DIO682X

Low-Power, Push-Button Controllers with Single or Dual Inputs

Features

- Wide operating range: 1.6 V to 6.6 V
- Low supply current: 10 nA (Typical)
- Two-state logic, input delay by TS pin:
  7.5s and 0s
- Multiple timing options available
- Single (DIO6822) or dual (DIO6820 and DIO6821/C) push-button inputs
- /RST output: active Low, open-drain output
- /RST pulse time:
  DIO6821 and DIO6822: 400ms (Typical)
  DIO6821C: 80ms (Typical)
  DIO6820: depend on inputs
- Very small packages: DFN1.45*1-6, DFN1*1-6, and DFN0.8*0.8-4

Applications

- Portable devices
- Navigation devices
- E-cigarette
- Toys

Descriptions

The series of DIO682X is low-current, ultra-small, push-button controller with single or dual inputs. These devices, which has a long setup delay time, provide the intended system reset and avoid the reset because of short push-button closures or unintended press action. This reset output can be programmed by TS pin or depends on inputs.

If both inputs (PB1 and PB2) are pulled low, the DIO6820 and DIO6821/C output an active-low reset pulse signal (/RST). For the DIO6821/C, the /RST pin outputs a low pulse signal with a fixed time. For the DIO6820, the /RST pin outputs a low pulse signal until either of the PBx inputs is released. However, for the DIO6822, if the input (PB1) is pulled low, the /RST pin outputs a low pulse signal with a fixed time.

The DIO682X has an active-low and open-drain output that can be wire-ORed with other open-drain devices. The DIO682X has a wide operating voltage from 1.6 V to 6.6 V and operation under the -40°C to +125°C temperature range. The DIO682X is a good choice for a micropower solution for system resetting needs.

Ordering Information

Order Part Number	Top Marking	RoHS	T_A	Package	
DIO6820QN6	W2V	Green	-40 to 85°C	DFN1.45*1-6	Tape & Reel, 5000
DIO6820TN6	WG	Green	-40 to 85°C	DFN1*1-6	Tape & Reel, 5000
DIO6821QN6	W2A	Green	-40 to 85°C	DFN1.45*1-6	Tape & Reel, 5000
DIO6821TN6	WH	Green	-40 to 85°C	DFN1*1-6	Tape & Reel, 5000
DIO6821CQN6	W1C	Green	-40 to 85°C	DFN1.45*1-6	Tape & Reel, 5000
DIO6821CTN6	WJ	Green	-40 to 85°C	DFN1*1-6	Tape & Reel, 5000
DIO6822QN6	W2B	Green	-40 to 85°C	DFN1.45*1-6	Tape & Reel, 5000
DIO6822CN4	B	Green	-40 to 85°C	DFN0.8*0.8-4	Tape & Reel, 5000
DIO6822TN6	WK	Green	-40 to 85°C	DFN1*1-6	Tape & Reel, 5000

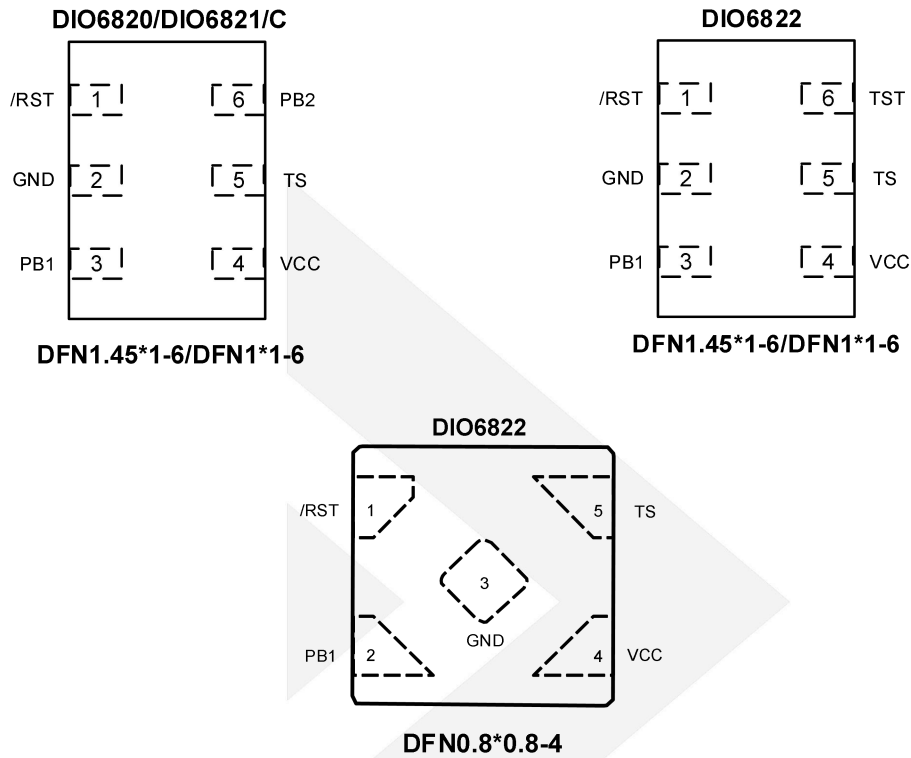| Marking Definition: W2V / WG / W2A / WH / W1C / WJ / W2B / B / WK	
W	The packaging week. Letter *A* to *Z* represents the 1st to 52nd weeks respectively, each letter for two weeks. For example, the letter *F* represents the 11th and 12th weeks.
2V; G; 2A; H; 1C; J; 2B; B; K	Fixed product code.

