



◆ Description

APT580 is a 80 Sec Easy Use Speech IC .It Support PWM or DAC voice output with high quality speech , There are 80 second Voice Length under 6 KHz sampling and 4 bit hardware compression. Its internal built-in a oscillator for system clock **without an external resistor**. Maximum 63 voice groups. One Group contain several steps(voice section) ; **Maximum 700 steps** for all the Groups. **Each Step** can be define **Trigger Mode, Output Status, Voice Section, Mute length, I/O Type** & **Simple Programming Function**. User can select **8bit / 5bit / 4bit** data compression. **Support three mode trigger IC** (Stand Alone, Serial Trigger Mode, CPU Command Mode). Easy use development system is for function selection and voice combination . PC download the ROM code by the USB Port .

◆ Functions

- MAX voice file : 700
- MAX Trigger Groups : 63
- Power On Trigger Group :1
- MAX Step : 700
- Signal step mute length : 0.64 s (6k sample rate)
- Operating Voltage range: 2.5V ~ 4.5V
- Total Voice Duration : 80" (120K Samples)
- I/O pin : 12
- Voice output : PWM or DAC
- Sequential Key : TG1 -> 32 Groups.
 TG2 -> 29 Groups.
 TG3~TG12-> 1 Group
- Debounce time : 50 us or 10 ms
- On/Off function : only for all TH PIN
- Sequential Key for Volume control function.
- Step can change Trigger I/O Type, Trigger Mode & Output Status.
- Hardware Trigger Group Repeat function.
- **Simple Programming Function :**
 - (a) Write data to working register.



- (b) Working Register Increasing.
- (c) Step Jump by Working Register / Volume Status.

- **Three Mode Trigger IC :**

- Key Stand-alone Trigger Mode :
 - A. Edge/Level
 - B. Hold/Unhold
 - C. Retrigger/Irretrigger
- Serial Trigger Mode :
Combinations of TG1 and TG2 to trigger maximum 63 Voice Group.
- CPU Command Mode :
User command through TG1,TG2,TG3 with SPI CPU Interface to control the Multi-Playback function.

- **Output status** (for each Output pin):

- A. Stand by Status. (High/Low Status)
- B. Busy Low Active.
- C. Busy High Active.
- D. LED Flash at 6 Hz.
- E. LED Flash at 3 Hz.
- F. LED Flash at 1.5 Hz.
- G. LED Flash at 0.75 Hz.

- H. PWM for LED Dimming Control.**

- **Play rate level :**

APT580 can provide different play rate in one code as follow below
Reference Sample Rate.

3K, 3.2K, 3.31K, 3.42K, 3.55K, 3.69K, 3.84K, 4K, 4.17K, 4.36K, 4.57K,
4.8K, 5.05K, 5.33K, 5.64K, 6K, 6.4K, 6.85K, 7.38K, 8K, 8.72K, 9.6K,
10.66K, 12K, 13.71K, 16K, 19.2K, 24K.

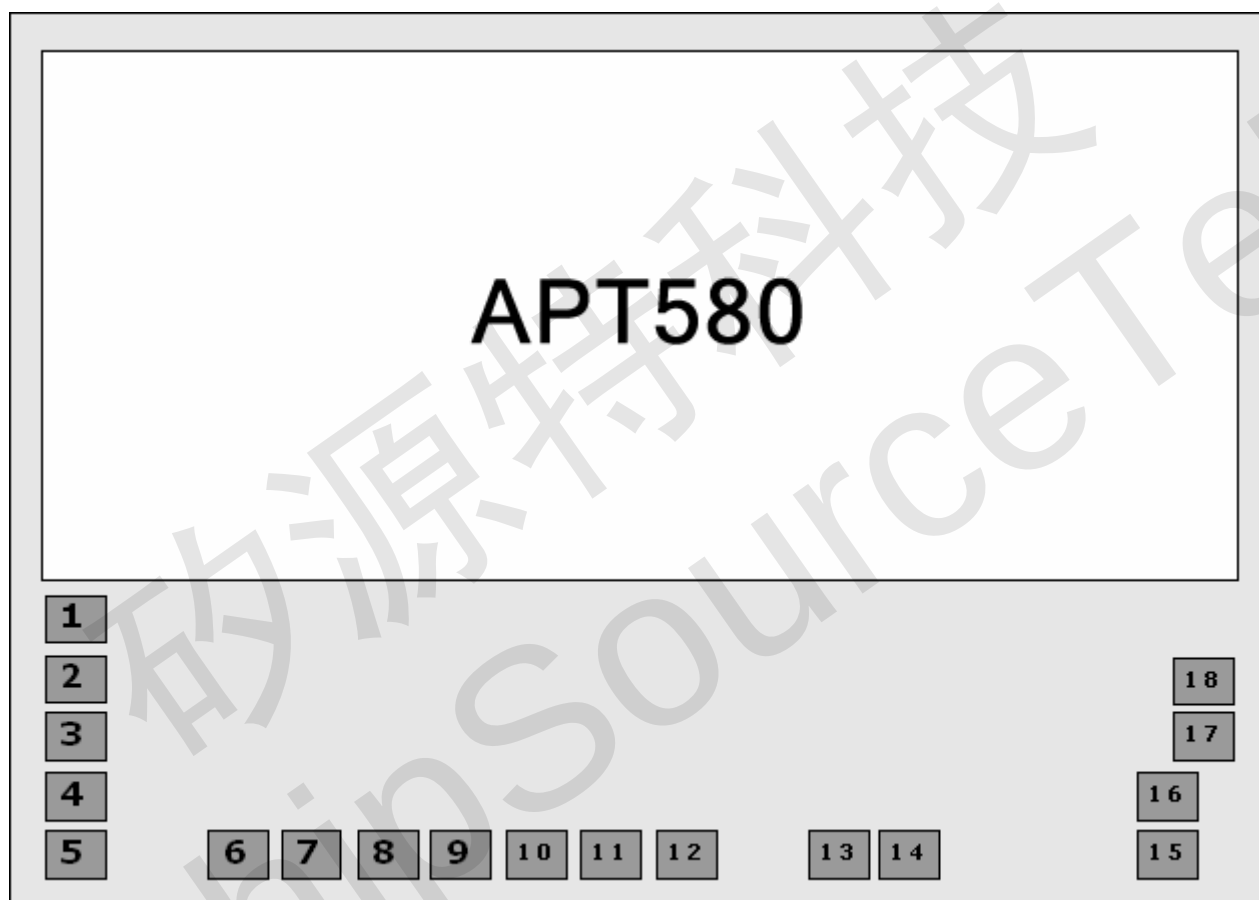
- **TG2 Low Reset**



● **TG3 Volume Control**

◆ **APT580 Pad Location**

CHIP SIZE: (0, 0) (1840,2008) UM



NO.	PAD NAME	X	Y	NO.	PAD NAME	X	Y
1	TG2/RSTB	-831	-539	10	TG10	-265	-915
2	TG1	-831	-630	11	TG11	-175	-915
3	TG3	-831	-720	12	TG12	-85	-915
4	TG4	-831	-810	13	VSS	192	-903
5	TG5	-831	-900	14	VSS	338	-903
6	TG6	-625	-915	15	PWM1	809	-929



