

DIP PHOTOCOUPLER
OPERATING AMBIENT TEMPERATURE 110°C

–NEPOC Series–

DESCRIPTION

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

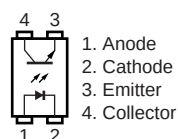
The PS2561D-1 is in a plastic DIP (Dual In-line Package) and the PS2561DL-1 is lead bending type (Gull-wing) for surface mount.

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 ($t_r = 3\text{ }\mu\text{s}$ TYP., $t_f = 5\text{ }\mu\text{s}$ TYP.)
- Ordering number of taping product: PS2561DL-1-F3 : 2 000 pcs/reel
: PS2561DL2-1-E3: 1 000 pcs/reel
- Pb-Free product
- ★ Safety standards
 - UL approved: No. E72422
 - CSA approved: No. CA 101391 (CA5A, CAN/CSA-C22.2 60065, 60950)
 - BSI approved: No. 7112/7420
 - SEMKO approved: No. 903238
 - NEMKO approved: No. P09210868
 - DEMKO approved: No. 314999
 - FIMKO approved: No. FI 25119
 - DIN EN60747-5-2 (VDE0884 Part2) approved: No. 40008862 (Option)

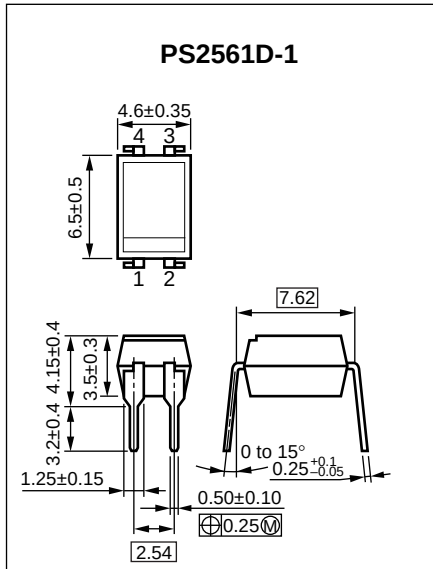
PIN CONNECTION
(Top View)**APPLICATIONS**

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

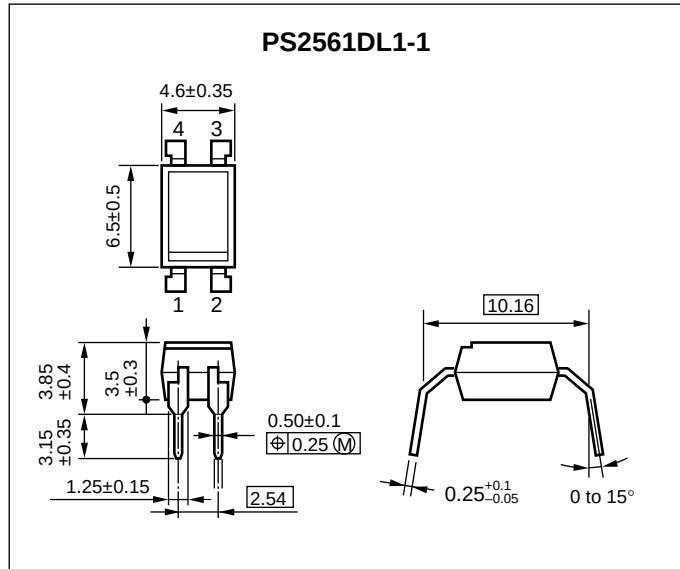
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PACKAGE DIMENSIONS (UNIT : mm)

