RV1S2951A

LOW FORWARD-CURRENT(IF), OPERATING AMBIENT TEMPERATURE 115 °C,
4-PIN ULTRA SMALL PACKAGE FLAT-LEAD PHOTOCOUPLER

R08DS0288EJ0100
Rev.1.00
Jun. 20, 2024

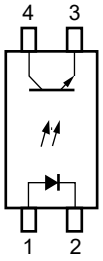
DESCRIPTION

The RV1S2951A is an optically coupled transistor-output isolator featuring the high current transfer ratio at a sub-mA of the forward current. The RV1S2951A consists of an AlGaAs LED on the input side and an NPN silicon phototransistor on the output side in an ultra-small flat-lead package to reduce the mounting area by 30 % compared with the SSOP for PS28xx series keeping 4 mm creepage distance.

FEATURES

- Ultra small flat-lead package (4.6 (W) × 2.5 (L) × 2.1 (H) mm)
- High current transfer ratio (CTR = 300 % MIN. @ I_F = 50 μA)
- Operating ambient temperature (115 °C MAX.)
- High isolation voltage (BV = 2 500 Vr.m.s.)
- Embossed tape product:
  RV1S2951ACCNS-1F0x#KC0: 3 500 pcs/reel
- Pb-free product
- Safety standard
  - UL : UL1577, Single protection
  - CSA : CAN/CSA-C22.2 No.62368-1, Reinforced insulation
  - VDE : DIN EN IEC 60747-5-5 (Option)

PIN CONNECTION
(Top View)



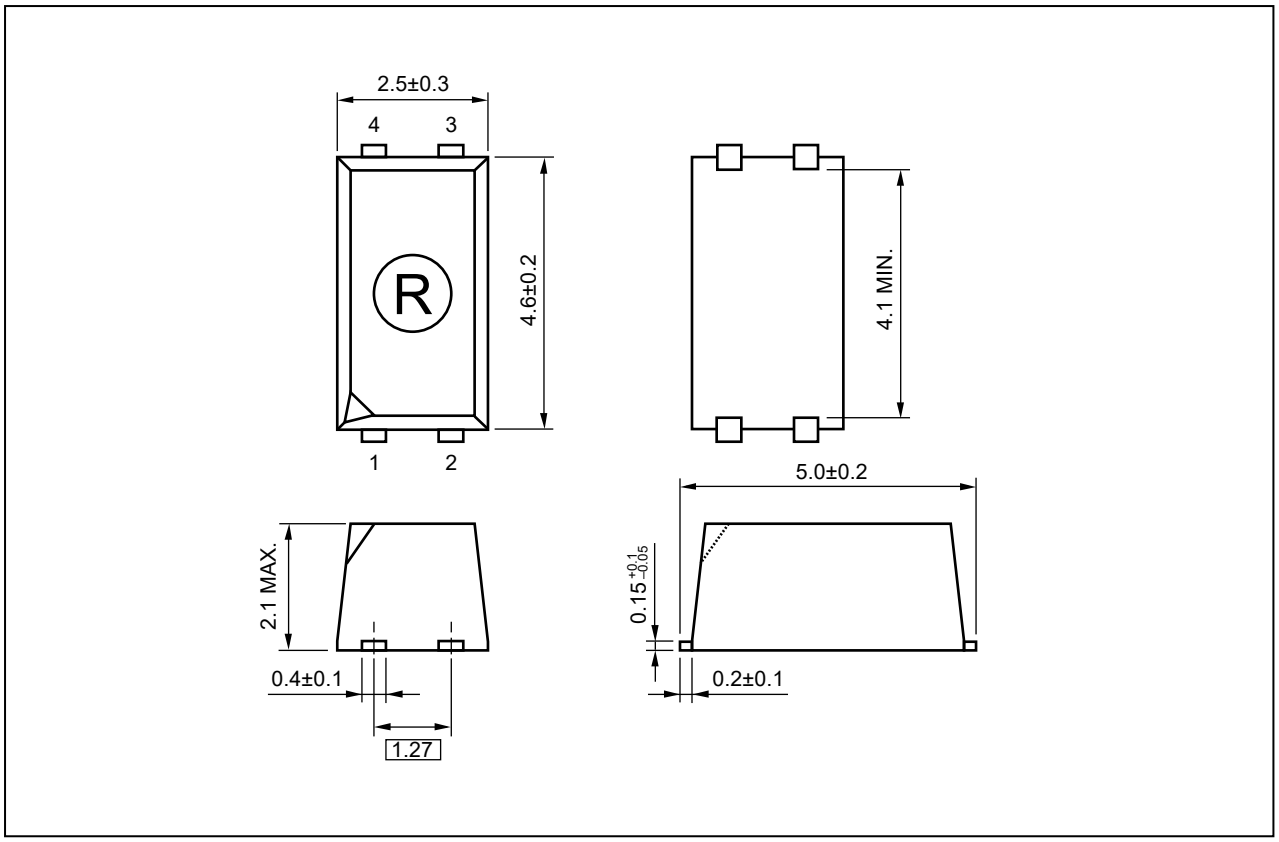
1. Anode
2. Cathode
3. Emitter
4. Collector

