

PS2561D-1, PS2561DL-1, PS2561DL1-1, PS2561DL2-1

R08DS0181EJ0100
Rev.1.00
May 11, 2020

DIP PHOTOCOUPLER OPERATING AMBIENT TEMPERATURE 110°C

DESCRIPTION

The PS2561D-1 is an optically coupled isolator containing a GaAs light emitting diode and an NPN silicon phototransistor.

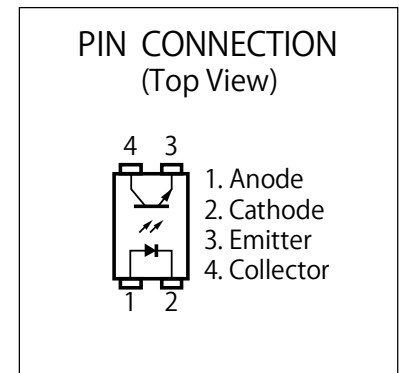
The PS2561D-1 is in a plastic DIP (Dual In-line Package) and the PS2561DL-1 is lead bending type (Gull-wing) for surface mount.

The PS2561DL1-1 is lead bending type for long creepage distance.

The PS2561DL2-1 is lead bending type for long creepage distance (Gull-wing) for surface mount.

FEATURES

- Operating ambient temperature: 110°C
- High isolation voltage (BV = 5 000 Vr.m.s.)
- High collector to emitter voltage ($V_{CEO} = 80\text{ V}$)
- High current transfer ratio (CTR = 160% TYP.)
- High-speed switching ($t_r = 3\ \mu\text{s}$ TYP., $t_f = 5\ \mu\text{s}$ TYP.)
- Ordering number of taping product: PS2561DL-1-F3 : 2 000 pcs/reel
- : PS2561DL2-1-F3 : 2 000 pcs/reel
- Pb-Free product
- Safety standards
 - UL approved: UL1577, Double protection
 - CSA approved: CAN/CSA-C22.2 No. 62368-1, Reinforced insulation
 - BSI approved: BS EN 62368-1, Reinforced insulation
 - SEMKO approved: EN 62368-1, IEC 62368-1, Reinforced insulation
 - NEMKO approved: EN 62368-1, Reinforced insulation
 - FIMKO approved: EN 62368-1, Reinforced insulation
 - DEMKO approved: EN 62368-1, Reinforced insulation
 - CQC approved: GB8898, GB4943.1, Reinforced insulation
 - VDE approved: DIN EN 60747-5-5 (Option)

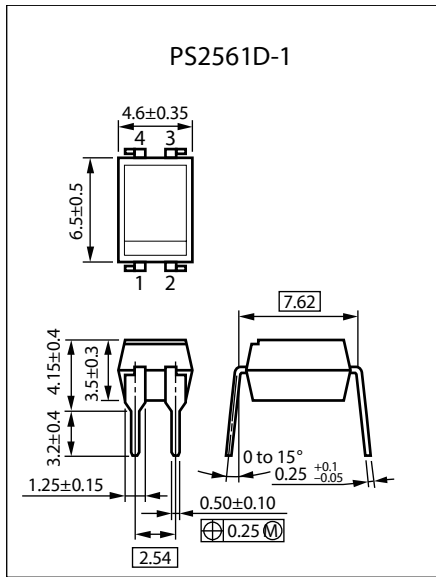


APPLICATIONS

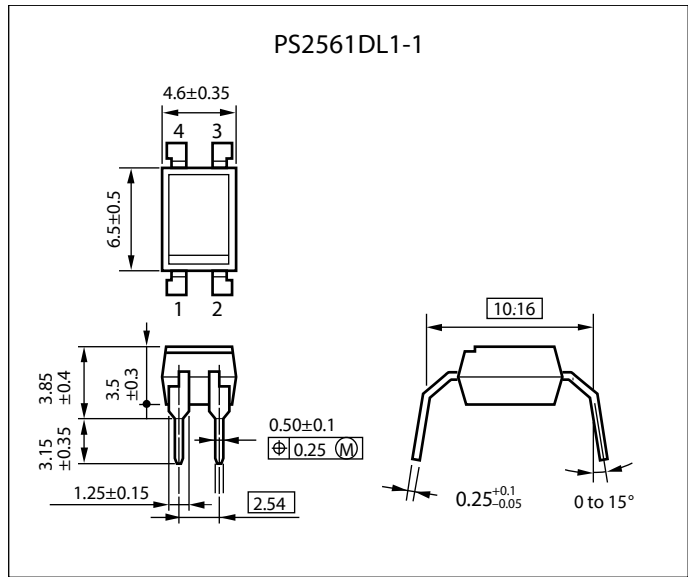
- Power supply
- Telephone/FAX.
- FA/OA equipment
- Programmable logic controllers

PACKAGE DIMENSIONS (UNIT: mm)

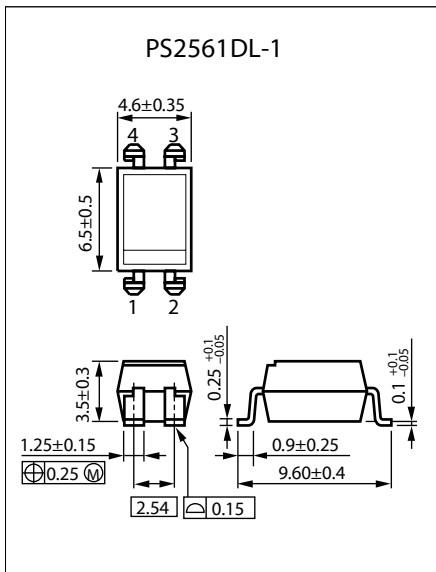
DIP Type



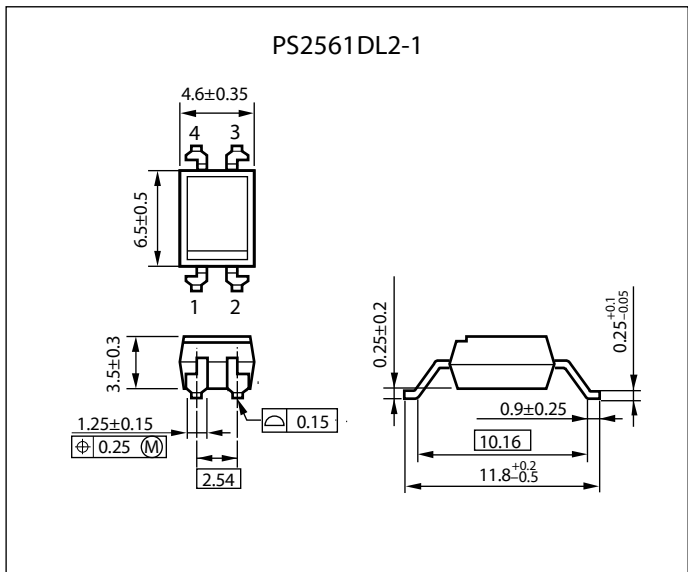
Long Creepage Distance



Lead Bending Type



Long Creepage Distance (Gull-Wing)

