SHARP

# PC923X OPIC Photocoupler

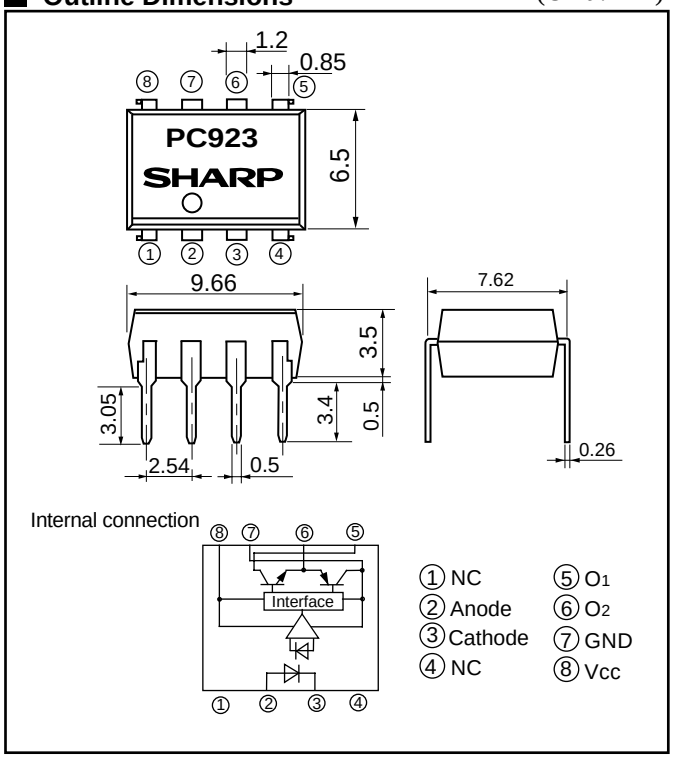
High Speed OPIC Photocoupler for MOS-FET/IGBT Drive

## Features

(1) Built-in direct drive circuit for MOS-FET/IGBT drive
($I_{O1P}$, $I_{O2P}$ : 0.4 A)
(2) High speed response
($t_{PHL}$,$t_{PLH}$ : MAX. 0.5 μs)
(3) Wide operating supply voltage range
($V_{CC}$ : 15 to 30 V, Ta= -10 to 60 ˚C )
(4) High noise reduction type
($CM_H$=MIN. -1 500 V/μs)
($CM_L$=MIN. 1 500 V/μs)
(5) High isolation voltage ($V_{iso(rms)}$ : 5 kV)

## Outline Dimensions

(Unit : mm)




## Applications

(1) Inverter controlled air conditioners

* "OPIC" (Optical IC) is a trademark of the SHARP Corporation. An OPIC consists of a light-detecting element and signal-processing circuit integrated onto a single chip.

## Absolute Maximum Ratings

(Unless specified, Ta=$T_{opr}$)

| Parameter | | | Symbol | Ratings | Unit |
|---|---|---|---|---|---|
| Input | | Forward current | $I_F$ | 20 | mA |
| | *1 | Reverse voltage | $V_R$ | 6 | V |
| Output | | Supply voltage | $V_{CC}$ | 35 | V |
| | | $O_1$ Output current | $I_{O1}$ | 0.1 | A |
| | *2 | $O_1$ Peak output current | $I_{O1P}$ | 0.4 | A |
| | | $O_2$ Output current | $I_{O2}$ | 0.1 | A |
| | *2 | $O_2$ Peak output current | $I_{O2P}$ | 0.4 | A |
| | | $O_1$ Output voltage | $V_{O1}$ | 35 | V |
| | | Power dissipation | $P_O$ | 500 | mW |
| | | Total power dissipation | $P_{tot}$ | 550 | mW |
| | *3 | Isolation voltage | $V_{iso(rms)}$ | 5.0 | kV |
| | | Operating temperature | $T_{opr}$ | -20 to +80 | ˚C |
| | | Storage temperature | $T_{stg}$ | -55 to +125 | ˚C |
| | *4 | Soldering temperature | $T_{sol}$ | 260 | ˚C |

*1 Ta=25˚C
*2 Pulse width ≤ 0.15 μs, duty ratio= 0.01
*3 40 to 60%RH, AC for 1 minute, Ta=25˚C
*4 For 10s

