

# PERFORMANCE PLASTIC PACKAGE ULTRA MINIATURE PURE SILICON™ CLOCK OSCILLATOR

ASEMP



Life Size   
3.2 x 2.5 x 0.85 mm

ASEMP

Moisture Sensitivity Level – MSL 1



RoHS/RoHS II compliant

## FEATURES:

- Ultra Miniature Pure Silicon™ Clock Oscillator
- High Performance MEMS Technology by Discera
- Low Power Consumption for high speed communication
- Exceptional Stability Over Temp. at -40 to +85°C, ±15ppm
- Extended Automotive Grade Temp. stability at -55 to +125°C, ±25ppm
- MIL-STD-883 shock and vibration compliant
- Durable QFN Plastic Compact Packaging
- Standby or Disable Tri-state function
- Low jitter (Period jitter RMS and Phase jitter RMS)
- High power supply noise reduction, -50dBc

## APPLICATIONS:

- Storage Area Networks (SATA, SAS, Fiber Channel)
- Passive Optical Networks (EPON, 10G-EPON, GPON, 10G-PON)
- Ethernet (1G, 10GBASE-T/KR/LR/SR, FCoE)
- PCI Express
- Display port

Low Jitter  
High Performance  
3G MEMS Technology!

## STANDARD SPECIFICATIONS:

### Common Key Electrical Specifications – CMOS, LVPECL, LVDS, and HCSL

| Parameters                           |        | Minimum                                                              | Typical | Maximum  | Units | Notes                              |
|--------------------------------------|--------|----------------------------------------------------------------------|---------|----------|-------|------------------------------------|
| Frequency Range                      | CMOS   | 2.3000*                                                              |         | 170.0000 | MHz   | -20 ~ +70°C<br>-40 ~ +85°C         |
|                                      | CMOS   | 3.3000*                                                              |         | 170.0000 |       | -40 ~ +105°C<br>-55 ~ +125°C       |
|                                      | LVPECL | 2.3000*                                                              |         | 460.0000 |       | Commercial, Industrial temp. range |
|                                      | LVDS   | 2.3000*                                                              |         | 460.0000 |       | Commercial, Industrial temp. range |
|                                      | HCSL   | 2.3000*                                                              |         | 460.0000 |       | Commercial, Industrial temp. range |
| Operating Temperature                |        | -20                                                                  |         | +70      | °C    | See options                        |
| Storage Temperature                  |        | -55                                                                  |         | +150     | °C    |                                    |
| Overall Frequency Stability          |        | -50                                                                  |         | +50      | ppm   | See options                        |
| Supply Voltage (Vdd)                 |        | +2.25                                                                |         | +3.6     | V     |                                    |
| Startup Time                         |        |                                                                      |         | 5        | ms    |                                    |
| Enable Time                          |        |                                                                      |         | 20       | ns    | STD (Tri-state)                    |
|                                      |        |                                                                      |         | 5        | ms    | PD option (Power Down)             |
| Disable Time                         |        |                                                                      |         | 5        | ns    |                                    |
| Disable Current                      |        |                                                                      | 20      | 22       | mA    | STD (Tri-state)                    |
|                                      |        |                                                                      |         | 0.095    |       | PD option (Power Down)             |
| Tri-state Function (Standby/Disable) |        | "1" (VIH≥0.75*Vdd) or Open: Oscillation<br>"0" (VIL<0.25*Vdd) : Hi Z |         |          | V     | 40kΩ pull-up resistor embedded     |
| Aging                                |        | -5.0                                                                 |         | +5.0     | ppm   | First year                         |

