TPC Module Design Update

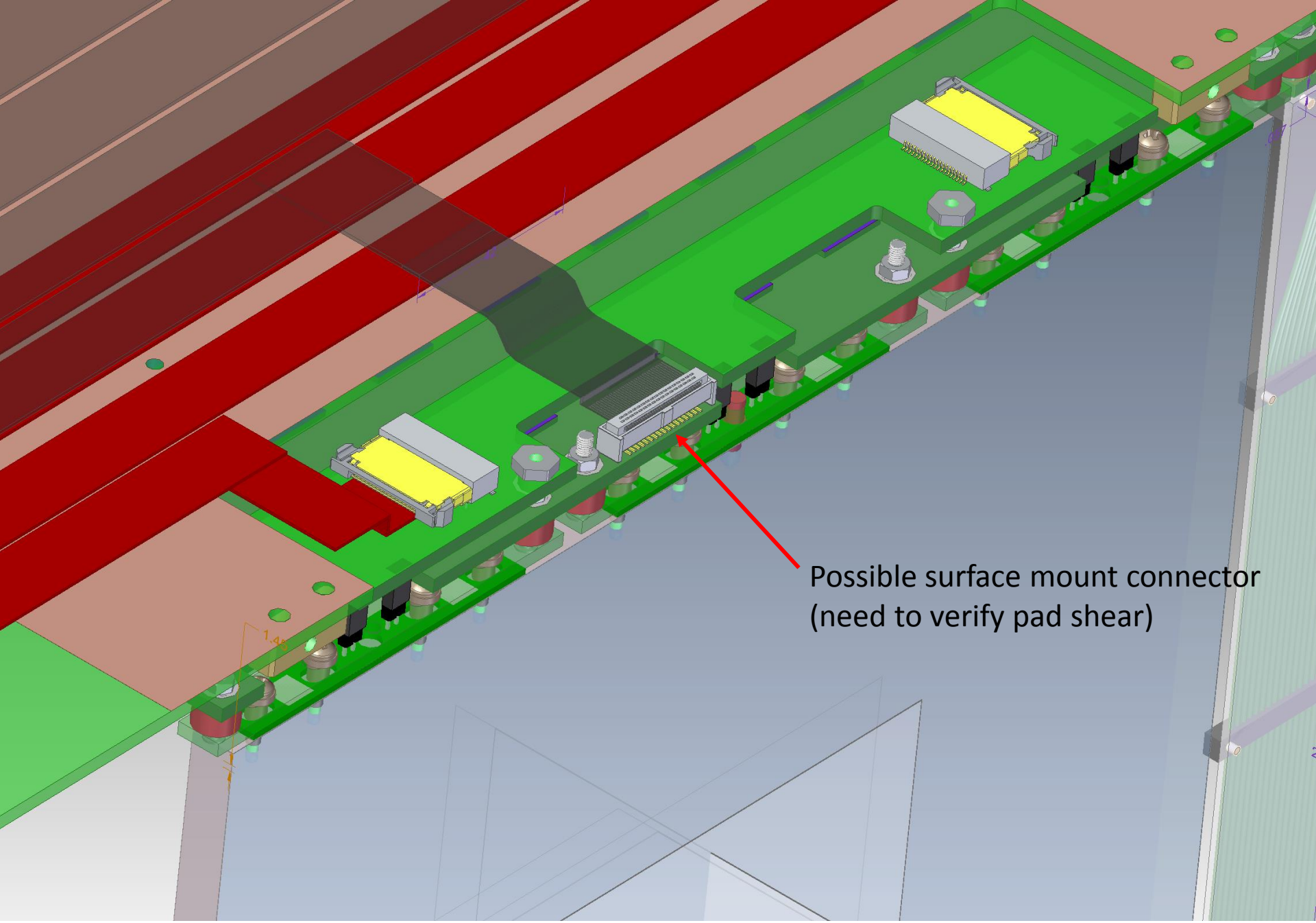
Knut Skarpaas

10/10/2019

I have been trying to get through the details prior to letting the next drawing set out-

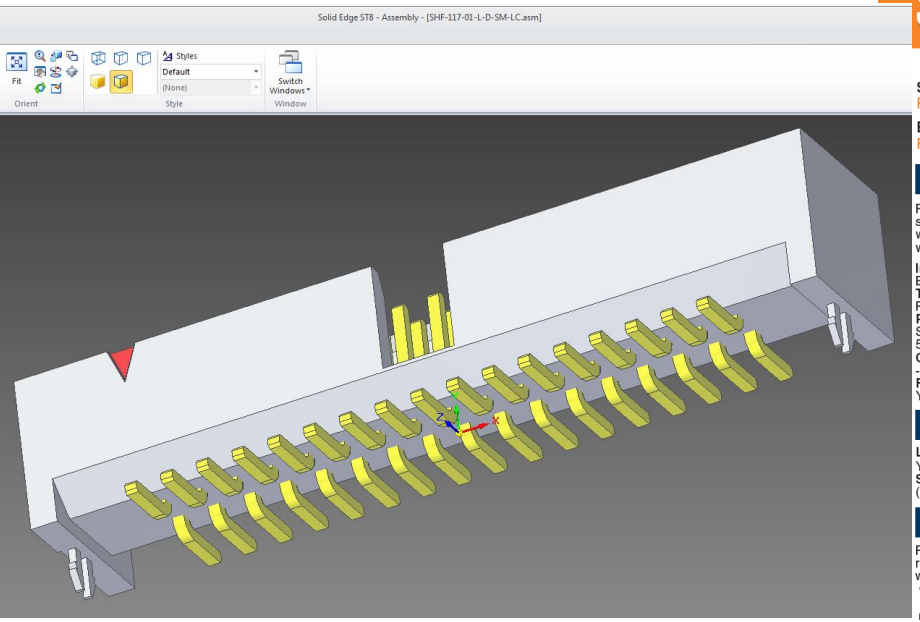
Pixel board and feedthrough-

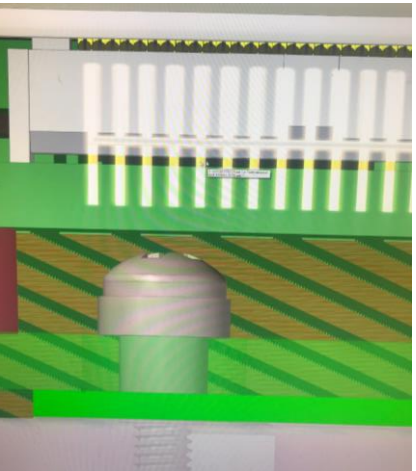
Things have gotten crowded in the corner of the TPC. As I put the thickness of the resistive sheet (.004” plus glue plus metal) along with the thickness of the reflective coating on the ArcLight (.004” plus glue) as well as some other clearance issues, things were getting too tight. I am moving the ArcLight in a little and the resistive cage out a little. I talked to Armin Karcher at LBNL who is doing the Pixel board routing. He let me move the holes and slots for the LCM modules inward by .3mm. While doing this, we talked about the Pixel board connector. The pins are not long enough and Armin did not find one with longer pins. He did find a surface mount version, which I uploaded and put in the CAD, but I want to mention that it could be more susceptible to pad shear on cooldown. Perhaps this could be tested, or others may have comments- The same connector (short pins) is on the feedthrough but that does not get cold (but still has the solder wicking issue if we go with pins) Perhaps the surface mount there also? Then we need to assure that the locating pins on the ends of the surface mount connector seal up. See the next slides for a view of this-


Possible surface mount connector
(need to verify pad shear)

SHF 117-01-L-D-SM-LC

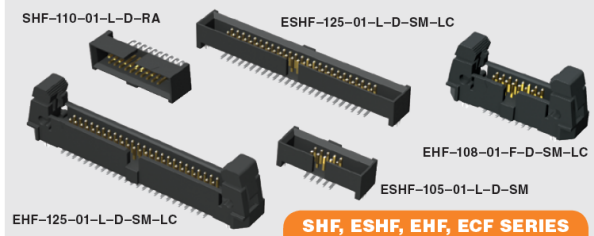
Need to verify that it will not shear the pads on cooldown





To the left is the connector with short pins

samtec



(1.27 mm) .050"

SHF, ESHF, EHF, ECF SERIES

SHROUDED & EJECTOR IDC HEADER

SHF, ESHF Mates with:
FFSD, FFTP (SHF)

EHF Mates with:
FFSD*, FFTP

SPECIFICATIONS

For complete specifications see www.samtec.com?SHF, www.samtec.com?ESHF or www.samtec.com?EHF

Insulator Material: Black Liquid Crystal Polymer
Terminal Material: Phosphor Bronze
Plating: Sn or Au over 50 µ" (1.27 µm) Ni
Operating Temp Range: -55 °C to +125 °C
RoHS Compliant: Yes

PROCESSING

Lead–Free Solderable: Yes
SMT Lead Coplanarity: (0.10 mm) .004" max

RECOGNITIONS

For complete scope of recognitions see www.samtec.com/quality

FILE NO. E111594

ALSO AVAILABLE
(MOQ Required)

- Other sizes

EJECTOR HEADER CAP
(Locks FFSD cable to EHF header)

ECF – NO. PINS PER ROW: 05, 08, 10, 13, 17, 20, 25

***Important Note:** EHF will not mate to FFSD with strain relief (-SR option), see ESHF series.

Note: Some lengths, styles and options are non-standard, non-returnable.

