

PHOTOCOUPLER

PS2581L1, PS2581L2

LONG CREEPAGE TYPE HIGH ISOLATION VOLTAGE 4-PIN PHOTOCOUPLER

DESCRIPTION

The PS2581L1, PS2581L2 are optically coupled isolators containing a GaAs light emitting diode and an NPN silicon phototransistor in a plastic DIP (Dual In-line Package).

Creepage distance and clearance of leads are over 8 millimeters.

The PS2581L2 is lead bending type (Gull-wing) for surface mounting.

FEATURES

- Long creepage and clearance distance (8 mm)
- High isolation voltage (BV: 5 kVr.m.s.)
- High collector to emitter voltage ($V_{CE0} = 80\text{ V}$)
- High-speed switching ($t_r = 3\ \mu\text{s}$, $t_f = 5\ \mu\text{s}$)
- High current transfer ratio (CTR: 200 %)
- UL recognized (No. E72422 (S))
- VDE0884 recognized

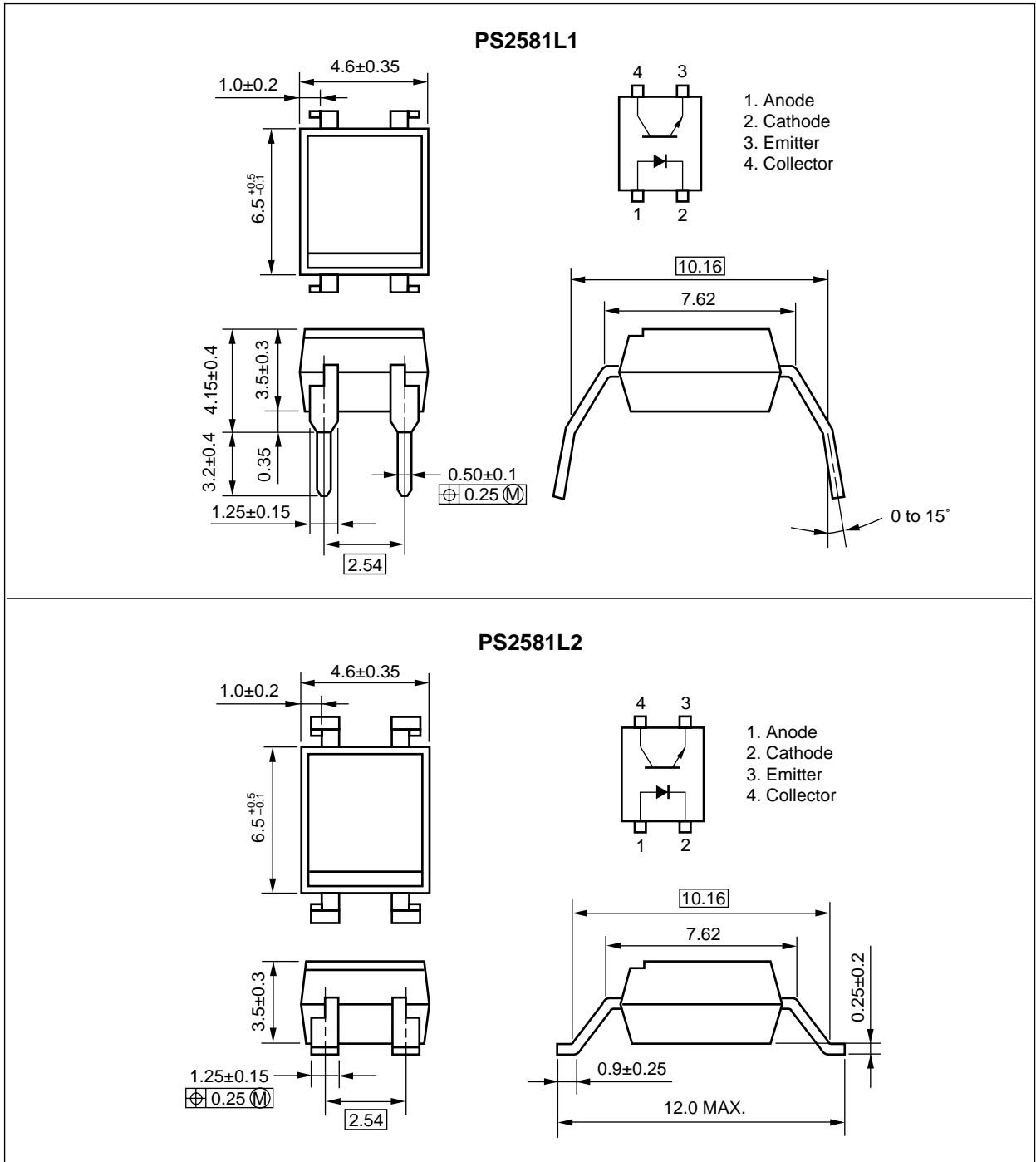
ORDERING INFORMATION

| Part Number | Package | Safety Standard Approval | Application Part Number ^{*1} |
|-------------|------------------------------|--------------------------|---------------------------------------|
| PS2581L1 | 4-pin DIP | UL, VDE approved | PS2581L1 |
| PS2581L2 | 4-pin DIP, lead bending type | | PS2581L2 |

*1 As applying to Safety Standard, following part number should be used.

The information in this document is subject to change without notice.

PACKAGE DIMENSIONS (in millimeters)



PHOTOCOUPLER CONSTRUCTION

