

HIGH NOISE REDUCTION, 15 Mbps CMOS OUTPUT TYPE 8-PIN SSOP PHOTOCOUPLER

–NEPOC Series–

DESCRIPTION

The PS9851-1, -2 are optically coupled isolators containing GaAlAs LED on the input side and a CMOS output IC on the output side.

They are high common mode transient immunity (CMR), high-speed CMOS output type photocouplers designed for high-speed logic interface circuits.

★ FEATURES

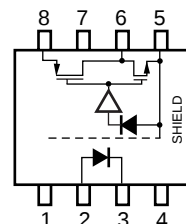
- High-speed response (15 Mbps)
- Operable at high temperature (–40 to +100°C)
- High common mode transient immunity ($CM_H, CM_L = \pm 20 \text{ kV}/\mu\text{s}$ TYP.)
- High isolation voltage ($BV = 2\,500 \text{ Vr.m.s.}$)
- Pulse width distortion ($|t_{PHL} - t_{PLH}| = 3 \text{ ns}$ TYP.)
- Ordering number of tape product : PS9851-1-F3, F4: 1 500 pcs/reel
: PS9851-2-F3, F4: 1 500 pcs/reel
- Pb-Free product
- Safety standards
 - UL approved: File No. E72422
 - DIN EN60747-5-2 (VDE0884 Part2) approved No.40008347 (Option)

APPLICATIONS

- FA Network
- Measurement equipment
- PDP

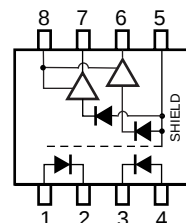
PIN CONNECTION (Top View)

PS9851-1



1. NC
2. Anode
3. Cathode
4. NC
5. GND
6. V_O
7. NC
8. V_{DD}

PS9851-2



1. Anode1
2. Cathode1
3. Cathode2
4. Anode2
5. GND
6. V_{O2}
7. V_{O1}
8. V_{DD}

The information in this document is subject to change without notice. Before using this document, please confirm that this is the latest version.

Technical drawing of a 4x4 pin connector. The drawing includes three views: a top view, a side view, and a cross-sectional view.

Top View Dimensions:

- Overall width: 5.21 ± 0.25 (include burr)
- Pin pitch: 5.08 ± 0.15
- Pin diameter: $0.4^{+0.10}_{-0.05}$
- Pin length: 1.27
- Pin spacing: 0.25

Side View Dimensions:

- Overall height: 3.27 ± 0.2
- Pin height: 0.1 ± 0.1
- Pin diameter: $0.4^{+0.10}_{-0.05}$
- Pin length: 1.27
- Pin spacing: 0.25

Cross-sectional View Dimensions:

- Overall width: 6.0 ± 0.2
- Pin pitch: 3.95 ± 0.1
- Pin diameter: $0.4^{+0.10}_{-0.05}$
- Pin length: 0.5 ± 0.3
- Pin spacing: 0.10

PS9851-1

9851-1
NL451

← Type Number
← Assembly Lot

(N)
No. 1 pin Mark
Initial of NEC
(Engraved mark)

N L 4 51
Rank Code
In-house Code
(L: Pb-Free)
Year Assembled
(Last 1 Digit)
Week Assembled
(Last 1 Digit)

PS9851-2

9851-2
NL451

← Type Number
← Assembly Lot

(N)
No. 1 pin Mark
Initial of NEC
(Engraved mark)

N L 4 51
Rank Code
In-house Code
(L: Pb-Free)
Year Assembled
(Last 1 Digit)
Week Assembled
(Last 1 Digit)

