

# PS2861B-1

R08DS0100EJ0400

Rev.4.00

4-PIN SSOP PHOTOCOUPLER OPERATING AMBIENT TEMPERATURE 110°C

Apr. 24, 2024

## DESCRIPTION

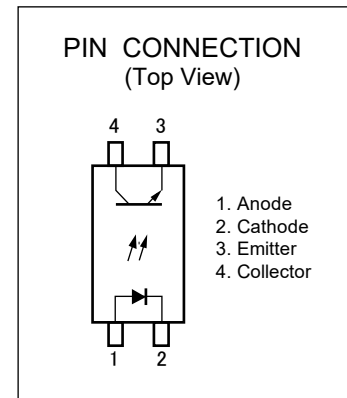
The PS2861B-1 is an optically coupled isolator containing a GaAs light emitting diode and an NPN silicon phototransistor.

The package has a shield effect to cut off ambient light, and is mounted in a Shrink SOP (Small Outline Package) for high density applications.

Due to the high isolation voltage between the input and output, the PS2861B-1 is suitable for interface and signal transfer circuits that require surface or high-density mounting.

## FEATURES

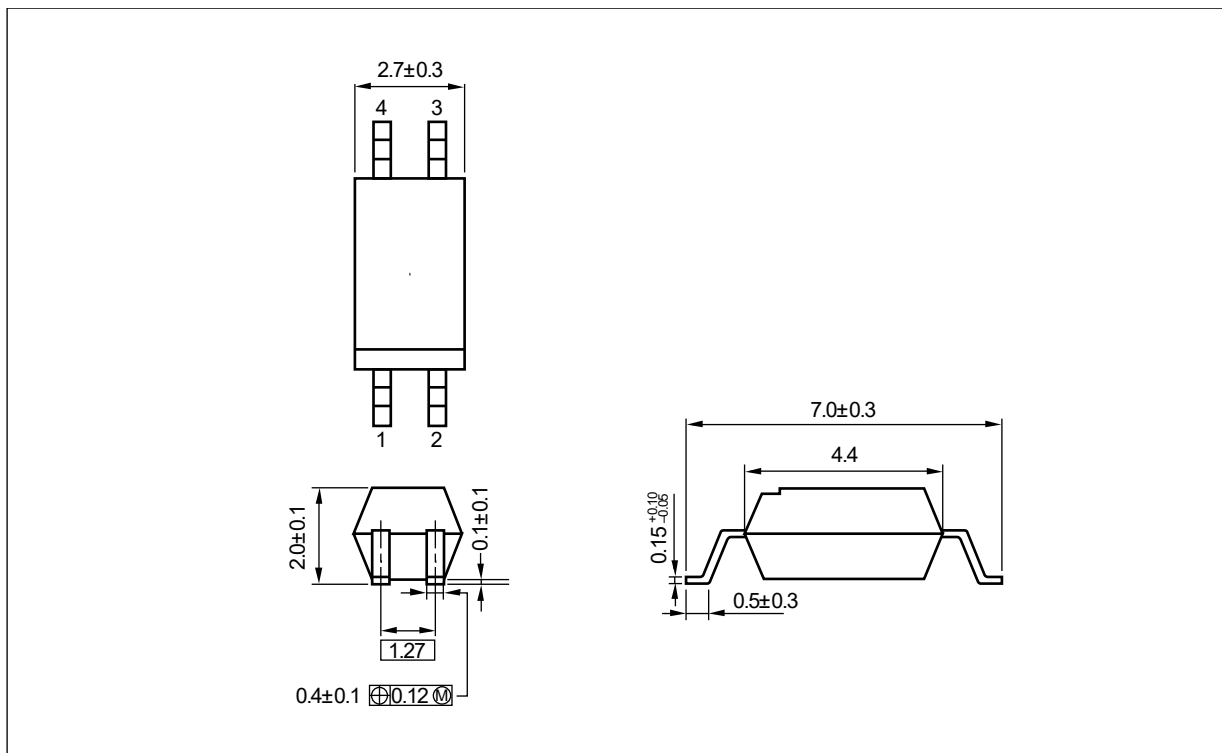
- Operating ambient temperature: 110 °C
- Isolation distance (0.4 mm MIN.)
- High isolation voltage (BV = 3 750 Vr.m.s.)
- Shrink SOP (Small Outline Package) type
- High-speed switching ( $t_r = 4 \mu s$  TYP.,  $t_f = 5 \mu s$  TYP.)
- Embossed tape product: PS2861B-1-F3: 3 500 pcs/reel
- Pb-free product
- Safety standards
  - UL approved: UL1577, Single protection
  - CSA approved: CAN/CSA-C22.2 No. 62368-1, Reinforced insulation
  - BSI approved: BS EN IEC 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: GB4943.1, Reinforced insulation
  - VDE approved: DIN EN IEC 60747-5-5 (Option)



## APPLICATIONS

- Power supply
- Programmable logic controllers

PACKAGE DIMENSIONS (UNIT: mm)

