

6-Channel Inverter Gate

Description

The FLG6G04 6-channel inverter gate is designed for 1.65V to 5.5V V_{CC} operation.

The FLG6G04 device performs the Boolean function $Y = \overline{A}$.

The CMOS device has high output drive while maintaining low static power dissipation over a broad V_{CC} operating range.

The FLG6G04 is available in Green SOP14, TSSOP14 packages. It operates over an ambient temperature range of -40°C to 125°C.

Features

- Operating Voltage Range: 1.65V to 5.5V
- Low Power Consumption: 1μA (Max)
- Operating Temperature Range: -40°C to +125°C
- Input accept Voltage to 5.5V
- High Output Drive: ±24mA at $V_{CC}=3.0V$
- I_{off} Supports Partial-Power-Down Mode Operation
- Micro Size Packages: SOP14, TSSOP14

Applications

- AC Receiver
- Blu-ray Players and Home Theaters
- Desktops or Notebook PCs
- Digital Video Cameras (DVC)
- Mobile Phones
- Personal Navigation Device (GPS)
- Portable Media Player

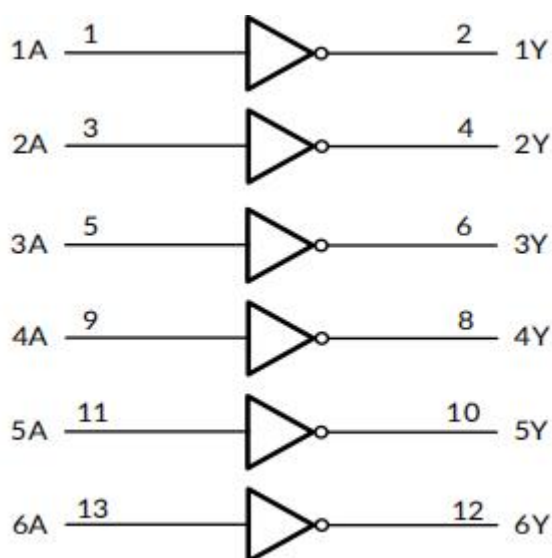
Order information ⁽¹⁾

Mode	Package	Specified Temperature range	Ordering Number	Packing Option
FLG6G04	SOP14	-40°C to +125°C	FLG6G04YSOP14G/TR	Tape and Reel,4000
	TSSOP14	-40°C to +125°C	FLG6G04YTSSOP14G/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.

LOGIC SYMBOL



Function Table

INPUT	OUTPUT
A	Y
H	L
L	H

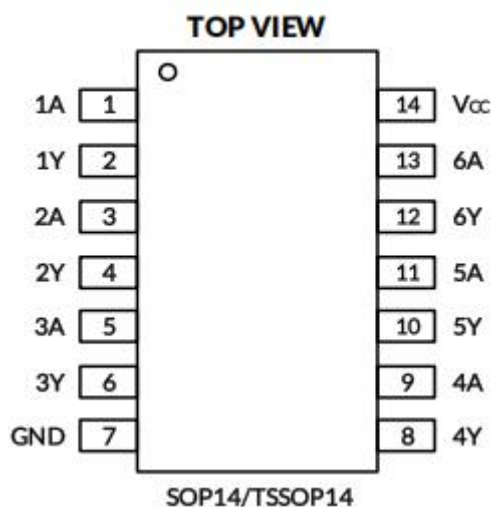
Note:

H=High Voltage Level

L=Low Voltage Level

$Y = \bar{A}$

Pin Configuration



Pin Description

Name	Pin	I/O ⁽¹⁾	Description
	SOP14/TSSOP14		
1A	1	I	Input 1
1Y	2	O	output 1
2A	3	I	Input 2
2Y	4	O	output 2
3A	5	I	Input 3
3Y	6	O	output 3
GND	7	P	Ground
4Y	8	O	output 4
4A	9	I	Input 4
5Y	10	O	output 5
5A	11	I	Input 5
6Y	12	O	output 6
6A	13	I	Input 6
Vcc	14	P	Power pin

Note:

I=input, O=output, P=Power.

Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted) ⁽¹⁾⁽²⁾

			Min	Max	Unit
V _{CC}	Supply voltage range		-0.5	6.5	V
V _I	Input voltage range ⁽²⁾		-0.5	6.5	V
V _O	Voltage range applied to any output in the high-impedance or power-off state ⁽²⁾		-0.5	6.5	V
V _O	Voltage range applied to any output in the high or low state ⁽²⁾⁽³⁾		-0.5	V _{CC} +0.5	V
I _{IK}	Input clamp current	V _I <0		-50	mA
I _{OK}	Output clamp current	V _O <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⁾	SOP14		105	°C/W
		TSSOP14		90	
T _J	Junction temperature ⁽⁵⁾		-65	150	°C
T _{stg}	Storage temperature		-65	150	°C

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_{θJA}, and T_A. The maximum allowable power dissipation at any ambient temperature is P_D = (T_{J(MAX)} - T_A) / R_{θJA}. 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)), per ANSI/ESDA/JEDEC JS-001 ⁽¹⁾	± 4000	V
		Charged device model (CDM), per ANSI/ESDA/JEDEC JS-002 ⁽²⁾	± 1500	V
		Machine model (MM))	± 400	V

Note:

(1) JEDEC document JEP155 states that 500 V HBM allows safe manufacturing with a standard ESD control process.

(2) JEDEC document JEP157 states that 250 V CDM allows safe manufacturing with a standard ESD control process

**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.

Recommended Operating Range

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

Parameter	Symbol	Test Conditions	Min	Max	Unit
Supply voltage	V_{CC}	Operating	1.65	5.5	V
		Data retention only	1.5		
High-level input voltage	V_{IH}	$V_{CC}=1.65\text{V to }1.95\text{V}$	$0.65 \times V_{CC}$		V
		$V_{CC}=2.3\text{V to }2.7\text{V}$	1.7		
		$V_{CC}=3\text{V to }3.6\text{V}$	2		
		$V_{CC}=4.5\text{V to }5.5\text{V}$	$0.7 \times V_{CC}$		
Low-level input voltage	V_{IL}	$V_{CC}=1.65\text{V to }1.95\text{V}$		$0.35 \times V_{CC}$	V
		$V_{CC}=2.3\text{V to }2.7\text{V}$		0.7	
		$V_{CC}=3\text{V to }3.6\text{V}$		0.8	
		$V_{CC}=4.5\text{V to }5.5\text{V}$		$0.3 \times V_{CC}$	
Input voltage	V_I		0	5.5	V
Output voltage	V_O		0	5.5	V
Input transition rise or fall	t_r, t_f	$V_{CC}=1.8\text{V} \pm 0.15\text{V}, 2.5\text{V} \pm 0.2\text{V}$		20	ns/V
		$V_{CC}=3.3\text{V} \pm 0.3\text{V}$		10	
		$V_{CC}=5\text{V} \pm 0.5\text{V}$		5	
Operating temperature	T_A		-40	+125	$^{\circ}\text{C}$

Note: (1) All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation.

Electrical Characteristics

● DC Characteristics

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

Parameter		Test Conditions	V _{CC}	Temp	Min ⁽²⁾	Typ ⁽³⁾	Max ⁽²⁾	Unit
V _{OH}		I _{OH} = -100μA	1.65V to 5.5V	Full	V _{CC} -0.1			V
		I _{OH} = -4mA	1.65V		1.2			
		I _{OH} = -8mA	2.3V		1.9			
		I _{OH} = -16mA	3V		2.4			
		I _{OH} = -24mA			2.3			
		I _{OH} = -32mA	4.5V		3.8			
V _{OL}		I _{OL} = 100μA	1.65V to 5.5V	Full			0.1	V
		I _{OL} = 4mA	1.65V				0.45	
		I _{OL} = 8mA	2.3V				0.3	
		I _{OL} = 16mA	3V				0.4	
		I _{OL} = 24mA					0.55	
		I _{OL} = 32mA	4.5V				0.55	
I _I	A input	V _I =5.5V or GND	0V to 5.5V	+25°C		±0.1	±1	μA
				Full			±5	
I _{off}		V _I or V _O =5.5V	0	+25°C		±0.1	±1	μA
				Full			±10	
I _{CC}		V _I =5.5V or GND, I _O =0	1.65V to 5.5V	+25°C		0.1	1	μA
				Full			10	
ΔI _{CC}		One input at V _{CC} -0.6V, Other inputs at V _{CC} or GND	3V to 5.5V	Full			500	μA
Input Capacitance (C _i)		V _I =V _{CC} or GND	3.3V	+25°C		4		pF

Note:

(1) All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation.

