



**高速光耦**  
**High Speed Photo**  
**Coupler**

**ATM6XX**

**Product Data Sheet**

**AOTE DCC**  
**RELEASE**

**台湾奥特半导体科技有限公司**

TAIWAN AOTE SEMICONDUCTOR TECHNOLOGY CO.,LTD

[www.aotesemi.com](http://www.aotesemi.com)

## 概述 Description

ATM600、ATM601、ATM611 内部有一个 850nm 的 AlGaAs LED，其光学耦合到具有选通输出的超高速集成光电检测器。这些器件采用 5 引脚外形封装，符合标准封装外形。

The ATM600 ATM601 ATM611 optocoupler consists of a 850 nm AlGaAs LED, optically coupled to a very high speed integrated photo-detector logic gate with a strobable output. The devices are packaged in a 5-pin small outline package which conforms to the standard footprint.

## 特性 Features

- 输入-输出隔离电压 ( $V_{ISO}=3750$  Vrms )  
High isolation voltage between input and output( $V_{ISO}=3750$  Vrms )
- 工作温度：  $-40^{\circ}\text{C} \sim 85^{\circ}\text{C}$   
Operating Temperature:  $-40^{\circ}\text{C} \sim 85^{\circ}\text{C}$
- 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 : 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.

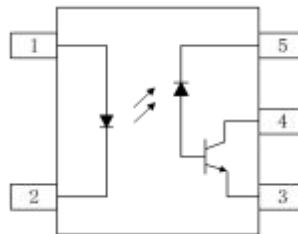
## 真值表 Truth table

LED	VO
OFF	H
ON	L

## 封装和原理图 Package and Schematic Diagram



SOP5



Pin Configuration

1. Anode
2. Cathode
3. GND
4. VO
5. VCC

注：在引脚 3 和 5 之间必须连接一个 0.1uF 的旁路电容器。



Note: 0.1uF bypass capacitor must be connected between pins 3 and 5.

**产品型号命名规则 Order Code**
**AT M6XX - UN Y - W (V) (ZZ)**

①                      ②                      ③      ④                      ⑤                      ⑥                      ⑦

- ① 公司代码 Company Code (AT: 奥特 Aote)
- ② 产品系列 Product Series (XX: 00, 01, 11)
- ③ 框架类型 Lead Frame (Cu: 铜框架 Copper)
- ④ 树脂类型 Epoxy (H: 无卤 Halogen-free)
- ⑤ 封装形式 Package (S: SOP)
- ⑥ 器件工作温度范围 Device Operating Temperature Range (H:125°C)
- ⑦ 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 “” 为奥特品牌 LOGO  
“” denotes LOGO
- 印字中的 “XX” 代表产品分档：00、01、11  
“XX” denotes the classification：00、01、11
- 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	Vrms	For 1 min

**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	$I_F$	50	mA
	反向电压 Reverse Voltage	$V_R$	5	V
	功耗 Power Dissipation	$P_D$	100	mW
接收端 Output	电源电压 Supply Voltage	$V_{CC}$	7.0	V
	输出电流 Output Current	$I_O$	50	mA
	输出电压 Output Voltage	$V_O$	7.0	V
	集电极功耗 Collector Power Dissipation	$P_C$	85	mW
工作温度 Operating Temperature		$T_{opr}$	-40 ~ +125	°C
存储温度 Storage Temperature		$T_{stg}$	-55 ~ +125	°C
焊接温度 Soldering Temperature		$T_{sol}$	260	°C

**推荐工作条件 Recommended Operating Conditions**

参数 Parameter	符号 Symbol	最小值 Min.	最大值 Max.	单位 Unit
电源电压 Supply Voltages	V <sub>CC</sub>	4.5	5.5	V
高电平输入电流 Input Current , High level	I <sub>FH</sub>	5	10.0	mA
低电平输入电流 Input Current , Low level	I <sub>FL</sub>	0	250	μA
操作温度 Operating Temperature	T <sub>a</sub>	-40	125	°C