APPLICATIONS

- Air conditioner
- Measurement equipment
- Power supply

Start of mass production
Jul. 2024

PACKAGE DIMENSIONS (UNIT: mm)

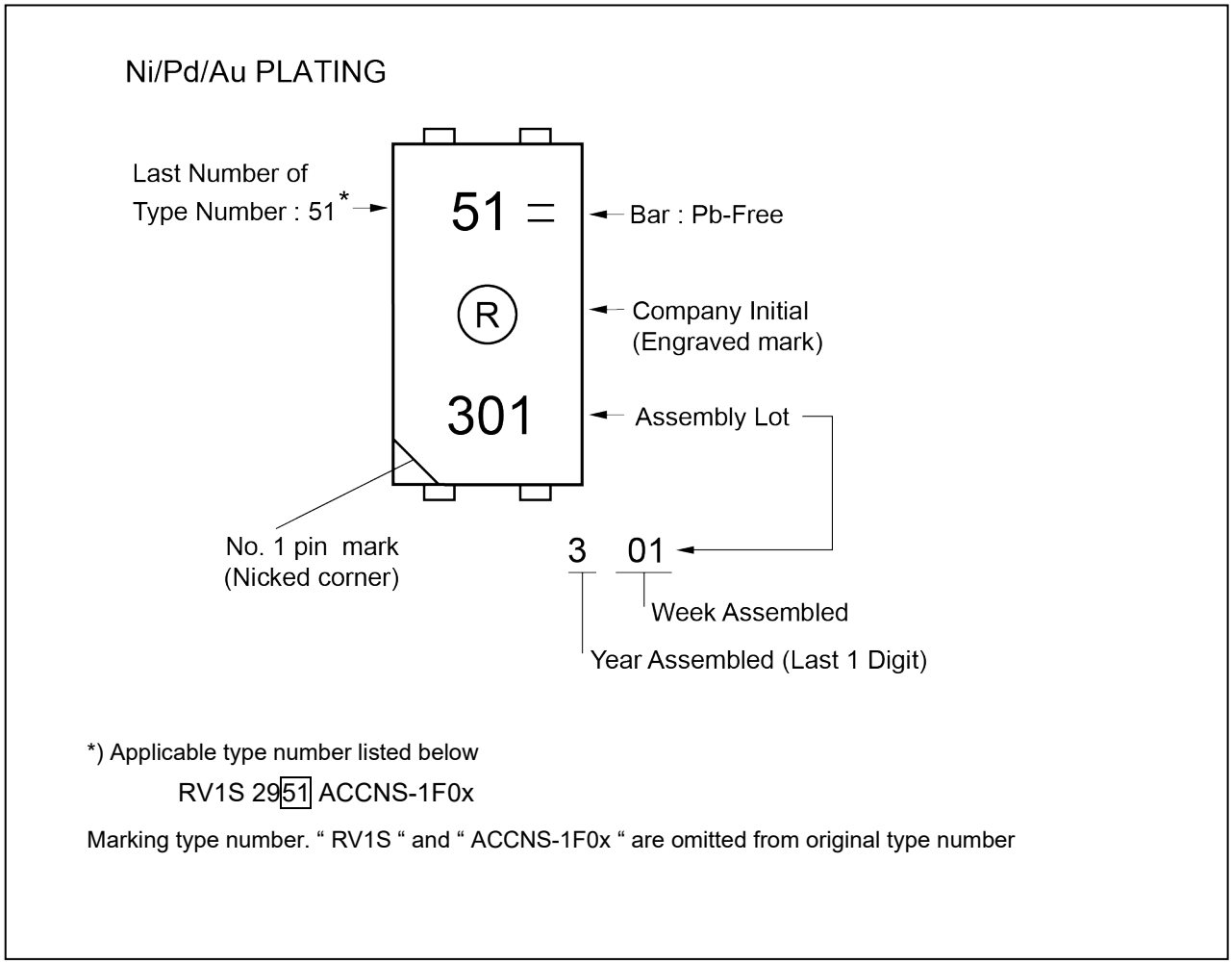


Weight : 0.05 g (TYP.)

