



INDIAN INSTITUTE OF TECHNOLOGY MADRAS
Chennai 600 036

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Ref: ELE/RADA/018/2019

Date: 14.06.2019

Senior Manager (Project Purchase)

Open Tender No: ELE/RADA/018/2019

Due Date: 24.06.2019, 3pm

No Pre-Bid meeting

Technical Bid opening meeting on 24.06.2019, 4 PM at the Department of Electrical Engineering, IIT-Madras.

Dear Sir/Madam,

On behalf of the Indian Institute of Technology Madras, offers are invited for **the fabrication, BOM procurement and population of a MM-wave (5 units) PCBs** conforming to the specifications given in Annexure I.

Vendor who can fabricate multilayer high-speed and high density PCBs and assemble the board need to respond to the tender.

Instructions to the Bidder

- I. Preparation of Bids:** - The tenders should be submitted under two-bid system (i.e.) Technical bid and Financial bid.
- II. Delivery of the tender:** - The tender shall be sent to the addresses mentioned below, either by post or by courier so as to reach our office before the due date and time specified in our schedule. The offer/bid can also be dropped in the tender box on or before the due date and time specified in the schedule. The tender box is kept in the office of the:

**The Senior Manager,
Project Purchase,
IC & SR Building 2nd floor,
I.I.T. Madras,
Chennai – 600 036.**

III. **Opening of the tender:** - The offer/bids will be opened by a committee duly constituted for this purpose. The technical bids will be opened first and will be examined by a technical committee which will decide the suitability of the bids as per our specifications and requirements. All bidders will be invited for opening of technical bids. With respect to opening the financial bid, only technically qualified bidders will be called.

IV. **Prices:** - The price should be quoted in net per unit (after breakup) and must include all packing and delivery charges to Department of Electrical Engineering. The offer/bid should be exclusive of taxes and duties. The percentage of tax & duties should be clearly indicated separately. IIT Madras is eligible for concessional GST and relevant certificate will be issued, if applicable.

In case of import supply, the price should be quoted without custom duty. IIT Madras is exempted from levy of IGST on Imports and eligible for concessional custom duty (not exceeding 5%) and the price should be quoted on EX-WORKS and CIP basis indicating the mode of shipment.

V. **Agency Commission:** - Agency commission, if any, will be paid to the Indian agents in rupees after receipt of the equipment and its satisfactory installation. Agency Commission will not be paid in foreign currency under any circumstances. The details should be explicitly shown in the tender document even in the case of 'Nil' commission. The tenderer should indicate the percentage of agency commission to be paid to the Indian agent. The foreign Principal should indicate the percentage of payment and it should be included in the basic price quoted originally (if any).

VI. **Terms of Delivery:** - The item should be supplied to the **Departments of Electrical Engineering, IIT Madras** as per the Purchase Order. In case of import supply, the item should be delivered at the cost of the supplier to our Institution. The Installation/Commissioning should be completed as specified in our important conditions.

VII. **Technical Bid Opening:** The technical bid will be opened on **24.06.2019** at 4 p.m. at the **Department of Electrical Engineering, IIT-Madras** and the financial bids of those tenders who are technically qualified will be opened on the same/later date under intimation to them.

VIII. **IIT Madras** reserves the full right to accept / reject any tender at any stage without assigning any reason.

Yours sincerely,

The Senior Manager (Project Purchase)
IC&SR Building, I.I.T. Madras,
Chennai – 600 036.

SCHEDULE

Important Conditions of the tender

1. The due date for the submission of the tender is **24.06.2019, 3 pm.**

The offers / bids should be submitted in two bids systems (i.e.) Technical bid and financial bid. The Technical bid should consist of all technical details / specifications only. The Financial bid should indicate item-wise price for each item and it should contain all Commercial Terms and Conditions including Taxes, transportation, packing & forwarding, installation, guarantee, payment terms, pricing terms etc. The Technical bid and financial bid should be put in separate covers and sealed. Both the sealed covers should be put in a bigger cover. The Open Tender for supply of **"MM-wave PCB Fabrication"** should be written on the left side of the Outer bigger cover and sealed.

2. **EMD: - The EMD in the form of account payee DD for Rs 100,000 value of the item in favor of Registrar IIT Madras should be enclosed in the cover containing Technical bid.** Any offer not accompanied with the EMD shall be rejected summarily as non-responsive.

The EMD of the unsuccessful bidders shall be returned within 30 days of the end of the bid validity period. The same shall be forfeited, if the tenderers withdraw their offer after the opening during the bid validity period. The Institute shall not be liable for payment of any interest on EMD. EMD is exempted for Micro and Small Enterprises (MSE) as defined in MSE Procurement Policy issued by Department of Micro, Small and Medium Enterprises (MSME).

When no local agent, the foreign vendor can submit demand draft equal to Rs 100,000 or wire transfer the amount to our account as detailed in the attachment (Annexure II) and enclose the proof with the Technical bid.

3. **Performance Security: -** The successful bidder should submit Performance Security for an amount of 5% of the value of the contract/supply. The Performance Security may be furnished in the form of an Account Payee DD, FD Receipt from the commercial bank, Bank Guarantee from any nationalized bank in India. **The performance security should be furnished within 21 days from the delivery of the purchase order.**

Performance Security in the form of Bank Guarantee:- In case the successful bidder wishes to submit Performance Security in the form of Bank Guarantee, the Bank Guarantee should be routed through the Beneficiary Bank to the end user bank. Otherwise, the Indian Agent of the foreign vendor has to submit a Bank Guarantee from a Nationalized Bank of India.