**产品特性参数 Electro-optical Characteristics (T<sub>a</sub> = 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 <sub>F</sub>	I <sub>F</sub> =10mA	-	1.33	1.8	V
	反向击穿电压 Reverse Breakdown Voltage	BV <sub>R</sub>	I <sub>R</sub> =10μA	5	-	-	V
	电容 Capacitance	C <sub>IN</sub>	V=0,f=1MHz	-	70	-	pF
	正向电压的温度系数 Diode Temperature Coefficient	ΔV <sub>F</sub> /ΔT <sub>A</sub>	I <sub>F</sub> =10mA	-	-1.9	-	mV/°C
接收端 Output	高电平电源电流 High Level Supply Current	I <sub>CCH</sub>	V <sub>CC</sub> =5.5V ,I <sub>F</sub> =0mA	-	6.0	9	mA
	低电平电源电流 Low Level Supply Current	I <sub>CCL</sub>	V <sub>CC</sub> =5.5V ,I <sub>F</sub> =0mA	-	7.5	10	mA
传输特性 Transfer Characteristics	高电平输出电流 HIGH Level Output Current	I <sub>OH</sub>	V <sub>CC</sub> =5.5V V <sub>O</sub> =5.5V I <sub>F</sub> =250μA	-	2.1	30	μA
	低电平输出电压 LOW Level Output Voltage	V <sub>OL</sub>	V <sub>CC</sub> =5.5V I <sub>F</sub> =5mA I <sub>CL</sub> =13mA	-	0.4	0.6	V
	输入阈值电流 Input Threshold Current	I <sub>TH</sub>	V <sub>CC</sub> =5.5V V <sub>O</sub> =0.6V I <sub>OL</sub> =13mA	-	2.4	5	mA
隔离电压 Isolation Voltage	V <sub>ISO</sub>	R <sub>H</sub> < 50% T <sub>A</sub> = 25°C I <sub>IO</sub> ≤ 50μA	3750	-	-	V <sub>RMS</sub>	
电阻 (输入到输出) Resistance (Input to Output)	R <sub>I-O</sub>	V <sub>I-O</sub> =500V	-	10 <sup>12</sup>	-	Ω	
电容 (输入到输出) Resistance (Input to Output)	C <sub>I-O</sub>	f=1MHz	-	0.6	-	pF	

**开关特性 Switching Specification (Ta = 25°C, I<sub>F</sub> = 7.5 mA, V<sub>CC</sub> = 5.0V)**

参数 Parameter	符号 Symbol	条件 Condition	最小 Min.	典型 Typ.	最大 Max.	单位 Unit
输出高电平传播延迟 Propagation Delay Time to High Output Level	T <sub>PLH</sub>	C <sub>L</sub> = 15pF R <sub>L</sub> = 350Ω T <sub>A</sub> = 25°C	-	41	100	ns
输出低电平传播延迟 Propagation Delay Time to Low Output Level	T <sub>PHL</sub>		-	50	100	ns
脉宽失真 Pulse Width Distortion	T <sub>PHL</sub> - T <sub>PLH</sub>		-	9	35	ns
输出上升时间(10% - 90%) Output Rise Time (10 to 90%)	tr		-	40	-	ns
输出下降时间(90% - 10%) Output Fall Time (90 to 10%)	tf		-	10	-	ns
传播延迟偏斜 Propagation Delay Skew	t <sub>psk</sub>		-	-	40	ns
输出高电平共模瞬态抑制 Common Mode Transient Immunity at High Output Level	M600		T <sub>A</sub> = 25°C, I <sub>F</sub> = 0mA  V <sub>CM</sub>   = 10V(Peak) V <sub>OH</sub> = 2.0V, R <sub>L</sub> = 350Ω	-	-	-
	M601	T <sub>A</sub> = 25°C, I <sub>F</sub> = 0mA  V <sub>CM</sub>   = 50V(Peak) V <sub>OH</sub> = 2.0V, R <sub>L</sub> = 350Ω	5000	-	-	
	M611	T <sub>A</sub> = 25°C, I <sub>F</sub> = 0mA  V <sub>CM</sub>   = 1000V(Peak) V <sub>OH</sub> = 2.0V, R <sub>L</sub> = 350Ω	20000	-	-	
输出低电平共模瞬态抑制 Common Mode Transient Immunity at Low Output Level	M600	I <sub>F</sub> = 7.5mA, V <sub>OL</sub> = 0.8V R <sub>L</sub> = 350Ω, T <sub>A</sub> = 25°C  V <sub>CM</sub>   = 10V(Peak)	-	-	-	V/μs
	M601	I <sub>F</sub> = 7.5mA, V <sub>OL</sub> = 0.8V R <sub>L</sub> = 350Ω, T <sub>A</sub> = 25°C  V <sub>CM</sub>   = 50V(Peak)	5000	-	-	
	M611	I <sub>F</sub> = 7.5mA, V <sub>OL</sub> = 0.8V R <sub>L</sub> = 350Ω, T <sub>A</sub> = 25°C  V <sub>CM</sub>   = 1000V(Peak)	20000	-	-	

