NQUNXIN
群芯微电子

中国芯 光电梦

达灵顿光耦

Darlington Photo Coupler

QX6N139

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QX6N139

Low Input Current, High Gain

概述 Description

QX6N139 使用发光二极管和集成高增益光检测器来提供在输入和输出之间极高的电流传输比。光检测器和输出级之间的独立引脚便于实现 TTL 兼容的饱和电压和高速运行。V_{CC} 和 V_O 可以连接在一起来实现常规的光敏达灵顿操作。基极接入终端实现对带宽增益的调节。

QX6N139 可适用在 CMOS、LSTTL 或其他低功耗应用中。0.5 mA 的 LED 电流在 0 至 70°C 的工作温度范围内可保证 400%的最小电流传输比。

The QX6N139 use a Light Emitting Diode and an integrated high gain photodetector to provide extremely high current transfer ratio between input and output. Separate pins for the photodiode and output stage result in TTL compatible saturation voltages and high speed operation. Where desired the VCC and VO terminals may be tied together to achieve conventional photodarlington operation. A base access terminal allows a gain band-width adjustment to be made.

The QX6N139 is for use in CMOS, LSTTL or other low power applications. A 400% minimum current transfer ratio is guaranteed over 0 to 70°C operating range for only 0.5 mA of LED current.

特性 Features

- 高电流传输比：典型值 2000%
  High current transfer ratio: 2000% typical
- 低输入电流要求：0.5mA
  Low input current requirements: 0.5 mA
- TTL 兼容输出：V_{OL} 典型值 0.1V
  TTL compatible output : 0.1 V VOL typical
- 基极接入实现带宽增益的调节
  Base access allows gain bandwidth adjustment
- 高输出电流：60mA
  High output current: 60 mA
- 8 引脚 DIP 和 SMD 封装
  Available in 8-Pin DIP and SMD package
- 符合安规标准：UL 1577，VDE DIN EN60747-5-5 (VDE 0884-5），CQC11-471543-2022
  Safety standard approval: UL 1577, VDE DIN EN60747-5-5 (VDE 0884-5），CQC11-471543-2022

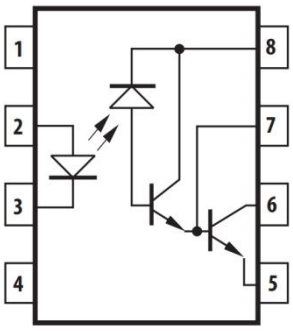
应用 Applications

- 可接地隔离大多数逻辑系列 – TTL/TTL，CMOS/ TTL，CMOS/CMOS，LSTTL/TTL，CMOS/LSTT
  Ground isolate most logic families – TTL/TTL,CMOS/ TTL, CMOS/CMOS, LSTTL/TTL, CMOS/LSTT
- 低输入电流接口
  Low input current line receiver
- EIA RS-232C 接口
  EIA RS-232C line receiver
- 电话铃声检测器
  Telephone ring detector
- 117 V 交流电压状态指示器 – 低输入功耗
  117 V ac line voltage status indicator – low input power dissipation
- 低功耗系统 – 接地隔离
  Low power systems – ground isolation

封装和原理图 Package and Schematic Diagram

DIP8

SMD8



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

注意:必须在引脚 5 和 8 之间连接 0.1uF 旁路电容。
Note: 0.1uF bypass capacitor must be connected between pins 5 and 8.

产品型号命名规则 Order Code

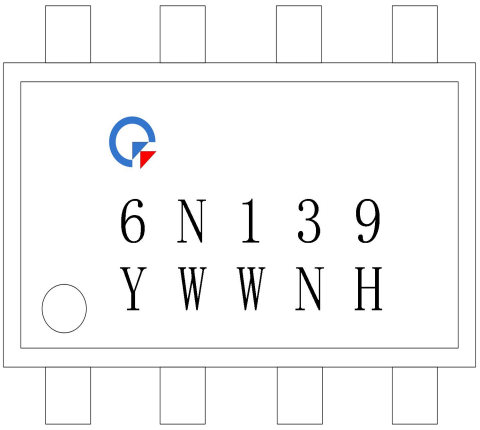
QX 6N139 - UN Y - W (V) (ZZ)

