

PS2933-1

HIGH COLLECTOR TO EMITTER VOLTAGE
4-PIN ULTRA SMALL FLAT-LEAD
PHOTOCOUPLER

R08DS0115EJ0100
Rev.1.00
Nov 29, 2013

DESCRIPTION

The PS2933-1 is an optically coupled isolator containing a GaAs light emitting diode and an NPN silicon phototransistor in one package for high density mounting applications.

An ultra small flat-lead package has been provided which realizes a reduction in mounting area of about 30% compared with the PS28xx series.

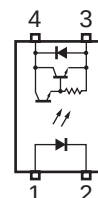
FEATURES

- Ultra small flat-lead package (4.6 (L) × 2.5 (W) × 2.1 (H) mm)
- High collector to emitter voltage ($V_{CEO} = 350 \text{ V}$)
- High isolation voltage ($BV = 2\,500 \text{ V r.m.s.}$)
- Ordering number of taping product: PS2933-1-F3: 3 500 pcs/reel
- <R> • Safety standards
 - UL approved: No. E72422
 - BSI approved (BS EN 60065, BS EN 60950)
 - DIN EN 60747-5-5 (VDE 0884-5) approved (Option)

APPLICATIONS

- Hybrid IC
- Telephone, Exchange equipment, FAX

PIN CONNECTION (Top View)

