

Single 2-input NOR Gate

General Description

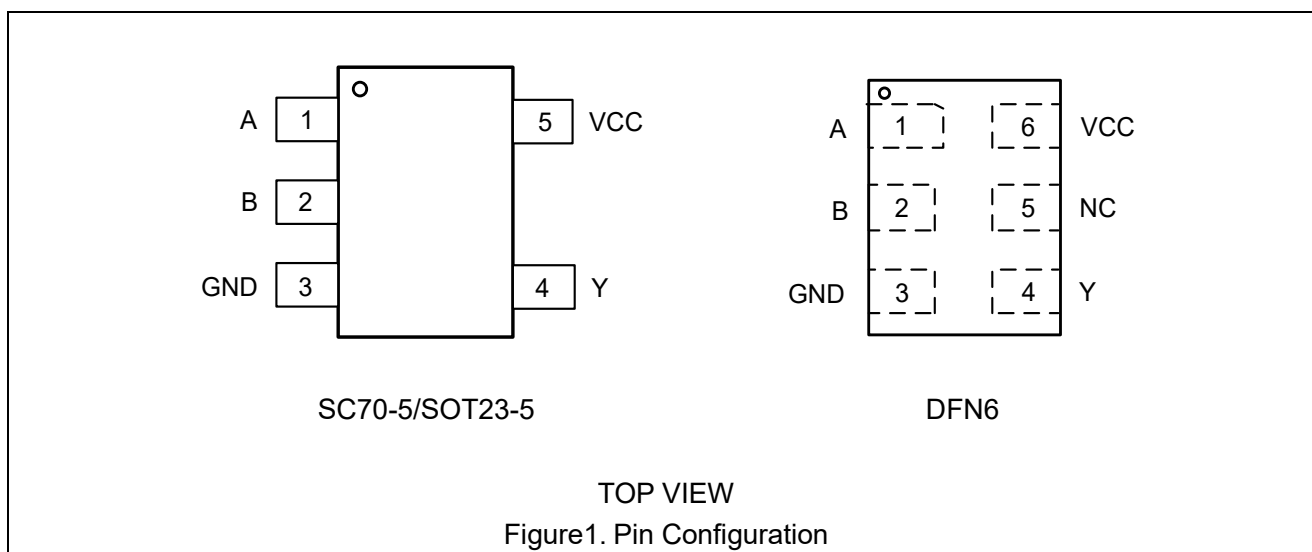
The ETQ74LVC1G02 is a high performance single 2-input NOR Gate operating from a 1.65V to 5.5V supply. This device is fabricated with advanced CMOS technology to achieve ultra-high speed with high output drive.

Features

- Designed for 1.65V to 5.5V V_{CC} Operation
- Over-Voltage Tolerant Inputs and Outputs
- $\pm 24\text{mA}$ Sink and Source Output Capability
- Near Zero Static Supply Current Substantially Reduces System Power Requirements
- These Devices are Pb-Free and are RoHS Compliant
- Multiple Package Options Automotive AEC-Q100 Grade 1 Qualified
 - Ambient Temperature Range of -40°C to $+125^{\circ}\text{C}$
 - ESD HBM $\pm 4\text{KV}$ PASS
 - ESD CDM $\pm 1\text{KV}$ PASS
 - Latch Up Current to $\pm 100\text{mA}$ PASS
- Part No. and Package Information

Part No.	Package	Packing Option	MSL
ETQ74LVC1G02	SC70-5(1.3mm × 2.1mm)	Tape and Reel, 3K/Reel	1
ETQ74LVC1G02T	SOT23-5(1.6mm × 2.9mm)	Tape and Reel, 3K/Reel	3
ETQ74LVC1G02Y	DFN6(1.0mm × 1.5mm)	Tape and Reel, 3K/Reel	1

Pin Configuration



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Pin Function

SC70-5/ SOT23-5

Pin No.	Pin Name	Function
1	A	Input A
2	B	Input B
3	GND	Ground
4	Y	Output Y
5	VCC	Supply Voltage

DFN6

Pin No.	Pin Name	Function
1	A	Input A
2	B	Input B
3	GND	Ground
4	Y	Output Y
5	NC	No Connect
6	VCC	Supply Voltage

