TOSHIBA PHOTOCOUPLER GaAs IRED & PHOTO-TRANSISTOR

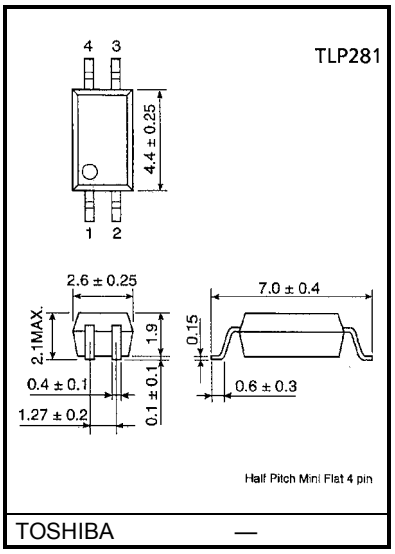
# TLP281,TLP281-4

**PROGRAMMABLE CONTROLLERS**
**AC/DC-INPUT MODULE**
**PC CARD MODEM(PCMCIA)**

TLP281 and TLP281-4 is a very small and thin coupler,suitable for surface mount assembly in applications such as PCMCIA Fax modem,programmable controllers.
TLP281 and TLP281-4 consist of photo transistor,optically coupled to a gallium arsenide infrared emitting diode.

- Collector-Emitter Voltage : 80 V (MIN)
- Current Transfer Ratio : 50% (MIN)
  Rank GB : 100% (MIN)
- Isolation Voltage : 2500 Vrms (MIN)
- UL Recognized : UL1577 , File No. E67349
- BSI Approved : BS EN 60065: 1994,
  : BS EN 41003: 1997
  Certificate No. 8143, 8144

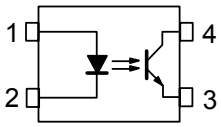
Unit in mm




Weight: 0.05 g

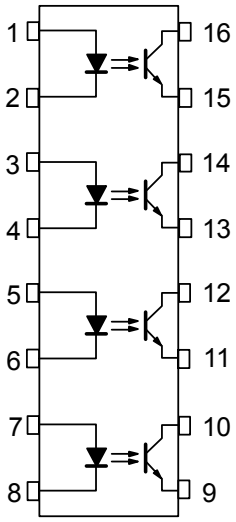
## PIN CONFIGURATION(Top view)

TLP281



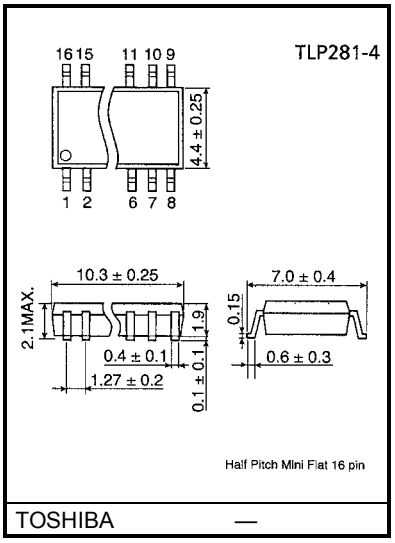

1:ANODE
2:CATHODE
3:EMITTER
4:COLLECTOR

TLP281-4




1,3,5,7 :ANODE
2,4,6,8 :CATHODE
9,11,13,15 :EMITTER
10,12,14,16 :COLLECTOR

Unit in mm




Weight: 0.19 g

| TYPE | Classi-Fication(*1) | Current Transfer Ration (%) ($I_C$ / $I_F$) $I_F$ = 5 mA, $V_{CE}$ = 5 V, Ta = 25℃ | | Marking of Classification |
|---|---|---|---|---|
| | | Min | Max | |
| TLP281 | Blank | 50 | 600 | Blank ,Y■,YE,G,G■,GR,B,BL,GB |
| | Rank Y | 50 | 150 | YE |
| | Rank GR | 100 | 300 | GR |
| | Rank BL | 200 | 600 | BL |
| | Rank GB | 100 | 600 | GB |
| | Rank YH | 75 | 150 | Y■ |
| | Rank GRL | 100 | 200 | G |
| | Rank GRH | 150 | 300 | G■ |
| | Rank BLL | 200 | 400 | B |
| TLP281-4 | Blank | 50 | 600 | Blank , GB |
| | Rank GB | 100 | 600 | GB |

