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MT6737x Design Notice V0.1



Change List (1)

Version	Date	Description
V0.1	2015.12.22	1. 1 st release

MT6737x Design Notice

- Please refer to MT6735 Design Package directly for **MT6737x**
 - MT6735 Design Notice
 - MT6735 PCB Layout / SMT Guide
 - MT6735 SCH and PCB Design Check List
 - MT6735_GPIO_FormaI_Application_Spec
- There are some differences between MT6735 & MT6737x
 - Feature Difference
 - Pin Difference
 - Pin Mux Difference
 - CLK Scheme Difference
 - IR TX/RX(Learning) Structure Difference

Chipset Part Number

Part Number	MT6737M	MT6737	MT6737T
C2K Version 6 Mode	MT6737V/CM	MT6737V/C	MT6735V/CT
LTE-FDD 5 Mode	MT6737V/WM	MT6737V/W	MT6735V/WT
LTE-TDD 3 Mode	MT6737V/TM	MT6737V/T	MT6735V/TT

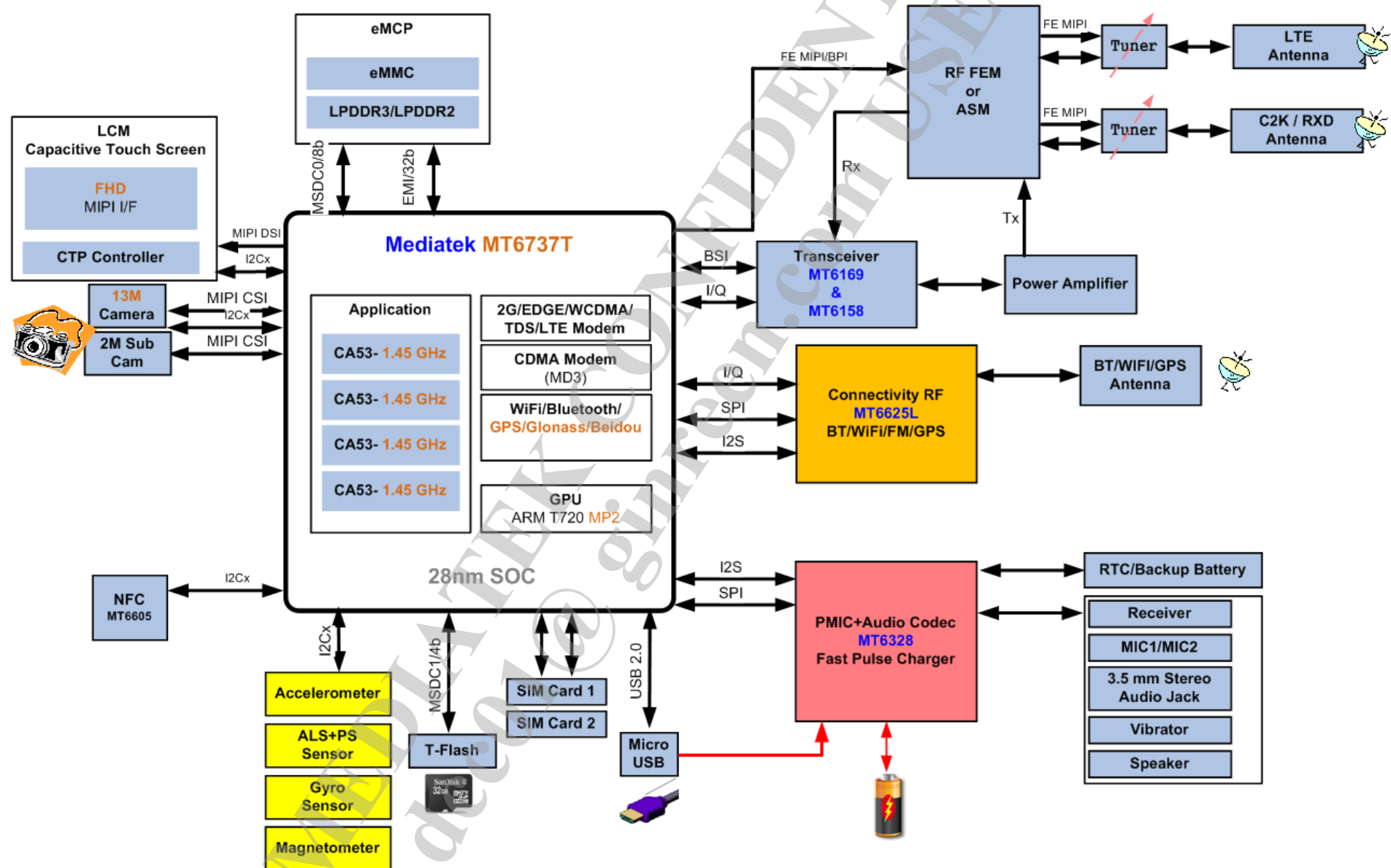
Feature Difference between MT6735 & MT6737x

