



TM065049-2 Trackpad

Specification

Document Version 1.1.2

JULY 2017



This document describes the TM065049-2 (65.00 x 49.00 mm, 3.0 to 5.5 volts, USB, and multi-finger gestures), which general part number is TM065049-2-R04U-0500-10.

Note: *The TM065049-2 supports both PS/2 and USB depending on what cable is connected. See Cirque's TM065049-2 for PS/2 specification for details on available features using the PS/2 protocol.*

Sample hardware and firmware are available upon request. See the [Part Ordering Information on page 20](#).

Document Version History

Date	Current Version	Description
NOVEMBER 2014	1.0	Initial documentation release
JANUARY 2016	1.1	Updated Copyright and cable connector, supplier information.
NOVEMBER 2016	1.1.1	Updated Sample Rate vs Tracking Speed data. Edited for readability.
JULY 2017	1.1.2	Added button board connection details

Notice

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TM065049-2 Trackpad Overview

The TM065049-2 trackpad's dimensions are ideal for integration into products where space is a constraint and cursor quality is vital (Figure 1). The TM065049-2 trackpad is based on Cirque's GlidePoint® Gen 4 technology, also referred to as Gen 4. Cirque's Gen 4 technology features Image Sensing technology and provides native multi-touch gestures without requiring a custom driver.

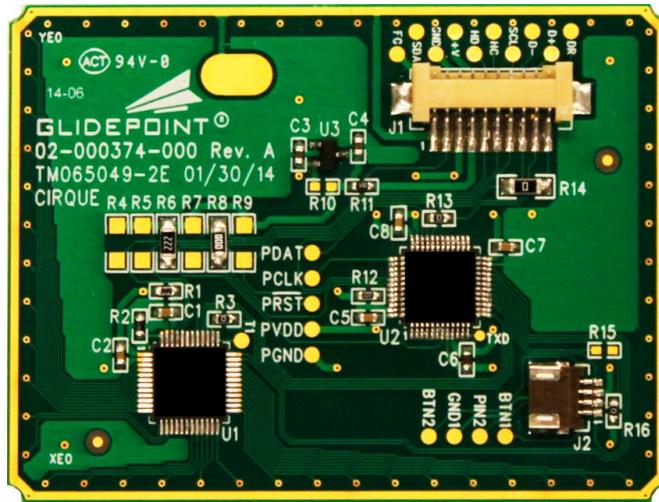


Figure 1. Component Side View of the TM065049-2 USB Trackpad

This document describes the mechanical and electrical specifications for the TM065049-2 trackpad. Suggested design considerations are also covered.

Note: The TM065049-2 supports both PS/2 and USB depending on what cable is connected. See Cirque's TM065049-2 for PS/2 specification for details on available features using the PS/2 protocol.

Benefits of the TM065049-2 Trackpad

Cirque's latest generation of trackpads define the standard for the pointing device industry. These solid-state devices are extremely durable because they have no moving parts to break down. This as well as the following benefits, makes the TM065049-2 an ideal solution for integration.

- | | |
|--|---|
| • Cirque's Gen 4 technology. | • Gestures work on all supported applications. |
| • Field upgradable. | • Able to track five points and report X and Y data. |
| • Built-in precise positioning and palm rejection. | • Highly reliable and durable. |
| • Environmentally sealed design. | • Superior navigation and high responsiveness. |
| • Adaptable and collaborative support for integrating this solution into your product. | • Advanced, multi-touch gestures without requiring an additional driver installation. |

Gen 4 Product Line Benefits

The GlidePoint Gen 4 image sensor uses a proprietary analog front end and customized MCU with flash memory, which provides the following benefits:

- Native multi-touch gestures - no additional driver installation is required.
- Built-in palm rejection technology.
- Optimized for the I2C and USB protocol.
- Excellent processing and measurement.
- Exceptional noise immunity.
- Superior default motion.

Cirque's GlidePoint trackpads operate as a standard mouse, and provide smooth and precise cursor control with no additional software for basic functions. The trackpad accurately responds to even the smallest finger movements, simply:

- Move a finger across the trackpad to move the cursor.
- Tap the pad to click.
- Tap the pad twice to double-click.
- Tap twice and then hold to drag, draw, and highlight.