★ ORDERING INFORMATION

Part Number	Order Number	Solder Plating Specification	Packing Style	Safety Standard Approval	Application Part Number ^{*1}
PS9851-1	PS9851-1-A	Pb-Free	20 pcs (Tape 20 pcs cut)	Standard products (UL approved)	PS9851-1
PS9851-1-F3	PS9851-1-F3-A		Embossed Tape 1 500 pcs/reel		
PS9851-1-F4	PS9851-1-F4-A				
PS9851-2	PS9851-2-A		20 pcs (Tape 20 pcs cut)		PS9851-2
PS9851-2-F3	PS9851-2-F3-A		Embossed Tape 1 500 pcs/reel		
PS9851-2-F4	PS9851-2-F4-A				
PS9851-1-V	PS9851-1-V-A		20 pcs (Tape 20 pcs cut)	DIN EN60747-5-2 (VDE0884 Part2) approved (Option)	PS9851-1
PS9851-1-V-F3	PS9851-1-V-F3-A		Embossed Tape 1 500 pcs/reel		
PS9851-1-V-F4	PS9851-1-V-F4-A				
PS9851-2-V	PS9851-2-V-A		20 pcs (Tape 20 pcs cut)		PS9851-2
PS9851-2-V-F3	PS9851-2-V-F3-A		Embossed Tape 1 500 pcs/reel		
PS9851-2-V-F4	PS9851-2-V-F4-A				

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

★ ABSOLUTE MAXIMUM RATINGS ($T_A = 25^{\circ}\text{C}$, 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_{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	2 500	Vr.m.s.
Operating Ambient Temperature		T_A	-40 to +100	$^{\circ}\text{C}$
Storage Temperature		T_{stg}	-55 to +125	$^{\circ}\text{C}$

***1** Reduced to 0.33 mA/ $^{\circ}\text{C}$ at $T_A = 85^{\circ}\text{C}$ or more for PS9851-2.

***2** AC voltage for 1 minute at $T_A = 25^{\circ}\text{C}$, RH = 60% between input and output.
Pins 1-4 shorted together, 5-8 shorted together.

RECOMMENDED OPERATING CONDITIONS ($T_A = 25^{\circ}\text{C}$)

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

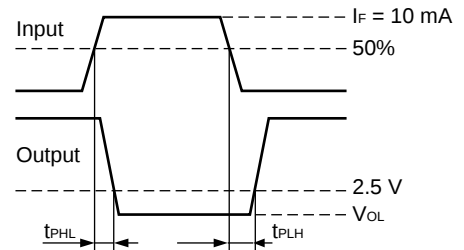
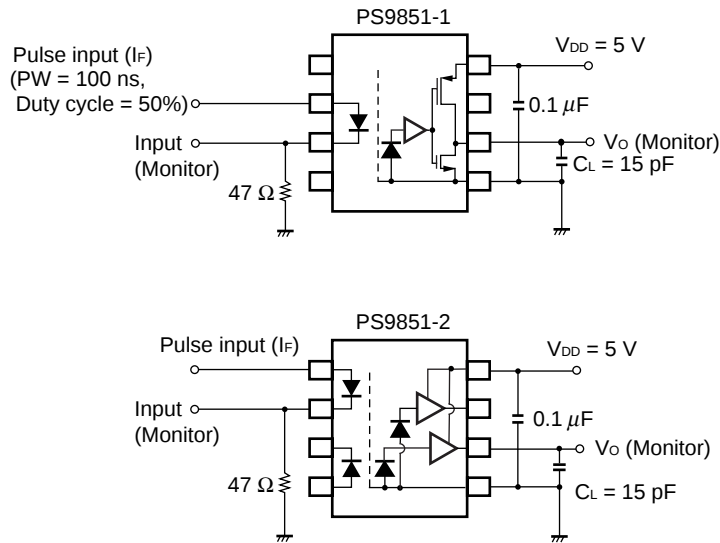
★ **ELECTRICAL CHARACTERISTICS** ($T_A = -40$ to $+100^\circ\text{C}$, $V_{DD} = 4.5$ to 5.5 V, unless otherwise specified)

