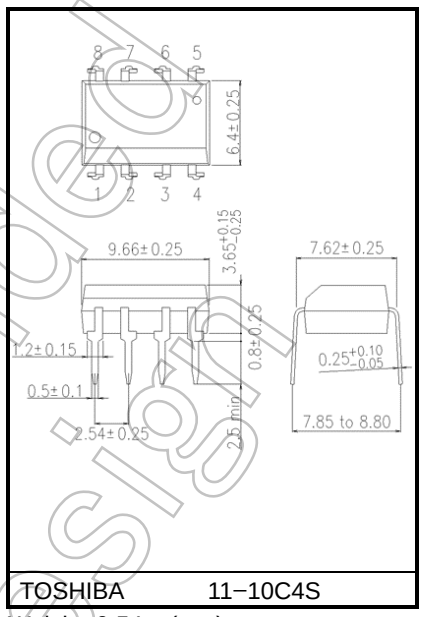
TOSHIBA Photocoupler IRED + Photo IC

TLP759(IGM)

Transistor Inverters
Air Conditioners
Line Receiver
Intelligent Power Modules (IPMs) Interfaces

Unit: mm



TOSHIBA 11−10C4S

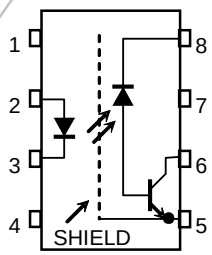
Weight: 0.54 g (typ.)

The TOSHIBA TLP759(IGM) consists of a high−output infrared emitting diode optically coupled to a high-speed photodiode with a transistor amplifier and is housed in an 8−pin DIP.
The TLP759(IGM) has no internal base connection. The Faraday shield in the photodetector chip provides an effective common-mode noise transient immunity.
The TLP759(IGM) guarantees minimum and maximum propagation delay, relative time difference between the rise and fall time, and common-mode transient immunity. Therefore, the TLP759(IGM) is suitable for an isolation interface between an intelligent power module (IPM) and a control IC in motor control applications.

- Isolation voltage: 5000V_{rms} (min)
- Common-mode transient immunity: ±10 kV / μs (min)
  @V_{CM} = 1500 V_{p-p}
- Switching Time: t_{pHL}, t_{pLH} = 0.1 μs (min), = 0.8 μs (max)
  @I_F = 10 mA, V_{CC} = 15 V, R_L = 20 kΩ, Ta = 25°C
- Switching time dispersion: 0.7 μs (max)
  ($|t_{pLH}-t_{pHL}|$)
- TTL compatible
- UL-recognized: UL 1577, File No.E67349
- cUL-recognized: CSA Component Acceptance Service No.5A
  File No.E67349
- VDE-approved: EN 60747-5-5 (Note 1)

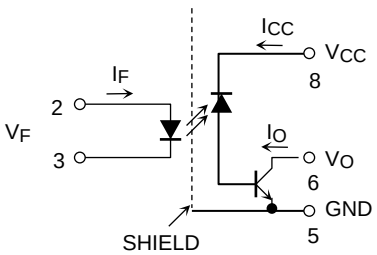
Note 1 : When a VDE-approved type is needed, please designate the **Option (D4)**.

Pin Configuration (top view)



1: NC
2: Anode
3: Cathode
4: NC
5: Emitter (GND)
6: Collector (Output)
7: NC
8: V_{CC}

Schematic



- **Construction mechanical rating**

	7.62-mm pitch standard type	10.16-mm pitch TLP759F(IGM) type
Creepage Distance	7.0 mm (min)	8.0 mm (min)
Clearance	7.0 mm (min)	8.0 mm (min)
Insulation Thickness	0.4 mm (min)	0.4 mm (min)

Start of commercial production
1995-01

Absolute Maximum Ratings (Ta = 25°C)

