

PROTECTION PRODUCTS

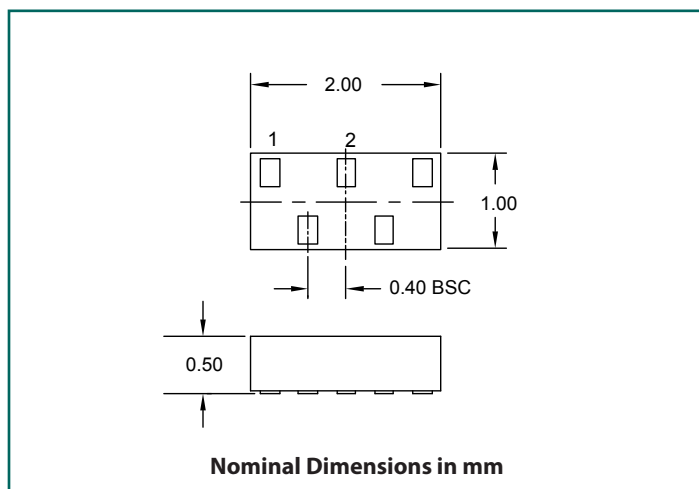
Description

RClamp®0564P is an ultra low capacitance ESD protection device specifically designed to protect high-speed differential lines. It offers desirable characteristics for board level protection including fast response time, low operating and clamping voltage, and no device degradation.

RClamp0564P features extremely good ESD protection characteristics highlighted by low peak ESD clamping voltage, and high ESD withstand voltage (+/-10kV contact per IEC 61000-4-2). RClamp0564P is designed to minimize both the ESD peak clamping and the TLP clamping. Package inductance is reduced at each pin resulting in lower peak ESD clamping voltage. RClamp0564P has a typical capacitance of 0.17pF allowing it to be used in high bandwidth applications such as HDMI 2.0 4K/2K, Thunderbolt, and USB 3.1. Each device will protect four high-speed data lines operating up to 5 volts.

RClamp0564P is in a 5-pin SGP2010N5 package measuring 2.0 x 1.0mm with a nominal height of 0.50mm. The leads have a nominal pin-to-pin pitch of 0.40mm. Flow-through package design simplifies PCB layout and maintains signal integrity on high-speed lines.

Nominal Dimensions



Features

- High ESD Withstand Voltage
 - ♦ IEC 61000-4-2 (ESD) 10kV (contact)
- Ultra-Low Capacitance: 0.17pF Typical
- Very Small PCB Area
- Protects Four High-Speed Data Lines
- Working Voltage: 5V
- Low Dynamic Resistance: 0.65 Ohms
- Large Operating Bandwidth: 12GHz
- Solid-State Silicon-Avalanche Technology

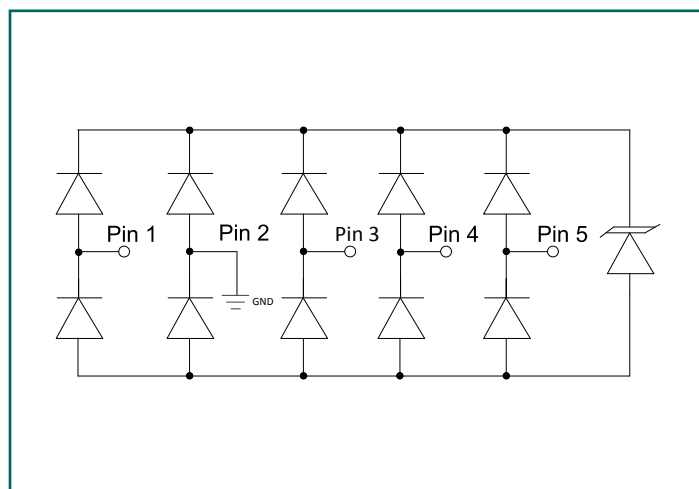
Mechanical Characteristics

- SGP2010N5 Package
- Pb-Free, Halogen Free, RoHS/WEEE Compliant
- Nominal Dimensions: 2.0 x 1.0 x 0.50 mm
- Lead Pitch: 0.40mm
- Lead Finish: NiPdAu
- Marking : Marking Code
- Packaging : Tape and Reel

