CLOCK OSCILLATORS
"HP" series (non-PLL based PECL)

Logic: PECL square wave

MERCURY
Since 1973

"**HP**" series use fundamental mode (inverted mesa) crystal to achieve stable and clean 10KH or 100KH differential PEC signals. No multiplier, no overtone and no phase lock loop technique is used. Jitter is as low as 1ps for the 155.520 MHz for SONET/SDH applications. The inherent advantage of differential PECL signal transmission provides improved noise immunity and makes the system less susceptible to ground noise.

PRODUCT SUMMARY:

Package code PECL	Frequency Range	Assembly Technique	Package Size (mm) [inches]. H: Seat height.
Thru-Hole Types			
4 PIN MODELS			
HP14	19.440 ~ 250 MHz	4 pin DIL full size. Hermetically sealed. Can height = 7.5 mm. Sealed crystal inside.	12.8 x 20.2 x 8.3H [0.504 x 0.795 x 0.327]
5 PIN MODELS			
HP514	19.440 ~250 MHz	5 pin DIL full size. Hermetically sealed. Can height = 7.5 mm. Sealed crystal inside.	12.8 x 20.2 x 8.3H [0.504 x 0.795 x 0.327]
6 PIN MODELS			
HP614	19.440 ~250 MHz	6 pin DIL full size. Hermetically sealed. Can height = 7.5 mm. Sealed crystal inside.	12.8 x 20.2 x 8.3H [0.504 x 0.795 x 0.327]
Surface Mount Types – Gull Wing			
4 PIN MODELS			
HP24	19.440 ~250 MHz	4 pin DIL full size. Hermetically sealed. Can height = 7.5 mm. Sealed crystal inside.	12.8 x 20.2 x 9.3H [0.504 x 0.795 x 0.366]
5 PIN MODELS			
HP524	19.440 ~250 MHz	5 pin DIL full size. Hermetically sealed. Can height = 7.5 mm. Sealed crystal inside.	12.8 x 20.2 x 9.3H [0.504 x 0.795 x 0.366]
6 PIN MODELS			
HP624	19.440 ~250 MHz	6 pin DIL full size. Hermetically sealed. Can height = 7.5 mm. Sealed crystal inside.	12.8 x 20.2 x 9.3H [0.504 x 0.795 x 0.366]
Surface Mount Types – Leadless			
HP62	19.440 ~250 MHz	6 pad Leadless.	9.6 x 11.4 x 2.5H [0.378 x 0.449 x 0.098]
HP64	19.440 ~250 MHz	6 pad Leadless.	9.6 x 11.4 x 4.7H [0.378 x 0.449 x 0.185]

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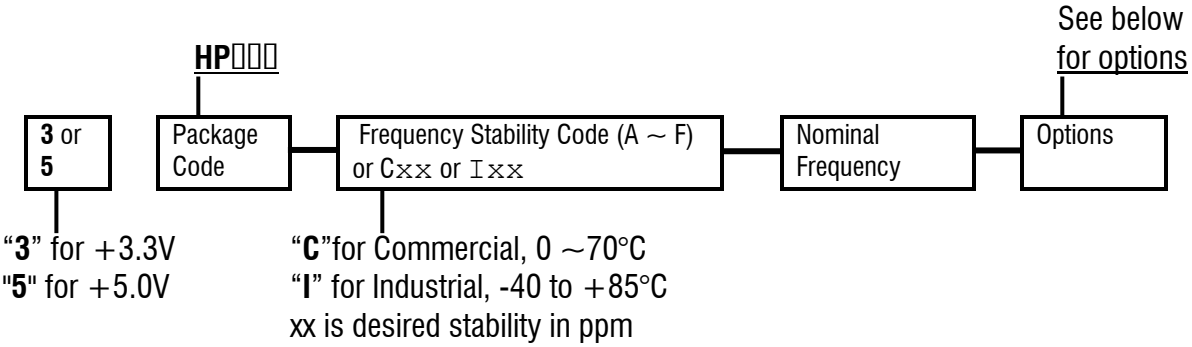
General Specification for "HP" series (low jitter)

T_A = +25°C, Inclusive of 25°C calibration tolerance, operating temperature range, Input voltage variation, load change, aging, shock and vibration.

