



MT7610E

802.11 a/n/ac single chip

EEPROM/Efuse Content

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Document Revision History

Revision	Date	Author	Description
0.0	2013/1/15	AlexCC Lin	Initial version : based on xls version 0108
0.1	2013/1/18	AlexCCLin	Add BBP comment
0.2	2013/1/18	AlexCCLin	Review
0.3	2013/1/23	AlexCCLin	Modify some typo
0.4	2013/1/28	Singing Lee	Modify default values
0.5	2013/2/8	Singing Lee	Modify 0x4F definition
0.6	2013/2/18	Singing Lee	Modify channel power definition Modify per-rate power definition

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1 General Description

1.1 General Descriptions

The MT7610E EEPROM layout provides configuration for vendor/product ID, SW setting, RF TX power setting.

Note :

If hardware select external EEPROM, please follow below EEPROM type.

The following table summarizes EEPROM used in MT7101E configuration.

		EEPROM Type	EEPROM size (in byte)
MT7610E	PCIexpress/Mini Card/Express Card	93C66	512 (0x200)

2 MT7610E EEPROM Layout

Offset	Default (hex)	b15 ~b8	b7 ~ b0
00h	7610	Chip ID	
02h	0100	EEPROM Version	
04h	0C00	Mac Address [15:0]	
06h	2643	Mac Address [31:16]	
08h	4060	Mac Address [47:32]	
0Ah	7610	PCIe Device ID	
0Ch	14C3	PCIe Vendor ID	
0Eh	0000	ASIC Reserved	
10h	0000	ASIC Reserved	
12h	7610	PCIe subsystem ID	
14h	14C3	PCIe subsystem VendorID	
16h	0000	ASIC Reserved	
18h	0000	ASIC Reserved	
1Ah	0000	ASIC Reserved	
1Ch	0000	ASIC Reserved	
1Eh	0000	ASIC Reserved	
20h	FFFF	ASIC Reserved	
22h	9FFF	ASIC Reserved	
24h	FFEF	ASIC Reserved	
26h	3E30	ASIC Reserved	
28h	9B3C	ASIC Reserved	
2Ah	FFFF	ASIC Reserved	
2Ch	FFFF	ASIC Reserved	
2Eh	FFFF	ASIC Reserved	
34h	FD11	NIC Configuration 0	
36h	0808	NIC Configuration 1	
38h	FFFF	ASIC Reserved	Country Region 5G band
3Ah	0155	LED Mode	Frequency offset
3Ch	FFFF	LED Reserved	
3Eh	FFFF	LED Reserved	
40h	FFFF	LED Reserved	
42h	00FF	NIC Configuration 2	

Offset	Default (hex)	b15 ~b8	b7 ~ b0
44h	0800	External LNA gain for 5G Band	Reserved
46h	0000	Reserved	Reserved
48h	0900	External LNA gain for 5G Band	Reserved
4Ah	0000	5G RSSI1 offset	5G RSSI0 offset
4Ch	0900	External LNA gain for 5G Band	TX mixer gain for 5G
4Eh	0000	Reserved	Reserved
50h	80FF	20M/40M BW Power delta for 5G band	Reserved
52h	0000	ASIC Reserved	ASIC Reserved
54h	0000	ASIC Reserved	ASIC Reserved
56h	0000	ASIC Reserved	ASIC Reserved
58h	0000	ASIC Reserved	ASIC Reserved
5Ah	0000	ASIC Reserved	ASIC Reserved
5Ch	0000	ASIC Reserved	ASIC Reserved
5Eh	0000	ASIC Reserved	ASIC Reserved
6Eh	FFFF	Reserved	Reserved
78h	0000	Channel 38 TX0 power(ALC)	Channel 36 TX0 power(ALC)
7Ah	0000	Channel 44 TX0 power(ALC)	Channel 40/42 TX0 power(ALC)
7Ch	0000	Channel 48/50 TX0 power(ALC)	Channel 46 TX0 power(ALC)
7Eh	0000	Channel 54 TX0 power(ALC)	Channel 52 TX0 power(ALC)
80h	0000	Channel 60 TX0 power(ALC)	Channel 56/58 TX0 power(ALC)
82h	0000	Channel 64 TX0 power(ALC)	Channel 62 TX0 power(ALC)
84h	0000	Channel 102 TX0 power(ALC)	Channel 100 TX0 power(ALC)
86h	0000	Channel 108 TX0 power(ALC)	Channel 104/106 TX0 power(ALC)
88h	0000	Channel 112/114 TX0 power(ALC)	Channel 110 TX0 power(ALC)
8Ah	0000	Channel 118 TX0 power(ALC)	Channel 116 TX0 power(ALC)
8Ch	0000	Channel 124 TX0 power(ALC)	Channel 120/122 TX0 power(ALC)
8Eh	0000	Channel 128/130 TX0 power(ALC)	Channel 126 TX0 power(ALC)
90h	0000	Channel 134 TX0 power(ALC)	Channel 132 TX0 power(ALC)
92h	0000	Channel 140/142/144 TX0 power(ALC)	Channel 136/138 TX0 power(ALC)
94h	0000	Channel 151 TX0 power(ALC)	Channel 146/149 TX0 power(ALC)
96h	0000	Channel 157 TX0 power(ALC)	Channel 153/155 TX0 power(ALC)

