ZT2628

18x10 channels
Capacitive Touch Screen Controller

PRODUCT FEATURES

- 6th Generation Capacitive touch screen controller
  - 18 x 10 channel
  - Up to 10 fingers
  - Up to 8 keys with TSP or FPC pattern
  - No scan rate degradation in multi touch
- Benefits
  - Hybrid Touch
    - Self + Mutual capacitance sensing
    - Enhanced Water Proof
    - Hover
  - HW Touch Detection
    - Touch Gesture Wakeup
    - Ultra Low Power Touch Detection
  - CDMS (SF)
    - Enhanced SF Technology
    - Higher SNR
    - Higher Scan Rate
    - Lower Power Consumption
- Fast response time (NOTE3)
  - Point detection latency : Down to 10msec
  - Point report rate : Down to 10msec
- High screen resolution
  - Up to 2048x2560
- Supporting LCD size
  - Up to 5 inch with 18x10 channel
- TSP sensor type
  - On-cell
  - GF1 with/without shield layer
  - G2(SITO) with/without shield layer
  - G1F without shield layer
  - GFF without shield layer
  - Metal Mesh sensor
- Minimum gap between TSP and LCD (NOTE1)
  - Down to 0.1mm UV resin gap
  - Down to 0.1mm AIR gap
- Sensor pattern :
  - Best performance for stylus pen, finger nail
  - 1 layer pattern for GF1,GF2,G1,G2(SITO),GG(SITO)
  - 2 layer pattern for G1F, GFF, GG(DITO), GFd
- High SNR
  - Stylus pen : down to 1.0phi tip (NOTE2)
- Window thickness
  - 0.5 ~ 1.5mm glass
  - 0.5 ~ 1.5mm plastic
- Supporting COB(Chip On Board)
  - Tested up to 150mm FFC/FPC
  - FFC or B2B connector
- I2C interface options
  - I2C : Supporting BYTE/DMA mode
  - I2C : Up to 400KHz/1MHz
  - I2C: Open drain I/O with 1.62V ~ 3.6V
- DSP technology for the noise reduction
  - Minimizing the cheek/grab noise
  - Minimizing the charger noise
  - Minimizing the LCD noise
  - Various digital filters
- No TSP calibration
  - Real time compensation
  - Fast/Easy mass production
- No RFI issue (NOTE4)
  - No interference to FM, NFC, GSM
  - Immune to 2G/3G/4G, WiFi, Bluetooth RF
- Windows software (ZTouchDebugger)
  - Demonstration, Evaluation, Debugging
  - Firmware downloading, data monitoring
  - Built in Test Mode for Mass production
- Manufacturing support
  - TSP drawing, FPC schematic, FPC gerber
  - Design guide for Test Machine
- Single power supply
  - 2.7V ~ 3.6V
  - No I2C power supply
- Wide operating temperature
  - Operating : -20°C ~ 85°C
  - Storage : -40°C ~ 125°C
- Small package
  - 36-pin QFN : 4mm x 4mm x 0.45T
- Hazardous Substance
  - Pb-free/Halogen-free, RoHS/REACH compliant

[NOTE]

1. The gap thickness is heavily affected by LCD types, glass thickness and TSP structure
2. Point diameter is affected by TSP performance
3. Response time is related to the channel counts, Cm, charger noise and LCD noise. Suggested value can be changed according to the system properties.
4. Need further discussion with the customer about RF interference such as antenna location for touch performance optimization.

