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EXC80H32

Projected Capacitive Touchscreen Controller Chip



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Introduction

EXC80H32 is a MCU based projected capacitive touch screen controller designed for commercial and industrial application. EXC80H32 controller supports high voltage driving signal to achieve high SNR and better wideband interference susceptibility. EXC80H32 needs an external DC/DC booster chip to generate high voltage. EXC80H32 provides different working frequencies to avoid narrow band interference. With high voltage driving and different working frequencies, EXC80H32 provides an excellent interference susceptibility performance. With eGalaxTouch software package, EXC80H32 supports different touch sensor structures - OGS, SITO, DITO, G/F, G/F/F and G/G structure. With high SNR, EXC80H32 provides an excellent solution for not only finger operation but also with thin gloves, etc application.

1 Features

Clocks	• External 12 MHz crystal • Internal PLL • Internal 32 bits RTC • Clock generator for digital modules • Clock generator for analog modules
Power Management	• Power supply : 3.0~3.6 VDC • Internal regulator for analog block • Internal regulator for digital core • Idle mode • Sleep mode
Memory	• 256KB embedded flash • 64KB SRAM + 1KB USB FIFO
ESD	• 2000V(HBM)
Analog Modules	• Up to 40 RX channels • Up to 26 TX channels - TX + RX must $\leq$ 58 channels • Signal generator
Communication Interface	• USB 2.0 compliant full speed with LPM L1 supported. • Configurable Serial Interface - UART : baud rate 115200(programmable), none parity, 8 data bits and 1 stops bit Support HW flow control - I2C : up to 400 KHz, support 1.8V and 3.3V⁽¹⁾
Digital Modules	• Timers, watch dog Timer • Multi-touch algorithm engine • Hardware algorithm accelerator • Hardware scan engine
Active Pen ⁽²⁾	• Support Microsoft pen protocol (MPP) version 1.51 • Support eGalax pen protocol
Temperature Range	• -40 to 85°C operation • -40 to 125°C storage
Package	• BGA 5.5mm x 9mm x 1.0mm • Ball Pitch : 0.5mm • Ball Count : 170

Table 1-1 Features

(1) I2C interface supports 1.8V and 3.3V level, it selected by schematic design.

(2) EXC80H46/32 needs special firmware to support active pen function.