Offset	Default (hex)	b15 ~b8	b7 ~ b0
98h	0000	Channel 161/163 TX0 power(ALC)	Channel 159 TX0 power(ALC)
9Ah	FF00	Reserved	Channel 165 TX0 power(ALC)
9Ch	FFFF	Reserved	Reserved
9Eh	FFFF	Reserved	Reserved
A0h	FFFF	Reserved	Reserved
A2h	FFFF	Reserved	Reserved
A4h	FFFF	Reserved	Reserved
D0h	FFFF	25C Temp Sensor Calibration	ASIC Reserved
D2h	811A	80BW power delta for 5G related to 20Mhz BW, one step is 0.5dB	5G TX target power
D4h	7440	TSSI 5G Group 2 boundary channel index	TSSI 5G Group 1 boundary channel index
D6h	0095	TSSI 5G Group 4 boundary channel index	TSSI 5G Group 3 boundary channel index
D8h	0000	TSSI 5G Group 6 boundary channel index	TSSI 5G Group 5 boundary channel index
DAh	0000	Reserved	TSSI 5G Group 7 boundary channel index
DCh	9B64	5G MB/HB boundary channel index Definition of 5G MB/HB channel for e-fuse 0x49/0x4D. Those channels whose indexes are less than this boundary and more than or equal to 0xDC belong to MB. Otherwise they belong to HB.	5G LB/MB boundary channel index Definition of 5G LB/MB channel for e-fuse 0x45/0x49. Those channels whose indexes are less than this boundary belong to LB.
DEh	0000	Reserved	Reserved
E0h	0000	Reserved	Reserved
E2h	0000	Reserved	Reserved
E4h	0000	Reserved	Reserved
E6h	0000	Reserved	Reserved
E8h	0000	Reserved	Reserved
EAh	0000	Reserved	Reserved
ECh	0000	Reserved	Reserved
Eeh	0000	Reserved	Reserved
F0h	FFFF	TSSI 5G offset for Group1	TSSI 5G slop for Group1
F2h	FFFF	TSSI 5G offset for Group2	TSSI 5G slop for Group2

Offset	Default (hex)	b15 ~b8	b7 ~ b0
F4h	FFFF	TSSI 5G offset for Group3	TSSI 5G slop for Group3
F6h	FFFF	TSSI 5G offset for Group4	TSSI 5G slop for Group4
F8h	FFFF	TSSI 5G offset for Group5	TSSI 5G slop for Group5
FAh	FFFF	TSSI 5G offset for Group6	TSSI 5G slop for Group6
FCh	FFFF	TSSI 5G offset for Group7	TSSI 5G slop for Group7
FEh	FFFF	TSSI 5G offset for Group8	TSSI 5G slop for Group8
110h	FFFF	Reserved for customer	Reserved for customer
112h	FFFF	Reserved for customer	Reserved for customer
114h	FFFF	Reserved for customer	Reserved for customer
116h	FFFF	Reserved for customer	Reserved for customer
118h	FFFF	ASIC Reserved	ASIC Reserved
11Ah	FFFF	Configured 5G Channels	Configured 5G Channels
11Ch	FFFF	Configured 5G Channels	Configured 5G Channels
120h	0707	5G Tx power for OFDM 12M/18M	5G Tx power for OFDM 6M/9M
122h	0004	5G Tx power for OFDM 48M/54M	5G Tx power for OFDM 24M/36M
124h	0707	TX power for 5G HT MCS=2,3	TX power for 5G HT MCS=0,1
126h	0004	TX power for 5G HT MCS=6,7	TX power for 5G HT MCS=4,5
12Ch	FF3F	Reserved	TX power for 5G HT MCS8,9

2.1 E2PROM layout version # (02h)

Value	Description
0	Version 0.
1 ~ 255	Invalid version. Treat as version 0.

