



晶体管光耦

Photo Transistor

QX127X

宁波群芯微电子股份有限公司

NINGBO QUNXIN MICROELECTRONICS CO., LTD.

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概述 Description

QX127X是一款由发光二极管和光电晶体管组成的光电耦合器。四引脚封装。

The QX127X is a photoelectric coupler composed of light-emitting diode and phototransistor. It is packaged in a 4-pin package.

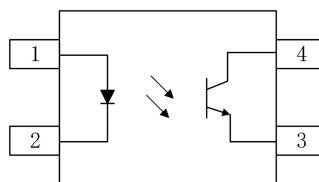
特性 Features

- 电流转换比(CTR)范围: $\geq 130\%$ ($I_F=5\text{mA}$, $V_{CE}=5\text{V}$, $T_A=25^\circ\text{C}$)
Current transfer ratio: $\geq 130\%$ ($I_F=5\text{mA}$, $V_{CE}=5\text{V}$, $T_A=25^\circ\text{C}$)
- 输入-输出隔离电压 ($V_{ISO}=3750\text{ V}_{rms}$)
High isolation voltage between input and output($V_{ISO}=3750\text{ V}_{rms}$)
- 集电极-发射极击穿电压 $BV_{CEO}\geq 75\text{V}$
Collector-emitter breakdown voltage $BV_{CEO}\geq 75\text{V}$
- AEC-Q101 合格
AEC-Q101 qualified
- 工作温度: $-40^\circ\text{C}\sim+125^\circ\text{C}$
Operating Temperature: $-40^\circ\text{C}\sim+125^\circ\text{C}$
- 符合加强绝缘标准
Meet reinforced insulation standards
- 符合安规标准 Meet safety standard approval:
 - VDE DIN EN60747-5-5 (VDE 0884-5) (CERTIFICATE NO UL-US-2128013-2)
 - UL 1577 (CERTIFICATE NO 40053982)
 - CQC 11-471543-2022 (CERTIFICATE NO CQC20001274613)

应用 Applications

- DC-DC 转换器
DC-DC converter
- 通讯设备
Communications equipment
- 可编程控制器
Programmable controller
- 信号传输
Signal transmission

封装和原理图 Package and Schematic Diagram



Pin Configuration

1. Anode
2. Cathode
3. Emitter
4. Collector

产品型号命名规则 Order Code

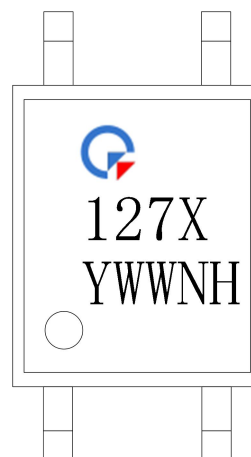
QX 127 X - UN Y - W (V) (ZZ)

① ② ③ ④ ⑤ ⑥ ⑦ ⑧

- ① 公司代码 Company Code (QX: 群芯 Qunxin)
- ② 产品系列 Product Series (127: 127)
- ③ 产品分档 classification: B、C、D、E 或空白
- ④ 框架类型 Lead Frame (Cu: 铜框架 Copper)
- ⑤ 树脂类型 Epoxy Type (H: 无卤 Halogen-free)
- ⑥ 封装形式 Package (S: SOP)
- ⑦ 器件工作温度范围 Device Operating Temperature Range (特殊范围需填或者空白 Special Range need to be filled in or left blank)
- ⑧ 内部补充代码 Internal Supplementary Code (数字或者空白 Number or None)

印字信息 Marking Information

- 印字中“”为群芯品牌 LOGO
“”denotes LOGO
- 印字中“X”代表产品分档: B、C、D、E 或空白
denotes the classification: B、C、D、E or None
- 印字中“Y”代表年份: A(2018),B(2019),C(2020).....
“Y”denotes YEAR: A(2018), B(2019), C(2020).....
- 印字中“WW”代表周号
“WW”denotes Week's number
- 印字中“N”代表星期几
“N”denotes day of the week
- 印字中的“H”代表无卤
“H”denotes Halogen-free