TYPE STRIP	1	NO. PINS PER ROW	01	PLATING OPTION	D	TAIL STYLE	OTHER OPTION

TYPE STRIP
- **SHF** = Mates with FFSD without Strain Relief
- **ESHF** = Mates with FFSD with Strain Relief

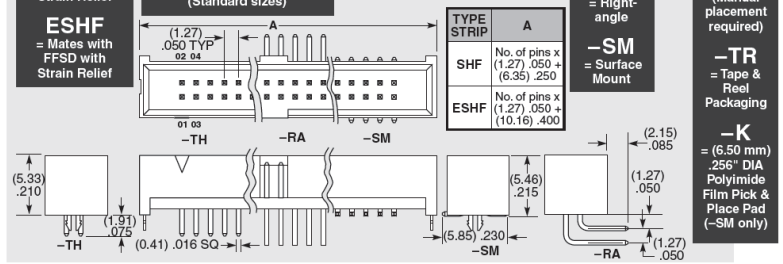
NO. PINS PER ROW
04, 05, 06, 08, 10, 11, 12, 13, 15, 17, 20, 25 (Standard sizes)

PLATING OPTION
- **–L** = 10 µ" (0.25 µm) Gold on post, Matte Tin on tail

TAIL STYLE
- **–TH** = Through-hole
- **–RA** = Right-angle
- **–SM** = Surface Mount

OTHER OPTION
- **–LC** = Locking Clip (Not available with –RA) (Manual placement required)
- **–TR** = Tape & Reel Packaging
- **–K** = (6.50 mm) .256" DIA Polyimide Film Pick & Place Pad (–SM only)

TYPE STRIP	A
SHF	No. of pins x (1.27) .050 + (6.35) .250
ESHF	No. of pins x (1.27) .050 + (10.16) .400



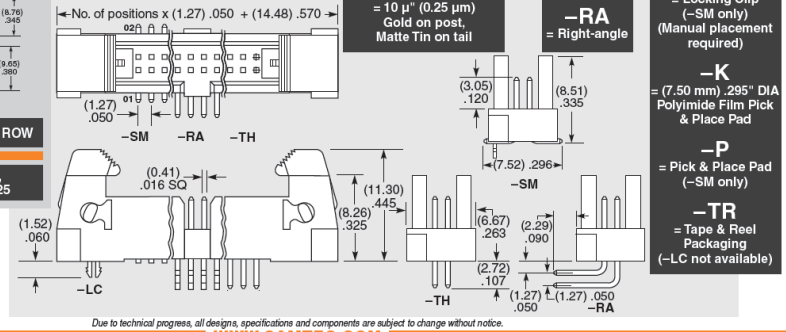
EHF	1	NO. PINS PER ROW	01	PLATING OPTION	D	TAIL OPTION	OTHER OPTION

NO. PINS PER ROW
04, 05, 08, 10, 13, 17, 20, 25 (Standard sizes)

PLATING OPTION
- **–F** = Gold flash on post, Matte Tin on tail
- **–L** = 10 µ" (0.25 µm) Gold on post, Matte Tin on tail

TAIL OPTION
Leave blank for Through-Hole version
- **–SM** = Surface Mount
- **–RA** = Right-angle

OTHER OPTION
- **–"XX"** = Polarized Position (–RA not available)
- **–LC** = Locking Clip (–SM only) (Manual placement required)
- **–K** = (7.50 mm) .295" DIA Polyimide Film Pick & Place Pad
- **–P** = Pick & Place Pad (–SM only)
- **–TR** = Tape & Reel Packaging (–LC not available)



ArcLight Modules-

I put skins on the PVT panel

As mentioned above, this, along with skin thicknesses on the field cage required the modules to be pushed inward by .3mm

Inner support near cathode made wider so the module won't be stressed

I recently realized that the SiPM optical center is shifted on the package. I am currently tuning the windows to coincide with the cold SiPM locations.

LCM Modules-

Added some plastic washers to the mounting screws (between the FR-4 and the polycarbonate)
The holes below the washers were opened up to 3.6mm dia to permit shrinkage about the center pin.
This larger hole should be on the SiPM board as well as the gasket which I believe is also FR-4.

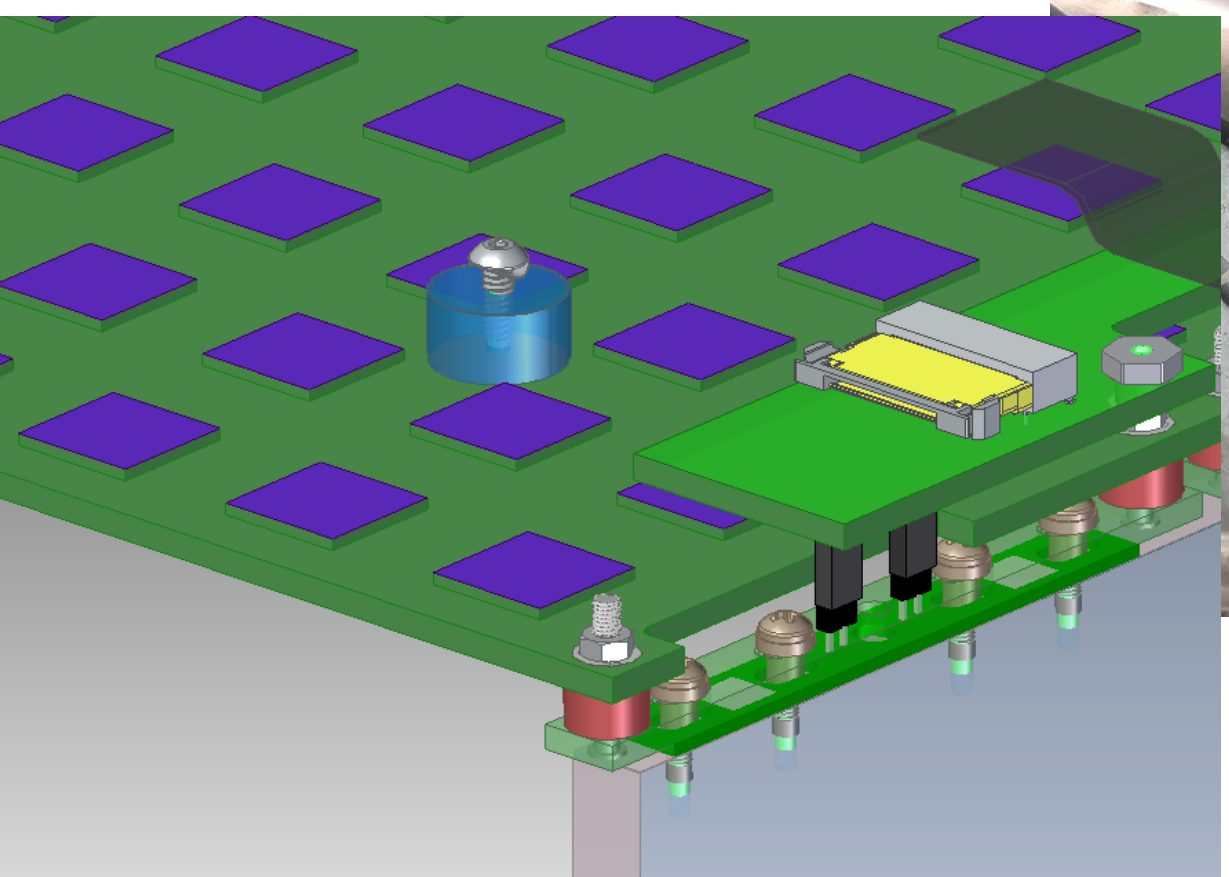
Note- in this location I use a stepped washer on the ArcLight so that screws can be tight and still slip (which I highly recommend)