| Parameter | Unit (MIN.) |
|-------------------------|-------------|
| Air Distance | 8 mm |
| Outer Creepage Distance | 8 mm |
| Inner Creepage Distance | 4 mm |
| Isolation Thickness | 0.4 mm |

ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C, unless otherwise specified)

| Parameter | | Symbol | Ratings | Unit |
|---------------------------------|------------------------------------|---------------------|-------------|---------|
| Diode | Reverse Voltage | V _R | 6 | V |
| | Forward Current (DC) | I _F | 80 | mA |
| | Power Dissipation Derating | ΔP _D /°C | 1.5 | mW/°C |
| | Power Dissipation | P _D | 150 | mW |
| | Peak Forward Current ^{*1} | I _{FP} | 1 | A |
| Transistor | Collector to Emitter Voltage | V _{CEO} | 80 | V |
| | Emitter to Collector Voltage | V _{ECO} | 7 | V |
| | Collector Current | I _C | 50 | mA |
| | Power Dissipation Derating | ΔP _C /°C | 1.5 | mW/°C |
| | Power Dissipation | P _C | 150 | mW |
| Isolation Voltage ^{*2} | | BV | 5 000 | Vr.m.s. |
| Operating Ambient Temperature | | T _A | -55 to +100 | °C |
| Storage Temperature | | T _{stg} | -55 to +150 | °C |

*1 PW = 100 μs, Duty Cycle = 1 %

*2 AC voltage for 1 minute at T_A = 25 °C, RH = 60 % between input and output

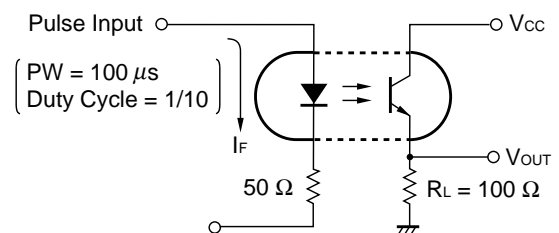
ELECTRICAL CHARACTERISTICS (T_A = 25 °C)