PHOTOCOUPLER CONSTRUCTION

Parameter	MIN.
Air Distance	4 mm
Creepage Distance	4 mm
Isolation Distance	0.15 mm

MARKING EXAMPLE



*) Applicable type number listed below

RV1S 2951 ACCNS-1F0x

Marking type number. " RV1S " and " ACCNS-1F0x " are omitted from original type number

ORDERING INFORMATION

Part Number	Order Number	Solder Plating Specification	Packing Style	Safety Standard Approval	Application Part Number *1
RV1S2951ACCNS -1F0C	RV1S2951ACCNS -1F0C#SC0	Pb-Free (Ni/Pd/Au)	Embossed Tape 50 pcs	UL, CSA Approved	RV1S2951A
	RV1S2951ACCNS -1F0C#KC0		Embossed Tape 3 500 pcs/reel		
RV1S2951ACCNS -1F0V	RV1S2951ACCNS -1F0V#SC0		Embossed Tape 50 pcs	UL, CSA, VDE Approved	
	RV1S2951ACCNS -1F0V#KC0		Embossed Tape 3 500 pcs/reel		

Notes: *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 (DC)	I_F	2.5	mA
	Reverse Voltage	V_R	5	V
	Power Dissipation	P_D	3.5	mW
	Peak Forward Current *1	I_{FP}	1.0	A
Transistor	Collector to Emitter Voltage	V_{CEO}	40	V
	Emitter to Collector Voltage	V_{ECO}	6	V
	Collector Current	I_C	80	mA
	Power Dissipation Derating *2	ΔP_C/°C	1.5	mW/°C
	Power Dissipation	Pc	150	mW
Isolation Voltage *3		BV	2 500	Vr.m.s.
Operating Ambient Temperature		T_A	−40 to +115	°C
Storage Temperature		T_{stg}	−40 to +125	°C

Notes: *1. PW = 100 µs, duty cycle = 1 %.

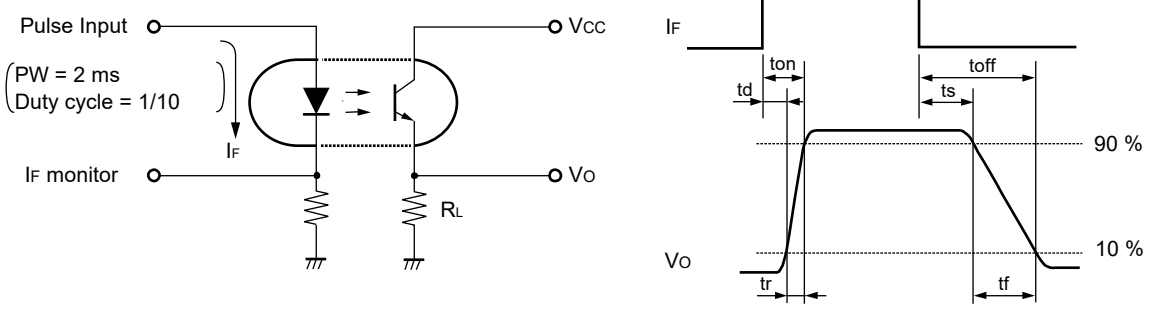
*2. Reduced at a rate of 1.5 mW/°C above T_A = 80 °C.

*3. 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.

ELECTRICAL CHARACTERISTICS (T_A = 25 °C)

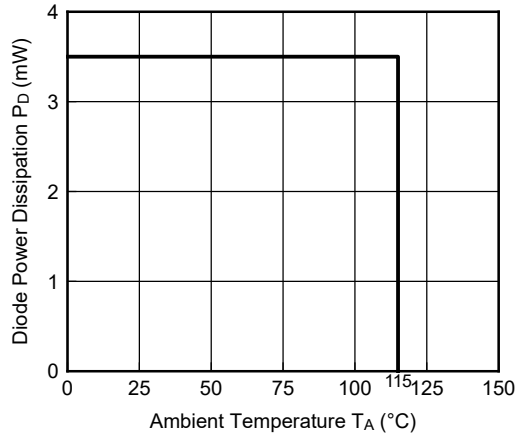
Parameter		Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Diode	Forward Voltage	V_F	I_F = 0.1 mA	1.22	1.37	1.52	V
	Reverse Current	I_R	V_R = 3 V			10	µA
	Input Capacitance	C_t	V = 0 V, f = 1 MHz		30		pF
Transistor	Collector to Emitter Dark Current	I_{CEO}	I_F = 0 mA, V_{CE} = 40 V			50	nA
Coupled	Current Transfer Ratio (I_C/I_F)	CTR1	I_F = 50 µA, V_{CE} = 5 V	300		800	%
		CTR2	I_F = 1 mA, V_{CE} = 5 V	300		800	%
	Collector Saturation Voltage	$V_{CE\ (sat)}$	I_F = 0.1 mA, I_C = 0.2 mA			0.3	V
	Isolation Resistance	R_{I-O}	V_{I-O} = 1kV_{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_F = 0.1 mA, R_L = 51 kΩ		115		µs
	Fall Time *1	t_f			1 150		
	Turn-on Time *1	t_{on}			130		
	Turn-off Time *1	t_{off}			1 300		
	Rise Time *1	t_r	V_{CC} = 5 V, I_C = 2 mA, R_L = 100 Ω		5		µs
	Fall Time *1	t_f			6		

