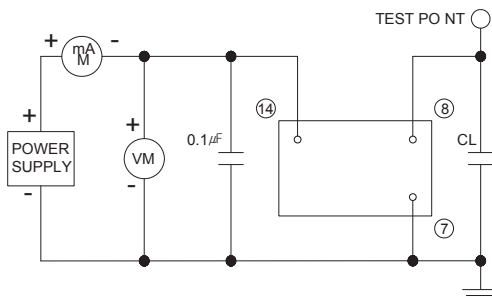
No.	Pin Connection
# 7	GND
# 8	Output
# 14	Vcc

◆ Standard Specification

(Nominal frequency referenced to frequency at 25 °C ±2 °C)

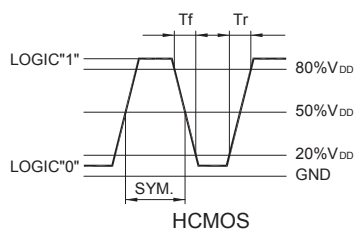
	MTD-H3 Series
Logic Family	HCMOS
Frequency Range	8.000 MHz ~ 35.000 MHz
Frequency Stability	+/-5.0ppm, +/-2.5ppm, +/-2.0ppm
Operating Temp.Range	-40 °C ~ +85 °C, -30 °C ~ +75 °C, -20 °C ~ 70 °C
Storage Temp.Range	-55 °C ~ +125 °C
Input Voltage	+ 3.3 Vdc ± 5%
Input Current	15.0mA Max
Output Level	Symmetry : 40/60% max @ 50% VDD Logic 0: 10% Vdd max Logic 1: 90% Vdd min Rise & Fall Times : 8ns max, 20~80%
Aging	+/- 1 ppm/year Max
Output Load	10Kohm//10pF, 15pF
Phase Noise	-40 dBc/Hz max @ 1 Hz offset from carrier -80 dBc/Hz max @ 10 Hz -110 dBc/Hz max @ 100 Hz -135 dBc/Hz max @ 1 kHz -140 dBc/Hz max @ 10 kHz -145 dBc/hZ max @ 100 kHz

◆ Test Circuit



Note: CL Includes probe and fixture capacitance

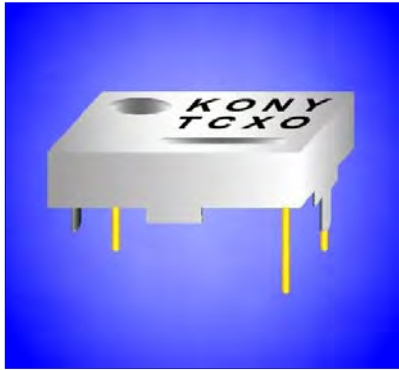
◆ Output Waveform



◆ Parts Number Guide

Classification	Designators							Description		
Example	M	T	D	-	H	1	6	A	3	20.000 MHz (Frequency)
Logo	M									MDX
Package size		T								TCXO
Product			D							Dip type 18.5mm X 12.0mm
Output Level					H					HCMOS
Temperature Range						4	8			-40 °C ~ +85 °C
						3	8			-30 °C ~ +80 °C
						3	7			-30 °C ~ +75 °C
						2	7			-20 °C ~ +70 °C
						1	6			-10 °C ~ +60 °C
Frequency Stability						0	5			+0 °C ~ +50 °C
								A		+/-2.0ppm
								B		+/-2.5ppm
Supply Voltage								C		+/-5.0ppm
									3	+3.3 Volt

Ref 2009-02b - All specifications are subject to change without notice



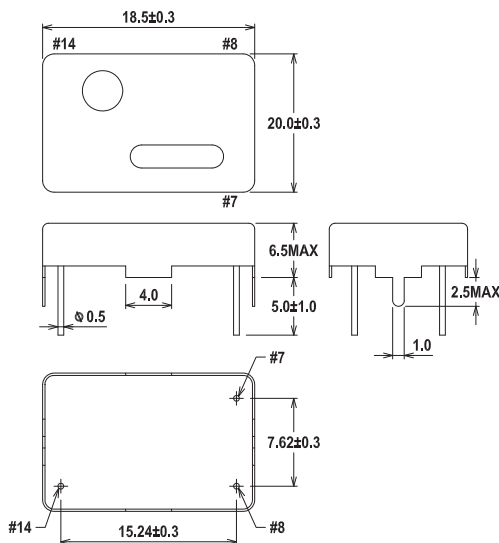
◆ Application

- Cellular Applications (GSM, TDMA, CDMA)
- GPS Devices
- Mobile and Portable Radio/Telephone Communications Transceivers
- Pb free product

◆ Options

- Carbon

◆ Dimension(mm)



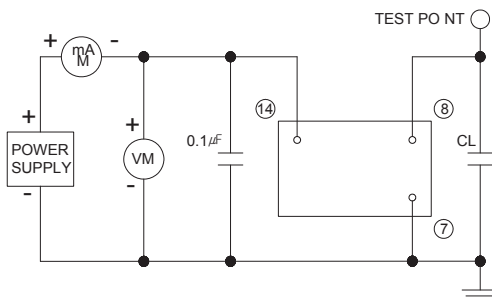
No.	Pin Connection
# 7	GND
# 8	Output
# 14	Vcc

◆ Standard Specification

(Nominal frequency referenced to frequency at 25 °C ± 2 °C)

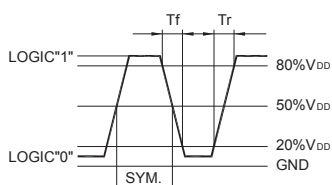
	MTD-S Series
Logic Family	Clipped Sine wave
Frequency Range	8.000 MHz ~ 35.000 MHz
Frequency Stability	+/-5.0ppm, +/-2.5ppm, +/-2.0ppm
Operating Temp. Range	-40°C ~ +85°C, -30°C ~ +75°C, -20°C ~ 70°C
Storage Temp. Range	-55°C ~ +125°C
Input Voltage	+5.0Vdc ± 5% or 3.3 Vdc ± 5%
Input Current	5.0mA Max
Output Level	1.0Volt Vp-p MIN
Aging	+/- 1 ppm/year Max
Output Load	10Kohm//10pF, 20Kohm//10pF
Phase Noise	-40 dBc/Hz max @ 1 Hz offset from carrier -80 dBc/Hz max @ 10 Hz -110 dBc/Hz max @ 100 Hz -135 dBc/Hz max @ 1 kHz -140 dBc/Hz max @ 10 kHz -145 dBc/hZ max @ 100 kHz

◆ Test Circuit



Note: CL Includes probe and fixture capacitance

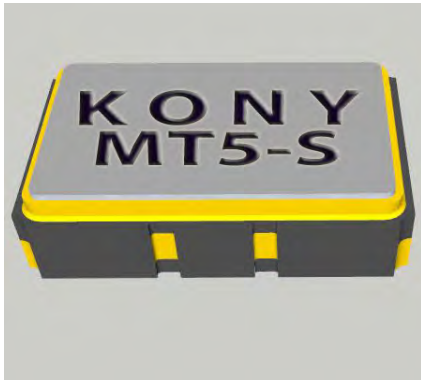
◆ Output Waveform



◆ Parts Number Guide

Classification	Designators								Description	
Example	M	T	D	-	S	1	6	A	()	20.000 MHz (Frequency)
Logo	M									MDX
Package size		T								TCXO
Product			D							Dip type 18.5mm X 12.0mm
Output Level					S					Clipped Sine wave
Temperature Range						4	8			-40°C ~ +85°C
						3	8			-30°C ~ +80°C
						3	7			-30°C ~ +75°C
						2	7			-20°C ~ +70°C
						1	6			-10°C ~ +60°C
Frequency Stability									A	+/-2.0ppm
									B	+/-2.5ppm
									C	+/-5.0ppm
Supply Voltage									()	+5.0 Volt
									3	+3.3 Volt

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Application

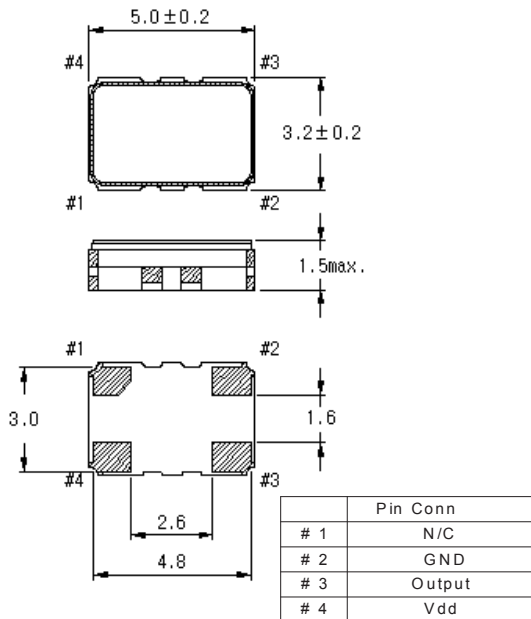
- Cellular Telephone (GSM,PDC, TDMA,CDMA) .
- Pb free product



Options

- TAPE & REEL

Dimension(mm)

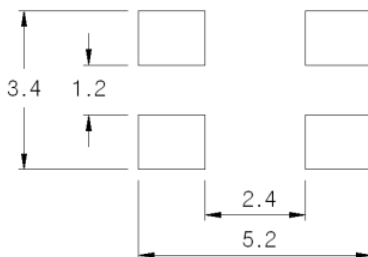


Standard Specification

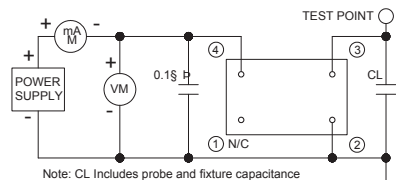
(Nominal frequency referenced to frequency at 25 °C±2 °C)