7	TG7	-535	-915	16	PWM2/DAC	810	-806
8	TG8	-445	-915	17	VDD	844	-718
9	TG9	-355	-915	18	VDDL	844	-633

◆ APT580 PIN Description

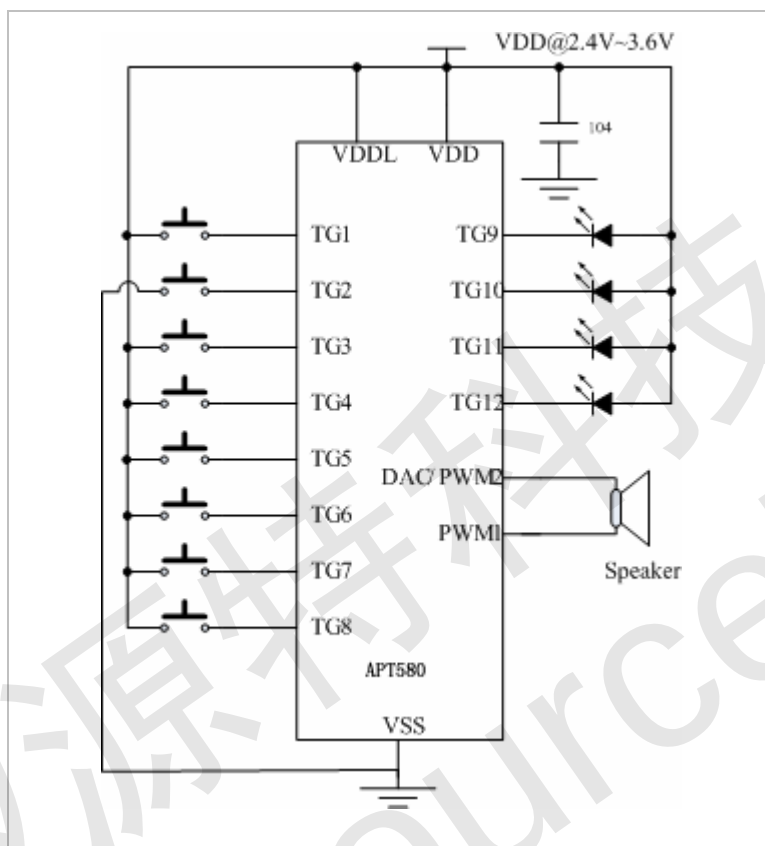
PIN NAME	I/O	Function
TG1	INPUT	Key Stand-alone Trigger Mode : TG1 is used to trigger the maximum 32 Voice Group one by one sequentially.
		Serial Trigger Mode : TG1 is used to trigger the maximum 63 Voice Group.
		CPU Command Mode : TG1 is used as Data Input Pin (DI).
		As Output PIN , Output the BUSY or Flash Signal.
TG2/RSTB	INPUT	Key Stand-alone Trigger Mode : TG2 is used to trigger the maximum 21 Voice Group one by one sequentially.
		Serial Trigger Mode : TG2 is used to trigger the maximum 31 Voice Group
		CPU Command Mode : TG2 is used as Clock Pin (SCK).
TG3	INPUT	Key Stand-alone Trigger Mode : TG3 is used trigger Only One Group.
		CPU Command Mode : TG3 is used as Clock Pin (DO).
		As Output PIN , Output the BUSY or Flash Signal.
TG4	INPUT	Key Stand-alone Trigger Mode : TG4 is used trigger Only One Group.
		As Output PIN , Output the BUSY or Flash Signal.
TG5	INPUT	Key Stand-alone Trigger Mode : TG5 is used trigger Only One Group.
		As Output PIN , Output the BUSY or Flash Signal.
TG6	INPUT	Key Stand-alone Trigger Mode : TG6 is used trigger Only One Group.
		As Output PIN , Output the BUSY or Flash Signal.
TG7	INPUT	Key Stand-alone Trigger Mode : TG7 is used trigger Only One Group.
		As Output PIN , Output the BUSY or Flash Signal.
TG8	INPUT	Key Stand-alone Trigger Mode : TG8 is used trigger Only One Group.
		As Output PIN , Output the BUSY or Flash Signal.
TG9	INPUT	Key Stand-alone Trigger Mode : TG9 is used trigger Only One Group.
		As Output PIN , Output the BUSY or Flash Signal.
TG10	INPUT	Key Stand-alone Trigger Mode : TG10 is used trigger Only One Group.
	OUTPUT	As Output PIN , Output the BUSY or Flash Signal.



PWM2	OUTPUT	As a PWM PIN , can Directly drive the Speaker .
		As a DAC PIN , 8 bit D/A Current Output.
PWM1	OUTPUT	As a PWM PIN , can Directly drive the Speaker .
VDD	INPUT	Power Supply PIN , Connected with a 0.1 uF to VSS.
VDDL	INPUT	Power Supply PIN , Connected with VDDL @ 2.4~3.6 V Working Voltage.
		Power Supply PIN , Connected with a 0.1 uF to VSS. @3.6~5V Working Voltage.
VSS	INPUT	Connected to Ground.
TG11	INPUT	Key Stand-alone Trigger Mode : TG11 is used trigger Only One Group.
		As Output PIN , Output the BUSY or Flash Signal.
TG12	INPUT	Key Stand-alone Trigger Mode : TG12 is used trigger Only One Group.
		As Output PIN , Output the BUSY or Flash Signal.



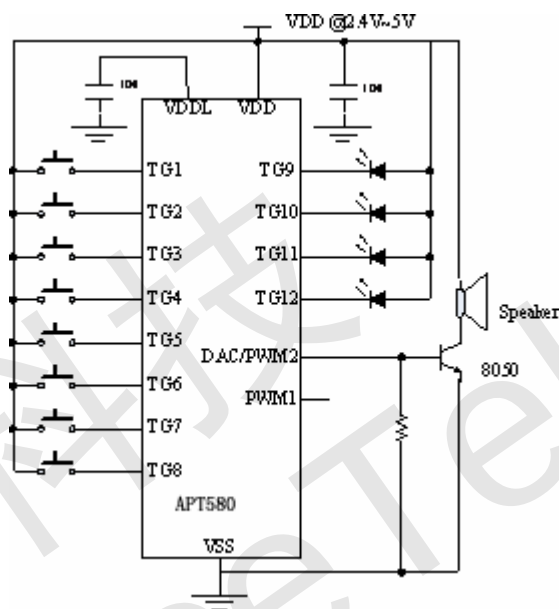
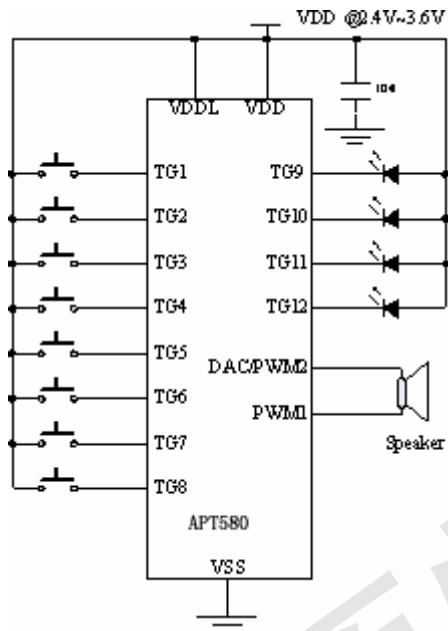
◆ TG2 Low Reset



