
eKTH5512C

**Capacitive Touchpad
Controller**

**Product
Specification**

Doc. V0.1


**ELAN MICROELECTRONICS CORP.
AUG 2017**



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ELAN MICROELECTRONICS CORPORATION

Headquarters:

No. 12, Innovation Road 1
Hsinchu Science Park
Hsinchu, TAIWAN 308
Tel: +886 3 563-9977
Fax: +886 3 563-9966
webmaster@emc.com.tw
<http://www.emc.com.tw>

Hong Kong:

Elan (HK) Microelectronics Corporation, Ltd.
Flat A, 19F., World Tech Centre
95 How Ming Street, Kwun Tong
Kowloon, HONG KONG
Tel: +852 2723-3376
Fax: +852 2723-7780

USA:

Elan Information Technology Group (U.S.A.)
PO Box 601
Cupertino, CA 95015
U.S.A.
Tel: +1 408 366-8225
Fax: +1 408 366-8225

Shenzhen:

Elan Microelectronics Shenzhen, Ltd.
8A floor, Microprofit Building, 6
Gaoxin Road, Shenzhen Hi-tech
Industrial Park, Nanshan, (South
Area), Shenzhen
CHINA 518057
Tel: +86 755 2601-0565
Fax: +86 755 2601-0500
elan-sz@elanic.com.cn

Shanghai:

Elan Microelectronics Shanghai, Ltd.
6F, Ke Yuan Building NO. 5
Bibo Road, Zhangjiang Hi-Tech
Park,
Shanghai, China 201203
Tel : 86-21-50803866
Fax : 86-21-50800273
elan-sh@elanic.com.cn



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Specification Revision History

Doc. Version	Revision Description	Date
V0.1	Initial Release	2017/08/09

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2 General Description

The eKTH5512C is a single-chip capacitive touch panel controller with high resolution ADC and powerful DSP. With mighty computing power, the controller can take care of lots of touch panel algorithm, even the multi-finger identification or gesture reorganization. It adopts mutual capacitance approaches which support true multi-touch capability. It provides high voltage (up to 11V) driving signals for a touch sensor. With the high voltage, it provides excellent noise immunity.

The EKTH5512C provides several packages with different TX and RX traces as below.

Part Number	Package	Size (mm)	TX	RX	USB	I2C
EKTH5512CSU	BGA132	5x10x0.8	36	56	Yes	Yes

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3 Features

- Mutual Capacitive Sensing Techniques
- Up to 10-finger detection and simultaneous tracking
- Support pen frequency range: 15 KHz ~ 200 KHz
- Support high pen voltage: 25V
- Windows 10 pen compliant
- Up to 100 Hz report rate
- Sensor size up to 12 inch diagonal supported at 5mm electrode pitch (EKTH5512CSU)

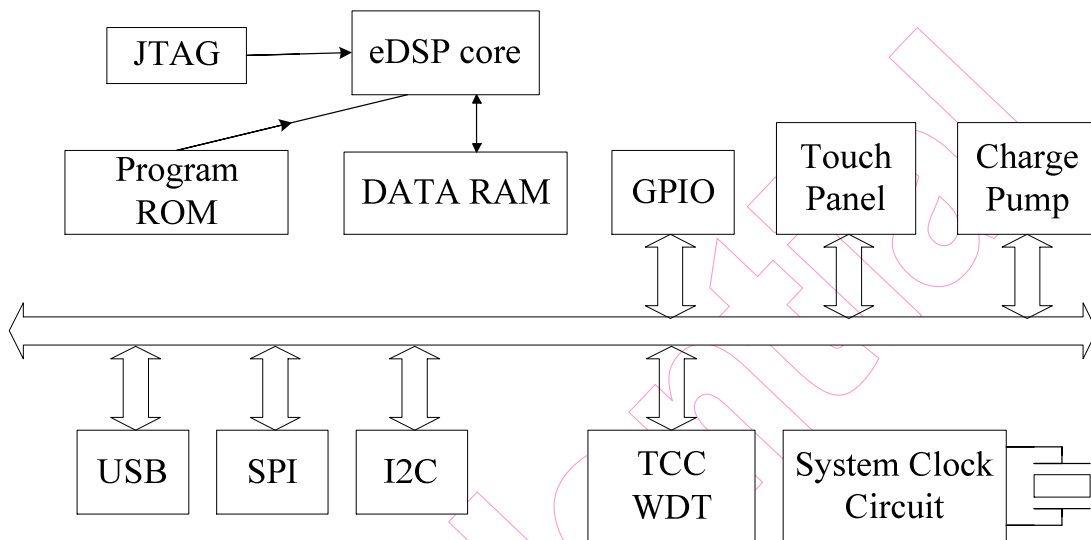
Low power and wide voltage operation:

- 3.0V to 3.6V supply voltage (Ripple < 100mV)
- 1.8V to 3.6V host interface voltage
- 1.8V chip core for low power operation

- Response time to touch less than 40ms
- Self-calibrating - no host side calibration needed
- USB (USB 2.0 Full Speed) with LPM (Link Power Management), I2C (100/400 kHz) or SPI (3M Max) interface options
- In-system reprogramming supported
- Flash data retention 10 years; flash endurance 1K cycles
- RoHS compliant
- Halogen Free
- Noise suppression including hardware filtering for AC charger noise mitigation
- 3 Operating Modes
 - Normal
 - Idle
 - Sleep
- High voltage (up to 11V) driving signals for a touch sensor
- Operating Temperature Range: -40°C to +85°C

4 Block Diagram

As shown in the block diagram below and as per our general description, the eKTH5512C uses a modified Harvard architecture in such a way that the memory is organized into two separate fields, namely, Program ROM and Data RAM. As the memories are separate, the central processing unit can read/write data at the same time.



5 Pin Description

Name	Type	Description
AGND	Power	Analog ground.
AVCC30	Power	3.0V Regulator output.
VCC33	Power	3.3V power supply.
VCC18	Power	1.8V regulator output for digital kernel. The trace of the connected capacitor should be less than 10mm.
DGND	Power	Digital ground.
VCCIO	Power	Power supply for IO pad.
RESETB	I	Global reset input. Low active.
PA7	I/O	General Purpose IO.
PA6	I/O	General Purpose IO.
PA3/PA14	I/O	General Purpose IO.
PA2/PA13	I/O	General Purpose IO.
PA1/PA12	I/O	General Purpose IO.
PA0/PA11	I/O	General Purpose IO.
PA5	I/O	General Purpose IO.
PA4	I/O	General Purpose IO.
PB0	I/O	General Purpose IO.
PA9	I/O	General Purpose IO.
PA10	I/O	General Purpose IO.
PB5	I/O	General Purpose IO.
PB4	I/O	General Purpose IO.
UD_DP	AIO	USB Interface
UD_DM	AIO	USB Interface
XOUT	AO	12M XTAL output for USB (The frequency tolerance is ± 50 ppm)
XIN	AI	12M XTAL Input for USB (The frequency tolerance is ± 50 ppm)
PA15	I/O	General Purpose IO.
PA8	I/O	General Purpose IO.
C2N	Power	Cathode of charge pump capacitor.
C2P	Power	Anode of charge pump capacitor.
C1P	Power	Anode of charge pump capacitor.
C1N	Power	Cathode of charge pump capacitor.