Low-Power, Push-Button Controllers with Single or Dual Inputs

Pin Assignment

DIO6820/DIO6821/C

DFN1.45*1-6/DFN1*1-6

DIO6822

DFN1.45*1-6/DFN1*1-6

DIO6822

DFN0.8*0.8-4

Figure 1. Top View

Pin Descriptions

Pin Name	Type	Description
GND	-	Ground.
PB1	I	Push-button input1. If the PB1 and PB2 hold low for longer than t_{TIMER} time, output the reset signal. (Only PB1 for the DIO6822).
PB2	I	Push-button input2. If the PB1 and PB2 hold low for longer than t_{TIMER} time, output the reset signal. (Only PB1 for the DIO6822).
/RST	O	Reset output, active low and open-drain. Reset is asserted (active low) when PBx are held low for longer than t_{TIMER} time (only PB1 for the DIO6822). /RST Pulse time: DIO6821 and DIO6822: 400 ms (typical) DIO6821C: 80 ms (typical) DIO6820: either of inputs is released.
TS	I	Time delay selection input. The push button time can be selected by connect to V_{CC} or GND. During operation, do not change the TS pin state and it be connected to either GND or V_{CC} permanently. The state must be changed during power off, or when either PBx input is high.
TST	-	Connect this pin to GND or V_{CC}
VCC	1	Power supply input. Supply voltage from 1.6 V to 6.6 V for the device. It is good analog design practice to place a 0.1 μF ceramic capacitor close to this pin.

Absolute Maximum Ratings

Stresses beyond those listed under the Absolute Maximum Rating table may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other condition beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Symbol	Parameter	Rating	Unit
V_{CC}	Input supply voltage	-0.3 to 7.0	V
V_{RST}	/RST pin voltage	-0.3 to 7.0	
V_{PB1}, V_{PB2}	PB1 and PB2 pin voltage	-0.3 to 7.0	
V_{TS}	TS pin voltage	-0.3 to (V_{CC} + 0.3)	
I_{RST}	/RST pin current	-20 to 20	mA
T_J	Operating junction temperature	-40 to 125	°C
T_{STG}	Storage Temperature	-65 to 150	
θ_{JA}	Package thermal resistance(DFN-6)	322	°C/W
θ_{JC}		70	

Recommended Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. DIOO does not recommend exceeding them or designing to absolute maximum ratings.

Symbol	Parameter	Min.	Typ.	Max.	Unit
V_{CC}	Input supply voltage	1.6		6.6	V
V_{TS}	TS pin voltage	0		V_{CC}	V
V_{PB1}, V_{PB2}	PB1 and PB2 pin voltage	0		6.6	V
V_{RST}	RST pin voltage	0		6.6	V
I_{RST}	RST pin current	0		10	mA

Electrical Characteristics

All specifications are over the operating temperature range of -40°C < T_J < 125°C and 1.6 V ≤ V_{CC} ≤ 6.6 V, unless otherwise noted. Typical values are at T_J = 25°C and V_{CC} = 3.3 V.

Symbol	Parameter	Conditions		Min.	Typ.	Max.	Unit
V_{CC}	Input supply			1.6		6.6	V
I_{CC}	Supply current (standby)	V_{CC} = 3.3 V			10		nA
		V_{CC} = 6.6 V, −40°C < T_J <85°C				0.3	µA
		V_{CC} = 6.6 V				0.5	µA
	Supply current (active timer) [1]	PB1, PB2 = 0 V, V_{CC} = 6.6 V	DIO6820, DIO6821/C		6.5	12	µA
		PB1 = 0 V, V_{CC} = 6.6 V	DIO6822		105	130	
V_{IH}	High-level input voltage	PB1, PB2	DIO6821/C	0.7V_{CC}			V
		PB1	DIO6822				
		PB1, PB2	DIO6820	0.85			
V_{IL}	Low-level input voltage	PB1, PB2	DIO6821/C	0		0.3V_{CC}	V
		PB1	DIO6822				
		PB1, PB2	DIO6820	0		0.3	
R_{PB1}	PB1 internal pullup resistance (DIO6822)				65		kΩ
I_{PB}	Input current (PB1, PB2)	PB1, PB2 = 0 V or V_{CC}	DIO6820 DIO6821/C	-50		50	nA
		PB1= V_{CC}	DIO6822	-50		50	
V_{OL}	Low-level output voltage	V_{CC} ≥ 4.5 V, I_{SINK} = 8 mA				0.4	V
		V_{CC} ≥ 3.3 V, I_{SINK} = 5 mA				0.3	
		V_{CC} ≥ 1.6 V, I_{SINK} = 3 mA				0.3	
I_{RSTb}	Open-drain output leakage current	High impedance, $V_{/RST}$ = 6.6 V		-0.35		0.35	µA

(1) Includes current through pullup resistor between input pin (PB1) and supply pin (V_{CC}) for the DIO6822.