Previously, it was necessary to install a driver for advanced gestures. Gen 4 provides multi-touch gestures (that is, advanced scroll, zoom, and other gesture capabilities) regardless of the operating system¹. For more information about [Advanced Gestures \(AG\) on page 12](#).

The firmware in Gen 4 trackpads includes superior cursor ballistics that has been optimized for best performance. These ballistics provide enhanced precision and cursor control. The palm rejection technology in the Gen 4 firmware detects large objects touching the trackpad. When a large object, or multiple objects, is on the trackpad, cursor movement is prevented.

¹ Gestures are dependent on the application. If the application supports the keystroke short cut, the gesture will occur regardless of the OS.

General Specifications

Operational Specifications

Position Detection Method:	Mutual capacitance sensing
X/Y Position Sensing Resolution:	Up to 60 counts/mm
X/Y Position Reporting:	Relative (similar to a mouse), or Absolute (via a register write)
Touch Force:	No contact pressure required
Lifetime: (Cirque PlasticOverlay)	Minimum 10,000,000 strokes (500 km)
	Note <i>These specifications are for Cirque's overlay. A custom overlay would need to be tested. See Overlay Specifications on page 15.</i>
Sample Rate:	Up to 100 samples/sec

Environmental Specifications

Operating Temperature: (Measured on Component side)	-40° to 85° Celsius
Operating Humidity at High Temperature:	Up to 95% relative humidity (Non-condensing)*
Storage Temperature:	-40 to 125° Celsius
Storage Humidity:	5% to 95% relative humidity (Non-condensing)*
ESD: (Applied to sensing surface)	Up to ±15 kV when module is properly installed

* Only for Humidity test, all other tests, Humidity is not controlled.

Note: For more information, see the [CT-120305 Environmental Test](#) document.

Interface Specifications

Communication Protocol:	USB
Hardware Requirements:	Compatible with native USB mouse drivers
Mechanical Buttons:	Two external buttons by default (Three external with optional configuration.)

Physical Specifications

Module Thickness:	5.50 mm Max Component Height (PCB + Overlay + Components) 1.90 mm \pm 0.25 mm (PCB + Overlay)
Module Length:	65.00 \pm 0.25 mm
Module Width:	49.00 \pm 0.25 mm
Module Weight:	< 14.0 grams
Active Sensing Area:	62.50 x 46.50 mm \pm 0.25 mm

Note: See [Physical Dimensions on page 8](#) for more information.

Electrical Specifications

Typical USB Average Voltage Range: 3.0 to 5.5 Volts

Suspend - not wake-enabled:	0.3 mA
Suspend - wake-enabled:	0.7 mA
Active - Touched:	19 mA
Idle	N/A*

*The Idle mode is not supported by Gen 4 USB modules.

Physical Dimensions

This section provides the dimensions of the TM065049-2 (Figure 2). These dimensions do not include an overlay.

Note: Unless otherwise noted,

- All dimensions shown in mechanical drawings are in millimeters and are not to scale
- All dimensional tolerances are ± 0.15 mm.