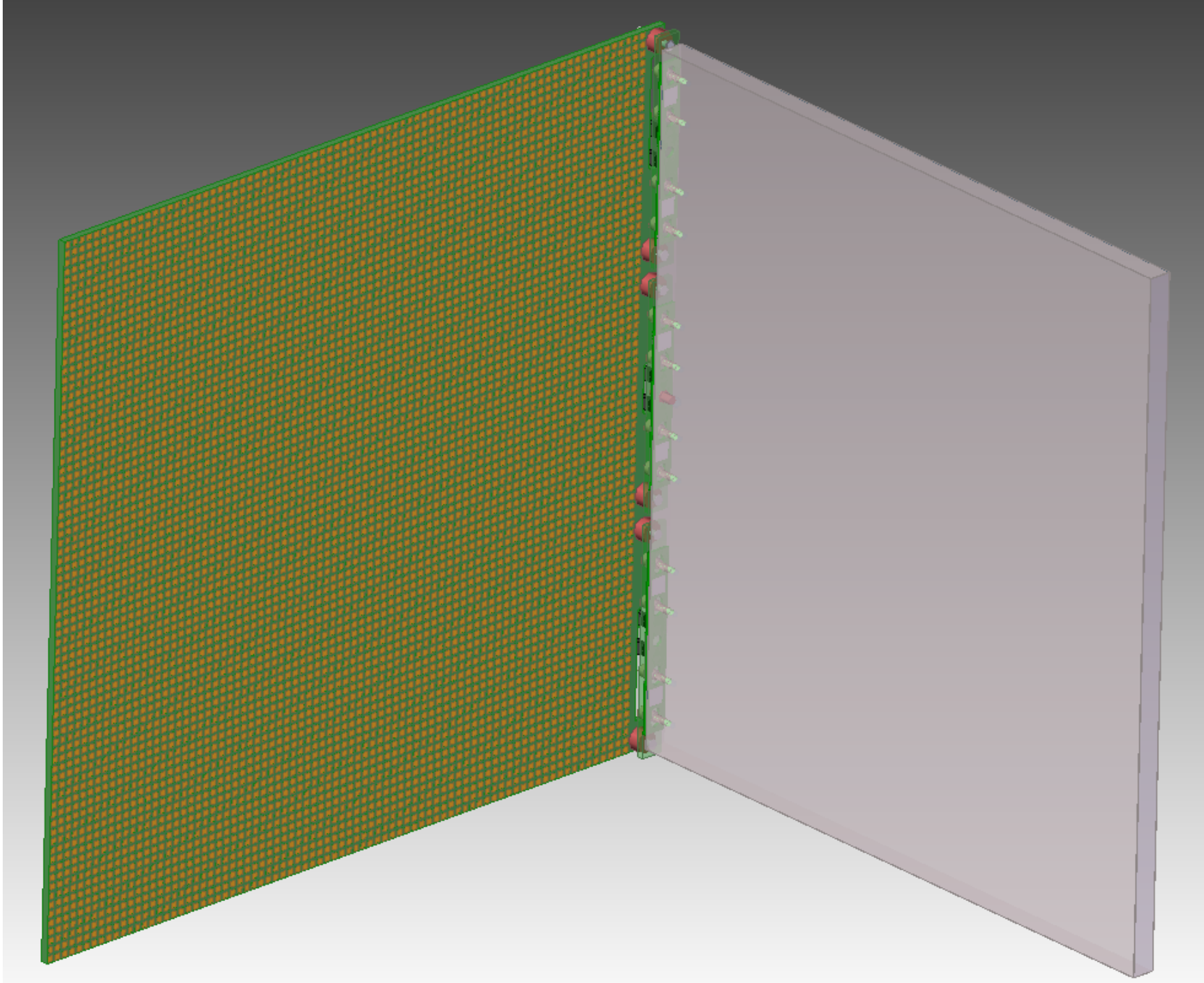
For all SiPM PC boards, the connection to the Pixel board is now a pressed in stud. The spacers for both systems are .210" thick and threaded to stiffen the studs. They are now .378" dia (a little smaller) and are probably polycarbonate

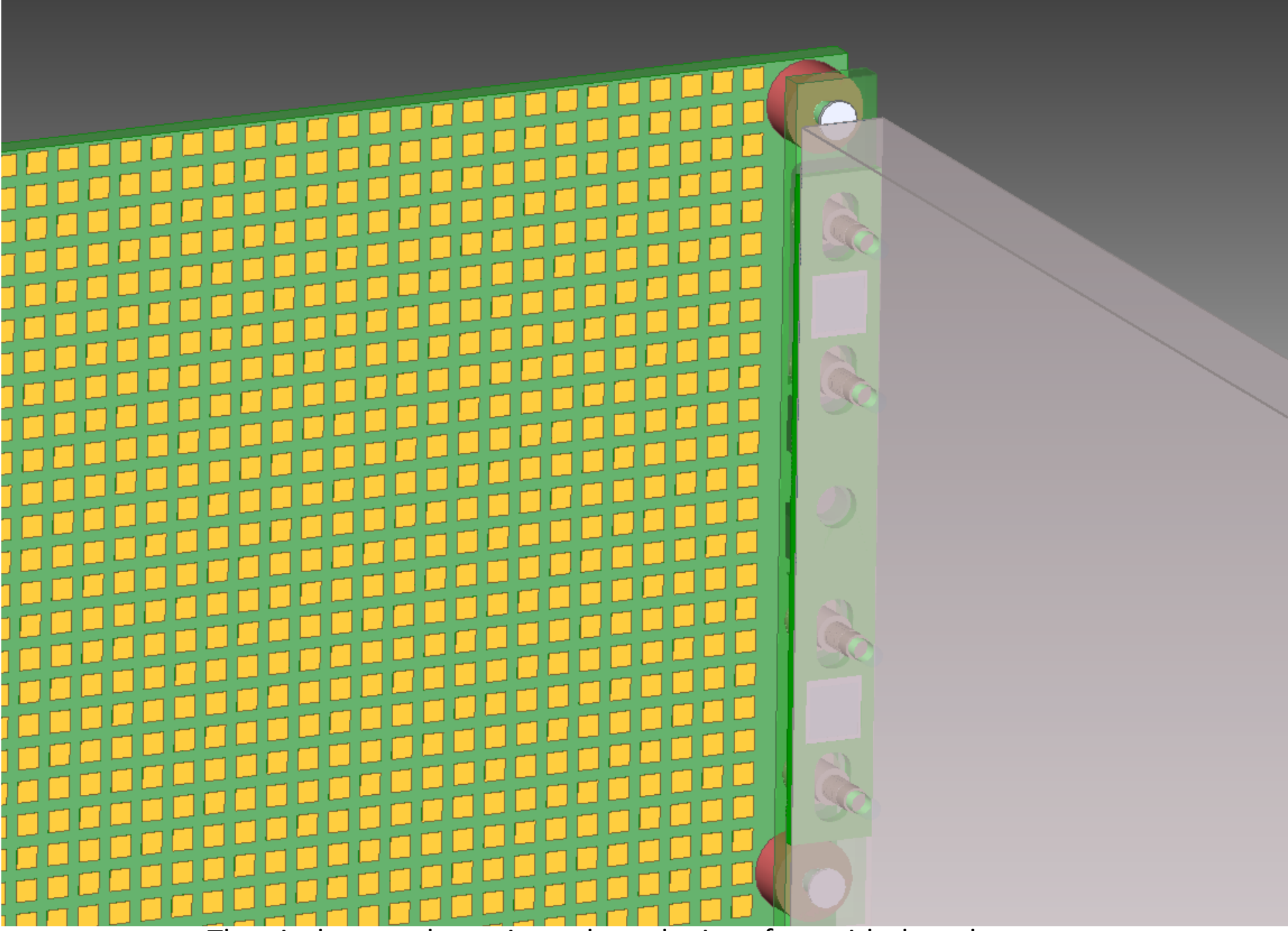
I notice that the holes in the gasket are the nominal size of the SiPM package (but the package has a +/- tolerance of .1mm so this should probably get more clearance)

I noticed that the optic center of the SiPM package is off to one side – also the slot is off to one side in the polycarbonate – To compensate for thermal contraction, I would suggest to move the SiPM's .21mm each closer to the center of the board (to be centered when cold)