Output Wave Form		**P E C L 100K square wave** Non-PLL based, fundamental mode inverted mesa crystal used.	
Frequency Range		19.440 ~ 250 MHz	
Standard Frequencies		38.880, 44.736, 50.000, 77.760, 100.000, 106.250, 125.000, 155.520, 166.6286, 200.0, 207.360, 212.500 MHz (partial list)	
Frequency Stability Commercial temp. range (code "**C**")		"**A**": ±25 ppm over 0°C to +70°C "**B**":±50 ppm over 0°C to +70°C "**C**":±100 ppm over 0°C to +70°C For non-standard please give desired frequency stability after the "C". For example "C20" is ±20 ppm over 0 to +70°C	
Frequency Stability Industrial temp. range (code "**I**")		"**D**":±25 ppm over -40°C to +85° (not available on all packages) "**E**":±50 ppm over -40°C to +85°C "**F**":±100 ppm over -40°C to +85°C For non-standard please give desired frequency stability after the "**I**". For example "I20" is ±20 ppm over -40 to +85°C	
Frequency Stability		vs Supply voltage ±5% change: ±3 ppm max. vs Load ±10% change: ±2 ppm max.	
Input Voltage Vcc		+3.3 V ±5% (**LVPECL**)	+5.0 V ±5% (**PECL**)
Output Voltage HIGH "1", V_{OH} (Relative to ground)		2.25 V min.	3.95 V min. 4.05 typical 4.15 V max
Output Voltage LOW "0", V_{OL} (Relative to ground)		1.65 V max.	3.15 min; 3.25 typical; 3.35 V max.
Current Consumption **(measured with terminating resistors)**		58 mA typical at 155.520 MHz 54 mA typical at 77.760 MHz	85 mA typical at 155.520 MHz 73 mA typical at 77.760 MHz
Load		50 ohms into Vcc-2V or Thevenin equivalent. (terminating resistors required on all outputs)	
Rise Time (Tr) and Fall Time (Tf)		1.5 nano sec. max (20% ↔ 80% Vcc)	
Duty Cycle at 50% output swing		50±2% typical; 50% ± 5% max. both outputs	
Jitter	**155.520 MHz, 5V as example**	Over 1 Hz to 1 MHz band width: 20 pico seconds RMS max. Over 10 Hz to 1 MHz band width: 1.8 pico seconds RMS max. Over 100 Hz to 1 MHz band width: 0.2 pico seconds RMS max. Over 12 kHz to 20 MHz band width: 1 pico seconds RMS max. Over 10 Hz to 20 MHz band width: 5 pico seconds RMS max.	
SSB Phase Noise	**155.520 MHz, 5V as example**	-50 dBc at 10 Hz offset, -80 dBc at 100 Hz offset, -110 dBc at 1 kHz offset, -135 dBc at 10 kHz offset, -145 dBc at 100 kHz offset, -145 dBc at 1 MHz offset	
Start-up Time		10 m sec. max.	
Aging		±2 ppm / year max.	
Storage Temperature		-55°C to +100°C	
Tri-state option		PECL output is disabled and complimentary output remains high when Tri-state pin is "HIGH". Both PECL and complimentary PECL outputs are high when Tri-state pin is "LOW'.	

PART NUMBER FORMAT AND EXAMPLES:



5HP14-A-125.0
represents +5.0 V non-PLL based PECL clock oscillator, 125.0 MHz in 4 pin DIP full size, frequency stability is ±25 ppm over 0 to +70°C. note: 125 MHz fundamental mode inverted mesa crystal used.

