

RV1S2451A

R08DS0290EJ0200

LOW FORWARD-CURRENT(I_F), OPERATING AMBIENT TEMPERATURE 115 °C,
8-PIN SOP WITH 15 mm CREEPAGE DISTANCE (LSDIP8) PHOTOCOUPLER

Rev.2.00

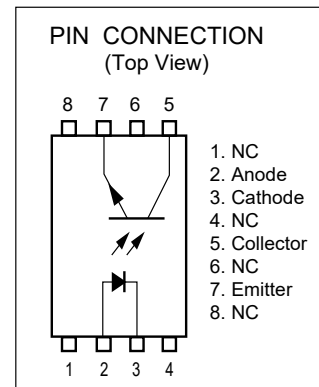
Oct. 11, 2024

DESCRIPTION

The RV1S2451A is an optically coupled isolator containing an AlGaAs LED on the input side and an NPN silicon phototransistor on the output side. The RV1S2451A is advanced package for high-voltage systems with very long creepage distance (15 mm). This product is suitable to reduce the board space when it is required to ensure higher isolation, such as 1 500V PV system, 690V industrial inverters and so on.

FEATURES

- Long creepage distance (15 mm MIN.)
- High current transfer ratio (CTR = 300 % MIN. @ I_F = 50 μA)
- Operating ambient temperature (115 °C MAX.)
- High isolation voltage (BV = 7 500 Vr.m.s.)
- Embossed tape product:
RV1S2451ACCSP-10Yx#KC0: 1 000 pcs/reel
- Pb-free product
Safety standard
 - UL : UL1577, Double protection
 - CSA : CAN/CSA-C22.2 No.62368-1, Reinforced insulation
 - VDE : DIN EN IEC 60747-5-5 (Option)

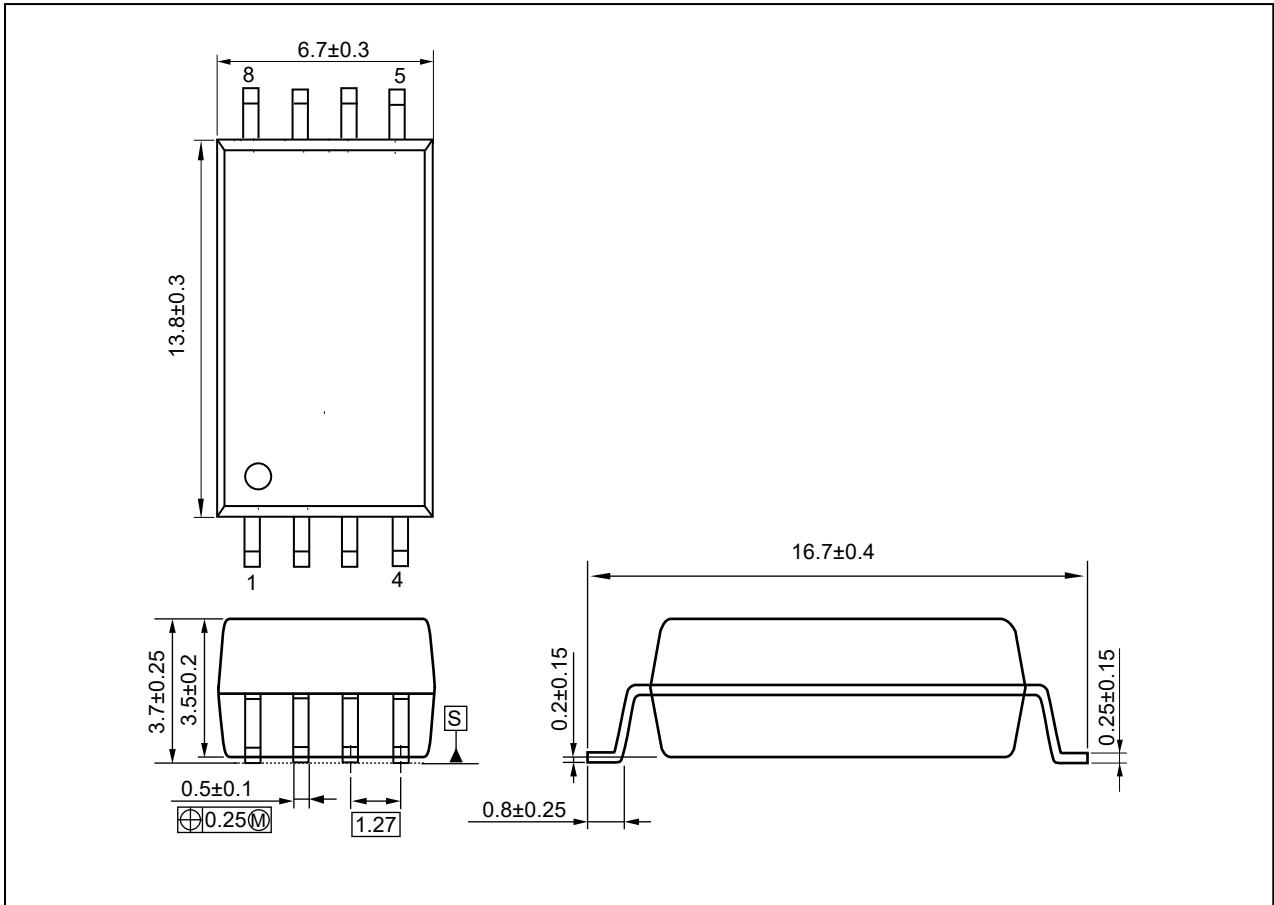


APPLICATIONS

- Inverter
- Measurement equipment
- Power supply

Start of mass production
Jul.2024

PACKAGE DIMENSIONS (UNIT: mm)