2 Block Diagram

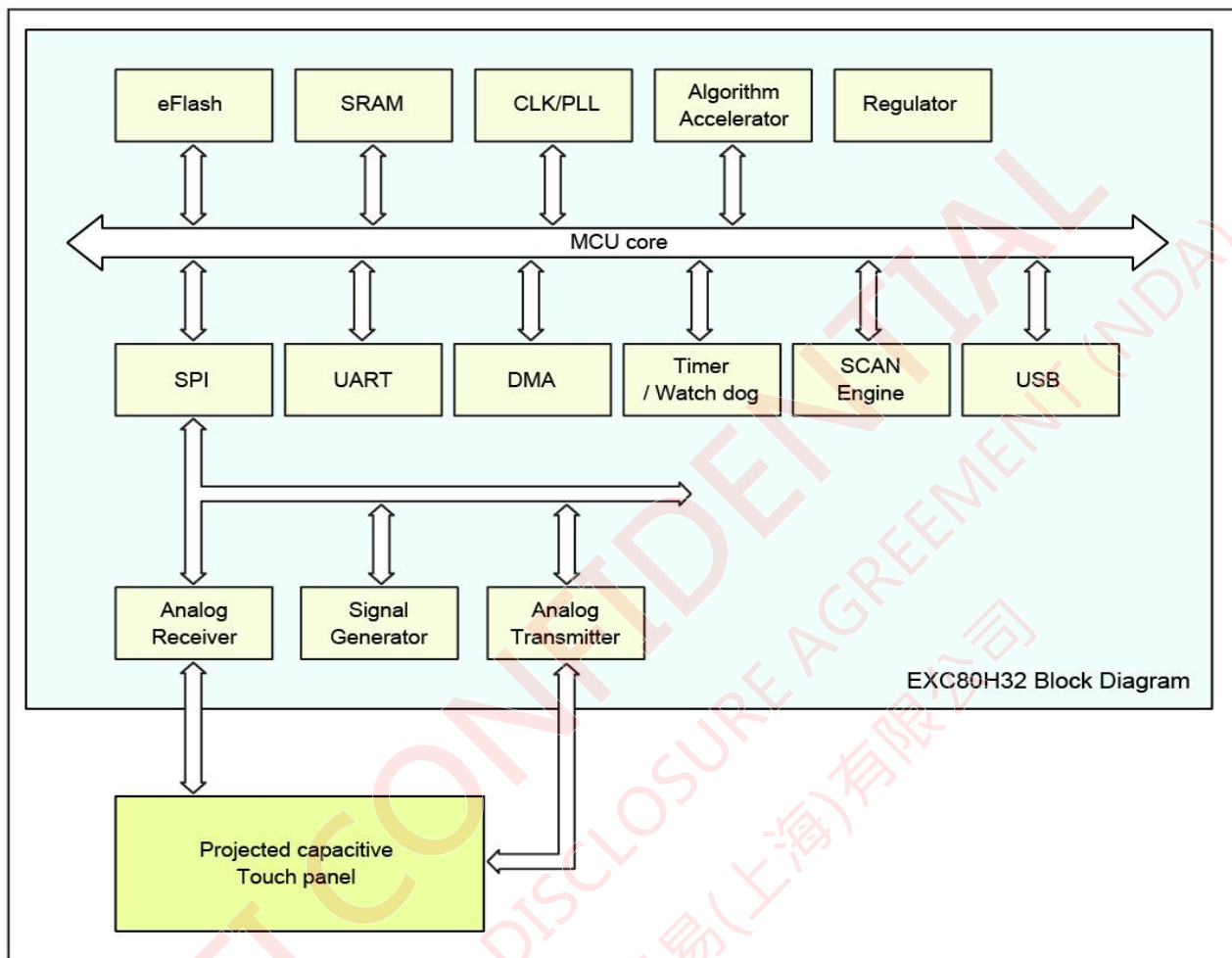


Figure 2-1 Block Diagram

3 Pinout Configuration



Figure 3-1 Top View EXC80H32

	1	2	3	4	5	6	7	8	9	10	
A	NC	DVDD	DGND	I2C_SCL	XOUT	XIN	GPIO2/M_I2C_SDA	DGND	DVDD	DGND	A
B	GPIO0/TP_EN	HV_EN	I2C_SDA	I2C_INT	RSTN	SDA3_A	SDA3_B	GPIO7/UART_RTS	UART_TX	GPIO3/M_I2C_SCL	B
C	NSS_A	NSS_B	PENINT_A	PENINT_B	DGND	SDA2_A	SDA2_B	GPIO6/UART_CTS	UART_RX	GPIO1/M_I2C_INT0	C
D	DVDD	DGND	GPIO4/M_I2C_INT1	DVDD	DGND	SDA1_A	SDA1_B	GPIO5	P14_D	P13_D	D
E	V150	/LDO15_EN	DVDD	DVDD	DGND	DGND	SDA0_A	SDA0_B	P15	USB_DP	E
F	RX0	RX1	RX2	RX3	AVDD	DVDD15	SCL_A	SCL_B	P015_D	USB_DM	F
G	RX4	RX5	RX6	RX7	AVDD	DGND	RDY_B	RDY_A	P013_D	P014_D	G
H	RX8	RX9	RX10	AGND	AGND	XI	RXCLK	RSTN_A	NTEST	DVDD	H
J	RX11	RX12	RX13	AGND	D	ATEST	VSSH	RSTN_B	DGND	DBUS	J
K	RX14	RX15	RX16	AGND	PWMA	VSSH	VDDH	VSSH	NC	NC	K
L	RX17	RX18	RX19	AGND	AOUT	VSSH	TX24	TX25	NC	NC	L
M	RX20	RX21	RX22	AGND	SERIN	VSSH	TX20	TX21	TX22	TX23	M
N	RX23	RX24	RX25	RX26	AGND	VDDH	TX16	TX17	TX18	TX19	N
P	RX27	RX28	RX29	RX39	NC	VSSH	TX3	TX7	TX14	TX15	P
R	RX30	RX31	RX32	NC	NC	VSSH	TX2	TX6	TX12	TX13	R
T	RX33	RX34	RX37	NC	NC	VSSH	TX1	TX5	TX9	TX11	T
U	RX35	RX36	RX38	NC	DVDD15	DGND	TX0	TX4	TX8	TX10	U