Block Diagram

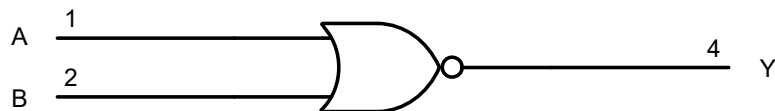


Figure2. Logic Symbol

Function Table

Input		Output
A	B	Y
L	L	H
L	H	L
H	L	L
H	H	L

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Absolute Maximum Ratings

Symbol	Parameter		Value	Unit
V _{CC}	DC Supply Voltage(VCC Pin)		-0.5 to 6.5	V
V _I	DC Input Voltage ⁽¹⁾		$-0.5 \leq V_I \leq 6.5$	V
V _O	DC Output Voltage Output in Higher or Low State		-0.5 to V _{CC} + 0.5	V
I _{IK}	DC Input Diode Current V _I < GND		-50	mA
I _{OK}	DC Output Diode Current V _O < GND, V _O > V _{CC}		±50	mA
I _O	DC Output Sink Current		±50	mA
I _{CC}	DC Supply Current per Supply Pin		+100	mA
I _{GND}	DC Ground Current per Supply Pin		-100	mA
T _{STG}	Storage Temperature Range		-65 to 150	°C
T _L	Lead Temperature, Soldering 10 Seconds		260	°C
T _J	Max Junction Temperature		150	°C
V _{ESD}	ESD Classification	Human Body Model ⁽²⁾	±4000	V
		Charged Device Model ⁽³⁾	±1000	
I _{LU}	Latch Up Current Above V _{CC} and GND at 125°C ⁽⁴⁾		±100	mA

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

Note1: I_O absolute maximum rating must be observed.

Note2: HBM tested per AEC-Q100-002(JEDEC JS-001);

Note3: CDM tested per AEC-Q100-011(JEDEC JS-002);

Note4: Latch up Current Maximum Rating tested per AEC-Q100-004(JEDEC JESD78F).

Thermal Characteristics

Symbol	Package	Ratings	Value	Unit
R _{θJA}	SC70-5	Thermal Characteristics, Thermal Resistance, Junction-to-Air	300	°C/W
	SOT23-5		250	
	DFN6		440	

Recommended Operating Conditions

Symbol	Parameter		Min	Max	Unit
V _{CC}	DC Supply Voltage		1.65	5.5	V
	Operating Date Retention		1.5	5.5	
V _{IN}	DC Input Voltage		0	5.5	V
V _{OUT}	DC Output Voltage (High or Low State)		0	5.5	V
T _A	Operating Temperature Range		-40	125	°C
t _r , t _f	Input Rise and Fall Time	V _{CC} = 2.5 V ± 0.2 V	0	20	ns/V
		V _{CC} = 3.0 V ± 0.3 V	0	10	
		V _{CC} = 5.0 V ± 0.5 V	0	5	

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Electrical Characteristics

DC Electrical Characteristics

Symbol	Parameter	Condition	V _{CC} (V)	T _A = 25°C			-40°C ≤ T _A ≤ 125°C		Unit
				Min	Typ	Max	Min	Max	
V _{IH}	High-Level Input Voltage		1.65 to 1.95 2.3 to 5.5	0.75V _{CC} 0.7V _{CC}			0.75V _{CC} 0.7V _{CC}		V
V _{IL}	Low-Level Input Voltage		1.65 to 1.95 2.3 to 5.5			0.25V _{CC} 0.3V _{CC}		0.25V _{CC} 0.3V _{CC}	V
V _{OH}	High-Level Output Voltage	I _{OH} = -100μA	1.65 to 5.5	V _{CC} -0.1	V _{CC}		V _{CC} -0.1		V
		I _{OH} = -3mA	1.65	1.29	1.4		1.29		
		I _{OH} = -8mA	2.3	1.9	2.1		1.9		
		I _{OH} = -12mA	2.7	2.2	2.4		2.2		
		I _{OH} = -16mA	3.0	2.4	2.7		2.4		
		I _{OH} = -24mA	3.0	2.3	2.5		2.3		
		I _{OH} = -32mA	4.5	3.8	4.0		3.8		
V _{OL}	Low-Level Output Voltage	I _{OH} = 100μA	1.65 to 5.5		0.0	0.1		0.1	V
		I _{OL} = 3mA	1.65		0.08	0.24		0.24	
		I _{OL} = 8mA	2.3		0.20	0.3		0.3	
		I _{OL} = 12mA	2.7		0.22	0.4		0.4	
		I _{OL} = 16mA	3.0		0.28	0.4		0.4	
		I _{OL} = 24mA	3.0		0.38	0.55		0.55	
		I _{OL} = 32mA	4.5		0.42	0.55		0.55	
I _{IN}	Input Leakage Current	V _{IN} = 5.5V or GND	0 to 5.5		±0.1			±1.0	μA
I _{OFF}	Power Off Leakage Current	V _{IN} = 5.5V or V _{OUT} = 5.5V	0			1		10	μA
I _{CC}	Quiescent Supply Current	V _{IN} = 5.5V or GND	5.5					10	μA

