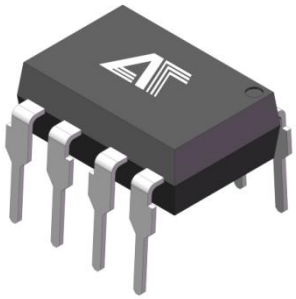
AOTE SEMICONDUCTOR



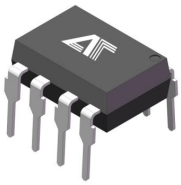
智能功率模块口光耦
Intelligent Power Module Optocoupler

AT4506

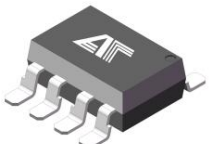
Product Data Sheet

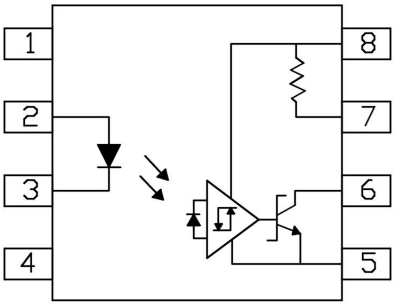
AOTE DCC
RELEASE

DIP8



SMD8





Pin Configuration
1.NC
2.Anode
3.Cathode
4.NC
5.GND
6.O
7.VL
8.VCC

◆ 封装逻辑原理图 Encapsulation logic schematic

AT4506 光耦采用高效光电转换技术，结合先进封装工艺，提供输入输出间的可靠隔离，支持DIP8-M、SMD8两种封装形式，适配多样化场景需求。

The AT4506 optocoupler adopts high-efficiency photoelectric conversion technology and advanced packaging processes, providing reliable input-output isolation. It supports Two package types (DIP8-M、SMD8) to meet diverse application requirements.

◆ 产品特征Product features

- 输入-输出隔离电压Vios=5000Vrms
  Input output isolation voltage：Vios=5000Vrms
- 15 kV/μs最小共模抑制;15kV/μs minimum Common Mode Rejection
- 4.5V 至 30V 宽工作电压范围；4.5V ~ 30V Wide operating VCC Range
- 爬电距离>7.0mm ; Creepage distance > 7.0mm;
- 输入-输出绝缘距离 >0.4mm； Input-Output insulation Thickness > 0.4mm
- 防潮等级 class1； MSL class1
- 产品符合 ROHS、REACH 及 HF 等环保法规要求;
  The products comply with ROHS, REACH and HF;

◆ 应用领域 Applications

- 交流/直流无刷电机驱动器 AC/DC brushless motor driver；高压反馈干扰，确保电机调速精度与可靠性；High voltage feedback interference ensures the accuracy and reliability of motor speed regulation;
- 工业变频与逆变器Industrial frequency conversion and inverter；缩短开关死区时间，优化IGBT/MOSFET的开关效率；Shorten the dead time of the switch，Optimizing the switching efficiency of IGBT/MOSFET
- 工业逆变器与USP电源Industrial inverters and USP power supplies通过高共模瞬态抗扰度（CMR15kV/μs抵御电压浪涌Resist voltage surges through high common mode transient immunity（CMR>15kV/μs）
- 充电桩与车载充电器Charging stations and car chargers；隔离车辆与充电设备的通信接口，防止地电位差导致信号失真；Communication interface between isolated vehicles and charging equipment，Prevent signal distortion caused by ground potential difference;

◆ 极限参数 Absolute Maximum Ratings (Ta =25℃)

参数 Parameter		符号 Symbol	额定值 Rating	单位 Unit
发射端 Input	平均输入电流 Average Forward Input Current	IF(AVG)	25	mA
	峰值正向输入电流 Peak Forward Input Current (50% duty cycle, ≤ 1 ms pulse width)	IF(PEAK)	1000	mA
	峰值瞬态输入电流 Peak Transient Input Current (≤1 μs pulse width, 300 pps)	IF(TRANS)	50	mA
	反向电压 Reverse Input Voltage	VR	5	V
接收端 output	平均输出电流 Average Output Current	IO(AVG)	15	mA
	电阻器电压 Resistor Voltage	V7	-0.5 ~VCC	V
	电源电压 Supply Voltage	VCC	-0.5 ~ 30	V
	输出电压 Output Voltage	VO	-0.5 ~ 30	V
	输出功耗 Output Power Dissipation[3]	PO	100	mW
总功耗 Total Power Dissipation		Pt	145	mW
隔离电压 Isolation voltage		VISO	5000	Vrms
工作温度 Operating Temperature		Topr	-40 ~+100	℃
存储温度 Storage Temperature		Tstg	-55 ~+125	℃

◆ 推荐操作条件 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	VDD	4.5	30	V
输出电压 Output Voltage	VO	0	30	V
开启电流 Forward Input Current (ON)	IF(ON)	10	20	mA
关断电压 Forward Input Voltage (OFF)	VF(OFF)	-5	0.8	V

◆ 产品特性参数Product characteristic parameters (Ta =25℃)

