PCT1322QK: Multi-Touch Capacitive Touch Controller

General Description

PCT1322QK is a low-power, 2-touch Capacitive-Touch controller to provide a touchpad system with high report rate, high accuracy, and low latency. It is using a mutual-capacitance measurement technology to sense capacitance changes and to detect multiple touch points simultaneously to realize as a touch system. It is designed to meet the increasingly demanding needs for multi-touch performance application. This is a PixArt's PocoTouch solution that supports touch detection, gesture interpretation and motion tracking for trackpad and touch pad in HID, mobile and wearable applications.

An Interrupt flag from the touch controller signals the host to read the touch reports. I2C is used for serial communication between the PCT1322QK and the host. A large set of registers facilitates features and performance optimization. Additional user enhancements or adjustments complement the system performance objectives.

Key Features

- Low power consumption
- Wide input power range
- Flexible touch are size and shape
- I2C interface
- Excellent Water Immunity
- Smart Auto-Calibration
- Palm Rejection
- Thick cover support, up to 2.0mm PC
- Win8 Gestures support
- Open-short test support
- Boot-load mode support

Applications

- Trackpad/Touch mouse/Touch keyboard
- Remote Controller /Wearable

Key Parameters

Parameter	Value
Channel Number	14x8 & 10x12
Touch area	1"~3.5"
Sensing Type	Mutual
Object Detection	5 Touches
Supply Voltage	1.8V +-10% or 2.0~3.6V
Power Consumption	1.6 mA @ 100fps/touch 25 uA @ Standby 6.2 uA @ Suspend mode
Sensitivity	4mm Stylus
Report Rate	Max 250Hz
Latency	< 10ms
CPI	300~2000
Operation Temperature (T_j)	-20 to +70 °C

Ordering Information

Part Number	Package Type
PCT1322QK	5mmx5mm QFN32

RoHS compliant

For any additional inquiries, please contact us at
http://www.pixart.com/contact.asp

Table of Contents

List of Figures

List of Tables

1.0Introduction

1.1 Overview

PCT1322QK touch controller consists of an analog front-end with dedicate 10 drive lines and 8 sense lines together with 4 flexible lines to connect to touch panel. The 4 flexible lines can be set to drive or sense line that means the cell resolution can be 14x8 ~ 10x12 according to user's preferred ID geometry. All drive and sense lines can be reordered to provide panel routing flexibility, and each drive/sense line can be independently switched on/off to match the touch screen active areas.

The controller applies a series of excitation signals to the drive electrodes. The signals are coupled to the sense lines via mutual capacitance. Touching anywhere on the panel with a finger alters the capacitance at that specific location. The PCT1322QK multi-touch controller can simultaneously resolve and track up to five touches. The high report rate allows the host to track rapid touches and movements with less than 15ms latency. The embedded processor filters the data, identifies the touch coordinates and gesture and then report to the host 250Hz maximum. However, PCT1322QK FW does noise avoidance automatically to get good SNR, so the report rate may be reduced automatically when the environment is noisy. PCT1322QK also has great flexibility on drive/sense setting, performance tuning and gesture definition through registers setting or boot-load setting.