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

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AC Electrical Characteristics

$t_r = t_f = 5\text{ns}$; $C_L = 50\text{pF}$; $R_L = 500\Omega$.

Symbol	Parameter	Condition	$V_{CC}(\text{V})$	$T_A = 25^\circ\text{C}$			$-40^\circ\text{C} \leq T_A \leq 125^\circ\text{C}$		Unit
				Min	Typ	Max	Min	Max	
t_{PLH} t_{PHL}	Propagation Delay (Figure3 and4)	$R_L = 1\text{M}\Omega$, $C_L = 15\text{pF}$	1.65	2.0	5.3	11.4	2.0	12.0	ns
			1.8	2.0	4.4	9.5	2.0	10.0	
		$R_L = 1\text{M}\Omega$, $C_L = 15\text{pF}$	2.5 ± 0.2	0.8	3.0	6.5	0.8	7.0	
		$R_L = 1\text{M}\Omega$, $C_L = 15\text{pF}$	3.3 ± 0.3	0.5	2.4	4.5	0.5	4.7	
		$R_L = 500\Omega$, $C_L = 50\text{pF}$		1.5	2.5	5.5	1.5	5.2	
		$R_L = 1\text{M}\Omega$, $C_L = 15\text{pF}$	5.0 ± 0.5	0.5	2.0	3.9	0.5	4.1	
		$R_L = 500\Omega$, $C_L = 50\text{pF}$		0.8	2.4	4.3	0.8	4.5	

Capacitive Characteristics

Symbol	Parameter	Condition	Typ	Unit
C_{IN}	Input Capacitance	$V_{CC} = 5.5\text{V}$, $V_I = 0\text{V}$ or V_{CC}	2.5	pF
C_{PD}	Power Dissipation Capacitance (5)	10MHz, $V_{CC} = 3.3\text{V}$, $V_I = 0\text{V}$ or V_{CC}	26	pF
		10MHz, $V_{CC} = 5.5\text{V}$, $V_I = 0\text{V}$ or V_{CC}	30	

Note5: C_{PD} is used to determine the dynamic power dissipation (P_D in μW).

$P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o)$ where:

f_i = input frequency in MHz;

f_o = output frequency in MHz;

