



PHOTOCOUPLER PS2705-1

HIGH ISOLATION VOLTAGE AC INPUT RESPONSE TYPE SOP MULTI PHOTOCOUPLER

–NEPOC Series–

DESCRIPTION

The PS2705-1 is an optically coupled isolator containing a GaAs light emitting diode and an NPN silicon phototransistor.

This package is SOP (Small Outline Package) type and has shield effect to cut off ambient light.

It is designed for high density mounting applications.

FEATURES

- AC input response
- High isolation voltage ($BV = 3\,750\text{ V r.m.s.}$)
- High current transfer ratio ($CTR = 100\% \text{ TYP.}$)
- SOP (Small Outline Package) type
- High-speed switching ($t_r = 3\,\mu\text{s TYP.}$, $t_f = 5\,\mu\text{s TYP.}$)
- Ordering number of taping product : PS2705-1-F3, F4
- ★ • Safety standards
 - UL approved: File No. E72422
 - BSI approved: File No. 8219/8220
 - CSA approved: File No. CA 101391
 - DIN EN60747-5-2 (VDE0884 Part2) approved (Option)

APPLICATIONS

- Hybrid IC
- Telephone/FAX
- FA/OA equipment
- Programmable logic controllers
- Power supply

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PS2705-1

TOP VIEW

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

Dimensions (mm):

- Top View: 4.0±0.5 (width), 7.0±0.3 (total width), 4.4 (inner width), 0.15^{+0.10}/_{-0.05} (height), 0.5±0.3 (base width)
- Front View: 2.1±0.2 (total height), 2.0 (height to top of pins), 0.1±0.1 (height to bottom of pins), 2.54 (pin pitch), 0.4^{+0.10}/_{-0.05} (pin width)
- Bottom View: 0.25(M) (tolerance)

The diagram shows a rectangular component marking area. Inside, the text "NEC" is at the top, followed by "2705" and "N601". A black dot in the bottom-left corner is labeled "No. 1 pin Mark". To the right of the box, four arrows point to specific features: "Trade Mark" points to "NEC", "Type Number" points to "2705", "Assembly Lot" points to "N601", and "*1" points to a vertical bar at the bottom-right of the box.

Below the component, the marking "N 6 01" is shown with vertical lines under each digit. To the right of these lines are labels: "Week Assembled" under "01", "Year Assembled (Last 1 Digit)" under "6", and "CTR Rank Name" under "N".

***1** Bar : Pb-Free

Remark "PS" and "-1" are omitted from original type number

★ ORDERING INFORMATION

Part Number	Order Number	Solder Plating Specification	Packing Style	Safety Standard Approval	Application Part Number ^{*1}
PS2705-1	PS2705-1-A	Pb-Free	Magazine case 100 pcs	Standard products (UL, BSI, CSA approved)	PS2705-1
PS2705-1-F3	PS2705-1-F3-A		Embossed Tape 3 500 pcs/reel		
PS2705-1-F4	PS2705-1-F4-A				
PS2705-1-V	PS2705-1-V-A		Magazine case 100 pcs	DIN EN60747-5-2	
PS2705-1-V-F3	PS2705-1-V-F3-A		Embossed Tape 3 500 pcs/reel	(VDE0884 Part2)	
PS2705-1-V-F4	PS2705-1-V-F4-A			Approved (Option)	

***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 (DC)	I_F	± 50	mA
	Power Dissipation Derating	$\Delta P_D/^\circ\text{C}$	0.8	mW/ $^\circ\text{C}$
	Power Dissipation	P_D	80	mW
	Peak Forward Current ^{*1}	I_{FP}	± 1	A
Transistor	Collector to Emitter Voltage	V_{CEO}	40	V
	Emitter to Collector Voltage	V_{ECO}	6	V
	Collector Current	I_C	80	mA
	Power Dissipation Derating	$\Delta P_C/^\circ\text{C}$	1.5	mW/ $^\circ\text{C}$
	Power Dissipation	P_C	150	mW
Isolation Voltage ^{*2}		BV	3 750	Vr.m.s.
Operating Ambient Temperature		T_A	-55 to +100	$^\circ\text{C}$
Storage Temperature		T_{stg}	-55 to +150	$^\circ\text{C}$

^{*1} PW = 100 μs , Duty Cycle = 1%

^{*2} AC voltage for 1 minute at $T_A = 25^\circ\text{C}$, RH = 60% between input and output
Pins 1-2 shorted together, 3-4 shorted together.