1.2 Architecture Block Diagram

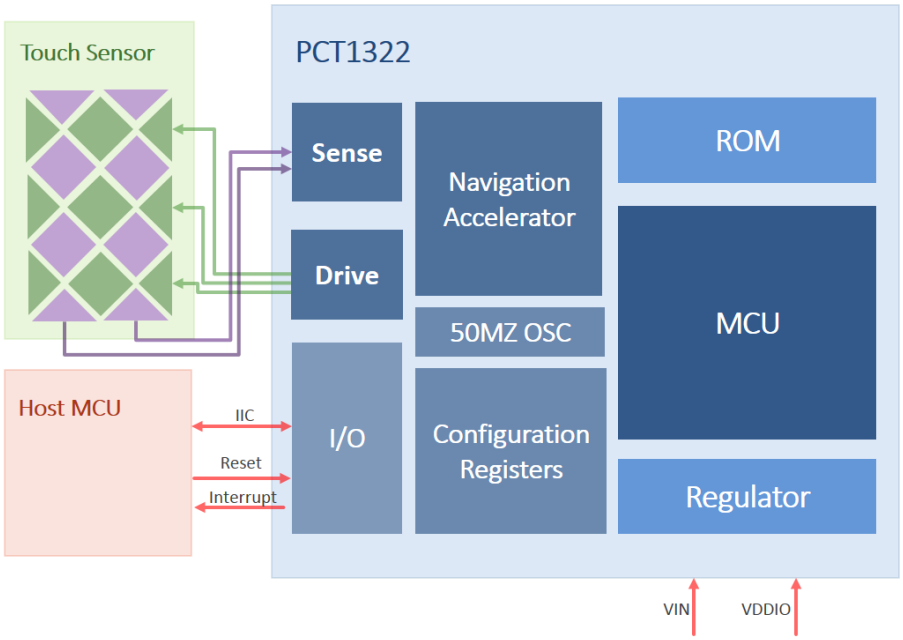


Figure 1. Block Diagram

1.3 Pin Definition

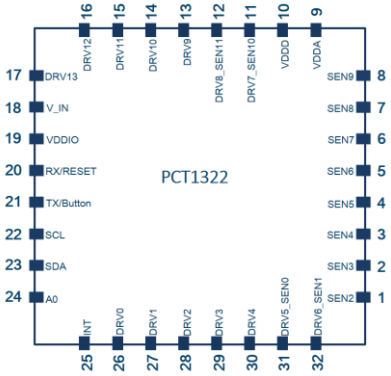


Figure 2. Pin Configuration

Table 1. Pin Signal Description

Pin No.	Name	Functional Description
1	SEN2	Sense line pin
2	SEN3	Sense line pin
3	SEN4	Sense line pin
4	SEN5	Sense line pin
5	SEN6	Sense line pin
6	SEN7	Sense line pin
7	SEN8	Sense line pin
8	SEN9	Sense line pin
9	VDDA	Analog power, connect 1uF to ground.
10	VDDD	Digital power, connect 1uF to ground
11	DRV7_SEN	Mux pin: Can be set to Drive or Sense function
12	DRV8_SEN	Mux pin: Can be set to Drive or Sense function
13	DRV9	Drive line pin
14	DRV10	Drive line pin
15	DRV11	Drive line pin
16	DRV12	Drive line pin
17	DRV13	Drive line pin
18	VIN	Main power input, connect 1uF to ground
19	VDDIO	Power for interface to Host, connect 0.1uF to ground
20	RX/RESET	Multi-function Pin
21	TX/Button	Multi-function Pin
22	SCL	I2C_SCL
23	SDA	I2C_SDA
24	A0	I2C slave ID pin
25	INT	Interrupt to Host to indicate data ready
26	DRV0	Drive line pin
27	DRV1	Drive line pin
28	DRV2	Drive line pin
29	DRV3	Drive line pin
30	DRV4	Drive line pin
31	DRV5_SEN	Mux pin: Can be set to Drive or Sense function
32	DRV6_SEN	Mux pin: Can be set to Drive or Sense function

2.0Electrical Specifications

2.1 Absolute Maximum Ratings

Table 2. Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit	Notes
Storage Temperature	Ts	-60	100	℃	
Operation Temperature	Ta	-20	70	℃	
Supply voltage with internal regulator	V_IN	-0.5	3.6	V	
	VDDIO	-0.5	3.6	V	
Supply voltage with external regulator	V_IN	-0.5	2	V	
	VDDIO	-0.5	3.6	V	
	VDDA	-0.5	2	V	
	VDDAIO	-0.5	5.5	V	
	VDDD	-0.5	2	V	
Relative Humidity	RH	0	85	%	
ESD	ESD		5	kV	
Analog pin voltage	VA	-0.3	VDDAIO+0.3	V	
Digital pin voltage	VD	-0.3	VDDIO+0.3	V	
Lead solder Temperature	Tsolder		260	°C	

Notes:

1. Maximum Ratings are those values beyond which damage to the device may occur.
2. Exposure to these conditions or conditions beyond those indicated may adversely affect device reliability.
3. Functional operation under absolute maximum-rated conditions is not implied. Functional operation should be restricted to the Recommended Operating Conditions.

