Octal Buffer/Driver With 3-State Outputs

Description

This FLG244 is an octal non-inverting buffer/driver with 3-state outputs.The 3-state outputs are controlled by the output enable inputs 1 $\overline{OE}$ and 2 $\overline{OE}$. A HIGH on $\overline{OE}$ causes the outputs to assume a high impedance OFF-state. V_{CC} supporting operating voltage from 1.65 V to 5.5 V.

To ensure the high-impedance state during power up or power down, $\overline{OE}$ should be tied to V_{CC} through a pullup resistor, the minimum value of the resistor is determined by the current-sinking capability of the driver.

Features

- Power-Supply Range:1.65V to 5.5V
- V_{CC} Isolation: If V_{CC} is at GND, Both Ports are in the High-Impedance State
- Extended Temperature : -40°C to +125°C
- I_{OFF}: Supports Partial-Power-Down Mode Operation

Applications

- Handset
- Smartphone
- Tablet
- Desktop PC

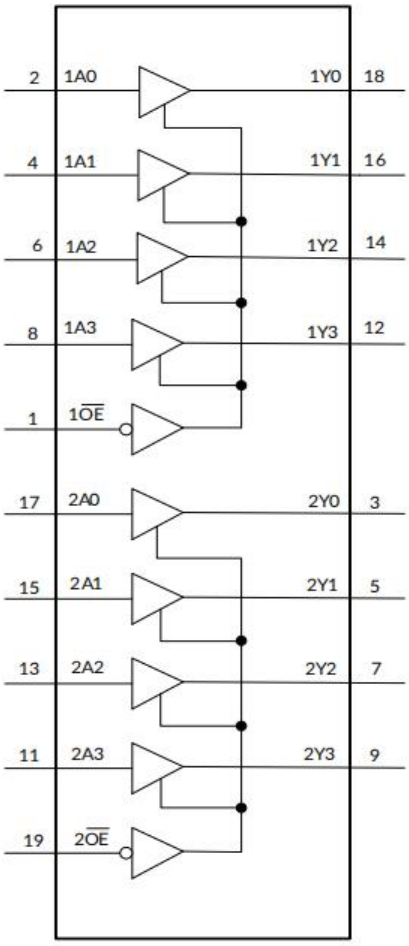
Order information (1)

Mode	Package	Specified Temperature range	Ordering Number	Packing Option
FLG244	SOP20	-40℃ to +125℃	FLG244YSOP20G/TR	Tape and Reel,1500
	TSSOP20	-40℃ to +125℃	FLG244YTSSOP20G/TR	Tape and Reel,4000

Note:

(1) This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document.

Functional Block Diagram



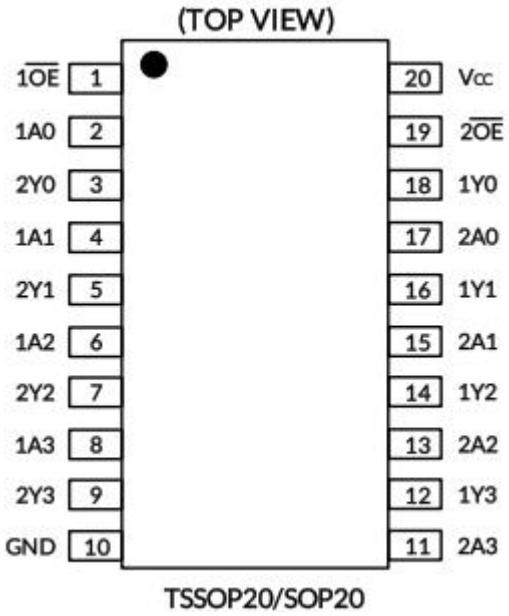
Function Table

INPUTS		OUTPUT
$\overline{OE}$	A PORT	Y PORT
L	H	H
L	L	L
H	X	Hi-Z

Note:

H=High Voltage Level, L=Low Voltage Level, X=don't care, Z=high impedance OFF-state

