PS2933-1

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

R08DS0115EJ0300
Rev.3.00
Oct. 23, 2023

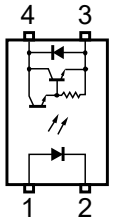
DESCRIPTION

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 (W) × 2.5 (L) × 2.1 (H) mm)
- High collector to emitter voltage (V_{CEO} = 350 V)
- High isolation voltage (BV = 2 500 Vr.m.s.)
- Embossed tape product: PS2933-1-F3: 3 500 pcs/reel
- Pb-free product
- Safety standards
  - UL approved: UL1577, Single protection
  - BSI approved: BS EN IEC 62368-1, Supplementary insulation
  - VDE approved: DIN EN IEC 60747-5-5 (Option)

PIN CONNECTION
(Top View)



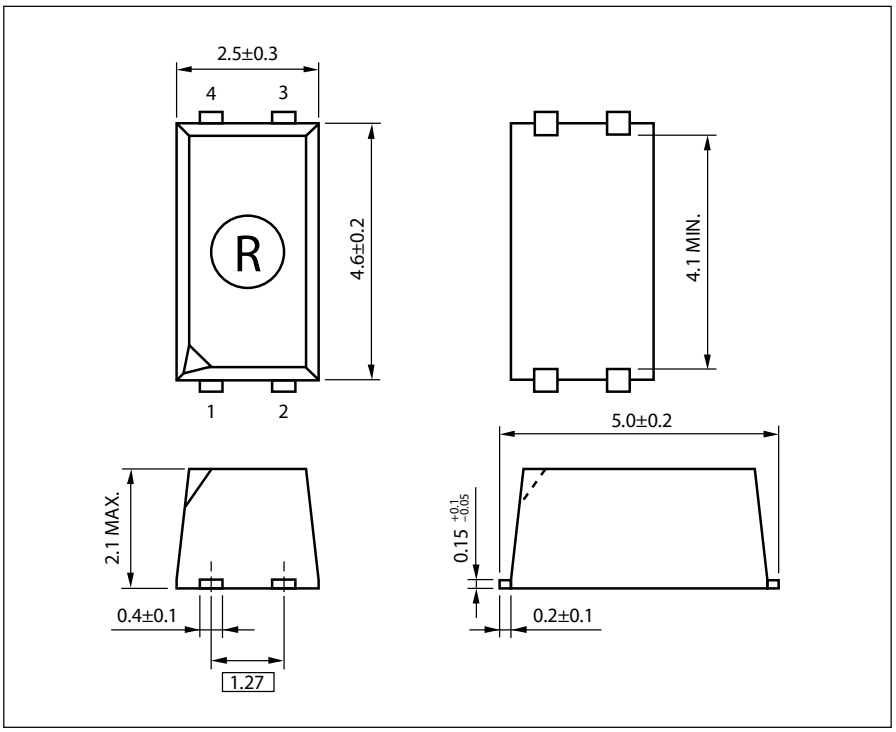
1. Anode
2. Cathode
3. Emitter
4. Collector

APPLICATIONS

- Hybrid IC
- Telephone, Exchange equipment, FAX

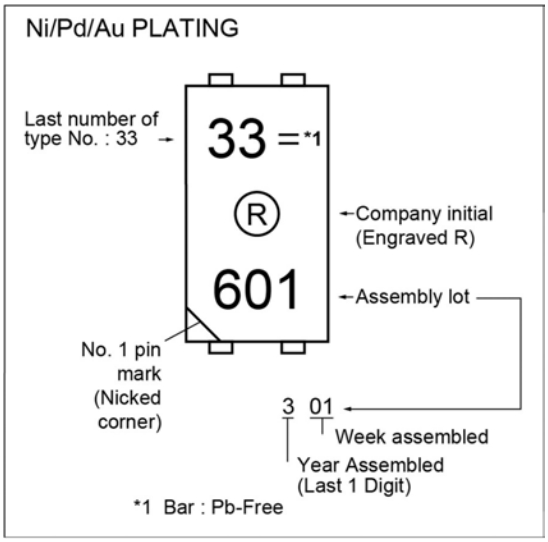
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PACKAGE DIMENSIONS (UNIT: mm)



Weight: 0.05g (TYP.)