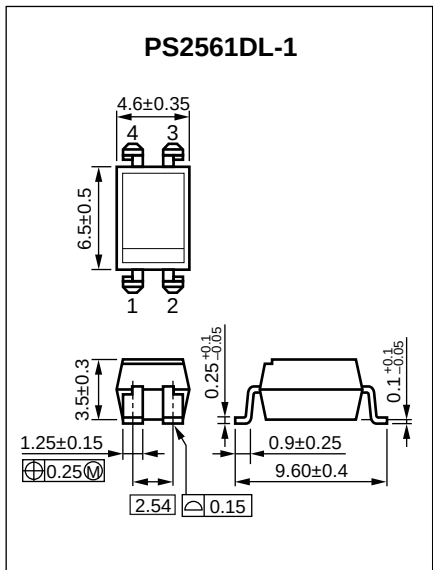
DIP Type



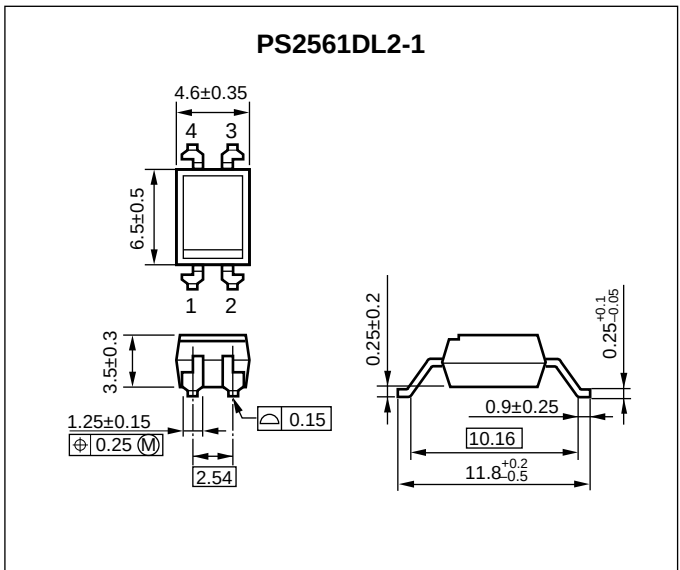
Long Creepage Distance



★ **Lead Bending Type**



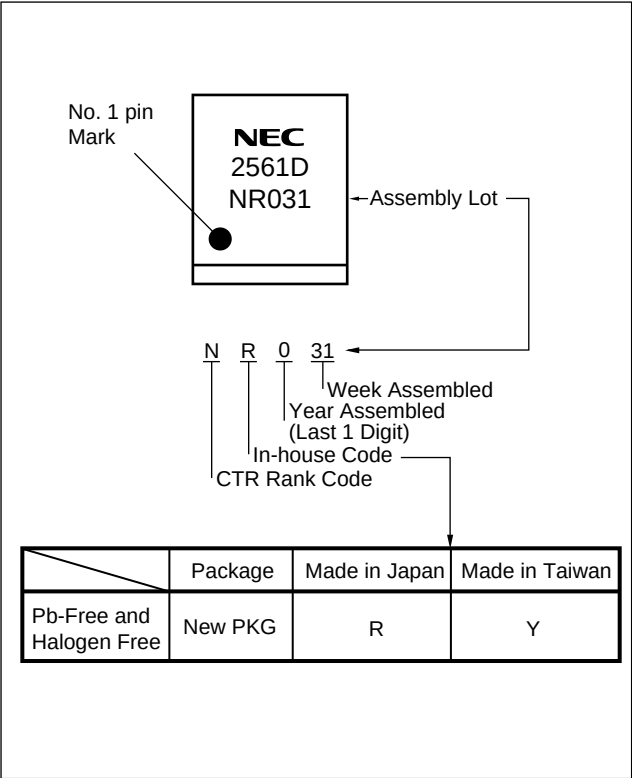
Long Creepage Distance (Gull-Wing)



PHOTOCOUPLER CONSTRUCTION

Parameter	PS2561D-1, PS2561DL-1	PS2561DL1-1, PS2561DL2-1
Air Distance (MIN.)	7 mm	8 mm
Outer Creepage Distance (MIN.)	7 mm	8 mm
Inner Creepage Distance (MIN.)	4 mm	4 mm
Isolation Distance (MIN.)	0.4 mm	0.4 mm

★ MARKING EXAMPLE



★ ORDERING INFORMATION

Part Number	Order Number	Solder Plating Specification	Packing Style	Safety Standard Approval	Application Part Number *1
PS2561D-1	PS2561D-1Y-A	Special version (Pb-Free and Halogen Free)	Magazine case 100 pcs	Standard products (UL, CSA, BSI, NEMKO, DEMKO, SEMKO, FIMKO 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				PS2561DL-1
PS2561DL2-1-E3	PS2561DL2-1Y-E3-A				PS2561DL2-1
PS2561D-1-V	PS2561D-1Y-V-A		Magazine case 100 pcs	DIN EN60747-5-2 (VDE0884 Part2) approved (Option)	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				PS2561DL-1
PS2561DL2-1-V-E3	PS2561DL2-1Y-V-E3-A				PS2561DL2-1

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

ABSOLUTE MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$, unless otherwise specified)

Parameter		Symbol	Ratings	Unit
Diode	Reverse Voltage	V_R	6	V
	Forward Current (DC)	I_F	40	mA
	Power Dissipation Derating	$\Delta P_D/^\circ\text{C}$	1.5	mW/ $^\circ\text{C}$
	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	$\Delta P_C/^\circ\text{C}$	1.5	mW/ $^\circ\text{C}$
	Power Dissipation	P_C	150	mW
Isolation Voltage ^{*2}		BV	5 000	Vr.m.s.
Operating Ambient Temperature		T_A	-55 to +110	$^\circ\text{C}$
Storage Temperature		T_{stg}	-55 to +150	$^\circ\text{C}$