\* For 2.3000MHz ≤ F0 ≤ 9.9999MHz, 6-8 weeks lead-time applies

### Key Electrical Specifications – CMOS

| Parameters                                 |                 | Minimum             | Typical | Maximum             | Units | Notes                 |
|--------------------------------------------|-----------------|---------------------|---------|---------------------|-------|-----------------------|
| Supply Current (I <sub>dd</sub> )          |                 |                     | 31      | 35                  | mA    | CL=15pF, 125MHz       |
| Output Logic Level                         | V <sub>OH</sub> | 0.9*V <sub>dd</sub> |         |                     | V     | I=±6mA                |
|                                            | V <sub>OL</sub> |                     |         | 0.1*V <sub>dd</sub> | V     |                       |
| Rise Time                                  | Tr              |                     | 1.1     | 2.0                 | ns    | CL=15pF<br>20% to 80% |
| Fall Time                                  | Tf              |                     | 1.3     | 2.0                 | ns    |                       |
| Duty Cycle                                 |                 | 45                  |         | 55                  | %     |                       |
| Integrated Phase Jitter (J <sub>PH</sub> ) |                 |                     | 0.30    | 2                   | ps    | 200kHz ~ 20MHz@125MHz |
|                                            |                 |                     | 0.38    | 2                   |       | 100kHz ~ 20MHz@125MHz |
|                                            |                 |                     | 1.70    | 2                   |       | 12kHz ~ 20MHz@125MHz  |
| Period Jitter RMS (J <sub>PER</sub> )      |                 |                     | 3.0     |                     | ps    |                       |

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## Key Electrical Specifications – LVPECL

| Parameters                             |          | Minimum       | Typical | Maximum       | Units | Notes                        |
|----------------------------------------|----------|---------------|---------|---------------|-------|------------------------------|
| Supply Current ( $I_{dd}$ )            |          |               | 56.5    | 58            | mA    | RL=50Ω                       |
| Output Logic Level                     | $V_{OH}$ | $V_{dd}-1.08$ |         |               | V     | RL=50Ω                       |
|                                        | $V_{OL}$ |               |         | $V_{dd}-1.55$ | V     |                              |
| Peak to Peak Output Swing ( $V_{pp}$ ) |          |               | 800     |               | mV    | Single ended                 |
| Rise Time                              | $T_r$    |               | 250     |               | ps    | RL=50Ω, CL=0pF<br>20% to 80% |
| Fall Time                              | $T_f$    |               | 250     |               |       |                              |
| Duty Cycle                             |          | 48            |         | 52            | %     | Differential                 |
| Integrated Phase Jitter ( $J_{PH}$ )   |          |               | 0.25    | 2             | ps    | 200kHz ~ 20MHz<br>@156.25MHz |
|                                        |          |               | 0.38    | 2             |       | 100kHz ~ 20MHz<br>@156.25MHz |
|                                        |          |               | 1.70    | 2             |       | 12kHz ~ 20MHz<br>@156.25MHz  |
| Period Jitter RMS ( $J_{PER}$ )        |          |               | 2.5     |               | ps    |                              |

## Key Electrical Specifications – LVDS

| Parameters                               |       | Minimum | Typical | Maximum | Units | Notes                        |
|------------------------------------------|-------|---------|---------|---------|-------|------------------------------|
| Supply Current ( $I_{dd}$ )              |       |         | 29      | 32      | mA    | RL=100Ω                      |
| Output Offset Voltage ( $V_{OS}$ )       |       | 1.125   |         | 1.4     | V     | RL=100Ω differential         |
| Delta Offset Voltage ( $\Delta V_{OS}$ ) |       |         |         | 50      | mV    |                              |
| Peak to Peak Output Swing ( $V_{pp}$ )   |       |         | 350     |         | mV    | Single ended                 |
| Rise Time                                | $T_r$ |         | 200     |         | ps    | RL=50Ω, CL=2pF<br>20% to 80% |
| Fall Time                                | $T_f$ |         | 200     |         |       |                              |
| Duty Cycle                               |       | 48      |         | 52      | %     | Differential                 |
| Integrated Phase Jitter ( $J_{PH}$ )     |       |         | 0.28    | 2       | ps    | 200kHz ~ 20MHz<br>@156.25MHz |
|                                          |       |         | 0.40    | 2       |       | 100kHz ~ 20MHz<br>@156.25MHz |
|                                          |       |         | 1.70    | 2       |       | 12kHz ~ 20MHz<br>@156.25MHz  |
| Period Jitter RMS ( $J_{PER}$ )          |       |         | 2.5     |         | ps    |                              |

