



# 晶体管光耦 Photo Transistor

## TLP785GB-S

Product Data Sheet

**AOTE DCC**  
**RELEASE**

**台湾奥特半导体科技有限公司**

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## 概述 Description

TLP785GB-S 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， 三种形式（DIP、DIP-M、SMD）

The TLP785GB-S is a photoelectric coupler composed of light-emitting diode and phototransistor. It is packaged in a 4-pin package of three forms such as DIP、DIP-M、SMD.

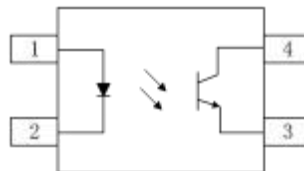
## 特性 Features

- 电流转换比(CTR)范围: 200% ~600% ( $I_F = 5\text{mA}$ ,  $V_{CE} = 5\text{V}$ ,  $T_a = 25^\circ\text{C}$ )  
Current transfer ratio: 200% ~600% ( $I_F = 5\text{mA}$ ,  $V_{CE} = 5\text{V}$ ,  $T_a = 25^\circ\text{C}$ )
- 输入-输出隔离电压 ( $V_{ISO} = 5000 \text{ Vrms}$ )  
High isolation voltage between input and output ( $V_{ISO} = 5000 \text{ Vrms}$ )
- 集电极-发射极击穿电压  $BV_{CEO} \geq 80\text{V}$   
Collector - emitter breakdown voltage  $BV_{CEO} \geq 80\text{V}$
- 工作温度:  $-55^\circ\text{C} \sim 110^\circ\text{C}$   
Operating Temperature:  $-55^\circ\text{C} \sim 110^\circ\text{C}$
- 符合加强绝缘标准  
Meet reinforced insulation standards
- 符合安规标准: UL 1577, VDE DIN EN60747-5-5 (VDE 0884-5), CQC11-471543-2022  
Meet safety standard approval: UL 1577, VDE DIN EN60747-5-5 (VDE 0884-5), CQC11-471543-2022

## 应用 Applications

- 开关电源, 智能电表  
Switching power supply, intelligent meter
- 工业控制, 测量仪器  
Industrial control, measuring instruments
- 办公设备, 比如复印机  
Office equipment such as copiers
- 家用电器, 比如空调、风扇、热水器等  
Household appliances: such as air conditioners, fans, water heaters, etc.



## 封装和原理图 Package and Schematic Diagram



Pin Configuration

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

## 印字信息 Marking Information

- 印字中 “” 为奥特品牌 LOGO  
“” denotes LOGO
- 印字中的 “X” 代表产品分档：C、D  
“X” denotes the classification：C、D
- 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	>7.0	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	>7.0	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 <sub>IORM</sub>	1500	V <sub>peak</sub>	DIN/EN/IEC EN60747-5-5
瞬态隔离电压 Transient isolation voltage	V <sub>IOTM</sub>	7000	V <sub>peak</sub>	DIN/EN/IEC EN60747-5-5
隔离电压 Isolation Voltage	V <sub>iso</sub>	>5000	V <sub>rms</sub>	For 1 min, RH < 60%

**极限参数 Absolute Maximum Ratings (Ta = 25°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 <sub>F</sub>	50	mA
	峰值正向电流(1us, 脉冲) Peak forward current (1us, pulse)	I <sub>FP</sub>	1000	mA
	反向电压 Reverse Voltage	V <sub>R</sub>	6	V
	功耗 Power Dissipation	P <sub>D</sub>	70	mW
接收端 output	集电极功耗 Collector Power Dissipation	P <sub>C</sub>	150	mW
	集电极电流 Collector Current	I <sub>C</sub>	50	mA
	集电极-发射极电压 Collector-Emitter Voltage	V <sub>CEO</sub>	80	V
	发射极-集电极电压 Emitter - Collector Voltage	V <sub>ECO</sub>	7	V
总功耗 Total Power Dissipation	P <sub>tot</sub>	200	mW	
隔离电压 Isolation Voltage	V <sub>iso</sub>	5000	V <sub>rms</sub>	
工作温度 Operating Temperature	T <sub>opr</sub>	-55 ~ +110	°C	
存储温度 Storage Temperature	T <sub>stg</sub>	-55 ~ +125	°C	
焊接温度 Soldering Temperature	T <sub>sol</sub>	260	°C	