***1** PW = 100 μs , Duty Cycle = 1%

***2** AC voltage for 1 minute at $T_A = 25^\circ\text{C}$, RH = 60% between input and output.

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

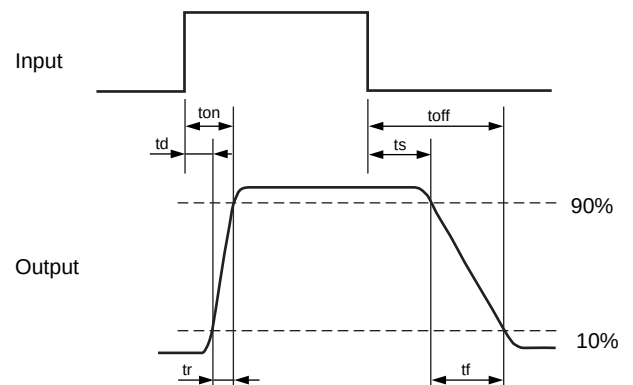
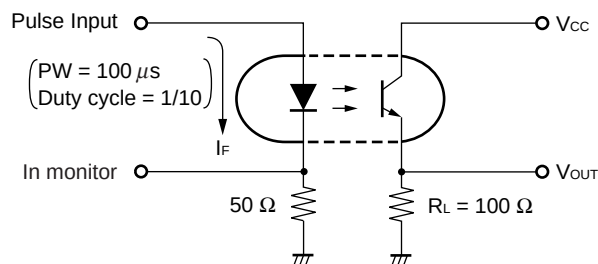
ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$)

Parameter		Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Diode	Forward Voltage	V_F	$I_F = 10\text{ mA}$		1.2	1.4	V
	Reverse Current	I_R	$V_R = 5\text{ V}$			5	μA
	Terminal Capacitance	C_t	$V = 0\text{ V}, f = 1.0\text{ MHz}$		10		pF
Transistor	Collector to Emitter Dark Current	I_{CEO}	$V_{CE} = 48\text{ V}, I_F = 0\text{ mA}$			100	nA
Coupled	Current Transfer Ratio (I_C/I_F)* ¹	CTR	$I_F = 5\text{ mA}, V_{CE} = 5\text{ V}$	50	160	400	%
			$I_F = 1\text{ mA}, V_{CE} = 5\text{ V}$	10	80		
	Collector Saturation Voltage	$V_{CE(sat)}$	$I_F = 10\text{ mA}, I_C = 2\text{ mA}$			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	$V_{CC} = 10\text{ V}, I_C = 2\text{ mA}, R_L = 100\ \Omega$		3		μs
	Fall Time* ²	t_f			5		