	MT5-S Series
Logic Family	Clipped Sine wave
Frequency Range	8.000 ~ 33.000MHz
Frequency Stability	+/-2.0ppm , +/-2.5ppm , +/-5.0ppm
Operating Temp.Range	-20°C ~ +70°C, -30°C ~ +75°C , -40°C ~ +85°C
Storage Temp.Range	-55°C ~ +125°C
Input Voltage	+ 3.3 Vdc ± 5%
Input Current	2.0mA Max
Output Level	+0.8 Volt Vp-p MIN
Aging	+/- 1 ppm/year Max
Output Load	10Kohm/10pF
Phase Noise	-135 dBc/Hz max @ 1 kHz

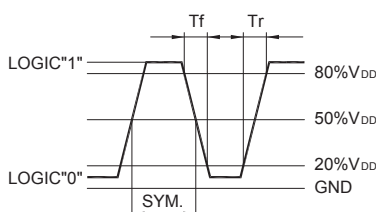
Recommended Land Pattern



Test Circuit



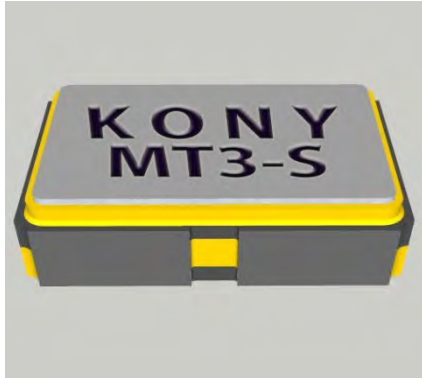
Output Waveform



Parts Number Guide

Classification	Description									
Example	M	T	5	-	S	2	7	A	--	20.000000 MHz (Frequency)
Logo	M									MDX-KONY
Product		T								TCXO
Package size			5							5 X 3.2mm
Output Level					S					Clipped Sine wave
Temperature Range						4	8			-40°C ~ +85°C
						3	8			-30°C ~ +80°C
						3	7			-30°C ~ +75°C
						2	7			-20°C ~ +70°C
						1	6			-10°C ~ +60°C
Frequency Stability						0	5			0°C ~ +50°C
								A		+/-2.0ppm
								B		+/-2.5ppm
								C		+/-5.0ppm

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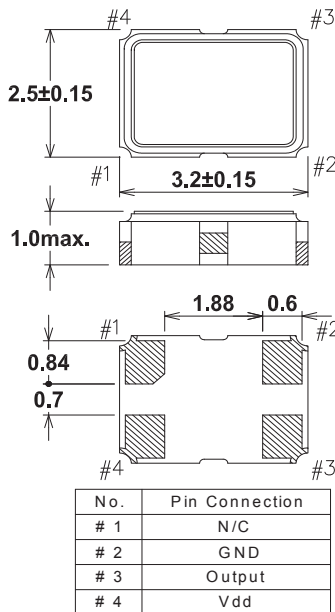
◆ Application

- Cellular Telephone (GSM,PDC, TDMA,CDMA) .
- Pb free product

◆ Options

- TAPE & REEL

◆ Dimension(mm)

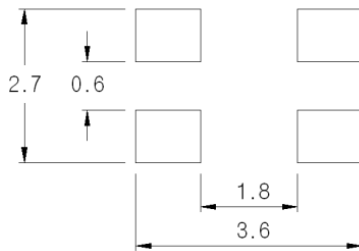


◆ Standard Specification

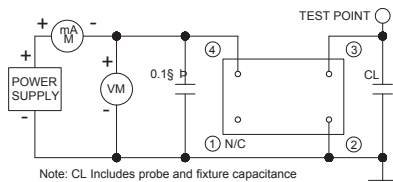
(Nominal frequency referenced to frequency at 25 °C±2 °C)

	MT3-S Series
Logic Family	Clipped Sine wave
Frequency Range	8.000 ~ 33.000MHz
Frequency Stability	+/-2.0ppm , +/-2.5ppm , +/-5.0ppm
Operating Temp.Range	-20°C ~ +70°C, -30°C ~ +75°C , -40°C ~ +85°C
Storage Temp.Range	-55°C ~ +125°C
Input Voltage	+ 3.3 Vdc ± 5%
Input Current	2.0mA Max
Output Level	+0.8 Volt Vp-p MIN
Aging	+/- 1 ppm/year Max
Output Load	10Kohm/10pF
Phase Noise	-135 dBc/Hz max @ 1 kHz

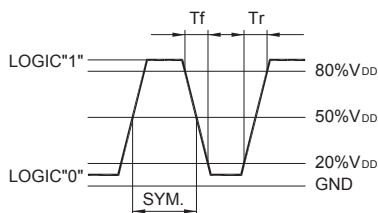
◆ Recommended Land Pattern



◆ Test Circuit



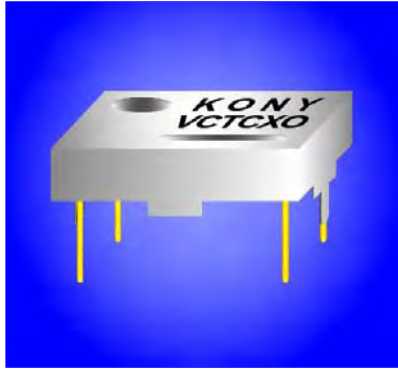
◆ Output Waveform



◆ Parts Number Guide

Classification	Description									
Example	M	T	3	-	S	2	7	A	--	20.000000 MHz (Frequency)
Logo	M									MDX-KONY
Product		T								TCXO
Package size			3							3.2 X 2.5mm
Output Level					S					Clipped Sine wave
Temperature Range						4	8			-40°C ~ +85°C
						3	8			-30°C ~ +80°C
						3	7			-30°C ~ +75°C
						2	7			-20°C ~ +70°C
						1	6			-10°C ~ +60°C
Frequency Stability						0	5			0°C ~ +50°C
								A		+/-2.0ppm
								B		+/-2.5ppm
								C		+/-5.0ppm

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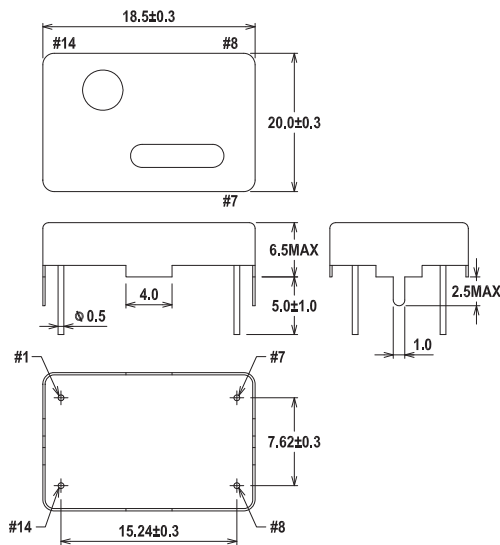
Application

- Cellular Applications (GSM, TDMA, CDMA)
- GPS Devices
- Mobile and Portable Radio/Telephone Communications Transceivers
- Pb free product

Options

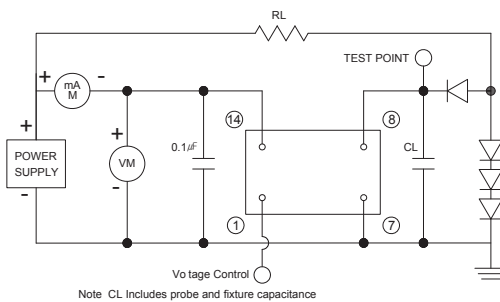
- Carbon

Dimension(mm)

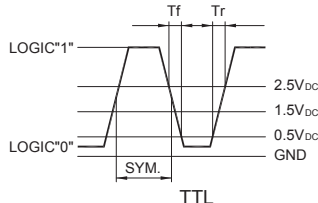


No.	Pin Connection
# 1	Voltage Control
# 7	GND
# 8	Output
# 14	Vcc

Test Circuit



Output Waveform



Standard Specification

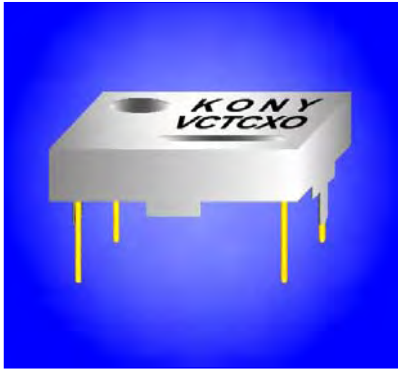
(Nominal frequency referenced to frequency at 25 °C ± 2 °C)

	MVTD-T Series
Logic Family	TTL
Frequency Range	8.000 MHz ~ 35.000 MHz
Frequency Stability	+/-5.0ppm, +/-2.5ppm, +/-2.0ppm
Pullability	+/-5ppm, +/-10ppm typ. (@Vcont = 2.5Vdc)
Operating Temp. Range	-40°C ~ +85°C, -30°C ~ +75°C, -20°C ~ 70°C
Storage Temp. Range	-55°C ~ +125°C
Input Voltage	+5.0 Vdc ± 5%
Input Current	15.0mA Max
Output Level	Symmetry : 40/60% max @ 1.5V Logic 0: 0.5V max Logic 1: 2.5V min Rise & Fall Times : 4ns max, 0.5 ~ 2.5V
Aging	+/- 1 ppm/year Max
Pullability	+/-5ppm, +/-10ppm (@Vcont=1.5V)
Output Load	2TTL or 15pF
Phase Noise	-40 dBc/Hz max @ 1 Hz offset from carrier -80 dBc/Hz max @ 10 Hz -110 dBc/Hz max @ 100 Hz -135 dBc/Hz max @ 1 kHz -140 dBc/Hz max @ 10 kHz -145 dBc/hZ max @ 100 kHz

