Survey Of MediaTek Chipsets For Various Cores

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Abstract

Technological advancements in the area of wireless communication, network and VLSI has fuelled exponential customers using smartphone and many handheld devices. Different vendors have designed and developed flagship smartphone products based on many chipsets. This paper presents a survey of MediaTek chipsets, based on the number of cores present in the processor.

Keywords—*smartphones; MediaTek; chipsets; processor cores; arm-cortex*

INTRODUCTION

There has been an exponential growth in the number of smartphone users. For 2016, the number of smartphone users reached 2.1 billion and this is expected to pass 5 billion by 2019. There are many players in the processor manufacturing such as QUALCOMM, NVidia, apple, Samsung, MediaTek, Kirin, Intel, amd, renesas mobile.[53]

MediaTek is giving the high performance at the lower cost comparing to other smart phone CPU makers and is suitable for the midrange & budget smart phones. Currently MediaTek is releasing its flagship processor in the market. MediaTek processor chips are improved in power efficiency and the heating issue is solved.

Along with the above mentioned parameters, the CPU decides the life span of the smart phone and the other factors. Owing to these reasons it is important to know about the processor and its properties.

In this paper we would be comparing the processor chips of the MediaTek, based on the number of cores. As per best of our knowledge there are no papers wherein all such information are discussed. Wikipedia gives the information based on the chips and there are no working devices listed. This motivated us to author this paper based n MediaTek processors.

ABOUT MEDIATEK AND ARM

MediaTek was part of United Microelectronics Corporation (UMC) designing chipsets for home entertainment products[53] .On May 28, 1997, the unit was spun off and incorporated. MediaTek Inc. was listed on the Taiwan Stock Exchange (TSEC) under the "2454" code on July 23, 2001. [5]

The company forayed into designing chip solutions to deep embedded systems as digital TVs, DVD players, tablets, mobile phones and smartphones. It is worth noting that MediaTek started out designing chipsets for optical drives. Track record of MediaTek signifies it has out beaten the competitors after entering new markets [40].

To provide design solutions for mobile devices the company launched a division in 2004. Within seven years it started taking orders for more than 500 million

mobile system-on-chip units per annum. These included solutions for both feature phones and smart devices. The company helped many smaller companies and newbies to foray into mobile/handheld device market which was dominated by large corporations. It also provided extensive system engineering assistance to them. The mobile chip market quickly became the main growth driver for the company [44] .

MediaTek showcased the new brand "Everyday Genius" at Mobile World Congress 2014, with the goal to make smartphones more reachable, cost-effective and affordable to consumer market [42].

Globally MediaTek shipped about 700 million units for over 1500 mobile models as of November 2014, With a great market capture, company posted revenues of US$5.3 billion in the first half of 2014 which was nearly as much as the whole of 2013. This overwhelming revenue growth was possible   partly due to revenue recognition from the acquisition of MStar which became effective at the beginning of 2014 [46].

ARM A7
The Cortex-A7 processor uses an energy-efficient 8-stage pipeline, which is built of the Cortex-A5 processor. The Cortex-A7 processor features an integrated L2 cache designed for low-power, with lower transaction latencies. This distinct feature has an effect of improved OS support for cache maintenance. On top of this there is improved branch prediction and an improved memory system performance, with 64-bit load-store path, 128-bit AMBA 4 AXI buses and increased TLB size (256 entry, up from 128 entries for Cortex-A9 and Cortex-A5), increasing performance for large workloads such as web browsing.[15]

The Cortex-A7 processor has all features of the high-performance Cortex-A15 and Cortex-A17 processors such as 128-bit AMBA 4 AXI bus interface, virtualization support in hardware, Large Physical Address Extensions (LPAE), NEON and provides up to 20% more single thread performance than the Cortex-A5 [16].

Key benefits
- Armv7-A architectural extensions (40-bit physical addressing, hardware virtualization support).
- In single thread integer performance, more than 20% improvement is achieved compared to Cortex-A5.
- In memory streaming performance Integrated L2 cache subsystem achieves up to 43% improvements and provides improved area efficiency.
- It is suited to the needs of wearable mobile devices and UI-based consumer products.

ARM A-53
The Cortex-A53 processor boasts of up to four powerful cores, each containing an L1 memory system and an associated single shared L2 cache [2], [45].

Performance of the Cortex-A53 processor is significantly and strikingly more than its earlier processors, delivering at a higher level of power efficiency. This feature of Cortex-A53 processor takes the performance of the core higher than that of the Cortex-A7 processor, which till date defined many popular mainstream and entry-level mobile platforms. The performance comparisons in [35] clearly shows the performance improvements of the Cortex-A53 processor against the Cortex-A7 processor.

