PS2535-1, PS2535L-1

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Rev.2.00
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HIGH COLLECTOR TO EMITTER VOLTATGE HIGH ISOLATION VOLTAGE

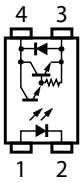
DESCRIPTION

The PS2535-1 and PS2535L-1 are optically coupled isolator containing a GaAs light emitting diode and an NPN silicon Darlington-connected phototransistor. High isolation voltage between the I/O, the high voltage between the collector and emitter of the transistor, and Darlington transistor output enables low-current input. The PS2535-1 is a plastic DIP (Dual In-line Package) model for the pin Insertion mounting and the PS2535L-1 is a Gull-wing lead bending model modified from the PS2535-1 for the surface mounting.

FEATURES

- High collector to emitter voltage (V_{CEO} = 350 V)
- High isolation voltage (BV = 5 000 Vr.m.s.)
- High current transfer ratio (CTR = 1 500 % TYP.)
- Embossed tape product: PS2535L-1-F3: 2 000 pcs/reel
- Pb-free product
- Safety standards
  - UL approved: UL 1577, Double protection
  - BSI approved: BS EN IEC 62368-1, Reinforced insulation
  - VDE approved: DIN EN IEC 60747-5-5 (Option)

PIN CONNECTION
(Top View)



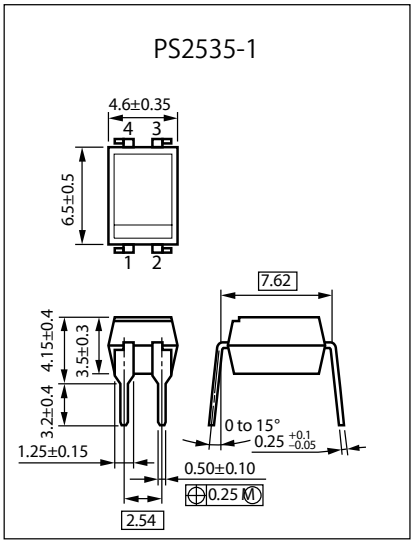
1. Anode
2. Cathode
3. Emitter
4. Collector

APPLICATIONS

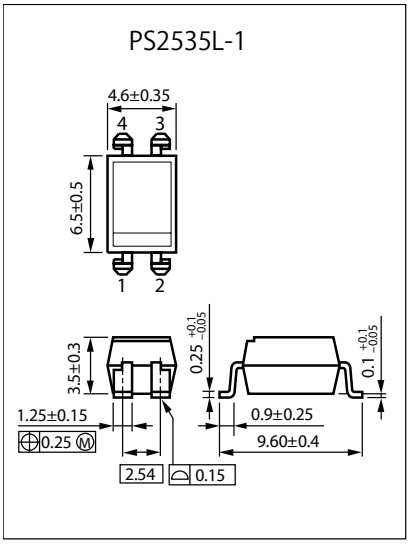
- Telephone, Exchange equipment
- FAX/MODEM

PACKAGE DIMENSIONS (UNIT: mm)

DIP Type



Lead Bending Type For Surface Mount

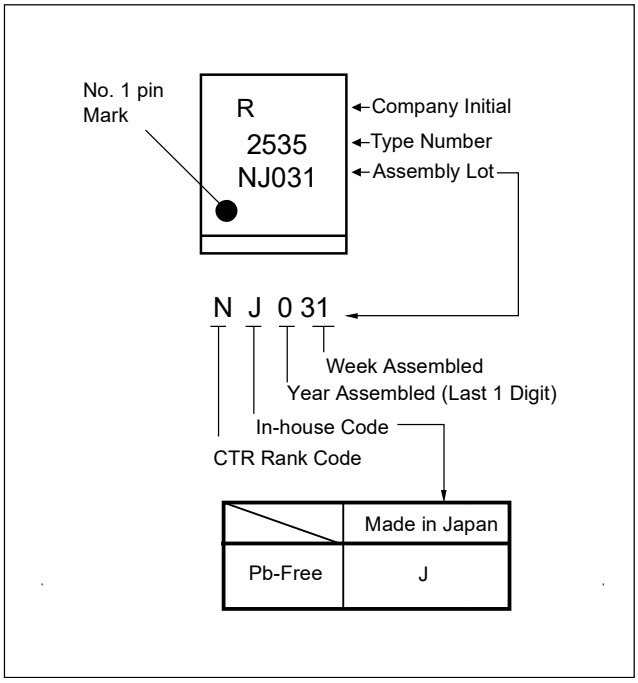


Weight (4-pin DIP) : 0.26 g (TYP.)