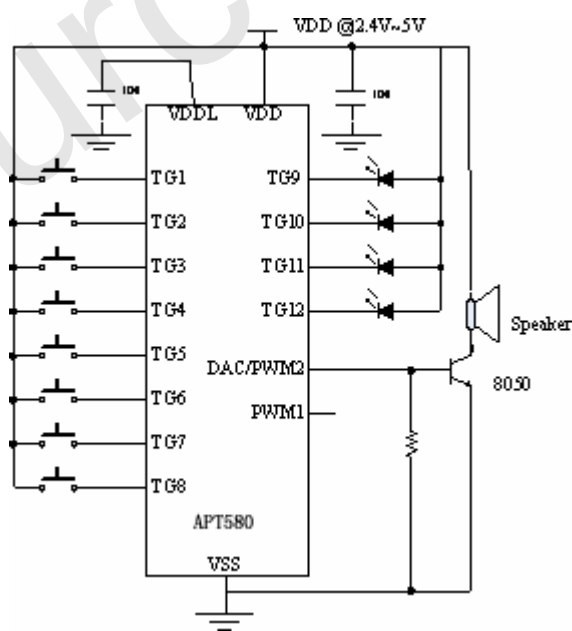
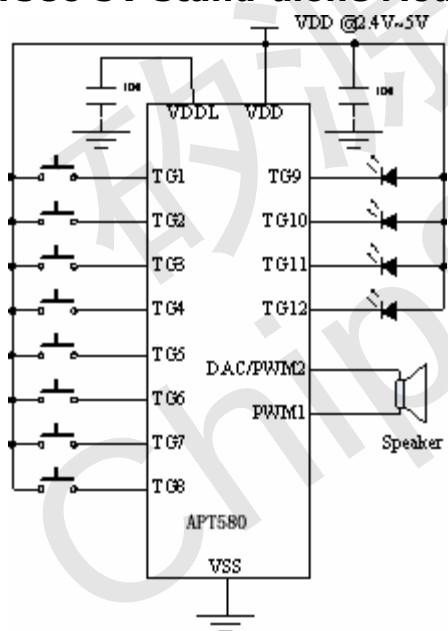