The Bank Guarantee should remain valid for a period of sixty days beyond the date of completion of all contractual obligations of the supplier including the warranty obligations.

4. **Indian agent:** If an Indian agent is involved, the following documents must be enclosed:

Foreign principal's proforma invoice indicating the commission payable to the Indian Agent and nature of after-sales service to be rendered by the Indian Agent.

- ✓ Copy of the agency agreement with the foreign principal and the precise relationship between them and their mutual interest in the business.

5. Documentary proof required:
 - a. Please indicate details of prior FPGA boards (or similar complexity of at least 18 layers) that have been fabricated by the vendor. Vendors lacking such prior experience (of at least 5 prior boards of similar complexity) will be disqualified.
 - b. Please include proof that the firm has existed for at least 5 years.
 - c. Please explicitly indicate all relevant Fabrication details, such as where the board will be fabricated.
 - d. Please explicitly indicate the details as to where the board will be assembled.

6. **Validity:** Validity of Quotation not less than 90 days from the due date of tender.

7. **Delivery Schedule:** - The tenderer should indicate clearly the time required for delivery of the item. In case there is any deviation in the delivery schedule, liquidated damages clause will be enforced or penalty for the delayed supply period will be levied.
Normally the delivery should be in 8 weeks from the date of PO (or as specified in Annexure 1 whichever is earlier). If there is a delay, the penalty will be @1% per week of delay subject to a max of 10% of the value of purchase order and if the delay is more than 10 weeks, the PO would be cancelled and liquidated damages will be enforced.

8. **Risk Purchase Clause:** - In the event of failure of supply of the item/equipment within the stipulated delivery schedule, the purchaser has all the right to purchase the item/equipment from other sources on the total risk of the supplier under risk purchase clause.

9. **Advance Payment:** No advance payment is generally admissible. In case of specific percentage of advance payment is required, the Foreign Vendor has to submit a Bank Guarantee equal to the amount of advance payment and it should be routed through the Beneficiary Bank to the end user Bank. Otherwise, the Indian Agent of the foreign vendor has to submit a Bank Guarantee through a Nationalized Bank of India.

10. **On-site Installation:** - The equipment or machinery has to be installed or commissioned by the successful bidder within 15 to 20 days from the date of receipt of the item at site of IIT Madras (as applicable).

11. **Late offer:** - The offers received after the due date and time will not be considered. The Institute shall not be responsible for the late receipt of Tender on account of Postal, Courier or any other delay.

12. **Acceptance and Rejection:** - I.I.T. Madras has the right to accept the whole or any part of the Tender or portion of the quantity offered or reject it in full without assigning any reason.

13. **Do not quote the optional items or additional items unless otherwise mentioned in the Tender documents / Specifications.**

14. Disputes and Jurisdiction:

Settlement of Disputes: Any dispute, controversy or claim arising out of or in connection with this PO including any question regarding its existence, validity, breach or termination, shall in the first instance be attempted to be resolved amicably by both the Parties. If attempts for such amicable resolution fails or no decision is reached within 30 days whichever is earlier, then such disputes shall be settled by arbitration in accordance with the Arbitration and Conciliation Act, 1996. Unless the Parties agree on a sole arbitrator, within 30 days from the receipt of a written request by one Party from the other Party to so agree, the arbitral panel shall comprise of three arbitrators. In that event, the supplier will nominate one arbitrator and the Project Coordinator of IITM shall nominate on arbitrator. The Dean IC&SR will nominate the Presiding Arbitrator of the arbitral tribunal. The arbitration proceeding shall be carried out in English language. The cost of arbitration and fees of the arbitrator(s) shall be shared equally by the Parties. The seat of arbitration shall be at IC&SR IIT Madras, Chennai.

- a. **The Applicable Law:** This Purchase Order shall be construed, Interpreted and governed by the Laws of India, Court at Chennai shall have exclusive jurisdiction subject to the arbitration clause.
- b. Any legal disputes arising out of any breach of contract pertaining to this tender shall be settled in the court of competent jurisdiction located within the city of Chennai in Tamil Nadu.

20. All Amendments, time extension, clarifications etc. will be uploaded on the website only and will not be published in newspapers. Bidders should regularly visit the above website to keep themselves updated. No extension in the bid due date/ time shall be considered on account of delay in receipt of any document by mail.

Acknowledgement: - It is hereby acknowledged that the tenderer has gone through all the conditions mentioned above and agrees to abide by them.

**SIGNATURE OF TENDERER
ALONG WITH SEAL OF THE
COMPANY WITH DATE**

Technical Specifications

Please provide an explicit compliance table for all the points below with justification as applicable.

- a. Please indicate prior FPGA boards (of similar complexity of at least 18 layers) that you have fabricated. Vendors without prior experience (of at least 5 prior boards) of similar complexity will be disqualified. Documentary evidence of the same should be provided.
- b. Firm should have existed for at least 5 years
- c. Explicitly indicate the Fab details and its technical capabilities, where the board will be fabricated.
- d. Explicitly indicate the plant details and its technical capabilities, where the board will be assembled.
- e. Firm must have prior experience in fabrication of PCB boards of similar complexity for 5G/4G applications. IITM may ask for documentary evidence for the same.
- f. The assembly facility should be in India **OR** there should be a local office in India:
 - i. Where IITM can ship the required components (FPGA's, Transceivers)
 - ii. Which takes care of the shipment/customs of the parts (if required), boards to the required fab/assembly plant.
 - iii. Which delivers the finished boards to IIT Madras in time.
 1. **IITM will NOT take responsibility of the shipment or the customs duty/procedure either for any items in the entire process.**
 2. The vendor should factor the shipment/custom clearance time in the proposal and will be evaluated as such.
- g. The assembly plant should be ready for some basic rework as the case arises

The final evaluation will be based on both the evaluation of the technical expertise of the firm and the financial bid with a weightage ratio of 8:2, i.e., 80% weightage to the technical expertise and 20% on the financial bid.