3HP614-C20-155.520-3T
represents +3.3 V clock oscillator with non-PLL based PECL output 155.520 MHz in 6 pin full size DIL, frequency stability is ±20 ppm over 0 to +70°C (commercial), with Tri-state option on pin 3.
note: 155.520 MHz fundamental mode inverted mesa crystal used.

MODELS WITH OPTIONS

4 pin thru-hole and gull wing models.

Part number suffix	**Pin 1**	**Pin 7**	**Pin 8**	**Pin 14**
blank	No Connection	Case ground	PECL Output	Supply Voltage
-1C	Complimentary PECL Output	Case ground	PECL Output	Supply Voltage
-1T	Tri-State	Case ground	PECL Output	Supply Voltage

5 pin thru-hole and gull wing models

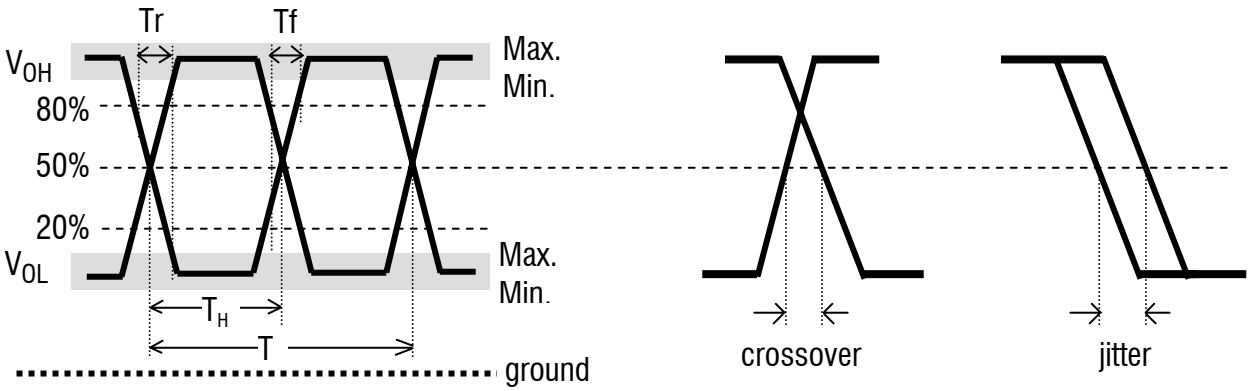
	Option			**Option**	
Part number suffix	**Pin 1**	**Pin 7**	**Pin 8**	**Pin 9**	**Pin 14**
blank	No Connection	Case ground	PECL Output	Complimentary PECL Output	Supply Voltage
- 1T	Tri-State	Case ground	PECL Output	Complimentary PECL Output	Supply Voltage

6 pin thru-hole and gull wing models

		Option			**option**	
Suffix	**Pin 1**	**Pin 3**	**Pin 7**	**Pin 8**	**Pin 12**	**Pin 14**
- 1T	Tri-State	No connection	Case ground	PECL Output	Complimentary PECL output	Supply Voltage
- 3T	No Connection	Tri-State	Case ground	PECL Output	Complimentary PECL output	Supply Voltage

6 pad leadless surface mount models : No option available. See package drawing for pin connect