Notes: *1. Test circuit for switching time

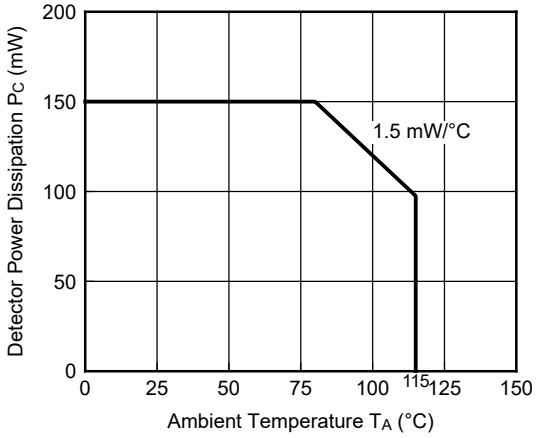


TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise specified)

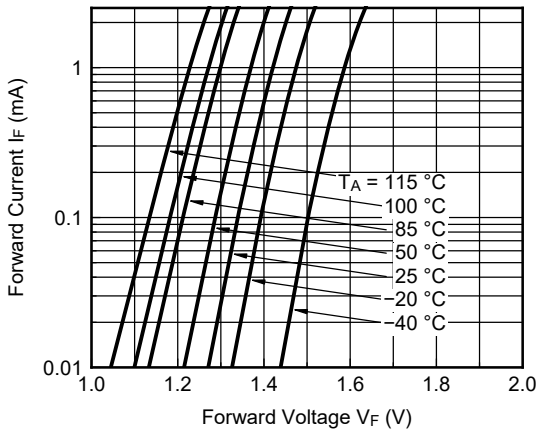
DIODE POWER DISSIPATION vs. AMBIENT TEMPERATURE



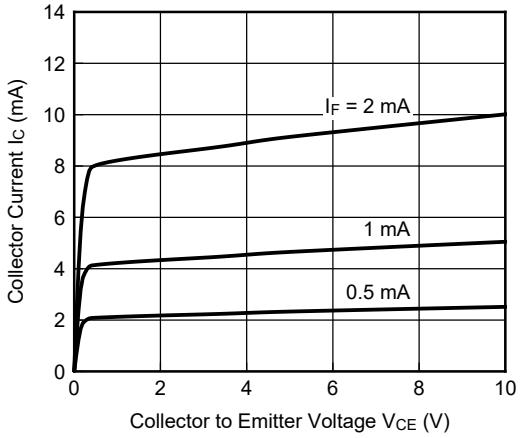
DETECTOR POWER DISSIPATION vs. AMBIENT TEMPERATURE



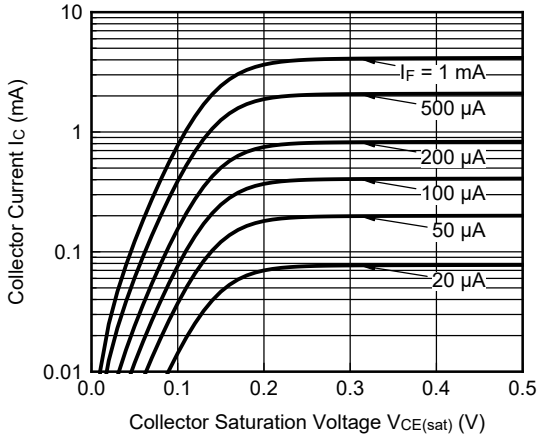
FORWARD CURRENT vs. FORWARD VOLTAGE



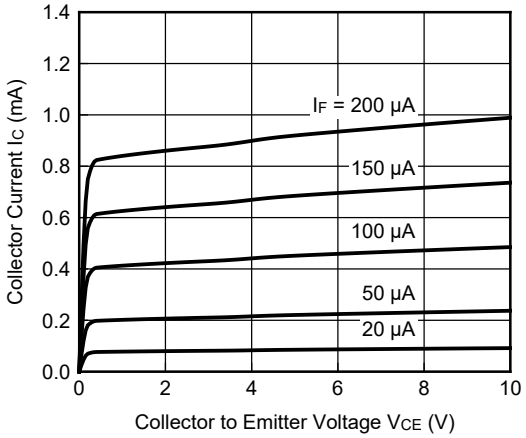
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



COLLECTOR CURRENT vs. COLLECTOR SATURATION VOLTAGE



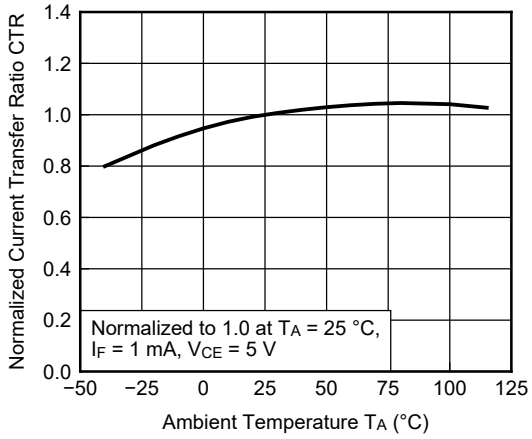
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