◆ APT580 Application Circuit

APT580 3V Stand-alone Mode



APT580 5V Stand-alone Mode





APT580 3V Serial Mode

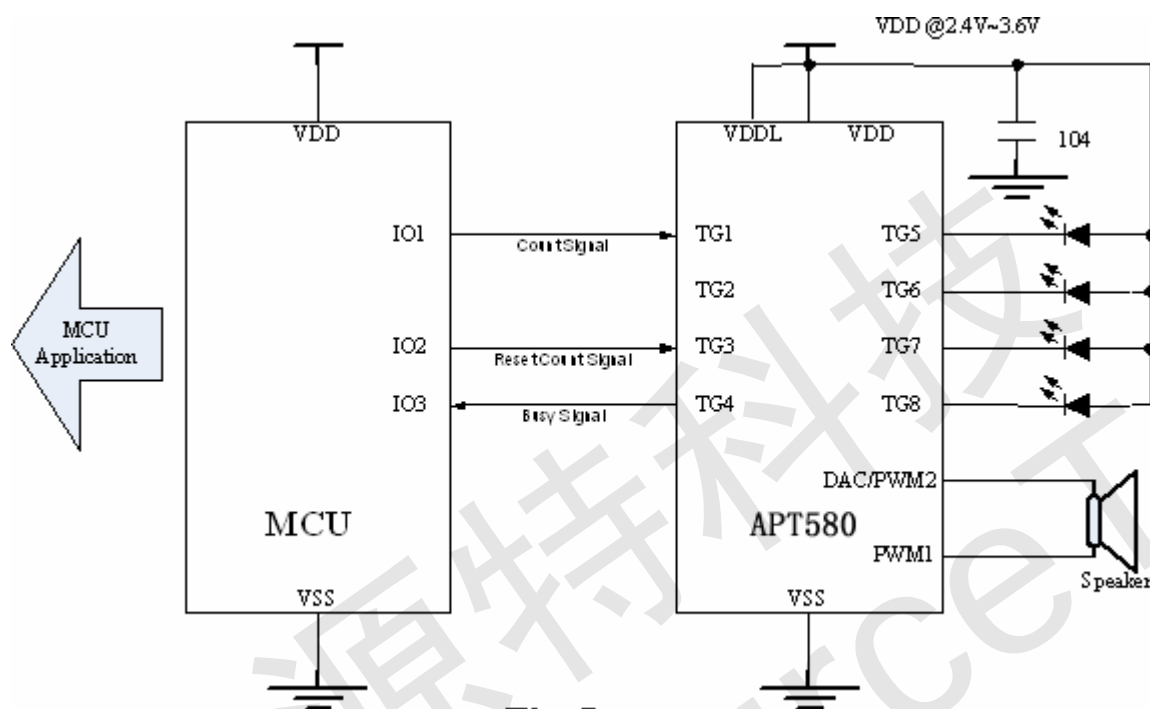


Fig. 5

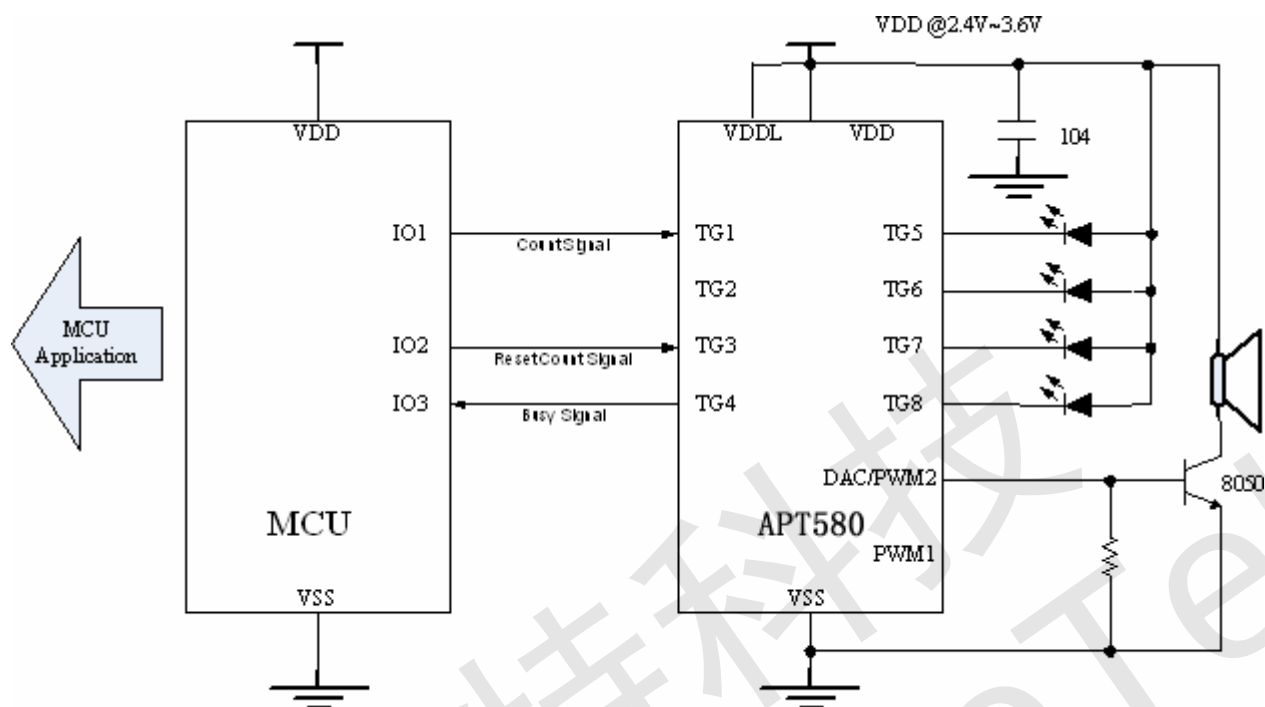


Fig. 6



APT580 5V Serial Mode

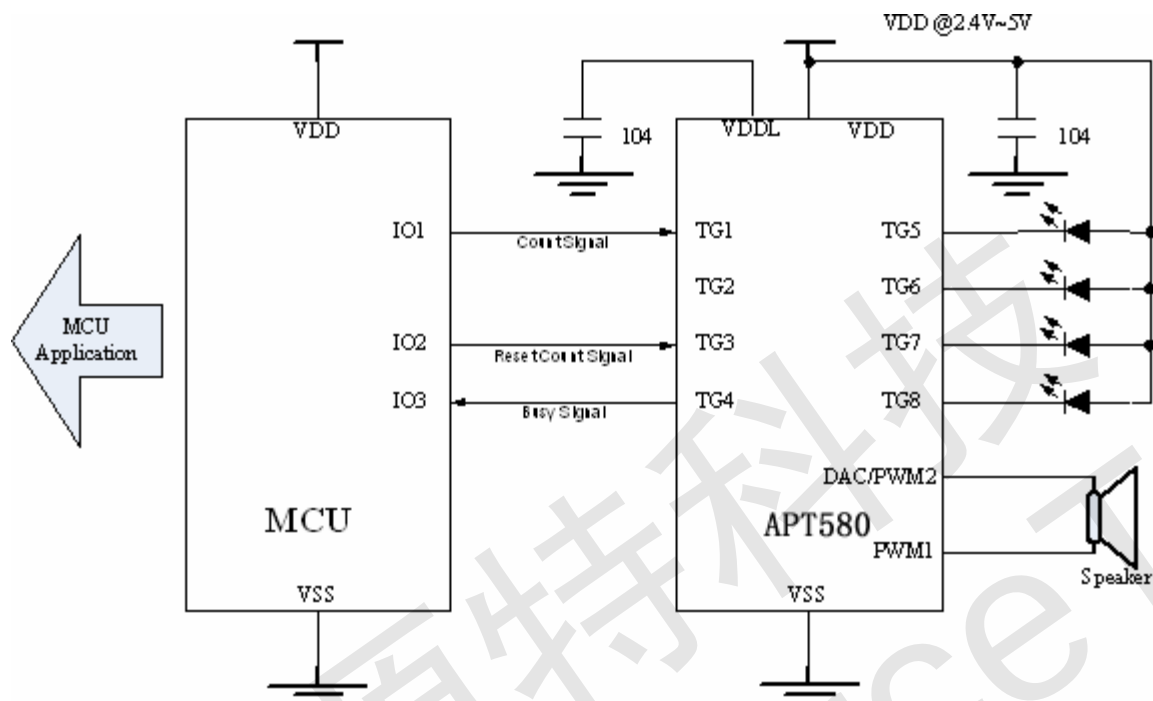


