

Request for Proposal (RFP) For

The Provision of Printed Circuit Board (PCB) Manufacturing to CSIR's Radar and Electronic Warfare Impact Area

RFP No. 3538/30/09/2022

Date of Issue	Friday, 16 September 2022	
Closing Date	Friday, 30 September 2022 at 16h30	
Place	Online only submission at tender@csir.co.za If the size of the documents exceed 25MB, send multiple emails. Use the RFP number and description as the subject on the email.	
Enquiries	Strategic Procurement Unit	E-mail: tender@csir.co.za
CSIR business hours	08h00 – 16h30	
Category	Engineering	

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SECTION A – TECHNICAL INFORMATION

1 INTRODUCTION

The Council for Scientific and Industrial Research (CSIR) is a leading scientific research and technology development organisation in Africa. In partnership with national and international partners, CSIR undertakes directed and multidisciplinary research and technology innovation that contribute to the improvement of the quality of life of South Africans and the world at large. The CSIR's main site is in Pretoria while it is represented in other provinces of South Africa through regional offices.

2 BACKGROUND

The Radar and Electronic Warfare Impact Area annually executes several projects that require Printed Circuit Board (PCB) manufacturing services from time to time.

To simplify the procurement of manufacturing services and expedite the delivery of PCBs, the CSIR would like to have a pool of manufacturers available who are pre-contracted. These manufacturers would be required to have the necessary experience and skills in the field of PCB manufacturing processes and have the required equipment and infrastructure available to deliver to the CSIR's requirements.

3 INVITATION FOR PROPOSAL

Proposals are hereby invited from suppliers that have a proven track record for the supply of Printed Circuit Board manufacturing services to the CSIR Defence and Security Cluster relating specifically to supply the following manufacture processes to the CSIR's Radar and EW Impact Area:

Note: Supply of material required for the manufacturing for any of the mentioned manufacturing processes shall form part of the offering.

1. Manufacturing of PCBs with a factory located in South Africa with a proven track record in the industry.
2. Manufacturing of Multi-layer PCBs consisting out of high frequency circuit materials such as Mercurywave™ 9350 and the RO4000® series, of at least 8 signal layers.
3. Manufacturing of Multi-layer PCBs consisting out of low frequency materials such as FR4, of at least 10 signal layers.

4. The supplier needs to have impedance control capability of $\pm 10\%$.
5. The supplier needs to have ENIG plating capabilities.
6. Supplier needs to have through-, blind-, and buried plated hole capabilities. Suppliers needs to have both mechanical drilled and laser drilled capabilities when making blind plated holes, with an aspect ratio of 0.8:1 or better.
7. Supplier must allow for custom layer stack-up specific to our needs.
8. Supply of material required for the manufacturing for any of the above-mentioned manufacturing processes.

Although applicants can apply for one or more of the manufacture processes within their proposal, preference would be given to suppliers able to perform all services within their own factory.

4 PROPOSAL SPECIFICATIONS

All proposals are to be submitted in a format the tenderers deem fit.

The proposal to be submitted will be based on the cost to manufacture PCBs of various levels of complexity. This serves as guideline to the CSIR. See ANNEXURE B for a list of typical layer stack-ups that is used in current designs. Note only minimal variation to the stack-ups can be tolerated.

A contract will be entered into with the successful suppliers to establish suitability (functional) and availability for a contracted manufacturing task.

Tasks will be contracted with the selected and contracted suppliers on an Ad Hoc basis once contracts are entered into with CSIR clients.

Depending on the projects contracted, the selected suppliers will be asked to sign an NDA (should no existing NDA be in place) with the CSIR.

4.1 Technical Proposal

The following must be submitted as part of the technical proposal:

- Covering letter;
- Company profile clearly stipulating the number of years rendering similar services;

- Service provider's performance on past and current assignments – Provide not less than five (5) contactable client references for similar services provided, clearly stating the position placed, and ability to complete assignments on time;

4.2 Financial Proposal

The following must be submitted as part of the financial proposal:

- Proposed cost/ commercial offer on official company letterhead.
- The pricing must be firm and inclusive of all costs and disbursements required to render the required services to the CSIR.
- Average hourly rate for specified manufacturing tasks.
- Provide a valid original or certified copy of B-BBEE certificate or valid sworn affidavit.