PHOTOCOUPLER CONSTRUCTION

Parameter	PS2535-1, PS2535L-1
Air Distance (MIN.)	7 mm
Creepage Distance (MIN.)	7 mm
Isolation Distance (MIN.)	0.4 mm

MARKING EXAMPLE



ORDERING INFORMATION

Part Number	Order Number *1	Solder Plating Specification	Packing Style	Safety Standard Approval	Application Part Number *2
PS2535-1	PS2535-1-A	Pb-Free	Magazine case 100 pcs	Standard Products (UL, BSI, Approved)	PS2535-1
PS2535L-1	PS2535L-1-A				PS2535L-1
PS2535L-1-F3	PS2535L-1-F3-A		Embossed Tape 2 000 pcs/reel		PS2535L-1
PS2535-1-V	PS2535-1-V-A		Magazine case 100 pcs	UL, BSI, VDE Approved	PS2535-1
PS2535L-1-V	PS2535L-1-V-A				PS2535L-1
PS2535L-1-V-F3	PS2535L-1-V-F3-A		Embossed Tape 2 000 pcs/reel		PS2535L-1

Notes: *1. When specifying CTR rank, please add “-CTR rank” after Order Number.

ex. L rank : PS2535-1-A-L

Notes: *2. 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	50	mA
	Reverse Voltage	V_R	6	V
	Power Dissipation *1	P_D	70	mW
	Peak Forward Current *2	I_{FP}	0.5	A
Transistor	Collector to Emitter Voltage	V_{CEO}	350	V
	Emitter to Collector Voltage	V_{ECO}	0.3	V
	Collector Current	I_C	120	mA
	Power Dissipation *3	P_C	200	mW
Isolation Voltage *4		BV	5 000	Vr.m.s.
Operating Ambient Temperature		T_A	–55 to +100	°C
Storage Temperature		T_{stg}	–55 to +150	°C

Note: *1. Reduced to 0.7 mW/°C at T_A = 25 °C or more.
*2. PW = 100 µs, Duty Cycle = 1 %
*3. Reduced to 2.0 mW/°C at T_A = 25 °C or more.
*4. 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)

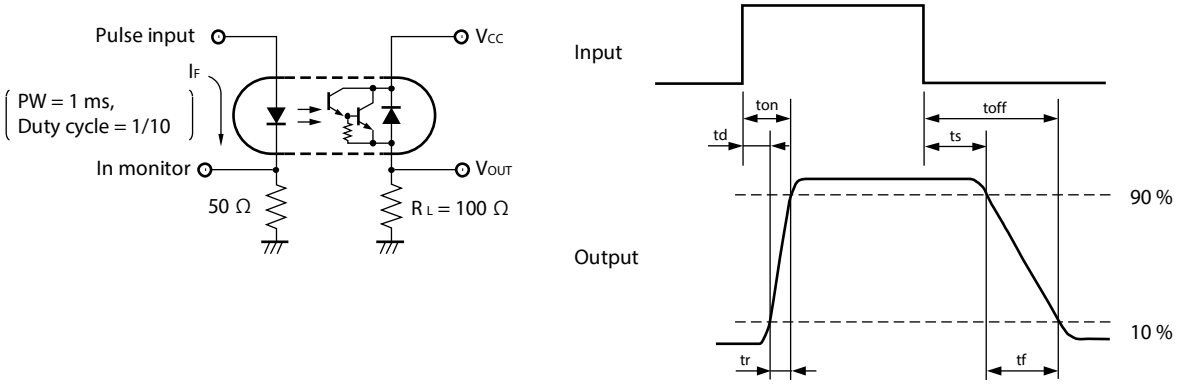
Parameter		Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Diode	Forward Voltage	V_F	I_F = 10 mA		1.2	1.4	V
	Reverse Current	I_R	V_R = 5 V			5	μA
	Terminal Capacitance	C_t	V = 0 V, f = 1.0 MHz		15		pF
Transistor	Collector to Emitter Dark Current	I_{CEO}	V_{CE} = 350 V, I_F = 0 mA			400	nA
Coupled	Current Transfer Ratio (I_C/I_F) *1	CTR	I_F = 1 mA, V_{CE} = 2 V	400	1 500	5 500	%
	Collector Saturation Voltage	$V_{CE\ (sat)}$	I_F = 1 mA, I_C = 2 mA			1.0	V
	Isolation Resistance	R_{I-O}	V_{I-O} = 1.0 kV_{DC}	10^{11}			Ω
	Isolation Capacitance	C_{I-O}	V = 0 V, f = 1.0 MHz		0.6		pF
	Rise Time *2	t_r	V_{CC} = 5 V, I_C = 10 mA, R_L = 100 Ω		18		μs
	Fall Time *2	t_f			5		