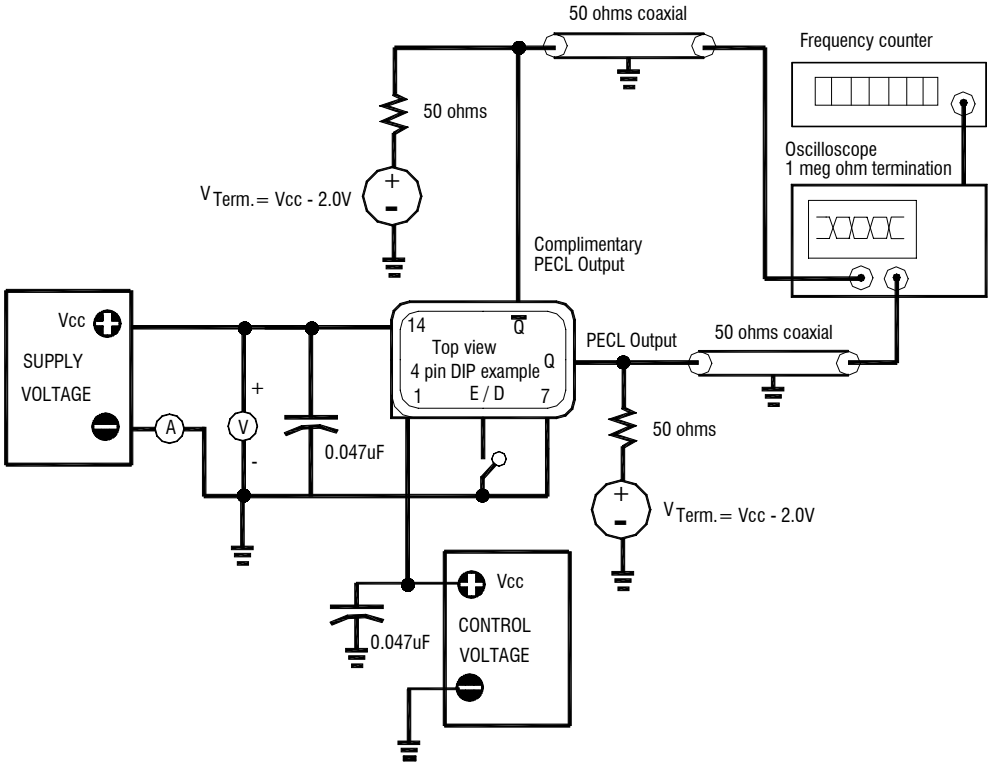
OUTPUT WAVEFORMS:



Duty cycle = $(T_H / T)*100$

TEST CIRCUIT

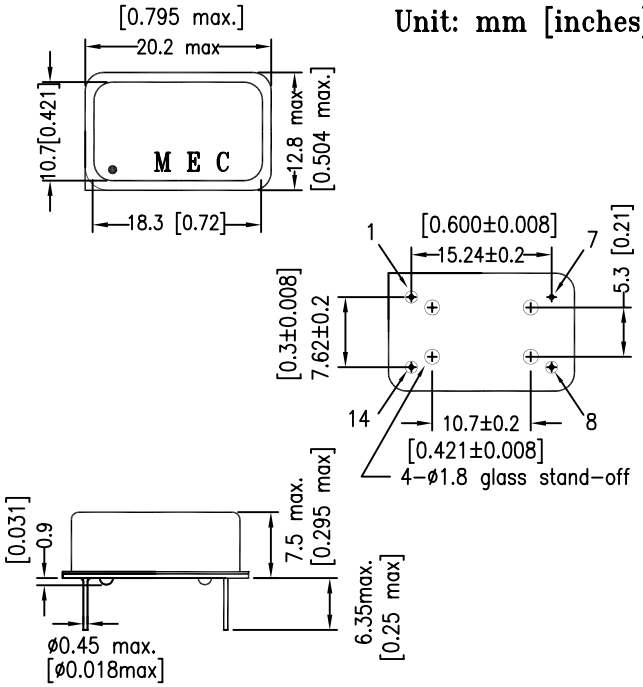
Apply to all models and options. Both PECL and complimentary PECL outputs shown.



Package: HP14

4 pins

Unit: mm [inches]