Parameter		Symbol	Conditions	MIN.	TYP. *1	MAX.	Unit
Diode	Forward Voltage	V_F	$I_F = 10$ mA, $T_A = 25^\circ\text{C}$		1.6	1.9	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 (1ch)		2.5	5	mA/ch
	Low Level Supply Current	I_{DDL}	$I_F = 10$ mA (1ch)		2	5	
	High Level Output Voltage	V_{OH}	$I_O = -20\mu\text{A}$, $I_F = 0$ mA	4.0	5.0		V
	Low Level Output Voltage *2	V_{OL}	$I_O = 20\mu\text{A}$, $I_F = 10$ mA		0	0.1	
Coupled	Threshold Input Current	I_{FHL}	$V_O < 1$ V		2.8	6	mA
	Isolation Resistance	R_{I-O}	$V_{I-O} = 1$ kV _{DC} , RH = 40 to 60%, $T_A = 25^\circ\text{C}$	10^{11}			Ω
	Isolation Capacitance	C_{I-O}	$V = 0$ V, $f = 1$ MHz, $T_A = 25^\circ\text{C}$		0.6		pF
	Propagation Delay Time (H $\rightarrow$ L) *3	t_{PHL}	$I_F = 10$ mA, $V_{DD} = 5$ V, $C_L = 15$ pF, CMOS Levels		34	60	ns
	Propagation Delay Time (L $\rightarrow$ H) *3	t_{PLH}			37	60	
	Pulse Width	PW		100			
	Pulse Width Distortion (PWD) *3	$ t_{PHL} - t_{PLH} $			3	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, $T_A = 25^\circ\text{C}$	10	20		kV/ μs
	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, $T_A = 25^\circ\text{C}$	10	20		

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

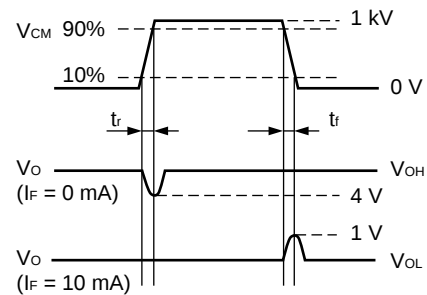
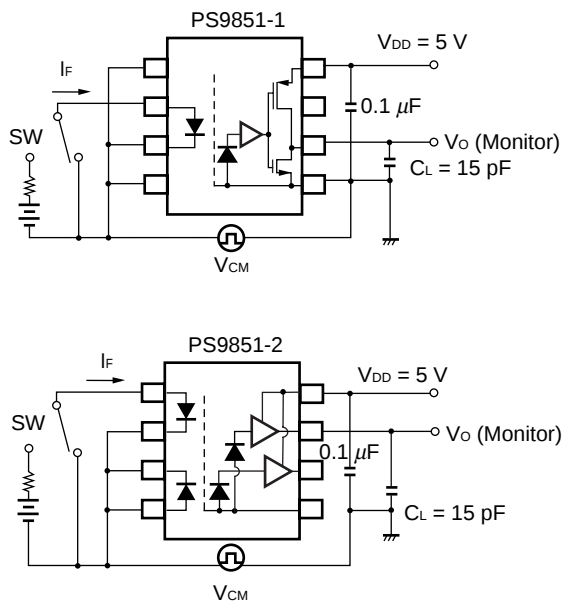
*2 Because V_{OL} of 2 V or more may be output when LED current input and when output supply, it is important to confirm the characteristics (operation with the power supply on and off) during design, before using this device.

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



Remark C_L includes probe and stray wiring capacitance.

***4 Test circuit for common mode transient immunity**



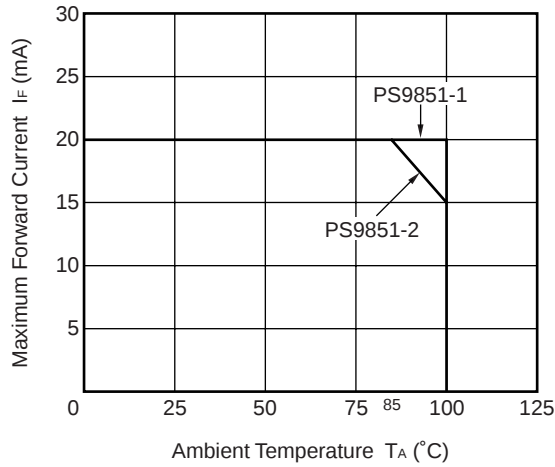
Remark C_L includes probe and stray wiring capacitance.