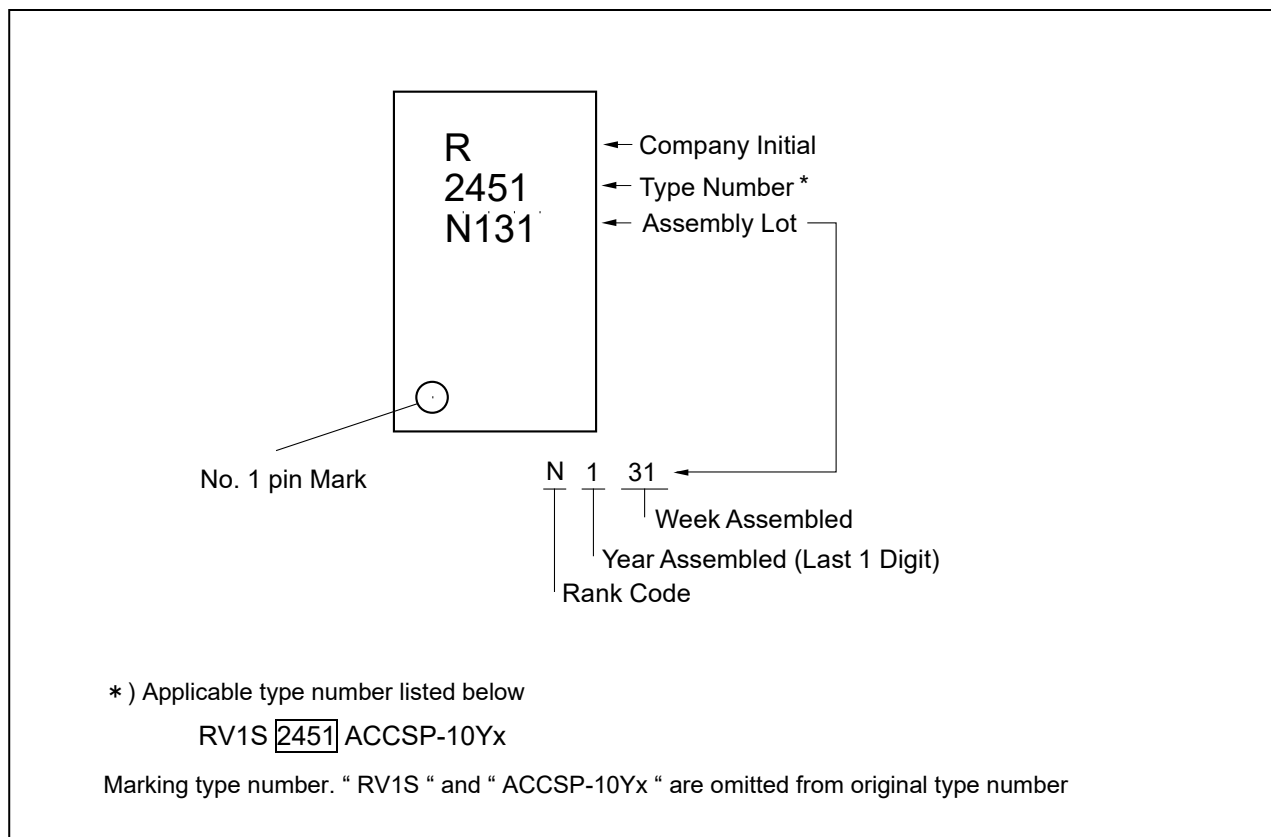


Weight : 0.642 g (TYP.)

PHOTOCOUPLER CONSTRUCTION

Parameter	MIN.
Air Distance	14.5 mm
Creepage Distance	15 mm
Isolation Distance	0.15 mm

MARKING EXAMPLE



ORDERING INFORMATION

Part Number	Order Number	Solder Plating Specification	Packing Style	Safety Standard Approval	Application Part Number *1
RV1S2451ACCSP-10YC	RV1S2451ACCSP-10YC#SC0	Pb-Free and Halogen Free (Ni/Pd/Au)	Embossed Tape 10 pcs	UL, CSA Approved	RV1S2451A
	RV1S2451ACCSP-10YC#KC0		Embossed Tape 1 000 pcs/reel		
RV1S2451ACCSP-10YV	RV1S2451ACCSP-10YV#SC0		Embossed Tape 10 pcs	UL, CSA, VDE Approved	
	RV1S2451ACCSP-10YV#KC0		Embossed Tape 1 000 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	P _C	150	mW
Isolation Voltage *3		BV	7 500	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.