Applications

- HDMI 1.4, HDMI1.4b and HDMI 2.0
- DisplayPort
- USB 3.0 and USB 3.1
- USB Type-C
- Thunderbolt
- MIPI / MDDI

Schematic



Absolute Maximum Ratings

Rating	Symbol	Value	Units
Peak Pulse Current (tp = 8/20μs)	I _{PP}	3	A
ESD per IEC 61000-4-2 (Contact) ⁽¹⁾ ESD per IEC 61000-4-2 (Air) ⁽²⁾	V _{ESD}	±10 ±15	kV
Operating Temperature	T _J	-40 to +85	°C
Storage Temperature	T _{STG}	-55 to +150	°C

Electrical Characteristics (T=25°C unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Reverse Stand-Off Voltage	V _{RWM}	-40°C to 85°C			5	V
Reverse Breakdown Voltage	V _{BR}	I _t = 10mA -40°C to 85°C	6.5	9.5	10.5	V
Holding Current	I _H			100		mA
Reverse Leakage Current	I _R	V _{RWM} = 5V	T = 25°C	1	50	nA
			T = 85°C	10	150	nA
Clamping Voltage ³	V _C	I _{pp} = 3A, tp = 8/20μs		4		V
ESD Clamping Voltage ⁴	V _C	I _{pp} = 4A, tp = 0.2/100ns (TLP)		5.5		V
ESD Clamping Voltage ⁴	V _C	I _{pp} = 16A, tp = 0.2/100ns (TLP)		13.5		V
Dynamic Resistance ^{4,5}	R _{DYN}	tp = 0.2/100ns (TLP)		0.65		Ohms
Junction Capacitance	C _J	V _R = 0V, f = 1MHz T = 25°C		0.17	0.20	pF
Cutoff Frequency	F _C	-3dB		12		GHz

Notes:

(1) Measured with a 40dB attenuator, 50 Ohm scope input impedance, 2GHz bandwidth. ESD gun return path connected to Ground Reference Plane (GRP)

(2) In-System ESD withstand voltage

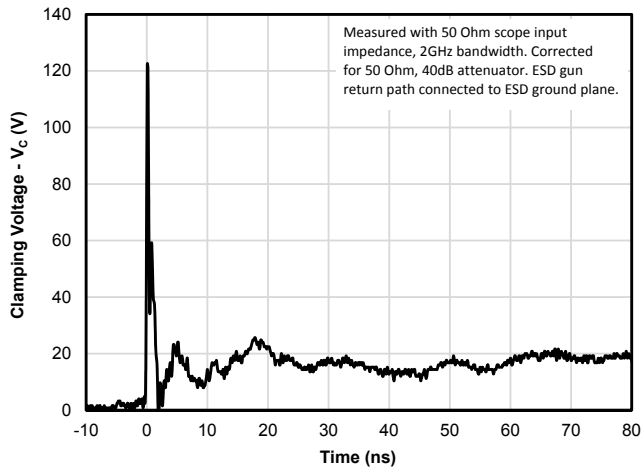
(3) Measured using a 1.2/50us voltage, 8/20us current combination waveform. Clamping is defined as the peak voltage across the device after the device snaps back to a conducting state.

(4) Transmission Line Pulse Test (TLP) Settings: tp = 100ns, tr = 0.2ns, I_{TLP} and V_{TLP} averaging window: t₁ = 70ns to t₂ = 90ns.

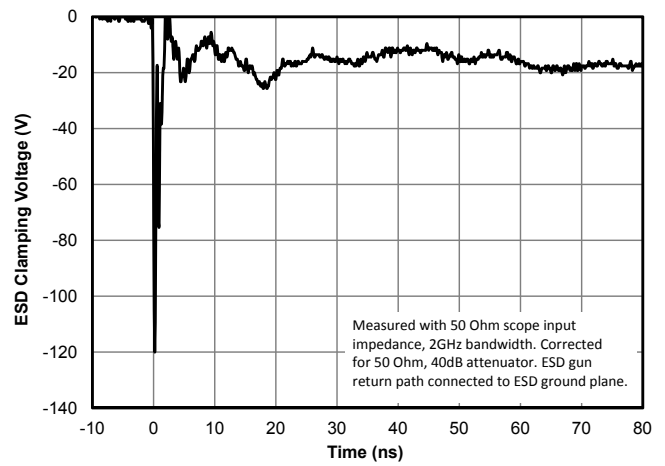
(5) Dynamic resistance calculated from I_{TLP} = 4A to I_{TLP} = 16A

