Overview

- Mirrorcle Technologies Inc. ("MTI") MEMS mirrors are available in the following standard ceramic packages:
  - In Connectorized (PCB with LCC) form: TINY20.4, TINY48.4
  - Un-connectorized: DIP24

- Detailed datasheet for each package is available at:

- In special cases of larger quantity orders other packages may be considered, after initial NRE and successful development.
Connectorized Packages Overview

Packages:

TINY20.4
TINY48.4

Mounts:

MOUNT-TINY.4-KMS
MOUNT-TINY.4-NM
Axes Orientation and Labels

- X+ and Y+ mirror rotation are defined by the rule of (right-hand) thumb, based on the x and y axes as shown in each diagram. (more on next page)

- Typically, MirrorcleTech MEMS mirrors are mounted so that X-axis driving provides laser beam sweep in the horizontal plane.
Scan Direction vs. Axis Rotation Orientation

- Mirrorcle documentation defines scanning based on rotation about an axis. For example, rotation about the X-axis is shown in images below (LEFT), which when mounted in Mirrorcle’s standard mounts results in horizontal scanning.

Rotation about the X-axis, as governed by X+ and X- terminals on the device results in beam scanning in the YZ plane (when laser is incident also in YZ plane)

Rotation about the Y-axis, as governed by Y- and Y+ terminals on the device results in beam scanning in the XZ plane (when laser is incident in XZ plane)

Note: Refer to Application Note AN004 - Angle of Incidence for additional information on the incoming beam orientation.
TINY20.4

All units in mm

4x Ø 1.73

15

12

15

12

1.65

1.57

5.6

S##### Device ID
(serial number)

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TINY48.4

All units in mm

S##### Device ID (serial number)

Pin 1

View from front

View from back

10-Pin connector (see page 11)
TINY20.4 Circuit Schematic
TINY48.4 Circuit Schematic
## Bill of Materials

<table>
<thead>
<tr>
<th>Item #</th>
<th>Qty</th>
<th>Ref Des</th>
<th>Digikey Part No.</th>
<th>Description</th>
<th>Package</th>
<th>Type</th>
<th>SMTs</th>
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<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>J1</td>
<td>1175-1629-ND</td>
<td>IDC BOX HEADER 0.050 10 POS</td>
<td>10-pin conn</td>
<td>smt</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>MEMS Package</td>
<td>LCC Package</td>
<td>LCC20, LCC48</td>
<td>LCC</td>
<td>smt</td>
<td>1</td>
</tr>
</tbody>
</table>
# J1 Connector Pinout

## 10 - Pin Header – J1

<table>
<thead>
<tr>
<th>Pin</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>HV_A (X+)</td>
<td>MEMS Channel X+</td>
</tr>
<tr>
<td>2</td>
<td>GND</td>
<td>Ground</td>
</tr>
<tr>
<td>3</td>
<td>HV_B (X-)</td>
<td>MEMS Channel X-</td>
</tr>
<tr>
<td>4</td>
<td>GND</td>
<td>Ground</td>
</tr>
<tr>
<td>5</td>
<td>HV_C (Y-)</td>
<td>MEMS Channel Y-</td>
</tr>
<tr>
<td>6</td>
<td>GND</td>
<td>Ground</td>
</tr>
<tr>
<td>7</td>
<td>HV_D (Y+)</td>
<td>MEMS Channel Y+</td>
</tr>
<tr>
<td>8</td>
<td>GND</td>
<td>Ground</td>
</tr>
<tr>
<td>9</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>10</td>
<td>GND</td>
<td>Ground</td>
</tr>
</tbody>
</table>

### Connector Part No.

| Digikey ID: 1175-1629-ND | 10 | Cable: SAM8219-ND |

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Using Connectorized Package MEMS Mirrors

- **Option 1: User’s own setup**
  - TINY20.4 and TINY48.4 packages can be used as delivered without any Mirrorcle-provided mounts (directly connected to Controller or Driver via ribbon cable). Users can utilize one or more of the provided holes or other methods to mount in their optical setups. Electrical connection from the Package connector is made directly to a Mirrorcle MEMS Controller or Driver.
  - **P/N:** n/a

- **Option 2: Mechanical Kinematic Mount for Breadboarding**
  - TINY20.4 and TINY48.4 packages can be mounted on a Mirrorcle-designed machined aluminum mount using 0-80 screws. The mount is assembled on top of a Thorlabs KMS mount with a ½” diameter post for easy integration into optical breadboarding setups. Electrical connection from the Package connector is made directly to a Mirrorcle MEMS Controller or Driver.
  - **P/N:** MOUNT-TINY.4-KMS
The mechanical mount has threaded holes for mounting on to a kinematic optical mount (KMS) with a breadboarding posts (8-32 thread), and holes for mounting of TINYPCBs (0-80 thread).

Carefully place the MEMS Mirror Package onto the mechanical mount such that the connector sits into the cavity, allowing for the cable to be connected from behind.

Secure the Package with two diagonally placed 0-80 screws.

Note: This Mount is not necessary in the optical setup. It is only intended as an optomechanical mount to assist with breadboarding and may be omitted. Mechanical model of mount available for purchase.