Fig. 7

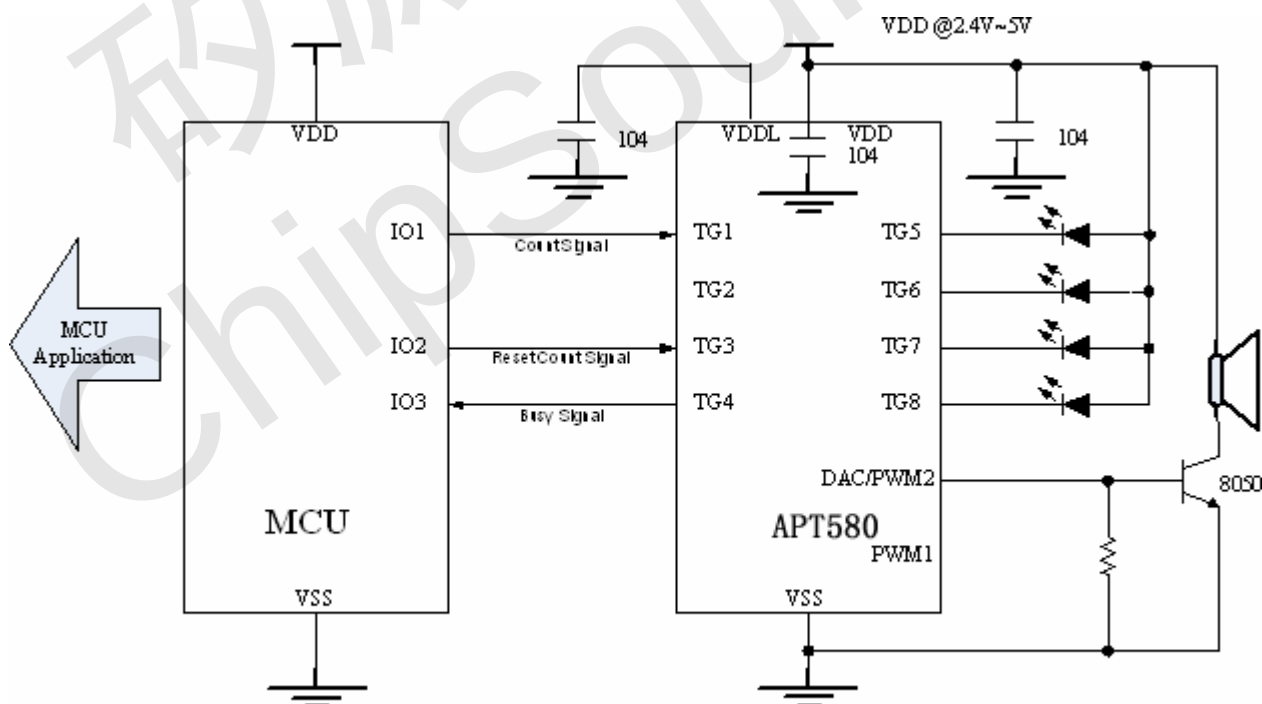


Fig. 8



APT580 3V CPU Mode

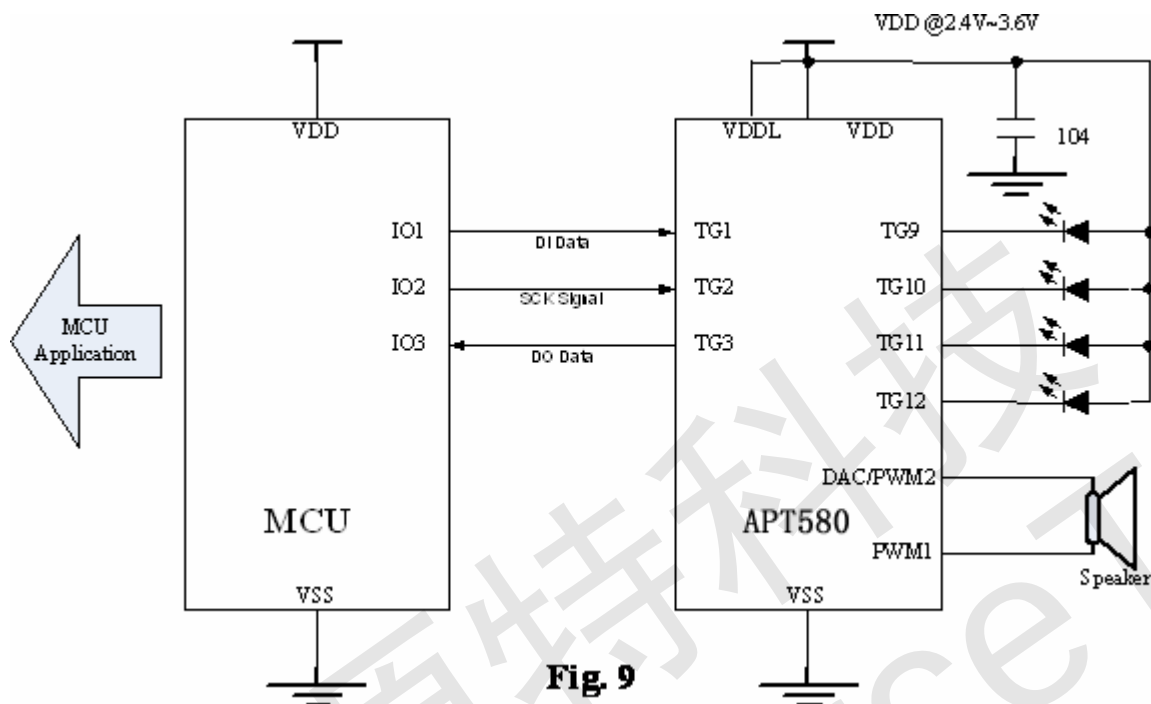


Fig. 9

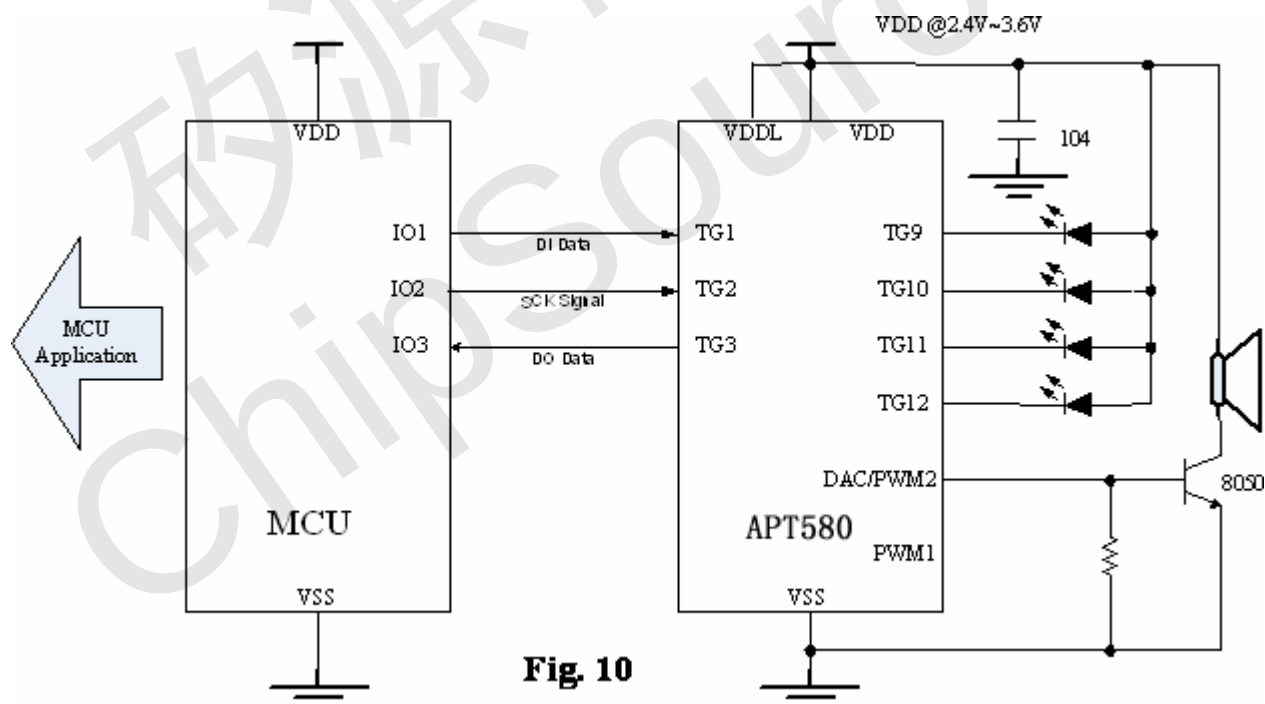


Fig. 10



Fig. 11

Fig. 11

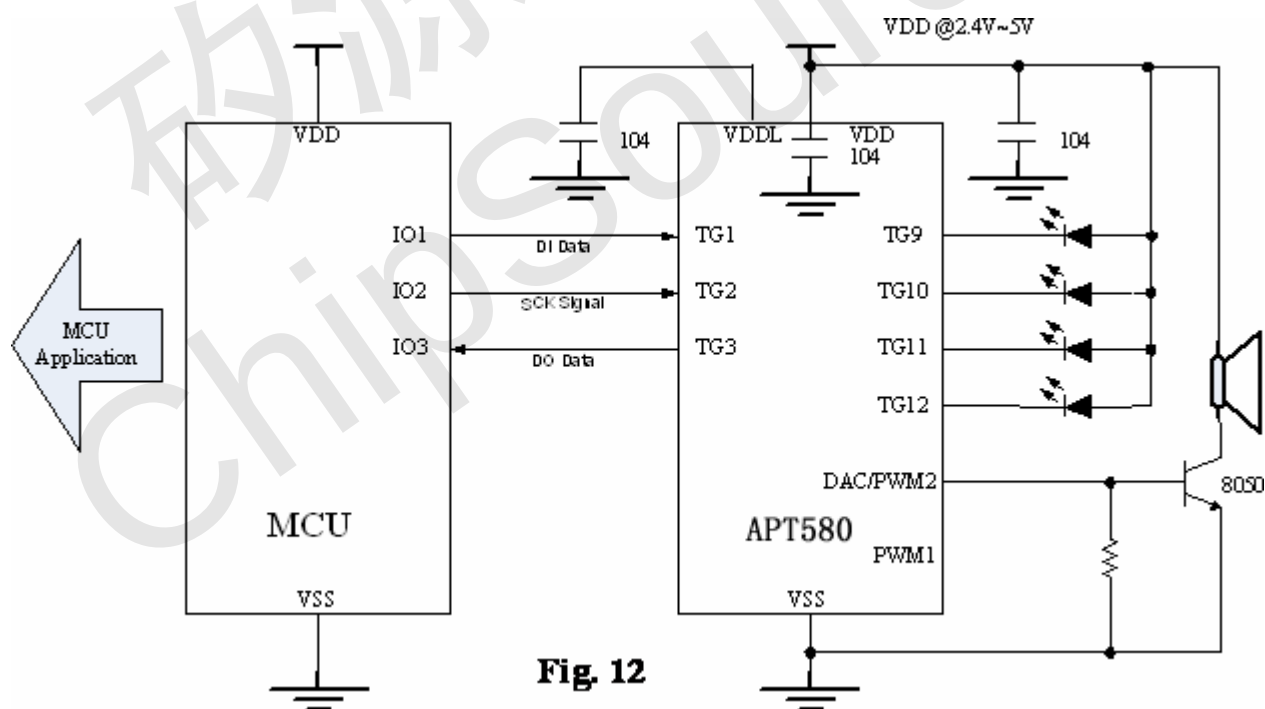
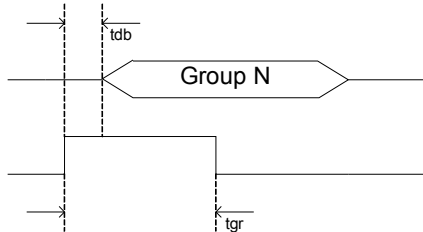