Typical Characteristics

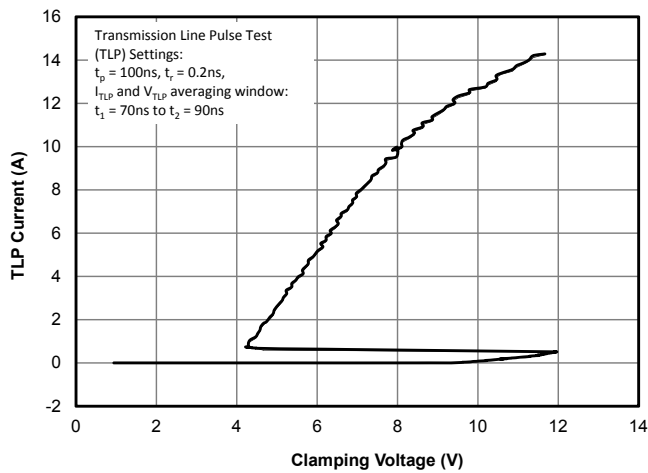
ESD Clamping (+8kV Contact per IEC 61000-4-2)



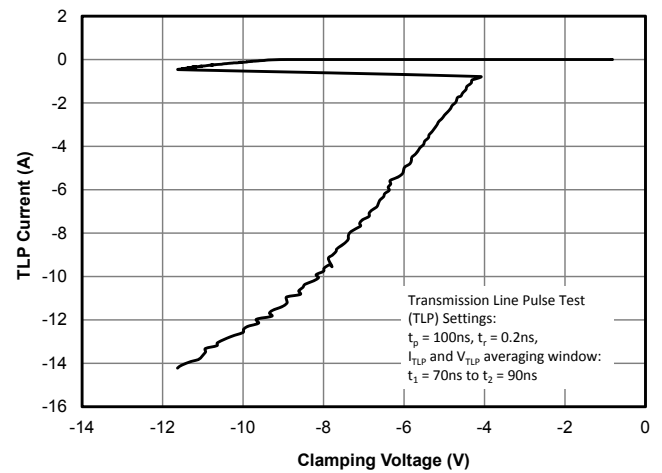
ESD Clamping (-8kV Contact per IEC 61000-4-2)