| Parameter | | Symbol | Conditions | MIN. | TYP. | MAX. | Unit |
|-------------------------|--------------------------------------|---|---|------------------|------|------|------|
| Diode | Forward Voltage | V _F | I _F = 10 mA | | 1.17 | 1.4 | V |
| | Reverse Current | I _R | V _R = 5 V | | | 5 | μA |
| | Junction Capacitance | C _t | V = 0 V, f = 1.0 MHz | | 50 | | pF |
| Transistor | Collector to Emitter Dark Current | I _{CEO} | V _{CE} = 80 V, I _F = 0 mA | | | 100 | nA |
| Coupled | Current Transfer Ratio ^{*1} | CTR | I _F = 5 mA, V _{CE} = 5 V | 80 | 200 | 400 | % |
| | Collector Saturation Voltage | V _{CE(sat)} | I _F = 10 mA, I _C = 2 mA | | | 0.3 | V |
| | Isolation Resistance | R _{I-O} | V _{I-O} = 1.0 kV | 10 ¹¹ | | | Ω |
| | Isolation Capacitance | C _{I-O} | V = 0 V, f = 1.0 MHz | | 0.5 | | pF |
| | Rise Time ^{*2} | t _r | V _{CC} = 10 V, I _C = 2 mA, R _L = 100 Ω | | 3 | | μs |
| Fall Time ^{*2} | t _f | V _{CC} = 10 V, I _C = 2 mA, R _L = 100 Ω | | 5 | | μs | |