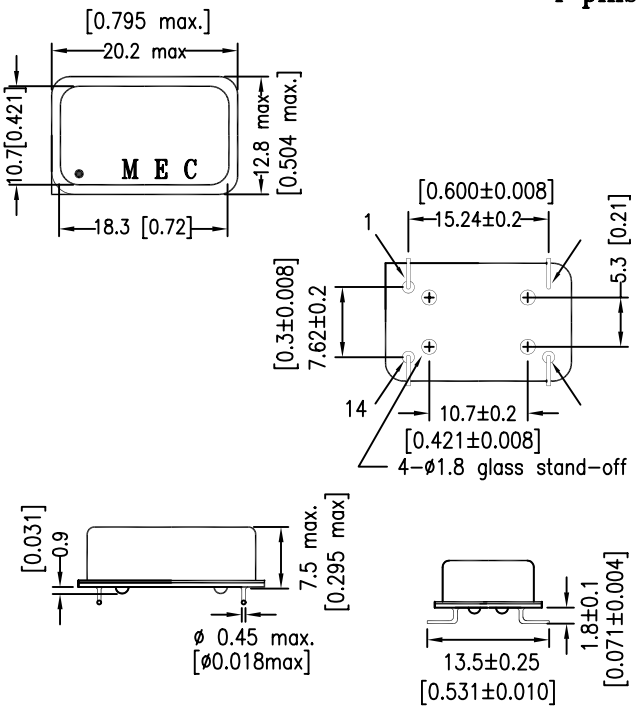
Pin Connections

Square corner is pin No.1

Pin 1: No connection, Tri–state or complimentary output
Pin 7: Vcc or VEE (refer to model options)
Pin 8: Output
Pin 14: Vcc or VEE (refer to model options)

Package: HP24

4 pins



Pin Connections

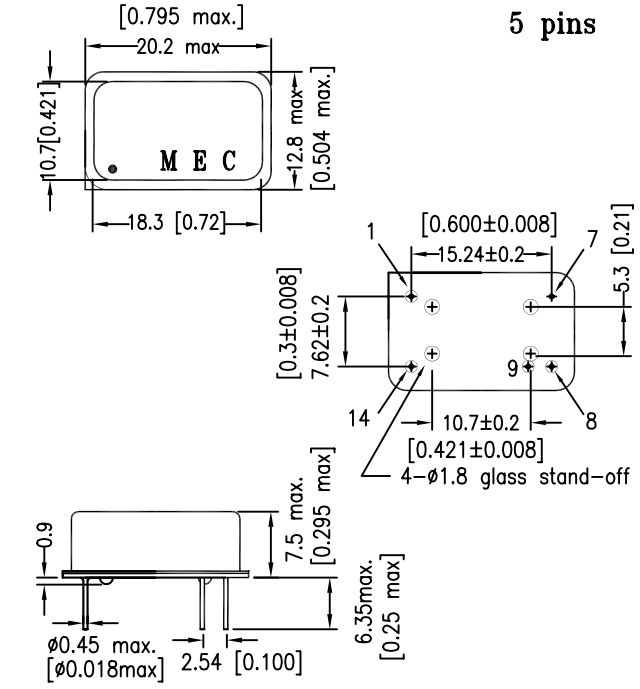
Square corner is pin No.1

Pin 1: No connection, Tri–state or complimentary output
Pin 7: Vcc or VEE (refer to model options)
Pin 8: Output
Pin 14: Vcc or VEE (refer to model options)