ELECTRICAL CHARACTERISTICS ($T_A = 25\text{ }^\circ\text{C}$)

Parameter		Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Diode	Forward Voltage	V_F	$I_F = \pm 5\text{ mA}$		1.1	1.4	V
	Terminal Capacitance	C_t	$V = 0\text{ V}$, $f = 1\text{ MHz}$		60		pF
Transistor	Collector to Emitter Dark Current	I_{CEO}	$I_F = 0\text{ mA}$, $V_{CE} = 40\text{ V}$			100	nA
Coupled	Current Transfer Ratio (I_C/I_F)* ¹	CTR	$I_F = \pm 5\text{ mA}$, $V_{CE} = 5\text{ V}$	50	100	300	%
	CTR Ratio * ²	CTR_1/CTR_2	$I_F = \pm 5\text{ mA}$, $V_{CE} = 5\text{ V}$	0.3	1.0	3.0	
	Collector Saturation Voltage	$V_{CE(sat)}$	$I_F = \pm 10\text{ mA}$, $I_C = 2\text{ mA}$			0.3	V
	Isolation Resistance	R_{I-O}	$V_{I-O} = 1\text{ kV}_{DC}$	10^{11}			Ω
	Isolation Capacitance	C_{I-O}	$V = 0\text{ V}$, $f = 1\text{ MHz}$		0.4		pF
	Rise Time * ³	t_r	$V_{CC} = 5\text{ V}$, $I_C = 2\text{ mA}$, $R_L = 100\text{ }\Omega$		3		μs
	Fall Time * ³	t_f			5		

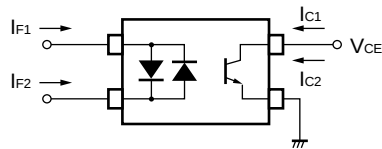
***1 CTR rank**

M: 50 to 150 (%)

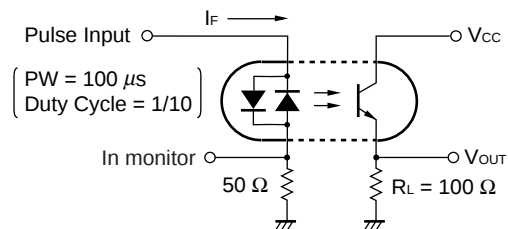
L: 100 to 300 (%)

N: 50 to 300 (%)

