

HIGH SPEED ANALOG OUTPUT TYPE
8 mm CREEPAGE 8-PIN PHOTOCOUPLER

-NEPOC Series-

DESCRIPTION

The PS8502, PS8502L1, PS8502L2 and PS8502L3 are 8-pin high speed photocouplers containing a GaAlAs LED on input side and a PN photodiode and a high speed amplifier transistor on output side on one chip. The PS8502 is in a plastic DIP (Dual In-line Package) with 8 mm creepage distance product.

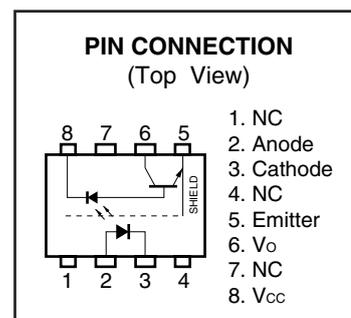
The PS8502L1 is lead bending type for long creepage distance.

The PS8502L2 is lead bending type for long creepage distance (Gull-wing) for surface mount.

The PS8502L3 is lead bending type (Gull-wing) for surface mounting.

FEATURES

- Long creepage distance (8 mm MIN.: PS8502L1, PS8502L2)
- High common mode transient immunity ($CM_H, CM_L = \pm 15 \text{ kV}/\mu\text{s}$ MIN.)
- High supply voltage ($V_{CC} = 35 \text{ V MAX.}$)
- High speed response ($t_{PHL}, t_{PLH} = 0.8 \mu\text{s MAX.}$)
- High isolation voltage ($BV = 5\,000 \text{ Vr.m.s.}$)
- TTL, CMOS compatible with a resistor
- Ordering number of tape product: PS8502L2-E3: 1 000 pcs/reel
: PS8502L3-E3: 1 000 pcs/reel
- Pb-Free product
- Safety standards
 - UL approved: File No. E72422
 - CSA approved: No. CA 101391
 - BSI approved: No. 8937, 8938
 - SEMKO approved: No. 615433
 - NEMKO approved: No. P06207243
 - DEMKO approved: No. 314091
 - FIMKO approved: No. FI 22827
 - DIN EN60747-5-2 (VDE0884 Part2) approved (Option)



APPLICATIONS

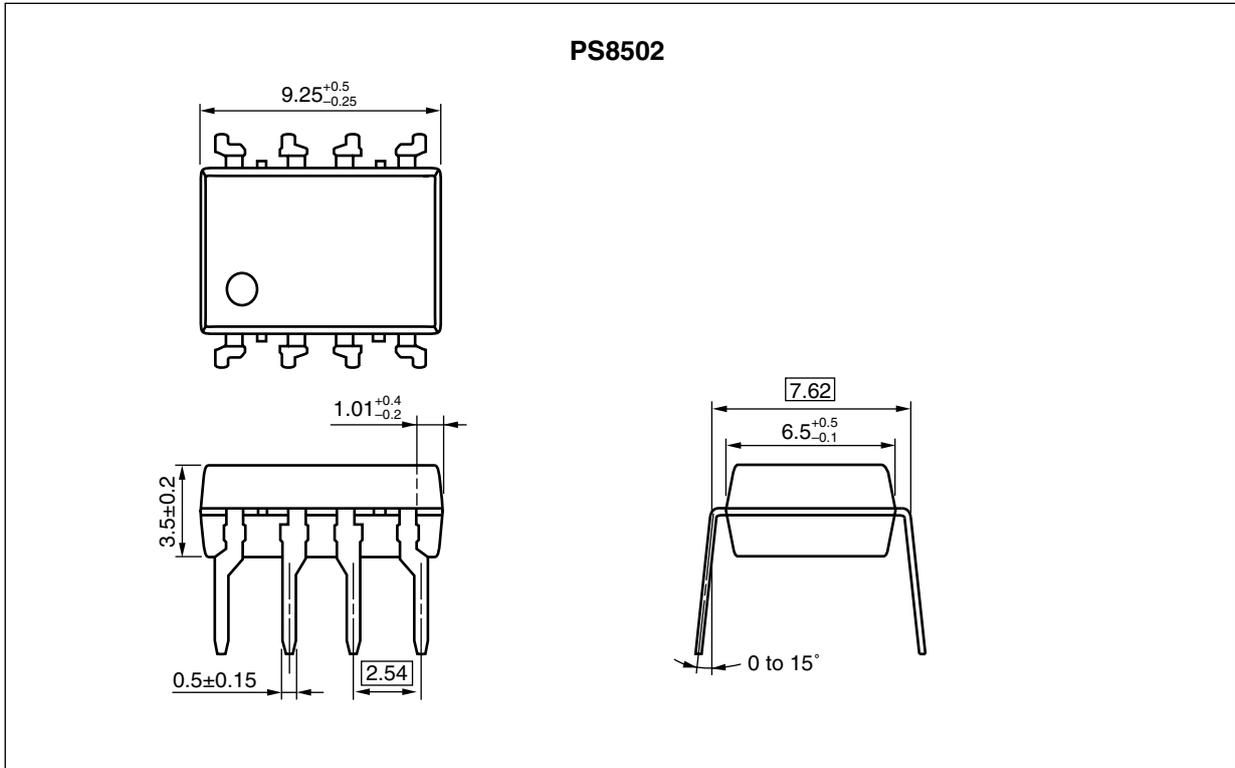
- Interface for measurement or control equipment
- Substitutions for relays and pulse transformers
- Modem, communications device
- General purpose inverter

