

TOSHIBA Photocoupler GaAs Ired & Photo-MOS FET / Photo-Transistor

TENTATIVE

TLP270D

Mobile / Note PCs

PDA's

Multimedia TVs

Modems

TLP270D has many multi-functions in DAA circuits for modems, which is a fully integrated design photocoupler in a 14pin(SOP16).

(1) Photorelay

Dial pulsing switch, hookswitch

- 1 form A
- Peak off-state voltage: 200V (min.)
- Trigger LED current: 3mA (max.)
- On-state current: 150mA (max.)

(2) Photocoupler

Ring detection

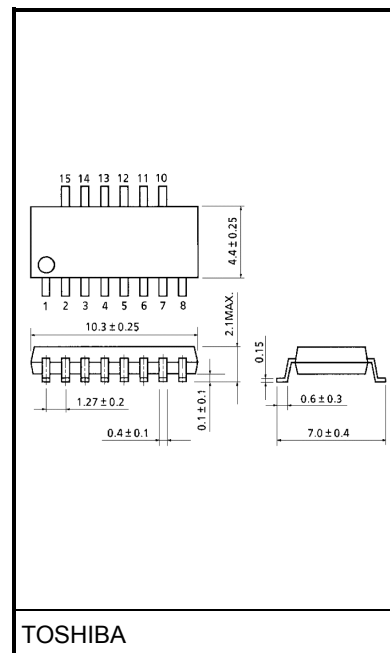
- Collector-emitter voltage: 80V (min.)
- Current transfer ratio: 50% (min.)

(3) Darlington transistor

Electronic inductor

- Collector-emitter voltage: 30V (min.)
- Collector current: 150mA (max.)

Unit in mm



Weight: 0.2g

(4) Bridge rectifier

Polarity protection

- Reverse voltage: 30V (min.)
- Forward voltage: 1.7V (max.)

(5) Zener diode

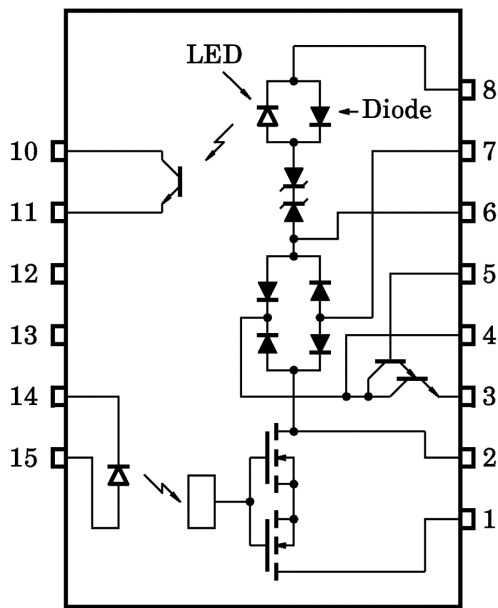
Ring detection protector

- Zener voltage: 22~32V

(Common)

- Isolation voltage: 1500Vrms (min.)
- UL recognized: UL1577, file No. E67349

Pin Configuration (top view)



- 1 : MOSFET Drain
- 2 : MOSFET Drain / Bridge Rectifier Input
- 3 : Darlington Emitter
- 4 : Darlington Collector / Bridge Rectifier Output
- 5 : Darlington Base
- 6 : Bridge Rectifier Input / LED Anode (Diode Cathode)
- 7 : Bridge Rectifier Input
- 8 : LED Cathode / Diode Anode
- 10 : Photo Tr. Collector
- 11 : Photo Tr. Emitter
- 12 : NC
- 13 : NC
- 14 : LED Cathode
- 15 : LED Anode

Photorelay(1-form-A)**Maximum Ratings (Ta = 25°C)**

Characteristic		Symbol	Rating	Unit
LED	Forward current	I_F	50	mA
	Forward current derating (Ta ≥ 25°C)	$\Delta I_F / ^\circ\text{C}$	-0.5	mA / °C
	Peak forward current (100μs pulse, 100pps)	I_{FP}	1	A
	Reverse voltage	V_R	5	V
	Junction temperature	T_j	125	°C
Detector	Off-state output terminal voltage	V_{OFF}	200	V
	On-state RMS current	I_{ON}	150	mA
	On-state RMS current derating (Ta ≥ 25°C)	$\Delta I_{ON} / ^\circ\text{C}$	-1.5	mA / °C
	Junction temperature	T_j	125	°C

Individual Electrical Characteristics (Ta = 25°C)