① ② ③ ④ ⑤ ⑥ ⑦

① 公司代码 Company Code（QX: 群芯 Qunxin）
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（特殊范围需填或者空白 Special Range or None）
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"G"为群芯品牌 LOGO
  "G"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
- 印字中"N"代表星期几
  "N"denotes WEEK Number 1, 2, 3, 4, 5, 6, 7
- 印字中的"H"代表无卤：而当产品有卤/无铅时，此处空白
  "H"denotes Halogen-free, when the product has halogen/lead-free, None here



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 Maximum Working Insulation Voltage	V_{IORM}	1500	V_{peak}	DIN/EN/DIN EN60747-5-5
瞬态隔离电压 Highest Allowable Overvoltage	V_{IOTM}	7000	V_{peak}	DIN/EN/DIN EN60747-5-5
隔离电压 Isolation Voltage	Viso	> 5000	Vrms	For 1 min

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

参数 Parameter		符号 Symbol	最小值 Min	最大值 Max.	单位 Unit
发射端 Input	平均输入电流 Average Forward Input Current	$I_{F(AVG)}$	-	20	mA
	峰值输入电流 Peak Forward Input Current (50% Duty Cycle, 1 ms Pulse Width)	I_{FPK}	-	40	mA
	峰值瞬态输入电流 Peak Transient Input Current (<1 μs Pulse Width, 300 pps)	$I_{F(TRAN)}$	-	1.0	A
	反向电压 Reverse Voltage	V_R	-	5	V
	功耗 Input Power Dissipation	P_I	-	35	mW
接收端 output	输出电流 Output Current (Pin 6)	I_O	-	60	mA
	发射极-基极反向电压 Emitter Base Reverse Voltage (Pin 5-7)	V_{EB}	-	0.5	V
	电源电压和输出电压 Supply Voltage and Output Voltage	V_{CC}	-0.5	18	V
	输出功率 Output Power Dissipation	P_O	-	100	mW
总功率 Total Power Dissipation		P_T	-	135	mW
工作温度 Operating Temperature		T_{opr}	-40	+85	℃
存储温度 Storage Temperature		T_{stg}	-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 Power Supply Voltage	V_{CC}	4.5	18	V
开启电流 Forward Input Current (ON)	$I_{F(ON)}$	0.5	12.0	mA
关断电压 Forward Input Voltage (OFF)	$V_{F(OFF)}$	0	1.1	V
操作温度 Operating Temperature	T_A	0	70	℃

特性参数 Electro-optical Characteristics (Ta=25℃)

0°C ≤ T_A ≤ 70°C, 4.5 V ≤ V_{CC} ≤ 18 V, 0.5 mA ≤ $I_{F(ON)}$ ≤ 12 mA, 0 V ≤ $V_{F(OFF)}$ ≤ 0.8 V, unless otherwise specified.

All typical specifications are at T_A = +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_F	I_F=1.6 mA	-	1.40	1.75	V
			TA = 25°C, I_F=1.6 mA	1.25	1.40	1.7	
	反向击穿电压 Reverse Breakdown Voltage	BV_R	IR=10 μA, TA = 25°C	5.0	-	-	V
	电容 Capacitance	CI_N	V=0, f=1MHz	-	60	-	pF
	正向电压的温度系数 Diode Temperature Coefficient	$\Delta V_F/\Delta T_A$	I_F=1.6 mA	-	-1.8	-	mV/°C
接收端 Output	低电平电源电流 Low Level Supply Current	I_{CCL}	I_F=1.6 mA, V_O=Open, V_{CC}=18V	-	0.4	1.5	mA
	高电平电源电流 High Level Supply Current	I_{CCH}	I_F= 0 mA, V_O=Open, V_{CC}=18V	-	0.01	10	μA
传输特性 Transfer Characteristics	低电平输出电压 LOW Level Output Voltage	V_{OL}	I_F= 0.5 mA, I_O=2 mA VCC=4.5V	-	0.1	0.4	V
			I_F= 1.6 mA, I_O=8 mA V_{CC}=4.5V				
			I_F= 5.0 mA, I_O=15 mA V_{CC}=4.5V				
			I_F= 12 mA, I_O=24 mA V_{CC}=4.5V	-	0.2	-	
	高电平输出电流 HIGH Level Output Current	I_{OH}	V_O=V_{CC}=18 V I_F=0mA	-	0.05	100	μA
	电流传输比* Current Transfer Ratio	CTR	I_F=0.5 mA, V_{CC}=4.5V V_O=0.4 V	400	2000	-	%
			I_F=1.6 mA, V_{CC}=4.5V V_O=0.4 V	500	1600	-	%
耐绝缘测试电压 Withstand Insulation Test Voltage		VI_{SO}	RH < 50%, t = 1 min., TA = 25°C	3750	-	-	Vrms
电阻（输入到输出） Resistance (Input to Output)		R_{I-O}	VI-O = 500 Vdc, RH < 45%	-	10^{12}	-	Ω
电容（输入到输出） Resistance (Input to Output)		C_{I-O}	f = 1 MHz	-	0.6	-	pF

