



# PHOTOCOUPLER PS2841-4A, PS2841-4B

## WORLD'S SMALLEST CLASS, FOUR CHANNELS 12-PIN ULTRA SHRINK SOP PHOTOCOUPLER

-NEPOC Series-

### DESCRIPTION

The PS2841-4A and PS2841-4B are optically coupled isolators containing GaAs light emitting diodes and NPN silicon phototransistors.

These products include four channels in a single package for high-density mounting applications.

The PS2841-4A and PS2841-4B are the world's smallest class of photocouplers and realize about 50% reduction in mounting area compared with the PS280x and PS281x Series.

### FEATURES

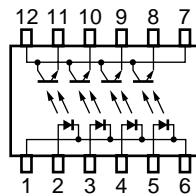
- Ultra small and thin package  
(12-pin ultra shrink SOP, Pin pitch 0.8 mm, 4.4 (L) × 5.6 (W) × 2.5 (H))
- Common lead PS2841-4A: cathode, collector common  
PS2841-4B: anode, collector common
- High current transfer ratio (CTR = 200% TYP. @  $I_f = 1\text{mA}$ )
- High isolation voltage (BV = 1 500 Vr.m.s.)
- Pb-Free product
- Ordering number of tape product:  
PS2841-4A-F3, F4: 2 500 pcs/reel  
PS2841-4B-F3, F4: 2 500 pcs/reel
- Safety standards
  - UL approved: File No. E72422

### APPLICATIONS

- Programmable logic controllers (PLCs)
- Input and output for function automation
- Hybrid IC

#### PIN CONNECTIONS (Top View)

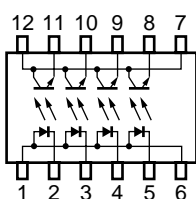
##### PS2841-4A



| Channel | Anode | Cathode     | Emitter | Collector    |
|---------|-------|-------------|---------|--------------|
| 1 ch    | 2     | 1, 6 common | 11      | 7, 12 common |
| 2 ch    | 3     | 1, 6 common | 10      | 7, 12 common |
| 3 ch    | 4     | 1, 6 common | 9       | 7, 12 common |
| 4 ch    | 5     | 1, 6 common | 8       | 7, 12 common |