Parts Number Guide

Classification	Description									
Example	M	VT	D	-	T	2	7	A	20.000000 MHz (Frequency)	
Logo	M								MDX	
Product		VT							VCTCXO	
Package size			D						Dip type 18.5mm X 12.0mm	
Output Level					T				TTL	
Temperature Range						4	8		-40°C ~ +85°C	
						3	8		-30°C ~ +80°C	
						3	7		-30°C ~ +75°C	
						2	7		-20°C ~ +70°C	
						1	6		-10°C ~ +60°C	
Frequency Stability & Pullability								0	5	0°C ~ +50°C
								A		+/-2.0ppm, Pullability +/-5 ppm
								B		+/-2.5ppm, Pullability +/-5 ppm
								C		+/-5.0ppm, Pullability +/-5 ppm
								D		+/-2.0ppm, Pullability +/-10 ppm
								E		+/-2.5ppm, Pullability +/-10 ppm
								F		+/-5.0ppm, Pullability +/-10 ppm

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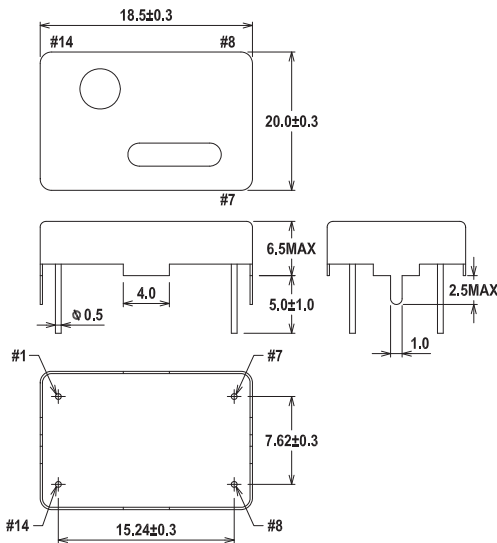
◆ Application

- Cellular Applications (GSM, TDMA,CDMA)
- GPS Devices
- Mobile and Portable Radio/Telephone Communications Transceivers
- Pb free product

◆ Options

- Carbon

◆ Dimension(mm)



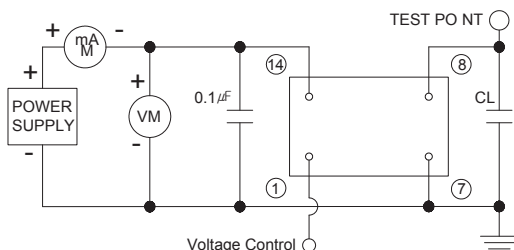
No.	Pin Connection
# 1	Voltage Control
# 7	GND
# 8	Output
# 14	Vcc

◆ Standard Specification

(Nominal frequency referenced to frequency at 25 °C ± 2 °C)

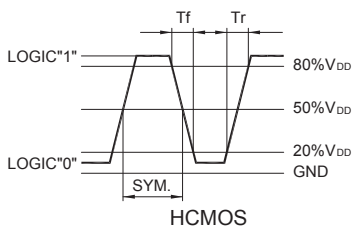
	MVTD-H Serie
Logic Family	HCMOS
Frequency Range	8.000 MHz ~ 35.000 MHz
Frequency Stability	+/-5.0ppm, +/-2.5ppm, +/-2.0ppm
Pullability	+/-5ppm, +/-10ppm typ. (@Vcont = 2.5Vdc)
Operating Temp.Range	-40 °C ~ +85 °C, -30 °C ~ +75 °C, -20 °C ~ 70 °C
Storage Temp.Range	-55 °C ~ +125 °C
Input Voltage	+ 5.0 Vdc ± 5% or +3.3 Vdc ± 5%
Input Current	15.0mA Max
Output Level	Symmetry : 40/60% max @ 50% Vdd Logic 0: 10% Vdd max Logic 1: 90% Vdd min Rise & Fall Times : 8ns max, 20~80%
Aging	+/- 1 ppm/year Max
Output Load	10Kohm//10pF, 15pF
Phase Noise	-40 dBc/Hz max @ 1 Hz offset from carrier -80 dBc/Hz max @ 10 Hz -110 dBc/Hz max @ 100 Hz -135 dBc/Hz max @ 1 kHz -140 dBc/Hz max @ 10 kHz -145 dBc/hZ max @ 100 kHz

◆ Test Circuit



Note: CL Includes probe and fixture capacitance

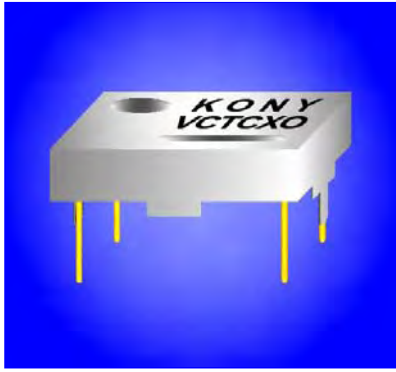
◆ Output Waveform



◆ Parts Number Guide

Classification	Designators								Description	
Example	M	VT	D	-	H	1	6	A	()	20.000 MHz (Frequency)
Logo	M									MDX
Package size		VT								VCTCXO
Product			D							Dip type 18.5mm X 12.0mm
Output Level					H					HCMOS
Temperature Range						4	8			-40 °C ~ +85 °C
						3	8			-30 °C ~ +80 °C
						3	7			-30 °C ~ +75 °C
						2	7			-20 °C ~ +70 °C
						1	6			-10 °C ~ +60 °C
Frequency Stability						0	5			+0 °C ~ +50 °C
								A		+/-2.0ppm
								B		+/-2.5ppm
Supply Voltage									()	+5.0 Volt
									3	+3.3 Volt

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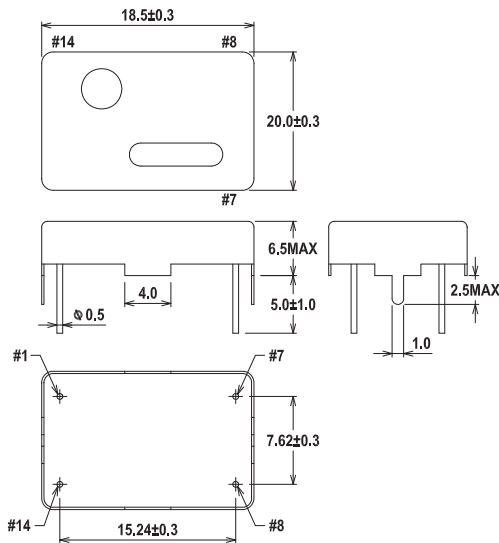
◆ Application

- Cellular Applications (GSM, TDMA,CDMA)
- GPS Devices
- Mobile and Portable Radio/Telephone Communications Transceivers
- Pb free product

◆ Options

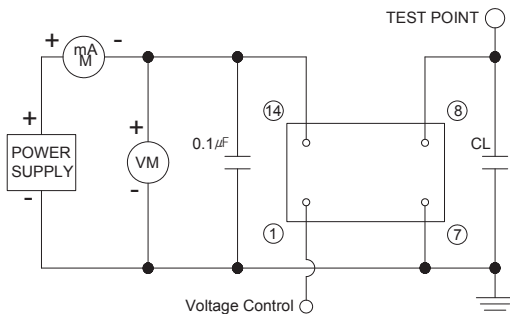
- Carbon

◆ Dimension(mm)



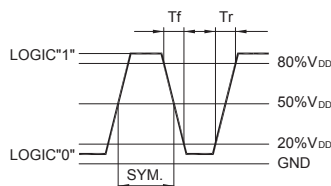
No.	Pin Connection
# 1	Voltage Control
# 7	GND
# 8	Output
# 14	Vcc

◆ Test Circuit



Note: CL Includes probe and fixture capacitance

◆ Output Waveform



◆ Standard Specification

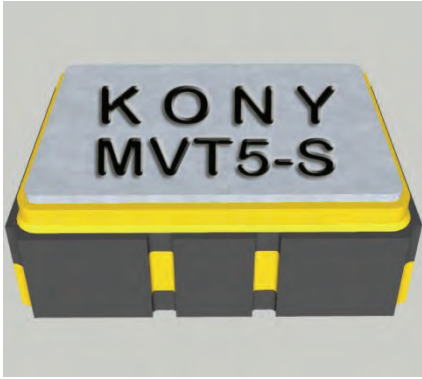
(Nominal frequency referenced to frequency at 25 °C ±2 °C)

MVTD-S Serie	
Logic Family	Clipped Sine wave
Frequency Range	8.000 MHz ~ 35.000 MHz
Frequency Stability	+/-5.0ppm, +/-2.5ppm, +/-2.0ppm
Pullability	+/-5ppm, +/-10ppm typ. (@Vcont = 2.5Vdc)
Operating Temp.Range	-40 °C ~ +85 °C, -30 °C ~ +75 °C, -20 °C ~ 70 °C
Storage Temp.Range	-55 °C ~ +125 °C
Input Voltage	+ 5.0 Vdc ± 5% or +3.3 Vdc ± 5%
Input Current	5.0mA Max
Output Level	1.0Volt Vp-p MIN
Aging	+/- 1 ppm/year Max
Output Load	10Kohm/10pF, 20Kohm/10pF
Phase Noise	-40 dBc/Hz max @ 1 Hz offset from carrier -80 dBc/Hz max @ 10 Hz -110 dBc/Hz max @ 100 Hz -135 dBc/Hz max @ 1 kHz -140 dBc/Hz max @ 10 kHz -145 dBc/hZ max @ 100 kHz

◆ Parts Number Guide

Classification	Designators								Description	
Example	M	VT	D	-	S	1	6	A	()	20.000 MHz (Frequency)
Logo	M									MDX
Package size		VT								VCTCXO
Product			D							Dip type 18.5mm X 12.0mm
Output Level					S					Clipped Sine wave
Temperature Range						4	8			-40 °C ~ +85 °C
						3	8			-30 °C ~ +80 °C
						3	7			-30 °C ~ +75 °C
						2	7			-20 °C ~ +70 °C
						1	6			-10 °C ~ +60 °C
Frequency Stability								A		+/-2.0ppm
								B		+/-2.5ppm
								C		+/-5.0ppm
Supply Voltage									()	+5.0 Volt
									3	+3.3 Volt