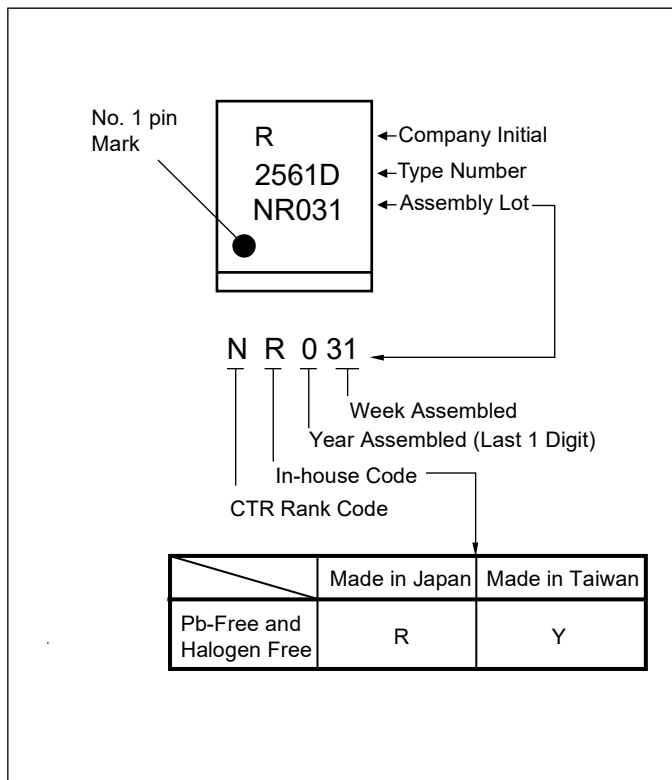


Weight (4-pin DIP) : 0.26 g (typ.)

PHOTOCOUPLER CONSTRUCTION

| Parameter | PS2561D-1, PS2561DL-1 | PS2561DL1-1, PS2561DL2-1 |
|---------------------------|-----------------------|--------------------------|
| Air Distance (MIN.) | 7 mm | 8 mm |
| Creepage Distance (MIN.) | 7 mm | 8 mm |
| Isolation Distance (MIN.) | 0.4 mm | 0.4 mm |

MARKING EXAMPLE



ORDERING INFORMATION

| Part Number | Order Number *1 | Solder Plating Specification | Packing Style | Safety Standard Approval | Application Part Number *2 | |
|------------------|---------------------|------------------------------|------------------------------|--|------------------------------|-------------|
| PS2561D-1 | PS2561D-1Y-A | Pb-Free and Halogen Free | Magazine case 100 pcs | Standard products (UL, CSA, BSI, SEMKO, NEMKO, FIMKO, DEMKO, CQC approved) | PS2561D-1 | |
| PS2561DL-1 | PS2561DL-1Y-A | | | | PS2561DL-1 | |
| PS2561DL1-1 | PS2561DL1-1Y-A | | | | PS2561DL1-1 | |
| PS2561DL2-1 | PS2561DL2-1Y-A | | | | PS2561DL2-1 | |
| PS2561DL-1-F3 | PS2561DL-1Y-F3-A | | Embossed Tape 2 000 pcs/reel | | PS2561DL-1 | |
| PS2561DL2-1-F3 | PS2561DL2-1Y-F3-A | | Embossed Tape 2 000 pcs/reel | | PS2561DL2-1 | |
| PS2561D-1-V | PS2561D-1Y-V-A | | Magazine case 100 pcs | UL, CSA, BSI, SEMKO, NEMKO, FIMKO, DEMKO, CQC, DIN EN 60747-5-5 approved | PS2561D-1 | |
| PS2561DL-1-V | PS2561DL-1Y-V-A | | | | PS2561DL-1 | |
| PS2561DL1-1-V | PS2561DL1-1Y-V-A | | | | PS2561DL1-1 | |
| PS2561DL2-1-V | PS2561DL2-1Y-V-A | | | | PS2561DL2-1 | |
| PS2561DL-1-V-F3 | PS2561DL-1Y-V-F3-A | | | | Embossed Tape 2 000 pcs/reel | PS2561DL-1 |
| PS2561DL2-1-V-F3 | PS2561DL2-1Y-V-F3-A | | | | Embossed Tape 2 000 pcs/reel | PS2561DL2-1 |

Notes: *1. When specifying CTR rank, please add "/CTR rank" after Order Number.

ex. L rank : PS2561D-1Y-A/L

Notes: *2. For the application of the Safety Standard, following part number should be used.

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 | 40 | 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 +110 | °C |
| Storage Temperature | | T _{stg} | -55 to +150 | °C |

Note: *1. PW = 100 μs, Duty Cycle = 1%

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

Pins 1-2 shorted together, 3-4 shorted together.