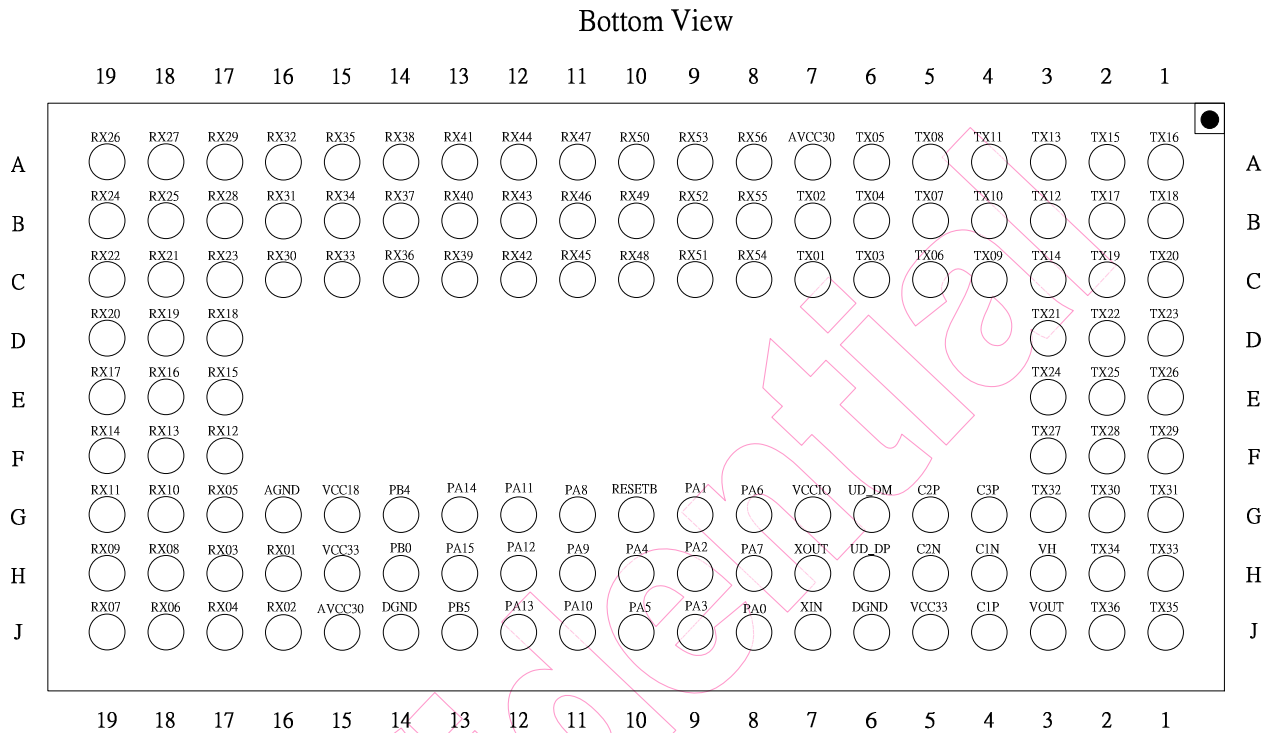


C3P	Power	Anode of charge pump capacitor.
VOUT	Power	Charge pump output voltage.
VH	Power	High Voltage regulator output for Driving traces.
TX[36:01]	AO	Touch panel driving traces. (EKTH5512CAY)
RX[56:01]	AI	Touch panel sensing traces. (EKTH5512CAY)

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6 Pinout

6.1 EKTH5512CAY BGA132 Pinout



7 Absolute Maximum Ratings

Parameter	Applicable Pins	Symbol	Condition	Rating	Unit
Voltage from VCC33 to DGND and AGND	–	–	–	-0.5 ~ +4.0	V
Voltage from any pin to DGND and AGND	–	–	–	-0.5 ~ +4.0	
Operating Temperature Range	–	T _A	–	-40 to +85	°C
Storage Temperature Range	–	T _{STR}	–	-65 to +125	

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8 Electrical Characteristics