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Application

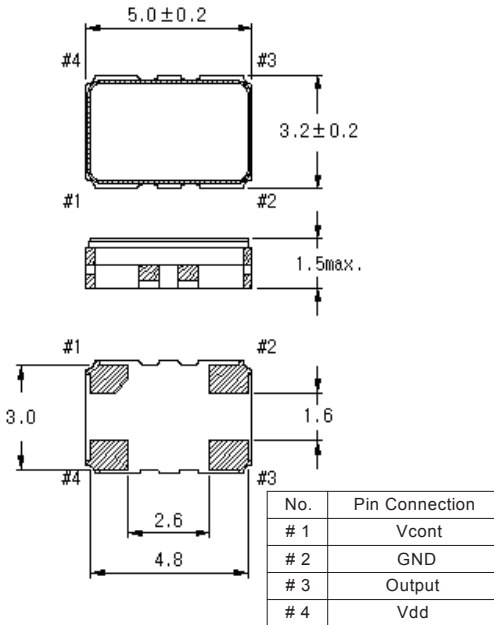
- Cellular Telephone (GSM,PDC, TDMA,CDMA) .
- Pb free product

Options

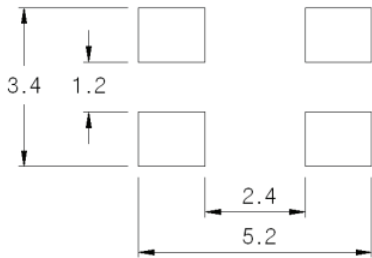
- TAPE & REEL



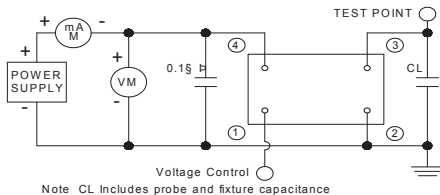
Dimension(mm)



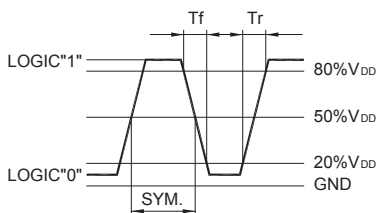
Recommended Land Pattern



Test Circuit



Output Waveform



Standard Specification

(Nominal frequency referenced to frequency at 25 °C±2 °C)

	MVT5-S Series
Logic Family	Clipped Sine wave
Frequency Range	8.000 ~ 33.000MHz
Frequency Stability	+/-2.0ppm , +/-2.5ppm , +/-5.0ppm
Operating Temp.Range	-20°C ~ +70°C, -30°C ~ +75°C , -40°C ~ +85°C
Storage Temp.Range	-55°C ~ +125°C
Input Voltage	+ 3.3 Vdc ± 5%
Input Current	2.0mA Max
Output Level	+0.8 Volt Vp-p MIN
Aging	+/- 1 ppm/year Max
Pullability	+/-3pm , +/-15ppm (@Vcont=1.5VDC±1.0V)
Output Load	10Kohm/10pF
Phase Noise	-135 dBc/Hz max @ 1 kHz

Parts Number Guide

Classification	Description								
Example	M	VT	5	-	S	2	7	A	20.000000 MHz (Frequency)
Logo	M								MDX-KONY
Product		VT							VCTCXO
Package size			5						5 X 3.2mm
Output Level					S				Clipped Sine wave
Temperature Range						4	8		-40°C ~ +85°C
						3	8		-30°C ~ +80°C
						3	7		-30°C ~ +75°C
						2	7		-20°C ~ +70°C
						1	6		-10°C ~ +60°C
						0	5		0°C ~ +50°C
Frequency Stability & Pullability								A	+/-2.0ppm , Pullability +/-3 ppm
								B	+/-2.5ppm , Pullability +/-3 ppm
								C	+/-5.0ppm , Pullability +/-3 ppm
								D	+/-2.0ppm , Pullability +/-15 ppm
								E	+/-2.5ppm , Pullability +/-15 ppm
								F	+/-5.0ppm , Pullability +/-15 ppm

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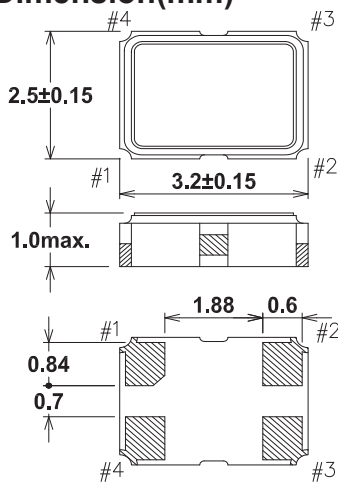
Application

- Cellular Telephone (GSM,PDC, TDMA,CDMA) .
- Pb free product

Options

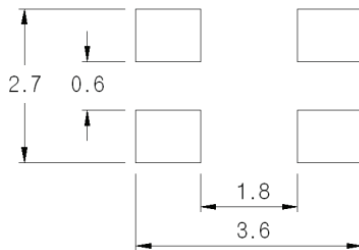
- TAPE & REEL

Dimension(mm)

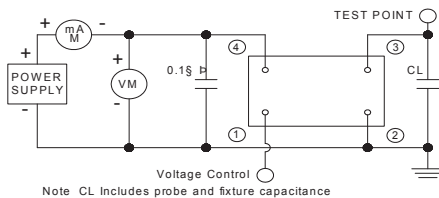


No.	Pin Connection
# 1	Vcont
# 2	GND
# 3	Output
# 4	Vdd

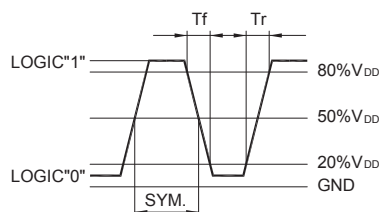
Recommended Land Pattern



Test Circuit



Output Waveform



Standard Specification

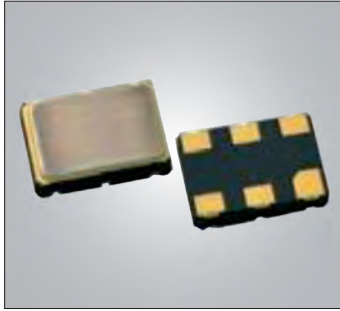
(Nominal frequency referenced to frequency at 25 °C±2 °C)

	MVT3-S Series
Logic Family	Clipped Sine wave
Frequency Range	8.000 ~ 33.000MHz
Frequency Stability	+/-2.0ppm , +/-2.5ppm , +/-5.0ppm
Operating Temp.Range	-20°C ~ +70°C, -30°C ~ +75°C , -40°C ~ +85°C
Storage Temp.Range	-55°C ~ +125°C
Input Voltage	+ 3.3 Vdc ± 5%
Input Current	2.0mA Max
Output Level	+0.8 Volt Vp-p MIN
Aging	+/- 1 ppm/year Max
Pullability	+/-3pm , +/-15ppm (@Vcont=1.5VDC±1.0V)
Output Load	10Kohm/10pF
Phase Noise	-135 dBc/Hz max @ 1 kHz

Parts Number Guide

Classification	Description								
Example	M	VT	3	-	S	2	7	A	20.000000 MHz (Frequency)
Logo	M								MDX-KONY
Product		VT							VCTCXO
Package size			3						3.2 X 2.5mm
Output Level					S				Clipped Sine wave
Temperature Range						4	8		-40°C ~ +85°C
						3	8		-30°C ~ +80°C
						3	7		-30°C ~ +75°C
						2	7		-20°C ~ +70°C
						1	6		-10°C ~ +60°C
Frequency Stability & Pullability						0	5		0°C ~ +50°C
								A	+/-2.0ppm , Pullability +/-3 ppm
								B	+/-2.5ppm , Pullability +/-3 ppm
								C	+/-5.0ppm , Pullability +/-3 ppm
								D	+/-2.0ppm , Pullability +/-15 ppm
								E	+/-2.5ppm , Pullability +/-15 ppm
								F	+/-5.0ppm , Pullability +/-15 ppm

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HDXO™ Product Brief

«Zero» lead-time Clock
for low jitter Applications



The MAE108xC & MAE105xC families of High Definition Crystal Oscillators (HDXO™) were developed for low Jitter, CMOS applications. These Oscillators take advantage of a confidential, 5th generation ASIC combined with a high performance Quartz crystal to provide low power consumption and low clock jitter at user defined configurations. The MAE108 & MAE105 are factory configured just before shipment for application specific options such as Frequency, Supply Voltage and Temperature Stability. This means there is no need to worry about long lead-times or costly inventory. Just call AEI and forget it.

Features / Options:

- Frequency range: 10 to 250 MHz
- 3.3, and 2.5 V supply options
- Commercial or Industrial temperature
- Pb-free/RoHS-compliant

Applications:

- High Speed Serial interface, PCI, PCIx, PCIe, USB
- Networking Clock and data recovery
- SONENT/SDH Test and measurement
- Single board Computer and Embedded
- FPGA/ASIC clock generation

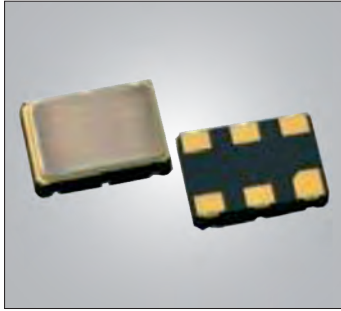
The High Definition capability is the result of being able to configure the oscillator performance and the output parameters. Oscillator parameters such as the load and gain are factory defined for each oscillator type to assure optimal performance and low jitter. Defining the frequency and output parameters is the last step.

In addition, the High Definition frequency generation provides superior Power Supply Noise Rejection (PSNR). The enhanced PSNR Characteristic in the HD Oscillator simplifies the process of generating low jitter clocks in noisy environments found in many of today's networking and communication systems designs.