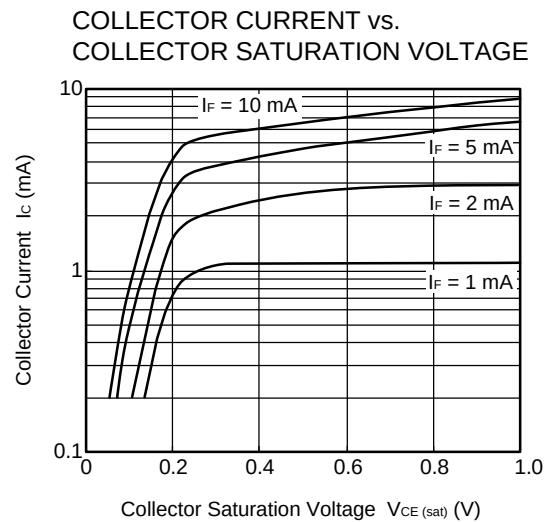
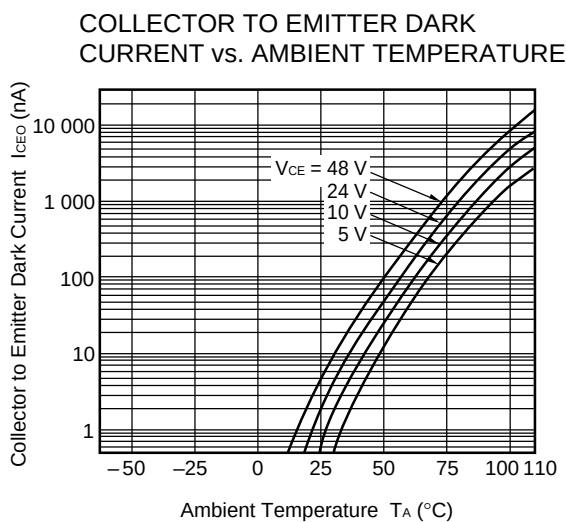
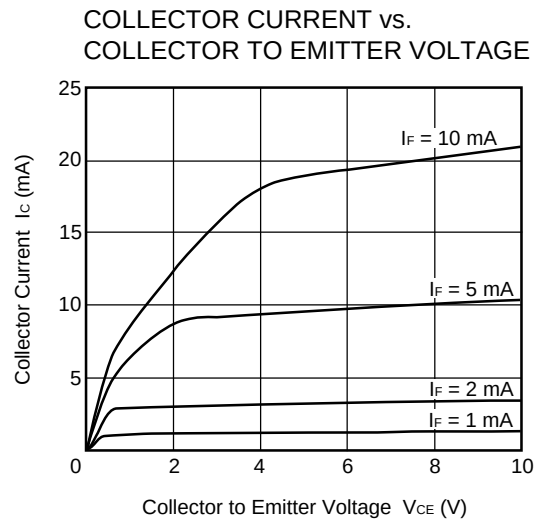
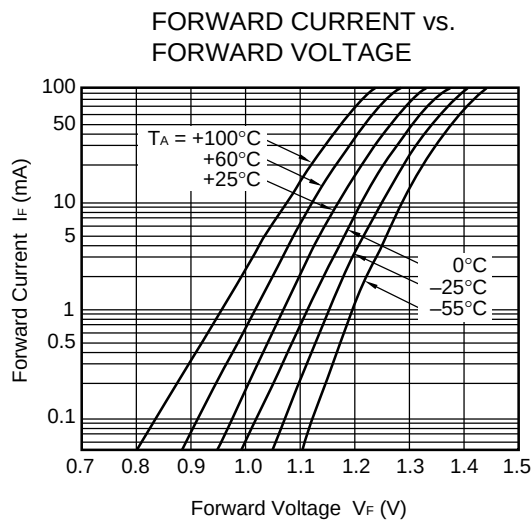
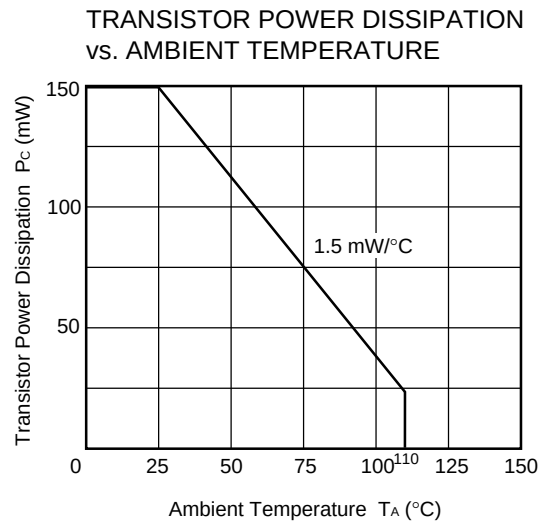
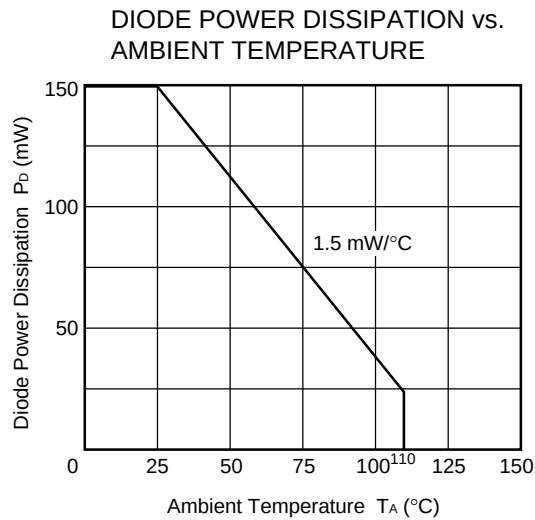
*1 CTR rank