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

Fig.1 Low-level voltage vs. Ambient temperature

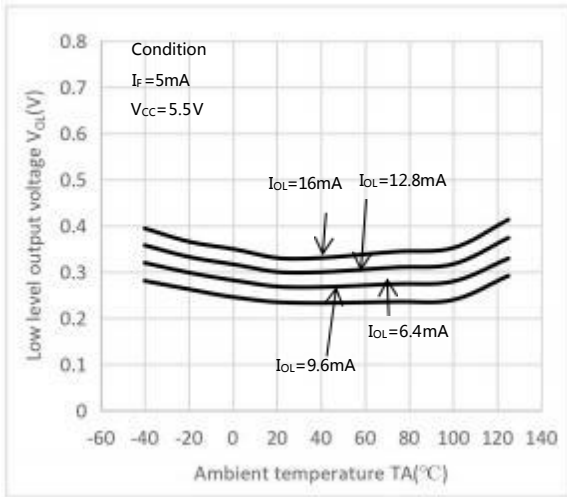


Fig.2 Forward current voltage vs. Forward voltage

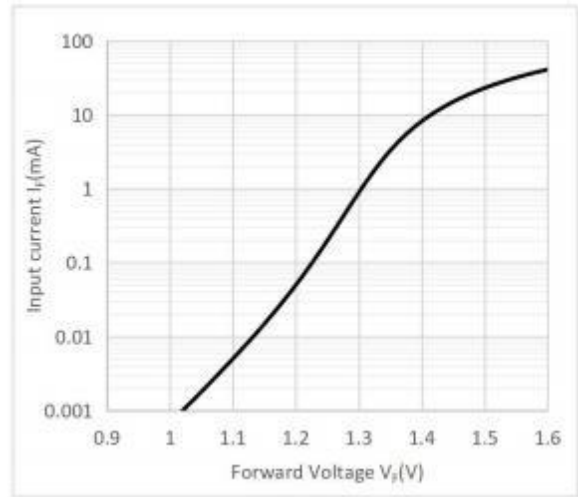


Fig.3 Switch time vs. Forward current

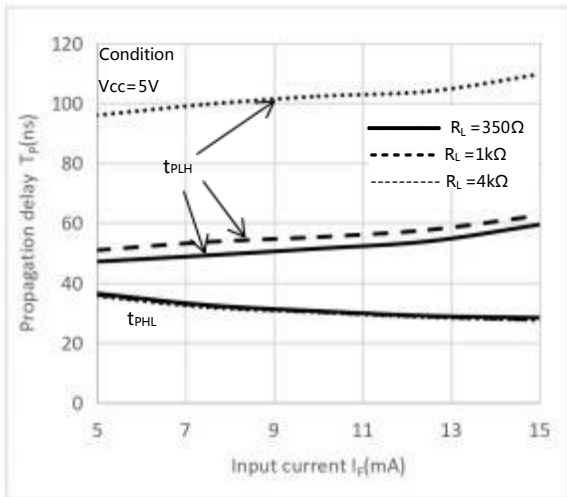