#### PIN CONNECTIONS (Top View)

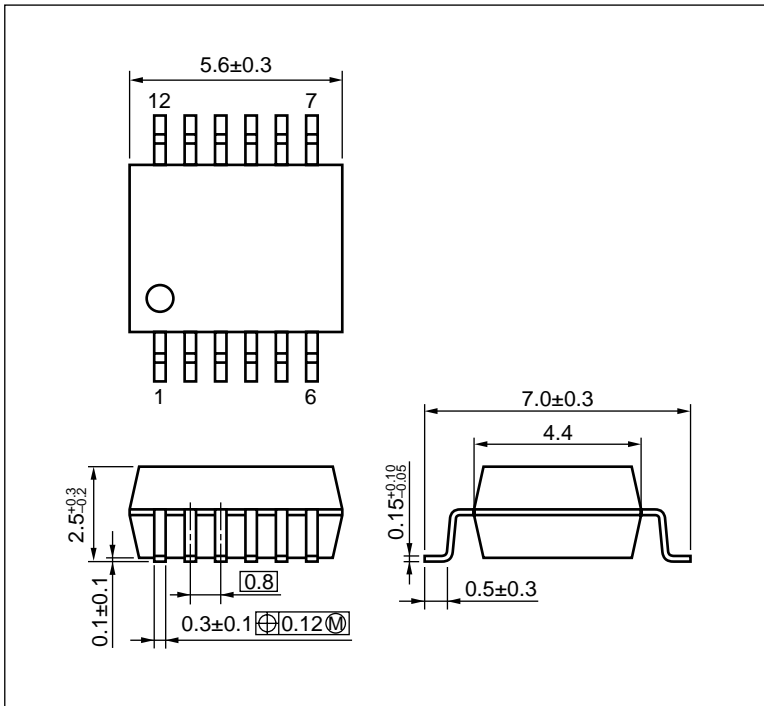
##### PS2841-4B



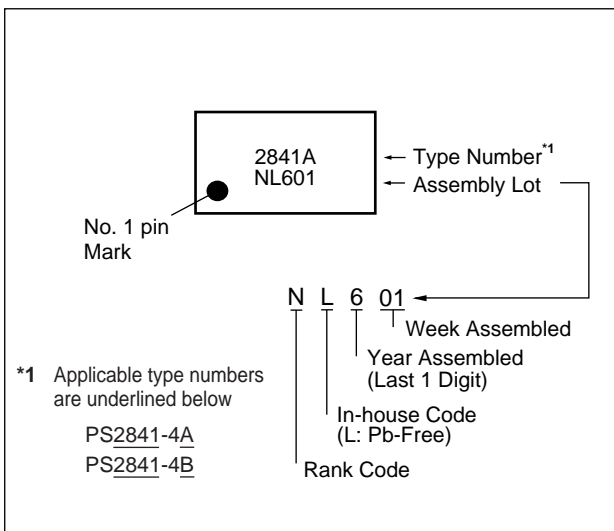
| Channel | Anode       | Cathode | Emitter | Collector    |
|---------|-------------|---------|---------|--------------|
| 1 ch    | 1, 6 common | 2       | 11      | 7, 12 common |
| 2 ch    | 1, 6 common | 3       | 10      | 7, 12 common |
| 3 ch    | 1, 6 common | 4       | 9       | 7, 12 common |
| 4 ch    | 1, 6 common | 5       | 8       | 7, 12 common |

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**PACKAGE DIMENSIONS (UNIT: mm)**



**<R> MARKING EXAMPLE**



<R> **ORDERING INFORMATION**

| Part Number  | Order Number   | Solder Plating Specification | Packing Style                | Safety Standard Approval           | Application Part Number <sup>*1</sup> |
|--------------|----------------|------------------------------|------------------------------|------------------------------------|---------------------------------------|
| PS2841-4A-F3 | PS2841-4A-F3-A | Pb-Free                      | Embossed Tape 2 500 pcs/reel | Standard products<br>(UL Approved) | PS2841-4A                             |
| PS2841-4A-F4 | PS2841-4A-F4-A |                              |                              |                                    |                                       |
| PS2841-4B-F3 | PS2841-4B-F3-A |                              |                              |                                    | PS2841-4B                             |
| PS2841-4B-F4 | PS2841-4B-F4-A |                              |                              |                                    |                                       |

\*1 For the application of the Safety Standard, following part number should be used.

**ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = 25°C, unless otherwise specified)**

| Parameter                       |                                    | Symbol               | Ratings     | Unit    |
|---------------------------------|------------------------------------|----------------------|-------------|---------|
| Diode                           | Forward Current (DC)               | I <sub>F</sub>       | 20          | mA/ch   |
|                                 | Reverse Voltage                    | V <sub>R</sub>       | 6           | V       |
|                                 | Power Dissipation Derating         | Δ I <sub>F</sub> /°C | 0.2         | mA /°C  |
|                                 | Peak Forward Current <sup>*1</sup> | I <sub>FP</sub>      | 0.5         | A/ch    |
| Transistor                      | Collector to Emitter Voltage       | V <sub>CEO</sub>     | 70          | V       |
|                                 | Emitter to Collector Voltage       | V <sub>ECO</sub>     | 5           | V       |
|                                 | Collector Current                  | I <sub>C</sub>       | 20          | mA/ch   |
|                                 | Power Dissipation Derating         | Δ P <sub>C</sub> /°C | 0.4         | mW/°C   |
|                                 | Power Dissipation                  | P <sub>C</sub>       | 40          | mW/ch   |
| Isolation Voltage <sup>*2</sup> |                                    | BV                   | 1 500       | Vr.m.s. |
| Operating Ambient Temperature   |                                    | T <sub>A</sub>       | -40 to +100 | °C      |
| Storage Temperature             |                                    | T <sub>stg</sub>     | -55 to +125 | °C      |

\*1 PW = 100 μs, Duty Cycle = 1%

\*2 AC voltage for 1 minute at T<sub>A</sub> = 25°C, RH = 60% between input and output.  
Pins 1-6 shorted together, 7-12 shorted together.