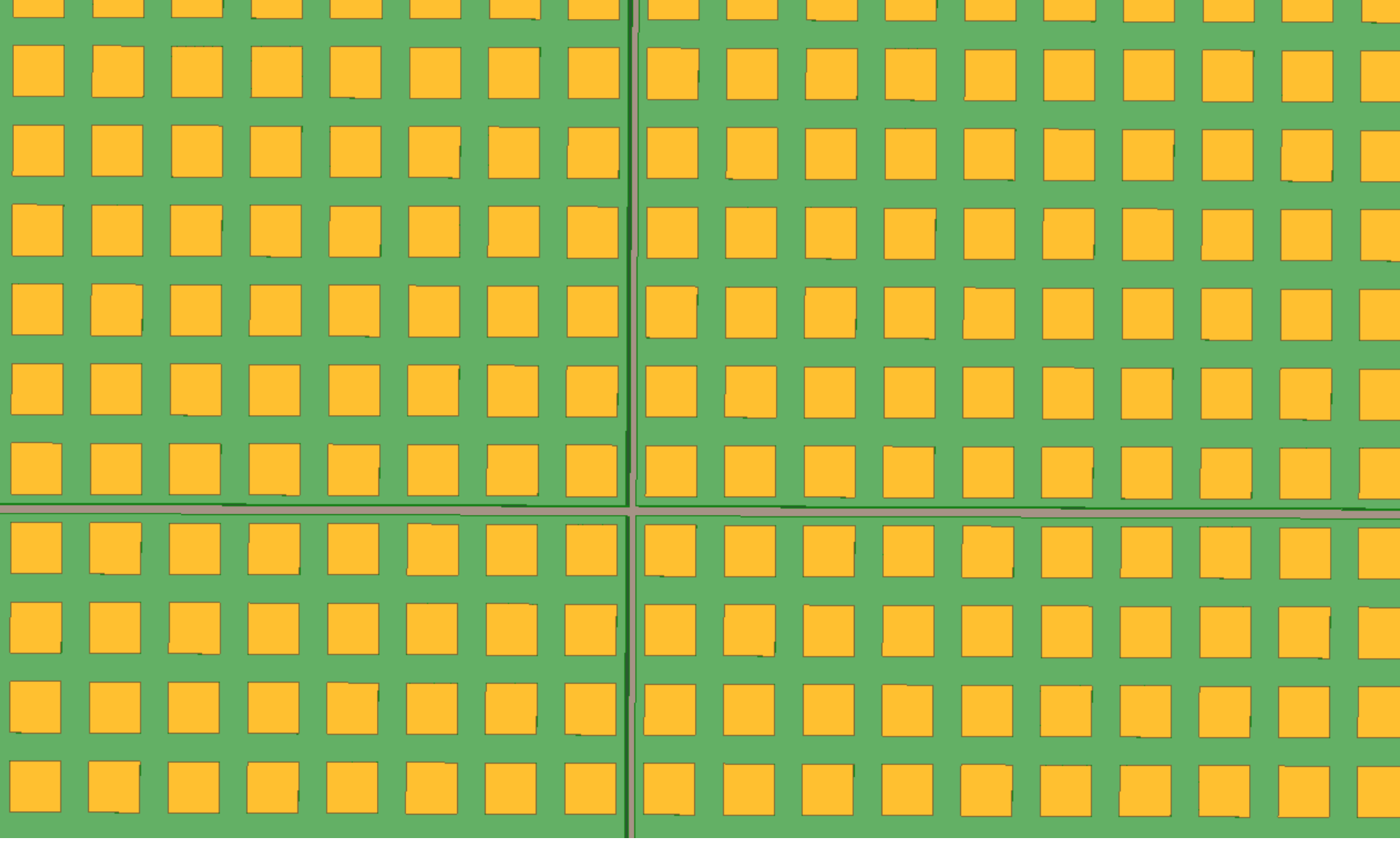
Many of the screws in the system are metric. The screw attaching the Pixel board to the anode support plate is a 6-32 UNC however. I was considering changing this to metric (M4), but after doing a blind tap test in polycarbonate, I confirmed that the larger thread form of this UNC fastener is more robust in a polymer.