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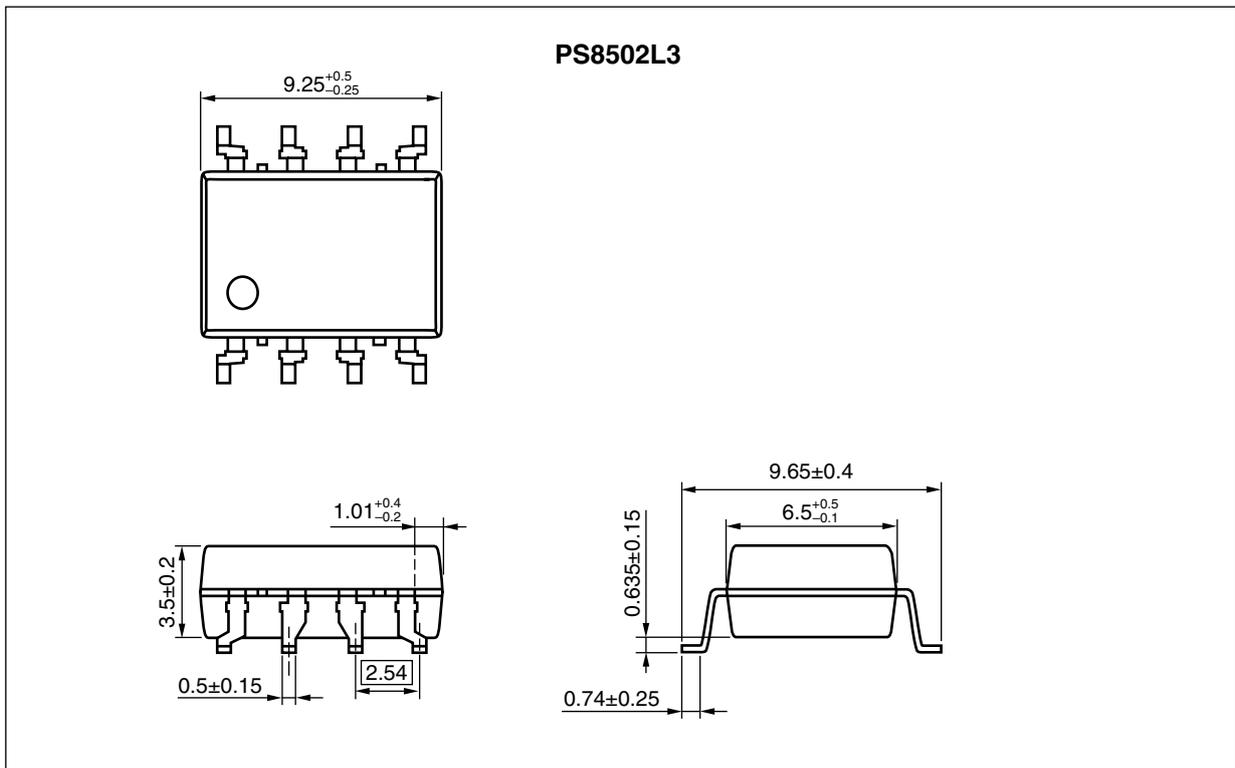
Not all products and/or types are available in every country. Please check with an NEC Electronics sales representative for availability and additional information.

PACKAGE DIMENSIONS (UNIT: mm)