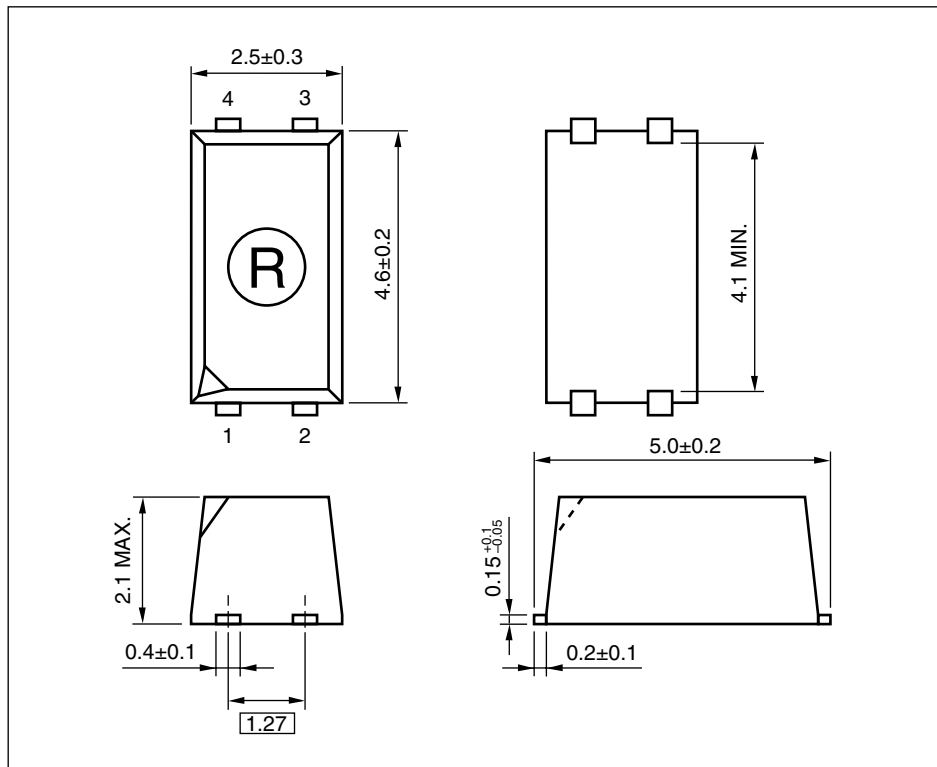


1. Anode
2. Cathode
3. Emitter
4. Collector

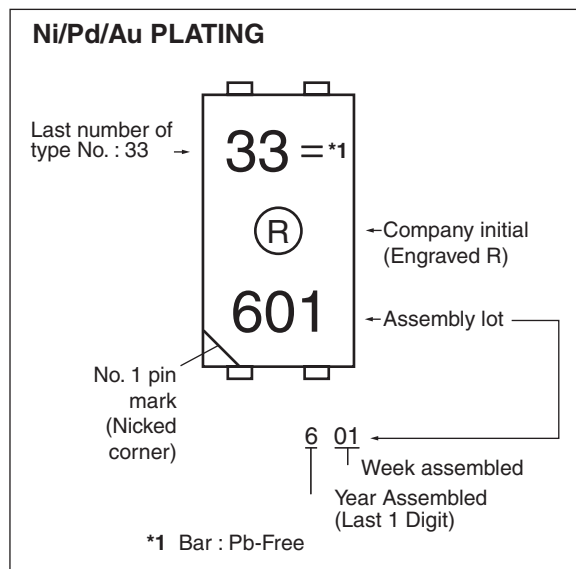
The mark <R> shows major revised points.

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

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PACKAGE DIMENSIONS (UNIT: mm)

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MARKING EXAMPLE**PHOTOCOUPLER CONSTRUCTION**

Parameter	MIN.
Air Distance	4 mm
Creepage Distance	4 mm
Isolation Distance	0.4 mm

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ORDERING INFORMATION

Part Number	Order Number	Solder Plating Specification	Packing Style	Safety Standard Approval	Application Part Number ^{*1}
PS2933-1	PS2933-1-AX	Pb-Free (Ni/Pd/Au)	50 pcs (Tape 50 pcs cut)	Standard products (UL, BSI approved)	PS2933-1
PS2933-1-F3	PS2933-1-F3-AX		Embossed Tape 3 500 pcs/reel		
PS2933-1-V	PS2933-1-V-AX		50 pcs (Tape 50 pcs cut)	UL, BSI, DIN EN 60747-5-5 (VDE 0884-5) Approved (Option)	
PS2933-1-V-F3	PS2933-1-V-F3-AX		Embossed Tape 3 500 pcs/reel		

Note: ^{*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	Forward Current	I_F	50	mA
	Forward Current Derating	$\Delta I_F/^\circ\text{C}$	0.5	mA/ $^\circ\text{C}$
	Peak Forward Current ^{*1}	I_{FP}	0.5	A
	Power Dissipation	P_D	60	mW
	Reverse Voltage	V_R	6	V
Detector	Collector to Emitter Voltage	V_{CEO}	350	V
	Emitter to Collector Voltage	V_{ECO}	0.3	V
	Collector Current	I_C	60	mA
	Power Dissipation Derating	$\Delta P_d/^\circ\text{C}$	1.2	mW/ $^\circ\text{C}$
	Power Dissipation	P_C	120	mW
Isolation Voltage ^{*2}		BV	2 500	Vr.m.s.
Total Power Dissipation		P_T	160	mW
Operating Ambient Temperature		T_A	-55 to +100	$^\circ\text{C}$
Storage Temperature		T_{stg}	-55 to +150	$^\circ\text{C}$

Notes: ^{*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.

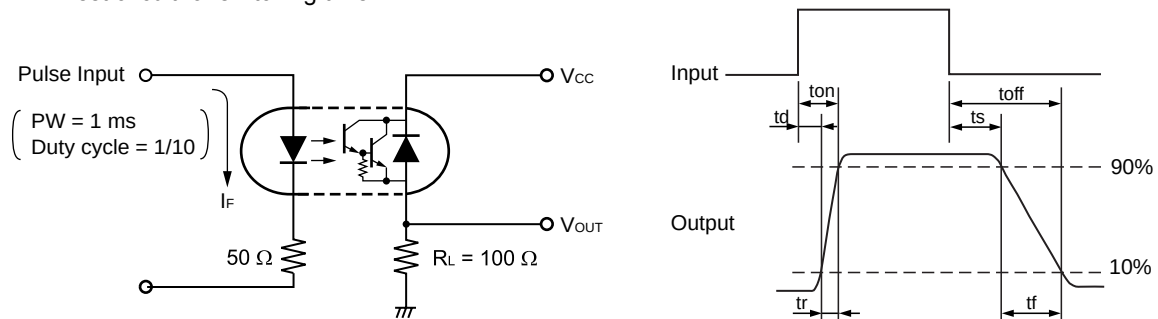
Pins 1-2 shorted together, 3-4 shorted together.