2.2 Recommended Operating Conditions

Table 3. Recommended Operating Conditions

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Operation Temperature	T_A	-20		70	℃	
Power Supply – With internal Regulator						
Supply voltage	V_IN	2.0	-	3.6	V	
	VDDIO	1.62	-	3.6	V	
Regulator output	VDDD	1.72	1.8	2	V	
	VDDA	1.72	1.8	2	V	
Power Supply – Without internal Regulator						
Supply voltage	V_IN	1.72	1.8	2.0	V	
	VDDD	1.72	1.8	2.0	V	
	VDDA	1.72	1.8	2.0	V	
	VDDCP	1.72	1.8	2.0	V	
	VDDIO	1.62	-	3.6	V	
Supply Noise – With internal Regulator						
VPP @ VIN				200	mVpp	
Supply Noise – Without internal Regulator						
VPP @ supply voltage				20	mVpp	

2.3 Electrical Characteristics

Electrical Characteristics are defined under recommended operating conditions.

Table 4. Power Consumption Specifications

Regulator Mode	Operation Mode	State	Report Rate (Hz)	Current Consumption
With internal Regulator turn on	Active(*1)	1-touch	100	1.6mA
	Sleep Mode (Touch Wakeup)	Rest1	10	0.21mA
		Rest2	2	25uA
	Suspend (Non Touch Wakeup)		0	6.3uA
Without internal Regulator (1.8V Power supply)	Active(*1)	1-touch	100	1.6mA
	Sleep Mode (Touch Wakeup)	Rest1	10	0.21mA
		Rest2	2	25uA
	Suspend (Non Touch Wakeup)		0	6.5uA