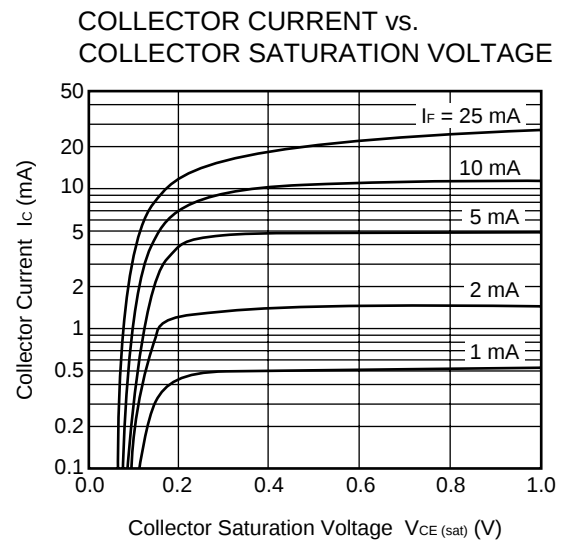
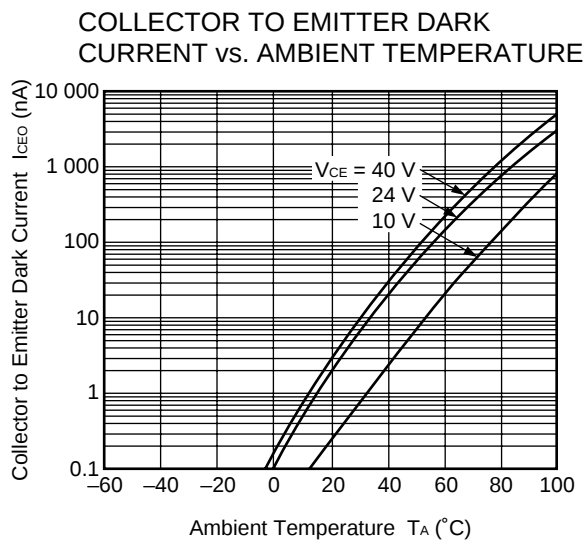
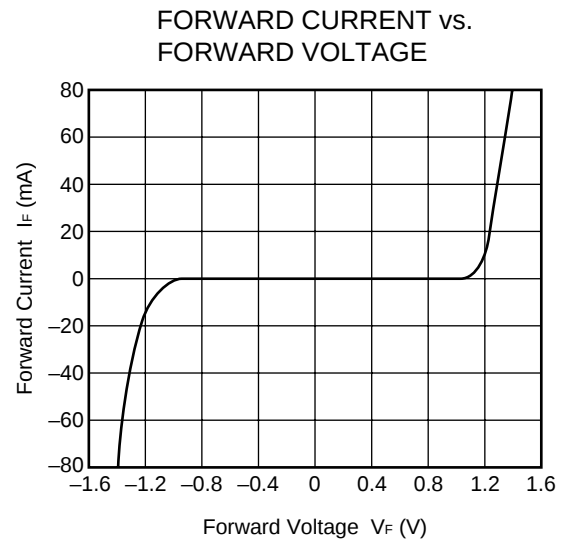
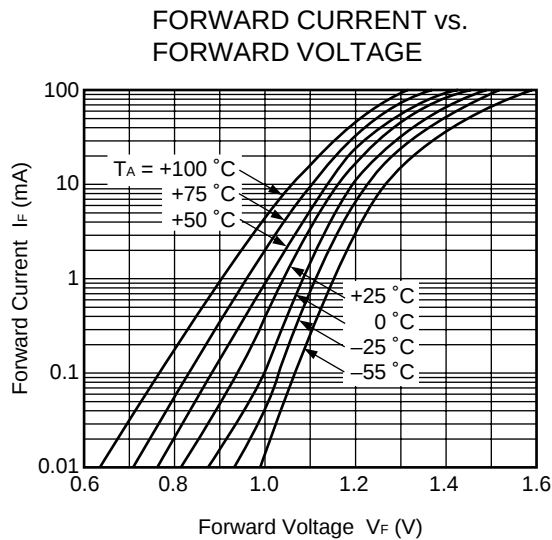
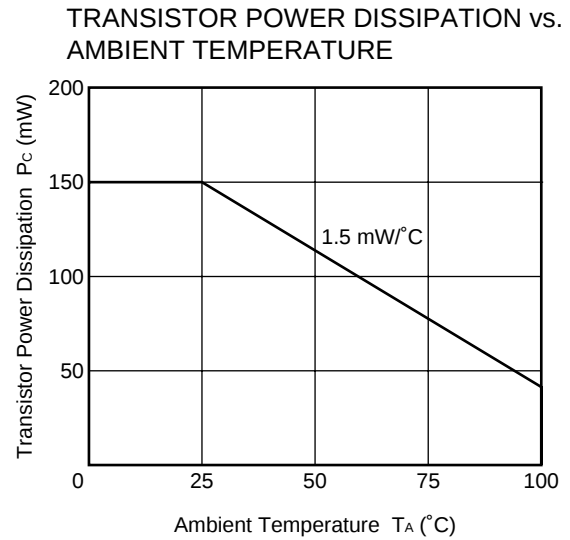
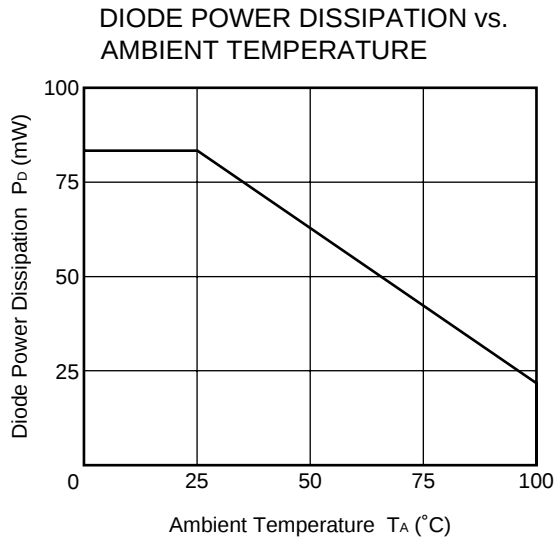
***2 $CTR_1 = I_{C1}/I_{F1}$, $CTR_2 = I_{C2}/I_{F2}$**



