The main reason is "TECHNOLOGY" not the money or market volume. We don't have any scientific knowledge neither technological expertise in semiconductor processing. Such knowledge & technology (single crystal generation, chemical diffusion, metal deposition, surface metrology, nm lithography etc) is listed under US export control list. So you can not buy those technologies does not matter how much money you spend, unless US Govt allows them to sale. Remember India buys Israeli Radar for 2B $, Old Russian Ship/submarine for ~B$ and others ..so as a country we have enough money, eagerness and we are ready to pay any sum of money to buy such technology. But the truth is nobody wants to sale us or give us those technology. Same is true for several other countries like European Unions. We were never in US favorite list of countries and then after nuclear bomb test in 1998 US put us in complete export restriction which virtually prohibit us to buy anything high technology equipment or technology (even milligram balance or a 2 nm rough surface is restricted to buy !! then Fab is a far reaching object). That restriction was lifted recently in 2008 after Dr. Manmohan Singh Govt signed nuclear treaty and India is taken out from export control list. But still US and Europe will never sale the whole set of those technology.

a) Our Scientist and Engineers from Govt sector or Private sector did not able to develop those key technologies. We don't have any technology to produce "Silicon Ingot" ( i,e Silicon Single Crystal) or other materials, the main building block for Semiconductor). As we don’t have technology so we didn't able to develop any full working semiconductor FAB in India. As mentioned earlier those technologies are heavily guarded and restricted by US Govt and Europeans. So even if Indian Govt or private company pay heft sum, nobody will eager to give you those technologies.

b) Specially for new generation material for example high speed material like GaAs, (used in mobile component), AlGaAs/AlGaN we even can't even buy those stuff (i,e wafer or technology) as they are completely prohibited under export restricted item even TODAY by US Govt . They can sold to India as a whole product (for example a mobile phone sold in India has GaAs transistor) but you can't buy directly GaAs manufacturing technology or material sitting in India. It is completely prohibited and restricted by US govt.(remember US even does not allow Israel to buy AlGaAs/AlGaN, so you can understand what will be India’s situation in that respect)

History of Indian Semiconductor IC manufacturing: Apart from two Govt company (Semiconductor India Ltd(SCL) and BEL (Bharat Electronics Ltd) there is still virtually nothing exist. During 80's SCL and BEL used to produce ASIC/Transistor using some old technology (licensing) from US company RCA that India Govt got from US Govt. SCL used to make made some ASIC (~ 2 micron), EEPROM etc that they used in ISRO and BEL made some TV/Radio ICs/Transistor/Amplifier /Thyristor/high current switch under RCA license that used mostly in BW and Color Television/Radio and in Indian locomotives/Motor circuit. Recently (~ 2011) Indian Govt negotiated with Tower Semiconductor (Israel) and bought one of their old plant in an attempt to produce some chip (mostly RAM, ASIC) in India. Intel didn't wanted to enter Indian market. Outside US INTEL has only Fab in Israel and Ireland and had not even one in China until recently (in 2011 Dailan) so India's chances are really really slim that Intel will come to India. There is no special reason why India will give any advantage for INTEL to come there and made such huge investment.

Whenever you heard something about Semiconductor company/startup in India, it solely based on outsourced software design for integrated circuit/micro controller i,e basically writing code (VHDL, verification etc) and is nothing to do with making any physical semiconductor in Lab. So of course "Made In India" is easy to say but in reality except Tower Semiconductor nothing actually practically worked till now.

.

There are companies which only design chips - like AMD, NVidia, Qualcomm, ARM and hundreds more. They are called fabless semiconductor company. Then there are companies which solely make semiconductors out of designs given by the former - like Global Foundries (previously a part of AMD), TSMC, Samsung etc. Then there are companies that do both, like Intel.

Computer chips have millions or even billions of transistors. Designing, optimizing and testing them is a gargantuan task. And then etching them onto silicon so small that some parts are only few atoms across is even more challenging. You need to build tools from scratch to do things others have not done before. Doing things what others have not done before is critical in the semiconductor industry so as not to slide into oblivion. You need software which can lay out billions of transistor, keeping in account transistor delay and quantum mechanical effects. You need fabs which can etch patterns with precision 20 times higher than the wavelength of visible light.

ALL that takes a lot of money.

You need a lot of super skilled people working on your projects over several years. You need to setup manufacturing facilities worth billions of dollars and you have to explore the dark corners of physics where nobody has gone before. Project costs run into several billions of dollars and it only returns profits after several years. Its this prohibitively high entry costs that keep newcomers away from the industry.