Technical criterion

	<u>Points (Total 80)</u>
Fabrication and Assembly of 18 layer HDI mixed signal boards (FPGA+ RF)	5
Fabrication and Assembly of PCB boards for 5G applications	10
Turnaround time for PCB fabrication	10
Compliance to the fabrication specifications	35
Production capabilities of the chosen fab and	5

expertise	
Assembly capabilities	5
Lead time for the assembly of the first PCB board	10

There are two stages:

Stage 1: PCB fabrication: At the end of Stage1, the firm should provide us with a report on the PCBs that were fabricated and proceed with the assembly only after technical approval by the IITM team.

Stage 2: BOM procurement and PCB assembly

The PCB Fabrication cost, BOM cost and Assembly cost should be separated and be explicitly mentioned.

	Compliance Yes/No
Turn around time from the receipt of the PO till the assembly (finished) and delivery of the first board delivered to IIT Madras (as per Stage 1)	4 Weeks

The technical details of the PCB Fabrication, BOM and PCB assembly are provided below.

PCB Fabrication

Please provide a compliance table for the following stating Yes/No. **The PCB details have to be provided.** The Gerber files will be provided once the PO is generated.

Fabrication Time	2 Weeks
# of Boards	<u>5</u>
No. of layers	18
Via Technology	Through Hole with back drilling option

Material(Specify clearly whether High Tg or Normal Tg)	Megtron-6
Impedance control (Yes/No) Mention tolerance	Yes
Board thickness (1.6mm/2.4mm/3.2mm/ any other) Mention Tolerance	Entire board must be: <ol style="list-style-type: none"> 1. 70.97mil thickness over the copper 2. 67.67mil thickness over the laminate 3. 71.97mil thickness over the Soldermask
Copper finish (35 microns/70 microns/ any other)	Copper Thickness: <ul style="list-style-type: none"> ● Outer Layers: <ol style="list-style-type: none"> a. Signal Layer Thickness 1.65 mil ● Inner Layers: <ol style="list-style-type: none"> a. Signal Layer Thickness 0.60 mil b. Power (Including ground) layers 0.60 and 1.2 mil
Min. finished hole dia (mil)	8 Mil Mech and 6 Mil Laser vias
Min. trace width (mil)	3
Min. spacing (mil)	3
Min. Annular ring (mil)	6
Board finish(Hot Air Levelled/ Electroless Ni-Au / Hard Gold / any other)	Enig
PCB Dimension in mm	130X180
<u>PCB Quantity fabricated(Min)</u>	<u>5</u>
Delivery time	14 working days
Metal core board	No
Mil Grade	No
Whether Group B Test Report required	No
Solder Mask Colour	Green

Silkscreen Colour	White
RoHS Compliant	Yes
UL Logo Required	Yes
Back Drilling Required	Yes(customer reserves the option to remove this feature)
RF VIAS	No

Stack up requirements of the board (Material and Stack-up cannot be changed.)

Customer required thickness	71.97/-9.25 mils Measured: Over mask on plated copper
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Layer Image:

Layer	Cu Thick. (mils)	Cu Foil wt (oz)	Lam. Thick. (mils)	Description
1	1.65	.375 oz		Foil .375 oz
2	0.60	0.5 oz	2.76	Preprea Meatron6 1035(75) 18Gx24
3	0.60	0.5 oz	3.00	Core Meatron6 3.00mils 1078 0.5 oz / 0.5 oz HVLP 18.25Gx24.25
4	0.60	0.5 oz	3.49	Preprea Meatron6 1078(72) 18Gx24
5	0.60	0.5 oz	3.00	Core Meatron6 3.00mils 1078 0.5 oz / 0.5 oz HVLP 18.25Gx24.25
6	0.60	0.5 oz	4.92	Preprea Meatron6 1035(75)/1035(75) 18Gx24
7	1.20	1 oz	3.00	Core Meatron6 3.00mils 1078 0.5 oz / 1 oz HVLP 18.25Gx24.25
8	0.60	0.5 oz	3.64	Preprea Meatron6 1078(72) 18Gx24
9	1.20	1 oz	2.00	Core Meatron6 2.00mils 1035 0.5 oz / 1 oz RTF 18Gx24
10	1.20	1 oz	4.05	Preprea Meatron6 1078(75) 18Gx24
11	0.60	0.5 oz	2.00	Core Meatron6 2.00mils 1035 0.5 oz / 1 oz RTF 18Gx24
12	1.20	1 oz	3.64	Preprea Meatron6 1078(72) 18Gx24
13	0.60	0.5 oz	3.00	Core Meatron6 3.00mils 1078 0.5 oz / 1 oz HVLP 18.25Gx24.25
14	0.60	0.5 oz	4.92	Preprea Meatron6 1035(75)/1035(75) 18Gx24
15	0.60	0.5 oz	3.00	Core Meatron6 3.00mils 1078 0.5 oz / 0.5 oz HVLP 18.25Gx24.25
16	0.60	0.5 oz	3.49	Preprea Meatron6 1078(72) 18Gx24
17	0.60	0.5 oz	3.00	Core Meatron6 3.00mils 1078 0.5 oz / 0.5 oz HVLP 18.25Gx24.25
18	1.65	.375 oz	2.76	Preprea Meatron6 1035(75) 18Gx24 Foil .375 oz