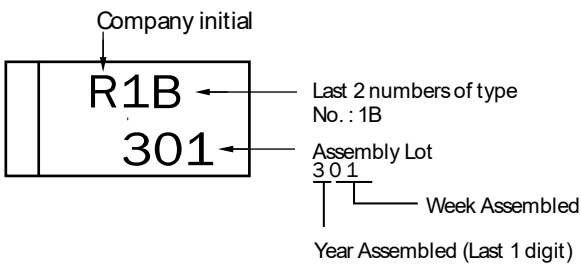
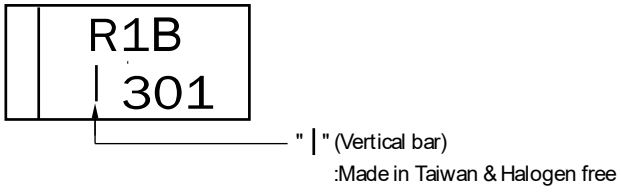
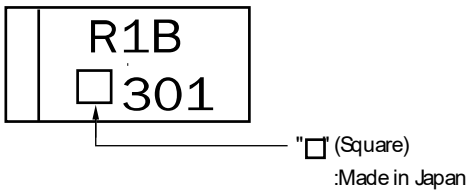
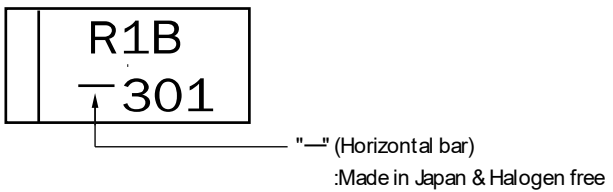


Weight ( 4-pin SSOP) : 0.05 g (typ.)

PHOTOCOUPLER CONSTRUCTION

Parameter	MIN.
Air Distance	5.0 mm
Creepage Distance	5.0 mm
Isolation Distance	0.4 mm

MARKING EXAMPLE

<p><b>Made in Taiwan</b></p>	 <p>Company initial</p> <p>Last 2 numbers of type No. : 1B</p> <p>Assembly Lot 301</p> <p>Week Assembled</p> <p>Year Assembled (Last 1 digit)</p>
<p><b>Made in Taiwan Halogen free</b></p>	 <p>" " (Vertical bar) :Made in Taiwan &amp; Halogen free</p>
<p><b>Made in Japan</b></p>	 <p>"□" (Square) :Made in Japan</p>
<p><b>Made in Japan Halogen free</b></p>	 <p>"—" (Horizontal bar) :Made in Japan &amp; Halogen free</p>

## ORDERING INFORMATION

Part Number	Order Number *1	Solder Plating Specification	Packing Style	Safety Standard Approval	Application Part Number *2
PS2861B-1	PS2861B-1Y-A	Pb-Free and Halogen Free	Embossed Tape 50 pcs	UL, CSA, BSI, SEMKO, NEMKO, FIMKO, DEMKO, CQC Approved	PS2861B-1
PS2861B-1-F3	PS2861B-1Y-F3-A		Embossed Tape 3 500 pcs/reel		
PS2861B-1-V	PS2861B-1Y-V-A		Embossed Tape 50 pcs	UL, CSA, BSI, SEMKO, NEMKO, FIMKO, DEMKO, CQC, VDE Approved	
PS2861B-1-V-F3	PS2861B-1Y-V-F3-A		Embossed Tape 3 500 pcs/reel		

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

ex. L rank : PS2861B-1Y-A/L

Notes: \*2. For the application of the safety standard, the following part number should be used.

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

Parameter		Symbol	Ratings	Unit
Diode	Forward Current (DC)	$I_F$	50	mA
	Reverse Voltage	$V_R$	6	V
	Power Dissipation Derating	$\Delta P_D/^\circ\text{C}$	0.6	mW/°C
	Power Dissipation	$P_D$	60	mW
	Peak Forward Current *1	$I_{FP1}$	2.5	A
	Peak Forward Current *2	$I_{FP2}$	1.0	
Transistor	Collector to Emitter Voltage	$V_{CEO}$	70	V
	Emitter to Collector Voltage	$V_{ECO}$	5	V
	Collector Current	$I_C$	50	mA
	Power Dissipation Derating	$\Delta P_C/^\circ\text{C}$	1.2	mW/°C
	Power Dissipation	$P_C$	120	mW
Isolation Voltage *3		BV	3 750	Vr.m.s.
Operating Ambient Temperature		$T_A$	-55 to +110	°C
Storage Temperature		$T_{stg}$	-55 to +150	°C

Notes: \*1. PW = 10  $\mu\text{s}$ , Duty Cycle = 1 %

\*2. PW = 100  $\mu\text{s}$ , Duty Cycle = 1 %

\*3. AC voltage for 1 minute at  $T_A = 25\text{ }^\circ\text{C}$ , RH = 60 % between input and output.