**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)**

| Parameter  |  | Symbol               | Conditions  | MIN.             | TYP. | MAX. | Unit |
|------------|--|----------------------|---|------------------|------|------|------|
| Diode      | Forward Voltage  | V <sub>F</sub>       | I <sub>F</sub> = 1 mA   | 0.9              | 1.1  | 1.2  | V    |
|            | Reverse Current  | I <sub>R</sub>       | V <sub>R</sub> = 5 V  |                  |      | 10   | μA   |
|            | Terminal Capacitance   | C <sub>T</sub>       | V = 0 V, f = 1 MHz  |                  | 15   |      | pF   |
| Transistor | Collector to Emitter Current   | I <sub>CEO</sub>     | I <sub>F</sub> = 0 mA, V <sub>CE</sub> = 24 V                       |                  |      | 100  | nA   |
| Coupled    | Current Transfer Ratio (I <sub>C</sub> /I <sub>F</sub> )                   | CTR                  | I <sub>F</sub> = 1 mA, V <sub>CE</sub> = 0.4 V                      | 100              | 200  | 400  | %    |
|            | Optical Leakage Current <sup>*1</sup><br>(1 to 2-ch, 2 to 3-ch, 3 to 4-ch) | I <sub>L</sub>       | I <sub>F</sub> = 5 mA, V <sub>CE</sub> = 24 V                       |                  |      | 100  | nA   |
|            | Collector Saturation Voltage   | V <sub>CE(sat)</sub> | I <sub>F</sub> = 1 mA, I <sub>C</sub> = 0.2 mA                      |                  | 0.13 | 0.3  | V    |
|            | Isolation Resistance   | R <sub>I-O</sub>     | V <sub>I-O</sub> = 1 kV <sub>DC</sub>                               | 10 <sup>11</sup> |      |      | Ω    |
|            | Isolation Capacitance  | C <sub>I-O</sub>     | V = 0 V, f = 1 MHz  |                  | 0.4  |      | pF   |
|            | Turn-on Time <sup>*2</sup>   | t <sub>on</sub>      | V <sub>CC</sub> = 5 V, I <sub>F</sub> = 1 mA, R <sub>L</sub> = 5 kΩ |                  | 20   |      | μs   |
|            | Turn-off Time <sup>*2</sup>  | t <sub>off</sub>     |   |                  | 110  |      |      |

\*1 The optically induced leakage current is current which can be measured at transistor if LED = "ON" and LED = "OFF".

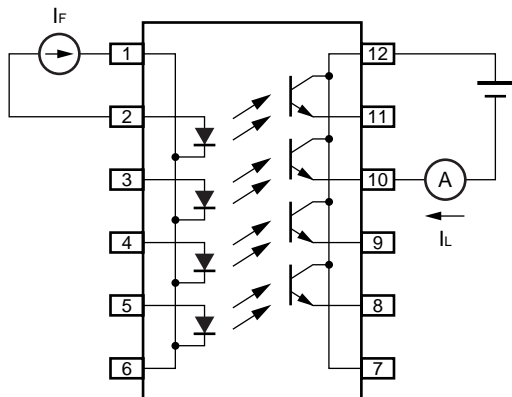
LED of channel 1 is switched to "ON".

At Tr-output of channel 2 a voltage is applied and one can measure a current between emitter and collector.

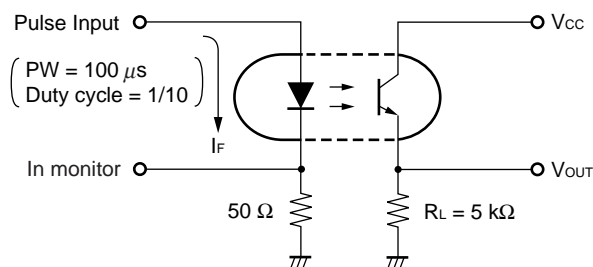
This is leakage current (at I<sub>F</sub> = 5 mA, V<sub>CEO</sub> = 24 V).

Measurement circuits for optical leakage current

E.g. : In the case of 1 to 2-ch (PS2841-4A)