Fig.4 Low-level output current vs. Ambient temperature

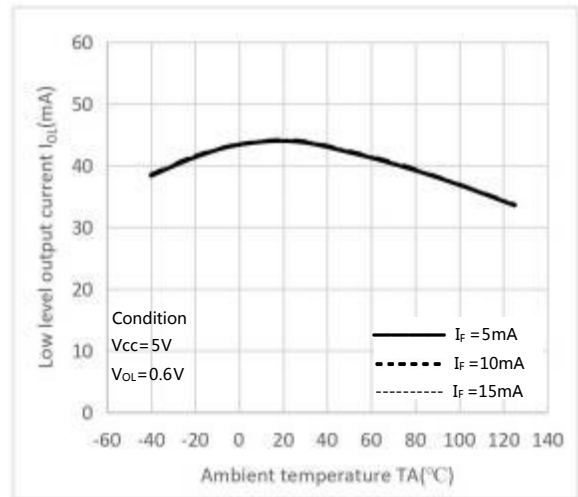


Fig.5 Starting current vs. Ambient temperature

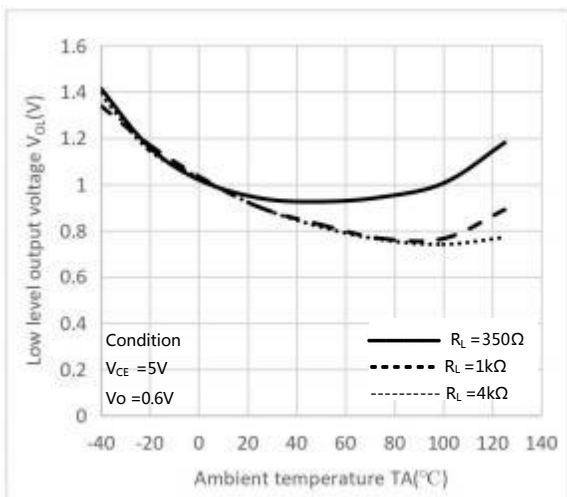


Fig.6 Output voltage vs. Input Forward current

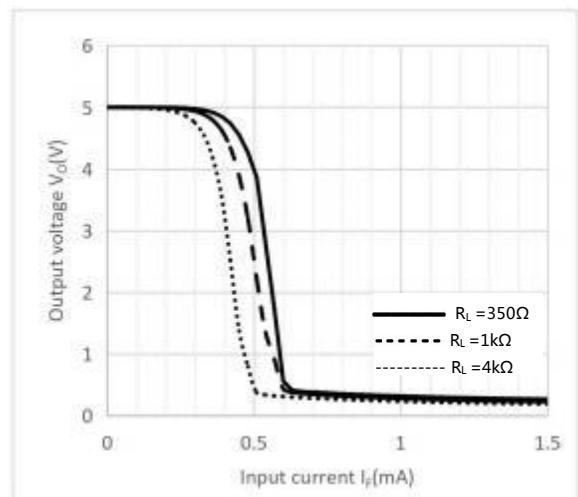


Fig.7 Pulse-width distortion vs. Ambient temperature

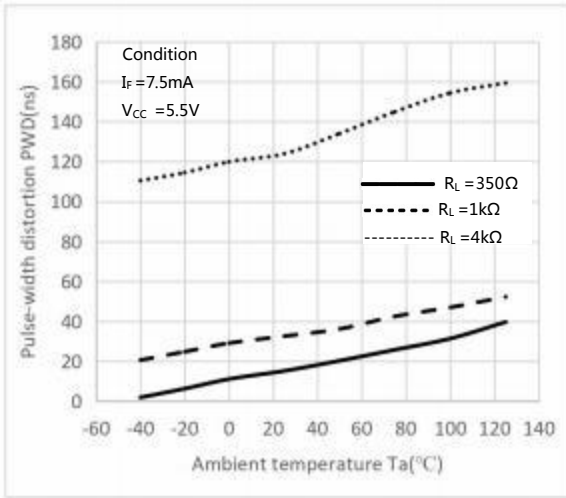