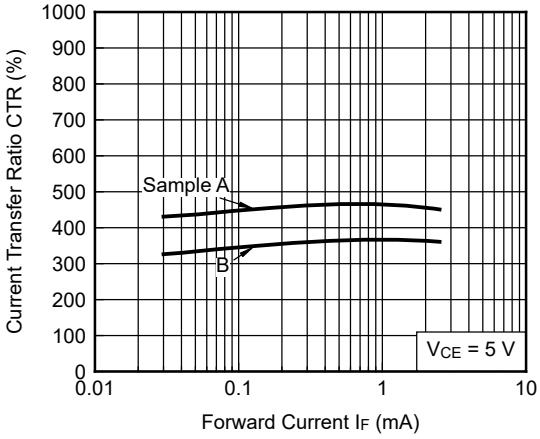
Remark The graphs indicate nominal characteristics.

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

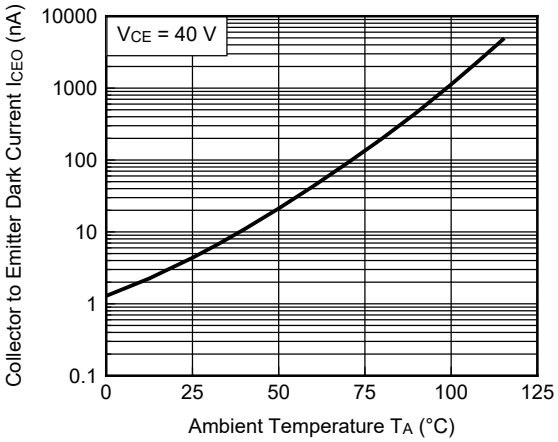
NORMALIZED CURRENT TRANSFER RATIO vs. AMBIENT TEMPERATURE



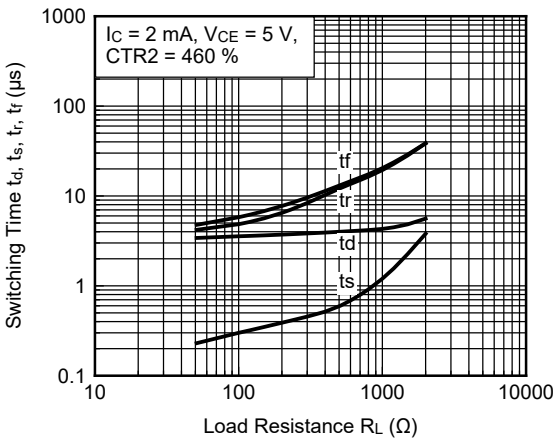
CURRENT TRANSFER RATIO vs. FORWARD CURRENT