参数 Parameter	符号 Symbol	条件 Condition	最小 Min.	典型 Typ.	最大 Max.	单位 Unit
电流传输比 Current Transfer Ratio	CTR	IF = 10 mA, VO = 0.6 V	44	90	-	%
低电平输出电流 Low Level Output Current	IOL	IF = 10 mA, VO = 0.6 V	4.4	9.0	-	mA
低电平输出电压 Low Level Output Voltage	VOL	IO = 2.4 mA	-	0.17	0.6	V
输入阈值电流 Input Threshold Current	ITH	VO = 0.8 V, IO = 0.75 mA	-	0.96	5	mA
高电平输出电流 High Level Output Current	IOH	VF = 0.8 V	-	3	50	μA
高电平电源电流 High Level Supply Current	ICCH	VF = 0.8 V, VO = Open	-	0.7	1.3	mA
低电平电源电流 Low Level Supply Current	ICCL	IF = 10 mA, VO = Open	-	0.7	1.3	mA
输入正向电压 Input Forward Voltage	VF	IF = 10 mA	-	1.32	1.8	V
正向电压的温度系数 Temperature Coefficient of Forward Voltage	ΔVF/ΔTA	IF = 10 mA	-	-	-1.6	mV/°C
输入反向击穿电压 Input Reverse Breakdown Voltage	BVR	IR = 10 μA	5	-	-	V
输入电容 Input Capacitance	CIN	f = 1 MHz, VF = 0 V	-	60	-	pF
内置上拉电阻 Internal Pull-up Resistor	RL	TA = 25°C	14	20	25	kΩ
内置上拉电阻温度系数 Internal Pull-up Resistor Temperature Coefficient	ΔRL/ΔTA	-	-	0.014	-	kΩ/°C
输入输出电阻 Input-Output Resistance	RI-O	VI-O = 500 Vdc	-	10^{12}	-	Ω
电容（输入-输出） Capacitance (Input-Output)	CI-O	f = 1 MHz	-	0.6	-	pF

◆ 开关特性 Switching Specification(Ta =25℃ , RL =20KΩ External)

参数 Parameter	符号 Symbol	条件 Condition	最小 Min.	典型 Typ.	最大 Max.	单位 Unit
逻辑低电平传输延迟 Propagation Delay Time to Logic Low at Output	TPHL	IF(on) = 10 mA, VF(off) = 0.8 V, VCC = 15.0 V, CL = 100 pF, VTHLH = 2.0 V, VTHHL = 1.5 V	30	250	400	ns
逻辑高电平传输延迟 Propagation Delay Time to High Output Level	TPLH		270	400	550	
脉宽失真 Pulse Width Distortion	PWD	CL = 100 pF	-	150	450	
传输延迟差 Propagation Delay Difference Between Any 2 Parts	TPLH-TPHL	-	-150	150	450	
输出高电平共模抑制 Output High Level Common Mode Transient Immunity	|CMH|	|VCM|=1000V IF =0mA	15	30	-	kV/μs
输出低电平共模抑制 Output Low Level Common Mode Transient Immunity	|CML |	|VCM|=1000V IF =6.0mA	15	30	-	

开关特性 Switching Specification(Ta =25℃, R_L =Internal Pull-up)

参数 Parameter	符号 Symbol	条件 Condition	最小 Min.	典型 Typ.	最大 Max.	单位 Unit
逻辑低电平传输延迟 Propagation Delay Time to Logic Low at Output	TPHL	IF(on)=10 mA, VF(off) = 0.8 V, VCC = 15.0 V, CL = 100 pF, VTHLH = 2.0 V, VTHHL = 1.5 V	20	300	400	ns
逻辑高电平传输延迟 Propagation Delay Time to High Output Level	TPLH		220	400	650	
脉宽失真 Pulse Width Distortion	PWD		-	100	500	
传输延迟差 Propagation Delay Difference Between Any 2 Parts	TPLH-TPHL		-150	100	500	
输出高电平共模抑制 Output High Level Common Mode Transient Immunity	|CMH|	|VCM|=1000V IF =0mA	-	30	-	kV/μs
输出低电平共模抑制 Output Low Level Common Mode Transient Immunity	|CML |	|VCM|=1000V IF =6.0mA	-	30	-	
电源抑制比 Power Supply Rejection	PSR	Square Wave,tRISE, tFALL> 5 ns, no bypass capacitors	-	1.0	-	Vp-p

◆ 电性特性曲线Electrical characteristic curve(Ta =25℃)