■ Feature Difference

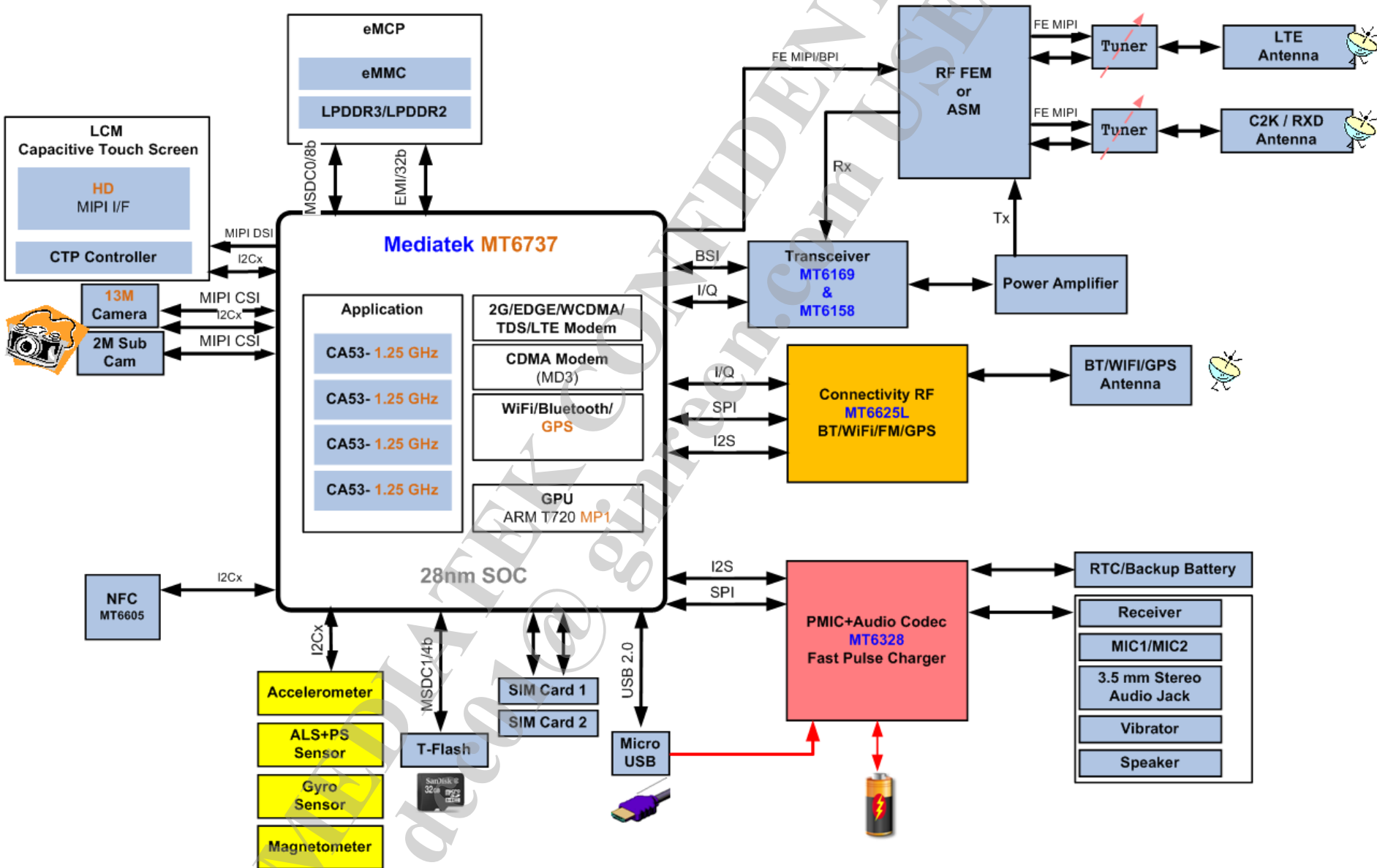
- CPU Spec
- Memory Spec
- Camera Spec
- GPU Spec
- Display Spec

Project	MT6735M	MT6735P	MT6735	MT6737M	MT6737	MT6737T
Apps CPU	4x CA53 1GHz	4x CA53 1GHz	4x CA53 1.3 GHz	4x CA53 1.1GHz	4x CA53 1.25GHz	4x CA53 1.45GHz
Memory	1x LPDDR2 533MHz 1x LPDDR3 533MHz	1x LPDDR2 533MHz 1x LPDDR3 533MHz	1x LPDDR2 533MHz 1x LPDDR3 640MHz	1x LPDDR2 533MHz 1x LPDDR3 533MHz	1x LPDDR2 533MHz 1x LPDDR3 640MHz	1x LPDDR2 533MHz 1x LPDDR3 733MHz
Camera	8MP @ 30fp Single ISP	8MP @ 30fp Single ISP	13MP @ 30fps Dual ISP	13MP @ 24fps Single ISP	13MP @ 28fp Single ISP	13MP @ 30fps Dual ISP
Video Decode	1080p 30fps H.264/H.265	1080p 30fps H.264/H.265	1080p 30fps H.264/H.265	1080p 30fps H.264/H.265	1080p 30fps H.264/H.265	1080p 30fps H.264/H.265
Video Encode	720p 30fps MPEG4	720p 30fps MPEG4	1080p 30fps H.264	720p 30fps MPEG4	720p 30fps MPEG4	1080p 30fps H.264
Graphics	ARM Mali-T720 MP1 450MHz	ARM Mali-T720 MP1 550MHz	ARM Mali-T720 MP2 450MHz	ARM Mali-T720 MP1 550MHz	ARM Mali-T720 MP1 650MHz	ARM Mali-T720 MP2 600MHz
Display	qHD 960x540 60fps	HD720 1280x720 60fps	FHD 1920x1080 (~50fps)	qHD 960x540 60fps	HD720 1280x720 60fps	FHD 1920x1080 60fps
Connectivity	Integrated Wi-Fi abgn/BT/FM/GPS	Integrated Wi-Fi abgn/BT/FM/GPS	Integrated Wi-Fi abgn/BT/FM/ GPS/Glonass/Beidou	Integrated Wi-Fi abgn/BT/FM/GPS	Integrated Wi-Fi abgn/BT/FM/GPS	Integrated Wi-Fi abgn/BT/FM/ GPS/Glonass/Beidou