2.2 NIC Configuration 0 (0x34)

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved		Board type		Reserved	External PA			TX Path setting				RX Path setting			
Reserved		Reserved		Reserved				1:1TX 2: 2TX				1: 1RX 2: 2RX			

NIC Configuration 0 Register Bit Fields Description

Offset	Field	Description
34h	3:0	RX front-end architecture in the system. 0 (0000): Reserved. 1 (0001): 1 RX front-end in the system. 2 (0010): 2 RX front-end in the system. 3 ~ F (0011 ~ 1111): Reserved.
	7:4	TX front-end architecture in the system. 0 (0000): Reserved. 1 (0001): 1 TX front-end in the system. 2 (0010): 2 TX front-end in the system. 3~ F (0011 ~ 1111): Reserved.
35h	9:8	external PA 00: 2.4G+5G external PA 01: 5G external PA 10: 2.4G external PA 11: disable
	10	External PA current setting – the IO driving current setting for external PA control pin 1: 8 mA (default) 0: 16mA

Offset	Field	Description
	11	Reserved.
	13:12	Define the board type. Reserved
	15:14	Reserved.

2.3 NIC Configuration 1 (0x36)

Bit[7:0]=0xFF will be treated as INVALID and used Default Value.

Bit[15:8]=0xFF will be treated as INVALID and used Default Value

7	6	5	4	3	2	1	0
WPS PBC	5G side band for 40M BW	2.4G side band for 40M BW	Proprietary Test bit	EXT LNA 5G	EXT LNA 2.4G	Temperature TX ALC	HW CTRL
0: off (D) 1: on	0: off (D) 1: on	0: off (D) 1: on (D)	0: off (D) 1: on	0: off 1: on	0: off 1: on	0: off (D) 1: on	0: off (D) 1: on

15	14	13	12	11	10	9	8
DAC test bit	BT Coexist	Internal TX ALC	Antenna Diversity		Broadband EXT LNA	40M BW in 5G band	40M BW in 2.4G band
0: off (D) 1: on	0: off (D) 1: on	0: off (D) 1: on	00: Disable (D)		0: off 1: on	0: on (D) 1: off	0: on (D) 1: off

NIC Configuration 1 Register Bit Fields Description

Offset	Field	Description
36h	0	Hardware Radio Control. 0: disable hardware radio control (default value). 1: enable hardware radio control. When "hardware radio control" bit is enabled (=1), the driver will read MAC's GPIO[2] status. When GPIO[2] pin is low, the radio is disabled. When GPIO[2] pin is high, the radio is enabled. The Radio ON/OFF is controlled by both software UI and MAC's GPIO[2] pin.
	1	External TX Auto Level Control. 0: disable external TX ALC function (default value). 1: enable external TX ALC function. When the TX ALC function is enabled (=1), the driver will use external thermistor to automatic compensate TX power varied due to temperature variation. It also needs to fill the register "Tx reference temperature for 2.4GHz (77h)" for the TX ALC function.

Offset	Field	Description
	2	External 2.4GHz band LNA. 0: Board without external LNA for 2.4GHz band must set this bit to 0. 1: Board with external LNA for 2.4GHz band must set this bit to 1 (default value).
	3	External 5GHz band LNA. 0: Board without external LNA for 5GHz band must set this bit to 0. 1: Board with external LNA for 5GHz band must set this bit to 1.
	4	Proprietary TEST BIT. For debug purpose. Default value is 0.
	5	2.4GHz side band for 40MHz BW. For debug purpose.
	6	5G side band for 40M BW For debug purpose.
	7	WPS Push Button Configuration control. 0: disable WPS PBC control (default value). 1: enable WPS PBC control. The WPS PBC function is controlled through GPIO[3]. If LED mode set to "Signal strength"(64), WPS PBC will be disabled.
37h	8	40M BW in 2.4GHz band. 0: enable 40MHz bandwidth for 2.4GHz band 1: disable 40MHz bandwidth for 2.4GHz band
	9	40M BW in 5G band 0: enable 40MHz bandwidth for 5GHz band. 1: disable 40MHz bandwidth for 5GHz band.
	10	Broadband EXT LNA 0: Board without external LNA must set this bit to 0. 1: Board with external LNA must set this bit to 1.
	12:11	Antenna Diversity control. Bit[12:11]: 00: disable diversity function (default value).