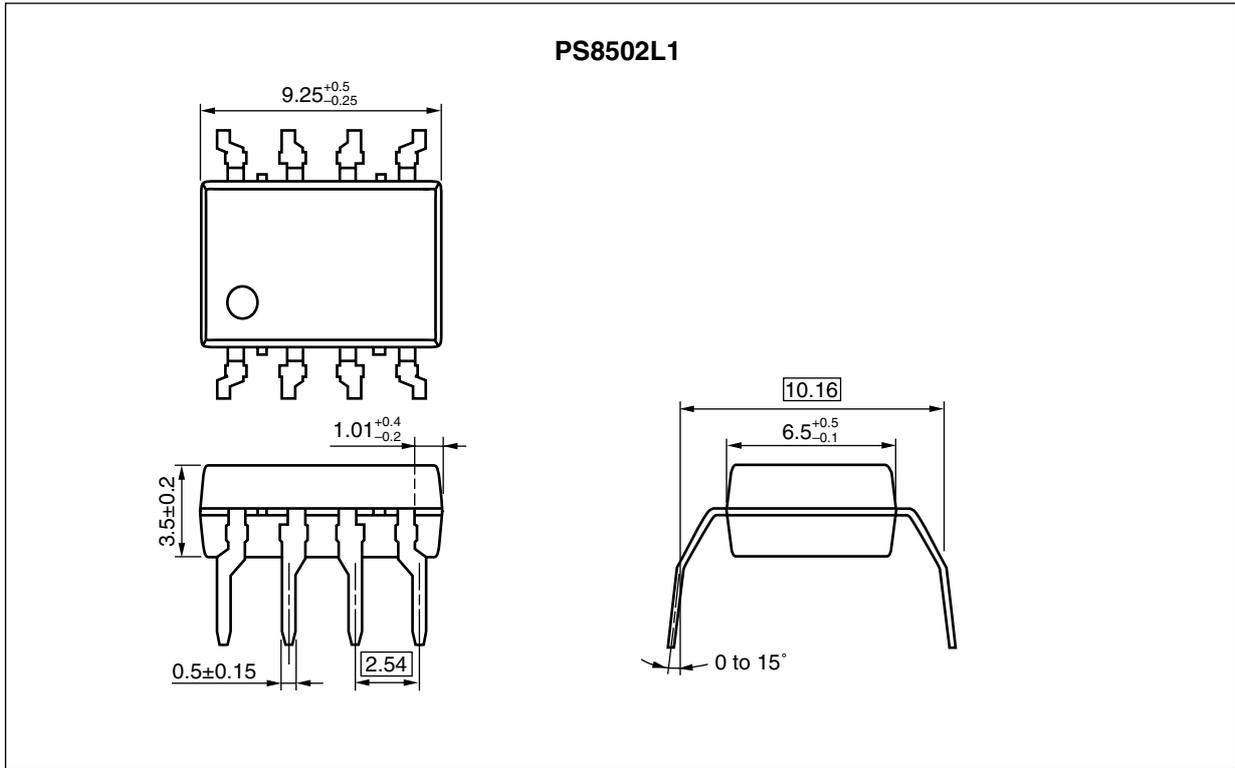
DIP Type



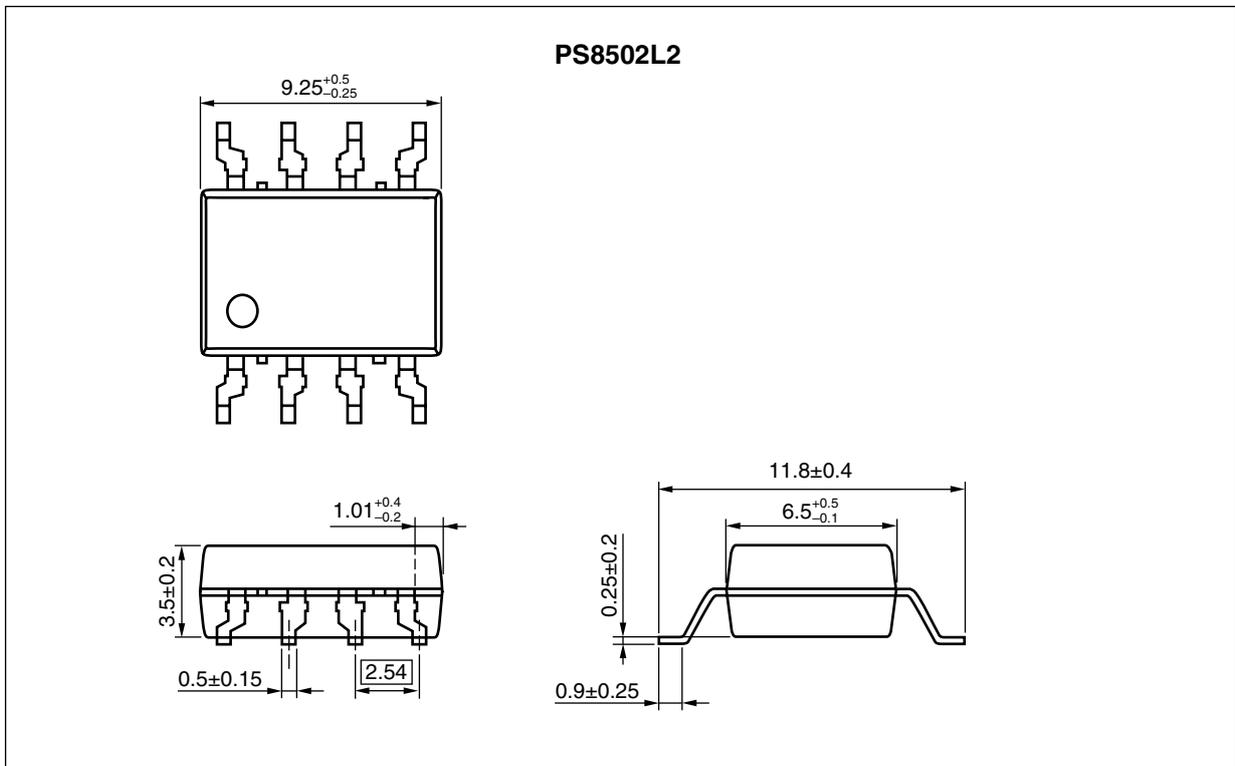
Lead Bending Type (Gull-wing) For Surface Mount



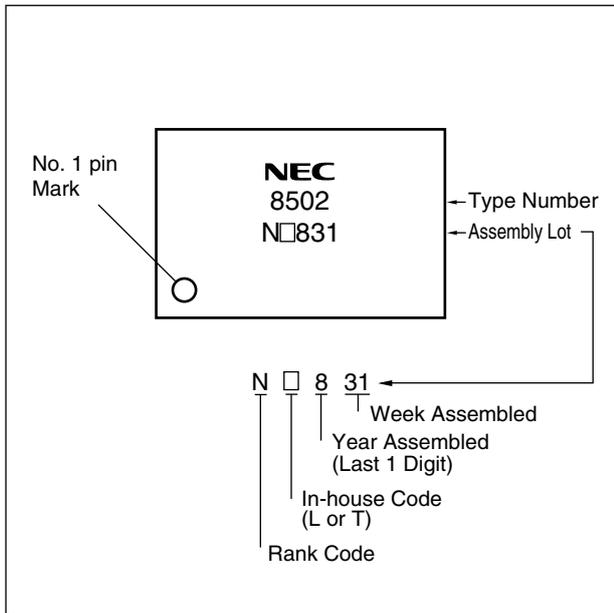
Lead Bending Type For Long Creepage Distance



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



<R> **MARKING EXAMPLE**



PHOTOCOUPLER CONSTRUCTION

Parameter	PS8502, PS8502L3	PS8502L1, PS8502L2
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			
PS8502	PS8502-AX	Pb-Free (Ni/Pd/Au)	Magazine case 50 pcs	Standard products (UL, CSA, BSI, SEMKO, NEMKO, DEMKO, FIMKO approved)	PS8502			
PS8502L1	PS8502L1-AX				PS8502L1			
PS8502L2	PS8502L2-AX				PS8502L2			
PS8502L3	PS8502L3-AX				PS8502L3			
PS8502L2-E3	PS8502L2-E3-AX		Embossed Tape 1 000 pcs/reel			PS8502L2		
PS8502L3-E3	PS8502L3-E3-AX					PS8502L3		
PS8502-V	PS8502-V-AX		Magazine case 50 pcs		DIN EN60747-5-2 (VDE0884 Part2) Approved (Option)	PS8502		
PS8502L1-V	PS8502L1-V-AX					PS8502L1		
PS8502L2-V	PS8502L2-V-AX					PS8502L2		
PS8502L3-V	PS8502L3-V-AX					PS8502L3		
PS8502L2-V-E3	PS8502L2-V-E3-AX			Embossed Tape 1 000 pcs/reel				PS8502L2
PS8502L3-V-E3	PS8502L3-V-E3-AX							PS8502L3

*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 _{CC}	35	V
	Output Voltage	V _O	35	V
	Output Current	I _O	8	mA
	Power Dissipation ²	P _C	100	mW
Isolation Voltage ³		BV	5 000	Vr.m.s.
Operating Ambient Temperature		T _A	-55 to +100	°C
Storage Temperature		T _{stg}	-55 to +125	°C

*1 Reduced to 0.33 mA/°C at T_A = 70°C or more.

