

PS9351L, PS9351L2

HIGH NOISE REDUCTION, 15 Mbps CMOS OUTPUT TYPE

R08DS0127EJ0100

Rev.1.00

8mm CREEPAGE 6-PIN SDIP PHOTOCOUPLER

Apr 24, 2015

DESCRIPTION

The PS9351L and PS9351L2 are optically coupled isolator containing a GaAlAs LED on the input side and a CMOS output IC on the output side.

The PS9351L and PS9351L2 are in 6-pin plastic SDIP (Shrink Dual In-line Package). The PS9351L2 has 8 mm creepage distance. The mount area of 6-pin plastic SDIP is half size of 8-pin DIP.

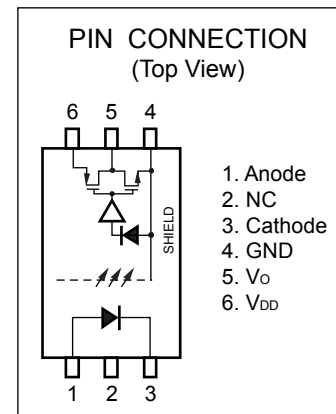
This photocoupler is high common mode transient immunity (CMR), a high-speed CMOS output type device designed for high-speed logic interface circuits.

The PS9351L is lead bending type (Gull-wing) for surface mounting.

The PS9351L2 is lead bending type for long creepage distance (Gull-wing) for surface mount.

FEATURES

- High-speed response (15 Mbps)
- Long creepage distance (8mm MIN. : PS9351L2)
- Operable at high temperature (-40 to +100°C)
- High common mode transient immunity ($CM_H, CM_L = \pm 20 \text{ kV}/\mu\text{s}$ TYP.)
- High isolation voltage ($BV = 5000 \text{ Vr.m.s.}$)
- Pulse width distortion ($|t_{PHL} - t_{PLH}| = 5 \text{ ns}$ TYP.)
- Ordering number of tape product : PS9351L-E3: 2,000 pcs/reel
: PS9351L2-E3: 2,000 pcs/reel
- Pb-Free product
- Safety standards
 - UL approved : No. E72422
 - CSA approved : No. CA 101391 (CA5A, CAN/CSA-22.2 60065, 60950)
 - DIN EN 60747-5-5 (VDE0884-5) approved (Option)



APPLICATIONS

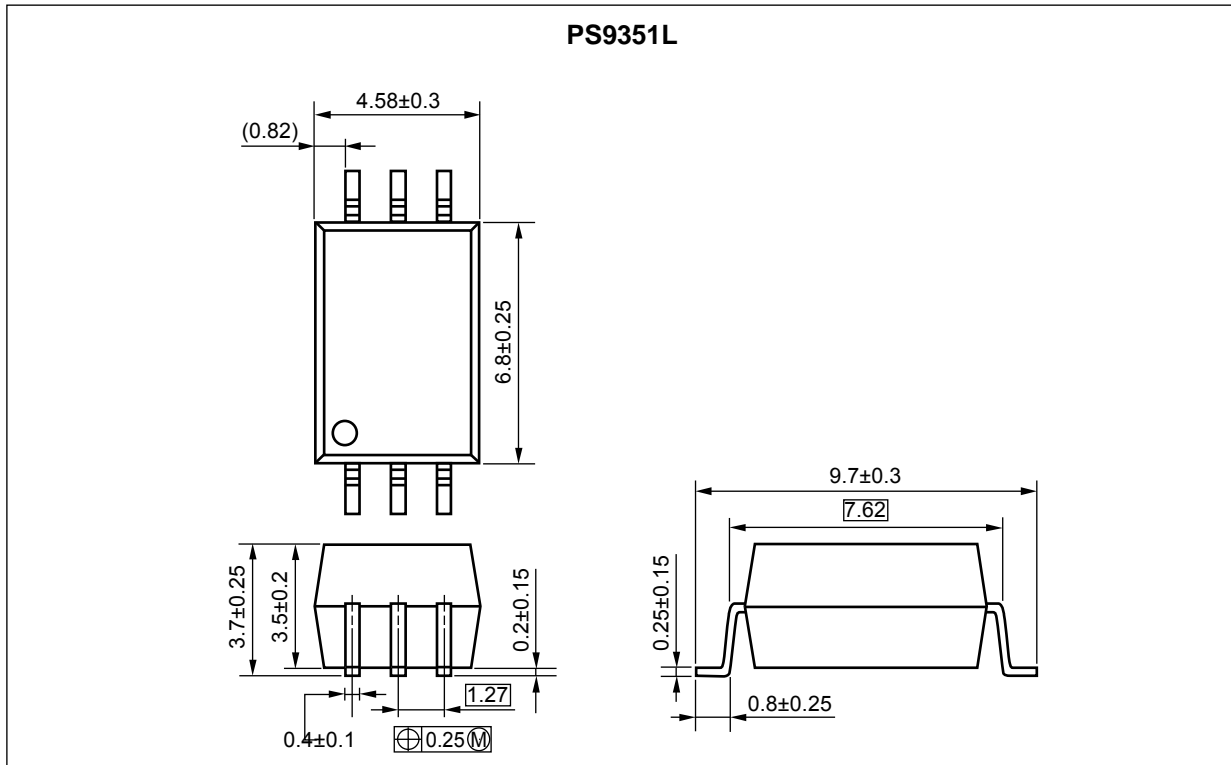
- FA Network
- Measurement equipment
- PDP

TRUTH TABLE

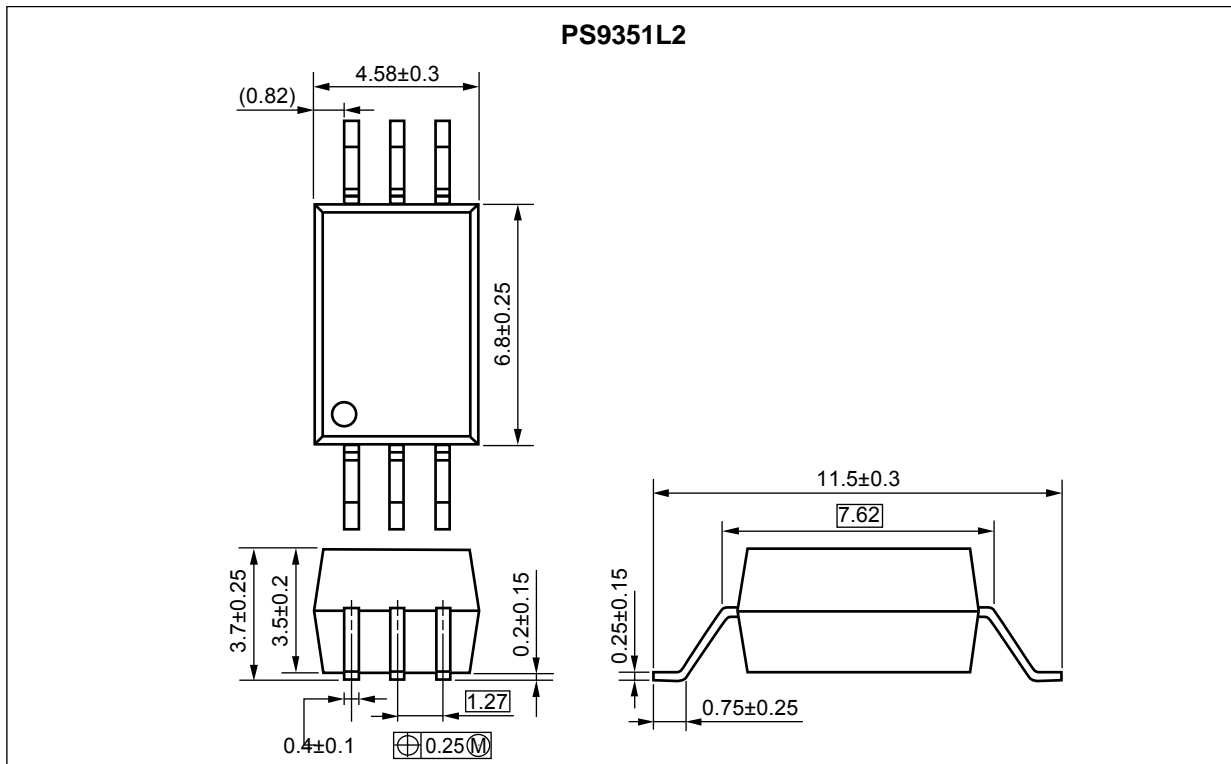
LED	Output
ON	L
OFF	H

PACKAGE DIMENSIONS (UNIT: mm)

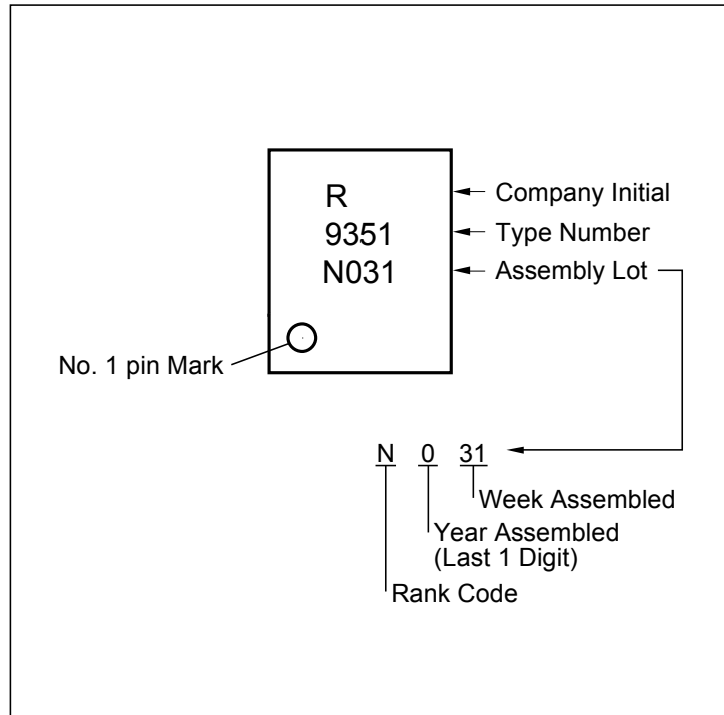
- Lead Bending Type (Gull-wing) For Surface Mount



- Lead Bending Type (Gull-wing) For Long Creepage Distance (Surface Mount)



MARKING EXAMPLE



PHOTOCOUPLER CONSTRUCTION

Parameter	PS9351L	PS9351L2
Air Distance (MIN.)	7 mm	8 mm
Outer Creepage Distance (MIN.)	7 mm	8 mm
Isolation Distance (MIN.)	0.4 mm	0.4 mm

ORDERING INFORMATION

Part Number	Order Number	Solder Plating Specification	Packing Style	Safety Standard Approval	Application Part Number*1
PS9351L	PS9351L-AX	Pb-Free (Ni/Pd/Au)	20 pcs (Tape 20 pcs cut)	Standard products UL, CSA approved	PS9351L
PS9351L-E3	PS9351L-E3-AX		Embossed Tape 2 000 pcs/reel		
PS9351L2	PS9351L2-AX		20 pcs (Tape 20 pcs cut)	Standard products UL, CSA approved	PS9351L2
PS9351L2-E3	PS9351L2-E3-AX		Embossed Tape 2 000 pcs/reel		
PS9351L-V	PS9351L-V-AX		20 pcs (Tape 20 pcs cut)	DIN EN60747-5-5 (VDE0884-5) approved (Option)	PS9351L
PS9351L-V-E3	PS9351L-V-E3-AX		Embossed Tape 2 000 pcs/reel		
PS9351L2-V	PS9351L2-V-AX		20 pcs (Tape 20 pcs cut)	DIN EN60747-5-5 (VDE0884-5) approved (Option)	PS9351L2
PS9351L2-V-E3	PS9351L2-V-E3-AX		Embossed Tape 2 000 pcs/reel		

Note: *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	25	mA
	Reverse Voltage	V _R	5	V
Detector	Supply Voltage	V _{DD}	0 to 5.5	V
	Output Voltage	V _O	-0.5 to V _{DD} +0.5	V
	Output Current	I _O	2	mA
Isolation Voltage *2		BV	5 000	Vr.m.s.
Operating Ambient Temperature		T _A	-40 to +100	°C
Storage Temperature		T _{stg}	-55 to +125	°C

Notes: *1. Reduced to 0.3 mA/°C at T_A = 70°C or more.

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

Pins 1-3 shorted together, 4-6 shorted together.

RECOMMENDED OPERATING CONDITIONS (T_A = 25°C)

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Forward Current	I _F	10		16	mA
Supply Voltage	V _{DD}	4.5	5.0	5.5	V

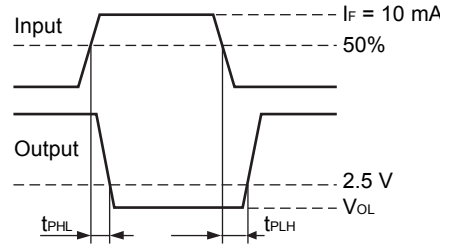
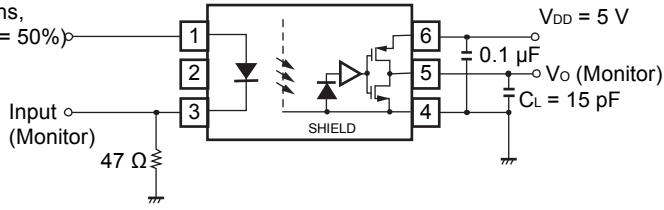
ELECTRICAL CHARACTERISTICS ($T_A = -40$ to $+100^\circ\text{C}$, $V_{DD} = 4.5$ to 5.5 V, unless otherwise specified)

Parameter		Symbol	Conditions	MIN.	TYP. *1	MAX.	Unit
Diode	Forward Voltage	V_F	$I_F = 10$ mA, $T_A = 25^\circ\text{C}$	1.2	1.56	1.8	V
	Reverse Current	I_R	$V_R = 3$ V, $T_A = 25^\circ\text{C}$			10	μA
	Terminal Capacitance	C_t	$V = 0$ V, $f = 1$ MHz, $T_A = 25^\circ\text{C}$		30		pF
Detector	High Level Supply Current	I_{DDH}	$I_F = 0$ mA		2.5	5	mA
	Low Level Supply Current	I_{DDL}	$I_F = 10$ mA		2	5	
	High Level Output Voltage	V_{OH}	$I_O = -20$ μA , $I_F = 0$ mA	4.0	5.0		V
	Low Level Output Voltage *2	V_{OL}	$I_O = 20$ μA , $I_F = 10$ mA		0	0.1	
Coupled	Threshold Input Current	I_{FHL}	$V_O < 1$ V		1.9	5	mA
	Isolation Resistance	R_{I-O}	$V_{I-O} = 1$ kV _{DC} , $R_H = 40$ to 60% , $T_A = 25^\circ\text{C}$	10^{11}			
	Isolation Capacitance	C_{I-O}	$V = 0$ V, $f = 1$ MHz, $T_A = 25^\circ\text{C}$		0.7		pF
	Propagation Delay Time (H \rightarrow L) *3	t_{PHL}	$I_F = 10$ mA, $V_{DD} = 5$ V, $C_L = 15$ pF, CMOS Levels		30	60	
	Propagation Delay Time (L \rightarrow H) *3	t_{PLH}			35	60	
	Pulse Width Distortion (PWD) *3	$ t_{PHL} - t_{PLH} $			5	30	
	Propagation Delay Skew	t_{PSK}				40	
	Rise Time	t_r			4		
	Fall Time	t_f			4		
	Common Mode Transient Immunity at High Level Output*4	CM_H		$V_{DD} = 5$ V, $I_F = 0$ mA, $V_{CM} = 1$ kV, $V_O > 4$ V, $T_A = 25^\circ\text{C}$	15	20	
Common Mode Transient Immunity at Low Level Output*4	CM_L	$V_{DD} = 5$ V, $I_F = 10$ mA, $V_{CM} = 1$ kV, $V_O < 1$ V, $T_A = 25^\circ\text{C}$	15	20			

Notes: *1. Typical values at $T_A = 25^\circ\text{C}$ *2. Because V_{OL} of 2 V or more may be output when LED current input and when output supply, it is important to confirm the characteristics (operation with the power supply on and off) during design, before using this device.

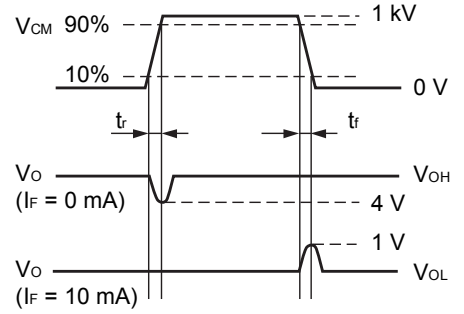
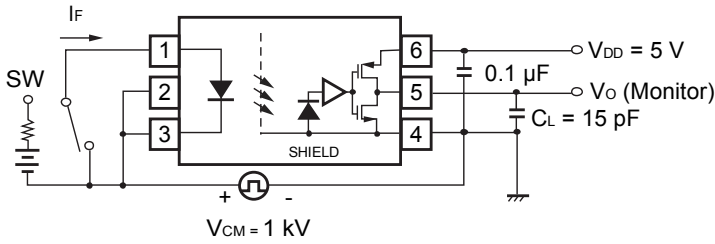
***3 Test circuit for propagation delay time**

Pulse input ($I_F = 10 \text{ mA}$)
 (PW = 100 ns,
 Duty cycle = 50%)



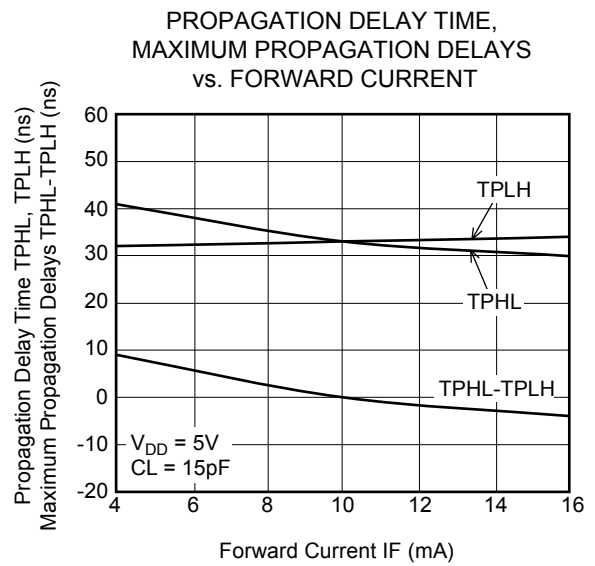
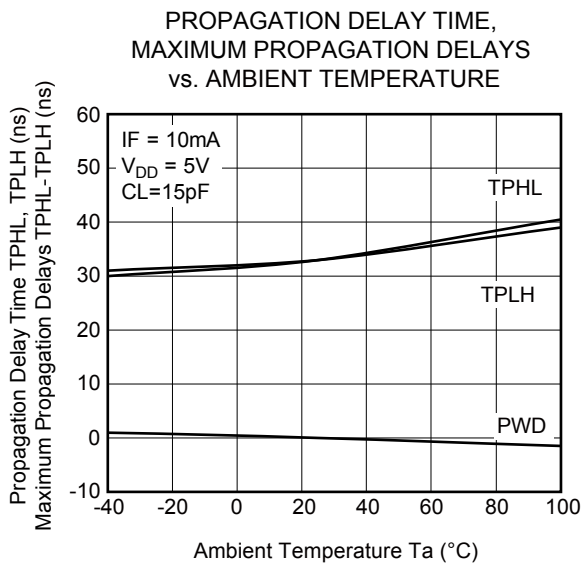
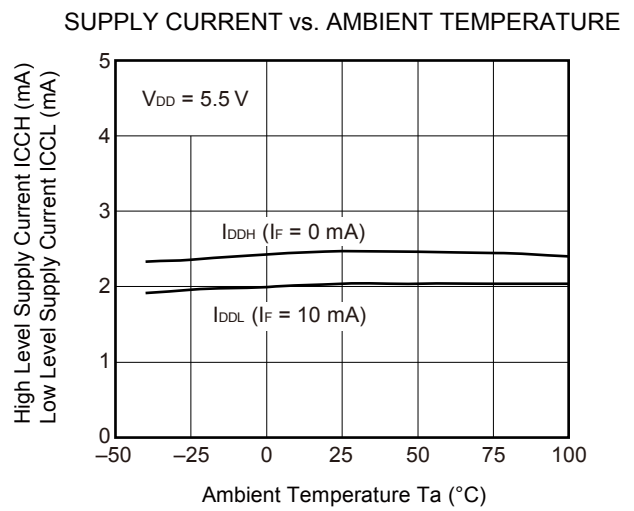
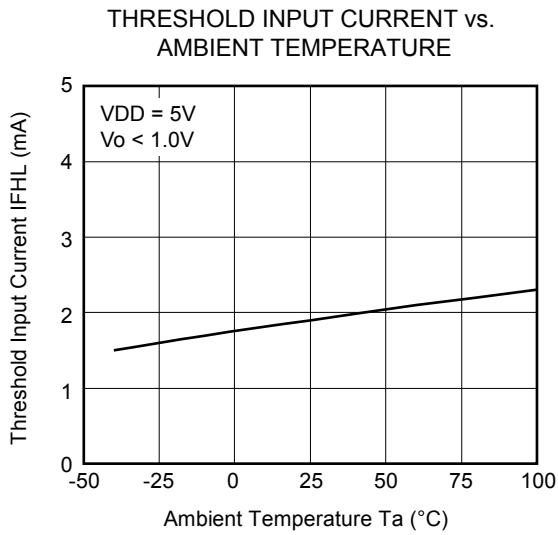
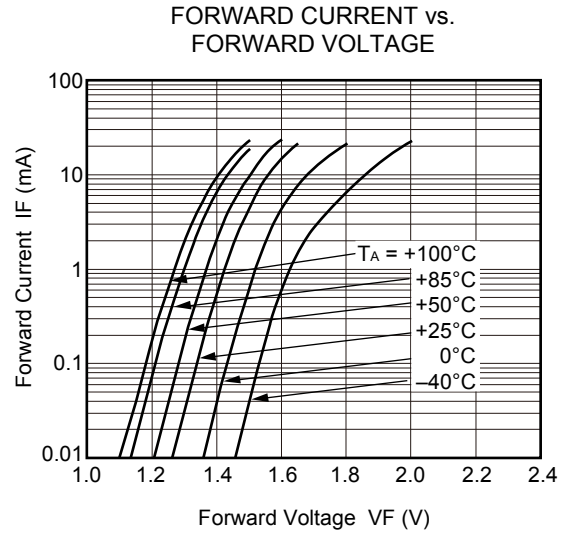
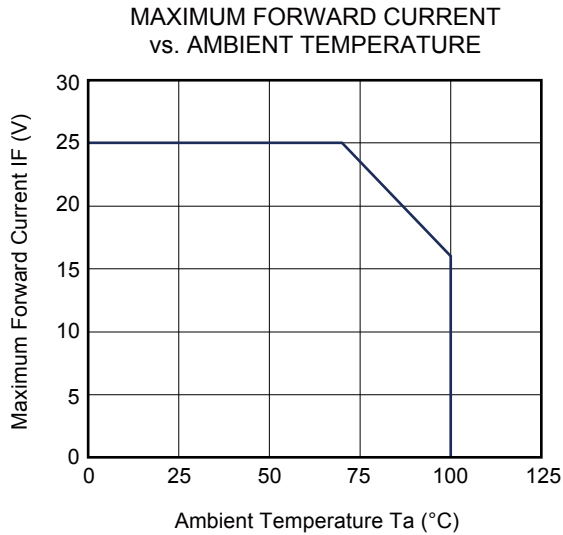
Remark C_L includes probe and stray wiring capacitance.

4 Test circuit for common mode transient immunity



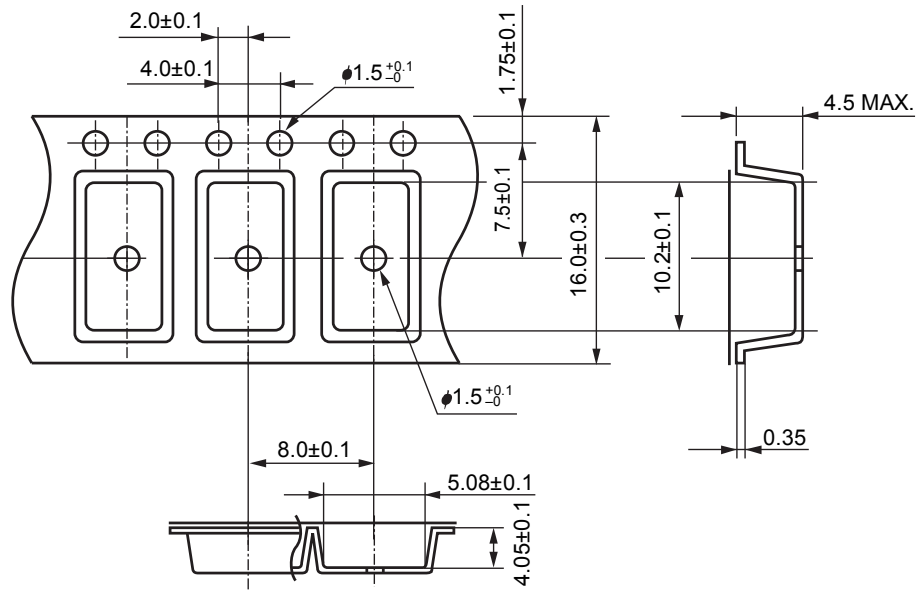
Remark C_L includes probe and stray wiring capacitance.

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

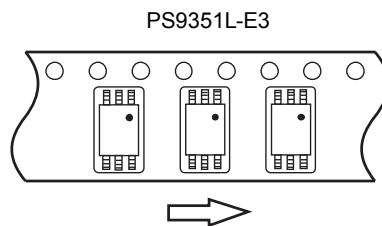


TAPING SPECIFICATIONS (UNIT:mm)

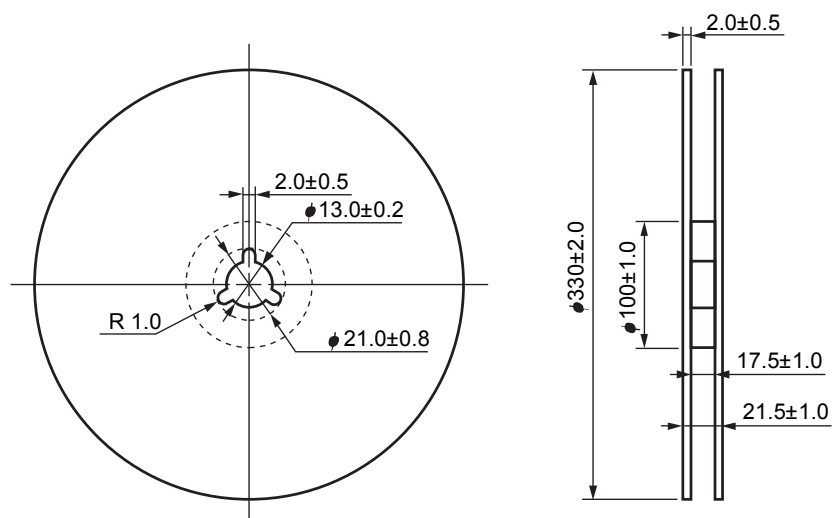
Outline and Dimensions (Tape)



Tape Direction

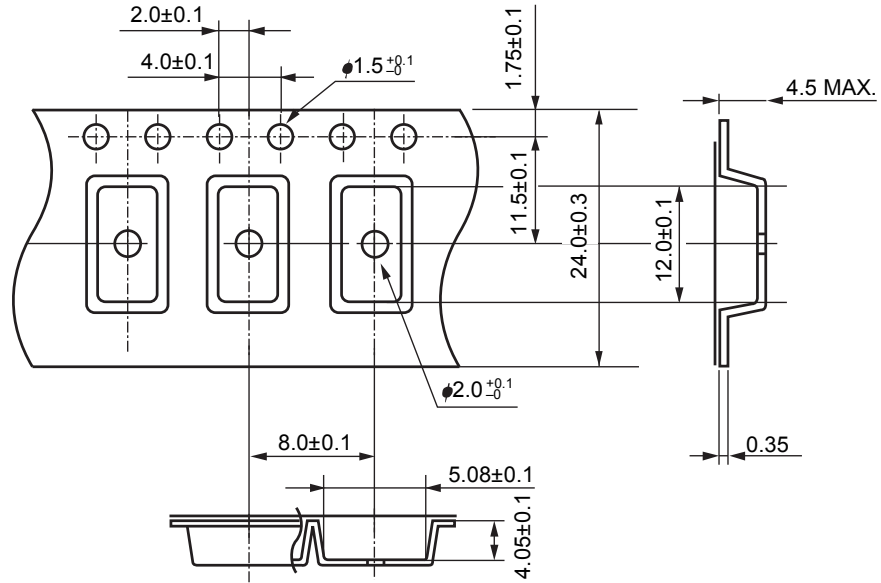


Outline and Dimensions (Reel)

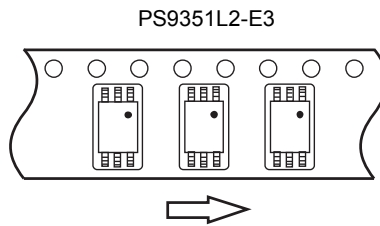


Packing: 2 000 pcs/reel

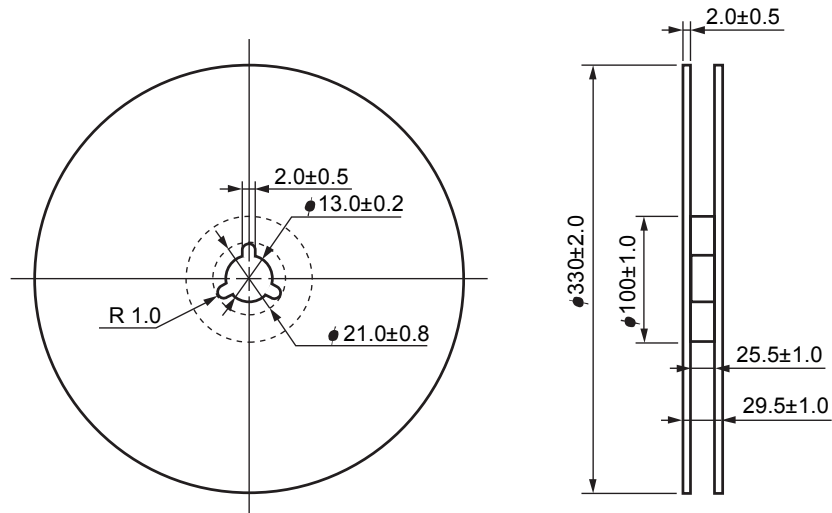
Outline and Dimensions (Tape)



Tape Direction

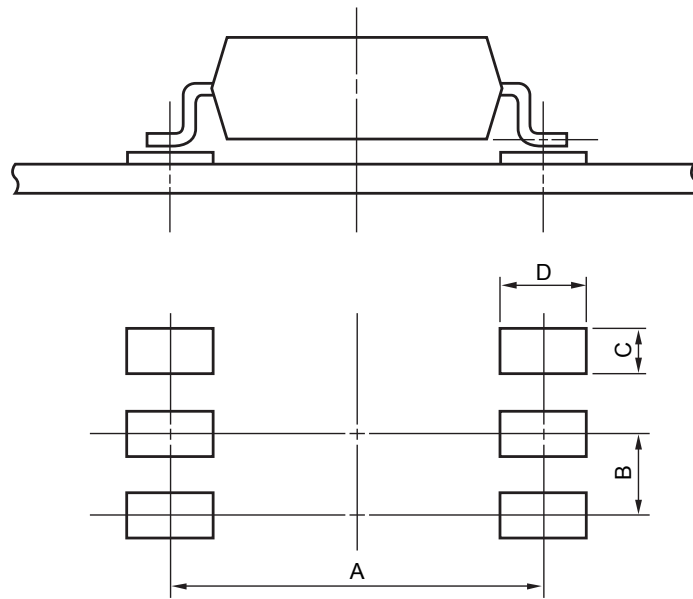


Outline and Dimensions (Reel)



Packing: 2 000 pcs/reel

RECOMMENDED MOUNT PAD DIMENSIONS (UNIT:mm)



Part Number	Lead Bending	A	B	C	D
PS9351L	lead bending type (Gull-wing) for surface mount	9.2	1.27	0.8	2.2
PS9351L2	lead bending type (Gull-wing) for long creepage distance (surface mount)	10.2	1.27	0.8	2.2

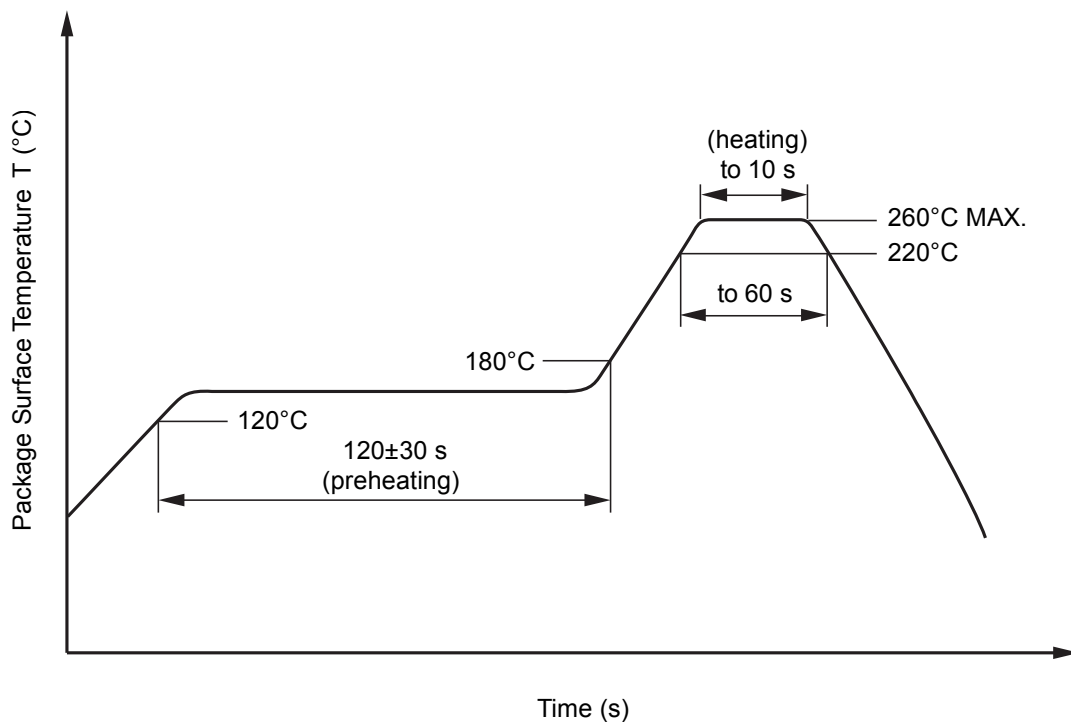
NOTES ON HANDLING

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) 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.)

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

(4) Cautions

- Fluxes Avoid removing the residual flux with freon-based and chlorine-based cleaning solvent.

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_{DD} and GND near device. Also, ensure that the distance between the leads of the photocoupler and capacitor is no more than 10 mm.
3. Pin 2 (which is an NC^{*1} pin) can either be connected directly to the GND pin on the LED side or left open.
Unconnected pins should not be used as a bypass for signals or for any other similar purpose because this may degrade the internal noise environment of the device.
*1 NC: Not connected (No connection)
4. Avoid storage at a high temperature and high humidity.

SPECIFICATION OF VDE MARKS LICENSE DOCUMENT

Parameter	Symbol	Spec.	Unit
Climatic test class (IEC 60068-1/DIN EN 60068-1)		40/100/21	
Dielectric strength maximum operating isolation voltage	U_{IORM}	1 130	V_{peak}
Test voltage (partial discharge test, procedure a for type test and random test) $U_{pr} = 1.6 \times U_{IORM.}, P_d < 5 \text{ pC}$	U_{pr}	1 808	V_{peak}
Test voltage (partial discharge test, procedure b for all devices) $U_{pr} = 1.875 \times U_{IORM.}, P_d < 5 \text{ pC}$	U_{pr}	2 119	V_{peak}
Highest permissible overvoltage	U_{TR}	8 000	V_{peak}
Degree of pollution (DIN EN 60664-1 VDE0110 Part 1)		2	
Comparative tracking index (IEC 60112/DIN EN 60112 (VDE 0303 Part 11))	CTI	175	
Material group (DIN EN 60664-1 VDE0110 Part 1)		III a	
Storage temperature range	T_{stg}	-55 to +125	°C
Operating temperature range	T_A	-40 to +100	°C
Isolation resistance, minimum value $V_{IO} = 500 \text{ V dc at } T_A = 25^\circ\text{C}$	Ris MIN.	10^{12}	Ω
$V_{IO} = 500 \text{ V dc at } T_A \text{ MAX. at least } 100^\circ\text{C}$	Ris MIN.	10^{11}	Ω
Safety maximum ratings (maximum permissible in case of fault, see thermal derating curve)			
Package temperature	T_{si}	175	°C
Current (input current I_F , $P_{si} = 0$)	I_{si}	400	mA
Power (output or total power dissipation)	P_{si}	700	mW
Isolation resistance $V_{IO} = 500 \text{ V dc at } T_A = T_{si}$	Ris MIN.	10^9	Ω

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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