## Key Electrical Specifications – HCSL

| Parameters                             |          | Minimum | Typical | Maximum | Units | Notes                        |
|----------------------------------------|----------|---------|---------|---------|-------|------------------------------|
| Supply Current ( $I_{dd}$ )            |          |         | 40      | 42      | mA    | RL=50Ω                       |
| Output Logic Level                     | $V_{OH}$ | 0.725   |         |         | V     | RL=50Ω                       |
|                                        | $V_{OL}$ |         |         | 0.1     | V     |                              |
| Peak to Peak Output Swing ( $V_{pp}$ ) |          |         | 750     |         | mV    | Single ended                 |
| Rise Time                              | $T_r$    | 200     |         | 400     | ps    | RL=50Ω, CL=2pF<br>20% to 80% |
| Fall Time                              | $T_f$    | 200     |         | 400     |       |                              |
| Duty Cycle                             |          | 48      |         | 52      | %     | Differential                 |
| Integrated Phase Jitter ( $J_{PH}$ )   |          |         | 0.25    | 2       | ps    | 200kHz ~ 20MHz<br>@156.25MHz |
|                                        |          |         | 0.37    | 2       |       | 100kHz ~ 20MHz<br>@156.25MHz |
|                                        |          |         | 1.70    | 2       |       | 12kHz ~ 20MHz<br>@156.25MHz  |
| Period Jitter RMS ( $J_{PER}$ )        |          |         | 2.5     |         | ps    |                              |

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## Absolute Maximum Ratings

| Item            | Minimum | Maximum              | Unit | Condition |
|-----------------|---------|----------------------|------|-----------|
| Supply Voltage  | -0.3    | +4.0                 | V    |           |
| Input Voltage   | -0.3    | V <sub>dd</sub> +0.3 | V    |           |
| Junction Temp.  |         | +150                 | °C   |           |
| Storage Temp.   | -55     | +150                 | °C   |           |
| Soldering Temp. |         | +260                 | °C   | 40sec max |
| ESD             |         |                      | V    |           |
| HBM             |         | 4,000                |      |           |
| MM              |         | 400                  |      |           |
| CDM             |         | 1,500                |      |           |

## ➤ OPTIONS AND PART IDENTIFICATION: (left blank if standard)

### Programmed Orders (Quantity > 1,000pcs)

ASEMP  -  MHz -  -  -

| Output Type | Frequency in MHz                                      | Operating Temp.      | Overall Freq. Stability | Tri-state (Pin 1) | Packaging                      |
|-------------|-------------------------------------------------------|----------------------|-------------------------|-------------------|--------------------------------|
| C: CMOS     | e.g. 156.2500 MHz<br>(Maximum 4 digits after decimal) | Blank: -20°C ~ +70°C | Blank: ±50ppm           | Blank: Tri-state  | Blank***: Tube (110pcs / Tube) |
| LP: LVPECL  |                                                       | L: -40°C ~ +85°C     | Y: ±10ppm*              | PD: Power Down    | T: Tape & Reel (1kpcs / reel)  |
| LV: LVDS    |                                                       | X: -40°C ~ +105°C    | R: ±25 ppm              |                   | T3: Tape & Reel (3kpcs / reel) |
| HC: HCSL    |                                                       | Z**: -55°C ~ +125°C  |                         |                   | T5: Tape & Reel (5kpcs / reel) |

\* Temp option L, X or -20°C ~ +70°C, only

\*\* CMOS output only

\*\*\* For Quick turn-around programmable orders < 1000pcs: Due to the immediate availability of stock and the qty of the order, the parts may be delivered as BULK: Cut Tape, Loose parts in Antistatic Bag or in Tube(s). The MOQ per the series will still apply for Tube packaging.

### Un-Programmed Orders

Blank un-programmed oscillators and our low cost portable programmer are available for quick turn engineering requirements. Please call ABRACON or visit MEMSpeed Pro II site <http://www.abracon.com/memspeedpro/MEMSpeedProFlyerII.pdf> for more information.

ASEMP  - BLANK -  -  -

| Output Type | Operating Temp.      | Overall Freq. Stability | Tri-state (Pin 1) | Packaging                      |
|-------------|----------------------|-------------------------|-------------------|--------------------------------|
| C: CMOS     | Blank: -20°C ~ +70°C | Blank: ±50ppm           | Blank: Tri-state  | Blank: Tube (110pcs / Tube)    |
| LP: LVPECL  | L: -40°C ~ +85°C     | Y: ±10ppm*              | PD: Power Down    | T: Tape & Reel (1kpcs / reel)  |
| LV: LVDS    | X: -40°C ~ +105°C    | R: ±25 ppm              |                   | T3: Tape & Reel (3kpcs / reel) |
| HC: HCSL    | Z**: -55°C ~ +125°C  |                         |                   | T5: Tape & Reel (5kpcs / reel) |

