## HIGH SPEED ANALOG OUTPUT TYPE 8 PIN PHOTOCOUPLER

## DESCRIPTION

PS8601 and PS8601L is a 8－pin high speed photocoupler containing a GaAIAs LED on input side and a P－N photodiode and a high speed amplifier transistor on output side on one chip．PS8601 is in a plastic DIP（Dual In－line Package）．PS8601L is lead bending type（Gull wing）for surface mount．

## FEATURES

－High supply voltage
（Vcc＝ 35 V MAX．）
－High speed response
（tphl，tplh： $0.8 \mu \mathrm{~s}$ MAX．）
－High isolation voltage
（BV： 5000 Vr．m．s．MIN．）
－TTL，CMOS compatible with a resistor
－Taping product number（PS8601L－E3）
－UL recognized［File No．E72422（s）］
－VDE0884 recognized：option

## APPLICATIONS

－Interface circuit for various instrumentations，control equipments．
－Computer and peripheral manufactures．
－Electrical isolation of TV video terminals．

## ORDERING INFORMATION

| PART NUMBER | PACKAGE | SAFETY STANDARD APPROVAL |
| :---: | :---: | :---: |
| PS8601 | 8 pin DIP | Normal specification products <br> －UL Approved |
| PS8601L | 8 pin DIP，lead bending type |  |
| PS8601L1 | 8 pin DIP，lead bending type （for long distance） |  |
| PS8601L2 |  |  |
| PS8601－V | 8 pin DIP | VDE0884 specification products（option） <br> －VDE Approved |
| PS8601L－V | 8 pin DIP，lead bending type |  |
| PS8601L1－V | 8 pin DIP，lead bending type （for long distance） |  |
| PS8601L2－V |  |  |

## ［Handling Precaution］

This product is weak for static electricity by designed with high speed integrated circuit．So，protect against static electricity when handling．

## PACKAGE DIMENSIONS (Unit: mm)

DIP (Dual In-line Package) Lead Bending type (Gull-wing)
PS8601

## Lead Bending type (for long distance)

PS8601L1

## ABSOLUTE MAXIMUM RATINGS ( $\mathrm{Tc}=\mathbf{2 5}^{\circ} \mathrm{C}$ )

Diode

| Forward Current | IF | 25 | mA |
| :---: | :---: | :---: | :---: |
| Reverse Voltage | VR | 5 | V |
| Power Dissipation | PD | 45 | mW |
| Detector |  |  |  |
| Supply Voltage | Vcc | 35 | V |
| Output Voltage | Vo | 35 | V |
| Output Current | lo | 8 | mA |
| Power Dissipation | Pc | 100 | mW |
| Isolation Voltage** | BV | 5000 | $V_{\text {r.m.s. }}$ |
| Operating Temperature | TA | -55 to +100 | ${ }^{\circ} \mathrm{C}$ |
| Storage Temperature | Tstg | -55 to +150 | ${ }^{\circ} \mathrm{C}$ |

*1 AC voltage for 1 minute at $\mathrm{T}_{\mathrm{A}}=25^{\circ} \mathrm{C}, \mathrm{RH}=60 \%$ between input and output.
ELECTRICAL CHARACTERISTICS ( $\mathrm{T}_{\mathrm{A}}=25^{\circ} \mathrm{C}$ )