**产品特性参数 Electro-optical Characteristics (Ta = 25°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	$V_{F1}$	$I_F=10mA$	1.0	-	1.3	V
	正向电压 Forward Voltage	$V_{F2}$	$I_F=20mA$	1.1	-	1.4	V
	反向电流 Reverse Current	$I_R$	$V_R=5V$	-	-	10	$\mu A$
	终端电容 Terminal Capacitance	$C_t$	$V=0, F=1kHz$	-	30	250	pF
接收端 Output	集电极暗电流 Collector Dark Current	$I_{CEO}$	$V_{CE}=50V$	-	-	100	nA
	集电极-发射极击穿电压 Collector-Emitter Breakdown Voltage	$BV_{CEO}$	$I_C=0.1mA, I_F=0$	80	-	-	V
	发射极-集电极击穿电压 Emitter-Collector Breakdown Voltage	$BV_{ECO}$	$I_E=10\mu A, I_F=0$	7	-	-	V
传输特性 Transfer Characteristics	电流传输比 Current Transfer Ratio	$CTR^*$	$I_F=5mA, V_{CE}=5V$	200	-	600	%
	集电极-发射极饱和压降 Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_F=1mA, I_C=1mA$	-	-	0.4	V
	隔离电阻 Isolation Resistance	$R_{ISO}$	DC500V, 40 ~ 60%R.H.	$1 \times 10^{12}$	-	-	$\Omega$
	隔离电容 Isolation capacitance	$C_{ISO}$	$V=0, F=1MHz$	-	0.6	1.0	pF
	截至频率 Cut-off Frequency	$F_c$	$V_{CE}=5V, I_C=2mA,$ $R_L=100\Omega, -3dB$	-	80	-	KHz
	上升时间 Rise Time	$T_r$	$V_{CE}=10V, I_C=2mA,$ $R_L=100\Omega$	-	-	12	$\mu s$
	下降时间 Fall Time	$T_f$	$V_{CE}=10V, I_C=2mA,$ $R_L=100\Omega$	-	-	12	$\mu s$
	导通时间 Turn on time	$T_{on}$	$V_{CE}=10V, I_C=2mA, R_L=$ $100\Omega$	-	-	12	$\mu s$
关断时间 Turn off time	$T_{off}$	$V_{CE}=10V, I_C=2mA, R_L=$ $100\Omega$	-	-	12	$\mu s$	

 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 ( $V_{CE}=5V, Ta = 25^\circ C$ )**

代码 Code	分档 classification	符号 Symbol	条件 Condition	最小值 Min.	最大值 Max.
电流传输比 Current Transfer Ratio	816D1	CTR1	$I_F=5mA, V_{CE}=5V$	300	450
		CTR2	$I_F=2mA, V_{CE}=5V$	200	500
	816D2	CTR1	$I_F=5mA, V_{CE}=5V$	380	600
		CTR2	$I_F=2mA, V_{CE}=5V$	250	500
	816D	CTR1	$I_F=5mA, V_{CE}=5V$	300	600
		CTR2	$I_F=2mA, V_{CE}=5V$	200	500
816C	CTR1	$I_F=5mA, V_{CE}=5V$	200	400	

