TOSHIBA Photocoupler GaAs IRed & Photo−Transistor

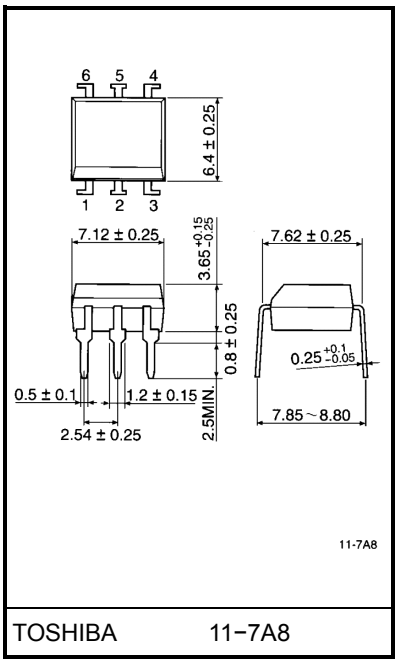
TLP570,TLP571

Programmable Controllers

AC / DC−Input Module

Solid State Relay

Unit in mm



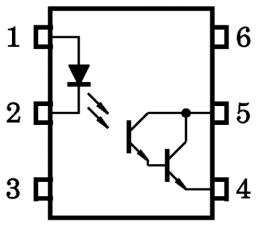
TOSHIBA 11−7A8

The TOSHIBA TLP570 and TLP571 consist of a darlington connected photo−transistor optically coupled to a gallium arsenide infrared emitting diode in a six lead plastic DIP package.
TLP570 is no−base internal connection for high−EMI environments.

- Collector−emitter voltage: 35V (min.)
- Current transfer ratio: 1000% (min.)
- Isolation voltage: 2500Vrms (min.)
- UL recognized: UL1577, file no. E67349

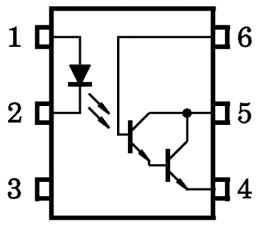
Pin Configurations (top view)

TLP570



1 : ANODE
2 : CATHODE
3 : NC
4 : EMITTER
5 : COLLECTOR
6 : NC

TLP571



1 : ANODE
2 : CATHODE
3 : NC
4 : EMITTER
5 : COLLECTOR
6 : BASE

Maximum Ratings (Ta = 25°C)

Characteristic		Symbol	Rating	Unit
LED	Forward current	I_F	70	mA
	Forward current derating (Ta ≥ 25°C)	ΔI_F / °C	−0.7	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	Collector−emitter voltage	V_{CEO}	35	V
	Collector−base voltage (TLP571)	V_{CBO}	80	V
	Emitter−collector voltage	V_{ECO}	7	V
	Emitter−base voltage (TLP571)	V_{EBO}	7	V
	Collector current	I_C	150	mA
	Power dissipation	P_C	150	mW
	Power dissipation derating (Ta ≥ 25°C)	ΔP_C / °C	−1.5	mW / °C
	Junction temperature	T_j	125	°C
Storage temperature range		T_{stg}	−55~125	°C
Operating temperature range		T_{opr}	−55~100	°C
Lead soldering temperature (10s)		T_{sold}	260	°C
Total package power dissipation		P_T	250	mW
Total package power dissipation derating (Ta ≥ 25°C)		ΔP_T / °C	−2.5	mW / °C
Isolation voltage (AC, 1 min., R.H.≤ 60%) (Note 1)		BV_S	2500	V_{rms}

(Note 1) Device considered a two terminal: Pins1, 2 and 3 shorted together and pins 4, 5 and 6 shorted together.

