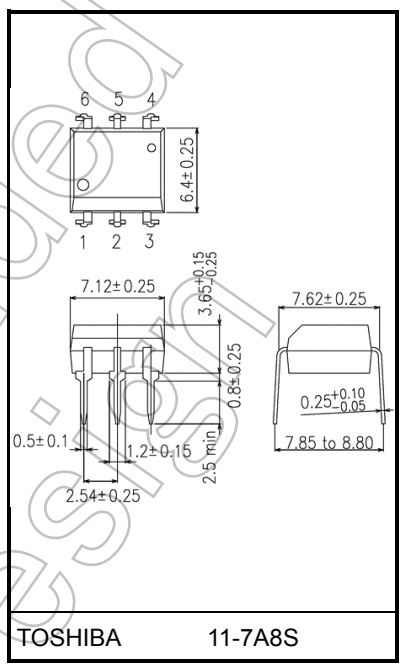
TOSHIBA Photocoupler IRED & Photo-Transistor

TLP570, TLP571

Programmable Controllers
AC / DC-Input Module
Solid State Relay

Unit: mm



TOSHIBA 11-7A8S

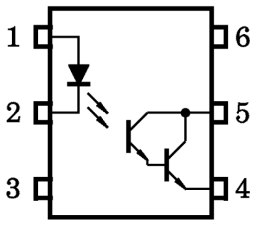
Weight: 0.4 g (typ.)

The TOSHIBA TLP570 and TLP571 consist of a Darlington connected photo-transistor optically coupled to an infrared emitting diode in a six lead plastic DIP package.
TLP570 has no-base internal connection for high-EMI environments.

- Collector-emitter voltage: 35 V (min)
- Current transfer ratio: 1000 % (min)
- Isolation voltage: 2500 Vrms (min)
- UL-recognized: UL 1577, File No.E67349
- cUL-recognized: CSA Component Acceptance Service No.5A
  File No.E67349

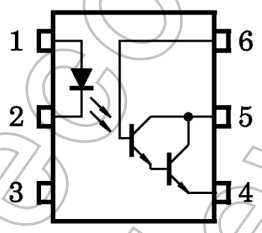
Pin Configurations (top view)

TLP570



1 : ANODE
2 : CATHODE
3 : NC
4 : EMITTER
5 : COLLECTOR
6 : NC

TLP571



1 : ANODE
2 : CATHODE
3 : NC
4 : EMITTER
5 : COLLECTOR
6 : BASE

Start of commercial production
1982-02

Absolute Maximum Ratings (Ta = 25°C)

Characteristic		Symbol	Rating	Unit
LED	Forward current	I_F	70	mA
	Forward current derating (Ta ≥ 25°C)	ΔI_F / °C	-0.7	mA / °C
	Peak forward current (100 μs pulse, 100 pps)	I_{FP}	1	A
	Reverse voltage	V_R	5	V
	Diode power dissipation	P_D	100	mW
	Diode power dissipation derating (Ta >25°C)	$\triangle P_D$ /°C	-1.0	mW/°C
	Junction temperature	T_j	125	°C
Detector	Collector-emitter voltage	V_{CEO}	35	V
	Collector-base voltage (TLP571)	V_{CBO}	80	V
	Emitter-collector voltage	V_{ECO}	7	V
	Emitter-base voltage (TLP571)	V_{EBO}	7	V
	Collector current	I_C	150	mA
	Power dissipation	P_C	150	mW
	Power dissipation derating (Ta ≥ 25°C)	ΔP_C / °C	-1.5	mW / °C
	Junction temperature	T_j	125	°C
Storage temperature range		T_{stg}	-55 to 125	°C
Operating temperature range		T_{opr}	-55 to 100	°C
Lead soldering temperature (10 s)		T_{sol}	260	°C
Total package power dissipation		P_T	250	mW
Total package power dissipation derating (Ta ≥ 25°C)		ΔP_T / °C	-2.5	mW / °C
Isolation voltage (AC, 60 s, R.H.≤ 60 %) (Note 1)		BV_S	2500	V_{rms}

Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings.
Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook (“Handling Precautions”/“Derating Concept and Methods”) and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

Note 1: Device considered a two terminal: Pins1, 2 and 3 shorted together and pins 4, 5 and 6 shorted together.