## ■ Electro-optical Characteristics

(Unless specified, Ta=$T_{opr}$)

| Parameter | | | Symbol | Conditions | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|---|---|---|
| Input | Forward voltage | | $V_{F1}$ | $T_a$= 25 ˚C, $I_F$ =10 mA | – | 1.6 | 1.75 | V |
| | | | $V_{F2}$ | $T_a$= 25 ˚C, $I_F$= 0.2 mA | 1.2 | 1.5 | – | V |
| | Reverse current | | $I_R$ | $T_a$= 25 ˚C, $V_R$= 5 V | – | – | 10 | μA |
| | Terminal capacitance | | $C_t$ | $T_a$=25 ˚C, V= 0, f= 1 kHz | – | 30 | 250 | pF |
| Output | Operation temperature supply voltage | | $V_{CC}$ | $T_a$= -10 to 60 ˚C | 15 | – | 30 | V |
| | | | | – | 15 | – | 24 | V |
| | $O_1$ low level output voltage | | $V_{O1L}$ | $V_{CC1}$=12 V, $V_{CC2}$= -12 V, $I_{O1}$= 0.1 A, $I_F$= 5 mA | – | 0.2 | 0.4 | V |
| | $O_2$ high level output voltage | | $V_{O2H}$ | $V_{CC}$=$V_{O1}$= 24 V, $I_{O2}$= -0.1 A, $I_F$= 5 mA | 18 | 21 | – | V |
| | $O_2$ low level output voltage | | $V_{O2L}$ | $V_{CC}$= 24 V, $I_{O2}$= 0.1 A, $I_F$= 0 | – | 1.2 | 2.0 | V |
| | $O_1$ leak current | | $I_{O1L}$ | $T_a$= 25 ˚C,$V_{CC}$=$V_{O1}$= 35 V, $I_F$=0 mA | – | – | 500 | μA |
| | $O_2$ leak current | | $I_{O2L}$ | $T_a$= 25 ˚C,$V_{CC}$=$V_{O2}$= 35 V, $I_F$=5 mA | – | – | 500 | μA |
| | High level supply current | | $I_{CCH}$ | $T_a$=25 ˚C, $V_{CC}$= 24 V, $I_F$= 5 mA | – | 6 | 10 | mA |
| | | | | $V_{CC}$= 24 V, $I_F$= 5 mA | – | – | 14 | mA |
| | Low level supply current | | $I_{CCL}$ | $T_a$=25 ˚C, $V_{CC}$= 24 V, $I_F$= 0 mA | – | 8 | 13 | mA |
| | | | | $V_{CC}$= 24 V, $I_F$= 0 mA | – | – | 17 | mA |
| Transfer characteristics | "Low→High" thresh hold input current *5 | | $I_{FLH}$ | $T_a$=25˚C, $V_{CC}$= 24 V | 0.3 | 1.5 | 3.0 | mA |
| | | | | $V_{CC}$= 24 V | 0.2 | – | 5.0 | mA |
| | Isolation resistance | | $R_{ISO}$ | $T_a$= 25 ˚C, DC= 500 V 40 to 60 %RH | 5 x $10^{10}$ | 1 x $10^{11}$ | – | Ω |
| | Response time | "Low→High"transfer time | $t_{PLH}$ | $T_a$= 25 ˚C, $V_{CC}$= 24 V,$I_F$= 5 mA, $R_G$= 47 Ω, $C_G$= 3000 pF | – | 0.3 | 0.5 | μs |
| | | "High→Low"transfer time | $t_{PHL}$ | | – | 0.3 | 0.5 | |
| | | Rise time | $t_r$ | | – | 0.2 | 0.5 | |
| | | Fall time | $t_r$ | | – | 0.2 | 0.5 | |
| | Instantaneous common mode rejection voltage "Output:High level" | | $CM_H$ | $T_a$=25 ˚C, $V_{CM}$=600 $V_{(peak)}$, $I_F$=5 mA $V_{CC}$= 24 V, $\Delta V_{O2H}$= 2.0 V | -1 500 | – | – | V/μs |
| | Instantaneous common mode rejection voltage "Output: Low level" | | $CM_L$ | $T_a$=25 ˚C, $V_{CM}$=600 $V_{(peak)}$, $I_F$= 0 mA $V_{CC}$= 24 V, $\Delta V_{O2L}$= 2.0 V | 1 500 | – | – | V/μs |

*5 $I_{FLH}$ is forward current when output $O_2$ become "Low" to "High"

*6 When measuring output and transfer characteristics, connect a by-pass capacitor(0.01μF or more) between $V_{CC}$ and GND near the device.

## ■ Truth Table

| Input | $O_2$ output | Tr. 1 | Tr. 2 |
|---|---|---|---|
| ON | High level | ON | OFF |
| OFF | Low level | OFF | ON |

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