All of this means the electrical performance of the MAE108/MAE105 is better than the comparable technologies. The High Definition options mean you can get what you need in as little as 1 week or less.

Configurations can be specified using the Part Number Definition Guide below.

MAE108xC, MAE105xC Definition Guide:							
Option Definition							Description
Example:	MAE108	0	C	3	5	I	156M2500 (Freq in MHz)
Package / Part Type	MAE108						7 x 5 mm package
	MAE105						5 x 3.2 mm package
Part Type - Output Definition		0					Single Output Option
		2					Dual Output Option
		4					Quad Output Option
Output / Voltage			C				HCMOS
Supply Voltage Definition				3			3.3V
				2			2.5V
Stability Definition					5		+/- 50ppm
					4		+/- 30ppm
					3		+/- 25ppm
					2		+/- 20ppm
					6		Custom
Temperature Definition						C	-20 to +70C
						I	-40 to +85C
						M	-55 to +125C
						Z	Custom



HDXO™ Product Brief

«Zero» lead-time Clock
for low jitter Applications



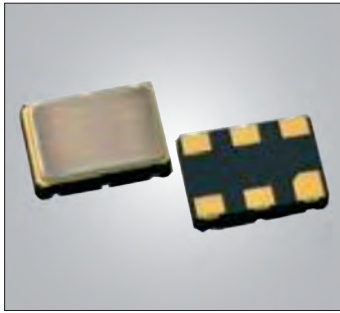
Operating Specifications:

Parameter	Symbol	Test Condition	Min	Typ	Max	Units
Frequency Range		HCMOS	10	—	250	MHz
Supply Voltage (1)	VDD	3.3 V option	2.97	3.3	3.63	V
		2.5 V option	2.25	2.5	2.75	
Supply Current		HCMOS		25	50	ma
Output Enable (OE)(2)		V _{IH}	0.75 x VDD	—	—	V
		V _{IL}	—	—	0.5	
Start up Time (3)	t _{start}		—	—	10	ms
Operating Temperature Range	T _A		-40	—	85	°C
Total Stability (1)(5)	f _t	Stability = ±20 ppm	—	—	±20	ppm
		Stability = ±25 ppm	—	—	±25	ppm
		Stability = ±50 ppm	—	—	±50	ppm
Initial Accuracy (4)	f _i	+25 °C at time of shipping	—	±10	—	ppm
Aging (4)	f _a	first year at 25 C average ambient	—	±3	—	ppm
		15 years at 25 C average ambient	—	±10	—	ppm
Output levels, CL = 15 pF	V _{OH}	I _{OH} = 32mA	0.8 x VDD	—	VDD	V
	V _{OL}	I _{OL} = 32mA	—	—	0.4	
Rise Time/Fall time (20/80%)	Tr / Tf	CL = 15pF		0.75	1	ns
Symmetry (duty cycle)	SYM	HCMOS: VDD/2	45	—	55	%
Period Jitter, 10K Cycles	JPER	RMS	—	2	—	ps
		Peak-to-Peak	—	14	—	
Phase Jitter (RMS)	JPHS	12 kHz to 20 MHz (OC-48)	—	0.6	1	ps
		50 kHz to 80 MHz (OC-192)	—	0.6	1	

Notes:

1. Selectable parameter specified by part number. See "Definition Guide" for further details.
2. OE pin includes a 20 KΩ pull-up resistor to Vdd.
3. Time from minimum Vdd power supply or tristate mode to Voh, min.
4. Initial accuracy, Temperature Stability, and 1st year aging are included in the Total Stability
5. Total Stability includes Initial accuracy, Temperature Stability, 1st year aging, Changes in frequency due to Supply Voltage and Load, Shock and Vibration, and Reflow

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HDXO™ Product Brief

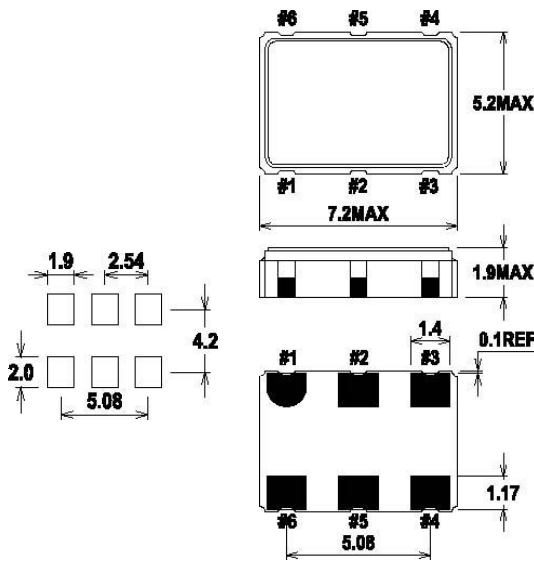
«Zero» lead-time Clock
for low jitter Applications



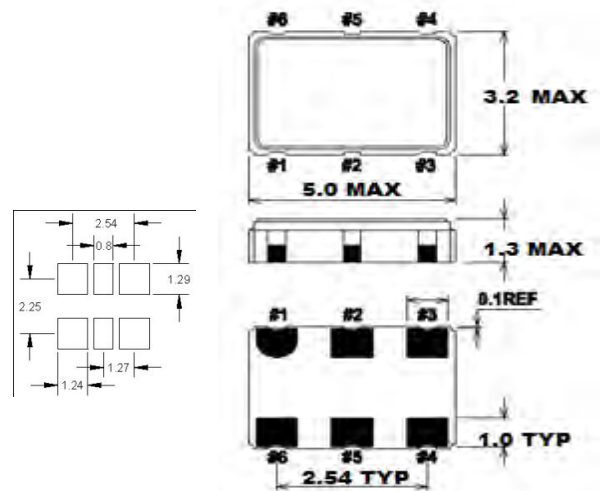
The MAE108xC and MAE105xC Voltage Controlled Crystal Oscillators are supplied in an industry-standard, RoHS compliant, 6-pad, 7 x5 mm package or 5 x 3.2 mm package.

HCMOS			
Pin#	MAE1080C MAE1050C	MAE1082C MAE1052C	MAE1084C MAE1054C
1	OE	OE	Output 4
2	NC	NC	Output 3
3	GND	GND	GND
4	Output 1	Output 1	Output 1
5	NC	Output 2	Output 2
6	Vdd	Vdd	Vdd

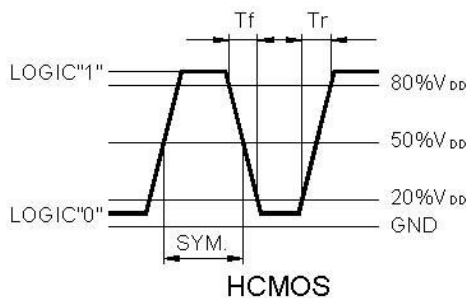
7.0 x 5.0 mm



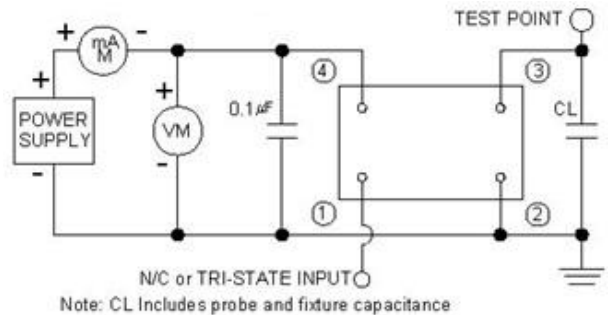
5.0 x 3.2 mm



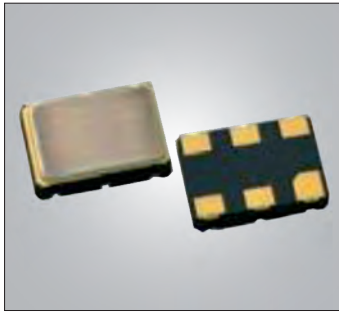
Output Waveform



Test Circuit



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HDXO™ Product Brief

«Zero» lead-time Clock
for low jitter Applications



The MAE108xP & MAE105xP were developed for low Jitter, PECL applications and the MAE108xL & MAE105xL were developed for low Jitter, LVDS applications. These Oscillators take advantage of a confidential, 5th generation ASIC combined with a high performance Quartz crystal to provide low power consumption and low clock jitter at user defined configurations. The MAE108 & MAE105 are factory configured just before shipment for application specific options such as Frequency, Supply Voltage and Temperature Stability. This means there is no need to worry about long lead-times or costly inventory. Just call AEI and forget it.

Features / Options:

- Frequency range: 10 to 1500 MHz
- 3.3, and 2.5 V supply options
- Commercial or Industrial temperature
- Pb-free/RoHS-compliant

Applications:

- High Speed Serial interface, PCI, PCIx, PCIe, USB
- Networking Clock and data recovery
- SONET/SDH Test and measurement
- Single board Computer and Embedded
- FPGA/ASIC clock generation

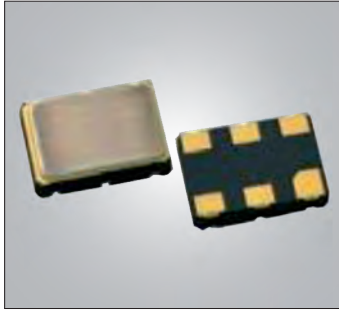
The High Definition capability is the result of being able to configure the oscillator performance and the output parameters. Oscillator parameters such as the load and gain are factory defined for each oscillator type to assure optimal performance and low jitter. Defining the frequency and output parameters is the last step.

In addition, the High Definition frequency generation provides superior Power Supply Noise Rejection (PSNR). The enhanced PSNR Characteristic in the HD Oscillator simplifies the process of generating low jitter clocks in noisy environments found in many of today's networking and communication systems designs.

All of this means the electrical performance of the MAE108/MAE105 is better than the comparable technologies. The High Definition options mean you can get what you need in as little as 1 week or less.

Configurations can be specified using the Part Number Definition Guide below.