Figure 3-2 TOP View EXC80H32 BGA Ball Pins

Ball Map	Pin Name	Type	Description
A1	NC	-	No Connect
A2	DVDD	Power	3.3V Digital Power
A3	DGND	Ground	Digital Ground
A4	I2C_SCL	I/O	To Host I2C Clock
A5	XOUT	Digital	Crystal Output
A6	XIN	Digital	Crystal Input Clock 12MHz
A7	GPIO2/M_I2C_SDA	I/O	GPIO or Master I2C Data line
A8	DGND	Ground	Digital Ground
A9	DVDD	Power	3.3V Digital Power
A10	DGND	Ground	Digital Ground
B1	GPIO0/TP_EN	I/O	GPIO or Enable Touch Function
B2	HV_EN	I/O	High Voltage Enable
B3	I2C_SDA	I/O	To Host I2C Data
B4	I2C_INT	I/O	To Host I2C INT
B5	RSTN	I/O	Reset
B6	SDA3_A	I/O	I2C Data Line
B7	SDA3_B	I/O	I2C Data Line
B8	GPIO7/UART_RTS	I/O	GPIO or UART RTS
B9	UART_TX	I/O	UART TX
B10	GPIO3/M_I2C_SCL	I/O	GPIO or Master I2C Clock line
C1	NSS_A	I/O	NSS
C2	NSS_B	I/O	NSS
C3	PENINT_A	I/O	GPIO
C4	PENINT_B	I/O	GPIO
C5	DGND	Ground	Digital Ground
C6	SDA2_A	I/O	I2C Data Line
C7	SDA2_B	I/O	I2C Data Line
C8	GPIO6/UART_CTS	I/O	GPIO or UART CTS
C9	UART_RX	I/O	UART RX
C10	GPIO1/M_I2C_INT0	I/O	GPIO or Master I2C INT0

Ball Map	Pin Name	Type	Description
D1	DVDD	Power	3.3V Digital Power
D2	DGND	Ground	Digital Ground
D3	GPIO4/M_I2C_INT1	I/O	GPIO or Master I2C INT1
D4	DVDD	Power	3.3V Digital Power
D5	DGND	Ground	Digital Ground
D6	SDA1_A	I/O	I2C Data Line
D7	SDA1_B	I/O	I2C Data Line
D8	GPIO5	I/O	GPIO
D9	P14_D	I/O	Debug Port
D10	P13_D	I/O	Debug Port
E1	V150	Power	1.5V LDO Output
E2	/LDO15_EN	I/O	Enable 1.5V LDO Output
E3	DVDD	Power	3.3V Digital Power
E4	DVDD	Power	3.3V Digital Power
E5	DGND	Ground	Digital Ground
E6	DGND	Ground	Digital Ground
E7	SDA0_A	I/O	I2C Data Line
E8	SDA0_B	I/O	I2C Data Line
E9	P15	I/O	GPIO
E10	USB_DP	I/O	USB D+
F1	RX0	Analog	Sense Signal
F2	RX1	Analog	Sense Signal
F3	RX2	Analog	Sense Signal
F4	RX3	Analog	Sense Signal
F5	AVDD	Power	Analog Power
F6	DVDD15	Power	1.5V Digital Power
F7	SCL_A	I/O	I2C Clock
F8	SCL_B	I/O	I2C Clock
F9	P015_D	I/O	Debug Port
F10	USB_DM	I/O	USB D-

Ball Map	Pin Name	Type	Description
G1	RX4	Analog	Sense Signal
G2	RX5	Analog	Sense Signal
G3	RX6	Analog	Sense Signal
G4	RX7	Analog	Sense Signal
G5	AVDD	Power	Analog Power
G6	DGND	Ground	Digital Ground
G7	RDY_B	I/O	GPIO
G8	RDY_A	I/O	GPIO
G9	P013_D	I/O	Debug Port
G10	P014_D	I/O	Debug Port
H1	RX8	Analog	Sense Signal
H2	RX9	Analog	Sense Signal
H3	RX10	Analog	Sense Signal
H4	AGND	Ground	Analog Ground
H5	AGND	Ground	Analog Ground
H6	XI	I/O	Reference Clock
H7	RXCLK	I/O	Reference Clock
H8	RSTN_A	I/O	Reset
H9	NTEST	I/O	For Test Only
H10	DVDD	Power	3.3V Digital Power
J1	RX11	Analog	Sense Signal
J2	RX12	Analog	Sense Signal
J3	RX13	Analog	Sense Signal
J4	AGND	Ground	Analog Ground
J5	D	Analog	Analog Reference Signal
J6	ATEST	I/O	For Test Only
J7	VSSH	Ground	Digital Ground
J8	RSTN_B	I/O	Reset
J9	DGND	Ground	Digital Ground
J10	DBUS	Analog	Analog Reference Signal