Recommends Operating Conditions

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Supply voltage	V_{CC}	—	5	24	V
Forward current	I_F	—	16	25	mA
Collector current	I_C	—	—	50	mA
Operating temperature	T_{opr}	−25	—	85	°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	Collector−emitter breakdown voltage	$V_{(BR)CEO}$	I_C = 1 mA	35	—	—	V
	Emitter−collector breakdown voltage	$V_{(BR)ECO}$	I_E = 0.1 mA	7	—	—	V
	Collector−base breakdown voltage (TLP571)	$V_{(BR)CBO}$	I_C = 0.1 mA	80	—	—	V
	Emitter−base breakdown voltage (TLP571)	$V_{(BR)EBO}$	I_E = 0.1 mA	7	—	—	V
	Collector dark current	I_{CEO}	V_{CE} = 24 V	—	10	200	nA
			V_{CE} = 24 V, Ta = 85°C	—	—	300	μA
	Collector dark current (TLP571)	I_{CER}	V_{CE} = 24 V, Ta = 85°C R_{BE} = 10 MΩ	—	0.5	10	μA
	Collector dark current (TLP571)	I_{CBO}	V_{CB} = 10 V	—	0.01	—	nA
	DC forward current gain (TLP571)	h_{FE}	V_{CE} = 5 V, I_C = 10 mA	—	50k	—	—
	Capacitance (collector to emitter)	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	I_C / I_F	I_F = 1 mA, V_{CE} = 1 V	1000	2000	—	%
Saturated CTR	I_C / $I_{F\ (sat)}$	I_F = 10 mA, V_{CE} = 1 V	500	—	—	%
Base photo−current (TLP571)	I_{PB}	I_F = 1 mA, V_{CB} = 1 V	—	2	—	μA
Collector−emitter saturation voltage	$V_{CE\ (sat)}$	I_C = 10 mA, I_F = 1 mA	—	—	1.0	V
		I_C = 100 mA, I_F = 10 mA	0.3	—	1.2	

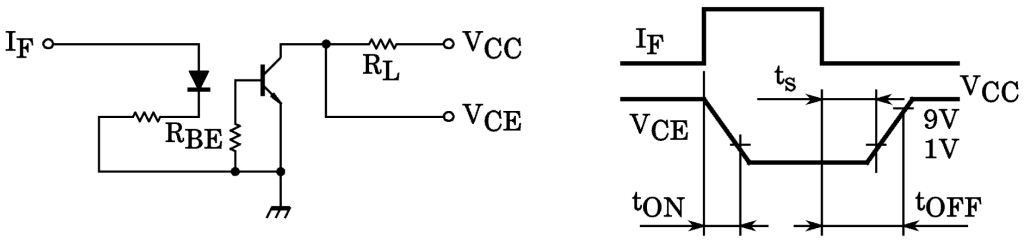
Isolation Characteristics (Ta = 25°C)

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	2500	—	—	V_{rms}
		AC, 1 second, in oil	—	5000	—	
		DC, 1 minute, in oil	—	5000	—	V_{dc}

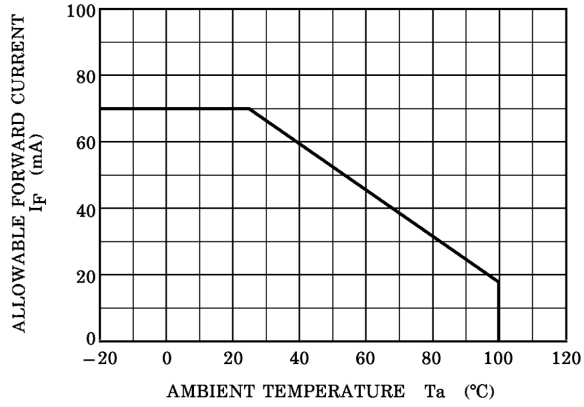
Switching Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Rise time	t_r	V_{CC} = 10 V I_C = 10 mA R_L = 100Ω	—	40	—	μs
Fall time	t_f		—	30	—	
Turn−on time	t_{ON}		—	45	—	
Turn−off time	t_{OFF}		—	35	—	
Turn−on time	t_{ON}	R_L = 180Ω (Fig.1) R_{BE} = open V_{CC} = 10 V, I_F = 10 mA	—	5	—	μs
Storage time	t_s		—	20	—	
Turn−off time	t_{OFF}		—	100	—	
Turn−on time	t_{ON}	R_L = 180Ω (Fig.1) R_{BE} = 10MΩ (TLP571) V_{CC} = 10 V, I_F = 10 mA	—	5	—	μs
Storage time	t_s		—	15	—	
Turn−off time	t_{OFF}		—	60	—	