绝缘和安规信息 Insulation and Safety related specifications

项目 Item	符号 Symbol	数值 Value	单位 Unit	备注 Remark
爬电距离 Creepage Distance	L	≥ 5.0	mm	从输入端到输出端，沿本体最短距离路径 Measured from input terminals to output terminals, shortest distance path along body.
电气间隙 Clearance Distance	L	≥ 5.0	mm	从输入端到输出端，通过空气的最短距离 Measured from input terminals to output terminals, shortest distance through air.
绝缘距离 Insulation Thickness	DTI	≥ 0.4	mm	发射器和探测器之间的绝缘厚度 Insulation thickness between emitter and detector.
峰值隔离电压 Peak Isolation Voltage	V_{IORM}	600	V_{peak}	DIN/EN/IEC EN60747-5-5
瞬态隔离电压 Transient Isolation Voltage	V_{IOTM}	5000	V_{peak}	DIN/EN/IEC EN60747-5-5
隔离电压 Isolation Voltage	V_{ISO}	> 3750	V_{rms}	For 1 minute

极限参数 Absolute Maximum Ratings ($T_A=25^{\circ}\text{C}$)

参数 Parameter		符号 Symbol	额定值 Rating	单位 Unit
发射端 Input	正向电流 Forward Current	I_F	20	mA
	反向电压 Reverse Voltage	V_R	6	V
	功耗 Power Dissipation	P_D	70	mW
接收端 Output	集电极功耗 Collector Power Dissipation	P_C	150	mW
	集电极电流 Collector Current	I_C	50	mA
	集电极-发射极电压 Collector-Emitter Voltage	V_{CEO}	75	V
	发射极-集电极电压 Emitter-Collector Voltage	V_{ECO}	7	V
总功耗 Total Power Dissipation		P_{tot}	150	mW
隔离电压 Isolation Voltage		V_{ISO}	3750	V_{rms}
工作温度 Operating Temperature		T_{opr}	$-40 \sim +125$	$^{\circ}\text{C}$
存储温度 Storage Temperature		T_{stg}	$-55 \sim +150$	$^{\circ}\text{C}$
焊接温度 Soldering Temperature		T_{sol}	260	$^{\circ}\text{C}$

产品特性参数 Electro-optical Characteristics ($T_A=25^{\circ}\text{C}$)

参数 Parameter		符号 Symbol	条件 Condition	最小 Min.	典型 Typ.	最大 Max.	单位 Unit
发射端 Input	正向电压 Forward Voltage	V_F	$I_F=1\text{mA}$	1.0	1.35	1.8	V
	反向电流 Reverse Current	I_R	$V_R=6\text{V}$	-	-	10	μA
	输入电容 Terminal Capacitance	C_t	$V=0, f=1\text{kHz}$	-	30	-	pF
接收端 Output	集电极暗电流 Collector Dark Current	I_{CEO}	$V_{CE}=75\text{V}$	-	-	100	nA
	集电极-发射极击穿电压 Collector-Emitter Breakdown Voltage	BV_{CEO}	$I_C=0.5\text{mA}, I_F=0$	75	130	-	V
	发射极-集电极击穿电压 Emitter-Collector Breakdown Voltage	BV_{ECO}	$I_E=0.1\text{mA}, I_F=0$	7	-	-	V
传输特性 Transfer Characteristics	电流传输比 Current Transfer Ratio	CTR*	$I_F=5\text{mA}, V_{CE}=5\text{V}$	130	-	600	%
	集电极-发射极饱和压降 Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_F=20\text{mA}, I_C=1\text{mA}$	-	0.1	0.2	V
	隔离电阻 Isolation Resistance	R_{ISO}	DC500V, 40~60%R.H.	5×10^{10}	1×10^{11}	-	Ω
	隔离电容 Isolation Capacitance	C_{ISO}	$V=0, f=1\text{MHz}$	-	0.3	1.5	pF
	开启时间 Turn On Time	T_{on}	$I_F=1.6\text{mA}$ $V_{CC}=5\text{V}$ $R_L=0.75\text{k}\Omega$	-	6	20	μs
	关断时间 Turn Off Time	T_{off}		-	6	20	μs
	上升时间 Rise Time	T_r		-	5	-	μs
	下降时间 Fall Time	T_f		-	5.5	-	μs

注*: 电流传输比= $I_C/I_F \times 100\%$ 。

Note*: $CTR=I_C/I_F \times 100\%$ 。

电流传输比分档表 CTR Classification Table ($I_F=5\text{mA}, V_{CE}=5\text{V}, T_A=25^{\circ}\text{C}$)