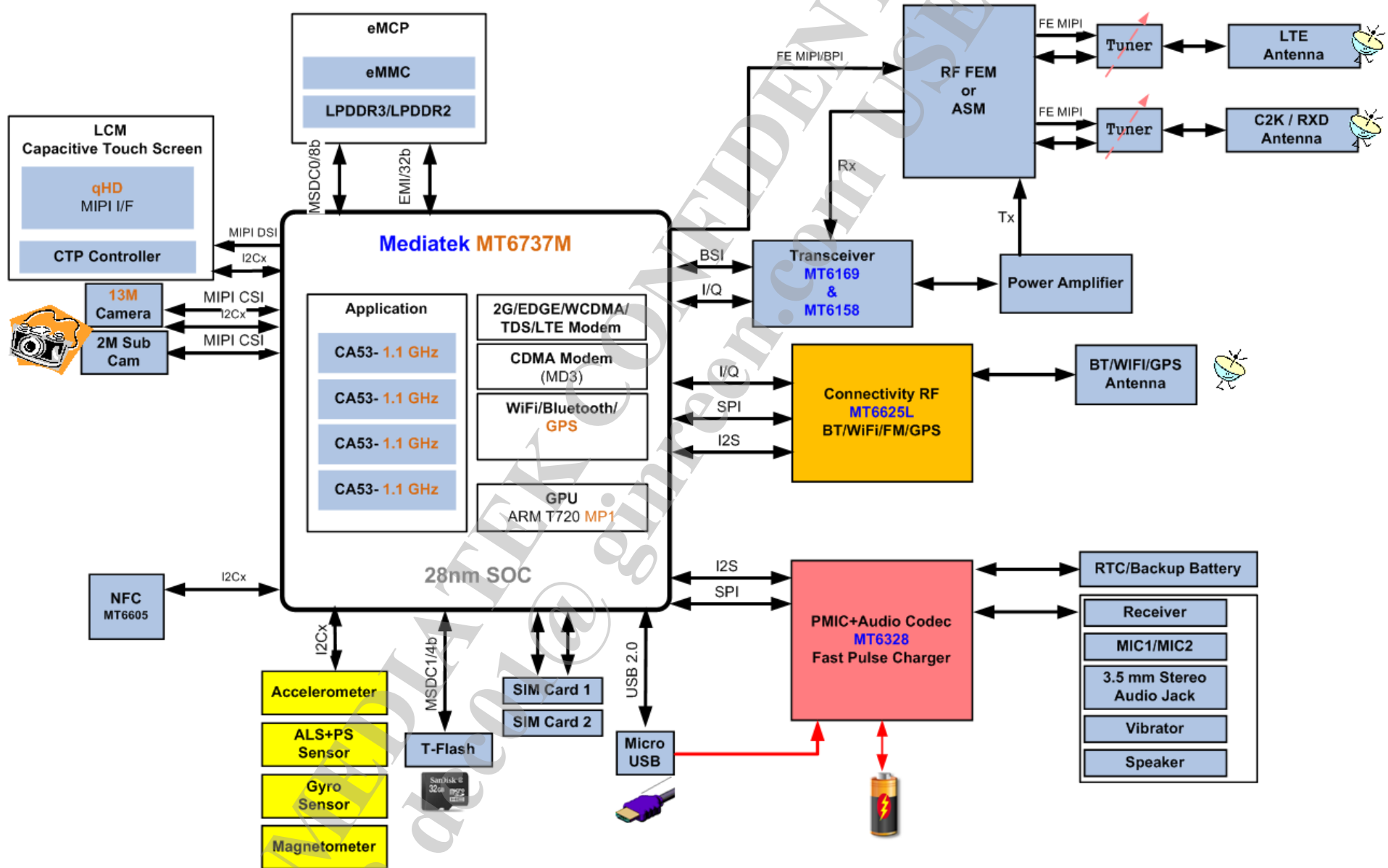
MT6737T System Block Introduction



MT6737 System Block Introduction



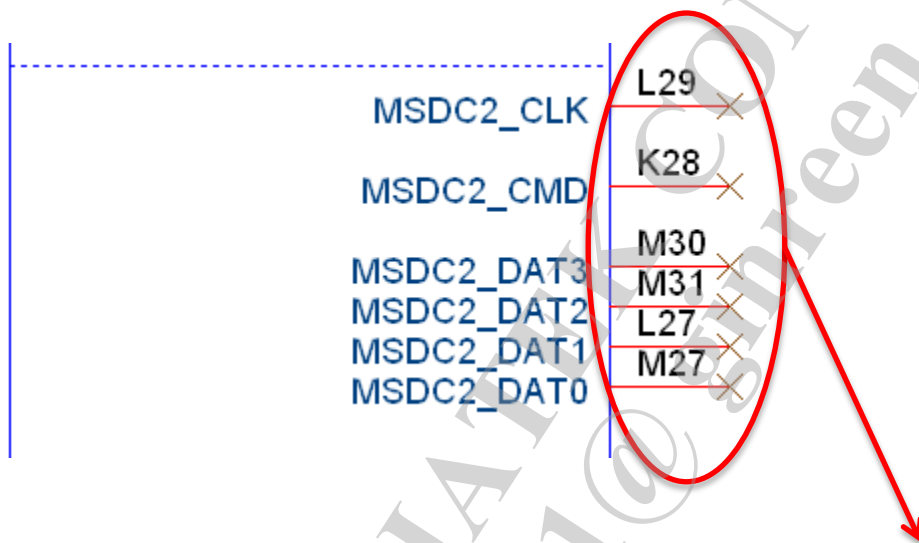
MT6737M System Block Introduction



Pin Difference between MT6735 & MT6737x

- There is a usage difference on MSDC2 pin for MT6735 & MT6737x

Pin Num	Pin Name	MT6735	MT6735M
K28	MSDC2_CMD	MSDC2 Pin can be used as MSDC or GPIO (Refer to Pin mux: Aux Func.0~7)	MSDC2 Pin can Not be used (MSDC2 Pin should be NC)
L29	MSDC2_CLK		
M27	MSDC2_DAT0		
L27	MSDC2_DAT1		
M31	MSDC2_DAT2		
M30	MSDC2_DAT3		



Project	MSDC2 Pin
MT6735	MSDC or GPIO
MT6735M	Keep " NC "
MT6735P	Keep " NC "
MT6753	MSDC or GPIO
MT6753T	MSDC or GPIO
MT6737T	MSDC or GPIO
MT6737	Keep " NC "
MT6737M	Keep " NC "

