

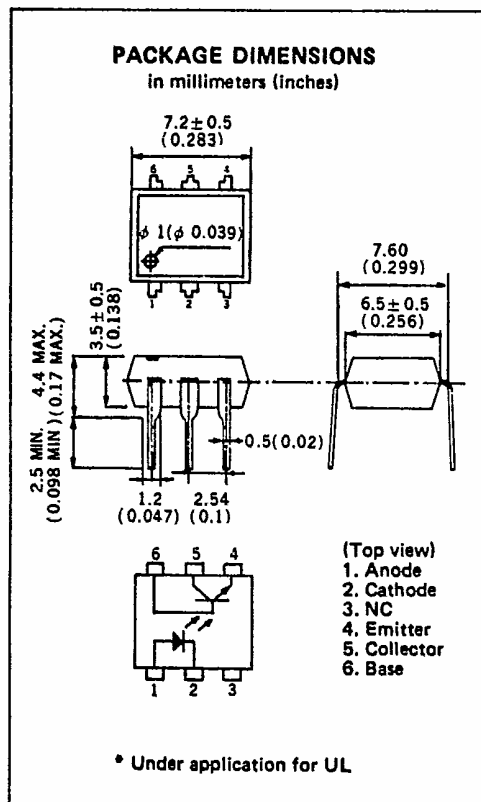
# PHOTO COUPLER PS2021

## PHOTO COUPLER (High Isolation Voltage) Single Transistor

—NEPOC SERIES—

### DESCRIPTION

The PS2021 is an optically coupled isolator containing a GaAs light emitting diode and an NPN silicon photo transistor.



### FEATURES

- Small package 7.2 x 6.5 x 3.5 mm
- High isolation voltage 4 000 V<sub>AC</sub> Rating
- High transfer ratio 50 % MIN.
- High speed switching  $t_r, t_f = 3 \mu s$  TYP.
- Economical, compact, Dual In-Line Plastic Package

### APPLICATIONS

- Interface circuit for various instrumentations, control equipments.
- Chopper circuits.
- Computer and peripheral manufactures.
- Pulse transformer.
- Data communication equipment.

### ABSOLUTE MAXIMUM RATINGS ( $T_a = 25^\circ C$ )

#### Diode

|                                                        |               |     |    |
|--------------------------------------------------------|---------------|-----|----|
| Reverse Voltage                                        | $V_R$         | 5.0 | V  |
| Forward Current (DC)                                   | $I_F$         | 80  | mA |
| Power Dissipation                                      | $P_D$         | 150 | mW |
| Peak Forward Current<br>(300 $\mu s$ , 2 % duty cycle) | $I_{F(peak)}$ | 3   | A  |

#### Transistor

|                                   |           |             |                 |
|-----------------------------------|-----------|-------------|-----------------|
| Collector to Emitter Voltage      | $V_{CEO}$ | 40          | V               |
| Collector to Base Voltage         | $V_{CBO}$ | 70          | V               |
| Emitter to Collector Voltage      | $V_{ECO}$ | 7           | V               |
| Collector Current                 | $I_C$     | 100         | mA              |
| Power Dissipation                 | $P_C$     | 150         | mW              |
| Isolation Voltage * 1             | BV        | 4000        | V <sub>AC</sub> |
| Storage Temperature               | $T_{stg}$ | -55 to +150 | $^\circ C$      |
| Operating Temperature             | $T_{opt}$ | -55 to +100 | $^\circ C$      |
| Lead Temperature (Soldering 10 s) |           | 260         | $^\circ C$      |
| Total Power Dissipation           | $P_T$     | 250         | mW              |

Nippon Electric Co., Ltd.