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

	Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Diode	Forward Voltage	V_F	$I_F = 1\text{ mA}$	0.9	1.1	1.3	V
	Reverse Current	I_R	$V_R = 5\text{ V}$			5	μA
	Terminal Capacitance	C_t	$V = 0\text{ V}, f = 1\text{ MHz}$		15		pF
Transistor	Collector to Emitter Current	I_{CEO}	$V_{CE} = 350\text{ V}$			400	nA
Coupled	Current Transfer Ratio (I_C/I_F)	CTR	$I_F = 1\text{ mA}, V_{CE} = 2\text{ V}$	400	2 000	4 500	%
	Collector Saturation Voltage	$V_{CE(SAT)}$	$I_F = 1\text{ mA}, I_C = 2\text{ mA}$		0.8	1	V
	Isolation Resistance	R_{I-O}	$V_{I-O} = 1\text{ kV}_{DC}$	10^{11}			Ω
	Isolation Capacitance	C_{I-O}	$V = 0\text{ V}, f = 1\text{ MHz}$		0.4		pF
	Rise Time ^{*1}	t_r	$V_{CC} = 5\text{ V}, I_C = 10\text{ mA}, R_L = 100\ \Omega$		20		μs
	Fall Time ^{*1}	t_f			5		

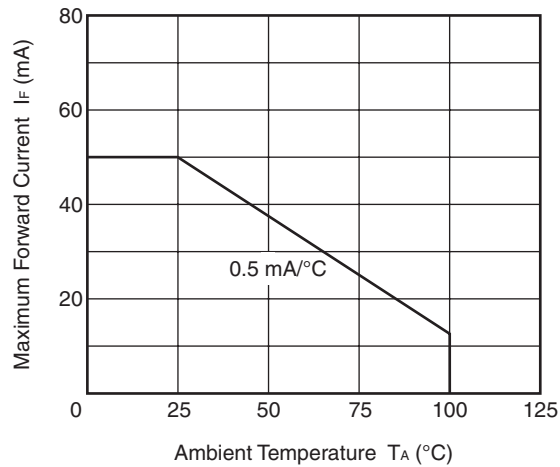
Note: ^{*1}. Test circuit for switching time

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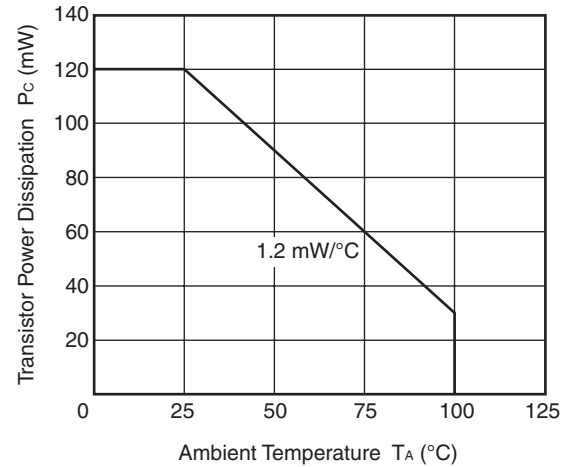


TYPICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$, unless otherwise specified)

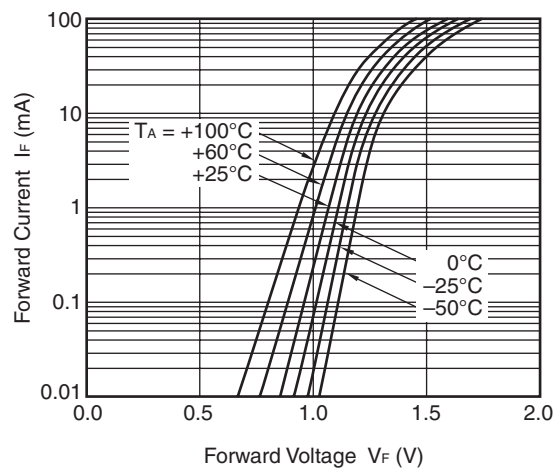
MAXIMUM FORWARD CURRENT vs. AMBIENT TEMPERATURE