USAGE CAUTIONS

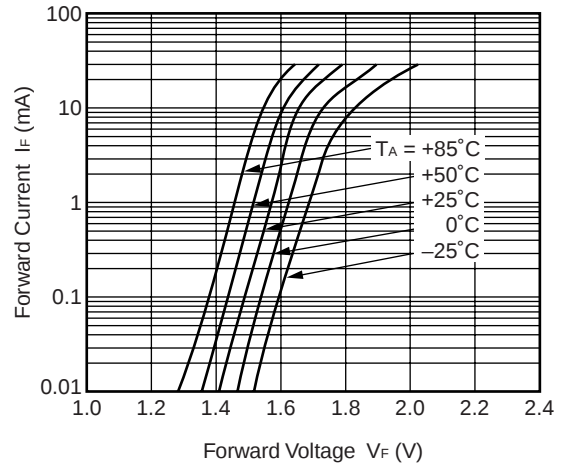
1. This product is weak for static electricity by designed with high-speed integrated circuit so protect against static electricity when handling.
2. By-pass capacitor of more than $0.1 \mu\text{F}$ is used between V_{DD} and GND near device. Also, ensure that the distance between the leads of the photocoupler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

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

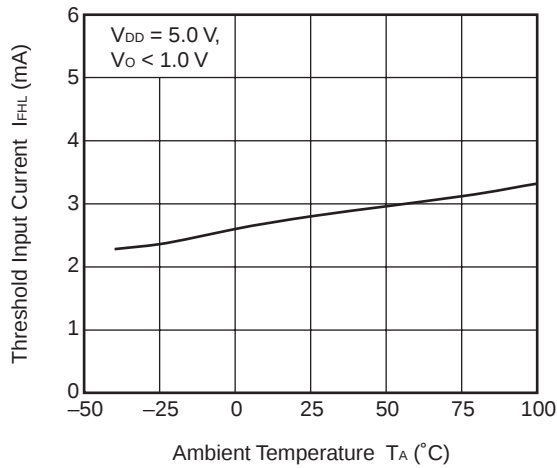
MAXIMUM FORWARD CURRENT
vs. AMBIENT TEMPERATURE



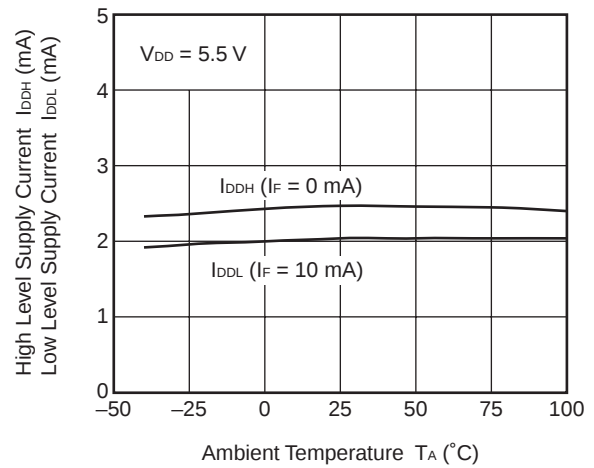
FORWARD CURRENT vs.
FORWARD VOLTAGE



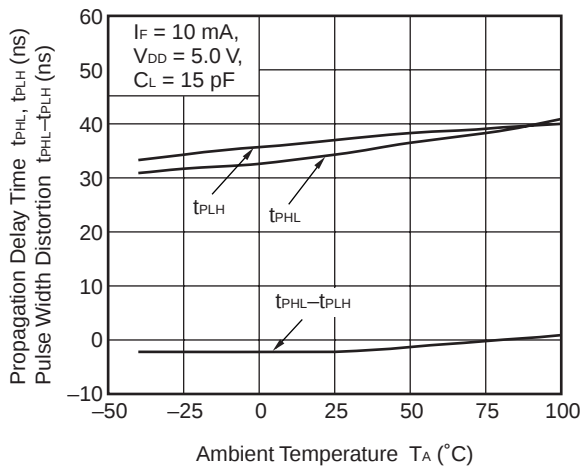
THRESHOLD INPUT CURRENT vs.
AMBIENT TEMPERATURE