Ball Map	Pin Name	Type	Description
K1	RX14	Analog	Sense Signal
K2	RX15	Analog	Sense Signal
K3	RX16	Analog	Sense Signal
K4	AGND	Ground	Analog Ground
K5	PWMA	Analog	Analog Reference Signal
K6	VSSH	Ground	Digital Ground
K7	VDDH	Power	High Voltage Power
K8	VSSH	Ground	Digital Ground
K9	NC	-	No Connect
K10	NC	-	No Connect
L1	RX17	Analog	Sense Signal
L2	RX18	Analog	Sense Signal
L3	RX19	Analog	Sense Signal
L4	AGND	Ground	Analog Ground
L5	AOUT	Analog	Analog Reference Signal
L6	VSSH	Ground	Digital Ground
L7	TX24	Analog	Drive Signal
L8	TX25	Analog	Drive Signal
L9	NC	-	No Connect
L10	NC	-	No Connect
M1	RX20	Analog	Sense Signal
M2	RX21	Analog	Sense Signal
M3	RX22	Analog	Sense Signal
M4	AGND	Ground	Analog Ground
M5	SERIN	I/O	Reference Signal
M6	VSSH	Ground	Digital Ground
M7	TX20	Analog	Drive Signal
M8	TX21	Analog	Drive Signal
M9	TX22	Analog	Drive Signal
M10	TX23	Analog	Drive Signal

Ball Map	Pin Name	Type	Description
N1	RX23	Analog	Sense Signal
N2	RX24	Analog	Sense Signal
N3	RX25	Analog	Sense Signal
N4	RX26	Analog	Sense Signal
N5	AGND	Ground	Analog Ground
N6	VDDH	Power	High Voltage Power
N7	TX16	Analog	Drive Signal
N8	TX17	Analog	Drive Signal
N9	TX18	Analog	Drive Signal
N10	TX19	Analog	Drive Signal
P1	RX27	Analog	Sense Signal
P2	RX28	Analog	Sense Signal
P3	RX29	Analog	Sense Signal
P4	RX39	Analog	Sense Signal
P5	NC	-	No Connect
P6	VSSH	Ground	Digital Ground
P7	TX3	Analog	Drive Signal
P8	TX7	Analog	Drive Signal
P9	TX14	Analog	Drive Signal
P10	TX15	Analog	Drive Signal
R1	RX30	Analog	Sense Signal
R2	RX31	Analog	Sense Signal
R3	RX32	Analog	Sense Signal
R4	NC	-	No Connect
R5	NC	-	No Connect
R6	VSSH	Ground	Digital Ground
R7	TX2	Analog	Drive Signal
R8	TX6	Analog	Drive Signal
R9	TX12	Analog	Drive Signal
R10	TX13	Analog	Drive Signal

Ball Map	Pin Name	Type	Description
T1	RX33	Analog	Sense Signal
T2	RX34	Analog	Sense Signal
T3	RX37	Analog	Sense Signal
T4	NC	-	No Connect
T5	NC	-	No Connect
T6	VSSH	Ground	Digital Ground
T7	TX1	Analog	Drive Signal
T8	TX5	Analog	Drive Signal
T9	TX9	Analog	Drive Signal
T10	TX11	Analog	Drive Signal
U1	RX35	Analog	Sense Signal
U2	RX36	Analog	Sense Signal
U3	RX38	Analog	Sense Signal
U4	NC	-	No Connect
U5	DVDD15	Power	1.5V Digital Power
U6	DGND	Ground	Digital Ground
U7	TX0	Analog	Drive Signal
U8	TX4	Analog	Drive Signal
U9	TX8	Analog	Drive Signal
U10	TX10	Analog	Drive Signal

Table 3-1 Pin Map

4 Electrical Characteristics

VDD = 3.3V, TA = 25°C, all voltage are with respect to ground, unless otherwise noted.