Note: No KMS P/N is MOUNT-TINY.4-NM
Unconnectorized Packages Overview

Packages:
DIP24

Mounts:
MOUNT-DIP.5-KMS
Axes Orientation and Labels

- X+ and Y+ mirror rotation is defined by the rule of (right-hand) thumb, based on the x and y axes as shown in each diagram.
- Typically, MirrorcleTech MEMS mirrors are mounted so that X-axis driving provides laser beam sweep in the horizontal plane.
DIP24 Dimensions

Ceramic Dimensions: 30.5 mm x 15.1 mm
Ceramic Thickness: 2.16 mm
Pin Pitch: 2.54 mm
**MOUNT-DIP.5-KMS Definitions**

- **PCB Dimensions:** 66.04mm x 25.40mm x 1.57mm
- **ZIF Socket Height:** ~12.5mm
- *ZIF socket lock extends 14mm from edge of PCB

**Easiest Handling:**
Device in DIP24 can be handled with gloved hands.
Socket operation does not require a tool.

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10-Pin connector
(see page 20 for Pinout)
DIP24 MiniPCB Circuit Schematic
# Bill of Materials

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<td>1</td>
<td>CON1</td>
<td>1175-1628-ND</td>
<td>BOX HEADER, 0.050 10 POS</td>
<td>Header</td>
<td>thru-hole</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>CON2</td>
<td>A300-ND</td>
<td>24 PIN ZIF SOCKET</td>
<td>Socket</td>
<td>thru-hole</td>
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CON1: Connector Pinout

10 - Pin Header

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<th>Pins</th>
<th>Mating Cables and Sockets</th>
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</thead>
<tbody>
<tr>
<td>Digikey ID: 1175-1628-ND</td>
<td>10</td>
<td>Cable: SAM8219-ND</td>
</tr>
</tbody>
</table>
For the DIP24 MEMS Mount, pin 1 is shown in the photos below, and pin 13 matches with the ZIF socket’s lever (socket is used opposite a “standard” ZIF configuration).

On the MEMS mirror’s DIP24 package, a gold marker indicates pin #1. Take care not to touch the protective cover covering the device. See figures in the following page for more details.

Prior to inserting the device into the ZIF socket, raise the lever on the ZIF socket to the up position. Carefully insert the DIP24 into the ZIF socket, mating pin 1 locations, and gently lower the ZIF lever to the down position (**CAUTION: do not allow the lever to snap down!**).

Note: When handling devices, disable the MEMS driver or Controller, or unplug the MEMS output cable from the MEMS driver or Controller.
How to Use – 2

- Always wear clean lab gloves and observe electrostatic discharge (ESD) protection procedures when handling devices. Open the lever on the ZIF socket such that it is 90° from the PCB surface.
- Hold the package only on its sides, not in any areas near the device cavity and the device itself. Place it into the ZIF socket.
- While holding the package against the MEMS Mount, (to prevent it from falling out when the ZIF lever is released), slowly lock the package into the socket by moving the lever on the ZIF package to the close position using two fingers.
Package Cover
AR-Coated Windows

- Three standard double-sided AR coated window options:

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<tbody>
<tr>
<td>Type A</td>
<td>400 nm</td>
<td>675 nm</td>
<td>22.5°</td>
<td>&gt;98%</td>
<td>A</td>
</tr>
<tr>
<td>Type B</td>
<td>675 nm</td>
<td>1040 nm</td>
<td>22.5°</td>
<td>&gt;98%</td>
<td>B</td>
</tr>
<tr>
<td>Type C</td>
<td>1040 nm</td>
<td>1600 nm</td>
<td>22.5°</td>
<td>&gt;98%</td>
<td>C</td>
</tr>
</tbody>
</table>

- All three window types transmittance are specified for +/−5° from AOI (Angle of Incidence) of 22.5°

- Customer specific wavelengths and AOI can be arranged for orders in quantities >250 units
Wedge for Tilted Window

- The AR-coated window can be mounted on an anodized aluminum wedge with a tilt to avoid reflections from the window to appear within (near the center of) the MEMS field-of-regard.
- The standard wedge is designed with a $-11^\circ$ tilt about the MEMS Y-axis (negative rotation about the Y-axis, sending the residual reflection UP)
Examples of Devices with Wedge-mounted Windows
Package Cover Attachment Options

- There are 3 methods of attaching the cover to the package:
  - The cover is permanently attached to the package using adhesive. Part: /EP
  - The cover is attached to the package using double-sided tape on all 4 edges. Part: /TP
  - A cover with temporary window (uncoated or coated with no specified optical performance) is lightly attached for protection of the MEMS Mirror and for easy removal, by using double-sided tape on only 2 edges. Part: /TW
MEMS Device Part Number Generation

Format: AAAAA.A-BBBBCC-DDDD-EE/F/GG

- A: MEMS actuator Design ID (e.g.: A7M20.1)
- B: Mirror diameter in microns (e.g.: 2000, NM for no Mirror)
- C: Mirror coating (AL, AU, SI for uncoated Silicon)
- D: MEMS carrier package ID (e.g.: TINY20.4)
- E: Cover window selection (e.g.: A)
- F: Wedge option: ‘/W’ for Wedge, or blank for no wedge
- G: Cover attachment method (e.g.: EP)

Thank You for Choosing

If you have any further questions or suggestions please email us:
support@mirrorcletech.com