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

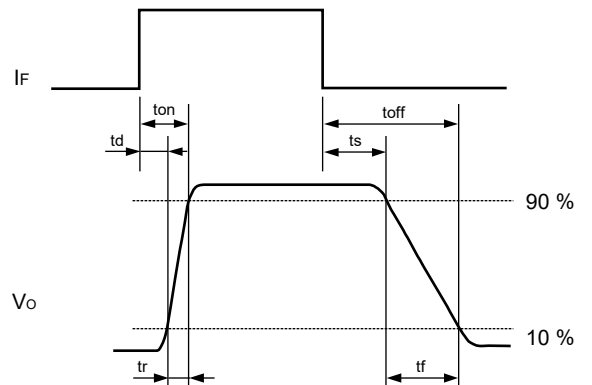
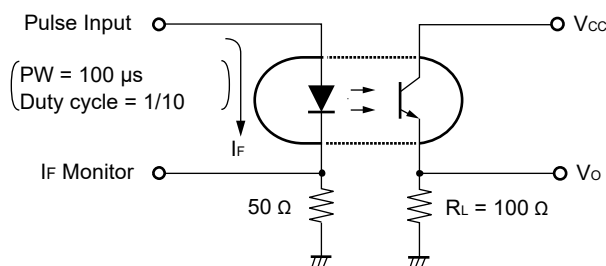
ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25 °C)

	Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Diode	Forward Voltage	V <sub>F</sub>	I <sub>F</sub> = 5 mA		1.1	1.4	V
	Reverse Current	I <sub>R</sub>	V <sub>R</sub> = 5 V			5	μA
	Terminal Capacitance	C <sub>t</sub>	V = 0 V, f = 1 MHz		15		pF
Transistor	Collector to Emitter Dark Current	I <sub>CEO</sub>	I <sub>F</sub> = 0 mA, V <sub>CE</sub> = 24 V			100	nA
Coupled	Current Transfer Ratio (I <sub>C</sub> /I <sub>F</sub> ) *1	CTR	I <sub>F</sub> = 5 mA, V <sub>CE</sub> = 5 V	50	150	300	%
			I <sub>F</sub> = 1 mA, V <sub>CE</sub> = 5 V	10	50		
	Collector Saturation Voltage	V <sub>CE(sat)</sub>	I <sub>F</sub> = 10 mA, I <sub>C</sub> = 2 mA			0.3	V
	Isolation Resistance	R <sub>I-O</sub>	V <sub>I-O</sub> = 1 kV <sub>DC</sub>	10 <sup>11</sup>			Ω
	Isolation Capacitance	C <sub>I-O</sub>	V = 0 V, f = 1 MHz		0.4		pF
	Rise Time *2	t <sub>r</sub>	V <sub>CC</sub> = 5 V, I <sub>C</sub> = 2 mA, R <sub>L</sub> = 100 Ω		4		μs
	Fall Time *2	t <sub>f</sub>			5		
	Turn-on Time *2	t <sub>on</sub>			5		
Turn-off Time *2	t <sub>off</sub>			5			

Notes: \*1. CTR rank

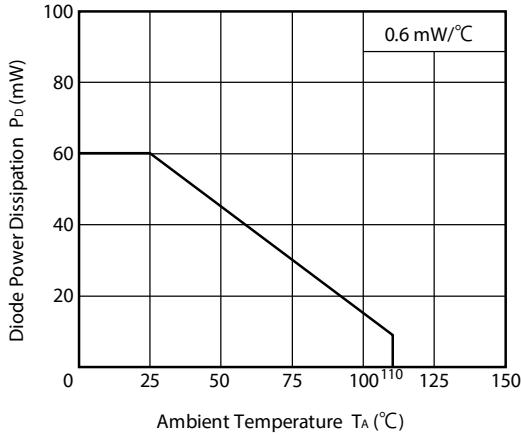
CTR rank	CTR (%)	Conditions
L	100 to 300	I <sub>F</sub> = 5 mA, V <sub>CE</sub> = 5 V
	20 and larger	I <sub>F</sub> = 1 mA, V <sub>CE</sub> = 5 V
M	50 to 150	I <sub>F</sub> = 5 mA, V <sub>CE</sub> = 5 V
	10 and larger	I <sub>F</sub> = 1 mA, V <sub>CE</sub> = 5 V
W	130 to 260	I <sub>F</sub> = 5 mA, V <sub>CE</sub> = 5 V
	26 and larger	I <sub>F</sub> = 1 mA, V <sub>CE</sub> = 5 V
N	50 to 300	I <sub>F</sub> = 5 mA, V <sub>CE</sub> = 5 V
	10 and larger	I <sub>F</sub> = 1 mA, V <sub>CE</sub> = 5 V

\*2. Test Circuit for Switching Time

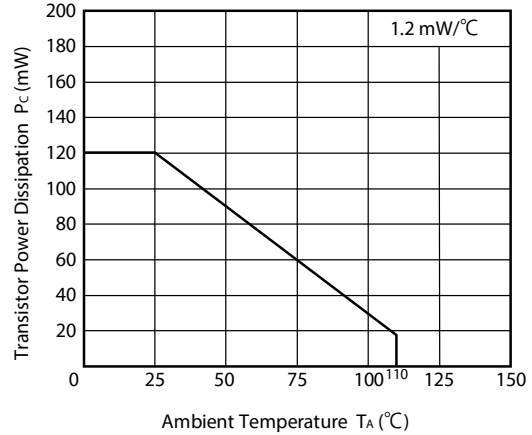


TYPICAL CHARACTERISTICS ( $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise specified)