*2 Reduced to 2.0 mW/°C at T_A = 75°C or more.

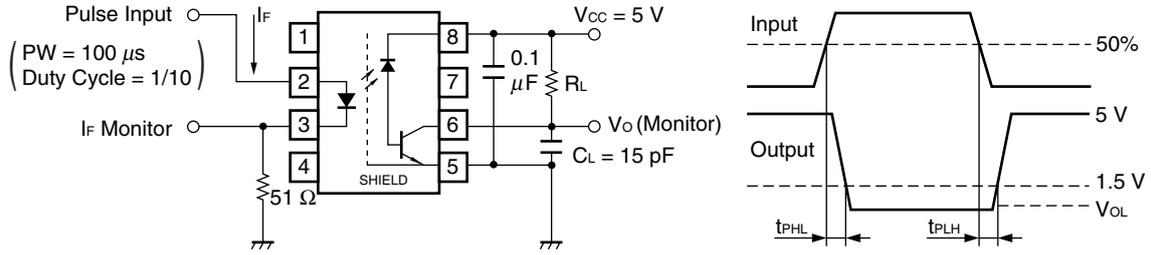
*3 AC voltage for 1 minute at T_A = 25°C, RH = 60% between input and output.
Pins 1-4 shorted together, 5-8 shorted together.

ELECTRICAL CHARACTERISTICS (T_A = 25°C)

Parameter		Symbol	Conditions	MIN.	TYP. ¹⁾	MAX.	Unit
Diode	Forward Voltage	V _F	I _F = 16 mA		1.7	2.2	V
	Reverse Current	I _R	V _R = 3 V			10	μA
	Forward Voltage Temperature Coefficient	ΔV _F /ΔT _A	I _F = 16 mA		-2.1		mV/°C
	Terminal Capacitance	C _t	V = 0 V, f = 1 MHz		60		pF
Detector	High Level Output Current	I _{OH} (1)	I _F = 0 mA, V _{CC} = V _O = 5.5 V		3	500	nA
	High Level Output Current	I _{OH} (2)	I _F = 0 mA, V _{CC} = V _O = 35 V			100	μA
	Low Level Output Voltage	V _{OL}	I _F = 16 mA, V _{CC} = 4.5 V, I _O = 2.4 mA		0.15	0.4	V
	Low Level Supply Current	I _{CCL}	I _F = 16 mA, V _O = Open, V _{CC} = 35 V		150		μA
	High Level Supply Current	I _{CCH}	I _F = 0 mA, V _O = Open, V _{CC} = 35 V		0.01	1	μA
Coupled	Current Transfer Ratio	CTR	I _F = 16 mA, V _{CC} = 4.5 V, V _O = 0.4 V	15			%
	Isolation Resistance	R _{I-O}	V _{I-O} = 1 kV _{DC}	10 ¹¹			Ω
	Isolation Capacitance	C _{I-O}	V = 0 V, f = 1 MHz		0.7		pF
	Propagation Delay Time (H → L) ²⁾	t _{PHL}	I _F = 16 mA, V _{CC} = 5 V, R _L = 1.9 kΩ		0.22	0.8	μs
	Propagation Delay Time (L → H) ²⁾	t _{PLH}	I _F = 16 mA, V _{CC} = 5 V, R _L = 1.9 kΩ		0.35	0.8	μs
	Common Mode Transient Immunity at High Level Output ³⁾	CM _H	I _F = 0 mA, V _{CC} = 5 V, V _{CM} = 1.5 kV, R _L = 4.1 kΩ	15			kV/μs
	Common Mode Transient Immunity at Low Level Output ³⁾	CM _L	I _F = 16 mA, V _{CC} = 5 V, V _{CM} = 1.5 kV, R _L = 4.1 kΩ	-15			kV/μs

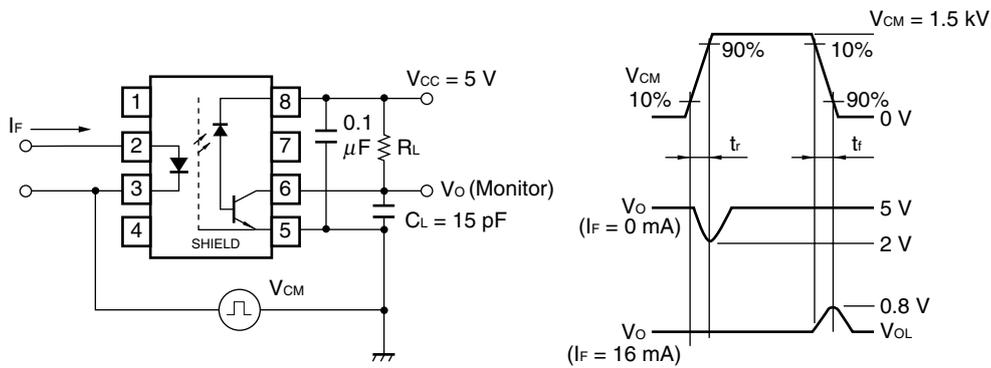
*1 Typical values at $T_A = 25^\circ\text{C}$

*2 Test circuit for propagation delay time



Remark C_L includes probe and stray wiring capacitance.