CTR Rank	CTR (%)	Conditions
H	80 to 160	$I_F = 5\text{ mA}, V_{CE} = 5\text{ V}$
	16 and larger	$I_F = 1\text{ mA}, V_{CE} = 5\text{ V}$
Q	100 to 200	$I_F = 5\text{ mA}, V_{CE} = 5\text{ V}$
	20 and larger	$I_F = 1\text{ mA}, V_{CE} = 5\text{ V}$
W	130 to 260	$I_F = 5\text{ mA}, V_{CE} = 5\text{ V}$
	26 and larger	$I_F = 1\text{ mA}, V_{CE} = 5\text{ V}$
L	200 to 400	$I_F = 5\text{ mA}, V_{CE} = 5\text{ V}$
	40 and larger	$I_F = 1\text{ mA}, V_{CE} = 5\text{ V}$
N	50 to 400	$I_F = 5\text{ mA}, V_{CE} = 5\text{ V}$
	10 and larger	$I_F = 1\text{ mA}, V_{CE} = 5\text{ V}$

★ *2 Test circuit for switching time

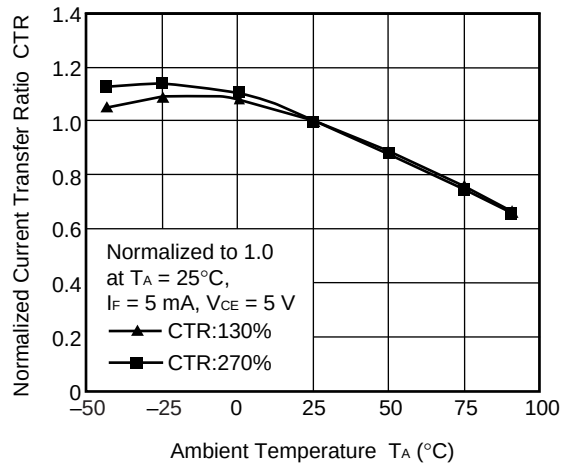


★ TYPICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$, unless otherwise specified)

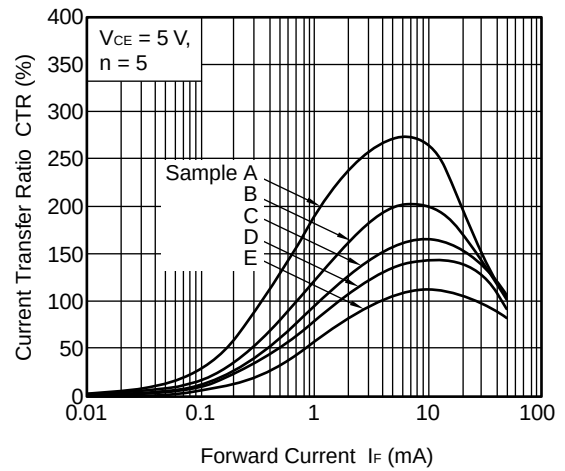


Remark The graphs indicate nominal characteristics.

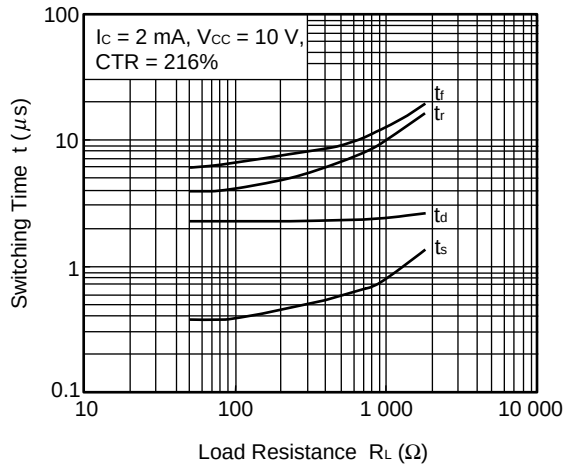
NORMALIZED CURRENT TRANSFER RATIO vs. AMBIENT TEMPERATURE



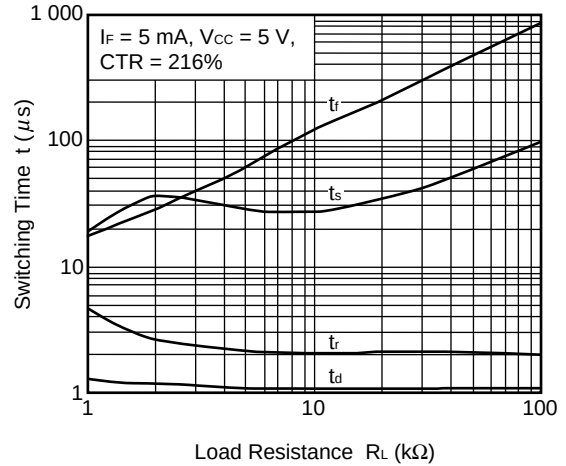
CURRENT TRANSFER RATIO vs. FORWARD CURRENT