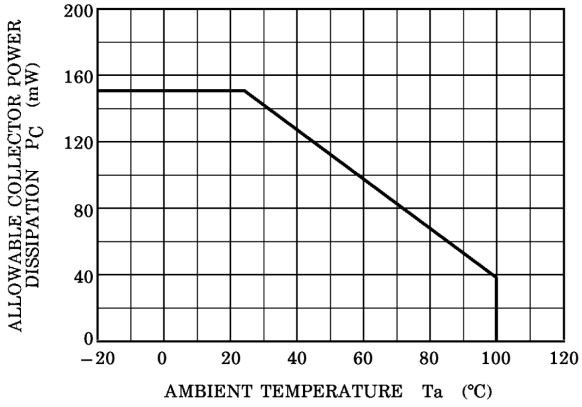
Fig. 1 Switching time test circuit



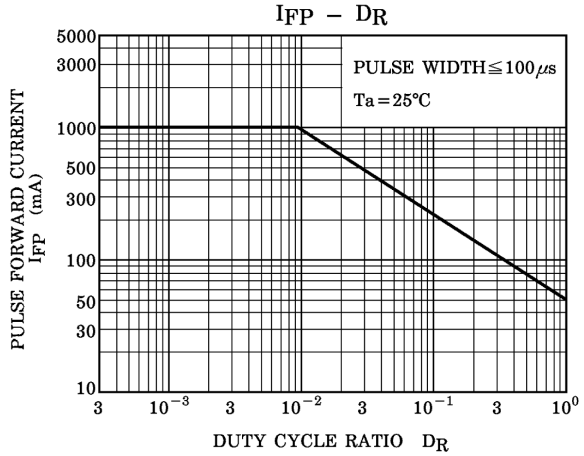
I_F – Ta



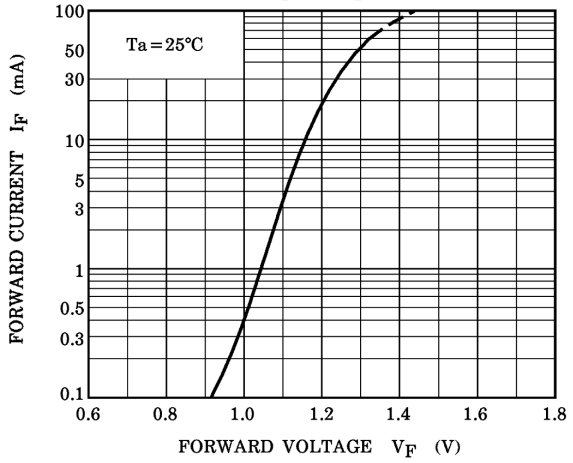
P_C – Ta



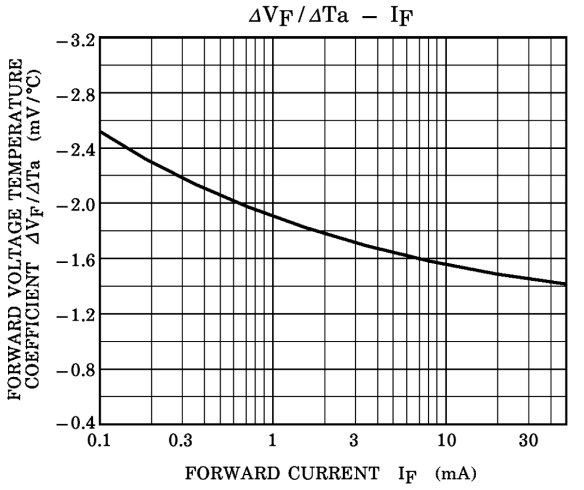
I_{FP} – D_R



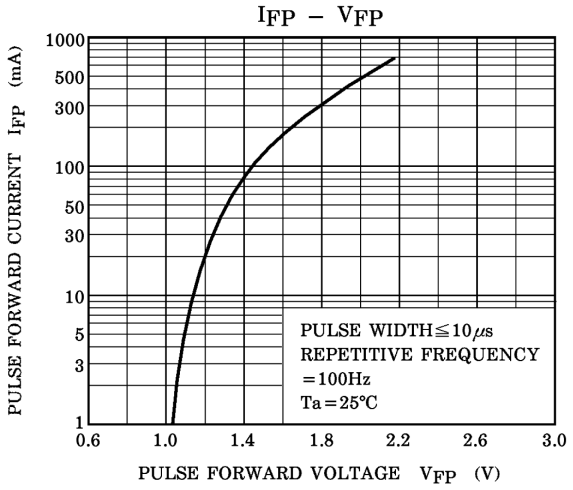
I_F – V_F