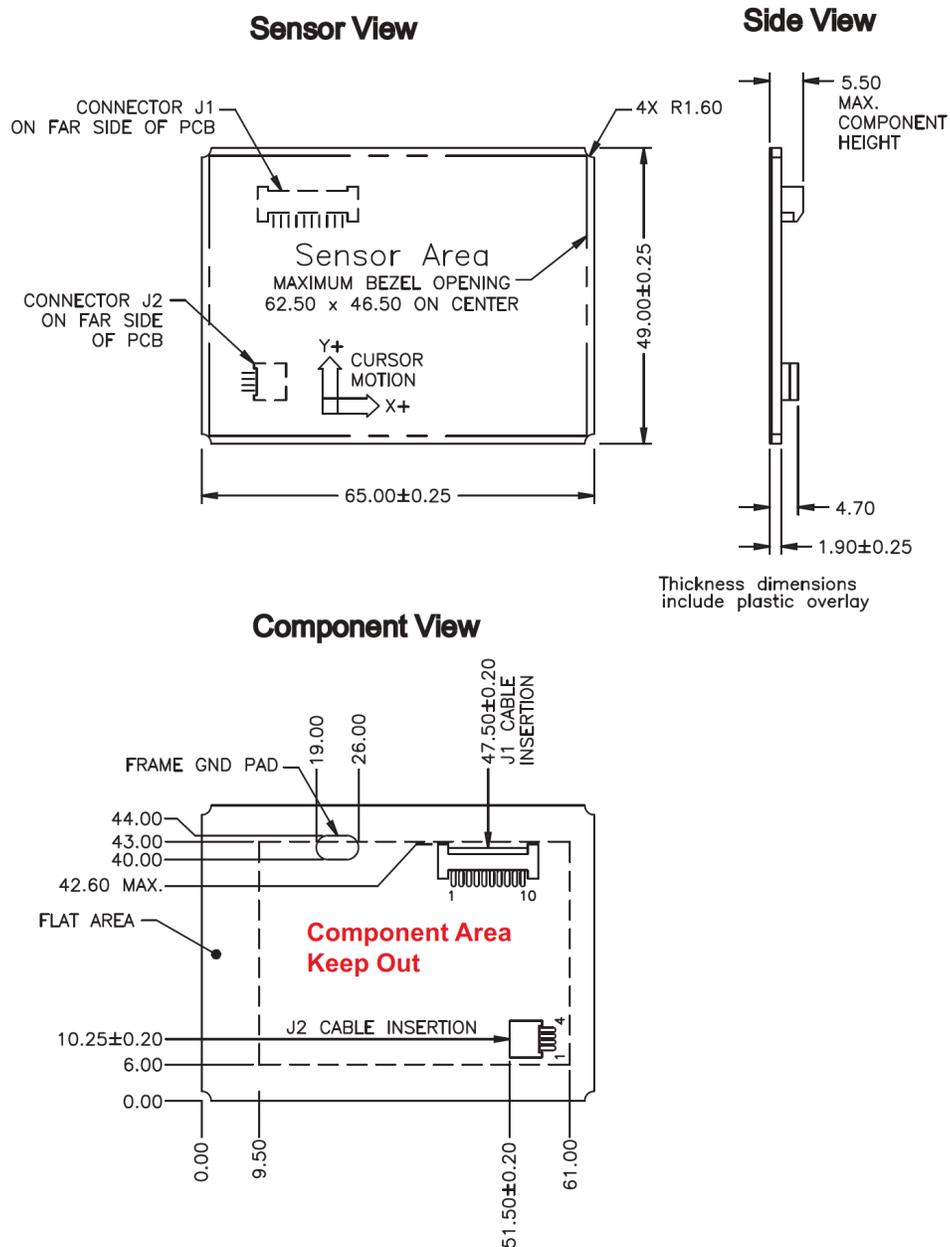


Figure 2. TM065049-2 Physical Dimensions - Sensor, Component, and Side Views

Interface Specifications

This section describes how the module connects or communicates to the host.