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*1	Solder Plating Specification	Packing Style	Safety Standard Approval	Application Part Number *2
PS2933-1	PS2933-1-AX	Pb-Free (Ni/Pd/Au)	Embossed Tape 50 pcs	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		Embossed Tape 50 pcs	UL, BSI, VDE Approved	
PS2933-1-V-F3	PS2933-1-V-F3-AX		Embossed Tape 3 500 pcs/reel		

Note: *1. For the application of the safety standard, the following part number should be used.

ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C, unless otherwise specified)

Parameter		Symbol	Ratings	Unit
Diode	Forward Current	I_F	50	mA
	Forward Current Derating	ΔI_F/°C	0.5	mA/°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	ΔP_C/°C	1.2	mW/°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	°C
Storage Temperature		T_{stg}	−55 to +150	°C

Notes: *1. PW = 100 μs, Duty Cycle = 1 %

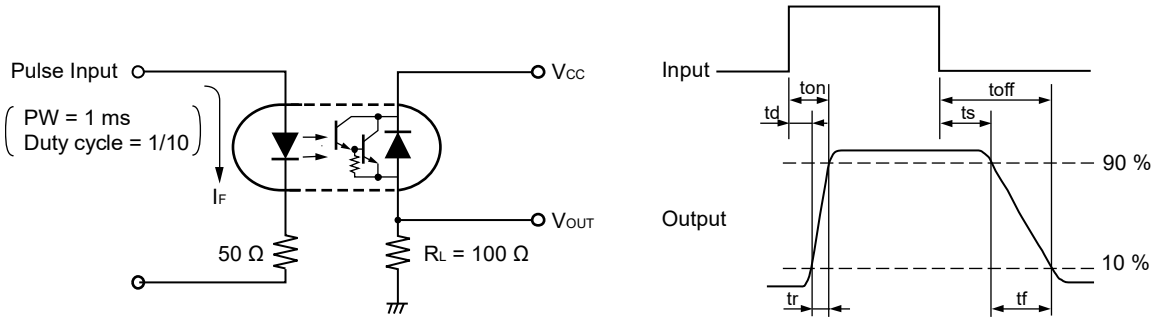
*2. AC voltage for 1 minute at T_A = 25 °C, RH = 60 % between input and output.
Pins 1-2 shorted together, 3-4 shorted together.

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ELECTRICAL CHARACTERISTICS (T_A = 25 °C)

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

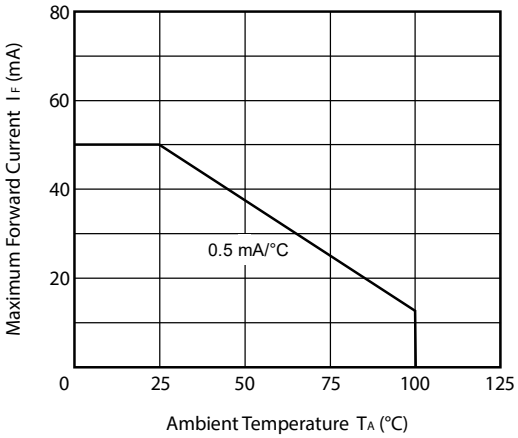
Note: *1. Test circuit for switching time



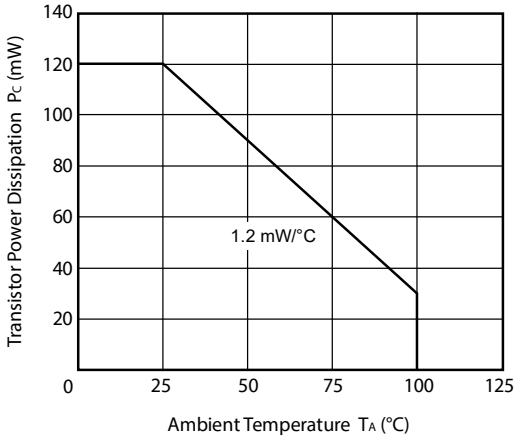
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TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise specified)