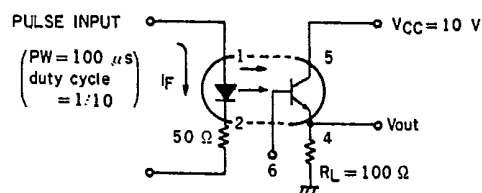
# ELECTRICAL CHARACTERISTICS (Ta = 25 °C)

| CHARACTERISTIC |                                        | SYMBOL                                | MIN.             | TYP. | MAX. | UNIT | TEST CONDITIONS                                                       |
|----------------|----------------------------------------|---------------------------------------|------------------|------|------|------|-----------------------------------------------------------------------|
| Diode          | Forward Voltage                        | V <sub>F</sub>                        |                  | 1.1  | 1.4  | V    | I <sub>F</sub> = 10 mA                                                |
|                | Forward Voltage                        | V <sub>F</sub>                        |                  | 1.2  | 1.5  | V    | I <sub>F</sub> = 50 mA                                                |
|                | Reverse Current                        | I <sub>R</sub>                        |                  |      | 10   | μA   | V <sub>R</sub> = 5 V                                                  |
|                | Junction Capacitance                   | C                                     |                  | 50   |      | pF   | V = 0, f = 1.0 MHz                                                    |
| Transistor     | Collector to Emitter Dark Current      | I <sub>CEO</sub>                      |                  |      | 50   | nA   | V <sub>CE</sub> = 10V, I <sub>F</sub> = 0                             |
|                | DC Current Gain                        | h <sub>FE</sub>                       |                  | 700  |      |      | I <sub>C</sub> = 2 mA, V <sub>CE</sub> = 5.0 V                        |
|                | Collector to Emitter Breakdown Voltage | BV <sub>CEO</sub>                     | 40               | 60   |      | V    | I <sub>C</sub> = 1 mA, I <sub>B</sub> = 0                             |
|                | Collector to Base Breakdown Voltage    | BV <sub>CBO</sub>                     | 70               | 120  |      | V    | I <sub>C</sub> = 100 μA, I <sub>E</sub> = 0                           |
|                | Emitter to Collector Breakdown Voltage | BV <sub>ECO</sub>                     | 7                | 9    |      | V    | I <sub>E</sub> = 100 μA, I <sub>B</sub> = 0                           |
| Coupled        | Current Transfer Ratio *2              | CTR (I <sub>C</sub> /I <sub>F</sub> ) | 50               |      |      | %    | I <sub>F</sub> = 10 mA, V <sub>CE</sub> = 5.0 V                       |
|                | Collector Saturation Voltage           | V <sub>CE</sub> (sat)                 |                  |      | 0.3  | V    | I <sub>F</sub> = 10 mA, I <sub>C</sub> = 2.0 mA                       |
|                | Isolation Resistance                   | R <sub>1-2</sub>                      | 10 <sup>11</sup> |      |      | Ω    | V <sub>in-out</sub> = 1.0 kV                                          |
|                | Isolation Capacitance                  | C <sub>1-2</sub>                      |                  | 0.5  |      | pF   | V = 0, f = 1.0 MHz                                                    |
|                | Rise Time *3                           | t <sub>r</sub>                        |                  | 3    |      | μs   | V <sub>CC</sub> = 10 V, I <sub>C</sub> = 2 mA, R <sub>L</sub> = 100 Ω |
|                | Fall Time *3                           | t <sub>f</sub>                        |                  | 3    |      | μs   | V <sub>CC</sub> = 10 V, I <sub>C</sub> = 2 mA, R <sub>L</sub> = 100 Ω |

