

# DATA SHEET

**CEL**

# PHOTOCOUPLER PS2533-1, PS2533L-1

## HIGH COLLECTOR TO EMITTER VOLTAGE HIGH ISOLATION VOLTAGE MULTI PHOTOCOUPLER SIRIES

-NEPOC Series-

### DESCRIPTION

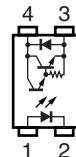
The PS2533-1 and PS2533L-1 are optically coupled isolators containing a GaAs light emitting diode and an NPN silicon darlington connected phototransistor.

The PS2533-1 is in a plastic DIP (Dual In-line Package) and the PS2533L-1 is lead bending type (Gull-wing) for surface mount.

### FEATURES

- High collector to emitter voltage ( $V_{CEO} = 350$  V)
- High Isolation voltage ( $BV = 5\,000$  Vr.m.s.)
- High current transfer ratio ( $CTR = 4\,000\%$  TYP.)
- High-speed switching ( $t_r, t_f = 100\ \mu\text{s}$  TYP.)
- Ordering number of tape product: PS2533L-1-F3: 2 000 pcs/reel
- Safety standards
  - UL approved: No. E72422
  - CSA approved: No. CA 101391 (CA5A, CAN/CSA-C22.2 60065, 60950)
  - BSI approved: No. 8221/8222
  - 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)



1. Anode
2. Cathode
3. Emitter
4. Collector

### APPLICATIONS

- Telephone, Exchange equipment
- FAX/MODEM

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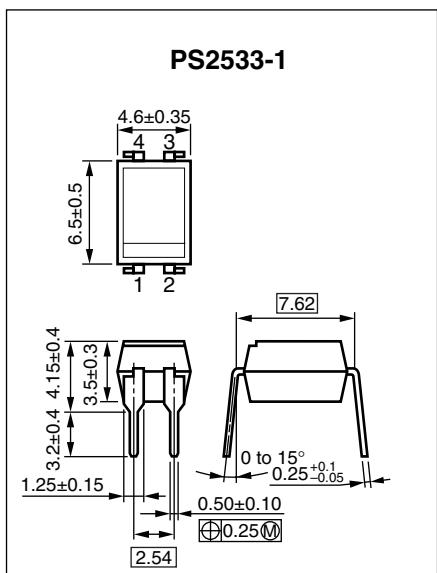
Printed in Japan

The mark <R> shows major revised points.

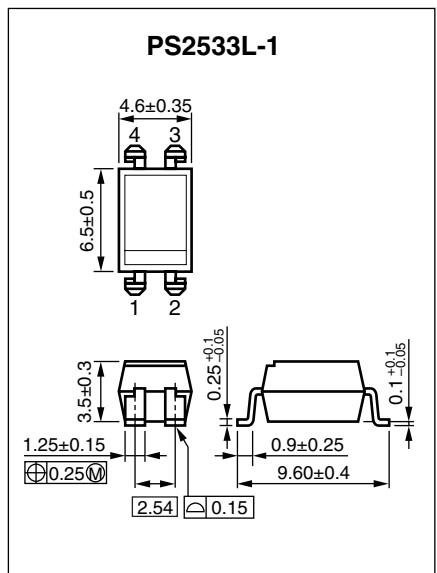
The revised points can be easily searched by copying an "<R>" in the PDF file and specifying it in the "Find what:" field.