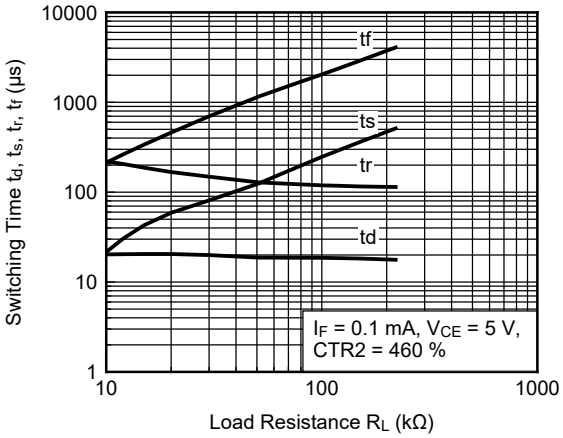
COLLECTOR TO EMITTER DARK CURRENT vs. AMBIENT TEMPERATURE



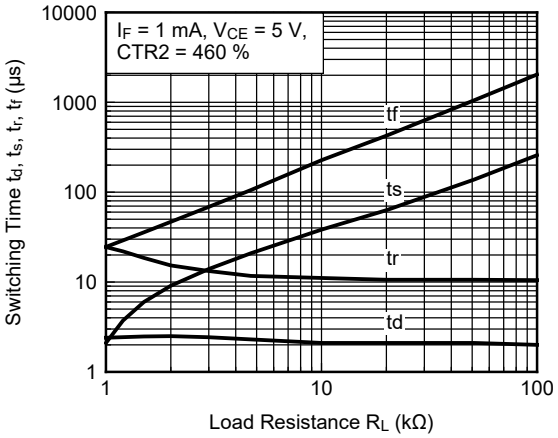
SWITCHING TIME vs. LOAD RESISTANCE



SWITCHING TIME vs. LOAD RESISTANCE



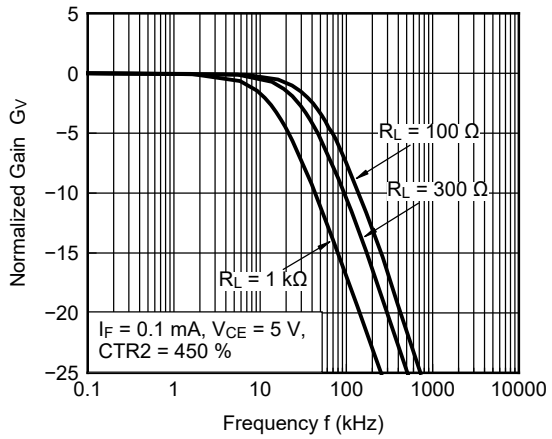
SWITCHING TIME vs. LOAD RESISTANCE



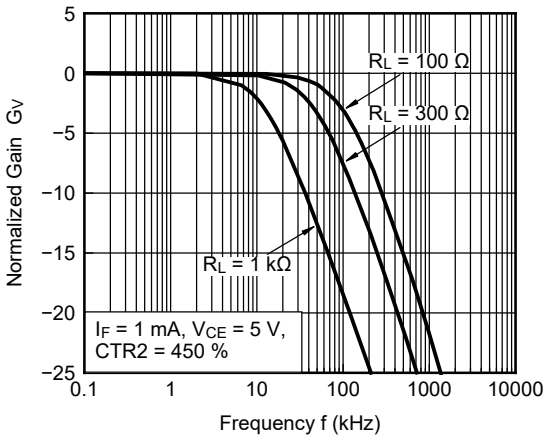
Remark The graphs indicate nominal characteristics.

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

NORMALIZED GAIN vs. FREQUENCY



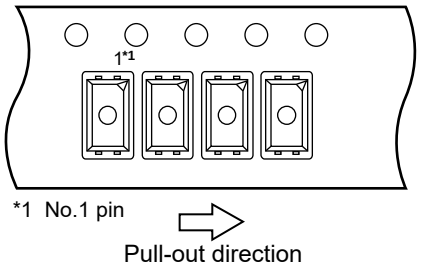
NORMALIZED GAIN vs. FREQUENCY



Remark The graphs indicate nominal characteristics.

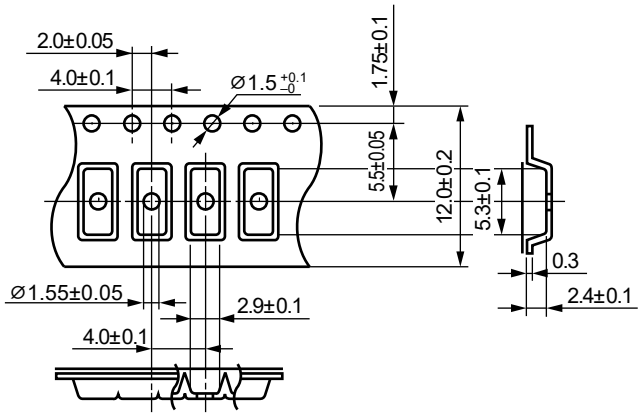
TAPING SPECIFICATIONS (UNIT: mm)

Tape Direction



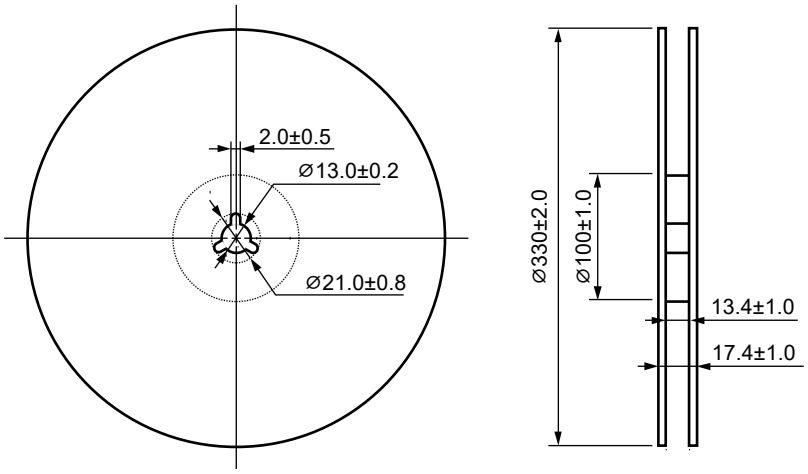
Outline and Dimensions (Tape)

(UNIT: mm)