Recommends Operating Conditions

Characteristic	Symbol	Min	Typ.	Max	Unit
Supply voltage	V_{CC}	—	5	24	V
Forward current	I_F	—	16	25	mA
Collector current	I_C	—	—	50	mA
Operating temperature	T_{opr}	-25	—	85	°C

Note: Recommended operating conditions are given as a design guideline to obtain expected performance of the device. Additionally, each item is an independent guideline respectively. In developing designs using this product, please confirm specified characteristics shown in this document.

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 V, f = 1 MHz	—	30	—	pF
Detector	Collector-emitter breakdown voltage	$V_{(BR)CEO}$	I_C = 1 mA	35	—	—	V
	Emitter-collector breakdown voltage	$V_{(BR)ECO}$	I_E = 0.1 mA	7	—	—	V
	Collector-base breakdown voltage (TLP571)	$V_{(BR)CBO}$	I_C = 0.1 mA	80	—	—	V
	Emitter-base breakdown voltage (TLP571)	$V_{(BR)EBO}$	I_E = 0.1 mA	7	—	—	V
	Collector dark current	I_{CEO}	V_{CE} = 24 V	—	10	200	nA
			V_{CE} = 24 V, Ta = 85 °C	—	—	300	μA
	Collector dark current (TLP571)	I_{CER}	V_{CE} = 24 V, Ta = 85 °C R_{BE} = 10 MΩ	—	0.5	10	μA
	Collector dark current (TLP571)	I_{CBO}	V_{CB} = 10 V	—	0.01	—	nA
	DC forward current gain (TLP571)	h_{FE}	V_{CE} = 5 V, I_C = 10 mA	—	50k	—	—
	Capacitance (collector to emitter)	C_{CE}	V = 0 V, f = 1 MHz	—	10	—	pF

Coupled Electrical Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Current transfer ratio	I_C / I_F	I_F = 1 mA, V_{CE} = 1 V	1000	2000	—	%
Saturated CTR	I_C / $I_{F\ (sat)}$	I_F = 10 mA, V_{CE} = 1 V	500	—	—	%
Base photo-current (TLP571)	I_{PB}	I_F = 1 mA, V_{CB} = 1 V	—	2	—	μA
Collector-emitter saturation voltage	$V_{CE\ (sat)}$	I_C = 10 mA, I_F = 1 mA	—	—	1.0	V
		I_C = 100 mA, I_F = 10 mA	0.3	—	1.2	

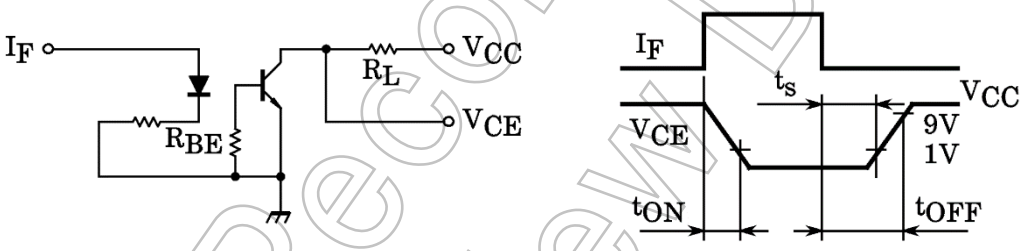
Isolation Characteristics (Ta = 25°C)

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 %	5×10^{10}	10^{14}	—	Ω
Isolation voltage	BV_S	AC, 60 s	2500	—	—	V_{rms}