Timing Requirements

All specifications are over the operating temperature range of -40°C < T_J < 125°C and 1.6 V ≤ V_{CC} ≤ 6.6 V, unless otherwise noted. Typical values are at T_J = 25°C and V_{CC} = 3.3 V.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
t_{TIMER}	Push-button timer[1]		-20%		20%	
		DIO6820: TS = GND	6	7.5	9	s
		DIO6820: TS = V_{CC}	10	12.5	15	
		DIO6821/C, DIO6822: TS = GND	6	7.5	9	
		DIO6821/C, DIO6822: TS = V_{CC}		0		
t_{RST}	Reset pulse duration		-20%		20%	
		DIO6821C	64	80	96	ms
		DIO6821	320	400	480	
		DIO6822	320	400	480	
t_{DD}	Detection delay (from input to /RST)[2]	For 0s t_{TIMER} condition		150		µs
t_{SD}	Start-up delay[2]	V_{CC} rising		300		µs

(1) For devices with a 0 second delay while TS = V_{CC}, this option is only for factory testing and is not intended for normal operation. In normal operation, the TS pin should be tied to GND.

(2) For devices with a 0 second delay when TS = V_{CC}, reset asserts in t_{DD} time when both PB inputs go low in this configuration. During start-up, if the PB inputs are low, reset asserts after a start-up time delay. This value is specified by design.

Low-Power, Push-Button Controllers with Single or Dual Inputs

Typical Performance Characteristics
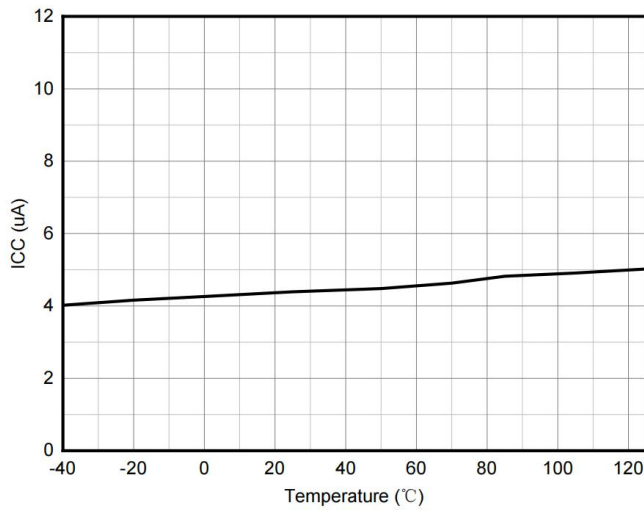
V_{CC} = 3.3 V, PB1 = PB2 = GND

Figure 2. Active Supply Current vs temperature
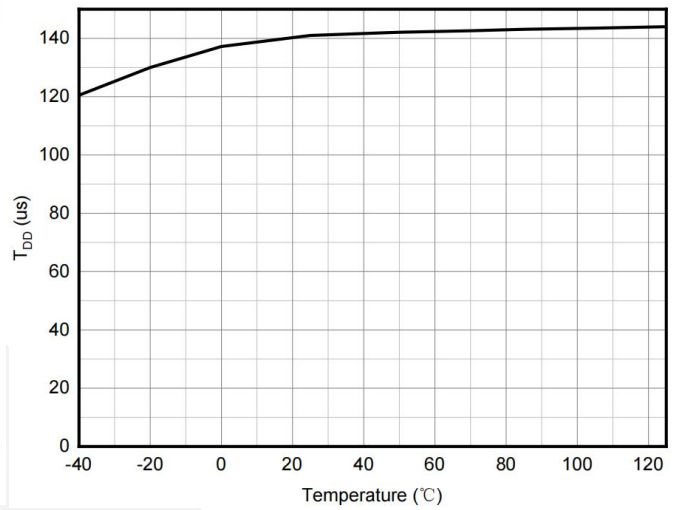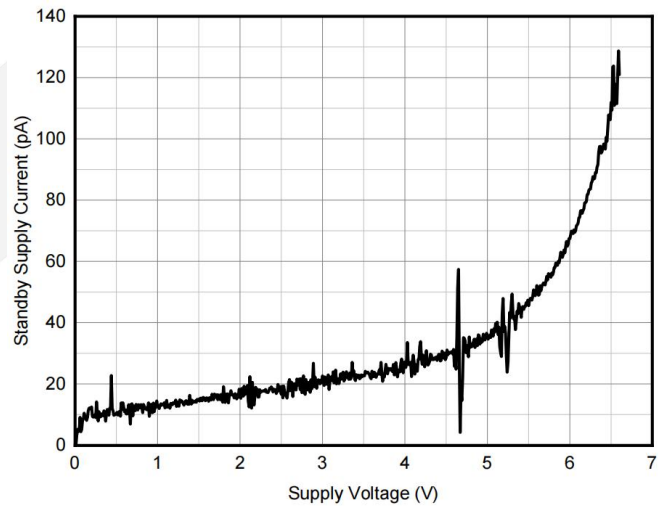

