

LONG CREEPAGE TYPE
HIGH ISOLATION VOLTAGE
6-PIN PHOTOCOUPLER

–NEPOC™ Series–

DESCRIPTION

The PS2651, PS2652, PS2651L2, PS2652L2 are optically coupled isolators containing a GaAs light emitting diode and an NPN silicon phototransistor in a plastic DIP (Dual In-line Package).

Creepage distance and clearance of leads are over 8 millimeters.

The PS2651L2, PS2652L2 are lead bending type (Gull-wing) for surface mount.

FEATURES

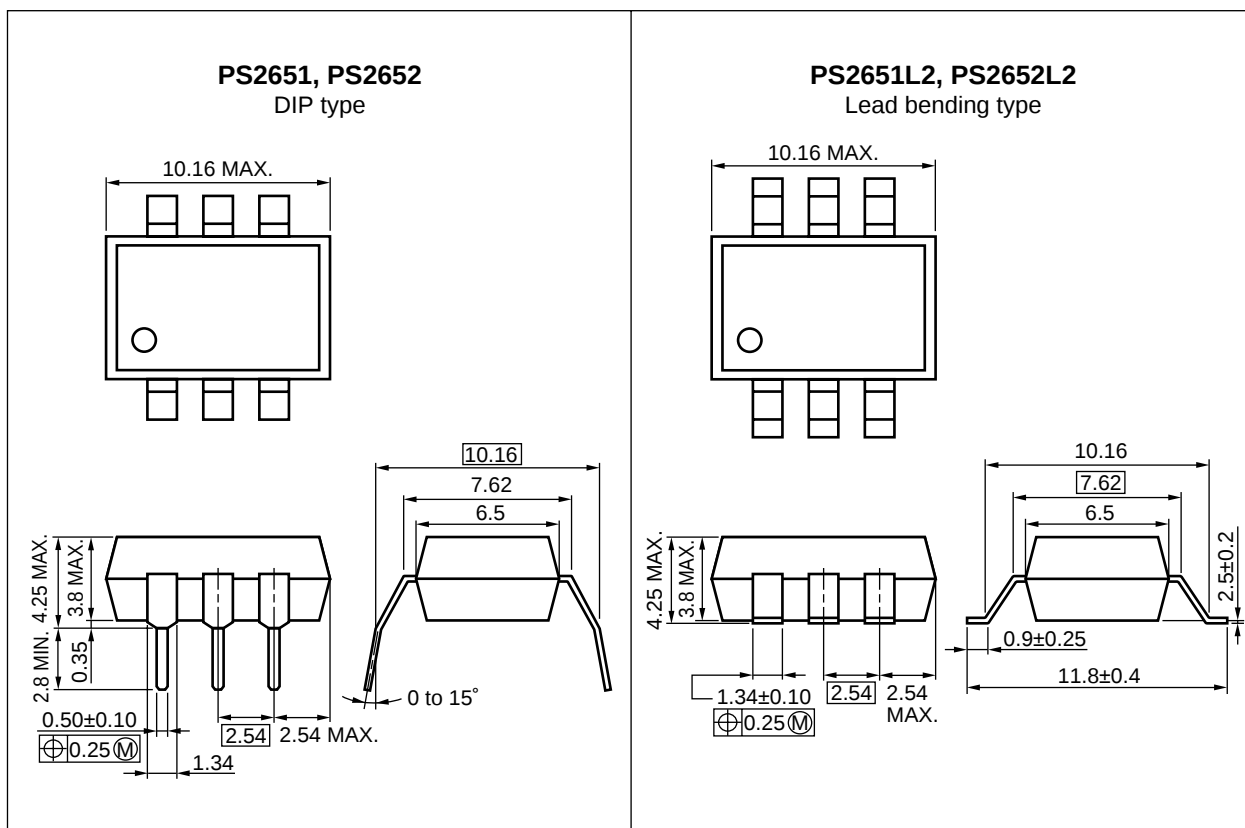
- Long creepage distance (8 mm)
- High Isolation voltage (BV = 5 000 Vr.m.s.)
- High collector to emitter voltage ($V_{CEO} = 80 \text{ V}$)
- High-speed switching ($t_r = 3 \mu\text{s}$ TYP., $t_f = 5 \mu\text{s}$ TYP.)
- High current transfer ratio (CTR = 200 % TYP.)
- UL approved: File No. E72422 (S)
- BSI approved (EN 60065/IEC 65, EN 60950/IEC 950) : No. 7250
- SEMKO approved (EN 60065/IEC 60065, EN 60950/IEC 60950) : No. 9317144
- NEMKO approved (EN 60065/IEC 65, EN 60950/IEC 950) : No. A21409
- DEMKO approved (EN 60065/IEC 60665, EN 60950/IEC 950) : No. 300535
- FIMKO approved (EN 60065/IEC 65, EN 60950/IEC 950) : No. 167265-08
- VDE0884 approved (Option)