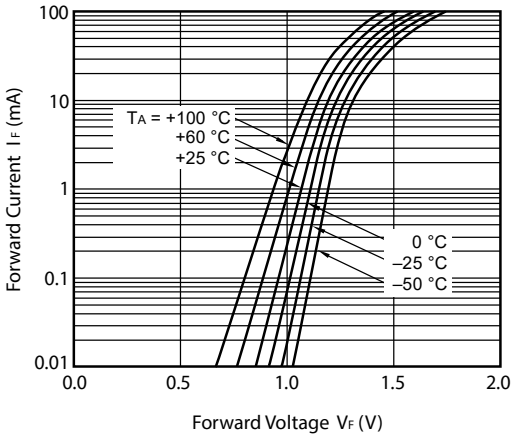
MAXIMUM FORWARD CURRENT vs. AMBIENT TEMPERATURE



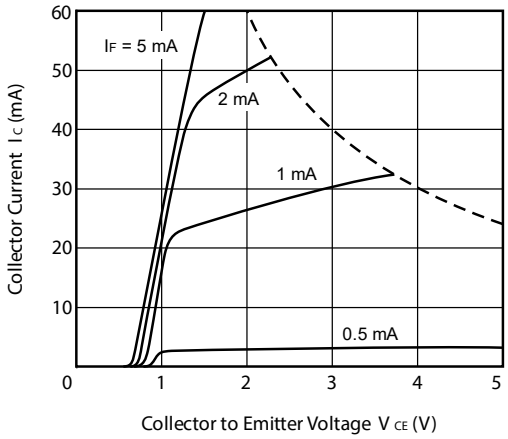
TRANSISTOR POWER DISSIPATION vs. AMBIENT TEMPERATURE



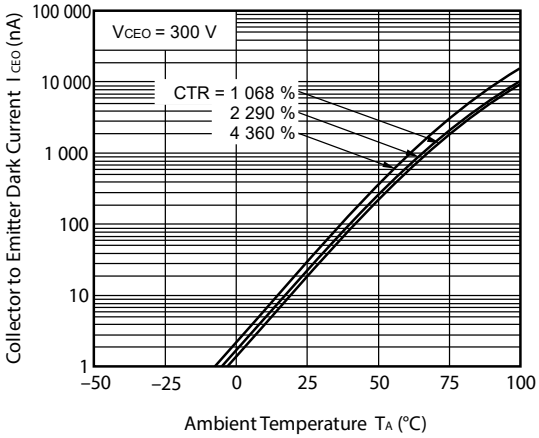
FORWARD CURRENT vs. FORWARD VOLTAGE



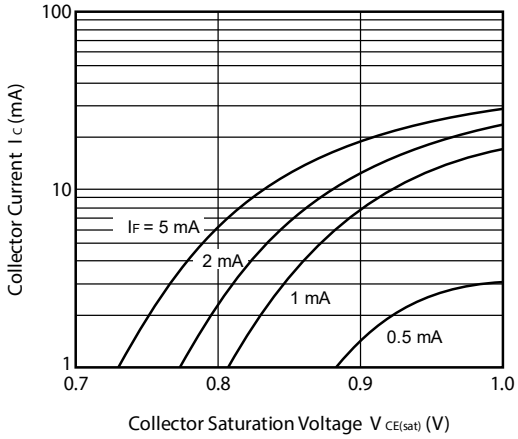
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