***3 Test circuit for switching time**

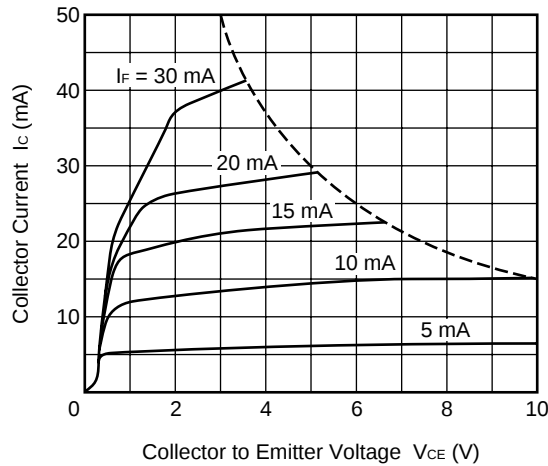


TYPICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$, unless otherwise specified)

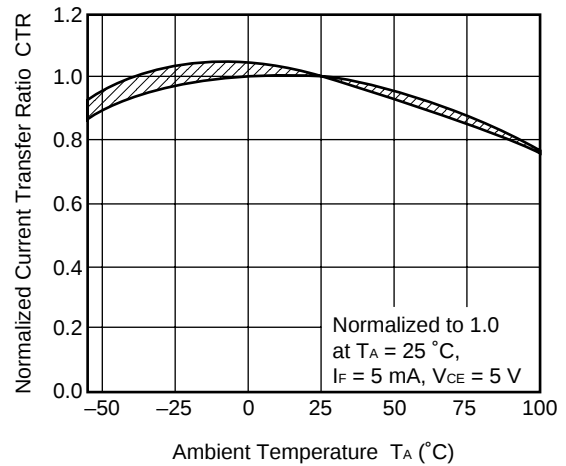


Remark The graphs indicate nominal characteristics.

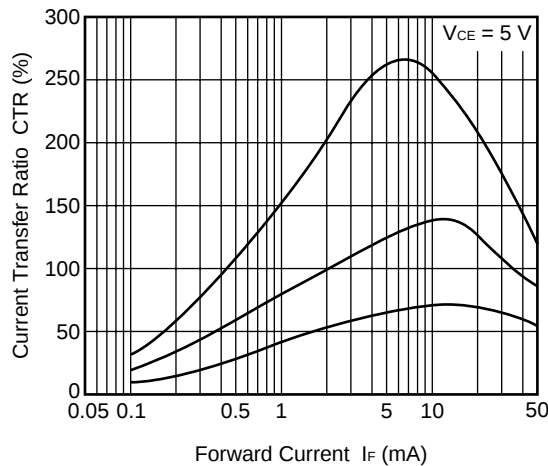
COLLECTOR CURRENT vs.
COLLECTOR TO EMITTER VOLTAGE



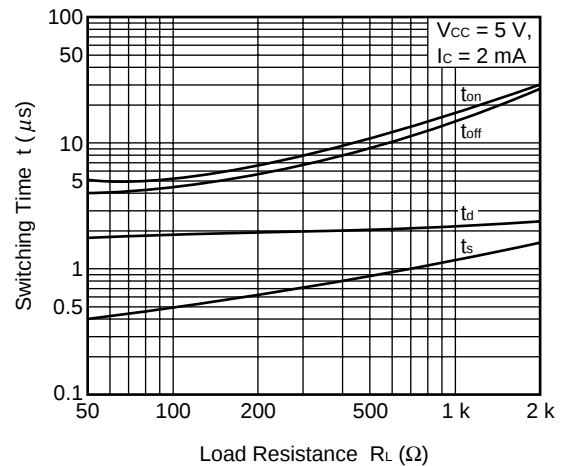
NORMALIZED CURRENT TRANSFER
RATIO vs. AMBIENT TEMPERATURE



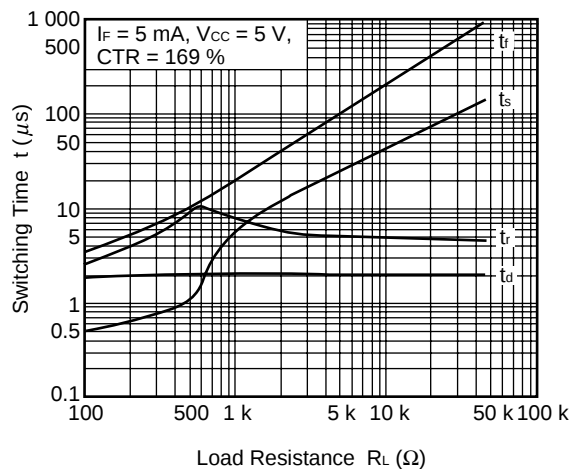
CURRENT TRANSFER RATIO vs.
FORWARD CURRENT