Note: *1. CTR rank

N: 400 to 5 500 (%)

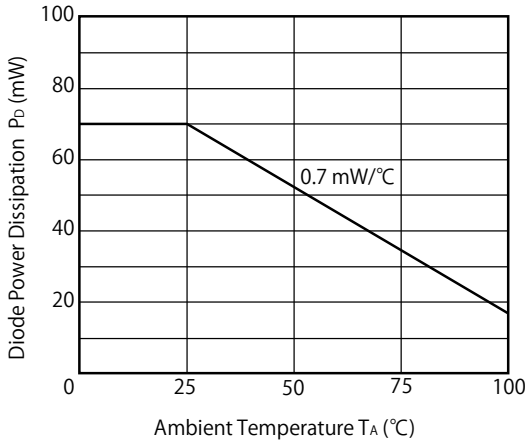
L: 1 500 to 5 500 (%)

*2. Test Circuit for Switching Time

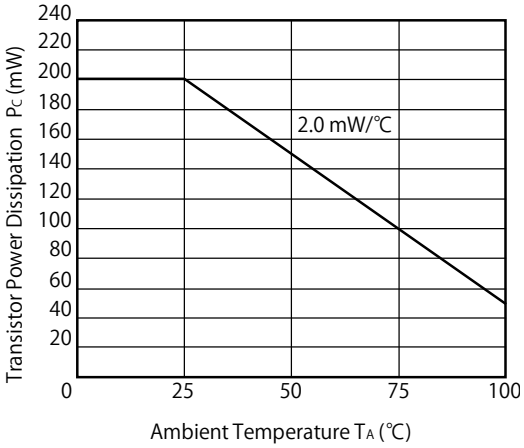


TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise specified)

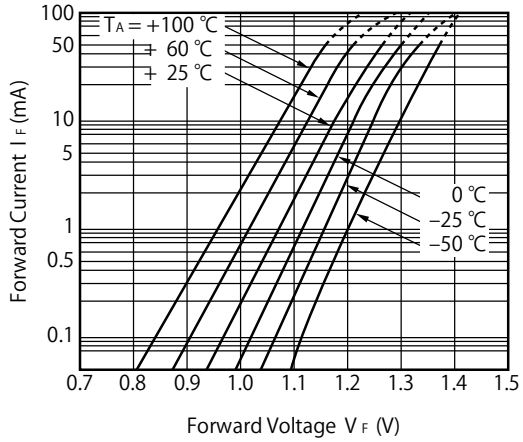
DIODE POWER DISSIPATION vs. AMBIENT TEMPERATURE



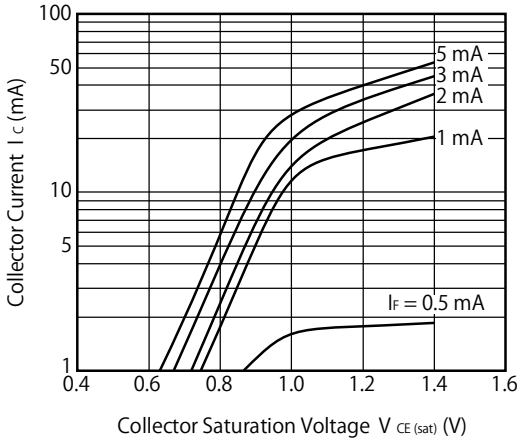
TRANSISTOR POWER DISSIPATION vs. AMBIENT TEMPERATURE