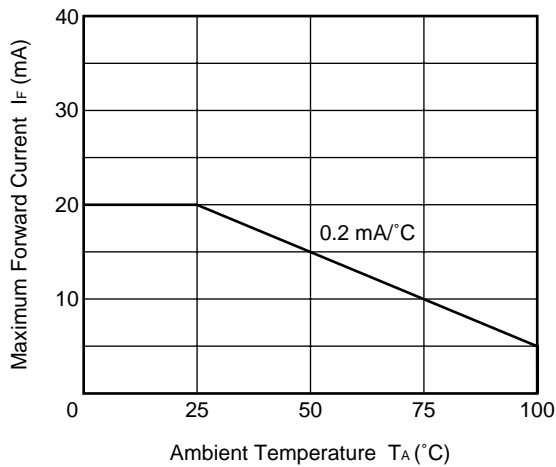


\*2 Test circuit for switching time

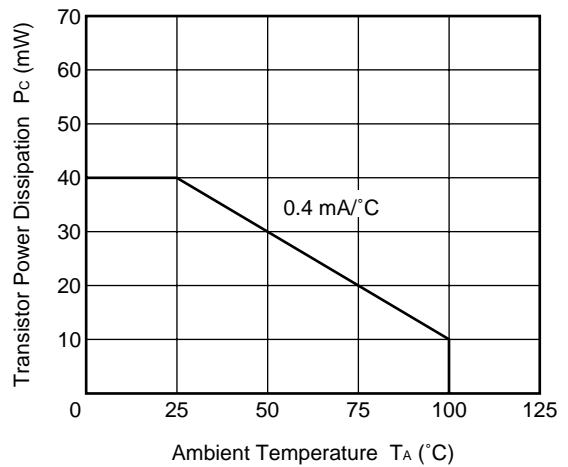


**TYPICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ , unless otherwise specified)**

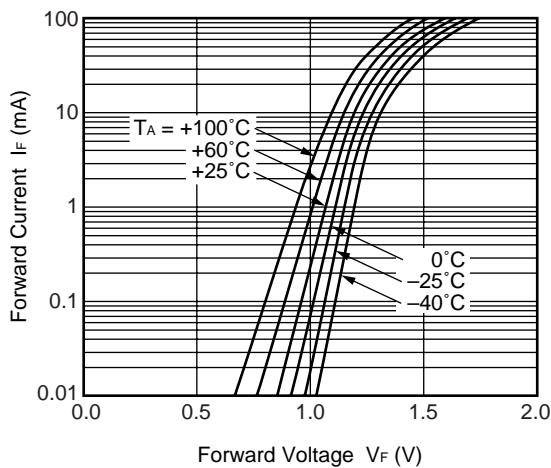
MAXIMUM FORWARD CURRENT vs. AMBIENT TEMPERATURE



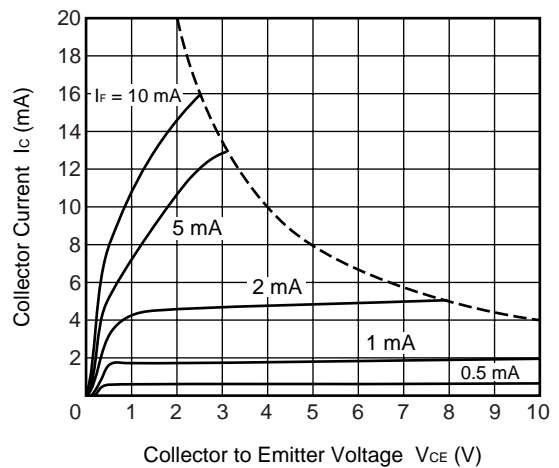
TRANSISTOR POWER DISSIPATION vs. AMBIENT TEMPERATURE



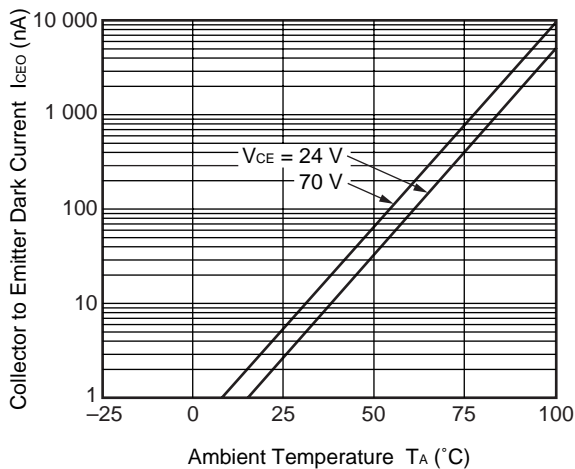
FORWARD CURRENT vs. FORWARD VOLTAGE



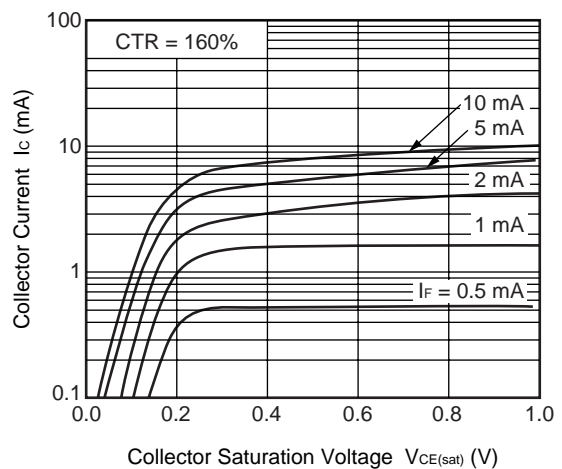
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