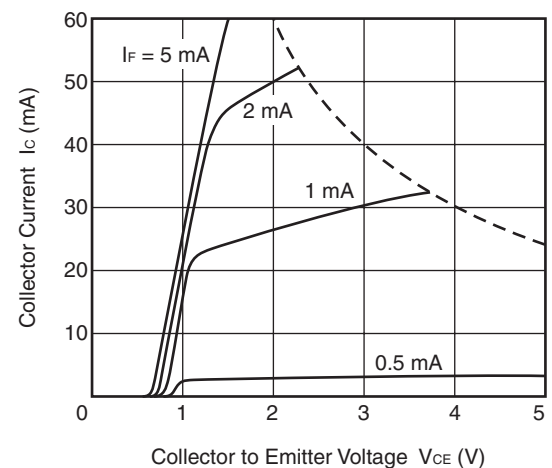
TRANSISTOR POWER DISSIPATION vs. AMBIENT TEMPERATURE



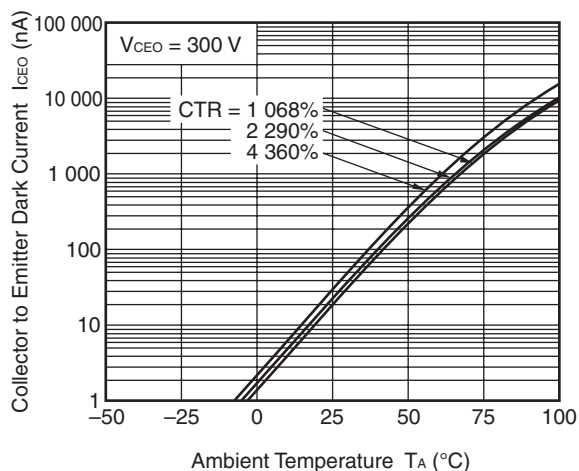
FORWARD CURRENT vs. FORWARD VOLTAGE



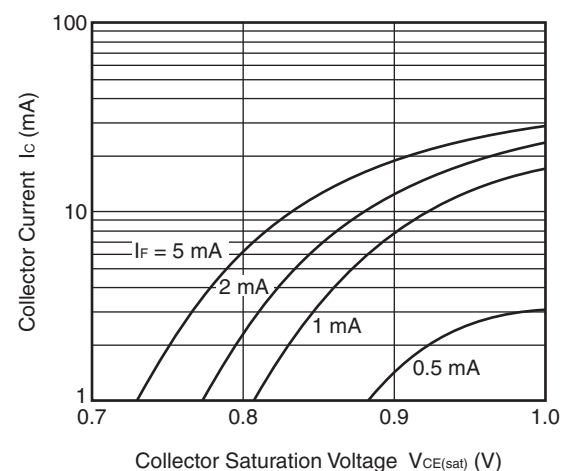
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



