

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

**TENTATIVE****TLP270G**

Mobile / Note PCS

PDAS

Multimedia TVs

Modems

TLP270G has many required multi-functions in DAA circuits for modems, which is a fully integrated design photocoupler in a 14 pin (SOP16).

**(1) Photorelay**

Dial pulsing switch, hookswitch

- 1 form A
- Peak off-state voltage: 350V (min.)
- Trigger LED current: 3mA (max.)
- On-state current: 120mA (max.)

**(2) Photocoupler**

Ring detection

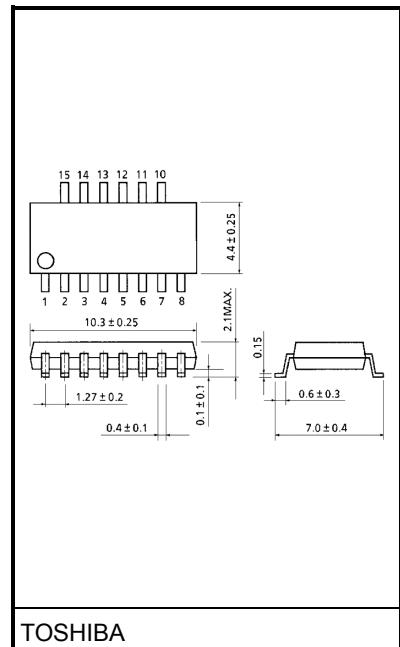
- Collector-emitter voltage: 80V (min.)
- Current transfer ratio: 50% (min.)

**(3) Darlington transistor**

Electronic inductor

- Collector-emitter voltage: 30V (min.)
- Collector current: 120mA (max.)

Unit in mm



Weight: 0.2 g

**(4) Bridge rectifier**

Polarity protection

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

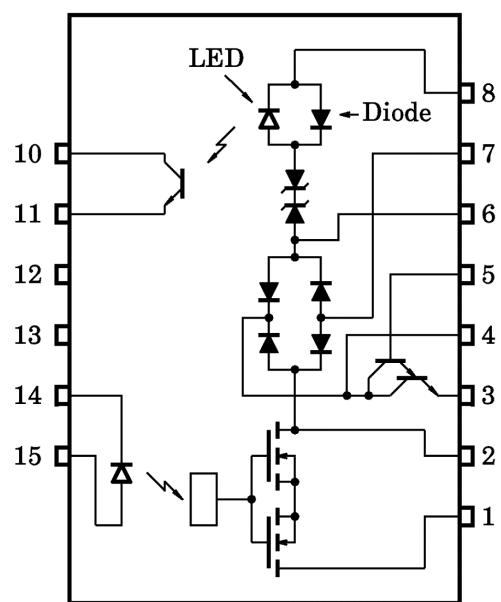
**(5) Zener diode**

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 <sub>F</sub>	50	mA
	Forward current derating (Ta≥25°C)	ΔI <sub>F</sub> / °C	-0.5	mA / °C
	Peak forward current (100μs pulse, 100pps)	I <sub>FP</sub>	1	A
	Reverse voltage	V <sub>R</sub>	5	V
	Junction temperature	T <sub>j</sub>	125	°C
Detector	Off-state output terminal voltage	V <sub>OFF</sub>	350	V
	On-state RMS current	I <sub>ON</sub>	120	mA
	On-state RMS current derating (Ta≥25°C)	ΔI <sub>ON</sub> / °C	-1.2	mA / °C
	Junction temperature	T <sub>j</sub>	125	°C

**Individual Electrical Characteristics (Ta = 25°C)**

Characteristic		Symbol	Test Condition	Min.	Typ.	Max.	Unit
LED	Forward voltage	V <sub>F</sub>	I <sub>F</sub> = 10mA	1.0	1.15	1.3	V
	Reverse current	I <sub>R</sub>	V <sub>R</sub> = 5V	—	—	10	μA
	Capacitance	C <sub>T</sub>	V = 0, f = 1MHz	—	30	—	pF
Detector	Off-state current	I <sub>OFF</sub>	V <sub>OFF</sub> = 350V	—	—	1	μA
	Capacitance	C <sub>OFF</sub>	V = 0, f = 1MHz	—	40	—	pF

**Coupled Electrical Characteristics (Ta = 25°C)**

Characteristic		Symbol	Test Condition	Min.	Typ.	Max.	Unit
Trigger LED current	I <sub>FT</sub>	I <sub>ON</sub>	= 120mA	—	1	3	mA
On-state resistance	R <sub>ON</sub>	I <sub>ON</sub>	= 120mA, I <sub>F</sub> = 5mA	—	22	35	Ω