COLLECTOR TO EMITTER DARK CURRENT vs. AMBIENT TEMPERATURE

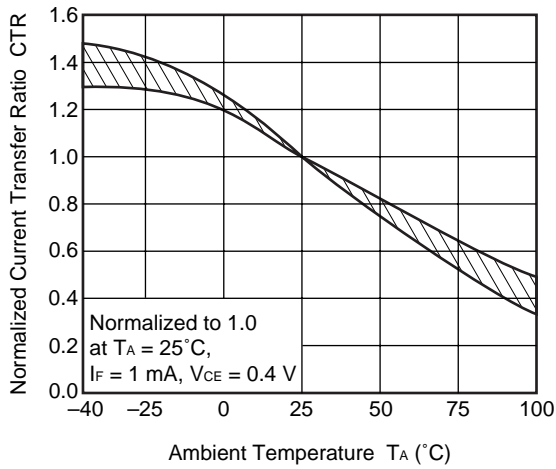


COLLECTOR CURRENT vs. COLLECTOR SATURATION VOLTAGE

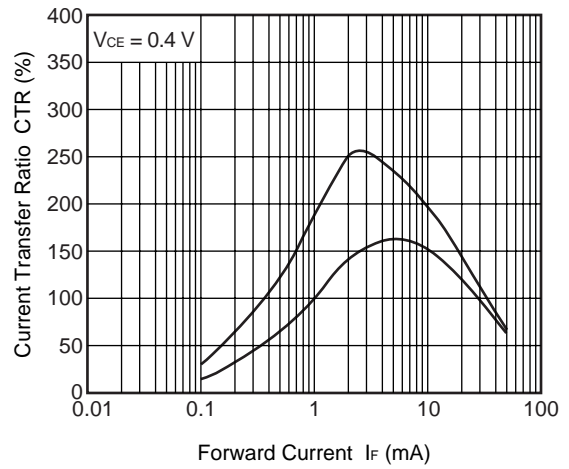


**Remark** The graphs indicate nominal characteristics.

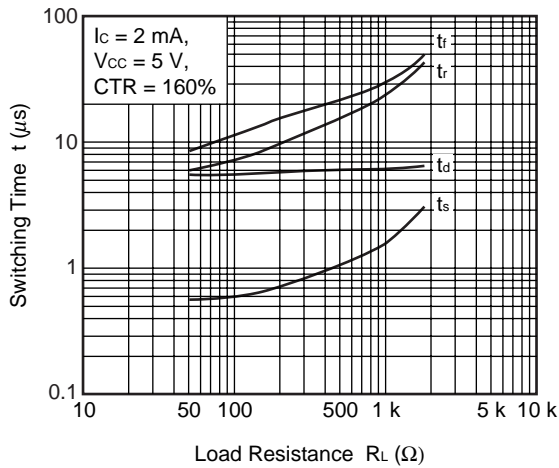
NORMALIZED CURRENT TRANSFER RATIO vs. AMBIENT TEMPERATURE



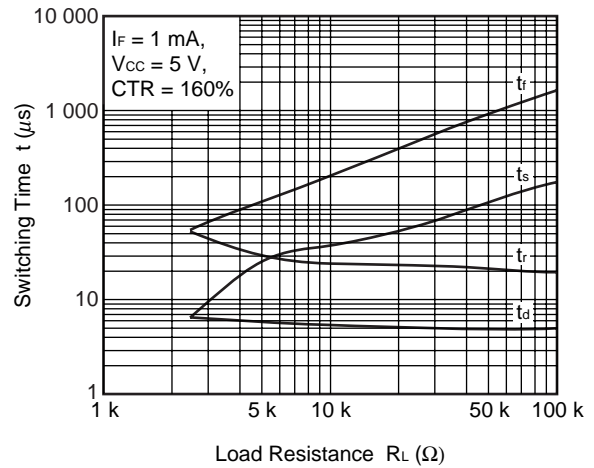
CURRENT TRANSFER RATIO vs. FORWARD CURRENT