Impedance table:

Layer	Structure Type	Coated Microstrip	Target Impedance (ohms)	Impedance Tolerance (ohms)	Target Linewidth (mils)	Edge Coupled Pitch * (mils)	Reference Layers	Modelled Linewidth (mils)	Modelled Impedance (ohms)	CoPlane r Space (mils)
1	Single Ended	Yes	50.00	+/-5	4.75	0.00	(2)	4.75	50.57	
1	Single Ended	Yes	40.00	+/-4	7.50	0.00	(2)	7.50	39.83	
1	Edge Coupled Differential	Yes	80.00	+/-8	5.50	10.00	(2)	5.50	80.03	
1	Edge Coupled Differential	Yes	100.00	+/-10	3.75	10.00	(2)	3.75	99.80	
3	Single Ended	---	50.00	+/-5	3.50	0.00	(4, 2)	3.50	48.89	
3	Edge Coupled Differential	---	80.00	+/-8	4.80	11.00	(4, 2)	4.80	80.05	
3	Single Ended	---	40.00	+/-4	5.00	0.00	(4, 2)	5.00	39.80	
3	Edge Coupled Differential	---	100.00	+/-10	3.25	11.00	(4, 2)	3.25	100.52	
5	Edge Coupled Differential	---	80.00	+/-8	5.50	9.50	(7, 4)	5.50	80.13	
5	Single Ended	---	40.00	+/-4	6.75	0.00	(7, 4)	6.75	39.50	
5	Single Ended	---	50.00	+/-5	4.50	0.00	(7, 4)	4.50	49.80	
5	Edge Coupled Differential	---	100.00	+/-10	4.00	10.00	(7, 4)	4.00	99.22	
6	Edge Coupled Differential	---	100.00	+/-10	4.00	10.00	(4, 7)	4.00	99.22	
6	Single Ended	---	40.00	+/-4	6.75	0.00	(4, 7)	6.75	39.50	
6	Edge Coupled Differential	---	80.00	+/-8	5.50	9.50	(4, 7)	5.50	80.13	
6	Single Ended	---	50.00	+/-5	4.50	0.00	(4, 7)	4.50	49.80	
13	Edge Coupled Differential	---	100.00	+/-10	4.00	10.00	(15, 12)	4.00	99.22	
13	Edge Coupled Differential	---	80.00	+/-8	5.50	9.50	(15, 12)	5.50	80.13	
13	Single Ended	---	50.00	+/-5	4.50	0.00	(15, 12)	4.50	49.80	
13	Single Ended	---	40.00	+/-4	6.75	0.00	(15, 12)	6.75	39.50	
14	Single Ended	---	40.00	+/-4	6.75	0.00	(12, 15)	6.75	39.50	
14	Single Ended	---	50.00	+/-5	4.50	0.00	(12, 15)	4.50	49.80	
14	Edge Coupled Differential	---	80.00	+/-8	5.50	9.50	(12, 15)	5.50	80.13	
14	Edge Coupled Differential	---	100.00	+/-10	4.00	10.00	(12, 15)	4.00	99.22	
16	Edge Coupled Differential	---	100.00	+/-10	3.25	11.00	(15, 17)	3.25	100.52	
16	Single Ended	---	50.00	+/-5	3.50	0.00	(15, 17)	3.50	48.89	
16	Single Ended	---	40.00	+/-4	5.00	0.00	(15, 17)	5.00	39.80	
16	Edge Coupled Differential	---	80.00	+/-8	4.80	11.00	(15, 17)	4.80	80.05	
18	Single Ended	Yes	40.00	+/-4	7.50	0.00	(17)	7.50	39.83	
18	Edge Coupled Differential	Yes	100.00	+/-10	3.75	10.00	(17)	3.75	99.80	
18	Edge Coupled Differential	Yes	80.00	+/-8	5.50	10.00	(17)	5.50	80.03	
18	Single Ended	Yes	50.00	+/-5	4.75	0.00	(17)	4.75	50.57	

This stack-up was created using estimated copper area percentages. (25% signal, 50% mix, 75% plane).

5 mm handling area on all sides

Assembly

1. **We require 5 boards to be populated.**
2. The FPGAs, Radio chips and few High speed connectors required for the board will be provided by us. The rest of the BOM (as provided in the next section) has to **be procured by the vendor for 5.**
3. Assembly schedule of the board
 - a. Stage1: Two boards:
 - i. One Board: Power components
 - ii. One Board: All components
 - b. Stage2: **Three boards** with all the components. (Stages 2 may have some changes to the board depending on stage 1 testing).
4. Time Lines for assembly, X-ray and delivery

Board	Stage 1 (Delivery)	Stage 2 (Delivery)
MM-wave	4 weeks from PO	7 weeks from PO

MM-wave Board

1	No of comps per board	1200
2	No of BGAs per board	8
3	Maximum pin count	1760, 1 mm BGA
4	Minimum BGA pitch	1 mm
5	Total No of points to be soldered (no of Pins)	6000(approx)
6	PTH pins	300
7	Both side assembly	Yes
8	Board Size-	130 X 180 mm
9	Board Thickness	71.97 Mils
10	No of Layers	18
11	Qty-	5 MM-wave boards (as per the schedule in point 3)
12	X-ray verification of the BGA's	Yes. Test results should be provided.