5 FUNCTIONAL EVALUATION CRITERIA

5.1 Refer to Annexure A for the evaluation and scoring criteria used in this process.

5.2 Proposals with functionality / technical points of less than the pre-determined minimum overall percentage of 70% will be eliminated from further evaluation.

6 ELIMINATION CRITERIA

Proposals will be eliminated under the following conditions:

- Submission after the deadline;
- Proposals submitted at incorrect location (Bids must be submitted electronically at tender@csir.co.za);
- Incomplete proposal submission
- National Treasury Restricted suppliers
- Failure to submit fully completed and signed SBD 4 and SBD 1.
- No prior PCB manufacturing experience
- No PCB manufacturing equipment, tools and infrastructure

7 PRICING SCHEDULE

No	PCB manufacturing or Process	Once off setup cost	Testing and sundries	Panel cost
1	Qty: x1; 377 mm x 235 mm Panel with the layer stack-up 1 (see ANNEXTURE B)			
2	Qty: x1; 377 mm x 235 mm Panel with the layer stack-up 2 (see ANNEXTURE B)			
3	Qty: x1; 377 mm x 235 mm Panel with the layer stack-up 3 (see ANNEXTURE B)			
4	Qty: x1; 377 mm x 235 mm Panel with the layer stack-up 4 (see ANNEXTURE B)			

Notes to Pricing:

Bidders are to note that if the price offered by the highest scoring bidder is not market-related, CSIR may not award the contract to that bidder. CSIR may:

- negotiate a market-related price with the Respondent scoring the highest points or cancel the RFP;
- if that bidder does not agree to a market-related price, negotiate a market-related price with the bidder scoring the second highest points or cancel the RFP;
- if the bidder scoring the second highest points does not agree to a market-related price, negotiate a market-related price with the bidder scoring the third highest points or cancel the RFP.
- If a market-related price is not agreed with the bidder scoring the third highest points, CSIR may cancel the RFP.

NB: The above cost must be inclusive of all costs required to render the required services as per above scope of work.

8 NATIONAL TREASURY CENTRAL SUPPLIER DATABASE REGISTRATION

Before any negotiations will start with the winning bidder it will be required from the winning bidder to:

- be registered on National Treasury's Central Supplier Database (CSD). Registrations can be completed online at: www.csd.gov.za;
- provide the CSIR of their CSD registration number; and
- provide the CSIR with a certified copy of their B-BBEE certificate. If no certificate can be provided, no points will be scored during the evaluation process. (RSA suppliers only)

9 PROCEDURE FOR SUBMISSION OF PROPOSALS

- 9.1 All proposals must be submitted electronically to tender@csir.co.za.
- 9.2 Respondents must use the RFP number as the subject reference number when submitting their bids.
- 9.3 The e-mail and file sizes should not exceed a total of 25MB per e-mail.
- 9.4 The naming/labeling syntax of files or documents must be short and simple (e.g., Product Catalogues).
- 9.5 All documents submitted electronically via e-mail must be clear and visible.
- 9.6 All proposals, documents, and late submissions after the due date will not be evaluated.

NB: NO HARD COPIES OR PHYSICAL SUBMISSIONS WILL BE ACCEPTED

10 TENDER PROGRAMME

The tender program, as currently envisaged, incorporates the following key dates:

- Issue of tender documents: 16/09/2022
- Last date for submission of queries: 23/09/2022
- Closing / submission Date: 30/09/2022

11 SUBMISSION OF PROPOSALS

- 11.1 All proposals are to be submitted electronically to tender@csir.co.za. No late proposals will be accepted.
- 11.2 Responses submitted by companies must be signed by a person or persons duly authorised.
- 11.3 All e-mailed proposal submissions are to be clearly subject-referenced with the RFP number. Proposals must consist of two parts, each of which must be sent in two separate e-mails with the following subject:
 - PART 1: Technical Proposal RFP No: 3538/30/09/2022
 - PART 2: Pricing Proposal RFP No: 3538/30/09/2022

11.4 The CSIR will award the contract to qualified tenderer(s) whose proposal is determined to be the most advantageous to the CSIR, taking into consideration the technical (functional) solution, price, and B-BBEE.