COLLECTOR TO EMITTER DARK CURRENT vs. AMBIENT TEMPERATURE

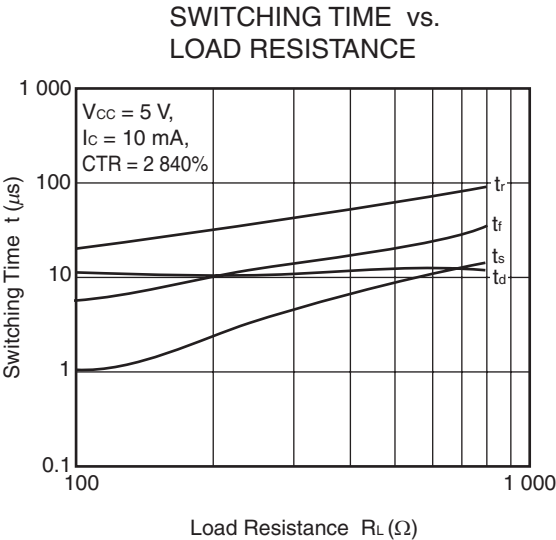
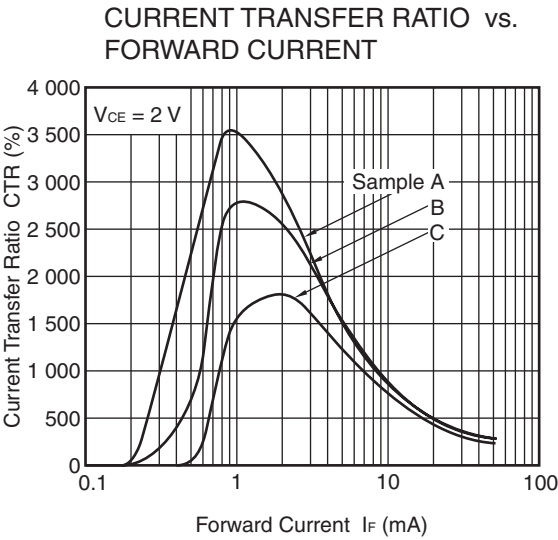
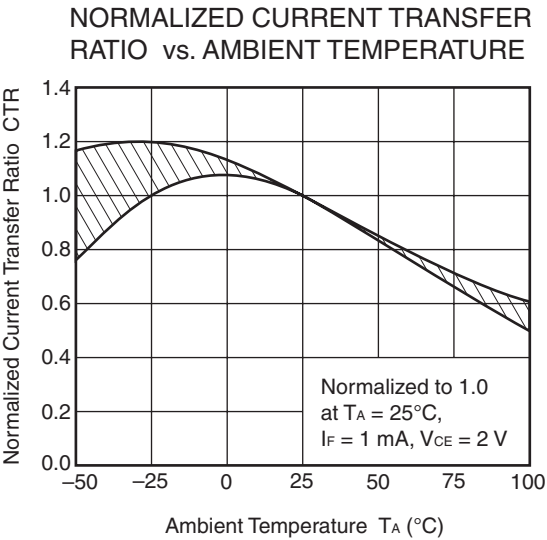


COLLECTOR CURRENT vs. COLLECTOR SATURATION VOLTAGE



Remark The graphs indicate nominal characteristics.

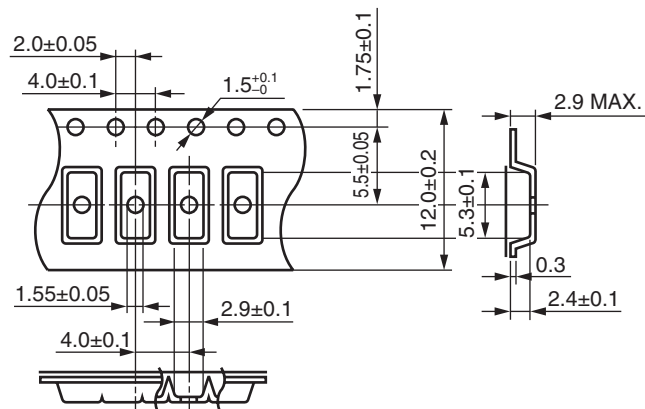
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Remark The graphs indicate nominal characteristics.

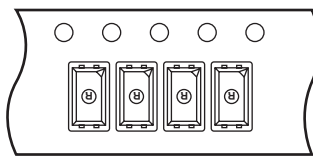
<R> TAPING SPECIFICATIONS (UNIT: mm)

Outline and Dimensions (Tape)