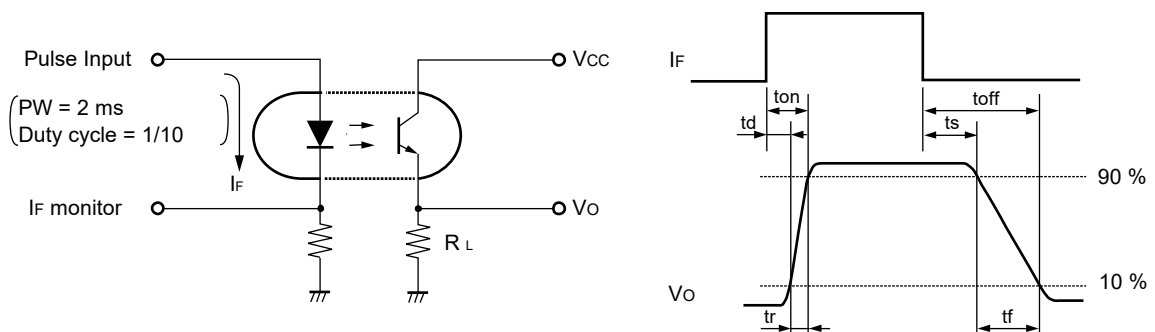
*3. AC voltage for 1 minute at T_A = 25 °C, RH = 60% between input and output.

Pins 1-4 shorted together, 5-8 shorted together.

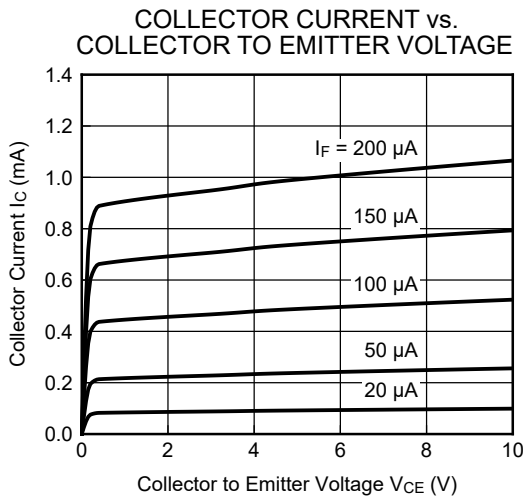
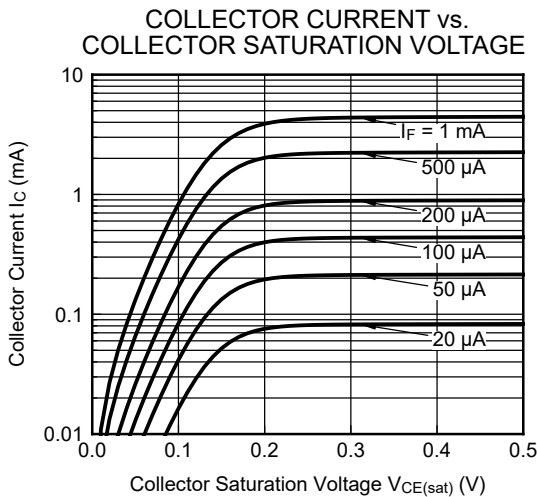
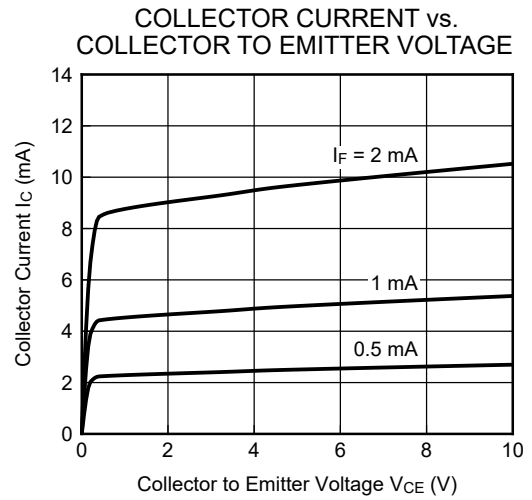
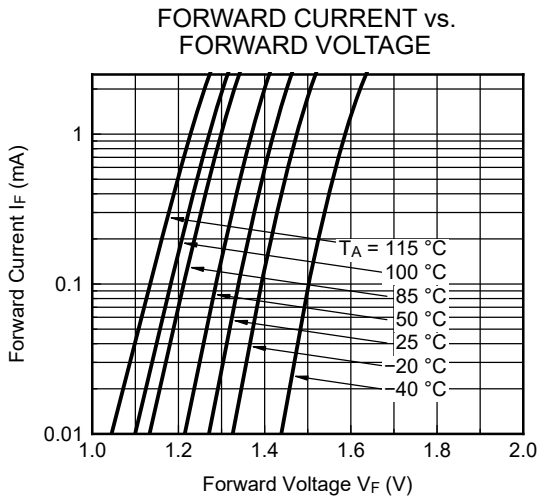
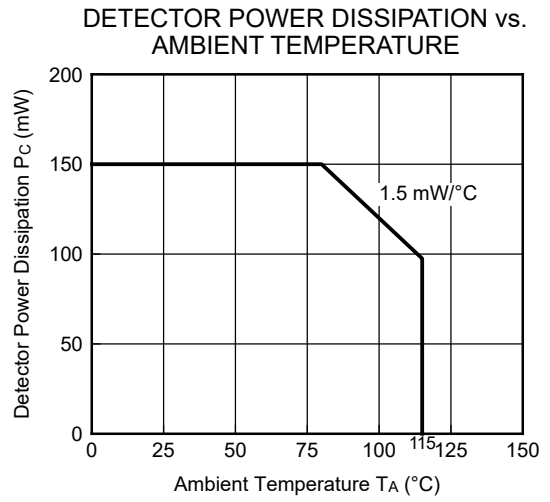
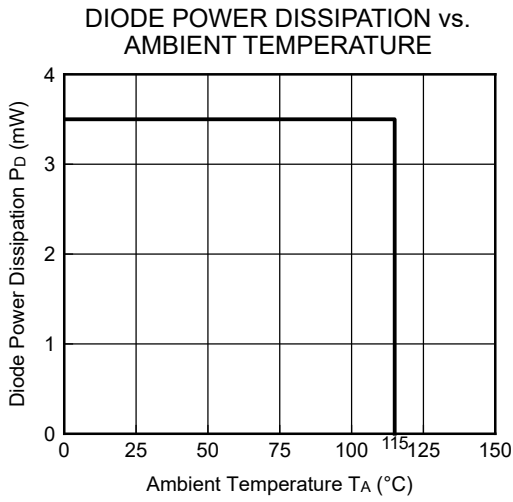
ELECTRICAL CHARACTERISTICS (T_A = 25 °C)

