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Document ID: ESS-102-220630-1

EXC81W60

Projected Capacitive Touchscreen Controller Chip



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Introduction

EXC81W60 is a MCU based projected capacitive touch screen controller designed for commercial and industrial application.

EXC81W60 controller supports high voltage driving signal to achieve high SNR and better wideband interference susceptibility.

EXC81W60 needs an external DC/DC booster chip to generate high voltage.

EXC81W60 provides different working frequencies to avoid narrow band interference. With high voltage driving and different working frequencies, EXC81W60 provides an excellent interference susceptibility performance. With eGalaxTouch software package, EXC81W60 supports different touch sensor structures - OGS, SITO, DITO, G/F, G/F/F and G/G structure. With high SNR, EXC81W60 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 • 128KB SRAM + 1KB USB FIFO
ESD	• 2000V(HBM)
Analog Modules	• Up to 66 RX channels • Up to 44 TX channels - TX + RX must $\leq$ 104 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, Voltage Level:3.3V
Digital Modules	• Timers, watch dog Timer • Multi-touch algorithm engine • Hardware algorithm accelerator • Hardware scan engine
Active Pen	• 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 8mm x 13.5mm x 1mm • Ball Pitch : 0.65mm • Ball Count : 220

Table 1-1 Features

2 Block Diagram

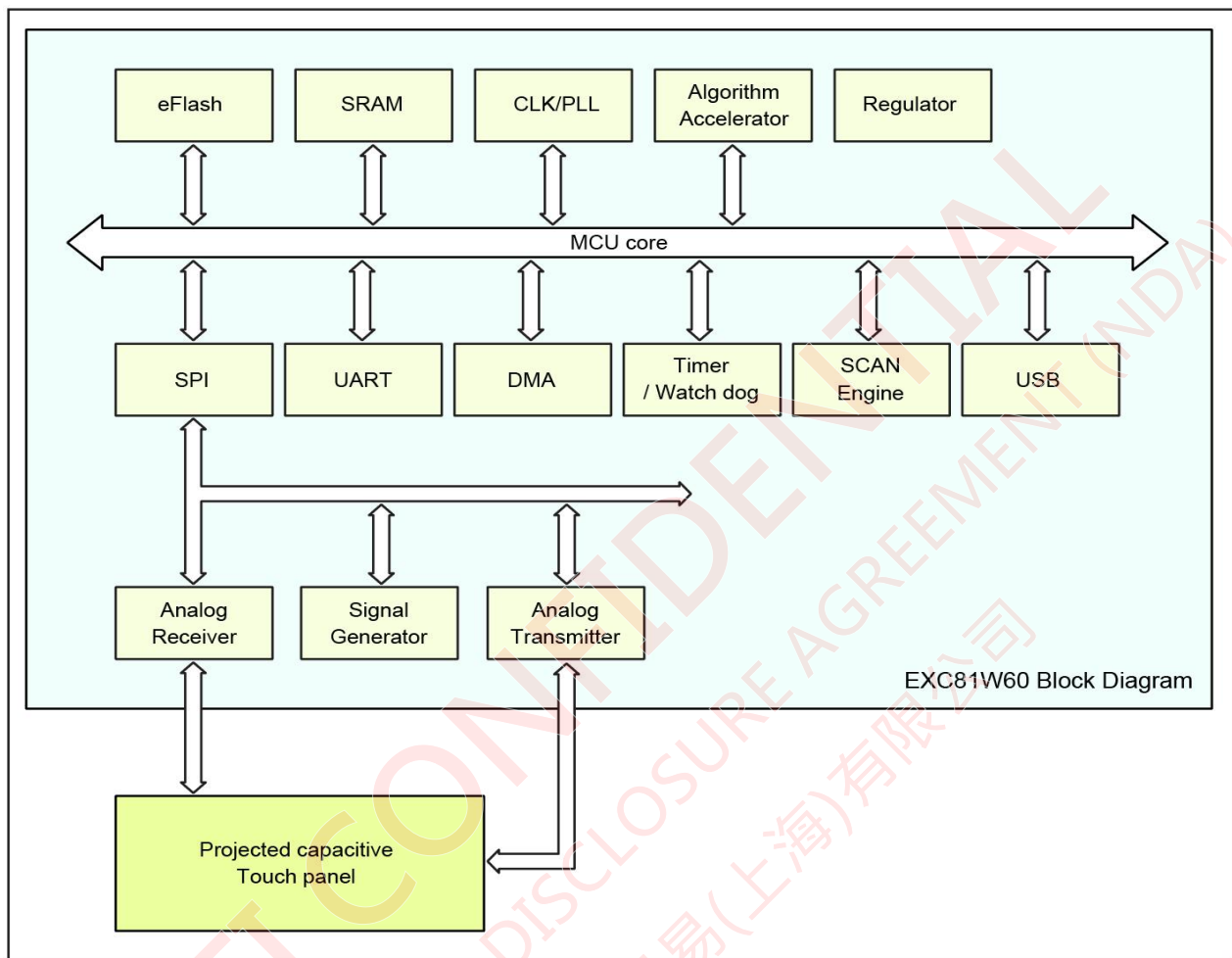


Figure 2-1 Block Diagram

3 Pinout Configuration



Figure 3-1 Top View EXC81W60

	1	2	3	4	5	6	7	8	9	10	11	
A	P05/GPIO0/TP_EN	VCAP	HV_ADIN	DVDD	RSTN	XOUT	XIN	DGND	DVDD	P07/GPIO1/M_I2C_SDA	P15	A
B	AGND	AGND	AGND	DGND	I2C_SDA	I2C_SCL	SDA3	P36/GPIO6/UART_RX	P18/GPIO2/M_I2C_SCL	P14_D	USB_DP	B
C	RX0	RX1	RX2	RX3	AGND	I2C_INT	SDA2	P35/GPIO5/UART_TX	P34/GPIO4/UART_RTS/M_I2C_INT1	P13_D	USB_DM	C
D	RX4	RX5	RX6	RX7	AGND	SCL	SDA1	RSTN_A	P33/GPIO3/UART_CTS/M_I2C_INT0	P015_D	P014_D	D
E	RX8	RX9	RX10	RX11	AGND	HV_EN	SDA0	RSTN_B	NTEST	P013_D	DVDD	E
F	RX12	RX13	RX14	RX15	DGND	DVDD15	NSS	VSSH	DBUS	B	DGND	F
G	RX16	RX17	RX18	RX19	AGND	PENINT	RXCLK	VSSH	NC	NC	NC	G
H	RX20	RX21	RX22	RX23	DGND	DVDD	VSSH	TX41	TX42	TX43	NC	H
J	RX24	RX25	RX26	RX27	AVDD	RDY	VSSH	TX37	TX38	TX39	TX40	J
K	RX28	RX29	RX30	RX31	AVDD	AGND	VDDH	TX33	TX34	TX35	TX36	K
L	RX32	RX33	RX34	RX35	AGND	ATEST	VSSH	TX29	TX30	TX31	TX32	L
M	RX36	RX37	RX38	RX39	AGND	SERIN	VSSH	TX25	TX26	TX27	TX28	M
N	RX40	RX41	RX42	RX43	AGND	AOUT	VSSH	TX21	TX22	TX23	TX24	N
P	RX44	RX45	RX46	RX47	AGND	PWMA	VSSH	TX17	TX18	TX19	TX20	P
R	RX48	RX49	RX50	RX51	AGND	D	VSSH	TX13	TX14	TX15	TX16	R
T	RX52	RX53	RX54	RX55	AVDD	AGND	VSSH	VSSH	TX10	TX11	TX12	T
U	RX56	RX57	RX58	RX59	NC	NC	NC	VSSH	TX7	TX8	TX9	U
V	RX60	RX61	RX62	RX63	NC	NC	NC	VSSH	TX4	TX5	TX6	V
W	RX64	RX65	NC	NC	NC	NC	NC	DGND	TX1	TX2	TX3	W
Y	NC	NC	NC	NC	NC	NC	NC	DVDD15	VSSH	VDDH	TX0	Y