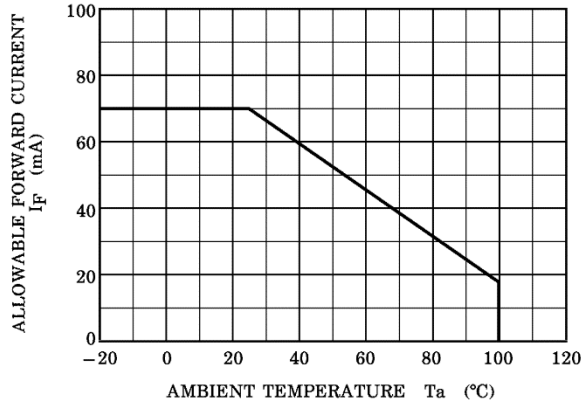
Switching Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Rise time	t_r	V_{CC} = 10 V I_C = 10 mA R_L = 100 Ω	—	40	—	μs
Fall time	t_f		—	30	—	
Turn-on time	t_{ON}		—	45	—	
Turn-off time	t_{OFF}		—	35	—	
Turn-on time	t_{ON}	R_L = 180 Ω (Fig.1) R_{BE} = open V_{CC} = 10 V, I_F = 10 mA	—	5	—	μs
Storage time	t_s		—	20	—	
Turn-off time	t_{OFF}		—	100	—	
Turn-on time	t_{ON}	R_L = 180 Ω (Fig.1) R_{BE} = 10 MΩ (TLP571) V_{CC} = 10 V, I_F = 10 mA	—	5	—	μs
Storage time	t_s		—	15	—	
Turn-off time	t_{OFF}		—	60	—	

