NEC

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 Vr.m.s.)
- High current transfer ratio (CTR = 100 % TYP.)
- SOP (Small Outline Package) type
- High-speed switching (t_r = 3 μs TYP., t_f = 5 μs TYP.)
- Ordering number of taping product : PS2705-1-F3, F4
- UL approved: File No. E72422 (S)
- VDE0884 approved (Option)

APPLICATIONS

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

ORDERING INFORMATION

Part Number	Package	Safety Standard Approval
PS2705-1	4-pin SOP	Standard products • UL approved
PS2705-1-V	4-pin SOP	VDE0884 approved products (Option)

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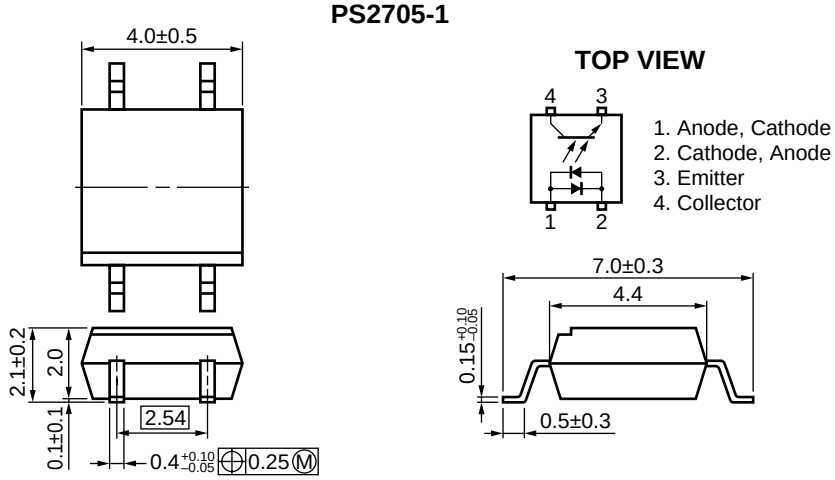
Printed in Japan

The mark ★ shows major revised points.

★ **PACKAGE DIMENSIONS (in millimeters)**

PS2705-1



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

Parameter		Symbol	Ratings	Unit
Diode	Forward Current (DC)	I_F	± 50	mA
	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	80	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
	Terminal Capacitance	C_t	V = 0 V, f = 1 MHz		60		pF
Transistor	Collector to Emitter Dark Current	I_{CEO}	I_F = 0 mA, V_{CE} = 40 V			100	nA
Coupled	Current Transfer Ratio (I_C/I_F) *1	CTR	I_F = ± 5 mA, V_{CE} = 5 V	50	100	300	%
	CTR Ratio *2	CTR_1/CTR_2	I_F = ± 5 mA, V_{CE} = 5 V	0.3	1.0	3.0	
	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 kV_{DC}	10^{11}			Ω
	Isolation Capacitance	C_{I-O}	V = 0 V, f = 1 MHz		0.4		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		

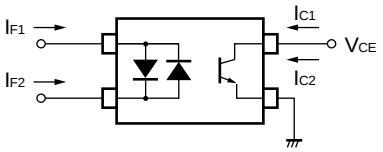
***1** CTR rank

M: 50 to 150 (%)

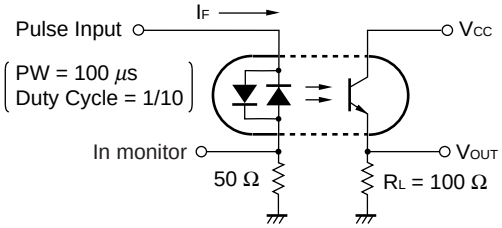
L: 100 to 300 (%)

N: 50 to 300 (%)

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

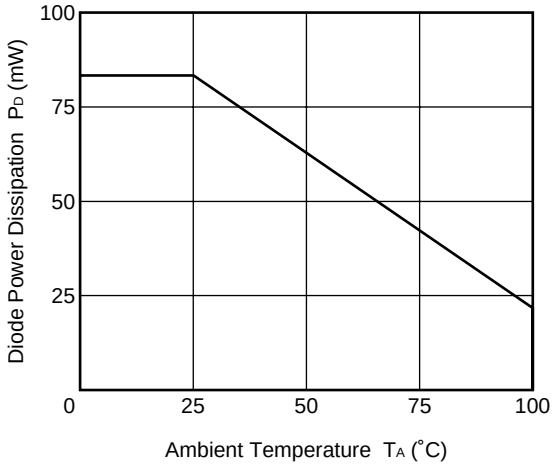


***3** Test circuit for switching time

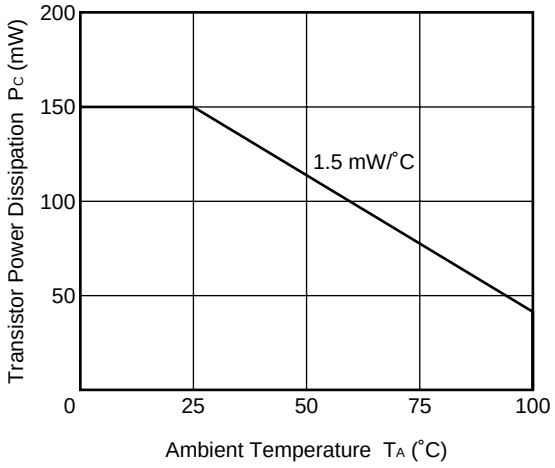


★ **TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise specified)**

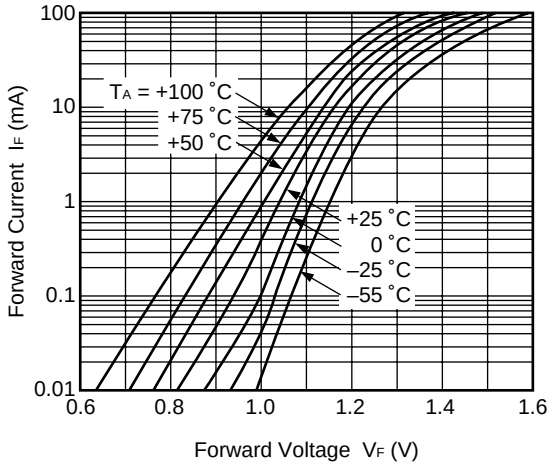
DIODE POWER DISSIPATION vs. AMBIENT TEMPERATURE



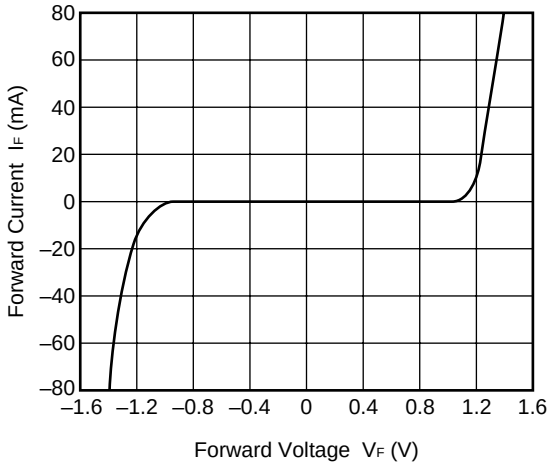
TRANSISTOR POWER DISSIPATION vs. AMBIENT TEMPERATURE



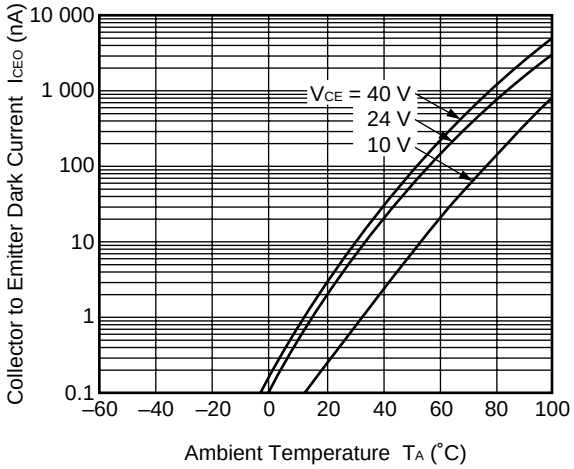
FORWARD CURRENT vs. FORWARD VOLTAGE



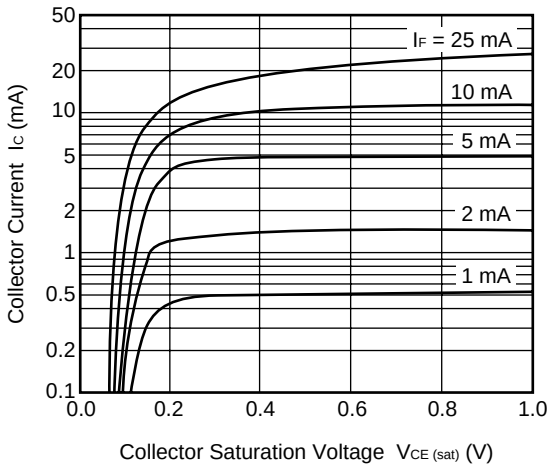
FORWARD CURRENT vs. FORWARD VOLTAGE



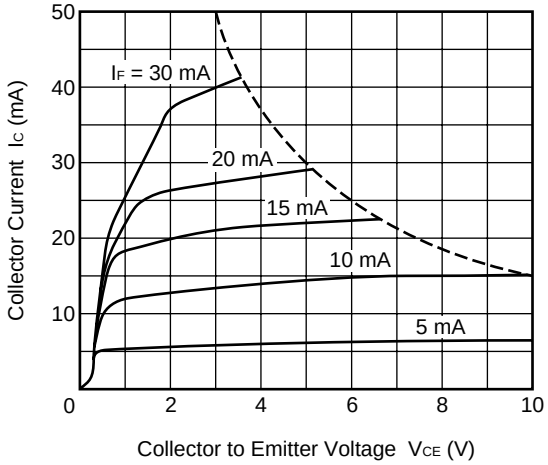
COLLECTOR TO EMITTER DARK CURRENT vs. AMBIENT TEMPERATURE



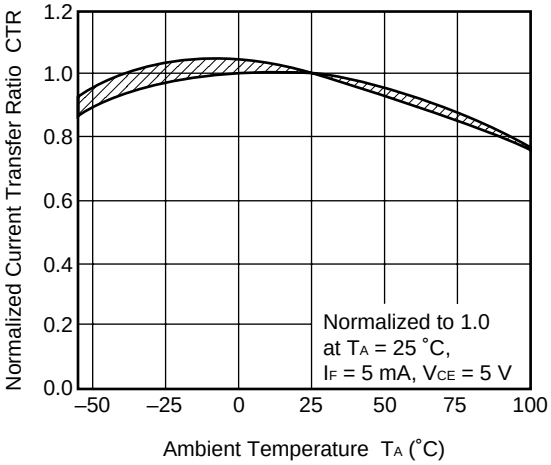
COLLECTOR CURRENT vs. COLLECTOR SATURATION VOLTAGE



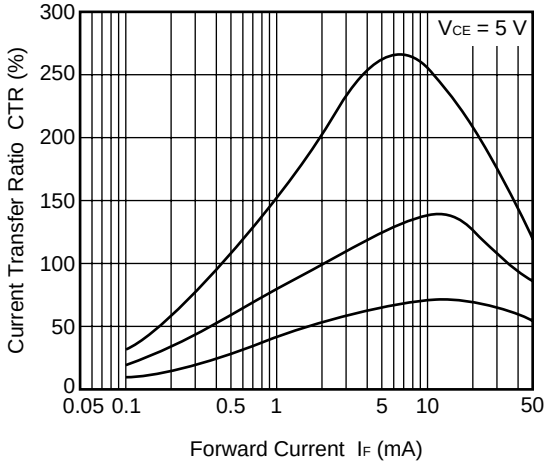
COLLECTOR CURRENT vs.
COLLECTOR TO EMITTER VOLTAGE



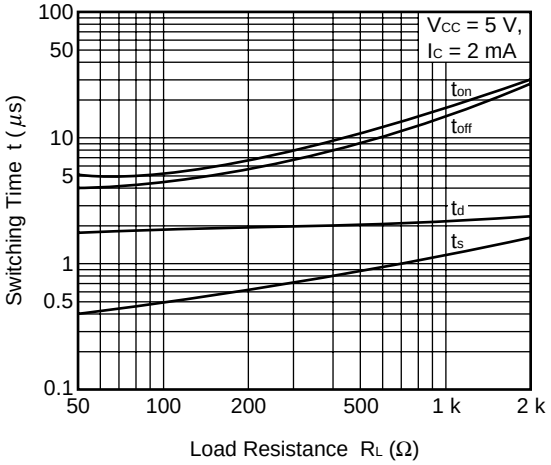
NORMALIZED CURRENT TRANSFER
RATIO vs. AMBIENT TEMPERATURE



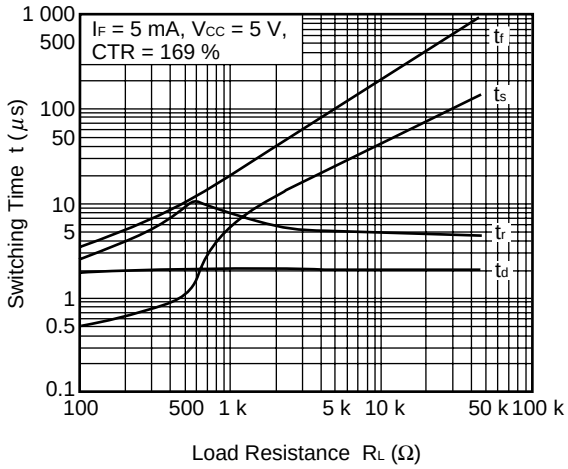
CURRENT TRANSFER RATIO vs.
FORWARD CURRENT



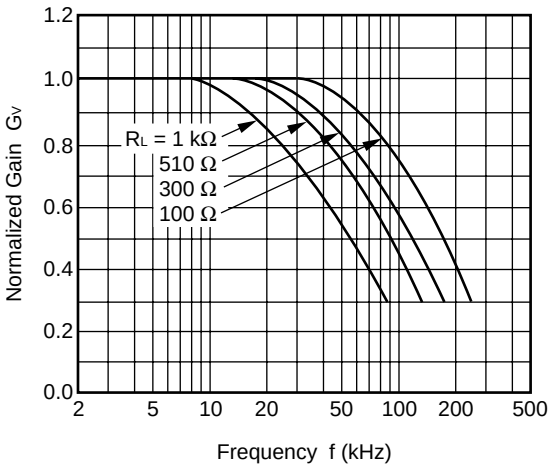
SWITCHING TIME vs.
LOAD RESISTANCE



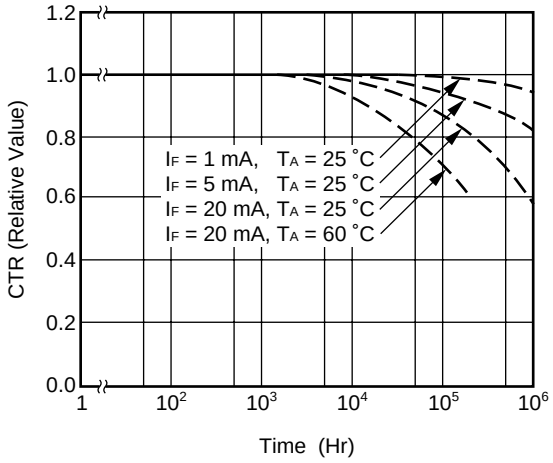
SWITCHING TIME vs.
LOAD RESISTANCE



FREQUENCY RESPONSE



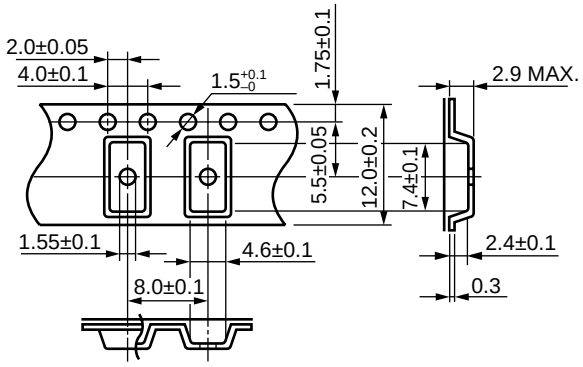
LONG TERM CTR DEGRADATION



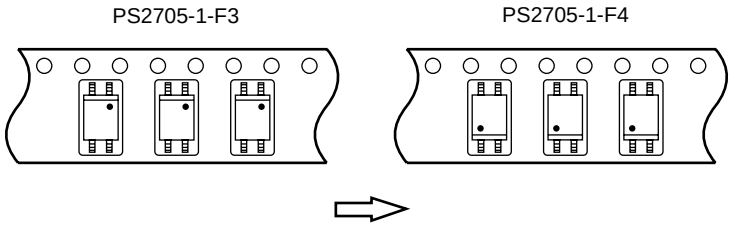
Remark The graphs indicate nominal characteristics.

★ **TAPING SPECIFICATIONS (in millimeters)**

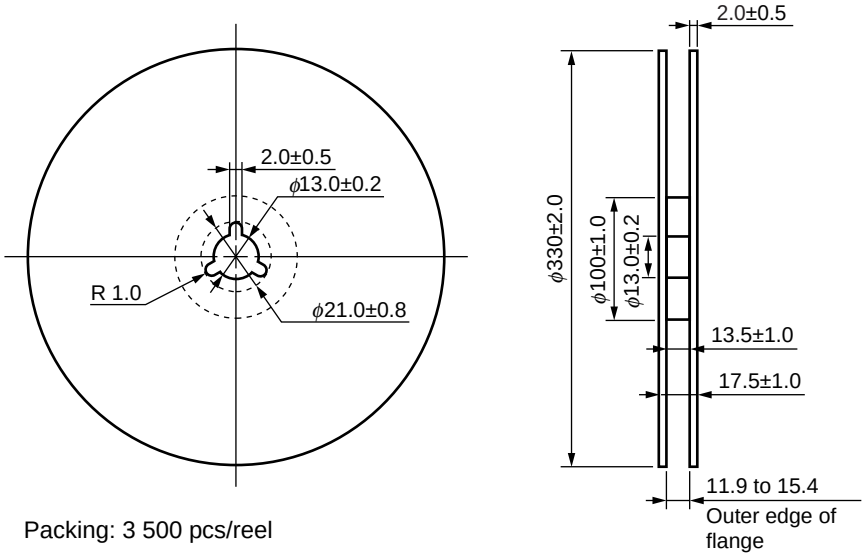
Outline and Dimensions (Tape)



Tape Direction



Outline and Dimensions (Reel)



Packing: 3 500 pcs/reel

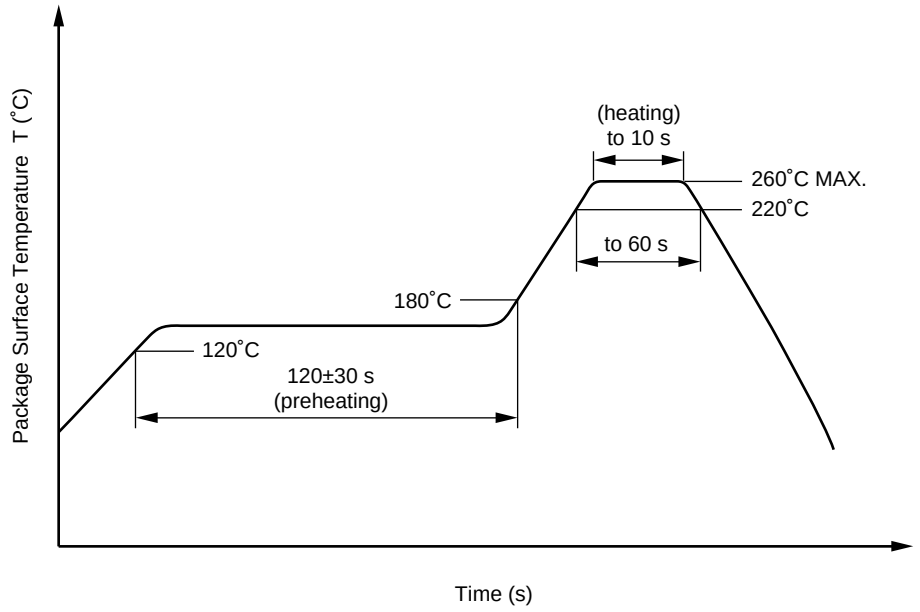
★ NOTES ON HANDLING

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.		IV	
	for rated line voltages ≤ 600 Vr.m.s.		III	
	Climatic test class (DIN IEC 68 Teil 1/09.80)		55/100/21	
	Dielectric strength			
	Maximum operating isolation voltage	U_{IORM}	710	V_{peak}
	Test voltage (partial discharge test, procedure a for type test and random test)	U_{pr}	850	V_{peak}
	$U_{pr} = 1.2 \times U_{IORM}$, $P_d < 5$ pC			
★	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	Ris MIN.	10^{12}	Ω
	V_{IO} = 500 V dc at T_A MAX. at least 100 °C	Ris MIN.	10^{11}	Ω
	Safety maximum ratings (maximum permissible in case of fault, see thermal derating curve)			
	Package temperature	Tsi	150	°C
	Current (input current I_F, Psi = 0)	Isi	200	mA
	Power (output or total power dissipation)	Psi	300	mW
	Isolation resistance			
	V_{IO} = 500 V dc at T_A = 175 °C (Tsi)	Ris MIN.	10^9	Ω

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M8E 00.4-0110

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Caution GaAs Products	The product contains gallium arsenide, GaAs. GaAs vapor and powder are hazardous to human health if inhaled or ingested. • 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. Follow related laws and ordinances for disposal. The product should be excluded from general industrial waste or household garbage.

▶**For further information, please contact**

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