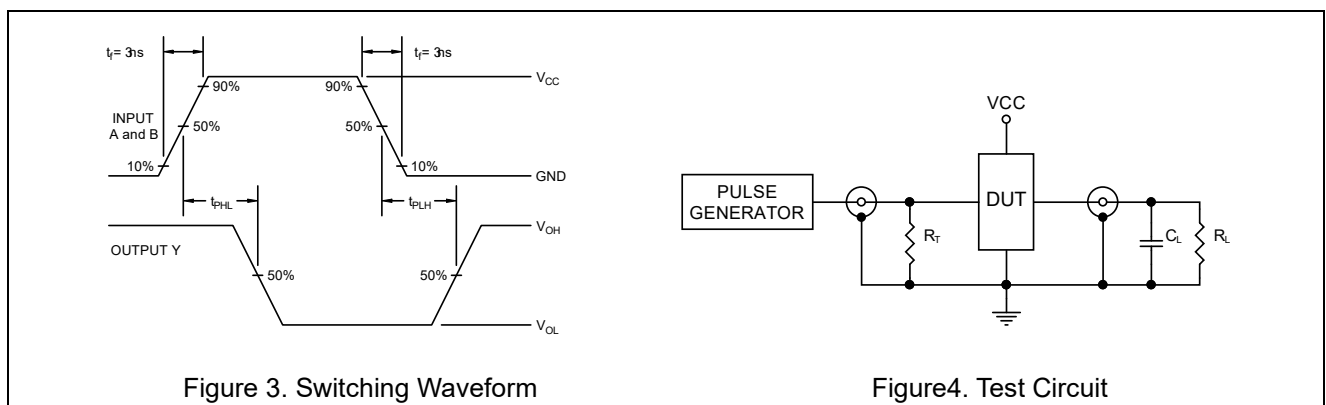
C_L = output load capacitance in pF;

V_{CC} = supply voltage in V;

N = number of inputs switching;

$\Sigma(C_L \times V_{CC}^2 \times f_o)$ = sum of outputs.

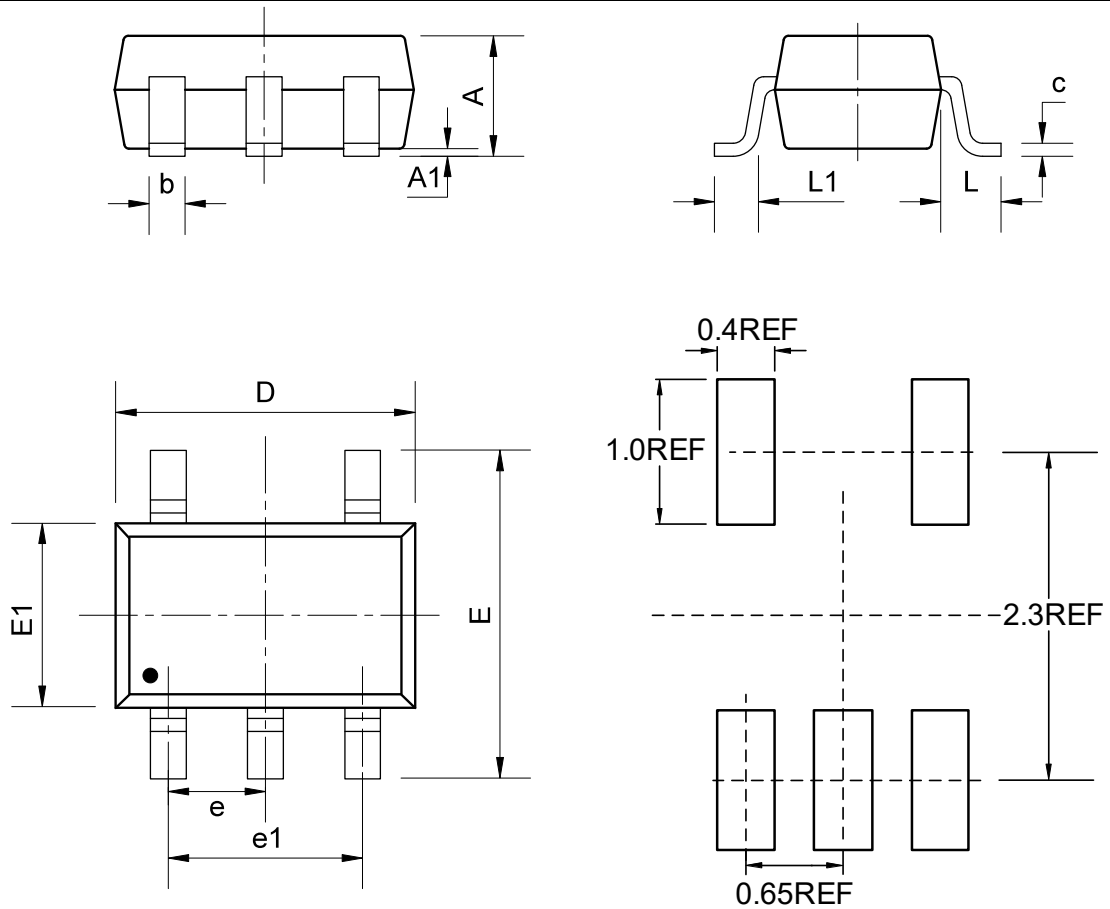
AC Test Circuit



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Package Dimension

SC70-5(1.3mm × 2.1mm)



