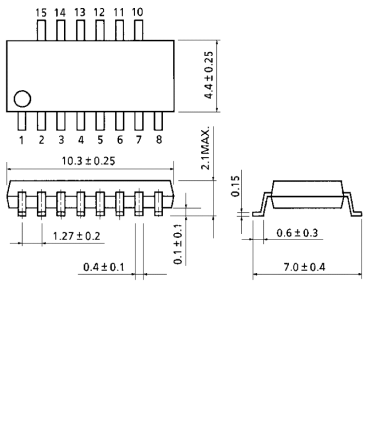
TOSHIBA Photocoupler GaAs Ired & Photo−MOS FET / Photo−Transistor

TENTATIVE

TLP270D

Mobile / Note PCs
PDAs
Multimedia TVs
Modems

Unit in mm



TOSHIBA

Weight: 0.2g

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.)

(4) Bridge rectifier

Polarity protection

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

(5) Zener diode

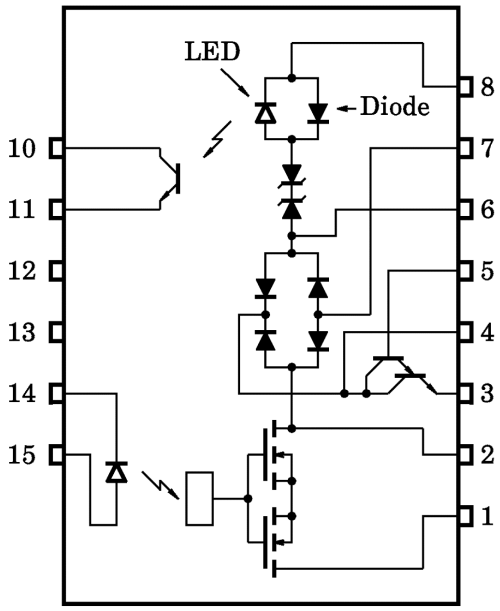
Ring detection protector

- 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)	ΔI_F / °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)	ΔI_{ON} / °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=10mA	1.0	1.15	1.3	V
	Reverse current	I_R	V_R=5V	—	—	10	μA
	Capacitance	C_T	V=0, f=1MHz	—	30	—	pF
Detector	Off−state current	I_{OFF}	V_{OFF}=200V	—	—	1	μA
	Capacitance	C_{OFF}	V=0, f=1MHz	—	90	—	pF

Coupled Electrical Characteristics (Ta = 25°C)

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

Switching Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Turn−on time	t_{ON}	R_L=200Ω, V_{CC}=20V, I_F=5mA	—	—	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 ≥ 25°C)	ΔI_F / °C	−0.5	mA / °C
	Pulse forward current (100μs pulse,100pps)	I_{FP}	1	A
	Junction temperature	T_j	125	°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 ≥ 25°C) (1 circuit)	ΔP_C / °C	−1.5	mW / °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=±10mA	1.0	1.15	1.3	V
	Capacitance	C_T	V=0, f=1MHz	—	60	—	pF
Detector	Collector−emitter breakdown voltage	$V_{(BR)CEO}$	I_C=0.5mA	80	—	—	V
	Emitter−collector breakdown voltage	$V_{(BR)ECO}$	I_E=0.1mA	7	—	—	V
	Collector dark current	I_D	V_{CE}=48V (ambient light: 100 lx)	— —	0.01 (2)	0.1 (20)	μA
			V_{CE}=48V, T_a=85°C (ambient light: 100 lx)	— —	2 (4)	50 (50)	μA
	Capacitance	C_{CE}	V=0, f=1MHz	—	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	50	—	—	%
		Rank GB	100	—	—	
Saturated CTR	I_C / I_F (sat)	I_F=1mA, V_{CE}=0.4V	—	60	—	%
		Rank GB	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	—	0.2	—	
		Rank GB	—	—	0.4	
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	tf		—	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=15Ω	—	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}=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=1MHz	—	0.8	—	pF
Isolation resistance	R_S	V_S=500V, 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

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