



PS2565-1, PS2565L-1, PS2565L1-1, PS2565L2-1

HIGH ISOLATION VOLTAGE AC INPUT RESPONSE TYPE MULTI PHOTOCOUPLER SERIES

—NEPOC Series—

★ DESCRIPTION

The PS2565-1 is optically coupled isolators containing GaAs light emitting diodes and an NPN silicon phototransistor.

The PS2565-1 is in a plastic DIP (Dual In-line Package) and the PS2565L-1 is lead bending type (Gull-wing) for surface mount.

The PS2565L1-1 is lead bending type for long creepage distance.

The PS2565L2-1 is lead bending type for long creepage distance (Gull-wing) for surface mount.

FEATURES

- AC input response
- High Isolation voltage ($BV = 5\,000\text{ V}_{r.m.s.}$)
- High collector to emitter voltage ($V_{CEO} = 80\text{ V}$)
- High current transfer ratio ($CTR = 200\% \text{ TYP.}$)
- High-speed switching ($t_r = 3\ \mu\text{s TYP.}$, $t_f = 5\ \mu\text{s TYP.}$)
- ★ • Ordering number of taping product: PS2565L-1-E3, E4, F3, F4, PS2565L2-1-E3, E4
- ★ • Safety standards
 - UL approved: File No. E72422
 - CSA approved: No. CA 101391
 - BSI approved: No. 7112/7420
 - SEMKO approved: No. 303059, 307244
 - NEMKO approved: No. P03200272, P03200747
 - DEMKO approved: No. 312341, 312340
 - FIMKO approved: No. FI 10620, FI 11898
 - DIN EN60747-5-2 (VDE0884 Part2) approved (Option)

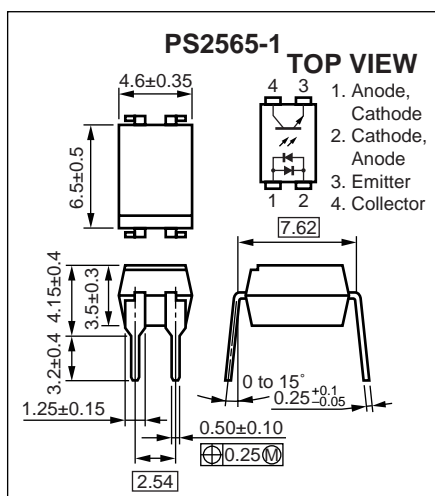
APPLICATIONS

- Telephone/FAX.
- FA/OA equipment
- Programmable logic controller

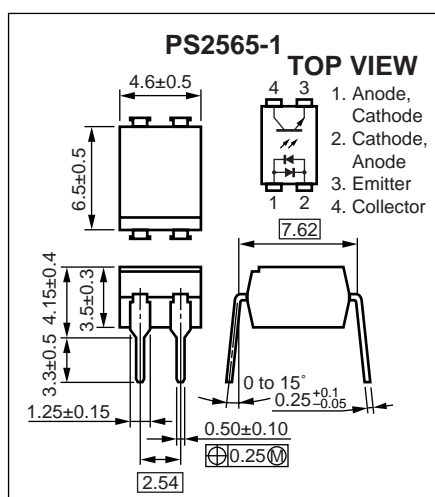
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★ **PACKAGE DIMENSIONS (UNIT : mm)**

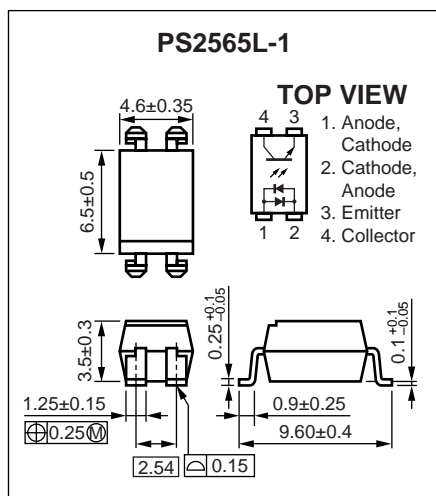
DIP Type (New package)



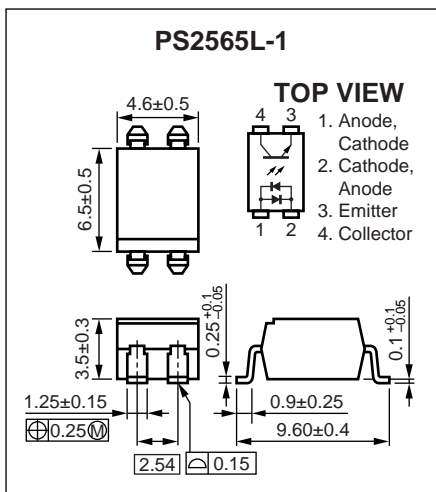
DIP Type



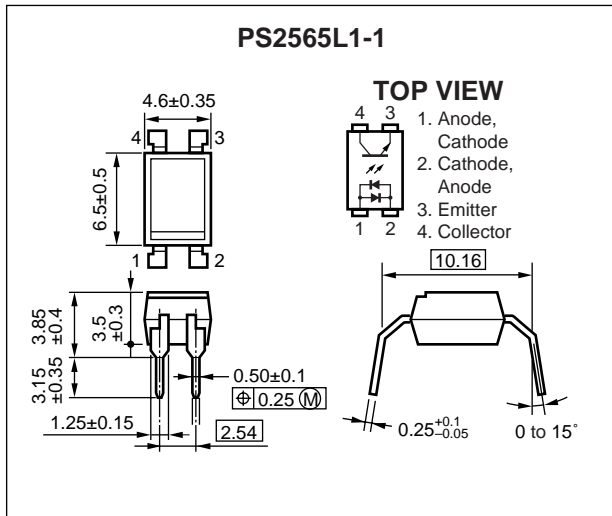
Lead Bending Type (New package)