MM-wave board Bill of Materials (BOM)

1. The following BOM is only for ONE board. The appropriate parts for **5 boards** should be procured
2. There could be an approx. 5% increase in the number of decoupling capacitors and termination resistors used.
3. Any items that are non-stocked need to be quoted - either for an alternate part or for the same part including the lead time.
4. We can share the excel sheet of the BOM on email request (rganti@ee.iitm.ac.in, raviteja@5gtbiitm.in, Please cc both the email id's).

Item	Reference	MANUFACTURER PART-NUMBER	PCB Footprint
1	CN1	DM3AT-SF-PEJM5	HIROSE_DM3AT-SF-PEJM5
2	C1	EEF-HX0D471R4 or EEFGX0D471R	CAPMP7343X200N
3	C2,C3,C4,C5,C6,C7	CL21A226MOCLRNC	CAPC2012X95N
4	C8,C9,C10,C26,C27,C48,C59,C65,C80,C81,C86,C87,C101,C317,C318,C417,C418,C419,C420,C421	C1206C106J4RACTU	CAPC3216X180N
5	C11,C12,C13,C17,C18,C19,C20,C21,C22	GRM21BR60J107ME15L	CC0603
6	C14,C15,C16,C40,C41,C51,C52,C69,C70	UWTOJ102MNL1GS	CAPAE830X1080N
7	C23,C33,C34,C35,C67,C68,C93,C94,C95,C324,C325,C326	C1210C226M4PACTU	CAPC3225X270N
8	C24,C25,C84,C85,C103,C128,C129,C135,C136,C142,C143,C149,C150,C156,C157,C163,C164,C165,C166,C169,C172,C173,C174,C175,C176,C177,C178,C179,C180,C181,C182,C183,C184,C185,C186,C187,C188,C189,C190,C191,C192,C200,C201,C202,C203,C204,C205,C206,C207,C208,C209,C210,C211,C213,C214,C226,C227,C228,C240,C241,C242,C254,C255,C256,C261,C262,C266,C268,C270,C277,C278,C279,C292,C296,C297,C298,C299,C300,C301,C302,C303,C304,C306,C308,C310,C312,C313,C314,C315,C316,C382,C384,C385,C386,C387,C391,C392,C393,C394,C395,C396,C397,C422,C430,C431,C432,C433	CL05A104KA5NNNC	CAPC1005X55N
9	C28,C88,C319	C1210C105M5PACTU	CAPC3225X170N
10	C29,C61,C82,C83,C89,C320	CL10B104KB8NNNC	CAPC1608X90N_B
11	C30,C90,C321	EEF-HX0D471R4	CAPMP7343X200N

12	C31,C32,C39,C44,C45,C46,C47,C50,C55,C56,C57,C58,C91,C92,C104,C105,C113,C114,C115,C116,C122,C123,C124,C126,C322,C323,C333,C334,C335,C336,C342,C343,C344,C345,C351,C352,C353,C354,C360,C361,C362,C363	GRM21BR60J107ME15L	CAPC3216X190N_A
13	C36,C38,C96,C98	OPEN	CAPC1608X87N
14	C37,C97,C328	04023D103KAT2A	CAPC1005X55N
15	C42,C43,C53,C54,C71,C72	UWTOJ681MNL1GS	CAPAE830X1080N
16	C49,C60	CL05A104KA5NNNC	CAPC1005X55N
17	C62,C108,C118,C127,C338,C347,C356,C365	C0402C101J5RAC7867	CAPC1005X55N
18	C63,C64	C0805C475J9RACAUTO	CAPC2012X140N_A
19	C66,C112,C117,C121,C125,C332,C337,C341,C346,C350,C355,C359,C364	EEE-1EA331UP	CAPAE830X1050N
20	C73,C74,C75	C3216X6S0G107M160AC	CAPC3216X190N_A
21	C76,C77,C78,C79,C99,C100,C366,C374,C383	C2220C476M4R2CAUTO	CAPC6050X550N
22	C102,C398,C414	LLL31MR70J475MA01L	CAPC1632X125N
23	C106,C107	GRM188R71C224KA01D	CAPC1608X87N
24	C109	C1005X5R1V225M050BC	CAPC1005X65N
25	C110,C111,C119,C120,C305,C307,C309,C311,C330,C331,C339,C340,C348,C349,C357,C358	CL32B226KAJNFNE	CAPC3225X270N
26	C130,C137,C144,C151,C158	GRM31CR61E226KE15L	CAPC3225X270N
27	C131,C132,C138,C139,C145,C146,C152,C153,C159,C160	GRM21BR61A106KE19L	CAPC2012X135N
28	C133,C140,C147,C154,C161	GRM155R6YA105KE11D	CAPC3225X170N
29	C134,C141,C148,C155,C162,C257,C280	04023D103KAT2A	CAPC1005X55N
30	C167,C171,C212,C215	CL05A104KA5NNNC	CAPC3225X170N
31	C168,C170,C213,C214	C1210C105J5RACTU	CAPC3225X170N
32	C215,C220,C225,C229,C234,C239,C243,C248,C253	CAPC1005X65N	CAPC1005X65N
33	C216,C217,C221,C222,C230,C231,C235,C236,C244,C245,C249,C250,C264,C265,C272,C273,C282,C283,C287,C288	GRM155R61A474KE15D	CAPC1005X55N
34	C218,C219,C223,C224,C232,C233,C237,C238,C246,C247,C251,C252,C267,C269,C274,C275,C284,C285,C289,C290	C1005X7R1C683K050BC	CAPC1005X55N
35	C258,C259,C260,C263,C271,C276,C281,C286,C291,C293,C294,C295	C1005X5R0J475M	CAPC1005X65N
36	C327,C329	DNI	CAPC1608X90N_D
37	C367,C368,C370,C371,C372,C373,C376,C377,C378,C379,C380,C381	GCM155R71H103JA55D	CAPC1005X55N
38	C369,C375	C1206C106J4RACTU	CAPC3216X180N
39	C388	GRM1535C1H330JDD5D	CAPC1005X55N
40	C389,C390	GRM1555C1H220JA01J	CAPC1005X55N
41	C399,C401	CL05A104KA5NNNC	CAPC1005X55N
42	C400,C403	C0603C474J4RACTU	CAPC1608X87N