MSDC2 Pin should be NC (No Connection) for MT6735M / 35P / 37 / 37M

Pin Mux Difference between MT6735 & MT6737x

- There is a pin mux difference on CMMCLK1 for MT6735 & MT6737x
 - MT6735M_P does **Not** have CMMCLK1 function
 - MT6735M_P does **Not** support PIP(picture in picture) function

Chipset	Pin Num	Pin Name	Aux Func.0	Aux Func.1	Aux Func.2	Aux Func.3	Aux Func.4	Aux Func.5
MT6735M	W29	CMDAT0	GPIO42	I0*CMDAT0	I0*CMCSD0	O*CMMCLK1		O:ANT_SEL5
	W28	CMDAT1	GPIO43	I0*CMDAT1	I0*CMCSD1	O*CMFLASH	I0:MD_EINT0	O*CMMCLK1
	Y31	CMPCLK	GPIO44	I0*CMPCLK	I0*CMCSK	I0*CMCSD2	B1:KCOL3	I0:SRCLKENAI2
	Y27	CMMCLK	GPIO45	O*CMMCLK0				
	Y28	CMMCLK1	GPIO46	O*CMMCLK1	I0:IDDIG	I0:lte_md32_jtag_t	I1:TDD_TRSTN	O:dm_jtintp

Project	CMMCLK1 Function
MT6735	V
MT6735M	X
MT6735P	X
MT6753	V
MT6753T	V
MT6737T	V
MT6737	X
MT6737M	X

CLK Scheme Difference between MT6735 & MT6737x

- There is a CLK Scheme difference for MT6735 & MT6737x
 - MT6735_53 does **Not** support co-TSX mode
 - C2K Version 6 Mode does **Not** support 32K-less mode
 - 32K-less mode **must** be implemented with co-TSX mode

26M CLK	32K CLK	MT6737T_37_37M (C2K Version 6 Mode)	MT6737T_37_37M (LTE-FDD 5 Mode/LTE-TDD 3 Mode)	MT6735_53 (C2K Version 6 Mode)	MT6735_53 (LTE-FDD 5 Mode/LTE-TDD 3 Mode)
MT6169: VCTCXO, MT6625L: external TCXO	32K-exist	V	V	V	V
MT6169 & MT6625L co-VCTCXO	32K-exist	V	V	V	V
MT6169 & MT6625L co-TSX	32K-exist	V	V	X	X
MT6169 & MT6625L co-TSX	32K-less	X	V	X	X

Schematic Notice-VCTXO/TSX & 32K-exist/32K-less co-PCB Design

- Please refer to MT6737x_REF_SCH for VCTXO/TSX & 32K-exist/32K-less co-PCB Design
 - MT6737x_MT6328_MT6169_MT6158_MT6625L_EMMC_LPDDR3_GT_CHINA_PHASE-2_TSX_REF_SCH_V0.x
 - Default BOM: co-TSX & 32K-exist
 - C2K Version 6 Mode does **Not** support 32K-less mode
 - MT6737x_MT6328_MT6169_MT6625L_EMMC_LPDDR2_CMCC_3M_PHASE-2_TSX_REF_SCH_V0.x
 - Default BOM: co-TSX & 32K-less
 - Only LTE-FDD 5 Mode/LTE-TDD 3 Mode **can** support 32K-less
- BOM difference for VCTXO/TSX & 32K-exist/32K-less co-PCB design

Clock Scheme	32K Crystal Component				32K_EN			MT6328 AuxADC		
	R2027	C2033	C2034	X2001	R3116	L3101	R3108	C2024	C2023	R2007
VCTXO + 32K Exist	NC	22pF	22pF	32K X'tal	NC	NC	1K	0R	1uF	0R
TSX + 32K Exist	NC	22pF	22pF	32K X'tal	NC	NC	0R	1nF	1uF	Bead
TSX + 32K Less	0R	NC	0R	NC	NC	0R	NC	1nF	1uF	Bead

Clock Scheme	XMODE			VDCXO_DIG			VCTXO / TSX Component										VCTXO2 Power
	R3119	R3118	R3107	R3115	R3117	R3114	R3126	R3124	R3125	R3127	X3102	U3103	C3113	C3114	C3115	C3161	VCTXO2 Power Connection
VCTXO + 32K Exist	NC	NC	1K	0R	NC	0R	0R	NC	NC	NC	NC	VCTXO	100nF	100nF	NC	NC	Connect to VCTXO_0_PMU
TSX + 32K Exist	0R	NC	NC	0R	NC	NC	NC	100K	0R	0R	TSX	NC	NC	NC	NC	NC	Connect to VCTXO_0_PMU
TSX + 32K Less	NC	0R	NC	NC	0R	NC	NC	100K	0R	0R	TSX	NC	NC	NC	NC	NC	Connect to VCTXO_1_PMU

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MT6737x IRTX/RX(Learning) Design Notice