★ APPLICATIONS

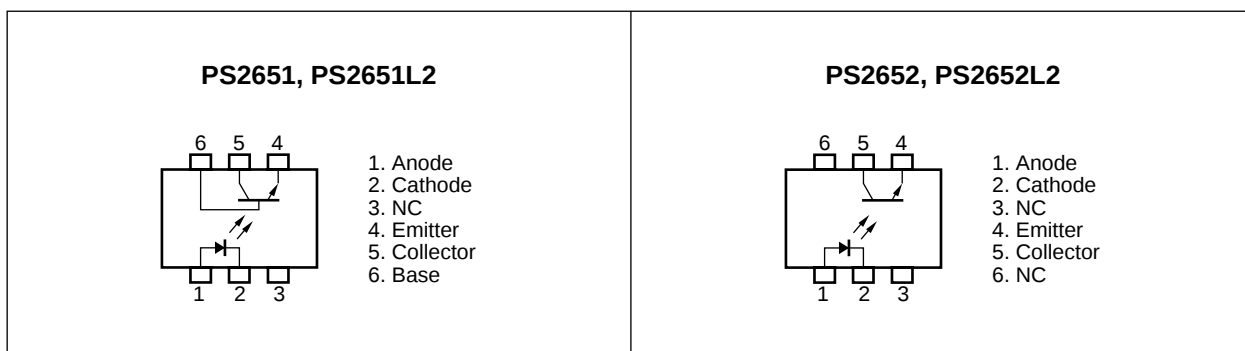
- Power supply
- Telephone, FAX
- FA/OA equipment

The information in this document is subject to change without notice.

★ PACKAGE DIMENSIONS (in millimeters)



PIN CONNECTIONS (TOP VIEW)



★ ORDERING INFORMATION

Part Number	Package	Safety Standard Approval	Application Part Number ^{*1}
PS2651, PS2652	6-pin DIP	Standard products	PS2651 PS2652
PS2651L2, PS2652L2	6-pin DIP (lead bending surface mount)	• UL approved • NEMKO approved • SEMKO approved • BSI approved • DEMKO approved • FIMKO approved	
PS2651-V, PS2652-V	6-pin DIP	VDE0884 approved products (Option)	
PS2651L2-V, PS2652L2-V	6-pin DIP (lead bending surface mount)	• VDE approved • BSI approved • NEMKO approved • FIMKO approved • UL approved • SEMKO approved • DEMKO approved	

***1** As applying to Safety Standard, following part number should be used.

ABSOLUTE MAXIMUM RATINGS ($T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)

Parameter		Symbol	Ratings	Unit
Diode	Forward Current (DC)	I_F	80	mA
	Reverse Voltage	V_R	6	V
	Power Dissipation Derating	$\Delta P_D/^{\circ}\text{C}$	1.5	mW/ $^{\circ}\text{C}$
	Power Dissipation	P_D	150	mW
	Peak Forward Current ^{*1}	I_{FP}	1	A
Transistor	Collector to Emitter Voltage	V_{CEO}	80	V
	Emitter to Collector Voltage	V_{ECO}	7	V
	Collector Current	I_C	50	mA
	Power Dissipation Derating	$\Delta P_D/^{\circ}\text{C}$	1.5	mW/ $^{\circ}\text{C}$
	Power Dissipation	P_C	150	mW
Isolation Voltage ^{*2}		BV	5 000	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 $T_A = 25\text{ }^{\circ}\text{C}$, RH = 60 % between input and output

ELECTRICAL CHARACTERISTICS (T_A = 25 °C)