Figure 3-2 TOP View EXC81W60 TFBGA Ball Pins

Ball Map	Pin Name	Type	Description
A1	P05/GPIO0/TP_EN	I/O	GPIO or Enable Touch Function
A2	VCAP	Power	Digital Power
A3	HV_ADIN	I/O	GPIO
A4	DVDD	Power	Digital Power
A5	RSTN	I/O	Reset
A6	XOUT	Digital	Crystal Output
A7	XIN	Digital	Crystal Input Clock 12MHz
A8	DGND	Ground	Digital Ground
A9	DVDD	Power	Digital Power
A10	P07/GPIO1/M_I2C_SDA	I/O	GPIO or Master I2C SDA
A11	P15	I/O	GPIO
B1	AGND	Ground	Analog Ground
B2	AGND	Ground	Analog Ground
B3	AGND	Ground	Analog Ground
B4	DGND	Ground	Digital Ground
B5	I2C_SDA	I/O	To Host I2C Data
B6	I2C_SCL	I/O	To Host I2C Clock
B7	SDA3	I/O	I2C Data Line
B8	P36/GPIO6/UART_RX	I/O	GPIO or UART RX
B9	P18/GPIO2/M_I2C_SCL	I/O	GPIO or Master I2C SCL
B10	P14_D	I/O	Debug Port
B11	USB_DP	I/O	USB D+
C1	RX0	Analog	Sense Signal
C2	RX1	Analog	Sense Signal
C3	RX2	Analog	Sense Signal
C4	RX3	Analog	Sense Signal
C5	AGND	Ground	Analog Ground
C6	I2C_INT	I/O	To Host I2C INT
C7	SDA2	I/O	I2C Data Line
C8	P35/GPIO5/UART_TX	I/O	GPIO or UART TX
C9	P34/GPIO4/UART_RTS/M_I2C_INT1	I/O	GPIO or UART RTS or Master I2C INT1
C10	P13_D	I/O	Debug Port
C11	USB_DM	I/O	USB D-

Ball Map	Pin Name	Type	Description
D1	RX4	Analog	Sense Signal
D2	RX5	Analog	Sense Signal
D3	RX6	Analog	Sense Signal
D4	RX7	Analog	Sense Signal
D5	AGND	Ground	Analog Ground
D6	SCL	I/O	I2C Clock Line
D7	SDA1	I/O	I2C Data Line
D8	RSTN_A	I/O	Reset
D9	P33/GPIO3/UART_CTS/M_I2C_INT0	I/O	GPIO or UART CTS or Master I2C INT0
D10	P015_D	I/O	Debug Port
D11	P014_D	I/O	Debug Port
E1	RX8	Analog	Sense Signal
E2	RX9	Analog	Sense Signal
E3	RX10	Analog	Sense Signal
E4	RX11	Analog	Sense Signal
E5	AGND	Ground	Analog Ground
E6	HV_EN	I/O	High Voltage Enable
E7	SDA0	I/O	I2C Data Line
E8	RSTN_B	I/O	Reset
E9	NTEST	I/O	For Test Only
E10	P013_D	I/O	Debug Port
E11	DVDD	Power	Digital Power
F1	RX12	Analog	Sense Signal
F2	RX13	Analog	Sense Signal
F3	RX14	Analog	Sense Signal
F4	RX15	Analog	Sense Signal
F5	DGND	Ground	Digital Ground
F6	DVDD15	Power	1.5V Digital Power
F7	NSS	I/O	NSS
F8	VSSH	Ground	Digital Ground
F9	DBUS	Analog	Analog Reference Signal
F10	B	Analog	Analog Reference Signal
F11	DGND	Ground	Digital Ground