Pin Configuration



Pin Description

Pin TSSOP20/SOP20	Name	Type (1)	Function
1	$1\overline{OE}$	I	Output Enable (Active Low). Pull $1\overline{OE}$ high to place all outputs in 3-state mode.
2	1A0	I	Input
3	2Y0	O	Output
4	1A1	I	Input
5	2Y1	O	Output
6	1A2	I	Input
7	2Y2	O	Output
8	1A3	I	Input
9	2Y3	O	Output
10	GND	G	Ground.
11	2A3	I	Input
12	1Y3	O	Output
13	2A2	I	Input
14	1Y2	O	Output
15	2A1	I	Input
16	1Y1	O	Output
17	2A0	I	Input
18	1Y0	O	Output
19	$2\overline{OE}$	I	Output Enable (Active Low). Pull $2\overline{OE}$ high to place all outputs in 3-state mode.
20	V_{CC}	P	Supply voltage. $1.65V \leq V_{CC} \leq 5.5V$

Note:

I=input, O=output, I/O=input and output, P=power.

Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted) (1)

Symbol	Parameter		Min	Max	Unit
V_{CC}	Supply Voltage Range		-0.5	6.5	V
V_I (2)	Input Voltage Range	A port	-0.5	6.5	V
		Control inputs	-0.5	6.5	V
V_O (2)	Voltage range applied to any output in the high-impedance or power-off state	Y port	-0.5	6.5	V
V_O (2)(3)	Voltage range applied to any output in the high or low state	Y port	-0.5	V_{CC}+0.5	V
I_{IK}	Input clamp current	V_I<0		-50	mA
I_{OK}	Output clamp current	Vo<0		-50	mA
I_O	Continuous output current			±50	mA
	Continuous current through V_{CC} or GND			±100	mA
θ_{JA}	Package thermal impedance (4)	TSSOP20		40	°C/W
		SOP20		40	
T_J	Junction Temperature (5)		-40	150	°C
T_{stg}	Storage temperature		-65	150	

Note:

(1) Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under Recommended Operating Conditions is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

(2) The input and output negative-voltage ratings may be exceeded if the input and output current ratings are observed.

(3) The value of V_{CC} is provided in the Recommended Operating Conditions table.

(4) The package thermal impedance is calculated in accordance with JESD-51.

(5) The maximum power dissipation is a function of $T_{J(MAX)}$, $R_{\theta JA}$, and T_A. The maximum allowable power dissipation at any ambient temperature is $P_D = (T_{J(MAX)} - T_A) / R_{\theta JA}$. All numbers apply for packages soldered directly onto a PCB.

ESD Ratings

The following ESD information is provided for handling of ESD-sensitive devices in an ESD protected area only.

		Value	Unit
$V_{(ESD)}$ Electrostatic discharge	Human-body model (HBM)), MIL-STD-883K METHOD 3015.9	±1500	V
	Charged device model (CDM), ANSI/ESDA/JEDEC JS-002-2018	±1500	V
	Machine model (MM), JESD22-A115	±200	V

ESD SENSITIVITY CAUTION

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

Recommanded Operating Range

V_{CC} is the supply voltage associated with the input port and output port. (1)(2)

Parameter		V_{CC}	Min	Typ	Max	Unit
Supply voltage	V_{CC}		1.65		5.5	V
High-level input Voltage (V_{IH})	Inputs (3)	1.65V to 1.95V	V_{CC} x0.65			V
		2.3V to 2.7V	1.7			
		3V to 3.6V	2			
		4.5V to 5.5V	V_{CC} x0.7			
Low-level input Voltage (V_{IL})	Inputs (3)	1.65V to 1.95V			V_{CC}x0.35	V
		2.3V to 2.7V			0.7	
		3V to 3.6V			0.8	
		4.5V to 5.5V			V_{CC}x0.3	
Input voltage (V_I)	Input voltage		0		5.5	V
Output voltage (V_O)	Output voltage		0		V_{CC}	V
High-level output current (I_{OH})		1.65V to 1.95V			-4	mA
		2.3V to 2.7V			-8	
		3V to 3.6V			-24	
		4.5V to 5.5V			-32	
Low-level output current (I_{OL})		1.65V to 1.95V			4	mA
		2.3V to 2.7V			8	
		3V to 3.6V			24	
		4.5V to 5.5V			32	

Input transition rise or fall rate(Δt/Δv)	Data inputs	1.65V to 1.95V			20	ns/V
		2.3V to 2.7V			20	
		3V to 3.6V			10	
		4.5V to 5.5V			5	
T_A Operating free-air temperature			-40		125	°C

Note:

(1) All unused or driven (floating) data inputs (I/Os) of the device must be held at logic HIGH or LOW (preferably V_{CC} or GND) to ensure proper device operation and minimize power.