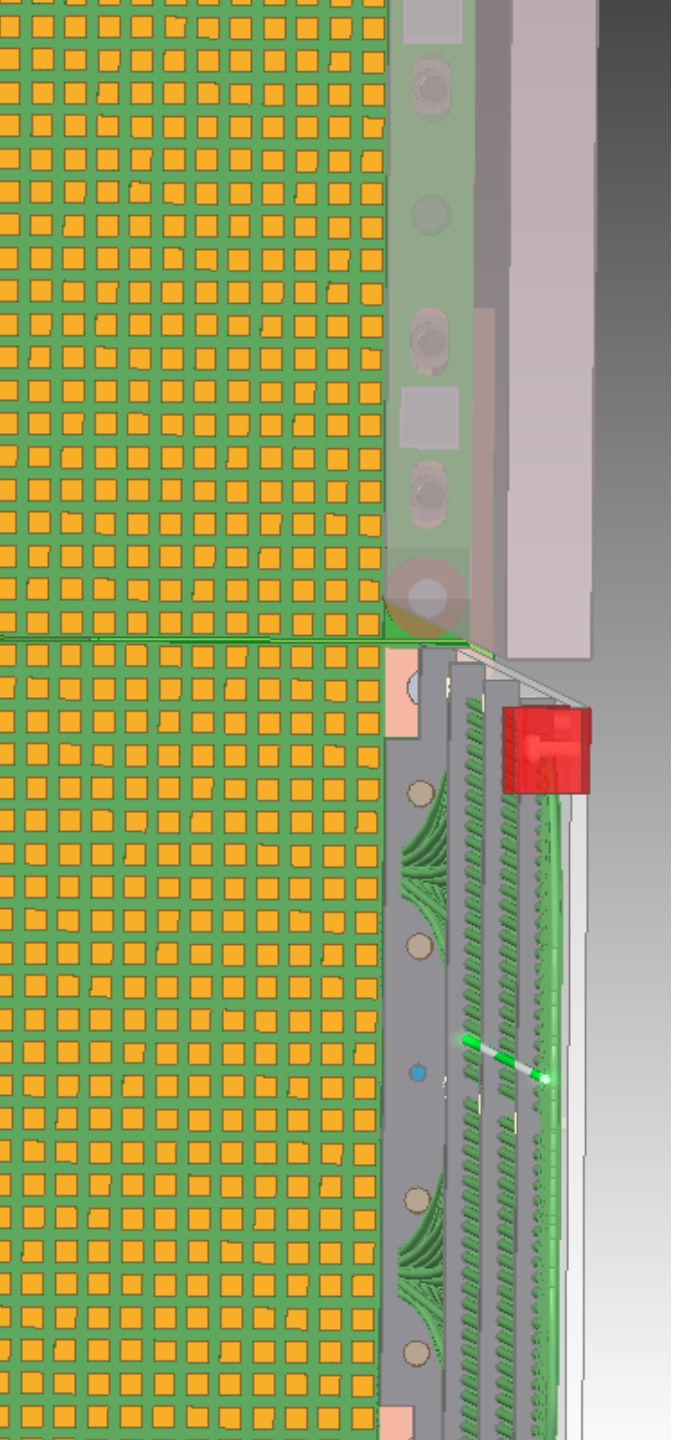


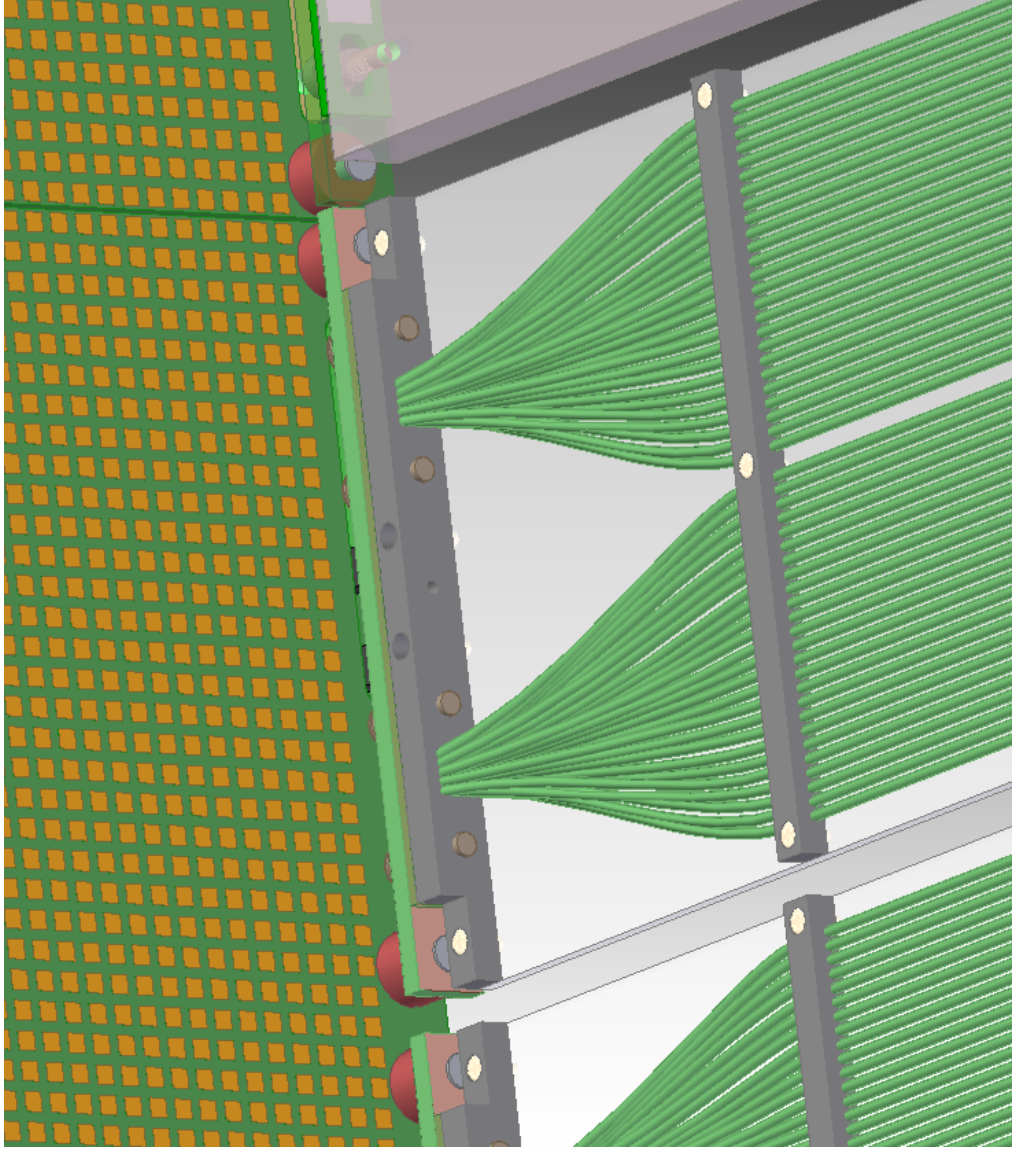


The pixels were drawn in to show the interface with the other components



This is the intersection of four Pixel planes
(the pitch is maintained from module to module)

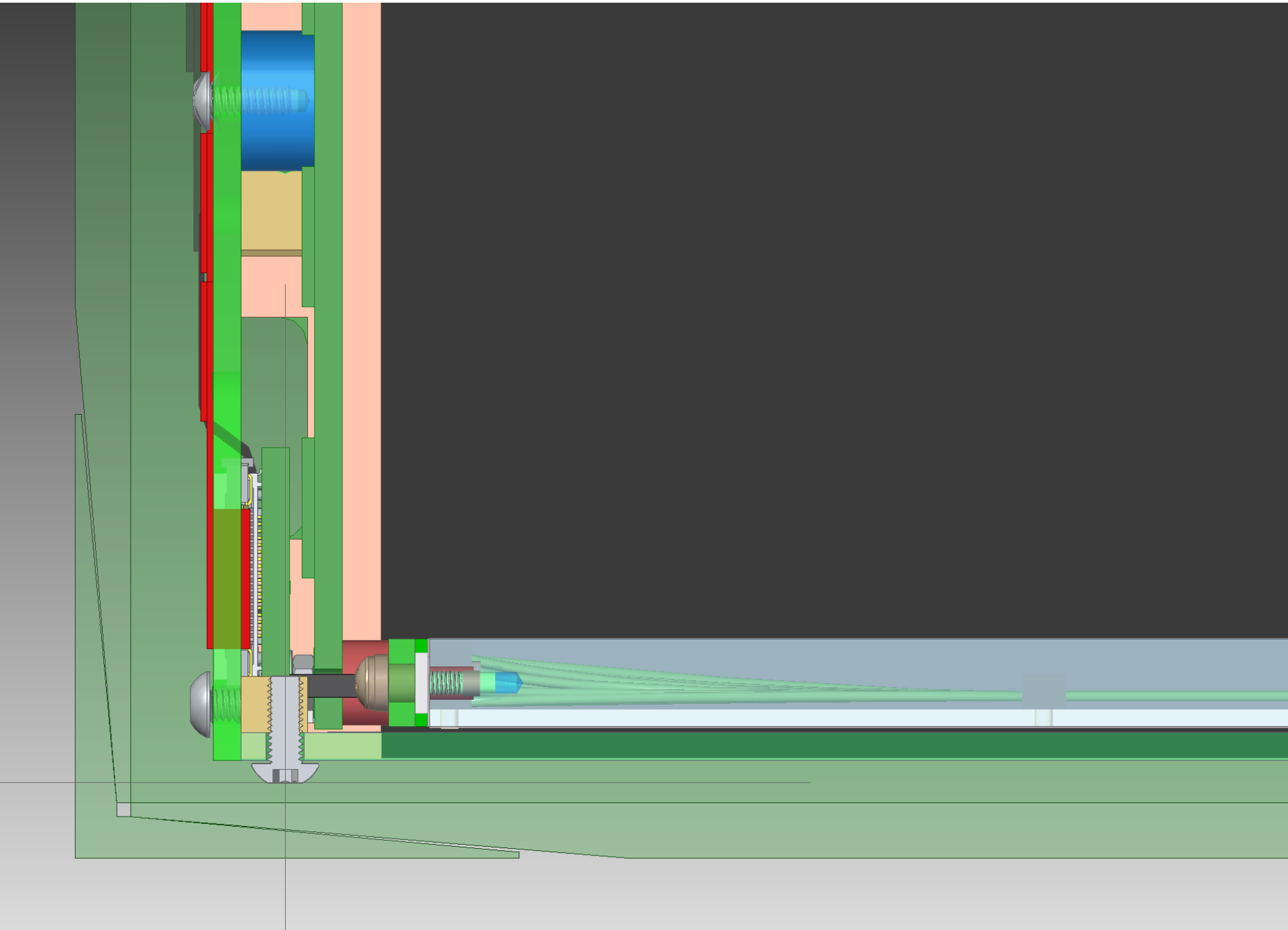




Views showing first row of pixels

There was recent interest in a large dewar to cyro check some large parts. Bob and I built a quick dewar (stainless liner, blue DOW Styrofoam insulation and a fiberglass outer cover) Bob just scaled this technique up for a test for Marty Breidenbach (shown here). If we want a large dewar like this for testing, Bob believes he can make one in 2 or 3 days.

I started to do some tests for manufacturing. Drilling from the front with the thin polyimide seems ok. If unsupported, the drills leave a burr on the other side which may be removed. We will test each of the configurations soon-



Things to do-

Check surface mount Pixel board connector to see if feet shear off board when cooled and pick connector for feedthrough (both sides)

Electric field in the corner- I am not sure if we resolved the electric field in the corner. At one point we talked about making a “curtain” to direct the field, but then I think it was dropped when we said that the SiPM board actually is slightly to the side of the pixel array- comments?

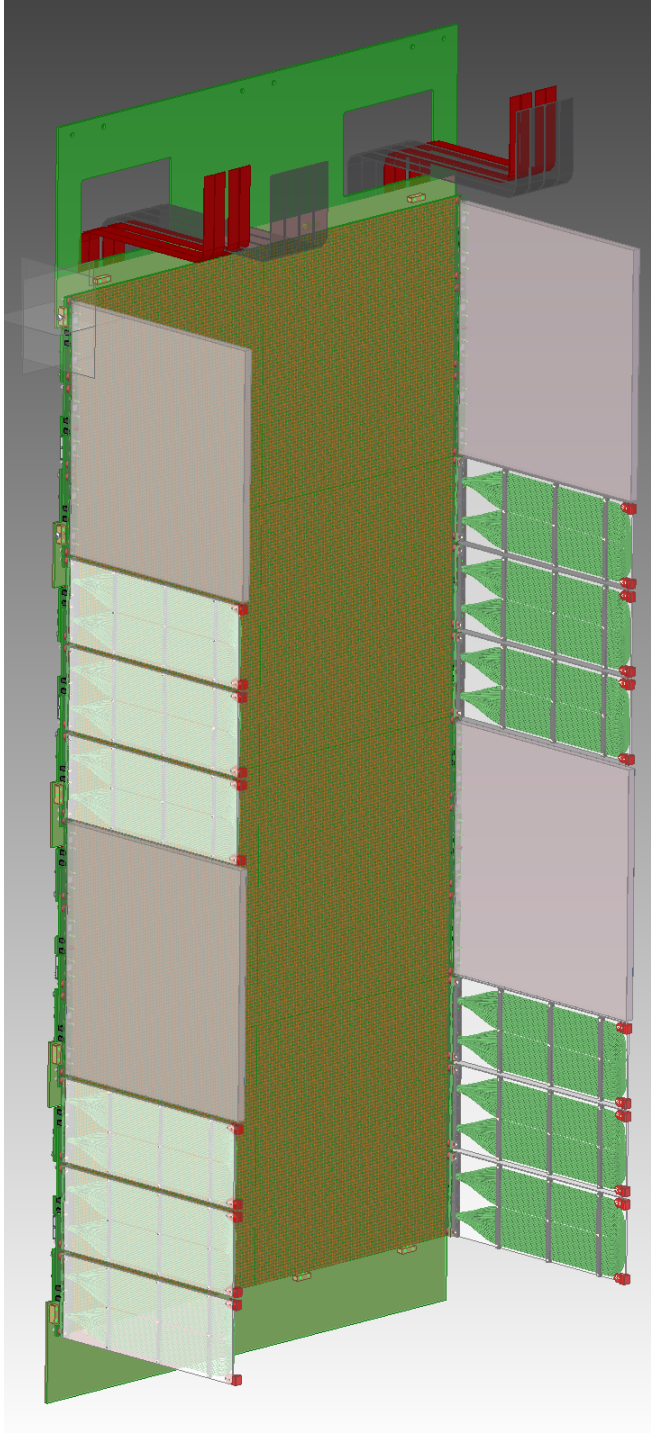
Cable organization- Make a of pattern on the back plane for clips to hold cables in place (could be just some tapped holes for plastic screws)