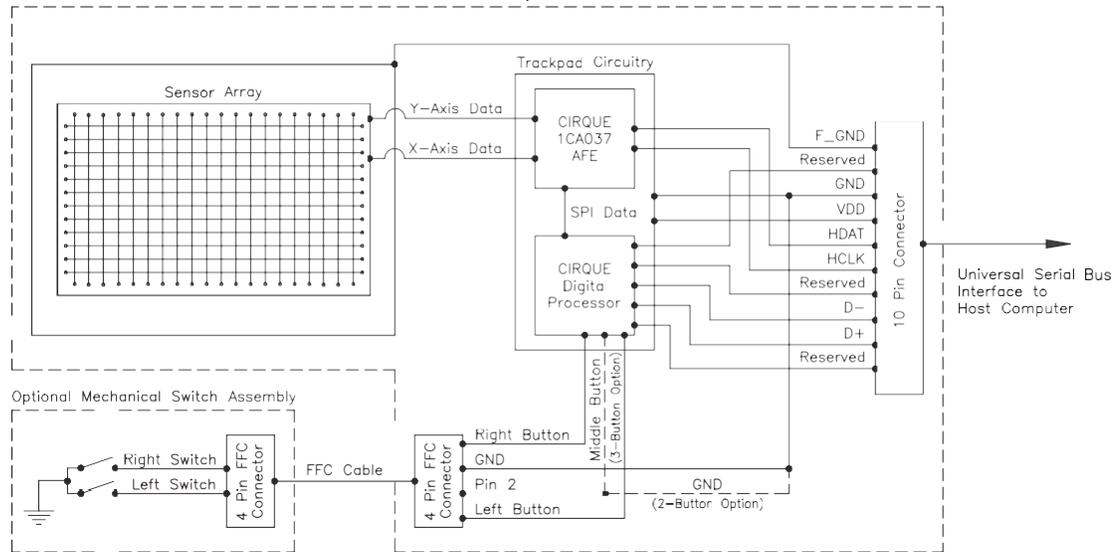


Figure 3. TM065049-2 System Interface Block Diagram

Connection to Host Computer

The 10-pin connector mounted on the trackpad module supports signals for USB communication, power supply, signal ground, and frame ground (SHIELD) (see Table 1).

Table 1. Pin Order for 10-Pin Connector

1	2	3	4	5	6	7	8	9	10
Frame Ground	Reserved	Ground	VDD	Reserved	Reserved	Reserved	USB D-	USB D+	Reserved

The connecting cable and mating connector are not included with the module. Both can be included as an additional option. See Table 2 below for supplier and manufacturing information.

Table 2. Host Cable Fabrication Information

Supplier	PCB Connector (Header Part #)	Cable Connector (Housing Part #)	Cable Connector (Crimp Pins Part #)
QVS (http://www.shopqvs.com/)	QVS1251RS0	QVS1253H10P	QVS1253-TP

Communication Specifications

The TM065049-2 supports the USB communication protocol. Positions are reported in a relative manner, the instantaneous position is always a DELTA with respect to the previous position. DELTAs are expressed in two's-complement notation.

USB Communication

USB communication between the TM065049-2 and the host computer is based upon USB HID class protocols as presented in the [Universal Serial Bus Specification, version 2.0 and USB Class Definition for Human Interface Devices \(HID\), version 1.11.](#)

The byte number value determines if the packet information is for a mouse or keyboard (see [Table 3](#)). The Mouse packet is shown in [Table 4](#). The Keyboard packet is shown in [Table 5](#) below. [Table 6 on page 11](#), provides the data for specific gestures.

Table 3. Gen 4 Data Format - Byte Number

Byte Number	Name	Description
0	ReportID	The unique identification assigned to each report, which is used to distinguish between mouse and keyboard data. For example, the mouse packet's report ID is 6 and a keyboard packet's report ID is 8.

Table 4. Mouse Packet Format - Report ID 6

Byte Number	Name	Description
1	Buttons	The button data.
2	X Delta	The X-motion deltas, signed 8-bit value.
3	Y Delta	The Y-motion deltas, signed 8-bit value.
4	Scroll Delta	The Vertical-scroll deltas, signed 8-bit value.
5	Pan Delta	The Horizontal-scroll deltas, signed 8-bit value.

Table 5. Keyboard Packet - Report ID 8

Byte Number	Name	Description
1	Modifier Keys	Bit 7 Right GUI Bit 6 Right Alt Bit 5 Right Shift Bit 4 Right Ctrl Bit 3 Left GUI Bit 2 Left Alt Bit 1 Left Shift Bit 0 Left Ctrl
2	Reserved	Reserved
3	Keycode 1	- Report ID 8
4	Keycode 2	Not used
5	Keycode 3	Not used
6	Keycode 4	Not used
7	Keycode 5	Not used
8	Keycode 6	Not used

Table 6. Keystate Table for Keystate 1- of Report ID 8

Value	Gesture	Key	Description
7	Minimize all	Letter "D"	Used for the Windows Logo key + D key command.
80	Back command	Left arrow	Used for the Alt + left arrow function.
79	Forward command	Right arrow	Used for the Alt + right arrow function.
6	Windows 8 Right edge	Left "C"	Used for the Windows Logo key + C key command.
43	Windows 8 Left edge	Tab	Used for the Windows Logo key + Tab key command.
29	Windows 8 Top edge	Letter "Z"	Used for the Windows Logo key + Z key command.