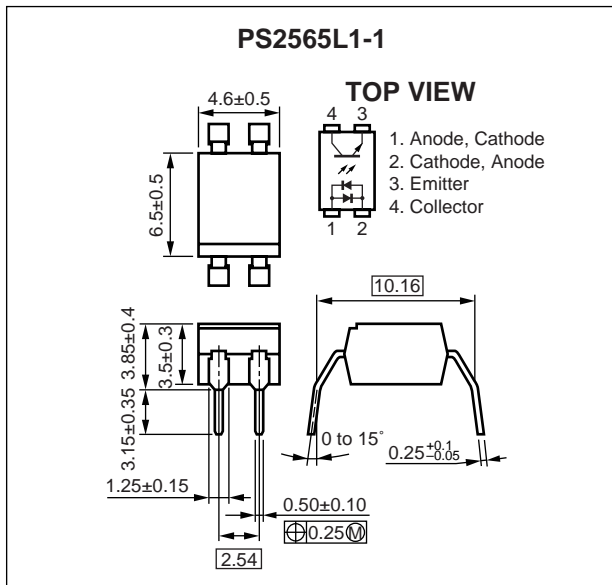
Lead Bending Type



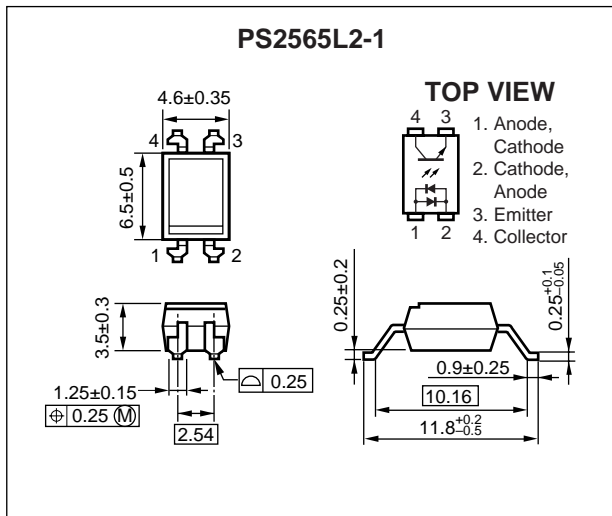
Lead Bending Type For Long Creepage Distance (New Package)



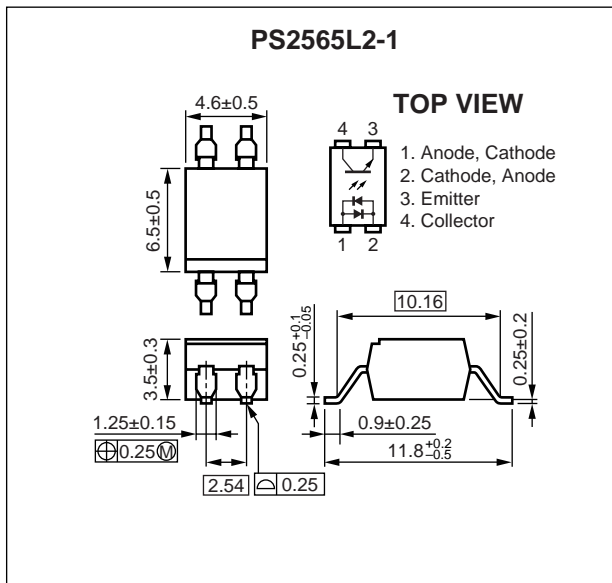
Lead Bending Type For Long Creepage Distance



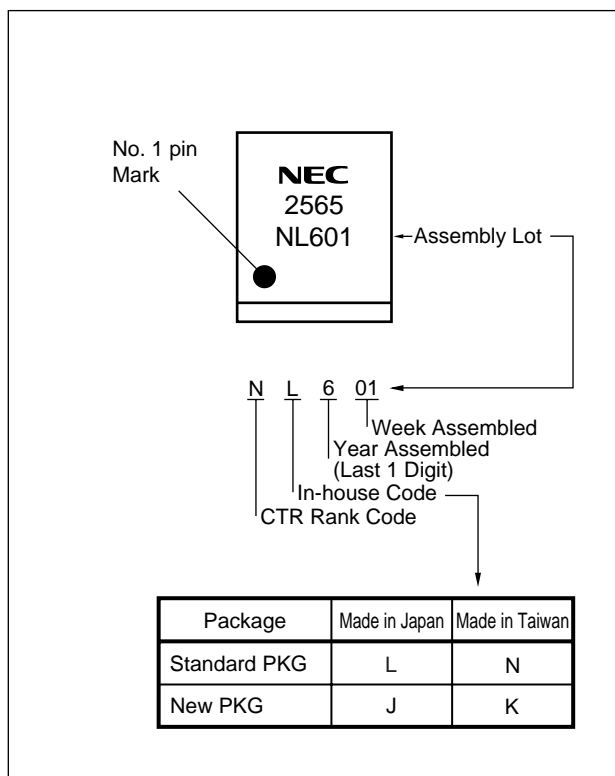
Lead Bending Type For Long Creepage Distance (Gull-Wing) (New Package)



Lead Bending Type For Long Creepage Distance (Gull-Wing)