Key benefits
- Highly efficient processor to cater the needs of applications of mobile, DTV, automotive, networking, storage, aerospace, and more.[37]

- High value Armv8-A architecture for standalone entry level designs.[39]
- The Cortex-A53 processor can be paired in a big. LITTLE configuration with any Armv8.0 core.
- Mature product with high volume shipment.
- Option available to configure and implement this processor in an Arm big. LITTLE mode.

ARM A-72

Cortex-A15 processor designs were based on 28nm technology. The Cortex-A72, in comparison, delivers 3.5x the sustained performance Cortex-A15 processor designs[1]. Several major micro-architectural improvements in the processor were built on the current generation of ARMv8-A cores. Major class of workload execution were improved due to the enhancements in floating point, integer and memory performance.

The processor technology is optimized for the 16nm Fin FET process technology. This optimized processor technology enables the Cortex-A72 to clock up to 2.5GHz in the mobile power envelope and achieves even higher total delivered performance.

In addition to these key performance improvement metrics, the Cortex-A72 CPU also benefitted from significantly lower power consumption. Owing to the improved efficiency combined with the optimized 16nm Fin FET process technology the Cortex-A72 processor achieves an overwhelming 75% power reduction in representative premium mobile workloads.

To execute in a BIG/LITTLE configuration Cortex-A72 and Cortex-A53 processor can be paired in a big. LITTLE configuration for mobile applications. Within the processor cluster of Cortex-

A72 processor there can exist up to four cores, each with their L1 instruction and data caches, together with a single shared L2 unified cache.

Key benefits

- New-age, powerful, high performance processor from ARM designed for infrastructure, mobile and automotive markets.
- Market-leading compute density across all application form factors.
- Full ARMV8-A 64 bit support with improved efficiency and performance.
- This processor can also be implemented in an Arm big. LITTLE configuration.

ARM A -35

Compared to its predecessors, Cortex-A35 processor delivers more performance at a higher level of power efficiency [4]. In the entry-level and popular mobile platforms, specifically, performance improvements offered by Cortex-A35 processor is more significant compared to Cortex-A7 processor.

A highly-efficient eight stage in-order pipeline is used by the Arm Cortex-A35 processor which is highly optimized to provide it with full ARMv8-A features coupled with maximized area and efficiency.

Key benefits

- Armv8-A is backward compatible with Armv7-A, with efficient 64-bit architecture.
- Prominent efficiency improvements such as low active power and improved performance as compared to the Cortex-A7.
- Armv8-A processor is scalable with new configuration options.

CLASSIFICATION BASED ON NUMBER OF CORES

Independent unit of processor is called core. Advantage of multiple cores is they

achieve higher performance at lower energy. This feature helps battery operated mobile devices to be more energy efficient due to each core of a multi-core CPU is energy efficient compared to a single large monolithic core. This allows higher performance with less energy. A challenge in this, however, is the additional overhead of writing parallel code.[45]

We classify the mobile processors based on the number of cores as shown in the fig. 1
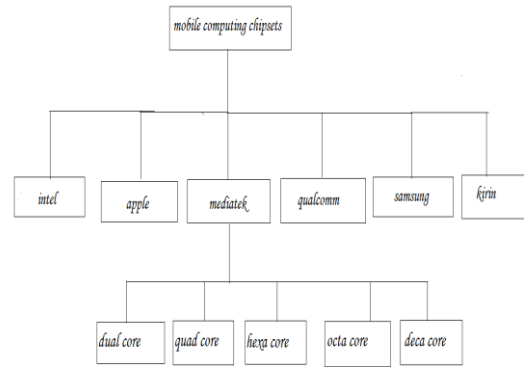