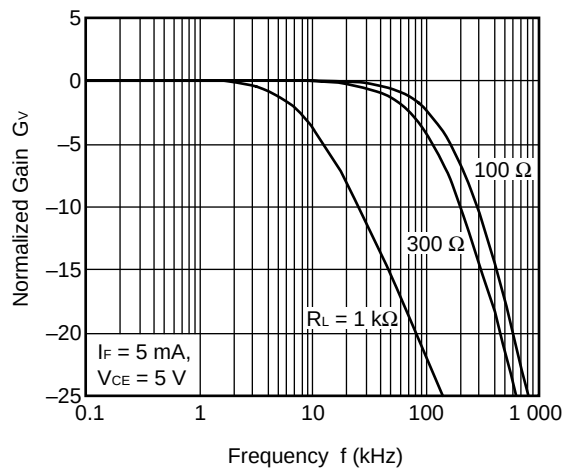
SWITCHING TIME vs. LOAD RESISTANCE



SWITCHING TIME vs. LOAD RESISTANCE



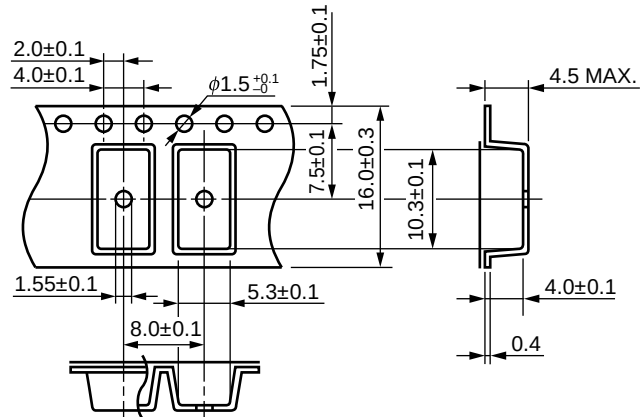
FREQUENCY RESPONSE



Remark The graphs indicate nominal characteristics.

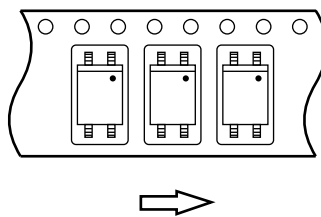
TAPING SPECIFICATIONS (UNIT : mm)

Outline and Dimensions (Tape)

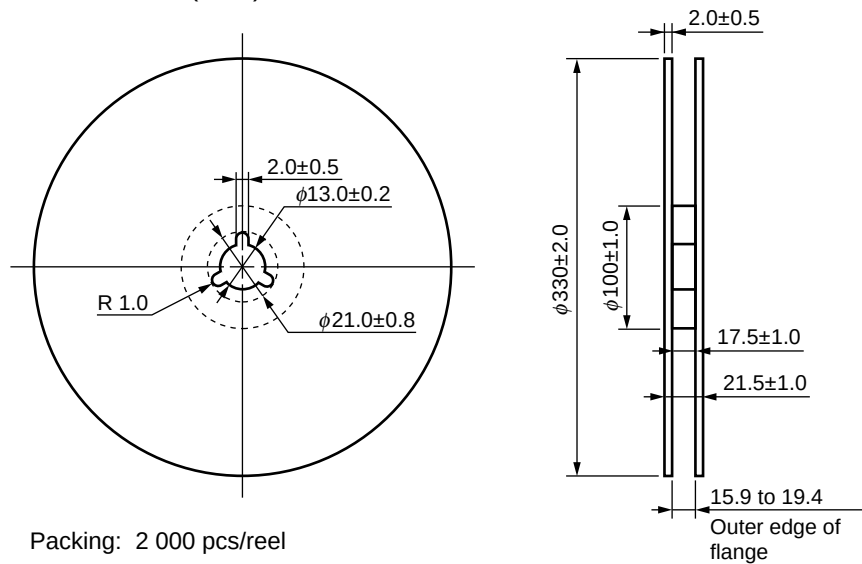


Tape Direction

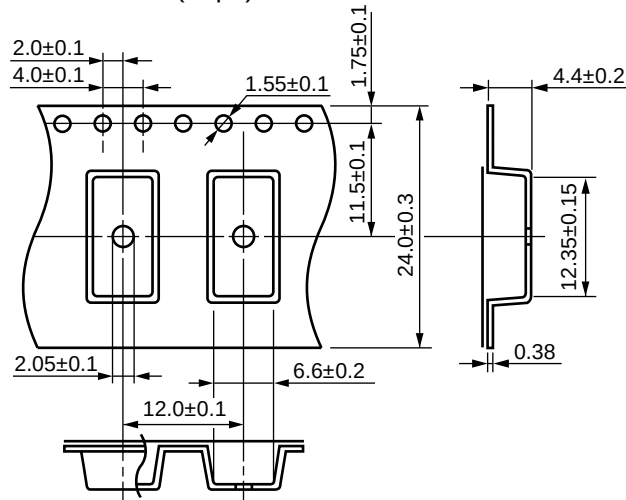
PS2561DL-1-F3



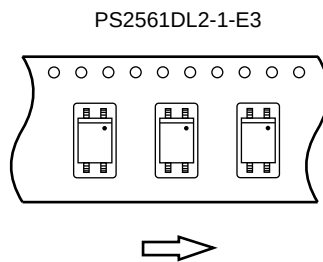
Outline and Dimensions (Reel)