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REVISION HISTORY

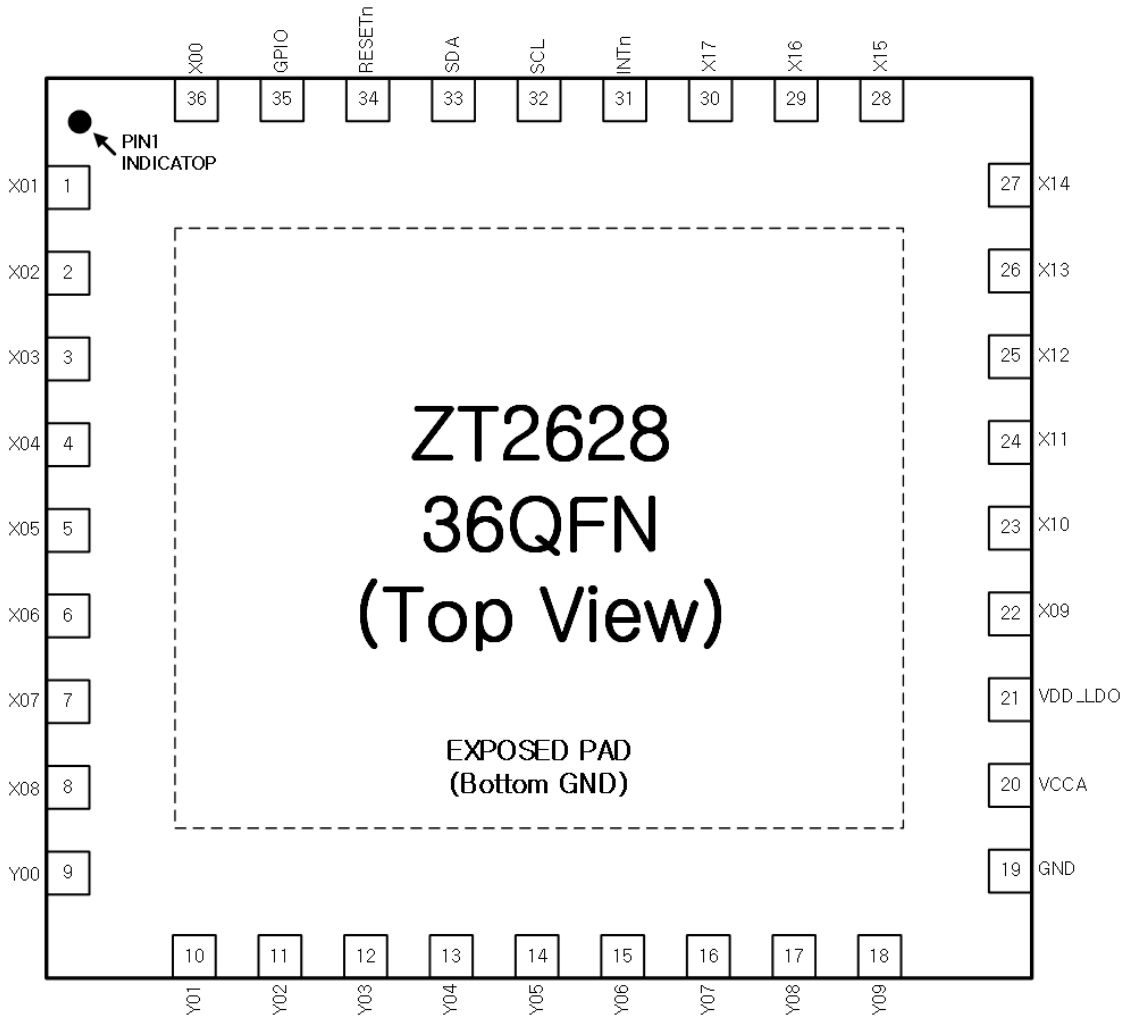
REV	DATE	AUTHOR	DESCRIPTION
1.0.0	2017/08/28	Leonard, Kim	First release

1. GENERAL DESCRIPTION

The ZT2628 is a 6th generation capacitive touch screen controller vitalizing the transparent capacitive touch screen panel. New hybrid AFE engine provides better wet touch, glove touch and stylus pen performance with higher SNR and two different types of capacitive data driven by mutual and self-sensing methods. In addition, the embedded hardwired touch-detection engine is able to minimize power consumption in idle mode during the system is suspended. The system can be revoked by user-defined gestures which can be programmed on the user space NVM embedded on this controller. It also includes all signal processing algorithms to provide the versatile filters to cope with various LCD types, noises and user-defined scenarios.

This controller has 28 channels which can be configurable to either 18 Tx by 10 Rx for the portrait type of display device. It supports wide I/O voltage level which can accept the various voltage level of I/O in HOST CPU so that it can be compatible with almost all HOST CPU for the mobile applications. For HOST CPU communication, it provides I2C interface with up to 1MHz of I2C clock speed which is the fastest in I2C specification.