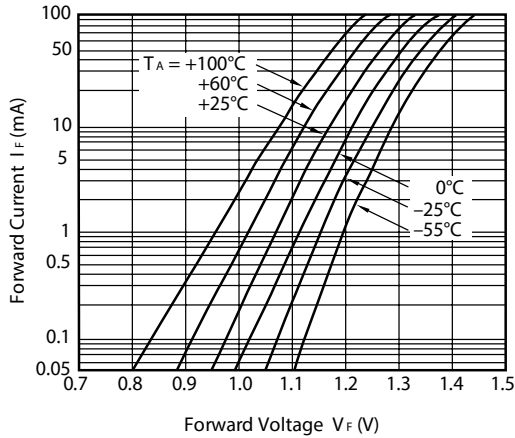
DIODE POWER DISSIPATION vs. AMBIENT TEMPERATURE



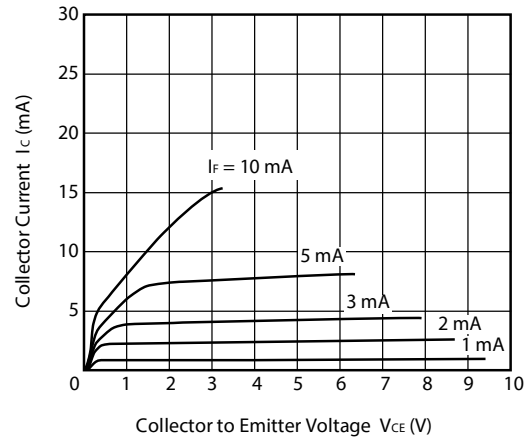
TRANSISTOR POWER DISSIPATION vs. AMBIENT TEMPERATURE



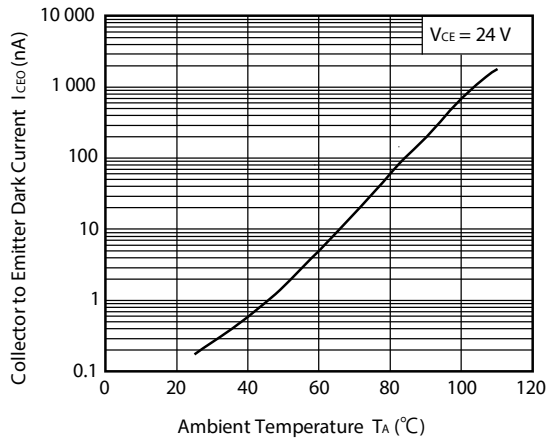
FORWARD CURRENT vs. FORWARD VOLTAGE



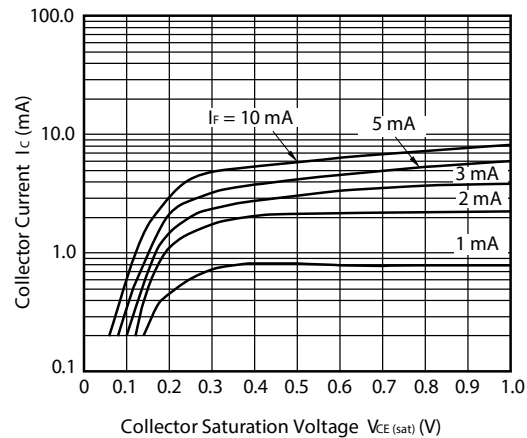
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