CLOCK
PECL

Package: HP514

5 pins



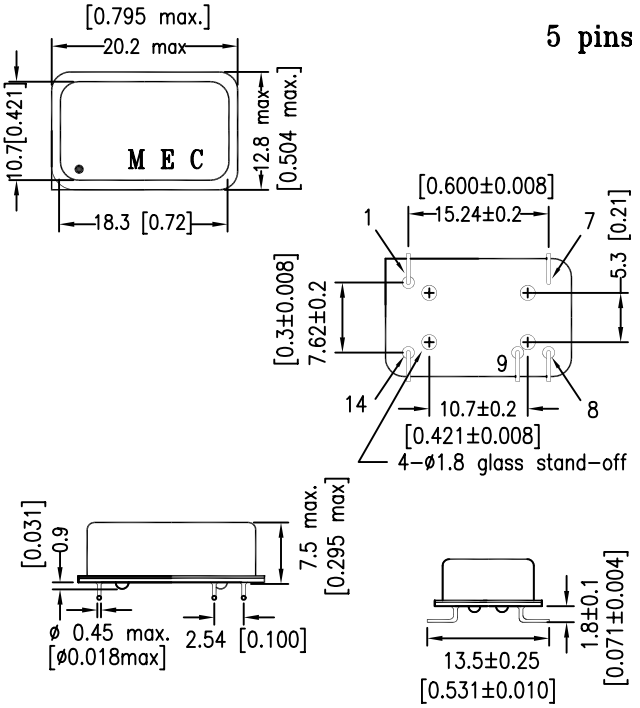
Pin Connections

Square corner is pin No.1
Pin 9: Complimentary output

Pin 1: No Connection or Tri–state
Pin 7: Ground
Pin 8: Output
Pin 14: Vcc

Package: HP524

5 pins



Pin Connections

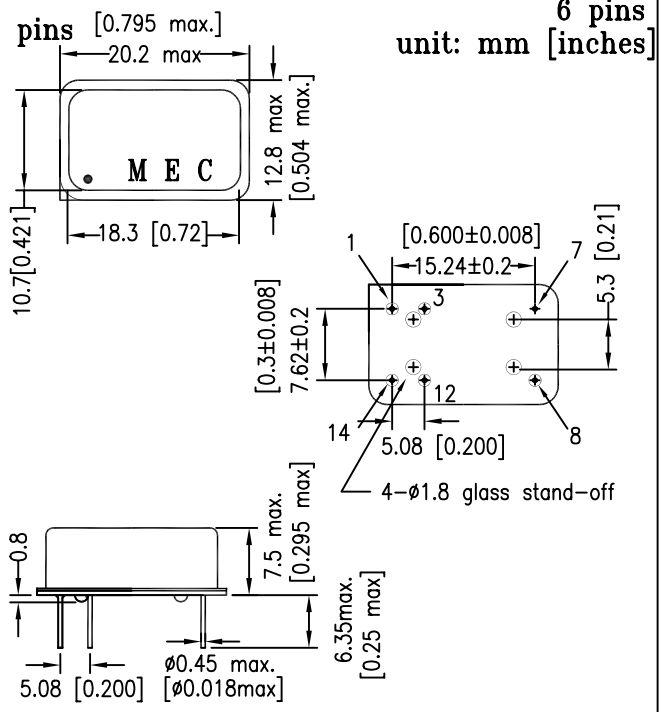
Square corner is pin No.1
Pin 9: Complimentary output

Pin 1: No Connection or Tri–state
Pin 7: Ground
Pin 8: Output
Pin 14: Vcc

Package: HP614

6 pins

6 pins
unit: mm [inches]



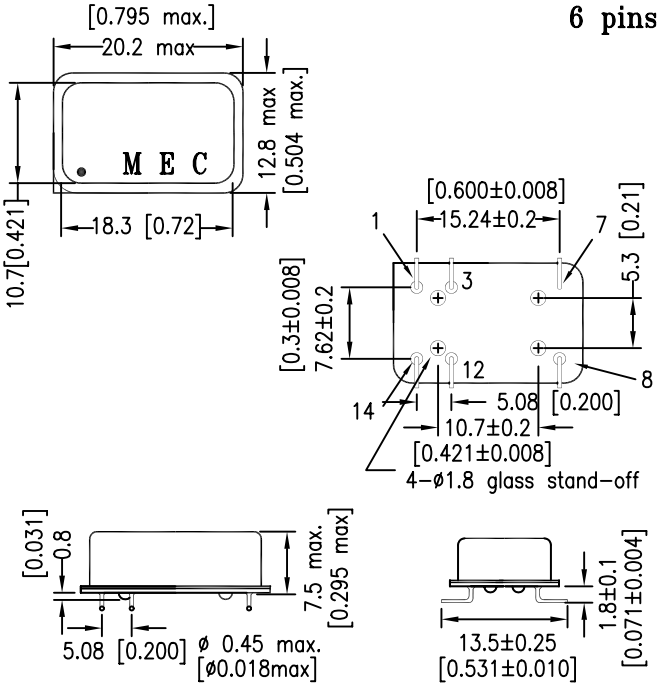
Square corner is pin No.1

Pin Connections

Pin 1: Tri–state or no Connection
Pin 7: Ground
Pin 8: Output
Pin 14: Vcc
Pin 3: Tri–state or no connection
Pin 12: Complimentary Output