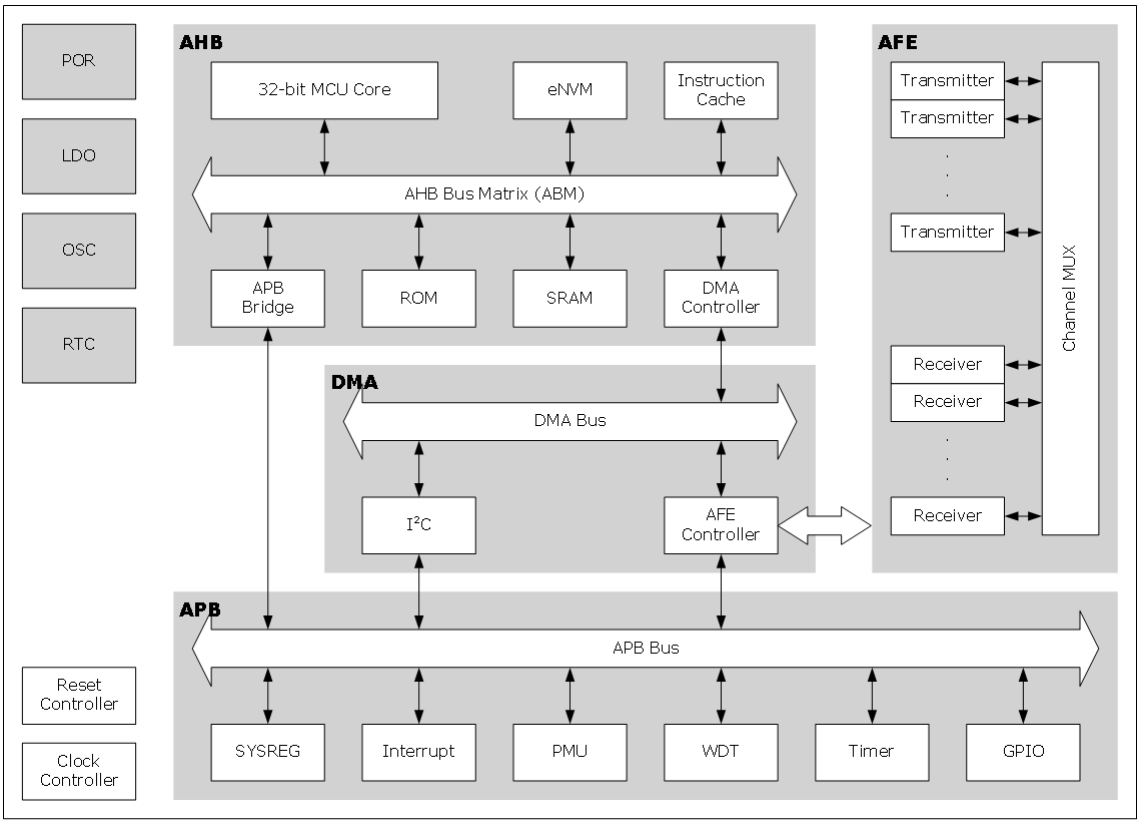
It is packaged in QFN to provide stable soldering on FPC (Flexible Printed Circuit) module. No external components except bypass filter capacitors for the power supply are needed.