Characteristic		Symbol	Test Condition	Min.	Typ.	Max.	Unit
LED	Forward voltage	V_F	$I_F=10\text{mA}$	1.0	1.15	1.3	V
	Reverse current	I_R	$V_R=5\text{V}$	—	—	10	μA
	Capacitance	C_T	$V=0, f=1\text{MHz}$	—	30	—	pF
Detector	Off-state current	I_{OFF}	$V_{OFF}=200\text{V}$	—	—	1	μA
	Capacitance	C_{OFF}	$V=0, f=1\text{MHz}$	—	90	—	pF

Coupled Electrical Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Trigger LED current	I_{FT}	$I_{ON}=150\text{mA}$	—	1	3	mA
On-state resistance	R_{ON}	$I_{ON}=150\text{mA}, I_F=5\text{mA}$	—	5	8	Ω

Switching Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Turn-on time	t_{ON}	$R_L=200\Omega, V_{CC}=20\text{V}, I_F=5\text{mA}$	—	—	1.5	ms
Turn-off time	t_{OFF}		—	—	1	

Photocoupler (AC-input transistor output)

Maximum Ratings (Ta = 25°C)

Characteristic		Symbol	Rating	Unit
LED	Forward current	I_F	± 50	mA
	Forward current derating (Ta $\geq 25^\circ\text{C}$)	$\Delta I_F / ^\circ\text{C}$	-0.5	mA / $^\circ\text{C}$
	Pulse forward current (100 μs pulse, 100pps)	I_{FP}	1	A
	Junction temperature	T_j	125	$^\circ\text{C}$
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	mW
	Collector power dissipation derating (Ta $\geq 25^\circ\text{C}$) (1 circuit)	$\Delta P_C / ^\circ\text{C}$	-1.5	mW / $^\circ\text{C}$
	Junction temperature	T_j	125	$^\circ\text{C}$

Individual Electrical Characteristics (Ta = 25°C)

Characteristic		Symbol	Test Condition	Min.	Typ.	Max.	Unit
LED	Forward voltage	V_F	$I_F = \pm 10\text{mA}$	1.0	1.15	1.3	V
	Capacitance	C_T	$V = 0, f = 1\text{MHz}$	—	60	—	pF
Detector	Collector-emitter breakdown voltage	$V_{(BR)CEO}$	$I_C = 0.5\text{mA}$	80	—	—	V
	Emitter-collector breakdown voltage	$V_{(BR)ECO}$	$I_E = 0.1\text{mA}$	7	—	—	V
	Collector dark current	I_D	$V_{CE} = 48\text{V}$ (ambient light: 100 lx)	—	0.01 (2)	0.1 (20)	μA
			$V_{CE} = 48\text{V}, T_a = 85^\circ\text{C}$ (ambient light: 100 lx)	—	2 (4)	50 (50)	μA
	Capacitance	C_{CE}	$V = 0, f = 1\text{MHz}$	—	10	—	pF

Coupled Electrical Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Current transfer ratio (CTR)	I_C / I_F	$I_F=5\text{mA}$, $V_{CE}=5\text{V}$ Rank GB	50	—	—	%
			100	—	—	
Saturated CTR	I_C / I_F (sat)	$I_F=1\text{mA}$, $V_{CE}=0.4\text{V}$ Rank GB	—	60	—	%
			30	—	—	
Collector-emitter saturation voltage	$V_{CE(sat)}$	$I_C=2.4\text{mA}$, $I_F=8\text{mA}$	—	—	0.4	V
		$I_C=0.2\text{mA}$, $I_F=1\text{mA}$ Rank GB	—	0.2	—	
			—	—	0.4	
Off-state collector current	$I_{C(off)}$	$V_F=0.7\text{V}$, $V_{CE}=48\text{V}$	—	—	10	μA

Switching Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Rise time	t_r	$V_{CC}=10\text{V}$, $I_C=2\text{mA}$, $R_L=100\Omega$	—	2	—	μs
Fall time	t_f		—	3	—	
Turn-on time	t_{on}		—	3	—	
Turn-off time	t_{off}		—	3	—	
Turn-on time	t_{ON}	$R_L=1.9\text{k}\Omega$, $V_{CC}=5\text{V}$, $I_F=16\text{mA}$	—	2	—	
Storage time	t_s		—	25	—	
Turn-off time	t_{OFF}		—	40	—	

Zener Diode
Individual Electrical Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Zener voltage	V_Z	—	22	27	32	V

Darlington Transistor

Maximum Ratings (Ta = 25°C)

Characteristic	Symbol	Rating	Unit
Collector–base voltage	V_{CBO}	30	V
Collector–emitter voltage	V_{CEO}	30	V
Emitter–base voltage	V_{EBO}	10	V
Collector current	I_C	0.15	A
Base current	I_B	20	mA
Collector power dissipation	P_C	350	mW
Junction temperature	T_j	125	°C