Fig. 12

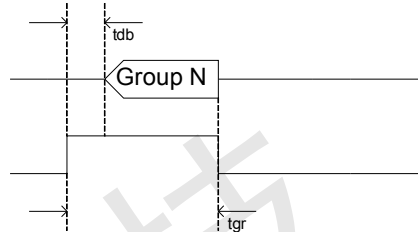


◆ APT580 Trigger Timing

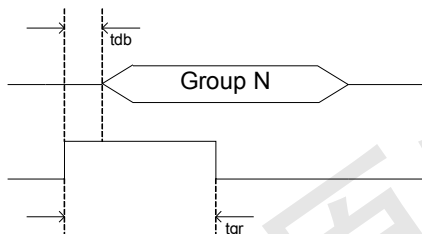
(a) Trigger Pulse Width < Group Length
Option Setting = Edge / Unhold



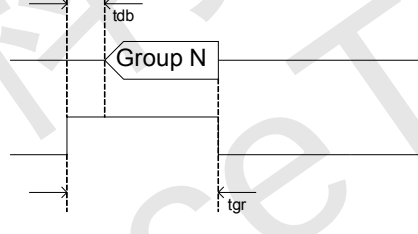
(b) Trigger Pulse Width < Group Length
Option Setting = Edge / Hold



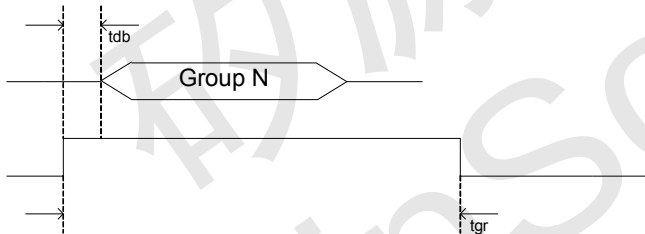
(c) Trigger Pulse Width < Group Length
Option Setting = Level / Unhold



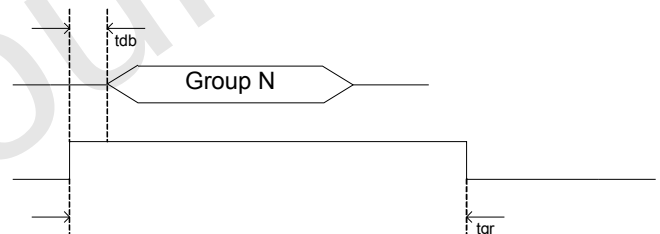
(d) Trigger Pulse Width < Group Length
Option Setting = Level / Hold



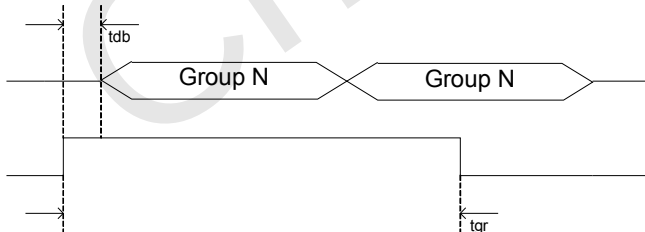
(e) Trigger Pulse Width > Group Length
Option Setting = Edge / Unhold



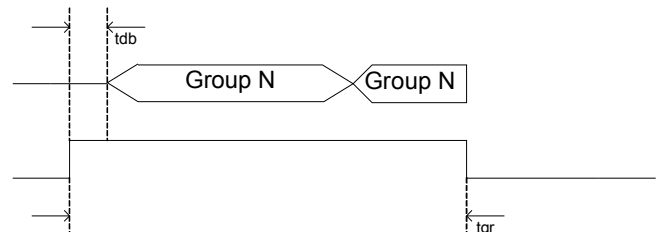
(f) Trigger Pulse Width > Group Length
Option Setting = Edge / Hold



(g) Trigger Pulse Width > Group Length
Option Setting = Level / Unhold

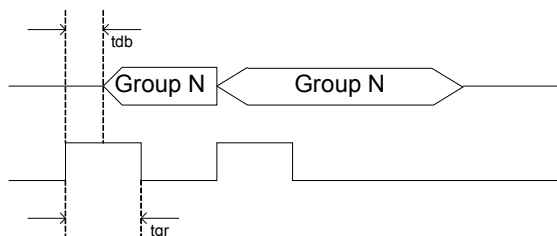


(h) Trigger Pulse Width > Group Length
Option Setting = Level / Hold

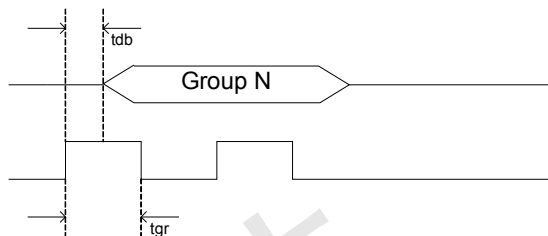




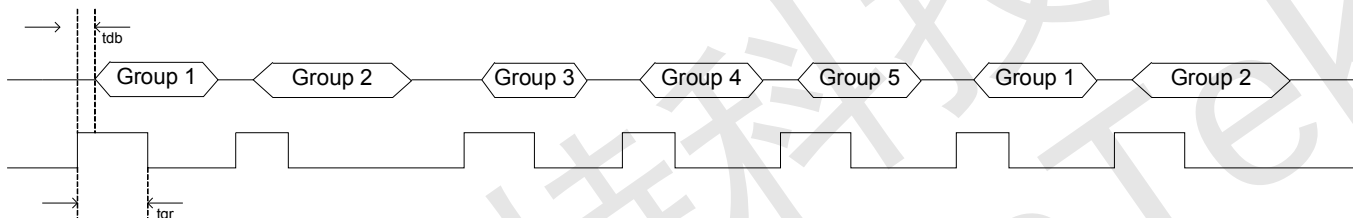
(i) Option Setting = Retrigger



(j) Option Setting = Irretrigger



(k) TG1 = Sequential Trigger & From Group1~Group5





◆ APT580 Trigger Voice Combination Example

Voice File	Description
Voice File A	Hello (1.5'')
Voice File B	Good Morning (3'')
Voice File C	John (1'')
Voice File D	Tom (1'')
Voice File E	Mary (1.5'')