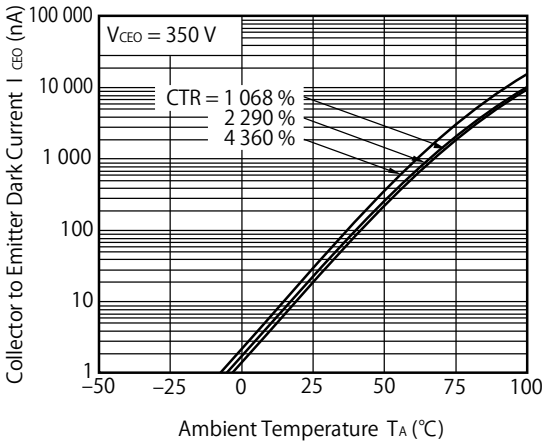
FORWARD CURRENT vs. FORWARD VOLTAGE



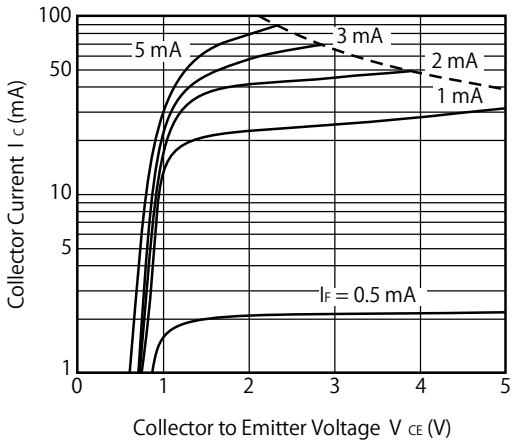
COLLECTOR CURRENT vs. COLLECTOR SATURATION VOLTAGE



COLLECTOR TO EMITTER DARK CURRENT vs. AMBIENT TEMPERATURE

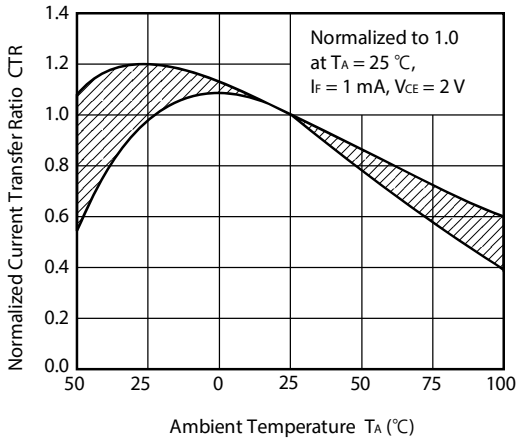


COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE

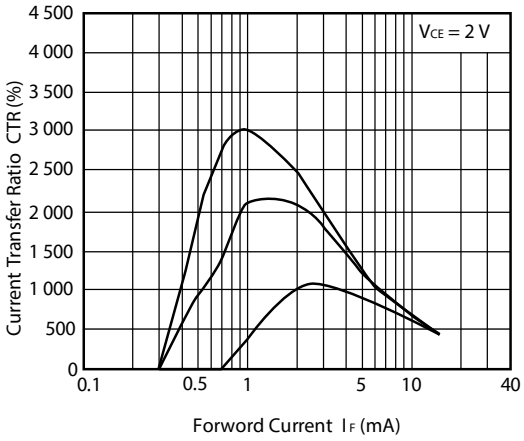


Remark The graphs indicate nominal characteristics.

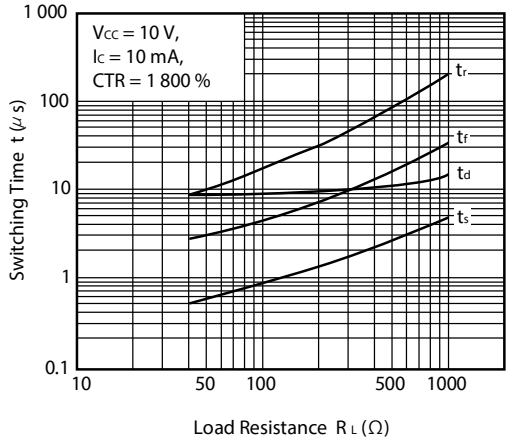
NORMALIZED CURRENT TRANSFER RATIO vs. AMBIENT TEMPERTURE



CURRENT TRANSFER RATIO vs. FORWARD CURRENT



SWITCHING TIME vs. LORD RESISTANCE

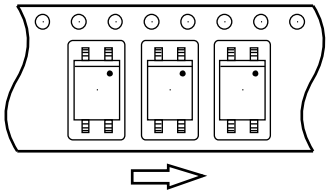


Remark The graphs indicate nominal characteristics.