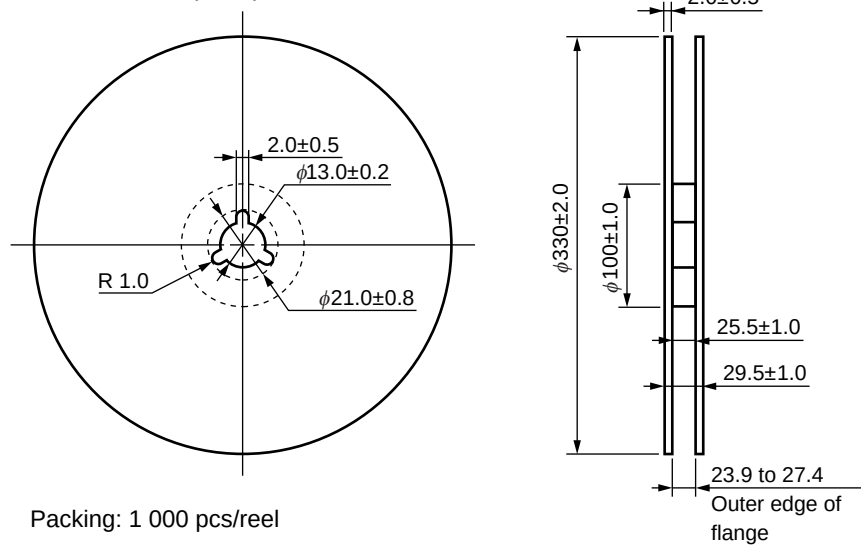
Outline and Dimensions (Tape)



Tape Direction

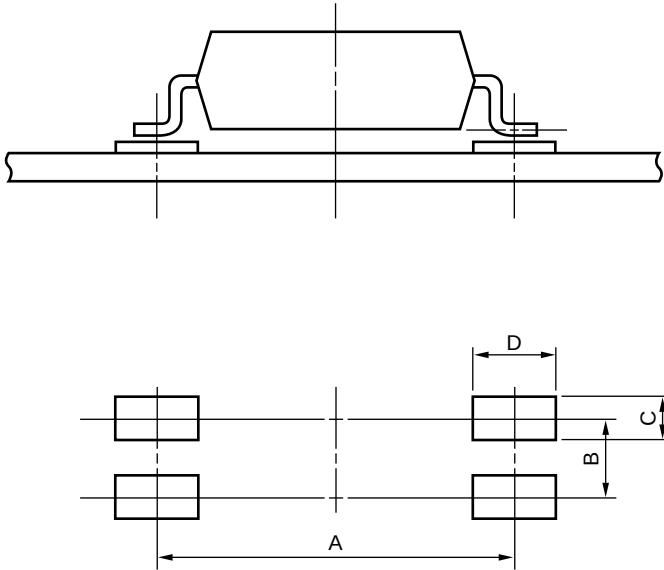


Outline and Dimensions (Reel)