代码 Code	最小值 Min.	最大值 Max.
None	130	600
B	130	260
C	200	400
D	300	600
E	220	400

典型光电特性曲线 Typical Electro-Optical Characteristics Curves

Fig.1 Relative Current Transfer Ratio vs. Forward Current

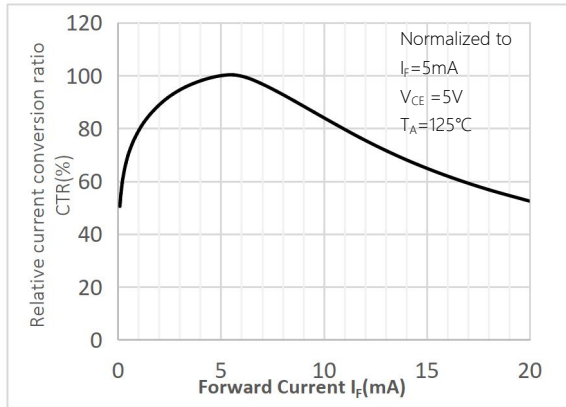


Fig.2 Forward Current vs. Forward Voltage

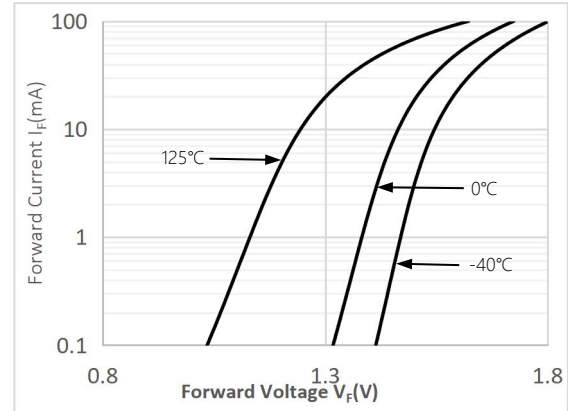


Fig.3 Collector Current vs. Collector-Emitter Voltage

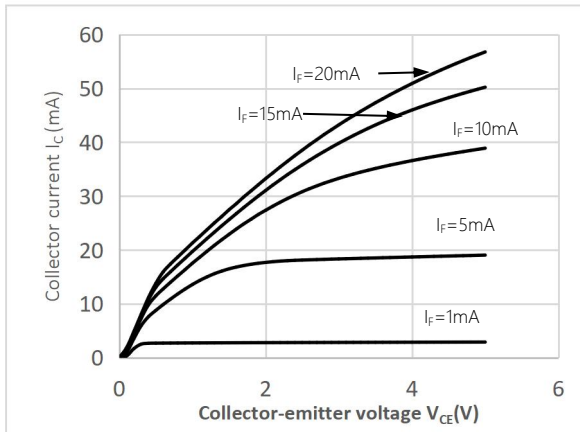


Fig.4 Relative Current Transfer Ratio vs. Ambient Temperature