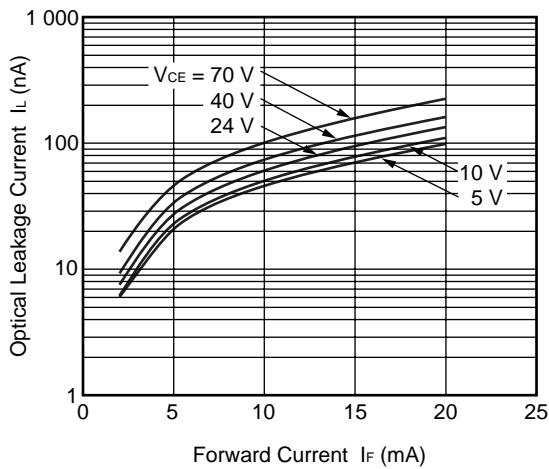
SWITCHING TIME vs. LOAD RESISTANCE



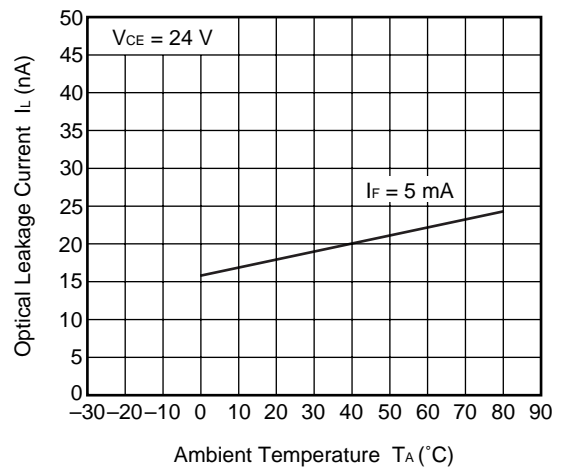
SWITCHING TIME vs. LOAD RESISTANCE



OPTICAL LEAKAGE CURRENT vs. FORWARD CURRENT



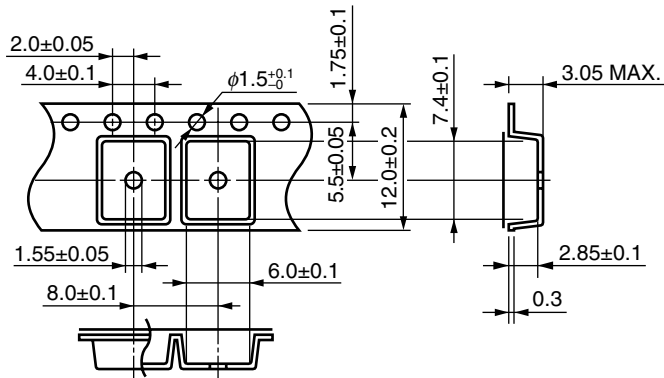
OPTICAL LEAKAGE CURRENT vs. AMBIENT TEMPERATURE



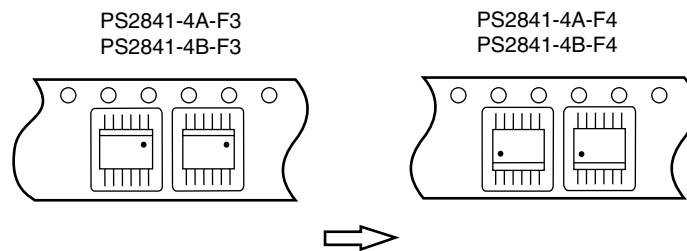
**Remark** The graphs indicate nominal characteristics.

TAPING SPECIFICATIONS (UNIT: mm)

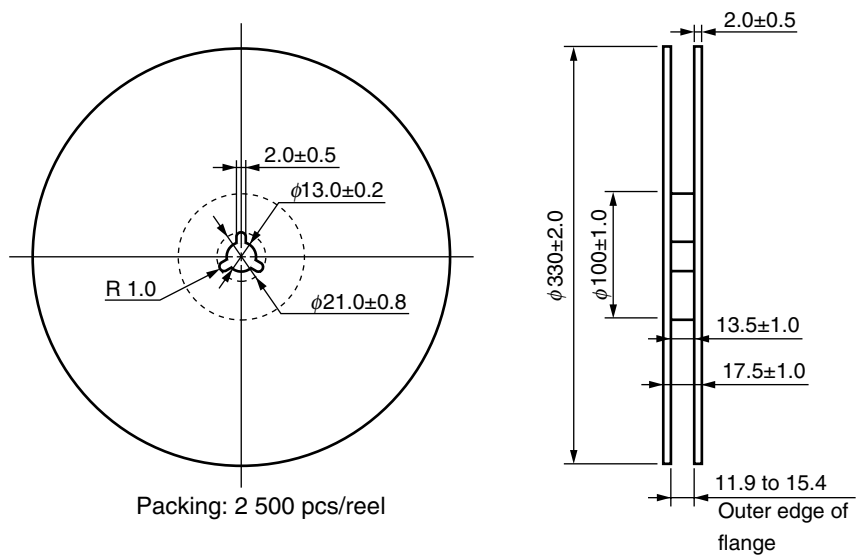
Outline and Dimensions (Tape)