DC Electrical Characteristics

VCCIO: 1.8V~3.6V ; VCC33: 3.0V~3.6V

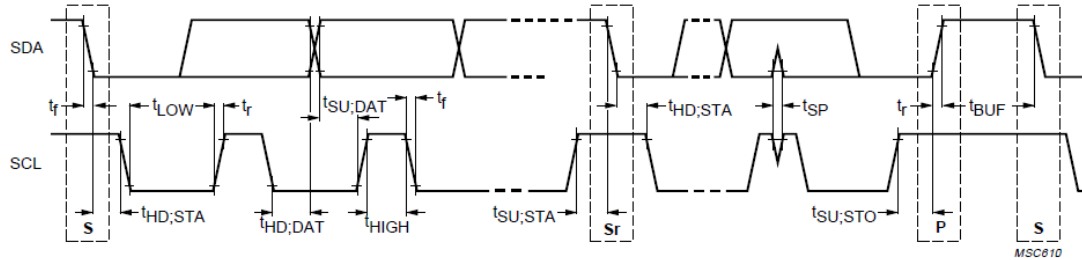
Parameter	Pins	Symbol	Condition	Rated Value			Unit
				Min.	Typ.	Max.	
Power supply voltage	Power	VCC33	—	3.0	3.3	3.6	V
	Power	VCCIO	—	1.8	3.3	3.6	
Input voltage	—	V _{IH}	—	VCCIO×0.7	—	VCCIO	V
	—	V _{IL}	—	0	—	VCCIO×0.3	
Pull-up resistor	I/O pins	R _{PU}	—	—	66	—	kΩ
Pull-down resistor	I/O pins	R _{PD}	—	—	15	—	
Output drive current	I/O pins	I _{OH}	VCCIO=3.3V VOH=2.4V	8 or 3.5 *Note 1	14 or 5.5 *Note 1	—	mA
Output drive current	I/O pins	I _{OL}	VCCIO =3.3V VOL=0.4V	5.5 or 2.5 *Note 1	11 or 4 *Note 1	—	
Output drive current	I/O pins	I _{OH}	VCCIO=1.8V VOH=1.5V	2 or 0.8 *Note 1	3 or 1 *Note 1	—	
Output drive current	I/O pins	I _{OL}	VCCIO =1.8V VOL=0.4V	4.5 or 2 *Note 1	7 or 2.5 *Note 1	—	
Normal mode (Pen Enabled) Current consumption @ Report rate 100Hz	Power	I _{NORMAL}	VCC33=3.3V	—	45 *Note 3	75	mA
Normal mode (Pen Disabled) Current consumption @ Report rate 100Hz	Power	I _{NORMAL}	VCC33=3.3V	—	60	75	mA
Idle mode (Pen Enabled) Current consumption	Power	I _{IDLE}	VCC33=3.3V	—	20	25	mA
Idle mode (Pen Disabled) Current consumption	Power	I _{IDLE}	VCC33=3.3V	—	15	20	mA
Sleep mode Current consumption *Note 2	Power	I _{SLEEP}	VCC33=3.3V	—	0.85	1	mA

Note 1: There are two drive/sink currents selectable through register setting.

Note 2: There is no Sleep mode when the interface is USB.

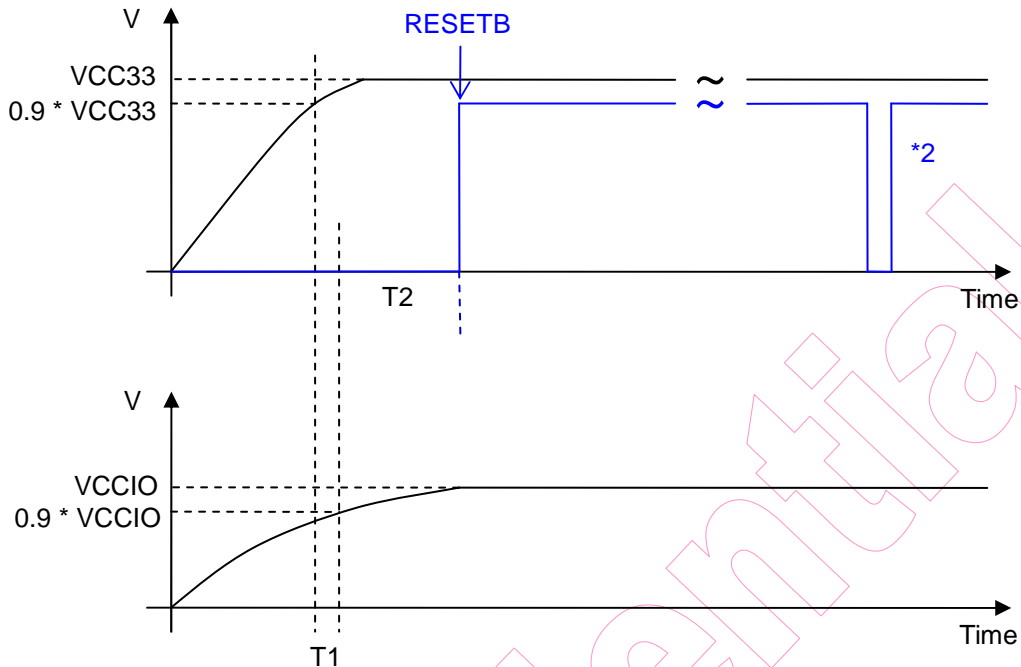
Note 3: "Pen Enabled" indicates the touch panel supports pen and finger. If user is using Pen, the power consumption is 30mA, otherwise, the power consumption is 60mA. We take the average, so the value is 45mA. The pen's and finger's scanning methods cause the difference of their power consumption. "Pen Disabled" indicates the touch panel supports only finger.