(2) All unused control inputs must be held at V_{CC} or GND to ensure proper device operation and minimize power consumption.

(3) For V_{CC} values not specified in the data sheet, V_{IH} min = V_{CC} × 0.7 V, V_{IL} max = V_{CC} × 0.3 V.

Electrical Characteristics

over recommended operating free-air temperature range (Full=-40°C to +125°C,TYP values are at T_A = +25°C, unless otherwise noted.) (1)

Parameter	Conditions	V_{CC}	Temp	MIN(1)	TYP(2)	MAX(1)	UNIT
V_{OH}	I_{OH} = -100 μA V_I=V_{IH}	1.65V to 4.5V	Full	V_{CC}-0.1			V
	I_{OH} = -4mA V_I=V_{IH}	1.65V		1.2			
	I_{OH} = -8mA V_I=V_{IH}	2.3V		1.9			
	I_{OH} = -24mA V_I=V_{IH}	3V		2.4			
	I_{OH} = -32mA V_I=V_{IH}	4.5V		3.8			
V_{OL}	I_{OL} = 100 μA V_I=V_{IL}	1.65V to 4.5V				0.1	V
	I_{OL} = 4mA V_I=V_{IL}	1.65V				0.45	
	I_{OL} = 8mA V_I=V_{IL}	2.3V				0.3	
	I_{OL} = 24mA V_I=V_{IL}	3V				0.55	
	I_{OL} = 32mA V_I=V_{IL}	4.5V				0.55	
I_I	V_I = 5.5V or GND	5.5V	+25°C			±1	μA
I_{off}	V_I or V_O = 0 to 5.5V	0V	+25°C			±1	μA
			Full			±2	
I_{OZ} (3)	V_O = V_{CC} or GND, $\overline{OE}$ =V_{IH}	1.65V to 5.5V	+25°C			±1	μA
			Full			±2	
I_{CC} V_{CC} supply current	V_I = V_{CC} or GND (4) I_O = 0	1.65V to 5.5V	+25°C			1	μA
			Full			5	
		0V	Full			-2	
ΔI_{CC}	One A port at V_{CC} - 0.6V, Y port = open	3V to 5.5V	Full			50	μA
C_I	V_I = VCC or GND	3.3V	+25°C		8.5		pF

C_O	$V_O = V_{CC}$ or GND	3.3V	+25°C		8.5		pF

Note:

(1) Limits are 100% production tested at 25°C. Limits over the operating temperature range are ensured through correlations using statistical quality control (SQC) method.

(2) Typical values represent the most likely parametric norm as determined at the time of characterization. Actual typical values may vary over time and will also depend on the application and configuration.

(3) For I/O ports, the parameter I_{OZ} includes the input leakage current.

(4) Hold all unused data inputs of the device at V_{CCI} or GND to assure proper device operation.

Switching Characteristics

Parameter	From (Input)	To (Output)	V_{CC}=1.8V ±0.15V		V_{CC}=2.5V ±0.2V		V_{CC}=3.3V ±0.3V		V_{CC}=5V ±0.5V		Unit
			Min	Max	Min	Max	Min	Max	Min	Max	
t_{PLH}	An	Yn	1.7	21.6	1.3	9.1	1.0	7.4	0.8	7.1	ns
t_{PHL}											
t_{PHZ}	$\overline{OE}$	Yn	2.4	32.2	1.9	12.9	1.7	12.0	1.3	10.2	ns
t_{PLZ}											
t_{PZH}	$\overline{OE}$	Yn	1.8	31.9	1.5	16	1.2	12.6	0.9	10.8	ns
t_{PZL}											

Operating Characteristics

T_A=25°C

Parameter		Test Conditions	V_{CC}=1.8V	V_{CC}=2.5V	V_{CC}=3.3V	V_{CC}=5V	Unit
			Typ	Typ	Typ	Typ	
$Cpd^{(1)}$	Outputs enabled	C_L=0, f=10MHz, tr=tf=1ns	42	42	43	44	pF
	Outputs disabled		2	2	2	3	

Note:

(1) Power dissipation capacitance per transceiver.