Offset	Field	Description
	13	Internal TX auto level control 0: disable internal TX ALC function (default value). 1: enable internal TX ALC function When the internal TX ALC function is enabled (=1), the driver will use the internal TX ALC function to automatic compensate TX power varied due to temperature variation. It also needs to fill the register "2.4G internal/external step value (77h)" for the TX ALC function.
	14	BT Coexist 0: Disable BT coexistence. 1: Enable BT coexistence.
	15	DAC test bit 0: Disable DAC test. 1: Enable DAC test.

2.4 NIC Configuration 2 (0x42)

Bit <15:12>	11	10:8	7	6	5	4	3	2	1	0
Reserved	25C Temperature Disable	Reserved	TX Stream				RX Stream			
			1: 1 Stream				1: 1 Stream			
			2: 2 Stream				2: 2 Stream			

Note:

1. The 1 stream support MCS0~MCS7. The 2 stream support MCS0~MCS15.
2. Stream setting should be equal or less than path setting of EEPROM (0x34)
3. Default=0xFF means that based on the path setting (0x34) for MAX capability.

NIC Configuration 2 Register Bit Fields Description

Offset	Field	Description
42h	3:0	RX stream. 0 (0000): Reserved 1 (0001): 1 RX stream 2 (0010): 2 RX stream 3 ~ F (0011 ~ 1111): Reserved.
	7:4	TX stream. 0 (0000): Reserved 1 (0001): 1 TX stream 2 (0010): 2 TX stream 3 ~ F (0011 ~ 1111): Reserved.
43h	10:8	ASIC Reserved.
	11	25C Temperature disable bit 0 : Enable 1 : Disable
	15:12	Reserved.

2.5 Country Region Code for 5G band (0x38)

Default value = FFh, which means read from INF and registry, more flexible than reading from EEPROM, this is our current InstallShield CCS implementation. We do not recommend customers to read SKU from EEPROM. therefore, FFh is our default value.

CountryCode— Specify the domain code, can be FFh or one of the followings,

Index	Support Channels
0	36, 40, 44, 48, 52, 56, 60, 64, 149, 153, 157, 161, 165
1	36, 40, 44, 48, 52, 56, 60, 64, 100, 104, 108, 112, 116, 120, 124, 128, 132, 136, 140
2	36, 40, 44, 48, 52, 56, 60, 64
3	52, 56, 60, 64, 149, 153, 157, 161
4	149, 153, 157, 161, 165
5	149, 153, 157, 161
6	36, 40, 44, 48
7	4, 48, 52, 56, 60, 64, 100, 104, 108, 112, 116, 120, 124, 128, 132, 136, 140, 149, 153, 157, 161, 165
8	0, 64
9	4, 48, 52, 56, 60, 64, 100, 104, 108, 112, 116, 132, 136, 140, 149, 153, 157, 161, 165
10	4, 48, 149, 153, 157, 161, 165
11	4, 48, 52, 56, 60, 64, 100, 104, 108, 112, 116, 120, 149, 153, 157, 161
12	4, 48, 52, 56, 60, 64, 100, 104, 108, 112, 116, 120, 124, 128, 132, 136, 140
13	0, 64, 100, 104, 108, 112, 116, 120, 124, 128, 132, 136, 140, 149, 153, 157, 161
14	4, 48, 52, 56, 60, 64, 100, 104, 108, 112, 116, 136, 140, 149, 153, 157, 161, 165
15	, 157, 161, 165, 169, 173
16	4, 48, 52, 56, 60, 64, 100, 104, 108, 112, 116, 120, 124, 128, 132, 136, 140, 149, 153, 157, 161, 165, 169, 173
30	Channels (Refer to 0x11Ah~11Dh)

Note: 1.) If set to Index #12, it will also turn on 802.11h and Carrier Detection by default

2.) The index value is decimal system.