★ **MARKING EXAMPLE**



★ ORDERING INFORMATION

| Part Number | Order Number | Solder Plating Specification | Packing Style | Safety Standard Approval | Application Part Number ^{*1} |
|-----------------|-------------------|------------------------------|------------------------------|---|---------------------------------------|
| PS2565-1 | PS2565-1-A | Pb-Free | Magazine case 100 pcs | Standard products (UL, CSA, BSI, NEMKO, SEMKO, DEMKO, FIMKO approved) | PS2565-1 |
| PS2565L-1 | PS2565L-1-A | | | | |
| PS2565L1-1 | PS2565L1-1-A | | | | |
| PS2565L2-1 | PS2565L2-1-A | | | | |
| PS2565L-1-E3 | PS2565L-1-E3-A | | Embossed Tape 1 000 pcs/reel | | |
| PS2565L-1-E4 | PS2565L-1-E4-A | | | | |
| PS2565L-1-F3 | PS2565L-1-F3-A | | Embossed Tape 2 000 pcs/reel | | |
| PS2565L-1-F4 | PS2565L-1-F4-A | | | | |
| PS2565L2-1-E3 | PS2565L2-1-E3-A | | Embossed Tape 1 000 pcs/reel | | |
| PS2565L2-1-E4 | PS2565L2-1-E4-A | | | | |
| PS2565-1-V | PS2565-1-V-A | | Magazine case 100 pcs | DIN EN60747-5-2 (VDE0884 Part2) approved products (option) | |
| PS2565L-1-V | PS2565L-1-V-A | | | | |
| PS2565L1-1-V | PS2565L1-1-V-A | | | | |
| PS2565L2-1-V | PS2565L2-1-V-A | | | | |
| PS2565L-1-V-E3 | PS2565L-1-V-E3-A | | Embossed Tape 1 000 pcs/reel | | |
| PS2565L-1-V-E4 | PS2565L-1-V-E4-A | | | | |
| PS2565L-1-V-F3 | PS2565L-1-V-F3-A | | Embossed Tape 2 000 pcs/reel | | |
| PS2565L-1-V-F4 | PS2565L-1-V-F4-A | | | | |
| PS2565L2-1-V-E3 | PS2565L2-1-V-E3-A | | Embossed Tape 1 000 pcs/reel | | |
| PS2565L2-1-V-E4 | PS2565L2-1-V-E4-A | | | | |

*1 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 | 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 |

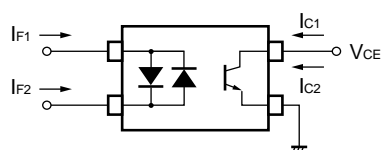
*¹ PW = 100 μs, Duty Cycle = 1%

*² AC voltage for 1 minute at T_A = 25°C, RH = 60% between input and output
Pins 1-2 shorted together, 3-4 shorted together.

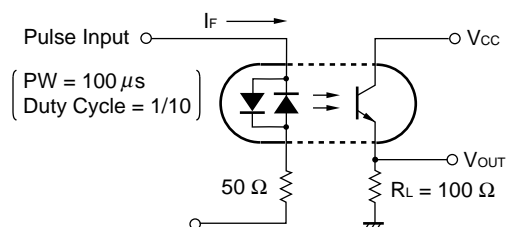
ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$)

| Parameter | | Symbol | Conditions | MIN. | TYP. | MAX. | Unit |
|------------|--------------------------------------|---------------|--|-----------|------|------|---------------|
| Diode | Forward Voltage | V_F | $I_F = \pm 10\text{ mA}$ | | 1.17 | 1.4 | V |
| | Terminal Capacitance | C_t | $V = 0\text{ V}, f = 1.0\text{ MHz}$ | | 100 | | pF |
| Transistor | Collector to Emitter Dark Current | I_{CEO} | $V_{CE} = 80\text{ V}, I_F = 0\text{ mA}$ | | | 100 | nA |
| Coupled | Current Transfer Ratio (I_C/I_F) | CTR | $I_F = \pm 5\text{ mA}, V_{CE} = 5\text{ V}$ | 80 | 200 | 400 | % |
| | CTR Ratio ^{*1} | CTR1/ CTR2 | $I_F = 5\text{ mA}, V_{CE} = 5\text{ V}$ | 0.3 | 1.0 | 3.0 | |
| | Collector Saturation Voltage | $V_{CE(sat)}$ | $I_F = \pm 10\text{ mA}, I_C = 2\text{ mA}$ | | | 0.3 | V |
| | Isolation Resistance | R_{I-O} | $V_{I-O} = 1.0\text{ kV}_{DC}$ | 10^{11} | | | Ω |
| | Isolation Capacitance | C_{I-O} | $V = 0\text{ V}, f = 1.0\text{ MHz}$ | | 0.5 | | pF |
| | Rise Time ^{*2} | t_r | $V_{CC} = 10\text{ V}, I_C = 2\text{ mA}, R_L = 100\text{ }\Omega$ | | 3 | | μs |
| | Fall Time ^{*2} | t_f | | | 5 | | |