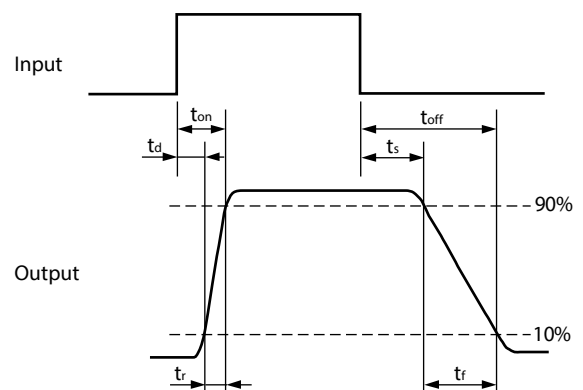
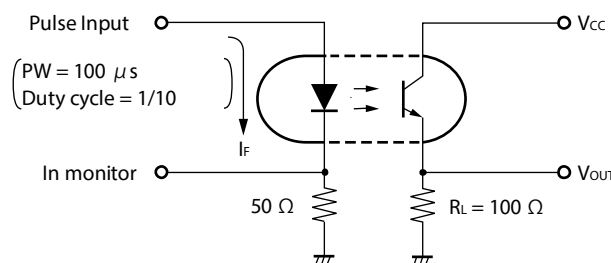
ELECTRICAL CHARACTERISTICS (T_A = 25°C)

| Parameter | | Symbol | Conditions | MIN. | TYP. | MAX. | Unit |
|------------|--|----------------------|---|------------------|------|------|------|
| Diode | Forward Voltage | V _F | I _F = 10 mA | | 1.2 | 1.4 | V |
| | Reverse Current | I _R | V _R = 5 V | | | 5 | μA |
| | Terminal Capacitance | C _t | V = 0 V, f = 1.0 MHz | | 10 | | pF |
| Transistor | Collector to Emitter Dark Current | I _{CEO} | V _{CE} = 48 V, I _F = 0 mA | | | 100 | nA |
| Coupled | Current Transfer Ratio (I _c /I _F)*1 | CTR | I _F = 5 mA, V _{CE} = 5 V | 50 | 160 | 400 | % |
| | | | I _F = 1 mA, V _{CE} = 5 V | 10 | 80 | | |
| | 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 _{DC} | 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 | | | 5 | | |

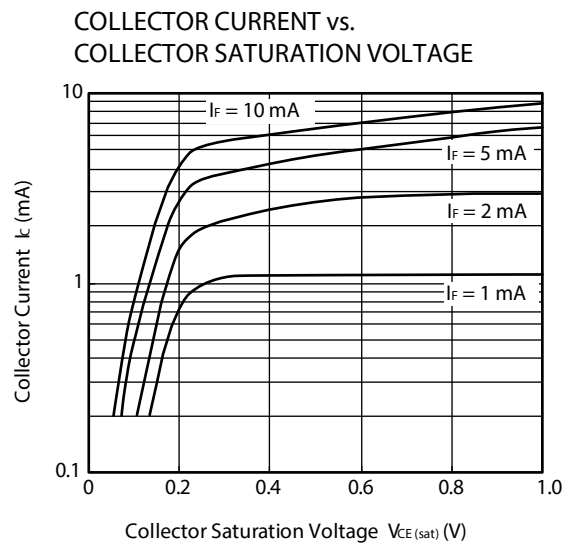
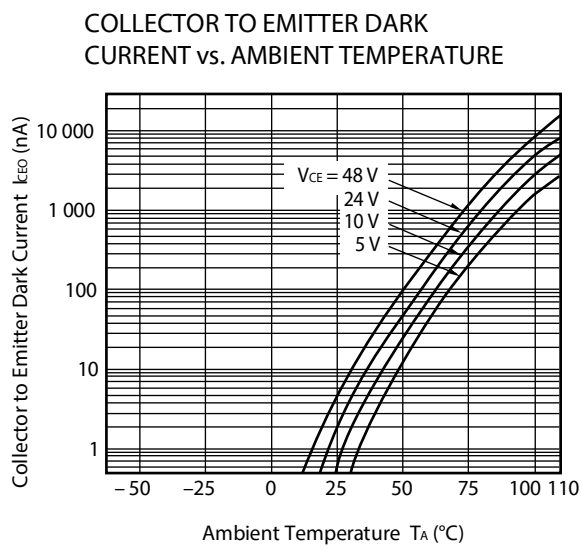
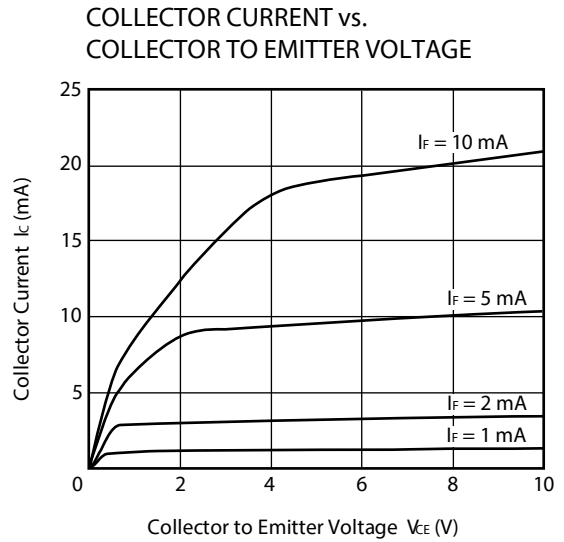
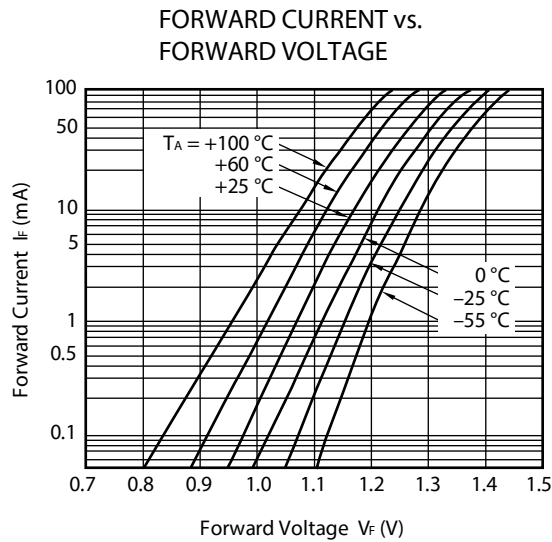
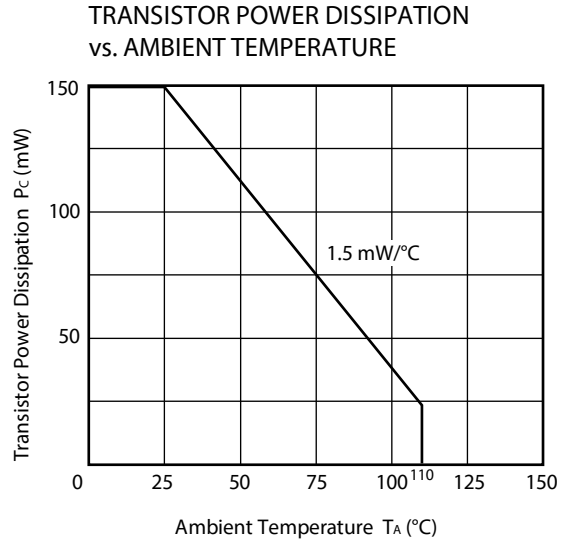
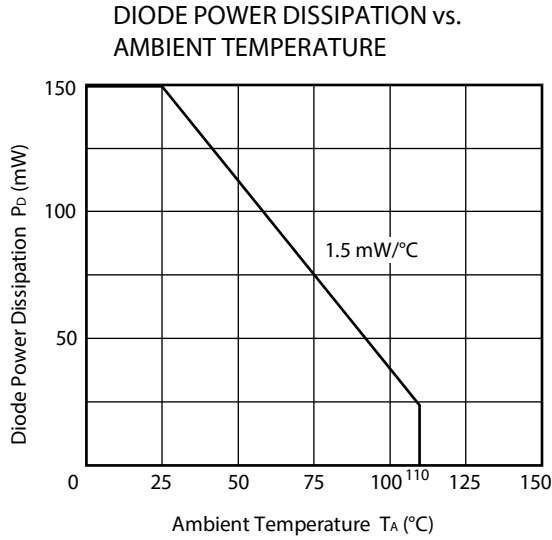
Note: *1. CTR rank