Buttons and Mechanical Switches

The TM065049-2 supports up to three separate buttons (two by default, three with optional configuration). Windows® based systems recognize the inputs as primary, secondary, and auxiliary buttons.

OEM customers may purchase or design and manufacture their own mechanical switch assembly. See [Table 4](#) and [Table 5](#) for supplier and manufacturing information.

Table 4. FFC Switch Interface

Manufacturer	Description	Part Number
Cirque Corporation	2-Button Switch Assembly	BTN000
Cirque Corporation	Standard length FFC cable (50.8 mm)	52-000001-02

Table 5. Cable and Connector Manufacturing Information

Manufacturer	Description	Part Number
Axon' Cable, Inc. (www.axon-cable.com)	Custom length FFC cable	FFC1.00A04/XXXXE4.0-4.0-06.0-06.0FB BB (Replace XXXX with preferred insulated length in mm)
J.S.T. Corporation (www.jst.com)	4-Pin FFC Connector	04FMS-1.0SP-TF(LF)(SN)

External Switch Interface

Button signals are routed through the 4-pin miniature flat-flex connector on the Component Side of the module (see [Figure 2 on page 8](#)). The pin-out details are shown in [Table 6](#). The 2-button configuration is default. The 3-button configuration is an optional hardware configuration.

This 1.0 mm pitch connector is designed to accept 0.33 mm thick Flexible Flat Cables (FFC) or Flexible Printed Circuits (FPC). The contacts on the connector simultaneously mate with both the top and bottom surfaces of the FFC or FPC, providing greater freedom in cable design and routing.

For ergonomic reasons, low-profile switch caps should be located near the bottom edge of the bezel window. Cirque recommends switch cap designs that are short but wide in order to prevent unintended button actuation during trackpad use.

Table 6. Button Connector Pin-out (4-Pin Connector)

	Pin #1	Pin #2	Pin #3	Pin #4
2-button configuration	Primary Button (LEFT)	GND	GND	Secondary Button (RIGHT)
3-button configuration	Primary Button (LEFT)	Auxiliary Button (Middle)	GND	Secondary Button (RIGHT)

User Interaction

This section describes how users can interact with the trackpad. For example, buttons, native multi-touch Advanced Gestures, and configurable options.

Configurable Options

Gen 4 offers two configurable gesture suites, a single finger suite and a multi-finger suite. Any gestures can be selected or disabled in either suite, allowing you to customize either gesture suite to meet your business needs. However, you cannot select gestures in both suites. These suites are customized through the USB interface. Contact Cirque for more information (see [Contact Information on page 20.](#))

Advanced Gestures (AG)

Cirque's GlidePoint TM065049-2 trackpad features single and multi-touch Advanced Gestures™, all without the need of a custom driver.

Note: *Currently, the Cirque GlidePoint driver is not available for this product.*

Users are able to interact in advanced ways without ever leaving the trackpad, allowing your devices to become even more useful to your customers. Gesture enabled devices offer the following:

Efficient Usability Experiences: Gestures allow users to activate programs and actions on the device. Familiar gestures that people use every day are easily made. For example, zooming in on pictures, and panning or scrolling through documents, all without having to perform multiple clicks and using menu bars. Gestures make it easier for your customers to use your devices.

Intuitive Interactions: Gestures are designed to function like everyday activities. A simple flick of your fingers, similar to turning a book page, will activate the back button on a web browser and other utilities. Dragging two fingers down the trackpad let users read a whole document without ever pushing a button. All open windows minimize by simply swiping three fingers in a downward motion.

Slides and Taps

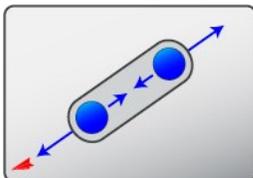
The following slides or taps are supported:

- Single-finger slide: Moves the mouse cursor.
- Tap: Primary button click.
- Double tap: Double click at the current cursor position.
- Two Finger tap: Activates right click menu.

