TENTATIVE TOSHIBA PHOTOCOUPLER GaAs IRED & PHOTO-MOS FET / PHOTO-TRANSISTOR

TLP270D

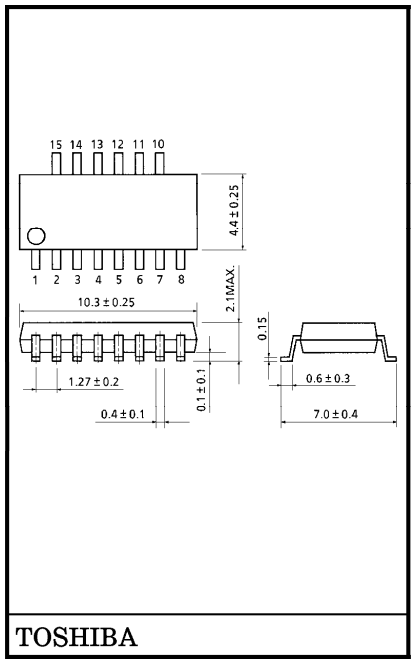
MOBILE / NOTE PCs

PDAs

MULTIMEDIA TVs

MODEMS

Unit in mm



TOSHIBA

Weight : 0.2 g

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 : 200 V (MIN.)
- Trigger LED Current : 3 mA (MAX.)
- On-State Current : 150 mA (MAX.)

② Photocoupler

Ring detection

- Collector-Emitter Voltage : 80 V (MIN.)
- Current Transfer Ratio : 50% (MIN.)

③ Darlington Transistor

Electronic inductor

- Collector-Emitter Voltage : 30 V (MIN.)
- Collector Current : 150 mA (MAX.)

④ Bridge Rectifier

Polarity protection

- Reverse Voltage : 30 V (MIN.)
- Forward Voltage : 1.7 V (MAX.)

⑤ Zener Diode

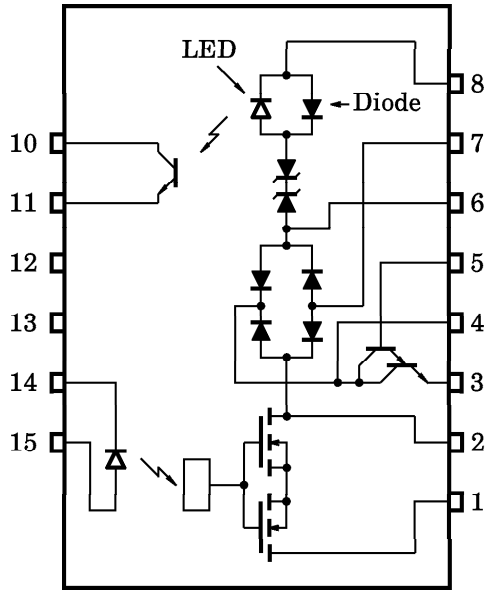
Ring detection protector

- Zener Voltage : 22~32 V

(Common)

- Isolation Voltage : 1500 Vrms (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 (100 μs pulse, 100 pps)	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 = 10 mA	1.0	1.15	1.3	V
	Reverse Current	I_R	V_R = 5 V	—	—	10	μA
	Capacitance	C_T	V = 0, f = 1 MHz	—	30	—	pF
DETECTOR	Off-State Current	I_{OFF}	V_{OFF} = 200 V	—	—	1	μA
	Capacitance	C_{OFF}	V = 0, f = 1 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 mA	—	1	3	mA
On-State Resistance	R_{ON}	I_{ON} = 150 mA, I_F = 5 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 Ω, V_{CC} = 20 V, I_F = 5 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 ≧ 25°C)	ΔI_F / °C	−0.5	mA / °C
	Pulse Forward Current (100 μs pulse, 100 pps)	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 = ±10 mA	1.0	1.15	1.3	V
	Capacitance	C_T	V = 0, f = 1 MHz	—	60	—	pF
DETECTOR	Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	I_C = 0.5 mA	80	—	—	V
	Emitter- Collector Breakdown Voltage	$V_{(BR)ECO}$	I_E = 0.1 mA	7	—	—	V
	Collector Dark Current	I_D	V_{CE} = 48 V	—	0.01	0.1	μA
			V_{CE} = 48 V (Ambient Light : 100 lx)	—	(2)	(20)	
			V_{CE} = 48 V, Ta = 85°C	—	2	50	μA
			V_{CE} = 48 V, Ta = 85°C (Ambient Light : 100 lx)	—	(4)	(50)	
	Capacitance	C_{CE}	V = 0, f = 1 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 mA, V_{CE} = 5 V	50	—	—	%
		Rank GB	100	—	—	
Saturated CTR	I_C / I_F (sat)	I_F = 1 mA, V_{CE} = 0.4 V	—	60	—	%
		Rank GB	30	—	—	
Collector-Emitter Saturation Voltage	V_{CE} (sat)	I_C = 2.4 mA, I_F = 8 mA	—	—	0.4	V
		I_C = 0.2 mA, I_F = 1 mA	—	0.2	—	
		Rank GB	—	—	0.4	
Off-State Collector Current	$I_{C (off)}$	V_F = 0.7 V, V_{CE} = 48 V	—	—	10	μA

SWITCHING CHARACTERISTICS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Rise Time	t_r	V_{CC} = 10 V, I_C = 2 mA, R_L = 100 Ω	—	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 kΩ, V_{CC} = 5 V, I_F = 16 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} = 30 V, I_E = 0	—	—	10	μA
Emitter Off Current		I_{EBO}	V_{EB} = 10 V, I_C = 0	—	—	10	μA
Collector-Emitter Breakdown Voltage		$V_{(BR)CEO}$	I_C = 10 mA, I_B = 0	30	—	—	V
DC Current Gain		h_{FE}	V_{CE} = 2 V, I_C = 150 mA	4000	—	—	
Collector-Emitter Saturation Voltage		$V_{CE(sat)}$	I_C = 0.15 A, I_B = 1 mA	—	—	1.5	V
Switching Time	Turn-on Time	t_{on}	I_B = 1 mA, V_{CC} = 15 V, R_L = 15 Ω	—	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} = 0.12 A	—	—	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 (10 s)	T_{sol}	260	°C
Isolation Voltage (AC, 1 min., 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 MHz	—	0.8	—	pF
Isolation Resistance	R_S	V_S = 500 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