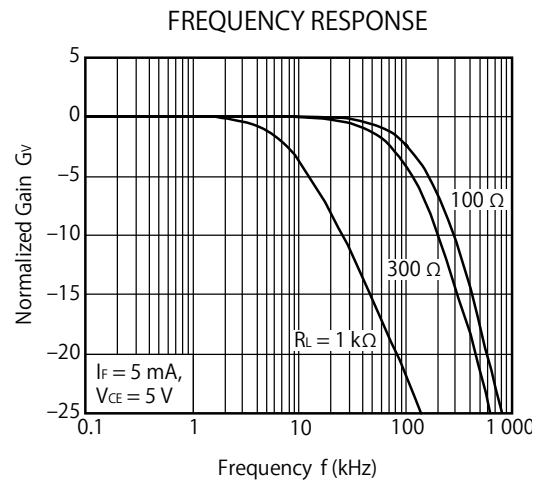
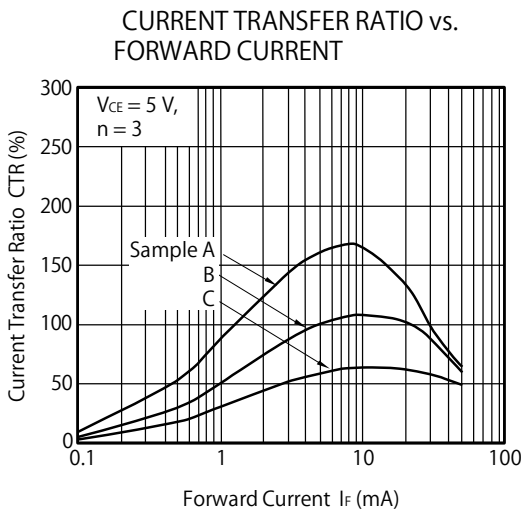
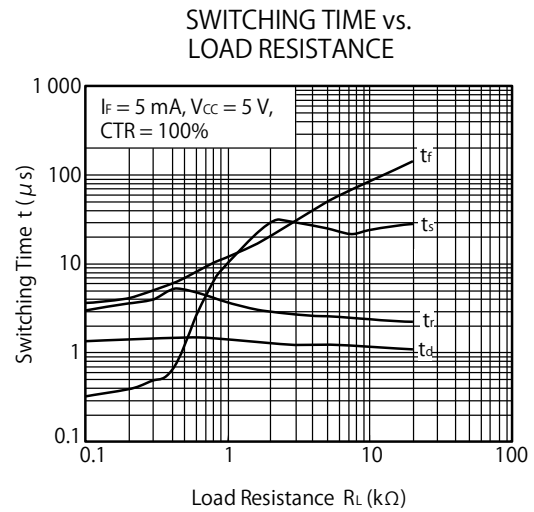
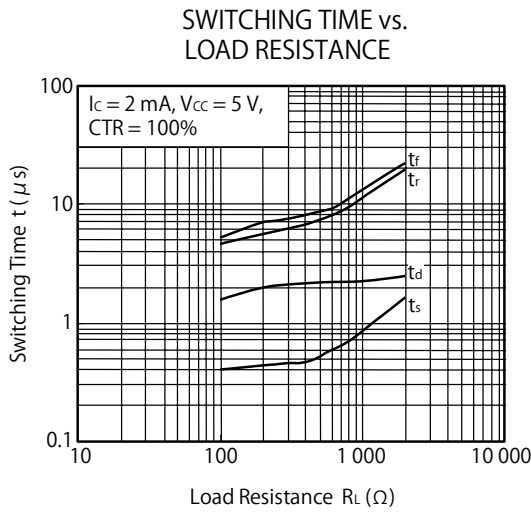
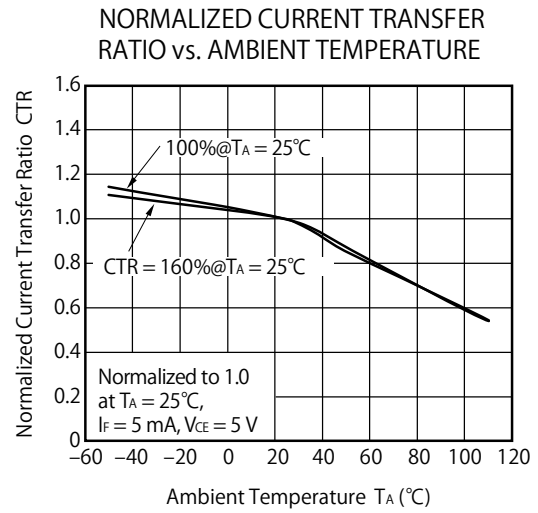
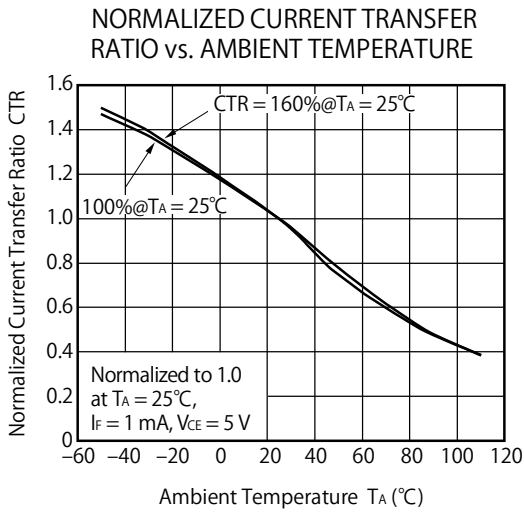
COLLECTOR TO EMITTER DARK CURRENT vs. AMBIENT TEMPERATURE



COLLECTOR CURRENT vs. COLLECTOR SATURATION VOLTAGE



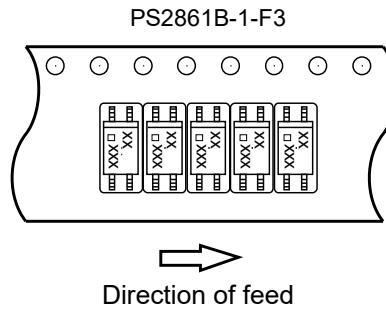
Remark The graphs indicate nominal characteristics.