2.6 Configured 5G Channels (0x11A~11Dh)

Default value=0x00, this field is available when 0x38h = 30. (Manual channel)

11Ah

7	6	5	4	3	2	1	0
CH64	CH60	CH56	CH52	CH48	CH44	CH40	CH36
0: off 1: on	0: off 1: on	0: off 1: on	0: off 1: on	0: off 1: on	0: off 1: on	0: off 1: on	0: off 1: on

11Bh

7	6	5	4	3	2	1	0
CH128	CH124	CH120	CH116	CH112	CH108	CH104	CH100
0: off 1: on	0: off 1: on	0: off 1: on	0: off 1: on	0: off 1: on	0: off 1: on	0: off 1: on	0: off 1: on

11Ch

7	6	5	4	3	2	1	0
CH165	CH161	CH157	CH153	CH149	CH140	CH136	CH132
0: off 1: on	0: off 1: on	0: off 1: on	0: off 1: on	0: off 1: on	0: off 1: on	0: off 1: on	0: off 1: on

11Dh

7	6	5	4	3	2	1	0
Reserve	Reserve	Reserve	Reserve	CH173	CH171	CH169	CH167
0: off 1: on	0: off 1: on	0: off 1: on	0: off 1: on	0: off 1: on	0: off 1: on	0: off 1: on	0: off 1: on

For example:

If available channels are 40, 48, 64, 116, 161, 165 and 173, then

0x38h = 30d, 0x11Ah = 8Ah, 0x11Bh = 10h, 0x11Ch = C0h, 0x11Dh = 08h

2.7 Frequency offset (0x3A)

Used for crystal calibration.

2.8 LED Mode Setting (0x3B)

Reserved.

2.9 External LNA gain for 5GHz Band (45h, 49h, 4Dh)

External LNA gain for 5GHz Band Register Bit Fields Description

Offset	Field	Description								
45h,	7:0	External LNA gain for 5GHz Band for channel 36 to 64. 1 step = 1dB. Example: <table><tr><th>Value</th><th>LNA gain (dB)</th></tr><tr><td>0000 0000</td><td>0</td></tr><tr><td>0000 0001</td><td>1</td></tr><tr><td>0000 1010</td><td>10</td></tr></table>	Value	LNA gain (dB)	0000 0000	0	0000 0001	1	0000 1010	10
Value	LNA gain (dB)									
0000 0000	0									
0000 0001	1									
0000 1010	10									
49h	7:0	External LNA gain for 5GHz Band for channel 100 to 128. 1 step = 1dB. Example: <table><tr><th>Value</th><th>LNA gain (dB)</th></tr><tr><td>0000 0000</td><td>0</td></tr><tr><td>0000 0001</td><td>1</td></tr><tr><td>0000 1010</td><td>10</td></tr></table>	Value	LNA gain (dB)	0000 0000	0	0000 0001	1	0000 1010	10
Value	LNA gain (dB)									
0000 0000	0									
0000 0001	1									
0000 1010	10									
4Dh	7:0	External LNA gain for 5GHz Band for channel 132 to 165. 1 step = 1dB. Example: <table><tr><th>Value</th><th>LNA gain (dB)</th></tr><tr><td>0000 0000</td><td>0</td></tr><tr><td>0000 0001</td><td>1</td></tr><tr><td>0000 1010</td><td>10</td></tr></table>	Value	LNA gain (dB)	0000 0000	0	0000 0001	1	0000 1010	10
Value	LNA gain (dB)									
0000 0000	0									
0000 0001	1									
0000 1010	10									

2.11 TX mixer gain setting for 5GHz band (4Ch)

TX mixer gain setting for 2.4GHz band Register Bit Fields Description

Offset	Field	Description
4Ch	7:0	This register is for 5GHz TX mixer gain setting. 1 (001)= +1dB 2 (010)= +4dB (Default) 4 (100)= +7dB

2.13 Reserved (0x4Fh)

2.14 20M/40M BW Power Delta for 5G band (0x51h)

Driver compensates the TX power value of 40M BW with this configured value.