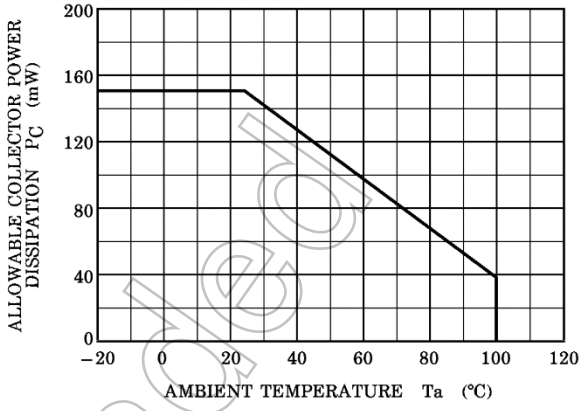
Fig. 1 Switching time test circuit



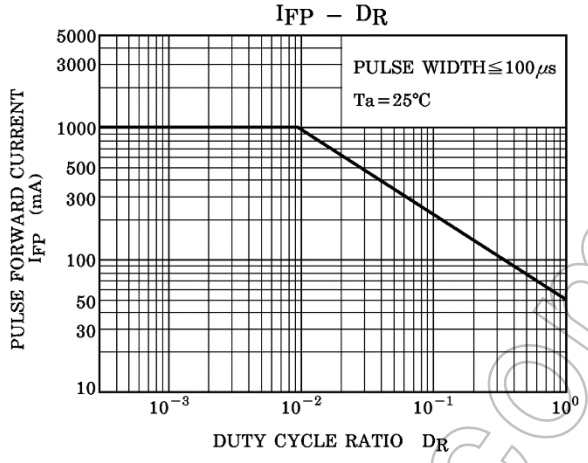
I_F – Ta



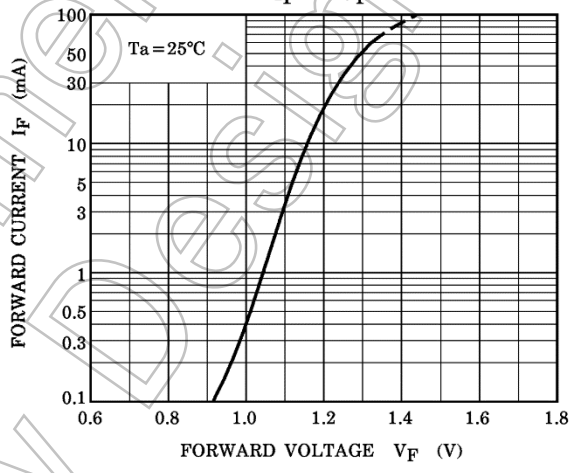
P_C – Ta



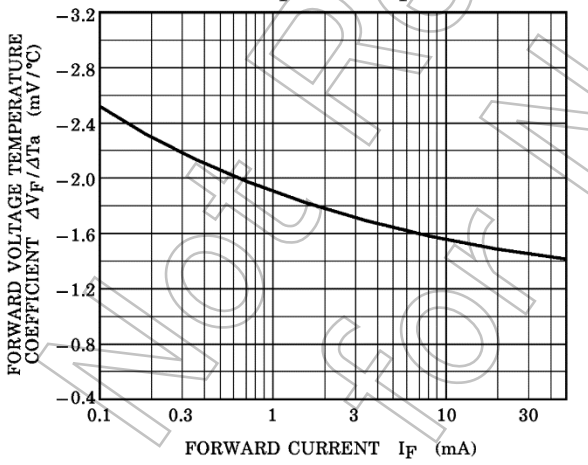
I_{FP} – D_R



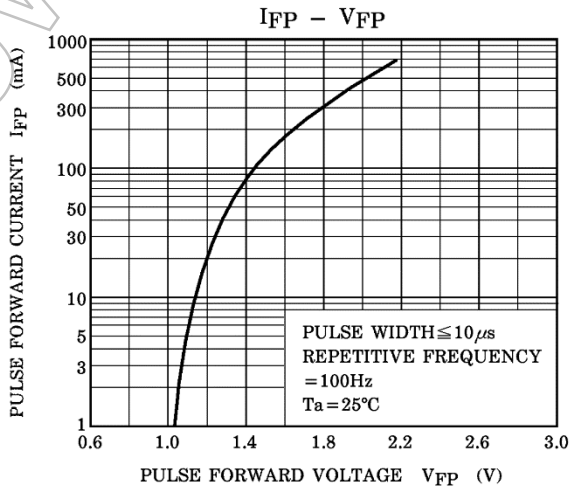
I_F – V_F



$\Delta V_F / \Delta Ta$ – I_F

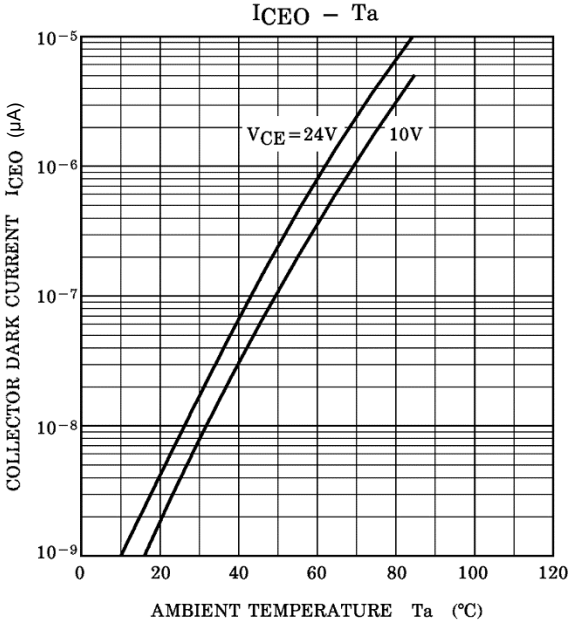


I_{FP} – V_{FP}

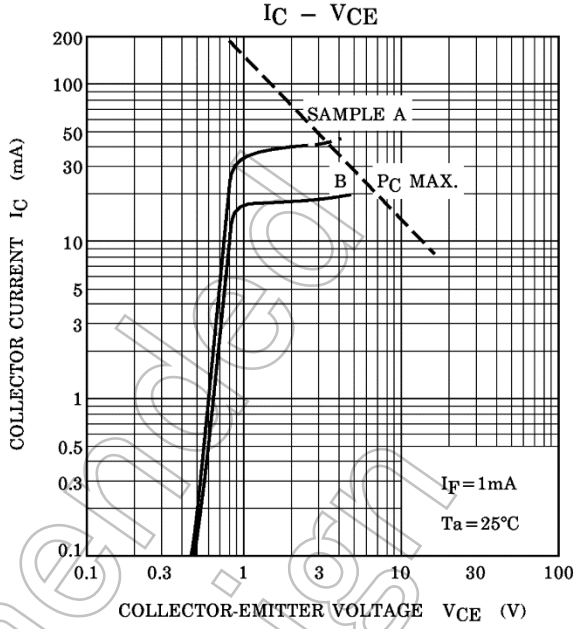


NOTE: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.