Fig.1 Output current vs Forward Voltage

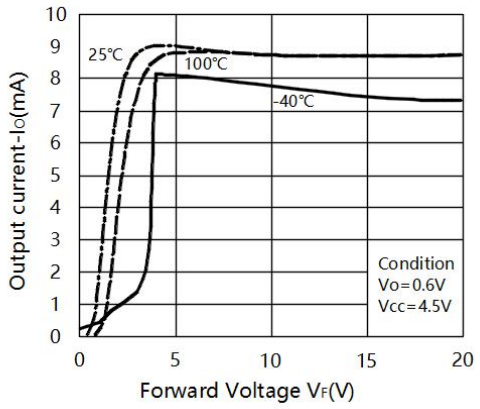


Fig.2 Normalized Output current vs Temperature

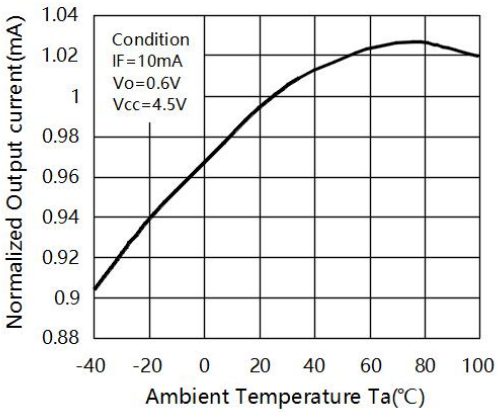


Fig.3 High Level output current vs Ambient Temperature

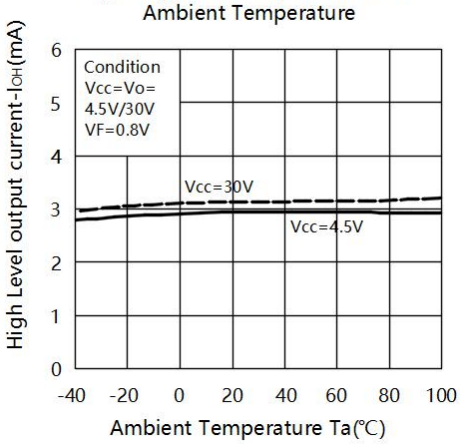


Fig.4 Input current vs Forward Voltage

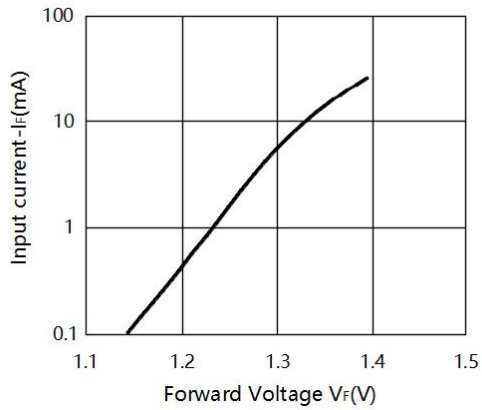


Fig.5 Propagation delay with exernal 20kΩ RL vs.Temperature

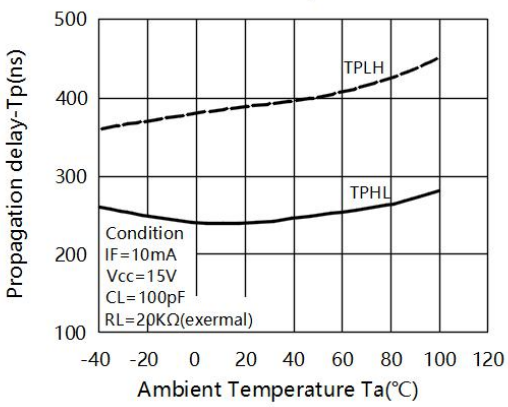


Fig.6 Propagation delay with internal 20kΩ RL vs.Temperature