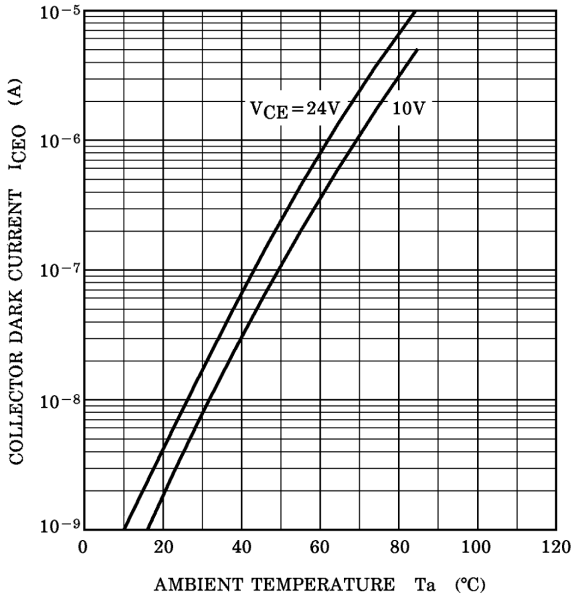
$\Delta V_F / \Delta Ta$ – I_F



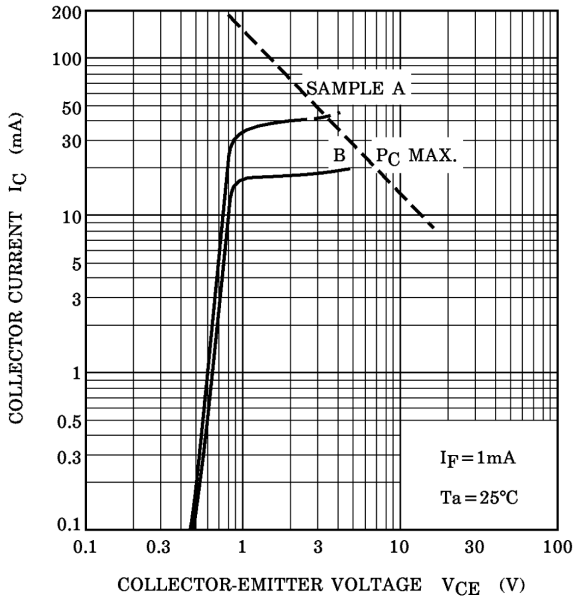
I_{FP} – V_{FP}



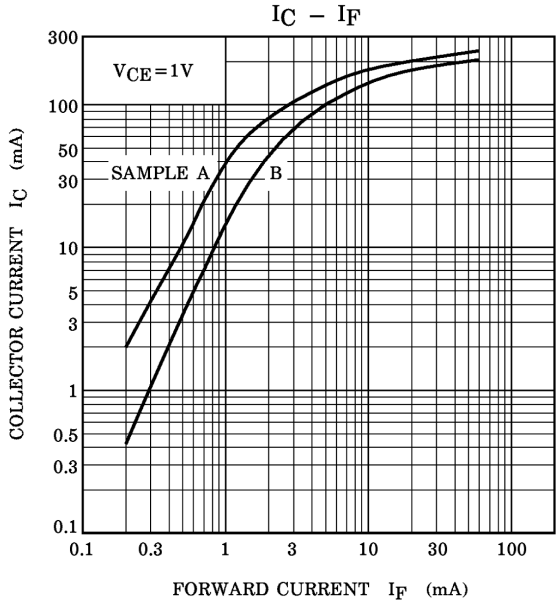
I_{CEO} – Ta



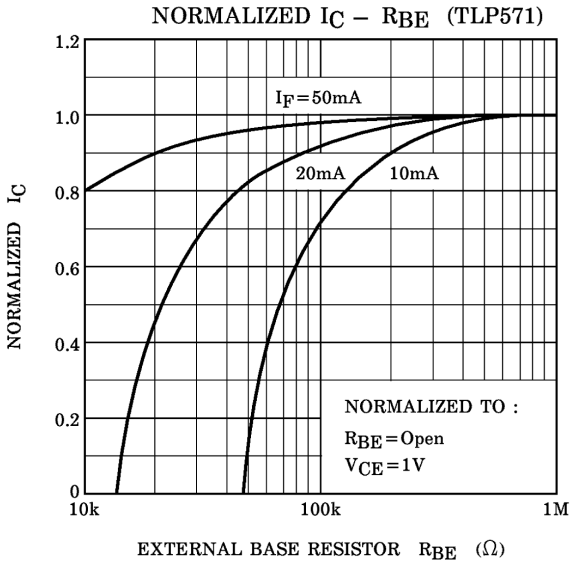
I_C – V_{CE}



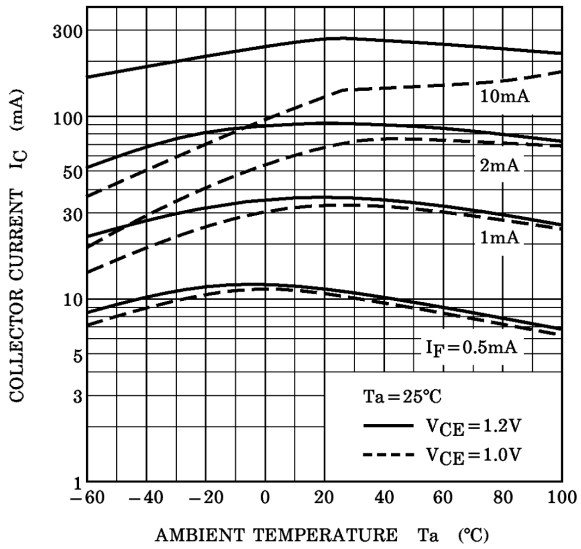