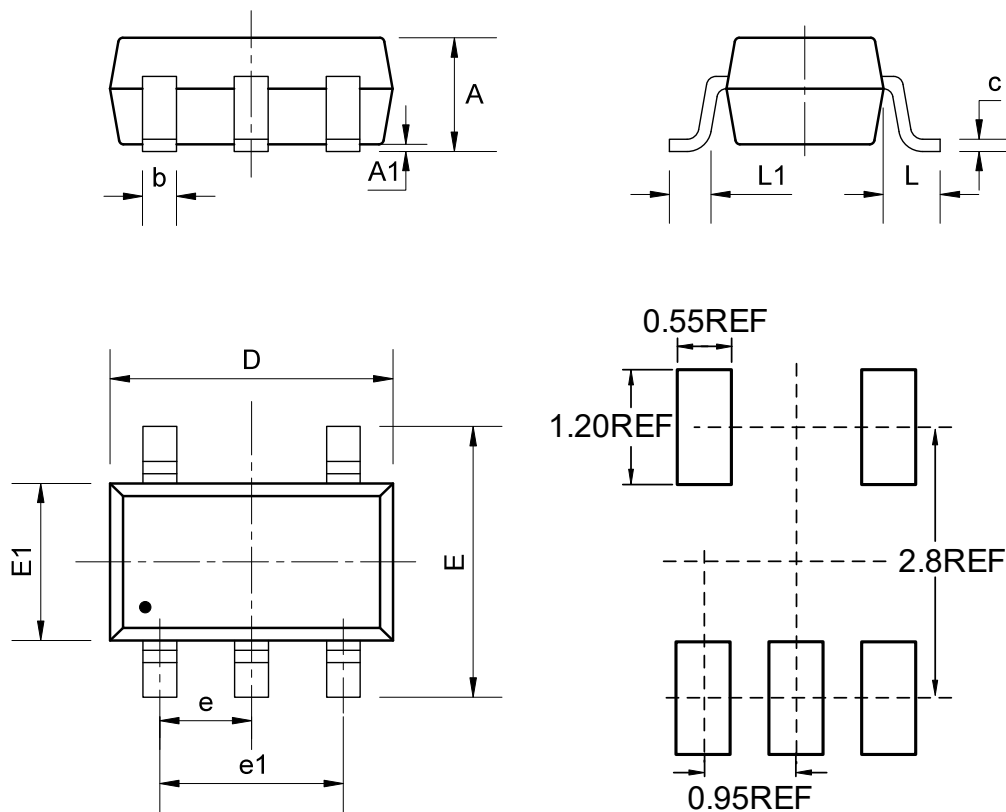
COMMON DIMENSIONS

(Unit: mm)

SYMBOL	MIN	NOM	MAX
A	-	-	1.05
A1	0	-	0.15
b	0.17	-	0.33
c	0.12	-	0.20
D	2.00	2.10	2.20
e	0.65BSC		
e1	1.30BSC		
E	2.20	2.30	2.40
E1	1.21	1.30	1.35
L	0.50REF		
L1	0.33REF		

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SOT23-5(1.6mm × 2.9mm)