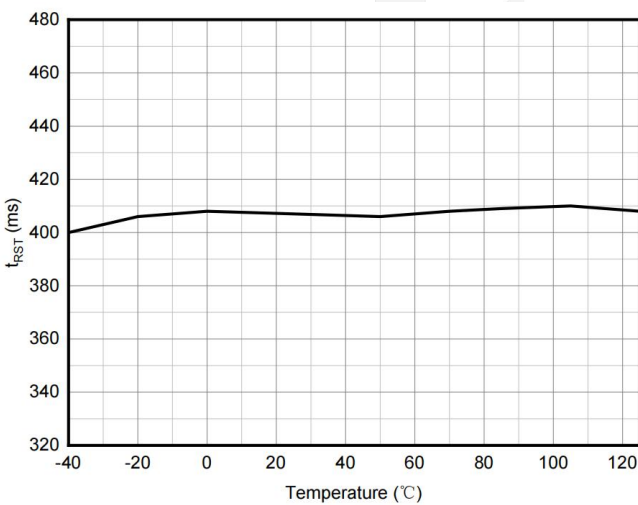V_{CC} = 3.3 V, TS = V_{CC}

Figure 3. T_{DD} vs Temperature
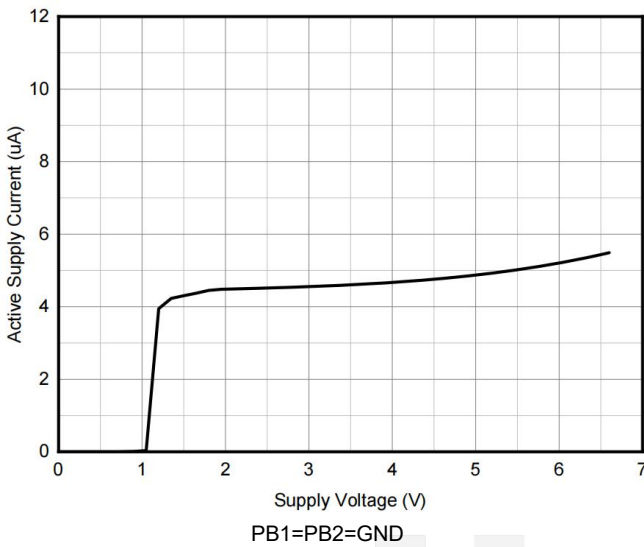
PB1=PB2=GND
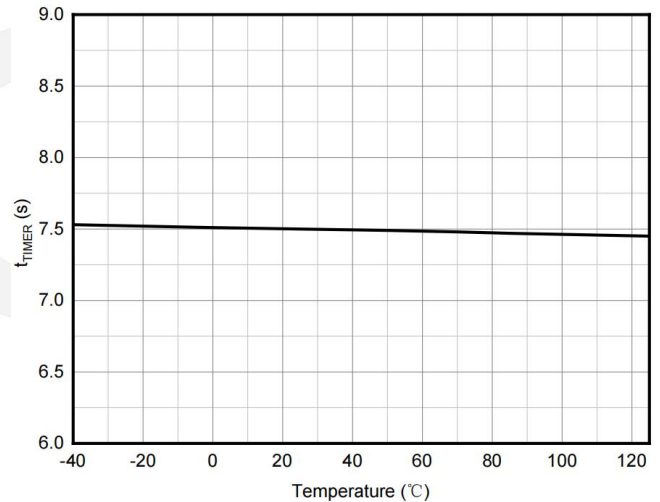
Figure 4. Active Supply Current vs Supply Voltage
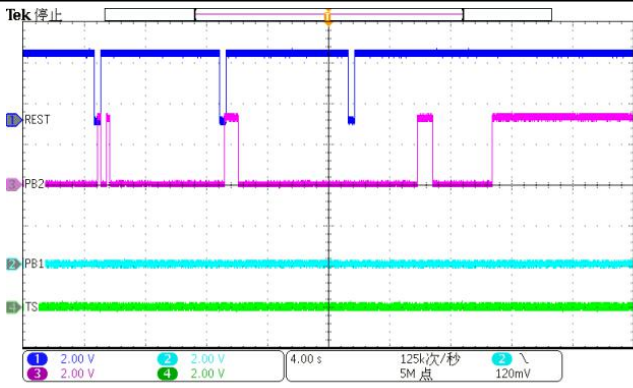