COLLECTOR TO EMITTER DARK CURRENT vs. AMBIENT TEMPERATURE



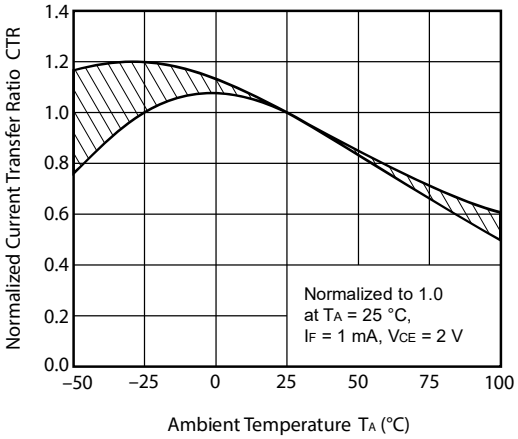
COLLECTOR CURRENT vs. COLLECTOR SATURATION VOLTAGE



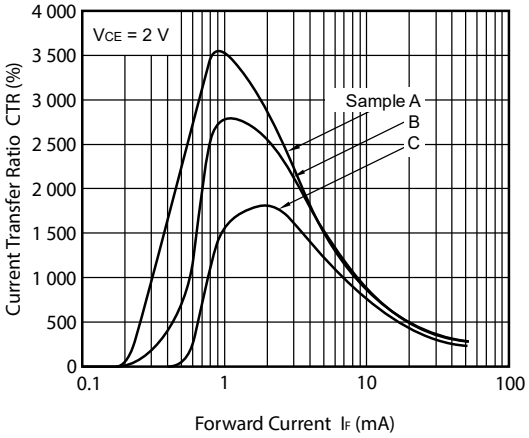
Remark The graphs indicate nominal characteristics.

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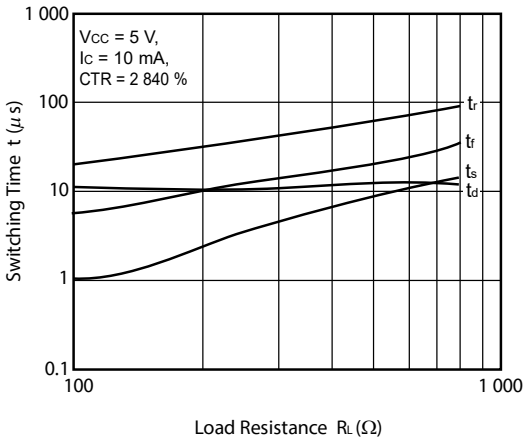
NORMALIZED CURRENT TRANSFER RATIO vs. AMBIENT TEMPERATURE



CURRENT TRANSFER RATIO vs. FORWARD CURRENT



SWITCHING TIME vs. LOAD RESISTANCE

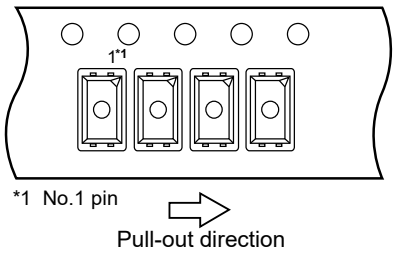


Remark The graphs indicate nominal characteristics.

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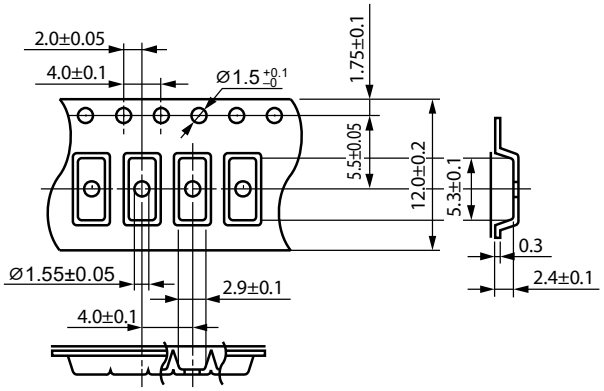
TAPING SPECIFICATIONS (UNIT: mm)