43	C402	C0402C272J5RAC7867	CAPC1005X55N
44	C404	CL05A106MP8NUB8	CAPC1005X55N
45	C415	C0603C102J5RACTU	capc1608x87n
46	C416	GRM21BR60J107ME15L	CC0603
47	C423	C1608X5R1E106M080AC	capc1608x87n
48	C424	C0603X105J4RAC7867	CAPC1608X95N_C
49	C425	CGB2A1X5R1E105K033B C	CAPC1608X95N_C
50	C426	EEE-1EA331UP	CAPAE830X1050N
51	C427,C428,C429	C1210C105J5RACTU	CAPC3225X170N
52	DS1	HSMF-C155	LED_HSMF-C157
53	DS2	SML-LX0603GW-TR	LEDC1608X70N
54	DS3,DS4,DS5	SML-LX0603IW-TR	LEDC1608X60N
55	D1	MBR120VLSFT1G	SODFL3617X100N
56	D2	1N4148X-TP	SODFL1608X77N
57	D3	SML-LX0603GW-TR	LEDC1608X60N
58	J1,J2,J3,J4,J5	DNP	TP_40C
59	J7	132134	AMPHENOL_132134
60	J9	Header5X2	Header5X2
61	J10	UE75-A20-6000T	AMPHENOL_UE75-A20-6000T
62	J11	768710006	MOLEX_768710006
63	J12	878321420	Molex_878321420
64	J13	Header 3X2	Header 3X2
65	J14	Header 5X2	Header5X2
66	J15	RJMG2012211A0FR	AMPHENOL_RJMG2012211A 0FR
67	J16	PBC36SAAN	SULLINS_PBC36SAAN
68	J19	HEADER 1X3	RC0603_3P
69	J20	HEADER 1X3	RC0603_3P
70	J21	Header 3X2	HEADER_3X2_IITM
71	J22	39281103	MOLEX_39281103
72	J23,J24	22112032	MOLEX_22-11-2032
73	J25,J26,J27,J28	Test point	TP_40C
74	L1,L4	RLF7030T-2R2M5R4	IND_RLF7030T-2R2M5R4
75	L2,L3	BLM15BD102SN1D	INDC1005X55N
76	L5	LBC2016T100K	INDC2016X180N
77	L6	MLF2012A1R8KT000	Header3X2
78	L7,L8,L9,L10,L11,L12	XAL4030-472ME	IND_XAL4030-472MEC
79	L13	RLF7030T-2R2M5R4	IND_RLF7030T-2R2M5R4
80	L14,L15,L16,L17	BLM21PG221SN1D	indc2012x105n
81	L18,L19	HZ0805E601R-10	INDC2012X110N_A
82	Q1	MMBT3904	SOT95P240X130N
83	Q2,Q3,Q4,Q5,Q6,Q7	2N3904ZL1G	TO260P1957X877-3N
84	Q8,Q9	NDS331N	sot95p240x120-3n
85	Q10	FDS6673BZ	MOSFET_FDMC8878
86	Q11	BSS138	SOT95P240X120-3N