*1: Ex. rank GB: TLP281 (GB)

(Note): Application type name for certification test, please use standard product type name, i.e.
TLP281 (GB): TLP281−1 , TLP281−4 (GB): TLP281−4

## MAXIMUM RATINGS (Ta = 25°C)

| CHARACTERISTIC | | SYMBOL | RATING | | UNIT |
|---|---|---|---|---|---|
| | | | TLP281 | TLP281−4 | |
| LED | Forward Current | $I_F$ | 50 | | mA |
| | Forward Current Derating | $\Delta I_F$ /°C | −0.7 (Ta≥53°C) | −0.5 (Ta≥25°C) | mA /°C |
| | Pulse Forward Current | $I_{FP}$ | 1 | | A |
| | Reverse Voltage | $V_R$ | 5 | | V |
| | Junction Temperature | $T_j$ | 125 | | °C |
| DETECTOR | Collector-Emitter Voltage | $V_{CEO}$ | 80 | | V |
| | Emitter-Collector Voltage | $V_{ECO}$ | 7 | | V |
| | Collector Current | $I_C$ | 50 | | mA |
| | Collector Power Dissipation (1 Circuit) | $P_C$ | 150 | 100 | mW |
| | Collector Power Dissipation Derating(Ta≥25°C) (1 Circuit) | $\Delta P_C$ /°C | −1.5 | −1.0 | mW /°C |
| | Junction Temperature | $T_j$ | 125 | | °C |
| Operating Temperature Range | | $T_{opr}$ | −55~100 | | °C |
| Storage Temperature Range | | $T_{stg}$ | −55~125 | | °C |
| Lead Soldering Temperature | | $T_{sol}$ | 260 (10s) | | °C |
| Total Package Power Dissipation (1 Circuit) | | $P_T$ | 200 | 170 | mW |
| Total Package Power Dissipation Derating (Ta≥25°C) (1 Circuit) | | $\Delta P_T$ /°C | −2.0 | −1.7 | mW /°C |
| Isolation Voltage (Note1) | | $BV_S$ | 2500(AC,1min,R.H.≤60%) | | Vrms |

(Note1)Device considered a two terminal device : LED side pins shorted together and DETECTOR side pins shorted together.

## INDIVIDUAL ELECTRICAL CHARACTERISTICS (Ta = 25°C)

| CHARACTERISTIC | | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|---|
| LED | Forward Voltage | $V_F$ | $I_F$ = 10 mA | 1.0 | 1.15 | 1.3 | V |
| | Reverse Current | $I_R$ | $V_R$ = 5 V | — | — | 10 | μA |
| | Capacitance | $C_T$ | V = 0, f = 1 MHz | — | 30 | — | pF |
| DETECTOR | Collector-Emitter Breakdown Voltage | $V_{(BR)\ CEO}$ | $I_C$ = 0.5 mA | 80 | — | — | V |
| | Emitter-Collector Breakdown Voltage | $V_{(BR)\ ECO}$ | $I_E$ = 0.1 mA | 7 | — | — | V |
| | Collector Dark Current (Note2) | $I_{CEO}$ | $V_{CE}$ = 48 V, Ambient Light Below (100 ℓx) | — | 0.01 (2) | 0.1 (10) | μA |
| | | | $V_{CE}$ = 48 V, Ta = 85°C Ambient Light Below (100 ℓx) | — | 2 (4) | 50 (50) | μA |
| | Capacitance (Collector to Emitter) | $C_{CE}$ | V = 0, f = 1 MHz | — | 10 | — | pF |

(Note 2) Because of the construction,leak current might be increased by ambient light. Please use photocoupler with less ambient light.