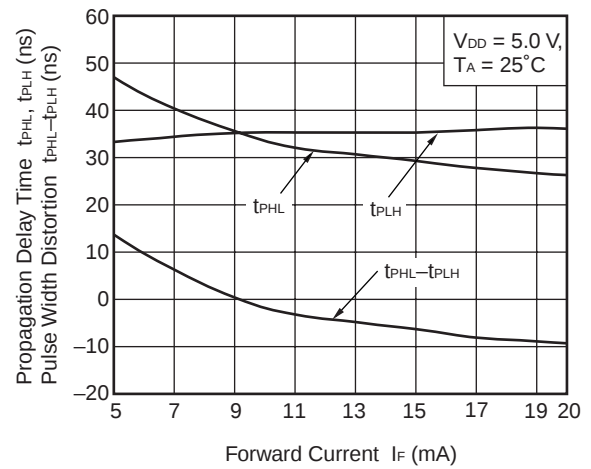
SUPPLY CURRENT vs.
AMBIENT TEMPERATURE



t_{PHL} , t_{PLH} , $t_{PHL}-t_{PLH}$ vs.
AMBIENT TEMPERATURE



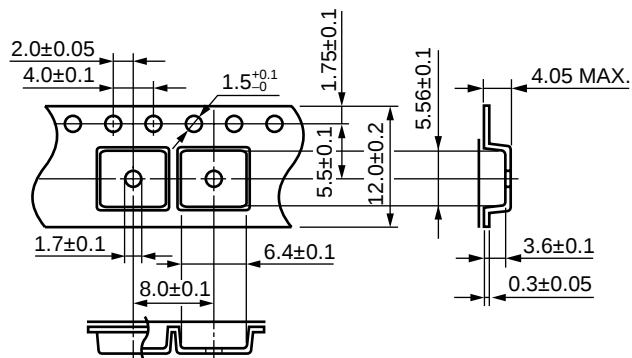
t_{PHL} , t_{PLH} , $t_{PHL}-t_{PLH}$ vs.
FORWARD CURRENT



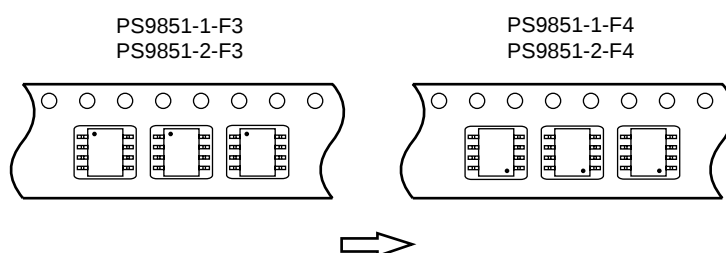
Remark The graphs indicate nominal characteristics.

TAPING SPECIFICATIONS (UNIT: mm)