| CTR Rank | CTR (%) | Conditions |
|----------|---------------|--|
| H | 80 to 160 | I _F = 5 mA, V _{CE} = 5 V |
| | 16 and larger | I _F = 1 mA, V _{CE} = 5 V |
| Q | 100 to 200 | I _F = 5 mA, V _{CE} = 5 V |
| | 20 and larger | I _F = 1 mA, V _{CE} = 5 V |
| W | 130 to 260 | I _F = 5 mA, V _{CE} = 5 V |
| | 26 and larger | I _F = 1 mA, V _{CE} = 5 V |
| L | 200 to 400 | I _F = 5 mA, V _{CE} = 5 V |
| | 40 and larger | I _F = 1 mA, V _{CE} = 5 V |
| N | 50 to 400 | I _F = 5 mA, V _{CE} = 5 V |
| | 10 and larger | I _F = 1 mA, V _{CE} = 5 V |

*2. Test Circuit for Switching Time

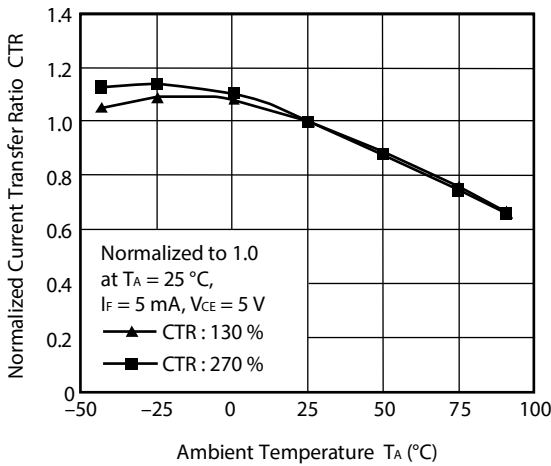


TYPICAL CHARACTERISTICS (T_A = 25°C, unless otherwise specified)

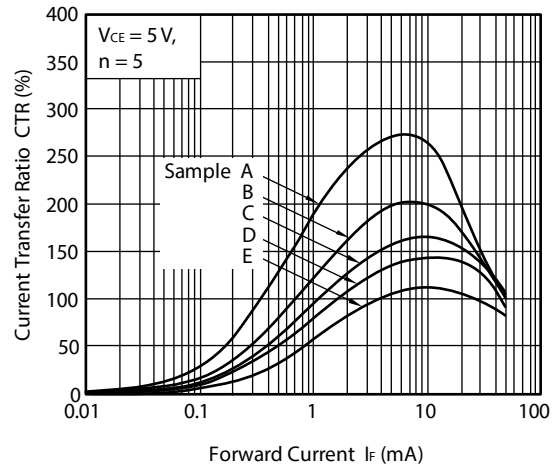


Remark The graphs indicate nominal characteristics.

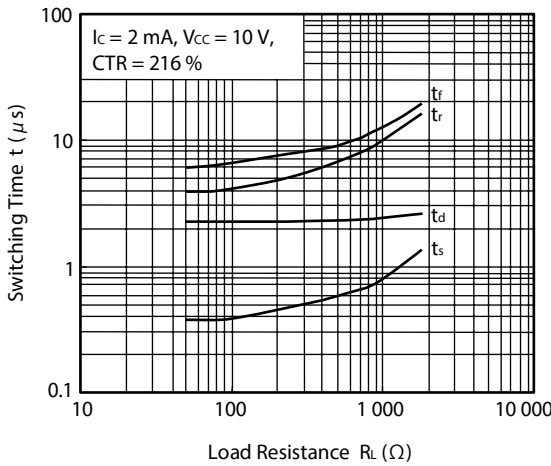
NORMALIZED CURRENT TRANSFER RATIO vs. AMBIENT TEMPERATURE



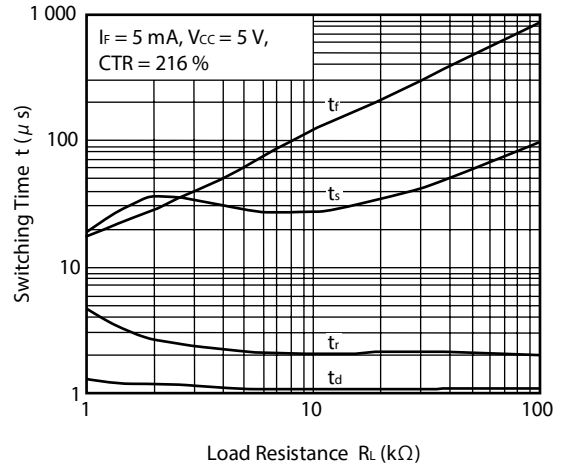
CURRENT TRANSFER RATIO vs. FORWARD CURRENT