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 _i	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		1 000	%
		CTR2	I _F = 1 mA, V _{CE} = 5 V	300		1 000	%
	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



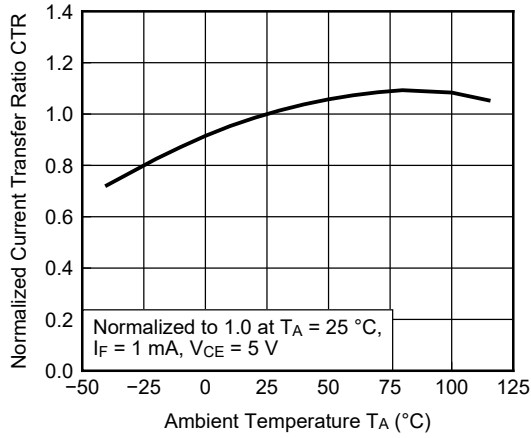
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise specified)



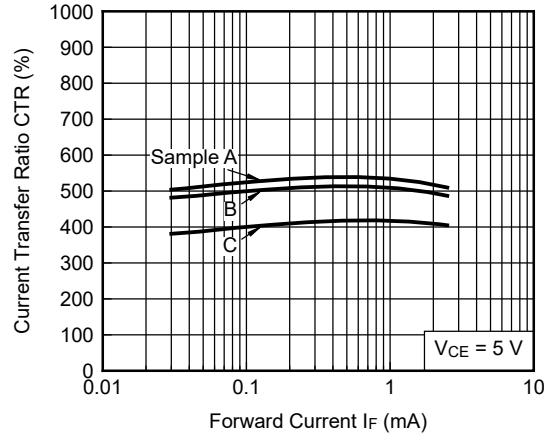
Remark The graphs indicate nominal characteristics.

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

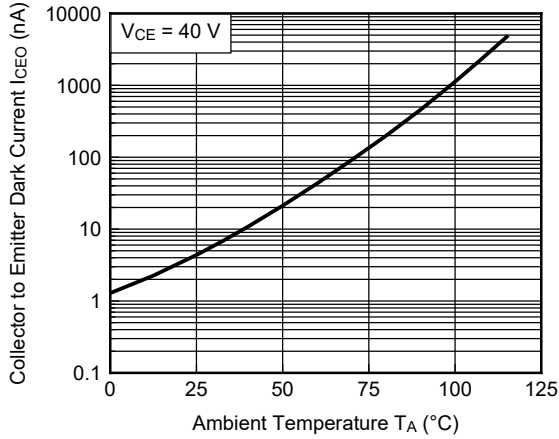
NORMALIZED CURRENT TRANSFER RATIO vs. AMBIENT TEMPERATURE



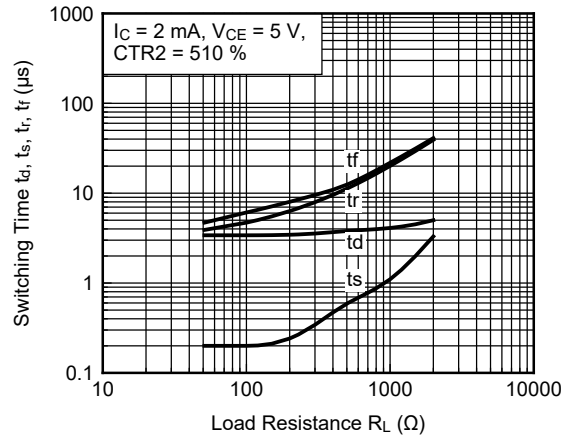
CURRENT TRANSFER RATIO vs. FORWARD CURRENT