Add threaded inserts to the anode support plate for the assembly tooling / fixture (the 1/8” FR-4 sheet will flex if we do not hold it with a frame). Once it is connected to the box, it becomes much more stiff. So far, most of the inserts are too tall – looking for a lower profile part

Finish ArcLight window locations

More feedthroughs on top

Backup slides



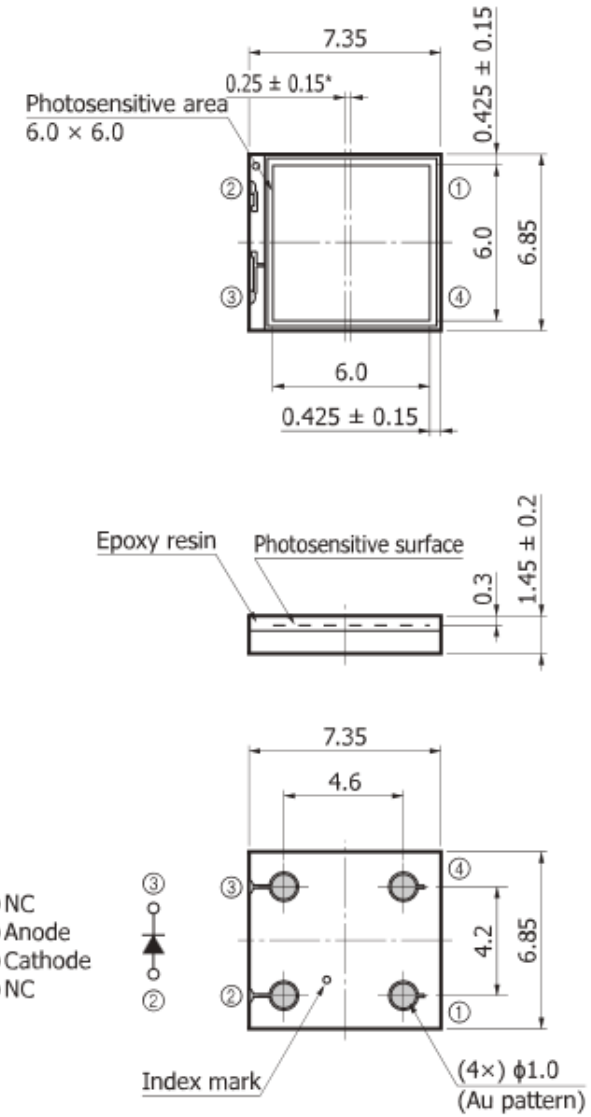
Hi James,

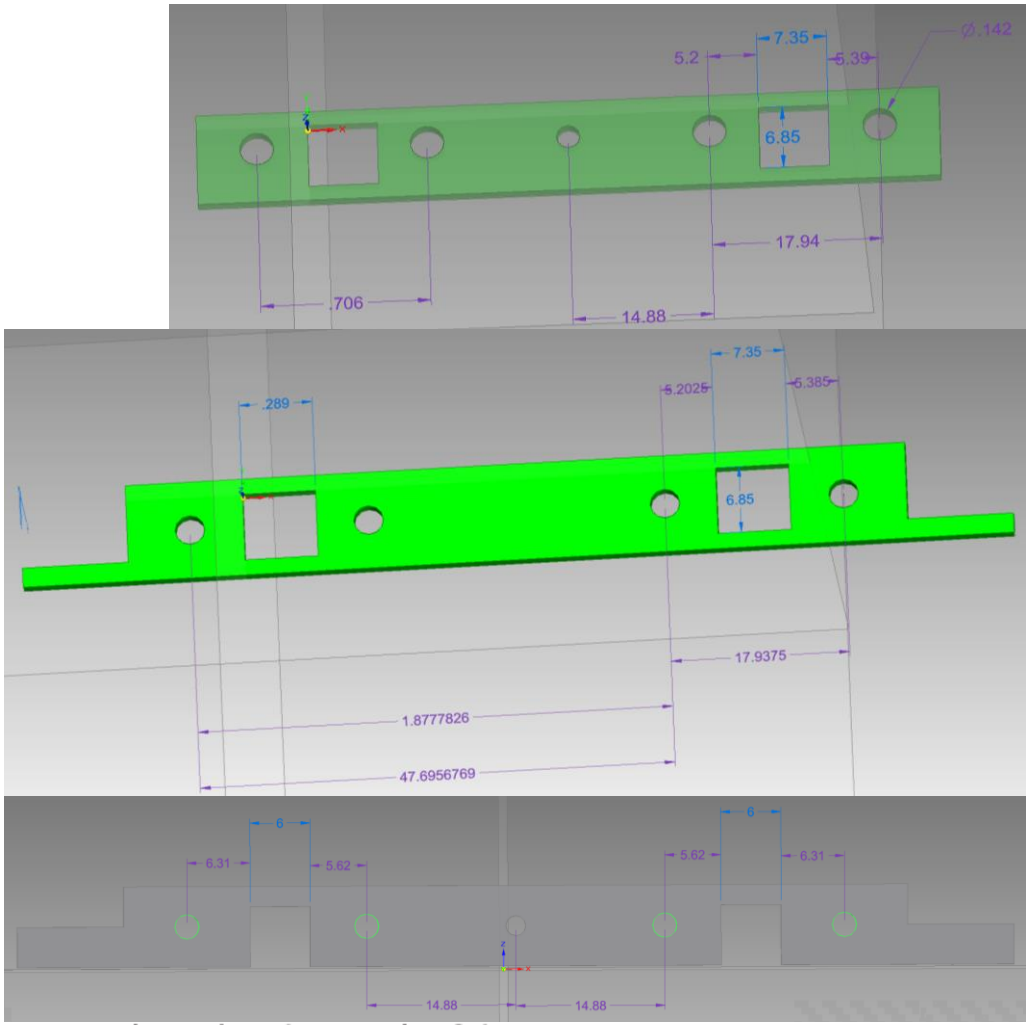
We are going to use two different packages for LCM - S13360-6025PE (SMD 25 um pixel) S13360-6050CS (Ceramic package, 50um pixel). For ArcLight, Igor insisted to use S13360-6025PE only.

Best,

Nick.

Dimensional outline (unit: mm)