## &lt;R&gt; PACKAGE DIMENSIONS (Unit : mm)

## DIP Type



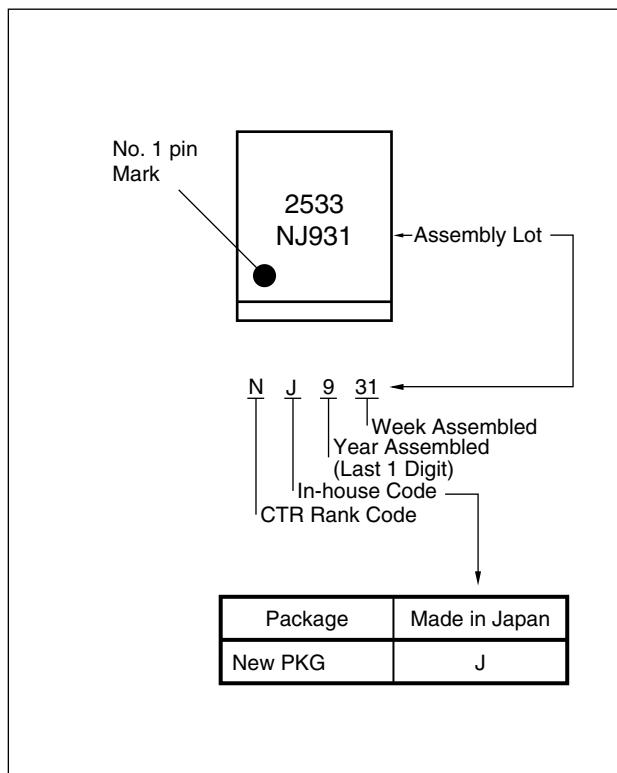
## Lead Bending Type



## &lt;R&gt; PHOTOCOUPLED CONSTRUCTION

Parameter	Unit (MIN.)
Air Distance	7 mm
Outer Creepage Distance	7 mm
Inner Creepage Distance	4 mm
Isolation Thickness	0.4 mm

## &lt;R&gt; MARKING EXAMPLE



## &lt;R&gt; ORDERING INFORMATION

Part Number	Order Number	Solder Plating Specification	Packing Style	Safety Standard Approval	Application Part Number <sup>*1</sup>	
PS2533-1	PS2533-1-A	Pb-Free	Magazine case 100 pcs	Standard products (UL, CSA, BSI, SEMKO, NEMKO, DEMKO, FIMKO approved)	PS2533-1	
PS2533L-1	PS2533L-1-A		Embossed Tape 2 000 pcs/reel			
PS2533L-1-F3	PS2533L-1-F3-A		Magazine case 100 pcs	DIN EN60747-5-2 (VDE0884 Part2) Approved (Option)		
PS2533-1-V	PS2533-1-V-A		Embossed Tape 2 000 pcs/reel			
PS2533L-1-V	PS2533L-1-V-A					
PS2533L-1-V-F3	PS2533L-1-V-F3-A					

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

**ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = 25°C, unless otherwise specified)**

Parameter		Symbol	Ratings	Unit
Diode	Forward Current (DC)	I <sub>F</sub>	80	mA
	Reverse Voltage	V <sub>R</sub>	6	V
	Power Dissipation Derating	ΔP <sub>D</sub> /°C	1.5	mW/°C
	Power Dissipation	P <sub>D</sub>	150	mW
	Peak Forward Current <sup>1</sup>	I <sub>FP</sub>	1	A
Transistor	Collector to Emitter Voltage	V <sub>CEO</sub>	350	V
	Emitter to Collector Voltage	V <sub>ECO</sub>	0.6	V
	Collector Current	I <sub>C</sub>	150	mA
	Power Dissipation Derating	ΔP <sub>C</sub> /°C	3.0	mW/°C
	Power Dissipation	P <sub>C</sub>	300	mW
Isolation Voltage <sup>2</sup>		BV	5 000	Vr.m.s.
Operating Ambient Temperature		T <sub>A</sub>	-55 to +100	°C
Storage Temperature		T <sub>stg</sub>	-55 to +150	°C

**\*1** PW = 100  $\mu$ s, Duty Cycle = 1%

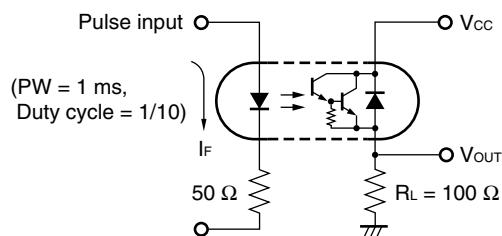
**\*2** AC voltage for 1 minute at T<sub>A</sub> = 25°C, RH = 60% between input and output.