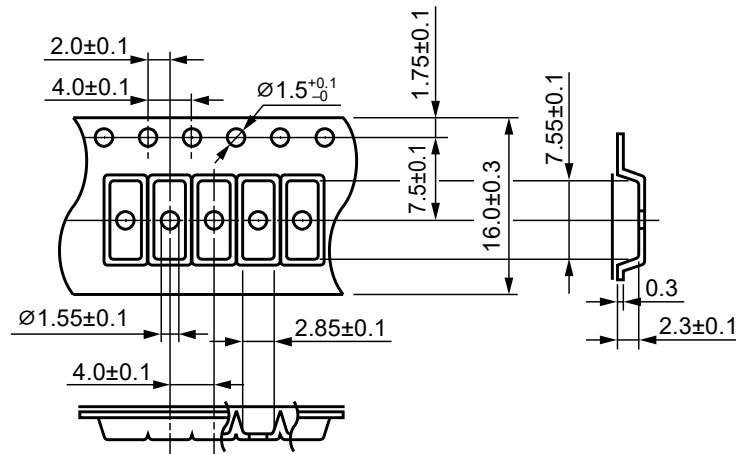
Remark The graphs indicate nominal characteristics.

TAPING SPECIFICATIONS (UNIT: mm)

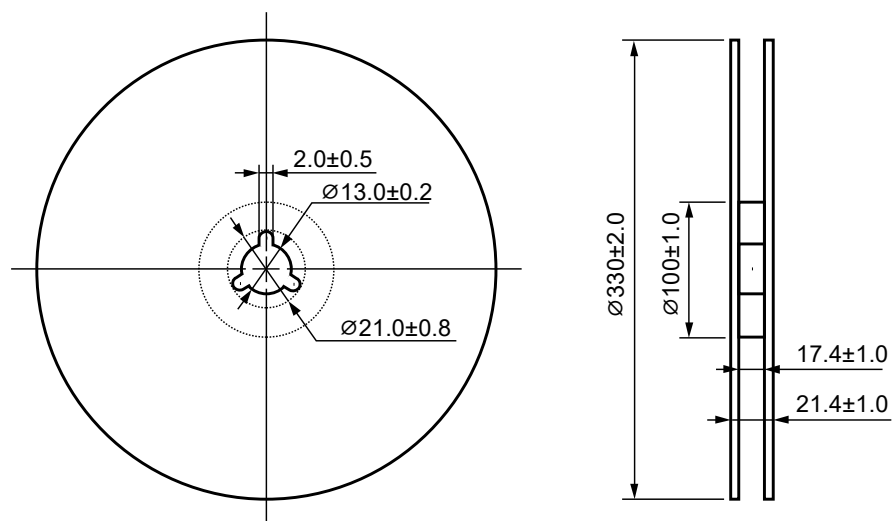
Taping Direction



Outline and Dimensions (Tape)



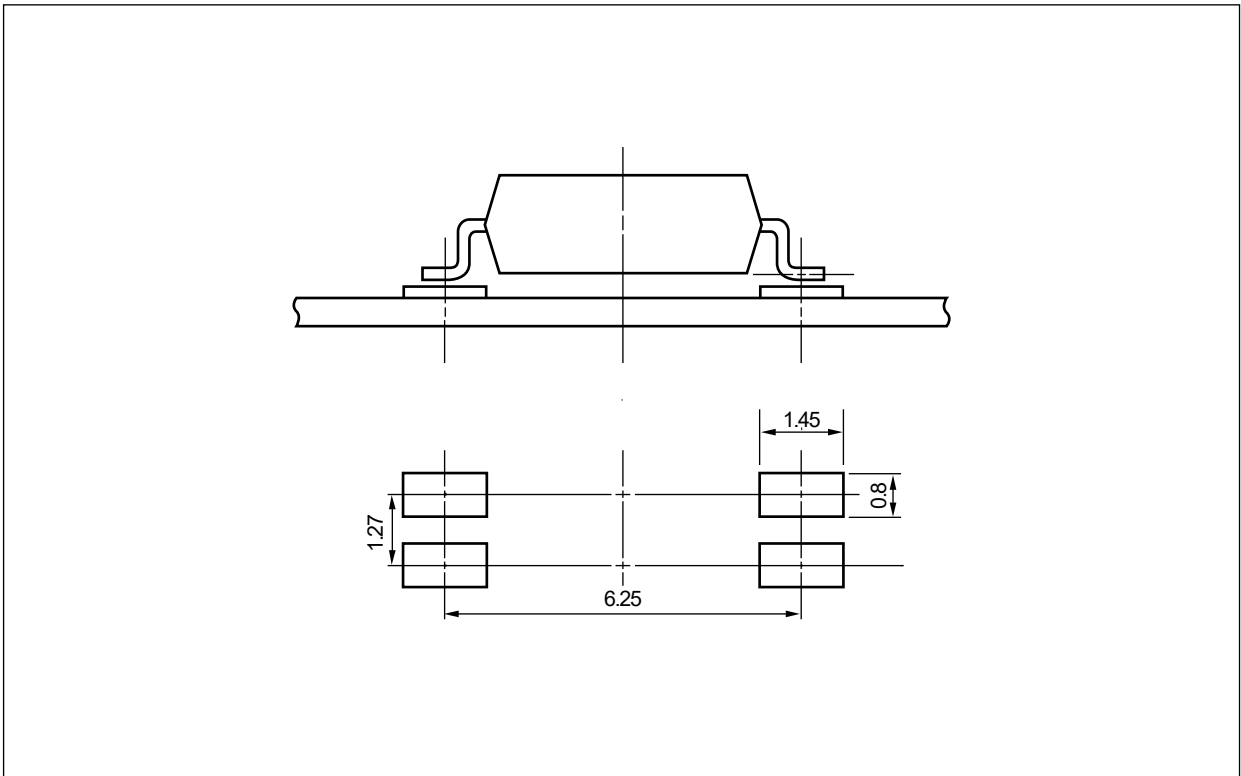
Outline and Dimensions (Reel)