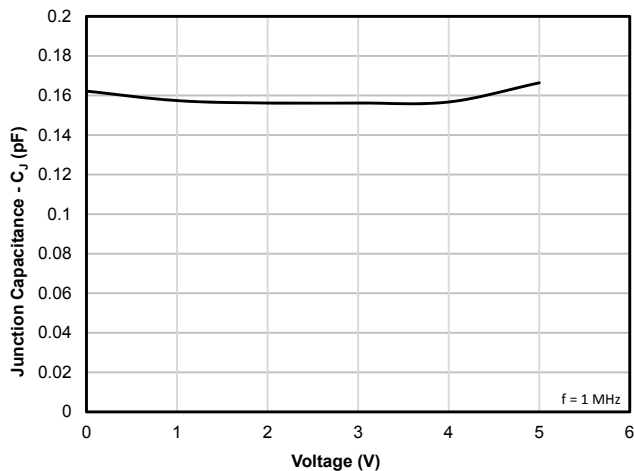
TLP IV Curve - Positive Pulse



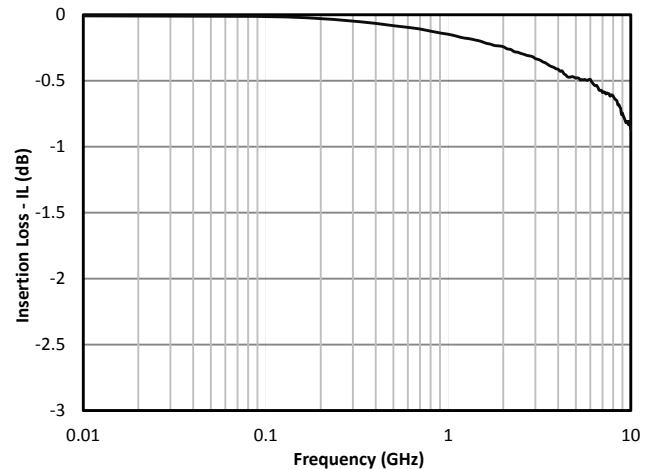
TLP IV Curve - Negative Pulse



Capacitance vs. Reverse Voltage



Insertion Loss (S21)



Application Information

HDMI 2.0 Interface Protection

HDMI 2.0 chips are constantly exposed to external ESD and cable discharge threats. Adding external ESD protection is critical but can be challenging. Both electrical and mechanical requirements must be considered. HDMI 2.0 provides the necessary bandwidth to support the higher resolution and frame rates of Ultra HD. This is accomplished by increasing the data rate on each data lane from 3.4 Gbps to 6 Gbps, which means the protection device must present an extremely low capacitance to preserve signal integrity. The external protection device should also have good ESD protection properties including low ESD peak clamping voltage and low dynamic resistance. Mechanically, the package design should allow the traces to easily flow through the package. This is important since differential pair trace lengths should be matched to avoid signal skew.

Protection Solutions

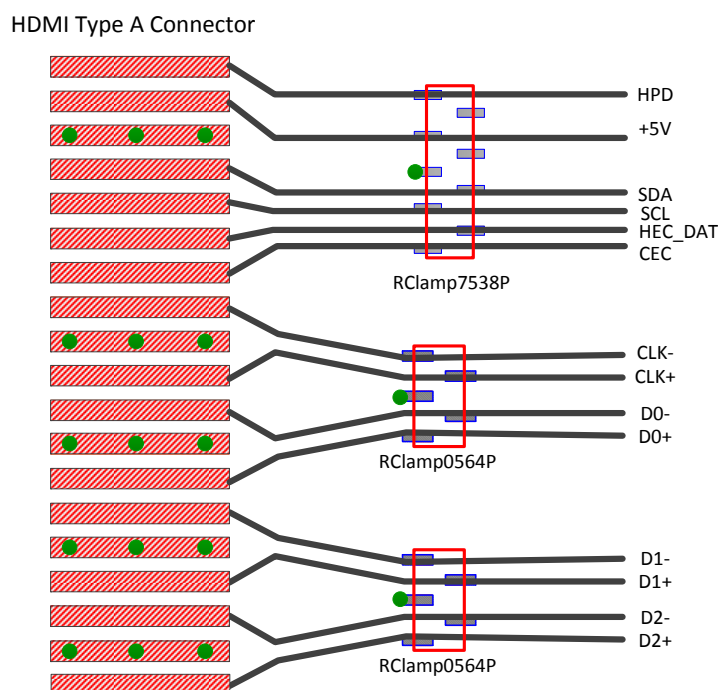
RClamp0564P has been specifically designed to protect high-speed interfaces. It has a typical capacitance of 0.17pF and a flow through package design.

A typical HDMI 2.0 protection solution is shown below. RClamp0564P is used to protect two high-speed differential data pairs. Line pairs are routed through pins 1, 5 and pins 3, 4. Ground connection is made at pin 2. RClamp0564P has little affect on a 5.94Gb/s signal with an HDMI 2.0 eye mask as shown in the eye diagrams below. Two RClamp0564P are required to protect all four clock and data differential pairs. The remaining six lines can also be protected using RClamp0564P. However, since they are not as sensitive to capacitive loading as the TMDS lines, a device such as RClamp7538P may be used as shown.