Ball Map	Pin Name	Type	Description
G1	RX16	Analog	Sense Signal
G2	RX17	Analog	Sense Signal
G3	RX18	Analog	Sense Signal
G4	RX19	Analog	Sense Signal
G5	AGND	Ground	Analog Ground
G6	PENINT	I/O	GPIO
G7	RXCLK	I/O	Reference Clock
G8	VSSH	Ground	Digital Ground
G9	NC	-	No Connect
G10	NC	-	No Connect
G11	NC	-	No Connect
H1	RX20	Analog	Sense Signal
H2	RX21	Analog	Sense Signal
H3	RX22	Analog	Sense Signal
H4	RX23	Analog	Sense Signal
H5	DGND	Ground	Digital Ground
H6	DVDD	Power	Digital Power
H7	VSSH	Ground	Digital Ground
H8	TX41	Analog	Drive Signal
H9	TX42	Analog	Drive Signal
H10	TX43	Analog	Drive Signal
H11	NC	-	No Connect
J1	RX24	Analog	Sense Signal
J2	RX25	Analog	Sense Signal
J3	RX26	Analog	Sense Signal
J4	RX27	Analog	Sense Signal
J5	AVDD	Power	Analog Power
J6	RDY	I/O	GPIO
J7	VSSH	Ground	Digital Ground
J8	TX37	Analog	Drive Signal
J9	TX38	Analog	Drive Signal
J10	TX39	Analog	Drive Signal
J11	TX40	Analog	Drive Signal

Ball Map	Pin Name	Type	Description
K1	RX28	Analog	Sense Signal
K2	RX29	Analog	Sense Signal
K3	RX30	Analog	Sense Signal
K4	RX31	Analog	Sense Signal
K5	AVDD	Power	Analog Power
K6	AGND	Ground	Analog Ground
K7	VDDH	Power	High Voltage Power
K8	TX33	Analog	Drive Signal
K9	TX34	Analog	Drive Signal
K10	TX35	Analog	Drive Signal
K11	TX36	Analog	Drive Signal
L1	RX32	Analog	Sense Signal
L2	RX33	Analog	Sense Signal
L3	RX34	Analog	Sense Signal
L4	RX35	Analog	Sense Signal
L5	AGND	Ground	Analog Ground
L6	ATEST	I/O	For Test Only
L7	VSSH	Ground	Digital Ground
L8	TX29	Analog	Drive Signal
L9	TX30	Analog	Drive Signal
L10	TX31	Analog	Drive Signal
L11	TX32	Analog	Drive Signal
M1	RX36	Analog	Sense Signal
M2	RX37	Analog	Sense Signal
M3	RX38	Analog	Sense Signal
M4	RX39	Analog	Sense Signal
M5	AGND	Ground	Analog Ground
M6	SERIN	I/O	Reference Signal
M7	VSSH	Ground	Digital Ground
M8	TX25	Analog	Drive Signal
M9	TX26	Analog	Drive Signal
M10	TX27	Analog	Drive Signal
M11	TX28	Analog	Drive Signal

Ball Map	Pin Name	Type	Description
N1	RX40	Analog	Sense Signal
N2	RX41	Analog	Sense Signal
N3	RX42	Analog	Sense Signal
N4	RX43	Analog	Sense Signal
N5	AGND	Ground	Analog Ground
N6	AOUT	Analog	Analog Reference Signal
N7	VSSH	Ground	Digital Ground
N8	TX21	Analog	Drive Signal
N9	TX22	Analog	Drive Signal
N10	TX23	Analog	Drive Signal
N11	TX24	Analog	Drive Signal
P1	RX44	Analog	Sense Signal
P2	RX45	Analog	Sense Signal
P3	RX46	Analog	Sense Signal
P4	RX47	Analog	Sense Signal
P5	AGND	Ground	Analog Ground
P6	PWMA	Analog	Analog Reference Signal
P7	VSSH	Ground	Digital Ground
P8	TX17	Analog	Drive Signal
P9	TX18	Analog	Drive Signal
P10	TX19	Analog	Drive Signal
P11	TX20	Analog	Drive Signal
R1	RX48	Analog	Sense Signal
R2	RX49	Analog	Sense Signal
R3	RX50	Analog	Sense Signal
R4	RX51	Analog	Sense Signal
R5	AGND	Ground	Analog Ground
R6	D	Analog	Analog Reference Signal
R7	VSSH	Ground	Digital Ground
R8	TX13	Analog	Drive Signal
R9	TX14	Analog	Drive Signal
R10	TX15	Analog	Drive Signal
R11	TX16	Analog	Drive Signal