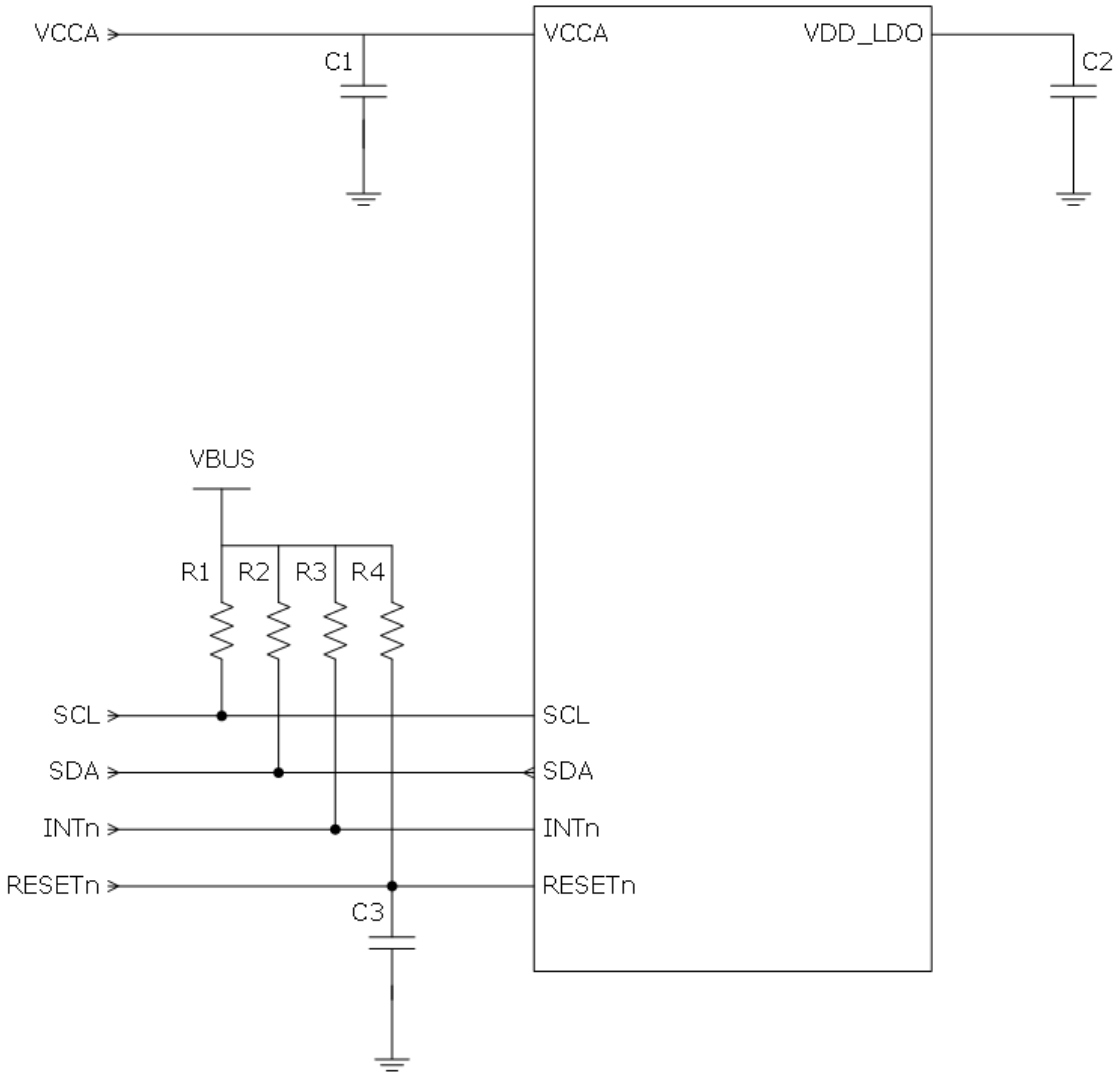
36 QFN (TOP VIEW) assignments

2. HARDWARE DESCRIPTIONS

2.1 BLOCK DIAGRAM



2.1.1 I2C HOST INTERFACE



C1	C2	C3 (NOTE1)	R1	R2	R3	R4 (NOTE1)
1uF	0.1uF	0.1uF	2.2KΩ	2.2KΩ	2.2KΩ	10KΩ

[NOTE]
1. R4 and C3 are optional components. RESET pin can be tied to VCCA directly

2.2 PIN ASSIGNMENT

(NOTES)
Suffix 'n' in "XXXn" means the low level assertion. Negation value for suffix 'n' signals shall be the logic 'HIGH'.

36	PIN NAME	TYPE	FUNCTION
1	X01	O	X forcing 01
2	X02	O	X forcing 02
3	X03	O	X forcing 03
4	X04	O	X forcing 04
5	X05	O	X forcing 05
6	X06	O	X forcing 06
7	X07	O	X forcing 07
8	X08	O	X forcing 08
9	Y00	I	Y sensing 00
10	Y01	I	Y sensing 01
11	Y02	I	Y sensing 02
12	Y03	I	Y sensing 03
13	Y04	I	Y sensing 04
14	Y05	I	Y sensing 05
15	Y06	I	Y sensing 06
16	Y07	I	Y sensing 07
17	Y08	I	Y sensing 08
18	Y09	I	Y sensing 09
19	GND	PWR	Ground
20	VCCA	PWR	Analog power supply
21	VDD_LDO	PWR	LDO Output
22	X09	O	X forcing 09
23	X10	O	X forcing 10
24	X11	O	X forcing 11
25	X12	O	X forcing 12
26	X13	O	X forcing 13
27	X14	O	X forcing 14
28	X15	O	X forcing 15
29	X16	O	X forcing 16
30	X17	O	X forcing 17
31	INTn	OD	Interrupt to Host
32	SCL	OD	I^2C clock
33	SDA	OD	I^2C data
34	RESETn	OD	Reset
35	GPIO	OD	General Purpose IO
36	X00	O	X forcing 00