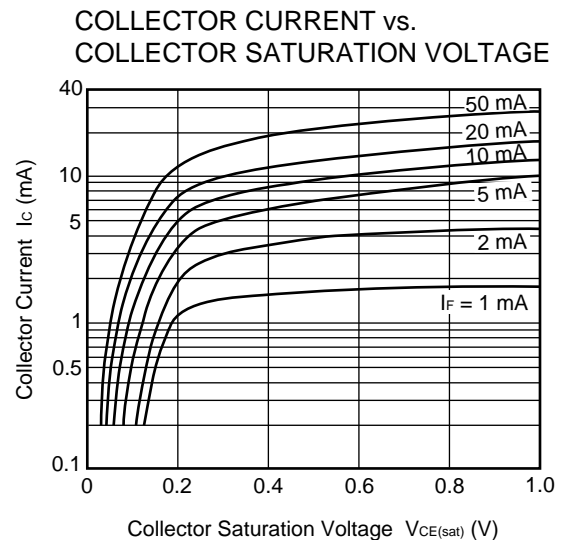
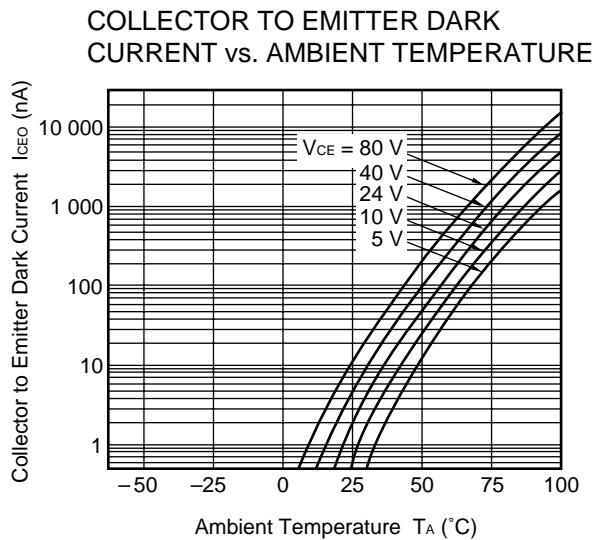
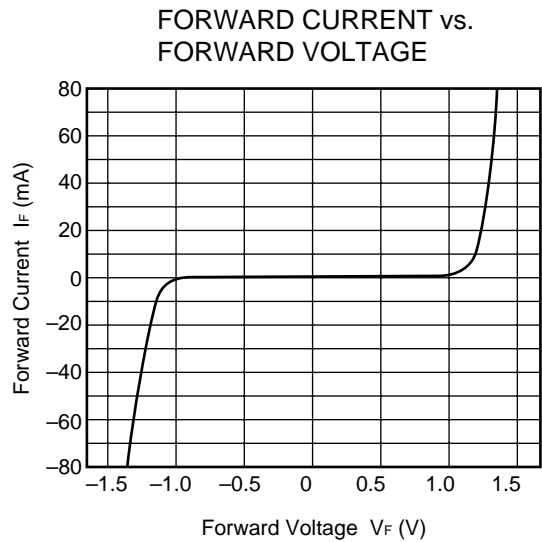
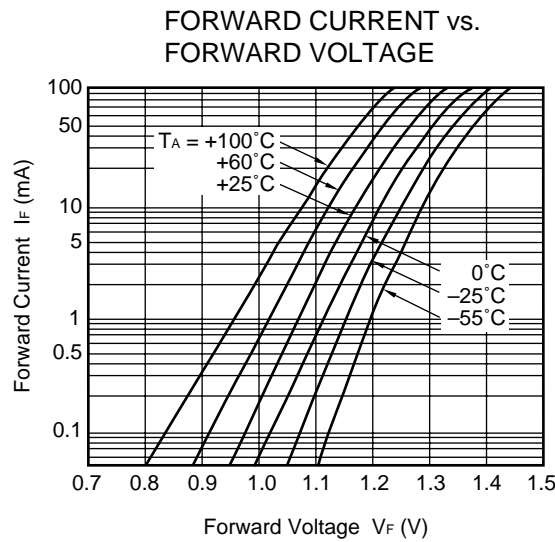
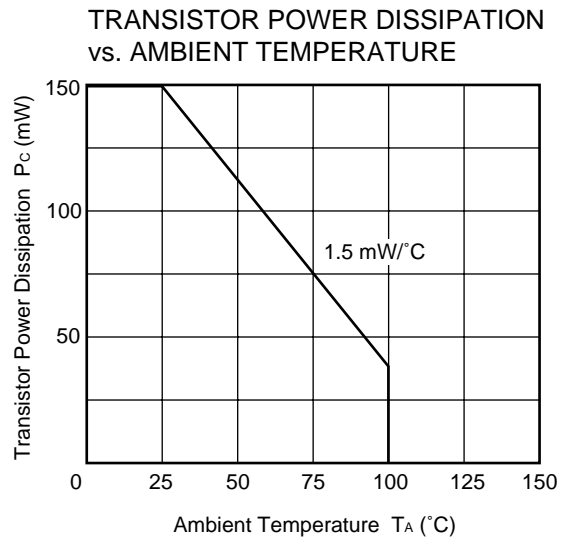
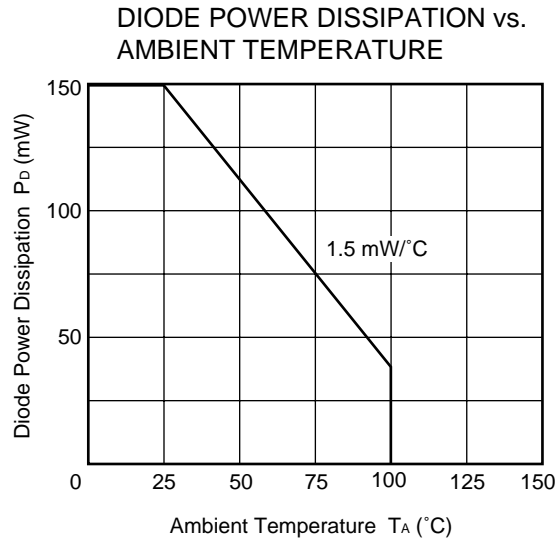
*1 $CTR1 = I_{C1}/I_{F1}$, $CTR2 = I_{C2}/I_{F2}$