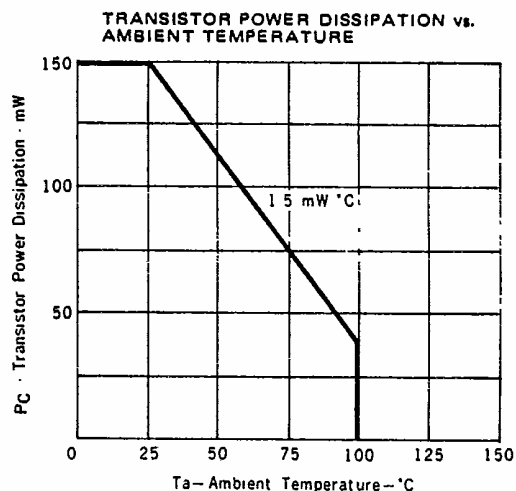
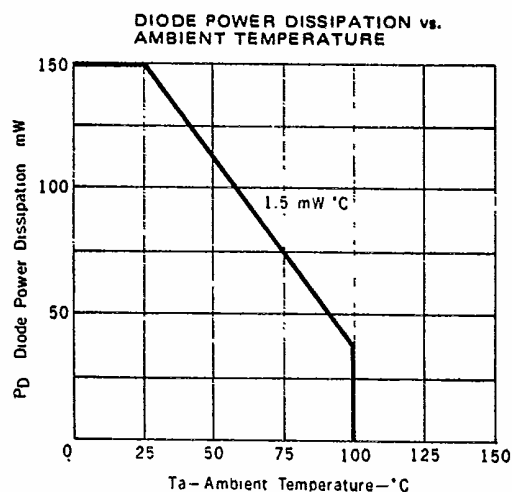
\* 1 Measuring Condition  
DC or AC voltage for 1 minute at Ta = 25 °C,  
RH = 60 %  
Between input (pin No. 1, 2 and No. 3 Common)  
and output (pin No. 4, 5 and No. 6 Common)

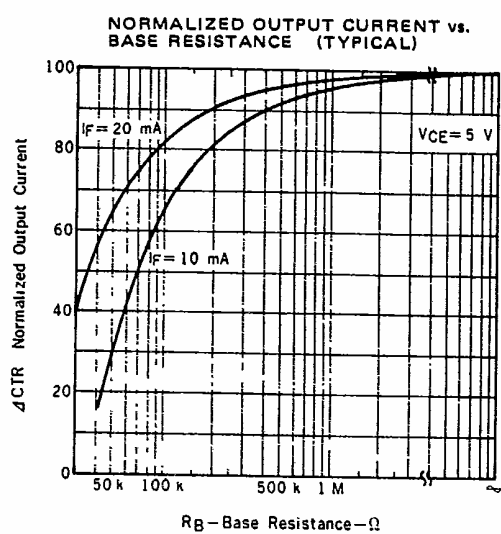
