### TOSHIBA PHOTOCOUPLER PHOTO RELAY

# TLP209D

MEASUREMENT INSTRUMENTS LOGIC IC TESTERS / MEMORY TESTERS BOARD TESTERS / SCANNERS

The TOSHIBA TLP209D consists of an infrared emitting diode optically coupled to a photo-MOSFET in a plastic SOP package.

Its characteristics include low OFF-state current and low output pin capacitance, enabling it to be used in high-frequency measurement instruments.

### **Features**

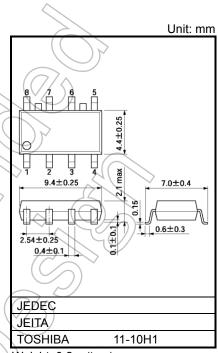
• 8 pin SOP (2.54SOP8) : 2.1 mm high, 2.54 mm pitch

2-Form-A

Peak Off-State Voltage : 200 V (min)
 Trigger LED Current : 3 mA (max)
 On-State Current : 50 mA (max)
 On-State Resistance : 50 Ω (max)
 Output Capacitance : 20 pF (max)

Isolation Voltage : 1500 Vrms (min)

UL-recognized : UL 1577, File No.E67349

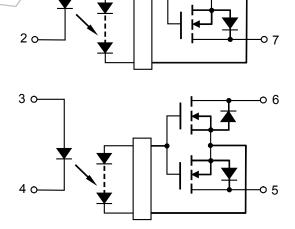


Weight: 0.2 g (typ.)

# Pin Configuration (top view)

# 1,3:ANODE 2,4:CATHODE 5:DRAIN D1 6:DRAIN D2 7:DRAIN D3 8:DRAIN D4

### **Schematic**



Start of commercial production 2008-10

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### Absolute Maximum Ratings (Ta = 25°C)

	Characteristics	Symbol	Rating	Unit
	Forward Current	lF	50	mA
	Forward Current Derating (Ta ≥ 25°C)	ΔI <sub>F</sub> /°C	-0.5	mA/°C
ED	Reverse Voltage	VR	5	V
쁘	Diode Power Dissipation	PD	50	mW
	Diode Power Dissipation Derating (Ta >25°C)	ΔP <sub>D</sub> /°C	-0.5	mW/°C
	Junction Temperature	Tj	125	°C
	Off-State Output Terminal Voltage	Voff	200	((x//)
~	On-State Current	Ion	50	mA
<b>JETECTOR</b>	On-State Current Derating (Ta ≥ 25°C)	Δl <sub>ON</sub> /°C	-0.5	mA/°C
ETE(	Output Power Dissipation	Ро	125	mW
□	Output Power Dissipation Derating (Ta ≥ 25°C)	ΔP <sub>O</sub> / °C	-1.25	mW / °C
	Junction Temperature	Tj	125	°C
Storage Temperature Range		T <sub>stg</sub>	-55 to 125	ζ°C,
Opera	ating Temperature Range	Topr	-40 to 85	°C <
Lead	Soldering Temperature (10 s)	Tsol	260	°C
Isolat	ion Voltage (AC, 60 s, R.H. ≤ 60 %) (NOTE1)	BVs	1500	Vrms

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 device: LED side pins shorted together, and DETECTOR side pins shorted together.

### **Recommended Operating Conditions**

Characteristics	/Symbol	Min	Тур.	Max	Unit
Supply Voltage	V <sub>DD</sub>		_	160	V
Forward Current	E	> 5	7.5	15	mA
On-State Current	ION	_	_	50	mA
Operating Temperature	Topr	-20	_	60	°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.

### Individual Electrical Characteristics (Ta = 25°C)

	Characteristics	Symbol	Test Condition	Min	Тур.	Max	Unit
	Forward Voltage	VF	I <sub>F</sub> = 10 mA	1.0	1.15	1.3	V
LED	Reverse Current	I <sub>R</sub>	V <sub>R</sub> = 5 V	_	_	10	μA
	Capacitance	СТ	V = 0 V, f = 1 MHz	_	30	_	pF
DETECTOR	Off-State Current	loff	V <sub>OFF</sub> = 160 V	_	ı	1	nA
	Capacitance	Coff	V = 0 V, f = 1 MHz	_	15	20	pF

# **Coupled Electrical Characteristics (Ta = 25°C)**

Characteristics	Symbol	Test Condition	Min	Тур.	Max	Unit
Trigger LED Current	I <sub>FT</sub>	I <sub>ON</sub> = 50 mA	_	1	3	mA
Return LED Current	IFC	I <sub>OFF</sub> = 100 μA	0.1	_	_	mA
On-State Resistance	Ron	I <sub>ON</sub> = 50 mA, I <sub>F</sub> = 5 mA	7/	40	50	Ω

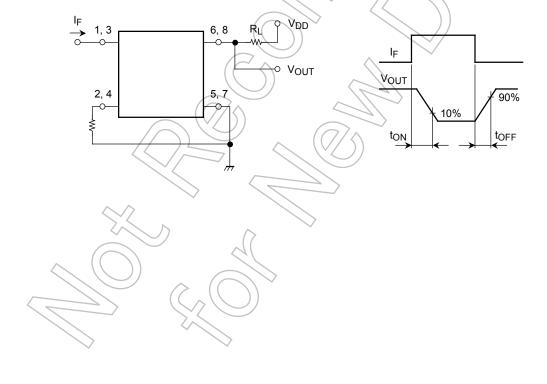
# **Isolation Characteristics (Ta = 25°C)**

Characteristics	Symbol	Test Condition	Min	Тур.	Max	Unit
Capacitance Input to Output	Cs	V <sub>S</sub> = 0 V, f = 1 MHz	)	0.8	-	pF
Isolation Resistance	Rs	V <sub>S</sub> = 500 V, R.H. ≦ 60 %	5 × 10 <sup>10</sup>	10 <sup>14</sup>	_	Ω
Isolation Voltage	BVs	AC, 60 s	1500	4	4	Vrms

# **Switching Characteristics (Ta = 25°C)**

Characteristics	Symbol	Test Condition	/	Min	Typ.	Max	Unit
Turn-on Time	ton	R <sub>L</sub> = 200 Ω	(Note 2)		0.03	0.5	me
Turn-off Time	toff	$V_{DD} = 10 \text{ V, I}_{E} = 5 \text{ mA}$		7(	0.07	0.2	ms

Note 2: SWITCHING TIME TEST CIRCUIT



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