Tape Direction



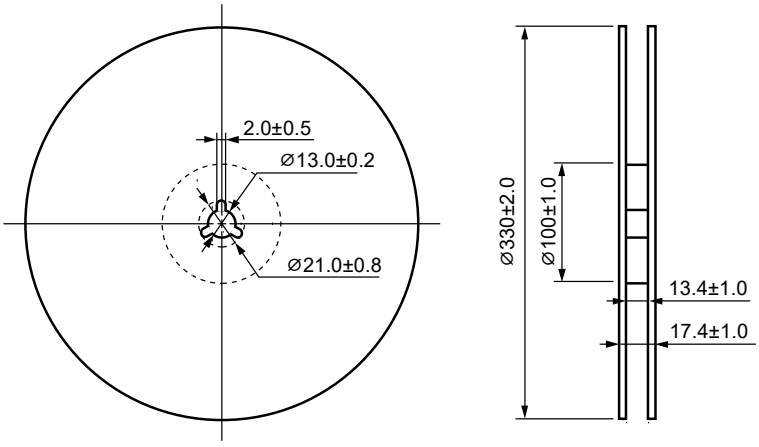
Outline and Dimensions (Tape)

(UNIT: mm)



Outline and Dimensions (Reel)

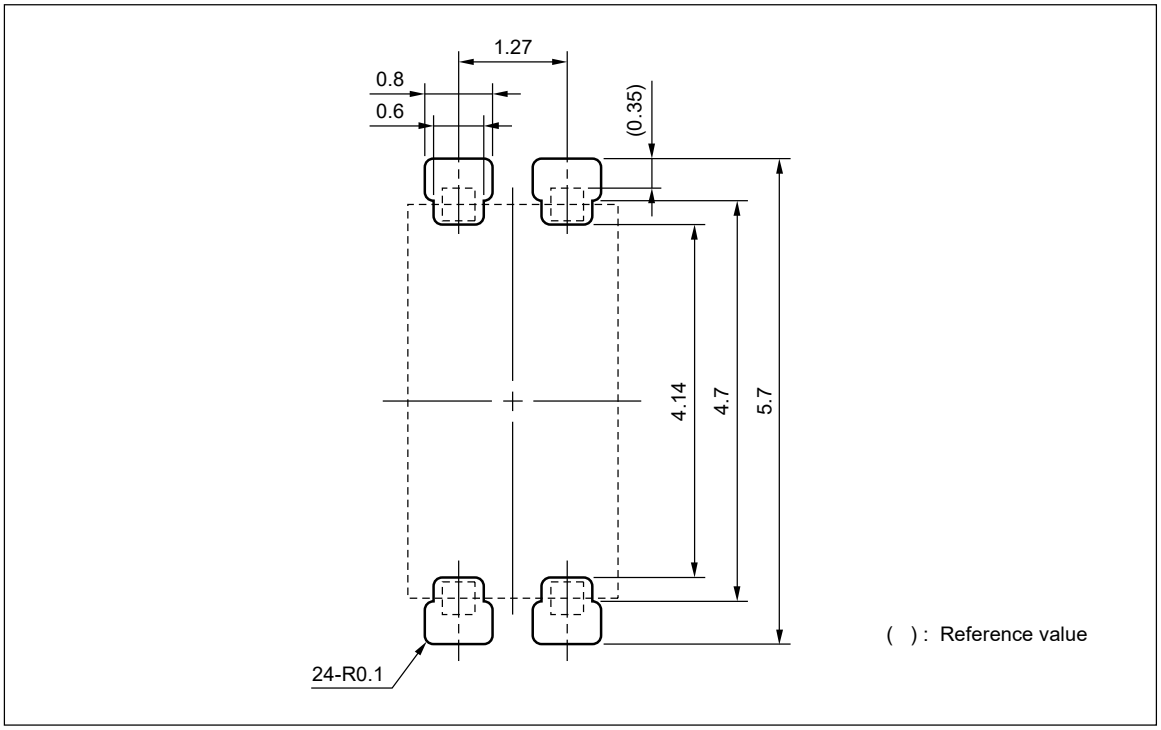
(UNIT: mm)



Packing: 3 500 pcs/reel

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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.