Fig.8 Switch time vs. Ambient temperature

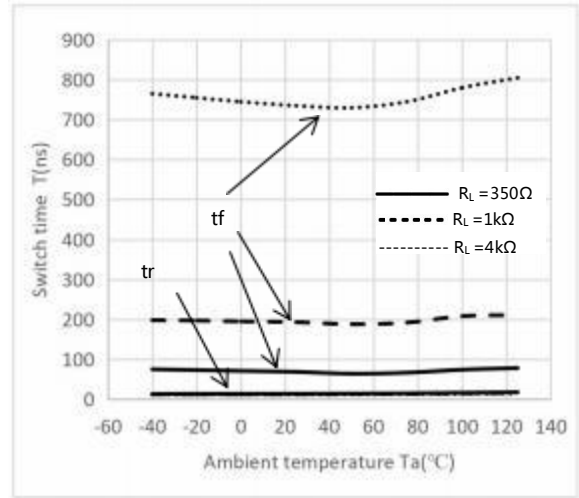


Fig.9 Propagation delay vs. Ambient temperature

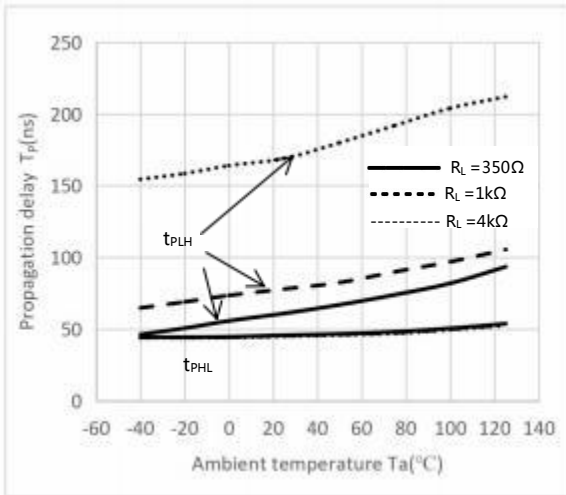
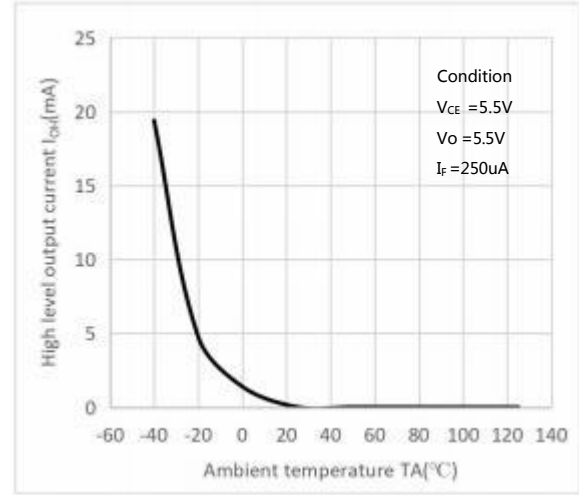
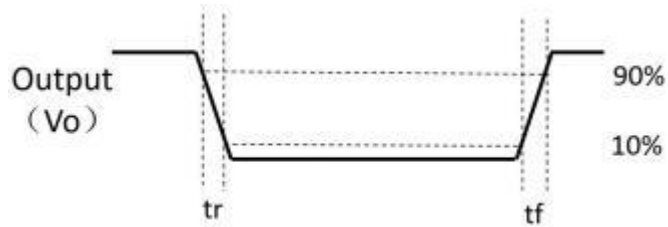
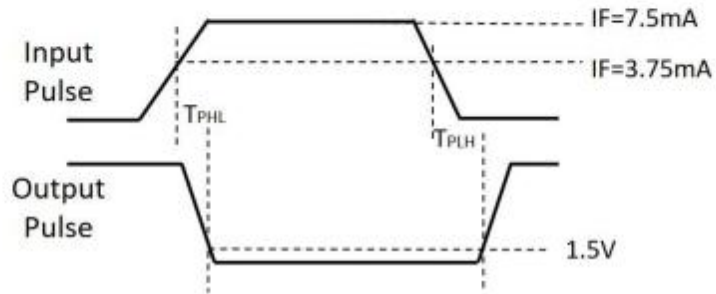
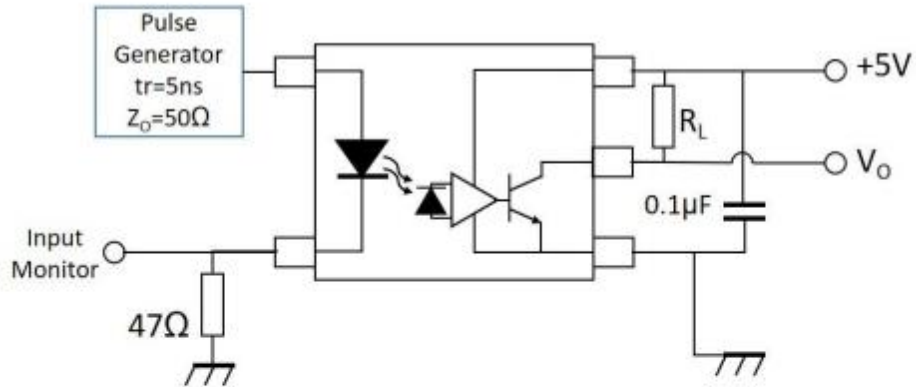