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

Fig.1 Current Transfer Ratio vs. Forward Current

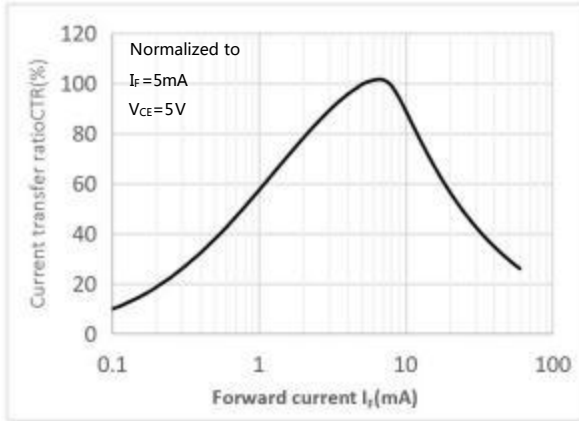


Fig.2 Forward Current vs Forward Voltage

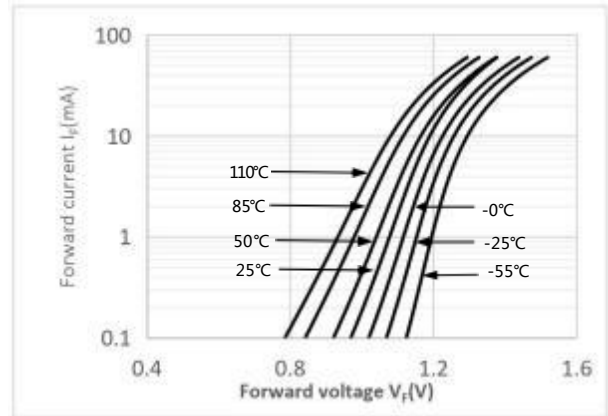


Fig.3 Collector Current vs. Collector-emitter Voltage

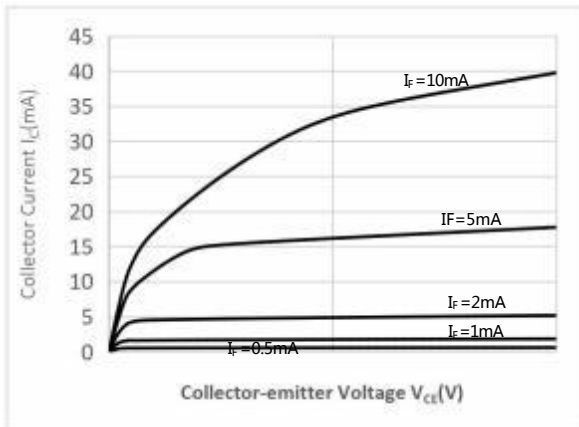


Fig.4 Relative Current Transfer Ratio vs. Ambient Temperature

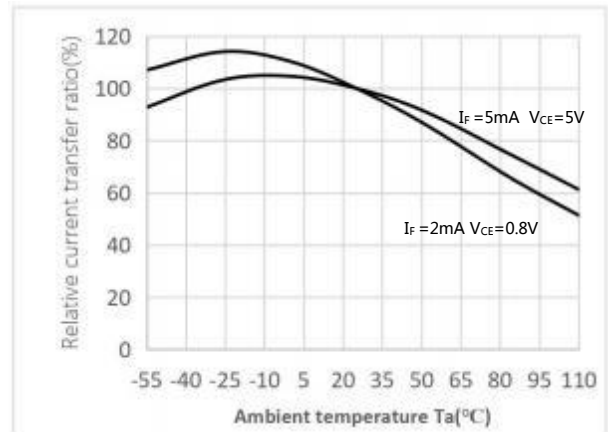


Fig.5 Collector-emitter Saturation Voltage vs. Ambient Temperature

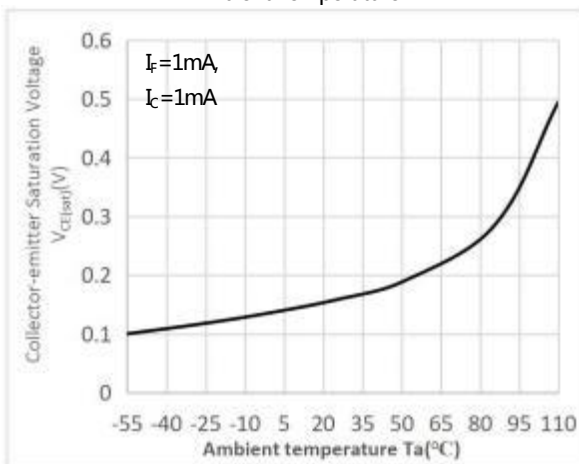


Fig.6 Collector Dark Current vs Ambient Temperature