MAE108xP(L), MAE105xP(L) Definition Guide:							
Option Definition							Description
Example:	MAE108	0	P	3	5	C	155M5200 (Freq in MHz)
Package / Part Type	MAE108						7 x 5 mm package
	MAE105						5 x 3.2 mm package
Part Type - Output Definition		0					Single Output Option
		2					Dual Output Option
Output / Voltage Definition			L				LVDS
			P				PECL
Supply Voltage Definition				3			3.3V
				2			2.5V
Stability Definition (* = VCXO Type Only)					5		+/- 50ppm
					4		+/- 30ppm
					3		+/- 25ppm
					2		+/- 20ppm
					6		Custom
Temperature Definition						C	-20 to +70C
						I	-40 to +85C
						M	-55 to +125C
						Z	Custom



HDXO™ Product Brief

«Zero» lead-time Clock
for low jitter Applications



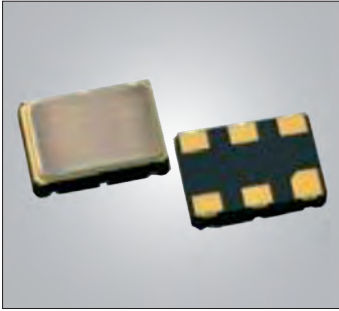
Operating Specifications:

Parameter	Symbol	Test Condition	Min	Typ	Max	Units
Nominal Frequency(1)	f ₀	LVPECL/LVDS	10	—	1500	MHz
Supply Voltage (1)	V _{DD}	3.3 V option	2.97	3.3	3.63	V
		2.5 V option	2.25	2.5	2.75	
Supply Current	I _{DD}	LVPECL/LVDS	—	25	50	mA
Output Enable (OE)(2)	V _{IH}	V _{IH}	0.75 x V _{DD}	—	—	V
	V _{IL}	V _{IL}	—	—	0.5	
Start up Time (3)	t _{start}		—	—	10	ms
Operable Temp Range	T _A		-40	—	85	°C
Total Stability (1)(5)	f _t	Stability = ±20 ppm	—	—	±20	ppm
		Stability = ±25 ppm	—	—	±25	ppm
		Stability = ±50 ppm	—	—	±50	ppm
Initial Accuracy (4)	f _i	+25 °C at time of shipping	—	±10	—	ppm
Aging (4)	f _a	Frequency drift over first year of operation at +25 C	—	±3	—	ppm
		Frequency drift over 15 year life at 25 C average ambient	—	±10	—	ppm
LVPECL Output: 50 Ω to V _{DD} – 2.0 V	V _O		V _{DD} – 1.42	—	V _{DD} – 1.25	V
	V _{OD}	Voltage Swing	1.1	—	1.9	V _{PP}
LVDS Output: R _{term} = 100 Ω	V _O		1.125	1.2	1.275	V
	V _{OD}	Voltage Swing	0.5	0.7	0.9	V _{PP}
Rise/Fall time (20/80%)	t _R , t _F	LVPECL/LVDS	—	—	350	ps
Symmetry (duty cycle)	SYM	LVPECL: V _{DD} – 1.3 V, LVDS: 1.25 V	45	—	55	%
Period Jitter, 10K Cycles	J _{PER}	RMS	—	2	—	ps
		Peak-to-Peak	—	14	—	
Phase Jitter (RMS): Freq > 500 MHz, LVPECL or LVDS Output types	φ _J	12 kHz to 20 MHz (OC-48)	—	0.25	0.4	ps
		50 kHz to 80 MHz (OC-192)	—	0.26	0.4	
Phase Jitter (RMS): Freq = 10 MHz to 500 MHz, LVPECL or LVDS Output types	φ _J	12 kHz to 20 MHz (OC-48)	—	0.6	1	ps
		50 kHz to 20 MHz (OC-192)	—	0.4	1	

Notes:

1. Selectable parameter specified by part number. See "Definition Guide" for further details.
2. OE pin includes a 20 KΩ pull-up resistor to V_{DD}.
3. Time from minimum V_{DD} power supply or tristate mode to V_{OH}, min.
4. Initial accuracy, Temperature Stability, and 1st year aging are included in the Total Stability
5. Total Stability includes Initial accuracy, Temperature Stability, 1st year aging,
Changes in frequency due to Supply Voltage and Load, Shock and Vibration, and Reflow

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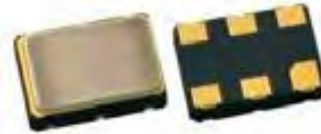
HDXO™ Product Brief

«Zero» lead-time Clock
for low jitter Applications



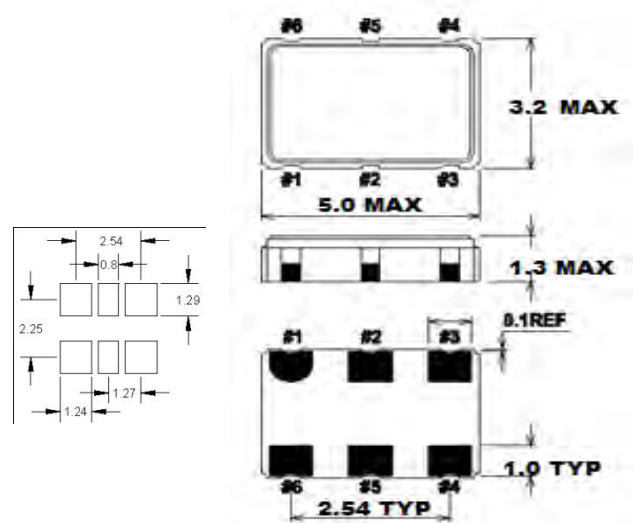
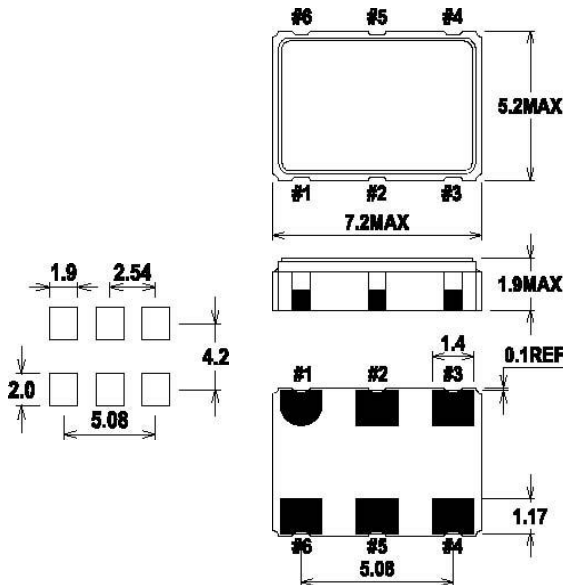
The MAE108xC and MAE105xC Voltage Controlled Crystal Oscillators are supplied in an industry-standard, RoHS compliant, 6-pad, 7 x 5 mm package or 5 x 3.2 mm package.

AE108xP(L) Pinout		
Pin#	MAE1080P(L) MAE1050P(L)	MAE1082P(L) MAE1052P(L)
1	OE	Output 2 (+)
2	NC	Output 2 (-)
3	GND	GND
4	Output (+)	Output 1 (+)
5	Output (-)	Output 1 (-)
6	Vdd	Vdd

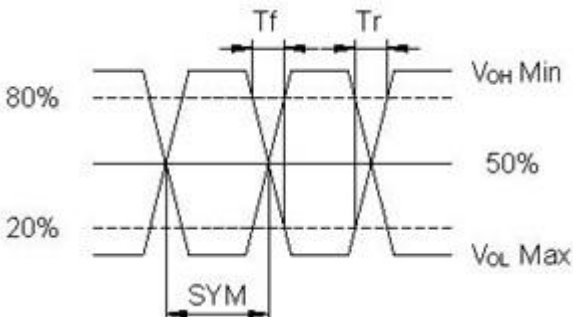


7.0 x 5.0 mm

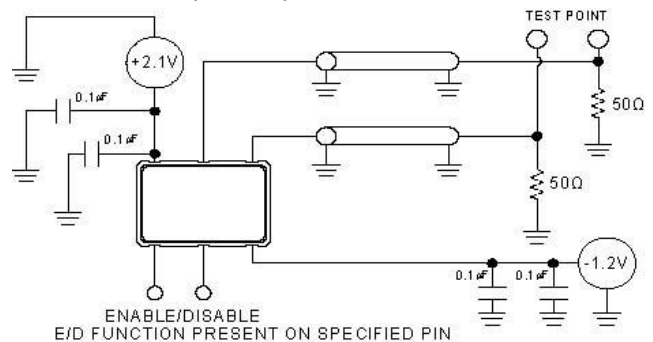
5.0 x 3.2 mm



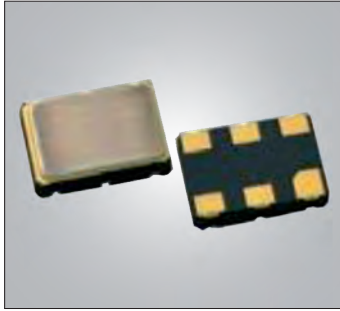
Output Waveform



Test Circuit (PECL)



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HDVCXO™ Product Brief

«Zero» lead-time Clock
for low jitter Applications



The MAE1087C & MAE1057C families of High Definition Crystal Oscillators (HDXO™) were developed for custom frequency, CMOS applications. These Oscillators take advantage of a confidential, 5th generation ASIC combined with a high performance Quartz crystal to provide low power consumption and low clock jitter at user defined configurations. The MAE108 & MAE105 are factory configured just before shipment for application specific options such as Frequency, Supply Voltage and Temperature Stability. This means there is no need to worry about long lead-times or costly inventory. Just call AEI and forget it.