\* Temp option L, X or -20°C ~ +70°C, only

\*\* CMOS output only

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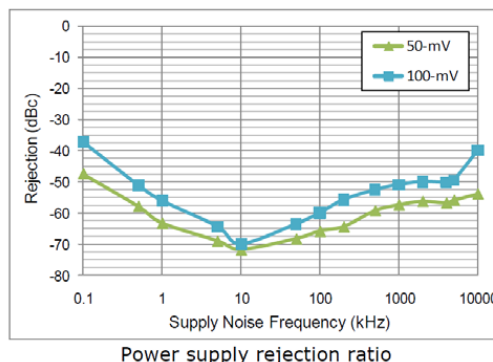
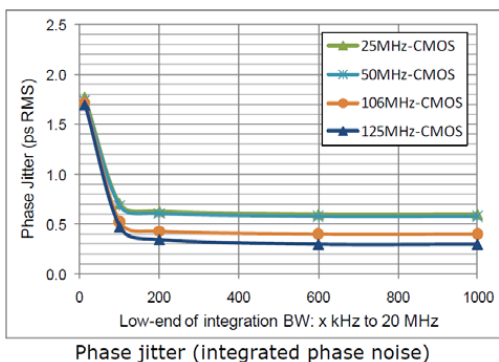


RoHS/RoHS II compliant

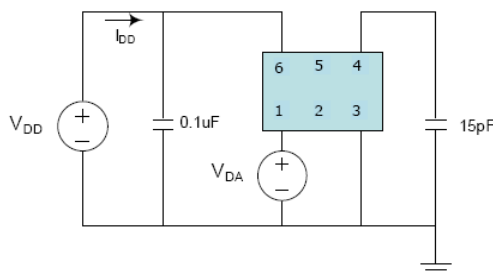
## NOMINAL PERFORMANCE PARAMETERS

(Unless specified otherwise: T=25° C, VDD=3.3 V)

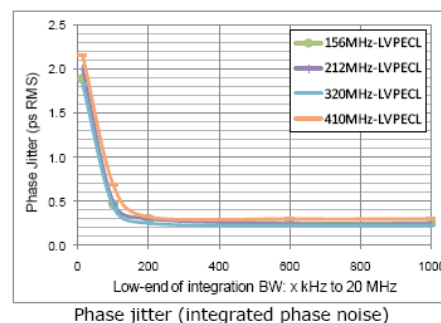
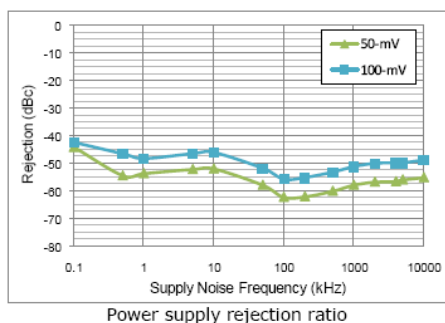
### CMOS OUTPUT