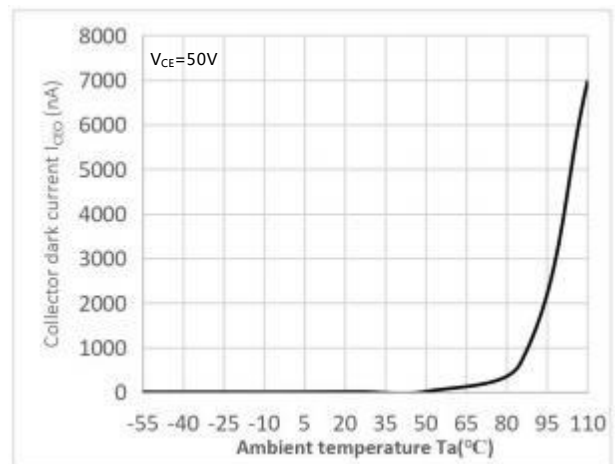


Fig.7 Response Time vs. Load Resistance

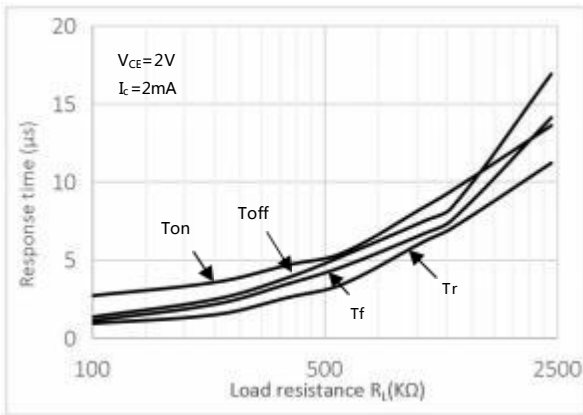


Fig.8 Frequency Response

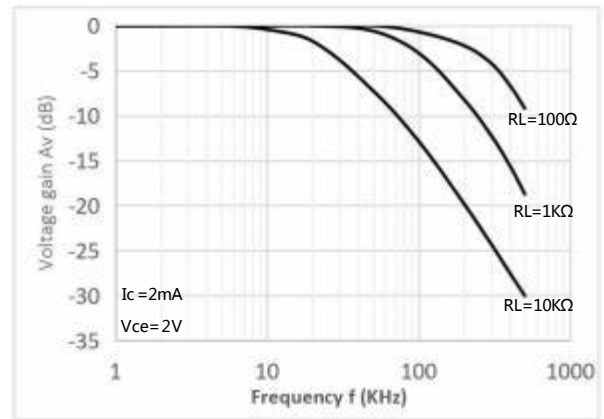


Fig.9 Collector-emitter Saturation Voltage vs. Forward Current

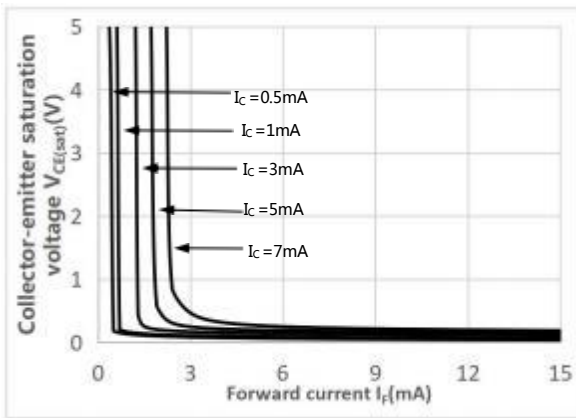
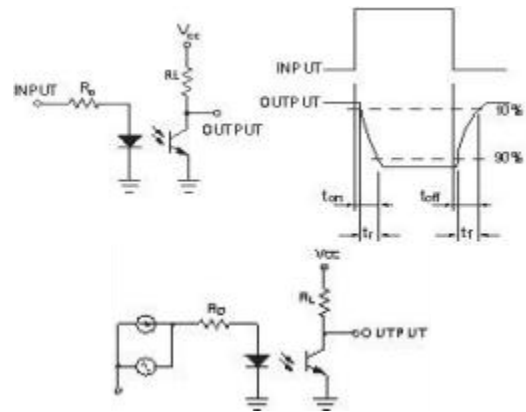
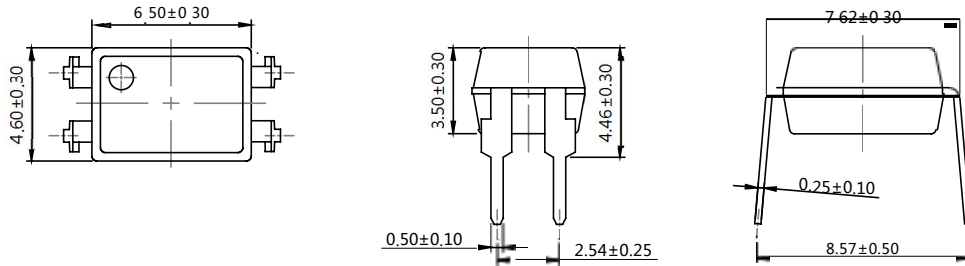


Fig.10 Test Circuits

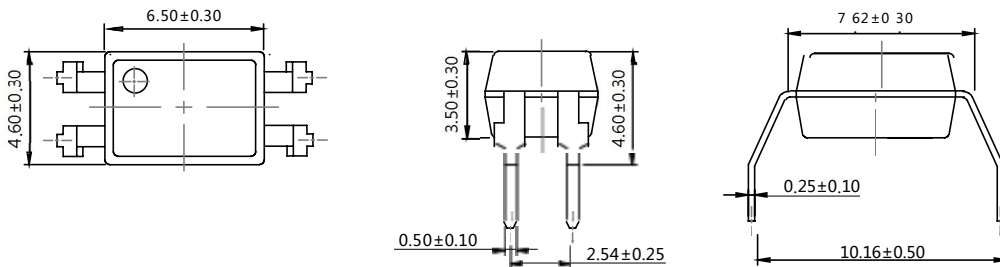


## 外形尺寸 Outline Dimensions

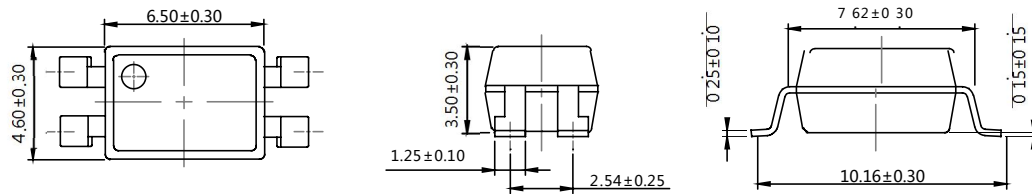
DIP4



DIP4-M

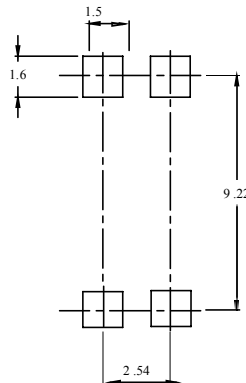


SMD4



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	Ts	150	200	°C
预热时间 Preheat Time	ts	60	120	s
升温速率 Ramp-Up Rate (T <sub>L</sub> to T <sub>P</sub> )	-	-	3	°C/s
液相线温度 Liquidus Temperature	T <sub>L</sub>	217		°C
时间高于 T <sub>L</sub> Time Above T <sub>L</sub>	t <sub>L</sub>	60	150	s
峰值温度 Peak Temperature	T <sub>P</sub>	-	260	°C
Tc 在(T <sub>P</sub> -5)和 T <sub>P</sub> 之间的时间 Time During Which Tc Is Between (T <sub>P</sub> -5) and T <sub>P</sub>	t <sub>p</sub>	-	30	s
降温速率 Ramp-down Rate(T <sub>P</sub> to T <sub>L</sub> )	-	-	6	°C/s

注 Note :

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；

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.