| PARAMETER |  | SYMBOL | MIN. | TYP | MAX. | UNIT | TEST CONDITIONS |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Diode | Forward Voltage | $V_{F}$ |  | 1.7 | 2.2 | V | $\mathrm{IF}_{\mathrm{F}}=16 \mathrm{~mA}$ |
|  | Reverse Current | IR |  |  | 10 | $\mu \mathrm{A}$ | $\mathrm{V}_{\mathrm{R}}=5 \mathrm{~V}$ |
|  | Forward Voltage Temperature Coefficient | $\frac{\Delta \mathrm{V}_{\mathrm{F}}}{\Delta \mathrm{~T}}$ |  | -1.6 |  | $\mathrm{mV} /{ }^{\circ} \mathrm{C}$ | $\mathrm{IF}=16 \mathrm{~mA}$ |
|  | Junction Capacitance | $\mathrm{C}_{\mathrm{t}}$ |  | 60 |  | pF | $\mathrm{V}=0, \mathrm{f}=1 \mathrm{MHz}$ |
| Detector | High Level Output Current | Іон 1 |  | 3 | 500 | nA | $\mathrm{IF}=0 \mathrm{~mA}, \mathrm{Vcc}=\mathrm{V}_{\mathrm{o}}=5.5 \mathrm{~V}$ |
|  | High Level Output Current | Іон 2 |  |  | 100 | $\mu \mathrm{A}$ | $\mathrm{IF}=0 \mathrm{~mA}, \mathrm{Vcc}-\mathrm{Vo}_{0}=35 \mathrm{~V}$ |
|  | Low Level Output Voltage | VoL |  | 0.1 | 0.4 | V | $\begin{aligned} & \mathrm{IF}=16 \mathrm{~mA}, \mathrm{Vcc}=4.5 \mathrm{~V}, \\ & \mathrm{Io}=1.2 \mathrm{~mA} \end{aligned}$ |
|  | Low Level Supply Current | Iccl |  | 50 |  | $\mu \mathrm{A}$ | $\mathrm{IF}_{\mathrm{F}}=16 \mathrm{~mA}, \mathrm{~V} \mathrm{o}=$ Open, $\mathrm{V} \mathrm{cc}=35 \mathrm{~V}$ |
|  | High Level Supply Current | Icch |  | 0.01 | 1 | $\mu \mathrm{A}$ | $\mathrm{IF}_{\mathrm{F}}=0 \mathrm{~mA}, \mathrm{~V}$ o $=$ Open, $\mathrm{Vcc}=35 \mathrm{~V}$ |
| Coupler | Current Transfer Ratio | CTR | 15 |  |  | \% | $\begin{aligned} & \mathrm{I}_{\mathrm{F}}=16 \mathrm{~mA}, \mathrm{~V}_{\mathrm{cc}}=4.5 \mathrm{~V}, \\ & \mathrm{~V}=0.4 \mathrm{~V} \end{aligned}$ |
|  | Isolation Resistance | R1-2 | $10^{11}$ |  |  | $\Omega$ | $V_{\text {in-out }}=1 \mathrm{kVDC}$ |
|  | Isolation Capacitance | $\mathrm{C}_{1-2}$ |  | 0.7 |  | pF | $\mathrm{V}=0, \mathrm{f}-1 \mathrm{MHz}$ |
|  | Propagation Delay Time $(\mathrm{H} \rightarrow \mathrm{~L})$ | tpHL |  | 0.5 | 0.8 | $\mu s$ | $\begin{aligned} & \mathrm{IF}_{\mathrm{F}}=16 \mathrm{~mA}, \mathrm{~V}_{\mathrm{cc}}=5 \mathrm{~V} \\ & \mathrm{RL}=1.9 \mathrm{k} \Omega \end{aligned}$ |
|  | Propagation Delay Time $(\mathrm{L} \rightarrow \mathrm{H})$ | tpLH |  | 0.3 | 0.8 | $\mu \mathrm{S}$ | $\begin{aligned} & \mathrm{IF}_{\mathrm{F}}=16 \mathrm{~mA}, \mathrm{~V}_{\mathrm{cc}}=5 \mathrm{~V} \\ & \mathrm{RL}=1.9 \mathrm{k} \Omega \end{aligned}$ |

*2 Test Circuit for Propagation Delay Time.



TYPICAL CHARACTERISTICS ( $\mathrm{T}_{\mathrm{A}}=25^{\circ} \mathrm{C}$ )

MAX. FORWARD CURRENT vs. AMBIENT TEMPERATURE


FORWARD CURRENT vs.
FORWARD VOLTAGE


CURRENT TRANSFER RATIO vs. FORWARD CURRENT


TRANSISTOR POWER DISSIPATION vs. AMBIENT TEMPERATURE


OUTPUT CURRENT vs.
OUTPUT VOLTAGE


NORMALIZED OUTPUT CURRENT vs. AMBIENT TEMPERATURE



## TAPING

1. TAPING DIRECTION

2. OUTLINE AND DIMENSIONS (TAPE)


|  | Unit: mm |
| :---: | :---: |
| SYMBOL | RATINGS |
| A | $10.7 \pm 0.1$ |
| B | $10.3 \pm 0.1$ |
| D0 | $1.55 \pm 0.1$ |
| D1 | $1.55 \pm 0.1$ |
| E | $1.75 \pm 0.1$ |
| F | $7.5 \pm 0.1$ |
| P0 | $4.0 \pm 0.1$ |
| P1 | $12.0 \pm 0.1$ |
| P2 | $2.0 \pm 0.1$ |
| T0 | $4.3 \pm 0.2$ |
| T1 | 0.3 |
| W | $16 \pm 0.3$ |