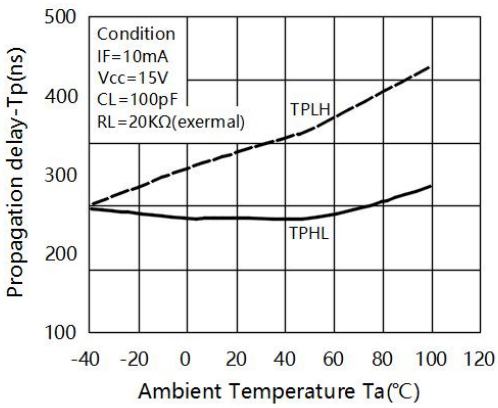


Fig.7 Propagation delay vs. Load resistance

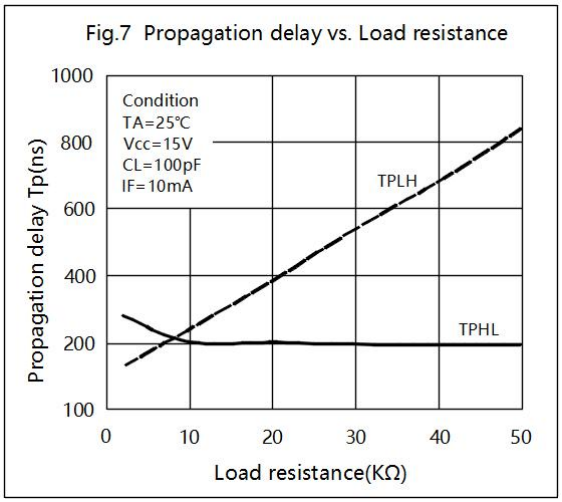


Fig.8 Propagation delay vs. Load capacitance

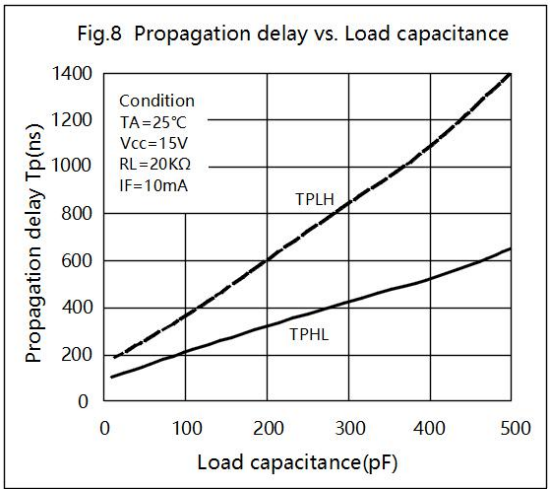


Fig.9 Propagation delay vs. supply voltage

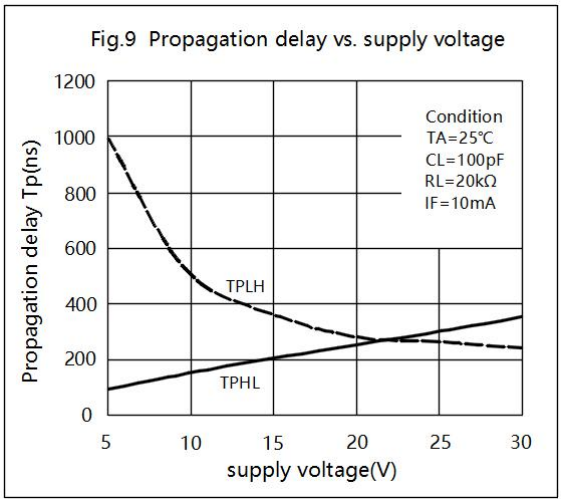
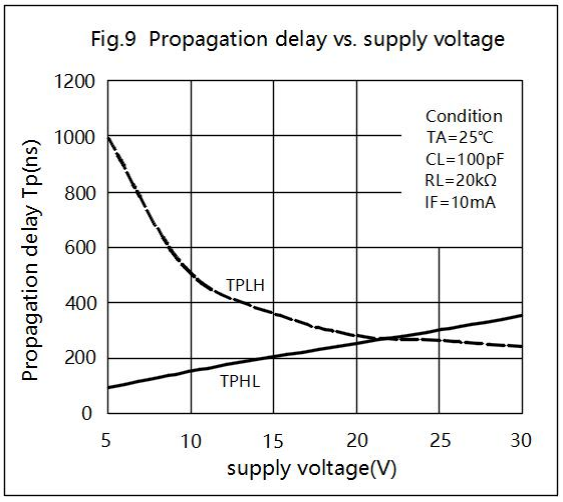
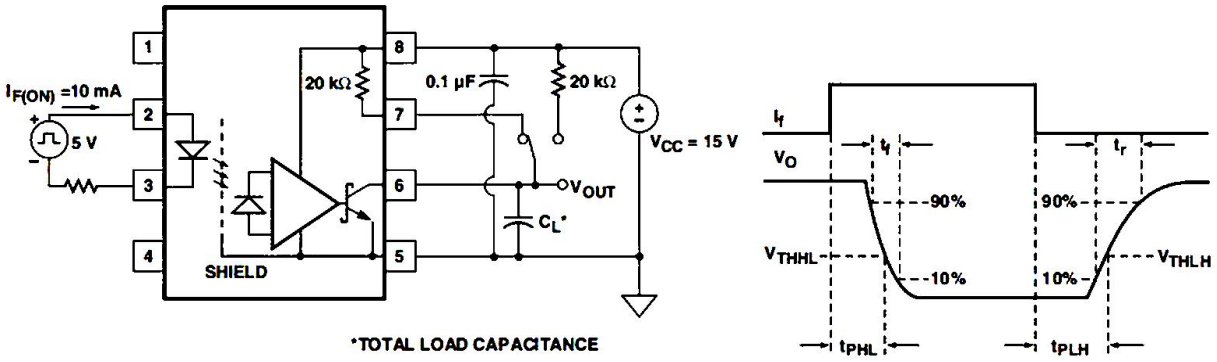


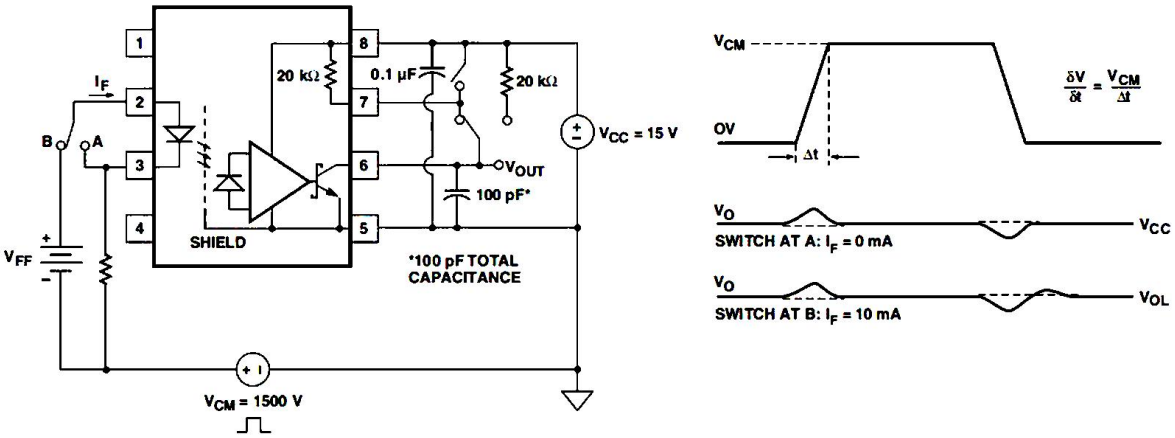
Fig.9 Propagation delay vs. supply voltage