注*：电流传输比=I_C/I_F x 100%。

Note*：CTR=I_C/I_F x 100%.

开关特性 Switching Specification

Over recommended operating conditions (T_A = 0 to +70°C), V_{CC}= 5V, unless otherwise specified.

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_{PHL}	I_F=0.5 mA, Rl = 4.7 kΩ	-	5	30	μs
		I_F= 0.5 mA, Rl = 4.7 kΩ T_A=25°C	-	5	25	μs
		I_F=12 mA, Rl = 270 Ω	-	0.2	2	μs
		I_F=12 mA, Rl = 270 Ω T_A=25°C	-	0.2	1	μs
输出低电平传播延迟 Propagation Delay Time to Low Output Level	t_{PLH}	I_F= 0.5 mA, Rl = 4.7 kΩ	-	18	90	μs
		I_F=0.5 mA, Rl = 4.7 kΩ T_A=25°C	-	18	60	μs
		I_F=12 mA, Rl=270 Ω	-	2	10	μs
		I_F=12mA, Rl=270 Ω T_A=25°C	-	2	7	μs
输出高电平共模瞬态抑制 Common Mode Transient Immunity at High Output Level	$\|CM_H\|$	I_F=0 mA, T_A= 25°C Rl = 2.2 kΩ, |VCM| = 10Vp-p	1000	10000	-	V/μs
输出低电平共模瞬态抑制 Common Mode Transient Immunity at Low Output Level	$\|CM_L\|$	I_F=1.6 mA, T_A= 25°C Rl = 2.2 kΩ, |VCM| = 10Vp-p	1000	10000	-	V/μs