3. ELECTRICAL CHARACTERISTICS

3.1 ABSOLUTE MAXIMUM RATINGS

SYMBOL	DESCRIPTION	MIN	TYP	MAX	UNIT
VCCA	Analog power supply voltage (1)	-0.5	-	4.0	V
V_{IN}	Input voltage for I/O bus (1)	-0.5	-	4.0	V
I_{IN}	DC input current (1)	-	-	50	mA
I_{OUT}	Output short circuit current (1)	-	-	50	mA
T_{STG}	Storage temperature (6)	-65	-	+150	°C
V_{ESD1}	Electrostatic handling HBM (3)	-4000	-	+4000	V
V_{ESD2}	Electrostatic handling MM (4)	-250	-	+250	V

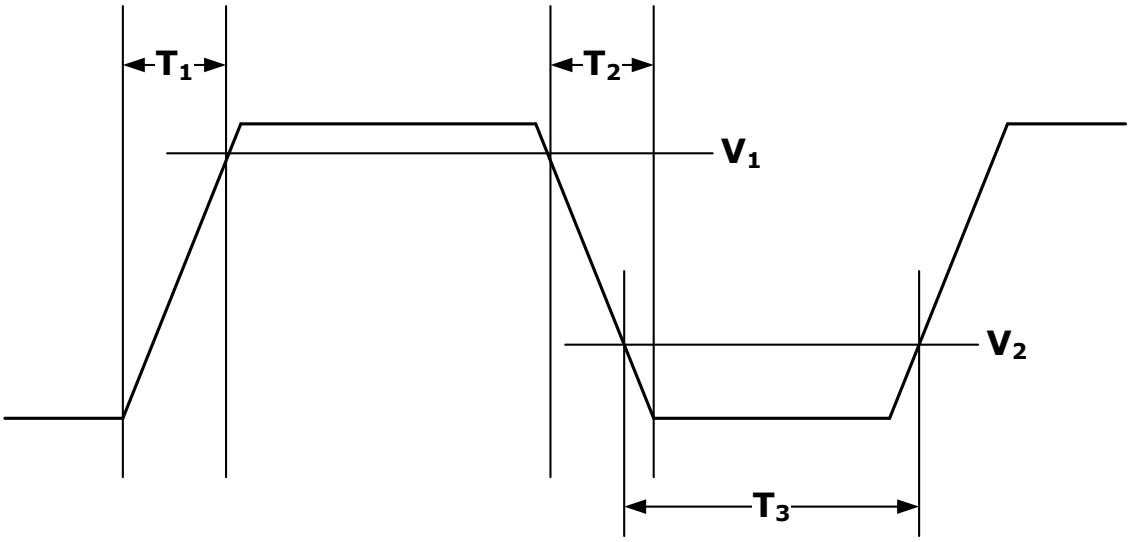
(NOTES)

1. Either voltage limit or current limit is sufficient to protect inputs.
2. Maximum ratings are defined based on the wide voltage
3. Equivalent to discharging a 100pF capacitor through a 1.5 kΩ series resistor.
4. Equivalent to discharging a 200pF capacitor through a 0 kΩ series resistor.
5. Permanent device damage may occur if the absolute maximum ratings are exceeded. These are stress rating only, and functional operation should be restricted to within the recommended conditions
6. Exposure to absolute maximum rating conditions for extended periods may affect the device reliability.

3.2 RECOMMENDED OPERATING CONDITIONS

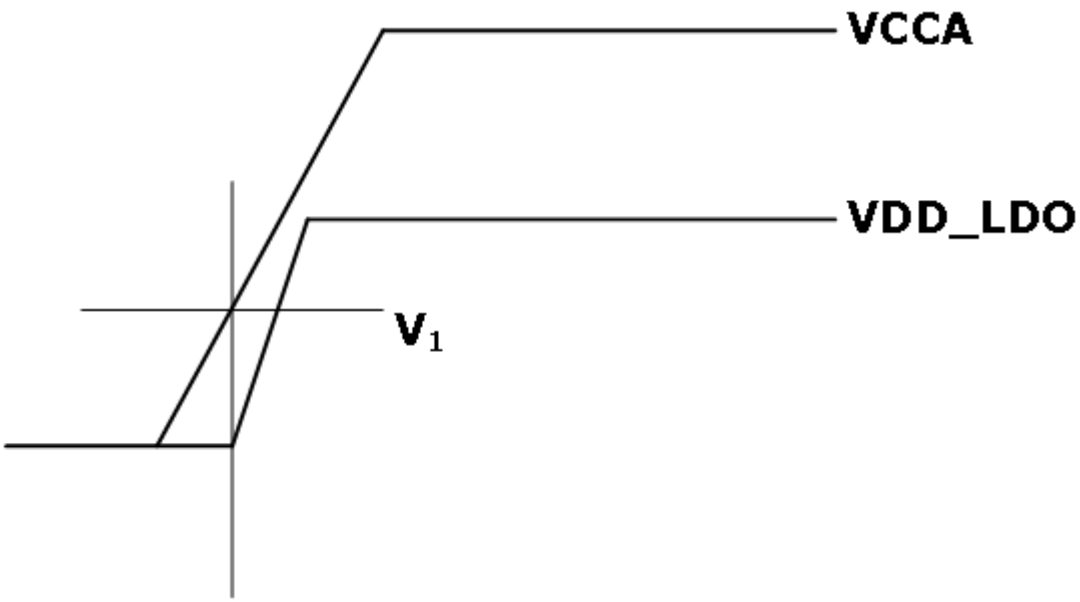
SYMBOL	DESCRIPTION	MIN	TYP	MAX	UNIT
VCCA	Analog power supply voltage	2.7	3.3	3.6	V
T_{OPT}	Operation environment temperature	-20	-	85	°C
T_J	Junction temperature	-40		125	°C