Ball Map	Pin Name	Type	Description
T1	RX52	Analog	Sense Signal
T2	RX53	Analog	Sense Signal
T3	RX54	Analog	Sense Signal
T4	RX55	Analog	Sense Signal
T5	AVDD	Power	Analog Power
T6	AGND	Ground	Analog Ground
T7	VSSH	Ground	Digital Ground
T8	VSSH	Ground	Digital Ground
T9	TX10	Analog	Drive Signal
T10	TX11	Analog	Drive Signal
T11	TX12	Analog	Drive Signal
U1	RX56	Analog	Sense Signal
U2	RX57	Analog	Sense Signal
U3	RX58	Analog	Sense Signal
U4	RX59	Analog	Sense Signal
U5	NC	-	No Connect
U6	NC	-	No Connect
U7	NC	-	No Connect
U8	VSSH	Ground	Digital Ground
U9	TX7	Analog	Drive Signal
U10	TX8	Analog	Drive Signal
U11	TX9	Analog	Drive Signal
V1	RX60	Analog	Sense Signal
V2	RX61	Analog	Sense Signal
V3	RX62	Analog	Sense Signal
V4	RX63	Analog	Sense Signal
V5	NC	-	No Connect
V6	NC	-	No Connect
V7	NC	-	No Connect
V8	VSSH	Ground	Digital Ground
V9	TX4	Analog	Drive Signal
V10	TX5	Analog	Drive Signal
V11	TX6	Analog	Drive Signal

Ball Map	Pin Name	Type	Description
W1	RX64	Analog	Sense Signal
W2	RX65	Analog	Sense Signal
W3	NC	-	No Connect
W4	NC	-	No Connect
W5	NC	-	No Connect
W6	NC	-	No Connect
W7	NC	-	No Connect
W8	DGND	Ground	Digital Ground
W9	TX1	Analog	Drive Signal
W10	TX2	Analog	Drive Signal
W11	TX3	Analog	Drive Signal
Y1	NC	-	No Connect
Y2	NC	-	No Connect
Y3	NC	-	No Connect
Y4	NC	-	No Connect
Y5	NC	-	No Connect
Y6	NC	-	No Connect
Y7	NC	-	No Connect
Y8	DVDD15	Power	1.5V Digital Power
Y9	VSSH	Ground	Digital Ground
Y10	VDDH	Power	High Voltage Power
Y11	TX0	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
VDD-GND	Supply 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	-	-	-	32	V
DVDD15	1.5V Power		1.425	1.5	1.575	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 3015.8.

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.