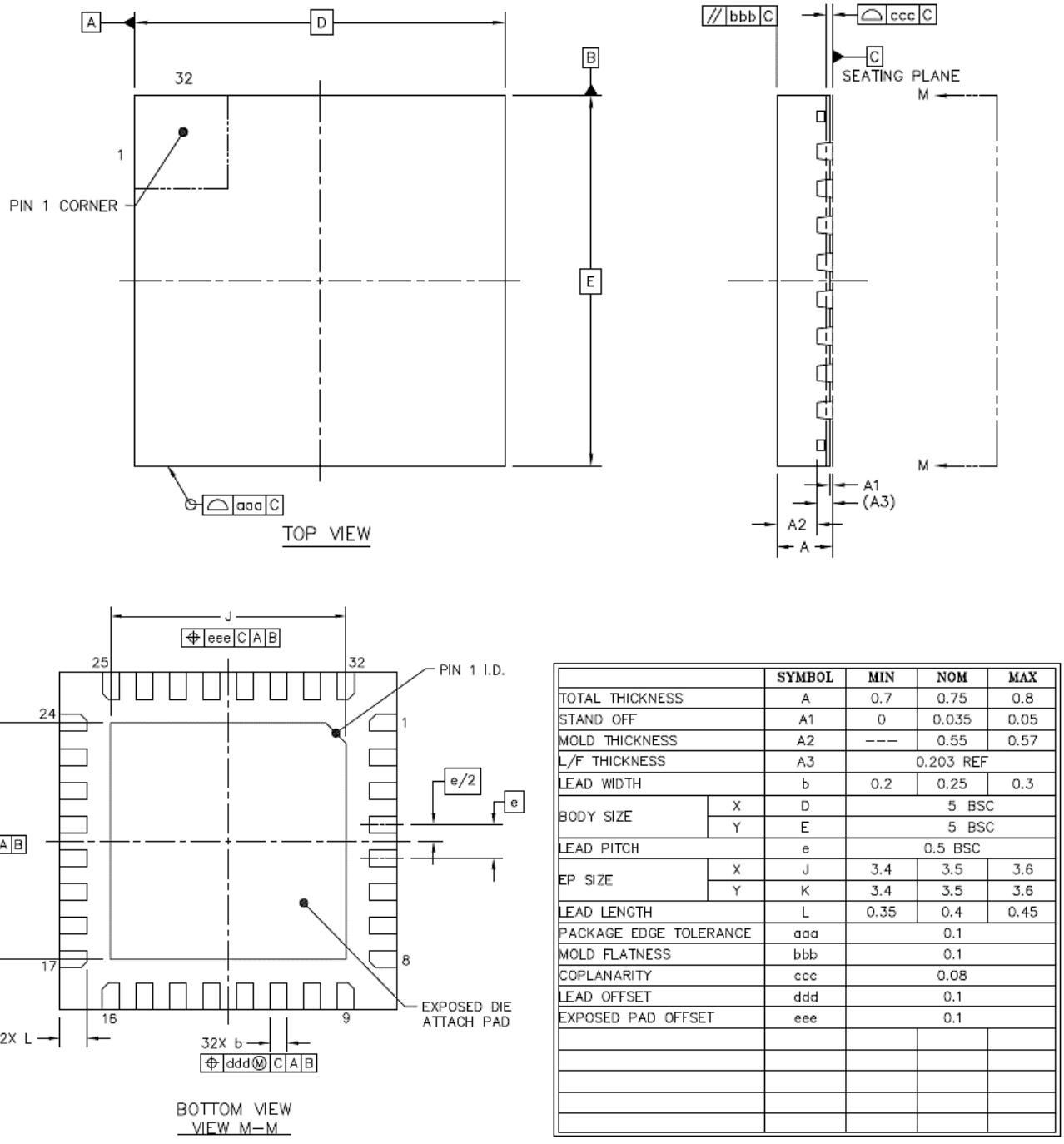
Table 5. Interface Level Specifications

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Input High Voltage	VIH	VDDIO*0.7			V	
Input Low Voltage	VIL			VDDIO*0.3	V	
Output High Voltage	VOH	VDDIO*0.8			V	
Output Low Voltage	VOL			VDDIO*0.2	V	

3.0Mechanical Specifications

3.1 Mechanical Dimensions

QFN-32 5mmx5mm



		SYMBOL	MIN	NOM	MAX
TOTAL THICKNESS		A	0.7	0.75	0.8
STAND OFF		A1	0	0.035	0.05
MOLD THICKNESS		A2	---	0.55	0.57
L/F THICKNESS		A3		0.203 REF	
LEAD WIDTH		b	0.2	0.25	0.3
BODY SIZE	X	D		5 BSC	
	Y	E		5 BSC	
LEAD PITCH		e		0.5 BSC	
EP SIZE	X	J	3.4	3.5	3.6
	Y	K	3.4	3.5	3.6
LEAD LENGTH		L	0.35	0.4	0.45
PACKAGE EDGE TOLERANCE		aaa		0.1	
MOLD FLATNESS		bbb		0.1	
COPLANARITY		ccc		0.08	
LEAD OFFSET		ddd		0.1	
EXPOSED PAD OFFSET		eee		0.1	