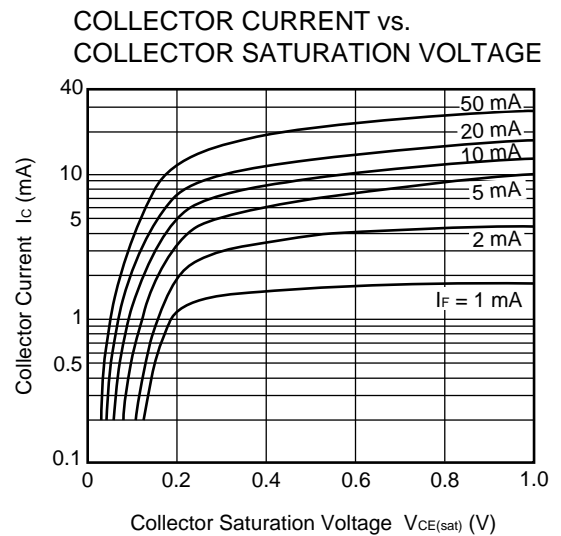
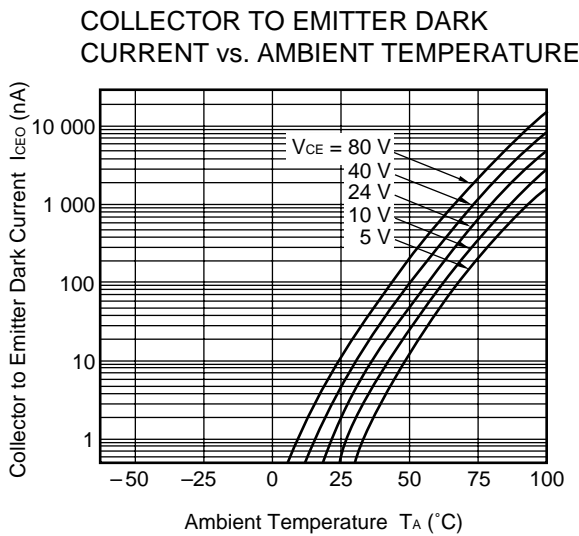
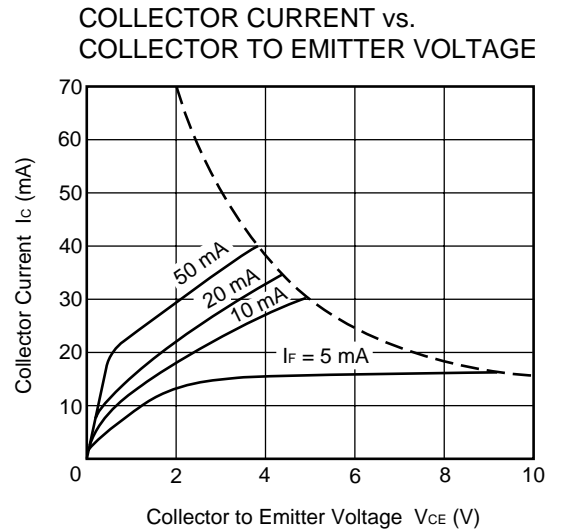
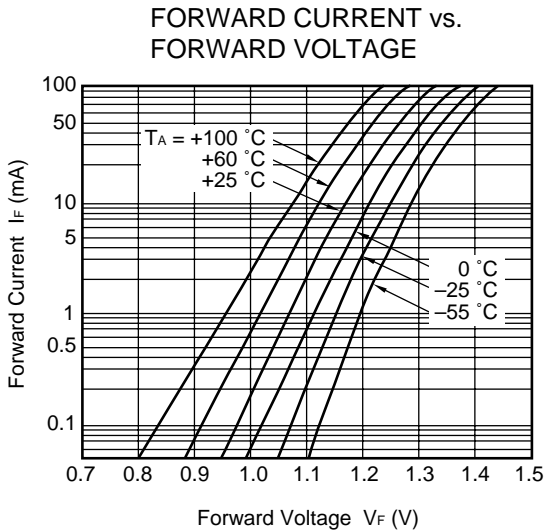
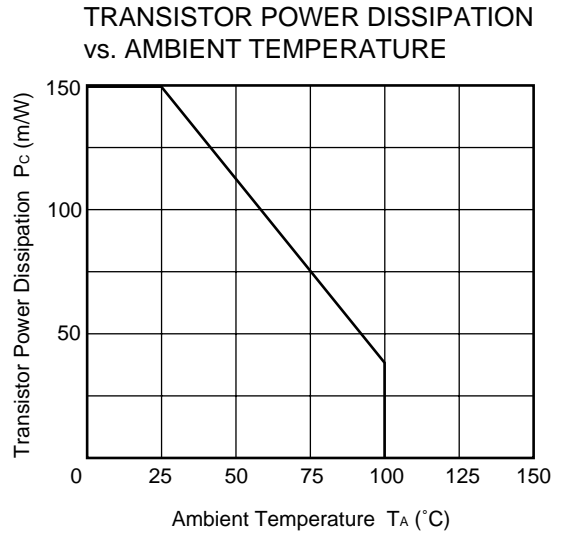
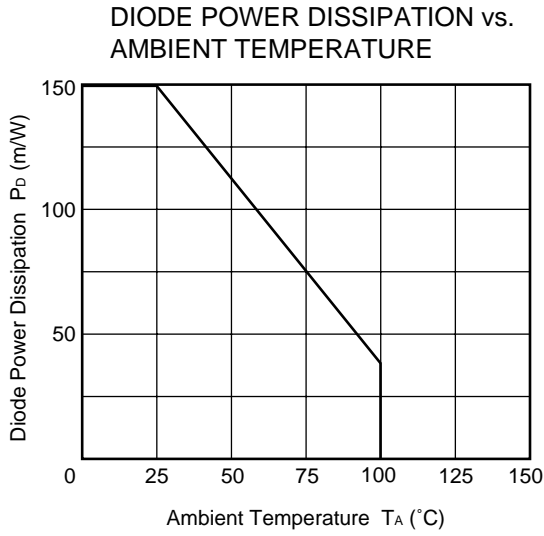
*1 CTR rank

- L : 200 to 400 (%)
- M : 80 to 240 (%)
- D : 100 to 300 (%)
- H : 80 to 160 (%)
- W : 130 to 260 (%)
- N : 80 to 400 (%)