Fig.10 High-level output current vs. Ambient temperature

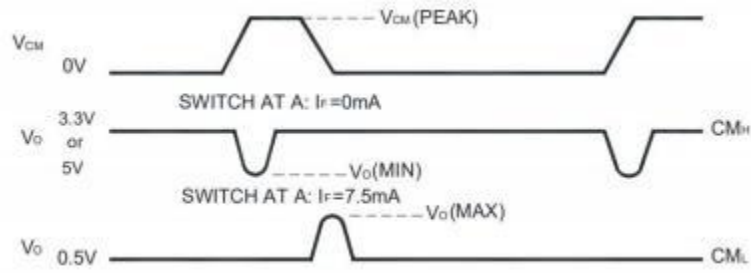
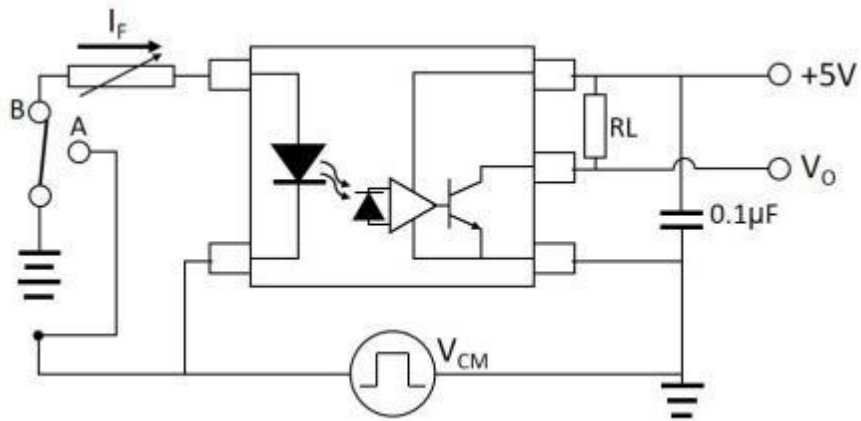