Fig. 1. *Classification of Mobile processors.*

Two core chipsets

Table 1. *, presents a list of all MediaTek chipset variants having two cores*

Table I   *TWO-CORE CHIPSETS*

type and year	width in bits	architecture	clock speed and technology	display and ram	GPU	other features	list of smartphones
Mt6572 2013 [50]	32bit	ARM cortex-A7	1.2 GHz 28nm	960*540(qHD) LPDDR2 266MHz	Mali-400@500MHz	It will bring dual core power to budget smartphones, improved the battery life, reducing manufacturing costs,802.11*WI-FI, Bluetooth, FM receiver, GPS,720p HD video recording and playback at 30fps,5-megapixel rear and 1.3-megapixel front cameras	jiayu, doogee (4), zopo, cubot (5), THL, ascer (2), wiko (7), leagoo, LG (2), archos (2), alcatel (3), huawei, tengda, landvo (2), elephone, jiake (3), mpie. [51]
mt6571[49]	32bit	ARM cortex-A7	1.2 GHz 28nm	960*540 (qHD) LPDDR2 266MHz	Mali-400@500MHz	command set architecture-ARMv7, the number of cores of the graphics processor-1, multi-mode release 8 HSPA+/TD-SCDMA,802.11*wi-Fi, Bluetooth, GPS, FM receiver.5MP rear and 1.3MP front cameras,720p HD video recording and playback at 30fps	elephone(2),lenovo(2),meizu (2),uiefone(1),zopo(2),[36]
Mt6572m 2013 [7]	32bit	ARM cortex-A7	1000 MHz 28nm	LPDDR2 266MHz	Mali-400@500MHz	multi core application processor with modem, memory interface(s) adelids SDRAM, LPDDR2 SDRAM, number of data bus channels re 1ch, semiconductor technology, supported cellular data link list, GPRS general packet radio service, UMTS universal mobile telecommunications system	HTC, ascer, wiko, alcatel (4), leagoo, landvo (4). [6]

Six Cores
Table 3. , presents a list of all MediaTek chipset variants having six cores

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Octa Cores

Table 4. , presents a list of all MediaTek chipset variants having eight cores.[43]

Ten Cores

Table 5. , presents a list of all MediaTek chipset variants having ten cores

As can be seen from the Tables I to V, various chipsets are classified based on the number of cores present detailed information such as the chipset type, architecture, clock speed and technology, GPU used, display and RAM. Also listed is various special features of the particular chipset. The table presents a consolidated details of various vendor's smartphones that use a particular MediaTek chipset. Also seen in the table is the width of the processor used in bits.

Table 2. , presents a list of all MediaTek chipset variants having four cores
Table II   FOUR-CORE CHIPSETS

type and year	width in bits and no of cores	architecture	clock speed and technology	display and ram	GPU	other features	list of smartphones
Mt6580 [8]	32 bits	ARM cortex-A7	1.3GHz 28nm	1280x720 LPDDR2/3 533MHz	Mali-400@533MHz	it brings quad core power and improved battery life to entry level smartphones accelerate the creation of images with optical quality, blutooth, wi-fi, GPS,1080P video encoding and decoding,13MP Primary cameras	doogee (9), wiko (9), cubot (6), asus (4), elephone (3), qukitel (3), ulefone (6), BLU (3), uhappy (2), jiake (3), THL, mpie (14), landvo (10), acer [9]
Mt6582[10]	32 bits	ARM cortex-A7	1.3GHz 28nm	720p HD LPDDR2/3 533MHz	Mali-400@500MHz	cost optimized system level design that reduces manufacturing costs, wi-fi, GPS, blutooth,8MP main camera,1080p full HD videos	Goophone (2), doogee (3) , Cubote (3), zopo, inew, huawei (2), lanovo (6), coolpad, inew, iocean (2), elephone (5)[11] Jiake (3), jiayu (3). Umi, ulefone, pomp
Mt6588 2013[12]	32bit	ARM cortex-A7	1.7GHz 28nm	1920x1080 LPDDR2/3 667MHz	Mali-400@600MHz	quad core processor, memory interface is LPDDR2 SDRAM, LPDDR3 SDRAM, data bus channel is 1ch, semiconductor technology, GPRS, general packet radio service, HSUPA high speed uplink access is a3.5GUMTS uplink protocol, GSM, wi-fi, FM, Bluetooth, GPS.	
Mt6589 2012[13]	32 bit	ARM cortex-A7	1.2 GHz 28nm	1280x800 LPDDR2/3 533MHz	PowerVR SGX544@286MHz	integrated image signal processor supports 13MP up to 15fps,13M camera ISP advanced features,1080p video decoder, build high performance,3G smart phone with pc-like browser,3D gaming and cinema class home entertainment experiences.	doogee, lenovo (4), acer (3), inew (5), huawei, oppo, sony, cubot (2), ZTE (2) THL, pomp (2), niken, runbo, wiko (4), coolpad. [14]
mt6732m 2014 [25]	64 bits	arm cortex A-53	1.3 ghz 28nm	Mali t-760 at 650mhz	1280*720 lpddr3 at 800mhz	multicore application with modem. Supported Cellular Data Links List of supported cellular data links CSD Circuit Switched Data (CSD) is the original data link protocol of GSM. Up to 9600bit/s download speed, GPRS General Packet Radio Service, UMTS Universal Mobile Telecommunications System.	landvo (1), elephone (1), coolpad (1), Lenovo (1). [26]
mt6732	64 bits	arm cortex	1.5 ghz 28nm	Mali t-760	1920*1	high performance with 32-	elephone (2), lenovo (2), meizu (2),