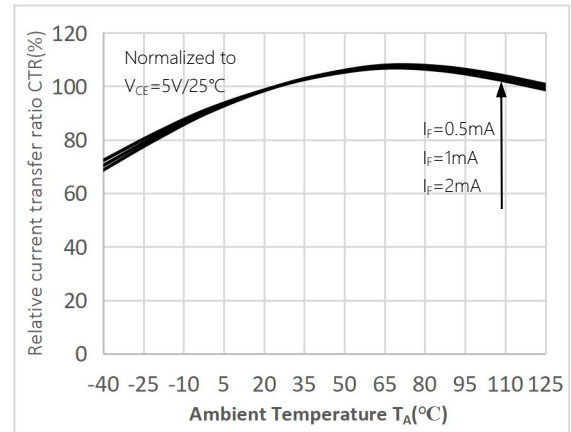


Fig.5 Collector-Emitter Saturation Voltage vs. Ambient Temperature

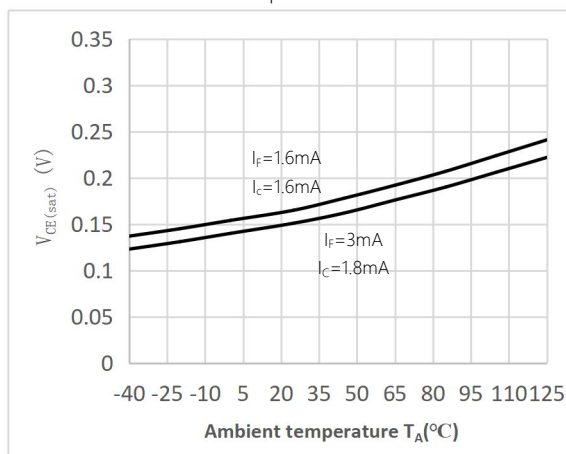


Fig.6 Collector Dark Current vs. Ambient Temperature

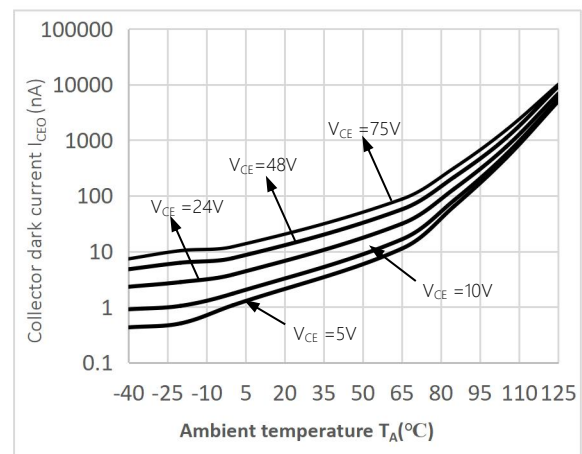


Fig.7 Response Time vs. Load Resistance

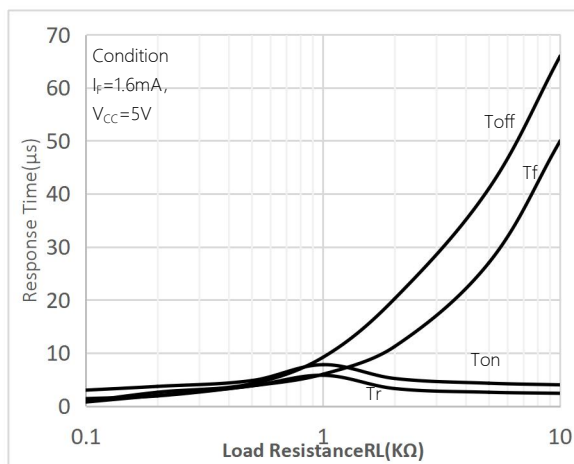


Fig.8 Collector Current vs. Ambient Temperature

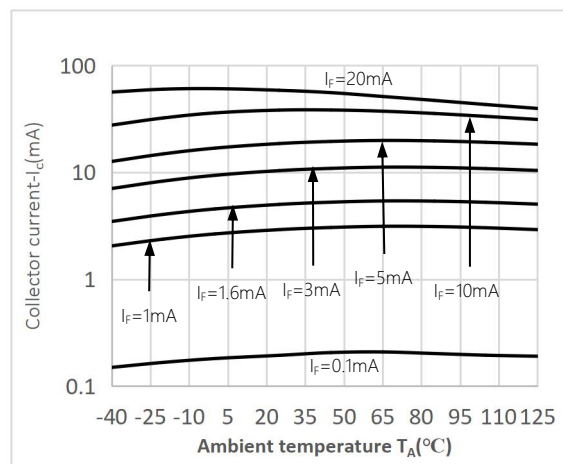
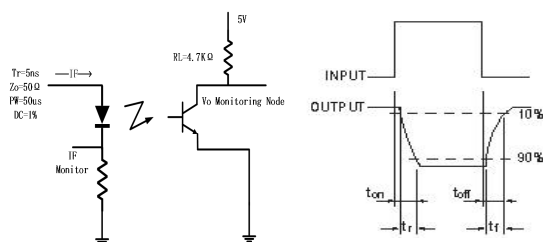
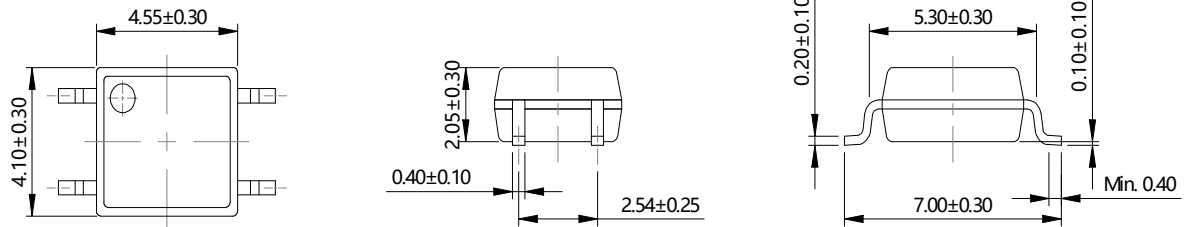