Parameter		Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Diode	Forward Voltage	V _F	I _F = 10 mA		1.1	1.4	V
	Reverse Current	I _R	V _R = 5 V			5	μA
	Terminal Capacitance	C _t	V = 0 V, f = 1.0 MHz		30		pF
Transistor	Collector to Emitter Dark Current	I _{CEO}	V _{CE} = 80 V, I _F = 0 mA			100	nA
	DC Current Gain ^{*1}	h _{FE}	I _C = 2 mA, V _{CE} = 5 V		700		
Coupled	Current Transfer Ratio ^{*2}	CTR	I _F = 5 mA, V _{CE} = 5 V	50	200	400	%
	Collector Saturation Voltage	V _{CE(sat)}	I _F = 10 mA, I _C = 2 mA			0.3	V
	Isolation Resistance	R _{I-O}	V _{I-O} = 1.0 kV _{DC}	10 ¹¹			Ω
	Isolation Capacitance	C _{I-O}	V = 0 V, f = 1.0 MHz		0.6		pF
	Rise Time ^{*3}	t _r	V _{CC} = 5 V, I _C = 2 mA, R _L = 100 Ω		3		μs
	Fall Time ^{*3}	t _f			5		

*1 PS2651, PS2651L2 only

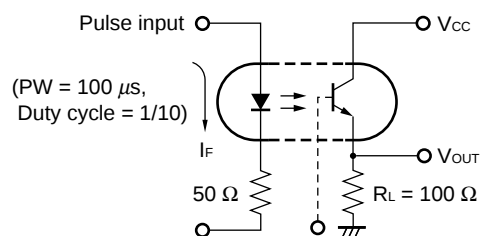
*2 CTR rank

K: 160 to 400 (%)