type and year	width in bits	architecture	clock speed and technology	display and ram	GPU	other features	list of smartphones
2014[27]		A-53		at 500mhz	080 lpddr3 at 667mhz	bit application. Bluetooth 4.0 support 13mp single image processing for high quality smart phone camera application & ultra hd playback support.	uiefone (1), zopo (2), bulbo (1), dooge (2), uhappy (1), kingzone91), acer (3), axigo (1), umi (1), mlai (1), sony (2), tengda (2), tcl (1), umi (1), timmy (1). [28]
mt6735 2015[29]	64 bits	arm cortex A-53	1.3 ghz 28nm	Mali t-760 at 500mhz	1920*1080/1280*720 lpddr3 at 640mhz	CPU architecture with neon multimedia processing bring pc like browse, low power stability, supports 13mp with advanced features like auto focus, paranoma mode, electrical stabilization, auto sensor, defect pixel correction	inew(5),bluboo(3),mlais(1),vphone(1),siswo(1), gionee(2),zopo(4),weimei(1),dooge(4),cubot(1),meizu(1),coolpad(1),v kworld(2),zte(7),leagoo(1),oukitel(1),wiko(4),acer(3),thl(1),huawei(5), uimi (1),kingzone(1),wiley(1),muwigo(1),lg(4),no1(2),wolder(1).[30]
mt6735m 2015[31]	64 bits	arm cortex A-53	1.0 ghz 28nm	Mali t-760 at 640mhz	1280*720 lpddr3 at 640mhz	(m versions significance of the lower clocked processor). the power efficient is suited for low demand tasks like browsing & light running application. camera support up to 13mp.	bulboo (1), elephone (1), vkworld (4), zopo (1), cubot (1), blackview (1), lenovo (2), bq (4), siswoo (2), kingzone (1), oukitel (1), inew (2), mywigo (2), woxter (1), lg (2), legoo (2), amigoo (1), alcatel (2), huawei (1), doogee (1), wolder (1), ulefone (1), haier (1). [32]
mt6735p 2015[33]	64 bits	arm cortex A-53	1.0 ghz 28nm	Mali t-720 at 640mhz	1280*720 lpddr3 at 640mhz	it built for the small budget mainstream android device.it integrates a category 4LTE modem with cdm a2000.it integrates memory controller (32bit, lpddr3,6.4gb/s) & it support up to 13mp camera.	elephone(3),siswoo(1),oukitel(6),doogee(9),leagoo(20,umi(2),archos(5),bluboo(2),cubot(3),blackview(2),homtom(3),lecotec(2),lenovo(6),uiefone(1),uhans(20,zte(7),mpie(1),vkworld(3),morefine(1),siswoo(1),alcatel(1),milai(1),plunk(2),coolpad(3),tcl(1),wolder(4),gigabyte(1),huawei(3),hisense(1),weimei(1),acer(2),motorala(2),amigoo(1),keecoo(1),inew(1),innjoo(3),intex(1),mywigo(1),enegryphone(2),pptv(1),haier(2). [34]

Table III   *SIX-CORE CHIPSETS*

type and year	width in bits	architecture	clock speed and technology	display and ram	GPU	other features	list of smartphones
Mt6591 2014[17]	32 bits	ARM cortex-A7	1.5 GHz 28nm	1920x1080 LPDDR2/3 667MHz	Mali-450@600 MHz	multi core application process with modem, support the instruction set ofARMv7, data bus channels are 1ch, hexa ARM cortex-A7 Harvard superscalar processor core, UMTS384KBPS(W-CDMA) universal mobile telecommunication system, embedded GPS module,156 MHz image single processor radio support	Xiaomi, tcl, lenovo, thl (3), wiko (3), ecoo (2), landvo (5), elephone, cubot (2), ulephone (3), inew, kingsing, malaise, legoo, doogee, blackview, lavde, kazam, gigabyte. [38]