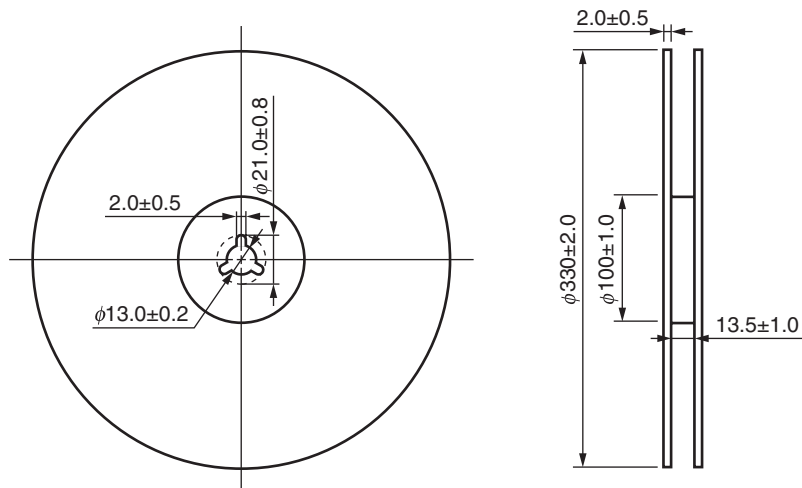


Tape Direction

PS2933-1-F3

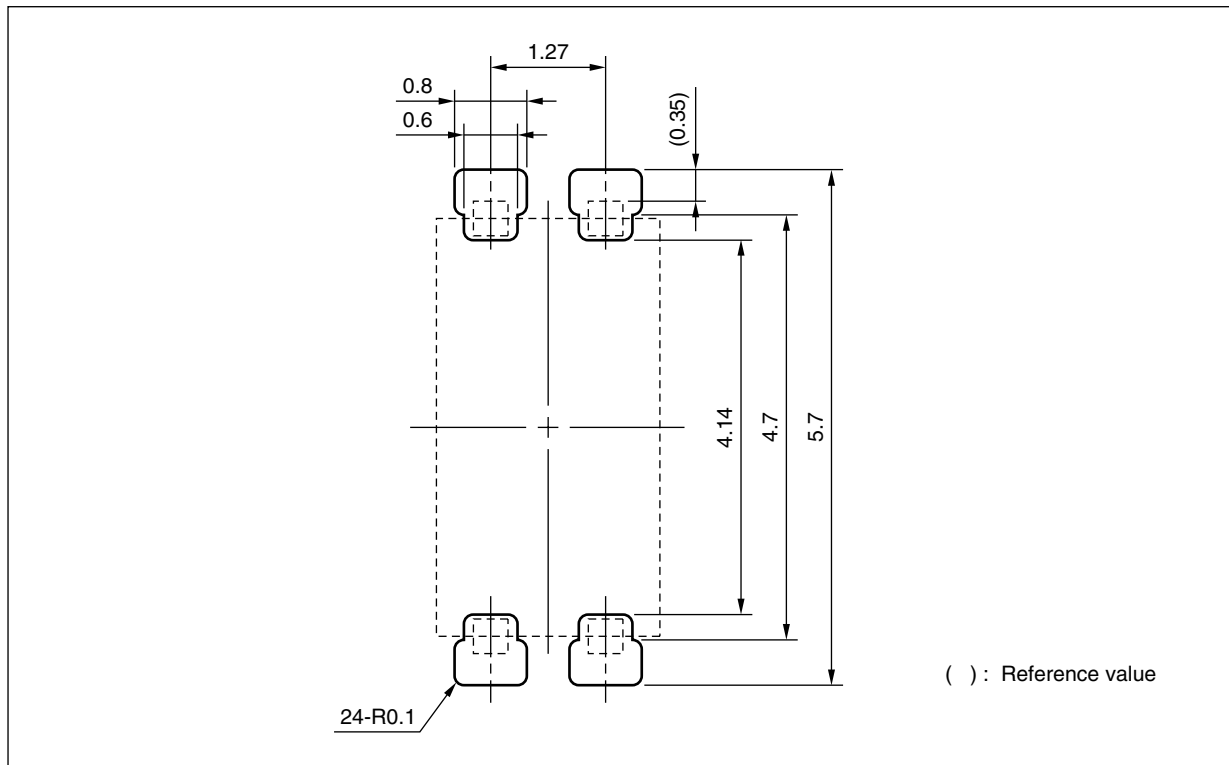


Outline and Dimensions (Reel)



Packing: 3 500 pcs/reel

RECOMMENDED MOUNT PAD DIMENSIONS (UNIT: mm)



Remark This drawing is considered to meet air and outer creepage distance 4.0 mm minimum. All dimensions in this figure must be evaluated before use.