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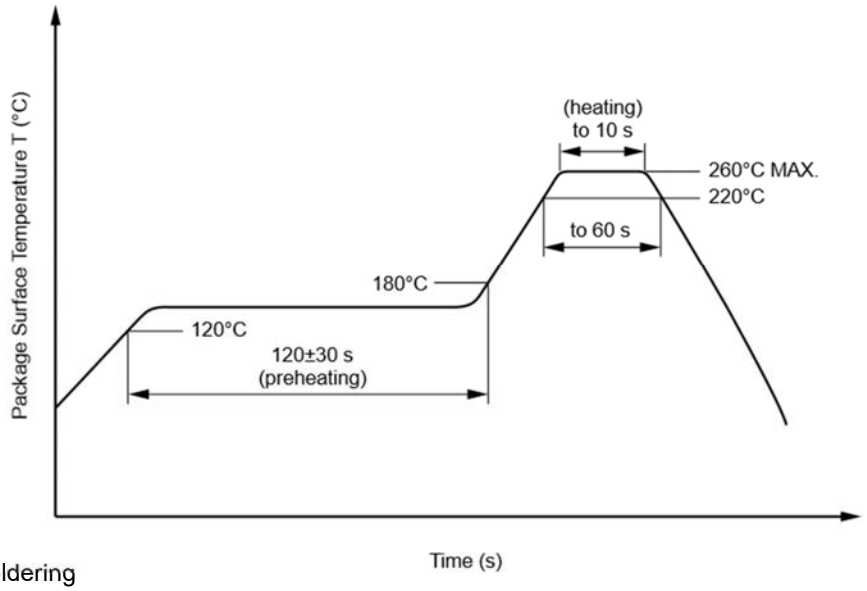
NOTES ON HANDLING

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) 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.

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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

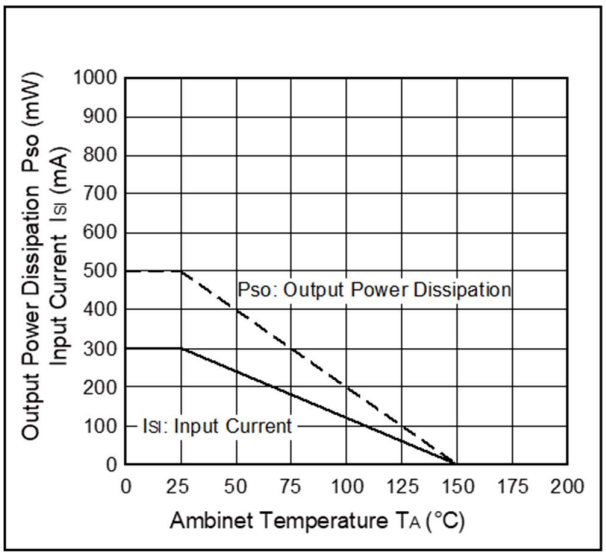
1. Protect against static electricity when handling.
2. Avoid storage at a high temperature and high humidity.
3. Avoid cleaning with Freon based or halogen-based (chlorinated etc.) solvents.
4. Do not use fixing agents or coatings containing halogen-based substances.