87	RADDR1,R2,R3,RADDR5,RPD6,RADDR6,RPD7,RADDR7,RPD8,RADDR8,RPD9,RADDR9,RPD10,RADDR10,RPD11,R22,R23,R30,R31,R38,R39,R66,R67,R74,R75,R266,R267,R274,R275,R282,R283,R290,R291,R302,R305,R311,R315,R322,R377,R378,R379,R380,R381	ERJ-2RKF1002X	RESC1005X40N_B
88	RADDR2,RADDR3	ERJ-2RKF1132X	RESC1005X40N_C
89	RADDR4	ERJ-2GEJ113X	RC0603
90	RPU1,RFCO1,RDCM1,RCS1,RCCM1,RASCR1,RPU2,RFCO2,RDCM2,RCCM2,RPU3,RFCO3,RDCM3,RCCM3,RPU4,RFCO4,RPU5,RFCO5,RPU6,RFCO6,R6,RPU7,RFCO7,R7,RPU8,RFCO8,RPU9,RPU10,R13,R17,R25,R26,R33,R34,R43,R44,R49,R53,R69,R70,R77,R78,R257,R261,R262,R269,R270,R277,R278,R285,R286,R293,R294,R303,R308,R310,R319,R324,R328,R331,R333	DNI	RESC1005X40N_C
91	RFREQ1,RFREQ2,RFREQ3,RVSET5,RFREQ6,RFREQ7,RFREQ8,RFREQ9,RFREQ10,RFREQ11	ERJ-2RKF2612X	RESC1005X40N_PEC
92	RFREQ4	ERJ-2RKF2872X	RESC1005X40N_PEC
93	RFREQ5	RT0402BRD0758K3L	RESC1005X40N_PEC
94	RPD1,RPD2,RPD3,RPD4,R4,RPD5,R19,R21,R55,R57,R265,R403,R404	ERJ-2GEJ104X	RESC1005X40N_B
95	RSS1,RSS2,RSS3,RSS4,RSS5,RSS6,RSS7,RSS8	ERJ-2RKF6812X	RESC1005X40N_PEC
96	RUVLO1	RT0402BRD0782K5L	RESC1005X40N_PEC
97	RVSET1,RVSET3	RT0402BRD0716K2L	RC0603
98	RVSET2	ERJ-2RKF1782X	RESC1005X40N_PEC
99	RVSET4,RVSET7	ERJ-2RKF3162X	RESC1005X40N_PEC
100	RVSET6	ERA-2AEB753X	RESC1005X40N_PEC
101	RVSET8	ERA-2AEB1692X	RESC1005X40N_PEC
102	RVSET9	MCT06030C1103FP500	RC0603
103	RVSET10	RC0603FR-07147KL	RC0603
104	R1,R14,R20,R24,R32,R40,R51,R56,R63,R68,R76,R259,R264,R268,R276,R284,R292	RC0603FR-07160KL	RESC1608X55N_A
105	R5	ERJ-2RKF6651X	RESC1005X40N_PEC
106	R8,R9,R10,R27,R28,R29,R35,R36,R37,R45,R46,R59,R60,R61,R71,R72,R73,R79,R80,R81,R271,R272,R273,R279,R280,R281,R287,R288,R289,R295,R296,R297	ERJ-2RKF1002X	RESC1005X40N
107	R11,R12,R47,R48,R82,R83,R89,R90,R96,R97,R103,R104,R110,R111,R255,R256	ERJ-2RKF10R0X	RESC1005X40N_PEC
108	R15,R50,R84,R91,R98,R105,R112,R258	LVK25R005FER	RES_LVK25R002DER_IITM
109	R16	ERJ-2RKF1132X	RESC1005X40N_PEC
110	R18,R54	DNI	RC0603
111	R41	ERA-2AEB392X	RESC1005X40N_PEC
112	R42,R312,R330,R332,R334	ERA-2AED102X	RESC1005X40N_B
113	R52,R85,R87,R88,R92,R94,R99,R100	ERJ-2RKF1132X	RESC1005X40N_B
114	R58,R62,R64	RT0402BRD072KL	RESC1005X40N_PEC

115	R65	ERJ-XGNF2612Y	RESC1005X40N_PEC
116	R86,R93,R107,R114,R414	ERJ-2RKF1132X	RESC1005X40N_B
117	R95	ERJ-2RKF1332X	RESC1005X40N_PEC
118	R101,R108	ERJ-2RKF1132X	RESC1005X40N_B
119	R102,R109,R116	ERJ-2RKF1332X	RESC1005X40N_B
120	R106,R113,R412	ERJ-2RKF1132X	RESC1005X40N_C
121	R115	ERJ-2RKF1132X	RESC1005X40N_PEC
122	R117,R118,R119,R120,R123,R124,R128,R129,R134,R135,R138,R139,R140,R141,R142,R143,R145,R146,R147,R152,R153,R154,R389,R413	DNP	RESC1005X40N_C
123	R121,R122,R250,R251,R252,R253,R309,R313,R314,R316,R317,R318,R321,R323,R325,R326,R327,R329	ERJ-2RKF22R0X	RESC1005X40N
124	R127,R130,R131,R132,R133,R148,R149,R150,R155,R156,R299,R300	ERJ-2RKF1132X	RESC1005X40N_C
125	R151	DNP	RESC1005X40N_C
126	R157,R158,R160,R161,R163,R164,R166,R167,R199,R200	ERJ-1GEJ101C	RESC0603X26L
127	R159,R162,R165,R168,R201	ERJ-2RKF2400X	RESC1005X40N_B
128	R169,R170,R171,R172,R173,R174,R175,R176,R177,R178,R179,R180,R181,R182,R183,R184,R185,R186,R187,R188,R189,R190,R191,R192,R193,R202,R203,R204,R205,R206,R207,R208,R209,R210,R211,R212,R213,R214,R215,R216,R217,R218,R219,R220,R221,R222,R223,R224,R225,R226	ERJ-2RKF39R2X	RESC1005X40N_PEC
129	R194,R195,R227,R228	ERJ-2RKF36R0X	RESC1005X40N_PEC
130	R196,R229,R342,R343,R344,R345,R367,R368	ERJ-2RKF4990X	RESC1005X40N_PEC
131	R197,R230	MCR01MZPF1001	RESC1005X40N_C
132	R198,R231,R338,R339,R340,R341,R349,R350,R351,R352,R362,R415,R416,R417,R418,R419,R420	ERJ-2RKF4701X	RESC1005X40N
133	R232,R233,R234,R235,R236,R238,R240,R241,R243,R320	RC1005F472CS	RESC1005X40N_C
134	R237,R239,R242	RC1005F472CS	RESC1005X40N_C
135	R244,R245,R390,R393	ERJ-2RKF1132X	RESC1005X40N_C
136	R246,R248,R249,R304	ERA-2AEB472X	RESC1005X40N
137	R247	ERA-2AEB472X	RESC1005X40N
138	R254	ERJ-2RKF1132X	RESC1005X40N_C
139	R260	ERJ-2RKF1132X	RESC1005X40N_PEC
140	R263	RN73H2ATTD9652B25	RC0603
141	R298,R301	ERJ-2RKF2491X	RESC1005X40N_B
142	R306	RT0402DRE0712K1L	RESC1005X35N
143	R307	ERJ-2RKF1132X	RESC1005X40N_C
144	R335,R336	RC0603FR-07220RL	RESC1608X55N_A
145	R337	RC0402FR-07240RL	RESC1005X40N_B