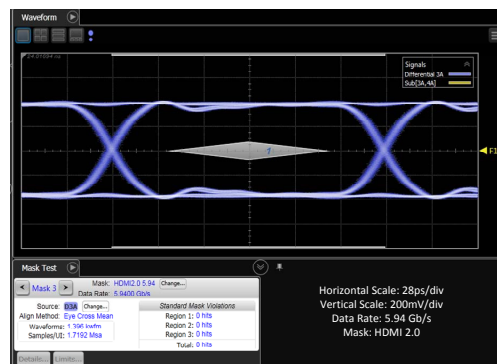
Device Placement

Placement of the protection component is a critical element for effective ESD suppression. TVS diodes should be placed as close to the connector as possible to reduce transient coupling to nearby traces. Ground connections should be made directly to the ground plane using micro-vias. This reduces parasitic inductance in the ground path and minimizes the clamping voltage seen by the protected device.

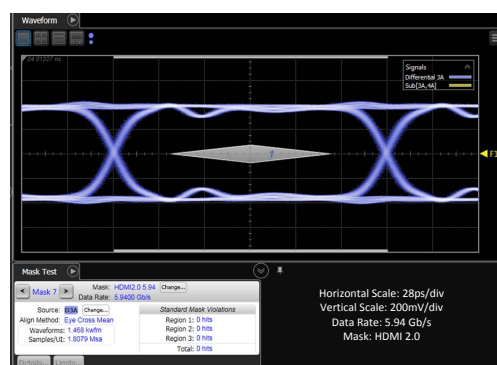
HDMI 2.0 Protection Example



5.94Gb/s Eye Diagram with RClamp0564P



5.94Gb/s Eye Diagram without RClamp0564P



Application Information

DisplayPort Interface Protection

DisplayPort chips are constantly exposed to external ESD and cable discharge threats. Adding external ESD protection is critical but can be challenging. Both electrical and mechanical requirements must be considered. DisplayPort version 1.4 can use the HBR3 transmission mode (32.4 Gbits/s) provides the necessary bandwidth to support the higher resolution and frame rates of Ultra HD. This is accomplished by increasing the data rate on each data lane from 5.4 Gbps to 8.1 Gbps, which means the protection device must present an extremely low capacitance to preserve signal integrity. The external protection device should also have good ESD protection properties including low ESD peak clamping voltage and low dynamic resistance. Mechanically, the package design should allow the traces to easily flow through the package. This is important since differential pair trace lengths should be matched to avoid signal skew.

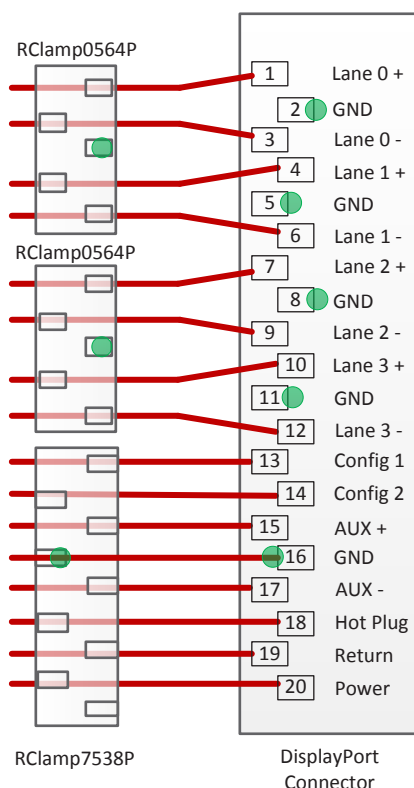
Protection Solutions

RClamp0564P has been specifically designed to protect high-speed interfaces. It has a typical capacitance of 0.17pF and a flow through package design. A typical DisplayPort protection solution is shown below. RClamp0564P is used to protect two high-speed differential data pairs. Line pairs are routed through pins 1, 5 and pins 3, 4. Ground connection is made at pin 2. Two RClamp0564P are required to protect all four clock and data differential pairs. The remaining six lines can also be protected using RClamp0564P. However, since they are not as sensitive to capacitive loading as the ML lines, a device such as RClamp7538P may be used as shown.