11.5 Proposals submitted must be in the following file formats:

- PDF

12 DEADLINE FOR SUBMISSION

12.1 Proposals shall be submitted at the e-mail address mentioned above no later than the closing date of 30/09/2022 during CSIR's business hours. The CSIR business hours are between 08h00 and 16h30.

12.2 Where a proposal is not received by the CSIR by the due date and stipulated e-mail address, it will be regarded as a late submission. Late submissions will not be considered.

13 AWARDING OF TENDERS

13.1 Awarding of tenders will be published on the National Treasury e-tender portal or the CSIR's tender website. No regret letters will be sent out.

14 EVALUATION PROCESS

14.1 Evaluation of proposals

An evaluation team will evaluate all proposals for functionality, price, and B-BBEE. Based on the results of the evaluation process and upon successful negotiations, the CSIR will approve the awarding of the contract to successful tenderer/s.

A two-phase evaluation process will be followed:

14.1.1 The first phase includes evaluation of elimination and functionality criteria,

14.1.2 The second phase includes the evaluation of price and B-BBEE status.

Pricing Proposals will only be considered after functionality phase has been adjudicated and accepted. Only proposals that achieved the specified minimum qualification scores for functionality will be evaluated further using the preference points system.

14.2 Preference points system

The 80/20 preference point system will be used where 80 points will be dedicated to pricing and 20 points to B-BBEE status. If all tenders received are more than R50m, the proposal will be cancelled and re-issued.

15 PRICING PROPOSAL

- 15.1** Pricing proposal must be cross-referenced to the sections in the Technical Proposal. Any options offered must be clearly labelled. Separate pricing must be provided for each option offered to ensure that pricing comparisons are clear and unambiguous.
- 15.2** Price needs to be provided in South African Rand (excl. VAT), with details on price elements that are subject to escalation and exchange rate fluctuations clearly indicated.
- 15.3** Price should include additional cost elements such as freight, insurance until acceptance, duty where applicable.
- 15.4** Only firm prices* will be accepted during the tender validity period. Non-firm prices** (including prices subject to rates of exchange variations) will not be considered.

*Firm price is the price that is only subject to adjustments in accordance with the actual increase or decrease resulting from the change, imposition, or abolition of customs or excise duty and any other duty, levy, or tax which, in terms of a law or regulation is binding on the contractor and demonstrably has an influence on the price of any supplies, or the rendering costs of any service, for the execution of the contract;

**Non-firm price is all prices other than "firm" prices.

- 15.5** Bidders must quote as per the pricing schedule.
- 15.6** Payment will be according to the CSIR Payment Terms and Conditions.

16 VALIDITY PERIOD OF PROPOSAL

- 16.1** Each proposal shall be valid for a minimum period of 24 months calculated from the closing date.

17 APPOINTMENT OF SERVICE PROVIDER

- 17.1** The contract will be awarded to the tenderer who scores the highest total number of points during the evaluation process, except where the law permits otherwise.
- 17.2** Appointment as a successful service provider shall be subject to the parties agreeing to mutually acceptable contractual terms and conditions. In the event of the parties failing to reach such agreement CSIR reserves the right to appoint an alternative supplier.
- 17.3** Awarding of contracts will be announced on the National Treasury website and no regret letters will be sent to unsuccessful bidders.

18 ENQUIRIES AND CONTACT WITH THE CSIR

Any enquiry regarding this tender shall be submitted in writing to CSIR at tender@csir.co.za with RFP No. 3538/30/09/2022 as the subject.

Any other contact with CSIR personnel involved in this tender is not permitted during the RFP process other than as required through existing service arrangements or as requested by the CSIR as part of the RFP process.

19 MEDIUM OF COMMUNICATION

All documentation submitted in response to this RFP must be in English.