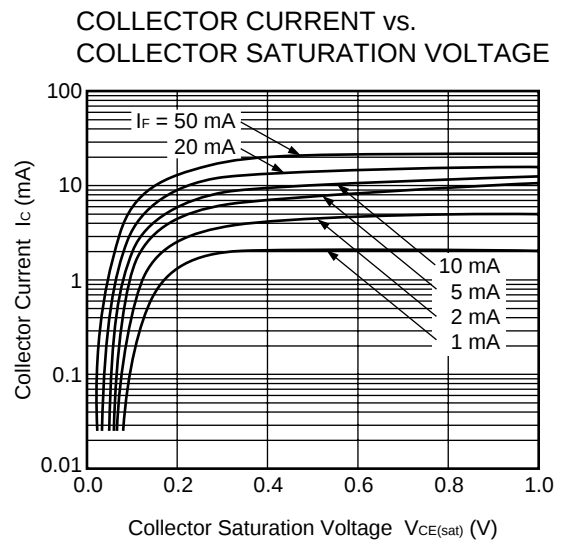
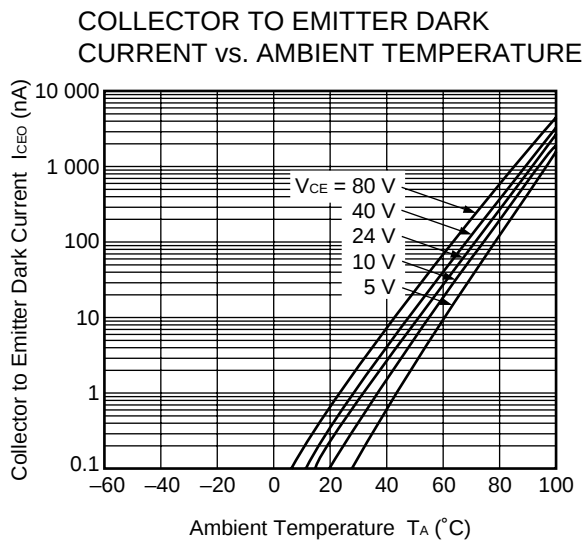
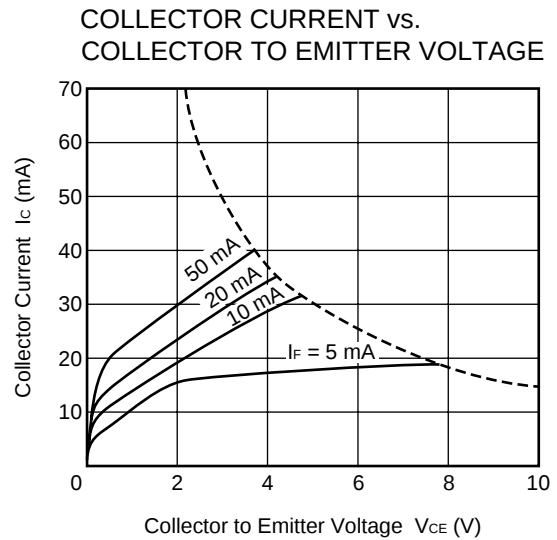
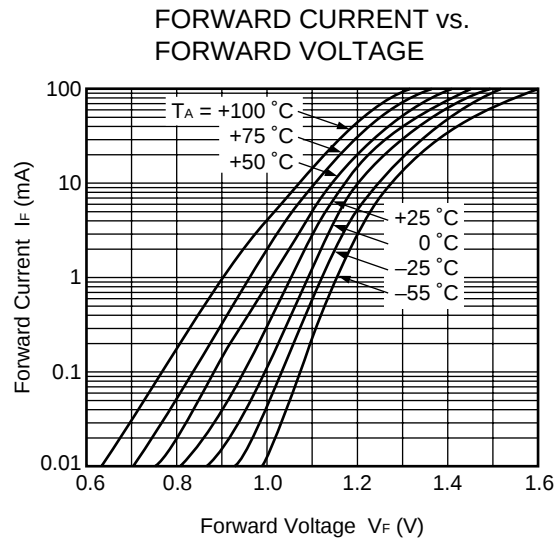
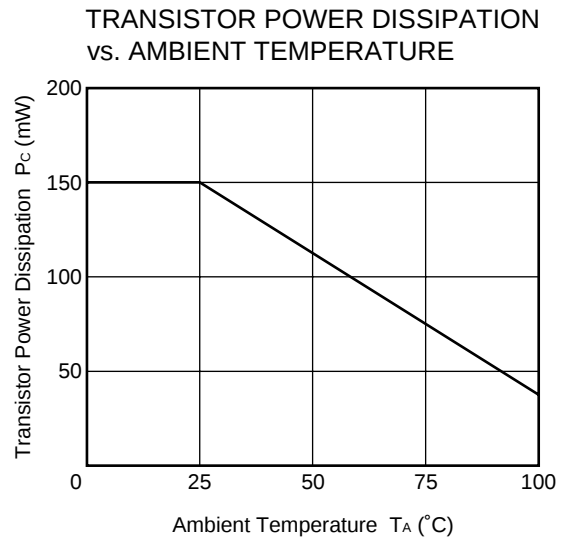
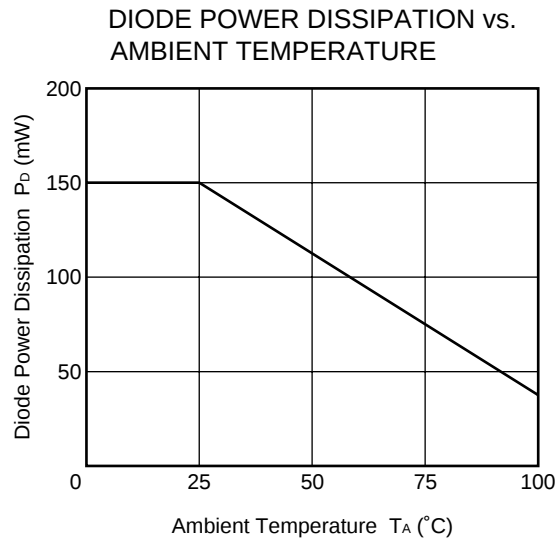
L: 80 to 240 (%)

M: 50 to 120 (%)