**Switching Characteristics (Ta = 25°C)**

Characteristic		Symbol	Test Condition	Min.	Typ.	Max.	Unit
Turn-on time	t <sub>ON</sub>	R <sub>L</sub> = 200Ω, V <sub>CC</sub> = 20V, I <sub>F</sub> = 5mA	—	—	1	—	ms
Turn-off time	t <sub>OFF</sub>		—	—	1	—	

Photocoupler(AC–input transistor output)**Maximum Ratings (Ta = 25°C)**

Characteristic		Symbol	Rating	Unit
LED	Forward current	I <sub>F</sub>	±50	mA
	Forward current derating (Ta≥25°C)	ΔI <sub>F</sub> / °C	-0.5	mA / °C
	Pulse forward current (100μs pulse, 100ppc)	I <sub>FP</sub>	1	A
	Junction temperature	T <sub>j</sub>	125	°C
Detector	Collector–emitter voltage	V <sub>CEO</sub>	80	V
	Emitter–collector voltage	V <sub>ECO</sub>	7	V
	Collector current	I <sub>C</sub>	50	mA
	Collector power dissipation (1 circuit)	P <sub>C</sub>	150	mW
	Collector power dissipation derating(Ta≥25°C) (1 circuit)	ΔP <sub>C</sub> / °C	-1.5	mW / °C
	Junction temperature	T <sub>j</sub>	125	°C

**Individual Electrical Characteristics (Ta = 25°C)**

Characteristic		Symbol	Test Condition	Min.	Typ.	Max.	Unit
LED	Forward voltage	V <sub>F</sub>	I <sub>F</sub> = ±10mA	1.0	1.15	1.3	V
	Capacitance	C <sub>T</sub>	V = 0, f = 1MHz	—	60	—	pF
Detector	Collector–emitter breakdown voltage	V <sub>(BR)CEO</sub>	I <sub>C</sub> = 0.5mA	80	—	—	V
	Emitter–collector breakdown voltage	V <sub>(BR)ECO</sub>	I <sub>E</sub> = 0.1mA	7	—	—	V
	Collector dark current	I <sub>D</sub>	V <sub>CE</sub> = 48V (ambient light: 100 lx)	—	0.01 (2)	0.1 (10)	μA
			V <sub>CE</sub> = 48V, T <sub>a</sub> = 85°C (ambient light: 100 lx)	—	2 (4)	50 (50)	μA
	Capacitance	C <sub>CE</sub>	V = 0, f = 1MHz	—	10	—	pF

## Coupled Electrical Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Current transfer ratio (CTR)	$I_C / I_F$	$I_F = 5\text{mA}, V_{CE} = 5\text{V}$ 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	$\mu\text{A}$

## 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	—	$\mu\text{s}$
Fall time	$t_f$		—	3	—	
Turn-on time	$t_{on}$		—	3	—	
Turn-off time	$t_{off}$		—	3	—	
Turn-on time	$t_{ON}$		—	2	—	
Storage time	$t_s$	$R_L = 1.9\text{k}\Omega, V_{CC} = 5\text{V}, I_F = 16\text{mA}$	—	25	—	
Turn-off time	$t_{OFF}$		—	40	—	

Zener Diode

## Individual Electrical Characteristics (Ta = 25°C)

Characteristics	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	$I_C$	0.12	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	$h_{FE}$	$V_{CE} = 2V, I_C = 120mA$	4000	—	—	
Collector-emitter saturation voltage	$V_{CE(sat)}$	$I_C = 0.12A, I_B = 1mA$	—	—	1.5	V
Switching time	Turn-on time	$t_{on}$	$I_B=1mA, V_{CC}=15V, R_L=15Ω$	—	0.20	—
	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	$I_O$	0.12	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 <sub>T</sub>	650	mW
Storage temperature range	T <sub>stg</sub>	-55~100	°C
Operating temperature range	T <sub>opr</sub>	-20~85	°C
Lead soldering temperature(10s)	T <sub>sol</sub>	260	°C
Isolation voltage (AC, 1min., R.H. ≤60%) (Note1)	BV <sub>S</sub>	1500	Vrms

(Note1): Device considered a two-terminal device: Pins 1, 2, 3, 4, 5, 6, 7 and 8 shorted together and pins10, 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 <sub>S</sub>	V <sub>S</sub> = 0, f = 1MHz	—	0.8	—	pF
Isolation resistance	R <sub>S</sub>	V <sub>S</sub> = 500V, R.H. ≤ 60%	5×10 <sup>10</sup>	10 <sup>14</sup>	—	Ω
Isolation voltage	BV <sub>S</sub>	AC, 1 minute	1500	—	—	Vrms
		AC, 1 second, in oil	—	3000	—	
		DC, 1 minute, in oil	—	3000	—	Vdc

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