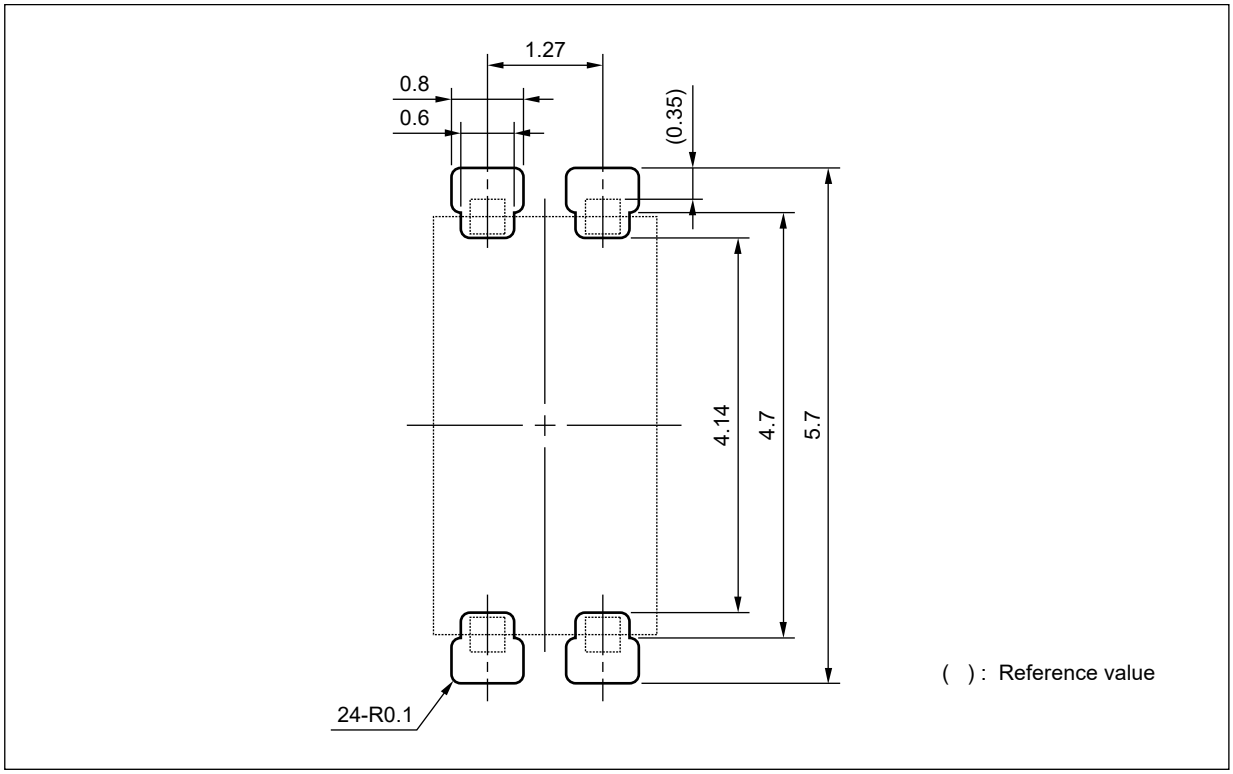
Outline and Dimensions (Reel)

(UNIT: mm)



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.

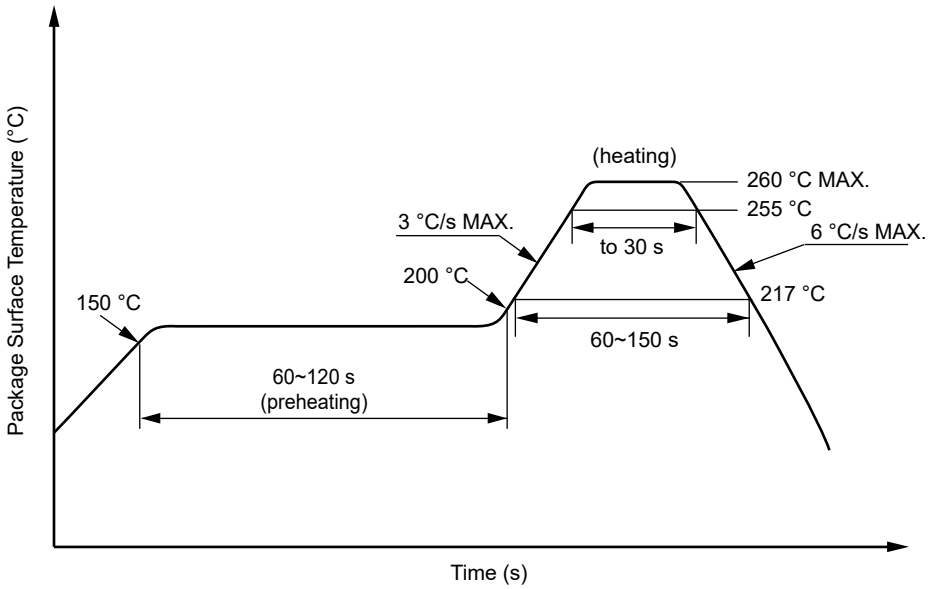
NOTES ON HANDLING

1. Recommended soldering conditions

(1) Infrared reflow soldering

• Peak reflow temperature	260 °C or below (package surface temperature)
• Time of peak reflow temperature -5 °C (255 °C)	30 seconds or less
• Time of temperature higher than 217 °C	60 to 150 seconds
• Time to preheat temperature from 150 to 200 °C	60 to 120 seconds
• 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



JEDEC J-STD-020E compliant soldering conditions

(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.

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 of the like into consideration before use.