Most major chip manufacturers are from USA because in the 50’s and 60’s, the US Department of Defence felt a compelling need to develop small and powerful computers in order to power their intelligent missiles and ever complex planes. I have written more about it here: Why do computers only use US-made processors? Long story short, the US defence establishments funded many early semiconductor companies, which gave them a head start in this field.

And the consumer PC market exclusively belongs to Intel and AMD because they have Intellectual property rights over x86–64. x86–64 is the Instruction Set Architecture (ISA) of Intel and AMD CPUs. An Instruction Set is like a language the software needs to be written in. It consists of codes which can be used to perform several operation and specifies formats to pass operands or data. So no other company can design, build and ship processors that speak x86–64 until either of the company allows them to. In fact AMD too would have been out of business a decade ago if they hadn’t developed x86–64 (and licensed to Intel), the 64 bit extension of Intel’s x86 ISA, which they leased to AMD in the early 90’s. Recently, AMD revealed partnership with Chinese semiconductor firms. They will be allowed to build x86 processors while AMD gets paid in return. So we will be seeing several Chinese desktop processors too over the coming years.

x86–64 is deeply entrenched into the desktop and server market, much like ARM is entrenched into the mobile space. So much code and so many systems have been written in these instruction sets that moving to a new instruction set would require them to rewrite all that code. So developers keep writing software for ARM or x86–64 while AMD, Intel and ARM keep shipping processors. Its legacy which keeps these companies alive.

Setting up a chip manufacturing company (also known as fab) is extremely capital intensive. The investment required to set up a single fab is in the range of $2.5 - $5 billion, which is very high for a lower middle income country like India.

Besides, like fellow quorians mentioned on this platform we need uniterrupted power, clean water etc. Fab’s need to be protected from extremely small impurities (in the order of ppm) and requires extraordinary effort to maintain those clean rooms since a single impurity will alter the characteristics of the chip. Maintaining that kind of cleanliness and stringent manufacturing practises is one big issue in our country. India does manufacture chips at a small scale for sensitive areas like defence and space research at fabs present within IISC, Semi conductor Labs, Mohali and few others places.But manufacturing chips at a large scale for consumer electronics and other industries is altogether a different ball-game.

The manpower required for these industries are extremely skilled and very niche, which takes decades to nurture them. Countries like Taiwan, South korea, japan started nurturing talent for these industries from 1970’s.We are far behind in this game and its not worth our nation’s time and effort anymore.

India faces this kind of problem in generic drug manufacturing companies too, where Indian companies are occasionally cautioned & warned by US FDA over alleged bad manufacturing practices involving cleanliness of the drug manufacturing areas.Infact many companies paid millions of dollar as fines for manufacturing violations.

Chip manufacturing companies require far more rigorous manufacturing standards in preventing impurities measured in ppm than drug manufacturing companies.

India has good expertise in chip designing but not in chip manufacturing.

Some of the guys here are confused with chip designing & chip manufacturing. Both require a very different skill set and resources.

P.S : IISc Bangalore has forwarded a proposal to setup a Gallium Nitride fab at its Center for Nano Science & Engineering ( CeNSE ) under the leadership of associate professor Srinivasan Raghavan with an estimated budget of 3000 crore INR. GaN is considered a wonder nano material and the future of semiconductor industry with wide ranging applications in developing cutting edge & strategic radar and communication systems. I believe Indian government is still mulling on the proposal and not sure when they will green light it. So you see, spending $3- $5 billion is out of question. If IISc gets funding for the proposed 3k crore fab, we all should celebrate it :-)

Infrastructure issue - Recently,Karnataka Govt. refused to set up Chip-Fab plant in Bangalore ,reason being lack of un-interrupted power supply and clean water supply (primary requirement of fab plant).

The country is noted for the sore absence of angel fund investors, efficient power supply, clean water for fab units, and poor waste management, warehousing, and road network infrastructures. On the other hand, India has some key advantages, including the availability of experts in VLSI design and semiconductor manufacturing, a vast internal market, low-cost engineering resources.

Govt. seeks to encourage local manufacturing and limit import of electronic merchandise, country's second-biggest foreign exchange-drainer after oil.

At any cost. no Indian companies can take this risk. In addition, foreign company can not invest due to poor infrastructure, low-skilled workers and electricity problems.

References:

Semiconductor fabrication plant - Wikipedia