I_C – I_F



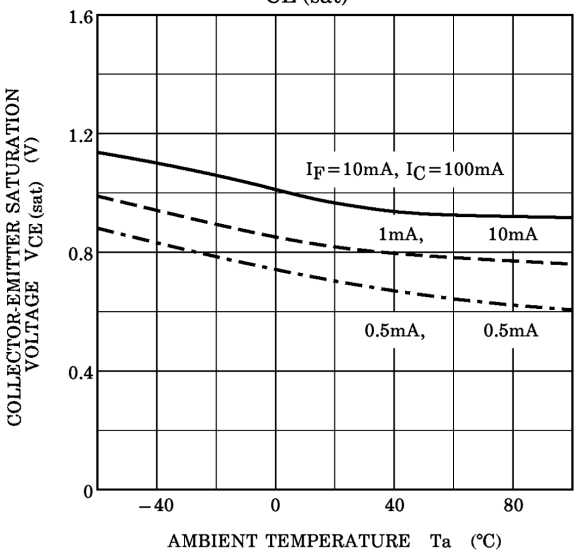
NORMALIZED I_C – R_{BE} (TLP571)



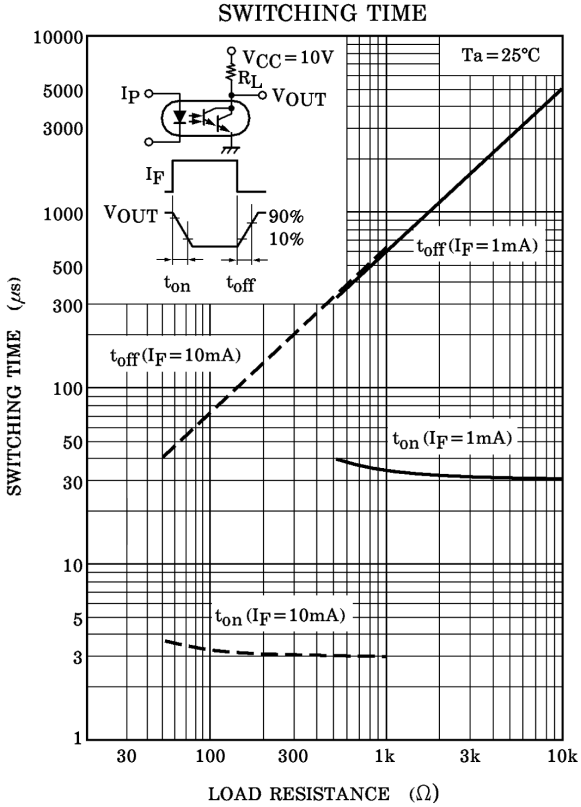
I_C – Ta



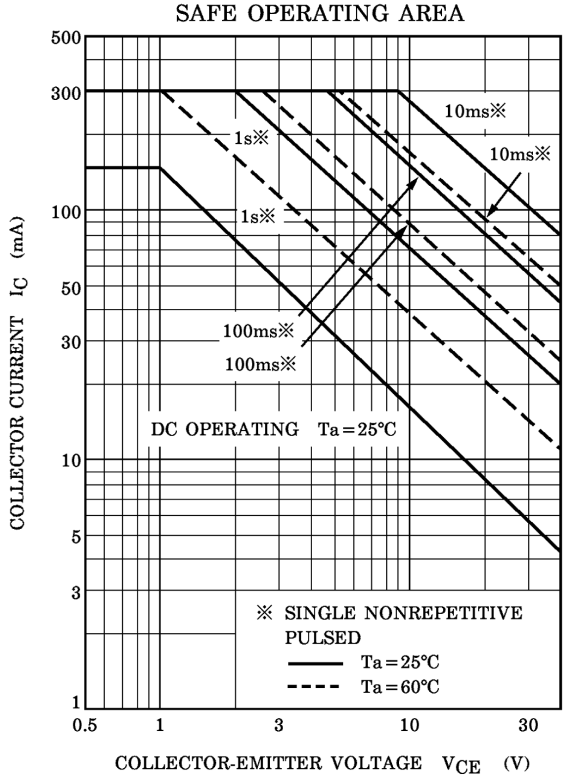
$V_{CE\,(sat)}$ – Ta



SWITCHING TIME



SAFE OPERATING AREA



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