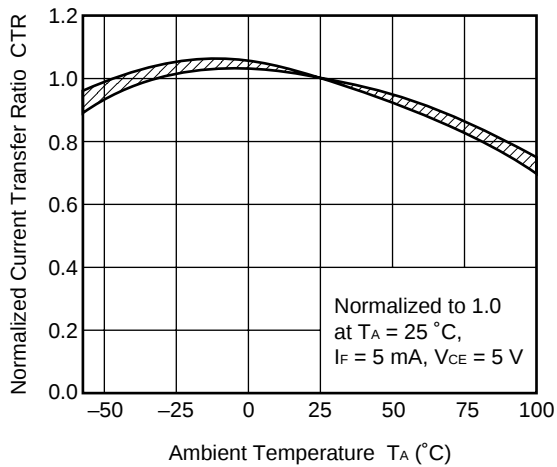
*3 Test circuit for switching time



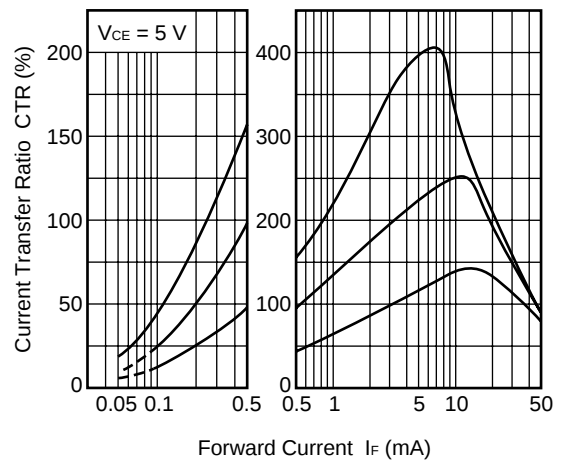
TYPICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$, unless otherwise specified)



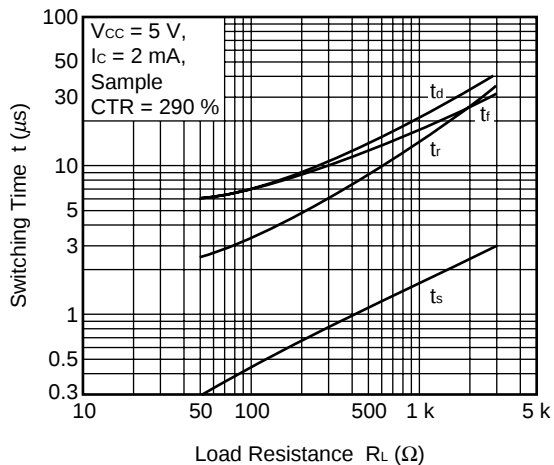
NORMALIZED CURRENT TRANSFER RATIO vs. AMBIENT TEMPERATURE



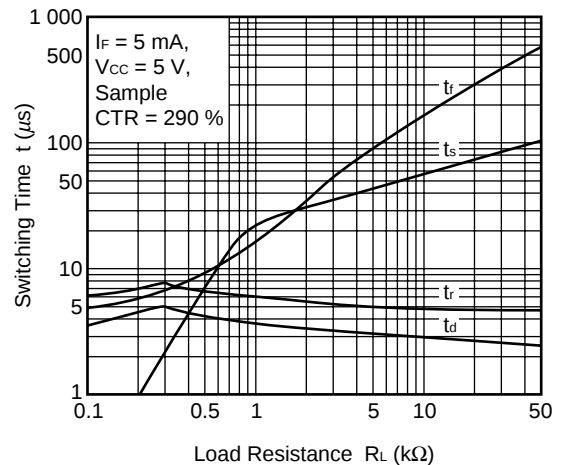
CURRENT TRANSFER RATIO vs. FORWARD CURRENT