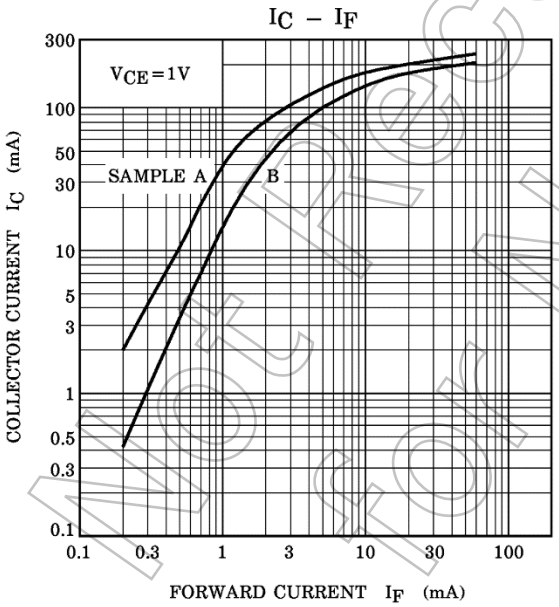
I_{CEO} – Ta



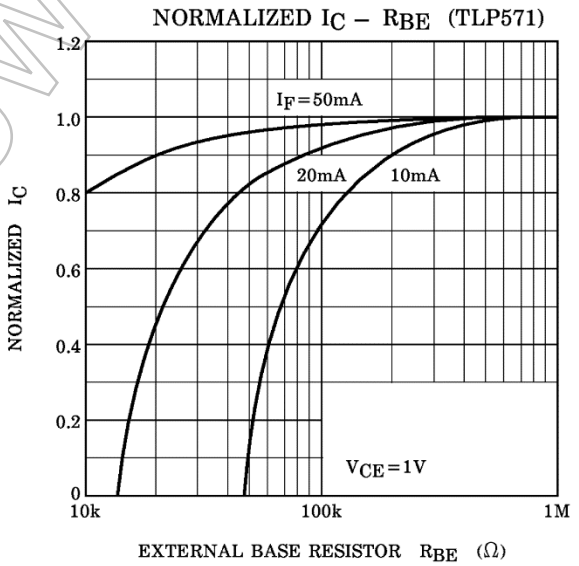
I_C – V_{CE}



I_C – I_F



NORMALIZED I_C – R_{BE} (TLP571)