20 COST OF PROPOSAL

Tenderers are expected to fully acquaint themselves with the conditions, requirements and specifications of this RFP before submitting proposals. Each tenderer assumes all risks for resource commitment and expenses, direct or indirect, of proposal preparation and participation throughout the RFP process. **The CSIR is not responsible directly or indirectly for any costs incurred by tenderers.**

21 CORRECTNESS OF RESPONSES

- 21.1** The tenderer must confirm satisfaction regarding the correctness and validity of their proposal and that all prices and rates quoted cover all the work/items specified in the RFP. The prices and rates quoted must cover all obligations under any resulting contract.
- 21.2** The tenderer accepts that any mistakes regarding prices and calculations will be at their own risk.

22 VERIFICATION OF DOCUMENTS

- 22.1** Tenderers should check the numbers of the pages to satisfy themselves that none are missing or duplicated. No liability will be accepted by the CSIR in regard to anything arising from the fact that pages are missing or duplicated.
- 22.2** Only one electronic copy of the proposal (Technical and Financial) must be submitted via e-mail to tender@csir.co.za. If the bidder sends more than one proposal, the first submission shall take precedence should it not have been recalled/withdrawn in writing by the bidder.
- 22.3** Pricing schedule and B-BBEE credentials should be submitted with the proposal, but as a separate document and no such information should be available in the technical proposal.

23 SUB-CONTRACTING

- 23.1** A tenderer will not be awarded points for B-BBEE status level if it is indicated in the tender documents that such a tenderer intends sub-contracting more than 25% of the value of the contract to any other enterprise that does not qualify for at least the points that such a tenderer qualifies for, unless the intended sub-contractor is an exempted micro enterprise that has the capability and ability to execute the sub-contract.
- 23.2** A tenderer awarded a contract may not sub-contract more than 25% of the value of the contract to any other enterprise that does not have an equal or higher B-BBEE status level than the person concerned, unless the contract is sub-contracted to an exempted micro enterprise that has the capability and ability to execute the sub-contract.

24 ADDITIONAL TERMS AND CONDITIONS

- 24.1** A tenderer shall not assume that information and/or documents supplied to CSIR, at any time prior to this request, are still available to CSIR, and shall consequently not make any reference to such information document in its response to this request.
- 24.2** Copies of any affiliations, memberships and/or accreditations that support your submission must be included in the tender.
- 24.3** In case of proposal from a joint venture, the following must be submitted together with the proposal:
- Joint venture Agreement including split of work signed by both parties;
 - The original or certified copy of the B-BBEE certificate of the joint venture;
 - The Tax Clearance Certificate of each joint venture member;
 - Proof of ownership/shareholder certificates/copies; and
 - Company registration certificates.
- 24.4** An omission to disclose material information, a factual inaccuracy, and/or a misrepresentation of fact may result in the disqualification of a tender, or cancellation of any subsequent contract.
- 24.5** Failure to comply with any of the terms and conditions as set out in this document will invalidate the Proposal.

25 CSIR RESERVES THE RIGHT TO

- 25.1** Extend the closing date;
- 25.2** Verify any information contained in a proposal;
- 25.3** Request documentary proof regarding any tendering issue;
- 25.4** Give preference to locally manufactured goods;
- 25.5** Appoint one or more service providers, separately or jointly (whether or not they submitted a joint proposal);
- 25.6** Award this RFP as a whole or in part;
- 25.7** Cancel or withdraw this RFP as a whole or in part.

26 DISCLAIMER

This RFP is a request for proposals only and not an offer document. Answers to this RFP must not be construed as acceptance of an offer or imply the existence of a contract between the parties. By submission of its proposal, tenderers shall be deemed to have satisfied themselves with and to have accepted all Terms & Conditions of this RFP. The CSIR makes no representation, warranty, assurance, guarantee or endorsements to tenderer concerning the RFP, whether with regard to its accuracy, completeness or otherwise and the CSIR shall have no liability towards the tenderer or any other party in connection therewith.

DECLARATION BY TENDERER

Only tenderers who completed the declaration below will be considered for evaluation.