Group1 = Step1 + Step 2

Group 2 = Step3 + Step 4 + Step 5

Group 3 = Step 6 + Step 7

Group1 = Hello John

Group 2= Hello Tom Good Morning

Group 3 = Good Morning Mary

Step1 = Voice File A

Step 2 = Voice File C

Step 3 = Voice File A

Step 4 = Voice File D

Step 5 = Voice File B

Step 6 = Voice File B

Step 7 = Voice File E

Total use 3 Group , 7 Steps

Voice duration= Hello + Good Morning + John + Tom + Mary

= 1.5'' + 3'' + 1'' + 1'' + 1.5''

= 8''

Total duration = 8'' (20''-8'' = 32'' space are free , can add more Voice File)



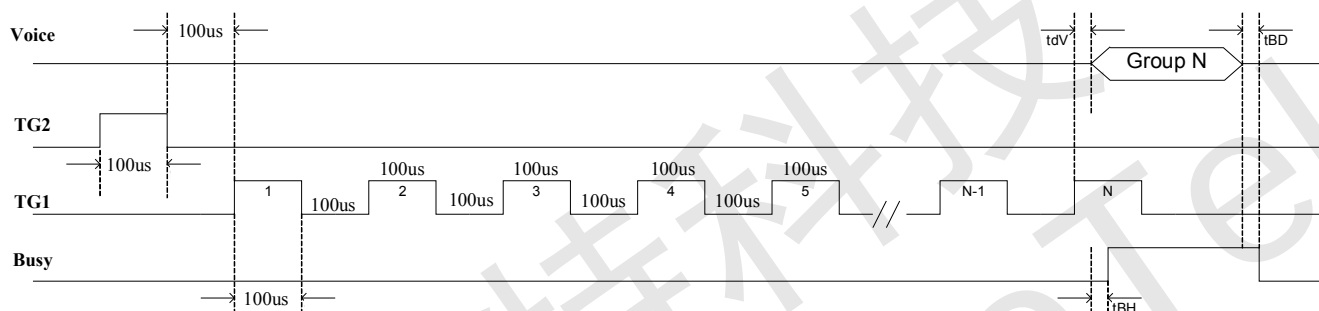
◆ APT580 Serial Mode Timing

TG1=Edge/Unhold/Retrigger

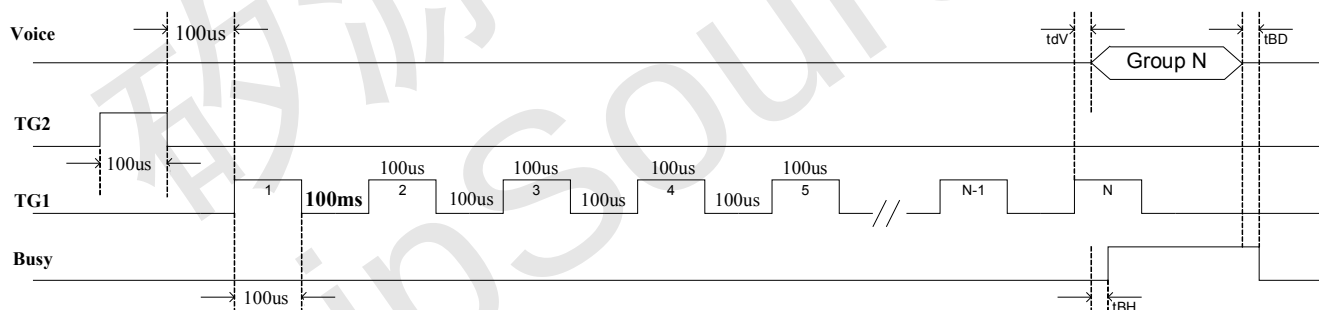
TG3=Reset PIN

※Tool : Controller Trigger

● PWM



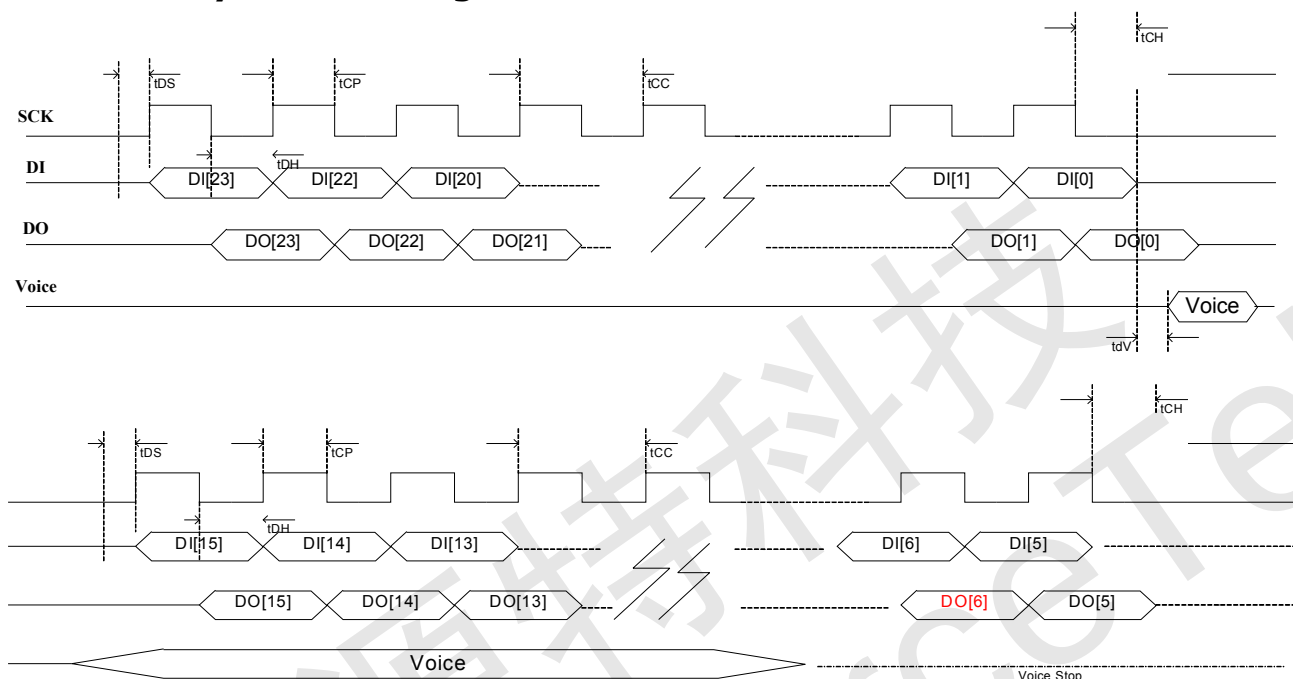
● DAC





◆ APT580 CPU Mode Timing

APT580 Play Voice Timing



* **DO[6]** =1 is Busy , =0 Voice Stop

APT580 Check Voice Stop Timing

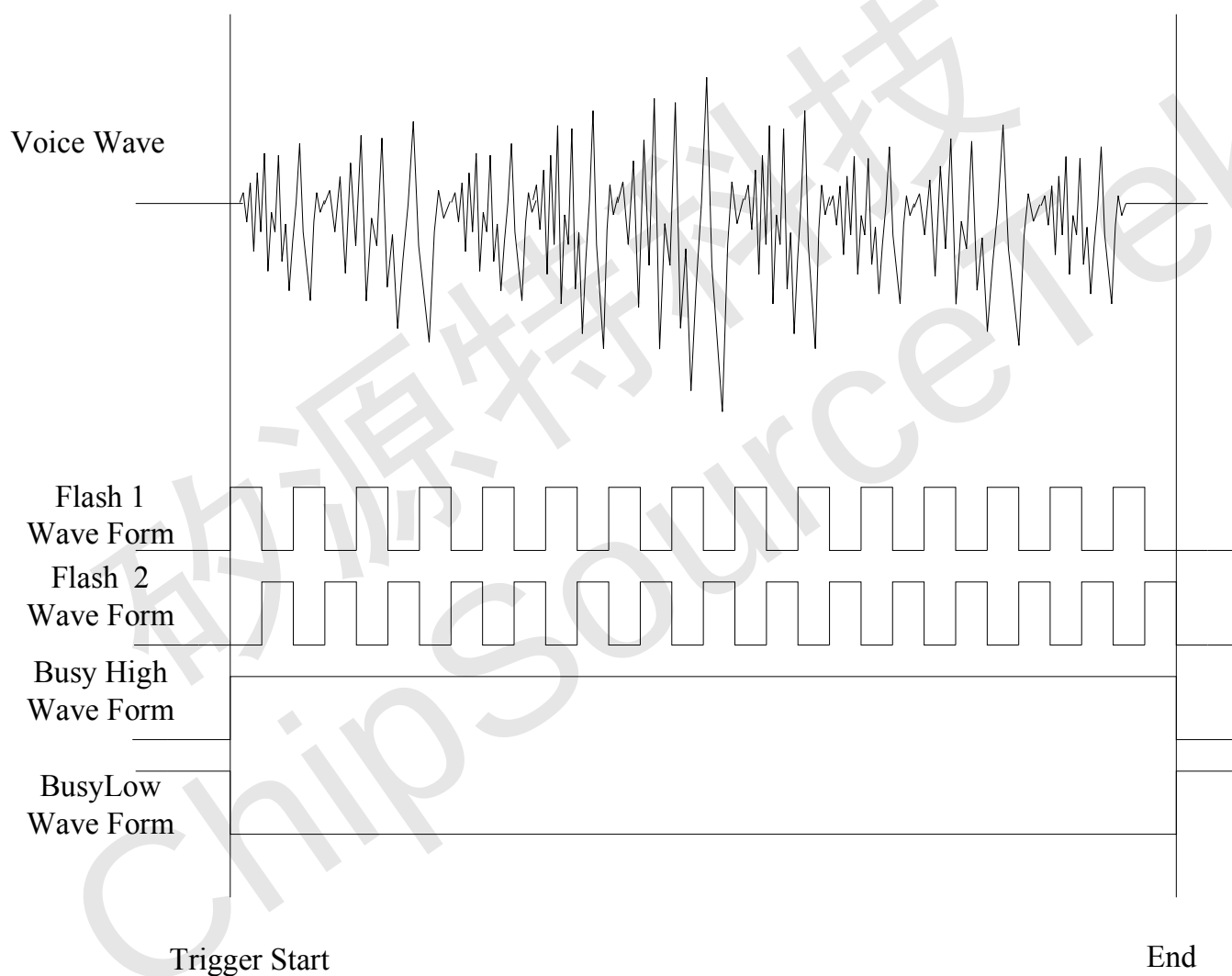
Command	PIN	Command Data	Clock Count	Description
Initial	DI	0x1E525B	24 clk	Wake up the chip
	DO			
START	DI	0x0A0140	24 clk	Wake up the chip
	DO			
STOP	DI	0x0A0100	24 clk	Stop up the chip
	DO			
PLAY	DI	0x18+ Group Address Ex:0x00C8	24 clk	Play Voice Step Address
	DO			
PAUSE	DI	0x0A0148	24 clk	Pause the Playback and hold at the Voice data
	DO			
RESUME	DI	0x0A0140	24 clk	Resume Playback from the previous Voice data
	DO			



Read Busy	DI	0x2200	16 clk	Check Voice is Stop or Not
	DO	Check DO[6]		

Play Address Command is generated by the Tool.

◆ APT580 Voice Wave & Output Status





◆ DC Electrical Characteristics

Item	Symbol	Min	Typ	Max	Unit	Condition
Operating voltage	VDD	2.4	3.0	4.5	V	