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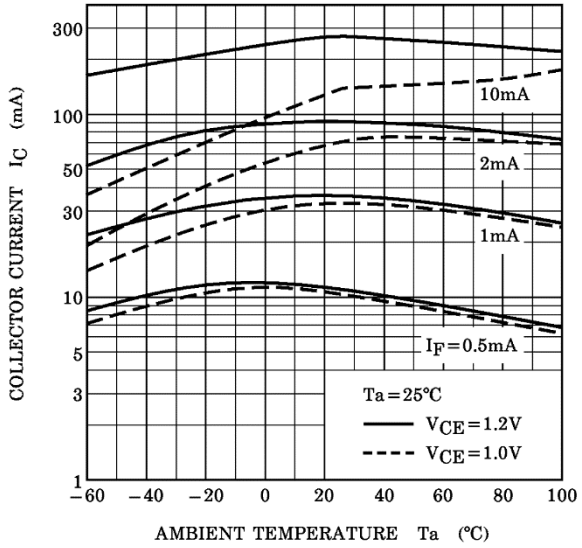
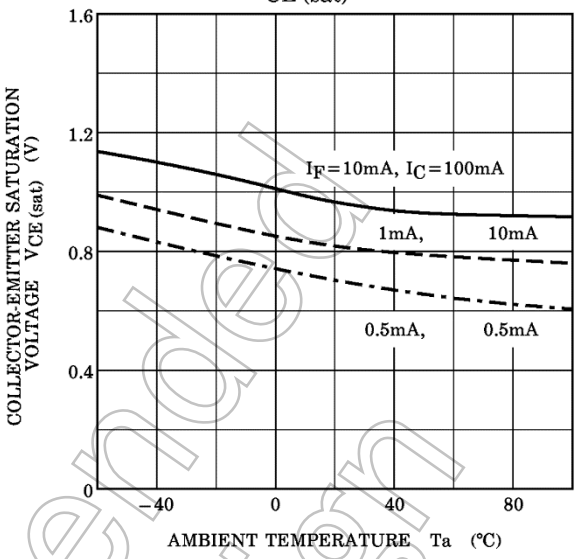
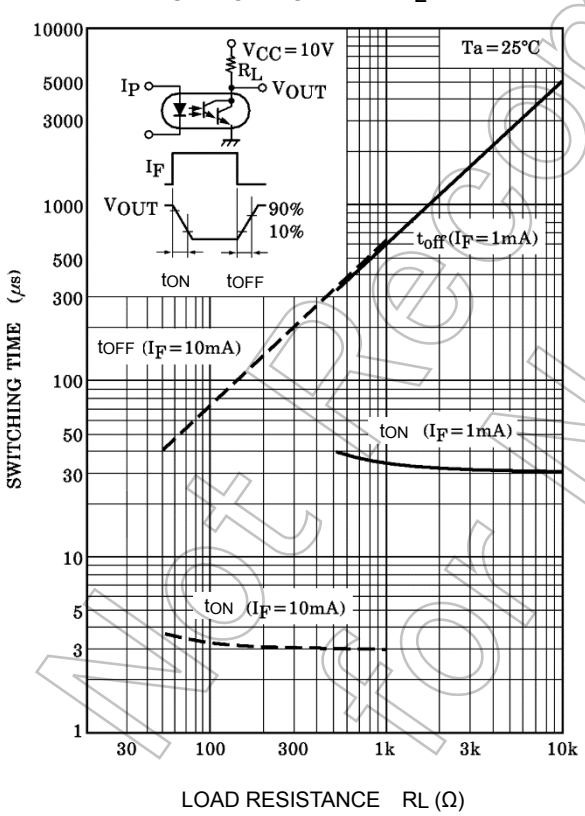
I_C – Ta



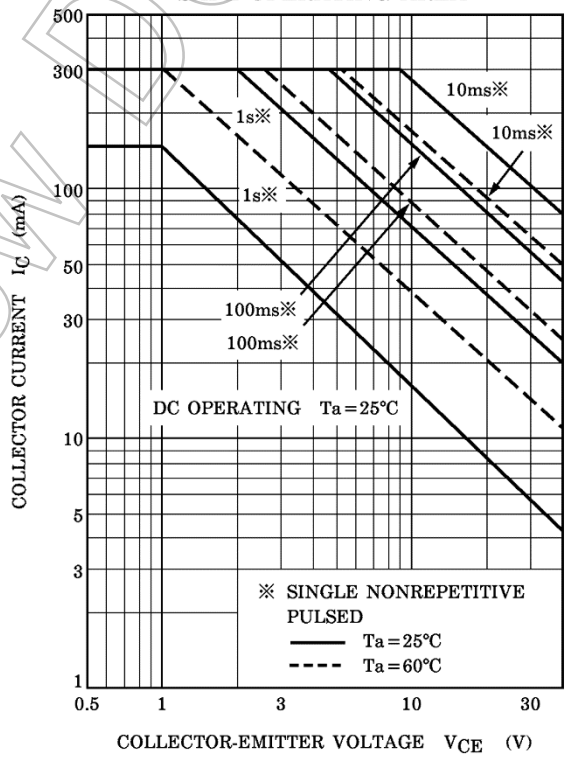
$V_{CE\,(sat)}$ – Ta



SWITCHING TIME – RL



SAFE OPERATING AREA



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