Figure 5. Standby Supply Current vs Supply Voltage

V_{CC} = 3.3 V, TS = GND

Figure 6. t_{RST} vs Temperature

V_{CC} = 3.3 V, TS = GND

Figure 7. t_{TIMER} vs Temperature

Low-Power, Push-Button Controllers with Single or Dual Inputs

V_{CC} = 3.3 V, TS = PB1 = GND

Figure 8. Sequential

Block Diagram
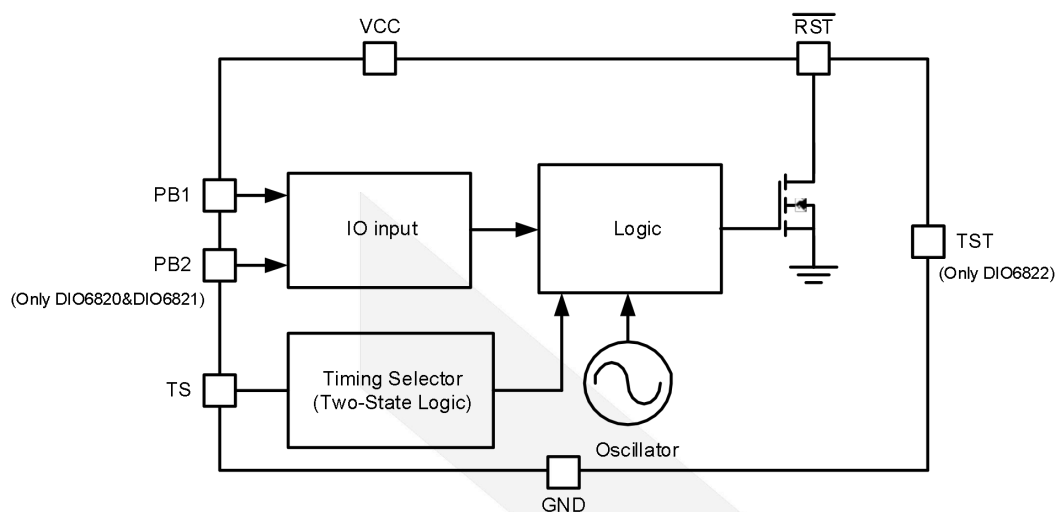
Figure 9. Block Diagram

Detailed Description

Overview

The series of the DIO682X is low-current, ultra-small, push-button controller with single or dual inputs. These devices provide the intended system reset and have a long setup delay time to avoid the reset due to short push-button closures or unintended press action. See Table 1 for details.

The DIO6820 asserts the output /RST when both inputs (PB1 and PB2) are held low for longer than t_{TIMER} time, and deasserts when either of input PBx is released.

The DIO6821/C asserts the output /RST when both inputs (PB1 and PB2) are held low for longer than t_{TIMER} time, and deasserts after a fixed time.

The DIO6822 asserts the output /RST when the PB1 input is held low for longer than t_{TIMER} time, and deasserts after a fixed time.

Table 1. Device Family Options

Device	Push buttons	Input	Reset Behavior (De-assertion)
DIO6820	2	NMOS-based threshold	Input (PBx) dependent
DIO6821/C	2	External pullup to V_{CC}	Fixed pulse
DIO6822	1	Internal pullup	Fixed pulse

Push-Button Timer Selection (TS)

The DIO682X family has two different push-button timer options by connecting the TS pin to either GND or V_{CC}, as shown in Table 2.

**Table 2. Push-Button Timer Option Examples**

PRODUCT	PUSH-BUTTON TIMER		RESET PULSE
	TS = V_{CC}	TS = GND	
DIO6820	12.5 s	7.5 s	N/A
DIO6821	0 s	7.5 s	400 ms
DIO6822	0 s	7.5 s	400 ms

During operation, do not change the TS pin state and be connected to either GND or V_{CC}. When powered up and

either of PBx inputs is high, the device checks the state of the TS pin to configure the push button timer. Therefore, if a timer option is undesired, the TS pin state must be changed during power off, or when either PBx input is high, to avoid false operation.
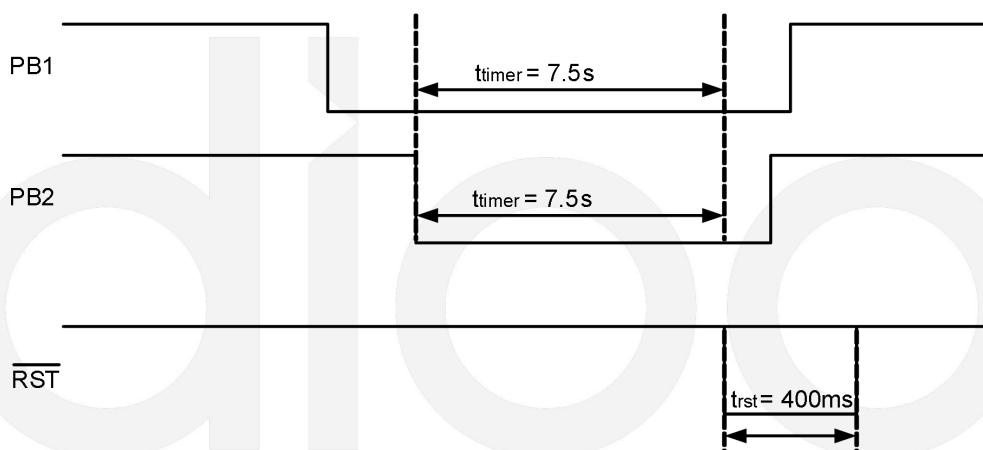
Inputs