3.3 POWER UP CONDITION



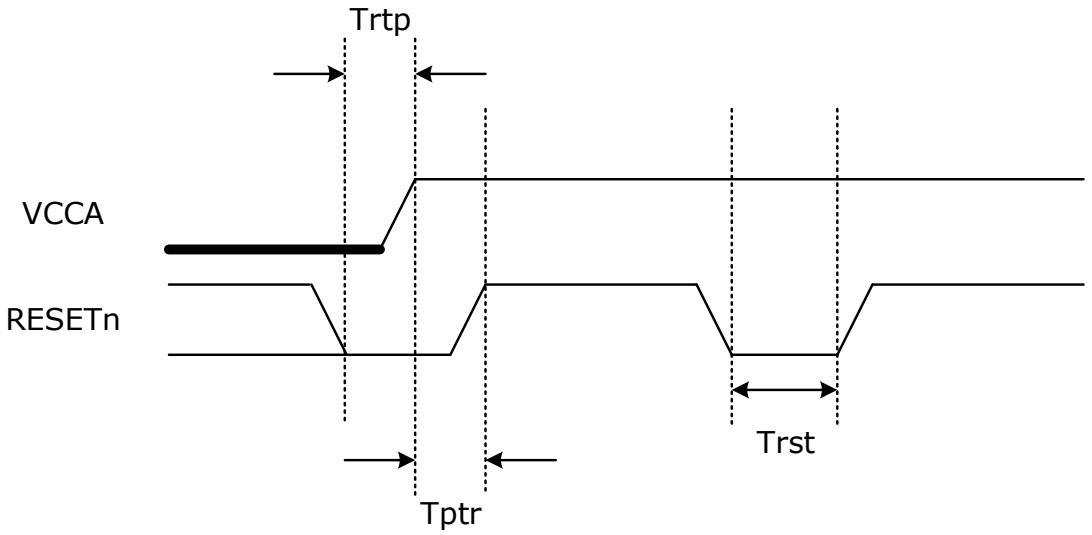
SYMBOL	PARAMETER	MIN	MAX	UNIT
T_1	Power-on time	-	10ms@V_1=2.5V	ms
T_2	Power-off time	-	10ms@V_2=0.3V	ms
T_3	From power-off to power-on time	20	-	ms

3.4 LDO



SYMBOL	PARAMETER	MIN	MAX	UNIT
V_1	LDO start-up threshold	0.7	1.0	V

3.5 Reset Sequence



SYMBOL	PARAMETER	MIN	MAX	UNIT
T_{rtp}	Reset to low time before power-on	0	-	us
T_{ptr}	Reset time after power-on	1	-	ms
T_{rst}	Reset time	1	-	ms