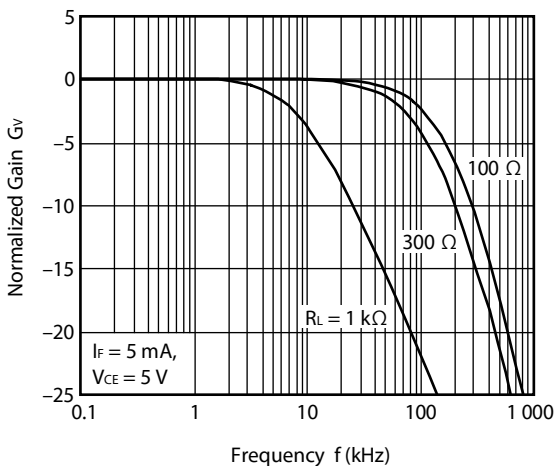
SWITCHING TIME vs. LOAD RESISTANCE



SWITCHING TIME vs. LOAD RESISTANCE



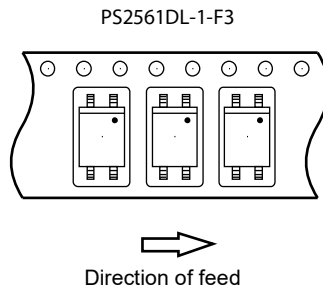
FREQUENCY RESPONSE



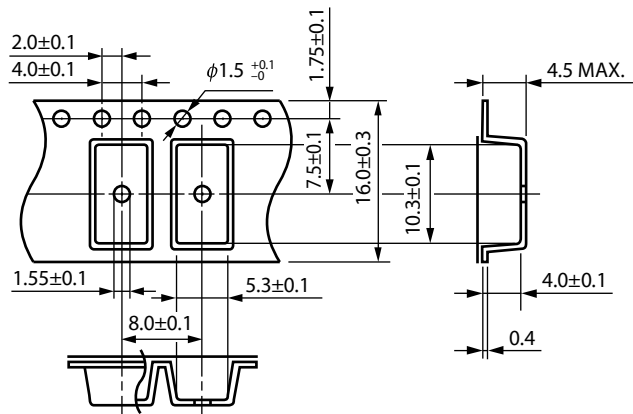
Remark The graphs indicate nominal characteristics.

TAPING SPECIFICATIONS (UNIT: mm)

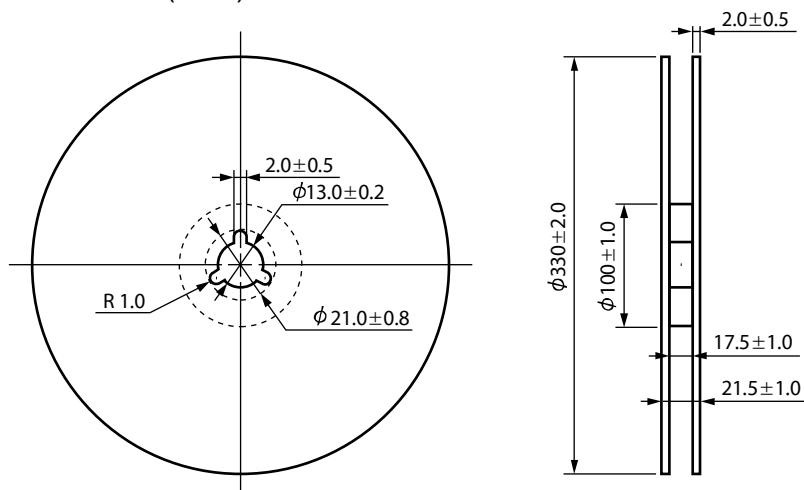
Taping Direction



Outline and Dimensions (Tape)



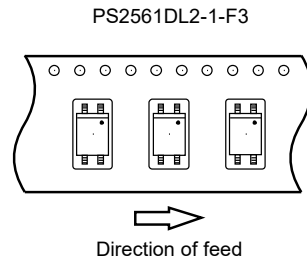
Outline and Dimensions (Reel)



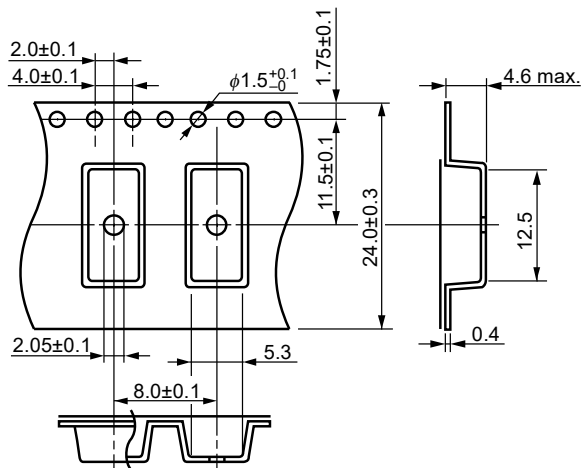
Packing: 2 000 pcs/reel

TAPING SPECIFICATIONS (UNIT: mm)