Symbol	Parameter	Condition	Min	TYP	Max	Unit
DVDD	Digital Power	-	3.0	3.3	3.6	V
AVDD	Analog Power	-	3.0	3.3	3.6	V
Crystal Clock	Crystal Clock	-	-	12	-	MHz
VIH	Input high level voltage	-	0.8VDD	-	-	V
VIL	Input Low level	-	-	-	0.3VDD	V
VOH	Output high voltage	I = 2mA	VDD-0.4	-	-	V
VOL	Output low voltage	I = 2mA	-	-	0.4	V
VDDH	High Voltage Power	-	-	-	26	V
DVDD15	1.5V Power	-	1.4	1.5	1.7	V

Table 4-1 DC Electrical Characteristics

Symbol	Parameter	Min	Max	Unit
VDD-GND	Maximum Power Supply Voltage	-0.3	3.6	V
Vin	Input I/O Pin Voltage	GND-0.3	4	V
IVDD	Total current at power	-	200	mA
IGND	Total current at Gnd	-	200	mA
Vesd	Electrostatics Discharge Voltage(HBM) ⁽¹⁾	2000	-	V
DVDD15	Maximum 1.5V Power	-	1.8	V

Table 4-2 Maximum Rating

(1) This test conforms to the MIL-STD-883J/Method 3015.9.

Symbol	Parameter	Conditions	Min ⁽¹⁾	Unit
N _{END}	Endurance	TA=-40 to +85°C	10k	Cycles

Table 4-3 Flash memory endurance

(1) Guaranteed by characterization, not tested in production.

Each I/O has two protection diodes as shown in Figure 4-1. These diode used for ESD protection and to clamp input voltage to a save level to prevent internal logic circuit damage.