RFP No: 3538/30/09/2022

I hereby undertake to render services described in the attached tendering documents to CSIR in accordance with the requirements and task directives / proposal specifications stipulated in **RFP No. 3538/30/09/2022** at the price/s quoted. My offer/s remains binding upon me and open for acceptance by the CSIR during the validity period indicated and calculated from the closing date of the proposal.

I confirm that I am satisfied with regards to the correctness and validity of my proposal; that the price(s) and rate(s) quoted cover all the services specified in the proposal documents; that the price(s) and rate(s) cover all my obligations and I accept that any mistakes regarding price(s) and rate(s) and calculations will be at my own risk.

I accept full responsibility for the proper execution and fulfilment of all obligations and conditions devolving on me under this proposal as the principal liable for the due fulfilment of this proposal.

I declare that I have no participation in any collusive practices with any tenderer or any other person regarding this or any other proposal. I accept that the CSIR may take appropriate actions, deemed necessary, should there be a conflict of interest or if this declaration proves to be false.

I confirm that I am duly authorised to sign this proposal.

NAME (PRINT)
CAPACITY
SIGNATURE
NAME OF FIRM
DATE

WITNESSES	
1
2
DATE:	

27 SCHEDULE OF BIDDER'S REFERENCE INFORMATION (NB- To be submitted with technical proposal)

The bidder must provide details of the bidder's current experience in providing similar services. Only references for work done in the past 5 years must be provided.

Company Name	Contact Person and contact details (email and telephone number)	Nature Of Work (Description of service performed and extent of Bidder's responsibilities)	Value of contract (Inclusive of VAT)	Contract duration (Start and End Dates)

28 ANNEXURE A

PCB manufacturing

Criteria	Score		Maximum Score	Tenderer's Score
Years of Experience in PCB manufacturing (Proof Required)	No Experience	0/30	30	
	1-5 years	10/30		
	5-10 years	20/30		
	>10 years	30/30		
Ability to manufacture FR4 PCB stack-up 1 in ANNEXTURE B, with minimal deviations (Proof Required)	Cannot manufacture to specification	0/10	10	
	Can manufacture to specification	10/10		
Ability to manufacture Mecurywave™ PCB stack-ups 2,3, and 4 in ANNEXTURE B, with minimal deviations (Proof Required)	0/3 stack-up variants	0/35	35	
	1/3 stack-up variants	10/35		
	2/3 stack-up variants	20/35		
	3/3 stack-up variants	35/35		
Ability to manufacture using RO4000® series type materials	Cannot manufacture using RO4000® type materials	0/5	5	
	Can manufacture using RO4000® type materials	5/5		
References	No references	0/10	10	
	3-4	5/10		
	5 and more	10/10		
Infrastructure	Supplier does not own infrastructure for manufacturing components	0/10	10	
	Supplier own infrastructure for manufacturing components	10/10		
		Total	100	