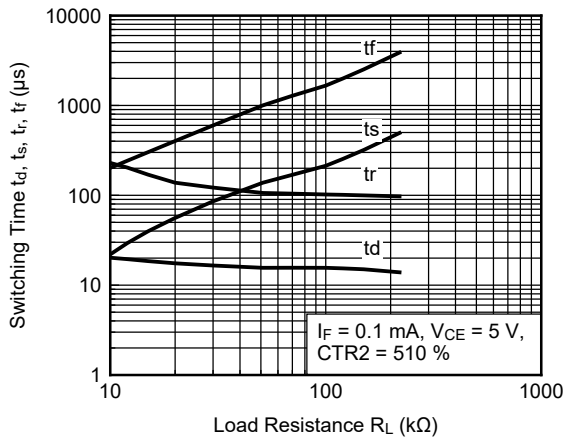
COLLECTOR TO EMITTER DARK CURRENT vs. AMBIENT TEMPERATURE



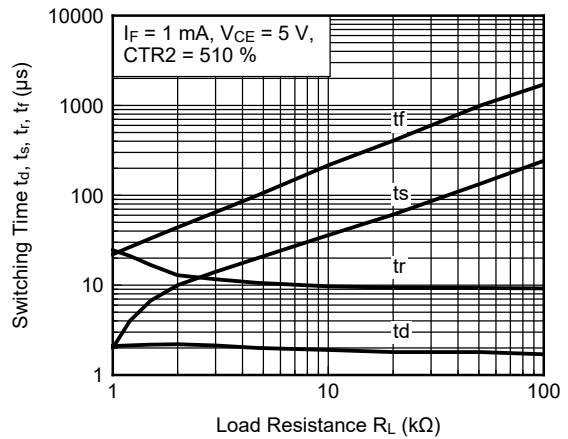
SWITCHING TIME vs. LOAD RESISTANCE



SWITCHING TIME vs. LOAD RESISTANCE

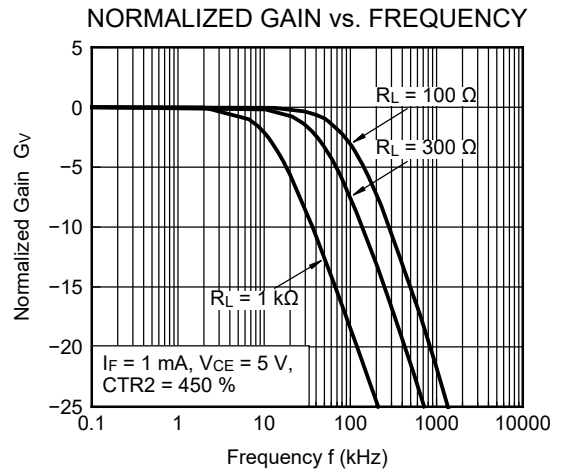
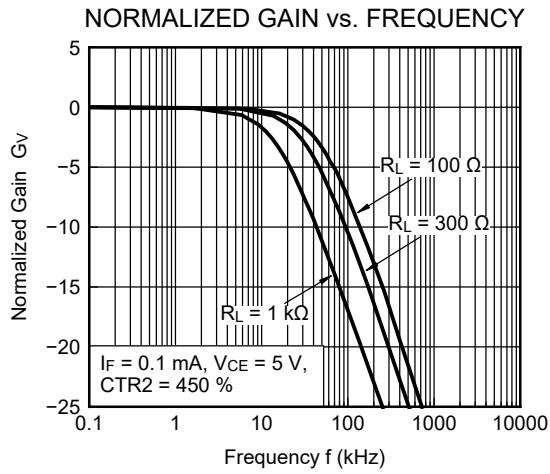


SWITCHING TIME vs. LOAD RESISTANCE



Remark The graphs indicate nominal characteristics.