The DIO6820 has two inputs: PB1 and PB2. When both inputs are simultaneously held low for longer than t_{TIMER} time, the device outputs an active-low reset signal, as shown in Figure 10. The reset signal is valid until either PB1 or PB2 is released. Each valid input condition can occur reset signal only one time. Only after the last input pin be released, when again both inputs are held low and stay low, then will an effective reset signal be output.
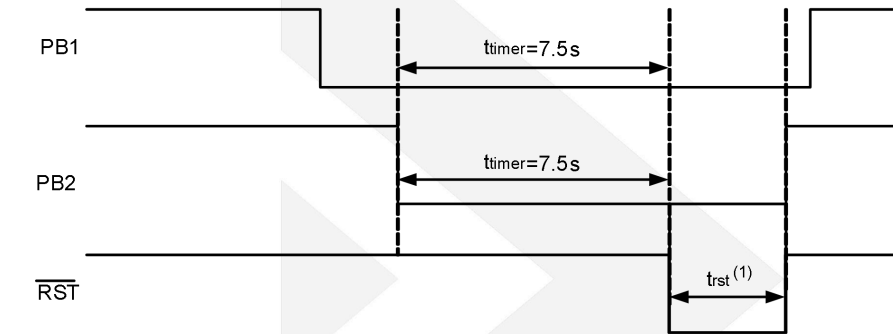
(1) For the DIO6820, t_{RST} is not a fixed time, but instead depends on one of the PB pins going high

Figure 10. DIO6820 Timing Diagram

The DIO6821/C has two inputs: PB1 and PB2. When both inputs are simultaneously held low for longer than t_{TIMER} time, the device outputs a reset single pulse with a fixed time (t_{RST}), see Figure 11. But for the DIO6821C, the fixed time is 80 ms, and for the DIO6821, the fixed time is 400 ms. After the t_{RST}, the reset signal goes high. A reset pulse occurs only one time when each valid input condition meets. Only after the last input pin is released, when both inputs are held low again, then an effective reset signal will be output.

Figure 11. DIO6821 Timing Diagram

The DIO6822 has only one input (PB1) which has been pulled up to V_{CC} internally. When the input is held low for

longer than the push-button timer period, t_{TIMER}), the device output a single reset pulse with a fixed time (t_{RST}); see Figure 12. After the t_{RST}, the reset signal goes high. A reset pulse occurs only one time after each valid input condition meets. Only after the input pin is released, when the input is held low again, then an effective reset signal will be output.
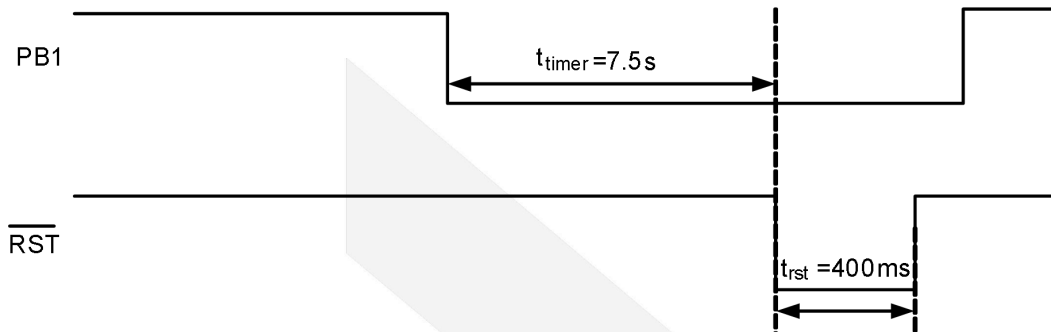

Figure 12. DIO6822 Timing Diagram

Output (/RST)

The output of the DIO682X is an active low, open-drain output /RST. Then the output needs a pull-up resistor to hold the line high when the output is in a high-impedance state (not asserted). By connecting a pull-up resistor to the proper voltage rail, the output can be connected to other devices at the correct interface voltage levels. The /RST pin of DIO682X can be pulled up to 6.6 V externally, independent of the device supply voltage. In order to get the right parameters, chose a proper pull-up resistor value is necessary. These parameters include V_{OL}, sink current capability, and output leakage current (I_{RSTb}). These parameters have been specified in Electrical Characteristics.

