RV1S9162A

R08DS0272EJ0100
Rev.1.00
May 09, 2022

15 Mbps, HIGH CMTI, IPM DRIVER,
5-PIN SOP PHOTOCOUPLER

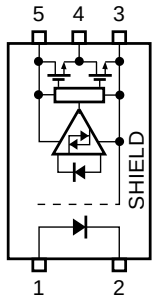
DESCRIPTION

The RV1S9162A is a photocoupler featuring high-speed switching up to 15 Mbps with active low output logic which consists of an AlGaAs LED on the input side and an integrated circuit with a photodiode on the output. The RV1S9162A is designed specifically for high common mode transient immunity (CMTI), wide operating power supply voltage range and high temperature operation up to T_A = 125 °C. It is suitable for IPM (Intelligent Power Module) drive.

FEATURES

- High speed switching (15 Mbps)
- High common mode transient immunity (CM_H, CM_L = ±100 kV/μs MIN.)
- Pulse width distortion ($|t_{PHL} - t_{PLH}|$ = 20 ns MAX.)
- Wide operating power supply voltage range (V_{CC} = 4.5 ~ 30 V)
- Operating ambient temperature (125 °C MAX.)
- High isolation voltage (BV = 3 750 Vr.m.s.)
- Embossed tape product : RV1S9162ACCSP-100x#KC0 : 2 500 pcs/reel
- Pb-Free product
- Safety standard
  - UL : UL1577, Double protection
  - CSA : CAN/CSA-C22.2 No.62368-1, Reinforced insulation
  - VDE : DIN EN 60747-5-5 (Option)

PIN CONNECTION
(Top View)



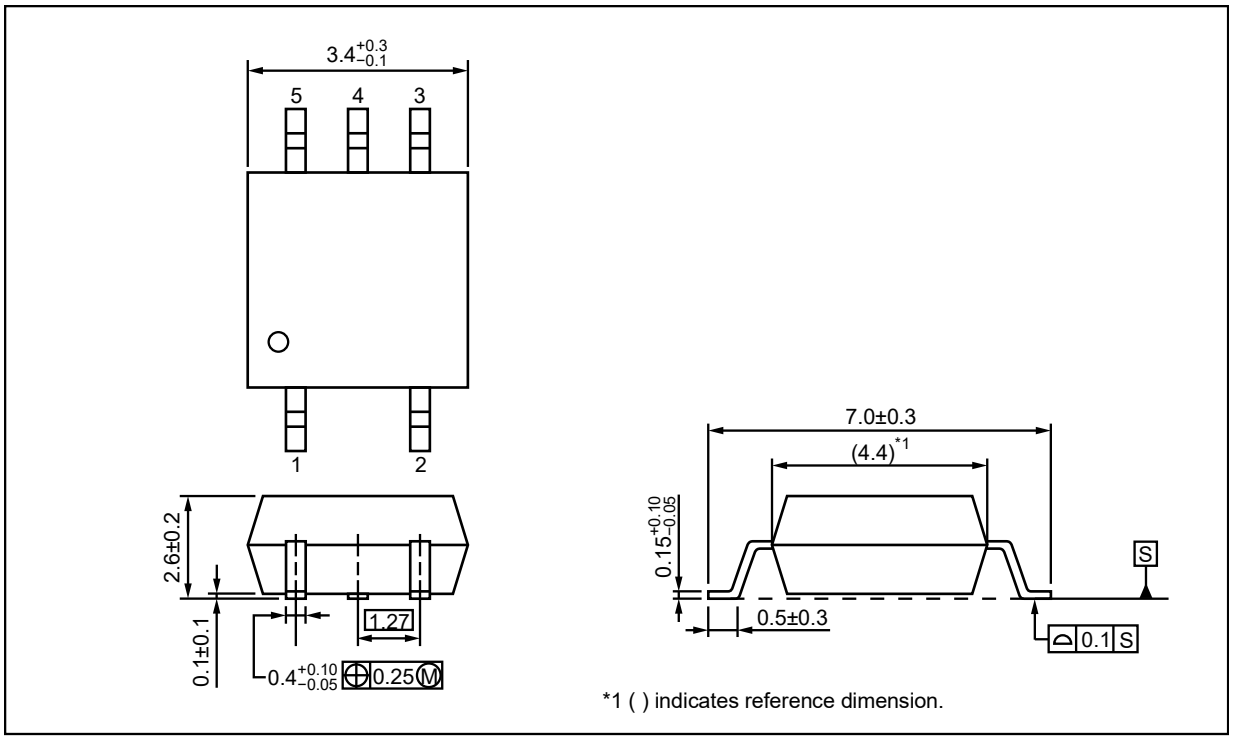
1. Anode
2. Cathode
3. GND
4. V_O
5. V_{CC}

APPLICATIONS

- IPM driver
- General purpose inverter

Start of mass production
Apr. 2022

PACKAGE DIMENSIONS (UNIT: mm)