Fig.9 Switching Time Test Circuit & Waveforms



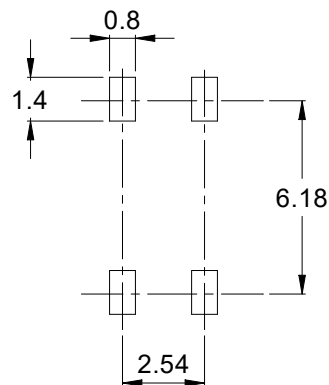
外形尺寸 Outline Dimensions

SOP4



单位 Unit: mm

建议焊盘布局 Recommended Pad Layout

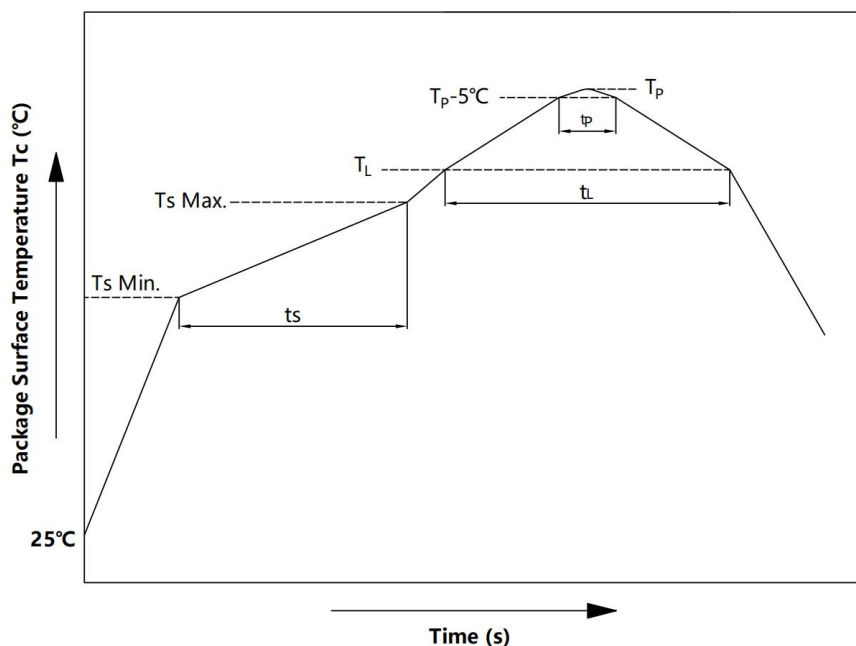


单位 Unit: mm

注：上图为产品正视图。

Note: The picture above is the front view of the product.