## COUPLED ELECTRICAL CHARACTERISTICS (Ta = 25°C)

| CHARACTERISTIC | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| Current Transfer Ratio | $I_C$ / $I_F$ | $I_F$ = 5 mA, $V_{CE}$ = 5 V | 50 | — | 600 | % |
| | | Rank GB | 100 | — | 600 | |
| Saturated CTR | $I_C$ / $I_{F\ (sat)}$ | IF = 1 mA, VCE = 0.4 V | — | 60 | — | % |
| | | Rank GB | 30 | — | — | |
| Collector-Emitter Saturation Voltage | $V_{CE\ (sat)}$ | $I_C$ = 2.4 mA, $I_F$ = 8 mA | — | — | 0.4 | V |
| | | $I_C$ = 0.2 mA, $I_F$ = 1 mA | — | 0.2 | — | |
| | | Rank GB | — | — | 0.4 | |
| Off-State Collector Current | $I_{C\ (off)}$ | $V_F$ = 0.7 V, $V_{CE}$ = 48 V | — | — | 10 | μA |

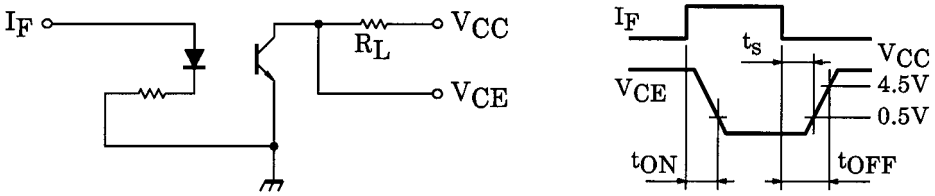
## ISOLATION CHARACTERISTICS (Ta = 25°C)

| CHARACTERISTIC | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| Capacitance (Input to Output) | $C_S$ | $V_S$ = 0 V, f = 1 MHz | — | 0.8 | — | pF |
| Isolation Resistance | $R_S$ | $V_S$ = 500 V, R.H.≤60% | $5\times10^{10}$ | $10^{14}$ | — | Ω |
| Isolation Voltage | $BV_S$ | AC , 1 minute | 2500 | — | — | Vrms |
| | | AC , 1 second,in OIL | — | 5000 | — | |
| | | DC , 1 minute, in OIL | — | 5000 | — | Vdc |

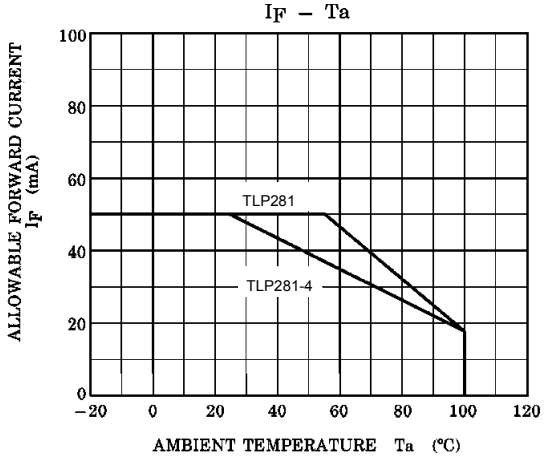
## SWITCHING CHARACTERISTICS (Ta = 25°C)

| CHARACTERISTIC | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| Rise Time | $t_r$ | $V_{CC}$ = 10 V, $I_C$ = 2 mA $R_L$ = 100Ω | — | 2 | — | μs |
| Fall Time | $t_f$ | | — | 3 | — | |
| Turn-On Time | $t_{on}$ | | — | 3 | — | |
| Turn-Off Time | $t_{off}$ | | — | 3 | — | |
| Turn-On Time | $t_{ON}$ | $R_L$ = 1.9 kΩ (Fig.1) $V_{CC}$ = 5 V, $I_F$ = 16 mA | — | 2 | — | μs |
| Storage Time | $t_s$ | | — | 25 | — | |
| Turn-Off Time | $t_{OFF}$ | | — | 40 | — | |