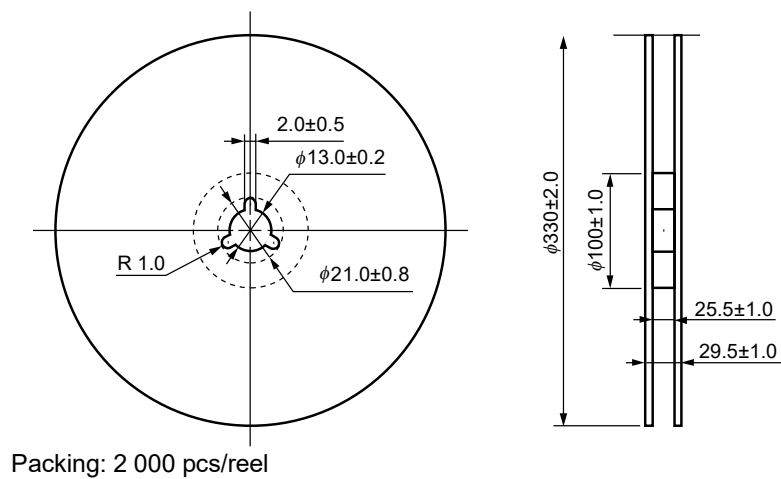
Taping Direction



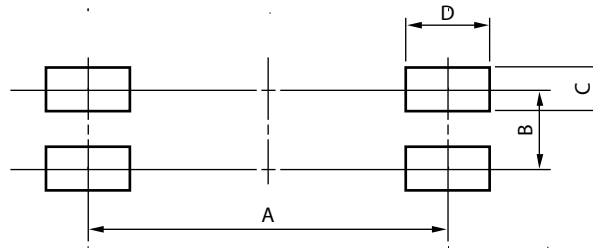
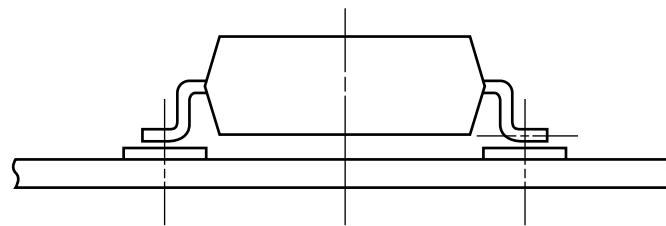
Outline and Dimensions (Tape)



Outline and Dimensions (Reel)



RECOMMENDED MOUNT PAD DIMENSIONS (UNIT: mm)



| Part Number | Lead Bending | A | B | C | D |
|-------------|---|------|------|-----|-----|
| PS2561DL | lead bending type (Gull-wing) for long creepage distance (surface mount) | 8.2 | 2.54 | 1.7 | 2.2 |
| PS2561DL2 | lead bending type (Gull-wing) for surface mount | 10.2 | 2.54 | 1.7 | 2.2 |

Remark All dimensions in this figure must be evaluated before use.

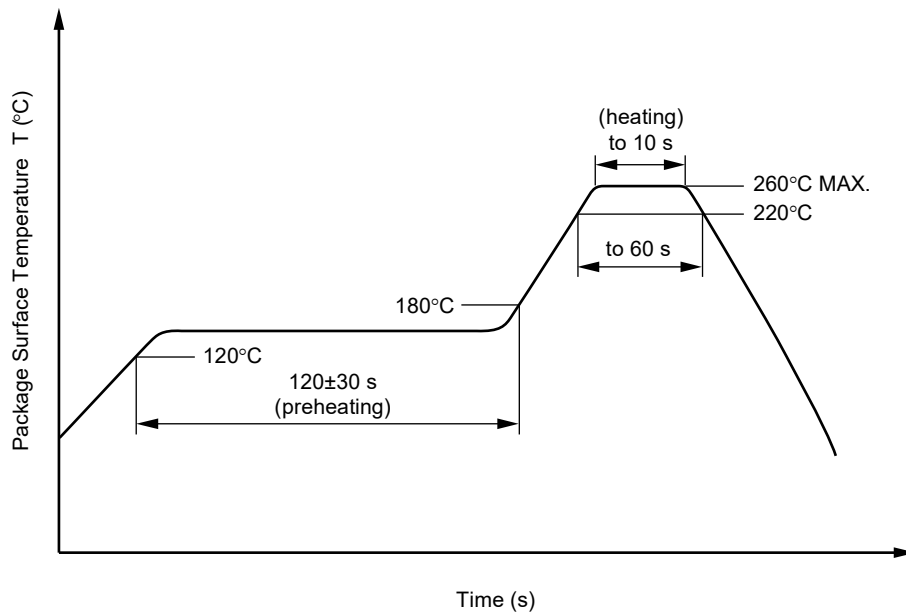
NOTES ON HANDLING

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

- Flux Cleaning
Avoid cleaning with Freon based or halogen-based (chlorinated etc.) solvents.
- Do not use fixing agents or coatings containing halogen-based substances.

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.

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.

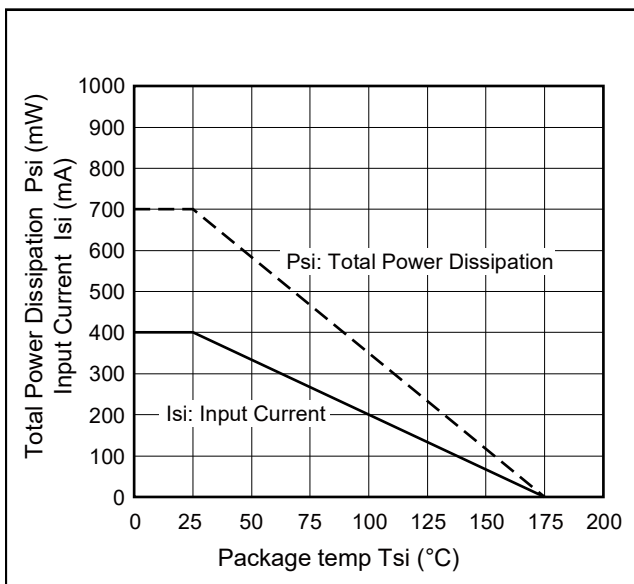
USAGE CAUTIONS

1. Protect against static electricity when handling.
2. Avoid storage at a high temperature and high humidity.
3. Avoid cleaning with Freon based or halogen-based (chlorinated etc.) solvents.
4. Do not use fixing agents or coatings containing halogen-based substances.