*3 Test circuit for common mode transient immunity

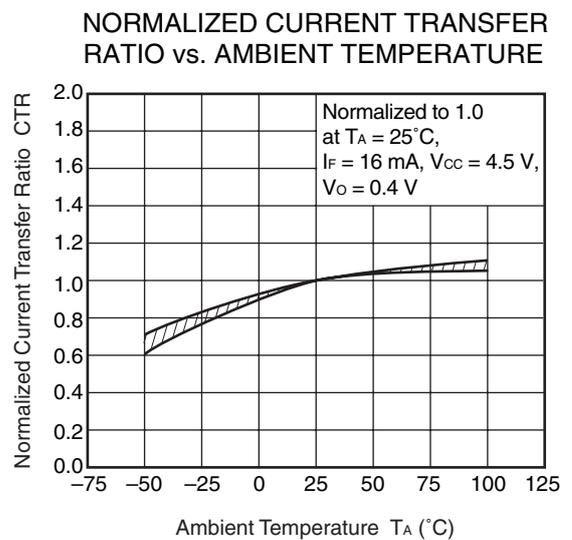
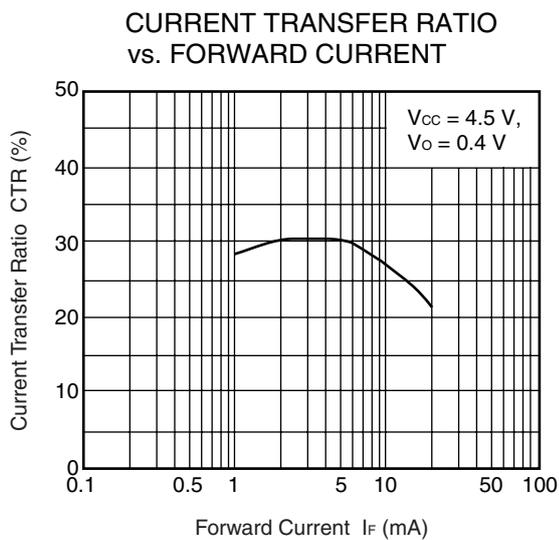
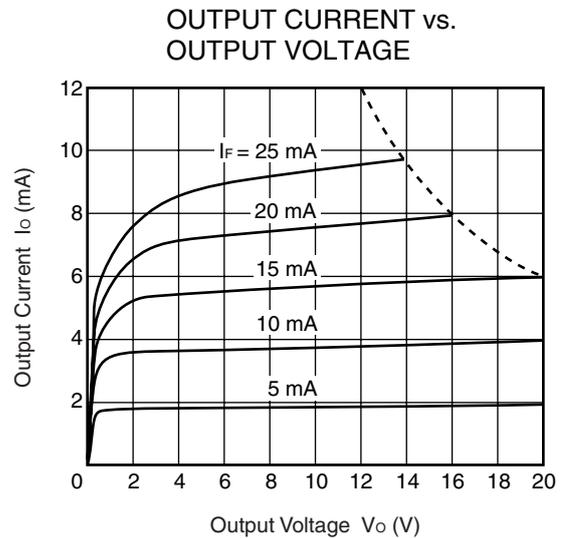
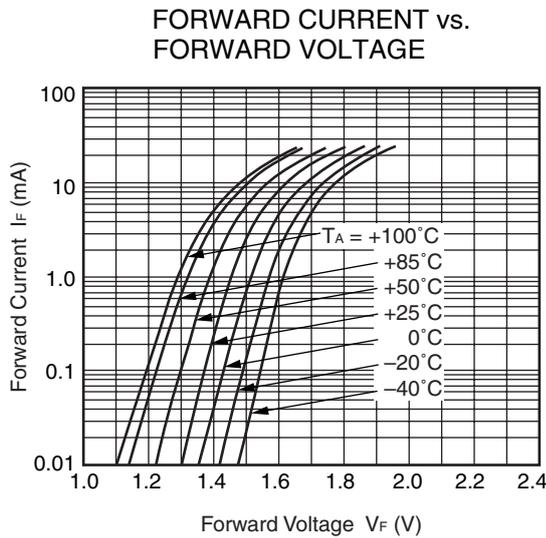
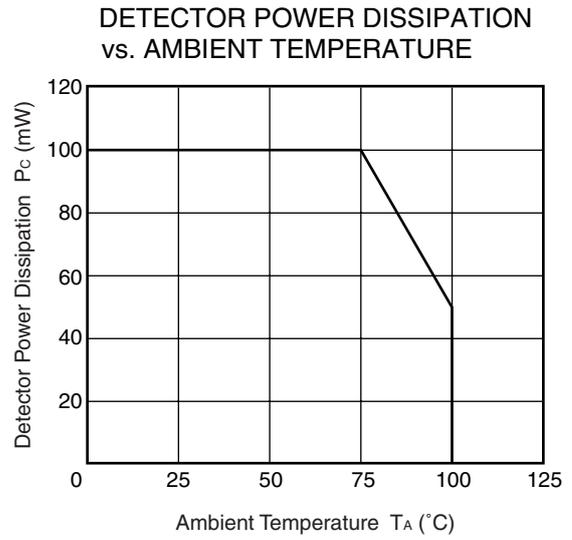
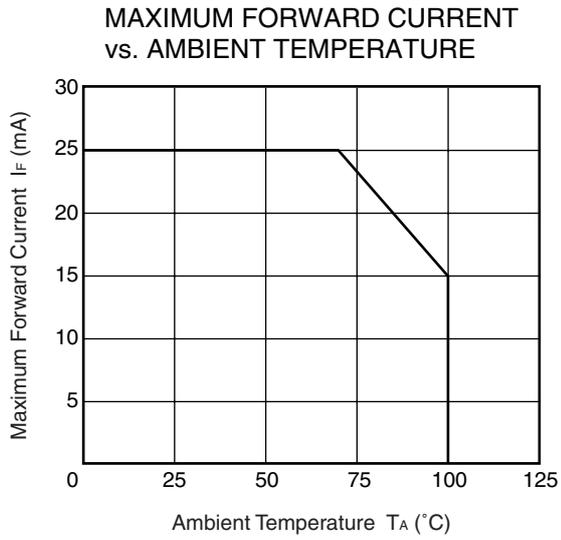


Remark C_L includes probe and stray wiring capacitance.