*2 Test circuit for switching time

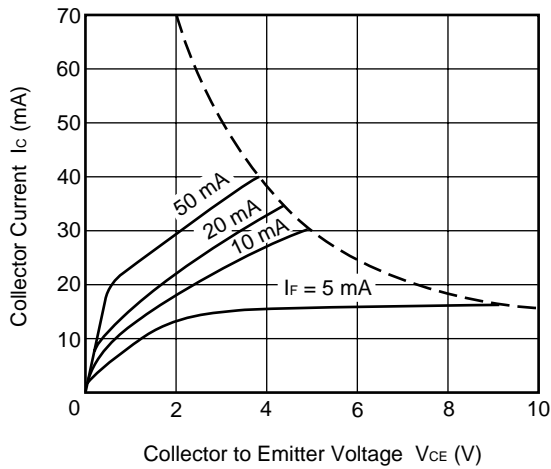


★ TYPICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$, unless otherwise specified)

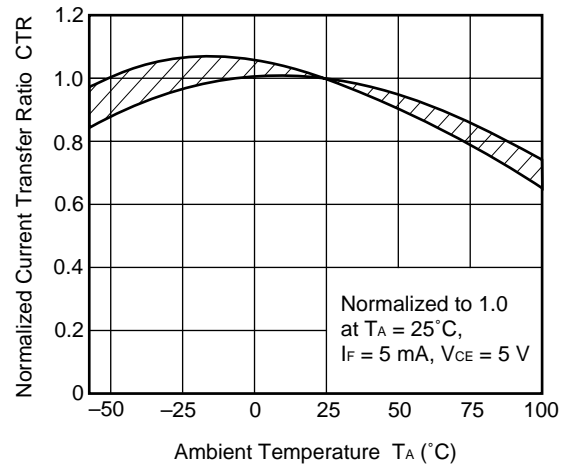


Remark The graphs indicate nominal characteristics.

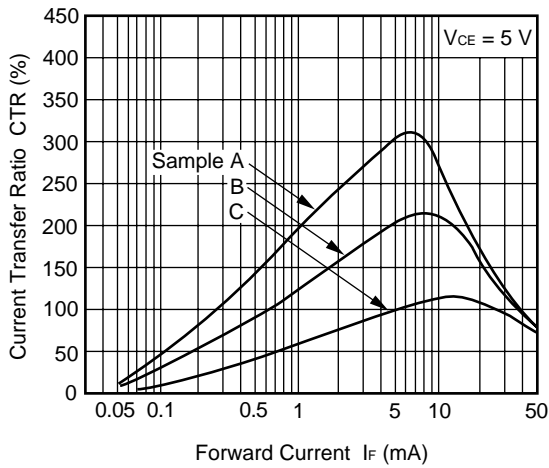
COLLECTOR CURRENT vs.
COLLECTOR TO EMITTER VOLTAGE



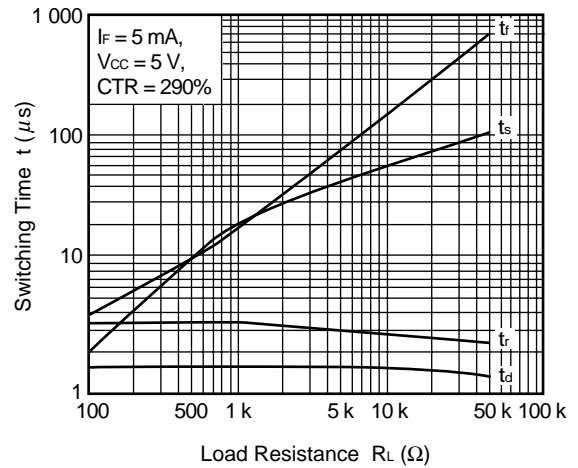
NORMALIZED CURRENT TRANSFER
RATIO vs. AMBIENT TEMPERATURE



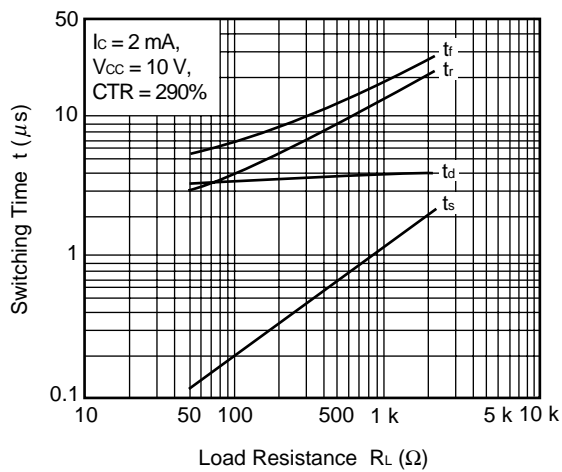
CURRENT TRANSFER RATIO vs.
FORWARD CURRENT