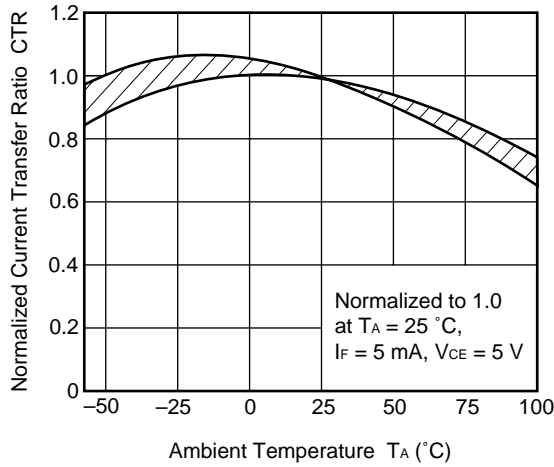
*2 Test Circuit for Switching Time



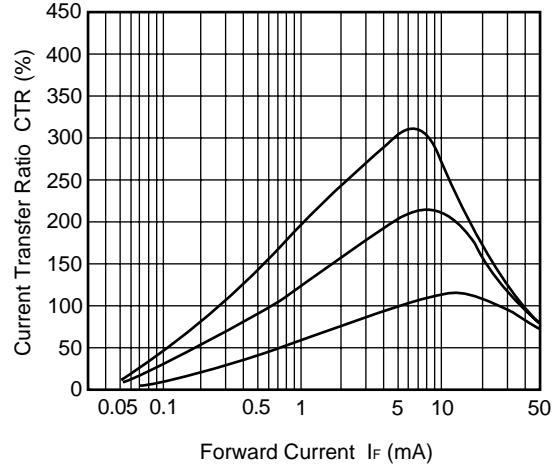
TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^\circ\text{C}$, unless otherwise specified)



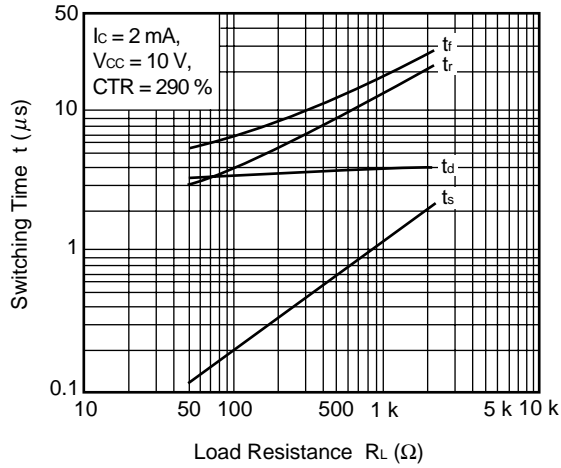
NORMALIZED CURRENT TRANSFER RATIO vs. AMBIENT TEMPERATURE



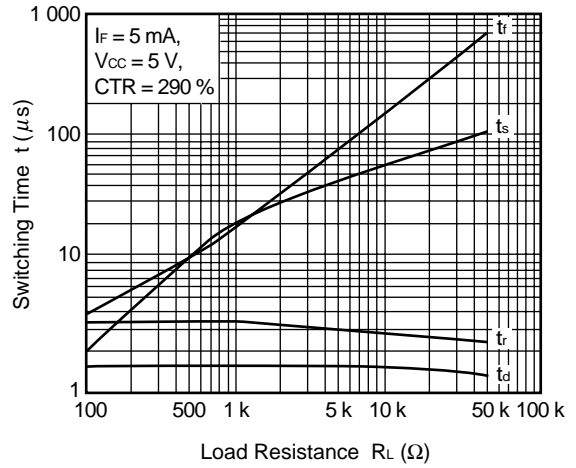
CURRENT TRANSFER RATIO vs. FORWARD CURRENT