Standby current (LDO ON)	I _{sb}	3	4	5	uA	VDD=3V,no load
Standby current (LDO OFF)	I _{sb}	1	1.5	3	uA	VDD=3V,no load
Operating current	I _{op}		600		uA	VDD=3V,no load
Drive current of Output	I _{od}		10		mA	VDD=3V VOUT=0.6V
Sink current of Output	I _{os}		30		mA	VDD=3V VOUT=2.4V
Drive current of PWM	I _{od}		200		mA	VDD=3V,VOUT=1.5V
Sink current of PWM	I _{os}		200		mA	VDD=3V,VOUT=1.5V



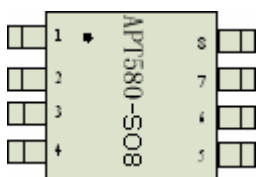
◆ AC Electrical Characteristics

Symbol	Characteristic	Rating			Unit
		Min.	Typ.	Max.	
tdb	Key Trigger debounce time (long)	14			ms
tdb	Key Trigger debounce time (short)	50			us
tBH	Busy signal output hold time	200			us
tBD	Busy signal output delay time	200			us
tdV	Voice output delay time	200			us
tCS	Chip Select setup time	1			us
tDS	Data In setup time	1			us
tDH	Data In hold time	1			us
tCP	Clock Pulse Width	1			us
tCC	Clock Cycle time	2			us
tCH	Chip Select hold time	1			us



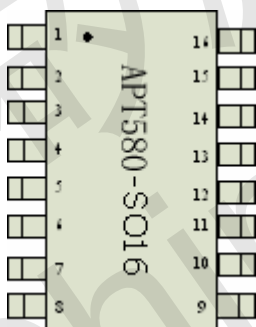
◆ APT580 Package Information

APT580-S08B



PIN	NAME
1	TG2/RSTB
2	TG1
3	TG3
4	VSS
5	PWM1
6	PWM2/DAC
7	VDD
8	VDDL

APT580-D08B



PIN	NAME
1	TG9
2	TG8
3	TG2
4	TG1
5	TG3
6	TG5
7	TG6
8	TG7
9	VSS
10	PWM1
11	PWM2/DAC
12	VDD
13	VDDL
14	TG12
15	TG11
16	TG10



◆ Writer Mapping Description

Writer Pin : TG1,TG2,TG3,PWM1,VDD,VDDL,VSS

OTP Writer Power Board Pin Mapping Table			
DIP 20	PAD Name	TH080-SO8	TH080-SO16
1 – VPP	1-TG2/RSTB	1-TG2/RSTB	3-TG2/RSTB
2 – DO	3-TG3	3-TG3	5-TG3
3 – DI	2-TG1	2-TG1	4-TG1
4 – GND	13,14-VSS	4-VSS	9-VSS
5 - TEST	X	X	X
17 – RSTN	X	X	X
NC	X	X	X
19 – CLK	15-PWM1	5-PWM1	10-PWM1
20 – VCC	17-VDD,18-VDDL	7-VDD,8-VDDL	12-VDD,13-VDDL

◆ Writer Board Slot Location (DIP20)