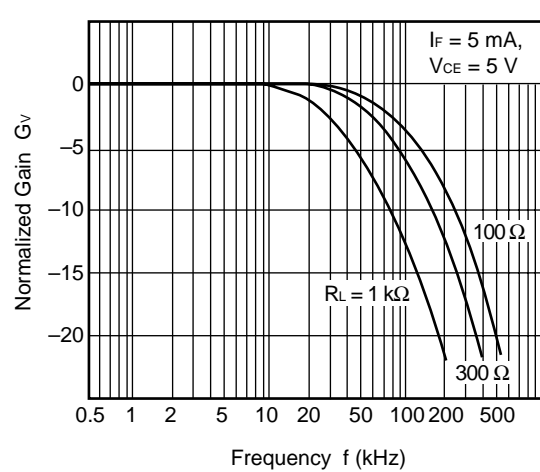
SWITCHING TIME vs.
LOAD RESISTANCE



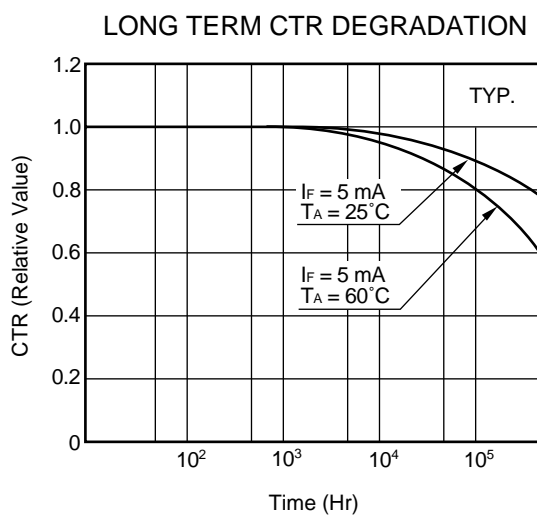
SWITCHING TIME vs.
LOAD RESISTANCE



FREQUENCY RESPONSE



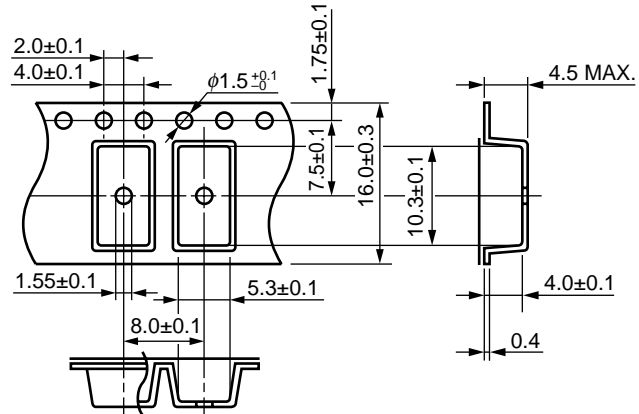
Remark The graphs indicate nominal characteristics.



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★ TAPING SPECIFICATIONS (UNIT : mm)

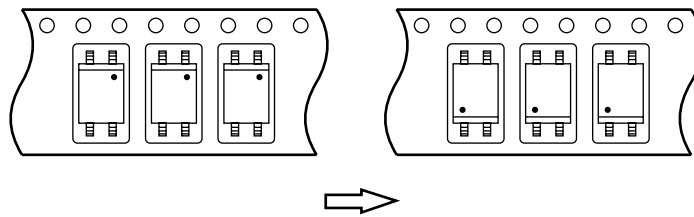
Outline and Dimensions (Tape)