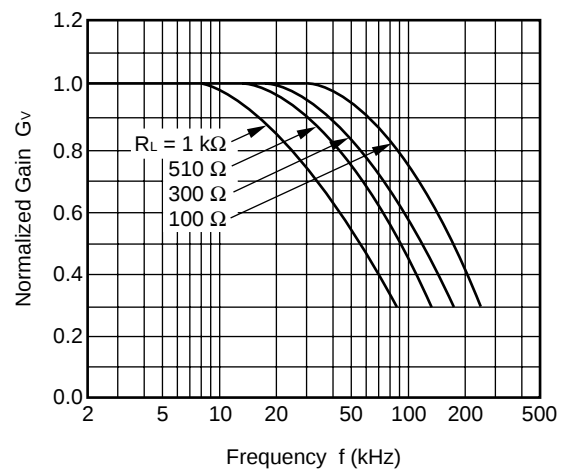
SWITCHING TIME vs.
LOAD RESISTANCE



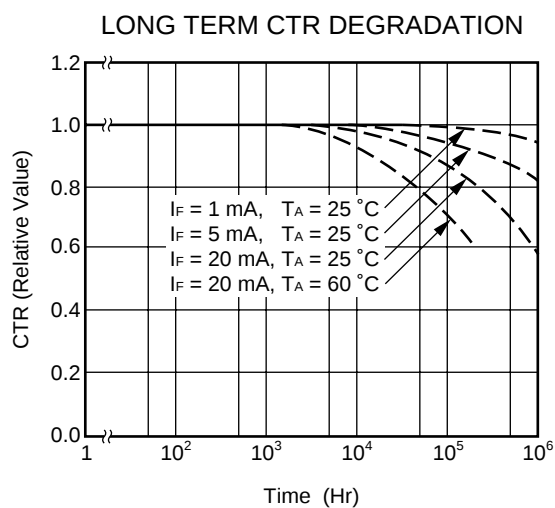
SWITCHING TIME vs.
LOAD RESISTANCE



FREQUENCY RESPONSE



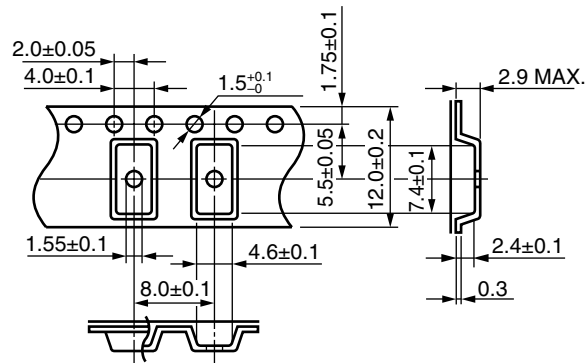
Remark The graphs indicate nominal characteristics.



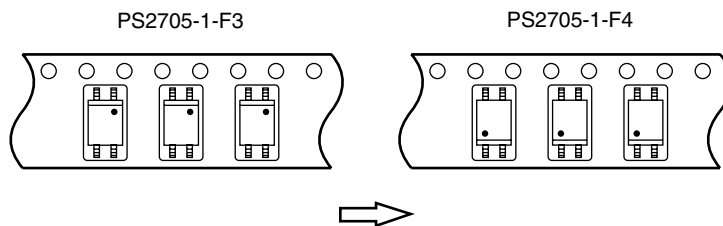
Remark The graph indicates nominal characteristics.

TAPING SPECIFICATIONS (in millimeters)

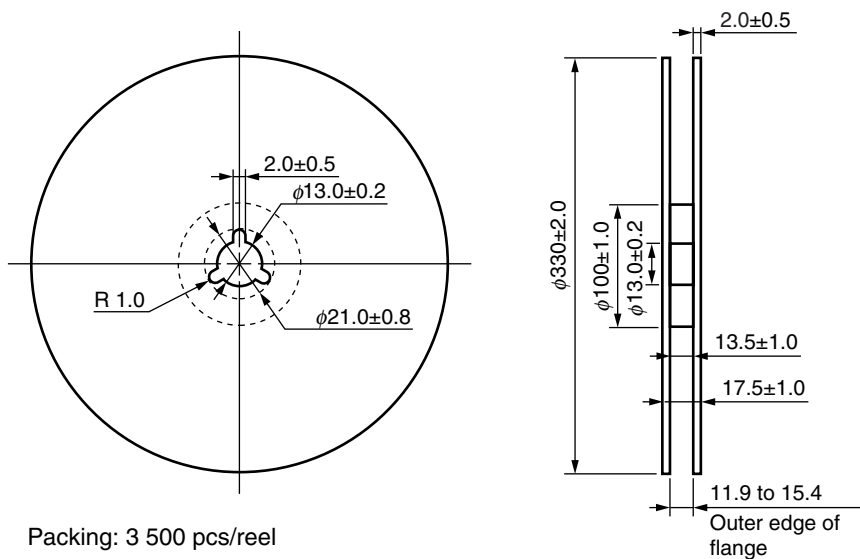
Outline and Dimensions (Tape)