Package: HP624

6 pins



Square corner is pin No.1

Pin Connections

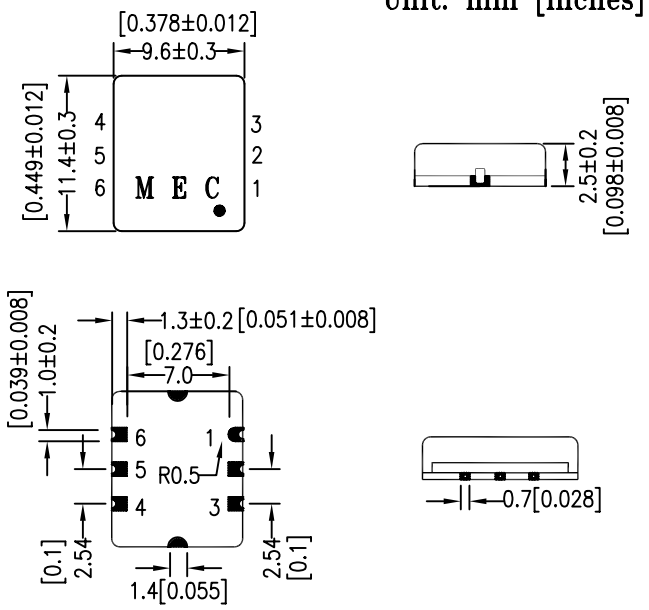
Pin 1: Tri–state or no Connection
Pin 7: Ground
Pin 8: Output
Pin 14: Vcc
Pin 3: Tri–state or no connection
Pin 12: Complimentary Output

CLOCK PECL

Package: HP62

"62" represents 6 pads and 2.5 mm overall height

Unit: mm [inches]



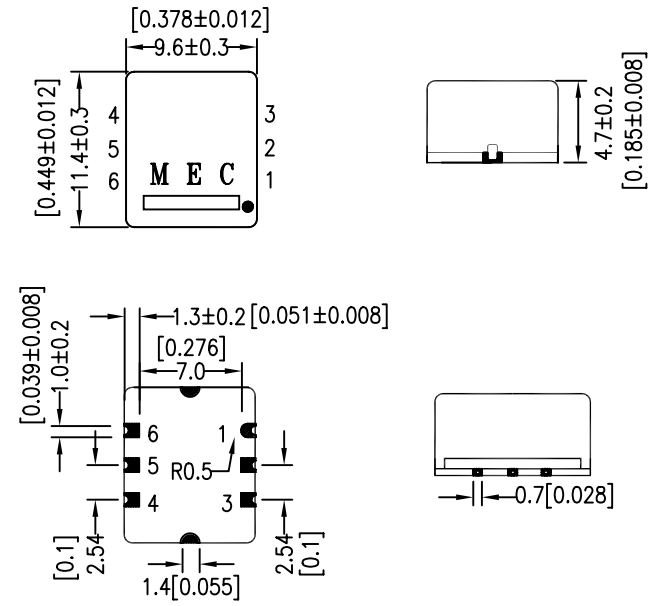
Rounded pad is pad No.1

Pad Connections:

Pad 1: No Connection
Pad 2: Tri–state
Pad 3: Ground
Pad 4: Output
Pad 5: Complimentary output
Pad 6: Vcc

Package: HP64

"64" represents 6 pads and 4.7 mm overall height



Rounded pad is pad No.1

Pad Connections:

Pad 1: No Connection
Pad 2: Tri–state
Pad 3: Ground
Pad 4: Output
Pad 5: Complimentary output
Pad 6: Vcc