Features / Options:

- Frequency range: 10 to 225 MHz
- 3.3, and 2.5 V supply options
- Commercial or Industrial temperature
- Pb-free/RoHS-compliant

Applications:

- High Speed Serial interface
- Networking Clock and data recovery
- SONET/SDH Test and measurement
- Single board Computer and Embedded
- FPGA/ASIC clock generation

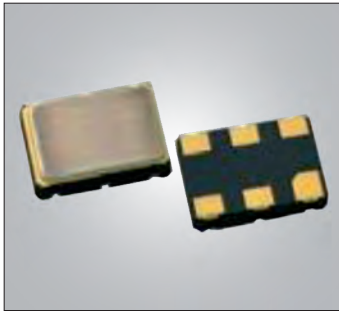
The High Definition capability is the result of being able to configure the oscillator performance and the output parameters. Oscillator parameters such as the load and gain are factory defined for each oscillator type to assure optimal performance and low jitter. Defining the frequency and output parameters is the last step.

In addition, the High Definition frequency generation provides superior Power Supply Noise Rejection (PSNR). The enhanced PSNR Characteristic in the HD Oscillator simplifies the process of generating low jitter clocks in noisy environments found in many of today's networking and communication systems designs.

All of this means the electrical performance of the MAE108/MAE105 is better than the comparable technologies. The High Definition options mean you can get what you need in as little as 1 week or less.

Configurations can be specified using the Part Number Definition Guide below.

AE1087C, AE1057C Definition Guide:							
Option Definition							Description
Example:	MAE108	7	C	3	7	C	155M5200 (Freq in MHz)
Package / Part Type	MAE108						7 x 5 mm package
	MAE105						5 x 3.2 mm package
Part Type - Output Definition		7					VCXO
Output / Voltage Definition			C				HCMOS
Supply Voltage Definition				3			3.3V
				2			2.5V
Stability-Pullability Definition					7		+/- 50ppm Stability, +/- 50 ppm APR
					8		+/- 50ppm Stability, +/- 100 ppm APR
					9		+/- 20ppm Stability, +/- 50 ppm APR
					6		Custom
Temperature Definition						C	-20 to +70C
						I	-40 to +85C
						M	-55 to +125C
						Z	Custom



HDVCXO™ Product Brief

«Zero» lead-time Clock
for low jitter Applications



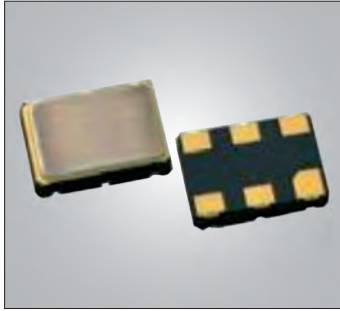
Operating Specifications:

Parameter	Symbol	Test Condition	Min	Typ	Max	Units
Frequency Range	F _n	HCMOS	10	—	225	MHz
Supply Voltage (1)	V _{DD}	3.3 V option	2.97	3.3	3.63	V
		2.5 V option	2.25	2.5	2.75	
Supply Current		HCMOS		25	50	ma
Output Enable (OE)(2)		V _{IH}	0.75 x V _{DD}	—	—	V
		V _{IL}	—	—	0.5	
Start up Time (3)	t _{start}		—	—	10	ms
Operating Temperature Range	T _A		-40	—	85	°C
Total Stability (1)(5)		Stability = ±20 ppm	—	—	±20	ppm
		Stability = ±25 ppm	—	—	±25	ppm
		Stability = ±50 ppm	—	—	±50	ppm
Initial Accuracy (4)		+25 °C at time of shipping	—	±10	—	ppm
Aging (4)		first year at 25 C average ambient	—	±3	—	ppm
		15 years at 25 C average ambient	—	±10	—	ppm
Control Voltage	V _c	3.3 V option	0	1.65	3.3	V
		2.5 V option	0	1.25	2.5	
Frequency Deviation, Absolute Pull Range (1)(6)	APR	V _c = 0.0 to 3.3V	+/-50		—	ppm
			+/-100		—	
Output levels, CL = 15 pF	V _{OH}	I _{OH} = 32mA	0.8 x V _{DD}	—	V _{DD}	V
	V _{OL}	I _{OL} = 32mA	—	—	0.4	
Rise Time/Fall time (20/80%)	T _r / T _f	CL = 15pF		0.75	1	ns
Symmetry (duty cycle)	SYM	HCMOS: V _{DD} /2	45	—	55	%
Period Jitter, 10K cycles	J _{PER}	RMS	—	2	—	ps
		Peak-to-Peak	—	14	—	
Phase Jitter (RMS)	J _{PHS}	12 kHz to 20 MHz (OC-48)	—	0.6	1	ps
		50 kHz to 80 MHz (OC-192)	—	0.6	1	

Notes:

- Selectable parameter specified by part number. See the "Definition Guide" for further details.
- OE pin includes a 20 KΩ pull-up resistor to V_{DD}.
- Time from minimum V_{DD} power supply or tristate mode to V_{OH}, min.
- Initial accuracy, Temperature Stability, and 1st year aging are included in the Total Stability
- Total Stability includes Initial Accuracy, Temperature Stability, 1st year aging, Changes in Frequency due to Supply Voltage and Load, Shock and Vibration, and Reflow
- Absolute Pull Range (APR) is the Minimum amount of Frequency Deviation relative to the Nominal Frequency It includes Changes in Temperature, Supply Voltage and Aging

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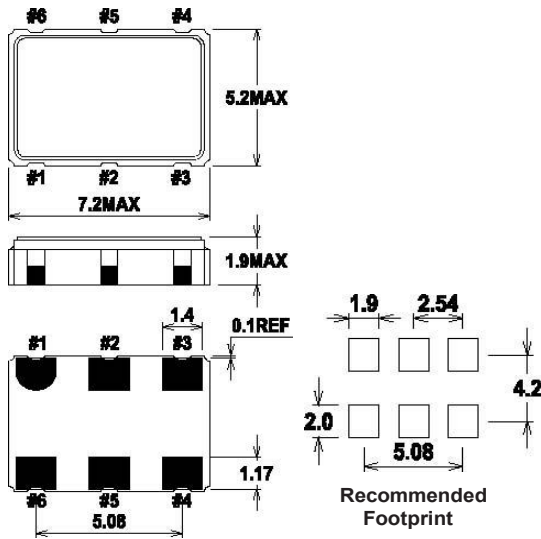
HDVCXO™ Product Brief

«Zero» lead-time Clock
for low jitter Applications

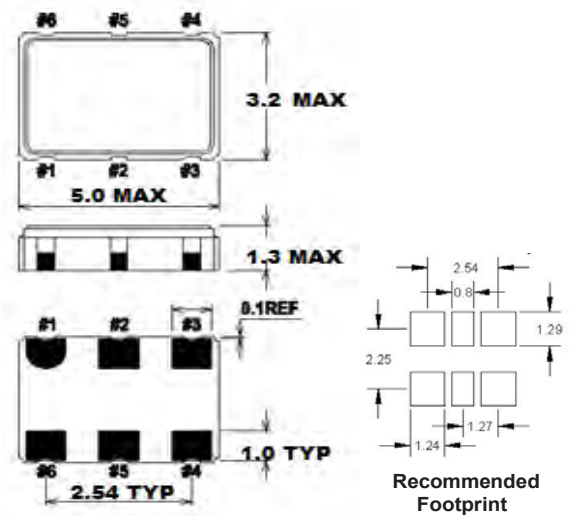


The MAE1087 and MAE1057 Voltage Controlled Crystal Oscillators are supplied in an industry-standard, RoHS compliant, 6-pad, 7 x5 mm package or 5 x 3.2 mm package.

7.0 x 5.0 mm



5.0 x 3.2 mm

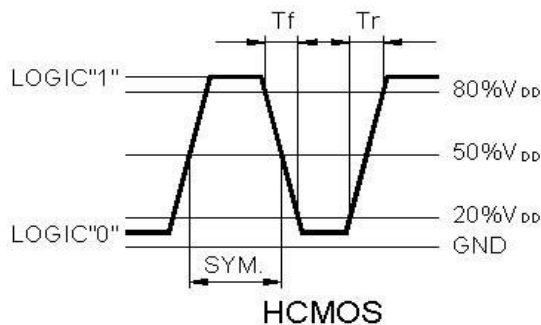


Pin Connections

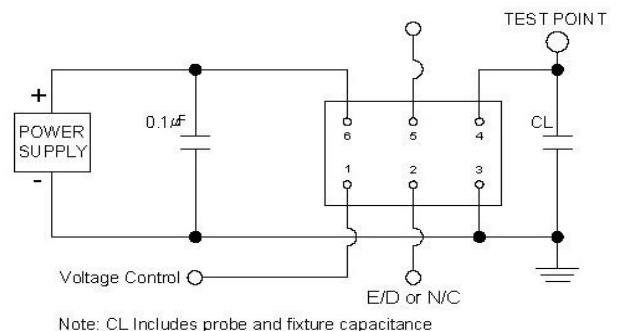
Pin #	MAE1087C MAE1057C
1	Vc
2	OE
3	GND
4	Output 1
5	NC
6	Vdd

Enable / Disable	
OE Pin Status	Output Status
High - N/C	Active
Low	High Z

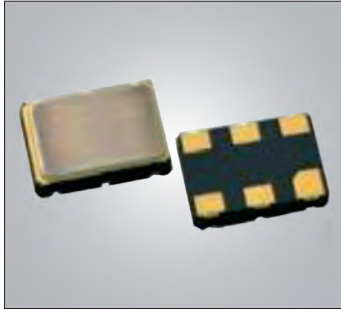
Output Waveform



Test Circuit



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HDVCXO™ Product Brief

«Zero» lead-time Clock
for low jitter Applications



The MAE1087P (L) & MAE1057P (L) families of High Definition Crystal Oscillators (HDXO™) were developed for custom frequency, Differential applications. These Oscillators take advantage of a confidential, 5th generation ASIC combined with a high performance Quartz crystal to provide low power consumption and low clock jitter at user defined configurations. The MAE108 & MAE105 are factory configured just before shipment for application specific options such as Frequency, Supply Voltage and Temperature Stability. This means there is no need to worry about long lead-times or costly inventory. Just call AEI and forget it.