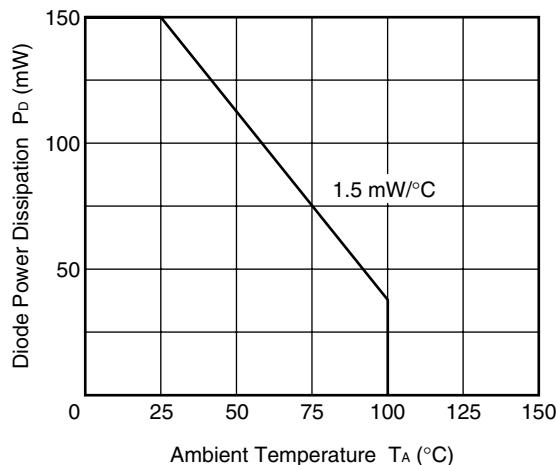
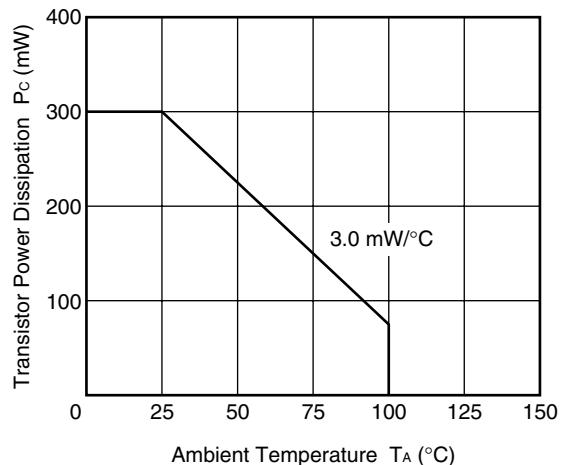
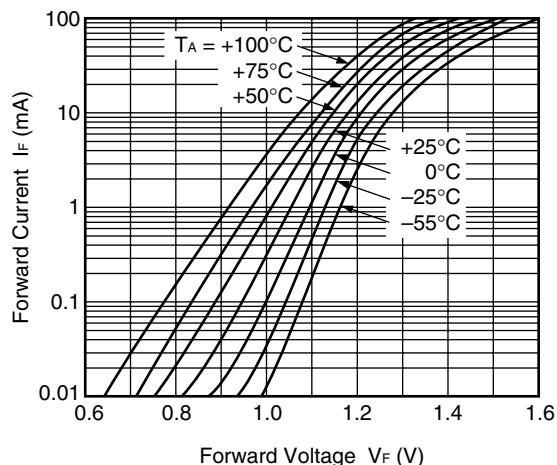
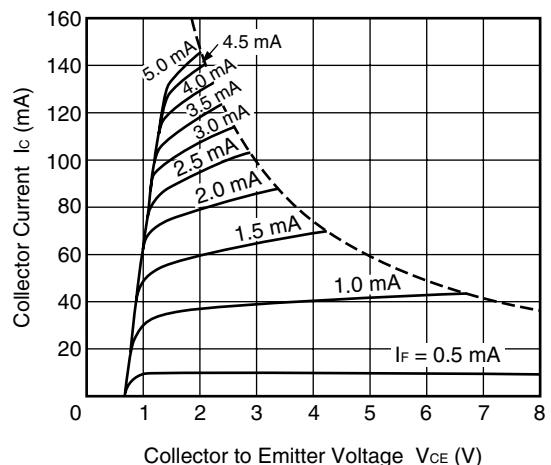
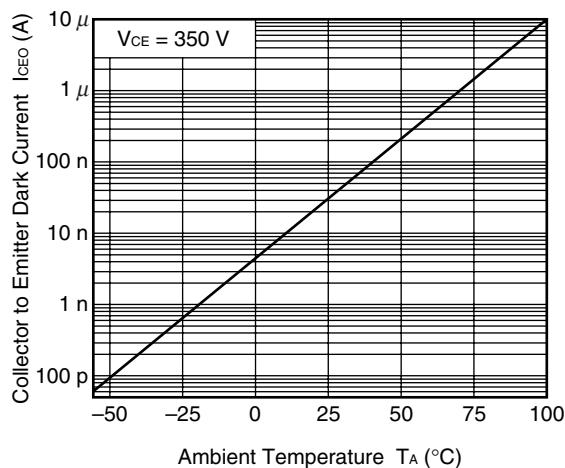
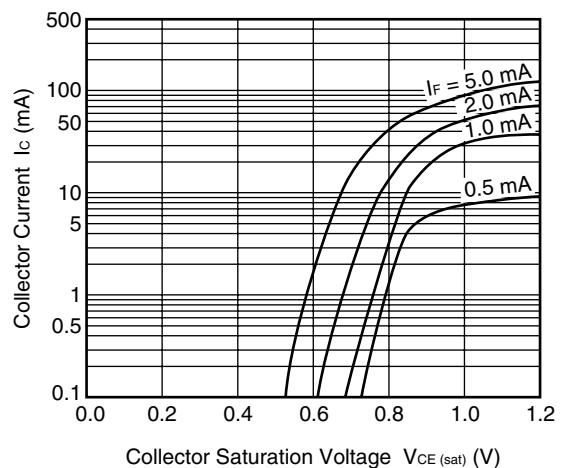
Pins 1-2 shorted together, 3-4 shorted together.