Packing : 3 500 pcs/reel



RECOMMENDED MOUNT PAD DIMENSIONS (UNIT: mm)



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

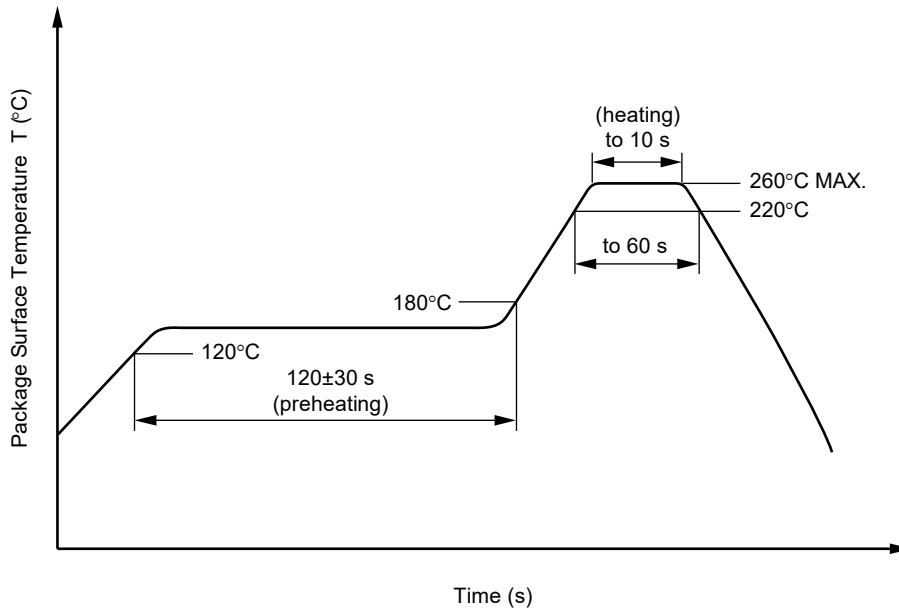
NOTES ON HANDLING

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 (per one side) 3 s or less
- Flux Rosin flux containing small amount of chlorine (The flux with a maximum chlorine content of 0.2 Wt% is recommended.)
- Place 1.5 to 2.0 mm or more away from the root of the lead

(4) Cautions

- Flux cleaning Avoid cleaning with Freon- or halogen-based (chlorinated etc.) solvents.
- Fixing/Coating 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.