IR TX/RX(Learning) Structure Difference between MT6735 & MT6737x

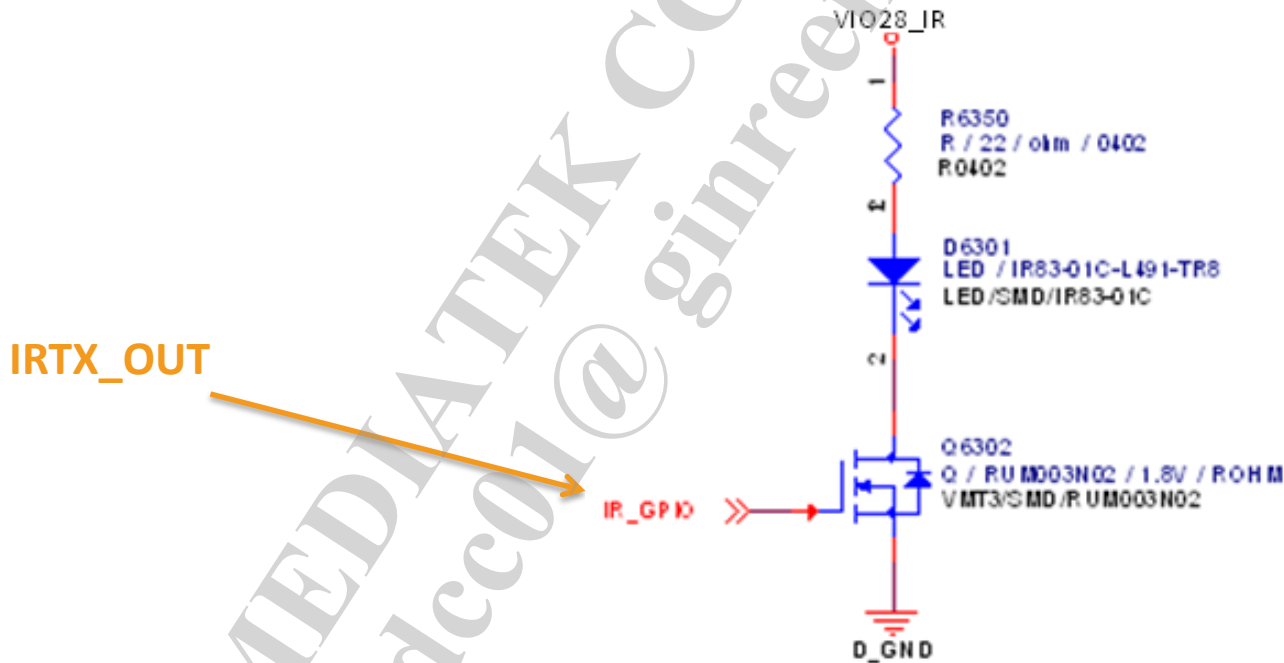
- There is a IR TX/RX(Learning) Structure Difference for MT6735 & MT6737x
 - Only MT6737x can support IR TX/RX(Learning)
 - MT6737x support IR_TX(1MOS Solution)

IR TX/RX(Learning) SW Support List		
Circuit Type	MT6735_53	MT6737T_37_37M
IR_TX(2MOS Solution)	Yes	No
IR_TX(1MOS Solution)	No	Yes
IR_TX & RX(Learning)	No	Yes

Schematic Notice: IR_TX(1MOS) only (1/3)

- IR_TX function: Choose pin mux with O:IRTX_OUT

Pin Name	Aux Func.0	Aux Func.1	Aux Func.2	Aux Func.3	Aux Func.4	Aux Func.5	Aux Func.6	Aux Func.7
EINT11	GPIO11	I0:MD_EINT1	O:IRTX_OUT	I0:c2k_uim0_hot_plug_in	O*CLKM0	O:I2S2_MCK	B1:SCL3	I1:URXD0
EINT12	GPIO12	O:I2S0_MCK	I0:c2k_uim1_hot_plug_in	B1:KCOL2	I0:MD_EINT2	O:IRTX_OUT	I0:SRCLKENAI2	O:PCM1_DO1
ANT_SELO	GPIO19	O*ANT_SELO	O:IRTX_OUT	O:IRDA_TX	O:c2k_uart0_txd	O:GPS_FRAME_SYNC	O:LTE_UTXD	B0:DBG_MON_A6
PCM_CLK	GPIO61	B0*PCM1_CLK[0]	O*DPI_D0	B0:I2S0_BCK	B1:KROW4	O:ANT_SEL3	O:IRTX_OUT	B0:DBG_MON_A18
BPI_BUS27	GPIO130	O*BPI_BUS27				O:I2S2_BCK	O:IRTX_OUT	O:LTE_UTXD
MSDC2_DAT3	GPIO203	B0*MSDC2_DAT3	O:ANT_SEL5	B1:SCL2	O:c2k_RTCK	I1:URXD1	B1:KCOL6	



Schematic Notice: IR_TX(1MOS) only (2/3)

- Component choice and IR_TX distance
 - Q6302(N-MOSFET)
 - Low on-resistance
 - Low voltage drive (1.8V) makes this device ideal for portable equipment

- D6301 (IR_LED)

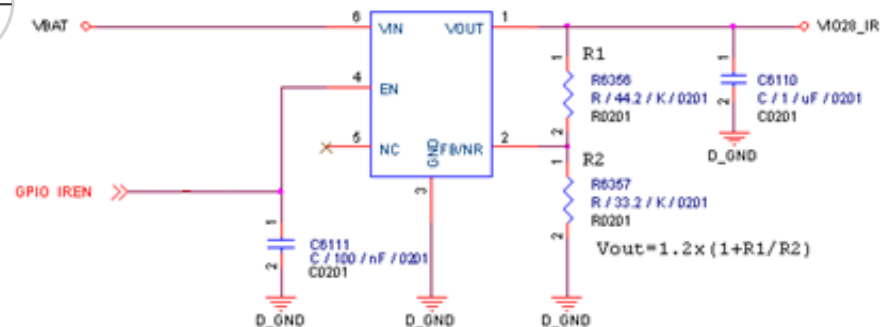
品名	Dimension(mm)	Wavelength	Intensity	view angle
IR83-01C/L491/TR8	1.6 x 0.8 x 1.52	940nm	4mW/sr at 20mA	X100/Y40deg

- IR TX Distance(Note1)

Summary		
	Value	Value
R6350	6.8 ohm	22 ohm
Q6302(MOS)	RUM003N02 (1.8V)	RUM003N02 (1.8V)
D6301(IR_LED)	IR83-01C-L491-TR8	IR83-01C-L491-TR8
IR TX distance	Around 9m	Around 4m

Schematic Notice: IR_TX(1MOS) only (3/3)

- **Component choice and IR_TX distance**
 - **Note1**
 - If customers choose different type of N-MOSFET and IR_LED, need to adjust the value of (R6350) resistance to gain the best distance (Note2,3,4)
 - **Note2**
 - Duty cycle of IRTX_OUT: Default is 33%
 - In this case, the Peak Forward Current of IR_LED(IR83-01C-L491-TR8) should not exceed 300mA
 - **Note3**
 - If customers choose different type of IR_LED, need to ask vendor to provide the “peak forward current” for 33% of duty cycle
 - **Note4**
 - To avoid violating the Absolute Maximum Current Rating of LDO and IR_LED, please use external LDO_2V8