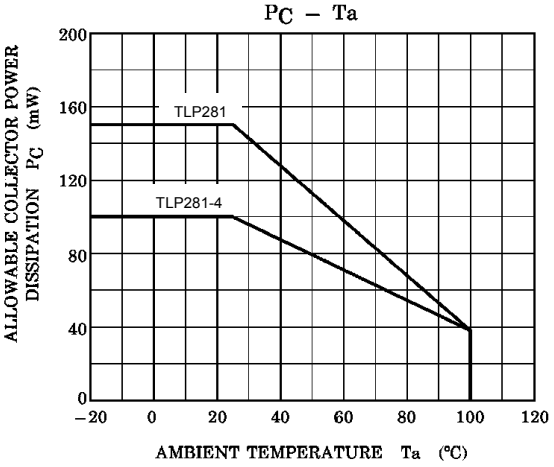
(Fig.1)SWITCHING TIME TEST CIRCUIT



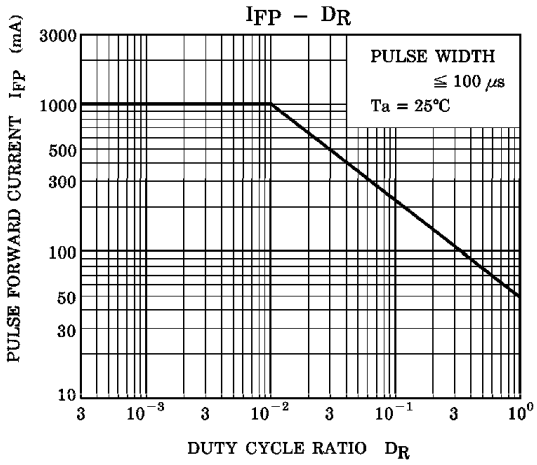
$I_F$ – Ta



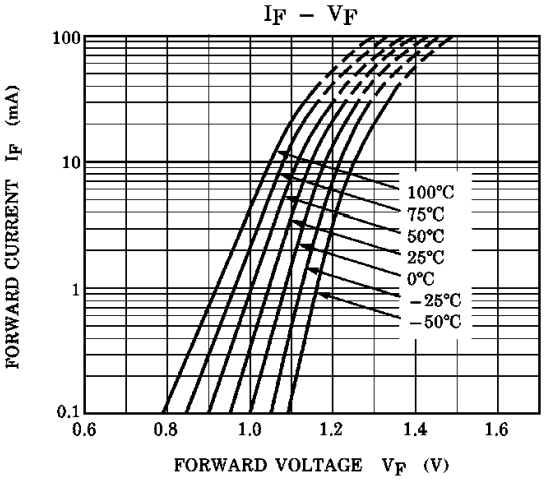

$P_C$ – Ta



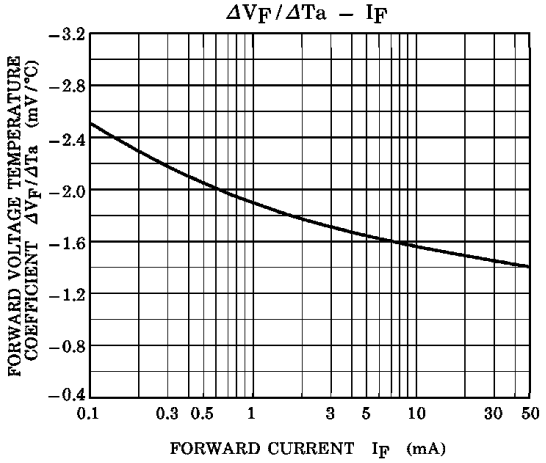

$I_{FP}$ – $D_R$



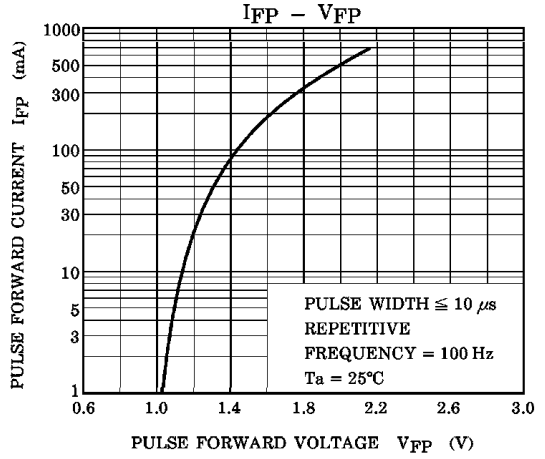

$I_F$ – $V_F$