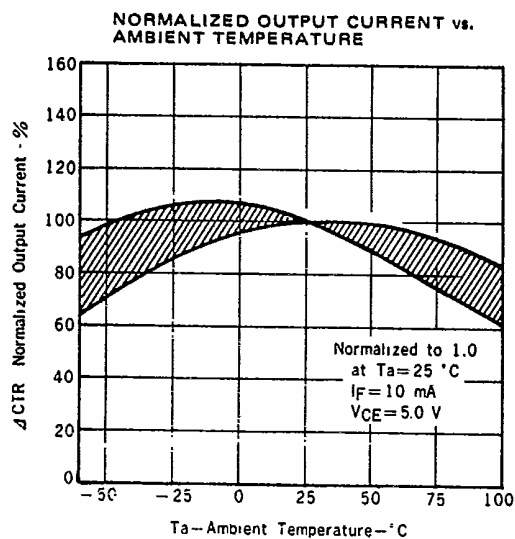
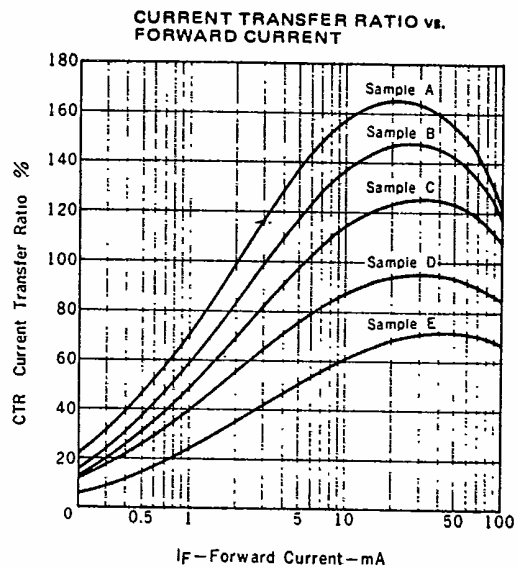
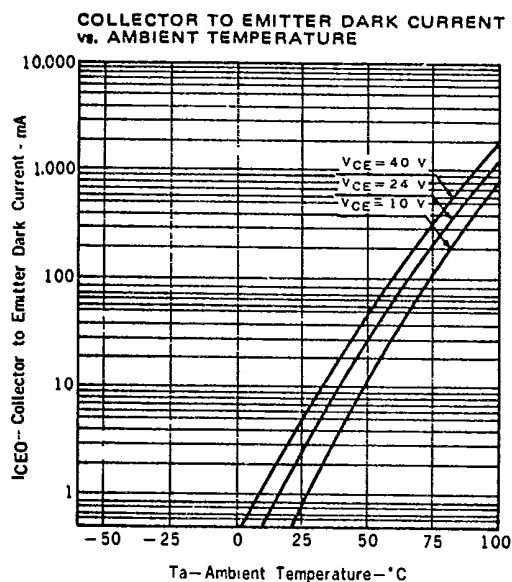
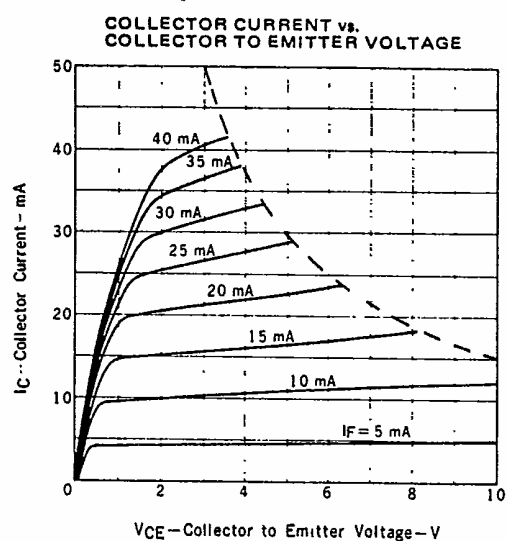
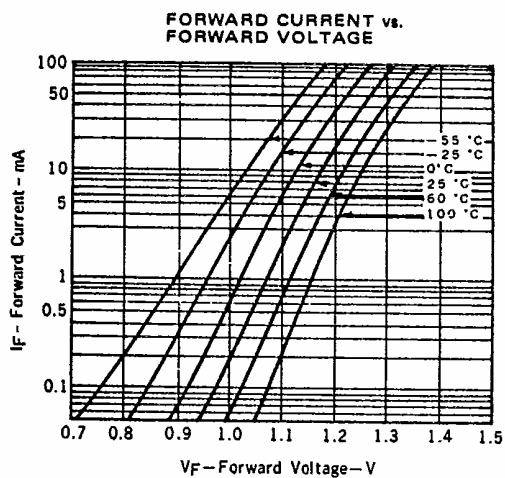
\* 2 CTR rank  
K: 150 %~300 %  
L: 90 %~180 %  
M: 50 %~110 %