Table IV.   *EIGHT-CORE CHIPSETS*

type and year	width in bits	architecture	clock speed and technology	display and ram	GPU	other features	list of smartphones
Mt6592 [18]	32 bits	ARM cortex-A7	2.0GHz 28nm	1920x1080 LPDDR2/3 667MHz	Mali-450@700 MHz	it includes 4 wireless connectivity functions, WLAN, BLUTOOTH GPS and FM receiver power operation, support the color enhancement, support side-by-side format output to stereo 3Dpanel in both portrait and landscape mode, supports 13MP, support noise reduction,	Xiaomi, tcl, lenovo, thl (3), wiko (3), ecoo (2), landvo (5), elephone, cubot (2), ulephone (3), inew, kingsing, malaise, legoo, doogee, blackview, lavde, kazam, gigabyte. [19]
Mt6592 m 2014[20]	32 bits	ARM cortex-A7	1.4 GHz 28nm	1920x1080 LPDDR2/3 667MHz	Mali-450@600 MHz	multi core application processor with modem, supported the instruction set of ARMv7, memory interface is LPDDR2	Cubot, jaiake (3), jiayu (9), xiaome, thl (30, umi, doogee, Lenovo (3), gionee, goophone (1), vivo, zopo (4), pomp, tengada (3), huawei (2), no1, bluboo,

type and year	width in bits	architecture	clock speed and technology	display and ram	GPU	other features	list of smartphones
						SDRAM, LPDDR3 SDRAM, data bus channels are 1ch, octave ARM cortex Harvard superscalar processor core, introduced in 3GPP R8, is the 4G access part of the evolved packet system (EPS)	ulefone (5), inew, coolpad (2), newman (3), iocan (3), elephone (5), htc, doogee, goophone, kingzone, voro, tengada. [23]
Mt6595 2014[22]	32 bits	ARM cortex-A7	2.2 GHz 28 nm	2560x1600 LPDDR2/3 933MHz	Power VR G6200@ 600MHz	multi core application processor with modem, supported the instruction set of ARMv7, memory interface is mobile(LP)DDR2 SDRAM, mobile(LP)DDR3 SDRAM, data bus channels are 1ch, quade 2.2GHz and 1.7GHz ARM cortex-A7 Harvard superscalar processor core, supported 20MP camera, embeddedGPS module, Bluetooth 4.0, FM radio, arm true zone, multi-GNSS, ANT+	meizu (3), zopo (2), infocus.[23]
Mt6595 m 2014[24]	32 bits	ARM cortex-A7	2.2 GHZ 28 nm	2560x1600 LPDDR2/3 933MHz	Power VR G6200@ 450MHz	multi core application processor with modem, supported the instruction set of ARMv7, memory interface is mobile(LP)DDR2 SDRAM, mobile(LP)DDR3 SDRAM, data bus channels are 1ch, qude 2GHz and 1.5GHz ARM cortex 17 Harvard superscalar processor cores,450 MHz power VR series6 G6200 GPU,1080P60 video encoding,2160p30 video decoding, support 16MP camera, ANT+, multi GNSS, Bluetooth 4.0, support FM radio, ARM Trust zone	

TABLE V.   TEN-CORE CHIPSETS

type and year	width in bits	architecture	clock speed and technology	display and ram	GPU	other features	list of smartphones
mt6797 (helio x20) 2015 [46]	64 bits	arm cortex A-53 (8 cores) & arm cortex A-72(2 cores)	4 cores with 1.4 ghz & 4 cores with 1.85 ghz & 2 cores with 2.3 ghz 20nm	Mali t-880 at 780mhz	2560*1600 lpddr3 at 933mhz	image signal Integrated processor supports 32 MP. Video encoding 4K2K @ 30fps with H.265 and HDR Video decoding 4K2K @ 30fps, h.264, h.265 / HEVC, MPEG-1/2/4, VC-1, VP-8, VP-9	alcatel (1), doogee (2), elephone (2), homtom (1), leeco (2), meizu (1), sharp (1), vernee (1), xiaomi (1), leagoo (1)
mt679X (helio x30) 2016 [47]	64 bits	arm cortex A-73 (2cores) & arm cortex A-53 (4 cores) & arm cortex A-35(4 cores)	2 cores with 2.6 ghz & 4 cores with 2.2 ghz & 4 cores with 1.9 ghz 10nm	power vgXtp-mt4 at 800mhz	2560*1600 lpddr4 at 1800mhz	Two 14-bit ISPs supporting 16+16MP dual camera functionality allows such as wide zoom combination lenses allow real-time depth of field effects, fastest auto exposure, improved real-time denoise in low-light conditions.	meizu (3)

CONCLUSION

The paper presents an exhaustive survey of different MediaTek chipsets based on the number of cores. The classification shares various other information such as architecture, speed, width and other details. Special features of each of the chipset is discussed in detail. Also details of smartphones based on various MediaTek chipset is presented lucidly.

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