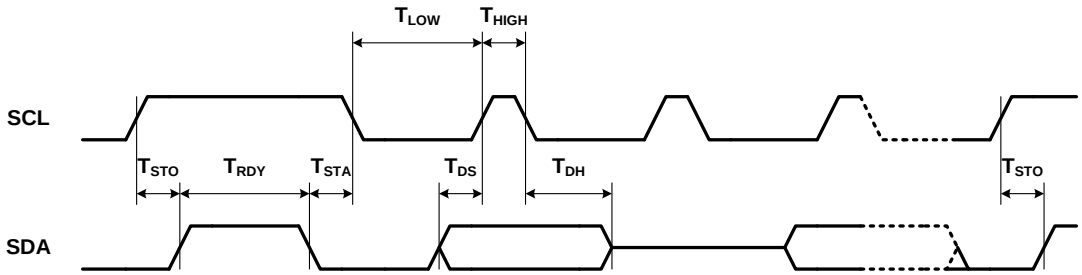
3.5 HOST INTERFACE I/O CHARACTERISTICS

3.5.1 I2C INTERFACE

SYMBOL	DESCRIPTION	MIN	TYP	MAX	UNIT
V_{IN}	Input voltage range	0	-	3.6	V
V_{OUT}	Output voltage range	0	-	VBUS	V
V_{IH}	Input threshold voltage for logic HIGH	1.2	-	-	V
V_{IL}	Input threshold voltage for logic LOW	-	-	0.6	V
V_{OL}	Output voltage for logic LOW	-	-	0.4	V
RPU	Input pull-up resistance	none	none	none	KΩ

(NOTE)
1. I_O = 4mA
2. VBUS is defined by the pull-up voltage

3.5.2 I2C INTERFACE TIMING



SYMBOL	PARAMETER	FAST-MODE		HS-MODE		UNIT
		MIN	MAX	MIN	MAX	
F_{SCL}	SCL clock frequency	0	400	0	1000	KHz
T_{LOW}	LOW period of SCL	1300	-	500	-	ns
T_{HIGH}	HIGH period of SCL	600	-	260	-	ns
T_{STA}	Hold time for START condition	600	-	260	-	ns
T_{STO}	Setup time for STOP condition	600	-	260	-	ns
T_{DH}	Data hold time	0	900	0	900	ns
T_{DS}	Data set-up time	100	-	50	-	ns
T_{rC}	Rise time of SCL	20	300	20	120	ns
T_{fC}	Fall time of SCL	20	300	20	120	ns
T_{rD}	Rise Time of SDA	20	300	20	120	ns
T_{fD}	Fall time of SDA	20	300	20	120	ns
T_{RDY}	Ready time between STOP and START condition	20	-	20	-	us

3.5.3 INTERRUPT

SYMBOL	DESCRIPTION	MIN	TYP	MAX	UNIT
V_{IN}	Input voltage range	0	-	3.6	V
V_{OUT}	Output voltage range	0	-	VBUS	V
V_{IH}	Input threshold voltage for logic HIGH	1.2	-	-	V
V_{IL}	Input threshold voltage for logic LOW	-	-	0.6	V
V_{OL}	Output voltage for logic LOW	-	-	0.4	V
RPU	Input pull-up resistance	none	none	none	KΩ