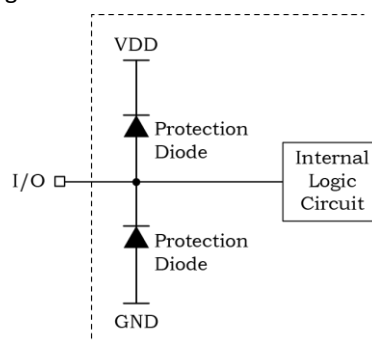


Figure 4-1 Protection Diode Scheme

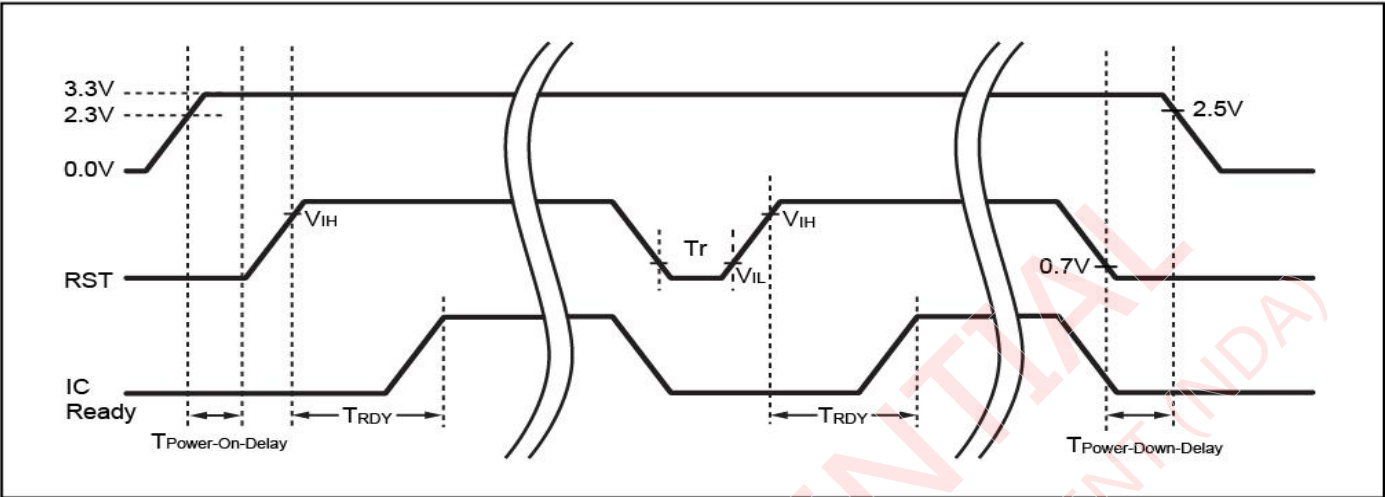


Figure 4-2 Power On Sequence Diagram

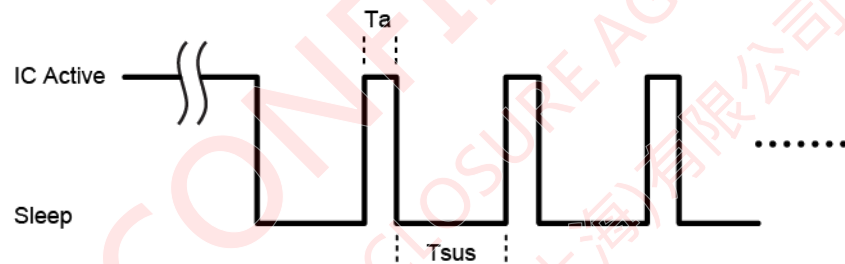


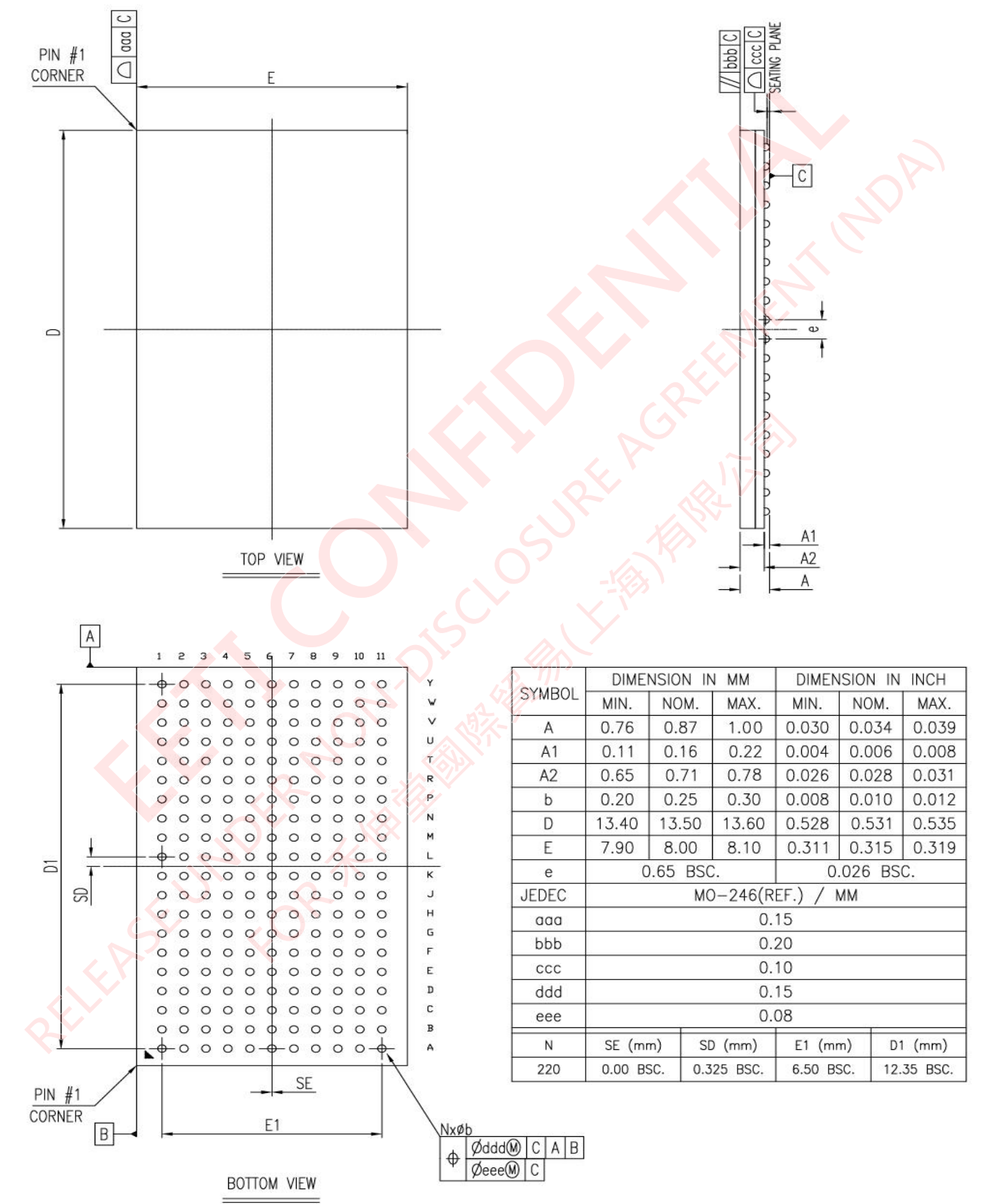
Figure 4-3 Idle Sequence Diagram

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 EXC81W60, drive low voltage, after ‘Tr’ time, please pull high again.
- NOTE :
- Incorrect power sequence may cause IC damage.