USAGE CAUTIONS

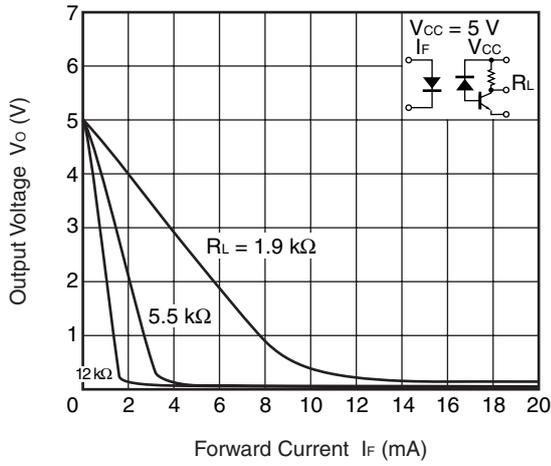
1. This product is weak for static electricity by designed with high-speed integrated circuit so protect against static electricity when handling.
2. By-pass capacitor of more than $0.1\ \mu\text{F}$ is used between V_{CC} and GND near device. Also, ensure that the distance between the leads of the photocoupler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

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

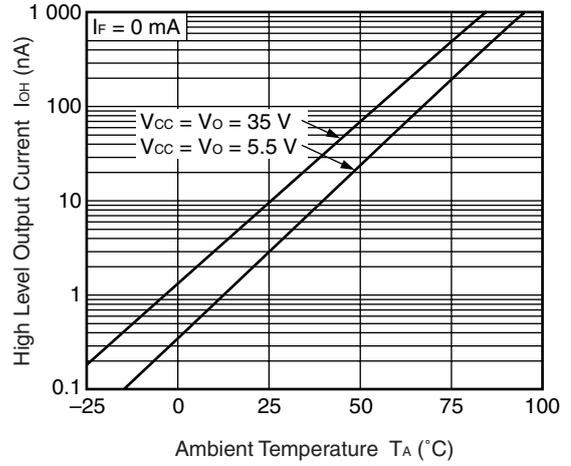


Remark The graphs indicate nominal characteristics.

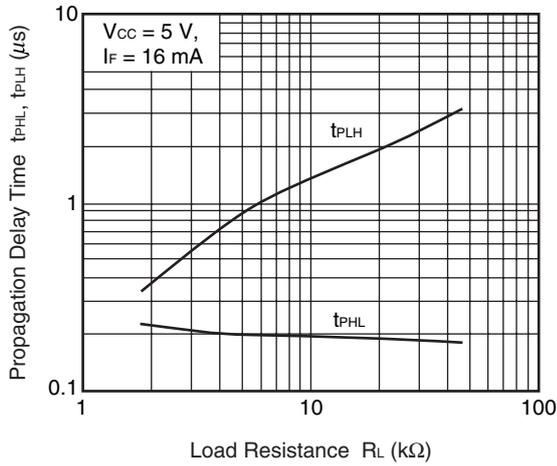
OUTPUT VOLTAGE vs. FORWARD CURRENT



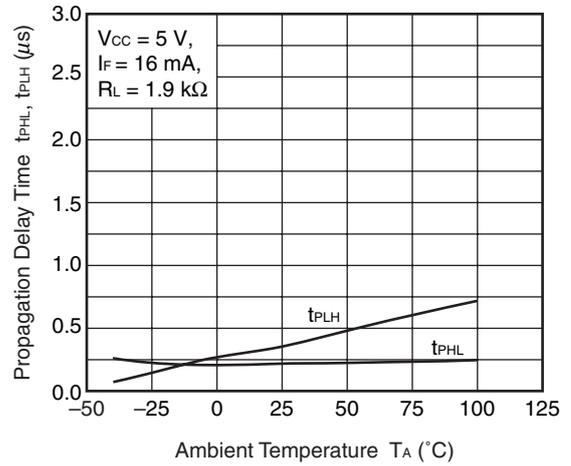
HIGH LEVEL OUTPUT CURRENT vs. AMBIENT TEMPERATURE



PROPAGATION DELAY TIME, vs. LOAD RESISTANCE



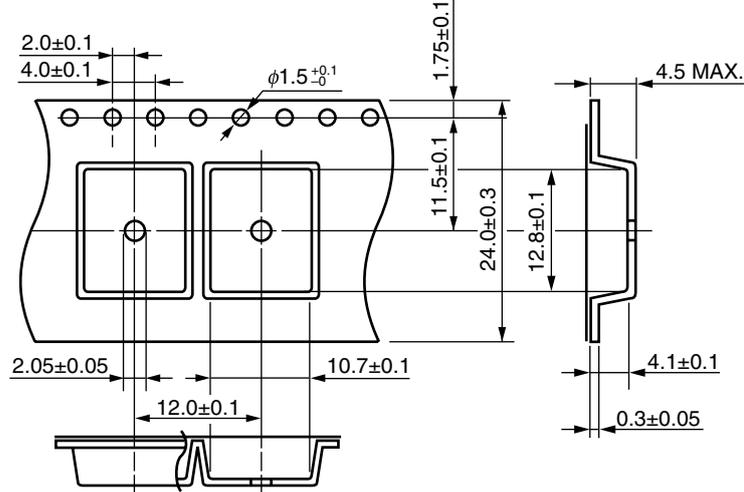
PROPAGATION DELAY TIME, vs. AMBIENT TEMPERATURE



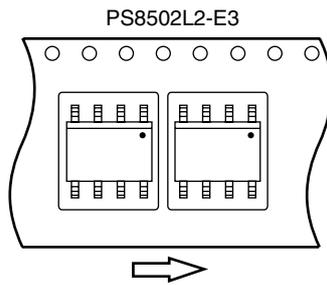
Remark The graphs indicate nominal characteristics.