3. OUTLINE AND DIMENSIONS (REEL)


Unit: mm

| SYMBOL | RATINGS |
| :---: | :---: |
| A | 330 |
| N | $80 \pm 5.0$ |
| W | $16.4_{-0}^{+2.0}$ |

4. PACKING; 1000 pieces/reel

## SOLDERING PRECAUTION

(1) Infrared reflow soldering

- Peak temperature : $235^{\circ} \mathrm{C}$ or lower (plastic surface)
- Time : 30 s or less
(Time during plastic surface temperature overs $210^{\circ} \mathrm{C}$ )
- No. of reflow times : Three
- Flux : Rosin-base flux

INFRARED RAY REFLOW TEMPERATURE PROFILE

<NOTES>
(1) Please avoid be removed the residual flux by water after the first reflow processes.

(2) Dip soldering

- Peak temperature : $260^{\circ} \mathrm{C}$ or lower
- Time : 10 s or less
- Flux : Rosin-base flux


## SPECIFICATION OF VDE MARKS LICENSE DOCUMENT (VDE0884)

| PARAMETER | SYMBOL | SPECK | UNIT |
| :---: | :---: | :---: | :---: |
| Application classification (DIN VDE0109) for rated line voltages $\leq 300 V_{\text {eff }}$ for rated line voltages $\leq 600 V_{\text {eff }}$ |  | $\begin{aligned} & \text { IV } \\ & \text { III } \end{aligned}$ |  |
| Climatic test class (DIN IEC 68 Teil 1/09.80) |  | 55/100/21 |  |
| Dielectric strength maximum operating isolation voltage. <br> Test voltage (partial discharge test procedure a for type test and random test) Upr $=1.2 \times$ Uіовм, $\mathrm{Pd}<5 \mathrm{pC}$ | Uiorm Upr | $\begin{gathered} 890 \\ 1068 \end{gathered}$ | $\bigvee_{\text {peak }}$ <br> $V_{\text {peak }}$ |
| Test voltage (partial discharge test procedure b for random test) $U_{\text {pr }}=1.6 \times$ UIorm, $\mathrm{Pd}<5 \mathrm{pC}$ | $U_{\text {pr }}$ | 1424 | $V_{\text {peak }}$ |
| Highest permissible overvoltage | UTR | 8000 | $V_{\text {peak }}$ |
| Degree of pollution (DIN VDE 0109) |  | 2 |  |
| Clearance distance |  | $>7.0$ | mm |
| Creepage distance |  | > 7.0 | mm |
| Comparative tracking index (DIN IEC 112/VDE 0303 part 1) | CTI | 175 |  |
| Material group (DIN VDE0109) |  | IIIa |  |
| Storage temperature range | Tstg | -55 to +150 | Cel |
| Operating temperature range | Tamb | -55 to +100 | Cel |
| Isolation resistance, minimum value $\begin{aligned} & \text { Uı }=500 \mathrm{~V} \text { dc at } 25 \mathrm{Cel} \\ & \mathrm{U}_{\mathrm{I} \circ}=500 \mathrm{~V} \text { dc at Tamp maximum at least } 100 \mathrm{Cel} \end{aligned}$ | Ris min <br> Ris min | $\begin{aligned} & 10^{12} \\ & 10^{11} \end{aligned}$ | ohm <br> ohm |
| Safety maximum ratings (maximum permissible in case of fault, see thermal derating curve) <br> Package temperature <br> Current (input current IF, Psi =0) <br> Power (output or total power dissipation) <br> Isolation resistance <br> U ı $=500 \mathrm{~V}$ dc at 175 Cel (Tsi) | Tsi <br> Isi <br> Psi <br> Ris min | $\begin{gathered} 175 \\ 400 \\ 700 \\ 10^{9} \end{gathered}$ | Cel <br> mA <br> mW <br> ohm |

## CAUTION

> The Great Care must be taken in dealing with the devices in this guide. The reason is that the material of the devices is GaAs (Gallium Arsenide), which is designated as harmful substance according to the law concerned. Keep the law concerned and so on, especially in case of removal.


#### Abstract

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