This section describes how the output is asserted or de-asserted and the relationship between the PB1 and PB2 inputs and the output. For detailed information, please refer to the timing diagram.
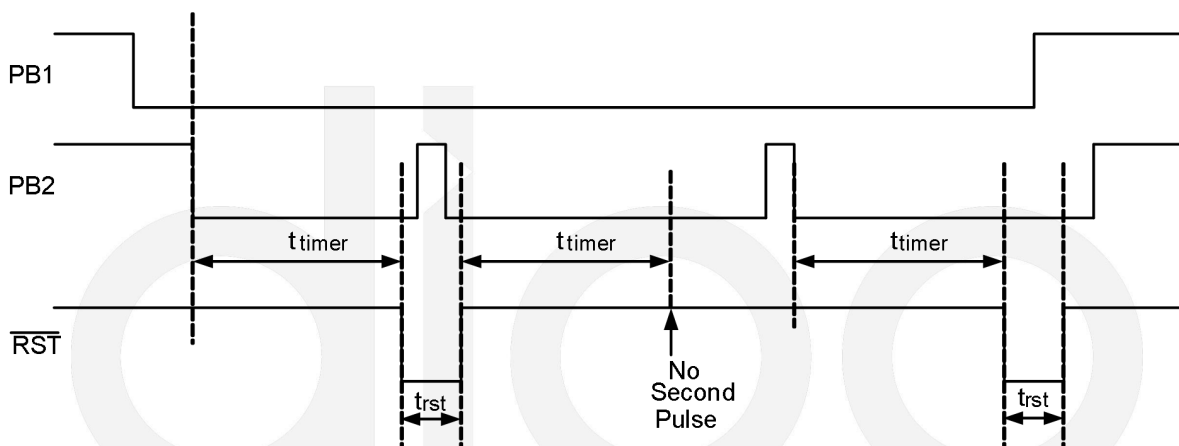

Figure 13. DIO6821/C Reset Timing Diagram

Once the reset is de-asserted, if the input condition has any change, the change will be detected. Any change of the input PB1 or PB2 will be ignored during the t_{RST} period. The change (low-to-high-to-low) is detected after the reset is de-asserted.

Device Functional Modes

Normal Operation (V_{CC} > 1.6 V)

In normal operation, the VCC is greater than 1.6 V ($V_{CC(min)}$) for approximately 300 µs (t_{SD}), the device output /RST signal will depend on the state of the PB1 and PB2 pins; see Table 1.

Below $V_{CC(min)}$ (1.6 V > V_{CC} > 1.3 V)

The below Vcc means that the V_{CC} is less than 1.6 V but greater than 1.3 V (typical). The device output /RST signal will depend on the state of the PB1 and PB2 pins; in this case, the electrical specifications in the Electrical Characteristics and Timing Requirements tables will be different when V_{CC} < $V_{CC(min)}$.

Power-On Reset (V_{CC} < 1.3 V)

When the V_{CC} is lower than 1.3 V (typical), the /RST output should be high-impedance. However, it is not ensured to maintain high-impedance under all conditions.
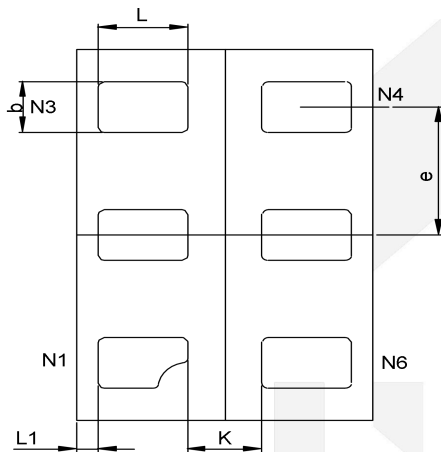
Physical Dimensions: DFN1.45*1-6
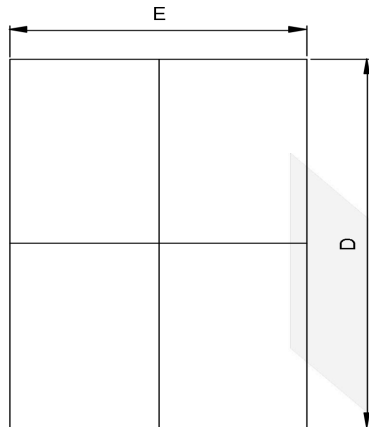
TOP VIEW
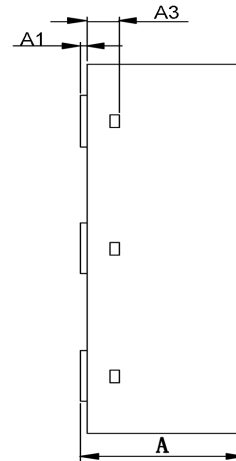
SIDE VIEW

BOTTOM VIEW

Common Dimensions (Units of measure = Millimeter)		
Symbol	**Min**	**Max**
A	0.500	0.600
A1	-0.004	0.046
A3	0.110 REF.	
D	1.350	1.550
E	0.900	1.100
k	0.250 REF.	
b	0.150	0.250
e	0.500TYP.	
L	0.224	0.376
L1	0.075 REF.	

Physical Dimensions: DFN1*1-6
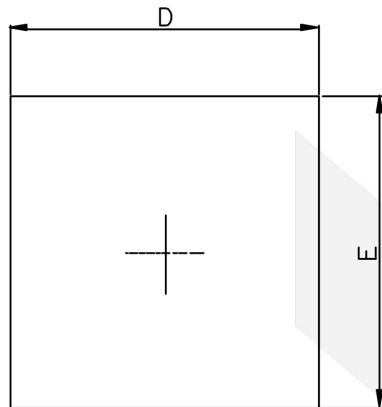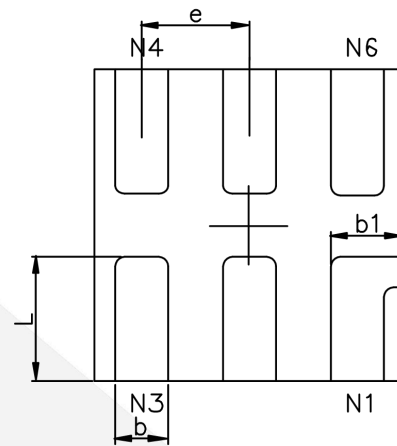
TOP VIEW