**开关时间测试电路 Witch Time Test Circuit**

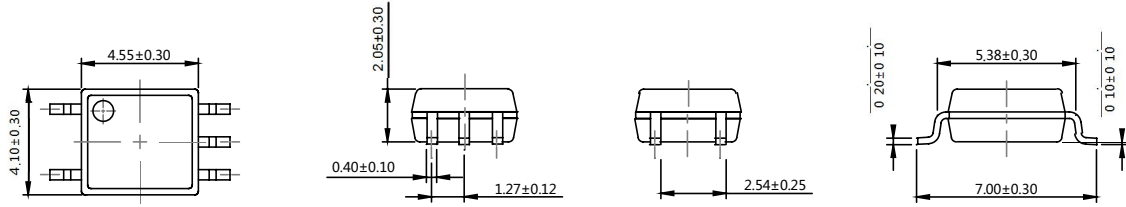


**CMR 测试电路 Test Circuit for Common Mode Transient Immunity**



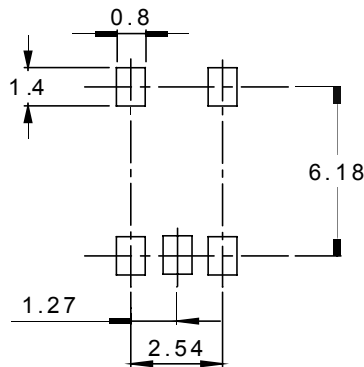
**外形尺寸 Outline Dimensions**

**SOP5**



单位 Unit: mm

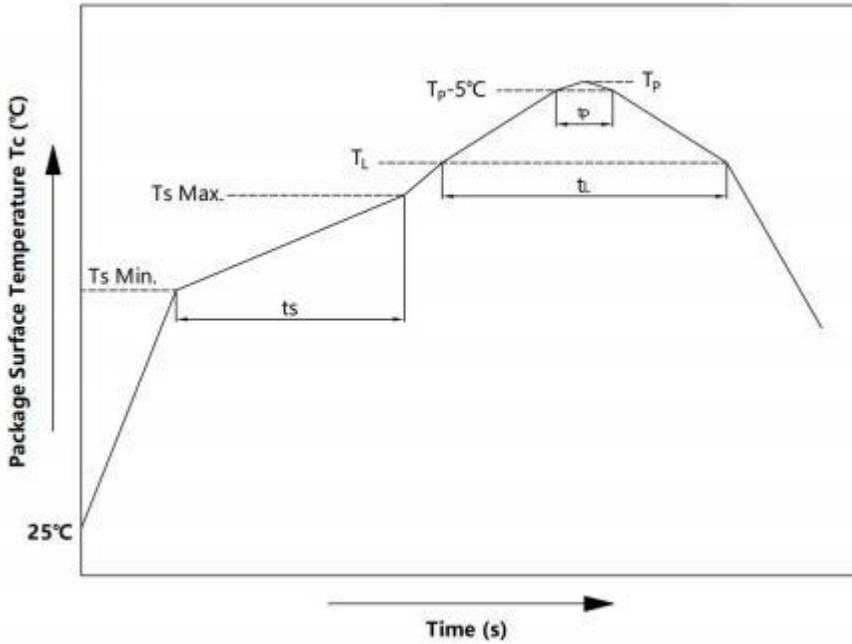
**建议焊盘布局 Recommended Pad Layout**



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**


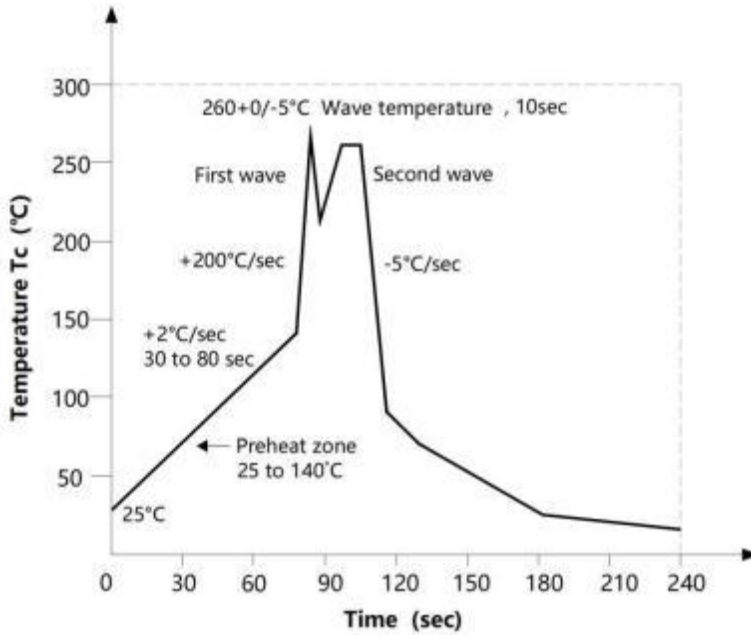
项目 Item	符号 Symbol	最小值 Min.	最大值 Max.	单位 Unit
预热温度 Preheat Temperature	Ts	150	200	°C
预热时间 Preheat Time	ts	60	120	s
升温速率 Ramp-Up Rate (T <sub>L</sub> to T <sub>P</sub> )	-	-	3	°C/s
液相线温度 Liquidus Temperature	T <sub>L</sub>	217		°C
时间高于 T <sub>L</sub> Time Above T <sub>L</sub>	t <sub>L</sub>	60	150	s
峰值温度 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.