Figure 3. Package Outline Diagram

4.0System Design References

4.1 Reference Schematics

4.1.1 Using Internal Regulator (V_IN > 2.0V)

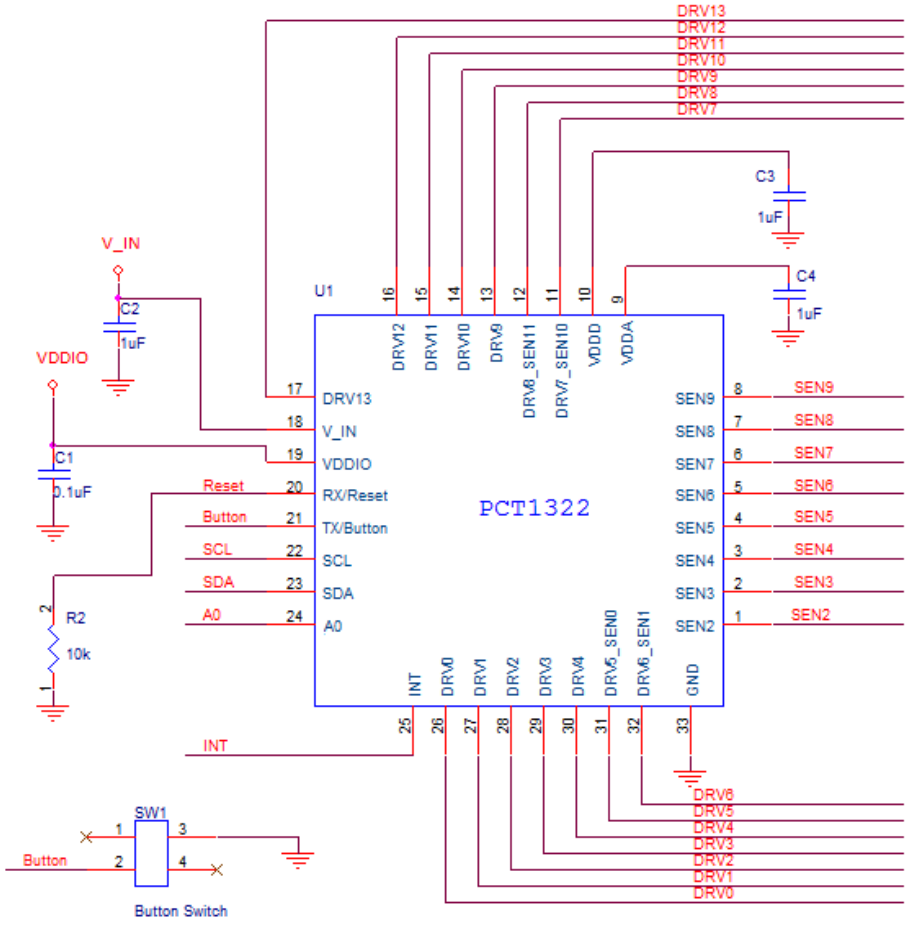


Figure 4. Reference Schematic for V_IN > 2.0V

4.1.2 Not using Internal Regulator (V_IN =1.8V)

If host provides 1.8V to PCT1322QK, VIN(pin18), VDDD(pin10), and VDDA(pin9) should be tied together in PCB layout.