BOTTOM VIEW
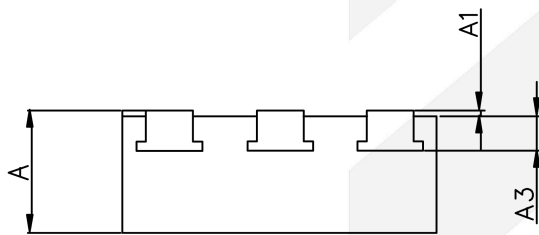
SIDE VIEW

Common Dimensions (Units of measure = Millimeter)			
Symbol	Min	Nom	Max
A	0.34	-	0.40
A1	-0.004	-	0.046
A3	0.11 REF.		
D	0.95	-	1.05
E	0.95	-	1.05
b	0.12	-	0.22
b1	0.185	-	0.285
e	0.35 TYP.		
L	0.35	-	0.45
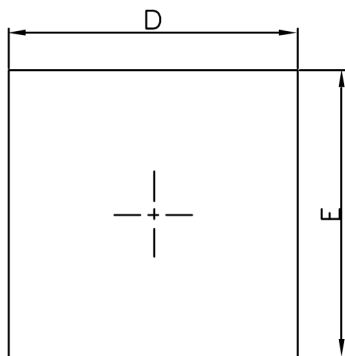
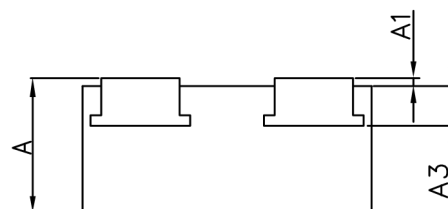**Low-Power, Push-Button Controllers with Single or Dual Inputs**

Physical Dimensions: DFN0.8*0.8-4

TOPVIEW
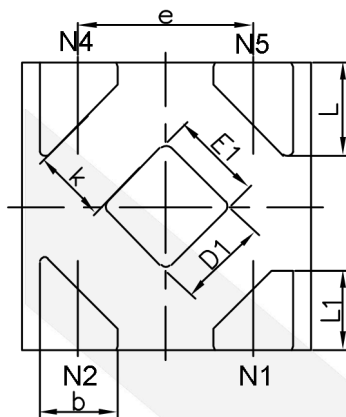
BOTTOMVIEW

SIDEVIEW

Common Dimensions (Units of measure = Millimeter)			
Symbol	Min	Nom	Max
A	0.320	-	0.400
A1	-0.004	-	0.046
A3	0.110 REF.		
D	0.750	-	0.850
E	0.750	-	0.850
D1	0.200	-	0.300
E1	0.200	-	0.300
k	0.150 MIN.		
b	0.170	-	0.270
e	0.480 TYP.		
L	0.170	-	0.380
L1	0.170	-	0.320
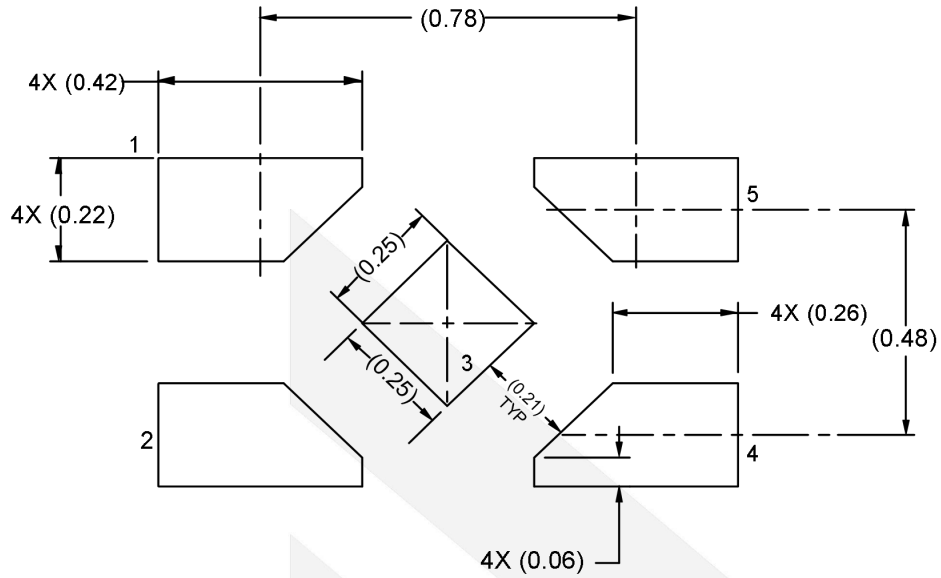
RECOMMENDED LAND PATTERN (Unit: mm)

CONTACT US

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For additional product information or full datasheet, please contact our sales department or representatives.