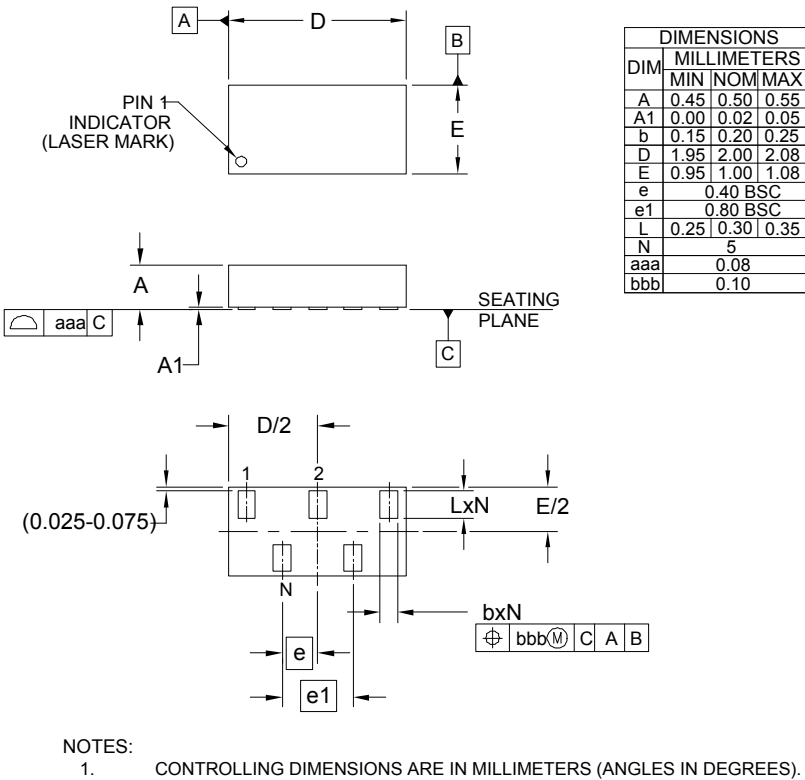
Device Placement

Placement of the protection component is a critical element for effective ESD suppression. TVS diodes should be placed as close to the connector as possible to reduce transient coupling to nearby traces. Ground connections should be made directly to the ground plane using micro-vias. This reduces parasitic inductance in the ground path and minimizes the clamping voltage seen by the protected device.