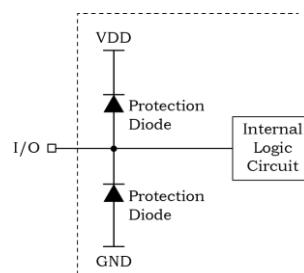


Figure 4-1 Protection Diode Scheme

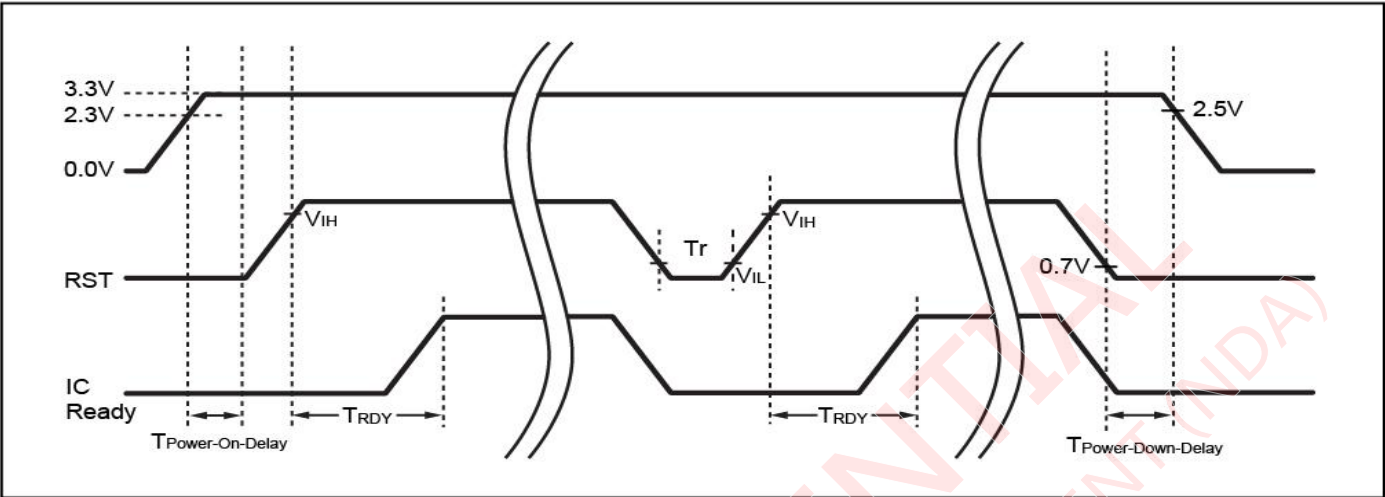


Figure 4-2 Power On Sequence Diagram

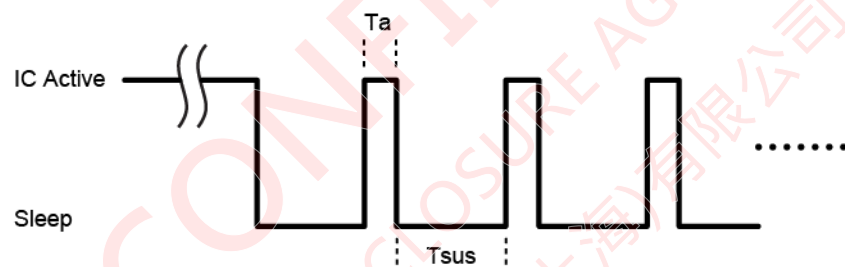


Figure 4-3 Idle Sequence Diagram

Symbol	Parameter	Condition	Min	TYP	Max	Unit
Tr	Host pull low period	-	1	-	-	ms
T _{RDY}	IC ready to communication	-	-	65	-	ms
Ta	IC active period	-	-	5	-	ms
Tsus	IC suspend period	-	-	10	-	ms
T _{Power-On-Delay}	Power-on delay	-	100	-	-	us
T _{Power-Down-Delay}	Power-down delay	-	0	-	-	ms
V _{IL}	RST input low Voltage	-	-	-	0.3VDD	V
V _{IH}	RST input high Voltage	-	0.8VDD	-	-	V

Table 4-4 AC Electrical Characteristics

- NOTE :
- If host needs to control RST pin or connect any GPIO pins, please make sure Host’s GPIO is configured to open-drain mode and pull-up(3.3V) resistor should be at touch IC side.
- NOTE :
- If host needs to reset EXC80H32, drive low voltage, after ‘Tr’ time, please pull high again.
- NOTE :
- Incorrect power sequence may cause IC damage.