Tape Direction



Outline and Dimensions (Reel)



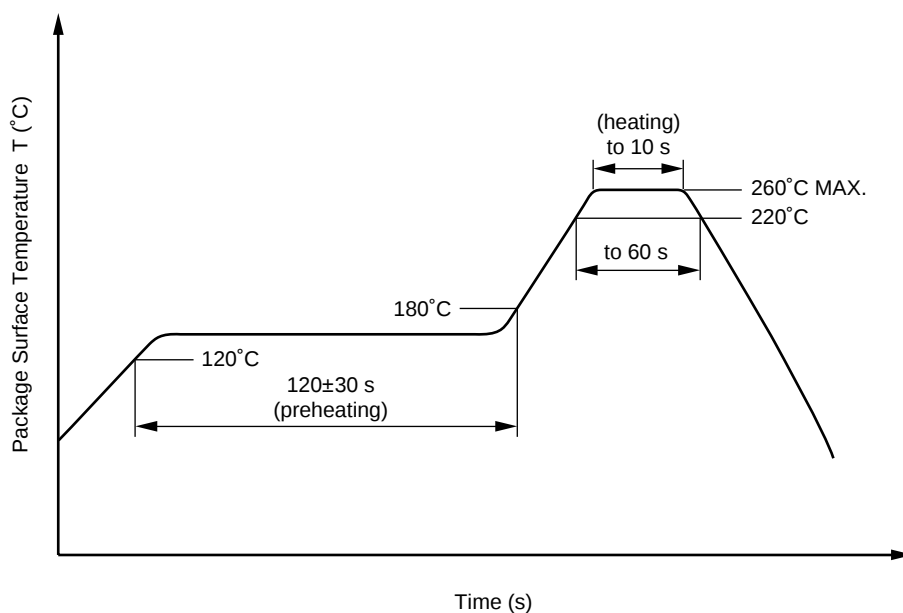
NOTES ON HANDLING

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 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. This tendency may sometimes be obvious, especially below $I_F = 1 \text{ mA}$.

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.

SPECIFICATION OF VDE MARKS LICENSE DOCUMENT (VDE0884)

Parameter	Symbol	Speck	Unit
Application classification (DIN VDE 0109) for rated line voltages ≤ 300 Vr.m.s. for rated line voltages ≤ 600 Vr.m.s.		IV III	
Climatic test class (DIN IEC 68 Teil 1/09.80)		55/100/21	
Dielectric strength Maximum operating isolation voltage Test voltage (partial discharge test, procedure a for type test and random test) $U_{pr} = 1.2 \times U_{IORM}$, $P_d < 5$ pC	U_{IORM} U_{pr}	710 850	V_{peak} V_{peak}
Test voltage (partial discharge test, procedure b for all devices test) $U_{pr} = 1.6 \times U_{IORM}$, $P_d < 5$ pC	U_{pr}	1 140	V_{peak}
Highest permissible overvoltage	U_{TR}	6 000	V_{peak}
Degree of pollution (DIN VDE 0109)		2	
Clearance distance		> 5	mm
Creepage distance		> 5	mm
Comparative tracking index (DIN IEC 112/VDE 0303 part 1)	CTI	175	
Material group (DIN VDE 0109)		III a	
Storage temperature range	T_{stg}	-55 to +150	°C
Operating temperature range	T_A	-55 to +100	°C
Isolation resistance, minimum value $V_{IO} = 500$ V dc at $T_A = 25$ °C $V_{IO} = 500$ V dc at T_A MAX. at least 100 °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 $V_{IO} = 500$ V dc at $T_A = 175$ °C (T_{si})	T_{si} I_{si} P_{si} Ris MIN.	150 200 300 10^9	°C mA mW Ω

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M8E 00.4-0110

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► For further information, please contact

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