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

Fig.1 Output current vs. Output Voltage

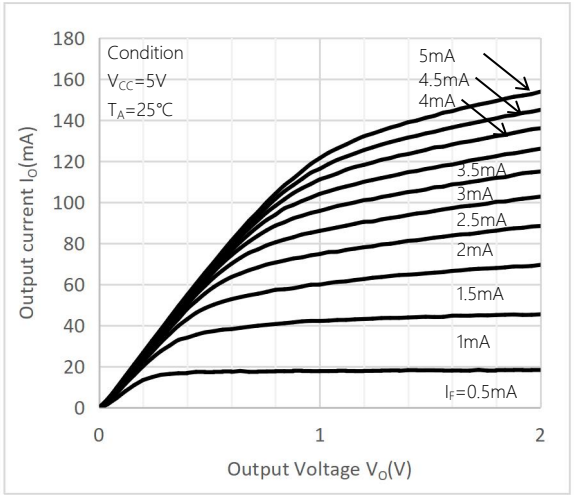


Fig.2 Current transfer ratio vs. Input current

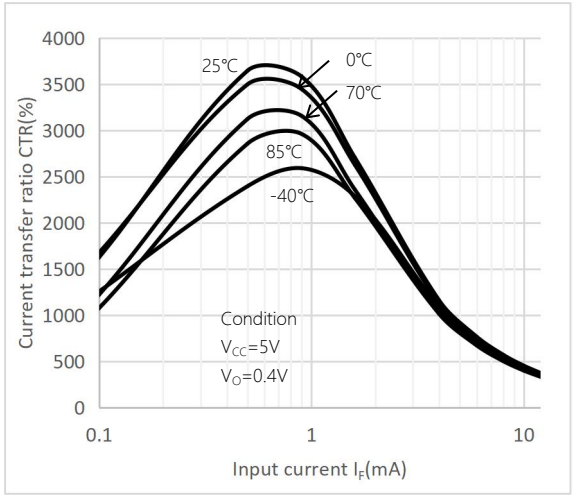


Fig.3 Output current vs. Input current

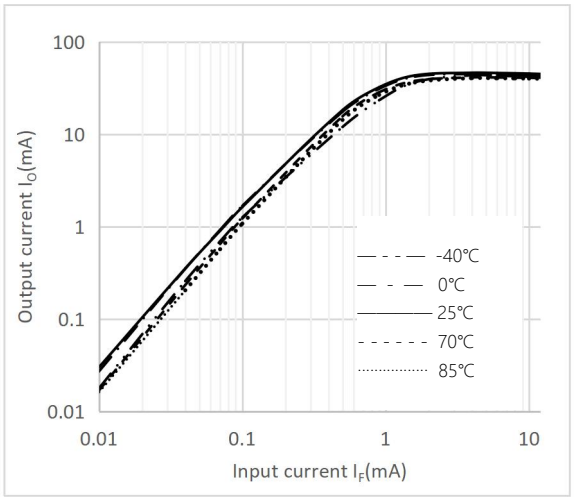


Fig.4 Input current vs. Forward Voltage

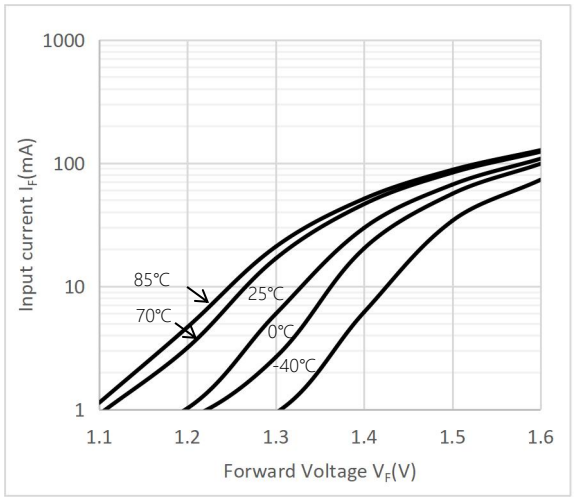


Fig.5 Propagation delay vs. Ambient temperature