5 Package Information



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

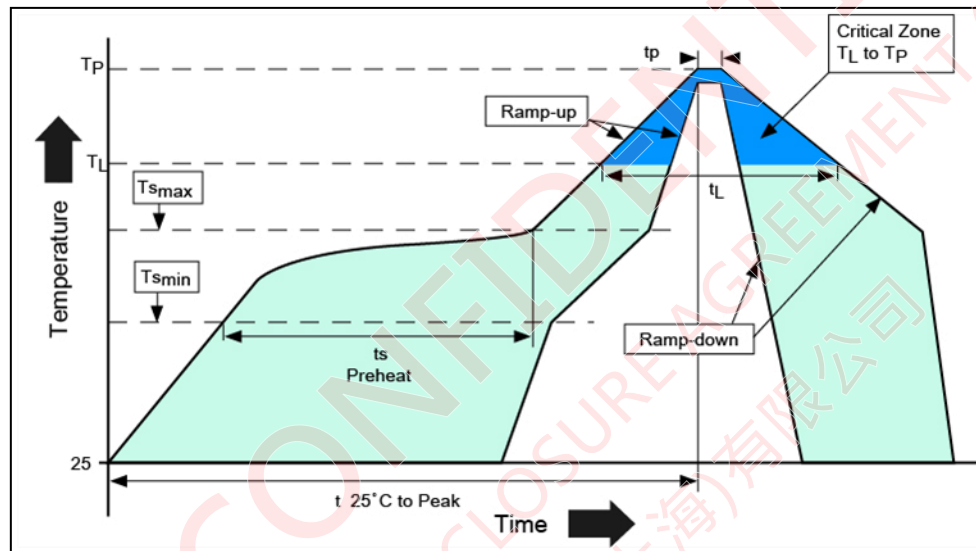


Figure 6-1 Diagram

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 (TL) -Time (tL)	217°C 60-150 seconds
Peak Temperature (T _p)	245±5°C
Time within 5°C of actual Peak Temperature (tp)	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-EXC81W60	-	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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