Description

The TCA9535 is mainly used to expand general-purpose input and output (GPIO) ports. Port data is transmitted via the standard two-line I²C protocol.

The TCA9535 features 16-bit quasi-bidirectional GPIO ports (P0~P7), which can directly drive LEDs. Each quasi-bidirectional GPIO port can be used as an input or output without the use of a data-direction control signal.

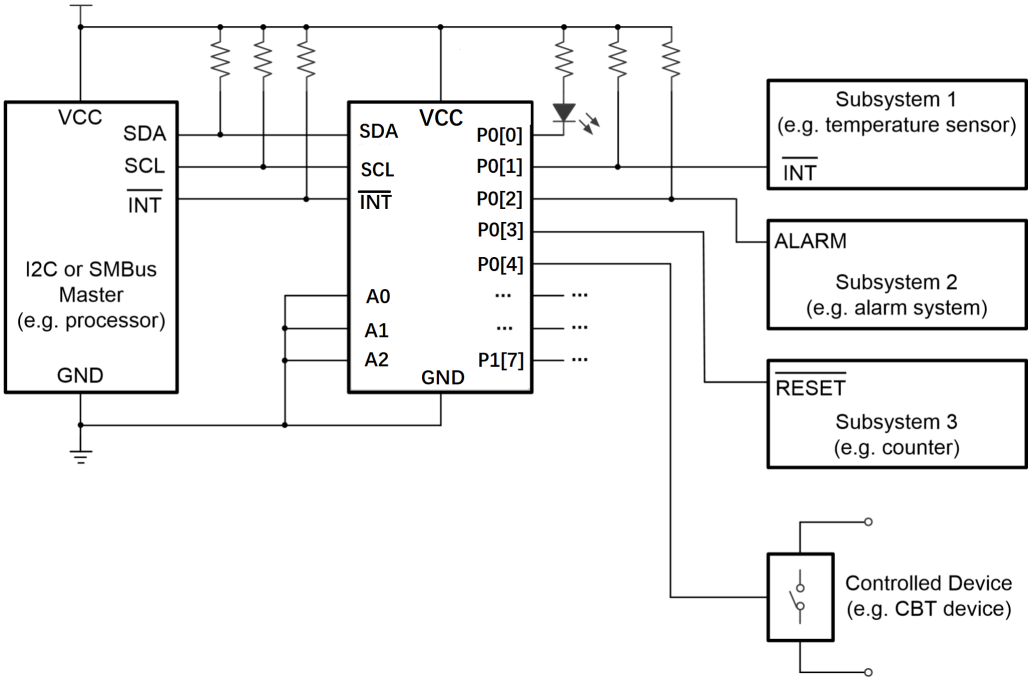
After power on, all GPIO ports are high.

Features

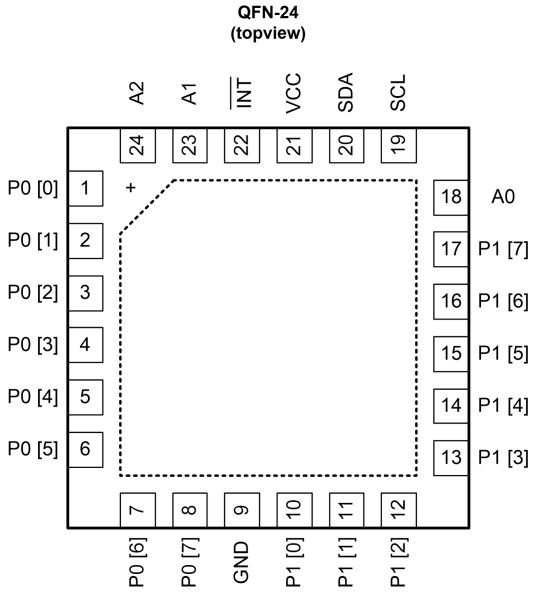
- I/O interface expander controlled by I²C
- Power supply voltage: 1.4V ~ 5.5 V
- Operating temperature: - 40 °C ~ +85 °C
- Standby power consumption: <1uA
- Can drive LED directly
- Open-drain interrupt output