Schematic Notice: IR_TX & Learning (1/7)

- IR_TX & Learning application
 - Pin suggestion

Signal	Voltage	Type	Aux Func.
IR_TX	1.8	GPIO	O:IRTX_OUT
IR_Learning	1.8	SPI	I0*SPI_MIA or I0*SPI_MIB
IR_LR_EN	1.8	GPIO	
IR_LDO_EN	1.8	GPIO	

- Description
 - IR_TX: Use “Aux Func.” of IRTX_OUT to control IR_TX
 - IR_Learning: Use “Aux Func.” of SPI_MIA or SPI_MIB for IR_Learning
 - IR_LR_EN: Use GPIO to enable IR_Learning function
 - IR_LDO_EN: Use GPIO to enable external LDO

Schematic Notice: IR_TX & Learning (2/7)

- IR_TX & Learning application
 - IR_TX Pin suggestion

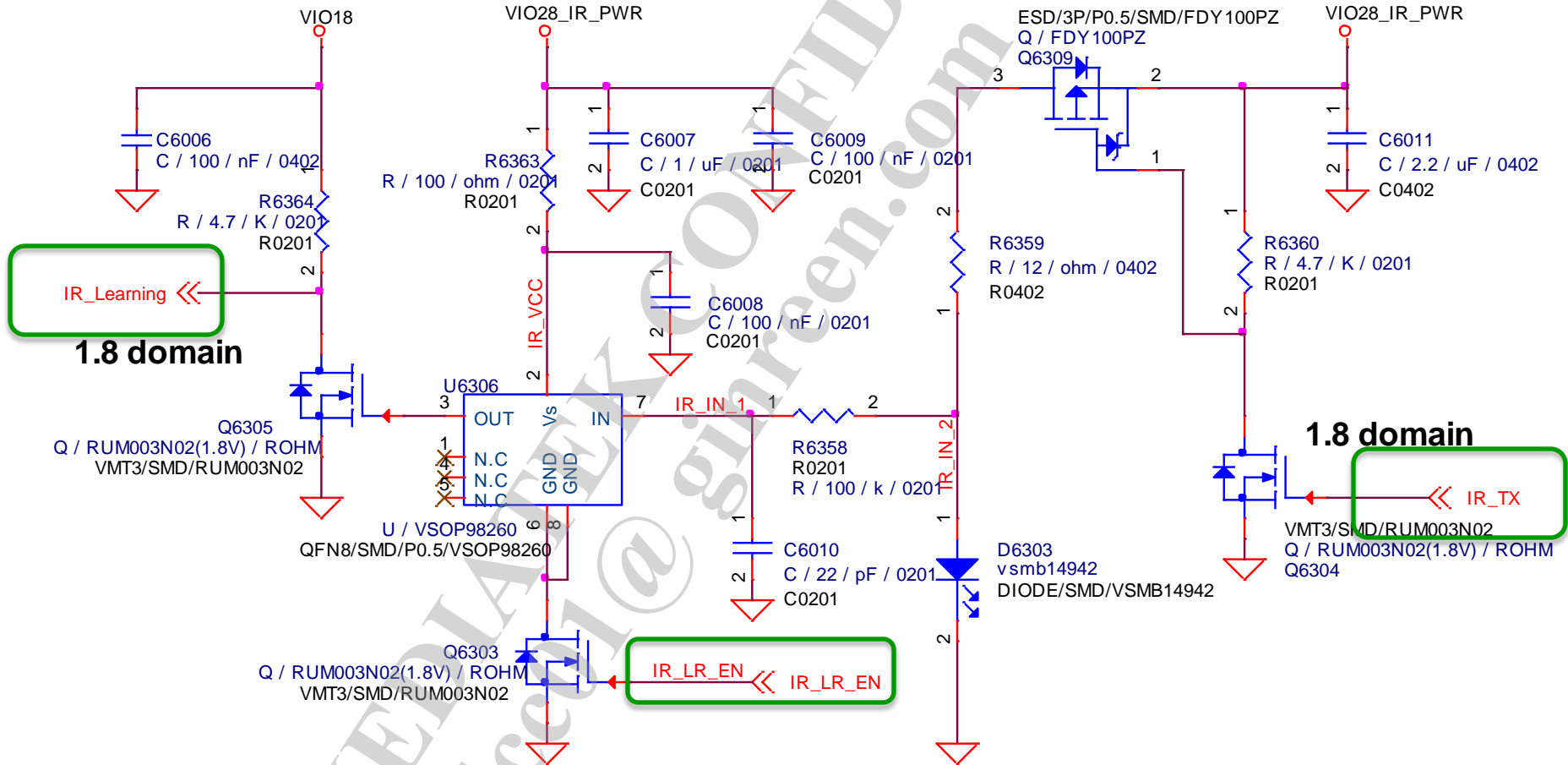
Pin Name	Aux Func.0	Aux Func.1	Aux Func.2	Aux Func.3	Aux Func.4	Aux Func.5	Aux Func.6	Aux Func.7
EINT11	GPIO11	I0:MD_EINT1	O:IRTX_OUT	I0:c2k_uim0_hot_plug_in	O*CLKM0	O:I2S2_MCK	B1:SCL3	I1:URXD0
EINT12	GPIO12	O:I2S0_MCK	I0:c2k_uim1_hot_plug_in	B1:KCOL2	I0:MD_EINT2	O:IRTX_OUT	I0:SRCLKENAI2	O:PCM1_DO1
ANT_SELO	GPIO19	O*ANT_SELO	O:IRTX_OUT	O:IRDA_TX	O:c2k_uart0_txd	O:GPS_FRAME_SYNC	O:LTE_UTXD	B0:DBG_MON_A6
PCM_CLK	GPIO61	B0*PCM1_CLK[0]	O*DPI_D0	B0:I2S0_BCK	B1:KROW4	O:ANT_SEL3	O:IRTX_OUT	B0:DBG_MON_A18
BPI_BUS27	GPIO130	O*BPI_BUS27				O:I2S2_BCK	O:IRTX_OUT	O:LTE_UTXD
MSDC2_DAT3	GPIO203	B0*MSDC2_DAT3	O:ANT_SEL5	B1:SCL2	O:c2k_RTCK	I1:URXD1	B1:KCOL6	