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

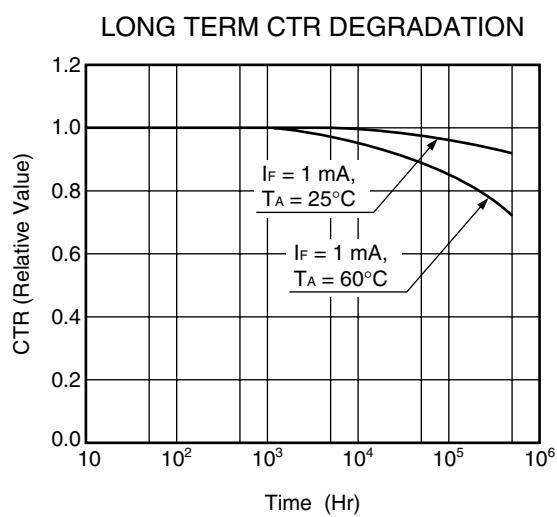
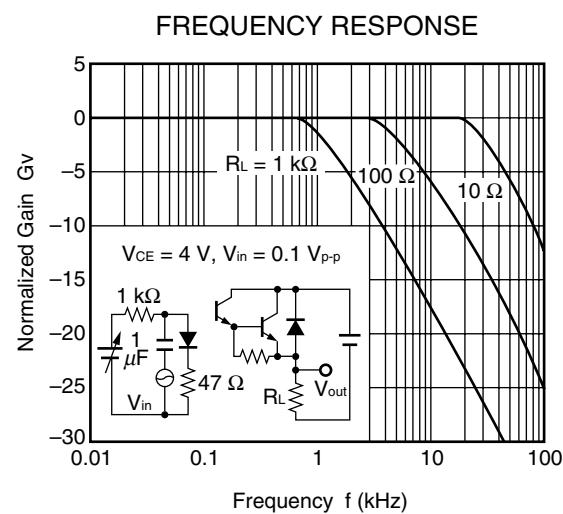
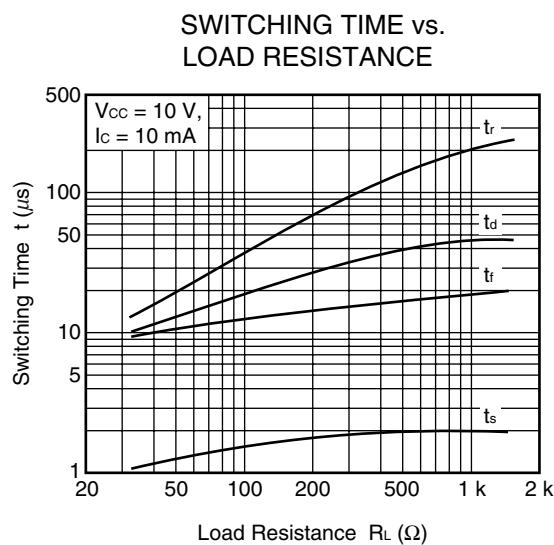
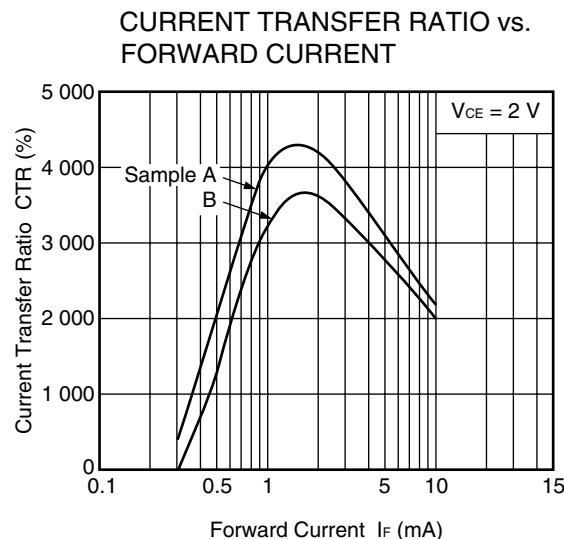
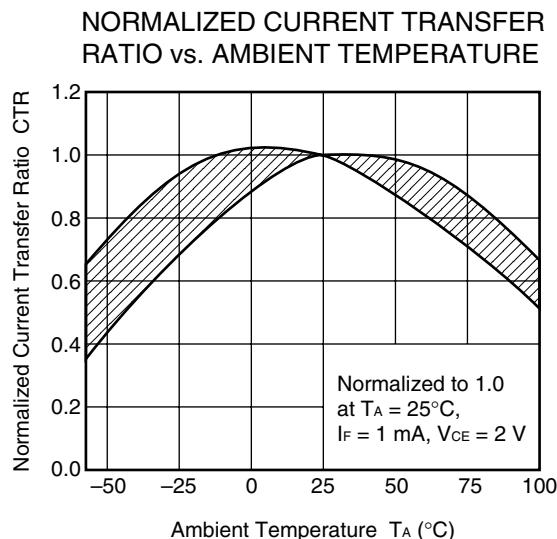
Parameter		Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Diode	Forward Voltage	$V_F$	$I_F = 10 \text{ mA}$		1.15	1.40	V
	Reverse Current	$I_R$	$V_R = 5 \text{ V}$			5	$\mu\text{A}$
	Terminal Capacitance	$C_t$	$V = 0 \text{ V}, f = 1.0 \text{ MHz}$		30		pF
Transistor	Collector to Emitter Dark Current	$I_{CEO}$	$V_{CE} = 350 \text{ V}, I_F = 0 \text{ mA}$			400	nA
Coupled	Current Transfer Ratio ( $I_C/I_F$ )	CTR	$I_F = 1 \text{ mA}, V_{CE} = 2 \text{ V}$	1 500	4 000	6 500	%
	Collector Saturation Voltage	$V_{CE(\text{sat})}$	$I_F = 1 \text{ mA}, I_C = 2 \text{ mA}$			1.0	V
	Isolation Resistance	$R_{I-O}$	$V_{I-O} = 1.0 \text{ kV}_{\text{DC}}$	$10^{11}$			$\Omega$
	Isolation Capacitance	$C_{I-O}$	$V = 0 \text{ V}, f = 1.0 \text{ MHz}$		0.6		pF
	Rise Time <sup>1</sup>	$t_r$	$V_{CC} = 5 \text{ V}, I_C = 10 \text{ mA}, R_L = 100 \Omega$		100		$\mu\text{s}$
	Fall Time <sup>1</sup>	$t_f$			100		