Typical Characteristics

NOTE: The graphs and tables provided following this note are a statistical summary based on a limited number of samples and are provided for informational purposes only.

At T_A = +25°C, V_{CC}=5V, unless otherwise noted.

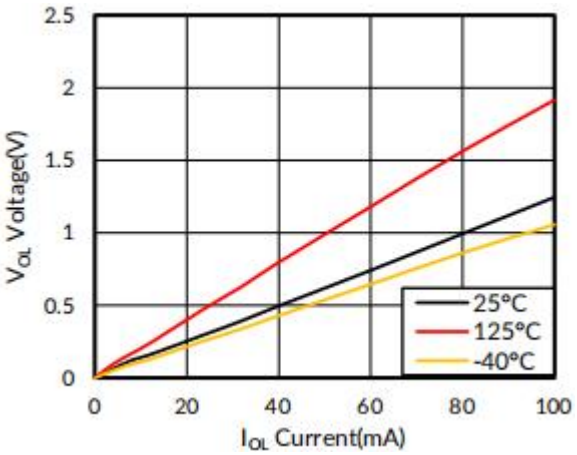


Figure 1. Voltage vs Current

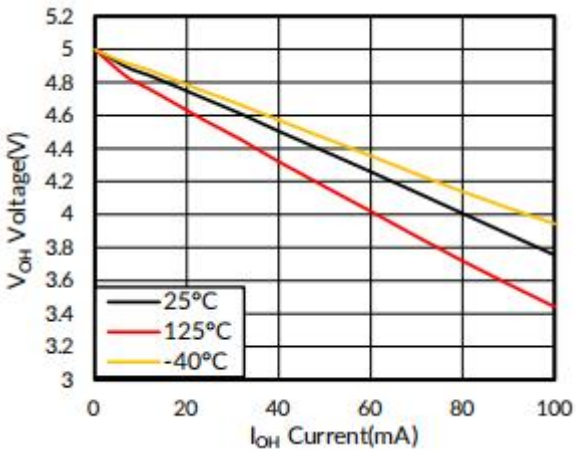
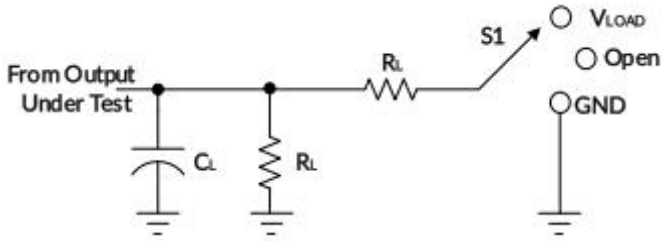