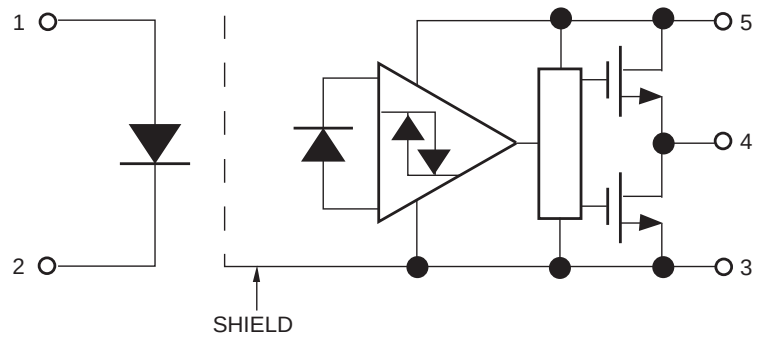


Weight : 0.08 g（Typ.）

PHOTOCOUPLER CONSTRUCTION

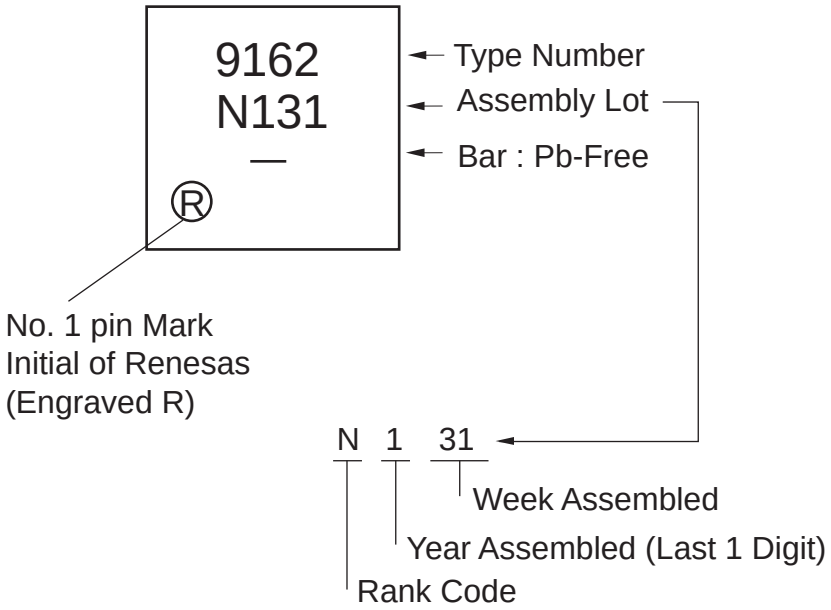
Parameter	MIN.
Air Distance	4.2 mm
Creepage Distance	4.2 mm
Isolation Distance	0.2 mm

BLOCK DIAGRAM



LED	Output
ON	L
OFF	H

MARKING EXAMPLE



*Applicable type numbers are listed below.

*) RV1S 9162 ACCSP-100x

Marking type number. “RV1S” and “ACCSP-100x” are omitted from original type number.

ORDERING INFORMATION

Part Number	Order Number	Solder Plating Specification	Packing Style	Safety Standard Approval	Application Part Number *1
RV1S9162ACCSP -100C	RV1S9162ACCSP -100C#SC0	Pb-Free and Halogen Free (Ni/Pd/Au)	20 pcs (Tape 20 pcs cut)	Standard products (UL, CSA approved)	RV1S9162A
	RV1S9162ACCSP -100C#KC0		Embossed Tape 2 500 pcs/reel		
RV1S9162ACCSP -100V	RV1S9162ACCSP -100V#SC0		20 pcs (Tape 20 pcs cut)	UL, CSA, DIN EN 60747-5-5 approved	
	RV1S9162ACCSP -100V#KC0		Embossed Tape 2 500 pcs/reel		

Notes:*1. For the application of the Safety Standard, following part number should be used.

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

Parameter		Symbol	Ratings	Unit
Diode	Forward Current *1	I_F	20	mA
	Reverse Voltage	V_R	5	V
Detector	Supply Voltage	V_{CC}	-0.5 to +30	V
	Output Voltage	V_O	-0.5 to V_{CC}	V
	Output Current	I_O	25	mA
	Power Dissipation *2	P_C	200	mW
Isolation Voltage *3		BV	3 750	Vr.m.s.
Operating Ambient Temperature		T_A	–40 to +125	°C
Storage Temperature		T_{stg}	–55 to +150	°C

Notes: *1. Reduced to 0.93 mA/°C at T_A = 110 °C or more.
*2. Reduced to 4.57 mW/°C at T_A = 90 °C or more.
*3. AC voltage for 1 minute at T_A = 25 °C, RH = 60 % between input and output.
Pins 1-2 shorted together, 3-5 shorted together.

RECOMMENDED OPERATING CONDITIONS

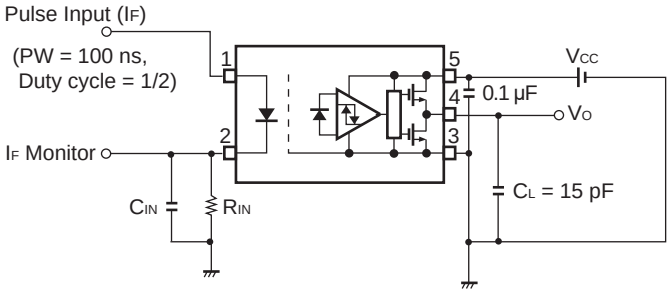
Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Supply Voltage	V_{CC}	4.5		30	V
Forward Current (ON)	$I_{F (ON)}$	5		12	mA
Forward Voltage (OFF)	$V_{F (OFF)}$	0		0.8	V
Supply Voltage Ramp Slew Rate	SR			0.5	V/µs
Operating Ambient Temperature	T_A	–40		125	°C

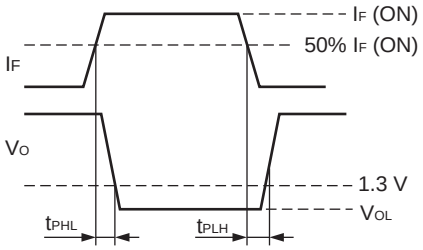
ELECTRICAL CHARACTERISTICS (T_A = -40 to +125 °C, V_{CC} = 4.5 to 30 V)

Parameter		Symbol	Conditions	MIN.	TYP.*1	MAX.	Unit
Diode	Forward Voltage	V_F	I_F = 5 mA, T_A = 25 °C	1.33	1.54	1.73	V
	Reverse Current	I_R	V_R = 3 V, T_A = 25 °C			10	μA
	Input Capacitance	C_t	V_F = 0 V, f = 1 MHz		30		pF
Detector	Low Level Output Voltage	V_{OL}	I_F = 5 mA, I_O = 3.5 mA			0.3	V
			I_F = 5 mA, I_O = 6.5 mA			0.5	
	High Level Output Voltage	V_{OH}	I_F = 0 mA, I_O = -3.5 mA	V_{CC}-1.5			V
			I_F = 0 mA, I_O = -6.5 mA	V_{CC}-2.0			
	Low Level Supply Current	I_{CCL}	I_F = 5 mA, V_{CC} = 30 V		1.7	3	mA
	High Level Supply Current	I_{CCH}	I_F = 0 mA, V_{CC} = 30 V		1.7	3	mA
	UVLO Threshold	V_{UVLO}	V_O < 1 V, I_F = 0 mA		3		V
Coupled	Threshold Input Current (H → L)	I_{FHL}	V_{CC} = 15 V, V_O < 0.3 V, I_O = 3.5 mA			3.0	mA
	Isolation Resistance	R_{I-O}	V_{I-O} = 1 kV dc, RH ≦ 60 %, T_A = 25 °C	10^{11}			Ω
	Isolation Capacitance	C_{I-O}	V = 0 V, f = 1 MHz		0.6		pF
	Propagation Delay Time (H → L) *2	t_{PHL}	V_{IN} = 0→5 V, C_{IN} = 60 pF, R_{IN} = 650 Ω, C_L = 15 pF, V_{THHL} = 1.3 V			60	ns
	Propagation Delay Time (L → H) *2	t_{PLH}	V_{IN} = 5→0 V, C_{IN} = 60 pF, R_{IN} = 650 Ω, C_L = 15 pF, V_{THLH} = 1.3 V			60	ns
	Pulse Width Distortion (PWD)	$\lvert t_{PHL}-t_{PLH} \rvert$	V_{IN} = 0⇔5 V, C_{IN} = 60 pF, R_{IN} = 650 Ω, C_L = 15 pF, V_{THHL}=V_{THLH}= 1.3 V			20	ns
	Propagation Delay Difference Between Any Two Parts (PDD)					25	
	Common Mode Transient Immunity at High Level Output *3	$\lvert CM_H \rvert$	V_{CC} = 30 V, T_A = 25 °C, Vo > 17 V, I_F = 0 mA, $\lvert V_{CM} \rvert$ = 1.5 kV	100			kV/μs
	Common Mode Transient Immunity at Low Level Output *3	$\lvert CM_L \rvert$	V_{CC} = 30 V, T_A = 25 °C, Vo < 1 V, I_F = 5 mA, $\lvert V_{CM} \rvert$ = 1.5 kV	100			kV/μs

Notes: *1. Typical values at T_A = 25 °C.

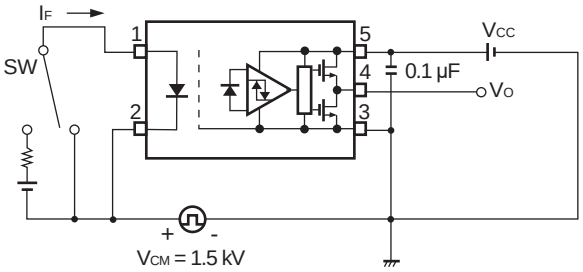
*2. Test circuit for propagation delay time

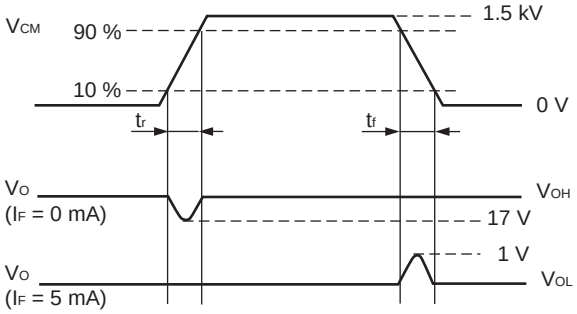




Remark C_L includes probe and stray wiring capacitance.

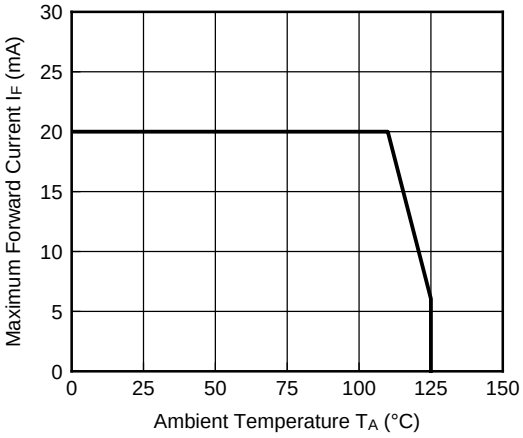
*3. Test circuit for common mode transient immunity



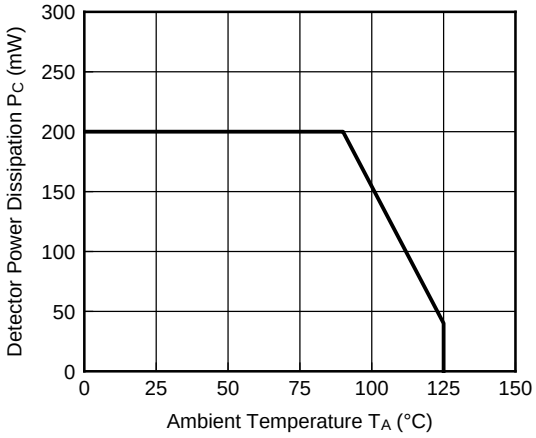


TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise specified)

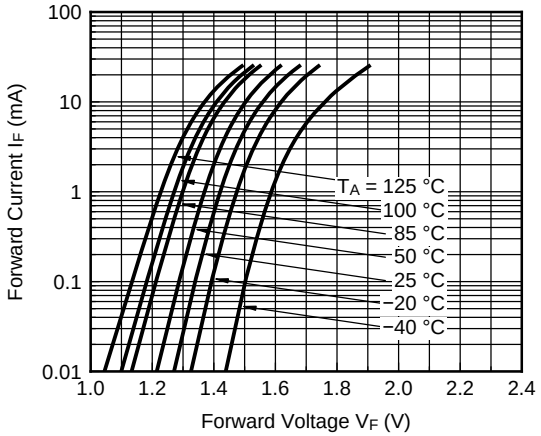
MAXIMUM FORWARD CURRENT vs. AMBIENT TEMPERATURE



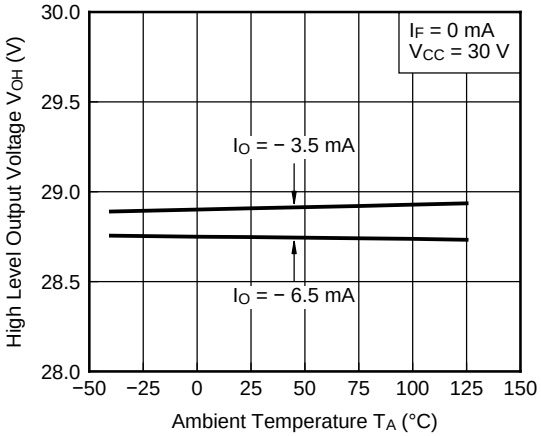
DETECTOR POWER DISSIPATION vs. AMBIENT TEMPERATURE



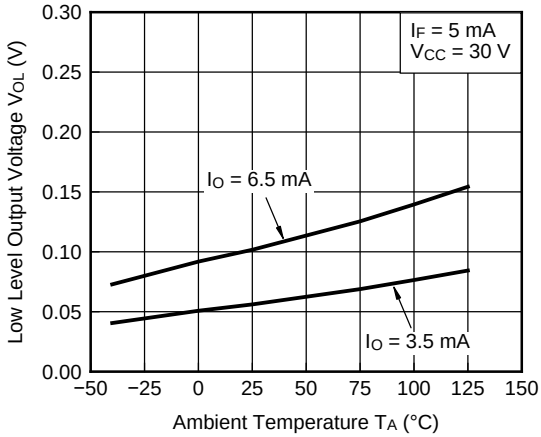
FORWARD CURRENT vs. FORWARD VOLTAGE



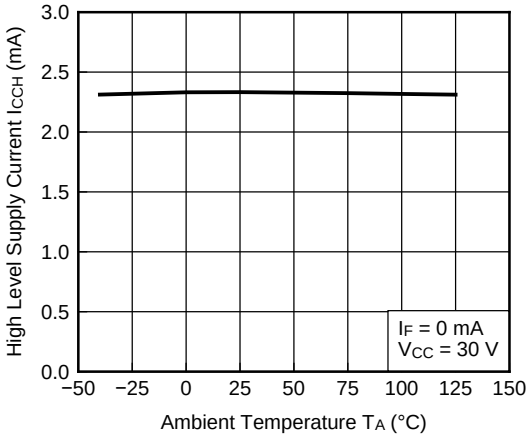
HIGH LEVEL OUTPUT VOLTAGE vs. AMBIENT TEMPERATURE



LOW LEVEL OUTPUT VOLTAGE vs. AMBIENT TEMPERATURE



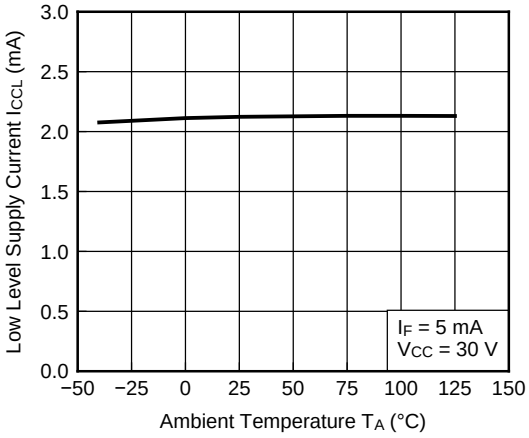
HIGH LEVEL SUPPLY CURRENT vs. AMBIENT TEMPERATURE



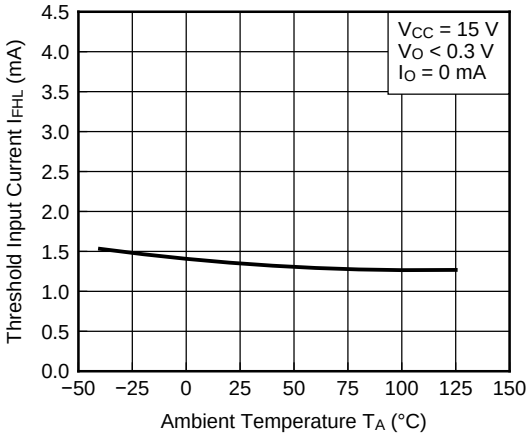
Remark The graphs indicate nominal characteristics.

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

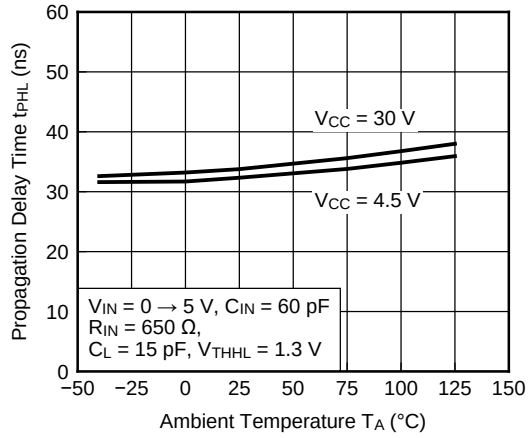
LOW LEVEL SUPPLY CURRENT vs. AMBIENT TEMPERATURE



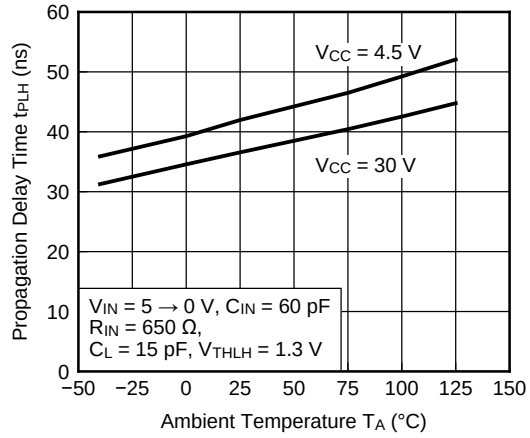
THRESHOLD INPUT CURRENT vs. AMBIENT TEMPERATURE



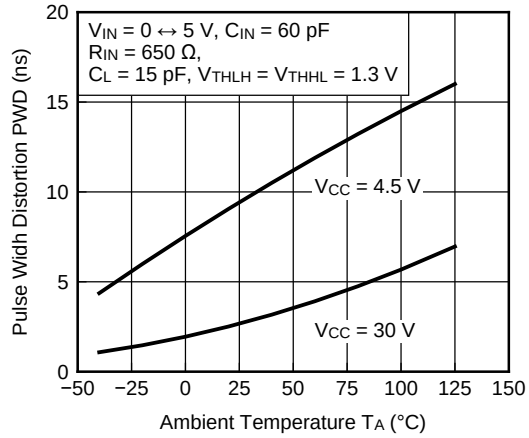
PROPAGATION DELAY TIME vs. AMBIENT TEMPERATURE



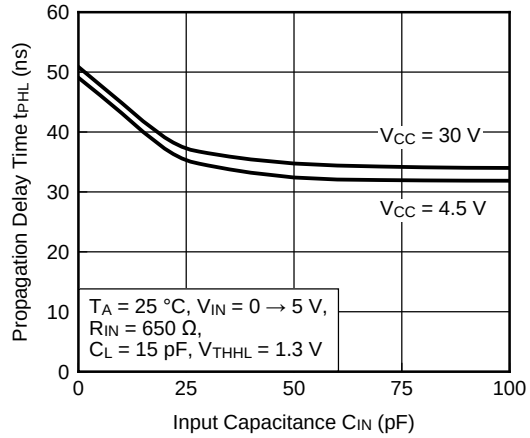
PROPAGATION DELAY TIME vs. AMBIENT TEMPERATURE



PULSE WIDH DISTORTION vs. AMBIENT TEMPERATURE

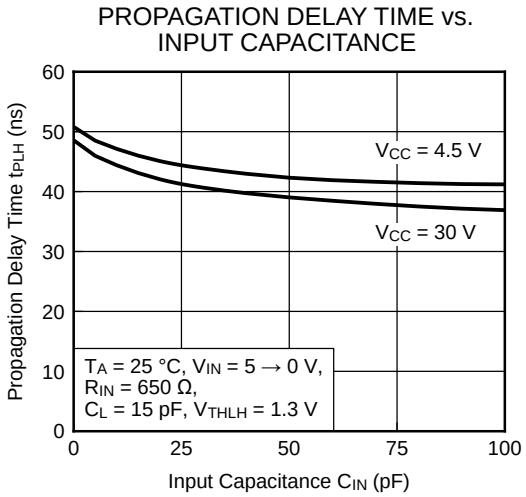


PROPAGATION DELAY TIME vs. INPUT CAPACITANCE



Remark The graphs indicate nominal characteristics.

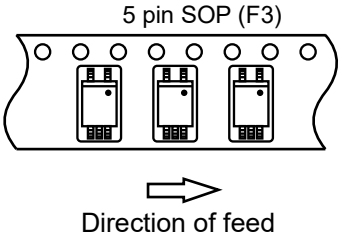
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise specified)



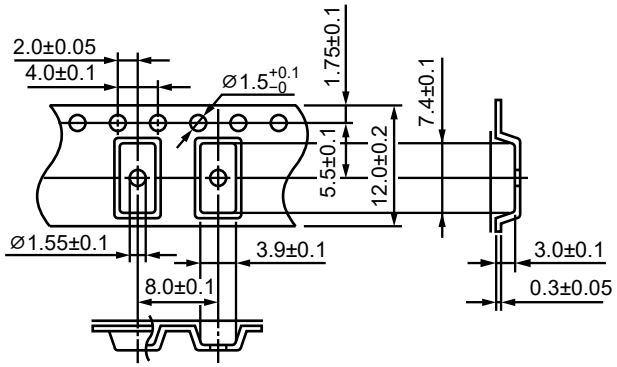
Remark The graphs indicate nominal characteristics.

TAPING SPECIFICATIONS (UNIT : mm)

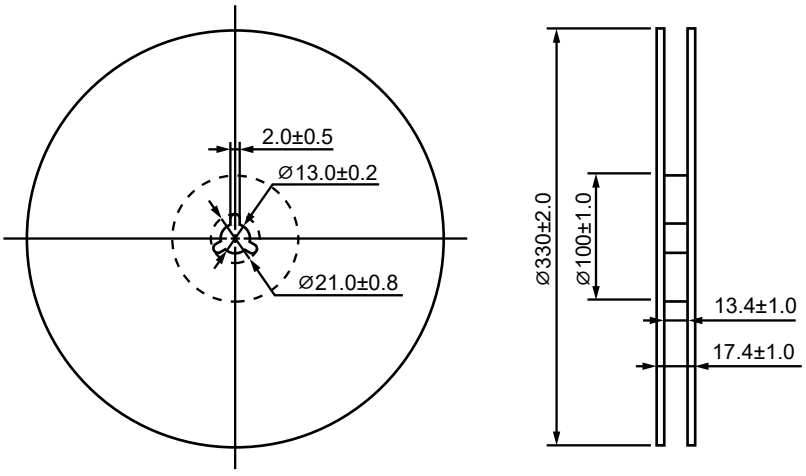
Tape Direction



Outline and Dimensions (Tape)

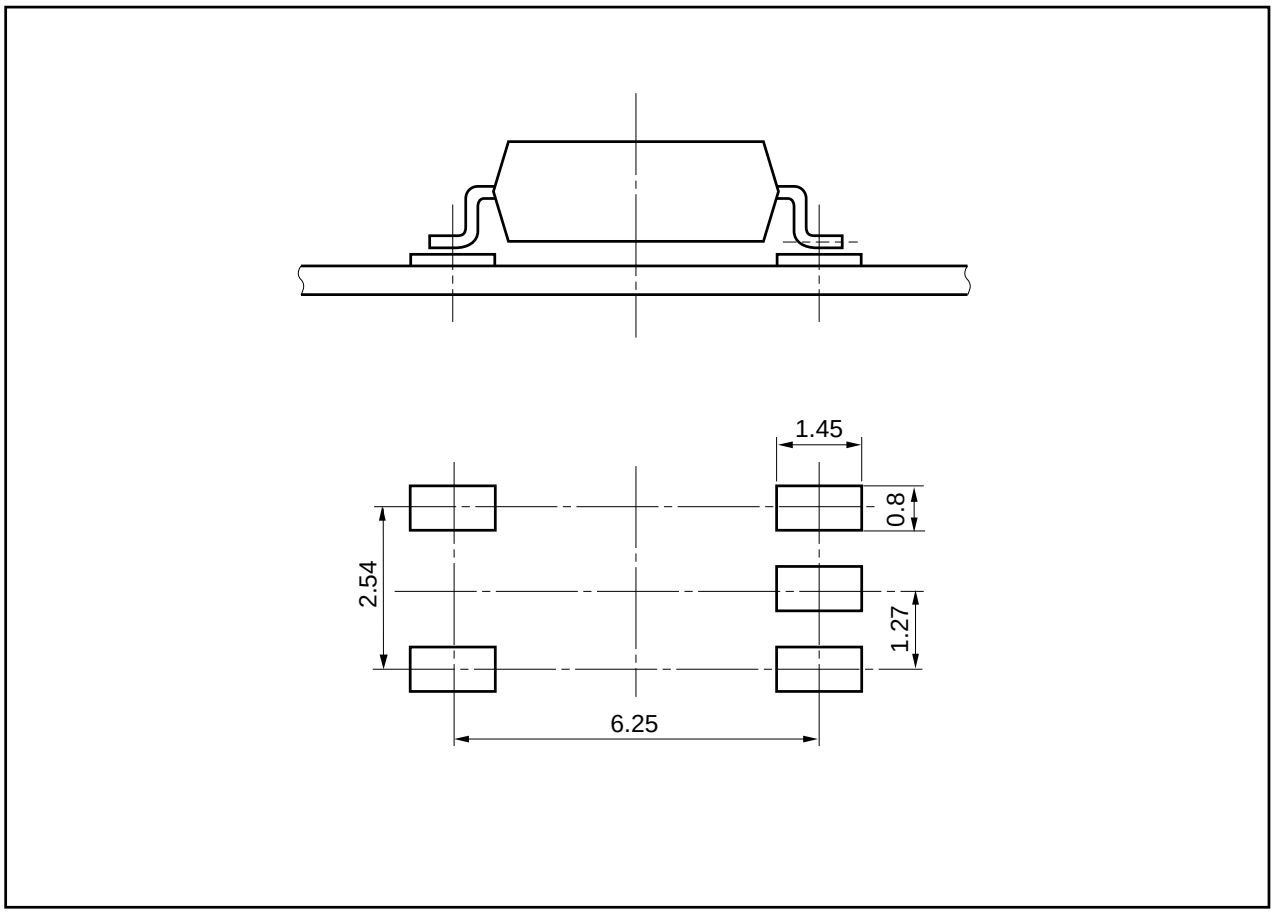


Outline and Dimensions (Reel)



Packing: 2 500 pcs/reel

RECOMMENDED MOUNT PAD DIMENSIONS (UNIT：mm)

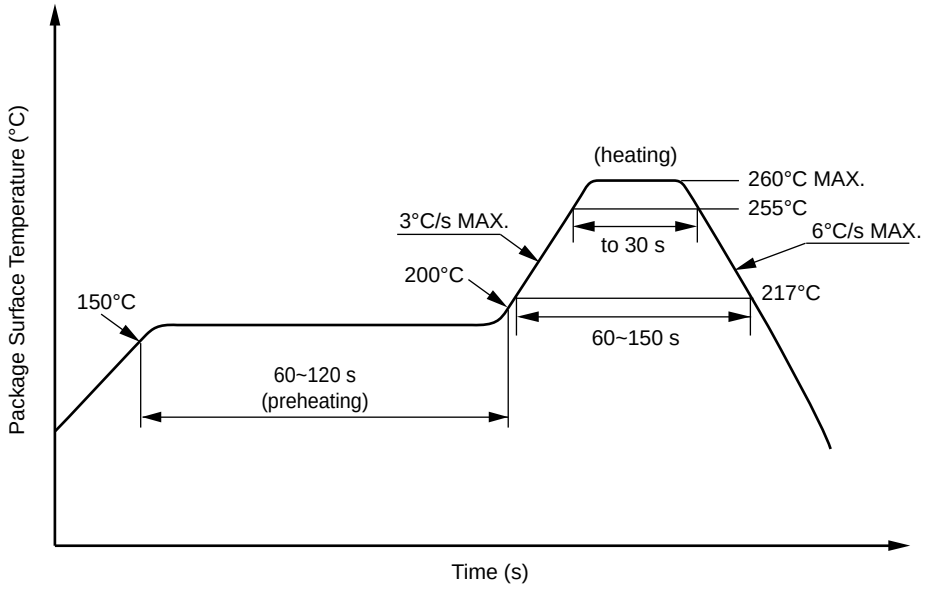


Remark All dimensions in this figure must be evaluated before use.

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 — 60～150 seconds
   - Time to preheat temperature from 150 to 200 °C — 60～120 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-020D 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 (each pins) — 3 seconds or less
- Flux — Rosin flux containing small amount of chlorine (The flux with a maximum chlorine content of 0.2 Wt% is recommended.)

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

(4) Cautions
- Flux Cleaning
  Avoid cleaning with Freon based or halogen-based (chlorinated etc.) solvents.
- 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 at startup, the output transistor may enter the on state, even if the voltage is within the absolute maximum ratings.

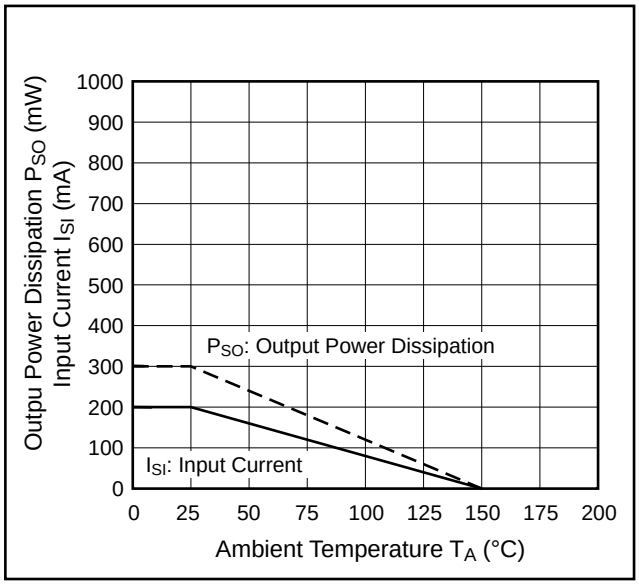
USAGE CAUTIONS

1. This product is weak for static electricity by designed with high-speed integrated circuit so protect against static electricity when handling.
2. By-pass capacitor of more than 0.1 µF is used between V_{CC} and GND near device. Also, ensure that the distance between the leads of the photocoupler and capacitor is no more than 10 mm.
3. Avoid storage at a high temperature and high humidity.

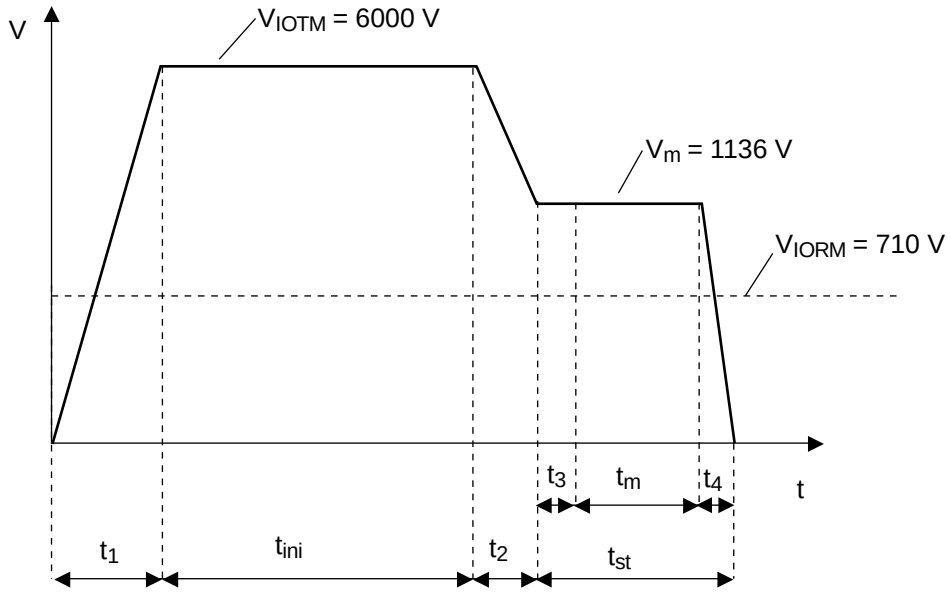
SPECIFICATION OF VDE MARKS LICENSE DOCUMENT

Parameter	Symbol	Rating	Unit
Climatic test class (IEC 60068-1/DIN EN 60068-1)		40/125/21	
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	 710 1 136	 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	1 331	V_{peak}
Highest permissible overvoltage	V_{IOTM}	6 000	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	400	
Material group (IEC 60664-1/DIN EN 60664-1 (VDE 0110-1))		Ⅱ	
Storage temperature range	T_{stg}	−55～+150	°C
Operating temperature range	T_A	−40～+125	°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.	 150 200 300 10^9	 °C mA mW Ω

Dependence of maximum safety ratings on ambient temperature

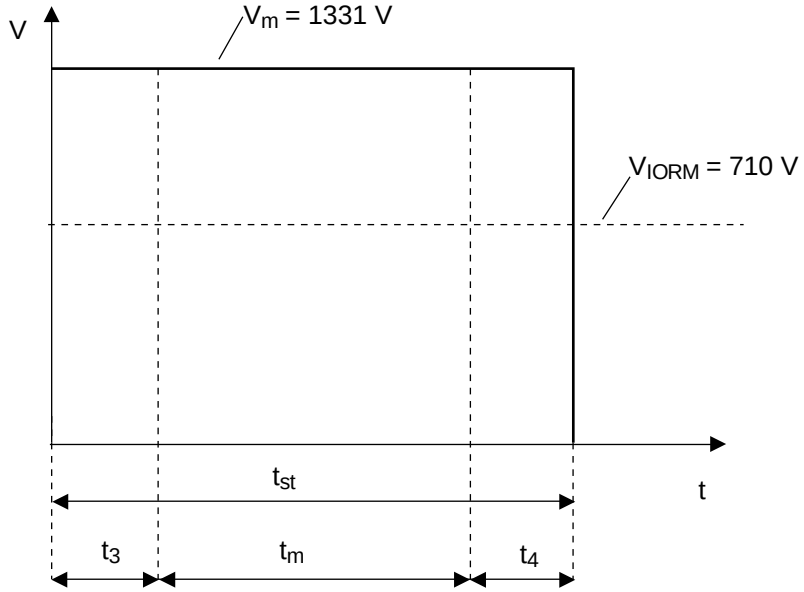


Method a) Destructive Test, Type and Sample Test



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.

Notice

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