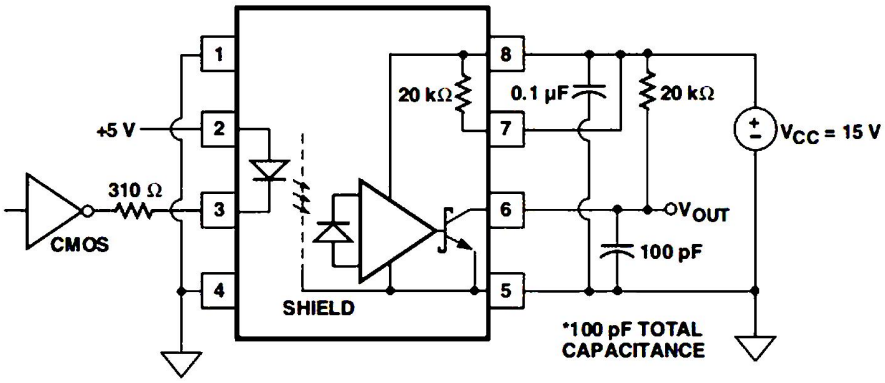
◆ 延迟时间测试电路 Propagation Delay Time Test Circuit



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

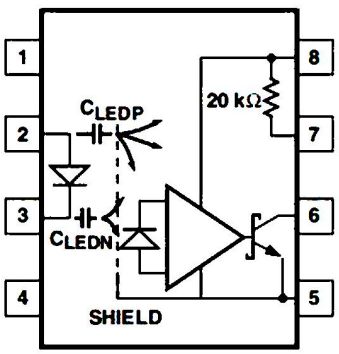


◆ 推荐 LED 驱动电路 Recommended LED Drive circuit



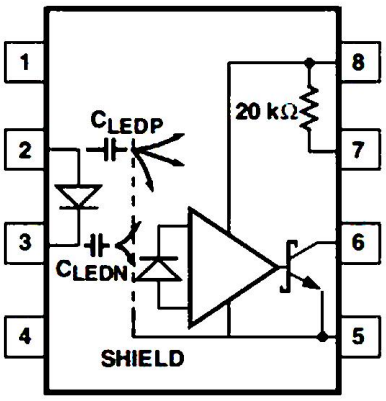
◆ 非屏蔽光耦器的光耦器输入到输出电容模型

Optocoupler input to output capacitance model for unshielded optocouplers



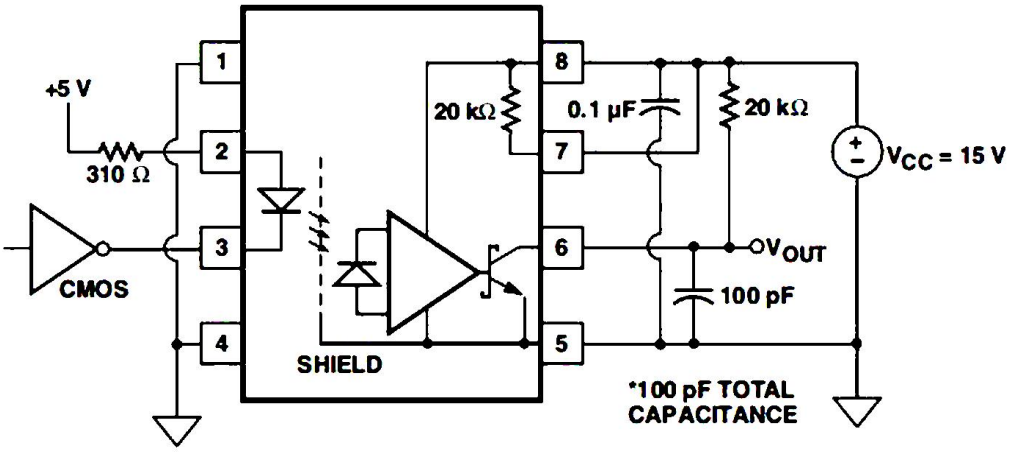
◆ 屏蔽光耦器的光耦输入输出电容模型

Optocoupler input to output capacitance model for shielded optocouplers



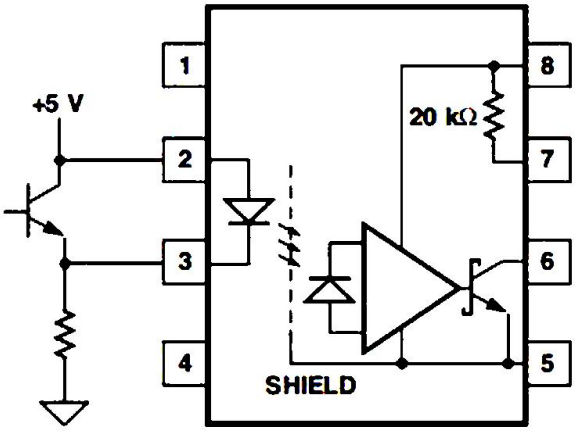
◆ 屏蔽光耦 LED 驱动电路与电阻连接的 LED 阳极（不推荐）

LED drive circuit with resistor connected to LED anode (not recommended)