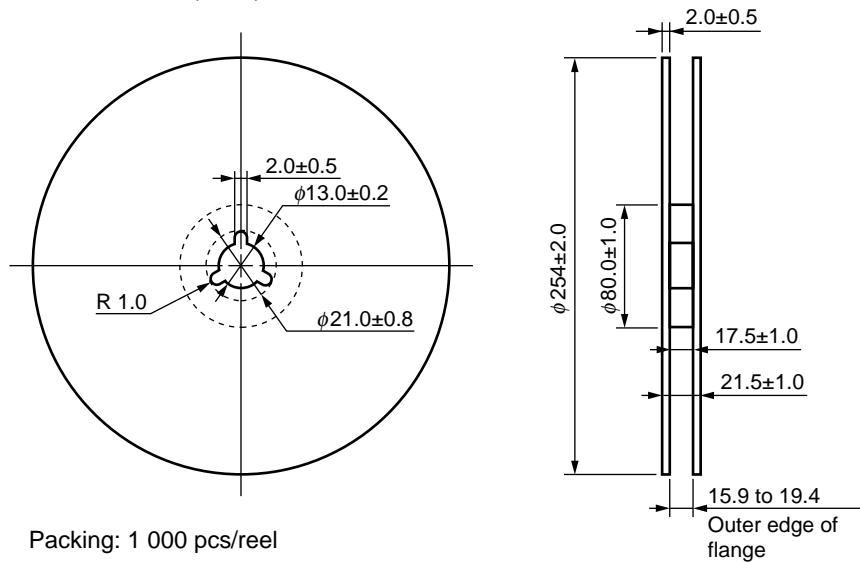
Tape Direction

PS2565L-1-E3

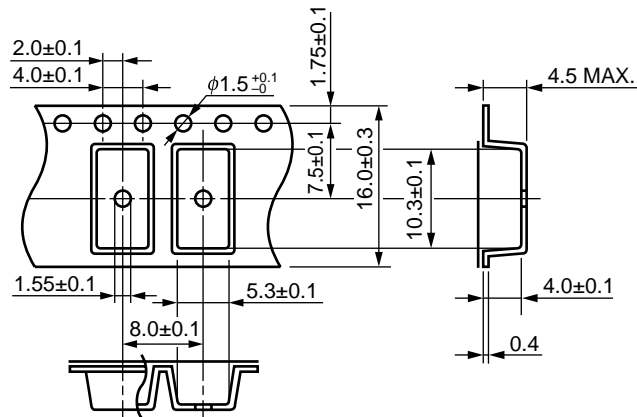
PS2565L-1-E4



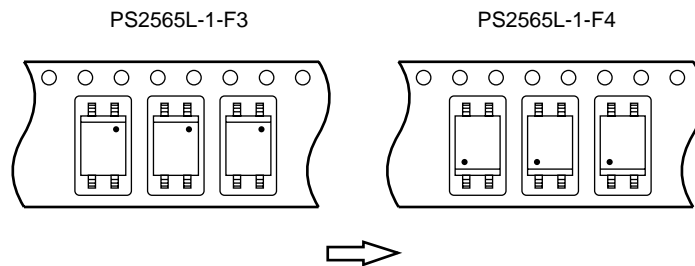
Outline and Dimensions (Reel)



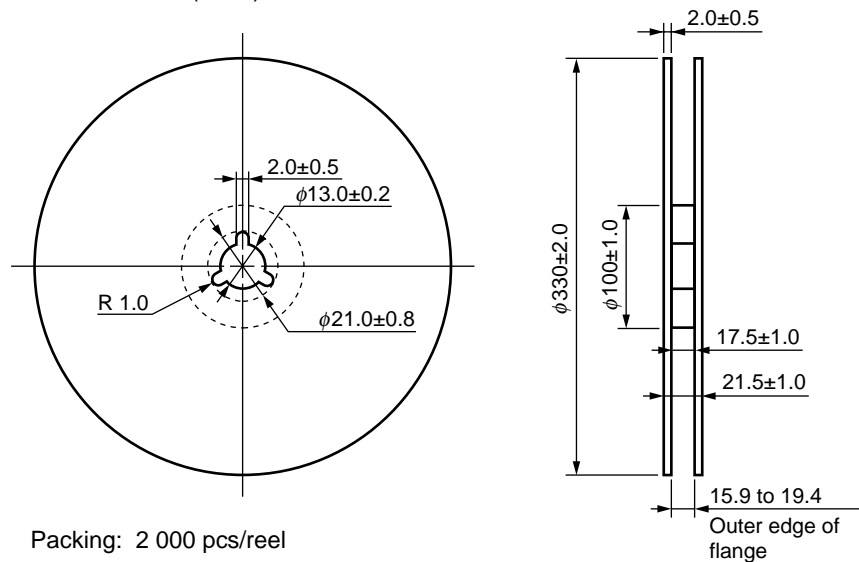
Outline and Dimesions (Tape)



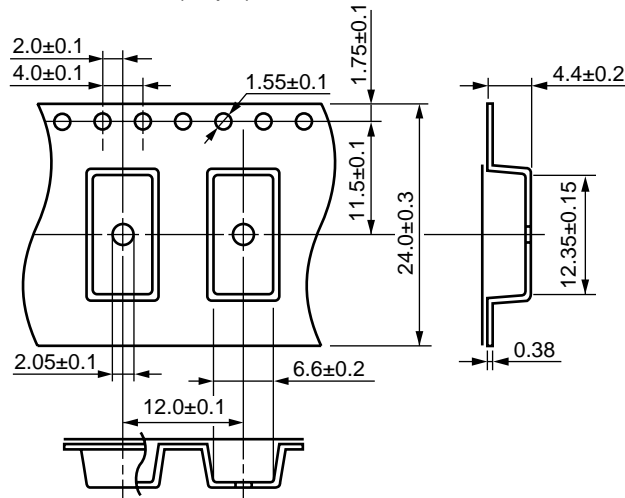
Tape Direction



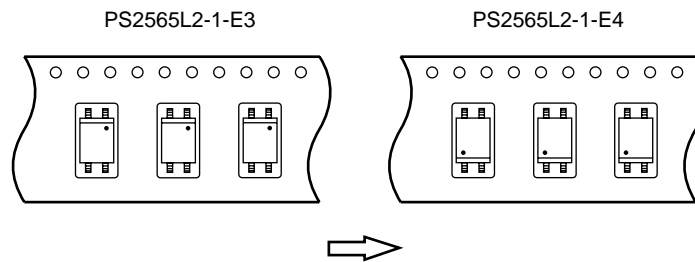
Outline and Dimensions (Reel)



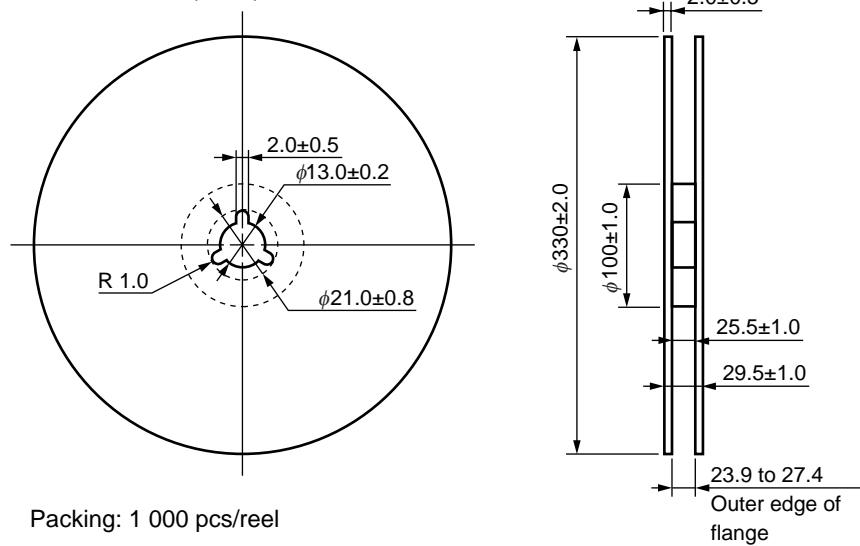
Outline and Dimensions (Tape)