Two-Finger Gestures

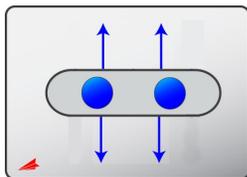
Gesture functions are subject to change with new releases.

Pinch/Zoom



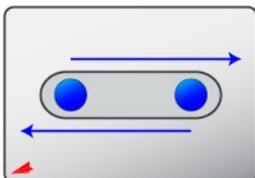
Place two fingers on the trackpad and expand the distance between the two fingers to zoom (enlarge the image view) or bring the fingers closer together to zoom out (shrink the image view).

Vertical Scroll/Pan



Move two fingers together on the trackpad to scroll vertically. Moving either up or down will scroll in that direction.

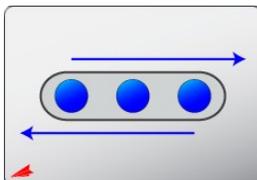
Horizontal Scroll/Pan



Move two fingers together on the trackpad to scroll horizontally (pan). Moving either left or right will scroll in that direction.

Three-Finger Gestures

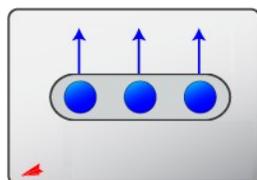
Back/Forward



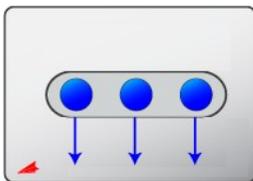
Flick three fingers quickly on the trackpad to go back and forward.

- Flick left to go back.
- Flick right to go forward.

Launch Start Menu



Flick three fingers upward on the trackpad to launch the Start Menu.

Minimize

Flick three fingers downward on the trackpad to minimize the active window.

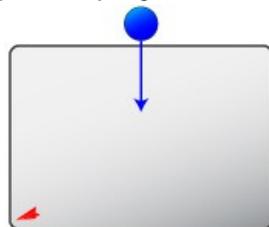
Swipe Gestures

In addition to the above gestures, the following Swipe gestures are supported.

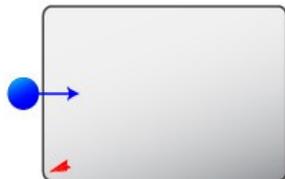
Note: Windows 8 gestures are only available to Windows 8 users.

Swipe from Right Edge

Place finger on the edge and then swipe from right edge onto the sensitive area of the trackpad. This act will toggle the charm bar.

Swipe from Top Edge

Place finger on the edge and then swipe down from top edge onto the sensitive area of the trackpad. This act will toggle the App commands.

Swipe from Left Edge

Place finger on the edge and then swipe from left edge onto the sensitive area of the trackpad. This act will cycle through previously open or used applications.

GlideExtend

The TM065049-2 includes Cirque's patented motion extender, GlideExtend[®]. GlideExtend differs from other motion extension approaches by allowing the user to retain direct control of the cursor at all times. When the user's finger encounters the edge of the trackpad during a drag, draw, or highlight operation, GlideExtend temporarily holds this function so that the user may lift and reposition their finger (similar to repositioning a mouse on a mouse pad). The user is always in control and is never required to "steer" as the cursor begins to coast in the direction of the finger.

Overlay Specifications

Cirque offers a series of laminate overlays that provide a durable surface that is resistant to environmental influences. Most of these overlays incorporate two distinct textures to define the areas on the trackpad where the GlideExtend® and Right Taps features may be activated during typical operations (see Figure 4). The slightly coarser texture of the GlideExtend zone provides valuable tactile feedback during drag, draw, and highlight operations and indicates to the consumer they may lift and reposition their finger away from the edge of the trackpad while GlideExtend is engaged. Similarly, the slightly coarser texture of the Right Taps zone alerts the consumer that tapping in this area will result in a secondary button input (“right click”). The Right Taps zone is also visually defined by a change in color.