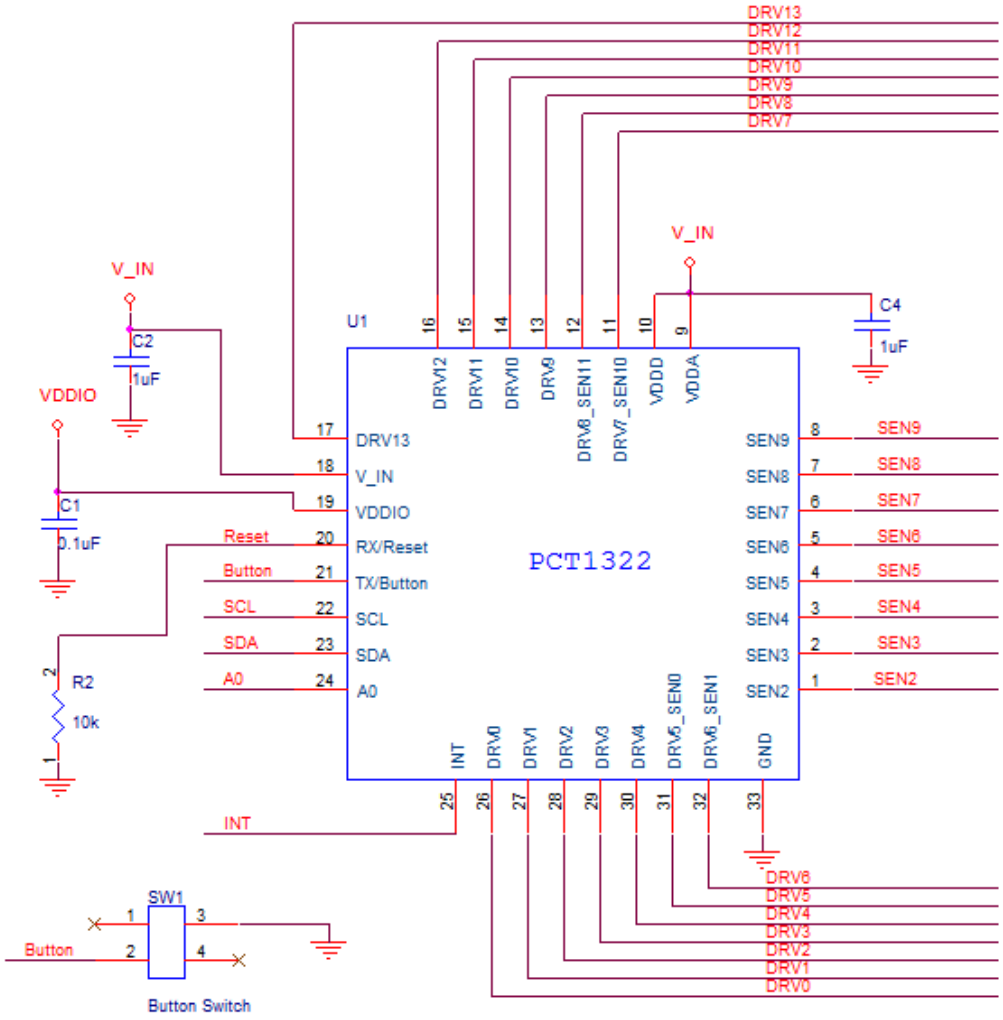
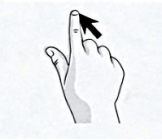


Figure 5. Reference Schematic for V_IN = 1.8V

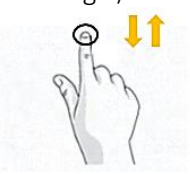
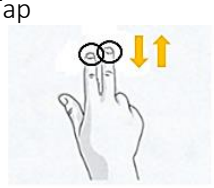
4.2 Gestures Support

PCT1322QK embeds gesture engine to support standard Win8 gestures. The corresponded gesture report registers could be read to get the respective gesture types. The optimization of gesture performance or user feeling can be tuned via registers. Beside the standard Win8 gestures, PCT1322QK also support single physical button to trigger right key and left key to increase user experience. For other gestures that not listed below, please contact your local PixArt's Sales and FAE for customized functions.

1. Mouse cursor manipulation

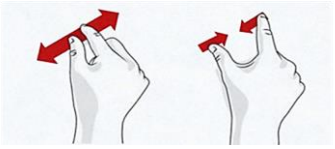


2. Single/double Finger Tap

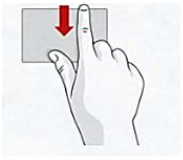
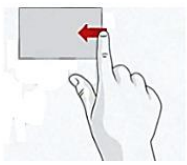
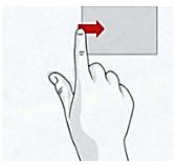



3. Two Finger Slide (Horizontal/Vertical)

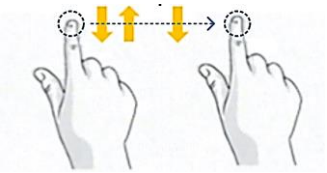
4. Two Finger Pinch



5. Swipe from Top/Right/Left Edge

6. Single finger tap and drag



Document Revision History

Revision No.	Date	Description of Change(s)
0.2	05 Jun 2015	Initial creation
1.0	20 Aug 2016	1st Release to customer