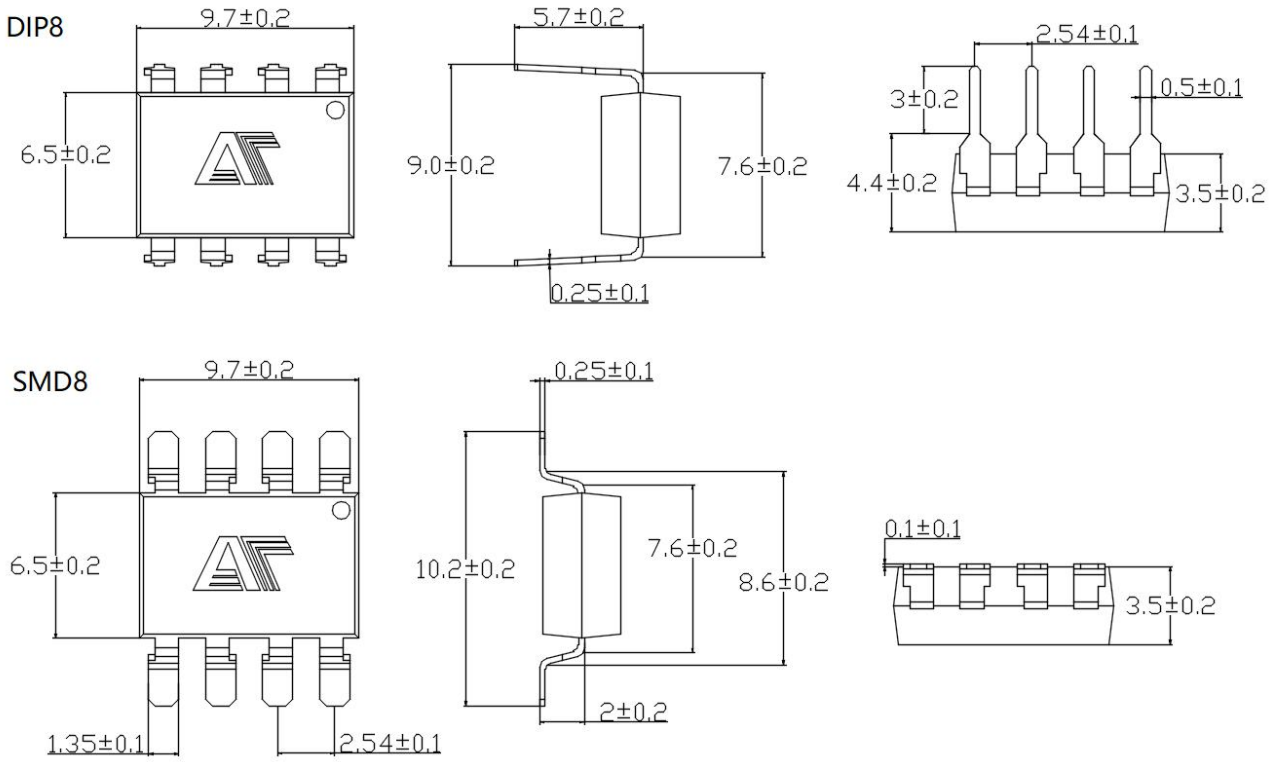


◆ 超高 CMR 推荐 LED 驱动电路

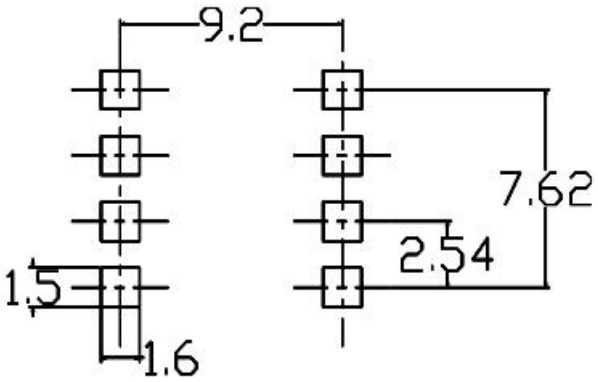
Recommended LED drive circuit for ultra high CMR



◆ 外形尺寸Overall dimension



推荐焊盘：
Recommended



单位：mm

◆ 产品型号命名规则 Order code

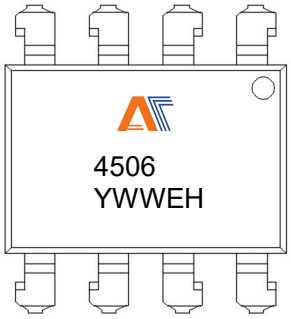
AT 4506 - UN Y - W (V) (ZZ)

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 (4506)
③ 框架类型 Lead Frame (Cu: 铜框架 Copper,Fe: 铁框架 Ferrum)
④ 树脂类型 Epoxy Type (H: 无卤 Halogen-free)
⑤ 封装形式 Package (D:DIP, S:SMD)
⑥ 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)
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“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“ E”代表内部代码
  “E”denotes Internal code
- 印字中的“H”代表无卤
  “H”denotes Halogen-free