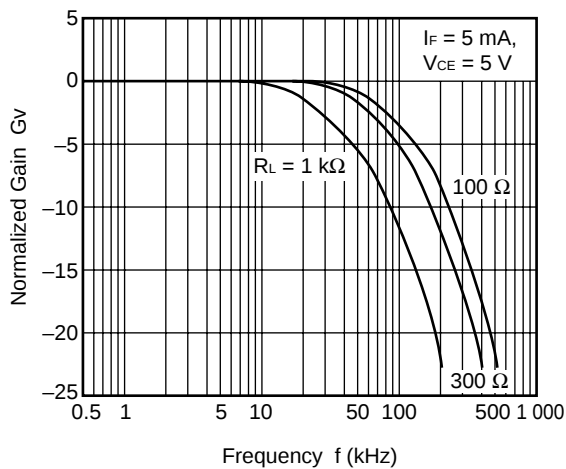
SWITCHING TIME vs. LOAD RESISTANCE



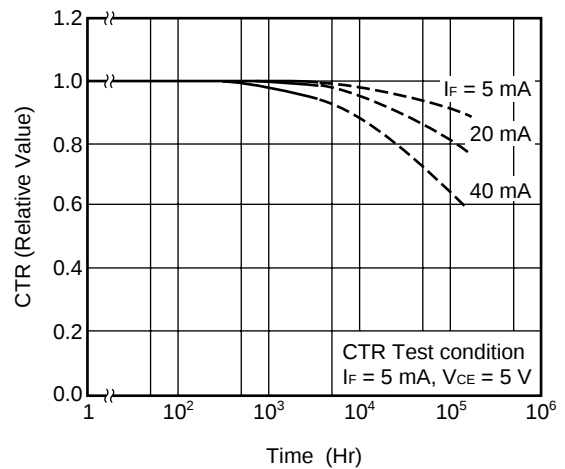
SWITCHING TIME vs. LOAD RESISTANCE



FREQUENCY RESPONSE



LONG TERM CTR DEGRADATION



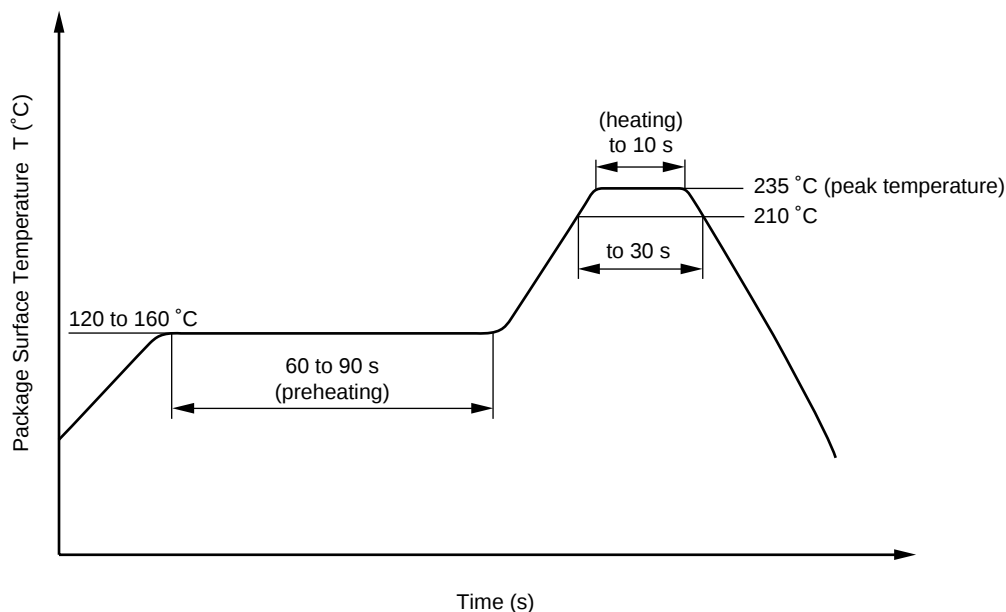
Remark The measurement of TYPICAL CHARACTERISTICS are only for reference, not guaranteed.

RECOMMENDED SOLDERING CONDITIONS

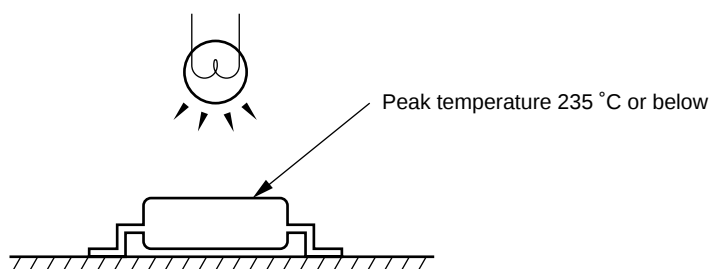
(1) Infrared reflow soldering

- Peak reflow temperature 235 °C (package surface temperature)
- Time of temperature higher than 210 °C 30 seconds or less
- 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



Caution Please avoid to removed the residual flux by water after the first reflow processes.



(2) Dip soldering

- Temperature 260 °C or below (molten solder temperature)
- Time 10 seconds or less
- Number of times One
- Flux Rosin flux containing small amount of chlorine (The flux with a maximum chlorine content of 0.2 Wt % is recommended.)

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}	890 1 068	V_{peak} V_{peak}
Test voltage (partial discharge test, procedure b for random test) $U_{pr} = 1.6 \times U_{IORM}$, $P_d < 5$ pC	U_{pr}	1 424	V_{peak}
Highest permissible overvoltage	U_{TR}	8 000	V_{peak}
Degree of pollution (DIN VDE 0109)		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 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	R_{is} MIN. R_{is} 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} R_{is} MIN.	175 400 700 10^9	°C mA mW Ω

[MEMO]

[MEMO]

CAUTION

Within this device there exists GaAs (Gallium Arsenide) material which is a harmful substance if ingested. Please do not under any circumstances break the hermetic seal.

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Specific: Aircrafts, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems or medical equipment for life support, etc.

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Anti-radioactive design is not implemented in this product.