TX power delta configuration Register Bit Fields Description

Offset	Field	Description
51h	5:0	40M BW TX power delta value (MAX=4sBm). 000001: 0.5dBm 000010: 1dBm 000011: 1.5dBm 000100: 2dBm 000101: 2.5dBm 000110: 3dBm 000111: 3.5dBm 001000: 4dBm
	6	1: increase 40M BW TX power with the delta value. 0: decrease 40M BW TX power with the delta value.
	7	1: enableTX power compensation.

Example:

The default calibrated TX power as followings with the TX power delta configuration is **not** enable.

- 40M BW TX power= 14dBm and 20M BW TX power = 14dBm

If want keep 20M BW TX power in 14dBm and reduce 40M BW TX power to 10dBm (delta=4dBm), set 51h = 88h (1000 1000).

2.15 5G band TX0 Power (78h~9Ah)

To prevent reading from EMPTY E2PROM, driver treats these “Channel xx Tx Power” value 0 and any value > =0x2C as invalid..

5GHz TX0 power setting register

Offset	b15 ~b8	b7 ~ b0
78h	Channel 38 TX0 power	Channel 36 TX0 power
7Ah	Channel 44 TX0 power	Channel 40/42 TX0 power
7Ch	Channel 48/50 TX0 power	Channel 46 TX0 power
7Eh	Channel 54 TX0 power	Channel 52 TX0 power
80h	Channel 60 TX0 power	Channel 56/58 TX0 power
82h	Channel 64 TX0 power	Channel 62 TX0 power
84h	Channel 102 TX0 power	Channel 100 TX0 power
86h	Channel 108 TX0 power	Channel 104/106 TX0 power
88h	Channel 112/114 TX0 power	Channel 110 TX0 power
8Ah	Channel 118 TX0 power	Channel 116 TX0 power
8Ch	Channel 124 TX0 power	Channel 120/122 TX0 power
8Eh	Channel 128/130 TX0 power	Channel 126 TX0 power
90h	Channel 134 TX0 power	Channel 132 TX0 power
92h	Channel 140/142/144 TX0 power	Channel 136/138 TX0 power
94h	Channel 151 TX0 power	Channel 146/149 TX0 power
96h	Channel 157 TX0 power	Channel 153/155 TX0 power
98h	Channel 161/163 TX0 power	Channel 159 TX0 power
9Ah	Reserved	Channel 165 TX0 power

2.16 Tx Power Slop / offset for 5G (0xF0~0xFF)

We can divide 5G channels into 1~8 groups by setting 5G group boundary channel index (0xD4~0xDA). For example, if we want to divide them into 2 groups, we only need to set TSSI 5G Group 1 boundary channel index; the channels less than Group 1 boundary channel index will be group 1 while the others will be group 2.

Each group will refer to its TSSI slope and offset (in 0xF0~0xFF).

2.17 5G Target Power (0xD2h)

D2h is 5G OFDM 54 M target power. Unit is 0.5 dBm.
e.g. For target power 13 dBm, set D2h as 0x1A

2.18 25C Temperature Sensor Calibration (0xD1h)

25°C temperature reference reading.

2.19 5G Tx rate power configuration(0x120h~0x12Dh)

Default value=0x00, 6bit signed 2's complement value. (1 step=0.5dBm)

Offset	Field	Description
120h	5:0	5G Tx per-rate power setting
~12Dh	7:6	Reserved

The 1 step=0.5 dBm.

Offset	Description	Bit [5:0]
120h	5G Tx power for OFDM 6M/9M	TX0 power setting
121h	5G Tx power for OFDM 12M/18M	TX0 power setting
122h	5G Tx power for OFDM 24M/36M	TX0 power setting
123h	5G Tx power for OFDM 48M/54M	TX0 power setting
124h	TX power for 5G HT MCS=0,1	TX0 power setting
125h	TX power for 5G HT MCS=2,3	TX0 power setting
126h	TX power for 5G HT MCS=4,5	TX0 power setting
127h	TX power for 5G HT MCS=6,7	TX0 power setting
12Ch	TX power for 5G HT MCS8,9	TX0 power setting
12Dh	TX power for 5G HT MCS10,11	TX0 power setting

2.20 Reserved for Customer (0x110h~0x117h)