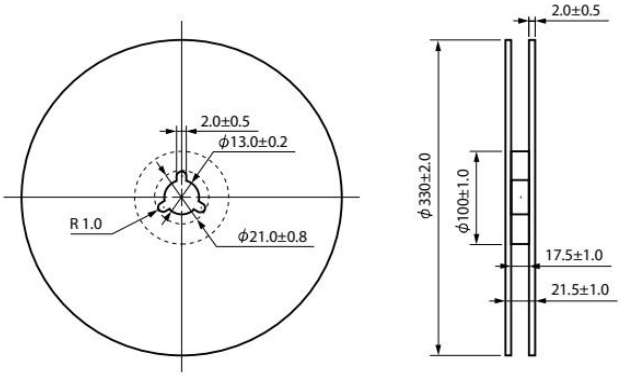


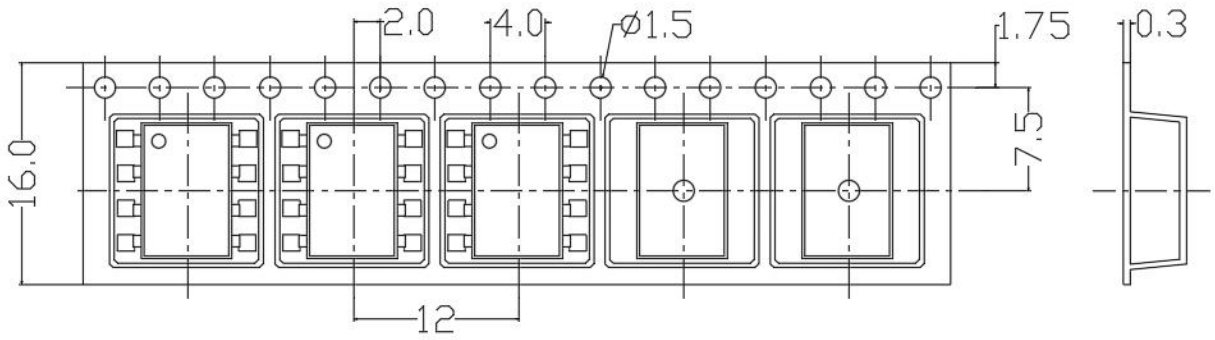
◆ 包装packing

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
SMD8	卷盘 (ϕ330mm蓝盘)	1000 只/盘	2 盘/盒	10 盒/箱	450*390*0.1mm	340*60*340 mm	620*360*365m m	首尾端空至少 200mm
DIP8	管装 (500*12*11mm)	45 只/管	50 管/盒	10 盒/箱	不适用	525*128*56 mm	535*275*300m m	每管使用蓝白胶塞，方向须一致
Package Type	**Packing Form**	**Quantity per Reel**	**Quantity per Box**	**Quantity per Carton**	**Antistatic Bag Specification**	**Box Specification**	**Carton Specification**	**Note**
SMD8	Reel (ϕ330mm Blue)	1000 pcs/reel	2 reels/box	10 boxes/ctn	450*390*0.1mm	340*60*340 mm	620*360*365m m	Leave at least 200mm of blank space at both ends
DIP8	Tube (500*12*11mm)	45 pcs/tube	50 tubes/box	10 boxes/ctn	NA	525*128*56 mm	535*275*300m m	Use blue and white rubber plugs for each tube in the same direction

• 编带包装 Tape & Reel

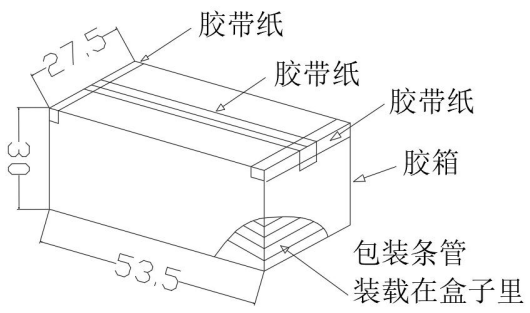
1）每卷数量：2000 只；
Qty/reel：2000 pcs；
2）每箱数量：40000 只；
Qty/ctn：40000 pcs；
3）内包装：每盒 2 盘；
Inner packing：2 reels/box；
4）示意图 Schematic:





• 管条包装Tape&Tube

1）每管数量：45 只。
Qty/Tube ： 45 pcs.
2）每箱数量：22500 只。
Qty/ctn：22500 pcs.
3）内包装 ： 每盒 50 管。
Inner packing：50 Tube/box.
4 ）示意图 Schematic