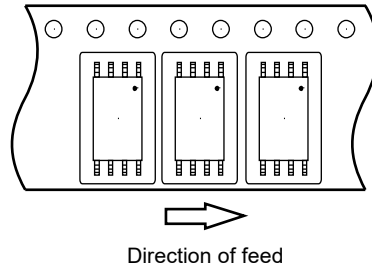
TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^\circ\text{C}$, unless otherwise specified)



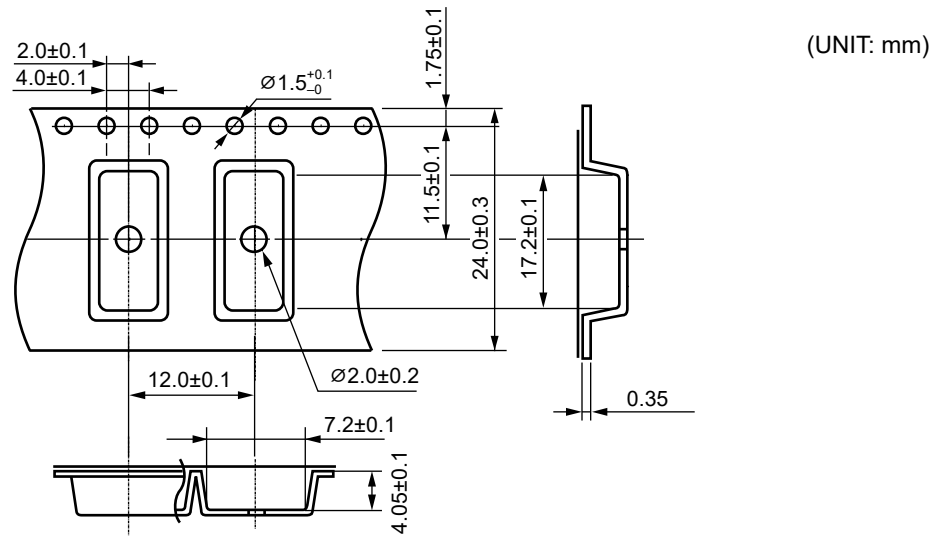
Remark The graphs indicate nominal characteristics.

TAPING SPECIFICATIONS (UNIT: mm)

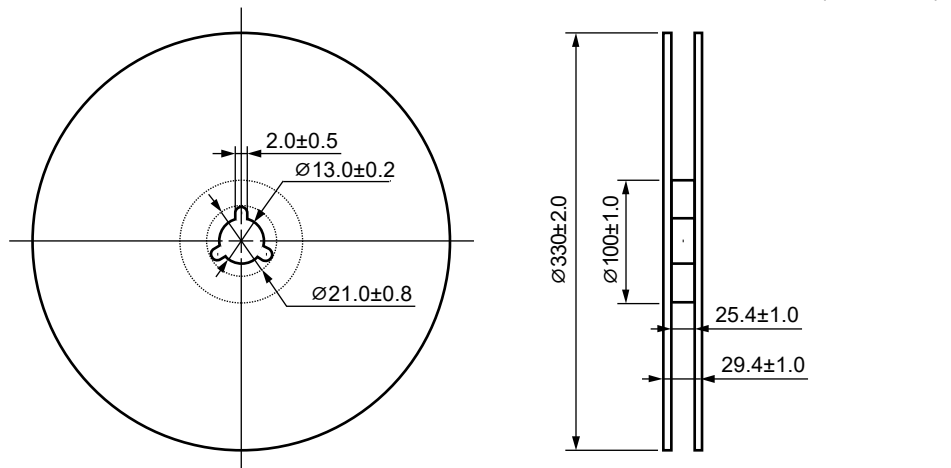
Tape Direction



Outline and Dimensions (Tape)

