

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

TENTATIVE

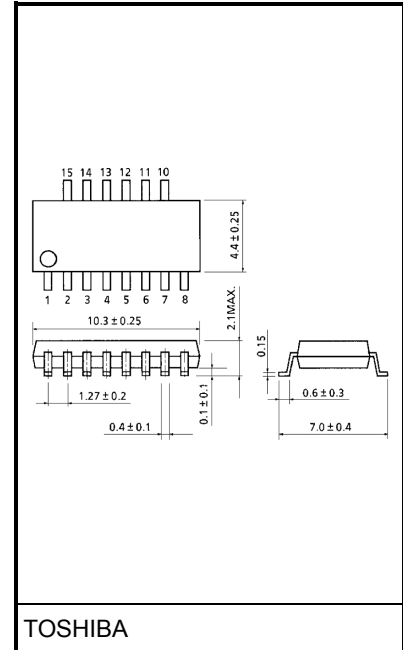
TLP270D

Mobile / Note PCs
 PDAs
 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

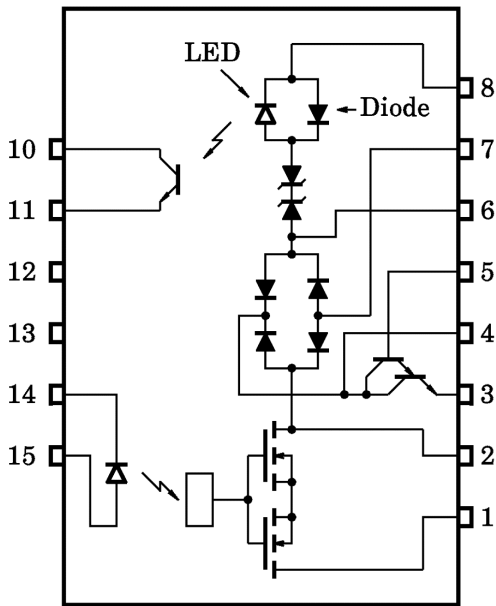
Ring detection protector

- 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 =5mA, V _{CE} =5V Rank GB	50	—	—	%
			100	—	—	
Saturated CTR	I _C / I _F (sat)	I _F =1mA, V _{CE} =0.4V Rank GB	—	60	—	%
			30	—	—	
Collector-emitter saturation voltage	V _{CE(sat)}	I _C =2.4mA, I _F =8mA	—	—	0.4	V
		I _C =0.2mA, I _F =1mA Rank GB	—	0.2	—	
Off-state collector current	I _{C(off)}	V _F =0.7V, V _{CE} =48V	—	—	10	μA

Switching Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Rise time	t _r	V _{CC} =10V, I _C =2mA, 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 =1.9kΩ, V _{CC} =5V, I _F =16mA	—	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: Pins 1, 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	$V_S=500\text{V}, \text{R.H.} \leq 60\%$	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

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