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

(3) 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.

● AC Characteristics

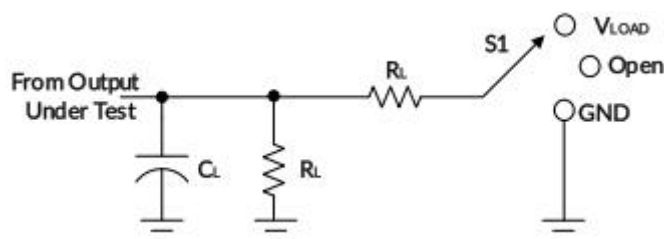
over recommended operating free-air temperature range (Full=-40°C to +125°C, TYP values are at $T_A = +25^\circ\text{C}$, unless otherwise noted.) ⁽¹⁾

Parameter	Symbol	Test Conditions		Min ⁽²⁾	Typ ⁽³⁾	Max ⁽²⁾	Unit
Propagation Delay	t_{pd}	$V_{CC}=1.8V\pm0.15V$	$C_L=30pF, R_L=1k\Omega$		13.0		ns
		$V_{CC}=2.5V\pm0.2V$	$C_L=30pF, R_L=500\Omega$		5.1		
		$V_{CC}=3.3V\pm0.3V$	$C_L=50pF, R_L=500\Omega$		4.2		
		$V_{CC}=5V\pm0.5V$	$C_L=50pF, R_L=500\Omega$		3.3		
Power dissipation capacitance	C_{pd}	$V_{CC}=1.8V$	$f=10MHz$		16		pF
		$V_{CC}=2.5V$			18		
		$V_{CC}=3.3V$			18		
		$V_{CC}=5V$			20		

Note:

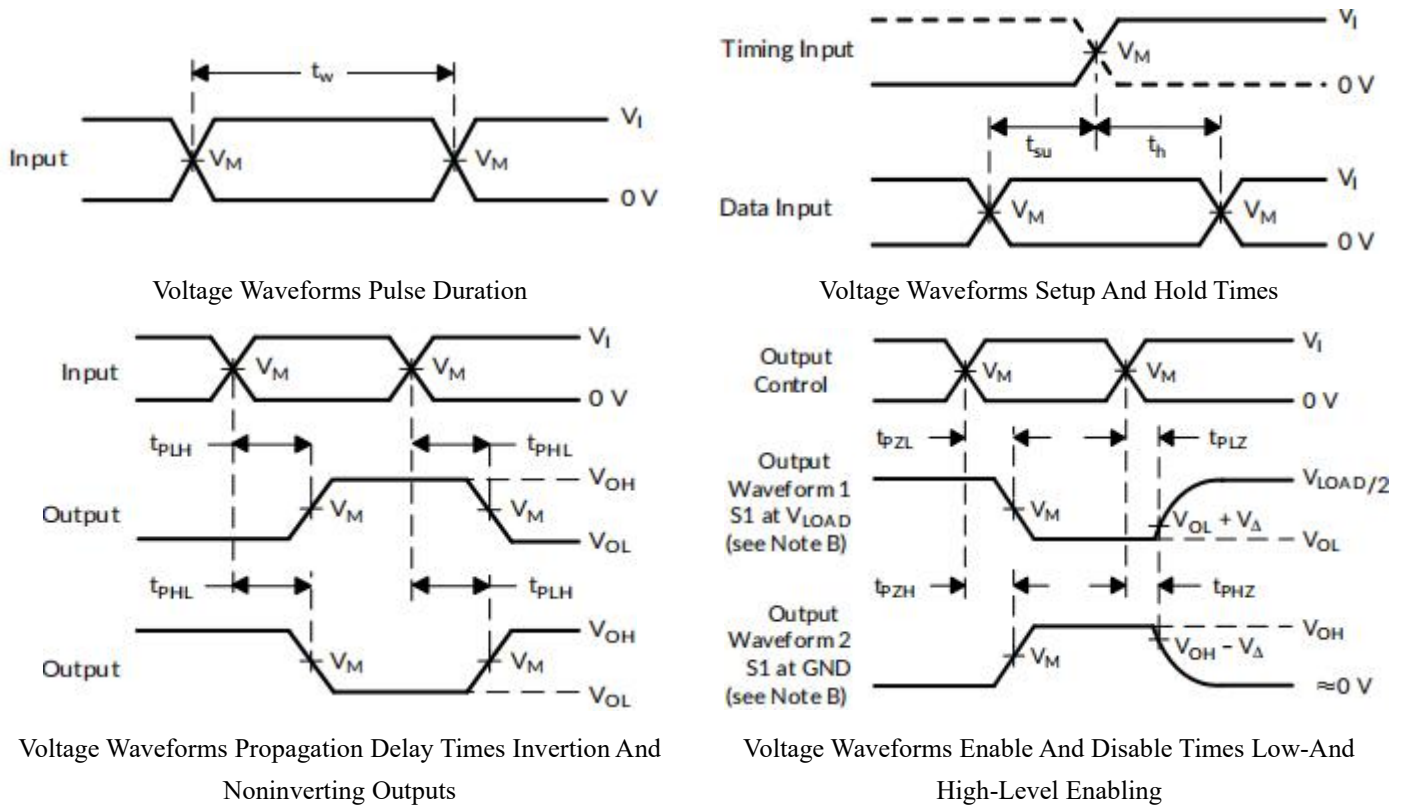
- (1) All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation.
- (2) This parameter is ensured by design and/or characterization and is not tested in production.
- (3) Typical values represent the most likely parametric norm as determined at the time of characterization. Actual typical values may vary over time and will also depend on the application and configuration.