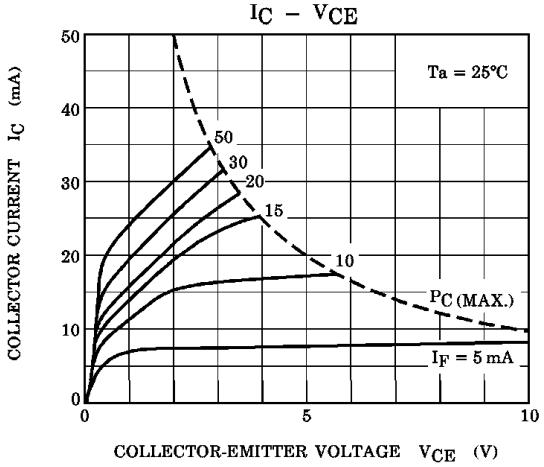

$\Delta V_F / \Delta Ta$ – $I_F$



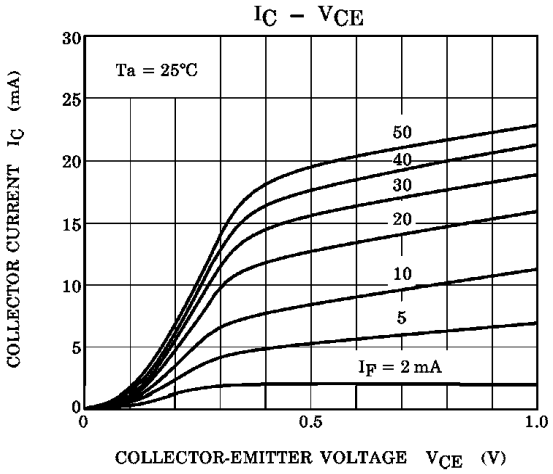

$I_{FP}$ – $V_{FP}$



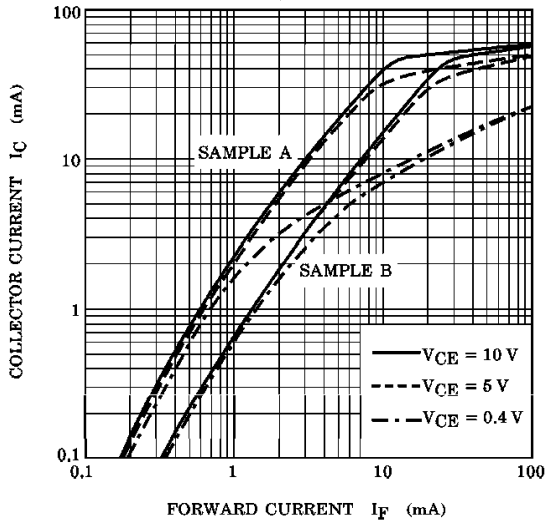
$I_C - V_{CE}$



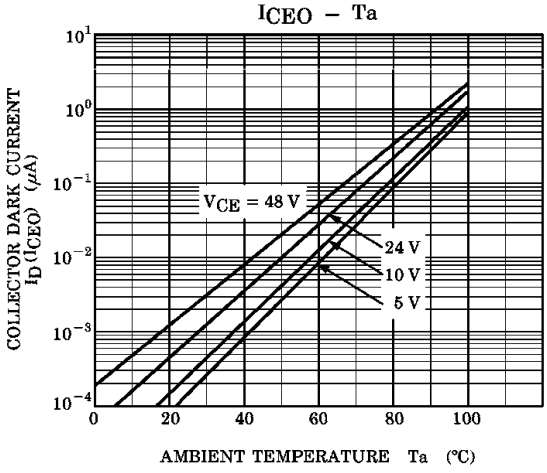

$I_C - V_{CE}$



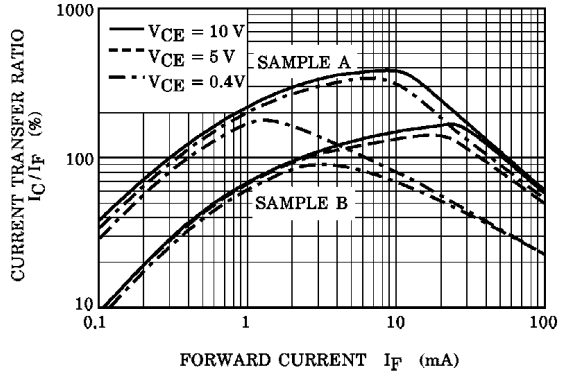

$I_C - I_F$



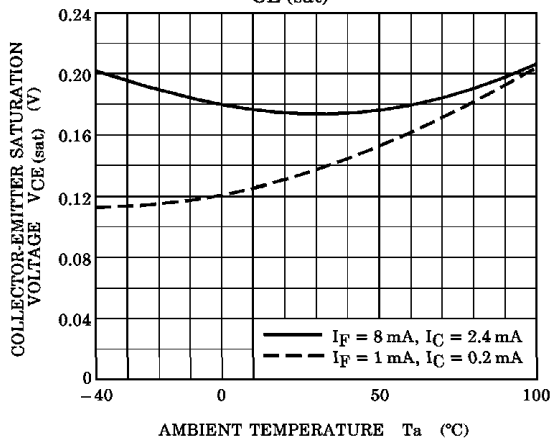