I2C AC Electrical Characteristics



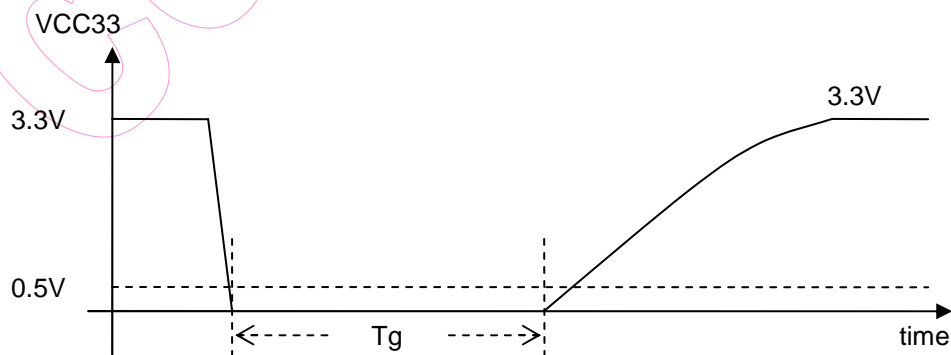
PARAMETER	SYMBOL	STANDARD MODE		FAST MODE		UNIT
		MIN	MAX	MIN	MAX	
SCL clock frequency	f_{SCL}	0	100	0	400	kHz
Hold time (repeated) START condition. After this period, the first clock pulse is generated	$t_{HD,STA}$	4.0	-	0.6	-	μs
LOW period of the SCL clock	t_{LOW}	4.7	-	1.3	-	μs
HIGH period of the SCL clock	t_{HIGH}	4.0	-	0.6	-	μs
Set-up time for a repeated START condition	$t_{SU,STA}$	4.7	-	0.6	-	μs
Data hold time:	$t_{HD,DAT}$	100	-	100	-	ns
Data set-up time	$t_{SU,DAT}$	250	-	100	-	ns
Rise time of both SDA and SCL signals	t_f	-	1000	20	300	ns
Fall time of both SDA and SCL signals	t_f	-	300	20	300	ns
Set-up time for STOP condition	$t_{SU,STO}$	4.0	-	0.6	-	μs
Bus free time between a STOP and START condition	t_{BUF}	4.7	-	1.3	-	μs
Capacitive load for each bus line	C_b	-	400	-	400	pF
Noise margin at the LOW level for each connected device (including hysteresis)	V_{nL}	$0.1V_{DD}$	-	$0.1V_{DD}$	-	V
Noise margin at the HIGH level for each connected device (including hysteresis)	V_{nH}	$0.2V_{DD}$	-	$0.2V_{DD}$	-	V

9 Power-on Sequence



- * 1. T1 must be ≥ 0 sec. T1: the time difference between $0.9V_{CC33}$ and $0.9V_{CCIO}$.
T2 must be ≥ 1 msec. T2: the time difference between $0.9V_{CCIO}$ and RESETB.
- * 2. In case a user wants to reset the controller without powering off, pull low the RESETB for more than two system clocks. It should be ≥ 500 usec.
- * 3. The touch panel scanning frequency is 80K~250KHz, so the power supply should NOT have noises in this frequency range.