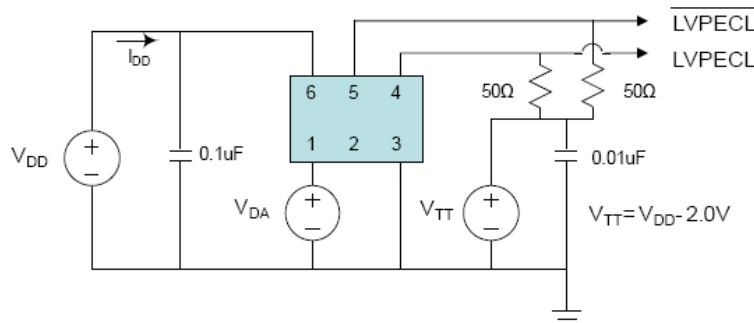
### Test Circuit



### LVPECL output



### Test Circuit



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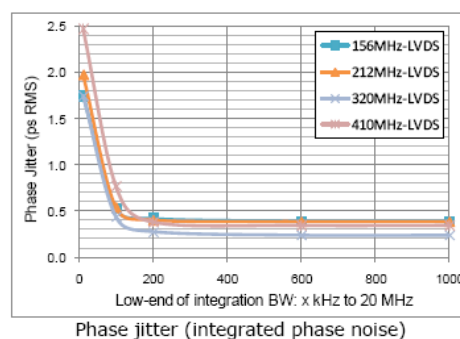
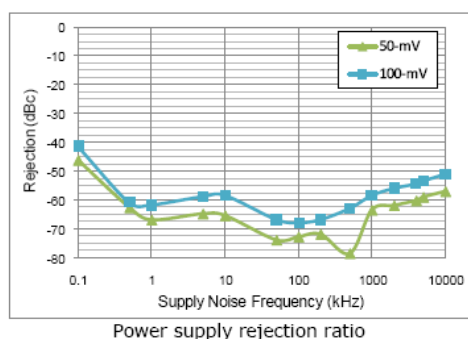
Life Size   
3.2 x 2.5 x 0.85 mm

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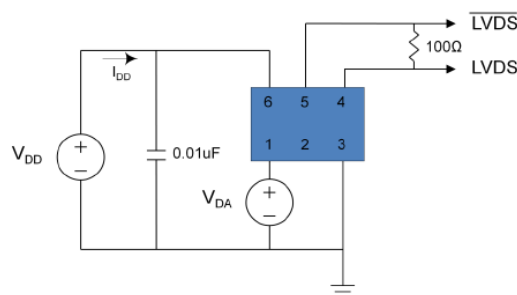


RoHS/RoHS II compliant

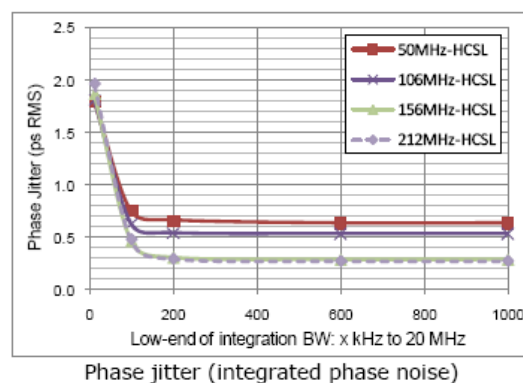
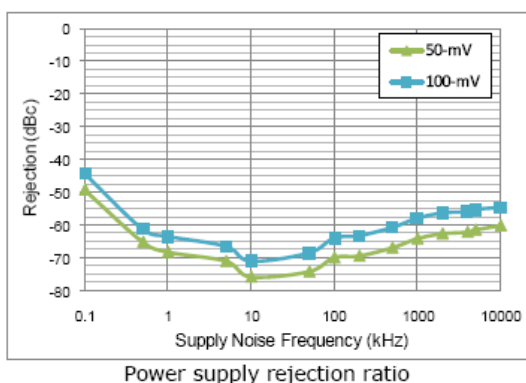
## LVDS OUTPUT