$I_{CEO} - Ta$



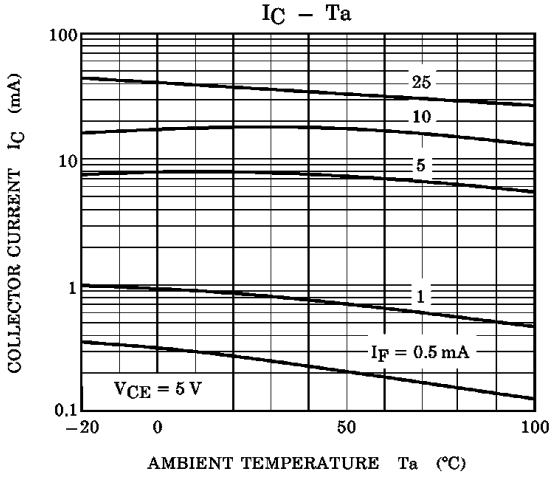

$I_C / I_F - I_F$



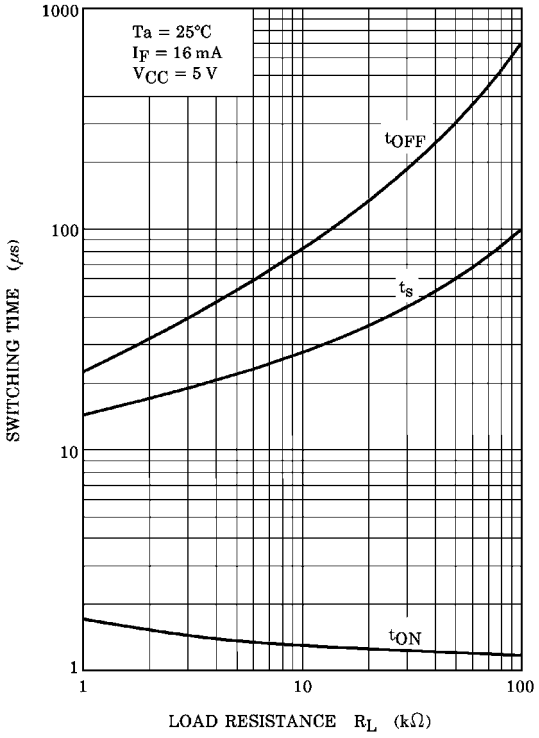
$V_{CE}$ (sat) – Ta



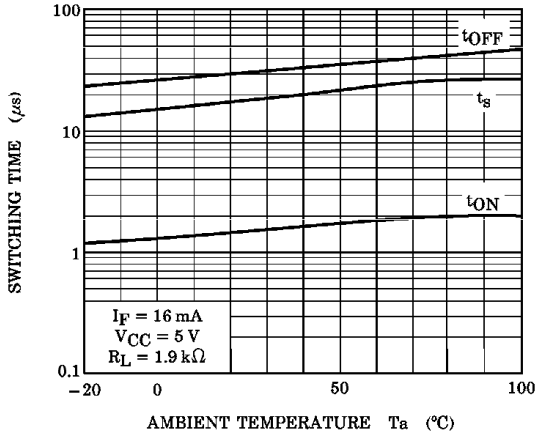

$I_C$ – Ta




SWITCHING TIME – $R_L$




SWITCHING TIME – Ta



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