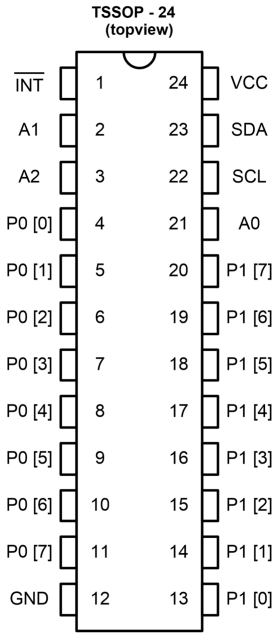
Applications

- Communication cabinet
- Servers
- Industrial automation
- Products with GPIO-Limited Processors



Pin Configuration and Functions





Pin Functions

PIN			DESCRIPTION
NAME	QFN-24	TSSOP-24	
A[0:2]	18, 23, 24	21, 2, 3	21, 2, 3 Address select pin. Choose to connect to a VCC
GND	9	12	Ground pin.
INT	22	1	Interrupt output. Open-drain output, requires a pull-up
P0[0:7]	1, 2, 3, 4 5, 6, 7, 8	4, 5, 6, 7 8, 9, 10, 11	Quasi-bidirectional GPIO port.
P1[0:7]	10, 11, 12, 13 14, 15, 16, 17	13, 14, 15, 16 17, 18, 19, 20	
SCL	19	22	Serial clock pin. Open drain output, requires pull-up
SDA	20	23	Serial data pin. Open drain output, requires pull-up
VCC	21	24	Power supply voltage pin. An additional 10uF decoupling

Absolute Maximum Ratings

	MIN	MAX	UNIT
Power Supply Voltage V+		6	V
Pin Voltage	- 0.5	6	V
Operating Temperature	- 55	15 0	°C
Junction Temperature		1 50	°C
Storage Temperature	- 60	1 50	°C

Unless otherwise noted, the specifications in the above table apply within the atmospheric temperature range.

Stresses beyond the range may cause permanent damage to the device.

Electrostatic Protection

		Value	UNIT
Electrostatic Discharge, V_{ESD}	Human Body Mode (HBM), per ANSI/ESDA/JEDEC JS-001	±2000	V
	Machine Mode (MM), per JEDEC-STD Classification	+100	V

Recommended Operating Conditions

	MIN	TYP	MAX	UNIT
Supply voltage V	1.4	3.3	5.5	V
Operating temperature range T	-40		85	°C

Unless otherwise noted, the specifications in the above table apply within the atmospheric temperature range.

Electrical Characteristics

Unless otherwise noted, the following data apply within the operating temperature range. (Typical operating conditions are + 25℃ and 3.3V)