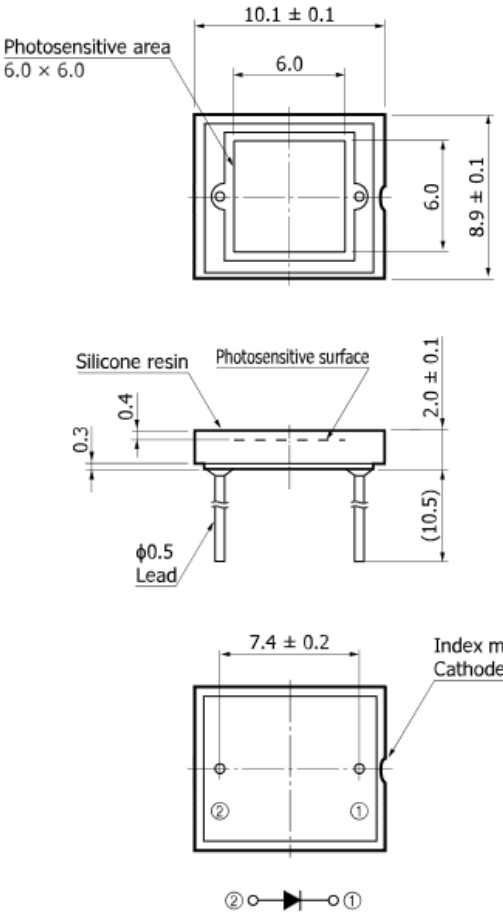


Tolerance unless otherwise noted: ±0.1

* Distance from chip center to package center

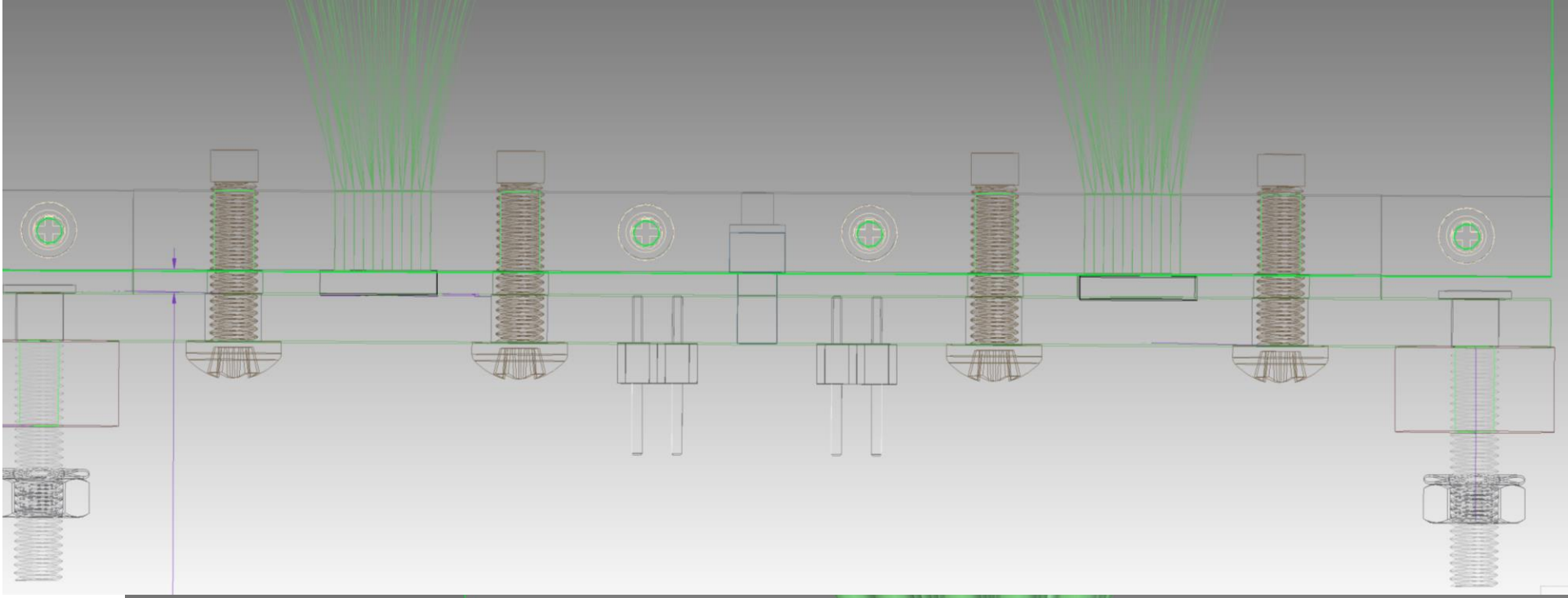
KAPDA0153EA

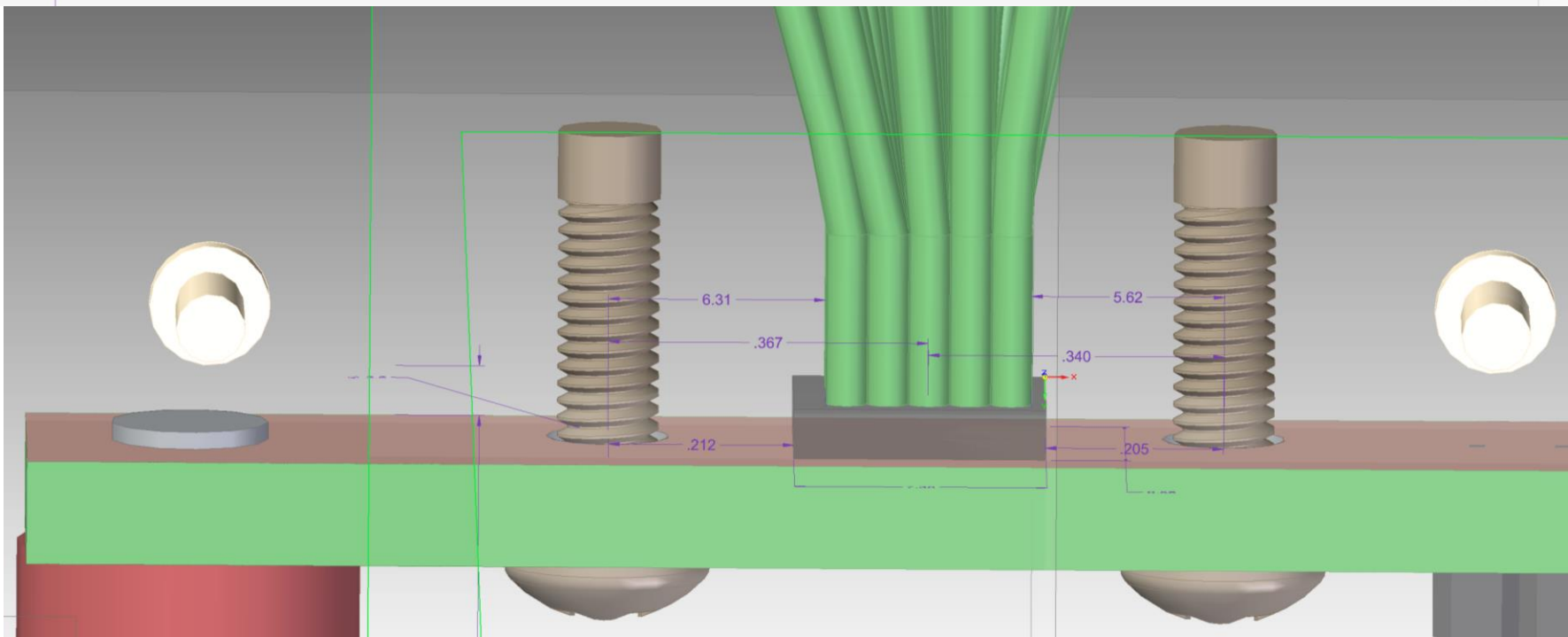
Dimensional outline (unit: mm)



Lead material: Fe-Ni-Co alloy
Lead processing: Au plating
Tolerance unless otherwise noted: ±0.2
Chip position accuracy:
X, Y≤±0.3 with respect to package center
The coating resin may extend a maximum of
0.1 mm above the upper surface of the package.

KSPDA0157EC




6.31
5.62
.367
.340
.212
.205

PEEK screws for the cathode-

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PEEK Hex Head Cap Screws

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Back to Main List

CATALOGUE

DATA SHEET

Solid Spot offers various length of PEEK Hex head cap screws (bolts) in metric size M4, M5, M6, M8, M10, and M12.

Solid Spot is a manufacture direct distributor and huge stock in CA, that's why we can provide cheapest price and same day shipping for most items.

- Certificate of Conformance (COC) is available upon request.
- RoHS, WEEE, REACH compliance, ISO 9001 registered factory.

Custom fasteners are also available.

Parts Number = "PKB" + M + L
(ex:PKB408 M=4 L=8)

M = Scrrew Diameter
L = Scew Length
B = Head Diameter
H = Head Thickness

Size	Length	Quantity	Price	Detail / Purchase
M4 B = 7.0mm H = 2.8mm Pitch=0.7mm	8mm	100pcs	$99.00	PKB408
	10mm	100pcs	$99.00	PKB410
	12mm	100pcs	$107.00	PKB412
	15mm	100pcs	$110.00	PKB415
	20mm	100pcs	$127.00	PKB420
	25mm	100pcs	$141.00	PKB425
	100mm	50pcs	$514.50	PKB4100
M5 B = 8.0mm H = 3.5mm Pitch=0.8mm	10mm	100pcs	$110.00	PKB510
	12mm	100pcs	$110.00	PKB512
	15mm	100pcs	$128.00	PKB515
	20mm	100pcs	$128.00	PKB520
	25mm	100pcs	$213.00	PKB525
	30mm	100pcs	$213.00	PKB530
	100mm	50pcs	$627.50	PKB5100

Polyether ether ketone

From Wikipedia, the free encyclopedia
(Redirected from PEEK)

Polyether ether ketone (PEEK) is a colourless organic thermoplastic polymer in the polyaryletherketone (PAEK) family, used in engineering applications. It was originally introduced by Victrex PLC, then Imperial Chemical Industries (ICI) in the early 1980s.

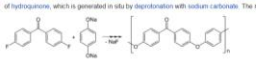
Contents [hide]
1 Synthesis
2 Properties
3 Applications
4 Processing options
5 Shape-memory PEEK in biomechanical applications
6 References

Polyether ether ketone	
Density	1320 kg/m³
Young's modulus (E)	3.6 GPa
Tensile strength (σu)	90–100 MPa
Elongation @ break	50%
notch test	55 kJ/m²
Glass temperature	143 °C
melting point	343 °C
Thermal conductivity	0.25 W/(m·K)
Water absorption, 24 hours (ASTM D 570)	0.1%

source:

Synthesis [edit]

PEEK polymers are obtained by step-growth polymerization by the dialkylation of bisphenolate salts. Typical is the reaction of 4,4′-difluorobenzophenone with the disodium salt of hydroquinone, which is generated in situ by deprotonation with sodium carbonate. The reaction is conducted around 300 °C in polar aprotic solvents - such as diphenyl sulphone.