Parameter Measurement Information



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

V_{CC}	INPUTS		V_M	V_{LOAD}	C_L	R_L	V_Δ
	V_I	tr/tf					
$1.8V\pm0.15V$	V_{CC}	$\leq 2ns$	$V_{CC}/2$	$2 \times V_{CC}$	30pF	1k Ω	0.15V
$2.5V\pm0.2V$	V_{CC}	$\leq 2ns$	$V_{CC}/2$	$2 \times V_{CC}$	30pF	500 Ω	0.15V
$3.3V\pm0.3V$	3V	$\leq 2.5ns$	1.5V	6V	50pF	500 Ω	0.3V
$5V\pm0.5V$	V_{CC}	$\leq 2.5ns$	$V_{CC}/2$	$2 \times V_{CC}$	50pF	500 Ω	0.3V



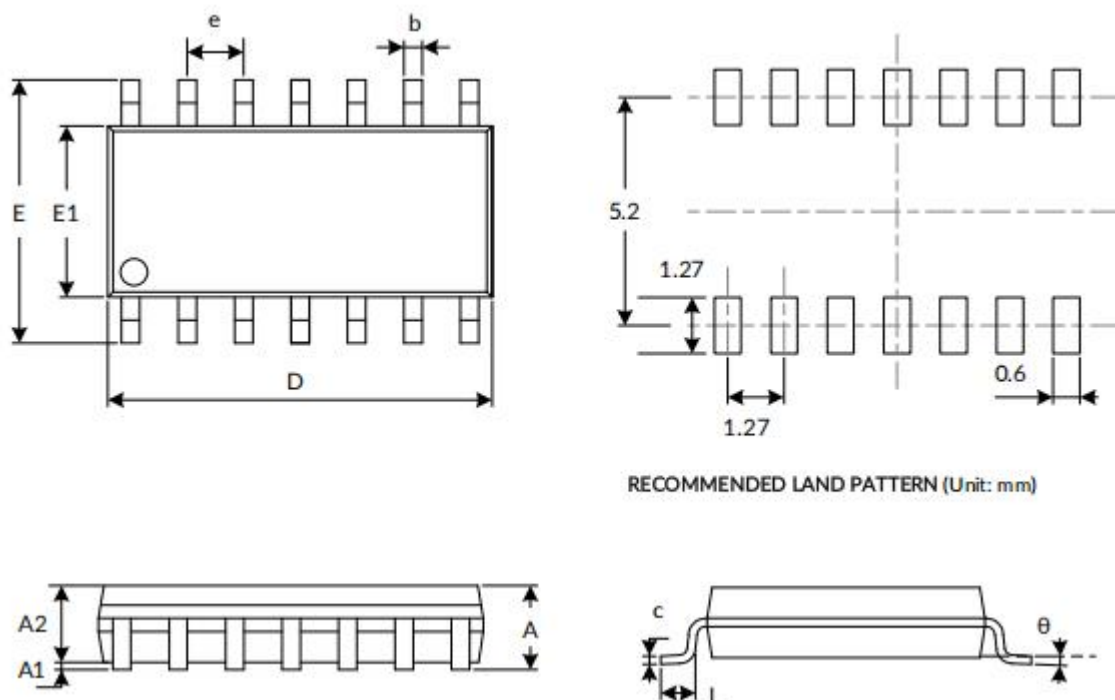
Notes:

- 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: $PRR \leq 10 \text{ MHz}$, $Z_O = 50\Omega$.
- 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 1. Load Circuit and Voltage Waveforms

Package Outline Dimensions(All dimensions in mm.)

Package Type: SOP14 ⁽³⁾

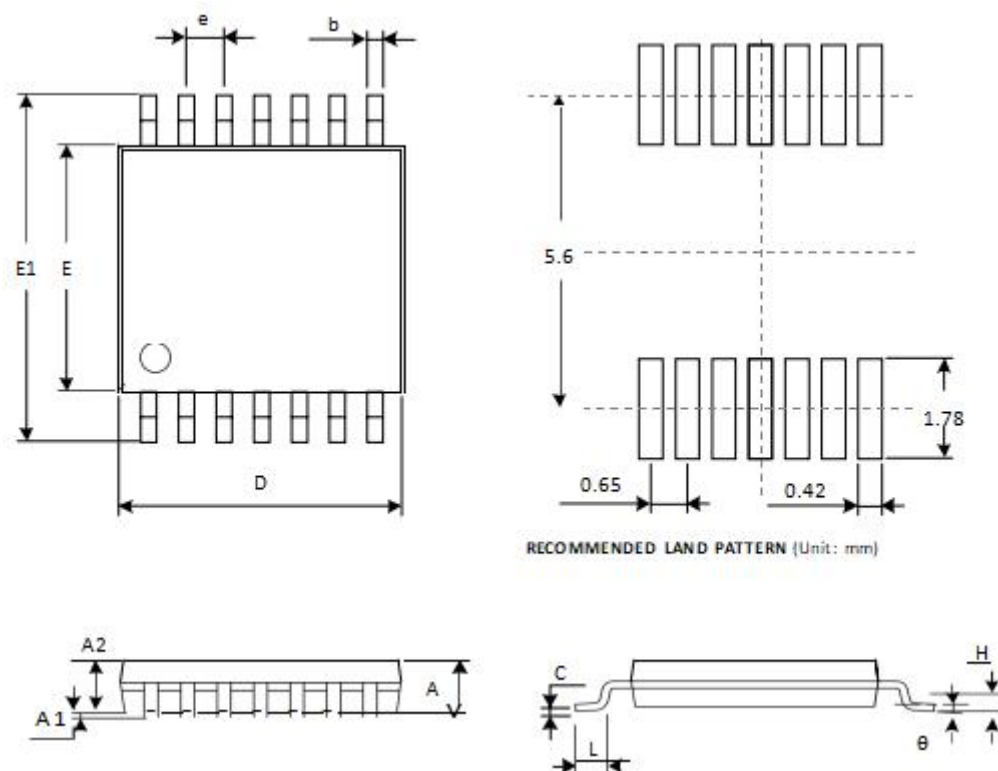


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A ⁽¹⁾	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.310	0.510	0.012	0.020
c	0.100	0.250	0.004	0.010
D ⁽¹⁾	8.450	8.850	0.333	0.348
e	1.270(BSC) ⁽²⁾		0.050(BSC) ⁽²⁾	
E	5.800	6.200	0.228	0.244
E1 ⁽¹⁾	3.800	4.000	0.150	0.157
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

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. This drawing is subject to change without notice.

Package Type: TSSOP14 ⁽³⁾



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
b	0.190	0.300	0.007	0.012
c	0.090	0.200	0.004	0.008
D ⁽¹⁾	4.860	5.100	0.191	0.201
E ⁽¹⁾	4.300	4.500	0.169	0.177
E1	6.250	6.550	0.246	0.258
e	0.650(BSC) ⁽²⁾		0.026(BSC) ⁽²⁾	
L	0.500	0.700	0.020	0.028
H	0.25(TYP)		0.01(TYP)	
θ	1°	7°	1°	7°

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. 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.