回流焊温度曲线图 Solder Reflow Profile

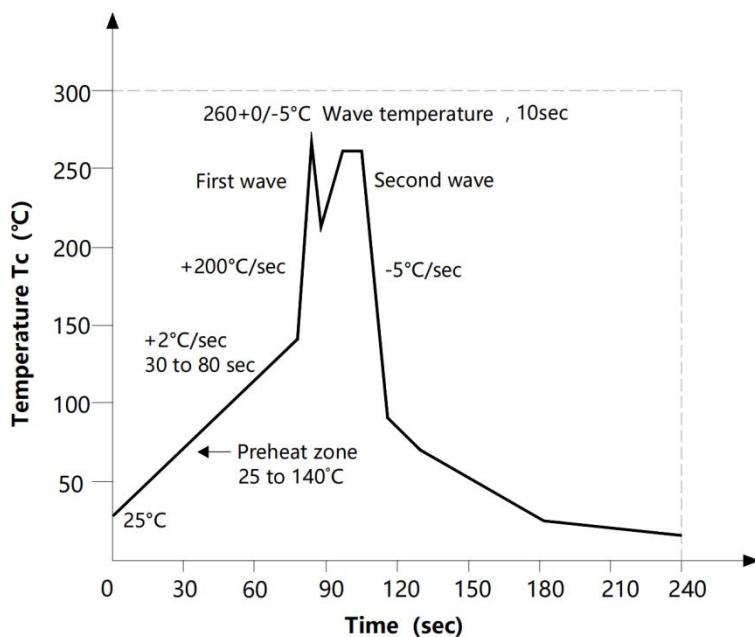


项目 Item	符号 Symbol	最小值 Min.	最大值 Max.	单位 Unit
预热温度 Preheat Temperature	T_s	150	200	$^\circ\text{C}$
预热时间 Preheat Time	t_s	60	120	s
升温速率 Ramp-Up Rate (T_L to T_P)	-	-	3	$^\circ\text{C/s}$
液相线温度 Liquidus Temperature	T_L	217		$^\circ\text{C}$
时间高于 T_L Time Above T_L	t_L	60	150	s
峰值温度 Peak Temperature	T_P	-	260	$^\circ\text{C}$
T_c 在 ($T_P - 5$) 和 T_P 之间的时间 Time During Which T_c Is Between ($T_P - 5$) and T_P	t_p	-	30	s
降温速率 Ramp-down Rate (T_P to T_L)	-	-	6	$^\circ\text{C/s}$

注：建议在所示的温度和时间条件下进行回流焊，最多不能超过三次；

Note: Reflow soldering is recommended at the temperatures and times shown, no more than three times;

波峰焊温度曲线图 Wave Soldering Profile



手工烙铁焊接 Soldering with hand soldering iron

A. 手工烙铁焊仅用于产品返修或样品测试;

Hand soldering iron is only used for product rework or sample testing;

B. 手工烙铁焊要求: 温度 $360^{\circ}\text{C} \pm 5^{\circ}\text{C}$, 时间 $\leq 3\text{s}$ 。

Hand soldering iron requirements: Temperature: $360^{\circ}\text{C} \pm 5^{\circ}\text{C}$, within 3s.

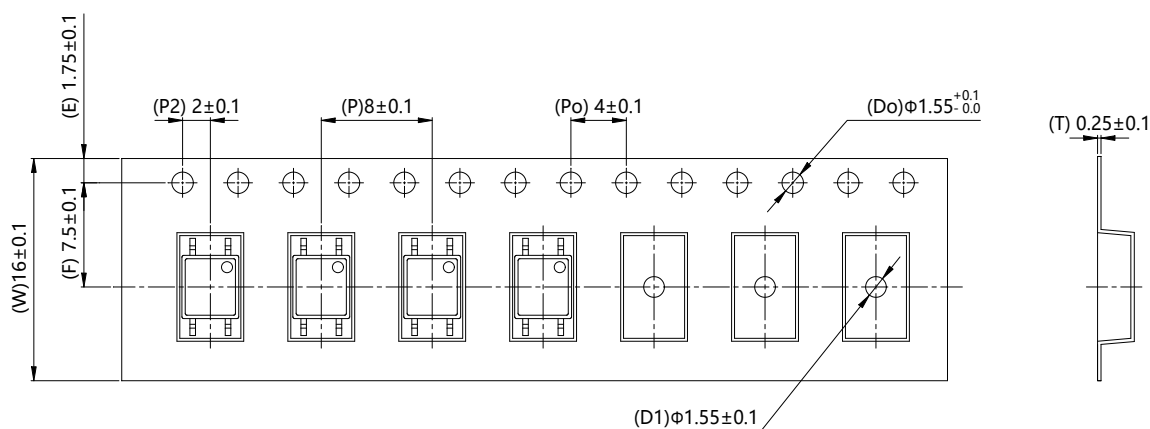
包装 Packing

■ 汇总表 Summary table

封装形式	包装方式	盘数量	盒数量	箱数量	静电袋规格	盒规格	箱(双瓦楞)规格	备注
SOP4	卷盘 ($\phi 330$ mm 蓝盘)	3000 只/盘	2 盘/盒	10 盒/箱	450*390*0.1mm	353*340*60mm	650*375*365mm	首端各空 50 个空格, 末端空 100
Package Type	Packing Form	Quantity per Reel	Quantity per Box	Quantity per Carton	Antistatic Bag Specification	Box Specification	Carton Specification	Note
SOP4	Reel ($\phi 330$ mm Blue)	3000 pcs/reel	2 reels/box	10 boxes/ctn	450*390*0.1mm	353*340*60mm	650*375*365mm	Leave 50 Spaces at the beginning and 100 Spaces at the end

■ 编带包装 Tape & Reel

- 1) 每卷数量: 3000 只。
Qty/reel: 3000 pcs.
- 2) 每箱数量: 60000 只。
Qty/ctn: 60000 pcs.
- 3) 内包装: 每盒 2 盘。
Inner packing: 2 reels/box.
- 4) 示意图 Schematic:



单位 Unit: mm

注意 Attention

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