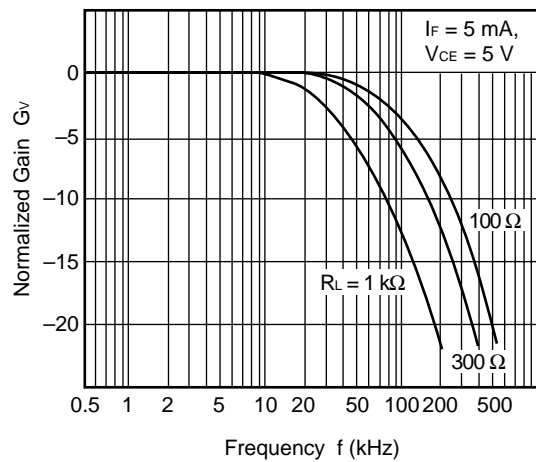
SWITCHING TIME vs. LOAD RESISTANCE



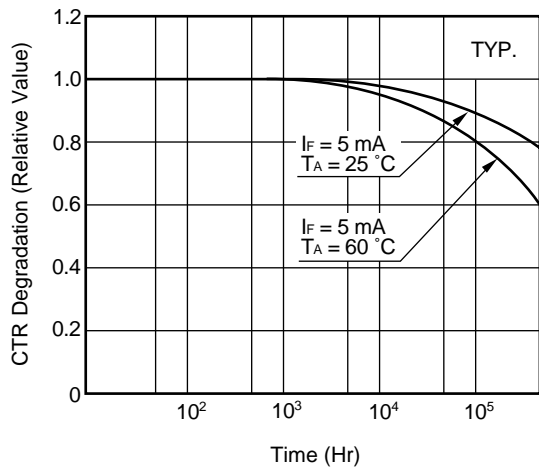
SWITCHING TIME vs. LOAD RESISTANCE



FREQUENCY RESPONSE

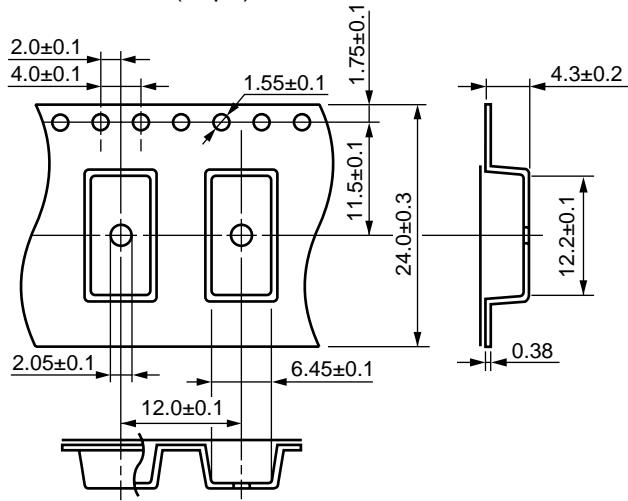


LONG TERM CTR DEGRADATION

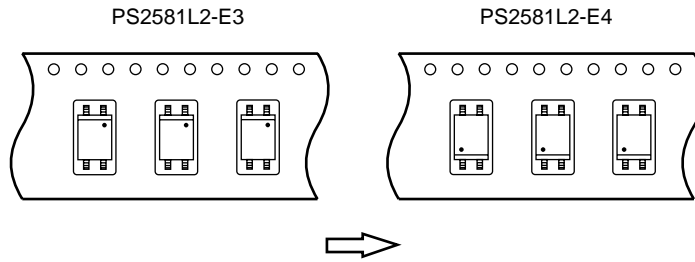


TAPING SPECIFICATIONS (in millimeters)

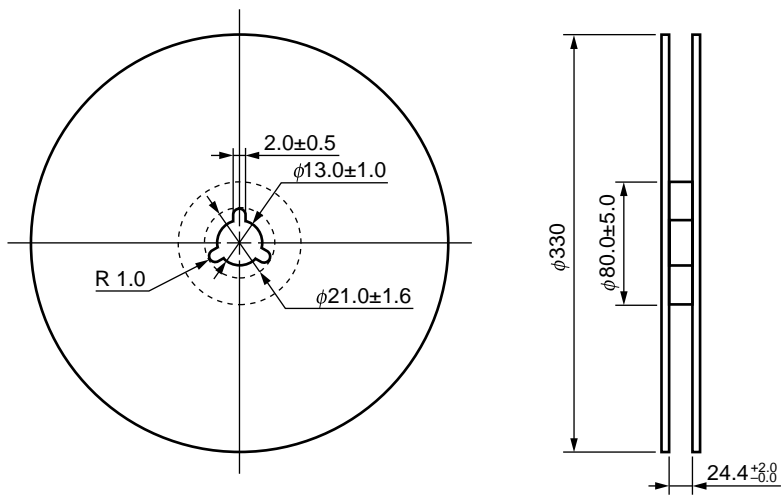
Outline and Dimensions (Tape)