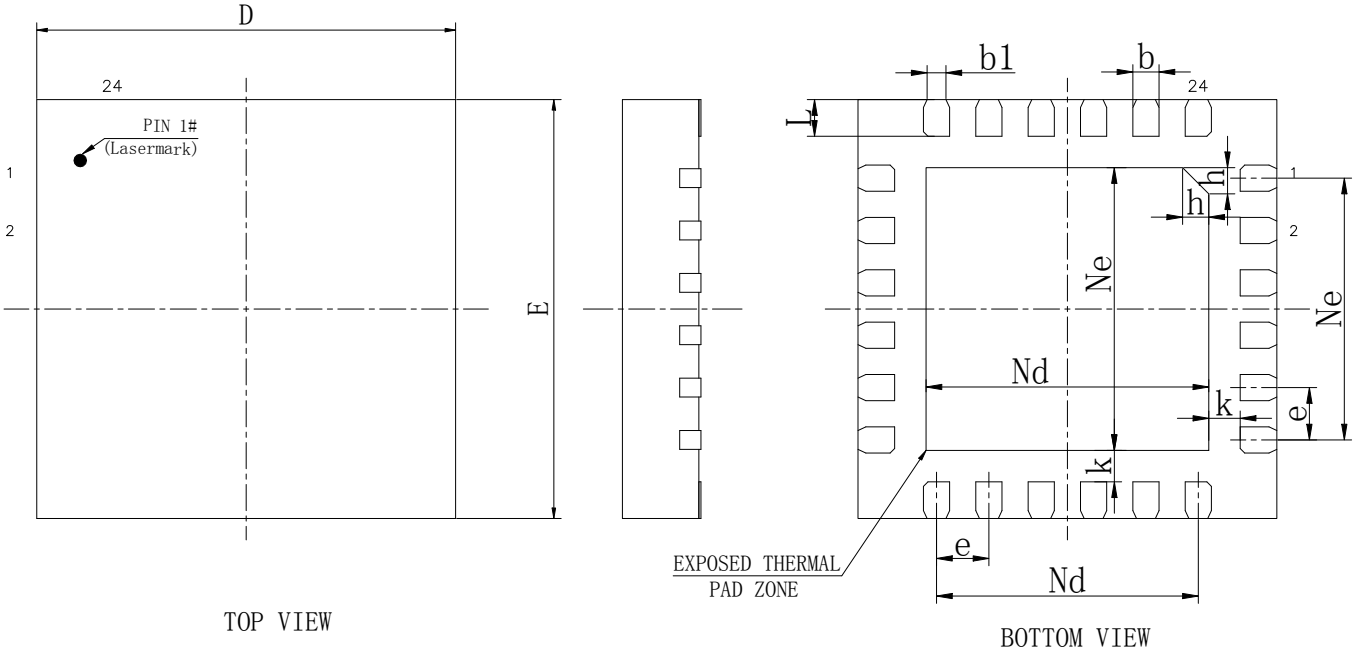
Parameters	Symbol	Test conditions	VCC	MIN	TYP	MAX	UNIT
I²C communication	f_{scl}	-	1.4 ~		0.4	1	MHz
I²C communication	$f_{scl,hs}$	-	5			2.4	MHz
Power on reset voltage	V_{POR}	-	5		1	1.2	V
GPIO pull current	I_{OH}	GPIO pins are grounded	5	1	5		mA
GPIO perfusion current	I_{OL}	Connect the GPIO pin to 1V	5	10	25		mA
SDA perfusion current	$I_{OL,SDA}$	The SDA pin is connected to 0.4V	1.4 ~	3			mA
INT perfusion current	$I_{OL,INT}$	The INT pin is connected to 0.4V	1.4 ~	3			mA
Power supply current	I_{work}	I²C communication frequency 100kHz	5		40	100	uA
Power supply current	I_{idle}	I²C does not correspond	5		1	10	uA

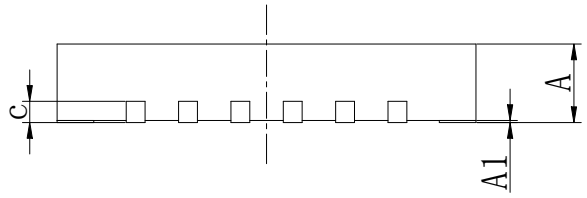
Switching Sequence

Unless otherwise specified, the following data apply within the operating temperature range with the GPIO port load capacitance <100pF. (Typical operating conditions are + 25℃ and 3.3V)

PARAMETER	SYMBOL	FROM	TO	MIN	TYP	MAX	UNIT
Output data valid	t_{pv}	SCL	GPIO			4	us
Input data setup time	t_{su}	GPIO	SCL		0		us
Input data hold time	t_h	GPIO	SCL		4		us
Interrupt valid time	t_{iv}	GPIO	INT			4	us
Interrupt reset delay time	t_{ir}	SCL	INT			4	us

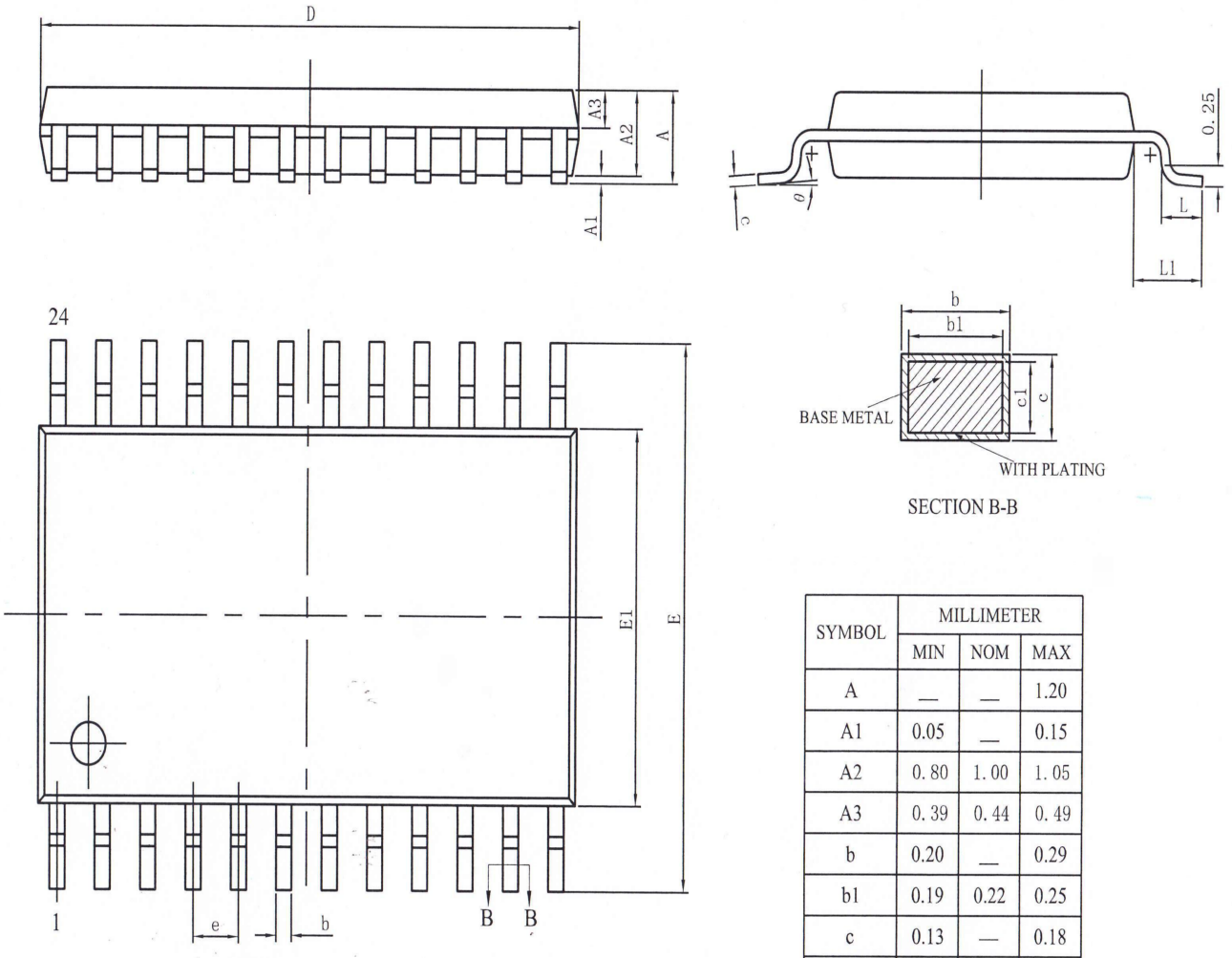
QFN -24





SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	0	0.02	0.05
b	0.20	0.25	0.30
b1	0.18REF		
c	0.203REF		
D	3.90	4.00	4.10
D2	2.60	2.70	2.80
e	0.50BSC		
Ne	2.50BSC		
Nd	2.50BSC		
E	3.90	4.00	4.10
E2	2.60	2.70	2.80
L	0.30	0.35	0.40
h	0.20	0.25	0.30
k	0.30REF		

TSSOP-24



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	—	—	1.20
A1	0.05	—	0.15
A2	0. 80	1. 00	1. 05
A3	0. 39	0. 44	0. 49
b	0.20	—	0.29
b1	0.19	0.22	0.25
c	0.13	—	0.18
c1	0.12	0.13	0.14
D	7.70	7.80	7.90
E	6.20	6.40	6.60
E1	4.30	4.40	4.50
e	0.65BSC		
L	0. 45	0. 60	0. 75
L1	1.00BSC		
θ	0	—	8°

Ordering information

Order code	Package	Baseqty	Deliverymode	Marking
UMW TCA9535PWR	TSSOP-24	2000	Tape and reel	PW535
UMW TCA9535RTWR	QFN-24	3000	Tape and reel	PW535