29 ANNEXURE B: Stack-ups required

1. Impedance controlled 10-layer FR4 (units in mm)

Layer	Stack up	Supplier	Supplier Description	Description	Type	Tg	εr	Base Thickness	Processed Thickness
1		Electra Polymers	Liquid PhotoImageable Mask	SolderMask		4.000			0.025
		Circuitfoil	Copper Foil	Copper				0.018	0.036
2		Nelco	N4000-29	Prepregs 106	Dielectric	185.000	4.080	0.060	0.059
		Nelco	N4000-29	Prepregs 1080	Dielectric	185.000	4.340	0.075	0.074
3		Nelco	N4000-29	Core 1 x 7628	FR-4	185.000	4.200	0.203	0.203
		Nelco	N4000-29	Prepregs 1080	Dielectric	185.000	4.340	0.075	0.049
4		Nelco	N4000-29	Prepregs 1080	Dielectric	185.000	4.340	0.075	0.049
		Nelco	N4000-29	Prepregs 1080	Dielectric	185.000	4.340	0.075	0.049
5		Nelco	N4000-29	Core 1 x 7628	FR-4	185.000	4.200	0.203	0.203
		Nelco	N4000-29	Prepregs 2113	Dielectric	185.000	4.500	0.100	0.086
6		Nelco	N4000-29	Prepregs 2113	Dielectric	185.000	4.500	0.100	0.086
		Nelco	N4000-29	Prepregs 2113	Dielectric	185.000	4.500	0.100	0.086
7		Nelco	N4000-29	Core 1 x 7628	FR-4	185.000	4.200	0.203	0.203
		Nelco	N4000-29	Prepregs 2113	Dielectric	185.000	4.500	0.100	0.086
8		Nelco	N4000-29	Prepregs 2113	Dielectric	185.000	4.500	0.100	0.086
		Nelco	N4000-29	Prepregs 2113	Dielectric	185.000	4.500	0.100	0.086
9		Nelco	N4000-29	Core 1 x 7628	FR-4	185.000	4.200	0.203	0.203
		Nelco	N4000-29	Prepregs 2116	Dielectric	185.000	4.470	0.135	0.120
10		Nelco	N4000-29	Prepregs 2113	Dielectric	185.000	4.500	0.100	0.089
		Circuitfoil	Copper Foil	Copper				0.018	0.036
		Electra Polymers	Liquid PhotoImageable Mask	SolderMask		4.000			0.025

Copper Thickness = 0.352 | Dielectric Thickness = 1.596 | Solder Mask Thickness = 0.050 | Stack Up Thickness = 1.948 | Stack Up Thickness with Soldermask = 1.998

Structure Image	Impedance ID	Structure Name	Impedance Signal Layer	Lower Trace Width (W1)	Upper Trace Width (W2)	Trace Separation (S1)	Lower Ground Strip Width (G1)	Ground Strip Separation (D1)	Trace Thickness (T1)	Calculated Impedance	Target Impedance
	1	Coated Microstrip 2B	1	0.220	0.208	0.000	0.000	0.000	0.036	49.540	50.000
	2	Edge Coupled Coated Microstrip 2B	1	0.138	0.126	0.155	0.000	0.000	0.036	100.060	100.000
	3	Offset Stripline 1B2A	3	0.198	0.186	0.000	0.000	0.000	0.035	49.720	50.000
	4	Edge Coupled Offset Stripline 1B2A	3	0.127	0.115	0.200	0.000	0.000	0.035	99.130	100.000

2. 4-layer Mercurywave™ with blind-vias on top and bottom side (units in mm)

Layer	Stack up	Supplier	Supplier Description	Description	Type	Tg	εr	Base Thickness	Processed Thickness
1		Neltec	9350	Mercurywave core	RF Laminate	200.000	3.500	1.524	0.018
		Neltec	Mercurywave	PrePreg 0106	Dielectric	210.000	3.500	0.043	0.043
		Neltec	Mercurywave	PrePreg 2116	Dielectric	210.000	3.500	0.105	0.105
		Neltec	9350	Mercurywave core	RF Laminate	200.000	3.500	1.524	1.524
2		Neltec	Mercurywave	PrePreg 2116	Dielectric	210.000	3.500	0.105	0.102
		Neltec	Mercurywave	PrePreg 2116	Dielectric	210.000	3.500	0.105	0.102
		Neltec	9350	Mercurywave core	RF Laminate	200.000	3.500	0.254	0.254
		Neltec	Mercurywave	PrePreg 2116	Dielectric	210.000	3.500	0.105	0.102
3		Neltec	Mercurywave	PrePreg 2116	Dielectric	210.000	3.500	0.105	0.102
		Neltec	Mercurywave	PrePreg 2116	Dielectric	210.000	3.500	0.105	0.102
		Neltec	9350	Mercurywave core	RF Laminate	200.000	3.500	0.254	0.254
		Neltec	Mercurywave	PrePreg 2116	Dielectric	210.000	3.500	0.105	0.102
4		Neltec	Mercurywave	PrePreg 2116	Dielectric	210.000	3.500	0.105	0.102
		Neltec	Mercurywave	PrePreg 2116	Dielectric	210.000	3.500	0.105	0.102
		Neltec	9350	Mercurywave core	RF Laminate	200.000	3.500	0.254	0.254
		Neltec	Mercurywave	PrePreg 2116	Dielectric	210.000	3.500	0.105	0.102