TAPING SPECIFICATIONS (UNIT: mm)

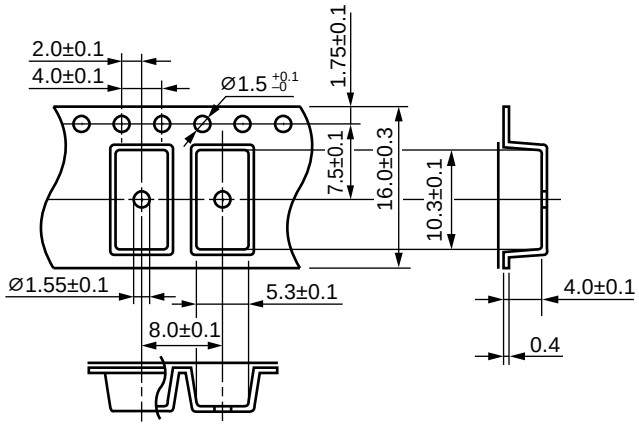
Tape Direction

PS2535L-1-F3

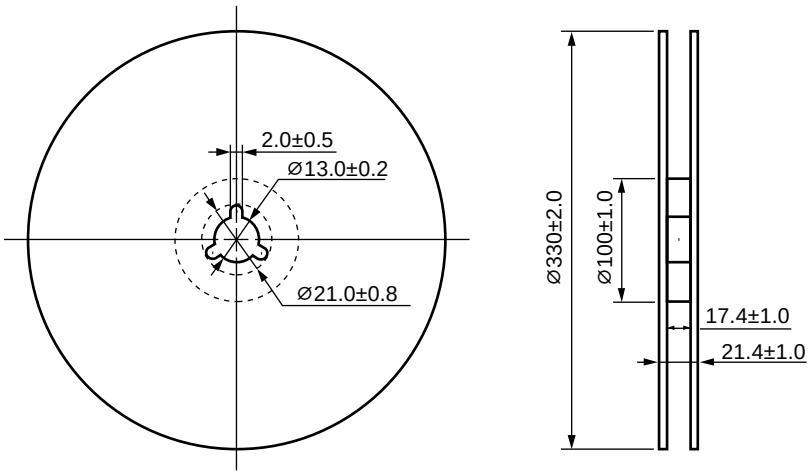


Direction of feed

Outline and Dimensions (Tape)

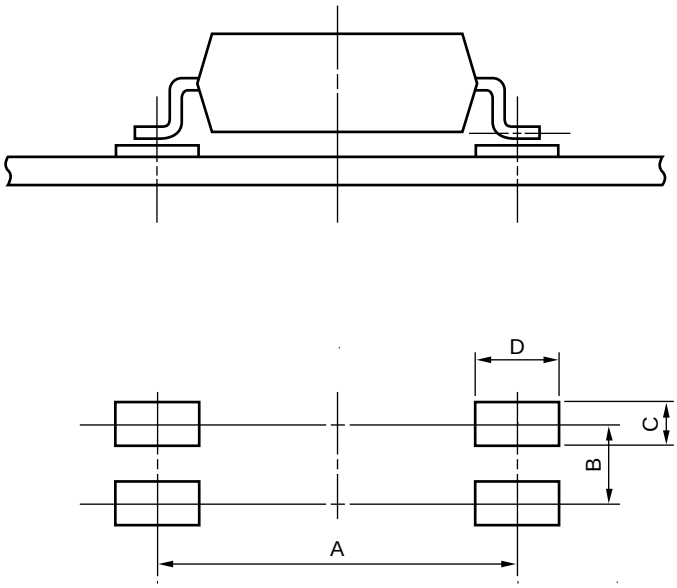


Outline and Dimensions (Reel)