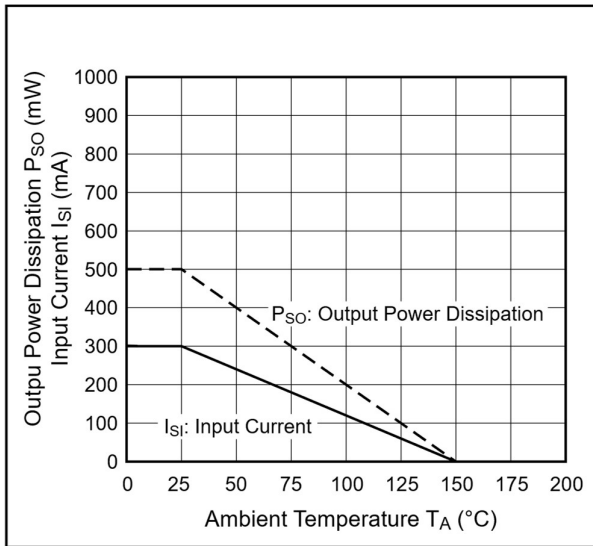
## USAGE CAUTIONS

1. Protect against static electricity when handling.
2. Avoid storage at a high temperature and high humidity.

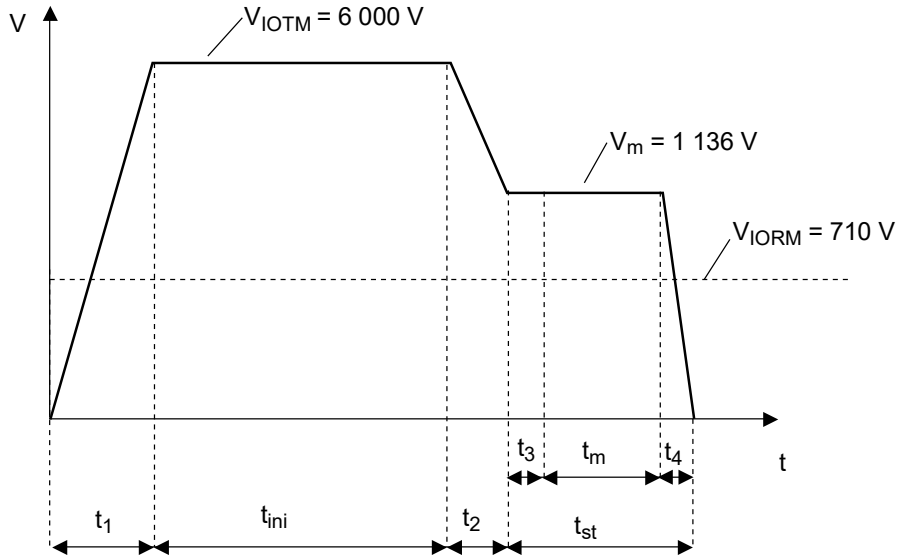
SPECIFICATION OF VDE MARKS LICENSE DOCUMENT

Parameter	Symbol	Rating	Unit
Climatic test class (IEC 60068-1/DIN EN 60068-1)		55/110/21	
Dielectric strength			
maximum operating isolation voltage	$V_{IORM}$	710	$V_{peak}$
Test voltage (partial discharge test, procedure a for type test and random test) $V_m = 1.6 \times V_{IORM}, q_{pd} < 5 \text{ pC}$	$V_m$	1 136	$V_{peak}$
Test voltage (partial discharge test, procedure b for all devices) $V_m = 1.875 \times V_{IORM}, q_{pd} < 5 \text{ pC}$	$V_m$	1 332	$V_{peak}$
Highest permissible overvoltage	$V_{IOTM}$	6 000	$V_{peak}$
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 $V_{I-O} = 500 \text{ V dc}, T_A = 25 \text{ °C}$	$R_{I-O \text{ MIN.}}$	$10^{12}$	$\Omega$
$V_{I-O} = 500 \text{ V dc}, T_A = \text{maximum temperature of rating, at least } 100 \text{ °C}$	$R_{I-O \text{ MIN.}}$	$10^{11}$	$\Omega$
Safety maximum ratings (maximum permissible in case of fault, see thermal derating curve)			
Maximum ambient temperature	$T_s$	150	°C
Maximum input current	$I_{SI}$	300	mA
Maximum output power dissipation	$P_{SO}$	500	mW
Isolation resistance, minimum value at $V_{I-O} = 500 \text{ V dc}, T_A = T_s$	$R_{I-O \text{ MIN.}}$	$10^9$	$\Omega$

Dependence of maximum safety ratings with package temperature

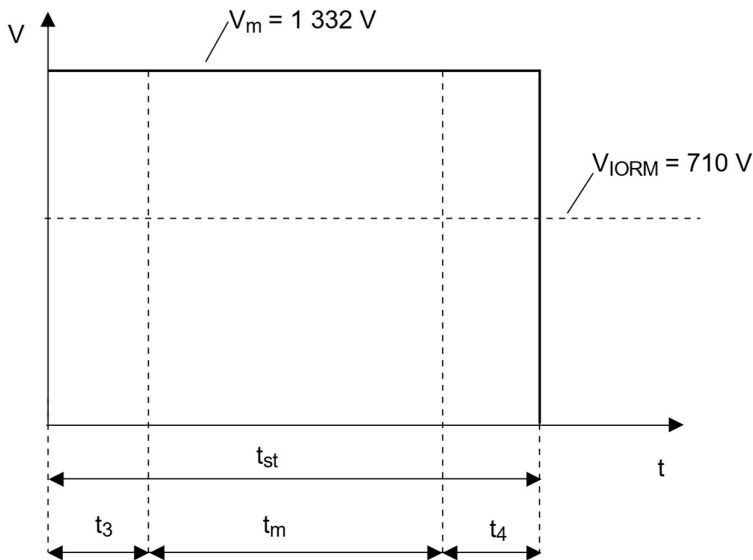


Method a) Destructive Test, Type and Sample Test



$t_1, t_2 = 1 \text{ to } 10 \text{ sec}$   
 $t_3, t_4 = 1 \text{ sec}$   
 $t_m = 10 \text{ sec}$   
 $t_{st} = 12 \text{ sec}$   
 $t_{ini} = 60 \text{ sec}$

Method b) Non-destructive Test, 100% Production Test



$t_3, t_4 = 0.1 \text{ sec}$   
 $t_m = 1.0 \text{ sec}$   
 $t_{st} = 1.2 \text{ sec}$

<b>Caution</b>	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"><li>• 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"><li>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.</li><li>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.</li></ol></li><li>• Do not burn, destroy, cut, crush, or chemically dissolve the product.</li><li>• Do not lick the product or in any way allow it to enter the mouth.</li></ul>
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