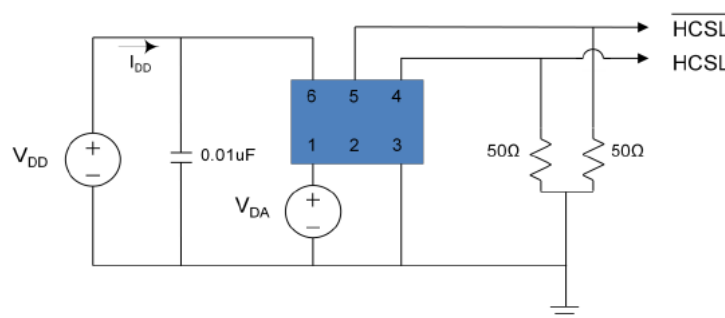
## Test Circuit



## HCSL OUTPUT



## Test Circuit



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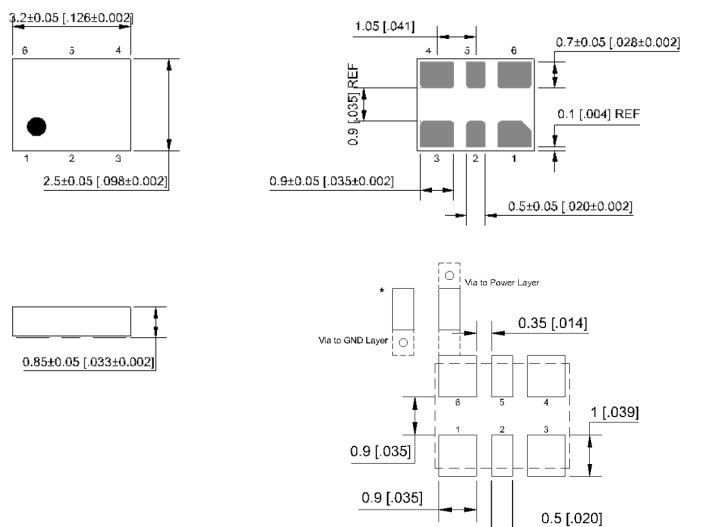
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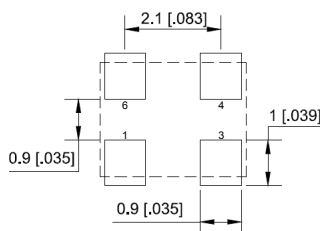
## OUTLINE DIMENSIONS:



Recommended Land Pattern for LVPECL, LVDS, HCSSL

| Pin # | Function                     |
|-------|------------------------------|
| 1     | Tri-state                    |
| 2     | NC                           |
| 3     | GND                          |
| 4     | Output                       |
| 5     | NC (CMOS)                    |
| 6     | Output (LVPECL, LVDS, HCSSL) |

Note: Recommend using an approximately 0.01uF bypass capacitor between PIN 6 and 3.

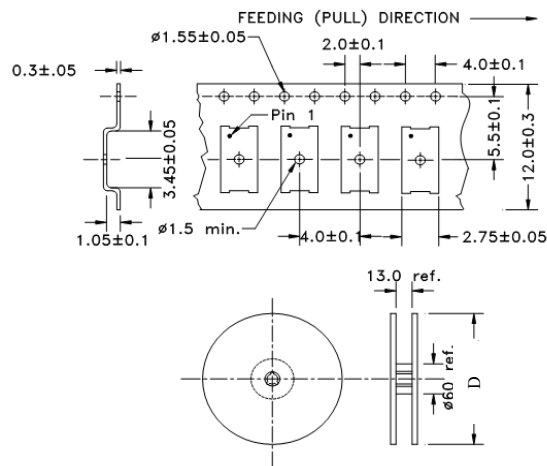


Recommended Land Pattern for CMOS

Dimensions: mm (inches)

## TAPE AND REEL:

T= 1,000pcs/reel (D=180mm)  
T3= 3,000pcs/reel (D=180mm)  
T5= 5,000pcs/reel (D=330mm)



Tube: 110 pcs/tube

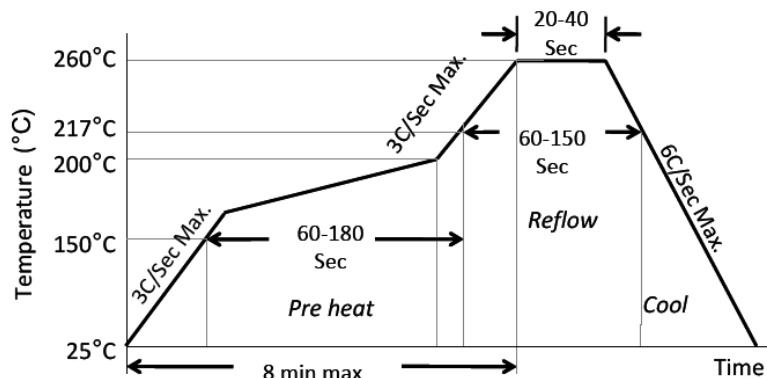


Unit orientation in tube:



Dimensions: mm

## REFLOW PROFILE:



|                                   |              |
|-----------------------------------|--------------|
| Ramp-Up Rate (200°C to Peak Temp) | 3°C/Sec Max. |
| Preheat Time 150°C to 200°C       | 60-180 Sec   |
| Time maintained above 217°C       | 60-150 Sec   |
| Peak Temperature                  | 255-260°C    |
| Time within 5°C of actual Peak    | 20-40 Sec    |
| Ramp-Down Rate                    | 6°C/Sec Max. |
| Time 25°C to Peak Temperature     | 8 min Max.   |

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