5 Package Information

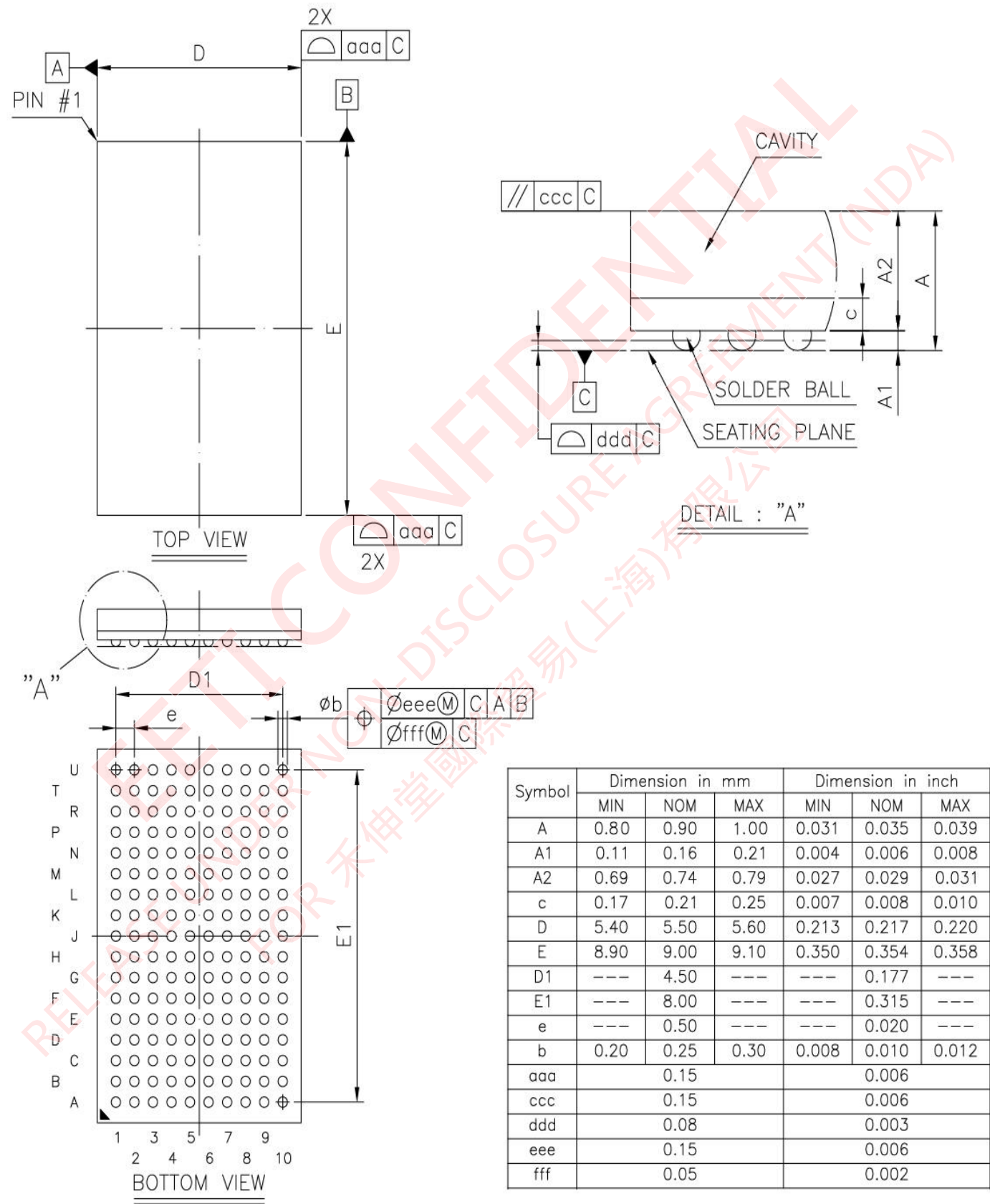


Figure 5-1 EXC80H32 BGA

6 General Reflow Profiles(For Reference)

A PCBA reflow profile depends on the thermal mass of the entire populated board.

The actual temperature used in the reflow oven is a function of:

- Solder paste types
- Board density
- Component location
- Component mass
- Board finish

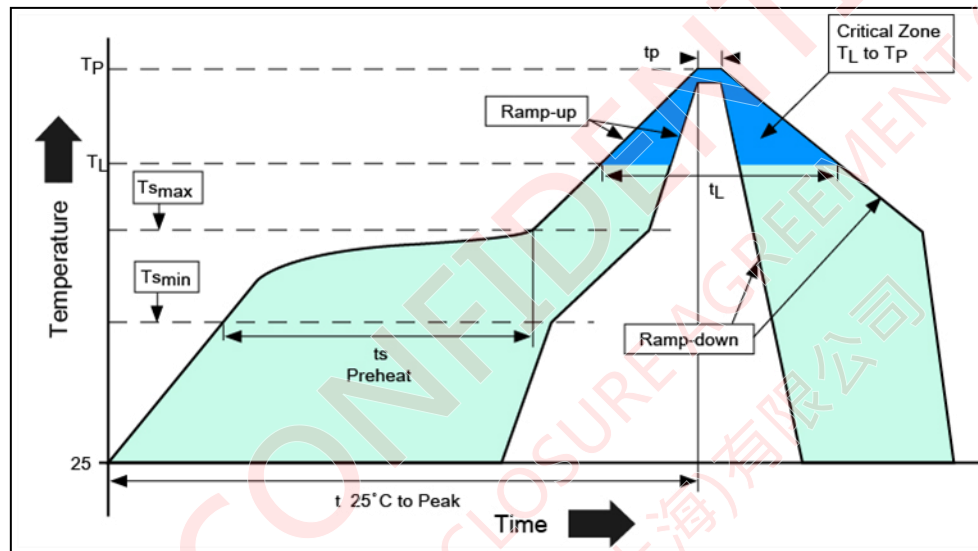


Figure 6-1 Diagram

Profile Feature	Pb-Free Assembly
Average ramp-up rate (T _{smax} to T _p)	1.5°C/second max
Preheat -Temperature Min (T _{smin}) -Temperature Max (T _{smax}) -Time (min to max) (ts)	150°C 200°C 60~180 seconds
Time maintained above: -Temperature (T _L) -Time (t _L)	217°C 60-150 seconds
Peak Temperature (T _p)	245±5°C
Time within 5°C of actual Peak Temperature (t _p)	30 seconds max
Ramp-down Rate	3°C/second max
Time 25°C to Peak Temperature	8 minutes max

Table 6-1 Description

Note:

1. All temperatures refer to topside of the package, measured on the package body surface.
2. Actual board assembly depends on other parts on board density and follow solder paste manufacturer's guideline.

7 Order Information

ETP-CP-EXC80H32	-	F	G	3	1
CP = Chip EX = Slave ASIC EXC = MCU	-	Tracking Code 1	Green Part	0 = LQFP 1 = QFN 2= TSSOP 3 = BGA 4 = TQFP	Tracking Code 2

Table 7-1 Description

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