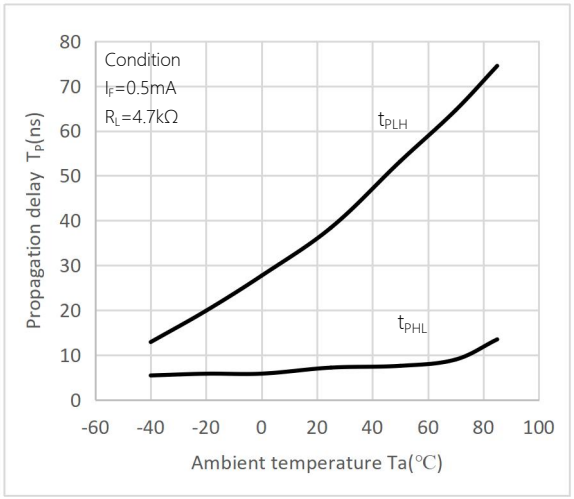


Fig.6 Propagation delay vs. Ambient temperature

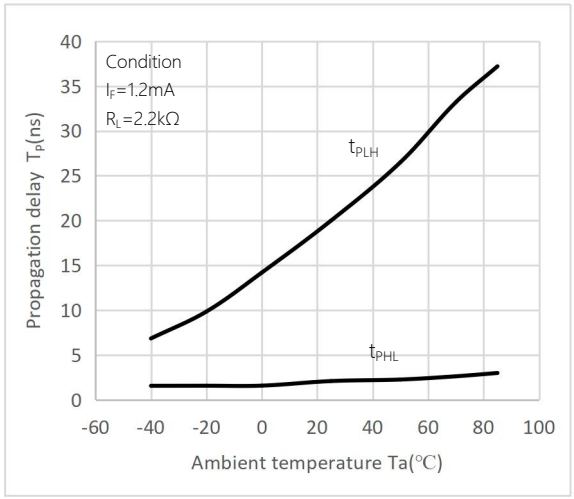


Fig.7 Propagation delay vs. Ambient temperature

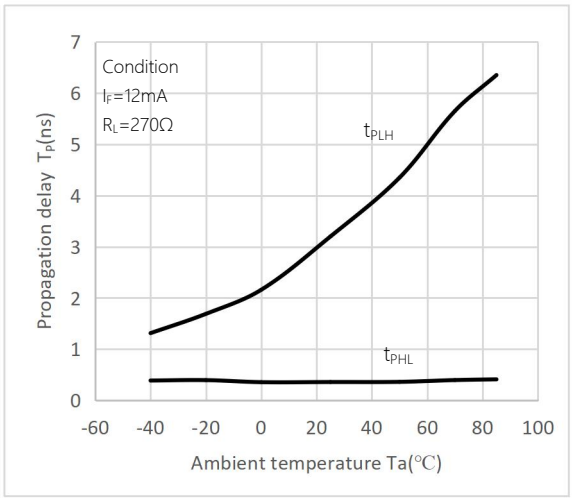


Fig.8 Forward Voltage vs. Ambient temperature

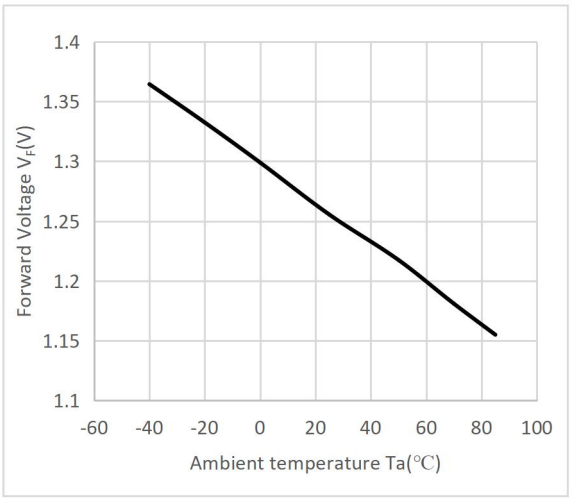
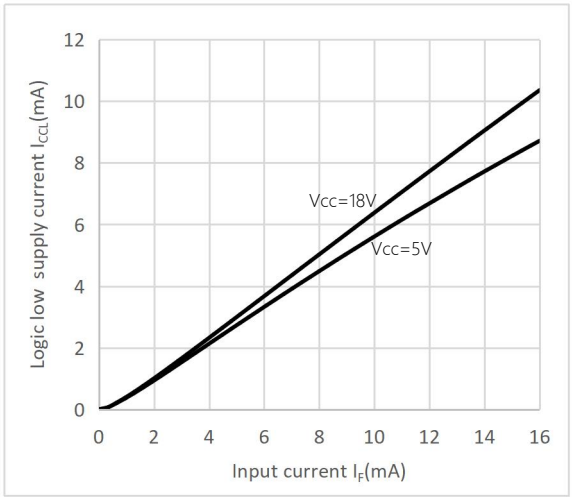
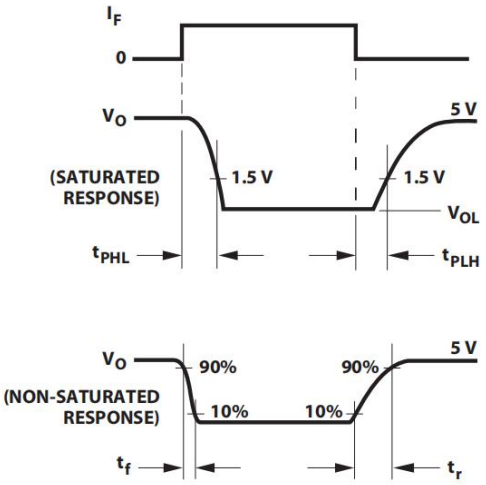
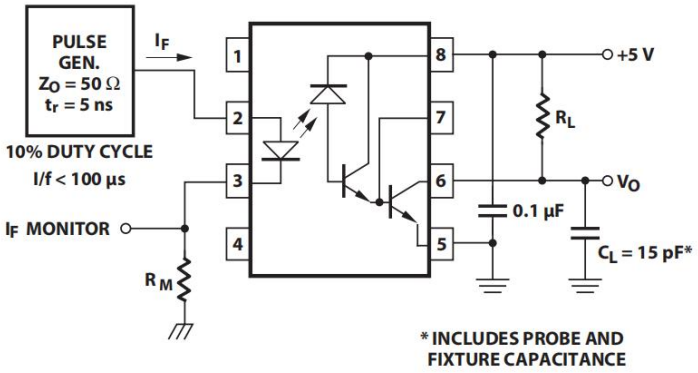