Note: The Right Taps Zone is not active in the default version of this product and will need to be activated to be used.

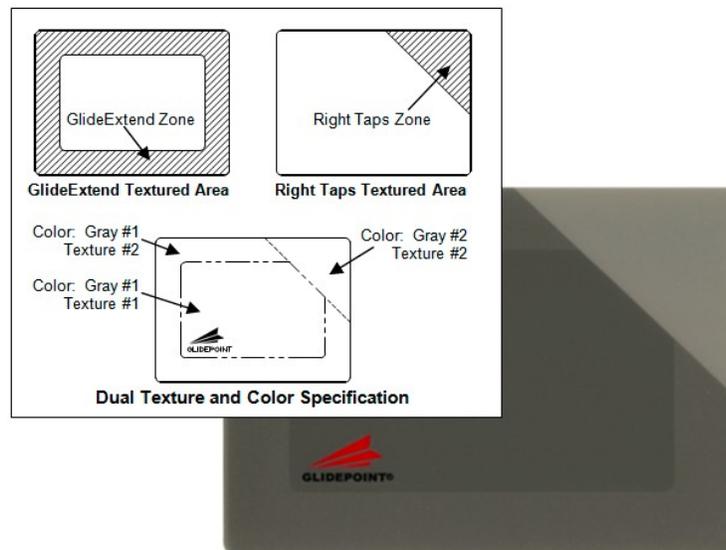


Figure 4. Standard OEM Overlay (Scale: NONE)

OEM customers can order a trackpad without an overlay and then purchase their own customized overlay. Custom overlays may include a logo and matching colors. Contact Cirque for overlay design guidelines.

Note: Ensure no air gaps remain when adhering an overlay to a trackpad. Air gaps between the trackpad sensing surface and the overlaying surface must be eliminated.

Overlay Design Recommendations

The following design recommendations are provided for manufacturing overlays:

- Do not use conductive materials over the sensing area as either an overlay substrate or a screen-printed coating (for example, ink, adhesive, and so forth.)
- Use thin overlay materials, such as polycarbonate or polyester 0.18 mm or 0.25 mm thick, in conjunction with an adhesive film 0.05 mm or 0.13 mm thick.
- Persistent contact between the overlay adhesive and the enclosure material must be made. Prevent air bubbles during the overlay application process.

Bezel Design Recommendations

Cirque offers the following bezel design recommendations as a guideline for integrating trackpads into enclosures.

Bezel Sidewall

Minimum Wall Thickness: A 1.0 mm minimum thickness is recommended to provide tactile feedback to the user, indicating that the finger has encountered a bezel edge.

Maximum Wall Thickness: An extremely thick and steep bezel sidewall may prevent a finger from accessing the outer edges of the trackpad and reduce the functional sensing and GlideExtend area of the pad.

Bezel Sidewall Geometry: A 30 to 45 degree tapered edge on the trackpad bezel is recommended to allow for optimum GlideExtend functionality. This edge also provides users with tactile feedback that they have encountered a bezel edge. Sidewall geometries outside of this 30 to 45 degree range can be used but should be verified through prototype to ensure satisfactory performance.

Bezel Window

Bezel Window Geometry: A rectangular or slightly modified rectangular window is recommended based upon the maximum bezel opening. It is important not to significantly infringe upon the GlideExtend region of the pad as it could result in diminished GlideExtend performance. For aesthetic reasons, an equal offset with respect to the maximum bezel opening is suggested when using the OEM dual textured overlay.

Alignment in Bezel: The trackpad should be reasonably centered in the bezel opening to ensure proper functionality.

Electrical Considerations

Conductive Bezel Materials: Conductive bezel materials may be used if the bezel does not overlap the maximum bezel opening area of the module.

Mounting Design Recommendations

The thin, flat profile of the TM065049-2 makes it compatible with a variety of industry practices for mounting trackpads into enclosures. Regardless of the mounting technique employed, it is important that the trackpad be supported from the underside of the trackpad assembly. This will prevent excessive flexing of the assembly during finger tapping operations.