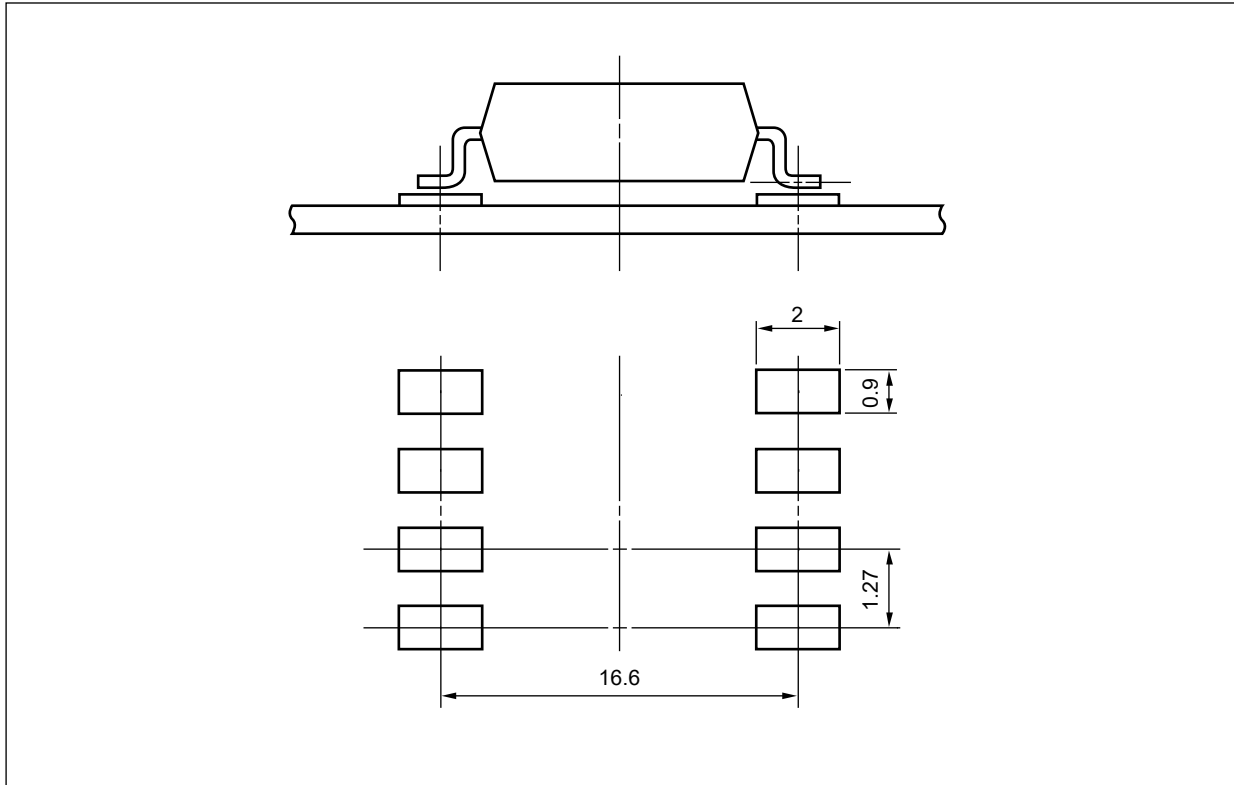


Outline and Dimensions (Reel)



包装数量: 1 000個/リール

RECOMMENDED MOUNT PAD DIMENSIONS (UNIT: mm)



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

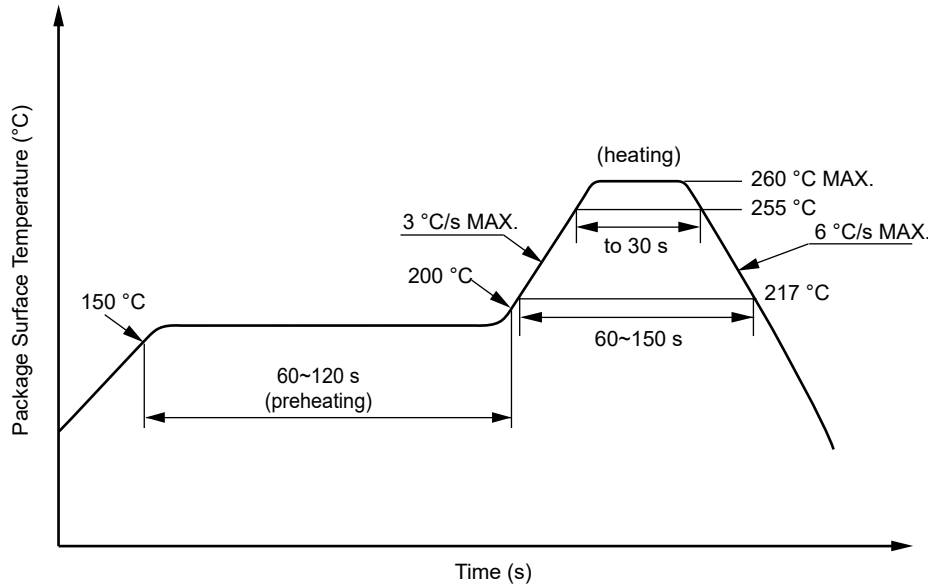
NOTES ON HANDLING

1. Recommended soldering conditions

(1) Infrared reflow soldering

- Peak reflow temperature 260 °C or below (package surface temperature)
- Time of peak reflow temperature -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) 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 of the like into consideration before use.