- IR_Learning Pin suggestion

Pin Name	Aux Func.	Aux Func.1	Aux Func.2	Aux Func.3
EINT3	GPIO003	O*CLKM1	O*DPI_D7	I0*SPI_MIB
SPI_MI	GPIO067	I0*SPI_MIA	O*SPI_MOA	O:I2S3_DO
SPI_MO	GPIO068	O*SPI_MOA	I0*SPI_MIA	O:I2S3_LRCK

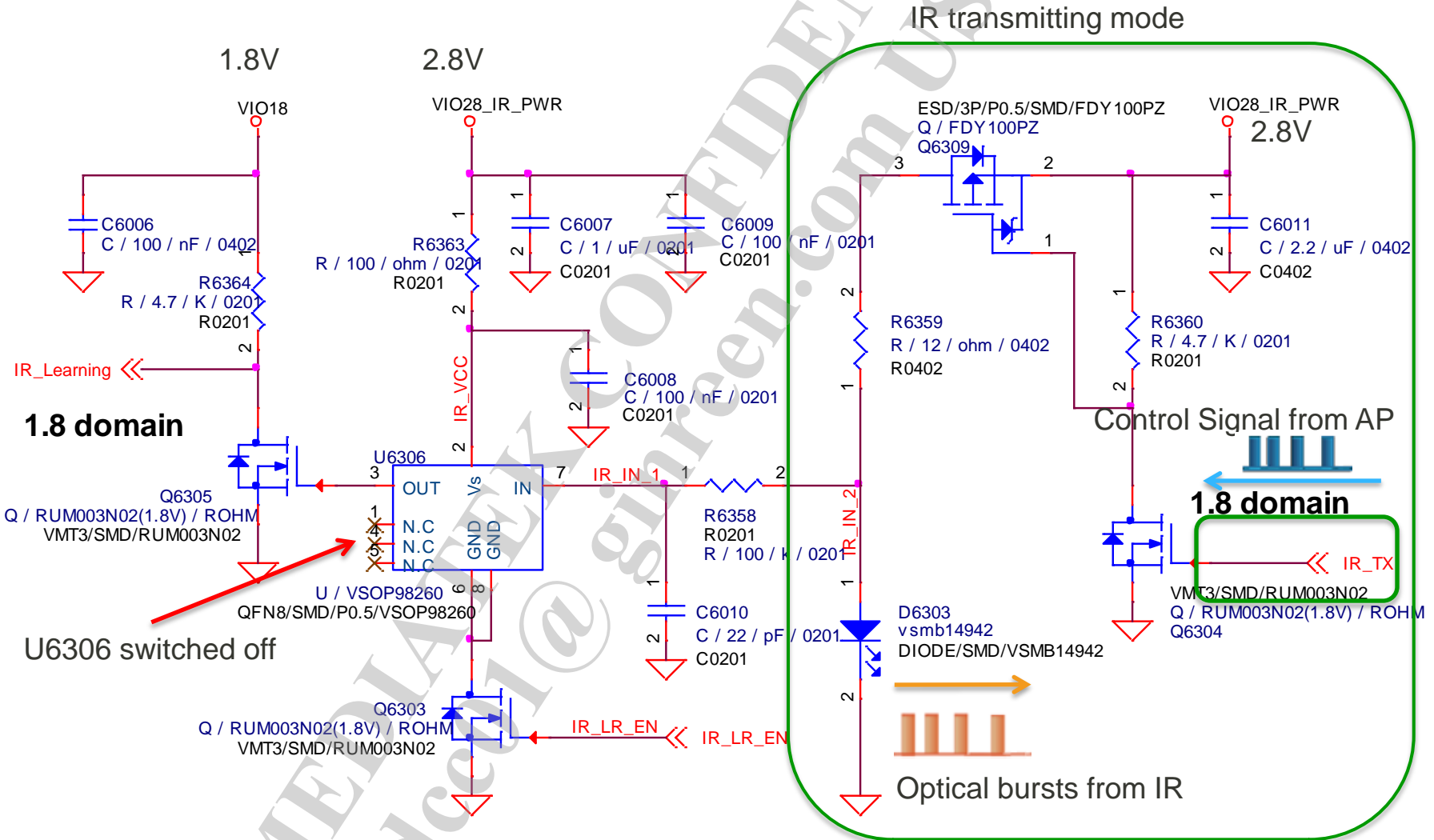
Schematic Notice: IR_TX & Learning (3/7)