Features / Options:

- Frequency range: 10 to 1500 MHz
- 3.3, and 2.5 V supply options
- Commercial or Industrial temperature
- Pb-free/RoHS-compliant

Applications:

- High Speed Serial interface
- Networking Clock and data recovery
- SONET/SDH Test and measurement
- Single board Computer and Embedded
- FPGA/ASIC clock generation

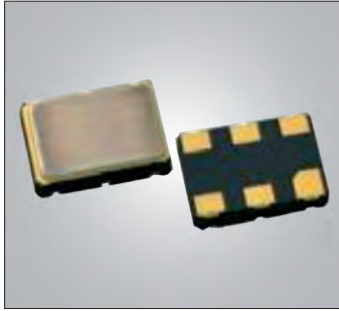
The High Definition capability is the result of being able to configure the oscillator performance and the output parameters. Oscillator parameters such as the load and gain are factory defined for each oscillator type to assure optimal performance and low jitter. Defining the frequency and output parameters is the last step.

In addition, the High Definition frequency generation provides superior Power Supply Noise Rejection (PSNR). The enhanced PSNR Characteristic in the HD Oscillator simplifies the process of generating low jitter clocks in noisy environments found in many of today's networking and communication systems designs.

All of this means the electrical performance of the MAE108/MAE105 is better than the comparable technologies. The High Definition options mean you can get what you need in as little as 1 week or less.

Configurations can be specified using the Part Number Definition Guide below.

MAE1087P(L), MAE1057P(L) Definition Guide:							
Option Definition							Description
Example:	MAE108	7	P	3	7	C	155M5200 (Freq in MHz)
Package / Part Type	MAE108						7 x 5 mm package
	MAE105						5 x 3.2 mm package
Part Type - Output Definition		7					VCXO
Output / Voltage Definition			L				LVDS
			P				PECL
Supply Voltage Definition				3			3.3V
				2			2.5V
Stability-Pullability Definition					7		+/- 50ppm Stability, +/- 50 ppm APR
					8		+/- 50ppm Stability, +/- 100 ppm APR
					9		+/- 20ppm Stability, +/- 50 ppm APR
					6		Custom
Temperature Definition						C	-20 to +70C
						I	-40 to +85C
						M	-55 to +125C
						Z	Custom



HDVCXO™ Product Brief

«Zero» lead-time Clock
for low jitter Applications



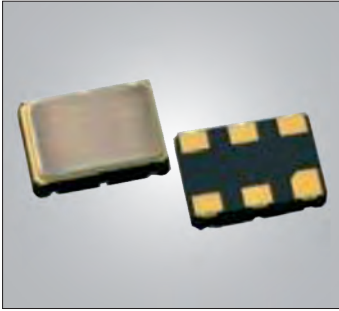
Operating Specifications:

Parameter	Symbol	Test Condition	Min	Typ	Max	Units
Nominal Frequency(1)	F _n	LVPECL/LVDS	10	—	1500	MHz
Supply Voltage (1)	V _{DD}	3.3 V option	2.97	3.3	3.63	V
		2.5 V option	2.25	2.5	2.75	
Supply Current	I _{DD}	LVPECL/LVDS	—	25	50	mA
Output Enable (OE)(2)	V _{IH}	V _{IH}	0.75 x V _{DD}	—	—	V
	V _{IL}	V _{IL}	—	—	0.5	
Start up Time (3)	t _{start}		—	—	10	ms
Operable Temp Range			-40	—	85	°C
Total Stability (1)(5)		Stability = ±20 ppm	—	—	±20	ppm
		Stability = ±25 ppm	—	—	±25	ppm
		Stability = ±50 ppm	—	—	±50	ppm
Initial Accuracy (4)		+25 °C at time of shipping	—	±10	—	ppm
Aging (4)		first year at 25 C average ambient	—	±3	—	ppm
		15 years at 25 C average ambient	—	±10	—	ppm
Control Voltage	V _c	3.3 V option	0	1.65	3.3	V
		2.5 V option	0	1.25	2.5	
Frequency Deviation, Absolute Pull Range (1)(6)	APR	V _c = 0.0 to 3.3V	+/-50	—	—	ppm
			+/-100	—	—	
LVPECL Output: 50 Ω to V _{DD} - 2.0 V	V _O		V _{DD} - 1.42	—	V _{DD} - 1.25	V
	V _{OD}	Voltage Swing	1.1	—	1.9	V _{PP}
LVDS Output: R _{term} = 100 Ω	V _O		1.125	1.2	1.275	V
	V _{OD}	Voltage Swing	0.5	0.7	0.9	V _{PP}
Rise/Fall time (20/80%)	t _r , t _f	LVPECL/LVDS	—	—	350	ps
Symmetry (duty cycle)	SYM	LVPECL: V _{DD} - 1.3 V, LVDS: 1.25 V	45	—	55	%
Period Jitter, 10K Cycles	J _{PER}	RMS	—	2	—	ps
		Peak-to-Peak	—	14	—	
Phase Jitter (RMS): Freq > 500 MHz, LVPECL or LVDS Output types	J _{PHS}	12 kHz to 20 MHz (OC-48)	—	0.25	0.4	ps
		50 kHz to 80 MHz (OC-192)	—	0.26	0.4	
Phase Jitter (RMS): Freq = 10 MHz to 500 MHz, LVPECL or LVDS Output types	J _{PHS}	12 kHz to 20 MHz (OC-48)	—	0.6	1	ps
		50 kHz to 20 MHz (OC-192)	—	0.4	1	

Notes:

- Selectable parameter specified by part number. See the "Definition Guide" for further details.
- OE pin includes a 20 K pull-up resistor to V_{DD}.
- Time from minimum V_{DD} power supply or tristate mode to V_{OH}, min.
- Initial accuracy, Temperature Stability, and 1st year aging are included in the Total Stability
- Total Stability includes Initial Accuracy, Temperature Stability, 1st year aging, Changes in Frequency due to Supply Voltage and Load, Shock and Vibration, and Reflow
- Absolute Pull Range (APR) is the Minimum amount of Frequency Deviation relative to the Nominal Frequency
The APR covers Changes in Temperature, Supply Voltage and Aging

Ref 2011-05a - All specifications are subject to change without notice



HDVCXO™ Product Brief

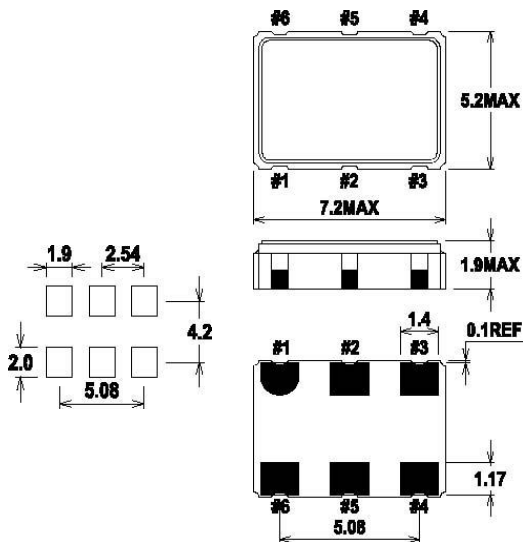
«Zero» lead-time Clock
for low jitter Applications



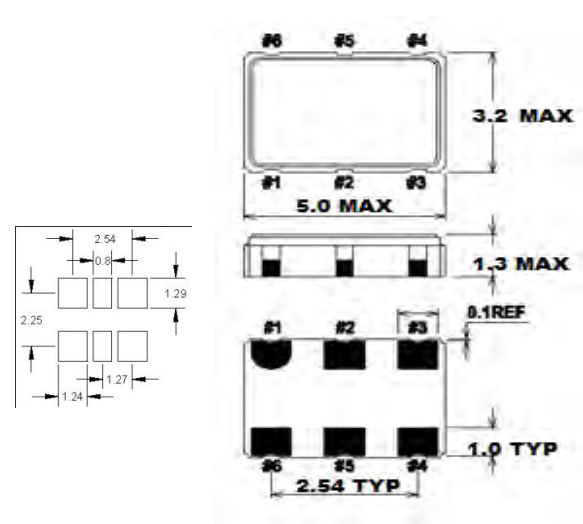
The MAE1087 and MAE1057 Voltage Controlled Crystal Oscillators are supplied in an industry-standard, RoHS compliant, 6-pad, 7 x 5 mm package or 5 x 3.2 mm package.

VCXO	DIFF
Pin#	MAE1087P(L) MAE1057P(L)
1	Vc
2	OE
3	GND
4	Output (+)
5	Output (-)
6	Vdd

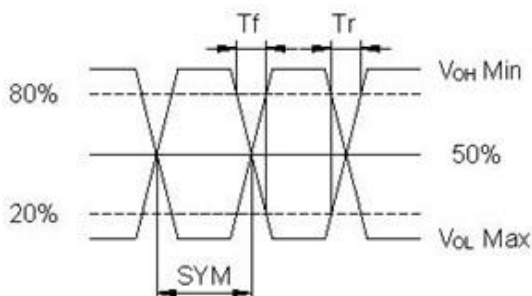
7.0 x 5.0 mm



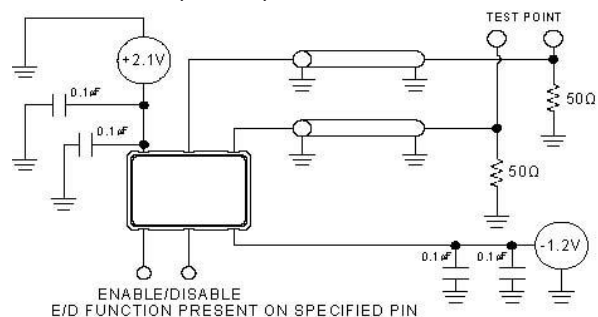
5.0 x 3.2 mm



Output Waveform



Test Circuit (PECL)



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