9.1 VCC33 Power Off and then Power On Sequence

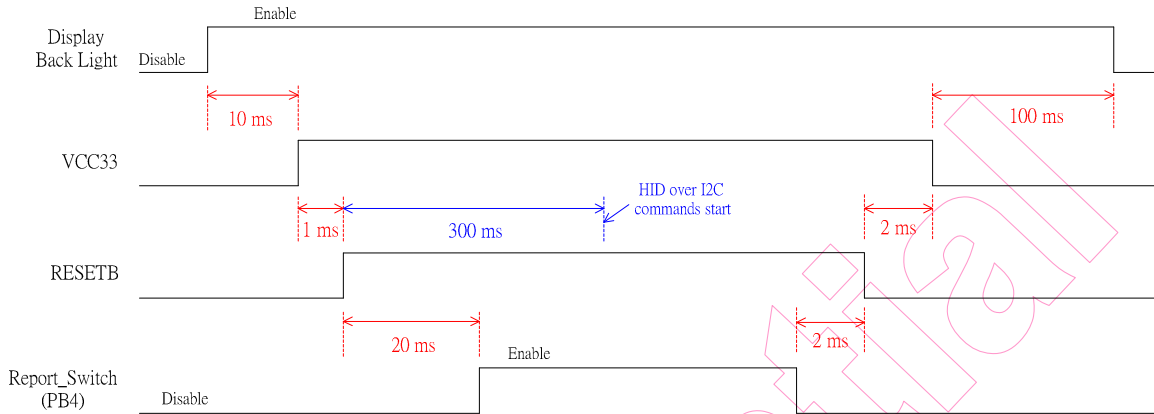


During power off, the VCC33 must be lower than 0.5V for at least 10us (i.e. $T_g > 10$ us) to make sure the touch controller be correctly reset.

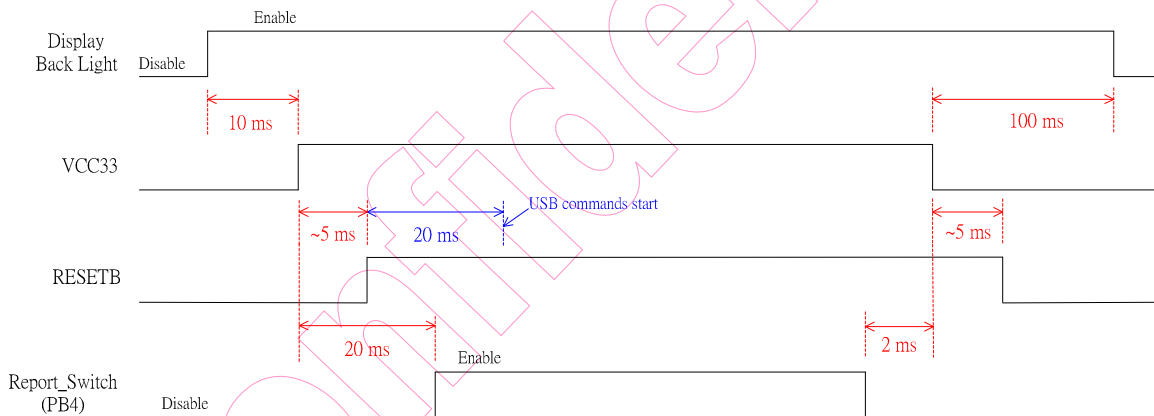
9.2 TP Power On/Off Sequence

Note: The times shown in the following figures are the minimum required time.

For I2C mode:

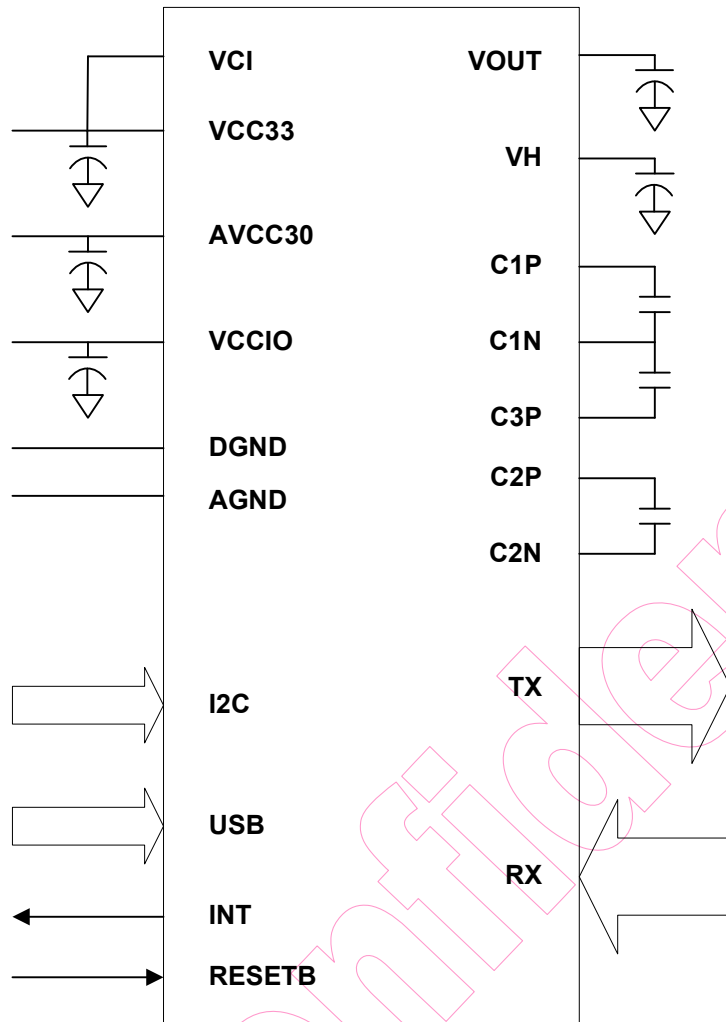


For USB mode



Note: The RESETB in USB mode is a RC reset signal. It is about 5ms after VCC goes high.

10 Application Circuits



11 Package Outlines

11.1 BGA132 Package Outline (5x10x0.8mm)

	SYMBOL	COMMON DIMENSIONS		
		MIN.	NOM.	MAX.
TOTAL THICKNESS	A	—	—	0.8
STAND-OFF	A1	0.11	—	0.21
BODY SIZE	D	5 BSC		
	E	10 BSC		
BALL WIDTH	b	0.2	—	0.3
BALL FITCH	e	0.6 BSC		
BALL COUNT	n	132		
EDGE BALL CENTER TO CENTER	D1	4 BSC		
	E1	9 BSC		

Precautions for SMT assembly process:

- 1) Recommend adding jump ring fixtures: use spring tension to fix the board and avoid deformation during reflow.
- 2) Recommend square design on both sides of the stencil to increase the amount of solder.
- 3) Recommend glue dispensing around IC: increase IC's adhesion after SMT to avoid solder crack caused by bending during operation.
- 4) It is recommended for FPC to have a stiffener made of stainless steel 150um or greater in thickness.

FOR SMT 加工注意事項:

- 1) 建議增加卡簧治具：靠彈簧張力進行固定以避免 PCB 回焊時形變。
- 2) 建議在 SMT 銅板兩側設計成方形，增加焊錫量。
- 3) 建議 IC 周圍點膠：增加 IC SMT 後粘著強度，避免人員作業彎折造成錫裂。
- 4) 建議 FPC 使用 Stainless steel (不銹鋼板) 材質做為補強板，厚度要求 150um 以上。

義隆電子股份有限公司 ELAN MICROELECTRONICS CORPORATION		TITLE: BGA 132L (5*10*0.8 mm) PACKAGE OUTLINE DIMENSION	
DWG NO: POD-128		File : BGA 132L	Edition: C
Draw	Name 彭瑩晏	Date 10/6/25	Unit : mm Scale: Free
Check	鍾玉真	10/6/25	Material:
Approved	柯明龍	10/6/25	Sheet: 1 of 1

A.1 ESD Information:

Item	Criteria	Reference Standard
HBM	Min. 2KV	MIL-STD-883E Method 3015.7
MM	Min. 200V	EIA/JESD22-A115-A
Latch Up	Min. 100mA	JEDEC-JC-78