\* 3 Test Circuit for Switching Time

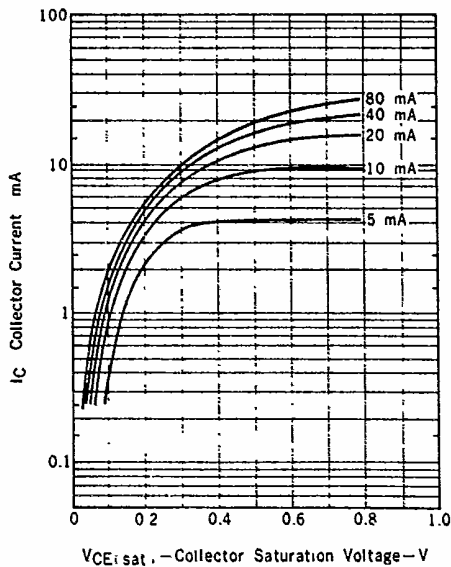


# TYPICAL CHARACTERISTICS (Ta = 25 °C)

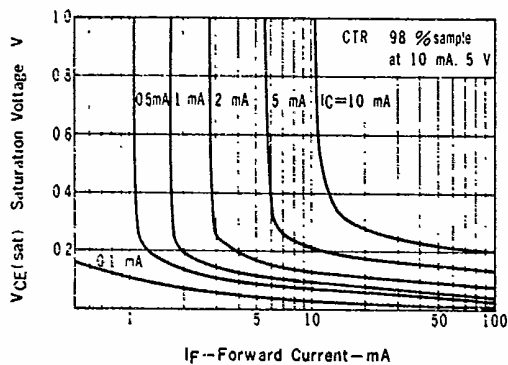




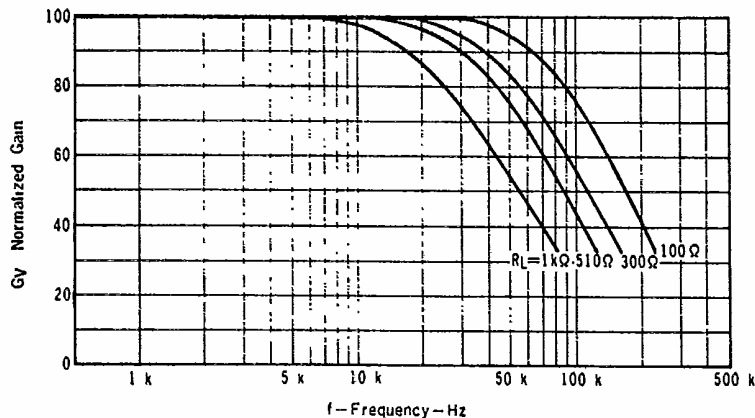
COLLECTOR CURRENT vs.  
COLLECTOR SATURATION VOLTAGE



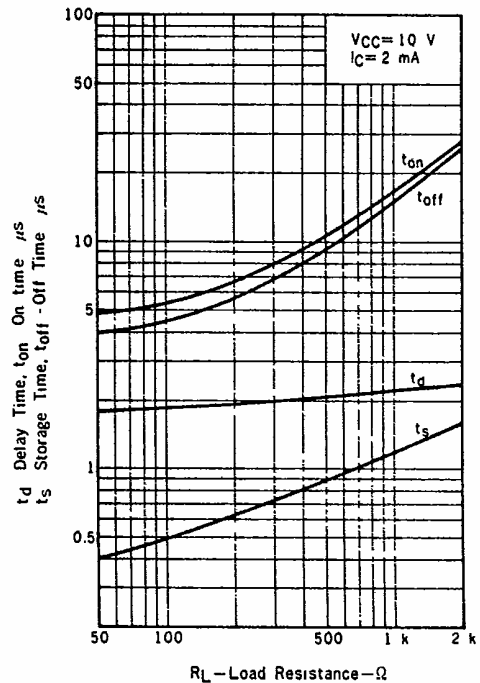
SATURATION VOLTAGE vs.  
FORWARD CURRENT



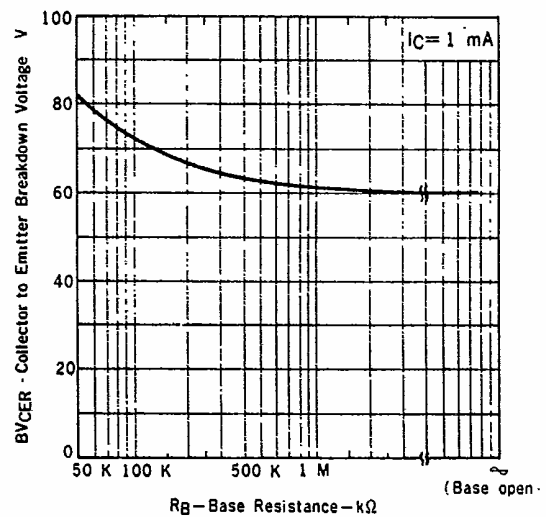
FREQUENCY RESPONSE



SWITCHING TIME vs.  
LOAD RESISTANCE



COLLECTOR TO EMITTER BREAKDOWN  
VOLTAGE vs. BASE RESISTANCE



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