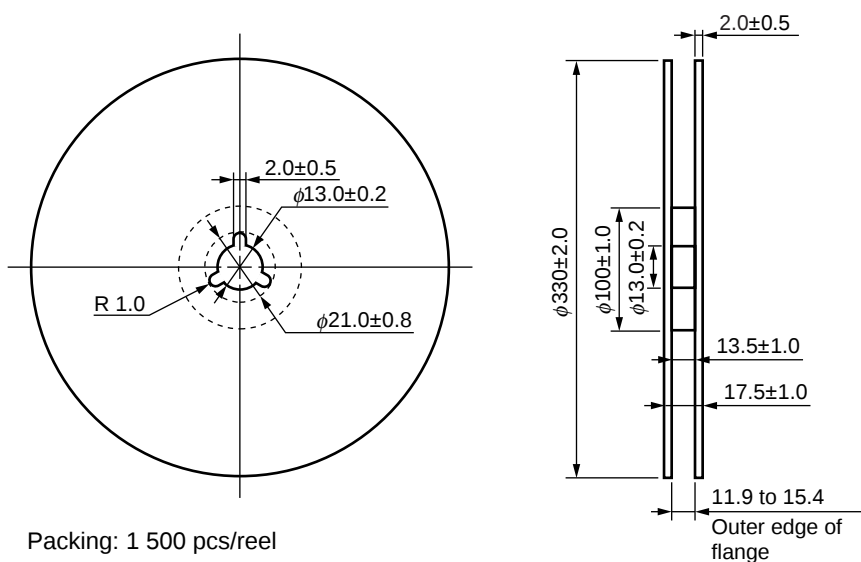
Outline and Dimensions (Tape)



Taping Direction



Outline and Dimensions (Reel)



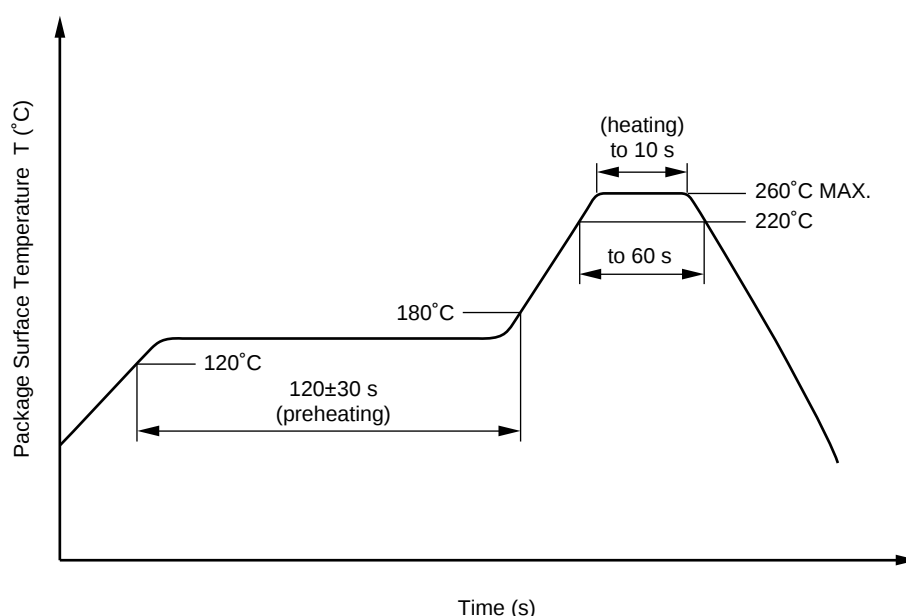
NOTES ON HANDLING

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 at startup, the CMOS IC on output side may enter the on state, even if the voltage is within the absolute maximum ratings.

★ USAGE CAUTIONS

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

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M8E 00.4-0110

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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► For further information, please contact

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Subject: Compliance with EU Directives

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CEL Pb-free products have the same base part number with a suffix added. The suffix –A indicates that the device is Pb-free. The –AZ suffix is used to designate devices containing Pb which are exempted from the requirement of RoHS directive (*). In all cases the devices have Pb-free terminals. All devices with these suffixes meet the requirements of the RoHS directive.

This status is based on CEL's understanding of the EU Directives and knowledge of the materials that go into its products as of the date of disclosure of this information.

Restricted Substance per RoHS	Concentration Limit per RoHS (values are not yet fixed)	Concentration contained in CEL devices	
		-A	-AZ
Lead (Pb)	< 1000 PPM	Not Detected	(*)
Mercury	< 1000 PPM	Not Detected	
Cadmium	< 100 PPM	Not Detected	
Hexavalent Chromium	< 1000 PPM	Not Detected	
PBB	< 1000 PPM	Not Detected	
PBDE	< 1000 PPM	Not Detected	

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