- IR_TX & Learning application
 - Circuit



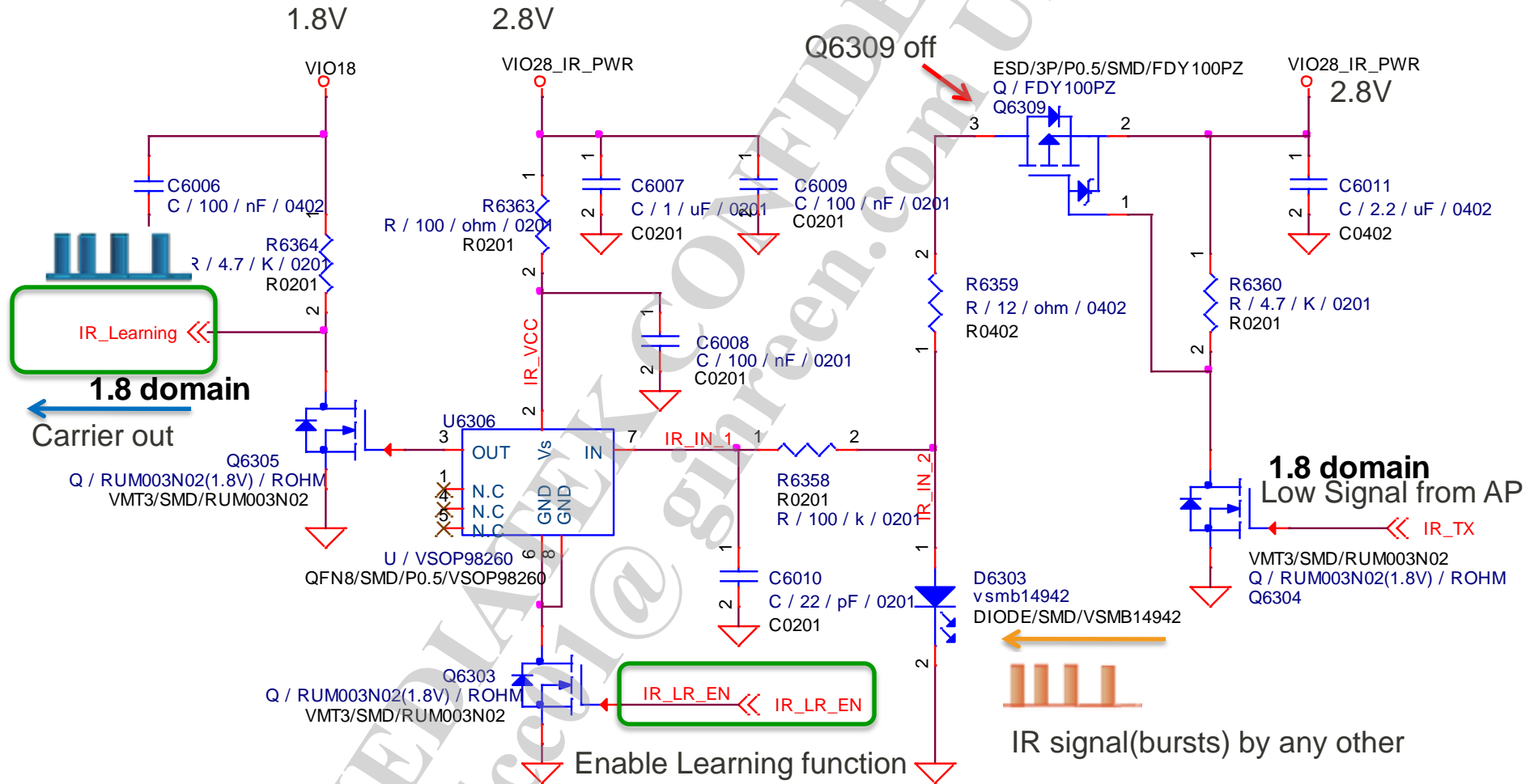
Schematic Notice: IR_TX & Learning (4/7)

- IR_TX & Learning application
 - TX mode



Schematic Notice: IR_TX & Learning (5/7)

- IR_TX & Learning application
 - Learning mode



Schematic Notice: IR_TX & Learning (6/7)

- Component choice and distance

- Q6309(P-MOSFET)

- P/N:FDY100PZ

- Q6303, Q6304 and Q6305(N-MOSFET)

- RUM003N02 (1.8V)

- Low voltage drive (1.8V) makes this device ideal for portable equipment

- U6306(Preamplifier)

- P/N:VSOP98260

- D6303 (IR_LED)

- P/N: VSMB14942

- Intensity:

$I_F = 20 \text{ mA}, t_p = 20 \text{ ms}$	I_e	2.8	5.5	8.5	mW/sr
$I_F = 100 \text{ mA}, t_p = 20 \text{ ms}$	I_e		27		mW/sr
$I_F = 1 \text{ A}, t_p = 100 \mu\text{s}$	I_e		210		mW/sr

- Distance(Note1)

Summary		
	Value	Value
R6359	6.8 ohm	12 ohm
Q6309(PMOS)	FDY100PZ	FDY100PZ
D6303(IR_LED)	VSMB14942	VSMB14942
Distance	Around 9m	Around 4m

Schematic Notice: IR_TX & Learning (7/7)

■ Component choice and distance

– Note1

- If customers choose different type of P-MOSFET and IR_LED, need to adjust the value of (R6359) resistance to gain the best distance(Note2,3,4)

– Note2

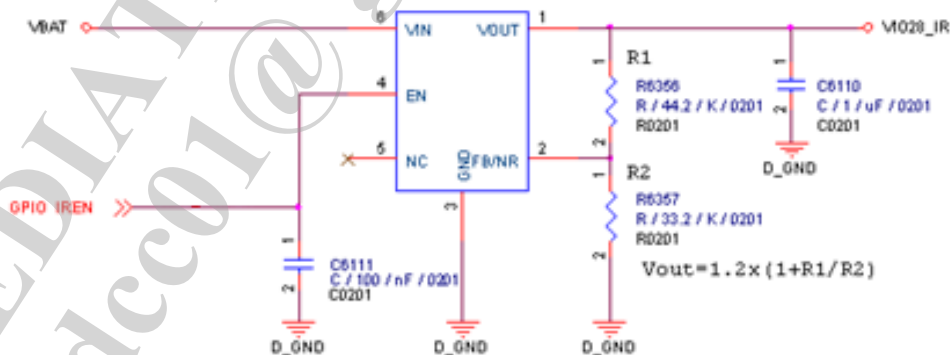
- Duty cycle of IRTX_OUT: Default is 33%
 - In this case, the Peak Forward Current of IR_LED(VSMB14942) should not exceed 240mA

– Note3

- If customers choose different type of IR_LED, need to ask vendor
 - IR_LED which is used in both directions as emitter and as detector
 - to provide the “peak forward current” for 33% of duty cycle

– Note4

- To avoid violating the Absolute Maximum Current Rating of LDO and IR_LED, please use external LDO_2V8



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