Characteristic			Symbol	Rating	Unit
LED	Forward current	(Note 1)	I_F	25	mA
	Pulse forward current	(Note 2)	I_{FP}	50	mA
	Peak transient forward current	(Note 3)	I_{FPT}	1	A
	Reverse voltage		V_R	5	V
	Diode power dissipation	(Note 4)	P_D	45	mW
Detector	Output current		I_O	8	mA
	Peak output current		I_{OP}	16	mA
	Output voltage		V_O	−0.5 to 20	V
	supply voltage		V_{CC}	−0.5 to 30	V
	Output power dissipation	(Note 5)	P_O	100	mW
Operating temperature range			T_{opr}	−55 to 100	°C
Storage temperature range			T_{stg}	−55 to 125	°C
Lead solder temperature(10 s)		(Note 6)	T_{sol}	260	°C
Isolation voltage(AC, 60 s, R.H. ≤ 60 %)		(Note 7)	BV_S	5000	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): Derate 0.8 mA / °C above 70 °C.
(Note 2): 50 % duty cycle, 1 ms pulse width.
Derate 1.6 mA / °C above 70 °C.
(Note 3): Pulse width PW ≤ 1 μs, 300 pps.
(Note 4): Derate 0.9 mW / °C above 70 °C.
(Note 5): Derate 2 mW / °C above 70 °C.
(Note 6): Soldering portion of lead: Up to 2 mm from the body of the device
(Note 7): Device considers a two-terminal device: Pins 1, 2, 3 and 4 shorted together and pins 5, 6, 7 and 8 shorted together.

Electrical Characteristics (Ta = 25°C)

Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
LED	Forward voltage	V_F	I_F = 16 mA		1.65	1.85	V
	Forward voltage temperature coefficient	$\Delta V_F / \Delta Ta$	I_F = 16 mA	—	−2	—	mV / °C
	Reverse current	I_R	V_R = 5 V	—	—	10	μA
	Capacitance between terminal	C_T	V_F = 0 V, f = 1 MHz	—	100	—	pF
Detector	High level output current	$I_{OH\ (1)}$	I_F = 0 mA, V_{CC} = V_O = 5.5 V	—	3	500	nA
		$I_{OH\ (2)}$	I_F = 0 mA, V_{CC} = 30 V, V_O = 20 V	—	—	5	μA
		I_{OH}	I_F = 0 mA, V_{CC} = 30 V, V_O = 20 V, Ta = 70 °C	—	—	50	
	High level supply current	I_{CCH}	I_F = 0 mA, V_{CC} = 30 V	—	0.01	1	μA
	Supply voltage	V_{CC}	I_{CC} = 0.01 mA	30	—	—	V
	Output voltage	V_O	I_O = 0.5 mA	20	—	—	V

Coupled Electrical Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Current transfer ratio	I_O / I_F	I_F = 10 mA, V_{CC} = 4.5 V, V_O = 0.4 V	25	35	75	%
		I_F = 10 mA, V_{CC} = 4.5 V, V_O = 0.4 V, Ta = −25 to 100 °C	15	—	—	
Low level output voltage	V_{OL}	I_F = 16 mA, V_{CC} = 4.5 V, I_O = 2.4 mA	—	—	0.4	V

Isolation Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Capacitance input to output	C_S	V = 0 V, f = 1 MHz (Note 7)	—	0.8	—	pF
Isolation resistance	R_S	R.H. ≤ 60 %, V_S = 500 V (Note 7)	1×10^{12}	10^{14}	—	Ω
Isolation voltage	BV_S	AC,60 s	5000	—	—	V_{rms}

Switching Characteristics (Ta = 25°C, Vcc = 15V)

Characteristic	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Propagation delay time (H→L)	t_{pHL}	1	I_F = 10 mA, R_L = 20 kΩ	0.1	0.45	0.8	μs
			I_F = 10 mA, R_L = 20 kΩ Ta = 0 to 85 °C	0.1	0.45	0.9	
Propagation delay time (L→H)	t_{pLH}		I_F = 10 mA, R_L = 20 kΩ Ta = −25 to 100 °C	0.1	0.45	1.0	
Switching time dispersion between on and off	$\|t_{pLH}-t_{pHL}\|$		I_F = 10 mA, R_L = 20 kΩ	—	0.15	0.7	μs
			I_F = 10 mA, R_L = 20 kΩ Ta = 0 to 85 °C	—	0.25	0.8	
			I_F = 10 mA, R_L = 20 kΩ Ta = −25 to 100 °C	—	0.25	0.9	
Common mode transient immunity at logic high output (Note 8)	CM_H	2	I_F = 0 mA V_{CM} = 1500 V_{p-p} R_L = 20 kΩ	10000	15000	—	V / μs
Common mode transient immunity at logic low output (Note 8)	CM_L		I_F = 10 mA V_{CM} = 1500 V_{p-p} R_L = 20 kΩ	−10000	−15000	—	V / μs