Taping Direction



Outline and Dimensions (Reel)



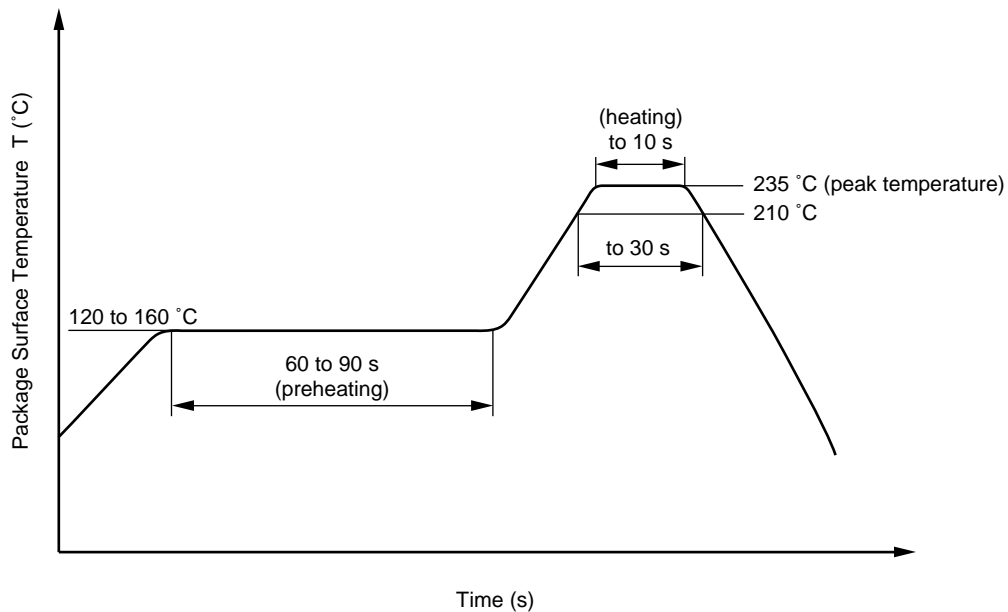
Packing: 1 000 pcs/reel

RECOMMENDED SOLDERING CONDITIONS

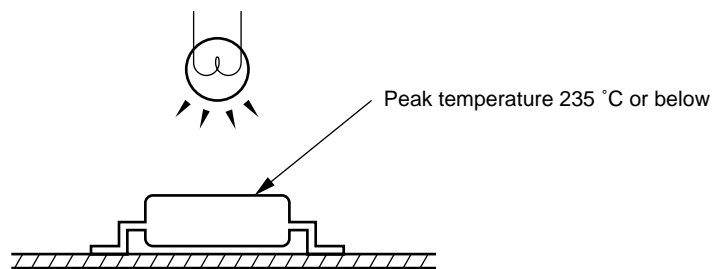
(1) Infrared reflow soldering

- Peak reflow temperature 235 °C (package surface temperature)
- Time of temperature higher than 210 °C 30 seconds or less
- 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



Caution Please avoid to removed the residual flux by water after the first reflow processes.



(2) Dip soldering

- Temperature 260 °C or below (molten solder temperature)
- Time 10 seconds or less
- Number of times One
- Flux Rosin flux containing small amount of chlorine (The flux with a maximum chlorine content of 0.2 Wt % is recommended.)