Tape Direction



Outline and Dimensions (Reel)



Packing: 1 000 pcs/reel

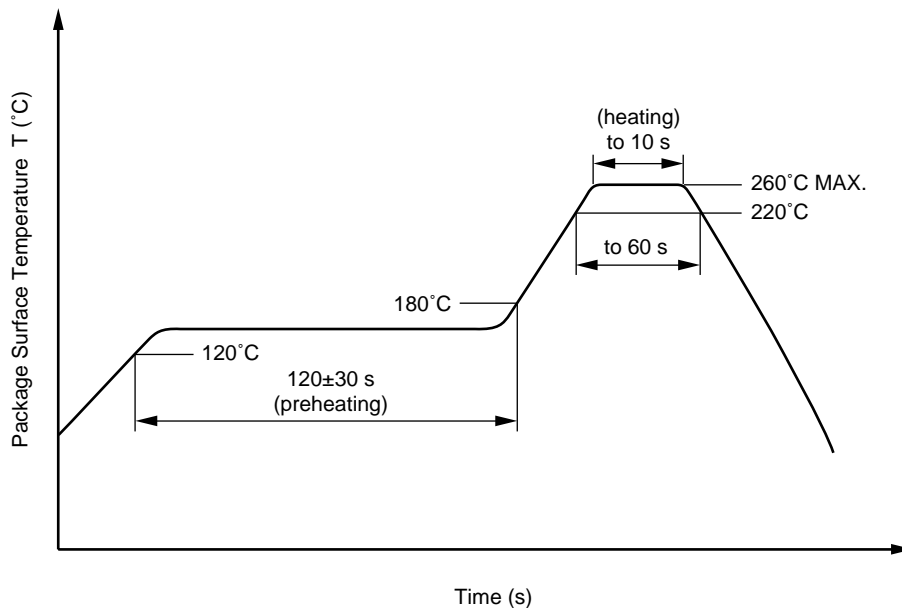
NOTES ON HANDLING

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.

★ 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. This tendency may sometimes be obvious, especially below $I_F = 1 \text{ mA}$.

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.

SPECIFICATION OF VDE MARKS LICENSE DOCUMENT

| 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 all devices 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 | | > 7.0 | mm |
| Creepage distance | | > 7.0 | 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 $T_A = 25^\circ\text{C}$ $V_{IO} = 500$ 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 , $P_{si} = 0$) Power (output or total power dissipation) Isolation resistance $V_{IO} = 500$ V dc at $T_A = 175^\circ\text{C}$ (T_{si}) | T_{si} I_{si} P_{si} Ris MIN. | 175 400 700 10^9 | °C mA mW Ω |

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 (2) "NEC semiconductor products" means any semiconductor product developed or manufactured by or for NEC (as defined above).

M8E 00.4-0110

| | | |
|----------------|---------------|---|
| Caution | GaAs Products | <p>This product uses gallium arsenide (GaAs). 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"> • 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"> 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. 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. • Do not burn, destroy, cut, crush, or chemically dissolve the product. • Do not lick the product or in any way allow it to enter the mouth. |
|----------------|---------------|---|

► For further information, please contact

NEC Compound Semiconductor Devices, Ltd. <http://www.ncsd.necel.com/>

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NEC Electronics (Europe) GmbH <http://www.ee.nec.de/>

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California Eastern Laboratories, Inc. <http://www.cel.com/>

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Subject: Compliance with EU Directives

CEL certifies, to its knowledge, that semiconductor and laser products detailed below are compliant with the requirements of European Union (EU) Directive 2002/95/EC Restriction on Use of Hazardous Substances in electrical and electronic equipment (RoHS) and the requirements of EU Directive 2003/11/EC Restriction on Penta and Octa BDE.

CEL Pb-free products have the same base part number with a suffix added. The suffix –A indicates that the device is Pb-free. The –AZ suffix is used to designate devices containing Pb which are exempted from the requirement of RoHS directive (*). In all cases the devices have Pb-free terminals. All devices with these suffixes meet the requirements of the RoHS directive.

This status is based on CEL's understanding of the EU Directives and knowledge of the materials that go into its products as of the date of disclosure of this information.

| Restricted Substance per RoHS | Concentration Limit per RoHS (values are not yet fixed) | Concentration contained in CEL devices | |
|-------------------------------|---|--|-----|
| | | -A | -AZ |
| Lead (Pb) | < 1000 PPM | Not Detected | (*) |
| Mercury | < 1000 PPM | Not Detected | |
| Cadmium | < 100 PPM | Not Detected | |
| Hexavalent Chromium | < 1000 PPM | Not Detected | |
| PBB | < 1000 PPM | Not Detected | |
| PBDE | < 1000 PPM | Not Detected | |

If you should have any additional questions regarding our devices and compliance to environmental standards, please do not hesitate to contact your local representative.

Important Information and Disclaimer: Information provided by CEL on its website or in other communications concerning the substance content of its products represents knowledge and belief as of the date that it is provided. CEL bases its knowledge and belief on information provided by third parties and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. CEL has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. CEL and CEL suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall CEL's liability arising out of such information exceed the total purchase price of the CEL part(s) at issue sold by CEL to customer on an annual basis.

See CEL Terms and Conditions for additional clarification of warranties and liability.