\*1 Test circuit for switching time



TYPICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ , unless otherwise specified)DIODE POWER DISSIPATION vs.  
AMBIENT TEMPERATURETRANSISTOR POWER DISSIPATION  
vs. AMBIENT TEMPERATUREFORWARD CURRENT vs.  
FORWARD VOLTAGECOLLECTOR CURRENT vs.  
COLLECTOR TO EMITTER VOLTAGECOLLECTOR TO EMITTER DARK  
CURRENT vs. AMBIENT TEMPERATURECOLLECTOR CURRENT vs.  
COLLECTOR SATURATION VOLTAGE

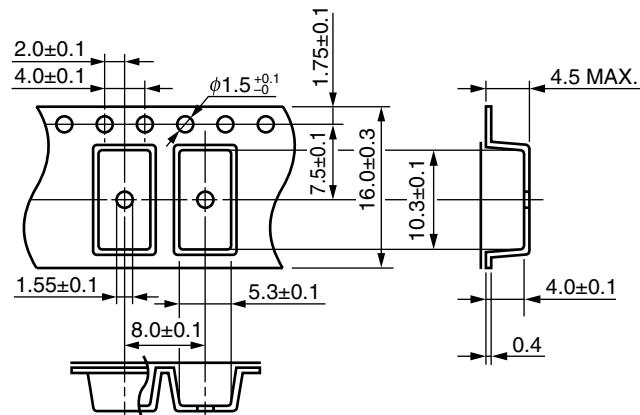
**Remark** The graphs indicate nominal characteristics.