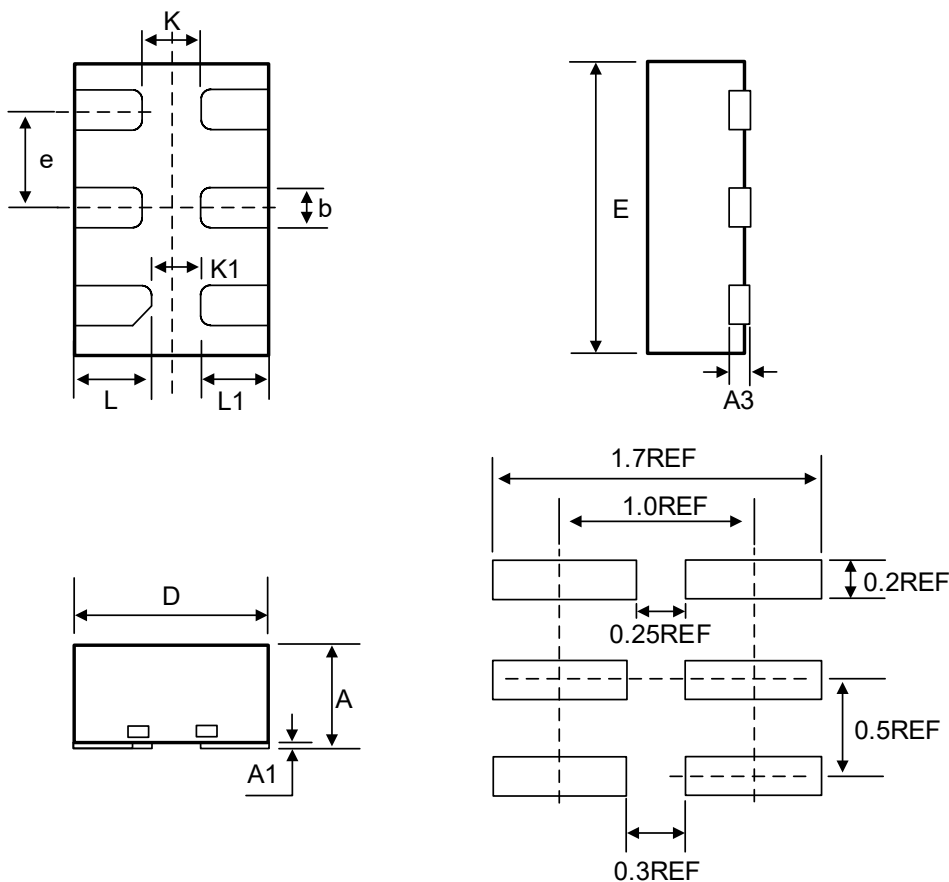
COMMON DIMENSIONS

(Unit: mm)

SYMBOL	MIN	NOM	MAX
A	-	-	1.25
A1	0	-	0.15
b	0.36	-	0.50
c	0.12	-	0.20
D	2.75	2.9	3.05
e	0.90	0.95	1.00
e1	1.80	1.90	2.00
E	2.60	2.80	3.00
E1	1.45	1.6	1.75
L	0.60REF		
L1	0.30	0.45	0.60

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DFN6 (1.0mm × 1.5mm)



COMMON DIMENSIONS

(Unit: mm)

SYMBOL	MIN	NOM	MAX
A	0.34	0.37	0.40
A1	0	0.02	0.05
A3	0.10REF		
b	0.10	0.15	0.20
D	0.95	1.00	1.05
E	0.95	1.00	1.05
e	0.30	0.35	0.40
H	0.10REF		
K	0.15	--	--
L	0.35	0.40	0.45
L1	0.075REF		

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Revision History and Checking Table

Version	Date	Revision Item	Modifier	Function & Spec Checking	Package & Tape Checking
1.0	2017-07-19	Original Version	Ma Yong jian	Ma Yong jian	Ma Yong jian
1.1	2021-06-25	Update DC/AC Table	Ma Yong jian	Ma Yong jian	Ma Yong jian
1.2	2022-07-05	Update Typeset	Shi bo	Shi bo	Shi bo
1.3	2022-08-01	Update Typeset	Shi bo	Shi bo	Shi bo
1.4	2022-10-14	Update format and Thermal Characteristics	Wu han	Shi bo	Zhu junli
1.5	2023-11-29	Update Typeset /ESD	Shi bo	Shi bo	Zhu junli
1.6	2025-06-07	Add Packing Option	Yang xiaoxu	Yang xiaoxu	Liu jiaying
1.7	2025-10-15	Update Format	Wang anran	Yang xiaoxu	Liu jiaying