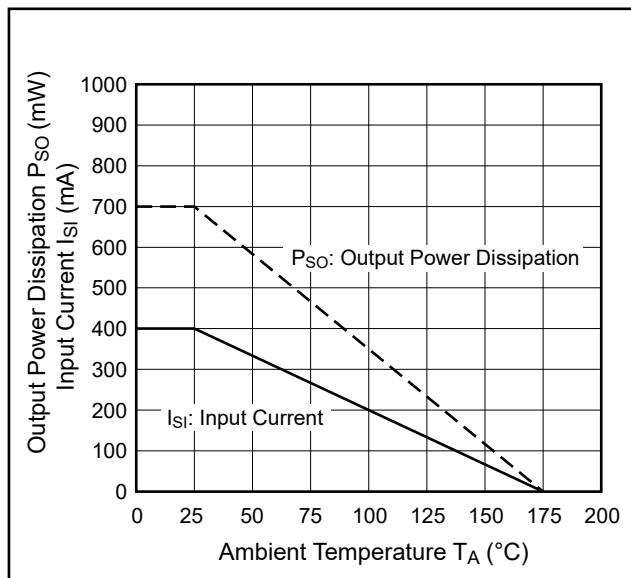
USAGE CAUTIONS

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

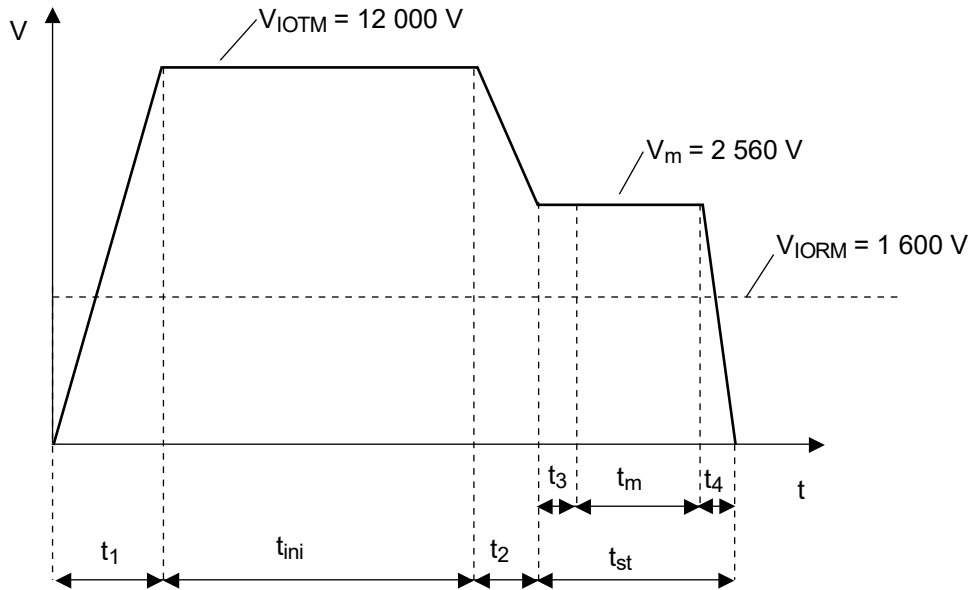
SPECIFICATION OF VDE MARKS LICENSE DOCUMENT

Parameter	Symbol	Rating	Unit
Climatic test class (IEC 60068-1/DIN EN 60068-1)		40/115/21	
Dielectric strength maximum operating isolation voltage	V_{IORM}	1 600	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	2 560	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	3 000	V_{peak}
Highest permissible overvoltage	V_{IOTM}	12 000	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 $V_{I-O} = 500 \text{ V dc}, T_A = 25 \text{ °C}$ $V_{I-O} = 500 \text{ V dc}, T_A = \text{maximum temperature of rating, at least } 100 \text{ °C}$	$R_{I-O} \text{ MIN.}$ $R_{I-O} \text{ MIN.}$	10^{12} 10^{11}	Ω Ω
Safety maximum ratings (maximum permissible in case of fault, see thermal derating curve)			
Maximum ambient temperature	T_s	175	°C
Maximum input current	I_{SI}	400	mA
Maximum output power dissipation	P_{SO}	700	mW
Isolation resistance, minimum value at $V_{I-O} = 500 \text{ V dc}, T_A = T_s$	$R_{I-O} \text{ MIN.}$	10^9	Ω

Dependence of maximum safety ratings on ambient temperature

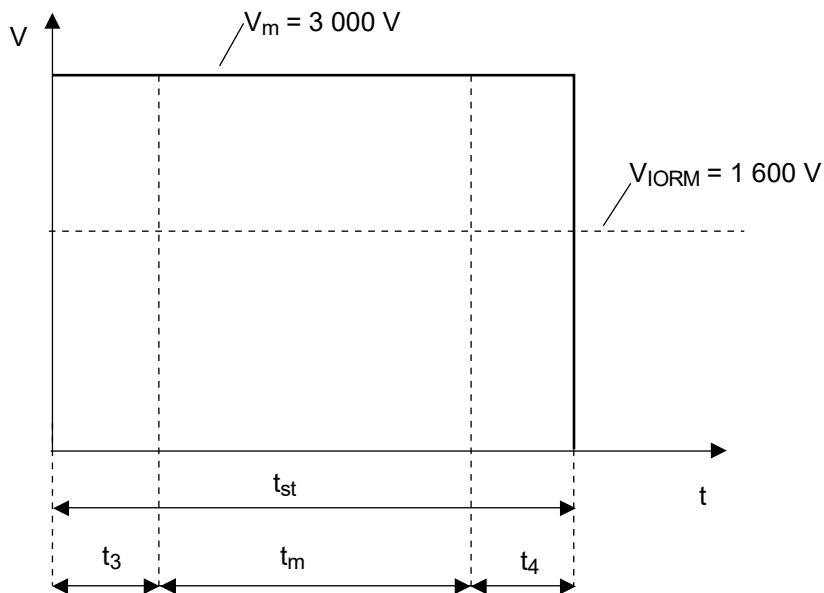


Method a) Destructive Test, Type and Sample Test



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

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



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

Caution	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">• 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">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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