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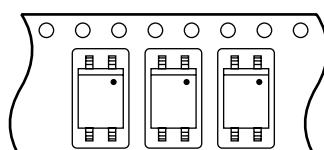
## &lt;R&gt; TAPING SPECIFICATIONS (Unit : mm)

Outline and Dimensions (Tape)

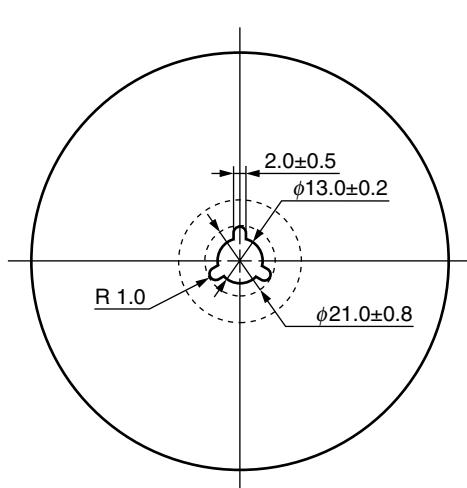


Tape Direction

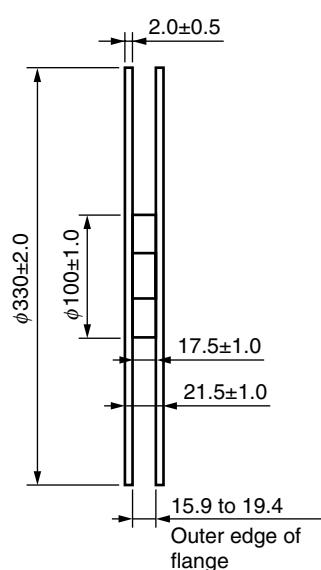
PS2533L-1-F3



Outline and Dimensions (Reel)



Packing: 2 000 pcs/reel



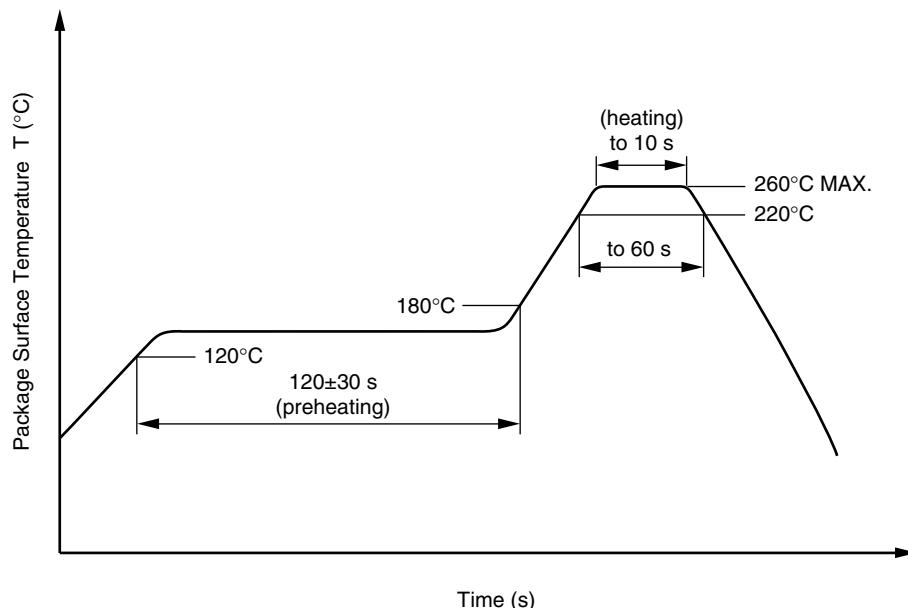
## NOTES ON HANDLING

### 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. 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.

## &lt;R&gt; SPECIFICATION OF VDE MARKS LICENSE DOCUMENT (VDE0884)

Parameter	Symbol	Spec	Unit
Climatic test class (IEC 60068-1/DIN EN 60068-1)		55/100/21	
Dielectric strength maximum operating isolation voltage Test voltage (partial discharge test, procedure a for type test and random test) $U_{pr} = 1.5 \times U_{IORM}$ , $P_d < 5 \text{ pC}$	$U_{IORM}$ $U_{pr}$	890 1 335	$V_{peak}$ $V_{peak}$
Test voltage (partial discharge test, procedure b for all devices test) $U_{pr} = 1.875 \times U_{IORM}$ , $P_d < 5 \text{ pC}$	$U_{pr}$	1 669	$V_{peak}$
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 +100	°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
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 $V_{IO} = 500 \text{ V dc at } T_A = 175^\circ\text{C (Tsi)}$	Tsi Isi Psi Ris MIN.	175 400 700 $10^9$	°C mA mW Ω

**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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