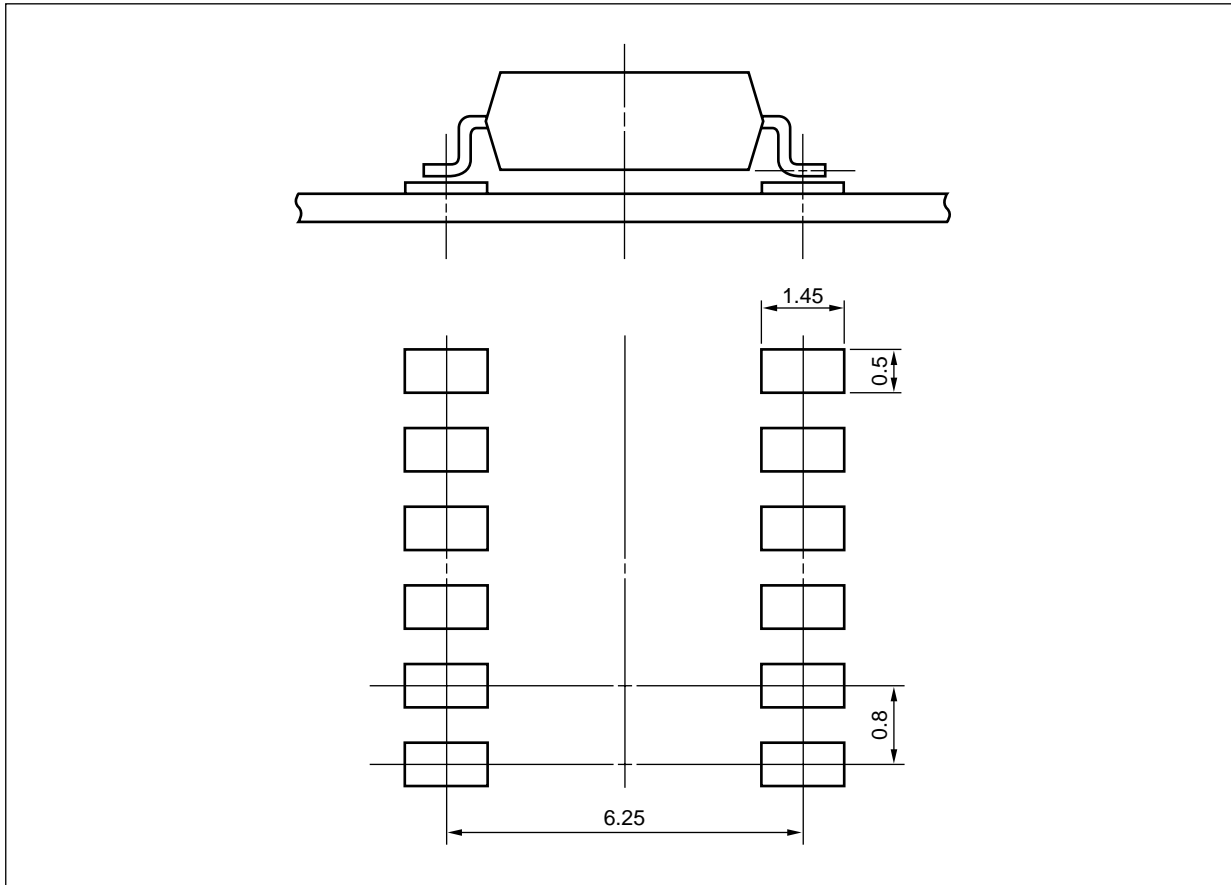
Tape Direction



Outline and Dimensions (Reel)



RECOMMENDED MOUNT PAD DIMENSIONS (UNIT: mm)