Packing: 1 000 pcs/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

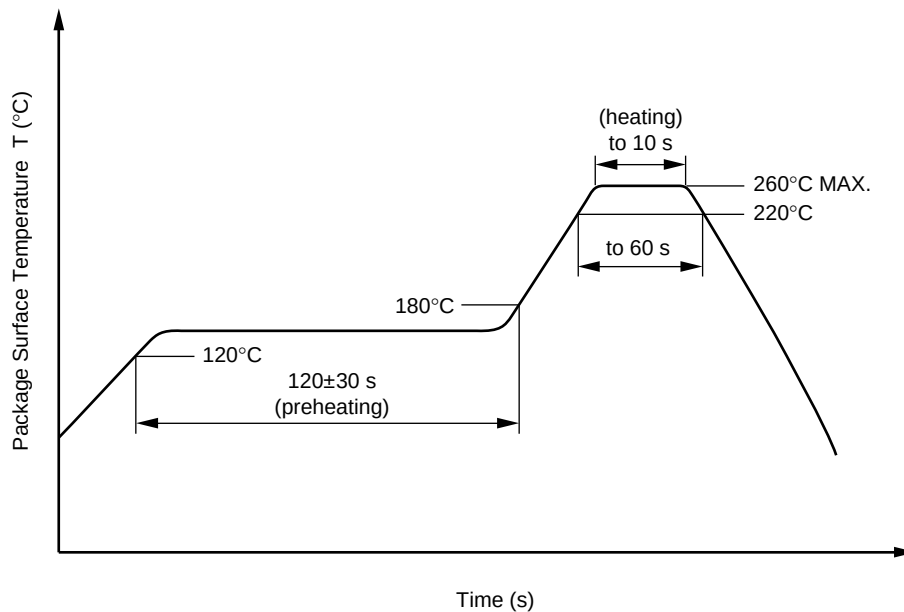
NOTES ON HANDLING

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 corrector-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.

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

Parameter	Symbol	Spec.	Unit
Climatic test class (IEC 60068-1/DIN EN 60068-1)		55/110/21	
Dielectric strength			
maximum operating isolation voltage	U_{IORM}	890	V_{peak}
Test voltage (partial discharge test, procedure a for type test and random test)	U_{pr}	1 335	V_{peak}
$U_{pr} = 1.5 \times U_{IORM}$, $P_d < 5 \text{ pC}$			
Test voltage (partial discharge test, procedure b for all devices)	U_{pr}	1 669	V_{peak}
$U_{pr} = 1.875 \times U_{IORM}$, $P_d < 5 \text{ pC}$			
Highest permissible overvoltage	U_{TR}	8 000	V_{peak}
Degree of pollution (DIN EN 60664-1 VDE0110 Part 1)		2	
Comparative tracking index (IEC 60112/DIN EN 60112 (VDE 0303 Part 11))	CTI	175	
Material group (DIN EN 60664-1 VDE0110 Part 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 $T_A = 25^\circ\text{C}$	$R_{is \text{ MIN.}}$	10^{12}	Ω
$V_{IO} = 500 \text{ V dc}$ at $T_A \text{ MAX.}$ at least 100°C	$R_{is \text{ MIN.}}$	10^{11}	Ω
Safety maximum ratings (maximum permissible in case of fault, see thermal derating curve)			
Package temperature	T_{si}	175	°C
Current (input current I_F , $P_{si} = 0$)	I_{si}	400	mA
Power (output or total power dissipation)	P_{si}	700	mW
Isolation resistance			
$V_{IO} = 500 \text{ V dc}$ at $T_A = T_{si}$	$R_{is \text{ MIN.}}$	10^9	Ω

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

Parameter	Symbol	Spec.	Unit
Climatic test class (IEC 60068-1/DIN EN 60068-1)		55/110/21	
Dielectric strength			
maximum operating isolation voltage	U_{IORM}	1 130	V_{peak}
Test voltage (partial discharge test, procedure a for type test and random test)	U_{pr}	1 695	V_{peak}
$U_{pr} = 1.5 \times U_{IORM}$, $P_d < 5 \text{ pC}$			
Test voltage (partial discharge test, procedure b for all devices)	U_{pr}	2 119	V_{peak}
$U_{pr} = 1.875 \times U_{IORM}$, $P_d < 5 \text{ pC}$			
Highest permissible overvoltage	U_{TR}	8 000	V_{peak}
Degree of pollution (DIN EN 60664-1 VDE0110 Part 1)		2	
Comparative tracking index (IEC 60112/DIN EN 60112 (VDE 0303 Part 11))	CTI	175	
Material group (DIN EN 60664-1 VDE0110 Part 1)		III a	
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Isolation resistance, minimum value			
$V_{IO} = 500 \text{ V dc}$ at $T_A = 25^\circ\text{C}$	Ris MIN.	10^{12}	Ω
$V_{IO} = 500 \text{ V dc}$ at $T_A \text{ MAX.}$ at least 100°C	Ris MIN.	10^{11}	Ω
Safety maximum ratings (maximum permissible in case of fault, see thermal derating curve)			
Package temperature	T_{si}	175	°C
Current (input current I_F , $\Psi_i = 0$)	I_{si}	400	mA
Power (output or total power dissipation)	Ψ_i	700	mW
Isolation resistance			
$V_{IO} = 500 \text{ V dc}$ at $T_A = T_{si}$	Ris MIN.	10^9	Ω

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"Specific": Aircraft, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems and medical equipment for life support, etc.

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M8E0904E

Caution	GaAs Products	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. • 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. 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.
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