

HIGH ISOLATION VOLTAGE DARLINGTON TRANSISTOR
SOP MULTI PHOTOCOUPLER SERIES

-NEPOC Series-

DESCRIPTION

The PS2702-1 is an optically coupled isolator containing a GaAs light emitting diode and an NPN silicon darlington-connected phototransistor.

This is mounted in a plastic SOP (Small Out-line Package) for high density applications.

This package has shield effect to cut off ambient light.

FEATURES

- High current transfer ratio (CTR = 2 000 % TYP.)
- High isolation voltage (BV = 3 750 Vr.m.s.)
- Small and thin (SOP) package
- High-speed switching (t_r , t_f = 200 μ s TYP.)
- Ordering number of taping product: PS2702-1-F3, F4
- UL approved: File No. E72422 (S)
- VDE0884 approved (Option)

APPLICATIONS

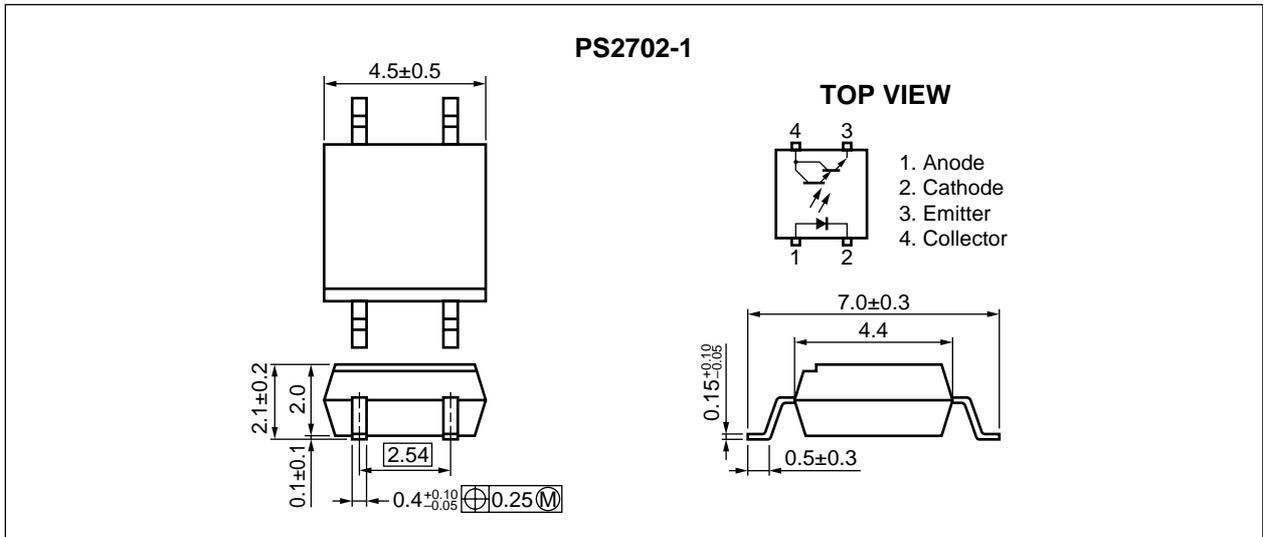
- Hybrid IC
- Telephone/FAX
- FA/OA equipment
- Programmable logic controllers

ORDERING INFORMATION

Part Number	Package	Safety Standard Approval
PS2702-1	4-pin SOP	Standard specification products • UL approved
PS2702-1-V	4-pin SOP	VDE0884 specification products (Option)

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 Not all devices/types available in every country. Please check with local NEC Compound Semiconductor Devices representative for availability and additional information.

★ PACKAGE DIMENSIONS (in millimeters)



ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C, unless otherwise specified)

Parameter		Symbol	Ratings	Unit
Diode	Forward Current (DC)	I _F	50	mA
	Reverse Voltage	V _R	6.0	V
	Power Dissipation Derating	ΔP _D /°C	0.8	mW/°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	200	mA
	Power Dissipation Derating	ΔP _C /°C	1.5	mW/°C
	Power Dissipation	P _C	150	mW
Isolation Voltage *2		BV	3 750	Vr.m.s.
Operating Ambient Temperature		T _A	-55 to +100	°C
Storage Temperature		T _{stg}	-55 to +150	°C

*1 PW = 100 μs, Duty Cycle = 1 %

*2 AC voltage for 1 minute at T_A = 25 °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 = 5 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 MHz		30		pF
Transistor	Collector to Emitter Dark Current	I _{CEO}	I _F = 0 mA, V _{CE} = 40 V			400	nA
Coupled	Current Transfer Ratio (I _c /I _F) ^{*1}	CTR	I _F = 1 mA, V _{CE} = 2 V	200	2 000		%
	Collector Saturation Voltage	V _{CE(sat)}	I _F = 1 mA, I _c = 2 mA			1.0	V
	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		0.4		pF
	Rise Time ^{*2}	t _r	V _{CC} = 5 V, I _c = 2 mA, R _L = 100 Ω		200		μs
	Fall Time ^{*2}	t _f			200		

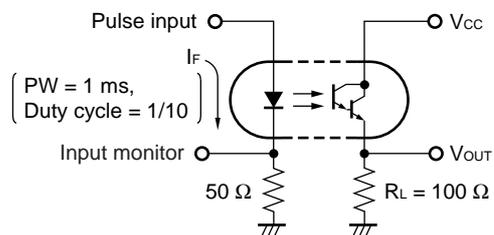
***1 CTR rank**

K: 2 000 to (%)

L: 700 to 3 400 (%)

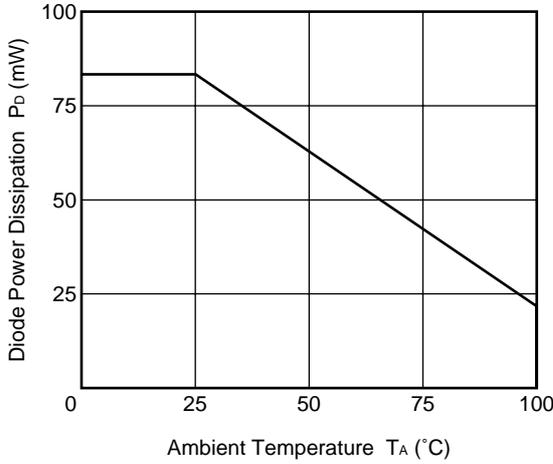
M: 200 to 1 000 (%)

***2 Test circuit for switching time**

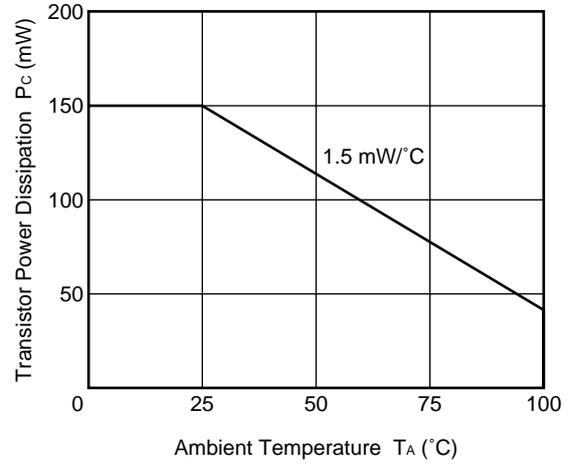


★ TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^\circ\text{C}$, unless otherwise specified)

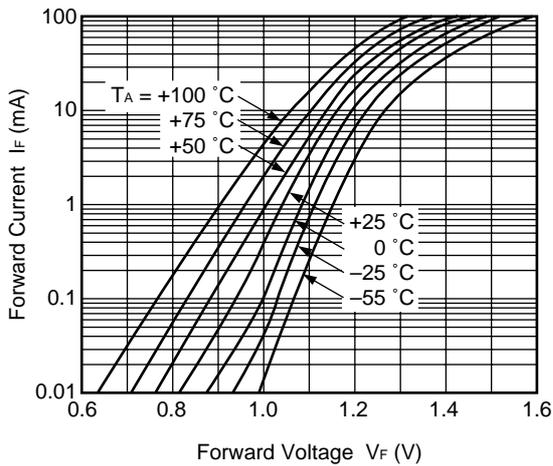
DIODE POWER DISSIPATION vs. AMBIENT TEMPERATURE



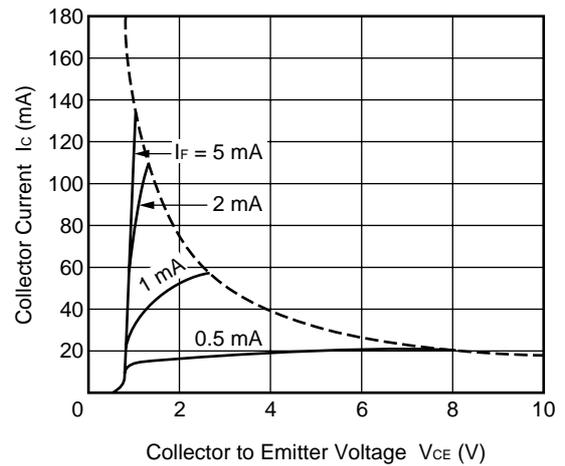
TRANSISTOR POWER DISSIPATION vs. AMBIENT TEMPERATURE



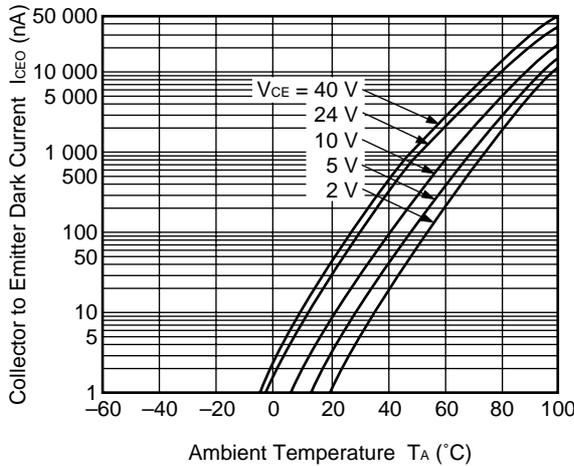
FORWARD CURRENT vs. FORWARD VOLTAGE



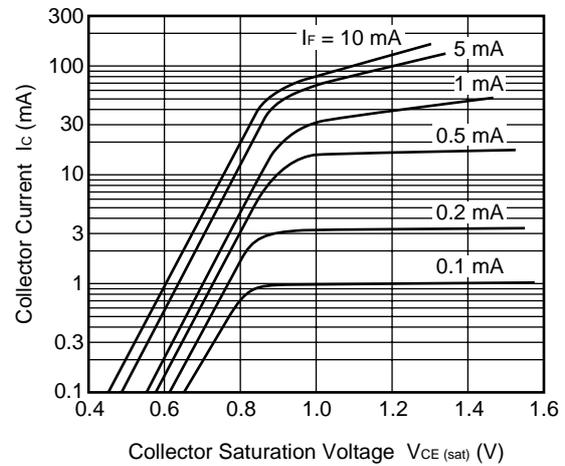
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



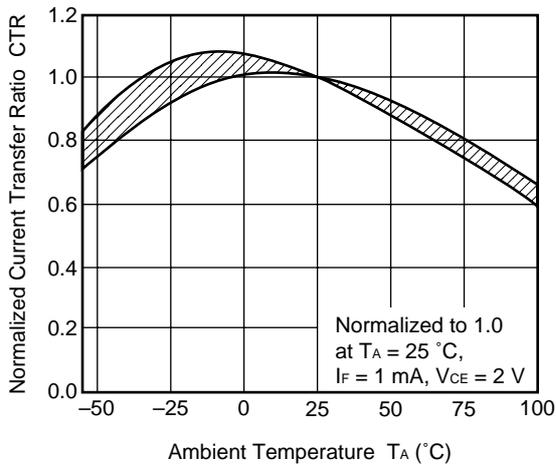
COLLECTOR TO EMITTER DARK CURRENT vs. AMBIENT TEMPERATURE



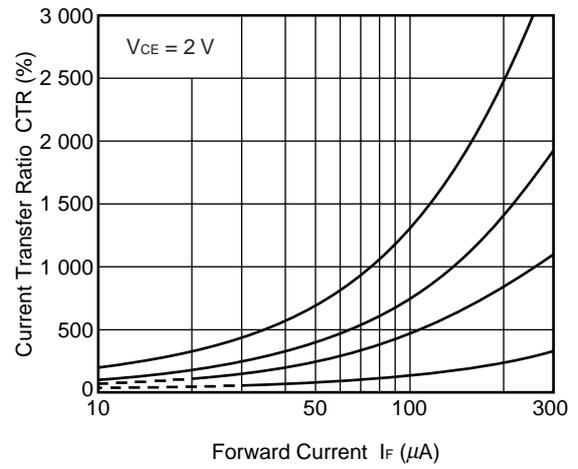
COLLECTOR CURRENT vs. COLLECTOR SATURATION VOLTAGE



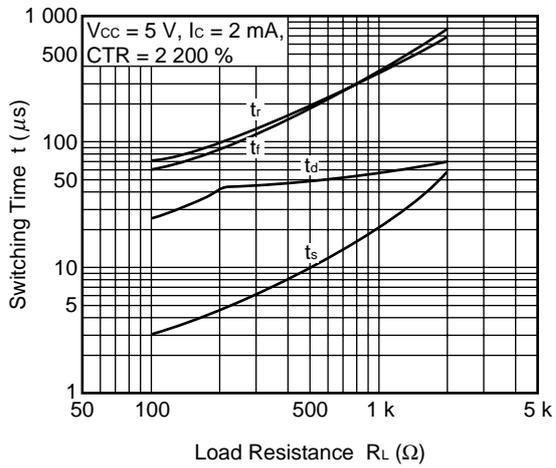
NORMALIZED CURRENT TRANSFER RATIO vs. AMBIENT TEMPERATURE



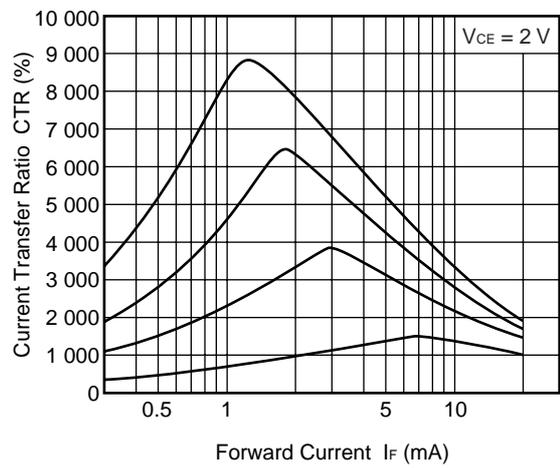
CURRENT TRANSFER RATIO vs. FORWARD CURRENT



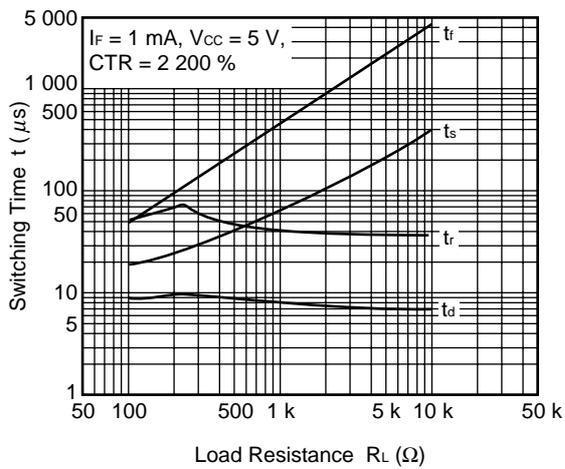
SWITCHING TIME vs. LOAD RESISTANCE



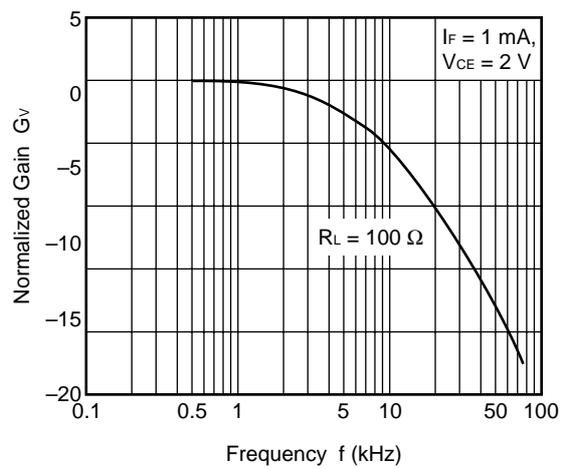
CURRENT TRANSFER RATIO vs. FORWARD CURRENT

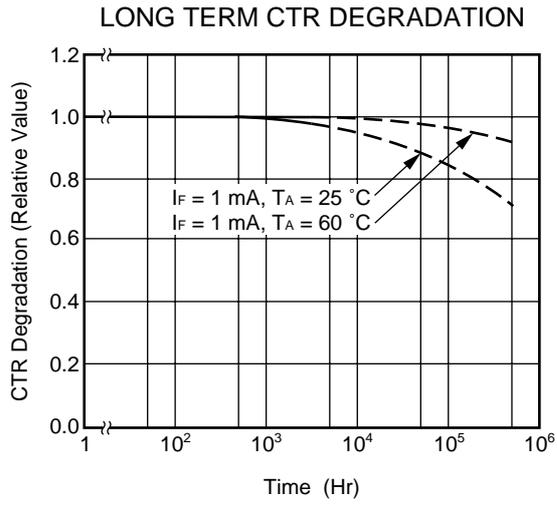


SWITCHING TIME vs. LOAD RESISTANCE



FREQUENCY RESPONSE

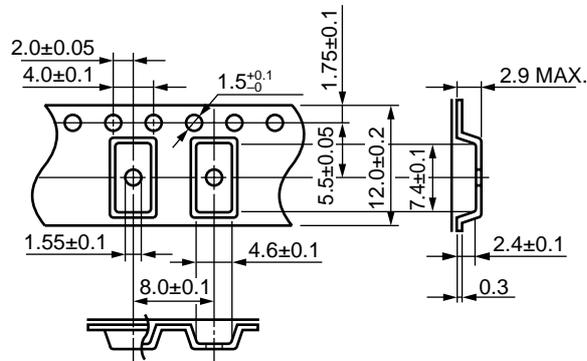




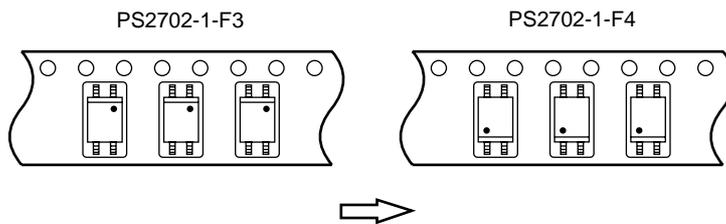
Remark The graphs indicate nominal characteristics.

★ TAPING SPECIFICATIONS (in millimeters)

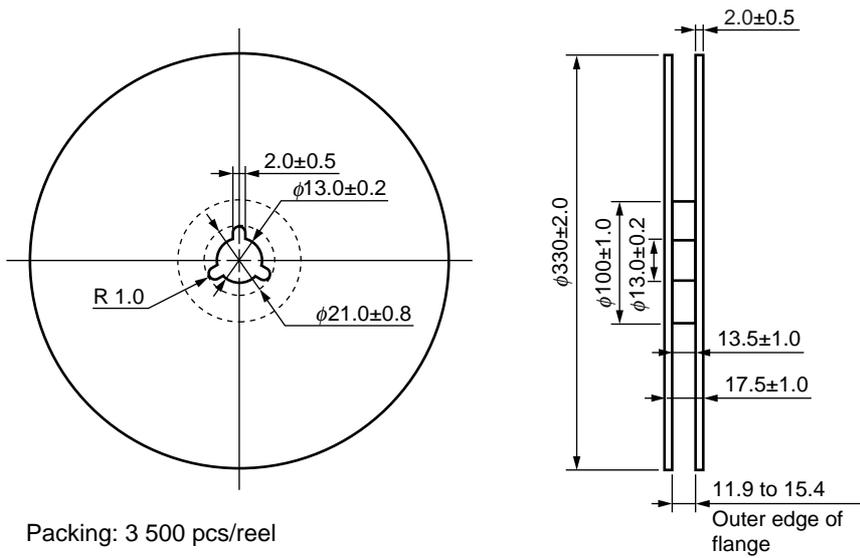
Outline and Dimensions (Tape)



Tape Direction



Outline and Dimensions (Reel)



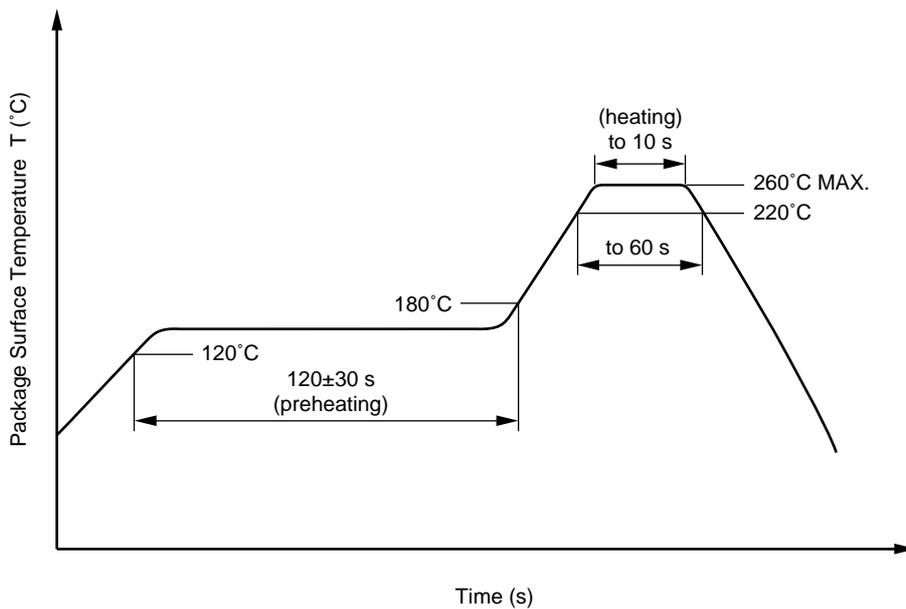
★ NOTES ON HANDLING

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) 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.

★ 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

SAFETY INFORMATION ON THIS PRODUCT

<div style="border: 1px solid black; padding: 2px; display: inline-block;">Caution</div>	<p>GaAs Products</p> <p>The product contains gallium arsenide, GaAs. GaAs vapor and powder are hazardous to human health if inhaled or ingested.</p> <ul style="list-style-type: none"> • Do not destroy or burn the product. • Do not cut or cleave off any part of the product. • Do not crush or chemically dissolve the product. • Do not put the product in the mouth. <p>Follow related laws and ordinances for disposal. The product should be excluded from general industrial waste or household garbage.</p>
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► For further information, please contact

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