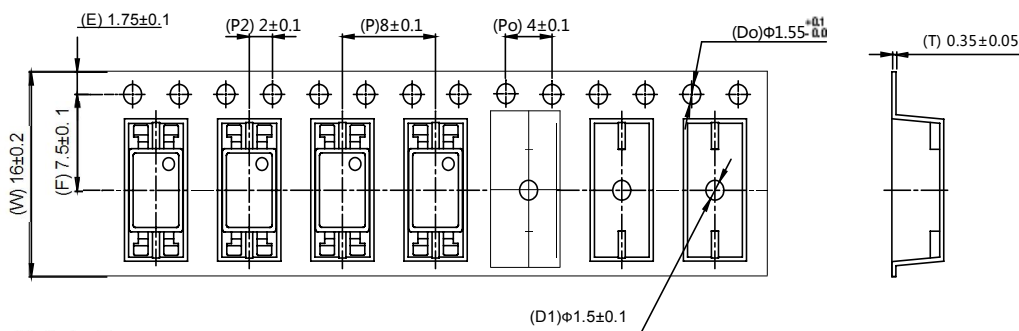
## 包装 Packing

### ■ 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
SMD4	卷盘 ( $\phi 330$ mm 蓝盘)	2000 只/盘	2 盘/盒	10 盒/箱	450*390*0.1mm	340*60*340mm	620*360*365mm	首尾端空至少 200mm
DIP4	管装 (500*12*11mm)	100 只/管	50 管/盒	10 盒/箱	不适用	525*128*56mm	535*275*300mm	每管使用蓝白胶塞， 方向须一致
DIP4-M	管装 (500*13*11mm)	100 只/管	50 管/盒	10 盒/箱	不适用	525*136*58mm	535*295*310mm	
Package Type	Packing Form	Quantity per Reel	Quantity per Box	Quantity per Carton	Antistatic Bag Specification	Box Specification	Carton Specification	Note
SMD4	Reel ( $\phi 330$ mm Blue)	2000 pcs/reel	2 reels/box	10 boxes/ctn	450*390*0.1mm	340*60*340mm	620*360*365mm	Leave at least 200mm of blank space at both ends
DIP4	Tube (500*12*11mm)	100 pcs /tube	50 tubes/box	10 boxes/ctn	NA	525*128*56mm	535*275*300mm	Use blue and white rubber plugs for each tube in the same direction
DIP4-M	Tube (500*13*11mm)	100 pcs /tube	50 tubes/box	10 boxes/ctn	NA	525*136*58mm	535*295*310mm	

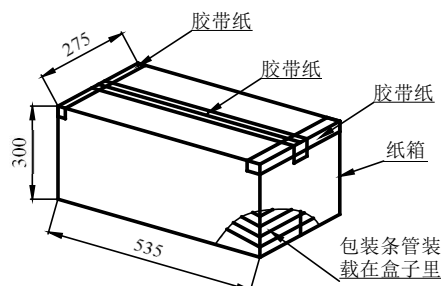
### ■ 编带包装 Tape & Reel

- 1) 每卷数量：2000 只。  
Qty/reel：2000 pcs.
- 2) 每箱数量：40000 只。  
Qty/ctn：40000 pcs.
- 3) 内包装：每盒 2 盘。  
Inner packing：2 reels/box.
- 4) 示意图 Schematic：



### ■ 管条包装 Tape & Tube

- 1) 每管数量：100 只。  
Qty/Tube：100 pcs.
- 2) 每箱数量：50000 只。  
Qty/ctn：50000 pcs.
- 3) 内包装：每盒 50 管。  
Inner packing：50 Tube/box.
- 4) 示意图 Schematic：



单位/Unit：mm

## 注意 Attention

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