**SPECIFICATION OF VDE MARKS LICENSE DOCUMENT (1/2)
(PS2561D-1, PS2561DL-1)**

| Parameter | Symbol | Rating | Unit |
|--|---|-----------------------------|----------------------------|
| Climatic test class (IEC 60068-1/DIN EN 60068-1) | | 55/110/21 | |
| Dielectric strength maximum operating isolation voltage Test voltage (partial discharge test, procedure a for type test and random test) $U_{pr} = 1.6 \times U_{IORM}, P_d < 5 \text{ pC}$ | U_{IORM} U_{pr} | 890 1 424 | V_{peak} V_{peak} |
| Test voltage (partial discharge test, procedure b for all devices) $U_{pr} = 1.875 \times U_{IORM}, P_d < 5 \text{ pC}$ | U_{pr} | 1 669 | V_{peak} |
| Highest permissible overvoltage | U_{IOTM} | 8 000 | V_{peak} |
| Degree of pollution (IEC 60664-1/DIN EN 60664-1 (VDE 0110-1)) | | 2 | |
| Comparative tracking index (IEC 60112/DIN EN 60112 (VDE 0303-11)) | CTI | 175 | |
| Material group (IEC 60664-1/DIN EN 60664-1 (VDE 0110-1)) | | III a | |
| Storage temperature range | T_{stg} | -55 to +150 | °C |
| Operating temperature range | T_A | -55 to +110 | °C |
| Isolation resistance, minimum value $V_{IO} = 500 \text{ V dc at } T_A = 25^\circ\text{C}$ $V_{IO} = 500 \text{ V dc at } T_A \text{ MAX. at least } 100^\circ\text{C}$ | $R_{is \text{ MIN.}}$ $R_{is \text{ MIN.}}$ | 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 , $P_{si} = 0$) Power (output or total power dissipation) Isolation resistance $V_{IO} = 500 \text{ V dc at } T_A = T_{si}$ | T_{si} I_{si} P_{si} $R_{is \text{ MIN.}}$ | 175 400 700 10^9 | °C mA mW Ω |

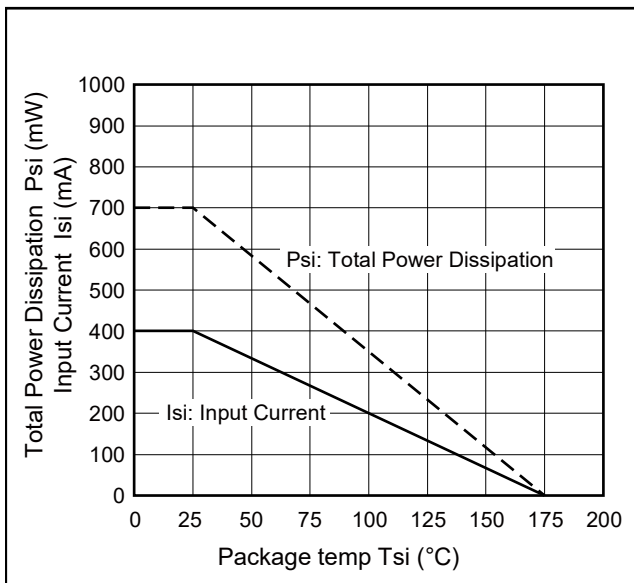
Dependence of maximum safety ratings with package temperature



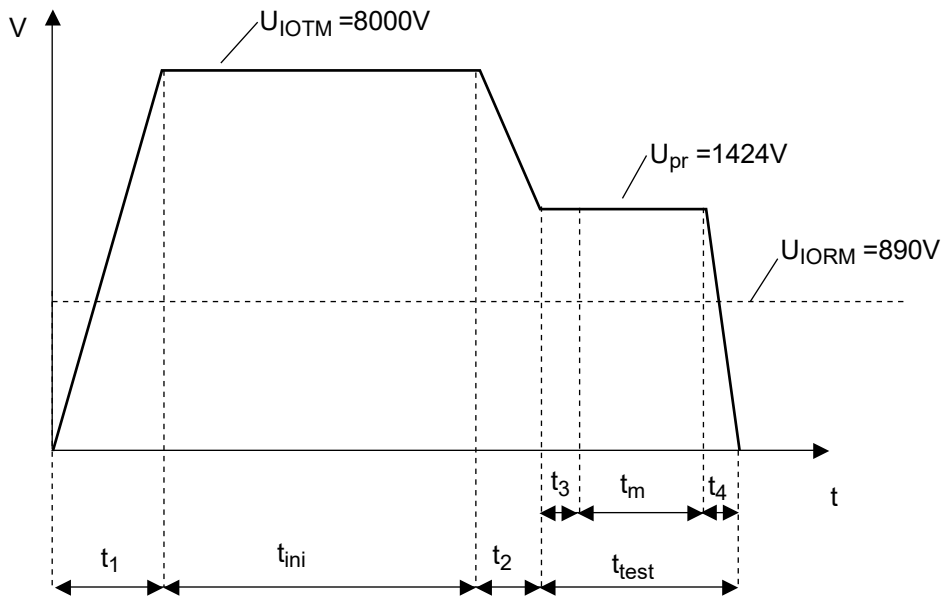
**SPECIFICATION OF VDE MARKS LICENSE DOCUMENT (2/2)
(PS2561DL1-1, PS2561DL2-1)**

| Parameter | Symbol | Rating | Unit |
|--|--|-----------------------------|----------------------------|
| Climatic test class (IEC 60068-1/DIN EN 60068-1) | | 55/110/21 | |
| Dielectric strength maximum operating isolation voltage Test voltage (partial discharge test, procedure a for type test and random test) $U_{pr} = 1.6 \times U_{IORM}, P_d < 5 \text{ pC}$ | U_{IORM} U_{pr} | 1 130 1 808 | V_{peak} V_{peak} |
| Test voltage (partial discharge test, procedure b for all devices) $U_{pr} = 1.875 \times U_{IORM}, P_d < 5 \text{ pC}$ | U_{pr} | 2 119 | V_{peak} |
| Highest permissible overvoltage | U_{IOTM} | 8 000 | V_{peak} |
| Degree of pollution (IEC 60664-1/DIN EN 60664-1 (VDE 0110-1)) | | 2 | |
| Comparative tracking index (IEC 60112/DIN EN 60112 (VDE 0303-11)) | CTI | 175 | |
| Material group (IEC 60664-1/DIN EN 60664-1 (VDE 0110-1)) | | III a | |
| Storage temperature range | T_{stg} | -55 to +150 | °C |
| Operating temperature range | T_A | -55 to +110 | °C |
| Isolation resistance, minimum value $V_{IO} = 500 \text{ V dc at } T_A = 25^\circ\text{C}$ $V_{IO} = 500 \text{ V dc at } T_A \text{ MAX. at least } 100^\circ\text{C}$ | 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 , $P_{si} = 0$) Power (output or total power dissipation) Isolation resistance $V_{IO} = 500 \text{ V dc at } T_A = T_{si}$ | T_{si} I_{si} P_{si} Ris MIN. | 175 400 700 10^9 | °C mA mW Ω |