SPECIFICATION OF VDE MARKS LICENSE DOCUMENT (VDE0884)

| Parameter | Symbol | Speck | Unit |
|--|---|-----------------------------|----------------------------|
| Application classification (DIN VDE 0109) for rated line voltages ≤ 300 Vr.m.s. for rated line voltages ≤ 600 Vr.m.s. | | IV III | |
| Climatic test class (DIN IEC 68 Teil 1/09.80) | | 55/100/21 | |
| Dielectric strength maximum operating isolation voltage. Test voltage (partial discharge test procedure a for type test and random test) $U_{pr} = 1.2 \times U_{IORM}$, $P_d < 5$ pC | U_{IORM} U_{pr} | 890 1 068 | V_{peak} V_{peak} |
| Test voltage (partial discharge test procedure b for random test) $U_{pr} = 1.6 \times U_{IORM}$, $P_d < 5$ pC | U_{pr} | 1 424 | V_{peak} |
| Highest permissible overvoltage | U_{TR} | 8 000 | V_{peak} |
| Degree of pollution (DIN VDE 0109) | | 2 | |
| Clearance distance | | > 8.0 | mm |
| Creepage distance | | > 8.0 | mm |
| Comparative tracking index (DIN IEC 112/VDE 0303 part 1) | CTI | 175 | |
| Material group (DIN VDE 0109) | | III a | |
| Storage temperature range | T_{stg} | -55 to +150 | °C |
| Operating temperature range | T_A | -55 to +100 | °C |
| Isolation resistance, minimum value $V_{IO} = 500$ V dc at $T_A = 25$ °C $V_{IO} = 500$ V dc at T_A MAX. at least 100 °C | Ris MIN. Ris MIN. | 10^{12} 10^{11} | Ω Ω |
| Safety maximum ratings (maximum permissible in case of fault, see thermal derating curve) Package temperature Current (input current I_F , $\Psi_i = 0$) Power (output or total power dissipation) Isolation resistance $V_{IO} = 500$ V dc at $T_A = 175$ °C (T_{si}) | T_{si} I_{si} Ψ_{si} Ris MIN. | 175 400 700 10^9 | °C mA mW Ω |

[MEMO]

[MEMO]

[MEMO]

CAUTION

Within this device there exists GaAs (Gallium Arsenide) material which is a harmful substance if ingested. Please do not under any circumstances break the hermetic seal.

No part of this document may be copied or reproduced in any form or by any means without the prior written consent of NEC Corporation. NEC Corporation assumes no responsibility for any errors which may appear in this document.

NEC Corporation does not assume any liability for infringement of patents, copyrights or other intellectual property rights of third parties by or arising from use of a device described herein or any other liability arising from use of such device. No license, either express, implied or otherwise, is granted under any patents, copyrights or other intellectual property rights of NEC Corporation or others.

While NEC Corporation has been making continuous effort to enhance the reliability of its semiconductor devices, the possibility of defects cannot be eliminated entirely. To minimize risks of damage or injury to persons or property arising from a defect in an NEC semiconductor device, customers must incorporate sufficient safety measures in its design, such as redundancy, fire-containment, and anti-failure features.

NEC devices are classified into the following three quality grades:

"Standard", "Special", and "Specific". The Specific quality grade applies only to devices developed based on a customer designated "quality assurance program" for a specific application. The recommended applications of a device depend on its quality grade, as indicated below. Customers must check the quality grade of each device before using it in a particular application.

Standard: Computers, office equipment, communications equipment, test and measurement equipment, audio and visual equipment, home electronic appliances, machine tools, personal electronic equipment and industrial robots

Special: Transportation equipment (automobiles, trains, ships, etc.), traffic control systems, anti-disaster systems, anti-crime systems, safety equipment and medical equipment (not specifically designed for life support)

Specific: Aircrafts, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems or medical equipment for life support, etc.

The quality grade of NEC devices is "Standard" unless otherwise specified in NEC's Data Sheets or Data Books. If customers intend to use NEC devices for applications other than those specified for Standard quality grade, they should contact an NEC sales representative in advance.

Anti-radioactive design is not implemented in this product.