(Note 8): CM_L is the maximum rate of fall of the common mode voltage that can be sustained with the output voltage in the logic low state (V_O < 1 V).
CM_H is the maximum rate of rise of the common mode voltage that can be sustained with the output voltage in the logic high state (V_O > 4 V).

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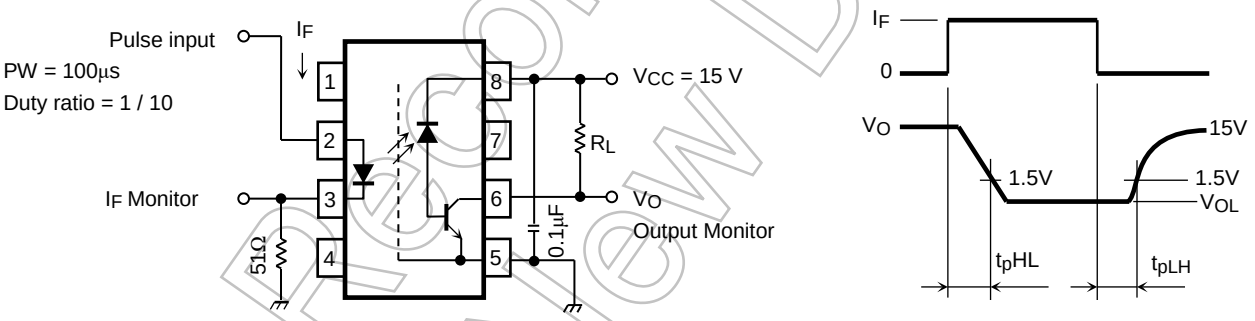
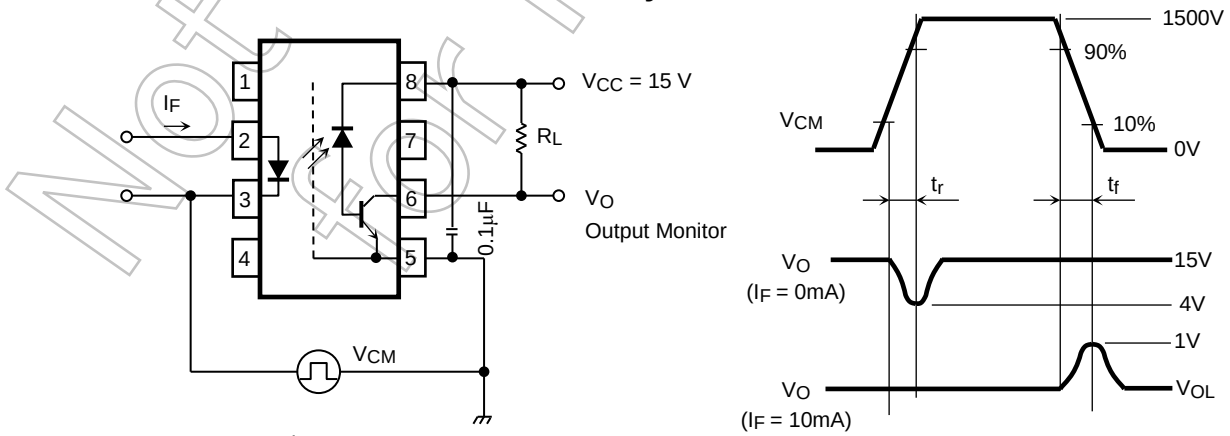
Test Circuit 1: Switching Time Test Circuit



Test Circuit 2: Common Mode Noise Immunity Test Circuit



Pulse generator
Z_O = 50Ω

$$CM_H = \frac{1200(V)}{t_r(\mu s)}, CM_L = \frac{1200(V)}{t_f(\mu s)}$$

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