Dependence of maximum safety ratings with package temperature

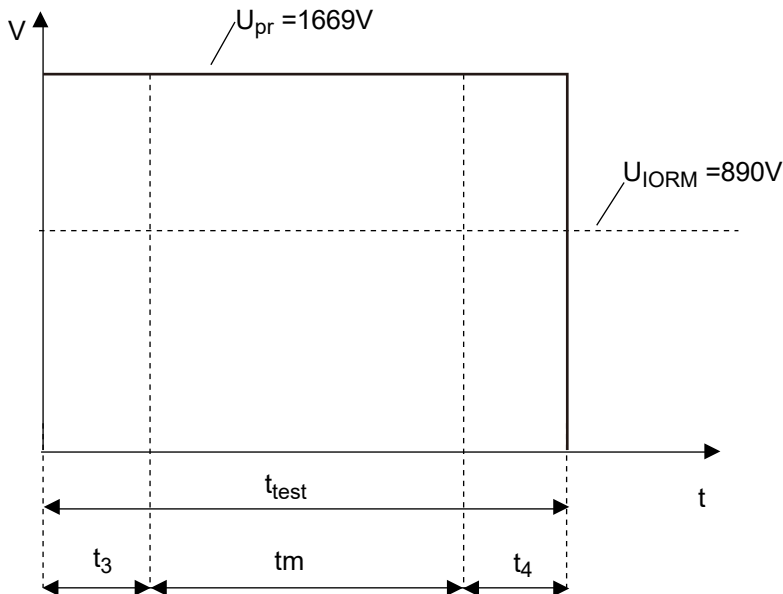


Method a) Destructive Test, Type and Sample Test (PS2561D-1, PS2561DL-1)



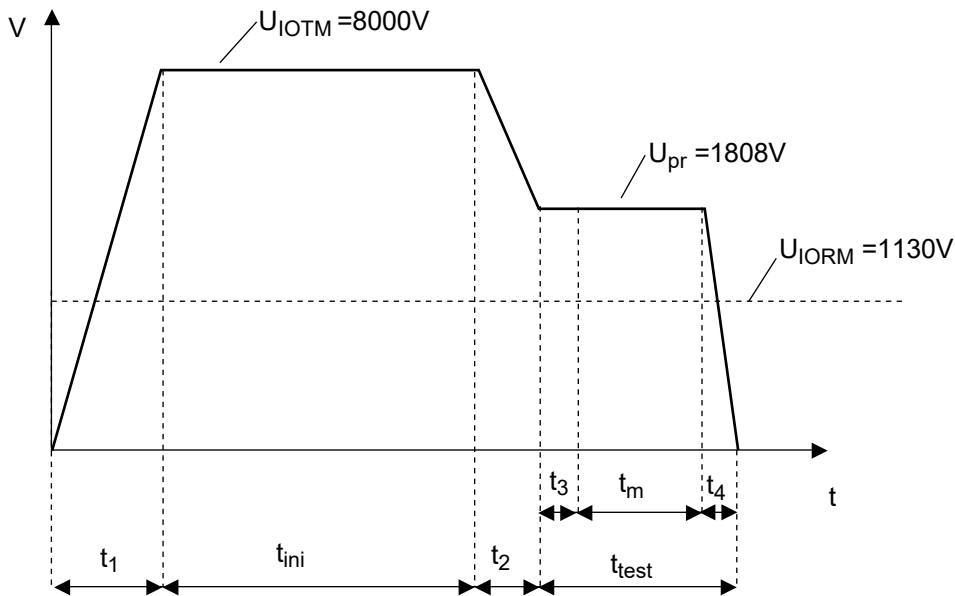
$t_1, t_2 = 1$ to 10 sec
 $t_3, t_4 = 1$ sec
 t_m (PARTIAL DISCHARGE) = 10 sec
 $t_{test} = 12$ sec
 $t_{ini} = 60$ sec

Method b) Non-destructive Test, 100% Production Test (PS2561D-1, PS2561DL-1)



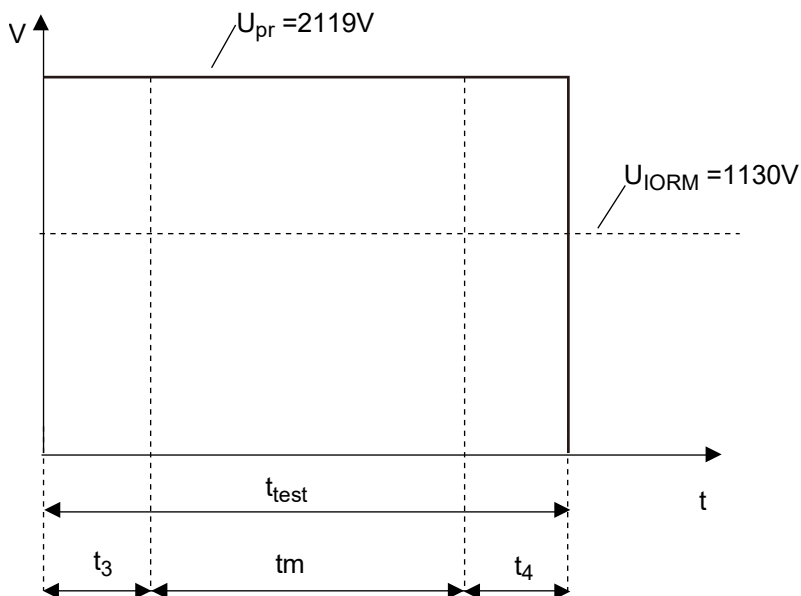
$t_3, t_4 = 0.1$ sec
 t_m (PARTIAL DISCHARGE) = 1.0 sec
 $t_{test} = 1.2$ sec

Method a) Destructive Test, Type and Sample Test (PS2561DL1-1, PS2561DL2-1)



$t_1, t_2 = 1$ to 10 sec
 $t_3, t_4 = 1$ sec
 t_m (PARTIAL DISCHARGE) = 10 sec
 $t_{test} = 12$ sec
 $t_{ini} = 60$ sec

Method b) Non-destructive Test, 100% Production Test (PS2561DL1-1, PS2561DL2-1)



$t_3, t_4 = 0.1$ sec
 t_m (PARTIAL DISCHARGE) = 1.0 sec
 $t_{test} = 1.2$ sec

| | | |
|----------------|---------------|--|
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