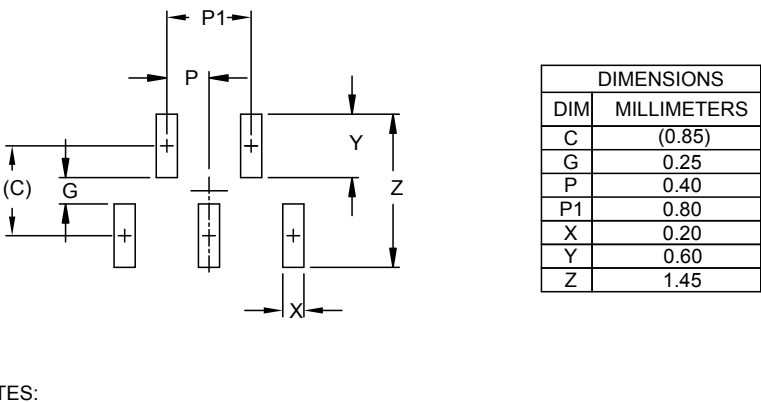
DisplayPort Protection Example



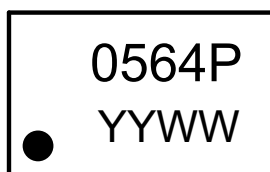
Outline Drawing - SGP2010N5



Land Pattern - SGP2010N5

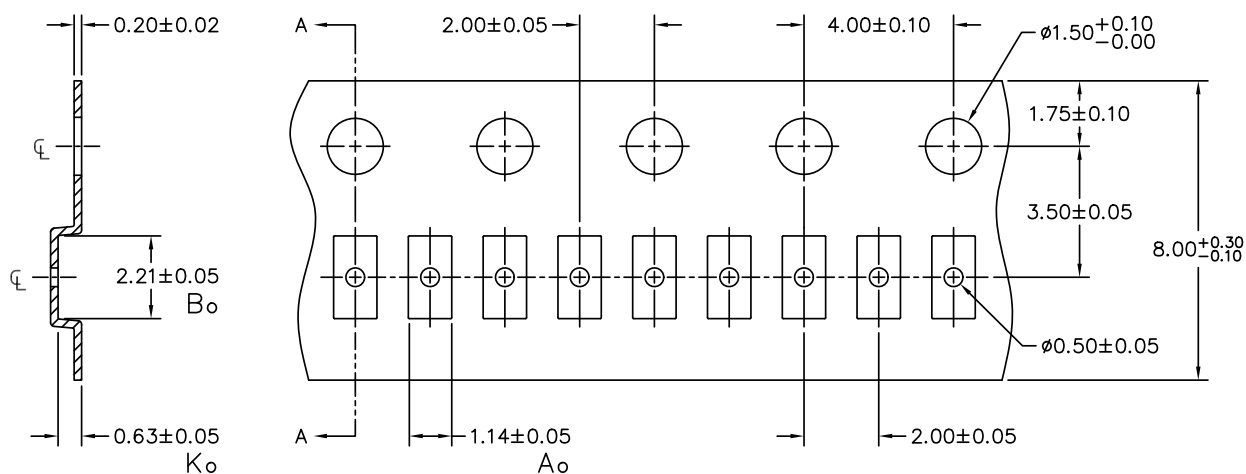


Marking Code



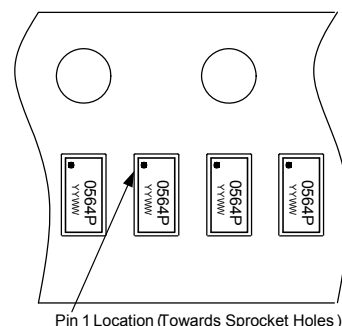
Notes: YYWW = Alphanumeric Date Code

Tape and Reel Specification



SECTION A-A

NOTE: ALL DIMENSIONS IN MILLIMETERS UNLESS OTHERWISE SPECIFIED.



Ordering Information

Part Number	Qty per Reel	Reel Size
RClamp0564P.TNT	10000	7 Inch
RailClamp and RClamp are registered trademarks of Semtech Corporation.		



IMPORTANT NOTICE

Information relating to this product and the application or design described herein is believed to be reliable, however such information is provided as a guide only and Semtech assumes no liability for any errors in this document, or for the application or design described herein. Semtech reserves the right to make changes to the product or this document at any time without notice. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. Semtech warrants performance of its products to the specifications applicable at the time of sale, and all sales are made in accordance with Semtech's standard terms and conditions of sale.

SEMTECH PRODUCTS ARE NOT DESIGNED, INTENDED, AUTHORIZED OR WARRANTED TO BE SUITABLE FOR USE IN LIFE-SUPPORT APPLICATIONS, DEVICES OR SYSTEMS, OR IN NUCLEAR APPLICATIONS IN WHICH THE FAILURE COULD BE REASONABLY EXPECTED TO RESULT IN PERSONAL INJURY, LOSS OF LIFE OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE. INCLUSION OF SEMTECH PRODUCTS IN SUCH APPLICATIONS IS UNDERSTOOD TO BE UNDERTAKEN SOLELY AT THE CUSTOMER'S OWN RISK. Should a customer purchase or use Semtech products for any such unauthorized application, the customer shall indemnify and hold Semtech and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs damages and attorney fees which could arise.

The Semtech name and logo are registered trademarks of the Semtech Corporation. All other trademarks and trade names mentioned may be marks and names of Semtech or their respective companies. Semtech reserves the right to make changes to, or discontinue any products described in this document without further notice. Semtech makes no warranty, representation or guarantee, express or implied, regarding the suitability of its products for any particular purpose. All rights reserved.

© Semtech 2015

Contact Information

Semtech Corporation
200 Flynn Road, Camarillo, CA 93012
Phone: (805) 498-2111, Fax: (805) 498-3804
www.semtech.com



Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



Как с нами связаться

Телефон: 8 (812) 309 58 32 (многоканальный)

Факс: 8 (812) 320-02-42

Электронная почта: org@eplast1.ru

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.