TAPING SPECIFICATIONS (UNIT: mm)

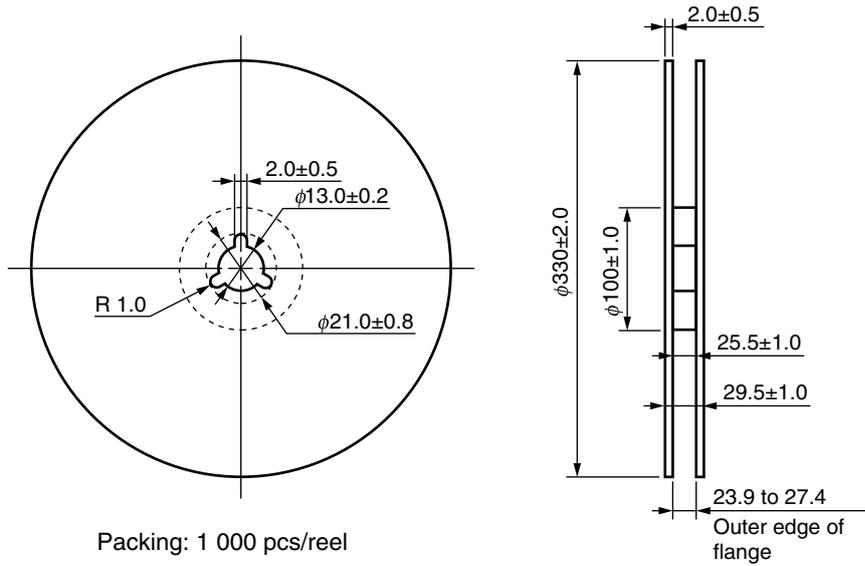
Outline and Dimensions (Tape)



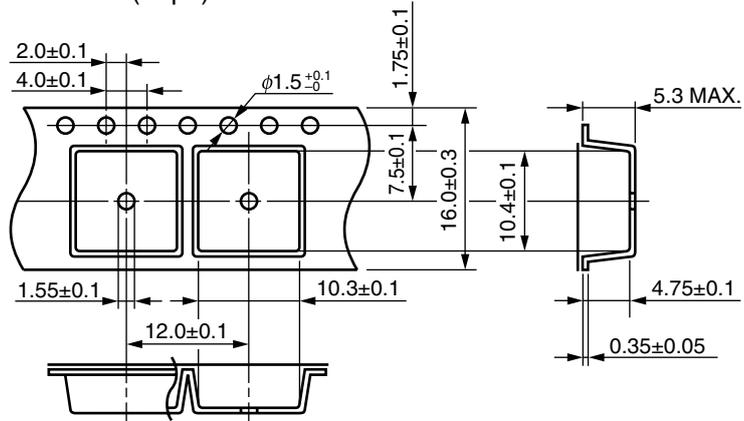
Tape Direction



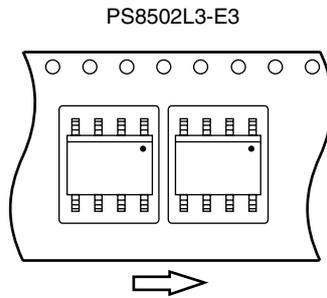
Outline and Dimensions (Reel)



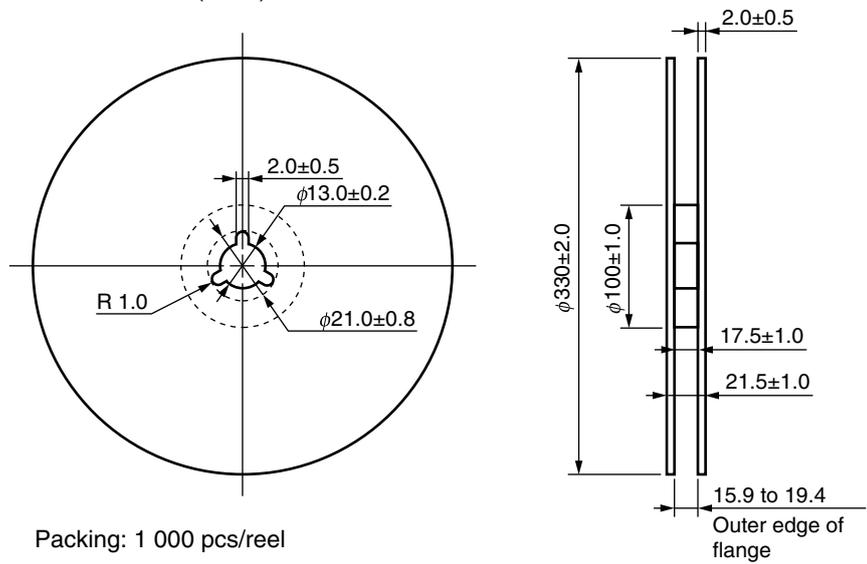
Outline and Dimensions (Tape)