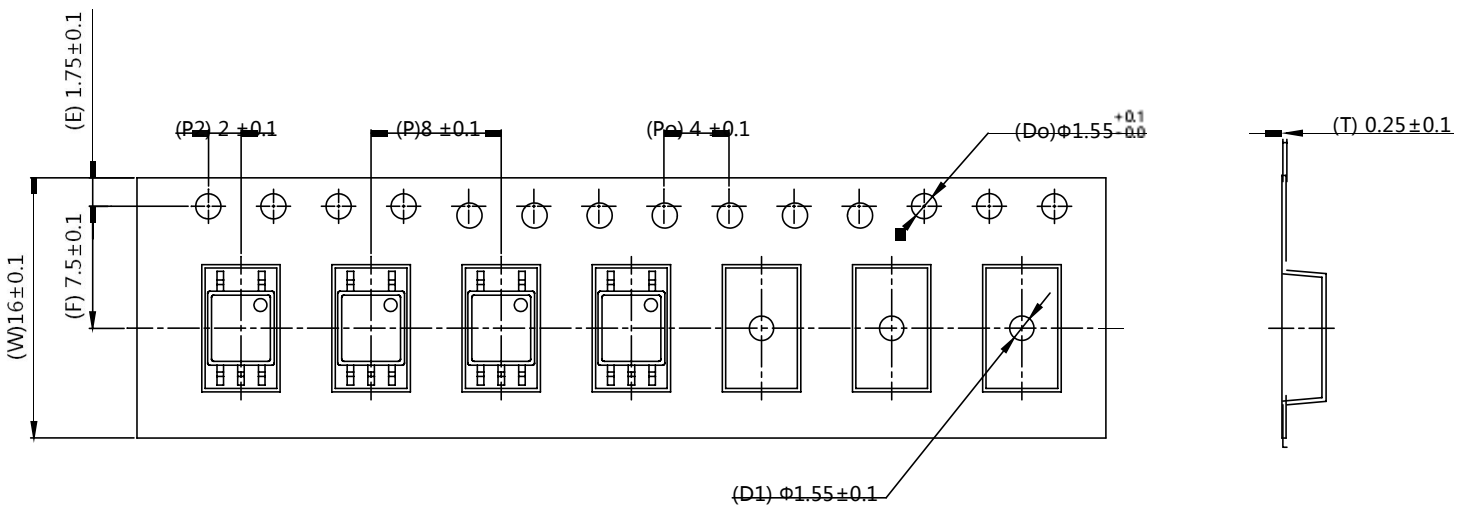
## 包装 Packing

### ■ 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
SOP5	编带 (φ330mm 蓝)	3k /盘	2 盘/盒	10 盒/箱	450*390*0.1mm	340*60*340mm	620*360*365mm	保护带 200mm (min)
Package Type	Packing Form	Quantity per Reel	Quantity per Box	Quantity per Carton	Antistatic Bag Specification	Box Specification	Carton Specification	Note
SOP5	Reel(φ330mm Blue)	3k pcs/reel	2 reels /box	10 boxes /ctn	450*390*0.1mm	340*60*340mm	620*360*365mm	Guard band 200mm min.

### ■ 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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