Packing: 2 000 pcs/reel

RECOMMENDED MOUNT PAD DIMENSIONS (UNIT: mm)



Part Number	Lead Bending	A	B	C	D
PS2535L	Lead Bending Type For Surface Mount	8.2	2.54	1.7	2.2

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

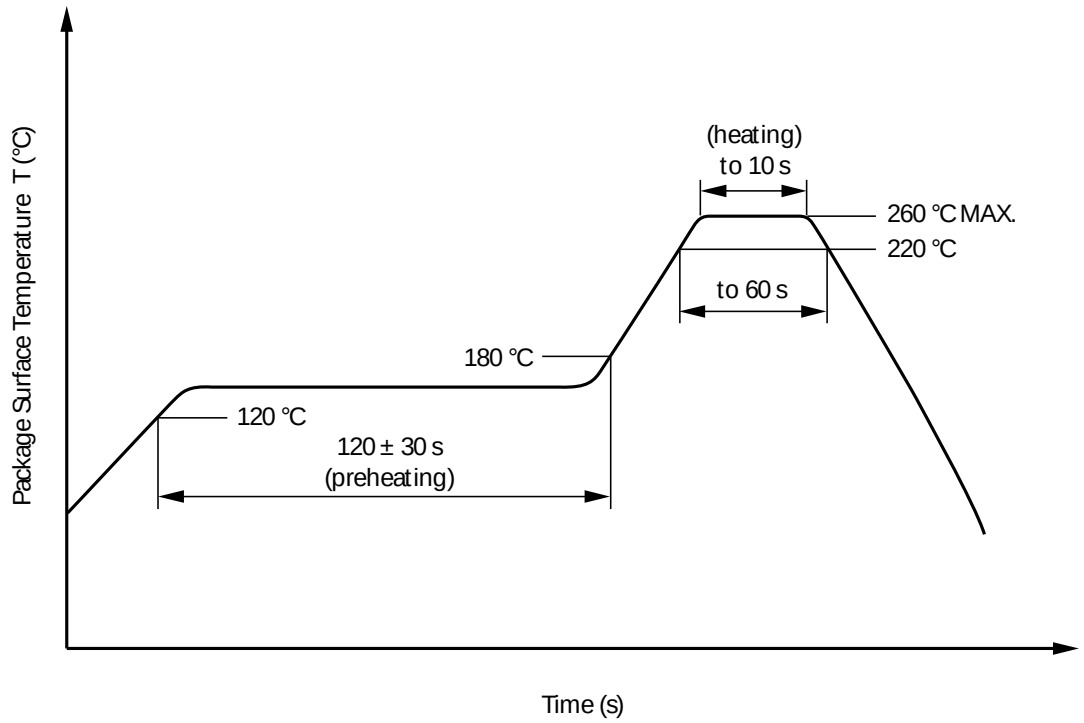
NOTES ON HANDLING

1. Recommended soldering conditions

(1) Infrared reflow soldering

• Peak reflow temperature	260 °C or below (package surface temperature)
• Time of peak reflow temperature	10 s or less
• Time of temperature higher than 220 °C	60 s 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 s 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 or the like into consideration before use.

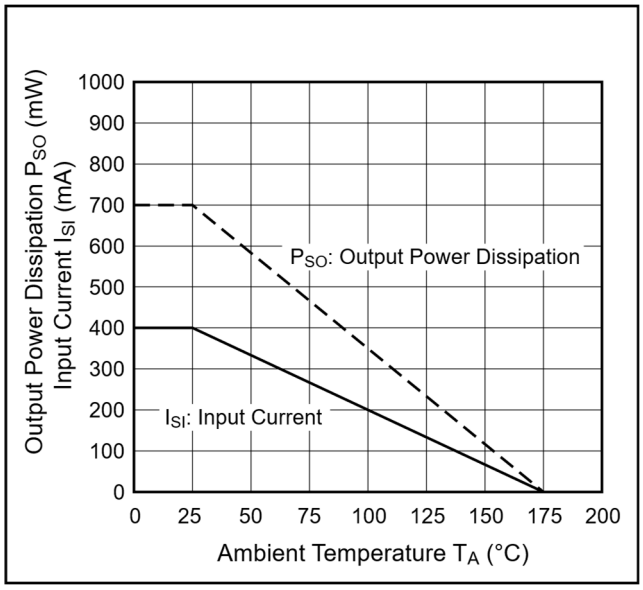
USAGE CAUTIONS

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.