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SPECIFICATION OF VDE MARKS LICENSE DOCUMENT

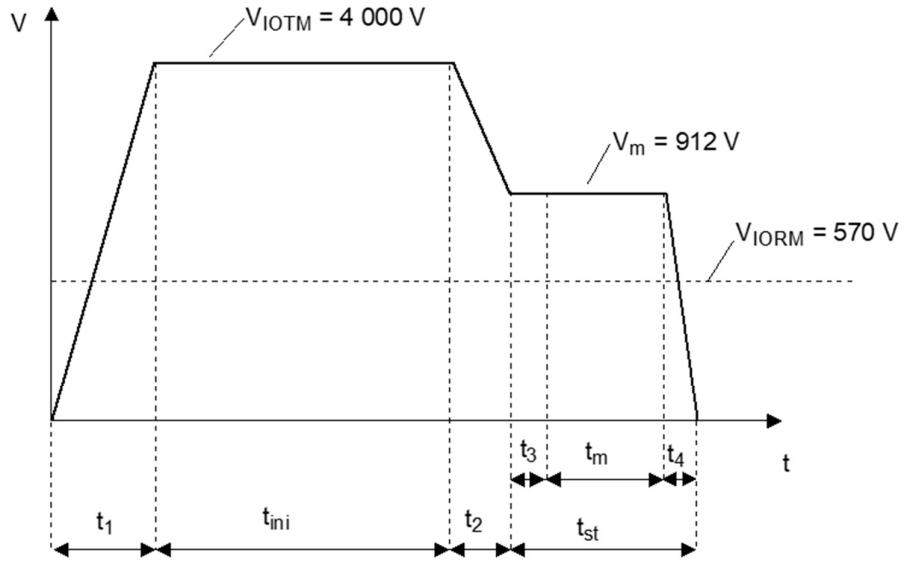
Parameter	Symbol	Rating	Unit
Climatic test class (IEC 60068-1/DIN EN 60068-1)		55/100/21	
Dielectric strength maximum operating isolation voltage Test voltage (partial discharge test, procedure a for type test and random test) $V_m = 1.6 \times V_{IORM.}$, $q_{pd} < 5$ pC	 V_{IORM} V_m	 570 912	 V_{peak} V_{peak}
Test voltage (partial discharge test, procedure b for all devices) $V_m = 1.875 \times V_{IORM.}$, $q_{pd} < 5$ pC	V_m	1 068	V_{peak}
Highest permissible overvoltage	V_{IOTM}	4 000	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 +100	°C
Isolation resistance, minimum value V_{I-O} = 500 V dc, T_A = 25 °C V_{I-O} = 500 V dc, T_A = maximum temperature of rating, at least 100 °C	 R_{I-O} MIN. R_{I-O} MIN.	 10^{12} 10^{11}	 Ω Ω
Safety maximum ratings (maximum permissible in case of fault, see thermal derating curve) Maximum ambient temperature Maximum input current Maximum output power dissipation Isolation resistance, minimum value at V_{I-O} = 500 V dc, $T_A = T_S$	 T_S I_{SI} P_{SO} R_{I-O} MIN.	 150 300 500 10^9	 °C mA mW Ω

Dependence of maximum safety ratings with package temperature



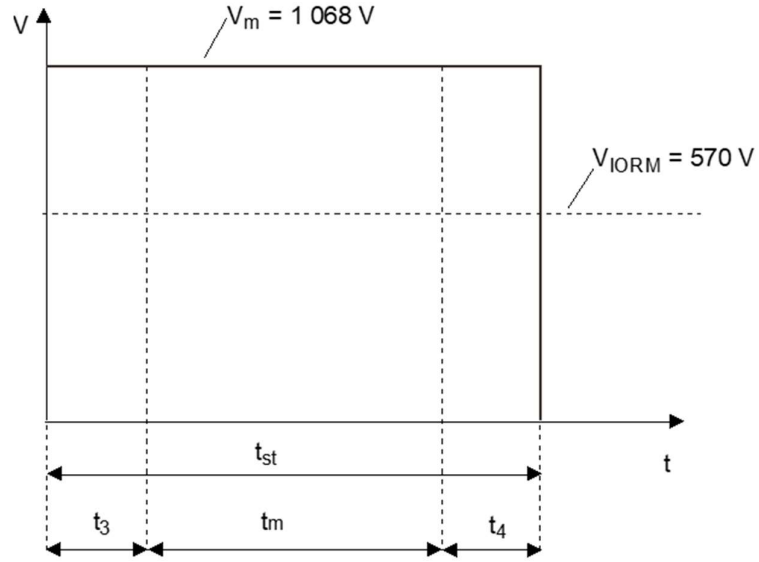
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Method a) Destructive Test, Type and Sample Test



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

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



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

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