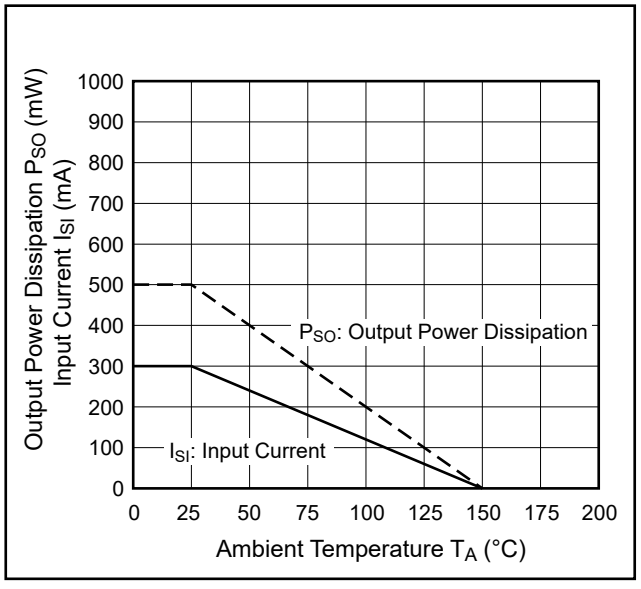
USAGE CAUTIONS

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

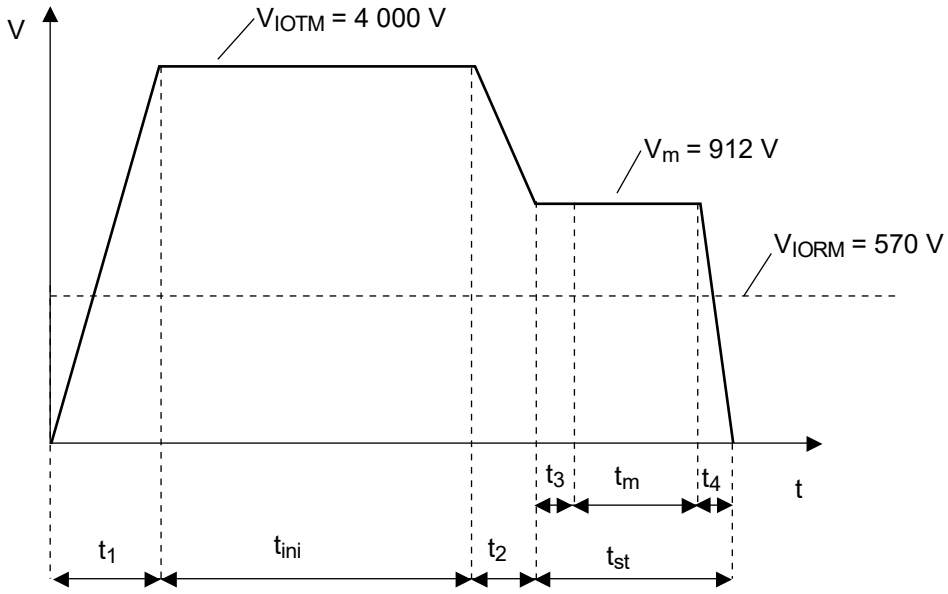
SPECIFICATION OF VDE MARKS LICENSE DOCUMENT

Parameter	Symbol	Rating	Unit
Climatic test class (IEC 60068-1/DIN EN 60068-1)		40/115/21	
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	1 069	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}	−40 to +125	°C
Operating temperature range	T_A	−40 to +115	°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 on ambient temperature

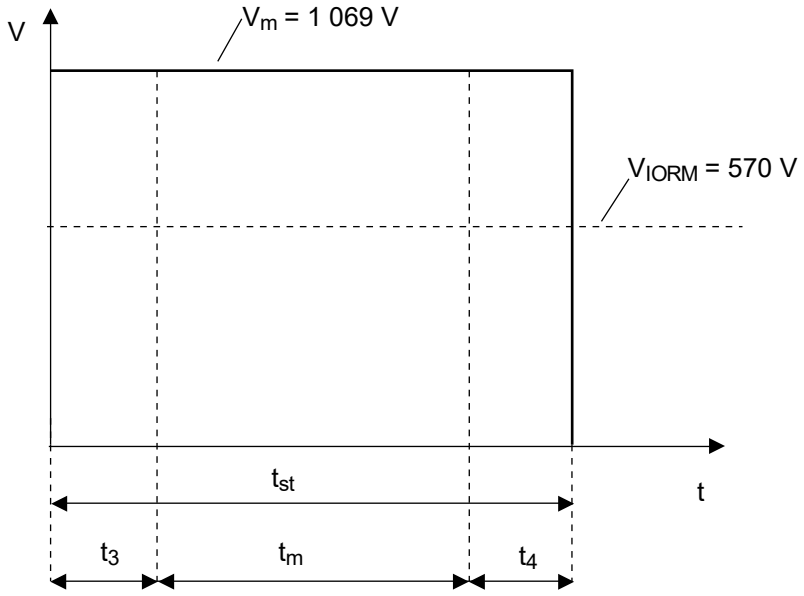


Method a) Destructive Test, Type and Sample Test



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

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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