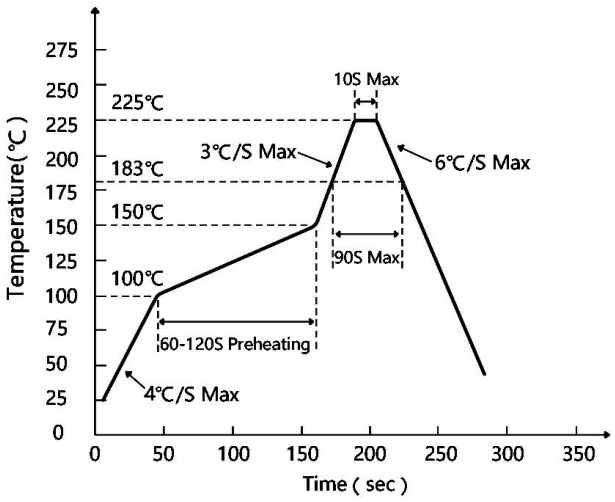


单位：mm

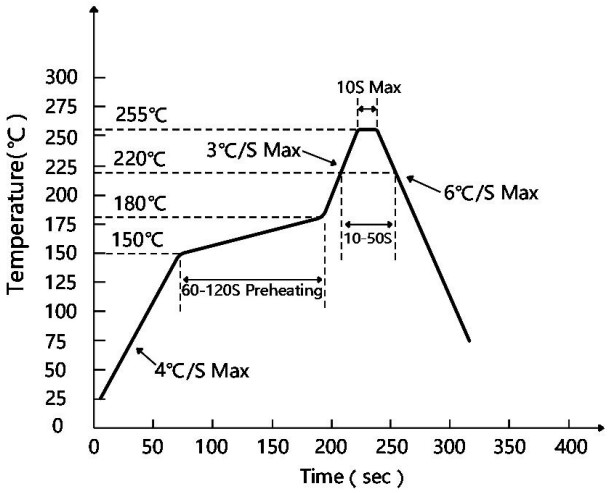
◆ 可靠性测试 Reliability Test Items And Conditions

实验项目 Test Items	参考标准 Reference	实验条件 Test Conditions	时间 Time	样品数 Quantity	判据 Criterion
可焊性 Solderability	JESD22-B102	Tsol=（245±5）℃, t=5s;	1 次1 times	22	0/22
耐焊接热 Resistance to Soldering Heat	JESD22-A106	Tsol=（260±5）℃, t=10s	3 次3 times	22	0/22
静电放电 ESD-HBM	JESD22-A114	Ta=25℃, HBM (2000V)	正反各 3 次 P&N 3 times	10	0/10
高温贮存 High emperature Storage	JESD22-A103	Ta=125℃	1000h	22	0/22
低温贮存 Low Temperature Storage	JESD22-A119	Ta= -55℃	1000h	22	0/22
冷热冲击 Thermal Shock	JESD22-A104	-55℃(15min)←→ 125℃(15min)	循环 300 次 300 cycles	22	0/22
常温寿命试验 Lifespan Test	JESD22-A108	Ta=25℃, IF=50mA ， Vcc=5V	1000h	22	0/22
高温寿命试验 DC Operating Life	JESD22-A108	Ta=110℃, IF=20mA ， Vcc=5V	1000h	76	0/76
高温高湿偏压 High Temperature High Humidity bias Voltage	JESD22-A101	Ta =85℃，RH=85% IF=0mA ， VCE=64V	1000h	22	0/22
高温偏压 High Temperature bias Voltage	JESD22-A108	Ta =110℃，IF=0mA ， VCE=80V	1000h	22	0/22
高压蒸汽试验 High pressure steam test	JESD22-A102	P=15PSIG ， 121℃, 100%RH	96h	22	0/22

◆ 回流焊温度曲线图 Solder Reflow Profile

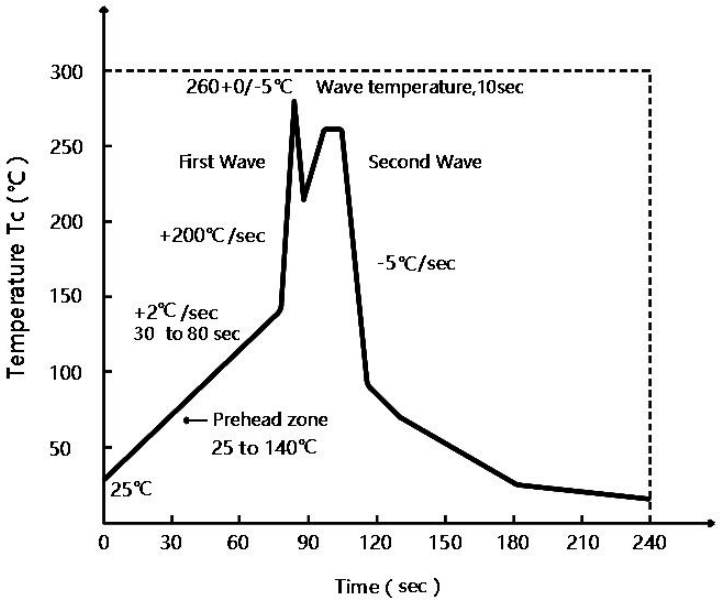


有铅制程 Lead Process



无铅制程 Lead Process

◆ 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 350℃ ± 5℃, 时间≤3s。

Hand soldering iron requirements: Temperature: 350℃ ± 5℃, within 3s.

◆ 注意 Attention

- 奥特半导体实施动态技术迭代机制，产品规格可能随工艺升级调整，最新技术参数以官网发布版本为准。

AOTE implements dynamic technical updates. Specifications are subject to change. Refer to the official website for the latest version.

- 用户需严格遵循本规格书限定的操作条件，因超范围使用（包括但不限于过载、高温、非兼容电路设计）导致的器件失效，不在质量保证范围内。

Users must strictly adhere to specified conditions. Failures caused by misuse (overload, high temperature, incompatible circuits) are excluded from warranty.

- 医疗设备、工业控制等关键场景应用前，需联系技术支持获取定制化验证方案。

Contact technical support for customized validation in critical applications (medical devices, industrial control).

- 本文档有效期至2025年12月31日，后续更新将通过官网公告推送。

This document is valid until Dec 31, 2025. Updates will be notified on the official website.

- 如需对技术参数或应用方案进行进一步确认，欢迎通过以下渠道获取官方支持：

For further clarification on technical specifications or application solutions, please contact us through official channels: