DATA SHEET

NEC

PHOTOCOUPLERS

PS2706-1, PS2706-2, PS2706-4

HIGH ISOLATION VOLTAGE AC INPUT, DARLINGTON TRANSISTOR TYPE SOP MULTI PHOTOCOUPLER

– NEPOC Series –

DESCRIPTION

The PS2706-1, -2 and -4 series are optically coupled isolator containing GaAs light emitting diodes and an NPN silicon darlington-connected phototransistor.

Each 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 isolation voltage
  (BV : 3.75 $kV_{r.m.s.}$ MIN.)
- SOP (Small Out-line Package)
- Each isolated channels per package
- AC input response
- High current transfer ratio
  (CTR: 200 % MIN. @ I_F = ±1 mA, V_{CE} = 2 V)
- High speed switching
  (t_r, t_f = 200 μs TYP.)
- Taping product number (only -1 type)
  (PS2706-1-E3, E4)
- UL Approved (File No. E72422(S))
- VDE 0884 Approved (Option)

ORDERING INFORMATION

ORDERING NUMBER	PACKAGE	SAFETY STANDARD APPROVAL
PS2706-1	4 pin SOP	Standard specification products • UL Approved
PS2706-2	8 pin SOP	
PS2706-4	16 pin SOP	
PS2706-1-V	4 pin SOP	VDE0884 specification products (Option) • VDE Approved • UL Approved
PS2706-2-V	8 pin SOP	
PS2706-4-V	16 pin SOP	

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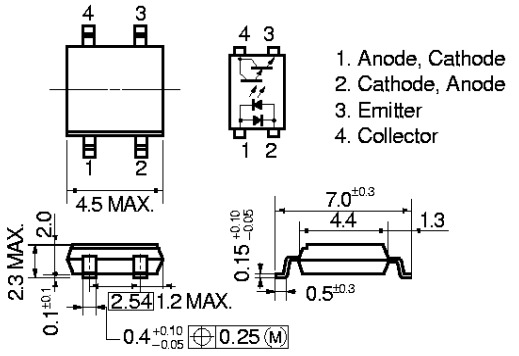
Date Published February 1996 P
Printed in Japan

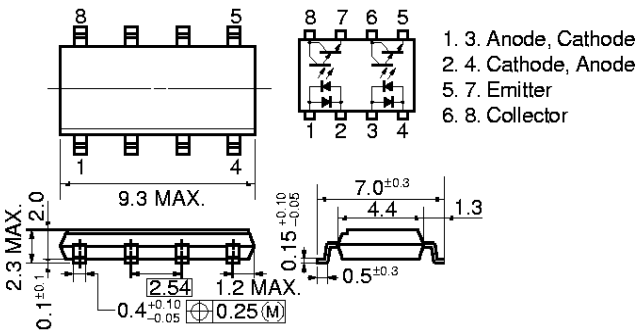
PACKAGE DIMENSIONS (Unit: in millimeters)

PS2706-1 **PIN CONNECTION (Top View)**



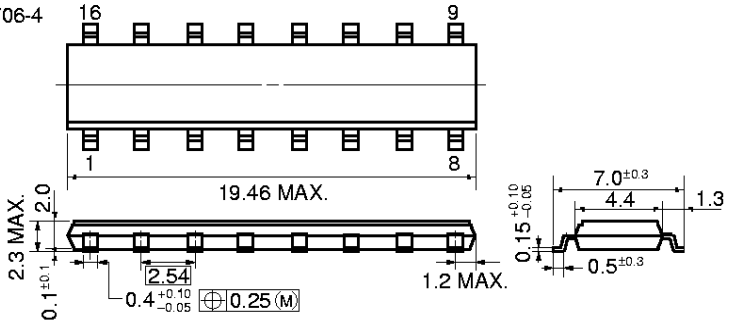
1. Anode, Cathode
2. Cathode, Anode
3. Emitter
4. Collector

PS2706-2 **PIN CONNECTION (Top View)**

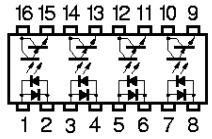


1. 3. Anode, Cathode
2. 4. Cathode, Anode
5. 7. Emitter
6. 8. Collector

PS2706-4



PIN CONNECTION (Top View)



1. 3. 5. 7. Anode, Cathode
2. 4. 6. 8. Cathode, Anode
9. 11. 13. 15. Emitter
10. 12. 14. 16. Collector

ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C)

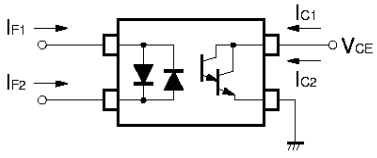
Diode		(PS2706-1)	(PS2706-2, 2706-4)	
Forward Current (DC)	IF	±50	±50	mA
Power Dissipation Derating	ΔP_D/°C	0.8	0.8	mW/°C
Power Dissipation	P_D	80	80	mW/channel
Peak Forward Current (PW = 100 μs, Duty Cycle 1 %)	$I_{F(peak)}$	±1	±1	A
Transistor				
Collector to Emitter Voltage	V_{CEO}	40	40	V
Emitter to Collector Voltage	V_{ECO}	6	6	V
Collector Current	I_C	200	160	mA/channel
Power Dissipation Derating	ΔP_C/°C	1.5	1.2	mW/°C
Power Dissipation	P_C	150	120	mW/channel
Coupled				
Isolation Voltage *1)	BV	3 750	3 750	$V_{r.m.s.}$
Storage Temperature	T_{stg}	–55 to +150	–55 to +150	°C
Operating Temperature	T_{opt}	–55 to +100	–55 to +100	°C

*1) AC voltage for 1 minute at T_A = 25 °C, RH = 60 % between input and output.

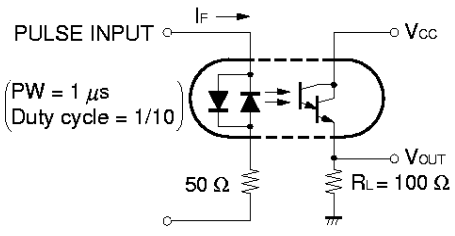
ELECTRICAL CHARACTERISTICS (T_A = 25 °C)

CHARACTERISTIC		SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Diode	Forward Voltage	V_F		1.1	1.4	V	I_F = ±5 mA
	Junction Capacitance	C_t		60		pF	V = 0, f = 1.0 MHz
Transistor	Collector to Emitter Dark Current	I_{CEO}			400	nA	V_{CE} = 40 V, I_F = 0
Coupled	Current Transfer Ratio	CTR	200	2 000		%	I_F = ±1 mA, V_{CE} = 2 V
	CTR Ratio *2)	CTR_1/CTR_2	0.3	1.0	3.0		I_F = ±1 mA, V_{CE} = 2 V
	Collector Saturation Voltage	$V_{CE(sat)}$			1.0	V	I_F = ±1 mA, I_C = 2 mA
	Isolation Resistance	R_{1-2}	10^{11}			Ω	V_{in-out} = 1.0 kV_{DC}
	Isolation Capacitance	C_{1-2}		0.4		pF	V = 0, f = 1.0 MHz
	Rise Time *3)	t_r		200		μs	V_{CC} = 5 V, I_C = 2 mA, R_L = 100 Ω
	Fall Time *3)	t_f		200		μs	V_{CC} = 5 V, I_C = 2 mA, R_L = 100 Ω

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

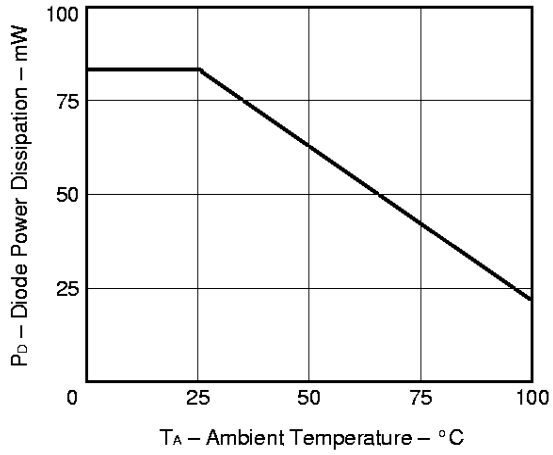


*3) Test Circuit for Switching Time

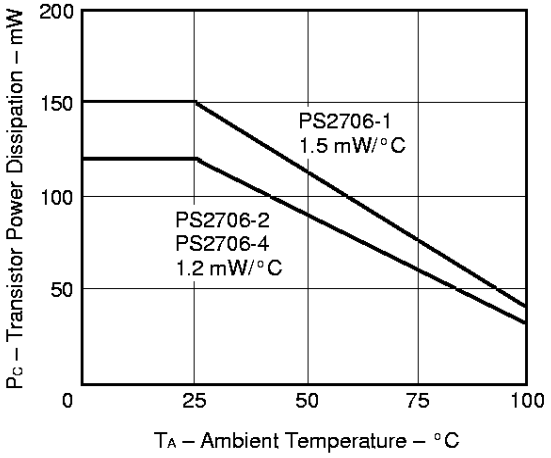


TYPICAL CHARACTERISTICS (T_A = 25 °C)

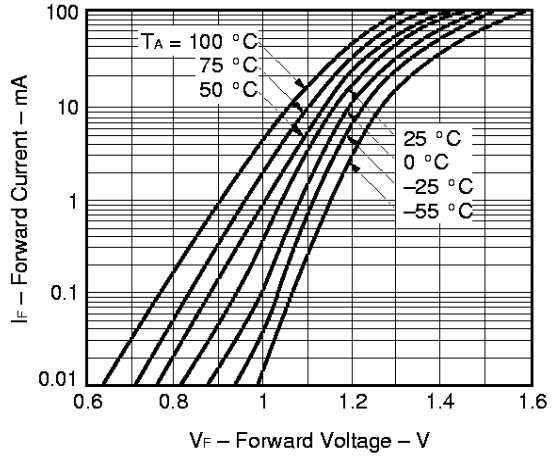
DIODE POWER DISSIPATION vs. AMBIENT TEMPERATURE



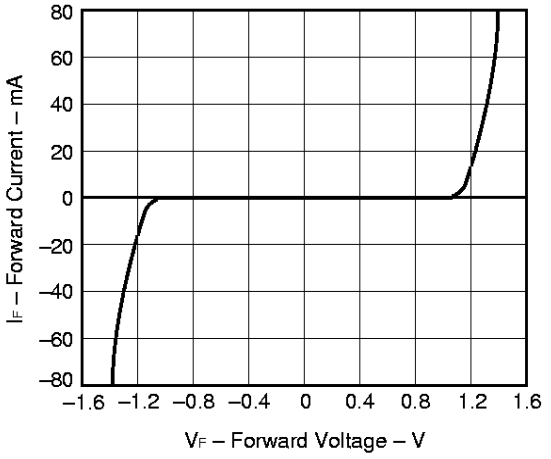
TRANSISTOR POWER DISSIPATION vs. AMBIENT TEMPERATURE



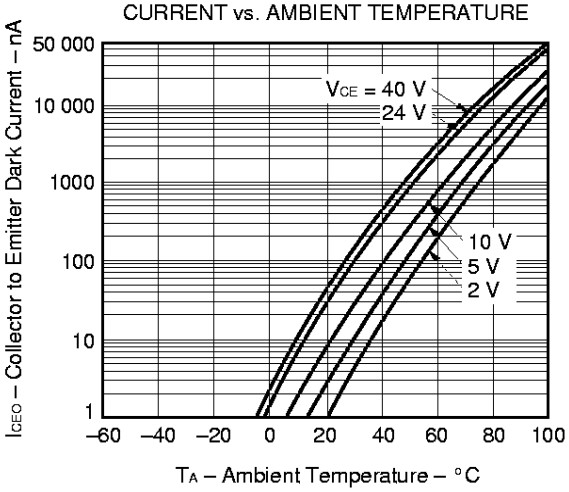
FORWARD CURRENT vs. FORWARD VOLTAGE



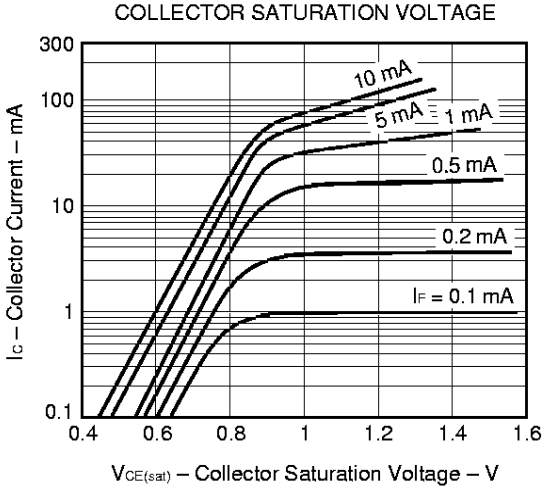
FORWARD CURRENT vs. FORWARD VOLTAGE



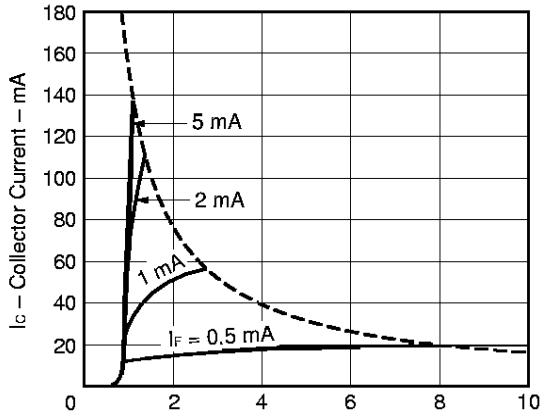
COLLECTOR TO EMITTER DARK CURRENT vs. AMBIENT TEMPERATURE



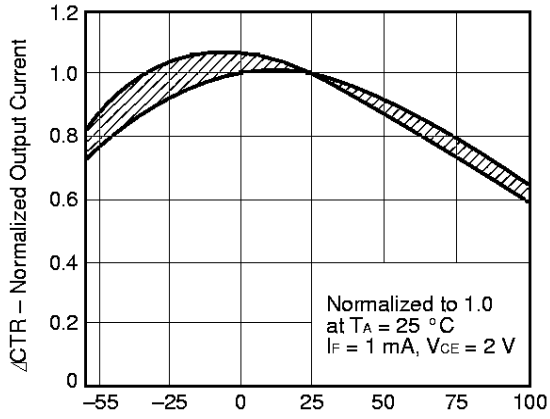
COLLECTOR CURRENT vs. COLLECTOR SATURATION VOLTAGE



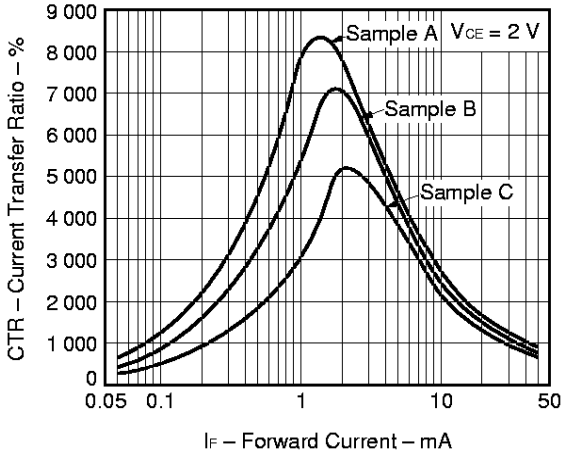
COLLECTOR CURRENT vs.
COLLECTOR TO EMITTER VOLTAGE



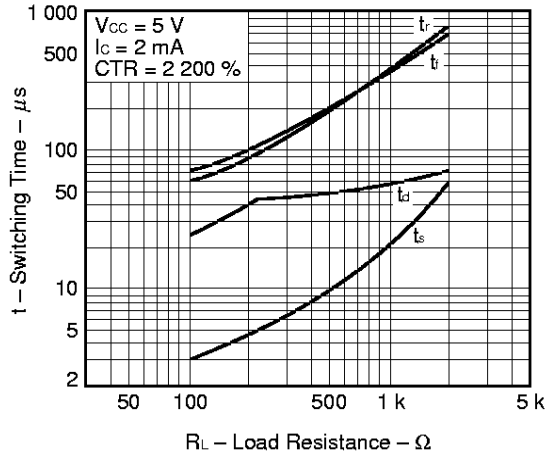
NORMALIZED OUTPUT CURRENT vs.
AMBIENT TEMPERATURE



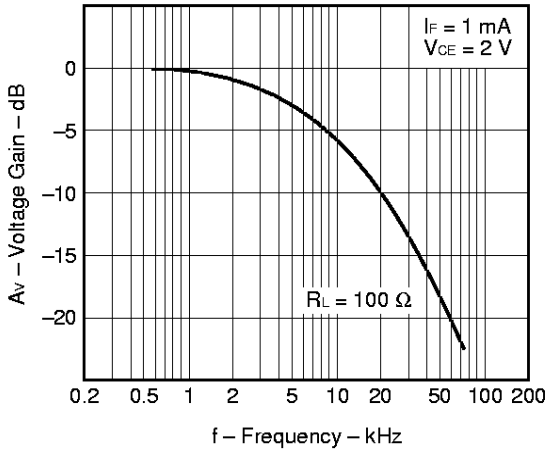
CURRENT TRANSFER RATIO (CTR) vs.
FORWARD CURRENT



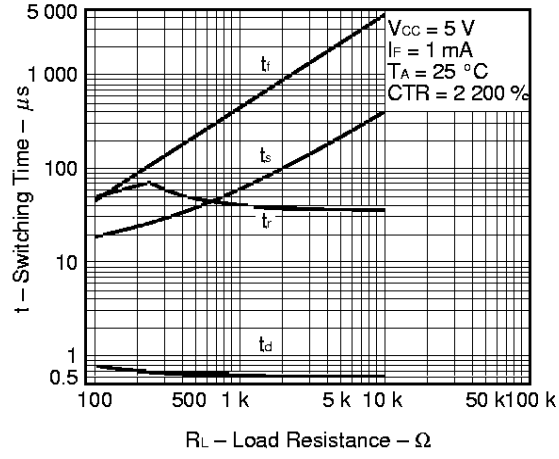
SWITCHING TIME vs.
LOAD RESISTANCE

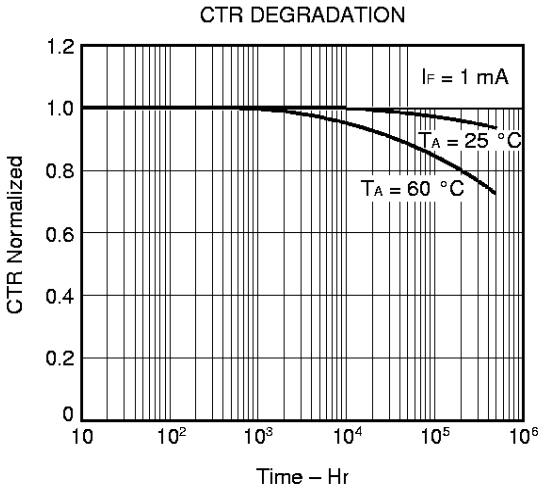


FREQUENCY RESPONSE



SWITCHING TIME vs.
LOAD RESISTANCE





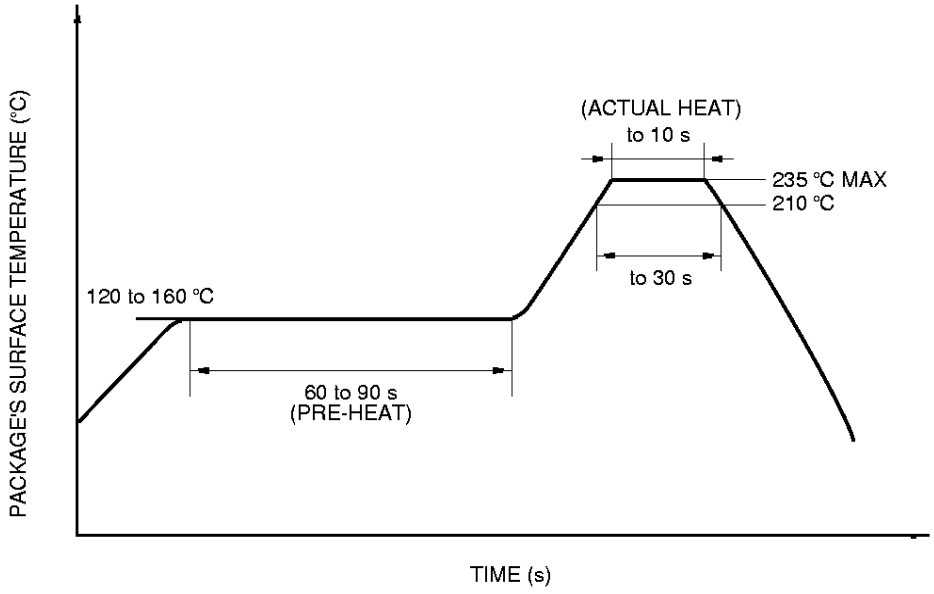
* The measurement of TYPICAL CHARACTERISTICS are only for reference, not guaranteed.

SOLDERING PRECAUTION

(1) Infrared reflow soldering

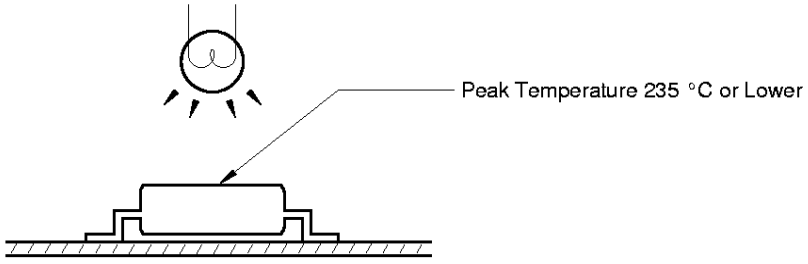
- Peak reflow temperature : 235 °C or below (Plastic surface temperature)
- Reflow time : 30 seconds or less (Time period during which the plastic surface temperature is 210 °C)
- Number of reflow processes : Three
- Flux : Rosin flux containing small amount of chlorine (The flux with a maximum chlorine content of 0.2 Wt % is recommended.)

INFRARED RAY REFLOW TEMPERATURE PROFILE



<NOTES>

(1) Please avoid to be removed the residual flux by water after the first reflow processes.



(2) Dip soldering

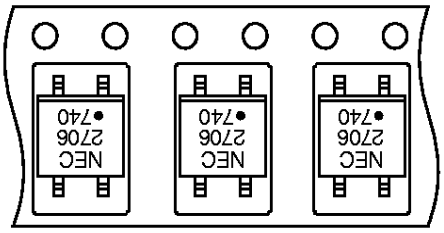
- Peak temperature : 260 °C or lower
- Time : 10 s or less
- Flux : Rosin-base flux

- **TAPING (Only PS2706-1)**

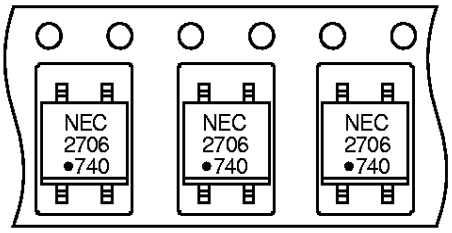
  These conform to EIAJ "Electronic Parts Taping Size" (RC-1009B: Chip type).

  There are two types of taping according to the direction in which SOP photo couplers are stuck to the tape.

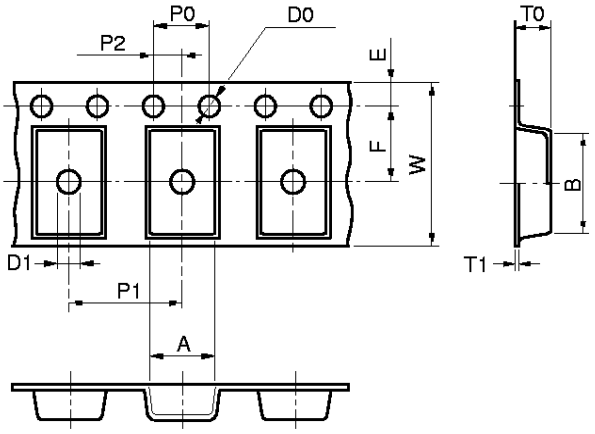
PS2706–1–E3



PS2706–1–E4



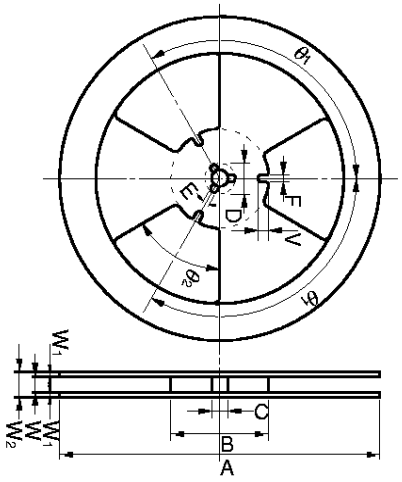
OUTLINE AND DIMENSIONS (:TAPE)



SYMBOL	RATINGS
A	4.6 ± 0.1
B	7.4 ± 0.1
D0	1.55 ± 0.1
D1	1.55 ± 0.1
E	1.75 ± 0.1
F	5.5 ± 0.1
P1	8 ± 0.1
P0	4 ± 0.1
P2	2 ± 0.1
T0	2.4 ± 0.1
T1	0.3
W	12 ± 0.2

Unit (mm)

OUTLINE AND DIMENSIONS (:REEL)



SYMBOL	RATINGS	
	E3, E4	F3, F4
A	178	330
B	66	
C	13 ± 0.5	
D	21 ± 0.8	
E	2.0 ± 0.5	
F	1.5 ± 0.5	
V	6 ± 1	
W	12.4 $^{+2.0}_{-0}$	
W1	1.5 ± 0.1	
W2	18.4 MAX.	
θ1	120°	
θ2	60°	

Unit (mm)

PACKING: 900 pieces/reel E3, E4

3 500 pieces/reel F3, F4

SPECIFICATION OF VDE MARKS LICENSE DOCUMENT (VDE0884)

PARAMETER	SYMBOL	SPECK	UNIT
Application classification (DIN VDE 0109) for rated line voltages ≤ 300 V_{eff} for rated line voltages ≤ 600 V_{eff}		 IV III	
Climatic test class (DIN 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 × U_{IORM}, Pd < 5 pC	 U_{IORM} U_{pr}	 710 850	 V_{peak} V_{peak}
Test voltage (partial discharge, test procedure b for random test) U_{pr} = 1.6 × U_{IORM}, Pd < 5 pC	U_{pr}	1140	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)		IIIa	
Storage temperature range	T_{stg}	–55 to +150	Cel
Operating temperature range	T_{amb}	–55 to +100	Cel
Isolation resistance, minimum value U_{IO} = 500 V dc at 25 Cel U_{IO} = 500 V dc at $T_{amp\ maximum}$ at least 100 Cel	 Ris min Ris min	 10^{12} 10^{11}	 ohm ohm
Safety maximum ratings (maximum permissible in case of fault, see thermal derating curve) Package temperature Current (input current IF, Psi = 0) Power (output or total power dissipation) Isolation resistance U_{IO} = 500 V dc at 175 Cel (Tsi)	 Tsi Isi Psi Ris min	 150 200 300 10^{9}	 Cel mA mW ohm

Caution

The Great Care must be taken in dealing with the devices in this guide.
The reason is that the material of the devices is GaAs (Galium Arsenide), which is designated as harmful substance according to the law concerned.
Keep the law concerned and so on, especially in case of removal.

M4 94.11