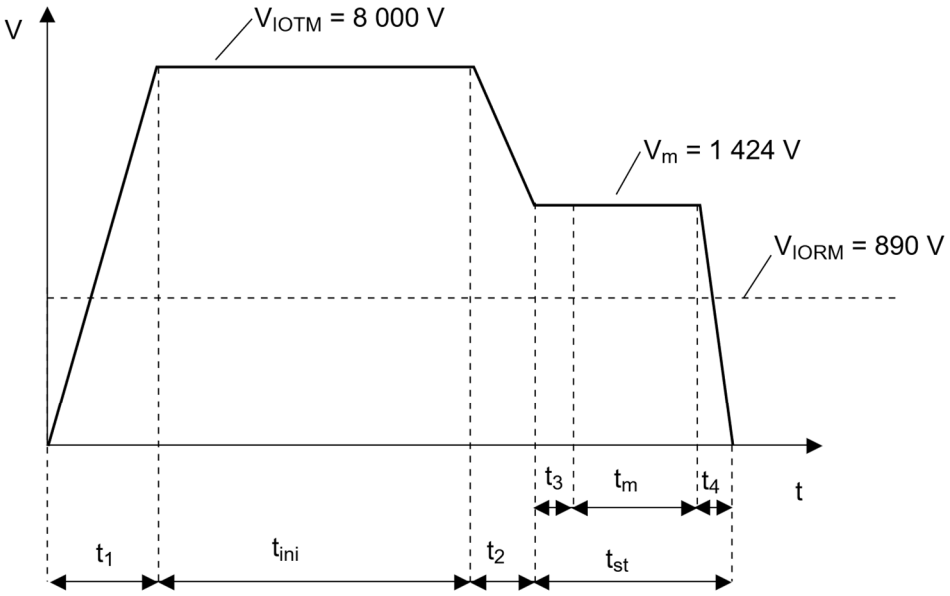
SPECIFICATION OF VDE MARKS LICENSE DOCUMENT

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	 890 1 424	 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	1 669	V_{peak}
Highest permissible overvoltage	V_{IOTM}	8 000	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.	 175 400 700 10^9	 °C mA mW Ω

Dependence of maximum safety ratings on ambient temperature

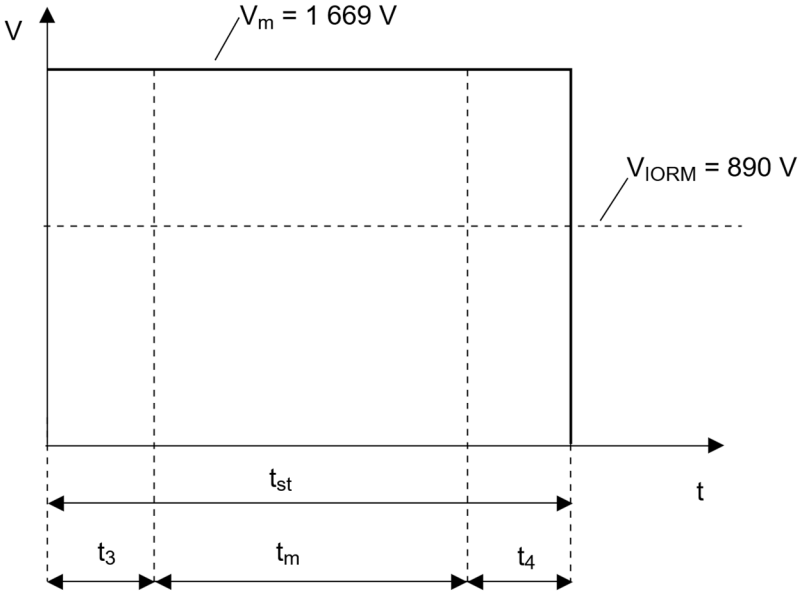


Method a) Destructive Test, Type and Sample Test



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 i any way allow it to enter the mouth.

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