Fig.9 Logic low supply current vs. Input current

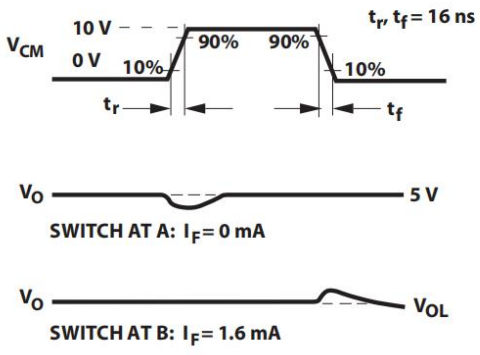


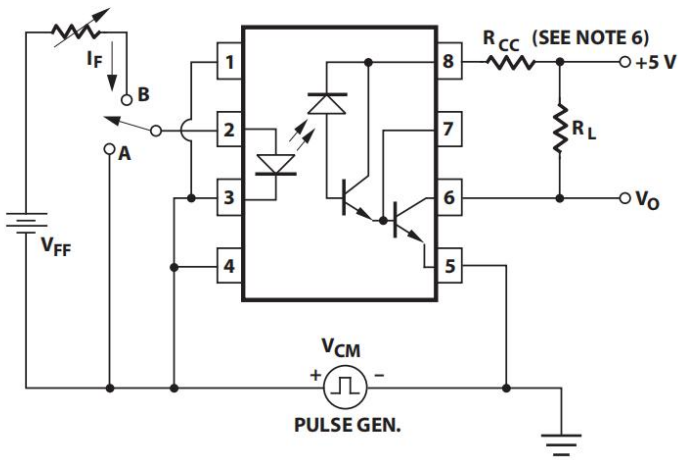
开关时间测试电路 Witch Time Test Circuit





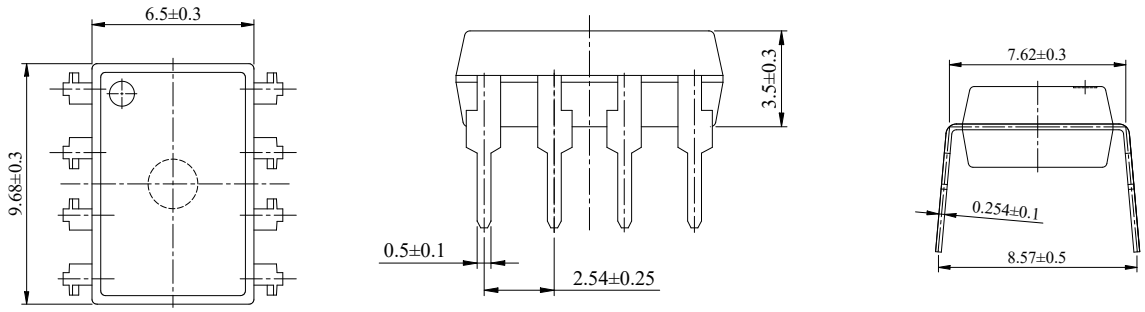
CMR 测试电路 Test Circuit for Common Mode Transient Immunity