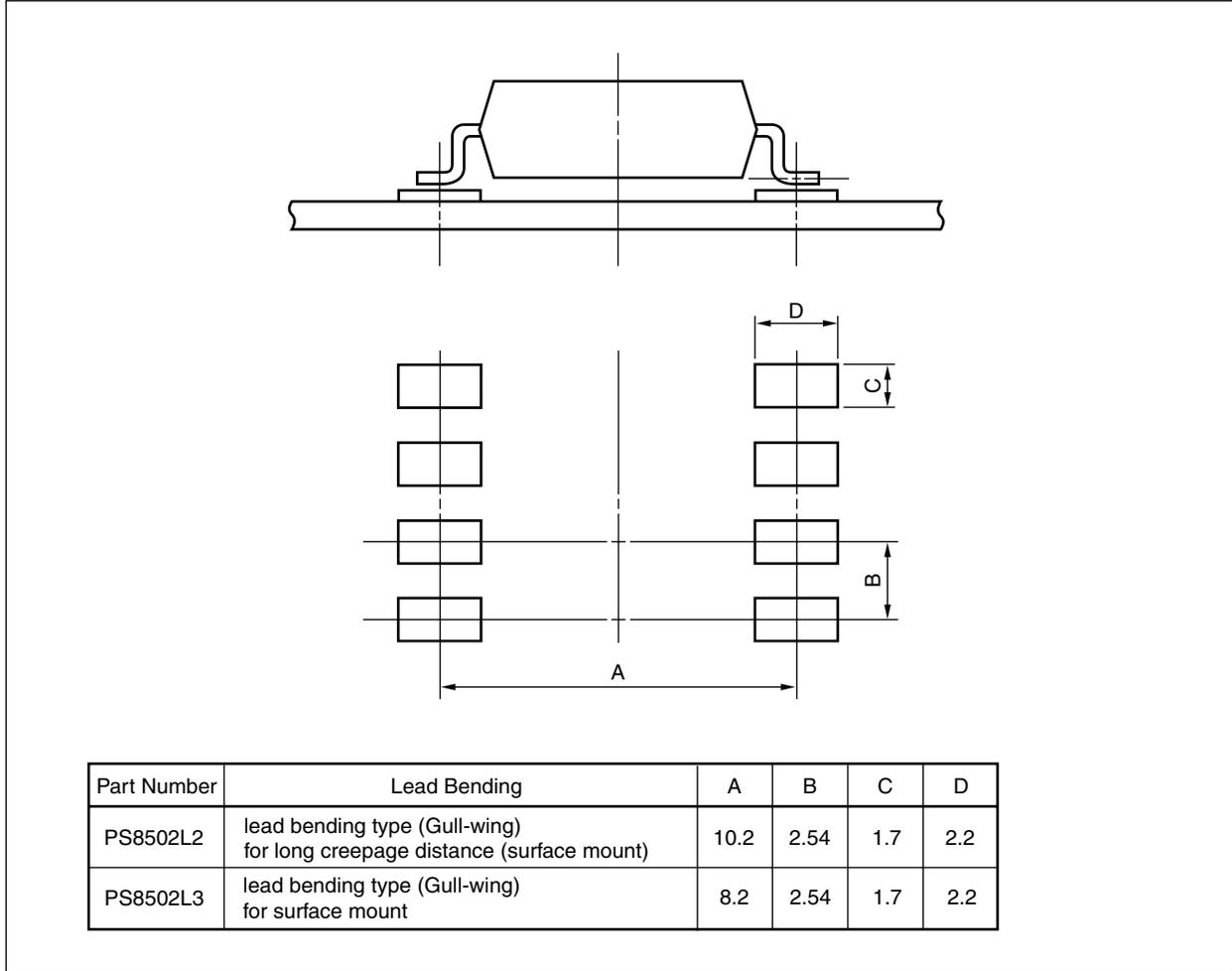
Tape Direction



Outline and Dimensions (Reel)



RECOMMENDED MOUNT PAD DIMENSIONS (UNIT: mm)



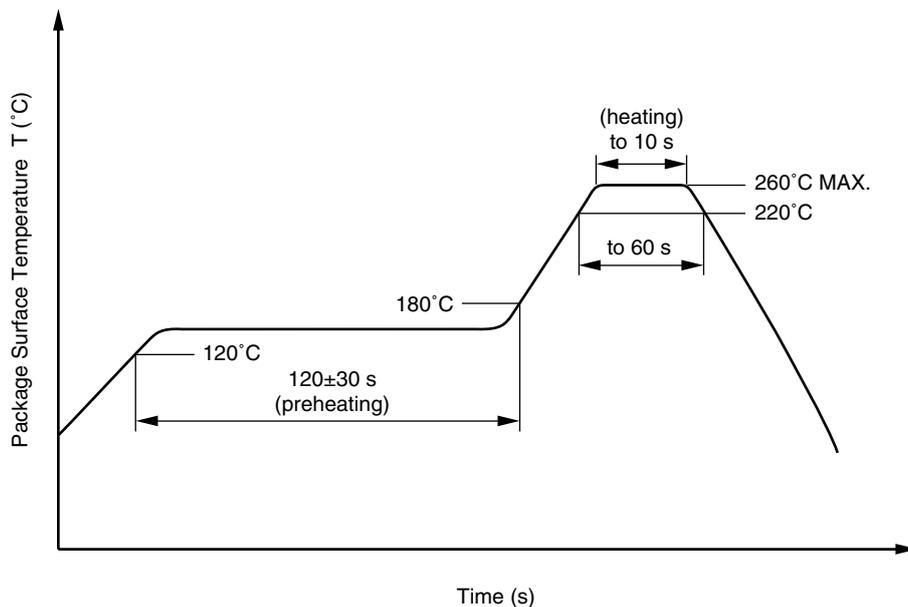
NOTES ON HANDLING

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.

(b) Please be sure that the temperature of the package would not be heated over 100°C.

(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 or between collector-emitters at startup, the output side may enter the on state, even if the voltage is within the absolute maximum ratings.

<R> USAGE CAUTIONS

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

SPECIFICATION OF VDE MARKS LICENSE DOCUMENT

Parameter	Symbol	Speck	Unit
Application classification (DIN EN 60664-1 VDE0110 Part 1) for rated line voltages ≤ 300 Vr.m.s. for rated line voltages ≤ 600 Vr.m.s.		IV III	
Climatic test class (DIN EN 60664-1 VDE0110)		55/100/21	
Dielectric strength maximum operating isolation voltage Test voltage (partial discharge test, procedure a for type test and random test) $U_{pr} = 1.5 \times U_{IORM}, P_d < 5 \text{ pC}$	U_{IORM} U_{pr}	1 130 1 695	V_{peak} 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	
Clearance distance		>8.0	mm
Creepage distance		>8.0	mm
Comparative tracking index (DIN IEC 112/VDE 0303 Part 1)	CTI	175	
Material group (DIN EN 60664-1 VDE0110 Part 1)		III a	
Storage temperature range	T_{stg}	-55 to +125	$^{\circ}\text{C}$
Operating temperature range	T_A	-55 to +100	$^{\circ}\text{C}$
Isolation resistance, minimum value $V_{IO} = 500 \text{ V dc at } T_A = 25^{\circ}\text{C}$ $V_{IO} = 500 \text{ V dc at } T_A \text{ MAX. at least } 100^{\circ}\text{C}$	Ris MIN. Ris MIN.	10^{12} 10^{11}	Ω Ω
Safety maximum ratings (maximum permissible in case of fault, see thermal derating curve) Package temperature Current (input current $I_F, P_{si} = 0$) Power (output or total power dissipation) Isolation resistance $V_{IO} = 500 \text{ V dc at } T_A = T_{si}$	T_{si} I_{si} P_{si} Ris MIN.	175 400 700 10^9	$^{\circ}\text{C}$ mA mW Ω

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