(NOTE)
1. I_O = 4mA
2. VBUS is defined by the pull-up voltage

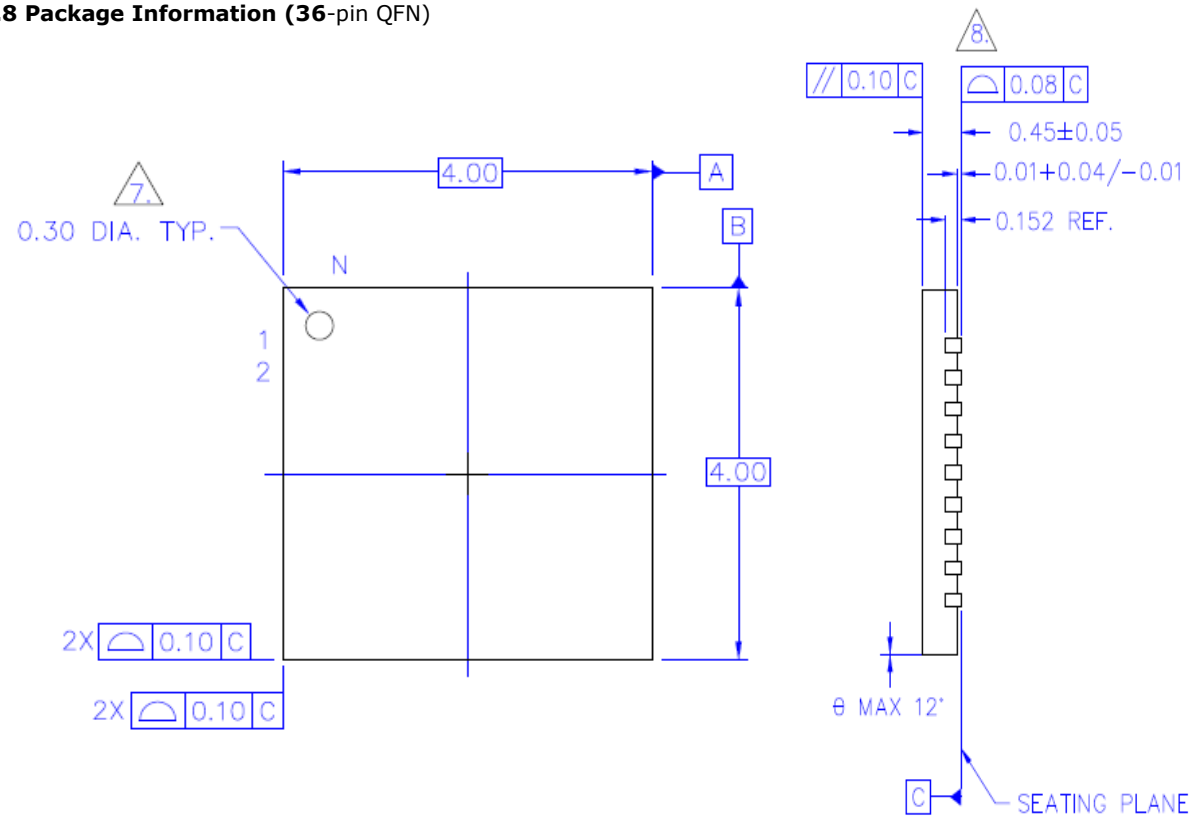
3.6 TX

SYMBOL	DESCRIPTION	MIN	TYP	MAX	UNIT
V_{OUT}	Output voltage range	0	-	3.3	V
F_{CLK}	TX clock frequency	1	-	2000	KHz
T_{rise}	Rising time	5	-	60	ns
T_{fall}	Falling time	5	-	60	ns

3.7 RX

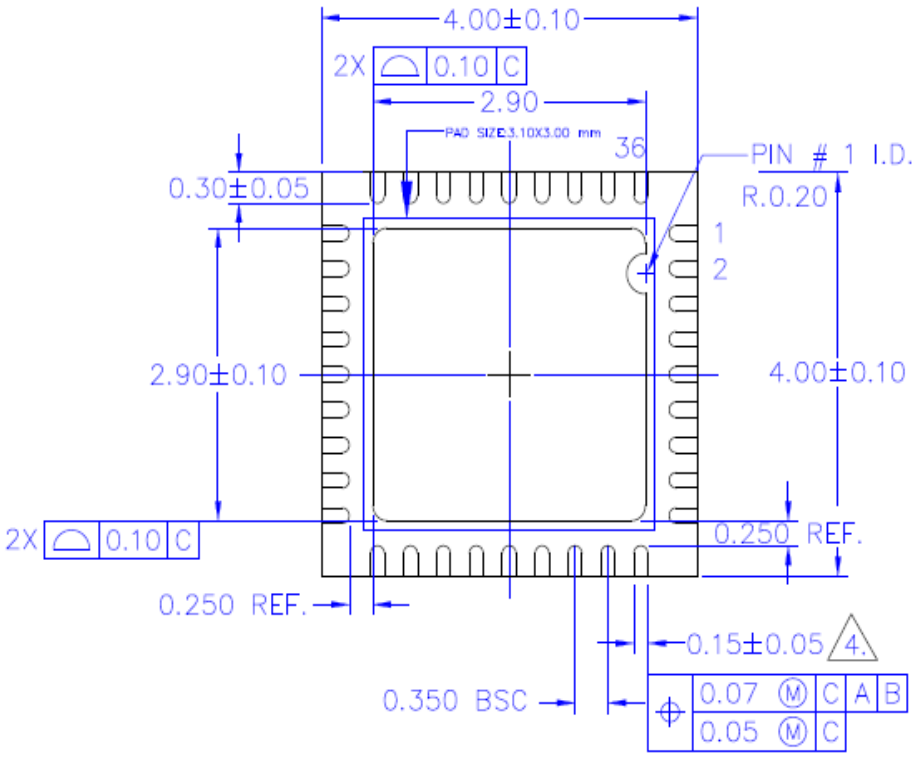
SYMBOL	DESCRIPTION	MIN	TYP	MAX	UNIT
V_{IN}	Input voltage range	0	-	3.6	V

3.8 Package Information (36-pin QFN)



Top View

Side View



Bottom View

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