146	R346	CRCW040220R0FKED	RESC1005X40N_C
147	R347	ERJ-2GEJ475X	RESC1005X40N_PEC
148	R348,R353,R354,R355,R364,R365	ERJ-2RKF2610X	RESC1005X40N_PEC
149	R356,R357,R358,R366	ERJ-2RKF1002X	RESC1005X40N_B
150	R359	ERJ-2RKF8061X	RESC1005X40N_PEC
151	R360,R361,R363	ERJ-2RKF8061X	RESC1005X40N_PEC
152	R369,R370,R371,R372,R373,R374	ERJ-2RKF30R0X	RESC1005X40N_PEC
153	R375,R376	RC0402FR-071KL	RESC1005X40N_PEC
154	R382,R383,R384,R385,R386,R387	RC0805FR-0730RL	RESC1005X40N_PEC
155	R388	RC0402FR-071KL	RESC1005X40N_VISHAY
156	R391	DNI	RESC1005X40N_PEC
157	R392,R394	RC0402FR-0720K5L	RESC1005X40N_D
158	R395	RC0402FR-074K7L	RESC6332X70N
159	R396,R397	RC0402FR-07100RL	RESC1005x40N_A
160	R402,R405	RC0402FR-07100RL	RESC1005X40N
161	R406	ERJ-2RKF2001X	RESC1005X40N_PEC
162	R407	ERJ-2RKF1002X	RESC1005X40N
163	R408	TNPW040214K5BEED	RC0603
164	R409	RC0402FR-075K49L	RC0603
165	R410	TBRC0402FR-071KL	RESC1005X40N_PEC
166	R411	ERJ-2RKF2001X	RESC1005X40N_PEC
167	SW1	SDA04H1SBD	SW_SDA04H1SBD
168	SW2	TL3301EF100QG	SW_TL3301EF100QG
169	SW3	1101M2S3AQE2	SW_1101M2S3AQE2
170	TP1,TP2,TP3,TP4,TP5,TP6,TP7,TP8,TP9,TP10,TP11,TP12,TP13,TP14,TP15,TP16,TP17,TP18,TP19,TP20,TP21,TP22,TP23,TP24,TP25,TP26,TP27,TP28,TP29,TP30,TP31,TP32,TP33,TP34,TP35,TP36,TP37,TP38,TP39,TP40,TP41,TP42,TP43,TP44,TP45,TP46,TP47,TP48,TP49,TP50,TP51,TP52,TP53,TP54,TP55,TP56,TP57,TP60	DNI	TP_40C
171	TP59	DNI	TP_40C
172	U1	ISL8272MARIZ	MODULE_ISL8272MAIRZ
173	U2,U8,U13,U15,U17,U19,U21,U31	INA226AIDGS	VSSOP50P490X110-10N
174	U3,U32	ISL85003FRZ-T7A	SON50P300X400X90-13N
175	U4,U5	ZL9010MAIRZ	MODULE_ZL9010MIRZ
176	U6	ZL9010MAIRZ	PQFN130P1500X1500X370-21N
177	U7	ISL80136IBEAJZ	SOIC127P602X168-9N_A
178	U9	ISL85003FRZ-T7A	SON50P300X400X90-13N
179	U10	MAX15303AA00+CM	QFN50P600X600X80-41N
180	U11,U12,U33,U34,U35,U36	ZL9006MIRZ	MODULE_ZL9010MIRZ
181	U14,U18	ISL80112IRAJZ	DFN50P300X300X100-11N
182	U16	ISL80112IRAJZ	DFN50P300X300X100-11N
183	U20,U22	ISL80112IRAJZ	DFN50P300X300X100-11N
184	U23,U24	Si5348A-D-GM	64-QFN (9x9)

185	U30,U39	SN74AVC1T45DCKR	TSOP65P400X130-8N
186	U38	KSZ9031RNXCC	QFN50P700X700X90-49N_T510
187	U40	MAX16025TE+	WQFN65P400X400X80-17N_A
188	U41	REF3012AIDBZT	SOT95P237X112-3N_TI
189	U43	TPS51200DRCT	SON50P310X310X100-11N
190	U44	ADP322ACPZ-145-R7	QFN50P300X300X80-17N_T175
191	U45,U46	MT25QU02GCBB8E12-0SIT	BGA24C100P5X5_600X800X120
192	X1	FC-13A 32.7680KA-A	XTAL320X150X90N_A
193	Y2,Y3	7M48072002	OSCCC250X320X80-4N
194	Y4,Y5	SIT5356-AI-FQ-25N0-40.000000F	10-SMD, No Lead
195	Z1,Z2,Z3,Z4,Z5	DNP	RESC1608X55N_A
196	Z7	DNP	RESC1608X55N_A



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July 22, 2016

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Please Credit in USD

(THROUGH)

JP MORGAN CHASE, NEW YORK
SWIFT CODE: CHASUS33

For Credit to

USD ACCOUNT No: 001-1395969, of CANARA BANK INTERNATIONAL DIVISION
MUMBAI

For Further Credit to

ACCOUNT NO: 2722101001741 of IIT Chennai – Swift Code: CNRBINBBIIT
OF THE REGISTRAR, IIT, MADRAS


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JOINT REGISTRAR (IC & SR)
आई.आई.टी. मद्रास
IIT, MADRAS

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Senior Manager
Canara Bank - IIT Madras branch



एस.अरवीन्दन
S.ARAVINDAN
सिनिअर प्रबन्धक Senior Manager
प.अ.सं. S.P.No.31649