Alignment

The four corners of the circuit board incorporate a quarter section of a 3.20 mm diameter hole that may be used to locate the trackpad within the bezel window. These sections may be used for alignment posts or studs on the underside of the bezel. A common method for aligning the trackpad in the bezel window involves incorporating a slightly recessed area in the underside of the bezel window. The geometry of this recessed area should closely follow the contour of the TM065049-2 circuit board and overlay, allowing a small amount of extra room to accommodate manufacturing tolerances.

Support Features

The TM065049-2 includes a flat area on the Component Side (underside) of the trackpad module (see [Figure 1 on page 4](#)). This flat area should be used for support features (such as ribs, posts, and brackets) to make contact with the underside of the assembly. Only insulated features are allowed to make contact with the flat area of the assembly.

Mounting Techniques

Clamshell Mounting: A common practice for mounting trackpads into enclosures involves clamping the assembly between two of the enclosure's components, resulting in a clamshell structure that secures the trackpad in place. The upper section of the clamshell typically includes the bezel window opening and alignment features, while the bottom section of the clamshell incorporates support features. It is recommended that a slight amount of interference exist between the clamshell structure and the trackpad to prevent it from sliding or rattling around within the bezel window.

Mounting Bracket Sub-Chassis: Mounting brackets typically employ screw bosses or stud-like features within close proximity to the bezel onto which the sub-chassis is secured. It is recommended that the trackpad be held in place between the sub-chassis and the underside of the enclosure with a slight compression fit. The sub-chassis should provide adequate support features to prevent the trackpad from flexing noticeably during heavy finger usage.

ESD Protection and EMI Specification

Cirque performs ESD tests at the module level. OEM customers should test and validate ESD performance at each system level. Cirque's ESD tests are based on the IEC61000-4-2, a system-level test specification.

To achieve good ESD performance (up to ± 15 kV), a low impedance path to frame ground must be present in order to dissipate inadvertent electrostatic discharges to the touch surface of the TM065049-2. Pin 1 on the 10-pin miniature connector provides a direct path to frame ground when properly connected to the host computer (J1: see [Figure 1 on page 4](#)).

If a suitable connection to frame ground is NOT present in the cable connecting the TM065049-2 trackpad to the host device, the circuit board includes a frame-ground solder pad on the Component Side of the trackpad module. Cirque recommends using either a drain wire (soldered directly to the pad) or conductive fabric tape to provide a connection between the trackpad and the frame ground of the host computer.

EMI Susceptibility

Cirque performs Electromagnetic Interference (EMI) tests based on the International Electrotechnical Commission (IEC) international standards for radiated and conducted electromagnetic interference.

The TM065049-2 trackpad exhibits low susceptibility to electromagnetic interference in noisy environments. Contact a Cirque OEM sales representative to obtain EMI guidelines and test procedures.

For more information, contact Cirque Corporation ([Contact Information on page 20](#)).

Contact Information

Contact a Cirque sales representative for a complete list of Cirque's OEM products.

In United States & Canada	(800) GLIDE-75 (454-3375)
Outside US & Canada	(801) 467-1100
Fax	(801) 467-0208
Web site	http://www.cirque.com

Part Ordering Information

When ordering parts, please contact your Cirque representative to assist you in selecting the correct size, power, configurations, and overlay that will best meet your capacitive touch needs.

Multi-Finger Gestures Part Number

Example: TM065049-2-R04U-0500-10

Table 7. USB Part Number Explanation

Category	Horizontal Size	Vertical Size	Variance	Volt	IC	I/O	Customer Special	Customer Special	Overlay	HW Diff	SW Diff
TM	65 mm	49 mm	2	R= 3 -5.5 V	04 = Rushmore	U = USB	0	50 Multi	0	1	0

Single-Finger Gestures Part Number

Example: TM065049-2-R04U-000-10

Table 8. USB Part Number Explanation

Category	Horizontal Size	Vertical Size	Variance	Volt	IC	I/O	Customer Special	Customer Special	Overlay	HW Diff	SW Diff
TM	65 mm	49 mm	2	R= 3 -5.5 V	04 = Rushmore	U = USB	0	00 single	0	1	0

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