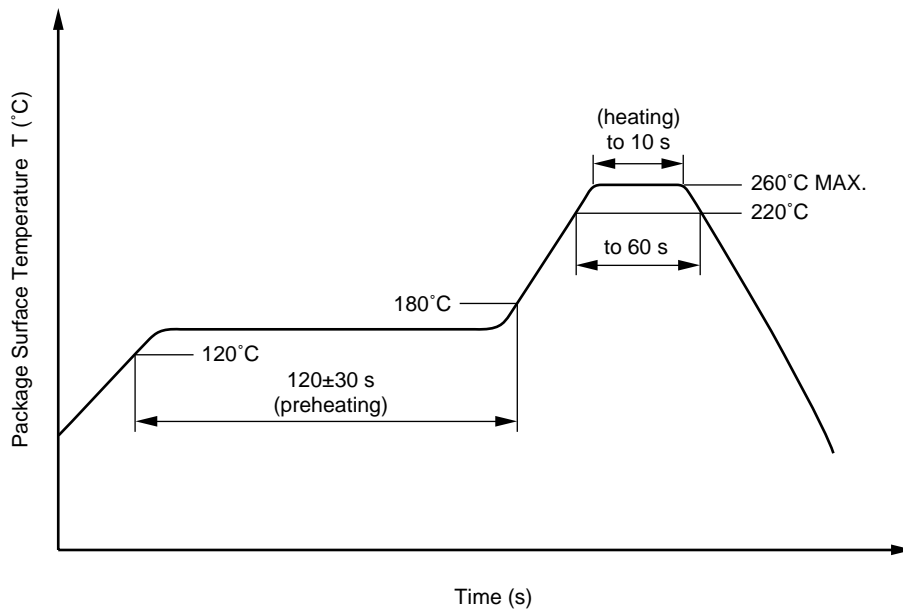
**NOTES ON HANDLING**

**1. Recommended soldering conditions**

**(1) Infrared reflow soldering**

- Peak reflow temperature 260°C or below (package surface temperature)
- Time of peak reflow temperature 10 seconds or less
- Time of temperature higher than 220°C 60 seconds or less
- Time to preheat temperature from 120 to 180°C 120±30 s
- Number of reflows Three
- Flux Rosin flux containing small amount of chlorine (The flux with a maximum chlorine content of 0.2 Wt% is recommended.)

Recommended Temperature Profile of Infrared Reflow



**(2) Wave soldering**

- Temperature 260°C or below (molten solder temperature)
- Time 10 seconds or less
- Preheating conditions 120°C or below (package surface temperature)
- Number of times One (Allowed to be dipped in solder including plastic mold portion.)
- Flux Rosin flux containing small amount of chlorine (The flux with a maximum chlorine content of 0.2 Wt% is recommended.)

**(3) Soldering by soldering iron**

- Peak temperature (lead part temperature) 350°C or below
- Time (each pins) 3 seconds or less
- Flux Rosin flux containing small amount of chlorine (The flux with a maximum chlorine content of 0.2 Wt% is recommended.)

(a) Soldering of leads should be made at the point 1.5 to 2.0 mm from the root of the lead.

(b) Please be sure that the temperature of the package would not be heated over 100°C.

**(4) Cautions**

- Fluxes

Avoid removing the residual flux with freon-based and chlorine-based cleaning solvent.

**2. Cautions regarding noise**

Be aware that when voltage is applied suddenly between the photocoupler's input and output or between collector-emitters at startup, the output transistor may enter the on state, even if the voltage is within the absolute maximum ratings.

**<R> 3. Measurement conditions of current transfer ratios (CTR), which differ according to photocoupler**

Check the setting values before use, since the forward current conditions at CTR measurement differ according to product.

When using products other than at the specified forward current, the characteristics curves may differ from the standard curves due to CTR value variations or the like. Therefore, check the characteristics under the actual operating conditions and thoroughly take variations or the like into consideration before use.

**USAGE CAUTIONS**

1. Protect against static electricity when handling.
2. Avoid storage at a high temperature and high humidity.

|                       |                      |   |
|-----------------------|----------------------|---|
| <p><b>Caution</b></p> | <p>GaAs Products</p> | <p>This product uses gallium arsenide (GaAs).<br/>GaAs vapor and powder are hazardous to human health if inhaled or ingested, so please observe the following points.</p> <ul style="list-style-type: none"> <li>• Follow related laws and ordinances when disposing of the product. If there are no applicable laws and/or ordinances, dispose of the product as recommended below.             <ol style="list-style-type: none"> <li>1. Commission a disposal company able to (with a license to) collect, transport and dispose of materials that contain arsenic and other such industrial waste materials.</li> <li>2. Exclude the product from general industrial waste and household garbage, and ensure that the product is controlled (as industrial waste subject to special control) up until final disposal.</li> </ol> </li> <li>• Do not burn, destroy, cut, crush, or chemically dissolve the product.</li> <li>• Do not lick the product or in any way allow it to enter the mouth.</li> </ul> |
|-----------------------|----------------------|---|

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