Copper Thickness = 0.177 | Dielectric Thickness = 4.113 | Solder Mask Thickness = 0.000 | Stack Up Thickness = 4.290 | Stack Up Thickness with Soldermask = 4.290

Drill Image	1st Layer	2nd Layer	Column Position	Drill Type	Minimum Size	Minimum Pad Size	Minimum Drill Size
	1	3	1	Mechanical PTH	0.400	0.600	0.400
	1	4	6	Mechanical PTH	0.450	0.650	0.450
	4	2	2	Laser PTH	1.300	1.500	1.300
	4	3	3	Laser PTH	0.650	0.850	0.650

3. 8-layer Mercurywave™ with blind-vias (units in mm)

Layer	Stack up	Supplier	Supplier Description	Description	Type	Tg	εr	Base Thickness	Processed Thickness
1		Electra Polymers	Liquid Photoimageable Mask	SolderMask				4.000	0.025
2		Neltec	9350	Mercurywave core	RF Laminate	200.000	3.500	0.035	0.053
3		Neltec	Mercurywave	PrePreg 1080	Dielectric	210.000	3.500	0.203	0.203
4		Neltec	Mercurywave	PrePreg 1080	Dielectric	210.000	3.500	0.035	0.035
5		Neltec	9350	Mercurywave core	RF Laminate	200.000	3.500	0.082	0.079
6		Neltec	Mercurywave	PrePreg 1080	Dielectric	210.000	3.500	0.082	0.079
7		Neltec	Mercurywave	PrePreg 1080	Dielectric	210.000	3.500	0.035	0.035
8		Neltec	9350	Mercurywave core	RF Laminate	200.000	3.500	0.203	0.203
		Electra Polymers	Liquid Photoimageable Mask	SolderMask				4.000	0.025

Copper Thickness = 0.316 | Dielectric Thickness = 1.103 | Solder Mask Thickness = 0.050 | Stack Up Thickness = 1.419 | Stack Up Thickness with Soldermask = 1.469

Drill Image	1st Layer	2nd Layer	Column Position	Minimum Size	Drill Type	Minimum Pad Size
	1	3	2	0.600	Laser PTH	0.800
	1	4	3	0.900	Laser PTH	1.100
	1	8	1	0.250	Mechanical PTH	0.450

4. 8-layer Mercurywave™ with blind-vias alternate stack-up (units in mm)

Layer	Stack up	Supplier	Supplier Description	Description	Type	Tg	εr	Base Thickness	Processed Thickness
1		Electra Polymers	Liquid Photoimageable Mask	SolderMask				4.000	0.025
2		Neltec	9350	Mercurywave core	RF Laminate	200.000	3.500	0.035	0.053
3		Neltec	Mercurywave	PrePreg 0106	Dielectric	210.000	3.500	0.035	0.035
4		Neltec	Mercurywave	PrePreg 1080	Dielectric	210.000	3.500	0.043	0.042
5		Neltec	9350	Mercurywave core	RF Laminate	200.000	3.500	0.254	0.254
6		Neltec	Mercurywave	PrePreg 1080	Dielectric	210.000	3.500	0.082	0.081
7		Neltec	Mercurywave	PrePreg 0106	Dielectric	210.000	3.500	0.043	0.042
8		Neltec	9350	Mercurywave core	RF Laminate	200.000	3.500	0.035	0.035
		Electra Polymers	Liquid Photoimageable Mask	SolderMask				4.000	0.025

Copper Thickness = 0.316 | Dielectric Thickness = 1.681 | Solder Mask Thickness = 0.050 | Stack Up Thickness = 1.997 | Stack Up Thickness with Soldermask = 2.047

Drill Image	1st Layer	2nd Layer	Column Position	Minimum Size	Drill Type	Minimum Pad Size
	1	3	2	1.000	Laser PTH	1.200
	1	4	3	1.700	Laser PTH	1.900
	1	8	1	0.250	Mechanical PTH	0.450