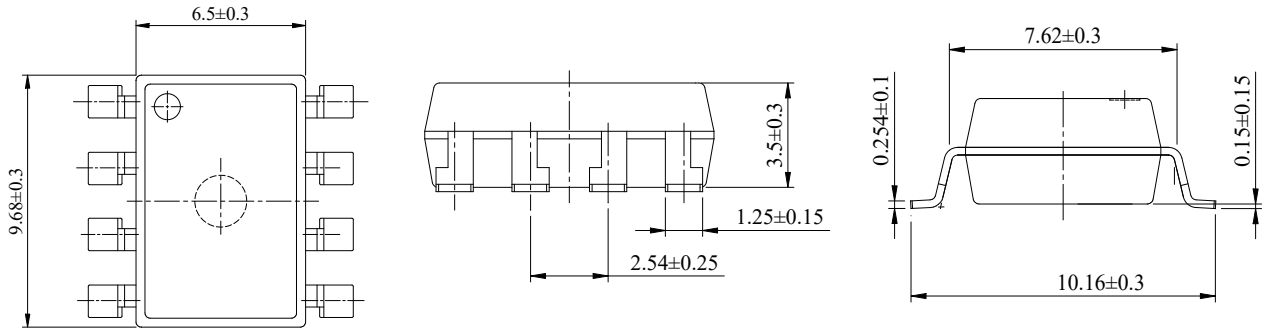


外形尺寸 Outline Dimensions

DIP8

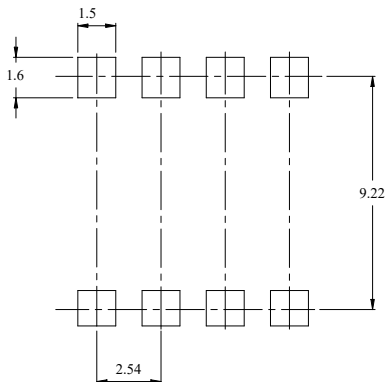


SMD8



单位 Unit: mm

建议焊盘布局 Recommended Pad Layout

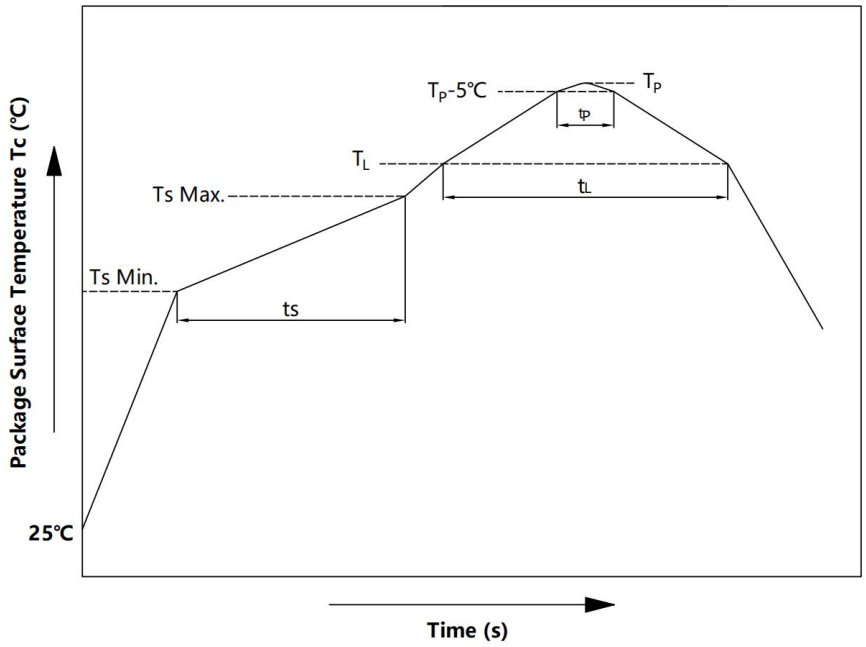


单位 Unit: mm

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



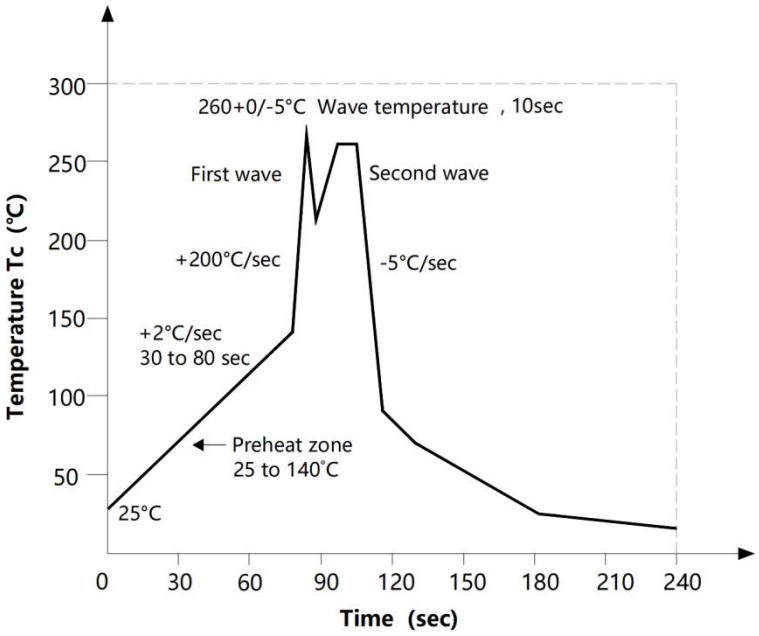
项目 Item	符号 Symbol	最小值 Min.	最大值 Max.	单位 Unit
预热温度 Preheat Temperature	Ts	150	200	℃
预热时间 Preheat Time	ts	60	120	s
升温速率 Ramp-Up Rate (T_L to T_P)	-	-	3	℃/s
液相线温度 Liquidus Temperature	T_L	217		℃
时间高于 T_L Time Above T_L	t_L	60	150	s
峰值温度 Peak Temperature	T_P	-	260	℃
Tc 在(T_P-5)和 T_P 之间的时间 Time During Which Tc 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	℃/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℃ ± 5℃，时间≤3s。
Manual soldering method Temperature: 360℃ ± 5℃, within 3s.