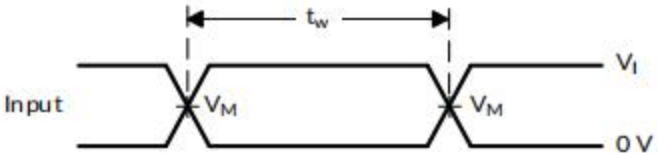
Figure 2. Voltage vs Current

Parameter Measurement Information

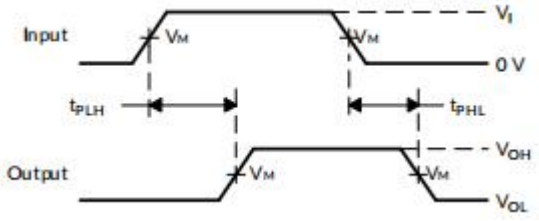


Test	S1
t_{Pd}	Open
t_{PLZ}/t_{PZL}	V_{LOAD}
t_{PHZ}/t_{PZH}	GND

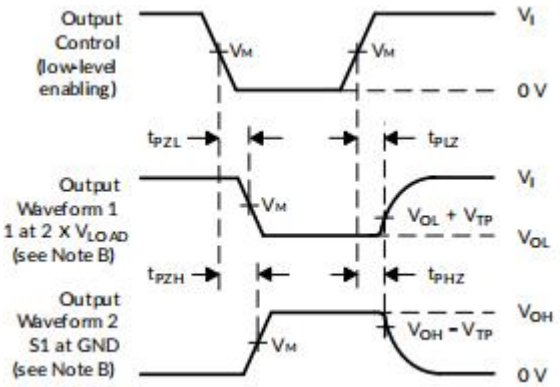
V_{CC}	V_I	V_M	C_L	R_L	V_Δ
1.8V±0.15V	V_{CC}	$V_{CC}/2$	15pF	2kΩ	0.15V
2.5V±0.2V	V_{CC}	$V_{CC}/2$	15pF	2kΩ	0.15V
3.3V±0.3V	2.7V	1.5V	15pF	2kΩ	0.3V
5V±0.5V	2.7V	1.5V	15pF	2kΩ	0.3V



Voltage Waveforms Pulse Duration



Voltage Waveforms Propagation Delay Times



Voltage Waveforms Enable And Disable Times

Notes:

A. C_L includes probe and jig capacitance.

B. Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.

C. All input pulses are supplied by generators having the following characteristics: PRR ≤ 10 MHz, Z_O = 50Ω dv/dt≥ 1V/ns.

D. The outputs are measured one at a time, with one transition per measurement.

E. t_{PLZ} and t_{PHZ} are the same as t_{dis}.

F. t_{PZL} and t_{PZH} are the same as t_{en}.

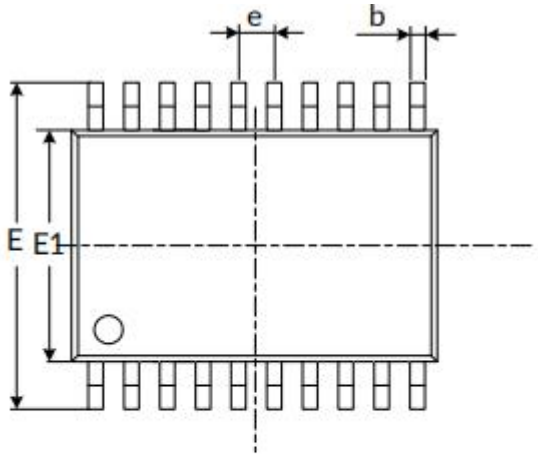
G. t_{PLH} and t_{PHL} are the same as t_{pd}.

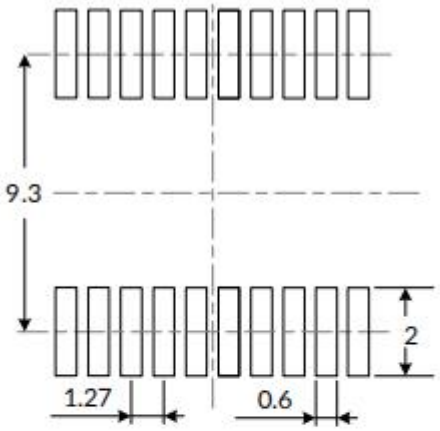
H. All parameters and waveforms are not applicable to all devices.

Figure 3. Load Circuit and Voltage Waveforms

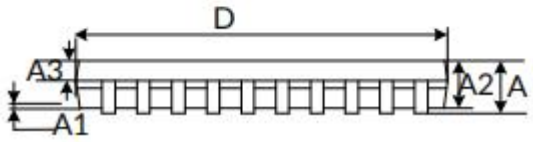
Package Outline Dimensions(All dimensions in mm.)

Package Type: SOP20 (4)





RECOMMENDED LAND PATTERN (Unit: mm)

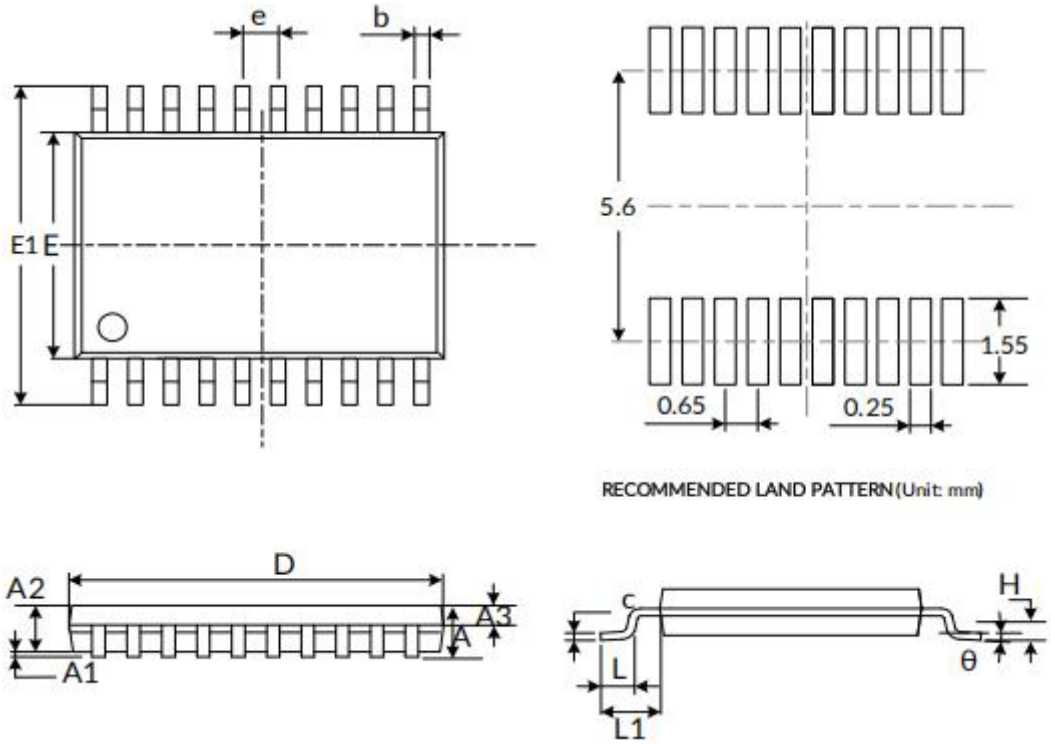


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A (1)		2.650		0.104
A1	0.100	0.300	0.004	0.012
A2	2.250	2.350	0.089	0.093
A3	0.970	1.070	0.038	0.042
b	0.390	0.470	0.015	0.019
c	0.250	0.290	0.010	0.011
D (1)	12.700	12.900	0.500	0.508
E	10.100	10.500	0.398	0.413
E1 (1)	7.400	7.600	0.291	0.299
e	1.270(BSC) (2)		0.050(BSC) (2)	
L	0.700	1.000	0.028	0.039
H	0.250(TYP)		0.010(TYP)	
θ	0°	8°	0°	8°
L1	1.400(REF) (3)		0.055(REF) (3)	

Note:

1. Plastic or metal protrusions of 0.15mm maximum per side are not included.
2. BSC (Basic Spacing between Centers), "Basic" spacing is nominal.
3. REF is the abbreviation for Reference.
4. This drawing is subject to change without notice.

Package Type: TSSOP20 (4)



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A (1)		1.200		0.047
A1	0.050	0.150	0.002	0.006
A2	0.800	1.050	0.031	0.041
A3	0.390	0.490	0.015	0.020
b	0.200	0.290	0.008	0.011
c	0.130	0.170	0.005	0.007
D (1)	6.400	6.600	0.252	0.260
E (1)	4.300	4.500	0.169	0.177
E1	6.200	6.600	0.244	0.260
e	0.650(BSC) (2)		0.026(BSC) (2)	
L	0.450	0.750	0.018	0.030
H	0.250(TYP)		0.010(TYP)	
θ	0°	8°	0°	8°
L1	1.00(REF) (3)		0.039(REF) (3)	

Note:

1. Plastic or metal protrusions of 0.15mm maximum per side are not included.
2. BSC (Basic Spacing between Centers), "Basic" spacing is nominal.
3. REF is the abbreviation for Reference.
4. This drawing is subject to change without notice.

Important Notice And Disclaimer

- We reserves the right to change the instruction manual without prior notice.
- Any semiconductor product has a certain possibility of failure or malfunction under specific conditions. The buyer is responsible for complying with safety standards and taking safety measures when using our products for system design and overall manufacturing to avoid potential failure risks that may cause personal injury or property damage.
- The improvement of product quality is endless, our company will be dedicated to provide customers with better products.