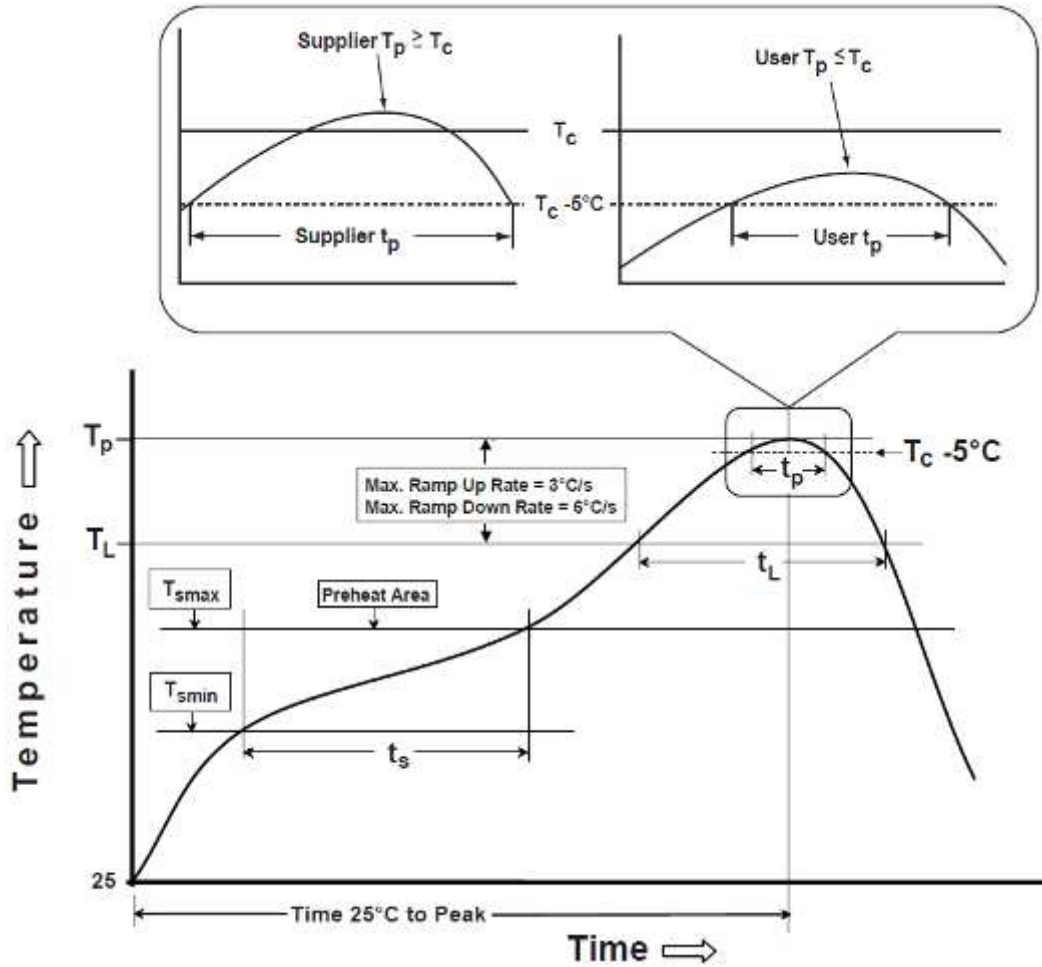
A.2 Moisture Sensitivity Level

Moisture Sensitivity Level	MSL 3	IPC/JEDEC J-STD-020
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A.3 Recommended Reflow Profile

Profile Feature	Pb-Free Assembly
Preheat/Soak Temperature Min (T _{min}) Temperature Max (T _{max}) Time (ts) from (T _{min} to T _{max})	150 °C 200 °C 60-120 seconds
Ramp-up rate (TL to T _p)	3 °C/second max.
Liquidous temperature (TL) Time (t _L) maintained above TL	217 °C 60-150 seconds
Peak package body temperature (T _p)	260 °C
Time (t _p)* within 5 °C of the specified classification temperature (T _c)	30* seconds
Ramp-down rate (T _p to TL)	6 °C/second max.
Time 25 °C to peak temperature	8 minutes max.

Classification Profile J-STD-020D



A.4 IC Marking Meanings

IC Marking	Meanings
ELAN	Logo
XXXXXXXXXX	IC P/N
XXXXXX	Lot Number
YYWWDD	Date code



联系方式



深圳市中芯微實業有限公司

深圳市龍崗區碧新路2002號中肯大廈607-608

電話/TEL: +86-0755-84200087

www.szzxv.com