Individual Electrical Characteristics (Ta = 25°C)

Characteristic		Symbol	Test Condition	Min.	Typ.	Max.	Unit
Collector off current		I_{CBO}	$V_{CB}=30V, I_E=0$	—	—	10	μA
Emitter off current		I_{EBO}	$V_{EB}=10V, I_C=0$	—	—	10	μA
Collector–emitter breakdown voltage		$V_{(BR)CEO}$	$I_C=10mA, I_B=0$	30	—	—	V
DC current gain		h_{FE}	$V_{CE}=2V, I_C=150mA$	4000	—	—	
Collector–emitter saturation voltage		$V_{CE(sat)}$	$I_C=0.15A, I_B=1mA$	—	—	1.5	V
Switching time	Turn–on time	t_{on}	$I_B=1mA, V_{CC}=15V, R_L=15\Omega$	—	0.20	—	μs
	Storage time	t_{stg}		—	0.6	—	
	Fall time	t_f		—	0.3	—	

Bridge Rectifier

Maximum Ratings (Ta = 25°C)

Characteristic	Symbol	Rating	Unit
Repetitive peak reverse voltage	V_{RRM}	30	V
Average output rectified current	I_O	0.15	A
Peak one cycle surge forward current	I_{FSM}	0.5	A
Junction temperature	T_j	125	°C

Individual Electrical Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Forward voltage	V_{FM}	$I_{FM}=0.12A$	—	—	1.7	V
Repetitive peak reverse current	I_{RRM}	$V_{RRM}=\text{rated}$	—	—	10	μA

Package (common)

Maximum Ratings (Ta = 25°C)

Characteristic	Symbol	Rating	Unit
Total package power dissipation	P_T	650	mW
Storage temperature range	T_{stg}	-55~100	°C
Operating temperature range	T_{opr}	-20~85	°C
Lead soldering temperature(10s)	T_{sol}	260	°C
Isolation voltage (AC, 1min., R.H.≤ 60%) (Note 1)	BV_S	1500	Vrms

(Note 1): Device considered a two-terminal device: Pins1, 2, 3, 4, 5, 6, 7 and 8 shorted together and pins 10, 11, 12, 13, 14 and 15 shorted together.

Isolation Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Capacitance input to output	C_S	$V_S=0$, $f=1\text{MHz}$	—	0.8	—	pF
Isolation resistance	R_S	$V_S=500\text{V}$, R.H.≤ 60%	5×10^{10}	10^{14}	—	Ω
Isolation voltage	BV_S	AC, 1 minute	1500	—	—	Vrms
		AC, 1 second, in oil	—	3000	—	
		DC, 1 minute, in oil	—	3000	—	Vdc

RESTRICTIONS ON PRODUCT USE

000707EBC

- TOSHIBA is continually working to improve the quality and reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing TOSHIBA products, to comply with the standards of safety in making a safe design for the entire system, and to avoid situations in which a malfunction or failure of such TOSHIBA products could cause loss of human life, bodily injury or damage to property.
In developing your designs, please ensure that TOSHIBA products are used within specified operating ranges as set forth in the most recent TOSHIBA products specifications. Also, please keep in mind the precautions and conditions set forth in the "Handling Guide for Semiconductor Devices," or "TOSHIBA Semiconductor Reliability Handbook" etc..
- The TOSHIBA products listed in this document are intended for usage in general electronics applications (computer, personal equipment, office equipment, measuring equipment, industrial robotics, domestic appliances, etc.). These TOSHIBA products are neither intended nor warranted for usage in equipment that requires extraordinarily high quality and/or reliability or a malfunction or failure of which may cause loss of human life or bodily injury ("Unintended Usage"). Unintended Usage include atomic energy control instruments, airplane or spaceship instruments, transportation instruments, traffic signal instruments, combustion control instruments, medical instruments, all types of safety devices, etc.. Unintended Usage of TOSHIBA products listed in this document shall be made at the customer's own risk.
- Gallium arsenide (GaAs) is a substance used in the products described in this document. GaAs dust and fumes are toxic. Do not break, cut or pulverize the product, or use chemicals to dissolve them. When disposing of the products, follow the appropriate regulations. Do not dispose of the products with other industrial waste or with domestic garbage.
- The products described in this document are subject to the foreign exchange and foreign trade laws.
- The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by TOSHIBA CORPORATION for any infringements of intellectual property or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any intellectual property or other rights of TOSHIBA CORPORATION or others.
- The information contained herein is subject to change without notice.