Properties [edit]

PEEK is a semicrystalline thermoplastic with excellent mechanical and chemical resistance properties that are retained to high temperatures. The processing conditions used to mold PEEK can influence the crystallinity and hence the mechanical properties. Its Young's modulus is 3.6 GPa and its tensile strength is 90 to 100 MPa. PEEK has a glass transition temperature of around 143 °C (289 °F) and melts around 343 °C (652 °F). Some grades have a useful operating temperature of up to 250 °C (482 °F). The thermal conductivity increases nearly linearly with temperature between room temperature and solidus temperature. It is highly resistant to thermal degradation, as well as to attack by both organic and aqueous environments. It is attacked by halogens and strong Brønsted and Lewis acids, as well as some halogenated compounds and aliphatic hydrocarbons at high temperatures. It is soluble in concentrated sulfuric acid at room temperature, although dissolution can take a very long time unless the polymer is in a form with a high surface-area-to-volume ratio, such as a fine powder or thin film. It has high resistance to biodegradation.

Applications [edit]

Because of its robustness, PEEK is used to fabricate items used in demanding applications, including bearings, piston parts, pumps, high-performance liquid chromatography columns, compressor plate valves, and electrical cable insulation. It is one of the few plastics compatible with ultra-high vacuum applications. PEEK is considered an advanced biomaterial used in medical implants, e.g., use with a high-resolution magnetic resonance imaging (MRI), for creating a partial replacement skull in neurosurgical applications.

PEEK is finding increased use in spinal fusion devices and reinforcing rods. It is extensively used in the aerospace, automotive, and chemical process industries. PEEK seals and manifolds are commonly used in fluid applications. PEEK also performs well in applications where continuous high temperatures (up to 500 °F/260 °C) are common. Because of this and its low thermal conductivity, it is also used in FFF printing to thermally separate the hot end from the cold end.

Processing options [edit]

PEEK melts at a relatively high temperature (343 °C / 649.4 °F) compared to most other thermoplastics. In the range of its melting temperature it can be processed using injection moulding or extrusion methods. It is technically feasible to process granular PEEK into filament form and 3D printing parts from the filament material using fused deposition modeling – FDM (or fused filament fabrication – FFF) technology. PEEK filaments have been demonstrated for producing medical devices up to class IIa. With this new filament, it is possible to use the FFF method for different medical applications like dentures.

In its solid state PEEK is readily machinable, for example, by (CNC) milling machines and is commonly used to produce high-quality plastic parts that are thermostable and both electrically and thermally insulating. Filled grades of PEEK can also be CNC machined, but special care must be taken to properly manage stresses in the material.

PEEK is considered a high-performance polymer, that is to say, its high price restricts its use to the most demanding applications only.

Shape-memory PEEK in biomechanical applications [edit]

PEEK is not traditionally a shape-memory polymer, however, recent advances in processing have allowed shape-memory behavior in PEEK with mechanical activation. This technology has expanded to applications in orthopedic surgery.

Force

1230 Newton = 276.515 Pound-force

PEEK Data Sheet

Torsional rupture torque

(Unit = N • m)	#2-56	#4-40	#6-32	#8-32	#10-24	#10-32	¼-20				
Material	0.07	0.17	0.34	0.62	-	1.06	1.87				
	M1.7	M2	M2.6	M3	M4	M5	M6	M8	M10	M12	M16
Material	0.02	0.06	0.16	0.30	0.64	1.28	2.26	5.98	10.80	18.60	-
Low head (hexagon)	-	-	-	0.15	0.54	1.11	1.72	-	-	-	-
Low head (hexalobular)	-	-	-	0.21	0.54	1.11	2.44	-	-	-	-
Very Low head (hexalobular)	-	-	-	0.15	0.50	1.09	1.71	-	-	-	-

* The above numerical values are for just reference and not guaranteed values.

* Numerical values are may vary based on operating conditions.

* Values are calculated based on the mean value. The recommended torque for each screw type is 50% of Torsional Rupture Torque values shown in the table.

Tensile rupture force

(Unit = N)	#2-56	#4-40	#6-32	#8-32	#10-24	#10-32	¼-20				
Basic	173	288	431	703	-	1064	1648				
	M1.7	M2	M2.6	M3	M4	M5	M6	M8	M10	M12	M16
Basic	59	160	312	430	765	1230	1670	3090	4900	7360	-
Low head (hexagon)	-	-	-	370	730	1170	1666	-	-	-	-
Low head (hexalobular)	-	-	-	375	744	1166	1665	-	-	-	-
Very Low head (hexalobular)	-	-	-	317	624	1146	1455	-	-	-	-

Storage conditions

- Avoid direct sunlight and storage in room temperature and avoid high humidity.
- Keep fasteners in the original plastic bag to avoid dust.
- Please store in a sealed container if removed from the plastic bag.
- Do not place heavy objects on the fasteners to avoid damage.

Attention for Use

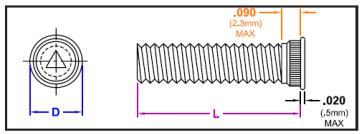
- Black spots may occasionally appear on the external surface. However, this has no impact on performance.
- Gate residue of screw head is 0.2mm or less.

JHP Fasteners, Inc

Broaching-Type Studs

SERIES
Captive - CKFH
PEM® - KFH
JHP Fasteners - SKFH

Manufactured by Captive Fastener Corp



CKFH broaching-type studs are electroplated with tin so they are readily solderable. Thus, they can be used both as solderable connectors and as permanently mounted mechanical fasteners.

INCH

Thread Size	Part Number	All dimensions are in inches L Length ± 0.015 inches						D ± 0.010"	Hole Size +.003/-.000	Max. Size Clearance Hole in Attached Parts	Max. Nut Tightening Torque (in-lbs)	Min Dist to Edge	Anvil Hole +0.003 -0.000)	Minimum Mat'l Thick
		0.250	0.312	0.375	0.500	0.625	0.750							
#4-40	CKFH440	-4	-5	-6	-8	-10	-12	0.18	0.120	0.145	4	0.15	0.113	0.060
#6-32	CFKH632	-4	-5	-6	-8	-10	-12	0.2	0.140	0.170	8	0.19	0.140	0.060
#8-32	CKFH832		-5	-6	-8	-10	-12	0.23	0.166	0.195	15	0.20	0.166	0.060
#10-32	CKFH1032			-6	-8	-10	-12	0.25	0.189	0.22	18	0.20	0.191	0.060

METRIC

Thread Size	Part Number	All dimensions are in millimeters L Length ± 0.25mm						D ± 0.010"	Hole Size +.003/-.000	Max. Size Clearance Hole in Attached Parts	Max. Nut Tightening Torque (in-lbs)	Min Dist to Edge	Anvil Hole +0.003 -0.000)	Minimum Mat'l Thick
		6	8	10	12	15	18							
M3 X 0.5	CKFHM3	-6	-8	-10	-12	-15	-18	4.58	3.0	3.7	0.45	3.8	3.1	1.5
M4 X 0.7	CKFHM4		-8	-10	-12	-15	-18	5.74	4.2	4.8	1.60	5.1	4.1	1.5
M5 X 0.8	CKFHM5			-10	-12	-15	-18	6.60	5.0	5.8	2.10	5.3	5.1	1.5

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SKFH	NTS		M McCormick

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Item #	Thread	Material	Min Mat'l Thickness	Finish	Hole Diameter +.003in (.08mm)/-.000	Min. Dist to Edge	Length	Price	Quantity
SKFH000M306BR	M3 x 0.50	Phosphor Bronze	1.5	Electro Tin	3	3.8	6	$0.10945 Volume Discounts	Buy Qty 0 Quote 0
SKFH000M308BR	M3 x 0.50	Phosphor Bronze	1.5	Electro Tin	3	3.8	8	$0.11021 Volume Discounts	Buy Qty 0 Quote 0
SKFH000M310BR	M3 x 0.50	Phosphor Bronze	1.5	Electro Tin	3	3.8	10	$0.11369 Volume Discounts	Buy Qty 0 Quote 0
SKFH000M312BR	M3 x 0.50	Phosphor Bronze	1.5	Electro Tin	3	3.8	12	$0.12938 Volume Discounts	Buy Qty 0 Quote 0
SKFH000M315BR	M3 x 0.50	Phosphor Bronze	1.5	Electro Tin	3	3.8	15	$0.13033 Volume Discounts	Buy Qty 0 Quote 0
SKFH000M318BR	M3 x 0.50	Phosphor Bronze	1.5	Electro Tin	3	3.8	18	$0.13314 Volume Discounts	Buy Qty 0 Quote 0

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