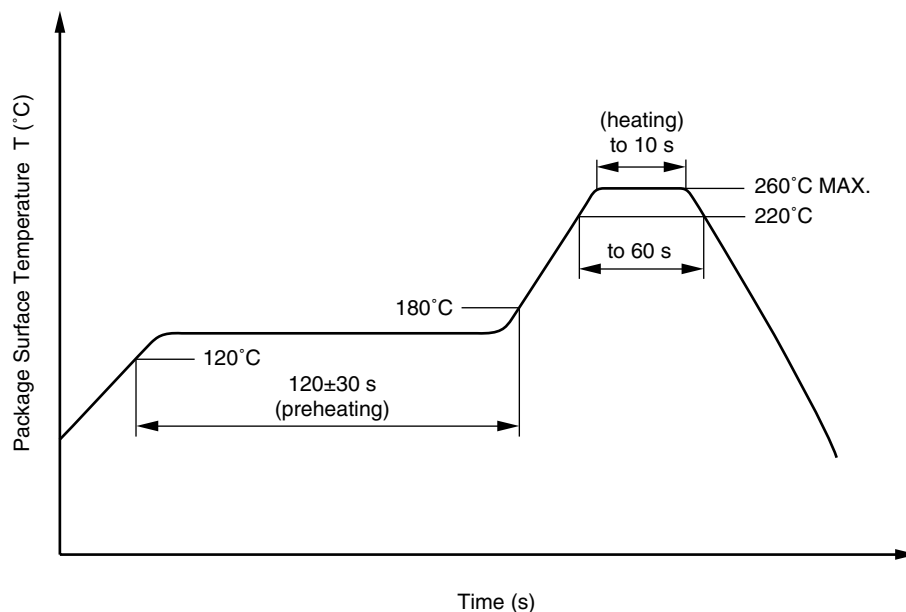
<R> **NOTES ON HANDLING**

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 or less |
| • Flux | Rosin flux containing small amount of chlorine (The flux with a maximum chlorine content of 0.2 Wt% or less 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% or less is recommended.) |

(3) Soldering by Soldering Iron

- | | |
|--|--|
| • Peak Temperature (lead part temperature) | 350°C or below |
| • Time (each pin) | 3 seconds or less |
| • Flux | Rosin flux containing small amount of chlorine (The flux with a maximum chlorine content of 0.2 Wt% or less is recommended.) |

(a) Soldering of leads should be made at the point 1.5 to 2.0 mm from the root of the lead

(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.

<R> SPECIFICATION OF VDE MARKS LICENSE DOCUMENT

Parameter	Symbol	Spec.	Unit
Climatic test class (IEC 60068-1/DIN EN 60068-1)		55/100/21	
Dielectric strength			
maximum operating isolation voltage	U_{IORM}	570	V_{peak}
Test voltage (partial discharge test, procedure a for type test and random test)	U_{pr}	912	V_{peak}
$U_{pr} = 1.6 \times U_{IORM}$, $P_d < 5 \text{ pC}$			
Test voltage (partial discharge test, procedure b for all devices)	U_{pr}	1 068	V_{peak}
$U_{pr} = 1.875 \times U_{IORM}$, $P_d < 5 \text{ pC}$			
Highest permissible overvoltage	U_{TR}	4 000	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 $T_A = 25^\circ\text{C}$	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}	150	°C
Current (input current I_F , $P_{si} = 0$)	I_{si}	300	mA
Power (output or total power dissipation)	P_{si}	500	mW
Isolation resistance			
$V_{IO} = 500 \text{ V dc}$ at $T_A = T_{si}$	Ris MIN.	10^9	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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Revision History	PS2933-1 Data Sheet
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Rev.	Date	Description	
		Page	Summary
2.00	May , 2006	–	NEC Electronics format 2nd Edition
1.00	Nov 29, 2013	Throughout	Renesas format is applied to this data sheet.
		p.1	Modification of FEATURES
		p.2	Modification of PACKAGE DIMENSIONS
			Modification of MARKING EXAMPLE
		p.3	Modification of ORDERING INFORMATION
		p.4	Modification of ELECTRICAL CHARACTERISTICS
		p.6	Modification of TYPICAL CHARACTERISTICS
		p.7	Modification of TAPING SPECIFICATIONS
		p.9	Modification of NOTES ON HANDLING
		p.11	Addition of SPECIFICATION OF VDE MARKS LICENSE DOCUMENT

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