C. 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;

D. 手工烙铁焊要求：温度 360℃ ± 5℃，时间≤3s。
Manual soldering method Temperature: 360℃ ± 5℃, within 3s.

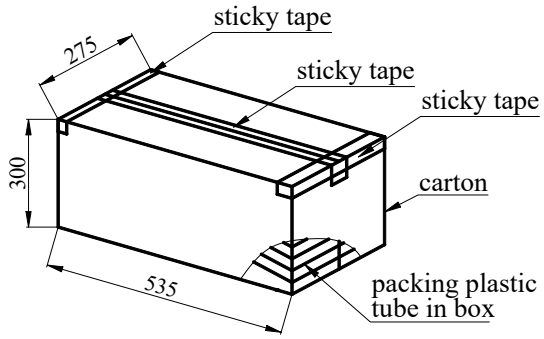
包装 Packing

■ 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
SMD8	卷盘 (ϕ330mm 蓝盘)	1k/盘	2 盘/盒	10 盒/箱	450*390*0.1mm	340*60*340mm	380*360*365mm	首端空 50 个空格，末端空 100
DIP8	管装 (500*12*11mm)	45/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
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)	1K pcs/reel	2 reels/box	10 boxes/ctn	380*380mm	340*60*340 mm	620*360*365 mm	Guard band 200mm min.
DIP8	Tube (500*12*11mm)	45 pcs /tube	50 tubes/box	10 boxes /ctn	NA	525*128*56 mm	535*275*300 mm	Endplug (blue) and Endplug (white) keep the direction

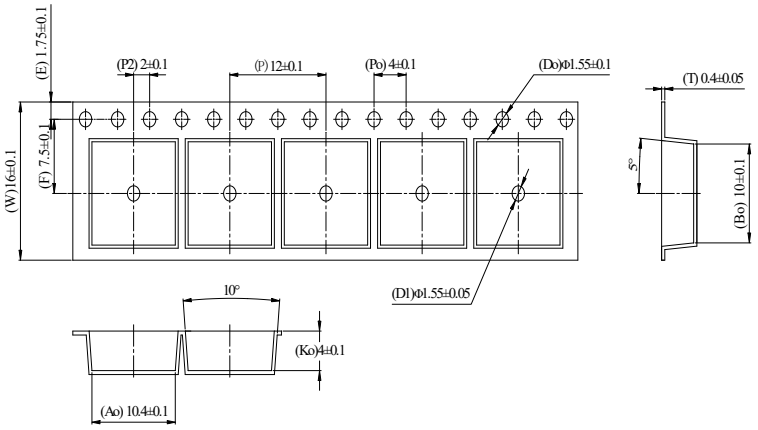
■ DIP8 条管包装 Tube

1) 每管数量：45 只。
   Pcs/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 tubes/box.
4) 示意图 Schematic：



■ SMD8 编带包装 Tape & Reel

1) 每卷数量：1000 只。
   Qty/reel：1000 pcs.
2) 每箱数量：20000 只。
   Qty/ctn：20000 pcs.
3) 内包装：每盒 2 盘。
   Inner packing：2 reels/box.
4) 示意图 Schematic：



单位 Unit：mm

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